

2013 Harley-Davidson Sportster Models Service Manual

99484-13

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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

2013 Harley-Davidson Sportster Models Service Manual

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2013 Harley-Davidson Sportster Models Service Manual (99484-13)

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

NOTES

ABOUT THIS MANUAL

GENERAL

This service manual has been prepared with 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 SERVICE MANUAL

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

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

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

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

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

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

PREPARATION FOR SERVICE

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), it must first be disarmed. 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, and is placed in italic type. It is recommended that you take special notice of these items.

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

⚠WARNING

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

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

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

PRODUCT REFERENCES

⚠WARNING

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

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

Kent-Moore Products

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

LOCTITE Sealing and THREADLOCKING Products

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

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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	1.5 MAINTENANCE SCHEDULE, General
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR FILTER, XL Models except XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR FILTER, XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.5 MAINTENANCE SCHEDULE, General
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.7 AIR FILTER, XL Models except XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.7 AIR FILTER, XL 1200V
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.24 WHEEL ALIGNMENT, Wheel Alignment
Battery cable connector nut	55-75 **in-lbs**	6.2-8.5 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery positive terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery strap screw	36-60 **in-lbs**	4.1-6.8 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm	1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Front
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.5 MAINTENANCE SCHEDULE, General
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Rear
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Front
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Rear
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear
Chain tensioner nut	20-25 ft-lbs	27.1-33.9 Nm	1.5 MAINTENANCE SCHEDULE, General
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	1.5 MAINTENANCE SCHEDULE, General

FASTENER	TORQUE VALUE		NOTES
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**	10.3-13.6 Nm	1.11 CLUTCH, Adjustment
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	1.19 STEERING HEAD BEARINGS, Fall-Away
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	1.19 STEERING HEAD BEARINGS, Fall-Away
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	1.5 MAINTENANCE SCHEDULE, General
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Headlamp clamp nut: XL 883L/N/R, XR 1200X	120-240 **in-lbs**	14-27 Nm	1.26 HEADLAMP ALIGNMENT, Headlamp: Adjustment
Headlamp horizontal adjustment: XL 1200X/C/C ANV/CP/CA/CB/V	30-35 ft-lbs	40.7-47.5 Nm	1.26 HEADLAMP ALIGNMENT, Headlamp: Adjustment
Headlamp vertical adjustment: XL 1200X/C/C ANV/CP/CA/CB/V	30-35 ft-lbs	40.7-47.5 Nm	1.26 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	1.5 MAINTENANCE SCHEDULE, General
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	1.5 MAINTENANCE SCHEDULE, General
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	1.5 MAINTENANCE SCHEDULE, General
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.18 SPARK PLUGS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	1.5 MAINTENANCE SCHEDULE, General
Spoke nipple	55 **in-lbs**	6.2 Nm	1.8 TIRES AND WHEELS, Wheel Spokes
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.5 MAINTENANCE SCHEDULE, General
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.13 THROTTLE CONTROL, Cable Inspection and Lubrication

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 head bolts 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. Also, check brake pads and discs for wear.
5. Cables for fraying, crimping and free operation.
6. Engine oil and transmission fluid levels.
7. Headlamp, auxiliary/fog lamp, tail lamp, stop lamp, horn and turn signal operation.

SHOP PRACTICES

Repair Notes

General maintenance practices are given in this section.

NOTES

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

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

All required parts or materials can be found in the 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 that will be returned to service inside the vehicle's powertrain such as gears, thrust washers and especially bearings in magnetic parts trays.

REPAIR AND REPLACEMENT PROCEDURES

Hardware and Threaded Parts

Install thread repair inserts when threaded holes in castings are stripped, damaged or not capable of withstanding specified torque.

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

Replace all damaged or missing lubrication fittings.

Use 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

Part Protection

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

Cleaning Process

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

Rust or Corrosion Removal

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

Bearings

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

⚠WARNING

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

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

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

TOOL SAFETY

Air Tools

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

Wrenches

- Never use an extension on a wrench handle.
- If possible, always pull on a wrench handle and adjust your stance to prevent a fall if something suddenly releases.
- Always keep the wrench squarely installed on the fastener.
- Never use a hammer on any wrench other than a STRIKING FACE wrench.
- Discard any wrench with damaged or battered points.
- Never use a pipe wrench to bend, raise or lift a pipe.

DIGITAL TECHNICIAN HARLEY

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% 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% may be used in your motorcycle without affecting vehicle performance. U.S. EPA regulations currently indicate that fuels with 15% 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.
- The only octane booster Harley-Davidson recommends is SCREAMIN' EAGLE SUPER OCTANE BOOST (available only in the U.S.). This is the only octane booster that has been extensively tested and approved for use with Harley-Davidson engines and 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 swallowed, do not induce vomiting. Contact a physician immediately. In case of contact with eyes, immediately flush with water. Contact a physician if irritation persists. (00357c)

NOTICE

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

Engine oil is a major factor in the performance and service life of the engine. Always use the proper grade of oil for the lowest temperature expected before the next scheduled oil change. 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 (Domestic)***	-	-	LED assembly
	XL 883N, XL 1200X/V (HDI)	2	0.35	52441-95
Tail and stop lamp	Tail and stop lamp XL 1200C/C ANV/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 (Domestic XL 883N, XL 1200X/V)**	2	2.25	68168-89A
	Rear (Canada XL 883N, XL 1200X)	-	2.25	68572-64B
	Rear (HDI XL 883R, XL 1200X/V)***	2	-	LED assembly
	Rear (all other models)	2	1.75	68163-84

* XL 1200C/C ANV/CP/CA/CB tail and stop lamp is illuminated with LED's. Replace entire assembly upon failure.
** Functions as turn signal, tail and stop lamps.
*** This is an LED assembly. Replace entire assembly upon failure.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MAINTENANCE SCHEDULE 1.5

GENERAL

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
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm
Chain tensioner nut	20-25 ft-lbs	27.1-33.9 Nm
Primary chain inspection cover	90-120 **in-lbs**	10.2-13.6 Nm
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm
Spark plug	12-18 ft-lbs	16.3-24.4 Nm
Spark plug	12-18 ft-lbs	16.3-24.4 Nm
Spoke nipple	55 **in-lbs**	6.2 Nm

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.

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

DIGITAL TECHNICIAN II

Table 1-4. Regular Service Intervals: 2013 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
Engine oil and filter	Replace	X	X	X	X	X	X	X	X	X	X	X	3, 7
Oil lines and brake system	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 3
Air cleaner	Inspect, service as required		X	X	X	X	X	X	X	X	X	X	7
Tires	Check pressure, inspect tread	X	X	X	X	X	X	X	X	X	X	X	3
Wheel spokes (if equipped)	Check tightness	X	X			X			X			X	1, 5, 7
Primary chain	Check adjustment	X	X	X	X	X	X	X	X	X	X	X	
Transmission lubricant	Replace	X		X		X		X		X		X	7
Clutch	Check adjustment	X	X	X	X	X	X	X	X	X	X	X	1, 7
Drive belt and sprockets	Inspect, adjust belt	X	X	X	X	X	X	X	X	X	X	X	1
Throttle, brake and clutch controls	Check, adjust and lubricate	X	X	X	X	X	X	X	X	X	X	X	1
Jiffy stand	Inspect and lubricate	X	X	X	X	X	X	X	X	X	X	X	1
Fuel lines and fittings	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 3
Fuel filter element	Replace	Replace every 100,000 mi (160,000 km).											1
Brake fluid	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	4
Brake pads and discs	Inspect for wear	X	X	X	X	X	X	X	X	X	X	X	

Table 1-4. Regular Service Intervals: 2013 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
Front brake lever pin	Inspect		X	X	X	X		X	X	X	X		1, 6
Front brake lever pin	Lubricate						X					X	1, 6
Brake caliper pins	Inspect		X	X	X	X		X	X	X	X		1, 6
Brake caliper pins	Lubricate						X					X	1, 6
Brake caliper boots and bushings	Inspect		X	X	X	X		X	X	X	X		1, 6
Brake caliper boots and bushings	Replace						X					X	1, 6
Rear master cylinder outer boot	Inspect		X	X	X	X	X	X	X	X	X	X	1, 6
Brake components	Replace brake rubber components in master cylinders and calipers						X					X	1, 6
Brake components	Lubricate master cylinder pistons						X					X	1, 6
Spark plugs	Replace							X					8
Electrical equipment and switches	Check operation	X	X	X	X	X	X	X	X	X	X	X	
Front forks	Rebuild											X	1, 9
Steering head bearings	Adjust	X				X				X			1, 2
Rear fork bearings		Inspect every 30,000 mi (48,000 km)											1
Critical fasteners	Check tightness	X		X		X		X		X		X	1
Engine mounts and stabilizer links	Inspect			X		X		X		X		X	1
Battery		Check battery and clean connections annually.											
Exhaust system	Inspect for leaks, cracks, and loose or missing fasteners or heat shields	X	X	X	X	X	X	X	X	X	X	X	3, 7
Road test	Verify component and system functions	X	X	X	X	X	X	X	X	X	X	X	

NOTES:

1. Should be performed by an authorized Harley-Davidson dealer, unless you have the proper tools, service data and are mechanically qualified.
2. Disassemble, lubricate and inspect every 30,000 mi (48,000 km).
3. Perform annually or at specified intervals, whichever comes first.
4. Replace DOT 4 hydraulic brake fluid and flush system every two (2) years.
5. 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 are equipped with spoke wheels. Consult appropriate topic in service manual.
6. Replace every four (4) years or at specified intervals, whichever comes first.
7. 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).
8. Replace every two (2) years or at specified intervals, whichever comes first.
9. Disassemble, inspect, rebuild forks and replace fork oil every 50,000 mi (80,000 km).

Table 1-5. Quick Reference Maintenance Chart

ITEM SERVICED	SPECIFICATION	DATA
Air cleaner	See 1.7 AIR FILTER	
	Air filter screw torque: XL Models	40-60 **in-lbs** (4.5-6.8 Nm)
	Air cleaner cover screw torque: XL Models	36-60 **in-lbs** (4.1-6.8 Nm)
Battery	Lubricant	Electrical Contact Lubricant
	Terminal screw torque	60-70 **in-lbs** (6.8-7.9 Nm)

Table 1-5. Quick Reference Maintenance Chart

ITEM SERVICED	SPECIFICATION	DATA
Brake fluid reservoir level (Check sight glass. If fluid is low, remove reservoir cover and re-check.)	Brake fluid type	DOT 4 Brake Fluid
	Proper fluid level (front brake)	1/4 in (6.35 mm) from the top of the reservoir
	Proper fluid level (rear brake)	Upper fluid level in reservoir
	Front master cylinder reservoir cover screw torque	9-17 **in-lbs** (1.0-2.0 Nm)
Brake pad linings and discs	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)
	Clutch inspection cover screw torque	90-120 **in-lbs** (10.3-13.6 Nm)
Clutch and throttle cables	Lubricant	Harley Lube
	Handlebar clamp screw torque	12-18 ft-lbs (16.3-24.4 Nm)
	Switch housing screw torque	35-45 **in-lbs** (4.0-5.1 Nm)
Critical fasteners	See 1.20 CRITICAL FASTENERS.	
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 883L/XL 883N/XL 1200X/XL 1200V/XL 1200C/C ANV/XL 1200CP/XL 1200CA/XL 1200CB: 1/4-5/16 in (6.35-7.94 mm)
		XL 883R: 9/16-5/8 in (14.3-15.9 mm)
	Belt deflection measurement taken midway between rear sprocket and idler	XR 1200X: 1/4-3/8 in (6.4-9.5 mm)
Engine idle speed	Idle speed	950-1050 rpm
Engine mounts/isolators and stabilizers	See 2.26 FRONT ENGINE MOUNT/ISOLATOR, 2.27 REAR ENGINE MOUNT/ISOLATOR, and 2.25 STABILIZER LINKS.	
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: XL Models	Type	Type "E" Hydraulic Fork Oil
	Amount	See 2.19 FRONT FORK: XL MODELS, Assembly.
Front fork oil: XR 1200X	Type	Big Piston Fork Oil
	Amount	See 2.20 FRONT FORK: XR 1200X, 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	Genuine Harley-Davidson Formula+ Transmission and Primary Chaincase Lubricant
Spark plugs: XL Models	Type	6R12
	Gap	0.038-0.043 in (0.96-1.09 mm)
	Torque	12-18 ft-lbs (16.3-24.4 Nm)

DIGITAL TECHNICIAN

Table 1-5. Quick Reference Maintenance Chart

ITEM SERVICED	SPECIFICATION	DATA
Spark plugs: XR 1200X	Type	10R12X
	Gap	0.032-0.038 in (0.81-0.97 mm)
	Torque	12-18 ft-lbs (16.3-24.4 Nm)
Steering head bearings	Lubricant	Special Purpose Grease
Tire condition and pressure	XL 883L	Front: 36 psi (248 kPa) Rear: 42 psi (290 kPa)
	XL Models (except XL 1200X/C/C ANV/CP/CA/CB)	Front: 30 psi (207 kPa) Rear: 40 psi (276 kPa)
	XL 1200X/C/C ANV/CP/CA/CB	Front: 36 psi (248 kPa) Rear: 40 psi (275 kPa)
	XR 1200X	Front: 36 psi (248 kPa) Rear: 42 psi (290 kPa)
	Wear	Replace tire if 1/32 in (0.8 mm) or less of tread pattern remains.
Wheel spokes	Spoke nipple torque	55 **in-lbs** (6.2 Nm)

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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
Anti-Seize Lubricant	98960-97	1 oz squeeze tube
Big Piston Fork Oil (Sportster XR only)	62600029	16 oz bottle
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	99861-02	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 (V-Rod only)	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
	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	94971-09	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		

ENGINE OIL AND FILTER 1.6

CHECKING AND ADDING OIL

Removing and Replacing Oil Filler Cap

1. Park the motorcycle on level ground on the jiffy stand.
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. Insert 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.

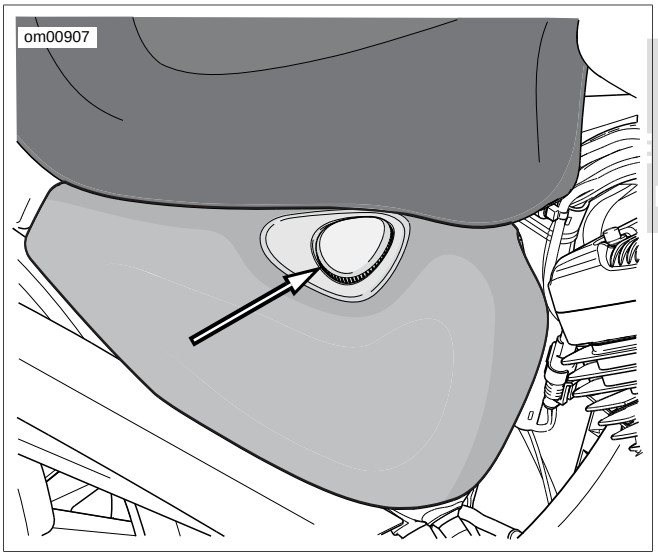
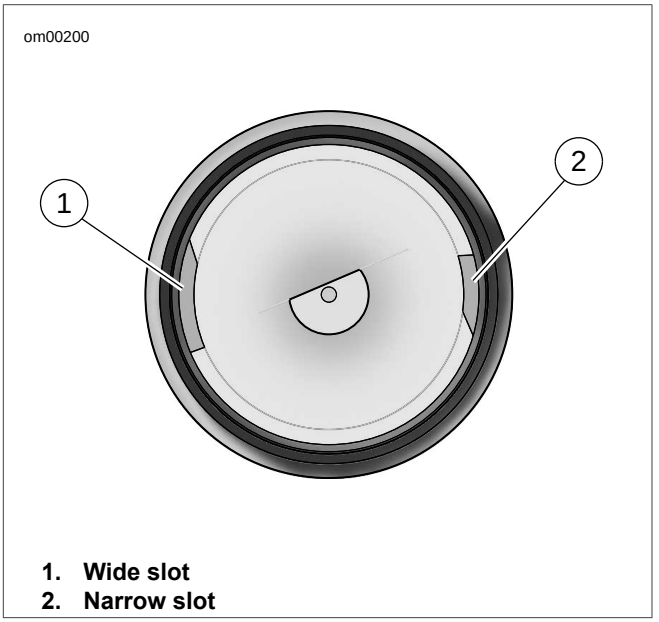


Figure 1-1. Filler Cap Location



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 on the jiffy stand.
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 on the jiffy stand.
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)

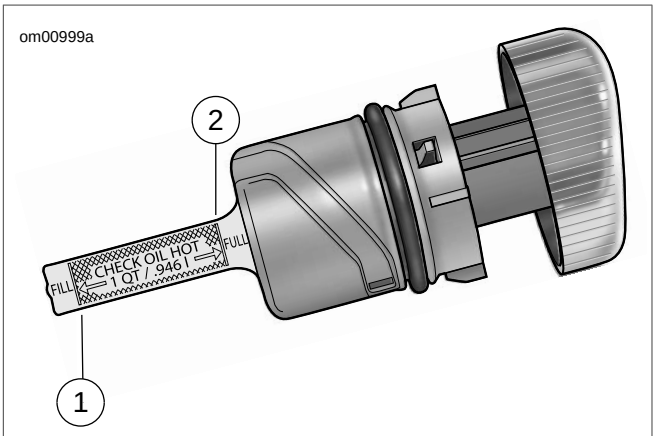
NOTES

- *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.*

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)

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. **At (or 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

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.*

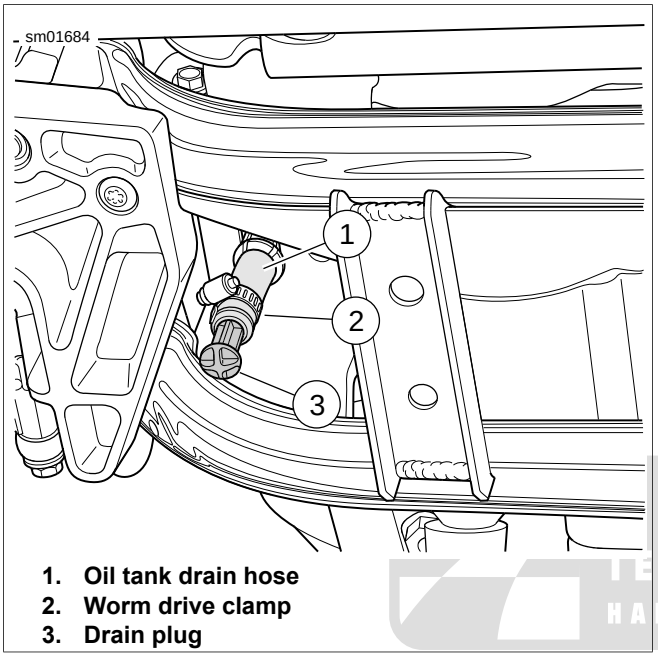
⚠WARNING

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)

Draining Oil Tank

1. Run engine until engine oil has reached normal operating temperature.

2. Remove dipstick from oil tank. Oil will drain faster when the dipstick is removed.
3. See Figure 1-4. Place a suitable container directly under the drain hose (1) at the bottom rear of the engine crankcase. The container must be able to hold approximately 3.0 qt (2.8 L).
4. Loosen worm drive clamp (2). Pull drain plug (3) from end of drain hose. Completely drain engine oil from oil tank. Drain engine crankcase only if needed.
5. Install drain plug into end of drain hose. Tighten worm drive clamp to 6-10 **in-lbs** (0.7-1.1 Nm).



1. **Oil tank drain hose**
2. **Worm drive clamp**
3. **Drain plug**

Figure 1-4. Oil Tank Drain Hose

Removing Oil Filter

1. Place a drain pan beneath front of engine crankcase.

NOTICE

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

2. See Figure 1-5 and Figure 1-6. Remove oil filter using HARLEY-DAVIDSON OIL FILTER WRENCH (Part No. HD-42311) or HARLEY-DAVIDSON OIL FILTER WRENCH (Part No. HD-44067-A). Turn oil filter counterclockwise to remove from filter mount.
3. Drain oil filter into drain pan. Discard oil filter.
4. Clean any oil spills off crankcase and frame.

NOTE

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

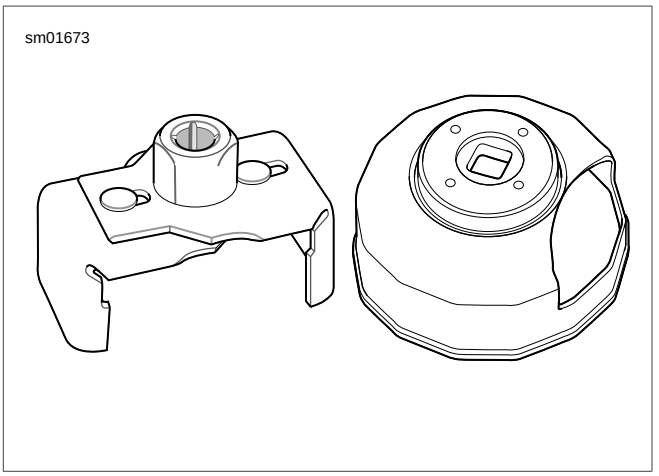
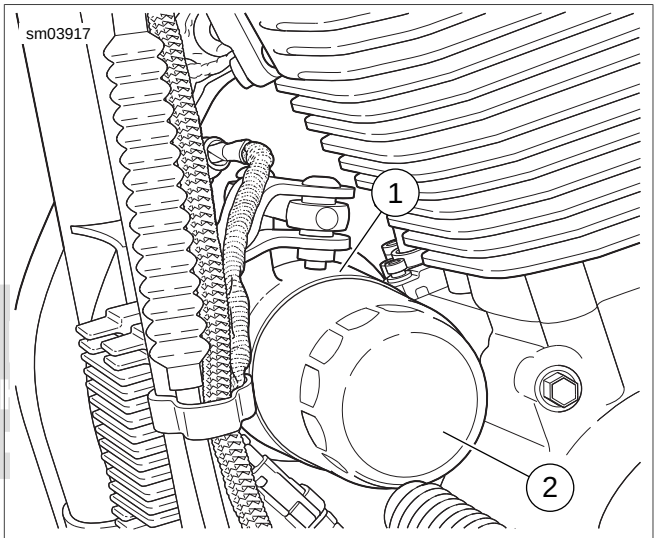


Figure 1-5. Oil Filter Wrenches



1. **Oil filter mount**
2. **Oil filter**

Figure 1-6. Oil Filter

Installing Oil Filter

NOTE

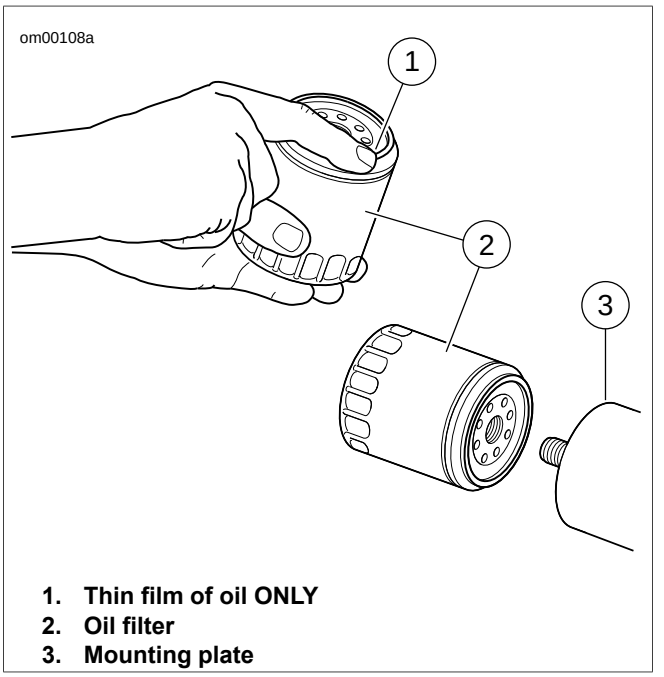
Minimize the time required for buildup of oil pressure when engine is first started. Partially fill oil filter before installation.

1. Pour about 4 fl oz (120 mL) of fresh, clean engine oil into **new** oil filter. Allow time for oil to soak into filter element.
2. See Figure 1-7. Wipe filter gasket contact surface of oil filter mount with a clean cloth. Surface should be smooth and free of any debris or old gasket material.
3. Apply a thin film of oil to gasket contact surface on crankcase (3) and gasket surface of **new** oil filter.

NOTE

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

4. Install **new** oil filter. Screw filter clockwise onto adapter until gasket contacts the filter mount surface. Then hand tighten an additional 1/2-3/4-turn to secure the oil filter.



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

Figure 1-7. Applying Thin Oil Film

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)

NOTE

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.

1. Refer to Table 1-2. Always use the proper grade of oil for the lowest expected air temperature before the next regularly scheduled oil change. Pour 2.0 qt (1.9 L) of oil into engine oil tank.
2. Install dipstick in oil tank. Verify cap is fully seated.
3. See Figure 1-8. Start engine. Verify that oil pressure signal lamp turns off when engine speed is 1000 rpm or above. Turn engine off.
4. Check for oil leaks at oil filter and oil tank drain hose. Perform oil level hot check.

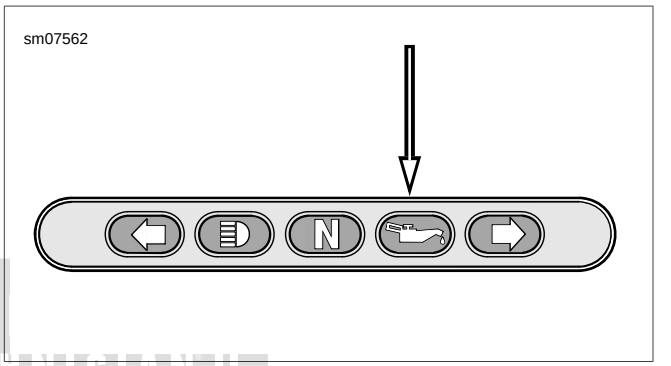


Figure 1-8. Oil Pressure Indicator

TECHNICIANS HARLEY-DAVIDSON®

AIR FILTER 1.7

XL MODELS EXCEPT XL 1200V

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 1-9. Remove the two fasteners (1) and the trim insert (2) from the air cleaner cover (3).
2. Remove the air cleaner cover from the backplate. Remove air cleaner seal (4) from the cover.
3. Remove three fasteners (5). Remove the air filter (6) and the gasket (7) from the backplate. Discard the gasket.
4. Inspect the O-rings. 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)

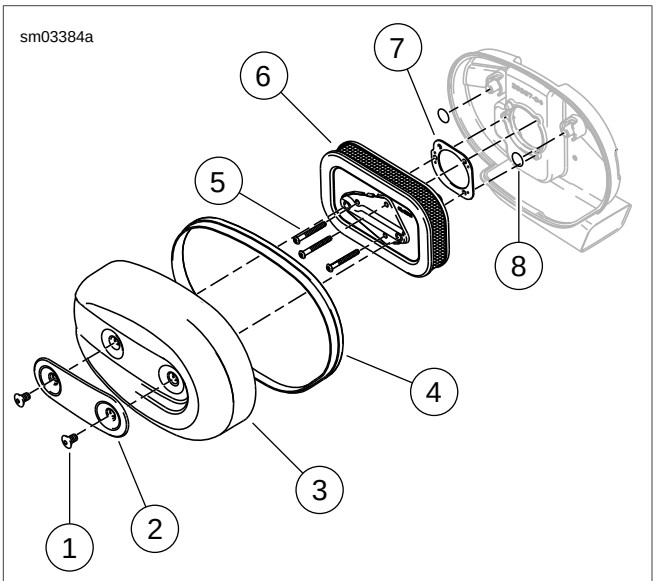
Installation

1. See Figure 1-9. Apply a thin coat of engine oil or light grease to the O-rings (8).
2. Position a **new** gasket (7) 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 (5). Install the air filter (6) onto the backplate. Tighten to 40-60 **in-lbs** (4.5-6.8 Nm).
4. Fit air cleaner seal (4) onto air cleaner cover (3). Verify alignment around cover edge.
5. Install air cleaner cover onto backplate. Do not pinch or distort seal.
6. Install trim insert (2) and cover assembly with fasteners (1). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **Fastener**
2. **Trim insert**
3. **Air cleaner cover**
4. **Air cleaner seal**
5. **Fastener**
6. **Air filter element**
7. **Gasket**
8. **O-ring**

Figure 1-9. Air Filter Element: XL Models except XL 1200V

XL 1200V

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 1-10. Remove the fastener (1) from the air cleaner cover (2).
2. Remove the cover from the backplate. Remove air cleaner seal (3) from the cover.
3. Remove three fasteners (4). Remove the air filter (5) from the backplate.
4. Inspect the O-rings. 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)

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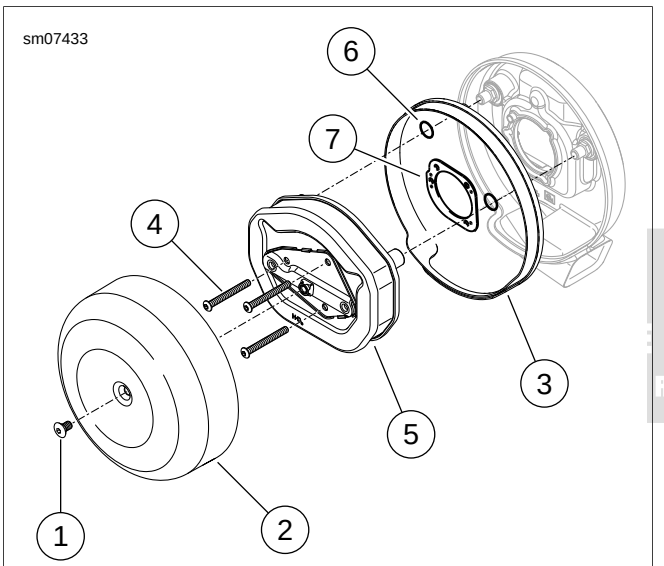
Installation

1. Apply a thin coat of engine oil to the O-rings (6).
2. Install a **new** gasket (7) on the air cleaner. Line up the gasket holes with the backplate holes.

NOTE

Install the filter (5) with THIS SIDE OUT on top.

3. See Figure 1-10. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to each of three air filter fasteners (4).
4. Install the air filter onto the backplate. Tighten to 40-60 **in-lbs** (4.5-6.8 Nm).
5. Fit air cleaner seal (3) onto air cleaner cover (2). Verify alignment around cover edge.
6. Install air cleaner cover onto backplate. Do not pinch or distort seal.
7. Install cover. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **Screw**
2. **Cover**
3. **Seal**
4. **Screw (3)**
5. **Filter**
6. **O-ring**
7. **Gasket**

Figure 1-10. Air Filter Element: XL 1200V

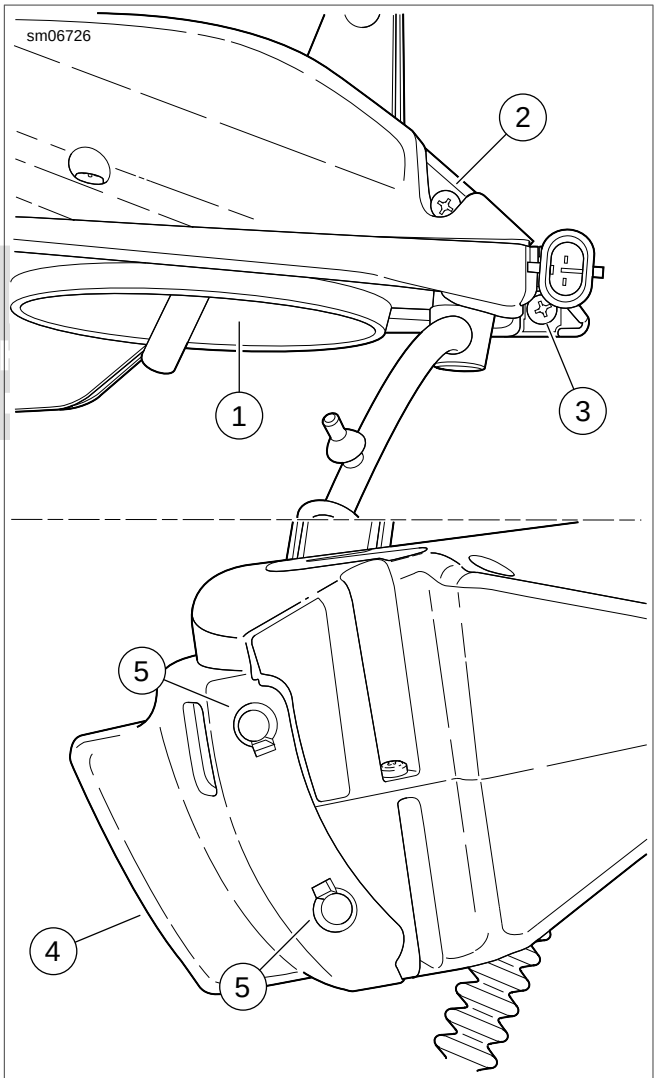
XR 1200X

Removal

WARNING

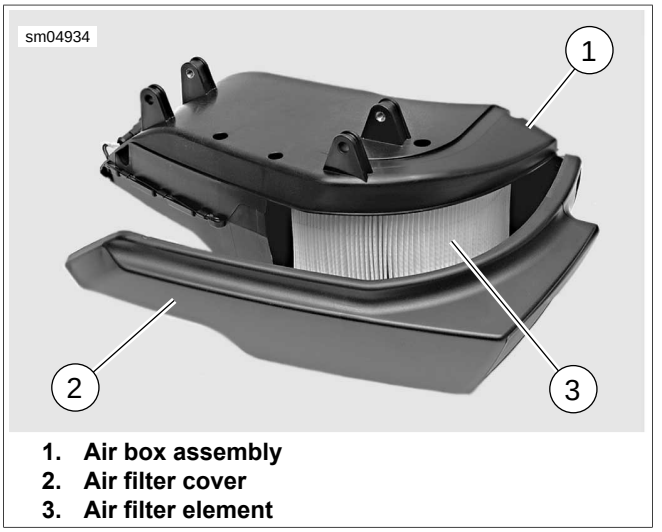
Stop the engine when refueling or servicing the fuel system. Do not smoke or allow open flame or sparks near gasoline. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00002a)

1. Remove the fuel tank. See 4.5 FUEL TANK: XR 1200X.
2. Remove the air box. See 1.7 AIR FILTER, XR 1200X.
3. See Figure 1-11. Remove the two screws (2, 3) securing the air filter cover (4) to air box (1).
4. Using a small flat blade screwdriver, gently pry two button head clips (5) securing air filter cover to air box. Discard button head clips.
5. See Figure 1-12. Gently pull rear end of air filter cover (2) away from air box. Disengage front of air filter cover from the air box and set the cover aside.
6. See Figure 1-13. Using a flat blade screwdriver, gently pry the lower front corner of the filter (2) out of the air box. Work screwdriver around bottom of filter gasket (4) to free the filter.
7. Carefully pull the filter out of the air box.
8. Clean the inside of the air box housing and cover.
9. Inspect the air filter seal. Replace if necessary.



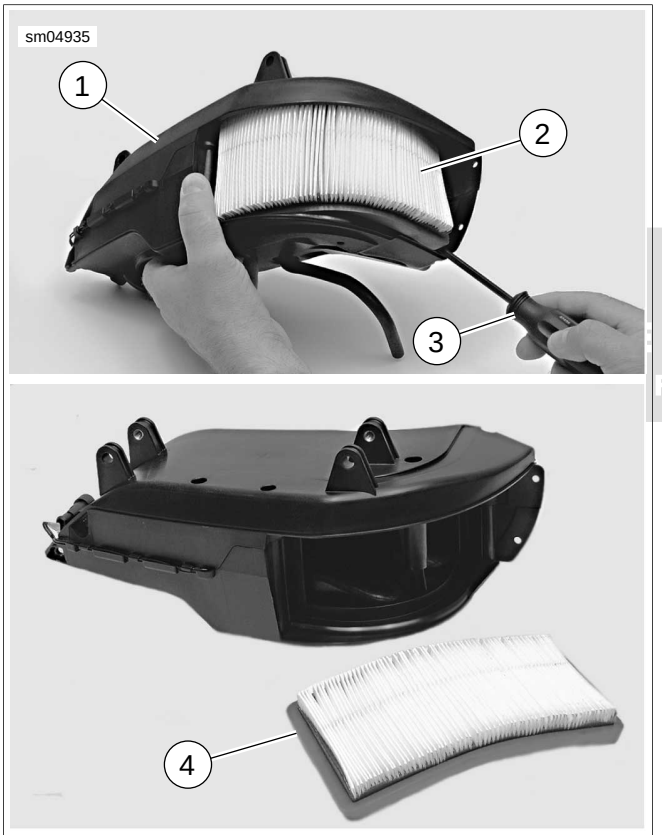
1. **Air box assembly**
2. **Screw**
3. **Screw**
4. **Air filter cover**
5. **Button head clip (2)**

Figure 1-11. Unbolting Air Filter Cover



1. **Air box assembly**
2. **Air filter cover**
3. **Air filter element**

Figure 1-12. Removing Air Filter Cover



1. **Air box assembly**
2. **Air filter element**
3. **Screwdriver**
4. **Gasket (built into air filter element)**

Figure 1-13. Removing Air Filter Element

Installation

1. See Figure 1-13. Form a **new** air filter into a curved shape. Slide top of air filter up into opening in air box. Top of the air filter must fit into channel in top of air box.
2. Press bottom and ends of air filter into air box. The air filter must fit into the air box opening.
3. See Figure 1-12. Position front of air filter cover (2) onto air box. Do not install button head clips at this time.
4. **Active Intake Models:** See Figure 1-15.
   a. Verify that the active intake connector wiring harness (4) is in the air box recess (5).
   b. Position the breather hose assembly inside the to air box. The breather hose cannot interfere with the active air solenoid flapper.

NOTE

Do not pinch the active intake connector wiring harness with the air filter cover.

5. Install rear of air filter cover (2) onto air box. Secure with two screws.
6. Install **new** button head clips. Press in firmly.
7. Install the air box. See 1.7 AIR FILTER, XR 1200X.
8. Install the fuel tank. See 4.5 FUEL TANK: XR 1200X.

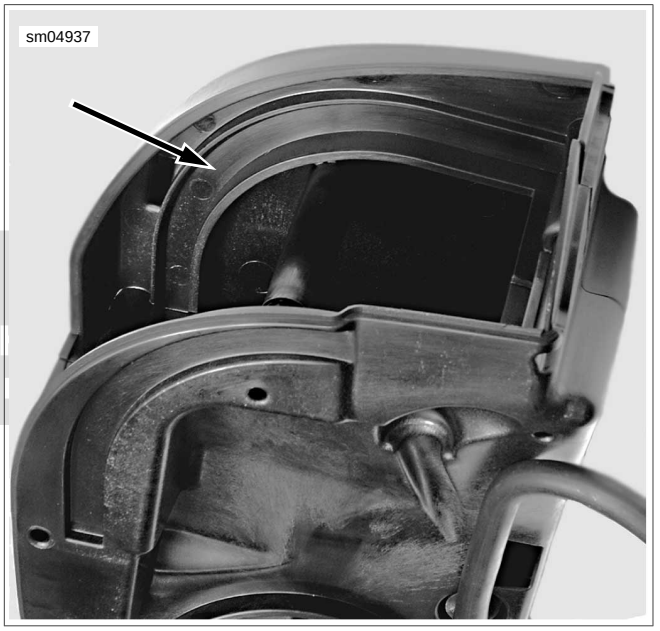
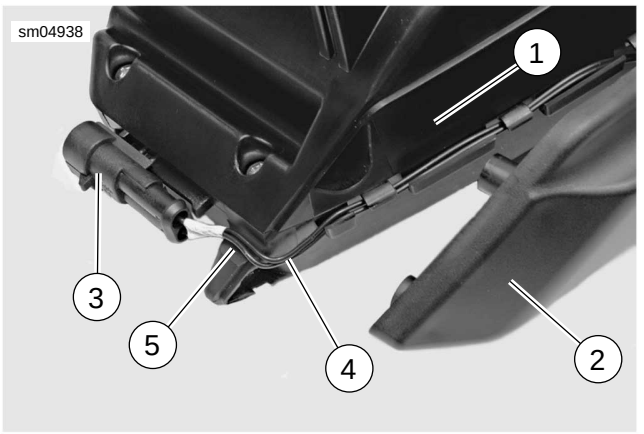


Figure 1-14. Filter Element Channel



1. **Air box assembly**
2. **Air filter cover**
3. **Active intake connector [178] (if equipped)**
4. **Wiring harness**
5. **Recess**

Figure 1-15. Installing Air Filter Cover

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.

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. Air Pressure (cold): 2013 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/C ANV	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 1200V	Front	30	207
	Rear	40	276
XL 1200X	Front	36	248
	Rear	40	276
XR 1200X	Front	36	248
	Rear	42	290

TIRE REPLACEMENT

Tread Wear

⚠WARNING

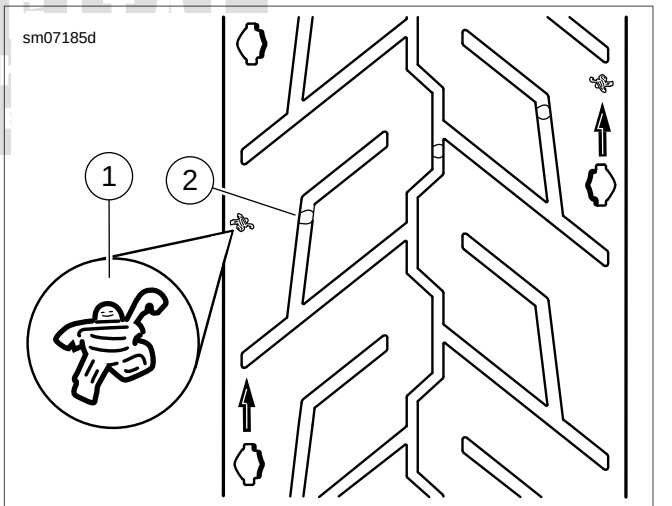
Replace tire immediately with a Harley-Davidson specified tire when wear bars become visible or only 1/32 in (0.8 mm) tread depth remains. Riding with a worn tire could result in death or serious injury. (00090c)

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.

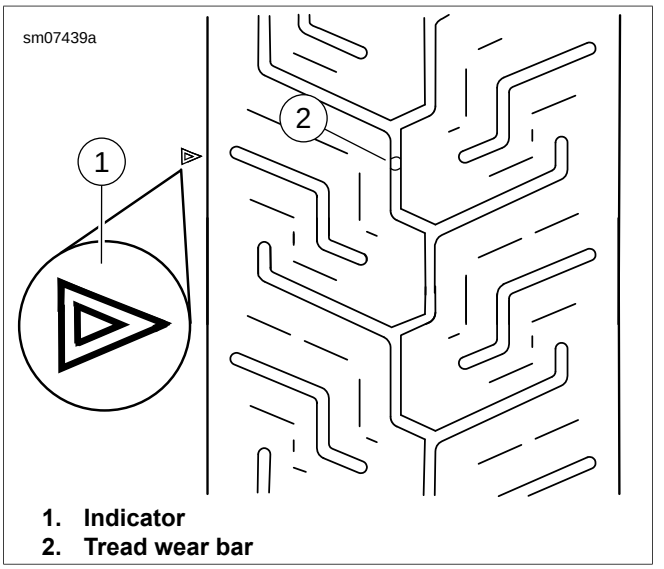
Replace the tires with **new** tires before the tread wear bars appear:

- See Figure 1-16 or Figure 1-17. 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 1-16. Tread Pattern: Michelin Tires



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

Figure 1-17. 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: 2013 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 1200C ANV XL 1200CP XL 1200CA XL 1200CB	F	Michelin Scorcher "31" 130/90B16
	R	Michelin Scorcher "31" 150/80B16
XL 1200V	F	Dunlop D402F MH90 21 M/C 54H WW
	R	Dunlop D401 150/80B16 M/C 71H WWW
XR 1200X	F	Michelin Scorcher "11F" 120/70ZR18
	R	Michelin Scorcher "11" 180/55ZR17

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 or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

Identify Wheel Spoke Groups

NOTE

Spokes are grouped in sets of four.

1. Raise wheel with a suitable lifting device.
2. See Figure 1-18. 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 1-18. Starting with the first group of spokes, loosen spoke (1) using SPOKE NIPPLE WRENCH (Part No. HD-94681-80) 1/4 turn.
2. Using SPOKE TORQUE WRENCH (Part No. HD-48985) tighten spoke (1) to the value listed in Table 1-9.
   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 then 1/4 turn past alignment mark.
3. Repeat previous two steps for spoke (4) in the same group.
4. Continue around the wheel checking spokes 1 and 4 until all groups are done.
5. Repeat procedure for spokes (2, 3) in each group.

NOTE

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

6. Check spokes, if any, that were labeled as not reaching the proper torque value after tightening 1/4 turn past alignment mark.
   a. Loosen spoke 1/4 turn past original alignment mark using SPOKE NIPPLE WRENCH (Part No. HD-94681-80).
   b. While tightening, if the torque wrench clicks before the alignment marks align, continue to turn the spoke nipple until the marks align.
   c. If the alignment marks align and the torque specification has not been reached, continue to tighten the spoke nipple until the correct torque is achieved, but do not turn spoke nipple more then 1/4 turn past alignment mark.
7. True the wheel. See 2.7 CHECKING AND TRUING WHEELS.

Table 1-9. Spoke Nipple Torque Specification

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

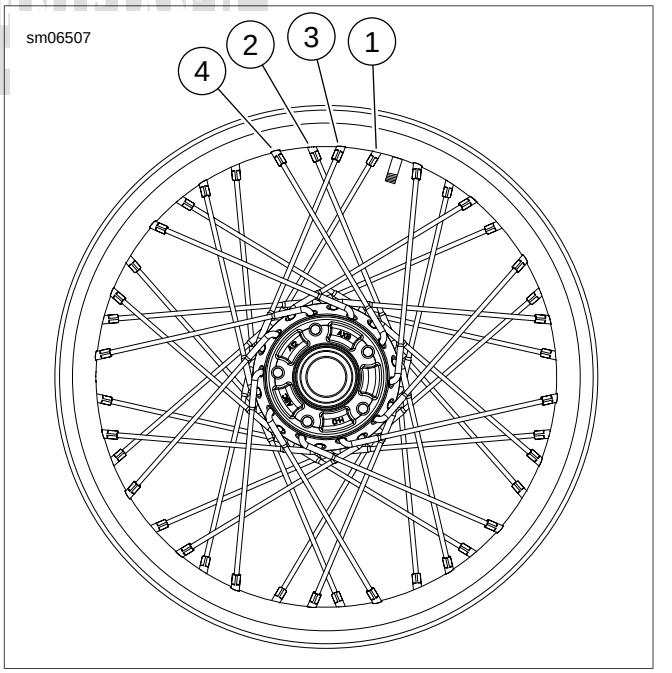


Figure 1-18. Tightening Laced Wheels (typical)

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 1-19. Remove the primary chain inspection cover (1).

NOTE

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

3. See Figure 1-20. Through the inspection opening, measure chain free play at the tightest position.

NOTE

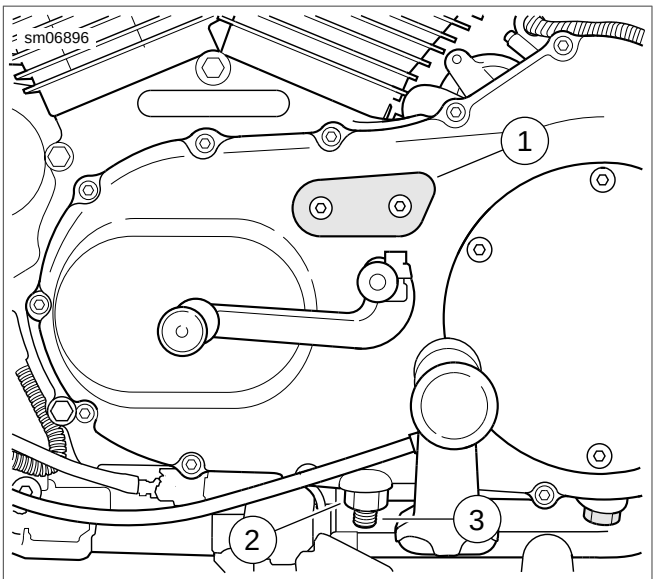
***Factory Setting:** The factory sets initial cold engine free play to 1/4-3/8 in (6.35-9.53 mm). With the engine cold, measure free play on a primary chain that has never been adjusted:*

- *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.*

NOTICE

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

4. If the measurement is not in specification, adjust the primary chain. Refer to Table 1-10.
   a. See Figure 1-19. 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 and 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: XL MODELS or 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X.
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 1-19. Primary Chain Inspection Cover and Adjuster

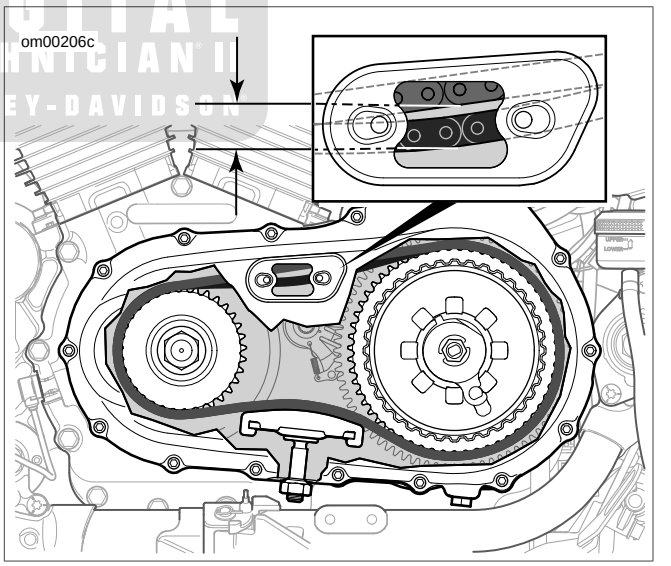


Figure 1-20. Primary Chain Free Play

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

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON

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. Ride motorcycle until engine is warmed up to normal operating temperature.

NOTE

Support motorcycle upright to equalize lubricant level in the transmission compartments.

2. Position motorcycle upright.

⚠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 foot controls:
   a. **XL Models with Mid-mount Controls:** Remove left side rider footrest and mounting bracket assembly. See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **XR 1200X:** Remove left side rider footrest, mounting bracket assembly, and shift linkage. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
5. See Figure 1-21. Remove screws with washers and remove clutch inspection cover (1).
6. See Figure 1-22. Verify that lubricant level is even with bottom of clutch diaphragm spring (1).

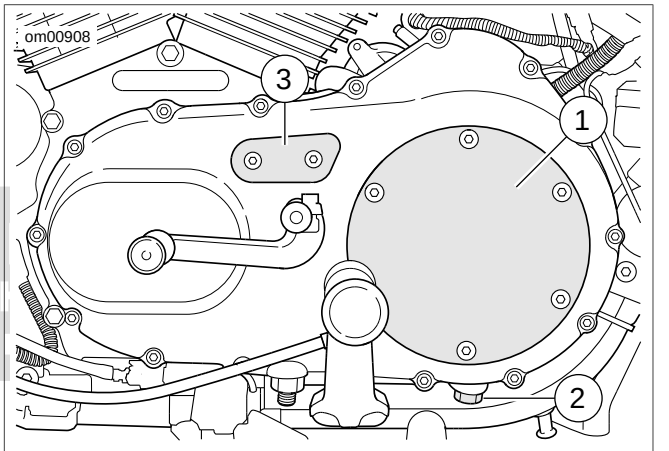
NOTICE

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

NOTICE

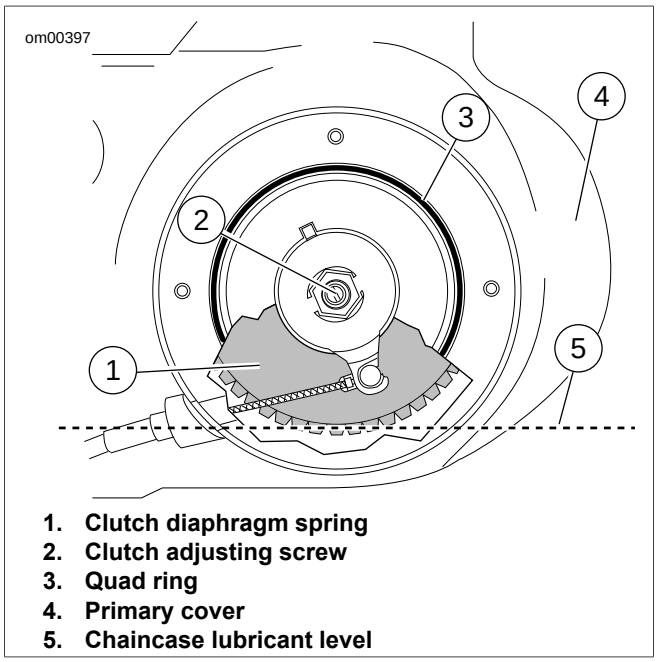
Do not overfill the primary chaincase with lubricant. Overfilling can cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle. (00199b)

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 a **new** quad ring. Verify that the quad ring is fully seated in groove of primary cover.
   b. See Figure 1-23. Install cover and tighten screws in sequence to 90-120 **in-lbs** (10.3-13.6 Nm).
9. Install left side rider footrest:
   a. **XL Models with Mid-mount Controls:** Install left side rider footrest and mounting bracket assembly. See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **XR 1200X:** Install left side rider footrest, mounting bracket assembly, and shift linkage. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
10. Install main fuse.
11. Run engine. Check for leaks.



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

Figure 1-21. Primary Cover: XL Model



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

Figure 1-22. 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. Ride motorcycle until engine is warmed up to normal operating temperature.
2. Turn the engine off and position motorcycle on jiffy stand. This will allow the chaincase lubricant to 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. Remove main fuse.
4. See Figure 1-21. Position a suitable container under transmission drain plug (2).
5. Remove drain plug. Drain lubricant.
6. Position the motorcycle straight up and level. This allows additional fluid to be drained from clutch compartment.

NOTE

Dispose of lubricant in accordance with local regulations.

NOTICE

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

7. Clean magnetic drain plug. Replace O-ring if damaged.
8. Apply LOCTITE 565 THREAD SEALANT and install drain plug. Tighten to 14-30 ft-lbs (19.0-40.7 Nm).
9. Remove the clutch inspection cover.
10. See Figure 1-22. Add 1.00 qt (0.95 L) of FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT through clutch inspection cover opening. Verify that lubricant level is even with bottom of clutch diaphragm spring (1).
11. Install the clutch inspection cover:
    a. Install a **new** quad ring. Verify that the quad ring is fully seated in groove of the primary cover.
    b. See Figure 1-23. Install cover and tighten screws in sequence to 90-120 **in-lbs** (10.3-13.6 Nm).
12. Install main fuse.
13. Run engine. Check for lubricant leaks.

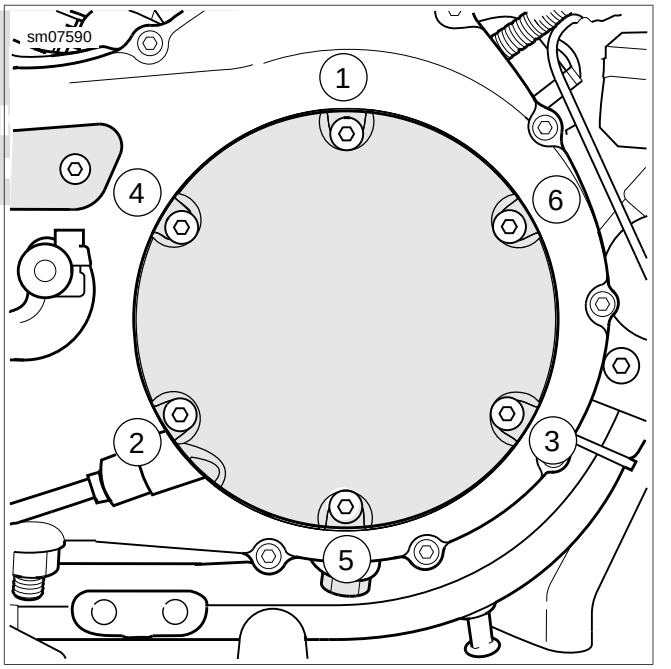


Figure 1-23. Clutch Inspection Cover Torque Sequence

CLUTCH 1.11

ADJUSTMENT

FASTENER	TORQUE VALUE	
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 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. **XL Models:** See Figure 1-24. Remove cable adjuster from the frame retaining clips.
3. See Figure 1-25. 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.

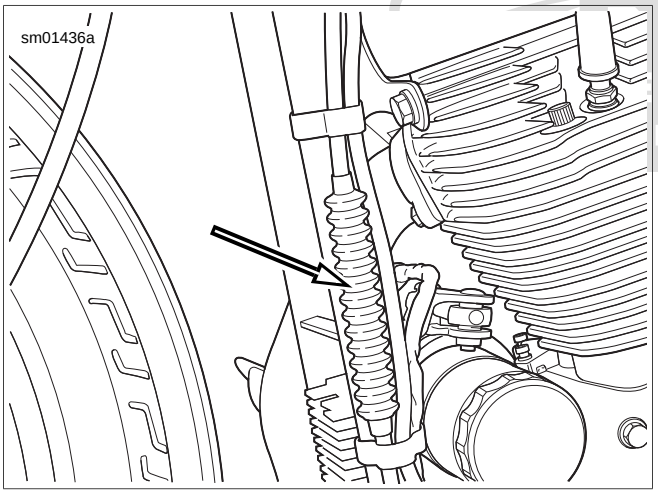
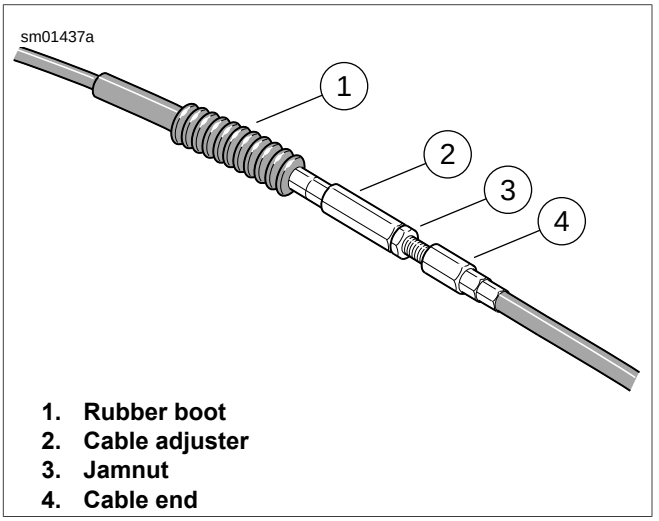


Figure 1-24. Clutch Cable Adjuster Location: XL Models

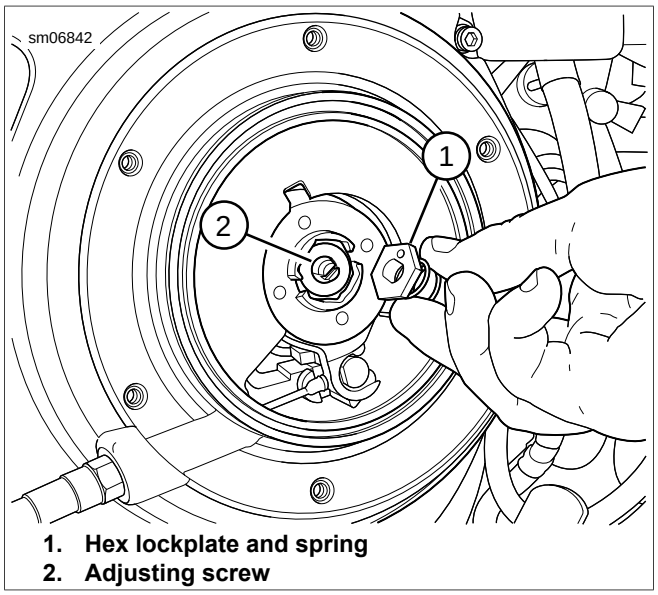


1. **Rubber boot**
2. **Cable adjuster**
3. **Jamnut**
4. **Cable end**

Figure 1-25. Clutch Cable Adjuster

Clutch Adjustment

1. Access the clutch inspection cover:
   a. **XL Models with Mid-mount Controls:** Remove the clutch side rider footrest and mounting bracket assembly. See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **XR 1200X:** Remove the clutch side rider footrest and shifter mounting bracket and a shift linkage pivot bolt. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
2. Remove the clutch inspection cover. Discard the quad ring.
3. See Figure 1-26. Remove the hex lockplate with the spring (1) from the clutch adjusting screw (2).
4. Turn the adjusting screw counterclockwise until resistance is felt and then turn the adjusting screw clockwise 1/4 turn.
5. Install the hex lockplate with the spring and 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 cross pattern to 90-120 **in-lbs** (10.3-13.6 Nm).
7. Install the foot controls:
   a. **XL Models with Mid-mount Controls:** Install the footrest and mounting bracket. See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **XR 1200X:** Install the rider footrest and shifter mounting bracket and shift linkage. See 2.42 RIDER FOOT CONTROLS: XR 1200X.

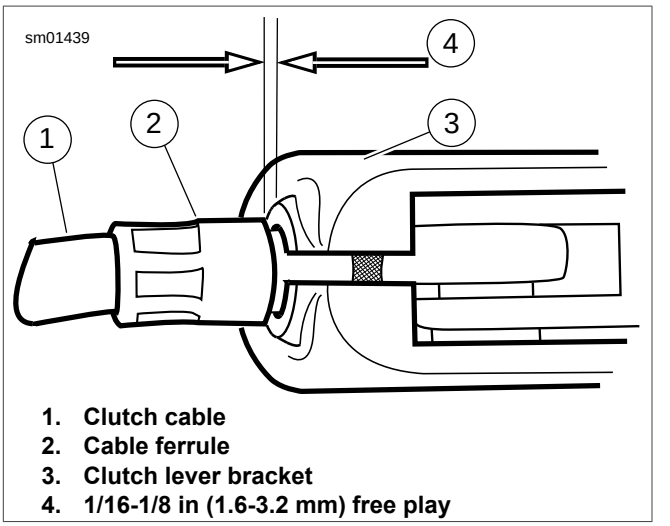


1. **Hex lockplate and spring**
2. **Adjusting screw**

Figure 1-26. 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 1-27. Pull the clutch cable ferrule (2) away from the clutch lever bracket (3) and measure the free play (4).
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. **XL Models:** Secure the cable in the cable retainers.
7. Install main fuse.



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

Figure 1-27. 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.

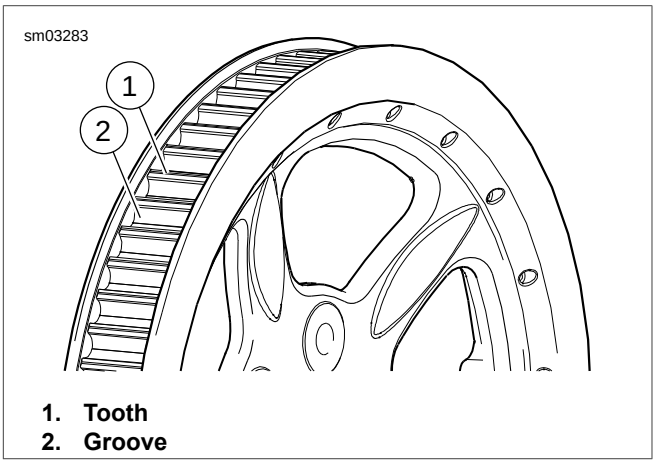
INSPECTION

Sprockets

NOTE

Chrome chips or rear sprocket gouges large enough to be harmful will leave a pattern on the belt face.

1. See Figure 1-28. 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 (see next step).
2. To check if chrome plating has worn off, drag a scribe or sharp knife point across the bottom of a groove (2) (between two teeth) with medium pressure.
   a. If scribe or knife point slides across groove without digging in or leaving a visible mark, chrome plating is still good.
   b. If scribe or knife points digs in and leaves a visible mark, it is cutting the bare aluminum. A knife point will not penetrate the chrome plating.
3. Replace rear sprocket if major tooth damage or loss of chrome exists.



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

Figure 1-28. Rear Sprocket

Idler Pulley: XR 1200X

See Figure 1-29. Inspect idler pulley for signs of uneven wear. Excessive lateral side play of 0.035 in (0.9 mm) or roughness indicates worn bearings. Replace idler pulley as an assembly. See 5.6 DRIVE BELT.



Figure 1-29. Measuring Lateral Side Play on Idler Pulley

Drive Belt

NOTE

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

See Figure 1-30. Inspect drive belt for:

- Cuts or unusual wear patterns.
- Outside edge bevelling (8). Some bevelling 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 will require belt replacement eventually. When cracks extend to the edge of the belt, failure is imminent.
- Inside (toothed portion) of belt for exposed tensile cords (normally covered by nylon layer and polyethylene layer).

This condition will result in belt failure and indicates worn transmission sprocket teeth. Replace belt and transmission sprocket.

- Signs of puncture or cracking at the base of the belt teeth. Replace belt if either condition exists.
- 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 the belt, but it should be watched closely before condition 2 develops which will require 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.
XR only	Excess edge wear	Check idler bearings and bracket attachment.

* See Figure 1-30.

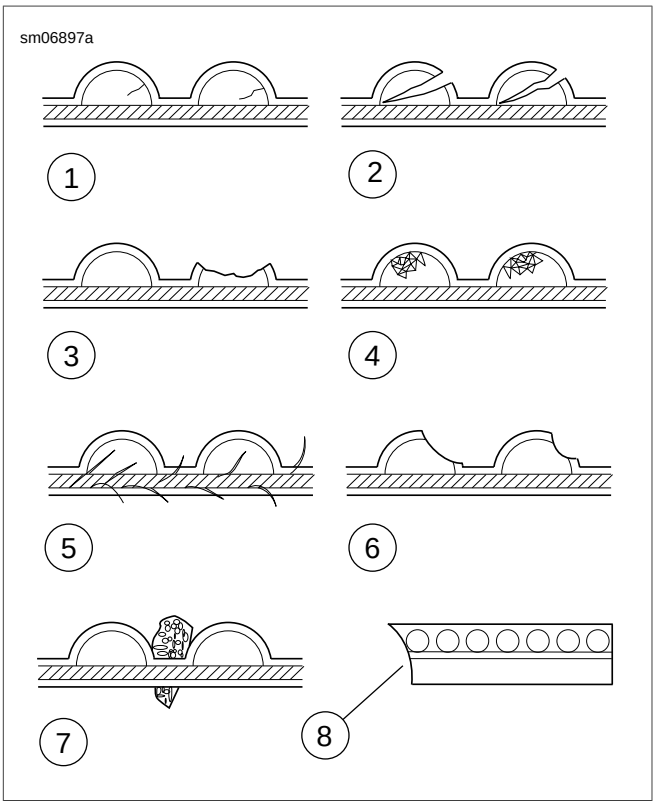


Figure 1-30. Drive Belt Wear Patterns

DRIVE BELT DEFLECTION

PART NUMBER	TOOL NAME
HD-35381A	BELT TENSION GAUGE

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

Gauging Deflection

Check belt deflection at the loosest spot in the belt with the transmission in neutral and the motorcycle at ambient temperature.

1. With the motorcycle unladen and resting on its jiffy stand, fit the BELT TENSION GAUGE (Part No. HD-35381A) on the belt.
   a. **XL Models:** See Figure 1-31. Position the gauge halfway between the transmission and rear wheel sprockets.
   b. **XR 1200X:** See Figure 1-32. Fit the tension gauge half-way (1) between the idler wheel and rear sprocket.

2. With the BELT TENSION GAUGE set to 0 lb (0 kg), note the current belt position.
   a. **XL Models:** See Figure 1-31. View position through window on drive belt guard.
   b. **XR 1200X:** See Figure 1-32. Check position (2) on front of debris deflector.
3. Using the BELT TENSION GAUGE, apply 10 lb (4.5 kg) of force to the bottom belt.
4. Count the number of gradations (3) between the original belt position and after applying the force. Multiply this number by 1/8 in (3.2 mm) to determine the deflection.
5. Compare the deflection to specifications. Refer to Table 1-13.
6. Adjust as necessary.

⚠WARNING

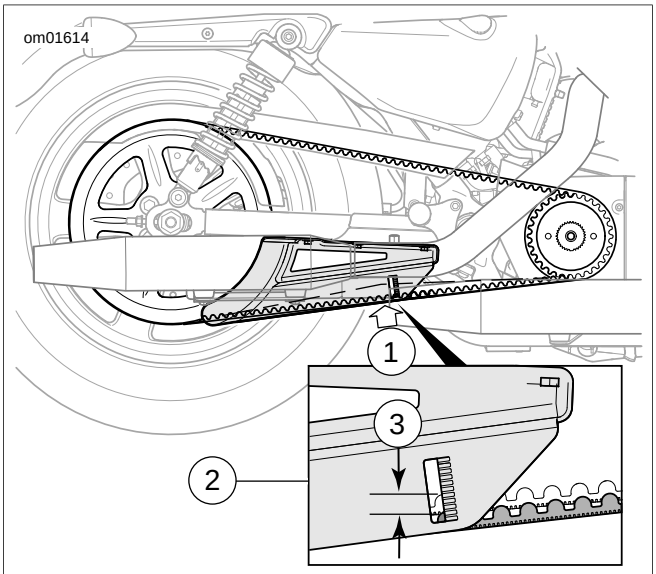
Be sure wheel and brake caliper are aligned. Riding with a misaligned wheel or brake caliper can cause the brake disc to bind and lead to loss of control, which could result in death or serious injury. (00050a)

NOTE

When gauging deflection, check the rear brake caliper position on rear brake disc. Disc should run true within brake caliper.

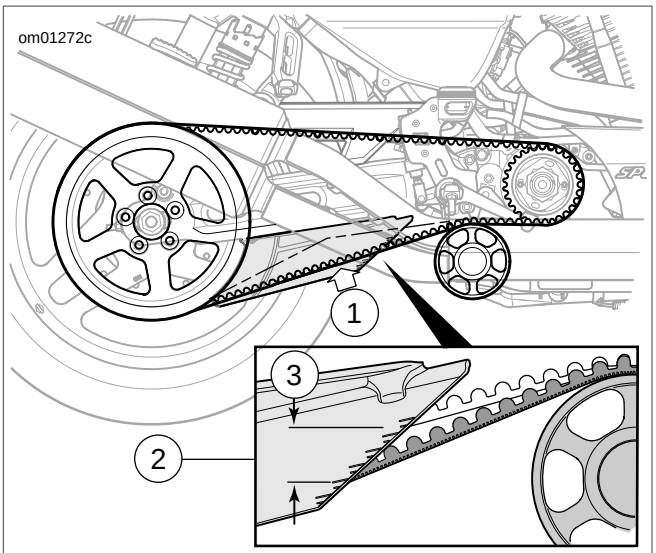
Table 1-13. Belt Deflection Specifications*

MODELS	in	mm
XL 883R	9/16-5/8	14.3-15.9
Other XL models	1/4-5/16	6.4-7.9
XR 1200X	1/4-3/8	6.4-9.5
* Deflection measured at 10 lb (4.5 kg) tension.		



1. **10 lb (4.5 kg)**
2. **Deflection gauge**
3. **Graduations 1/8 in (3.2 mm)**

Figure 1-31. Belt Deflection: XL Models



1. **10 lb (4.5 kg)**
2. **Deflection gauge**
3. **Graduations 1/8 in (3.2 mm)**

Figure 1-32. Belt Deflection: XR 1200X

Adjustment

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 when rear wheel is adjusted.

1. **XL Models:** See Figure 1-33. Remove screw (4) from clamp (3) on rear brake line (2).
2. See Figure 1-34. Remove and discard E-clip (1) and loosen rear axle nut (4).

NOTE

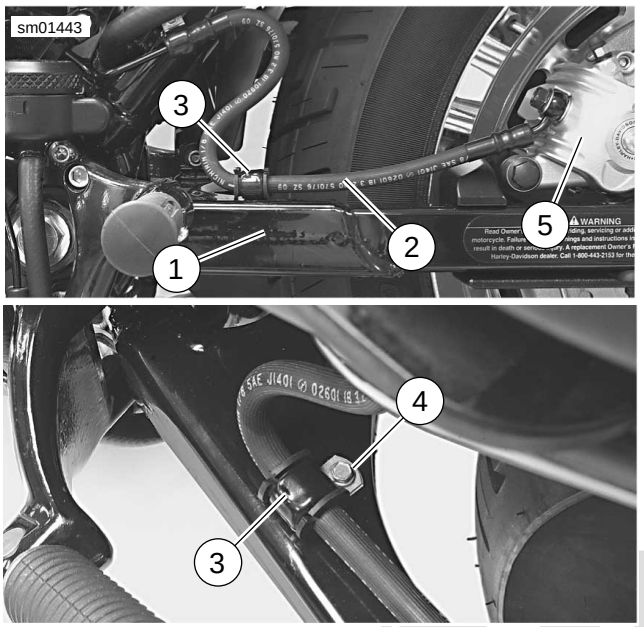
Turn both adjuster nuts the same number of turns in order to maintain approximate alignment of rear wheel.

3. Turn axle adjuster nuts (2) on each side of rear fork clockwise to decrease belt deflection (increase tension), or counterclockwise to increase belt deflection (decrease tension).
4. Check rear wheel alignment. See 1.24 WHEEL ALIGNMENT, Wheel Alignment.

⚠WARNING

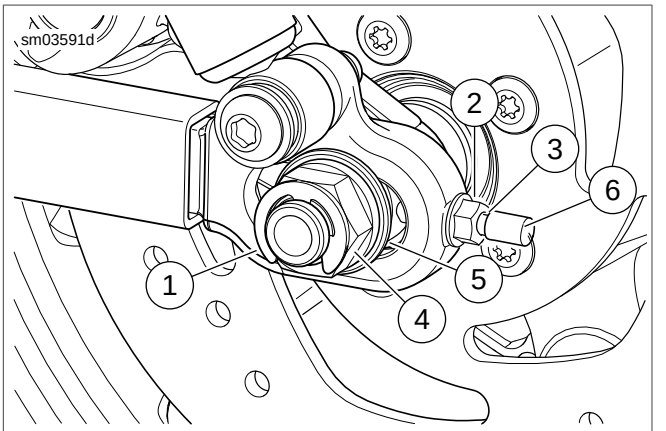
Do not exceed specified torque when tightening axle nut. Exceeding torque can cause wheel bearings to seize during vehicle operation, which could result in death or serious injury. (00408e)

5. After belt deflection and wheel alignment are properly adjusted,
   a. Tighten axle nut (4) to 95-105 ft-lbs (129-142 Nm). Install **new** E-clip (1).
   b. **XL Models:** See Figure 1-33. Reposition clamp (3) on rear brake line (2) and secure clamp to rear fork (1) with screw (4). Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).



1. **Rear fork**
2. **Rear brake line**
3. **Clamp**
4. **Screw**
5. **Rear brake caliper**

Figure 1-33. Rear Brake Line: XL Models



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

Figure 1-34. Drive Belt Adjustment: XL Models

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 the throttle cable tension. See 1.13 THROTTLE CONTROL, Cable Adjustment.
2. See Figure 1-35. Remove screws (1) to separate the 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 if necessary.
6. Apply a light coat of graphite to handlebar. Replace throttle grip.
7. Pour two drops of HARLEY LUBE into the 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)

1. Back off the friction screw.
2. Roll on and release the throttle grip. If the 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.

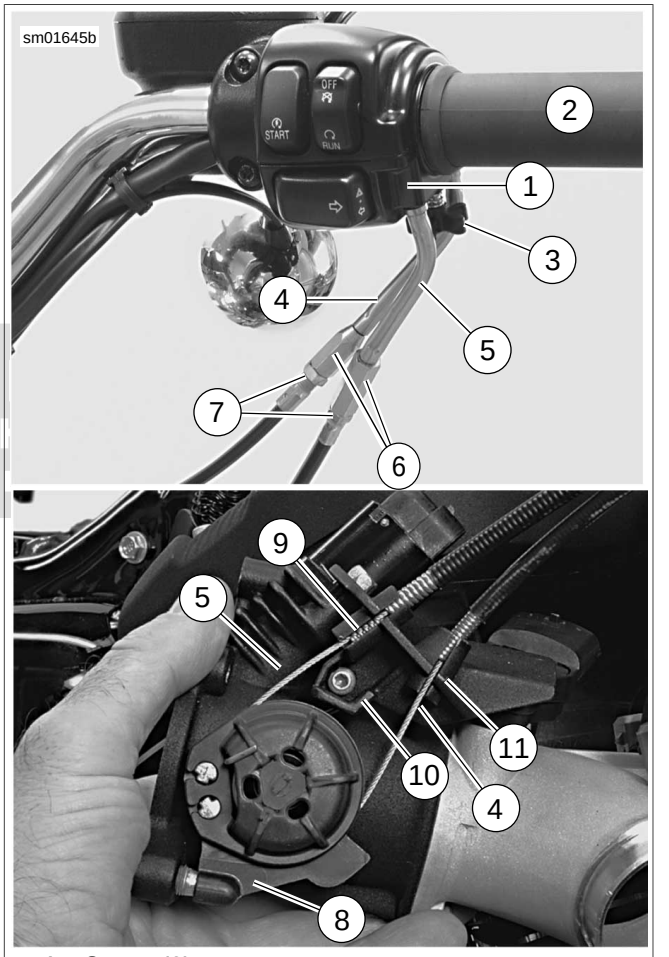
Adjustment

1. See Figure 1-35. 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, gently turn throttle control grip (2) to 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. Turn adjuster counterclockwise an additional 1/2-1 turn. Tighten jamnut on throttle cable adjuster.
7. Turn handlebar to right stop. Turn adjuster (6) on idle control cable (5) to lengthen sleeve until end of cable housing touches spring (9) within cable guide (11).

NOTE

Verify that throttle wheel returns to idle each time throttle grip is released.

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 the rubber boots over the 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 1-35. Throttle Cable Adjustment (typical)

CABLE AND CHASSIS LUBRICATION 1.14

GENERAL

Inspect and lubricate the following items according to1.5 MAINTENANCE SCHEDULE.

- Front brake hand lever
- Clutch hand lever
- Throttle control cables
- Throttle control grip sleeve
- Clutch cable
- Foot shift lever pivot (if applicable)
- Rear brake lever pivot
- 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 2.28 THROTTLE CABLES: ALL MODELS.

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.

FOOT SHIFT LEVER AND REAR BRAKE PEDAL

Clean and lubricate the foot shift lever pivot (on models with forward controls) and rear brake pedal pivot with ANTI-SEIZE LUBRICANT at scheduled service intervals as specified in 1.5 MAINTENANCE SCHEDULE.

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

JIFFY STAND

Clean and lubricate the jiffy stand. For more information, see 2.38 JIFFY STAND.

STEERING HEAD BEARINGS

Lubricate the steering head bearings with SPECIAL PURPOSE GREASE. See 1.19 STEERING HEAD BEARINGS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BRAKES 1.15

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)

⚠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 may render them inoperative.*

⚠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)

BRAKE LINES

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	
Rubber hose	No marks	OK/Monitor
	Slight dent or flattening of ribs*	
	Worn 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

1. **Front brake:** Position vehicle on a flat level surface. Turn handlebar so front brake master cylinder is approximately level. See Figure 1-36.
2. Check for fluid through reservoir sight glass.

NOTE

XL Models: *See Figure 1-37. Rear brake reservoir cover may be removed to more easily verify fluid level in reservoir.*

3. **Rear brake:** Prepare vehicle:
   a. Have an assistant hold vehicle upright on a level surface.
   b. See Figure 1-38 or Figure 1-39. Check that fluid level is between upper (3) and lower (4) marks on reservoir sight window.
4. If fluid is not visible through sight glass (front) or level in sight window is low (rear), check system for leaks. Check that brake pads are properly installed and not worn beyond service wear limits. Perform any necessary repairs. See 1.16 BRAKE PADS AND DISCS: XL MODELS or 1.17 BRAKE PADS AND DISCS: XR 1200X.
5. If fluid is still not visible through sight glass (front) or level in sight window is low (rear), remove cover to verify fluid level. If necessary, add DOT 4 BRAKE FLUID. Replace cover. See 2.17 BLEEDING BRAKES.
6. Front brake hand lever and rear brake foot pedal must have a firm feel when applied. If not, bleed system using only DOT 4 BRAKE FLUID. See 2.17 BLEEDING BRAKES.

NOTE

XL Models: *Replace rear brake reservoir cover if removed.*

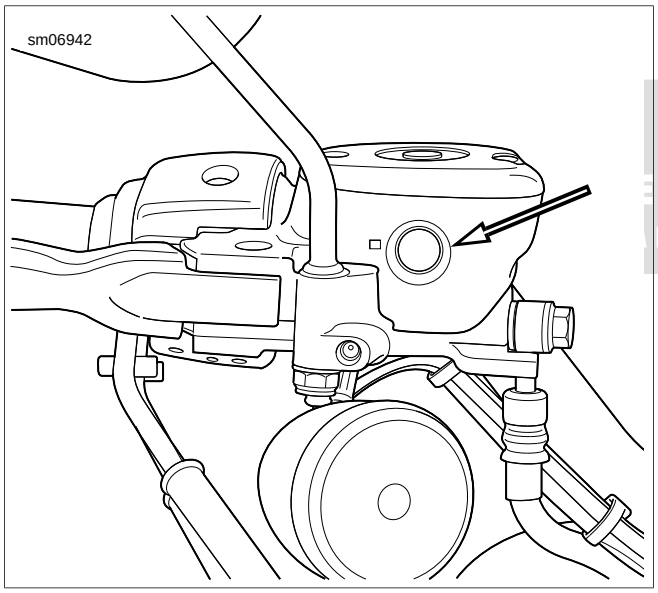


Figure 1-36. Master Cylinder Sight Glass (typical)

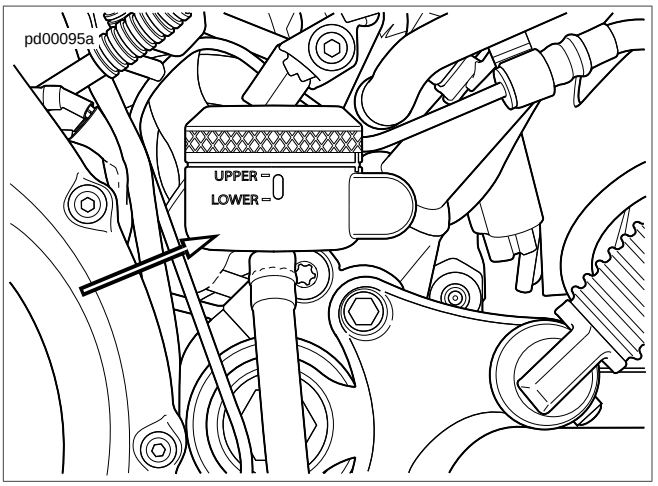
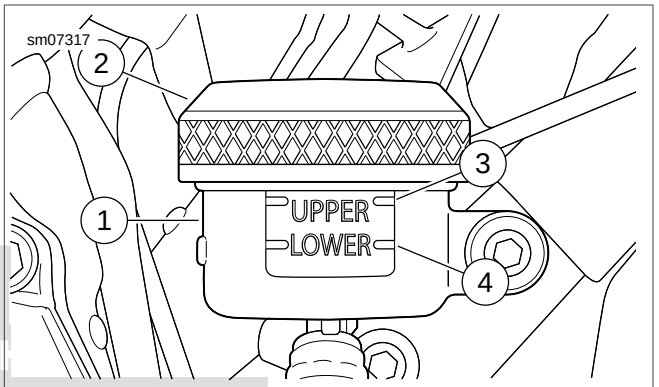
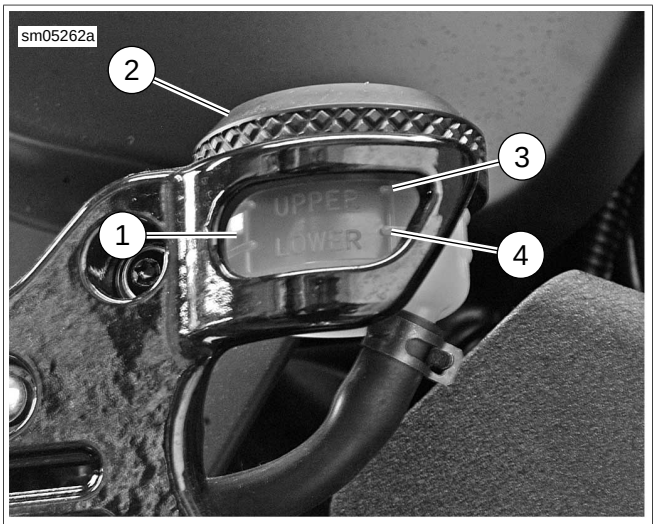


Figure 1-37. Rear Brake Master Cylinder Reservoir Cover (typical)



1. **Reservoir**
2. **Reservoir cap**
3. **Upper fluid level**
4. **Lower fluid level**

Figure 1-38. Rear Brake Master Cylinder Reservoir: XL Models



1. **Reservoir**
2. **Reservoir cap**
3. **Upper fluid level**
4. **Lower fluid level**

Figure 1-39. Rear Brake Master Cylinder Reservoir: XR 1200X

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
Excessive lever or pedal travel or spongy feel	Air in system	Bleed brake system.
	Master cylinder reservoir low on fluid	Fill master cylinder reservoir with approved brake fluid. Bleed brake system.
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	Fill master cylinder reservoir with approved brake fluid and bleed brake system.
	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 - do not retract.	Cup in master cylinder blocking relief port	Inspect master cylinder.
	Master cylinder overfilled	Correct fluid level.

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BRAKE PADS AND DISCS: XL MODELS 1.16

INSPECTION

Brake Pads

⚠CAUTION

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

NOTICE

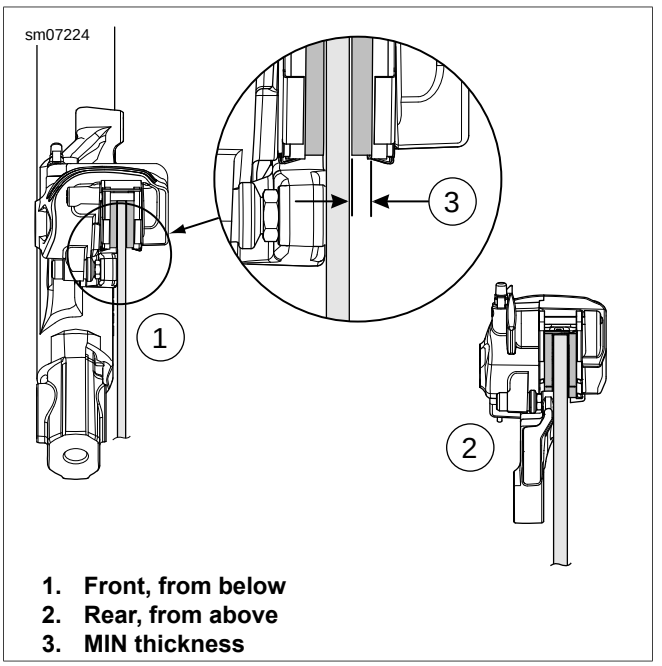
D.O.T. 4 brake fluid will damage painted and body panel surfaces it comes in contact with. Always use caution and protect surfaces from spills whenever brake work is performed. Failure to comply can result in cosmetic damage. (00239b)

⚠WARNING

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

See Figure 1-40. Replace brake pads if brake pad friction material on either the front or rear caliper is worn to 0.04 in (1.02 mm) or less (3) above the backing plate. Always replace both pads in a caliper as a set. See 1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front or 1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Rear.

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



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

Figure 1-40. XL Brake Pad MIN Thickness

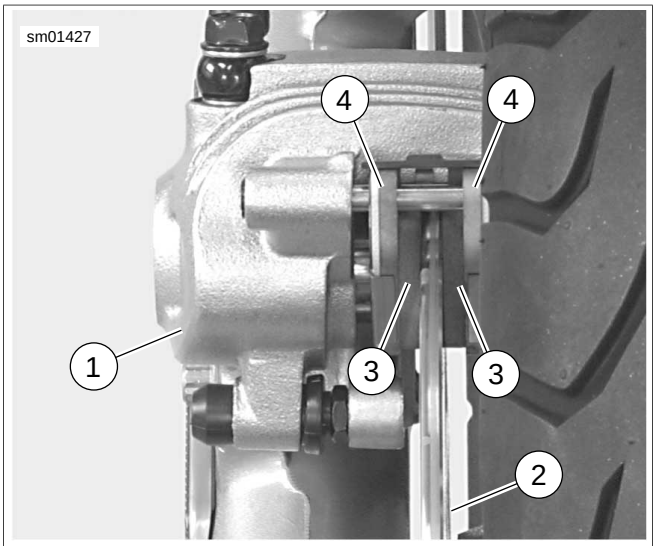
Brake Disc Thickness, Lateral Runout and Warpage

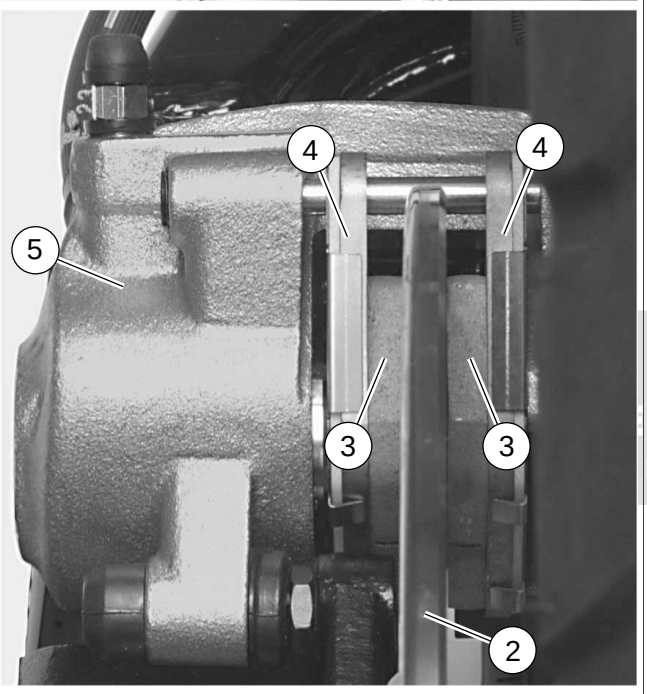
See Figure 1-41. The minimum brake disc thickness is stamped on the side of the disc. Replace disc if worn past minimum thickness or badly scored.

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

- To replace front brake disc(s), see 2.5 WHEELS, Front Wheel.
- To replace rear brake disc, see 2.5 WHEELS, Rear Wheel.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON





1. **Front brake caliper (from below)**
2. **Brake disc**
3. **Brake pad**
4. **Brake pad backing plate**
5. **Rear brake caliper (from rear)**

Figure 1-41. Brake Pads and Discs

BRAKE PAD REPLACEMENT: FRONT

FASTENER	TORQUE VALUE	
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

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

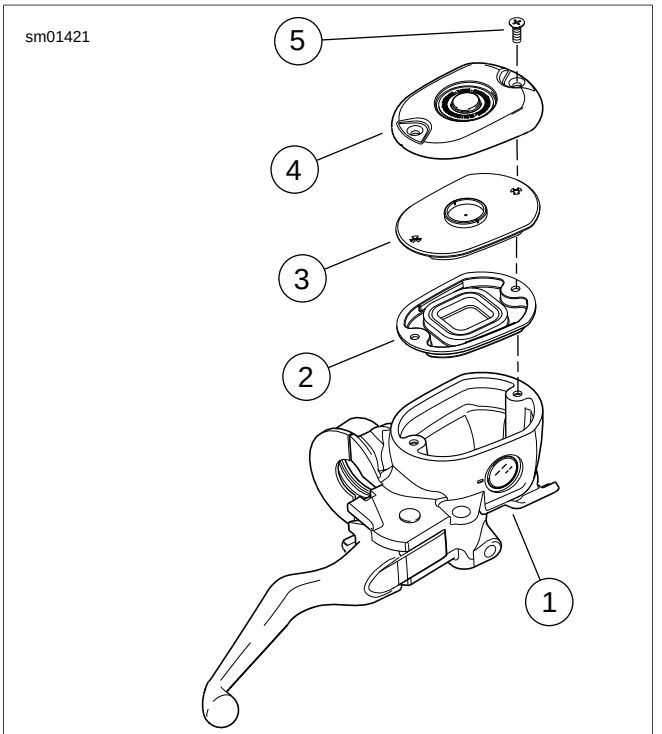
- *Do not remove front caliper(s) from mounting bracket unless caliper mounting pins require service. Caliper removal increases risk of contaminate damage.*
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Cover handlebar switches with a shop towel before adding brake fluid to front master cylinder reservoir. Spilling brake fluid on handlebar switches may render them inoperative.*

1. Position motorcycle so that front master cylinder reservoir is level.
2. See Figure 1-42. Remove two screws (5), reservoir cover (4), diaphragm plate (3) and diaphragm (2) from master cylinder reservoir (1).
3. Wrap a shop towel around the master cylinder reservoir to contain any brake fluid spills.

NOTE

As the pistons are pushed back into the caliper, fluid level may rise higher than fluid level mark at about 1/4 in (6.35 mm) below top of reservoir. You may have to remove fluid to allow for this.

4. Press against the side of the brake caliper body to push the outside brake pad (pad closest to caliper pistons) back. This pushes the caliper pistons back into their bores.



1. **Front brake master cylinder assembly**
2. **Diaphragm**
3. **Diaphragm plate**
4. **Reservoir cover**
5. **Captive screw (2)**

Figure 1-42. Front Brake Master Cylinder Cover Assembly (typical)

NOTES

- *See Figure 1-43. Verify that the pad spring is installed before installing the **new** pads.*
- *Front and rear brake caliper pads are not interchangeable.*

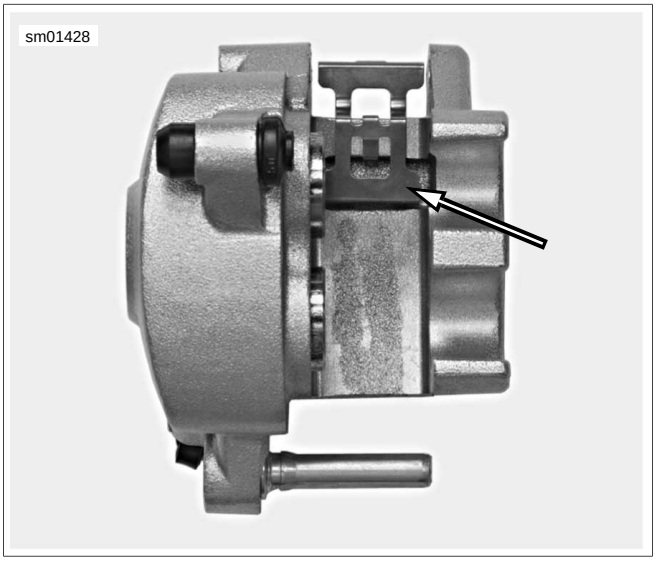


Figure 1-43. Front Caliper Pad Spring

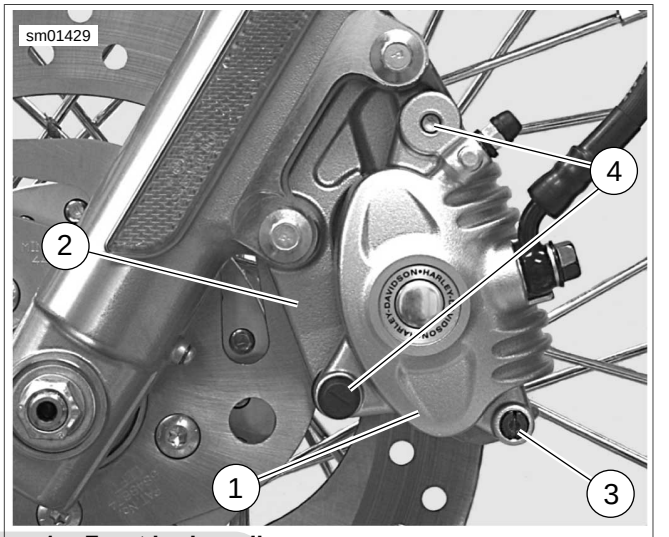
5. See Figure 1-44. Remove pad pin plug (3).

6. See Figure 1-45. Loosen, but do not remove, brake pad pin.

NOTE

Do not completely remove brake pad pin from caliper during the next step. Completely removing pad pin at this time may cause difficulty during assembly.

7. Once the pistons have been fully retracted into their bores, pull pad pin part way until inside pad drops free. Note the pad's original orientation for replacement purposes.



1. **Front brake caliper**
2. **Caliper mounting bracket**
3. **Pad pin plug**
4. **Caliper mounting pins**

Figure 1-44. Front Caliper Assembly

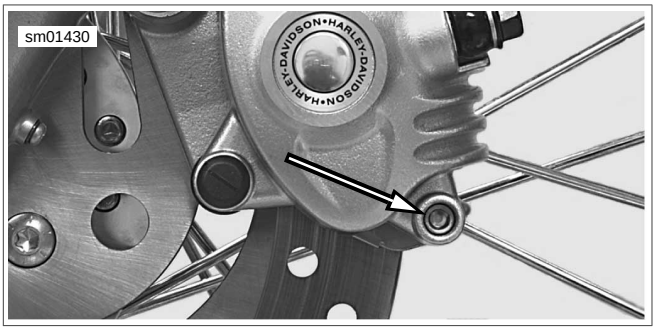


Figure 1-45. Brake Pad Pin (plug removed)

8. See Figure 1-46. Install **new** inside brake pad (1) using same orientation as pad previously removed. Align mounting tabs.

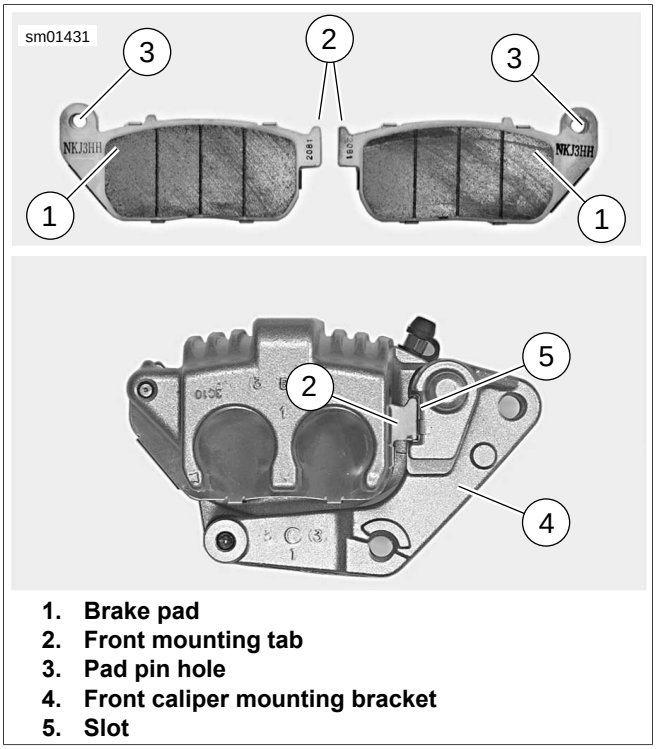
9. While holding **new** inside pad in place, pull pad pin out and remove outside brake pad. Note the pad's original orientation for replacement purposes.

10. Install **new** outside brake pad using the same orientation as pad previously removed. Align mounting tabs.

11. Temporarily insert a 1/8 drill bit in caliper pad pin hole to hold both pads in place.

12. Inspect pad pin for grooving and wear. Measure pad pin diameter in an unworn area, and then in the area of any

grooving or wear. If wear exceeds 0.011 in (0.28 mm), replace pin.



1. **Brake pad**
2. **Front mounting tab**
3. **Pad pin hole**
4. **Front caliper mounting bracket**
5. **Slot**

Figure 1-46. Front Brake Pads

13. Press brake pads firmly up against pad spring. Remove drill bit. Install pad pin. Tighten to 131-173 **in-lbs** (14.8-19.6 Nm).

NOTE

If pad pin does not fit, check the following:

- *You are using a set of pads, not two identical pads.*
- *Pad spring orientation must match Figure 1-43.*
- *See Figure 1-46. Fully seat mounting tabs (2) in slot (5).*
- *Push pads against pad spring before installing pad pin.*

14. See Figure 1-44. Install pad pin plug (3). Tighten to 18-25 **in-lbs** (2.0-2.9 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)

15. Pump brake lever to move pistons out until they contact outside brake pad. Verify piston location against 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.

16. See Figure 1-47. Check brake fluid level in master cylinder. Add enough DOT 4 BRAKE FLUID to reservoir to bring fluid level even with ridge (1) cast into inside of reservoir, about 1/4 in (6.35 mm) below top edge.



1. **Cast-in ridge**
2. **Sight glass**

Figure 1-47. Filling Front Master Cylinder Reservoir (typical)

17. See Figure 1-42. Install diaphragm (2), diaphragm plate (3), reservoir cover (4) and screws (5) on front brake master cylinder reservoir. 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)

18. Test brake system.
    a. Turn ignition switch ON. Pump brake lever to verify operation of the stop lamp.
    b. Test ride the motorcycle. If the brakes feel spongy, bleed the system. See 2.17 BLEEDING BRAKES.

NOTE

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

BRAKE PAD REPLACEMENT: REAR

FASTENER	TORQUE VALUE	
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm
Brake pad plug	18-25 **in-lbs**	2.0-2.9 Nm

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

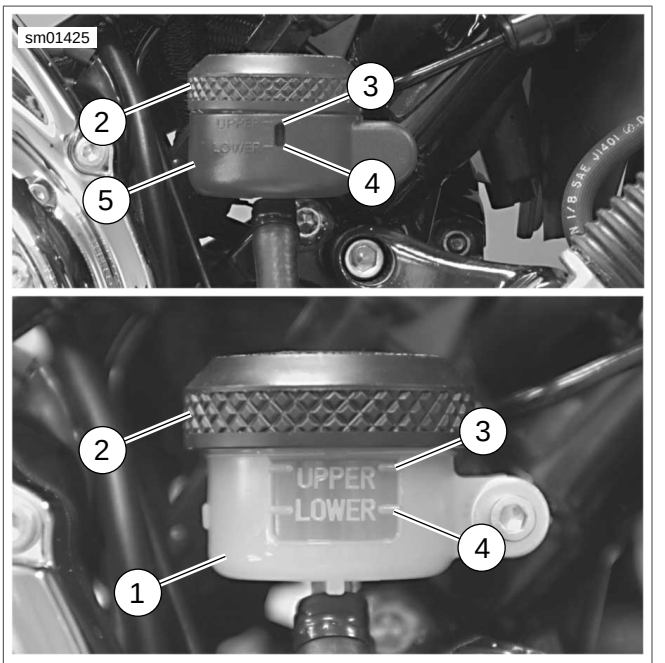
- *See Figure 1-50. Do **not** remove or loosen the caliper mounting pins (4). Removing caliper from mounting bracket increases the risk of contaminants falling into caliper boots and bushings. These contaminants could damage caliper during vehicle operation.*
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*

1. Position vehicle on a flat level surface.

NOTE

See Figure 1-48. As the piston is pushed back into the caliper, fluid level may rise higher than the upper fluid level (3) in the reservoir (1). You may have to remove fluid to allow for this.

2. See Figure 1-48. Remove rear master cylinder reservoir cap (2).
3. Place a suitable container under the rear master cylinder to catch any fluid that may overflow.



1. Rear brake master cylinder reservoir
2. Reservoir cap
3. Upper fluid level
4. Lower fluid level
5. Reservoir cover

Figure 1-48. Rear Brake Master Cylinder Reservoir: XL Models

4. Press against the side of the brake caliper body to push the outside brake pad (pad closest to caliper piston) back. This pushes the caliper piston back into its bore.

NOTES

- *See Figure 1-49. Verify that the pad spring is installed before installing **new** pads.*
- *Front and rear brake pads are not interchangeable.*

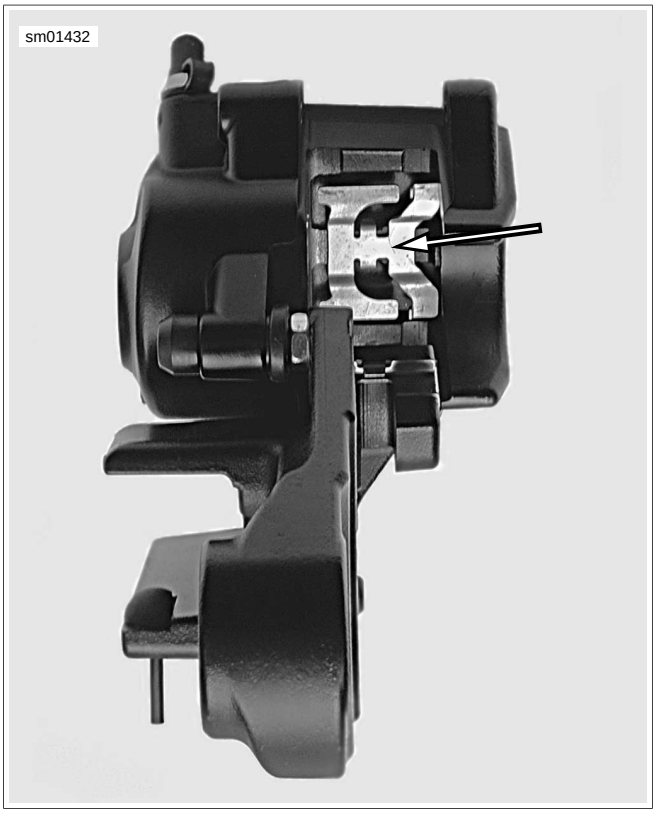


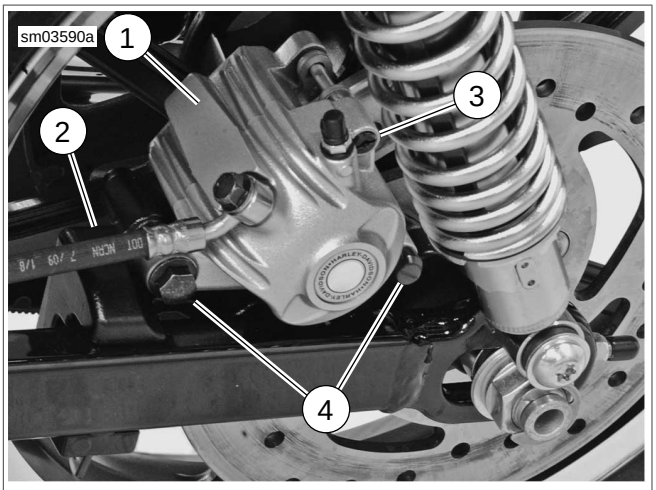
Figure 1-49. Rear Caliper Pad Spring

5. See Figure 1-50. Remove pad pin plug (3).
6. See Figure 1-51. Loosen, but do not remove, brake pad pin.

NOTE

Do not completely remove brake pad pin from caliper during the next step. Completely removing pad pin at this time may cause difficulty during assembly.

7. Once the piston has been fully retracted into its bore, pull pad pin part way until inside pad drops free. Note the pad's original orientation for replacement purposes.



1. **Rear brake caliper**
2. **Caliper mounting bracket**
3. **Pad pin plug**
4. **Caliper mounting pins**

Figure 1-50. Rear Caliper Assembly

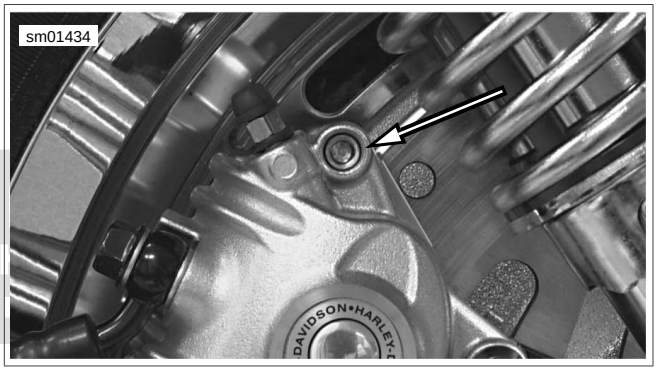


Figure 1-51. Brake Pad Pin (plug removed)

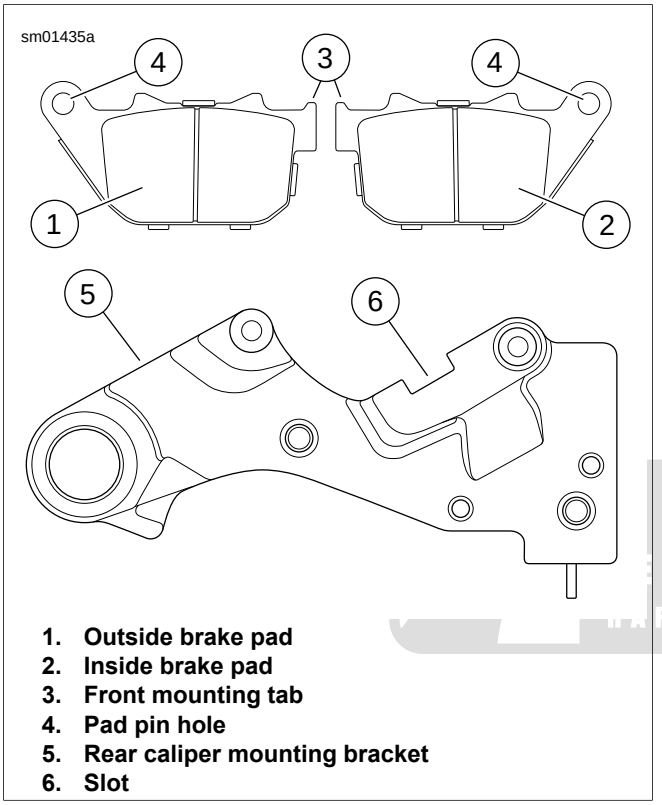
8. See Figure 1-52. Install **new** inside brake pad (2) using same orientation as pad previously removed. Align mounting tabs.
9. While holding **new** inside pad in place, pull pad pin out and remove outside brake pad (1). Note the pad's original orientation for replacement purposes.
10. Install **new** outside brake pad using the same orientation as pad previously removed. Align mounting tabs.
11. Temporarily insert a 1/8-in (3.175 mm) drill bit in caliper pad pin hole to hold pads in place.
12. Inspect pad pin for grooving and wear. Measure pad pin diameter in an unworn area, and then in the area of any grooving or wear. If wear exceeds 0.011 in (0.28 mm), replace pin.
13. Press brake pads firmly up against pad spring. Remove drill bit. Install pad pin. Tighten to 131-173 **in-lbs** (14.8-19.6 Nm).

NOTE

If pad pin does not fit, check the following:

- *You are using a set of pads, not two identical pads.*
- *Pad spring orientation must match Figure 1-49.*
- *See Figure 1-52. Pad front mounting tabs (3) must be fully seated in mounting bracket slot (6).*
- *Before the pad pin is installed, push pads up against the pad spring.*

14. See Figure 1-50. Install pad pin plug (3). Tighten to 18-25 **in-lbs** (2.0-2.9 Nm).



1. **Outside brake pad**
2. **Inside brake pad**
3. **Front mounting tab**
4. **Pad pin hole**
5. **Rear caliper mounting bracket**
6. **Slot**

Figure 1-52. Rear Brake Pads

⚠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)

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

NOTES

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Fill the rear brake master cylinder reservoir must be in a level position.*
- *See Figure 1-48. Reservoir cover (5) may be removed from rear brake master cylinder reservoir (1) to more easily verify fluid level in reservoir.*

16. See Figure 1-48. If desired, remove rear brake master cylinder reservoir cover (5) by grasping cover and gently pulling it straight away from reservoir (1).
17. Check brake fluid level in master cylinder reservoir. If necessary, add DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level (3).
18. Replace master cylinder reservoir cap (2). Replace reservoir cover (5), if removed.

⚠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)

19. Test brake system.
    a. Turn ignition switch ON. Pump brake pedal to verify operation of the stop lamp.
    b. Test ride motorcycle at low speed. If the brakes feel spongy, bleed the system. See 2.17 BLEEDING BRAKES.

NOTE

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

BRAKE PADS AND DISCS: XR 1200X 1.17

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 1-53. Replace brake pads if thickness of brake pad friction material (3) is worn to 0.040 in (1.02 mm) or less. Always replace both pads in a caliper as a set. See 1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Front or 1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear.

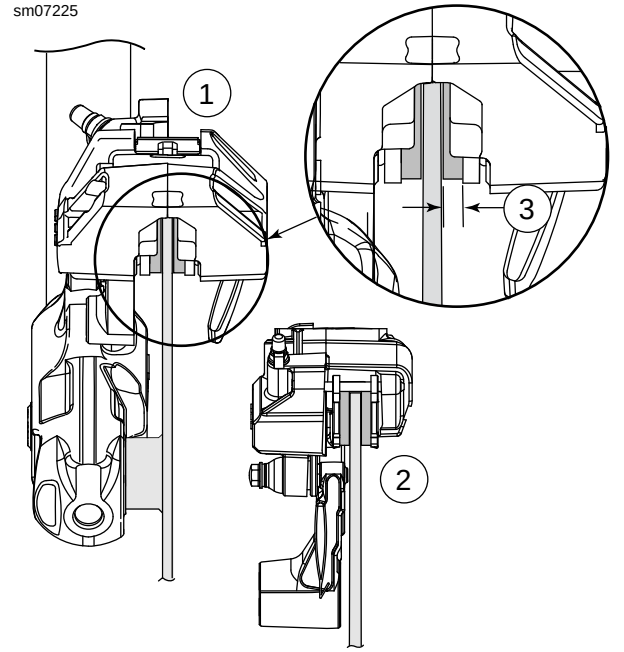
When checking the brake pads and discs, inspect the brake hoses for correct routing and any signs of damage or leakage.

Brake Disc Thickness, Lateral Runout and Warpage

See Figure 1-54. The minimum brake disc (4) thickness is stamped on the side of the disc. Replace disc if worn past minimum thickness or badly scored.

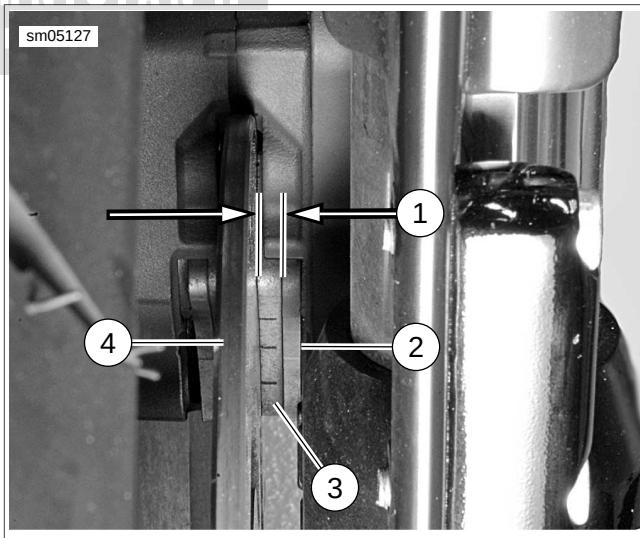
Maximum brake disc lateral runout and warpage is 0.008 in (0.2 mm) when measured near the outside diameter.

- To replace front brake disc(s), see 2.5 WHEELS, Front Wheel.
- To replace rear brake disc, see 2.5 WHEELS, Rear Wheel.



1. Front, from below
2. Rear, from above
3. MIN thickness

Figure 1-53. Brake Pad MIN Thickness: XR 1200X



1. Friction material thickness
2. Pad backing plate
3. Friction material
4. Brake disc

Figure 1-54. Brake Pad Inspection (front brake shown)

BRAKE PAD REPLACEMENT: FRONT

FASTENER	TORQUE VALUE	
Brake pad pin	131-173 **in-lbs**	14.8-19.6 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

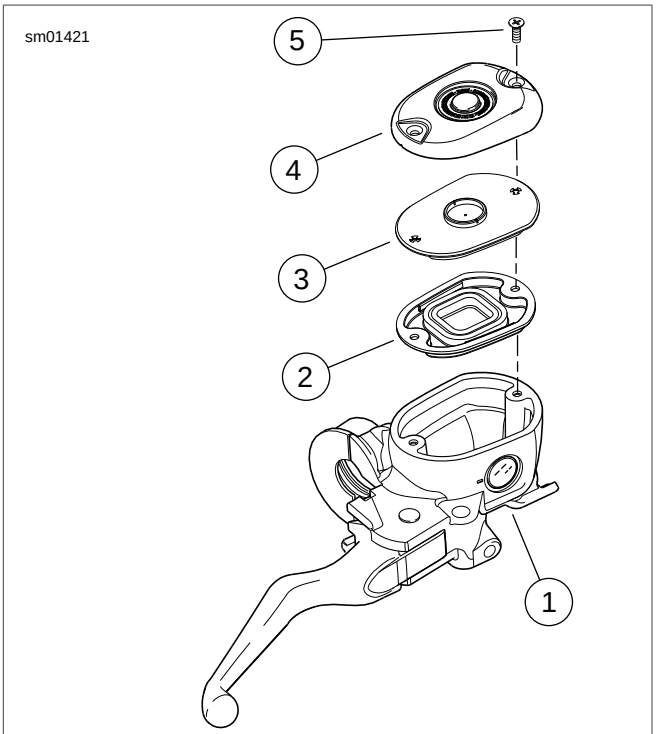
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Cover handlebar switches with a shop towel before adding brake fluid to front master cylinder reservoir. Spilling brake fluid on handlebar switches may render them inoperative.*

1. Turn handlebar to level the front master cylinder reservoir.
2. See Figure 1-55. Remove two screws (5), reservoir cover (4), diaphragm plate (3) and diaphragm (2) from master cylinder reservoir (1).

NOTE

As the pistons are pushed back into the caliper, fluid level may rise higher than fluid level mark at about 1/4 in (6.35 mm) below top of reservoir. Remove fluid as necessary to prevent overflow.

3. Wrap a shop towel around the master cylinder reservoir to contain any brake fluid spills.
4. Pry between the brake pads and brake disc to force all caliper pistons back into their bores. Do not to scratch the rotor or cause warpage.



1. **Front brake master cylinder assembly**
2. **Diaphragm**
3. **Diaphragm plate**
4. **Reservoir cover**
5. **Captive screw (2)**

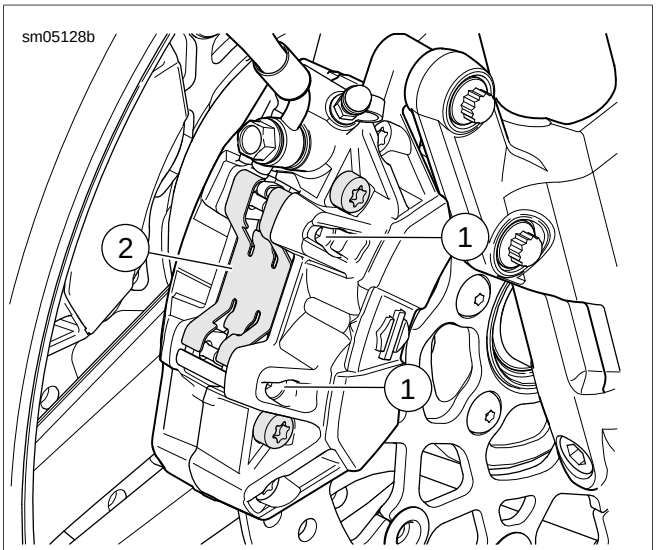
Figure 1-55. Front Brake Master Cylinder Cover Assembly (typical)

5. See Figure 1-56. Remove pad pins (1).
6. Remove pad spring (2) and brake pads through opening in caliper assembly.

NOTE

The pad pins are manufactured with a relief near the center of their length, where the pad spring touches. Do not use this area as a measurement point to determine pad pin wear.

7. Inspect pad pin for grooving and wear. Measure pad pin diameter in an unworn area and in the area of any grooving or wear. If wear exceeds 0.011 in (0.28 mm), replace pin.
8. Inspect pad spring for wear or cracks. Replace if necessary.



1. **Pad pins**
2. **Pad spring**

Figure 1-56. Front Caliper Assembly: XR 1200X

Installation

NOTE

See Figure 1-57. When replacing front brake pads, make sure pad spring is installed with the arrow and word UP (2) pointing up and captured by both pad pins (3).

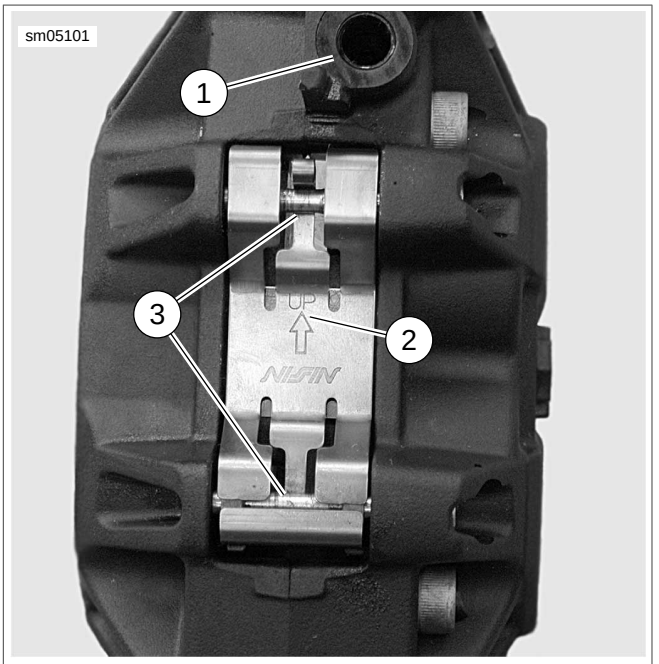
1. See Figure 1-56. Install **new** outer brake pad and pad spring. Make sure friction material faces brake disc.

NOTE

If pad pin does not fit, check the following:

- *You are using the correct set of pads.*
- *Pad spring orientation must match Figure 1-57.*
- *Push pads tight up against pad spring before pad pins are installed.*

2. While holding **new** outer pad in place, insert pad pins through holes in tabs of pad and into pad spring.
3. Install **new** inner brake pad, making sure friction material faces brake disc.
4. Push pad pins through holes in tabs of inner pad and into holes in caliper housing.
5. Tighten pad pins to 131-173 **in-lbs** (14.8-19.6 Nm).



1. **Banjo bolt hole**
2. **Arrow and word "UP"**
3. **Pad pins (2)**

Figure 1-57. Front Caliper Pad Spring Orientation

⚠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)

6. Pump brake lever to move pistons out until they contact outside brake pad. Verify piston location against 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.

7. See Figure 1-58. Check brake fluid level in master cylinder. Add enough DOT 4 BRAKE FLUID to reservoir to bring fluid level even with ridge (1) cast into inside of reservoir, about 1/4 in (6.35 mm) below top edge.



1. **Cast-in ridge**
2. **Sight glass**

Figure 1-58. Filling Front Master Cylinder Reservoir (typical)

8. See Figure 1-55. Install diaphragm (2), diaphragm plate (3), reservoir cover (4) and screws (5) on front brake master cylinder reservoir. 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)

9. Test brake system.
   a. Turn ignition switch ON. Pump brake lever to verify operation of the stop lamp.
   b. Test ride the motorcycle at low speed. If the brakes feel spongy, bleed the system. See 2.17 BLEEDING BRAKES.

NOTE

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

BRAKE PAD REPLACEMENT: REAR

FASTENER	TORQUE VALUE	
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 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

- *Do **not** remove rear caliper from mounting bracket unless caliper mounting pins and boots require service. Removing caliper from mounting bracket unnecessarily increases the risk of contaminants falling into caliper boots and bushings. These contaminants could damage caliper during vehicle operation.*
- *See Figure 1-60. It is **not** required or recommended to remove or loosen the caliper mounting fasteners (2).*
- *It is **not** necessary or recommended to remove the rear brake caliper from the caliper mounting bracket to replace pads.*
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*

1. Place motorcycle in an upright, level position.
2. Remove rear master cylinder reservoir cover.
3. Place a suitable container under the rear master cylinder to catch any fluid that may overflow.

NOTE

The fluid level can rise above the upper fluid level in the reservoir. Remove fluid as necessary.

4. Press against the outside of the brake caliper body to push the caliper piston back into its bore, forcing fluid back to the reservoir.

NOTE

*See Figure 1-59. Verify that pad spring is installed before installing **new** pads.*

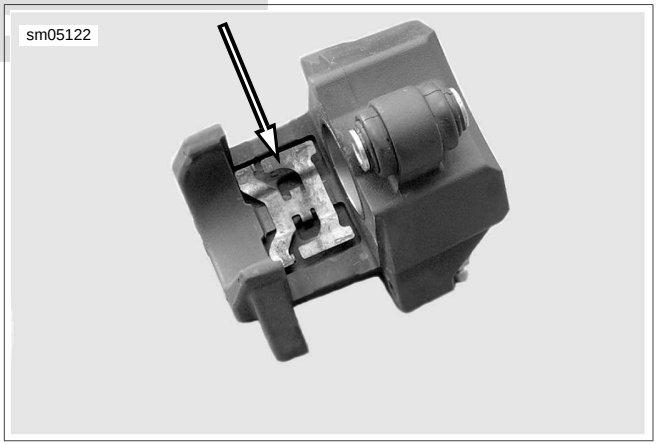


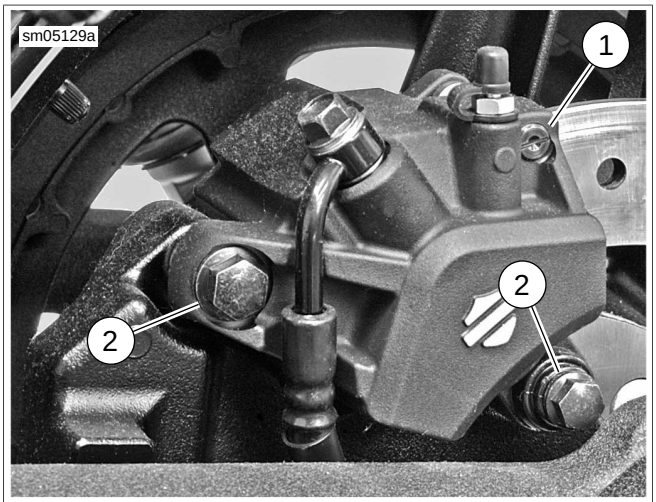
Figure 1-59. Rear Caliper Pad Spring

NOTE

Left shock absorber is disconnected from rear fork for clarity of photograph. Pad replacement does not require the shock be disconnected.

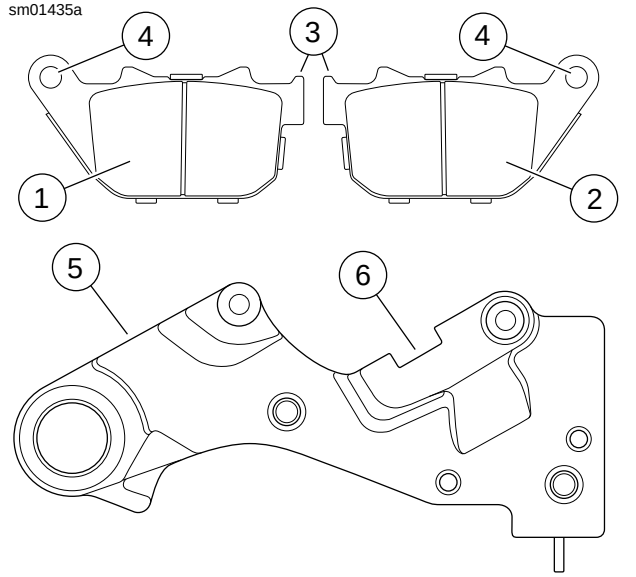
5. See Figure 1-60. Remove pad pin plug (1).
6. Loosen, but do not remove, brake pad pin (metric).
7. Pull pad pin part way out until inner pad drops free. Remove pad and note the pad's original orientation for replacement purposes.
8. Continue to remove pad pin until outer pad drops free.

9. Inspect pad pin for grooving and wear.
10. Measure pad pin diameter in an unworn area and then in the area of any grooving or wear. If wear exceeds 0.011 in (0.28 mm), replace pin.



1. **Pad pin plug**
2. **Mounting fasteners**

Figure 1-60. Rear Caliper Assembly: XR 1200X



1. **Outside brake pad**
2. **Inside brake pad**
3. **Front mounting tab**
4. **Pad pin hole**
5. **Rear caliper mounting bracket**
6. **Slot**

Figure 1-61. Rear Brake Pads: XR 1200X

Installation

NOTE

The caliper and mounting bracket are shown removed for clarity of photograph. Removal is not required to replace brake pads.

1. See Figure 1-61. Install **new** outside brake pad using the same orientation as pad previously removed. Make sure front mounting tab (3) is seated in slot (6) in caliper mounting bracket and pad friction material faces brake disc.
2. Install pad pin into caliper and through outer pad.
3. Position inner pad and continue to install pad pin while pressing brake pads firmly up against pad spring. Tighten pad pin to 131-173 **in-lbs** (14.8-19.6 Nm).

NOTE

If pad pin does not fit, check the following:

- *The part number of the pads.*
- *See Figure 1-59. Check pad spring orientation.*
- *See Figure 1-61. Pad front mounting tabs (3) must be fully seated in mounting bracket slot (6).*
- *Push the pads tight up against pad spring before pad pin is installed.*

4. Install pad pin plug. Tighten to 18-25 **in-lbs** (2.0-2.9 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. Pump brake pedal to move piston out until it contacts outside brake pad. Verify piston location against 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)

NOTE

Position rear brake master cylinder reservoir level when filling or checking fluid level

6. Check brake fluid level in master cylinder reservoir. If necessary, add DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level.
7. Replace reservoir 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)

8. Test brake system.
   a. Turn ignition switch ON. Pump brake pedal to verify operation of the stop lamp.
   b. Test ride motorcycle at low speed. If the brakes feel spongy, bleed the system. See 2.17 BLEEDING BRAKES.

NOTE

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

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

SPARK PLUGS 1.18

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 1-62. Compare plug deposits to Table 1-16.

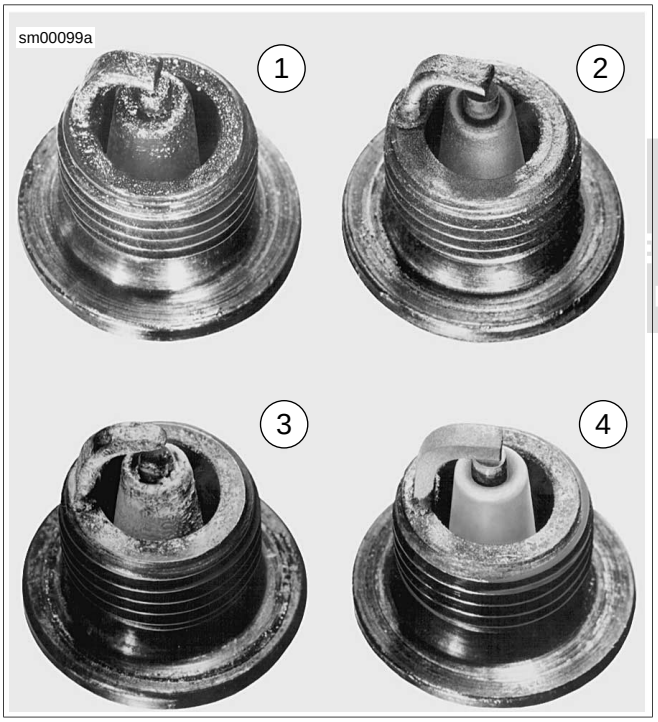


Figure 1-62. Spark Plug Deposits

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.

* See Figure 1-62.
** 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

The spark plug gap is within specification when there is a slight drag on the gauge.

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 1-63. Connect spark plug cables. Verify cables are connected to coil, spark plugs and anchor clips or harness caddies.

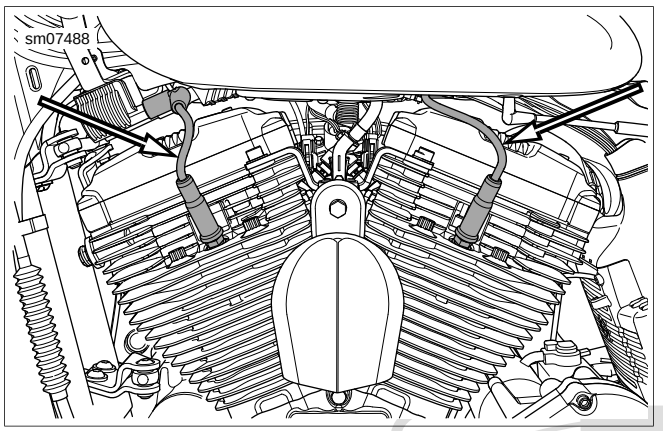


Figure 1-63. Spark Plug Cable Routing: All Models

Table 1-17. Spark Plug Gap

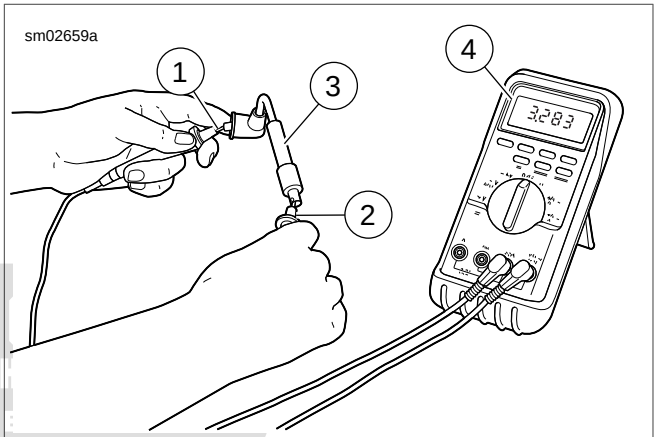
MODEL	TYPE	in	mm
XL	6R12	0.038-0.043	0.97-1.09
XR	10R12X	0.032-0.038	0.81-0.97

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 1-64. 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 1-64. Testing Resistance

STEERING HEAD BEARINGS 1.19

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

Measurement

1. Raise the front wheel off the floor.
2. Remove the components that interfere with front fork swing.
3. Disconnect the clutch cable.
4. Cover the front fender tip with a strip of masking tape.
5. Install a pointer mounted to a floor stand. With the front wheel pointed straight ahead, position the pointer at the center of the fender.
6. 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.
7. Measure the distance between the two fall-away marks.
8. If fall-away is not within specification, adjust the fork stem bolt. Refer to Table 1-19.

Table 1-19. Fall-Away Specifications

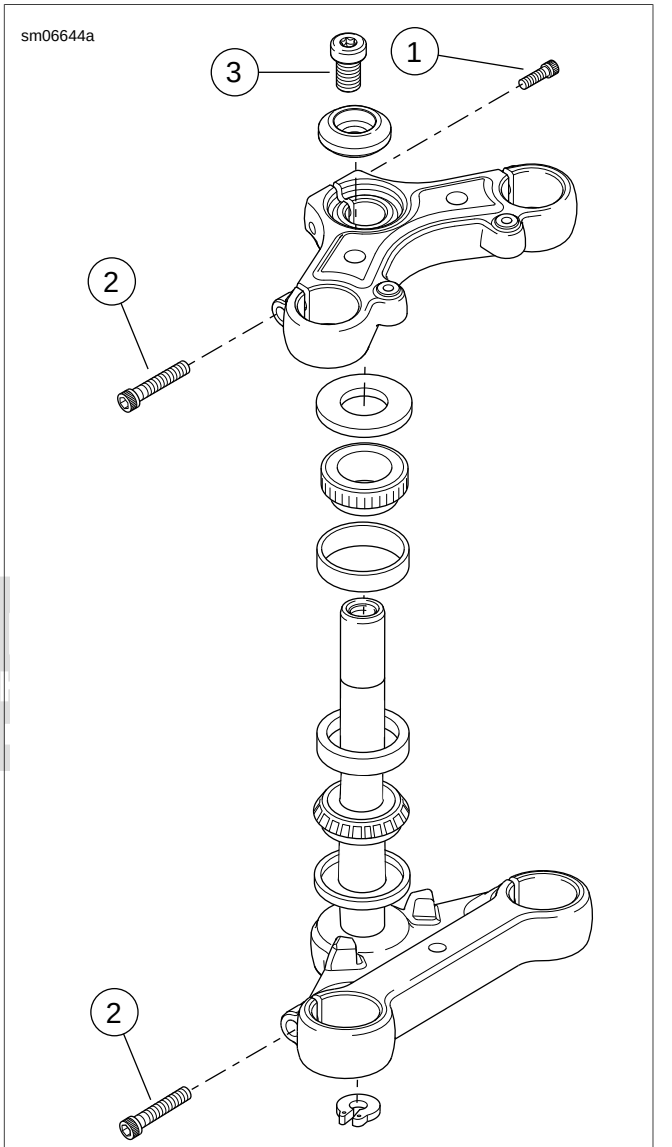
MODEL	MINIMUM		MAXIMUM	
	in	mm	in	mm
XL models	1.0	25	2.0	50
XR 1200X	2.0	50	4.0	100

Adjustment

1. See Figure 1-65. 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 screws to 30-35 ft-lbs (40.7-47.5 Nm).
4. Verify fall-away.

LUBRICATION

See Figure 1-65. Disassemble the steering head assembly and lubricate the tapered roller bearings with SPECIAL PURPOSE GREASE. See 2.21 FORK STEM AND BRACKET ASSEMBLY.



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

Figure 1-65. Steering Head Assembly (typical)

CRITICAL FASTENERS 1.20

INSPECTION

Checking Torques on Fasteners

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

1. Attempt to turn the fastener using a torque wrench set to the minimum torque specification for that fastener. Refer to Table 1-20.
   a. If the fastener does not rotate, the fastener torque has been maintained. No further attention is necessary.
   b. If the fastener rotates, remove it to determine if it has a locking agent.
   c. If it has a locking agent, clean all locking material from the threaded hole. Replace the fastener with a **new** one or clean the original fastener threads and apply the appropriate locking agent (see appropriate procedure).
   d. Install fastener. Tighten to specification.
2. If the fastener does not have a locking agent, install fastener. Tighten to specification.

Table 1-20. Critical Fasteners

SYSTEM	FASTENER	TORQUE	
Hand controls	Switch housing screws, upper and lower	35-45 **in-lbs**	4.0-5.1 Nm
	Clutch lever handlebar clamp screws	108-132 **in-lbs**	12.2-14.9 Nm
	Master cylinder handlebar clamp screws	108-132 **in-lbs**	12.2-14.9 Nm
Engine	Stabilizer link screws	25-35 ft-lbs	33.9-47.5 Nm
	Stabilizer link frame bracket mounting screws, upper front	25-35 ft-lbs	33.9-47.5 Nm
	Stabilizer link engine bracket mounting screws, upper front	55-65 ft-lbs	74.6-88.2 Nm
	Stabilizer link frame bracket mounting screws, lower front	25-35 ft-lbs	33.9-47.5 Nm
	Isolator mounting bolt, front	95-105 ft-lbs	129-142 Nm
	Fork pivot/engine mount bolts	60-70 ft-lbs	81.4-95.0 Nm
	Isolator mounting bracket screws, front (left side)	25-35 ft-lbs	33.9-47.5 Nm
	Isolator mounting bracket screws, rear (left side)	25-35 ft-lbs	33.9-47.5 Nm
Brakes	Brake line banjo bolts	20-25 ft-lbs	27.1-33.9 Nm
	Brake disc mounting screws, front	16-24 ft-lbs	21.7-32.6 Nm
	Brake disc mounting screws, rear	30-45 ft-lbs	40.7-61.1 Nm
	Reservoir cover screws, front	9-17 **in-lbs**	1.0-2.0 Nm
	Master cylinder mounting screws, rear: XL	17-22 ft-lbs	23.1-29.9 Nm
	Master cylinder mounting screws, rear: XR	72-96 **in-lbs**	8.1-10.9 Nm
	Master cylinder bracket-to-frame mounting screws, rear: XL	17-22 ft-lbs	23.1-29.9 Nm
	Master cylinder/footrest bracket-to-frame mounting screws, rear: XR	45-50 ft-lbs	61-67.8 Nm
	Brake caliper mounting bolts, front	28-38 ft-lbs	38.0-51.6 Nm
Axle nuts	Front	60-65 ft-lbs	81-88 Nm
	Rear	95-105 ft-lbs	129-142 Nm

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Table 1-20. Critical Fasteners

SYSTEM	FASTENER	TORQUE	
Front fork/handlebar	Lower bracket pinch screws	30-35 ft-lbs	40.7-47.5 Nm
	Fork upper bracket pinch screws	30-35 ft-lbs	40.7-47.5 Nm
	Fork stem bolt	23-27 ft-lbs, loosen, 72-96 **in-lbs**	31.2-36.6 Nm, loosen, 8.1-10.9 Nm
	Fork stem pinch screw	30-35 ft-lbs	40.7-47.5 Nm
	Axle pinch screw, front: XL	21-27 ft-lbs	28.5-36.6 Nm
	Axle pinch screw, front: XR	41-48 ft-lbs	55.6-65.1 Nm
	Handlebar clamp mounting screw	12-18 ft-lbs	16.3-24.4 Nm
	Riser mounting bolts	30-40 ft-lbs	40.7-54.3 Nm
Final drive	Sprocket mounting bolts, rear	60 ft-lbs, loosen 180 degrees, 80 ft-lbs	81.3 Nm, loosen 180 degrees, 108 Nm

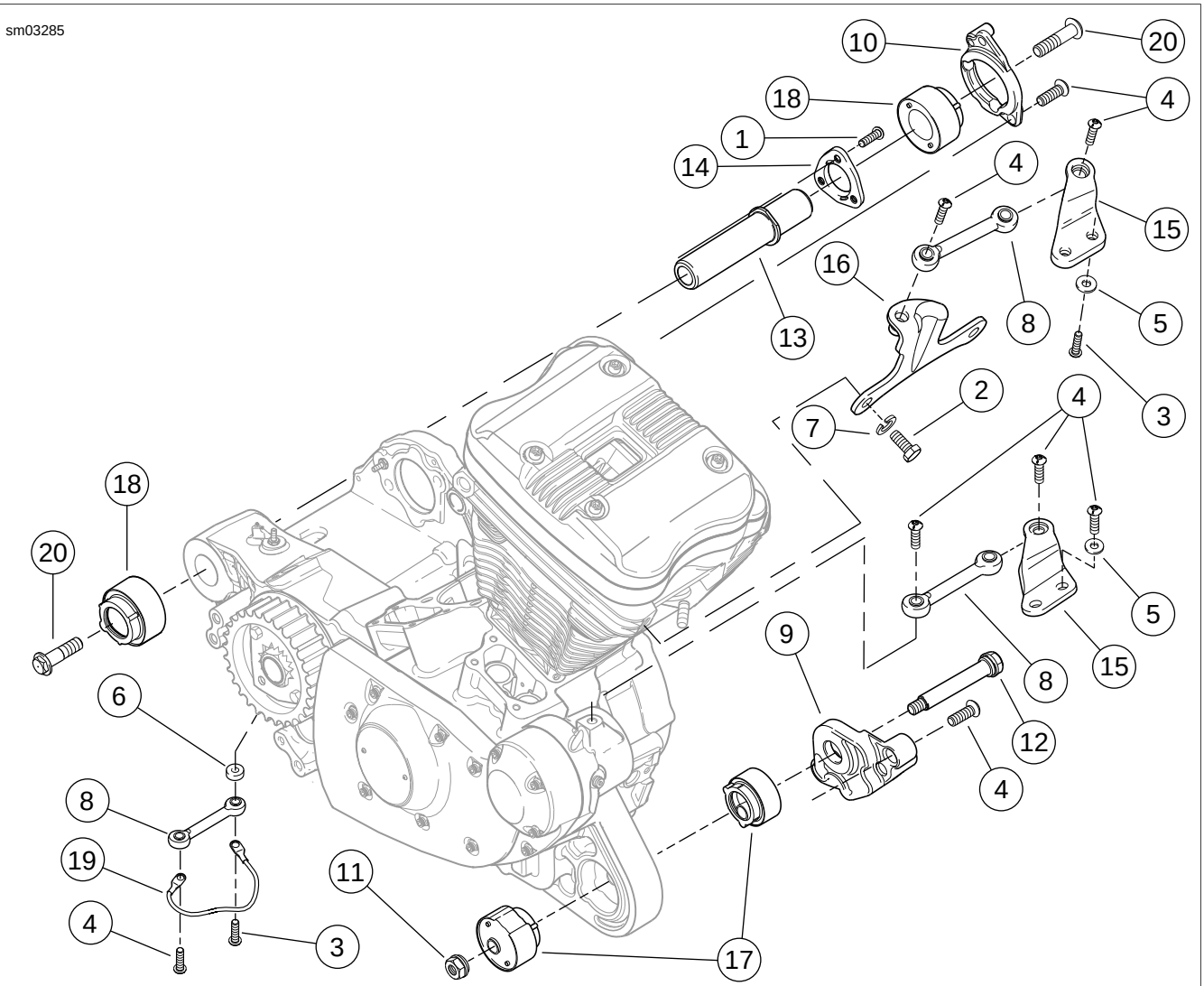
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ENGINE MOUNTS AND STABILIZER LINKS 1.21

INSPECTION

Check engine mounts and stabilizer links as follows:

1. See Figure 1-66. 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 2.25 STABILIZER LINKS, 2.26 FRONT ENGINE MOUNT/ISOLATOR, or 2.27 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
20. Rear fork pivot bolt (2)

Figure 1-66. Engine Mounting Assemblies: All Models (typical)

BATTERY MAINTENANCE 1.22

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)

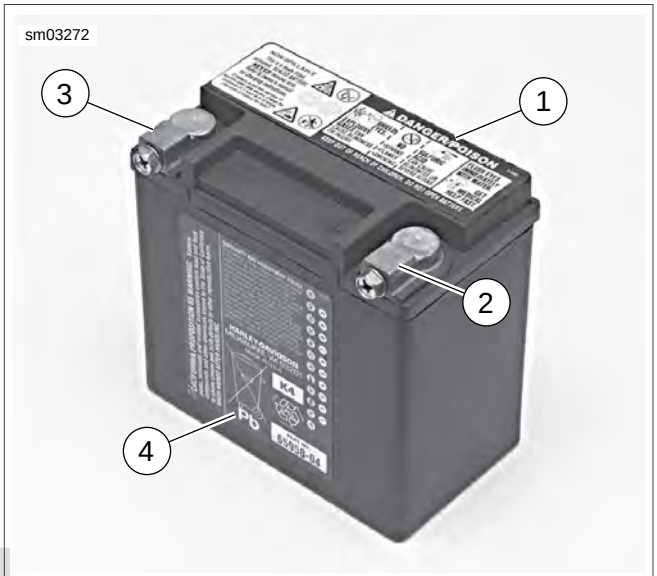
NOTICE

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.

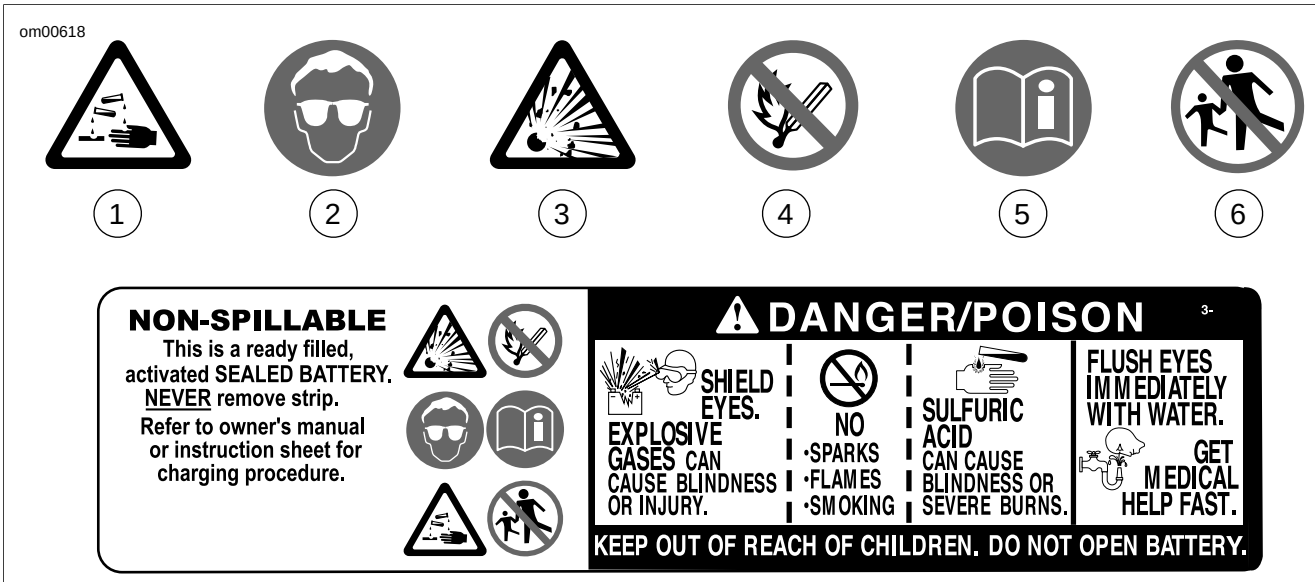
NOTE

For charging information, see 1.22 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 1-67. 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 1-68. Battery Warning Label

Table 1-21. 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.

BATTERY DISCONNECTION AND REMOVAL

⚠WARNING

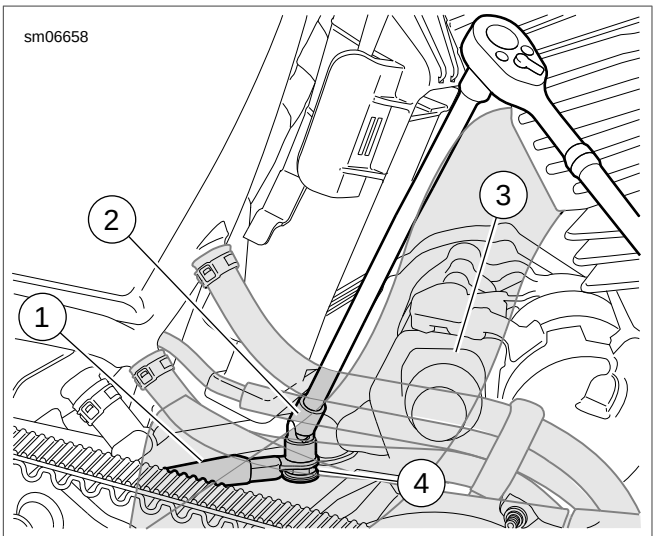
Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

1. Open left side cover.

NOTE

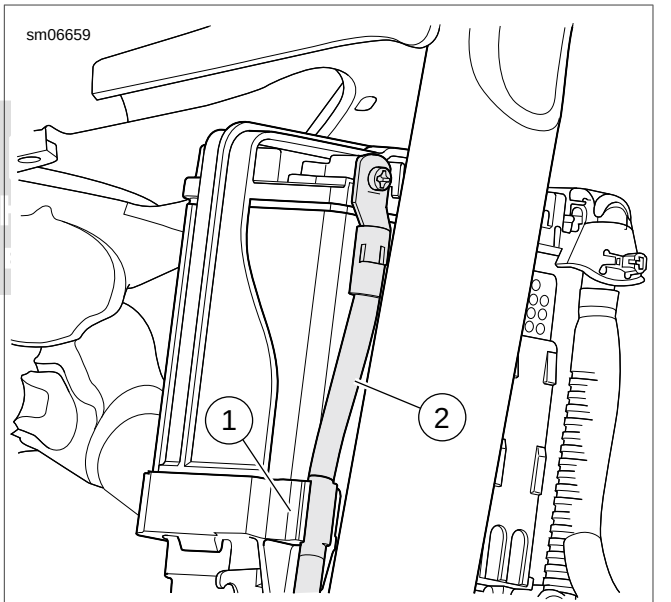
Models with sirens: *Verify that fob is present and turn ignition key to IGNITION before removing main fuse or disconnecting battery.*

2. See Figure 1-69. Using a swivel socket (2), remove nut that secures the negative (-) battery cable (1) connector to ground stud (4) on crankcase boss behind starter motor assembly (3). Remove cable connector from stud.
3. See Figure 1-70. Pull end of negative (-) cable (2) forward gently to free it from cable holder (1).
4. See Figure 1-71. Press main fuse holder (1) toward the rear of the motorcycle until it pops off its mounting pin on battery strap (4). Remove main fuse holder from battery strap.
5. Press data link connector (6) toward the rear of the motorcycle until it pops off its mounting pin on battery strap. Remove the connector from battery strap.
6. Remove battery strap screw (5). Unhook battery strap from battery tray mount on top of battery and remove strap.
7. Lift up protective rubber boot covering battery positive (+) terminal (3). Remove screw from battery positive (+) terminal and remove positive (+) battery cable.
8. Disconnect positive (+) battery cable from cable holder (2).
9. Slide the battery (with attached negative cable) out the left side until the negative battery cable is accessible.
10. Disconnect the negative battery cable at the battery (-) terminal. Leave the cable on the vehicle.
11. Remove battery from battery tray. Note routing of negative (-) battery cable around frame downtube.
12. If battery is to be stored out of the motorcycle, close left side cover.



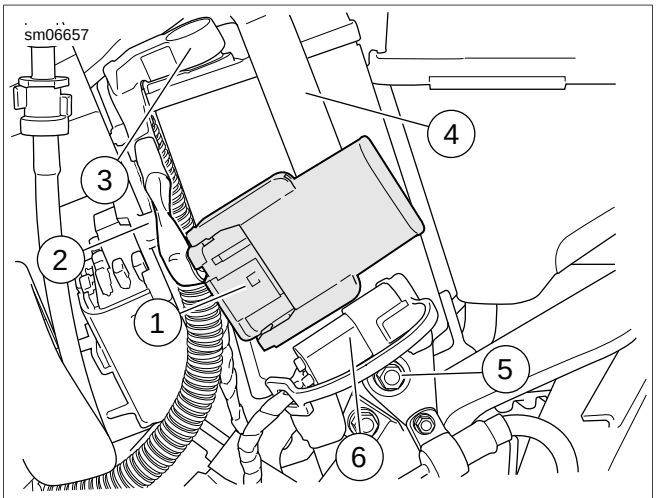
1. **Negative (-) battery cable**
2. **Swivel socket**
3. **Starter motor assembly**
4. **Ground stud**

Figure 1-69. Negative (-) Battery Connection



1. **Cable holder**
2. **Negative battery cable**

Figure 1-70. Negative (-) Battery Cable Holder



1. **Main fuse and holder**
2. **Positive (+) battery cable holder**
3. **Positive (+) battery terminal (under protective rubber boot)**
4. **Battery strap**
5. **Screw**
6. **Data link connector**

Figure 1-71. Main Fuse and Battery Location: All Models

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)

Voltmeter Test

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

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 1-22.

Table 1-22. 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 or less at less 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, con-

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

nect 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.

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.*

⚠WARNING

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

NOTICE

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

2. Connect red battery charger lead to the positive terminal and black battery charger lead to the negative terminal of the battery.

NOTE

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

3. Step away from the battery and turn on the charger.

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

BATTERY INSTALLATION AND CONNECTION

FASTENER	TORQUE VALUE	
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Battery strap screw	36-60 **in-lbs**	4.1-6.8 Nm
Battery positive terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Battery cable connector nut	55-75 **in-lbs**	6.2-8.5 Nm

NOTICE

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

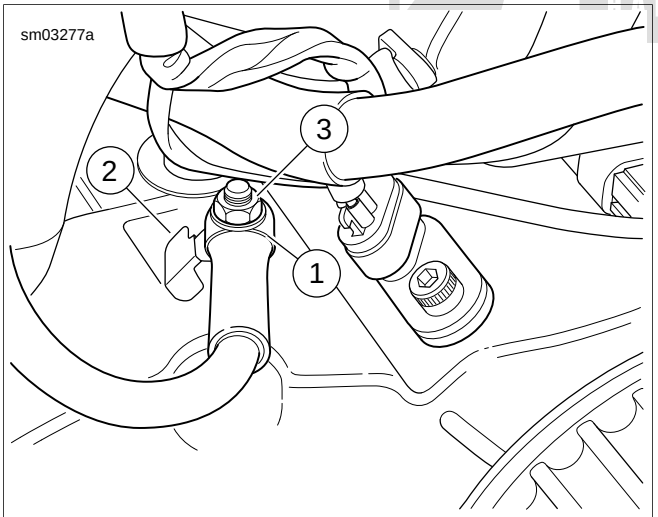
1. Open left side cover.
2. Apply a light coat of petroleum jelly or corrosion retardant material to the negative (-) battery terminal.
3. Slide fully charged battery into battery tray.
4. Insert screw through negative battery cable and into negative battery terminal. Thread screw into terminal. Tighten screw to 60-70 **in-lbs** (6.8-7.9 Nm).
5. Verify that the negative (-) battery cable is disconnected from the ground stud on crankcase.
6. Hook top of battery strap (4) to battery tray mount on top of battery. Install strap screw (5). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).

7. Route main positive battery cable through holders on electrical bracket.
8. Hook main fuse holder (1) to top pin on battery strap and slide forward until it snaps into place.
9. Hook data link connector (6) to bottom pin on battery strap and slide forward until it snaps into place.
10. See Figure 1-70. Press negative (-) battery cable (2) into cable holder (1).

⚠WARNING

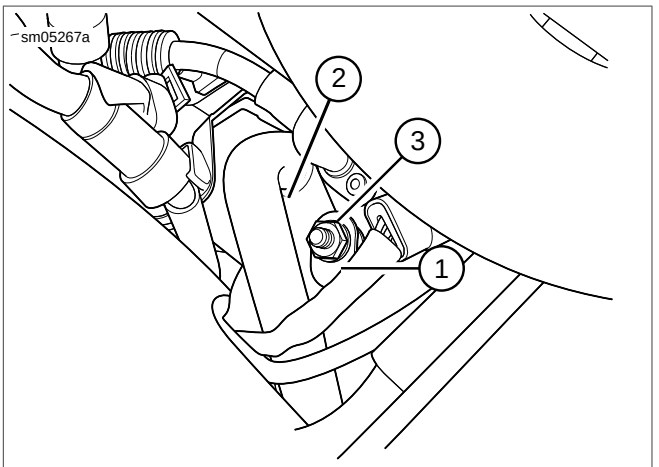
Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

11. See Figure 1-71. With negative battery cable disconnected, insert positive terminal screw through main fuse cable then main positive battery cable. Install screw into positive battery terminal (3). Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
12. Apply a light coat of petroleum jelly or corrosion retardant material to the positive (+) battery terminal. Place protective rubber boot over terminal.
13. See Figure 1-69. Place negative (-) battery cable connector onto ground stud (4) on crankcase boss behind starter motor assembly (3). Thread nut onto stud.
14. See Figure 1-72 or Figure 1-73. Press negative (-) battery cable connector (1) against cable stop (2) on crankcase and tighten nut (3) to 55-75 **in-lbs** (6.2-8.5 Nm).
15. Close left side cover.



1. **Negative battery cable connector**
2. **Cable stop**
3. **Nut**

Figure 1-72. Attaching Negative (-) Battery Cable to Ground Stud Crankcase: XL Models



1. **Negative battery cable connector**
2. **Cable stop**
3. **Nut**

Figure 1-73. Attaching Negative (-) Battery Cable to Ground Stud Crankcase: XR 1200X

STORAGE

PART NUMBER	TOOL NAME
99863-01A	GLOBAL BATTERY CHARGER

⚠WARNING

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

If the motorcycle is 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 GLOBAL BATTERY CHARGER, 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.

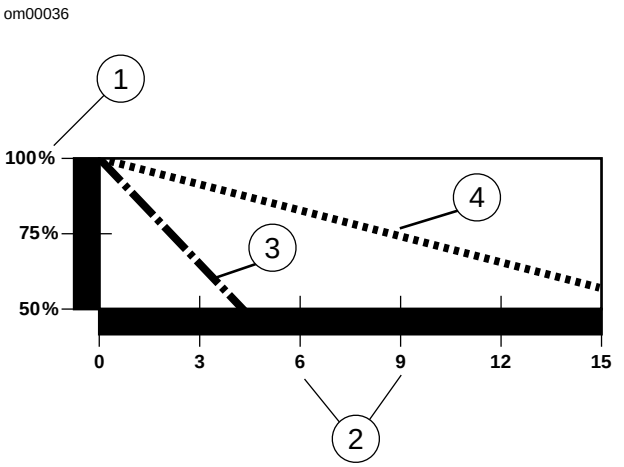
See Figure 1-74. A battery that is removed from the vehicle is affected by self-discharge. A battery that is stored in the vehicle is affected by self-discharge and, more significantly, by parasitic loads. A parasitic load is caused by things like diode leakage or maintaining computer memory with the 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 the GLOBAL BATTERY CHARGER (Part No. 99863-01A) 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 1-74. Effective Rate of Temperature on Battery Self-discharging Rate

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EXHAUST SYSTEM 1.23

EXHAUST SYSTEM LEAK CHECK

1. Check entire exhaust system for loose or missing fasteners, damaged pipe clamps or brackets, and obvious signs of leakage (carbon tracks at pipe joints, etc.).
2. Check for loose or damaged heat shields. Repair or replace as necessary.
3. Check for exhaust leaks:
   a. Start engine.
   b. Cover muffler end with a clean dry shop towel.
   c. Listen for exhaust leakage.
   d. Remove shop towel.
4. Correct any leaks detected. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.

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WHEEL ALIGNMENT 1.24

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

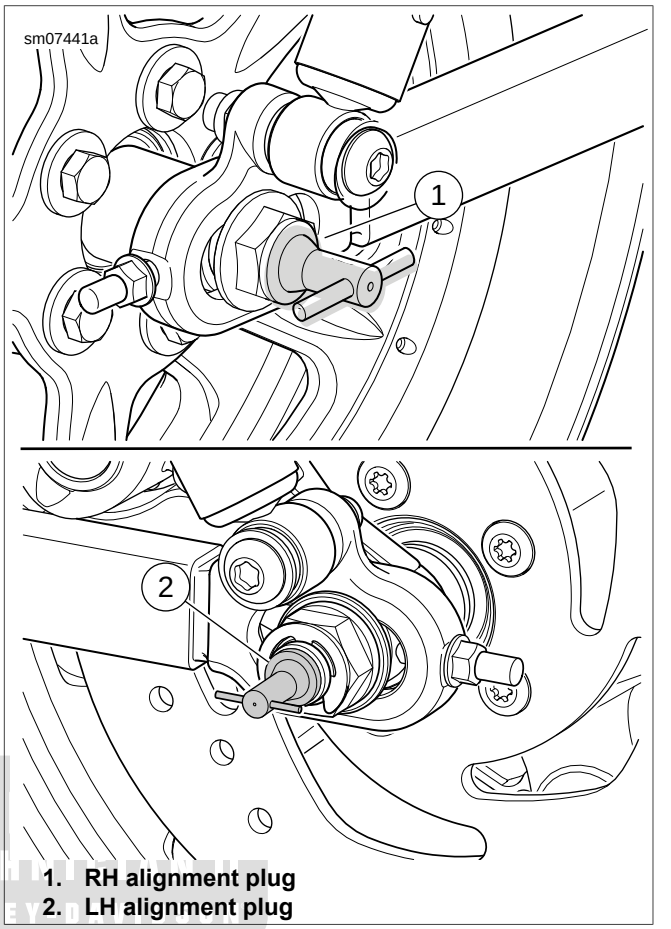
⚠ WARNING

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

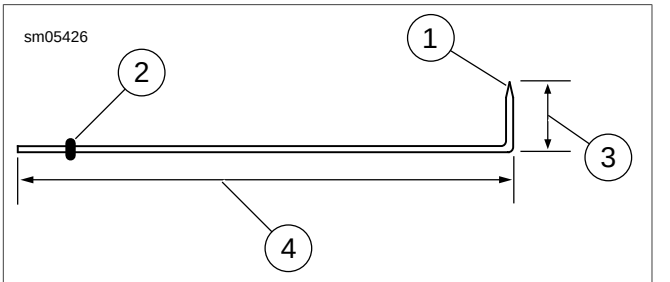
Some models may require muffler removal.

1. See Figure 1-75. Insert alignment plugs (1, 2) from the AXLE ALIGNMENT PLUGS (Part No. HD-48856-A) into right and left ends of rear axle. Turn handle until plug is firmly held in the axle.
2. **XL Models:** See Figure 1-76. Fabricate an alignment tool using a piece of 1/8 in (3.175 mm) diameter aluminum welding rod 21.5 in (546 mm) long:
   a. Grind one end down to a blunt point.
   b. Use pliers to bend rod at a 90 degree angle, 2.25 in (57 mm) from the blunt point.
   c. Place a snug-fitting rubber grommet (2) on rod to act as a slide measurement indicator.
3. **XR 1200X:** See Figure 1-77. Fabricate an alignment tool using a piece of 1/8 in (3.175 mm) diameter aluminum welding rod 22.375 in (568 mm) long:
   a. Grind one end down to a blunt point.
   b. Use pliers to bend rod as shown.
   c. Place a snug-fitting rubber grommet (2) on rod to act as a slide measurement indicator.
4. Gauge distance between rear fork pivot bolt and rear axle alignment plug center:
   a. See Figure 1-78. Insert blunt point of alignment tool in rear fork pivot bolt dimple (2) on right side of rear fork (3).
   b. Slide rubber grommet along tool shaft until it aligns with hole in center of alignment plug (5).
   c. Without moving grommet, position alignment tool on left side of rear fork.
5. Verify measurements match on both sides of axle. Adjust if necessary.



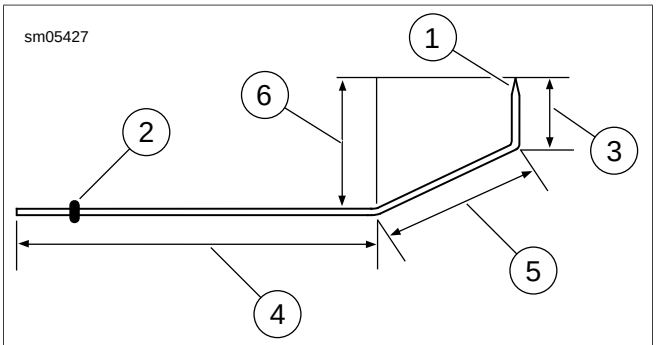
1. RH alignment plug
2. LH alignment plug

Figure 1-75. Axle Alignment Plugs



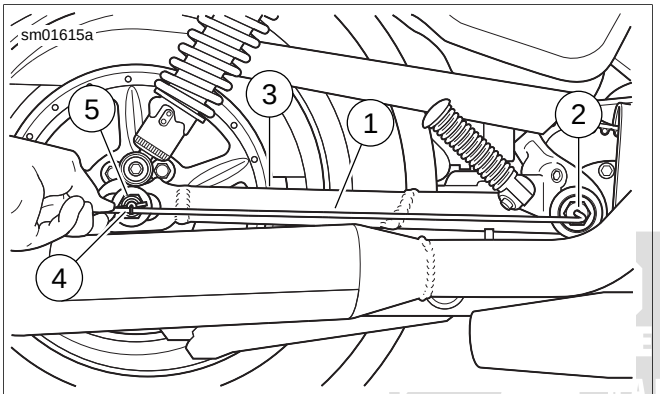
1. Blunt point
2. Rubber grommet
3. 2.25 in (57 mm)
4. 19.25 in (489 mm)

Figure 1-76. Wheel Alignment Tool: XL Models



1. **Blunt point**
2. **Rubber grommet**
3. **5/8 in (16 mm)**
4. **15-1/4 in (387 mm)**
5. **6-1/2 in (165 mm)**
6. **3-7/8 in (98 mm)**

Figure 1-77. Wheel Alignment Tool: XR 1200X



1. **Wheel alignment tool**
2. **Rear fork pivot bolt dimple**
3. **Rear fork**
4. **Rubber grommet**
5. **Axle alignment plug**

Figure 1-78. Checking Wheel Alignment Using Wheel Alignment Tool: XL Models

Adjusting Wheel Alignment

1. Remove and discard E-clip.
2. Loosen rear axle nut.
3. On side of rear fork that has longer distance from pivot bolt to axle center, 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 procedures above. Do so by applying moderate upward force on lower span of drive belt. This 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. Verify drive belt deflection after aligning rear wheel. Adjust if required. See 1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection.

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, 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)

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

SUSPENSION ADJUSTMENTS 1.25

FRONT FORK: XR 1200X

⚠WARNING

Adjust both forks equally. Improper fork adjustment can lead to loss of control, which could result in death or serious injury. (00124c)

NOTICE

Compression and rebound adjusting valves may be damaged if too much force is used at either end of the adjustment range. (00237a)

Spring Preload

1. See Figure 1-79. With a hex key, turn the preload adjuster counterclockwise until it stops. This is the minimum preload setting.
2. Calculate the total load and turn the adjuster clockwise to specification. Refer to Table 1-23.

Rebound Damping

1. See Figure 1-80. Turn the rebound damping adjuster (1) clockwise H (hard) until it stops. This is the maximum rebound setting.
2. Turn adjuster counterclockwise S (soft) to specification. Refer to Table 1-24.

Compression Damping

1. See Figure 1-80. Turn the compression damping adjuster (2) clockwise H (hard) until it stops. This is the maximum compression setting.
2. Turn the adjuster counterclockwise S (soft) to specification. Refer to Table 1-24.

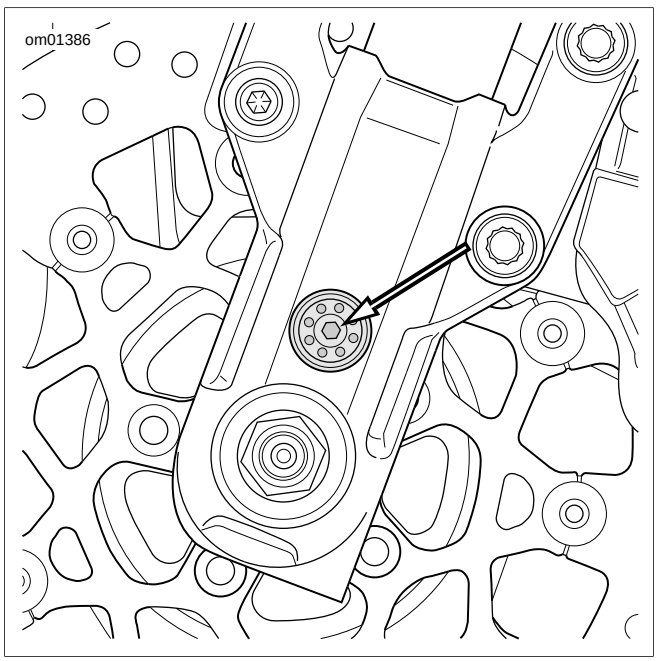
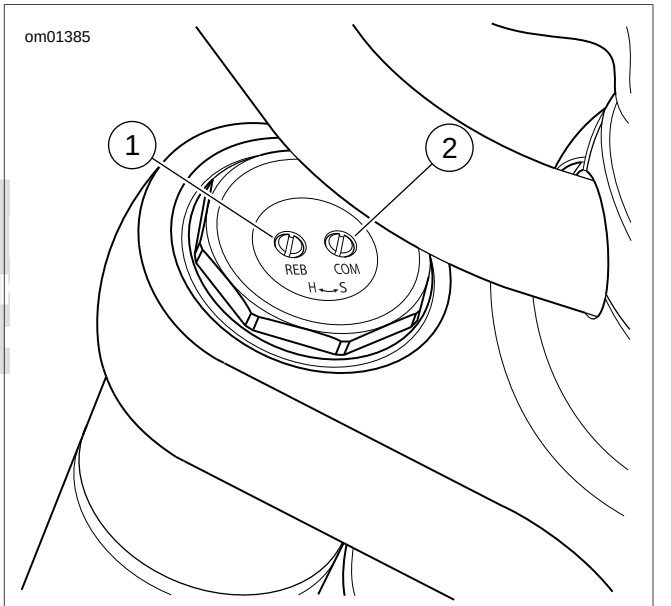


Figure 1-79. Spring Preload Adjuster: XR 1200X

Table 1-23. Recommended Spring Preload: XR 1200X

LOAD*	TURNS** FROM MINIMUM
Less than 165 lb (75.0 kg)	0-4
165-195 lb (75.0-89.0 kg)	4-6
195-225 lb (89.0-102.0 kg)	6-8
225-255 lb (102.0-116.0 kg)	8-10
255 lb (116.0 kg) to maximum added weight allowed. Refer to Table 2-4.	More than 10

*Add the weight of the rider, passenger, riding gear, accessories, and cargo.
**Turns are clockwise turns in from minimum.
- To increase preload, turn the adjuster clockwise.
- To decrease preload, turn the adjuster counterclockwise.



1. **Rebound damping adjuster**
2. **Compression damping adjuster**

Figure 1-80. Fork Rebound and Compression Damping Adjusters: XR 1200X

Table 1-24. Recommended Fork Rebound and Compression Damping: XR 1200X

DAMPING*	TURNS FROM MAX**
Rebound (REB)	3
Compression (COM)	5

*Turns are counterclockwise out from maximum.
- To increase damping, turn adjuster clockwise (H).
- To decrease damping, turn adjuster counterclockwise (S).

SHOCK ABSORBER PRELOAD: ALL MODELS

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 1-83. 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 (1) to position three.*

XL Models: See Figure 1-81. Using SHOCK ADJUSTMENT SPANNER (Part No. 94448-82B), turn the adjustment cam to specification.

- **Five position shocks:** Refer to Table 1-25.
- **Three position shocks:** Refer to Table 1-26.

XR 1200X: See Figure 1-82. Use the spanner wrench with extension handle from the tool kit to turn the adjustment cam to specification. Refer to Table 1-25.

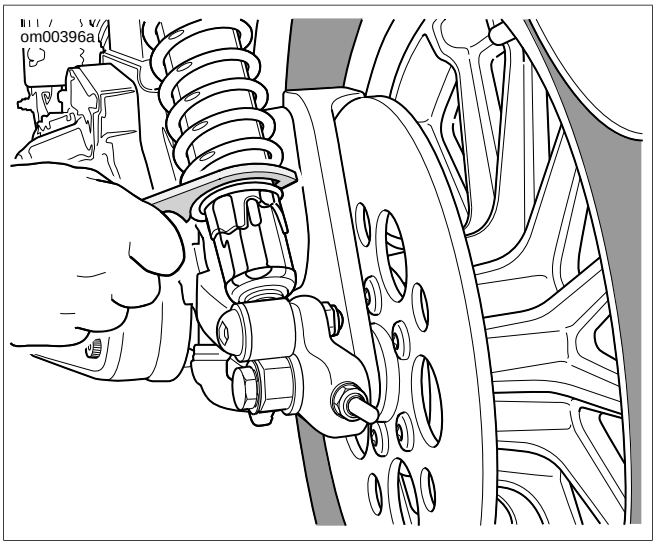


Figure 1-81. Shock Absorber Preload Adjustment: XL Models

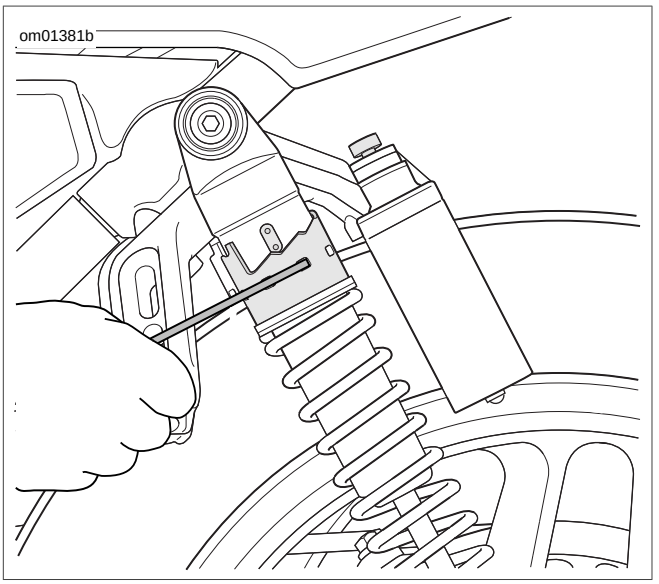


Figure 1-82. Shock Absorber Preload Adjustment: XR 1200X

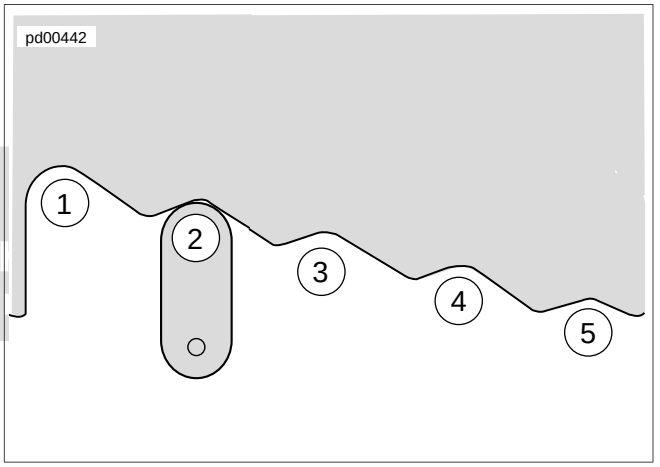


Figure 1-83. Shock Preload Cam Positions (typical)

XL 883L/N, XL1200X/V and certain XL1200CP models are configured for solo operation. If you choose to add a passenger and/or cargo to the vehicle, the ride quality may be compromised. See a Harley-Davidson dealer for two-up seats, passenger pegs and suspension options.

Table 1-25. 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. Refer to Table 2-3 and Table 2-4.	5
* Add the weight of the rider, passenger, riding gear, accessories, and cargo. ** See Figure 1-83.	

Table 1-26. 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. Refer to Table 2-4 and Table 2-3.	3
* Add the weight of the rider, passenger, riding gear, accessories, and cargo.	

Table 1-27. Maximum Added Weight Allowed: Sportster Models

MODEL	MAX LOAD	
	lb	kg
XL 883L	437	198.2
XL 883N	435	197.3
XL 883R	427	193.7
XL 1200C/C ANV/CP	418	189.6
XL 1200CA	427	193.7
XL 1200CB	427	193.7
XL 1200X	433	196.4
XL 1200V	445	201.8
XR 1200X	427	193.7

SHOCK ABSORBER REBOUND AND COMPRESSION: XR 1200X

⚠WARNING

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

NOTICE

Compression and rebound adjusting valves may be damaged if too much force is used at either end of the adjustment range. (00237a)

Shock Absorber Rebound Damping Adjustment

1. See Figure 1-84. Turn the rebound adjuster in the direction of the embossed H (hard) until it stops. This is the maximum rebound damping setting.
2. Turn the rebound adjuster toward the embossed S (soft) the recommended number of clicks. Refer to Table 1-28.

Shock Absorber Compression Damping Adjustment

1. See Figure 1-85. Using fingers, turn the compression adjuster clockwise H (hard) until it stops. This is the maximum compression damping setting.
2. Turn the compression adjuster counterclockwise (H to S) (hard to soft) the recommended number of clicks. Refer to Table 1-28.

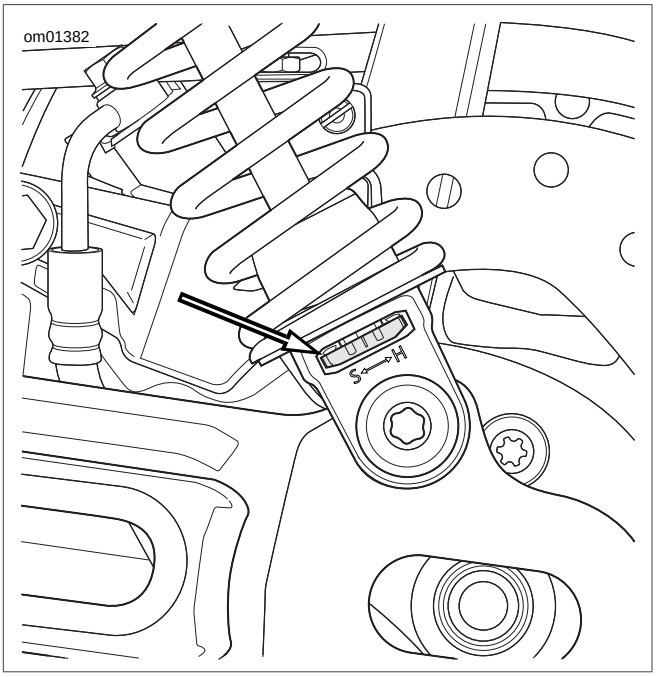


Figure 1-84. Rebound Damping Adjuster: XR 1200X

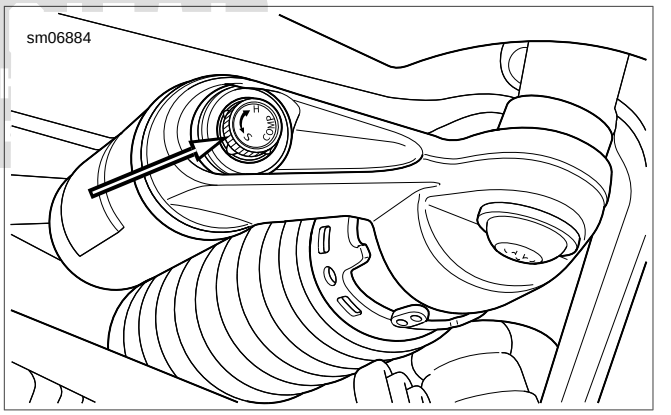


Figure 1-85. Compresson Damping Adjuster: XR 1200X

Table 1-28. Recommended Rear Shock Rebound and Compression Damping: XR 1200X

DAMPING	CLICKS FROM MAX (H to S)
Rebound (REB)	5
Compression (COMP)	7

SUSPENSION TUNING: XR 1200X

After the suspension has been set to the recommend settings and the tires have been inflated to recommended pressures, ride the motorcycle and adjust the suspension damping as required. Refer to Table 1-29.

Table 1-29. Suspension Damping Adjustment Guidelines: XR 1200X

MOTORCYCLE BEHAVIOR	SUGGESTED REMEDY
Soft or unsettled feeling around corners or after bumps	Increase rebound damping.
Leaping feeling or topping after large bumps	Increase rebound damping.
Harsh/sharp feedback over bumps	Decrease rebound damping.
Feels like motorcycle drops down over chatter bumps	Decrease rebound damping.
Excessive bottoming through potholes	Increase compression damping.
Excessive dive when applying front brake	Increase compression damping (forks).
Hard feeling or inadequate absorption over bumps	Decrease compression damping.
Feels excessively stiff or busy around corners	Decrease compression damping.

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HEADLAMP ALIGNMENT 1.26

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

NOTE

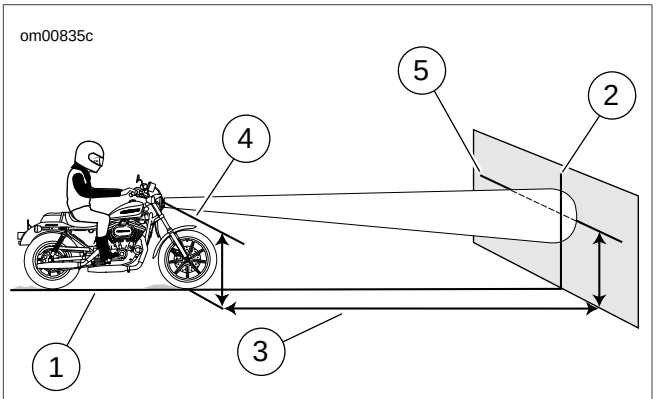
Choose a wall in minimum light.

4. See Figure 1-86. 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

The headlamp is aligned when the light beam hot spot is centered over the intersection of the lines.

9. 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**

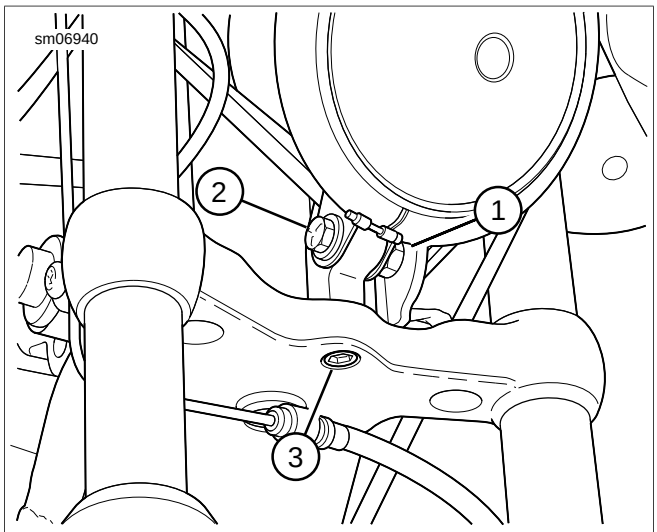
Figure 1-86. Headlamp Alignment: Sportster Models

HEADLAMP: ADJUSTMENT

FASTENER	TORQUE VALUE	
Headlamp horizontal adjustment: XL 1200X/C/C ANV/CP/CA/CB/V	30-35 ft-lbs	40.7-47.5 Nm
Headlamp vertical adjustment: XL 1200X/C/C ANV/CP/CA/CB/V	30-35 ft-lbs	40.7-47.5 Nm
Headlamp clamp nut: XL 883L/N/R, XR 1200X	120-240 **in-lbs**	14-27 Nm

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

1. Set horizontal adjustment:
   a. See Figure 1-87. Loosen the horizontal adjustment screw (3).
   b. Turn the headlamp right or left as necessary to direct the light beam straight ahead.
   c. Tighten the horizontal adjustment screw to 30-35 ft-lbs (40.7-47.5 Nm).
2. Set vertical adjustment:
   a. Loosen the locknut (1) for the vertical adjustment bolt.
   b. Tilt headlamp up or down to properly aim it at the horizontal line on the wall.
   c. Tighten headlamp locknut to 30-35 ft-lbs (40.7-47.5 Nm).

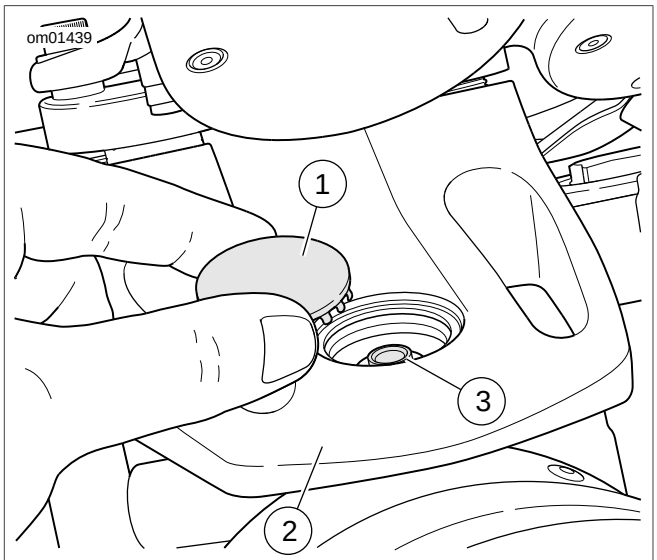


1. **Locknut**
2. **Vertical adjustment bolt**
3. **Horizontal adjustment screw**

Figure 1-87. Headlamp Adjustment: XL 1200X/C/C ANV/CP/CA/CB/V

Adjustment: XL 883R/L/N, XR 1200X

1. See Figure 1-88. Remove snap plug (1) on top of headlamp bracket (2).
2. Loosen headlamp clamp nut (3).
3. Tilt headlamp up or down to properly aim it in relation to the horizontal line and, at the same time, turn it right or left to direct light beam straight ahead.
4. Tighten headlamp clamp nut to 120-240 **in-lbs** (14-27 Nm) after lamp is properly positioned.
5. Install snap plug in headlamp bracket.



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

Figure 1-88. Headlamp Adjustment: XL 883R/L/N, XR 1200X (XR 1200X shown)

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PLACING IN STORAGE

PART NUMBER	TOOL NAME
98716-87A	STORAGE COVER

WARNING

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

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 rear belt deflection. See 1.24 WHEEL ALIGNMENT.
6. Inspect rear belt and sprockets. See 1.12 DRIVE BELT AND SPROCKETS.
7. Inspect air cleaner filter. See 1.7 AIR FILTER, XL Models except XL 1200V or 1.7 AIR FILTER, XR 1200X.
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 1.22 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 STORAGE COVER (Part No. 98716-87A) or light canvas. Plastic materials that do not breathe promote the formation of condensation, which leads to corrosion.

REMOVAL FROM STORAGE

WARNING

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

1. Charge and install 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.

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TROUBLESHOOTING 1.28

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. TSM/TSSM/HFSM Bank Angle Sensor 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) and/or TSM/TSSM/HFSM.
8. Bank Angle Sensor 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 O2).
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.

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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.

BRAKES

Brake Does Not Hold Normally

1. Brake fluid reservoir low, system leaking or pads worn.
2. Brake system contains air bubbles.
3. Master cylinder/caliper piston seals worn or parts damaged.
4. Brake pads contaminated with grease or oil.
5. Brake pads badly worn.
6. Brake disc badly worn or warped.
7. Brake drags - insufficient brake pedal or hand lever free play, caliper piston worn or damaged, or excessive brake fluid in reservoir.

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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

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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, front, nut	60-65 ft-lbs	81-88 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Axle, front, nut	60-65 ft-lbs	81-88 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Axle, front, pinch screw: XL Models	21-27 ft-lbs	28.5-36.6 Nm	2.5 WHEELS, Front Wheel
Axle, front, pinch screw: XL Models	21-27 ft-lbs	28.5-36.6 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Axle, front, pinch screw: XR 1200X	41-48 ft-lbs	55.6-65.1 Nm	2.5 WHEELS, Front Wheel
Axle, front, pinch screw: XR 1200X	41-48 ft-lbs	55.6-65.1 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
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: XL Models	120-180 **in-lbs**	13.6-20.4 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XL Models
Belt guard screw: XR 1200X	72-96 **in-lbs**	8.1-10.8 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XR 1200X
Brake caliper, front, bridge bolt	12-18 ft-lbs	16.9-24.5 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Assembly
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Assembly
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Assembly
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.17 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
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 battery tray screw	30-40 **in-lbs**	3.4-4.5 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake line/switch, rear, tee bracket screw: XL Models	72-120 **in-lbs**	8.14-13.6 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake line/switch, rear, tee bracket screw: XR 1200X	17-22 **in-lbs**	1.9-2.5 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X

FASTENER	TORQUE VALUE		NOTES
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.12 REAR BRAKE MASTER CYLINDER: XR 1200X, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line clamp screw, steering stem, XL Models	120-168 **in-lbs**	13.6-19.0 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line clamp screw, steering stem, XR 1200X	96-144 **in-lbs**	11-16 Nm	2.16 BRAKE LINES, Front Brake Line
Brake master cylinder, front, reservoir cover screw	9-17 **in-lbs**	1.0-2.0 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.17 BLEEDING BRAKES, Procedure
Brake master cylinder, rear, mounting screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake master cylinder, rear, mounting screw: XR 1200X	72-96 **in-lbs**	8.1-10.9 Nm	2.12 REAR BRAKE MASTER CYLINDER: XR 1200X, Installation
Brake master cylinder, rear, pushrod nut: XR 1200X	130-173 **in-lbs**	14.7-19.6 Nm	2.12 REAR BRAKE MASTER CYLINDER: XR 1200X, Assembly
Brake master cylinder, rear, pushrod shoulder nut	130-173 **in-lbs**	14.7-19.6 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Assembly
Brake master cylinder clamp, front, screw	108-132 **in-lbs**	12.2-14.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Brake master cylinder mounting bracket, rear, screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake master cylinder mounting bracket, rear, screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	2.13 REAR BRAKE MASTER CYLINDER RESERVOIR, Installation: XL Models
Brake master cylinder reservoir, rear, mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	2.13 REAR BRAKE MASTER CYLINDER RESERVOIR, Installation: XR 1200X
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	2.23 REAR FORK, Installation
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installing Brake Pads in Caliper

FASTENER	TORQUE VALUE		NOTES
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Assembly
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installing Brake Pads in Caliper
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to brake pedal screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to brake pedal screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Caliper bolt pin: XL Models	15-18 ft-lbs	19.6-24.5 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Caliper to mouting bracket: XL Models	87-130 **in-lbs**	9.8-14.7 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Clutch lever anti-rattle spring screw	8-13 **in-lbs**	0.9-1.5 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Cylinder head exhaust port nut	96-120 **in-lbs**	10.9-13.6 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Debris deflector screw: XL Models	36-60 **in-lbs**	4.1-6.8 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XL Models
Debris deflector screw: XR 1200X	72-96 **in-lbs**	8.1-10.8 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XR 1200X
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Fender, inner screw: XR 1200X	72-120 **in-lbs**	8.1-13.6 Nm	2.35 REAR FENDER: XR 1200X, Installation
Fender, rear, mounting fastener	132-216 **in-lbs**	14.9-24.4 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L
Fender, rear, mounting fastener	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 1200C/C ANV/CP/CA/CB

FASTENER	TORQUE VALUE		NOTES
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm	2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender bracket to forks, front: XR 1200X	15-19 ft-lbs	21-25 Nm	2.31 FRONT FENDER, All Models
Fender support, rear, screw	132-216 **in-lbs**	14.9-24.4 Nm	2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender to bracket, front: XR 1200X	30-60 **in-lbs**	4.1-6.8 Nm	2.31 FRONT FENDER, All Models
Fender to fork brace, front: XL 1200X	30-42 **in-lbs**	3.4-4.7 Nm	2.31 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	2.31 FRONT FENDER, All Models
Footrest bracket fastener: XR 1200X	45-50 ft-lbs	61-68 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Footrest clevis fastener: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Right Footrest and Rear Brake Pedal Assembly
Footrest clevis fastener: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.23 REAR FORK, Installation
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.19 FRONT FORK: XL MODELS, Installation
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.19 FRONT FORK: XL MODELS, Installation
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.20 FRONT FORK: XR 1200X, Installation
Fork, front, oil drain screw: XL 883N/R	13-17 **in-lbs**	1.5-2.0 Nm	2.19 FRONT FORK: XL MODELS, Changing Fork Oil: XL Models
Fork, front, stem bolt, 1st torque	23-27 ft-lbs	31.2-36.6 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation

FASTENER	TORQUE VALUE		NOTES
Fork, front, stem bolt, final torque	72-96 **in-lbs**	8.1-10.9 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, lower front, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	2.23 REAR FORK, Installation
Fork brace to forks: XL 1200X	18-22 ft-lbs	25-30 Nm	2.31 FRONT FENDER, All Models
Fork cap to outer tube: XR 1200X	21-29 ft-lbs	29-39 Nm	2.20 FRONT FORK: XR 1200X, Assembly
Fork piston rod hex nut: XR 1200X	19-22 ft-lbs	26-30 Nm	2.20 FRONT FORK: XR 1200X, Assembly
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm	2.19 FRONT FORK: XL MODELS, Changing Fork Oil: XL Models
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm	2.19 FRONT FORK: XL MODELS, Installation
Fork slider tube fastener: XL Models	132-216 **in-lbs**	14.9-24.4 Nm	2.19 FRONT FORK: XL MODELS, Assembly
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.30 HANDLEBAR, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.30 HANDLEBAR, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.30 HANDLEBAR, Installation
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm	2.30 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	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
License plate, rear, keps nut, XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 1200C/C ANV/CP/CA/CB
License plate bolt	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 883R/L
License plate bracket, rear, fasteners: XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 1200C/C ANV/CP/CA/CB
License plate fasteners, front: XL 1200X/C/C ANV (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.32 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate: XL Models (India)
License plate fasteners, front: XL 883L/N/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.32 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate: XL Models (India)

FASTENER	TORQUE VALUE		NOTES
License plate screw: XL 883L/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.37 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate: XL Models (India)
License plate screw: XL 883N, XL 1200X (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.37 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate: XL Models (India)
License plate support bracket screws	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 883R/L
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Muffler bracket to footrest bracket screw: XR 1200X	15-19 ft-lbs	20.4-25.8 Nm	2.43 PASSENGER FOOTRESTS, XR 1200X
Passenger footrest support bracket fastener: XL Models	45-50 ft-lbs	61-68 Nm	2.43 PASSENGER FOOTRESTS, XL Models
Passenger footrest support bracket fastener: XR 1200X	45-50 ft-lbs	61-68 Nm	2.43 PASSENGER FOOTRESTS, XR 1200X
Passenger pillion retainer post screw: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	2.35 REAR FENDER: XR 1200X, Installation
Rear caliper mounting bolt	14-18 ft-lbs	19.6-24.5 Nm	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Rear caliper pin bolt	14-18 ft-lbs	19.6-24.5 Nm	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Rider footrest support bracket mounting screw	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Rod guide case to inner tube: XR 1200X	66 ft-lbs	90 Nm	2.20 FRONT FORK: XR 1200X, Assembly
Saree guard, left-front, passenger footrest support bracket fastener	16-20 ft-lbs	21.7-27.1 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Seat mounting screw: XL Models	20-40 **in-lbs**	2.3-4.5 Nm	2.39 SEAT, Seat: XL Models
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 1200C/C ANV/CP/CA/CB
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm	2.34 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	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly

FASTENER	TORQUE VALUE		NOTES
Shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shift linkage fastener	120-180 **in-lbs**	13.6-20.3 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Shift pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Adjusting Shift Pedal: Forward Controls Models
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Adjusting Shift Lever
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Adjusting Shift Pedal: Forward Controls Models
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Adjusting Shift Lever
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	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XL Models
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.24 SHOCK ABSORBERS, Installation/Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads.
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.24 SHOCK ABSORBERS, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)/Saree Guards: Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT to the threads.
Single caliper 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	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.7 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket mounting screw, 1st torque	60 ft-lbs	81.3 Nm	2.5 WHEELS, Rear Wheel
Sprocket mounting screw, final torque	80 ft-lbs	108.0 Nm	2.5 WHEELS, Rear Wheel
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link, upper front, engine bracket mounting screw	55-65 ft-lbs	74.6-88.2 Nm	2.25 STABILIZER LINKS, Upper Front Stabilizer Link

FASTENER	TORQUE VALUE		NOTES
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Rear Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Stop lamp, rear, switch: XL Models	132-168 **in-lbs**	14.9-18.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Stop lamp, rear, switch: XR 1200X	132-168 **in-lbs**	14.9-18.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Strut cover fastener	96-156 **in-lbs**	10.9-17.6 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Strut cover fastener	96-156 **in-lbs**	10.9-17.6 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.28 THROTTLE CABLES: ALL MODELS, Assembly and Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.30 HANDLEBAR, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.30 HANDLEBAR, Installation
Tailsection bolts: XR 1200X	72-120 **in-lbs**	8.1-13.6 Nm	2.35 REAR FENDER: XR 1200X, Installation
Turn signal clamp, front, screw	96-120 **in-lbs**	10.9-13.6 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Turn signal stalk locknut	132-216 **in-lbs**	14.9-24.4 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L
Turn signal stalk locknut	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 1200C/C ANV/CP/CA/CB
Turn signal stalk locknut	132-216 **in-lbs**	14.9-24.4 Nm	2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Turn signal stalk locknut	96-156 **in-lbs**	10.9-17.6 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
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

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
Wheel base	60.0	1524	59.3	1506	59.8	1519
Road clearance	5.6	142	3.8	97	3.9	99
Seat height*	27.3	693	25.5	648	25.7	653
*With 180 lb (81.7 kg) rider on seat.						

Table 2-2. Dimensions: XL 1200 Models and XR 1200X

ITEM	XL 1200C/C ANV		XL 1200CA		XL 1200CB		XL 1200X		XL 1200V		XR 1200X	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
Wheel base	59.8	1520	59.8	1520	59.8	1520	59.8	1519	60.0	1524	60.0	1524
Road clearance	4.3	110	4.3	110	4.3	110	3.9	99	4.7	120	5.9	150
Seat height*	26.6	676	26.6	676	26.6	676	26.0	660	26.6	676	29.2	742
*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 the sum of the weight of the motorcycle, accessories, and the maximum weight of the rider, passenger and cargo that can be safely carried.
- GAWR is the maximum amount of weight that can be safely carried on each axle.
- The GVWR and GAWR are shown on the information plate, located on the frame down tube.

NOTES

- *The maximum additional weight allowed on the motorcycle equals the Gross Vehicle Weight Rating (GVWR) minus the 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 the 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*	563	255.4	573	260.0	565	256.3
Maximum added weight allowed**	437	198.2	427	193.7	435	197.3
GVWR	1000	453.6	1000	453.6	1000	453.6
GAWR front	339	154.0	335	152.0	335	152.0
GAWR rear	661	300.0	665	301.6	665	301.6
*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 cannot exceed this weight.						

Table 2-4. Weights: XL 1200 Models and XR 1200X

ITEM	XL 1200C/C ANV		XL 1200CA		XL 1200CB		XL 1200X		XL 1200V		XR 1200X	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
Running weight*	582	264.0	573	260.0	573	260.0	567	257.2	555	251.7	573	259.9
Maximum added weight allowed**	418	189.6	427	193.7	427	193.7	433	196.4	445	201.8	427	193.7
GVWR	1000	453.6	1000	453.6	1000	453.6	1000	453.6	1000	453.6	1000	453.6
GAWR, front	335	152.0	335	152.0	335	152.0	335	152.0	335	152.0	340	154.2
GAWR, rear	665	301.6	665	302.0	665	302.0	665	301.6	665	301.6	660	299.4

*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 cannot exceed this weight.

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 and XR 1200X

ITEM	XL 1200C/C ANV/CP/CA/CB		XL 1200X/V		XR 1200X	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
Fuel tank (total)	4.5 gal	17.0 L	2.1 gal	7.9 L	3.5 gal	13.2 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 gal	3.8 L	0.65 gal	2.5 L	0.8 gal	3.0 L

Table 2-7. Brake Disc Specifications: XL Models

SPECIFICATION	in	mm
Diameter (front)	11.500	292
Diameter (rear)	10.236	260
Minimum thickness (front)	0.200	5.08
Minimum thickness (rear)	0.230	5.84
Maximum disc runout (front and rear)	0.008	0.20

Table 2-8. Brake Disc Specifications: XR 1200X

SPECIFICATION	in	mm
Diameter (front)	11.500	292
Diameter (rear)	10.236	260
Minimum thickness (front)	0.187	4.75
Minimum thickness (rear)	0.230	5.84
Maximum disc runout (front and rear)	0.006	0.15

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 2-9. 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 883R XL 883N	19 in - front	T19 x 2.15 MT	Michelin Scorcher "31"	100/90B19
XL 883R XL 883N	16 in - rear	T16 x 3.00 D	Michelin Scorcher "31"	150/80B16
XL 1200C/C ANV 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
XR 1200X	18 in - front	E18 x 3.5 MT	Michelin Scorcher "11F"	120/70ZR18
	17 in - rear	E17 x 5.5 MT	Michelin Scorcher "11"	180/55ZR17

Table 2-10. 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
XL 1200X	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/C ANV/CP/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 2-11.

Location

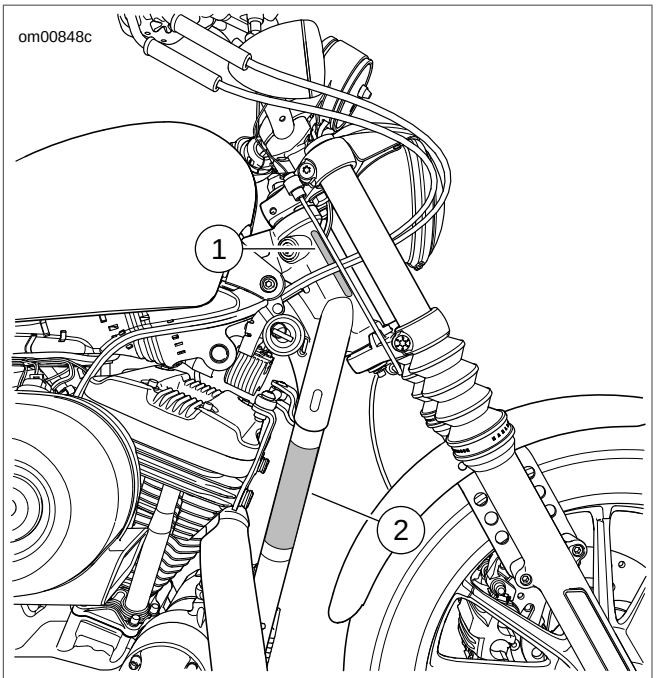
See Figure 2-1. The full 17-digit VIN is stamped on the right side of the frame near the steering head. In some destinations, a printed VIN label is also attached to the right front downtube.

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: Sportster Models

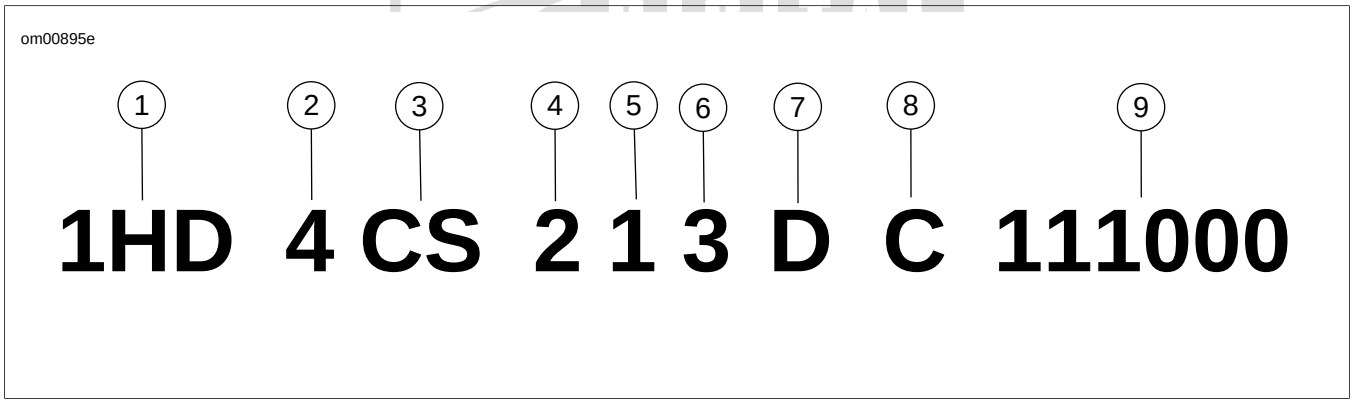


Figure 2-2. Typical Harley-Davidson VIN: 2013 Sportster Models

Table 2-11. Harley-Davidson VIN Breakdown: 2013 Sportster Models

POSITION	DESCRIPTION	POSSIBLE VALUES
1	World manufacturer identifier	1HD=Originally manufactured for sale **within** the United States 5HD=Originally manufactured for sale **outside** of the United States 932=Originally manufactured in and for sale only in Brazil market MEG=Originally manufactured in and for sale only in India market
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 6=Evolution® 1202 cm^3 precision-cooled, fuel-injected

Table 2-11. Harley-Davidson VIN Breakdown: 2013 Sportster Models

POSITION	DESCRIPTION	POSSIBLE VALUES	
5	Introduction date/Configuration and calibration recognition	**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	D=2013	
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 2-12. VIN Model Codes: 2013 Sportster Models

CODE	MODEL	NAME	CODE	MODEL	NAME
CR	XL 883L	SuperLow®	LE	XL 883N	Iron 883™
CS	XL 883R	883 Roadster	LF	XL 1200V	Seventy-Two™
CT	XL 1200C XL 1200C ANV	1200 Custom	LH	XL 1200CP	1200 Custom
LC	XL 1200X	Forty-Eight™	LJ	XL 1200CA	1200 Custom Limited A
LD	XR 1200X	XR1200X™	LK	XL 1200CB	1200 Custom Limited B

DIGITAL TECHNICIAN HARLEY-DAVIDSON

TIRES 2.4

REMOVAL

NOTE

Take care when removing and installing tire to prevent cosmetic damage to wheel. This is especially true with wheels that feature painted surfaces.

1. Remove wheel from motorcycle. 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 the tube only. Removing one side allows the tube to be replaced and allows for inspection of tire.*

3. Loosen both tire beads from rim flange. 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.
6. Replace tube and rim seal prior to installing tire.

⚠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)

7. Repair tread on tubeless tires if puncture is 1/4 in (6.4 mm) or smaller. Repairs must be made from inside the tire.
8. 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.

Locate the colored balance dot on the sidewall 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).



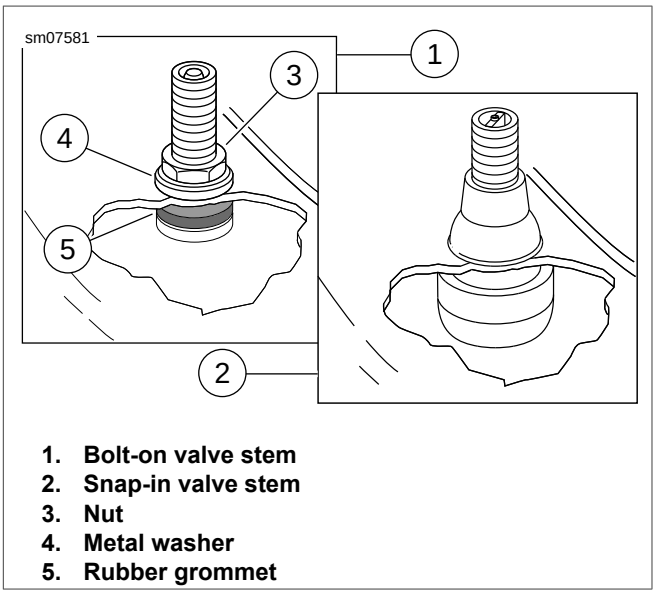
Figure 2-3. Installing Rim Strip

Tubeless Tires

WARNING

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

1. See Figure 2-4. Replace damaged or leaking valve stems.
2. **XL 883L/N/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 1200C/C ANV/CP/CA 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.

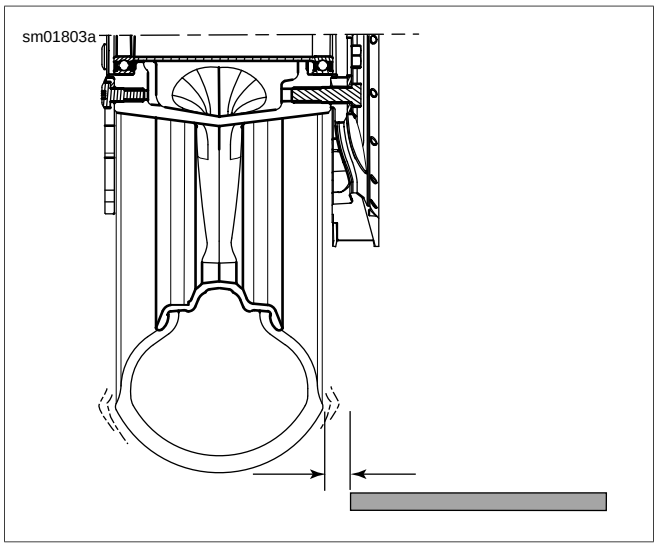


Figure 2-5. Tire Lateral Runout

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.

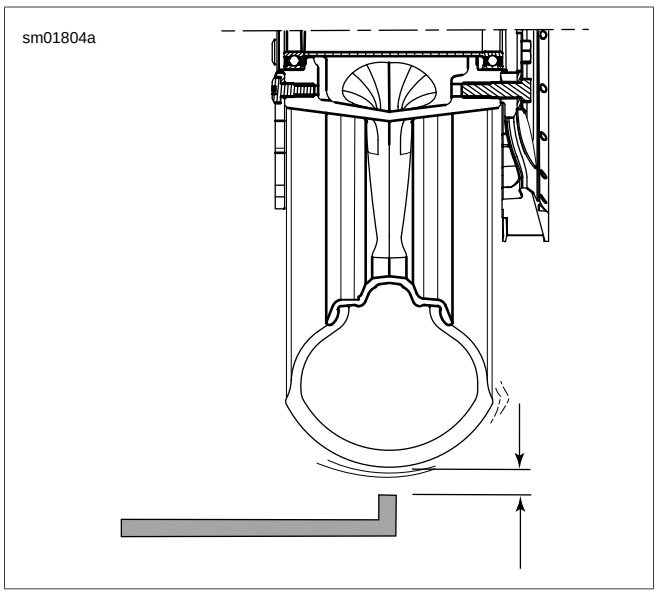


Figure 2-6. Tire Radial Runout

WHEEL BALANCING

NOTE

Install tire after balancing. See See 2.5 WHEELS, Front Wheel or 2.5 WHEELS, Rear Wheel.

Static vs Dynamic

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

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

Weights

The maximum weight permissible to accomplish balance is 3.5 oz (99.2 g) (total weight applied to the rim). If more than 3.5 oz (99.2 g) of weight is required, 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

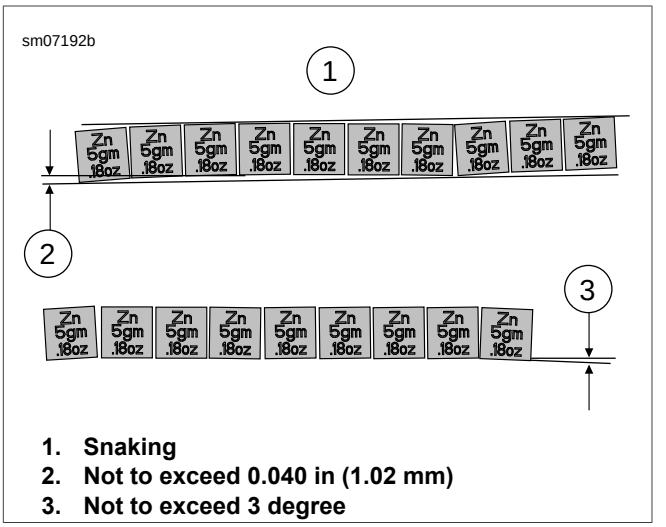
- *If adding more than 1.5 oz (43 g) of weight at one location, divide the amount so that half is applied to each side of rim.*
- *On cast wheels without a flat area near the bead, place the weights crosswise through the opening.*

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

NOTE

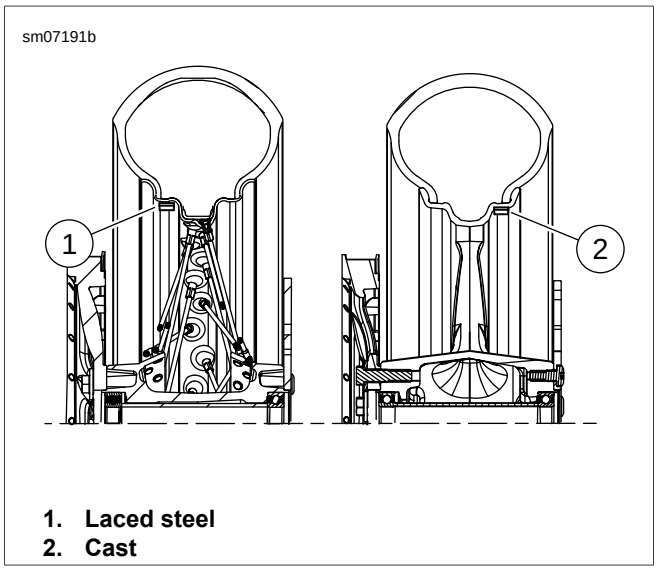
See Figure 2-7. When installing wheel weights, consider cosmetics. Keep snaking (1) within 0.040 in (1.02 mm) (2) of straight. Also keep the angle alignment of individual segments (3) within 3 degrees.

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

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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 1.28 TROUBLESHOOTING or refer to Table 2-13 for a list of probable causes.

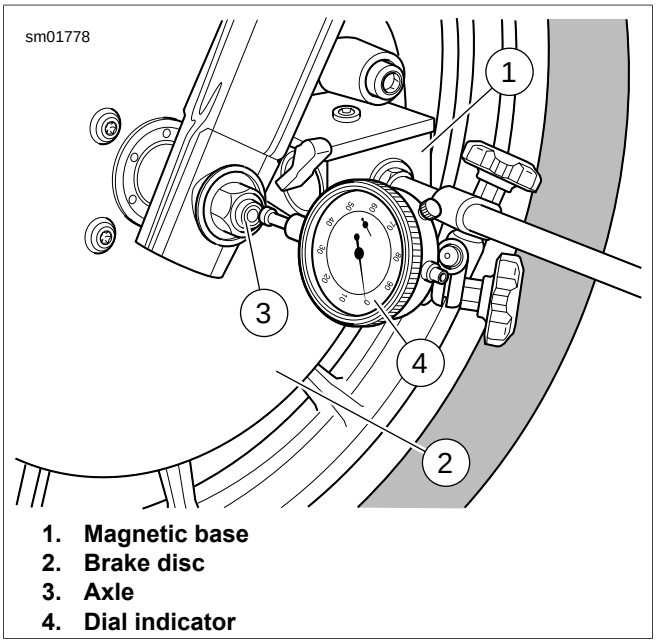
Keep tires inflated to the recommended air pressure. Always balance the wheel after replacing a tube or tire.

Table 2-13. 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 2.23 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 vertical runout not be 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 may be satisfactory if dynamic balancing facilities are not available. However, dynamic balancing is strongly recommended.
Steering head bearings.	Replace pitted or worn bearings. Adjust fall-away. See 2.21 FORK STEM AND BRACKET ASSEMBLY.
Damper tubes.	Check for leaks. See 2.19 FRONT FORK: XL MODELS or 2.20 FRONT FORK: XR 1200X.
Shock absorbers.	Check damping action and mounting stud bushings. See 2.24 SHOCK ABSORBERS.
Rear fork bearings.	Check for looseness. See 2.23 REAR FORK.

WHEEL BEARING END PLAY

1. Raise the wheel off the ground.
2. See Figure 2-9. Mount a magnetic base dial indicator on the brake disc.
3. Set the indicator contact point on the end of the axle.
4. Move the wheel back as far as it will go. Hold the wheel in position and zero the dial indicator.
5. Move the wheel forward as far as it will go. Note the reading of the dial indicator. Verify the reading.
6. If end play is greater than specification, remove the wheel and replace both wheel bearings. Refer to Table 2-14.



1. **Magnetic base**
2. **Brake disc**
3. **Axle**
4. **Dial indicator**

Figure 2-9. Check Wheel Bearing End Play

Table 2-14. 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
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm
Axle, front, nut	60-65 ft-lbs	81-88 Nm
Axle, front, pinch screw: XL Models	21-27 ft-lbs	28.5-36.6 Nm
Axle, front, pinch screw: XR 1200X	41-48 ft-lbs	55.6-65.1 Nm

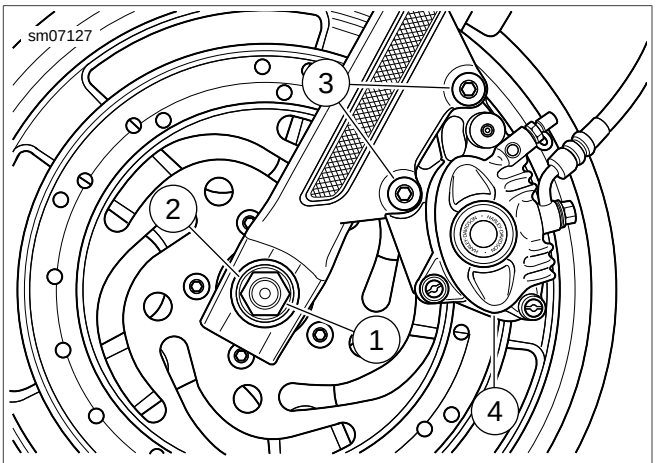
Removal

1. Raise the front wheel off the ground.

NOTES

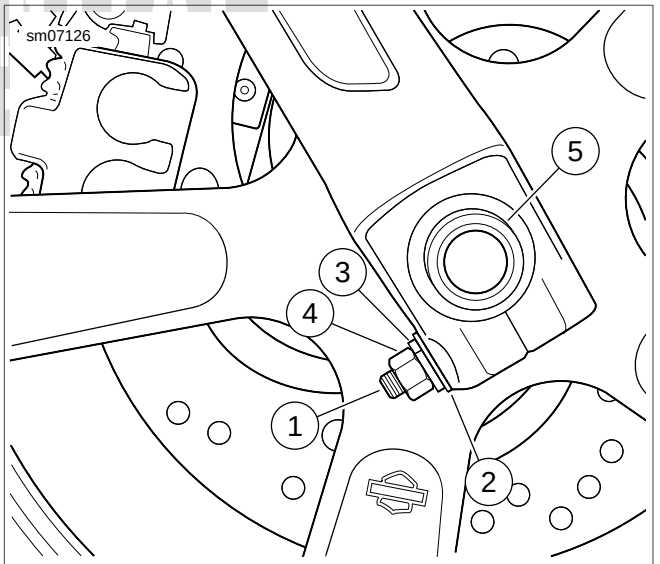
- *Do not operate the front brake lever with the front wheel removed or the caliper pistons may be forced out. Seating the pistons requires disassembly of the caliper.*
- *On models with dual disc brakes, remove both calipers.*

2. See Figure 2-10. Remove brake caliper mounting screws (3). Slide caliper (4) off brake disc and secure caliper out of the way.
3. **XL 1200X/C/C ANV/CP/CA/CB:** Remove the front fender. See 2.31 FRONT FENDER.
4. Remove axle nut (1) and flat washer (2) from axle on left side of vehicle.
5. See Figure 2-11. On right side of vehicle, loosen nut (4) on pinch screw (1). Pull axle out of hub while supporting wheel.
6. Remove spacer and front wheel assembly.



1. **Axle nut**
2. **Flat washer**
3. **Brake caliper mounting screws**
4. **Brake caliper**

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 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

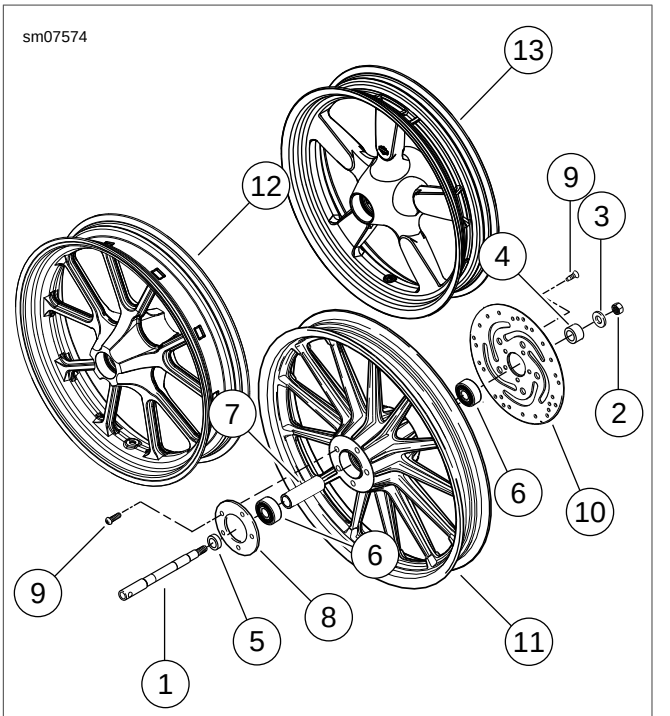
Be sure that brake fluid or other lubricants do not contact brake pads or discs. Such contact can adversely affect braking ability, which could cause loss of control, resulting in death or serious injury. (00290a)

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 the bulb shaped end (2) of the slots points opposite the direction of rotation (3).

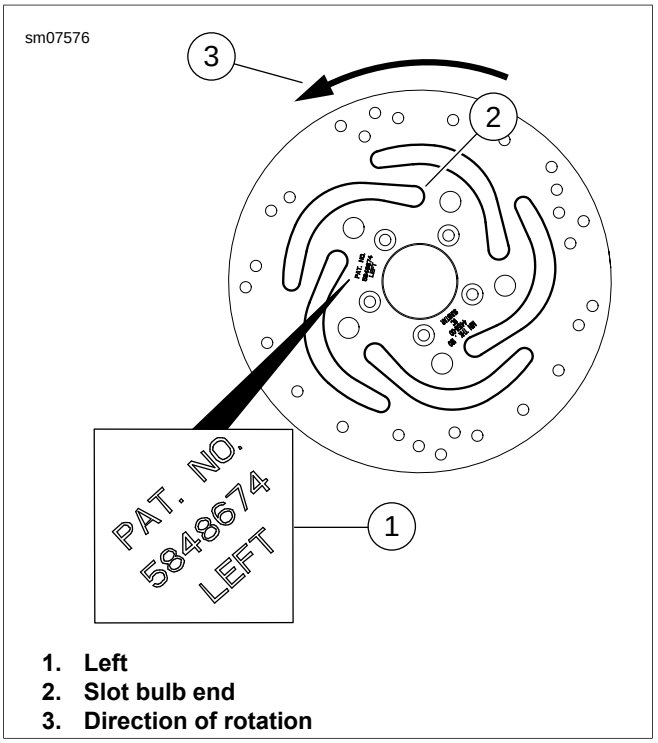
3. Install brake disc. Secure with **new** screws and tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).



1. **Axle**
2. **Nut**
3. **Washer**
4. **Wide spacer**
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**
13. **XL 1200C/C ANV/CP/CA**

Figure 2-12. Single Disc Wheels: XL Models

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

Figure 2-13. Single Disc Orientation

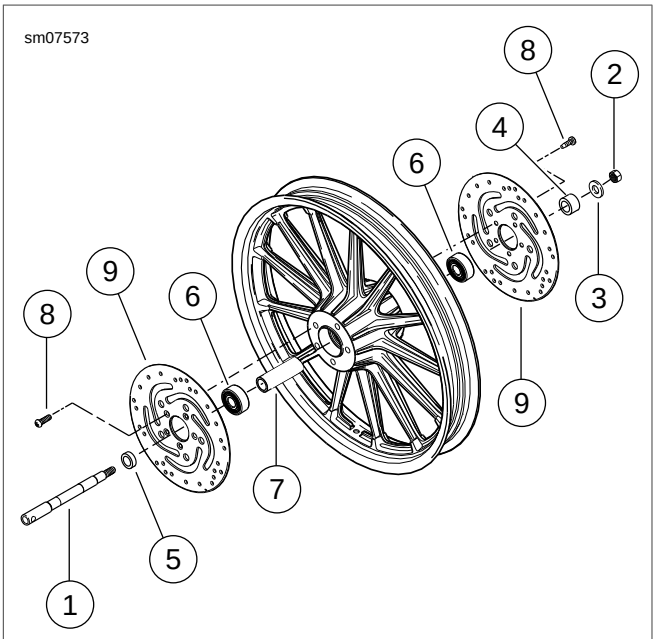
Assembly Cast Dual Disc: XL 883R

1. See Figure 2-14. Install hub spacer (7) and **new** wheel bearings (6). See 2.5 WHEELS, Sealed Wheel Bearings.

NOTE

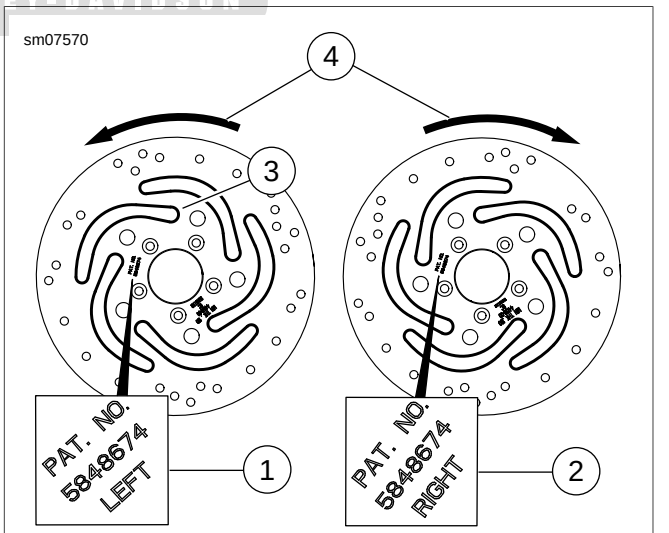
See Figure 2-15. The words LEFT (1) and RIGHT (2) on the discs will be located on the left and right sides.

2. Hold brake discs together with inboard sides facing each other (minimum thickness and part number stampings are on outboard side of brake disc). The bulb shaped end (3) of each slot is on the trailing edge of the slot in the direction of rotation (4).
3. Rotate one brake disc as necessary, until all vent holes are aligned with those of the other brake disc.
4. Keeping the paint marks on the edge of both discs aligned, install both brake discs onto hub. Secure with **new** screws.
5. Holding brake discs aligned, use a felt marking pen or paint pen to draw a line across the edge of both brake discs.
6. Tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).
7. Verify that wheel is true. See 2.7 CHECKING AND TRUING WHEELS, Cast Wheel Runout.



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

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



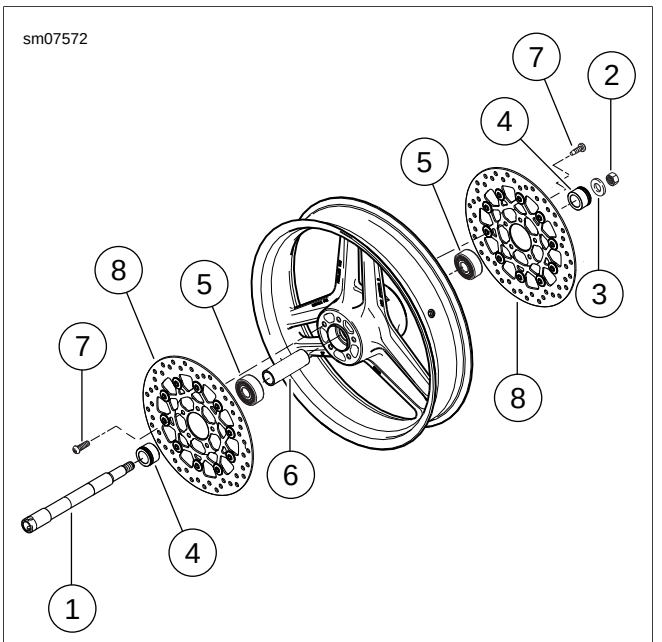
1. **Left**
2. **Right**
3. **Slot bulb end**
4. **Direction of rotation**

Figure 2-15. Dual Disc Orientation: XL 883R

Assembly Cast Dual Disc: XR 1200X

See Figure 2-16. . XR 1200X models are equipped with a floating front brake disc. They are non-directional and do not need to be matched with opposite disc.

Tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).



1. **Axle**
2. **Nut**
3. **Washer**
4. **Spacer (2)**
5. **Bearing (2)**
6. **Hub spacer**
7. **Fastener (10)**
8. **Brake disc (2)**

Figure 2-16. Dual Disc Wheel: XR 1200X

Disassembly: Laced Front Wheel

1. See Figure 2-17. If necessary, remove five screws (1) and brake disc (9).
2. If necessary, remove wheel bearings (4) and hub spacer (6). See 2.5 WHEELS, Sealed Wheel Bearings.

NOTE

*If only rim is to be replaced, tape spokes together to hold position on hub and 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. If it is necessary to disassemble wheel, loosen spoke nipples and spokes and slide each spoke out of hub.

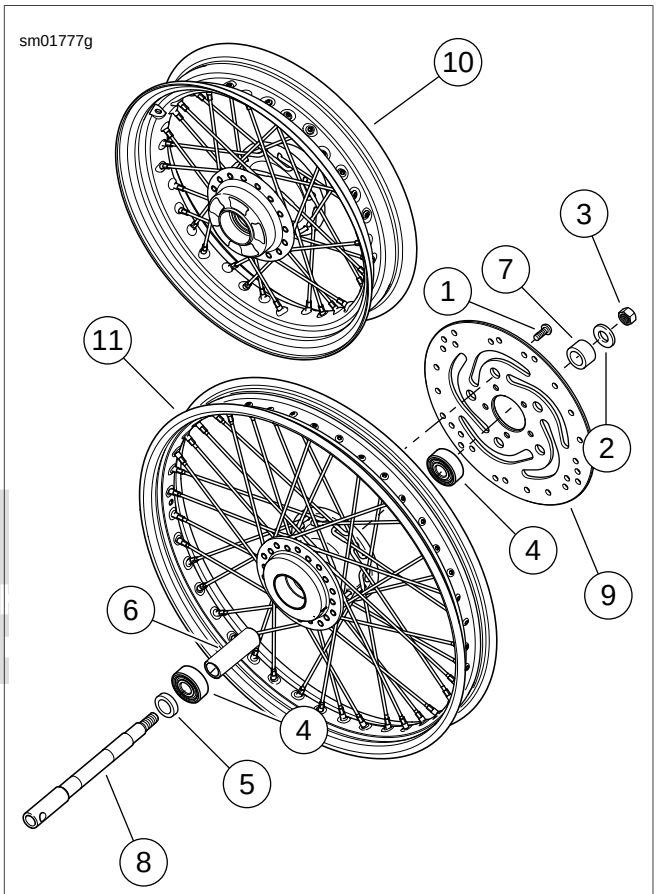
Assembly: Laced Front Wheel

1. See Figure 2-17. 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) and tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).
4. Verify that wheel is true.



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

Figure 2-17. Laced Front Wheel

Installation

1. Apply a light coat of ANTI-SEIZE LUBRICANT to the axle, bearing bores, and hub spacer bore.
2. Position wheel between forks. Verify that bearing spacers on right and left side of wheel bearings are in position.

3. With pinch screw 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.
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. **Dual Disc Models:** Align calipers to brake discs:
   a. Make sure axle pinch screw nut is loose.
   b. Position right fork leg against bearing spacer.
   c. **XL Models:** Tighten axle pinch screw to 21-27 ft-lbs (28.5-36.6 Nm).
   d. **XR 1200X:** Tighten axle pinch screw to 41-48 ft-lbs (55.6-65.1 Nm).
7. **XL 1200X/C/C ANV/CP/CA/CB:** Install front fender. See 2.31 FRONT FENDER.
8. Install brake caliper(s). See 2.9 FRONT BRAKE CALIPER: XL MODELS or 2.10 FRONT BRAKE CALIPER: XR 1200X.

⚠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)

9. Pump brake lever to move pistons out until they contact outside brake pad(s). 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, 1st 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

Removal

1. Secure motorcycle upright on a suitable lift. Raise rear end of motorcycle high enough to permit wheel removal.
2. **XL Models:** Remove rear muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.
3. **XL Models:** Remove right lower shock absorber nut and pull screw out slightly. This will help avoid damage to sprocket when rear wheel is removed.
4. See Figure 2-18. 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.

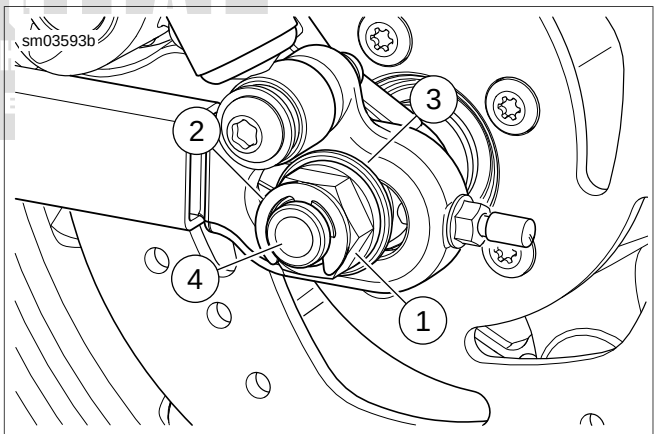
NOTE

It is not necessary to disassemble rear brake caliper in order to remove rear wheel.

8. **XR 1200X:** Disengage brake hose from clamps on lower side of rear fork. Carefully slide caliper and bracket assembly forward to disengage from brake disk and boss on rear fork. Support assembly from frame using rope or bungee cord.
9. Remove spacers and roll rear wheel assembly back out of fork.
10. Remove rear wheel assembly.

NOTE

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



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

Figure 2-18. Rear Wheel Mounting

Disassembly

NOTES

- *Sportster models sold in certain markets are equipped with rear wheel compensating sprockets. See C.1 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 2-19 or Figure 2-20. 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: *If only rim is to be replaced, tape spokes together to hold position on hub and remove spokes from rim. See 1.12 DRIVE BELT AND SPROCKETS.*

5. **Laced Wheel:** If it is necessary to disassemble wheel, loosen the spoke nipples and spokes and slide each spoke out of hub.

Cleaning and Inspection

1. Inspect all parts for damage or excessive wear.

⚠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: XL MODELS OR 1.17 BRAKE PADS AND DISCS: XR 1200X.
3. Inspect rear belt and sprocket. See 1.12 DRIVE BELT AND SPROCKETS.

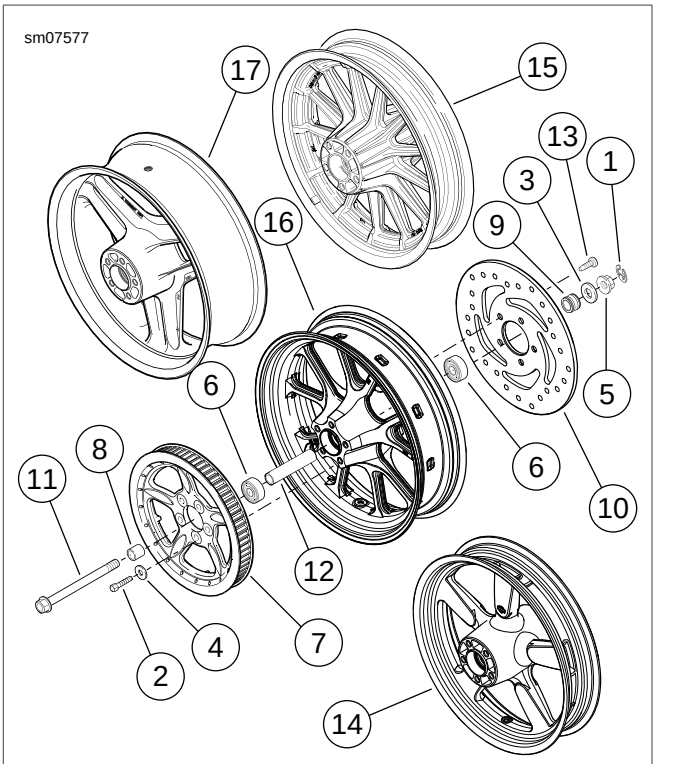
Assembly

1. **Laced Wheel:** if wheel was disassembled, reassemble hub, rim, spokes and nipples, and tighten spokes. See 1.12 DRIVE BELT AND SPROCKETS.
2. Install hub spacer and **new** wheel bearings, if removed. See 2.5 WHEELS, Sealed Wheel Bearings.
   a. **Cast or disc wheel:** See Figure 2-19.
   b. **Laced wheel:** See Figure 2-20.
3. If brake disc was removed, install brake disc on valve stem side of wheel. Secure with **new** screws and tighten to 30-45 ft-lbs (40.7-61.1 Nm).

NOTE

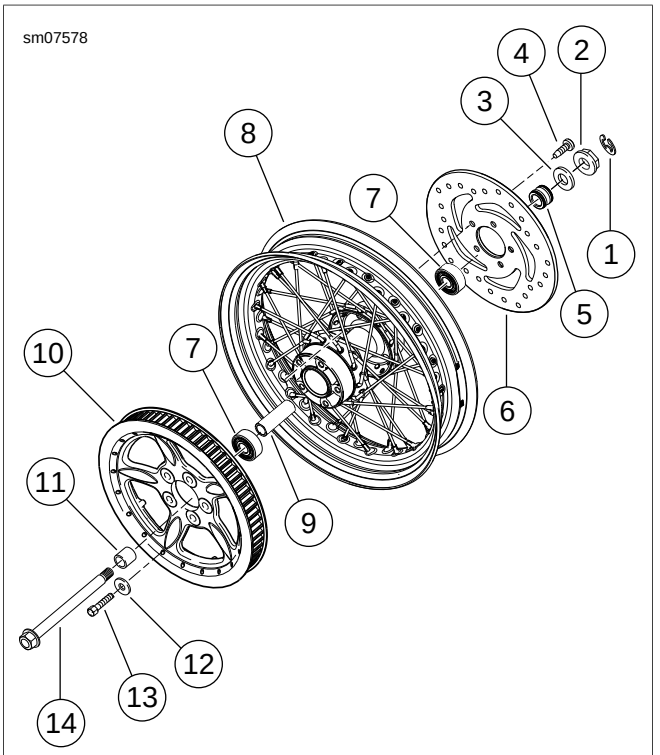
Sportster models sold in certain markets are equipped with rear wheel compensating sprockets. See C.1 COMPENSATING SPROCKET.

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 and 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**
10. **Brake disc**
11. **Axle**
12. **Hub spacer**
13. **Screw (5)**
14. **Wheel: 16 in XL 1200C/C ANV/CP/CA (certain markets)**
15. **Wheel: 16 in XL 883N/R**
16. **Wheel: 17 in XL 883L**
17. **Wheel: 17 in XR 1200X**

Figure 2-19. Cast Rear Wheel



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

Figure 2-20. Laced Rear Wheel

Installation

1. See Figure 2-19 or Figure 2-20. Apply a light coat of ANTI-SEIZE LUBRICANT to the axle, bearing bores, and hub spacer bore.
2. Place wheel centrally in the rear fork assembly. Engage the brake disc in the caliper on XL models.
3. **XR 1200X:** With the wheel as far forward as possible, install the caliper/bracket assembly in place, engaging the brake disk and the boss on the rear fork.
4. Slide wheel forward and slip belt over sprocket and then slide the wheel back.
5. Position sprocket side spacer between wheel and rear fork.
6. Insert axle through right side of rear fork and right side axle adjuster, sprocket side spacer, wheel assembly, disc side spacer, rear caliper bracket, and left side of rear fork and left side axle adjuster.
7. Install washer and axle nut on left end of axle. Do not tighten nut at this time.
8. **XL Models:** Slide right lower shock absorber screw back in place. Install nut and tighten to 45-50 ft-lbs (61-68 Nm).

NOTE

If rear brake caliper was disassembled or removed, see 2.14 REAR BRAKE CALIPER: XL MODELS or 2.15 REAR BRAKE CALIPER: XR 1200X.

9. Check for proper belt tension and rear wheel alignment. See 1.24 WHEEL ALIGNMENT.
10. 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)

11. Check wheel bearing end play. See 2.5 WHEELS, Wheel Bearing End Play.
12. **XL Models:** Install rear muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.

⚠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)

13. Pump brake pedal to move piston out 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 caliper cast front wheel hub plate screw	16-24 ft-lbs	21.7-32.6 Nm

Inspection

1. Inspect the play of the wheel bearings by finger while they are in the wheel. Rotate the inner bearing race and check for abnormal noise. Make sure bearing rotates 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. If not already done, remove wheel from motorcycle. See 2.5 WHEELS. On models with a single front brake caliper, remove hub plate from wheel on side opposite front brake disc.

NOTE

See Figure 2-21. Some wheel hubs may not provide adequate support for the puller bridge. In these cases, center a used brake disc over the hub to support the puller bridge while removing the bearing.

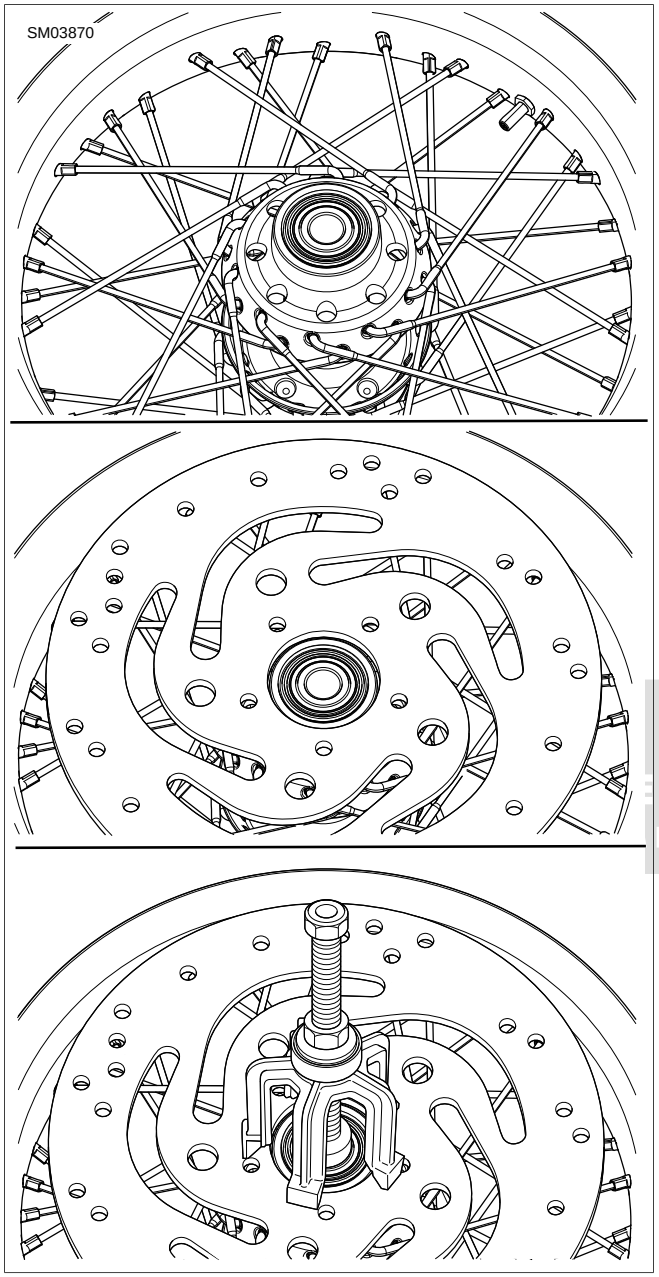
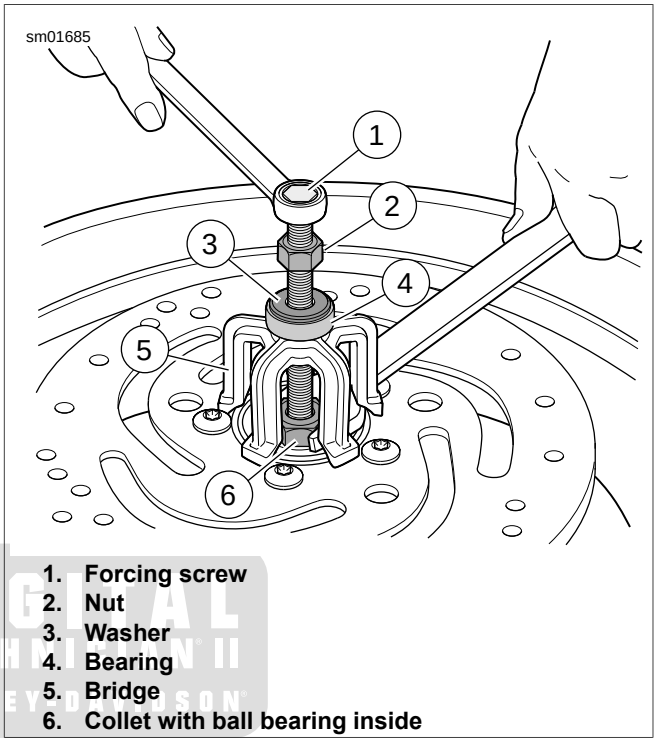


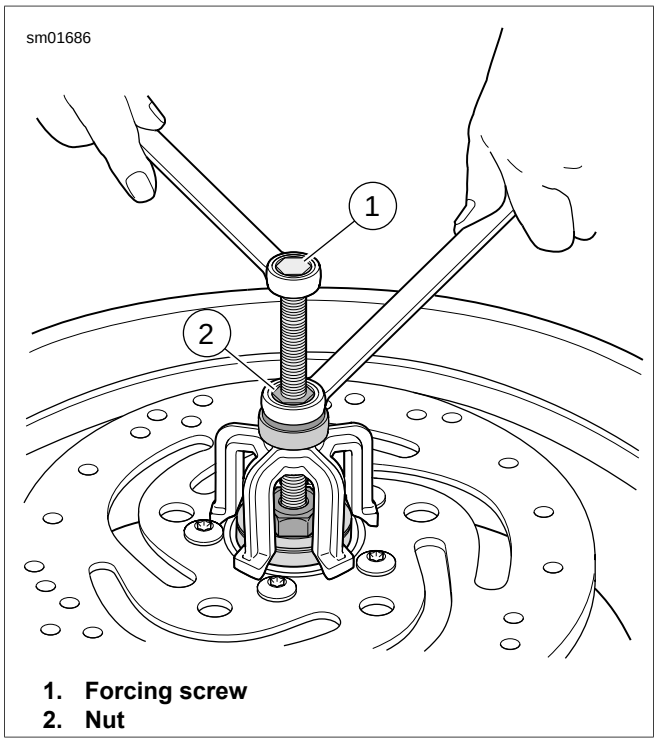
Figure 2-21. Brake Disk as Puller Aid

2. See Figure 2-22. Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C) and assemble.
   a. Sparingly apply graphite lubricant to threads of 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.
3. Hold end of forcing screw and turn collet to expand edges of collet.
4. See Figure 2-23. When expanded collet has gripped bearing edges, hold end of forcing screw (1) and turn the nut (2) to remove bearing from wheel.
5. Remove spacer from inside wheel hub.
6. 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 2-22. Wheel Bearing Removal Tool



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

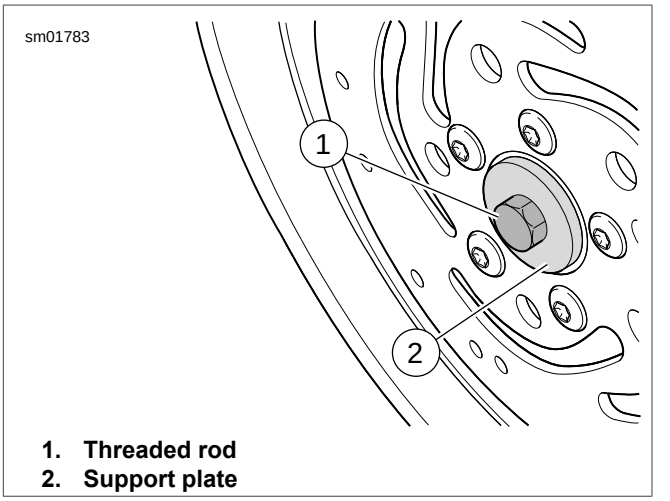
Figure 2-23. Removing Bearing

Installation

NOTES

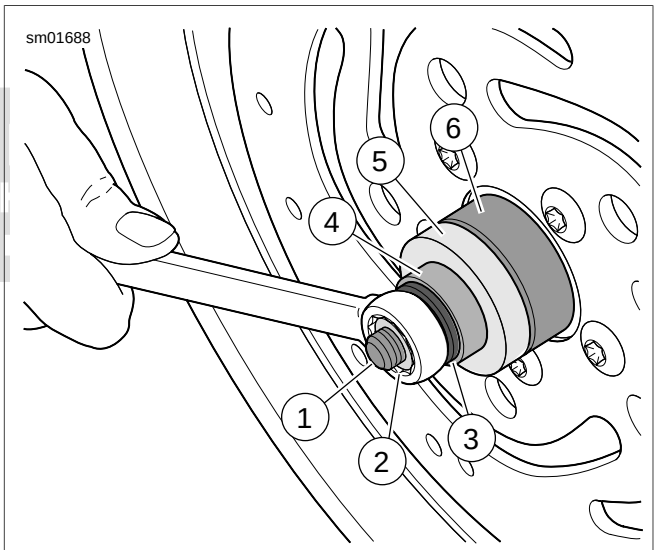
- *When installing wheel bearings, use specialty tool WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C).*
- *Always install first bearing on primary brake disc side. If front wheel has two brake discs, install bearing on the left side first.*

1. Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C) and assemble.
   a. Sparingly apply graphite lubricant to threads of threaded rod for prolonged service life and smooth operation.
   b. See Figure 2-24. Place threaded rod (1) through support plate (2). Insert assembly through wheel.
   c. See Figure 2-25. Place **new** bearing on rod (1) with lettered side facing out.
   d. Assemble installer (5), bearing (4), washer (3) and nut (2) over rod.
2. Hold hex end of threaded rod and turn nut to install wheel bearing. Bearing is fully seated when nut can no longer be turned. Remove tool.
3. Install spacer inside wheel hub.
4. Reverse tool and install opposite side wheel bearing.
5. Install hub plate opposite brake disc and secure with **new** screws. Tighten to 16-24 ft-lbs (21.7-32.6 Nm).



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

Figure 2-24. Assembling Installation Tool



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

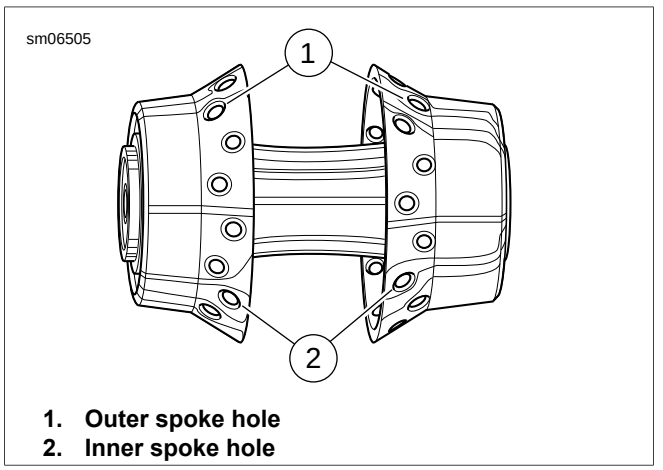
Figure 2-25. Installing Bearing

WHEEL LACING 2.6

WHEEL LACING: ANGLE FLANGE HUB

NOTES

- *See Figure 2-26. 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.*



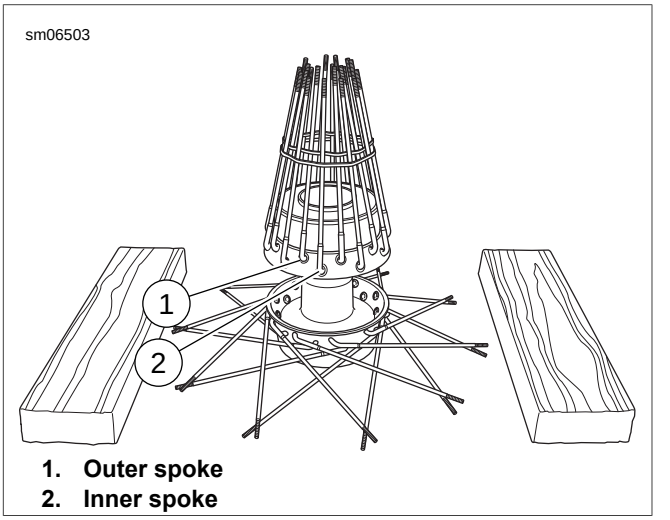
1. **Outer spoke hole**
2. **Inner spoke hole**

Figure 2-26. 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 2-27. 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 2-27. Spokes Gathered

7. Install lower flange outer spokes and loosely install spoke nipples:
   a. **Rim with side valve hole:** See Figure 2-28. Start at the valve stem hole (1).
   b. **Rim with center valve hole:** See Figure 2-29. 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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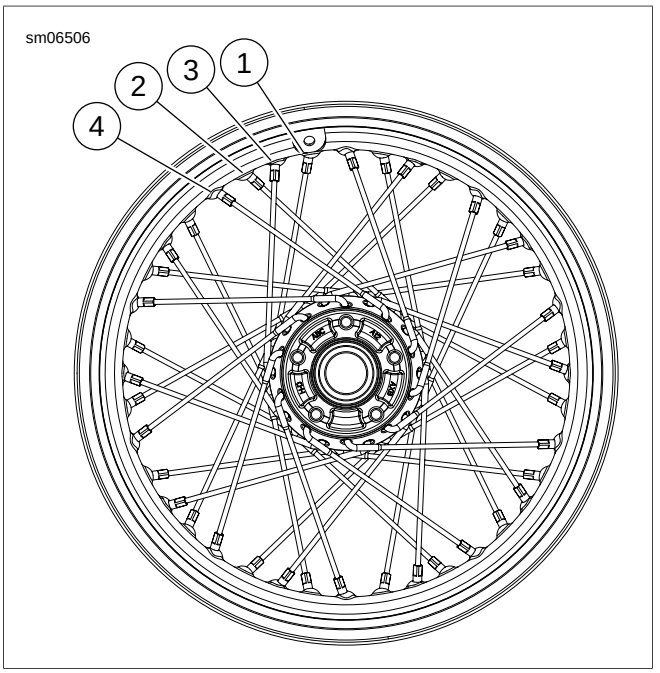


Figure 2-28. Side Valve Rim

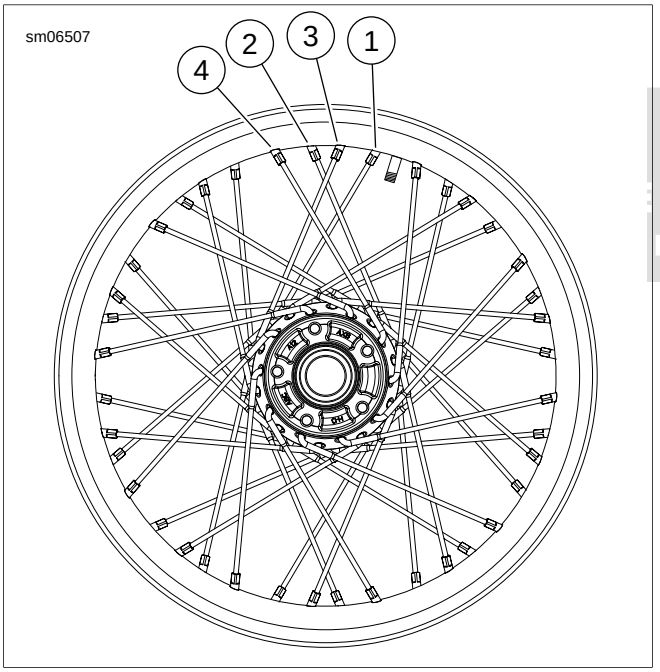


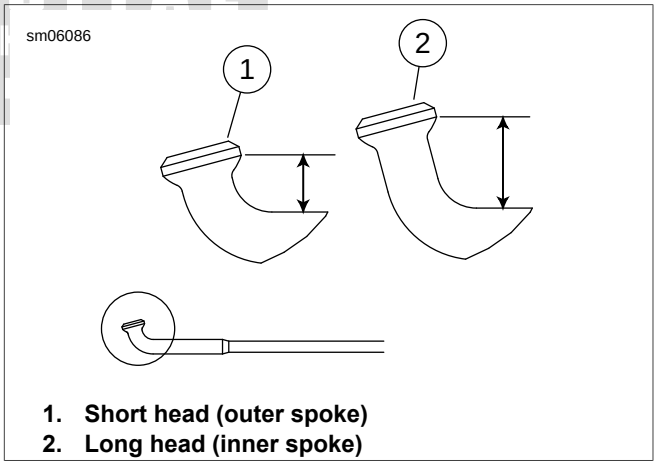
Figure 2-29. Center Valve Rim

WHEEL LACING: STRAIGHT FLANGE HUB, SINGLE HOLE CIRCLE

NOTES

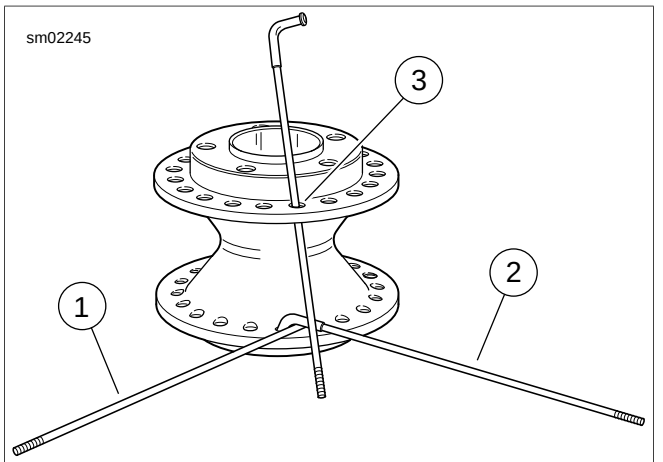
- *See Figure 2-31. The following procedure is valid for laced wheels that use a straight flange, single spoke hole circle hub regardless of rim style or diameter.*
- *The primary brake side of the hub has one or two grooves cut into the disc mounting surface.*

1. See Figure 2-30. 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 2-31. 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 2-32. 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 2-30. Spoke Heads



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

Figure 2-31. Lacing Single Row Wheel Hub

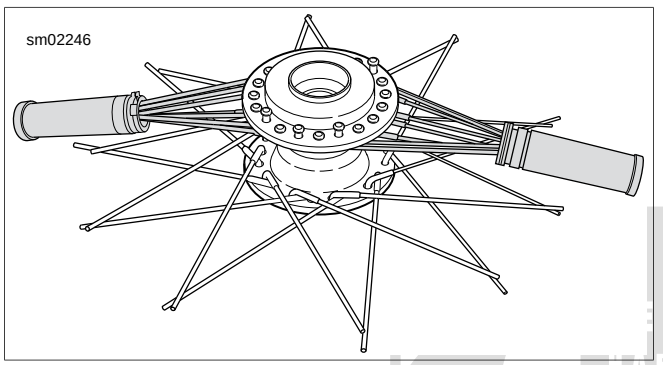


Figure 2-32. Bundling Top Spokes

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 2-33. 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.

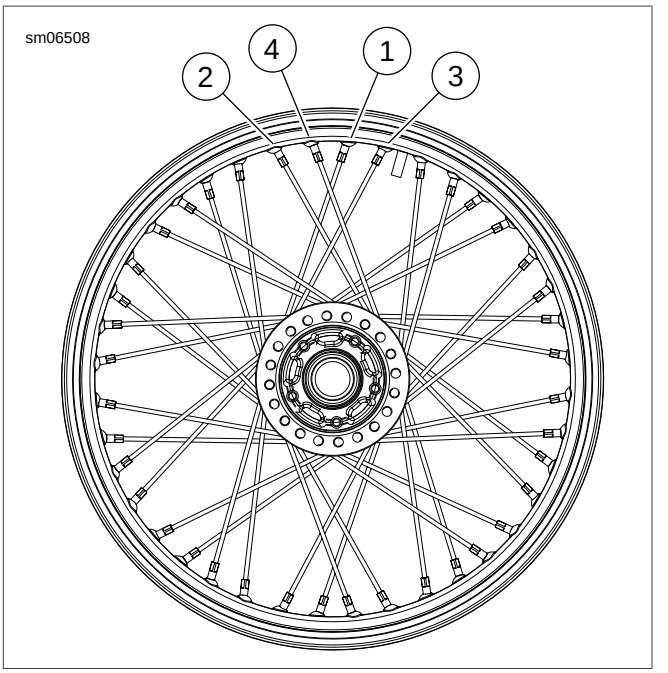


Figure 2-33. 40 Spoke Single Row Straight Flange Hub

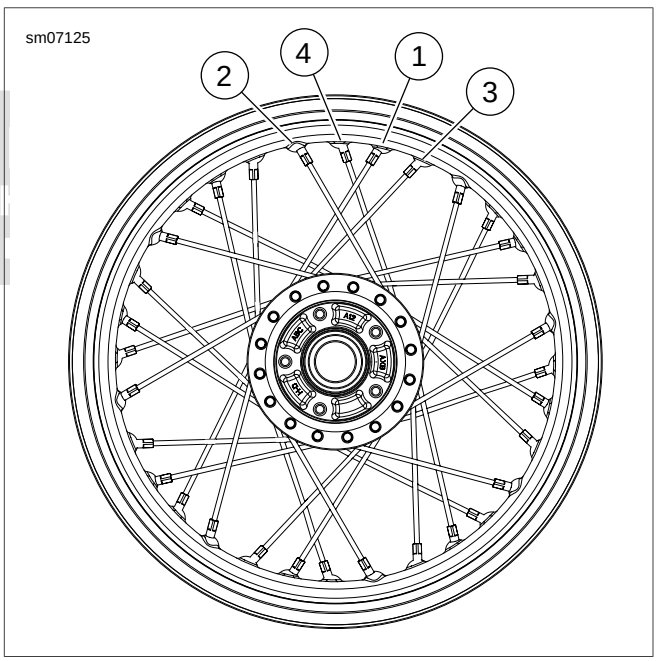


Figure 2-34. 32-Spoke Single Row Straight Flange Hub

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 2-35. Carefully release each top bundle and fan the spokes around the rim edge.

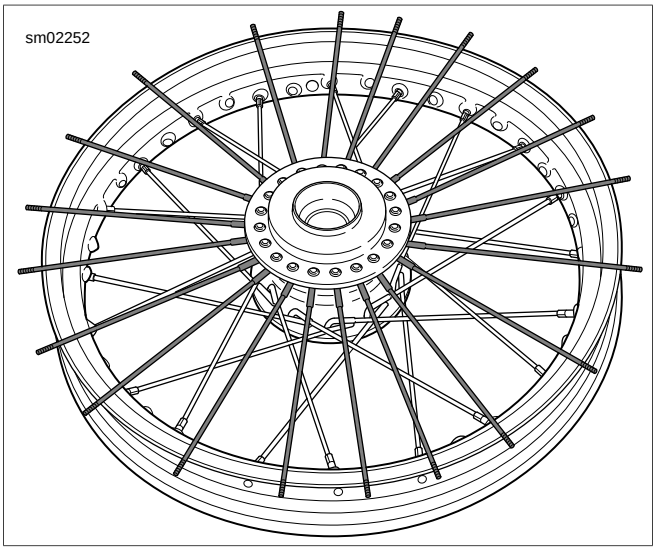


Figure 2-35. Fanning Top Flange Spokes

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.

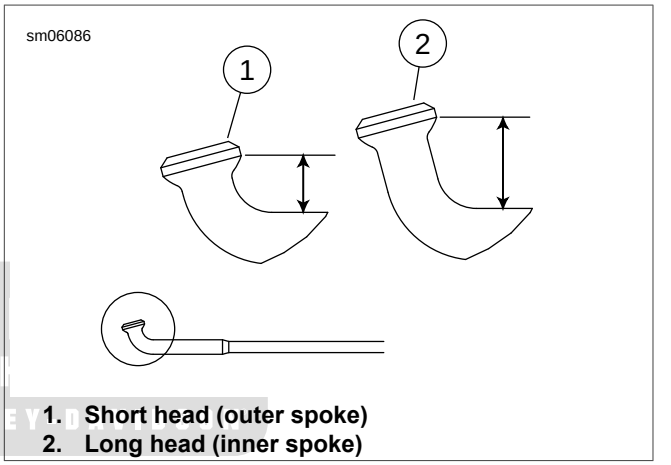
16. See Figure 2-33. Beginning with the first hole counterclockwise (3) from valve stem hole, install upper flange inner spokes (long head) in every 4th hole.
17. Rotate outer spokes (short head) counterclockwise and install in the remaining holes (4) in the rim.
18. Verify spoke heads are seated. Evenly 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

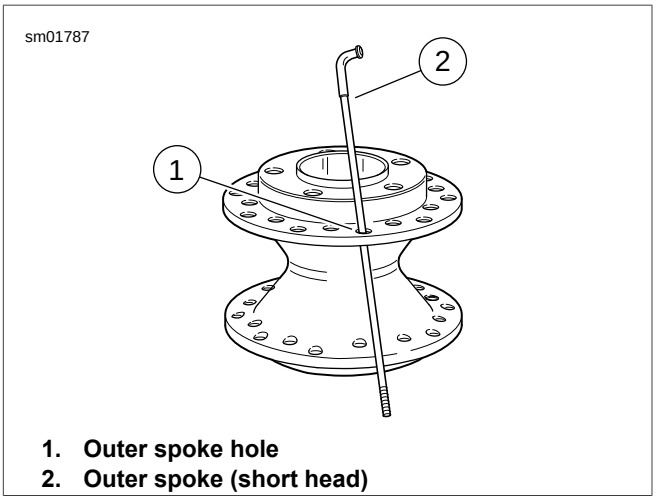
- *See Figure 2-37. This procedure is valid for 40-spoke wheels that use a straight flange, dual spoke hole circle hub regardless of rim style or diameter.*
- *The primary brake side of the hub has one or two grooves cut into the disc mounting surface.*

1. See Figure 2-36. 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 2-37. 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 2-38. 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 2-36. Spoke Heads



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

Figure 2-37. Lacing Dual Row Wheel Hub

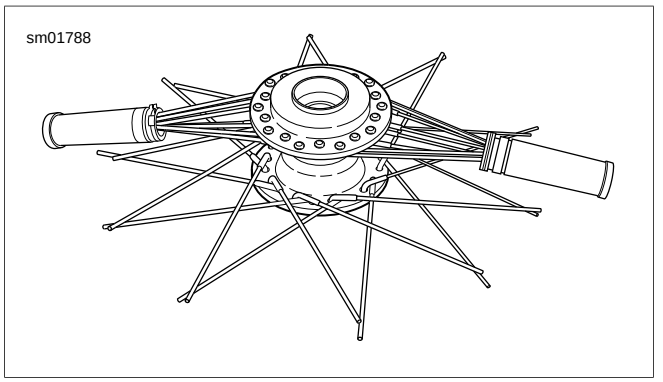


Figure 2-38. Bundling Top Spokes

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 2-39. 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.

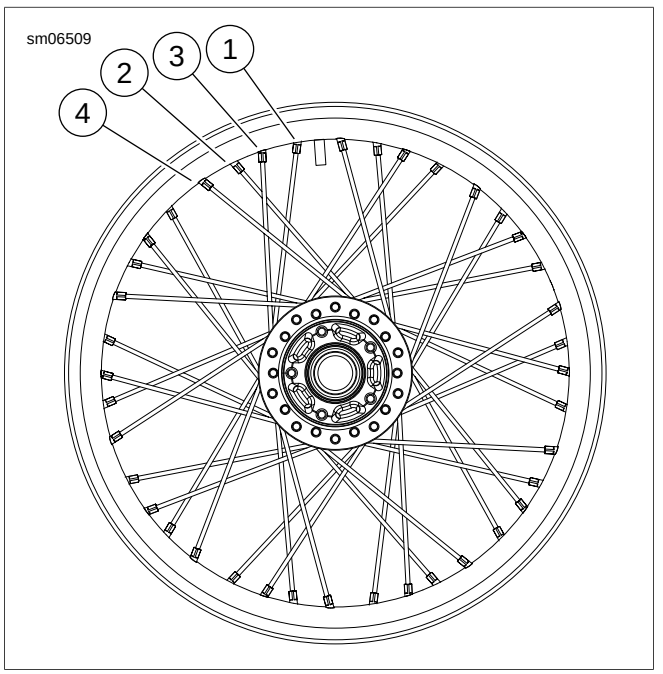


Figure 2-39. Flat Flange Hub, Dual Row

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 2-40. Carefully release each top bundle and fan the spokes around the rim edge.

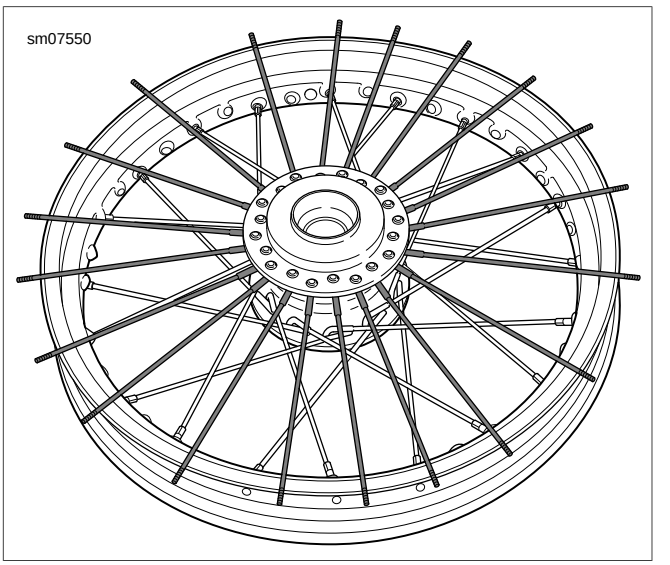


Figure 2-40. Fanning Top Flange Spokes

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 2-39. 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 and 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 2-41. 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 2-15.

Radial Runout

1. See Figure 2-42. 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 2-15.

Table 2-15. Wheel Rim Runout

RUNOUT	in	mm
Lateral	0.030	0.76
Radial	0.030	0.76

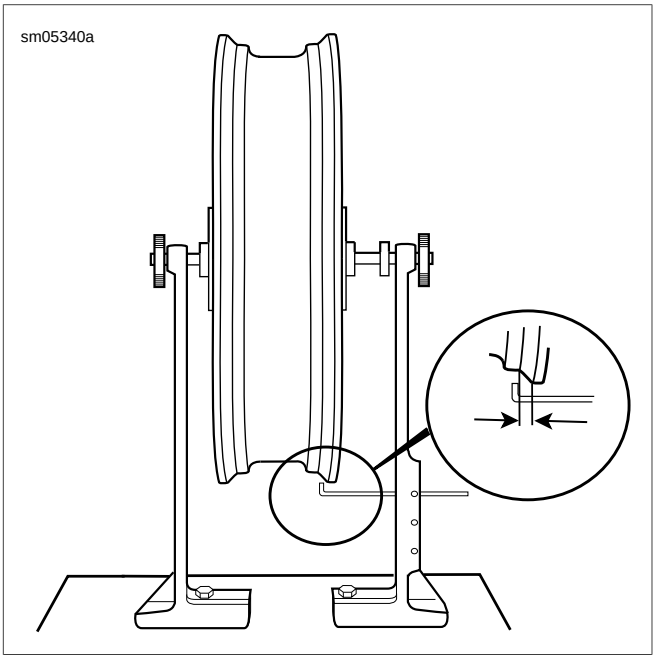


Figure 2-41. Lateral Runout

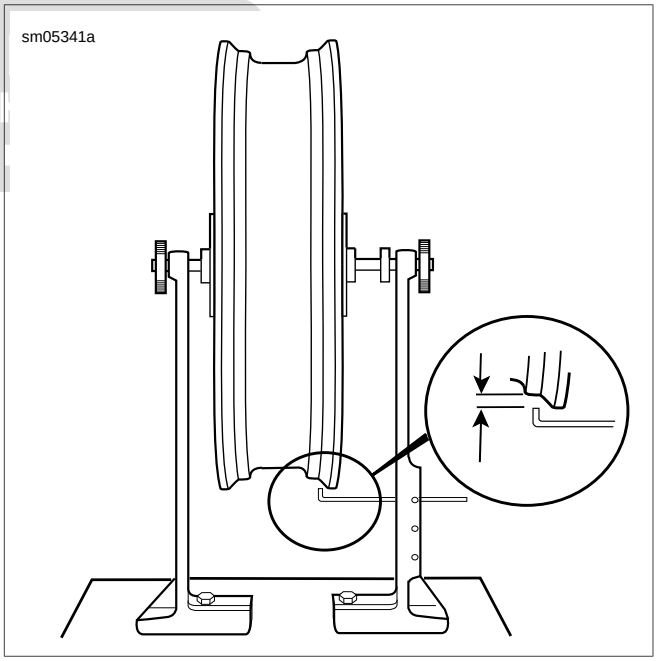


Figure 2-42. Radial Runout

LACED WHEEL RIM OFFSET

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

1. See Figure 2-43. 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.

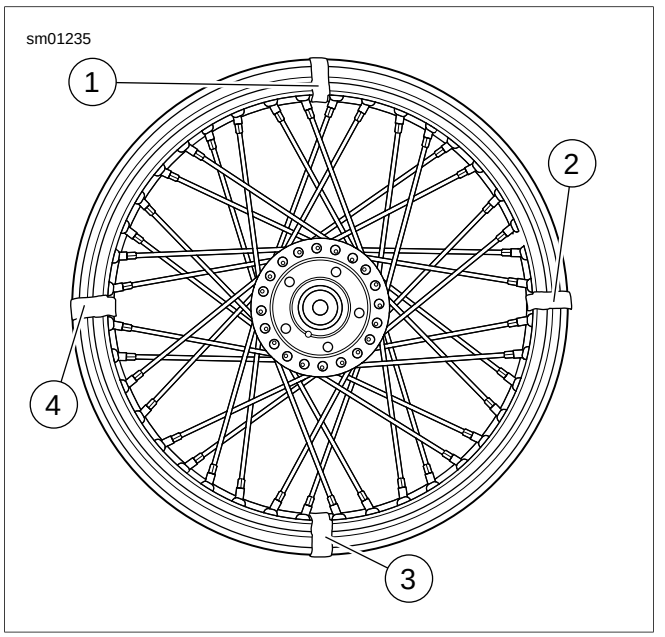


Figure 2-43. Marking Spoke Groups

2. See Figure 2-44. 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 2-45. Measure the distance from the straightedge to the location shown, based on rim design, to determine distance A. Refer to Table 2-16.

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.

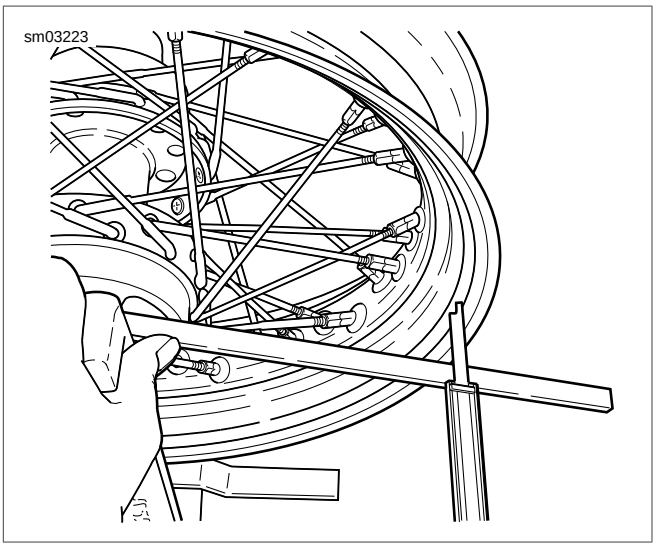
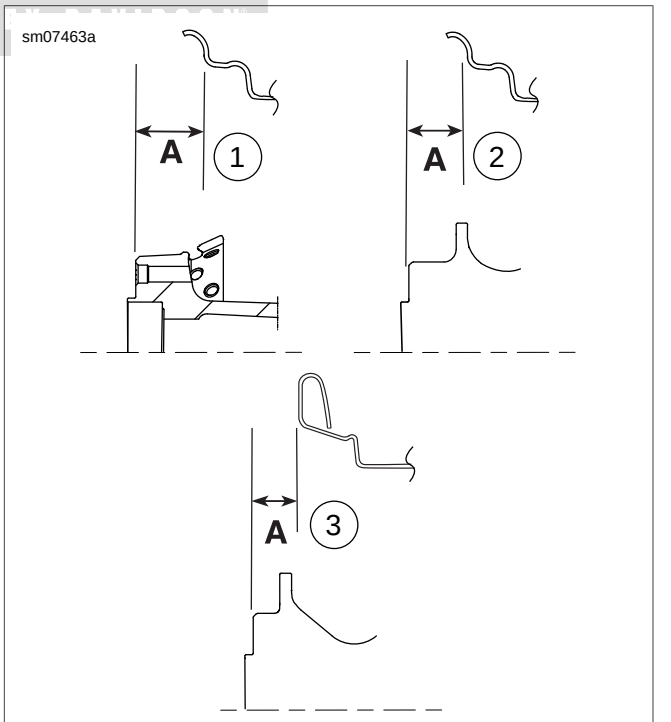


Figure 2-44. Checking Wheel Hub Offset Dimension (typical)

Table 2-16. 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 2-45.



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

Figure 2-45. 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 STAND

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

NOTES

- *Dial indicators are more accurate than gauge rods.*
- *Radial truing should be performed before lateral truing.*

Radial Runout

1. See Figure 2-46. With the wheel mounted in WHEEL TRUING STAND (Part No. HD-99500-80), adjust the truing stand gauge (3) near to the rim's tire bead safety hump (4). If using a dial indicator, place the tip on the safety bead hump.
2. If working with a straight flange hub, seat each spoke head in the hub flange using a flat nose punch and mallet.

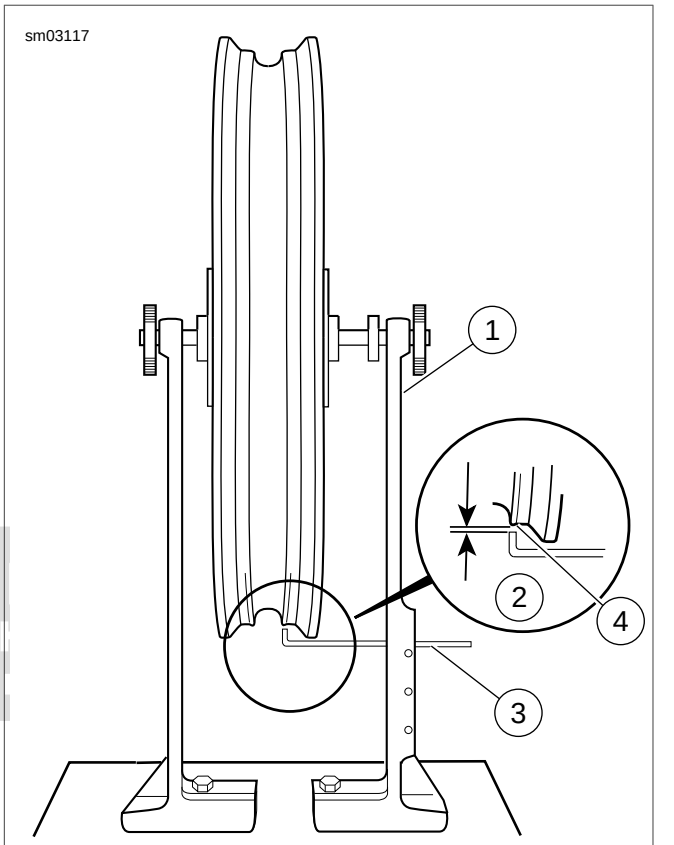
NOTES

- *Always loosen the appropriate spokes, using SPOKE NIPPLE WRENCH (Part No. 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 2-17.
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 2-46. Checking Radial Runout

Table 2-17. 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 2-47. With the wheel mounted in WHEEL TRUING STAND (Part No. HD-99500-80), adjust the gauge rod (3) near the rim bead flange.
2. Rotate the rim slowly and check lateral runout (2). If runout exceeds 0.030 in (0.76 mm), adjust spokes as follows.

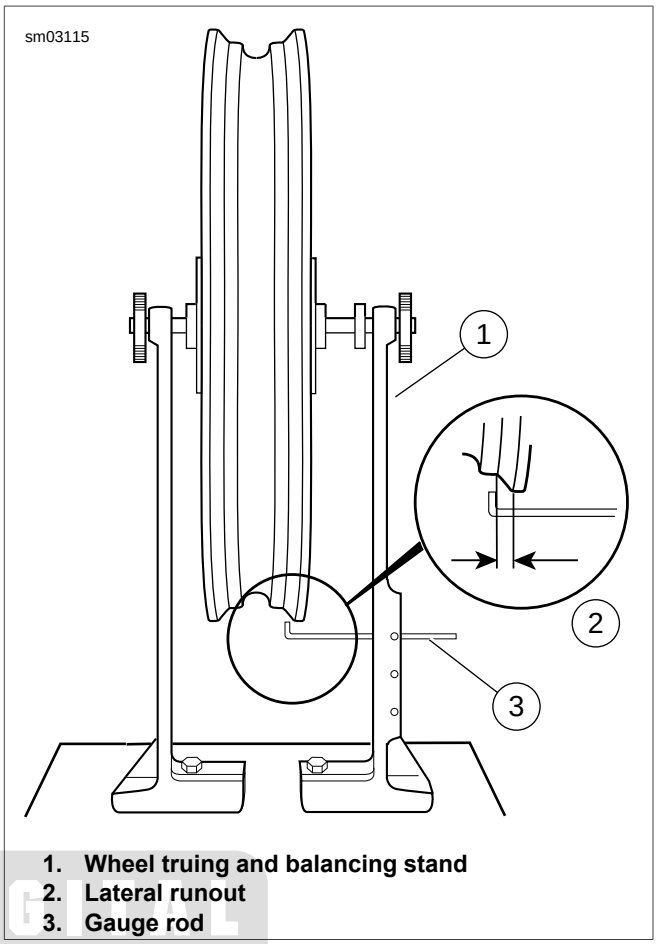
NOTES

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

3. Again working in groups of four, loosen two spokes on the tight side and tighten the two spokes on the loose side.
4. Repeat with each group until wheel is within specification.
5. Verify all spoke nipples are tightened to the specification. Refer to Table 2-17.
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 2-47. Checking Lateral Runout

DIGITAL TECHNICIAN HARLEY-DAVIDSON®

FRONT BRAKE MASTER CYLINDER 2.8

GENERAL

The front brake master cylinder designed for dual disc (two caliper) operation has a larger bore than the master cylinder designed for single disc (one caliper) operation.

See Figure 2-48. The bore size is cast into the side of the master cylinder body facing the handlebar.

- The single disc master cylinder has "11" (11 mm) cast into the body.
- The dual disc master cylinder has "1/2" (1/2 in) cast into the body.

NOTE

Use only CCI #20 BRAKE GREASE to lubricate master cylinder bores, pistons, primary cups and secondary cups. Use only KS62F assembly grease on caliper pistons and piston seals. Use only G40M BRAKE GREASE on the caliper pins and boots, brake lever pivot hole, and the end of the piston that contacts the brake lever.

⚠WARNING

Do not use parts from single caliper repair kits (9/16 inch bore) on dual caliper models. Likewise, do not use parts from dual caliper repair kits (11/16 inch bore) on single caliper models. Using incorrect parts can cause brake failure, which could result in death or serious injury. (00278a)

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.

INSPECTION

1. Check the fluid level in the front brake reservoir. If it is low, refill and bleed brake system. See 2.17 BLEEDING BRAKES.
2. Check for fluid leaks in the brake line, around banjo fittings or front brake caliper pistons or bleeder valve. Repair and bleed brake system.
   a. For brake line replacement procedure, see 2.16 BRAKE LINES.
   b. To repair front brake caliper, see procedure in 2.9 FRONT BRAKE CALIPER: XL MODELS or 2.10 FRONT BRAKE CALIPER: XR 1200X.
   c. See 2.17 BLEEDING BRAKES for hydraulic brake system bleeding procedure.
3. Check front brake friction pads and disc(s) for excessive wear or damage. Replace if necessary.
   a. See 1.16 BRAKE PADS AND DISCS: XL MODELS or1.17 BRAKE PADS AND DISCS: XR 1200X for specifications and brake pad replacement procedure.
   b. See 2.5 WHEELS for brake disc replacement procedure.
4. Eliminate any air in the hydraulic brake assembly by bleeding the system. See 2.17 BLEEDING BRAKES.

If none of these conditions exist but the front brake system does not operate properly, the front brake master cylinder is defective. Repair or replace if necessary.

REMOVAL

1. See Figure 2-49. Loosen turn signal clamp screw (3) and remove turn signal assembly (5) from front brake master cylinder housing (1).
2. Remove locknut, washer (4) and mirror (2) from master cylinder housing.

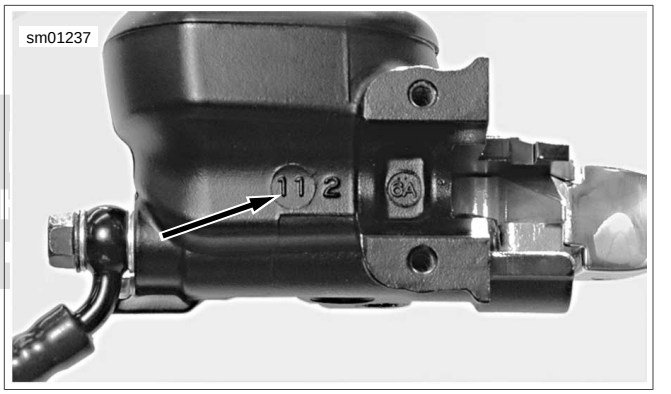
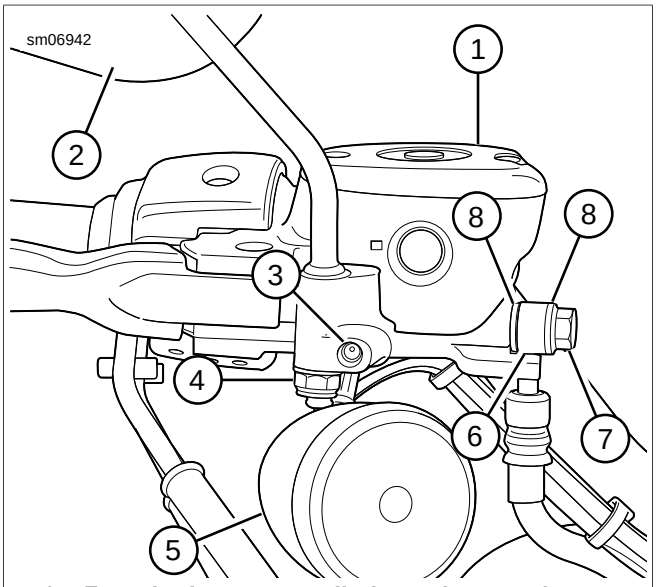
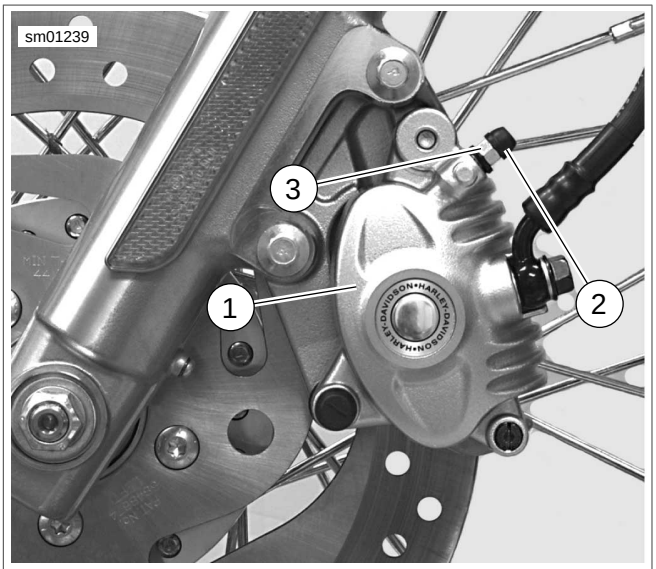


Figure 2-48. Verifying Front Brake Master Cylinder Bore Size (single disc master cylinder)



1. **Front brake master cylinder and reservoir**
2. **Mirror**
3. **Turn signal clamp screw**
4. **Locknut and washer**
5. **Turn signal assembly**
6. **Front brake banjo fitting**
7. **Banjo bolt**
8. **Sealing washer**

Figure 2-49. Front Brake Master Cylinder (typical)



1. **Front brake caliper**
2. **Bleeder nipple cap**
3. **Bleeder valve**

Figure 2-50. Front Caliper Bleeder Valve (typical)

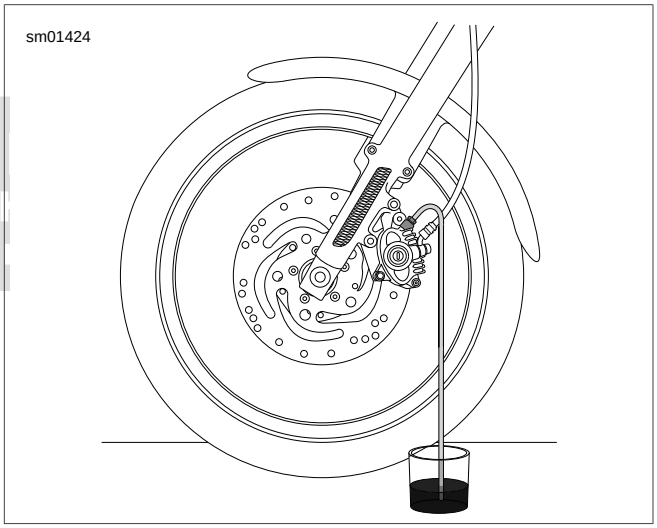


Figure 2-51. Bleeding Hydraulic System

⚠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. See Figure 2-50 and Figure 2-51. Drain brake fluid:
   a. Remove bleeder nipple cap (2) from bleeder valve (3) on front brake caliper (1).
   b. Install a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder valve (3). Place free end in a suitable container.
   c. Open bleeder valve about 1/2 turn.
   d. Pump brake hand lever several times to drain brake fluid.
   e. Close bleeder valve.

NOTE

Dispose of brake fluid in accordance with local regulations.

4. See Figure 2-49. Remove banjo bolt (7) and two washers (8) to disconnect front brake line banjo fitting (6) from master cylinder (1). Discard washers.
5. See Figure 2-52. Squeeze front brake lever and place a 5/32 in (4 mm) thick cardboard insert between brake lever and lever bracket. Release brake lever.

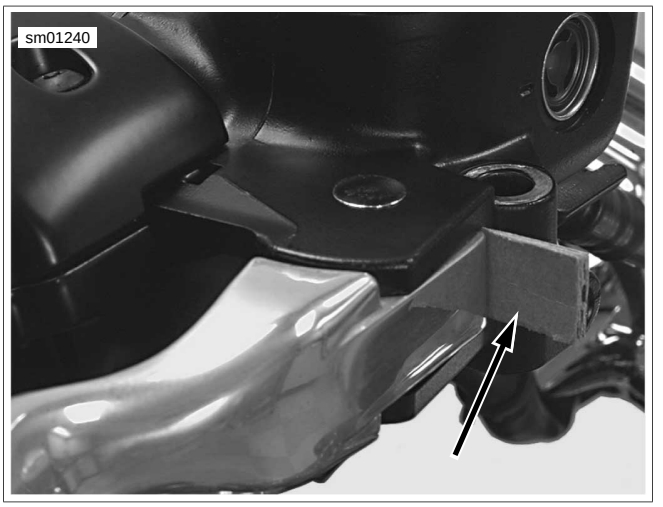


Figure 2-52. Install Cardboard Insert Before Removing Master Cylinder Assembly

NOTICE

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

NOTE

Use the eyelet of an ordinary cable strap if the cardboard insert is not available.

6. See Figure 2-53. Remove the two screws (6) and washers (7) securing the handlebar clamp (8) to the master cylinder housing (5). Remove the brake lever/master cylinder assembly and clamp from the handlebar.

DISASSEMBLY

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 2-53. Remove retaining ring (17) from pivot pin (9) groove at bottom of master cylinder bracket. Discard retaining ring.
2. Remove pivot pin and brake hand lever (18) from master cylinder assembly.
3. Remove and discard dust boot (16).

NOTE

See Figure 2-54. Clamp front brake master cylinder in a vise by the mirror mounting boss only. Use brass or aluminum jaw covers or other protective device on vise jaws to prevent damage to master cylinder.

4. See Figure 2-54. Clamp master cylinder in a vise so that banjo fitting hole is pointing straight down.

WARNING

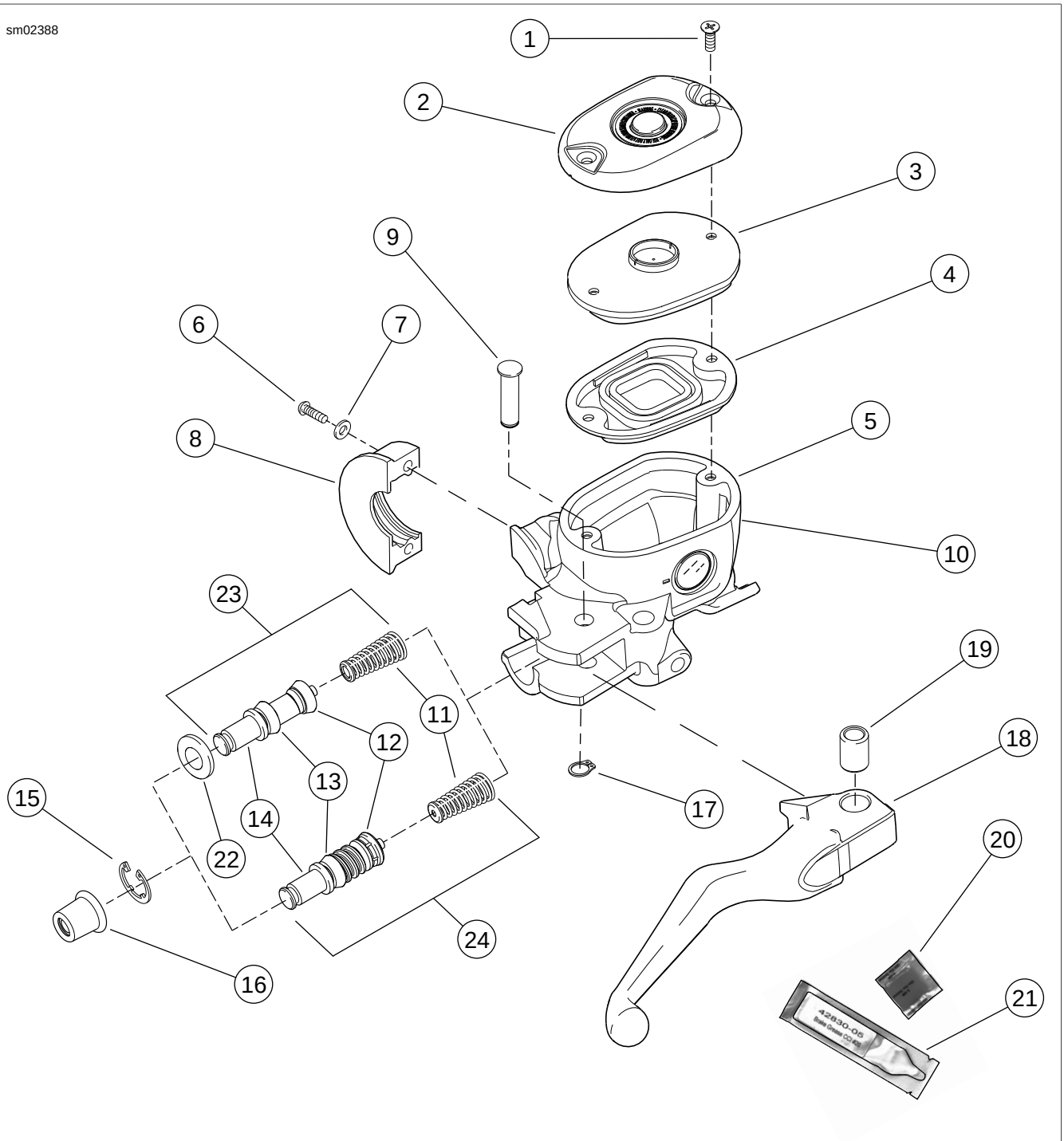
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

5. See Figure 2-53. Press down on end of piston and remove retaining ring (15). Discard retaining ring.
6. **Single disc piston assembly:** remove stop plate (22).
7. Remove and discard piston assembly (12, 13, 14) and piston spring (11).

NOTES

- *See Figure 2-53. Both primary (12) and secondary (13) cups are fitted into grooves in the piston body (14). The piston spring (11) fits onto the end of the piston.*
- *Always clean the cover before removal. This prevents dirt and other contaminants from entering the master cylinder reservoir.*

8. Remove two screws (1), cover (2), diaphragm plate (3) and diaphragm (4) from the master cylinder reservoir.



1. Screw (2)
2. Reservoir cover
3. Diaphragm plate
4. Diaphragm
5. Master cylinder housing
6. Screw (2)
7. Washer (2)
8. Handlebar clamp
9. Pivot pin
10. Brake line banjo fitting seating surface
11. Spring*
12. Primary cup*
13. Secondary cup*
14. Piston*
15. Retaining ring*
16. Dust boot*
17. Retaining ring
18. Brake hand lever
19. Bushing
20. G40M brake grease*
21. CCI #20 brake grease*
22. Stop plate (single disc piston only)*
23. Single disc piston assembly
24. Dual disc piston assembly

Figure 2-53. Front Brake Master Cylinder Assembly (*Provided in Service Parts Kit)

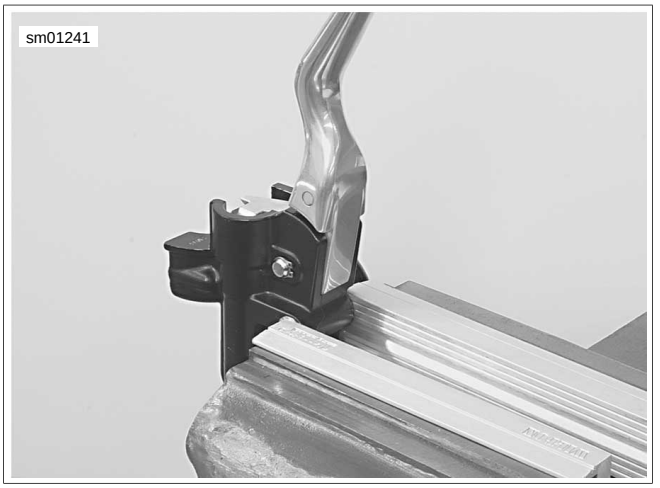


Figure 2-54. Clamping Front Master Cylinder

CLEANING, 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

Do not use a wire or similar instrument to clean drilled passages in bottom of reservoir.

1. Clean brake system components with denatured alcohol. Do not contaminate with mineral oil or other solvents.
   a. Wipe dry with a clean, lint free cloth.
   b. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply.

⚠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. Carefully inspect all parts for wear or damage. Replace as necessary.
   a. Inspect the piston bore in the master cylinder housing for scoring, pitting or corrosion.
   b. Inspect the outlet port that mates with the brake line banjo fitting. This is a critical sealing surface.
   c. Inspect diaphragm for damage.

ASSEMBLY

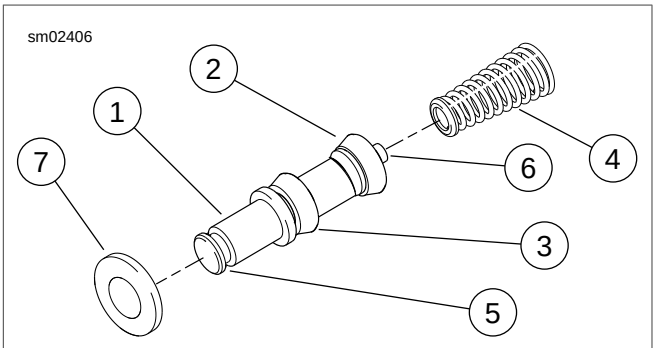
⚠WARNING

Do not use parts from single caliper repair kits (9/16 inch bore) on dual caliper models. Likewise, do not use parts from dual caliper repair kits (11/16 inch bore) on single caliper models. Using incorrect parts can cause brake failure, which could result in death or serious injury. (00278a)

NOTES

- *Always reassemble the master cylinder using **new** parts from the correct service repair kit.*
- *CCI #20 BRAKE GREASE is recommended for lubrication of cylinder bore, cups and seals prior to assembly.*
- *See Figure 2-54. Clamp front brake master cylinder in a vise by the mirror mounting boss only. Use brass or aluminum jaw covers or other protective device on vise jaws to prevent damage to master cylinder.*

1. See Figure 2-54. Clamp master cylinder in a vise so that banjo fitting hole is pointing straight down.
2. See Figure 2-53. Coat piston bore of master cylinder housing (5), piston (14), primary cup (12) and secondary cup (13) with CCI #20 BRAKE GREASE (21) supplied in the service parts kit.
3. See Figure 2-55. Install piston assembly into master cylinder.
   a. Press small end of piston spring (4) onto mounting boss (6) on piston (1).
   b. Slide piston/spring assembly, flared end of spring first, into master cylinder bore so that spring seats against counter bore (recess) at bottom of cylinder.
   c. **Single disc piston:** Slide stop plate (7) down over end of piston.



1. **Piston**
2. **Primary cup**
3. **Secondary cup**
4. **Piston spring**
5. **Dust boot groove**
6. **Piston spring mounting boss**
7. **Stop plate (single disc piston only)**

Figure 2-55. Front Brake Master Cylinder Piston (Typical-Single Disc Piston Shown)

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

NOTE

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

4. See Figure 2-53.
   a. **Dual disc master cylinder:** Press down on piston (14) and install **new** retaining ring (15). Verify that retaining ring is fully seated in groove.
   b. **Single disc master cylinder:** Press down on piston (14) and stop plate (22), and install **new** retaining ring (15). Verify that retaining ring is fully seated in groove.
5. Install **new** dust boot (16). Large lip of dust boot fits down inside end of piston bore. Small lip of dust boot fits into groove in end of piston (item 5, Figure 2-55).
6. Apply approximately 0.1 g G40M BRAKE GREASE (from service parts kit) to each of the following two locations:
   a. Pivot hole in brake hand lever (18).
   b. End of piston (14).
7. Align hole in brake hand lever with hole in master cylinder bracket. From top of assembly, slide pivot pin (9) through bracket and hand lever.

⚠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)

8. Install **new** retaining ring (17) in pivot pin groove. Verify that retaining ring is fully seated in groove.
9. Remove master cylinder assembly from vise. Install cover (2), diaphragm plate (3) and diaphragm (4) on master cylinder reservoir. Install two screws (1) to fasten cover to reservoir, but do not tighten at this time.
10. See Figure 2-56. Squeeze front brake lever and place a 5/32 in (4 mm) thick cardboard insert between brake lever and lever bracket. Release brake lever.



Figure 2-56. Install 5/32 in (4 mm) Cardboard Insert Before Installing Master Cylinder Assembly

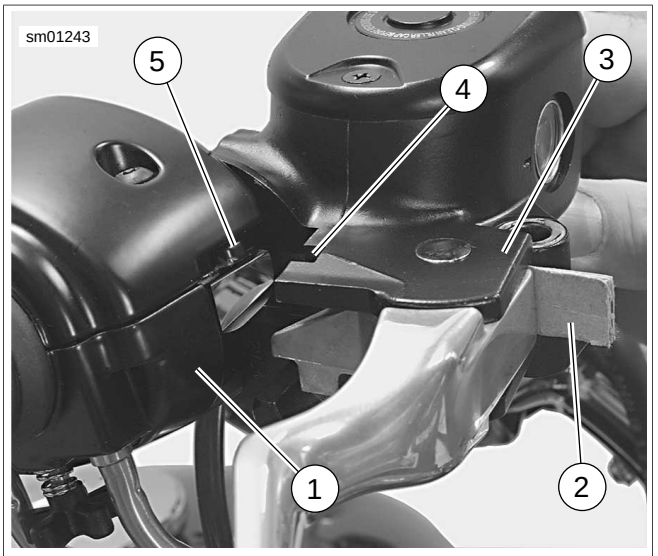
INSTALLATION

FASTENER	TORQUE VALUE	
Brake master cylinder clamp, front, screw	108-132 **in-lbs**	12.2-14.9 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm
Cylinder head exhaust port nut	96-120 **in-lbs**	10.9-13.6 Nm

NOTICE

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

1. See Figure 2-57. Position brake lever/master cylinder assembly inboard of switch housing assembly (1). Engage tab (5) on lower switch housing in slot (4) at top of brake lever bracket (3).
2. See Figure 2-53. Align holes in handlebar clamp (8) with master cylinder housing (5). Start two screws (6) with washers (7). Beginning with top screw, tighten to 108-132 **in-lbs** (12.2-14.9 Nm).



1. **Switch housing assembly**
2. **5/32 in (4 mm) cardboard insert**
3. **Brake lever bracket**
4. **Slot**
5. **Tab**

Figure 2-57. Fitting Brake Lever/Master Cylinder To Right Handlebar Switch Housing

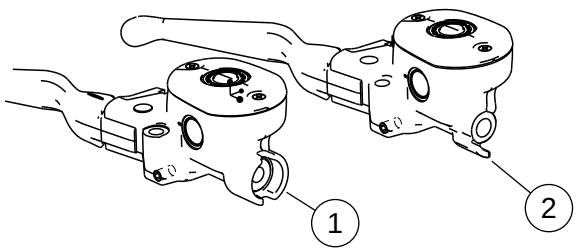
NOTICE

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

NOTE

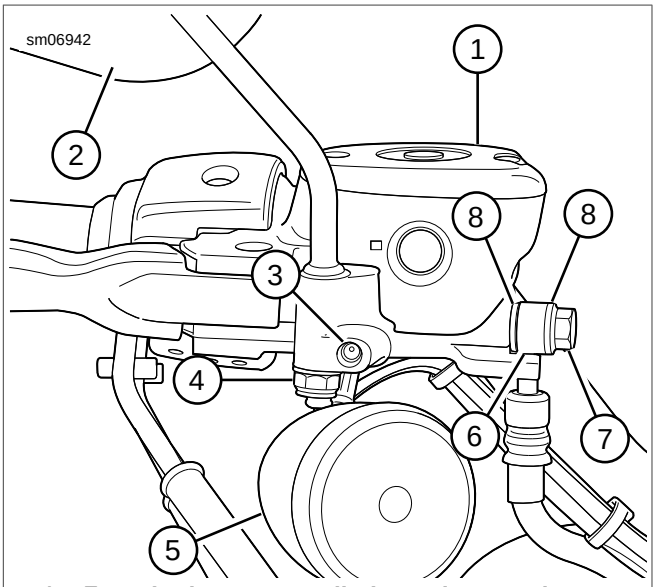
See Figure 2-58. The master cylinder housing positive stops for banjo fittings are different on XL Models and the XR 1200X. Never intermix model components. When tightening the banjo bolt, verify that the banjo fitting is correctly oriented and contacts the positive stop.

3. See Figure 2-59. Position a **new** washer (8) on each side of hydraulic brake line banjo fitting (6). Insert banjo bolt (7) through washers and fitting. Thread bolt into master cylinder housing. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).



1. **XR 1200X**
2. **XL models**

Figure 2-58. Front Brake Master Cylinder Identification



1. **Front brake master cylinder and reservoir**
2. **Mirror**
3. **Turn signal clamp screw**
4. **Locknut and washer**
5. **Turn signal assembly**
6. **Front brake banjo fitting**
7. **Banjo bolt**
8. **Sealing washer**

Figure 2-59. Front Brake Master Cylinder (typical)

4. See Figure 2-53. Position motorcycle so that top of master cylinder reservoir is level. Remove two screws (1), front master cylinder reservoir cover (2), diaphragm plate (3) and diaphragm (4).

⚠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 may render them inoperative.*
- *See Figure 2-60. Do not use sight glass (2) to determine maximum fluid level. Sight glass should only be used as a visual indicator that fluid level is low and needs attention.*

A ridge (1) is cast into the inside of the reservoir to help determine the correct maximum fluid level.

- *Fill master cylinder only with DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir. Do not reuse old brake fluid.*

5. See Figure 2-60. Add enough DOT 4 BRAKE FLUID to reservoir to bring fluid level even with ridge (1) cast into inside of reservoir, about 1/4 in (6.35 mm) below top edge.



1. **Cast-in ridge**
2. **Sight glass**

Figure 2-60. Filling Front 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)

6. Verify proper operation of master cylinder relief port. Slowly actuate brake hand lever with reservoir cover removed. A slight spurt of fluid will break fluid surface in reservoir compartment if all internal components are working properly.
7. Bleed brake system. See 2.17 BLEEDING BRAKES.

NOTE

On dual caliper models, bleed both calipers.

⚠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. See Figure 2-59. Install mirror (2), secure with locknut and washer (4). Position mirror for rearward visibility. Tighten locknut to 96-144 **in-lbs** (10.9-16.3 Nm).

NOTE

***XL 1200X:** Install mirror upside down. Check clearance between mirrors and gas tank while turning handlebar lock to lock.*

9. **All Models except XL 1200X:** Install turn signal assembly (5). Position so lens faces directly forward. Verify turn signal does not strike fuel tank when the handlebar is turned full right. Tighten clamp screw (3) to 96-120 **in-lbs** (10.9-13.6 Nm).
10. Verify operation of stop lamp.

⚠WARNING

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

11. Test brake system.
    a. Test ride motorcycle at low speed. If brake feels spongy, repeat bleeding procedure.
    b. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See 2.17 BLEEDING BRAKES.

FRONT BRAKE CALIPER: XL MODELS 2.9

REMOVAL

NOTE

If only replacing brake pads, do not remove front brake caliper(s). For brake pad replacement only, see 1.16 BRAKE PADS AND DISCS: XL MODELS.

⚠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)

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

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

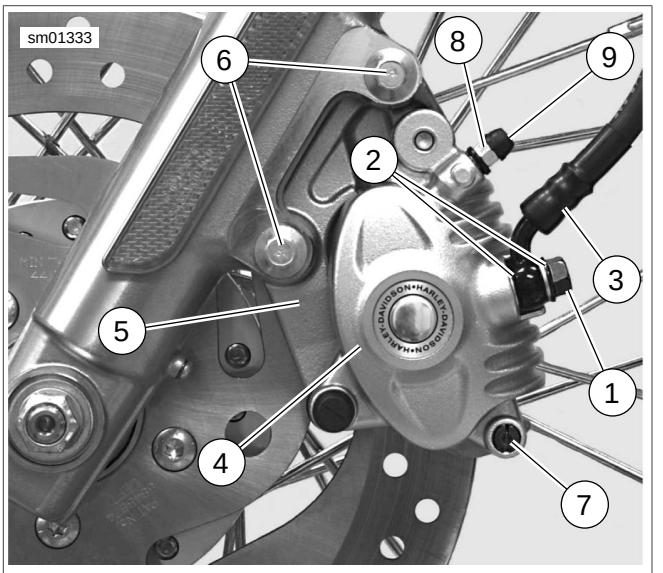
If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

1. See Figure 2-61. Remove bleeder nipple cap (9) from bleeder valve (8) on front brake caliper (4).
2. See Figure 2-62. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder valve, while placing free end in a suitable container. Open bleeder valve about 1/2 turn. Pump brake hand lever repeatedly to drain brake fluid. Close bleeder valve.

NOTE

Dispose of brake fluid in accordance with local regulations.

3. See Figure 2-61. Remove the banjo bolt (1) and both washers (2) to detach front brake line (3) from caliper (4). Discard washers.
4. Remove pad pin plug (7).
5. See Figure 2-63. Loosen, but do not remove, brake pad pin.
6. See Figure 2-61. Remove both mounting bolts (6) (12 pt/10 mm). Pull caliper and mounting bracket assembly rearward to disengage from brake disc.



1. **Banjo bolt**
2. **Washer (2)**
3. **Front brake line**
4. **Brake caliper**
5. **Caliper mounting bracket**
6. **Mounting bolt (2) (12 pt/10 mm)**
7. **Pad pin plug**
8. **Bleeder valve**
9. **Bleeder nipple cap**

Figure 2-61. Front Caliper Assembly

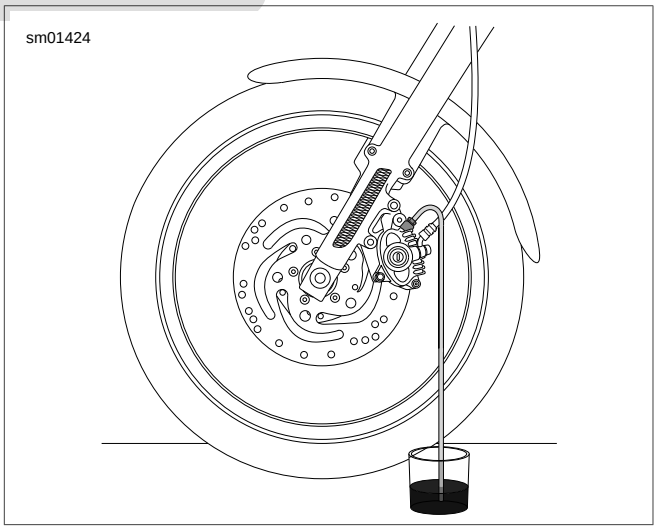


Figure 2-62. Bleeding Hydraulic System

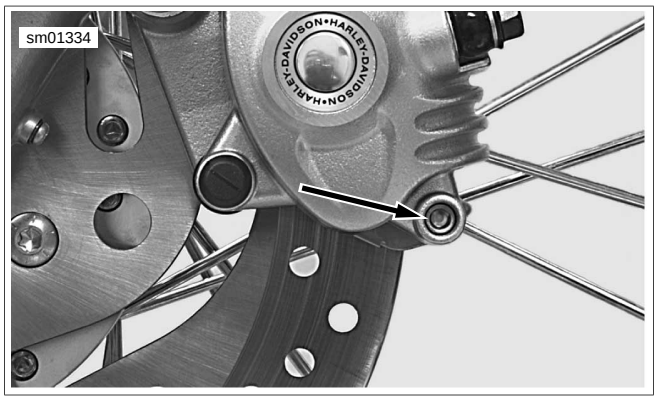


Figure 2-63. Brake Pad Pin (Plug Removed)

DISASSEMBLY

1. See Figure 2-64. Remove brake pad pin (14) and brake pads (8) from caliper body (15).
2. Slide brake caliper off mounting bracket (1).
3. Remove pad spring (16). Do not remove bleeder valve (10) at this time.
4. See Figure 2-65. Install a discarded brake pad in the caliper (1) with the backing plate (4) facing the pistons. Position the brake pad so the friction material (3) is against the back of the caliper, as shown.
5. Loosely install brake pad pin (2) to hold brake pad in place.

⚠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 damage banjo bolt sealing surface or threads of banjo bolt hole in brake caliper. Use an air nozzle with a rubber tip.

⚠CAUTION

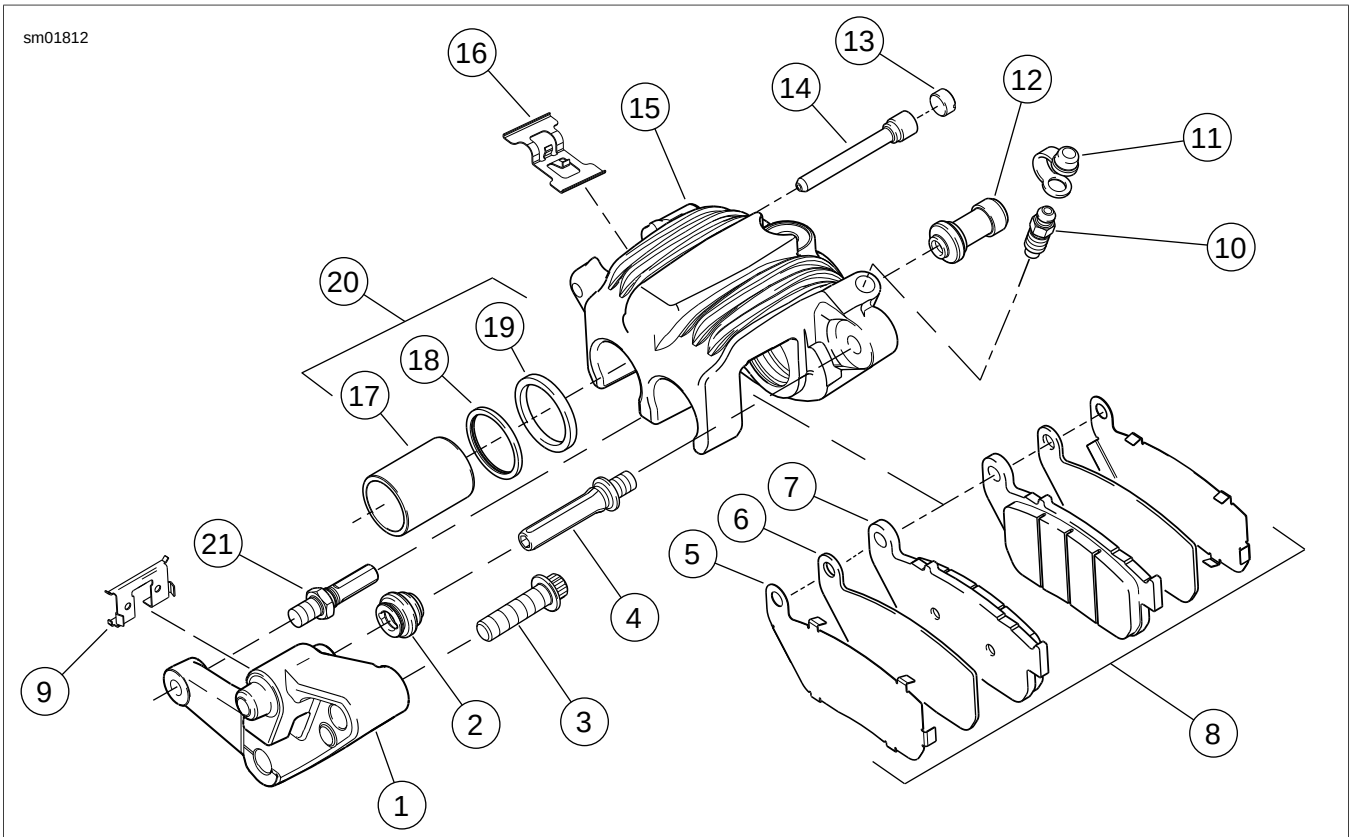
When removing piston with compressed air, piston can develop considerable force and fly out of caliper bore. Keep hands away from piston to avoid possible injury. (00530b)

6. See Figure 2-66. Gently apply low pressure compressed air to banjo bolt hole (3) to force pistons from caliper bores.
7. Remove brake pad pin and brake pad.
8. See Figure 2-64. Remove both pistons (17) from caliper bores by hand. If necessary, wiggle pistons gently to completely remove.

NOTE

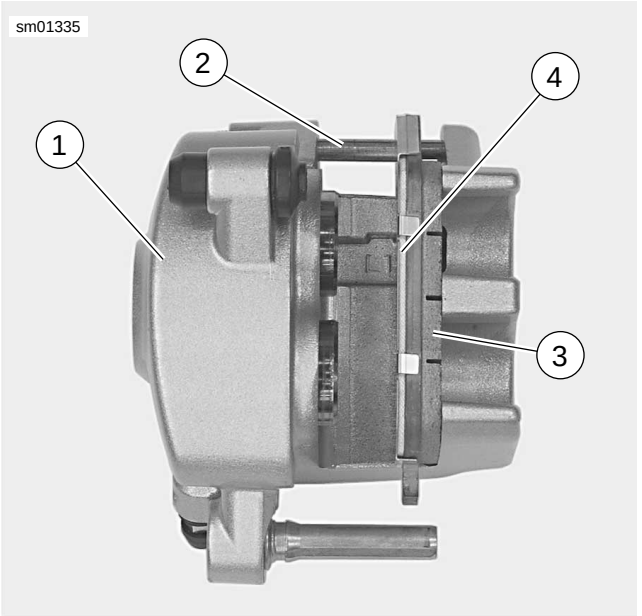
Damaged piston bores will leak when reassembled. Do not use metal objects to remove or install objects from piston bores. Prevent damage to pistons, seals and bores by only using a wooden toothpick when servicing calipers.

9. See Figure 2-67. Using a wooden toothpick (1), remove dust seal (2) and piston seal (3) from each caliper bore. Discard seals.
10. See Figure 2-64. If necessary, remove bleeder valve (10).



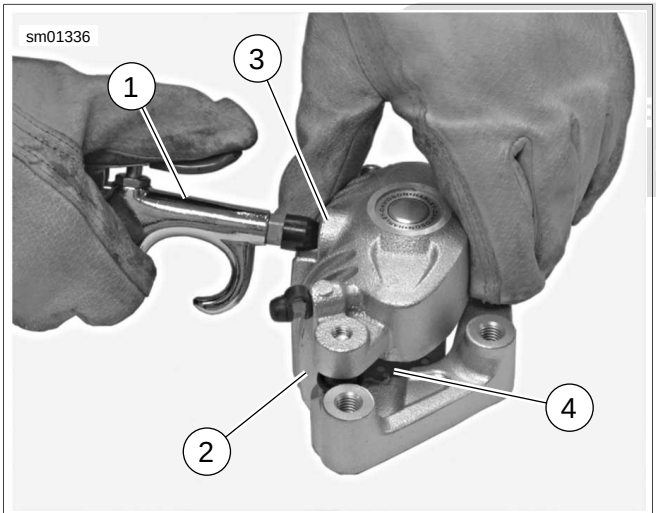
1. Caliper bracket
2. Caliper pin boot
3. Screw (2)
4. Bolt pin (caliper)
5. Pad retainer (2)
6. Insulator (2)
7. Brake pad (2)
8. Brake pad set (includes item 9)
9. Retainer clip (not sold separately)
10. Bleeder valve
11. Bleeder nipple cap
12. Caliper bushing boot
13. Pad pin plug
14. Pad pin
15. Caliper body
16. Pad spring
17. Piston (2)
18. Piston seal (2)
19. Dust seal (2)
20. Piston kit
21. Bolt pin (mounting bracket)

Figure 2-64. Front Brake Caliper Assembly



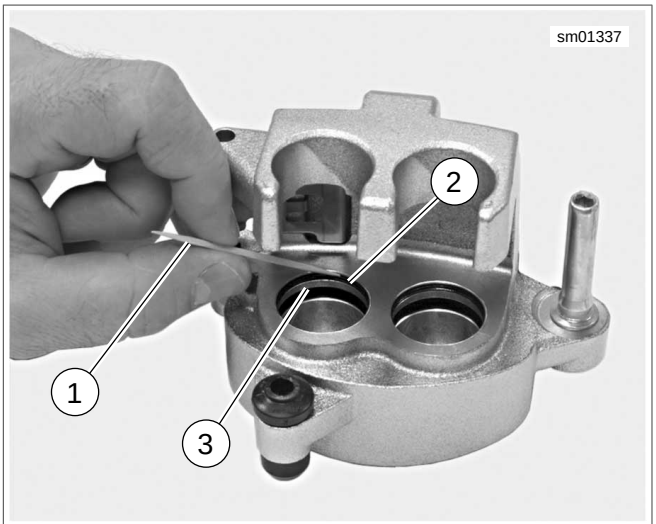
1. Brake caliper
2. Brake pad pin
3. Brake pad friction material
4. Brake pad backing plate

Figure 2-65. Preparing Caliper for Piston Removal



1. Low pressure air nozzle
2. Brake caliper
3. Banjo bolt hole
4. Brake pad

Figure 2-66. Removing Pistons



1. Wooden toothpick
2. Dust seal
3. Piston seal

Figure 2-67. Caliper Seals

CLEANING, INSPECTION AND REPAIR

WARNING

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

1. See Figure 2-64. Wipe old lubrication from inside of caliper pin boot (2) and caliper bushing boot (12) with a soft, clean cloth.
2. Clean all other rubber parts with DOT 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Clean all metal parts with denatured alcohol. 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)

3. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.

4. Carefully inspect all components. Replace any parts that appear damaged or worn.
   a. Check pistons (17) for pitting, scratching or corrosion on outside surfaces.
   b. Inspect caliper piston bores. Do not hone bores. If bores show pitting or corrosion, replace caliper.
   c. Inspect pad pin (14) for grooving and wear. Measure the pad pin diameter in an unworn area, and then in the area of any grooving or wear. If wear is more than 0.011 in (0.28 mm), replace pad pin.
   d. Inspect caliper bolt pin (4). If damaged or excessively worn, replace brake caliper assembly.
   e. Inspect caliper bushing boot and caliper pin boot. If worn or damaged, replace.
   f. Always replace all seals after disassembly.

⚠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)

5. Inspect brake pads and brake disc. Replace if necessary.
   a. See 1.16 BRAKE PADS AND DISCS: XL MODELS for specifications.
   b. See 2.5 WHEELS for brake disc replacement procedure.

ASSEMBLY

FASTENER	TORQUE VALUE	
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm

NOTE

Use ONLY KS62F assembly grease for lubrication. Use of DOT 4 BRAKE FLUID will result in increased brake lever travel.

1. Lubricate the following parts prior to assembly using a light coat of KS62F assembly grease from the service parts kit. All other surfaces must be dry for assembly.
   a. Nose radius of pistons. See Figure 2-68.
   b. All surfaces of piston seals and dust seals.

NOTE

Damaged piston bores will leak when reassembled. Do not use metal objects to remove or install objects in piston bores. Prevent damage to bores by only using a wooden toothpick when servicing calipers.

2. See Figure 2-67. Install a **new** piston seal (3) and a **new** dust seal (2) into each piston bore.
3. See Figure 2-68. Carefully insert pistons by hand, nose radius first, into caliper bores. If installation shows resistance, remove piston(s) and check that seals are properly installed and fully seated in grooves.
4. See Figure 2-64. Install bleeder valve (10) on caliper housing if removed. Tighten bleeder valve to 35-61 **in-lbs** (4.0-6.9 Nm).
5. See Figure 2-69. Install pad spring in channel. Press firmly into place.



Figure 2-68. Piston Nose Radius

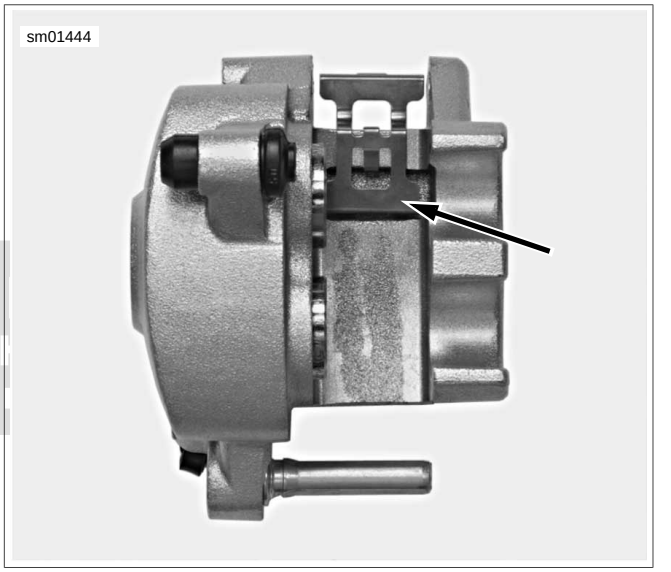
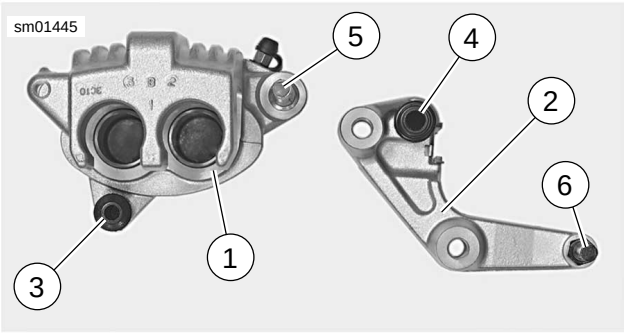


Figure 2-69. Front Caliper Pad Spring

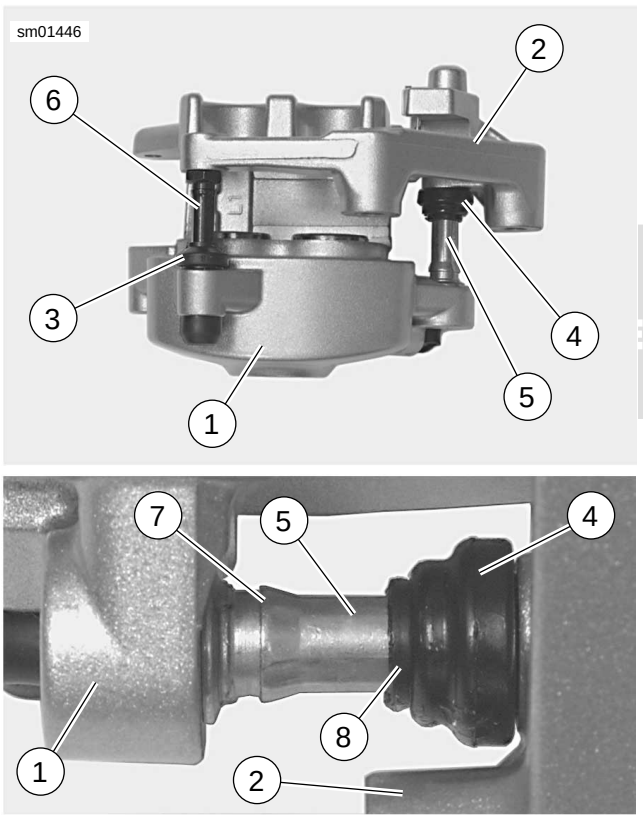
LUBRICATING FRONT CALIPER BOLT PINS AND BOOTS

1. See Figure 2-70. Apply approximately 0.4 g of G40M BRAKE GREASE inside caliper bushing boot (3) and caliper pin boot (4).
2. See Figure 2-71. Apply G40M BRAKE GREASE inside boot lip (8) to prevent sticking between boots (3, 4) and bolt pins (5, 6).
3. Assemble brake caliper and mounting bracket, carefully sliding bolt pins into boots. Slide brake caliper all the way onto mounting bracket until boot lips fit over tapered shoulders (7) of bolt pins.



1. **Front brake caliper**
2. **Caliper mounting bracket**
3. **Caliper bushing boot**
4. **Caliper pin boot**
5. **Caliper bolt pin**
6. **Bracket bolt pin**

Figure 2-70. Lubricating Caliper Boots and Pins



1. **Front brake caliper**
2. **Caliper mounting bracket**
3. **Caliper bushing boot**
4. **Caliper pin boot**
5. **Caliper bolt pin**
6. **Bracket bolt pin**
7. **Tapered shoulder**
8. **Boot lip**

Figure 2-71. Assembling Front Brake Caliper and Mounting Bracket

INSTALLING BRAKE PADS IN CALIPER

FASTENER	TORQUE VALUE	
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm

NOTE

Rear brake pads cannot be used on front brake calipers.

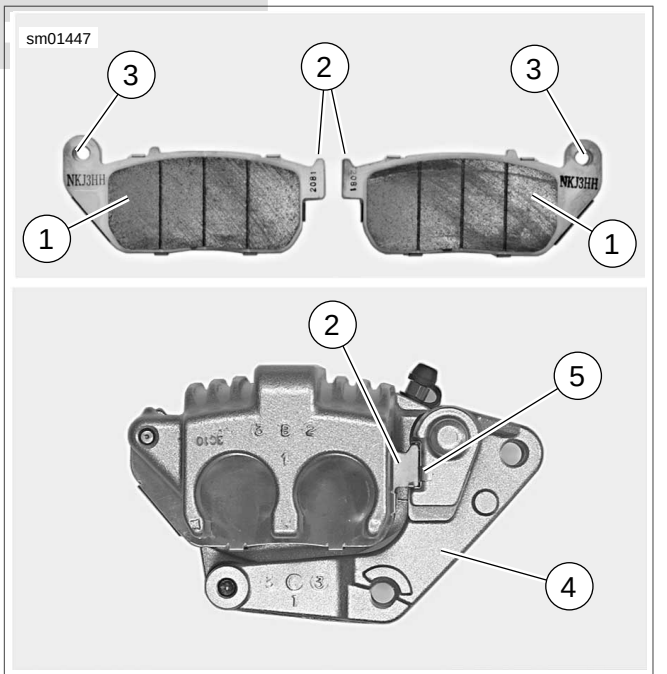
1. See Figure 2-72. Insert one set of brake pads (1) into caliper with friction material on pad facing opening for brake disc. Curved portion of pad fits into recessed area of caliper. Make sure brake pad front mounting tab (2) fits into slot (5) in caliper mounting bracket (4).
2. See Figure 2-64. Press brake pads (8) tightly up against pad spring (16) and install pad pin (14). Tighten to 131-173 **in-lbs** (14.8-19.6 Nm).

NOTE

If pad pin does not fit, check the following:

- *You are using a set of pads, not two identical pads.*
- *Pad spring orientation must match Figure 2-69.*
- *See Figure 2-72. Pad front mounting tabs (2) must be fully seated in mounting bracket slot (5).*
- *Pads must be pushed tight up against pad spring before pad pin is installed.*

3. See Figure 2-64. Install pad pin plug (13). Tighten to 18-25 **in-lbs** (2.0-2.9 Nm).



1. **Brake pad**
2. **Front mounting tab**
3. **Pad pin hole**
4. **Front caliper mounting bracket**
5. **Slot**

Figure 2-72. Front Brake Pads

INSTALLATION

FASTENER	TORQUE VALUE	
Axle, front, nut	60-65 ft-lbs	81-88 Nm
Axle, front, pinch screw: XL Models	21-27 ft-lbs	28.5-36.6 Nm
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Brake master cylinder, front, reservoir cover screw	9-17 **in-lbs**	1.0-2.0 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. **Dual Caliper Models:** Align calipers to brake discs.
   a. Tighten axle nut to 60-65 ft-lbs (81-88 Nm).
   b. Loosen axle pinch screw nut.
   c. Position right fork leg against bearing spacer. Tighten axle pinch screw to 21-27 ft-lbs (28.5-36.6 Nm).
2. See Figure 2-73. Place brake caliper (4) with mounting bracket (5) over brake disc with bleeder valve (8) facing upwards. Install mounting bolts (6) 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)

NOTE

Brake caliper housing has a positive stop for banjo fitting. When tightening banjo bolt into brake caliper in the next step, rotate banjo fitting clockwise until it contacts positive stop.

3. Position a **new** washer (2) on each side of hydraulic brake line (3) banjo fitting. Insert banjo bolt (1) through washers and fitting. Thread bolt into caliper housing. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).
4. **Dual Caliper Models:** Repeat previous two steps for other brake caliper.
5. Remove cover screws, top cover and gasket from front brake master cylinder reservoir.

NOTES

- *See Figure 2-74. Do not use sight glass to determine maximum fluid level. Sight glass should only be used as a visual indicator that fluid level is low and needs attention.*
- *Cover handlebar switches with a shop towel before adding brake fluid to front master cylinder reservoir. Spilling brake fluid on handlebar switches may render them inoperative.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir. Do not reuse old brake fluid.*

6. See Figure 2-74. Add enough DOT 4 BRAKE FLUID to reservoir to bring fluid level even with ridge cast into inside of reservoir, about 1/4 in (6.35 mm) below top edge.

⚠WARNING

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

7. Bleed brake system. See 2.17 BLEEDING BRAKES.

NOTE

On dual caliper models, bleed both calipers.

⚠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)

8. Verify proper operation of master cylinder relief port. Turn handlebar to level reservoir. Squeeze brake lever slowly with reservoir cover removed. A slight spurt of fluid will break the surface if all internal components are working properly.
9. See Figure 2-74. Add enough DOT 4 BRAKE FLUID to reservoir to bring fluid level even with ridge cast into inside of reservoir, about 1/4 in (6.35 mm) below top edge.
10. Install gasket and cover on master cylinder with screws. Tighten to 9-17 **in-lbs** (1.0-2.0 Nm).

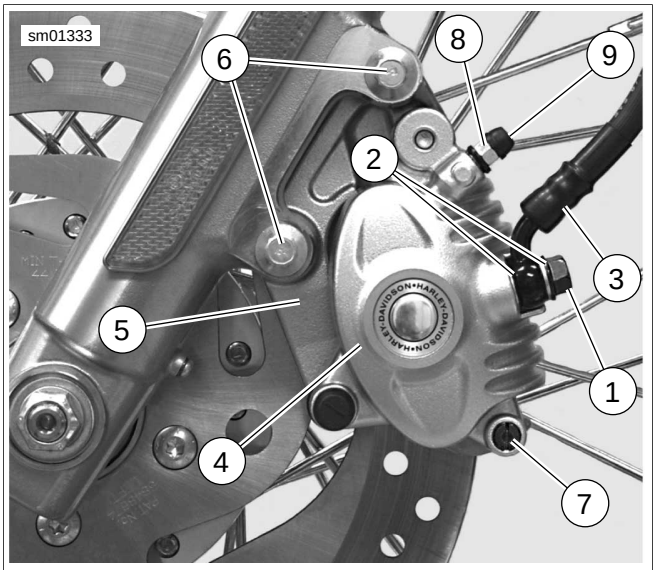
⚠WARNING

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)

11. Test brake system.
    a. Turn ignition switch ON. Squeeze brake hand lever to verify operation of the stop lamp.
    b. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See 2.17 BLEEDING BRAKES.

NOTE

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



1. **Banjo bolt**
2. **Washer (2)**
3. **Front brake line**
4. **Brake caliper**
5. **Caliper mounting bracket**
6. **Mounting bolt (2) (12 pt/10 mm)**
7. **Pad pin plug**
8. **Bleeder valve**
9. **Bleeder nipple cap**

Figure 2-73. Front Caliper Assembly



1. **Cast-in ridge**
2. **Sight glass**

Figure 2-74. Filling Front Master Cylinder Reservoir

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FRONT BRAKE CALIPER: XR 1200X 2.10

REMOVAL

NOTE

Do not remove front brake calipers if only replacing brake pads See 1.17 BRAKE PADS AND DISCS: XR 1200X.

⚠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)

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

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

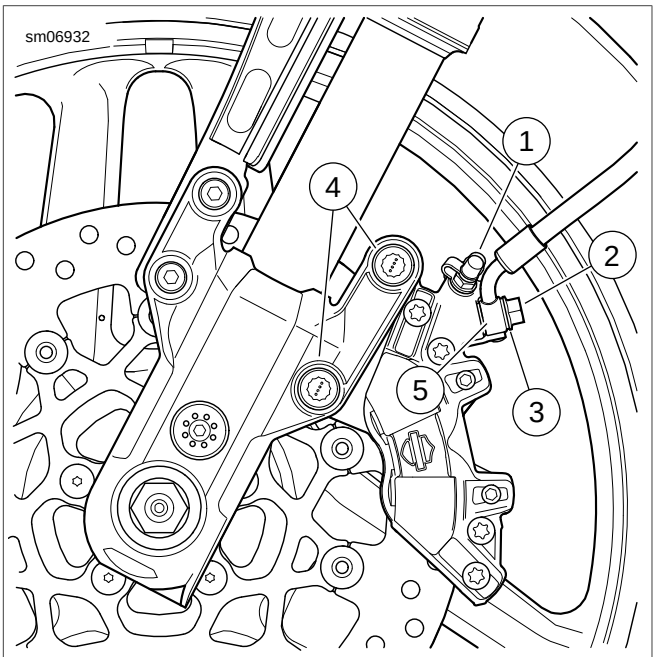
If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

1. See Figure 2-75. Remove bleeder nipple cap from bleeder valve (1) on front brake caliper.
2. See Figure 2-76. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder valve, while placing free end in a suitable container. Open bleeder valve about 1/2 turn. Pump brake hand lever repeatedly to drain brake fluid. Close bleeder valve.

NOTE

Dispose of brake fluid in accordance with local regulations.

3. See Figure 2-75. Remove the banjo bolt (2) (metric) and both washers (3) to detach front brake line from caliper. Discard washers.
4. Remove both mounting bolts (4) (metric). Pull caliper assembly rearward to remove from brake disc.



1. **Bleeder valve**
2. **Banjo bolt (metric)**
3. **Sealing washer**
4. **Mounting bolt (metric)**
5. **Banjo fitting**

Figure 2-75. Front Caliper Assembly: XR 1200X

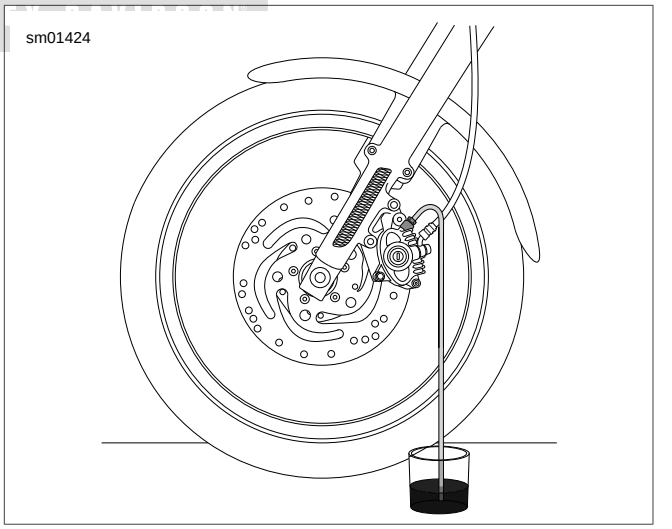
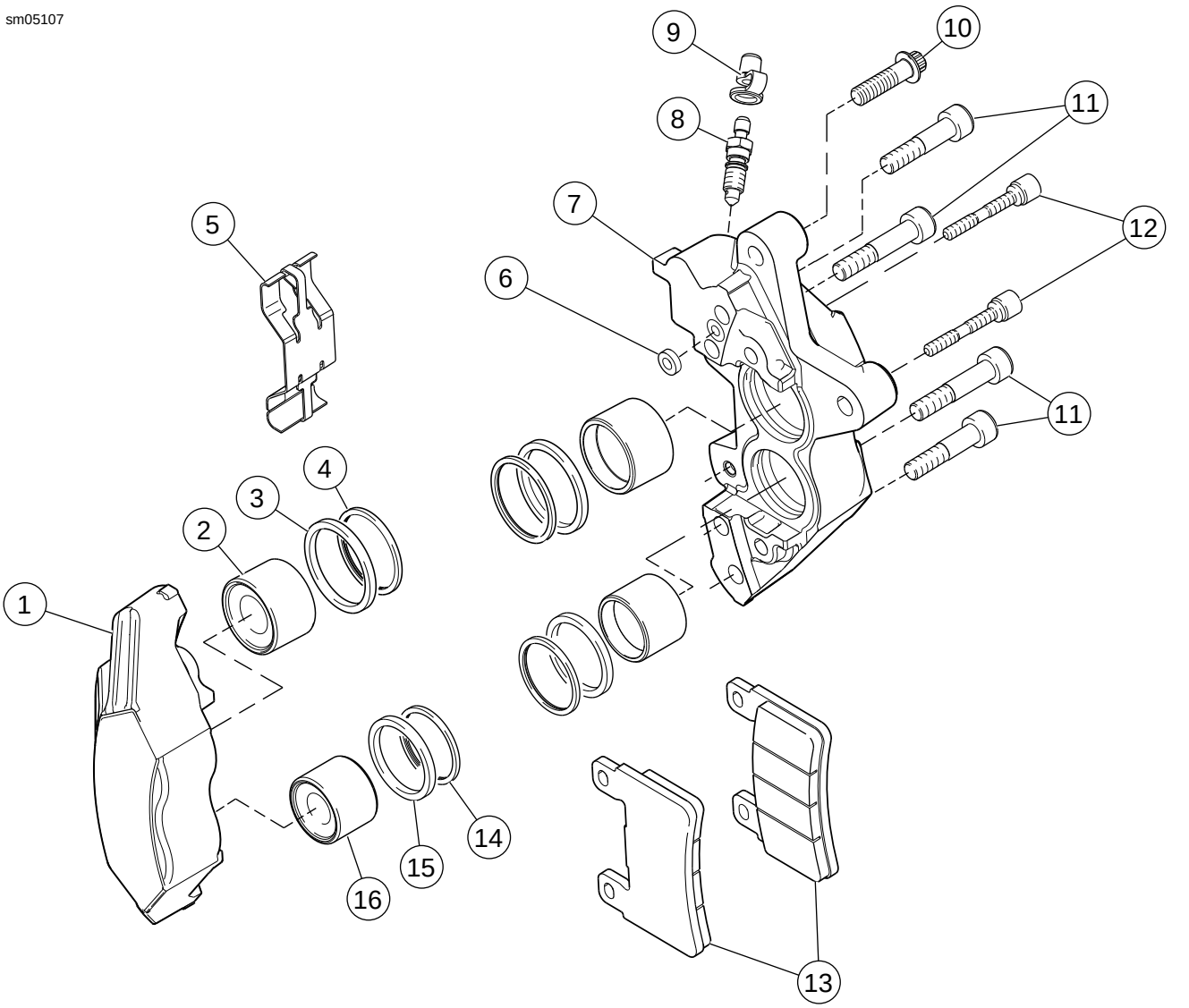


Figure 2-76. Bleeding Hydraulic System



1. **Inner caliper housing**
2. **Upper piston (large) (2)**
3. **Piston seal (large) (2)**
4. **Piston dust seal (large) (2)**
5. **Pad spring**
6. **Crossover seal**
7. **Outer caliper housing**
8. **Bleeder valve**
9. **Bleeder valve cap**
10. **Caliper mounting bolt (2)**
11. **Bridge bolt (4)**
12. **Pad pin (2)**
13. **Pad set**
14. **Piston dust seal (small) (2)**
15. **Piston seal (small) (2)**
16. **Lower piston (small) (2)**

Figure 2-77. Front Brake Caliper Assembly

DISASSEMBLY

1. See Figure 2-78. Remove brake pad pins (1) and anti-rattle spring (2).
2. Slide one brake pad out of caliper assembly. Do not remove bleeder valve (3) at this time.
3. With one brake pad in the caliper, loosely install brake pad pins (1) to hold brake pad in place.

⚠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 damage banjo bolt sealing surface or threads of banjo bolt hole in brake caliper. Use an air nozzle with a rubber tip.

⚠CAUTION

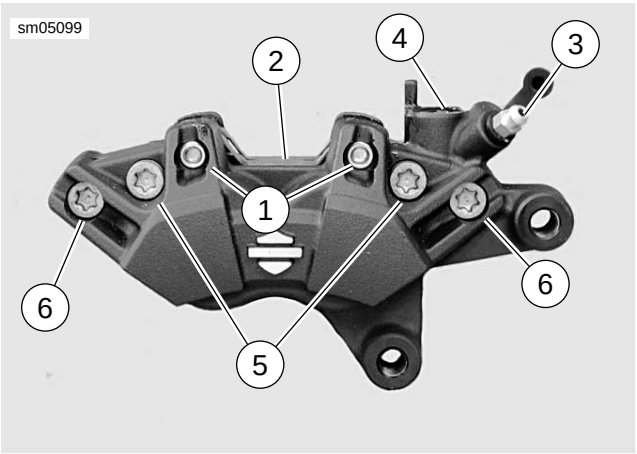
When removing piston with compressed air, piston can develop considerable force and fly out of caliper bore. Keep hands away from piston to avoid possible injury. (00530b)

4. See Figure 2-78. Gently apply low pressure compressed air to banjo bolt hole (4) to force pistons from caliper bores.
5. Remove brake pad pins and brake pad.
6. Remove bridge bolts (5, 6) and separate caliper housings.
7. Remove pistons from each housing by hand. If necessary, wiggle pistons gently to completely remove.

NOTE

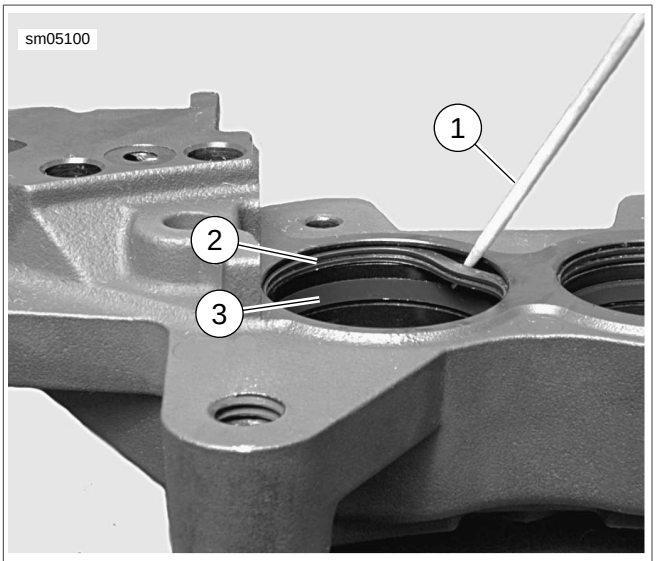
Damaged piston bores will leak when reassembled. Do not use metal objects to remove or install objects from piston bores. Prevent damage to pistons, seals and bores by only using a wooden toothpick when servicing calipers.

8. See Figure 2-79. Using a wooden toothpick (1), remove dust seal (2) and piston seal (3) from each caliper bore. Discard seals.
9. See Figure 2-78. If necessary, remove bleeder valve (3).



1. **Pad pins (2) (metric)**
2. **Spring**
3. **Bleeder valve**
4. **Banjo bolt hole**
5. **Bridge bolt, long (2)**
6. **Bridge bolt, short (2)**

Figure 2-78. Preparing Caliper for Piston Removal



1. **Wooden toothpick**
2. **Dust seal**
3. **Piston seal**

Figure 2-79. Caliper Seals

CLEANING, INSPECTION AND REPAIR

⚠WARNING

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

1. Clean all rubber parts with DOT 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Clean all metal parts with denatured alcohol. 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)

2. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
3. Carefully inspect all components. Replace as necessary.
   a. Check pistons for pitting, scratches or corrosion on outside surfaces.
   b. Inspect piston bores. Do not hone bores. Replace as necessary.

NOTE

The pad pins are manufactured with a relief near the center of their length, where the pad spring touches. Do not use

this area as a measurement point to determine pad pin wear.

c. Inspect pad pin for grooving and wear at the pad contact points. Measure the pad pin diameter in an unworn area and in an area of any grooving or wear. If wear exceeds 0.011 in (0.28 mm), replace pad pin.

d. Inspect pad spring for wear or cracks. Replace if necessary.

e. Always replace all seals after disassembly.

⚠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)

4. Inspect brake pads and brake disc. Replace if necessary.
   a. **Specifications:** See 1.17 BRAKE PADS AND DISCS: XR 1200X.
   b. **Brake Disc:** See 2.5 WHEELS.

ASSEMBLY

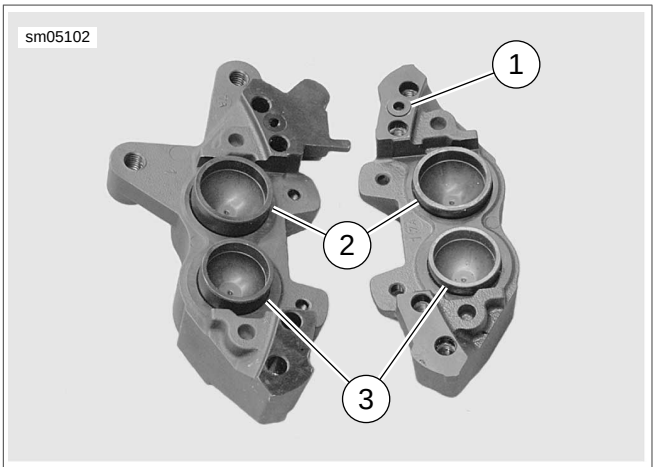
FASTENER	TORQUE VALUE	
Brake caliper, front, bridge bolt	12-18 ft-lbs	16.9-24.5 Nm
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm

1. Lubricate the following parts using a light coat of G40M BRAKE GREASE. All other surfaces must be dry.
   a. Nose radius of pistons.
   b. All surfaces of piston seals and dust seals.

NOTES

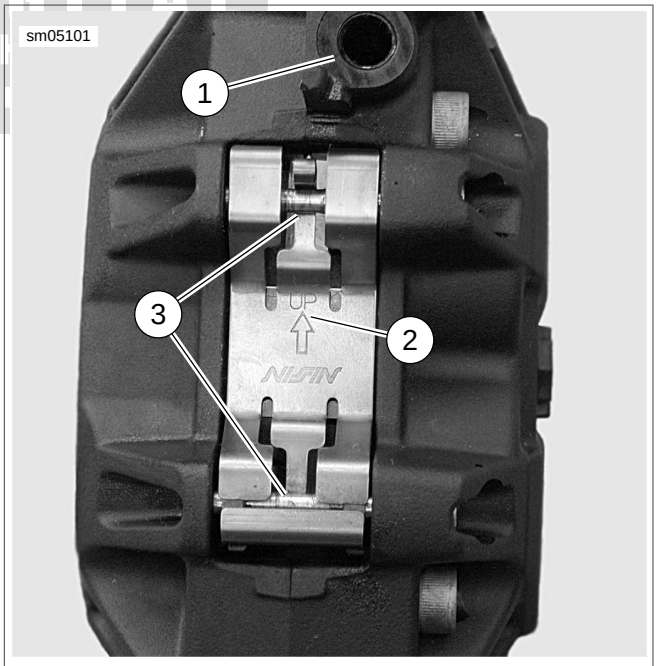
- *Damaged piston bores will leak when reassembled. Do not use metal objects to remove or install objects in piston bores. Prevent damage to bores by only using a wooden toothpick when servicing calipers.*
- *Pistons and bores differ slightly in diameter: one large and one small in each housing.*

2. See Figure 2-79. Install a **new** piston seal (3) and a **new** dust seal (2) into each piston bore.
3. See Figure 2-80. Carefully insert pistons (2, 3) by hand, nose radius first, into caliper bores. If installation shows resistance, remove piston(s) and check that seals are properly installed and fully seated in grooves. Press pistons completely into bores.
4. Install **new** crossover seal (1).
5. See Figure 2-78. Install bridge bolts (5, 6).
   a. Apply a drop of LOCTITE 569 THREAD SEALANT to the threads of the bridge bolts.
   b. Assemble caliper housings and secure with bridge bolts. Verify the bridge bolts are in the correct locations based on length.
   c. Tighten bridge bolts to 12-18 ft-lbs (16.9-24.5 Nm).
6. See Figure 2-81. Install brake pads and pad spring. Verify the spring is oriented as shown with the arrow and word "UP" (2) facing the banjo bolt hole (1). Secure with pad pins (3).
7. Tighten pad pins to 131-173 **in-lbs** (14.8-19.6 Nm).
8. Install bleeder valve on caliper housing if removed. Tighten bleeder valve to 35-61 **in-lbs** (4.0-6.9 Nm).



1. **Crossover seal**
2. **Large piston (2)**
3. **Small piston (2)**

Figure 2-80. Caliper Housings and Pistons



1. **Banjo bolt hole**
2. **Arrow and word "UP"**
3. **Pad pins (2)**

Figure 2-81. Front Caliper Pad Spring Orientation

INSTALLATION

FASTENER	TORQUE VALUE	
Axle, front, nut	60-65 ft-lbs	81-88 Nm
Axle, front, pinch screw: XR 1200X	41-48 ft-lbs	55.6-65.1 Nm
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 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. Align calipers to brake discs.
   a. Tighten axle nut to 60-65 ft-lbs (81-88 Nm).
   b. Loosen axle pinch screw nut.
   c. Position right fork leg against bearing spacer. Tighten axle pinch screw to 41-48 ft-lbs (55.6-65.1 Nm).
2. See Figure 2-82. Place brake caliper over brake disc with bleeder valve (1) facing upwards. Install mounting bolts (4) and 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)

NOTE

Brake caliper housing has a positive stop for banjo fitting. When tightening banjo bolt into brake caliper in the next step, rotate banjo fitting clockwise until it contacts positive stop.

3. Position a **new** washer (3) on each side of hydraulic brake line banjo fitting (5). Insert banjo bolt (2) through washers and fitting. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).
4. Bleed brake system. See 2.17 BLEEDING BRAKES.

NOTE

Bleed both calipers.

⚠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)

5. Verify operation of master cylinder relief port. With motorcycle positioned with master cylinder reservoir is level, squeeze brake lever slowly with reservoir cover removed. A slight spurt of fluid will break the surface if all internal components are working properly.
6. Install gasket and cover on master cylinder. Install screws. Tighten to 9-17 **in-lbs** (1.0-2.0 Nm).

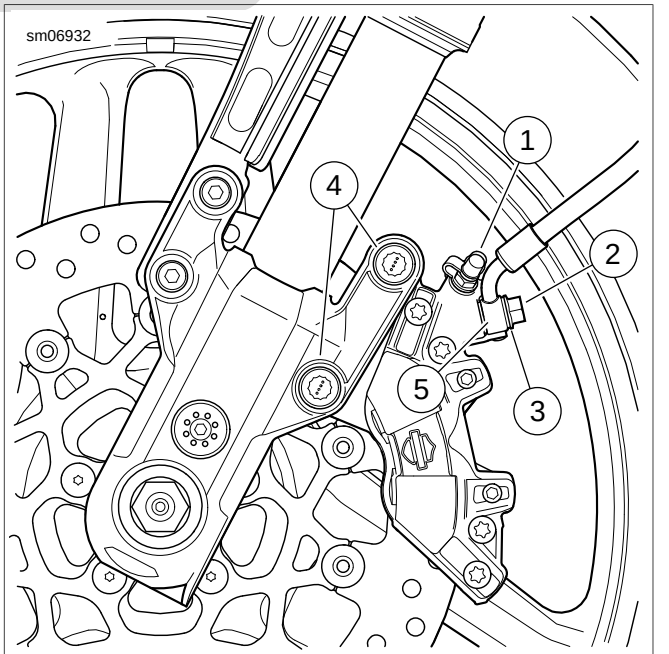
⚠WARNING

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)

7. Test brake system.
   a. Turn ignition switch ON. Squeeze brake hand lever to verify operation of the stop lamp.
   b. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See 2.17 BLEEDING BRAKES.

NOTE

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



1. **Bleeder valve**
2. **Banjo bolt (metric)**
3. **Sealing washer**
4. **Mounting bolt (metric)**
5. **Banjo fitting**

Figure 2-82. Front Caliper Assembly: XR 1200X

REAR BRAKE MASTER CYLINDER: XL MODELS 2.11

GENERAL

The rear brake master cylinder is mounted transverse to the centerline, beneath the rear fork pivot shaft assembly.

If the rear brake feels spongy or excessive pedal travel exists or the brake does not work at all, proceed to Inspection.

NOTES

- *Use only CCI #20 BRAKE GREASE to lubricate master cylinder bores, pistons, primary cups and secondary cups.*
- *Use only KS62F assembly grease on caliper pistons and piston seals.*
- *Use only G40M BRAKE GREASE on the caliper pins and boots.*

⚠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.

INSPECTION

1. Check the fluid level in the rear brake reservoir. If it is low, refill and bleed brake system. See 2.17 BLEEDING BRAKES.
2. Check for fluid leaks in the brake line, around banjo fittings or rear brake caliper piston or bleeder valve. Repair brake system.
   a. **Brake Line:** See 2.16 BRAKE LINES.
   b. **Brake Caliper:** See 2.14 REAR BRAKE CALIPER: XL MODELS.
3. Check rear brake friction pads and disc for excessive wear or damage. Replace as necessary.
   a. **Brake Pads:** See 1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Rear.
   b. **Brake Discs:** See 2.5 WHEELS.
4. Check mechanical brake linkage from brake pedal to master cylinder for damage. Replace as necessary.
   a. **Models with Mid-Mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
5. Eliminate any air in the hydraulic brake assembly by bleeding the system. See 2.17 BLEEDING BRAKES.

If none of these conditions exist but the rear brake system does not operate properly, the rear 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)

1. Drain rear brake master cylinder reservoir and remove hose clamp and feed hose from master cylinder feed hose port fitting. Discard hose clamp. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
2. Remove bleeder nipple cap from bleeder valve on rear brake caliper. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder valve, while placing free end in a suitable container.

NOTE

Dispose of brake fluid in accordance with local regulations.

3. Open bleeder valve about 1/2-turn. Pump brake pedal to drain brake fluid. Close bleeder valve but do not tighten.
4. **Models with EVAP Controls:** Remove EVAP canister and mounting bracket. See 4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister.

⚠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

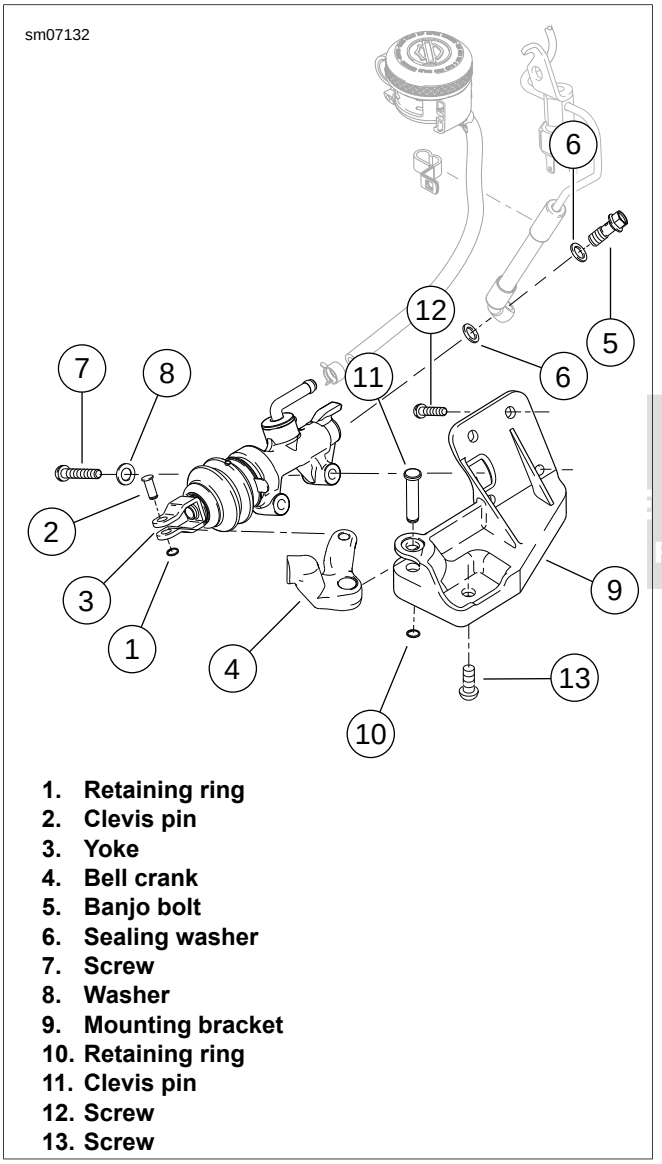
Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

5. See Figure 2-83. Remove retaining ring (1) from clevis pin (2). Remove clevis pin and disengage master cylinder yoke (3) from bell crank (4). Discard retaining ring.

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

6. Remove banjo bolt (5) and washers (6) from master cylinder. Lift banjo fitting away from master cylinder. Discard washers.
7. Remove two screws (7) and two washers (8) securing rear master cylinder to master cylinder mounting bracket (9) and remove rear master cylinder.
8. If it is necessary to remove master cylinder mounting bracket:
   a. Remove retaining ring (10) and clevis pin (11). Disconnect bell crank from mounting bracket.
   b. Remove two screws (12).
   c. Remove screw (13) and mounting bracket.



1. **Retaining ring**
2. **Clevis pin**
3. **Yoke**
4. **Bell crank**
5. **Banjo bolt**
6. **Sealing washer**
7. **Screw**
8. **Washer**
9. **Mounting bracket**
10. **Retaining ring**
11. **Clevis pin**
12. **Screw**
13. **Screw**

Figure 2-83. Rear Brake Master Cylinder

DISASSEMBLY

NOTES

- *Do not disassemble the rear master cylinder unless problems are being experienced. Discard all seals during the disassembly procedure. Install a complete rebuild kit when the unit is reassembled.*
- *Clamp rear brake master cylinder in a vise by its mounting bosses only. Use brass or aluminum jaw covers or other protective device on vise jaws to prevent damage to master cylinder.*

1. See Figure 2-84. Clamp rear brake master cylinder in a vise with yoke (1) pointing up.
2. Remove external boot (2). Remove spring pin (3) from end of pushrod (4). Discard spring pin.

NOTE

Grip yoke by the edges with an adjustable wrench. Do not grip yoke by the flats or the yoke may become deformed.

3. Hold yoke with an adjustable wrench. Using an open-end wrench, loosen shoulder nut. Remove yoke.

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)

4. Press down on spring retainer (5) to compress external return spring (6). While spring is compressed, remove shoulder nut from pushrod. Carefully release pressure on external return spring. Remove spring retainer and external return spring.
5. Remove and discard inner boot (8).

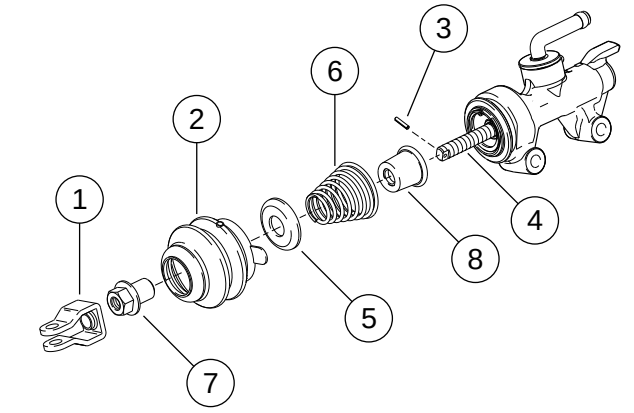
NOTE

Do not remove boot collar nut and pushrod retainer from pushrod.

WARNING

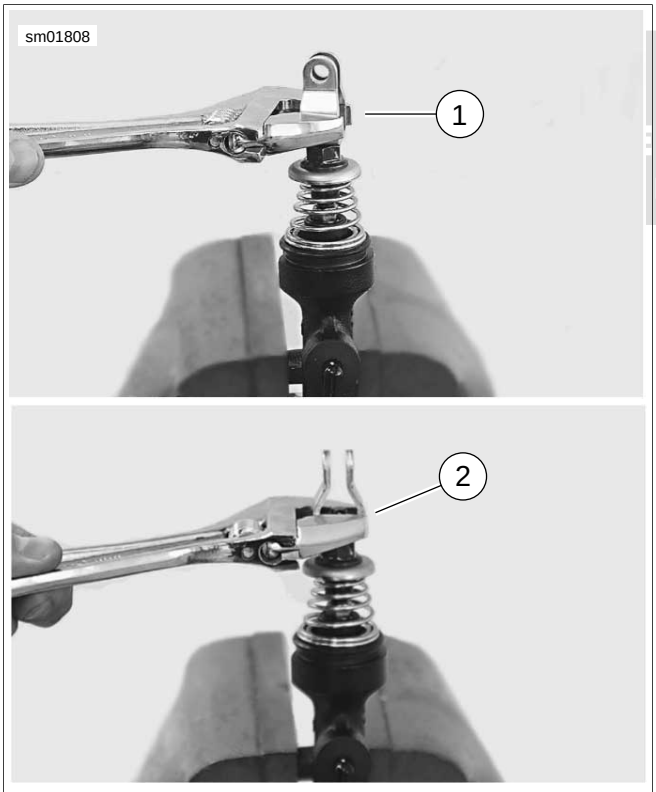
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

6. See Figure 2-86. Thread shoulder nut back onto pushrod several turns, to protect pushrod threads. Press down on pushrod to compress piston spring (1). Remove retaining ring (2).
7. Remove pushrod (3) with boot collar nut (4) and pushrod retainer (5), piston (6) with secondary cup (7), primary cup (8) and piston spring. Discard retaining ring, piston with secondary cup, primary cup and piston spring.
8. Remove dust cover (9), retaining ring (10), feed port fitting (11) and O-ring (12). Discard retaining ring and O-ring.



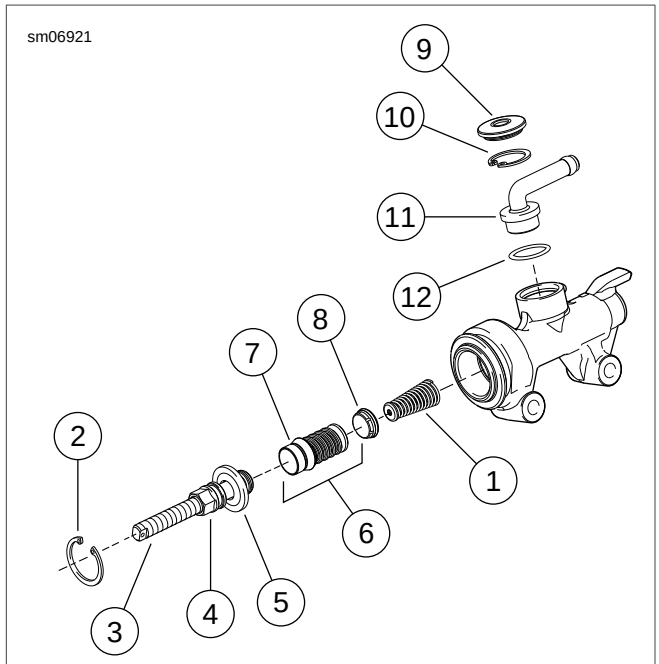
1. Yoke
2. External boot
3. Spring pin
4. Pushrod
5. Spring retainer
6. External spring
7. Shoulder nut
8. Inner boot

Figure 2-84. Rear Brake Master Cylinder



1. Incorrect
2. Correct

Figure 2-85. Tightening Yoke



1. Piston spring
2. Retaining ring
3. Pushrod
4. Boot collar nut
5. Pushrod retainer
6. Piston
7. Secondary cup
8. Primary cup
9. Dust cover
10. Retaining ring
11. Feed port fitting
12. O-ring

Figure 2-86. Rear Brake 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)

1. Blow out drilled passages and piston bore in master cylinder body with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.

2. Carefully inspect all components.
   a. Inspect piston bore for damage. Replace as necessary.
   b. Inspect outlet port that mates with brake line banjo fitting. This is a critical sealing surface. Replace as necessary.
3. Verify that vent holes in master cylinder are completely open and free of dirt or debris.

ASSEMBLY

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, pushrod shoulder nut	130-173 **in-lbs**	14.7-19.6 Nm

NOTES

- *When assembling rear brake master cylinder, always use **new** parts from the service parts kit. See the parts catalog.*
- *Lubricate cylinder bore, cups and seals with CCI #20 BRAKE GREASE before assembly.*
- *Stand master cylinder on wooden block or clean, lint-free towel to protect seating surfaces.*

1. Coat **new** O-ring with DOT 4 BRAKE FLUID. Install O-ring and feed port fitting into feed port on top of master 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.

2. Secure with **new** retaining ring. Verify that retaining ring is fully seated in groove.
3. Slide dust cover onto feed port fitting. Press into place in master cylinder feed port. Turn feed port fitting so it points toward banjo fitting end of master cylinder body.

NOTE

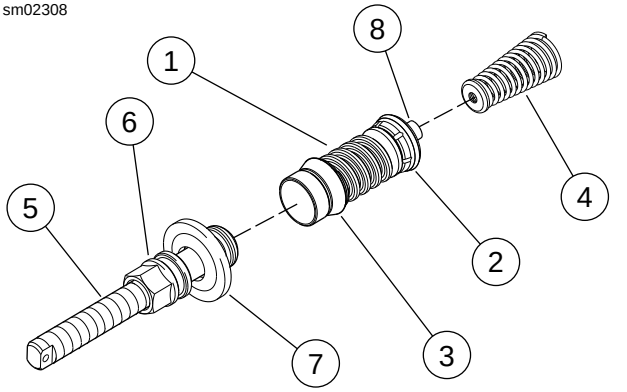
Clamp rear brake master cylinder in a vise by its mounting bosses only. Use brass jaw covers or other protective device on vise jaws to prevent damage to master cylinder.

4. Clamp master cylinder in a vise with banjo fitting end pointing down.
5. See Figure 2-87. Lubricate master cylinder bore, **new** piston (1) with **new** secondary cup (3), and **new** primary cup (2) with CCI #20 BRAKE GREASE supplied in the service parts kit.

⚠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)

6. Press small end of **new** piston spring (4) onto mounting boss (8) on piston (1).
7. Slide piston/spring assembly, flared end of spring first, into cylinder bore so that spring seats against counter bore (recess) at bottom of cylinder.
8. Apply approximately 0.1 g of G40M BRAKE GREASE to ball end of pushrod (5). Insert ball end of pushrod into cupped end of piston.



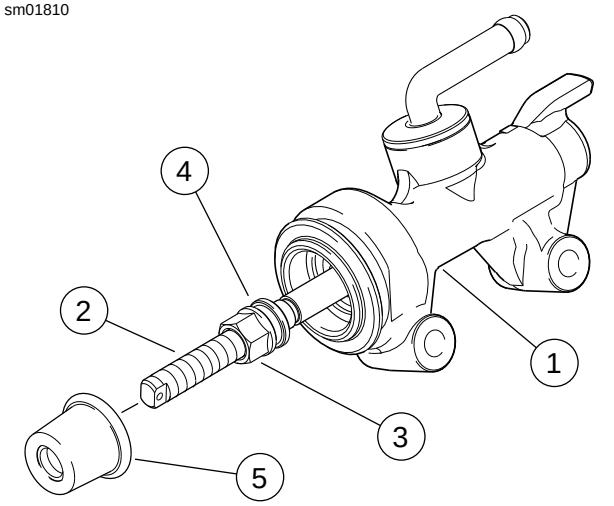
1. **Piston**
2. **Primary cup**
3. **Secondary cup**
4. **Piston spring**
5. **Pushrod**
6. **Boot collar nut**
7. **Pushrod retainer**
8. **Piston spring mounting boss**

Figure 2-87. Rear Master Cylinder Piston, Pushrod and Spring 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)

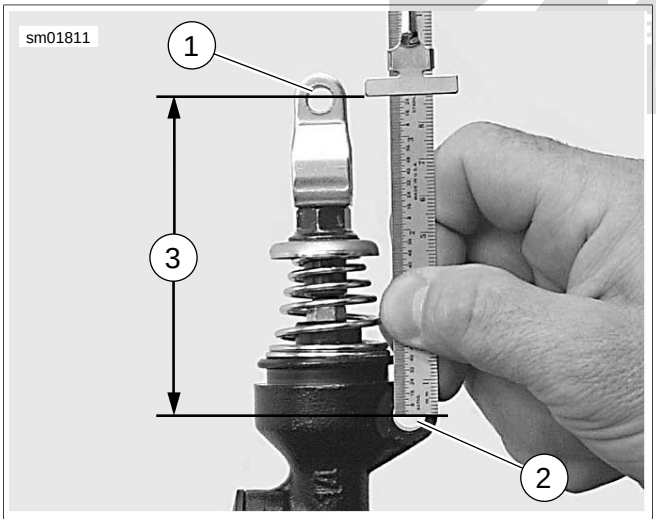
9. Temporarily thread shoulder nut onto pushrod several turns to protect pushrod threads. Press down on pushrod to compress piston spring. Slide pushrod retainer down into master cylinder bore.
10. Secure pushrod assembly with **new** retaining ring. Verify that retaining ring is fully seated in groove. Remove shoulder nut from pushrod.
11. See Figure 2-88. Apply approximately 0.1 g of G40M BRAKE GREASE around groove (4) in boot collar nut (3). Carefully slide inner boot (5) down onto pushrod (2) and into end of master cylinder bore. Press lip of inner boot down around groove in boot collar nut.
12. Install external return spring and spring retainer. Thread shoulder nut shoulder-first onto pushrod several turns past flats.
13. Thread yoke onto pushrod, at least 2-3 turns past flats. Install **new** spring pin into end of pushrod.



1. **Rear brake master cylinder assembly**
2. **Pushrod**
3. **Boot collar nut**
4. **Groove**
5. **Inner boot**

Figure 2-88. Lubricating and Installing Inner Boot

14. See Figure 2-89. Measure from centerline of clevis pin hole (1) in yoke to centerline of master cylinder mounting boss hole (2) closest to yoke.
15. Turn yoke on pushrod to 3.40-3.48 in (86.3-88.3 mm).



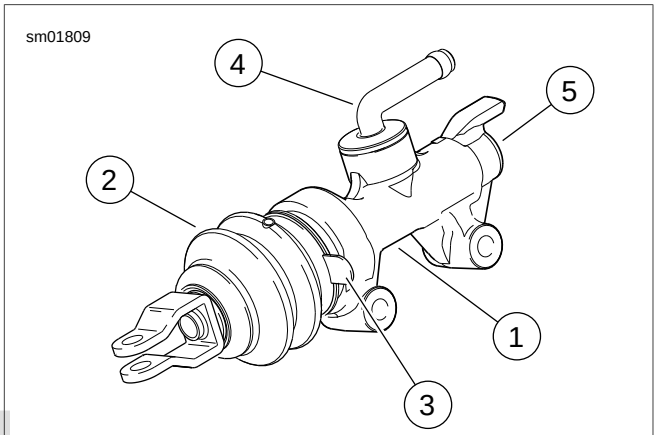
1. **Clevis pin hole**
2. **Mounting boss hole**
3. **3.40-3.48 in (86.3-88.3 mm)**

Figure 2-89. Adjusting Pushrod Length

NOTE

Grip yoke by the edges with adjustable wrench. Do not grip yoke by the flats or the yoke may become deformed.

16. Holding yoke with an adjustable wrench, turn shoulder nut back against yoke. Tighten to 130-173 **in-lbs** (14.7-19.6 Nm).
17. See Figure 2-90. Remove master cylinder assembly from vise. Slide external boot (2) over yoke/pushrod assembly and external return spring.
18. Install the external boot.
    a. Position external boot tabs (3) at the 3 o'clock and 9 o'clock position when master cylinder body (1) is held upright. The drain hole is at bottom of boot when master cylinder is mounted.
    b. Fit lip on large end of the external boot to groove in end of master cylinder.
    c. Seat the spring retainer in groove in small end of external boot.



1. **Rear master cylinder assembly**
2. **External boot**
3. **Tabs (2)**
4. **Feed port fitting**
5. **Banjo fitting hole**

Figure 2-90. Assembled Rear Master Cylinder

INSTALLATION

FASTENER	TORQUE VALUE	
Brake master cylinder mounting bracket, rear, screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm
Brake master cylinder mounting bracket, rear, screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm
Brake master cylinder, rear, mounting screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 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)

NOTE

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

1. See Figure 2-83. Install mounting bracket (9):
   a. Attach mounting bracket to frame loosely with screws (12, 13) and tighten two screws (12) to 17-22 ft-lbs (23.1-29.9 Nm).
   b. Tighten screw (13) to 17-22 ft-lbs (23.1-29.9 Nm).
2. Install bell crank (4) with clevis pin (11). Secure with **new** retaining ring (10).
3. Install rear master cylinder assembly on mounting bracket with screws (7) and washers (8). Tighten to 17-22 ft-lbs (23.1-29.9 Nm).
4. Fit yoke (3) onto bell crank (4). Install clevis pin (2) and secure with **new** retaining ring (1).

NOTE

Master cylinder housing has a positive stop for banjo fitting. When tightening banjo bolt into master cylinder in the next step, rotate banjo fitting clockwise until it contacts positive stop.

5. Position a **new** sealing washer (6) on each side of hydraulic brake line banjo fitting. Insert banjo bolt (5) through washers and fitting. Thread bolt into master cylinder housing. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).
6. Install rear brake master cylinder feed hose on master cylinder feed hose port fitting. Secure with **new** hose clamp. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
7. **Models with EVAP Controls:** Install the EVAP canister and mounting bracket. See 4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister.

⚠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.*
- *Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.*
- *Reservoir cover may be removed from rear brake master cylinder reservoir to more easily verify fluid level in reservoir.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir. Do not reuse old brake fluid.*

8. Position motorcycle upright (not resting on jiffy stand).
9. Remove reservoir cap.
10. Fill rear master cylinder reservoir with DOT 4 brake fluid until the fluid level reaches the UPPER mark on the reservoir.
11. Bleed brake system. See 2.17 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)

12. Test operation of the 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)

13. Test ride motorcycle at low speed.

REAR BRAKE MASTER CYLINDER: XR 1200X 2.12

GENERAL

The rear brake master cylinder is mounted to the right side rider footrest/rear brake pedal bracket.

If the rear brake feels spongy or excessive pedal travel exists or the brake does not work at all, proceed with Inspection which follows.

⚠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.

INSPECTION

1. Check the level of fluid in the rear brake reservoir. If it is low, refill and bleed brake system. See 2.17 BLEEDING BRAKES.
2. Check for fluid leaks in the brake line, around banjo fittings or rear brake caliper piston or bleeder valve. Repair and bleed brake system.
   a. For brake line replacement procedure, see 2.16 BRAKE LINES.
   b. To repair rear brake caliper, see procedure in 2.15 REAR BRAKE CALIPER: XR 1200X.
   c. See 2.17 BLEEDING BRAKES for hydraulic brake system bleeding procedure.
3. Check rear brake friction pads and disc for excessive wear or damage. Replace as necessary.
   a. See 1.17 BRAKE PADS AND DISCS: XR 1200X for specifications.
   b. See 1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear for brake pad replacement procedure.
   c. See 2.5 WHEELS for brake disc replacement procedure.
4. Eliminate any air in the hydraulic brake assembly by bleeding the system. See 2.17 BLEEDING BRAKES.

If none of these conditions exist but the rear brake system does not operate properly, repair or replace 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)

1. See Figure 2-91. Drain rear brake master cylinder reservoir (7) and remove feed hose (8) from master cylinder feed hose port fitting. Discard hose clamp. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
2. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over rear caliper bleeder valve and place free end of tubing in a suitable container.
3. Open bleeder valve about 1/2-turn. Pump brake pedal to drain brake fluid. Close bleeder valve but do not tighten.

NOTE

Dispose of brake fluid in accordance with local regulations.

⚠WARNING

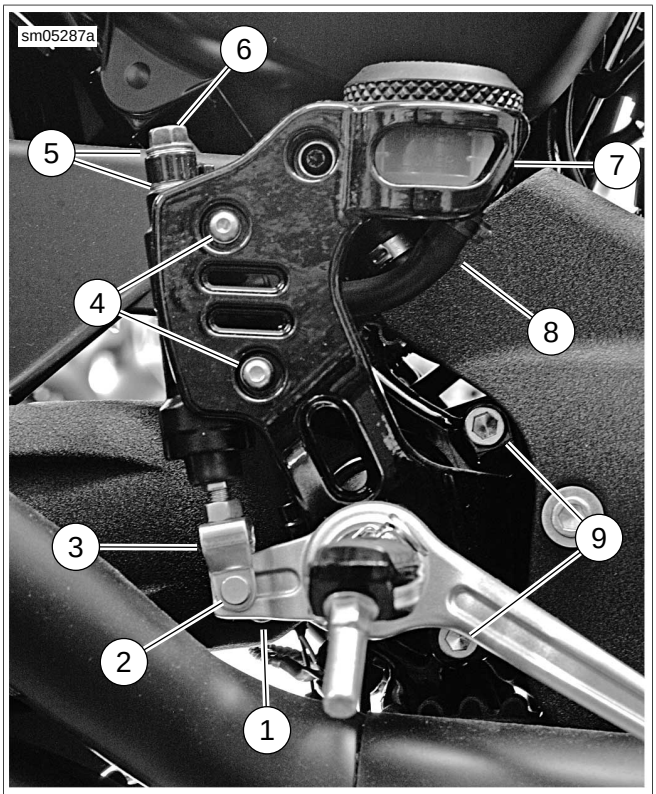
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

4. Remove retaining ring (1) from clevis pin (2). Remove clevis pin and disengage master cylinder yoke (3) from brake pedal. Discard retaining ring.

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

5. Remove banjo bolt (6) and washers (5). Lift banjo fitting away from master cylinder. Discard washers.
6. Remove two screws (4) securing rear master cylinder to master cylinder mounting bracket and remove rear master cylinder.
7. If it is necessary to remove master cylinder/footpeg mounting bracket, remove fasteners (9). See 2.42 RIDER FOOT CONTROLS: XR 1200X.



1. **Retaining ring**
2. **Clevis pin**
3. **Yoke**
4. **Screw and washer (2)**
5. **Washer (2)**
6. **Banjo bolt**
7. **Reservoir**
8. **Feed hose**
9. **Fastener (2)**

Figure 2-91. Rear Brake Master Cylinder and Reservoir

DISASSEMBLY

NOTES

- *Do not disassemble the rear master cylinder unless problems are being experienced. Discard all seals during the disassembly procedure. Install a complete rebuild kit when the unit is reassembled.*
- *Clamp rear brake master cylinder in a vise by its mounting bosses only. Use brass or aluminum jaw covers or other protective device on vise jaws to prevent damage to master cylinder.*

1. See Figure 2-92. Clamp rear brake master cylinder in a vise with yoke pointing up.

NOTE

Grip yoke by the edges with an adjustable wrench. Do not grip yoke by the flats or the yoke may become deformed.

2. Hold yoke with an adjustable wrench. Using an open-end wrench, loosen shoulder nut. Remove yoke.
3. See Figure 2-93. Remove nut (4) from pushrod (5).
4. Remove and discard boot (6).

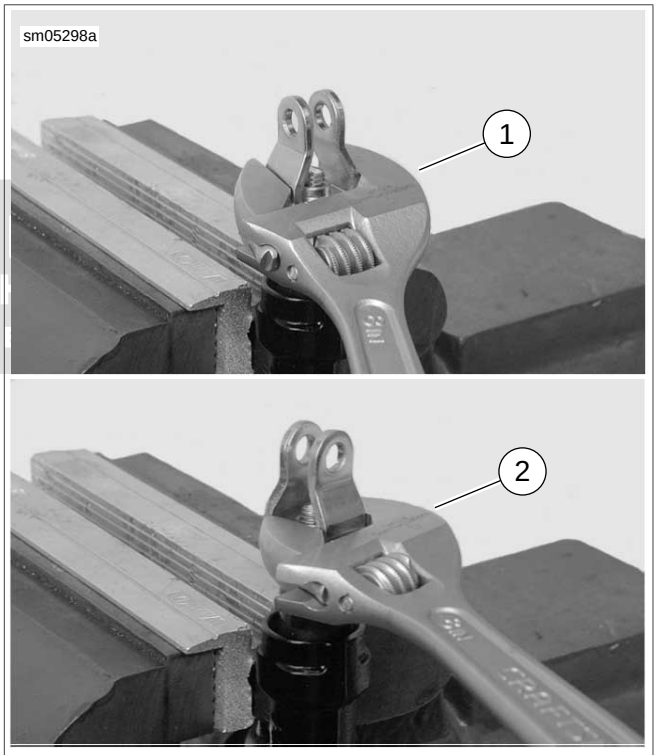
⚠WARNING

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

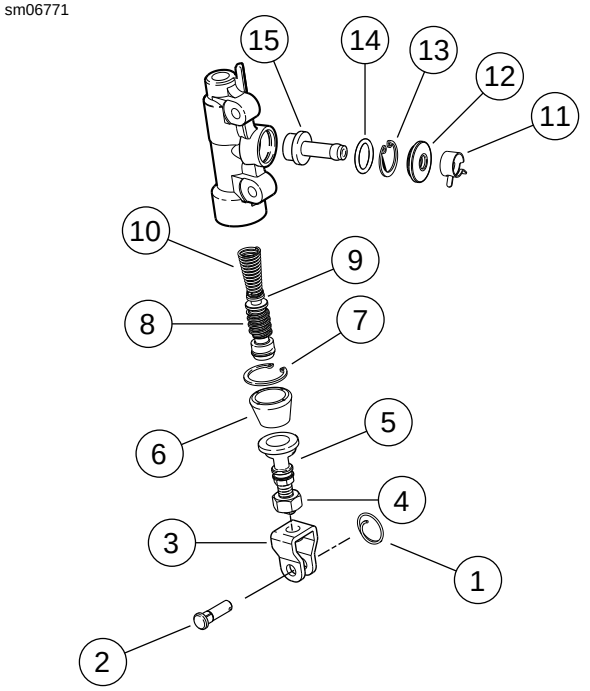
- *Do not remove boot collar nut from pushrod.*
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*

5. Thread nut (4) back onto pushrod several turns, to protect pushrod threads.
6. Press down on pushrod to compress piston spring (10). Remove retaining ring (7), pushrod (5) with boot collar nut, piston (8) with secondary cup, primary cup (9) and piston spring (10). Discard retaining ring, piston/cup assembly and piston spring.
7. Remove dust cover (12), retaining ring (13), feed port fitting (15) and O-ring (14). Discard retaining ring and O-ring.



1. **Incorrect**
2. **Correct**

Figure 2-92. Holding Yoke



1. Retaining ring
2. Clevis pin
3. Yoke
4. Nut
5. Pushrod
6. Boot
7. Retaining ring
8. Piston
9. Primary cup
10. Piston spring
11. Retaining clip
12. Dust cover
13. Pushrod retainer
14. O-ring
15. Feed port fitting

Figure 2-93. Rear Brake Master Cylinder

CLEANING, INSPECTION AND REPAIR

⚠WARNING

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

⚠WARNING

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

1. Thoroughly clean master cylinder body and all brake system components. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
2. Carefully inspect all parts for wear or damage and replace as necessary.
   a. Inspect piston bore in master cylinder housing for scratches, grooves, scoring, pitting or corrosion. Replace housing if any of these conditions are found.
   b. Inspect outlet port that mates with brake line banjo fitting. This is a critical sealing surface. If necessary, replace housing.
3. Verify that vent holes in master cylinder are completely open and free of dirt or debris.

ASSEMBLY

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, pushrod nut: XR 1200X	130-173 **in-lbs**	14.7-19.6 Nm

NOTES

- *When assembling rear brake master cylinder, always use **new** parts from the service parts kit. Consult the PARTS CATALOG for the correct kit part number.*
- *CCI #20 BRAKE GREASE is recommended for lubrication of cylinder bore, cups and seals prior to assembly.*
- *Stand master cylinder on wooden block or clean, lint-free towel to protect seating surfaces.*

⚠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 2-93. Coat **new** O-ring (14) with DOT 4 BRAKE FLUID. Install O-ring and feed port fitting (15) into feed port on master cylinder body. Secure with **new** retaining ring (13). Verify that retaining ring is fully seated in groove.
2. Slide dust cover (12) onto feed port fitting and press into place in master cylinder feed port.

NOTE

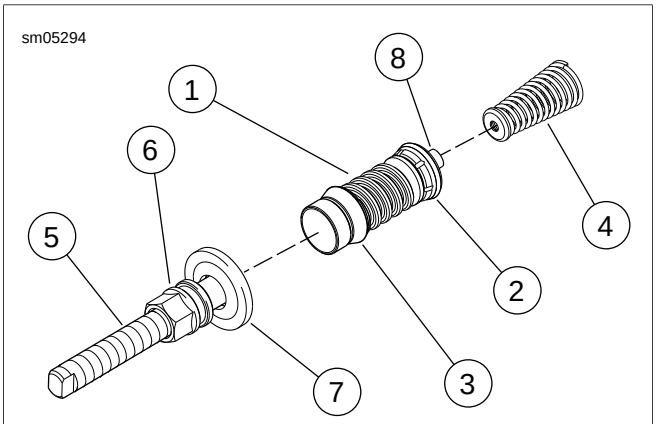
Clamp rear brake master cylinder body in a vise by its mounting bosses only. Use brass jaw covers or other protective device on vise jaws to prevent damage to master cylinder.

3. Clamp master cylinder in a vise with banjo fitting end pointing down.
4. See Figure 2-94. Lubricate master cylinder bore, **new** piston (1) with **new** secondary cup (3), and **new** primary cup (2) with CCI #20 BRAKE GREASE supplied in the service parts kit.

⚠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. Press small end of **new** piston spring (4) onto mounting boss (8) on piston.



1. **Piston**
2. **Primary cup**
3. **Secondary cup**
4. **Piston spring**
5. **Pushrod**
6. **Boot collar nut**
7. **Pushrod retainer**
8. **Piston spring mounting boss**

Figure 2-94. Rear Master Cylinder Piston, Pushrod and Spring Assembly

6. Slide piston/spring assembly, flared end of spring first, into cylinder bore so that spring seats against counter bore (recess) at bottom of cylinder.
7. Apply approximately 0.1 g of G40M BRAKE GREASE to ball end of 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

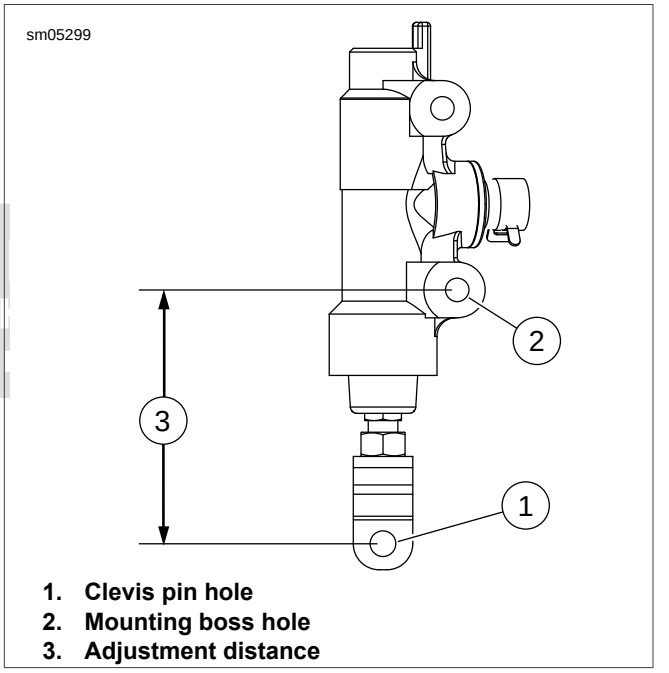
Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

8. See Figure 2-93. Temporarily thread nut (4) onto pushrod (5) several turns to protect pushrod threads.
9. Insert pushrod into master cylinder body. Press down on pushrod to compress piston spring (10). Slide pushrod retainer down into master cylinder bore and hold in place.
10. Secure pushrod assembly with **new** retaining ring (7). Verify that retaining ring is fully seated in groove. Remove nut (4) from pushrod.
11. Apply approximately 0.1 g of G40M BRAKE GREASE around groove in boot collar nut. Carefully slide boot (6) down onto pushrod and into end of master cylinder bore. Press lip of boot down around groove in boot collar nut.
12. Thread nut (4) onto pushrod (5), several turns past flats.
13. Thread yoke (3) onto pushrod, at least 2-3 turns past flats.
14. See Figure 2-95. Measure distance (3) from centerline of clevis pin hole (1) in yoke to centerline of master cylinder mounting boss hole (2) closest to yoke. This distance must be 2.64-2.76 in (67.1-70.1 mm). Adjust yoke until this distance is obtained.

NOTE

Grip yoke by the edges with adjustable wrench. do not grip yoke by the flats or the yoke may become deformed.

15. While holding yoke with an adjustable wrench, turn shoulder nut back against yoke. Tighten to 130-173 **in-lbs** (14.7-19.6 Nm).
16. Remove master cylinder assembly from vise.



1. **Clevis pin hole**
2. **Mounting boss hole**
3. **Adjustment distance**

Figure 2-95. Adjusting Pushrod Length

INSTALLATION

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, mounting screw: XR 1200X	72-96 **in-lbs**	8.1-10.9 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 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 2-91. Assemble and install master cylinder/footpeg mounting bracket if it was removed. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
2. Install rear master cylinder assembly to mounting bracket with screws and washers (4). Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
3. Fit yoke (3) onto foot pedal. Install clevis pin (2). Secure with **new** retaining ring (1).

NOTE

Master cylinder housing has a positive stop for banjo fitting. When tightening banjo bolt into master cylinder in the next step, rotate banjo fitting clockwise until it contacts positive stop.

4. Position a **new** washer (5) on each side of hydraulic brake line banjo fitting. Insert banjo bolt (6) through washers and fitting. Thread banjo bolt into master cylinder housing. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).
5. Install rear brake master cylinder feed hose (8) on master cylinder feed hose port fitting. Secure with **new** hose clamp.

⚠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.*
- *Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.*
- *Reservoir cover may be removed from rear brake master cylinder reservoir to more easily verify fluid level in reservoir.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir. Do not reuse old brake fluid.*

6. Position motorcycle upright (not resting on jiffy stand).
7. See Figure 2-96. Remove reservoir cap (2).
8. Fill rear master cylinder reservoir (1) with DOT 4 BRAKE FLUID until the fluid level reaches the UPPER mark (3) on the reservoir.
9. Bleed brake system. See 2.17 BLEEDING BRAKES.
10. Turn ignition switch ON. Test operation of stop lamp.

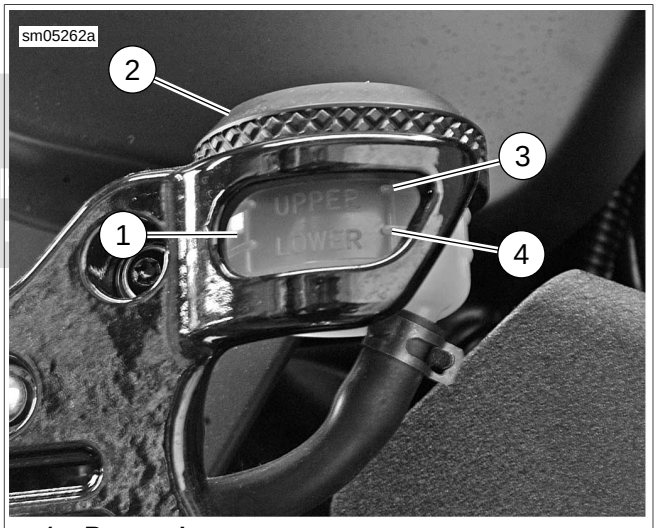
⚠WARNING

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)

11. Test ride motorcycle at low speed. If brake feels spongy, repeat bleeding procedure.



1. **Reservoir**
2. **Reservoir cap**
3. **Upper fluid level**
4. **Lower fluid level**

Figure 2-96. Rear Brake Master Cylinder Reservoir: XR 1200X

REAR BRAKE MASTER CYLINDER RESERVOIR 2.13

REMOVAL: XL MODELS

⚠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

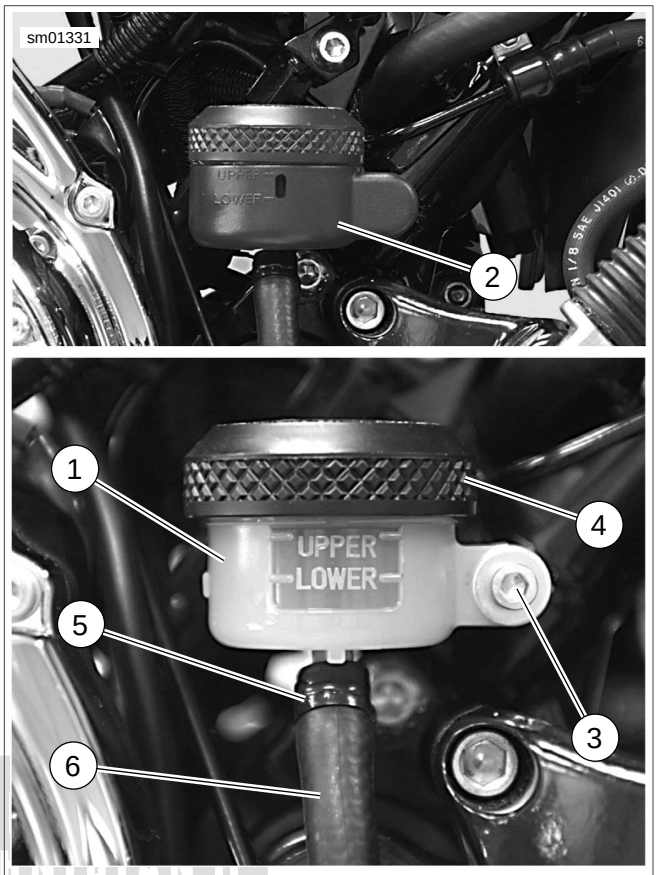
If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

1. Position motorcycle upright on suitable lift.
2. See Figure 2-97. Grasp reservoir cover (2) and gently pull straight out from reservoir (1).
3. Remove screw with captive washer (3).
4. Remove reservoir cap (4). Hold reservoir upside down over a suitable container and drain brake fluid.

NOTE

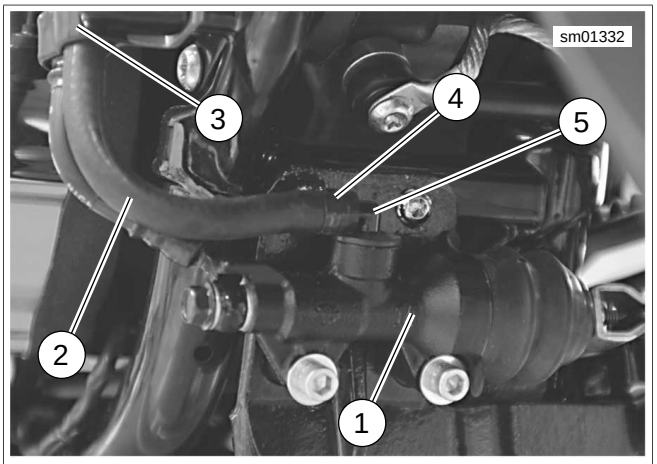
Dispose of brake fluid in accordance with local regulations.

5. Loosen hose clamp (5). Pull feed hose (6) from reservoir. Slide hose clamp off free end of feed hose.
6. See Figure 2-98. Slide feed hose (2) down through clamp (3). Hold free end of hose down over container and drain any brake fluid remaining in hose.
7. Loosen hose clamp (4). Pull feed hose off feed hose port (5) on master cylinder (1).
8. Cover feed hose port with a clean, lint-free cloth to keep dirt and debris out of master cylinder.



1. **Rear brake master cylinder reservoir**
2. **Reservoir cover**
3. **Mounting screw with captive washer**
4. **Reservoir cap**
5. **Hose clamp**
6. **Master cylinder feed hose**

Figure 2-97. Reservoir Mount



1. **Rear brake master cylinder**
2. **Master cylinder feed hose**
3. **Clamp**
4. **Hose clamp**
5. **Feed hose port**

Figure 2-98. Master Cylinder Feed Hose

INSTALLATION: XL MODELS

FASTENER	TORQUE VALUE	
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 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 2-98. Slide end of feed hose (2) onto feed hose port (5) on master cylinder (1). Secure feed hose to fitting with hose clamp (4).
2. Slide free end of feed hose up through clamp (3).
3. See Figure 2-97. Slide hose clamp (5) onto free end of feed hose (6).
4. Push feed hose onto fitting on reservoir (1). Secure with a hose clamp.
5. Install reservoir using screw with captive washer (3). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).

NOTES

- *Level the rear brake master cylinder reservoir.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir. Do not reuse old brake fluid.*

6. Position motorcycle upright (not resting on jiffy stand). Fill master cylinder reservoir with DOT 4 BRAKE FLUID until the fluid level reaches the UPPER mark on the reservoir.
7. Bleed brake system. See 2.17 BLEEDING BRAKES.
8. Install reservoir cover (2).
9. Verify tail lamp, and stop lamp.
10. Test ride motorcycle. If brake feels spongy, repeat bleeding procedure.

REMOVAL: XR 1200X

⚠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)

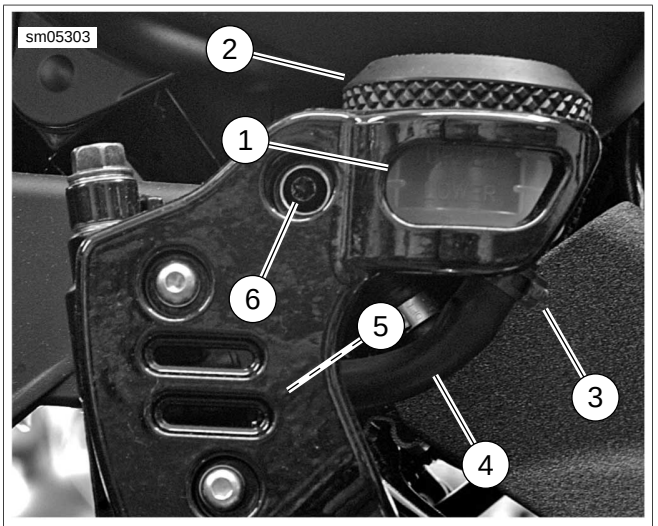
NOTICE

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. Position motorcycle upright on suitable lift.
2. See Figure 2-99. Loosen reservoir cap (2).
3. Remove screw (6).
4. Remove reservoir cap (2). Hold reservoir upside down over a suitable container and drain brake fluid.
5. Loosen hose clamp (3) and pull feed hose (4) from reservoir. Slide hose clamp off free end of feed hose.
6. Loosen hose clamp (5) and pull feed hose off master cylinder. Cover feed hose port with a clean, lint-free cloth to keep dirt and debris out of master cylinder.



1. **Rear brake master cylinder reservoir**
2. **Reservoir cap**
3. **Hose clamp**
4. **Feed hose**
5. **Hose clamp (master cylinder)**
6. **Screw**

Figure 2-99. Rear Brake Master Cylinder Reservoir: XR 1200X

INSTALLATION: XR 1200X

FASTENER	TORQUE VALUE	
Brake master cylinder reservoir, rear, mounting screw	36-60 **in-lbs**	4.1-6.8 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 2-99. Slide end of feed hose (4) onto feed hose port on master cylinder. Secure feed hose to fitting with hose clamp (5).
2. Slide hose clamp (3) onto free end of feed hose (4).
3. Push feed hose onto fitting on reservoir (1). Secure with a hose clamp.
4. Install reservoir using screw (6). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).

NOTES

- *Level the rear brake master cylinder reservoir.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir. Do not reuse old brake fluid.*

5. Position motorcycle upright (not resting on jiffy stand). Fill master cylinder reservoir with DOT 4 BRAKE FLUID until the fluid level reaches the UPPER mark on the reservoir.
6. Bleed brake system. See 2.17 BLEEDING BRAKES.
7. Install reservoir cover (2).
8. Verify operation of brake lamp.
9. Test ride motorcycle. If brake feels spongy, repeat bleeding procedure.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR BRAKE CALIPER: XL MODELS 2.14

REMOVAL

NOTE

If only replacing brake pads, do not remove rear brake caliper. For brake pad replacement only, see 1.16 BRAKE PADS AND DISCS: XL MODELS.

⚠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)

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

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

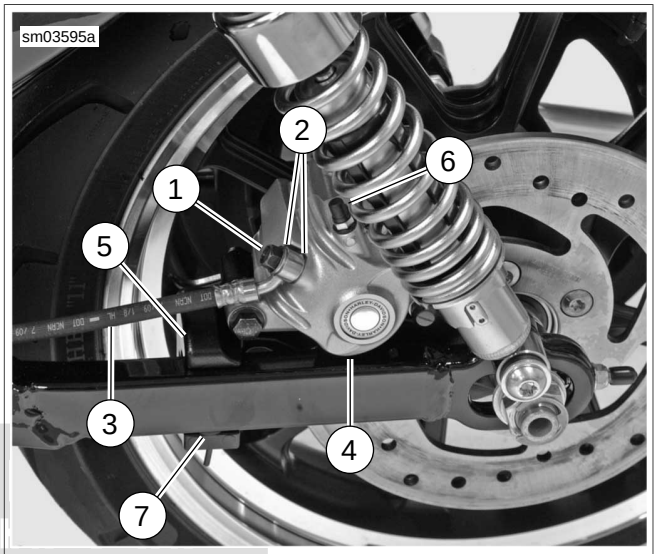
- *Do **not** remove rear caliper from mounting bracket unless caliper mounting pins and boots require service. Removing caliper from mounting bracket increases the risk of contaminants falling into caliper boots and bushings. This could result in damage to the caliper during vehicle operation.*
- *It is further **not** required or recommended to remove or loosen the caliper mounting pins.*
- *It is **not** necessary or recommended to remove the rear brake caliper from the caliper mounting bracket to perform caliper service.*
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*

1. Position vehicle upright on a suitable lift.
2. Place a suitable container under the rear caliper brake line banjo fitting to catch any brake fluid that may leak out. Do not reuse brake fluid.

NOTE

Dispose of brake fluid in accordance with local regulations.

3. See Figure 2-100. Remove the banjo bolt (1) and both washers (2) to detach rear brake line (3) from brake caliper (4). Discard washers.
4. Remove pad pin plug.
5. See Figure 2-101. Remove brake pad pin.
6. See Figure 2-102. Remove brake pads (15).
7. Remove rear wheel. See 2.5 WHEELS, Rear Wheel.
8. Remove rear brake caliper and caliper mounting bracket.



1. **Banjo bolt**
2. **Washer (2)**
3. **Rear brake line**
4. **Brake caliper**
5. **Caliper mounting bracket**
6. **Bleeder valve**
7. **Damper**

Figure 2-100. Rear Caliper Assembly

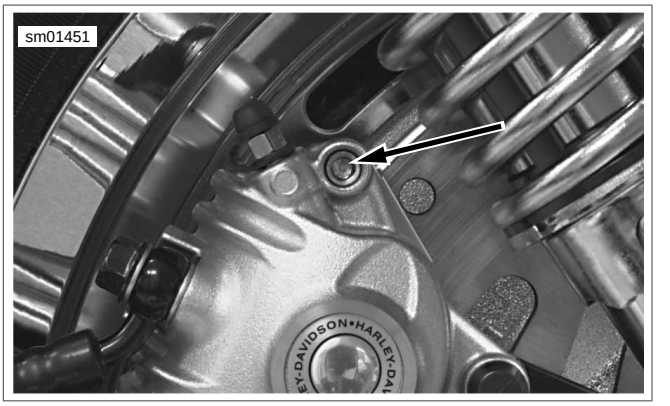
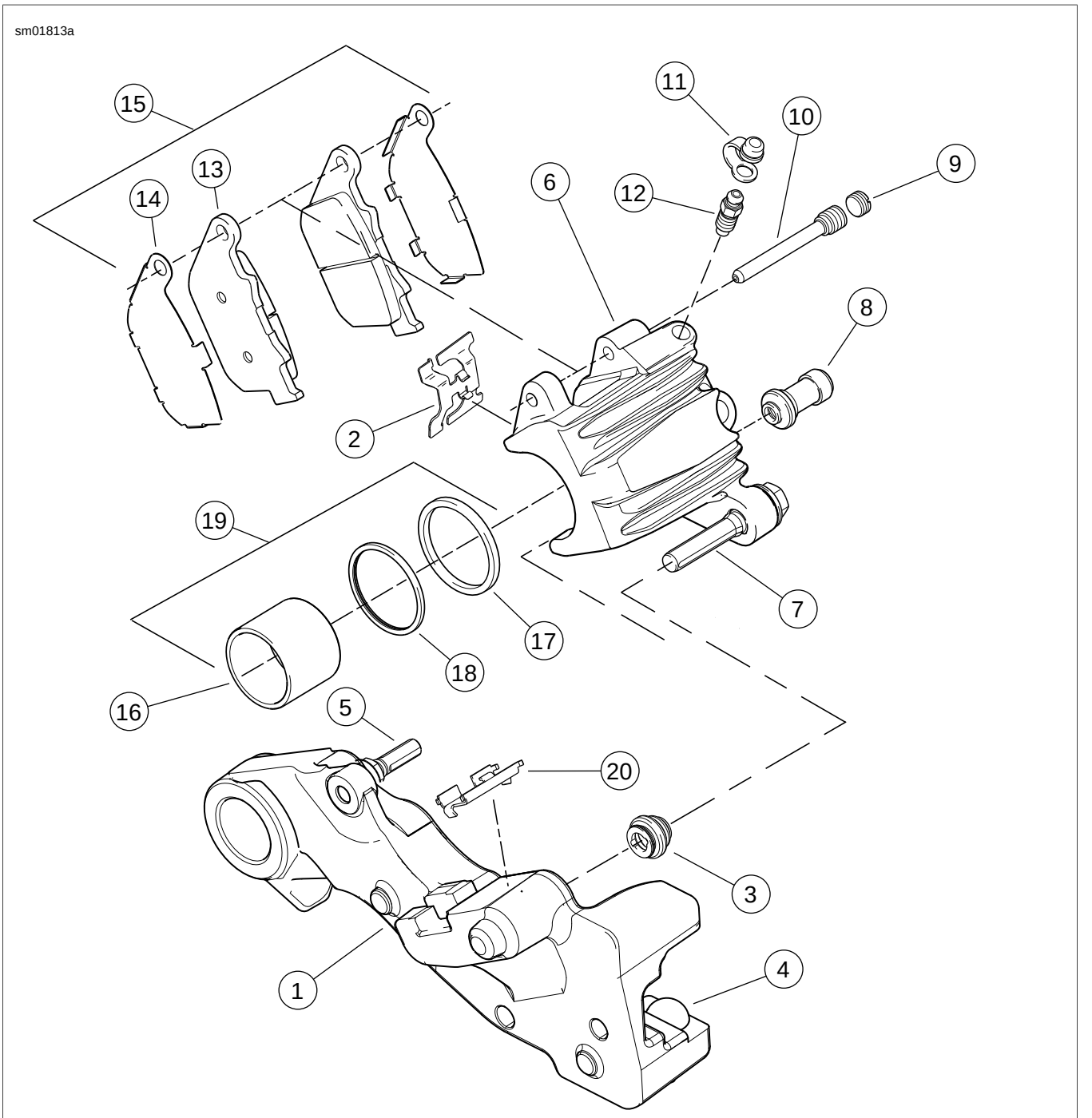


Figure 2-101. Brake Pad Pin (plug removed)



1. Caliper mounting bracket
2. Pad spring
3. Caliper pin boot
4. Damper
5. Mounting bracket bolt pin (do not remove)
6. Caliper body
7. Caliper bolt pin (do not remove)
8. Caliper bushing boot
9. Pad pin plug
10. Pad pin
11. Bleeder nipple cap
12. Bleeder valve
13. Brake pad (2)
14. Pad retainer (2)
15. Brake pad set (includes item 20)
16. Piston
17. Piston seal
18. Dust seal
19. Piston kit
20. Retainer clip (not sold separately)

Figure 2-102. Rear Brake Caliper Assembly: XL Models

DISASSEMBLY

1. See Figure 2-102. Remove pad spring (2). Do not remove bleeder valve (12) at this time.
2. See Figure 2-103. Install a discarded brake pad in the caliper with the backing plate (4) facing the piston. Position the brake pad so the friction material (3) is against the back of the caliper, as shown.
3. Loosely install brake pad pin (2) to hold brake pad in place.

⚠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

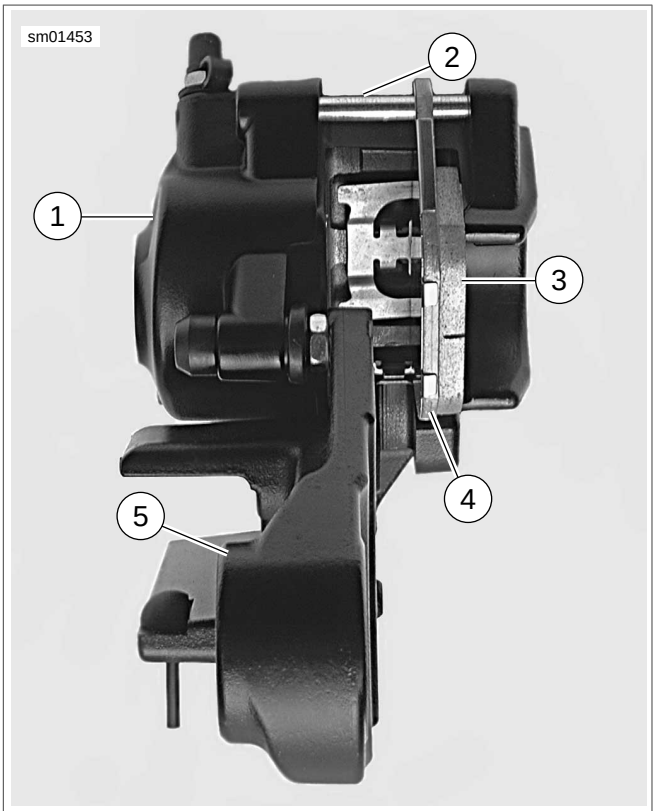
Do not damage banjo bolt sealing surface or threads of banjo bolt hole in brake caliper. Use an air nozzle with a rubber tip.

4. See Figure 2-104. Gently apply low pressure compressed air to banjo bolt hole (3) to force piston from caliper bore.
5. Remove brake pad pin and brake pad from caliper.
6. See Figure 2-102. Remove piston (16) from caliper bore by hand. If necessary, gently wiggle piston to completely remove.

NOTE

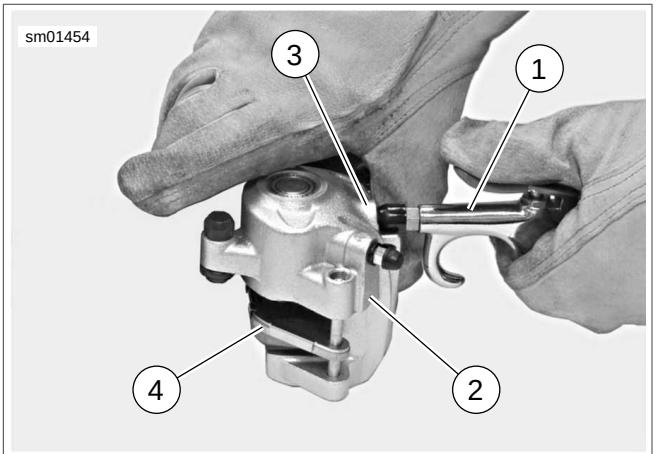
A damaged piston bore will leak when reassembled. Do not use metal objects to remove or install components in piston bore. Prevent damage to piston, seal and bore by only using a wooden toothpick when servicing caliper.

7. See Figure 2-105. Using a wooden toothpick (1), remove dust seal (2) and piston seal (3) from caliper bore. Discard seals.
8. See Figure 2-102. If necessary, remove bleeder valve (12).



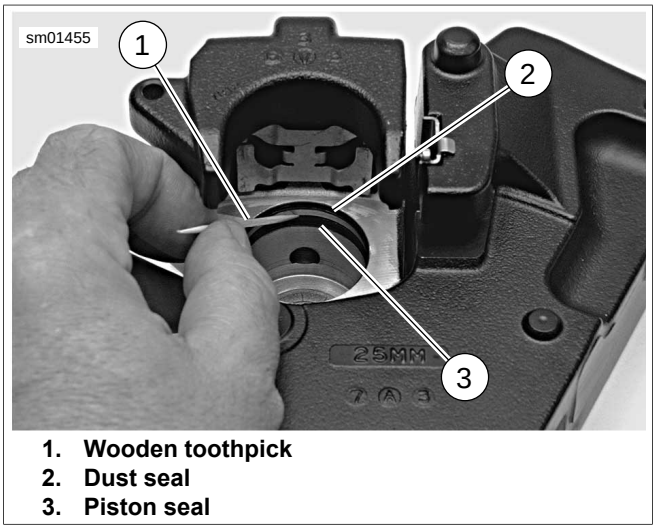
1. **Brake caliper**
2. **Brake pad pin**
3. **Brake pad friction material**
4. **Brake pad backing plate**
5. **Brake caliper mounting bracket**

Figure 2-103. Preparing Caliper for Piston Removal



1. **Low pressure air nozzle**
2. **Brake caliper**
3. **Banjo bolt hole**
4. **Brake pad**

Figure 2-104. Removing Piston (caliper removed from mounting bracket)



1. **Wooden toothpick**
2. **Dust seal**
3. **Piston seal**

Figure 2-105. Caliper Seals

CLEANING, INSPECTION AND REPAIR

WARNING

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

1. Clean piston bore with denatured alcohol.
2. Clean all rubber parts with DOT 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. 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)

3. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
4. Carefully inspect all components. Replace as necessary.
   a. Check piston for pitting, scratching or corrosion on outside surfaces.
   b. Inspect caliper piston bore. Do not hone bore. If bore shows pitting or corrosion, replace caliper.
   c. Inspect pad pin for grooving and wear. Measure the pad pin diameter in an unworn area, and then in the area of any grooving or wear. If wear is more than 0.011 in (0.28 mm), replace pad pin.
   d. Always replace all seals after disassembly.

WARNING

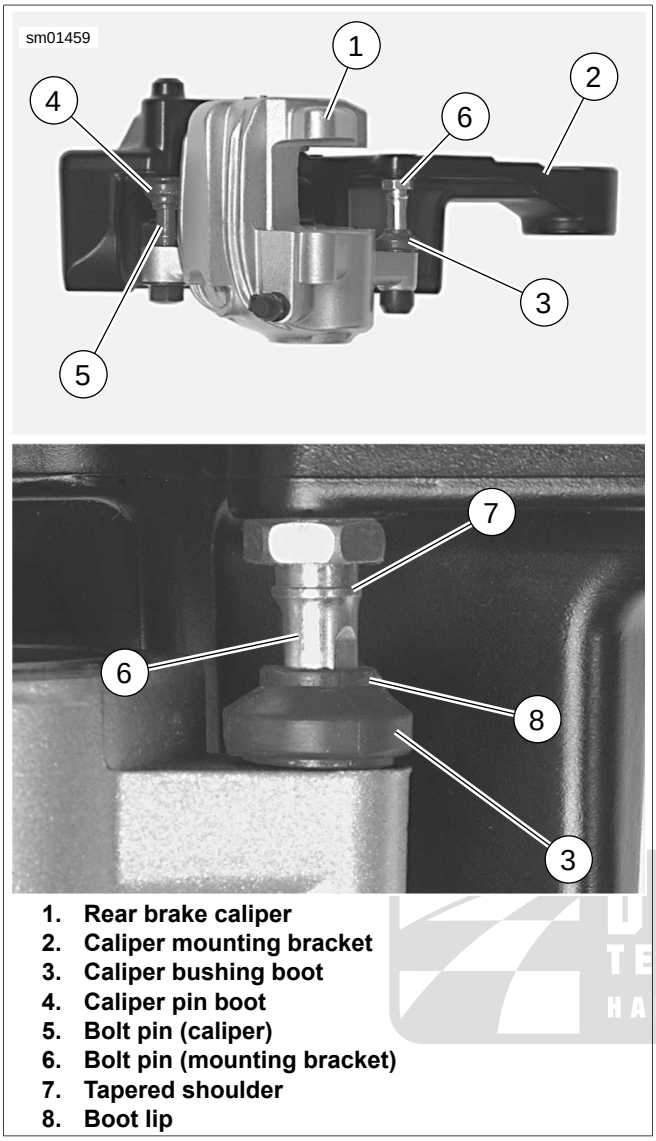
Always replace brake pads in complete sets for correct and safe brake operation. Improper brake operation could result in death or serious injury. (00111a)

5. Inspect brake pads and brake disc. Replace if necessary.
   a. See 1.16 BRAKE PADS AND DISCS: XL MODELS for specifications.
   b. See 2.5 WHEELS for brake disc replacement procedure.

LUBRICATING REAR CALIPER BOLT PINS AND BOOTS

1. Apply approximately 0.4 g of G40M BRAKE GREASE inside caliper bushing boot and caliper pin boot.
2. See Figure 2-106. Apply G40M BRAKE GREASE inside boot lip (8) to prevent sticking between boots (3, 4) and bolt pins (5, 6).
3. Insert mounting bracket bolt pin (6) into caliper bushing boot (3).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Rear brake caliper**
2. **Caliper mounting bracket**
3. **Caliper bushing boot**
4. **Caliper pin boot**
5. **Bolt pin (caliper)**
6. **Bolt pin (mounting bracket)**
7. **Tapered shoulder**
8. **Boot lip**

Figure 2-106. Assembling Rear Brake Caliper to Mounting Bracket

ASSEMBLY

NOTE

Use ONLY KS62F assembly grease for lubrication. Use of DOT 4 brake fluid will result in increased brake pedal travel.

1. Lubricate the following parts prior to assembly using a light coat of KS62F assembly grease from the service parts kit. All other surfaces must be dry for assembly.
   a. Nose radius of piston. See Figure 2-107.
   b. All surfaces of piston seal and dust seal.

NOTE

A damaged piston bore will leak when reassembled. Do not use metal objects to remove or install components in piston bore. Prevent damage to bore by only using a wooden toothpick when servicing caliper.

2. See Figure 2-105. Install a **new** piston seal (3) and a **new** dust seal (2) into piston bore.
3. Carefully insert piston by hand, nose radius first (see Figure 2-102), into caliper bore. If installation shows resistance, remove piston and check that seals are properly installed and fully seated in grooves.
4. See Figure 2-102. Install bleeder valve (12) on caliper housing if removed. Do not tighten bleeder valve at this time.
5. See Figure 2-108. Install pad spring in channel. Press firmly into place.



Figure 2-107. Piston Nose Radius

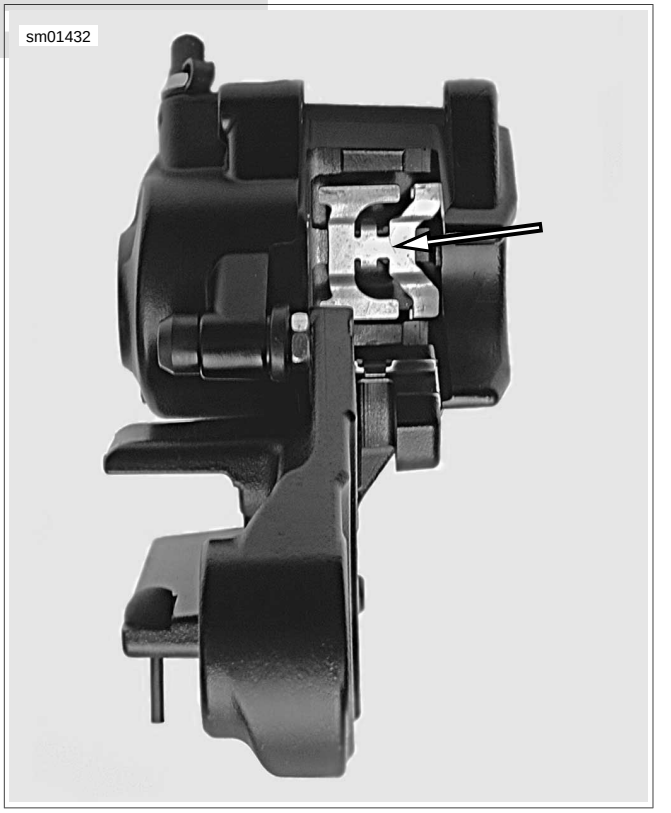


Figure 2-108. Rear Caliper Pad Spring

INSTALLATION

FASTENER	TORQUE VALUE	
Caliper to mouting bracket: XL Models	87-130 **in-lbs**	9.8-14.7 Nm
Caliper bolt pin: XL Models	15-18 ft-lbs	19.6-24.5 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm

1. See Figure 2-109. Before installing caliper, make sure that retainer clip is properly installed on mounting bracket.
2. See Figure 2-102. Install rear caliper onto the mounting bracket:
   a. Apply a small amount of LOCTITE 272 HIGH STRENGTH/HIGH TEMPERATURE THREAD-LOCKER AND SEALANT (red/orange) to mounting bracket bolt pin (5) threads.
   b. Place the rear caliper assembly (6) onto the mounting bracket (1). Using an open end wrench, thread mounting bracket bolt pin into caliper mounting bracket. Tighten to 87-130 **in-lbs** (9.8-14.7 Nm).
   c. Apply a small amount of LOCTITE 272 HIGH STRENGTH/HIGH TEMPERATURE THREAD-LOCKER AND SEALANT (red/orange) to threads of caliper bolt pin (7).
   d. Slide caliper bolt pin through front mounting hole in caliper (6). Carefully insert bolt pin shaft into caliper pin boot (3) in mounting bracket (1).
   e. Screw bolt pin into caliper. Tighten to 15-18 ft-lbs (19.6-24.5 Nm).
3. Install rear brake caliper and mounting bracket assembly onto vehicle.

NOTE

Brake caliper housing has a positive stop for banjo fitting. When tightening banjo bolt into brake caliper in the next step, rotate banjo fitting clockwise until it contacts positive stop.

4. See Figure 2-110. Position a **new** washer (2) on each side of hydraulic brake line (3) banjo fitting. Insert banjo bolt (1) through washers and fitting. Thread bolt into caliper housing. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).

NOTE

Front brake pad sets cannot be used on rear brake calipers.

5. Insert brake pads into caliper with friction material on pad facing brake disc. Curved portion of pad fits into recessed area of caliper. Make sure brake pad front mounting tab (fits into slot in caliper mounting bracket.
6. See Figure 2-102. Press brake pads (15) tightly up against pad spring (2) and install pad pin (10). Tighten to 131-173 **in-lbs** (14.8-19.6 Nm).

NOTE

If pad pin does not fit, check the following:

- *You are using a set of pads, not two identical pads.*
- *See Figure 2-108. Pad spring orientation must match.*
- *Pad front mounting tabs must be fully seated in mounting bracket slot.*
- *Pads must be pushed tight up against pad spring before pad pin is installed.*

7. See Figure 2-102. Install pad pin plug (9). Tighten to 18-25 **in-lbs** (2.0-2.9 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.*
- *Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.*
- *See Figure 2-111. Reservoir cover (2) may be removed from rear brake master cylinder reservoir (1) to more easily verify fluid level in reservoir.*

8. See Figure 2-111. To remove reservoir cover, grasp cover (2) and gently pull straight out from reservoir (1).
9. Remove rear brake master cylinder reservoir cap (5). Add DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level (3). Do not overfill reservoir. Do not reuse brake fluid.

⚠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)

10. Bleed brake system. See 2.17 BLEEDING BRAKES.

⚠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)

11. Verify proper operation of master cylinder relief port.
    a. Press against rear brake caliper to push caliper piston back into its bore. This pushes brake fluid back through master cylinder and verifies that relief port is not plugged.
    b. Pump brake pedal until caliper piston pushes pads against disc and pressure is returned to brake system.
12. Add DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level.
13. Install reservoir cover if removed.

⚠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 brake system.
    a. Turn ignition switch ON. Pump brake pedal to verify operation of stop lamp.
    b. Test ride motorcycle at low speed. If brakes feel spongy, bleed system again. See 2.17 BLEEDING BRAKES.

NOTE

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

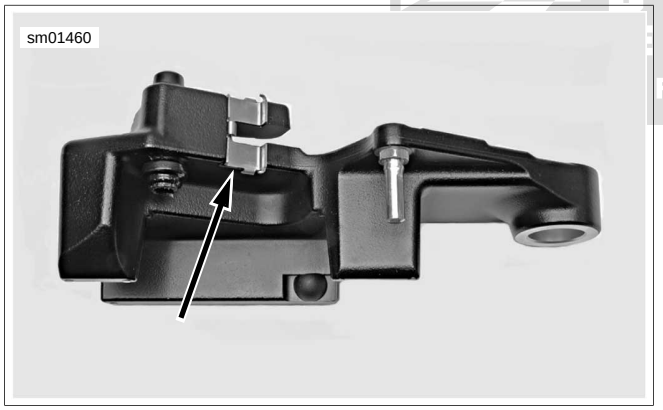
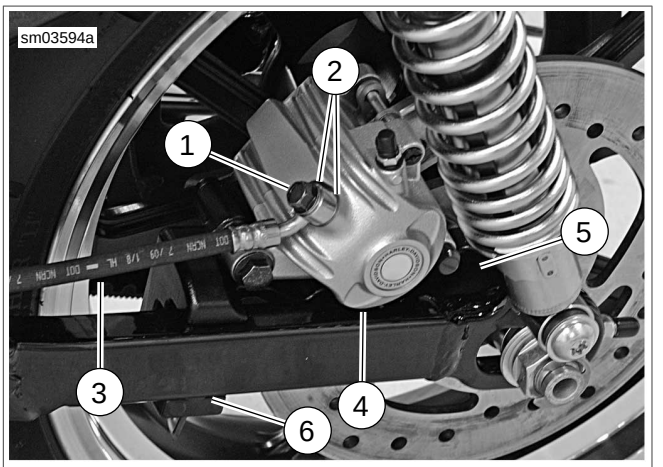
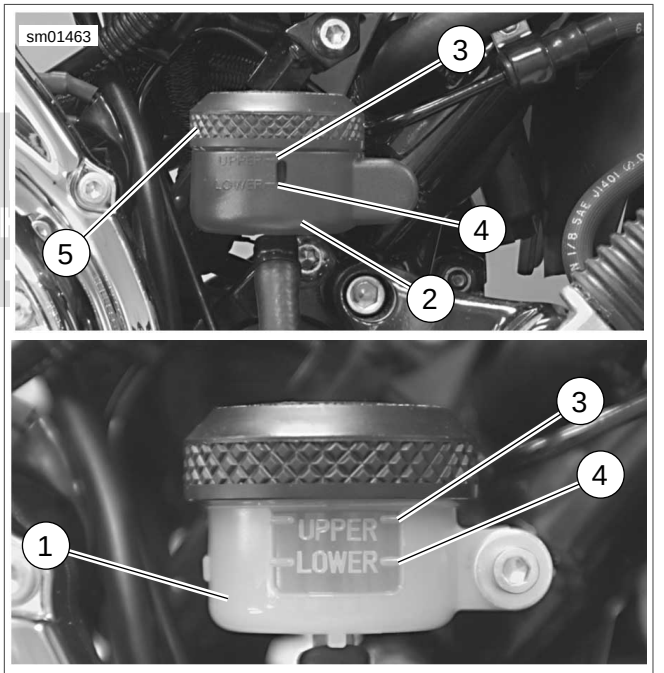


Figure 2-109. Retainer Clip



1. **Banjo bolt**
2. **Sealing washer (2)**
3. **Rear brake line**
4. **Brake caliper**
5. **Caliper mounting bracket**
6. **Damper**

Figure 2-110. Rear Caliper Assembly



1. **Rear brake master cylinder reservoir**
2. **Reservoir cover**
3. **Upper fluid level**
4. **Lower fluid level**
5. **Reservoir cap**

Figure 2-111. Rear Brake Master Cylinder Reservoir

REAR BRAKE CALIPER: XR 1200X 2.15

REMOVAL

NOTE

If only replacing brake pads, do not remove rear brake caliper. See 1.17 BRAKE PADS AND DISCS: XR 1200X.

⚠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)

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

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

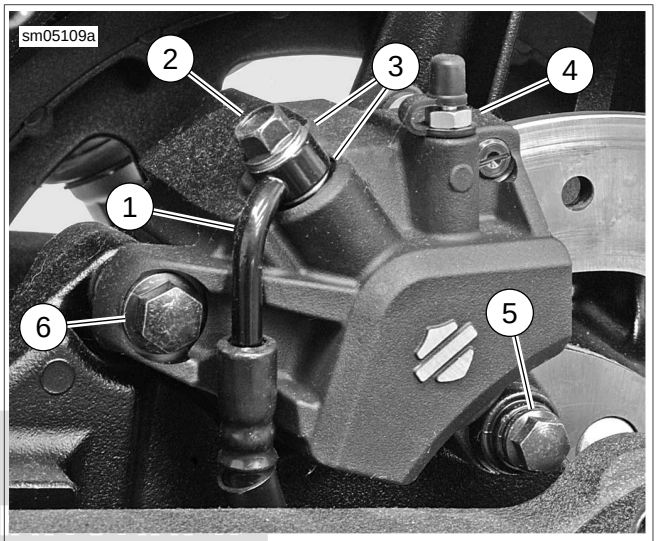
If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

1. Position motorcycle on a suitable lift.
2. Place a suitable container under the rear caliper brake line banjo fitting to catch any brake fluid that may leak out. Do not reuse brake fluid.

NOTE

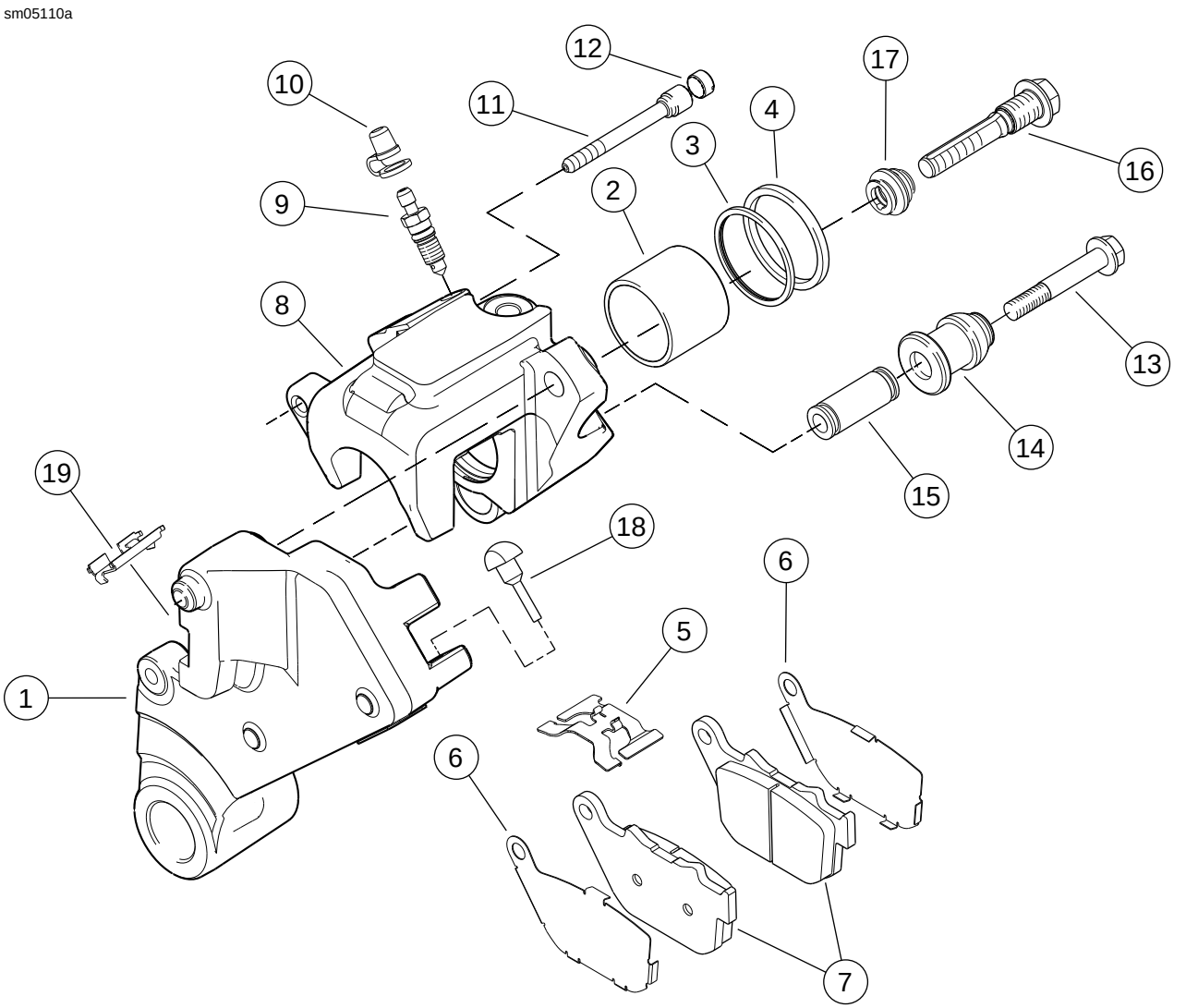
Dispose of brake fluid in accordance with local regulations.

3. Disconnect left shock absorber from rear fork. Rotate shock absorber out of the way.
4. Loosen rear axle nut and turn adjuster nuts to allow the rear wheel to move forward to the adjustment limit.
5. See Figure 2-112. Remove the banjo bolt (2) and both washers (3) to detach rear brake line (1) from brake caliper. Discard washers.
6. Remove mounting bolt (5) and bolt pin (6).
7. Remove caliper assembly.



1. **Rear brake line**
2. **Banjo bolt**
3. **Washer (2)**
4. **Bleeder valve**
5. **Mounting bolt**
6. **Bolt pin**

Figure 2-112. Rear Caliper Assembly



1. **Caliper mounting bracket**
2. **Piston**
3. **Dust seal**
4. **Piston seal**
5. **Pad spring**
6. **Pad retainer**
7. **Brake pad**
8. **Caliper housing**
9. **Bleeder valve**
10. **Bleeder nipple cap**
11. **Pad pin**
12. **Pad pin plug**
13. **Mounting bolt**
14. **Boot**
15. **Bushing**
16. **Bolt pin**
17. **Boot**
18. **Damper**
19. **Wear plate**

Figure 2-113. Rear Brake Caliper: XR 1200X

DISASSEMBLY

1. See Figure 2-114. Remove brake pad pin plug to expose brake pad pin (1). Remove brake pad pin and pads (2).
2. See Figure 2-115. Remove pad spring (1).
3. Remove bushing (2) from boot (3). Remove boot from mounting hole (4). Do not remove bleeder valve at this time.
4. See Figure 2-116. Install a discarded brake pad (1) in the caliper with the backing plate facing the piston. Position the brake pad so the friction material is against the back of the caliper, as shown.
5. Loosely install brake pad pin (2) to hold brake pad in place.

⚠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

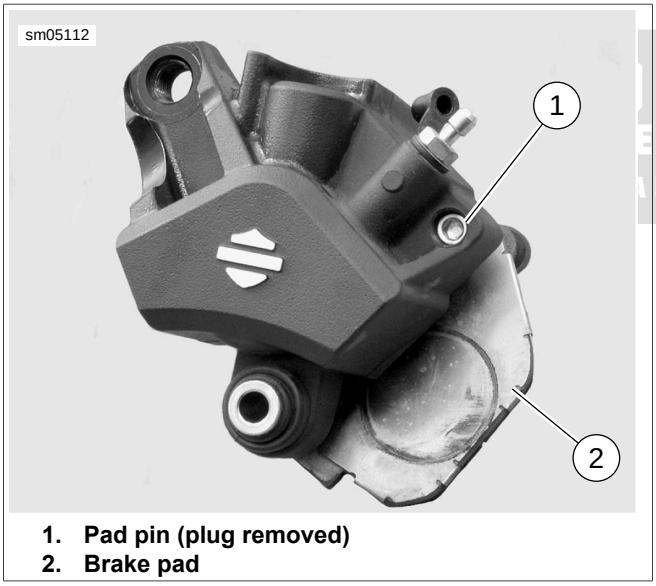
Do not damage banjo bolt sealing surface or threads of banjo bolt hole in brake caliper. Use an air nozzle with a rubber tip.

6. Gently apply low pressure compressed air to banjo bolt hole (3) to force piston from caliper bore.
7. Remove brake pad pin and brake pad from caliper.
8. Remove piston from caliper bore by hand. If necessary, gently wiggle piston to completely remove.

NOTE

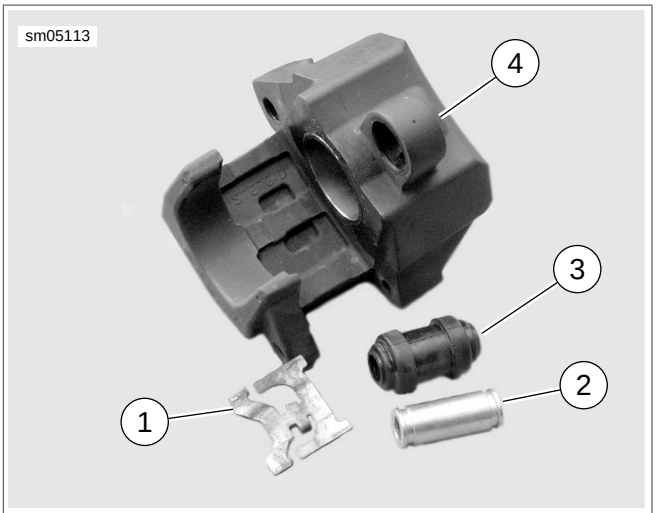
A damaged piston bore will leak when reassembled. Do not use metal objects to remove or install components in piston bore. Prevent damage to piston, seal and bore by only using a wooden toothpick when servicing caliper.

9. See Figure 2-117. Using a wooden toothpick (1), remove dust seal (2) and piston seal (3) from caliper bore. Discard seals.
10. If necessary, remove bleeder valve.



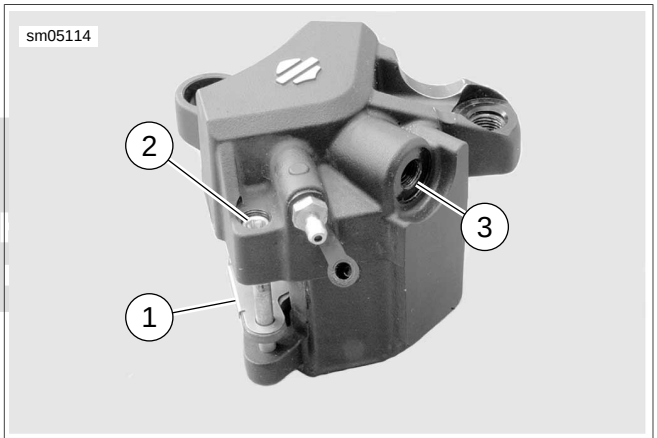
1. **Pad pin (plug removed)**
2. **Brake pad**

Figure 2-114. Pad Pin



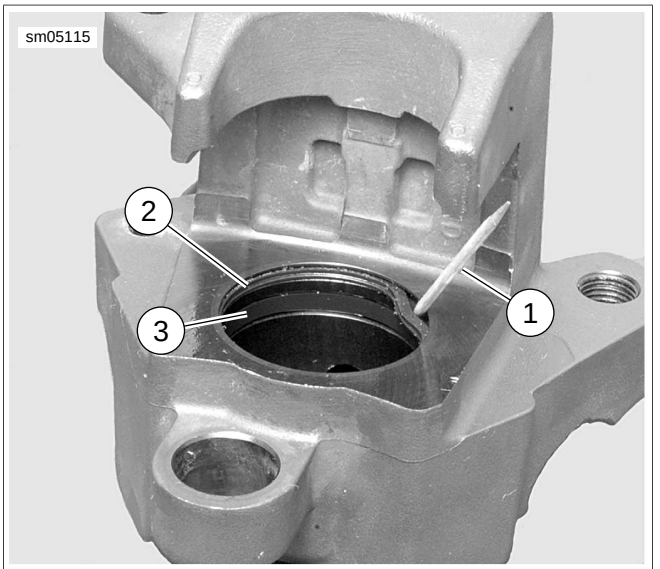
1. **Pad spring**
2. **Bushing**
3. **Boot**
4. **Mounting hole**

Figure 2-115. Spring, Bushing and Boot



1. **Discarded brake pad**
2. **Pad pin**
3. **Banjo bolt hole**

Figure 2-116. Removing Piston: XR 1200X



1. **Wooden toothpick**
2. **Dust seal**
3. **Piston seal**

Figure 2-117. Caliper Seals

CLEANING, INSPECTION AND REPAIR

WARNING

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

1. Clean piston bore with denatured alcohol.
2. Clean all rubber parts with DOT 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. 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)

3. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
4. Carefully inspect all components. Replace any parts that appear damaged or worn.
   a. Check piston for pitting, scratching or corrosion on outside surfaces.
   b. Inspect caliper piston bore. Do not hone bore. If bore shows pitting or corrosion, replace caliper.
   c. Inspect pad pin for grooving and wear. Measure the pad pin diameter in an unworn area and then in the area of any grooving or wear. If wear is more than 0.011 in (0.28 mm), replace pad pin.
   d. Always replace all seals after disassembly.
5. Inspect bushing boot and bolt pin boot for deterioration or damage. Replace as necessary.
6. Inspect wear plate on caliper mount for wear. Replace as necessary.

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)

7. Inspect brake pads and brake disc. Replace if necessary.
   a. See 1.17 BRAKE PADS AND DISCS: XR 1200X for specifications.
   b. See 2.5 WHEELS for brake disc replacement procedure.

ASSEMBLY

1. See Figure 2-118. If removed, install bushing boot (3) in caliper.
2. Apply approximately 0.4 g of G40M BRAKE GREASE inside caliper bushing boot (3).
3. Insert caliper bushing (2) into boot. Verify that the lips of boot are engaged in grooves at either end of bushing.
4. Install pad spring (1) in caliper housing. Verify that the spring is installed in the orientation shown.

NOTE

Use ONLY KS62F assembly grease for lubrication of internal brake parts. Use of DOT 4 brake fluid will result in increased brake pedal travel.

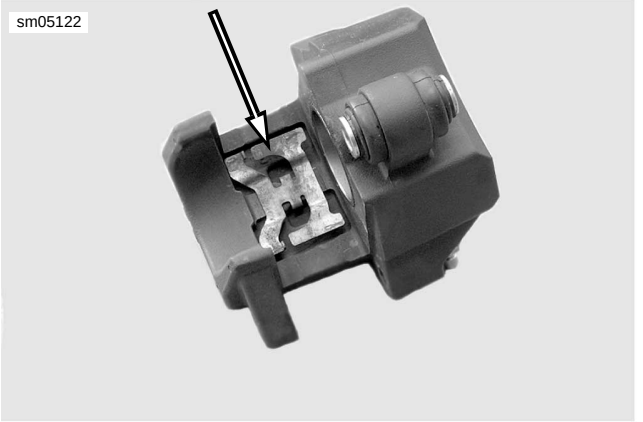
5. Lubricate the following parts prior to assembly using a light coat of KS62F assembly grease from the service parts kit. All other surfaces must be dry for assembly.
   a. Nose radius of piston.
   b. All surfaces of piston seal and dust seal.

NOTE

A damaged piston bore will leak when reassembled. Do not use metal objects to remove or install components in piston bore. Prevent damage to bore by only using a wooden toothpick when servicing caliper.

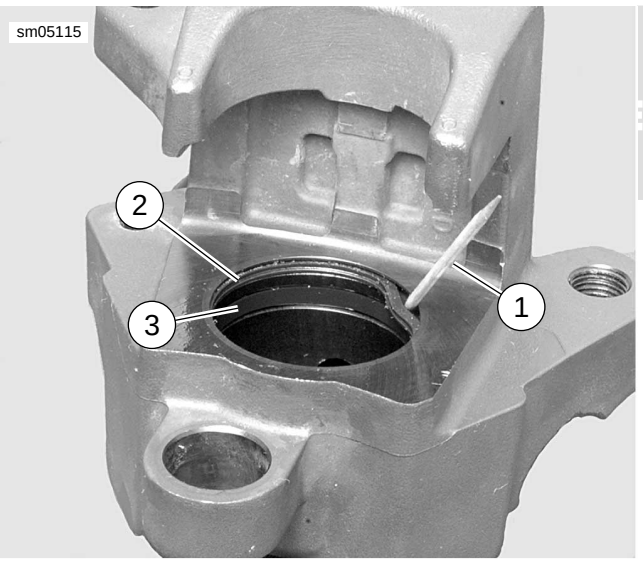
6. See Figure 2-119. Install a **new** piston seal (3) and a **new** dust seal (2) into piston bore.

7. Carefully insert piston by hand, nose radius first, into caliper bore. If installation shows resistance, remove piston and check that seals are properly installed and fully seated in grooves.
8. Install bleeder valve if removed. Do not tighten bleeder valve at this time.



1. **Pad spring**
2. **Bushing**
3. **Boot**

Figure 2-118. Assemble Caliper



1. **Wooden toothpick**
2. **Dust seal**
3. **Piston seal**

Figure 2-119. Caliper Seals

INSTALLATION

FASTENER	TORQUE VALUE	
Rear caliper pin bolt	14-18 ft-lbs	19.6-24.5 Nm
Rear caliper mounting bolt	14-18 ft-lbs	19.6-24.5 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

1. See Figure 2-120. If removed, install bolt pin boot (1).
2. Apply approximately 0.4 g of G40M BRAKE GREASE inside bolt pin boot.
3. If removed, install wear plate (2) on mounting bracket.
4. See Figure 2-121. Apply a drop of LOCTITE 272 HIGH STRENGTH/HIGH TEMPERATURE THREADLOCKER AND SEALANT (red/orange) to threads of bolt pin (6).
5. Place rear caliper assembly onto mounting bracket. Install bolt pin (6), being careful not to pinch or roll boot over.
6. See Figure 2-122. Verify that the lip of the boot (1) properly engages the groove (2) in the bolt pin.
7. Tighten bolt pin to 14-18 ft-lbs (19.6-24.5 Nm).
8. See Figure 2-121. Install mounting bolt (5) and tighten to 14-18 ft-lbs (19.6-24.5 Nm).

NOTE

Brake caliper housing has a positive stop for banjo fitting. When tightening banjo bolt into brake caliper in the next step, rotate banjo fitting clockwise until it contacts positive stop.

9. Position a **new** washer (3) on each side of hydraulic brake line (1) banjo fitting. Insert banjo bolt (2) through washers and fitting and thread bolt into caliper housing. Tighten to 20-25 ft-lbs (27.1-33.9 Nm).
10. Install brake pads. See 1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear.
11. Secure lower end of shock absorber to rear fork. Tighten to 45-50 ft-lbs (61-68 Nm).
12. Adjust drive belt and check vehicle alignment. See 1.24 WHEEL ALIGNMENT.

⚠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.*
- *Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.*

13. Remove rear brake master cylinder reservoir cap. Add DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level (3). Do not overfill reservoir. Do not reuse brake fluid.
14. Bleed brake system. See 2.17 BLEEDING BRAKES.

⚠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)

15. Verify proper operation of master cylinder relief port.
    a. Press against rear brake caliper to push caliper piston back into its bore. This pushes brake fluid back through master cylinder and verifies that relief port is not plugged.
    b. Pump brake pedal until caliper piston pushes pads against disc and pressure is returned to brake system.
16. Add DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level.

⚠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)

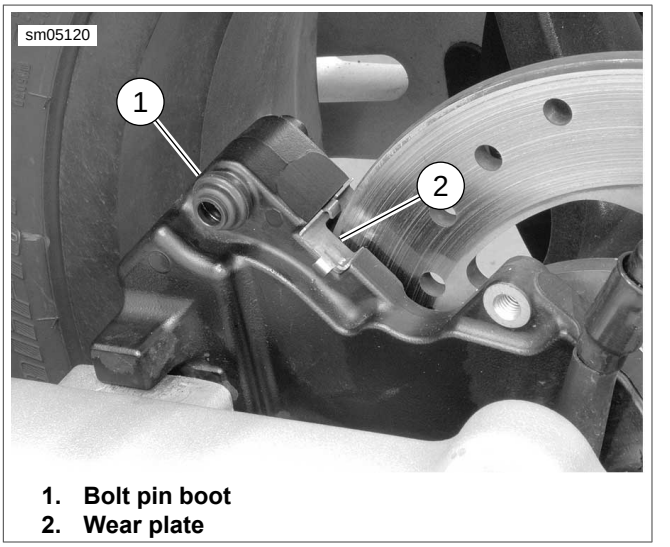
⚠WARNING

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)

17. Test brake system.
    a. Turn ignition switch ON. Pump brake pedal to verify operation of stop lamp.
    b. Test ride motorcycle at low speed. If brakes feel spongy, bleed system again. See 2.17 BLEEDING BRAKES.

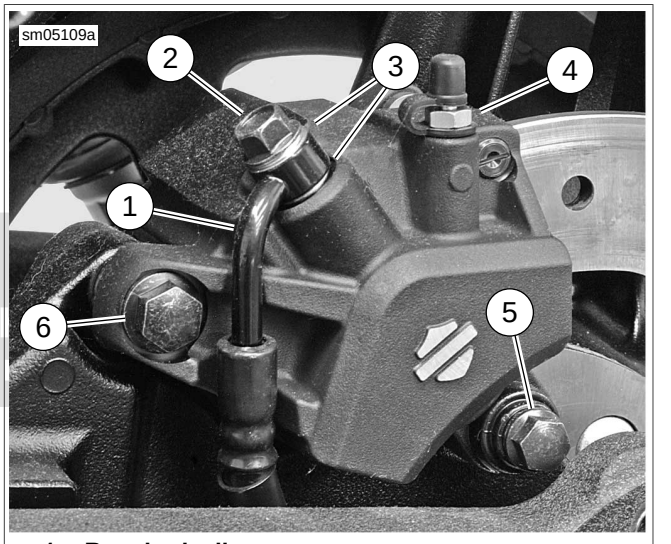
NOTE

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



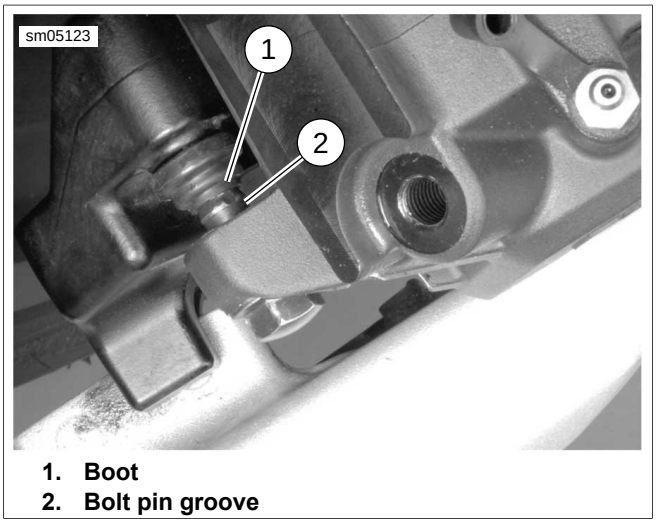
1. **Bolt pin boot**
2. **Wear plate**

Figure 2-120. Caliper Mount



1. **Rear brake line**
2. **Banjo bolt**
3. **Washer (2)**
4. **Bleeder valve**
5. **Mounting bolt**
6. **Bolt pin**

Figure 2-121. Rear Caliper Assembly



1. Boot
2. Bolt pin groove

Figure 2-122. Bolt Pin and Boot

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BRAKE LINES 2.16

FRONT BRAKE LINE

FASTENER	TORQUE VALUE	
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm
Brake line clamp screw, steering stem, XL Models	120-168 **in-lbs**	13.6-19.0 Nm
Brake line clamp screw, steering stem, XR 1200X	96-144 **in-lbs**	11-16 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 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)

NOTE

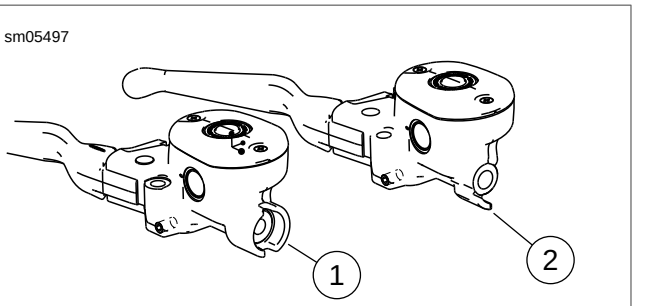
Dispose of brake fluid in accordance with local regulations.

1. Drain the brake fluid. See 2.17 BLEEDING BRAKES, Procedure.
2. Remove the brake line clamp screw from fork bracket.
   a. **XL Models:** Upper fork bracket
   b. **XR 1200X:** Lower fork bracket
3. Remove brake line clamp at steering stem under the lower fork bracket.
   a. **Dual Disc Models:** Remove screw with captive washer and clamp to remove brake line manifold.
   b. **Single Disc Models:** Remove screw with captive washer and clamp.

NOTE

Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.

4. Remove the banjo bolt and sealing washers from the master cylinder assembly. Discard sealing washers.
5. Remove the banjo bolt and sealing washers to detach the brake line from the front brake caliper(s). Discard sealing washers.
6. Inspect the brake line. Replace as necessary.



1. **XR 1200X**
2. **XL models**

Figure 2-123. Front Brake Master Cylinder Identification

Installation

NOTES

- *See Figure 2-123. The XR 1200X and XL models are equipped with different master cylinder housings. Do not mix parts.*
- *When tightening banjo bolt to the master cylinder or caliper, verify the banjo fitting contacts the positive stop.*

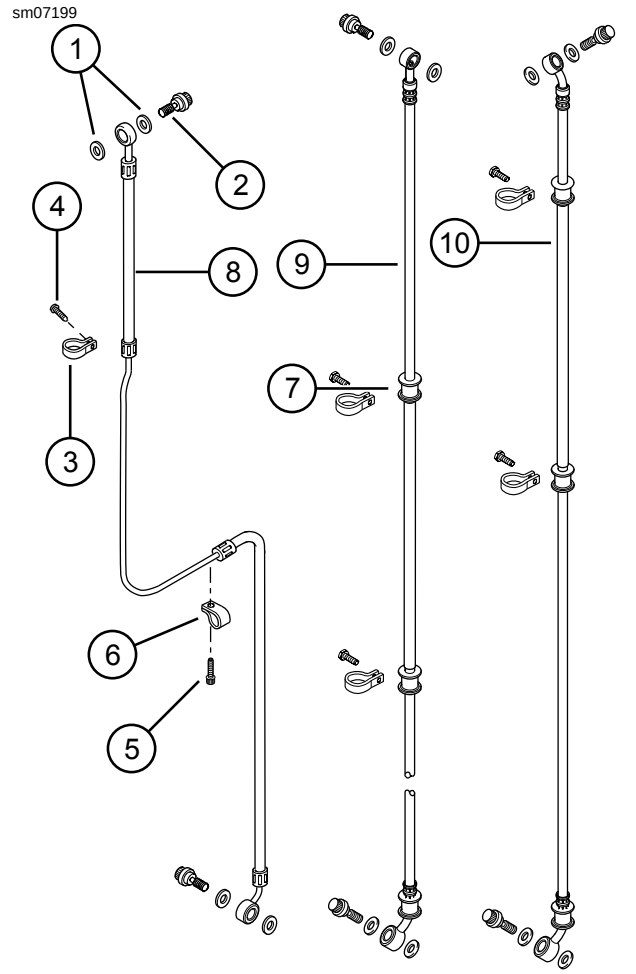
1. Route the brake line. See 2.16 BRAKE LINES, Front Brake Line Routing.
2. See Figure 2-124 or Figure 2-125. Loosely install the master cylinder banjo bolt (2) and fitting with **new** sealing washers (1).
3. Loosely install the upper clamp (3) with the screw (4):
   a. **XL Models:** To the upper fork bracket.
   b. **XR 1200X:** To the lower fork bracket.
4. Loosely install the lower clamp.
   a. **Single Disc Models:** To the lower fork bracket stem with screw with captive washer.
   b. **Dual Disc Models:** See Figure 2-125. Thread the screw (5) with captive washer through the brake line manifold (7) and guide (6) into the steering head stem.
5. Loosely install the banjo bolt and banjo fitting with **new** sealing washers to the brake caliper(s).

6. Tighten the fasteners to specification:
   a. Master cylinder banjo bolt to 20-25 ft-lbs (27.1-33.9 Nm)
   b. Clamp-to-fork bracket to 45-65 **in-lbs** (5.1-7.4 Nm)
   c. **XL Models:** brake line-to-steering stem clamp screw to 120-168 **in-lbs** (13.6-19.0 Nm)
   d. **XR 1200X:** brake line-to-steering stem clamp screw 96-144 **in-lbs** (11-16 Nm)
   e. Banjo bolt-to-brake caliper(s) to 20-25 ft-lbs (27.1-33.9 Nm)
7. Fill and bleed brakes with **new** DOT 4 BRAKE FLUID. See 2.17 BLEEDING BRAKES, Procedure.

WARNING

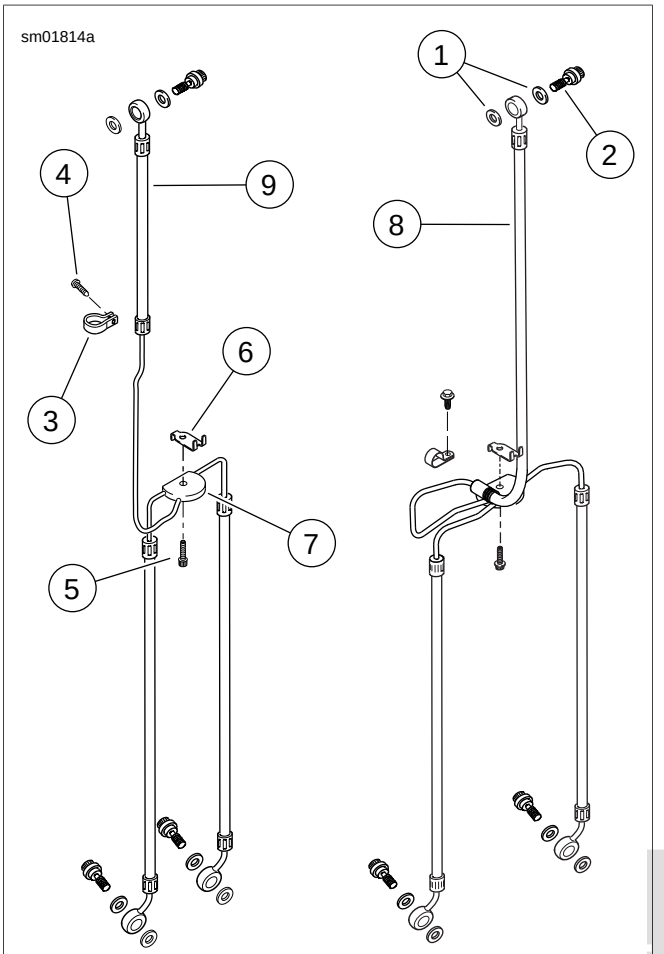
After repairing the brake system, test brakes at low speed. If brakes are not operating properly, testing at high speeds can cause loss of control, which could result in death or serious injury. (00289a)

8. Test ride motorcycle. Repeat brake bleeding, if necessary.



1. **Sealing washer**
2. **Banjo bolt**
3. **Clamp**
4. **Screw**
5. **Screw w/captive washer**
6. **Clamp**
7. **Grommet**
8. **Brakeline: XL 883L/N, XL 1200C/C ANV/X, XL 1200CP w/Pull Back**
9. **Brakeline: XL 1200V/CP/CB w/Mini-Ape**
10. **Brakeline: XL 1200CP/CA w/Drag Bar**

Figure 2-124. Brakelines: Single Disc Models



1. **Sealing washer**
2. **Banjo bolt**
3. **Clamp**
4. **Screw**
5. **Screw**
6. **Guide**
7. **Brakeline manifold**
8. **Brakeline: XR 1200X**
9. **Brakeline: XL 883R**

Figure 2-125. Brakelines: Dual Disc Models

FRONT BRAKE LINE ROUTING

⚠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. Fit the upper clamp to the metal fitting at the top of the single metal tube section.

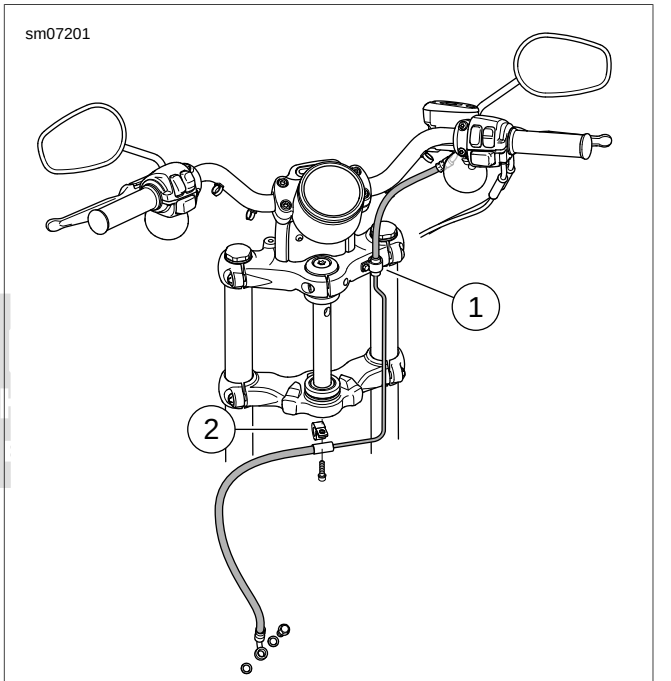
NOTE

The brake line on dual disc models self-aligns. It creates a gap between the metal tubing section and the lower fork bracket. Visually confirm the gap.

2. Route the brake line behind the handlebar and the fork brackets.
3. Separate the two brake lines and route down to the calipers.

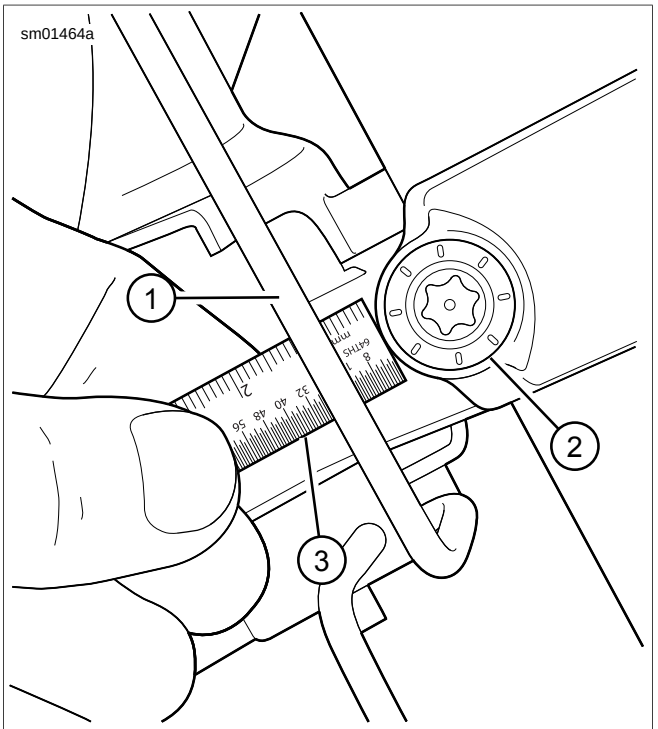
XL 883L/N, XL 1200X, XL 1200C/C ANV/CP w/Pull Back

1. See Figure 2-126. Fit the upper and lower clamps to the metal fittings at the ends of the metal tube section.
2. Route the brake line downward in front of the right side of the handlebar and inward behind fork brackets.
3. Continue routing the brake line downward crossing to left side of the vehicle under front fork lower bracket to the brake caliper.
4. **Single Disc Models:** See Figure 2-127. Adjust the location of the brake line in the lower P-clamp until there is a 1/4 in (6.35 mm) gap between the brake line metal tubing and the lower fork bracket pinch bolt.



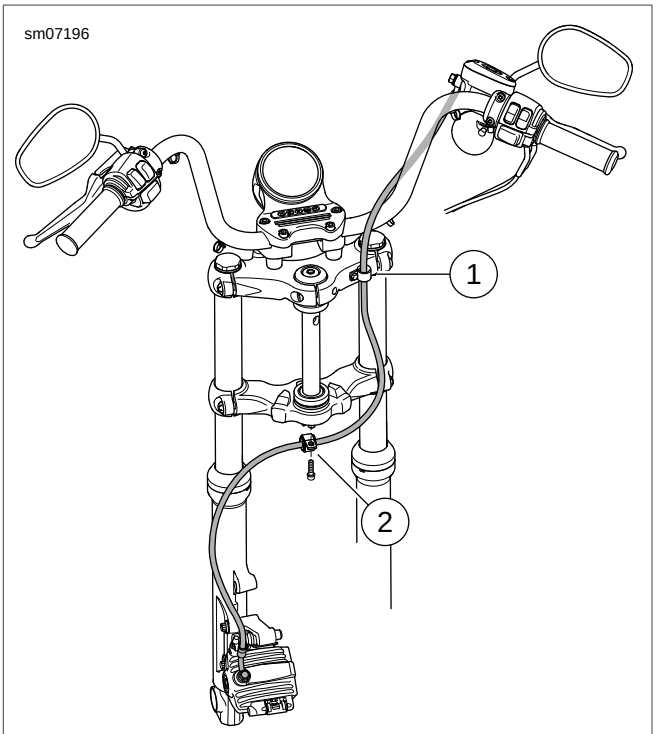
1. **Upper P-clamp**
2. **Lower P-clamp**

Figure 2-126. Brakeline Routing: XL 883L/N, XL 1200X, XL 1200C/C ANV/CP w/Pull Back



1. **Front brake line**
2. **Lower fork bracket pinch bolt**
3. **Ruler**

Figure 2-127. Measuring Front Brake Line Clearance



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

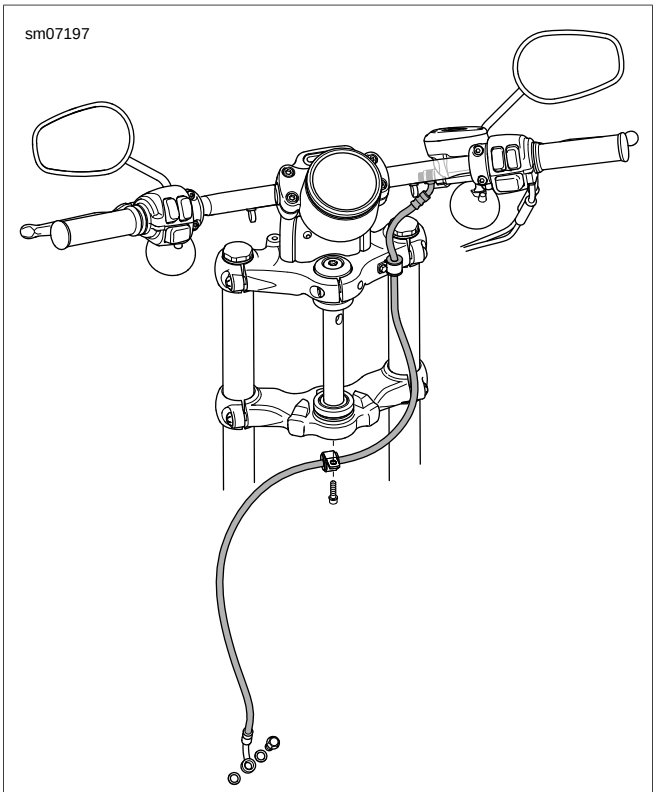
Figure 2-128. Brake Line Routing: XL 1200V/CP/CB w/Mini-Ape

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

1. Fit the upper and lower clamps to the brake line grommets.
2. See Figure 2-128. Match the straight banjo bolt fitting to the master cylinder and route the brake line over the top of the mini-ape and behind the fork brackets.
3. Cross the brake line under the lower fork bracket and down the fork leg to the brake caliper.

XL 1200CP/CA with Drag Bar

1. See Figure 2-129. Fit the upper and lower clamps to the brake line grommets.
2. Match the banjo bolt fitting to the master cylinder and route the brake line behind the fork brackets.
3. Cross the brake line under the lower fork bracket and down the fork leg to the brake caliper.



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

Figure 2-129. Brake Line Routing: XL 1200CP/CA w/Drag Bar

XR 1200X

1. See Figure 2-130. Fit the upper clamp to the metal fitting at the top of the single metal tube section.

NOTE

The brake line on dual disc models will self-align. It creates a gap between the metal tubing section and the lower fork bracket. Visually confirm the gap.

2. Route the brake line behind the handlebar and the fork brackets.
3. Separate the two brake lines and route down to the calipers.

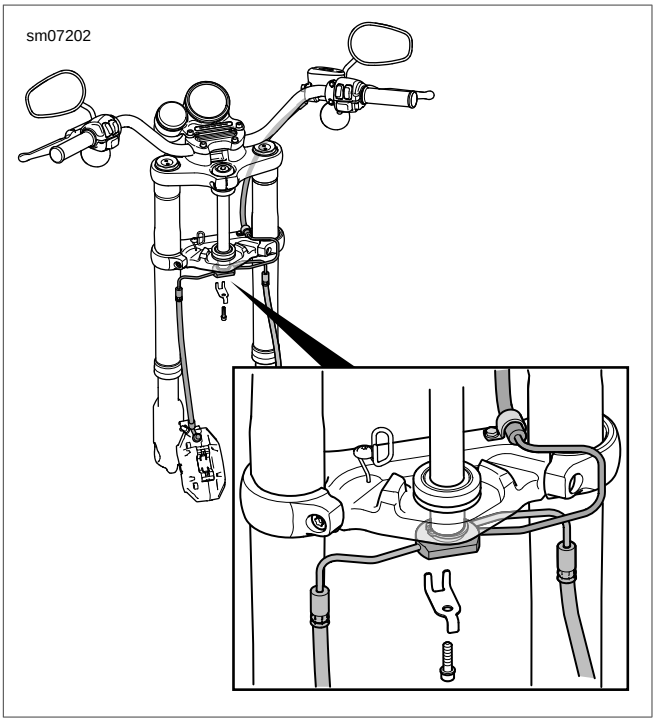


Figure 2-130. Brakeline Routing: XR 1200X

REAR BRAKE LINE: XL MODELS

FASTENER	TORQUE VALUE	
Stop lamp, rear, switch: XL Models	132-168 **in-lbs**	14.9-18.9 Nm
Brake line/switch, rear, tee bracket screw: XL Models	72-120 **in-lbs**	8.14-13.6 Nm
Brake hose clamp to battery tray screw	30-40 **in-lbs**	3.4-4.5 Nm
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 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 master cylinder reservoir. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
2. Drain the rear brake line:
   a. Remove bleeder nipple cap from bleeder valve on rear brake caliper.
   b. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder valve. Place the free end in a suitable container.
   c. Open bleeder valve 1/2 turn.
   d. Pump brake pedal to drain brake fluid.
   e. Close bleeder valve.
3. See Figure 2-131. Unplug harness connectors [121] from stop lamp switch (7).
4. Remove banjo bolt (2) and washers (1) to detach rear brake line (3) from master cylinder body and rear brake caliper. Discard washers.
5. Remove screw (5) to detach brake line clamp (4) with bushing (12) from rear fork.
6. Remove screw (10) to detach brake line clamp (9) from battery tray bracket.
7. Remove screw (11) securing brake line/switch tee (6) to battery tray bracket.
8. Feed brake line up through clamp (8).
9. Hold hex body of brake line/switch tee with an open-end wrench. Remove stop lamp switch from brake line/switch tee.

Installation

1. See Figure 2-131. Thread stop lamp switch (7) into brake line/switch tee (6) on **new** rear brake line (3). Hold hex body of brake line/switch tee with an open-end wrench. Tighten stop lamp switch to 132-168 **in-lbs** (14.9-18.9 Nm).
2. Feed rear brake line down through B-clamp (8).
3. Position brake line/switch tee mounting bracket on battery tray bracket. Secure with screw (11). Tighten to 72-120 **in-lbs** (8.14-13.6 Nm).
4. Install clamp (9) and screw (10) to secure rear brake hose to battery tray bracket. Tighten screw to 30-40 **in-lbs** (3.4-4.5 Nm).

NOTE

When installing clamp (4), bushing (12) and screw (5), adjust the brake hose length between rear caliper and clamp so there is no extra length. Do not twist or stretch brake hose. Make sure bushing sits squarely in clamp and around hose.

5. Install clamp (4) with bushing (12) and screw (5), to secure rear brake hose to rear fork. Tighten screw to 30-40 **in-lbs** (3.4-4.5 Nm).

NOTE

Master cylinder and brake caliper housings have a positive stop for banjo fitting. When tightening banjo bolt into master cylinder and brake caliper in the next step, rotate banjo fitting clockwise until it contacts positive stop.

6. Position **new** washers (1) on each side of banjo fittings by rear brake master cylinder and rear brake caliper. Insert banjo bolts (2) through washers and banjo fittings. Tighten to 20-25 ft-lbs (27.1-33.9 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)

NOTE

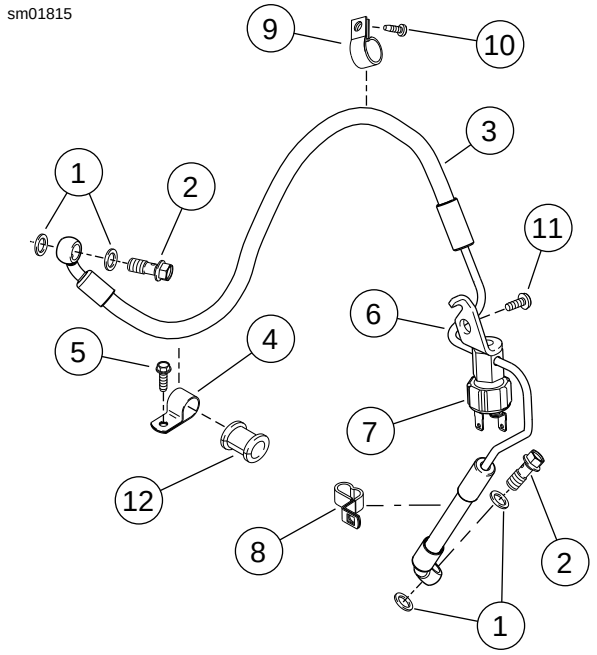
Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.

7. Position motorcycle upright (not resting on jiffy stand). Fill rear brake master cylinder reservoir with DOT 4 BRAKE FLUID and bleed brake system. See 2.17 BLEEDING BRAKES.
8. Tighten bleeder valve to 35-61 **in-lbs** (4.0-6.9 Nm). Install bleeder nipple cap.

⚠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. Verify tail lamp, and stop lamp.
10. Test ride motorcycle. If rear brake feels spongy, bleed system again. See 2.17 BLEEDING BRAKES.



1. **Washer (4)**
2. **Banjo bolt (2)**
3. **Rear brake line**
4. **Clamp**
5. **Screw**
6. **Brake line/switch tee**
7. **Stop lamp switch assembly**
8. **Clamp**
9. **Clamp**
10. **Screw**
11. **Screw**
12. **Bushing**

Figure 2-131. Rear Brake Line: XL Models

REAR BRAKE LINE: XR 1200X

FASTENER	TORQUE VALUE	
Stop lamp, rear, switch: XR 1200X	132-168 **in-lbs**	14.9-18.9 Nm
Brake line/switch, rear, tee bracket screw: XR 1200X	17-22 **in-lbs**	1.9-2.5 Nm
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 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

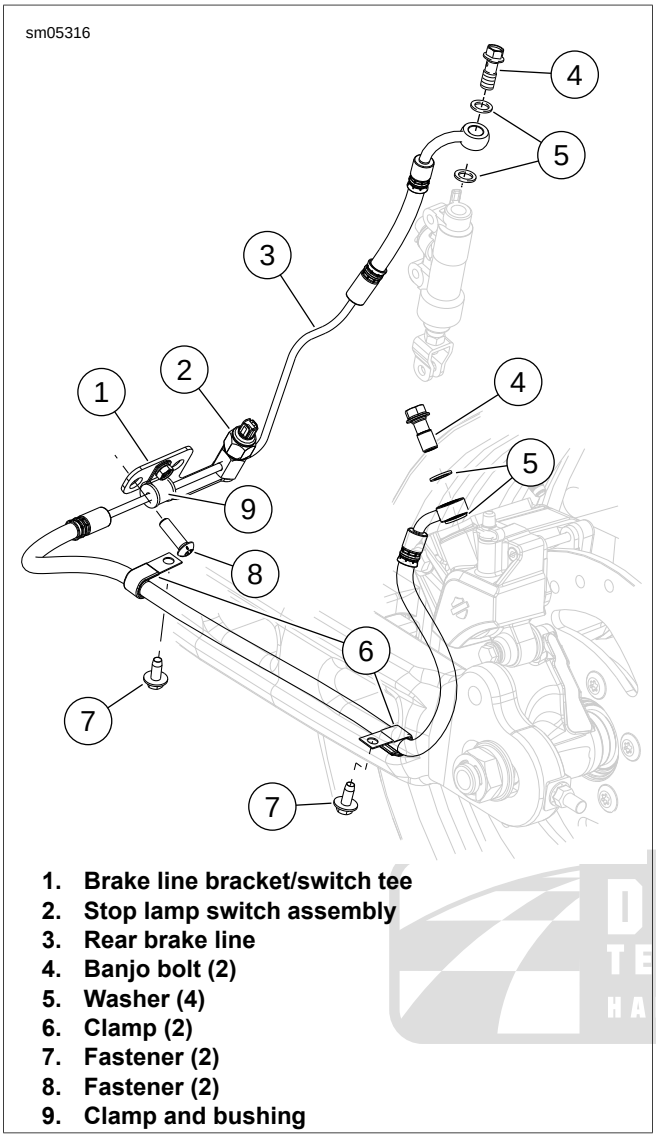
D.O.T. 4 brake fluid will damage painted and body panel surfaces it comes in contact with. Always use caution and protect surfaces from spills whenever brake work is performed. Failure to comply can result in cosmetic damage. (00239b)

NOTE

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

Removal

1. Drain rear brake master cylinder reservoir. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
2. Drain brake fluid:
   a. Remove cap from bleeder valve on rear brake caliper.
   b. Install a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder valve. Place free end in a suitable container.
   c. Open bleeder valve 1/2 turn.
   d. Pump brake pedal to drain brake fluid.
   e. Close bleeder valve.
3. See Figure 2-132. Unplug harness connectors [121] from stop lamp switch (2).
4. Remove banjo bolts (4) and washers (5) to detach rear brake line (3) from master cylinder body and rear brake caliper. Discard washers.
5. Remove fasteners (7) to detach brake line clamps (6) from rear fork.
6. Remove fasteners (8) securing brake line bracket/switch tee (1) to lower frame.
7. Hold hex body of brake line bracket/switch tee with an open-end wrench. Remove stop lamp switch from brake line bracket/switch tee assembly.
8. If necessary, remove clamp and bushing (9).



1. **Brake line bracket/switch tee**
2. **Stop lamp switch assembly**
3. **Rear brake line**
4. **Banjo bolt (2)**
5. **Washer (4)**
6. **Clamp (2)**
7. **Fastener (2)**
8. **Fastener (2)**
9. **Clamp and bushing**

Figure 2-132. Rear Brake Line: XR 1200X

Installation

1. See Figure 2-132. Thread stop lamp switch (2) into brake line bracket/switch tee (1) on rear brake line (3). Hold hex body of brake line bracket/switch tee with an open-end wrench. Using a 1.0-in six-point deep socket, tighten stop lamp switch assembly to 132-168 **in-lbs** (14.9-18.9 Nm).
2. If removed, install clamp and bushing (9).

⚠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)

3. Route brake line assembly to master cylinder and brake caliper. Loosely install **new** washers (5) and banjo bolts (4) to hold line in place.
4. Position brake line bracket/switch tee on lower frame and secure with fasteners (8). Tighten to 17-22 **in-lbs** (1.9-2.5 Nm).
5. Connect harness connectors [121] to stop lamp switch (2).

NOTES

- *Make sure stop lamp switch harness does not contact grounding strap.*
- *Master cylinder and brake caliper housings have a positive stop for banjo fitting. When tightening banjo bolt into master cylinder and brake caliper in the next step, rotate banjo fitting clockwise until it contacts positive stop.*

6. With **new** washers (5) on each side of banjo fittings, tighten banjo bolts (4) to 20-25 ft-lbs (27.1-33.9 Nm).
7. Secure brake line to bottom of rear fork with clamps (6) and fasteners (7).

⚠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)

NOTE

Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.

8. Position motorcycle upright (not resting on jiffy stand). Fill rear brake master cylinder reservoir with DOT 4 BRAKE FLUID and bleed brake system. See 2.17 BLEEDING BRAKES.
9. Tighten bleeder valve to 35-61 **in-lbs** (4.0-6.9 Nm). Install bleeder nipple cap.
10. Verify tail lamp, and stop lamp.
11. Test ride motorcycle. If rear brake feels spongy, bleed system again. See 2.17 BLEEDING BRAKES.

BLEEDING BRAKES 2.17

GENERAL

⚠WARNING

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

⚠CAUTION

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

NOTICE

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

NOTICE

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

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

PROCEDURE

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

NOTE

If the brake system was completely drained, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-On BB200A). Refer to the instructions provided with the tool. If a vacuum brake bleeder is not available, use the following procedure.

1. Remove bleeder valve cap. Install end of clear plastic tubing over bleeder valve 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)

4. Refer to Table 2-18. Add brake fluid as necessary. Verify operation of the master cylinder relief port by actuating the brake pedal or lever. A slight spurt of fluid will break the surface.
5. Operate the brake lever or pedal to build hydraulic pressure.

NOTE

Pay careful attention to the level of the fluid in the master cylinder reservoir and add fluid before it empties to avoid drawing air into the brake lines.

6. While holding pressure with the brake lever or pedal:
   a. Open bleeder valve about 3/4 turn.
   b. Close bleeder valve 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 valve to specification. Install bleeder valve cap.

NOTE

If bleeding a dual caliper brake system, repeat steps to bleed the second brake line and caliper.

9. Check and 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 will be ejected from the reservoir.

10. Refer to Table 2-19. Verify 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 and tighten to specification.
    b. **Rear Master Cylinder Reservoir:** Install cover screws and tighten to specification.

NOTE

Dispose of used brake fluid in accordance with local regulations.

11. Verify stop lamp operation.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

⚠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 2-18. Fluid Level

ITEM	SPECIFICATION
Front reservoir	Boss or ridge
Rear reservoir	Ledge or range window

Table 2-19. Torque Specifications

COMPONENT	TORQUE
Bleeder	35-61 **in-lbs** (4.0-6.9 Nm)
Front cover	9-17 **in-lbs** (1.0-2.0 Nm)
Rear cover	Hand tighten

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

LEFT SIDE COVER 2.18

GENERAL

See Figure 2-133. The left side cover provides access to the battery (1), fuses (3, 4) and diagnostic connector (5).

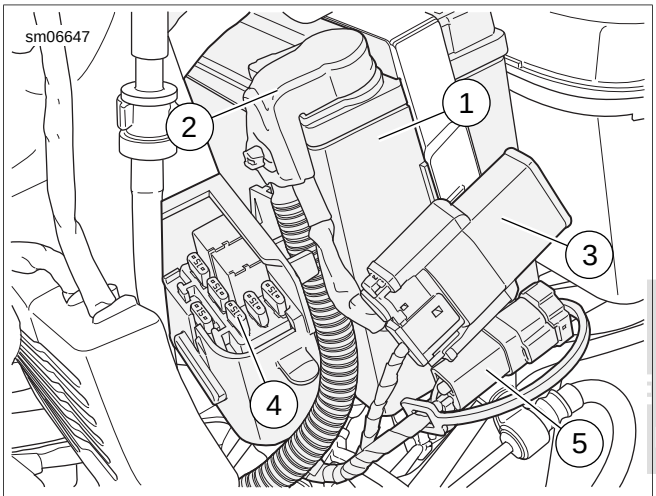
XL Models: The left side cover is secured by two barrel clips secured to two upper slots that fit into socket clips mounted to the frame.

XR 1200X: The left side cover is secured by two molded-in posts that fit into grommets.

The side cover is also secured by a bottom slot that fits onto a mounting tab on the battery tray.

NOTE

The left side cover does not need to be completely removed to access the battery or fuses.



1. **Battery**
2. **Positive (+) battery terminal (under protective rubber boot)**
3. **Main fuse and holder**
4. **System fuses and relays**
5. **Diagnostic connector (data link)**

Figure 2-133. Main Fuse and Battery Location: All Models

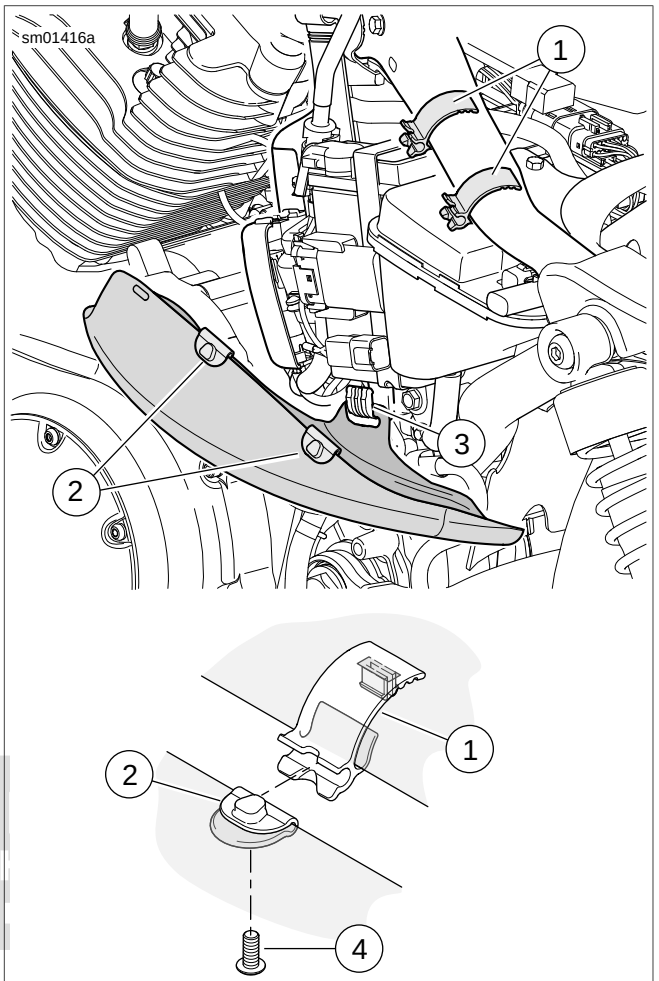
OPENING LEFT SIDE COVER

1. Place a clean, dry cloth over rear brake master cylinder reservoir and left passenger foot peg (if equipped). This will protect left side cover from damage.

NOTE

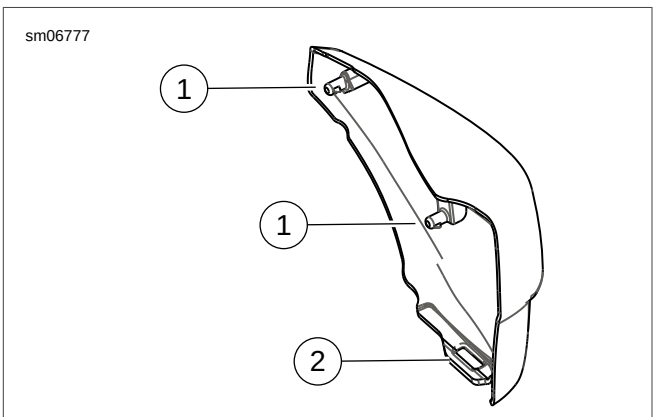
On XL models, disengage the rear clip first for easier opening.

2. See Figure 2-134 or Figure 2-135. Grasp top corners of side cover. Gently pull away from plastic socket clips (XL models) or grommets (XR 1200X) on frame.



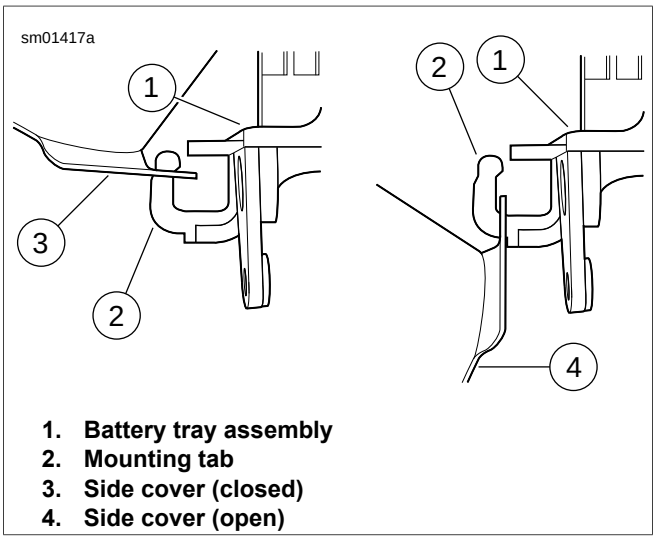
1. **Socket clips (on frame)**
2. **Side cover barrel clips (top)**
3. **Mounting tab (on battery tray)**
4. **Side cover barrel clips mounting screw (bottom)**

Figure 2-134. Left Side Cover: XL Models



1. **Side cover mounting posts (top)**
2. **Side cover mounting slot (bottom)**

Figure 2-135. Left Side Cover: XR 1200X



1. **Battery tray assembly**
2. **Mounting tab**
3. **Side cover (closed)**
4. **Side cover (open)**

Figure 2-136. Left Side Cover Bottom Mount: All Models

3. See Figure 2-136. Rotate top of cover away from motorcycle and down slightly. Mounting slot on cover will slide down mounting tab (2) on battery tray assembly (1). Side cover (4) will rest on top of rear brake master cylinder reservoir and left passenger footrest (if equipped).

NOTICE

Leaning or placing tools on side cover could cause damage to cover and/or mounting tab on battery tray. (00523b)

CLOSING LEFT SIDE COVER

1. Grasp top corners of side cover. While rotating top of cover up toward motorcycle, gently pull cover up so that mounting slot slides up mounting tab.
2. Press top of side cover into place:
   a. **XL models:** See Figure 2-134. Line up barrel clips on side cover with socket clips on motorcycle frame, aligning with front clip first. Press top of side cover into clips until you hear an audible snap.
   b. **XR 1200X:** See Figure 2-135. Line up molded-in posts in top of side cover with mounting grommets on motorcycle frame. Press posts in side cover into grommets until snug.

NOTE

Side cover should snap into place with minimal pressure. Using excessive force or striking side cover to close it can damage mounting clips (XL models) or molded-in posts (XR 1200X).

REMOVING LEFT SIDE COVER

1. See Figure 2-134 or Figure 2-135. Grasp top corners of side cover. Gently pull away from plastic mounting clips (XL models) or grommets (XR 1200X) on frame.

NOTE

On XL models, disengage the rear clip first for easier opening.

2. See Figure 2-137. Lift side cover up and tilt cover to the rear of the motorcycle. With a slight back and forth rocking motion, pull up gently until cover disengages from mounting tab on battery tray.

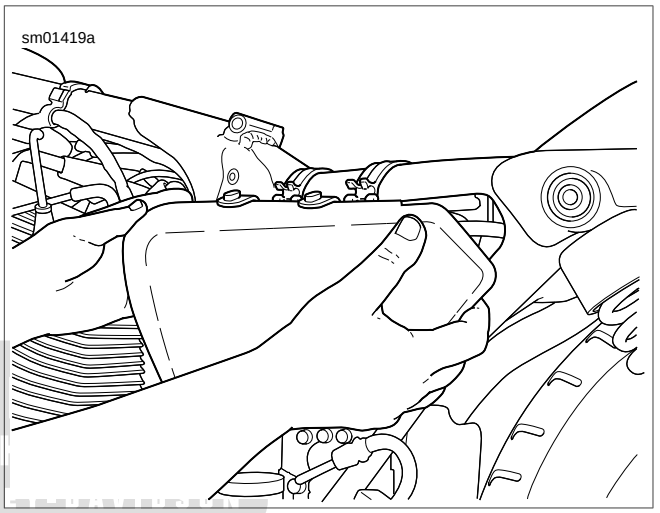


Figure 2-137. Removing Left Side Cover: All Models (XL Model Shown)

INSTALLING LEFT SIDE COVER

1. Position side cover over battery tray assembly. Align slot in bottom of cover to mounting tab on battery tray.
2. Gently guide the side cover down over mounting tab.
3. Close the left side cover. See 2.18 LEFT SIDE COVER, Closing Left Side Cover.

FRONT FORK: XL MODELS 2.19

CHANGING FORK OIL: XL MODELS

FASTENER	TORQUE VALUE	
Fork, front, oil drain screw: XL 883N/R	13-17 **in-lbs**	1.5-2.0 Nm
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm

Drain Forks: XL 883N/R

1. Place a drain pan under bottom of the fork slider.
2. See Figure 2-138. With the motorcycle upright (not resting on jiffy stand) and with the front fork pointed straight ahead, remove the drain screw and washer (1) from the bottom of the slider tube (4).
3. Drain fork oil by repeatedly compressing front suspension slowly.

NOTES

- *If fork oil is emulsified, aerated or light brown in color, it has been contaminated by water. Replace the fork oil seals.*
- *Dispose of fork oil in accordance with local regulations.*

4. Replace the drain screw and washer. Tighten to 13-17 **in-lbs** (1.5-2.0 Nm).

Fill Forks: XL 883N/R

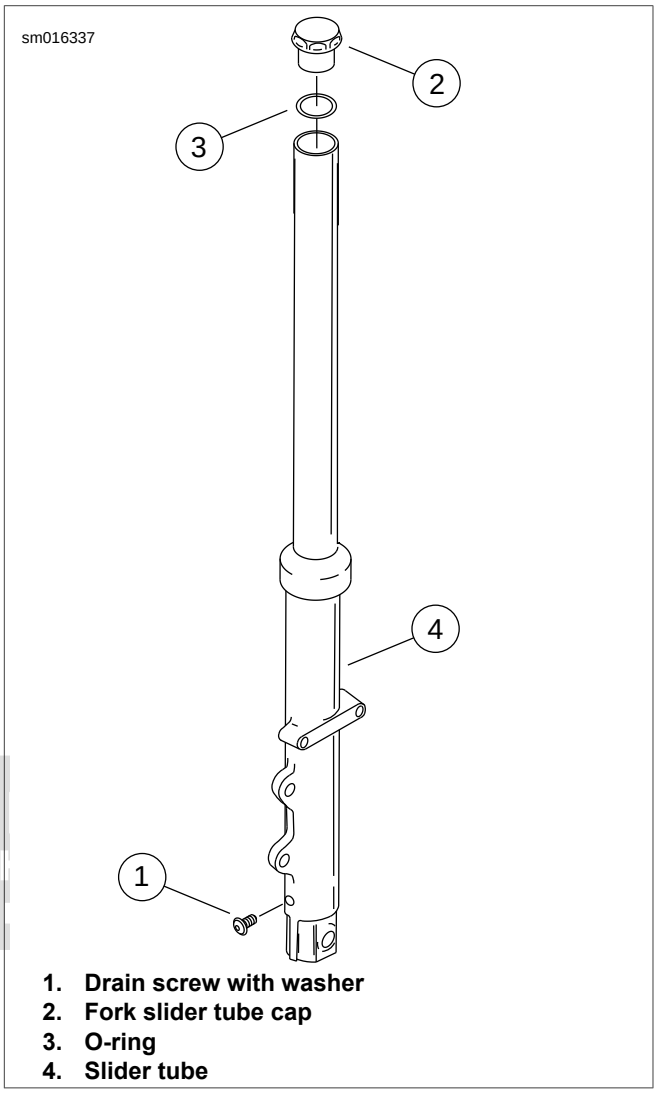
⚠WARNING

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

NOTE

Extend the forks to relieve the spring preload by raising the motorcycle off the ground.

1. See Figure 2-138. Remove fork slider tube cap (2) with O-ring (3) from each slider tube (4). Replace the O-ring if damaged or worn.
2. Fill each fork with type TYPE "E" HYDRAULIC FORK OIL to specification. Refer to Table 2-20.
3. Install each slider tube cap. Tighten to 22-58 ft-lbs (29.9-78.7 Nm).



1. **Drain screw with washer**
2. **Fork slider tube cap**
3. **O-ring**
4. **Slider tube**

Figure 2-138. Draining Front Fork Oil: XL 883N/R

Table 2-20. Fork Oil Specifications: XL Models

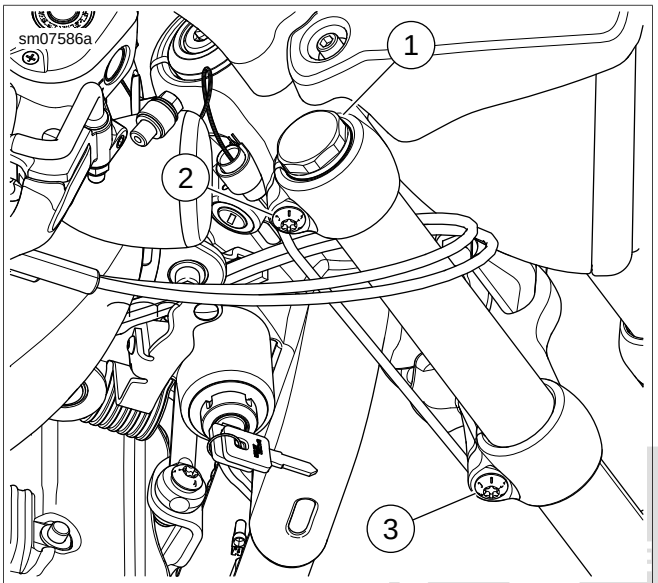
MODEL	oz	mL
XL 883L	12.3	364
XL 883N	13.6	401
XL 883R	12.4	366
XL 1200V/C/C ANV/CP/CA/CB	12.4	366
XL 1200X	11.4	337

Drain Forks: XL 883L and XL 1200X/C/C ANV/CP/CA/CB/V

1. Remove the fork from the fork brackets. See 2.19 FRONT FORK: XL MODELS, Removal.
2. Remove the fork cap.
3. Turn the fork upside down over a pan and pump the slider to drain out the fork oil.

REMOVAL

1. Remove front brake caliper(s). See 2.9 FRONT BRAKE CALIPER: XL MODELS.
2. Remove front wheel assembly. See 2.5 WHEELS.
3. Remove front fender mounting screws and locknuts. Remove fender. See 2.31 FRONT FENDER.
4. See Figure 2-139. Loosen, but do not remove, slider tube caps (1).
5. Loosen front fork upper and lower bracket pinch screws (2 and 3). Remove fork assemblies from fork brackets.



1. **Slider tube cap**
2. **Upper pinch bolt**
3. **Lower pinch bolt**

Figure 2-139. Fork Tube Bracket

DISASSEMBLY

Drain Fork Oil

1. See Figure 2-141. Remove tube cap (7) from slider tube (9). Remove O-ring (6) from tube cap.
2. Place a pan under the fork. Remove the drain screw and washer (19) from slider. Drain the fork oil.

Fork Disassembly

1. See Figure 2-141. Remove spring (5) from slider tube.
2. **All except XL 883L and XL 1200X:** Remove spring collar (20) and spring washer (21) from slider tube.
3. **All except XL 883N:** Remove cover (11).

NOTE

See Figure 2-144. The XL 883N is equipped with fork gaiters (2) instead of metal covers. The lower lip (3) of the gaiter fits into the groove at the upper end of the slider (1). The upper end of the gaiter fits tightly around the slider tube, just below the lower bracket (4).

4. **XL 883N:** See Figure 2-144. 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 2-141. 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.

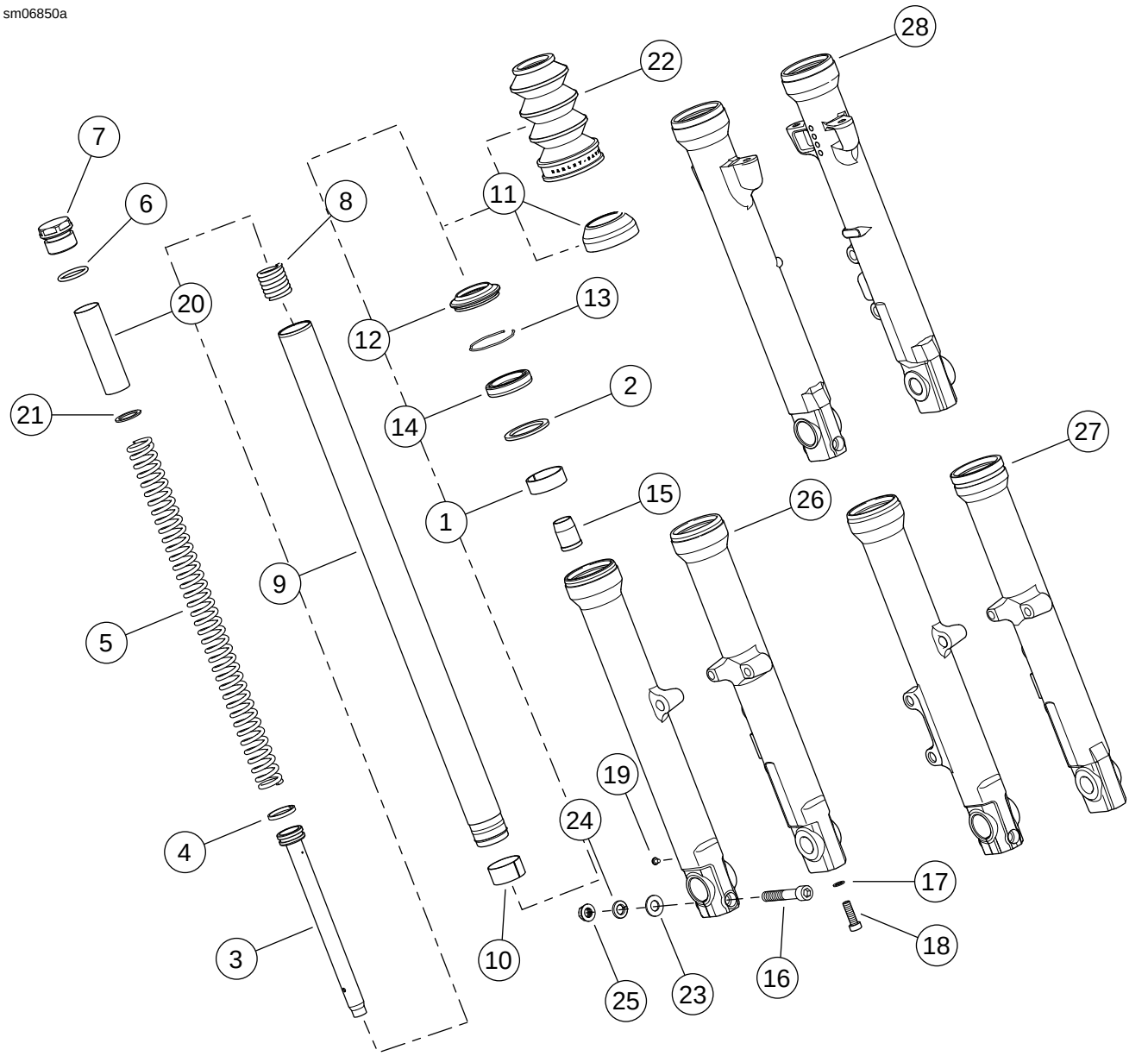
NOTE

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 the oil seal (14), the spacer (2) and the upper bushing with the lower bushing on the slider.
9. Remove sleeve (15). Sleeve will be found 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(s) (4) from damper tube.
13. Remove lower bushing from damper tube only if replacement is necessary.

CLEANING, INSPECTION AND REPAIR

1. Thoroughly clean and inspect all parts. Replace as necessary.
2. See Figure 2-140. Inspect the O-ring (6) for damage, wear or general deterioration. Replace as necessary.
3. Replace all other removed seals.
4. Inspect damper tube ring(s) (4). Replace as necessary.
5. Check dust seal (12) where it contacts slider tube (9). Dust seal should provide continuous contact against slider tube and should not show excessive wear.
6. Check slider tube where it is contacted by seal. Tube surface should be shiny, smooth and free of scoring or abrasions.
7. Verify small hole in lower end of slider tube groove is unobstructed.



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. Drain screw and washer (XL 883N/R)
20. Spring collar (all except XL 883L and XL 1200X)
21. Spring washer (all except XL 883L and XL 1200X)
22. Fork gaiter (XL 883N)
23. Washer
24. Lockwasher
25. Nut
26. Sliders (RH and LH XL 883L/N and 1200V/C/C ANV/CP/CA/CB)
27. Sliders (RH and LH XL 883R)
28. Sliders (RH and LH XL 1200X)

Figure 2-140. Front Slider Tube/Slider Assembly: XL Models

ASSEMBLY

PART NUMBER	TOOL NAME
HD-36583	FORK SEAL AND BUSHING INSTALLATION TOOL

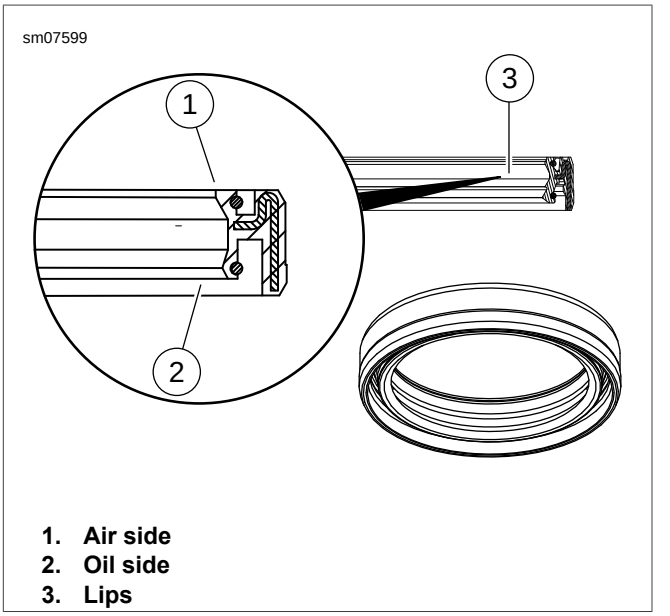
FASTENER	TORQUE VALUE	
Fork slider tube fastener: XL Models	132-216 **in-lbs**	14.9-24.4 Nm

1. See Figure 2-140. 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 ring(s) (4) into groove(s) of damper tube (3).
3. Place rebound spring (8) over damper tube (3). Insert damper tube into slider tube.
4. Insert spring (5) into slider tube with the tapered end down. Push damper tube through opening at bottom of slider tube using spring. Place sleeve (15) over end of damper tube.
5. **All except XL 1200X:** Install spring washer (21) and spring collar (20) into slider tube.
6. Install slider tube assembly into slider. Install screw (18) with washer (17) at bottom of slider. Move slider tube through its full range of travel within slider several times to verify proper component alignment. Then, applying downward force on spring, final tighten screw to 132-216 **in-lbs** (14.9-24.4 Nm).

NOTES

- *See Figure 2-141. Coat the lips (3) of the oil with HARLEY-DAVIDSON SEAL GREASE.*
- *Apply HARLEY-DAVIDSON SEAL GREASE to the mating surfaces of the dust cover and the oil seal.*

7. See Figure 2-140. 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 the installation tool.
8. Install internal circle clip (13) into groove in top of slider bore.
9. Install dust seal (12) at top of slider.
10. **All except XL 883N:** Install cover (11).
11. **XL 883N:** See Figure 2-144. Slide a fork gaiter (2) down each slider tube. Peel back the lower lip (3) and slip over the end of fork slider (1). Fit the lower lip down over groove in upper end of fork slider. Slide the upper end of fork gaiter down as far as possible.
12. **All except XL 883L and XL 1200X/V/C/C ANV/CP/CA/CB:** See Figure 2-140. Install the drain screw and washer (19) into lower end of slider.
13. Fill the fork tube with fork oil. See 2.19 FRONT FORK: XL MODELS, Fill with Fork Oil.



1. **Air side**
2. **Oil side**
3. **Lips**

Figure 2-141. Oil Seal

FILL WITH FORK OIL

PART NUMBER	TOOL NAME
HD-59000-B	OIL LEVEL GAUGE

1. Position fork tube assembly upright. Compress the assembly fully.
2. Pour approximately 14 fl oz (414 mL) of TYPE "E" HYDRAULIC FORK OIL into fork.
3. Pump the slider tube 8-10 times to expel air and compress the assembly fully.
4. See Figure 2-142. Use the OIL LEVEL GAUGE (Part No. HD-59000-B) to set the fork oil level.
   a. Adjust the length of the draw off tube to specification (1). Refer to Table 2-21.
   b. Lock the tube (2) to the collar (3) with the thumb lock (4).
   c. Fit the collar to the fork tube.
   d. Draw off the excess oil.
5. Install spring and other components.

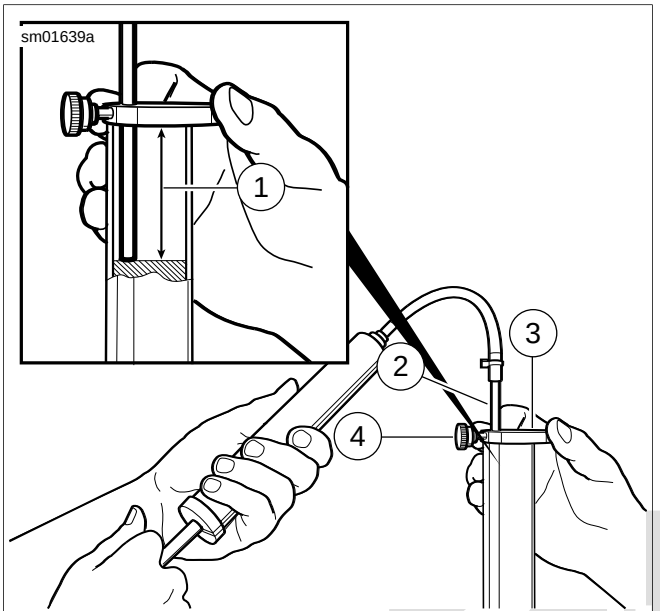
NOTE

Apply HARLEY-DAVIDSON SEAL GREASE to the 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: XL Models

MODEL	in	mm
XL 883N	3.11	79
XL 883L	4.80	122
XL 1200X	6.34	161
XL 883R/XL 1200V	4.92	125
XL 1200C/C ANV/CP/CA/CB	4.72	120



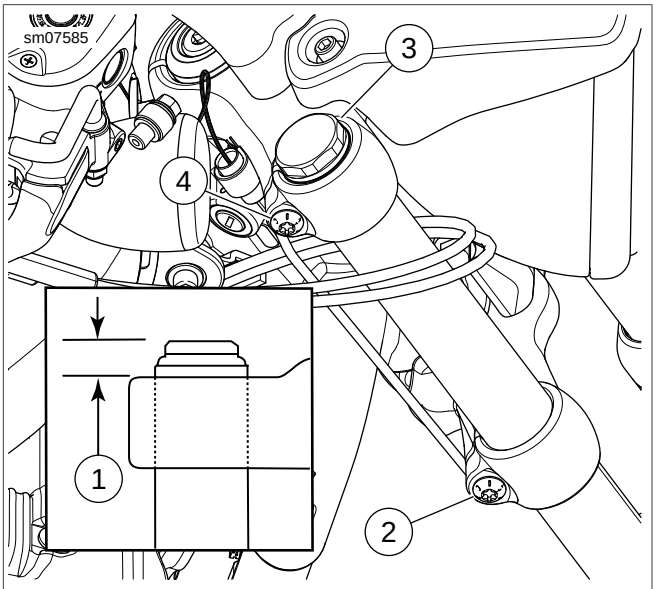
1. **Fork oil level**
2. **Tube**
3. **Collar**
4. **Thumb lock**

Figure 2-142. Oil Level Gauge

INSTALLATION

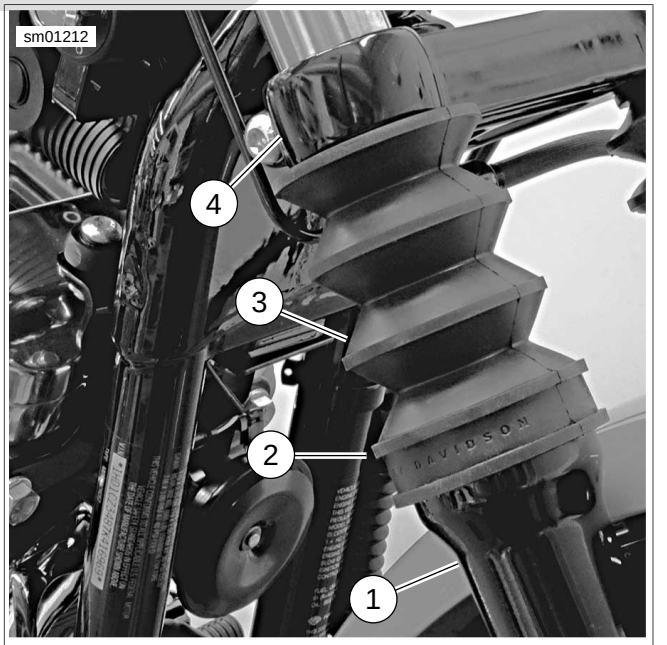
FASTENER	TORQUE VALUE	
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm

1. See Figure 2-143. Insert each fork assembly through front fork lower and upper brackets. Position slider tubes so that top of each tube cap extends 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 2-144. Slide upper end of each fork gaiter (2) up until it contacts underside of front fork lower bracket (4).
6. Install front fender. See 2.31 FRONT FENDER.
7. Install front wheel assembly and front brake 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 2-143. Tube Cap Extension



1. **Fork slider (2)**
2. **Fork gaiter (2)**
3. **Fork gaiter lower lip**
4. **Front fork lower bracket**

Figure 2-144. Fork Gaiter: XL 883N Only

FRONT FORK: XR 1200X 2.20

REMOVAL

PART NUMBER	TOOL NAME
HD-48287	TRIPLE TREE WEDGE TOOL

1. Remove front brake calipers. See 2.10 FRONT BRAKE CALIPER: XR 1200X.
2. Remove front wheel assembly. See 2.5 WHEELS.
3. Remove front fender and bracket assembly. See 2.31 FRONT FENDER.
4. See Figure 2-145. Remove upper and lower fork bracket pinch bolts.
5. Using TRIPLE TREE WEDGE TOOL (Part No. HD-48287), insert wedge in fork brackets to relieve clamping pressure on fork tubes.
6. Remove fork from upper and lower fork brackets.
7. Repeat steps for other side.

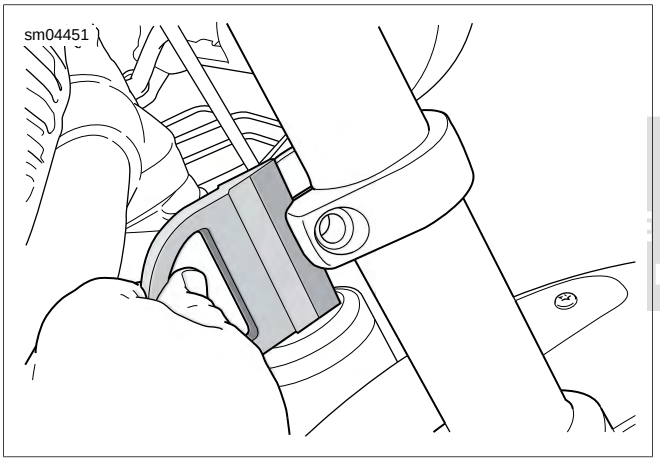


Figure 2-145. Insert Triple Tree Wedge (typical)

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-41177	FORK HOLDING TOOL
HD-50083	ROD CASE GUIDE SOCKET
HD-50084	FORK CAP WRENCH

Initial Disassembly

⚠WARNING

Wear safety glasses or goggles when servicing fork assembly. Do not remove slider tube caps without relieving spring preload or caps and springs can fly out, which could result in death or serious injury. (00297a)

NOTE

Count and record the number of rotations out (counterclockwise) for the preload adjuster.

1. See Figure 2-146. Back the preload off the fork spring.
2. Clamp the outer tube in the FORK HOLDING TOOL (Part No. HD-41177).
3. See Figure 2-147. Loosen the fork cap with the FORK CAP WRENCH (Part No. HD-50084).
4. See Figure 2-148. Pull the cap and piston rod up out of the outer tube and loosen the rod case guide with the ROD CASE GUIDE SOCKET (Part No. HD-50083).

NOTE

Hold the rod case guide. Turn the axle clamp casting to unthread the case guide from the inner tube.

5. See Figure 2-149. Remove the piston rod assembly from the inner tube.

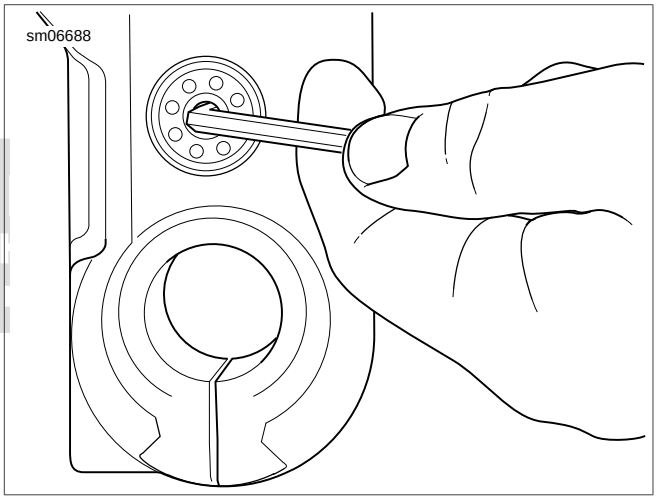


Figure 2-146. Preload Adjuster

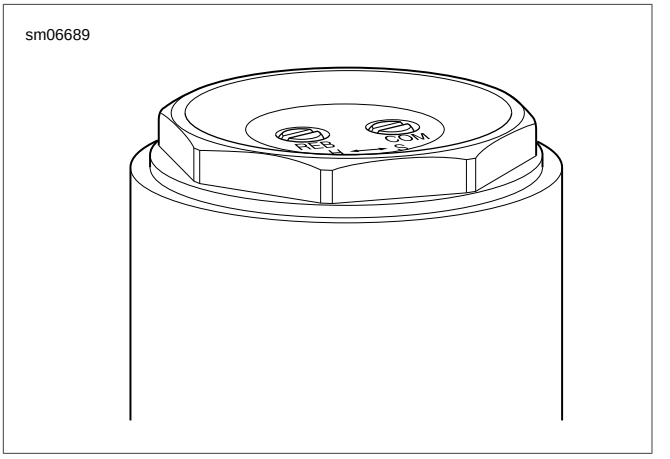


Figure 2-147. Loosen Fork Cap

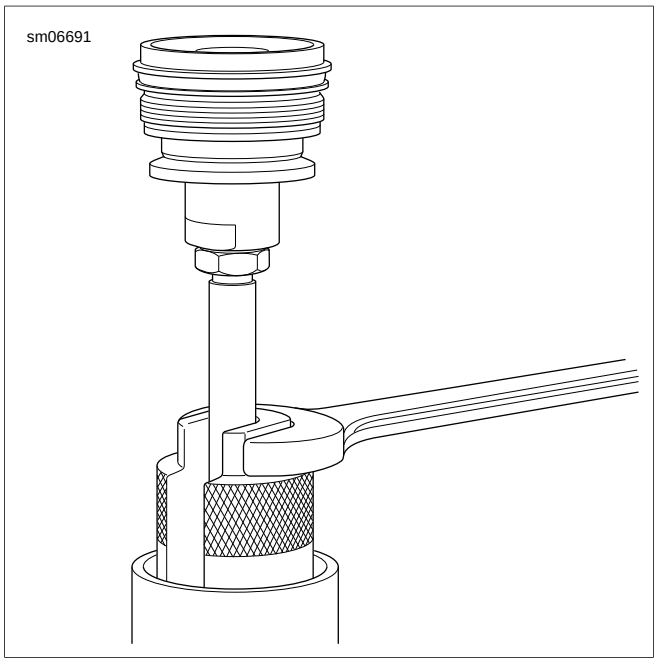


Figure 2-148. Rod Guide Nut Socket

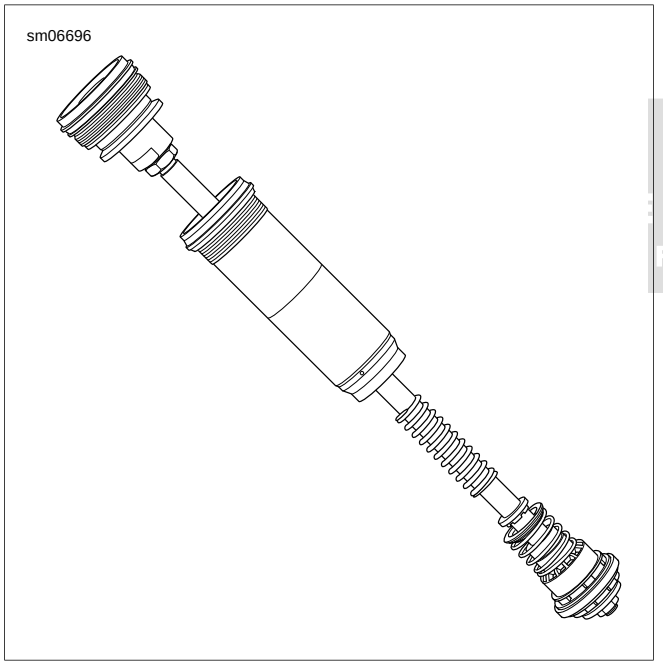


Figure 2-149. Piston Rod Assembly with Rod Case Guide

Drain the Fork Oil

1. See Figure 2-150. Drain the oil into a pan. Remove:
   a. The upper spring collar
   b. The spring
   c. The lower spring collar
2. Pump the inner tube 10 or more times to empty the oil from the fork.

NOTE

Dispose of fork oil in accordance with local regulations.

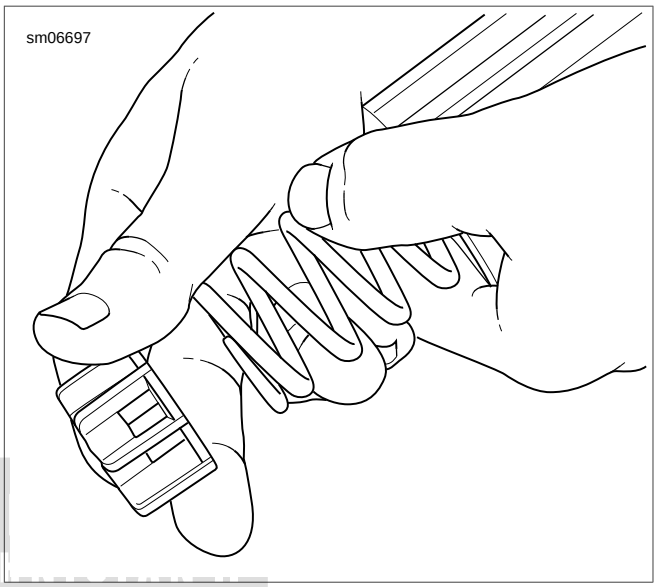
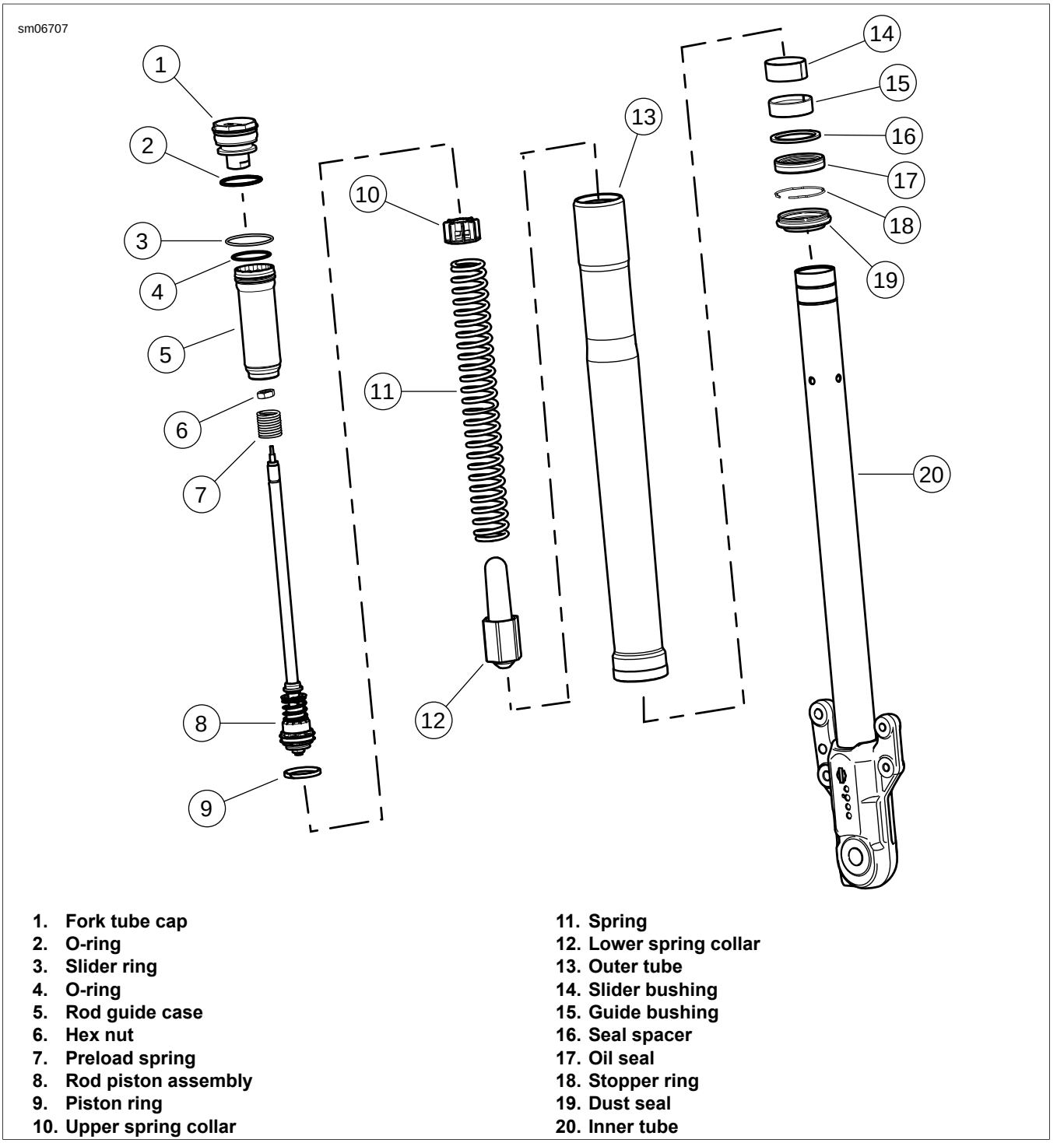


Figure 2-150. Remove the Upper Spring Collar and the Spring

Complete Disassembly

1. See Figure 2-151. Remove the stopper ring (18) from the groove inside the outer tube (13).
2. Slide the inner tube (20) out of the outer tube.
3. From the inner tube remove:
   a. Slide bushing (14)
   b. Guide bushing (15)
   c. Seal spacer (16)
   d. Oil seal (17)
   e. The stopper ring
   f. The dust seal (19)



1. **Fork tube cap**
2. **O-ring**
3. **Slider ring**
4. **O-ring**
5. **Rod guide case**
6. **Hex nut**
7. **Preload spring**
8. **Rod piston assembly**
9. **Piston ring**
10. **Upper spring collar**
11. **Spring**
12. **Lower spring collar**
13. **Outer tube**
14. **Slider bushing**
15. **Guide bushing**
16. **Seal spacer**
17. **Oil seal**
18. **Stopper ring**
19. **Dust seal**
20. **Inner tube**

Figure 2-151. Fork Assembly: XR 1200X

CLEANING AND INSPECTION

1. Thoroughly clean components.
2. Replace all oil seals and O-rings.
3. Inspect components. Replace as necessary.
   a. Fork tube bushing and slider guide bushing for wear.
   b. Dust cover (where it rubs on fork tube) for wear.
   c. Springs for damaged coils.
   d. Fork tube or slider for bends or wear.

ASSEMBLY

PART NUMBER	TOOL NAME
B-42571	FORK SEAL DRIVER AND DUST BOOT INSTALLER
B-59000B	OIL LEVEL GAUGE
HD-41177	FORK HOLDING TOOL
HD-50083	ROD CASE GUIDE SOCKET
HD-50084	FORK CAP WRENCH

FASTENER	TORQUE VALUE	
Fork piston rod hex nut: XR 1200X	19-22 ft-lbs	26-30 Nm
Rod guide case to inner tube: XR 1200X	66 ft-lbs	90 Nm
Fork cap to outer tube: XR 1200X	21-29 ft-lbs	29-39 Nm

Piston Rod Service

1. Separate the hex nut from the fork cap and remove the fork cap and hex nut from the piston rod assembly.

NOTES

- *The piston rod assembly should not be disassembled any further than is described.*
- *Do not use TYPE "E" HYDRAULIC FORK OIL to lubricate the components for assembly. Use BIG PISTON FORK OIL.*

2. See Figure 2-152. Replace the O-ring on the fork cap.
3. See Figure 2-153. Replace the rod guide case O-ring (1) and the slider ring (2).
4. Replace the rebound spring.
5. See Figure 2-154. Replace the fork piston ring.
6. Install the hex nut and the fork cap on the piston rod assembly.
7. Tighten to 19-22 ft-lbs (26-30 Nm).

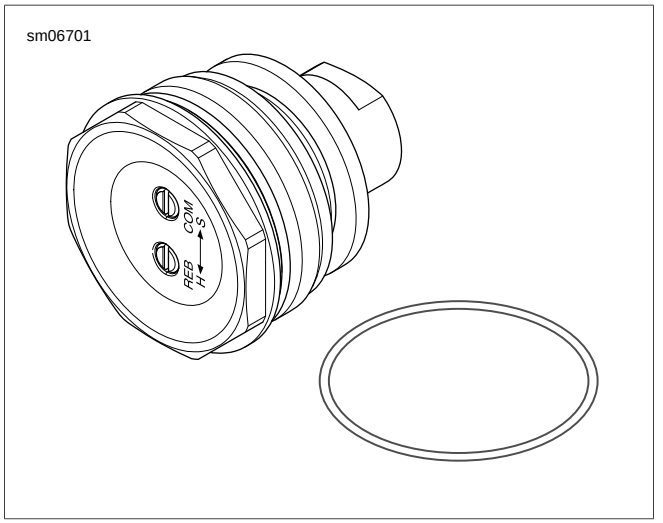
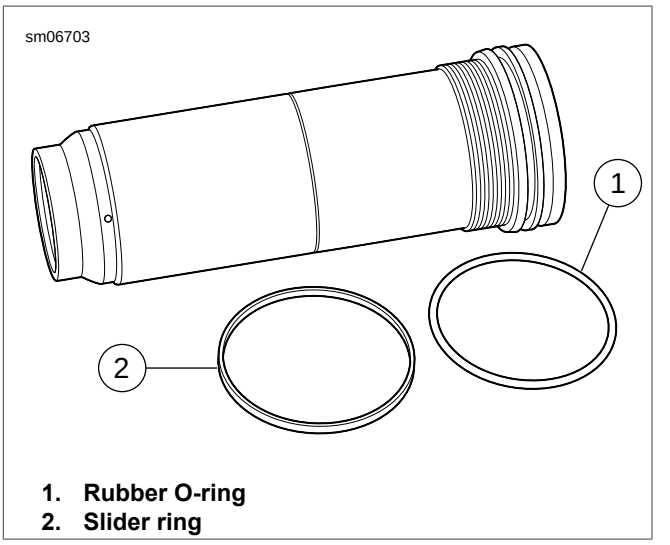


Figure 2-152. Fork Cap and O-Ring



1. **Rubber O-ring**
2. **Slider ring**

Figure 2-153. Rod Guide Case and O-Rings

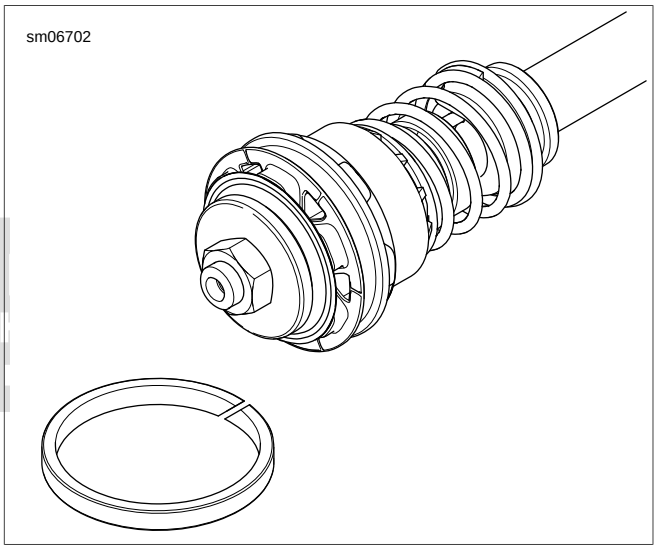


Figure 2-154. Fork Rod Piston and Ring

Initial Assembly

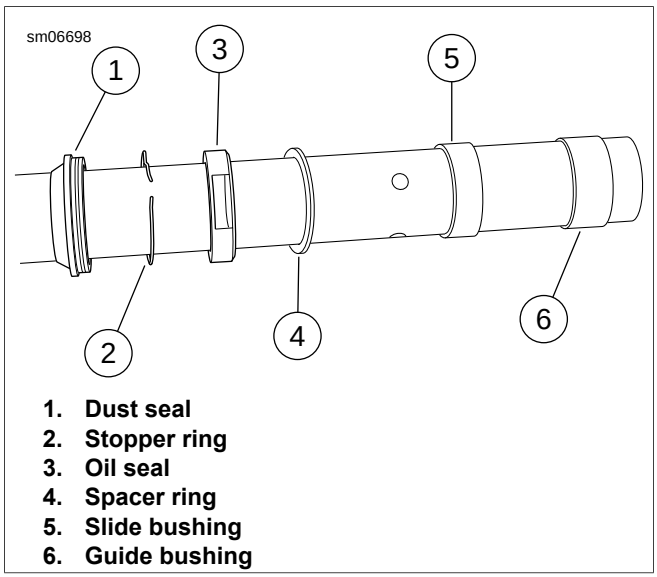
1. See Figure 2-155. Install on the inner fork tube:
   a. Dust seal (1)
   b. Oil seal stopper ring (2)
   c. Seal with the stamp side down (3)
   d. Seal spacer with the chamfer up (4)
   e. Guide bushing (6)
   f. Slide bushing (5)

NOTE

Do not use TYPE "E" HYDRAULIC FORK OIL to lubricate the components for assembly. Use BIG PISTON FORK OIL to lubricate the components for assembly.

2. Spread fork oil or sealing grease inside the lip of the oil seal.
3. Slide the inner tube into the outer tube.

4. See Figure 2-156. Seat the oil seal with the FORK SEAL DRIVER AND DUST BOOT INSTALLER (Part No. B-42571).
5. Snap the stopper ring into the groove in the outer tube.
6. Seat the dust seal with the seal driver.



1. **Dust seal**
2. **Stopper ring**
3. **Oil seal**
4. **Spacer ring**
5. **Slide bushing**
6. **Guide bushing**

Figure 2-155. Inner Tube Components

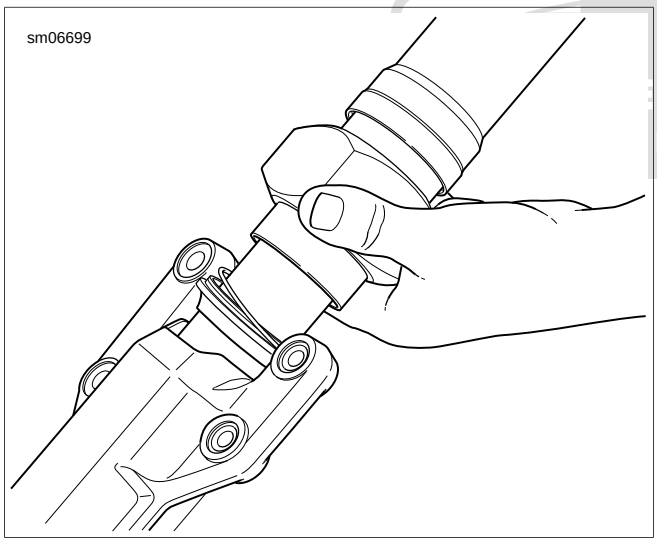


Figure 2-156. Seating the Oil Seal

Fill with Fork Oil

1. Mount the fork assembly in the FORK HOLDING TOOL (Part No. HD-41177) and fully compress the inner tube.

NOTE

Measure the fork spring. Replace as necessary. Refer to Table 2-22.

2. Install:
   a. Lower spring collar
   b. Fork spring
   c. Upper spring collar

NOTE

Do not use TYPE "E" HYDRAULIC FORK OIL in the XR 1200X forks.

3. Fill fork with BIG PISTON FORK OIL until the oil reaches the side hole in the inner tube.
4. Pump the outer tube 8-10 times to expel the air from the assembly.

NOTE

Do not damage the slide ring on the rod guide case.

5. Install the piston assembly:
   a. Guide the piston rod into the inner tube.
   b. Hand tighten the rod guide case to the inner tube.
   c. Gently pull up on the outer tube to fit the slider ring to the outer tube.
6. Using the ROD CASE GUIDE SOCKET (Part No. HD-50083), tighten to 66 ft-lbs (90 Nm).
7. Fill fork with addition BIG PISTON FORK OIL until the oil spills over the rod guide case.
8. Pump the piston assembly/outer tube several times to expel any additional air.

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9. See Figure 2-157. Use the OIL LEVEL GAUGE (Part No. B-59000B) to set the level of the oil in the outer fork tube to specification. Refer to Table 2-24.

Table 2-22. Minimum Spring Service Length

MODEL	in	mm
XR 1200X	13.65	346.6

Table 2-23. Fork Oil Volume

MODEL	oz	cm^3
XR 1200X	19.6	580

Table 2-24. Fork Oil Level

MODEL	in	mm
XR 1200X	1.77	45

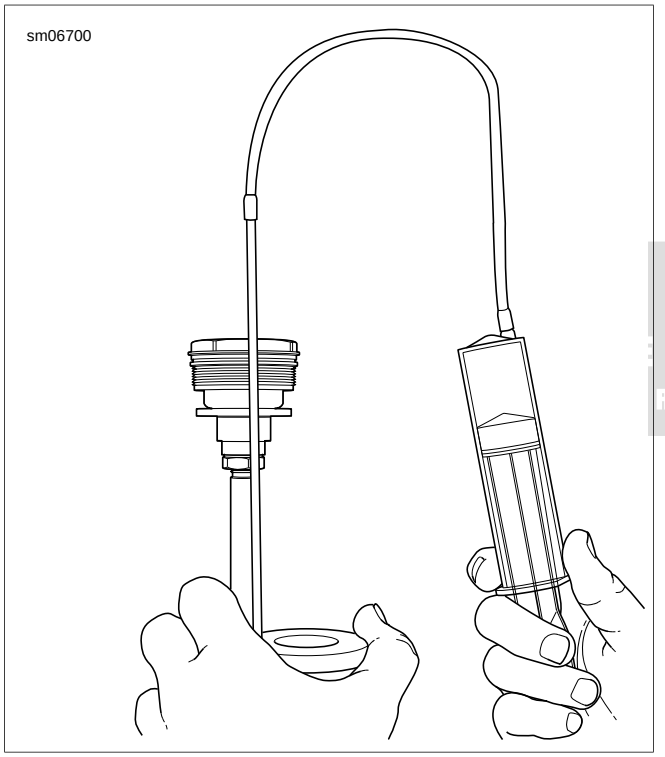


Figure 2-157. Drawing Off Excess Fork Oil

Complete Assembly

1. Use the FORK CAP WRENCH (Part No. HD-50084) to install the fork cap and tighten to 21-29 ft-lbs (29-39 Nm).
2. Adjust the preload to identical settings on both forks.

INSTALLATION

PART NUMBER	TOOL NAME
HD-48287	TRIPLE TREE WEDGE TOOL

FASTENER	TORQUE VALUE	
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm

NOTES

- *Fork tube installation height must match the opposite side exactly for proper vehicle operation, reliability and performance.*
- *When installing fork leg in fork brackets, do not twist fork leg to avoid damage to cosmetic finishes.*

1. Identify left and right side fork assemblies.
2. Insert fork assembly from the lower fork bracket upward through the upper fork bracket.
3. Remove TRIPLE TREE WEDGE TOOL (Part No. HD-48287) used during removal process.
4. See Figure 2-158. Measure fork tube installation height. Adjust fork tubes to specification. Refer to Table 2-25.

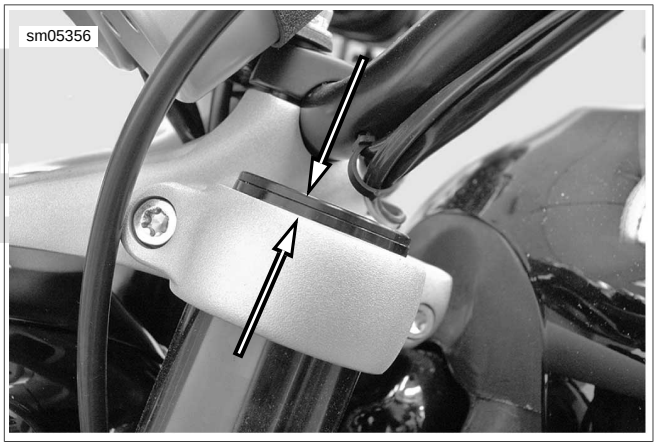


Figure 2-158. Fork Installation Height Measurement

Table 2-25. Fork Installation Height Specifications

MODEL	in	mm
XR 1200X	0.388-0.468	9.86-11.88

5. Tighten pinch bolts to 30-35 ft-lbs (40.7-47.5 Nm).
6. Install front fender and bracket. See 2.31 FRONT FENDER.
7. Install front brake caliper hydraulic lines and install front brake calipers. See 2.10 FRONT BRAKE CALIPER: XR 1200X.
8. Install front wheel and align the wheel to the forks. See 2.5 WHEELS.

FORK STEM AND BRACKET ASSEMBLY 2.21

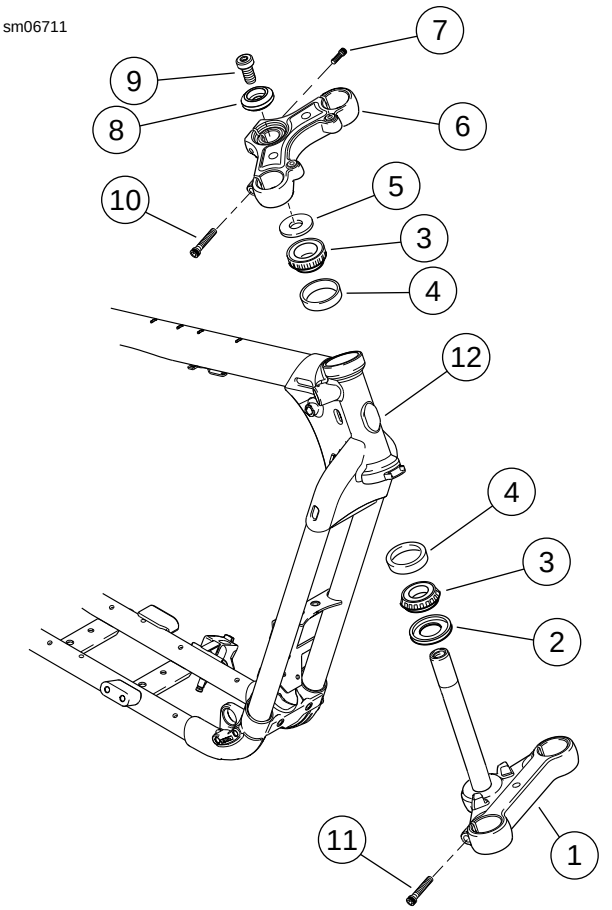
REMOVAL AND DISASSEMBLY

1. Cover the fuel tank.
2. Remove the fork assemblies. See 2.19 FRONT FORK: XL MODELS or 2.20 FRONT FORK: XR 1200X.
3. See Figure 2-159. Loosen fork stem pinch screw (7). Remove fork stem bolt (9) and washer (8).
4. Lift handlebar assembly from steering head with fork upper bracket (6) attached. Carefully position assembly out of the way. Exercise caution to avoid damaging control cables, wiring harnesses, clutch cable or brake lines.

NOTE

Only disconnect handlebar connections if removing as an assembly.

5. Remove upper seal (5) and upper bearing cone (3). Slide fork stem and lower bracket (1) from frame.



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 2-159. 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 2-159. 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 or scoring
   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 appeares to be good. Mismatched bearings can lead to excessive wear and premature replacement. (00532b)

5. Replace bearings and bearing cups as follows:
   a. The lower bearing cone is a slip fit on the fork stem. Remove lower bearing cone by sliding it up and off fork stem. If necessary, gently pry bearing cone off fork stem with a pair of flat blade screw drivers. Remove lower seal (2).
   b. 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). **If bearing cups are removed, the bearings cannot be reused. They must be replaced.**

ASSEMBLY AND INSTALLATION

PART NUMBER	TOOL NAME
HD-39302	STEERING HEAD BEARING RACE INSTALLATION TOOL

FASTENER	TORQUE VALUE	
Fork, front, stem bolt, 1st 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

1. See Figure 2-159. 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 2.19 FRONT FORK: XL MODELS or 2.20 FRONT FORK: XR 1200X. Leave both lower fork bracket pinch screws (11) loose.
7. Tighten fork stem bolt (9) to 23-27 ft-lbs (31.2-36.6 Nm). Loosen fork stem bolt, then retighten to 72-96 **in-lbs** (8.1-10.9 Nm).
8. Tighten lower fork bracket pinch bolt to 30-35 ft-lbs (40.7-47.5 Nm).
9. Tighten fork stem pinch screw (7) to 30-35 ft-lbs (40.7-47.5 Nm).
10. Adjust steering head bearing fall-away. See 1.19 STEERING HEAD BEARINGS, Fall-Away.

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BELT GUARD AND DEBRIS DEFLECTOR 2.22

BELT GUARD: XL MODELS

FASTENER	TORQUE VALUE	
Belt guard screw: XL Models	120-180 **in-lbs**	13.6-20.4 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

Removal

1. See Figure 2-160. 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 (10).

Installation

1. See Figure 2-160. 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 (10) 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 rear belt guard mounting hole. Thread locknut (1) on screw. Tighten to 45-50 ft-lbs (61-68 Nm).

DEBRIS DEFLECTOR: XL MODELS

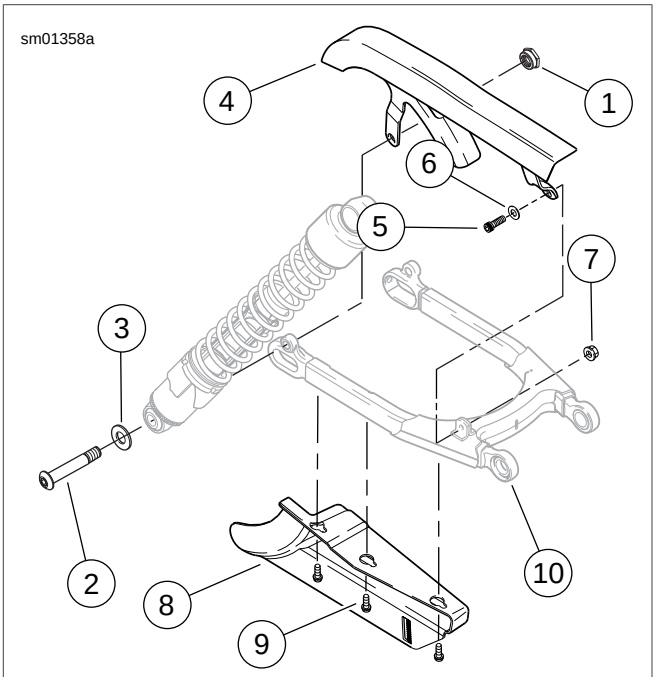
FASTENER	TORQUE VALUE	
Debris deflector screw: XL Models	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. See Figure 2-160. Loosen, but do not remove, three screws with captive washers (9) securing debris deflector (8) to underside of rear fork (10).
2. Slide debris deflector forward until keyway slots in deflector clear screw heads.

Installation

1. See Figure 2-160. Position debris deflector (8) in place on underside of rear fork (10).
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)**
10. **Rear fork**

Figure 2-160. Belt Guard/Debris Deflector: XL Models

BELT GUARD: XR 1200X

FASTENER	TORQUE VALUE	
Belt guard screw: XR 1200X	72-96 **in-lbs**	8.1-10.8 Nm

Removal

See Figure 2-161. Remove two screws with captive washers (2) securing belt guard to top of rear fork (5).

Installation

1. See Figure 2-161. Slide belt guard (1) into place on top of rear fork (5).
2. Install two screws with captive washers (2).
3. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).

DEBRIS DEFLECTOR: XR 1200X

FASTENER	TORQUE VALUE	
Debris deflector screw: XR 1200X	72-96 **in-lbs**	8.1-10.8 Nm

Removal

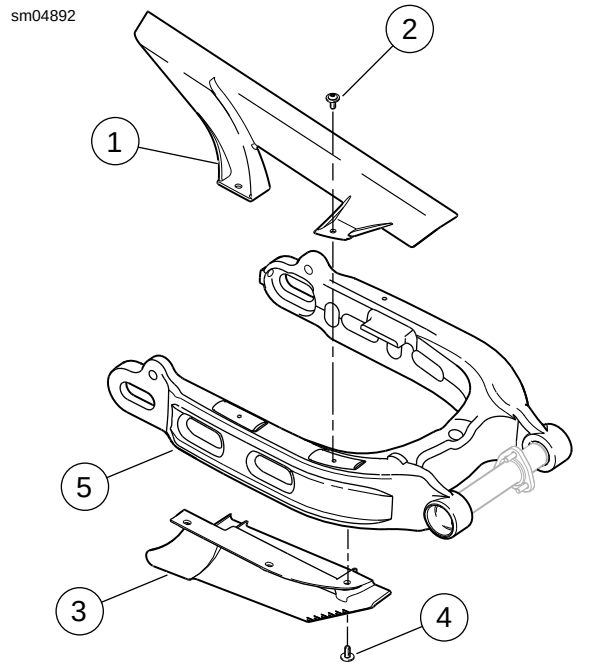
NOTE

Front screw is located inboard of debris deflector.

See Figure 2-161. Remove three screws with captive washers (4) securing debris deflector (3) to underside of rear fork (5).

Installation

1. See Figure 2-161. Position debris deflector (3) in place on underside of rear fork (5).
2. Install three screws (4).
3. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).



1. **Belt guard**
2. **Screw with captive washer (2)**
3. **Debris deflector**
4. **Screw with captive washer (3) (front screw inboard of debris deflector)**
5. **Rear fork**

Figure 2-161. Belt Guard/Debris Deflector: XR 1200X

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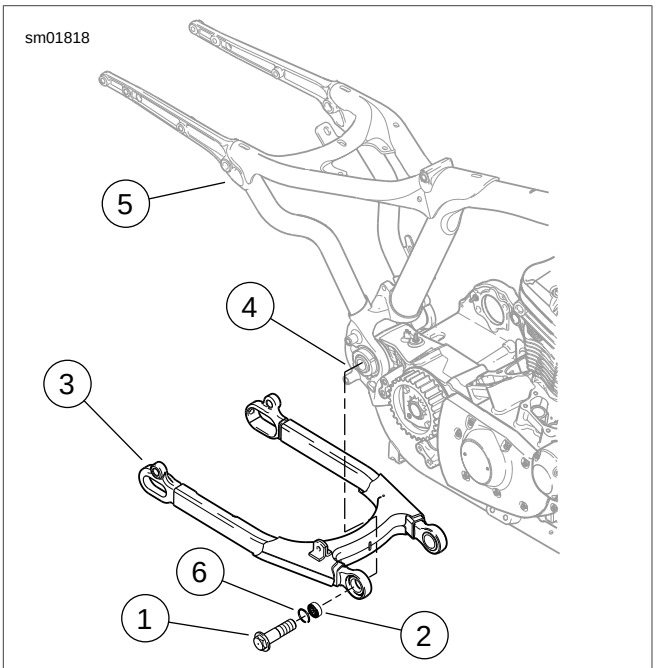
REAR FORK 2.23

REMOVAL

NOTE

Label hardware for location and orientation upon removal.

1. Position motorcycle on a suitable lift.
2. **XL models:** Remove rear exhaust pipe and muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.
3. **XR 1200X:** Remove exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
4. Remove rear wheel. See 2.5 WHEELS.
5. Remove rear brake caliper assembly from rear fork. See 2.14 REAR BRAKE CALIPER: XL MODELS or 2.15 REAR BRAKE CALIPER: XR 1200X.
6. Remove screw(s) securing brake line clamp(s) to rear fork.
7. **XR 1200X:** Remove fasteners securing brake line to left side of rear fork.
8. Remove both shock absorber screws, washers and nuts from rear fork. See 2.24 SHOCK ABSORBERS.
9. Remove rear belt guard and debris deflector. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
10. **XL Models:** Remove rear brake reservoir cover by grasping cover and gently pulling straight out from reservoir. Remove reservoir mounting screw and pull reservoir back out of the way. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
11. **XL Models:** Loosen, but do not remove, top mounting screw from left passenger footrest bracket. Remove bottom mounting screw. Move brake hoses and clamp forward slightly to gain access to left rear fork/engine mount bolt.
12. **XR 1200X:** Remove left and right rider footrests. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
13. See Figure 2-162. Support rear fork (3). Remove rear fork/engine mount bolts (1) and pull fork assembly from frame.



1. **Bolt (2)**
2. **Bearing (2)**
3. **Rear fork**
4. **Pivot shaft**
5. **Frame**
6. **Retaining ring**

Figure 2-162. Rear Fork Assembly

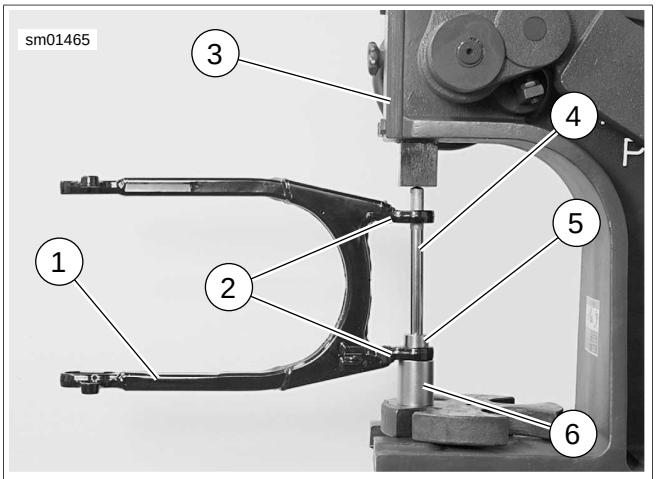
DISASSEMBLY

PART NUMBER	TOOL NAME
HD-46281	BEARING REMOVER/INSTALLER TOOL

NOTE

See Figure 2-162. Remove pivot bearings (2) only if replacement is required.

1. See Figure 2-163. Using BEARING REMOVER/INSTALLER TOOL (Part No. HD-46281) (4, 5, 6), carefully press bearing assemblies from fork bearing bosses (2):
   a. Place receiver cup (6) on press bed, with recessed end of cup facing up.
   b. Place rear fork pivot bearing boss (2) over cup as shown in the photo.
   c. Slide pilot (5) through bearing and into receiver cup.
   d. Insert handle (4) through other rear fork pivot bearing boss and bearing, down into pilot.
   e. Engage press ram on end of handle and press bearing out.
2. Turn rear fork over. Press out the opposite pivot bearing.



1. **Rear fork**
2. **Pivot bearing boss**
3. **Press**
4. **Handle**
5. **Pilot**
6. **Receiver cup**

Figure 2-163. 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. Blow dry with low pressure compressed air.
3. Carefully inspect bearings for wear and/or corrosion. Replace as necessary.
4. See Figure 2-162. Make sure pivot bearing retaining ring (6) is not bent or damaged. If it is, replace it with a **new** retaining ring.
5. Make sure retaining ring is fully seated in the groove in each bearing (2).
6. Check that rear fork (3) is not bent, twisted or cracked. Replace as necessary.

ASSEMBLY

PART NUMBER	TOOL NAME
HD-46281	BEARING REMOVER/INSTALLER TOOL

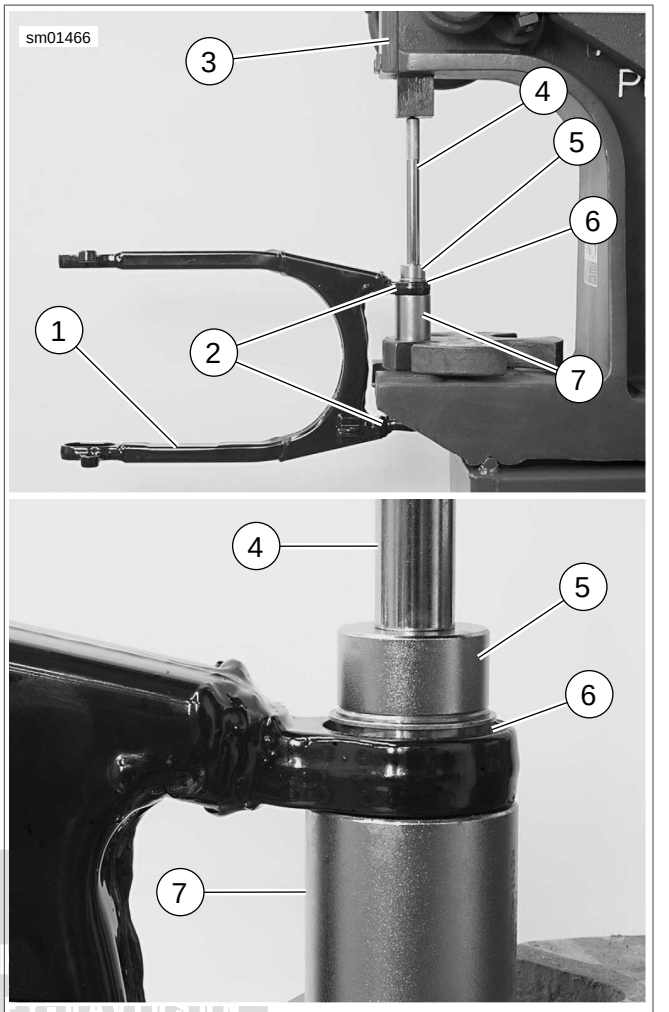
1. See Figure 2-162. If necessary, press **new** bearings (2) into position in rear fork, using BEARING REMOVER/INSTALLER TOOL (Part No. HD-46281):
   a. See Figure 2-164. Place receiver cup (7) on press bed, with recessed end of cup facing up.
   b. Place rear fork pivot bearing boss (2) over cup as shown in the photo.
   c. Place **new** pivot bearing (6) over pivot bearing boss, with retaining ring side of bearing up.
   d. Slide pilot (5) through **new** pivot bearing, through pivot bearing boss, and into receiver cup.
   e. Insert handle (4) down into pilot.
   f. Engage press ram on end of handle and press bearing down until retaining ring bottoms out in rear fork pivot bearing boss.
2. Turn rear fork over. Press the other pivot bearing into rear fork pivot bearing boss.

INSTALLATION

FASTENER	TORQUE VALUE	
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm
Footrest mount fastener	45-50 ft-lbs	61-68 Nm
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm

1. Slide rear fork assembly into position on motorcycle.
2. See Figure 2-162. Holding rear fork assembly in position, install rear fork/engine mount bolts (1). Tighten to 60-70 ft-lbs (81.4-95.0 Nm).
3. **XL Models:** Position rear brake hose clamp and left passenger footrest bracket in place. Install lower mounting screw. Tighten both mounting screws to 45-50 ft-lbs (61-68 Nm).
4. **XL Models:** Install rear brake reservoir using screw with captive washer. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm). Place reservoir cover over reservoir and gently press cover into place. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
5. **XR 1200X:** Install left and right rider footrests. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
6. Install belt guard and debris deflector. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
7. Install shock absorbers onto rear fork. See 2.24 SHOCK ABSORBERS.

8. Install rear brake caliper assembly. See 2.14 REAR BRAKE CALIPER: XL MODELS or 2.15 REAR BRAKE CALIPER: XR 1200X.
9. **XR 1200X:** Secure rear brake line to left side of fork. See 2.16 BRAKE LINES.
10. Install rear wheel and adjust rear belt. See 2.5 WHEELS.
11. **XL Models:** Install rear exhaust pipe and muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.
12. **XR 1200X:** Install exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.



1. **Rear fork**
2. **Pivot bearing boss**
3. **Press**
4. **Handle**
5. **Pilot**
6. **Bearing**
7. **Receiver cup**

Figure 2-164. Installing Rear Fork Pivot Bearings

SHOCK ABSORBERS 2.24

REMOVAL

NOTES

- *If a lift is not available, remove and install one shock absorber at at time.*
- *If necessary to remove saree guards, see 2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India).*

1. Note the shock absorber settings.
   a. **All Models:** Preload.
   b. **XR 1200X:** Rebound and compression.
2. See Figure 2-165. Remove fastener (1), washer (2) and locknut (3) from bottom end of the shock absorber (4 or 5).
3. Remove the fastener (6) and washer (7 or 2) from top end of shock absorber.
4. **XL Models:** Remove the stud cover (8).
5. Remove the shock absorber.

CLEANING AND INSPECTION

NOTE

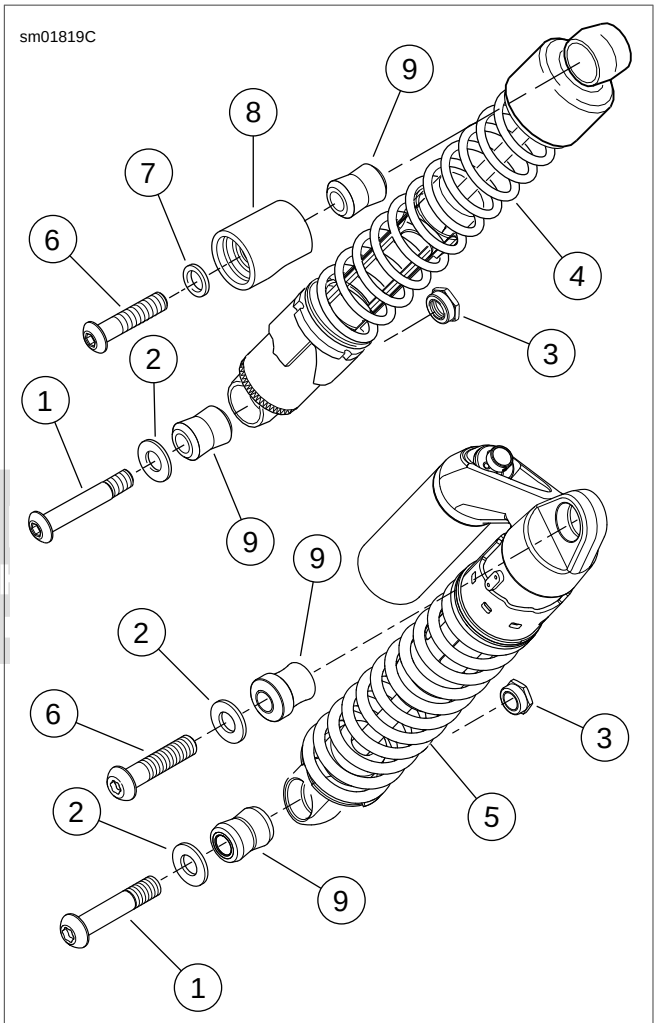
Replace shock absorbers as set if either unit is damaged.

1. Clean and inspect all parts for wear and damage.
2. Check rubber bushings for wear, cracking and stiffness.
3. Examine shock absorber for signs of leakage.

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

1. See Figure 2-165. Assemble the upper fastener stack.
   a. **XL Models:** Assemble the upper fastener (6), the washer (7) and the stud cover (8).
   b. **XR 1200X:** Assemble the upper fastener (6) and the washer (2).
2. Install shock absorber mounting stack through the shock absorber (4 or 5).
3. Position bottom end of shock absorber against outboard side of rear fork mount. Insert mounting bolt (1) and washer (2) through the damper bushing (9) and the rear fork mount.
4. Thread on the locknut (3).
5. Remove the upper mounting bolt and apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads.
6. Install the mounting bolt into the frame boss. Tighten to 45-50 ft-lbs (61-68 Nm).
7. Tighten the lower shock absorber locknut to 45-50 ft-lbs (61-68 Nm).
8. Adjust the shock absorber to the original settings.
   a. **All Models:** Preload.
   b. **XR 1200X:** Rebound and Compression.



1. **Mounting bolt**
2. **Washer**
3. **Locknut**
4. **Shock absorber: XL models**
5. **Shock absorber: XR 1200X**
6. **Mounting bolt**
7. **Washer**
8. **Stud cover: XL models**
9. **Damper bushing**

Figure 2-165. Shock Absorbers: All Models

SHOCK DISPOSAL: SCHRADER VALVE MODELS

1. Remove the shock.
2. See Figure 2-166. Locate the valve.

NOTE

Cap may require pliers to remove.

3. Remove the valve cap.

WARNING

Discharging pressurized oil and gas can pierce skin and cause flying debris, which could cause serious injury. Wear safety glasses and gloves. (00601b)

4. Press the valve stem with a flat blade screwdriver to release the gas.
5. Dispose of the shock.

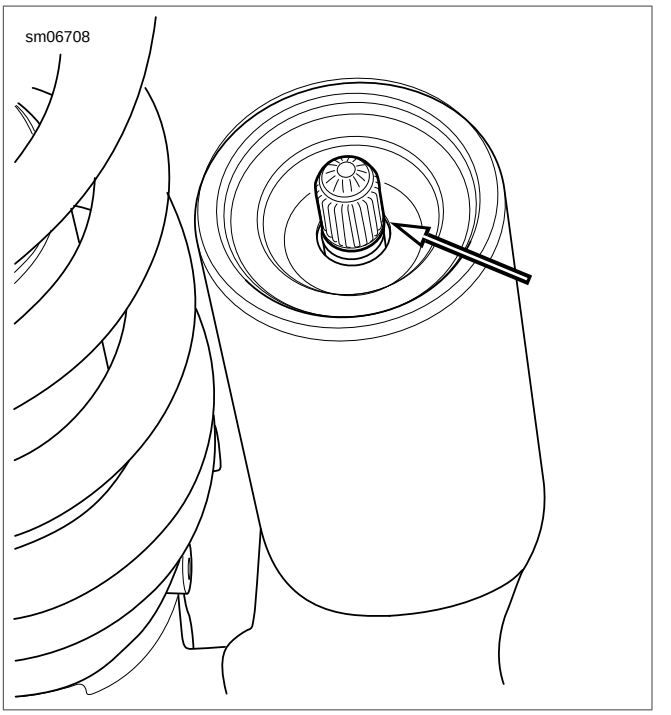


Figure 2-166. Schrader Valve Location: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

STABILIZER LINKS 2.25

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, 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
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm

Removal

1. See Figure 2-167. Remove screws (4) and stabilizer link (2).

NOTE

Models with a side-mounted horn do not include a horn bracket (9).

2. Remove screws (5), washers (8), horn bracket (9) and upper frame bracket (3) from frame.
3. Remove screws (6), lockwashers (7) and engine bracket (1) from front cylinder head.

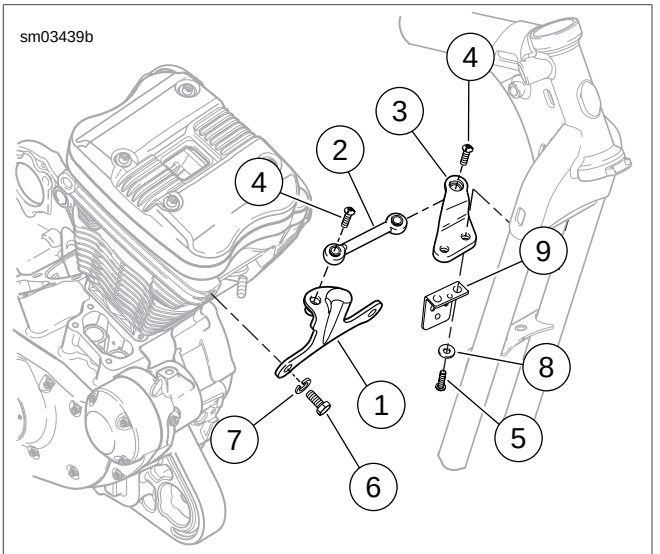
Installation

1. See Figure 2-167. 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).
3. Install stabilizer link (2) with screws (4). 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 2-167. Upper Front Stabilizer Link Assembly

LOWER FRONT STABILIZER LINK

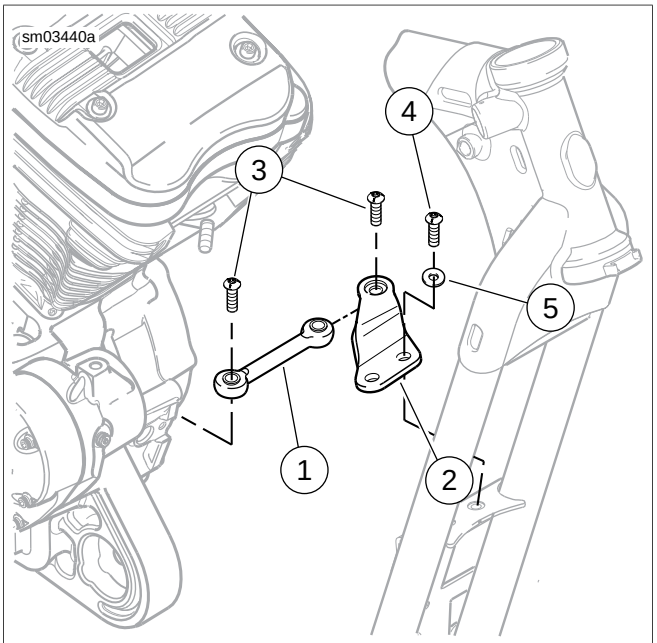
FASTENER	TORQUE VALUE	
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm

Removal

1. Position motorcycle upright on suitable lift.
2. See Figure 2-168. Remove screws (3) and stabilizer link (1).
3. Remove screws (4), washers (5) and lower frame bracket (2) from frame.

Installation

1. See Figure 2-168. 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 (1). Secure with screws (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 2-168. Lower Front Stabilizer Link Assembly (typical)

REAR STABILIZER LINK

FASTENER	TORQUE VALUE	
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm

Removal

1. **Motorcycles Equipped with EVAP Controls:** Remove EVAP canister and mounting bracket. See 4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister.
2. See Figure 2-169. Remove short screw (3), long screw (4), ground strap (2), stabilizer link (1) and spacer (5).

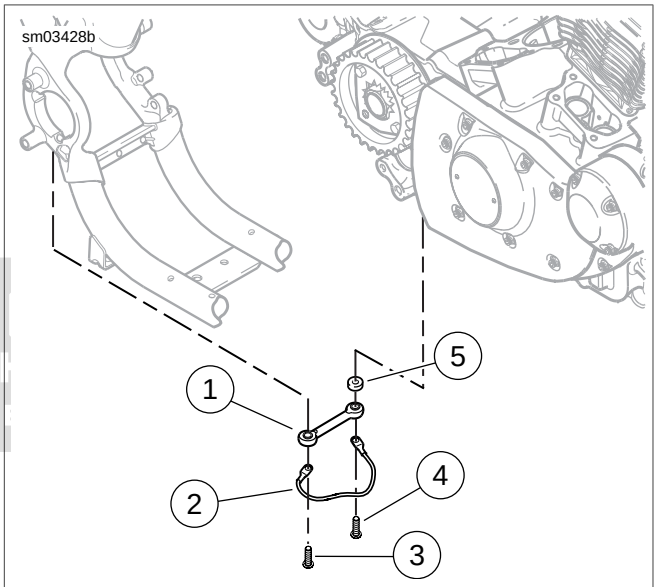
Installation

1. See Figure 2-169. Install short screw (3) through ground strap (2) and stabilizer link (1). Thread screw into frame on right side of motorcycle. Do not tighten at this time.
2. Install long screw (4) through ground strap, stabilizer link and spacer (5) into engine case.

NOTES

- ***XL Models:*** *Orient the ground strap so it does not come into contact with the EVAP canister mounting hardware.*
- ***XR 1200X:*** *Check that the ground strap does not contact the rear stop switch harness before tightening stabilizer link screws.*

3. Tighten both screws to 25-35 ft-lbs (33.9-47.5 Nm).
4. **Motorcycles Equipped with EVAP Controls:** Install EVAP canister and mounting bracket. See 4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister.



1. **Stabilizer link**
2. **Grounding strap**
3. **Screw**
4. **Screw**
5. **Spacer**

Figure 2-169. Rear Stabilizer Link Assembly (typical)

FRONT ENGINE MOUNT/ISOLATOR 2.26

REMOVAL

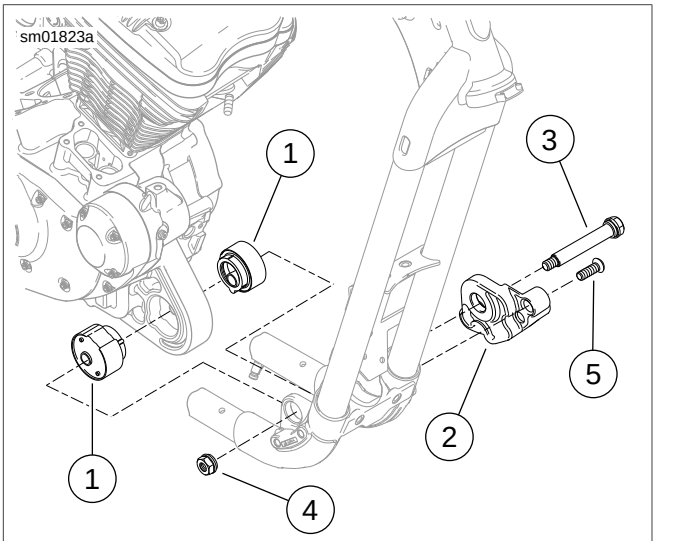
PART NUMBER	TOOL NAME
HD-45968	FAT JACK

1. Position motorcycle on a suitable lift.
2. Remove the exhaust system. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
3. **XR 1200X:** Remove the air box assembly. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
4. Loose the rear axle and drive belt. See 5.6 DRIVE BELT.
5. **XL Models with Forward Mount Controls:** Remove both forward control assemblies. See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
6. Support front of engine with FAT JACK (Part No. HD-45968) and suitable blocks.
7. See Figure 2-167. Remove screw (4) securing upper front stabilizer link (2) to stabilizer link bracket (3).
8. See Figure 2-168. Remove screw (3) securing lower front stabilizer link (1) to stabilizer link bracket (2).
9. See Figure 2-169. Remove screw (4) from left end of rear stabilizer link (1) and ground strap (2). Remove spacer (5).

NOTE

See Figure 2-170. Jack the engine up or down to remove bolt (3).

10. Remove nut (4) and bolt (3) from front engine mount/isolator assembly.
11. Remove screws (5) from front isolator mount (2) on left side of motorcycle. Remove isolator mount and left front isolator (1).
12. Without damaging the wire harness caddy, raise the front of the engine.
13. Without damaging the frame downtube, carefully pry front end of engine to the left approximately 1.0 in (25.4 mm).
14. Remove the right front isolator (1) from the crankcase.



1. **Isolator**
2. **Front isolator mount**
3. **Bolt**
4. **Nut**
5. **Screw (2)**

Figure 2-170. Front Engine Mount/Isolator

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 2-170. Install both front isolators (1) in engine mounting boss on front of crankcase. Note that each isolator has a half-moon tab and fits into engine mounting boss in only one way. Push engine to the 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 2-168. 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 2-167. 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 2-169. 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 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
10. Install the exhaust system. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
11. **XR 1200X:** Install the air box assembly. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
12. Adjust the drive belt and tighten the rear axle. See 5.6 DRIVE BELT.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR ENGINE MOUNT/ISOLATOR 2.27

REMOVAL

PART NUMBER	TOOL NAME
HD-45967	SHOP DOLLY
HD-45968	FAT JACK

1. **XR 1200X:** Remove the air box assembly. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
2. Remove exhaust system. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
3. With the aid of a FAT JACK (Part No. HD-45968), support motorcycle on SHOP DOLLY (Part No. HD-45967).

NOTE

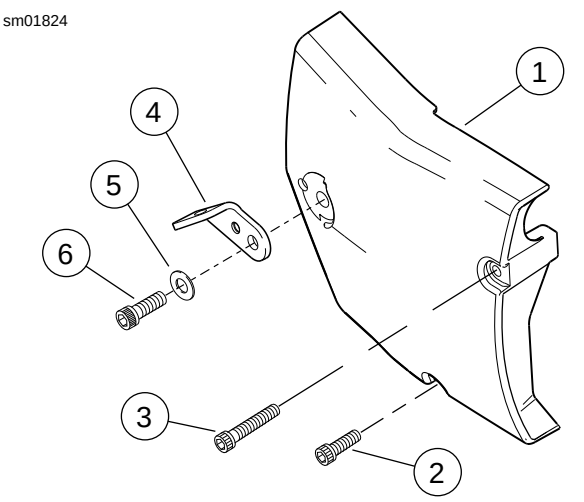
Position vehicle on SHOP DOLLY so that FAT JACK may be used (with the aid of suitable blocks) to support engine when rear engine mount is removed.

4. Remove sprocket cover.
   a. **XL Models:** See Figure 2-171. Remove screw (6), washer (5) and exhaust pipe clamp bracket (4). Remove two screws (2, 3). Remove sprocket cover (1).
   b. **XR 1200X:** See Figure 2-172. Remove screw and washer (2) and screws (3, 4). Remove sprocket cover (1).
5. Loosen rear axle and remove rear drive belt. See 5.6 DRIVE BELT.
6. **XL Models with Passenger Footrests:** Remove left passenger footrest assembly. See 2.43 PASSENGER FOOTRESTS.
7. **XR 1200X:** Remove left and right rider controls and brackets. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
8. Unbolt rear brake master cylinder remote reservoir. Do not disconnect hose from reservoir. Secure reservoir to vehicle in an upright position, out of the way. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
9. Support rear fork assembly using vehicle tiedown straps.
10. See Figure 2-173. Remove rear fork pivot bolts (1).
11. Pull rear fork back far enough to clear rear engine mounts and isolators.
12. **Motorcycles Equipped with EVAP:** Remove EVAP canister and mounting bracket. See 4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister.
13. See Figure 2-169. Remove screws (3, 4) securing rear stabilizer link (1). Remove stabilizer link, ground strap (2), and spacer (5).
14. See Figure 2-167. Remove screw (4) securing upper front stabilizer link (2) to stabilizer link bracket (3).
15. See Figure 2-168. Remove screw (3) securing lower front stabilizer link (1) to stabilizer link bracket (2).
16. Support rear of engine with lifting device and suitable blocks.
17. See Figure 2-173. Remove two screws (7) securing rear isolator mount (2) to left side of frame. Remove isolator mount and left isolator (3).
18. Remove three screws (6) securing rear pivot lockplate (5) to rear of engine case. Remove lockplate and rear fork pivot shaft (4).

NOTE

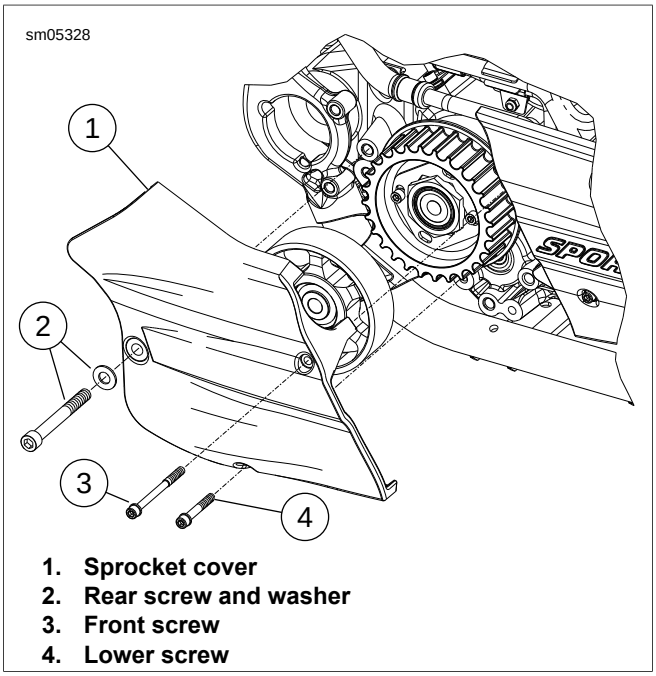
Engine may need to be jacked up or down slightly to aid in removing pivot shaft.

19. Carefully pry rear end of engine to the left approximately 1.0 in (25.4 mm). Remove right rear isolator (3) from frame.



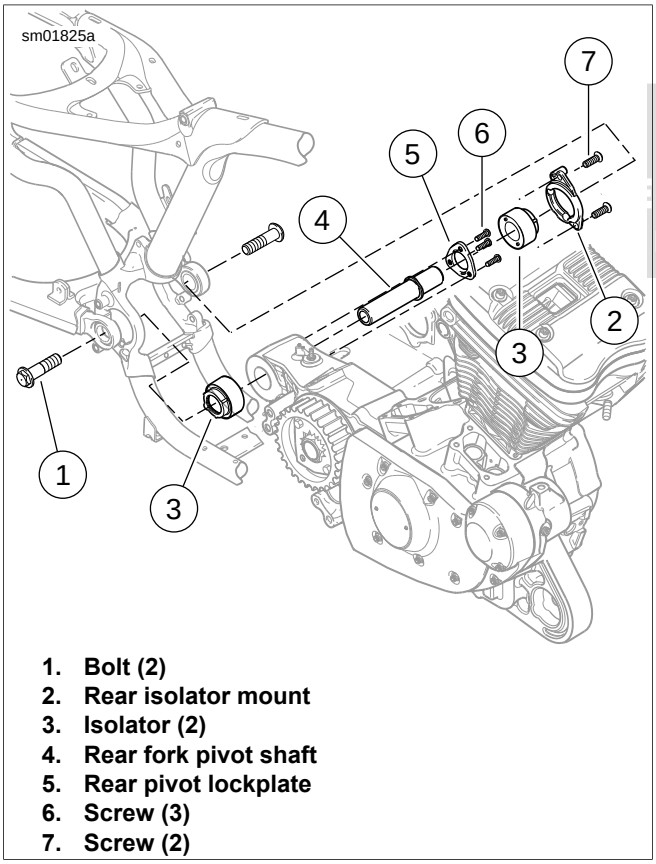
1. **Sprocket cover**
2. **Screw**
3. **Screw**
4. **Exhaust pipe clamp bracket**
5. **Washer**
6. **Screw**

Figure 2-171. Sprocket Cover: XL Models



1. **Sprocket cover**
2. **Rear screw and washer**
3. **Front screw**
4. **Lower screw**

Figure 2-172. Sprocket Cover: XR 1200X



1. **Bolt (2)**
2. **Rear isolator mount**
3. **Isolator (2)**
4. **Rear fork pivot shaft**
5. **Rear pivot lockplate**
6. **Screw (3)**
7. **Screw (2)**

Figure 2-173. Rear Engine Mount/Isolator: Typical (XL Models)

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, lower front, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 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
Sprocket cover, rear 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 2-173. Install **new** right rear isolator (3) into frame, lining up tabs on isolator with slots in frame. Slide rear end of engine to the right until engine mounting boss on rear of crankcase contacts right isolator.
2. Slide rear fork pivot shaft (4) through engine mounting boss.

NOTE

Engine may need to be moved 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 2-167. 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 2-168. 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 2-169. 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).

NOTE

XR 1200X: *Check that the ground strap does not contact the rear stop switch harness before tightening stabilizer link screws.*

10. **Motorcycles Equipped with EVAP:** Install EVAP canister and mounting bracket. See 4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister.
11. See Figure 2-173. Slide rear fork forward into position. Install rear fork pivot/engine mount bolts (1). Tighten to 60-70 ft-lbs (81.4-95.0 Nm). Remove vehicle tiedown straps supporting rear fork.
12. Install rear brake master cylinder remote reservoir. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
13. **XL Models equipped with Passenger Footrests:** Install left passenger footrest assembly. See 2.43 PASSENGER FOOTRESTS.
14. **XR 1200X:** Install left and right rider foot controls and brackets. See 2.42 RIDER FOOT CONTROLS: XR 1200X.
15. Install and adjust rear drive belt and tighten rear axle. See 5.6 DRIVE BELT.
16. **XL Models:** Install sprocket cover.
    a. See Figure 2-171. Install sprocket cover (1). Secure with two screws (2, 3). Note that long screw goes in top hole, short screw in bottom hole. Do not tighten screws at this time.
    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. **XR 1200X:** Install sprocket cover.
    a. See Figure 2-172. Tighten screw (2) to 30-33 ft-lbs (40.7-44.7 Nm).
    b. Tighten screws (3, 4) to 80-120 **in-lbs** (9.0-13.6 Nm).
18. Install exhaust system. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
19. **XR 1200X:** Install the air box assembly. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

THROTTLE CABLES: ALL MODELS 2.28

REMOVAL AND DISASSEMBLY

⚠WARNING

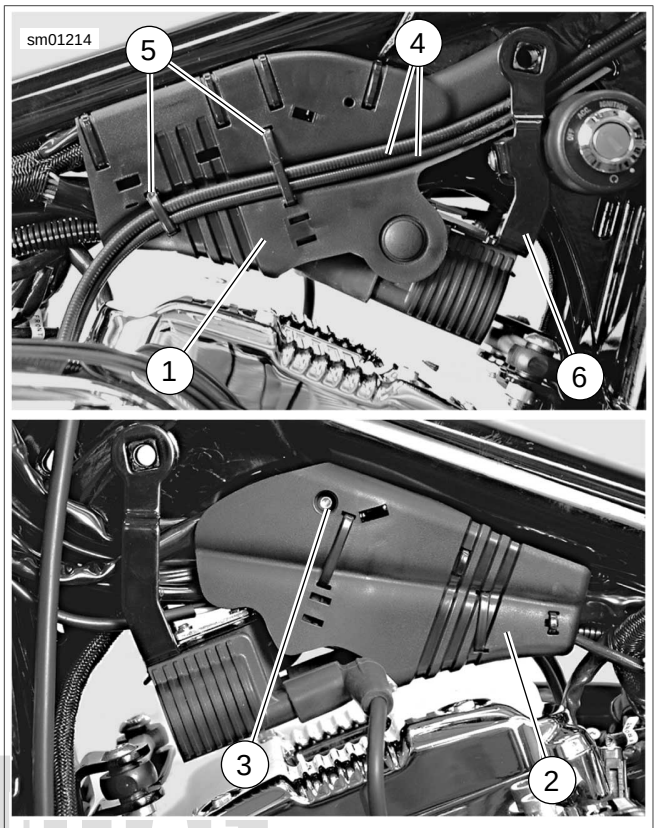
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠WARNING

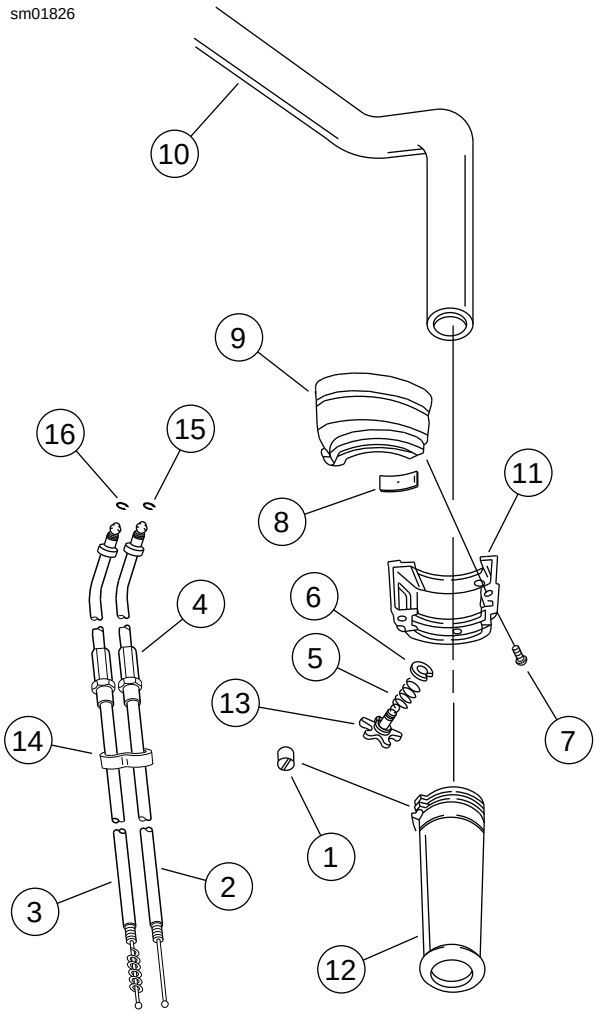
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. **XL Models:**
   a. See Figure 2-174. Remove screw (3) securing left wire harness caddy (2) to right wire harness caddy (1). See 6.28 ELECTRICAL CADDIES. Separate left wire harness caddy from right wire harness caddy.
   b. Cut cable straps (5) securing throttle cables (4) to right wire harness caddy. Remove and discard cable straps.
   c. Disengage ignition coil bracket (6) uprights from frame bosses and remove throttle cables from recess in right wire harness caddy.
6. See Figure 2-175. Slide rubber boot off each cable adjuster (4).
7. See Figure 2-176. Loosen jamnut (5) on each adjuster (6). Turn adjusters in direction which will shorten cable housings to minimum length.
8. See Figure 2-175. Remove two screws (7) and separate upper housing (9) from lower housing (11).
9. Unhook ferrules (1) and cables (2, 3) from throttle control grip (12) and lower housing (11).
10. **XR 1200X:** See Figure 2-178. Disengage cables from retainer (2) on lower fork bracket. Disengage cables from loop retainer (3) located under fuel tank.
11. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V, 4.3 AIR CLEANER ASSEMBLY, XL 1200V or 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
12. Disconnect cables from induction module.
13. See Figure 2-175. Remove friction spring (8), throttle friction screw (13) and spring (5) from lower housing.



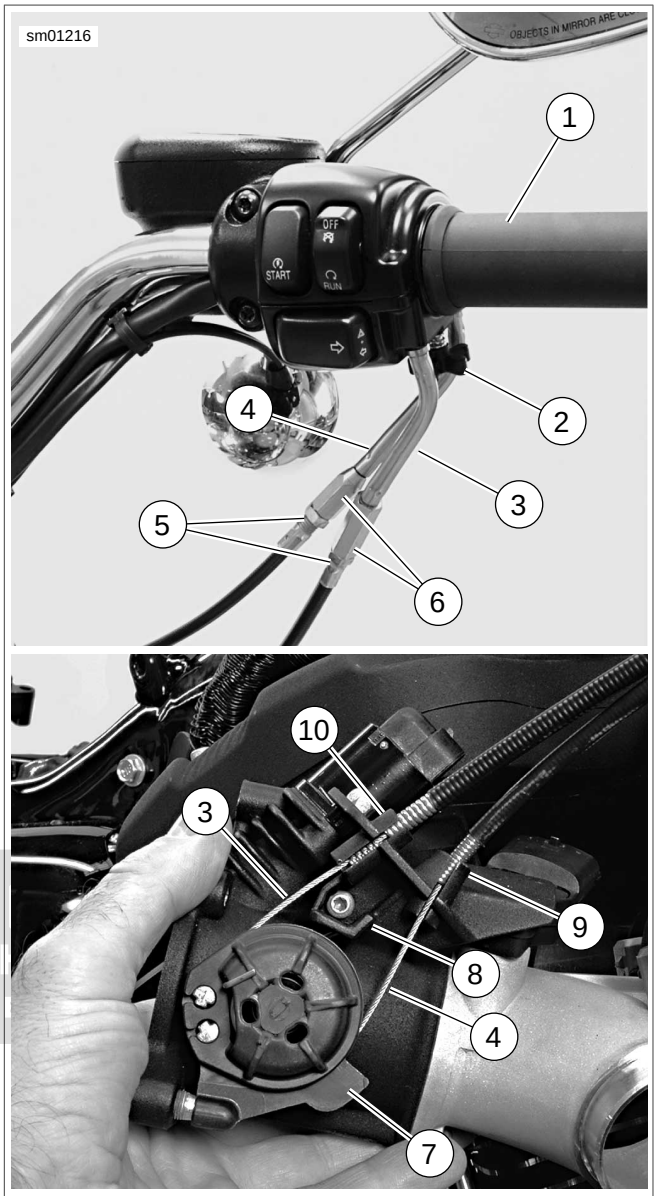
1. **Right wire harness caddy**
2. **Left wire harness caddy**
3. **Screw**
4. **Throttle cables**
5. **Cable straps**
6. **Ignition coil bracket**

Figure 2-174. Wire Harness Caddy Assembly: XL Models



1. Ferrule (2)
2. Throttle control cable assembly
3. Idle control cable assembly
4. Cable adjuster (2)
5. Spring
6. Retaining ring
7. Screw (2)
8. Friction spring
9. Upper housing
10. Handlebar
11. Lower housing
12. Throttle control grip
13. Throttle friction screw
14. Throttle cable clip
15. Throttle retaining ring
16. Idle retaining ring

Figure 2-175. Throttle Control, Right Handlebar



1. Throttle control grip
2. Throttle friction screw
3. Idle control (pull-close) cable
4. Throttle control (pull-open) cable
5. Jamnut (2)
6. Cable adjuster (2)
7. Throttle cam
8. Cam stop
9. Idle control cable guide (on throttle body)
10. Throttle control cable guide (on throttle body)

Figure 2-176. Throttle/Idle Control Cable (typical)

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.

ASSEMBLY AND INSTALLATION

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

1. See Figure 2-175. Apply a light coating of graphite to the handlebar (10) and the inside surface of the upper and lower housings (9, 11).
2. Install spring (5), throttle friction screw (13) and friction spring (8) in lower housing (11).
3. Attach cable assemblies (2, 3) to lower housing. See Figure 2-176. Throttle control cable (4) has a 5/16 in (7.9 mm) fitting end and is positioned to front of lower housing. Idle control cable (3) has a 1/4 in (6.3 mm) fitting end and is positioned to rear of lower housing.
4. See Figure 2-175. Connect cables:
   a. Install throttle control grip (12) over end of right handlebar (10).
   b. Position lower housing (11) onto right handlebar, engaging lower housing with throttle control grip.
   c. Position ferrules (1) over cable ball ends.
   d. Seat ferrules (with cables attached) in their respective notches of the throttle control grip.
5. Install upper housing (9) over handlebar. Install the lower housing using screws (7). Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
6. **XL Models:** See Figure 2-177. Route the cables:
   a. Point the cables forward from the throttle control grip and the front fork upper bracket.
   b. Turn the cables downward between right slider tube and headlamp.
   c. Route the cables rearward along right side of frame steering head and frame backbone.
   d. Turn the cables over the ignition switch housing.
   e. Pass the cables between the coil bracket and frame.
   f. Route the cables downward to the induction module.
7. **XR 1200X:** See Figure 2-178. Route the cables:
   a. Route the cables forward between right fork and brake hose (1).
   b. Turn the cables back between the forks above the lower fork bracket.
   c. Pass the cables through the wire retainer (2) on the lower fork.
   d. Route the cables above the front cylinder toward the induction module.
8. See Figure 2-176. Install idle control cable (3) housing into inboard (idle) cable guide (9) on induction module.
9. Install throttle control cable (4) housing and spring into outboard cable guide (10) on induction module.

NOTE

The forward cable strap secures the instrument connector [20]. The rear cable strap secures wiring harnesses on other side of caddy wall.

10. **XL Models:** See Figure 2-174. Place throttle cables (4) into channel in right wire harness caddy (1). Secure with two cable straps (5).

⚠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)

11. **XL Models:** See Figure 2-174. Mount left wire harness caddy (2) to right wire harness caddy (1). Secure with screw (3) and tighten.
    a. Do not pinch the cables between the frame and/or forks.
    b. Verify that the cables do not pull tight when the handlebar is turned full lock left and right.
12. Adjust control cables. See 1.13 THROTTLE CONTROL, Cable Adjustment.
13. Install air cleaner assembly.
14. Install fuel tank and connect fuel hose. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
15. **XR 1200X:** See Figure 2-178. Secure cables in loop retainer (3). Attach retainer to the bottom of the 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)

16. Install seat.
17. Install main fuel.

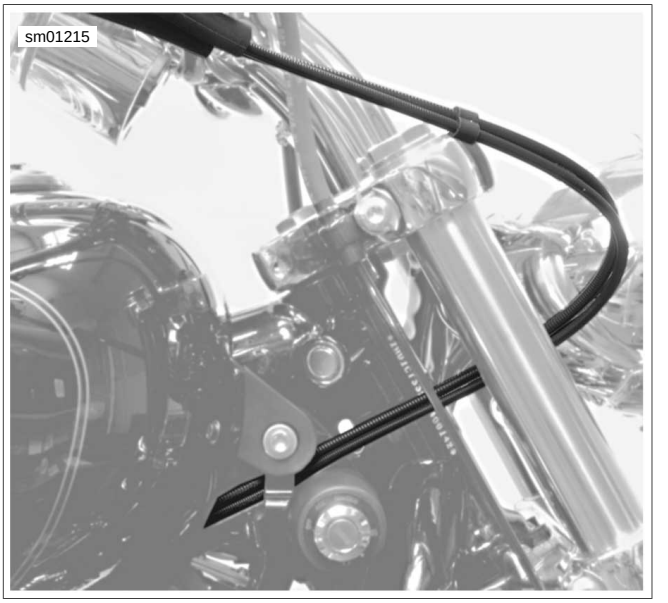
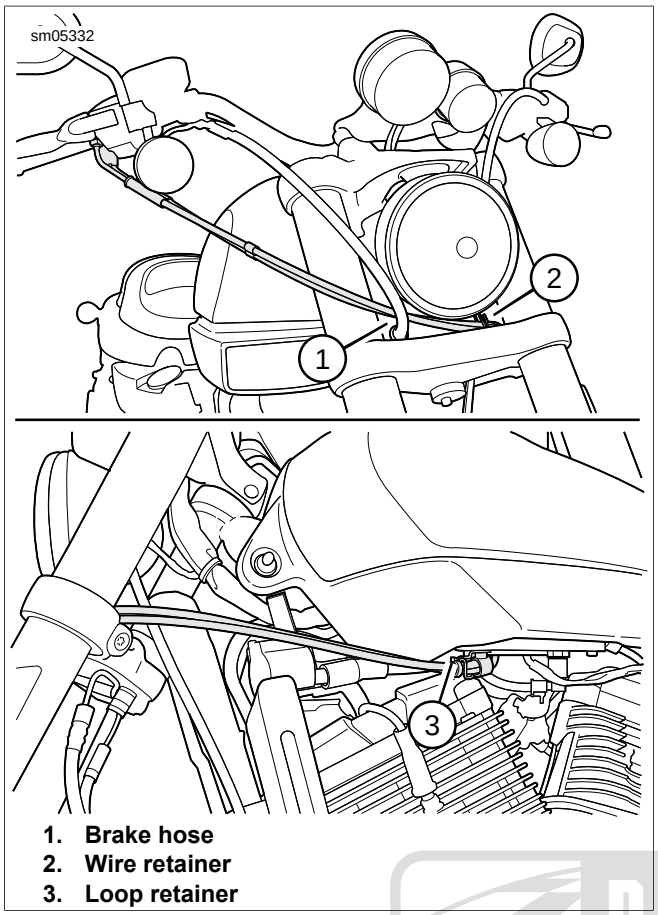


Figure 2-177. Throttle Control Cable Routing: XL Models



1. Brake hose
2. Wire retainer
3. Loop retainer

Figure 2-178. Throttle Control Cable Routing: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CLUTCH CONTROL 2.29

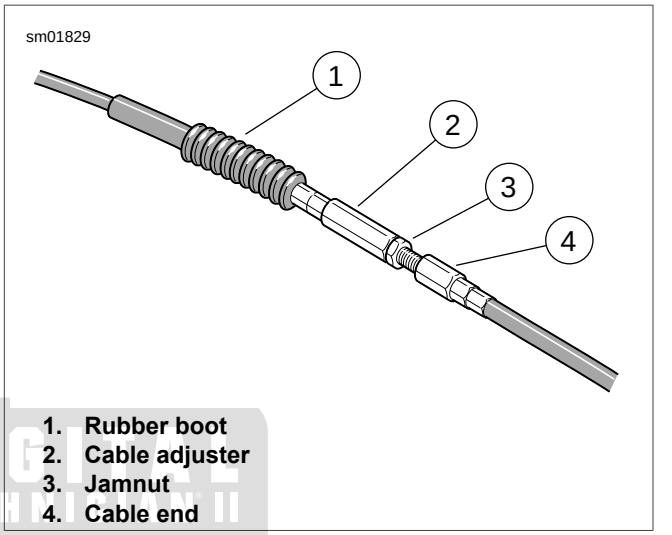
REMOVAL AND DISASSEMBLY

Clutch Cable: Lower

WARNING

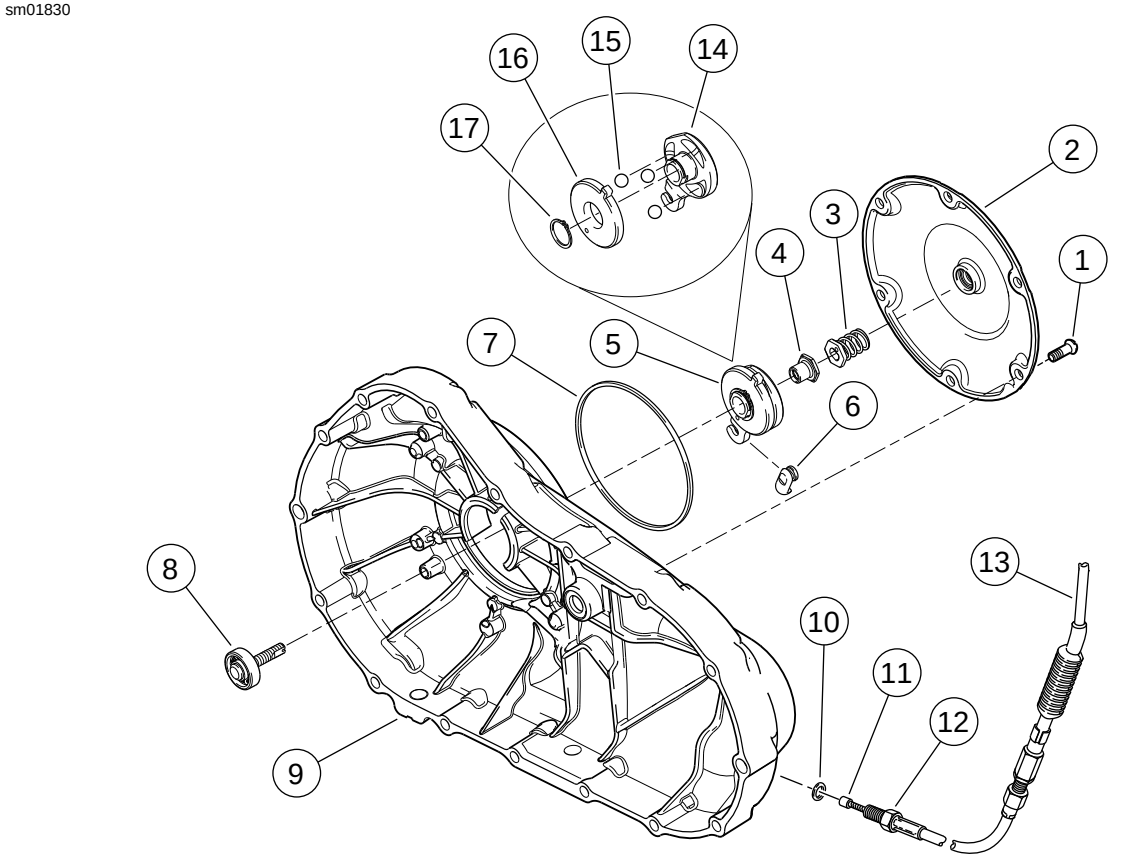
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. **Mid-mount Controls:** Remove left side rider footrest and mounting bracket assembly. See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS or 2.42 RIDER FOOT CONTROLS: XR 1200X.
3. See Figure 2-179. Slide rubber boot (1) on clutch cable adjuster (2) upward to expose adjuster mechanism. Loosen jamnut (3) from adjuster. Turn adjuster to shorten cable housing until there is a large amount of free play at clutch hand lever. See 1.11 CLUTCH.
4. See Figure 2-180. Remove six screws (1) and clutch inspection cover (2). Exercise caution to avoid damaging or dislodging quad ring (7) from groove in primary cover (9).
5. Slide hex lockplate with attached spring (3) from flats of adjusting screw assembly (8).
6. Turn adjusting screw assembly clockwise to release ramp assembly (5) and coupling (6). As the adjusting screw is turned, ramp assembly moves forward. Remove nut (4) from end of adjusting screw.
7. Remove hook of ramp from cable coupling. Remove clutch cable end (11) from slot in coupling. Remove coupling and ramp assembly.
8. 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.
9. Clean all metal parts in a non-volatile cleaning solution or solvent.



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

Figure 2-179. 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 2-180. Clutch Release Mechanism

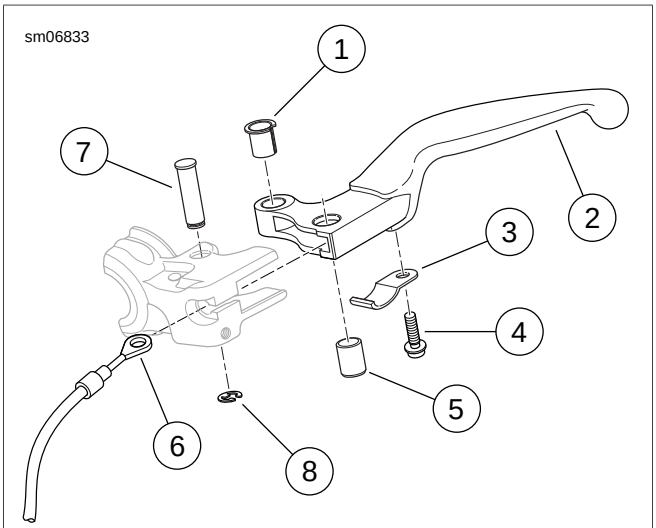
Clutch Lever and Cable: Upper

1. See Figure 2-181. 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 the bushing from the top of the 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 2-181. Clutch Lever and Cable

Clutch Hand Control

NOTE

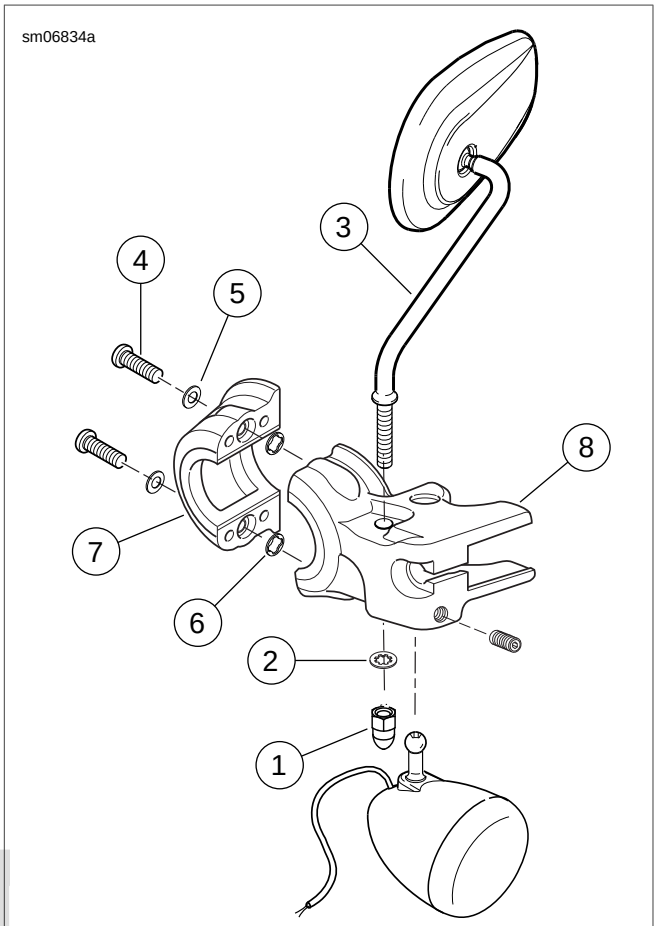
XL 1200X: *Leave the turn signals and brackets installed.*

1. **All Models except XL 1200X:** Loosen the set screw. Remove the turn signal assembly from the clutch lever bracket. See 6.18 FRONT TURN SIGNALS, All Except XL 1200X.
2. See Figure 2-182. Loosen and remove the locknut (1), lockwasher (2) and mirror (3).

NOTE

Loosen the two screws of the left handlebar switch housing to remove clutch control clamp and clutch lever bracket.

3. See Figure 2-182. Loosen the two screws (4) and washers (5) with nylon retainers (6) to remove the clutch control clamp (7).
4. Remove the clutch lever bracket (8).



1. **Locknut**
2. **Washer**
3. **Mirror**
4. **Fastener**
5. **Washer**
6. **Nylon retainer**
7. **Clamp**
8. **Bracket**

Figure 2-182. 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 clamp, front, 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 mount fastener	45-50 ft-lbs	61-68 Nm

Clutch Hand Control

1. Position clutch control clamp and clutch lever bracket onto left handlebar. Hold clamp and bracket assembly firmly against left handlebar switch housing.
2. Secure components to left handlebar using two screws and washers and retainers. Tighten to 108-132 **in-lbs** (12.2-14.9 Nm).

NOTES

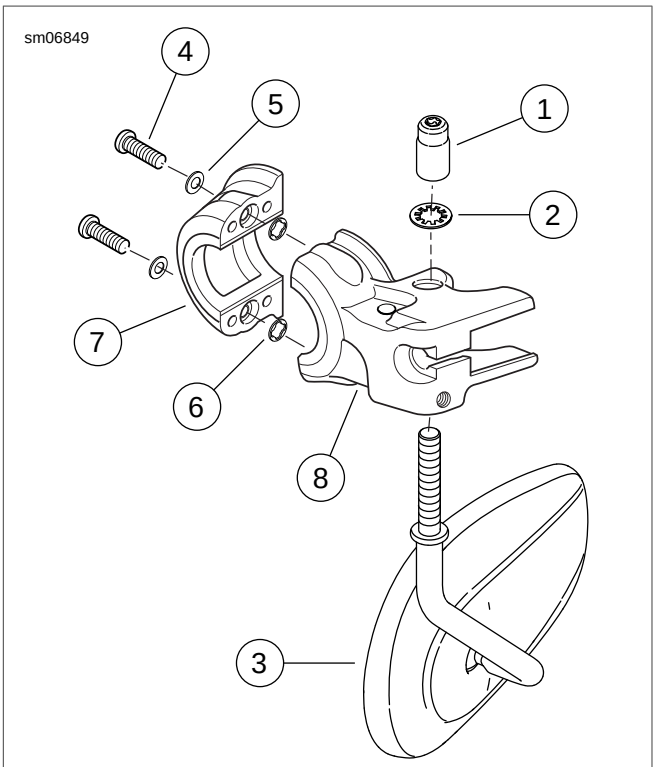
- *Adjust the mirrors for rider vision.*
- *Adjust the mirrors to not strike the fuel tank on lock to lock handlebar turns.*

XL 1200X: *See Figure 2-183.*

3. Install mirror with locknut and lockwasher. Tighten locknut to 96-144 **in-lbs** (10.9-16.3 Nm).
4. **All Models except XL 1200X:** Install turn signal and secure with set screw. See 6.18 FRONT TURN SIGNALS, All Except XL 1200X.
5. Position so turn signal lens faces directly forward. Verify turn signal does not strike fuel tank when the handlebar is turned full left. Tighten set screw 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 2-183. Clutch Hand Control Bracket: XL 1200X

Clutch Lever and Clutch Cable: Upper

1. Install anti-rattle spring and screw onto clutch lever. Tighten screw to 8-13 **in-lbs** (0.9-1.5 Nm).
2. Install bushing in clutch lever. Bushing has a collar on one end and must be installed from top of lever.
3. Connect end of clutch cable upper section to clutch lever using clutch cable pin.
4. Position lever within clutch lever bracket, install pivot pin and secure with **new** retaining ring.

Clutch Cable: Lower

1. **XL Models:** See Figure 2-184. Route the clutch cable (3):
   a. Forward from clutch lever (1).
   b. Downward to left front fork slider tube. Refer to Table 2-26.
   c. Through two clips (6) on left front frame downtube.
   d. Rearward to the primary cover (4).

2. **XR 1200X:** See Figure 2-185. Route the clutch cable:
   a. Down between the fork tubes and clamps.
   b. Downward to inboard side of the left front fork slider tube.
   c. Through the two clips in the oil cooler mounting bracket.

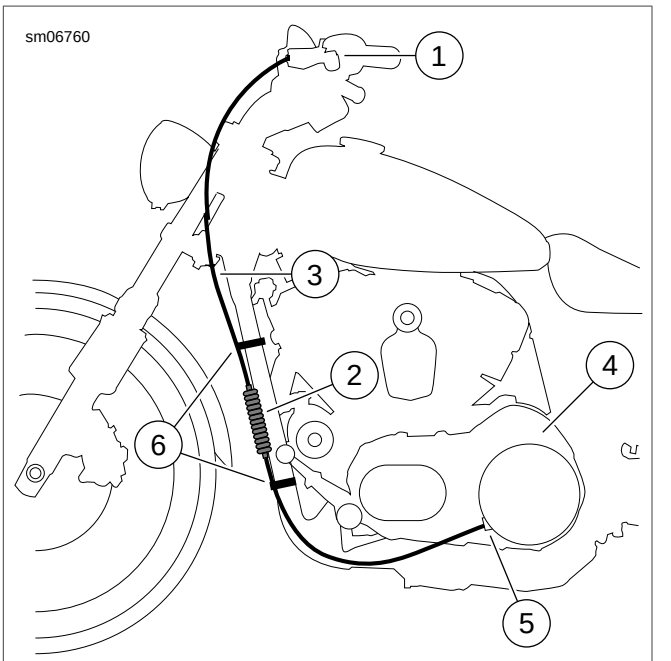
NOTE

Check that cable is not pinched between the lower steering head bracket and frame and the left and right fork stops.

Table 2-26. Clutch Cable Lower Routing Around Left Fork Slider

MODEL	ROUTE	NOTES
XL 883L	Outboard	-
XL 883N	Outboard	-
XL 883R	Outboard	-
XL 1200C/C ANV XL 1200CP/CA/CB	Inboard	Through the clutch cable guide
XL 1200X	Inboard	-
XL 1200V	Inboard	-

3. See Figure 2-180. Install **new** O-ring (10) over cable end fitting (12) of clutch cable (13) lower section. Screw fitting into primary cover (9). Tighten to 36-108 **in-lbs** (4.1-12.2 Nm).
4. Install coupling (6) over cable end (11) with the rounded side inboard and the ramp connector button outboard. With retaining ring side of ramp assembly (5) facing inward, place hook of ramp around coupling button. Rotate assembly counterclockwise until tang on inner ramp (16) fits in slot of primary cover.
5. 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). Turn adjusting screw counter-clockwise until resistance is felt. Then back off adjusting screw 1/4 turn.
6. Install hex lockplate with spring (3) onto flats of adjusting screw assembly (8). If necessary, turn adjusting screw clockwise slightly so that lockplate slides onto flats while also fitting within recess of outer ramp.
7. Verify that quad ring (7) is fully seated in groove of primary cover (9). Install clutch inspection cover (2) and secure with six screws (1). Tighten screws in a cross pattern to 90-120 **in-lbs** (10.2-13.6 Nm).
8. **Models with Mid-mount Controls:** Install left side rider footrest and mounting bracket assembly. Tighten footrest bracket mounting screws to 45-50 ft-lbs (61-68 Nm). See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS or 2.42 RIDER FOOT CONTROLS: XR 1200X.
9. Install main fuse.



1. **Clutch lever**
2. **Cable adjuster boot**
3. **Clutch cable**
4. **Primary cover**
5. **Cable end fitting**
6. **Clip (2)**

Figure 2-184. Clutch Cable Routing: XL Models

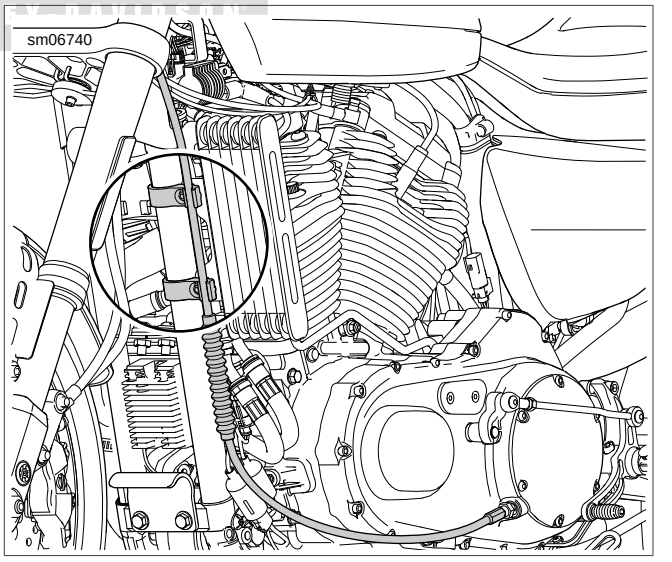


Figure 2-185. Clutch Cable Clips: XR 1200X

HANDLEBAR 2.30

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 2.29 CLUTCH CONTROL.
3. Remove two screws securing left handlebar switch assembly to handlebar. See 6.35 LEFT HANDLEBAR SWITCHES. Let wires carefully support the switch assembly.
4. Remove left handlebar grip. See 2.30 HANDLEBAR, Left Hand Grip.
5. Remove front brake master cylinder assembly from right handlebar. See 2.8 FRONT BRAKE MASTER CYLINDER.

XL 1200C/C ANV

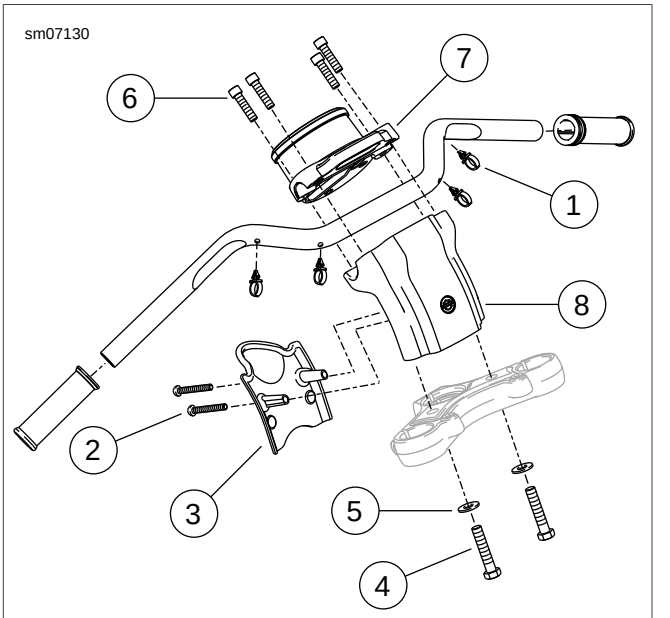
1. See Figure 2-186. Cut and remove four wiring harness retainers (1). Discard retainers.
2. Loosen, but do not remove, two control housings screws.
3. Remove two screws (2) and riser cover (3).
4. Remove four screws (6) and upper handlebar clamp/speedometer housing (7). Detach handlebar from riser.
5. Slide right hand control and throttle assembly off the 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 2-186. See **Removal, XL 1200C/C ANV**.

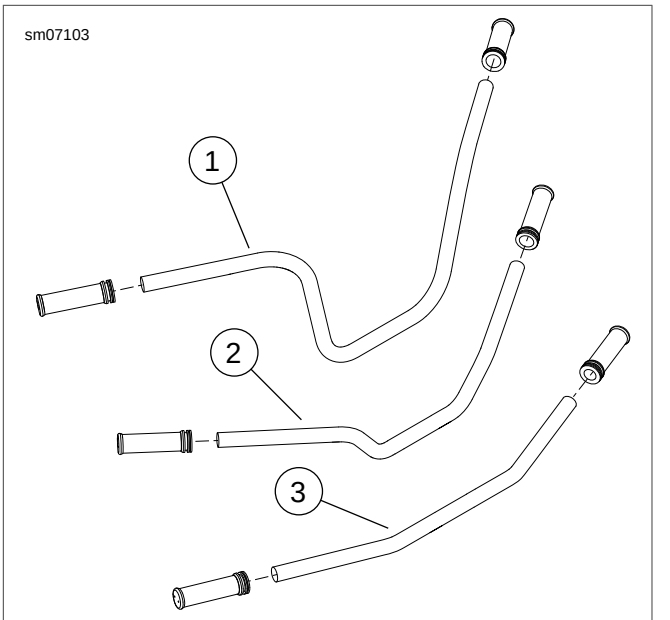
Drag Bar: See Figure 2-187. See **Removal, XL 1200C/C ANV**.

Mini-Ape: See Figure 2-187. See **Removal, All XL Models except XL 1200C/C ANV**.



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 2-186. Handlebar: XL 1200C/C ANV/CP Pull Back

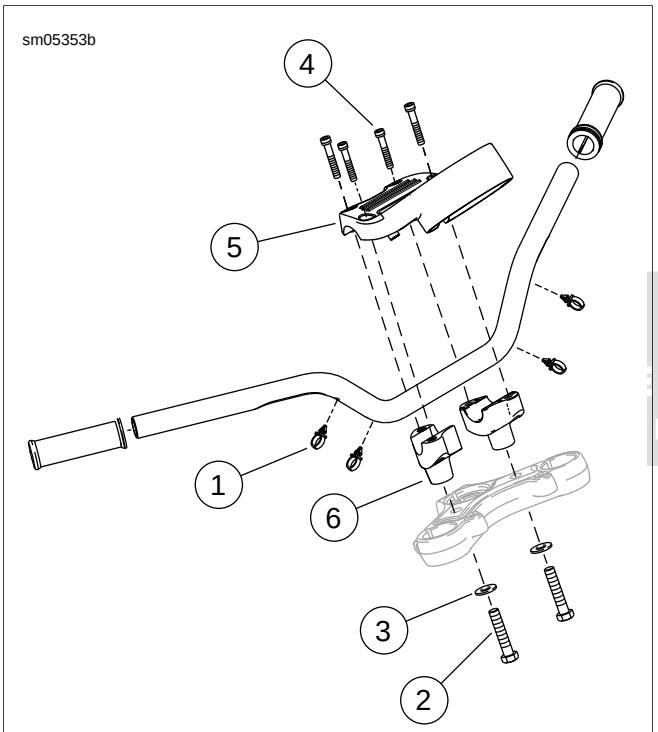


1. **Mini-ape: XL 1200CP/CB**
2. **Pull back: XL 1200CP**
3. **Drag: XL 1200CP/CA**

Figure 2-187. Handlebars: XL 1200CP/CA/CB

All XL Models except XL 1200C/C ANV

1. See Figure 2-188. Cut and remove four wiring harness retainers (1). Be careful not to 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 the 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 two bolts, washers (3) and lower handlebar clamps from upper fork bracket.

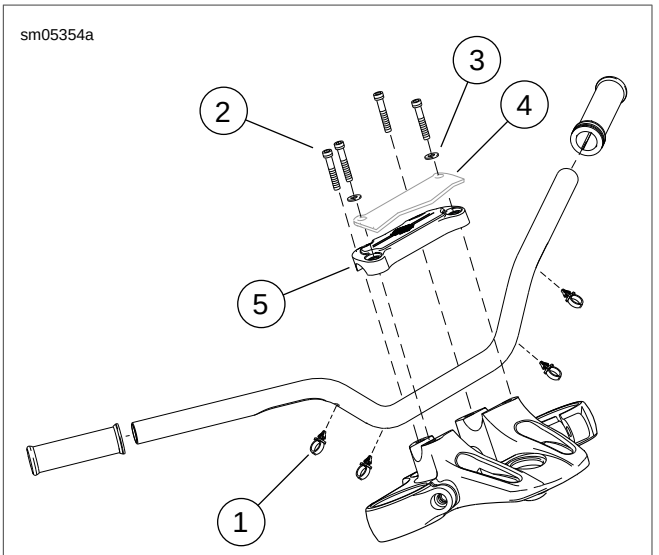


1. **Wire harness retainer (4)**
2. **Bolt (2)**
3. **Washer (2)**
4. **Screw (4)**
5. **Bolt-on instrument bracket/clamp**
6. **Lower handlebar clamp**

Figure 2-188. Handlebar: XL 883L/N/R

XR 1200X

1. See Figure 2-189. Cut and remove four wiring harness retainers (1). Be careful not to cut into wiring harnesses. Discard retainers.
2. Loosen, but do not remove, two right hand control housing screws.
3. Remove two front screws (2) and washers (3). Remove instrument bracket (4).
4. Remove two rear screws (2) and upper clamp (5).
5. Detach handlebar from upper fork bracket.
6. Slide right hand control housing and throttle assembly off detached handlebar.



1. **Wire harness retainer (4)**
2. **Screw (4)**
3. **Washer (2)**
4. **Instrument bracket**
5. **Upper handlebar clamp**

Figure 2-189. Handlebar: XR 1200X

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 clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 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/C ANV/CP with One-Piece Riser

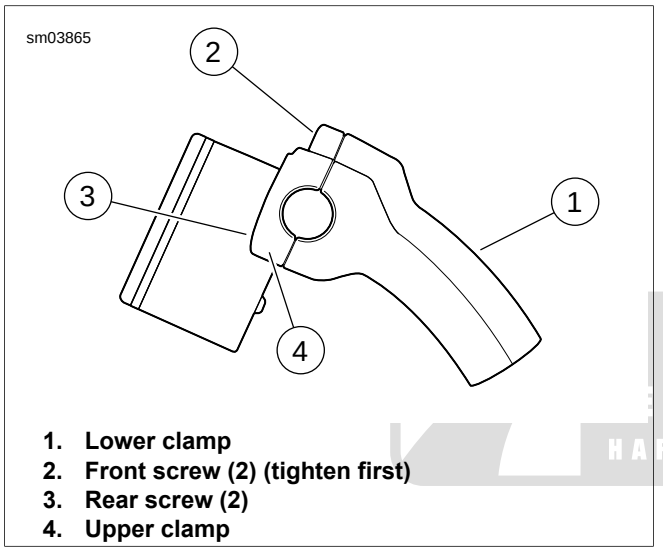
1. If the riser was removed, secure the riser to the upper fork bracket with two bolts and washers. Route the handlebar wiring inside the riser. Tighten to 30-40 ft-lbs (40.7-54.3 Nm).
2. Side the right side handlebar control housing and throttle assembly onto the right end of the handlebar.

3. See Figure 2-190. Install the handlebar:
   a. Position handlebar on the lower handlebar camp.
   b. Adjust handlebar to the desired position.
   c. Place the upper handlebar clamp/speedometer housing in position and thread four screws in place.
   d. Tighten the front screws first to 12-18 ft-lbs (16.3-24.4 Nm).
   e. Tighten the rear screws to 12-18 ft-lbs (16.3-24.4 Nm).

NOTES

- *Route the handlebar wiring harnesses.*
- *Do not pinch the wiring harnesses.*

4. Install the 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 2-190. Handlebar Riser: XL 1200C/C ANV

XL 1200CP

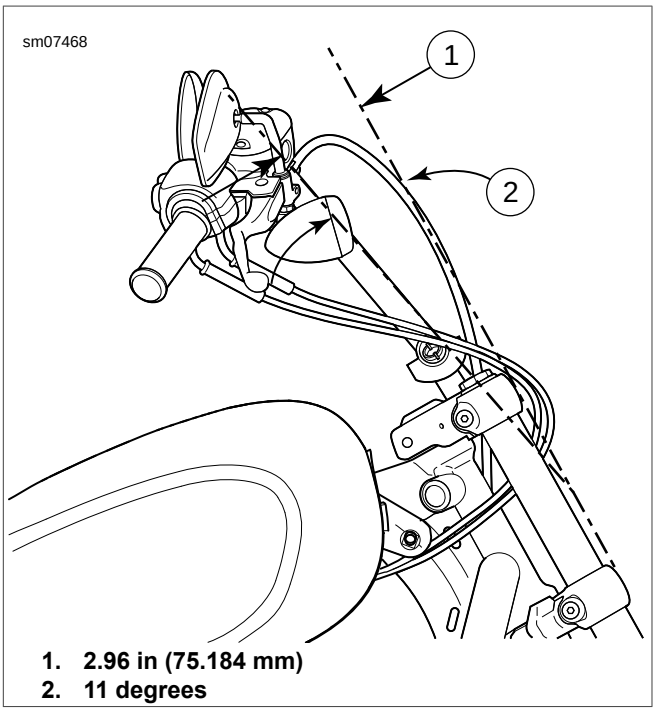
Pull Back: See Figure 2-187. See **Installation, XL 1200C/C ANV**.

Drag Bar: See Figure 2-188. See **Installation, XL 1200C/C ANV**.

Mini-Ape: See Figure 2-188. See **Installation, All Models except XL 1200C/C ANV**.

NOTE

See Figure 2-191. Rotate mini-ape handlebar 11 degrees (2) rearward of the fork angle. Measure from a straight edge placed on the fork bracket 2.96 in (75 mm) to the end of the straight (1) (beginning of the last bend). This angle positions the handgrips 15 in (381 mm) above seat height.



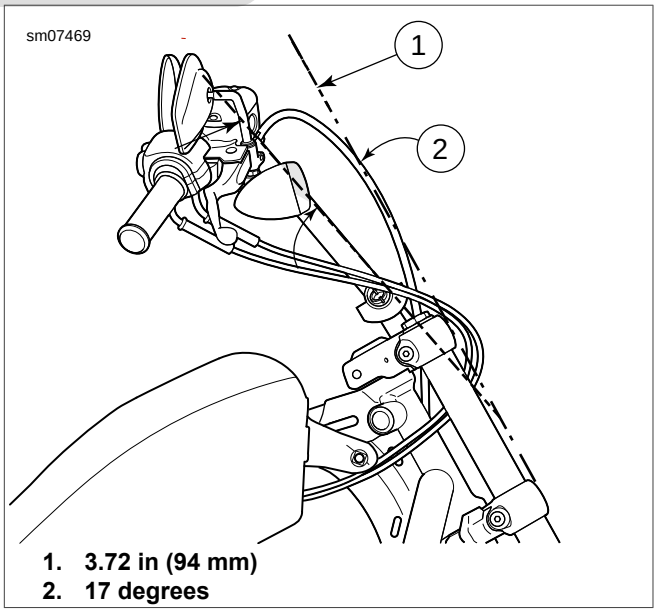
1. **2.96 in (75.184 mm)**
2. **11 degrees**

Figure 2-191. XL 1200CP/CB Mini-Ape Handlebar Angle

XL 1200V

NOTE

See Figure 2-192. Rotate mini-ape handlebar 17 degrees (2) rearward of the fork angle. Measure from a straight edge placed on the fork bracket 3.72 in (94 mm) to the end of the straight (1) (beginning of the last bend). This angle positions the center of the handgrips 15 in (381 mm) above seat height.



1. **3.72 in (94 mm)**
2. **17 degrees**

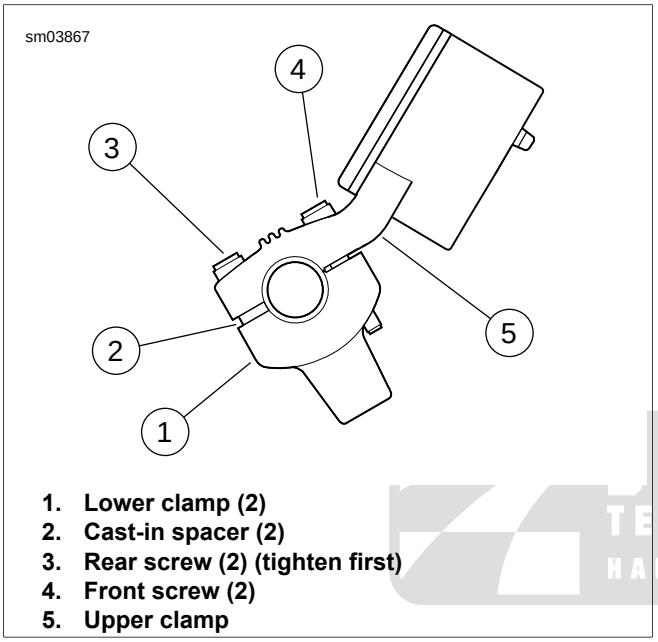
Figure 2-192. XL 1200V Handlebar Angle Domestic, California and Canada Markets Only

All XL Models except XL 1200C/C ANV

1. If lower handlebar clamps were removed, secure clamps to upper fork bracket with bolts and washers. Finger tighten

bolts only at this time. Route the wiring harnesses between the 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. See Figure 2-193. Adjust handlebar to desired position. Tighten rear screws first, to 12-18 ft-lbs (16.3-24.4 Nm). Then tighten front screws to 12-18 ft-lbs (16.3-24.4 Nm).
5. 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 2-193. Handlebar Riser: XL Models except XL 1200C/C ANV

XR 1200X

1. Slide right side handlebar control housing and throttle assembly onto right end of handlebar. Position handlebar on upper fork bracket.
2. Place upper handlebar clamp in position. Install the rear screws.
3. Place instrument bracket in position. Install front screws and washers.
4. Adjust handlebar to desired position. Tighten rear screws first, to 12-18 ft-lbs (16.3-24.4 Nm). Then tighten front screws to 12-18 ft-lbs (16.3-24.4 Nm).

All Models

1. Install front brake master cylinder assembly. See 2.8 FRONT BRAKE MASTER CYLINDER.
2. Install a **new** left hand grip. See 2.30 HANDLEBAR, Left Hand Grip.
3. Position left hand control and loosely install hand control clamp screws. See 6.35 LEFT HANDLEBAR SWITCHES.
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 2.29 CLUTCH CONTROL.
   b. Left hand control clamp screws to 35-45 **in-lbs** (4.0-5.1 Nm).
   c. Right hand 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 the following:
   a. Clutch cable adjustment/operation.
   b. Proper throttle cable operation.
   c. All electrical switch functions.
   d. Proper brake operation and stop lamp function.

LEFT HAND GRIP

Removal

Slice the hand grip open with a sharp knife. Peel the hand grip open to remove.

Installation

1. Rough the left grip end of the handlebar with emery cloth.
2. Clean the grip end with acetone.
3. Apply LOCTITE 770 PRISM PRIMER to the 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 the inside of the **new** hand grip.

NOTE

LOCTITE 411 PRISM INSTANT ADHESIVE will set in four minutes and cure in 24 hours.

5. Install the **new** hand grip with a twisting motion.

FRONT FENDER 2.31

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	25-30 Nm
Fender to bracket, front: XR 1200X	30-60 **in-lbs**	4.1-6.8 Nm
Fender bracket to forks, front: XR 1200X	15-19 ft-lbs	21-25 Nm

See Figure 2-194. Install and tighten in a cross pattern to specification. Refer to Table 2-27.

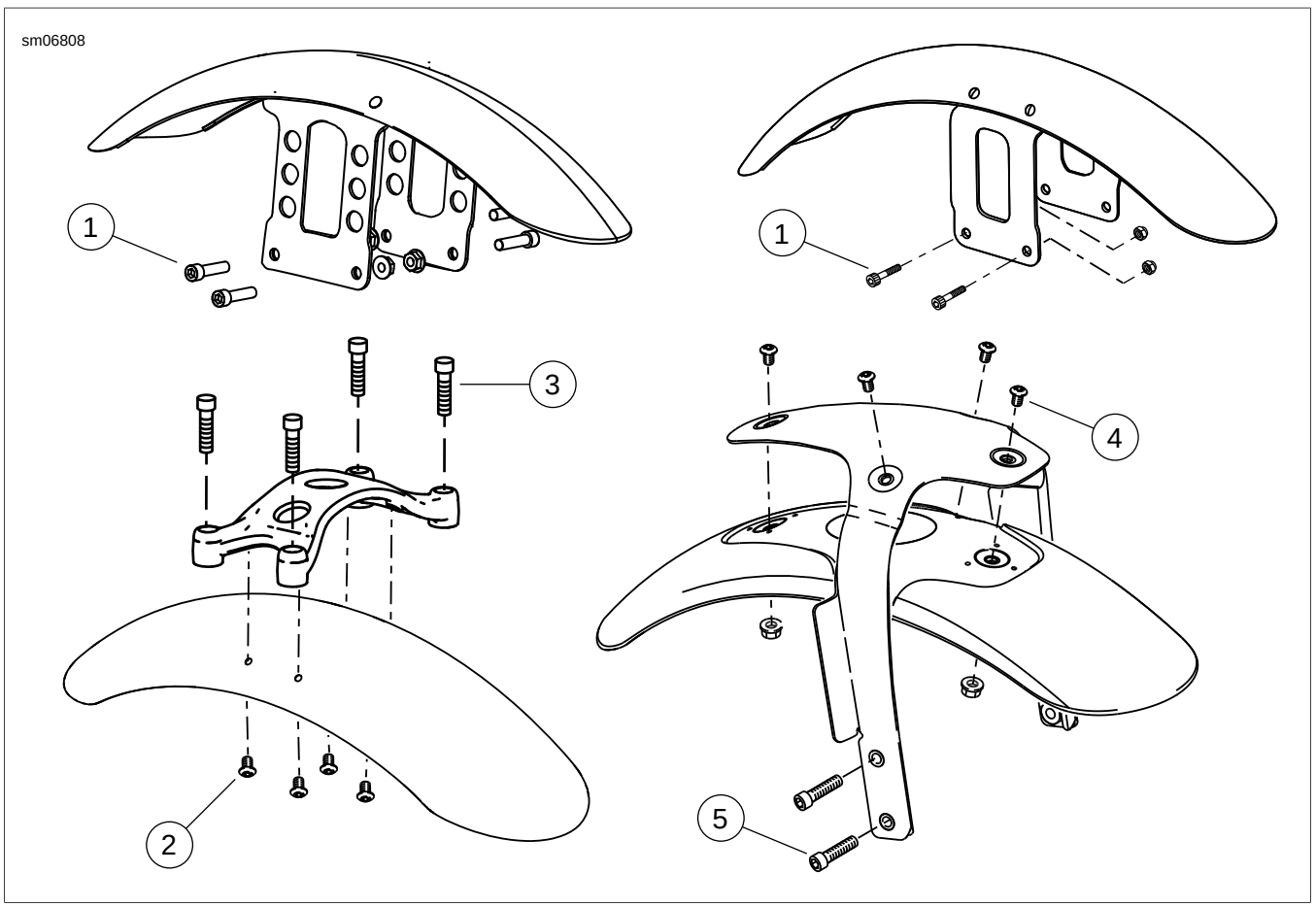


Figure 2-194. Front Fenders

Table 2-27. 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 (25-30 Nm)
XR 1200X	4	Fender to bracket, front: XR 1200X (fasteners with locknuts)	30-60 **in-lbs** (4.1-6.8 Nm)
	5	Front fender bracket to forks: XR 1200X	15-19 ft-lbs (21-25 Nm)

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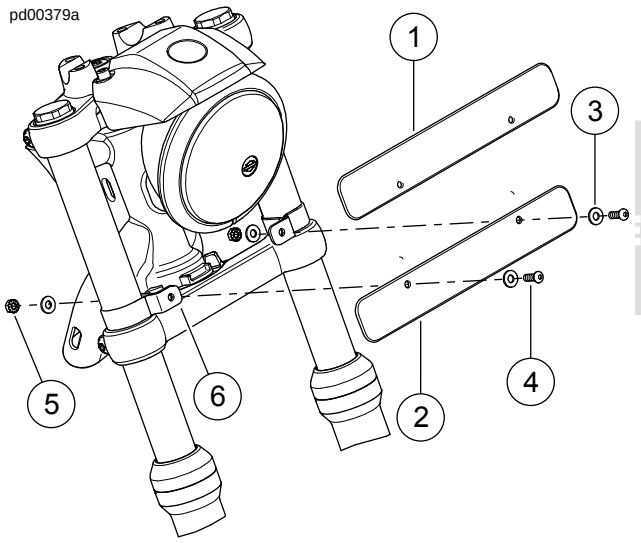
FRONT LICENSE PLATE: INDIA MODELS 2.32

FRONT LICENSE PLATE: XL MODELS (INDIA)

FASTENER	TORQUE VALUE	
License plate fasteners, front: XL 883L/N/R (India)	10-15 **in-lbs**	1.1-1.7 Nm
License plate fasteners, front: XL 1200X/C/C ANV (India)	10-15 **in-lbs**	1.1-1.7 Nm

XL 883L/N/R

1. See Figure 2-195. Install P-clamps (6) on fork tubes.
2. Install license plate to P-clamps and secure 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).

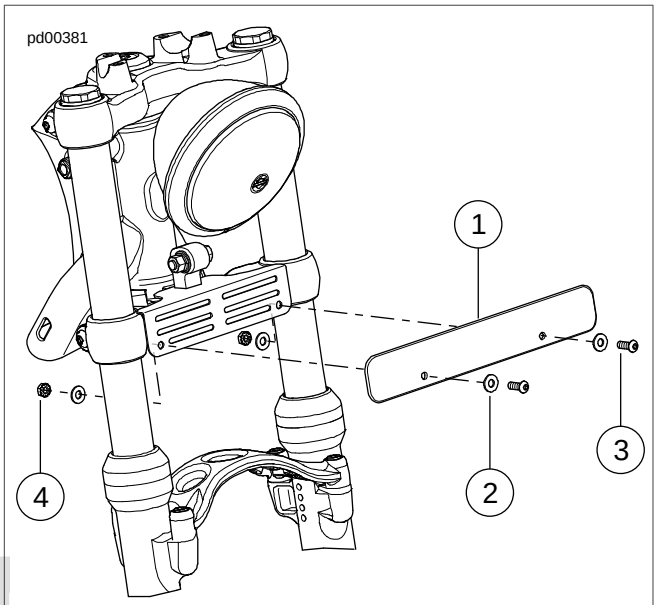


1. **License plate: XL 883N/R**
2. **License plate: XL 883L**
3. **Washer (4)**
4. **Fastener (2)**
5. **Nut (2)**
6. **P-clamp (2)**

Figure 2-195. License Plate Mount: XL 883L/N/R (India)

XL 1200X/C/C ANV

1. See Figure 2-196. 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 2-196. License Plate Mount: XL 1200X/C/C ANV (India)

REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V 2.33

XL 883R/L

FASTENER	TORQUE VALUE	
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	132-216 **in-lbs**	14.9-24.4 Nm
Fender, rear, mounting fastener	132-216 **in-lbs**	14.9-24.4 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 2-197. Disconnect the rear lighting connector [7] (2) housings.
4. Access fender hardware.
   a. Remove lower shock bolts.
   b. Raise motorcycle to lower rear wheel.
5. Remove the tail lamp assembly.
   a. Remove the tail lamp lens and bulb. See 6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X.
   b. See Figure 2-198. Unplug left [19] (1) and right [18] (2) turn signal connectors from rear lighting circuit board.
   c. Pull turn signal wiring harnesses thru holes in tail lamp base and rear fender.
   d. Disengage turn signal wiring harnesses from wire retention brackets.
6. See Figure 2-199. Remove rear turn signal stalk locknuts (1) from inside rear fender on both sides.
   a. See Figure 2-200. Support fender and remove front strut cover fastener (4) with washer (3) and locknut (1), and rear strut cover fastener (4) with washer (3) and clip nut (5) on both sides.
   b. Remove rear fender strut covers with 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 with attached license plate bracket, tail lamp base and wire harness.

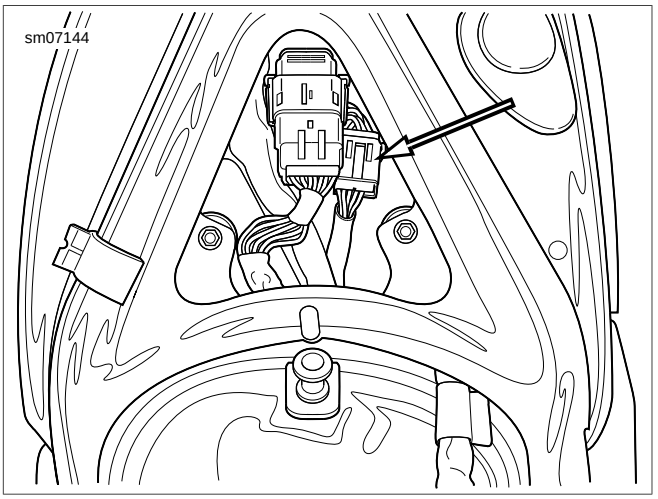
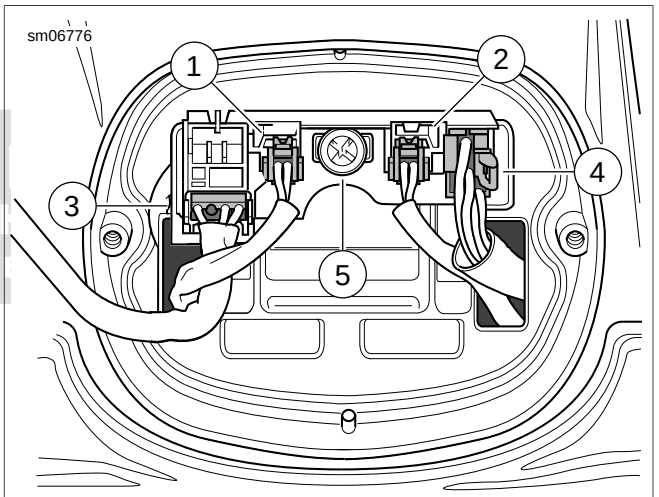
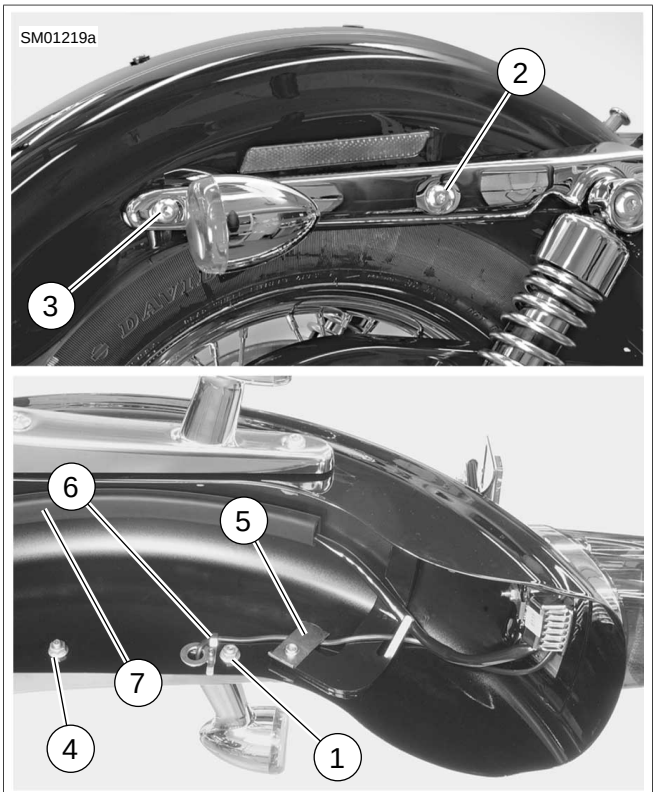


Figure 2-197. Rear Lighting Connector [7]



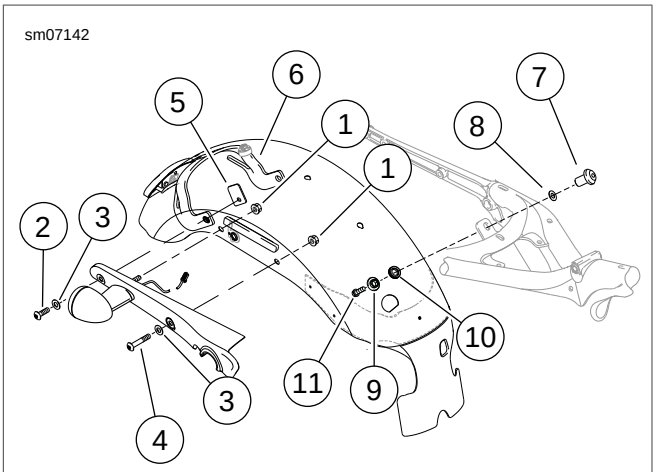
1. **Left turn signal connector [19]**
2. **Right turn signal connector [18]**
3. **Rear lighting power connector [94]**
4. **Tail lamp connector [93]**
5. **Screw with washer**

Figure 2-198. Tail Lamp Housing



1. Rear turn signal stalk nut (2)
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. Wire retention bracket
7. Rear lighting wiring harness and conduit

Figure 2-199. Rear Fender, Strut Cover and Turn Signal Lamp Assembly



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 2-200. Rear Fender Assembly: XL 883R/L

Installation

1. Carefully install rear fender onto motorcycle.
2. See Figure 2-200. Align holes in fender with those in struts. Support fender and install fasteners (4, 2) through fender struts and fender to hold fender in place.
3. Route rear lighting harness connector [7B] between frame cross member and top of oil tank.
4. Connect housings [7].
5. Secure front of fender with bolt (11), washer (8) and seat post (7). Finger-tighten.
6. **H-DSSS equipped models:** Make sure antenna harness is not pinched between fender and frame crossmember.
7. Remove fasteners (4, 2) and install fender strut cover with attached turn signal assembly to fender strut. 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. Install fastener (2), washer (3) and clip nut (5) in aft mounting hole. Finger-tighten.

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10. In sequence, tighten all fender mounting hardware:
    a. Tighten bolt and seat post to 96-156 **in-lbs** (10.9-17.6 Nm).
    b. Tighten turn signal stalk locknuts to 132-216 **in-lbs** (14.9-24.4 Nm).
    c. Tighten fender mounting fasteners to 132-216 **in-lbs** (14.9-24.4 Nm).
11. Install the tail lamp assembly.
    a. Route turn signal wiring harnesses through the wire retention brackets.
    b. Pull turn signal wiring harnesses through holes in rear fender and tail lamp base.
    c. See Figure 2-198. Connect tail lamp connector [94] (3) and left [19] (1) and right [18] (2) turn signal connectors.
    d. Install the tail lamp lens and bulb. See 6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X.
12. 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)

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. Verify license plate lamp, tail lamp, stop lamp and turn signals.

XL 1200C/C ANV/CP/CA/CB

FASTENER	TORQUE VALUE	
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	96-156 **in-lbs**	10.9-17.6 Nm
Fender, rear, mounting fastener	96-156 **in-lbs**	10.9-17.6 Nm

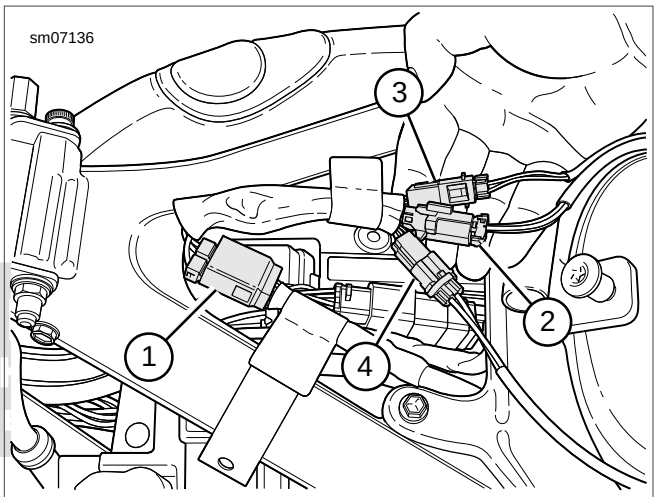
Removal

1. Remove seat.

WARNING

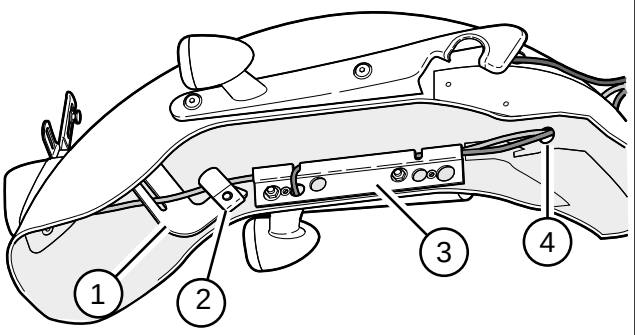
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. See Figure 2-201. Disconnect the right [18] (3) and left [19] (4) turn signal connectors and the tail lamp connector [40] (2).
4. Remove the lower shock bolts and lower the rear wheel to access the fender hardware.
5. See Figure 2-202. Route the turn signal wire harness through the openings (4) in the fender and from the retention bracket (3).
6. See Figure 2-203. Remove rear turn signal stalk nuts (1) from inside rear fender on both sides.
7. Support the fender and remove the front (4) and rear (2) fender fasteners with washers (3) and strut covers with 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 from motorcycle.



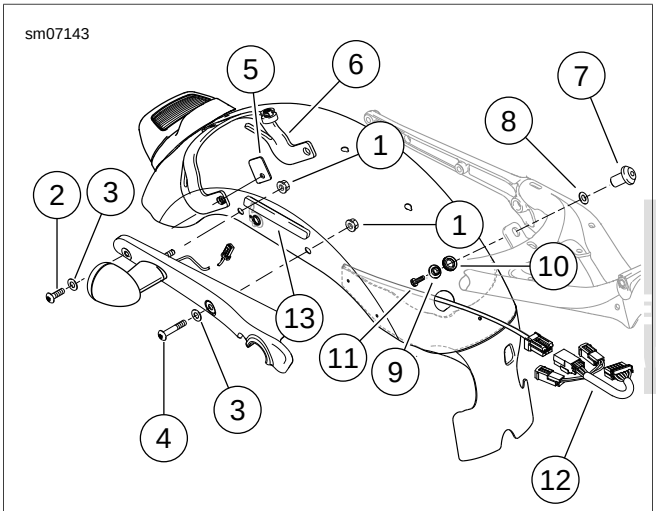
1. **Main harness connector [7]**
2. **Tail lamp connector [40]**
3. **RH turn signal connector [18]**
4. **LH turn signal connector [19]**

Figure 2-201. Turn Signal Wire Harness: XL 1200C/C ANV/CP/CA/CB



1. **Fender brace**
2. **Retention clip**
3. **Retention bracket**
4. **Fender opening**

Figure 2-202. Inner Rear Fender: XL 1200C/C ANV/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. **Subharness**
13. **Wire retention bracket (2)**

Figure 2-203. Rear Fender Assembly: XL 1200C/C ANV/CP

Installation

1. Install rear fender onto motorcycle. Align holes in fender with those 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. Connect tail lamp housings [40].
3. See Figure 2-203. Secure front of fender with bolt (11), washer (8) and seat post (7). Finger-tighten.
4. **H-DSSS equipped models:** Make sure antenna harness is not pinched between fender and frame crossmember.
5. Remove bolts from right side of fender. Install fender strut cover with attached turn signal assembly to fender strut with the locknut (1).
6. Secure fender to strut with fasteners (4), washer (3) and locknut (1) in forward mounting hole. Install fastener (2), washer (3) and clip nut (5) in aft mounting hole. Finger-tighten screws only at this time.
7. Push turn signal wiring harness through openings in strut and fender. Install nut onto turn signal stalk from inside fender. Finger-tighten.
8. Now tighten all fender mounting hardware in the following sequence:
   a. Tighten bolt (11) and seat post (7) to 96-156 **in-lbs** (10.9-17.6 Nm).
   b. Tighten turn signal stalk nuts (1) to 96-156 **in-lbs** (10.9-17.6 Nm).
   c. Tighten fasteners (2, 4) to 96-156 **in-lbs** (10.9-17.6 Nm).
9. Install the lower lower shock bolts and lower the rear wheel.
10. See Figure 2-201. Connect the right [18] (3) and left [19] (4) turn signal connectors and the tail lamp connector [40] (2).
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. Verify turn signals, tail lamp, and stop lamp.

FENDER PREPARATION

Tail Lamp Assembly

XL 883R/L: Replace the tail lamp. See 6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X.

XL 883N and XL 1200X/V: The tail lamps are the rear turn signals.

XL 1200C/C ANV/CP/CA/CB: Replace LED tail lamp assembly. See 6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB.

License Plate Lamp Module: XL 883N and XL 1200X/V

Replace the license plate lamp module. See 6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V.

Seat Nut

Remove the C-clip and the seat nut. Replace with a **new** seat nut kit.

Fender Extension

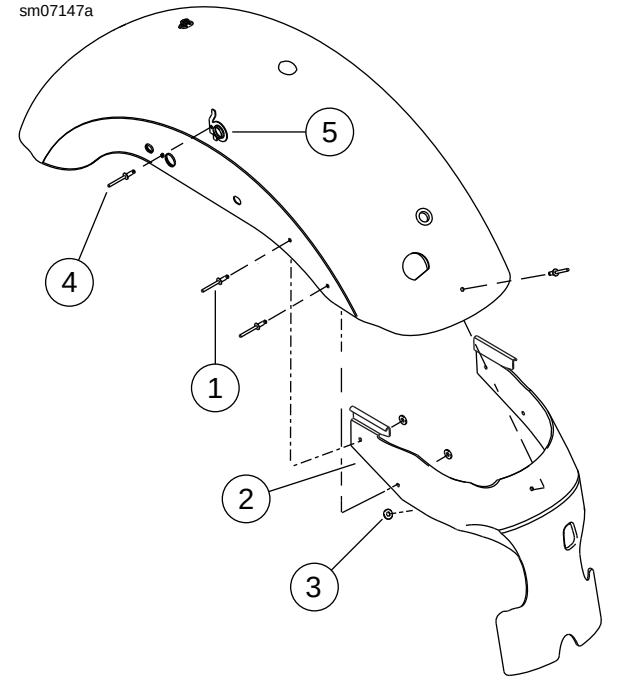
1. See Figure 2-204. Drill out rivets (1) securing rear fender extension (2) to fender with a 1/4 drill bit.
2. Rivet fender extension to fender backed by a washer (3).

Wire Harness with Conduit

1. Protect fender. Clean inside of fender with a mixture of alcohol and water. Allow to air-dry.
2. Position **new** wire harness and conduit inside fender in same location. Insert end of wiring harness with D plug through D hole in front of fender. Insert plug.
3. Slide conduit toward D plug as far as it will go. Insert other end of wiring harness through housing hole in rear of fender.
4. Remove adhesive tape backing from conduit and press conduit in place along right side curve of fender.

Wire Retention Bracket

1. See Figure 2-204. Drill out rivets (4) securing wire retention brackets (5) with a 1/4 in drill.
2. Rivet wire retention brackets to fender.



1. **Rivet**
2. **Extension**
3. **Washer**
4. **Rivet**
5. **Wire retention bracket**

Figure 2-204. Fender Extension

LICENSE PLATE BRACKET: XL 883R/L

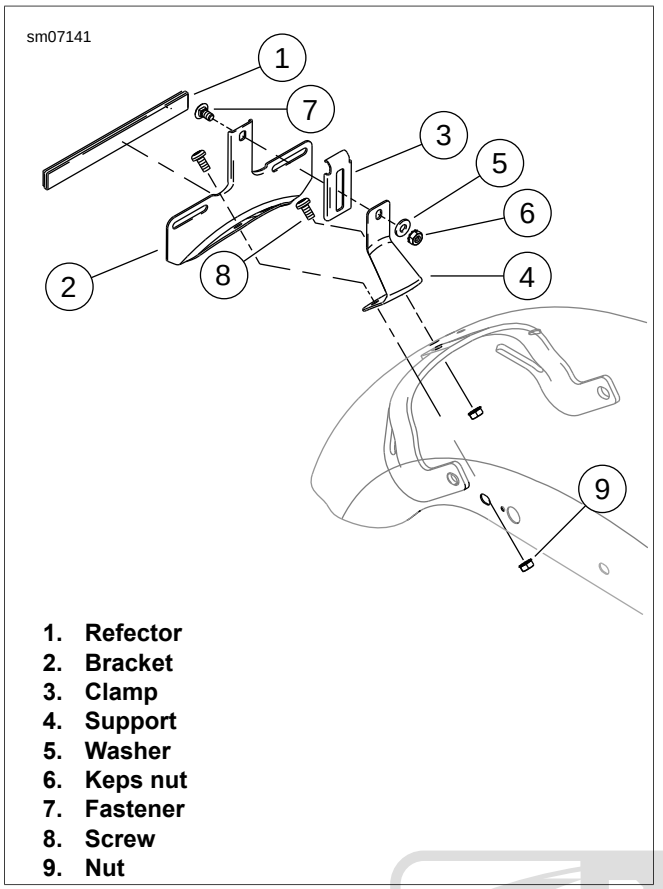
FASTENER	TORQUE VALUE	
License plate support bracket screws	20-25 **in-lbs**	2.3-2.8 Nm
License plate bolt	20-25 **in-lbs**	2.3-2.8 Nm

Removal

1. See Figure 2-205. Loosen the keps nut and remove the license plate.
2. Remove the keps nut, washer and bolt to remove the clamp and the bracket.
3. Remove the three screws to remove the support bracket from the fender.

Installation

1. Mount the support bracket on the fender with the screws.
2. Fit the fender brace to the middle screw.
3. Secure with washers and nuts. Tighten the screws to 20-25 **in-lbs** (2.3-2.8 Nm).
4. Assemble the bracket and the clamp to the support bracket with the bolt, washer and keps nut.
5. Install the license plate. Tighten the keps nut to 20-25 **in-lbs** (2.3-2.8 Nm).



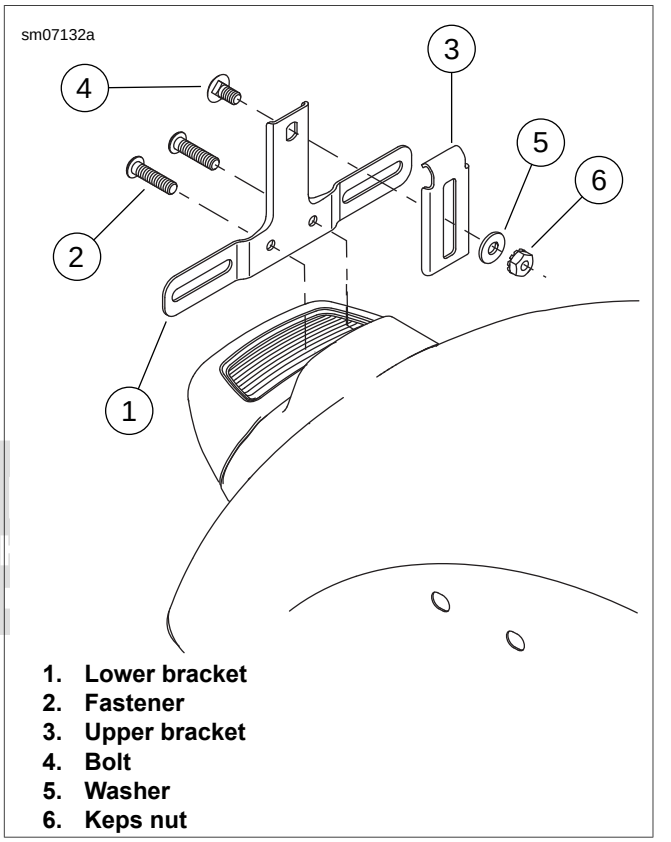
1. **Refector**
2. **Bracket**
3. **Clamp**
4. **Support**
5. **Washer**
6. **Keps nut**
7. **Fastener**
8. **Screw**
9. **Nut**

Figure 2-205. License Plate Bracket: XL Models except XL 883N, XL 1200X/C/CP

LICENSE PLATE BRACKET: XL 1200C/C ANV/CP/CA/CB

FASTENER	TORQUE VALUE	
License plate bracket, rear, fasteners: XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm
License plate, rear, keps nut, XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm

1. See Figure 2-206. Disassemble the upper license plate bracket bolt (4), washer (5) and keps nut (6).
2. Remove the two fasteners (2) from the tail lamp base to remove the lower license plate bracket (1).
3. Install the lower bracket and fasteners. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
4. Install the tail lamp. See 6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB.
5. Assemble the upper bracket (3) with bolt (4), washer (5) and keps nut (6).
6. Install the license plate and tighten the keps nut to 20-25 **in-lbs** (2.3-2.8 Nm).



1. **Lower bracket**
2. **Fastener**
3. **Upper bracket**
4. **Bolt**
5. **Washer**
6. **Keps nut**

Figure 2-206. License Plate Bracket

REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V 2.34

GENERAL

Certain XL 883N and XL 1200X/V models have a side-mount license plate bracket. This bracket includes a license plate lamp module.

NOTE

Due to local regulations, this side mount license plate bracket may not be offered in all markets.

Certain models do not have a rear fender-mounted tail lamp and stop lamp. Instead, the rear turn signals also function as tail lamps and stop lamps and are controlled by a rear lighting converter module located under the seat.

For instructions on replacing the rear lighting converter module, see 6.20 REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM).

NOTES

- *XL 883N/XL 1200X models sold in the international market are equipped with a center mounted license plate bracket that has a license plate lamp assembly.*
- *XL 883N/XL 1200X models sold in the international market are not equipped with a rear lighting converter module. LED assemblies in the rear turn signal housings serve as the stop lamp, tail lamp and turn signals.*

REMOVAL AND DISASSEMBLY

⚠WARNING

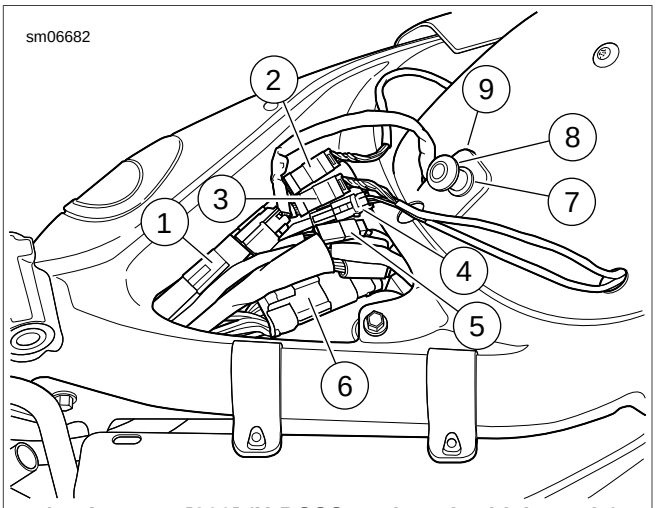
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Position motorcycle upright on lift.
3. Remove seat.

NOTE

For this procedure it will not be necessary to remove the rear wheel.

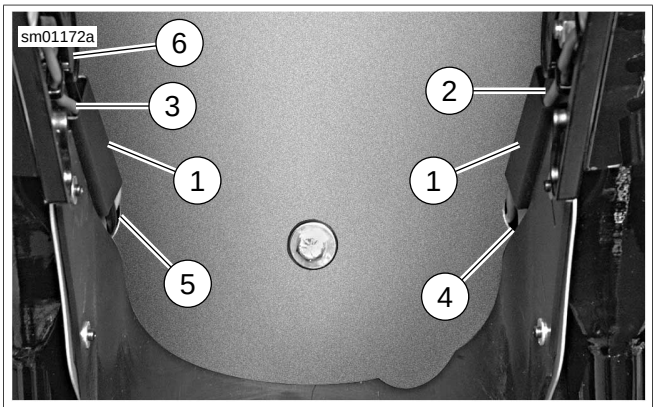
4. Raise motorcycle to remove pressure on the shock bolts.
5. Remove lower shock bolts. See 2.24 SHOCK ABSORBERS, Removal.
6. Using jack, raise motorcycle in order to gain clearance between rear wheel and fender.
7. See Figure 2-207. Unplug license plate lamp connector (4) [40]. Unplug right rear lighting harness connector (2) [18]. This connector is identified by a brown band on the harness near the connector. Unplug left rear harness connector (3) [19].



1. **Antenna [209] (H-DSSS equipped vehicles only)**
2. **Right rear lighting harness connector [18]**
3. **Left rear lighting harness connector [19]**
4. **License plate lamp harness [40]**
5. **Main wiring harness connector [7]**
6. **Engine harness connector [145]**
7. **Flat washer**
8. **Seat post**
9. **Frame crossmember tab**

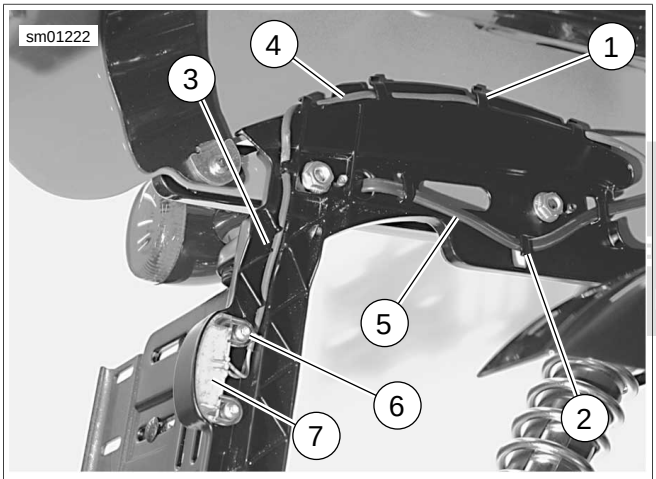
Figure 2-207. Rear Lighting Harness Connectors: XL 883N, XL 1200X/V

8. See Figure 2-208. Carefully pull both rear lighting harnesses (2, 3) and license plate lamp harness (6) through feed-through holes (4, 5) in rear fender.
9. Remove both rear lighting harnesses and license plate lamp harness from fender harness clips (1).
10. See Figure 2-209. Remove left rear lighting harness (5) from harness clips (2) on lower side of bracket on left side of fender. Repeat this step for right side of fender.
11. See Figure 2-210. Remove rear turn signal stalk nuts (6) from inside rear fender on both sides.
12. Remove forward fender support screw with washer (2) and nut (4), and aft fender support screw with washer (3) and nut plate (5) (domestic only) on both sides.
13. Remove screw with washer (9) and rear fender brace (7).
14. **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.
15. Remove rear fender strut covers (1) with attached turn signal assemblies from rear fender struts. Carefully pull turn signal wiring harnesses through holes in rear fender and strut as each strut cover is removed.



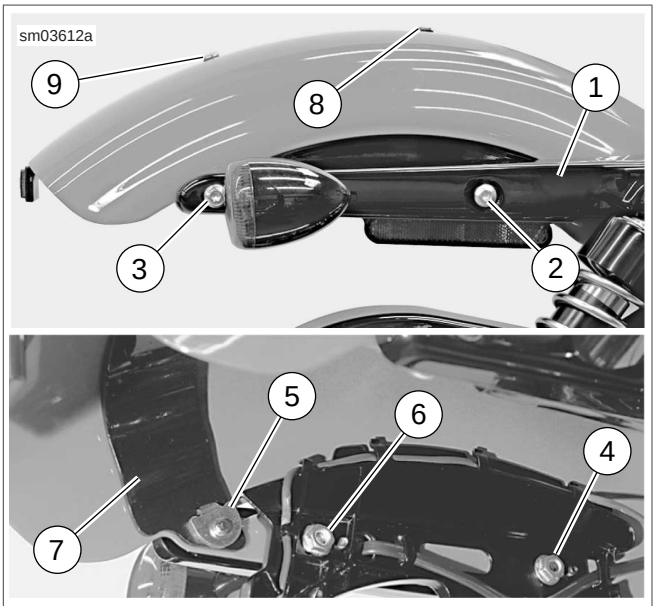
1. Harness bracket (2)
2. Right rear lighting harness
3. Left rear lighting harness
4. Right feed-through hole
5. Left feed-through hole
6. License plate lamp harness

Figure 2-208. Lighting Harnesses 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

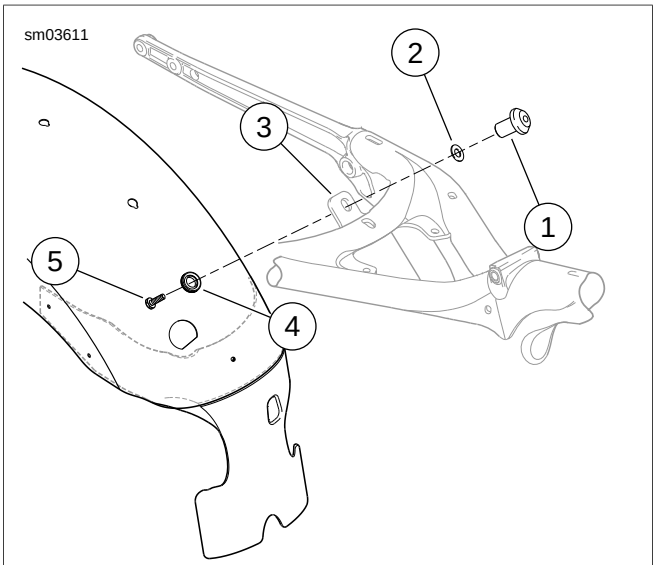
Figure 2-209. Removing/Installing License Plate Lamp Module (domestic only)



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

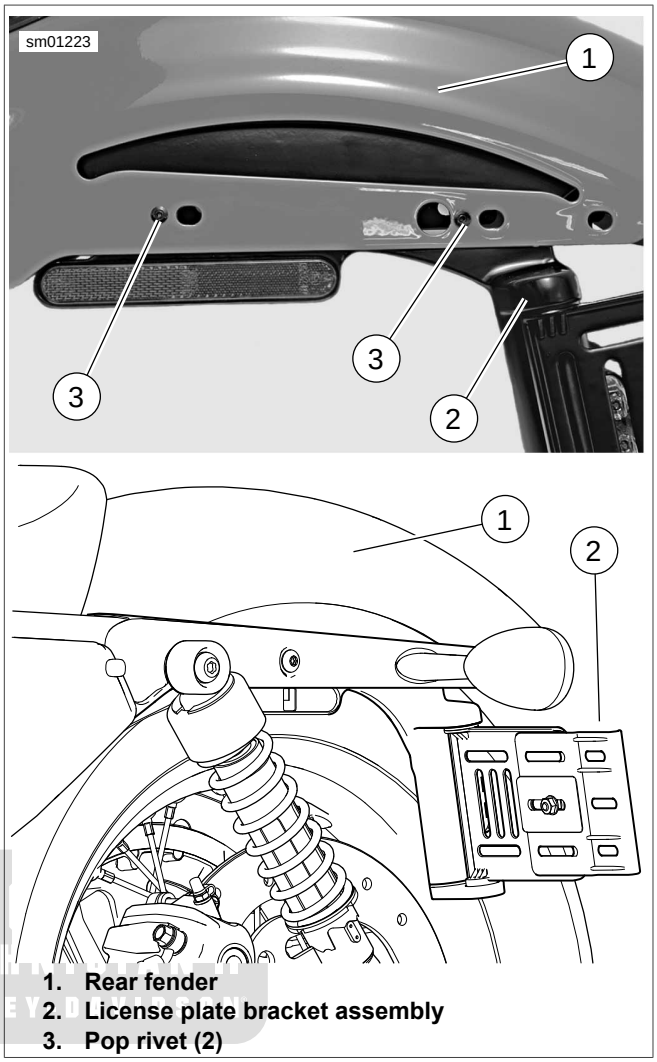
Figure 2-210. Rear Fender, Strut Cover and Turn Signal Lamp Assembly (domestic shown)

16. Place a clean shop towel between each fender strut and fender to protect paint.
17. Have an assistant hold rear fender in place. See Figure 2-211. Remove seat post (1), washer (2) and screw (5). Remove rear fender from vehicle, being careful not to damage paint. Lay rear fender on a soft, clean surface.
18. **Domestic Models:** Remove convertible side mount license plate bracket from rear fender.
    a. See Figure 2-209. 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 2-212. Carefully drill out two pop rivets (3) securing license plate bracket assembly (2) to left side of fender.
19. See Figure 2-210. If rear fender is being replaced, do the following:
    a. Remove fender seat nut kit (8).
    b. Carefully drill out pop rivets securing rear fender extension to old fender with a 1/4-in (6.35 mm) diameter drill bit.
    c. Set nut kit and fender extension aside for now.



1. **Seat post**
2. **Washer**
3. **Fender mounting tab**
4. **Grommet**
5. **Screw**

Figure 2-211. Seat Post/Rear Fender Mount Hardware



1. **Rear fender**
2. **License plate bracket assembly**
3. **Pop rivet (2)**

Figure 2-212. Removing/Installing License Plate Bracket Assembly (domestic)

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	132-216 **in-lbs**	14.9-24.4 Nm
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm
Fender support, rear, screw	132-216 **in-lbs**	14.9-24.4 Nm

1. See Figure 2-210. If **new** rear fender is being installed, do the following:
   a. Install fender seat nut kit (8).
   b. Rivet rear fender extension to fender.

2. **DOM Models:** Install convertible side mount license plate bracket on fender.
   a. See Figure 2-212. Position license plate bracket assembly (2) against inside of rear fender (1) on left side. Line up holes in bracket with holes in fender and secure bracket to fender with two **new** pop rivets (3).
   b. See Figure 2-209. 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 the aid of an assistant, carefully install rear fender onto vehicle.
4. See Figure 2-211. 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. **H-DSSS:** Make sure antenna harness feeds up between oil tank and fender on right side of vehicle and is not pinched between fender and frame crossmember.
6. Remove shop towels from fender struts.
7. See Figure 2-210. Install fender strut covers (1) with 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.
8. Thread nut (6) onto each rear turn signal stalk finger-tight. Install two forward fender support screws with washers (2). Thread nut (4) onto each screw finger-tight.
9. **HDI Models:** Hook tab of license plate bracket into slot in rear fender brace.
10. 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. **DOM Models:** See Figure 2-213. Install nut plate (2) on each mounting screw (5) finger-tight.

NOTE

***DOM Models:** see Figure 2-213. Make certain that tab (3) on each nut plate (2) fits into slot (4) in fender brace (1) when securing nut plate with rearmost fender mounting screw (5).*

11. Now tighten all fender mounting hardware in the following sequence:
    a. See Figure 2-211. Tighten screw (5) and seat post (1) to 96-156 **in-lbs** (10.9-17.6 Nm).
    b. See Figure 2-210. Tighten left and right turn signal stalk nuts (6) to 132-216 **in-lbs** (14.9-24.4 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 132-216 **in-lbs** (14.9-24.4 Nm).
12. See Figure 2-208. 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.
13. Carefully feed both rear lighting harnesses and license plate lamp harness through feed-through holes (4, 5) in rear fender.
14. Plug in license plate lamp connector [40]. Plug in left rear lighting harness connector [18].
15. Plug in right rear lighting harness connector [19]. This connector is identified by a brown band on the harness near the connector.

⚠WARNING

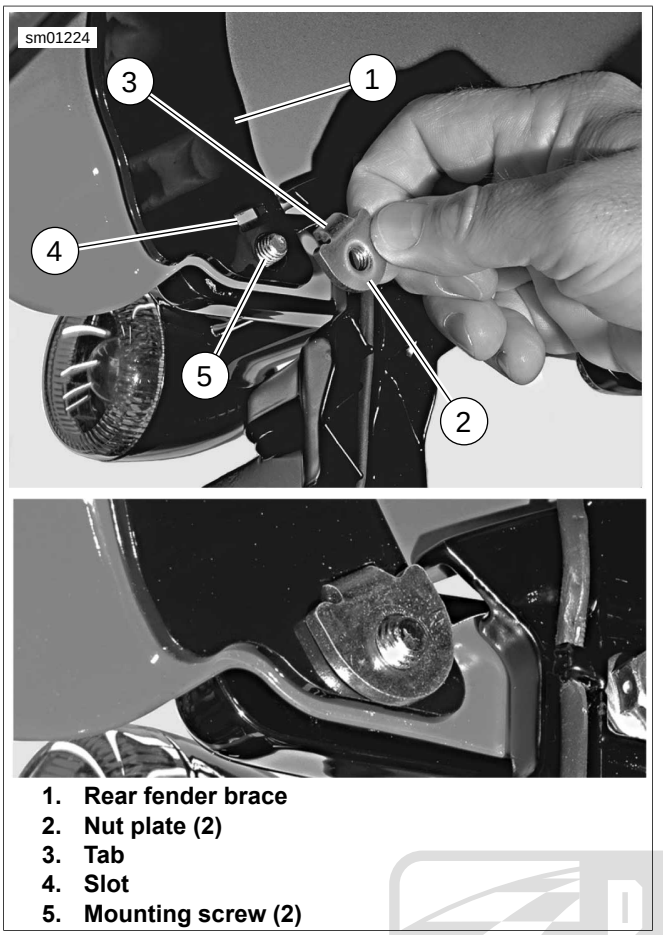
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

16. Install seat.
17. Lower motorcycle and install lower shock bolts. See 2.24 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. Turn ignition switch ON. Verify all rear lighting is operating properly: license plate lamp, tail lamps, stop lamps and turn signals.



1. Rear fender brace
2. Nut plate (2)
3. Tab
4. Slot
5. Mounting screw (2)

Figure 2-213. Rear Fender Nut Plate (Domestic Only)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR FENDER: XR 1200X 2.35

REMOVAL

1. Remove rider's seat and passenger pillion.

⚠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 2-214. Remove three bolts and washers (1). Remove two bolts (2) and retainers (3). Lift tail section (4) off from motorcycle.
4. Remove screw (5). Rotate inner fender (6) down and release tabs (7) from notches in frame.
5. Disconnect ECM connector and remove inner fender and ECM as an assembly. Remove ECM from inner fender if necessary.

INSTALLATION

FASTENER	TORQUE VALUE	
Passenger pillion retainer post screw: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm
Fender, inner screw: XR 1200X	72-120 **in-lbs**	8.1-13.6 Nm
Tailsection bolts: XR 1200X	72-120 **in-lbs**	8.1-13.6 Nm

1. See Figure 2-214. If removed, install passenger pillion retainer post (9). Tighten screw (8) to 36-60 **in-lbs** (4.1-6.8 Nm).
2. If removed, install ECM on inner fender.
3. While holding inner fender/ECM assembly in place, connect ECM connector.
4. Verify that the tabs (7) are located in notches in frame and secure inner fender with screw (5). Tighten to 72-120 **in-lbs** (8.1-13.6 Nm).

NOTE

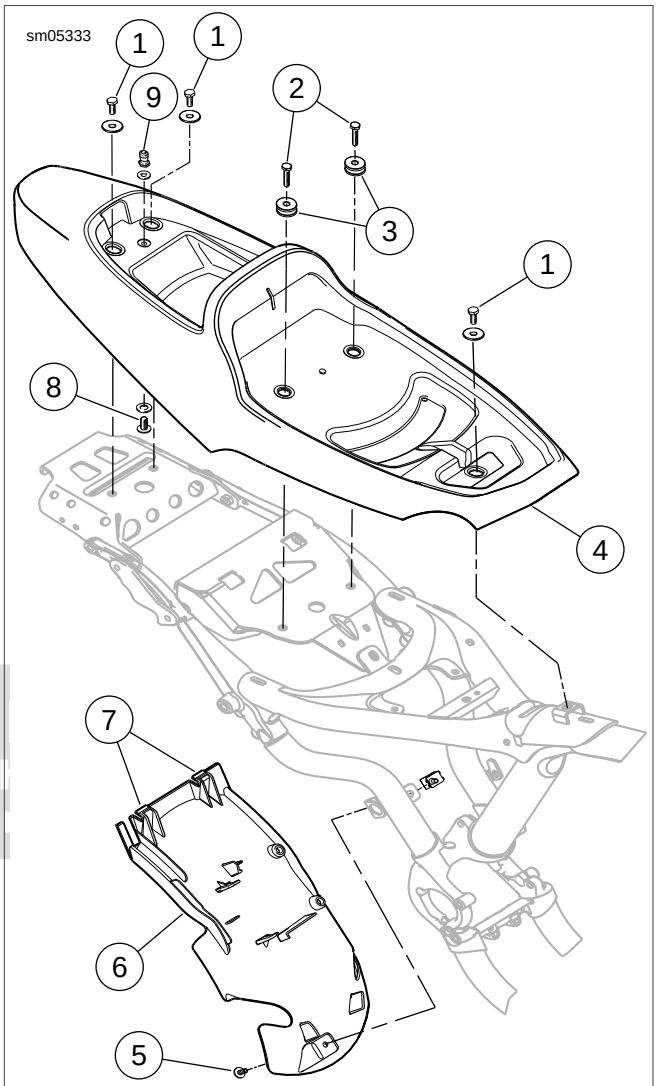
Washers and retainers (3) are installed with shoulder down.

5. Install tailsection (4) and secure with bolts, washers, and seat retainers. Tighten bolts to 72-120 **in-lbs** (8.1-13.6 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)

6. Install passenger pillion and rider's seat.
7. Install main fuse.



1. **Bolt and washer, short (3)**
2. **Bolt, long (2)**
3. **Seat retainer (2)**
4. **Tail section**
5. **Screw, inner fender**
6. **Inner fender**
7. **Tabs**
8. **Pillion retainer post screw**
9. **Passenger pillion retainer post**

Figure 2-214. Rear Fender: XR 1200X

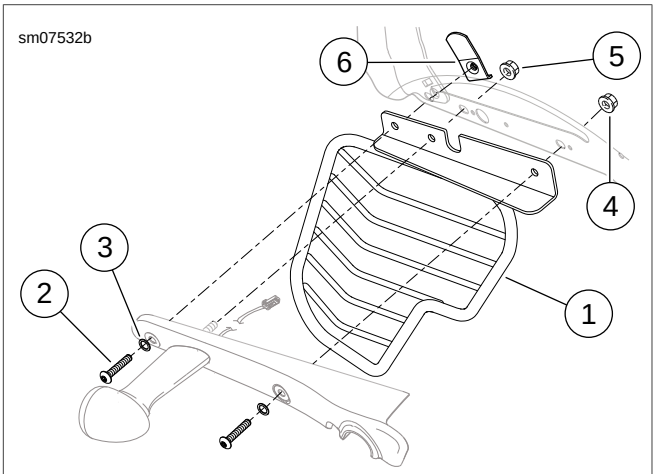
SAREE GUARD: INDIA MODELS 2.36

SAREE GUARD: XL 883R, XL 1200C/C ANV (INDIA)

FASTENER	TORQUE VALUE	
Strut cover fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	96-156 **in-lbs**	10.9-17.6 Nm
Strut cover fastener	96-156 **in-lbs**	10.9-17.6 Nm
Saree guard, left-front, passenger footrest support bracket fastener	16-20 ft-lbs	21.7-27.1 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

Right, Left-Rear

1. Remove the rear strut cover. See 2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L.
2. See Figure 2-215. Remove the saree guard (1).
3. Install the saree guard.
   a. Fit the saree guard to the fender strut.
   b. Thread the turn signal connector and wire harness through the notch in the saree guard and the hole in the fender.
   c. Install the strut cover.
   d. Verify the installation of the rear fastener clip nut (6).
   e. Install the front and rear strut cover fasteners (2) and washers (3).
   f. Install the front fastener locknut (4) and the turn signal stalk locknut (5).
4. Tighten the fasteners:
   a. Front strut cover fastener to 96-156 **in-lbs** (10.9-17.6 Nm).
   b. Turn signal stalk locknut to 96-156 **in-lbs** (10.9-17.6 Nm).
   c. Rear strut cover fastener to 96-156 **in-lbs** (10.9-17.6 Nm).
5. Complete the strut cover installation. See 2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L.



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 2-215. Right, Left-Rear Saree Guard

Left-Front

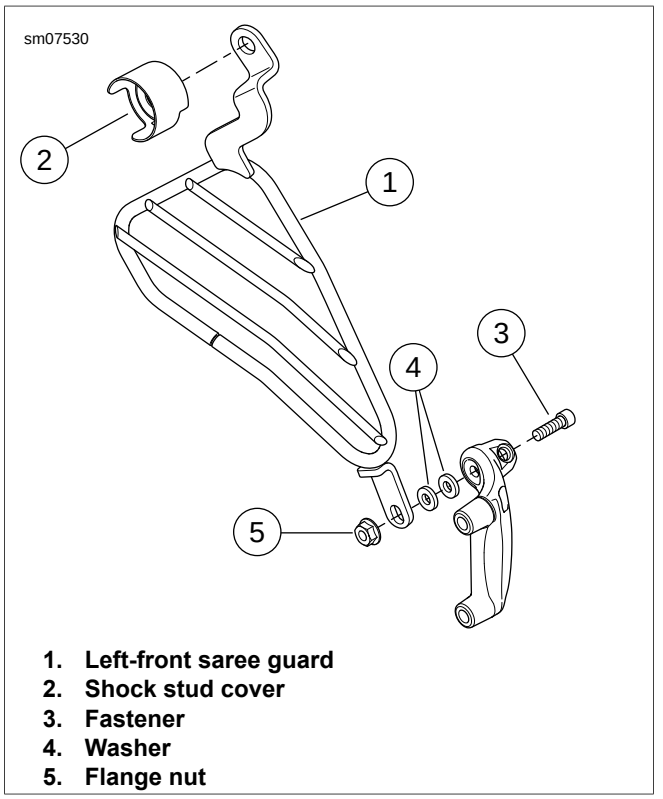
1. Remove the left passenger footrest. See 2.43 PASSENGER FOOTRESTS, XL Models.
2. Remove the left upper rear shock absorber fastener and washer. See 2.24 SHOCK ABSORBERS, Removal.
3. See Figure 2-216. Remove the saree guard (1).
   a. Remove the stud cover (2).
   b. Remove the screw (3), the two washers (4) and the flange nut (5).

NOTE

Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of the shock absorber fastener.

4. Install the saree guard.
   a. Fit the saree guard to the footrest bracket and the shock mount.
   b. Install the screw, washers and the flange nut.
   c. Install the shock stud cover.
   d. Install the shock absorber fastener and washer.
5. Tighten the passenger footrest support bracket fastener to 16-20 ft-lbs (21.7-27.1 Nm).
6. Tighten the shock absorber mounting bolt to 45-50 ft-lbs (61-68 Nm).
7. Install the passenger footrest. See 2.43 PASSENGER FOOTRESTS, XL Models.

DIGITAL TECHNICIAN HARLEY-DAVIDSON



1. **Left-front saree guard**
2. **Shock stud cover**
3. **Fastener**
4. **Washer**
5. **Flange nut**

Figure 2-216. Left-Front Saree Guard

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

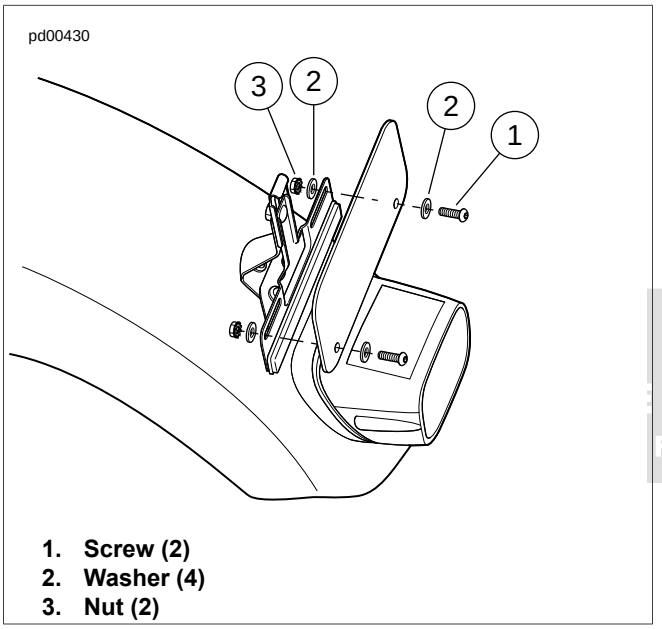
REAR LICENSE PLATE: INDIA MODELS 2.37

REAR LICENSE PLATE: XL MODELS (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/C ANV

1. See Figure 2-217. Assemble the screws (1), washers (2) the license plate and the nuts (3) to the license plate bracket.
2. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).

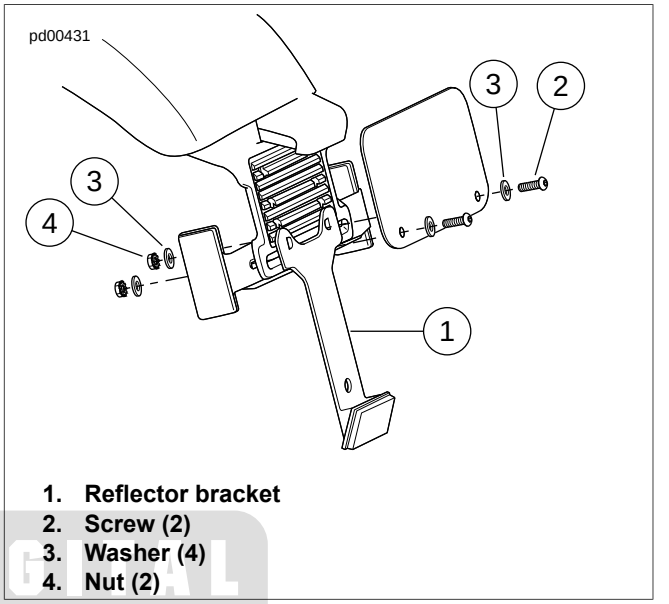


1. **Screw (2)**
2. **Washer (4)**
3. **Nut (2)**

Figure 2-217. License Plate Bracket: XL 883L/R (India) (shown)

XL 883N, XL 1200X

1. See Figure 2-218. Move the reflector bracket (1) to the lowest mounting holes.
2. Assemble the screws (2), washers (3), license plate and nuts (4) to the license plate bracket.
3. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).



1. **Reflector bracket**
2. **Screw (2)**
3. **Washer (4)**
4. **Nut (2)**

Figure 2-218. License Plate Bracket: XL 883N (India) (shown)

JIFFY STAND 2.38

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

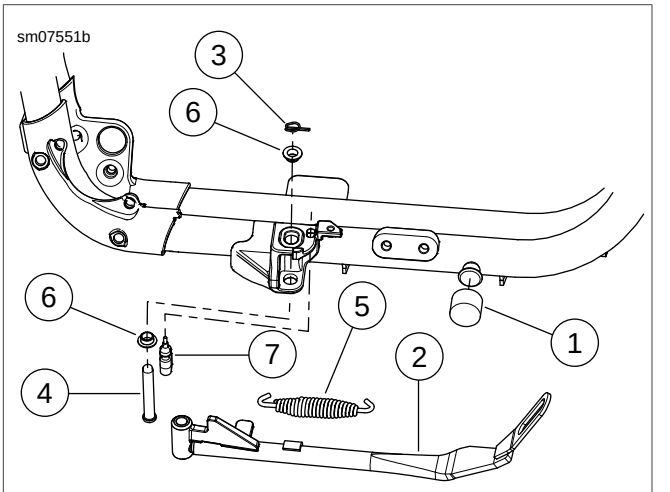
Remove stop to release spring tension.

2. See Figure 2-219. 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 6.29 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS.

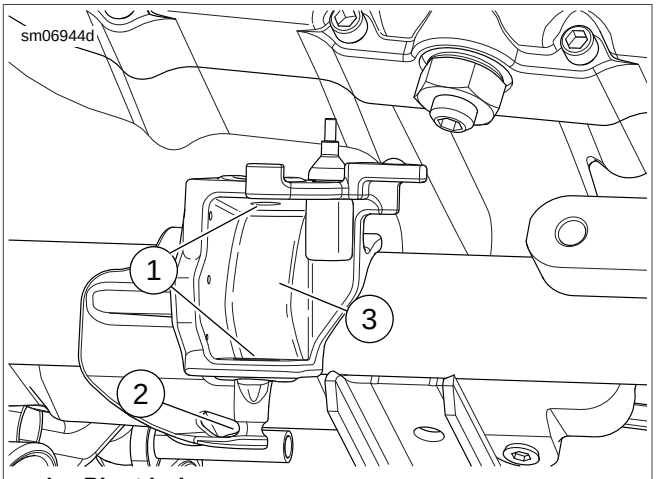


1. **Stop**
2. **Leg**
3. **Pretzel clip**
4. **Clevis pin**
5. **Spring**
6. **Bushing (2)**
7. **Bumper**

Figure 2-219. Jiffy Stand

CLEANING AND LUBRICATION

1. Clean the jiffy stand components, the frame-mounted yoke and the anchor pin.
2. See Figure 2-220. 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 2-220. 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 6.29 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 2-221. 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 2-222. 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.

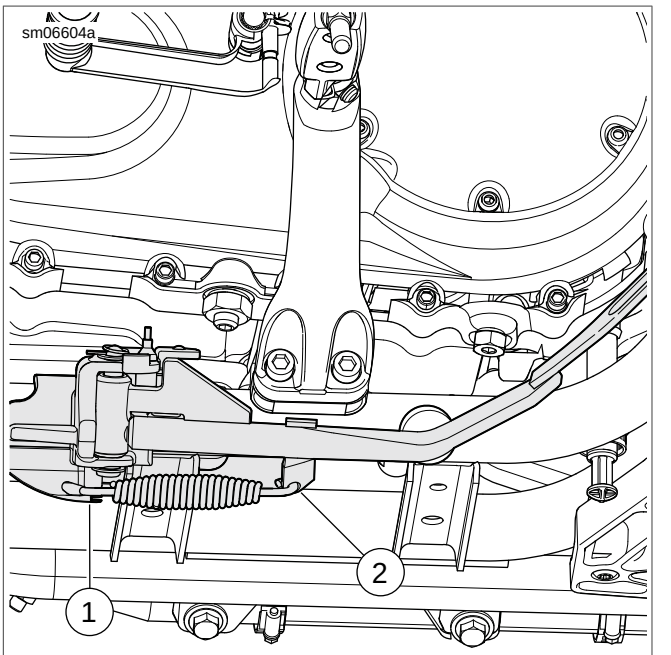
⚠WARNING

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 2-221. Jiffy Stand (typical)

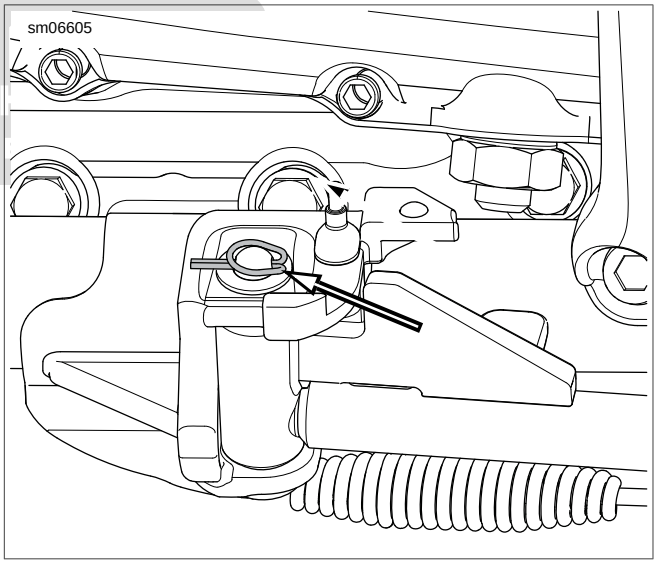


Figure 2-222. Pretzel Clip

SEAT: XL MODELS

FASTENER	TORQUE VALUE	
Seat mounting screw: XL Models	20-40 **in-lbs**	2.3-4.5 Nm

Removal

1. Remove screw to detach seat from rear fender.
2. Slide seat forward.
3. See Figure 2-223. Lift up slightly to detach keyhole bracket from seat post.

NOTES

- ***Solo Seat:*** *See Figure 2-224.*
- ***Two-Up Seat:*** *See Figure 2-225.*

4. 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. If two-up seat, inspect passenger strap (4) for damage or excessive wear.

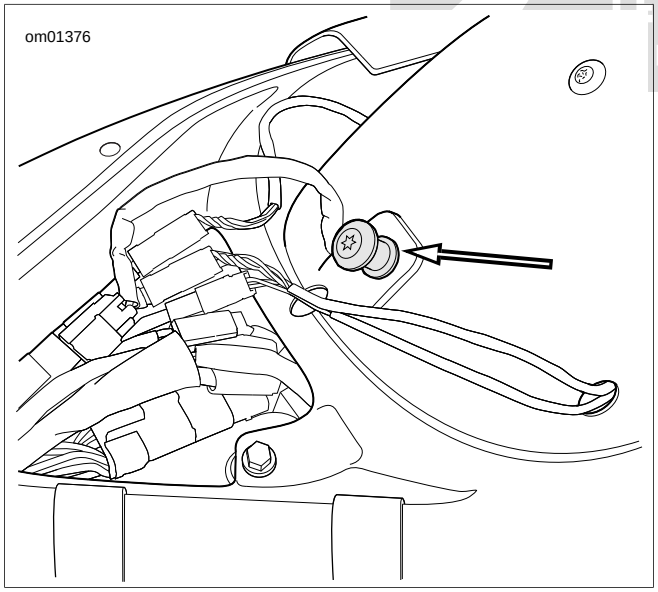
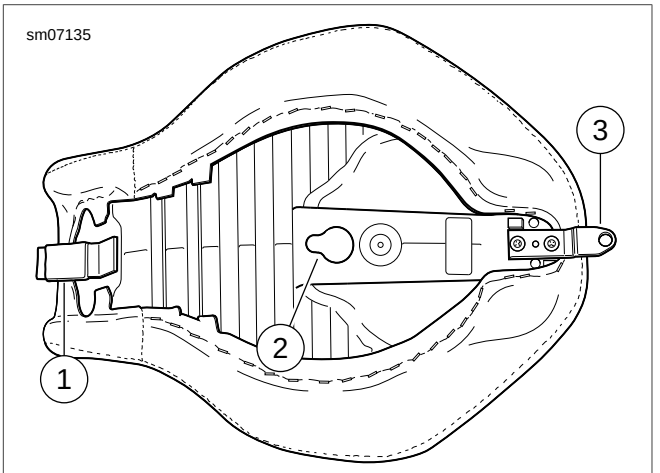
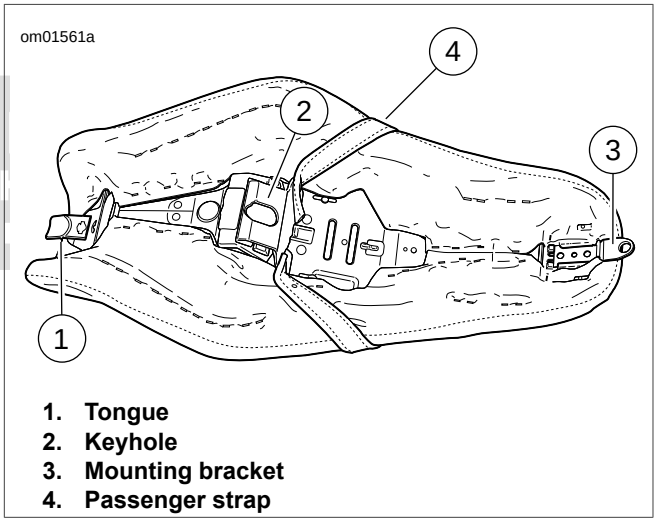


Figure 2-223. Seat Post: XL Models



1. **Tongue**
2. **Keyhole**
3. **Mounting bracket**

Figure 2-224. Seat: XL Solo



1. **Tongue**
2. **Keyhole**
3. **Mounting bracket**
4. **Passenger strap**

Figure 2-225. Seat: XL Two-Up

Installation

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

Mounting bracket of solo seat uses forward hole in rear fender. Dual seat bracket uses rearward hole.

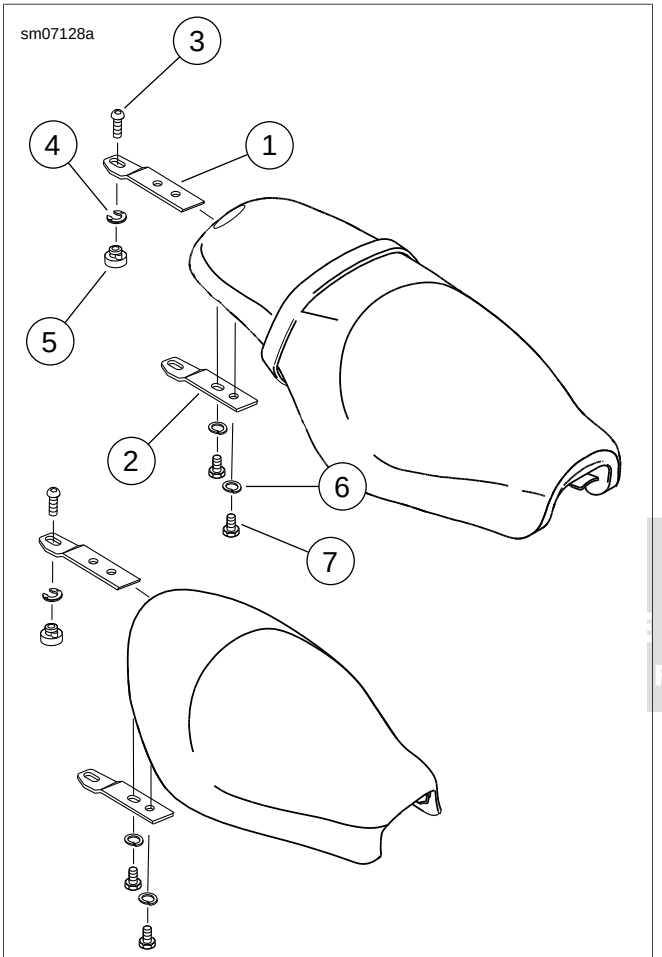
4. See Figure 2-226. Install seat mounting screw with captive washer to fasten seat mounting bracket to top of rear fender.
5. Pull up on seat to verify that it is locked in place.

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 2-226. Seat Assembly: XL Models

SEAT: XR 1200X

Removal

1. See Figure 2-227. Reach under front end of tailsection. Press the two seat tabs inward.
2. Pull front of seat upward to disengage seat from the front end of the tailsection.
3. Pull seat forward over fuel tank.

NOTES

- *When removing the seat, verify that the mounting bracket under the seat is tightly secured to the seat bottom.*
- *Check for loose or missing rivets.*
- *Inspect passenger strap for damage or excessive wear. The passenger strap is not sold separately. Replace entire seat if the strap is damaged.*

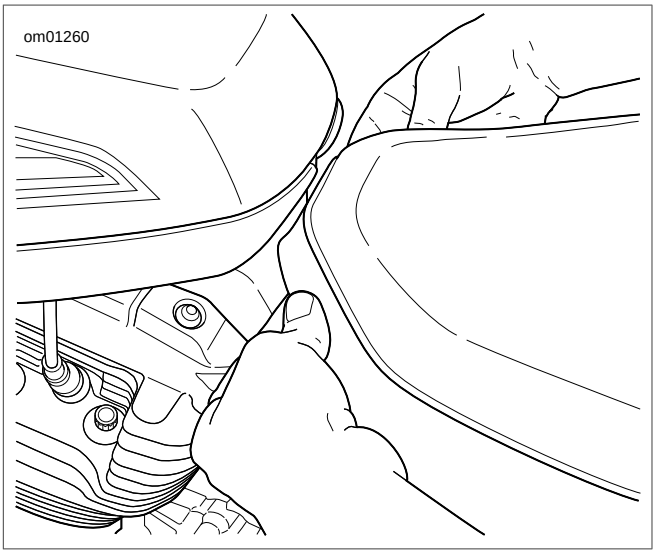


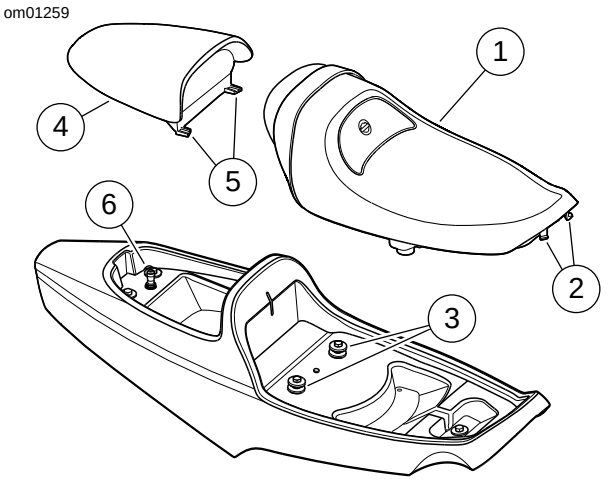
Figure 2-227. Front Seat Tabs (under tailsection): XR 1200X

Installation

1. See Figure 2-228. Align the guides in the seat bracket with the seat posts. Place rear of seat into tailsection.
2. Push down on front of seat until the two tabs engage the front end of tailsection.

⚠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)



1. **Seat**
2. **Seat tabs**
3. **Seat posts**
4. **Passenger pillion**
5. **Pillion tabs**
6. **Pillion seat post**

Figure 2-228. Seat and Pillion: XR 1200X

PASSENGER PILLION: XR 1200X

Removal

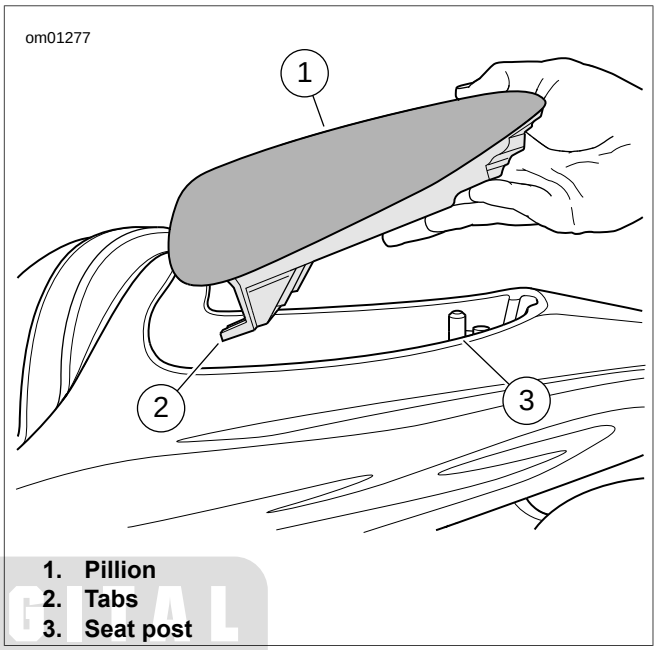
1. See Figure 2-229. Lift the rear of pillion to disengage grommet from the seat post.
2. Pull pillion out from tailsection.

Installation

1. See Figure 2-229. Insert pillion into trunk, aligning tabs on pillion with the slots in the trunk.
2. Push down firmly on rear of pillion until grommet fully engages the seat post.

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)



1. **Pillion**
2. **Tabs**
3. **Seat post**

Figure 2-229. Passenger Pillion: XR 1200X

DIGITAL TECHNICIAN HARLEY-DAVIDSON®

RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS 2.40

RIGHT FOOTREST AND REAR BRAKE PEDAL ASSEMBLY

FASTENER	TORQUE VALUE	
Footrest mount fastener	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 to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm
Brake rod to brake pedal screw	120-180 **in-lbs**	13.6-20.4 Nm

Removal

1. Remove front muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.
2. See Figure 2-230. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
3. Remove brake rod (5) from brake pedal (6) and master cylinder bell crank.
4. Remove retaining ring (7), screw (8) and clevis (9). Discard retaining ring.
5. Remove two fasteners (10) and right rider footrest/brake pedal support bracket (11) from frame.

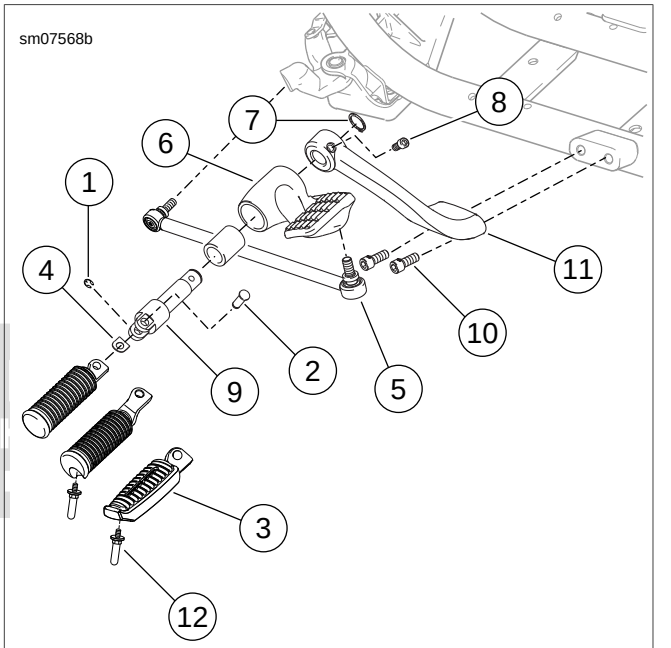
Installation

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 the 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 **new** retaining ring.

NOTE

Position spring washer inside clevis with the square edge toward the inside.

3. Install footrest.
   a. Install footrest and spring washer on clevis.
   b. Align holes and push clevis pin from top down through hole in clevis.
   c. Install **new** retaining ring.
4. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
5. Install the brake rod.
   a. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of both brake rod ball stud screws.
   b. Thread one end of brake rod into master cylinder bell crank. Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
   c. Thread other end of brake rod into brake pedal. Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
6. Install front muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.



1. **Retaining ring**
2. **Clevis pin**
3. **Footrest**
4. **Spring washer**
5. **Brake rod**
6. **Brake pedal**
7. **Retaining ring**
8. **Screw**
9. **Clevis**
10. **Screw (2)**
11. **Bracket**
12. **Wear peg**

Figure 2-230. Right Footrest and Rear Brake Pedal

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
Rider footrest support bracket mounting screw	45-50 ft-lbs	61-68 Nm
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm

Removal

1. See Figure 2-231. 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

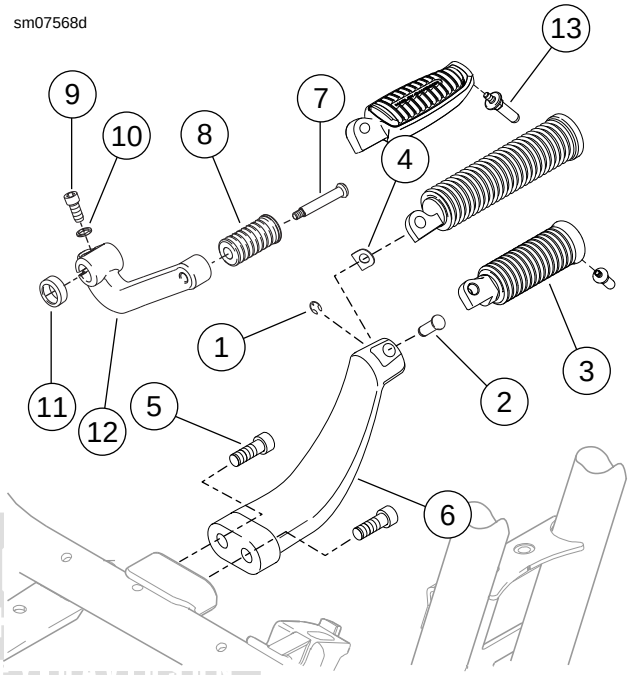
*A **new** shifter peg screw comes with a lock patch.*

2. Install the shifter peg.
   a. Clean screw threads of the shifter peg screw and apply one or two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
   b. Install shifter peg and screw.
   c. Tighten screw 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 the square edge toward the inside.

4. Install footrest.
   a. Install footrest with spring washer on footrest support bracket.
   b. Align holes and push clevis pin from top down through hole in support bracket.
   c. 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 2-231. Left Footrest and Shift Lever

RIDER FOOT CONTROLS: XL FORWARD CONTROLS 2.41

RIGHT FOOTREST AND REAR BRAKE PEDAL ASSEMBLY

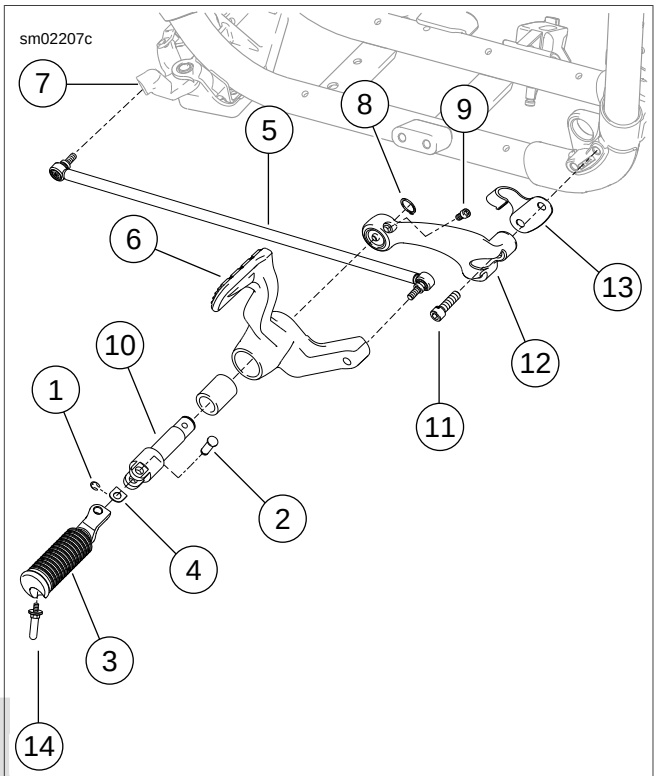
FASTENER	TORQUE VALUE	
Footrest mount fastener	45-50 ft-lbs	61-68 Nm
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm
Brake rod to brake pedal screw	120-180 **in-lbs**	13.6-20.4 Nm

Removal

1. See Figure 2-232. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
2. Remove brake rod (5) from brake pedal (6) and master cylinder bell crank (7).
3. Remove retaining ring (8), screw (9) and clevis (10). Slide brake pedal off clevis. Discard retaining ring.
4. Remove two screws (11), footrest/brake pedal support bracket (12) and J-clip (13) from frame.

Installation

1. See Figure 2-232. Position J-clip (13) against frame as shown. Mount footrest/brake pedal support bracket (12) and J-clip to frame with screws (11). Tighten to 45-50 ft-lbs (61-68 Nm).
2. Slide brake pedal (6) onto clevis (10). Mount clevis on footrest/brake pedal support bracket. Line up hole in clevis with hole in support bracket. Secure with screw (9). Tighten to 13-17 ft-lbs (17.6-23.0 Nm). Install **new** retaining ring (8) on end of clevis.
3. Install footrest (3) on clevis with spring washer (4). Make sure spring washer is positioned inside clevis with the square edge toward the inside. Align holes and push clevis pin (2) from top down through hole in clevis. Secure with **new** retaining ring (1).
4. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
5. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of both brake rod ball stud screws.
6. Thread one end of brake rod (5) into master cylinder bell crank (7). Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
7. Thread other end of brake rod into brake pedal. Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).



1. **Retaining ring**
2. **Clevis pin**
3. **Footrest**
4. **Spring washer**
5. **Brake rod**
6. **Brake pedal**
7. **Bell crank**
8. **Retaining ring**
9. **Screw**
10. **Clevis**
11. **Screw (2)**
12. **Footrest/brake pedal support bracket**
13. **J-clip**
14. **Wear peg**

Figure 2-232. 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 mount fastener	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 2-233. 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 the shifter rod screws (7) and the 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

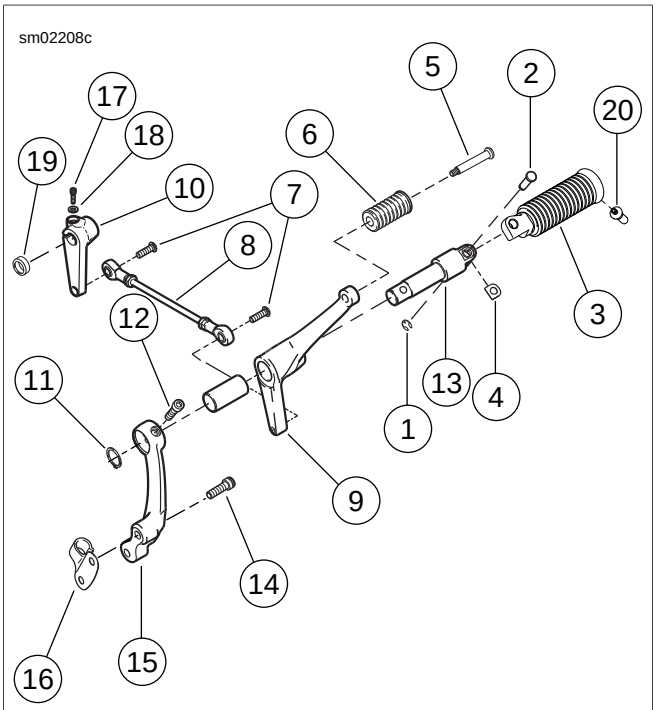
1. See Figure 2-233. Install rubber washer (19) and shift lever (10) onto transmission shifter shaft, with shift lever arm pointing straight down. Secure with pinch screw (17) and washer (18). Tighten pinch screw to 16-20 ft-lbs (21.7-27.1 Nm).
2. Mount j-clip (16) and footrest/shift lever support bracket (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 the spring washer inside clevis with the square edge toward the 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 re-using shifter peg screw, clean screw threads and 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).

DIGITAL TECHNICIAN II 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 2-233. Shifter Side Forward Controls

ADJUSTING SHIFT PEDAL: FORWARD CONTROLS MODELS

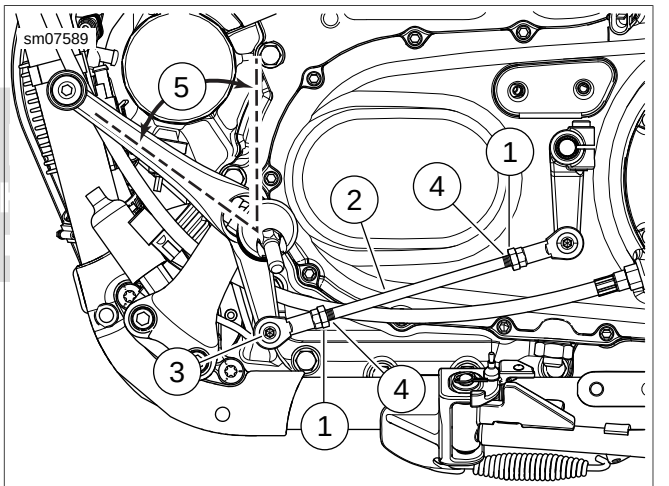
FASTENER	TORQUE VALUE	
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm

1. See Figure 2-234. Loosen locknuts (1) on shift rod (2).
2. Remove ball joint screw (3).

NOTE

Adjust so that an equal number of threads (4) are visible on both ends of the shift rod.

3. Turn ball joint or shift rod to adjust rod length.
4. Temporarily attach ball joint to shift lever.
5. Measure the shift lever angle (5). Remove and adjust as necessary until the 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 2-234. Shifter Linkage: Models with Forward Controls

RIDER FOOT CONTROLS: XR 1200X 2.42

RIGHT FOOTREST AND REAR BRAKE PEDAL ASSEMBLY

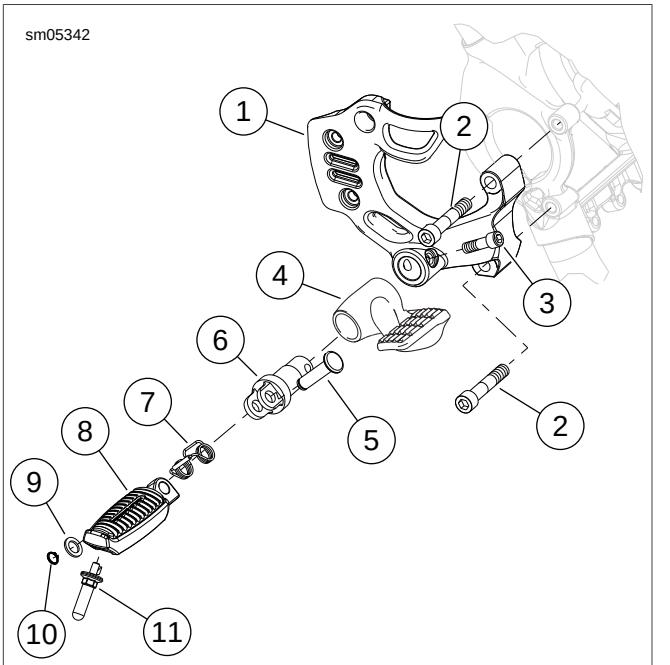
FASTENER	TORQUE VALUE	
Footrest clevis fastener: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm

Removal

1. Remove clevis pin connecting master cylinder to brake pedal. See 2.12 REAR BRAKE MASTER CYLINDER: XR 1200X.
2. If necessary, remove wear peg (11).
3. See Figure 2-235. Remove retaining ring (10) and washer (9). Discard retaining ring.
4. Remove clevis pin (5), spring (7), and footrest (8).
5. Remove bolt (3), footrest clevis (6), and brake pedal (4).
6. If necessary, remove bracket (1). The master cylinder must be disconnected from the bracket or brake line disconnected prior to removing the two fasteners (2). See 2.12 REAR BRAKE MASTER CYLINDER: XR 1200X.

Installation

1. If removed, install master cylinder/footrest bracket. See 2.12 REAR BRAKE MASTER CYLINDER: XR 1200X.
2. See Figure 2-235. Install brake pedal on footrest clevis and install footrest clevis. Tighten bolt (3) to 13-17 ft-lbs (17.6-23.0 Nm).
3. Install footrest (8) and spring (7) on clevis and secure with clevis pin (5). Install washer (9) and **new** retaining ring (10).
4. If removed, install wear peg and tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
5. Connect brake pedal to master cylinder. See 2.12 REAR BRAKE MASTER CYLINDER: XR 1200X.



1. **Master cylinder/footrest bracket**
2. **Fastener**
3. **Footrest clevis bolt**
4. **Brake pedal**
5. **Clevis pin**
6. **Footrest clevis**
7. **Spring**
8. **Footrest**
9. **Washer**
10. **Retaining ring**
11. **Wear peg**

Figure 2-235. Rider Foot Control, Right Side: XR 1200X

LEFT FOOTREST AND SHIFT LEVER ASSEMBLY

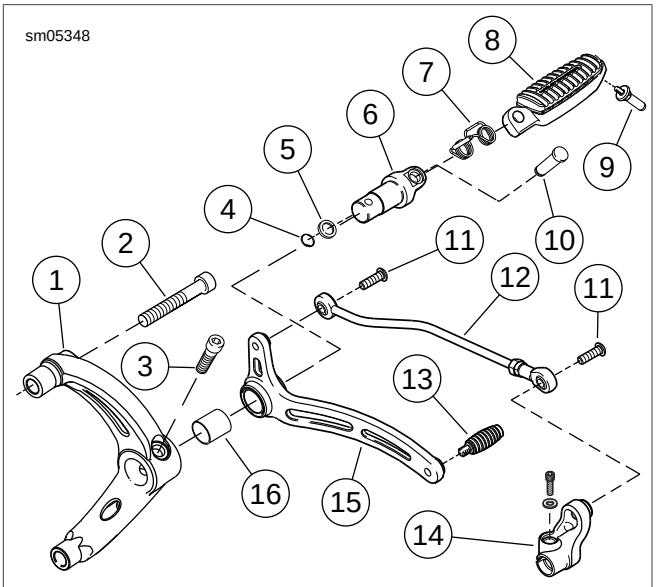
FASTENER	TORQUE VALUE	
Footrest bracket fastener: XR 1200X	45-50 ft-lbs	61-68 Nm
Footrest clevis fastener: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm
Shift linkage fastener	120-180 **in-lbs**	13.6-20.3 Nm

Removal

1. See Figure 2-236. Remove fasteners (11) and remove linkage (12).
2. If necessary, remove wear peg (9).
3. Remove retaining ring (4) and washer (5). Discard retaining ring.
4. Remove clevis pin (10), spring (7), and footrest (8).
5. Remove bolt (3), footrest clevis (6), and foot shift lever (15).
6. Remove shifter peg (13).
7. If necessary, remove fasteners (2) and bracket (1).

Installation

1. See Figure 2-236. If removed, install bracket (1). Tighten fasteners (2) to 45-50 ft-lbs (61-68 Nm).
2. Install foot shift lever on footrest clevis. Install footrest clevis and bolt (3). Tighten to 13-17 ft-lbs (17.6-23.0 Nm).
3. Install footrest (8) and spring (7) on clevis. Secure with clevis pin (10). Install washer (5) and **new** retaining ring (4).
4. Install shifter peg (13). Tighten to 96-144 **in-lbs** (10.9-16.3 Nm).
5. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
6. Connect linkage (12) between foot shift lever (15) and transmission shift lever (14) using fasteners (11). Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
7. Check shift linkage adjustment. Adjust as necessary.



1. **Bracket**
2. **Fastener (2)**
3. **Footrest clevis bolt**
4. **Retaining ring**
5. **Washer**
6. **Footrest clevis**
7. **Spring**
8. **Footrest**
9. **Wear peg**
10. **Clevis pin**
11. **Fastener (2)**
12. **Shift linkage**
13. **Shifter peg**
14. **Transmission shift lever**
15. **Foot shift lever**
16. **Bushing**

Figure 2-236. Rider Foot Control, Left Side: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

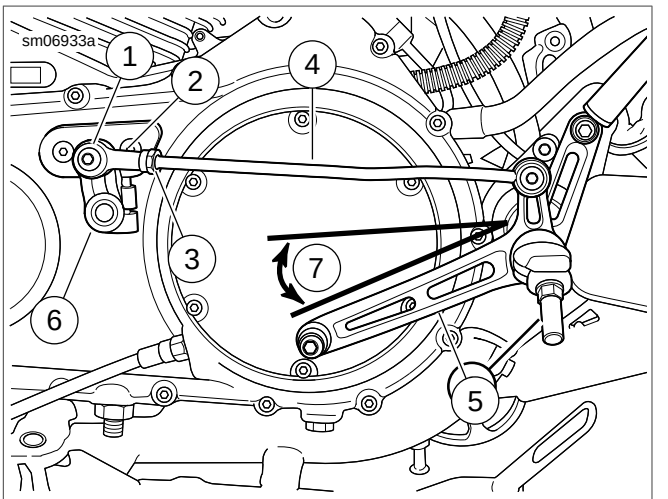
ADJUSTING SHIFT LEVER

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

The foot shift linkage is set at the factory and normally should need no adjustment. However, the shift linkage can be adjusted for rider preference.

See Figure 2-237. Adjust shifter rod assembly (4) length until shifter lever (5) is at approximately 20 degrees from horizontal as shown in the figure.

1. Loosen jamnut (3) on front end of shifter rod.
2. Remove screw (1) securing ball joint (2) to shifter arm (6).
3. Turn ball joint in one direction or the other to adjust rod length as necessary. Temporarily attach ball joint to shifter arm and check angle.
4. When angle of shift lever assembly is at 20 degrees, install screw (1). Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
5. Holding ball joint with a wrench on the flats, tighten the jamnuts to 84-132 **in-lbs** (9.5-14.9 Nm).



1. **Screw**
2. **Ball joint**
3. **Jamnut**
4. **Shifter rod**
5. **Shifter lever assembly**
6. **Shifter arm**
7. **20 degrees**

Figure 2-237. Adjusting Shift Pedal: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

PASSENGER FOOTRESTS 2.43

XL MODELS

FASTENER	TORQUE VALUE	
Passenger footrest support bracket fastener: XL Models	45-50 ft-lbs	61-68 Nm

Removal

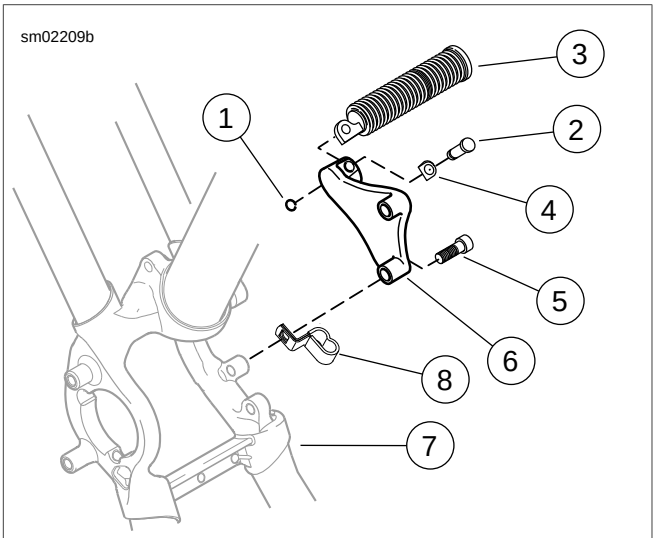
1. See Figure 2-238. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
2. Remove two screws (5) and footrest support bracket (6) from frame (7).

Installation

NOTE

See Figure 2-238. Position clamp (8) between the left footrest support bracket (6) and the lower support bracket hole in the frame.

1. See Figure 2-238. Attach footrest support bracket (6) to frame (7) with two fasteners (5). Tighten to 45-50 ft-lbs (61-68 Nm).
2. Install footrest (3) on footrest support bracket with spring washer (4). Make sure spring washer is positioned inside support bracket mounting boss with the square edge toward the inside.
3. Align holes and push clevis pin (2) from top down through hole in support bracket. Secure with **new** retaining ring (1).



1. **Retaining ring**
2. **Clevis pin**
3. **Footrest**
4. **Spring washer**
5. **Fastener (2)**
6. **Footrest support bracket**
7. **Frame**
8. **Clamp (left side only)**

Figure 2-238. Passenger Footrest Assembly (optional on some models)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

XR 1200X

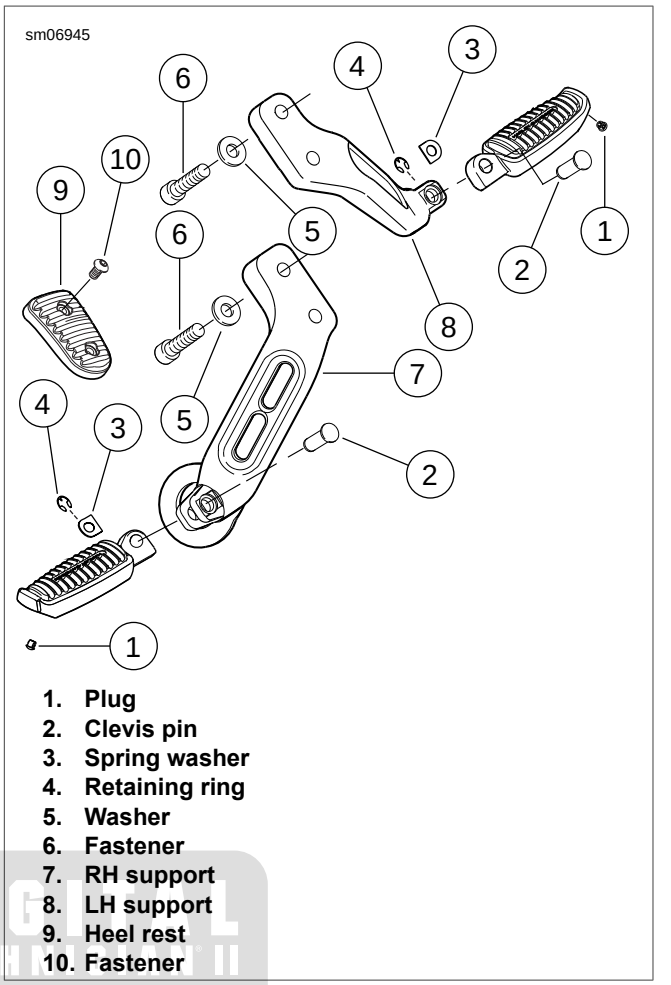
FASTENER	TORQUE VALUE	
Passenger footrest support bracket fastener: XR 1200X	45-50 ft-lbs	61-68 Nm
Muffler bracket to footrest bracket screw: XR 1200X	15-19 ft-lbs	20.4-25.8 Nm

Removal

1. See Figure 2-239. Remove retaining ring (4), clevis pin (2), footrest and spring washer (3). Discard retaining ring.
2. On right side of vehicle, remove screw securing muffler bracket to footrest support bracket.
3. Remove two fasteners (6), washers (5) and footrest support (7, 8) from frame.

Installation

1. See Figure 2-239. Attach left and right footrest support (7, 8) to frame with two fasteners (6) and washers (5). Tighten to 45-50 ft-lbs (61-68 Nm).
2. Attach muffler bracket to footrest support bracket with screw. Tighten to 15-19 ft-lbs (20.4-25.8 Nm).
3. Install footrests on footrest support with spring washer (3). Make sure spring washer is positioned inside support bracket mounting boss with the square edge toward the inside.
4. Align holes in footrest and support bracket and push clevis pin (2) from top down through hole in support bracket. Secure with **new** retaining ring (4).



1. **Plug**
2. **Clevis pin**
3. **Spring washer**
4. **Retaining ring**
5. **Washer**
6. **Fastener**
7. **RH support**
8. **LH support**
9. **Heel rest**
10. **Fastener**

Figure 2-239. Left and Right Passenger Footrests

FORK LOCK 2.44

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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

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: XL MODELS or 4.5 FUEL TANK: XR 1200X.
4. Turn front forks full left lock.
5. See Figure 2-240. See Figure 2-241. Using a 5/64 drill bit, carefully drill a hole in the center of the lock pin.

NOTE

Take time to carefully orient drill bit to center of lock pin. If drill bit slides off-center, removal of lock pin will be difficult.

6. See Figure 2-242. To remove lock pin, insert a screw extractor into the drilled hole. Hold body of screw extractor with a pliers or tap handle and using a small hammer gently "tap" on the pliers or tap handle to remove lock pin.
7. Remove lock assembly.



Figure 2-240. Fork Lock Pin

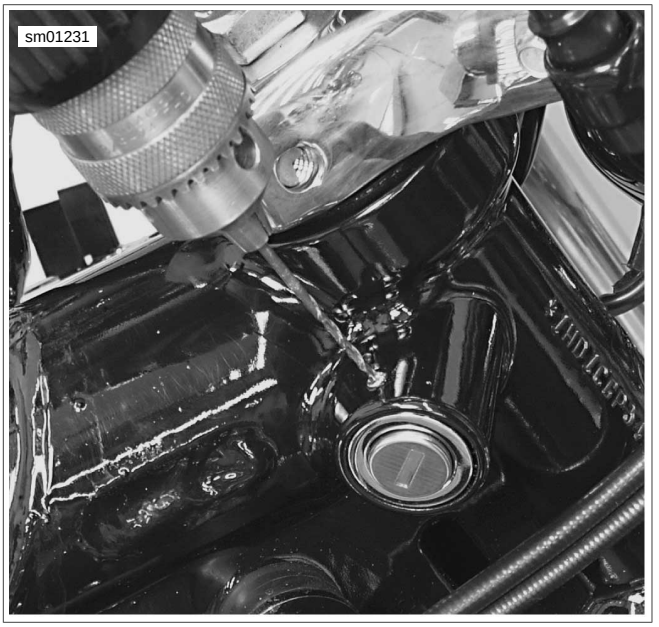


Figure 2-241. Drilling Lock Pin

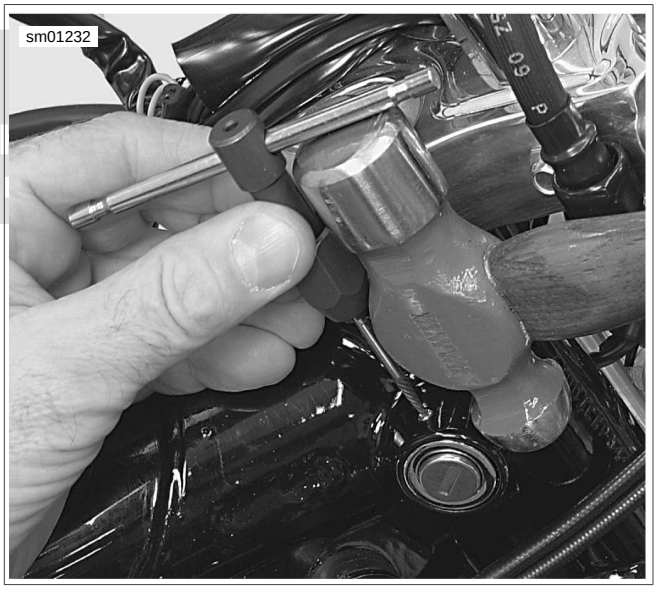


Figure 2-242. Removing Lock Pin

INSTALLATION

1. Insert **new** lock assembly in frame lock housing.
2. Align lock pin hole in **new** lock assembly with hole in the frame lock housing.
3. Drive **new** lock pin in position (flush with frame lock housing).
4. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. Verify proper operation of fork lock.
   a. Turn front forks fully to the 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 and remove from fork lock.
   e. Verify that front forks are now free to fully turn right and left.
6. Install main fuse.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MEDALLIONS, SERIALIZED BADGES AND TANK EMBLEMS 2.45

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, the 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 surface to dry.

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 the medallion.*
- *The adhesive bonds in 72 hours at room temperature.*

2. Remove protective film from back of medallion.
3. Apply even pressure across the 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 HARLEY-DAVIDSON®

NOTES

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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NOTES

FASTENER TORQUE VALUES 3.1

FASTENER TORQUE VALUES IN THIS CHAPTER

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

FASTENER	TORQUE VALUE		NOTES
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Brake hose clamp to frame, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Breather screw: XL Models	35-55 **in-lbs**	4.0-6.2 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Check valve housing fastener: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
Check valve housing fastener: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Check valve plug fitting: XR 1200X	15-21 ft-lbs	20.3-28.5 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Cylinder headbolts, 1st torque	96-120 **in-lbs**	11-14 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder headbolts, 1st torque	96-120 **in-lbs**	11-14 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder headbolts, final torque	13-15 ft-lbs	18-20 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder headbolts, final torque	13-15 ft-lbs	18-20 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder head oil feed flare fitting: XR 1200X	22-26 ft-lbs	29.8-35.3 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Cylinder head oil feed line flare nut: XR 1200X	13-17 ft-lbs	18-23 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Engine mount, front, bolt	95-105 ft-lbs	129 -142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X

FASTENER	TORQUE VALUE		NOTES
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.21 OIL PUMP: XR 1200X, Assembly
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Gearcase housing plug	108-156 **in-lbs**	12.2-17.6 Nm	3.21 OIL PUMP: XR 1200X, Assembly
Ignition switch mounting screw	34-45 **in-lbs**	4.0-5.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Ignition switch mounting screw	34-45 **in-lbs**	4.0-5.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Induction module cover to cylinder head fastener: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Induction module cover to induction module fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Induction module cover to wire form fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Isolator mount, front, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Isolator mount, front, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Oil cooler fastener: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Oil cooler fastener: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Cooler/Apply LOCTITE 243 MEDIUM STRENGHT THREADLOCKER AND SEALANT (blue)
Oil deflector plate screw: XR 1200X	38-48 **in-lbs**	4.3-5.4 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm	3.23 OIL FILTER MOUNT, Assembly

FASTENER	TORQUE VALUE		NOTES
Oil line quick connect fitting, cylinder head return: XR 1200X	108-156 **in-lbs**	12.2-17.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines
Oil line retainer, front, nut: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines
Oil pump cover screws	70-80 **in-lbs**	7.9-9.0 Nm	3.20 OIL PUMP: XL MODELS, Assembly
Oil pump feed fitting	100-120 **in-lbs**	11.3-13.6 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil pump high pressure feed hose fitting nut	85-105 **in-lbs**	9.6-11.8 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil pump high pressure feed hose to crankcase fitting	60-90 **in-lbs**	6.8-10.2 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil pump quick connect fitting: XR 1200X	108-156 **in-lbs**	12.2-17.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines
Oil pump rotor cover screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	3.21 OIL PUMP: XR 1200X, Assembly
Oil pump rotor cover screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Oil pump to crankcase screw	125-150 **in-lbs**	14.1-16.9 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil rigid line retainer, rear, screw: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines
Oil rigid line retainer, rear, screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines
Oil tank mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	3.24 OIL TANK, Installation
Pinion shaft locking nut: XR 1200X	19-21 ft-lbs	26-29 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models/ plus an additional 15-19 degrees of rotation
Pinion shaft locking nut: XR 1200X	19-21 ft-lbs	26-29 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X/ plus 15-19 degrees of rotation
Piston oil jet screw	38-48 **in-lbs**	4.3-5.4 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Retainer plate, lower front, fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Return oil manifold screw: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Return Oil Manifold
Rocker cover, inner, large bolt	18-22 ft-lbs	24.4-29.8 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, screw	135-155 **in-lbs**	15.3-17.5 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, small bolt	135-155 **in-lbs**	15.3-17.5 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, outer, screw	120-168 **in-lbs**	13.5-19.0 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Shift linkage pivot bolt	120-180 **in-lbs**	13.6-20.3 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Shock absorber mounting bolt	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Siren/canister bracket rear brake line fastener	17-22 ft-lbs	23.0-29.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models

FASTENER	TORQUE VALUE		NOTES
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link, lower, frame bracket, front, mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link, lower, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.16 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	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Stabilizer link cylinder head bracket	55-65 ft-lbs	74.6-88.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link cylinder head bracket	55-65 ft-lbs	74.6-88.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stop lamp switch bracket screw	72-120 **in-lbs**	8.1-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Tappet cover, anti-rotation mounting screw	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets
Tappet cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods

SPECIFICATIONS 3.2

SPECIFICATIONS: SPORTSTER MODELS

Table 3-1. Engine

ITEM	XL 883 MODELS		XL 1200 MODELS		XR 1200X	
Number of cylinders	2					
Type	4-cycle, 45 degree, V-twin, air cooled					
Compression ratio	8.9-1		9.7-1		10.0-1	
Bore	3.000 in	76.20 mm	3.500 in	88.90 mm	3.500 in	88.90 mm
Stroke	3.812 in	96.82 mm	3.812 in	96.82 mm	3.812 in	96.82 mm
Displacement	53.9 in^3	883 cm^3	73.4 in^3	1202 cm^3	73.4 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: All 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
***XR 1200X:** Oversized pistons are not available. Replace piston and/or cylinder as needed.				

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
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 OperatingTemperature

rpm	XL MODELS*		XR 1200X**	
	psi	kPa	psi	kPa
1000	7-12	43.3-82.7	16-20	110.3-137.9
2500	10-17	68.9-117	40-44	275.8-303.4
* Pressure reading taken at oil pressure switch fitting. ** Pressure reading taken at oil cooler inlet.				

Table 3-17. Electrical: XL Models

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. Electrical: XR 1200X

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	10R12X	
Spark plug size	12 mm	
Spark plug gap	0.032-0.038 in	0.81-0.97 mm
Spark plug torque	12-18 ft-lbs	16.3-24.4 Nm

Table 3-19. Oil Pump: All Models

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.

XL Models

The oil pump is non regulatory and delivers its entire volume of oil under pressure to the oil filter mount.

XR 1200X

The feed oil pump incorporates a bypass valve that will open at approximately 50 psi (345 kPa), preventing overpressure in the oil cooler and related components. The XR 1200X incorporates a thermostat in the oil cooler return path.

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 3-20. 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.

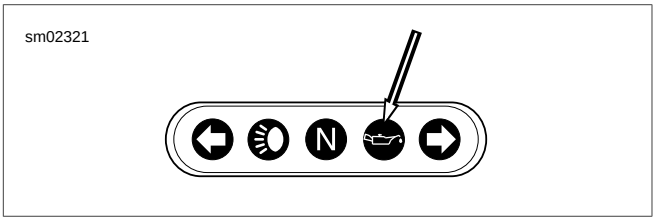


Figure 3-1. Oil Pressure Indicator Lamp

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.

Table 3-20. Oil 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 3.23 OIL FILTER MOUNT and 3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
	Malfunctioning or improperly installed pressure relief valve.
Flickers at idle.	Incorrect idle speed. Malfunctioning or improperly installed check valve. See 3.23 OIL FILTER MOUNT and 3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
	Malfunctioning or improperly installed pressure relief valve.

Table 3-20. Oil Lamp Troubleshooting

OIL PRESSURE INDICATOR LAMP	PROBABLE CAUSES
Does not glow when ignition is turned on (prior to 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-96921-125	OIL PRESSURE GAUGE ADAPTER
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT
HD-96925-58	OIL PRESSURE GAUGE ADAPTER

1. Fill oil tank to proper level. 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: XL Models

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.

Connecting Gauge: XR 1200X

1. See Figure 3-5. Disconnect the quick connect fitting from the inlet side of the oil cooler (4). See 3.12 PRECISION COOLING SYSTEM: XR 1200X, General.
2. Connect OIL PRESSURE GAUGE ADAPTER (Part No. HD-96921-125) (5) to the oil hose (6).
3. Connect the other end of the adapter to the oil cooler fitting (4).

Testing Pressure

1. See Figure 3-4 or Figure 3-5. 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, engine oil should be 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. Ride motorcycle until engine reaches normal operating temperature.
3. Check and record the pressure readings at normal idle (approximately 1000 rpm) and again at 2500 rpm. Refer to Table 3-21.

Table 3-21. Oil Pressure: At OperatingTemperature

rpm	XL MODELS*		XR 1200X**	
	psi	kPa	psi	kPa
1000	7-12	43.3-82.7	16-20	110.3-137.9
2500	10-17	68.9-117	40-44	275.8-303.4
* Pressure reading taken at oil pressure switch fitting. ** Pressure reading taken at oil cooler inlet.				

Removing Gauge: XL Models

1. Stop engine. 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 from vehicle.
2. See Figure 3-2. Coat threads of oil pressure switch (2) with LOCTITE 565 PIPE SEALANT with TEFLON. Replace the oil pressure switch. Using OIL PRESSURE SENDING UNIT WRENCH, tighten switch snugly. DO NOT OVER-TIGHTEN.
3. Plug in connector [120] (3) by pushing elbow connector straight up onto stud on oil pressure switch.

Removing Gauge: XR 1200X

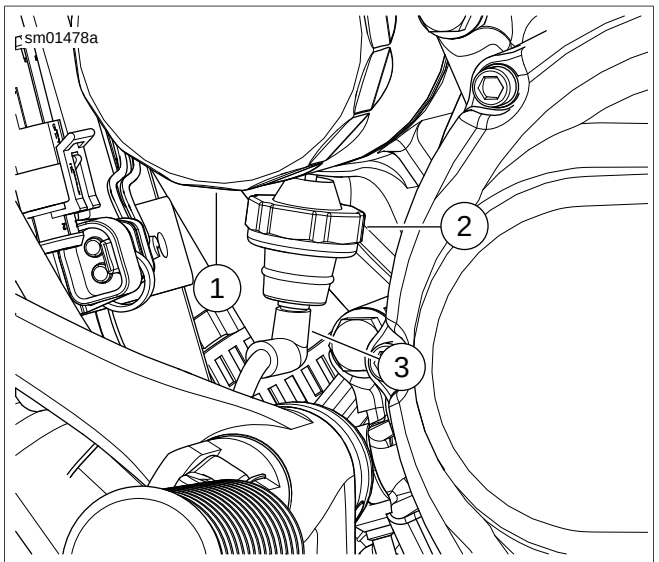
1. Stop engine. Cut cable straps securing gauge and hose. Remove banjo bolt, gauge assembly, washers and adapter from vehicle.
2. Connect oil hose to oil cooler fitting, making sure it is securely latched.

Finalize Test

NOTE

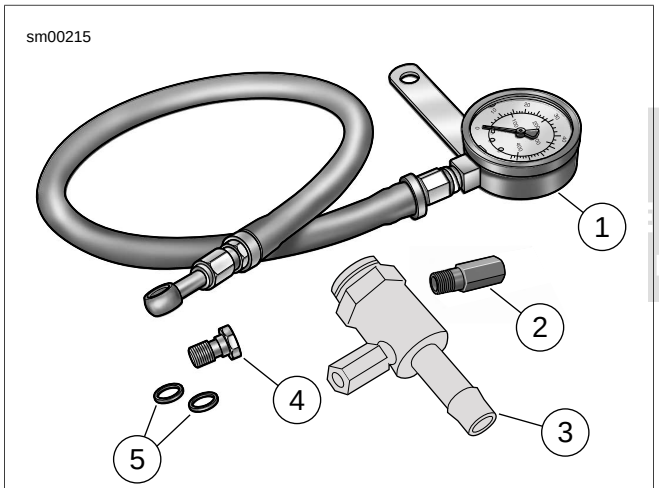
If an appreciable amount of oil leaked out when oil pressure switch was removed, replace with fresh oil.

1. Check oil level in oil tank. See 1.6 ENGINE OIL AND FILTER. Top off oil level if necessary.
2. Start engine. Test oil pressure switch for proper operation. Check for oil leaks.



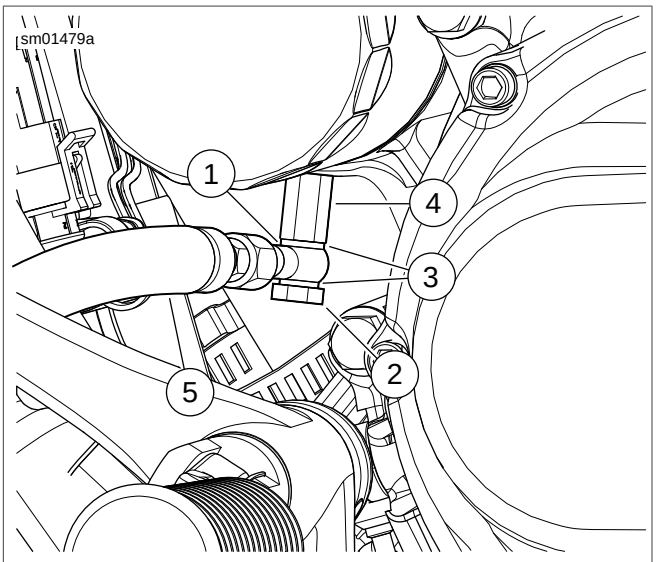
1. Oil filter
2. Indicator switch
3. Switch connector [120]

Figure 3-2. Oil Pressure Indicator Switch



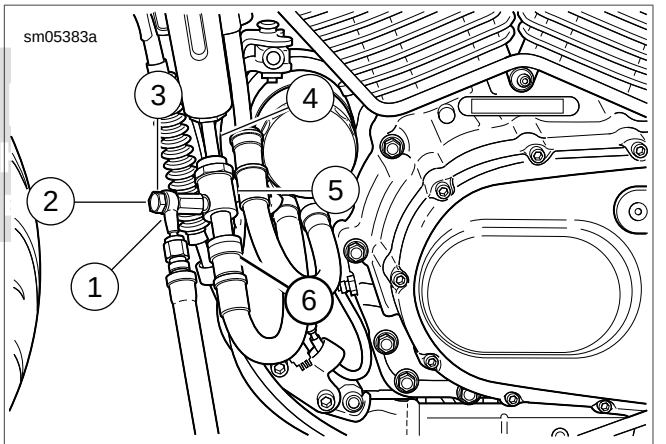
1. Gauge
2. Adapter, pressure switch hole (XL models)
3. Adapter, oil cooler line (XR 1200X)
4. Banjo bolt
5. Washers (2)

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



1. Oil pressure gauge banjo fitting
2. Banjo bolt
3. Washer (2)
4. Oil cooler connector
5. Adapter
6. Oil cooler hose fitting

Figure 3-5. Oil Pressure Test Connections: XR 1200X

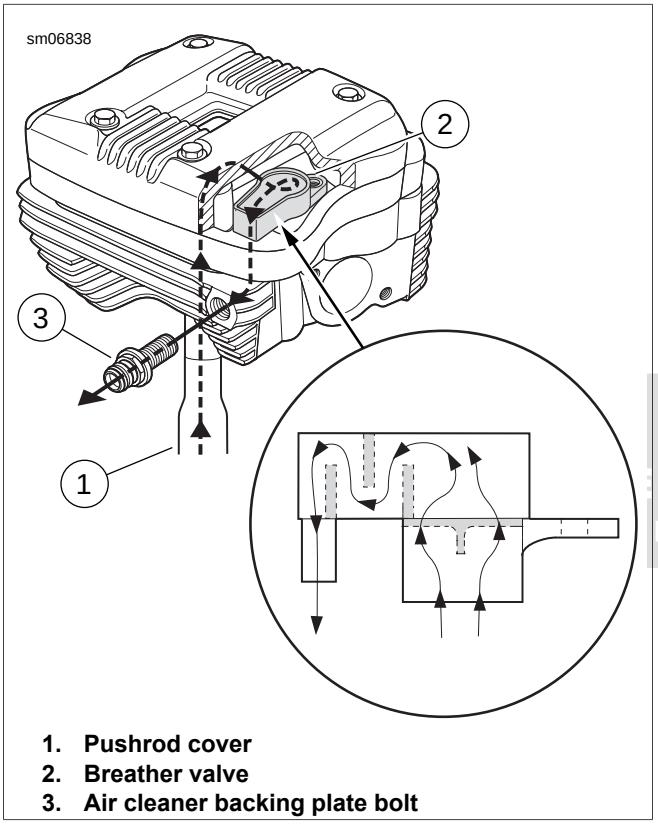
CRANKCASE BREATHING SYSTEM 3.4

XL MODELS

See Figure 3-6. 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**

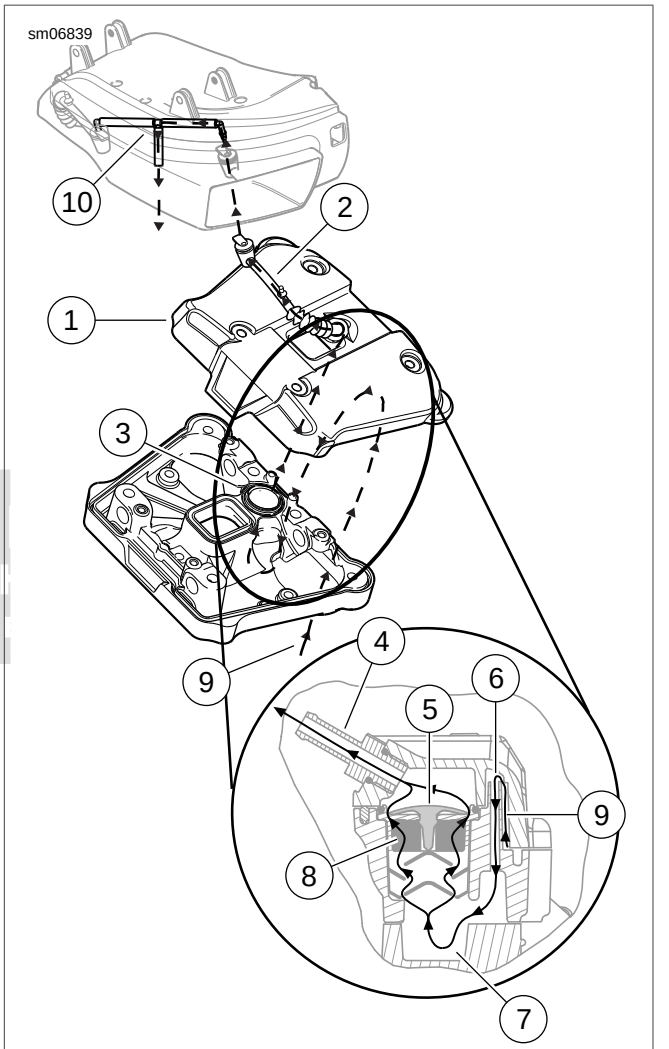
Figure 3-6. Crankcase Breathing System: XL Models

XR 1200X

See Figure 3-7. During the piston downstroke, internal crankcase pressure increases. Crankcase air/oil mist (9) is forced into the area around the rocker arms and valve springs. The vapor travels through two passages (6) in the inner rocker cover. Then into a cavity (7) between the cylinder head and inner rocker cover. The vapor then moves into the filter media (8) of the breather valve (3).

The oil-laden vapor passes through the filter media (8) of the breather valve assembly. The oil separates from the crankcase air and drains back into cavity (7). There it flows toward the exhaust valve. The oil then passes through a small drain hole adjacent to the exhaust valve and returns to the crankcase.

Air pressure forces the breather umbrella valve (5) to open. Air flows through a fitting (4) in the outer rocker cover. The umbrella valve prevents the air from moving back into the crankcase during piston upstroke. Air travels through a vapor hose (2) connected to a hose and tee assembly (10) in the air box. The air eventually exits into the intake air stream above the induction module. The air is consumed by the engine.



1. **Rocker cover**
2. **Vapor hose**
3. **Breather valve assembly**
4. **Vapor hose fitting**
5. **Umbrella valve**
6. **Passage**
7. **Cavity**
8. **Filter media**
9. **Vapor from crankcase**
10. **Hose and tee**

Figure 3-7. Crankcase Breathing System: XR 1200X

TROUBLESHOOTING 3.5

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 reaching the hydraulic lifters, remove and inspect. Clean lifter bore of all foreign material. Replace parts as necessary. See 3.22 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 3-22.
   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 3-23.
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 3-22. Normal Compression Ranges

ENGINE	COMPRESSION	
	psi	bar
XL 883	165-180	11.4-12.4
XL 1200	200-225	13.8-15.5
XR 1200X	170-185	11.7-12.8

Table 3-23. 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.

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 3.13 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 1.28 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

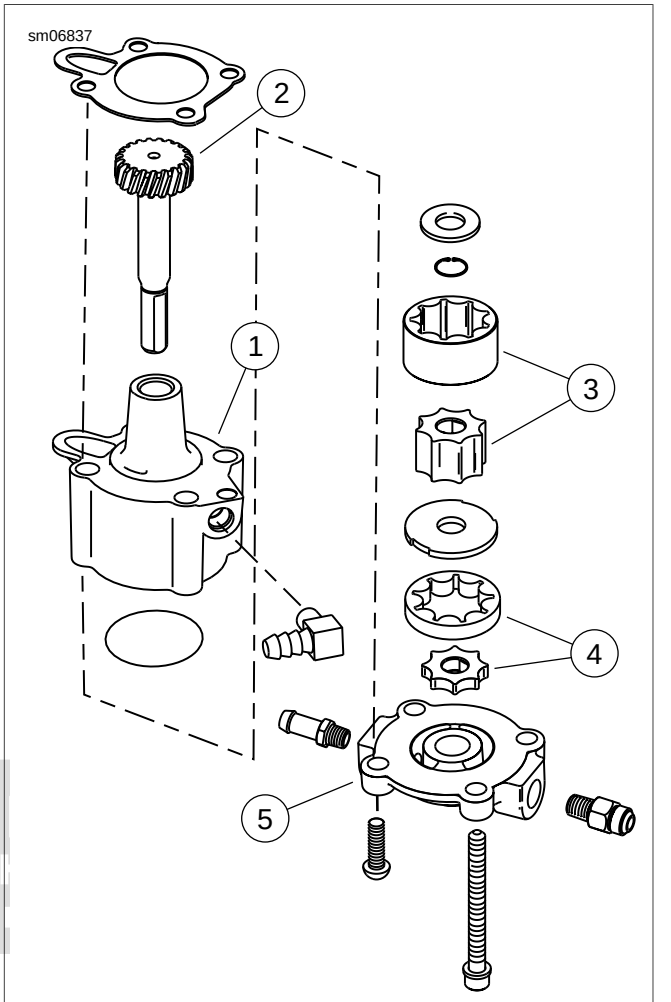
OIL PUMP OPERATION

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.

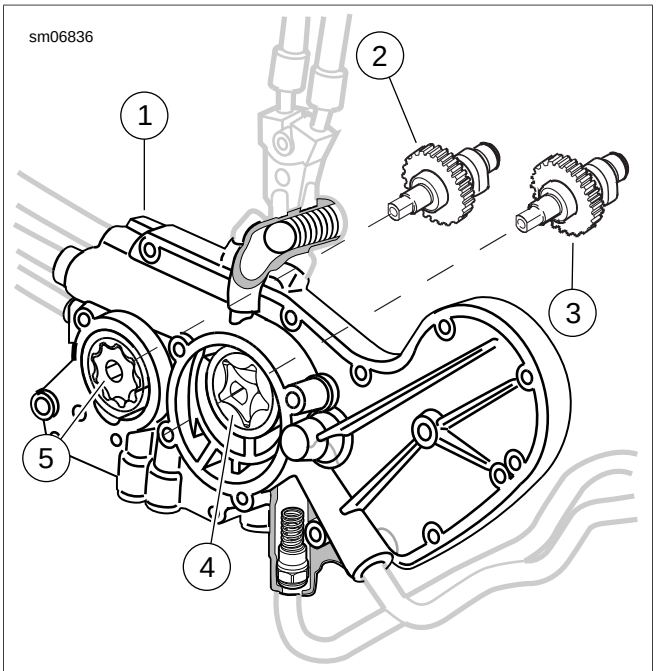
XL Models: See Figure 3-8. Both rotor sets (3, 4) are driven off a common shaft (2) that is coupled by gears to the crankshaft.

XR 1200X: See Figure 3-9. The feed rotor set (4) is driven by flats on the front intake camshaft (3). The scavenge rotor set (5) is driven by flats on the rear exhaust camshaft (2).



1. **Body**
2. **Gear shaft**
3. **Scavenge rotor set**
4. **Feed rotor set**
5. **Cover**

Figure 3-8. Oil Pump: XL Models

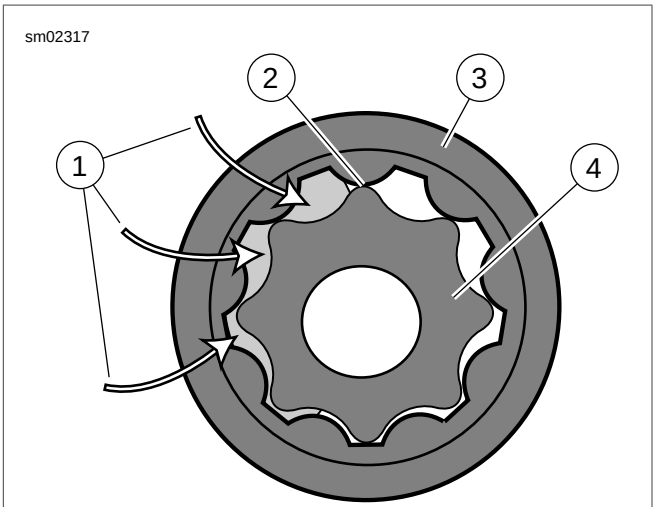


1. **Housing, oil pump**
2. **Exhaust camshaft, rear cylinder**
3. **Intake camshaft, front cylinder**
4. **Feed rotor set**
5. **Scavenge rotor set**

Figure 3-9. Oil Pump: XR 1200X

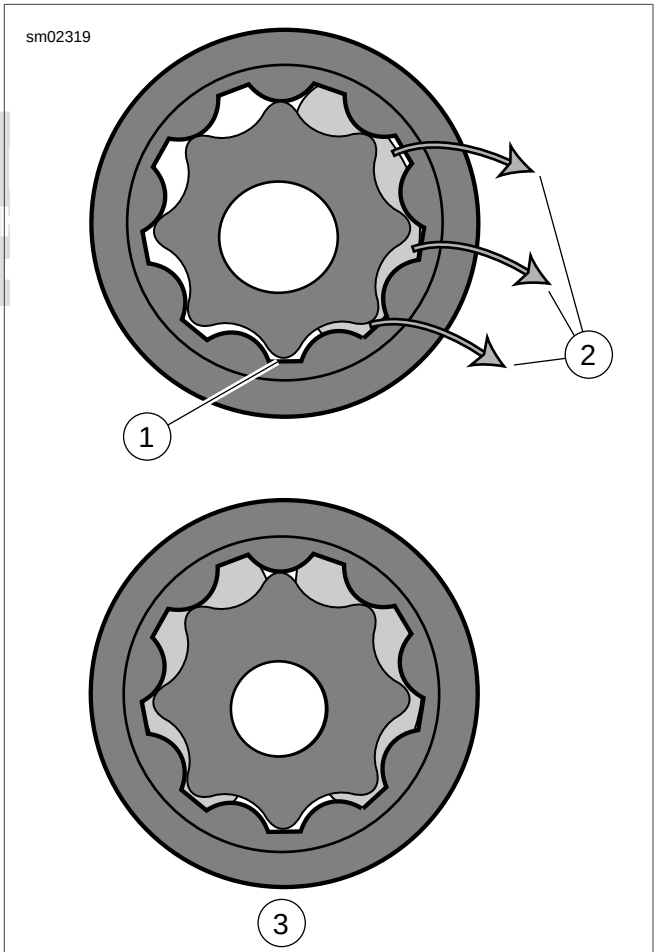
See Figure 3-10. As the crankshaft rotates, the cavity volume increases between the gerotors on the inlet side of the pump. This creates a vacuum causing oil to be drawn in. The volume continues to increase until it is equivalent to that of the missing lobe on the inner gerotor.

See Figure 3-11. 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 3-10. Inlet Side Oil Flow



1. **Seal**
2. **Oil out**
3. **Continuous flow**

Figure 3-11. Outlet Side Oil Flow

OIL FLOW: XL MODELS

NOTE

See Figure 3-12. 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 3.20 OIL PUMP: XL MODELS.
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 properly 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 pump's 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.** This 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.

OIL FLOW: XR 1200X

NOTE

See Figure 3-13. 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 and internal passages.** Oil enters the inlet cavity of the **feed pump**. See 3.21 OIL PUMP: XR 1200X.
2. The feed pump transfers oil through a **passage** in the pump housing to a point where it splits direction. The pump is capable of delivering more oil than can flow through the engine. When oil pressure exceeds 50 psi (345 kPa), the **bypass valve** opens. Oil circulates into the inlet side of the feed pump.
3. Part of the oil passes through an **internal passage** toward the oil filter and part heads toward the oil cooler line.
4. Oil exits the oil pump housing through a **line** connected with quick connect fittings and enters the lower end of the oil cooler. Oil flows up through the oil cooler and exits the upper end where it flows back to the oil pump housing.
5. A **thermostat** is located where the oil cooler return line connects to the oil pump housing. The thermostat begins to open when the oil reaches 190 °F (88 °C). As it opens, oil from the cooler flows past while oil flow from the feed pump is restricted. This provides cooled oil for engine lubrication. When the **thermostat** is full open, oil flow is sealed off from the pump. All oil then passes through the oil cooler, past the **thermostat**, and towards the oil filter.
6. Oil flowing to the filter passes through an **internal passage** to the oil filter mount.
7. Oil flows through the **filter mount cavity** to the oil filter.
8. 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 attaches the filter to filter mount).
9. Adequate oil pressure in the filter supply passage activates the **oil pressure indicator lamp switch** and shuts off the oil pressure indicator lamp.
10. Oil flowing from the filter adapter opens the **check ball.** The check ball opens at 5-7 psi (34-48 kPa) oil pressure.
11. With the check ball open, oil flows into the **crankcase feed galley.**
12. 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.
13. Also from the feed galley in the crankcase, oil flows through a cross drilled passage to the **check valve assembly**. Then to the cylinder heads through **flexible**

lines. Oil flows across the cylinder heads and through passages that surround the exhaust ports. Oil exits each cylinder head near the exhaust port.

14. **Oil exiting** the heads flows to the **return oil manifold** where it is mixed with the scavenge oil from the scavenge pump and is pushed back to the tank.
15. Oil flows from the feed galley through an **intersecting passage** in the oil pump body and cam support. Oil flow is then routed to the **outer bearing** of the rear intake camshaft. A cast-in passage allows oil into a cavity that surrounds the end of the pinion gear shaft.
16. From the **cavity** at the pinion shaft end, oil enters the center hole in the **oil pump rotor cover**. The center hole intersects a passage that carries oil to the outer bearings of the front intake camshaft and rear exhaust camshaft.
17. The outer bearing of the front exhaust camshaft is lubricated through a **drilled passage** that intersects with the feed galley.
18. Crankcase end of bearings of the cams are fed through holes in the camshaft.
19. A small amount of oil flows from the feed galley in the right crankcase through a **restricted orifice.** This 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.
20. 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 properly lubricate the rod bearing assembly.
21. Oil flows up passages in the **pushrods** to the rocker arm shafts and bushings.
22. The valve stems are lubricated by oil supplied through drilled oil holes in the **rocker arms**.
23. Oil collected in the pushrod areas of the cylinder heads flows down the **pushrod covers** to the **tappet blocks**. It drains through holes in the tappet blocks and provides lubrication to the gearcase components. Oil then settles to the bottom of the gearcase and is collected by the scavenge pump.
24. Feed oil to the rocker area is returned to the gearcase through a **passage** in the cylinder head, cylinder, and crankcase.
25. Oil collected in the **sump** is splash-fed to the pistons, cylinder walls and flywheel components.
26. 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.
27. Oil collected in the gearcase passes through a **passage** in the oil pump body and cam support and is also collected by the scavenge pump.
28. The **scavenge pump** pushes the collected oil back to the oil tank.
29. Crankcase vents to oil tank.

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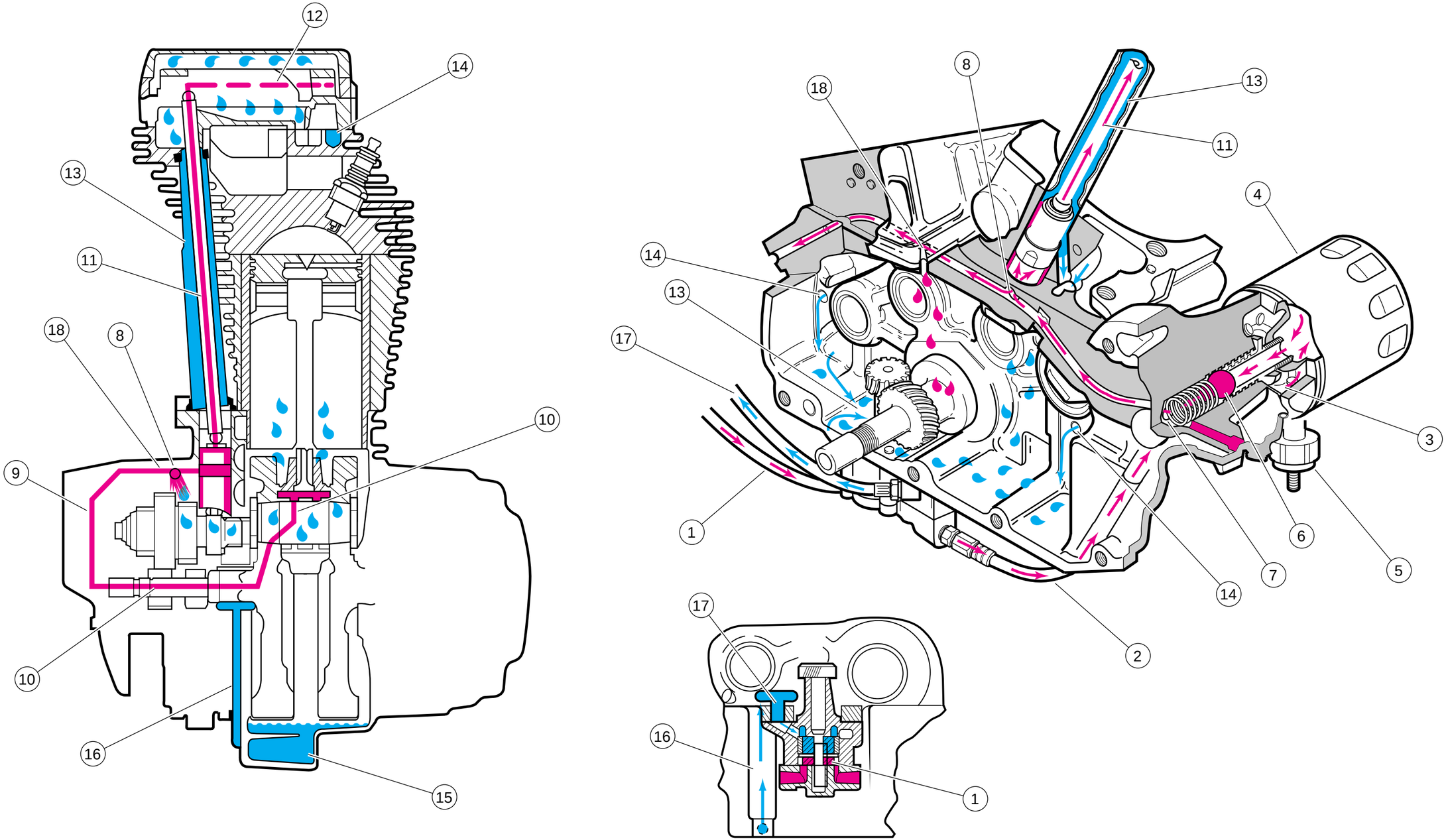


Figure 3-12. Lubrication Diagram: XL Models (Red=Feed Oil, Blue=Return Oil)

Figure 3-12.
Lubrication Diagram: XL Models (Red=Feed Oil, Blue=Return Oil)

Figure 3-12.
Lubrication Diagram: XL Models (Red=Feed Oil, Blue=Return Oil)

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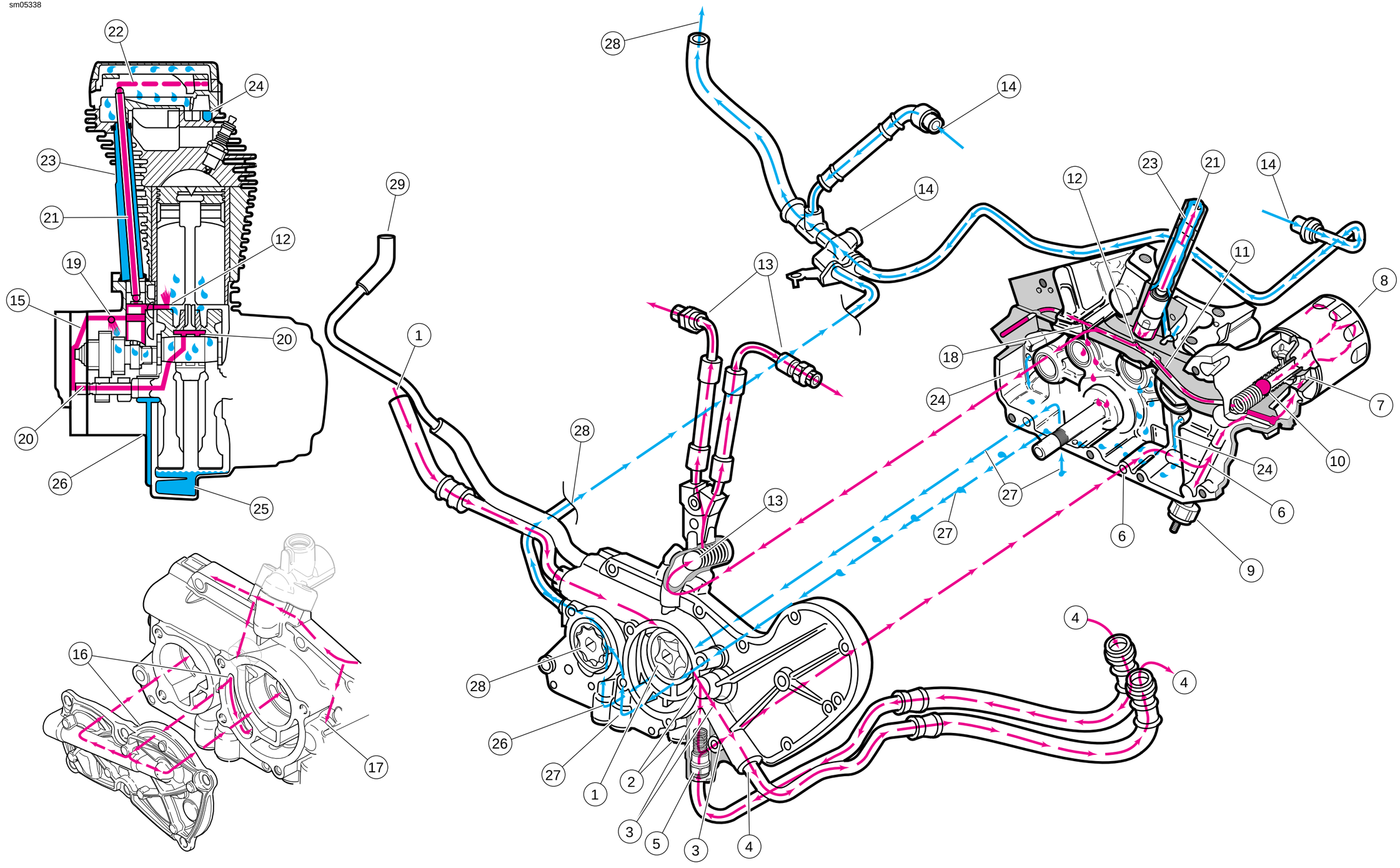


Figure 3-13. Lubrication Diagram: XR 1200X (Red=Feed Oil, Blue=Return Oil)

Figure 3-13.
Lubrication Diagram: XR 1200X (Red=Feed Oil, Blue=Return Oil)

Figure 3-13.
Lubrication Diagram: XR 1200X (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 1.28 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 may 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 3-24. Engine in Chassis

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove parts necessary to gain access to all components above cylinder deck. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Stripping Motorcycle for Top End Repair.	
Continue with 3.13 TOP END OVERHAUL: DISASSEMBLY. Remove/repair sub-assembly components only if necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, XL Models or 3.4 CRANKCASE BREATHING SYSTEM, XR 1200X.
Remove cylinder heads. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.14 CYLINDER HEAD.
Remove pushrods, pushrod covers and tappet covers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappets. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Tappets.	*Inspect and repair as necessary. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
Remove cylinders and pistons. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.	*Inspect and repair as necessary. See 3.15 CYLINDER AND PISTON. Inspect upper connecting rod and repair as necessary. See 3.15 CYLINDER AND PISTON, Connecting Rod Bushings.
Complete all appropriate steps under 3.16 TOP END OVERHAUL: ASSEMBLY.	
Complete motorcycle assembly. See 3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	
* When this step is completed during top end service, advance to 3.16 TOP END OVERHAUL: ASSEMBLY if no other work is to be done.	

ENGINE REMOVED FROM CHASSIS

Table 3-25. Engine Removed from Chassis

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove engine from chassis. See 3.10 REMOVING ENGINE FROM CHASSIS.	
Start 3.13 TOP END OVERHAUL: DISASSEMBLY. Remove and repair subassembly components as necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, XL Models or 3.4 CRANKCASE BREATHING SYSTEM, XR 1200X.
Remove cylinder heads. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.14 CYLINDER HEAD.
Remove pushrods, pushrod covers and tappet covers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappets. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Tappets.	*Inspect and repair as necessary. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
Remove cylinders and pistons. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.	*Inspect and repair as necessary. See 3.15 CYLINDER AND PISTON. Inspect upper connecting rod and repair as necessary. See 3.15 CYLINDER AND PISTON, Connecting Rod Bushings.
Complete all appropriate steps under 3.16 TOP END OVERHAUL: ASSEMBLY.	
Install engine in motorcycle. Complete all appropriate steps under 3.11 INSTALLING ENGINE IN CHASSIS.	
Complete motorcycle assembly. See 3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	
* When this step is completed during top end service, advance to 3.16 TOP END OVERHAUL: ASSEMBLY if no other work is to be done.	

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BOTTOM END SERVICE 3.9

ENGINE IN CHASSIS

Table 3-26. Engine in Chassis: Cam Compartment Service

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove parts necessary to gain access to all components above cylinder deck. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Stripping Motorcycle for Top End Repair.	
Continue with 3.13 TOP END OVERHAUL: DISASSEMBLY. Remove/repair sub-assembly components only if necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, XL Models or 3.4 CRANKCASE BREATHING SYSTEM, XR 1200X.
Remove pushrods, pushrod covers and tappet covers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappets. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Tappets.	Inspect and repair as necessary. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
Continue with 3.17 BOTTOM END OVERHAUL: DISASSEMBLY.	
Remove gear case cover and cam gears. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears: XL Models or 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Oil Pump Housing/Gearcase Cover and Cam Gears: XR 1200X.	*Inspect and repair as necessary. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears: XL Models or 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Oil Pump Housing/Gearcase Cover and Cam Gears: XR 1200X.
Remove oil pump components. See 3.20 OIL PUMP: XL MODELS or 3.21 OIL PUMP: XR 1200X.	Inspect and repair as necessary. See 3.20 OIL PUMP: XL MODELS or 3.21 OIL PUMP: XR 1200X.
Complete all appropriate steps under 3.22 BOTTOM END OVERHAUL: ASSEMBLY.	
Complete motorcycle assembly. See 3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	
* When this step is completed during bottom end service, advance to 3.22 BOTTOM END OVERHAUL: ASSEMBLY if no other work is to be done.	

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ENGINE REMOVED FROM CHASSIS

Table 3-27. 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 3.13 TOP END OVERHAUL: DISASSEMBLY. Remove and repair subassembly components as necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, XL Models or 3.4 CRANKCASE BREATHING SYSTEM, XR 1200X.
Remove cylinder heads. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	Inspect and repair as necessary. See 3.14 CYLINDER HEAD.
Remove pushrods and pushrod covers. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappet covers and tappets. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.	Inspect and repair as necessary. See 3.16 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods.
Remove cylinders and pistons. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.	Inspect and repair as necessary. See 3.15 CYLINDER AND PISTON. Inspect upper connecting rod and repair as necessary. See 3.15 CYLINDER AND PISTON, Connecting Rod Bushings.
Continue with 3.17 BOTTOM END OVERHAUL: DISASSEMBLY. Remove and repair subassembly components as necessary.	
Remove gearcase cover and cam gears. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears: XL Models or 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Oil Pump Housing/Gearcase Cover and Cam Gears: XR 1200X.	Inspect and repair as necessary. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears: XL Models or 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Oil Pump Housing/Gearcase Cover and Cam Gears: XR 1200X.
Remove oil pump. See 3.20 OIL PUMP: XL MODELS or 3.21 OIL PUMP: XR 1200X.	Inspect and repair as necessary. See 3.20 OIL PUMP: XL MODELS or 3.21 OIL PUMP: XR 1200X.
Complete all appropriate steps under 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Crankcase to split crankcases and remove flywheel assembly, piston jets, etc.	Inspect and repair as necessary. See 3.19 CRANKCASE. Inspect and repair transmission assembly as necessary. See 5.9 TRANSMISSION REMOVAL AND DISASSEMBLY, 5.10 TRANSMISSION ASSEMBLY, 5.14 TRANSMISSION INSTALLATION and related subjects.
Complete all appropriate steps under 3.22 BOTTOM END OVERHAUL: ASSEMBLY.	
Complete all appropriate steps under 3.16 TOP END OVERHAUL: ASSEMBLY.	
Install engine in motorcycle. Complete all appropriate steps under 3.11 INSTALLING ENGINE IN CHASSIS.	
Complete motorcycle assembly. See 3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	

TECHNICIAN
HARLEY-DAVIDSON

REMOVING ENGINE FROM CHASSIS 3.10

PROCEDURE: XL MODELS

PART NUMBER	TOOL NAME
HD-45967	SHOP DOLLY
HD-45968	FAT JACK
HD-46284	ENGINE HOOK

⚠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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS.
2. Remove seat.
3. Remove left side cover. See 2.18 LEFT SIDE COVER.

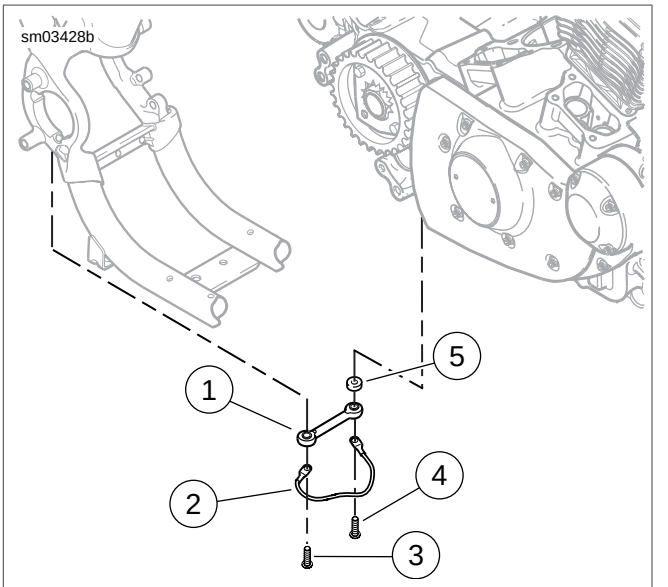
⚠WARNING

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)

4. Disconnect battery. See 1.22 BATTERY MAINTENANCE.
5. Drain primary chaincase/transmission fluid. See 1.10 TRANSMISSION LUBRICANT.
6. Drain oil tank. See 1.6 ENGINE OIL AND FILTER. Do not install drain plug back in end of drain hose at this time.
7. Remove O2 sensor connectors [137], [138].
8. Remove exhaust pipes and mufflers. See 4.13 EXHAUST SYSTEM: XL MODELS.
9. Remove right front footrest assembly and rear brake linkage.
   a. **Models with Mid-mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
10. Remove screw, washer and exhaust pipe clamp bracket from sprocket cover. Remove two screws securing sprocket cover to engine case. Remove sprocket cover.
11. 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 rear drive belt from transmission sprocket. See 5.6 DRIVE BELT.
12. Remove transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
13. Remove exhaust system interconnect. See 4.13 EXHAUST SYSTEM: XL MODELS.
14. Disconnect oil tank feed, drain and return hoses from oil tank. Pull drain hose up through drain hose sleeve in rear of engine crankcase. Remove hose. See 3.24 OIL TANK.
15. Drain fuel tank. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS.
16. Remove air cleaner assembly.
   a. **XL Models except XL 1200V:** See 4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V.
   b. **XL 1200V:** See 4.3 AIR CLEANER ASSEMBLY, XL 1200V.
   c. **XL 1200X:** See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
   d. **EVAP Controlled Models:** Remove EVAP purge hose from induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
17. Remove the horn.
   a. **Front Mount:** See 6.32 HORN, Replacement: Front Mount.
   b. **Side Mount:** See 6.32 HORN, Replacement: Side Mount.
18. Unplug the following connectors from the induction module:
   a. Fuel injector connectors [84], [85].
   b. TMAP sensor [80].
   c. IAC [87].
   d. TPS [88].
19. Unplug the following electrical connectors from the engine:
   a. 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 6.22 CRANK POSITION SENSOR (CKP).
   e. Alternator AC connector [46]. See 6.23 VOLTAGE REGULATOR.
   f. Neutral indicator switch connector [136]. See 6.26 NEUTRAL INDICATOR SWITCH.
   g. VSS [65]. See 6.25 VEHICLE SPEED SENSOR (VSS).
   h. Starter relay wire (GN) at starter motor. See 6.10 STARTER.
   i. ET sensor [90]. Cut the barbed cable strap securing sensor harness to ECM caddy. Remove the cable strap. See 4.7 ENGINE TEMPERATURE (ET) SENSOR.
20. Disconnect clutch cable. Remove from clutch lever on left handlebar. Remove cable clips securing clutch cable to frame left front downtube. See 2.29 CLUTCH CONTROL.

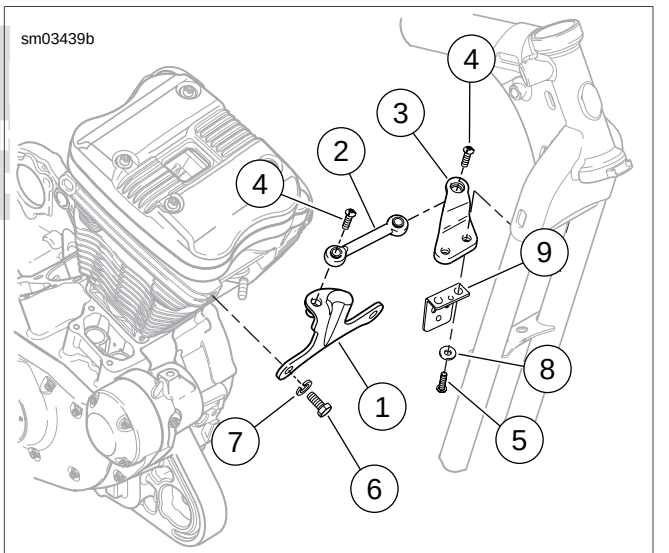
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

21. Remove push-in fastener securing right wire harness caddy to coil bracket. Discard push-in fastener. Remove screw securing ignition switch to coil bracket. Unplug spark plug wires from coil. Unplug ignition coil harness connector [83] from coil. Remove coil and bracket from frame. See 6.13 IGNITION COIL.
22. Remove screw securing left wire harness caddy to right wire harness caddy. Separate caddies. See 6.28 ELECTRICAL CADDIES, Wire Harness Caddy: XL Models.
23. Unplug the following harness connectors located in the wire harness caddies:
    a. Instruments connector [20].
    b. Headlamp connector [38].
    c. Right hand control connector (black) [22].
    d. Left hand control connector (gray) [24].
    e. Front turn signal connector [31].
24. 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.
25. Remove induction module and intake manifold as a unit. Secure induction module/intake manifold assembly and throttle cables out of the way. See 4.8 INDUCTION MODULE: XL MODELS.
26. **EVAP Controlled Models:** Remove EVAP canister and disconnect hoses. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
27. See Figure 3-14. Remove screws (3, 4), grounding strap (2), stabilizer link (1) and spacer (5).
28. See Figure 3-15. Remove upper stabilizer link (2) and brackets (3, 1):
    a. Remove screw (4) securing stabilizer link to engine bracket (1).
    b. Remove screws (5) and washers (8). Remove horn bracket (9) (models with front mounted horn) and upper stabilizer link bracket with stabilizer link.
    c. Remove fasteners (6) and washers (7) and cylinder head bracket (1).
29. See Figure 3-16. Remove lower stabilizer link (1) and lower frame bracket (2):
    a. Remove screw (3) securing stabilizer link to engine crankcase boss.
    b. Remove screws (4), washers (5) and lower frame bracket with stabilizer link.
30. Remove rider left footrest and mounting bracket assembly and shift lever.
    a. **Models with Mid-mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
    b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.



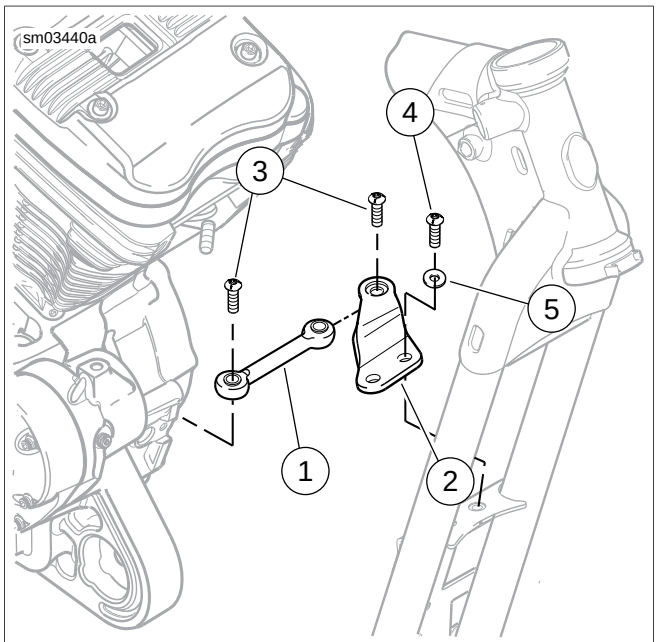
1. **Stabilizer link**
2. **Grounding strap**
3. **Screw**
4. **Screw**
5. **Spacer**

Figure 3-14. Rear Stabilizer Link Assembly (typical)



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 3-15. Upper Front Stabilizer Link Assembly



1. **Lower stabilizer link**
2. **Lower frame bracket**
3. **Screw (2)**
4. **Screw (2)**
5. **Washer (2)**

Figure 3-16. Lower Front Stabilizer Link Assembly (typical)

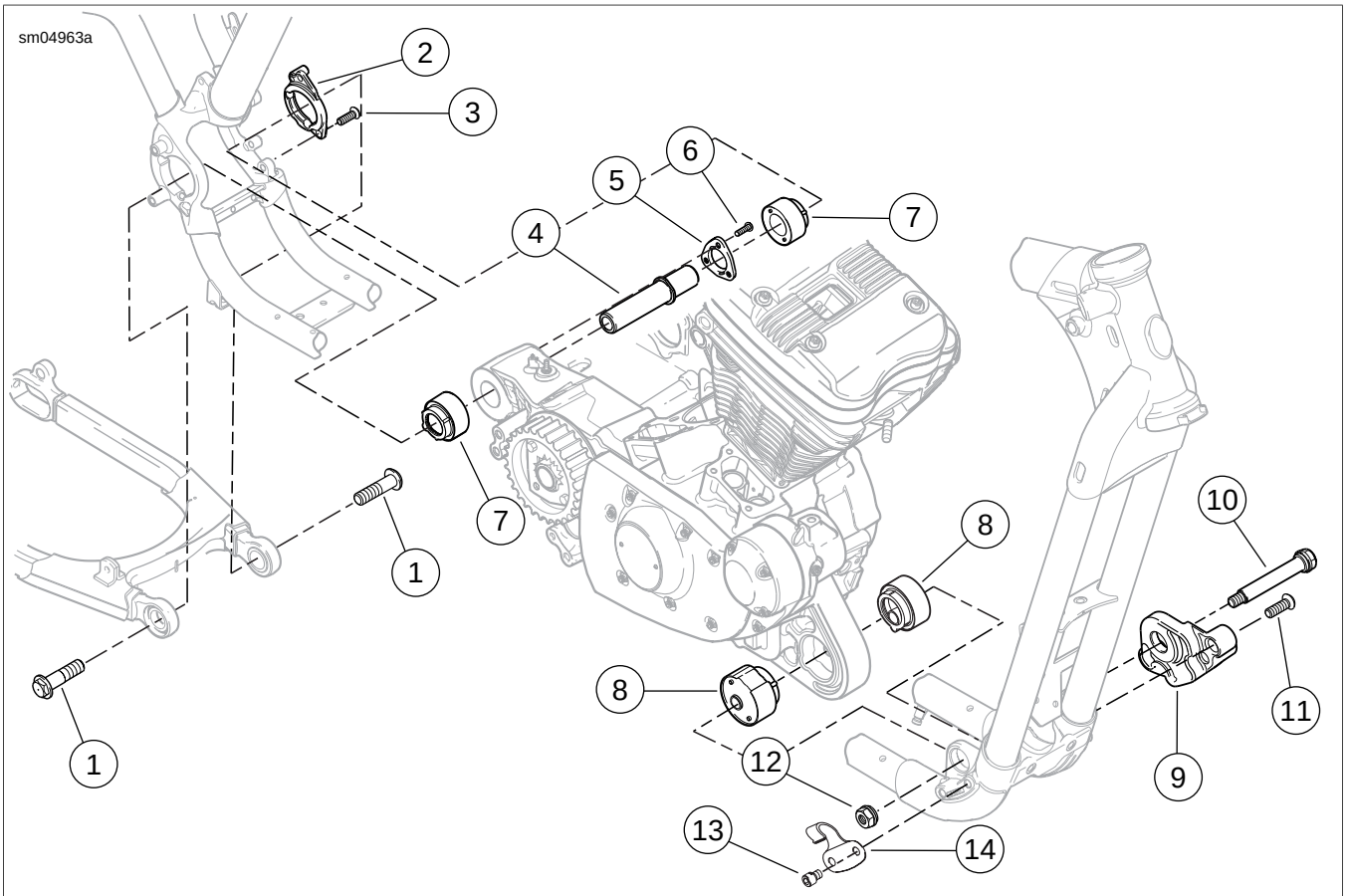
31. **Models with Passenger Footrests:** Remove left passenger footrest and mounting bracket assembly. See 2.43 PASSENGER FOOTRESTS.

NOTE

Keep reservoir upright. If the reservoir is inverted, bleed the rear brake. See 2.17 BLEEDING BRAKES.

32. Remove rear brake master cylinder remote reservoir. Do not disconnect hose from reservoir. Secure reservoir upright, out of the way. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
33. Remove rear stop lamp switch from battery tray. Unplug rear stop lamp switch connectors [121].
34. Remove screw and P-clamp securing rear brake hose to battery tray.
35. Pull rear stop lamp switch and brake lines out of the way. Be careful not to bend or kink metal brake lines. See 6.21 REAR STOP LAMP SWITCH.
36. With the aid of a FAT JACK (Part No. HD-45968), support motorcycle on SHOP DOLLY (Part No. HD-45967).
37. See Figure 3-17. Remove fasteners (13) and J-clip (14) from each side of frame.
38. Loosen, but do not remove, two front isolator mounting bracket screws (11) on left side of engine.
39. Loosen, but do not remove, two rear isolator mounting bracket screws (3) on left side of engine.
40. Attach ENGINE HOOK (Part No. HD-46284) and engine hoist. Carefully raise engine enough to relieve pressure from mounting bolts.
41. Remove front engine mount bolt (10) and nut (12).
42. Remove two screws (11) and front isolator mount (9).
43. Remove two rear engine mount/rear fork pivot bolts (1). Pull rear fork back until fork pivot bosses clear the frame.
44. Remove oil tank vent hose from oil tank. See 3.24 OIL TANK.
45. Remove two screws (3) and rear isolator mounting bracket (2) from frame.
46. 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.

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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
14. J-clip (2)

Figure 3-17. Engine Mount/Isolator Components (typical)

PROCEDURE: XR 1200X

PART NUMBER	TOOL NAME
HD-45967	SHOP DOLLY
HD-45968	FAT JACK
HD-46284	ENGINE HOOK

⚠WARNING

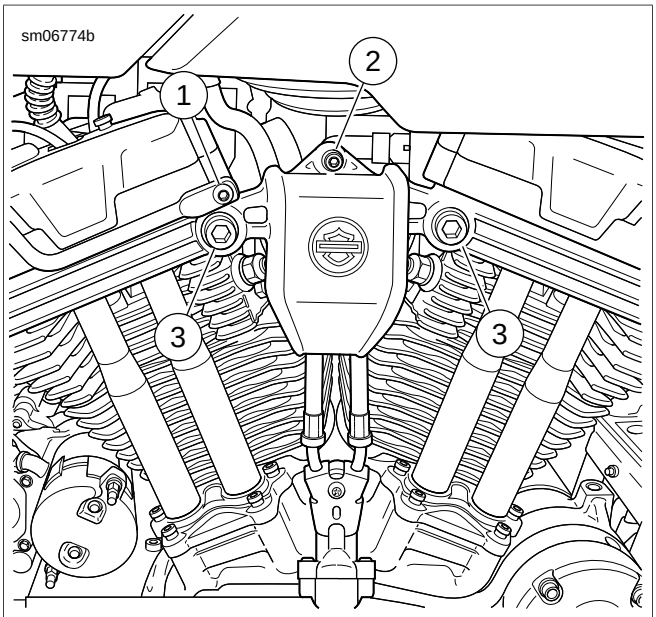
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Position vehicle upright. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XR 1200X.
2. Remove seat.
3. Remove left side cover. See 2.18 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)

4. Disconnect negative (-) battery cable from ground stud on crankcase. Disconnect positive (+) battery cables at battery. Remove battery. See 1.22 BATTERY MAINTENANCE.
5. Drain primary chaincase/transmission fluid. See 1.10 TRANSMISSION LUBRICANT.
6. Drain oil tank. Do not install drain plug back in end of drain hose at this time. See 1.6 ENGINE OIL AND FILTER.
7. See Figure 3-18. Remove fasteners (1, 2, 3) and remove induction module cover. Cut cable strap securing TPS harness to side plate.



1. **Fastener, wire form**
2. **Fastener, to induction module**
3. **Screws (2)**

Figure 3-18. Induction Module Cover: XR 1200X

8. Disconnect O2 sensor connectors [137], [138] and remove exhaust pipes and mufflers as an assembly. See 4.14 EXHAUST SYSTEM: XR 1200X.
9. Remove these parts if present:

   EVAP Controlled Models: Remove EVAP canister and disconnect hoses. See 4.20 EVAPORATIVE EMISSIONS CONTROL.

   All other Models: Remove siren if equipped. See 6.30 SECURITY SYSTEM/OPTIONAL SIREN.
10. See Figure 3-19. Remove two fasteners (1) retaining siren/canister mount plate and brake line (2) retainer.
11. Remove three screws securing sprocket cover to engine case. Remove sprocket cover.
12. Remove belt guard and debris deflector from rear fork.
13. Remove fastener securing right shock absorber to the rear fork.
14. 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 rear drive belt. See 5.6 DRIVE BELT.
15. Remove transmission sprocket only if transmission or engine are to be disassembled. See 5.15 TRANSMISSION SPROCKET.
16. Disconnect rear stop lamp switch connectors [121].
17. Remove rear brake line from clamps at the bottom of left rear fork.

NOTE

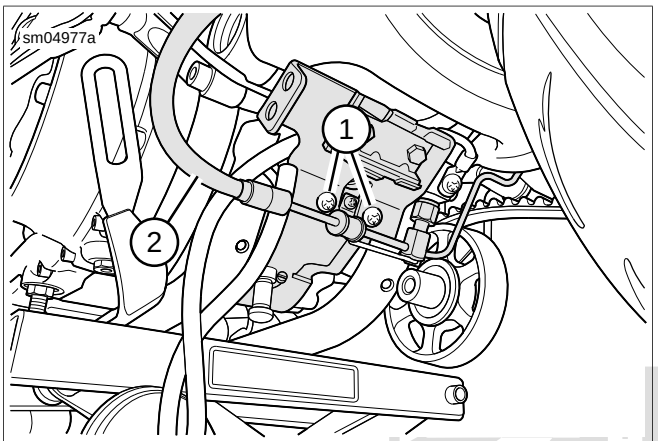
When securing rear master cylinder out of the way in the next step, make sure to keep the reservoir upright. If the reservoir is allowed to hang upside down, air bubbles could be introduced into the rear master cylinder. If this happens, the rear brake must be bled to remove all air from the hydraulic brake system.

18. See Figure 3-20. Remove fasteners (1) and remove rider's right footrest including master cylinder assembly and rear brake linkage. Be careful not to bend or kink metal brake line and remove assembly out left side of motorcycle. Tie assembly, with master cylinder upright, out of the way.
19. Disconnect oil tank feed, drain and return hoses from oil tank. Pull drain hose up through drain hose sleeve in rear of engine crankcase and remove hose from vehicle. See 3.24 OIL TANK.
20. Unplug horn connectors and remove horn from horn bracket. See 6.32 HORN.
21. Remove fasteners securing air cleaner to fuel tank. Drain and remove fuel tank. See 4.5 FUEL TANK: XR 1200X.
22. Remove air cleaner from induction module as an assembly. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
23. **EVAP Controlled Models:** Remove EVAP purge hose from induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
24. Unplug the following connectors from the induction module:
    a. Fuel injector connectors [84], [85].
    b. Temperature/Manifold absolute pressure (TMAP) sensor connector [80].
    c. Idle Air Control (IAC) connector [87].
    d. Throttle Position (TPS) connector [88].
25. Unplug the following electrical connectors from the engine:
    a. Ground wire at powertrain ground stud on crankcase.
    b. Spark plug wires.
    c. Oil pressure switch connector [120]. See 6.31 OIL PRESSURE SWITCH.
    d. Crank position (CKP) sensor connector [79]. See 6.22 CRANK POSITION SENSOR (CKP).
    e. Alternator AC connector [46] and DC connector [77]. See 6.23 VOLTAGE REGULATOR.
    f. Neutral indicator switch connector [136]. See 6.26 NEUTRAL INDICATOR SWITCH.
    g. Vehicle speed sensor (VSS) connector [65]. See 6.25 VEHICLE SPEED SENSOR (VSS).
    h. Starter relay wire (GN) at starter motor. See 6.10 STARTER.
    i. Engine Temperature (ET) sensor connector [90]. Cut and remove barbed cable strap securing sensor harness to H-bracket. See 4.7 ENGINE TEMPERATURE (ET) SENSOR.
26. If equipped, disconnect jiffy stand sensor connector [133] and remove sensor. See 6.29 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS.
27. Disconnect clutch cable and remove from clutch lever on left handlebar. Remove cable from oil cooler mount and

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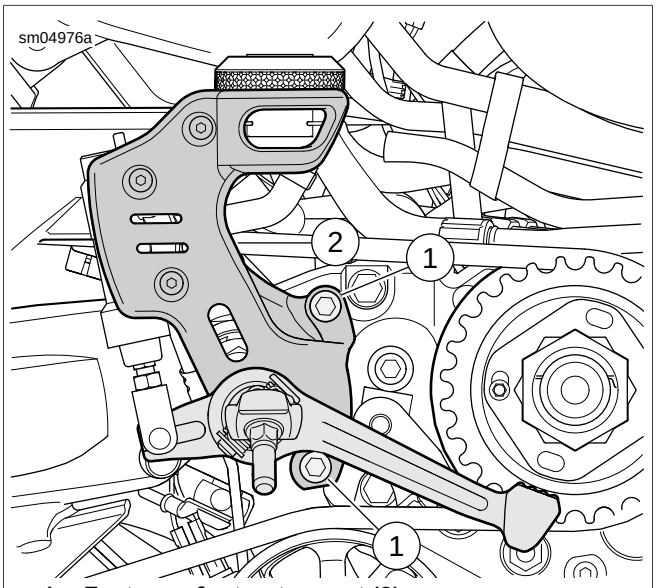
clips securing clutch cable to left front downtube. See 2.29 CLUTCH CONTROL.

28. See Figure 3-21. Remove oil cooler fasteners (1) from frame mounts (2) and remove oil cooler. It is not necessary to disconnect the oil hoses attached to the oil cooler. Tie oil cooler to engine.
29. Remove ignition coil. See 6.13 IGNITION COIL.
30. Position ignition switch out of the way.
31. Remove induction module, leaving cables attached. Secure induction module assembly and throttle cables out of the way. See 4.9 INDUCTION MODULE: XR 1200X.
32. See Figure 3-22. Remove screws (3, 4), grounding strap (2), stabilizer link (1) and spacer (5).



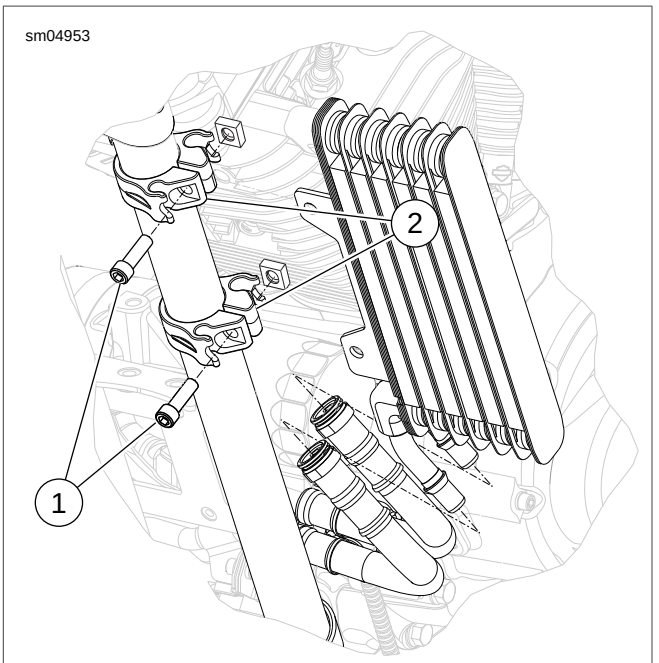
1. Fastener, siren/canister mount
2. Rear brake line

Figure 3-19. Siren/Canister Mount Plate and Brake Line



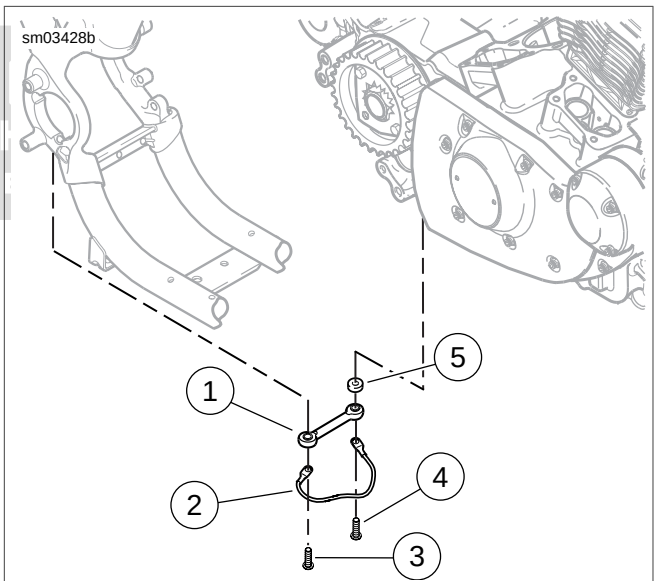
1. Fastener, footrest mount (2)
2. Footrest and master cylinder bracket

Figure 3-20. Right Footrest and Rear Master Cylinder



1. Fastener (2)
2. Oil cooler mount (2)

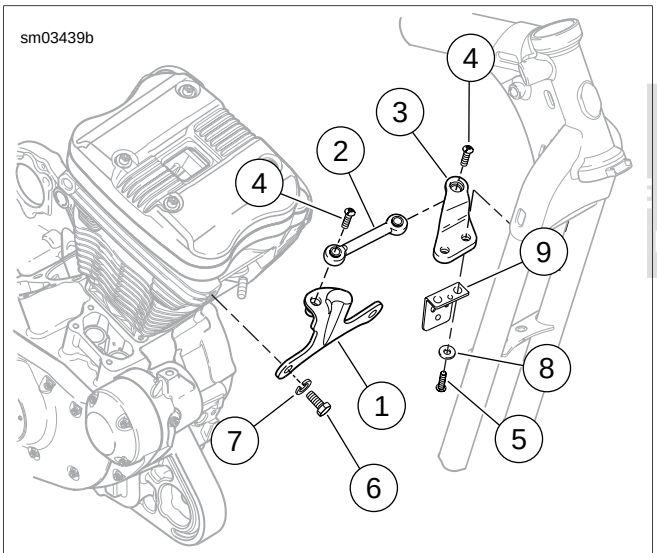
Figure 3-21. Oil Cooler Mounts



1. Stabilizer link
2. Grounding strap
3. Screw
4. Screw
5. Spacer

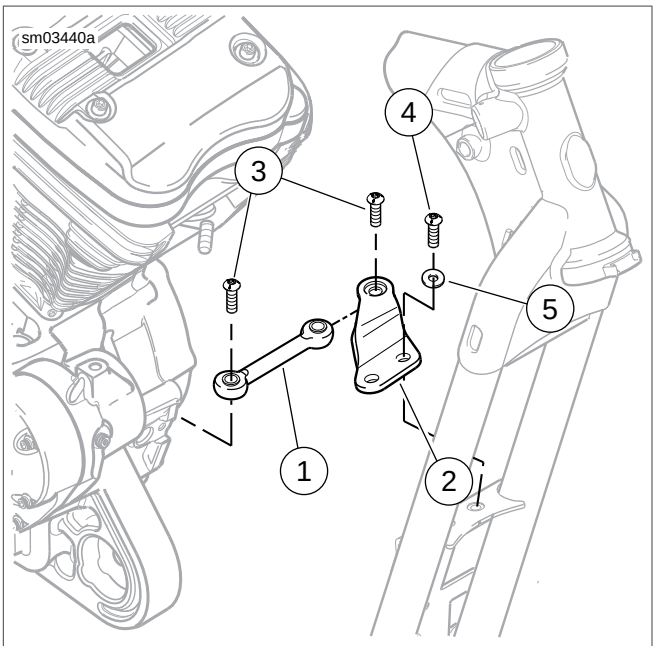
Figure 3-22. Rear Stabilizer Link Assembly (typical)

33. See Figure 3-23. Remove upper stabilizer link (2), cylinder head stabilizer bracket (1) and the upper frame bracket (3):
    a. Remove screw (4) securing stabilizer link to cylinder head bracket (1).
    b. Remove screws (5) and washers (8). Remove horn bracket (9) and upper stabilizer link bracket (3) with stabilizer link.
    c. Remove screws (6) and lock washers (7) and the cylinder head bracket (1).
34. See Figure 3-24. Remove lower stabilizer link (1) and lower frame bracket (2) as an assembly:
    a. Remove screw (3) securing stabilizer link to engine crankcase boss.
    b. Remove screws (4), washers (5) and lower frame bracket with stabilizer link.
35. See Figure 3-25. Remove fastener (1) and disconnect shift linkage from transmission shift lever.
36. Remove fasteners (2) and remove rider left footrest and mounting bracket assembly along with foot shift lever and linkage.



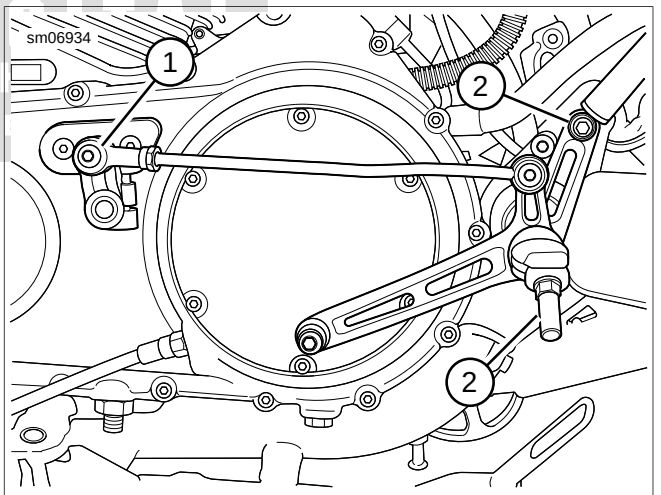
1. **Engine bracket**
2. **Upper stabilizer link**
3. **Upper frame bracket**
4. **Screw**
5. **Screw (2)**
6. **Screw (2)**
7. **Lockwasher (2)**
8. **Washer (2)**
9. **Horn bracket (front mount models)**

Figure 3-23. Upper Front Stabilizer Link Assembly



1. **Lower stabilizer link**
2. **Lower frame bracket**
3. **Screw (2)**
4. **Screw (2)**
5. **Washer (2)**

Figure 3-24. Lower Front Stabilizer Link Assembly (typical)

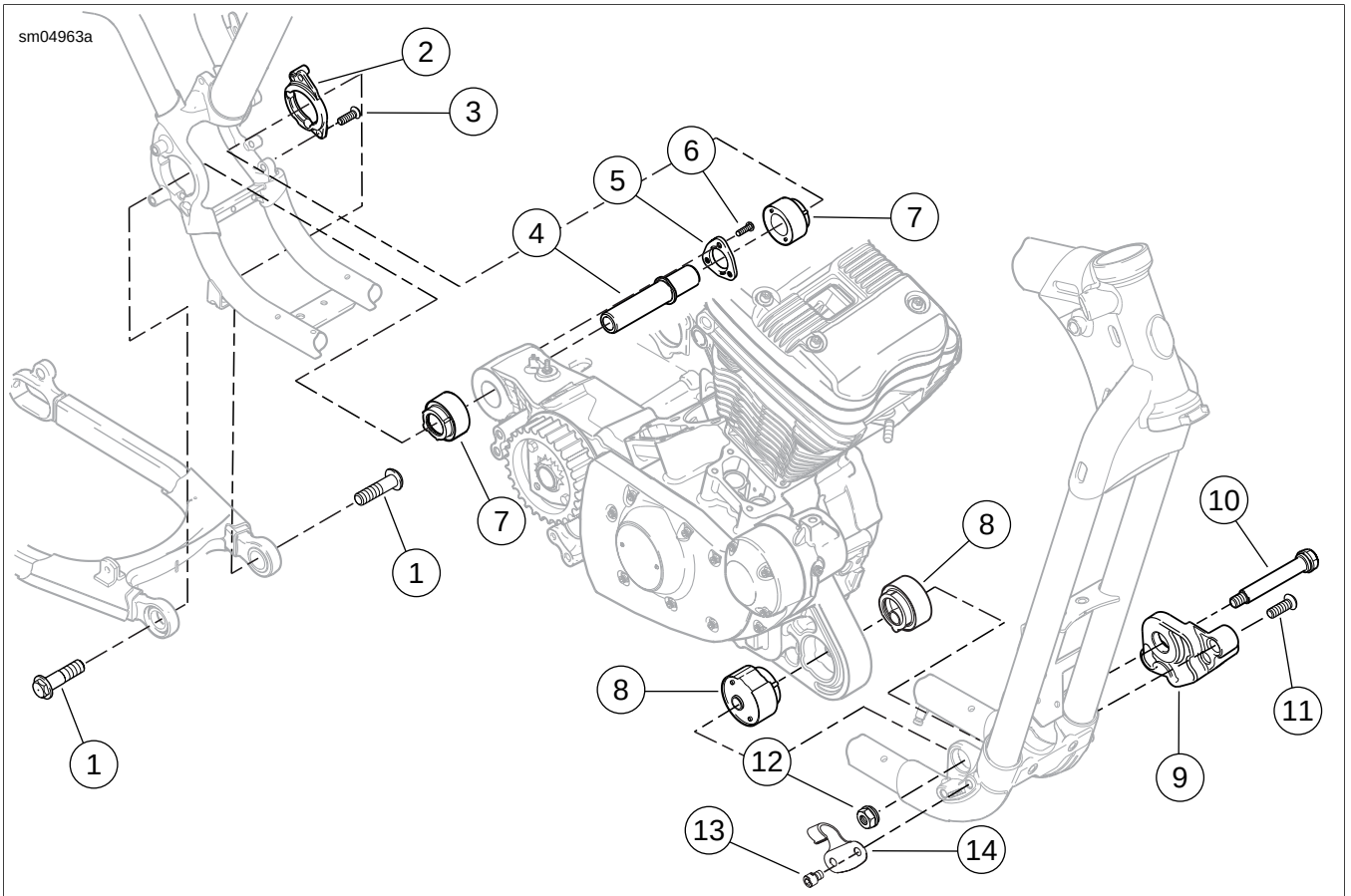


1. **Fastener, shift linkage**
2. **Fastener, footrest mount (2)**

Figure 3-25. Left Footrest and Shift Linkage

37. With the aid of a FAT JACK (Part No. HD-45968), support motorcycle on SHOP DOLLY (Part No. HD-45967).
38. See Figure 3-26. Remove fasteners (13) and j-clip (14) from each side of frame.
39. Loosen, but do not remove, two front isolator mounting bracket screws (11) on left side of engine.
40. Loosen, but do not remove, two rear isolator mounting bracket screws (3) on left side of engine.

41. Attach ENGINE HOOK (Part No. HD-46284) and engine hoist. Carefully raise engine enough to relieve pressure from mounting bolts.
42. Remove front engine mount bolt (10) and nut (12).
43. Remove two screws (11) and front isolator mount (9).
44. Remove two rear engine mount/rear fork pivot bolts (1). Pull rear fork back until fork pivot bosses clear the frame.
45. Remove oil tank vent hose from oil tank. See 3.24 OIL TANK.
46. Remove two screws (3) and rear isolator mounting bracket (2) from frame.
47. Rotate backbone electrical caddy to the left to allow room to lift the engine.
48. Lift engine as necessary and swing assembly out from left side of chassis, rear of engine first. 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**
14. **J-clip (2)**

Figure 3-26. Engine Mount/Isolator Components (typical)

INSTALLING ENGINE IN CHASSIS 3.11

PROCEDURE: XL MODELS

PART NUMBER	TOOL NAME
HD-45967	SHOP DOLLY
HD-45968	FAT JACK
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
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm
Stop lamp switch bracket screw	72-120 **in-lbs**	8.1-13.6 Nm
Brake hose clamp to frame, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm
Stabilizer link, lower, 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
Stabilizer link cylinder head bracket	55-65 ft-lbs	74.6-88.2 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Ignition switch mounting screw	34-45 **in-lbs**	4.0-5.1 Nm
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 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
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

1. See Figure 3-17. 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 at this time.
2. Position right front isolator (8) on front of engine. Do not Install left front isolator at this time.
3. Attach ENGINE HOOK (Part No. HD-46284) and engine hoist to engine.
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). Do not tighten screws at this time.
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). Do not tighten screws at this time.
8. Insert front engine mount bolt (10) from left side, through isolators and crankcase boss. Place nut (12) on bolt but do not tighten at this time.
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. Using **new** hose clamp, install oil tank vent hose at oil tank. See 3.24 OIL TANK.
12. Install rear fork with pivot/engine mount bolts (1). Tighten to 60-70 ft-lbs (81.4-95.0 Nm).
13. Tighten front engine mount bolt (10) and nut (12) to 95-105 ft-lbs (129-142 Nm).
14. Remove ENGINE HOOK (Part No. HD-46284).
15. With the aid of a FAT JACK (Part No. HD-45968), remove motorcycle from SHOP DOLLY (Part No. HD-45967).
16. Install stop lamp switch and brake lines.
    a. Carefully move the stop lamp switch and brake lines into place.
    b. Secure switch assembly to battery tray with bolt. Tighten to 72-120 **in-lbs** (8.1-13.6 Nm).
    c. Secure flexible brake hose to battery tray with p-clamp and screw. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
    d. Plug rear stop lamp switch connectors [121] into rear stop lamp switch. See 6.21 REAR STOP LAMP SWITCH.
17. Install rear brake master cylinder remote reservoir. Secure with screw with captive washer. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm). Install reservoir cover. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
18. **Models with Passenger Footrests:** Install left passenger footrest assembly. Tighten mounting screws to 45-50 ft-lbs (61.0-67.8 Nm). See 2.43 PASSENGER FOOTRESTS.
19. Install shift lever and rider left footrest and mounting bracket assembly:
    a. **Models with Mid-mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
    b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.

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NOTE

Check each end of the stabilizer links for excessive wear prior to installation. The spherical ball end may rotate loosely, but should not have any lateral movement. Replace the link if lateral movement exists.

20. See Figure 3-16. Install lower front stabilizer link and frame bracket:
    a. Install lower frame bracket (2) with stabilizer link (1). Secure with screws (4) and washers (5). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
    b. Install screw (3) securing stabilizer link to engine crankcase boss. Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
21. See Figure 3-15. Install upper stabilizer link (2), upper frame bracket (3) and cylinder head bracket (1) :
    a. Install stabilizer link bracket to front head with two screws and lockwashers. Tighten to 55-65 ft-lbs (74.6-88.2 Nm).
    b. Install upper frame bracket with stabilizer link, horn bracket (9) (models with front mounted horn), screws (5) and washers (8). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
    c. Install screw (4) securing stabilizer link to engine bracket (1). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
22. See Figure 3-14. Install spacer (5), rear stabilizer link (1), grounding strap (2) and screws (3, 4). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).

NOTE

***XL Models:** Verify that the EVAP canister mounting hardware does not contact the rear stabilizer ground strap.*

23. **EVAP Controlled Models:** Install EVAP canister and hoses. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
24. Install induction module and intake manifold. See 4.8 INDUCTION MODULE: XL MODELS.
25. 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 connector (black) [22].
    d. Left hand control connector (gray) [24].
    e. Front turn signal connector [31].
26. Mount caddies together. Verify tabs on caddies engage each other and frame backbone bracket. Secure with screw. See 6.27 MAIN WIRING HARNESS.
27. Position ignition coil and bracket on frame behind steering head. Position the wiring harnesses, the right wire harness caddy and the throttle cables between the coil bracket uprights.
28. Plug ignition coil harness connector [83] into coil. See 6.13 IGNITION COIL. Mount ignition switch to coil bracket with screw. Tighten screw to 34-45 **in-lbs** (4.0-5.1 Nm). Secure right wire harness caddy to coil bracket with new push-in fastener.
29. Connect clutch cable to clutch lever on handlebar. Attach clutch cable (along with wiring harness and front O2 sensor harness) to frame front left downtube with cable clips. Adjust clutch. See 2.29 CLUTCH CONTROL.
30. Plug the following electrical connectors into the engine:
    a. Engine Temperature (ET) sensor connector [90]. Secure sensor harness to ECM caddy with barbed cable strap. To avoid damage to sensor during vehicle operation, secure harness with a loop between sensor and ECM caddy. Press barbed prong of cable strap into hole in boss in ECM caddy. See 4.7 ENGINE TEMPERATURE (ET) SENSOR.
    b. Starter relay wire (GN) at starter motor. See 6.10 STARTER.
    c. Vehicle speed sensor (VSS) connector [65]. See 6.25 VEHICLE SPEED SENSOR (VSS).
    d. Neutral indicator switch connector [136]. See 6.26 NEUTRAL INDICATOR SWITCH.
    e. Alternator AC connector [46]. See 6.23 VOLTAGE REGULATOR.
    f. Crank position (CKP) sensor connector [79]. See 6.22 CRANK POSITION SENSOR (CKP).
    g. Oil pressure switch connector [120]. See 6.31 OIL PRESSURE SWITCH.
    h. Spark plug wires.
    i. Ground wire at powertrain ground stud on crankcase.
31. Connect the following connectors to the induction module. See 4.8 INDUCTION MODULE: XL MODELS.
    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.
    a. **XL Models except XL 1200V:** See 4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V.
    b. **XL 1200V:** See 4.3 AIR CLEANER ASSEMBLY, XL 1200V.
    c. **EVAP Controlled Models:** Install EVAP purge hose on induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.

⚠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)

34. Install fuel tank and screw. Tighten to 15-20 ft-lbs (20.4-27.1 Nm). Attach quick-connect fitting on fuel line to fuel tank fitting. Gently tug on quick-connect fitting to make sure it is securely locked in place. See 4.4 FUEL TANK: XL MODELS.
35. Route oil drain hose down through drain hose sleeve in rear of engine crankcase. Using new hose clamps, install oil tank feed, drain and return hoses onto oil tank. Install drain plug in end of drain hose. Secure with worm drive clamp. Tighten clamp securely. See 3.24 OIL TANK.
36. Install exhaust system interconnect. See 4.13 EXHAUST SYSTEM: XL MODELS.
37. Install transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
38. Install rear drive belt and hand-tighten rear axle. Final belt adjustment will be performed later. See 5.6 DRIVE BELT.
39. Install sprocket cover. Secure with two screws. Note that long screw goes in top hole, short screw in bottom hole. Do not tighten screws at this time.
40. Install exhaust pipe clamp bracket, washer and screw to sprocket cover. Tighten to 30-33 ft-lbs (40.7-44.8 Nm). Now tighten other two sprocket cover screws to 80-120 **in-lbs** (9.0-13.6 Nm).
41. Install right front footrest assembly and rear brake linkage.
    a. **Models with Mid-mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
    b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
42. Install exhaust pipes and mufflers. Plug in O2 sensor connectors [137], [138]. Route the rear O2 sensor harness toward left side of motorcycle. Loop the harness back to the harness connector. The harness cannot contact the exhaust pipe or port. See 4.13 EXHAUST SYSTEM: XL MODELS.
43. Fill oil tank. 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.
45. Adjust belt tension and rear wheel alignment. Tighten rear axle nut to 95-105 ft-lbs (129-142 Nm). Install **new** E-clip. See 1.24 WHEEL ALIGNMENT.

⚠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. Connect battery. See 1.22 BATTERY MAINTENANCE.
47. Install left side cover. See 2.18 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)

48. Install seat.

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PROCEDURE: XR 1200X

PART NUMBER	TOOL NAME
HD-45967	SHOP DOLLY
HD-45968	FAT JACK
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
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm
Engine mount, front, bolt	95-105 ft-lbs	129 -142 Nm
Retainer plate, lower front, fastener	45-50 ft-lbs	61.0-67.8 Nm
Stabilizer link, lower, frame bracket, front, mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link cylinder head bracket	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
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm
Shift linkage pivot bolt	120-180 **in-lbs**	13.6-20.3 Nm
Ignition switch mounting screw	34-45 **in-lbs**	4.0-5.1 Nm
Oil cooler fastener: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm
Induction module cover to cylinder head fastener: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm
Induction module cover to induction module fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm
Induction module cover to wire form fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm
Siren/canister bracket rear brake line fastener	17-22 ft-lbs	23.0-29.8 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61.0-67.8 Nm
Sprocket cover, rear 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
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

1. See Figure 3-26. Verify 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 at this time.
2. Position right front isolator (8) on front of engine. Do not install left front isolator at this time.
3. Attach ENGINE HOOK (Part No. HD-46284) and engine hoist to engine.
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). Do not tighten screws at this time.
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). Do not tighten screws at this time.
8. Insert front engine mount bolt (10) from left side, through isolators and crankcase boss. Place nut (12) on bolt but do not tighten at this time.
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. Using **new** hose clamp, install oil tank vent hose at oil tank. See 3.24 OIL TANK.
12. Install rear fork with pivot/engine mount bolts (1). Tighten to 60-70 ft-lbs (81.4-95.0 Nm).
13. Tighten front engine mount bolt (10) and nut (12) to 95-105 ft-lbs (129 -142 Nm).
14. Install J-clip (14) to each side of frame. Tighten fasteners (13) to 45-50 ft-lbs (61.0-67.8 Nm).
15. Remove ENGINE HOOK (Part No. HD-46284).
16. With the aid of a FAT JACK (Part No. HD-45968), remove motorcycle from SHOP DOLLY (Part No. HD-45967).
17. See Figure 3-24. Install lower front stabilizer link and frame bracket:
    a. Install lower frame bracket (2) with stabilizer link (1). Secure with screws (4) and washers (5). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
    b. Install screw (3) securing stabilizer link to engine crankcase boss. Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
18. See Figure 3-23. Install cylinder head stabilizer link bracket (1), upper stabilizer link (2) and upper frame bracket (3):
    a. Install the fasteners (6), lockwashers (7) and the stabilizer cylinder head bracket (1). Tighten to 55-65 ft-lbs (74.6-88.2 Nm).
    b. Install upper frame bracket with stabilizer link, horn bracket (9) (models with front mounted horn), screws (5) and washers (8). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
    c. Install screw (4) securing stabilizer link to cylinder head bracket (1). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).

19. See Figure 3-22. Install spacer (5), rear stabilizer link (1), grounding strap (2) and screws (3, 4). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
20. See Figure 3-25. Install shift lever and rider left footrest and mounting bracket assembly. Tighten fasteners (2) to 45-50 ft-lbs (61.0-67.8 Nm).
21. Connect shift linkage to transmission shift lever. Tighten fastener (1) to 120-180 **in-lbs** (13.6-20.3 Nm).
22. Install induction module and intake manifold. See 4.9 INDUCTION MODULE: XR 1200X.
23. Rotate backbone wire harness caddy down into place.
24. See 6.13 IGNITION COIL. Position ignition coil and bracket on backbone caddy behind steering head. Place front wire harnesses, mounting boss from right wire harness caddy and throttle cables between coil bracket uprights.
25. Plug ignition coil harness connector [83] into coil. Mount ignition switch to coil bracket with screw. Tighten to 34-45 **in-lbs** (4.0-5.1 Nm). Secure right wire harness caddy to coil bracket with new push-in fastener.
26. Connect clutch cable to clutch lever on handlebar. Secure cable to lower oil cooler mount. Attach clutch cable (along with wiring harness and front O2 sensor harness) to frame front left downtube with cable clips. Adjust clutch. See 2.29 CLUTCH CONTROL.
27. See Figure 3-21. Install the oil cooler to the frame mounts. Tighten fasteners (1) to 36-60 **in-lbs** (4.1-6.8 Nm).
28. Plug the following electrical connectors into the engine:
    a. Engine Temperature (ET) sensor connector [90]. Secure sensor harness to H-bracket with barbed cable strap. To avoid damage to sensor during vehicle operation, secure harness with a loop between sensor and H-bracket. Press barbed prong of cable strap into hole in boss in H-bracket. See 4.7 ENGINE TEMPERATURE (ET) SENSOR.
    b. Starter relay wire (GN) at starter motor. See 6.10 STARTER.
    c. Vehicle speed sensor (VSS) connector [65]. See 6.25 VEHICLE SPEED SENSOR (VSS).
    d. Neutral indicator switch connector [136]. See 6.26 NEUTRAL INDICATOR SWITCH.
    e. Alternator AC connector [46]. Secure to right downtube with a cable strap. See 6.23 VOLTAGE REGULATOR.
    f. Connect voltage regulator DC connector [77] and secure to frame cross member with cable strap. See 6.23 VOLTAGE REGULATOR.
    g. Crank position (CKP) sensor connector [79]. See 6.22 CRANK POSITION SENSOR (CKP).
    h. Oil pressure switch connector [120]. See 6.31 OIL PRESSURE SWITCH.
    i. Spark plug wires.
    j. Ground wire at powertrain ground stud on crankcase.
29. See 4.9 INDUCTION MODULE: XR 1200X and plug the following into the induction module:
    a. TPS [88].
    b. IAC [87].
    c. TMAP [80].
    d. Fuel injector connectors [84], [85].
30. Install and connect jiffy stand sensor. See 6.29 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS.
31. Install and connect horn. See 6.32 HORN.
32. See Figure 3-18. Install induction module cover. Secure TPS harness to cover during installation.
    a. Tighten fasteners (2) to 20-24 ft-lbs (27.1-32.5 Nm).
    b. Tighten fastener (1) to 84-108 **in-lbs** (9.5-12.2 Nm).
    c. Tighten fastener (3) to 84-108 **in-lbs** (9.5-12.2 Nm).
33. Install air cleaner assembly on induction module. Connect breather hoses to rocker box fittings. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
34. EVAP Controlled Models: Install EVAP purge hose on induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.

⚠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)

35. Install fuel tank. Tighten screws to 15-20 ft-lbs (20.4-27.1 Nm). Attach quick-connect fitting on fuel line to fuel tank fitting. Gently tug on quick-connect fitting to make sure it is securely locked in place. See 4.5 FUEL TANK: XR 1200X.
36. Secure air filter assembly to fuel tank with two screws.
37. Install oil hoses.
    a. Feed oil drain hose down through drain hose sleeve in rear of engine crankcase.
    b. Using **new** hose clamps, install oil tank feed, drain and return hoses onto oil tank.
    c. Install drain plug in end of drain hose.
    d. Secure with worm drive clamp. Tighten clamp securely. See 3.24 OIL TANK.
38. See Figure 3-20. Install right rider footrest assembly and rear master cylinder assembly. Tighten fasteners (1) to 45-50 ft-lbs (61.0-67.8 Nm).
39. See Figure 3-19. Secure brake line and siren/canister mount plate to frame and rear fork. Tighten fasteners (1) to 17-22 ft-lbs (23.0-29.8 Nm). Connect rear stop lamp switch connectors.

NOTE

Verify that the EVAP canister mounting hardware does not contact the rear stabilizer ground strap.

40. Install these parts if present:
    a. **EVAP Controlled Models:** Install EVAP canister and hoses. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
    b. **All other Models:** Install siren if equipped. See 6.30 SECURITY SYSTEM/OPTIONAL SIREN.
41. If removed, install transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
42. Install rear drive belt and hand-tighten rear axle. Final belt adjustment will be performed later. See 5.6 DRIVE BELT.
43. Secure right shock absorber to rear fork. Tighten to 45-50 ft-lbs (61.0-67.8 Nm).
44. Install belt guard and debris deflector.
45. Install sprocket cover. Tighten sprocket cover screws.
    a. Tighten rear (larger) screw to 30-33 ft-lbs (40.7-44.8 Nm).
    b. Tighten forward and lower (smaller) screws to 80-120 **in-lbs** (9.0-13.6 Nm).
46. Install exhaust pipes and mufflers. See 4.14 EXHAUST SYSTEM: XR 1200X.

NOTE

It is important to route and secure the front O2 sensor harness correctly to prevent premature harness failure. See 4.12 OXYGEN (O2) SENSOR, Installation.

47. Plug in O2 sensor connectors [137], [138]. Make sure each O2 sensor harness is routed and secured correctly. See 4.12 OXYGEN (O2) SENSOR, Installation.
48. Fill oil tank. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Filter.
49. Fill primary chaincase/transmission with FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT. See 1.10 TRANSMISSION LUBRICANT.
50. Adjust belt tension and rear wheel alignment. Tighten rear axle nut to 95-105 ft-lbs (129-142 Nm). Install **new** E-clip. See 1.24 WHEEL ALIGNMENT.
51. Connect battery. See 1.22 BATTERY MAINTENANCE.
52. Install left side cover. See 2.18 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)

53. Install seat.

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PRECISION COOLING SYSTEM: XR 1200X 3.12

GENERAL

PART NUMBER	TOOL NAME
HD-46503	OIL LINE REMOVER, 1/2 INCH
HD-49096	OIL LINE REMOVER, 3/8 INCH

See Figure 3-27. The oil lines used in the Precision Cooling System incorporate flanged oil lines and quick connect fittings. Quick connect fittings can be separated using either the OIL LINE REMOVER, 1/2 INCH (Part No. HD-46503) or OIL LINE REMOVER, 3/8 INCH (Part No. HD-49096).

1. Close the OIL LINE REMOVER over the oil line. Match the notches in the tool flange to the U-bends in the retainer clip.
2. Rotate the tool to expand the spring clip.
3. Use finger and thumb to hold the OIL LINE REMOVER squarely against the fitting to keep the spring clip expanded. Use only enough pressure to hold the tool square. Excess pressure will prevent simultaneously pulling the line and tool from the fitting.
4. Pull the oil line and the tool from the fitting.
5. Apply a light film of clean engine oil to the oil line. This eases assembly and prevents damage to the connector O-ring.
6. To assemble, push the oil line squarely into quick connect fitting to connect.

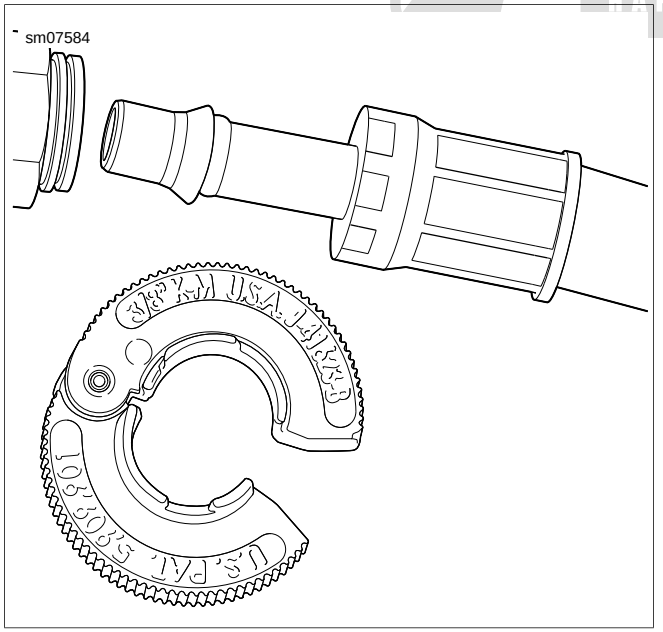


Figure 3-27. Flanged Oil Line and Remover

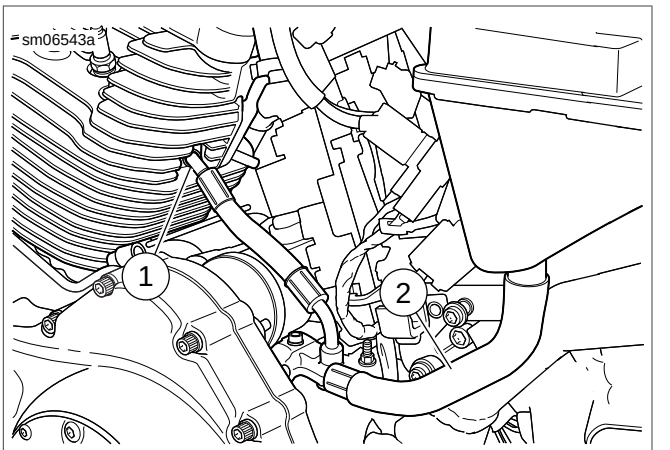
RETURN OIL MANIFOLD

PART NUMBER	TOOL NAME
HD-49096	OIL LINE REMOVER, 3/8 INCH

FASTENER	TORQUE VALUE	
Return oil manifold screw: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm

Removal

1. Disconnect and remove battery. See 1.22 BATTERY MAINTENANCE.
2. Remove exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
3. Drain oil tank. See 1.6 ENGINE OIL AND FILTER.
4. Remove oil drain hose from sleeve in rear engine crankcase.
5. Remove battery positive (+) cable from starter motor. See 6.10 STARTER.
6. See Figure 3-29. From right side of motorcycle, remove fastener (1) securing oil manifold.
7. See Figure 3-28. Disconnect oil return hose (2) from oil tank.
8. Remove rear cylinder head oil line (1) from quick connect fitting using OIL LINE REMOVER, 3/8 INCH (Part No. HD-49096) while sliding return oil manifold back off from rigid oil lines and remove assembly from engine.



1. **Rear cylinder head oil line**
2. **Return oil hose to tank**

Figure 3-28. Rear Cylinder Oil Line

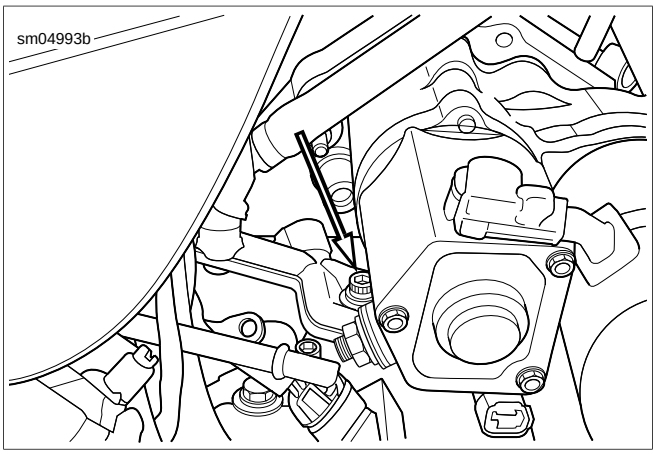


Figure 3-29. Return Oil Manifold Fastener

Installation

1. Install **new** O-rings in manifold assembly and apply a light film of oil to them.
2. Start return oil manifold on rigid lines and install rear cylinder head oil line in quick connect fitting. Verify that it is securely held by the retainer clip.
3. See Figure 3-29. Slide oil manifold onto rigid lines and secure with screw (1). Tighten to 84-108 **in-lbs** (9.5-12.2 Nm).
4. Connect oil return hose to oil tank. Secure with clamp.
5. Install and connect oil tank drain hose. Install and secure plug in drain hose.
6. Connect battery positive (+) cable to starter. See 6.10 STARTER.
7. Install battery. See 1.22 BATTERY MAINTENANCE.
8. Fill the oil tank. See 1.6 ENGINE OIL AND FILTER.

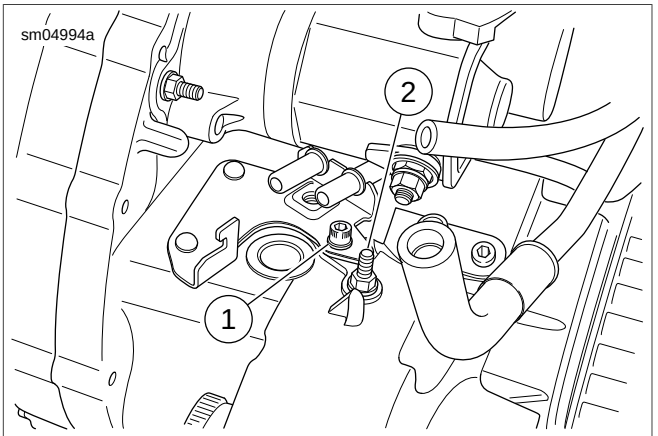
CYLINDER HEAD OIL RETURN LINES

PART NUMBER	TOOL NAME
HD-49096	OIL LINE REMOVER, 3/8 INCH

FASTENER	TORQUE VALUE	
Oil line quick connect fitting, cylinder head return: XR 1200X	108-156 **in-lbs**	12.2-17.6 Nm
Oil line retainer, front, nut: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm
Oil rigid line retainer, rear, screw: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm

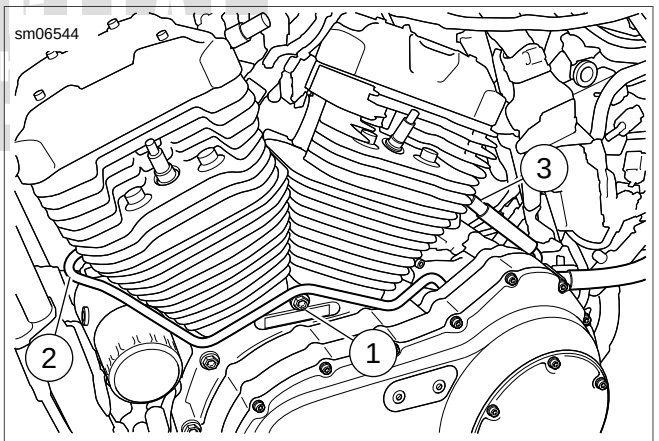
Removal

1. Remove return oil manifold. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Return Oil Manifold.
2. See Figure 3-30. Remove fastener (1) and raise retainer until alignment pin (2) is clear of bore in crankcase. Roll retainer out from beneath rigid oil lines to remove.
3. See Figure 3-31. Remove nut (1) and washer.
4. Separate front oil line (2) from cylinder head using OIL LINE REMOVER, 3/8 INCH (Part No. HD-49096).
5. Separate rear oil line (3) from cylinder head using OIL LINE REMOVER, 3/8 INC (Part No. HD-49096).
6. If front oil line needs to be completely removed, remove starter. See 6.10 STARTER.
7. If necessary, remove quick connect fitting from cylinder head.



1. **Fastener**
2. **Alignment pin (hidden)**

Figure 3-30. Rigid Oil Line Retainer



1. **Locknut**
2. **Front oil line**
3. **Rear oil line**

Figure 3-31. Cylinder Head Oil Lines

Installation

NOTE

*Used O-rings can leak. Always install **new** O-rings when performing repairs.*

1. If removed from cylinder head, install quick connect fittings with **new** O-rings. Tighten to 108-156 **in-lbs** (12.2-17.6 Nm).
2. Install **new** internal O-rings in quick connect fittings.
3. If removed, place front cylinder head oil line on engine and install electric starter. See 6.10 STARTER.

NOTE

Apply a light film of oil to the end of the line before inserting it into the fitting.

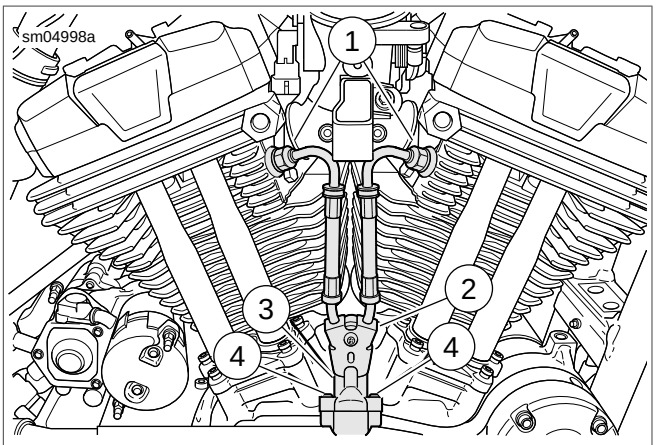
4. See Figure 3-31. Connect front oil line (2) to cylinder head. Verify that it is securely held by the retainer clip.
5. Secure front line to crankcase with locknut (1) and washer. Tighten to 84-108 **in-lbs** (9.5-12.2 Nm).
6. Install retainer.
   a. See Figure 3-30. Roll retainer under rigid lines at rear of crankcase.
   b. Orient alignment pin to bore in case.
   c. Verify that the flanges on lines are on the manifold side of the retainer.
   d. Secure with fastener (1).
   e. Tighten to 84-108 **in-lbs** (9.5-12.2 Nm).
7. Install return oil manifold. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Return Oil Manifold.
8. See Figure 3-31. Connect rear oil line (3) to cylinder head. Verify that it is securely held by the retainer clip.

CYLINDER HEAD OIL FEED ASSEMBLY

FASTENER	TORQUE VALUE	
Check valve plug fitting: XR 1200X	15-21 ft-lbs	20.3-28.5 Nm
Check valve housing fastener: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm
Cylinder head oil feed flare fitting: XR 1200X	22-26 ft-lbs	29.8-35.3 Nm
Cylinder head oil feed line flare nut: XR 1200X	13-17 ft-lbs	18-23 Nm

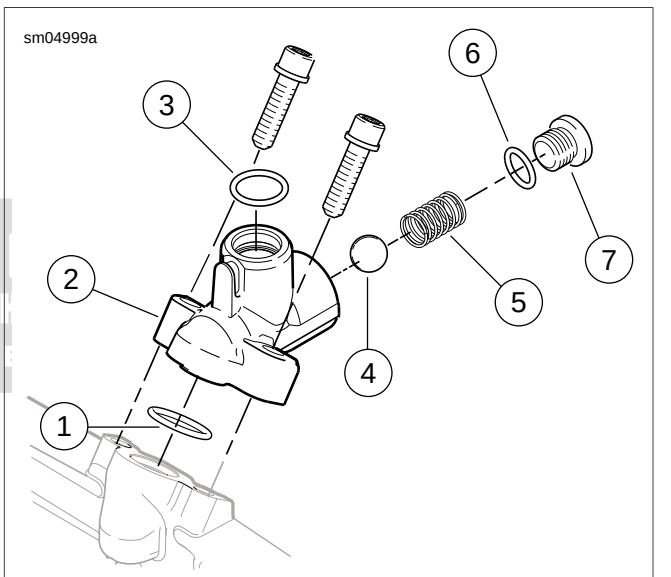
Removal

1. Disconnect the battery. See 1.22 BATTERY MAINTENANCE.
2. Drain oil tank. See 1.6 ENGINE OIL AND FILTER.
3. See Figure 3-32. Disconnect flare nuts (1) from each cylinder head.
4. Pull oil feed hose connector (2) straight up to remove feed hose assembly from check valve assembly (3).
5. Remove two fasteners (4) and check valve assembly (3).
6. See Figure 3-33. Carefully clamp assembly in vise and remove plug fitting (7).
7. Remove spring (5) and ball (4).
8. If necessary, remove flare fittings from cylinder heads.
9. Inspect components for wear or damage and replace as necessary.



1. **Feed oil line flare nut**
2. **Feed oil line connector**
3. **Check valve assembly**
4. **Fastener**

Figure 3-32. Cylinder Head Oil Feed Assembly



1. **Base O-ring**
2. **Check valve housing**
3. **O-ring**
4. **Check ball**
5. **Spring cartridge assembly**
6. **O-ring**
7. **Plug fitting**

Figure 3-33. Check Valve Components

Installation

1. See Figure 3-33. Install ball (4) and spring (5) into housing (2).

NOTE

*Used O-rings can leak. Always install **new** O-rings when performing repairs.*

2. Install **new** O-ring (6) on check valve plug fitting (7) and install fitting. Tighten to 15-21 ft-lbs (20.3-28.5 Nm).
3. Install **new** O-ring (3) in bore of housing.

4. Install housing (2) with **new** base O-ring (1). Tighten fasteners to 90-120 **in-lbs** (10.3-13.6 Nm).
5. If removed, apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the flare fittings. Install in cylinder heads with **new** O-rings. Tighten to 22-26 ft-lbs (29.8-35.3 Nm).

NOTE

Apply a light film of oil to the end of the line before inserting it into the fitting.

6. See Figure 3-32. Push oil feed hose assembly straight down to install. Connect oil line flare nuts (1) to cylinder head flare fittings. Hold lines to prevent rotation and tighten to 13-17 ft-lbs (18-23 Nm).
7. Install and connect battery. See 1.22 BATTERY MAINTENANCE.
8. Fill oil tank. See 1.6 ENGINE OIL AND FILTER.

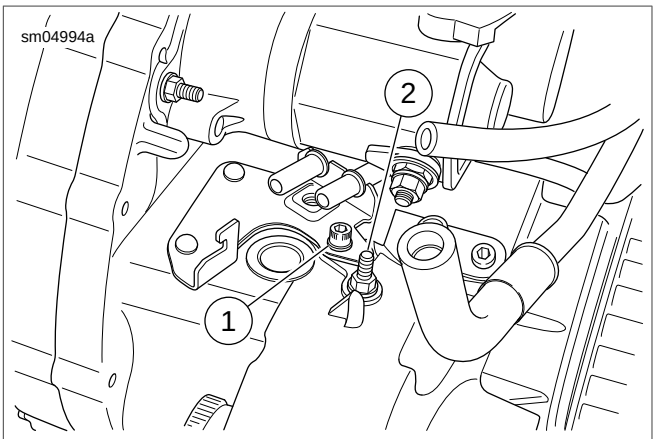
OIL PUMP LINES

PART NUMBER	TOOL NAME
HD-46503	OIL LINE REMOVER, 1/2 INCH
HD-49096	OIL LINE REMOVER, 3/8 INCH

FASTENER	TORQUE VALUE	
Oil pump quick connect fitting: XR 1200X	108-156 **in-lbs**	12.2-17.6 Nm
Oil rigid line retainer, rear, screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm

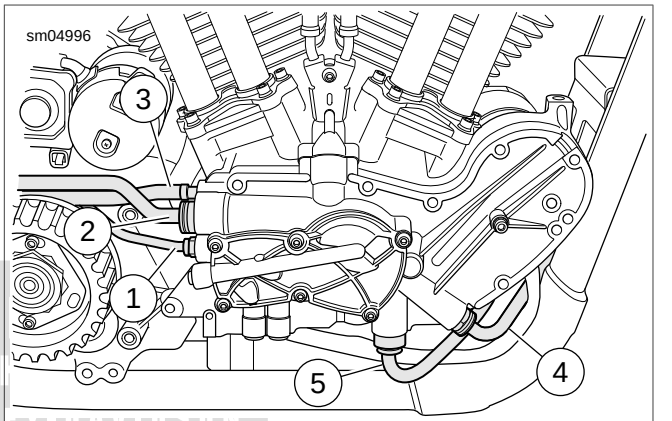
Removal

1. Remove return oil manifold. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Return Oil Manifold.
2. Remove retainer.
   a. See Figure 3-34. Remove fastener (1).
   b. Raise retainer until alignment pin (2) is clear of bore in crankcase.
   c. Roll retainer out from beneath rigid oil lines.
3. See Figure 3-35. Remove return oil line (1) from gearcase cover using OIL LINE REMOVER, 3/8 INCH (Part No. HD-49096).
4. If removing the return oil line, remove starter. See 6.10 STARTER.
5. Remove feed oil line (2) from gearcase cover using OIL LINE REMOVER, 1/2 INCH (Part No. HD-46503).
6. Disconnect vent hose (3) from fitting on oil pump.
7. See Figure 3-36. Remove locknut (1) and washer. Remove oil cooler line retainer (2) from lines.
8. See Figure 3-35. Release each oil cooler line (4, 5) from bottom of gearcase cover using OIL LINE REMOVER, 1/2 INCH (Part No. HD-46503).
9. If necessary, remove quick connect fittings.



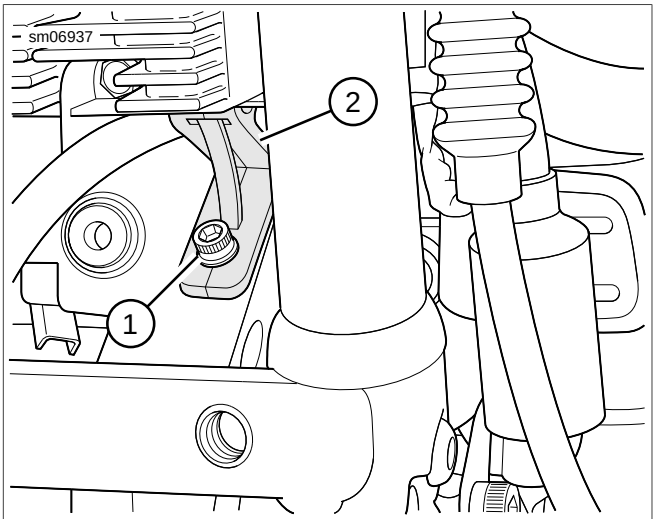
1. **Fastener**
2. **Alignment pin (hidden)**

Figure 3-34. Rigid Oil Line Retainer



1. **Oil pump return line**
2. **Oil pump feed line**
3. **Vent hose**
4. **Oil cooler line, to cooler**
5. **Oil cooler line, from cooler**

Figure 3-35. Oil Pump Lines



1. **Fastener**
2. **Line retainer (partially hidden)**

Figure 3-36. Oil Cooler Line Retainer

Installation

NOTE

*Used O-rings can leak. Always install **new** O-rings when performing repairs.*

1. If removed, install quick connect fittings with **new** O-rings. Tighten to 108-156 **in-lbs** (12.2-17.6 Nm).
2. Install **new** O-rings in quick connect fittings.

NOTE

Apply a light film of oil to the end of each line before inserting it into the fitting.

3. See Figure 3-35. Connect oil cooler lines (4, 5) to lower gearcase cover. Verify each is securely held by the retainer clip.
4. See Figure 3-36. Install oil cooler line retainer (2) and tighten fastener (1) securely.
5. See Figure 3-35. If removed, place return line (1) on engine and install starter. See 6.10 STARTER.
6. Connect vent (3), feed oil (2) and return oil (1) lines to oil pump body and cam support. Verify each is securely held by the retainer clip.
7. Remove retainer.
   a. See Figure 3-34. Roll retainer under rigid lines at rear of crankcase.
   b. Orient alignment pin (2) to bore in case.
   c. Verify flanges on lines are on the manifold side of the retainer.
   d. Secure with screw (1).
   e. Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
8. Install return oil manifold. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Return Oil Manifold.
9. Fill oil tank. See 1.6 ENGINE OIL AND FILTER.

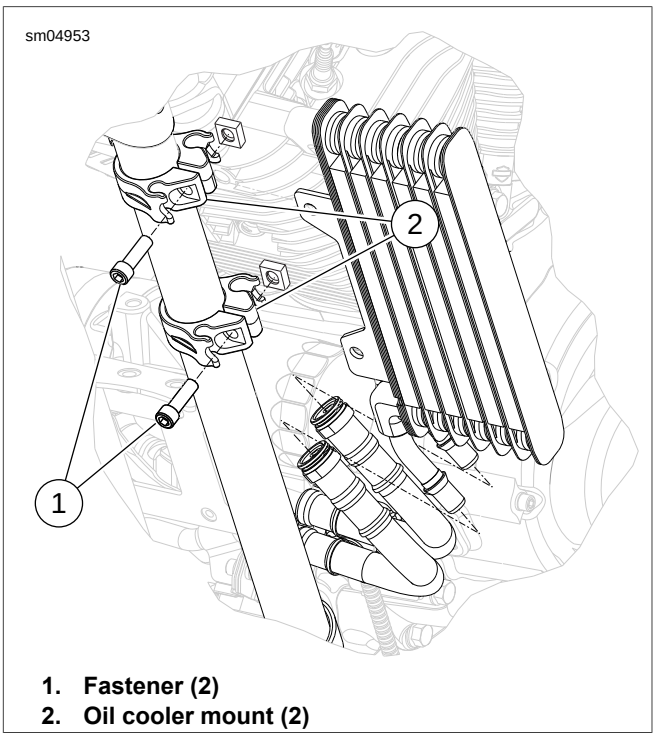
OIL COOLER

PART NUMBER	TOOL NAME
HD-46503	OIL LINE REMOVER, 1/2 INCH

FASTENER	TORQUE VALUE	
Oil cooler fastener: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. Disconnect the battery. See 1.22 BATTERY MAINTENANCE.
2. Drain oil tank. See 1.6 ENGINE OIL AND FILTER.
3. Using OIL LINE REMOVER, 1/2 INCH (Part No. HD-46503), separate oil cooler lines from oil cooler.
4. See Figure 3-37. Remove fasteners (1) securing oil cooler to frame brackets.
5. Remove oil cooler from motorcycle.
6. If necessary, remove oil cooler rigid lines from gearcase cover. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines.



1. **Fastener (2)**
2. **Oil cooler mount (2)**

Figure 3-37. Oil Cooler Mounts

Installation

NOTE

*Used O-rings can leak. Always install **new** O-rings when performing repairs.*

1. Install **new** O-rings in quick connect fittings.
2. If removed, install oil cooler rigid lines. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines.

NOTE

See Figure 3-38. Position oil cooler parallel with down tubes as shown. Do not orient oil cooler forward of down tubes or clutch cable damage will result.

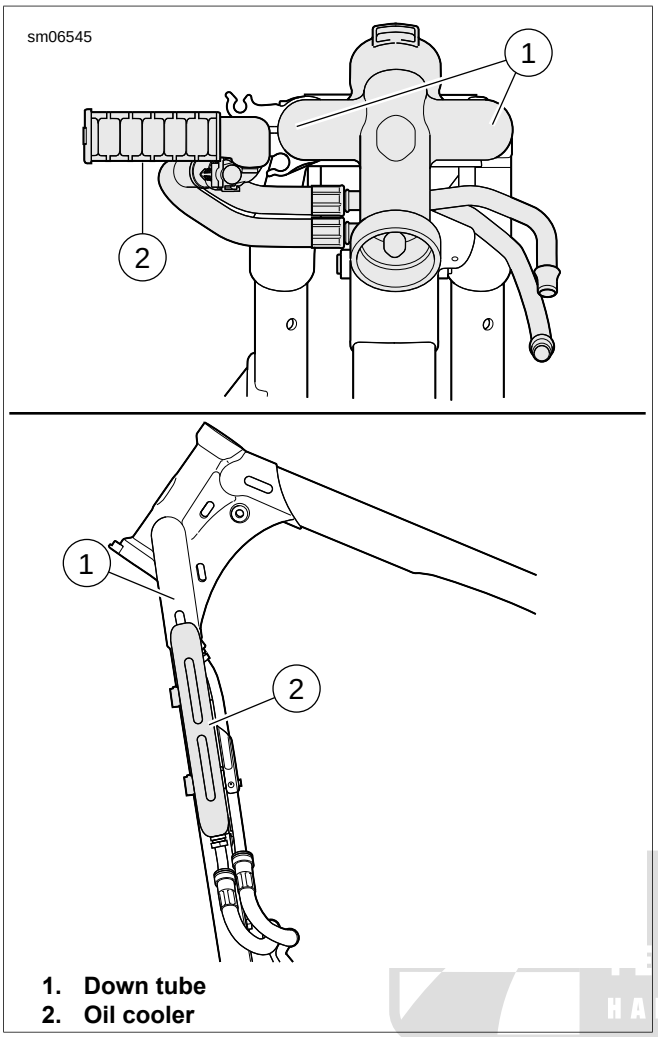
3. See Figure 3-37. Secure oil cooler to frame brackets. Tighten fasteners (1) to 36-60 **in-lbs** (4.1-6.8 Nm).

NOTE

Apply a light film of oil to the end of the line before inserting it into the fitting.

4. Connect oil lines to oil cooler fittings. Verify that each is securely held by the retainer clip.
5. Fill the oil tank. See 1.6 ENGINE OIL AND FILTER.
6. Connect the battery. See 1.22 BATTERY MAINTENANCE.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Down tube
2. Oil cooler

Figure 3-38. Oil Cooler Orientation

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TOP END OVERHAUL: DISASSEMBLY 3.13

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 3.14 CYLINDER HEAD and 3.15 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

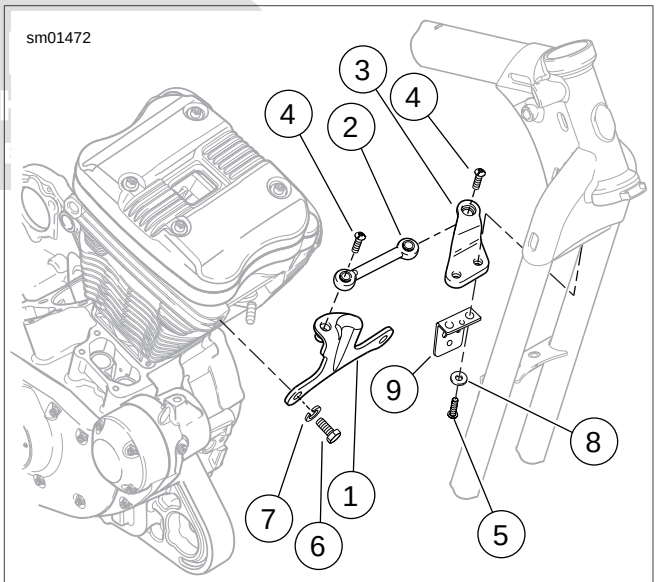
When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
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. Unplug O2 sensor connectors [137], [138] and remove exhaust pipes and mufflers. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
5. Disconnect spark plug cables from spark plugs.
6. Drain and remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
7. Remove horn.
   a. **Front Mount:** See 6.32 HORN, Replacement: Front Mount.
   b. **Side Mount:** See 6.32 HORN, Replacement: Side Mount.
8. Remove air cleaner assembly:
   a. **XL Models except XL 1200V:** Remove cover, air filter and air cleaner backing plate. See 4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V.
   b. **XL 1200V:** Remove cover, air filter and air cleaner backing plate. See 4.3 AIR CLEANER ASSEMBLY, XL 1200V.
   c. **CA Models:** Remove EVAP purge hose from induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
9. Remove induction module. See 4.8 INDUCTION MODULE: XL MODELS or 4.9 INDUCTION MODULE: XR 1200X.
10. Secure induction module assembly and throttle cables out of the way.
11. See Figure 3-39. 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. **Lock washer (2)**
8. **Washer (2)**
9. **Horn bracket**

Figure 3-39. Upper Front Stabilizer Link Assembly

CYLINDER HEADS

Disassembling Rocker Covers

NOTICE

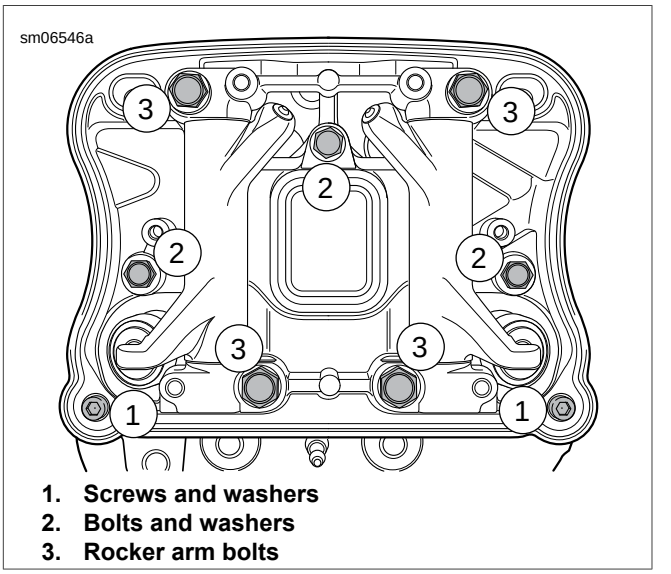
Prevent engine damage. Washers and fasteners used in the engine are hardened parts. Do not use unhardened parts. (00544b)

1. Remove spark plugs.
2. See Figure 3-42. Remove four screws with captive washers (1) and sealing washers (2). Discard sealing washers.
3. Remove outer rocker cover (3) or (20).
4. Remove and discard gaskets (4, 5).
5. Rotate crankshaft until both valves are closed on head being removed.
6. See Figure 3-40. Remove hardware securing inner rocker cover to cylinder head in the following order.
   a. Remove two screws and washers (1).
   b. Remove three bolts and washers (2).
   c. Loosen four 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 3-42. Remove inner rocker cover (8) or (24). Remove and discard gasket (16).
8. Remove breather assembly:
   a. **XL Models:** Remove screw (6), breather assembly (7) and breather seal (17). Discard seal.
   b. **XR 1200X:** Push breather assembly (23) and O-ring (22) out from the under side.

NOTE

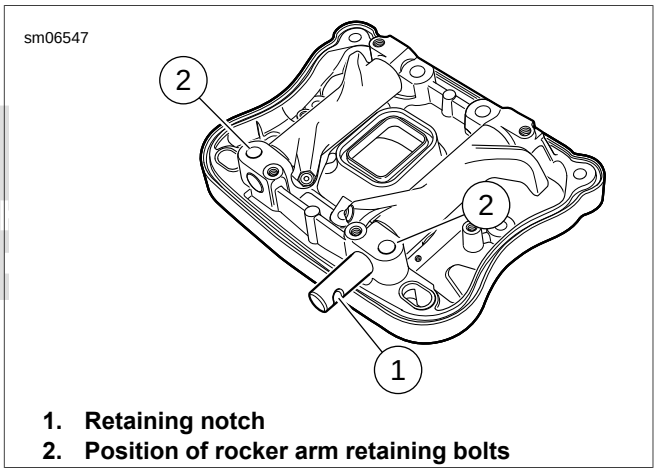
Mark rocker arm shafts for reassembly in their original positions. Install valve train components in their original positions or increased engine wear may result.

9. See Figure 3-41. Remove rocker arm shafts by tapping them out using a hammer and a soft metal punch.
10. See Figure 3-42. Remove rocker arms (11, 12). Mark the rocker arms for reassembly in their original locations.



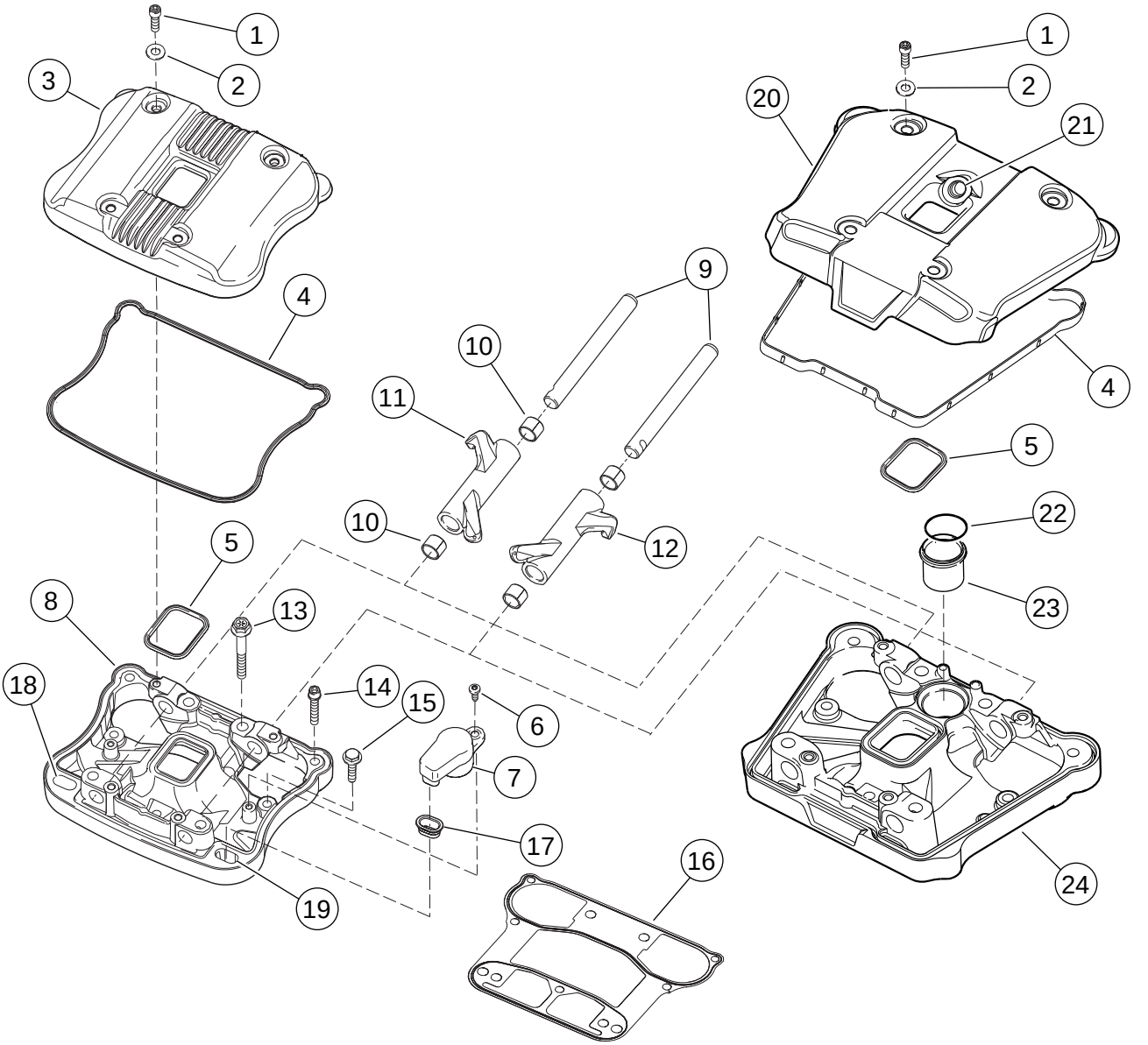
1. **Screws and washers**
2. **Bolts and washers**
3. **Rocker arm bolts**

Figure 3-40. Inner Rocker Cover Fasteners (typical)



1. **Retaining notch**
2. **Position of rocker arm retaining bolts**

Figure 3-41. Removing Rocker Arm Shafts (typical)



1. **Screw w/captive washer (4)**
2. **Sealing washer (4)**
3. **Outer rocker cover: XL Models**
4. **Gasket**
5. **Gasket**
6. **Screw**
7. **Breather assembly: XL Models**
8. **Inner rocker cover: XL Models**
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: XL Models**
18. **Breather location: Front Cylinder: XL Models**
19. **Breather location: Rear Cylinder: XL Models**
20. **Outer rocker cover: XR 1200X**
21. **Breather hose fitting hole: XR 1200X**
22. **O-ring: XR 1200X**
23. **Breather filter and valve assembly: XR 1200X**
24. **Inner rocker cover: XR 1200X**

Figure 3-42. Rocker Cover Assembly

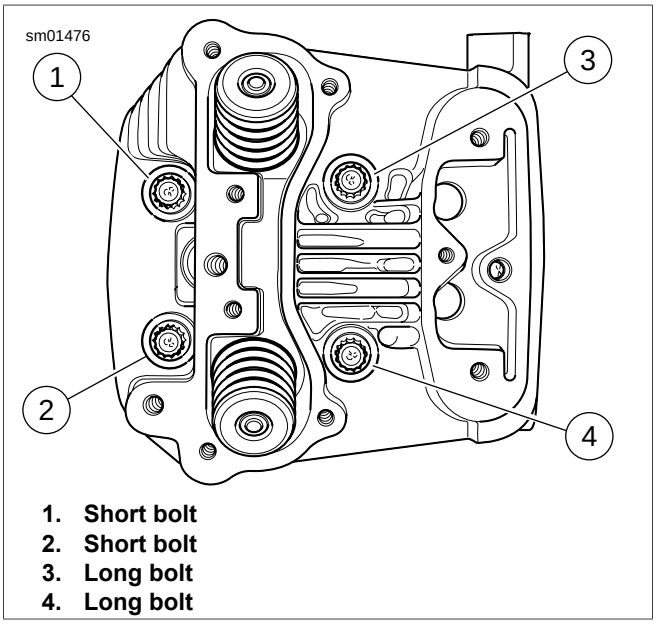
Removing Cylinder Head

NOTE

See Figure 3-43 or Figure 3-44. Follow sequence of incremental removal as described below to prevent component damage.

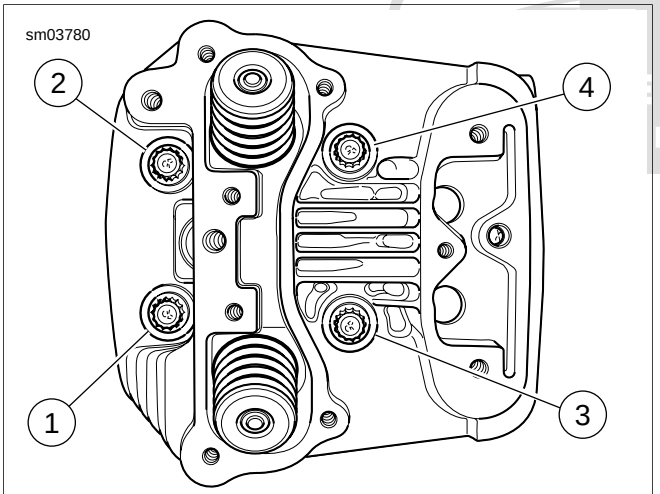
1. **XR 1200X:** Remove precision cooling lines. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines.
2. See Figure 3-43 and Figure 3-44. Loosen each head bolt 1/8-turn following the sequence shown.

3. Continue loosening in 1/8-turn increments until screws are loose. Remove head screws.
4. Remove cylinder head and head gasket. Discard head gasket.



1. **Short bolt**
2. **Short bolt**
3. **Long bolt**
4. **Long bolt**

Figure 3-43. Front Cylinder Headbolt Torque Sequence

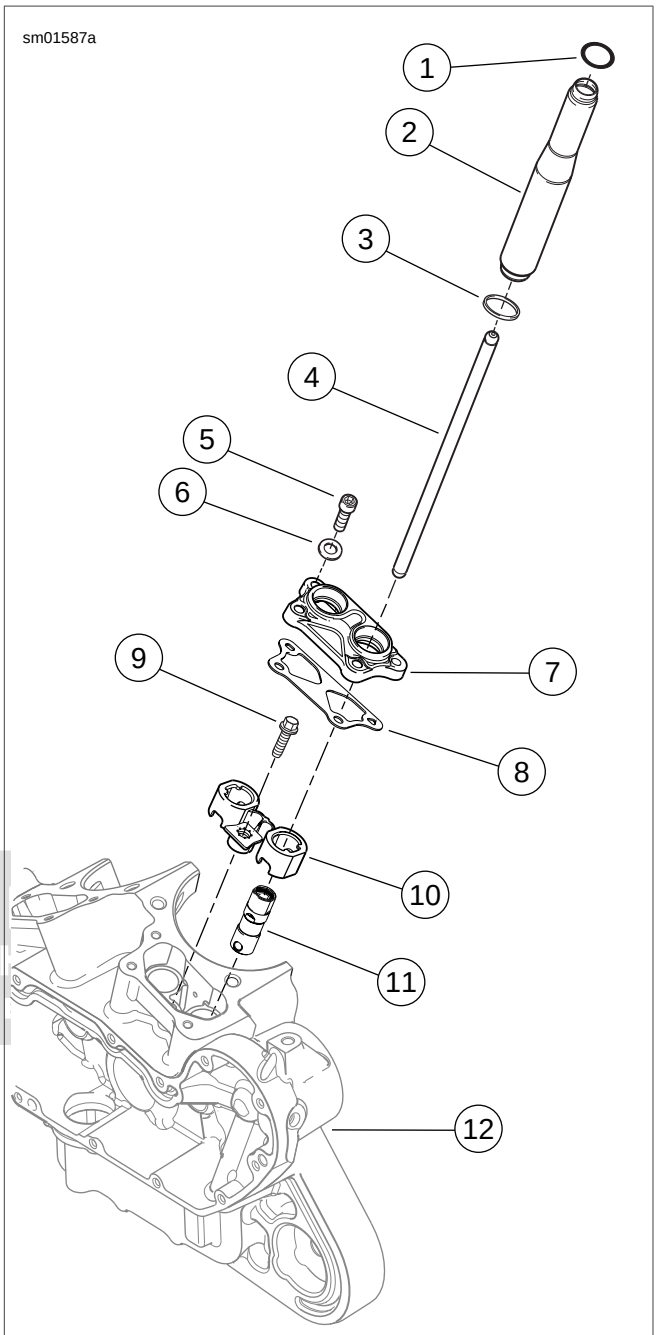


1. **Short bolt**
2. **Short bolt**
3. **Long bolt**
4. **Long bolt**

Figure 3-44. Rear Cylinder Headbolt Torque Sequence

Disassembling Pushrods and Covers

1. See Figure 3-45. Remove pushrod covers (2), O-rings (1, 3) and pushrods (4). Mark the location and orientation (top and bottom) of each pushrod. Discard O-rings.
2. Remove socket screws (5) and washers (6). Remove tappet cover (7) and gasket (8). Discard gasket.



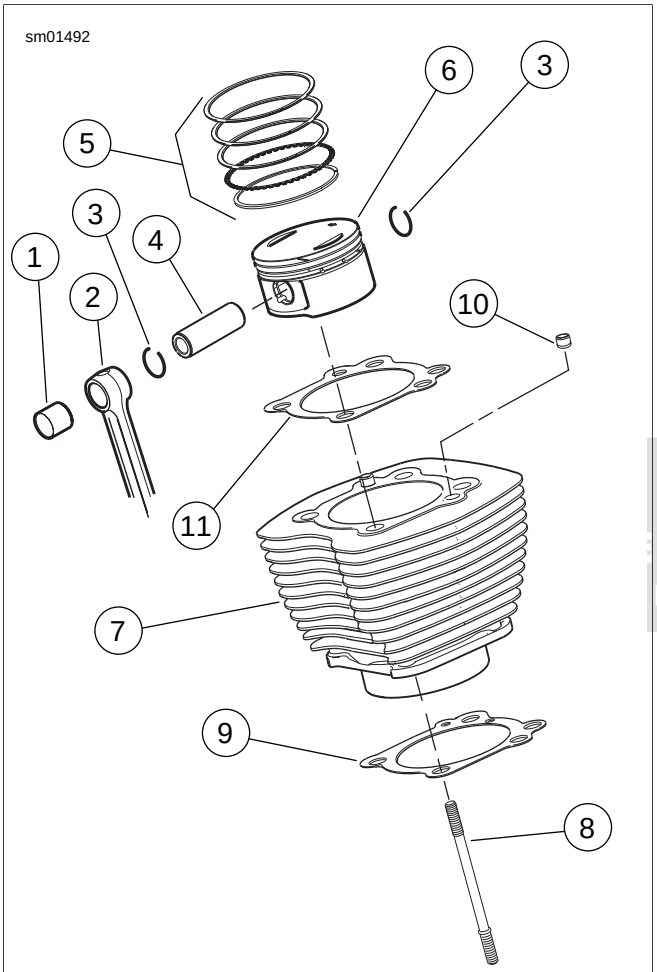
1. **O-ring (4)**
2. **Pushrod cover (4)**
3. **O-ring (4)**
4. **Pushrod (4)**
5. **Screw (8)**
6. **Washer (8)**
7. **Tappet cover (2)**
8. **Gasket (2)**
9. **Screw (2)**
10. **Anti-rotation device (2)**
11. **Tappet (4)**
12. **Right crankcase**

Figure 3-45. 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. Clean engine before disassembly.
2. See Figure 3-46. 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 3-46. Cylinder and Piston

3. Carefully raise cylinder just enough to permit placing clean towel under piston to prevent any foreign matter from falling into crankcase.

NOTE

If cylinder does not come loose, tap lightly with rawhide or plastic hammer perpendicular to cylinder fins. Never try to pry cylinder up.

4. Carefully lift cylinder over piston and cylinder studs (8). Do not allow piston to fall against cylinder studs.

NOTE

To avoid damage to piston assembly and/or cylinder studs, do not allow piston to fall against studs.

5. 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.

6. 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.

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)

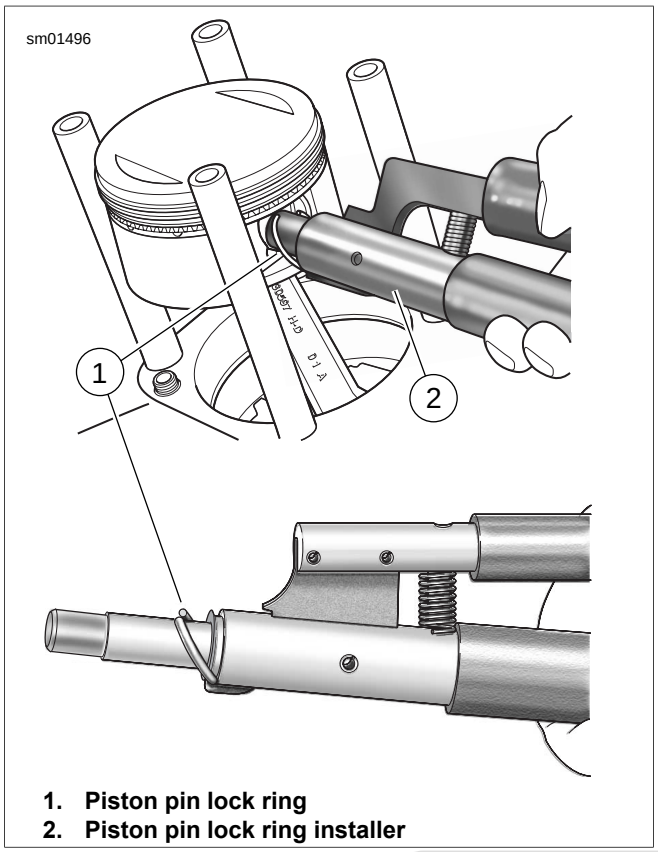
⚠WARNING

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)

7. See Figure 3-47. 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.

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.*



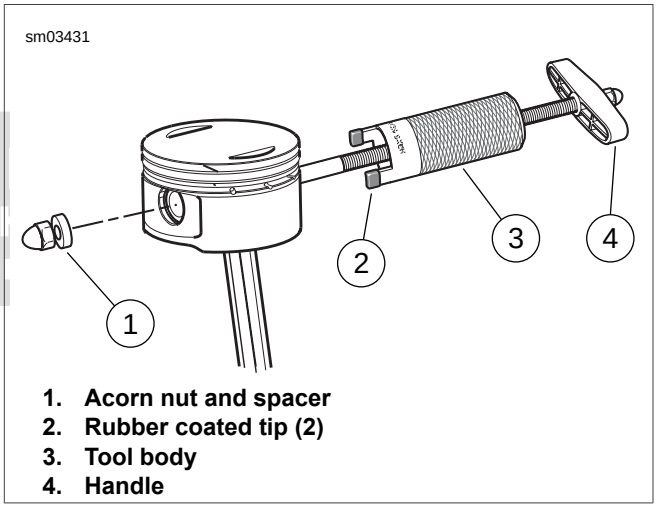
1. **Piston pin lock ring**
2. **Piston pin lock ring installer**

Figure 3-47. 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.

8. 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 3-48. 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.
9. Remove piston from connecting rod. Be sure to hold connecting rod shank upright to prevent it from striking crankcase.
10. 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.
11. Mark each pin boss with either an "F" or an "R" to indicate front or rear cylinder, respectively.
12. 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 3-48. Removing Piston Pin with HD-42320-A Piston Pin Remover

CYLINDER HEAD 3.14

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR

1. See Figure 3-49. Clamp VALVE SPRING COMPRESSOR (Part No. HD-34736-B) in vise and compress valve spring.
2. See Figure 3-50. 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), and valve seal (2) and lower valve spring collar assembly (4) by hand. No special tools are required to remove valve seal and lower valve spring collar assembly.

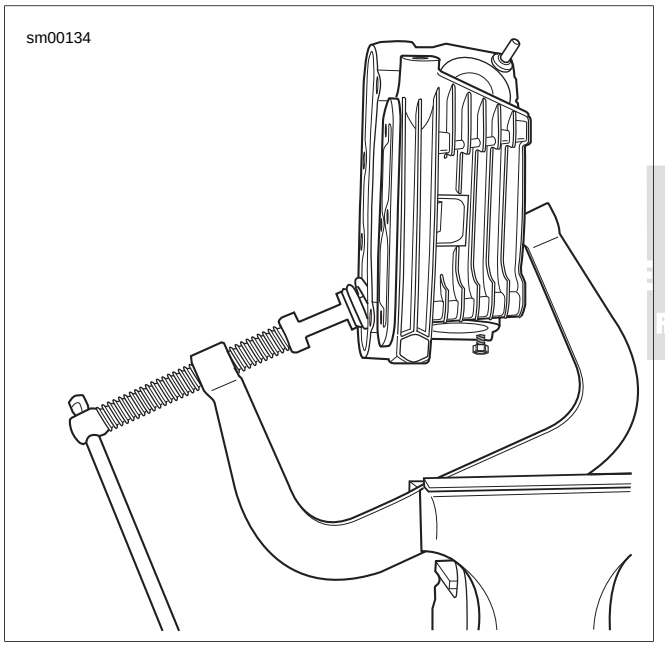
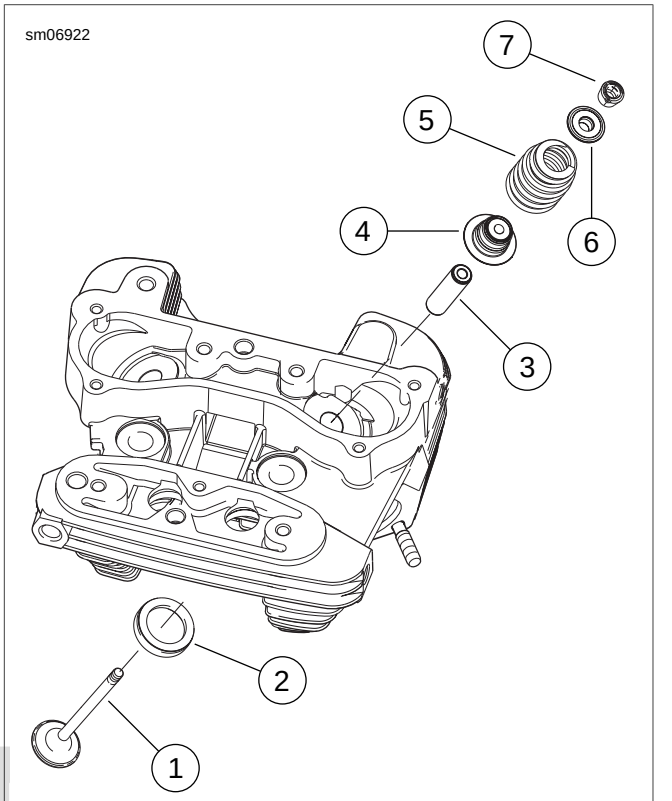


Figure 3-49. Valve Spring Compressor



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 3-50. 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 3-51. 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).

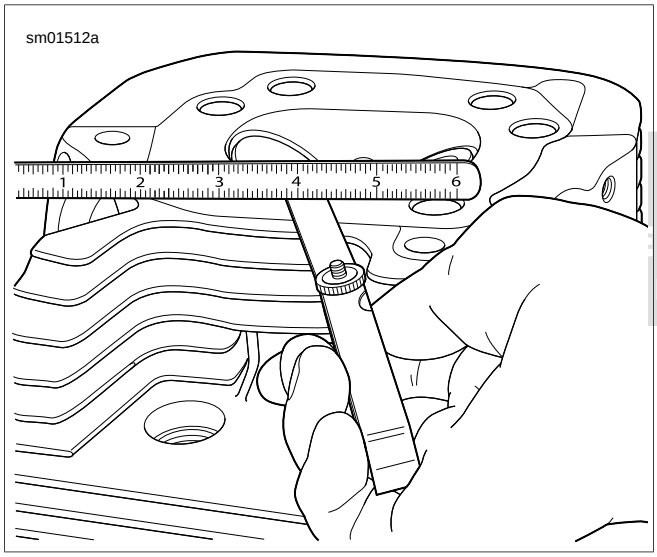


Figure 3-51. Gasket Surface: Flat Within 0.006 in (0.152 mm)

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 3-52. Measure and record rocker arm shaft diameter at the positions where rocker arm bushings ride and where shaft fits in inner rocker cover.

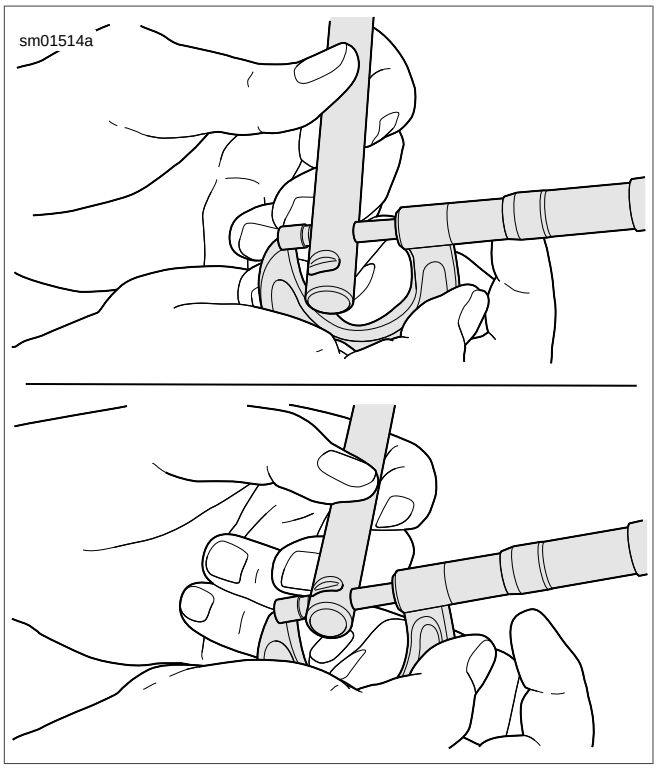


Figure 3-52. Measuring Rocker Arm Shaft Diameter at Bushing Position (top) and Cover Position (bottom)

3. Measure and record rocker arm shaft bore diameters.
   a. See Figure 3-53. Measure rocker arm shaft bore in inner rocker cover.
   b. See Figure 3-54. 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 3.14 CYLINDER HEAD, Replacing Rocker Arm Bushings.
5. See Figure 3-55. 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).

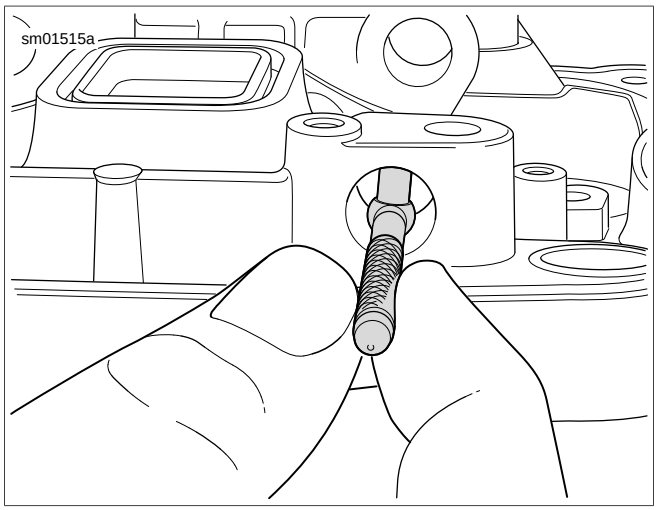


Figure 3-53. Measuring Rocker Arm Shaft Bore Diameter in Inner Rocker Cover

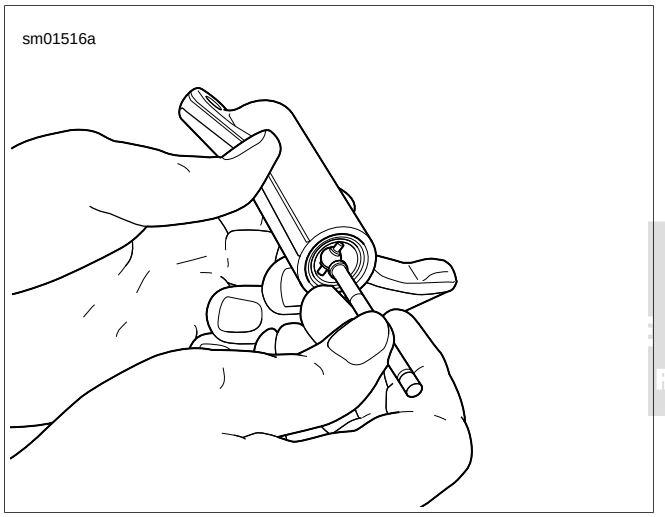
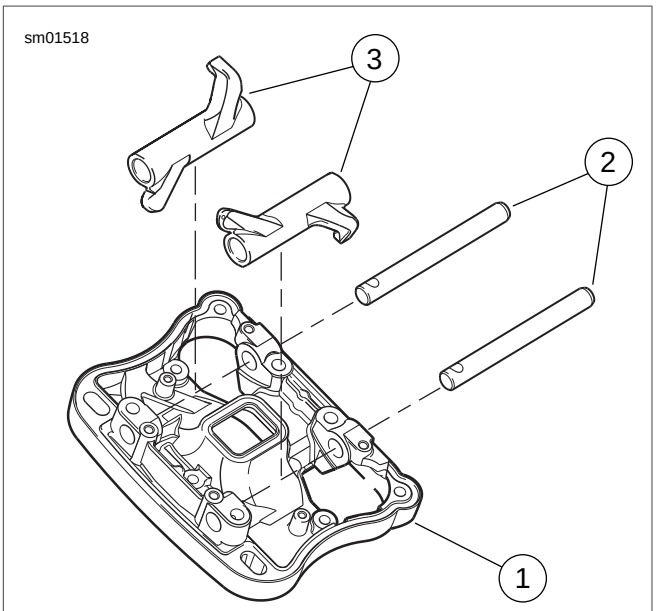


Figure 3-54. Measuring Rocker Arm Bushing Inner Diameter



1. **Inner rocker cover**
2. **Rocker arm shaft (2)**
3. **Rocker arm (2)**

Figure 3-55. 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. Valve heads should have a seating surface width of 0.040-0.062 in (1.02-1.57 mm), and should be free of pit marks and burn spots. The color of carbon on exhaust valves should be black or dark brown. White or light buff carbon indicates 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.

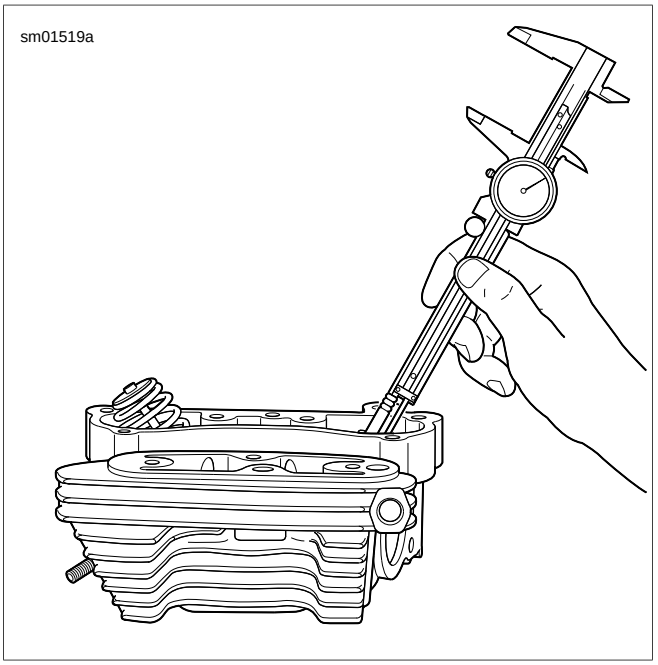


Figure 3-56. Measuring Valve Stem Protrusion

2. See Figure 3-56. 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 3-57. Measure free length of each spring. Refer to Table 3-28.
3. Test compression force of spring using VALVE SPRING TESTER (Part No. HD-96796-47). Refer to Table 3-28.
4. Replace as necessary.

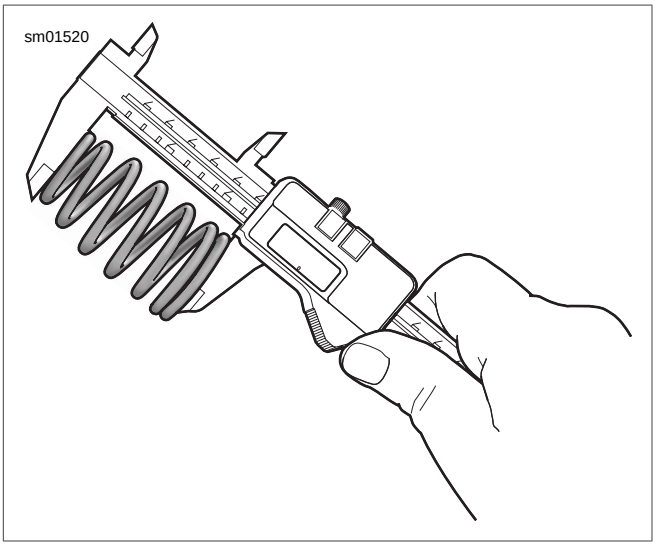


Figure 3-57. Checking Spring Free Length

Table 3-28. 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 3-58. 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.

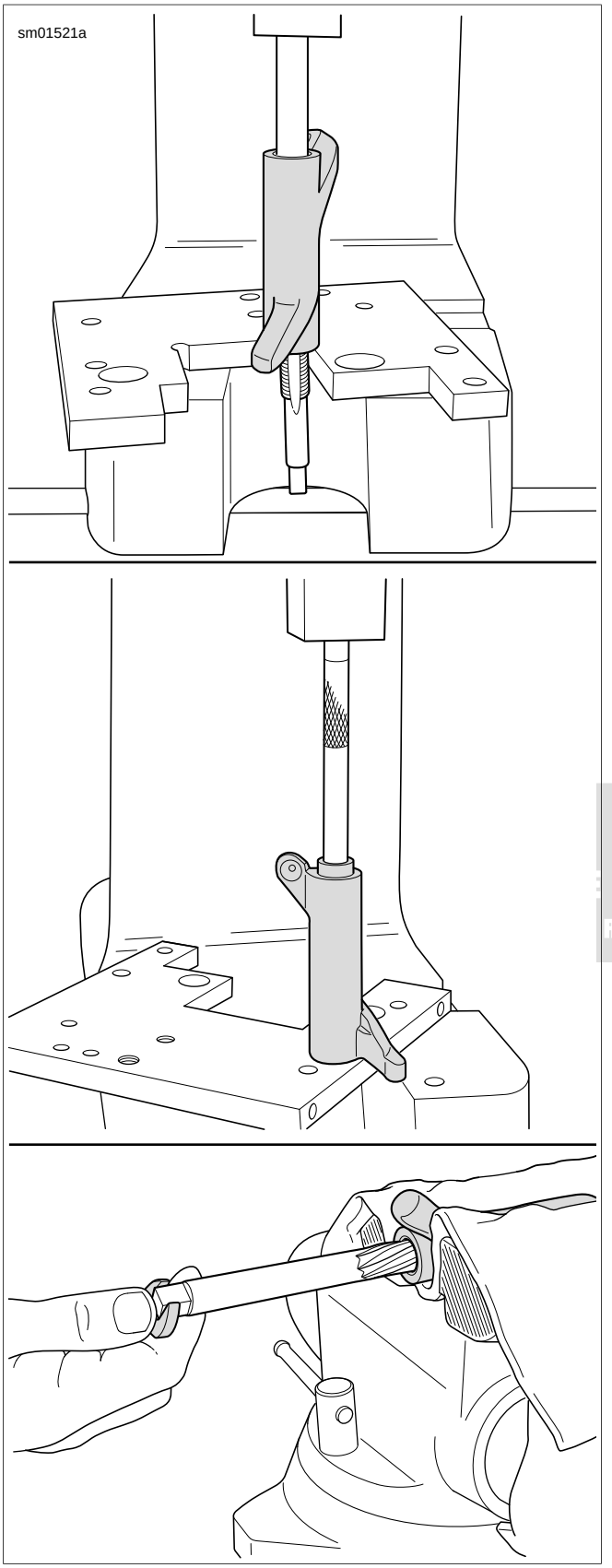


Figure 3-58. Replacing Rocker Arm Bushings

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. It is the valve stem bore in valve guide that determines valve seat grinding location. If valve stems and/or valve guides are worn beyond service wear limits, install new parts. Refer to Table 3-29.

Removal

NOTES

- *Always use cylinder head support stand. Misalignment during valve guide replacement will cause damage to cylinder head valve guide bore.*
- *Lock ring is present on OEM intake and exhaust valve guides on XR 1200X only.*

1. See Figure 3-59. Prepare cylinder head for valve guide replacement.
   a. **XR 1200X:** Remove and discard lock ring from valve guide groove.
   b. 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).
   c. Position cylinder head so that valve seat is centered on seat adapter.

NOTE

Do not press out the valve guide from the bottom of the cylinder head. Excessive carbon buildup prevents a proper interference fit for valve guides.

2. See Figure 3-60. 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 3-59. Installer sleeve (2) is not used for removal of valve guide.

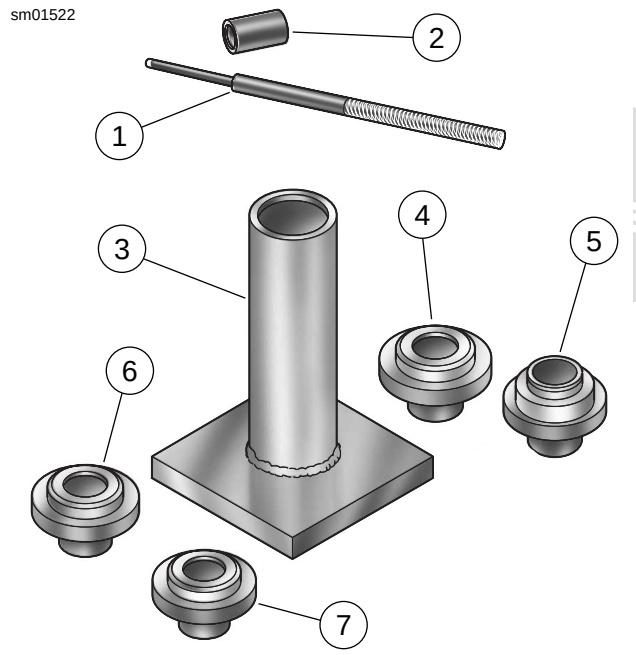
3. Center VALVE GUIDE REMOVER/INSTALLER under ram (3) of press. Apply pressure until valve guide drops free of cylinder head. Discard valve guide.

Table 3-29. 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

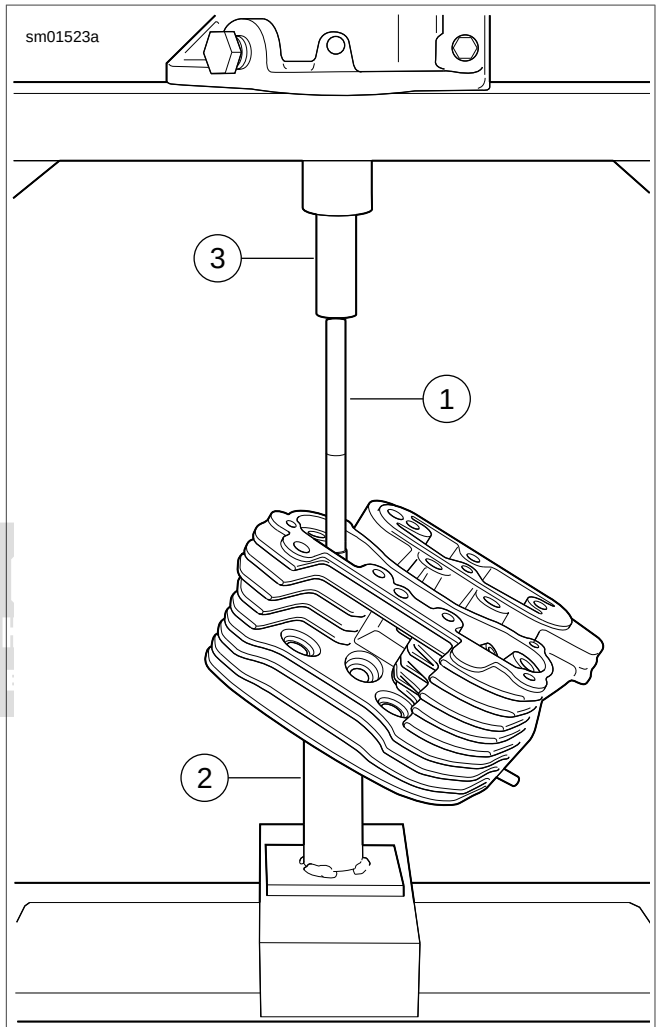
Table 3-30. Valve Guide Remover/Installer Components

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 3-59. Valve Guide Replacement Tools



1. Valve guide remover/installer
2. Cylinder head support stand
3. Ram

Figure 3-60. 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, a replacement valve guide will be used. If interference fit is not within specification, the cylinder head must be replaced.
2. Measure cylinder head bore and outside diameter of replacement valve guide to verify correct interference fit.

NOTE

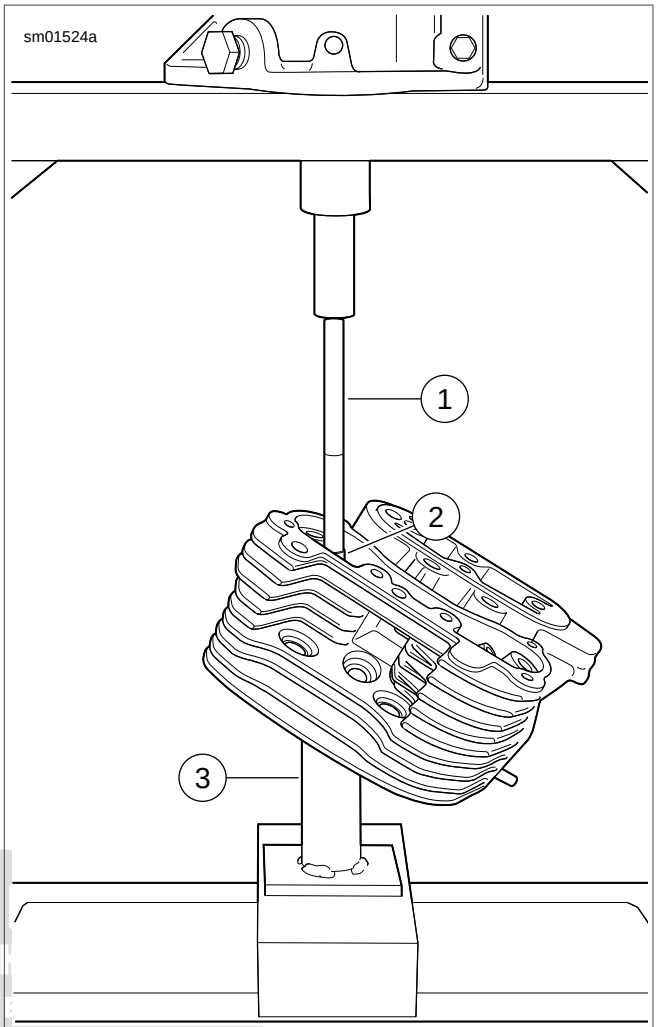
Always use cylinder head support stand. Misalignment during valve guide replacement will cause damage to cylinder head valve guide bore.

3. Prepare cylinder head for valve guide replacement.
   a. See Figure 3-59. 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. At top of cylinder head, start valve guide into bore.
   d. Place installer sleeve (2) over valve guide and then insert VALVE GUIDE REMOVER/INSTALLER (1) into installer sleeve.
   e. See Figure 3-61. Center VALVE GUIDE REMOVER/INSTALLER (1) under ram of press and apply pressure only until valve guide is started in bore and then 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 bend remover/installer, break valve guide, distort cylinder head casting and/or damage cylinder head valve guide bore.

   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.
   h. **XR 1200X:** Install **new** lock ring into valve guide groove. Make sure that lock ring is square and fully seated in the groove.



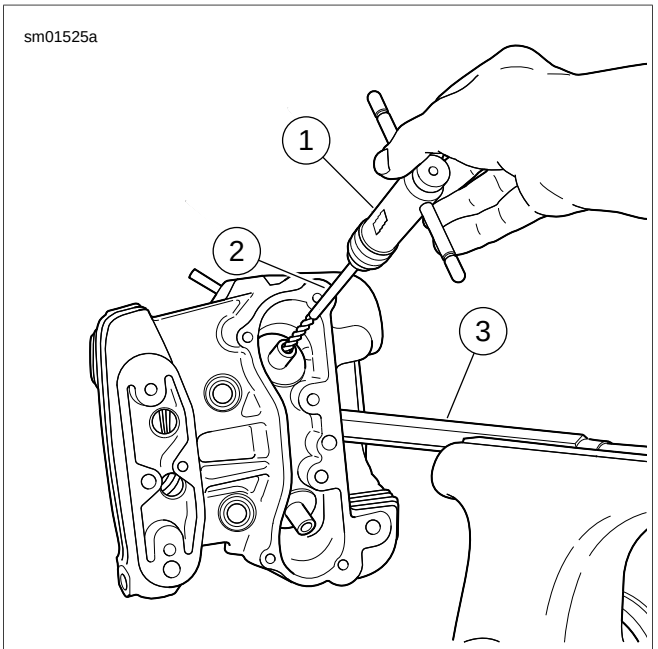
1. Valve guide remover/installer
2. Installer sleeve
3. Cylinder head support stand

Figure 3-61. Installing Shoulderless Valve Guide

4. Secure cylinder head for service.
   a. See Figure 3-62. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.

NOTE

Valve guides must be reamed to within 0.0005-0.0001 in (0.013-0.0025 mm) of finished size.



1. **T-handle**
2. **Valve guide reamer**
3. **Holding fixture**

Figure 3-62. 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 shaft of reamer out combustion chamber side of valve guide.

NOTE

Abrasive particles can damage machined surfaces and plug oil passageways possibly resulting in engine failure.

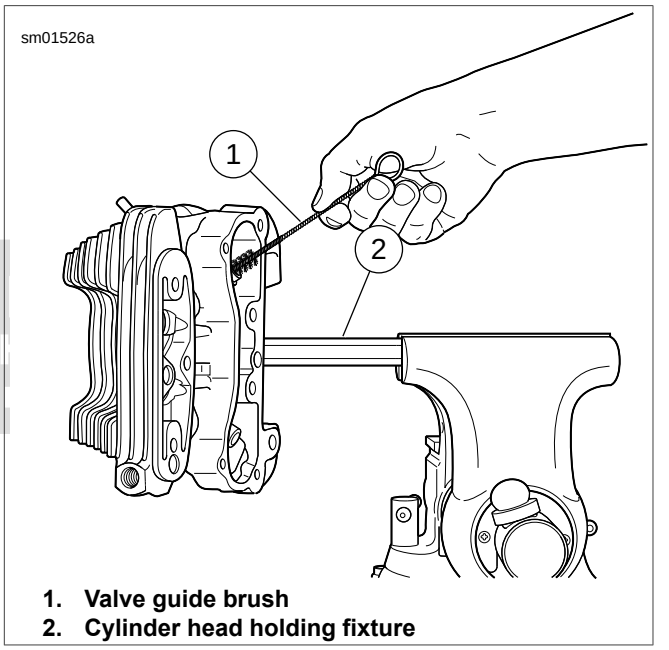
⚠WARNING

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

6. Direct compressed air into the valve guide bore to remove any metal shavings or debris.
7. See Figure 3-63. Clean valve guide bore with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) (1).
8. See Figure 3-64. Obtain the VALVE GUIDE HONE (Part No. B-45525) and REAMER LUBRICANT (Part No. HD-39964).
   a. Install hone in a high speed electric drill.
   b. Apply REAMER LUBRICANT to finishing stones of hone and valve guide bore.
   c. Start finishing stones of hone into bore.
   d. Complete 10 to 12 complete strokes using entire length of finishing stone arrangement and drill. Work for a crosshatch pattern of approximately 60 degrees.

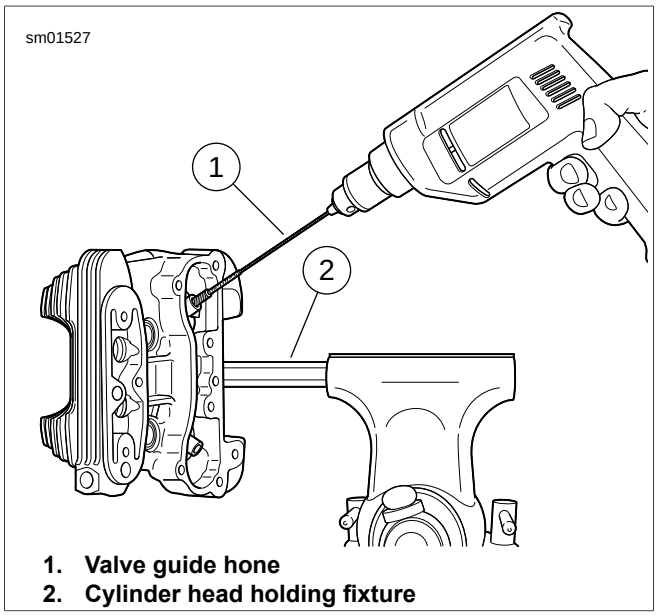
NOTE

The hone is not intended for the removal of material.



1. **Valve guide brush**
2. **Cylinder head holding fixture**

Figure 3-63. Scrubbing Valve Guide Bore



1. **Valve guide hone**
2. **Cylinder head holding fixture**

Figure 3-64. Honing Valve Guide Bore

NOTE

Abrasive particles can damage machined surfaces and plug oil passageways possibly resulting in engine failure.

⚠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. Direct low pressure compressed air into the valve guide bore to remove any debris.
10. See Figure 3-63. 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 3-29.
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. Blow parts dry 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 3-29. If **new** valve guides must be installed, see 3.14 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 and lock it down for quick reference. This is the location of your valve seat.

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.*

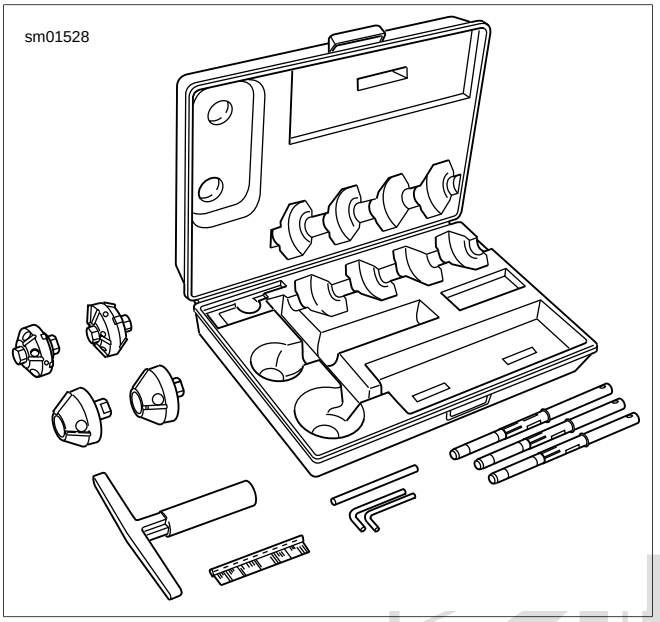


Figure 3-65. Neway Valve Seat Cutter Set (Part no. HD-35758-C)

5. See Figure 3-65. 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

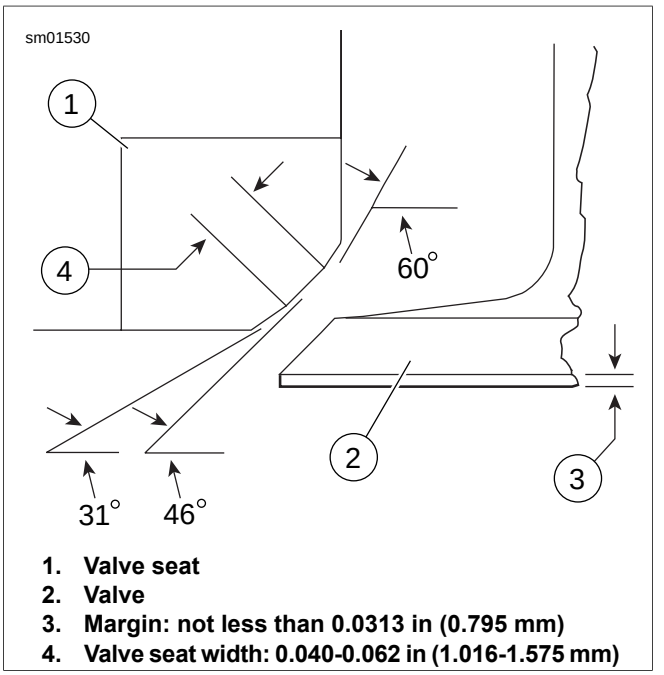
Hold pressure against the valve for a minimum of 10 seconds. If any leakage occurs, examine the valve seat for irregularities or defects and if necessary repeat the above cutting process.

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 3-66. 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 3-71. Insert valve (1) into valve guide (3) and bottom valve on valve seat (2).
3. See Figure 3-67. 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 3-68. 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 3-69. 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.*

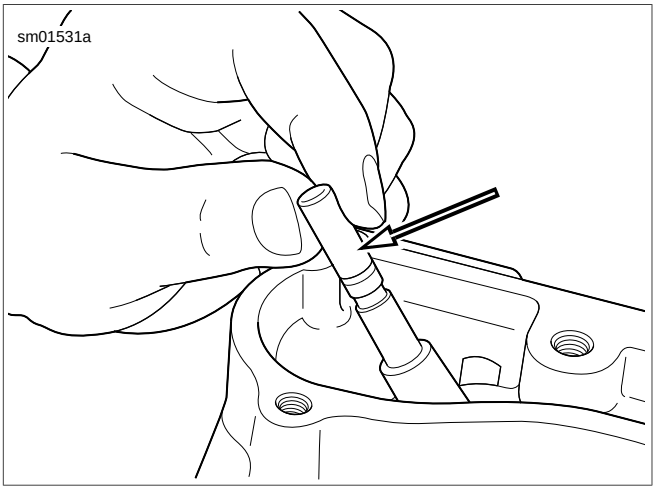


Figure 3-67. Valve Guide Seal Protector Sleeve

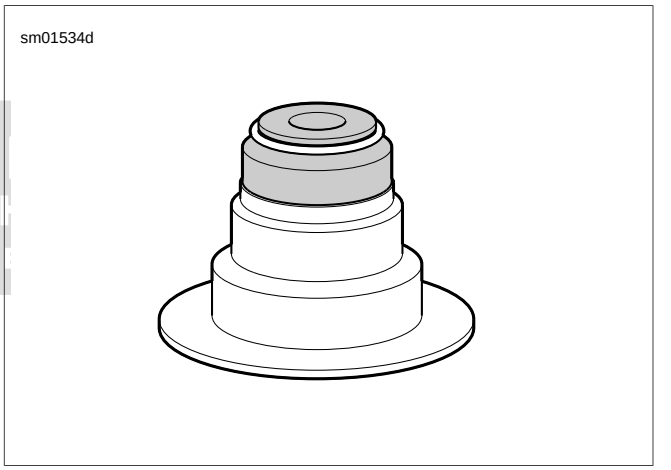


Figure 3-68. Valve Seal and Lower Valve Collar Assembly (seal and lower collar replaced as assembly only)

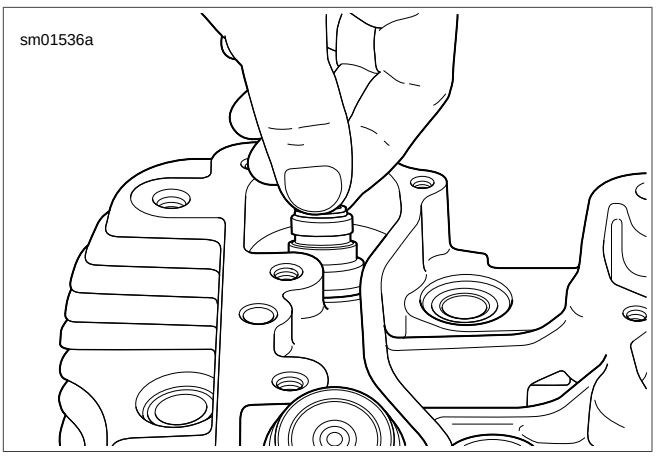


Figure 3-69. Valve Seal and Lower Valve Collar Assembly Installation

5. See Figure 3-71. Install valve spring (5) and upper collar (6).
6. See Figure 3-70. Compress valve spring with VALVE SPRING COMPRESSOR (Part No. HD-34736-B).
7. See Figure 3-71. 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).

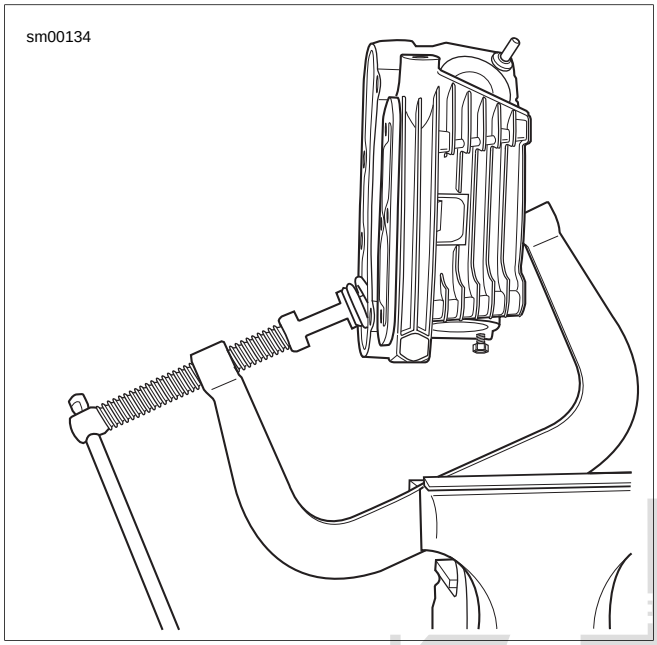
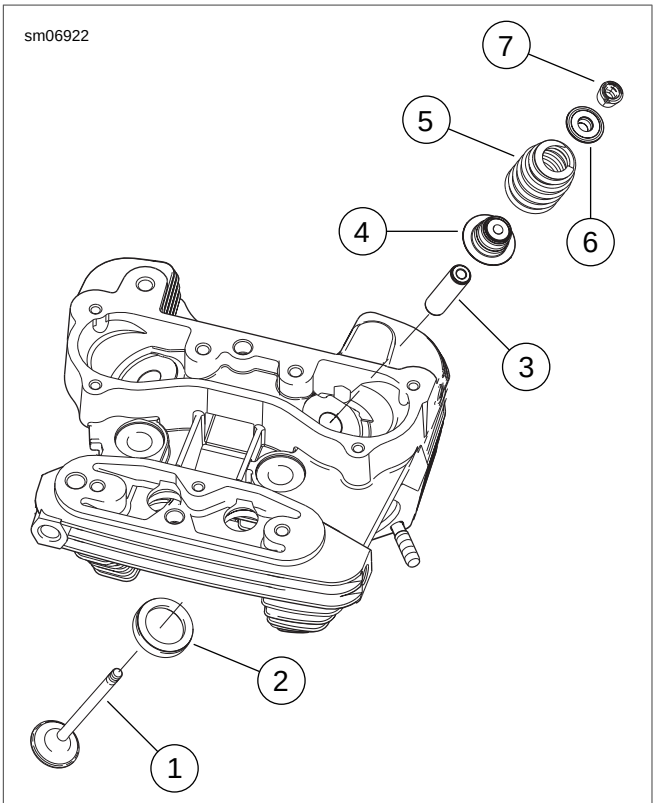


Figure 3-70. Valve Spring Compressor



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 3-71. Cylinder Head

CYLINDER AND PISTON 3.15

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 3.15 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 3-72. 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.

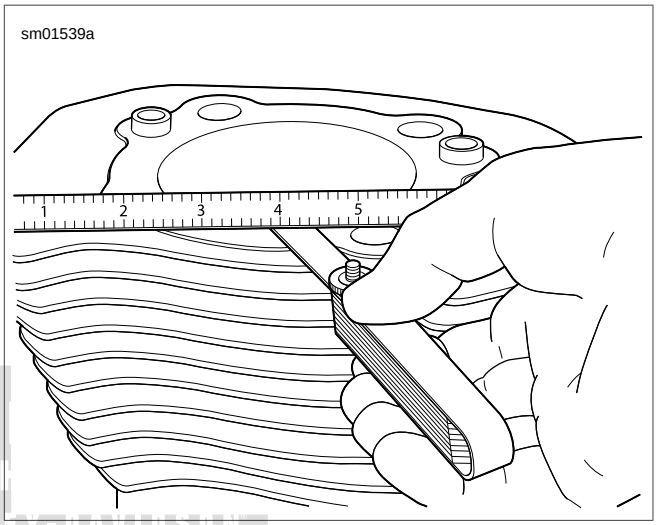


Figure 3-72. Checking Gasket Surfaces

Measuring Cylinder Bore

1. See Figure 3-73. 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 3.16 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 3-31.

Table 3-31. 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
***XR 1200X:** Oversized pistons are not available. Replace piston and/or cylinder if exceeds wear limits.				

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.

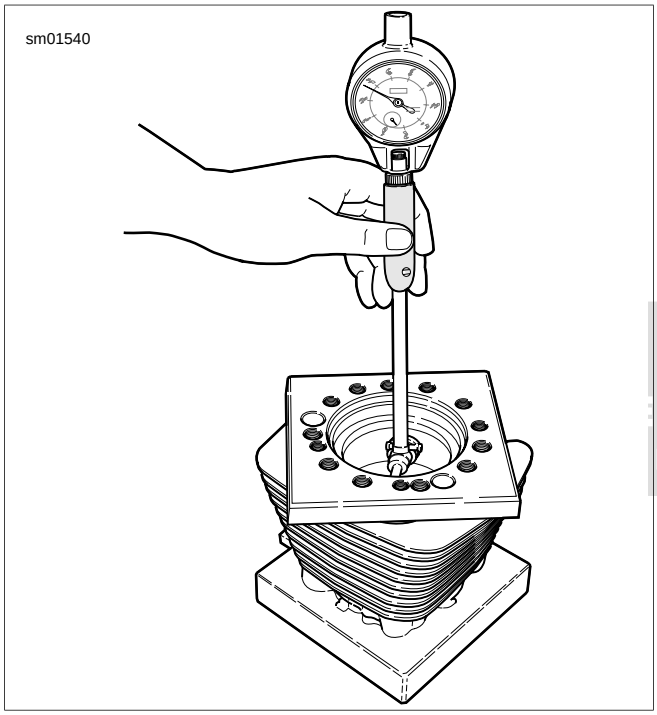


Figure 3-73. Measuring Cylinder Bore

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 3-74. 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 3-75. 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).

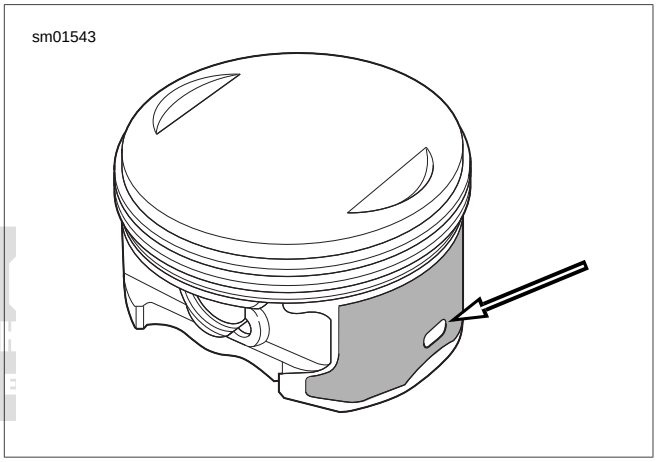
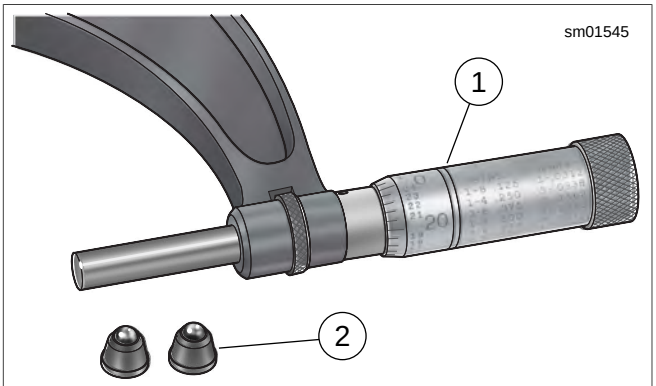


Figure 3-74. Measurement Area



1. 4-5 inch micrometer
2. Spherical ball anvil adapter (2)

Figure 3-75. 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 3-32.

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.*

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537c)

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 3-32. 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) ****XR 1200X:** Oversized pistons are not available. Replace piston and/or cylinder if exceeds wear limits.				

Fitting Piston Rings

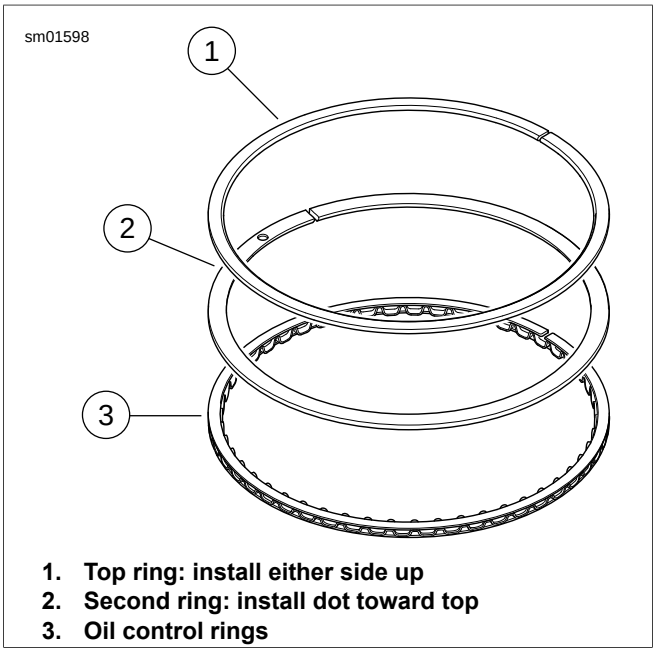
See Figure 3-76. Piston rings are of two types: compression and oil control. The two compression rings are positioned in the two upper piston ring grooves. The dot on the second compression ring must face upward. Ring sets are available to fit standard and oversize pistons.

Piston ring sets must be properly fitted to piston and cylinder:

1. See Figure 3-77. 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 3-76. Piston Rings

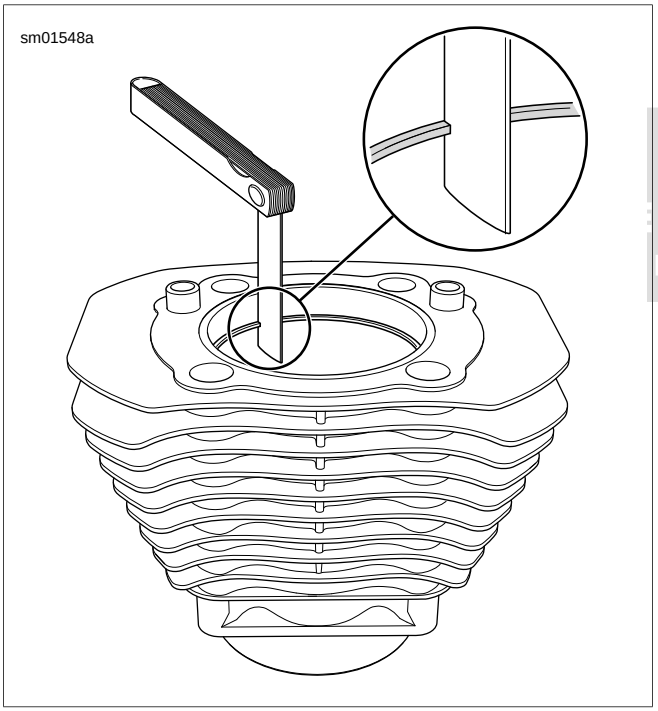


Figure 3-77. Measuring Ring End Gap

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 3-78. 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.

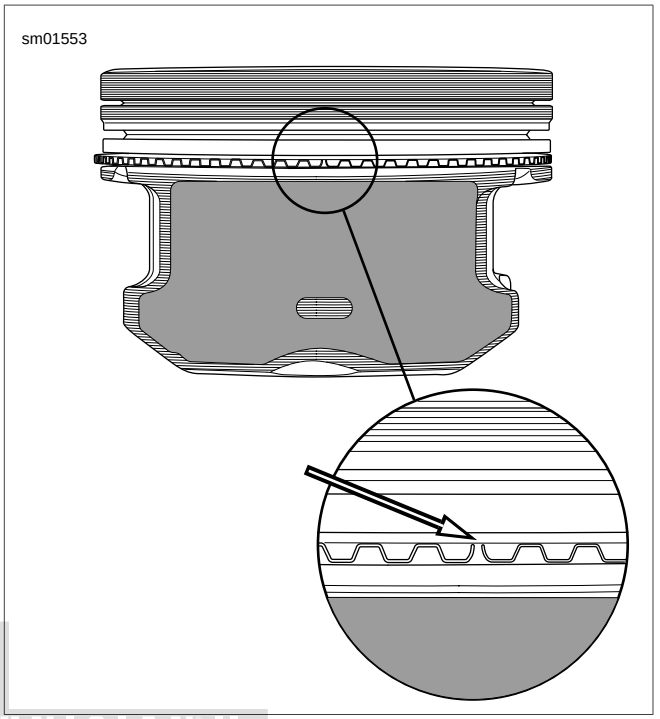


Figure 3-78. Installing Oil Control Ring Expander Spring (typical)

4. See Figure 3-79. 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.

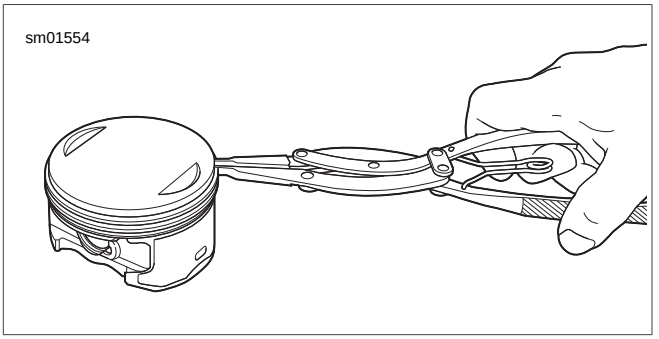


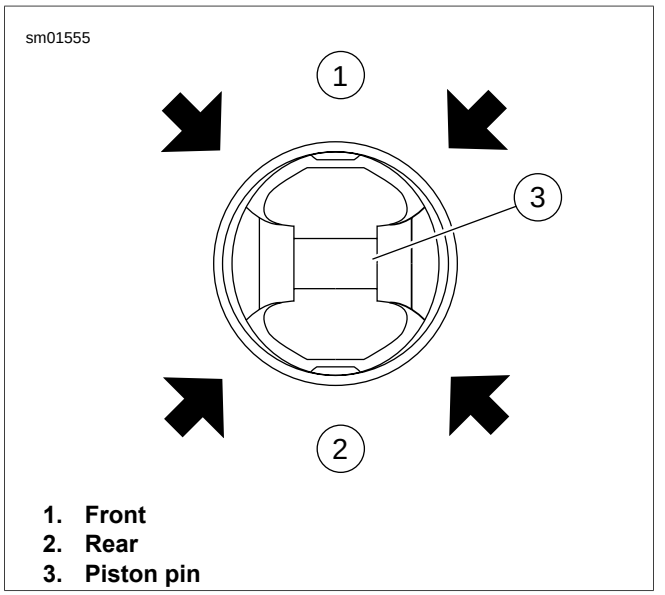
Figure 3-79. Installing Piston Rings

5. See Figure 3-80. 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 3-81. 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 3-80. Position Ring End Gaps at Arrows

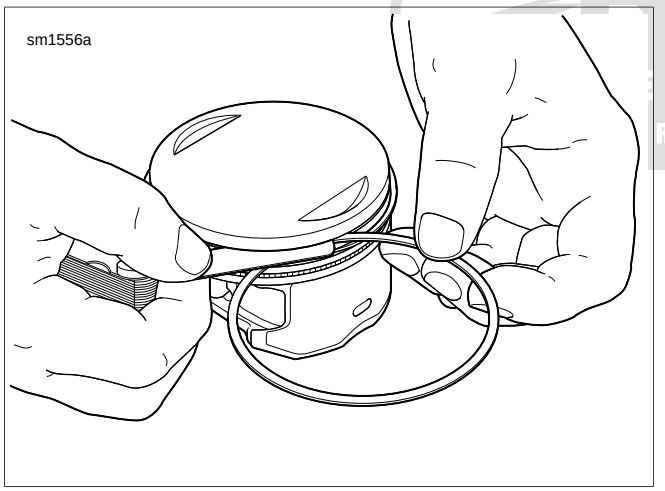


Figure 3-81. Measuring Ring Clearance in Groove

CONNECTING ROD BUSHINGS

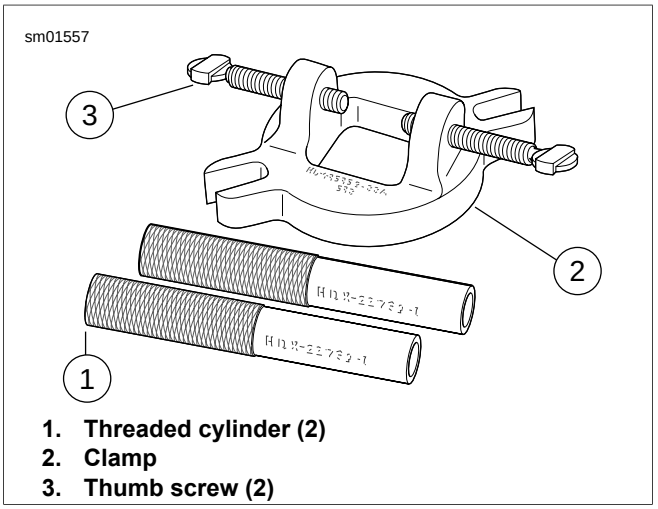
PART NUMBER	TOOL NAME
HD-35102	WRIST PIN BUSHING HONE
HD-39964	REAMER LUBRICANT
HD-94800-26A	CONNECTING ROD BUSHING REAMER
HD-95952-33C	CONNECTING ROD CLAMPING TOOL
HD-95970-32D	CONNECTING ROD BUSHING REMOVER/INSTALLER

Removing Upper Connecting Rod Bushings

NOTES

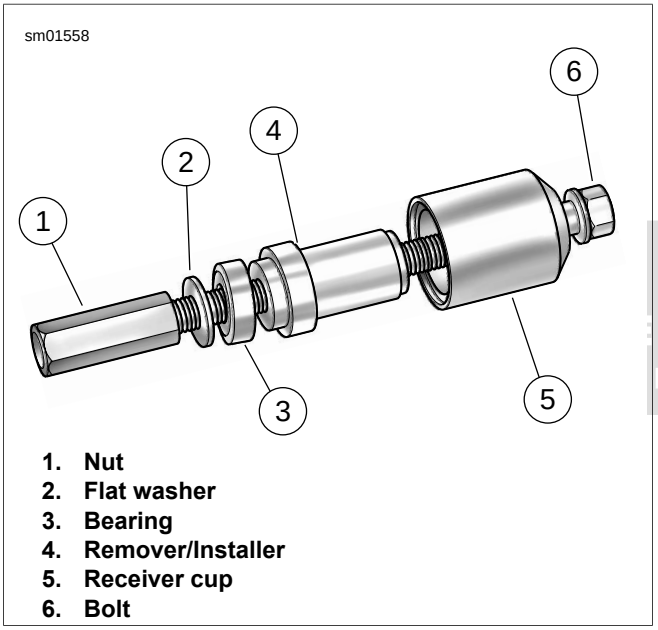
- *Replace the upper connecting rod bushing if the piston pin to rod bushing clearance exceeds 0.002 in (0.051 mm).*
- *Place clean shop towels in and around the crankcase bore. This prevents prevents chips and shavings from falling into the crankcase.*
- *If CONNECTING ROD CLAMPING TOOL (Part No. HD-95952-33C) holes are too small, enlarge the holes in the tool.*

1. See Figure 3-82. 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 3-83. 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 3-82. 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 3-83. Connecting Rod Bushing Remover/Installer (Part No. HD-95970-32D)

4. Remove bushing as follows:
   a. See Figure 3-84. Slide remover side of remover/installer onto bolt. The driver is stamped to verify proper orientation.
   b. See Figure 3-83. 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.

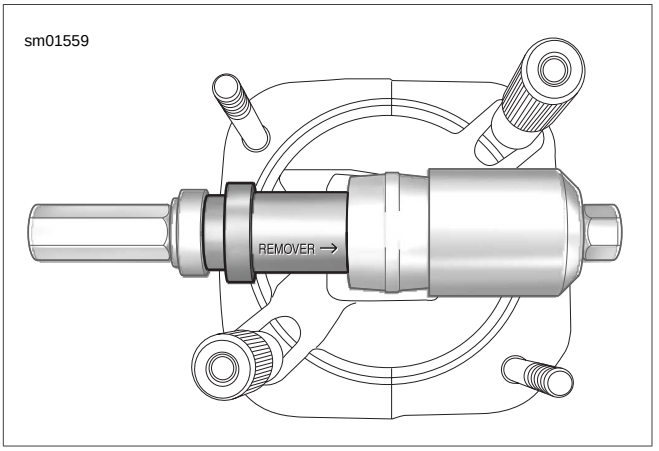


Figure 3-84. Remover Stackup. Use Remover Side Of Remover/Installer

Installing Upper Connecting Rod Bushings

1. See Figure 3-83. 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 3-85. 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 3-86. 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, but exercise caution to avoid scratching or gouging bushing.

NOTE

Leave CONNECTING ROD CLAMPING TOOL installed during bushing reaming procedure which follows.

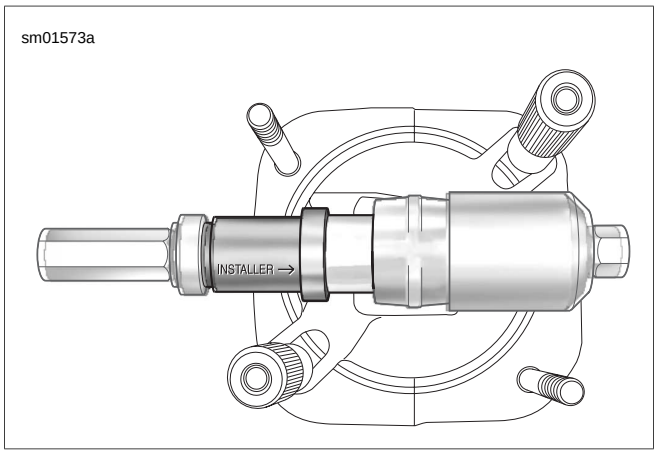
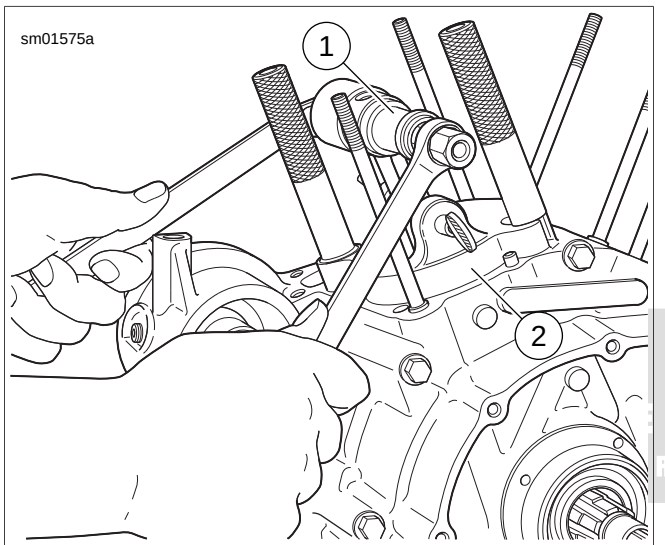


Figure 3-85. Installer Stackup



1. **Piston bushing tool**
2. **Rod clamping fixture**

Figure 3-86. 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. Activating the drill, move the entire length of the finishing stone arrangement forward and backward through the bushing bore for 10 to 12 complete strokes. 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. Flywheel and connecting rod assembly must be replaced. Straightening

connecting rods by bending will damage the bearing on the crank pin and the piston pin bushing.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

TOP END OVERHAUL: ASSEMBLY 3.16

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 3.22 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 3-87. Install XL 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 3-88. 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.

NOTE

*Avoid damage to cylinder and piston. Always use **new** lock ring. Clean lock ring groove and seat lock ring firmly in groove. If it does not, 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.*

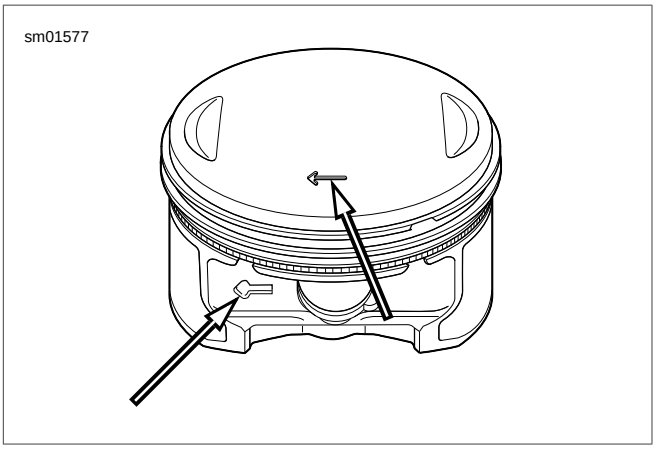


Figure 3-87. Arrows on Piston Must Point Toward Front of Engine

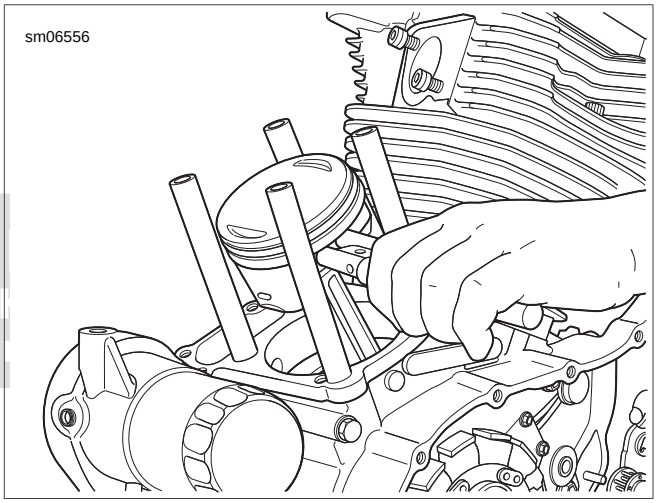
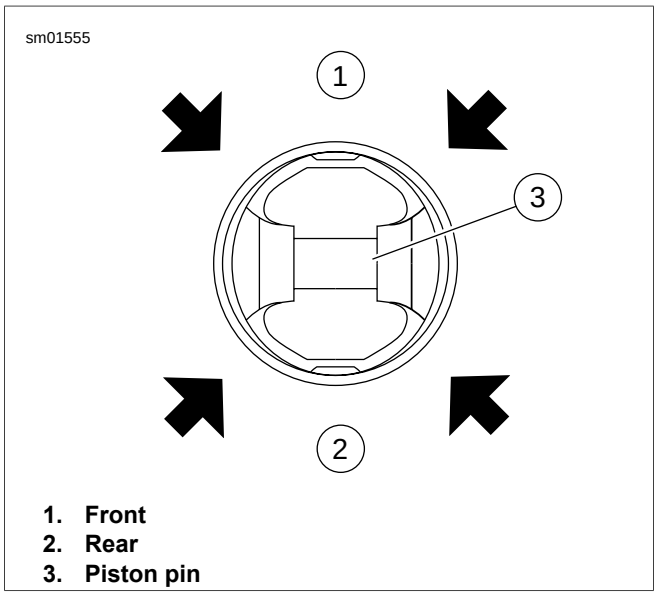


Figure 3-88. Installing Piston Lock Rings

5. See Figure 3-89. 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 3-89. Position Ring End Gaps at Arrows

8. See Figure 3-90. Install PISTON SUPPORT PLATE (Part No. HD-42322) as shown. Rotate crankshaft to rest piston on support plate.
9. See Figure 3-91. 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.

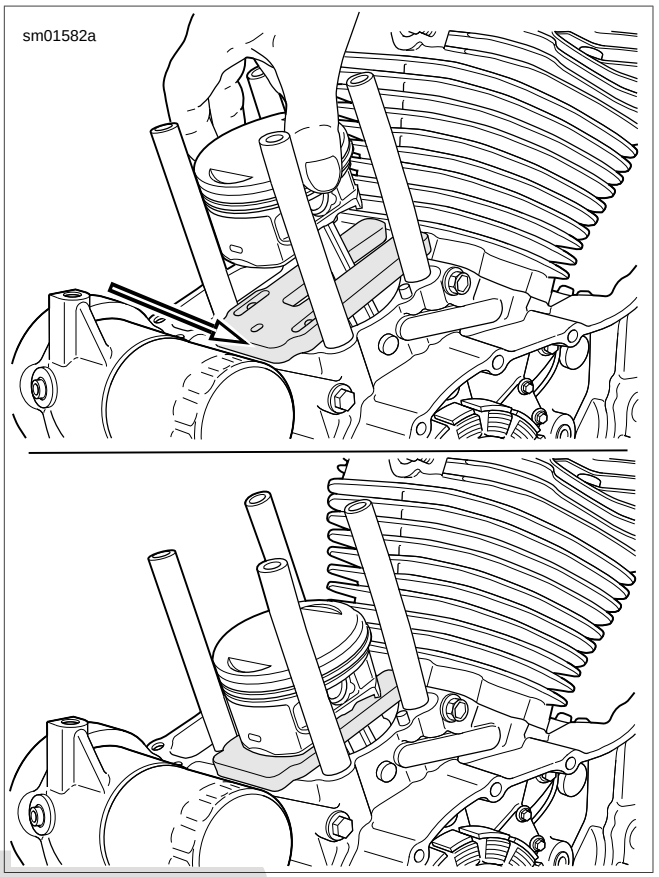


Figure 3-90. Piston Support Plate

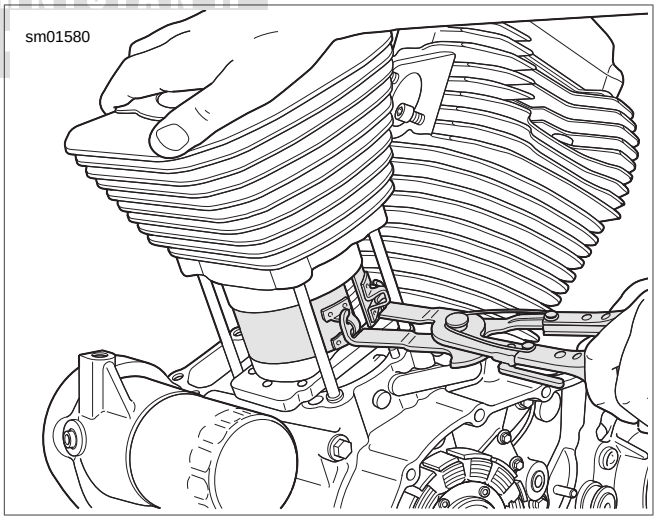


Figure 3-91. Installing Cylinder Over Piston

TAPPET COVERS, PUSHROD COVERS AND PUSHRODS

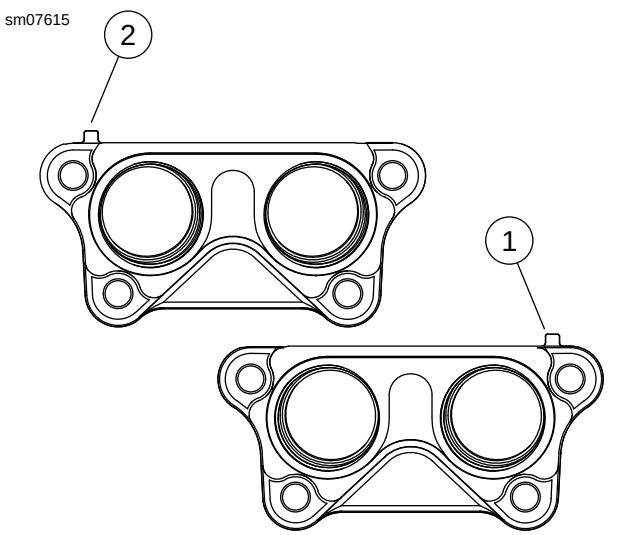
FASTENER	TORQUE VALUE	
Tappet cover fastener	90-120 **in-lbs**	10.2-13.6 Nm

1. See Figure 3-93. If anti-rotation devices (10) and tappets (11) have been removed, install the tappets. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.

2. See Figure 3-92. Orient tabs of the front (1) and rear (2) tappet covers to the front and rear cylinders.
3. See Figure 3-93. Install tappet covers (7) with **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 3-33.
6. Slide intake and exhaust pushrods (4) down inside pushrod covers until they rest on seat at top of tappet (11).

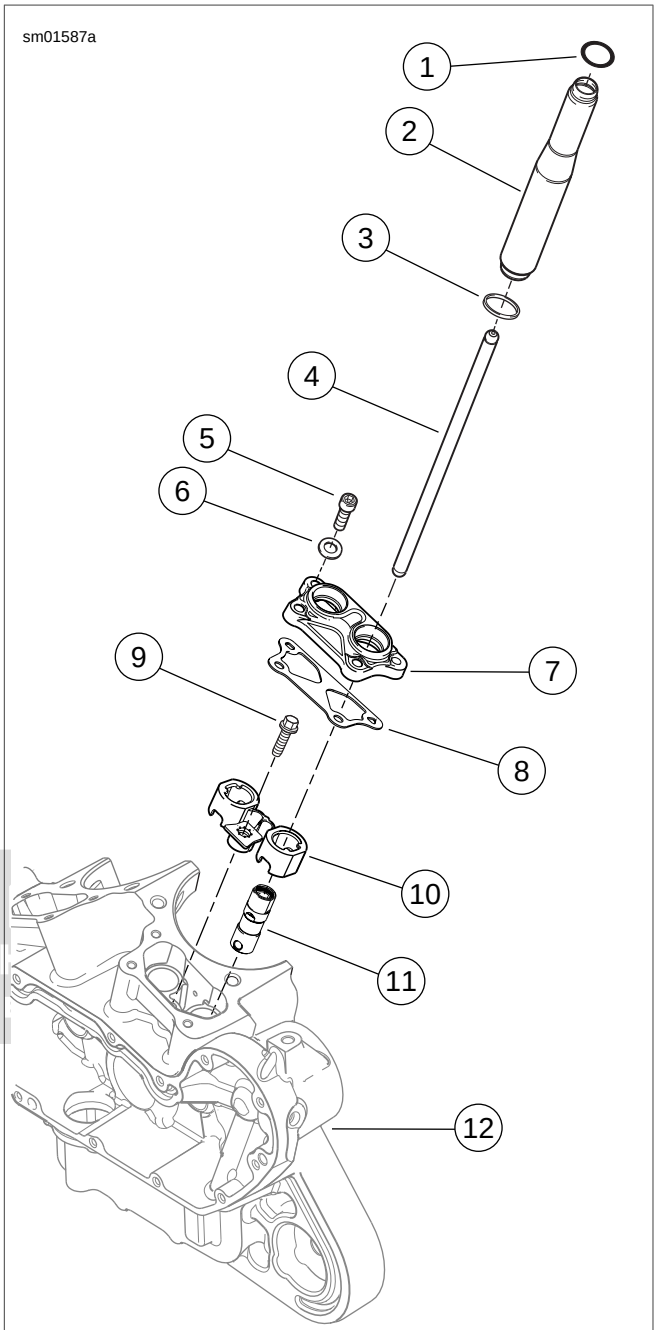
Table 3-33. Pushrod Specifications

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 3-92. 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 3-93. Middle Valve Train Components

CYLINDER HEAD

FASTENER	TORQUE VALUE	
Cylinder headbolts, 1st torque	96-120 **in-lbs**	11-14 Nm
Cylinder headbolts, final torque	13-15 ft-lbs	18-20 Nm
Cylinder headbolts, 1st torque	96-120 **in-lbs**	11-14 Nm
Cylinder headbolts, final torque	13-15 ft-lbs	18-20 Nm

NOTES

- *Install the pushrod covers and lower cover retainers before installing cylinder heads. See 3.16 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 headbolts 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 headbolts from studs. Wipe or blow dry thread surfaces.
4. Thoroughly clean and dry gasket surfaces of cylinder and cylinder head.

NOTE

***XR 1200X:** See Figure 3-94. The cylinder head gasket has metal patches (2) that must be installed against the cylinder head. When installing the gasket on the cylinder, be sure the words "THIS SIDE UP" (1) and the metal patches (2) are visible.*

5. See Figure 3-95. 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

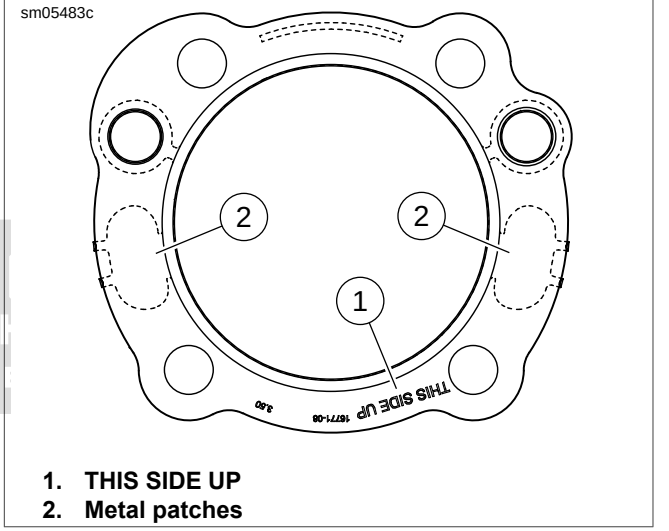
Only oil film must remain on the cylinder head screw surfaces. Too much oil will pool in the head screw sleeve preventing full thread engagement.

7. Lightly coat threads, underside of flange and bottom face of cylinder headbolts in clean Harley-Davidson 20W50 engine oil. Wipe off excess oil.
8. Start cylinder headbolts onto cylinder studs, two short bolts on left side of engine, two long bolts on right. Tighten all bolts only finger-tight at this time.

NOTE

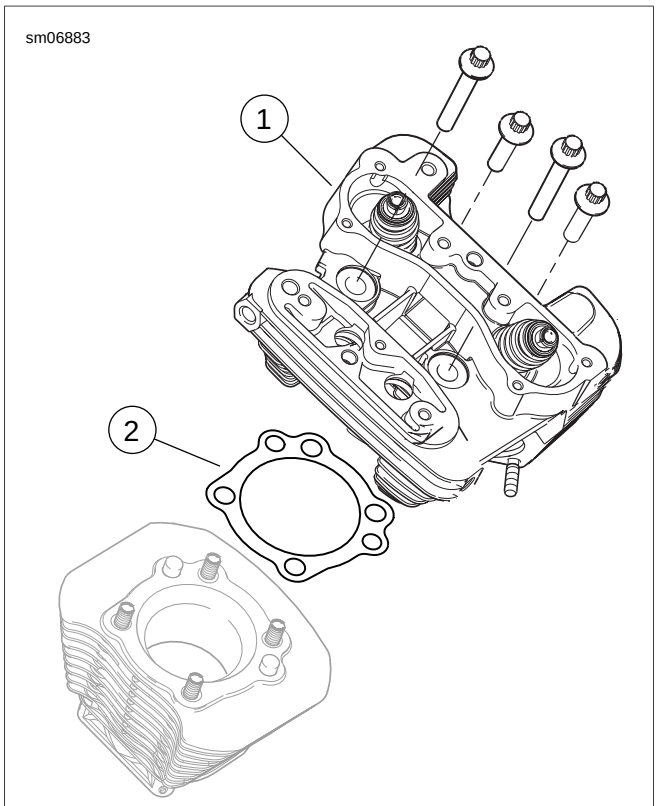
The procedure for tightening the head screws is critical to proper distribution of pressure over gasket area. It prevents gasket leaks, stud failure and head and cylinder distortion.

9. See Figure 3-96 and Figure 3-97. In sequence, tighten headbolts in the following steps:
   a. Tighten each bolt to 96-120 **in-lbs** (11-14 Nm).
   b. Tighten each bolt to 13-15 ft-lbs (18-20 Nm).
   c. **Loosen all bolts.**
10. After headbolts are loosened from initial torque, tighten bolts in three stages. Tighten in sequence:
    a. Tighten each bolt to 96-120 **in-lbs** (11-14 Nm).
    b. Tighten each bolt to 13-15 ft-lbs (18-20 Nm).
    c. See Figure 3-98. Mark cylinder head and headbolt shoulder with a line (1).
    d. Tighten each bolt an additional 85-95 degrees (2).
11. **XR 1200X:** Install Precision Cooling oil lines. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines.



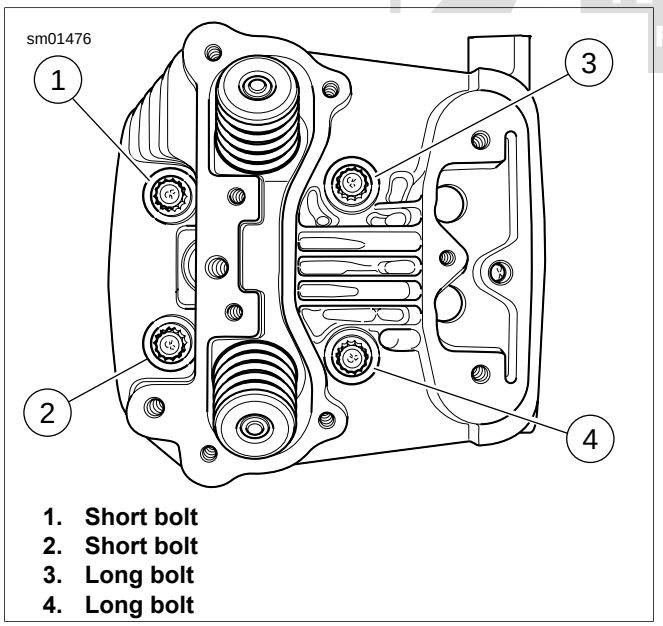
1. **THIS SIDE UP**
2. **Metal patches**

Figure 3-94. Cylinder Head Gasket: XR 1200X



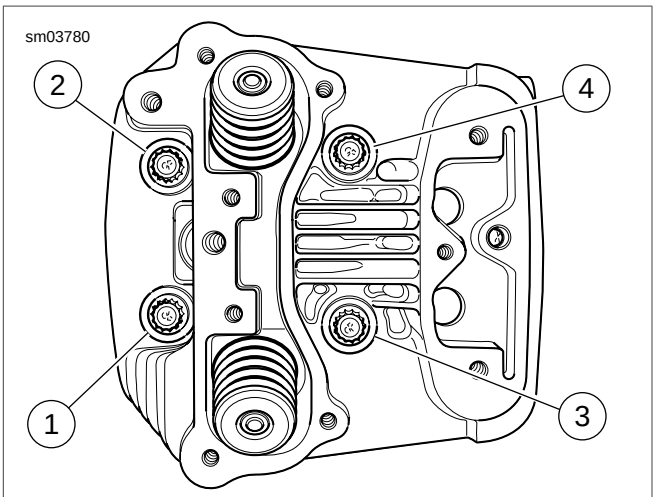
1. Cylinder head
2. Gasket

Figure 3-95. Cylinder Head Installation



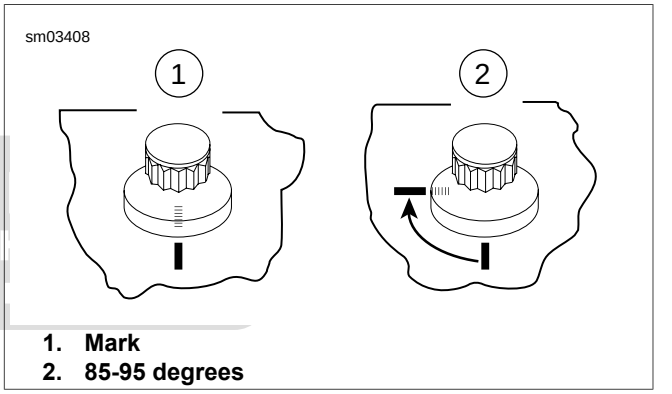
1. Short bolt
2. Short bolt
3. Long bolt
4. Long bolt

Figure 3-96. Front Cylinder Headbolt Torque Sequence



1. Short bolt
2. Short bolt
3. Long bolt
4. Long bolt

Figure 3-97. Rear Cylinder Headbolt Torque Sequence



1. Mark
2. 85-95 degrees

Figure 3-98. Tighten Headbolts

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: XL Models	35-55 **in-lbs**	4.0-6.2 Nm
Rocker cover, outer, screw	120-168 **in-lbs**	13.5-19.0 Nm

Inner Cover

1. For each cylinder, rotate crankshaft so that the lifters are on the base circle of the cams.
2. Install **new** gasket (1) with FRONT HEAD facing up on the front head and REAR HEAD facing up on the rear head.
   a. **XL Models:** See Figure 3-101.
   b. **XR 1200X:** See Figure 3-102.
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 and finger tighten all fasteners (3, 5, 4) one turn at a time.
5. See Figure 3-99. Tighten the fasteners in sequence:
   a. Tighten the four large bolts (1, 2, 3, 4) and then 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 screws (9, 10) to 135-155 **in-lbs** (15.3-17.5 Nm).

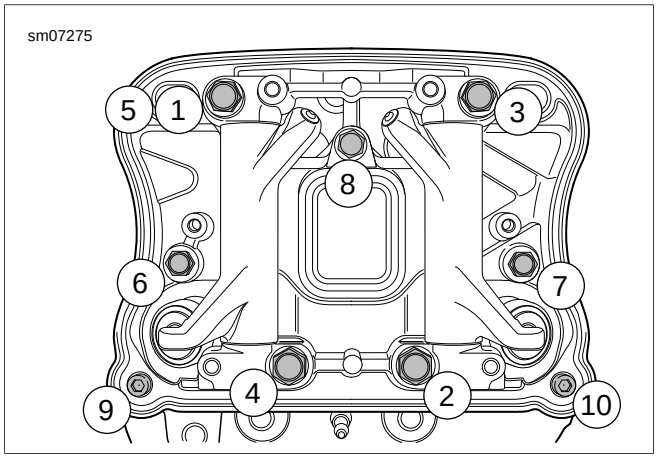


Figure 3-99. Inner Rocker Cover Torque Sequence

Breather: XL Models

1. Identify breather location for front and rear cylinders.
2. See Figure 3-101. Install breather (7) with **new** breather seal (6).
3. Install screw (8). Tighten to 35-55 **in-lbs** (4.0-6.2 Nm).

Breather: XR 1200X

1. See Figure 3-102. Inspect and replace the umbrella check valve (8) if necessary.
2. Install a **new** O-ring (6) on the breather assembly (7).
3. Install breather in cavity.

Outer Cover

NOTES

- ***XL Models:*** *See Figure 3-101.*
- ***XR 1200X:*** *See Figure 3-102.*

1. 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 3-100. Tighten fasteners (1, 2, 3, 4) in sequence and then re-tighten the first fastener (5) to 120-168 **in-lbs** (13.5-19.0 Nm).

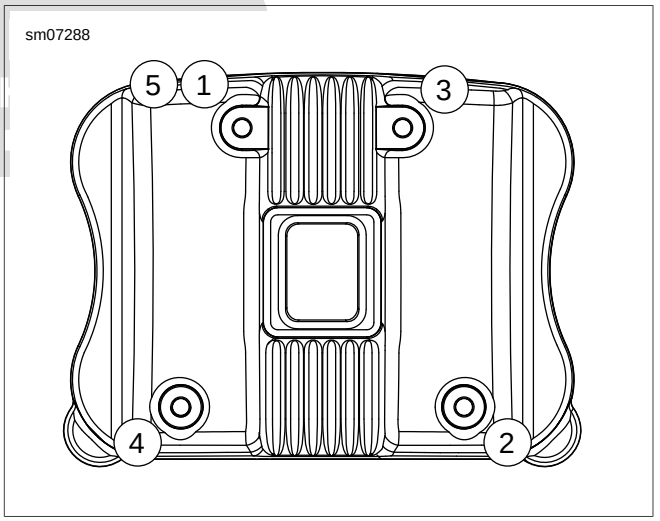
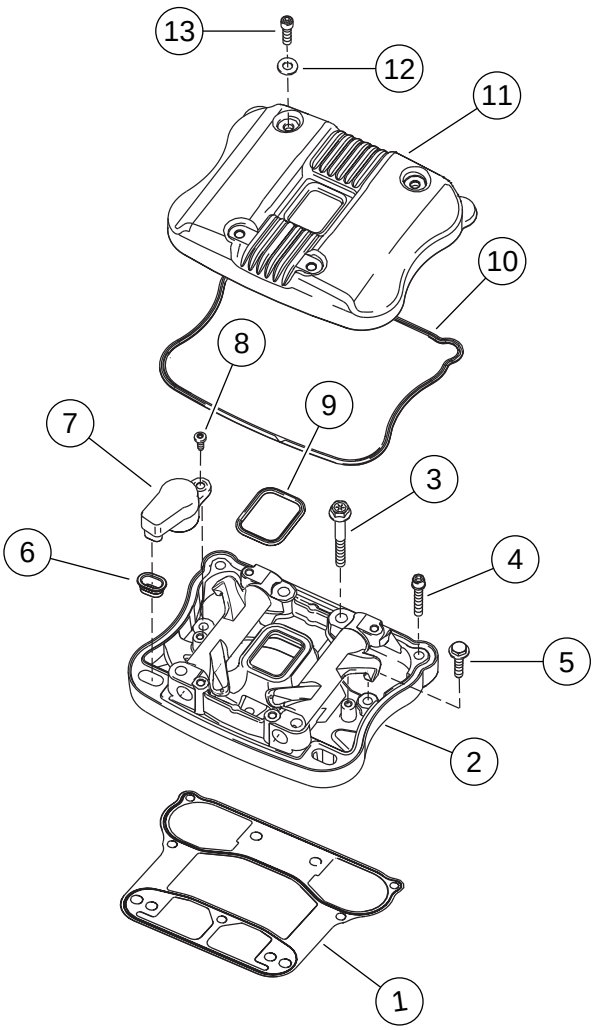
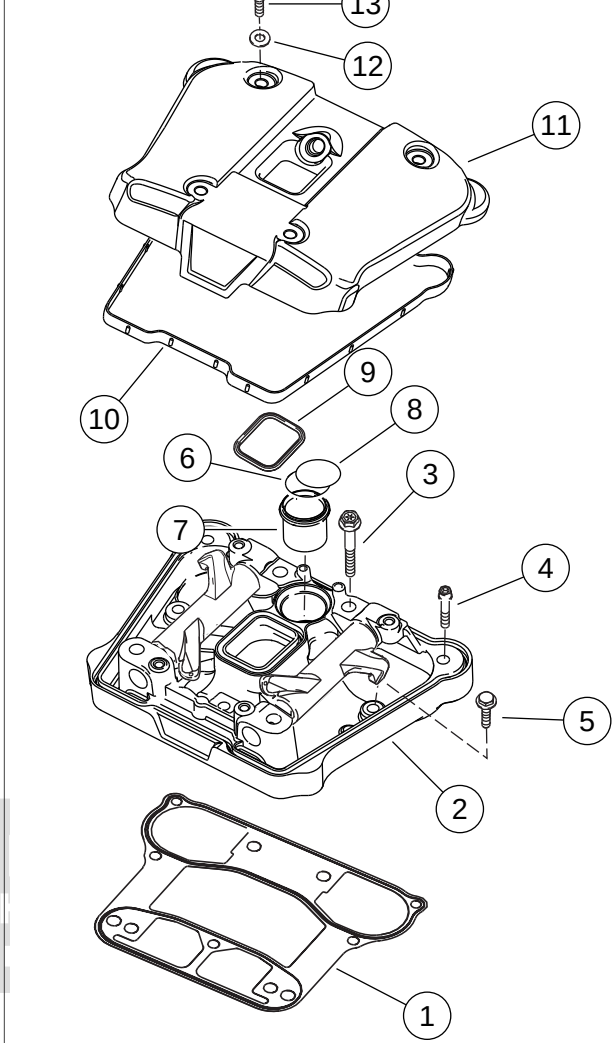


Figure 3-100. Outer Cover Torque Sequence



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 3-101. Rocker Cover: XL Models



1. Gasket
2. Inner rocker cover
3. Large bolts (4)
4. Screws (2)
5. Small bolts (3)
6. O-ring
7. Breather
8. Umbrella valve
9. Gasket
10. Gasket
11. Outer rocker cover
12. Sealing washer (4)
13. Fastener (4)

Figure 3-102. Rocker Cover: XR 1200X

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 mounting screw	15-20 ft-lbs	20.4-27.1 Nm

1. See Figure 3-103. 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 assembly. See 4.8 INDUCTION MODULE: XL MODELS or 4.9 INDUCTION MODULE: XR 1200X.
3. Install the following connectors into the induction module:
   a. TPS [88].
   b. IAC [87].
   c. TMAP sensor [80].
   d. Fuel injector connectors [84], [85].
4. Install air cleaner assembly:
   a. **XL Models except XL 1200V:** Install backplate, air filter and air cleaner cover. See 4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V.
   b. **XL 1200V:** Install backplate, air filter and air cleaner cover. See 4.3 AIR CLEANER ASSEMBLY, XL 1200V.
   c. **XR 1200X:** Install air box assembly and connect crankcase vent hoses. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
   d. **EVAP Controlled Models:** Install EVAP purge hose on induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
5. Install horn.
   a. **Front Mount:** See 6.32 HORN, Replacement: Front Mount.
   b. **Side Mount:** See 6.32 HORN, Replacement: Side Mount.

⚠WARNING

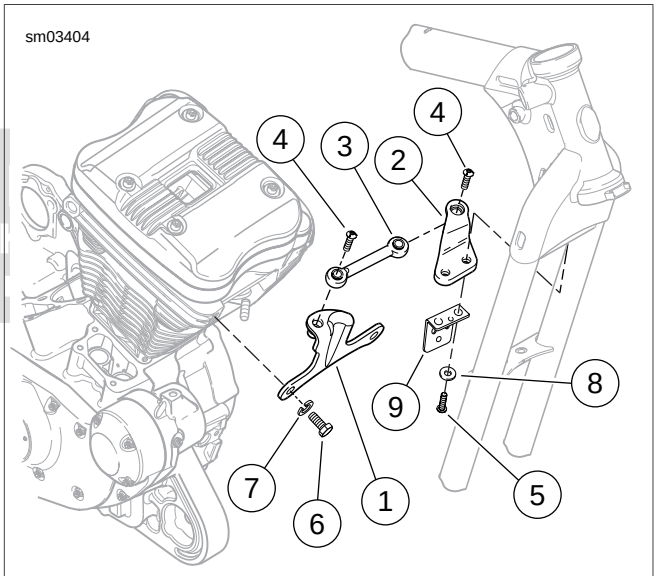
When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

6. Install fuel tank.
   a. Tighten to 15-20 ft-lbs (20.4-27.1 Nm).
   b. Attach quick-connect fitting on fuel line to fuel tank fitting.
   c. Gently tug on quick-connect fitting to verify that it is securely locked in place. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
7. Install exhaust pipes and mufflers. Plug in O2 sensor connectors [137], [138]. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
8. Connect spark plug cables to spark plugs.
9. 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)

10. 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 3-103. Upper Front Stabilizer Link Assembly (typical)

BOTTOM END OVERHAUL: DISASSEMBLY 3.17

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.

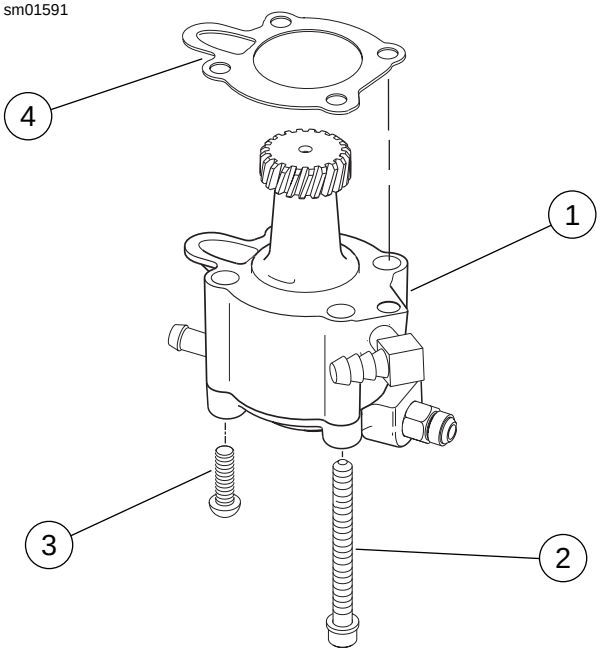
Then disassemble top end of engine. See 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads and 3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.

Thoroughly clean area around gearcase cover and tappets. Blow loose dirt from crankcase with low pressure compressed air.

The oil pump design and function differs between XL models and the XR 1200X. See 3.6 ENGINE LUBRICATION SYSTEM.

OIL PUMP: XL MODELS

1. Remove oil pump feed and return hoses. Mark hoses for later installation. Discard hose clamps.
2. See Figure 3-104. 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 3.20 OIL PUMP: XL MODELS.

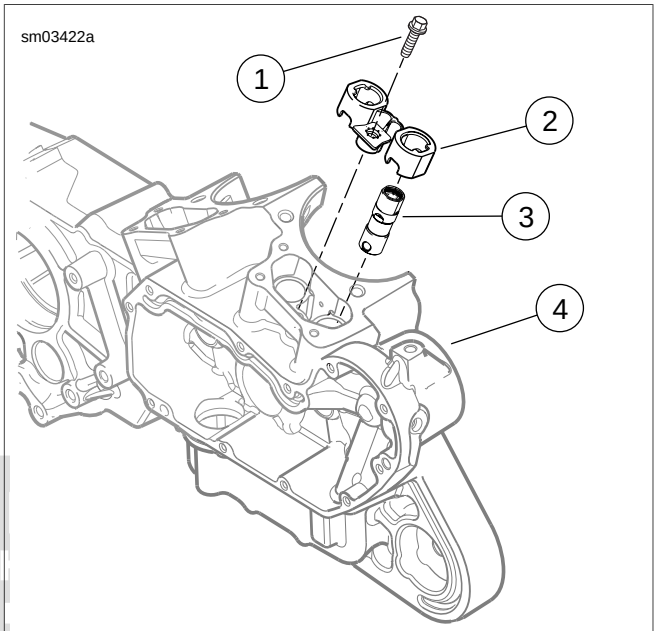


1. **Oil pump**
2. **Screw w/ washer (2)**
3. **Screw, Torx (2)**
4. **Gasket**

Figure 3-104. Oil Pump: XL Models

TAPPETS

1. See Figure 3-105. Remove screw (1).
2. Remove anti-rotation device (2). Tag anti-rotation device for location (front/rear cylinder) as it is removed.
3. Remove tappet (3). Tag 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 3-105. 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: XL MODELS

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. Remove any parts that will interfere with gearcase disassembly.
2. Remove inner rocker cover to remove valve spring pressure from the camshafts. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models.
3. Measure cam gear end play and record measurements. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Cam Gear End Play.
4. Place a pan under gearcase to collect oil.

NOTE

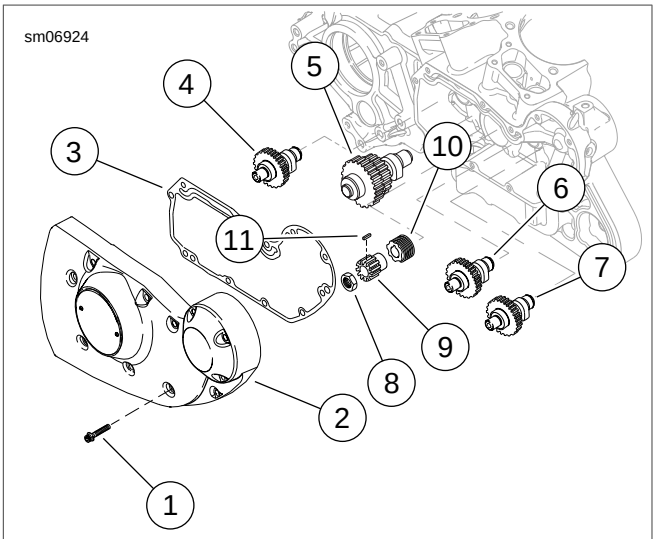
Never pry cover off. Tap lightly with a rawhide hammer.

5. See Figure 3-106. Remove cover screws (1) and cover (2). Discard old 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 3-106. Gearcase Cover and Cam Gears

OIL PUMP HOUSING/GEARCASE COVER AND CAM GEARS: XR 1200X

The oil pump is integrated into the gearcase cover. Oil pump rotors can be removed with gearcase cover in place. It is not necessary to remove the oil pump rotors to remove the gearcase cover.

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. Remove any parts that will interfere with gearcase disassembly.
2. Remove inner rocker cover to remove valve spring pressure from the camshafts. See 3.13 TOP END OVERHAUL: DISASSEMBLY, General.
3. Measure cam gear end play and record measurements. See 3.17 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 3-107. Remove cover screws (1) and remove cover (2). Discard old gasket.

6. See Figure 3-108. Remove rigid lines (1) and vent hose (2) from gearcase cover. Mark lines and hoses for later installation. Discard hose clamps. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines.
7. Remove two check valve housing screws (3).
8. Remove six screws (4) and remove oil pump cover (5). Discard O-rings.
9. Remove three fasteners (6). Loosely install oil pump cover to prevent the gerotors from falling out unexpectedly.

NOTE

Never pry gearcase cover off. Tap lightly with a rawhide hammer.

10. Carefully remove gearcase cover. Discard old gasket.

NOTE

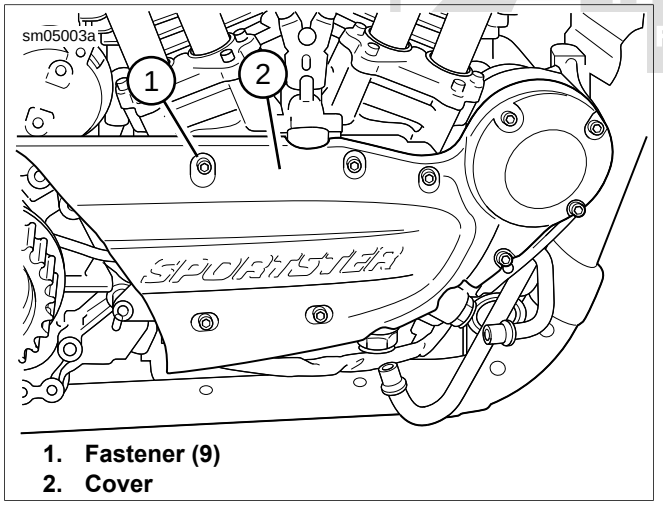
Repair the oil pump if required. See 3.21 OIL PUMP: XR 1200X.

11. See Figure 3-109. Remove cam gears (1, 2, 3, and 4). Carefully mark each component to verify correct installation.

NOTE

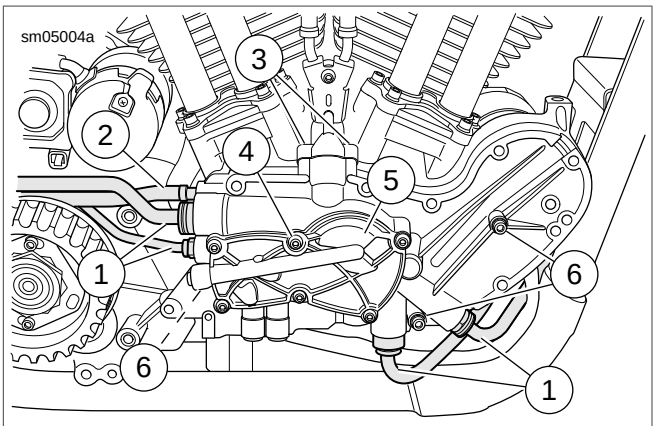
Nut (5) is secured by LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red).

12. Remove nut (5). Slide pinion gear (6) and spacer (7) off pinion shaft.
13. Remove oil pump cover. Mark rotors with a permanent marker to identify outer surfaces. Remove rotors from housing.



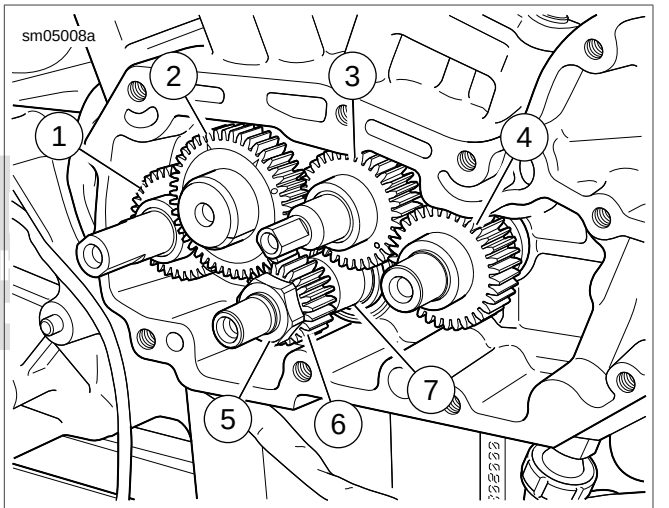
1. **Fastener (9)**
2. **Cover**

Figure 3-107. Oil Pump Cover: XR 1200X



1. **Rigid lines**
2. **Vent hose**
3. **Check valve screws (2)**
4. **Oil pump cover screw (6)**
5. **Oil pump cover**
6. **Gearcase cover fastener (3)**

Figure 3-108. Gearcase Cover and Oil Pump: XR 1200X



1. **Rear exhaust cam gear**
2. **Rear intake cam gear**
3. **Front intake cam gear**
4. **Front exhaust cam gear**
5. **Nut**
6. **Pinion gear**
7. **Spacer**

Figure 3-109. Cam Gears: XR 1200X

CRANKCASE

Split Crankcase

1. Remove clutch and primary drive components. See 5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS.
2. Remove starter motor. See 6.10 STARTER.
3. Mount crankcase assembly in engine stand. Position crankcase so that it is tilted at a 45 degree angle, right side down.

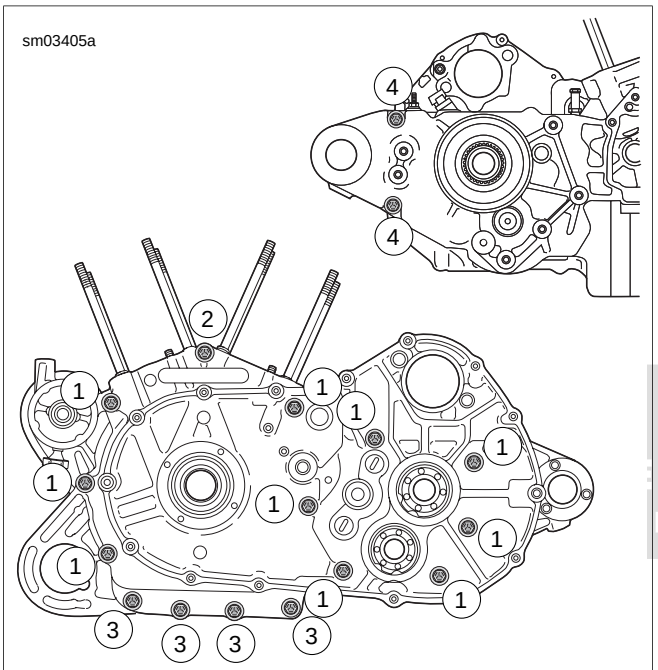
⚠CAUTION

Do not rotate right crankcase half in engine stand such that flywheel sprocket shaft is facing down. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00553b)

NOTE

XR 1200X: *See Figure 3-110. The fastener between the cylinders is a double headed bolt (2).*

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. **XR 1200X: double-headed long fastener**
3. **Short fastener: left side**
4. **Long fastener: right side**

Figure 3-110. Crankcase Fasteners

6. See Figure 3-111. 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 3-112. Remove the flywheel assembly from right crankcase.
8. Remove transmission assembly from left crankcase. See 5.9 TRANSMISSION REMOVAL AND DISASSEMBLY.

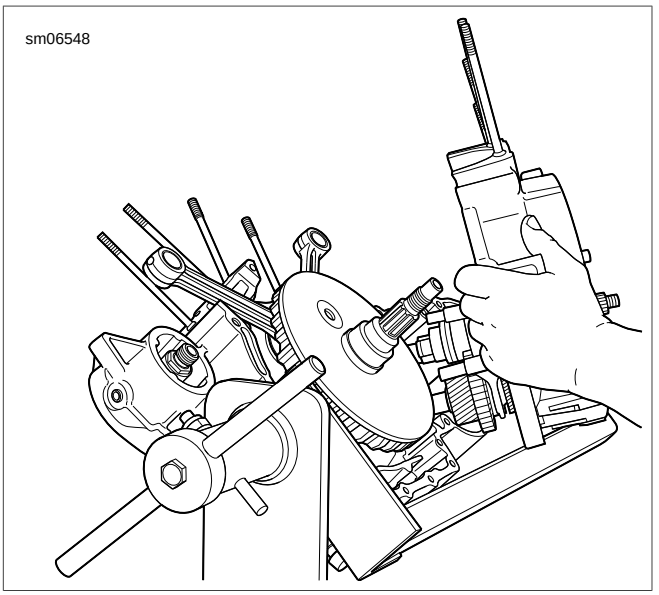


Figure 3-111. Separating Crankcase Halves

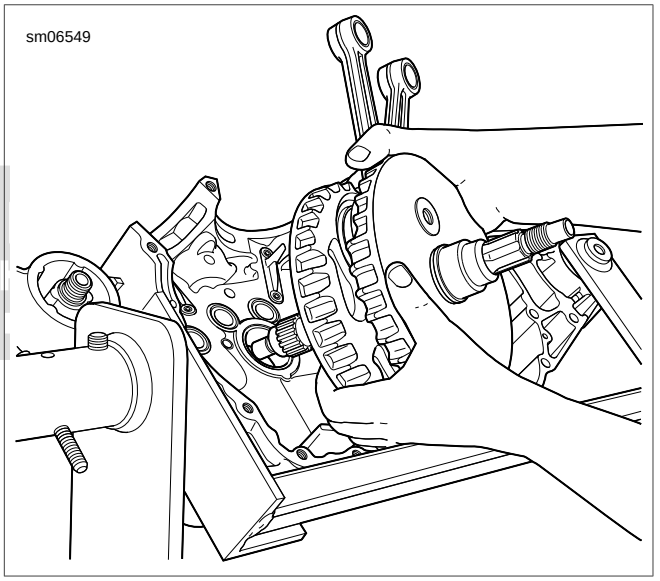
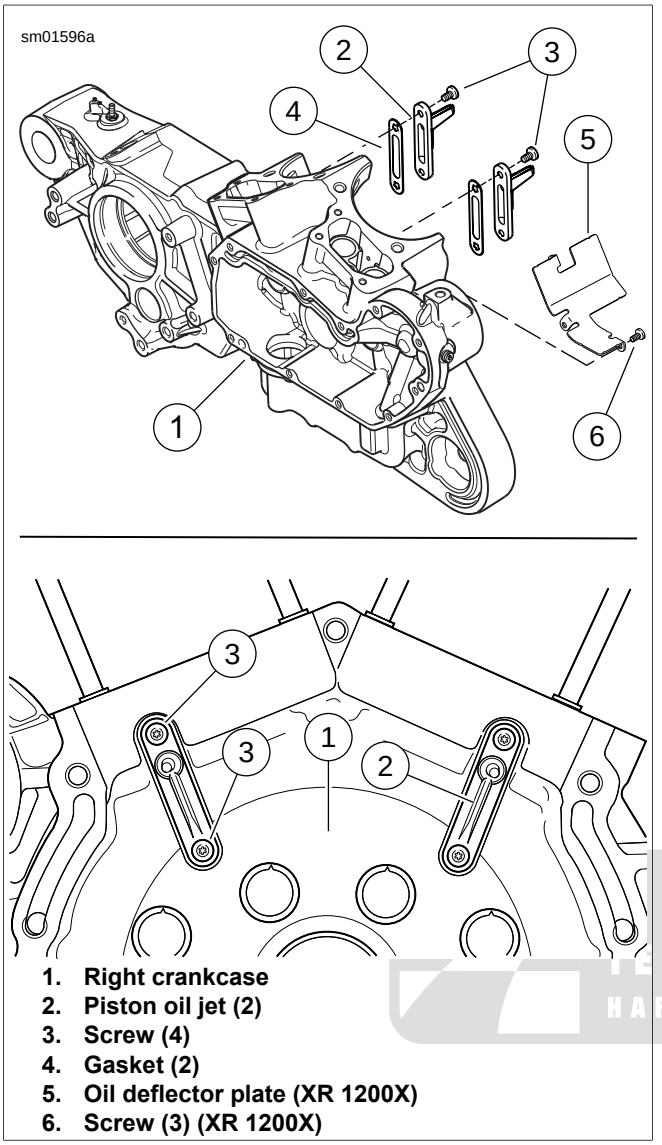


Figure 3-112. Removing Flywheels from Right Crankcase

Piston Oil Jets

1. See Figure 3-113. Remove two TORX 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.
3. **XR 1200X:** Remove three screws (6) and oil deflector plate (5).



1. **Right crankcase**
2. **Piston oil jet (2)**
3. **Screw (4)**
4. **Gasket (2)**
5. **Oil deflector plate (XR 1200X)**
6. **Screw (3) (XR 1200X)**

Figure 3-113. Piston Oil Jet Assemblies

Removing Cylinder Base Studs

If cylinder base studs require replacement, proceed as follows.

1. Thread a 3/8-16 nut onto cylinder base stud.
2. Thread 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. Loosen nuts and remove from cylinder base stud.

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GEARCASE: XL MODELS 3.18

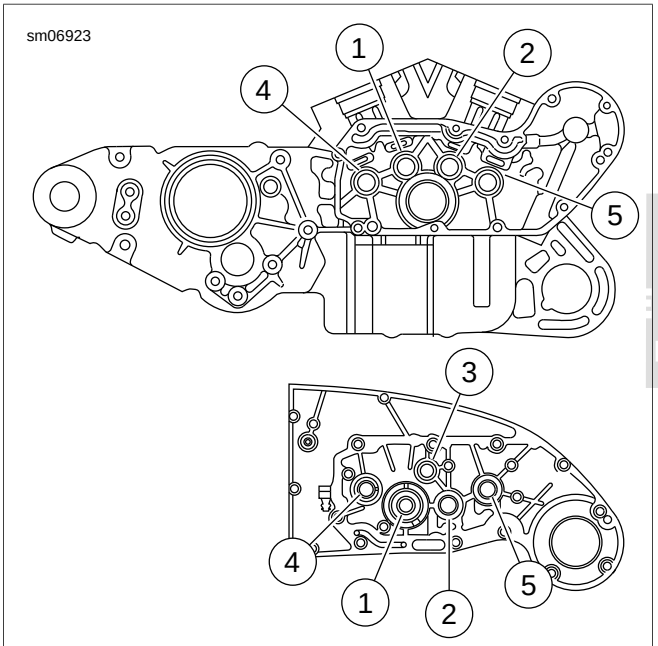
BUSHING INSPECTION AND REMOVAL: XL ONLY

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 3-114. Measure each bushing and its corresponding cam gear shaft or pinion gear shaft. Replace bushings that exceed service wear limits. Refer to Table 3-34.
2. See Figure 3-115. 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 3-114. Cam and Pinion Bushings

Table 3-34. 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

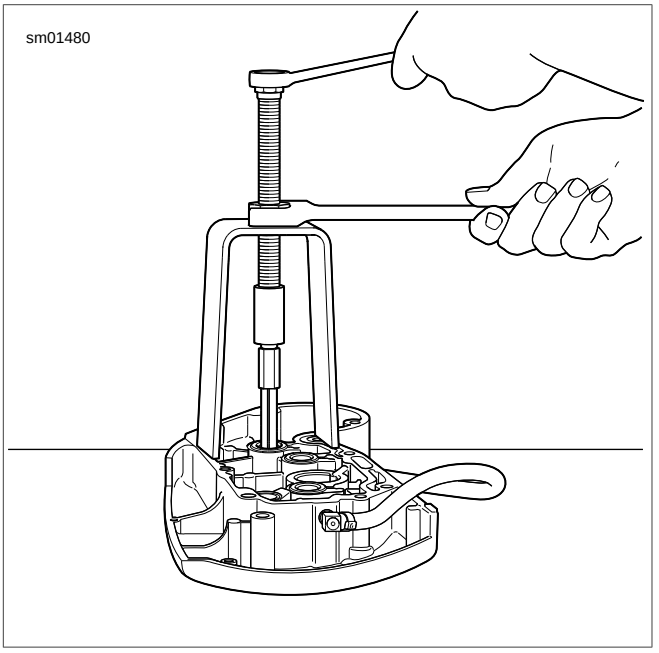


Figure 3-115. Removing Cam Bushing from Gearcase Cover

BUSHING INSTALLATION: XL ONLY

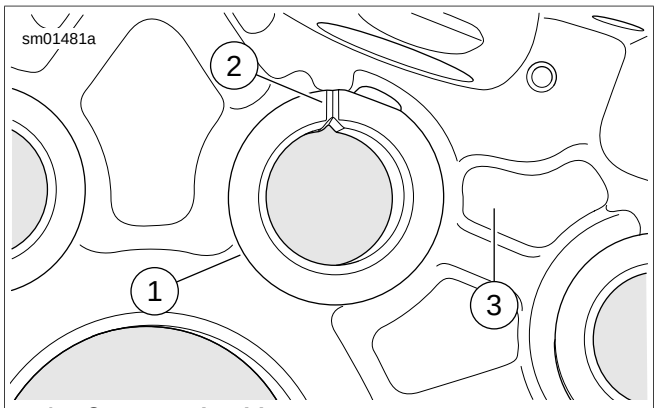
NOTE

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

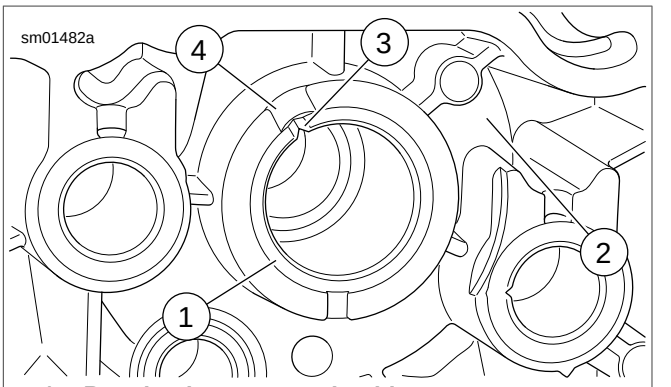
See Figure 3-116. Each cam gear bushing installed in right crankcase must be positioned with its oiling slot at exact top of bore (12 o'clock position).

1. Using an arbor press, install each bushing in crankcase bore until bushing shoulder contacts crankcase boss.
2. Ream the **new** bushing to size after installation. See 3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only.



1. Cam gear bushing
2. Slot at top
3. Right crankcase

Figure 3-116. Cam Gear Bushing Installed in Crankcase



1. Rear intake cam gear bushing
2. Gearcase cover
3. Cam bushing slot
4. Gearcase cover slot

Figure 3-117. Rear Intake Cam Gear Bushing Installed in Gearcase Cover

Cam Gear Bushings (Except Rear Intake Bushing) in Gearcase Cover

1. Using an arbor press, install each bushing in its gearcase cover bore so that bushing shoulder contacts cover boss. There is no need to orient these particular bushings in any specific position of rotation within gearcase cover bores.
2. Line-ream the **new** bushing to correct size after installation. See 3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only.

Rear Intake Cam Gear Bushing in Gearcase Cover

Rear intake cam gear bushing must be installed in its gearcase cover bore using an arbor press. The bushing must be oriented in a specific position of rotation within the cover bore.

1. See Figure 3-117. 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 3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only.

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 3-118. 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 3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only.

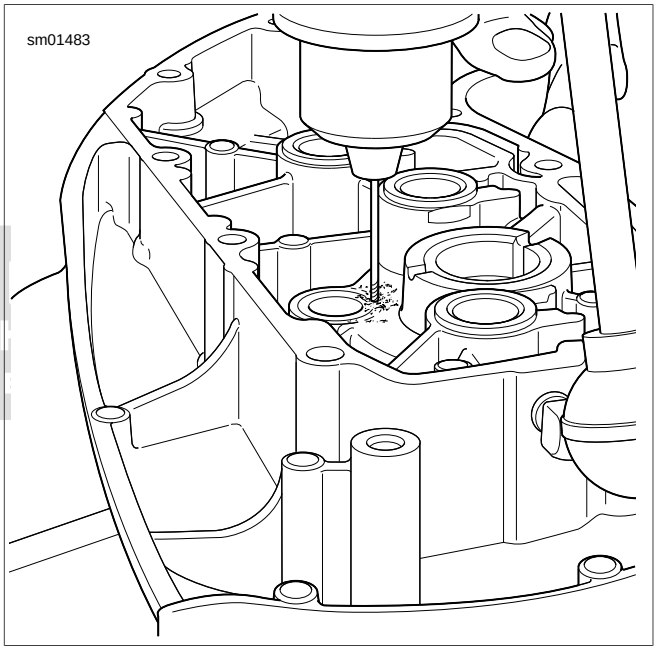


Figure 3-118. Drilling Pinion Bushing Dowel Pin Hole in Gearcase Cover

BUSHING REAMING: XL ONLY

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.*

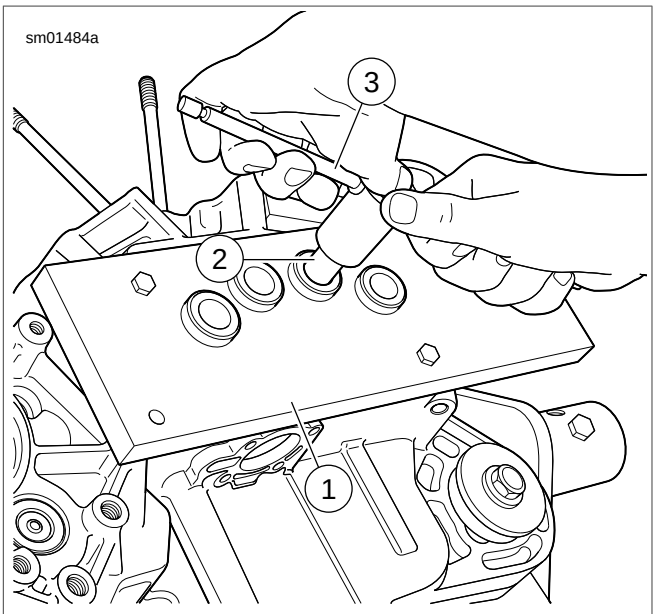
Cam Gear Bushings in Right Crankcase

1. Separate two halves of crankcase, if not already done. Place right crankcase on flat surface with gearcase side up.
2. See Figure 3-119. 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. Insert two bolts (supplied with pilot) through two remaining holes in pilot, and into threaded holes of crankcase. Tighten bolts securely.
3. 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.
4. 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)

5. 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 3-119. Reaming Cam Gear Bushing in Right Crankcase

Cam Gear Bushings (Except Rear Intake Bushing) in Gearcase Cover

NOTE

Newly installed cam gear bushings must be line-reamed 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 3.18 GEARCASE: XL MODELS, Bushing Installation: XL Only. Attach gearcase cover to right crankcase, which has been disassembled from left crankcase, securing with a minimum of three mounting screws.
2. Insert a standard 11/16 reamer through the previously reamed cam gear bushing in right crankcase, which is 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

Newly installed cam gear bushings must be line-reamed 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. Rear intake cam gear bushing must be installed in gearcase cover as described in 3.18 GEARCASE: XL MODELS, Bushing Installation: XL Only.
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 a minimum of 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. Pinion shaft bushing must be installed in gearcase cover as described in 3.18 GEARCASE: XL MODELS, Bushing Installation: XL Only. Attach gearcase cover to right crankcase, which has been disassembled from left crankcase, securing with a minimum of three mounting screws.
2. See Figure 3-120. Install a PILOT (Part No. HD-94812-87) into right crankcase roller race. Insert REAMER (Part No. HD-94812-1) through the pilot.
3. 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.
4. 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)

5. 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.

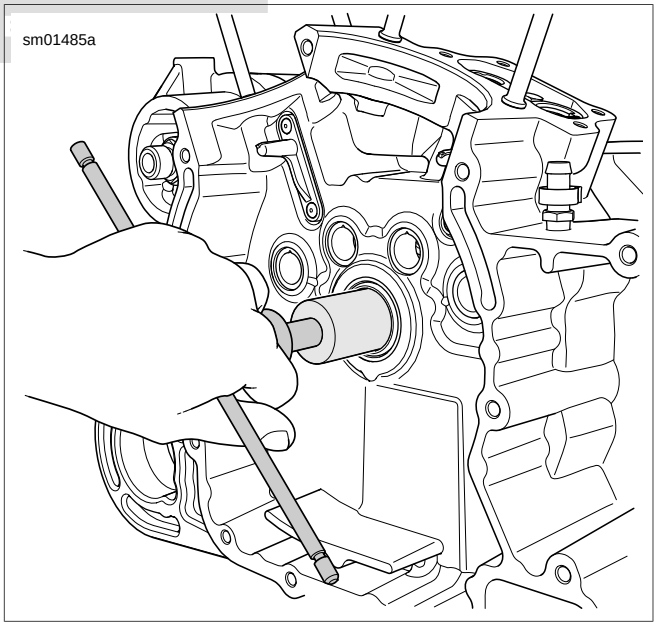


Figure 3-120. Line Reaming Pinion Shaft Bushing

CRANKCASE 3.19

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

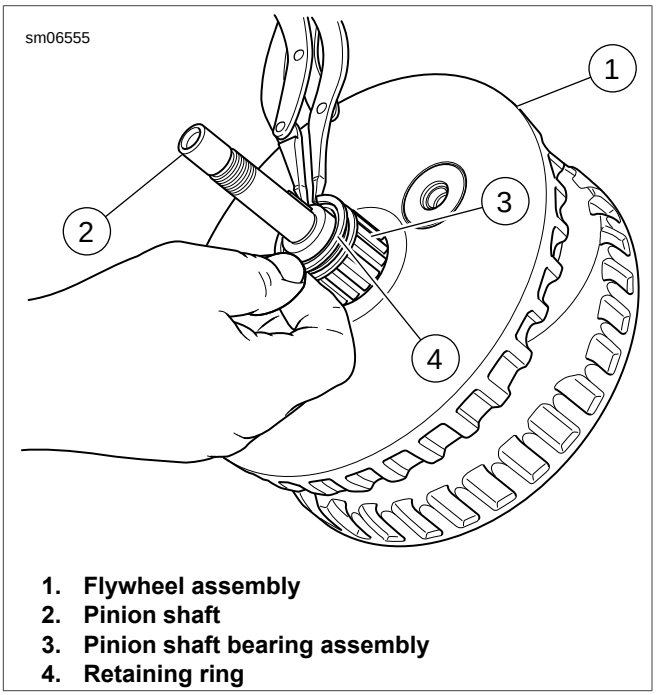
PART NUMBER	TOOL NAME
B-45655, HD-42720-2, HD-46663	CRANKCASE BEARING REMOVER/INSTALLER WITH ADAPTER
CJ 114	SNAP-ON BODY DENT PULLER
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS

1. Disassemble crankcase, see 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Crankcase.

NOTE

Remove either the pinion shaft bearing or the left main bearing with this procedure.

2. See Figure 3-121. Pinion shaft bearing assembly (3) will remain 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 3-121. 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 3-122. Remove outer left main bearing retaining ring.
4. Remove left main oil seal from left crankcase using SNAP-ON BODY DENT PULLER (Part No. CJ 114).
5. Remove thrust washer next to left main bearing.

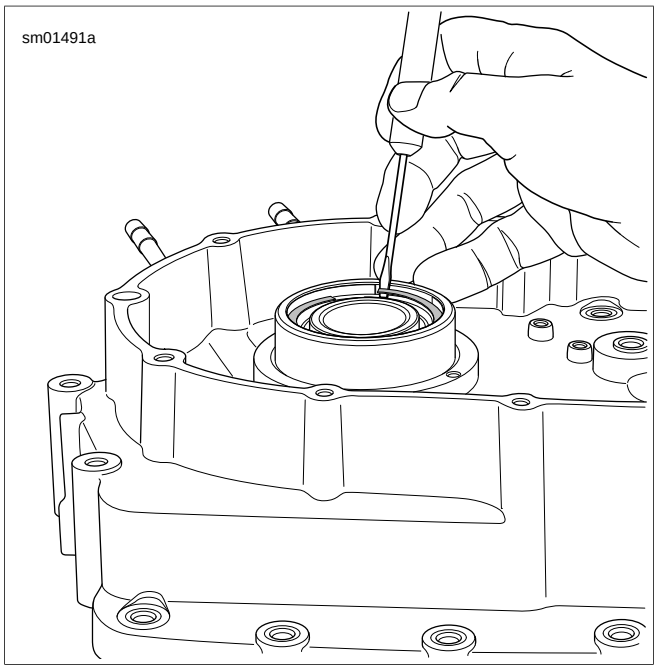


Figure 3-122. Removing Left Main Oil Seal Retaining Ring

6. See Figure 3-123. 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 3-124. Using CRANKCASE BEARING REMOVER/INSTALLER WITH ADAPTER (Part No. B-45655, HD-42720-2, 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.

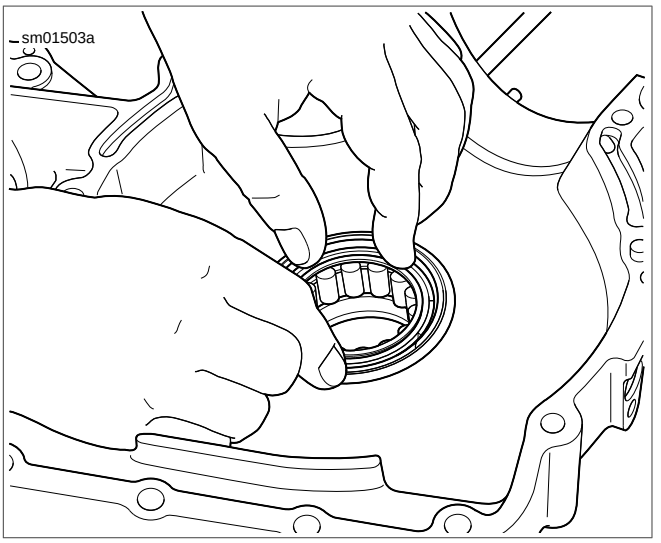
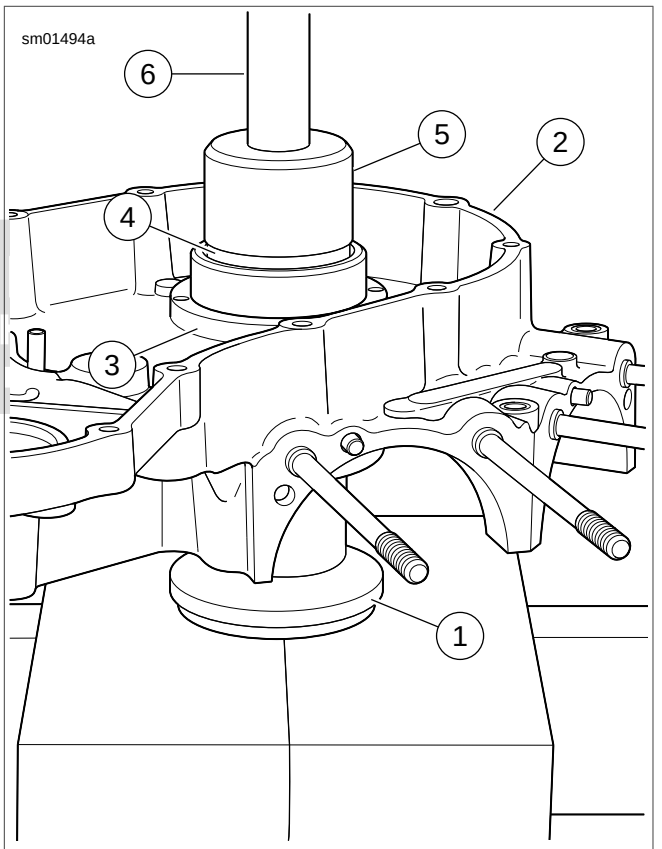


Figure 3-123. Removing Left Main Bearing Retaining Ring



1. **Support tube**
2. **Left crankcase**
3. **Crankshaft bearing bore**
4. **Adapter**
5. **Pilot/driver**
6. **Press ram**

Figure 3-124. Removing Left Main Bearing from Crankcase

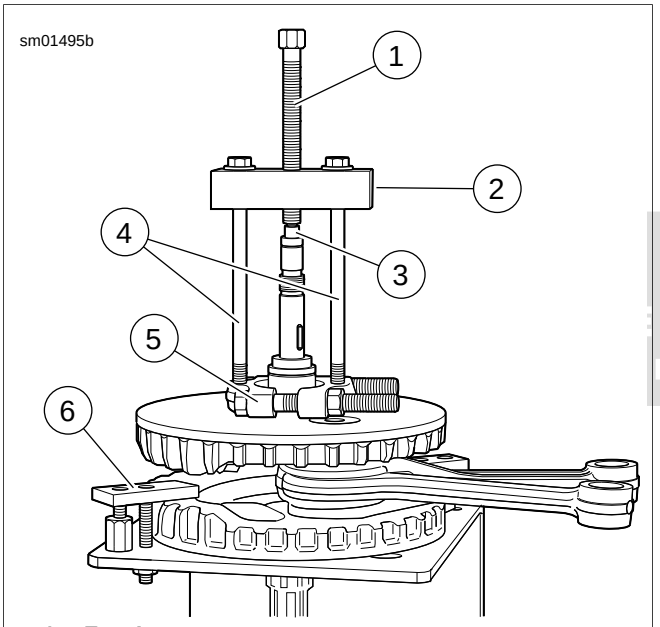
FITTING PINION BEARINGS

PART NUMBER	TOOL NAME
HD-34902-7	END CAP
J-21686-12	FORCING SCREW
J-7830-5	BRIDGE
SNAP-ON TOOLS STOCK NO. CJ950	BEARING SEPARATOR

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 3-125. To remove pinion shaft inner race, use BEARING SEPARATOR (Part No. Snap-on Tools Stock 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 3-125. 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).

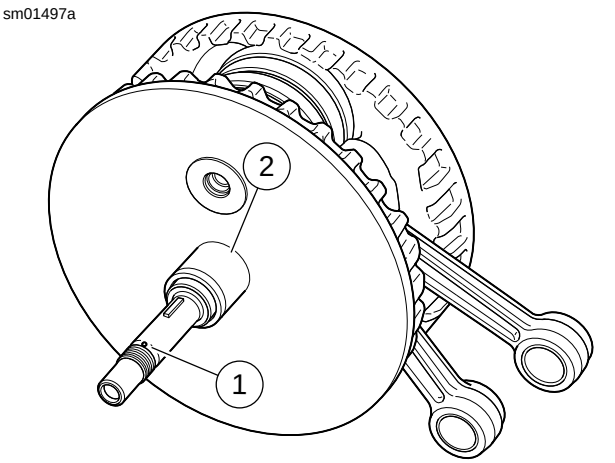
A running clearance of 0.0002-0.0008 in (0.005-0.020 mm) is established during crankcase set or flywheel assembly replacement and engine rebuild.

See Figure 3-126. Installed inner races are identified at the factory as shown.

See Figure 3-128. 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 3-126. Factory Inner Race Sizes

Table 3-35. 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 3-127. 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 3-38.

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).

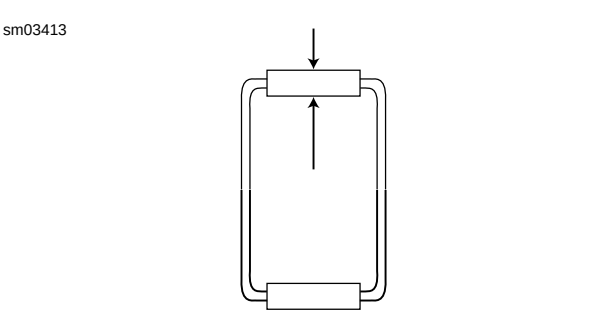


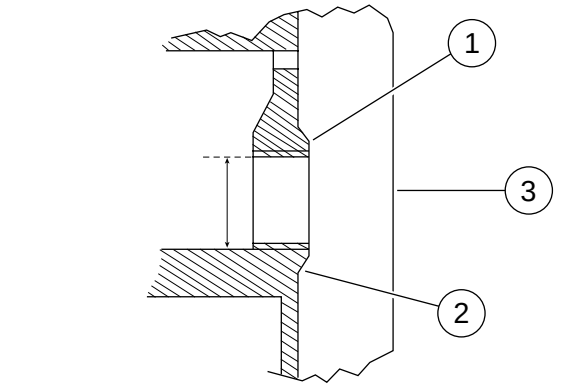
Figure 3-127. Bearing Roller OD (A)

Table 3-36. Roller Specifications

ROLLER OD (A)	IDENTIFICATION (PACKAGE COLOR)
Largest	Red
	Blue
	White (gray)
Smallest	Green

Table 3-37. 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 3-128. Factory Outer Race Sizes

Table 3-38. 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 3-130, Figure 3-131, and Figure 3-132.

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 3-39. 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 3-39.
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 3.19 CRANKCASE, Lapping Engine Main Bearing Races.
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 3-39.
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 3-40. See 3.19 CRANKCASE, Lapping Engine Main Bearing Races.

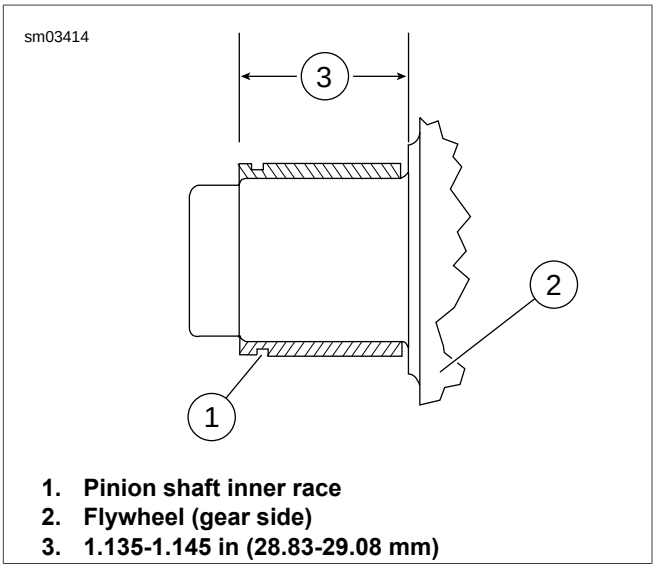
Table 3-40. New Pinion Bearing Outer Race Fit and Finish

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 3-125. Pull inner race from pinion shaft using BEARING SEPARATOR (Part No. Snap-on Tools Stock 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 3-129. 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 3-38.

Table 3-41. 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 3-129. Inner Race Location

Inner Bearing Finish Example

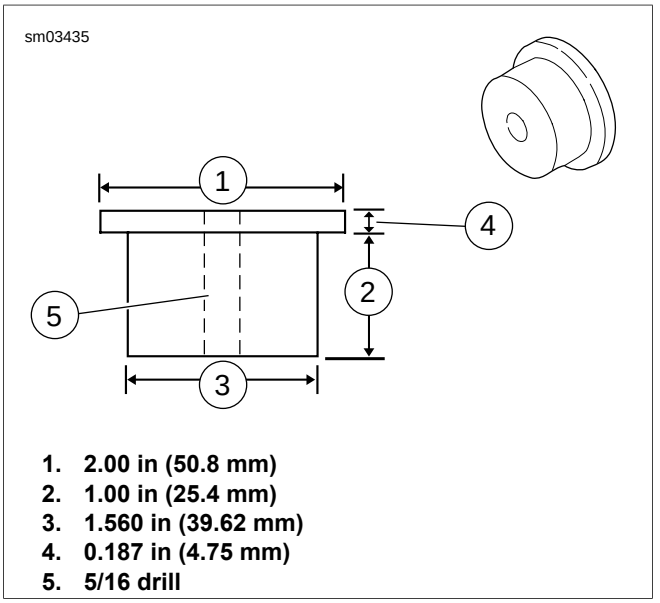
The following example illustrates how to determine the required inner race OD:

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 3-38.

NOTE

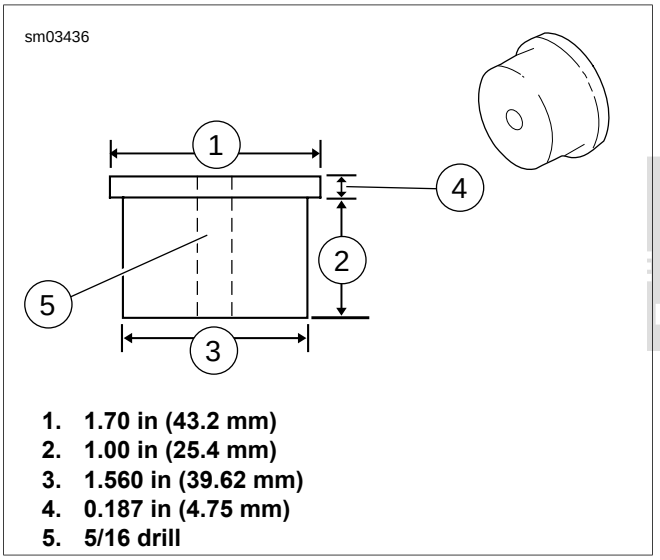
Have machinist precision grind outer race to center or middle of required OD range. This will prevent grinding outer race undersize and gives a more easily achieved tolerance range.

2. Precision grind inner race OD to the middle of the desired range. Refer to Table 3-38.
3. Measure OD at four places. Verify that OD is to specification. Refer to Table 3-41.
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 3-38.



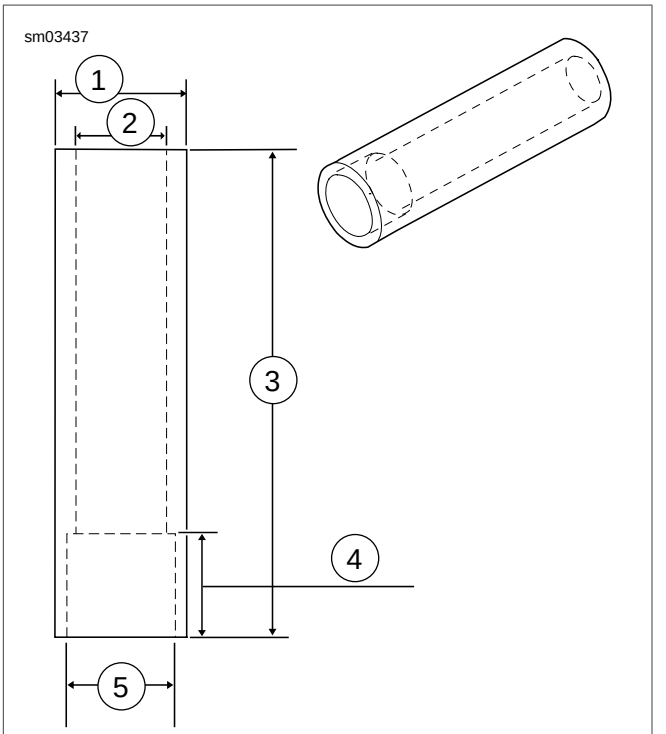
1. **2.00 in (50.8 mm)**
2. **1.00 in (25.4 mm)**
3. **1.560 in (39.62 mm)**
4. **0.187 in (4.75 mm)**
5. **5/16 drill**

Figure 3-130. 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 3-131. 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 3-132. Pinion Shaft Inner Race Installation Tool

LAPPING ENGINE MAIN BEARING RACES

PART NUMBER	TOOL NAME
HD-46287	LAPPING TOOL ADAPTER
HD-96710-40C	CRANKCASE MAIN BEARING LAPPING TOOL
HD-96718-87	CRANKCASE MAIN BEARING LAP

1. See Figure 3-133. Obtain CRANKCASE MAIN BEARING LAPPING TOOL (Part No. HD-96710-40C). Assemble CRANKCASE MAIN BEARING LAP (Part No. HD-96718-87) to lapping handle.

NOTE

Left main bearing must be installed in left crankcase to use LAPPING TOOL ADAPTER (Part No. HD-46287) in the next step. See 3.22 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. Tighten arbor expansion collars using a length of 0.156 in (3.96 mm) rod as spanner until arbor begins to drag. 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. Withdraw arbor far enough to coat lightly with 220 grit lapping compound. Do not apply a heavy coat. Reposition lap in bushing and turn handle at moderate hand speed. Work lap back and forth in bushing, as it is revolved, to avoid grooving and tapering.
6. At frequent intervals, remove lap from crankcase, wash and inspect bushing. Lapping is completed when entire bushing surface has a dull, satin finish rather than a glossy, smooth appearance.

⚠WARNING

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

7. When finished, flush off lap tool using cleaning solvent and dry using compressed air. Apply fresh, light coat of fine lapping compound.

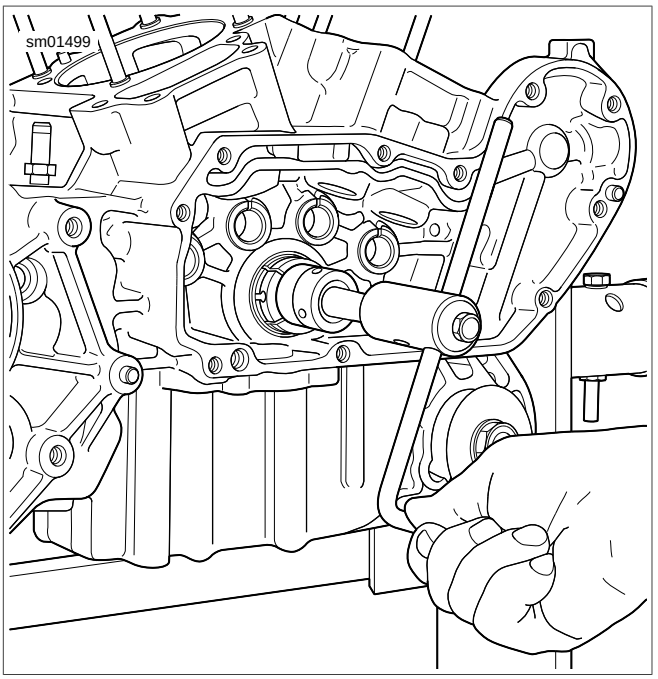


Figure 3-133. Lapping Pinion Shaft Main Bearing

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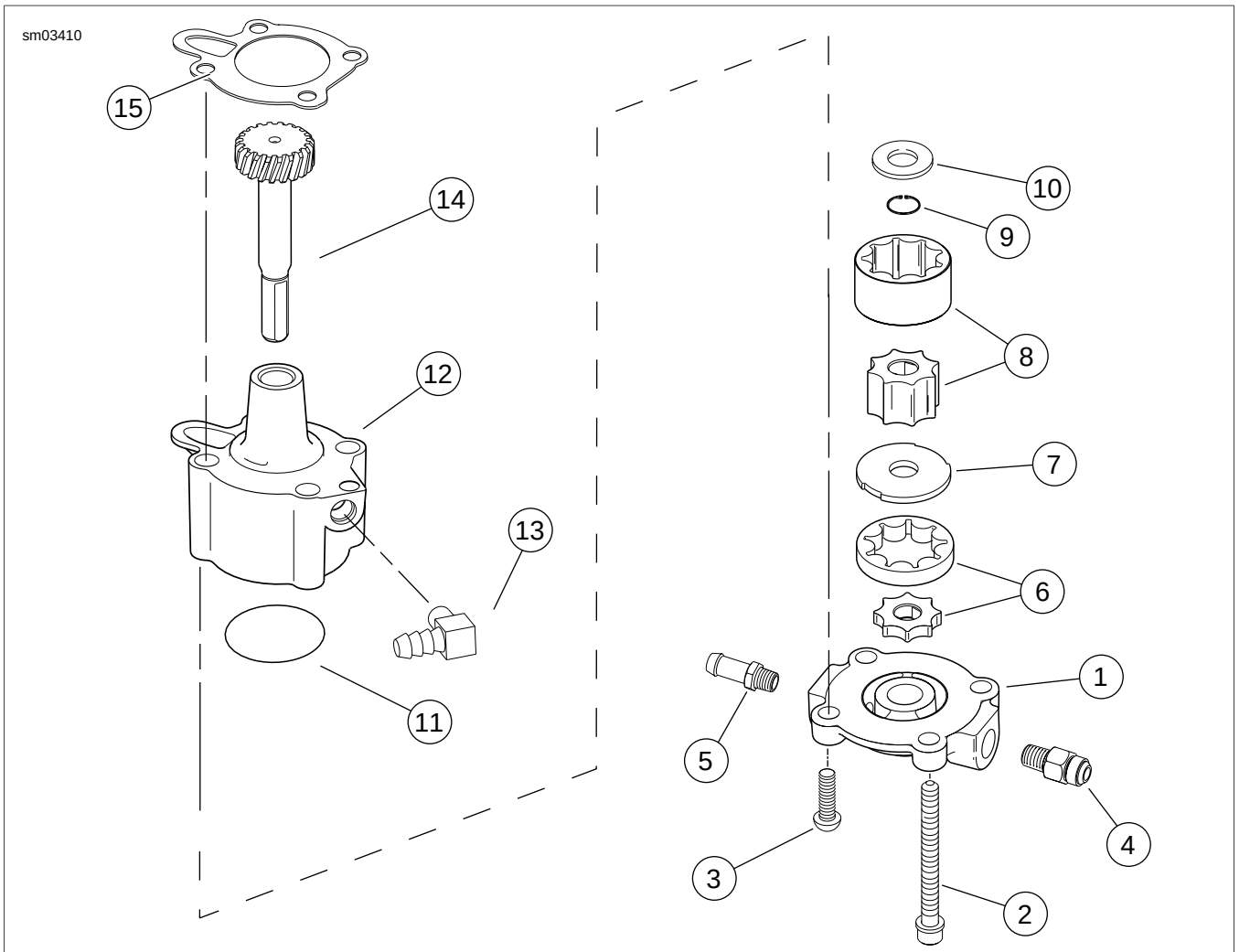
OIL PUMP: XL MODELS 3.20

GENERAL

The oil pump seldom needs servicing. Check for all possible malfunctions related to oil pressure before disassembling oil pump.

1. Make sure all oil line connections are tight. Verify that lines are not pinched or damaged.
2. Check level and condition of oil in tank. Pressure will be affected if oil is diluted. In freezing weather, proper circulation of oil can be affected if the oil feed line becomes clogged with ice or sludge.
3. Check for a grounded oil pressure switch wire [120] or faulty switch if oil pressure indicator light fails to go out with engine running.

See 3.6 ENGINE LUBRICATION SYSTEM, 3.24 OIL TANK and 6.31 OIL PRESSURE SWITCH.



1. **Oil pump cover**
2. **Screw w/ 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 3-134. Oil Pump: XL Models

REMOVAL

NOTE

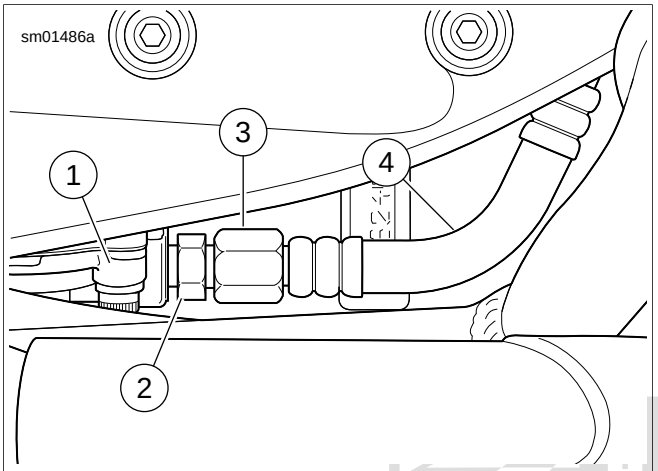
The oil pump can be removed with engine in frame and without removing gearcase cover.

1. Drain oil from oil tank.

NOTE

See Figure 3-135. 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 3-135. 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 3-135. Oil Pump Feed Hose

NOTE

See Figure 3-134. 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 3-134. Carefully remove two screws (2) that secure oil pump to crankcase. Pump will drop with screws removed. Discard mounting gasket (15).
4. Disconnect and tag the two remaining oil hoses from the pump.

DISASSEMBLY

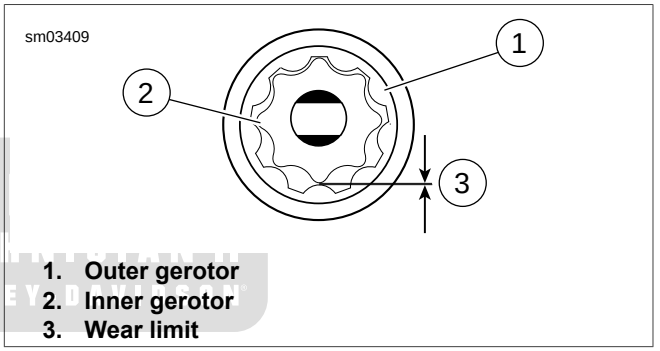
1. See Figure 3-134. Remove two Torx screws (3). Lift cover (1) off body (12). Remove and discard O-ring (11).
2. Slide both pieces of feed gerotor set (6), separator plate (7) and both pieces of scavenge gerotor set (8) off gear shaft (14).
3. Remove and discard retaining ring (9). Remove thrust washer (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. Blow out holes and oil passages with compressed air.
2. See Figure 3-136. Inspect both gerotor sets for wear.
   a. Mesh pieces of each set together as shown.
   b. Use a feeler gauge to determine clearance.
   c. The SERVICE WEAR LIMIT between gerotors is 0.004 in (0.102 mm). Replace gerotors as a set if clearance exceeds this dimension.
   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 3-136. Gerotor Wear Limits

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 3-134. 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 two Torx 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 3-134. Place **new** mounting gasket (15) in position.
2. Secure pump to crankcase with two 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 3-135. 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. Fill oil tank with proper oil. See 1.6 ENGINE OIL AND FILTER.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

OIL PUMP: XR 1200X 3.21

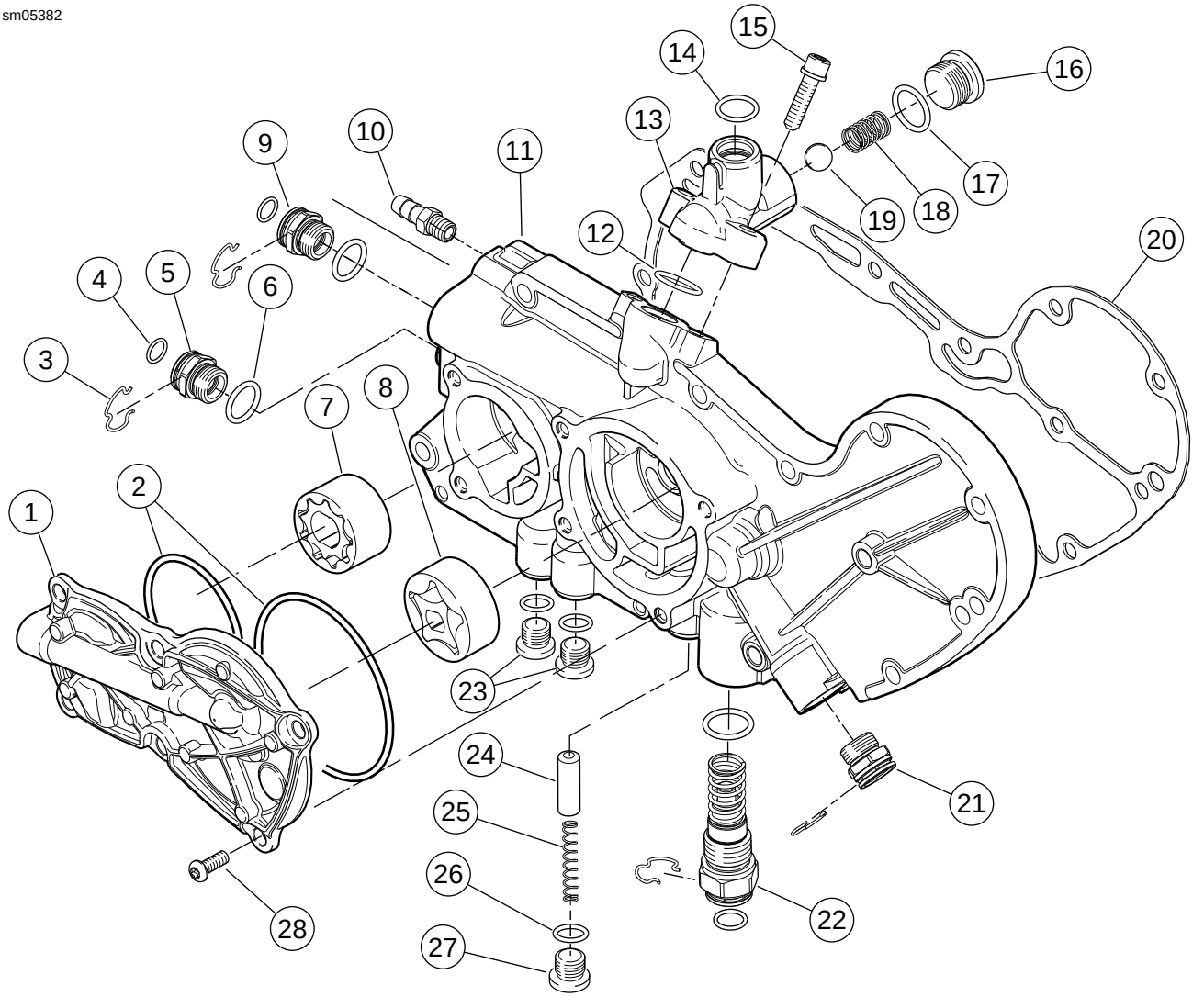
GENERAL

The oil pump seldom needs servicing. Check for all possible malfunctions related to oil pressure before disassembling oil pump.

1. Make sure all oil line connections are tight. Verify that lines are not pinched or damaged.
2. Check level and condition of oil in tank. Pressure will be affected if oil is diluted. In freezing weather, proper circulation of oil can be affected if the oil feed line becomes clogged with ice or sludge.
3. Check for a grounded oil pressure switch wire [120] or faulty switch if oil pressure indicator light fails to go out with engine running.

See 3.6 ENGINE LUBRICATION SYSTEM, 3.24 OIL TANK and 6.31 OIL PRESSURE SWITCH.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Oil pump rotor cover**
2. **O-rings, rotor cover**
3. **Retainer**
4. **O-ring, internal (1 each fitting)**
5. **Line connector fitting, return oil**
6. **O-ring, external (1 each fitting)**
7. **Scavenge gerotor set**
8. **Feed gerotor set**
9. **Line connector fitting, supply oil**
10. **Vent line fitting**
11. **Oil pump/gearcase housing**
12. **O-ring**
13. **Check valve housing, cylinder head oil**
14. **O-ring**
15. **Fastener (2)**
16. **Plug**
17. **O-ring**
18. **Spring**
19. **Check ball**
20. **Gasket**
21. **Line connector fitting, oil to cooler**
22. **Thermostat (oil from cooler)**
23. **Plugs**
24. **Bypass valve shuttle**
25. **Spring, bypass valve**
26. **O-ring**
27. **Plug**
28. **Fastener (6)**

Figure 3-137. Oil Pump: XR 1200X

DISASSEMBLY

NOTE

The oil pump can be removed with engine in frame and without removing gearcase cover.

1. Remove the exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
2. Drain oil from oil tank.
3. Place pan under oil pump to collect oil.
4. See Figure 3-138. Remove nine fasteners (1) and remove gearcase and oil pump cover (2).
5. See Figure 3-139. Remove oil cooler rigid lines (3) from gearcase cover. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines.
6. Remove six screws (1) and remove oil pump cover (2). Discard cover O-rings.

NOTE

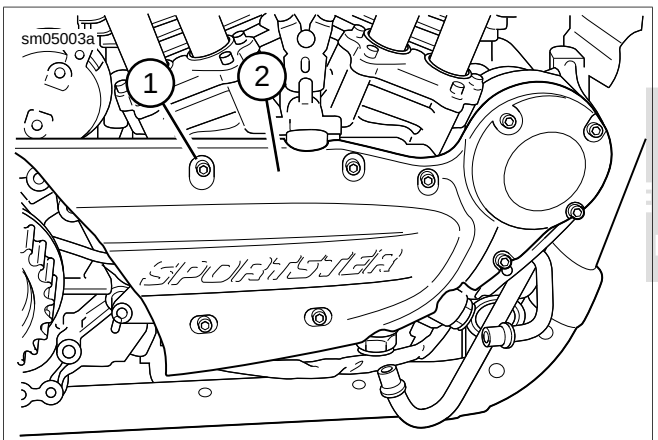
If oil pump rotors are to be re-used, they must be installed in the original location and orientation as when they are removed. Failure to do so can result in accelerated wear and possible engine failure.

7. See Figure 3-140. Wipe the oil film from the exposed surfaces of the rotors (1, 2) and mark each rotor using a permanent marker to aid in reassembly.

NOTE

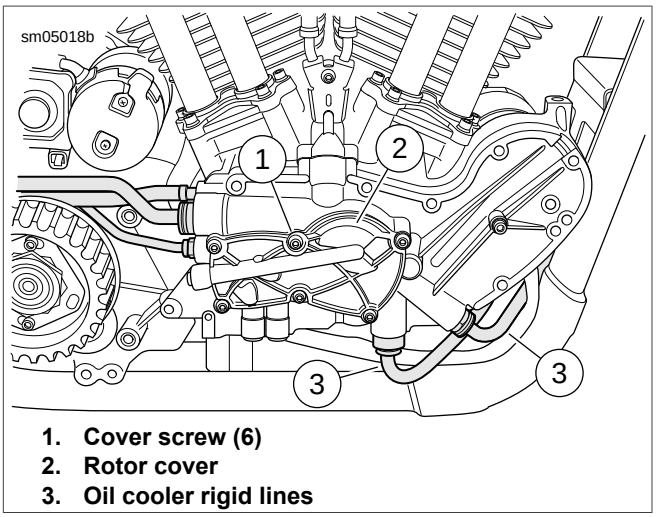
The surface tension of the remaining oil film will make the rotors "stick" against the bottom of the bore. Never use a metallic tool to remove oil pump rotors. This could result in damage requiring rotor or gearcase cover replacement.

8. Grasp the outer rotor (1) of each stage and pull from housing bore.
9. Remove each inner rotor (2).
10. Remove the thermostat fitting (3) and spring.
11. Remove the plug and bypass valve components (4).
12. If necessary, remove remaining line connector fittings from gearcase cover.
13. Remove and discard all used O-rings.



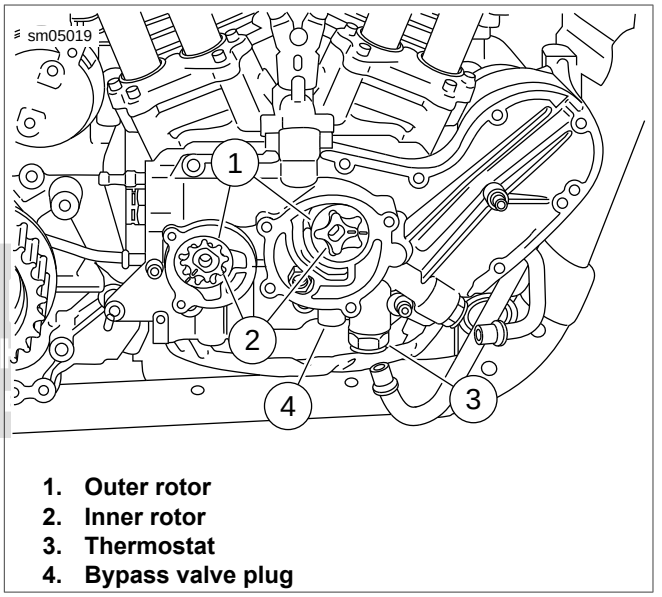
1. **Fastener (9)**
2. **Cover**

Figure 3-138. Oil Pump Cover: XR 1200X



1. **Cover screw (6)**
2. **Rotor cover**
3. **Oil cooler rigid lines**

Figure 3-139. Oil Pump Rotor Cover: XR 1200X



1. **Outer rotor**
2. **Inner rotor**
3. **Thermostat**
4. **Bypass valve plug**

Figure 3-140. Oil Pump: XR 1200X

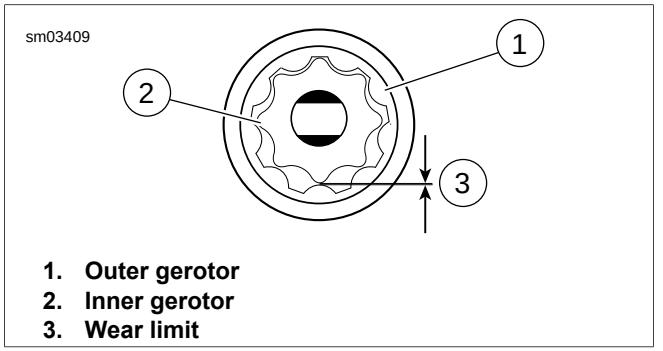
CLEANING AND INSPECTION

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 out holes and oil passages with compressed air.

2. See Figure 3-141. Inspect both gerotor sets for wear.
   a. Mesh pieces of each set together as shown.
   b. Use a feeler gauge to determine clearance.
   c. The SERVICE WEAR LIMIT between gerotors is 0.004 in (0.102 mm). Replace gerotors as a set if clearance exceeds this dimension.
   d. Measure thickness of feed gerotors with a micrometer. Replace gerotors as a set if they are not the same thickness.
3. See Figure 3-142. Inspect thermostat spring for distortion or cracks. Inspect rubber seal for damage. Replace thermostat assembly as necessary.



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

Figure 3-141. Gerotor Wear Limits

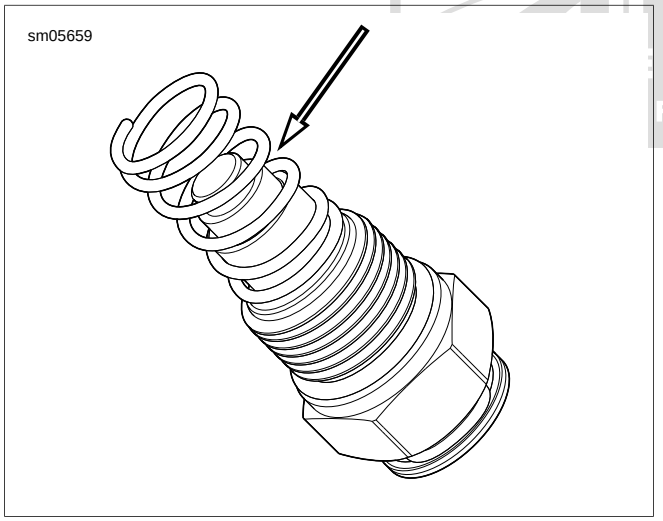


Figure 3-142. Thermostat: XR 1200X

ASSEMBLY

FASTENER	TORQUE VALUE	
Gearcase housing plug	108-156 **in-lbs**	12.2-17.6 Nm
Oil pump rotor cover screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm

NOTE

*Used O-rings can leak. Always install **new** O-rings when performing repairs.*

1. Install **new** internal O-rings in each line connector fitting.
2. Install **new** external O-rings on all connector fittings that have been removed.

NOTE

Apply a light coat of new engine oil to the shuttle valve components and oil pump rotors during assembly.

3. See Figure 3-140. Install bypass valve components (4). Tighten plug to 108-156 **in-lbs** (12.2-17.6 Nm).
4. Install thermostat and oil cooler line fitting (3).

NOTE

If oil pump rotors are to be re-used, they must be installed in the original location and orientation. Make sure the mark made during disassembly is visible when installing the rotors. Failure to do so can result in accelerated wear and possible engine failure.

5. Install each outer rotor (1) in its original location.
6. Install each inner rotor (2) in its original location.
7. See Figure 3-139. Install **new** O-rings in oil pump rotor cover and install cover using six fasteners (1). Tighten fasteners to 90-120 **in-lbs** (10.2-13.6 Nm).
8. Install oil cooler rigid lines (3) to quick connect fittings. See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines.
9. See Figure 3-143. Install oil pump/cam support housing cover. Secure with 9 socket fasteners. Tighten in the sequence shown to 90-120 **in-lbs** (10.2-13.6 Nm).
10. Install the exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.

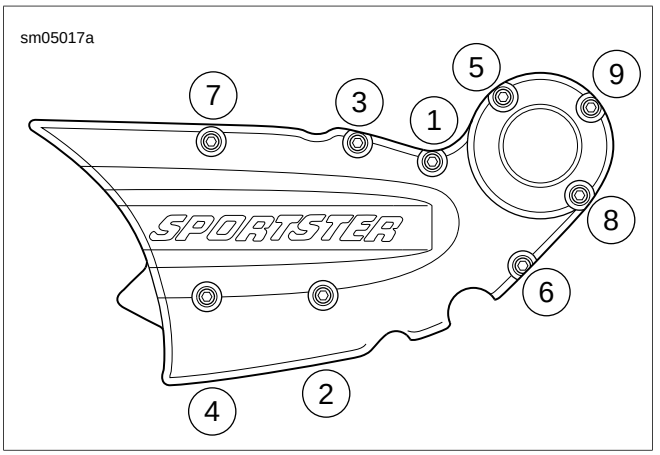


Figure 3-143. Oil Pump Cover Torque Sequence: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BOTTOM END OVERHAUL: ASSEMBLY 3.22

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-42579-6	SPROCKET SHAFT ADAPTER
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

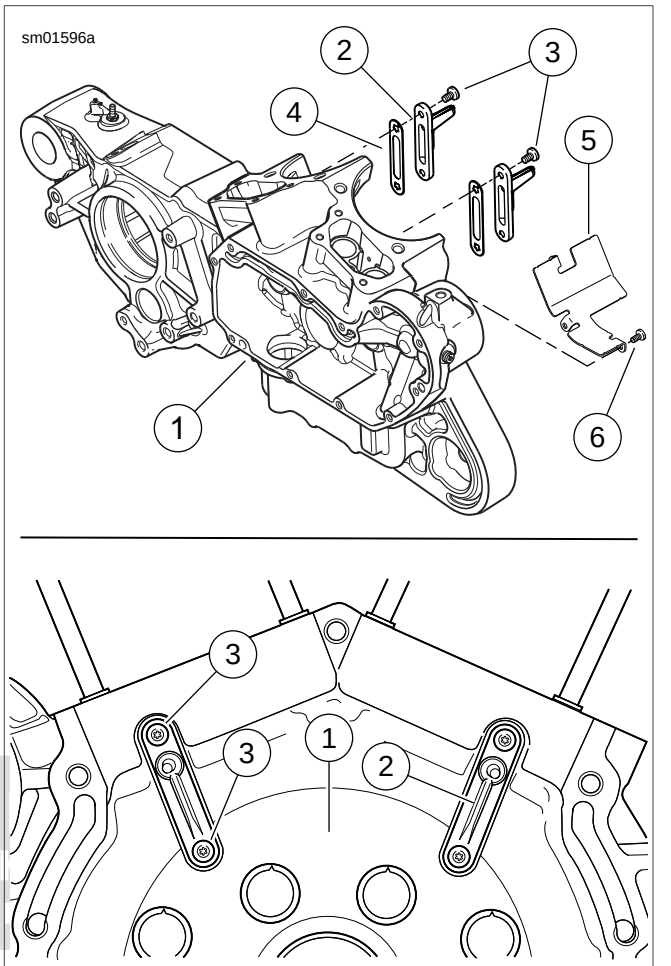
FASTENER	TORQUE VALUE	
Piston oil jet screw	38-48 **in-lbs**	4.3-5.4 Nm
Oil deflector plate screw: XR 1200X	38-48 **in-lbs**	4.3-5.4 Nm
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm

Installing Piston Oil Jets

NOTES

- *Damaged gaskets will result in either oil leakage or low oil pressure.*
- *See Figure 3-144. Gasket (4) is part of piston oil jet (2) assembly and is not sold separately.*

1. See Figure 3-144. 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 TORX screws (3) and screws (6).
3. Install TORX screws to secure piston oil jet assembly to crankcase. Tighten to 38-48 **in-lbs** (4.3-5.4 Nm).
4. **XR 1200X:** Install oil deflector plate (5) using three screws (6). Tighten to 38-48 **in-lbs** (4.3-5.4 Nm).

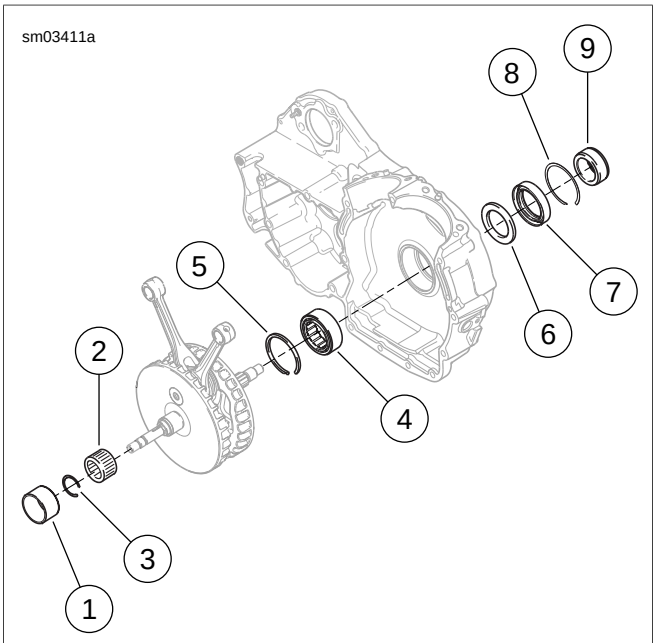


1. **Right crankcase**
2. **Piston oil jet (2)**
3. **Screw (4)**
4. **Gasket (2)**
5. **Oil deflector plate (XR 1200X)**
6. **Screw (3) (XR 1200X)**

Figure 3-144. Piston Oil Jet Assemblies

Installing Pinion Shaft Bearings

1. See Figure 3-145. Lubricate pinion shaft and pinion shaft bearing (2) with SCREAMIN' EAGLE ASSEMBLY LUBE.
2. Slip bearing on pinion shaft.
3. See Figure 3-146. 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 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 3-145. Pinion Shaft and Left Main Bearings

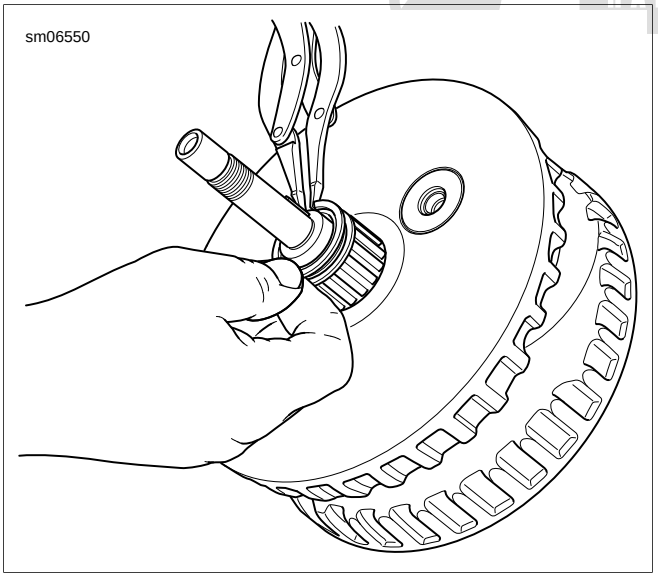


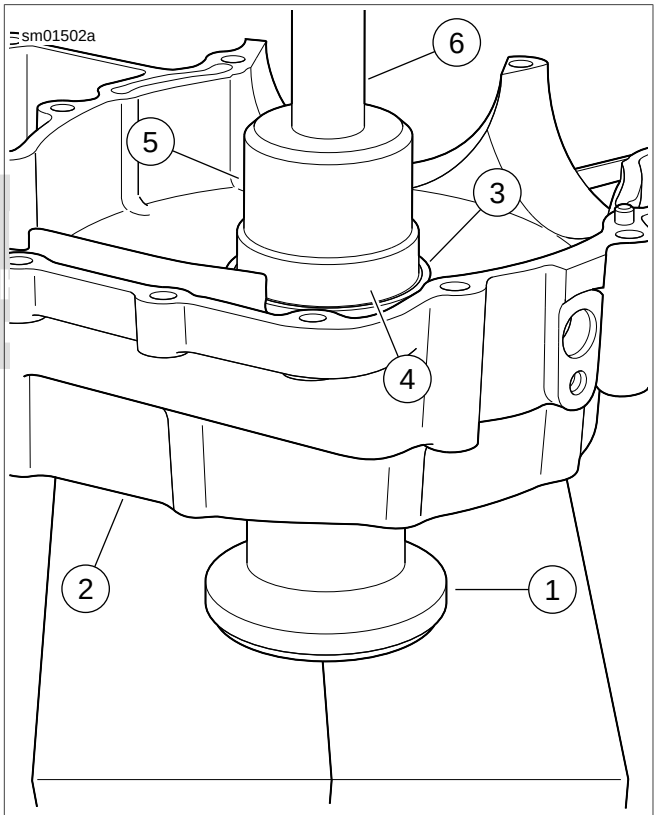
Figure 3-146. Installing Pinion Shaft Bearing and Retaining Ring

Installing Left Main Bearing

NOTE

When installing the left main bearing, the bearing presses from the inside of the left crankcase toward the outside. A shoulder is incorporated into the left crankcase which allows the bearing to be installed in one direction only.

1. See Figure 3-147. 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 3-148. 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 3-147. Installing Left Main Bearing in Crankcase

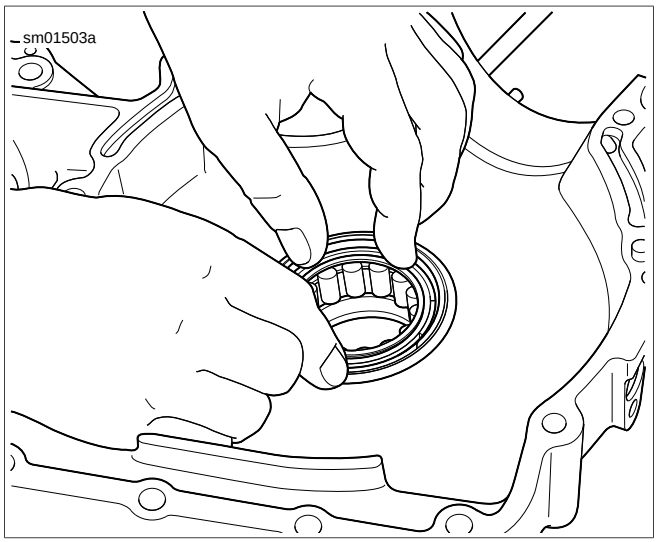


Figure 3-148. Installing Left Main Bearing Retaining Ring

Assembling Crankcase Halves

1. Install transmission assembly in left crankcase. See 5.14 TRANSMISSION INSTALLATION.

NOTE

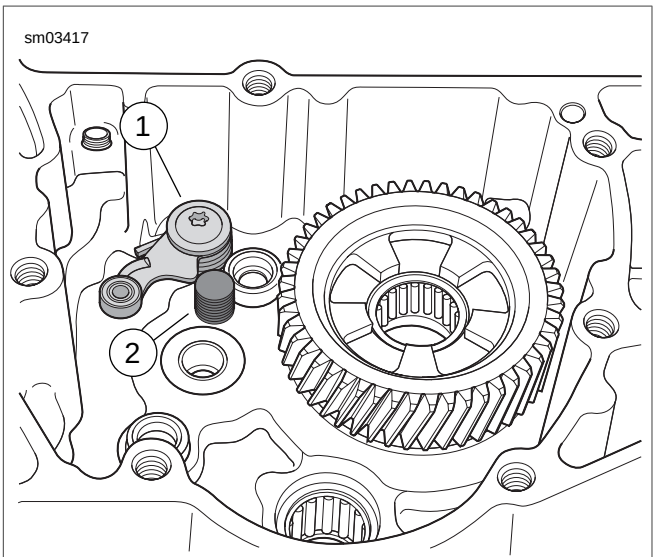
See Figure 3-149. The gear detent assembly Aid is used to move the gear detent lever clear of the shifter drum for assembly.

2. Retract detent assembly in right case half and install GEAR DETENT ASSEMBLY AID (Part No. B-45520) until it bottoms in right case half.
3. Shift transmission to 1st gear.
4. Lubricate left main bearing with SCREAMIN' EAGLE ASSEMBLY LUBE.
5. Assemble crankcase halves together.
   a. See Figure 3-150. 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 3-151. Carefully fit crankcases together.

NOTE

***XR 1200X:** See Figure 3-152. Install the double-ended bolt in position 8 to secure the front cylinder head oil return line.*

   e. Apply a drop of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to last few threads of each crankcase fastener and install fasteners (thirteen long and four short) in crankcase assembly.
   f. In sequence, tighten fasteners to 15-19 ft-lbs (20.3-25.8 Nm).
6. Remove transmission gear detent assembly aid.



1. **Detent assembly**
2. **Detent assembly aid**

Figure 3-149. Using Gear Detent Assembly Aid (Part No. B-45520)

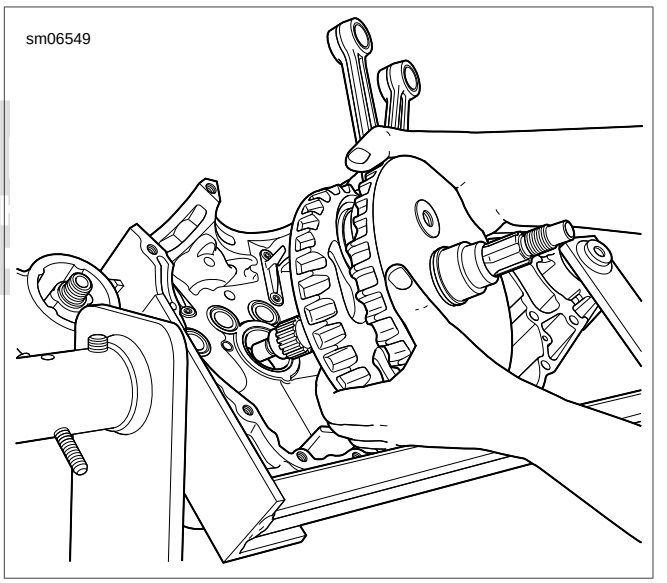


Figure 3-150. Installing Flywheels in Right Crankcase

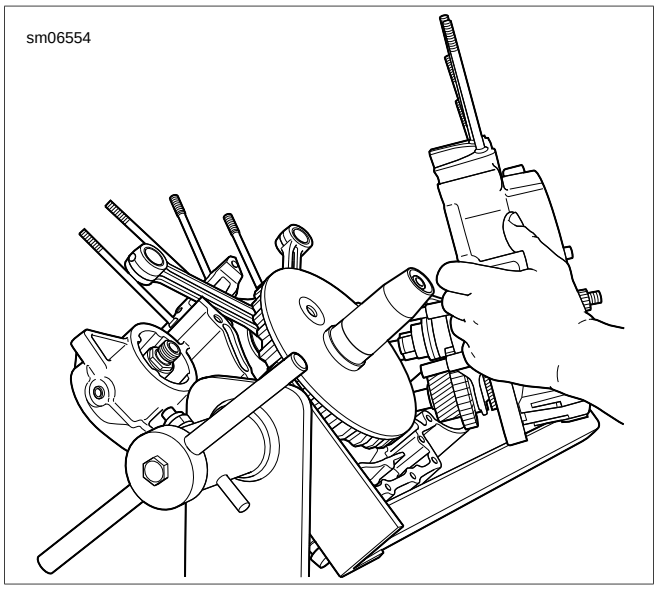


Figure 3-151. Assembling Crankcases with Crankshaft Guide Tool (Part No. HD-42326-B)

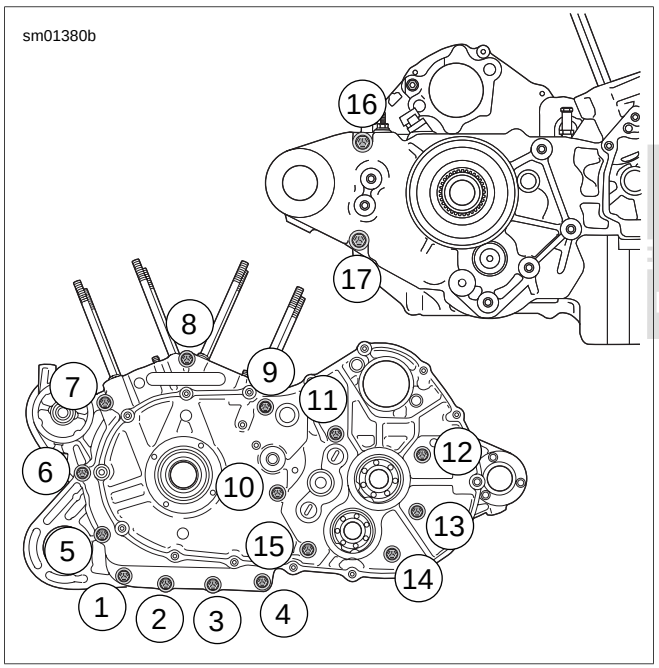


Figure 3-152. Crankcase Fastener Torque Sequence

7. See Figure 3-153 and Figure 3-154. Install spacer in ID of **new** seal. With the open (lipped) side of seal facing outward, center seal/spacer assembly over bearing bore.

NOTES

- *Removing spacer after installation requires seal procedure to be repeated.*
- *The XR 1200X requires the use of the SPROCKET SHAFT ADAPTER (Part No. HD-42579-6).*

8. See Figure 3-155. 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 makes contact with the bearing. Remove tool from sprocket shaft.
9. Install retaining ring into groove in sprocket shaft bearing bore.

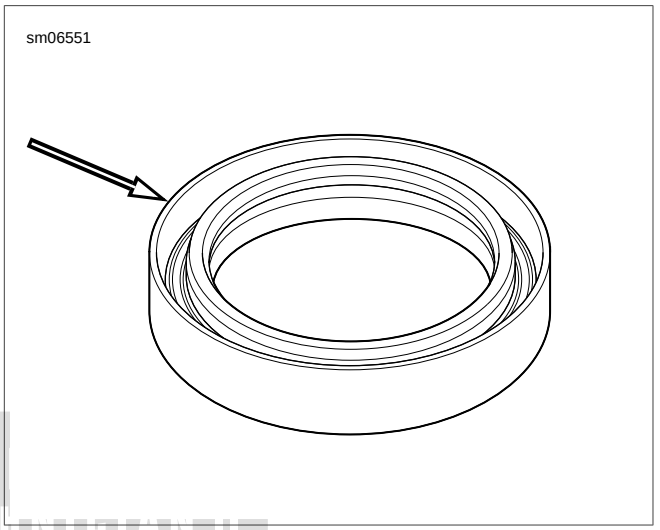


Figure 3-153. Open Side of Seal Faces Out

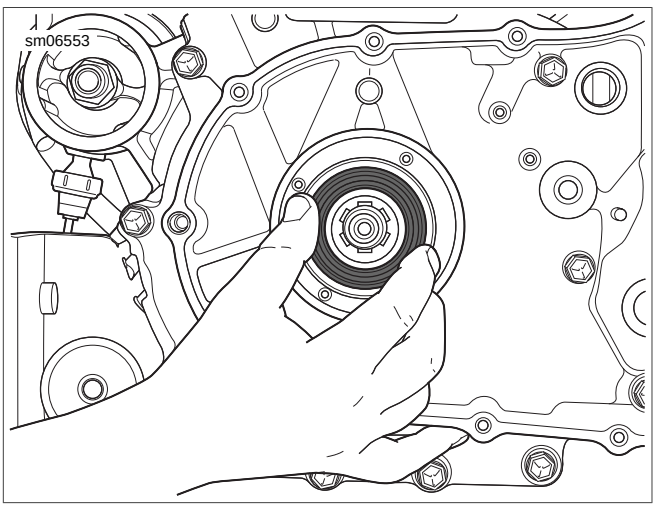
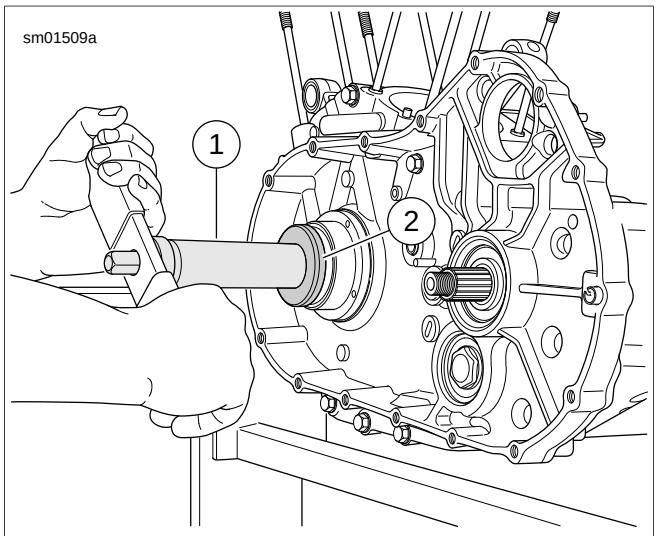


Figure 3-154. Install Spacer and Seal



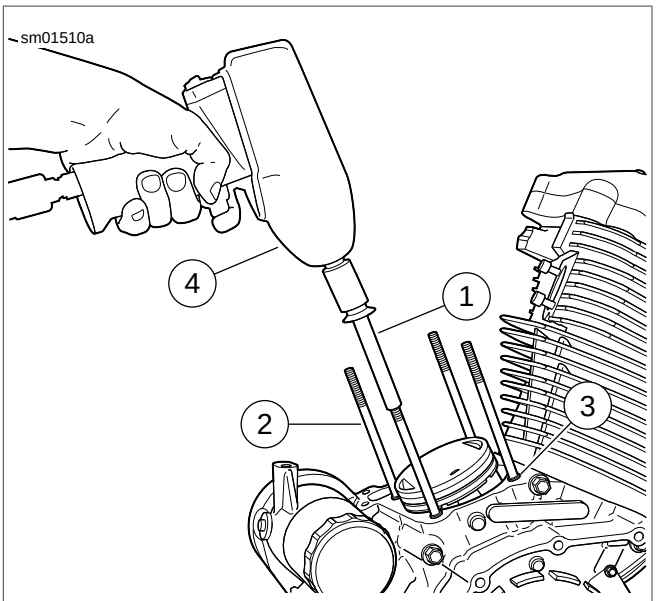
1. **Bearing/seal installer (Part No. HD-42579-A)**
2. **Seal/spacer installer (Part No. B-45676-A)**

Figure 3-155. Install Bearing Seal/Spacer

Installing Cylinder Base Studs

See Figure 3-156. If cylinder studs were removed, install them as follows:

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 3-156. 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 3-157. 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 3-42.

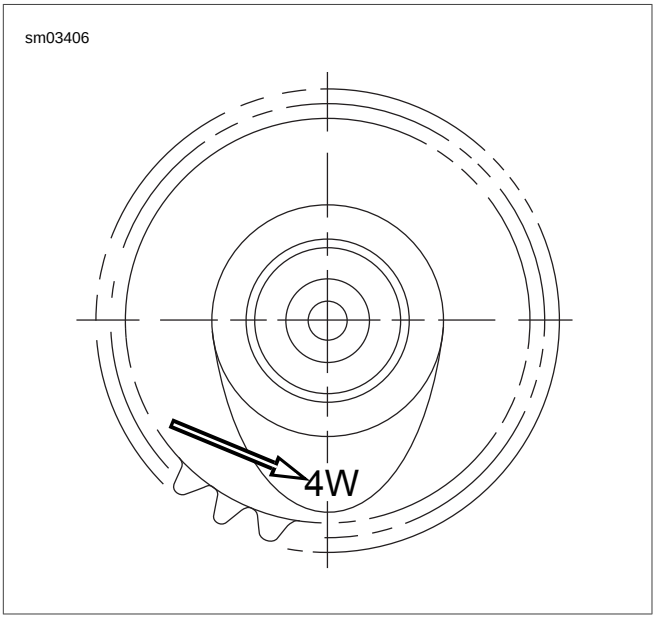


Figure 3-157. Cam Identification (typical)

Table 3-42. Cam Identification

CAM LOCATION	XL	XR
Rear exhaust	1W	1S
Rear intake	2W	2S
Front intake	3W	3S
Front exhaust	4W	4S

CAM GEARS AND GEARCASE COVER: XL MODELS

PART NUMBER	TOOL NAME
HD-43984	CRANKSHAFT LOCKING TOOL

FASTENER	TORQUE VALUE	
Pinion shaft locking nut: XR 1200X	19-21 ft-lbs	26-29 Nm
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm

1. See Figure 3-158. Make sure shaft key (1) is installed on flywheel pinion shaft. Install oil pump drive gear (10) and pinion gear (9) on pinion shaft.

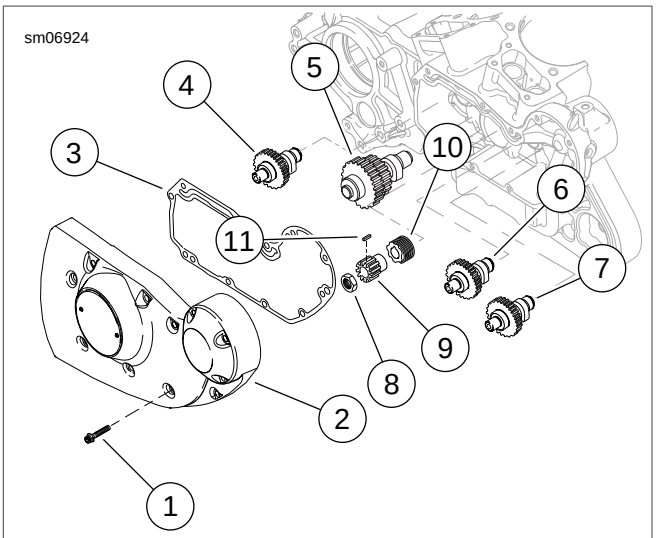
NOTE

See Figure 3-159. 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 3-158. Clean threads on pinion shaft and nut (8). Apply several drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to threads of nut.

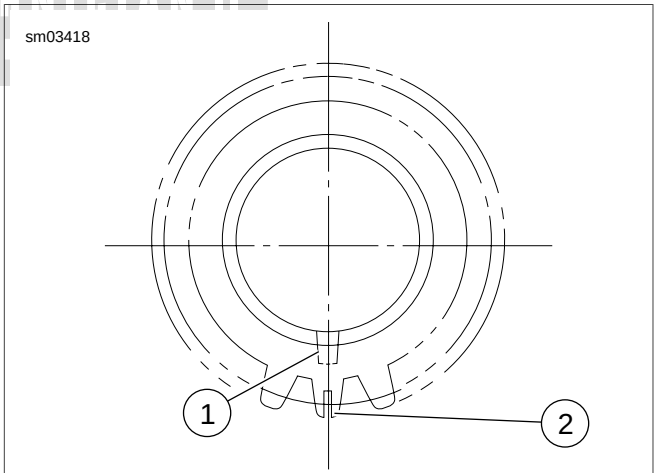
NOTE

When using CRANKSHAFT LOCKING TOOL, do NOT use impact wrench to drive nut onto pinion shaft.



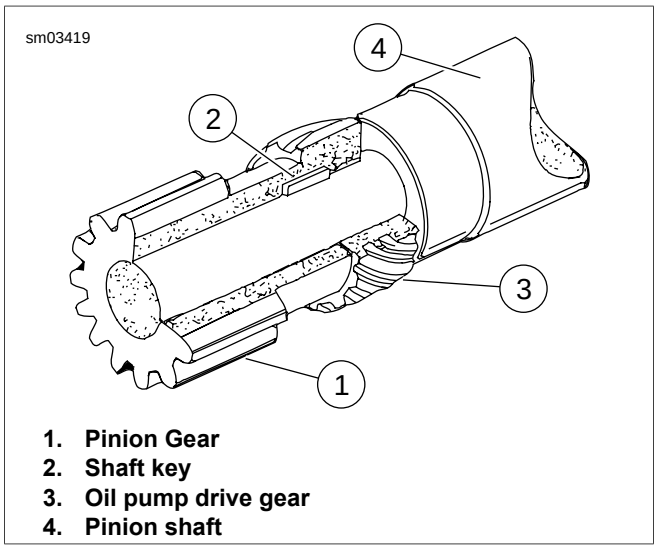
1. **Fastener**
2. **Cover**
3. **Gasket**
4. **Rear exhaust cam**
5. **Rear intake cam**
6. **Front intake cam**
7. **Front exhaust cam**
8. **Nut**
9. **Pinion gear**
10. **Oil pump drive gear**
11. **Shaft key**

Figure 3-158. Gearcase Cover and Cam Gears



1. **Keyway**
2. **Timing mark at centerline of keyway**

Figure 3-159. Pinion Gear Timing Mark and Keyway



1. **Pinion Gear**
2. **Shaft key**
3. **Oil pump drive gear**
4. **Pinion shaft**

Figure 3-160. Oil Pump Drive Gear and Pinion Gear Installed on Pinion Shaft

3. See Figure 3-161. 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 an additional 15-19 degrees of rotation.
   e. Remove CRANKSHAFT LOCKING TOOL (Part No. HD-43984).

NOTE

See Figure 3-162. Install rear exhaust and front intake cam gears before rear intake cam gear. This 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 3-162. Rotate crankshaft until timing mark on pinion gear points exactly at centerline of rear intake cam bushing.

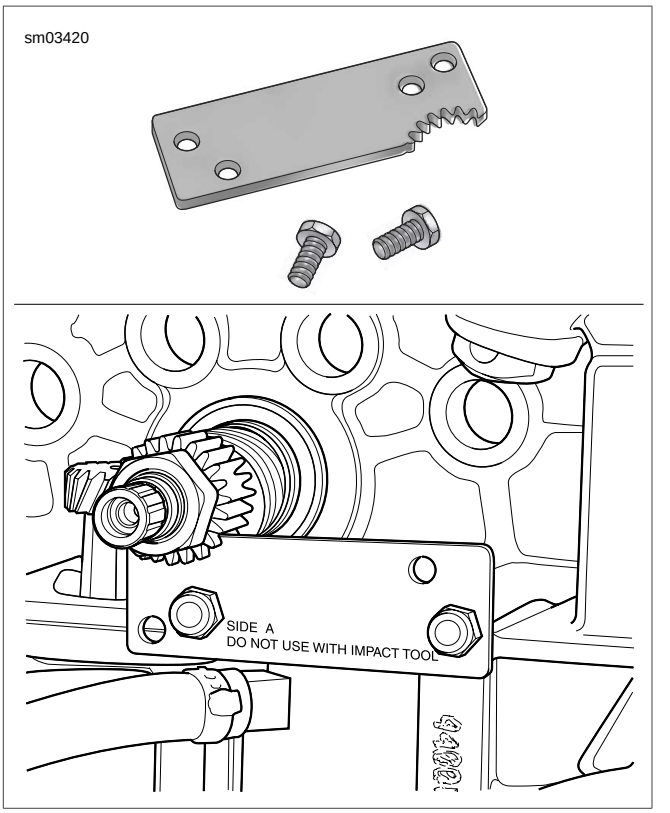


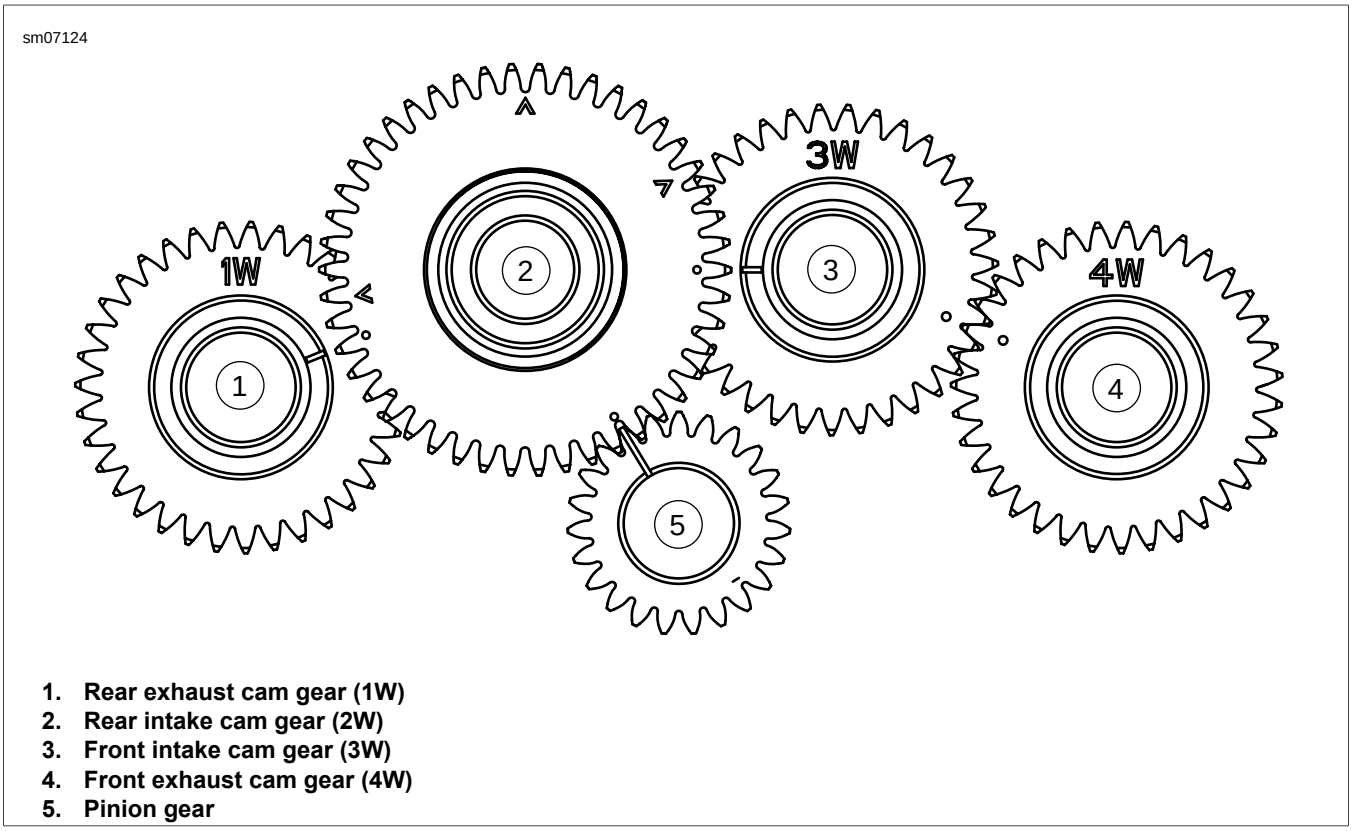
Figure 3-161. Crankshaft Locking Tool (Part No. HD-43984)

6. See Figure 3-158. 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 3-162. "V" marks on rear intake cam are not used for timing of Sportster model engines.

8. See Figure 3-158. Install rear intake cam (5). As you install this cam, rotate it so that the three timing marks (dots) line up exactly 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 3-162. Verify timing marks. If necessary, remove a cam, rotate it slightly, and install. If timing marks are off even one tooth, engine will not run correctly.
11. See Figure 3-158. 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 3-162. 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. Install gearcase cover. Secure cover to crankcase with 11 fasteners.
14. See Figure 3-163. Tighten in sequence to 90-120 **in-lbs** (10.2-13.6 Nm).
15. Gauge cam gear end play. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Cam Gear End Play.

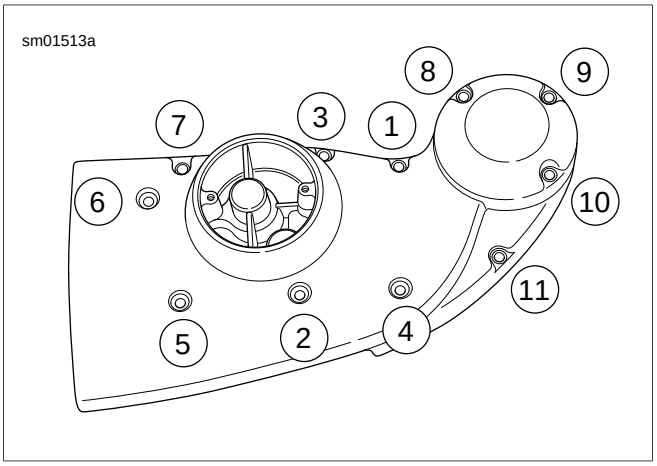


Figure 3-163. Gearcase Cover Mounting Screw Torque Sequence

CAM GEARS AND GEARCASE COVER: XR 1200X

PART NUMBER	TOOL NAME
HD-43984	CRANKSHAFT LOCKING TOOL

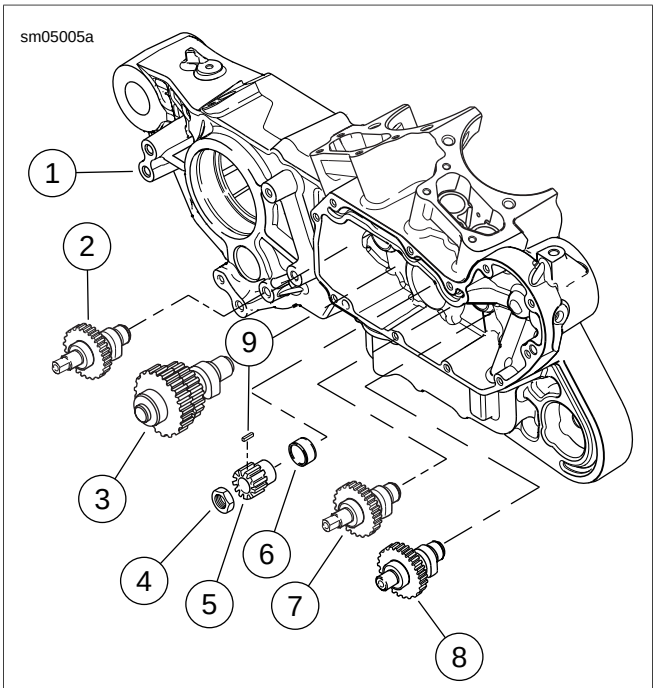
FASTENER	TORQUE VALUE	
Pinion shaft locking nut: XR 1200X	19-21 ft-lbs	26-29 Nm
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm
Oil pump rotor cover screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm
Check valve housing fastener: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm

1. See Figure 3-164. Make sure t-key (9) is installed on flywheel pinion shaft. Install spacer (6) and pinion gear (5) on pinion shaft.

NOTE

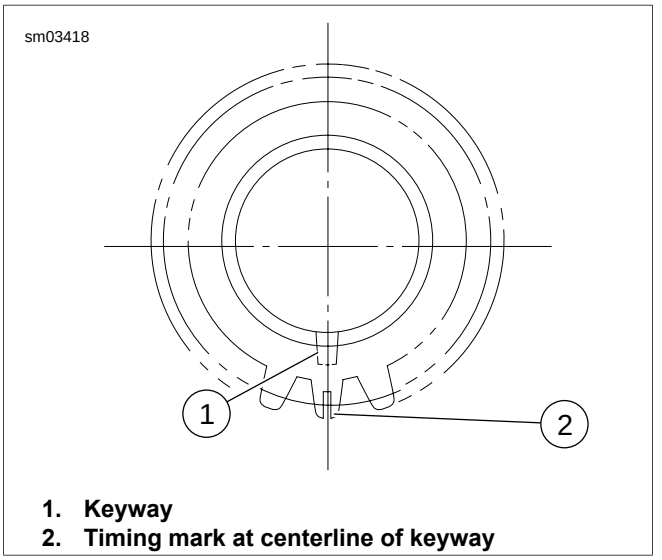
See Figure 3-165. Timing mark on pinion gear tooth is aligned with keyway in ID of pinion gear. The timing mark will allow you to easily position pinion gear over t-key and against oil pump drive gear on pinion shaft.

2. See Figure 3-164. Clean threads on pinion shaft and nut (4). Apply several drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to threads of nut.



1. **Right crankcase half**
2. **Rear exhaust cam gear**
3. **Rear intake cam gear**
4. **Nut**
5. **Pinion gear**
6. **Spacer**
7. **Front intake cam gear**
8. **Front exhaust cam gear**
9. **T-key**

Figure 3-164. Gearcase and Valve Train Components: XR 1200X



1. **Keyway**
2. **Timing mark at centerline of keyway**

Figure 3-165. Pinion Gear Timing Mark and Keyway

NOTE

When using CRANKSHAFT LOCKING TOOL, do NOT use impact wrench to drive nut onto pinion shaft.

3. See Figure 3-166. Install CRANKSHAFT LOCKING TOOL (Part No. HD-43984) over pinion shaft. Install nut on pinion shaft. Tighten to 19-21 ft-lbs (26-29 Nm). Then tighten nut 15-19 degrees of rotation. Remove CRANKSHAFT LOCKING TOOL (Part No. HD-43984).

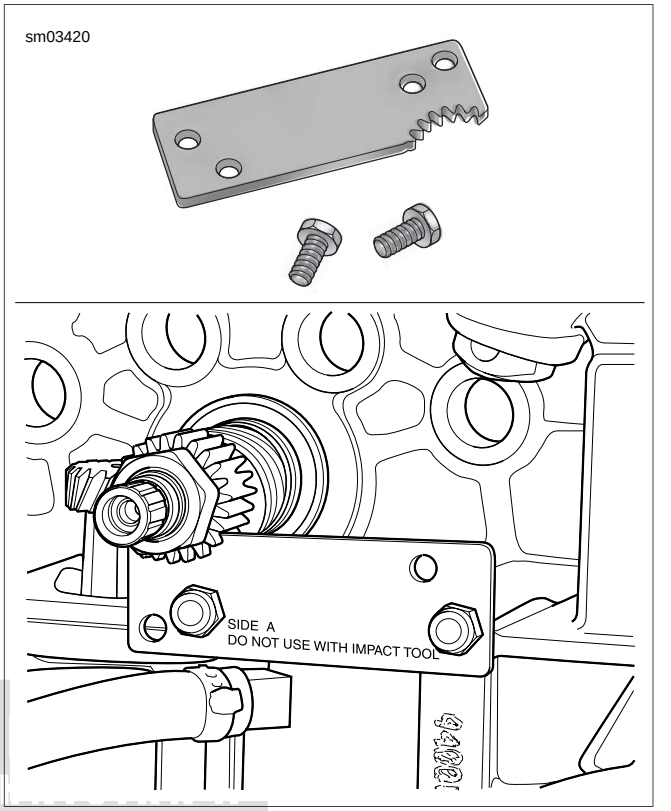


Figure 3-166. Crankshaft Locking Tool (Part No. HD-43984)

NOTE

Because of the larger diameter gear on the outboard end of the rear intake cam gear, install the rear exhaust and front intake cam gears before the rear intake cam gear.

4. Lubricate all cams and all cam bores in right crankcase with SCREAMIN' EAGLE ASSEMBLY LUBE.
5. See Figure 3-167. Rotate crankshaft until timing mark on pinion gear points exactly at centerline of rear intake cam bore.
6. Install rear exhaust cam. Rotate cam until timing mark (a slot) points exactly at centerline of rear intake cam bore.
7. Install front intake cam. Rotate cam until slotted timing mark points exactly at centerline of rear intake cam bore.

NOTE

V marks on rear intake cam are not used for timing of Sportster model engines.

8. Install rear intake cam. Rotate the cam to line up the three timing marks (dots) exactly with timing marks on the pinion gear, rear exhaust cam and front intake cam.
9. Install front exhaust cam. Rotate the cam to line up its timing mark (a dot) with timing mark (dot) of front intake cam.

10. Verify timing marks. If necessary, remove a cam, rotate it slightly and replace it. If timing marks are off even one tooth, engine will not run correctly.
11. Lubricate all cam bores in gearcase cover with engine oil.
12. See Figure 3-168. Install gearcase cover with **new** gasket and secure with three fasteners (6). Tighten fasteners to 90-120 **in-lbs** (10.2-13.6 Nm).
13. Install oil pump rotors. Orient the rotors as removed.
14. Install **new** O-rings in oil pump cover and install using six fasteners (4). Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
15. Install check valve housing using a new base O-ring. Tighten fasteners (3) to 90-120 **in-lbs** (10.3-13.6 Nm).
16. Connect rigid lines (1) and vent hose (2). See 3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines.
17. See Figure 3-169. Install gearcase and oil pump cover. Secure with 9 socket fasteners. Tighten in the sequence shown to 90-120 **in-lbs** (10.2-13.6 Nm).
18. Gauge cam gear end play. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY, Cam Gear End Play.

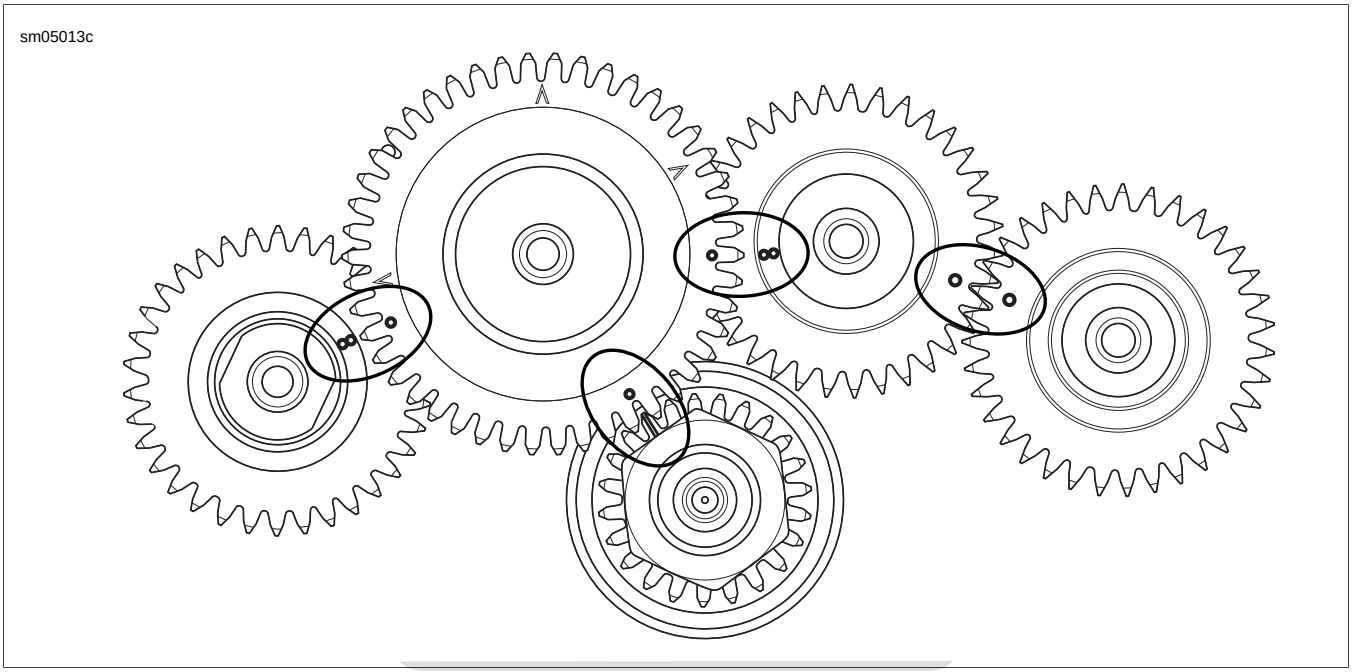
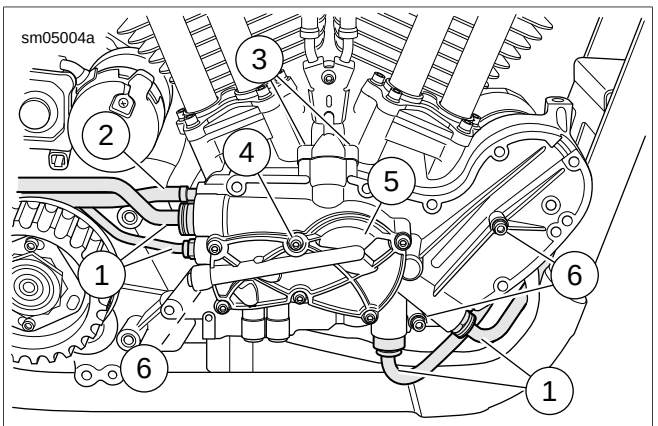


Figure 3-167. Cam and Pinion Gear Timing Marks: XR 1200X (V-marks are not used for timing)



1. **Rigid lines**
2. **Vent hose**
3. **Check valve screws (2)**
4. **Oil pump cover screw (6)**
5. **Oil pump cover**
6. **Gearcase cover fastener (3)**

Figure 3-168. Gearcase Cover and Oil Pump: XR 1200X

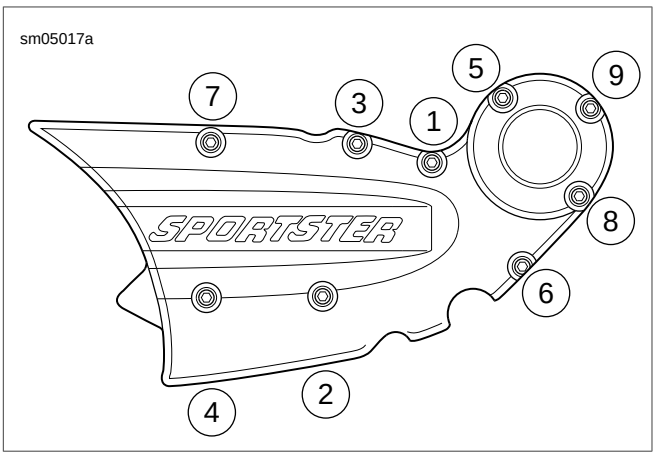


Figure 3-169. Oil Pump Cover Torque Sequence: XR 1200X

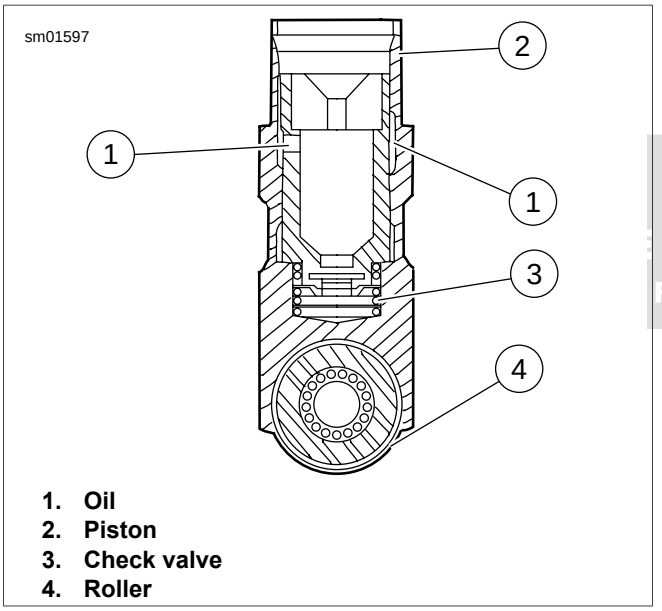
TAPPETS

FASTENER	TORQUE VALUE	
Tappet cover, anti-rotation mounting screw	90-120 **in-lbs**	10.2-13.6 Nm

General

See Figure 3-170. 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 3-170. 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 3-43.
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 3-43. 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 3-171. 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

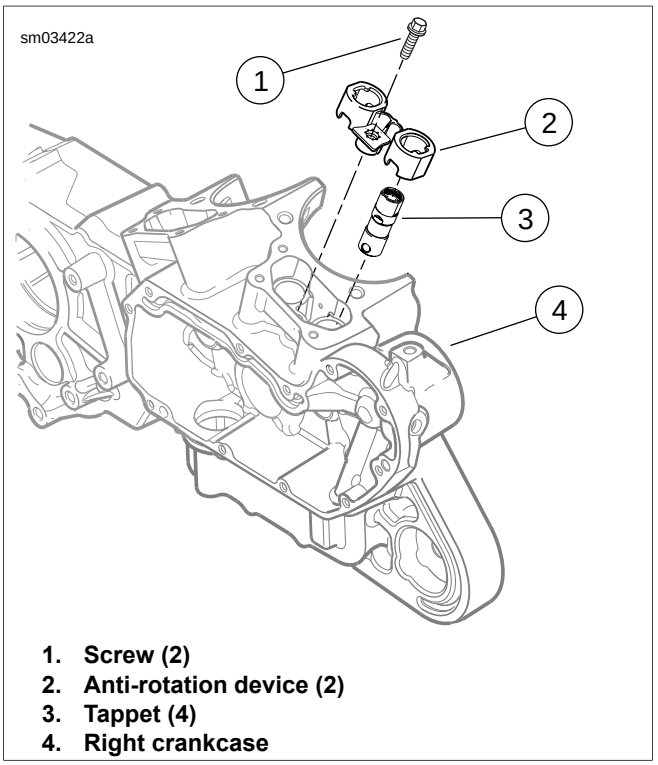
Face the flats of the tappets front and rear when installed in the engine and with the oil feed hole toward the gear cover.

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 3.16 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 3-171. Tappet Components

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OIL FILTER MOUNT 3.23

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:

- **XL Models:** 10-13 psi (69-90 kPa) oil pressure.
- **XR 1200X:** 5-7 psi (34-48 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 3-172. 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.

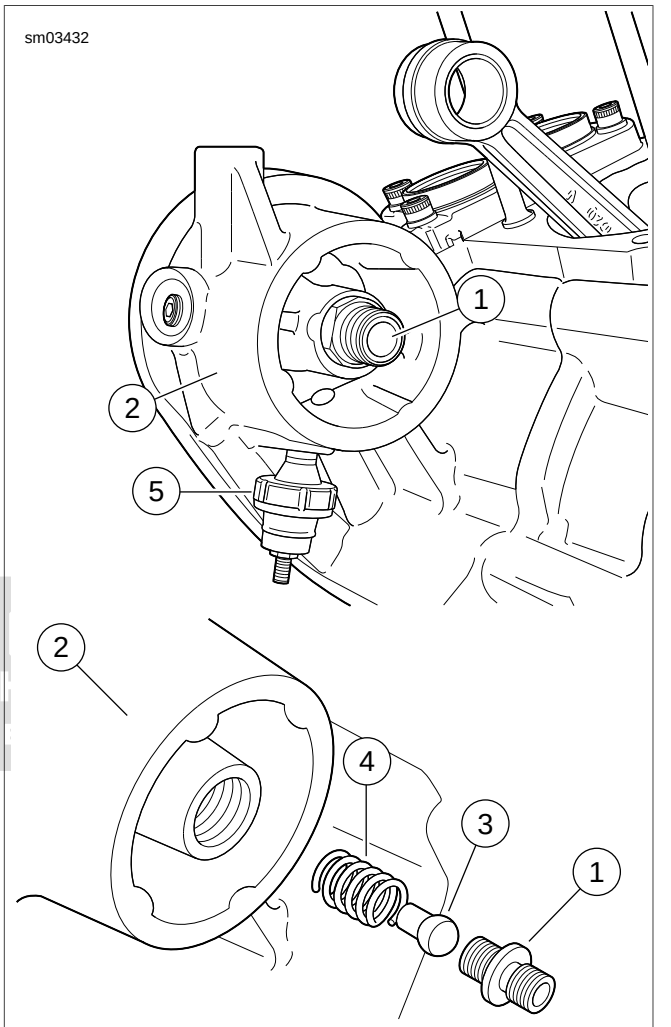
ASSEMBLY

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 3-172. 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 oil filter adapter to 18-22 ft-lbs (24.4-29.8 Nm).
3. Install oil filter. Fill oil tank with proper 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 3-172. Oil Filter Mount, Typical (XL model shown)

OIL TANK 3.24

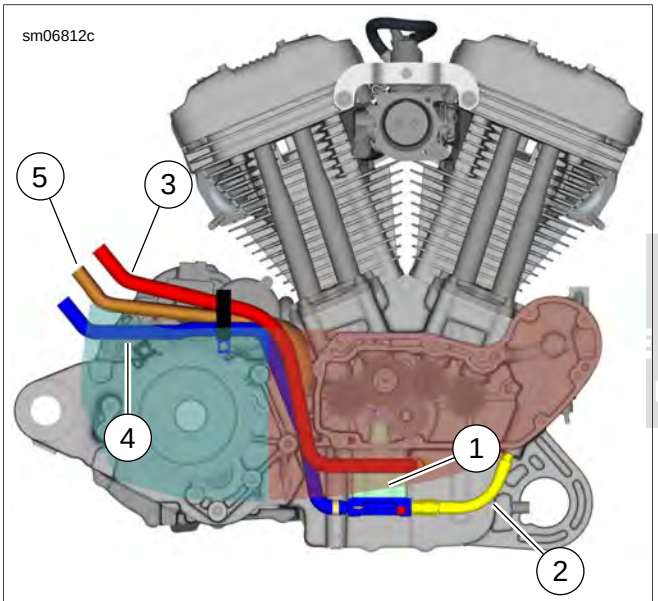
PRESSURE RELIEF VALVE

The oil tank has a pressure relief valve in the top of the tank. If the vent line is pinched, restricted or if the tank is overfilled, excessive pressure is created. The valve opens if the pressure in the tank exceeds 10 psi (68.9 kPA).

OIL LINE ROUTING: XL MODELS

See Figure 3-173. The feed, vent and return ports are located on the bottom of the oil tank to reduce under seat congestion. An oil line routes the oil from the feed port at the lower right front corner to a fitting on the oil pump.

From the feed section of the oil pump, another feed line directs the flow up to the oil filter mount. Eventually, oil drains to the sump where it collects in the scavenge section of the oil pump. The return line routes the oil back to the tank where the cycle is repeated.



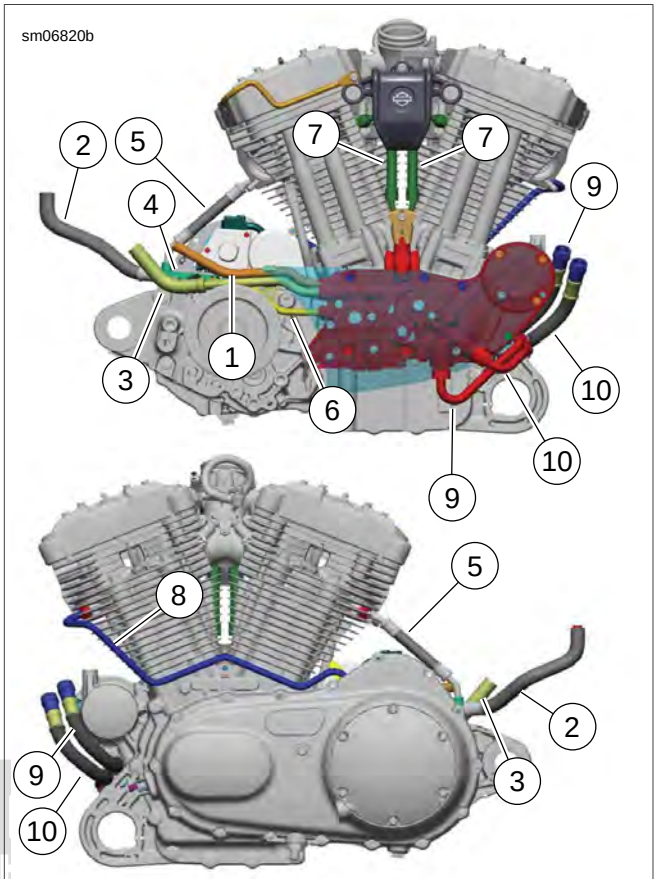
1. **Oil pump**
2. **Oil feed line**
3. **Return oil line**
4. **Feed oil line**
5. **Vent line**

Figure 3-173. Engine Hose Routing: XL Models

OIL LINE ROUTING: XR 1200X

See Figure 3-174. The feed, vent and return ports are located on the bottom of the oil tank to reduce under seat congestion. An oil line routes the oil from the feed port at the lower right front corner to a fitting on the oil pump.

Oil travels to the feed pump through an internal passage in the pump housing. The feed pump pushes oil to the oil cooler, oil filter, and cylinder heads. Oil used for lubricating internal engine components eventually drains into the sump. Here the scavenge pump collects it and routes it back to the oil tank. The oil from the cylinder heads and from the scavenge pump is returned to the oil tank. See 3.6 ENGINE LUBRICATION SYSTEM, Oil Flow: XR 1200X.



1. **Vent line**
2. **Return oil to tank**
3. **Oil feed line**
4. **Return oil manifold**
5. **Rear cylinder head return oil line**
6. **Return oil from pump**
7. **Cylinder head feed oil lines**
8. **Front cylinder head return oil line**
9. **Oil from oil cooler**
10. **Oil to oil cooler**

Figure 3-174. Engine Oil Line Routing: XR 1200X

REMOVAL

1. Remove seat.
2. Remove left side cover. See 2.18 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)

3. Disconnect negative (-) battery cable from ground stud on crankcase. Disconnect positive (+) battery cables at battery.
4. Drain oil tank. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Filter.

5. Remove right side cover by gently prying bottom lip off tab on oil tank. Then lift top of cover off two stanchions molded into top of oil tank.
6. Remove rear belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.

NOTE

For ease of assembly, mark oil tank lines, oil feed, drain, vent and return, as they are removed from oil tank.

7. Remove clamp and disconnect the drain line from oil tank.
8. Remove clamp from upper end of feed oil line and disconnect line from oil tank.
9. Remove clamp from upper end of the return oil line and disconnect the line from oil tank.
10. Remove rear fender. See 2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, 2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V or 2.35 REAR FENDER: XR 1200X.
11. Remove clamp from upper end of vent oil line and disconnect line from oil tank.
12. Remove three screws and remove oil tank from right side of motorcycle.

INSTALLATION

FASTENER	TORQUE VALUE	
Oil tank mounting screw	36-60 **in-lbs**	4.1-6.8 Nm

1. Slide oil tank into position in frame from right side of vehicle.
2. See Figure 3-175 or Figure 3-176. Install oil tank mounting screw (3) through bracket (4) and loosely screw into oil tank to hold tank in place.
3. Install remaining two mounting screws through frame and screw into oil tank. Tighten all three fasteners to 36-60 **in-lbs** (4.1-6.8 Nm).

NOTES

- ***All Models:*** *The vent oil hose is composed of a flexible hose originating at the gearcase cover elbow fitting, mated to a hard plastic line, then another flexible hose at the oil tank vent fitting.*
- ***XR 1200X:*** *The return oil line is a manifold assembly that branches between the crankcase and the rear cylinder head.*

4. Install the oil vent hose (5), the feed hose (8), the drain hose (9) and the return oil line (6) to the oil tank fittings. Secure with **new** clamps.
5. Install rear fender. See 2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, 2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V or 2.35 REAR FENDER: XR 1200X.
6. Install rear belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
7. Install right side cover.
   a. Engage two holes on top of cover onto stanchions on top of oil tank.
   b. Rotate bottom end of cover downward until bottom lip of cover snaps in place on tab on bottom of oil tank.
8. Fill oil tank and install filler cap/dipstick. See 1.6 ENGINE OIL AND FILTER, Checking and Adding Oil.

⚠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)

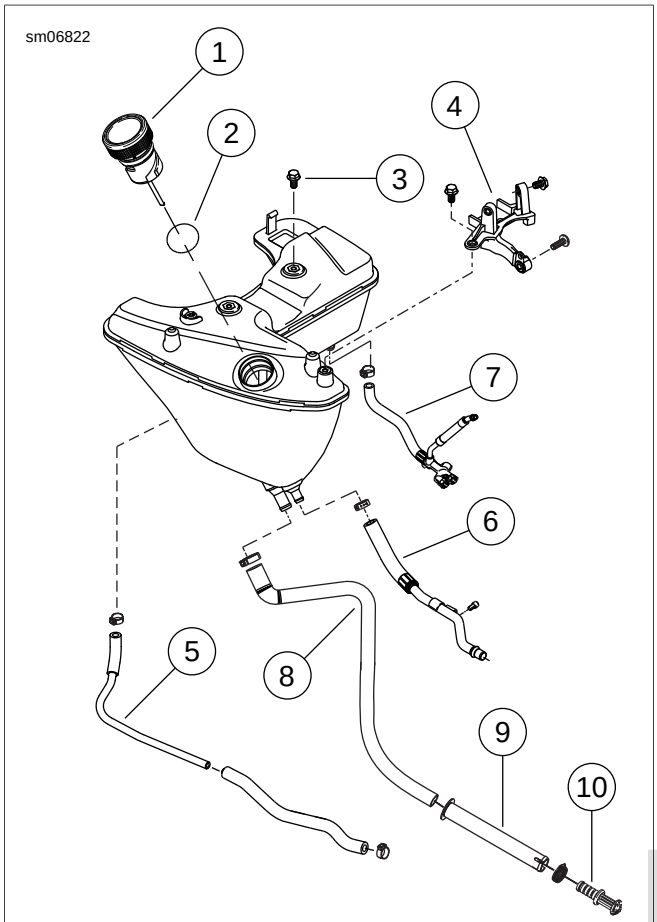
9. Connect positive (+) battery cables to battery. Connect negative (-) battery cable to ground point on engine crankcase. See 1.22 BATTERY MAINTENANCE.
10. Install left side cover.

⚠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)

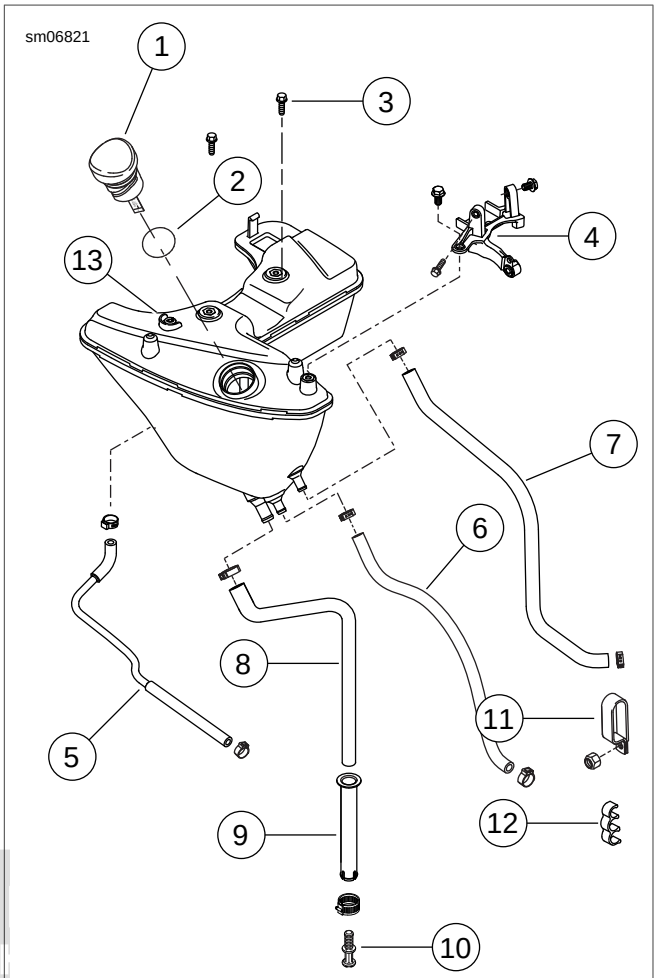
11. Install seat.

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1. Filler cap/dipstick
2. O-ring
3. Oil tank mounting screw
4. Bracket
5. Oil vent line
6. Oil feed line
7. Oil return line
8. Oil drain line
9. Oil drain line sleeve
10. Drain plug

Figure 3-175. Engine Oil Tank Assembly: XR 1200X



1. Filler cap/dipstick
2. O-ring
3. Oil tank mounting screw
4. Bracket
5. Oil vent line
6. Oil feed line
7. Oil return line
8. Oil drain line
9. Oil drain line sleeve
10. Drain plug
11. Clamp
12. Hose clip
13. Relief valve

Figure 3-176. Engine Oil Tank Assembly: XL Models

NOTES

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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 box to bracket fasteners: XR 1200X	36-60 **in-lbs**	4.1-6.7 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm	4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm	4.3 AIR CLEANER ASSEMBLY, XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL 1200V
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Cylinder head exhaust port nut	96-120 **in-lbs**	10.9-13.6 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Cylinder head oil feed flare fitting: XR 1200X	22-26 ft-lbs	29.8-35.3 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Cylinder head oil feed line flare nut: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
ET sensor	120-168 **in-lbs**	13.6-19.0 Nm	4.7 ENGINE TEMPERATURE (ET) SENSOR, Installation
EVAP canister clip mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
EVAP canister guard screw	35-45 **in-lbs**	4.0-5.1 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
EVAP canister mounting bracket screw	17-22 ft-lbs	23.1-29.9 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
EVAP canister mounting bracket screw	17-22 ft-lbs	23.1-29.9 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
Exhaust clamp, lower nut: XR 1200X	30-33 ft-lbs	40.7-44.7 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Exhaust flange nut: XR 1200X	96-120 **in-lbs**	10.8-13.6 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation/SPECIAL SEQUENCE TO TIGHTEN
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Exhaust pipe clamp bracket screw: XL Models	30-33 ft-lbs	40.7-44.8 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Exhaust pipe clamp nut: XL Models	20-30 ft-lbs	27.1-40.7 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Filler housing screws	40-45 **in-lbs**	4.5-5.1 Nm	4.5 FUEL TANK: XR 1200X, Assemble Fuel Tank
Fuel hose retaining bracket screw	60 **in-lbs**	6.8 Nm	4.15 FUEL INJECTORS, Installation
Fuel pump bracket mounting screw	19-36 **in-lbs**	2.1-4.1 Nm	4.16 FUEL PUMP, Assembly
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.16 FUEL PUMP, Installation
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.17 FUEL FILTER ELEMENT, Installation
Fuel tank cover screw: XR 1200X	24-30 **in-lbs**	2.7-3.4 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Fuel tank fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Fuel tank fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank

DIGITAL TECHNICIAN HARLEY-DAVIDSON

FASTENER	TORQUE VALUE		NOTES
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm	4.4 FUEL TANK: XL MODELS, Installing Fuel Tank
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm	4.8 INDUCTION MODULE: XL MODELS, Installation
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm	4.15 FUEL INJECTORS, Installation
IAC mounting screw: XL models	60 **in-lbs**	6.8 Nm	4.10 IDLE AIR CONTROL (IAC), Installation: XL Models
IAC mounting screw: XL Models	60 **in-lbs**	6.8 Nm	4.8 INDUCTION MODULE: XL MODELS, Assembly
IAC mounting screw: XR 1200X	60 **in-lbs**	6.8 Nm	4.9 INDUCTION MODULE: XR 1200X, Assembly
IAC mounting screw: XR 1200X	60 **in-lbs**	6.8 Nm	4.10 IDLE AIR CONTROL (IAC), Installation: XR 1200X
Induction module cable bracket screw: XL Models	60 **in-lbs**	6.8 Nm	4.8 INDUCTION MODULE: XL MODELS, Assembly
Induction module cover to cylinder head fastener: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X
Induction module cover to cylinder head sockethead bolts: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Induction module cover to induction module fastener: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Induction module cover to induction module fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X
Induction module cover to wire form fastener: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Induction module mounting bracket screw: XL models	90-120 **in-lbs**	10.2-13.6 Nm	4.8 INDUCTION MODULE: XL MODELS, Installation
Induction module screw: XL models	35 **in-lbs**	4.0 Nm	4.8 INDUCTION MODULE: XL MODELS, Assembly
Induction module screw: XL Models	35 **in-lbs**	4.0 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XL Models
Intake manifold mounting screw: XL models	96-120 **in-lbs**	10.9-13.6 Nm	4.8 INDUCTION MODULE: XL MODELS, Installation
Intake manifold mounting screw: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Interconnect bracket to frame fastener: XR 1200X	30-33 ft-lbs	40.7-44.7 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Master cylinder mounting bracket, rear, screw: XL models	17-22 ft-lbs	23.0-29.8 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
Muffler interconnect bracket mounting screw: XL Models	30-33 ft-lbs	40.7-44.7 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Muffler mount to frame, front fastener: XR 1200X	45-50 ft-lbs	61.0-67.8 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler mount to frame, rear fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler to front muffler mount fastener: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler to interconnect bracket screw: XL Models	15-19 ft-lbs	20.4-25.8 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Muffler to muffler bolt: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler torca clamp nut	38-43 ft-lbs	51.6-58.4 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FASTENER	TORQUE VALUE		NOTES
Muffler to rear muffler mount fastener: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
O2 sensor	29-44 ft-lbs	39.3-59.7 Nm	4.12 OXYGEN (O2) SENSOR, Installation
O2 sensor	29-44 ft-lbs	39.3-59.7 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Throttle cable bracket screw: XR 1200X	60 **in-lbs**	6.8 Nm	4.9 INDUCTION MODULE: XR 1200X, Assembly
TMAP sensor screw	80 **in-lbs**	9.0 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X
TPS screw: XL Models	35 **in-lbs**	4.0 Nm	4.6 THROTTLE POSITION SENSOR (TPS), Installation: XL Models
TPS screw: XR 1200X	29 **in-lbs**	3.3 Nm	4.6 THROTTLE POSITION SENSOR (TPS), Installation: XR 1200X
Wire form to induction module cover fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

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 and XR 1200X

ITEM	XL 1200C/C ANV/CP/CA/CB		XL 1200X/V		XR 1200X	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
Fuel tank (total)	4.5 gal	17.0 L	2.1 gal	7.9 L	3.5 gal	13.2 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 gal	3.8 L	0.65 gal	2.5 L	0.8 gal	3.0 L

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

AIR CLEANER ASSEMBLY 4.3

XL MODELS EXCEPT XL 1200V

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 two screws (1) and trim insert (2) from air cleaner cover (3).
2. Remove air cleaner cover from air cleaner backplate (10).
3. Remove air cleaner seal (4) from air cleaner cover.
4. Remove three screws (5). Remove air filter element (6) and gasket (7). Discard gasket.
5. Remove O-rings from the breather screws (9). Discard the O-rings.

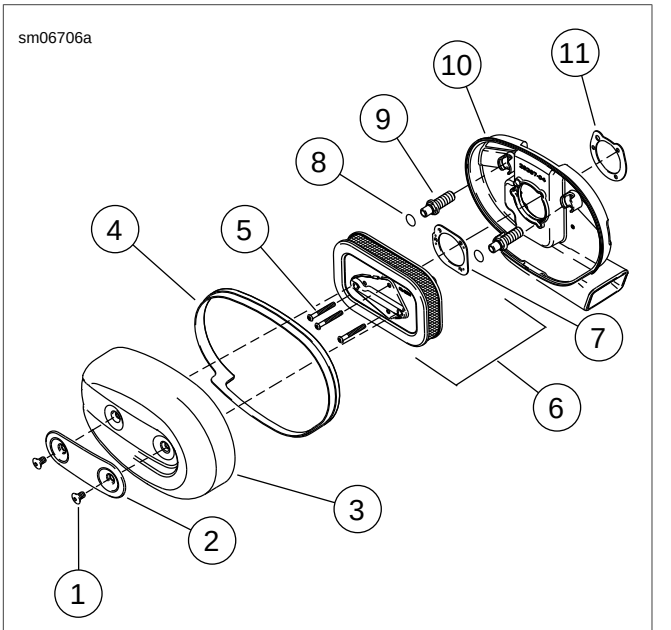
NOTICE

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

6. Remove two breather screws (9) from air cleaner backplate.
7. Remove air cleaner backplate and gasket (11).

Installation

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. To prevent damage, 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. Line up 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 the air cleaner seal around the entire edge of cover.
7. Install air cleaner cover onto backplate. Do not pinch or distort seal.
8. Install trim insert (2) and air cleaner cover with two screws (1). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



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: All XL except XL 1200V

XL 1200V

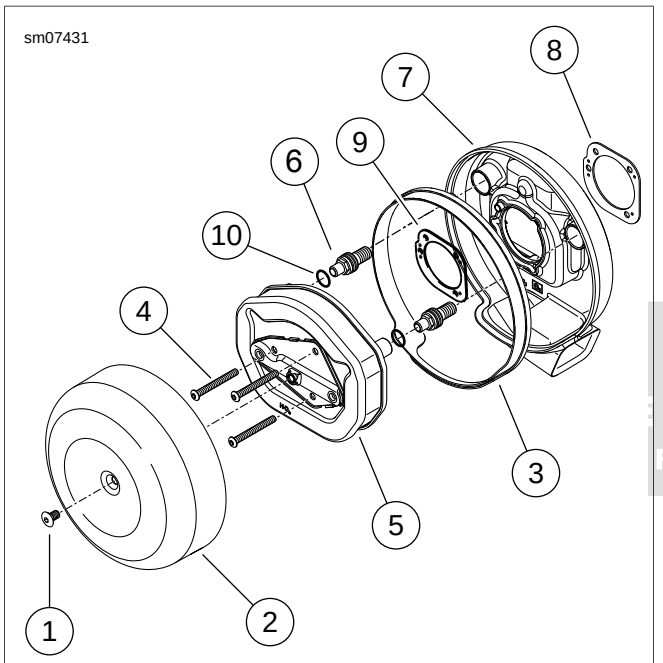
FASTENER	TORQUE VALUE	
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. See Figure 4-2. Remove the cover screw (1).
2. Remove the cover (2) and the seal (3).
3. Remove the three screws (4), the air filter element (5) and gasket (9).
4. Remove the O-rings (10). Discard the O-rings.
5. Remove the two breather screws (6).
6. Remove the backplate (7) and gasket (8).
7. Inspect and replace parts as necessary.
8. Clean or replace the air filter element as necessary. See 1.7 AIR FILTER, Cleaning Filter Element.

Installation

1. See Figure 4-2. Install the gasket (8) and backplate (7).
2. Apply LOCTITE 243 MEDIUM STRENGTH THREAD-LOCKER AND SEALANT (blue) to existing screws or use **new** breather screws (6). Install the breather screws. Tighten to 84-120 **in-lbs** (9.5-13.6 Nm).
3. Apply engine oil to **new** O-rings (10). Install the O-rings on the breather tubes.
4. Install the filter gasket (9).
5. Install the air filter element (5) and screws (4). Tighten to 40-60 **in-lbs** (4.5-6.8 Nm).
6. Fit the cover (2) to the seal (3).
7. Install the cover and screw (1). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **Screw**
2. **Cover**
3. **Seal**
4. **Screw (3)**
5. **Filter element**
6. **Breather screw**
7. **Backplate**
8. **Backplate gasket**
9. **Filter gasket**
10. **O-ring**

Figure 4-2. Air Cleaner Assembly: XL 1200V

XR 1200X

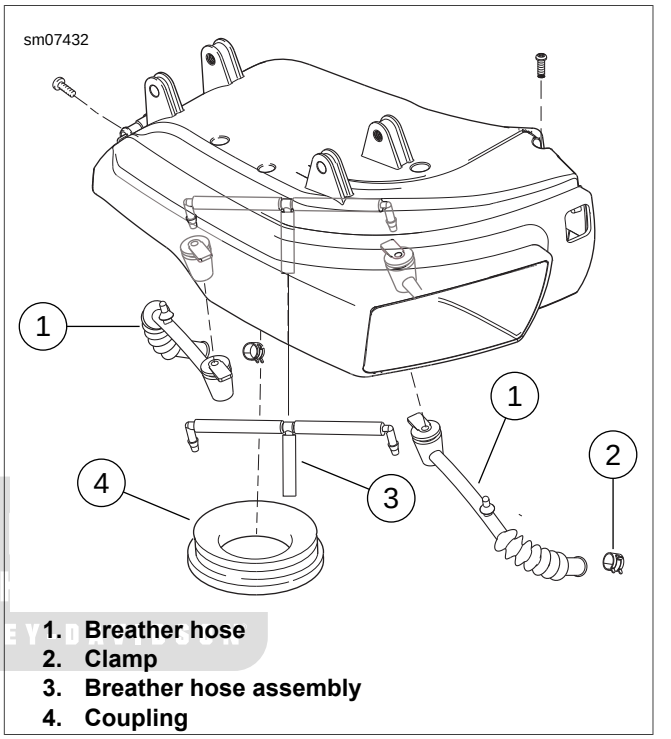
Removal

1. Remove the fuel tank. See 4.5 FUEL TANK: XR 1200X.
2. **HDI Models:** Disconnect active intake solenoid connector [178].

NOTE

Leave the rubber coupling attached to the induction module.

3. Lift the air box off induction module.
4. See Figure 4-3. Disconnect the crankcase breather hoses from the front and rear rocker cover fittings.
5. Remove the air box assembly.
6. Remove the cover and air filter element as necessary. See 1.7 AIR FILTER, XR 1200X.
7. Replace damaged parts as necessary.



1. **Breather hose**
2. **Clamp**
3. **Breather hose assembly**
4. **Coupling**

Figure 4-3. Air Box: XR 1200X

Installation

NOTE

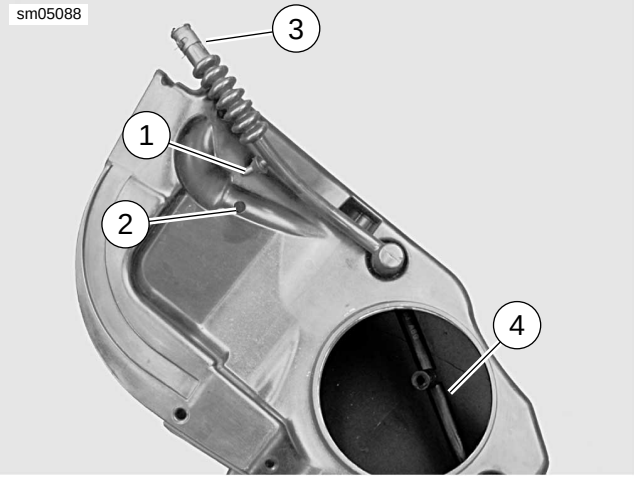
See Figure 4-4. Check that the breather hose assembly (4) inside the air box does not interfere with the active air solenoid flapper.

1. Install all hoses.
2. Snap the anchor barb (1) of the front crankcase vent hose in the hole (2) in the air box bottom.
3. If removed, install the air filter element and cover. See 1.7 AIR FILTER, XR 1200X.
4. Seat the rubber coupling on the induction module.
5. Verify that the clamps are in place.
6. See Figure 4-5. Hold the air box close. Connect crankcase vent hoses to the fittings (2) on the front and rear rocker covers.

NOTE

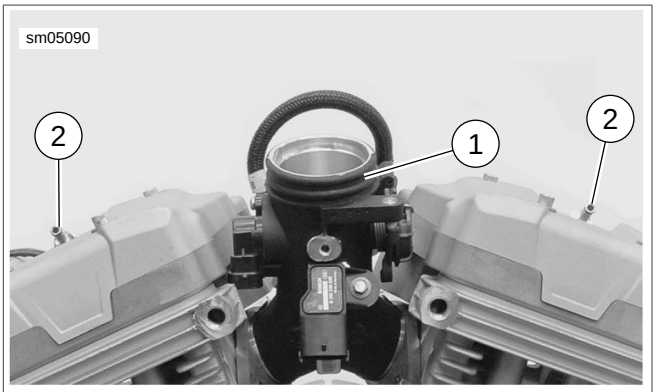
The edge of hole in air box must encircle the groove in the coupling.

7. Seat the coupling into the air box opening.
8. **HDI Models:** Connect the active intake solenoid connector [178].
9. Install the fuel tank. See 4.5 FUEL TANK: XR 1200X.



1. **Anchor barb**
2. **Anchor hole in air box**
3. **Vent hose clamp**
4. **Breather hose assembly**

Figure 4-4. Front Crankcase Vent Hose



1. **Induction module throat**
2. **Fittings on rocker covers**

Figure 4-5. Air Box Connections

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL TANK: XL MODELS 4.4

PURGING AND DISCONNECTING FUEL SUPPLY HOSE

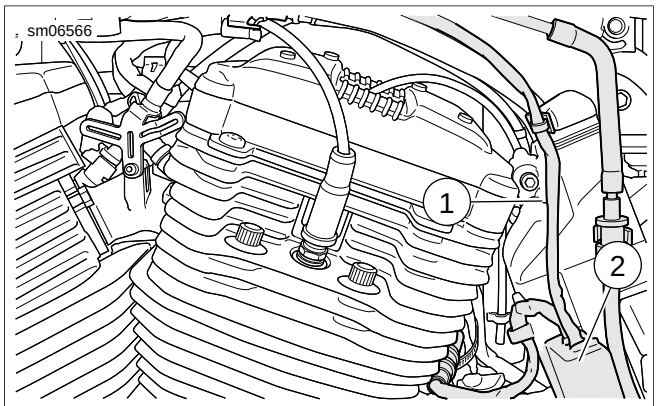
⚠WARNING

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

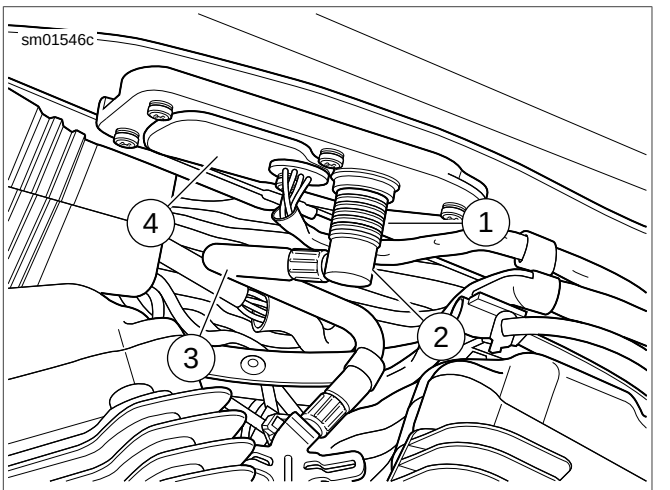
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge the fuel supply line of high pressure gasoline.
   a. Remove left side cover. See 2.18 LEFT SIDE COVER.
   b. See Figure 4-6. Remove fuel pump connector from ECM caddy cover (2).
   c. Unplug fuel pump connector [141].
   d. Start engine and allow vehicle to run.
   e. When engine stalls, operate starter for 3 seconds to remove any remaining fuel from fuel hose.
   f. Shut off ignition.
2. See Figure 4-7. Push up on release sleeve (1) on fuel pump quick-connect fitting and pull down on fuel supply hose fitting (2) to disconnect fuel supply hose (3) from fuel pump module (4). Immediately clean up any fuel spills.



1. **Fuel pump wiring**
2. **ECM caddy cover (fuel pump connector inside)**

Figure 4-6. Fuel Pump Connector: XL Models



1. **Release sleeve (quick-connect fitting)**
2. **Fuel supply hose fitting**
3. **Fuel supply hose**
4. **Fuel pump module**

Figure 4-7. 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)

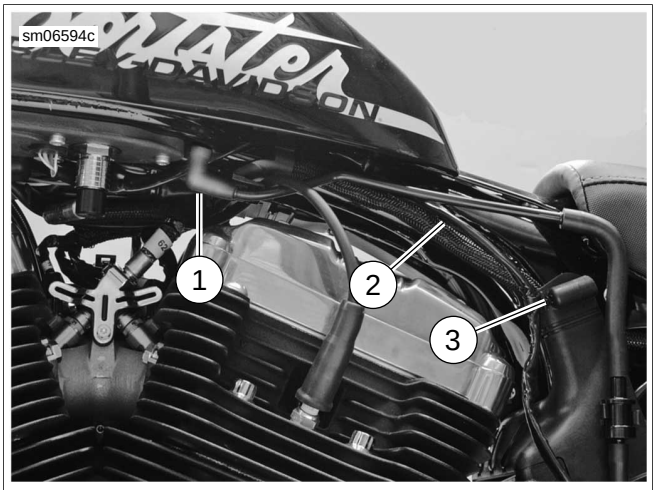
1. Remove main fuse.
2. Remove seat.

NOTES

- *If the fuel tank is being removed only to gain access to items otherwise hidden, it is not necessary to drain the fuel from the tank. If the fuel tank is to be disassembled or repaired, follow the step below to drain the fuel.*
- *Drain fuel into an approved container.*

3. Drain fuel tank:
   a. Obtain a suitable fuel transfer pump with a long, flexible nozzle.
   b. Position vehicle upright. Remove fuel tank filler cap.
   c. Insert fuel transfer pump nozzle into fuel tank filler spout. Aim nozzle toward right side of fuel tank to avoid contacting and damaging fuel pump assembly.
   d. Direct the pump output into an approved container.
   e. Pump fuel until fuel tank is empty.
   f. Immediately wipe up any spilled fuel.
4. See Figure 4-8. Remove vent hose (1) from fuel tank vent nipple. Remove cable clip (3) securing fuel pump wiring harness (2) to mounting boss on H-bracket.
5. Unplug fuel pump connector [141].

6. Remove protective caps, locknuts, screws and washers from front and rear of fuel tank.
7. Place a clean, soft cloth over front of fuel tank to keep tank from contacting top fork clamp and damaging paint. Lift up rear of fuel tank. Remove fuel pump harness from clip on wire harness caddy latch clip on frame backbone.
8. Lift fuel tank off motorcycle.
9. Remove fuel pump assembly. See 4.16 FUEL PUMP.



1. **Vent hose**
2. **Fuel pump wiring harness**
3. **Cable clip**

Figure 4-8. Fuel Tank Vent Hose

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 fuel tank interior with commercial cleaning solvent or a soap and water solution. Shake fuel tank to agitate cleaning agent.
2. Thoroughly flush fuel tank after cleaning. Allow fuel tank to air dry.
3. Carefully inspect fuel hose and vent hose for damage, cuts, cracks, holes, wear or general deterioration. Replace as necessary.
4. Inspect the fuel tank for leaks or other damage. If a damaged fuel tank cannot be successfully repaired, replace it.

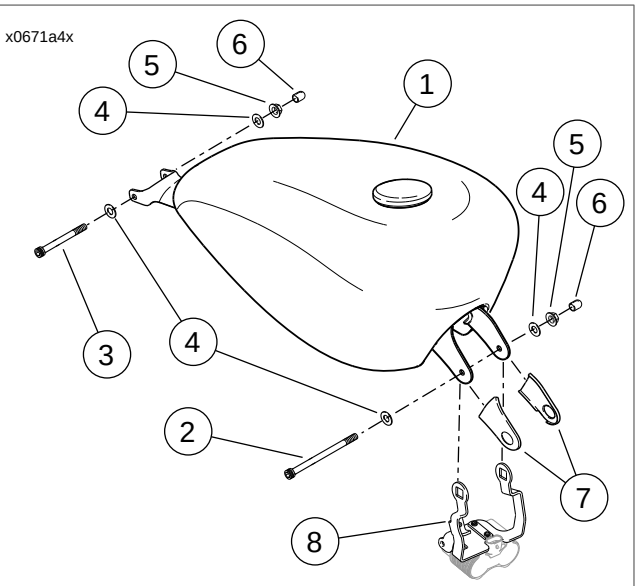
INSTALLING FUEL TANK

FASTENER	TORQUE VALUE	
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm

NOTE

Verify wiring harnesses are not pinched between fuel tank and frame during tank installation.

1. Install fuel pump into fuel tank using **new** gasket. See 4.16 FUEL PUMP.
2. See Figure 4-9. Position fuel tank on motorcycle. Verify that front fuel tank brackets are located outboard of ignition coil bracket (8).
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).



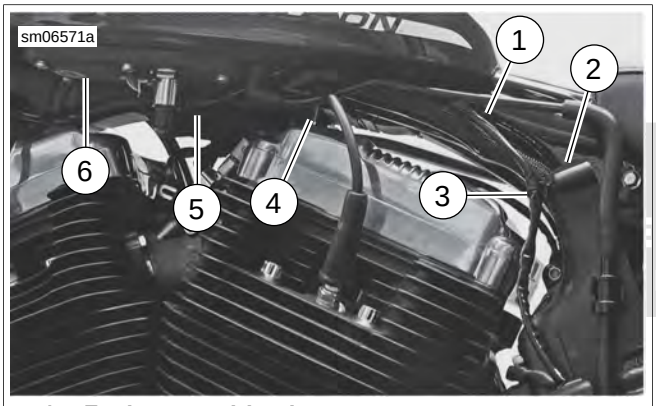
1. **Fuel tank (typical)**
2. **Screw (long)**
3. **Screw (short)**
4. **Washer (4)**
5. **Locknut (2)**
6. **Protective cap (2)**
7. **Cosmetic cover (2)**
8. **Ignition coil bracket**

Figure 4-9. Fuel Tank Mounting (typical)

4. See Figure 4-10. Place a clean, soft cloth over front of fuel tank to keep tank from contacting top fork clamp and damaging paint.
5. Lift up rear of fuel tank.
6. Place fuel pump wiring harness (1) into clip on wire harness caddy latch clip on frame backbone tube. Verify that

the harness forms a loop (5) between caddy latch clip and fuel pump module (6). Do not pinch harness between fuel tank and frame backbone tube.

7. Route fuel pump wiring harness down along left side of H-bracket. Secure with cable clip (3). Push clip into hole in mounting boss (2) on H-bracket.
8. Install fuel tank.
   a. Lower rear of fuel tank into position.
   b. See Figure 4-9. 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.
9. See Figure 4-8. Install vent hose onto fuel tank vent nipple.
10. Connect the fuel pump connector [141] housings.



1. **Fuel pump wiring harness**
2. **Cable clip mounting boss on ECM caddy**
3. **Cable clip**
4. **Wire harness caddy latch clip**
5. **Fuel pump wiring harness loop**
6. **Fuel pump module**

Figure 4-10. Fuel Pump Wiring 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 4-7. Connect fuel hose.
   a. Push up on release sleeve (1).
   b. Push fuel hose fitting (2) into fuel pump module fuel pump quick-connect fitting.
   c. Pull down on release sleeve to lock quick-connect fitting.
   d. Tug on fuel hose fitting to make sure it is securely locked in place.
2. See Figure 4-8. 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 and carefully inspect for leaks around fuel pump module.
4. Install main fuse.
5. Turn ignition switch ON and verify fuel pump is activated. Carefully inspect for leaks at quick-connect fitting. Turn ignition switch OFF.

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.

VAPOR VALVE

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)

See Figure 4-11. The fuel tank is vented through a standpipe (vent tube) within the tank. A hose (1) at the base of the fuel tank is connected to the standpipe.

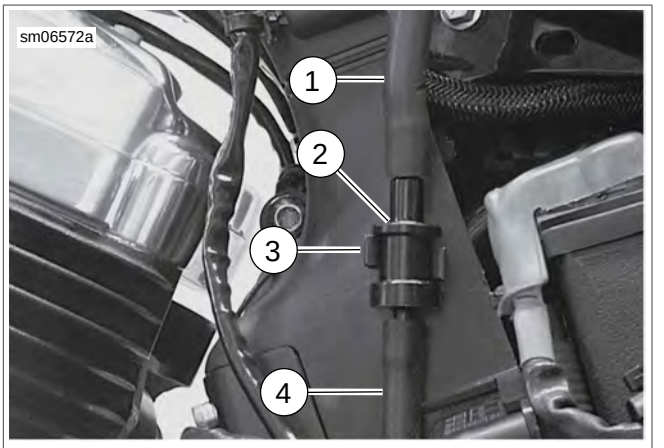
WARNING

Keep vent and vapor valve lines away from exhaust and engine. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00263a)

The fuel tank vent hose is connected to a vapor valve (2). This valve attaches into a clip (3) on the ECM caddy behind the left side cover. On non-evaporative emission controlled models, another hose (4) vents the vapor valve to the atmosphere. On evaporative emission controlled models, that hose is routed to the charcoal canister. See 4.20 EVAPORATIVE EMISSIONS CONTROL.

NOTES

- *Mount the vapor valve in an upright position with the longer fitting positioned at the top or excessive fuel vapor pressure may build up within the fuel tank.*
- *Do NOT force vapor valve into clip. Forcing valve in to clip could cause clip to break, necessitating replacement of the ECM caddy.*



1. **Fuel-to-vapor valve hose**
2. **Vapor valve**
3. **Vapor valve clip**
4. **Vapor valve-to-atmosphere hose (non-evaporative emission controlled models)**

Figure 4-11. Vapor Valve

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL TANK: XR 1200X 4.5

PURGING AND DISCONNECTING FUEL SUPPLY HOSE

⚠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

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)

⚠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 the fuel supply line of high pressure gasoline.
   a. See Figure 4-12. Unplug fuel pump connector [141].
   b. Start engine and allow vehicle to run.
   c. When engine stalls, operate starter for 3 seconds to remove any remaining fuel from fuel hose.
   d. Shut off ignition.

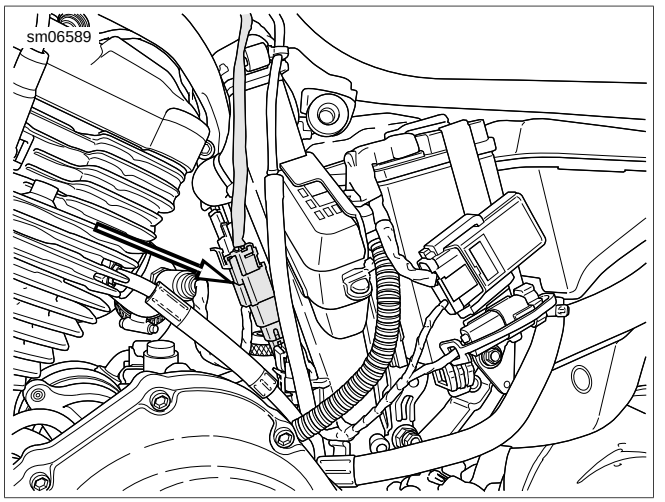
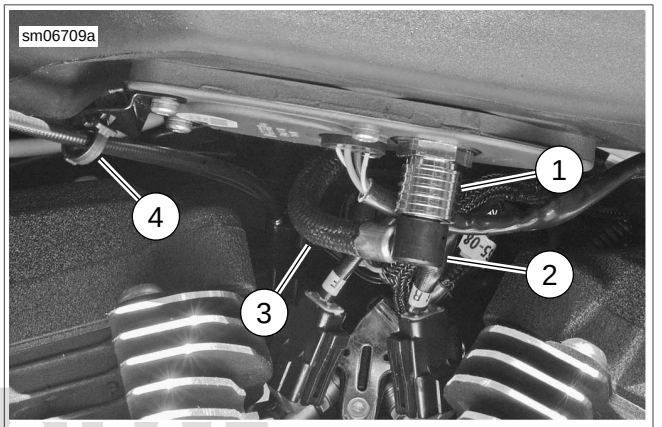


Figure 4-12. Fuel Pump Connector Location

⚠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)

2. See Figure 4-13. Push up on release sleeve (1) on fuel pump quick-connect fitting and pull down on fuel supply hose fitting (2) to disconnect fuel supply hose (3). Immediately clean up any fuel spills.



1. Release sleeve (quick-connect fitting)
2. Fuel supply hose fitting
3. Fuel supply hose
4. Throttle cable retainer

Figure 4-13. Fuel Tank Quick-Connect Fitting

REMOVING FUEL TANK

1. Purge the fuel supply line of high pressure gasoline. Disconnect fuel line from fuel tank. See 6.3 FUSES AND RELAYS, Main Fuse.

⚠WARNING

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

2. Remove main fuse.

NOTES

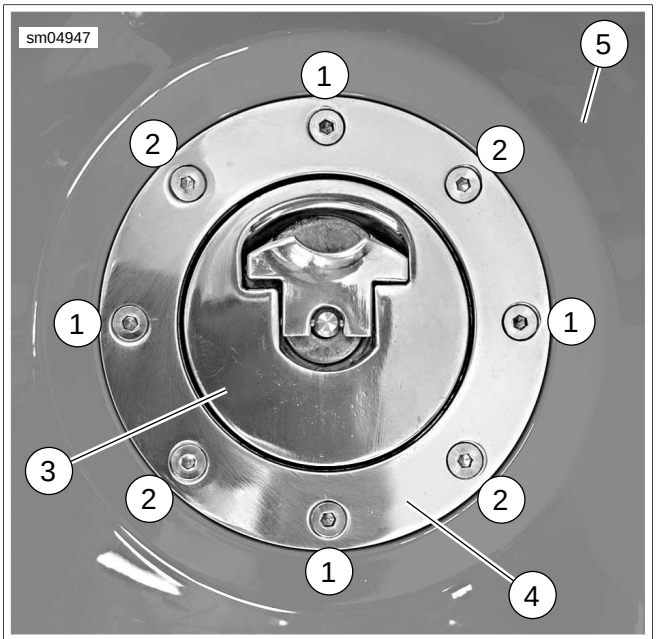
- *If the fuel tank is being removed only to gain access to items otherwise hidden, it is not necessary to drain the fuel from the tank. If the fuel tank is to be disassembled or repaired, drain the fuel tank.*
- *Drain fuel into an approved container.*

3. Drain fuel tank:
   a. Obtain a suitable fuel transfer pump with a long, flexible nozzle.
   b. Position vehicle upright. Remove fuel tank filler cap.
   c. Insert fuel transfer pump nozzle into fuel tank filler spout. Aim nozzle toward right side of fuel tank to avoid contacting and damaging fuel pump assembly.
   d. Direct the pump output into an approved container.
   e. Pump fuel until fuel tank is empty.
   f. Replace fuel tank filler cap.
   g. Immediately wipe up any spilled fuel.
4. See Figure 4-13. Remove retainer (4) securing throttle cables to plate on bottom of fuel tank.

NOTE

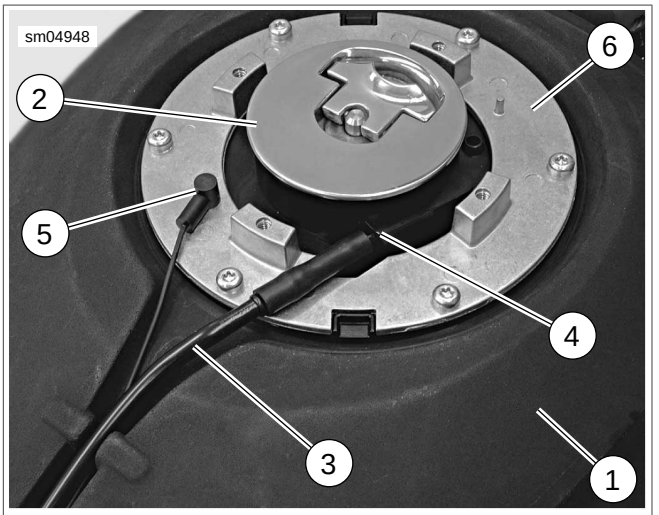
See Figure 4-14. Short screws (2) secure trim ring to fuel tank cover only. It is not necessary to remove these screws unless either trim ring or fuel tank cover is being replaced.

5. See Figure 4-14. Remove four long screws (1) that secure trim ring (4) and fuel tank cover (5) to fuel tank.
6. Carefully lift fuel tank cover off fuel tank. Slide cover forward slightly as it is lifted to clear sides of fuel tank.
7. See Figure 4-15. Remove vent hose (3) from fuel tank vent fitting (4). With a gentle twisting motion, pull ground wire connector [210] (5) straight up off pin on fuel tank clamp ring (6).
8. Remove vent hose and ground wire from trough in center of fuel tank. Pull vent hose and ground wire back out of the way.



1. **Screw, long (4)**
2. **Screw, short (4)**
3. **Fuel cap**
4. **Trim ring**
5. **Fuel tank cover**

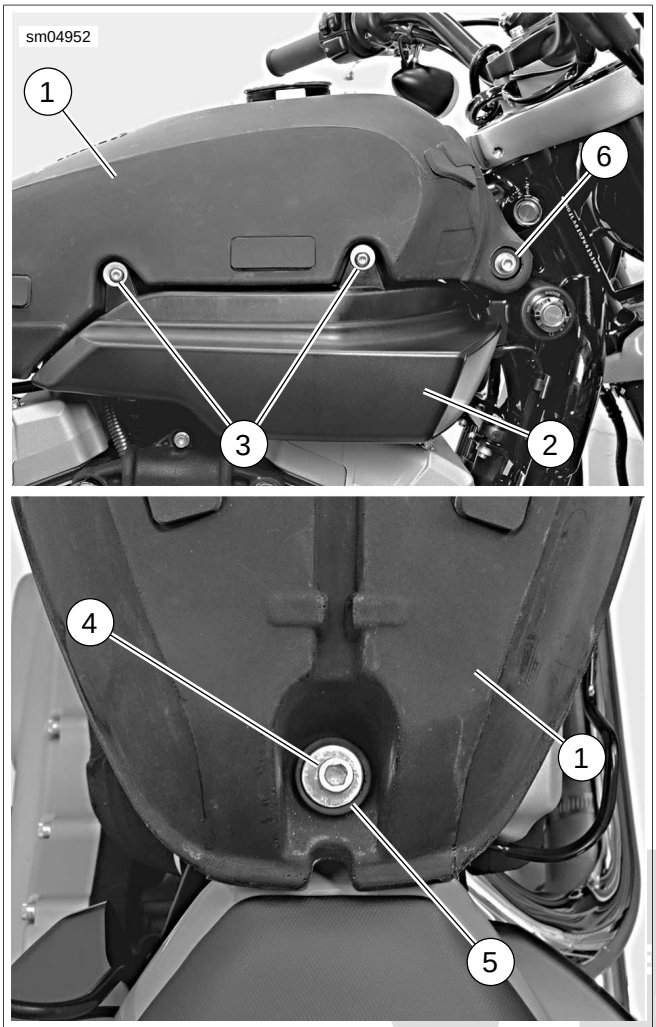
Figure 4-14. Fuel Cap and Trim Ring



1. **Fuel tank**
2. **Fuel cap**
3. **Vent hose**
4. **Vent fitting**
5. **Ground wire connector [210]**
6. **Clamp ring**

Figure 4-15. Fuel Tank Vent Hose and Ground Wire

9. See Figure 4-16. Remove two screws and washers (3) securing air box to bottom of fuel tank.
10. Remove screw with washer (4) from rear of fuel tank. Remove protective plastic cap (not shown) from threaded end of screw (6). Remove screw, washers and locknut from the front of the fuel tank.
11. See Figure 4-13. Remove throttle cable retainer (4) from fuel tank.



1. **Fuel tank**
2. **Air box**
3. **Screw w/washer (2)**
4. **Screw w/washer**
5. **Rubber grommet**
6. **Screw w/washers and locknut**

Figure 4-16. Fuel Tank and Air Box Mounting Fasteners

12. Lift fuel tank off motorcycle.

NOTE

See Figure 4-19. Metal bushings (4) inside the grommets (3) may fall when fuel tank is lifted off vehicle. Make sure they do not fall out and become lost.

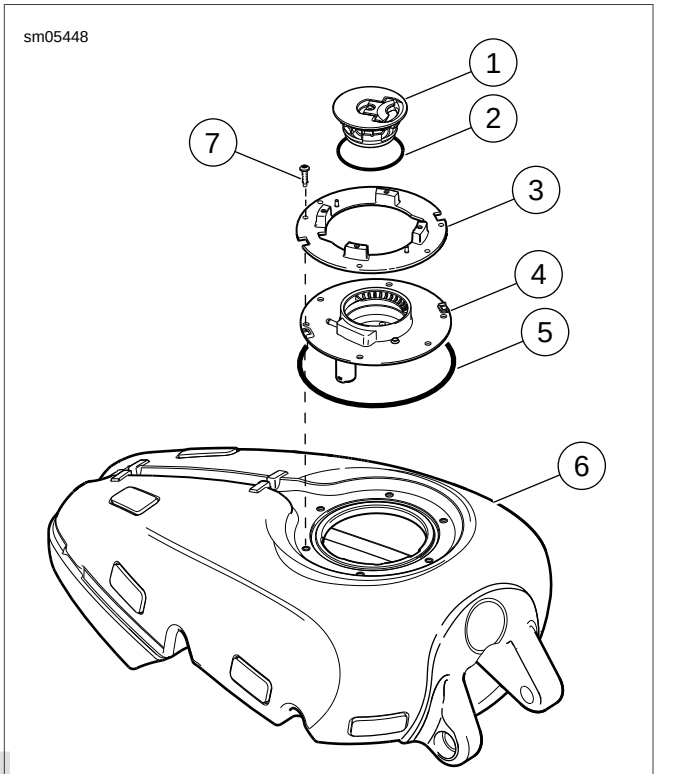
13. Remove fuel pump assembly from fuel tank. See 4.16 FUEL PUMP.

DISASSEMBLE FUEL TANK

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. See Figure 4-17. Remove filler cap (1) with O-ring (2).
2. Remove screws (7) and clamp ring (3).
3. Remove top ring (4).
4. Remove O-ring (5).



1. **Filler cap**
2. **O-ring**
3. **Clamp ring**
4. **Top ring**
5. **O-ring**
6. **Fuel tank**
7. **Screw (6)**

Figure 4-17. Fuel Tank Assembly

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 fuel tank interior with commercial cleaning solvent or a soap and water solution. Shake fuel tank to agitate cleaning agent.
2. Thoroughly flush fuel tank after cleaning. Allow fuel tank to air dry.
3. Carefully inspect fuel hose and vent hose for damage, cuts, cracks, holes, wear or general deterioration. Replace as necessary.
4. Inspect the fuel tank for leaks or other damage. Replace the tank if necessary.

ASSEMBLE FUEL TANK

FASTENER	TORQUE VALUE	
Filler housing screws	40-45 **in-lbs**	4.5-5.1 Nm

⚠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. See Figure 4-17. Install **new** O-ring (5) on the fuel tank (6). Verify that it is seated properly.
2. Install top ring and clamp ring with screws (7).
3. See Figure 4-18. Tighten screws in the sequence shown to 40-45 **in-lbs** (4.5-5.1 Nm).
4. See Figure 4-17. Install filler cap (1) with a **new** O-ring (2).

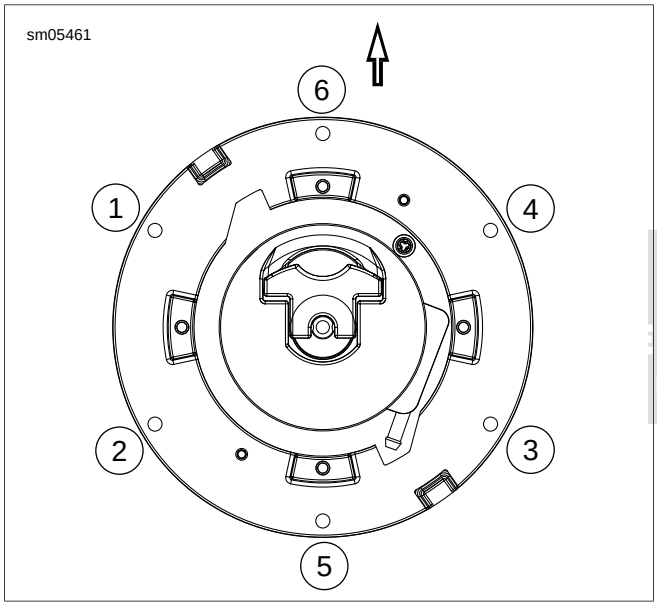


Figure 4-18. Filler Housing Torque Sequence

INSTALLING FUEL TANK

FASTENER	TORQUE VALUE	
Air box to bracket fasteners: XR 1200X	36-60 **in-lbs**	4.1-6.7 Nm
Fuel tank fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm
Fuel tank fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm
Fuel tank cover screw: XR 1200X	24-30 **in-lbs**	2.7-3.4 Nm

NOTE

Be sure that wiring harnesses do not get pinched between fuel tank and frame during tank installation.

1. Install fuel pump into fuel tank using **new** gasket. See 4.16 FUEL PUMP.
2. See Figure 4-19. Install rubber grommets (3) in both front mounting holes of fuel tank. Insert metal bushings (4) into rubber grommets, oriented as shown. Verify that the clip nut (5) is installed on frame bracket.

NOTES

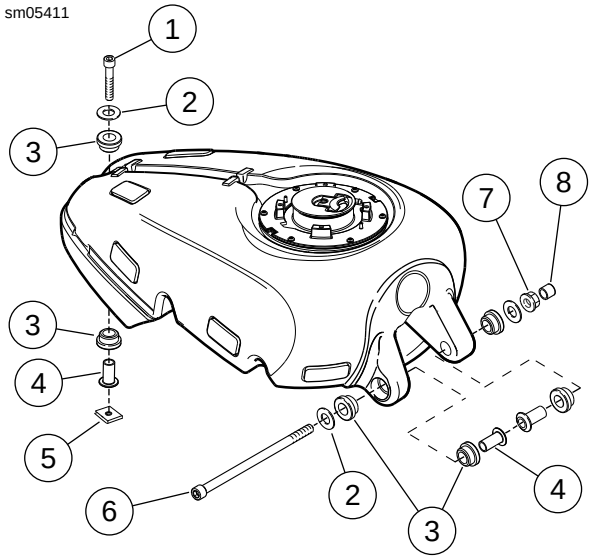
- *Verify that the ignition coil bracket is positioned between the tank mount and the frame.*
- *Verify that the air box mounting brackets are mated.*

3. Position fuel tank on motorcycle.
4. Insert screw (6) with washer (2) through fuel tank front mounting brackets and vehicle frame. Install remaining washer and locknut (7) on other end of screw. Do not tighten at this time.
5. Secure pump harness to main harness retainer located under fuel tank.
6. Install rubber grommets (3) in rear mounting hole of fuel tank.

NOTE

Verify that the air box grommet is securely installed on induction module and air box opening. An improperly seated grommet could lead to accelerated engine wear. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.

7. Secure air box to brackets on bottom of fuel tank. Tighten to 36-60 **in-lbs** (4.1-6.7 Nm).
8. Mount the fuel tank.
   a. Locate the metal bushing (4) inside the rear lower rubber grommet (3) of fuel tank.
   b. Install screw (1), washer (2) and upper grommet (3).
   c. Thread into clip nut (5). Tighten to 15-20 ft-lbs (20.3-27.1 Nm).
   d. Tighten front screw (6) and locknut (7) to 15-20 ft-lbs (20.3-27.1 Nm).
9. See Figure 4-13. Secure throttle cables to bottom of fuel tank using a **new** loop retainer.
10. See Figure 4-15. Connect vent hose (3) and ground wire (5) as shown. Route ground wire and vent hose in trough in top of tank.
11. See Figure 4-14. Install fuel tank cover and secure with four screws (1). Tighten screws to 24-30 **in-lbs** (2.7-3.4 Nm).
12. Connect fuel pump connector [141].
13. Connect fuel supply fitting. See 4.5 FUEL TANK: XR 1200X, Connecting Fuel Hose and Filling Fuel Tank.



1. **Rear screw**
2. **Washer (3)**
3. **Rubber grommet (6)**
4. **Metal bushing (3)**
5. **Clip nut**
6. **Front screw**
7. **Locknut**
8. **Cap**

Figure 4-19. Fuel Tank Mounting

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 4-13. Connect the fuel hose fitting:
   a. Push up on release sleeve (1).
   b. Push fuel hose fitting (2) into fuel pump module fuel pump quick-connect fitting.
   c. Pull down on release sleeve to lock quick-connect fitting.
   d. Tug on fuel hose fitting to make sure it is securely locked in place.

⚠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)

2. Fill fuel tank and carefully inspect for leaks around fuel pump module.
3. Install main fuse.
4. Turn ignition switch ON and verify fuel pump is activated. Carefully inspect for leaks at quick-connect fitting and induction module. Turn ignition switch OFF.
5. Install left side cover.

DIGITECHNICIAN II HARLEY-DAVIDSON

THROTTLE POSITION SENSOR (TPS) 4.6

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 4-20 or Figure 4-21. The TPS is located on the side of the induction module. The TPS monitors the physical position of the throttle shaft. See the electrical diagnostic manual.

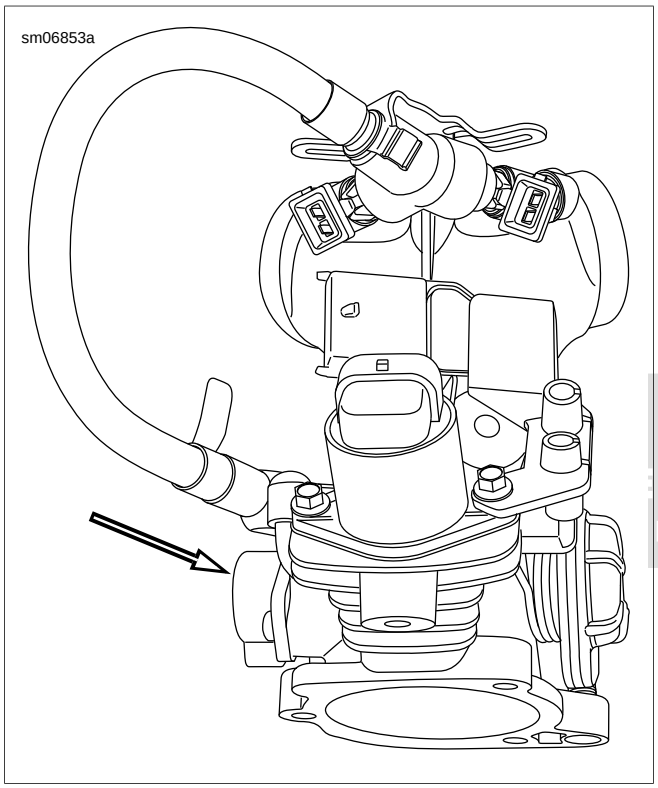


Figure 4-20. TPS Location: XL Models

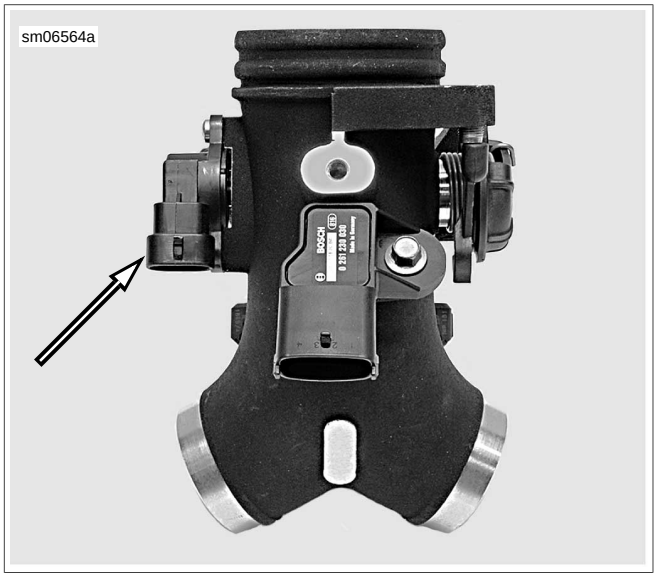


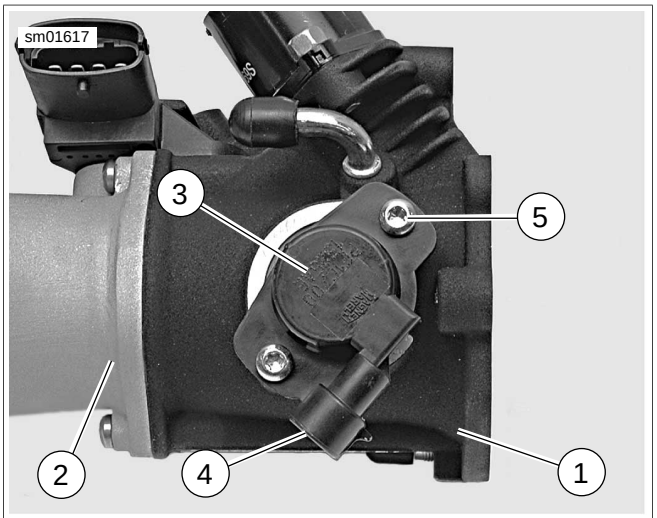
Figure 4-21. TPS Location: XR 1200X

REMOVAL: XL MODELS

⚠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 4-22. Unplug TPS harness connector [88B] from connector socket [88A] (4). Cover both connectors with tape.
4. 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 4-22. Throttle Position Sensor (TPS) Removal: XL Models

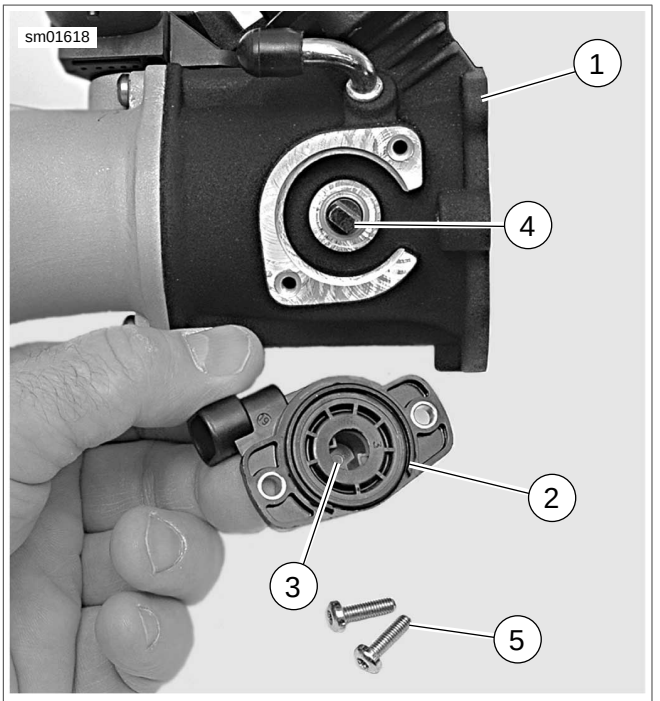
INSTALLATION: XL MODELS

FASTENER	TORQUE VALUE	
TPS screw: XL Models	35 **in-lbs**	4.0 Nm

NOTES

- *Throttle must be closed to install the TPS.*
- *See Figure 4-22. Note orientation of TPS (3) relative to induction module (1) body. The connector socket is at approximately the 7 o'clock position, facing toward intake manifold (2).*

1. See Figure 4-23. 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).
2. Make sure TPS body is flush against mounting boss on induction module body. Install two screws (5) to fasten sensor to induction module. Tighten screws to 35 **in-lbs** (4.0 Nm).
3. Open and close throttle plates and check for proper operation. Be sure mechanism operates smoothly 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. Close left side cover.
8. Start motorcycle. Check throttle operation and idle speed.
9. Check for leaks at the quick connect fitting and at the induction module.



1. **Induction module**
2. **TPS**
3. **Pocket**
4. **Throttle shaft**
5. **Screw (2)**

Figure 4-23. Throttle Position Sensor (TPS) Installation: XL Models

REMOVAL: XR 1200X

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)

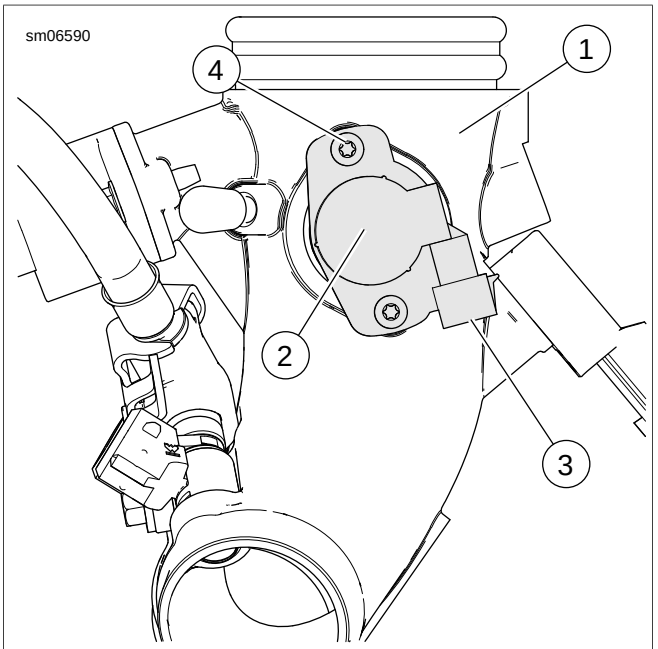
1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XR 1200X.

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 and air box. See 4.5 FUEL TANK: XR 1200X and 4.3 AIR CLEANER ASSEMBLY, XR 1200X.

4. See Figure 4-24. Remove induction module from vehicle. See 4.9 INDUCTION MODULE: XR 1200X.
5. Remove two screws (4) and detach TPS (2) from induction module (1).



1. **Induction module**
2. **TPS**
3. **TPS connector socket [88A]**
4. **Screw (2)**

Figure 4-24. Throttle Position Sensor (TPS) Removal: XR 1200X

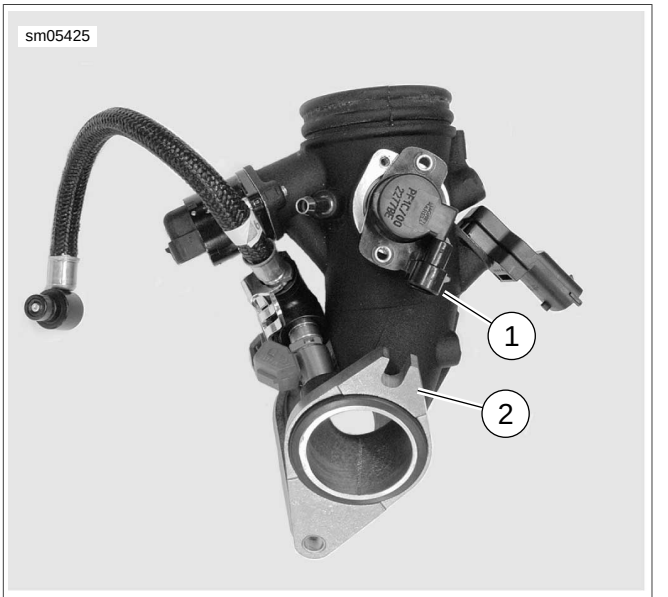
INSTALLATION: XR 1200X

FASTENER	TORQUE VALUE	
TPS screw: XR 1200X	29 **in-lbs**	3.3 Nm

NOTES

- *Throttle must be closed for installation of throttle position sensor.*
- *See Figure 4-24. Note installed orientation of TPS (2) relative to induction module (1) body. The connector socket is at approximately the 5:00 o'clock position.*

1. See Figure 4-25. Place sensor over throttle shaft with the connector housing (1) facing toward the mounting flange (2).
2. Rotate the TPS counterclockwise into position as shown in Figure 4-24.
3. Make sure TPS body is flush against mounting boss on induction module body. Install two screws (4). Tighten to 29 **in-lbs** (3.3 Nm).
4. Open and close throttle plate. Be sure mechanism operates smoothly without binding or sticking.



1. **Connector housing**
2. **Mounting flange**

Figure 4-25. Throttle Position Sensor (TPS) Installation: XR 1200X

5. Install induction module. See 4.9 INDUCTION MODULE: XR 1200X.
6. Install air box assembly and fuel tank. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X and 4.5 FUEL TANK: XR 1200X.

⚠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)

7. Connect fuel hose to fuel pump module. Fill fuel tank and carefully check for leaks around fuel hose fitting. See 4.5 FUEL TANK: XR 1200X.
8. Install main fuse.
9. Turn ignition switch on. Check for leaks at the quick connect fitting and at the induction module.
10. Start motorcycle. Check throttle operation and idle speed.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE TEMPERATURE (ET) SENSOR 4.7

GENERAL

See Figure 4-26. The ET sensor is located in the top of the rear cylinder head. See the electrical diagnostic manual.

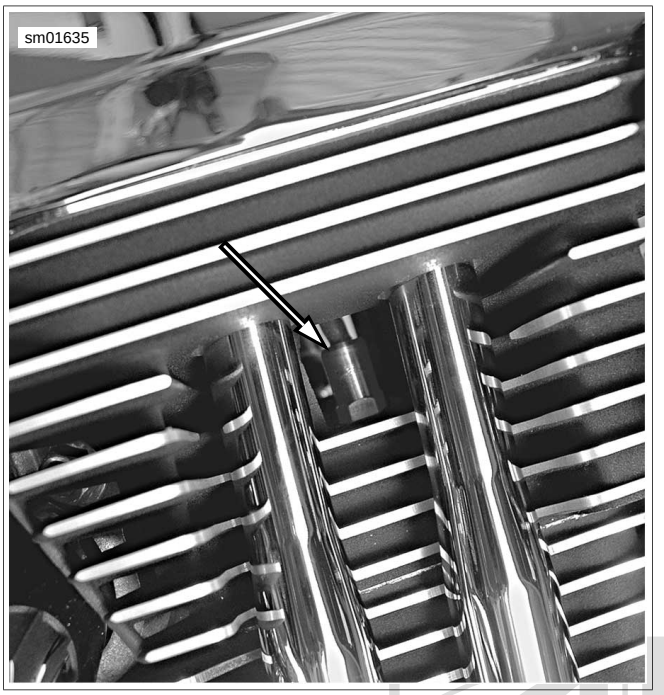


Figure 4-26. ET Sensor Location

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

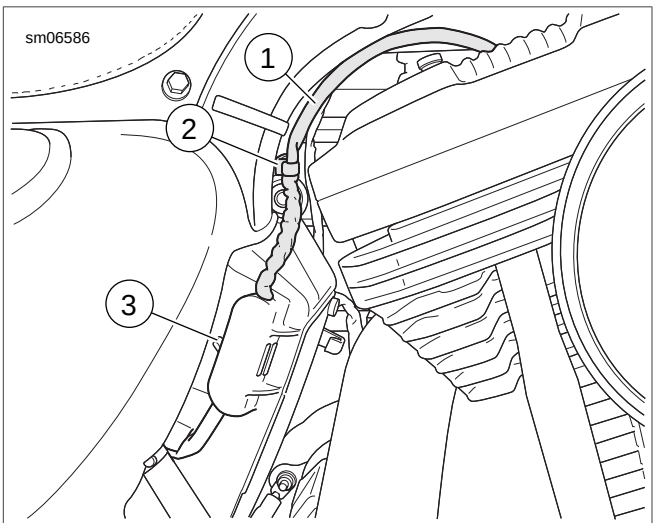
Gasoline can drain from quick-connect fitting when removing fuel line. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00267a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠WARNING

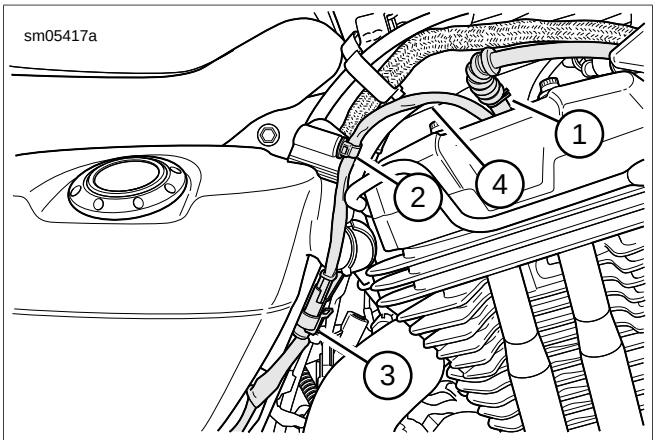
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
4. See Figure 4-27 or Figure 4-28. Disconnect the ET sensor connector [90] (3) located on right side of H-bracket/ECM caddy.
5. Cut barbed cable strap (2) to free sensor harness from H-bracket/ECM caddy.
6. **XR 1200X:** See Figure 4-28. Disconnect the breather hose (1) from the rear cylinder to gain access to the sensor.
7. Remove ET sensor as follows:
   a. Attach a universal joint, a 6 inch extension and a ratchet to the TEMPERATURE SENSOR SOCKET (Part No. HD-48116-A).
   b. See Figure 4-29. Fit engine temperature 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 4-30. 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). This will facilitate removal of the sensor.
   e. Remove ET sensor from rear cylinder head.



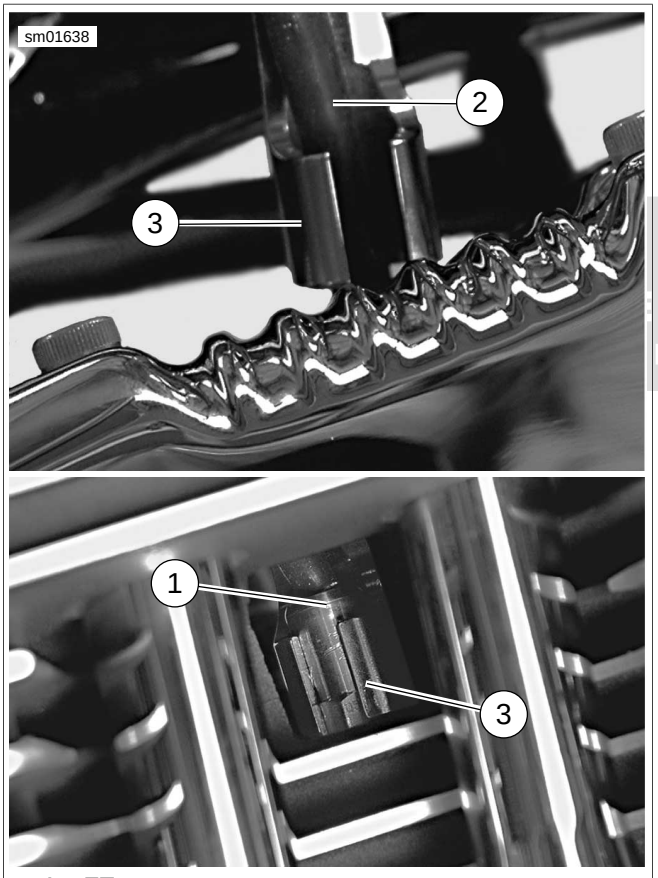
1. **Harness loop**
2. **Barbed cable strap**
3. **Engine temperature sensor connector location**

Figure 4-27. ET Sensor Harness: XL Models



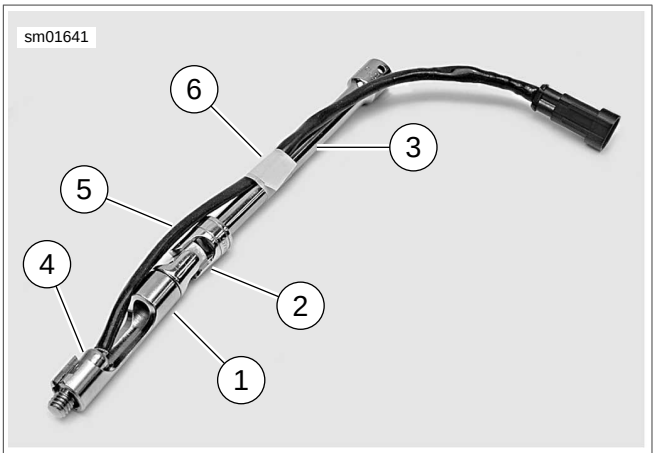
1. **Breather hose**
2. **Barbed cable strap**
3. **Sensor harness connector [90]**
4. **Harness Loop**

Figure 4-28. ET Sensor Harness: XR 1200X



1. **ET sensor**
2. **Sensor harness**
3. **Temperature sensor socket**

Figure 4-29. Installing ET Sensor Socket (XL shown)



1. **Temperature sensor socket**
2. **Universal joint**
3. **Socket extension**
4. **Engine temperature sensor**
5. **Sensor harness**
6. **Tape**

Figure 4-30. Tape ET Sensor Harness to Extension

INSTALLATION

FASTENER	TORQUE VALUE	
ET sensor	120-168 **in-lbs**	13.6-19.0 Nm

1. See Figure 4-30. Fit engine the ET sensor (4) into temperature sensor socket (1).

NOTE

The sensor harness MUST turn with the socket and extension. The harness may be damaged when the sensor is installed.

2. Holding 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 and carefully thread sensor into head. Do not cross-thread. Tighten to 120-168 **in-lbs** (13.6-19.0 Nm).

NOTE

See Figure 4-27. Make sure there is a loop (4) in sensor harness when securing harness. If harness is pulled tight or contacting the rear rocker cover, it could be damaged during vehicle operation.

4. See Figure 4-27 or Figure 4-28. Use a barbed cable strap (2) to secure sensor harness. Position cable strap so harness forms a loop (4) between sensor and cable strap.
5. Connect sensor connector [90] (3) and secure to H-bracket/ECM caddy.
6. Install fuel tank and connect fuel supply hose. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
7. Install main fuse.
8. Close 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)

9. Install seat.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

INDUCTION MODULE: XL MODELS 4.8

REMOVAL

WARNING

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

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

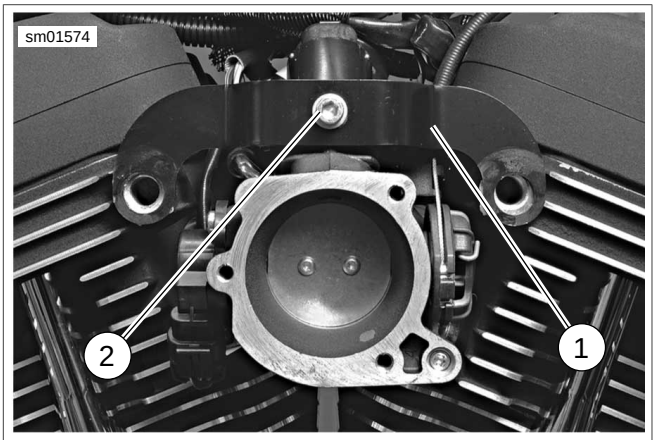
Gasoline can drain from quick-connect fitting when removing fuel line. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00267a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS.

WARNING

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

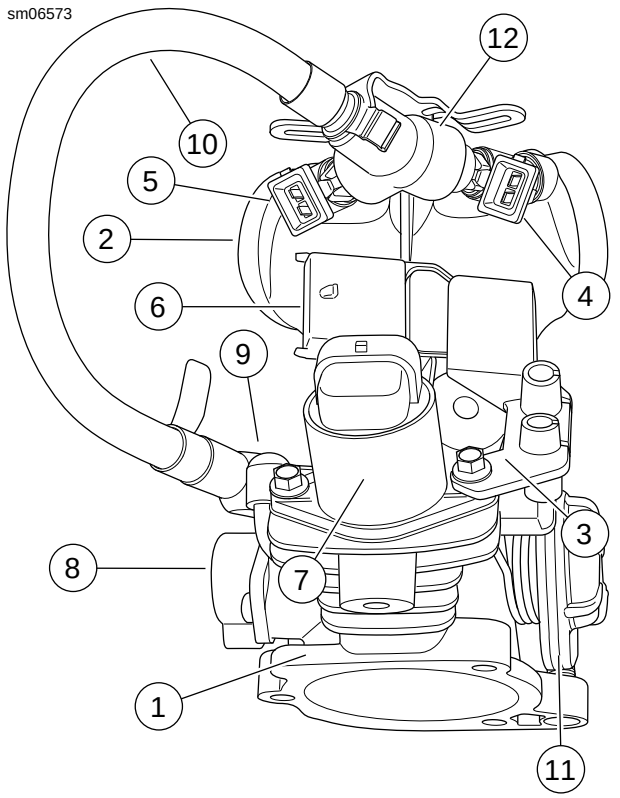
2. Remove main fuse.
3. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
4. Remove seat.
5. Pull fuel tank back to access induction module.
   a. Loosen (but do not remove) front fuel tank mounting screw.
   b. Remove rear fuel tank mounting screw, washers and nut.
   c. Carefully pivot rear of fuel tank upward and prop in position. See 4.4 FUEL TANK: XL MODELS.
6. See Figure 4-31. Remove screw (2) and mounting bracket (1).



1. **Mounting bracket**
2. **Screw**

Figure 4-31. Induction Module Mounting Bracket

7. See Figure 4-32. 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 Controlled 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 hose**
11. **Throttle wheel**
12. **Fuel rail**

Figure 4-32. Induction Module Assembly

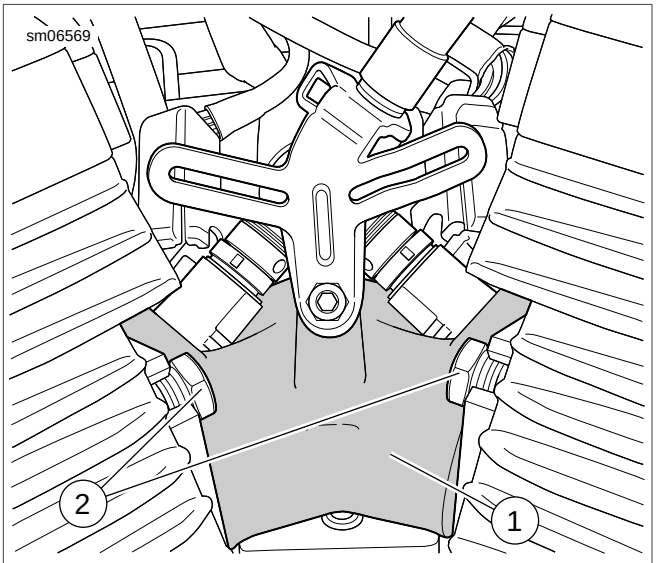
9. See Figure 4-33. Slide rubber boot off idle control cable assembly (1).
10. Loosen jamnut (3).
11. Loosen cable adjuster as far as possible to provide maximum slack in idle cable.



1. **Idle control (pull close) cable assembly**
2. **Cable adjuster**
3. **Jamnut**

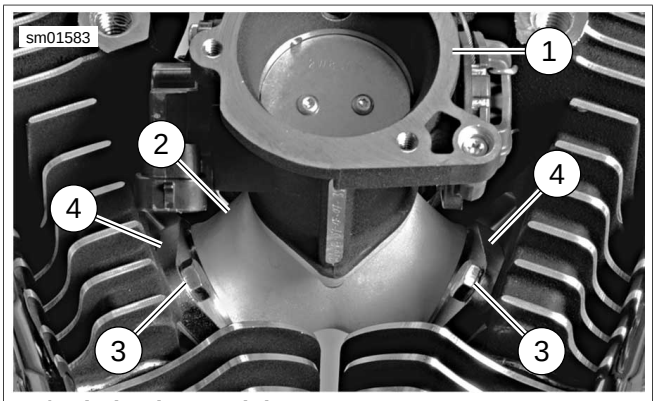
Figure 4-33. Idle Control Cable Adjustment

12. See Figure 4-34. Loosen two screws (2) securing intake manifold to heads on left side of vehicle, but do not remove screws.
13. See Figure 4-35. Remove two 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 vehicle.



1. **Intake manifold**
2. **Screw (2)**

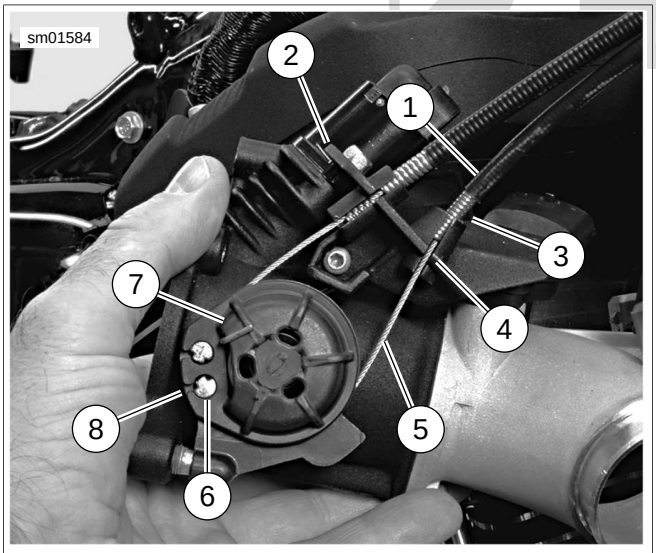
Figure 4-34. Intake Manifold Mounting Screws: Left Side



1. **Induction module**
2. **Intake manifold**
3. **Screw (2)**
4. **Mounting flange (2)**

Figure 4-35. Intake Manifold Mounting Screws: Right Side

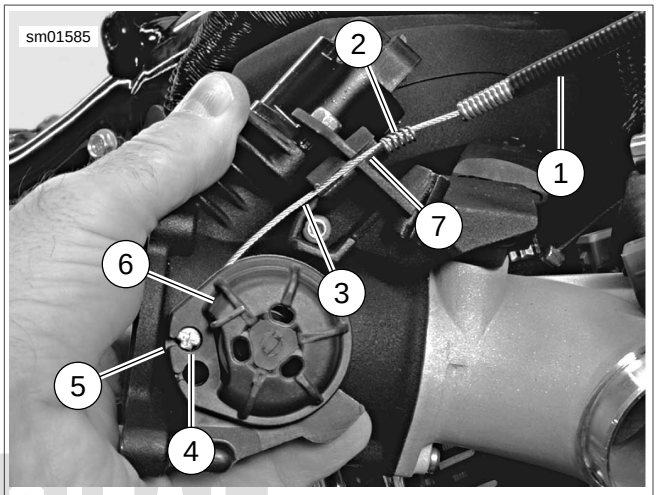
15. See Figure 4-35. Remove throttle cable (5) from throttle wheel (7)
    a. Lift throttle cable housing (1) up out of cable guide (3) in throttle/idle cable bracket (2).
    b. Slide throttle cable (5) out through slot (4) in cable guide.
    c. Unwind throttle cable from groove in throttle wheel (7).
    d. Slide cable out through slot (8) and 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 4-36. Removing/Installing Throttle Cable

16. See Figure 4-37. In a similar fashion, 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) and 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 4-37. Removing/Installing Idle Cable

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 hose, fuel rail and fuel injectors. See 4.15 FUEL INJECTORS.
2. See Figure 4-38. Remove screws (1, 2) and cable bracket (3) from induction module (4).

NOTE

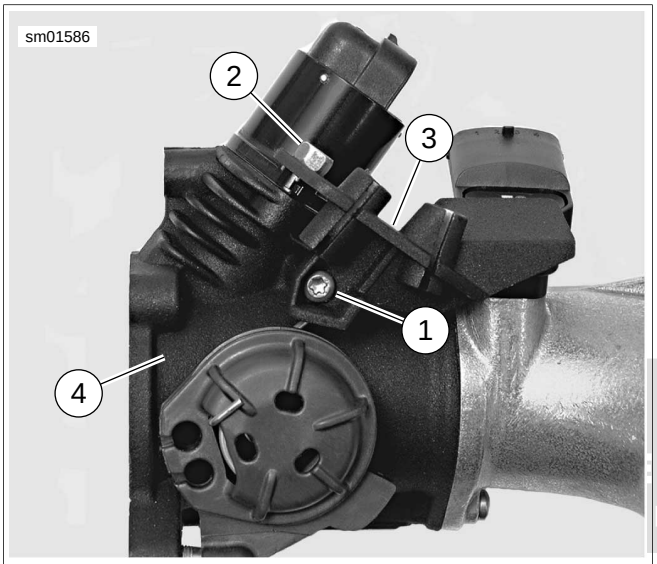
When removing the IAC, the mounting screws MUST be heated to soften the thread sealant and avoid breakage during removal. Use ONLY HEAT GUN (Part No. HD-25070) to heat the screws. NEVER use an open flame.

3. Remove the following assemblies:
   a. TPS. See 4.6 THROTTLE POSITION SENSOR (TPS).
   b. TMAP sensor. See 4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR.
   c. IAC. See 4.10 IDLE AIR CONTROL (IAC).

4. See Figure 4-39. Remove two screws (3) to separate induction module (1) from intake manifold (2). Discard O-ring (4).

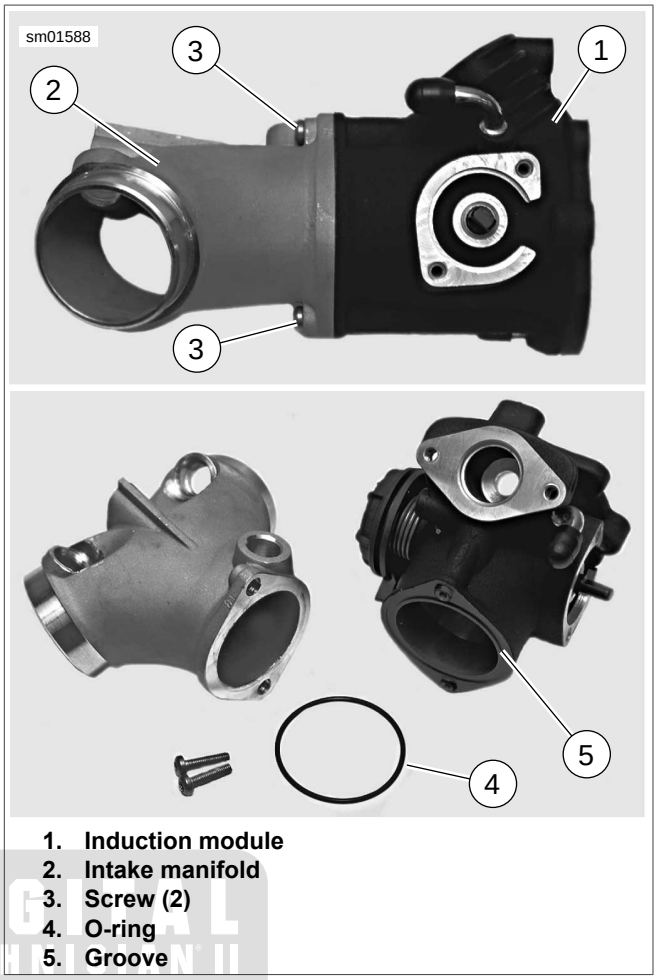
NOTE

At this level of disassembly, induction module contains no more serviceable parts. If induction module is determined to be damaged or defective, replace it.



1. **Screw**
2. **Screw**
3. **Cable bracket**
4. **Induction module**

Figure 4-38. Removing/Installing Cable Bracket



1. **Induction module**
2. **Intake manifold**
3. **Screw (2)**
4. **O-ring**
5. **Groove**

Figure 4-39. Induction Module Assembly

ASSEMBLY

FASTENER	TORQUE VALUE	
Induction module screw: XL models	35 **in-lbs**	4.0 Nm
IAC mounting screw: XL Models	60 **in-lbs**	6.8 Nm
Induction module cable bracket screw: XL Models	60 **in-lbs**	6.8 Nm

1. See Figure 4-39. Place **new** O-ring (4) into groove (5) in induction module (1) mating surface.
2. Mate 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 4.6 THROTTLE POSITION SENSOR (TPS).
   b. TMAP sensor. See 4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR.
   c. IAC. See 4.10 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 at this time.

4. See Figure 4-38. Install cable bracket (3) onto induction module (4):
   a. Obtain **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 hose. See 4.15 FUEL INJECTORS.

INSTALLATION

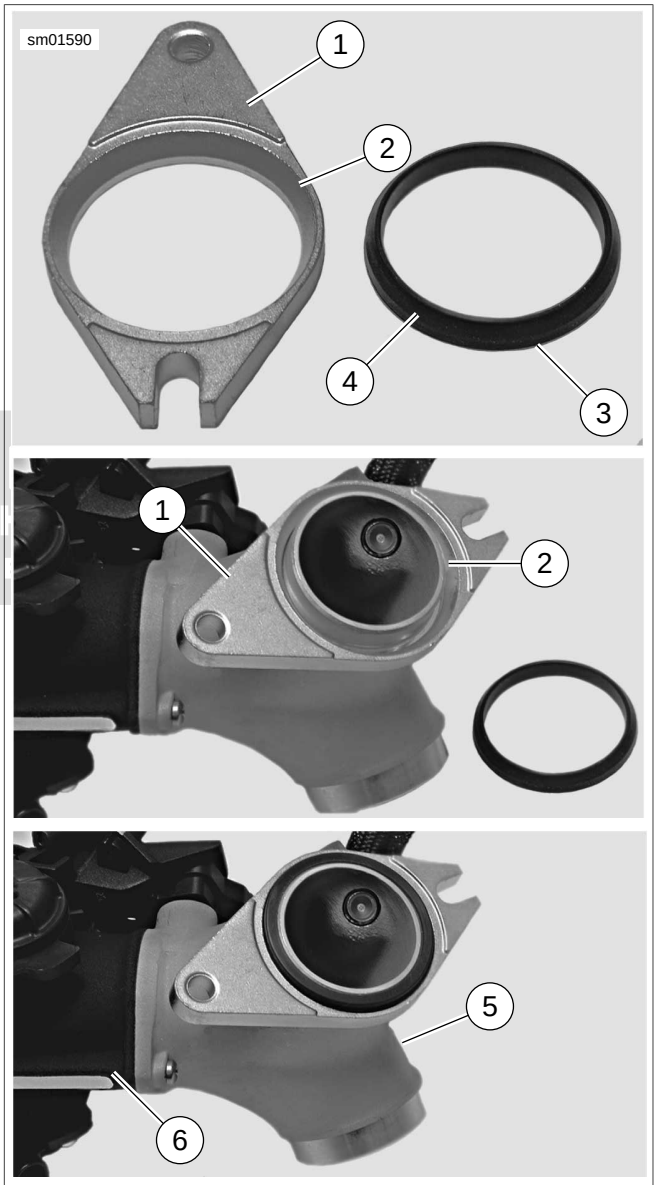
FASTENER	TORQUE VALUE	
Induction module mounting bracket screw: XL models	90-120 **in-lbs**	10.2-13.6 Nm
Intake manifold mounting screw: XL models	96-120 **in-lbs**	10.9-13.6 Nm
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm

1. See Figure 4-34. Make sure two mounting screws (2) are screwed into heads two or three turns.
2. See Figure 4-40. 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 the flanges are correctly installed on the manifold. Verify 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 4-35. 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 4-31. Install mounting bracket (1) and screw (2). Tighten screw finger-tight.
7. Temporarily install two breather screws through mounting bracket. Thread breather screws into cylinder heads finger-tight. This will properly line up induction module assembly.
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 4-37. 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 4-36. 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 and idle cables. See 1.13 THROTTLE CONTROL.



1. **Mounting flange (2)**
2. **Counterbore**
3. **Seal (2)**
4. **Beveled edge**
5. **Intake manifold**
6. **Induction module**

Figure 4-40. Installing Mounting Flange and Seal

15. **EVAP Controlled Models:** See Figure 4-41. Install purge hose onto fitting (2) on induction module (1).
16. See Figure 4-42. 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: XL MODELS.
18. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.

⚠WARNING

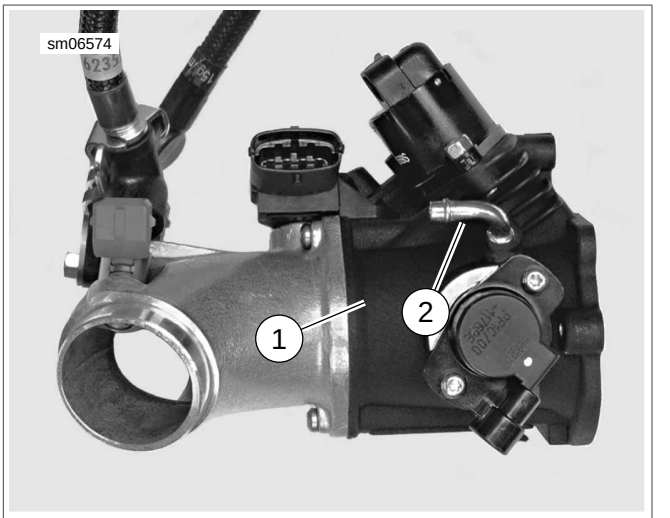
To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

19. Connect fuel hose to fuel pump module. Fill fuel tank. Carefully check for leaks around fuel pump module. See 4.4 FUEL TANK: XL MODELS.
20. Install main fuse.
21. Close left side cover.
22. Turn ignition switch to ON and OFF to reset IAC to park position.

⚠WARNING

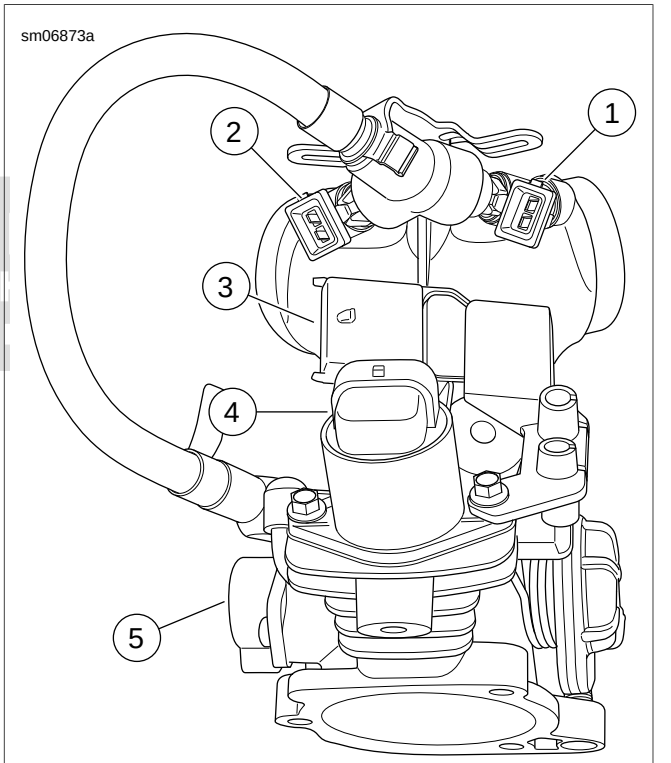
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

23. Install seat.



1. **Induction module**
2. **Purge hose (to canister) fitting**

Figure 4-41. 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 4-42. Induction Module Electrical Connectors

INDUCTION MODULE: XR 1200X 4.9

REMOVAL

WARNING

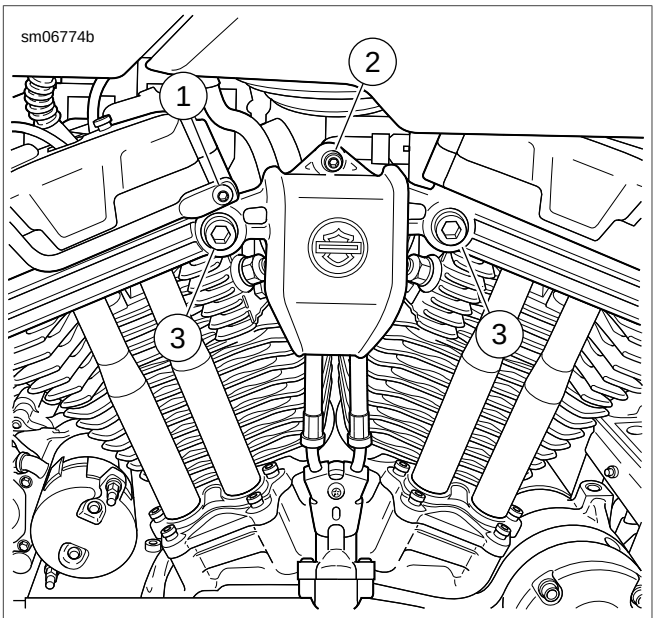
Stop the engine when refueling or servicing the fuel system. Do not smoke or allow open flame or sparks near gasoline. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00002a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XR 1200X.

WARNING

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

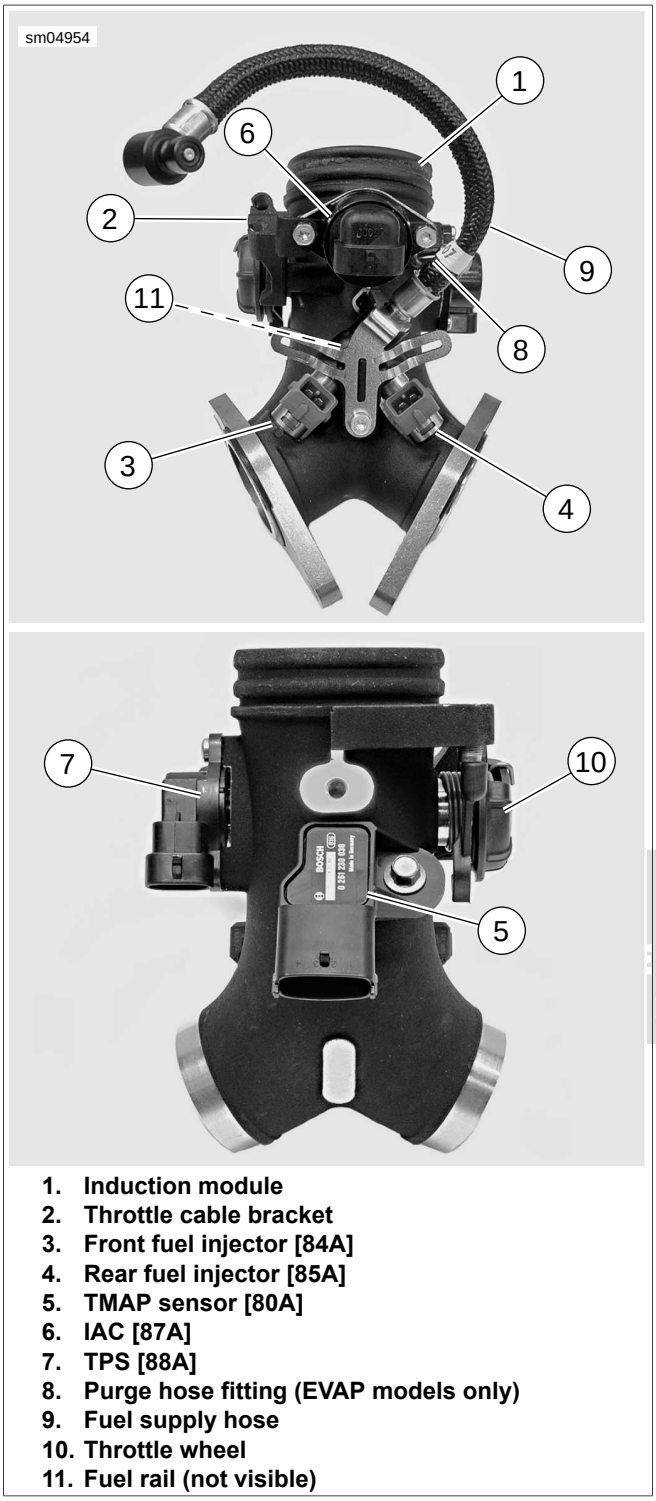
2. Remove main fuse.
3. Remove fuel tank and air box. See 4.5 FUEL TANK: XR 1200X and 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
4. See Figure 4-43. Remove screws (3), fastener (1) and fastener (2).
5. Pull cover away from induction module and disengage cable retainer from back side of cover. Remove cover.
6. Disengage throttle cables from induction module. See 2.28 THROTTLE CABLES: ALL MODELS.
7. See Figure 4-44. Unplug the following connectors:
   a. Front fuel injector (3) [84],
   b. Rear fuel injector (4) [85],
   c. TMAP sensor (5) [80],
   d. IAC (6) [87],
   e. TPS (7) [88].
8. **EVAP Controlled Models:** Remove purge hose from fitting (8).
9. See Figure 4-45. Disconnect oil line flare nuts (1) from flare fittings (2) in cylinder heads. Remove flare fittings (2) from cylinder heads.
10. Loosen but do not remove left side screws holding induction module to cylinder head.
11. Remove two screws (3) securing induction module to cylinder heads on right side of vehicle.
12. Remove induction module from engine.



1. **Fastener, wire form**
2. **Fastener, to induction module**
3. **Screws (2)**

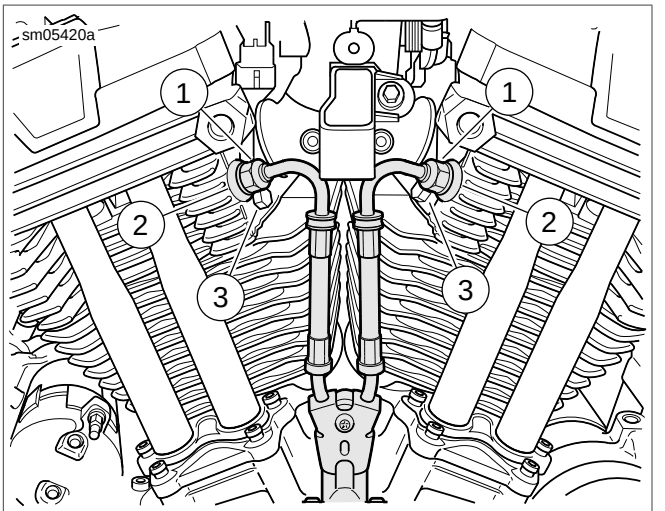
Figure 4-43. Induction Module Cover: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Induction module**
2. **Throttle cable bracket**
3. **Front fuel injector [84A]**
4. **Rear fuel injector [85A]**
5. **TMAP sensor [80A]**
6. **IAC [87A]**
7. **TPS [88A]**
8. **Purge hose fitting (EVAP models only)**
9. **Fuel supply hose**
10. **Throttle wheel**
11. **Fuel rail (not visible)**

Figure 4-44. Induction Module



1. **Flare nuts**
2. **Flare fittings**
3. **Fastener**

Figure 4-45. Remove Induction Module

DISASSEMBLY

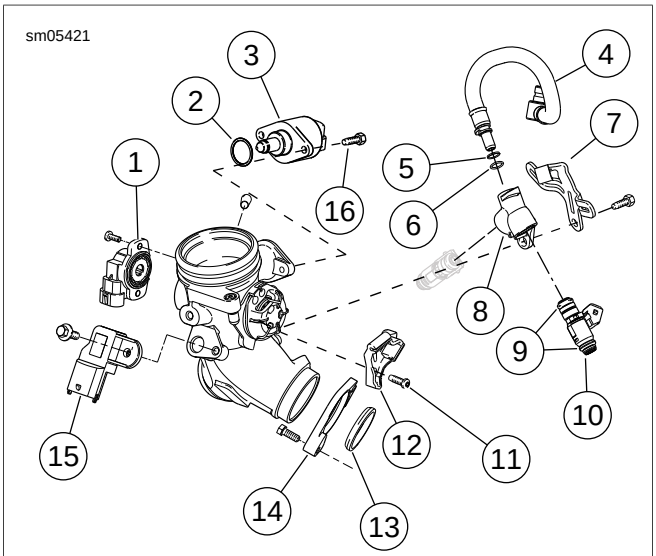
PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

1. See Figure 4-46. Remove retainer (7). Remove fuel rail (8) with hose (4) and injectors (10) from the induction module.
2. Remove hose (4) and injectors (10) from fuel rail.
3. Remove cable bracket (12).

NOTE

Screws (16) MUST be heated to soften the thread sealant and avoid breakage during removal. Use ONLY HEAT GUN (Part No. HD-25070) to heat the screws. NEVER use an open flame.

4. Remove IAC (3). See 4.10 IDLE AIR CONTROL (IAC), Removal: XR 1200X.
5. Remove TMAP (15), and TPS (1).
6. Remove mounting flanges (14) and seals (13).



1. **TPS**
2. **O-ring**
3. **IAC**
4. **Fuel hose**
5. **Nylon washer (included with hose (4))**
6. **O-ring (included with hose (4))**
7. **Retainer**
8. **Fuel rail**
9. **O-ring (4) (included in hardware and O-ring kit)**
10. **Fuel injector (2)**
11. **Screw**
12. **Throttle cable bracket**
13. **Intake seal**
14. **Mounting flange**
15. **TMAP sensor**
16. **Screw, IAC (2)**

Figure 4-46. Induction Module

ASSEMBLY

FASTENER	TORQUE VALUE	
IAC mounting screw: XR 1200X	60 **in-lbs**	6.8 Nm
Throttle cable bracket screw: XR 1200X	60 **in-lbs**	6.8 Nm

1. See Figure 4-46. Install the following:
   a. TPS. See 4.6 THROTTLE POSITION SENSOR (TPS).
   b. TMAP sensor. See 4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR.
   c. IAC. See 4.10 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 at this time.

2. Install cable bracket (12) onto induction module:
   a. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of screw (11).
   b. Install screw finger-tight.
   c. Tighten both IAC mounting screws to 60 **in-lbs** (6.8 Nm).
   d. Tighten screw (11) to 60 **in-lbs** (6.8 Nm).
3. Install fuel injectors, fuel rail and fuel hose. See 4.15 FUEL INJECTORS.

INSTALLATION

FASTENER	TORQUE VALUE	
Intake manifold mounting screw: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm
Cylinder head oil feed flare fitting: XR 1200X	22-26 ft-lbs	29.8-35.3 Nm
Cylinder head oil feed line flare nut: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm
Induction module cover to cylinder head sockethead bolts: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm
Induction module cover to induction module fastener: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm
Induction module cover to wire form fastener: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm

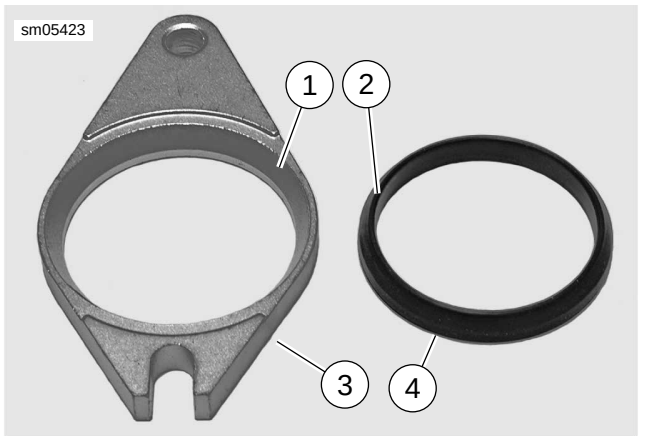
1. Install the two left side mounting screws two or three turns into the heads.
2. See Figure 4-47. Install mounting flanges (3) on induction module with counterbore (1) facing toward the engine.
3. Install **new** seals (4).
   a. Placed the beveled edge facing the mounting flange counterbore.
   b. Rotate the flange to the slotted mounting hole is on the same side as the IAC solenoid.

NOTES

- *Verify that the flanges are installed on the manifold.*
- *Verify that the rubber seals are in place.*

4. See Figure 4-45. 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. While holding induction module assembly in place, install two mounting screws (3) into remaining mounting flange holes. Tighten all four screws finger-tight.
6. Tighten to 90-120 **in-lbs** (10.3-13.6 Nm).
7. Inspect O-rings on flare fittings (2). Replace as necessary.
8. Install flare fittings in cylinder heads. Tighten to 22-26 ft-lbs (29.8-35.3 Nm).

9. Connect oil line flare nuts (1) to flare fittings (2). Tighten to 13-17 ft-lbs (17.6-23.0 Nm).
10. Install throttle cables. See 2.28 THROTTLE CABLES: ALL MODELS.
11. Adjust throttle and idle cables. See 1.13 THROTTLE CONTROL.



1. **Beveled counterbore**
2. **Beveled edge**
3. **Mounting flange**
4. **Tapered seal**

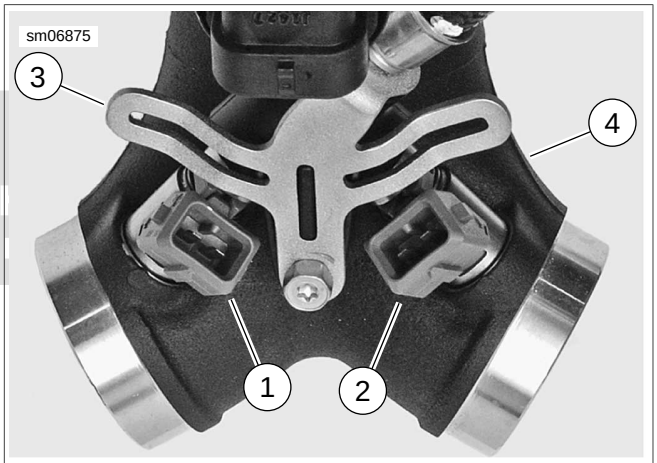
Figure 4-47. Mounting Flange and Seal

12. **EVAP Controlled Models:** See Figure 4-44. Install purge hose onto fitting (8) on induction module (1).

NOTE

XR 1200X: *See Figure 4-48. The fuel injector harness leads must NEVER be routed between the retaining bracket (3) and the induction module body (4). Improper routing will result in chafing of the insulation resulting in poor engine performance.*

13. See Figure 4-44. Plug in the following connectors:
    a. Front fuel injector (3) [84],
    b. Rear fuel injector (4) [85],
    c. TMAP sensor (5) [80],
    d. IAC (6) [87],
    e. TPS (7) [88].
14. Secure TPS harness to cover with a **new** cable strap with anchor.
15. Install induction module cover. Finger tighten the fasteners.
16. Tighten:
    a. Socket headbolts to 20-24 ft-lbs (27.1-32.5 Nm).
    b. Cover-to-induction module fastener to 90-120 **in-lbs** (10.2-13.6 Nm).
    c. Cover-to-wire form fastener to 90-120 **in-lbs** (10.2-13.6 Nm).
17. Install air box. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
18. Install fuel tank. See 4.4 FUEL TANK: XL MODELS.
19. Fill fuel tank. Check for leaks around fuel pump module and quick connector. See 4.4 FUEL TANK: XL MODELS.
20. Install main fuse.
21. Close left side cover.
22. Reset IAC to park.
    a. Turn ignition to ON.
    b. Turn ignition to OFF.
23. Start engine. Check for fuel leaks.



1. **Front fuel injector [84]**
2. **Rear fuel injector [85]**
3. **Retaining bracket**
4. **Induction module**

Figure 4-48. Fuel Injectors and Retaining Bracket

IDLE AIR CONTROL (IAC) 4.10

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)

XL Models: See Figure 4-49.

XR 1200X: See Figure 4-50.

The ECM uses the IAC to control engine idle speed. See the electrical diagnostic manual.

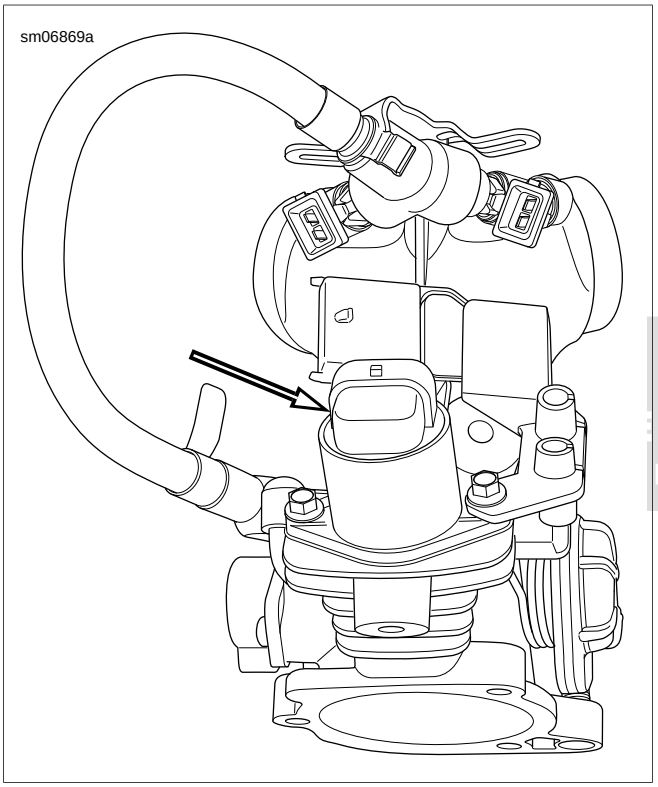


Figure 4-49. IAC: XL Models

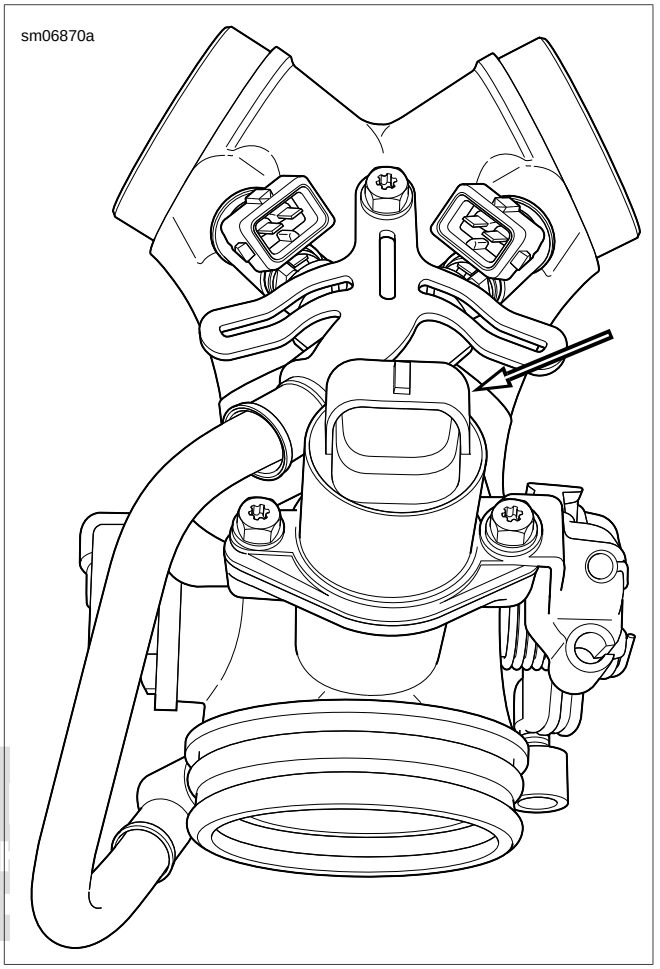


Figure 4-50. IAC: XR 1200X

REMOVAL: XL MODELS

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

WARNING

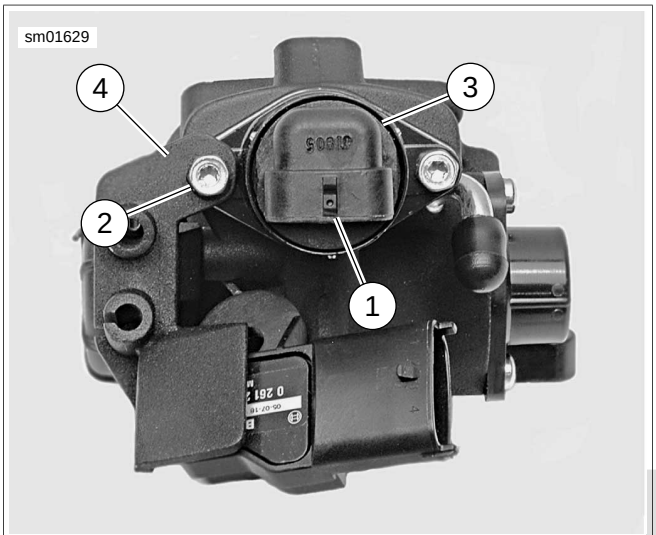
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
3. See Figure 4-51. Unplug harness connector [87B] from IAC connector [87A] (1).

NOTE

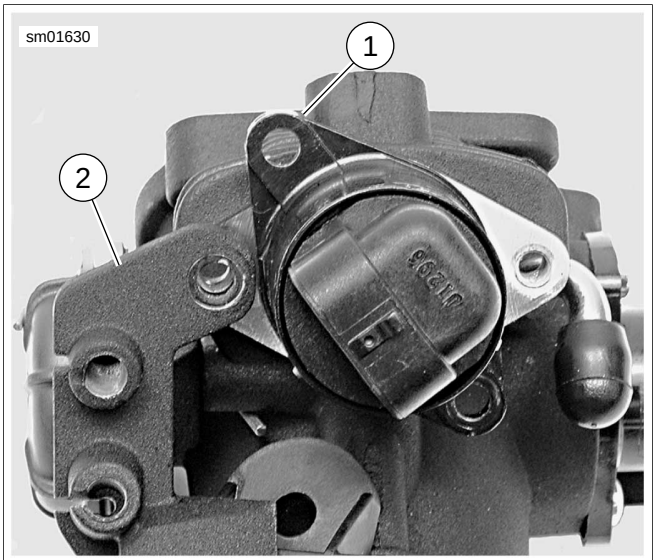
Heat screws (2) to soften the thread sealant and avoid breakage during removal. Use ONLY HEAT GUN (Part No. HD-25070) to heat the screws. NEVER use an open flame.

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 4-52. Grasp IAC and 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 4-51. IAC Removal/Installation: XL Models



1. **IAC mounting tab (2) (rotated 45 degrees)**
2. **Throttle cable bracket**

Figure 4-52. Removing/Installing IAC: XL Models

INSTALLATION: XL MODELS

FASTENER	TORQUE VALUE	
IAC mounting screw: XL models	60 **in-lbs**	6.8 Nm

1. See Figure 4-53. If re-using IAC (1), inspect O-ring (2) for cuts, tears or signs of deterioration. Replace IAC if O-ring is damaged.

⚠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 4-52. Rotate IAC approximately 45 degrees clockwise so IAC mounting tab will clear throttle cable bracket (2) when IAC is installed.
5. With a gentle twisting motion, insert IAC into induction module.
6. Rotate IAC so that harness connector faces intake manifold and mounting tab is underneath tab on throttle cable bracket.
7. Install IAC.
   a. See Figure 4-51. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of each screw (2).
   b. Install two 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.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **IAC**
2. **O-ring**
3. **Pintle**

Figure 4-53. IAC and O-ring

REMOVAL: XR 1200X

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

NOTE

It is not necessary to remove the fuel tank, air box or induction module from the vehicle in order to replace the IAC.

⚠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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XR 1200X.

⚠WARNING

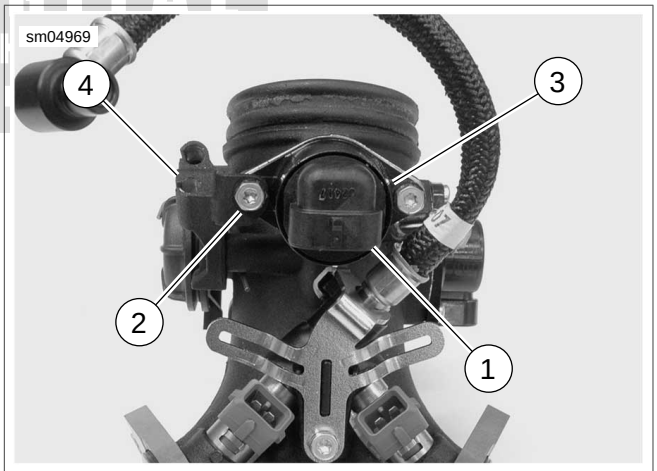
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. See Figure 4-54. Unplug harness connector [87B] from IAC connector [87A] (1).

NOTE

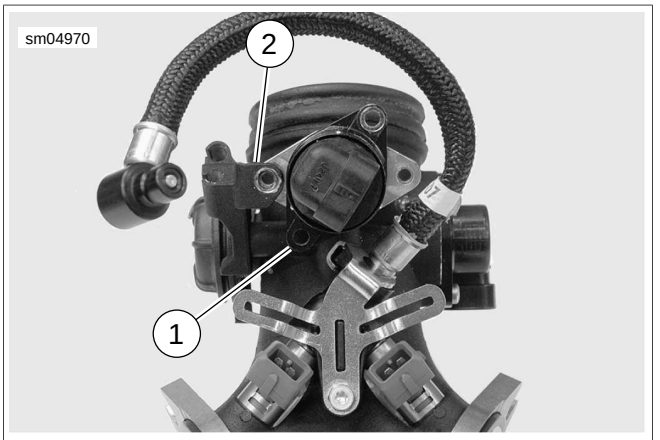
Screws (2) MUST be heated to soften the thread sealant and avoid breakage during removal. Use ONLY HEAT GUN (Part No. HD-25070) to heat the screws. NEVER use an open flame.

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 and remove.
5. See Figure 4-55. Grasp IAC and rotate counterclockwise 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 4-54. IAC Removal/Installation: XR 1200X



1. **IAC mounting tab (2) (rotated 45 degrees)**
2. **Throttle cable bracket**

Figure 4-55. Removing/Installing IAC: XR 1200X

INSTALLATION: XR 1200X

FASTENER	TORQUE VALUE	
IAC mounting screw: XR 1200X	60 **in-lbs**	6.8 Nm

1. See Figure 4-53. If re-using IAC (1), inspect O-ring (2) for cuts, tears or signs of deterioration. Replace IAC if O-ring is damaged.

⚠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 4-55. Rotate IAC approximately 45 degrees counterclockwise so IAC mounting tab will clear throttle cable bracket (2) when IAC is installed.
5. With a gentle twisting motion, insert IAC into induction module.
6. Rotate IAC so that harness connector points straight down and mounting tab is underneath tab on throttle cable bracket.
7. Install the IAC.
   a. See Figure 4-54. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of each screw (2).
   b. See Figure 4-54. Install two 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. Connect fuel hose to fuel pump module. See 4.5 FUEL TANK: XR 1200X.
10. Install main fuse.
11. Close left side cover.
12. Turn on ignition switch and start motorcycle. Carefully check for leaks around fuel hose fitting.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR 4.11

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 4-56 or Figure 4-57. 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.

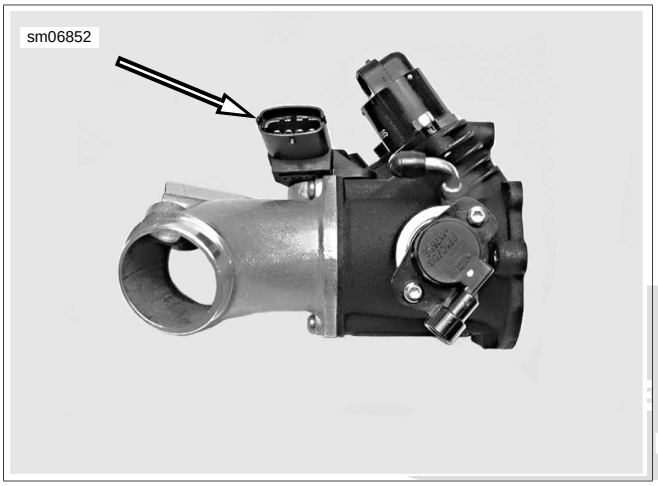


Figure 4-56. TMAP Location: XL Models



Figure 4-57. TMAP Location: XR 1200X

REMOVAL: XL MODELS

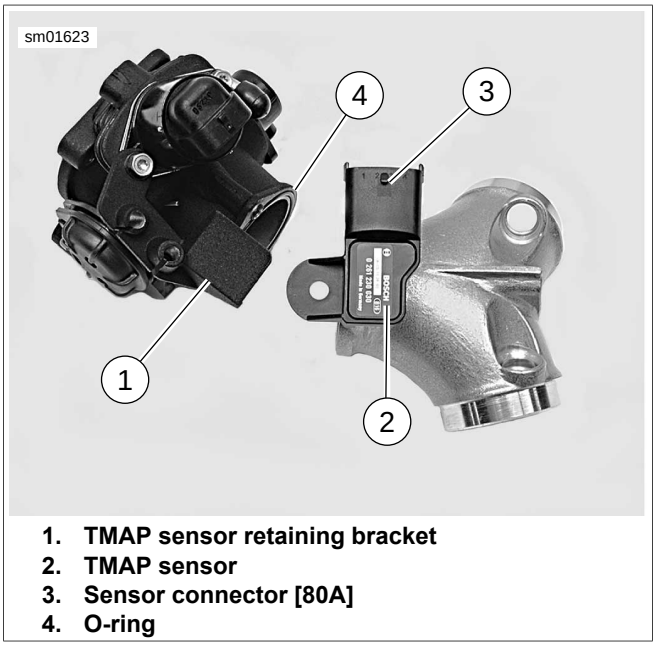
⚠WARNING

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. Remove fuel rail and fuel injectors. See 4.15 FUEL INJECTORS. This will allow access to the two screws that secure the induction module to the intake manifold.
4. See Figure 4-56. Remove two screws (2) and separate induction module from intake manifold. See 4.8 INDUCTION MODULE: XL MODELS.
5. See Figure 4-58. Pull induction module away from intake manifold far enough so that TMAP sensor retaining bracket (1) clears TMAP sensor body (2).
6. Unplug harness connector [80B] from TMAP connector [80A] (3).
7. Grasp TMAP sensor and 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 4-58. TMAP Sensor Removal/Installation

INSTALLATION: XL MODELS

FASTENER	TORQUE VALUE	
Induction module screw: XL Models	35 **in-lbs**	4.0 Nm

1. See Figure 4-59. If re-using TMAP sensor (1), inspect O-ring (2) in groove of sensor for cuts, tears or signs of deterioration. Replace if necessary.
2. Apply a thin coat of **clean** engine oil to TMAP sensor O-ring.
3. See Figure 4-58. 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 cuts, tears or signs of deterioration. Install **new** O-ring if necessary. Make certain 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 4.15 FUEL INJECTORS.
8. 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)

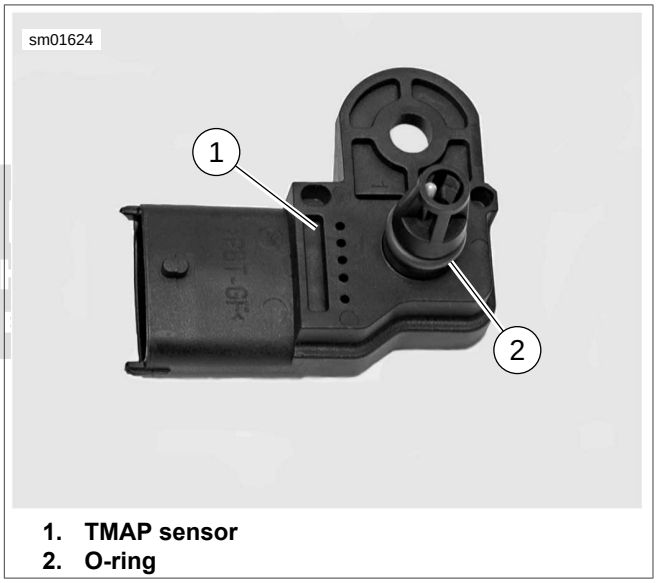
WARNING

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)

9. Connect fuel hose to fuel pump module.
10. Fill fuel tank. Carefully check for leaks around fuel pump module. See 4.4 FUEL TANK: XL MODELS, Connecting Fuel Hose and Filling Fuel Tank.
11. Install main fuse.
12. Close left side cover.



1. **TMAP sensor**
2. **O-ring**

Figure 4-59. TMAP Sensor

REMOVAL: XR 1200X

WARNING

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

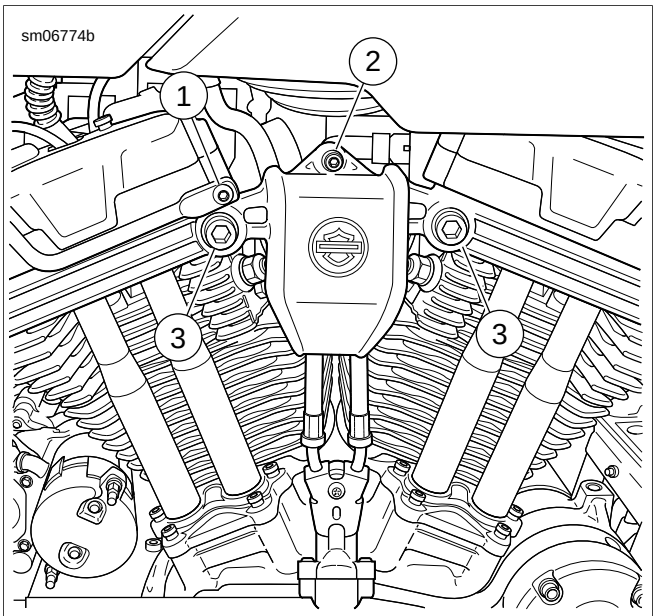
1. Remove main fuse.

NOTE

See Figure 4-60. The TMAP sensor harness and TPS harness are attached to inside of induction module cover. It is not necessary to remove the retainer securing these harnesses to the induction module cover in order to access TMAP sensor.

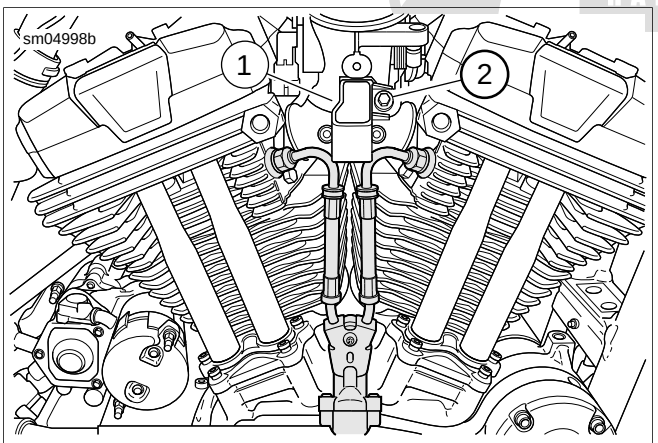
2. Remove screws (3) and the wire form (1) and induction module fastener (2).

3. Carefully rotate induction module cover out of the way.
4. Unplug TMAP sensor harness connector [80B].
5. See Figure 4-61. Remove screw (2).
6. Grasp TMAP sensor (1) and with a gentle twisting motion, pull sensor straight up out of induction module body.



1. **Fastener, wire form**
2. **Fastener, to induction module**
3. **Screws (2)**

Figure 4-60. Induction Module Cover: XR 1200X



1. **TMAP sensor [80A]**
2. **Screw**

Figure 4-61. TMAP Sensor: XR 1200X

INSTALLATION: XR 1200X

FASTENER	TORQUE VALUE	
TMAP sensor screw	80 **in-lbs**	9.0 Nm
Induction module cover to cylinder head fastener: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm
Induction module cover to induction module fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm
Wire form to induction module cover fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm

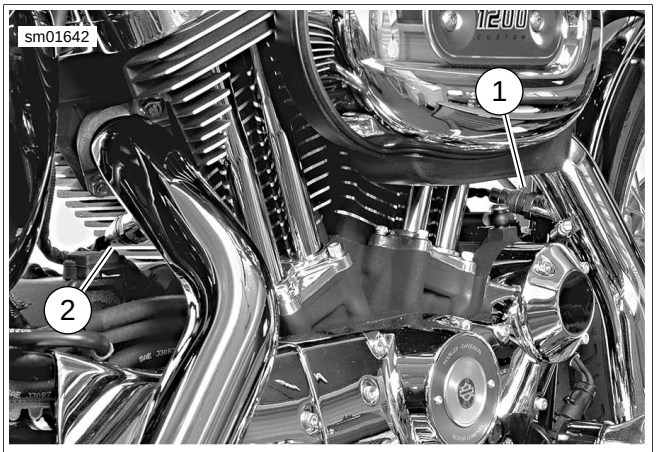
1. If re-using TMAP sensor, inspect O-ring for cuts, tears or signs of deterioration. Replace if necessary.
2. Apply a thin coat of **clean** engine oil to TMAP sensor O-ring.
3. With a gentle twisting motion, insert sensor into induction module with connector [80A] pointing down. Secure sensor to induction module with screw. Tighten to 80 **in-lbs** (9.0 Nm).
4. Plug sensor harness connector [80B] into TMAP sensor.
5. See Figure 4-60. Install the induction module cover.
   a. Rotate cover between cylinder heads.
   b. Install all fasteners finger-tight.
   c. Verify cover alignment before proceeding.
   d. Tighten socket head screws (3) to 20-24 ft-lbs (27.1-32.5 Nm).
   e. Tighten fastener (2) to 84-108 **in-lbs** (9.5-12.2 Nm).
   f. Tighten fastener (1) to 84-108 **in-lbs** (9.5-12.2 Nm).
6. Install main fuse.

DIGITAL TECHNICIAN HARLEY-DAVIDSON®

OXYGEN (O2) SENSOR 4.12

GENERAL

See Figure 4-62. The O2 sensors are installed in threaded bosses on the inboard side of the front and rear exhaust pipes. For O2 sensor troubleshooting, see the electrical diagnostic manual.



1. **Front O2 sensor**
2. **Rear O2 sensor**

Figure 4-62. O2 Sensor Locations: XL Models

REMOVAL

PART NUMBER	TOOL NAME
HD-48262	OXYGEN SENSOR SOCKET
HD-48647	OXYGEN SENSOR SOCKET

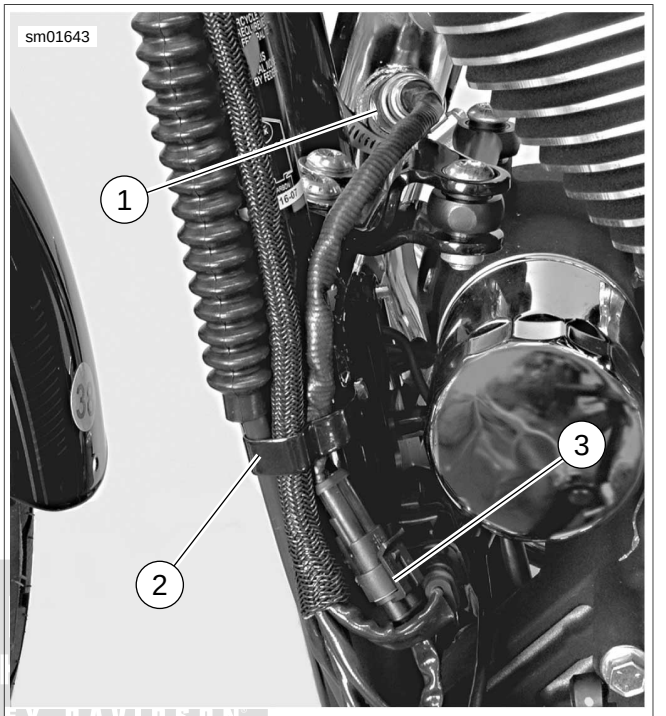
1. **All Models:** See Figure 4-63. Disconnect the front O2 sensor connector:
   a. Remove the frame clip (2).
   b. Disconnect the sensor pin connector [138A] housing (3) from the socket connector [138B] housing.
2. **XL Models:** See Figure 4-64. Disconnect the rear O2 sensor connector:
   a. Remove the rear O2 sensor connector [137] (2) from the ECM caddy (1).
   b. Disconnect the rear O2 sensor pin connector [137A] housing from the socket connector [137B] housing.
3. **XR 1200X:** Disconnect the rear O2 sensor pin connector [137A] housing from the socket connector [137B] housing.

NOTE

If O2 sensors are to be reused:

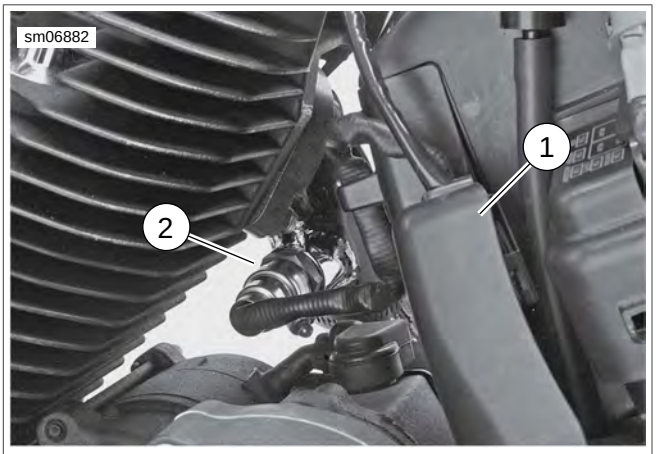
- *Mark each sensor FRONT or REAR.*
- *Do not damage the sensor wire harness.*

4. Remove the front and rear sensor:
   a. **XL Models:** Use the OXYGEN SENSOR SOCKET (Part No. HD-48262).
   b. **XR 1200X:** Use the OXYGEN SENSOR SOCKET (Part No. HD-48647).



1. **Front O2 sensor**
2. **Frame clip**
3. **O2 sensor connector [138]**

Figure 4-63. Front O2 Sensor and Connector (XL shown)



1. **ECM caddy cover**
2. **O2 sensor**

Figure 4-64. Rear Oxygen Sensor: XL Models

INSTALLATION

PART NUMBER	TOOL NAME
HD-48262	OXYGEN SENSOR SOCKET
HD-48647	OXYGEN SENSOR SOCKET

FASTENER	TORQUE VALUE	
O2 sensor	29-44 ft-lbs	39.3-59.7 Nm

NOTES

- *Do not install O2 sensors that have been dropped or impacted by other components. Damage to the sensor element may have occurred.*
- *New O2 sensors have threads coated with anti-seize material.*
- *If a sensor is being reused, apply a thin coat of ANTI-SEIZE LUBRICANT to the sensor threads and install new seal rings.*
- *Do not use any other grease or sealant product on sensor threads.*

1. Install the front and rear sensors:
   a. **XL Models:** Use the OXYGEN SENSOR SOCKET (Part No. HD-48262) to install the front and rear O2 sensors.
   b. **XR 1200X:** Use the OXYGEN SENSOR SOCKET (Part No. HD-48647) to install the front and rear O2 sensors.
2. Tighten to 29-44 ft-lbs (39.3-59.7 Nm).

NOTE

The O2 connector must be clean and free of any dielectric grease.

3. **All Models:** Route the front O2 wire harness:
   a. Connect the pin and socket connector [138] housings.
   b. Install the frame clip over the sensor harness, clutch cable, and wiring harness on left frame down tube.

NOTE

Route rear O2 sensor harness toward left side in a loop away from the exhaust system. Avoid contact with exhaust port or exhaust pipe.

4. **XL Models:** Route the rear O2 sensor wire harness:
   a. Connect the pin and socket connector [137] housings.
   b. Route the wire harness and snap the connector into the ECM caddy.
   c. Slide the caddy into place and tighten the fastener.
5. **XR 1200X:** Route sensor harness and connect pin and socket connector [137] housings.

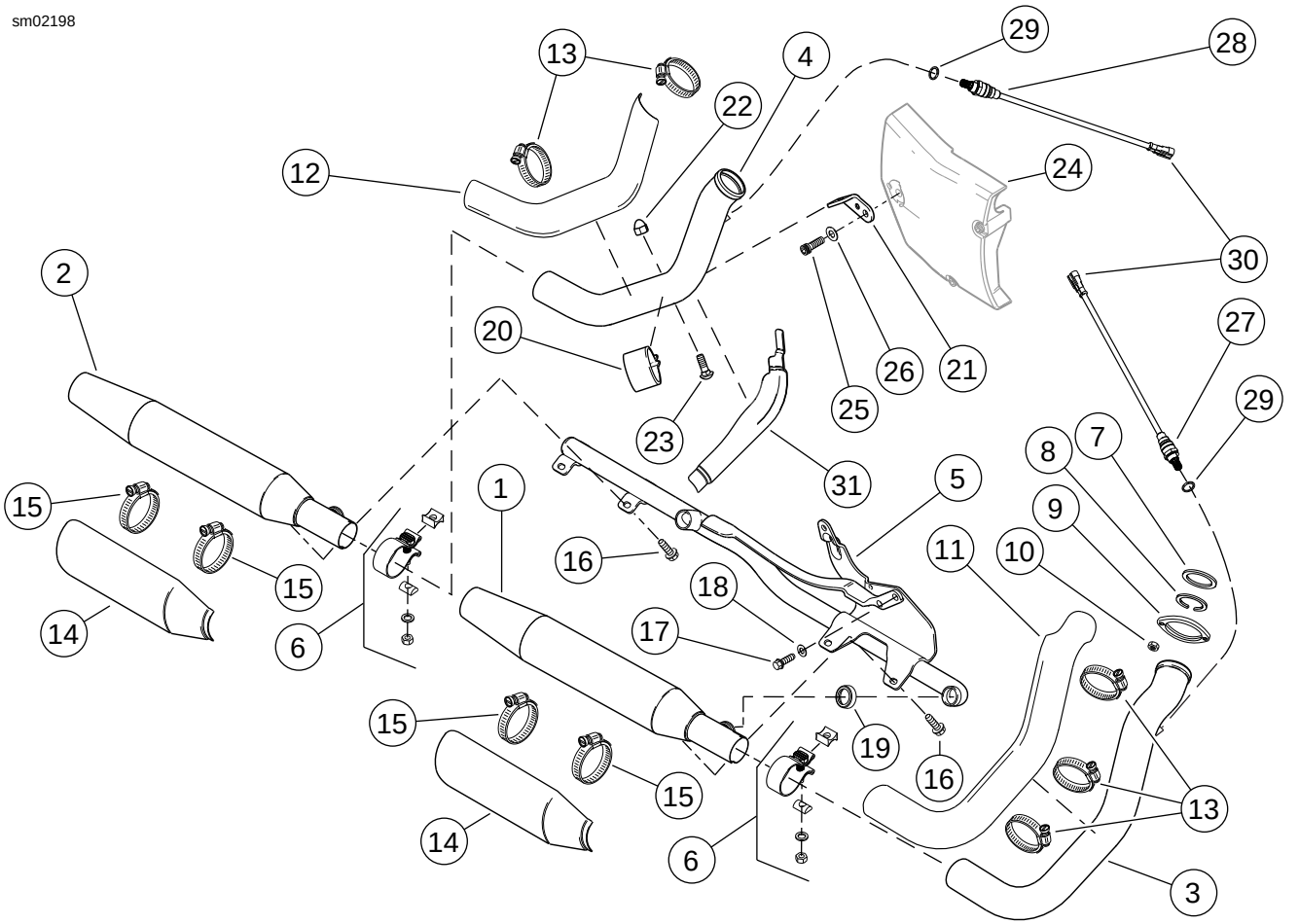
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EXHAUST SYSTEM: XL MODELS 4.13

GENERAL

PART NUMBER	TOOL NAME
PFSX916	SNAP-ON WRENCH

To facilitate removing exhaust pipe header nuts, use SNAP-ON WRENCH (Part No. PFSX916).



1. Muffler, front
2. Muffler, rear
3. Exhaust pipe, front
4. Exhaust pipe, rear
5. Muffler interconnect bracket
6. Torca muffler clamp assembly (2)
7. Exhaust port gasket (2)
8. Exhaust gasket retaining ring (2)
9. Exhaust pipe flange (2)
10. Nut (4)
11. Heat shield, front exhaust pipe
12. Heat shield, rear exhaust pipe
13. Worm drive clamp (5)
14. Muffler heat shield (2) (HDI, England, Japan, Brazil) (2)
15. Worm drive clamp (4)
16. Flanged bolt (4)
17. Screw (3)
18. Washer (3)
19. Muffler interconnect gasket (2)
20. Exhaust pipe clamp
21. Exhaust pipe clamp bracket
22. Acorn nut
23. Screw
24. Engine sprocket cover
25. Screw
26. Washer
27. Front O2 sensor assembly
28. Rear O2 sensor assembly
29. Seal ring (2)
30. O2 sensor connectors (2): [137], [138]
31. Heat shield, rear exhaust pipe (mid-control vehicles only)

Figure 4-65. Exhaust System, All XL Models

REMOVAL

Mufflers and Exhaust Pipes

NOTE

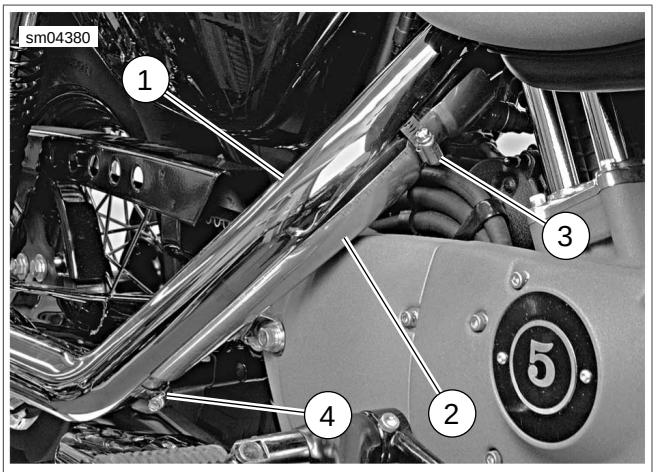
See Figure 4-66. Vehicles with mid controls are equipped with an extra heat shield (2) on the rear exhaust pipe.

1. See Figure 4-65. Remove heat shields:
   a. **Models with Mid Controls:** Remove worm drive clamps (13) from heat shield (12) completely. Remove bottom heat shield.
   b. **All Models:** Open worm drive clamps (13) and remove exhaust pipe heat shields (11, 12).
   c. **HDI, England, Asia Pacific, India, Japan, Brazil Models:** Open worm drive clamps (15) and remove muffler heat shields (14).
2. Unplug O2 sensor connectors (30). Front connector [138] is mounted on left front frame downtube. Rear connector [137] is attached to the ECM caddy on the left.
3. Remove nuts (10) from front and rear cylinder head exhaust studs.
4. Remove flanged bolts (16) securing front and rear mufflers (1, 2) to muffler interconnect bracket (5).
5. Loosen Torca muffler clamp assemblies (6) on front and rear mufflers. Remove mufflers. Discard muffler interconnect gaskets (19).
6. Remove and discard Torca clamps.

NOTE

*New Torca muffler clamps have eliminated the need for silicone or graphite tape during assembly. Always use **new** clamps during installation to maintain sealing integrity and prevent leakage.*

7. Remove nut (22) and screw (23) from exhaust pipe clamp (20). Separate exhaust pipe clamp from clamp bracket (21).
8. Remove front and rear exhaust pipes (3, 4). Slide exhaust pipe clamp off rear exhaust pipe.
9. Remove exhaust port gasket (7), retaining ring (8) and exhaust pipe flange (9) from each exhaust pipe. Discard gasket.
10. Remove O2 sensor assemblies (27, 28) from front and rear exhaust pipes. Discard seal rings (29). See 4.12 OXYGEN (O2) SENSOR.

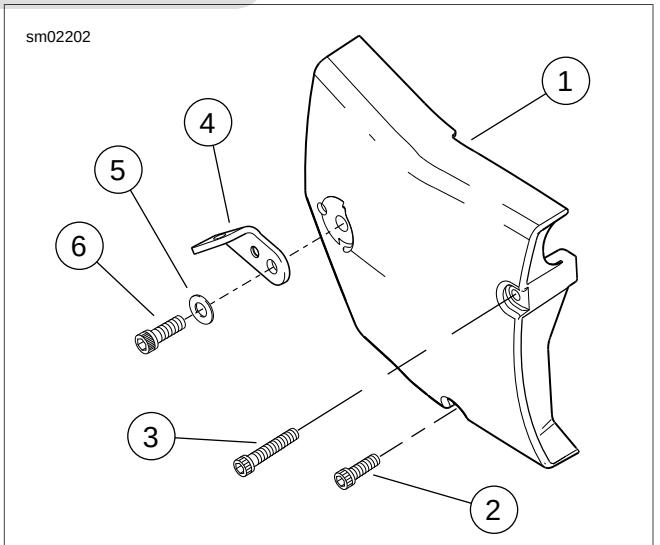


1. **Top heat shield**
2. **Bottom heat shield**
3. **Upper worm drive clamp**
4. **Lower worm drive clamp**

Figure 4-66. Rear Exhaust Pipe Heat Shields: Vehicles with Mid Controls

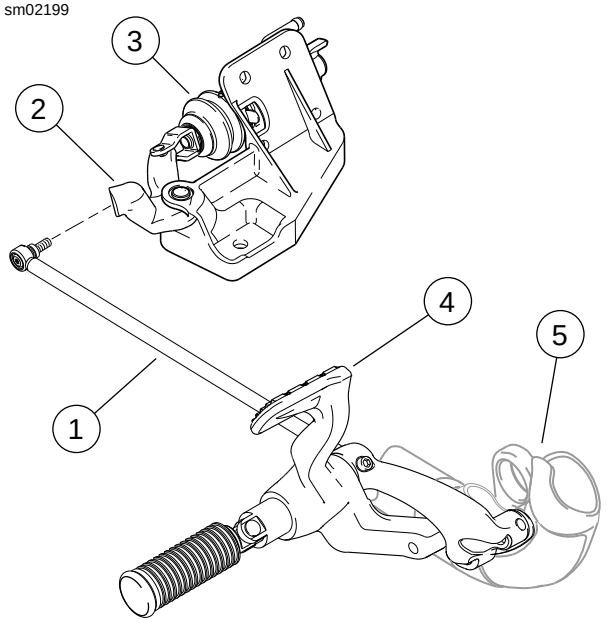
Muffler Interconnect Bracket

1. See Figure 4-67. Remove screw (6), washer (5) and exhaust pipe clamp bracket (4). Remove two screws (2, 3). Remove sprocket cover (1).
2. See Figure 4-68. Remove rear brake rod (1) at bell crank (2).
3. See Figure 4-65. Remove three screws (17) and washers (18) securing muffler interconnect bracket (5) to engine crankcase. Remove muffler interconnect bracket.



1. **Sprocket cover**
2. **Screw**
3. **Screw**
4. **Exhaust pipe clamp bracket**
5. **Washer**
6. **Screw**

Figure 4-67. Sprocket Cover



1. **Rear brake rod**
2. **Bell crank**
3. **Rear brake master cylinder assembly**
4. **Rear brake pedal**
5. **Frame**

Figure 4-68. Rear Brake Linkage

INSTALLATION

PART NUMBER	TOOL NAME
PFSX916	SNAP-ON SWIVEL BALL SOCKET EXTENSION

FASTENER	TORQUE VALUE	
Muffler interconnect bracket mounting screw: XL Models	30-33 ft-lbs	40.7-44.7 Nm
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm
Exhaust pipe clamp bracket screw: XL Models	30-33 ft-lbs	40.7-44.8 Nm
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm
O2 sensor	29-44 ft-lbs	39.3-59.7 Nm
Muffler to interconnect bracket screw: XL Models	15-19 ft-lbs	20.4-25.8 Nm
Cylinder head exhaust port nut	96-120 **in-lbs**	10.9-13.6 Nm
Muffler torca clamp nut	38-43 ft-lbs	51.6-58.4 Nm
Exhaust pipe clamp nut: XL Models	20-30 ft-lbs	27.1-40.7 Nm
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm

Muffler Interconnect Bracket

1. See Figure 4-65. Install muffler interconnect bracket (5) to engine case with three screws (17) and washers (18). Tighten to 30-33 ft-lbs (40.7-44.7 Nm).
2. See Figure 4-68. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to rear brake rod ball stud screw. Attach rear brake rod (1) to bell crank (2). Tighten screw to 120-180 **in-lbs** (13.6-20.4 Nm).
3. See Figure 4-67. Install sprocket cover (1). Install but do not tighten the screws (2, 3). Note that long screw goes in top hole, short screw in bottom hole.
4. Install exhaust pipe clamp bracket (4), washer (5) and screw (6). 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).

Exhaust Pipes and Mufflers

NOTES

- *To facilitate installing exhaust pipe header nuts, use SNAP-ON SWIVEL BALL SOCKET EXTENSION (Part No. PFSX916).*
- *If reusing the O2 sensors, apply a thin coat of ANTI-SEIZE LUBRICANT to the threads prior to installation. Do not use any other grease or sealant product on sensor threads.*
- *The electrical connector must also be clean and free of dielectric grease.*

1. See Figure 4-65. If the front and rear O2 sensor assemblies (27, 28) are being reused, install **new** seal rings (29) onto each sensor. Apply a thin coat of ANTI-SEIZE LUBRICANT to the sensor threads.

2. Install sensor assemblies into front and rear exhaust pipes. Tighten to 29-44 ft-lbs (39.3-59.7 Nm). See 4.12 OXYGEN (O2) SENSOR.
3. Place exhaust pipe flange (9), exhaust gasket retaining ring (8) and **new** exhaust port gasket (7) over front end of each exhaust pipe (3, 4). Position flange so that inside counterbore faces cylinder head exhaust port.
4. Position front ends of front and rear exhaust pipes into front and rear cylinder heads, respectively. Position holes in flanges over mounting studs and loosely install nuts (10). Do not tighten nuts at this time.
5. Install exhaust pipe clamp (20) on rear exhaust pipe (4) with square hole facing down. Assemble exhaust pipe clamp to exhaust pipe clamp bracket (21) with screw (23) and acorn nut (22). Verify that the bracket fits between ends of clamp. Do not tighten at this time.
6. Install **new** muffler interconnect gaskets (19) in interconnect mating holes in mufflers (1, 2).
7. Place **new** Torca clamp assemblies (6) over slotted end of each muffler. Install each muffler onto the end of its respective exhaust pipe.
8. Rotate both mufflers until their mounting bosses line up with holes in muffler interconnect bracket. Carefully mate each muffler with exhaust port in interconnect bracket. Loosely install flanged bolts (16). Do not tighten at this time.
9. Tighten exhaust system fasteners in the following sequence:
   a. Tighten four flanged bolts securing mufflers to interconnect bracket to 15-19 ft-lbs (20.4-25.8 Nm).
   b. Tighten four nuts at cylinder head exhaust studs to 96-120 **in-lbs** (10.9-13.6 Nm).
   c. Tighten two Torca clamps to 38-43 ft-lbs (51.6-58.4 Nm).
   d. Tighten rear exhaust pipe clamp nut (22) to 20-30 ft-lbs (27.1-40.7 Nm).
10. Plug in O2 sensor connectors (30). Front connector [138] is mounted on left front frame downtube. Rear connector [137] is attached to the left side of the ECM caddy. See 4.12 OXYGEN (O2) SENSOR.
11. Install heat shields:
    a. Open worm drive clamps (13) and install heat shields (11, 12) on exhaust pipes. Position each clamp so that screw is on the outboard side in the most accessible position.
    b. **Models with Mid Controls:** See Figure 4-66. Tighten lower worm drive clamp (4) a few turns. Slide lower portion of bottom heat shield (2) into lower worm drive clamp. Engage upper portion of bottom heat shield into upper worm drive clamp (3).
    c. **All Models:** Tighten all exhaust pipe heat shield clamps to 20-40 **in-lbs** (2.3-4.5 Nm).
    d. **HDI, England, Asia Pacific, India, Japan and Brazil Models:** Open worm drive clamps (15). Install the muffler heat shields (14). Position each clamp so that screw is on the outboard side in the most accessible position. Tighten clamps securely.

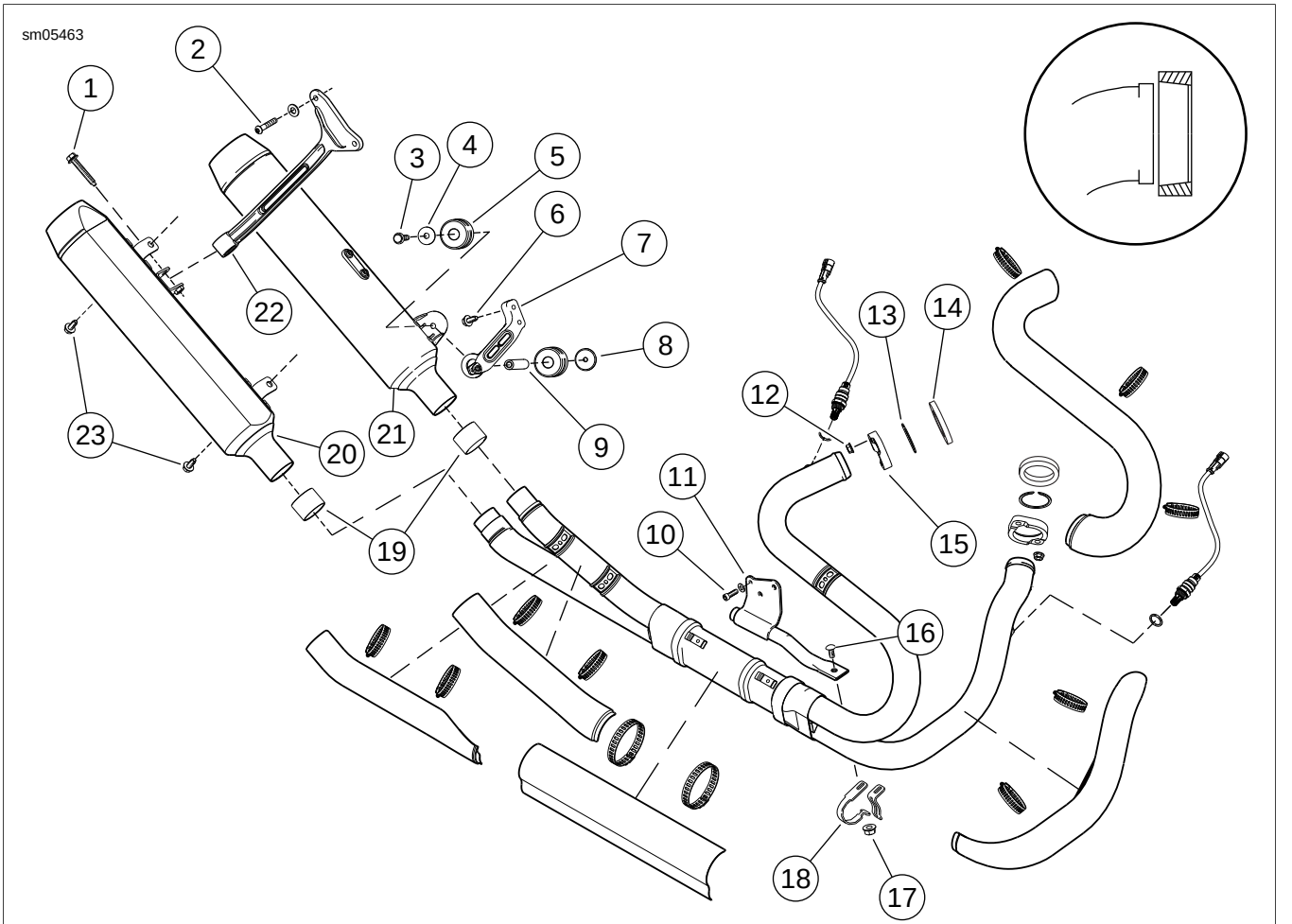
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EXHAUST SYSTEM: XR 1200X 4.14

GENERAL

PART NUMBER	TOOL NAME
PFSX916	SNAP-ON WRENCH

To facilitate removing exhaust pipe header nuts, use SNAP-ON WRENCH (Part No. PFSX916).



1. **Fastener, rear muffler mount**
2. **Fastener, mount to frame**
3. **Fastener, front muffler mount**
4. **Flat washer**
5. **Grommet, front mount (2)**
6. **Fastener, front muffler mount (2)**
7. **Front muffler mount**
8. **Washer-nut**
9. **Sleeve**
10. **Fastener, interconnect bracket (3)**
11. **Interconnect bracket**
12. **Nut (4)**
13. **Retaining ring (2)**
14. **Exhaust port gasket (2)**
15. **Exhaust pipe flange (2)**
16. **Carriage bolt**
17. **Flanged nut**
18. **Lower clamp**
19. **Muffler gasket (2)**
20. **Lower muffler**
21. **Upper muffler**
22. **Rear muffler mount**
23. **Bolt, muffler-to-muffler (2)**

Figure 4-69. Exhaust System: XR 1200X

REMOVAL

Mufflers

1. See Figure 4-69. Remove forward muffler mount fastener (3) and washer-nut (8).
2. Remove two bolts (23) fastening mufflers together.
3. Slide upper muffler (21) back off header pipe to remove.
4. Remove rear muffler mount fastener (1).

5. Rotate lower muffler (20) counterclockwise to disengage from the rear mount (22) and slide back off header pipe to remove.
6. Remove mount grommets (5) and sleeve (9).
7. Inspect rear mount (22) and replace if damaged.
8. Inspect muffler seals (19) and replace if necessary:
   a. Pull seal out of muffler using a hook-type tool.
   b. Push **new** seal into place being careful not to distort or damage the new seal.

Header Pipes

1. Remove mufflers.
2. Disconnect O2 sensor connectors. Remove sensor if necessary. See 4.12 OXYGEN (O2) SENSOR.
3. See Figure 4-69. Loosen or remove head pipe heat shields to gain access to header pipe flange nuts (12).
4. Remove flange nuts (12) and pull flanges (15) off from studs.
5. Remove nut (17) and carriage bolt (16) from lower clamp (18).

NOTE

Be careful not to drop or hit header pipe assembly. Damage to the catalytic converter may result.

6. Remove header pipe assembly from vehicle.
7. Inspect exhaust port gasket (14) and replace if necessary.
   a. Pry gasket from exhaust port in cylinder head being careful not to damage the bore.
   b. Push **new** gasket into place with the larger ID facing the header pipe, as shown in the inset in Figure 4-69.
8. Remove retainer rings (13) and flanges (15) if necessary.
9. If necessary, remove mount brackets (7, 22) and interconnect bracket (11).

INSTALLATION

FASTENER	TORQUE VALUE	
Muffler mount to frame, rear fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm
Muffler mount to frame, front fastener: XR 1200X	45-50 ft-lbs	61.0-67.8 Nm
Interconnect bracket to frame fastener: XR 1200X	30-33 ft-lbs	40.7-44.7 Nm
Exhaust flange nut: XR 1200X	96-120 **in-lbs**	10.8-13.6 Nm
Exhaust clamp, lower nut: XR 1200X	30-33 ft-lbs	40.7-44.7 Nm
Muffler to front muffler mount fastener: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm
Muffler to muffler bolt: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm
Muffler to rear muffler mount fastener: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm

1. See Figure 4-69. If removed, install flanges (15) and retaining rings (13).
2. If removed, install rear mount (22), front mount (7) and interconnect bracket (11).
   a. Tighten fasteners (2) to 15-20 ft-lbs (20.3-27.1 Nm).
   b. Tighten fasteners (6) to 45-50 ft-lbs (61.0-67.8 Nm).
   c. Tighten fasteners (10) to 30-33 ft-lbs (40.7-44.7 Nm).

NOTE

Do not damage exhaust port gaskets (14) when positioning header pipes in exhaust port area.

3. Install **new** exhaust port gaskets (14).
4. Install head pipe assembly in position and loosely secure lower clamp (18) with carriage bolt (16) and flange nut (17).
5. Install flanges (15) and finger-tighten nuts (12). Do not tighten until mufflers are installed.
6. Install mufflers.
7. Place lower muffler (20) on header pipe. Rotate until rear mount fastener (1) can be installed. Loosely install fastener (1).
8. Place upper muffler (21) on header pipe.
9. Install muffler-to-muffler bolts (23) finger-tight.
10. Install grommets (5), sleeve (9), fastener (3), washer (4) and washer nut (8). Tighten finger-tight.
11. Tighten the exhaust flange nuts (12) to 96-120 **in-lbs** (10.8-13.6 Nm) in the following sequence:
    a. The front exhaust pipe lower exhaust flange nut
    b. The front exhaust pipe upper exhaust flange nut
    c. The rear exhaust pipe lower exhaust flange nut
    d. The rear exhaust pipe upper exhaust flange nut

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12. Verify the exhaust header pipes do not contact the drive belt idler pulley. Verify that there is sufficient clearance for proper operation of the rear brake pedal. Tighten nut (17) to 30-33 ft-lbs (40.7-44.7 Nm).
13. Tighten fastener (3) to 120-180 **in-lbs** (13.6-20.3 Nm).
14. Tighten muffler to muffler bolts (23) to 120-180 **in-lbs** (13.6-20.3 Nm).
15. Tighten rear mount fastener (1) to 120-180 **in-lbs** (13.6-20.3 Nm).
16. Install heat shields. Tighten to 20-40 **in-lbs** (2.3-4.5 Nm).
17. Install and connect the O2 sensors. See 4.12 OXYGEN (O2) SENSOR.

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FUEL INJECTORS 4.15

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

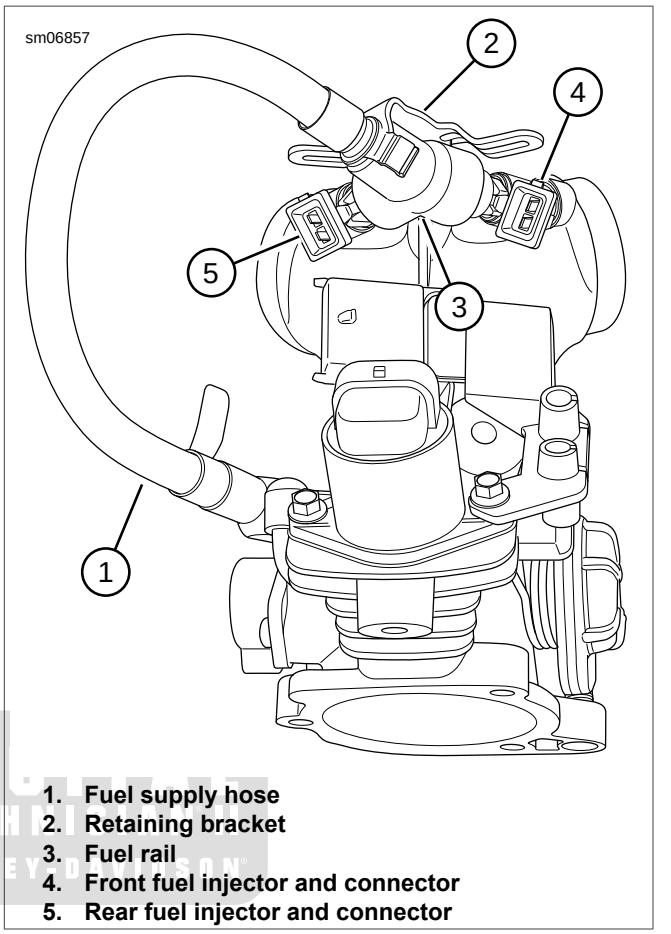
Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

WARNING

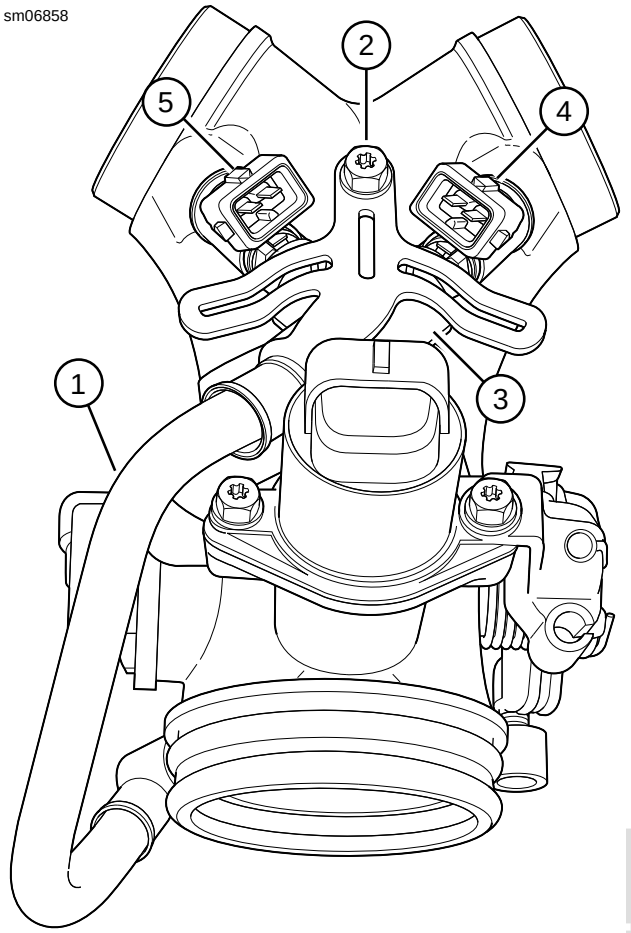
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. **XL Models with 4.5 gal (17.0 L) fuel tank**: Access to the fuel injectors and fuel rail may be easier if the fuel tank is raised up as follows:
   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: XL MODELS.
   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 4-72. 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 the fuel supply hose (1) or fuel rail (6), disassemble as follows:
   a. Hold fuel rail in place.
   b. With a gentle twisting motion, pull fuel supply hose straight up out of fuel rail.
7. Hold fuel injectors (9, 10) in place by pressing down on harness connectors (7, 8) and with a gentle rocking motion, pull fuel rail off injectors.
8. With a gentle twisting motion, pull fuel injectors out of intake manifold (XL models) or induction module (XR 1200X).
9. Remove and discard O-rings (11).



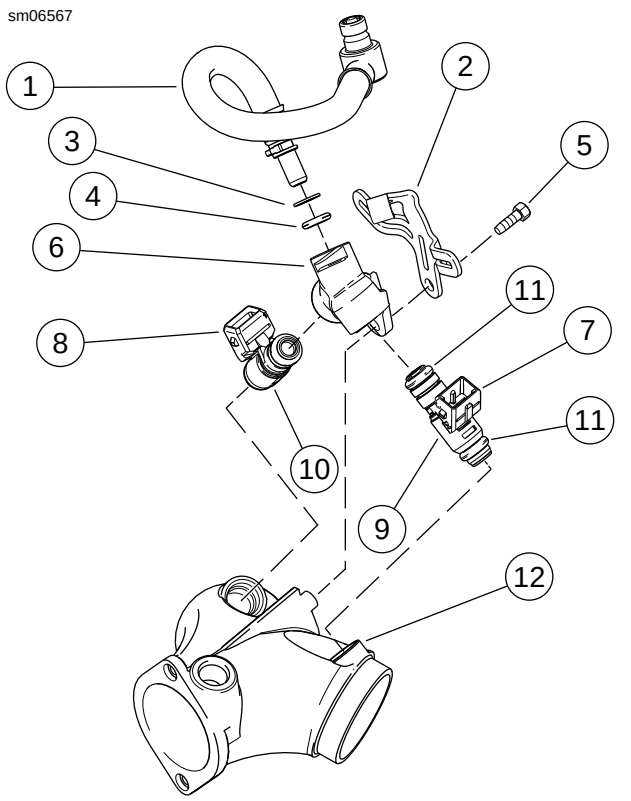
1. **Fuel supply hose**
2. **Retaining bracket**
3. **Fuel rail**
4. **Front fuel injector and connector**
5. **Rear fuel injector and connector**

Figure 4-70. Fuel Injector Assembly Location: XL Models



1. Fuel supply hose
2. Retaining bracket
3. Fuel rail (not visible)
4. Front fuel injector and connector
5. Rear fuel injector and connector

Figure 4-71. Fuel Injector Assembly Location: XR 1200X



1. Fuel supply hose
2. Retaining bracket
3. Sealing washer (only available with fuel supply hose)
4. O-ring (only available with fuel supply hose)
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) (provided in repair kit)
12. Intake manifold

Figure 4-72. Fuel Injector Assemblies: XL Models

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel hose retaining bracket screw	60 **in-lbs**	6.8 Nm
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm

1. See Figure 4-72. 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 (XL models) or induction module (XR 1200X).
3. See Figure 4-70 or Figure 4-71. Rotate fuel injectors so that harness connectors are positioned 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 the fuel supply hose and fuel rail were separated in the disassembly procedure, reassemble:
   a. See Figure 4-72. 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 hose into fuel rail bore until collar on hose is flush with top of fuel rail.
6. See Figure 4-72. Install retaining bracket (2) and fastener (5) as follows:
   a. See Figure 4-73. Orient fuel supply hose so that locating flange (2) is positioned as shown.
   b. Install retaining bracket (3). Fit the U-shaped opening in bracket around fuel supply hose and locating flange.
   c. See Figure 4-72. Secure retaining bracket (2) with screw (5). Tighten to 60 **in-lbs** (6.8 Nm).

NOTES

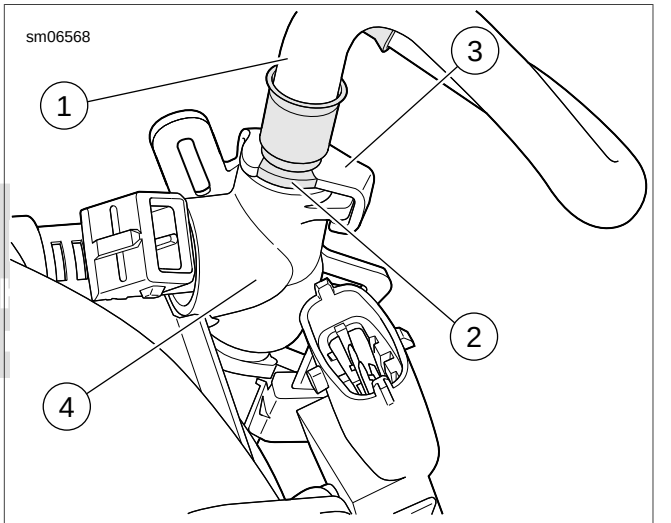
- ***XL Models:*** *See Figure 4-70. The fuel injector harness leads are mounted between the bracket and induction module.*
- ***XR 1200X:*** *See Figure 4-71. Do not route the fuel injector harness leads between the retaining bracket (2) and induction module body. Improper routing will result in chafing of the insulation resulting in poor engine performance.*

7. Connect engine sub-harness connectors to the fuel injectors. Verify that the wire harnesses are routed outside the wings of retaining bracket (2) on XR 1200X.

⚠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. **XL Models with 4.5 gal (17.0 L) Fuel Tank:** if the 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: XL MODELS.
   f. Install seat.
9. Connect fuel hose to fuel pump module. Fill fuel tank. Check for leaks around fuel pump module. See 4.4 FUEL TANK: XL MODELS.
10. Install main fuse.
11. Close left side cover.



1. **Fuel supply hose**
2. **Locating flange**
3. **Retaining bracket**
4. **Fuel rail**

Figure 4-73. Mounting Fuel Hose and Fuel Rail: XL Models

FUEL PUMP 4.16

GENERAL

WARNING

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

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 hose for cuts, tears, holes or other damage. Replace hose if any damage is found. Even a small hole can cause a reduction in fuel pressure.

REMOVAL

WARNING

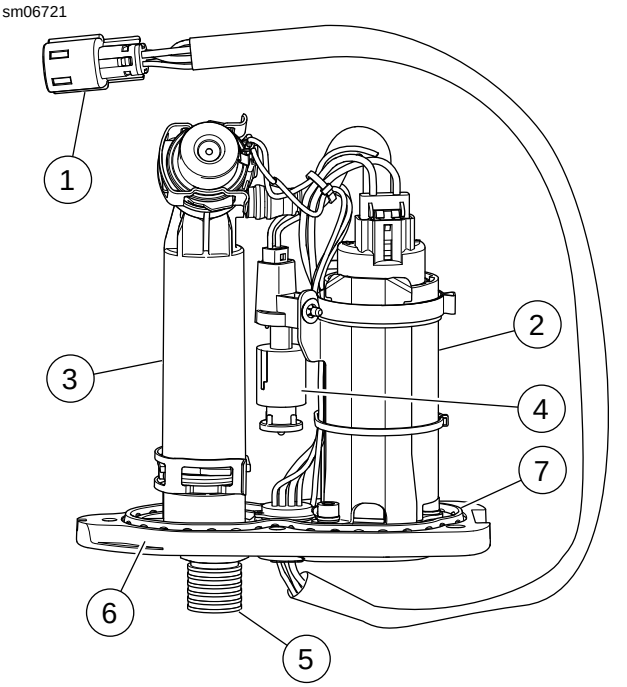
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

WARNING

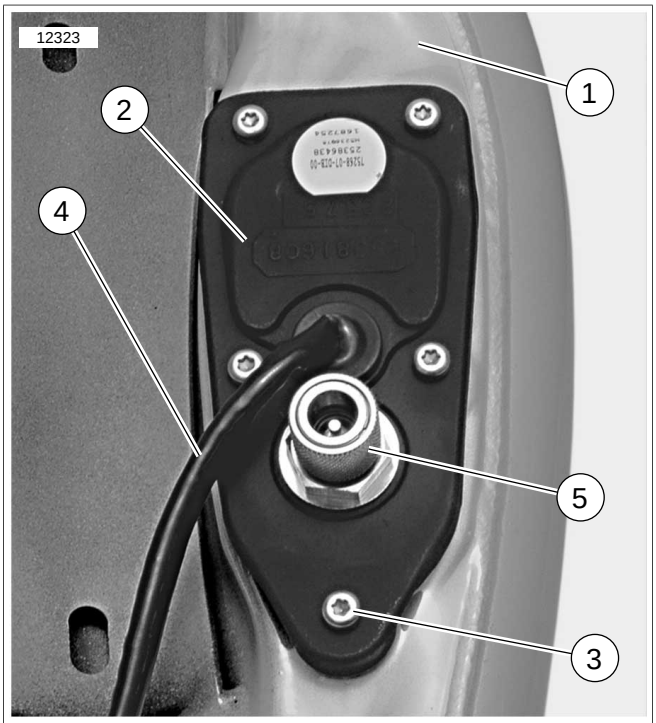
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. See Figure 4-74. Unplug fuel pump harness connector [141] (1), located forward of fuse/relay block on left side of vehicle.
4. Drain and remove fuel tank from vehicle. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. See Figure 4-75. Lay fuel tank upside-down on a soft cloth.
6. Remove five screws (3).
7. Carefully lift fuel pump module out of fuel tank. See Figure 4-76. To facilitate removal, tilt module when it is almost completely free of fuel tank.
8. See Figure 4-74. Remove and discard cover plate seal (7).



1. **Fuel pump harness connector [141]**
2. **Fuel pump**
3. **Fuel filter housing**
4. **Sending unit float**
5. **Quick-connect fitting**
6. **Cover plate**
7. **Cover plate seal**

Figure 4-74. Fuel Pump Module



1. **Fuel tank**
2. **Fuel pump module**
3. **Screw (5)**
4. **Fuel pump harness**
5. **Quick-connect fitting**

Figure 4-75. Fuel Pump Module: All Models

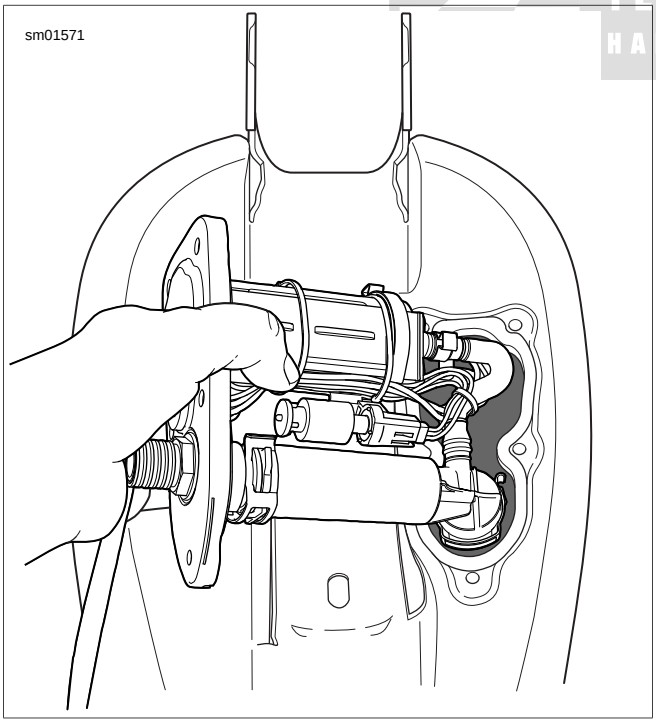
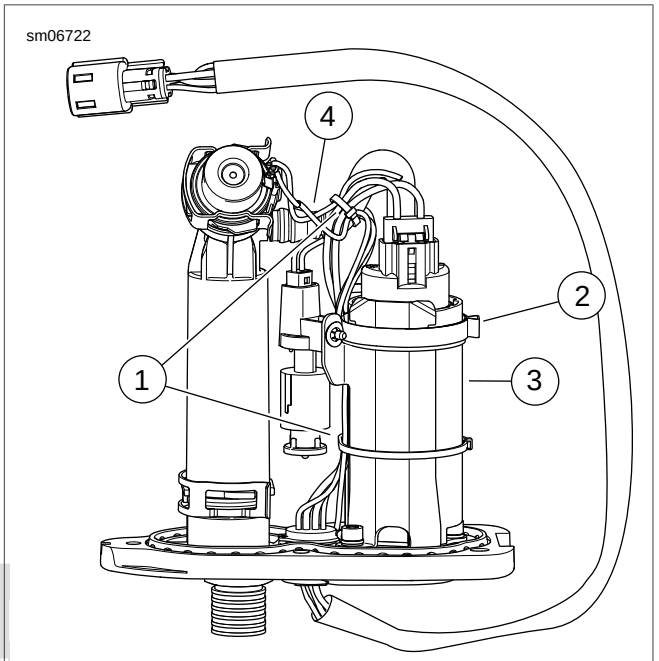


Figure 4-76. Removing/Installing Fuel Pump Module: All Models

DISASSEMBLY

The disassembly procedure consists of the following groups:

- Pressure regulator and filter housing.
- Fuel pump assembly and pump bracket.
- Low fuel level sensor assembly.
- Fuel pump.



1. **Cable strap (3)**
2. **Pump assembly clamp**
3. **Pump bracket**
4. **Filter housing hose**

Figure 4-77. Fuel Pump Cable Straps and Pump Clamp

NOTE

See Figure 4-77. Maintain the relative positions of the wiring harness cable straps (1) and pump assembly clamp (2).

Pressure Regulator and Filter Housing

1. See Figure 4-77. Remove cable strap (1) securing wiring harness to the filter housing hose (4).
2. See Figure 4-78. Remove ground clip (12) from top of filter housing (23).
3. Remove and discard clamp (1). Remove filter housing hose from top of fuel pump (2).
4. Remove retaining clip (24) from top of filter housing and remove pressure regulator (22).
5. Remove second retaining clip (24) from bottom of filter housing and 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 4-77. Make note of the location of any cable straps securing wiring harness to the fuel pump bracket (3). Remove cable straps.
2. See Figure 4-78. 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 three screws w/lockwashers (6) and remove pump bracket from cover plate (9).

Low Fuel Level Sensor Assembly

1. See Figure 4-77. Make note of the location of cable strap (1) securing low fuel level sensor connector to filter housing hose (4). Remove cable strap.
2. See Figure 4-78. Unplug the 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).

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 will not turn off until there is sufficient fuel in the tank, the ignition switch has been turned off and on and the motorcycle has begun forward speed.

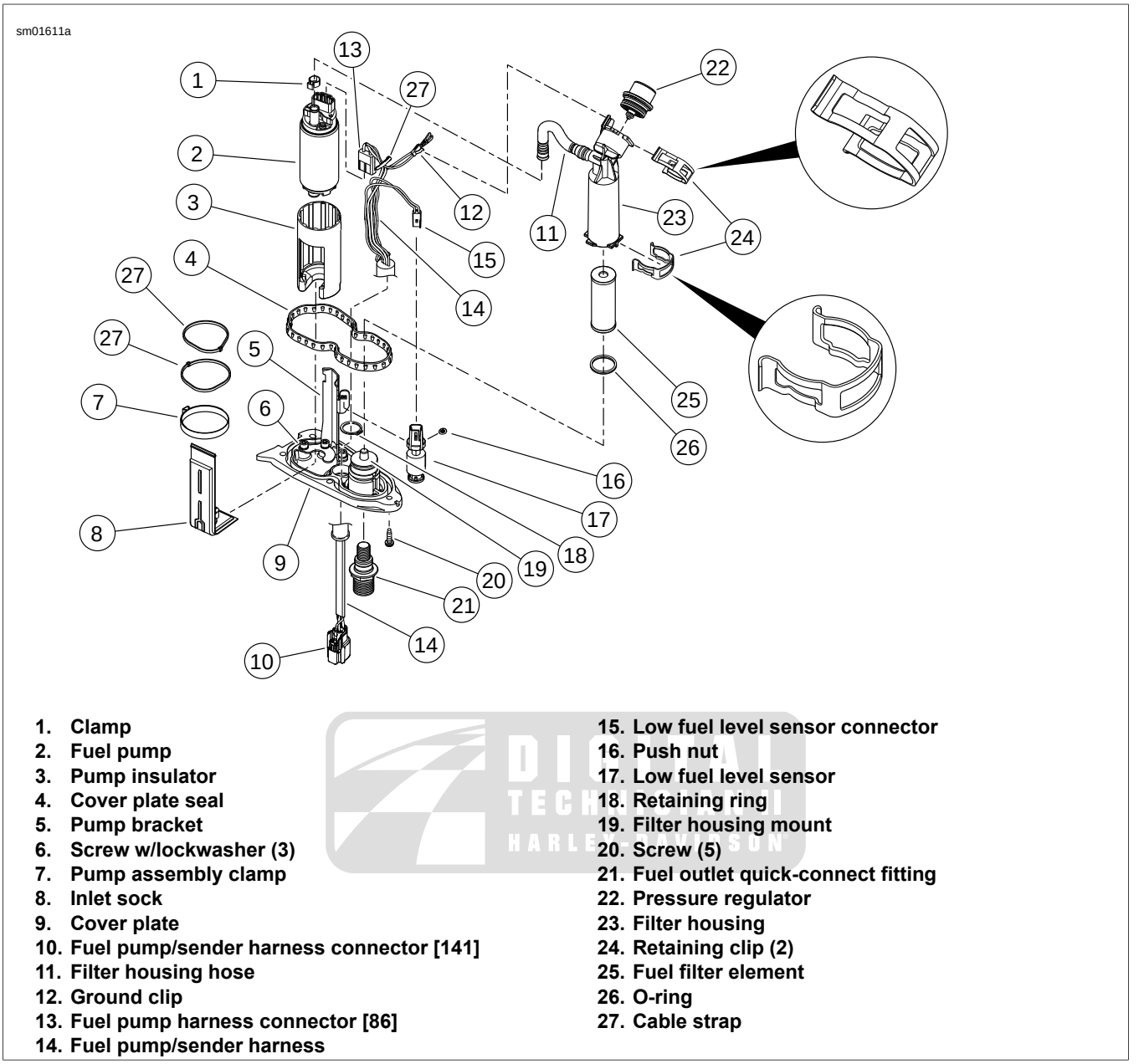
1. See Figure 4-78. Install low fuel level sensor assembly (17) onto pump bracket (5). Secure with push nut (16).
2. Plug the fuel pump/sender harness connector (15) into the low fuel level sensor (17).
3. See Figure 4-77. Secure low fuel level sensor connector and fuel pump/sender harness to filter housing hose (4) with cable strap (1).

Fuel Pump Assembly and Pump Bracket

1. See Figure 4-78. 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) with pump insulator (3) onto pump bracket. Secure with pump assembly clamp (7) (for relative position of clamp, see Figure 4-77.)
4. Install filter housing hose (11) on top of fuel pump. Secure with clamp (1).
5. Plug in fuel pump harness connector [86] (13).
6. See Figure 4-77. Secure fuel pump/sender harness to fuel pump bracket (3) with cable straps (1).

Pressure Regulator and Filter Housing

1. See Figure 4-78. Install the **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. Secure with retaining clip (24) at bottom of housing, making sure that clip is oriented exactly as shown in Figure 4-78.
3. Install pressure regulator (22) on top of filter housing. Secure with second retaining clip (24), making sure that clip is oriented exactly as shown in Figure 4-78.
4. Install filter housing hose (11) on top of fuel pump (2). Secure with clamp (1).
5. Install ground clip (12) on top of filter housing.
6. See Figure 4-77. Secure fuel pump/sender harness to filter housing hose (4) with cable strap (1).



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 4-78. Fuel Pump and Sender Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm

1. See Figure 4-78. Install **new** cover plate seal (4) into groove in cover plate (9).
2. See Figure 4-76. 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 4-79. Install screws. Tighten to 40-45 **in-lbs** (4.5-5.1 Nm) in sequence.
4. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
   a. Verify that the 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. 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: XL MODELS or 4.5 FUEL TANK: XR 1200X.
6. Install main fuse.
7. Close left side cover.

8. Check for leaks:
   a. Turn ignition switch to ON.
   b. Verify fuel pump is activated.
   c. Check for leaks at quick connect.
   d. Turn ignition switch to OFF.

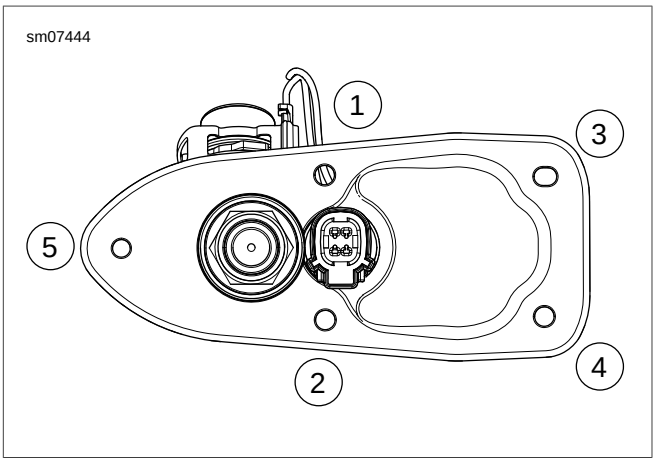


Figure 4-79. Fuel Pump Module Torque Sequence

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL FILTER ELEMENT 4.17

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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
2. Remove seat.

WARNING

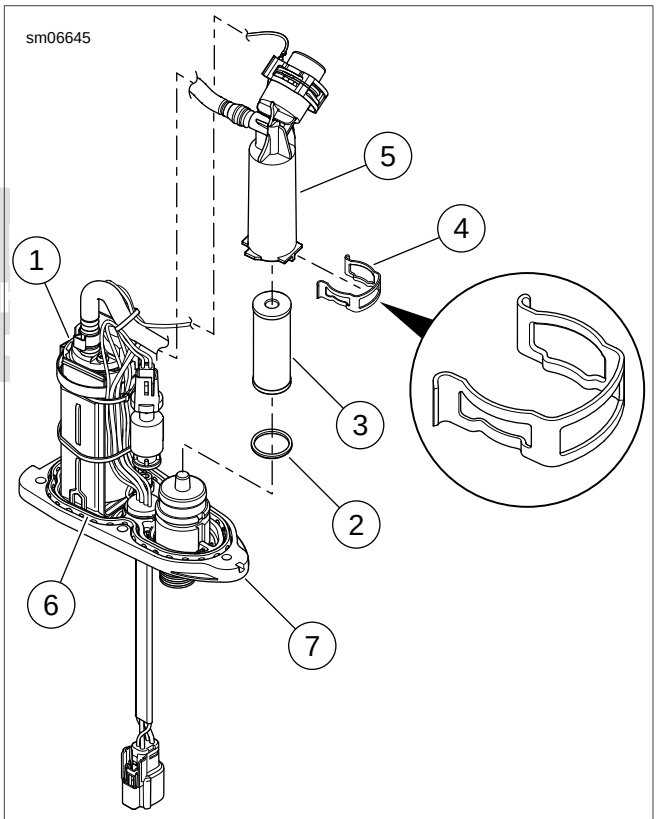
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

3. Remove main fuse.
4. Drain and remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. Remove fuel pump assembly from fuel tank. See 4.16 FUEL PUMP.
6. See Figure 4-80. Remove and discard cover plate seal (6).
7. Remove retaining clip (4) and lift filter housing (5) off fuel pump assembly (1).
8. Remove and discard filter element (3).

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm

1. See Figure 4-80. 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 cross pattern to 40-45 **in-lbs** (4.5-5.1 Nm). See 4.16 FUEL PUMP.
6. Install fuel tank and reconnect fuel hose. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X. Fill fuel tank and carefully check for leaks.
7. Install main fuse.
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 4-80. Replacing Fuel Filter Element

FUEL PRESSURE TEST 4.18

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 the Fuel Pressure Gauge

1. Purge the fuel supply hose and disconnect the fuel supply hose from the fuel pump module.
   a. **XL Models:** See 4.4 FUEL TANK: XL MODELS.
   b. **XR 1200X:**See 4.5 FUEL TANK: XR 1200X.
2. Connect the fuel pump connector [141].

NOTE

Do not kink the fuel hose when installing or removing fuel pressure gauge and adapter.

3. See Figure 4-81. Attach the FUEL PRESSURE GAUGE ADAPTER (Part No. HD-44061) as follows:
   a. See Figure 4-82. Pull up on sleeve of fuel tank quick-connect fitting (2) and insert neck of the fuel pressure gauge adapter (3) into quick-connect fitting.
   b. Push up on bottom of adapter and pull down on sleeve until it clicks. Tug on adapter to verify that it is locked in place.
   c. In the same manner, connect vehicle's fuel supply hose fitting (1) to quick-connect fitting (4) on the adapter.

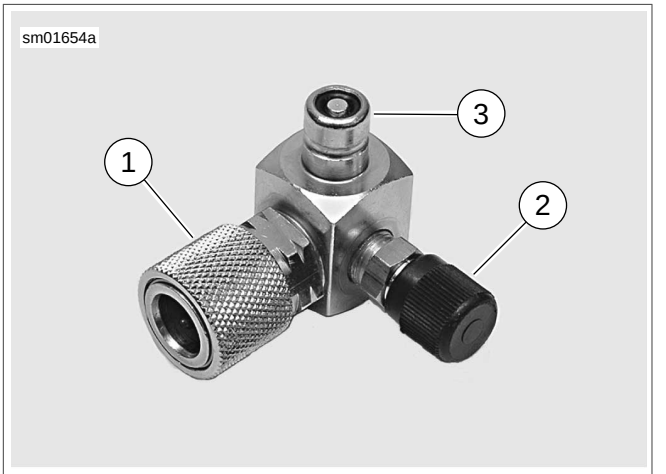
⚠WARNING

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 the fuel valve (6) and air bleed petcock on the fuel pressure gauge are closed.
5. See Figure 4-83. Remove protective cap from free end of fuel pressure gauge adapter.
6. Connect the FUEL PRESSURE GAUGE (Part No. HD-41142) to the Schroeder valve.

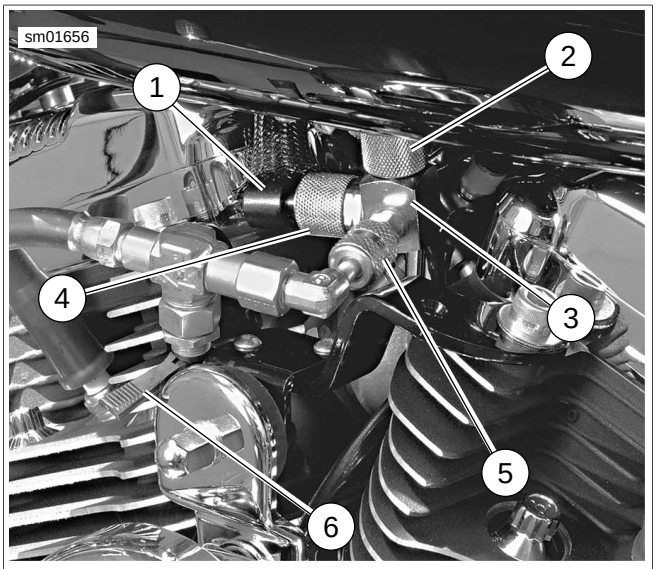
Perform Test

1. Start and idle engine to pressurize the fuel system. Open the fuel valve to allow the flow of fuel down the hose of the pressure gauge.
2. Purge air from gauge and hose:
   a. Position the clear air bleed tube in a suitable container.
   b. Open and close the air bleed petcock to purge the gauge and hose of air.
   c. Repeat this step several times until only solid fuel (without bubbles) flows from the air bleed tube.
   d. Close the petcock.
3. Open and close throttle to change engine speed. Note the reading of the pressure gauge.
4. Turn the engine OFF and service as necessary. Refer to Table 4-3.



1. **Quick-connect fitting**
2. **Protective cap**
3. **Fuel tank fitting (neck)**

Figure 4-81. 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 4-82. Assembling Adapter, Gauge and Fuel Supply Hose to Fuel Tank: All Models

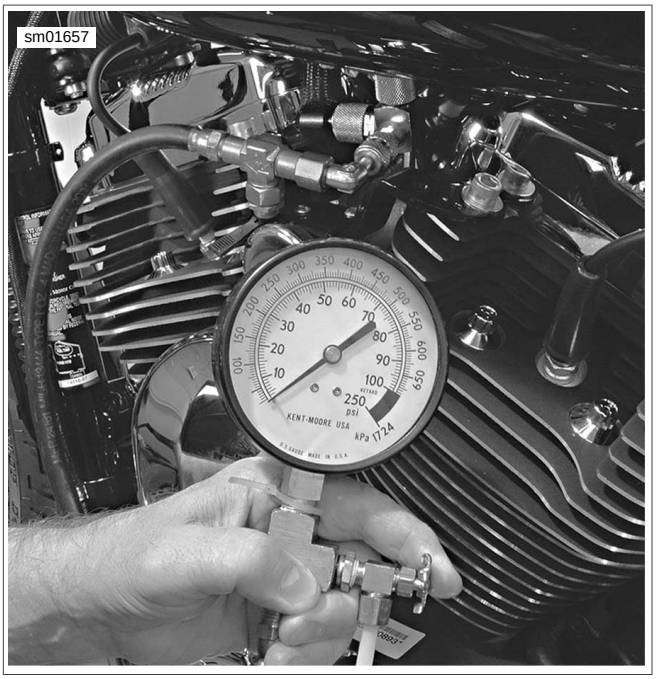


Figure 4-83. Fuel Pressure Gauge Installed: All Models

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)	Repair or replace as necessary.
	Faulty pressure regulator	Replace.
Steady at: 55-62 psi (380-425 kPa)	Operating fuel pressure	
More than: 62 psi (425 kPa)	Check valve fitting and fuel tank	Replace as necessary.
	Fuel pressure regulator	Replace.

Return to Service

1. Position the air bleed tube in a suitable container. Open the air bleed petcock to relieve the fuel system pressure and purge the 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 the 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. Pull up on knurled sleeve of the fuel pressure gauge adapter quick-connect fitting and remove vehicle's fuel supply hose from adapter. 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. Push up on release sleeve of fuel pump quick-connect fitting and push the fuel hose fitting into quick-connect fitting. Pull down on release sleeve to lock. Tug on fuel hose fitting to verify that it is locked.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

INTAKE LEAK TEST 4.19

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

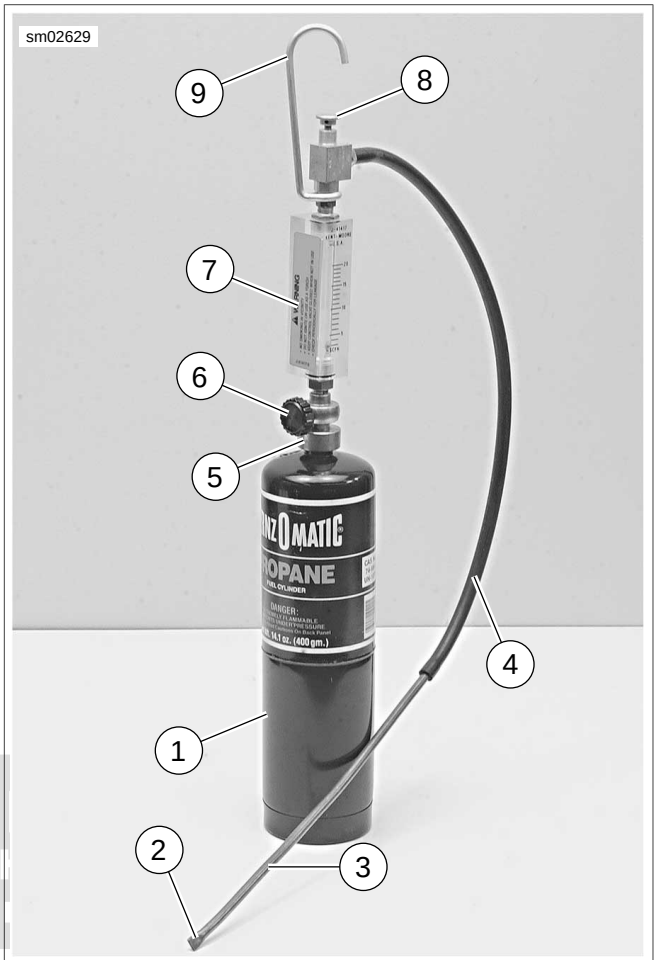
- Standard 14 oz. propane cylinder.
- PROPANE ENRICHMENT KIT (Part No. HD-41417).

Tester Assembly

1. See Figure 4-84. Make sure valve knob (6) is closed (fully clockwise).
2. Screw valve assembly (5) onto propane bottle (1).

Tester Adjustment

1. See Figure 4-84. 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 4-84. Leak Tester

PROCEDURE

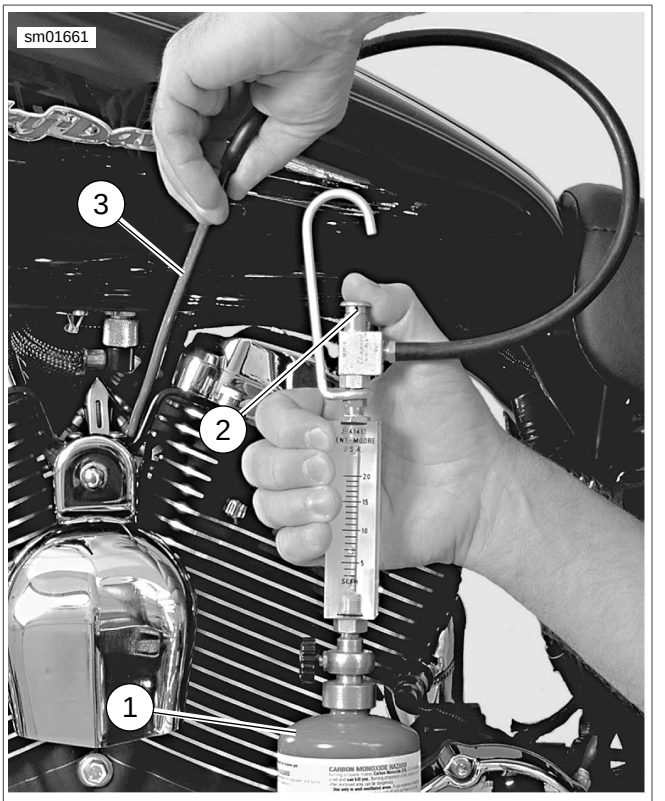
1. Start engine.
2. Warm up engine to operating temperature.

NOTE

Do not direct propane stream toward air cleaner. If propane enters air cleaner, a false reading will be obtained.

3. See Figure 4-85. Aim nozzle (3) toward possible sources of leak such as intake manifold mating surfaces.
4. Press and release trigger button (2) to dispense propane. Tone of engine will change when propane enters source of leak. Repeat as necessary to detect leak.

5. When test is finished, close valve knob (turn knob fully clockwise).



1. **Propane bottle**
2. **Trigger button**
3. **Nozzle**

Figure 4-85. Checking for Leaks: All Models

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

EVAPORATIVE EMISSIONS CONTROL 4.20

GENERAL

Motorcycles sold in some markets have an evaporative (EVAP) emissions control system.

See Figure 4-86. The EVAP functions in the following manner:

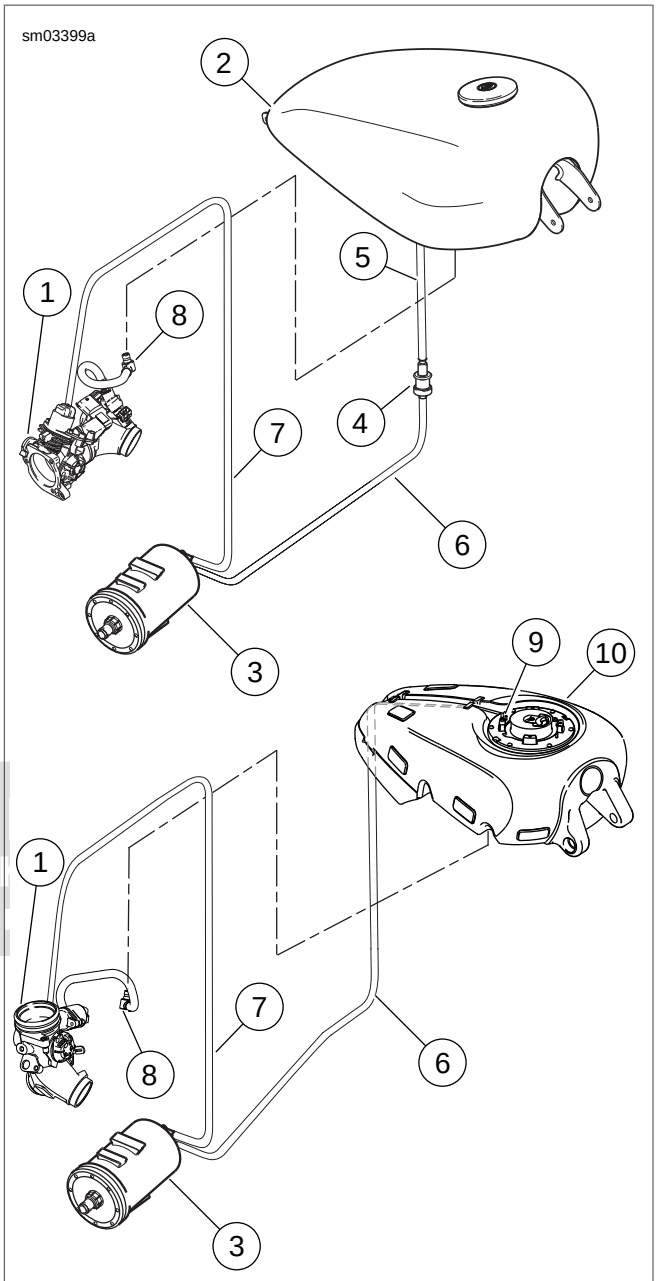
- Hydrocarbon vapors in the fuel tank (2, 10) are vented through the vapor valve (4) or vent fitting (9). The vapors are stored in the charcoal canister (3). When tipped, the valve closes. Gasoline cannot leak into the charcoal canister from the vapor valve hoses (5, 6).
- When the engine is running, intake negative pressure (vacuum) slowly draws hydrocarbon vapors from the charcoal canister through the purge hose (7). These vapors pass through the intake and are burned as part of normal combustion in the engine.

⚠WARNING

Keep evaporative emissions vent lines away from exhaust and engine. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00266a)

NOTE

The EVAP system is designed to operate with a minimum of maintenance. Check that all hoses are connected and correctly routed. They cannot be pinched, kinked, cracked or torn. Improper connections could leak charcoal from canister.



1. **Induction module**
2. **Fuel tank (XL models only)**
3. **Charcoal canister**
4. **External vapor valve (XL models only)**
5. **Fuel tank-to-vapor valve hose**
6. **Vapor valve-to-canister hose**
7. **Purge hose**
8. **Fuel supply hose**
9. **Vent fitting (XR 1200X)**
10. **Fuel tank (XR 1200X)**

Figure 4-86. Evaporative Emissions Control System (typical)

CHARCOAL CANISTER

FASTENER	TORQUE VALUE	
EVAP canister mounting bracket screw	17-22 ft-lbs	23.1-29.9 Nm
Master cylinder mounting bracket, rear, screw: XL models	17-22 ft-lbs	23.0-29.8 Nm
EVAP canister mounting bracket screw	17-22 ft-lbs	23.1-29.9 Nm
EVAP canister clip mounting screw	36-60 **in-lbs**	4.1-6.8 Nm
EVAP canister guard screw	35-45 **in-lbs**	4.0-5.1 Nm

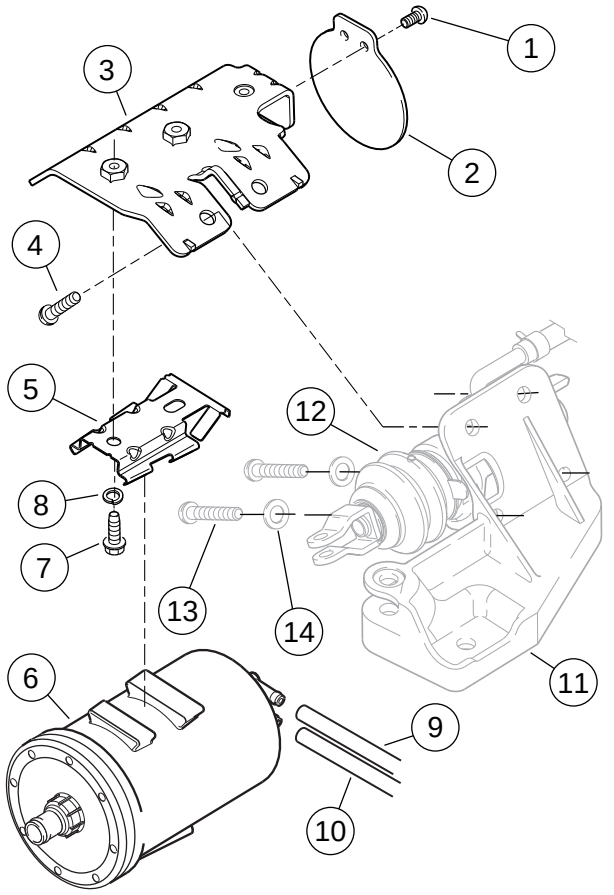
The charcoal canister is mounted to a bracket attached to the rear brake master cylinder bracket, near the bottom of the frame in front of the rear fork pivot point.

Removal

1. See Figure 4-87. Remove two screws (1) and canister guard (2).
2. Mark the two hoses (9, 10) connected to charcoal canister (6). Disconnect hoses from canister.
3. Press the locking tabs at the left end of canister clip (5). Slide canister towards left side of vehicle until it disengages from canister clip.
4. Remove two screws (7) and washers (8) to detach canister clip from canister mounting bracket (3).
5. **XL Models:** If canister mounting bracket requires repair/replacement, proceed as follows:
   a. Remove two screws (13) and washers (14) securing rear master cylinder to mounting bracket. This will allow you to move the rear master cylinder to access the remaining fasteners.
   b. Remove two screws (4) to detach canister mounting bracket from rear master cylinder mounting bracket.
6. **XR 1200X:** See Figure 4-88. If canister mounting bracket requires repair/replacement, remove two screws (2) to detach canister mounting bracket from frame.

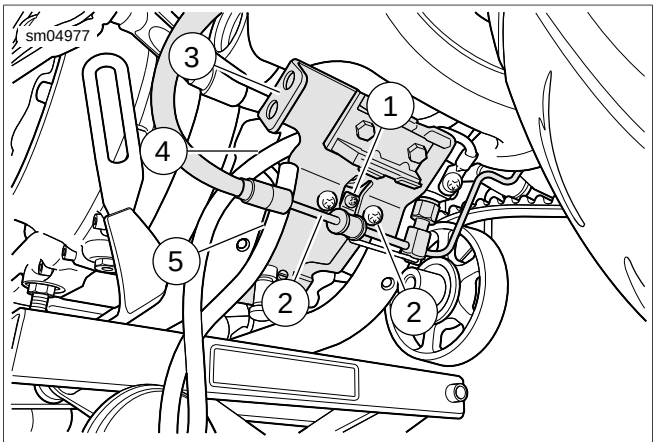
NOTE

It is not necessary to remove brake line clamp screw (1).



1. **Screw (2)**
2. **Canister guard**
3. **Canister mounting bracket**
4. **Screw (2)**
5. **Canister clip**
6. **Charcoal canister**
7. **Screw (2)**
8. **Washer (2)**
9. **Purge hose from induction module**
10. **Vent hose from vapor valve**
11. **Rear master cylinder bracket**
12. **Rear master cylinder**
13. **Screw (2)**
14. **Washer (2)**

Figure 4-87. Charcoal Canister Mounting (typical)



1. **Screw**
2. **Canister mounting bracket screws (2)**
3. **Canister mounting bracket**
4. **Fuel tank-to-canister hose**
5. **Canister-to-induction module hose**

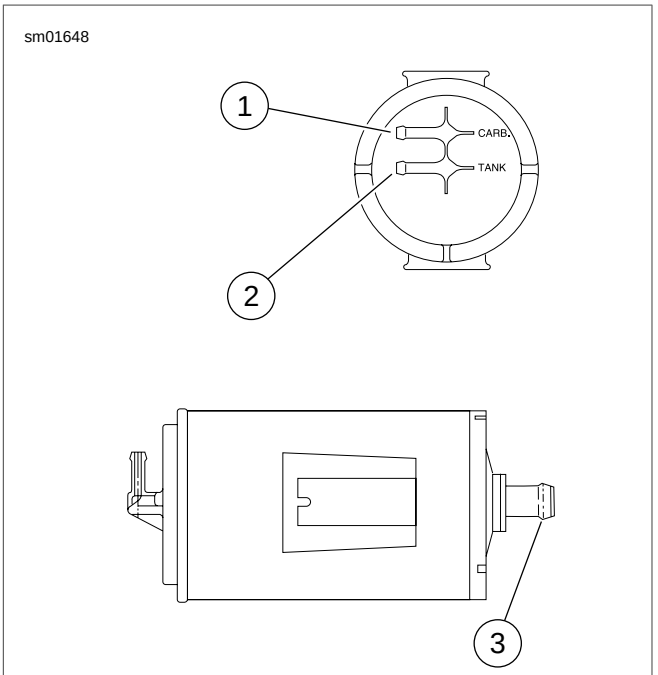
Figure 4-88. Charcoal Canister Mount: XR 1200X

Installation

NOTE

XL Models: *Verify that the EVAP canister mounting hardware does not contact the rear stabilizer ground strap.*

1. **XL Models:** See Figure 4-87. If canister mounting bracket (3) was removed, proceed as follows:
   a. Attach bracket (3) to rear master cylinder mounting bracket and frame with two screws (4). Tighten to 17-22 ft-lbs (23.1-29.9 Nm).
   b. Apply one or two drops of LOCTITE 243 to screws (13). Install rear master cylinder (12) to mounting bracket (11) with screws and washers (14). Tighten to 17-22 ft-lbs (23.0-29.8 Nm).
2. **XR 1200X:** See Figure 4-88. If canister mounting bracket (3) was removed, proceed as follows:
   a. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of the mounting screws (2).
   b. Install bracket and tighten screws (2) to 17-22 ft-lbs (23.1-29.9 Nm).
3. See Figure 4-87. Attach canister clip (5) to canister mounting bracket with two screws (7) and two washers (8). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
4. Starting at left side of canister clip, slide charcoal canister (6) to the right until tabs on canister clip lock canister in place. Bend tabs outward somewhat if canister is not held securely.
5. See Figure 4-89. Connect two hoses (1, 2), marked during disassembly, to their proper fittings on canister.
6. See Figure 4-87. Install canister guard (2) using two screws (1). Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).



1. **Purge hose from induction module**
2. **Vent hose from fuel tank and vapor valve**
3. **Clean air port (no hose connection)**

Figure 4-89. Charcoal Canister Connections

VAPOR VALVE: XL MODELS

Removal

NOTES

- ***XL Models:*** *The vapor valve is located under the left side cover in a clip molded into the ECM caddy.*
- ***XR 1200X:*** *The vapor valve is incorporated in the fuel tank filler housing. See 4.5 FUEL TANK: XR 1200X.*

1. Open left side cover. See 2.18 LEFT SIDE COVER.
2. See Figure 4-90. Carefully remove vapor valve (2).
3. Mark two hoses (1, 3) connected to upper and lower fittings of vapor valve. Remove hoses from fittings.

NOTE

On non-EVAP system models, charcoal canister is absent and bottom hose of vapor valve is vented to the atmosphere.

Installation

⚠WARNING

Keep vent and vapor valve lines away from exhaust and engine. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00263a)

NOTE

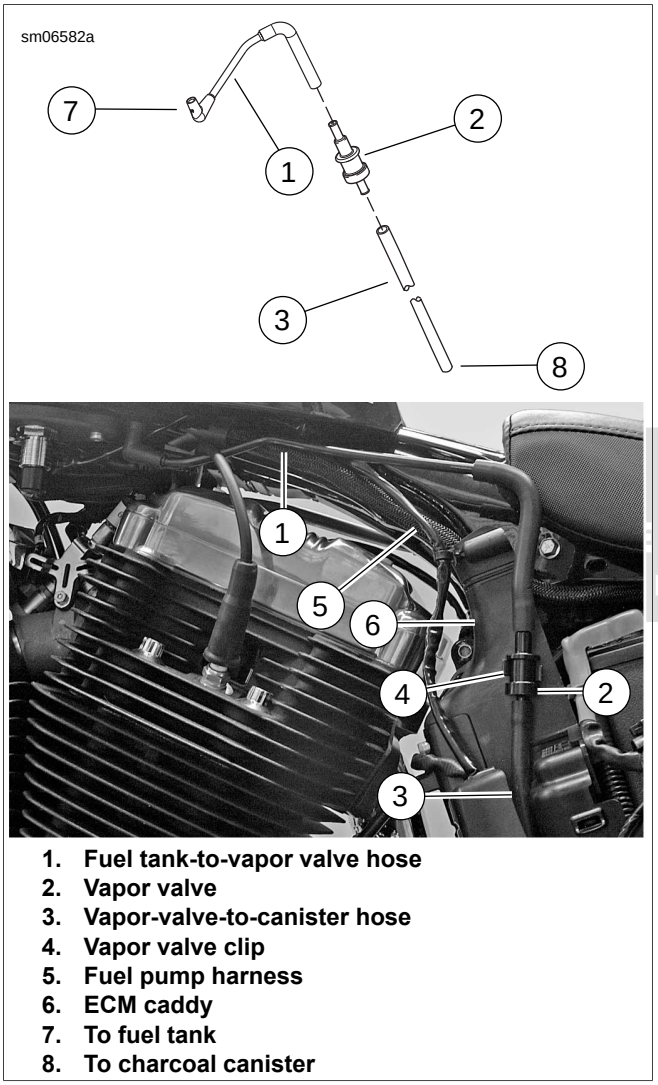
Mount the vapor valve in an upright position with the longer fitting positioned at the top or excessive fuel vapor pressure may build up within the fuel tank. Mounting the vapor valve upside down will result in fuel flow problems.

1. See Figure 4-90. Hold vapor valve (2) in an upright position with the long necked end pointing up. Insert top fitting of vapor valve into fuel tank-to-vapor valve hose (1). Install bottom vapor valve fitting into vapor valve-to-canister hose (3).
2. Carefully push body of vapor valve into clip (4) molded into the ECM caddy (6).

NOTE

Do NOT force vapor valve into clip. Forcing valve in to clip could cause clip to break, necessitating replacement of the ECM caddy.

3. Close left side cover.



1. **Fuel tank-to-vapor valve hose**
2. **Vapor valve**
3. **Vapor-valve-to-canister hose**
4. **Vapor valve clip**
5. **Fuel pump harness**
6. **ECM caddy**
7. **To fuel tank**
8. **To charcoal canister**

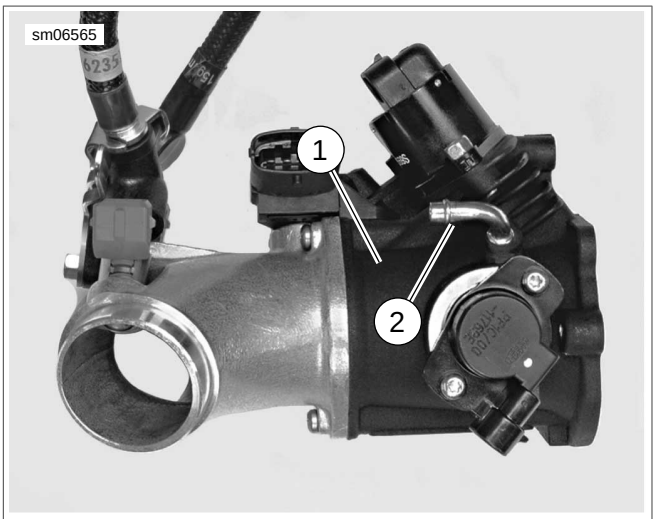
Figure 4-90. Vapor Valve and Hose Routing: XL EVAP Models

HOSE ROUTING

Induction Module

XL Models: Remove the fuel tank and air cleaner/backplate assembly to access the induction module.

XR 1200X: See Figure 4-91. Route the evaporative emissions control hose to the purge hose fitting (2) on the induction module (1).



1. **Induction module**
2. **Purge hose (to canister) fitting**

Figure 4-91. Emissions Hose Routing at Induction Module

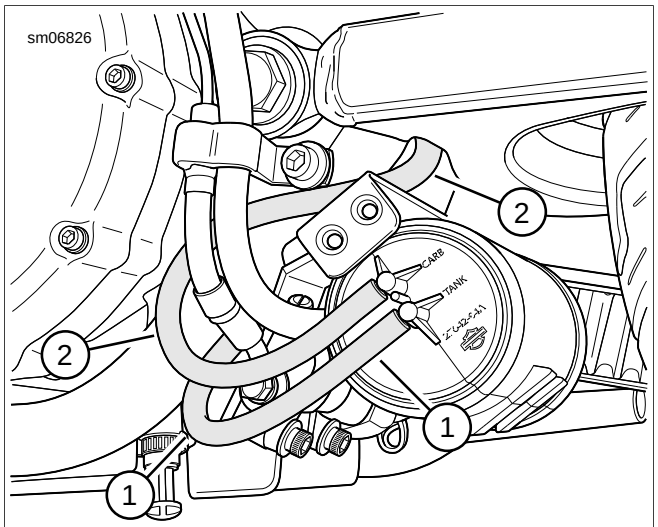
Canister Hose Routings: XL Models

1. See Figure 4-92. Connect the vapor valve-to-canister hose (1) to the canister lower fitting marked TANK and the canister-to-induction module purge hose (2) to the upper fitting labeled CARB.
2. Route the vapor valve-to-canister hose:
   a. Under the frame.
   b. Behind the rear brake master cylinder bracket.
   c. Up the frame tube in front of the rear fork pivot.
   d. Inside the electrical caddy to the vapor valve inside the left side cover.
3. Connect the vapor valve-to-canister hose to the vapor valve.
4. Connect fuel tank-to-vapor valve hose the the vapor valve.
5. Route the fuel tank-to-vapor valve hose forward along the left side of frame backbone and connect to fitting on bottom of fuel tank.
6. Route the canister-to-induction module purge hose:
   a. Loop behind the brake fluid lines and around the master cylinder.
   b. Behind the frame.
   c. Between the rear fork and the rear fork pivot.
   d. Behind the oil lines and up behind the oil tank.
   e. Route canister-to-induction module purge hose up right side of frame rear downtube.
   f. Loop the hose over the wire harness caddy and forward along the caddy and the frame backbone.
   g. Connect the hose to the induction module.

NOTE

Position the hose against the engine sub-harness and as far from the rear rocker cover as possible.

7. See Figure 4-93. Secure the hose to the holes in the wire harness caddy with barbed cable straps.



1. **Tank to vapor valve**
2. **CARB to induction module**

Figure 4-92. EVAP Canister and Hose Routing

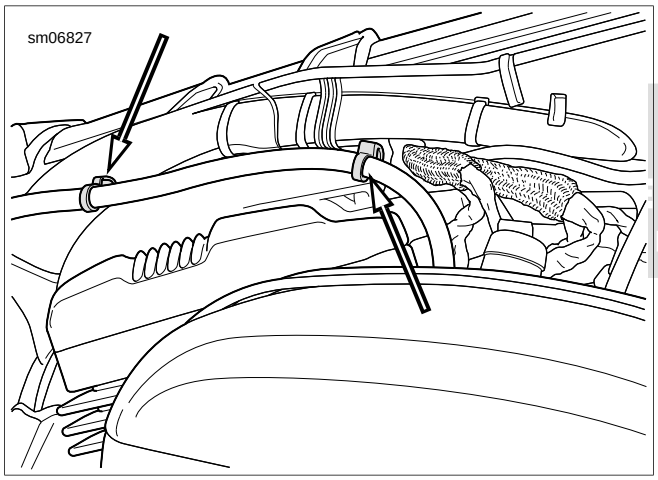
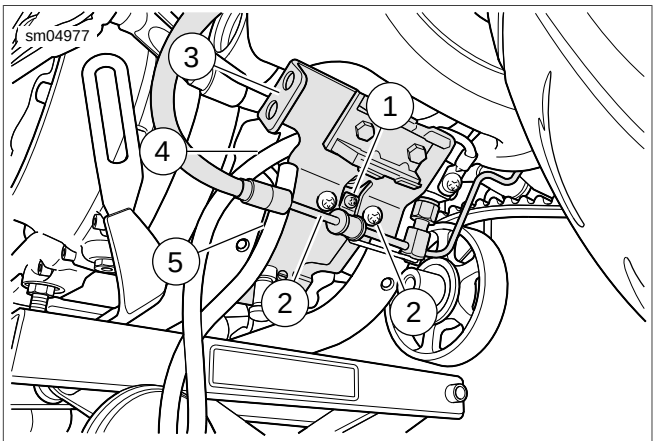


Figure 4-93. Cable Strap Locations

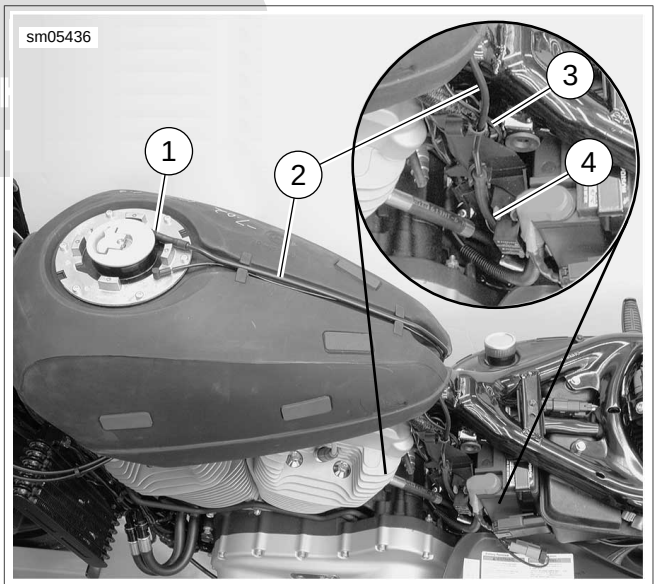
Canister Hose Routings: XR 1200X

1. See Figure 4-94. Route both hoses up past canister mount and between rear fork pivot point and rear end of crankcase as shown.
2. See Figure 4-95. Route fuel vapor hose (4) up along left side of frame rear downtube and outside the left electrical caddy. Connect to vapor tube (2).
3. Connect vapor tube (2) to fitting (1) on fuel tank filler housing and place in channel on top of fuel tank.
4. Secure to electrical caddy with barbed clamp (3).
5. See Figure 4-96. Route canister-to-induction module purge hose (1) up right side of frame rear downtube. Continue routing hose forward along right side of frame backbone tube and down, connecting hose to induction module fitting (3).
6. Secure hose to channels on rear end of right wire harness caddy (4). Verify that hose is positioned up against engine sub-harness. Secure hose and harness with clamp (2).
7. Connect hoses to labeled fittings on left side of charcoal canister.



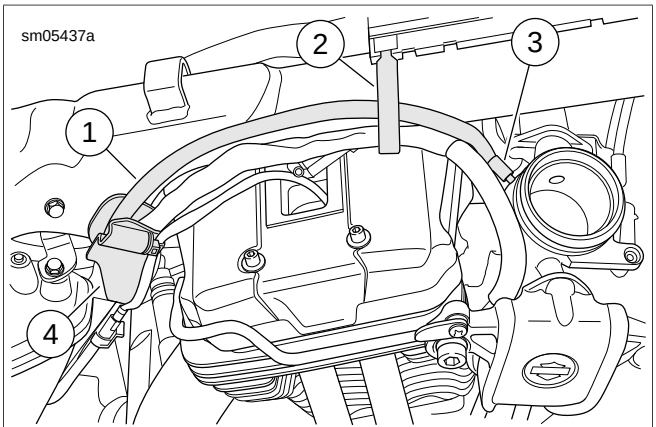
1. **Screw**
2. **Canister mounting bracket screws (2)**
3. **Canister mounting bracket**
4. **Fuel tank-to-canister hose**
5. **Canister-to-induction module hose**

Figure 4-94. Charcoal Canister Mount: XR 1200X



1. **Vapor fitting**
2. **Vapor tube**
3. **Clamp**
4. **Vapor hose**

Figure 4-95. Vapor Hose Routing



1. **Purge hose**
2. **Clamp**
3. **Induction module fitting**
4. **Right wire harness caddy**

Figure 4-96. Purge Hose Routing

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

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	5.6 DRIVE BELT, Drive Belt: XL Models
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	5.6 DRIVE BELT, Drive Belt: XR 1200X
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	5.14 TRANSMISSION INSTALLATION, Shifter Shaft Installation
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	5.14 TRANSMISSION INSTALLATION, Assembling Crankcases
Engine sprocket bolt: XR 1200X	155-165 ft-lbs	210.0-224.0 Nm	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation
Engine sprocket nut: XL Models	240-260 ft-lbs	326-353 Nm	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Installation
Exhaust pipe clamp bracket fastener: XL Models	30-33 ft-lbs	40.7-44.8 Nm	5.6 DRIVE BELT, Drive Belt: XL Models
Exhaust pipe clamp bracket fastener: XR 1200X	30-33 ft-lbs	40.7-44.8 Nm	5.15 TRANSMISSION SPROCKET, Installation
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	5.15 TRANSMISSION SPROCKET, Installation
Gear detent assembly screw	90-110 **in-lbs**	10.2-12.4 Nm	5.14 TRANSMISSION INSTALLATION, Installation
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	5.3 PRIMARY COVER, Installation
Idler pulley bracket flanged nut: XR 1200X	33-35 ft-lbs	44.7-47.5 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Idler pulley fastener: XR 1200X	70-80 ft-lbs	95-109 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Muffler interconnect bracket mounting screw: XR 1200X	30-33 ft-lbs	40.7-44.8 Nm	5.15 TRANSMISSION SPROCKET, Installation
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	5.14 TRANSMISSION INSTALLATION, Assembling Crankcases
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 screw	100-120 **in-lbs**	11.3-13.6 Nm	5.3 PRIMARY COVER, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.6 DRIVE BELT, Drive Belt: XL Models
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.6 DRIVE BELT, Drive Belt: XR 1200X
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.15 TRANSMISSION SPROCKET, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.15 TRANSMISSION SPROCKET, Installation
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	5.6 DRIVE BELT, Drive Belt: XR 1200X
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	5.15 TRANSMISSION SPROCKET, Installation

FASTENER	TORQUE VALUE		NOTES
Transmission mainshaft nut: XL Models	50-60 ft-lbs	67.8-81.3 Nm	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Installation
Transmission mainshaft nut: XR 1200X	50-60 ft-lbs	67.8-81.3 Nm	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation
Transmission sprocket lockplate fastener	90-120 **in-lbs**	10.3-13.6 Nm	5.15 TRANSMISSION SPROCKET, Installation
Transmission sprocket nut	50 ft-lbs	68 Nm	5.15 TRANSMISSION SPROCKET, Installation/Initial torque plus 30-40 degrees.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

SPECIFICATIONS: DRIVE 5.2

SPORTSTER SPECIFICATIONS

Table 5-1. Sprocket Teeth

DRIVE	ITEM	NUMBER OF TEETH				
		XL 883 MODELS		XL 1200 MODELS		XR 1200X
		U.S.	WORLD	U.S.	WORLD	U.S./WORLD
Primary	Engine	34	34	38	38	34
	Clutch	57	57	57	57	57
Final	Transmission	29	29	29	30	28
	Rear wheel	68	68	68	68	68

Table 5-2. Overall Drive Ratios

GEAR	XL 883 MODELS	XL 1200 MODELS		XR 1200X
	ALL	U.S.	WORLD	U.S./WORLD
1st	10.407	9.315	9.004	10.782
2nd	7.436	6.653	6.432	7.702
3rd	5.530	4.948	4.783	5.728
4th	4.583	4.102	3.965	4.748
5th	3.931	3.517	3.400	4.071

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

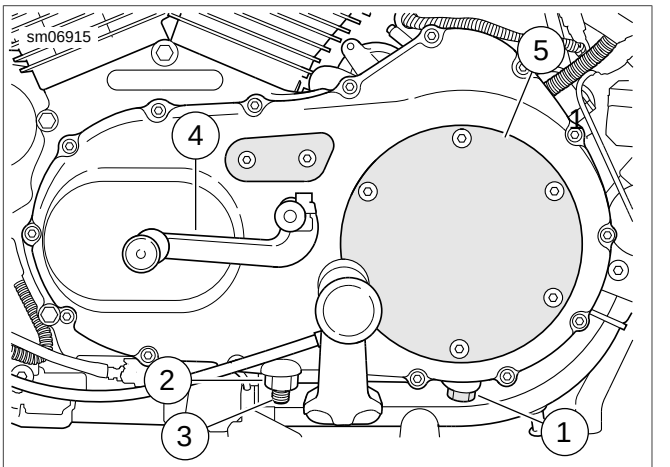
To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect battery cables (negative (-) cable first) before proceeding. (00307a)

1. Disconnect the negative (-) battery cable from the engine stud on the back of the crankcase behind the starter motor assembly. See 1.22 BATTERY MAINTENANCE.
2. Remove left side rider footrest and mounting bracket assembly.
   a. **Models with Mid-mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS or 2.42 RIDER FOOT CONTROLS: XR 1200X.
   b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
3. See Figure 5-1. Place a drain pan under the engine. Remove drain plug (1) and drain lubricant from primary drive housing.

NOTE

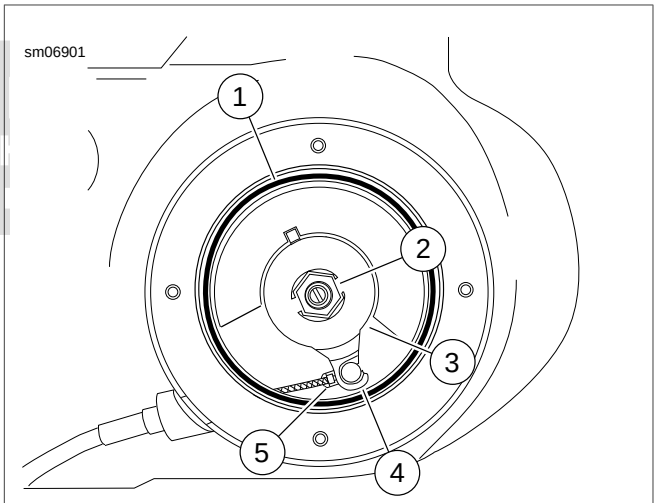
Dispose of primary lubricant in accordance with local regulations.

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 the clutch cable tension at the clutch cable adjuster.
7. Remove the clutch inspection cover (5).
8. See Figure 5-2. Remove the quad ring (1) from the groove in the primary cover. Discard the quad ring.
9. Slide 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 the 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 sixteen screws with captive washers securing primary cover to engine crankcase. Remove cover and gasket. Discard gasket.
14. See Figure 5-5. Remove and discard shifter shaft oil seal.



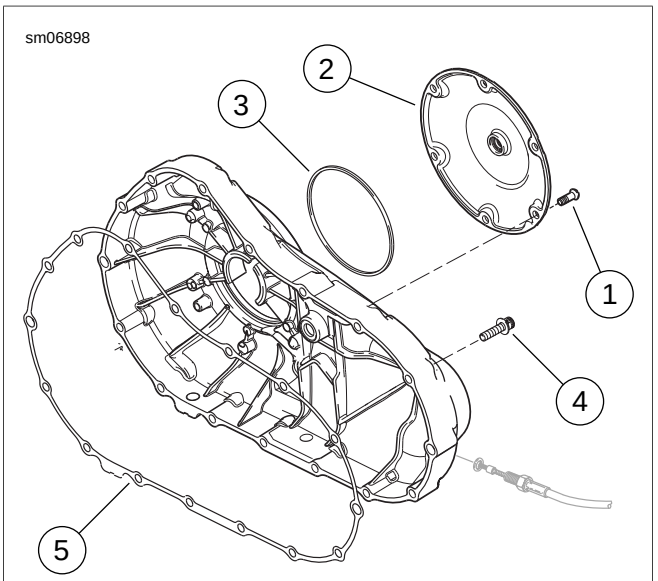
1. **Primary drain plug**
2. **Locknut**
3. **Adjuster screw**
4. **Shift lever**
5. **Clutch inspection cover**

Figure 5-1. Primary Cover



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

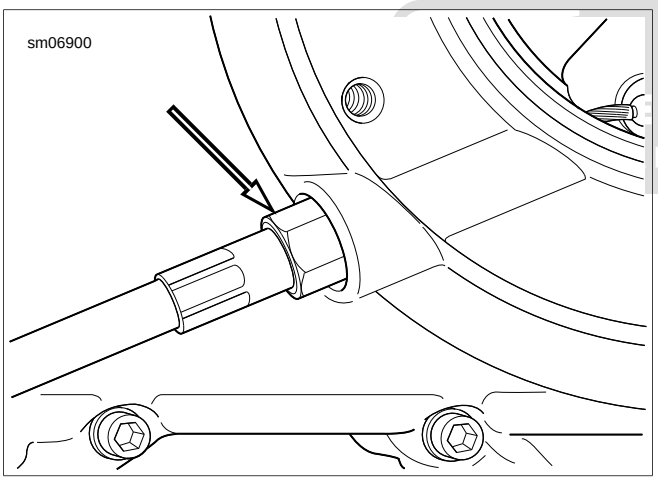


Figure 5-4. Clutch Cable Fitting

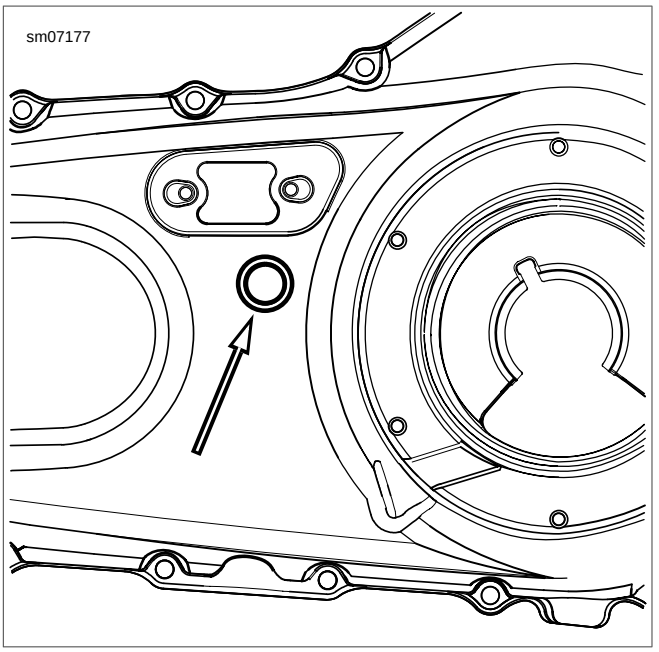
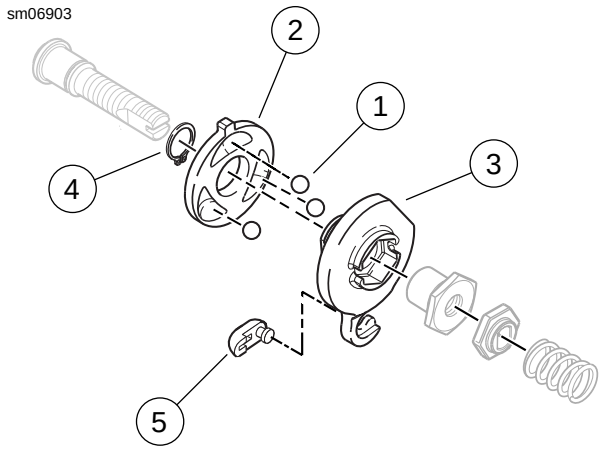


Figure 5-5. Shifter Shaft Oil Seal

CLUTCH RELEASE RAMP

1. Clean all parts in cleaning solvent. Dry with a clean, lint-free cloth.
2. See Figure 5-6. Inspect three balls (1) and ball socket surfaces of inner ramp (2) and outer ramp (3). Replace parts 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 the 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

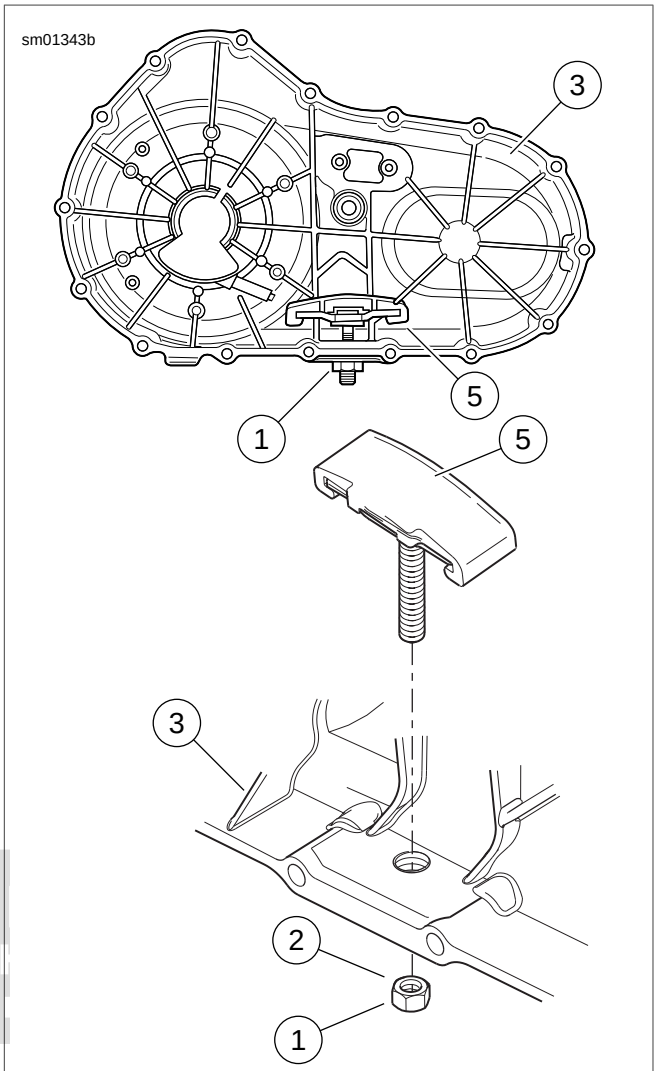
PRIMARY CHAIN ADJUSTER

1. See Figure 5-7. Remove locknut (1) from adjuster screw (4). Turn adjuster screw out of the threaded boss in the primary cover (3).
2. Inspect the adjuster shoe (5). Replace if worn or damaged.
3. Position the adjuster inside the primary cover (3) with the closed side of shoe against the cover. Thread the adjuster screw (4) all the way into the threaded boss at the bottom of the cover.

NOTE

Hold adjuster screw in place with a hex key while threading locknut on.

4. Thread the locknut (1) onto the adjuster screw with the nylon sealing surface (2) toward the 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 screw	100-120 **in-lbs**	11.3-13.6 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
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 the primary cover.

3. Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of primary cover screws.
4. See Figure 5-8. Install primary cover and gasket using sixteen screws with captive washers. Tighten to 100-120 **in-lbs** (11.3-13.6 Nm) in sequence.
5. Install drain plug:
   a. Clean the magnetic drain plug.
   b. Inspect O-ring and replace if necessary.
   c. Apply LOCTITE 565 PIPE SEALANT WITH TEFLON to the 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 the lockplate slides onto flats. Fit the lockplate within recess of outer ramp.
10. Install the oil drain plug. Tighten the oil drain plug.
11. Fill transmission to specification.
12. Install **new** quad ring in groove of primary cover. Verify that quad ring is fully seated in groove.
13. Install six 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 the clutch and the clutch lever free play. See 1.11 CLUTCH.
15. Install left side rider footrest and mounting bracket assembly.
   a. **Models with Mid-mount Controls:** See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS or 2.42 RIDER FOOT CONTROLS: XR 1200X.
   b. **Models with Forward Controls:** See 2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
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 the battery cables.

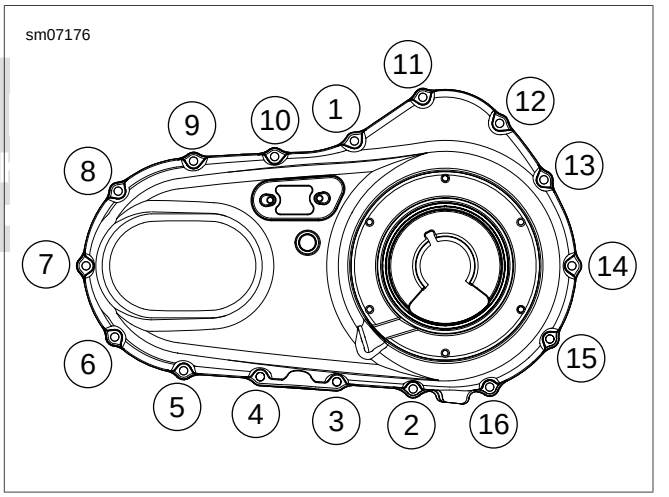


Figure 5-8. Outer Primary Cover Torque Sequence

PRIMARY DRIVE AND CLUTCH: XL MODELS 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 the only service work required, perform REMOVAL steps 1 and 4 only, and then proceed to the NOTES under DISASSEMBLY.

1. Disconnect negative (-) battery cable from stud on engine crankcase behind starter motor assembly. See 1.22 BATTERY MAINTENANCE.
2. Open left side cover. See 2.18 LEFT SIDE COVER.
3. Remove positive (+) battery cable from battery positive (+) terminal. See 1.22 BATTERY MAINTENANCE.
4. Remove the primary cover. Discard the primary cover gasket. See 5.3 PRIMARY COVER.

NOTE

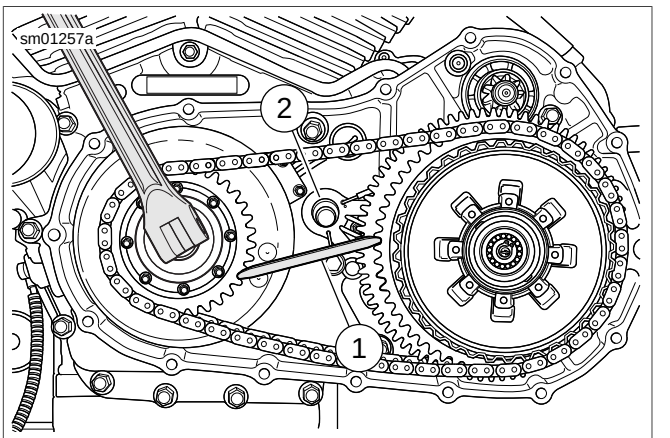
See Figure 5-9. Do not position the sprocket locking link too close to the shifter shaft (2). If the sprocket locking link contacts the shifter shaft the sprocket locking link may damage the shifter shaft and/or the engine crankcase.

5. 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).
6. Remove the engine sprocket nut. Do not remove engine sprocket at this time.
7. See Figure 5-10. Remove large retaining ring (16). Remove adjusting screw assembly (12, 13, 14 and 15) from pressure plate (11).

NOTE

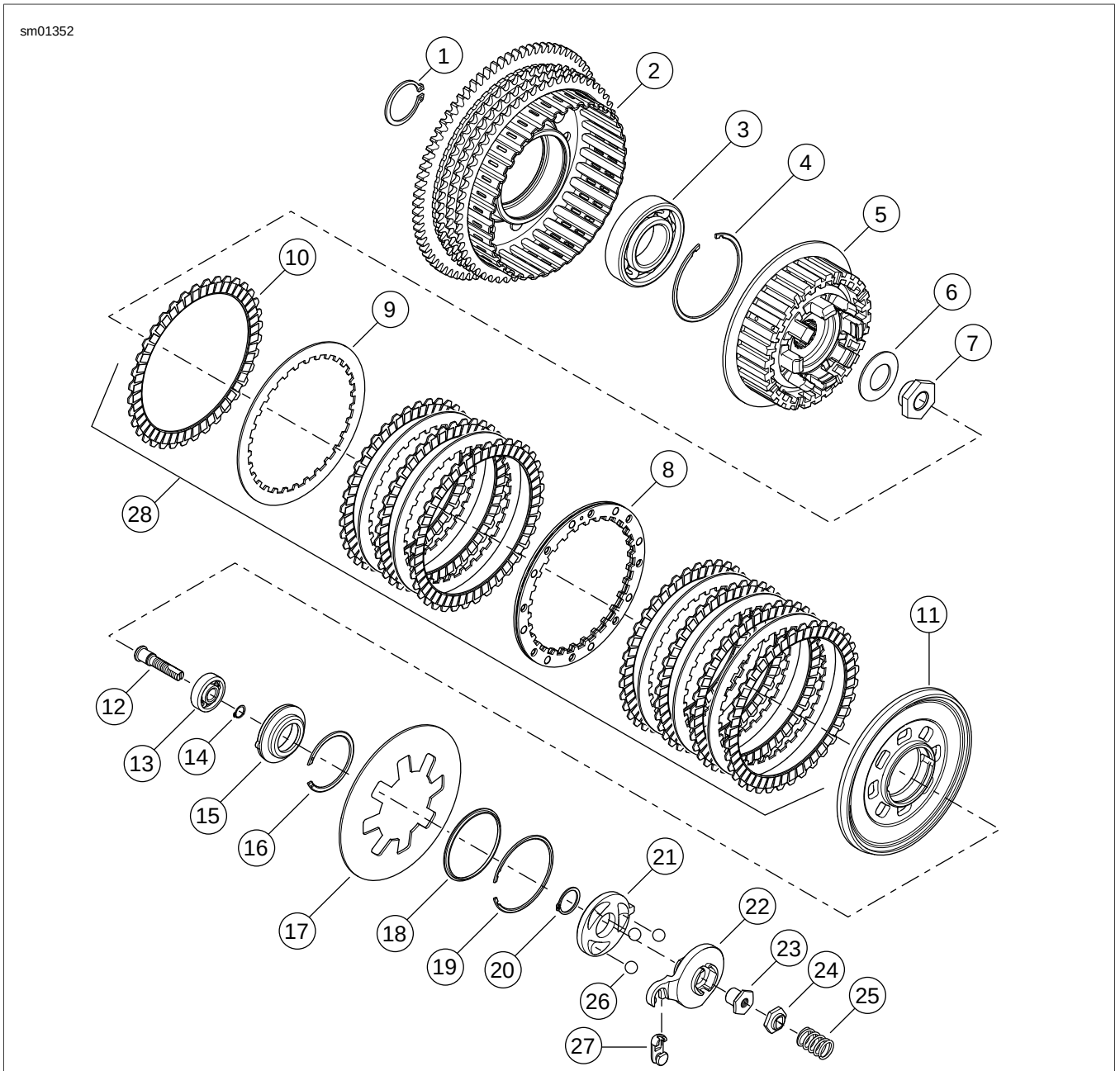
Transmission mainshaft nut (7) has left-hand threads. Turn nut clockwise to loosen and remove from mainshaft.

8. Remove mainshaft nut (7) and spring washer (6).
9. Remove the clutch assembly, primary chain and engine sprocket as an assembly from the vehicle.
10. Inspect primary chain. Replace if necessary.
11. Inspect stator and rotor. Replace if necessary. See 6.24 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: XL Models

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

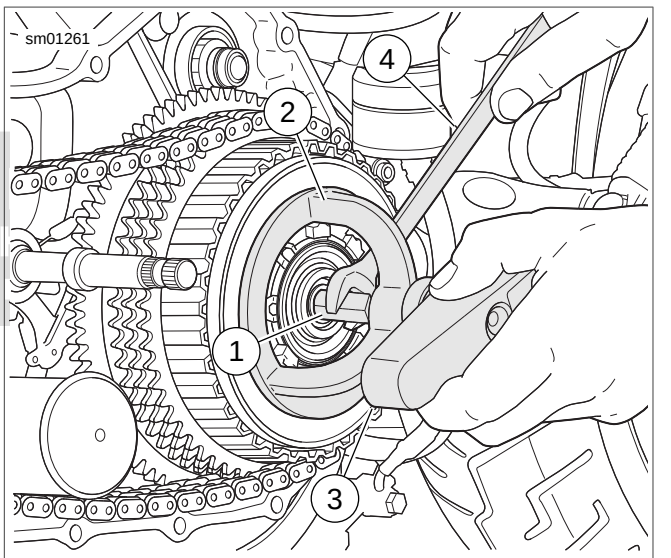
See Figure 5-10. Turn compressing tool handle only enough to remove retaining ring (19) and spring seat (18). Excessive compression of diaphragm spring could damage clutch pressure plate.

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: XL MODELS

NOTE

See Figure 5-10. If replacement of clutch pack (28) is the only service work required, perform all INSPECTION AND REPAIR steps (except Step 2f), and then proceed to the NOTES under ASSEMBLY.

⚠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. See Figure 5-10. Wash all parts, except the friction plates (10) and bearings (3 and 13), in a non-volatile cleaning solution or solvent. Blow parts dry with low pressure compressed air.
2. Examine the clutch components as follows:
   a. Inspect all clutch plates for wear and discoloration.
   b. Inspect all friction plates (10) 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 the plates are damaged, or warped more than 0.006 in (0.15 mm), replace the entire clutch pack.
   e. Wipe the lubricant from the seven wide friction plates.
   f. See Figure 5-12. Measure the thickness of each friction plate. If any one of the plates is less than 0.0795 in (2.02 mm), replace the entire clutch pack.
   g. See Figure 5-10. Inspect clutch shell ball bearing (3) for smoothness by rotating clutch shell while holding clutch hub. If bearing is rough or binds, it must be replaced.
   h. See Figure 5-13. Check the primary chain sprocket (3) and the starter ring gear (4) on the clutch shell (1). If either sprocket or ring gear are badly worn or damaged, replace the clutch shell.
   i. Check the slots (5, 6) that mate with the 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 the diaphragm spring (17) for cracks or bent tabs. Install a **new** spring if either condition exists.

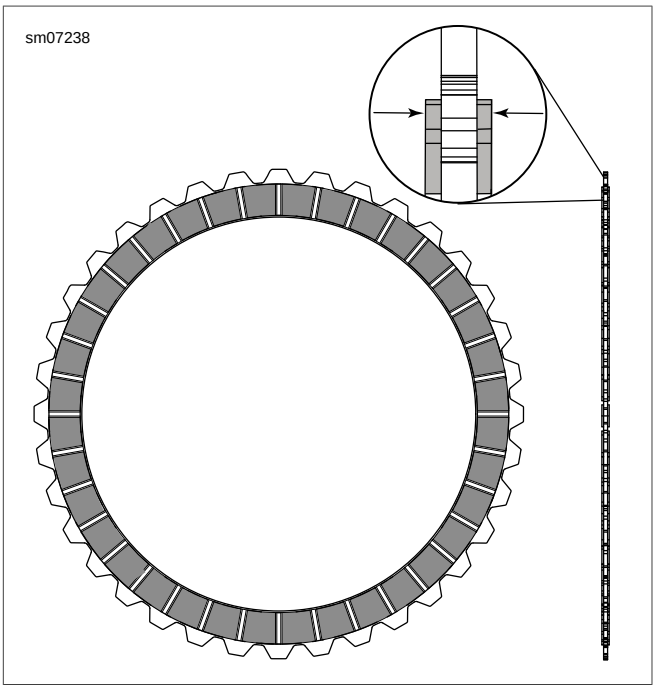
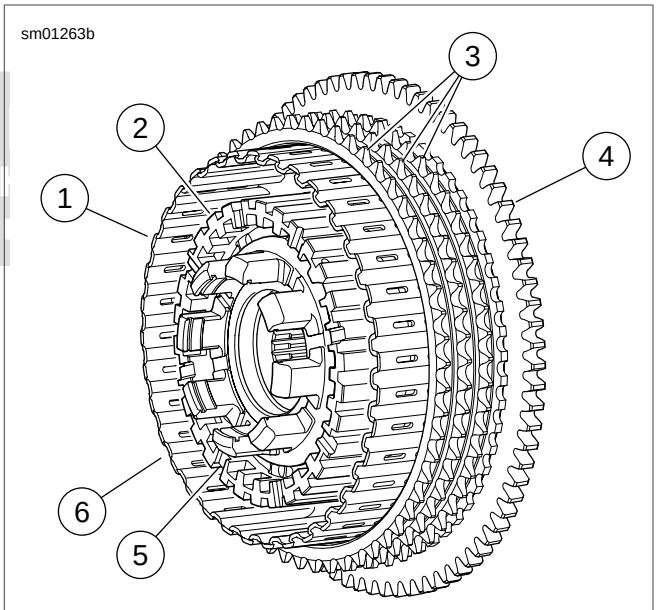


Figure 5-12. Friction Plate Thickness



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

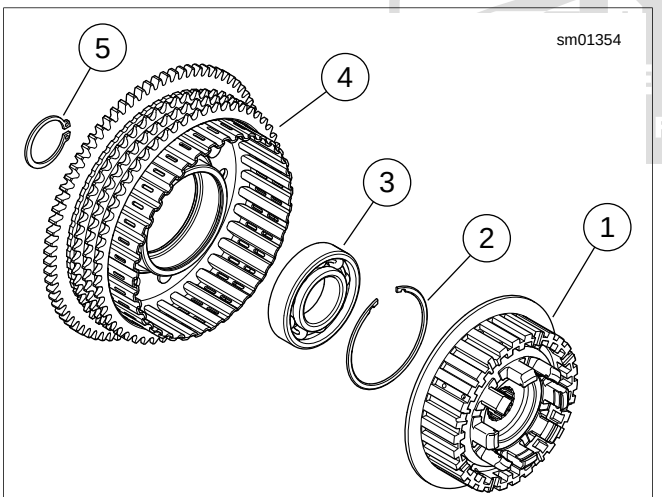
ASSEMBLY

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, and 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: XL Models	240-260 ft-lbs	326-353 Nm
Transmission mainshaft nut: XL Models	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 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

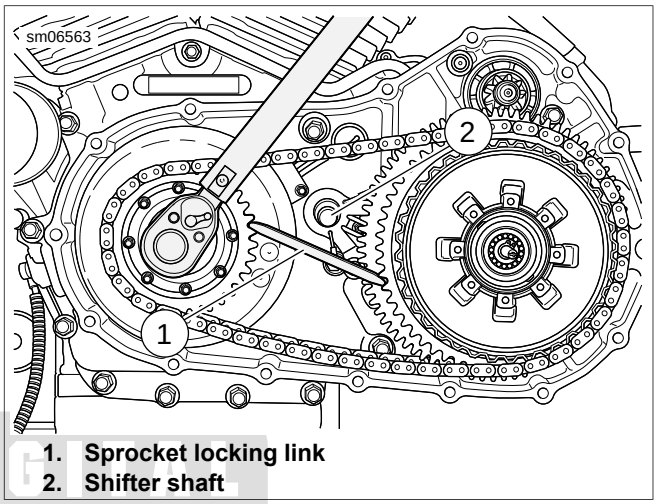
See Figure 5-15. Do not position the sprocket locking link too close to the shifter shaft (2). If the sprocket locking link contacts the shifter shaft while tightening the engine sprocket nut, the shifter shaft and/or the engine crankcase may be damaged.

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

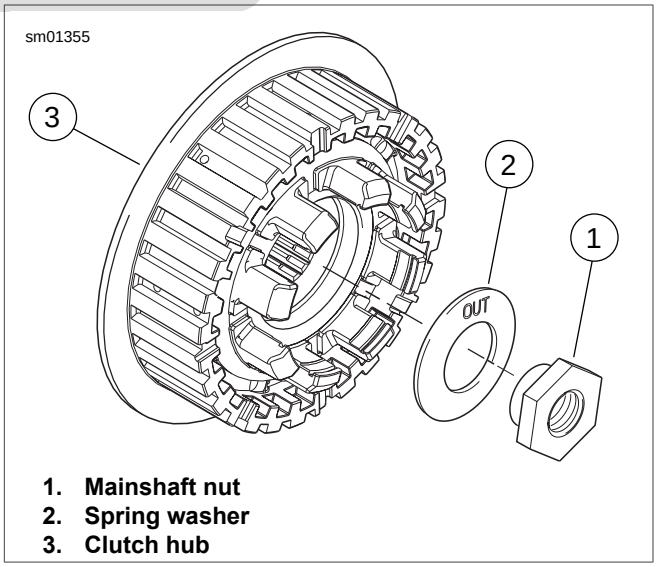
See Figure 5-16. Washer (2) must be installed with the word "out" facing the transmission mainshaft nut (1). Incorrect assembly can result in clutch and/or transmission failure.

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 1.22 BATTERY MAINTENANCE.



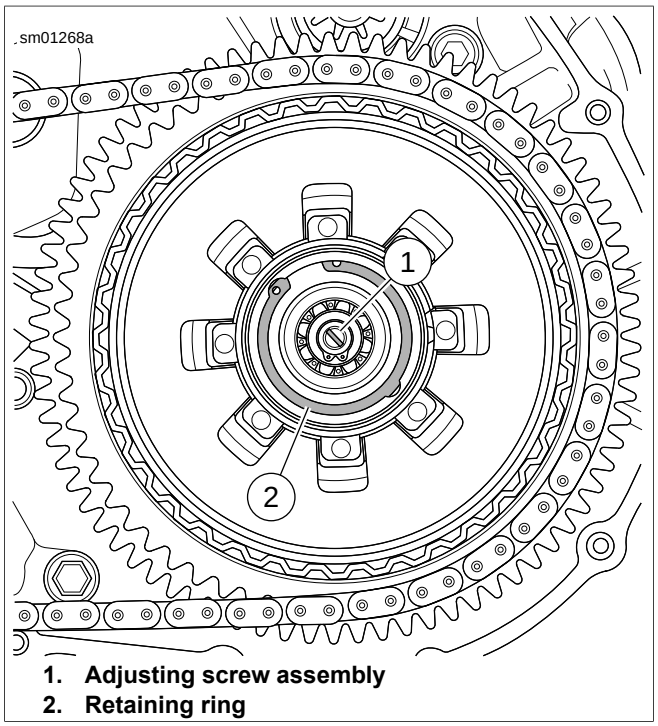
1. **Sprocket locking link**
2. **Shifter shaft**

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

PRIMARY DRIVE AND CLUTCH: XR 1200X 5.5

TROUBLESHOOTING

See 5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Troubleshooting.

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)

1. Disconnect negative (-) battery cable from stud on engine crankcase behind starter motor assembly. See 1.22 BATTERY MAINTENANCE.
2. Open left side cover. See 2.18 LEFT SIDE COVER.
3. Remove positive (+) battery cable from battery positive (+) terminal. See 1.22 BATTERY MAINTENANCE.
4. Remove primary cover and discard primary cover gasket. See 5.3 PRIMARY COVER.

NOTES

- *See Figure 5-18. Make sure not to position the sprocket locking link (1) too close to the shifter shaft (2). Contact between sprocket locking link and shifter shaft during engine sprocket bolt removal will cause damage to the surrounding assemblies.*
- *The engine sprocket bolt is a single-use fastener. Discard and replace with a **new** bolt upon removal.*
- *Japanese models require PRIMARY DRIVE LOCKING TOOL (Part No. HD-46283).*

5. Install SPORTSTER 5-SPEED SPROCKET LOCKING LINK (Part No. HD-38362). Remove and discard the engine sprocket bolt. Do not remove engine sprocket at this time.
6. See Figure 5-19. Remove large retaining ring (12). Remove adjusting screw assembly (13, 14, 15 and 16) from pressure plate (17).

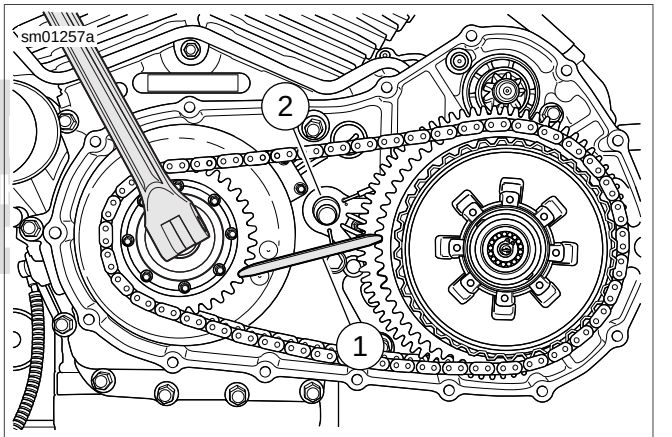
NOTE

Transmission mainshaft nut (23) has left-hand threads. Turn nut clockwise to loosen and remove from mainshaft.

7. Remove nut (23) and spring washer (24). Remove the clutch assembly, primary chain and engine sprocket from the vehicle as an assembly.
8. Inspect primary chain. Replace as necessary.
9. Inspect stator and rotor. See 6.24 ALTERNATOR. Replace damaged parts as necessary.

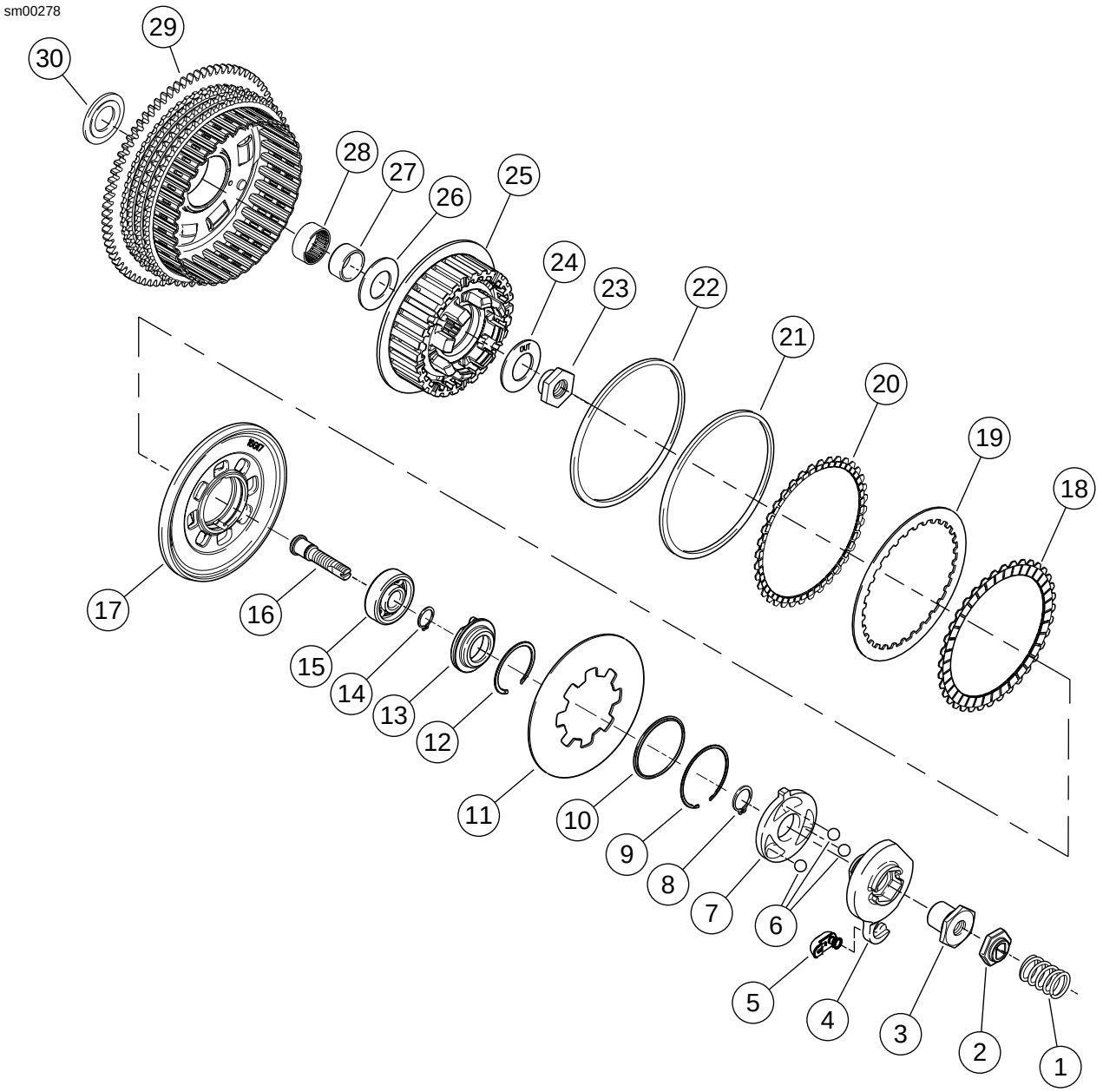
NOTE

If replacement of primary chain is the only service work required, proceed directly to 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation. Skip Step 1 of that procedure and begin with the NOTE preceding Step 2.



1. **Sprocket locking link**
2. **Shifter shaft**

Figure 5-18. Loosen Engine Sprocket Bolt



1. Spring
2. Lockplate
3. Nut
4. Outer ramp
5. Coupling
6. Ball (3)
7. Inner ramp
8. Retaining ring
9. Retaining ring
10. Spring seat
11. Diaphragm spring
12. Retaining ring
13. Release plate
14. Retaining ring
15. Bearing
16. Adjusting screw
17. Pressure plate
18. Friction plate, fiber (7)
19. Steel plate (7)
20. Friction plate, narrow, fiber
21. Damper spring
22. Damper spring seat
23. Mainshaft nut
24. Washer
25. Clutch hub
26. Inner thrust washer
27. Needle bearing inner race
28. Needle bearing
29. Clutch shell and sprocket
30. Outer thrust washer

Figure 5-19. Clutch Assembly: XR 1200X

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-38515-91	CLUTCH SPRING FORCING SCREW
HD-38515-A	SPRING COMPRESSING TOOL

1. See Figure 5-19. With clutch assembly removed from primary chaincase, install adjusting screw assembly (13, 14, 15 and 16) into pressure plate (17):
   a. Match the two tabs on perimeter of release plate (13) to the notches in pressure plate.
   b. Install the retaining ring (12).

⚠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. Assemble the compressing tool:
   a. Thread the CLUTCH SPRING FORCING SCREW (Part No. HD-38515-91) onto the clutch adjusting screw.
   b. Place the bridge of SPRING COMPRESSING TOOL (Part No. HD-38515-A) against diaphragm spring.
   c. Thread the tool handle onto end of forcing screw.

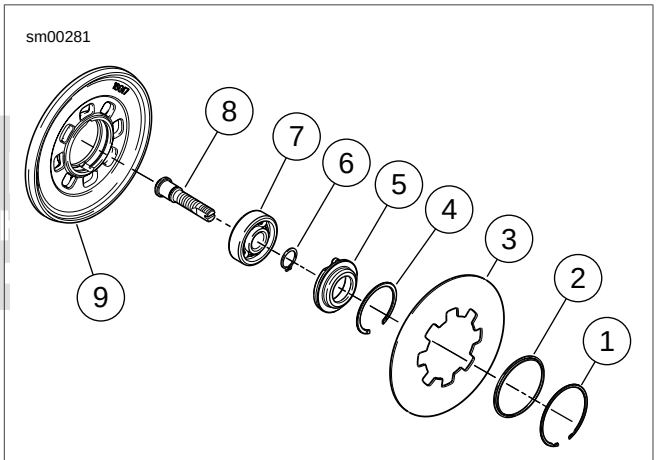
NOTE

Excessive compression of diaphragm spring could damage clutch pressure plate.

3. 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 (9) and spring seat (10).
4. Remove and discard retaining ring. Remove spring seat from the groove in clutch hub prongs. Remove the diaphragm spring (11), pressure plate (17), adjusting screw components (13, 14, 15 and 16) and compressing tool as an assembly.
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 (12) and adjusting screw assembly from pressure plate. If necessary, disassemble adjusting screw assembly. See 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Adjusting Screw.
7. Remove the clutch pack from the clutch hub. The clutch pack consists of seven friction (fiber) plates (18), seven steel plates (19), one narrow friction plate (20), one damper spring (21) and one seat (22).

ADJUSTING SCREW

1. See Figure 5-20. Remove adjusting screw assembly.
   a. Remove large retaining ring (1).
   b. Remove adjusting screw assembly from pressure plate (9).
2. If necessary, disassemble adjusting screw assembly.
   a. Remove and discard small retaining ring (6).
   b. Separate the adjusting screw (8) from the bearing (7) and release plate (5).
   c. Remove bearing (7) from release plate (5).
3. Replace components as required and reassemble adjusting screw assembly in reverse order.
4. Install adjusting screw assembly into pressure plate.
   a. See Figure 5-35. Align two tabs on perimeter of release plate with corresponding recesses (3) in pressure plate.
   b. Secure the adjusting screw assembly with **new** retaining ring.



1. **Retaining ring**
2. **Spring seat**
3. **Diaphragm spring**
4. **Retaining ring**
5. **Release plate**
6. **Retaining ring**
7. **Bearing**
8. **Adjusting screw**
9. **Pressure plate**

Figure 5-20. Adjusting Screw Assembly

CLUTCH PACK CLEANING AND INSPECTION

Steel Plates

1. Wash the steel plates, and the damper spring and seat in solvent.

2. See Figure 5-21. Inspect each steel plate.
   a. Check for wear, grooves, or discoloration.
   b. Gauge warpage around the plate. If warpage exceeds specifications, replace the entire clutch pack. Refer to Table 5-5.
3. Inspect the damper spring and the spring seat. Replace as required.

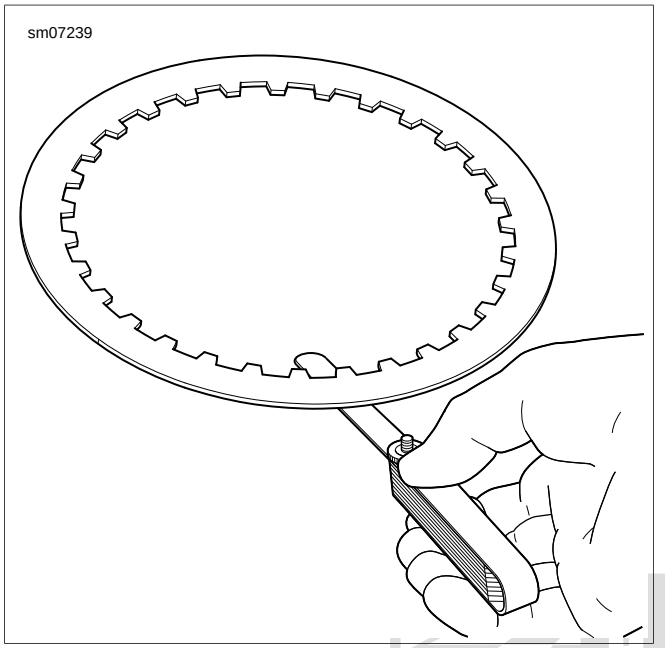


Figure 5-21. Gauging a Steel Plate

Friction Plates

NOTE

Do not wash the friction plates in solvent.

1. Wipe the friction plates clean of lubricant.
2. See Figure 5-22. Inspect each friction plate.
   a. Check for wear or discoloration.
   b. Measure the seven friction plates. If one thickness is less than specified, replace the entire clutch pack. Refer to Table 5-5.

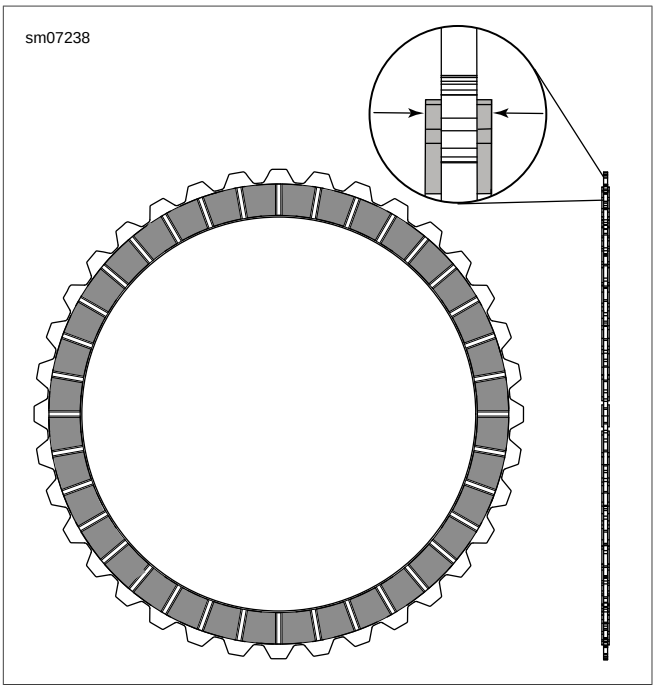


Figure 5-22. Friction Plate Thickness

Table 5-5. Clutch Pack Plate Specifications

ITEM	SERVICE WEAR LIMIT	
	in	mm
CLUTCH PLATE THICKNESS		
Friction plate (fiber)	0.0795	2.0200
Steel plate	N/A	N/A
MAXIMUM ALLOWABLE WARPAGE		
Friction plate (fiber)	0.0059	0.1500
Steel plate	0.0059	0.1500

CLUTCH SHELL/HUB INSPECTION

1. Inspect engine sprocket for damage or excessive wear. Replace as required.
2. Disassemble adjusting screw assembly and inspect bearing, release plate, and adjusting screw. See 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Adjusting Screw.
3. Remove clutch hub from clutch shell. Inspect primary chain sprocket and the starter ring gear on the clutch shell.
4. Inspect slots that mate with the clutch plates on both clutch shell and hub.
5. See Figure 5-23. Inspect the clutch shell compensating spring set.

NOTE

It is possible for the compensating springs to float and move during inspection. This condition is normal.

6. See Figure 5-24. Inspect clutch shell needle bearing for smoothness. Rotate the clutch shell while holding the clutch hub. If bearing is rough or binds, it must be replaced.

See 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Clutch Shell Bearing Replacement.

7. See Figure 5-25. Inspect clutch shell bearing inner race on the back side of the clutch hub for pitting and wear. If the inner race shows any signs of damage, the complete hub assembly must be replaced.
8. Replace damaged parts as necessary.

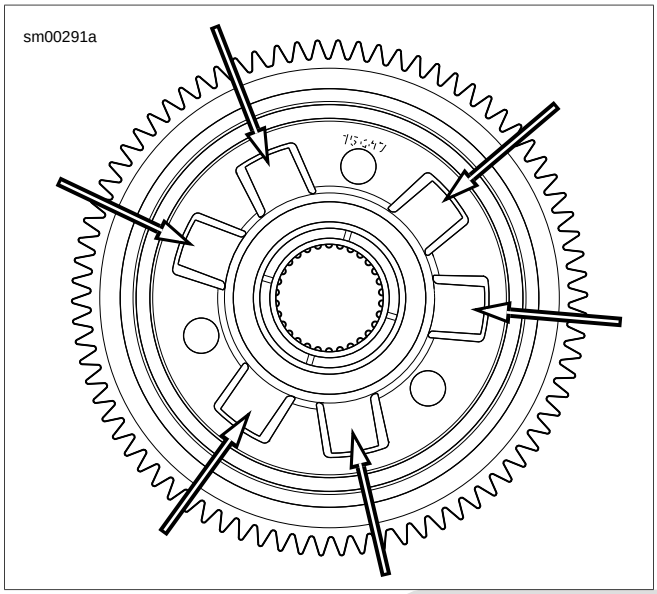


Figure 5-23. Compensating Spring Set

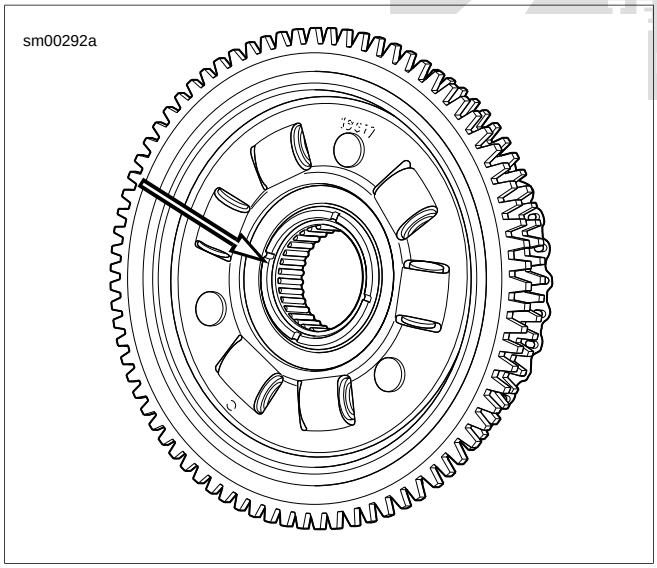


Figure 5-24. New Needle Bearing in Clutch Shell

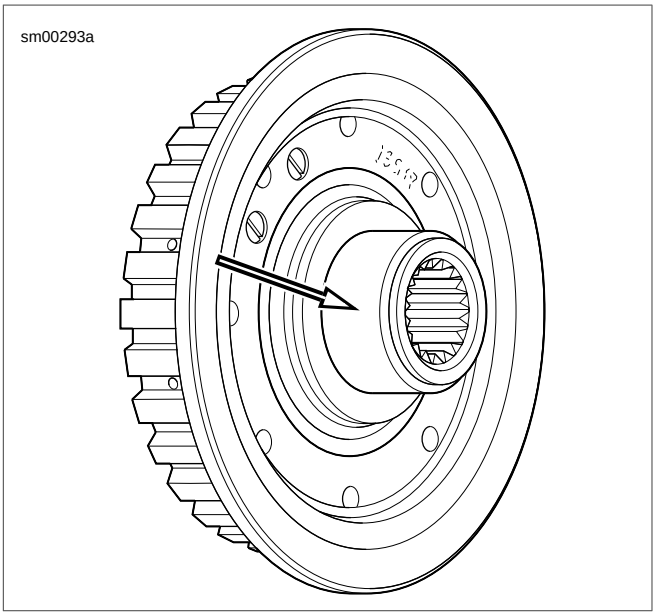


Figure 5-25. Clutch Hub Bearing Race

CLUTCH SHELL BEARING REPLACEMENT

PART NUMBER	TOOL NAME
B-45926	CLUTCH SHELL BEARING REMOVER/INSTALLER

NOTE

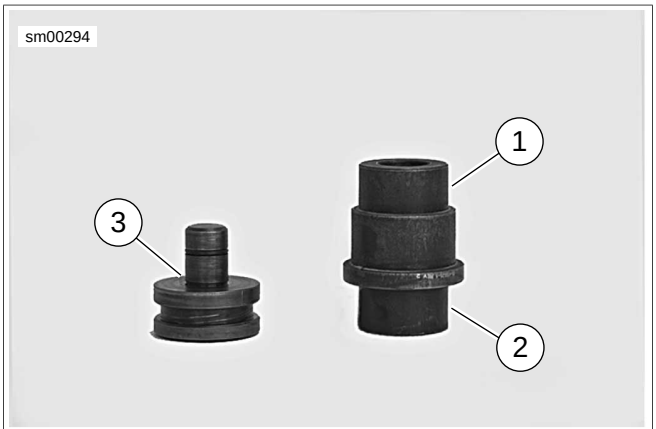
The clutch shell uses a caged needle bearing that corresponds to an inner race installed on the clutch hub.

1. See Figure 5-27. Place clutch shell on support blocks with sprocket side facing up.

NOTE

The CLUTCH SHELL BEARING REMOVER/INSTALLER (Part No. B-45926) is clearly marked for removal and installation purposes.

2. See Figure 5-27. Insert removal end of tool into bearing assembly and remove bearing from clutch shell.
3. See Figure 5-28. Remove bearing guide from end of CLUTCH SHELL BEARING REMOVER/INSTALLER (Part No. B-45926).
4. Place **new** needle bearing onto installer end of tool and insert the bearing guide.
5. See Figure 5-29. Place clutch shell on support blocks with sprocket side facing up.
6. Press bearing into clutch shell until tool bottoms on the shell. This will be the correct installed height.



1. Removal end of bearing tool
2. Installation end of bearing tool
3. Bearing guide, installer

Figure 5-26. Clutch Shell Bearing Remover/Installer

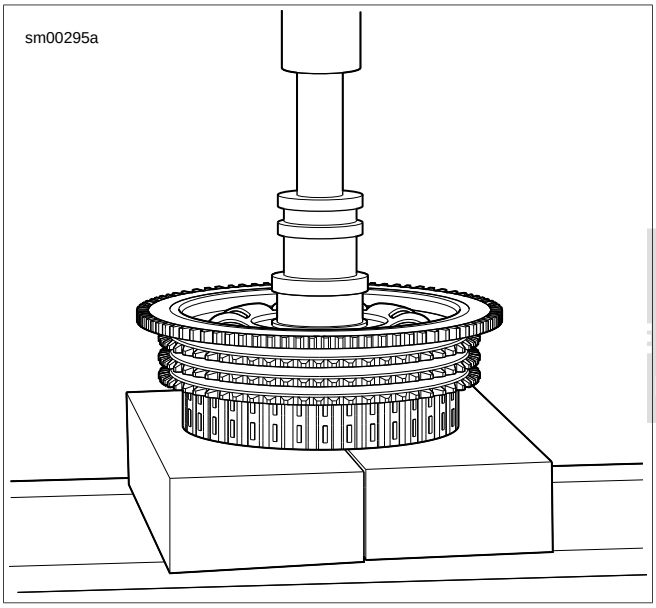
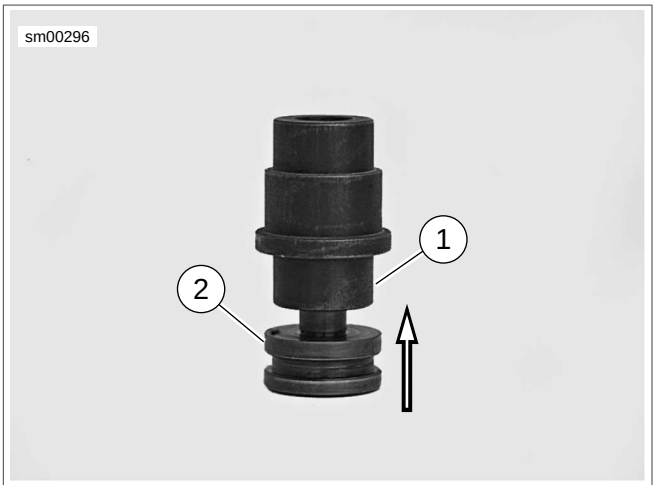
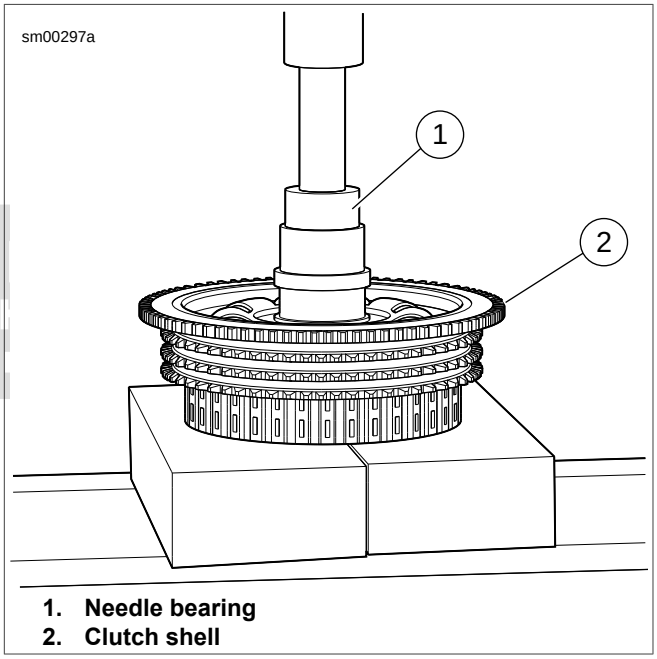


Figure 5-27. Removing Clutch Shell Needle Bearing



1. Place needle bearing on tool in this location
2. Bearing guide

Figure 5-28. Bearing Installer



1. Needle bearing
2. Clutch shell

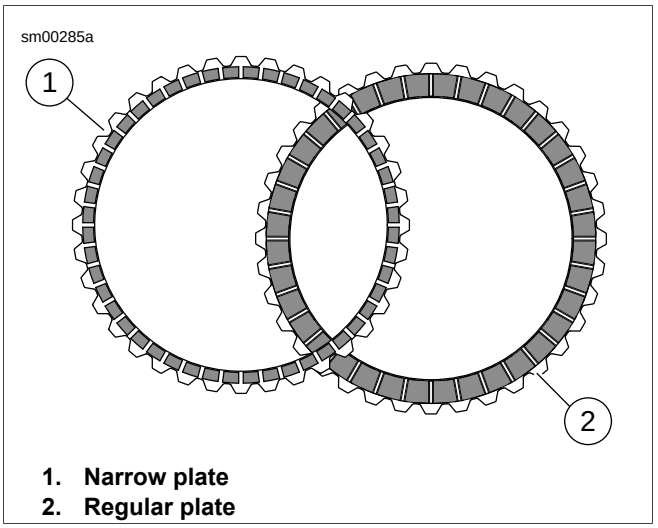
Figure 5-29. Installing Clutch Shell Needle Bearing

ASSEMBLY

PART NUMBER	TOOL NAME
HD-38515-A	SPRING COMPRESSING TOOL

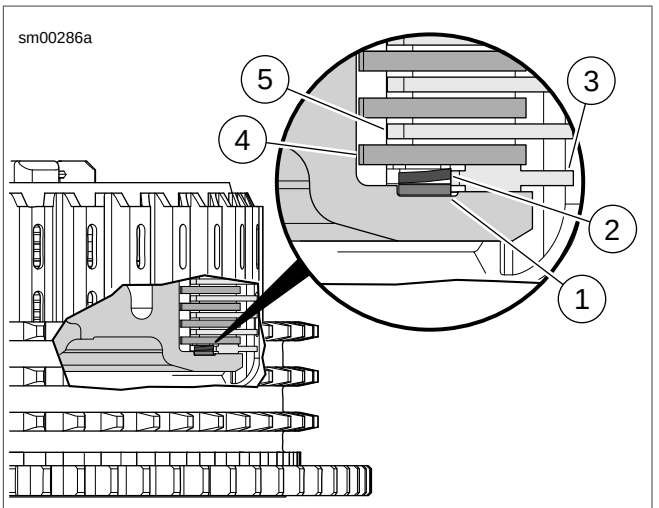
1. Submerge and soak all friction and steel plates in GENUINE HARLEY-DAVIDSON FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT for at least five minutes.
2. See Figure 5-30. Install narrow friction plate on the clutch hub, engaging tabs on plate with slots in clutch shell.
3. See Figure 5-31. Install damper spring seat (1) on clutch hub so that it seats inboard of narrow friction plate (3).

4. Install damper spring (2) on clutch hub with the concave side up (facing opposite damper spring seat).
5. Install a steel plate (4) and then a friction plate (5) on the clutch hub. Install six remaining sets in the same manner, alternating between steel plates and friction plates.



1. **Narrow plate**
2. **Regular plate**

Figure 5-30. Friction Plates



1. **Damper spring seat**
2. **Damper spring**
3. **Narrow friction plate**
4. **Steel plate**
5. **Friction plate**

Figure 5-31. Clutch Pack Stack-Up

6. Place pressure plate, diaphragm spring, adjusting screw assembly with **new** retaining ring and spring seat onto clutch pack.
7. Install the retaining ring:
   a. See Figure 5-32. Align square openings of pressure plate and diaphragm spring so that the assembly can be installed over prongs on clutch hub.
   b. Position spring seat with its larger outer diameter side toward diaphragm spring.

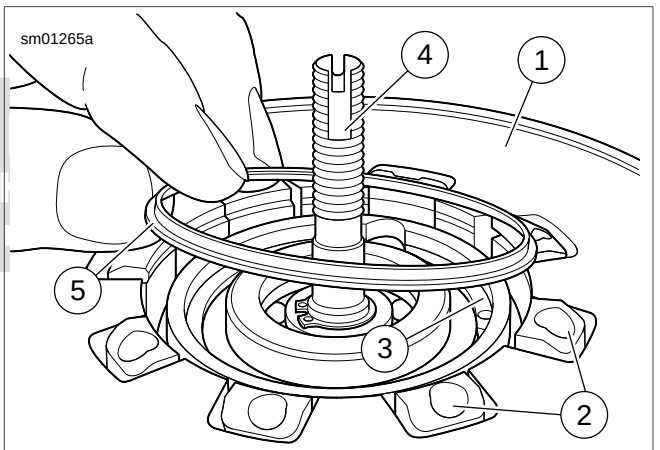
NOTE

Turn compressing tool handle only the amount required to install spring seat and retaining ring. Excessive compression of diaphragm spring could damage clutch pressure plate.

   c. Install SPRING COMPRESSING TOOL (Part No. HD-38515-A) onto clutch hub against diaphragm spring.
   d. Place a wrench on the clutch spring forcing screw flats to prevent the forcing screw from turning.
   e. Turn compressing tool handle clockwise until diaphragm spring compresses just enough to install new retaining ring into the groove in clutch hub prongs.
   f. With retaining ring fully seated in groove of clutch hub, remove the compression tool.

NOTE

Remove the tool to allow the diaphragm spring to move outward forcing the spring seat up into the inside of the retaining ring. The spring seat is an operating surface for the diaphragm spring and prevents the retaining ring from coming out.



1. **Diaphragm spring (pressure plate below)**
2. **Prongs on clutch hub**
3. **Retaining ring**
4. **Adjusting screw assembly**
5. **Spring seat**

Figure 5-32. Spring Seat Installation

INSTALLATION

PART NUMBER	TOOL NAME
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK
HD-46283	PRIMARY DRIVE LOCKING TOOL

FASTENER	TORQUE VALUE	
Engine sprocket bolt: XR 1200X	155-165 ft-lbs	210.0-224.0 Nm
Transmission mainshaft nut: XR 1200X	50-60 ft-lbs	67.8-81.3 Nm

1. See Figure 5-19. Remove retaining ring (12). Remove adjusting screw assembly (13, 14, 15, 16) from pressure plate (17) to allow installation of the transmission mainshaft nut and washer.

NOTE

Prior to installing engine sprocket bolt and transmission mainshaft nut, thoroughly clean threads of engine sprocket shaft, transmission mainshaft and mainshaft nut to remove any oil that might contaminate and interfere with locking agent.

2. Thoroughly clean threads of engine sprocket shaft, transmission mainshaft and mainshaft nut to remove any oil.

NOTES

- *See Figure 5-33. Do not position the sprocket locking link (1) too close to the shifter shaft (2). The sprocket locking can damage the shifter shaft and/or engine crankcase.*
- *Japan models use PRIMARY DRIVE LOCKING TOOL (Part No. HD-46283).*

3. See Figure 5-33. Install SPORTSTER 5-SPEED SPROCKET LOCKING LINK (Part No. HD-38362) (1).

4. Install **new** engine sprocket bolt. Tighten to 155-165 ft-lbs (210.0-224.0 Nm).

NOTE

See Figure 5-34. 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.

5. Install mainshaft nut.
   a. See Figure 5-34. Apply two or three drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) onto threads of transmission mainshaft.
   b. Install spring washer (2) and mainshaft nut (1) (left-hand threads) on transmission mainshaft.
   c. Tighten to 50-60 ft-lbs (67.8-81.3 Nm).

6. Remove the sprocket locking link.

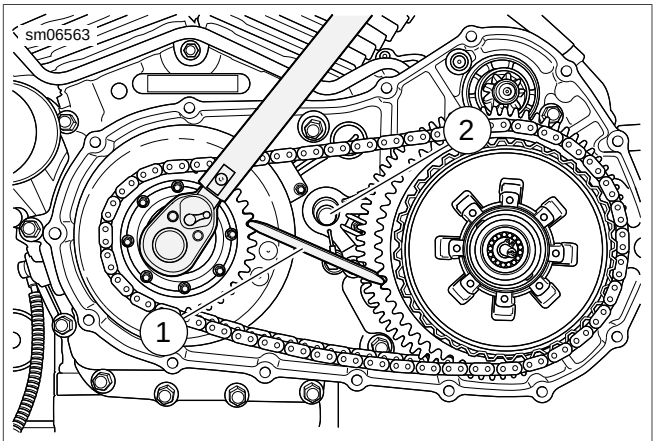
7. See Figure 5-35. Install adjusting screw assembly in pressure plate with two tabs on perimeter of release plate matched to recesses in pressure plate. Secure with a **new** retaining ring.

8. Install primary cover using **new** gasket. See 5.3 PRIMARY COVER.

9. Adjust primary chain and clutch. See 1.9 PRIMARY CHAIN and 1.11 CLUTCH.

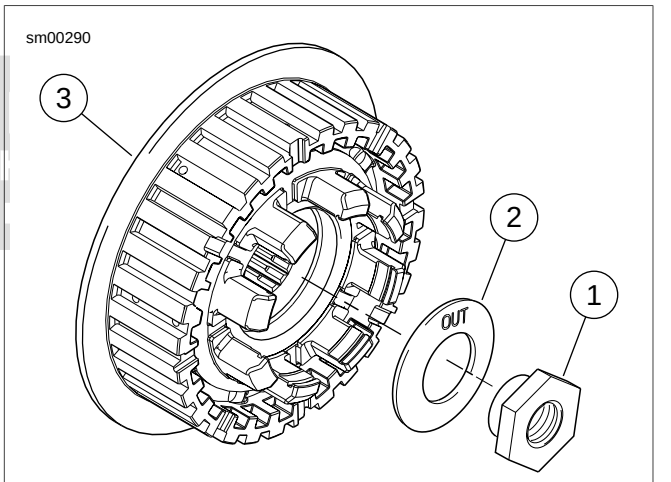
10. Fill transmission. See 1.10 TRANSMISSION LUBRICANT.

11. Connect battery and close left side cover. See 1.22 BATTERY MAINTENANCE.



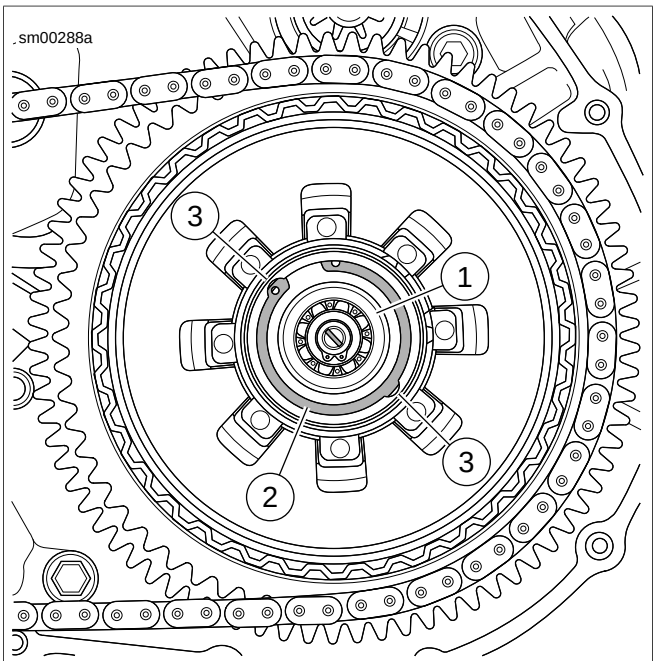
1. **Sprocket locking link**
2. **Shifter shaft**

Figure 5-33. Tighten Engine Sprocket Bolt



1. **Mainshaft nut**
2. **Washer**
3. **Clutch hub**

Figure 5-34. Mainshaft Nut and Washer



1. Adjusting screw assembly
2. Retaining ring
3. Tab recesses

Figure 5-35. Clutch Adjusting Screw Assembly and Retaining Ring

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DRIVE BELT 5.6

DRIVE BELT HANDLING

See Figure 5-36.

- 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).

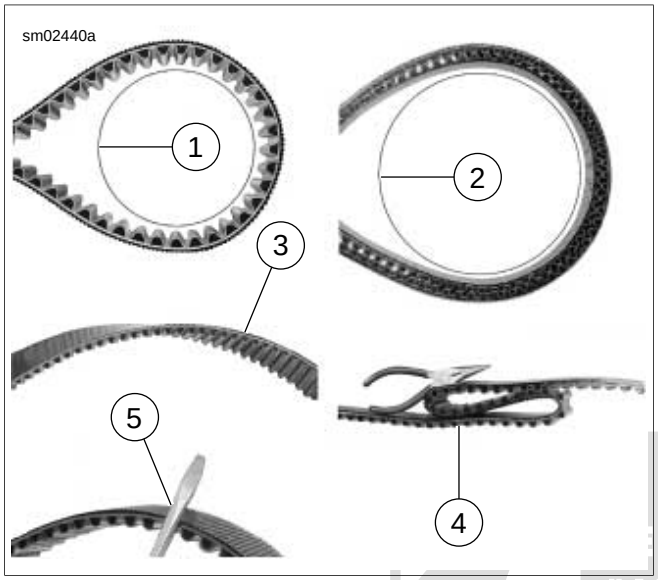


Figure 5-36. Drive Belt Handling

DRIVE BELT: XL MODELS

FASTENER	TORQUE VALUE	
Exhaust pipe clamp bracket fastener: XL Models	30-33 ft-lbs	40.7-44.8 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

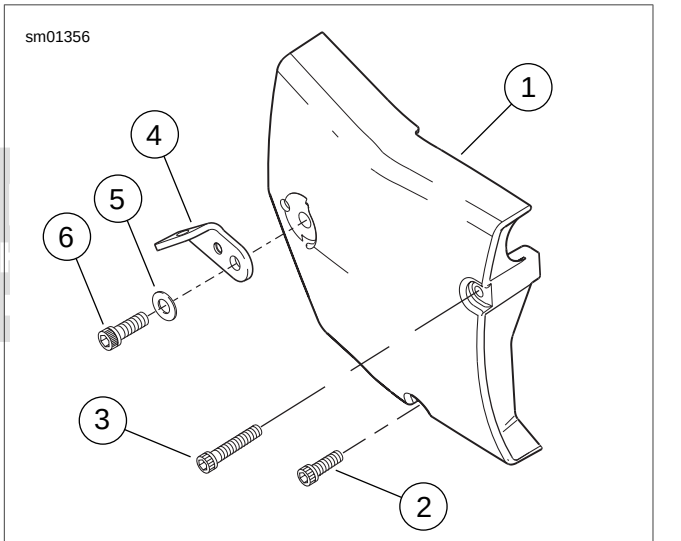
Removal

1. Remove mufflers and rear exhaust pipe. See 4.13 EXHAUST SYSTEM: XL MODELS.
2. **Mid-Mount Controls:** Remove right side rider footrest/brake pedal and mounting bracket assembly. See 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
3. See Figure 5-37. Remove screw (6), washer (5) and exhaust pipe clamp bracket (4).
4. Remove two screws (2, 3).
5. See Figure 5-38. Remove E-clip (1). Discard E-clip.
6. Loosen rear axle nut (4).
7. Turn the 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 2.24 SHOCK ABSORBERS, Removal.
9. Remove the belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XL Models.
10. Remove the debris deflector. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XL Models.

⚠WARNING

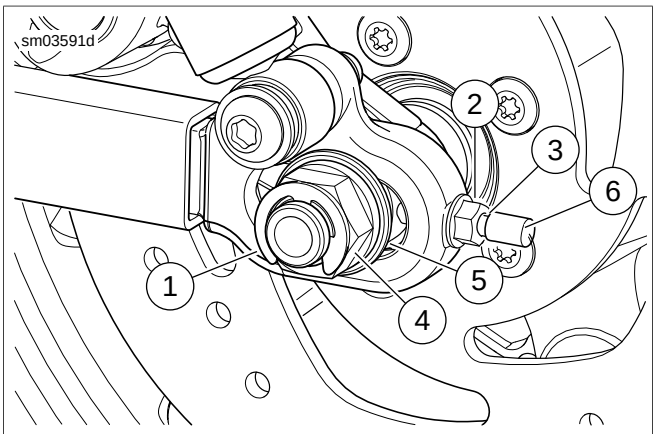
Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

11. See Figure 5-39. Remove belt.



1. **Sprocket cover**
2. **Screw**
3. **Screw**
4. **Exhaust pipe clamp bracket**
5. **Washer**
6. **Screw**

Figure 5-37. Sprocket Cover: XL Models



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

Figure 5-38. Drive Belt Adjustment: XL Models

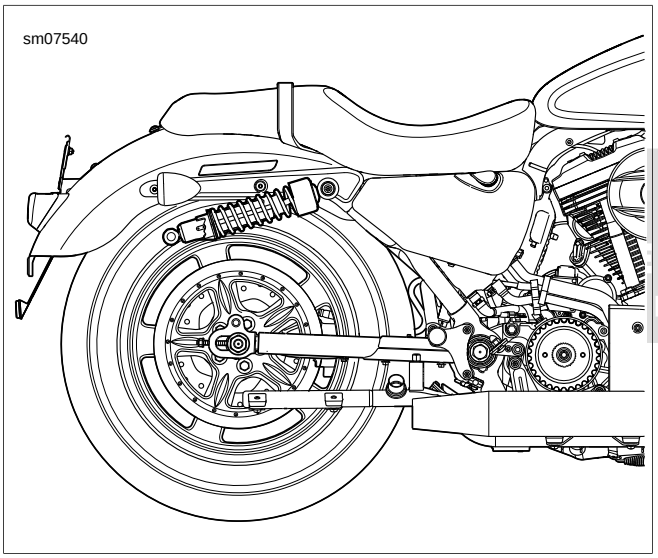


Figure 5-39. Drive Belt Removal: XL Models

Installation

1. Install belt onto sprockets.
2. Install the front of belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XL Models.
3. Install the debris deflector. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XL Models.
4. Install right lower shock absorber bolt, washer and locknut. See 2.24 SHOCK ABSORBERS, Installation.

NOTE

See Figure 5-37. Short screw (2) goes in bottom hole. Long screw (3) goes in top hole. Do not tighten screws.

5. Install sprocket cover (1). Secure with two screws.
6. Install exhaust pipe clamp bracket (4), washer (5) and screw (6).
7. Tighten:
   a. Exhaust pipe clamp bracket fastener 30-33 ft-lbs (40.7-44.8 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 2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
9. Install rear exhaust pipe and mufflers. See 4.13 EXHAUST SYSTEM: XL MODELS.
10. Adjust belt tension. See 1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection.
11. Check wheel alignment. See 1.24 WHEEL ALIGNMENT, Wheel Alignment.
12. See Figure 5-38. Tighten rear axle nut (4) to 95-105 ft-lbs (129-142 Nm).
13. Install **new** E-clip (1).

IDLER PULLEY: XR 1200X

FASTENER	TORQUE VALUE	
Idler pulley fastener: XR 1200X	70-80 ft-lbs	95-109 Nm
Idler pulley bracket flanged nut: XR 1200X	33-35 ft-lbs	44.7-47.5 Nm
Sprocket cover, rear 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

Removal

1. See Figure 5-40. Remove sprocket cover (1).

NOTE

It is not necessary to remove the drive belt completely.

2. Release tension from drive belt and slide belt off drive sprocket (5). See 5.6 DRIVE BELT, Drive Belt: XL Models.

NOTE

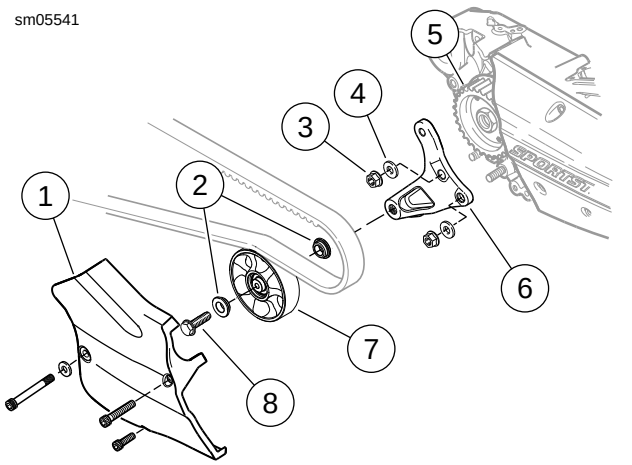
If exhaust system interference prevents removal, loosen all exhaust system mount fasteners and flange nuts. Pull exhaust system away from engine to allow room to remove idler assembly.

3. Remove nuts (3) and washers (4). Remove idler pulley and bracket assembly from vehicle.
4. Spin and check idler pulley (7) for bearing wear. See 1.12 DRIVE BELT AND SPROCKETS, Inspection.

NOTE

The idler pulley bearings can not be replaced separately.

5. If idler pulley needs replacement, remove fastener (8) and bushings (2). Discard idler pulley and replace with **new** idler pulley (7).



1. **Sprocket cover**
2. **Bushing (2)**
3. **Flanged nut (2)**
4. **Washer (2)**
5. **Drive sprocket**
6. **Idler pulley bracket**
7. **Idler pulley**
8. **Fastener**

Figure 5-40. Drive Belt Idler: XR 1200X

Installation

1. See Figure 5-40. Install **new** or existing idler pulley (7), if removed. Tighten fastener (8) to 70-80 ft-lbs (95-109 Nm).
2. Install idler pulley and bracket assembly. Install washers (4) and flanged nuts (3). Tighten to 33-35 ft-lbs (44.7-47.5 Nm).
3. Install drive belt and adjust belt tension and wheel alignment. See 1.24 WHEEL ALIGNMENT.
4. Install sprocket cover:
   a. Tighten rear (larger) screw to 30-33 ft-lbs (40.7-44.8 Nm).
   b. Tighten forward and lower (smaller) screws to 80-120 **in-lbs** (9.0-13.6 Nm).
5. If loosened, align. Tighten exhaust system components. See 4.14 EXHAUST SYSTEM: XR 1200X.

DRIVE BELT: XR 1200X

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

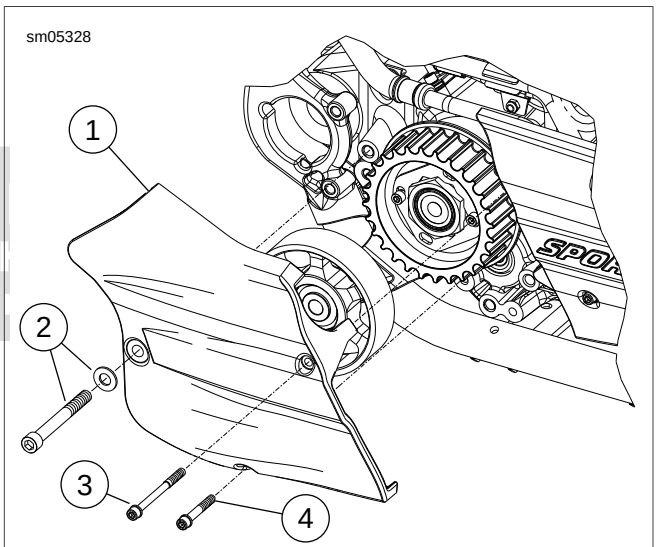
Removal

1. Remove exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
2. See Figure 5-41. Remove screws (2, 3, 4). Remove sprocket cover (1).
3. See Figure 5-42. Remove E-clip. Discard E-clip (1).
4. Loosen rear axle nut (4).
5. Turn the axle adjuster nut (2) on each side of rear fork an equal number of turns counterclockwise to release belt tension.
6. Remove right lower shock absorber screw, washer and locknut. See 2.24 SHOCK ABSORBERS, Removal.
7. Remove belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XR 1200X.
8. Remove debris deflector. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XR 1200X.

⚠WARNING

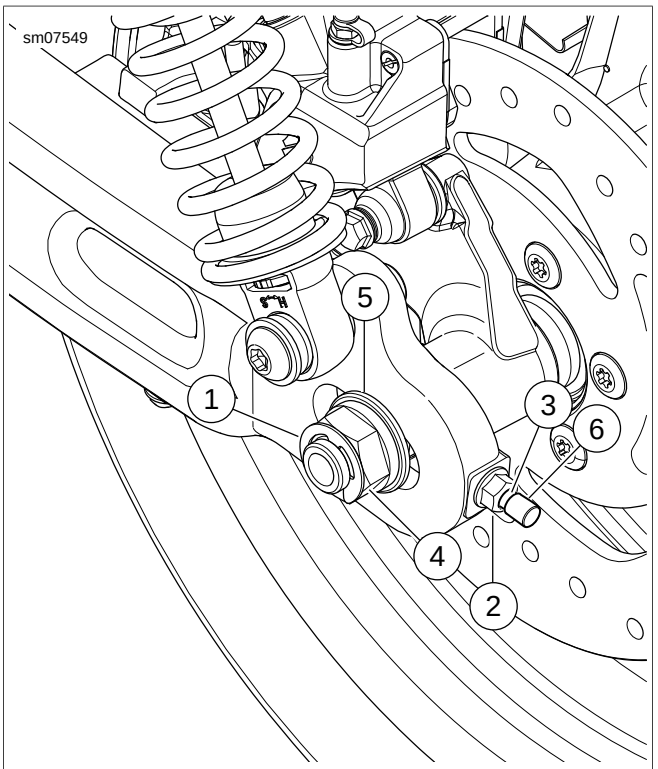
Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

9. See Figure 5-43. Remove belt.



1. **Sprocket cover**
2. **Rear screw and washer**
3. **Front screw**
4. **Lower screw**

Figure 5-41. Sprocket Cover: XR 1200X



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

Figure 5-42. Drive Belt Adjustment: XR 1200X

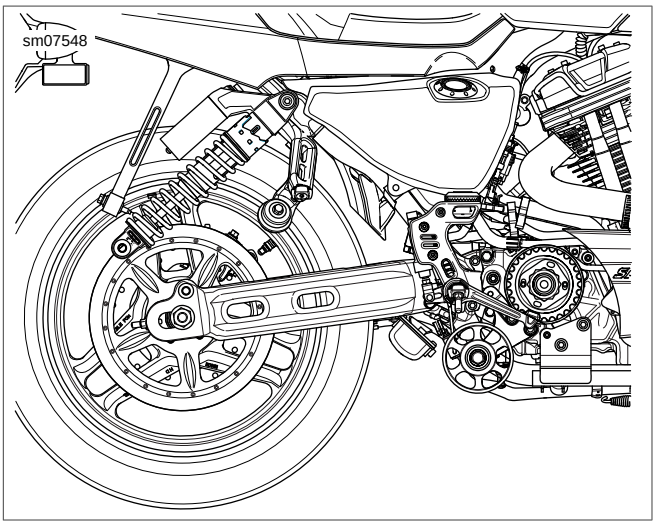


Figure 5-43. Drive Belt Removal: XR 1200X

Installation

1. Install belt onto sprockets.
2. Install belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XR 1200X.
3. Install debris deflector. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XR 1200X.
4. Install right lower shock absorber bolt, washer and locknut. See 2.24 SHOCK ABSORBERS, Installation.

NOTE

See Figure 5-41. Long screw (3) goes in top hole. Short screw (4) goes in bottom hole.

5. Install sprocket cover (1).
   a. Tighten screw (2) to 30-33 ft-lbs (40.7-44.8 Nm).
   b. Tighten screws (3, 4) to 80-120 **in-lbs** (9.0-13.6 Nm).
6. Install exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X, Installation.
7. Adjust belt tension. See 1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection.
8. Check rear wheel alignment. See 1.24 WHEEL ALIGNMENT, Wheel Alignment.
9. See Figure 5-42. Tighten rear axle nut (4) to 95-105 ft-lbs (129-142 Nm). Install **new** E-clip (1).

DIGITAL TECHNICIAN HARLEY-DAVIDSON

TRANSMISSION POWER FLOW 5.7

GENERAL

See Figure 5-44. 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

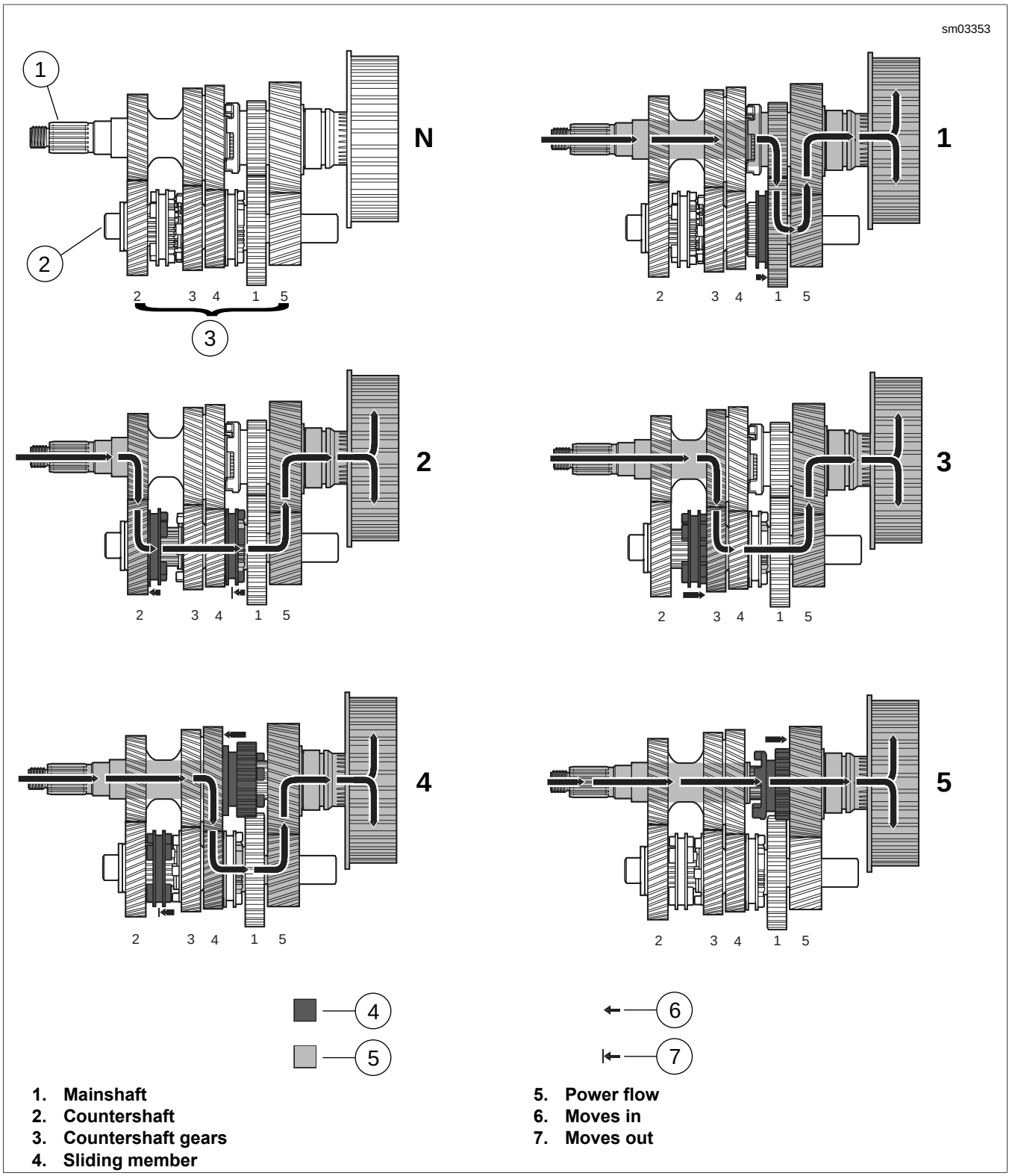


Figure 5-44. Transmission Power Flow

CASE DISASSEMBLY FOR TRANSMISSION REMOVAL 5.8

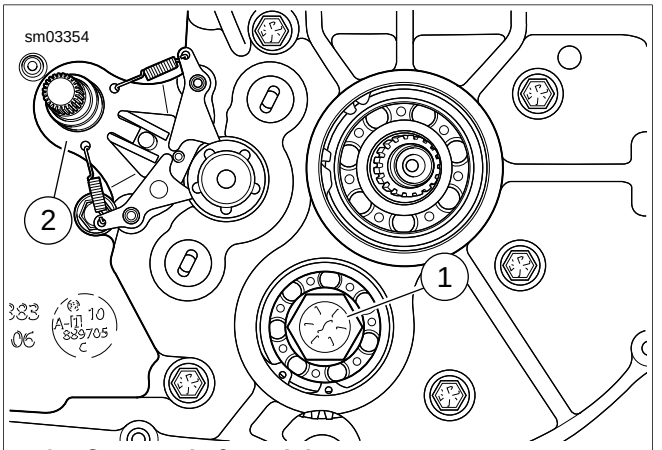
GENERAL

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

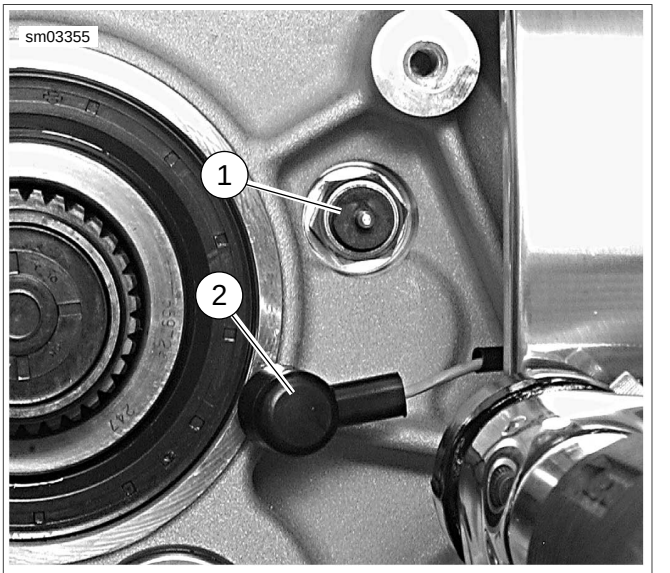
PART NUMBER	TOOL NAME
HD-42310-45	ENGINE SUPPORT CRADLE

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 3.13 TOP END OVERHAUL: DISASSEMBLY.
4. Remove primary cover, clutch assembly, primary chain and engine sprocket. See 5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS or 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X.
5. Disassemble gearcase. See 3.17 BOTTOM END OVERHAUL: DISASSEMBLY.
6. Remove transmission sprocket.
7. See Figure 5-45. Place transmission in 1st gear. Remove countershaft retaining screw (1).
8. Place transmission in neutral. See Figure 5-46. Unplug neutral switch connector [131] (2) by pulling connector straight off neutral switch (1). Remove neutral switch and flat washer.
9. See Figure 5-47. Verify shifter drum detent is visible in neutral switch hole indicating that transmission is in neutral.



1. **Countershaft retaining screw**
2. **Shifter shaft assembly**

Figure 5-45. Countershaft Retaining Screw



1. **Neutral indicator switch**
2. **Neutral switch connector**

Figure 5-46. Neutral Switch and Connector

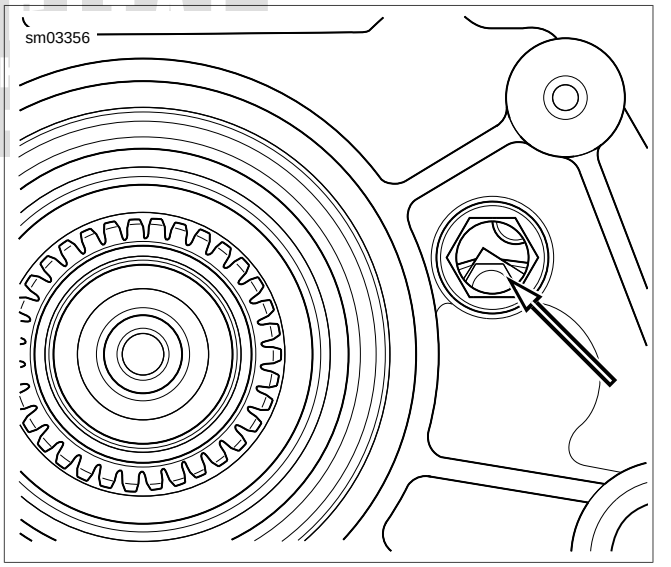
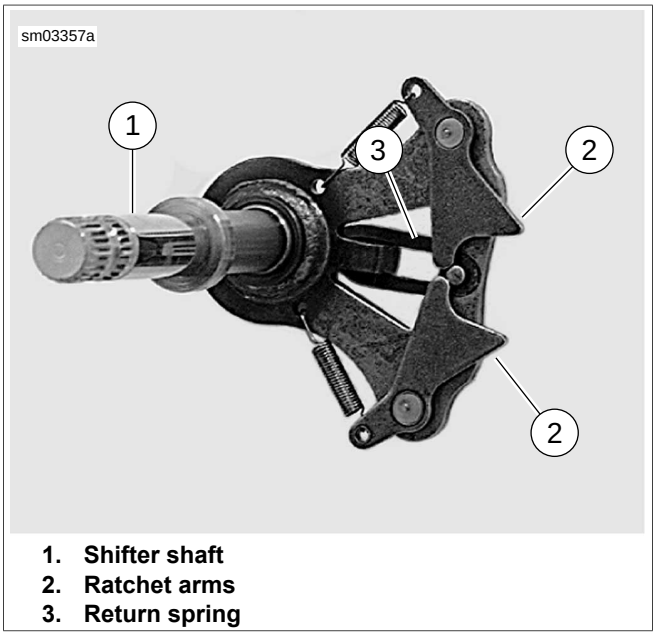


Figure 5-47. Shifter Drum Neutral Detent

10. See Figure 5-48 and Figure 5-49. Compress the ratchet arms (item 2, Figure 5-48) in order to clear the shifter drum, and remove shifter shaft assembly from left crankcase half.
11. Remove starter. See 6.10 STARTER.
12. See Figure 5-50. With transmission still in neutral, scribe a line on the end of the shifter drum at the 12 o'clock position for later reference.



1. **Shifter shaft**
2. **Ratchet arms**
3. **Return spring**

Figure 5-48. Shifter Shaft Assembly

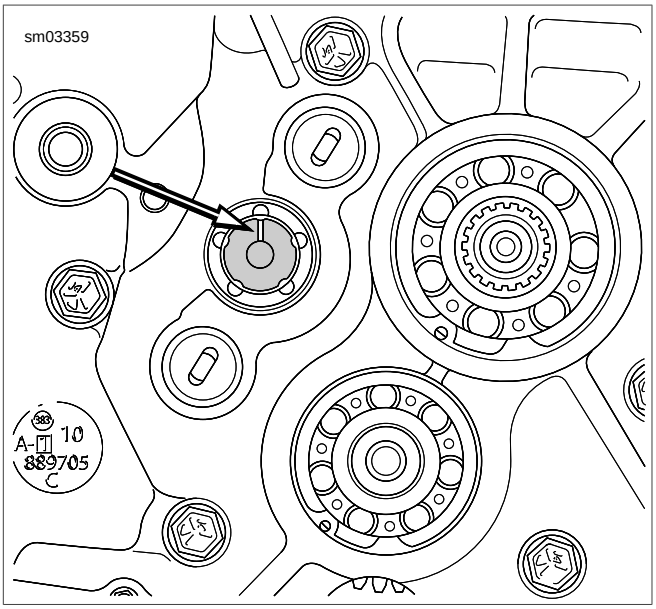


Figure 5-50. Scribed Line on Shifter Drum at 12 o'clock

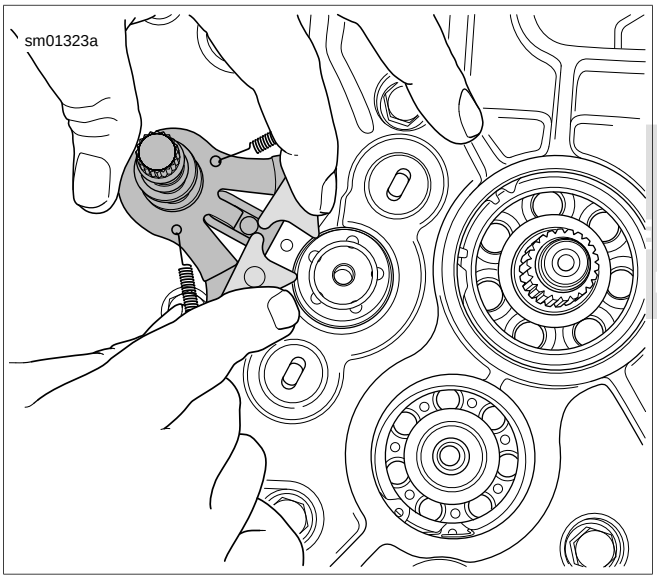
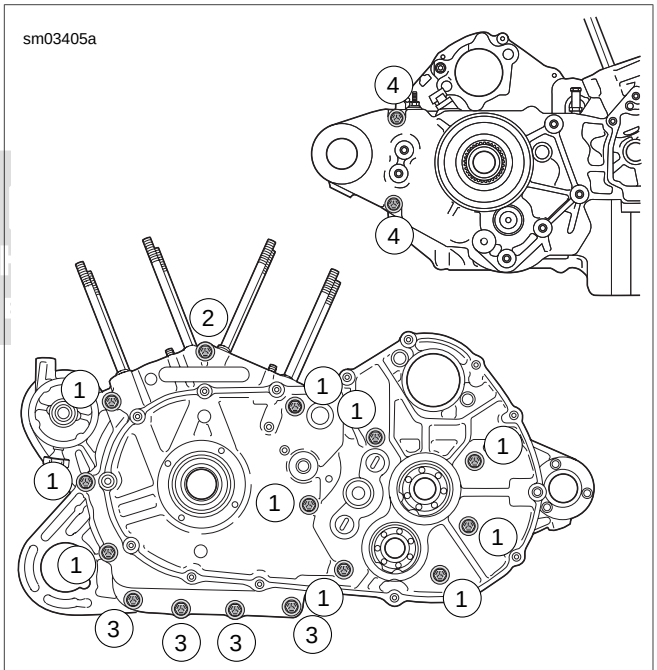


Figure 5-49. Removing Shifter Shaft Assembly



1. **Long fastener: left side**
2. **XR 1200X: double-headed long fastener**
3. **Short fastener: left side**
4. **Long fastener: right side**

Figure 5-51. Crankcase Fasteners

NOTE

Crankcase assembly has 17 fasteners: 15 inserted from left side and two inserted from right side. Make certain all fasteners have been removed before attempting to separate crankcase halves.

13. See Figure 5-51. Remove 15 crankcase fasteners (11 long and four short) from left side of crankcase assembly. Remove two fasteners from right side of crankcase assembly.

14. Tap crankcase gently with rawhide mallet to loosen and separate the halves. See Figure 5-52. 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 5-53. Remove flywheel assembly from right crankcase half.
16. See Figure 5-54. Remove screw (1), gear detent assembly (2) and detent spring (3) from inside transmission cavity of right crankcase.

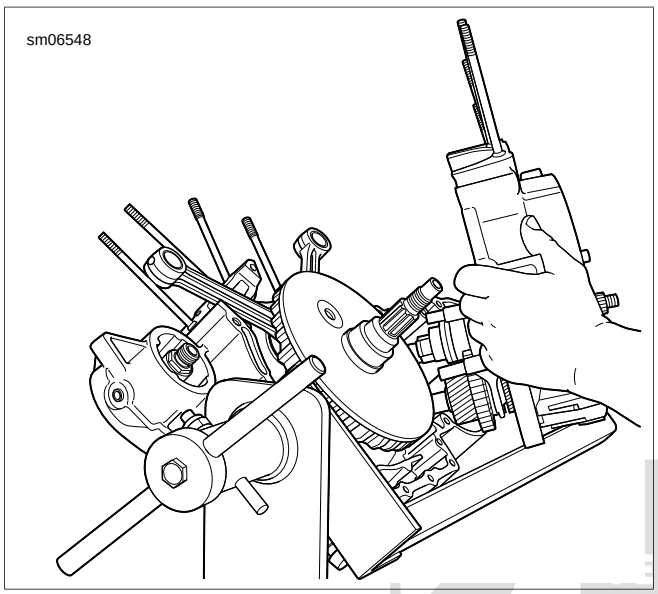


Figure 5-52. Separating Crankcase Halves

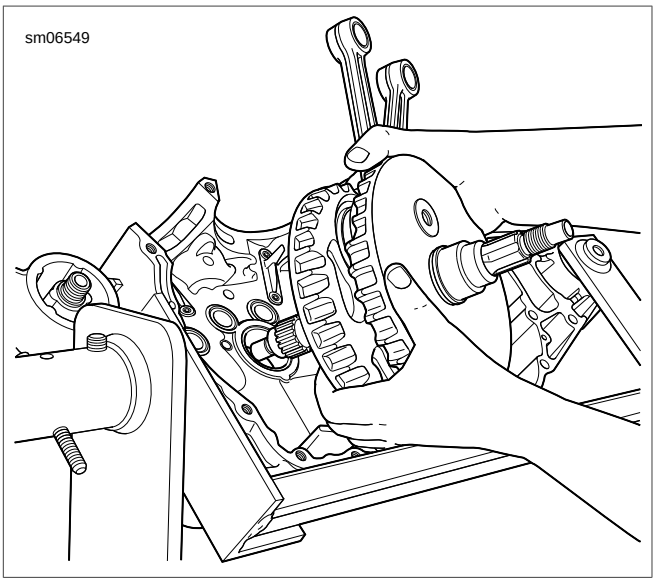
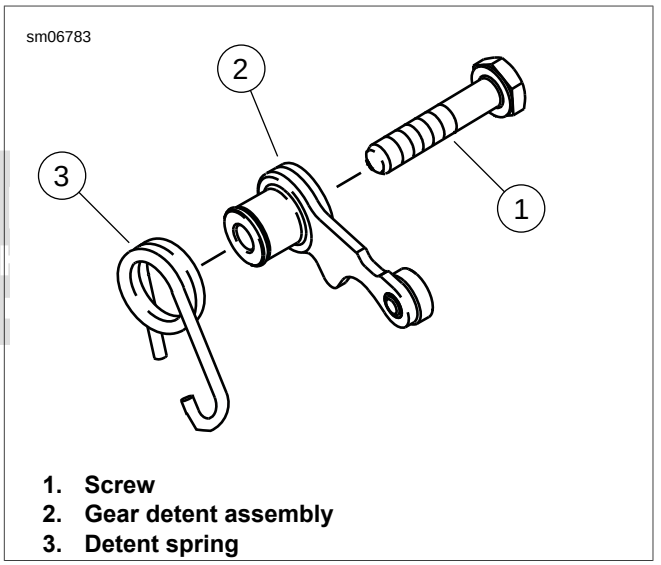


Figure 5-53. Removing Flywheel Assembly From Right Crankcase Half



1. **Screw**
2. **Gear detent assembly**
3. **Detent spring**

Figure 5-54. Gear Detent Assembly

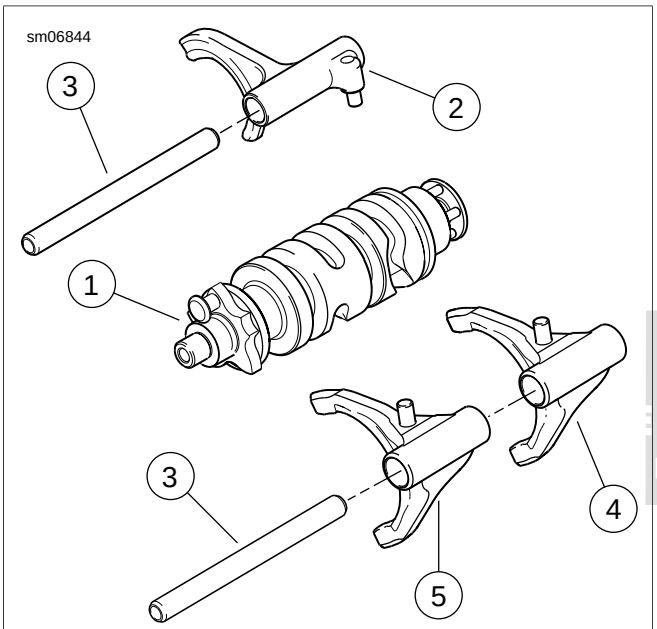
TRANSMISSION REMOVAL AND DISASSEMBLY 5.9

TRANSMISSION REMOVAL FROM LEFT CRANKCASE

PART NUMBER	TOOL NAME
B-43895-1	REMOVER
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL

NOTE

See Figure 5-55. 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. **Coutnershaft shifter fork (2nd/3rd)**

Figure 5-55. Shifter Forks, Drum and Shafts

1. See Figure 5-56. 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 5-57. 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.

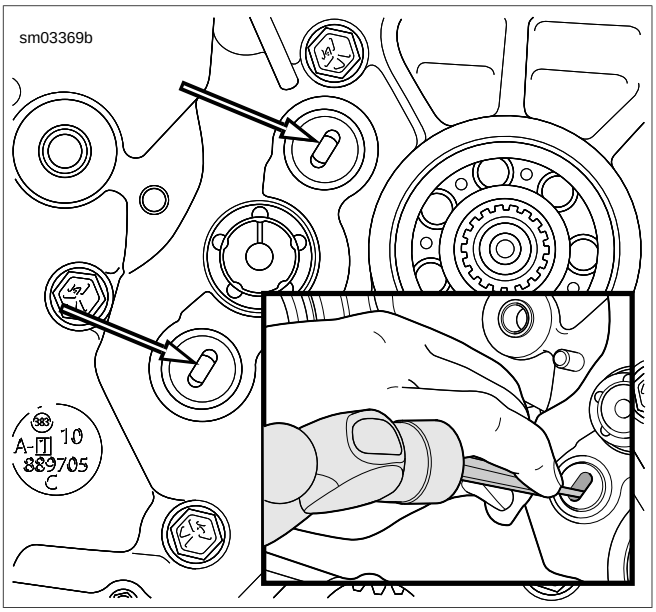
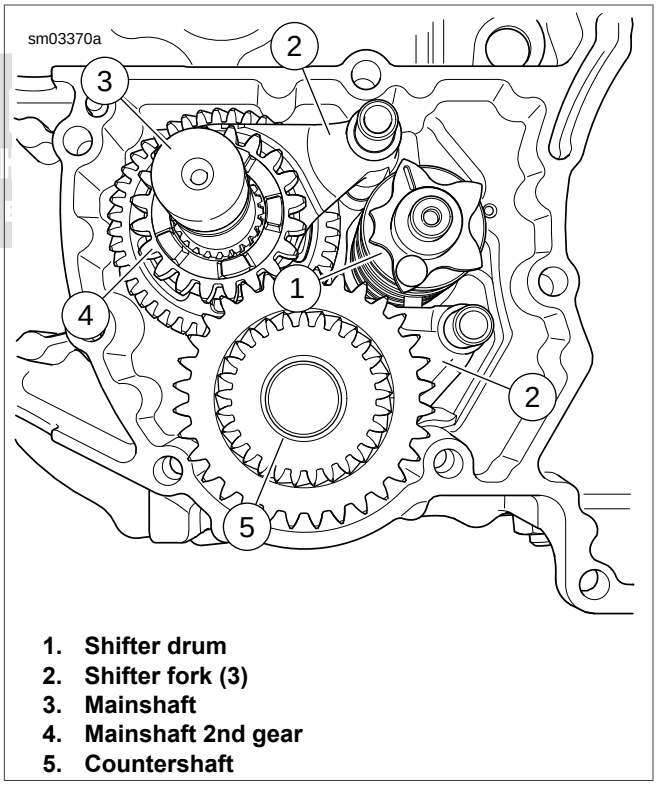
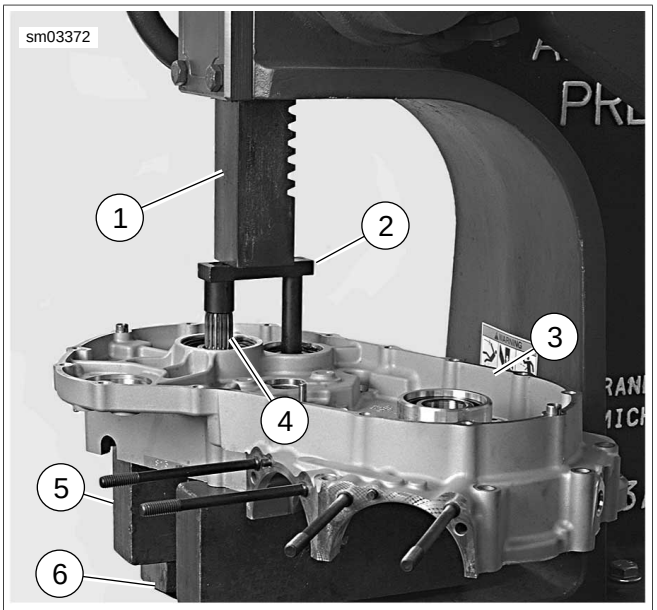


Figure 5-56. Slots For Removing Shifter Fork Shafts



1. **Shifter drum**
2. **Shifter fork (3)**
3. **Mainshaft**
4. **Mainshaft 2nd gear**
5. **Countershaft**

Figure 5-57. Transmission Assembly



1. **Press ram**
2. **Transmission remover**
3. **Crankcase**
4. **Transmission assembly (countershaft visible)**
5. **Parallel support (2)**
6. **Press bed**

Figure 5-58. 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

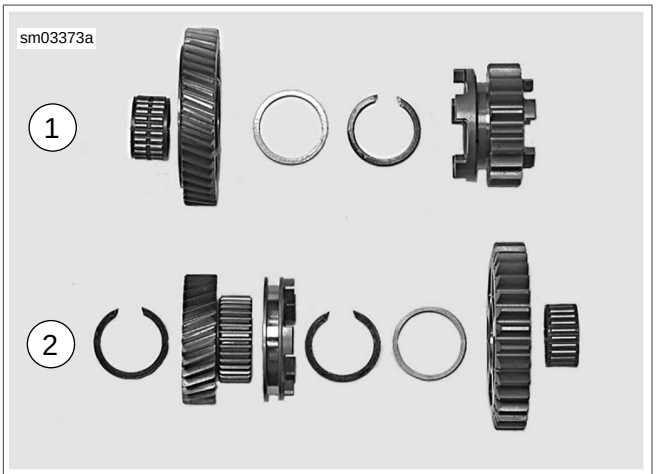
Use the TRANSMISSION REMOVAL AND INSTALLATION TOOL (Part No. B-43985) to remove the transmission.

3. See Figure 5-58. Remove left crankcase half and transmission assembly (4) from engine stand.
   a. Place crankcase half (3) 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.

MAINSHAFT/COUNTERSHAFT

NOTES

- *Transmission operation creates a specific wear pattern on the parts. Always install parts in their original locations and orientations.*
- *See Figure 5-59. As each component is removed, place it on a clean surface in the exact order of removal.*



1. **Mainshaft**
2. **Countershaft**

Figure 5-59. Transmission Parts Identification

MAINSHAFT DISASSEMBLY

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

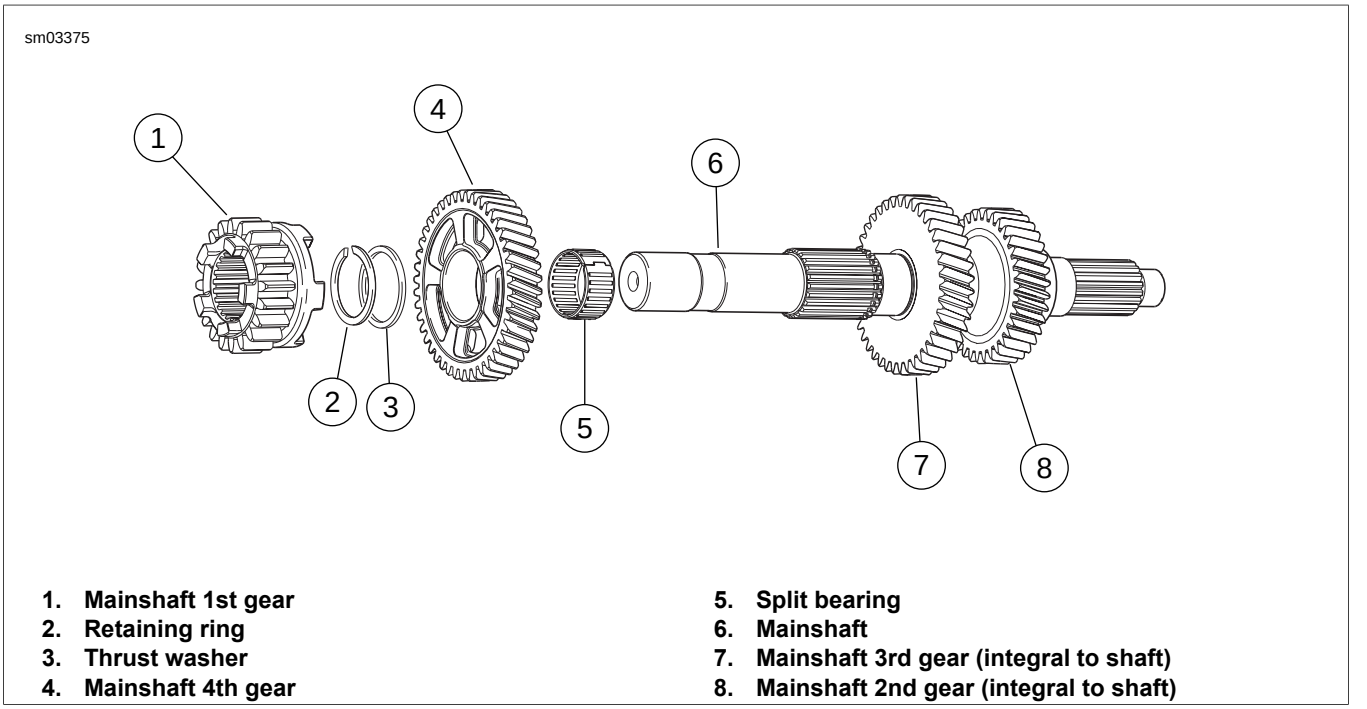
NOTES

- *Mainshaft 2nd and 3rd gears are integral to the shaft.*
- *Mainshaft 1st 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.*

⚠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 5-60. Remove 1st gear (1).
2. Use TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586-A) to expand and remove retaining ring (2). Discard retaining ring.
3. Slide thrust washer (3) off end of mainshaft.
4. Remove 4th 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 5-60. Transmission Mainshaft Assembly Once Removed from Left Crankcase/Disassembly

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 if necessary.
3. Inspect the engaging dogs on the gears. Replace if necessary.

COUNTERSHAFT DISASSEMBLY

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

NOTES

- *Countershaft 5th gear is integral to the shaft.*
- *Once the transmission assembly has been pressed out of the left crankcase half, the mainshaft and countershaft assemblies can be serviced separately.*
- *All thrust washers are one common part number. This transmission requires no shimming.*
- *Use correct retaining ring pliers with correct tips. Verify that tips are not excessively worn or damaged.*

⚠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 5-61. Remove spacer (19) and 2nd gear (18) from the end of the 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.

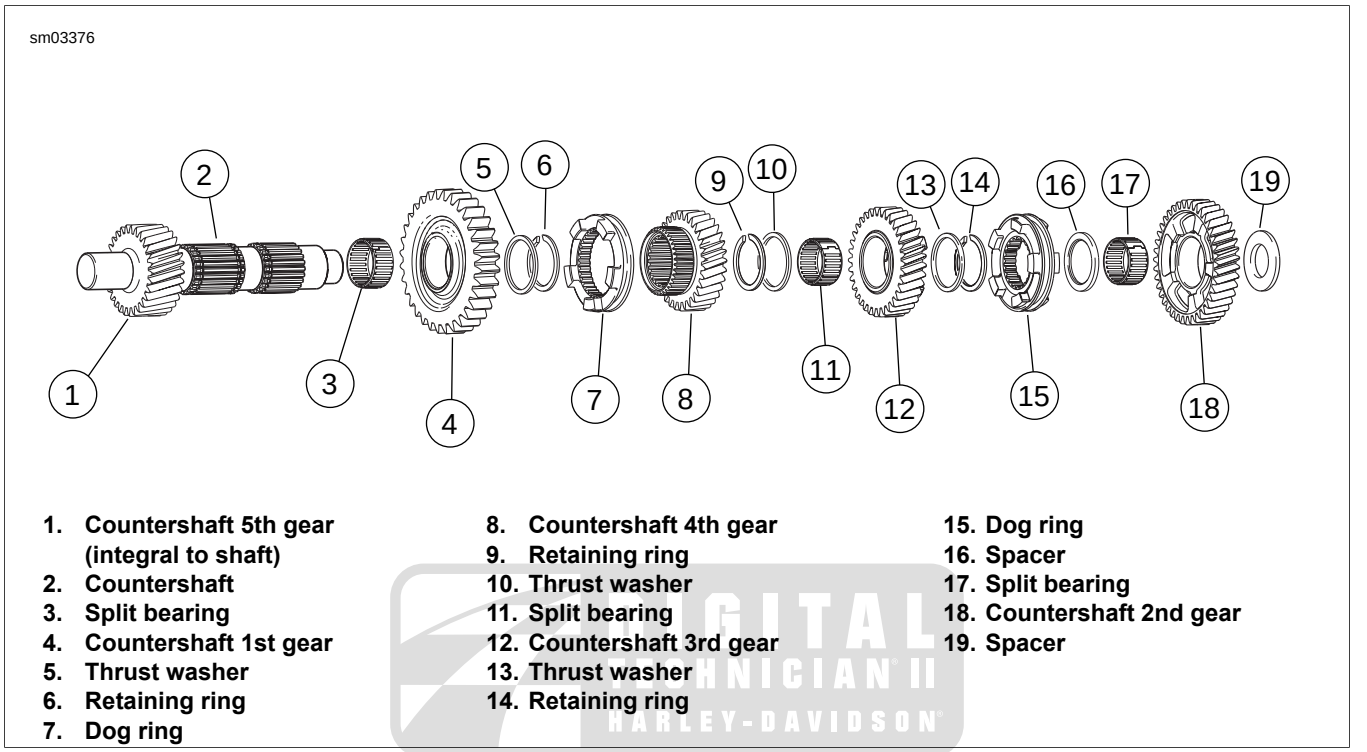
3. Remove dog ring (15).
4. Using RETAINING RING PLIERS (Part No. J-5586-A), expand and remove retaining ring (14). Discard retaining ring.
5. Remove thrust washer (13), 3rd gear (12), and split bearing (11). Discard bearing.
6. Remove thrust washer (10).
7. Expand, remove and discard retaining ring (9).
8. Remove 4th gear (8) and dog ring (7).
9. Expand, remove and discard retaining ring (6).
10. Remove thrust washer (5), 1st gear (4) and split bearing (3). Discard bearing.

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 bearings) in cleaning solvent and blow dry with compressed air.
2. Check gear teeth for damage. Replace if necessary.
3. Inspect the engaging dogs on the gears. Replace if necessary.



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 5-61. Transmission Countershaft Assembly Once Removed from Left Crankcase/Disassembly

TRANSMISSION ASSEMBLY 5.10

MAINSHAFT ASSEMBLY

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

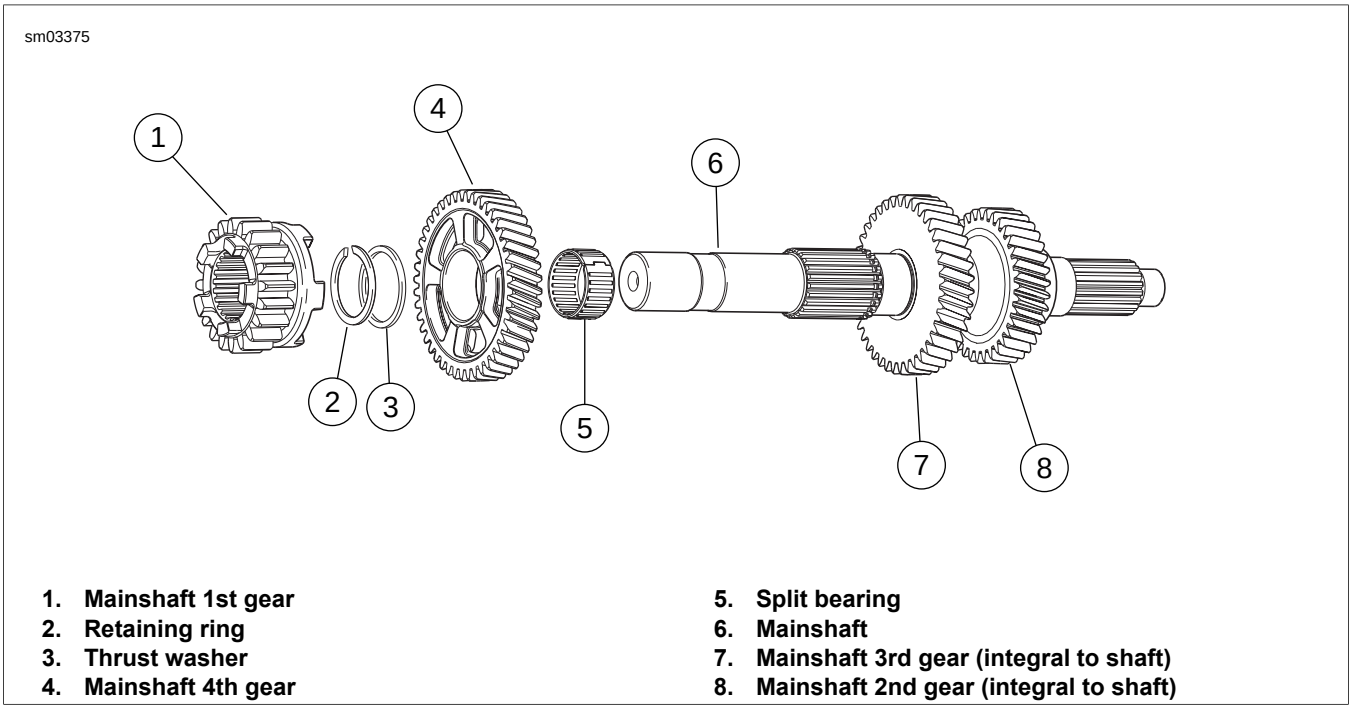
⚠WARNING

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

- *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 prior to assembly.*

1. See Figure 5-62. Install **new** split bearing (5) in 4th gear position on mainshaft.
2. Install 4th 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 1st 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 5-62. 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

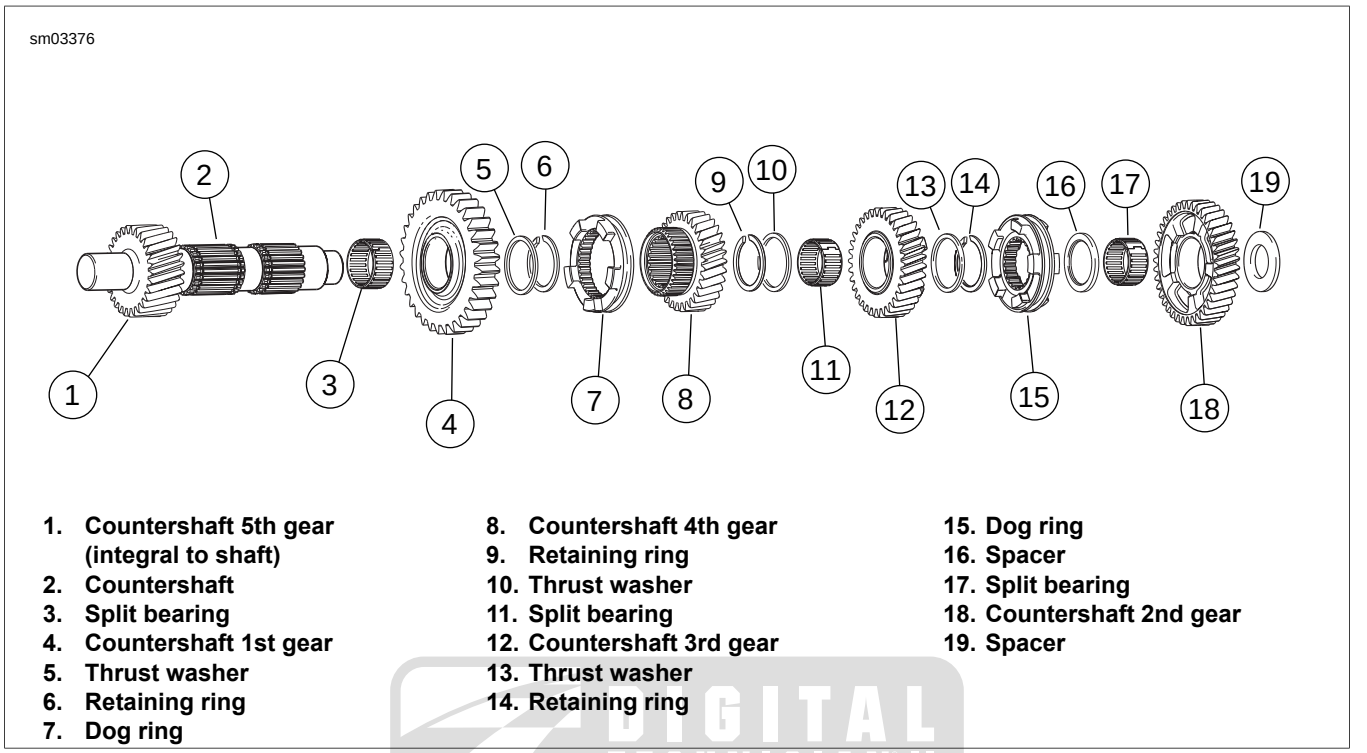
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*
- *During assembly, the split bearings and the internal bores of the gears must be lubricated with SCREAMIN' EAGLE ASSEMBLY LUBE prior to assembly. Leaving these parts dry could accelerate wear at start-up.*

1. See Figure 5-63. Install **new** split bearing (3) in 1st gear position on mainshaft.
2. Install 1st 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 4th 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 3rd gear position on mainshaft.
8. Install 3rd 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 2nd gear position on shaft.
13. Install 2nd gear (18) and spacer (19).

NOTE

At this point both mainshaft and countershaft sub-assemblies are ready to 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 5-63. Transmission Countershaft Assembly Once Removed from Left Crankcase/Disassembly

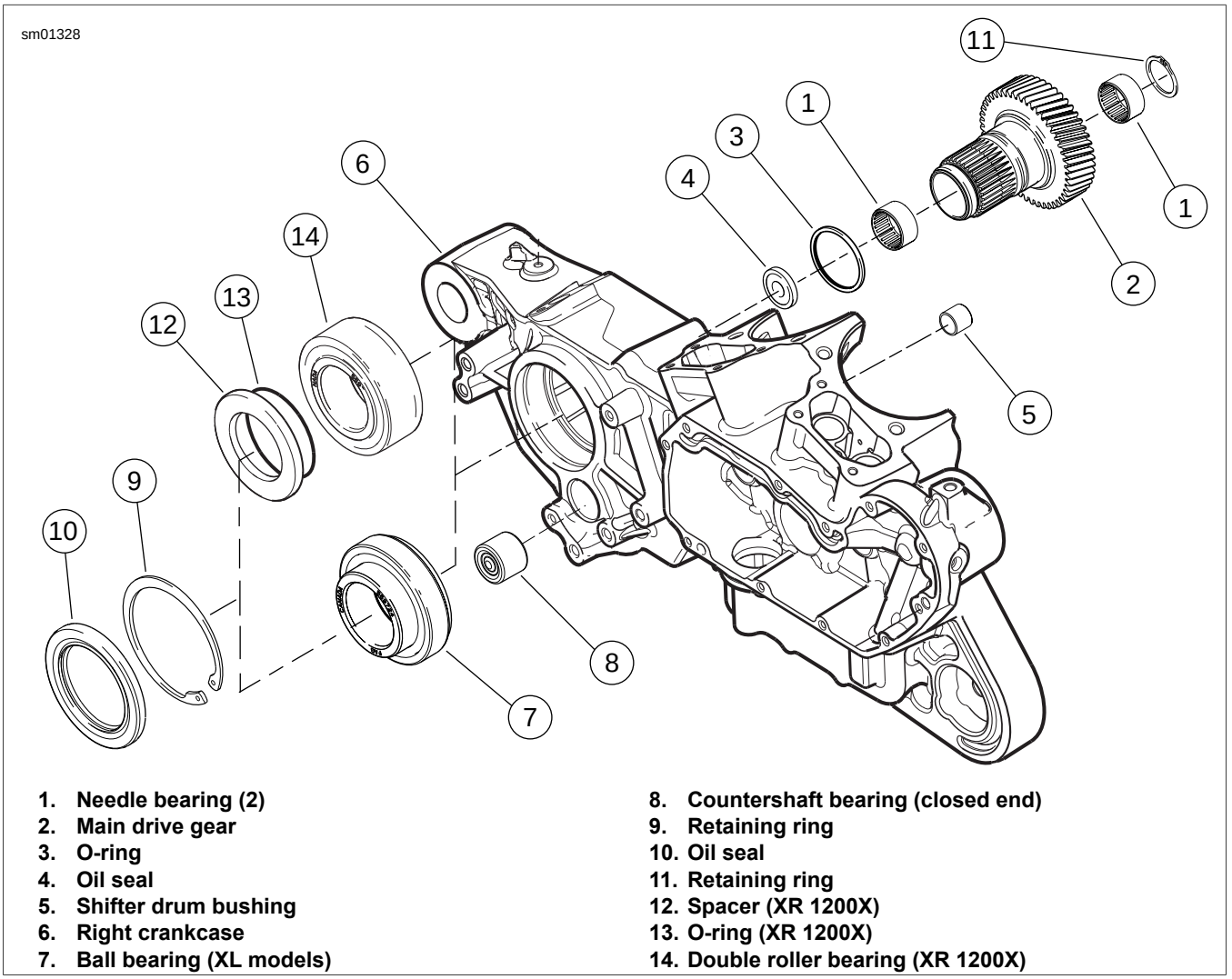
DIGITAL TECHNICIAN II HARLEY-DAVIDSON®

MAIN DRIVE GEAR AND BEARING 5.11

GENERAL

NOTE

See Figure 5-64. Main drive gear (2) removal requires replacement of the main drive gear bearing (7 or 14). Gear removal procedure destroys bearing's inner race.



1. Needle bearing (2)
2. Main drive gear
3. O-ring
4. Oil seal
5. Shifter drum bushing
6. Right crankcase
7. Ball bearing (XL models)
8. Countershaft bearing (closed end)
9. Retaining ring
10. Oil seal
11. Retaining ring
12. Spacer (XR 1200X)
13. O-ring (XR 1200X)
14. Double roller bearing (XR 1200X)

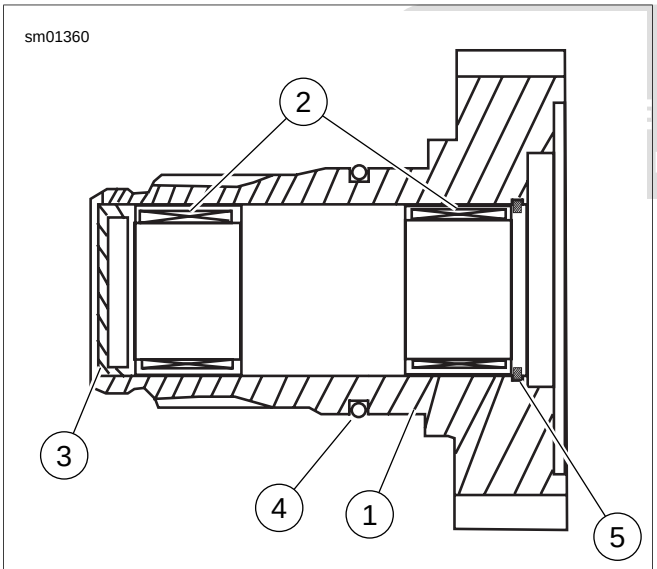
Figure 5-64. Main Drive Gear and Bearing Assembly

REMOVAL

PART NUMBER	TOOL NAME
B-45847	CROSS PLATE
HD-35316-11	RECEIVER CUP
HD-35316-13	BEARING DRIVER
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

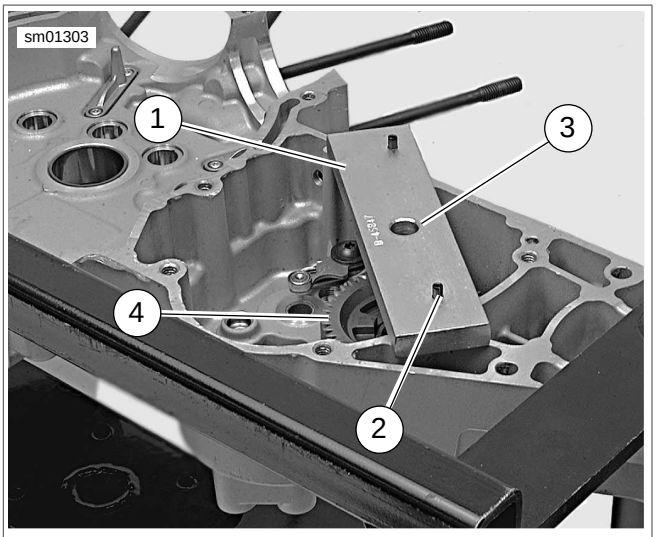
1. Split crankcases. See 5.8 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.
2. See Figure 5-65. From inside right crankcase, tap out seal (3) at end of main drive gear (1). Discard seal.
3. Obtain MAIN DRIVE GEAR REMOVER AND INSTALLER SET (Part No. HD-35316-D). See Figure 5-66. Position CROSS PLATE (Part No. B-45847) (1) on right crankcase as shown. Position so roll pins (2) fit into crankcase mating screw holes and bolt hole (3) is centered over main drive gear (4).



1. **Main drive gear**
2. **Needle bearing (2)**
3. **Seal**
4. **O-ring**
5. **Retaining ring**

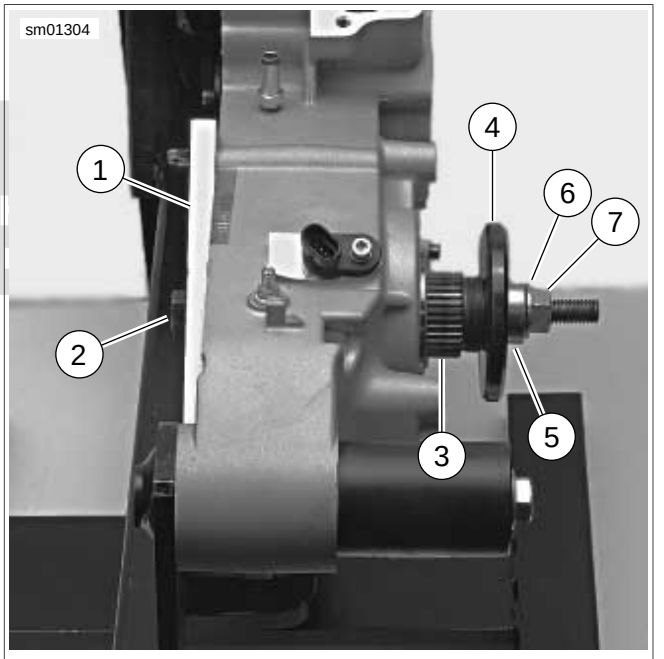
Figure 5-65. Main Drive Gear Assembly (typical)

4. See Figure 5-67. 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 5-66. Positioning Cross Plate (typical)



1. **Cross plate**
2. **8 in bolt**
3. **Main drive gear**
4. **Washer**
5. **Bearing**
6. **Washer**
7. **Nut**

Figure 5-67. Removing Main Drive Gear (typical)

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

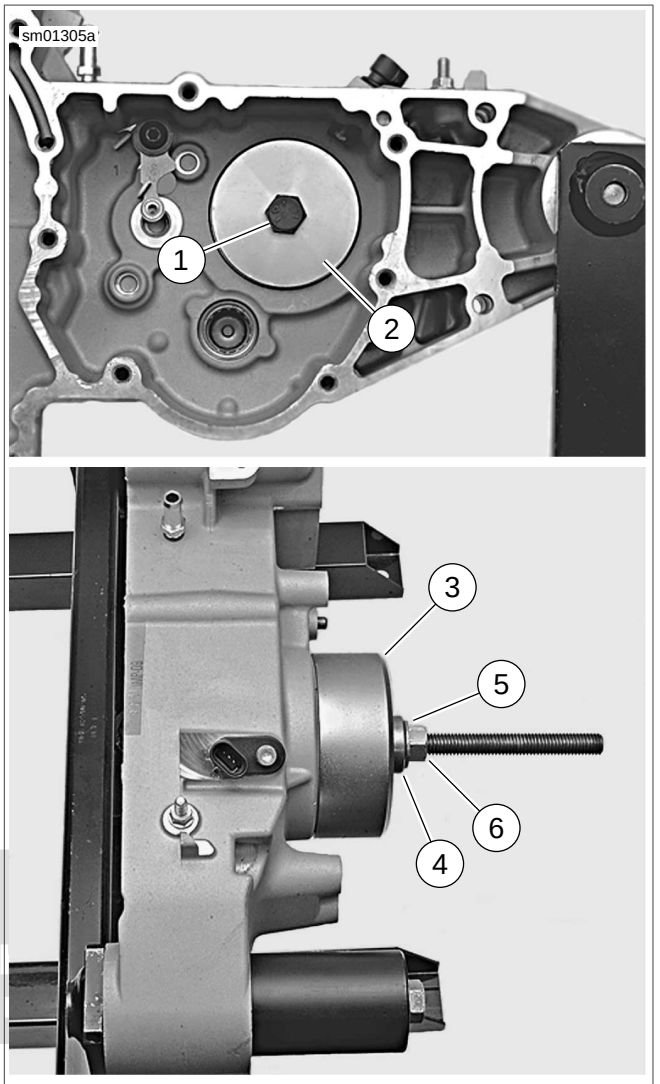
Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

1. See Figure 5-64. Remove and discard oil seal (10). Remove and discard main drive gear bearing retaining ring (9).
2. **XR 1200X:** Remove spacer (12) and O-ring (13).
3. See Figure 5-68. Install driver components: From inside crankcase, position bearing driver (2) over main drive gear bearing.
   a. **XL Models:** Use the BEARING DRIVER (Part No. HD-35316-9).
   b. **XR 1200X:** Use the BEARING DRIVER (Part No. HD-35316-13).
4. Insert 8 INCH BOLT (Part No. HD-35316-4A) (1) through bearing driver and bearing.
5. At outside of case, slide RECEIVER CUP (Part No. HD-35316-11) (3) onto bolt and over bearing. Install the bearing (4), flat washer (5) and nut (6) over end of bolt.

NOTE

Support bearing remover assembly as you remove bearing in the following step. Entire assembly will fall out of crankcase when bearing comes free.

6. Tighten nut until main drive gear ball bearing is free.
7. Discard main drive gear ball bearing.



1. **8 inch bolt**
2. **Bearing driver**
3. **Receiver cup**
4. **Bearing**
5. **Flat washer**
6. **Nut**

Figure 5-68. Removing Main Drive Gear Bearing (typical)

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-95637-46B	BEARING RACE PULLER

1. See Figure 5-64. Remove retaining ring (11) from inboard end of main drive gear (2). Discard retaining ring.
2. See Figure 5-65. 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

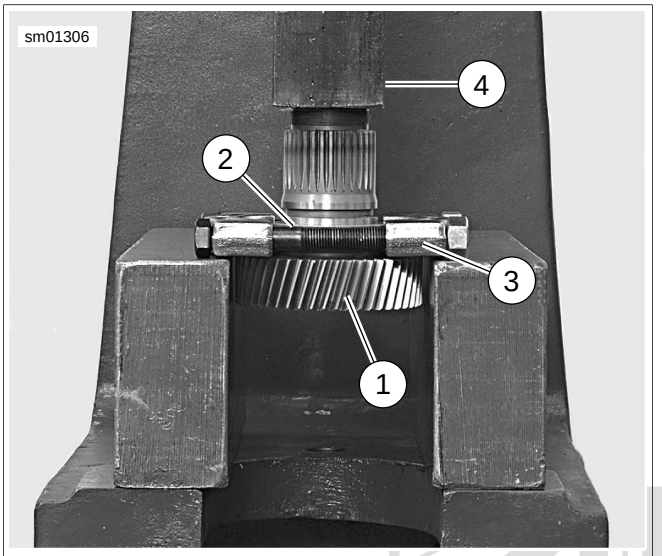
When the main drive gear is removed, a portion of the bearing inner race remains attached to the main drive gear. Remove this inner race before installing main drive gear.

4. See Figure 5-69. 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 5-69. Removing Inner Bearing Race From Main Drive Gear (typical)

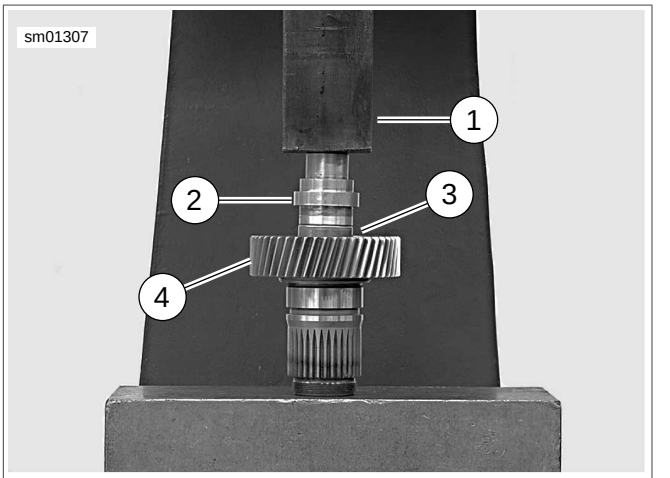
ASSEMBLY

PART NUMBER	TOOL NAME
HD-47855	INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XL MODELS
HD-48643	INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XR 1200X

NOTE

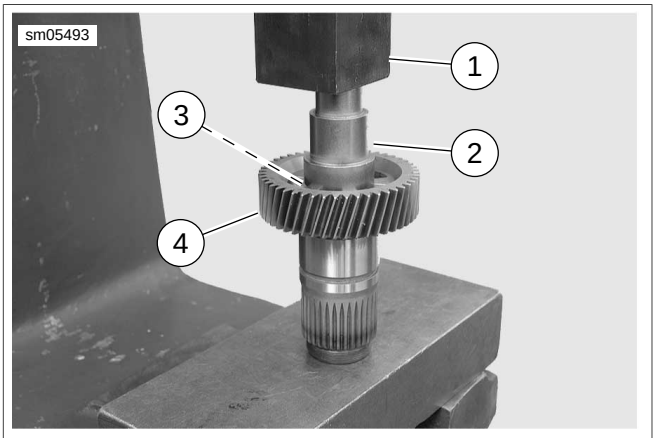
The correct installed bearing depth is reached when the installation tool bottoms on the gear.

1. See Figure 5-70 or Figure 5-71. 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 installation tool (2) with end stamped "INNER" facing needle bearing.
   a. **XL Models:** INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XL MODELS (Part No. HD-47855)
   b. **XR 1200X:** INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XR 1200X (Part No. HD-48643)
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 5-70. Pressing Inner Needle Bearing Assembly into Main Drive Gear: XL Models



1. **Press ram**
2. **Needle bearing installation tool**
3. **Needle bearing (not visible)**
4. **Main drive gear**

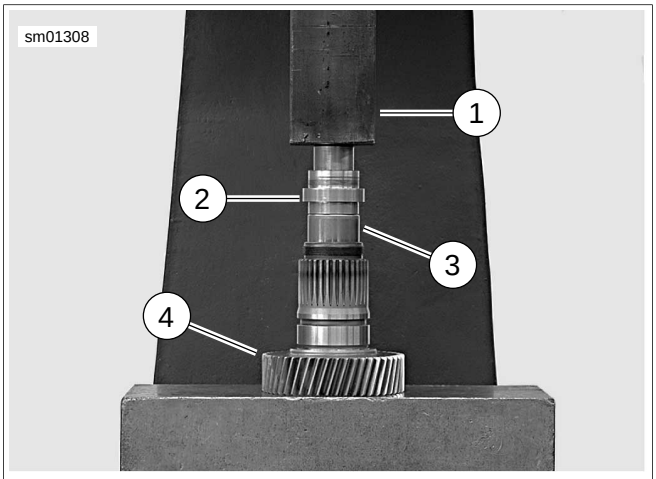
Figure 5-71. Pressing Inner Needle Bearing Assembly into Main Drive Gear: XR 1200X

4. See Figure 5-72 or Figure 5-73. 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.

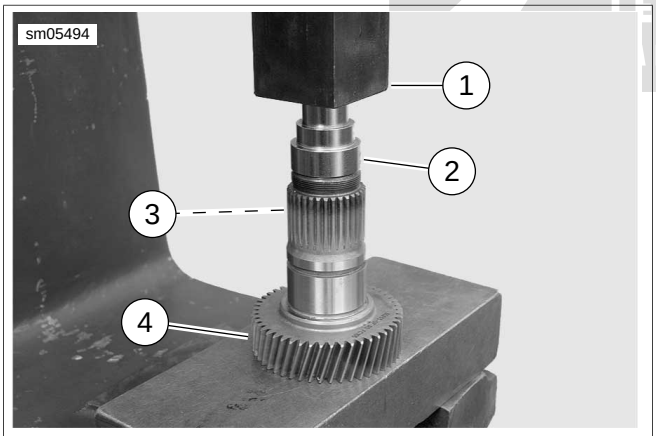
6. Press in the outer needle bearing until the installation tool bottoms on the main drive gear.

7. See Figure 5-64. 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 5-72. Pressing Outer Needle Bearing Assembly into Main Drive Gear: XL Models



1. **Press ram**
2. **Needle bearing installation tool**
3. **Needle bearing (not visible)**
4. **Main drive gear**

Figure 5-73. Pressing Outer Needle Bearing Assembly into Main Drive Gear: XR 1200X

INSTALLATION

PART NUMBER	TOOL NAME
B-45847	CROSS PLATE
HD-35316-12	INSTALLER CUP
HD-35316-13	BEARING DRIVER
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: XL Models

1. See Figure 5-74. 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 5-75. 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

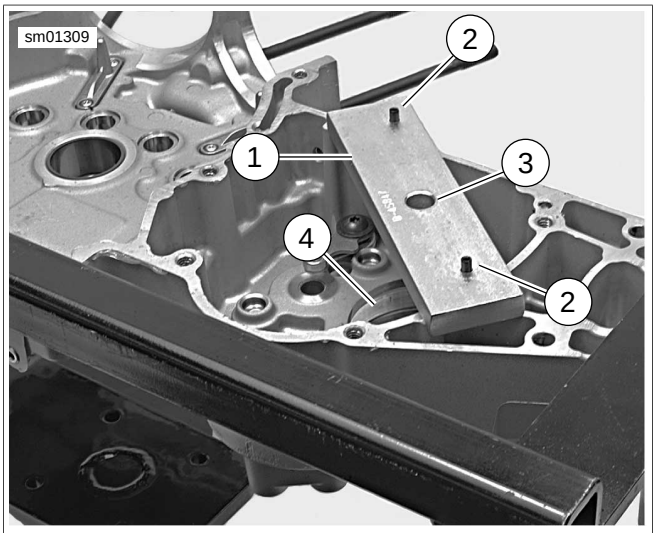
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

NOTE

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

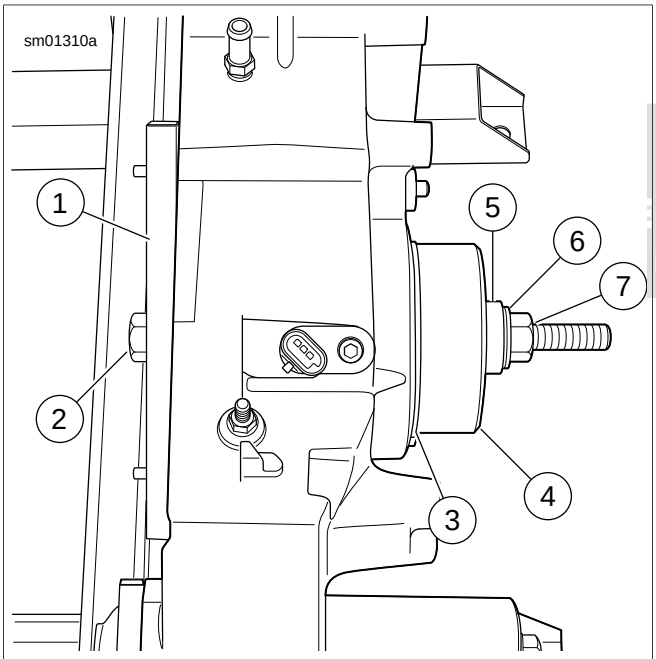
6. See Figure 5-78. At outside of case install **new** beveled retaining ring (9) in groove inside bearing bore with beveled side facing outside of case.

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 5-74. Positioning Cross Plate: XL Models



1. Cross plate
2. 8 inch bolt
3. Main drive gear bearing
4. Bearing driver
5. Bearing
6. Flat washer
7. Nut

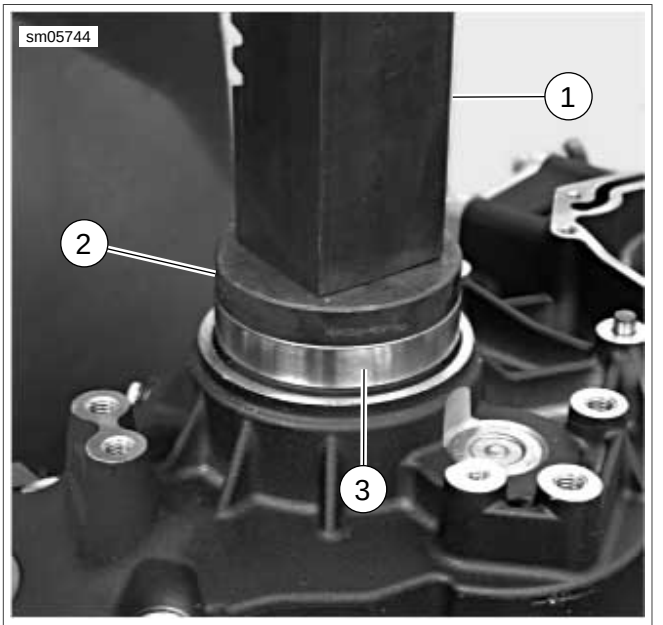
Figure 5-75. Installing Main Drive Gear Bearing: XL Models

Main Drive Gear Bearing: XR 1200X

NOTE

Due to the design of the bearing, BEARING DRIVER (Part No. HD-35316-13) and an arbor press must be used to press the main drive gear bearing on all XR 1200X.

1. See Figure 5-76. From the outside of the case, position the main drive gear bearing (3) and bearing driver (2) over bearing bore in crankcase.
2. Press on main drive gear bearing driver until driver bottoms against lip cast into crankcase bearing bore.



1. Press ram
2. Bearing driver
3. Main drive gear bearing

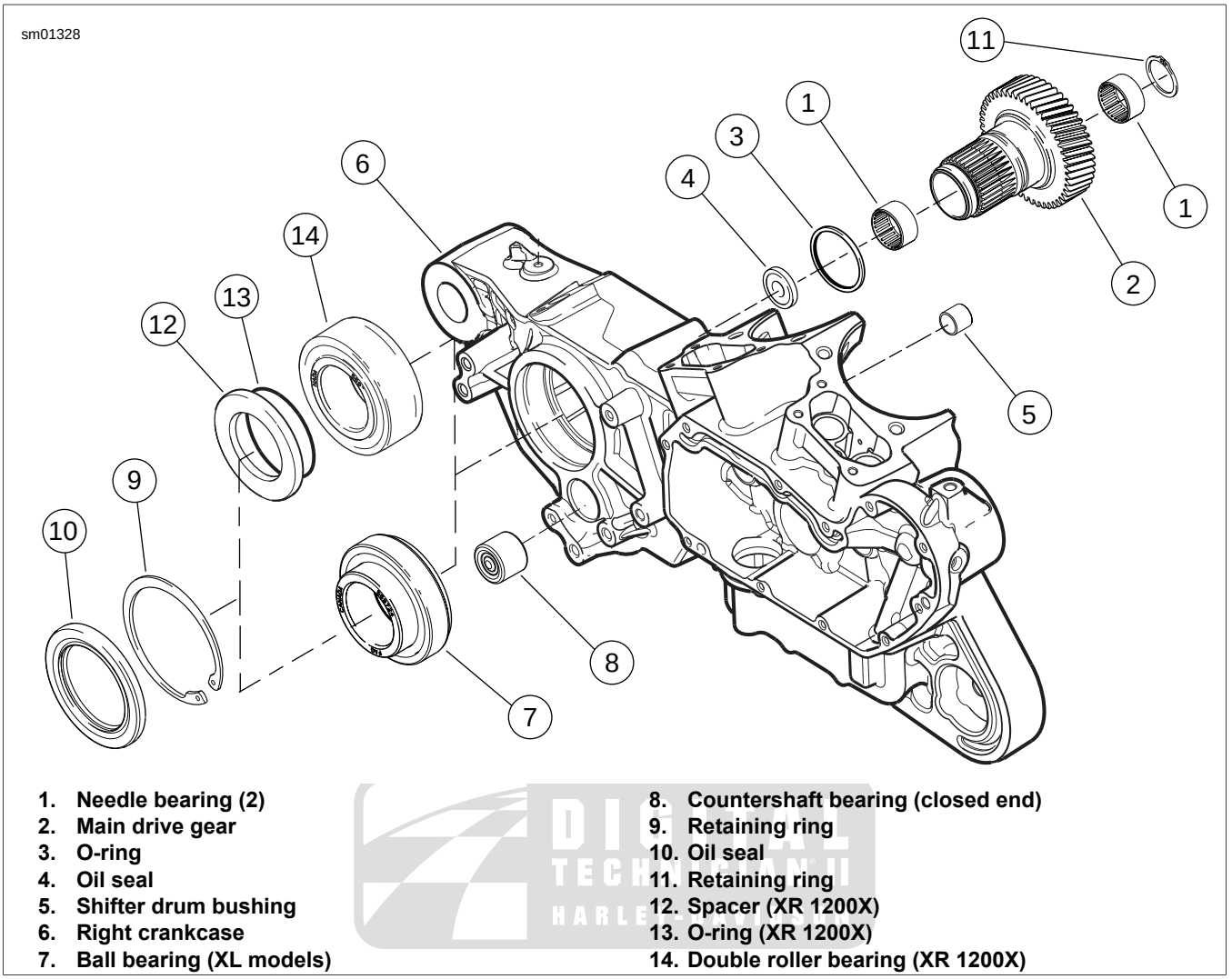
Figure 5-76. Installing Main Drive Gear Bearing: XR 1200X

Main Drive Gear

1. See Figure 5-77. Lubricate both main drive gear needle bearing assemblies with SPECIAL PURPOSE GREASE.
2. See Figure 5-78. Install **new** O-ring (3) into groove in main drive gear (2). Lubricate O-ring with SCREAMIN' EAGLE ASSEMBLY LUBE.



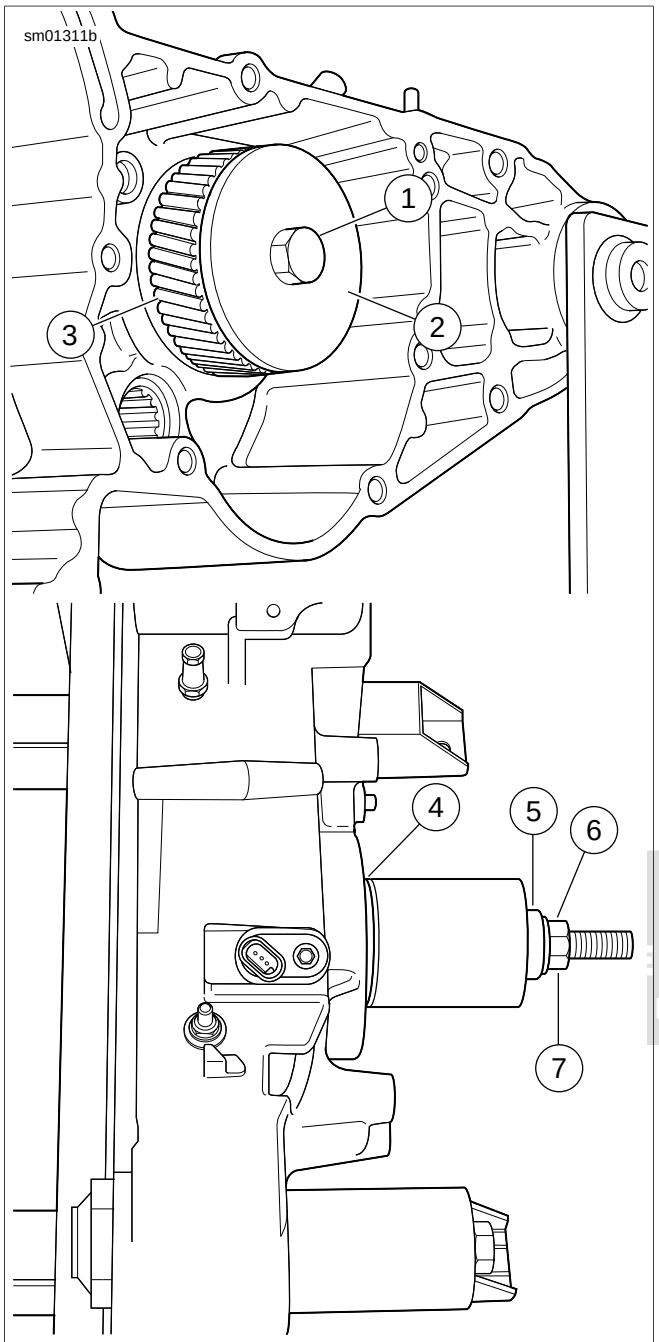
Figure 5-77. Lubricating Main Drive Gear Needle Bearing



1. **Needle bearing (2)**
2. **Main drive gear**
3. **O-ring**
4. **Oil seal**
5. **Shifter drum bushing**
6. **Right crankcase**
7. **Ball bearing (XL models)**
8. **Countershaft bearing (closed end)**
9. **Retaining ring**
10. **Oil seal**
11. **Retaining ring**
12. **Spacer (XR 1200X)**
13. **O-ring (XR 1200X)**
14. **Double roller bearing (XR 1200X)**

Figure 5-78. Main Drive Gear and Bearing Assembly

3. See Figure 5-79. 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 5-78. 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 5-79. Installing Main Drive Gear (typical)

Main Drive Gear Seal

1. **XR 1200X:** See Figure 5-78. Install spacer (12) and **new** O-ring (13) onto main drive gear.
2. Obtain MAIN DRIVE GEAR SEAL INSTALLER KIT (Part No. HD-47856).
3. See Figure 5-80. From outside of crankcase, install PILOT (Part No. HD-47856-2) over end of main drive gear bearing inner race.
4. Coat lips of **new** main drive gear seal with SCREAMIN' EAGLE ASSEMBLY LUBE.
5. See Figure 5-81. 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.

6. See Figure 5-82. 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.

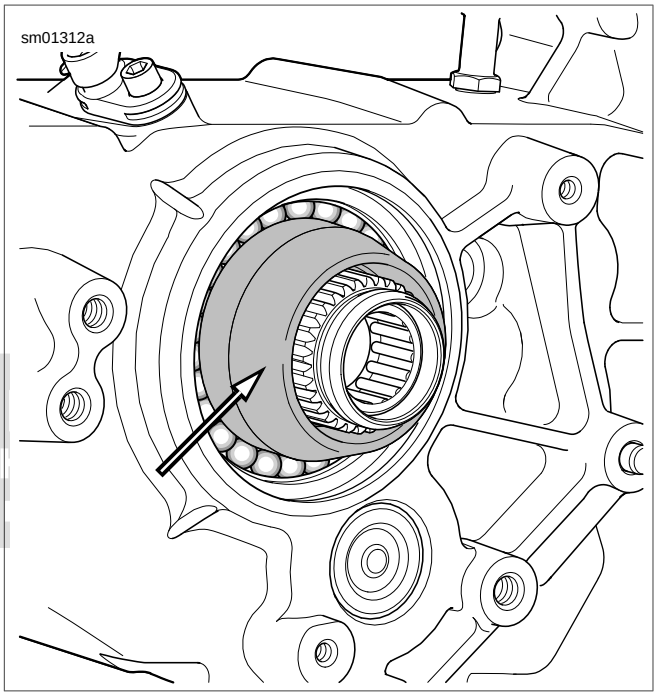


Figure 5-80. Install Pilot (typical)

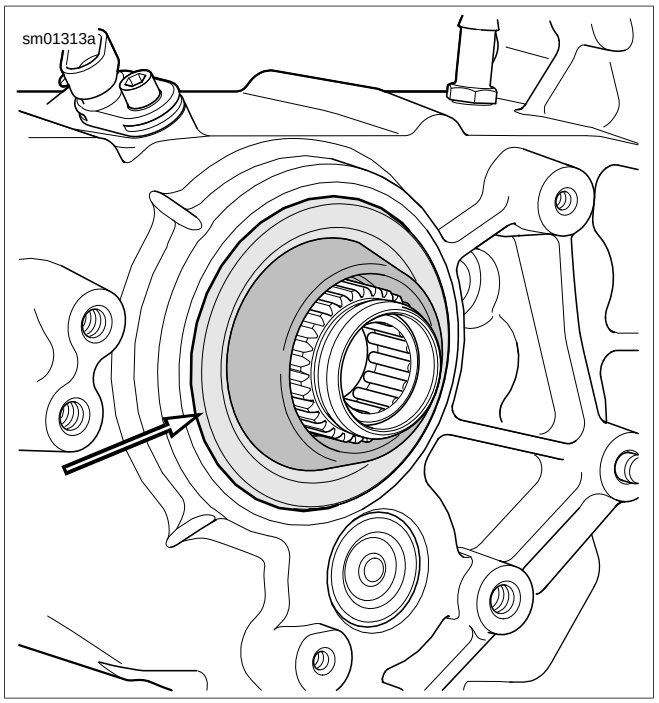


Figure 5-81. Install Main Drive Gear Seal (typical, XL model shown)

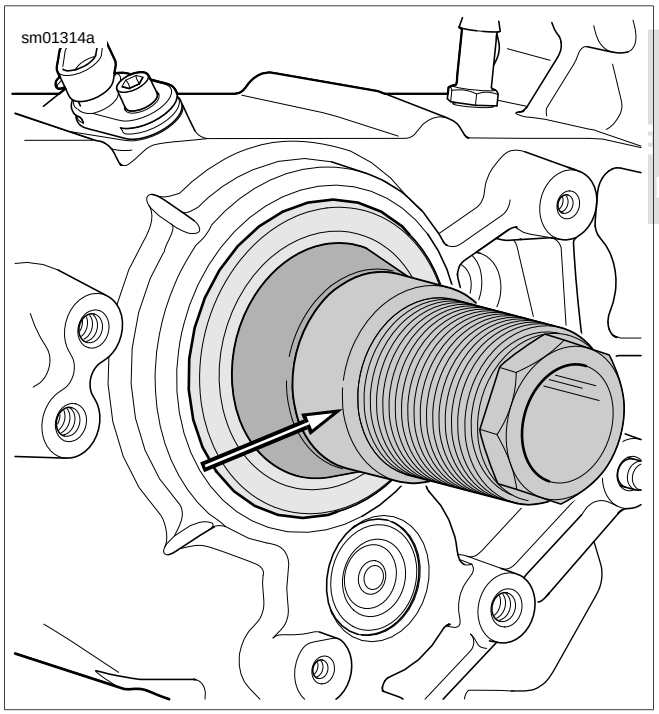


Figure 5-82. Install Adapter (typical, XL model shown)

7. See Figure 5-83. Slide INSTALLER (Part No. HD-47856-1) over adapter until cupped end of installer is flat against seal.
8. See Figure 5-84. Thread LARGE NUT (Part No. HD-47856-5) onto end of adapter, until it tightens against installer.
9. See Figure 5-85. 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.
10. 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.

11. Remove nut, installer, adapter and pilot.

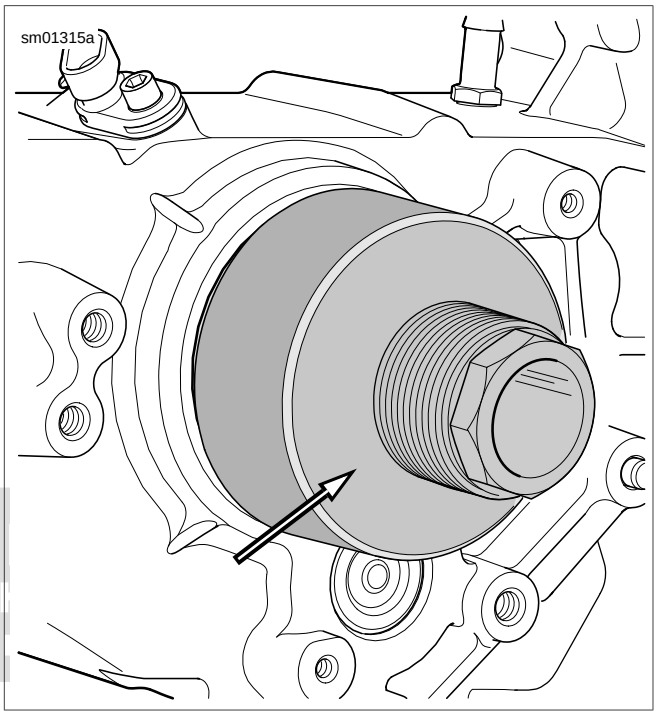


Figure 5-83. Place Installer over Adapter (typical, XL model shown)

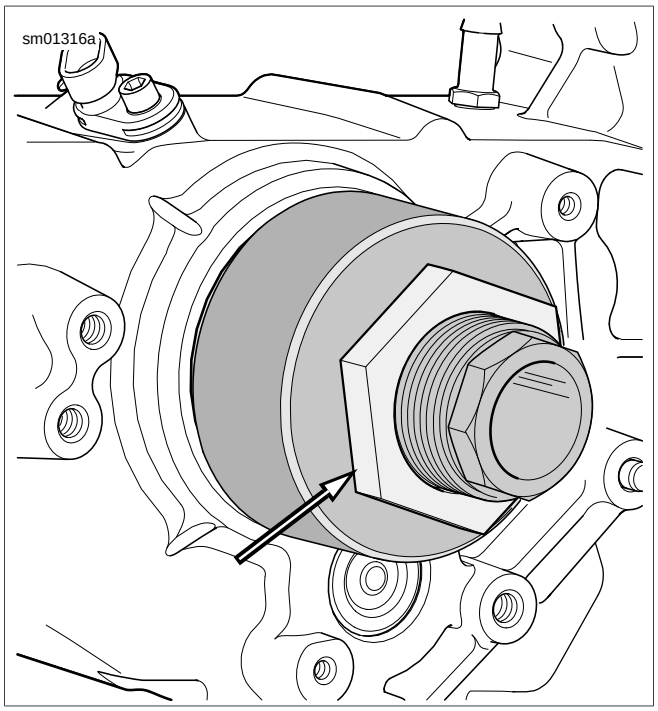
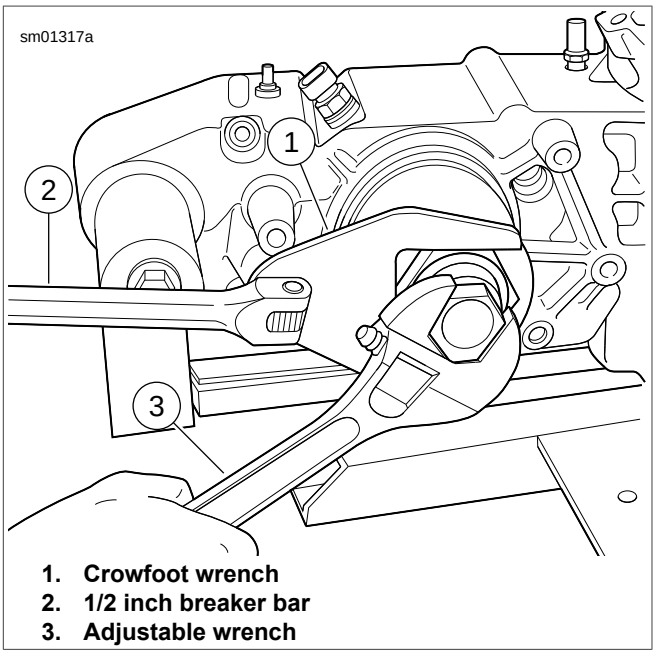


Figure 5-84. Install Nut (typical, XL model shown)



1. Crowfoot wrench
2. 1/2 inch breaker bar
3. Adjustable wrench

Figure 5-85. Press Seal Into Crankcase (typical, XL model shown)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TRANSMISSION RIGHT CASE BEARINGS 5.12

REMOVAL

PART NUMBER	TOOL NAME
HD-95760-69A	BUSHING AND BEARING PULLER
HD-95765-69A	1/2 INCH COLLET

Split crankcases. See 5.8 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.

Countershaft Needle Bearing

See Figure 5-86. From inside transmission case use a bearing driver to remove countershaft bearing (1) from crankcase bore.

Shifter Drum Bushing

1. See Figure 5-86. 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

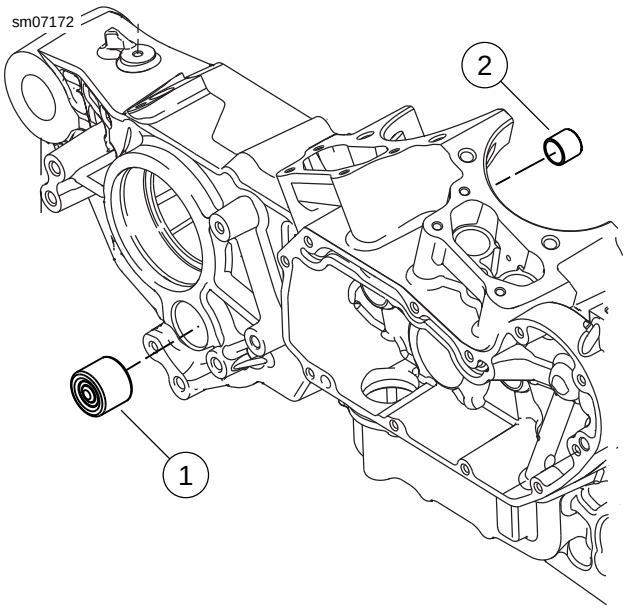
PART NUMBER	TOOL NAME
A-157C	SNAP-ON BUSHING DRIVER SET

Countershaft Needle Bearing

1. Find a bearing driver 1-1/4 inch in diameter.
2. See Figure 5-86. 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 5-86. Using SNAP-ON BUSHING DRIVER SET (Part No. A-157C) and the 1/2 inch 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 5-86. Transmission Right Case Bearings

TRANSMISSION LEFT CASE BEARINGS 5.13

REMOVAL

PART NUMBER	TOOL NAME
PR-36	SNAP-ON SNAP RING PLIERS

Mainshaft and Countershaft Bearings

1. Split crankcases. See 5.8 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.
2. Disassemble transmission. See 5.9 TRANSMISSION REMOVAL AND DISASSEMBLY.
   a. Remove shifter forks and drum.
   b. Remove countershaft and mainshaft.
3. Inspect the mainshaft and countershaft ball bearings for pitting, scoring, discoloration or other damage.
4. See Figure 5-88. 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 pitting, scoring, discoloration or excessive wear.
2. If bushing requires replacement, press bushing out of crankcase from primary side toward inside of case.

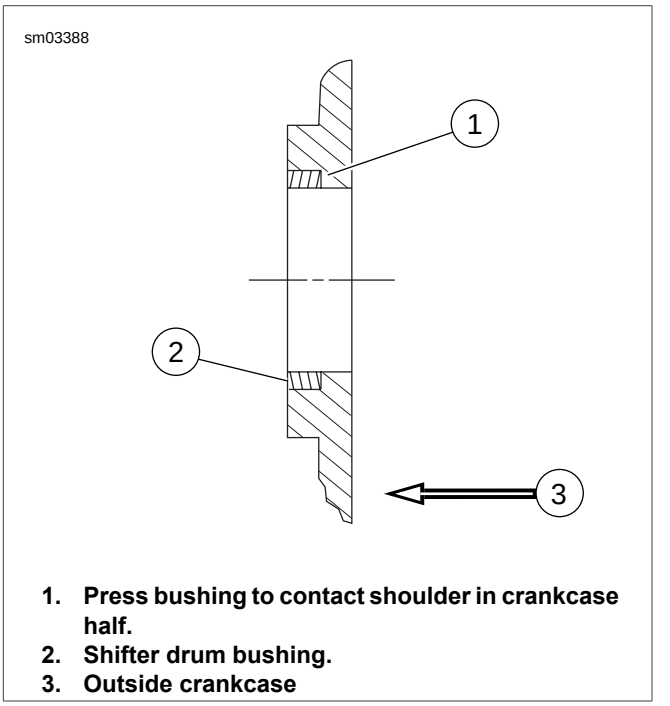
INSTALLATION

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.

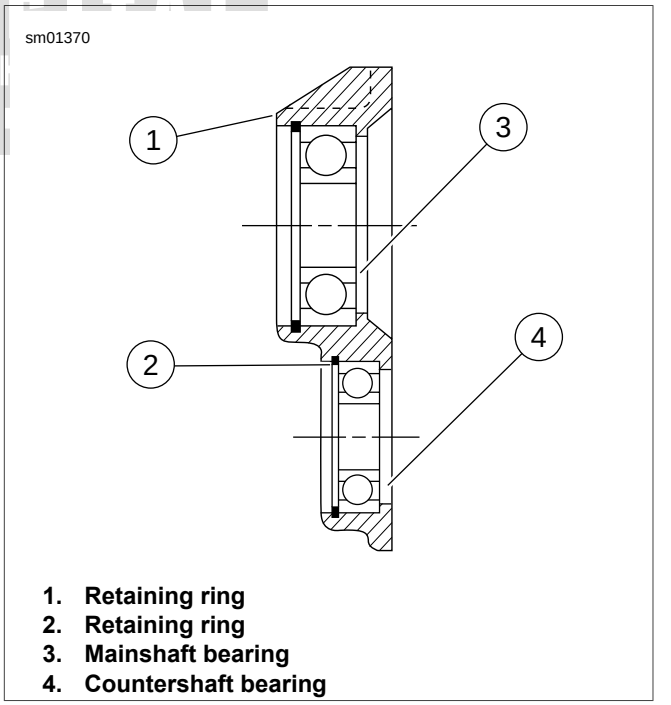
Shift Drum Bushing

1. Place crankcase on press with outside surface of crankcase downward.
2. See Figure 5-87. 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 5-87. Shifter Drum Bushing Assembly



1. **Retaining ring**
2. **Retaining ring**
3. **Mainshaft bearing**
4. **Countershaft bearing**

Figure 5-88. Ball Bearing Assembly

TRANSMISSION INSTALLATION 5.14

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

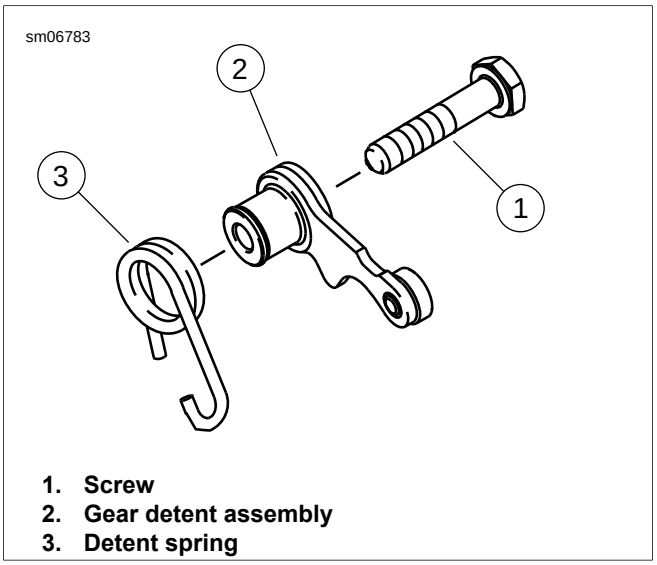
FASTENER	TORQUE VALUE	
Gear detent assembly screw	90-110 **in-lbs**	10.2-12.4 Nm

1. See Figure 5-89. 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

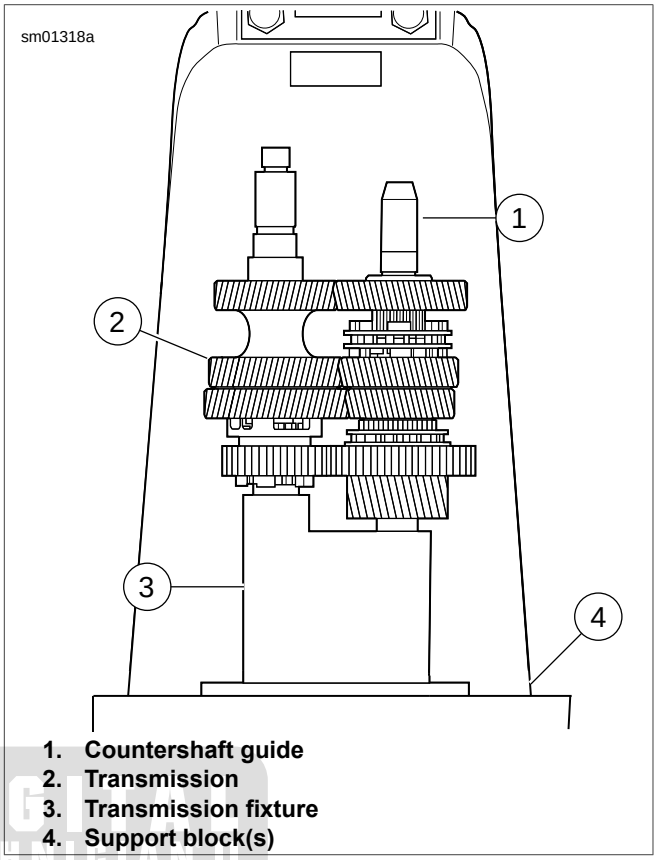
Use the TRANSMISSION REMOVAL AND INSTALLATION TOOL (Part No. B-43985) to install the countershaft.

4. See Figure 5-90. 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**

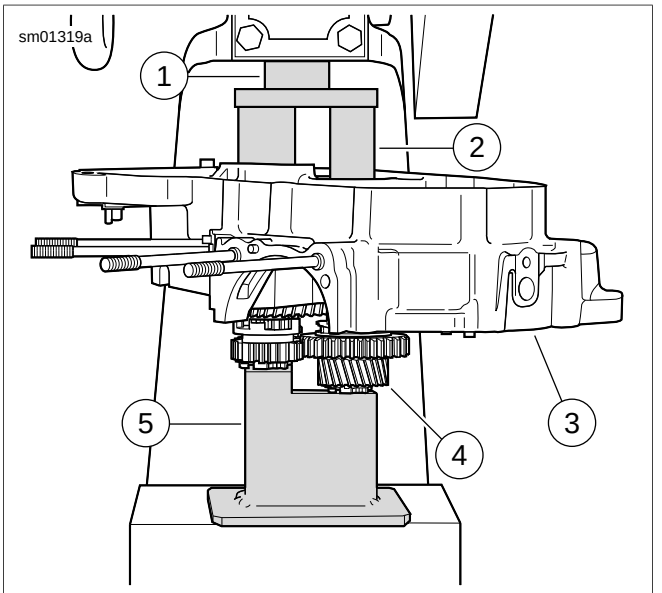
Figure 5-89. Gear Detent Assembly



1. **Countershaft guide**
2. **Transmission**
3. **Transmission fixture**
4. **Support block(s)**

Figure 5-90. Transmission on Fixture

6. See Figure 5-91. 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 5-91. 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 5-92. 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.

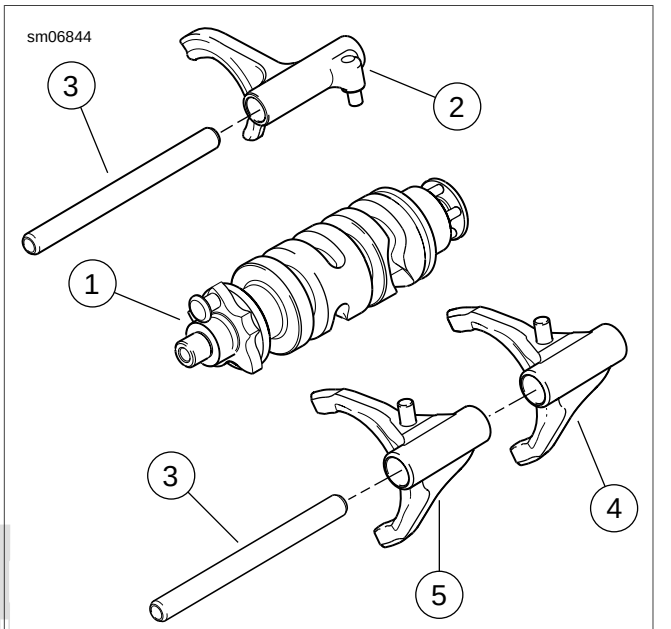
NOTE

See Figure 5-93. 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. **Coutnershaft shifter fork (2nd/3rd)**

Figure 5-92. Shifter Forks, Drum and Shafts

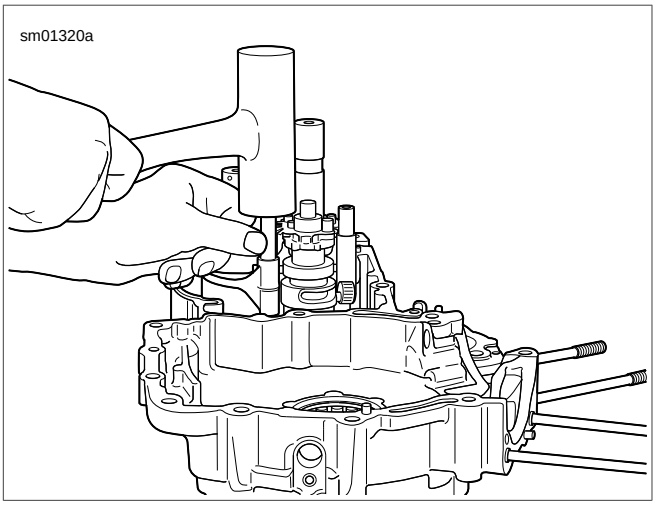


Figure 5-93. Installing Shifter Fork Shafts

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 5-94. 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 5-95. Install flywheel assembly into right crankcase half.

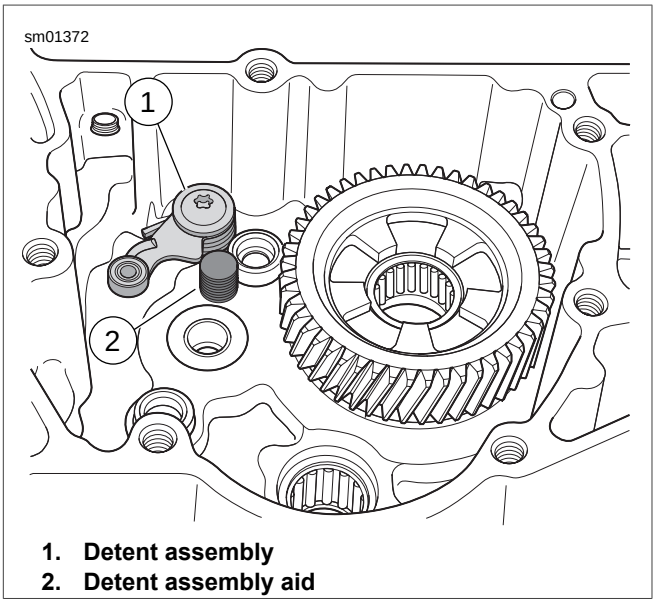
⚠CAUTION

Do not rotate right crankcase half in engine stand such that flywheel sprocket shaft is facing down. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00553b)

NOTE

Always place transmission in 1st gear when assembling crankcases. Other gear selections could cause damage.

3. Place transmission in 1st gear.
4. See Figure 5-96. 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 5-97. In sequence, tighten to 15-19 ft-lbs (20.3-25.8 Nm).
5. Remove GEAR DETENT ASSEMBLY AID and 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 5-94. Using Gear Detent Assembly Aid (Part No. B-45520)

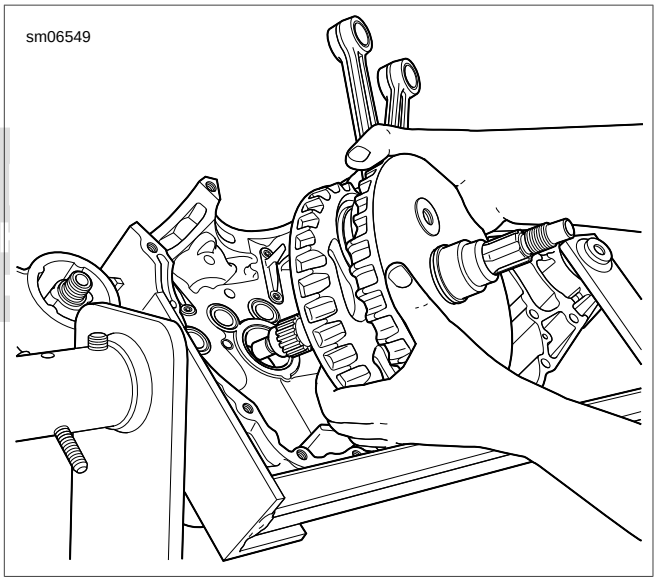


Figure 5-95. Installing Flywheel Assembly In Right Crankcase

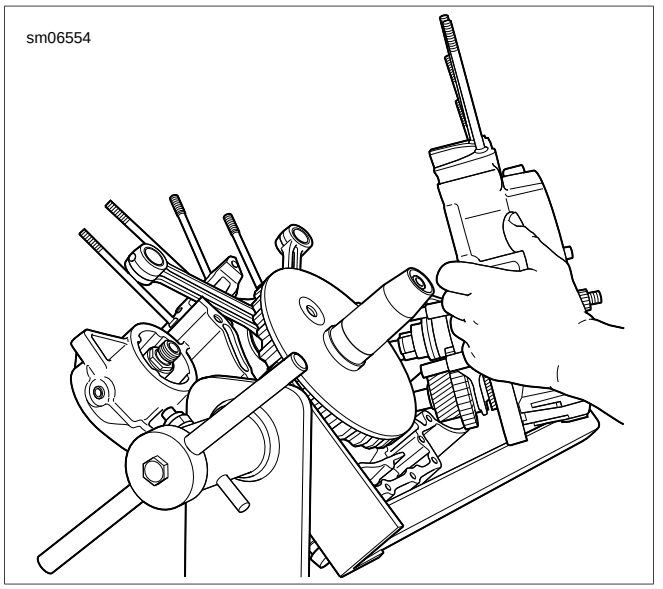


Figure 5-96. Assembling Crankcases With Crankshaft Guide Tool (Part No. HD-42326-A)

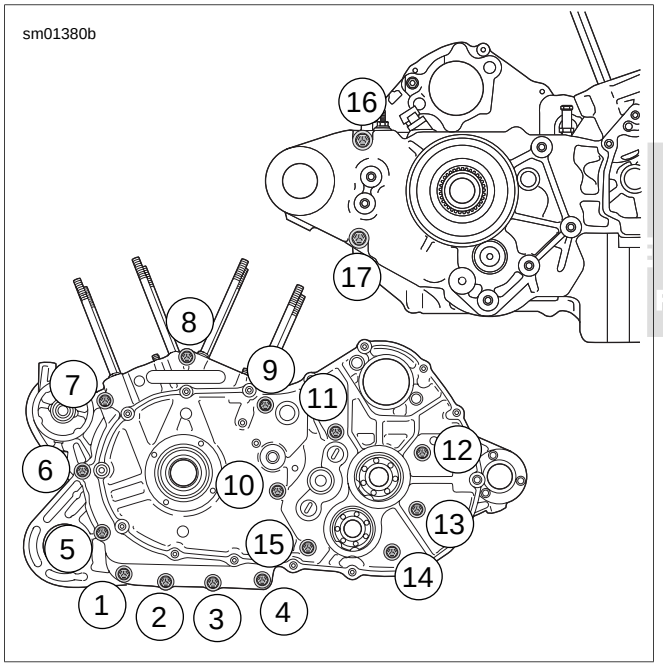


Figure 5-97. Crankcase Fastener Torque Sequence

SHIFTER SHAFT INSTALLATION

FASTENER	TORQUE VALUE	
Countershaft retaining screw	33-37 ft-lbs	44.8-50.2 Nm

1. See Figure 5-98. Correctly install shifter return spring onto the reverse side of the shifter shaft assembly before placing shaft in left crankcase half.

NOTE

See Figure 5-100. Verify shifter shaft return spring assembly and installation. Incorrect spring installation could cause problems with shifting.

2. See Figure 5-100. 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 5-101. 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 and tighten screw to 33-37 ft-lbs (44.8-50.2 Nm).
5. Install transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
6. Continue assembling engine. See 3.22 BOTTOM END OVERHAUL: ASSEMBLY and 3.16 TOP END OVERHAUL: ASSEMBLY.
7. Install primary chain and engine sprocket, clutch assembly, and primary cover. See 5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS or 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X.
8. Install engine in chassis. See 3.11 INSTALLING ENGINE IN CHASSIS.

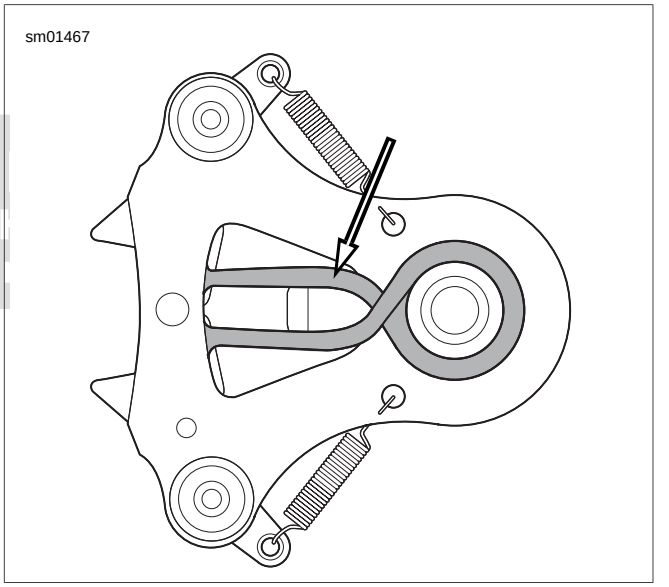


Figure 5-98. Shifter Shaft Return Spring (Correctly Installed)

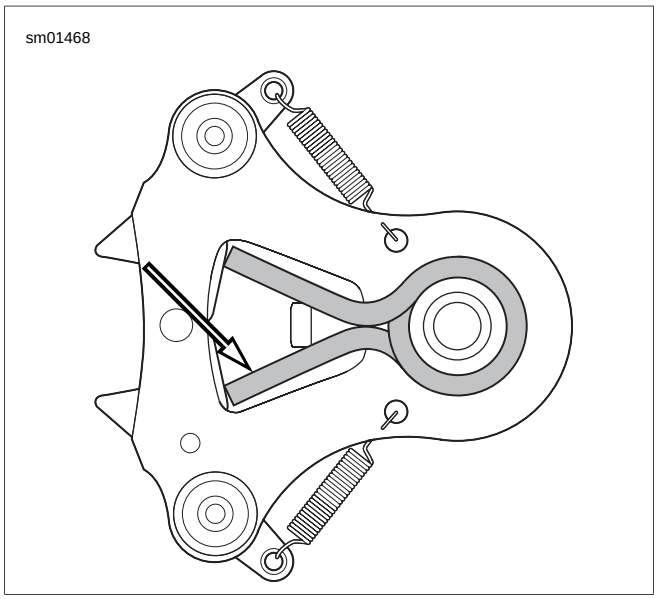


Figure 5-99. Shifter Shaft Return Spring (Incorrectly Installed)

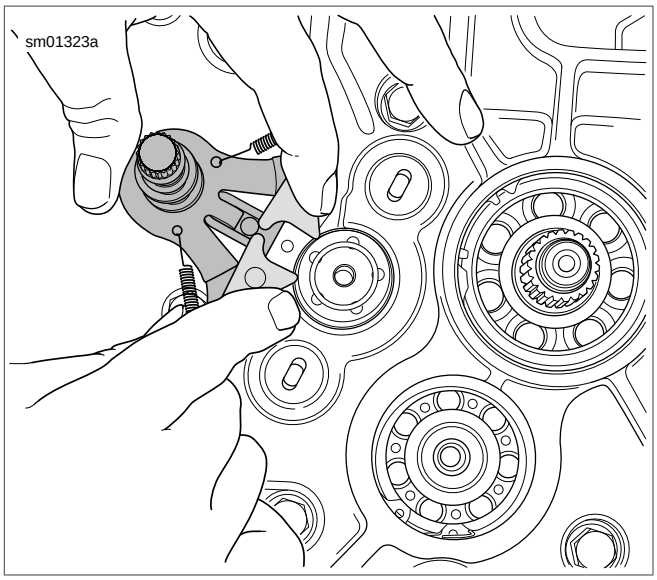


Figure 5-100. Installing Shifter Shaft Assembly

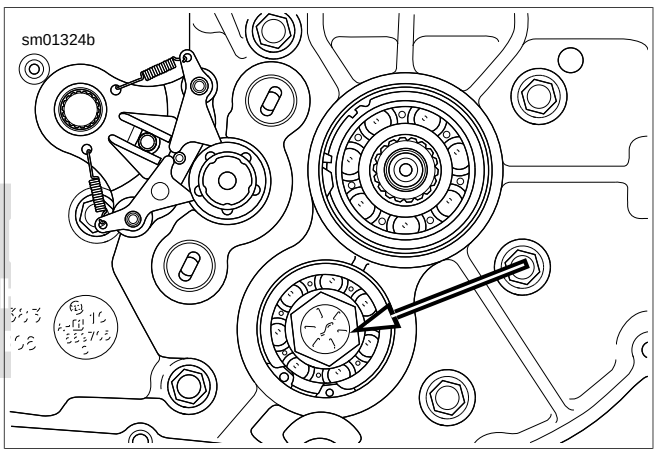


Figure 5-101. Countershaft Retaining Screw

TRANSMISSION SPROCKET 5.15

REMOVAL

PART NUMBER	TOOL NAME
HD-42310-45	ENGINE CRADLE
HD-46282-1A	FINAL DRIVE SPROCKET HOLDING TOOL REACTION ADAPTER
HD-46282-A	FINAL DRIVE SPROCKET HOLDING 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)

Preparation

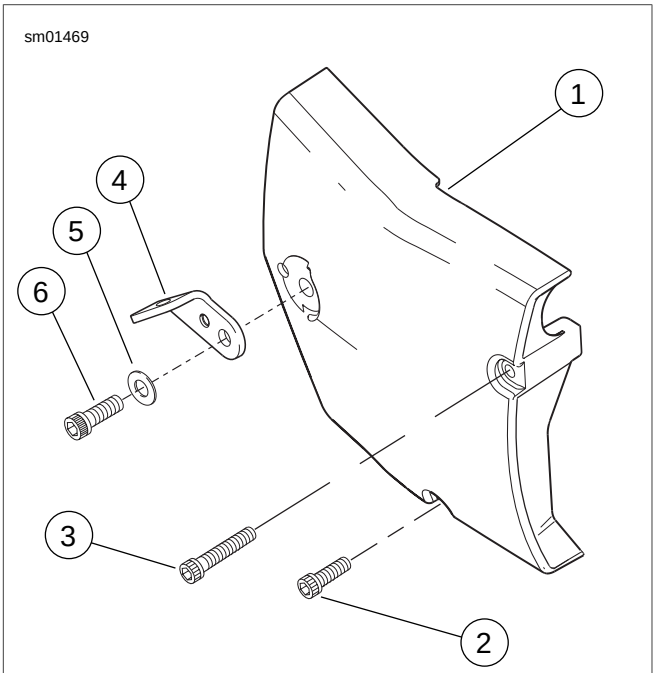
1. Remove main fuse.
2. Shift transmission into neutral.

XL Models

1. Remove rear muffler and rear exhaust pipe. See 4.13 EXHAUST SYSTEM: XL MODELS.
2. See Figure 5-102. Remove screw (6), washer (5) and exhaust pipe clamp bracket (4). Remove two screws (2, 3) and remove sprocket cover (1).
3. Remove belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
4. Remove rear drive belt from transmission sprocket. Pull belt back out of the way. Do not bend belt too tightly or twist belt. See 5.6 DRIVE BELT.
5. See Figure 5-103. Remove screw and washer (6) from exhaust interconnect bracket.

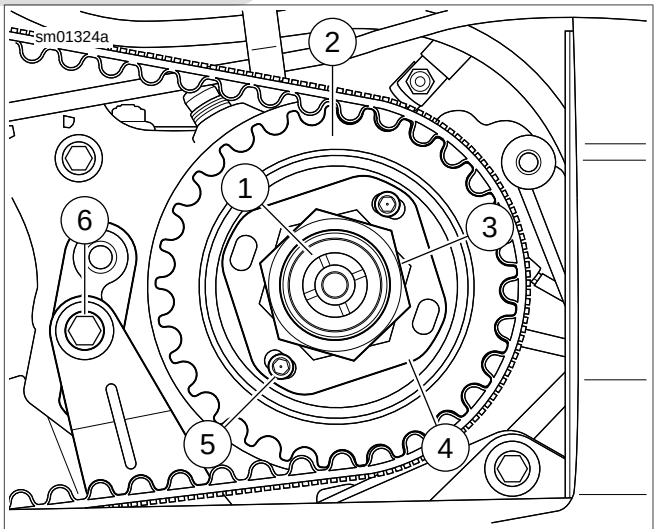
XR 1200X

1. Remove exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
2. Remove three screws securing sprocket cover to engine crankcase. Remove sprocket cover.
3. Remove belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
4. Remove the rear brake master cylinder assembly:
   a. Remove two screws securing rear brake master cylinder assembly, rider footrest and mounting bracket to vehicle's frame.
   b. Carefully pull assembly back out of the way. Secure to frame with cable strap or bungee cord.
   c. Do not kink or bend metal portion of brake line.
5. Remove rear drive belt from transmission sprocket. Pull belt back out of the way. Do not bend belt too tightly or twist belt. See 5.6 DRIVE BELT.



1. **Sprocket cover**
2. **Screw**
3. **Screw**
4. **Exhaust pipe clamp bracket**
5. **Washer**
6. **Screw**

Figure 5-102. Sprocket Cover: XL Models



1. **Main drive gear shaft**
2. **Transmission sprocket**
3. **Transmission sprocket nut**
4. **Lockplate**
5. **Screw (2)**
6. **Screw and washer**

Figure 5-103. Transmission Sprocket Assembly: All Models

DIGITAL TECHNICIAN HARLEY-DAVIDSON

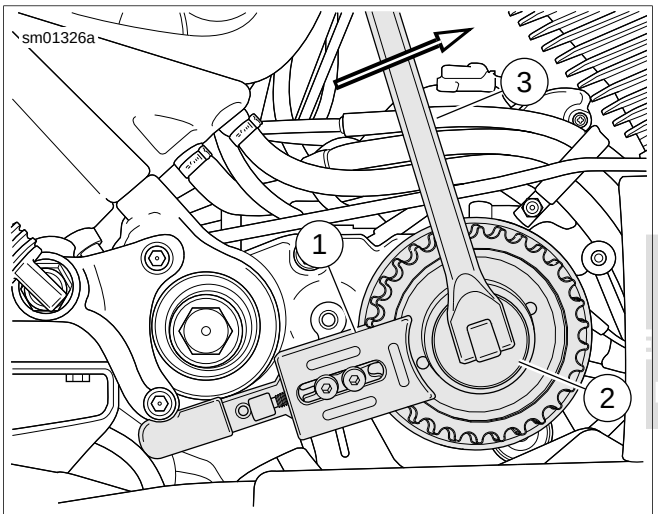
All Models

1. See Figure 5-103. Remove two screws (5) and sprocket lockplate (4).

NOTES

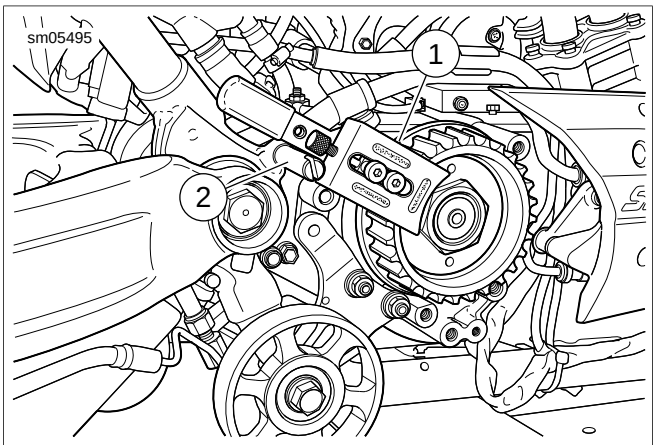
- *See Figure 5-105. On XR 1200X and XL models without passenger footrests, install FINAL DRIVE SPROCKET HOLDING TOOL REACTION ADAPTER (Part No. HD-46282-1A) into bottom footrest bracket hole in frame. Place handle of tool underneath adapter.*
- *If the engine is mounted in the ENGINE CRADLE (Part No. HD-42310-45), the rear crankcase support serves as a tool stop for the sprocket holding tool.*

2. See Figure 5-104. Install the FINAL DRIVE SPROCKET HOLDING TOOL (Part No. HD-46282-A) (1). Hold the sprocket nut with MAINSHAFT LOCKNUT WRENCH (Part No. HD-46288) (2). Use a breaker bar (3) to loosen the nut. Place handle of sprocket holding tool under bottom of footrest bracket. Turn nut **clockwise** to remove it.



1. **Transmission sprocket holding tool**
2. **Mainshaft locknut wrench**
3. **Breaker bar**

Figure 5-104. Removing Transmission Locknut



1. **Transmission sprocket holding tool**
2. **Sprocket holding tool adapter**

Figure 5-105. Sprocket Holding Tool and Adapter (installation XR 1200X)

INSTALLATION

PART NUMBER	TOOL NAME
HD-46282	TRANSMISSION SPROCKET HOLDING TOOL
HD-46282-1A	SPROCKET HOLDING TOOL ADAPTER
HD-46288	MAINSHAFT LOCKNUT WRENCH

FASTENER	TORQUE VALUE	
Transmission sprocket nut	50 ft-lbs	68 Nm
Transmission sprocket lock-plate fastener	90-120 **in-lbs**	10.3-13.6 Nm
Muffler interconnect bracket mounting screw: XR 1200X	30-33 ft-lbs	40.7-44.8 Nm
Exhaust pipe clamp bracket fastener: XR 1200X	30-33 ft-lbs	40.7-44.8 Nm
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm
Footrest mount fastener	45-50 ft-lbs	61-68 Nm
Sprocket cover, rear 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

Preparation

1. See Figure 5-103. Install transmission sprocket (2) onto main drive gear shaft (1).

NOTE

See Figure 5-105. On XR 1200X and XL models without passenger footrests, screw SPROCKET HOLDING TOOL ADAPTER (Part No. HD-46282-1A) into top footrest bracket hole in frame. Place handle of tool on top of adapter.

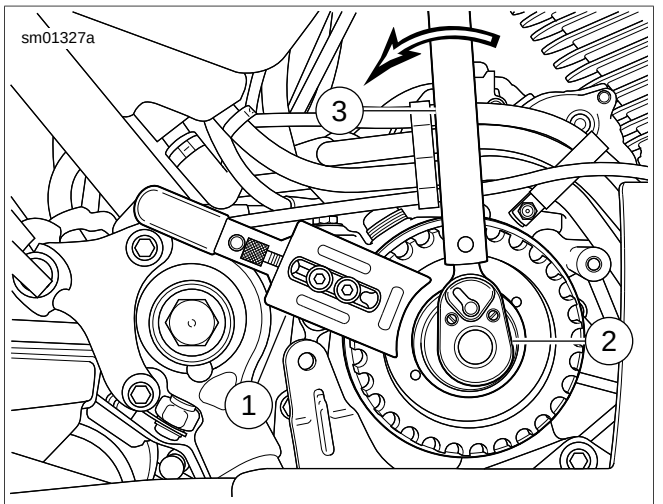
2. Shift transmission into neutral. Apply LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to the **left-hand threads** of transmission sprocket nut (3). Apply a thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to the back face of the sprocket nut. Turn the nut **counterclockwise** to install it onto main drive gear shaft.
   a. See Figure 5-106. Use TRANSMISSION SPROCKET HOLDING TOOL (Part No. HD-46282) (1), MAINSHAFT LOCKNUT WRENCH (Part No. HD-46288) (2), and a torque wrench (3). Place handle of sprocket holding tool on top of footrest bracket. Tighten nut to 50 ft-lbs (68 Nm) initial torque, ONLY.
   b. See Figure 5-107. Scribe a line on the transmission sprocket nut and continue the line on the transmission sprocket as shown.
   c. Tighten the transmission sprocket nut an additional 30-40 degrees.

NOTE

The lockplate has can be turned to either side to align the screw holes. If the screw holes cannot be properly aligned,

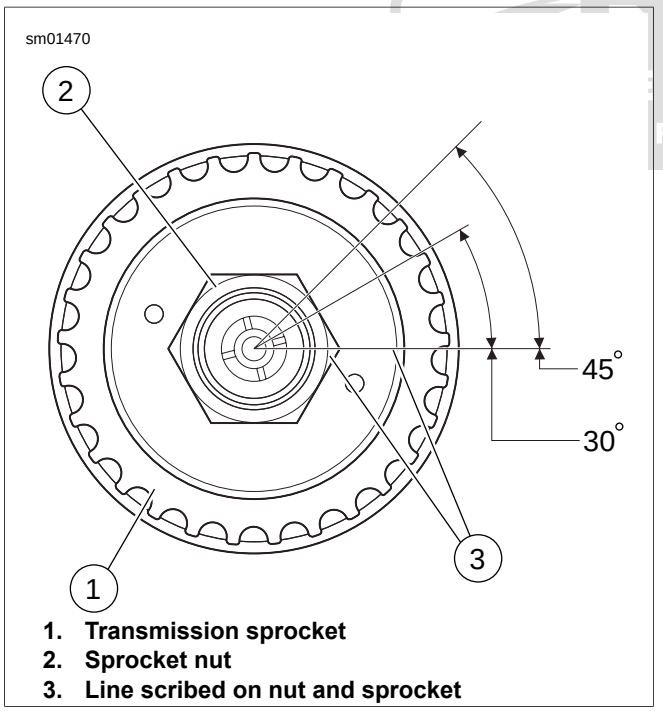
tighten the nut slightly until the holes align. Do not exceed 45 degrees. Never LOOSEN nut to align the screw holes.

d. See Figure 5-103. Install lockplate (4) over nut (3) so that two of lockplate's four drilled holes (diagonally opposite) align with sprocket's (2) two tapped holes.



1. **Transmission sprocket holding tool**
2. **Mainshaft locknut wrench**
3. **Torque wrench**

Figure 5-106. Tightening Transmission Locknut: All Models



1. **Transmission sprocket**
2. **Sprocket nut**
3. **Line scribed on nut and sprocket**

Figure 5-107. Transmission Sprocket Nut Final Tightening Procedure

NOTE

Always install BOTH screws to secure the lockplate.

3. Install socket head screws (5) through two of the four holes in lockplate, then into two corresponding tapped holes in sprocket. Tighten to 90-120 **in-lbs** (10.3-13.6 Nm).
4. **XR 1200X and XL Models without Passenger Footrests:** Remove SPROCKET HOLDING TOOL ADAPTER (Part No. HD-46282-1A).

XL 1200X

1. See Figure 5-103. Install screw and washer (6) to secure muffler interconnect bracket to engine crankcase. Tighten to 30-33 ft-lbs (40.7-44.8 Nm).
2. Install rear drive belt onto transmission sprocket. See 5.6 DRIVE BELT.
3. Adjust rear belt deflection and rear wheel alignment. See 1.24 WHEEL ALIGNMENT.
4. Install belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
5. See Figure 5-102. Install sprocket cover (1). Secure with two screws (2, 3). Note that long screw goes in top hole, short screw in bottom hole. Do not tighten screws at this time.
6. Install exhaust pipe clamp bracket (4), washer (5) and screw (6). 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).
7. Install rear exhaust pipe and rear muffler. See 4.13 EXHAUST SYSTEM: XL MODELS.

XR 1200X

1. Install rear drive belt onto transmission sprocket. See 5.6 DRIVE BELT.
2. Adjust rear belt deflection and rear wheel alignment. See 1.24 WHEEL ALIGNMENT.
3. Attach rear brake master cylinder, rider footrest and mounting bracket assembly to frame with two screws. Tighten to 45-50 ft-lbs (61-68 Nm).
4. Install belt guard. See 2.22 BELT GUARD AND DEBRIS DEFLECTOR.
5. Install sprocket cover.
   a. Install longer screw in top hole.
   b. Install shorter one in bottom hole.
   c. Install larger diameter fastener in rear hole.
   d. Tighten rear (larger dia.) fastener to 30-33 ft-lbs (40.7-44.8 Nm).
   e. Tighten forward and lower (smaller) screws to 80-120 **in-lbs** (9.0-13.6 Nm).
6. Install exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.

All Models

Install main fuse.

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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	6.24 ALTERNATOR, Assembly and Installation
Alternator stator mounting screw	30-40 **in-lbs**	3.4-4.5 Nm	6.24 ALTERNATOR, Assembly and Installation
Battery negative cable to crankcase nut	55-75 **in-lbs**	6.2-8.5 Nm	6.8 BATTERY CABLES, Installation
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.8 BATTERY CABLES, Installation
Battery positive cable to starter post locknut	60-85 **in-lbs**	6.8-9.6 Nm	6.8 BATTERY CABLES, Installation
Battery positive terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.8 BATTERY CABLES, Installation
Battery strap screw	36-60 **in-lbs**	4.1-6.8 Nm	6.8 BATTERY CABLES, Installation
Battery tray mounting fasteners	96-156 **in-lbs**	10.9-17.6 Nm	6.9 BATTERY TRAY, Installation
Brake hose clamp to battery tray screw	30-40 **in-lbs**	3.4-4.5 Nm	6.9 BATTERY TRAY, Installation
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	6.21 REAR STOP LAMP SWITCH, Replacement
CKP screw	90-120 **in-lbs**	10.3-13.6 Nm	6.22 CRANK POSITION SENSOR (CKP), Installation
Clutch cable guide: XL 1200C/C ANV/CP/CA/CB	45-65 **in-lbs**	4.0-7.3 Nm	6.14 HEADLAMP, Headlamp Mounts
Coil mounting bracket screw	35-45 **in-lbs**	4.0-5.1 Nm	6.13 IGNITION COIL, Installation
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm	6.13 IGNITION COIL, Installation
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm	6.13 IGNITION COIL, Installation
Converter module bracket fasteners, rear lighting	36-60 **in-lbs**	4.1-6.8 Nm	6.20 REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM), Installation
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.9 BATTERY TRAY, Installation
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.20 REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM), Installation
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.27 MAIN WIRING HARNESS, Installation
ECM cover fastener: XL Models	30-60 **in-lbs**	3.4-6.8 Nm	6.6 ELECTRONIC CONTROL MODULE (ECM), Installation
ECM fasteners: XR 1200X	18-22 **in-lbs**	2.0-2.5 Nm	6.6 ELECTRONIC CONTROL MODULE (ECM), Installation
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fender support, rear, screw: XL 883N	132-216 **in-lbs**	14.9-24.4 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	6.18 FRONT TURN SIGNALS, XL 1200X
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200X/V, XL 1200CP/CB with Mini-Ape Handlebar/XL883N - Tighten rear first, front second.
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200X/V, XL 1200CP/CB with Mini-Ape Handlebar/Tighten rear first, front second: XL883N.

FASTENER	TORQUE VALUE		NOTES
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XR 1200X
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.34 RIGHT HANDLEBAR SWITCHES, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.35 LEFT HANDLEBAR SWITCHES, Installation
Handlebar riser clamp screw	12-18 ft-lbs	16.3 -24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 1200C/C ANV/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser clamp screw	12-18 ft-lbs	16.3 -24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 1200C/C ANV/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 1200C/C ANV/CP/CA except with Mini-Ape Handlebar/XL1200C
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp clamp nut: XL 883L/N/R, XR 1200X	120-240 **in-lbs**	14-27 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp mount: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp mount: XL 1200X	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp upper bracket fasteners: XL 883L/R/N, XR 1200X	120-192 **in-lbs**	14-22 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp visor: XL 1200C/C ANV/CP/CA/CB	120-192 **in-lbs**	14-22 Nm	6.14 HEADLAMP, Headlamp Mounts
Horn, side mounted, acorn nut	60-180 **in-lbs**	6.8-20.4 Nm	6.32 HORN, Replacement: Side Mount
Horn, side mounted, stud nut	80-100 **in-lbs**	9.0-11.3 Nm	6.32 HORN, Replacement: Side Mount
Horn mounting screw	36-48 **in-lbs**	4.1-5.4 Nm	6.32 HORN, Replacement: Front Mount
Ignition switch bracket screw	35-45 **in-lbs**	4.0-5.1 Nm	6.28 ELECTRICAL CADDIES, Wire Harness Caddy: XL Models
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm	6.11 IGNITION SWITCH, Installation
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm	6.28 ELECTRICAL CADDIES, Wire Harness Caddy: XR 1200X
JSS screw	96-120 **in-lbs**	10.9-13.6 Nm	6.29 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS, Installation
License plate lamp housing screw: XL 883N	14-16 **in-lbs**	1.2-1.3 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	6.26 NEUTRAL INDICATOR SWITCH, Replacement
Oil pressure switch	50-70 **in-lbs**	5.6-7.9 Nm	6.31 OIL PRESSURE SWITCH, Installation
Oil pressure switch adapter: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	6.31 OIL PRESSURE SWITCH, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: Domestic Only
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	6.10 STARTER, Solenoid
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm	6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Speedometer Installation
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm	6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Trip Odometer Reset Switch Replacement/XL 1200X

FASTENER	TORQUE VALUE		NOTES
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm	6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Tachometer Installation/XL 1200X
Speedometer backplate fasteners: XL models	8-12 **in-lbs**	0.9-1.4 Nm	6.4 SPEEDOMETER: XL MODELS, Installation
Starter motor oil line clamp fastener	16-21 **in-lbs**	1.8-2.4 Nm	6.10 STARTER, Installation
Starter mounting bolt	13-20 ft-lbs	17.6-27.1 Nm	6.10 STARTER, Installation
Starter positive terminal nut	60-85 **in-lbs**	6.8-9.6 Nm	6.10 STARTER, Installation
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	6.10 STARTER, Solenoid
Stator harness retainer screw	56 **in-lbs**	6.3 Nm	6.24 ALTERNATOR, Assembly and Installation/Screw must be flush with plate. Do not exceed torque specification.
Stop lamp switch bracket screw	72-120 **in-lbs**	8.1-13.6 Nm	6.9 BATTERY TRAY, Installation
Stop lamp switch to tee nut	132-168 **in-lbs**	14.9-18.9 Nm	6.21 REAR STOP LAMP SWITCH, Replacement
Strut cover screw	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883R/L
Strut cover screw	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.34 RIGHT HANDLEBAR SWITCHES, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.35 LEFT HANDLEBAR SWITCHES, Installation
Tail lamp base mounting screw: XL Models	45-48 **in-lbs**	5.1-5.4 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X
Tail lamp base mounting screw: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X
Tail lamp LED base fasteners: XL 1200C/C ANV/CP/CA/CB	40-50 **in-lbs**	4.5-5.6 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB
Tail lamp LED screws: XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB
Tail lamp lens screw	20-24 **in-lbs**	2.3-2.7 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Bulb Replacement Except XL 1200C/C ANV/CP/CA/CB
Tail lamp lens screw	20-24 **in-lbs**	2.3-2.7 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X
Turn signal, front, ball head studs	96-144 **in-lbs**	10.8-16.3 Nm	6.18 FRONT TURN SIGNALS, All Except XL 1200X
Turn signal clamp, front, screw	96-120 **in-lbs**	10.8-13.6 Nm	6.18 FRONT TURN SIGNALS, All Except XL 1200X
Turn signal housing, rear, screws: XR 1200X	30-40 **in-lbs**	3.4-4.5 Nm	6.19 REAR TURN SIGNALS, XR 1200X
Turn signal housing to bracket: XL 1200X	12-16 ft-lbs	16.3-21.7 Nm	6.18 FRONT TURN SIGNALS, XL 1200X
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.19 REAR TURN SIGNALS, XL 883R/L
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.19 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	6.19 REAR TURN SIGNALS, XL 1200C/C ANV/CP/CA/CB
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883R/L
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883N and XL 1200X/V

FASTENER	TORQUE VALUE		NOTES
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 1200C/C ANV/CP/CA/CB
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 1200C/C ANV/CP/CA/CB
Voltage regulator mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	6.23 VOLTAGE REGULATOR, Installation: XL Models
Voltage regulator mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	6.23 VOLTAGE REGULATOR, Installation: XR 1200X
VSS screw	90-120 **in-lbs**	10.2-13.6 Nm	6.25 VEHICLE SPEED SENSOR (VSS), Installation

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

SPECIFICATIONS: ELECTRICAL 6.2

SPECIFICATIONS

Table 6-1. Electrical: XL Models

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. Electrical: XR 1200X

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	10R12X	
Spark plug size	12 mm	
Spark plug gap	0.032-0.038 in	0.81-0.97 mm
Spark plug torque	12-18 ft-lbs	16.3-24.4 Nm

Table 6-3. Ignition Coil Resistance

RESISTANCE	PRIMARY	SECONDARY
All Models	0.3-0.7 Ohm	1500-2400 Ohm

Table 6-4. Alternator

ITEM	SPECIFICATION
AC voltage output	20-28 VAC per 1000 engine rpm
Stator coil resistance	0.1-0.3 Ohm

Table 6-5. Voltage Regulator

ITEM	SPECIFICATION
Voltage output @ 75 °F	14.3-14.7 VDC
Current @ 3600 rpm	32 A

Table 6-6. Fuses

ITEM	AMP RATING
Main fuse	30
Battery	15
Ignition	15
Lights	15
Accessories	15
Electronic Control Module (ECM)	15

Table 6-7. Starter Specifications

STARTER DATA	
Free speed	3000 rpm (min) @ 11.5 V
Free current	90 A (max) @ 11.5 V
Cranking current	200 A (max) @ 68 °F
Stall torque	8.0 ft-lbs (10.8 Nm) @ 2.4 V

Table 6-8. 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

DIGITAL TECHNICIAN II HARL

FUSES AND RELAYS 6.3

GENERAL

The starter relay allows a relatively small amount of current flowing through the starter button to control the large current flow required to activate the starter solenoid.

See Figure 6-3. The electrical system relay/fuse block is located in front of the battery under the left side cover. The relays and fuses are mounted in the relay/fuse block. All fuses are rated at 15 amperes.

MAIN FUSE

Removal

1. Open left side cover. See 2.18 LEFT SIDE COVER.

NOTE

Models with Sirens: *Verify that fob is present and turn ignition key to IGNITION before removing main fuse or disconnecting battery.*

2. See Figure 6-1. Squeeze cover release latches (4) together and pull fuse holder [5] (1) from protective cover (3).
3. See Figure 6-2. Grasp fuse holder (2) and pull main fuse (1) straight out.
4. Close left side cover.

NOTE

Always close left side cover if performing other procedures. Failure to close cover will cause cosmetic damage.

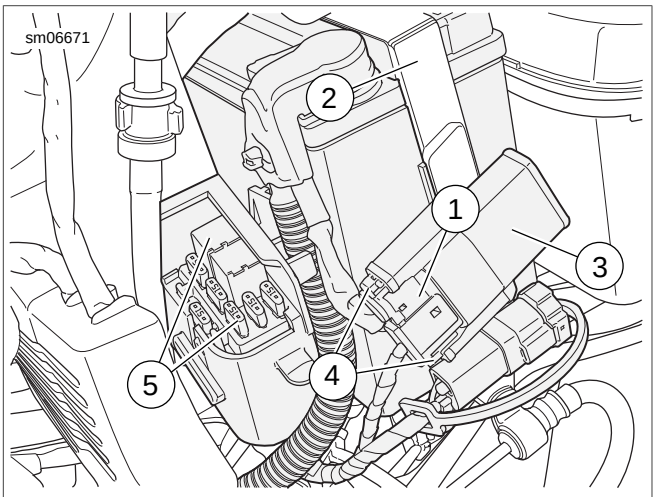
Installation

1. Open left side cover. See 2.18 LEFT SIDE COVER.
2. Verify ignition key is turned to OFF position.
3. See Figure 6-1. Install main fuse (1) by lining up spade terminals on fuse with sockets in fuse holder [5] (2). Press fuse firmly into holder.
4. See Figure 6-2. While holding protective cover (3) in place, push fuse holder [5] (1) into cover until cover release latches (4) snap into place.
5. Close left side cover.

⚠WARNING

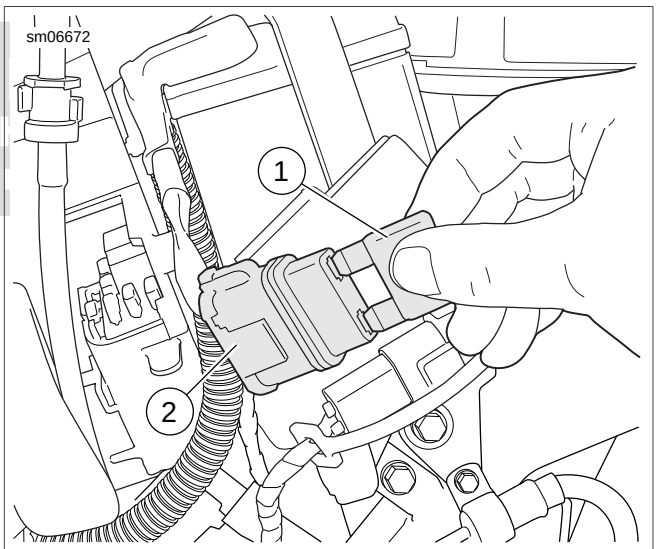
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

6. Turn ignition switch ON. Verify proper operation of electrical system.



1. **Main fuse holder [5]**
2. **Battery strap**
3. **Protective cover**
4. **Cover release catches**
5. **Relay and fuse blocks**

Figure 6-1. 30 A Main Fuse Location: All Models



1. **Main fuse**
2. **Fuse holder [5]**

Figure 6-2. Removing/Installing Main Fuse

FUSES

1. Open left side cover. See 2.18 LEFT SIDE COVER.
2. See Figure 6-3. Remove suspect fuse (3-7).
   a. Inspect fuse for damage. Always discard damaged fuses.
   b. Replace fuse by pressing firmly into socket.
3. Close left side cover.

4. Turn ignition switch ON. Verify operation of electrical system.

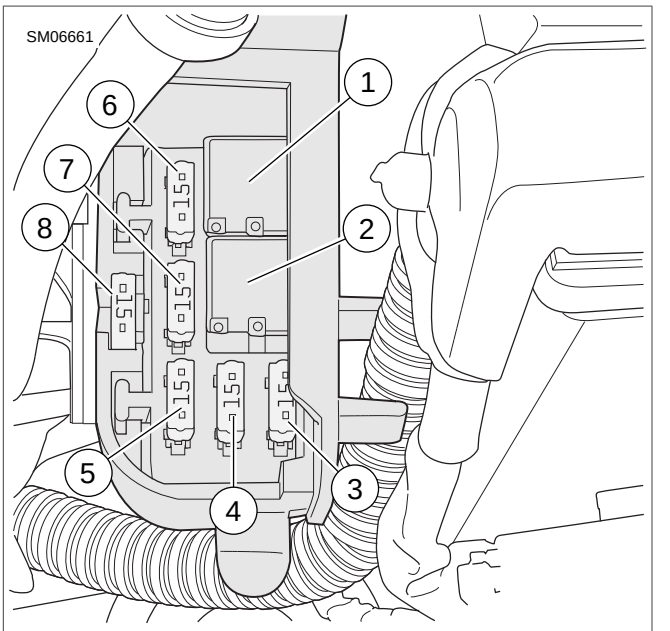
RELAYS

1. Open left side cover. See 2.18 LEFT SIDE COVER.

NOTICE

Always use replacement fuses that are of the correct type and amperage rating. Use of incorrect fuses can result in damage to electrical systems. (00222a)

2. See Figure 6-3. To unplug old relay (1 or 2), grasp body of relay and with a gentle rocking motion, pull straight out from relay/fuse block.
3. To install **new** relay, line up spade terminals of relay with sockets in relay/fuse block and push relay firmly into sockets.
4. Close left side cover.
5. Verify operation of lighting system.



1. **System relay**
2. **Starter relay**
3. **Ignition fuse**
4. **Lights fuse**
5. **Accessory fuse**
6. **ECM fuse**
7. **Battery fuse**
8. **Spare fuse**

Figure 6-3. Relay/Fuse Block (typical)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

SPEEDOMETER: XL MODELS 6.4

REMOVAL

NOTE

The speedometer has backlight LEDs that cannot be replaced. If an LED fails, replace the entire unit.

⚠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 reset switch boot from trip odometer reset switch on speedometer housing back plate.
3. Remove two screws and back plate.
4. Unplug speedometer socket connector [39B] from back of speedometer.
5. Gently push out speedometer and front gasket.

NOTE

***XL 1200X:** This model does not have a back gasket.*

6. Inspect front and back gaskets, speedometer connector [39] and wiring, trip odometer reset switch and wiring and reset switch boot. Repair or replace as required.

INSTALLATION

PART NUMBER	TOOL NAME
HD-45929	CRIMPING TOOL

FASTENER	TORQUE VALUE	
Speedometer backplate fasteners: XL models	8-12 **in-lbs**	0.9-1.4 Nm

Reset Switch

1. Push trip reset socket terminals out the front of the speedometer socket connector half [39B].
2. Cut off socket terminals. Pull faulty switch wires out of connector.
3. Push wires of a replacement switch through speedometer connector (sockets 8, 11) and crimp **new** socket terminals using CRIMPING TOOL (Part No. HD-45929).
4. Draw terminal back into connector until terminal seats.

Speedometer

NOTES

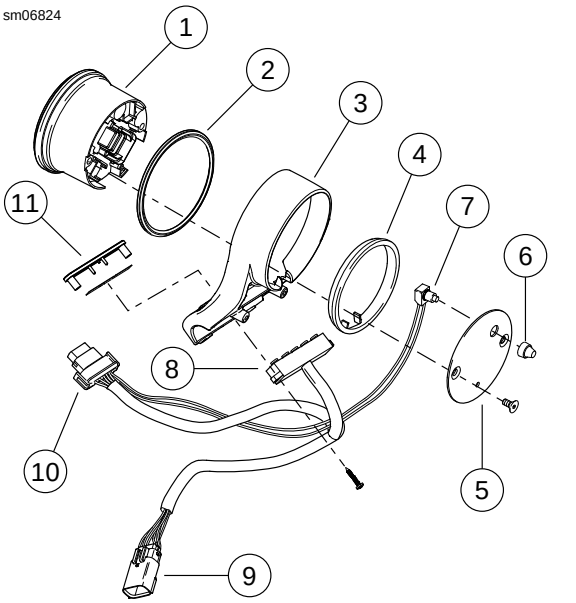
- ***XL 883L/N/R and XL 1200V and XL 1200CP/CB Models with Mini Ape Handlebar:** See Figure 6-4.*
- ***XL 1200X:** See Figure 6-5.*
- ***XL 1200C/C ANV/CP/CA except XL 1200CP/CB Models with Mini Ape Handlebar:** See Figure 6-6.*

1. Install front gasket on speedometer.
2. Threading speedometer harness and connector [39B] through back gasket, install matching tabs of gasket to locating keys in instrument housing/bracket.

NOTE

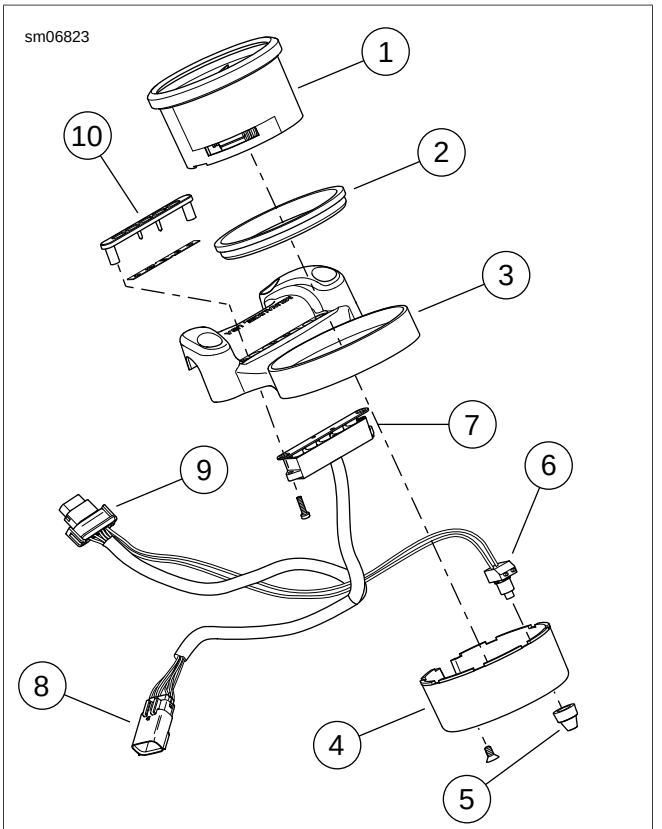
If necessary, lubricate rubber gaskets with alcohol or glass cleaner.

3. Orient face upright. Press speedometer into instrument housing/bracket. Wiring must past between locating keys and gasket and through cutout in speedometer back.
4. Plug speedometer socket connector [39] into back of speedometer.
5. Push trip odometer reset switch through backplate. Thread on reset switch boot.
6. Hold backplate in place with reset switch in rectangular boss in back of speedometer and vent hole at bottom. Install fasteners. Tighten to 8-12 **in-lbs** (0.9-1.4 Nm).
7. Install main fuse.



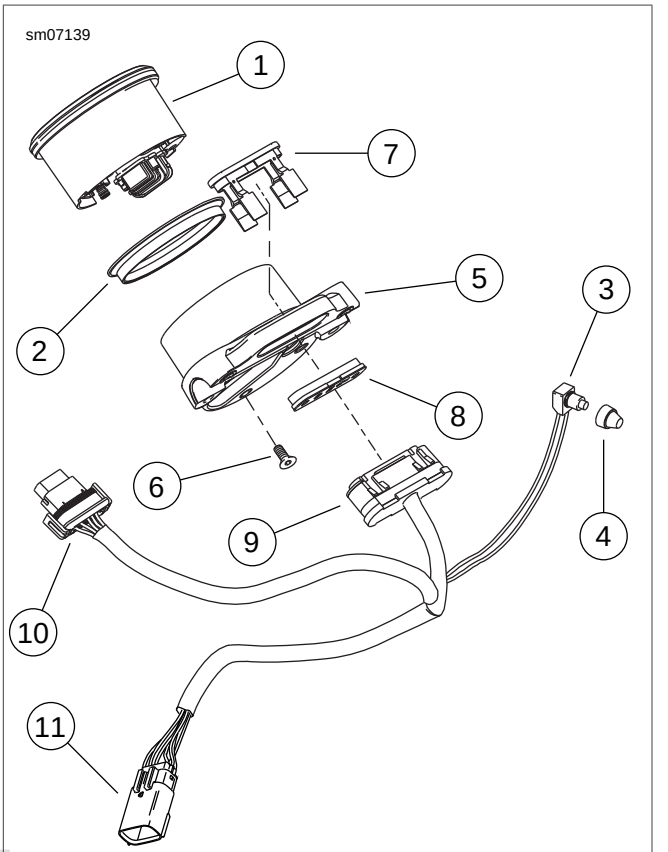
1. **Speedometer**
2. **Front gasket**
3. **Instrument housing/bracket**
4. **Back gasket**
5. **Backplate**
6. **Reset switch boot**
7. **Trip odometer reset switch**
8. **Indicator lamp module**
9. **Speedometer harness connector [39B]**
10. **Instrument harness connector [20A]**
11. **Indicator lamp bezel**

Figure 6-4. Speedometer Components: XL 883L/N/R, XL 1200V, XL 1200CP/CB Mini-Ape Handlebar



1. Speedometer
2. Front gasket
3. Instrument housing/bracket
4. Back plate
5. Reset switch boot
6. Trip odometer reset switch
7. Indicator lamp module
8. Speedometer harness connector [39B]
9. Instrument harness connector [20A]
10. Indicator lamp bezel

Figure 6-5. Speedometer Components: XL 1200X



1. Speedometer
2. Gasket
3. Trip odometer reset switch
4. Reset switch boot
5. Instrument housing
6. Fastener
7. Indicator lamp bezel
8. Indicator lamp lens
9. Indicator lamp module
10. Instrument harness connector [20A]
11. Speedometer harness conector [39B]

Figure 6-6. Speedometer: XL 1200C/C ANV/CP/CA

SPEEDOMETER AND TACHOMETER: XR 1200X 6.5

SPEEDOMETER REMOVAL

⚠WARNING

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

NOTE

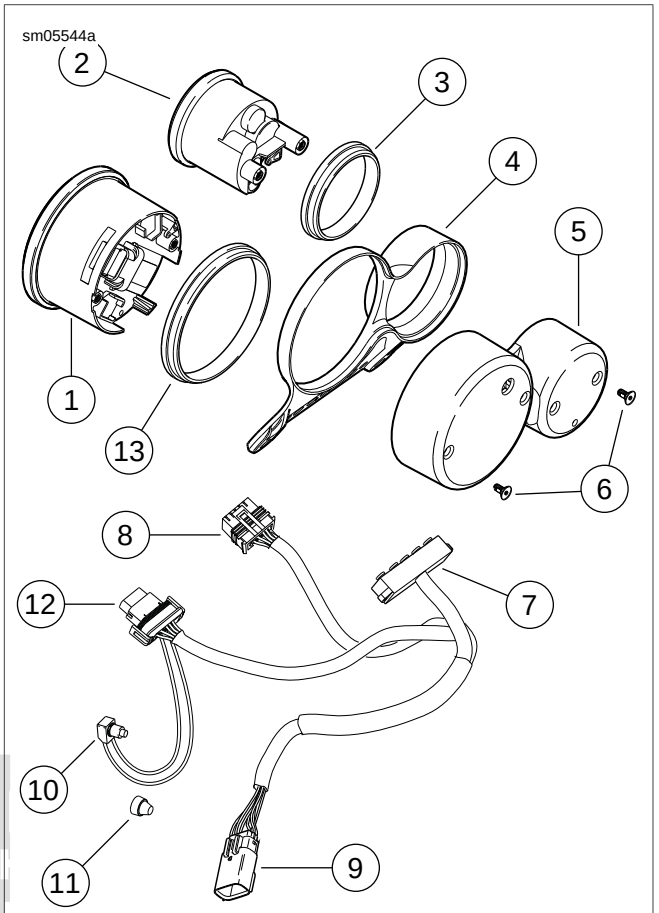
This part cannot be repaired. Replace upon failure.

1. Remove main fuse.
2. See Figure 6-7. Remove reset switch boot (11).
3. Remove screws (6) and back cover (5).
4. Disconnect speedometer connector [39B] (8).
5. Push out the speedometer (2) with gasket (3).
6. Inspect gasket (3), speedometer connector [39B] (8), and wiring. Repair or replace as required.

SPEEDOMETER INSTALLATION

FASTENER	TORQUE VALUE	
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm

1. See Figure 6-7. Install gasket (3) on speedometer (2).
2. Orient face upright and press speedometer (2) into instrument housing/bracket (4).
3. Install speedometer connector [39B] (8).
4. Attach trip odometer reset switch (10) into squared boss on back cover (5) and secure with reset switch boot (11).
5. Place back cover over speedometer and tachometer while positioning harness to avoid damage. Rotate speedometer and tachometer as needed to align mounting holes. Install screws (6). Tighten to 12-18 **in-lbs** (1.4-2.0 Nm).
6. Install main fuse.



1. **Tachometer**
2. **Speedometer**
3. **Speedometer gasket**
4. **Instrument housing/bracket**
5. **Back cover**
6. **Screw**
7. **Indicator lamp module**
8. **Speedometer connector [39B]**
9. **Instrument harness connector [20A]**
10. **Trip odometer reset switch**
11. **Reset switch boot**
12. **Tachometer connector [108B]**
13. **Tachometer gasket**

Figure 6-7. Instruments: XR 1200X

TRIP ODOMETER RESET SWITCH REPLACEMENT

PART NUMBER	TOOL NAME
HD-45929	CRIMPING TOOL

FASTENER	TORQUE VALUE	
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 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 6-7. Remove reset switch boot (11) from back cover (5).
3. Remove screws (6) and back cover (5).
4. Remove tachometer connector [108B] (12).
5. Follow instructions to push the trip reset socket terminals out the front of the tachometer connector [108B]. See A.10 DELPHI MICRO 64 SEALED CONNECTOR.
6. Cut off the socket terminals. Pull the faulty switch out of the connector.
7. Push the wires of a replacement switch through the tachometer connector [108B] (sockets 8, 11) and crimp **new** socket terminals using CRIMPING TOOL (Part No. HD-45929), on replacement switch wiring.
8. Draw the terminals back into the connector until the terminal seats.
9. Install tachometer connector [108B] (12).
10. Position reset switch in squared boss on back cover (5). Secure with a **new** reset switch boot (11).
11. Place back cover over speedometer and tachometer while positioning harness to avoid damage. Align mounting holes. Install screws (6). Tighten to 12-18 **in-lbs** (1.4-2.0 Nm).
12. Install main fuse.

TACHOMETER REMOVAL

NOTE

The speedometer and tachometer have backlight LEDs that cannot be replaced. If an LED fails, replace the entire unit.

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 6-7. Remove reset switch boot (11) from back cover (5).
3. Remove screws (6) and back cover (5).
4. Open latches on each side of tachometer connector [108B] (12) and separate connector halves.
5. Push out the tachometer with gasket (13).
6. Inspect gasket, tachometer connector, trip odometer reset switch, reset switch boot and wiring. Repair or replace as required.

TACHOMETER INSTALLATION

FASTENER	TORQUE VALUE	
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm

1. If replacing the trip odometer reset switch, see 6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Trip Odometer Reset Switch Replacement.
2. See Figure 6-7. Install gasket (13) on tachometer (1).
3. Orient face upright and press tachometer (1) into instrument housing/bracket (4).
4. Attach tachometer connector [108B] (12) to tachometer.
5. Attach trip odometer reset switch (10) into squared boss on back cover (5) and secure with reset switch boot (11).
6. Place back cover over speedometer and tachometer while positioning harness to avoid damage. Align mounting holes. Install screws (6). Tighten to 12-18 **in-lbs** (1.4-2.0 Nm).
7. Install main fuse.

ELECTRONIC CONTROL MODULE (ECM) 6.6

GENERAL

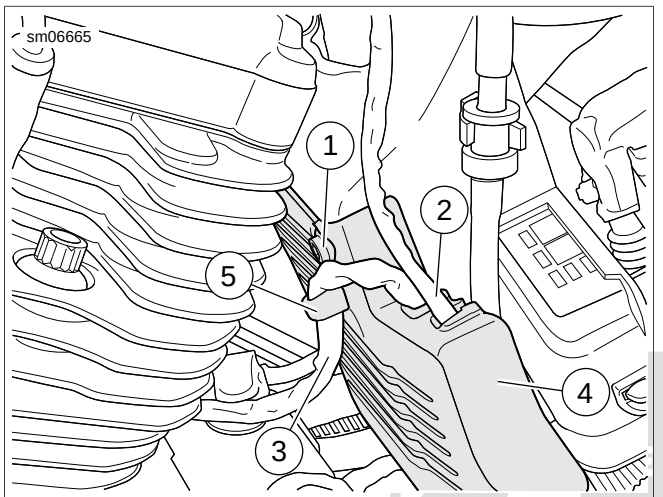
See Figure 6-9. The ECM receives data from sensors such as the CKP sensor and the TMAP sensor. The ECM uses this data to time the ignition spark as well as providing other engine management functions.

NOTE

This part cannot be repaired. Replace upon failure.

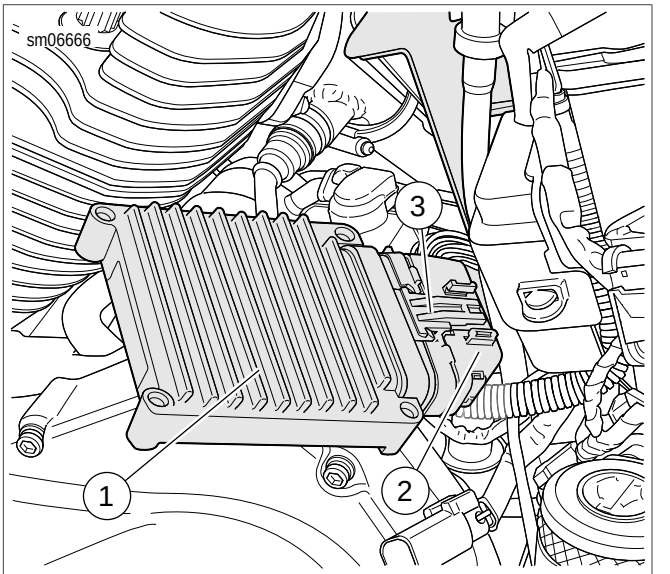
XL Models: The ECM is mounted in front of the battery in a caddy.

XR 1200X: The ECM is mounted in a bracket on the rear fender under the seat.



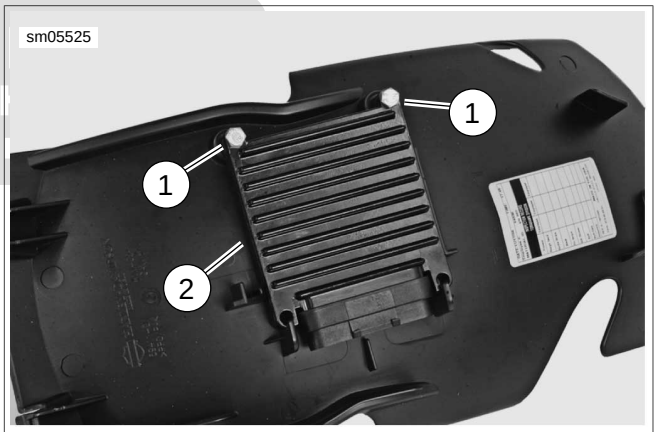
1. **ECM cover fastener**
2. **Fuel pump wiring**
3. **Rear O2 sensor wiring**
4. **ECM cover**
5. **Rear O2 sensor wiring clip**

Figure 6-8. ECM Cover: XL Models



1. **ECM**
2. **ECM connector**
3. **ECM connector latch**

Figure 6-9. ECM: XL Models



1. **Fastener (2)**
2. **Electronic Control Module**

Figure 6-10. Electronic Control Module (ECM): XR 1200X

REMOVAL

XL Models

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 6-8. Remove fuel pump wiring (2) from ECM cover (4). Disconnect fuel pump connector [141].

3. Remove rear oxygen sensor (O2) wiring (3) from rear O2 sensor wiring clip (5) and ECM cover. Disconnect rear O2 connector [85].
4. Remove ECM cover fastener (1).
5. Slide ECM cover out from left side of vehicle.
6. Press the clip holding the ECM to the caddy and remove the ECM.
7. See Figure 6-9. Press the connector latch (3) and unplug ECM wiring harness connector (2) [78B] from ECM (1).

XR 1200X

⚠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 rear fender. See 2.35 REAR FENDER: XR 1200X.
3. See Figure 6-10. Remove fasteners (1) and ECM (2).

INSTALLATION

FASTENER	TORQUE VALUE	
ECM cover fastener: XL Models	30-60 **in-lbs**	3.4-6.8 Nm
ECM fasteners: XR 1200X	18-22 **in-lbs**	2.0-2.5 Nm

XL Models

1. See Figure 6-9. Plug ECM wiring harness connector [78B] (2) into ECM. Gently press connector until latch (3) clicks in place.
2. Install ECM into caddy. Press ECM into caddy until it is held by clip.
3. See Figure 6-8. Slide ECM cover (4) into position from left side of motorcycle.
4. Install ECM cover fastener (1). Tighten to 30-60 **in-lbs** (3.4-6.8 Nm).
5. Connect rear O2 connector [85]. Install O2 sensor wiring (3) into ECM cover and clip (5)
6. Connect fuel pump connector [141]. Install fuel pump wiring (2) into ECM cover (4).
7. Install main fuse.
8. Perform password learn procedure. See 6.38 TSM/HFSM: PASSWORD LEARN.

XR 1200X

1. See Figure 6-10. Install ECM (2) and fasteners (1).
2. Tighten fasteners to 18-22 **in-lbs** (2.0-2.5 Nm).
3. Install rear fender. See 2.35 REAR FENDER: XR 1200X.
4. Install main fuse.
5. Perform password learn procedure. See 6.38 TSM/HFSM: PASSWORD LEARN.

⚠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.

TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM) 6.7

GENERAL

See Figure 6-11. The TSM has two functions:

- Control turn signals.
- Serve as the BAS.

The optional factory-installed security system provides the same functionality as the TSM, but also includes security and immobilization functions.

Two security system modules are available: The TSSM for Japan/Korea markets and the HFSM for all other markets.

See the electrical diagnostic manual for complete details of the TSM/TSSM/HFSM features and functions.

NOTE

This part cannot be repaired. Replace upon failure.



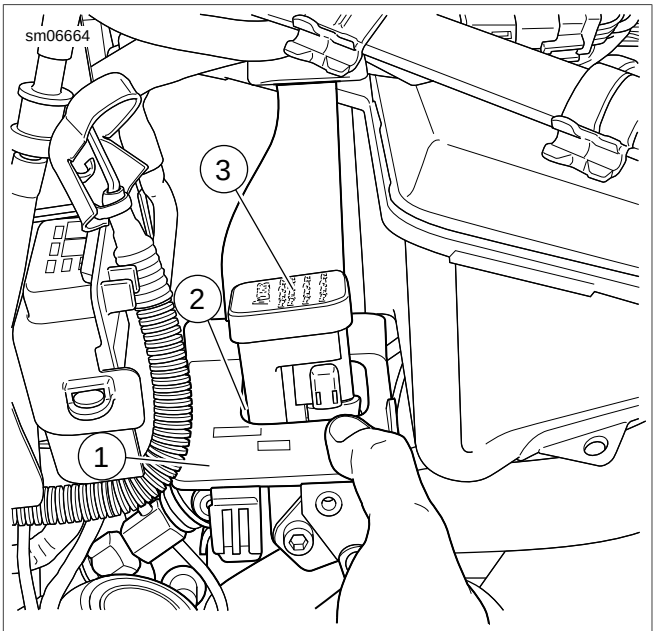
Figure 6-11. TSM/TSSM/HFSM (TSM Shown)

REMOVAL

NOTE

See Figure 6-12. The TSM/TSSM/HFSM (3) is located in a cavity in the bottom of the battery tray (1).

1. Remove battery. See 1.22 BATTERY MAINTENANCE.
2. Unplug wiring harness connectors: 4-pin connector [208] (HFSM only) has one latch. Unplug this connector first. Then unplug 12-pin connector [30B].
3. See Figure 6-12. Reach under the battery tray (1) and push upward on TSM/TSSM/HFSM (3) to lift it out of its cavity (2).
4. Remove TSM/TSSM/HFSM from vehicle.



1. **Battery tray**
2. **Cavity**
3. **TSM/TSSM/HFSM**

Figure 6-12. TSM/TSSM/HFSM Connectors: All Models

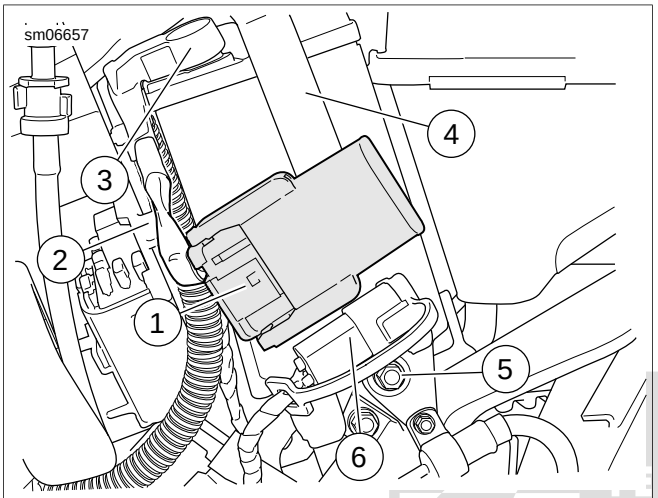
INSTALLATION

1. See Figure 6-12. Pull wiring harness connector [208] (HFSM only) and connector [30B] up through cavity (2) in bottom of battery tray (1).
2. Position TSM/TSSM/HFSM (3) over cavity with connector(s) facing oil tank.
3. Lower TSM/TSSM/HFSM into cavity. See Figure 6-12. Make sure top of TSM/TSSM/HFSM is flush with bottom of battery tray.
4. Plug 4-pin [208] (HFSM only) and 12-pin [30B] wiring harness connectors into TSM/TSSM/HFSM.
5. Install battery. Do not install left side cover at this time. See 1.22 BATTERY MAINTENANCE.
6. Perform TSM/TSSM/HFSM password learn and set-up procedure. See 6.38 TSM/HFSM: PASSWORD LEARN for procedure.
7. Install left side cover. See 2.18 LEFT SIDE COVER.

BATTERY CABLES 6.8

REMOVAL

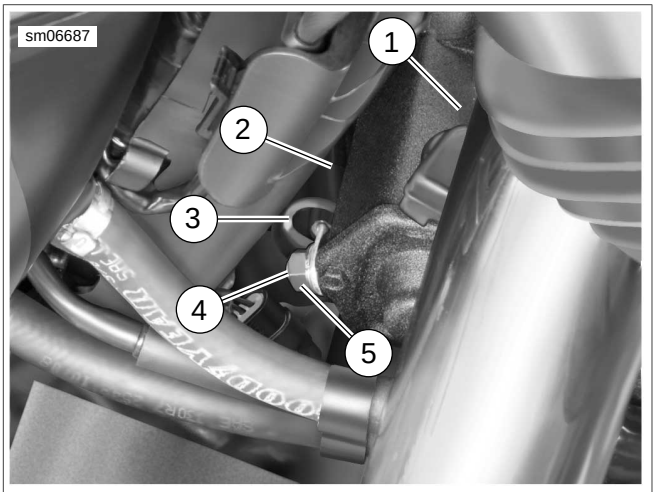
1. Remove left side cover. See 2.18 LEFT SIDE COVER.
2. See Figure 6-13. Slide main fuse and holder (1) toward rear of motorcycle to detach from battery strap (4).
3. Remove battery. See 1.22 BATTERY MAINTENANCE.
4. Disconnect negative (-) battery cable from crankcase.
5. Inspect main fuse wiring harness and holder
6. Note routing of negative (-) battery cable around frame downtube.



1. **Main fuse and holder**
2. **Positive (+) battery cable holder**
3. **Positive (+) battery terminal (under protective rubber boot)**
4. **Battery strap**
5. **Screw**
6. **Data link connector**

Figure 6-13. Main Fuse and Battery Location: All Models

7. Inspect positive (+) and negative (-) cables for cuts, fraying or other damage. See 1.22 BATTERY MAINTENANCE.
8. See Figure 6-14. As required, pull back rubber cap (3) and using a 12 mm wrench, remove nut with captive lockwasher (5) and positive (+) battery cable (2) from starter post (4).



1. **Starter assembly**
2. **Positive (+) battery cable**
3. **Rubber cap**
4. **Starter post**
5. **Nut with captive lockwasher**

Figure 6-14. Positive (+) Cable Starter Post Connection: All Models

INSTALLATION

FASTENER	TORQUE VALUE	
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Battery positive terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Battery strap screw	36-60 **in-lbs**	4.1-6.8 Nm
Battery positive cable to starter post locknut	60-85 **in-lbs**	6.8-9.6 Nm
Battery negative cable to crankcase nut	55-75 **in-lbs**	6.2-8.5 Nm

1. Apply a light coat of petroleum jelly or corrosion retardant material to the negative battery terminal.
2. Slide battery in battery tray. Connect negative (-) battery cable to battery. Tighten to 60-70 **in-lbs** (6.8-7.9 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)

3. See Figure 6-13. With negative (-) battery cable disconnected from ground on crankcase, install the fuse cable and the positive (+) battery cable.
   a. Thread fastener through main fuse cable.
   b. Thread fastener through the positive (+) battery cable.
   c. Thread fastener into the positive battery terminal (3).
   d. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).

4. Apply a light coat of petroleum jelly or corrosion retardant material to the positive battery terminal. Place protective rubber boot over terminal.
5. Hook top of battery strap (4) to battery tray mount on top of battery. Install screw (5). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
6. Place positive battery cable into holder on ECM caddy.
7. Hook main fuse and holder (1) to pin on battery strap and slide forward until it snaps into place.
8. Hook data link connector [91A] (6) to pin on battery strap and slide forward until it snaps into place.
9. See Figure 6-14. Install positive (+) battery cable (2) and nut with captive lockwasher (5) on starter post (4). Using a 12 mm wrench, tighten to 60-85 **in-lbs** (6.8-9.6 Nm).
10. Push rubber cap (3) over starter post.
11. Place negative battery cable connector onto stud on crankcase boss behind starter motor assembly. Thread nut onto crankcase ground stud behind starter motor.
12. See Figure 6-14. Press negative battery cable connector against cable stop on crankcase. Using a swivel socket, tighten to 55-75 **in-lbs** (6.2-8.5 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)

13. Install seat.

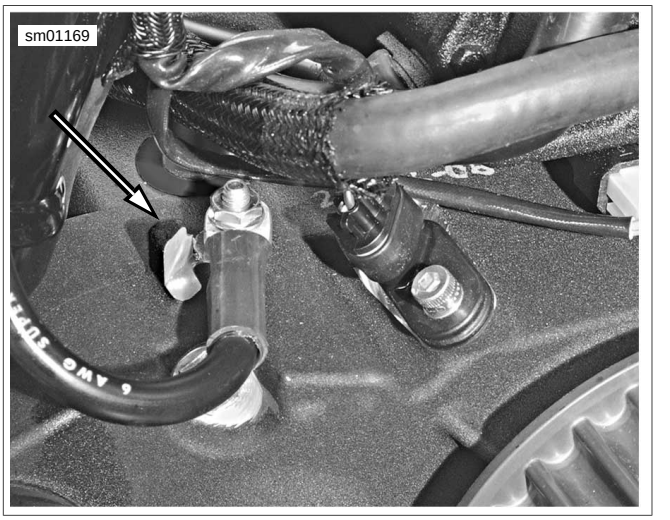


Figure 6-15. Negative Battery Cable Stop on Crankcase (typical)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BATTERY TRAY 6.9

GENERAL

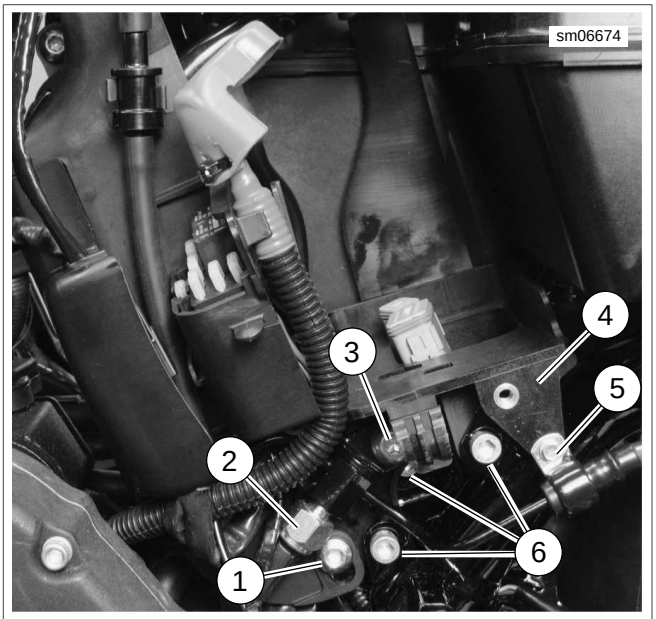
See Figure 6-16. The battery tray is located behind the left side cover. The battery tray supports the battery, TSM/TSSM/HFSM and rear stop lamp switch (XL models only).

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 battery. See 1.22 BATTERY MAINTENANCE.
2. Unplug and remove TSM/TSSM/HFSM. See 6.7 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM).
3. **XL Models:** see Figure 6-16. Position rear stop lamp switch as follows:
   a. Remove rear brake master cylinder reservoir cover.
   b. Secure the reservoir out of the way. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
   c. Remove brake line clamp fastener (5) from battery tray (4).
   d. Remove TORX fastener (3) securing rear stop lamp switch assembly (2) to battery tray. Gently pull stop lamp switch assembly back out of the way. Do not bend or stress metal brake lines.
   e. Remove ECM caddy fastener (1).

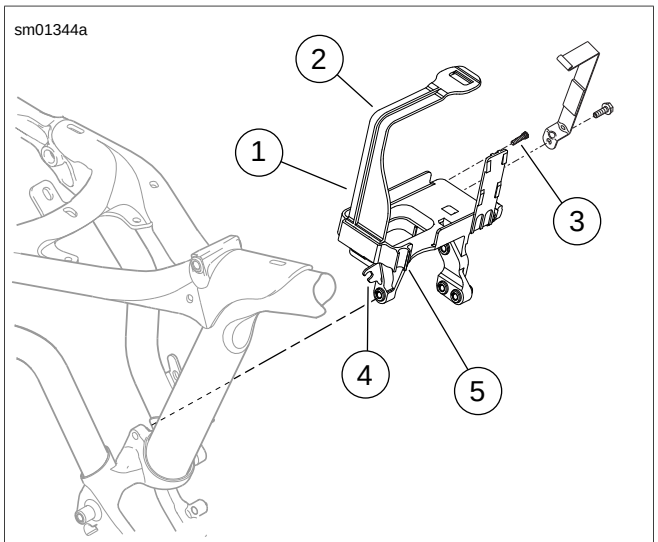


1. **ECM caddy fastener**
2. **Rear stop lamp switch assembly**
3. **TORX fastener**
4. **Battery tray**
5. **Brake line clamp fastener**
6. **Battery tray fastener**

Figure 6-16. Battery Tray Assembly

4. See Figure 6-17. Remove three fasteners (3) securing battery tray to mounting tabs on frame.
5. Lift up battery tray slightly so that mounting tabs will clear mounts on frame. As you lift up on tray, pull down gently on end of battery strap support (2) to clear frame and wiring harnesses above battery tray.
6. Remove negative battery cable and vent line from battery tray retaining clips.
7. Slide battery tray out and remove from left side.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Battery tray**
2. **Battery strap support**
3. **Screw (3)**
4. **Oil tank vent clip**
5. **Battery cable clip**

Figure 6-17. Battery Tray

INSTALLATION

FASTENER	TORQUE VALUE	
Battery tray mounting fasteners	96-156 **in-lbs**	10.9-17.6 Nm
Stop lamp switch bracket screw	72-120 **in-lbs**	8.1-13.6 Nm
Brake hose clamp to battery tray screw	30-40 **in-lbs**	3.4-4.5 Nm
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm

1. See Figure 6-16. Make sure the TSM/TSSM/HFSM connector [30B], the antenna connector [208B] (HFSM only) and the rear stop lamp switch assembly (2) are out of the way.
2. See Figure 6-17. Slide battery tray (1) into place. Make sure battery tray mounting tabs are positioned behind (to the right of) frame mounts.
3. Secure the negative battery cable and the oil tank vent line to the battery tray retaining clips (4, 5).
4. Install three screws (3) to secure battery tray to frame. Do not tighten screws until all three have been started. Tighten to 96-156 **in-lbs** (10.9-17.6 Nm).
5. **XL models only:** see Figure 6-16. Position rear stop lamp switch as follows:
   a. Install rear stop lamp switch (2). Secure with TORX screw (3). Tighten to 72-120 **in-lbs** (8.1-13.6 Nm).
   b. Secure brake hose clamp (5) to battery tray with screw. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
   c. Install ECM caddy fastener (1). Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
   d. Install rear brake master cylinder reservoir. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
   e. Install reservoir cover.
6. Install TSM/TSSM/HFSM into cavity in bottom of battery tray. See 6.7 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM).

⚠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)

7. Install battery. See 1.22 BATTERY MAINTENANCE.
8. Install left side cover. See 2.18 LEFT SIDE COVER.

STARTER 6.10

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 1.22 BATTERY MAINTENANCE.
2. Drain transmission lubricant and remove primary cover. See 5.3 PRIMARY COVER.
3. Remove rear muffler and exhaust pipe. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.
4. Remove the starter solenoid connector [128].
5. Remove positive (+) battery lead and solenoid wire from starter.

NOTE

A ball hex driver may be required to gain access to the starter mounting bolts.

6. See Figure 6-18. Remove the two starter mounting bolts and washers.
7. **XL Models:** Remove fastener securing oil line retaining clamp to starter.
8. Remove starter and gasket from right side of motorcycle.

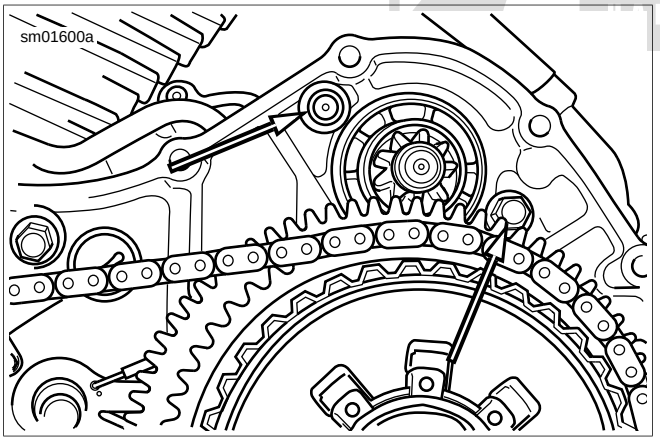


Figure 6-18. Starter Mounting Bolts

TOUCH-UP PAINT

Touch up damaged paint before installation. Follow the directions provided with the touch-up 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 terminal nut	60-85 **in-lbs**	6.8-9.6 Nm

1. Install starter and starter gasket from right side of motorcycle.
2. See Figure 6-18. Install two starter mounting bolts and washers. Tighten to 13-20 ft-lbs (17.6-27.1 Nm).
3. **XL Models:** Install oil line clamp to starter motor. Tighten to 16-21 **in-lbs** (1.8-2.4 Nm).
4. Connect the starter solenoid connector [128].
5. Install positive (+) battery cable and solenoid wire to solenoid stud. Tighten to 60-85 **in-lbs** (6.8-9.6 Nm). Place rubber boot securely over terminal.
6. Install primary cover. See 5.3 PRIMARY COVER.
7. Fill primary chaincase / transmission with proper lubricant. See 1.10 TRANSMISSION LUBRICANT.
8. Install rear exhaust pipe and muffler. See 4.13 EXHAUST SYSTEM: XL MODELS or 4.14 EXHAUST SYSTEM: XR 1200X.

⚠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)

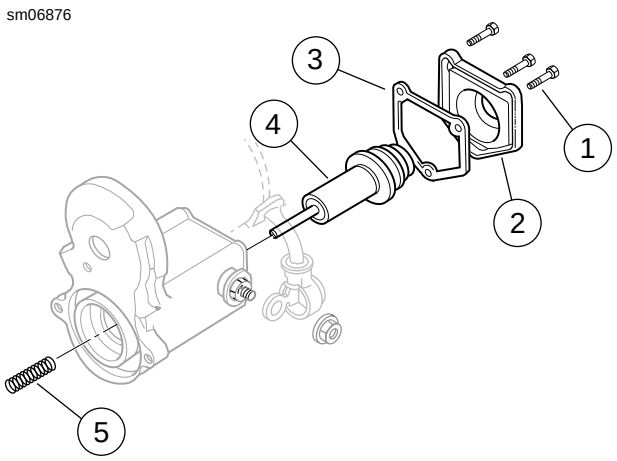
9. Connect battery. See 1.22 BATTERY MAINTENANCE.

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 6-19. Remove fasteners (1), cover (2) and gasket (3).
2. Remove the plunger (4) with spring (5).

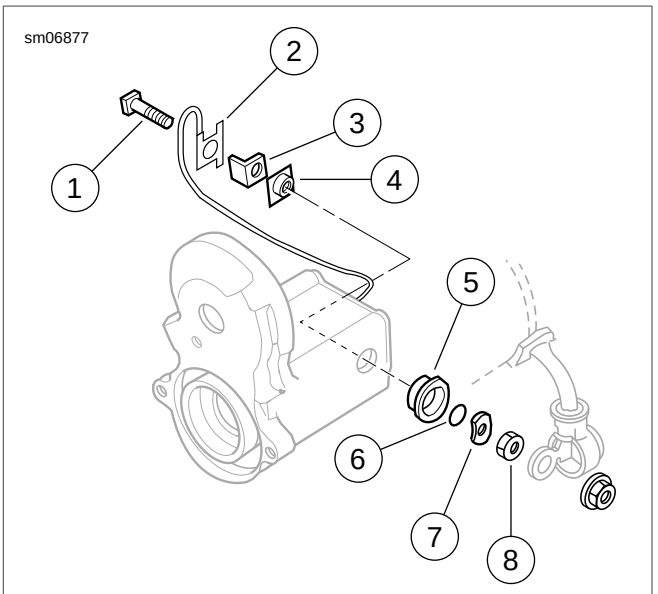


1. **Fasteners**
2. **Cover**
3. **Gasket**
4. **Plunger**
5. **Spring**

Figure 6-19. Soleniod 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 6-20. 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 6-20. Short Post Contact (starter)

Long Post Contact: Battery Positive

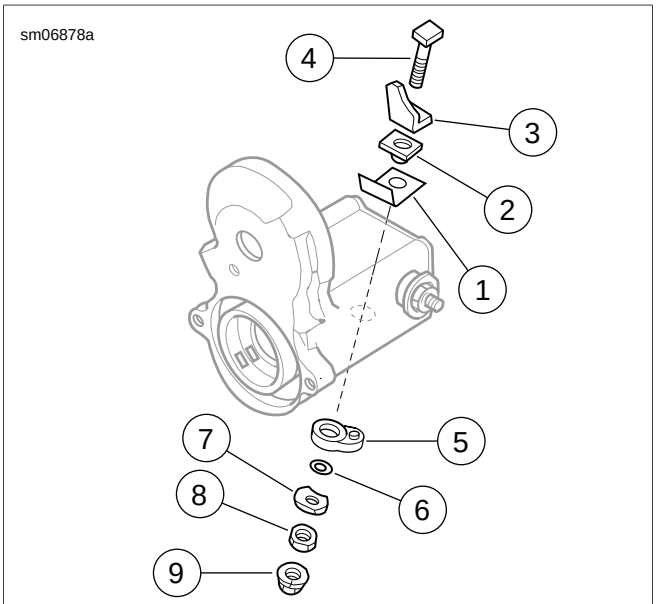
1. See Figure 6-21. Remove the long post contact:
   a. Remove hex nut (9).
   b. Remove jamnut (8), wave washer (7), O-ring (6) and the round bushing (5).
   c. Remove post bolt (4), contact plate (3), square bushing (2) and paper insulator (1).
2. Install the long post contact:
   a. Insert the square 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 6-21. 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 ring terminal.
7. Install the hex nut. Tighten to 60-80 **in-lbs** (6.8-9.0 Nm).

CLUTCH SHAFT ASSEMBLY

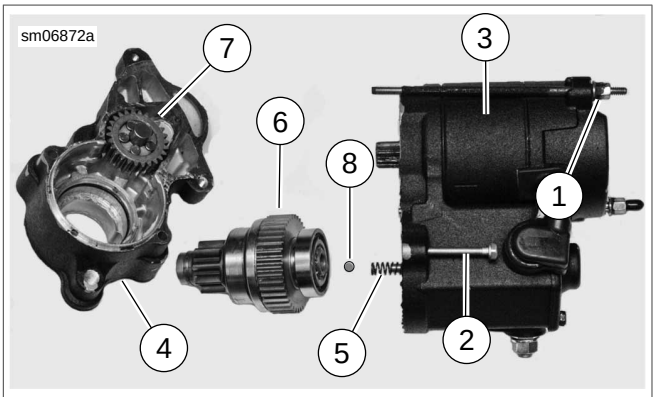
Removal

1. See Figure 6-22. 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 6-22. Starter Drive Housing and Clutch Shaft

Inspection

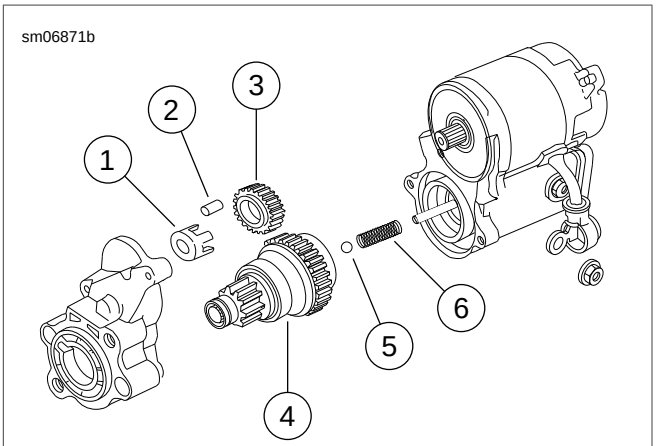
1. Inspect the O-rings in the clutch assembly housing bore.
2. Inspect the spring for kinks or elongation.
3. Inspect the steel ball.
4. Inspect the idler gear and the cage.
5. Inspect the clutch shaft assembly pinion gear for missing or damaged teeth.
6. Check that the roller bearings and the clutch gear on the clutch shaft rotate freely.

Installation

1. Lubricate components with LUBRIPLATE 110.
2. See Figure 6-23. 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.

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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 6-23. Starter Clutch Assembly

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IGNITION SWITCH 6.11

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)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

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: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. See Figure 6-24. Remove ignition switch face nut (5).
6. Remove mounting screw (7). Remove switch cover (3). Remove switch (2) from switch cover (3).
7. Remove cable strap securing switch harness to wire harness caddy.
8. Cut switch wires 3.0 in (76.2 mm) from switch.
9. Remove harness covering.

INSTALLATION

PART NUMBER	TOOL NAME
HD-39969	ULTRA TORCH UT-100

FASTENER	TORQUE VALUE	
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm

1. Slide replacement conduit on harness wires.

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)

2. Observing color codes, install seal splice connectors to harness wires. Complete sealed splice to **new** ignition switch. Seal splice connectors with ULTRA TORCH UT-100 (Part No. HD-39969) or other radiant heating device. See A.23 SEALED SPLICE CONNECTOR.
3. Slide conduit over sealed splice connectors.
4. See Figure 6-24. Insert ignition switch into hole of switch cover. The word "TOP" stamped on the switch body should face upward toward the lettering on the switch position decal. Loosely install face nut (5).
5. Install mounting screw (7). Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
6. Tighten face nut (5) to secure switch (2) within cover (3).
7. Using **new** cable strap (6), secure ignition switch harness to wire harness caddy.
8. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

WARNING

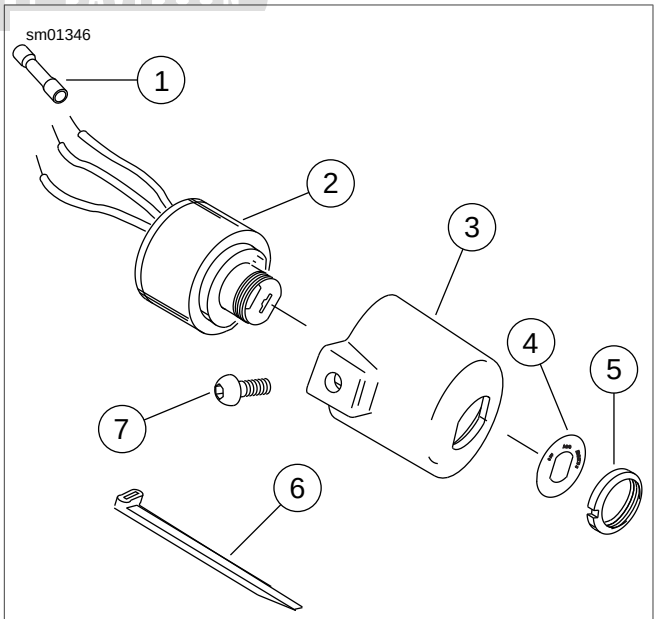
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

9. Install seat.
10. Install main fuse.

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 ignition switch.



1. **Sealed splice connector**
2. **Ignition switch**
3. **Switch cover**
4. **Decal**
5. **Face nut**
6. **Cable strap**
7. **Mounting screw**

Figure 6-24. Ignition Switch

SPARK PLUG CABLES 6.12

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 the fuel supply hose of high-pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠WARNING

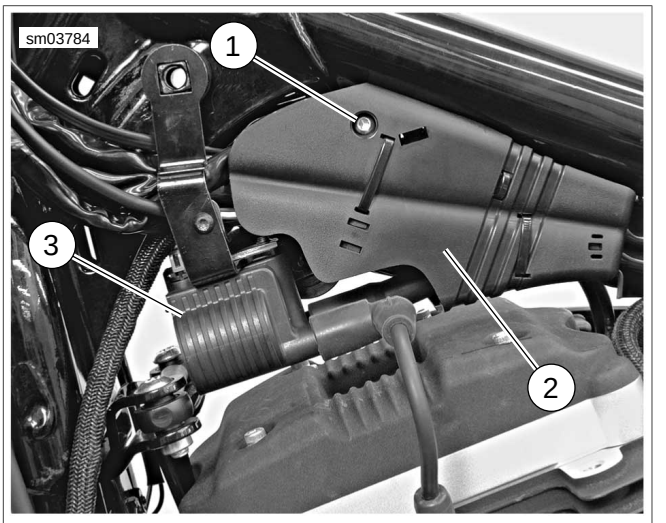
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. **XL Models:** See Figure 6-25. Remove screw (1) securing left wire harness caddy (2) to right wire harness caddy. See 6.28 ELECTRICAL CADDIES. Carefully disengage left wire harness caddy and pull 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 will damage the cable's carbon core.

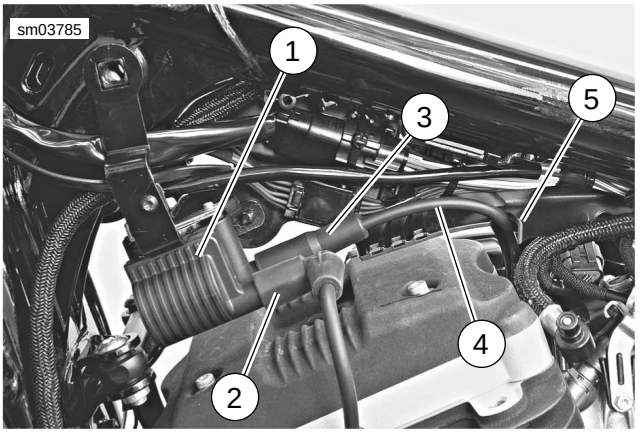
6. See Figure 6-26 or Figure 6-27. Pull front spark plug boot and cable (2) from left side ignition coil (1) tower.



1. **Screw**
2. **Left wire harness caddy**
3. **Ignition coil**

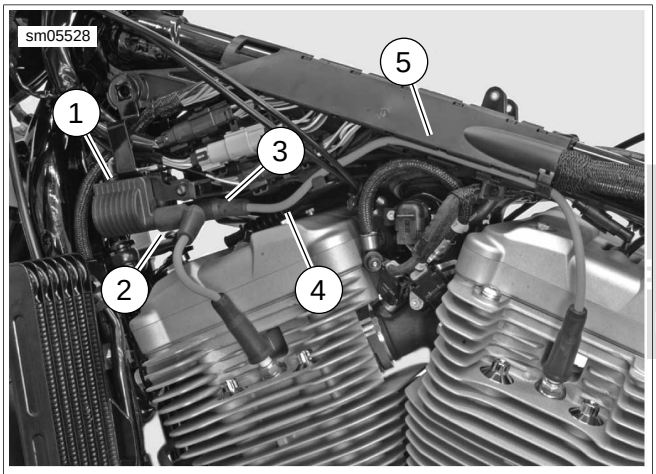
Figure 6-25. Ignition Coil and Left Wire Harness Caddy: XL Models

7. Pull rear spark plug boot (3) and cable from right side ignition coil tower.
8. Unplug spark plug boot and cable assemblies from front and rear spark plugs.
9. **XL Models:** Disengage rear spark plug cable from notch in right wire harness caddy (5). Remove the cable.
10. **XR 1200X:** See Figure 6-27. Disengage rear spark plug cable from wire harness caddy (5). Remove the cable.
11. **XL Models:** See Figure 6-28. 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). Discard cable strap.



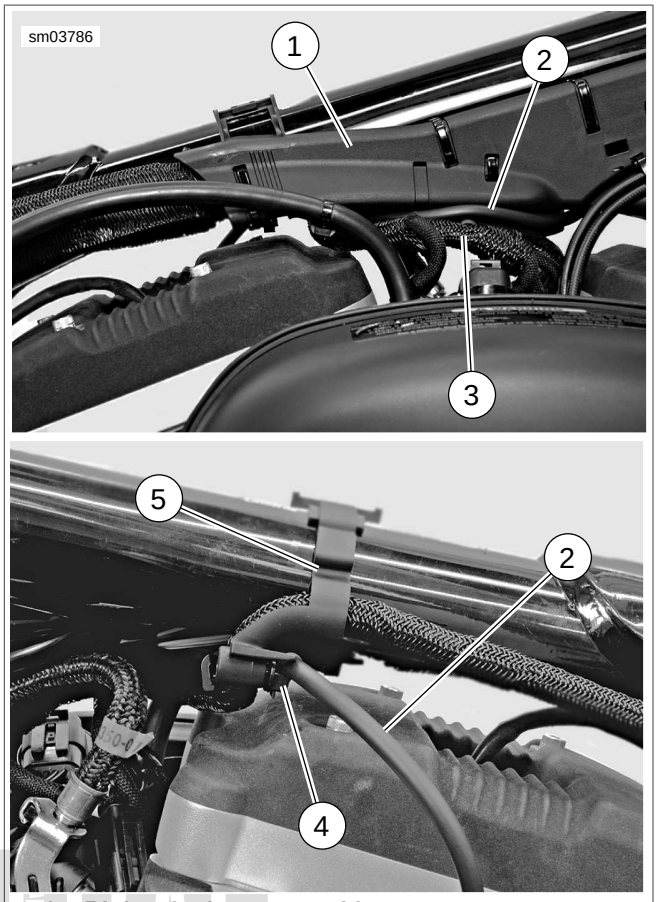
1. Ignition coil
2. Front spark plug cable boot
3. Rear spark plug cable boot
4. Rear spark plug cable
5. Notch in right wire harness caddy

Figure 6-26. Spark Plug Cable Routing: XL Models



1. Ignition coil
2. Front spark plug cable boot
3. Rear spark plug cable boot
4. Rear spark plug cable
5. Harness caddy

Figure 6-27. Spark Plug Cable Routing: XR 1200X



1. Right wire harness caddy
2. Rear spark plug cable
3. Engine sub-harness
4. Cable strap
5. Caddy latch clip

Figure 6-28. Rear Spark Plug Cable Routing: XL Models

INSTALLATION

1. See Figure 6-26 or Figure 6-27. Plug rear spark plug cable boot (3) into right side ignition coil (1) tower.
2. **XL Models:** Route cable between wire harness caddies, and down through notch (5) in right caddy, toward right side of engine.
3. **XR 1200X:** Route rear spark plug cable through harness caddy (5) as shown.
4. **XL Models:** See Figure 6-28. Route rear spark plug cable (2) in trough in right wire harness caddy (1), over top of engine sub-harness (3) and back toward left side of engine.
5. **XL Models:** See Figure 6-29. Install **new** barbed cable strap (3) onto spark plug cable (1), 7.0-7.25 in (178-184 mm) from tip of spark plug cable boot (2).
   a. Orient the cable strap so that the spark plug cable is above the mounting boss on the caddy latch clip.
   b. Press the cable strap barbed prong firmly into the hole in the caddy latch clip mounting boss.
6. Plug rear spark plug cable and boot onto rear spark plug until it clicks.

7. See Figure 6-26 or Figure 6-27. Plug front spark plug cable and boot (2) into left side ignition coil (1) tower. Plug other end of cable onto front spark plug until it clicks.

NOTE

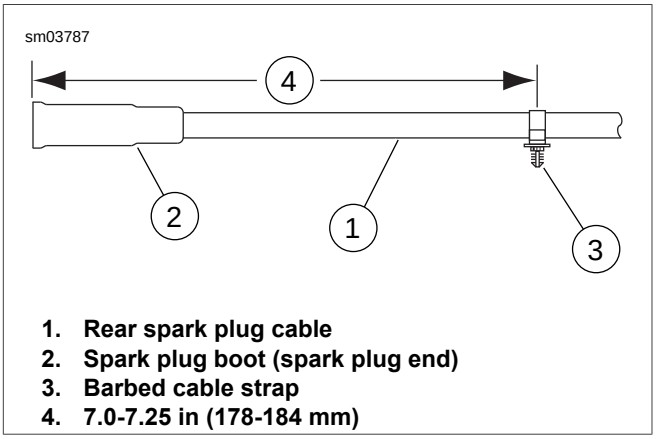
Make sure rear spark plug cable is routed properly and cannot chafe against frame, fuel tank or rear cylinder head.

8. **XL Models:** See Figure 6-25. Mate left wire harness caddy (2) to right wire harness caddy. Secure with screw (1) and tighten. See 6.28 ELECTRICAL CADDIES.
9. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠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)

10. Install seat.
11. Install main fuse.
12. Start the engine. Verify ignition function.



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 6-29. Rear Spark Plug Cable and Cable Strap: XL Models

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

IGNITION COIL 6.13

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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module on bottom left side of fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

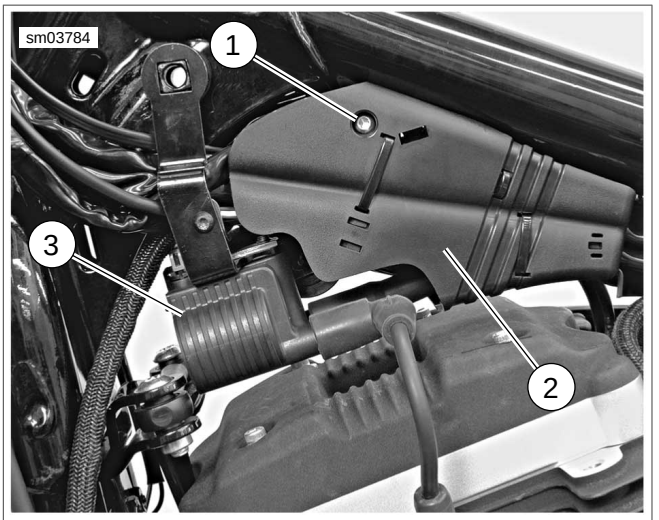
WARNING

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: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. **XL Models Only:** See Figure 6-30. Remove screw (1) securing left wire harness caddy (2) to right wire harness caddy. Carefully disengage left wire harness caddy and pull away from frame backbone. See 6.28 ELECTRICAL CADDIES.

NOTE

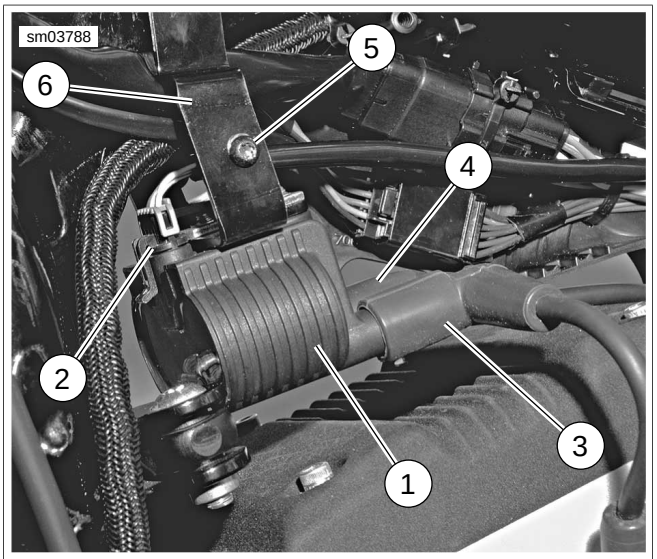
Always grasp rubber boot as close as possible to the spark plug terminal when removing spark plug cables. Do not pull on the cable portion itself. Pulling on the cable will damage the cable's carbon core.



1. **Screw**
2. **Left wire harness caddy**
3. **Ignition coil**

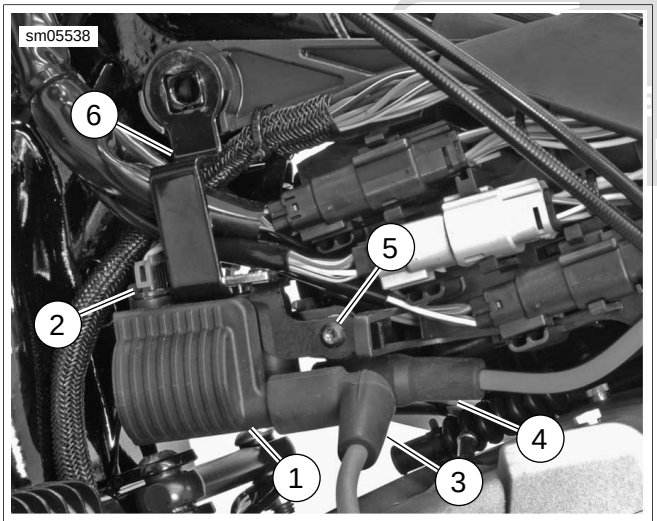
Figure 6-30. Ignition Coil and Left Wire Harness Caddy: XL Models

6. See Figure 6-31 or Figure 6-32. Unplug coil harness connector [83B] (2) from ignition coil (1).
7. Pull front spark plug boot and cable (3) from left ignition coil tower.
8. Pull rear spark plug boot and cable (4) from right ignition coil tower.
9. Remove screw (5) securing coil bracket (6). Remove coil and bracket from vehicle.
10. See Figure 6-33 or Figure 6-34. Remove two screws (4) to separate ignition coil (1) from mounting bracket (2) and plate (3).



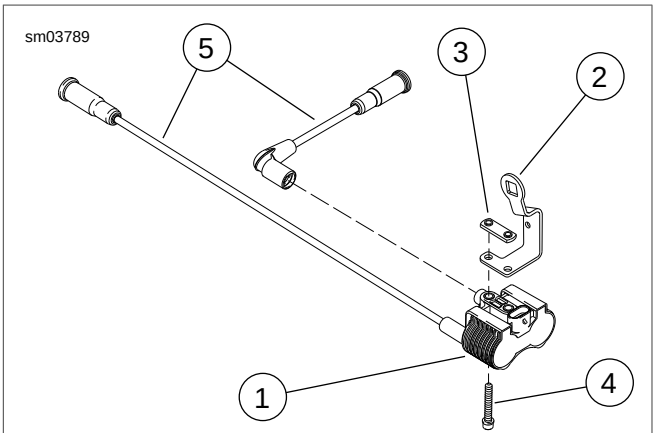
1. Ignition coil
2. Coil harness connector [83B]
3. Front spark plug boot and cable
4. Rear spark plug boot and cable
5. Screw
6. Mounting bracket

Figure 6-31. Ignition Coil Mounting and Connections: XL Models Only



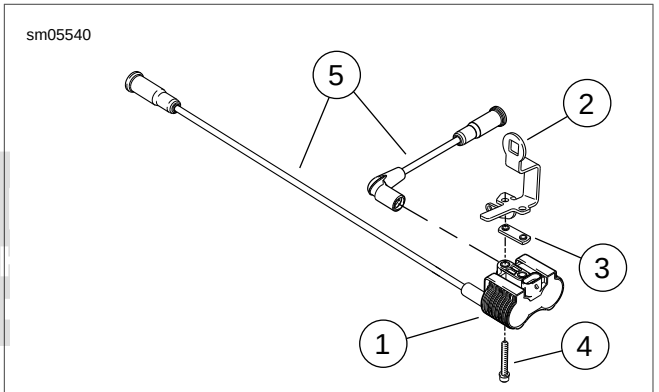
1. Ignition coil
2. Coil harness connector [83B]
3. Front spark plug boot and cable
4. Rear spark plug boot and cable
5. Screw
6. Mounting bracket

Figure 6-32. Ignition Coil Mounting and Connections: XR 1200X



1. Ignition coil
2. Mounting bracket
3. Plate
4. Screw (2)
5. Spark plug cables (2)

Figure 6-33. Ignition Coil Mounting: XL Models Only



1. Ignition coil
2. Mounting bracket
3. Plate
4. Screw (2)
5. Spark plug cables (2)

Figure 6-34. Ignition coil Mounting: XR 1200X

INSTALLATION

FASTENER	TORQUE VALUE	
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm
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. **XL Models:** See Figure 6-33. Position **new** ignition coil (1) on underside of mounting bracket (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).
2. **XR 1200X:** See Figure 6-34. Position plate (3) over **new** ignition coil (1). Place screws (4) through coil and plate and secure to mounting bracket (2). Tighten to 24-72 **in-lbs** (2.7-8.1 Nm).

3. See Figure 6-31 or Figure 6-32. Install the 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).
4. Plug spark plug cables into ignition coil towers: front spark plug cable (3) to left side of coil, rear spark plug cable (4) to right side of coil.
5. **XL Models:** See Figure 6-30. Mate left wire harness caddy (2) to right wire harness caddy. Secure with screw (1) and tighten. See 6.28 ELECTRICAL CADDIES.
6. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠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.
8. Install main fuse.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

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, XR 1200X:** See Figure 6-35. Remove the screw (1), nut (2)and the trim ring (3).
   b. **XL 1200V/C/CP/CA/CB:** See Figure 6-36. 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).

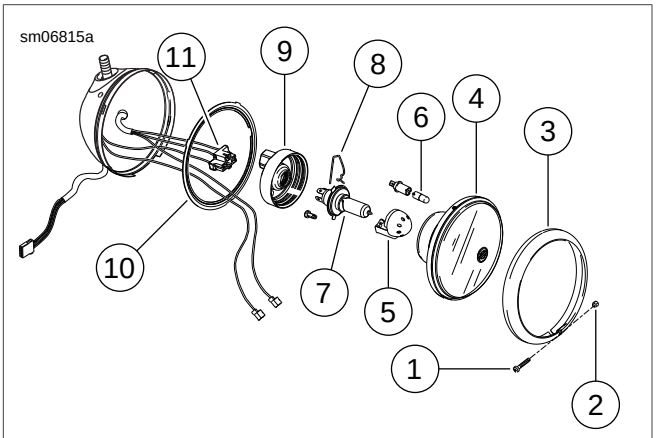
NOTE

The tab opposite the center spade connector of bulb fits the top notch in the reflector which points to the top of the 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, XR 1200X:** 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.

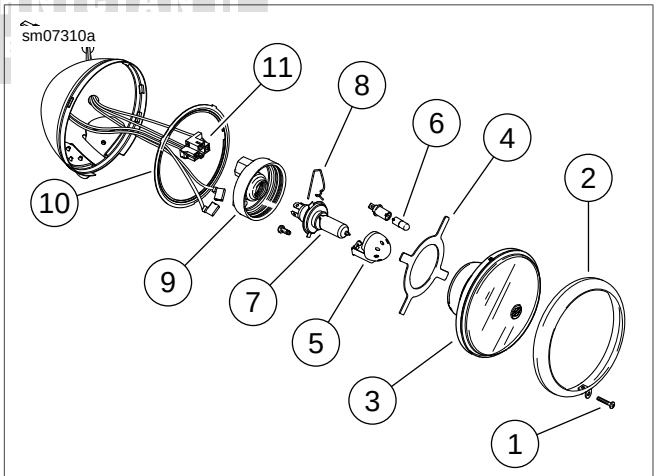
Position Lamp: HDI

1. Disconnect the spade connectors from the position lamp bulb holder.
2. Pull the bulb holder from the lens.
3. Quarter turn the bulb to remove and replace.
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. **Wire clip**
9. **Rubber boot**
10. **Adapter ring**
11. **Connector**

Figure 6-35. Headlamp Assembly: XL 883L/N/R, XR 1200X



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 6-36. Headlamp Assembly: XL 1200V/C/CP/CA/CB

HEADLAMP MOUNTS

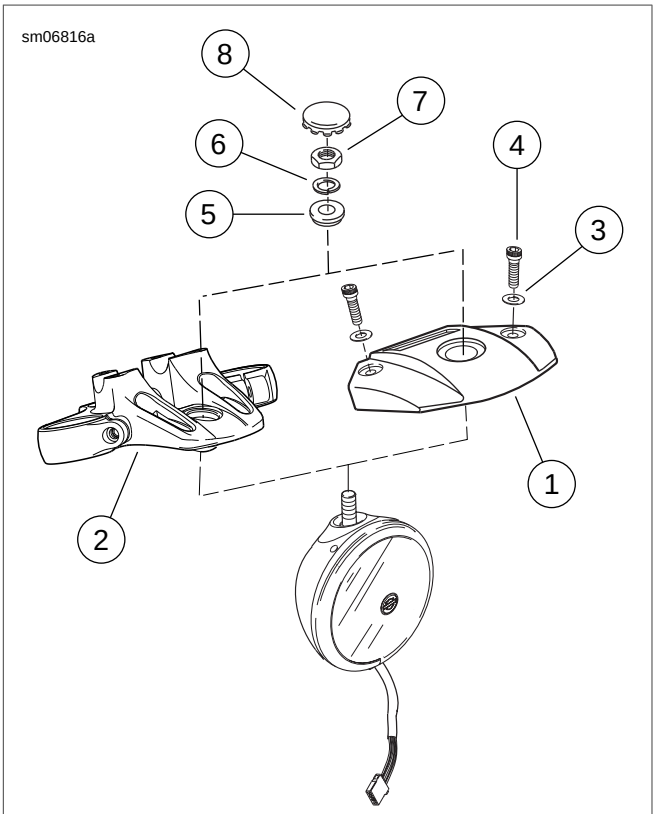
FASTENER	TORQUE VALUE	
Headlamp upper bracket fasteners: XL 883L/R/N, XR 1200X	120-192 **in-lbs**	14-22 Nm
Headlamp clamp nut: XL 883L/N/R, XR 1200X	120-240 **in-lbs**	14-27 Nm
Headlamp mount: XL 1200X	30-35 ft-lbs	41-47 Nm
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm
Headlamp mount: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm
Clutch cable guide: XL 1200C/C ANV/CP/CA/CB	45-65 **in-lbs**	4.0-7.3 Nm
Headlamp visor: XL 1200C/C ANV/CP/CA/CB	120-192 **in-lbs**	14-22 Nm

Mount: XL 883L/N/R, XR 1200X Models

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. Install the headlamp assembly:
   a. See Figure 6-37. Mount the upper bracket (1) to the upper fork clamp with a washer (3) and fastener (4). Tighten to 120-192 **in-lbs** (14-22 Nm).
   b. **XR 1200X:** The headlamp assembly installs directly into the upper fork clamp (2).
3. Install the headlamp assembly with a washer (5), lockwasher (6) and nut (7) and hand tighten.
4. Install main fuse.
5. Align the headlamp. Final tighten to 120-240 **in-lbs** (14-27 Nm).
6. Install the plug (8).

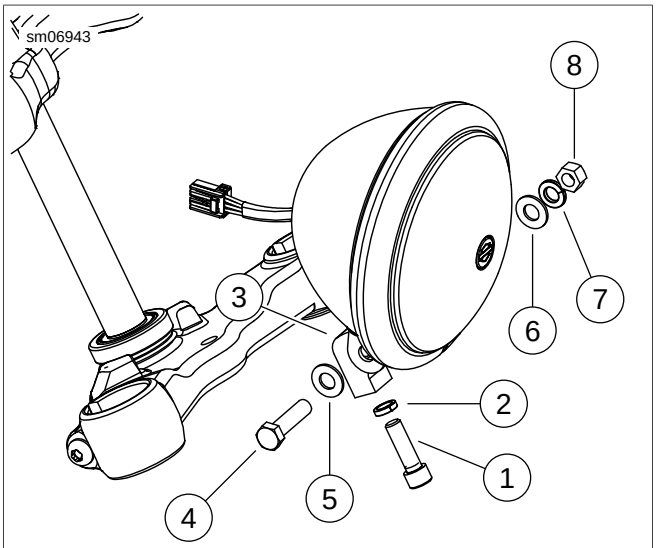


1. **Upper bracket (XL 883L/N/R)**
2. **Upper fork clamp (XR 1200X)**
3. **Washer**
4. **Fastener**
5. **Washer**
6. **Lockwasher**
7. **Nut**
8. **Plug**

Figure 6-37. Headlamp Mount

Mount: XL 1200X

1. Remove main fuse.
2. See Figure 6-38. Install the fastener (1), washer (2) and mounting post (3). Tighten to 30-35 ft-lbs (41-47 Nm).
3. Install the headlamp with the fastener (4), washer (5). Secure with the washer (6), lockwasher (7) and nut (8). Hand tighten.
4. Install main fuse.
5. Align the headlamp.
6. Tighten the headlamp assembly to 30-35 ft-lbs (41-47 Nm).

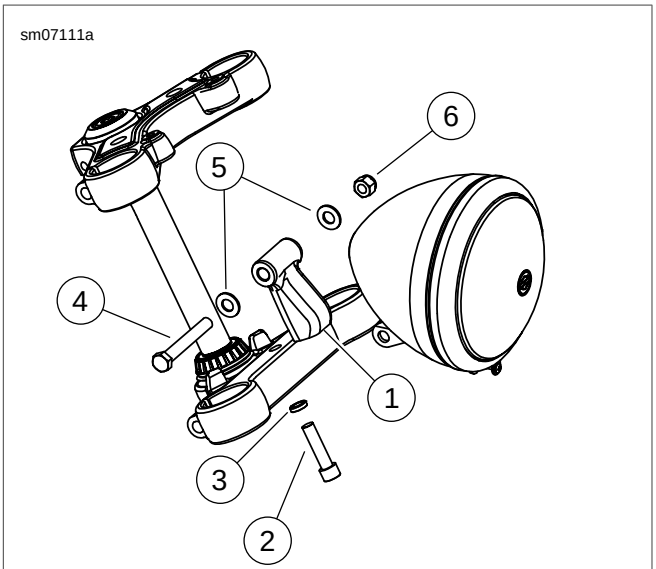


1. **Fastener**
2. **Washer**
3. **Mounting post**
4. **Mount fastener**
5. **Washer**
6. **Washer**
7. **Lockwasher**
8. **Nut**

Figure 6-38. Headlamp Assembly Mount: XL 1200X

Mount: XL 1200V/C/CP/CA/CB

1. See Figure 6-39. Remove main fuse.
2. Install the fastener (2), washer (3) and mounting post (1). Tighten to 30-35 ft-lbs (41-47 Nm).
3. Assemble the washer stack (5) and fastener (4). Install the headlamp assembly. Hand tighten.
4. Install main fuse.
5. Align the headlamp.
6. Tighten the headlamp locknut (6) to 30-35 ft-lbs (41-47 Nm).

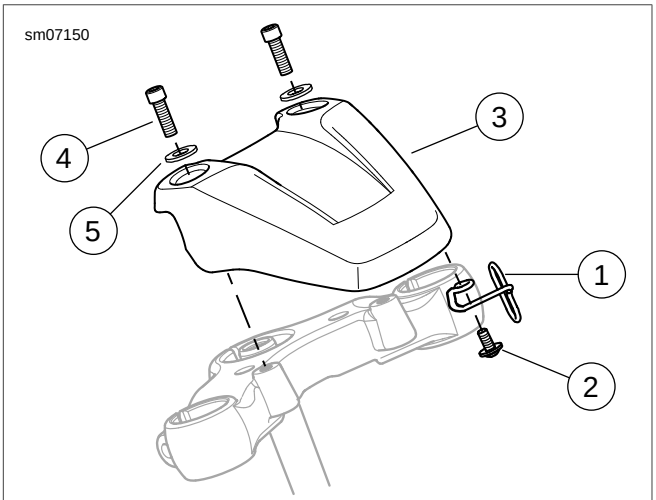


1. **Mount**
2. **Fastener**
3. **Washer**
4. **Fastener**
5. **Washer**
6. **Locknut**

Figure 6-39. Headlamp Mount: XL 1200V/C/CP/CA/CB

Visor: XL 1200C/C ANV/CP/CA/CB

1. See Figure 6-40. Install the clutch cable guide (1) with fastener (2). Tighten to 45-65 **in-lbs** (4.0-7.3 Nm).
2. Install the headlamp visor (3) with 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 6-40. Headlamp Visor: XL 1200C/C ANV/CP/CA/CB

INDICATOR LAMP MODULE 6.15

GENERAL

The indicator lamps are LEDs housed in a self-contained, non-repairable module.

NOTE

This part cannot be repaired. Replace upon failure.

PRELIMINARY DISASSEMBLY: ALL MODELS

⚠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. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠WARNING

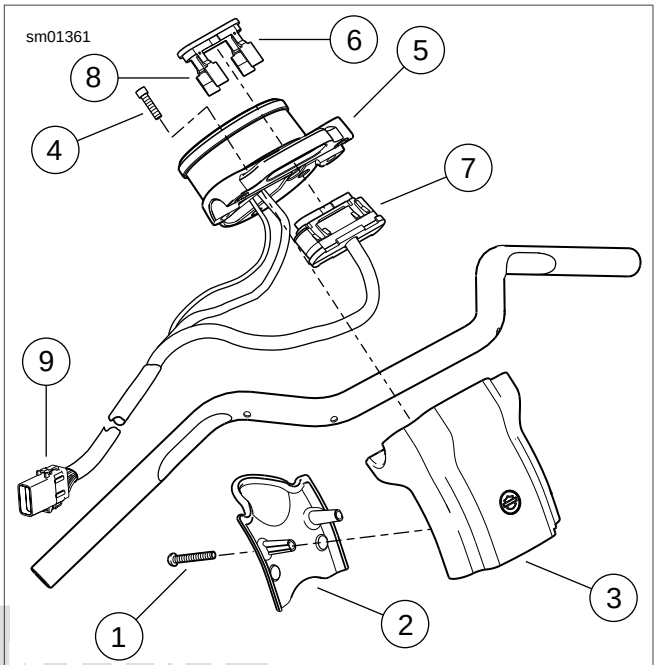
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. See 6.28 ELECTRICAL CADDIES:
   a. **XL Models:** Remove screw securing left wire harness caddy to right wire harness caddy.
   b. Locate instruments connector [20] on right wire harness caddy for XL models and on left side of caddy for XR 1200X. Unplug connector [20A].
6. Record the location of all cable straps securing instrument harness to vehicle. Cut cable straps to free instrument harness.

REPLACEMENT: XL 1200C/C ANV/CP/CA EXCEPT WITH MINI-APE HANDLEBAR

FASTENER	TORQUE VALUE	
Handlebar riser clamp screw	12-18 ft-lbs	16.3 -24.4 Nm
Handlebar riser clamp screw	12-18 ft-lbs	16.3 -24.4 Nm
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm

1. See Figure 6-41. 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 the speedometer. See 6.4 SPEEDOMETER: XL MODELS, 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 6-41. Indicator Lamps: XL 1200C/C ANV/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 and remove harness from vehicle.
7. Place **new** instrument harness in position.
8. Carefully feed connector [20A] end down through upper fork bracket and along left side of frame steering head.

NOTE

Verify that speedometer harness and trip odometer switch harness are positioned underneath the handlebar and that the indicator lamp module harness feeds over the top of the handlebar.

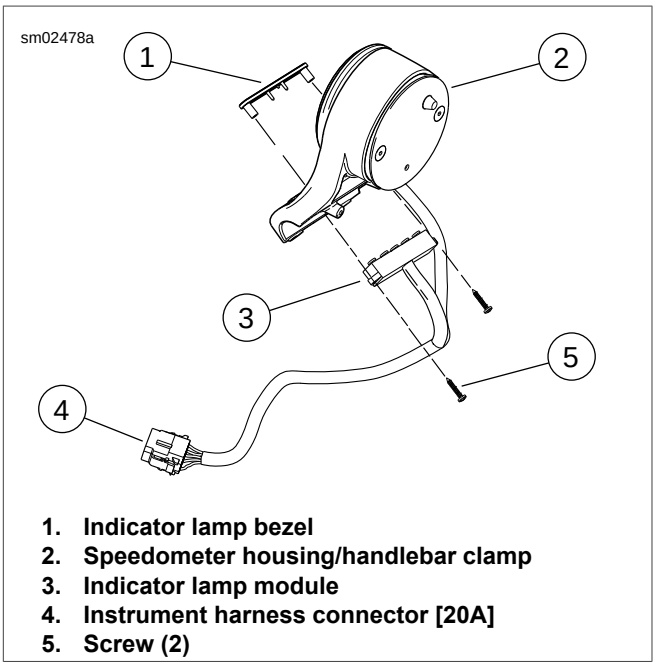
9. Carefully feed end of harness with connector [39B] and trip odometer reset button through back of speedometer housing/handlebar clamp.

10. Install the speedometer. See 6.4 SPEEDOMETER: XL MODELS, Installation.
11. See Figure 6-41. 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 the handlebar to the 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 the handlebar control harnesses are not pinched between handlebar riser and riser cover. Tighten to 8-12 **in-lbs** (0.9-1.4 Nm).
16. Proceed to 6.15 INDICATOR LAMP MODULE, Assembly: All Models.

REPLACEMENT: XL 883R/L/N, XL 1200X/V, XL 1200CP/CB WITH MINI-APE HANDLEBAR

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 clean soft cloth to protect surface.
2. See Figure 6-42. 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 the indicator lamp bezel.
4. Remove speedometer. See 6.4 SPEEDOMETER: XL MODELS, Removal.
5. Remove instrument harness.
6. Place **new** instrument harness in position.
7. Install speedometer. See 6.4 SPEEDOMETER: XL MODELS, Installation.
8. See Figure 6-42. Assemble the indicator lamp bezel (1) and the 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).
11. Proceed to 6.15 INDICATOR LAMP MODULE, Assembly: All Models.



1. **Indicator lamp bezel**
2. **Speedometer housing/handlebar clamp**
3. **Indicator lamp module**
4. **Instrument harness connector [20A]**
5. **Screw (2)**

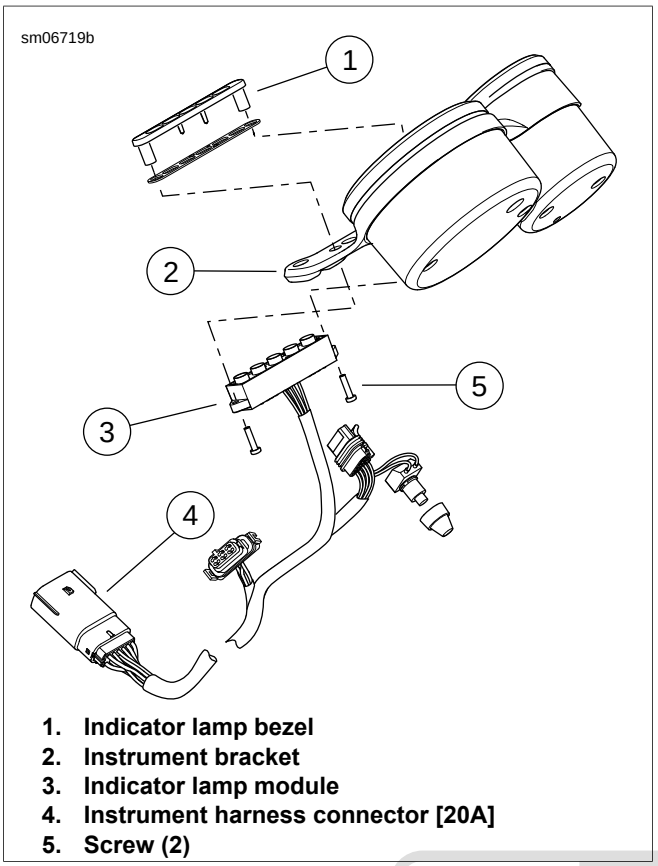
Figure 6-42. Indicator Lamps: XL 883R/L/N, XL 1200X/V, XL 1200CP/CB (w/mini-ape handlebar)

REPLACEMENT: XR 1200X

FASTENER	TORQUE VALUE	
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm

1. Cover headlamp bracket with a clean soft cloth to protect surface.
2. See Figure 6-43. Holding instrument bracket (2), remove two screws with lockwashers securing instrument bracket to handlebar risers.
3. Remove two screws (5) to separate indicator lamp module (3) from instrument bracket and the indicator lamp bezel (1).

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1. **Indicator lamp bezel**
2. **Instrument bracket**
3. **Indicator lamp module**
4. **Instrument harness connector [20A]**
5. **Screw (2)**

Figure 6-43. Indicator Lamps: XR 1200X

4. Remove instrument harness. See 6.4 SPEEDOMETER: XL MODELS or 6.5 SPEEDOMETER AND TACHOMETER: XR 1200X.
5. Install **new** instrument harness. See 6.4 SPEEDOMETER: XL MODELS or 6.5 SPEEDOMETER AND TACHOMETER: XR 1200X.
6. See Figure 6-43. Assemble the indicator lamp bezel and the indicator lamp module (3) onto instrument bracket (2). Secure with two screws (5).
7. Install instrument bracket onto handlebar risers. Tighten to 12-18 ft-lbs (16.3-24.4 Nm).
8. Proceed to 6.15 INDICATOR LAMP MODULE, Assembly: All Models.

ASSEMBLY: ALL MODELS

1. **XL Models:** See 6.28 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. Secure with screw and tighten.
2. **XR 1200X:** See 6.28 ELECTRICAL CADDIES.
   a. Feed instrument harness along left side of frame next to left and right hand control harnesses and inside of coil bracket upright.
   b. Plug instrument harness pin connector [20A] into socket connector [20B] in right wire harness caddy.
3. Secure instrument harness to vehicle with cable straps in locations previously noted.
4. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. 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)

6. Install seat.

TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V 6.16

BULB REPLACEMENT EXCEPT XL 1200C/CANV/CP/CA/CB

FASTENER	TORQUE VALUE	
Tail lamp lens screw	20-24 **in-lbs**	2.3-2.7 Nm

NOTE

XL 883N/XL 1200X/V:

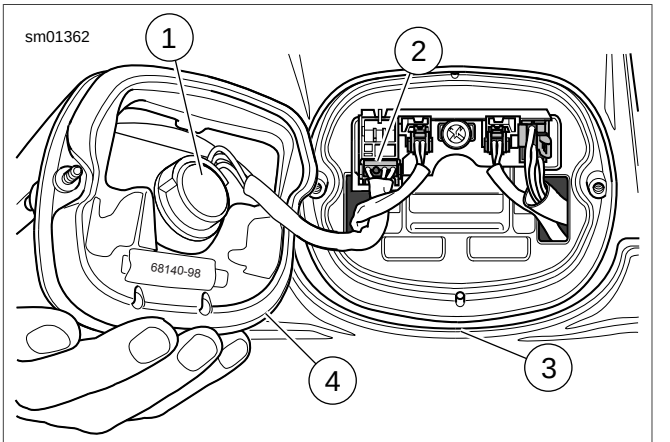
- *The stop lamps are dual filament turn signal bulbs in housings with red lenses. Replace the turn signal bulbs.*
- *Certain markets require the XL 883R/L tail lamp.*

1. Turn the ignition switch to OFF.
2. See Figure 6-44. Remove two screws and lens (4) from base (3).
3. Press the 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 from socket.
5. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT. Install **new** bulb into socket.
6. Install bulb assembly into lens. Turn assembly one-quarter turn clockwise to lock in place.
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. Test tail lamp.



1. **Bulb/socket assembly**
2. **4-pin multilock connector**
3. **Base**
4. **Lens**

Figure 6-44. Tail Lamp

BASE REPLACEMENT: XL 883R/L AND XR 1200X

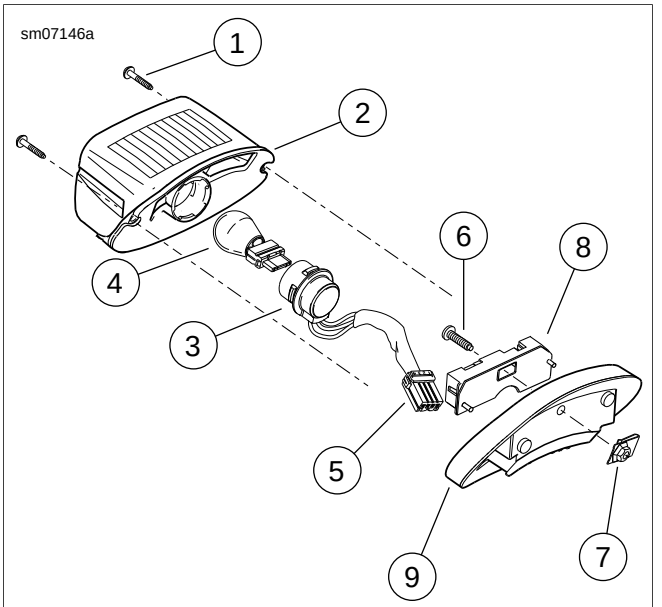
FASTENER	TORQUE VALUE	
Tail lamp base mounting screw: XL Models	45-48 **in-lbs**	5.1-5.4 Nm
Tail lamp base mounting screw: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm
Tail lamp lens screw	20-24 **in-lbs**	2.3-2.7 Nm

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 6-45 or Figure 6-46. Remove two screws (1) and lens (2) from base (9).
3. See Figure 6-47. Press locking tab and remove 4-Pin multilock connector [93] (1) from circuit board.
4. Press locking tabs and remove right [18] (3) and left [19] (2) two 2-Pin turn signal connectors and 6-Pin Power In connector [94] (4) from the circuit board.
5. **XL Models except 1200C/CP/CA/CB:** See Figure 6-45. Remove base as follows:
   a. Remove screw (6) from nut plate (7).
   b. Remove circuit board (8) from base.
   c. Remove base (9) from rear fender.

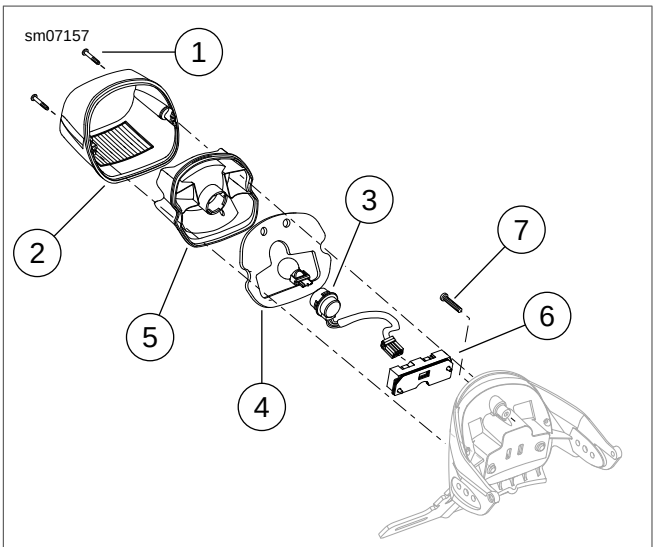
6. **XL Models except 1200C/CP/CA/CB:** Install base as follows:
   a. Install base on rear fender.
   b. Install screw, pin housing and circuit board to base. Tighten to 45-48 **in-lbs** (5.1-5.4 Nm).



1. **Screw**
2. **Lens**
3. **Socket**
4. **Bulb**
5. **Tail lamp connector [93]**
6. **Screw**
7. **Nut plate**
8. **Circuit board**
9. **Base**

Figure 6-45. Tail Lamp Assembly: XL 883R/L

7. **XR 1200X:** See Figure 6-49. Remove base as follows:
   a. Remove pin housing and circuit board from base.
   b. Remove screws (1, 2) and remove base from frame.
   c. If replacing base, remove turn signals from base. See 6.18 FRONT TURN SIGNALS.



1. **Screw**
2. **Lens**
3. **Socket**
4. **Gasket**
5. **Reflector**
6. **Circuit board**
7. **Fastener**

Figure 6-46. Tail Lamp Assembly: XR 1200X

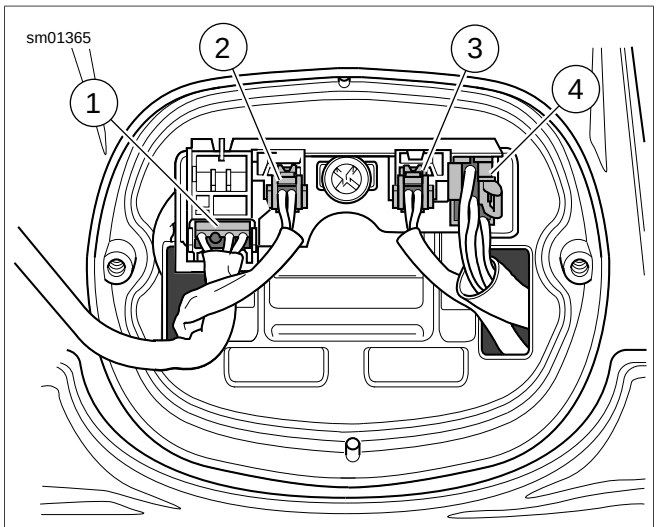
8. **XR 1200X:** See Figure 6-49. Install base as follows:
   a. Install base to frame with screws (1, 2). Tighten screw to 36-60 **in-lbs** (4.1-6.8 Nm).
   b. Set pin housing and circuit board onto base.
9. Install connectors to circuit board.
10. Install lens to base with two screws. Tighten screws to 20-24 **in-lbs** (2.3-2.7 Nm).
11. 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)

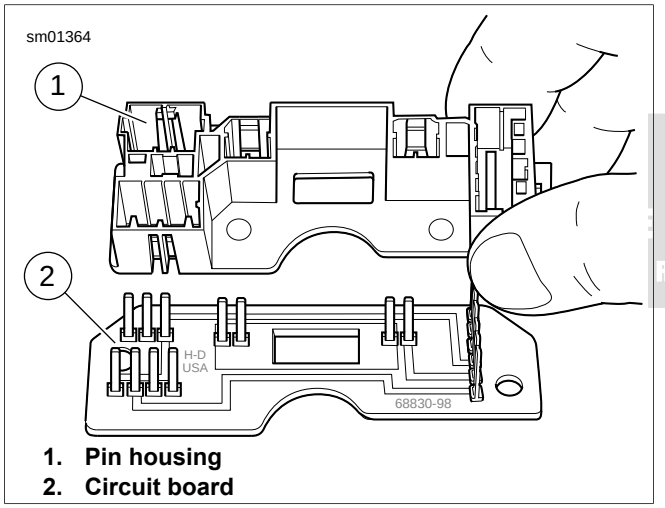
12. Verify operation of lighting system.

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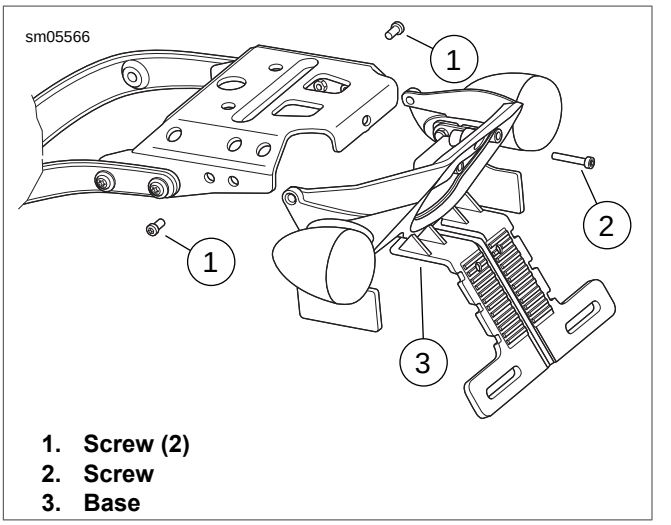
1. Tail lamp [93]
2. Left turn signal [19]
3. Right turn signal [18]
4. Power in [94]

Figure 6-47. Tail Lamp Base Connectors



1. Pin housing
2. Circuit board

Figure 6-48. Pin Housing and Circuit Board



1. Screw (2)
2. Screw
3. Base

Figure 6-49. Tail Lamp Base: XR 1200X

LED TAIL LAMP: XL 1200C/C ANV/CP/CA/CB

FASTENER	TORQUE VALUE	
Tail lamp LED screws: XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm
Tail lamp LED base fasteners: XL 1200C/C ANV/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 the seat.
3. See Figure 6-50. Separate the tail lamp subharness connector [40] housings.
4. Remove the lower rear shock bolts and raise the motorcycle to access the tail lamp. See 2.24 SHOCK ABSORBERS.
5. See Figure 6-51. Remove the fasteners (3) and remove the wire harness from the inner fender rail.
6. Separate the tail lamp base (2) from the rubber gasket (5).
7. Remove the two screws (4) to remove the LED (1) from the tail lamp base.

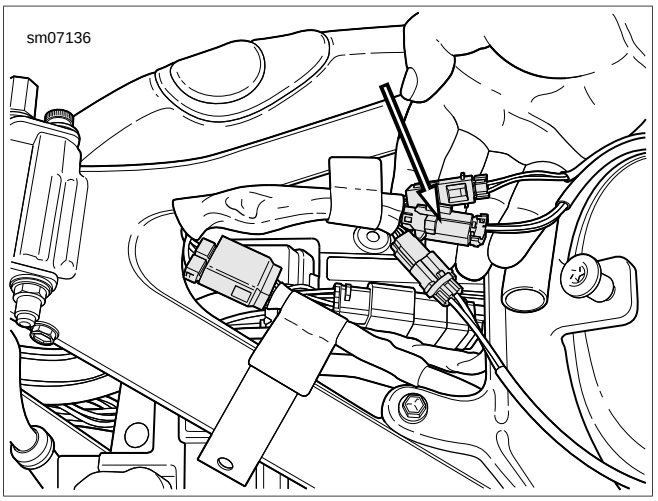


Figure 6-50. Tail Lamp Subharness Connector [40]

Installation

1. Thread the LED wire harness through the tail lamp base and the rubber gasket.
2. Fasten the LED to the tail lamp base and tighten the screws to 20-25 **in-lbs** (2.3-2.8 Nm).
3. Loosely install the rubber gasket and the tail lamp to the fender and thread the wire harness back through the inner rail.
4. Tighten the fasteners to 40-50 **in-lbs** (4.5-5.6 Nm).
5. Lower the rear wheel and install the shock bolts. See 2.24 SHOCK ABSORBERS.
6. Connect the subharness connector [7] housings.
7. Install main fuse.

⚠WARNING

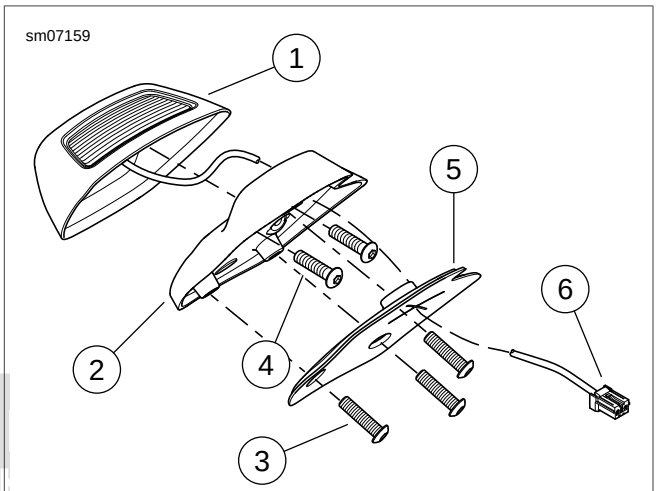
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

8. Install the 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. Verify operation of lighting system.



1. **LED tail lamp**
2. **Base**
3. **Fasteners**
4. **Screws**
5. **Gasket**
6. **Subharness connector [40]**

Figure 6-51. LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB

LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V 6.17

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: DOMESTIC 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.
2. Position vehicle upright on a suitable lift. Use a FAT JACK (Part No. HD-45968) or similar lifting device underneath frame to raise rear end of motorcycle high enough to permit the removal of the lower shock absorber mounting screws.
3. Remove lower shock absorber mounting screw and nut on each side of vehicle. See 2.24 SHOCK ABSORBERS.
4. Continue to raise vehicle enough to access wiring on underside of rear fender.
5. Remove seat.
6. See Figure 6-52. Unplug license plate lamp connector [40].
7. See Figure 6-53. 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 6-54. Remove license plate lamp harness (3) from upper license plate bracket harness clips (1) and harness channel (2).
10. Remove two screws (4) and license plate lamp module (5) from license plate bracket.

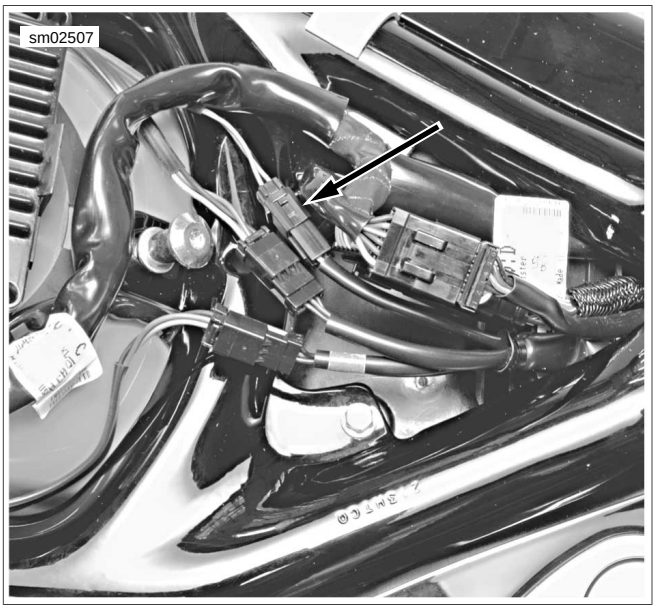
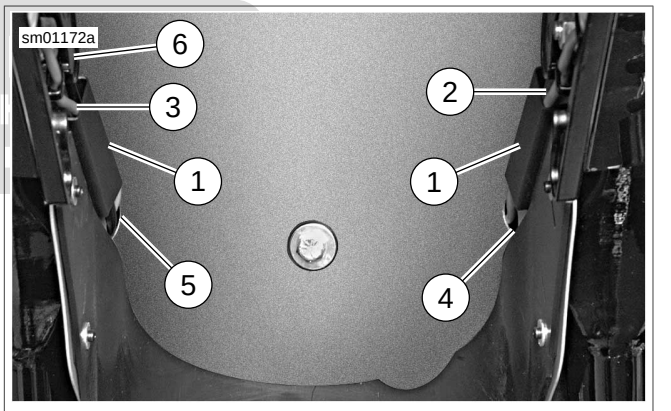
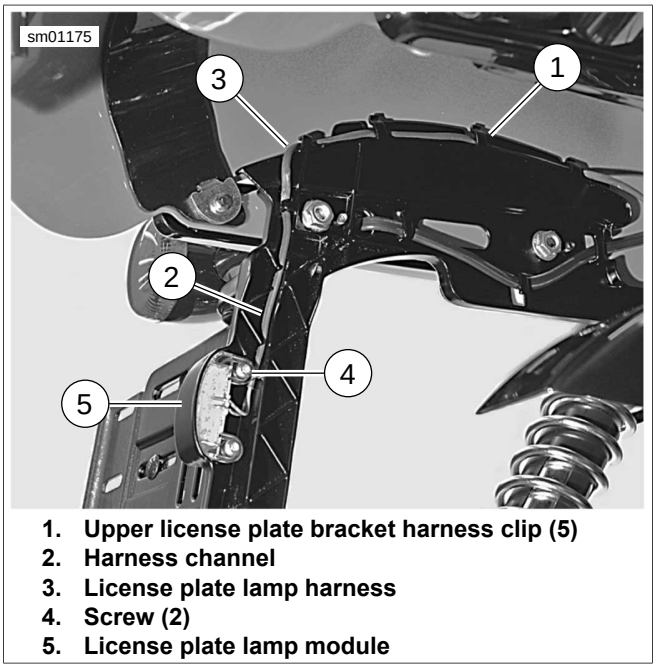


Figure 6-52. License Plate Lamp Connector [40]



1. **Harness bracket (2)**
2. **Right rear lighting harness**
3. **Left rear lighting harness**
4. **Right feed-through hole**
5. **Left feed-through hole**
6. **License plate lamp harness**

Figure 6-53. Lighting Harnesses 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 6-54. Removing/Installing License Plate Lamp Module: XL 883N, XL 1200X

INSTALLATION: DOMESTIC ONLY

FASTENER	TORQUE VALUE	
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

1. See Figure 6-54. 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 6-53. 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. See Figure 6-52. Plug in license plate lamp connector [40].

⚠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 of vehicle. Tighten to 45-50 ft-lbs (61-68 Nm). See 2.24 SHOCK ABSORBERS.
8. Install main fuse.
9. Remove vehicle from lift.

⚠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. Verify operation of lighting system.

REMOVAL: NON-DOMESTIC

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

See Figure 6-55. The XL 883N and XL 1200X/V models built for international markets incorporate a center-mounted license plate holder and lamp assembly.

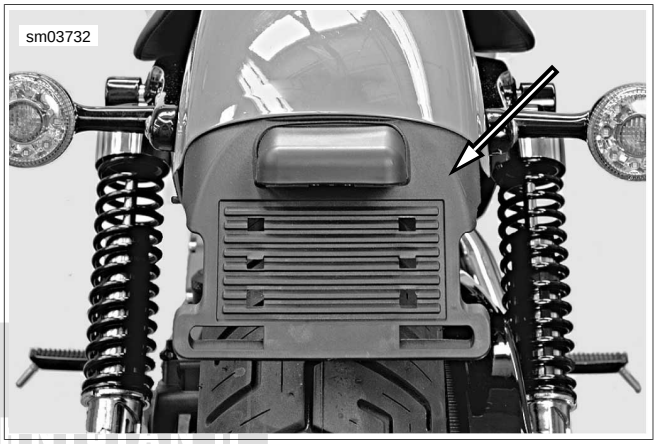
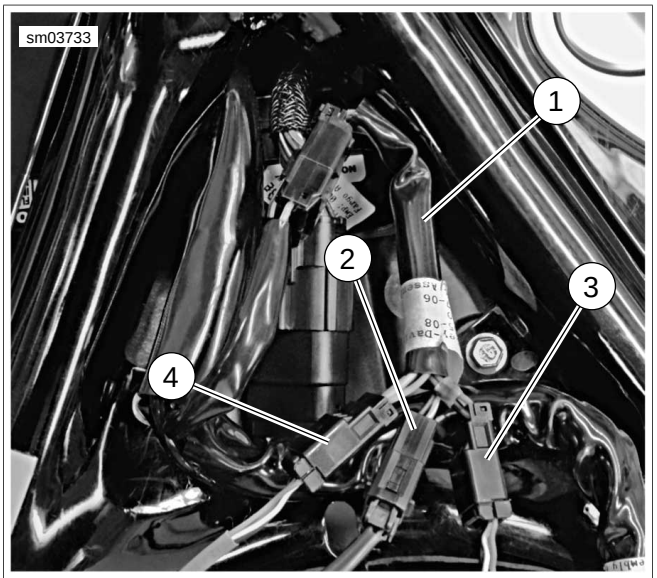


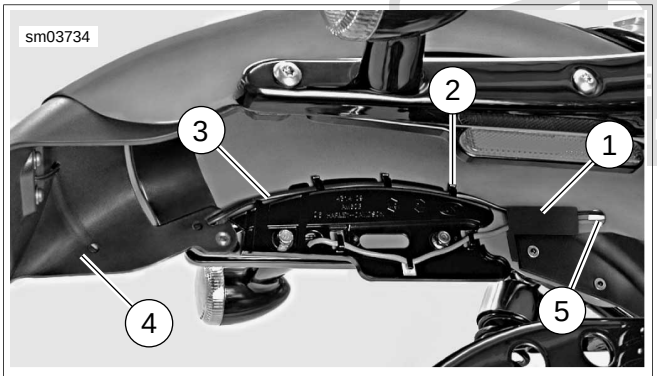
Figure 6-55. License Plate Holder and Lamp Assembly: XL 883N, XL 1200X/V (HDI)

1. Remove main fuse.
2. Remove seat.
3. Use a FAT JACK (Part No. HD-45968) or similar lifting device underneath frame to raise rear end of motorcycle high enough to permit the removal of the lower shock absorber mounting screws.
4. Remove lower shock absorber mounting screw and nut on each side of vehicle. See 2.24 SHOCK ABSORBERS.
5. Continue to raise vehicle enough to access wiring on underside of rear fender.
6. See Figure 6-56. Unplug license plate lamp harness connector [40] (2).
7. See Figure 6-57. Remove license plate lamp harness (3) from harness bracket (1) and three harness clips (2). Feed harness and connector in through hole in rear fender.
8. See Figure 6-58. Remove two 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).



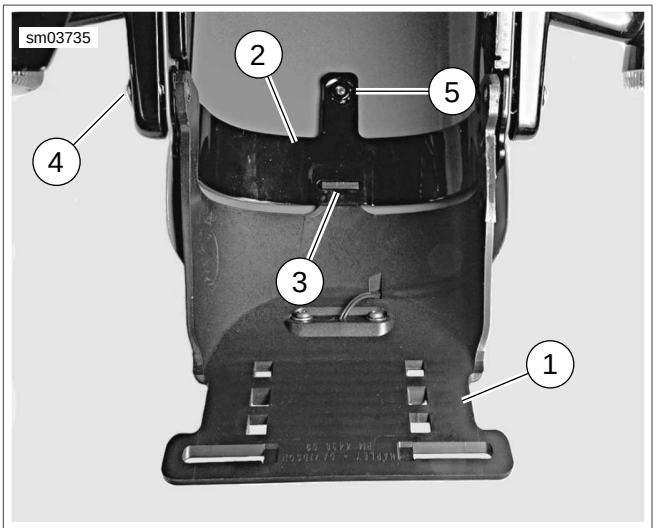
1. Interconnect harness
2. License plate lamp harness connector [40]
3. Right turn signal/brake/tail lamp harness connector [18]
4. Left turn signal/brake/tail lamp harness connector [19]

Figure 6-56. Rear Lighting Interconnect Harness: XL 883N, XL 1200X (HDI)



1. Harness bracket
2. Harness clip (3)
3. License plate lamp harness
4. License plate holder
5. Feedthrough hole

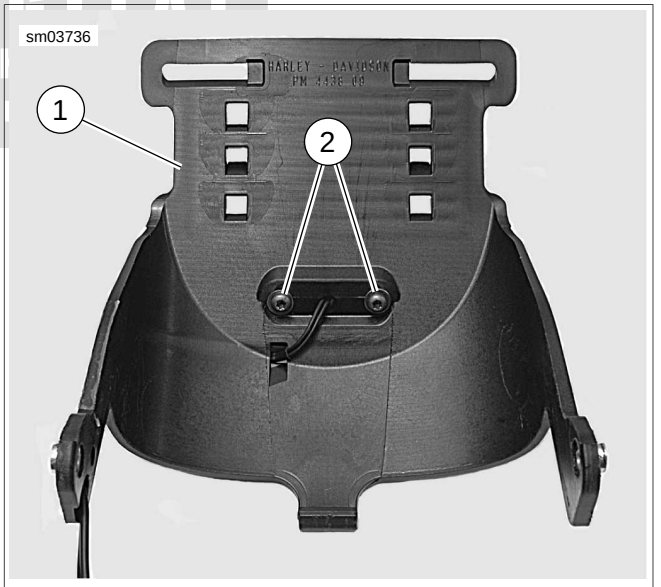
Figure 6-57. License Plate Holder and Lamp Harness Mounting: XL 883N, XL 1200X (HDI)



1. License plate holder
2. Rear fender brace
3. Tab
4. Fender support screw with washer (2)
5. Screw with washer

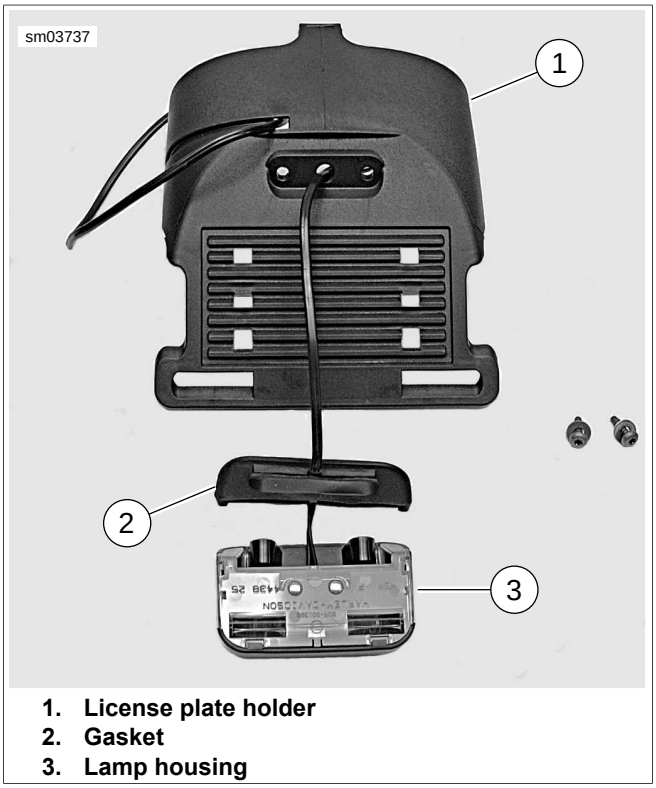
Figure 6-58. License Plate Holder: XL 883N, XL 1200X (HDI)

9. See Figure 6-59. Remove two screws with washers (2) securing license plate lamp housing to license plate holder (1). See Figure 6-60. Separate lamp housing (3) and gasket (2) from license plate holder (1).



1. License plate holder
2. Screw with washer (2)

Figure 6-59. License Plate Holder and Lamp Mounting Screws: XL 883N, XL 1200X (HDI)

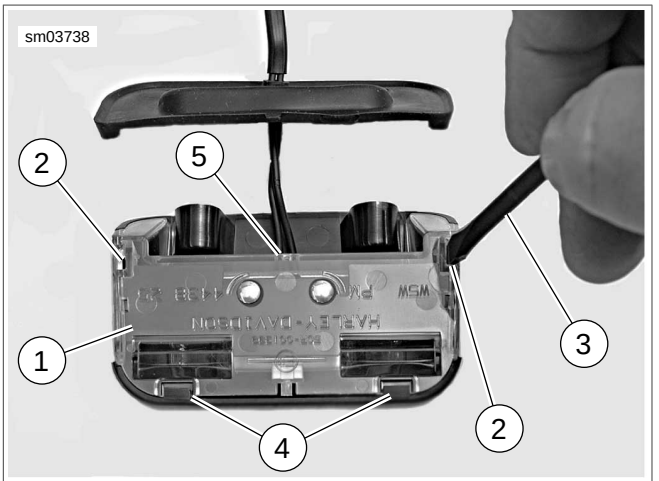


1. **License plate holder**
2. **Gasket**
3. **Lamp housing**

Figure 6-60. Lamp Housing Separated from License Plate Holder: XL 883N, XL 1200X (HDI)

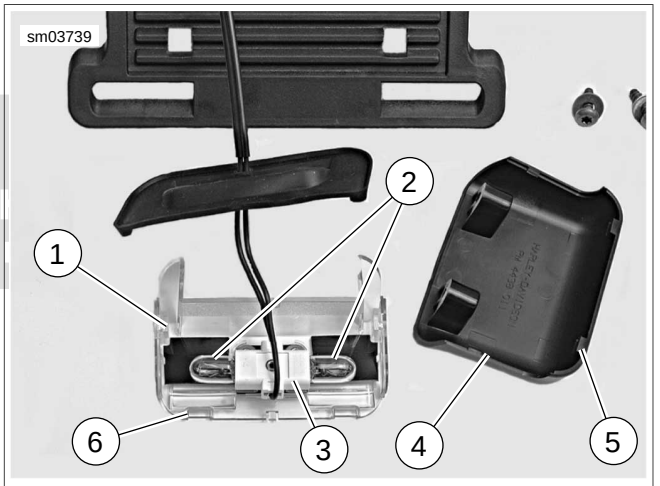
10. See Figure 6-61. Insert the tip of a small flat bladed screwdriver (3) into each slot (2) in lamp housing. Gently tilt screwdriver handle outward (away from lamp housing) just enough to disengage housing from cover. Separate housing from cover and slide housing away from tabs (4) in cover.

11. See Figure 6-62. 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. **Feedthru slots for harness wires**

Figure 6-61. Removing License Plate Lamp Housing Cover: XL 883N, XL 1200X (HDI)



1. **Lamp housing**
2. **Light bulb (2)**
3. **Socket assembly**
4. **Housing cover**
5. **Tab (2)**
6. **Slot (2)**

Figure 6-62. Replacing License Plate Light Bulbs: XL 883N, XL 1200X (HDI)

INSTALLATION: HDI

FASTENER	TORQUE VALUE	
License plate lamp housing screw: XL 883N	14-16 **in-lbs**	1.2-1.3 Nm
Fender support, rear, screw: XL 883N	132-216 **in-lbs**	14.9-24.4 Nm
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

1. If reusing license plate lamp housing, see Figure 6-62. Carefully fit housing cover (4) onto lamp housing (1), sliding tabs on cover (5) into slots (6) in housing. Make sure harness wires fit into feedthrough slots in housing. Gently snap cover onto housing, being careful not to pinch wires.
2. See Figure 6-60. Fit gasket (2) onto lamp housing (3).
3. See Figure 6-59. Install lamp housing onto license plate holder (1) with lamp housing cover facing upward. Secure with two screws (2). Tighten to 14-16 **in-lbs** (1.2-1.3 Nm).
4. See Figure 6-58. Fit tab (3) on license plate holder (1) into slot in rear fender brace (2). Install assembly onto vehicle. Install screw with washer (5) through fender and into fender brace. Tighten only finger-tight at this time.
5. Install two screws with washers (4) through fender struts, fender, fender brace and into threaded inserts in license plate holder.
6. See Figure 6-63. Make sure license plate holder threaded inserts (3) fit into holes (4) in fender brace (2). Tighten to 132-216 **in-lbs** (14.9-24.4 Nm).
7. Now tighten screw securing fender to center of fender brace to 20-25 **in-lbs** (2.3-2.8 Nm).
8. See Figure 6-57. Install license plate lamp harness (3) into three clips (2) in fender bracket. Feed harness and connector through feedthrough hole (5) in fender. Press harness into harness bracket (1).
9. See Figure 6-56. Plug license plate lamp harness connector [40B] into interconnect harness connector [40B] (2).
10. Install lower shock absorber screw and nut on each side of vehicle. Tighten to 45-50 ft-lbs (61-68 Nm). See 2.24 SHOCK ABSORBERS.

⚠WARNING

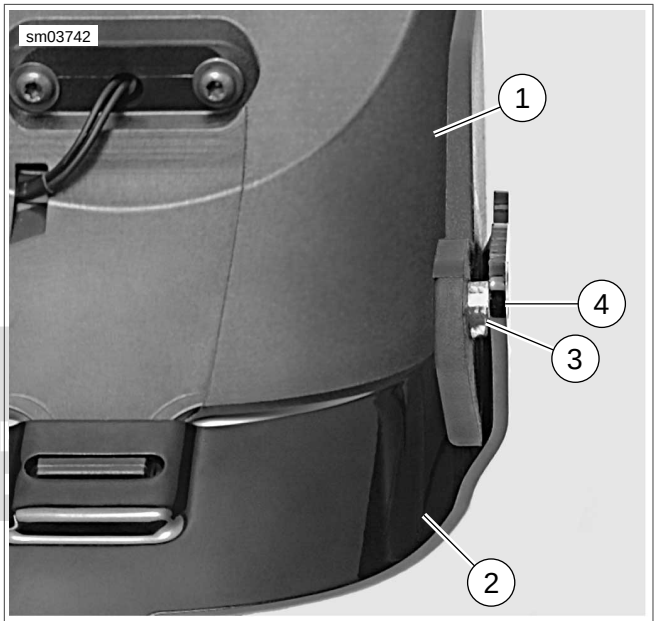
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

11. Install seat.
12. 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)

13. Verify operation of lighting system.



1. **License plate holder**
2. **Rear fender brace**
3. **Threaded insert**
4. **Hole**

Figure 6-63. License Plate Holder and Rear Fender Brace: XL 883N, XL 1200X (HDI)

FRONT TURN SIGNALS 6.18

BULB REPLACEMENT

1. Insert coin in notch of front or rear turn signal lens cap. Carefully twist coin until lens cap pops out of turn signal housing.
2. Replace bulb.
   a. Push bulb and turn counterclockwise.
   b. Pull bulb from socket when tab on bulb clears opening on socket.
   c. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT.
   d. Push **new** bulb in and turn clockwise to lock in place.
3. Snap lens cap back into housing.

ALL EXCEPT XL 1200X

FASTENER	TORQUE VALUE	
Turn signal, front, ball head studs	96-144 **in-lbs**	10.8-16.3 Nm
Turn signal clamp, front, screw	96-120 **in-lbs**	10.8-13.6 Nm

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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

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: XL MODELS or 4.5 FUEL TANK: XR 1200X.
4. Separate left and right wire harness caddies. See 6.27 MAIN WIRING HARNESS.
5. See Figure 6-64. Locate turn signal connector [31] (4) mounted on right wire harness caddy (2). Press latch (5) and separate connector halves.
6. Remove the corresponding socket terminals from connector [31B].
7. See Figure 6-65. Loosen the hex screw holding turn signal housing ball end stud to front of hand lever bracket.
8. Pull the wire conduit through the coil bracket, the fork clamp and handlebar clips.

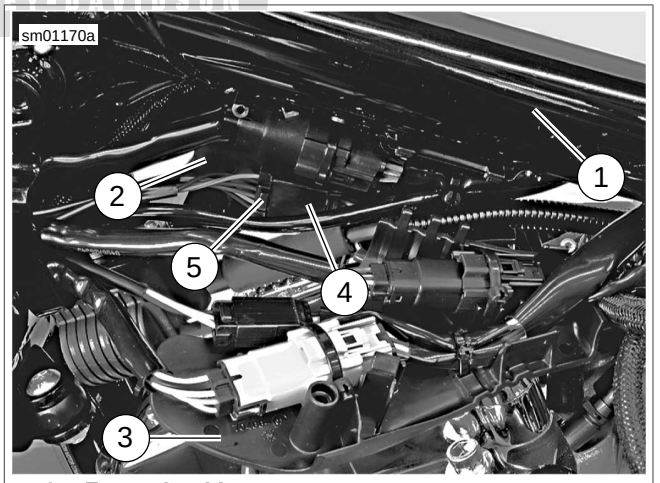
Installation

1. See Figure 6-66. Inspect the ball head stud (1) and replace as required. Tighten **new** ball head studs to 96-144 **in-lbs** (10.8-16.3 Nm).
2. Lay old turn signal housing and wires next to **new** and cut **new** wires to length.
3. Trim sheath back approximately 2.5 in (63.5 mm) and crimp **new** socket terminals onto wires.
4. Route wires through handlebar clips, between fork clamp and head lamp bracket and then through coil bracket.
5. Install housing ball end stud into the lever bracket and aim to front. Tighten to 96-120 **in-lbs** (10.8-13.6 Nm).
6. Insert socket terminals into turn signal connector.
7. Join the connector [31] halves. Reassemble left and right wire harness caddies. See 6.27 MAIN WIRING HARNESS.
8. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
9. 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)

10. Test the turn signals.

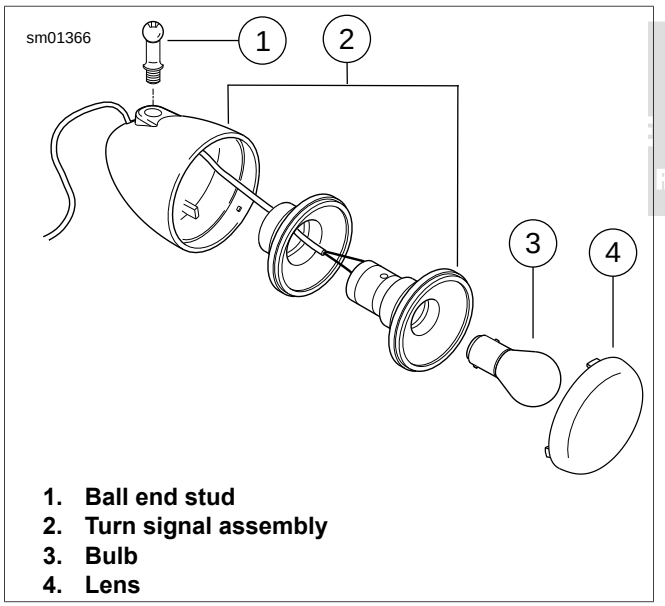


1. **Frame backbone**
2. **Right wire harness caddy**
3. **Left wire harness caddy**
4. **Turn signal connector [31]**
5. **Connector latch**

Figure 6-64. Turn Signal Connector [31]



Figure 6-65. Turn Signal Ball Stud Screw



1. **Ball end stud**
2. **Turn signal assembly**
3. **Bulb**
4. **Lens**

Figure 6-66. Front Turn Signal Components: All Except XL 1200X

XL 1200X

FASTENER	TORQUE VALUE	
Turn signal housing to bracket: XL 1200X	12-16 ft-lbs	16.3-21.7 Nm
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm

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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS.

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: XL MODELS.
4. Separate left and right wire harness caddies. See 6.27 MAIN WIRING HARNESS.
5. Locate the turn signal connector [31] mounted on right wire harness caddy. Press latch and separate connector halves.
6. Remove the corresponding socket terminals from connector [31B].
7. Remove the turn signal bracket fastener (front fork bracket pinch screw) and washer and the bracket.
8. Remove the turn signal nut and lockwasher to remove the turn signal.

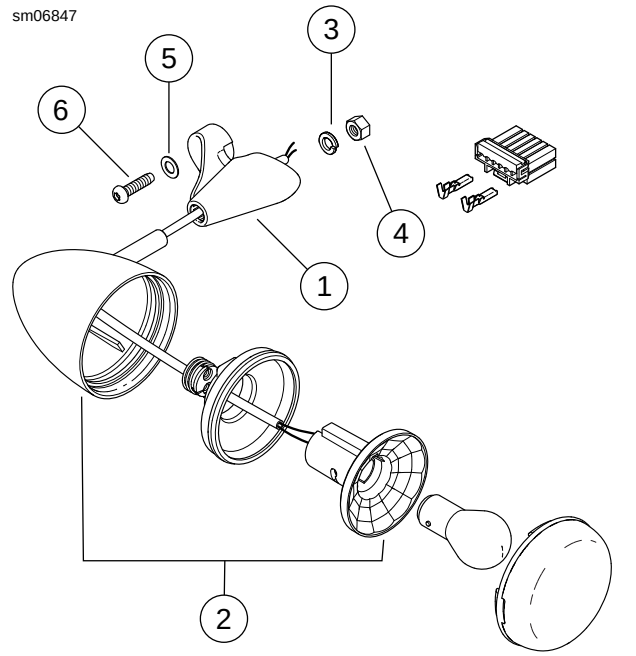
Installation

1. See Figure 6-67. Thread the turn signal leads through the bracket (1).
2. Install the turn signal (2) with the lockwasher (3) and nut (4) and tighten to 12-16 ft-lbs (16.3-21.7 Nm).
3. Fit the bracket to the upper fork clamp.
4. Install and tighten the turn signal bracket fastener (6) and washer (5) (front fork bracket pinch screw) to 30-35 ft-lbs (40.7-47.5 Nm).
5. Insert socket terminals into turn signal connector.
6. Join the connector [31] halves. Reassemble left and right wire harness caddies. See 6.27 MAIN WIRING HARNESS.
7. Install the cable straps.
8. Install the fuel tank. See 4.4 FUEL TANK: XL MODELS.
9. 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)

10. Verify operation of lighting system.



1. **Turn signal bracket**
2. **Turn signal assembly**
3. **Lockwasher**
4. **Nut**
5. **Washer**
6. **Fork pinch screw**

Figure 6-67. Front Turn Signal Components: XL 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR TURN SIGNALS 6.19

GENERAL

Bulb Replacement

See 6.18 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. The rear turn signal/stop lamp functions are provided by an electronic converter module. See 6.20 REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM).

NOTE

XL 883N and XL 1200X/V models in certain markets are equipped with LED rear turn signal/stop lamp/tail lamp assemblies. These models do not require an electronic converter module. The LED assemblies are sealed units and cannot be disassembled. The entire rear turn signal housing assembly must be replaced.

XL 883R/L

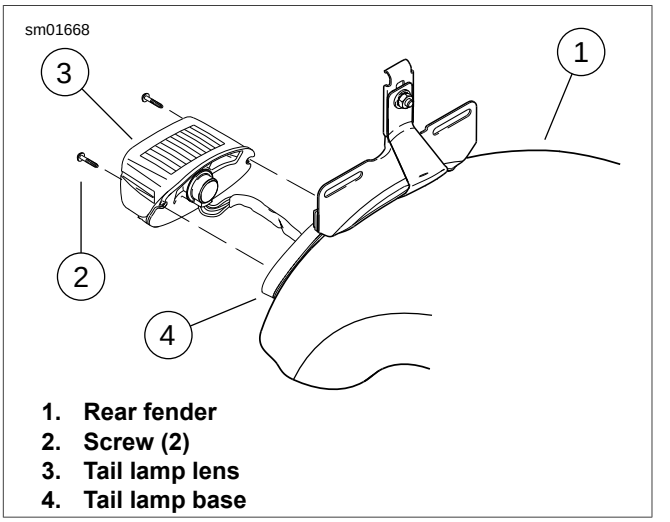
FASTENER	TORQUE VALUE	
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm
Strut cover screw	132-216 **in-lbs**	14.9-24.4 Nm

Removal

WARNING

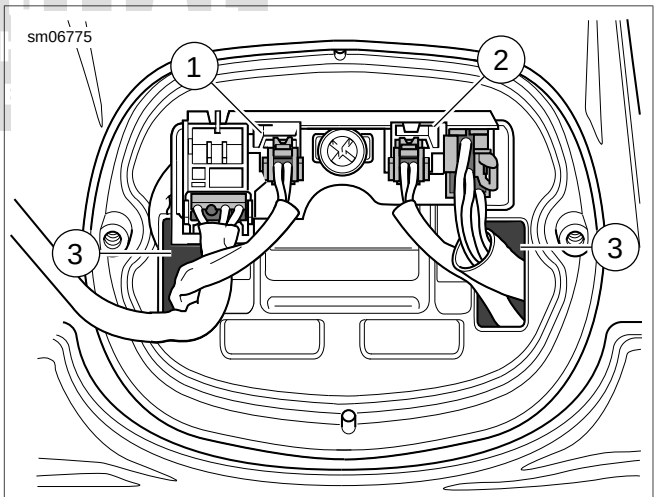
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.
3. See Figure 6-68. Remove two screws (2) and tail lamp lens (3) from tail lamp base (4).
4. See Figure 6-69. 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 2.24 SHOCK ABSORBERS.
6. See Figure 6-70. Disengage turn signal wiring harnesses from wire retention brackets (1).
7. See Figure 6-71. Remove screws (3, 4), washers (5), nuts (7) and nut plate (8).
8. Remove rear fender strut covers (1) with 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). Mount will separate from turn signal housing.



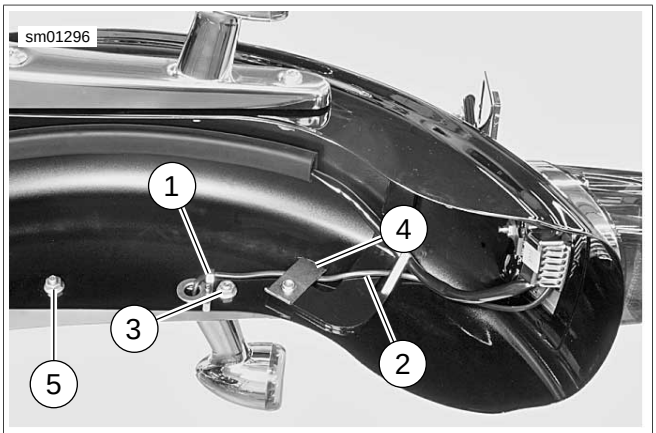
1. **Rear fender**
2. **Screw (2)**
3. **Tail lamp lens**
4. **Tail lamp base**

Figure 6-68. Tail Lamp Lens: All Models Except XL 883N, XL 1200X/V and XL 1200C/C ANV/CP/CA/CB



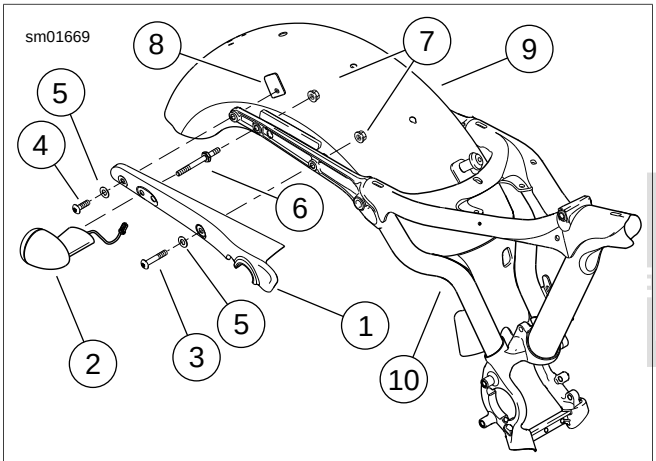
1. **Left turn signal connector [19]**
2. **Right turn signal connector [18]**
3. **Wiring harness access hole (2)**

Figure 6-69. Turn Signal Connectors: All Models Except XL 883N, XL 1200X/V/C/CP/CA/CB



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 6-70. Turn Signal Wire Routing: XL 883R/L



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. **Nut (4)**
8. **Nut plate (2)**
9. **Rear fender**
10. **Frame**

Figure 6-71. 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 6-72. 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 132-216 **in-lbs** (14.9-24.4 Nm).
   b. Tighten strut cover screws to 132-216 **in-lbs** (14.9-24.4 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 2.24 SHOCK ABSORBERS.
14. Install main fuse.

⚠WARNING

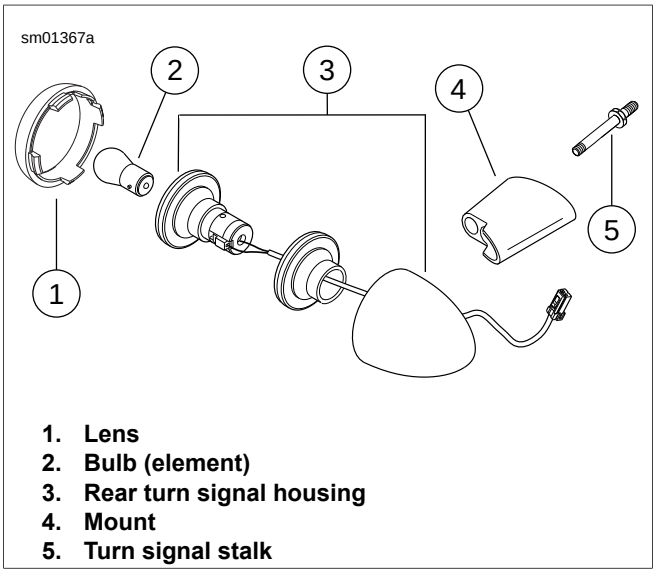
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

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. Verify operation of lighting system.



1. **Lens**
2. **Bulb (element)**
3. **Rear turn signal housing**
4. **Mount**
5. **Turn signal stalk**

Figure 6-72. Rear Turn Signal Components: XL 883R/L

XL 883N AND XL 1200X/V

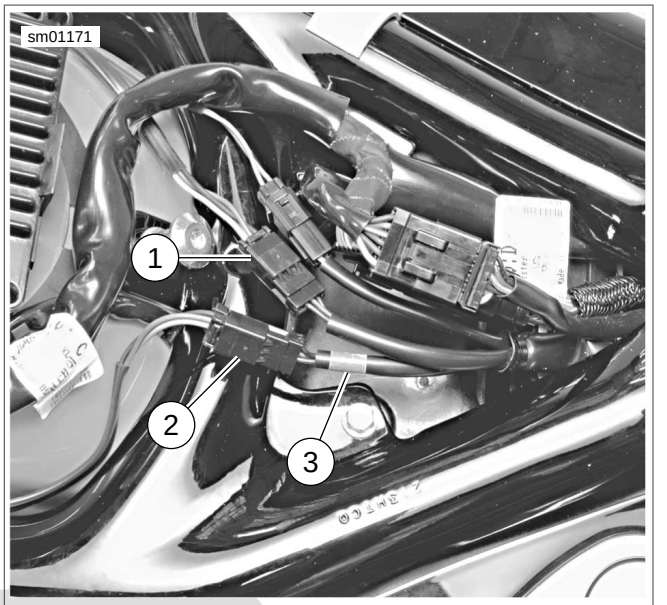
FASTENER	TORQUE VALUE	
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm
Strut cover screw	132-216 **in-lbs**	14.9-24.4 Nm

Removal

WARNING

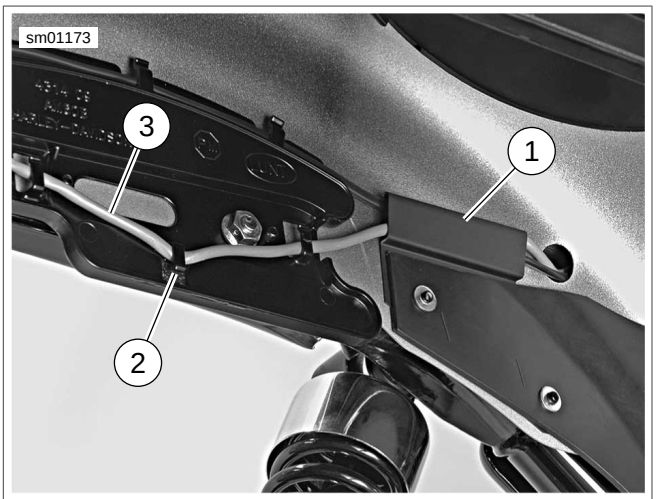
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.
3. Raise the rear wheel.
4. Remove lower shock absorber mounting screws and nuts. See 2.24 SHOCK ABSORBERS.
5. Raise motorcycle to access the underside of the rear fender.
6. See Figure 6-73. Unplug rear lighting harness connectors [18], [19] (1, 2).
7. See Figure 6-74. Remove left rear lighting harness (3) from RH and LH harness bracket (1).
8. Remove lighting harness from RH and LH lower bracket harness clips (2).
9. See Figure 6-75. Pull both rear lighting harnesses (2, 3) through feed-through holes (4, 5) in rear fender.
10. See Figure 6-76. Remove screws (3, 4), washers (5), nuts (7) and nut plate (8). Remove rear fender strut covers (1) with 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). Mount will separate from turn signal housing.



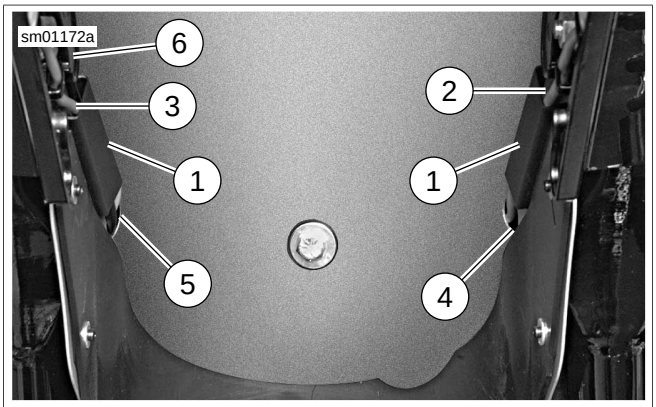
1. **Left rear lighting harness connector [19]**
2. **Right rear lighting harness connector [18]**
3. **Brown band**

Figure 6-73. Rear Lighting Harness Connectors: XL 883N, XL 1200X/V



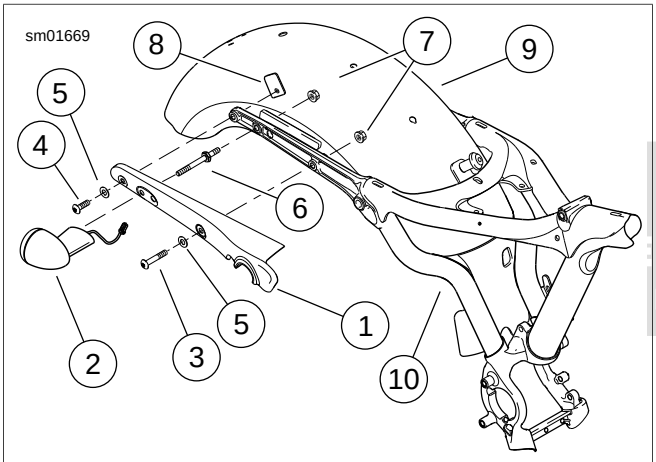
1. **Harness bracket**
2. **Lower bracket harness clip (3)**
3. **Left rear lighting harness**

Figure 6-74. Rear Lighting Harness Removal/Installation: XL 883N, XL 1200X/V



1. **Harness bracket (2)**
2. **Right rear lighting harness**
3. **Left rear lighting harness**
4. **Right feed-through hole**
5. **Left feed-through hole**
6. **License plate lamp harness**

Figure 6-75. Lighting Harnesses 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. **Nut (4)**
8. **Nut plate (2)**
9. **Rear fender**
10. **Frame**

Figure 6-76. 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 6-77. 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. 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 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 6-78. Make certain that tab (3) on nut plate (2) fits into slot (4) in fender brace (1) when securing nut plate with rearmost fender mounting screw (5).

8. Tighten mounting screws in the following sequence:
   a. Tighten turn signal stalk nuts to 132-216 **in-lbs** (14.9-24.4 Nm).
   b. Tighten strut cover screws to 132-216 **in-lbs** (14.9-24.4 Nm).
9. Install lower shock absorber mounting screws and nuts. See 2.24 SHOCK ABSORBERS.
10. Install main fuse.

WARNING

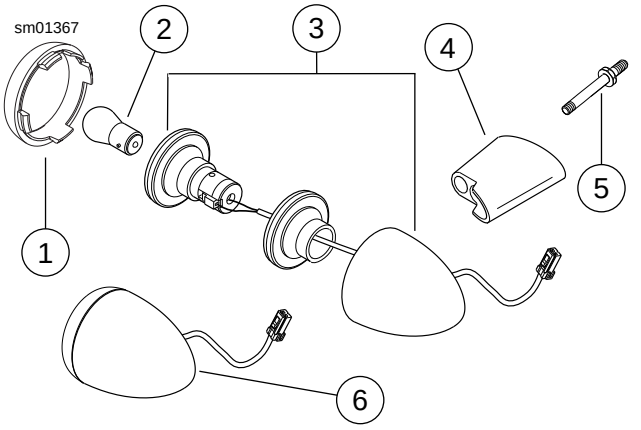
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

11. Install seat.

WARNING

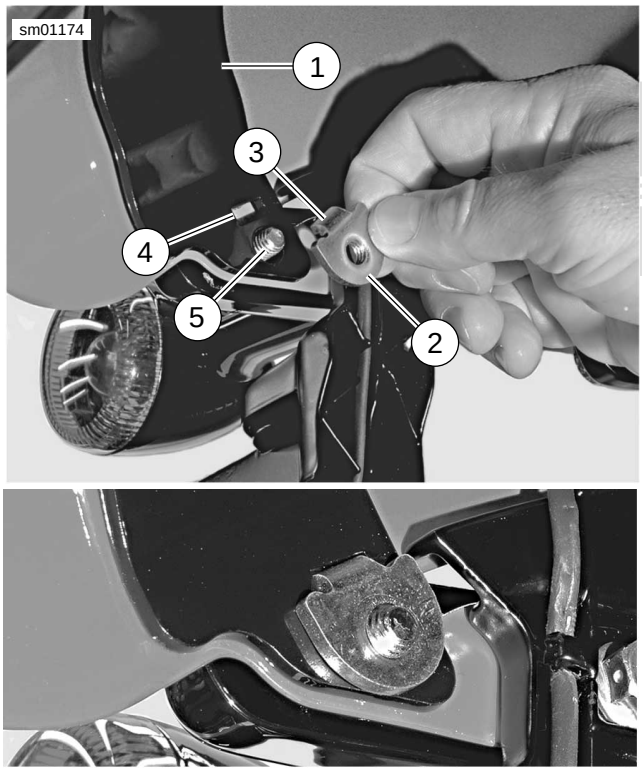
Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

12. Verify operation of lighting system.



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 6-77. Rear Turn Signal Components



1. **Rear fender brace**
2. **Nut plate (2)**
3. **Tab**
4. **Slot**
5. **Mounting screw (2)**

Figure 6-78. Rear Fender Nut Plate: XL 883N, XL 1200X/V

XL 1200C/C ANV/CP/CA/CB

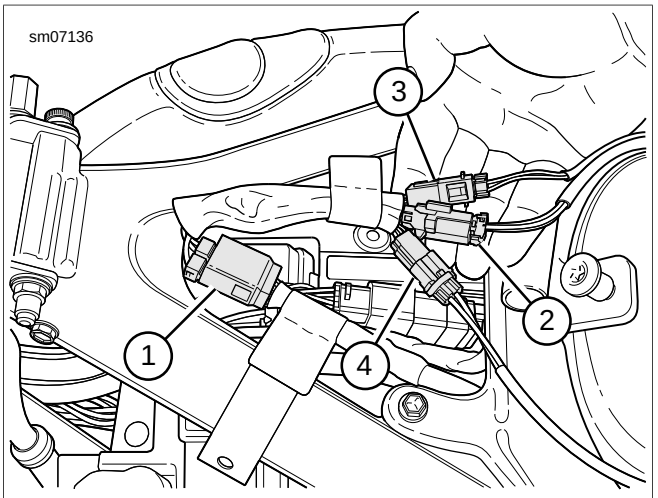
FASTENER	TORQUE VALUE	
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm

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 wheel.
4. Remove the lower shock absorber mounting screws and nuts. See 2.24 SHOCK ABSORBERS.
5. Raise the motorcycle to access the underside of the rear fender.
6. See Figure 6-79. Separate the RH [18] (3) and LH [19] (4) turn signal connector housings.
7. Remove the turn signal wire harness from the RH and LH 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 RH [18B] and LH [19B] turn signal connectors.



1. **Main harness connector [7]**
2. **Tail lamp connector [40]**
3. **RH turn signal connector [18]**
4. **LH turn signal connector [19]**

Figure 6-79. Turn Signal Wire Harness: XL 1200C/C ANV/CP/CA/CB

Installation

1. Lay turn signal housing wires next to **new** and 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 and 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], [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 132-216 **in-lbs** (14.9-24.4 Nm).
   b. Fender strut cover to strut to 132-216 **in-lbs** (14.9-24.4 Nm).
9. Thread turn signal wires through fender and behind the wire retention bracket.
10. Thread the turn signal wires through the fender openings and connect the housings [18] and [19].
11. Install shock absorber mounting screws and nuts and lower the motorcycle. See 2.24 SHOCK ABSORBERS.
12. 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)

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)

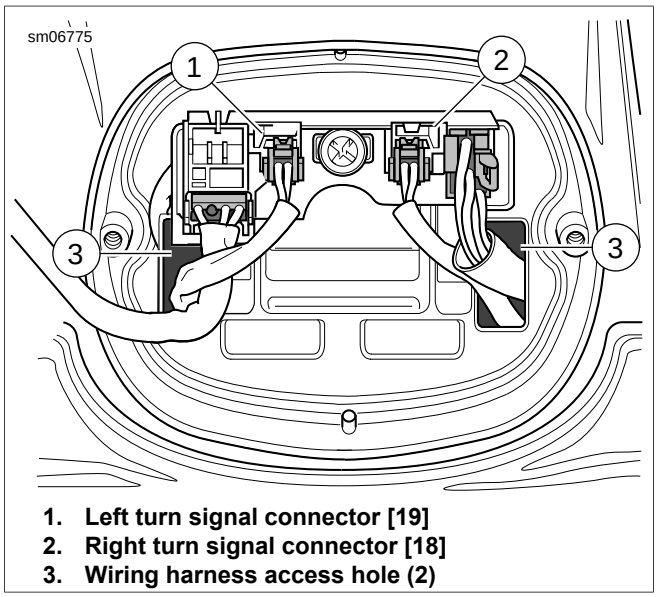
14. Verify operation of lighting system.

XR 1200X

FASTENER	TORQUE VALUE	
Turn signal housing, rear, screws: XR 1200X	30-40 **in-lbs**	3.4-4.5 Nm

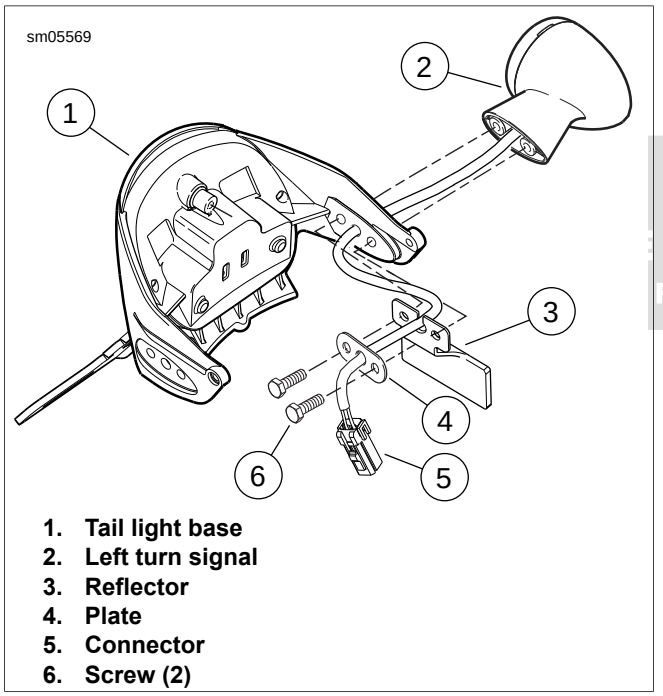
Removal

1. Remove seat.
2. Remove main fuse.
3. Remove two screws and tail lamp lens from tail lamp base.
4. See Figure 6-80. Remove left and right turn signal connectors (1, 2). Pull turn signal wiring harnesses through harness access holes in tail lamp base (3).
5. Remove socket terminals from left and right turn signal connectors.
6. See Figure 6-81. Remove screws (6), plate (4), reflector (3) and turn signal housing (2).
7. 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).
8. Crimp **new** terminals onto wires.



1. **Left turn signal connector [19]**
2. **Right turn signal connector [18]**
3. **Wiring harness access hole (2)**

Figure 6-80. Turn Signal Connectors: All Models Except XL 883N, XL 1200X/V/C/CP/CA/CB



1. **Tail light base**
2. **Left turn signal**
3. **Reflector**
4. **Plate**
5. **Connector**
6. **Screw (2)**

Figure 6-81. Turn Signal Housing Removal: XR 1200X

Installation

1. See Figure 6-81. Install turn signal housing (2), reflector (3), and plate (4) with screws (6). Tighten screws to 30-40 **in-lbs** (3.4-4.5 Nm).
2. Press wiring harness terminal sockets into left [19B] and right [18B] connector housings.
3. Push left and right turn signal wiring harnesses through corresponding harness access holes in tail lamp base.
4. Plug left turn signal connector [18] and right connector [19] into left and right sockets located on rear lighting circuit board in tail lamp base.
5. Attach tail lamp lens to tail lamp base.
6. 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)

⚠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.
8. Verify operation of lighting system.

DIGITAL TECHNICIAN® II
HARLEY-DAVIDSON®

REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM) 6.20

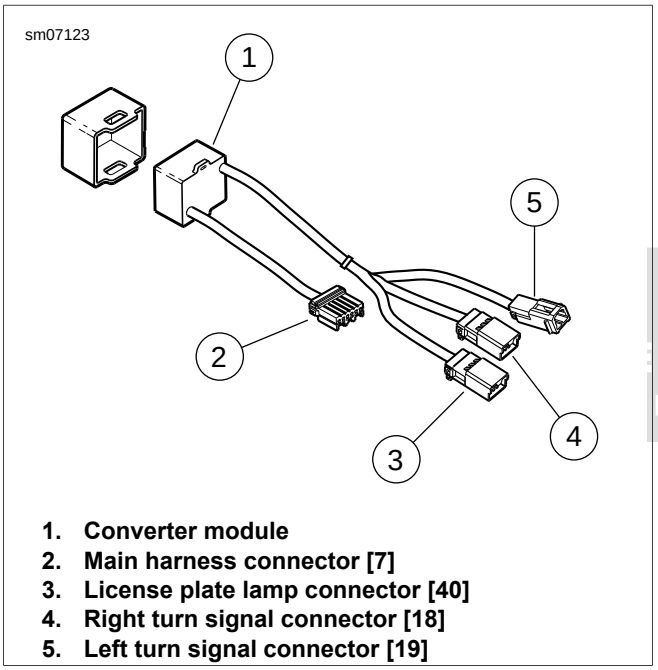
GENERAL

NOTE

HDI XL 883N and XL 1200X/V models have a sealed LED tail lamp, stop lamp and turn signal assembly in each rear turn signal housing.

The domestic XL 883N and XL 1200X/V rear turn signal lamps also serve as tail lamps and stop lamps. One filament provides the tail lamp function while the other filament provides the turn signal and stop lamp.

See Figure 6-82. In order for a single filament to function both as turn signal and stop lamp, a converter module is required. The converter module is located in front of the battery, under the frame "Y" section.



1. **Converter module**
2. **Main harness connector [7]**
3. **License plate lamp connector [40]**
4. **Right turn signal connector [18]**
5. **Left turn signal connector [19]**

Figure 6-82. Converter and Interconnect Harness

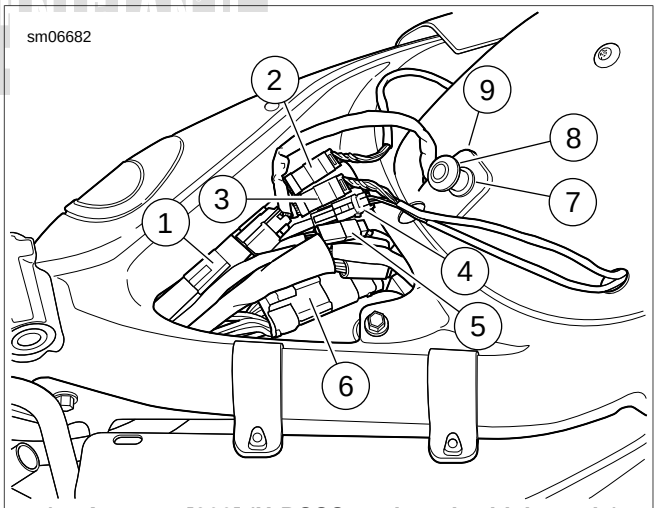
REMOVAL

1. Remove seat.

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)

2. Remove battery. See 1.22 BATTERY MAINTENANCE.
3. See Figure 6-83. Unplug the following harness connectors:
   a. Antenna [209] (1) (H-DSSS equipped motorcycles only)
   b. Right rear lighting harness [18] (2)
   c. Left rear lighting harness [19] (3)
   d. License plate lamp harness [40] (4)
   e. Main wiring harness [7] (5)
   f. Engine harness connector [145] (6)
4. See Figure 6-84. Remove ECM caddy fastener.
5. Remove right side cover.
6. Remove fastener securing bracket to oil tank.
7. Remove barbed cable strap securing temperature sensor harness to bracket.
8. See Figure 6-85. Remove bracket fasteners (2).
9. Remove bracket (3) with converter module (7).
10. Remove cable strap securing temperature sensor wire to oil tank mounting bracket.
11. Remove rubber mounting tab (5) from mounting tab hole (4) to release module from bracket.



1. **Antenna [209] (H-DSSS equipped vehicles only)**
2. **Right rear lighting harness connector [18]**
3. **Left rear lighting harness connector [19]**
4. **License plate lamp harness [40]**
5. **Main wiring harness connector [7]**
6. **Engine harness connector [145]**
7. **Flat washer**
8. **Seat post**
9. **Frame crossmember tab**

Figure 6-83. Rear Lighting Harness Connectors: XL 883N, XL 1200X/V

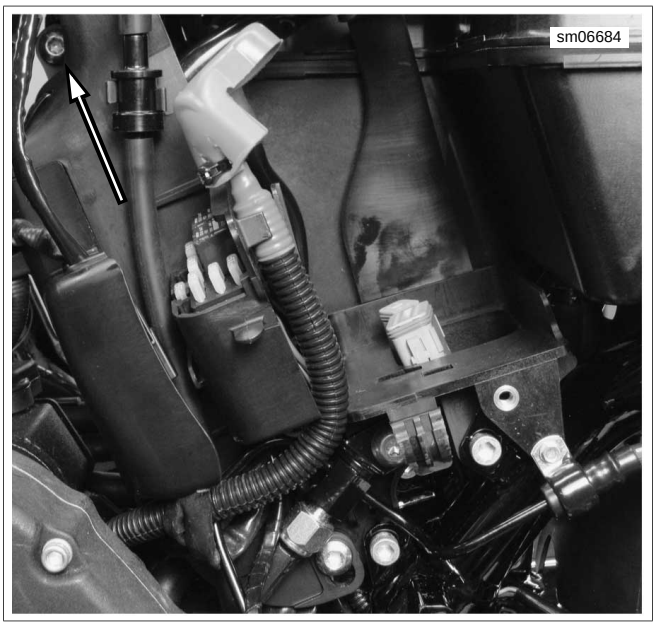
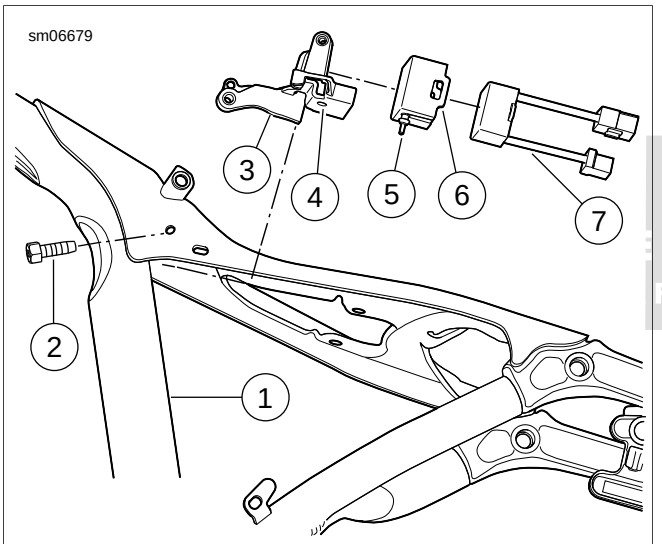


Figure 6-84. ECM Caddy Fastener



1. **Frame**
2. **Bracket fastener (3)**
3. **Bracket**
4. **Mounting tab hole**
5. **Rubber mounting tab**
6. **Module holder**
7. **Module**

Figure 6-85. Converter Module

INSTALLATION

FASTENER	TORQUE VALUE	
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm
Converter module bracket fasteners, rear lighting	36-60 **in-lbs**	4.1-6.8 Nm

1. Feed converter module/interconnect harness connectors up through battery compartment, forward of battery strap bracket.
2. See Figure 6-85. Install module (7) and module holder (6) into bracket (3) by pulling rubber mounting tab (5) into mounting tab hole (4).
3. Position bracket up inside frame, under "Y" section.
4. Install but do not tighten bracket fasteners (2).
5. See Figure 6-84. Install ECM caddy fastener. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
6. Tighten bracket fasteners to 36-60 **in-lbs** (4.1-6.8 Nm).
7. Secure temperature sensor wire to oil tank mounting bracket with a cable strap.
8. Install right side cover.
9. See Figure 6-83. Plug in the following harness connectors:
   a. Antenna [209] (1)
   b. Right rear lighting harness [18] (2)
   c. Left rear lighting harness [19] (3)
   d. License plate lamp harness [40] (4)
   e. Main wiring harness [7] (5)
   f. Engine harness connector [145] (6)
10. Install battery. See 1.22 BATTERY MAINTENANCE.

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. Close left side cover. See 2.18 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)

12. Install seat.
13. Verify operation of lighting system.

REAR STOP LAMP SWITCH 6.21

GENERAL

XL Models: See Figure 6-86. The rear stop lamp switch (3) is located behind the rear brake master cylinder reservoir under the left side cover. The rear stop lamp switch is threaded into a tee nut in the rear brake line.

XR 1200X: The rear stop lamp switch is located underneath the motorcycle near the rear brake master cylinder reservoir. The rear stop lamp switch threads into a tee nut in the rear brake line.

The stop lamp switch is an open type switch which closes with hydraulic pressure. When the pressure in the line reaches a preset level, the rear stop lamp switch closes and the rear stop lamp illuminates.

NOTE

This part cannot be repaired. Replace upon failure.

REPLACEMENT

FASTENER	TORQUE VALUE	
Stop lamp switch to tee nut	132-168 **in-lbs**	14.9-18.9 Nm
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm

1. Remove main fuse.
2. **XL Models:** move rear brake master cylinder reservoir out of the way:
   a. Remove the rear brake master cylinder reservoir cover. Grasp cover and pull straight away from reservoir.
   b. Remove reservoir mounting screw and secure reservoir upright out of the way. See 2.13 REAR BRAKE MASTER CYLINDER RESERVOIR.
3. See Figure 6-86 or Figure 6-87. Pull terminal sockets from spade connections (4) on stop lamp switch.
4. Remove stop lamp switch (3) from tee nut (2).
5. Thread **new** stop lamp switch (3) to tee nut (2) on brake line. Tighten switch to 132-168 **in-lbs** (14.9-18.9 Nm).

NOTE

***XR 1200X:** Make sure that the brake switch wires do not contact the ground strap cable.*

6. Install terminal sockets on switch spade connections (4).
7. **XL Models:** Install rear brake master cylinder reservoir:
   a. Replace the reservoir mounting screw. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
   b. Replace the brake master cylinder reservoir cover.
8. Install main fuse.
9. Install left side cover.
10. Refill master cylinder and bleed brakes. See 2.17 BLEEDING BRAKES.

WARNING

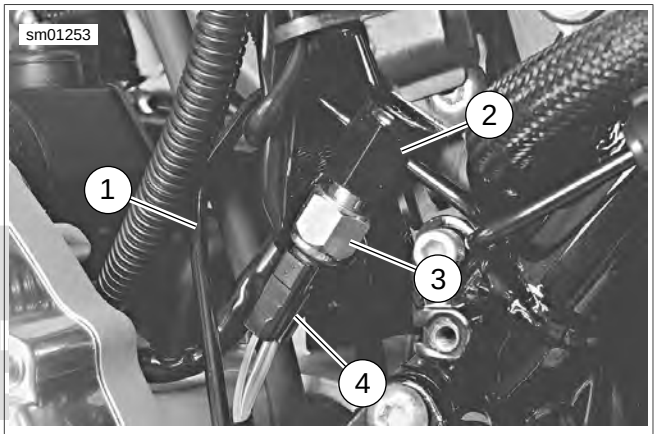
After repairing the brake system, test brakes at low speed. If brakes are not operating properly, testing at high speeds can cause loss of control, which could result in death or serious injury. (00289a)

11. Test operation of rear brake.

WARNING

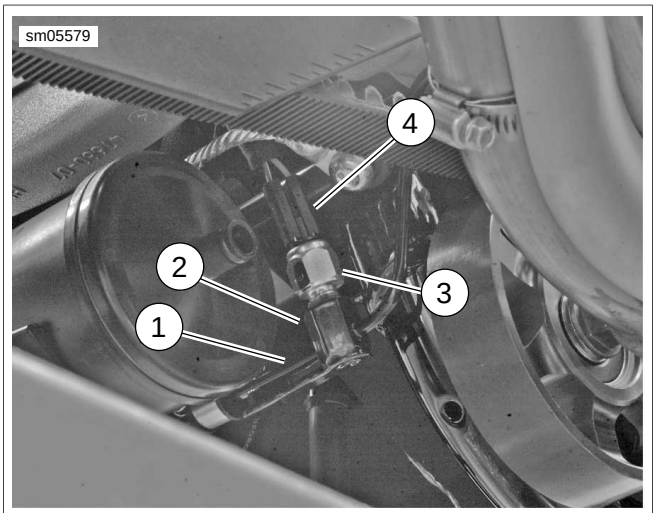
Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

12. Test operation of stop lamp with the rear brake applied and the ignition/light switch turned ON.



1. **Rear brake line**
2. **Tee nut**
3. **Rear stop lamp switch**
4. **Spade connector terminal socket (2) [121]**

Figure 6-86. Rear Stop Lamp Switch: XL Models Only



1. Rear brake line
2. Tee nut
3. Rear stop lamp switch
4. Spade connector terminal socket (2) [121]

Figure 6-87. Rear Stop Lamp Switch: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CRANK POSITION SENSOR (CKP) 6.22

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

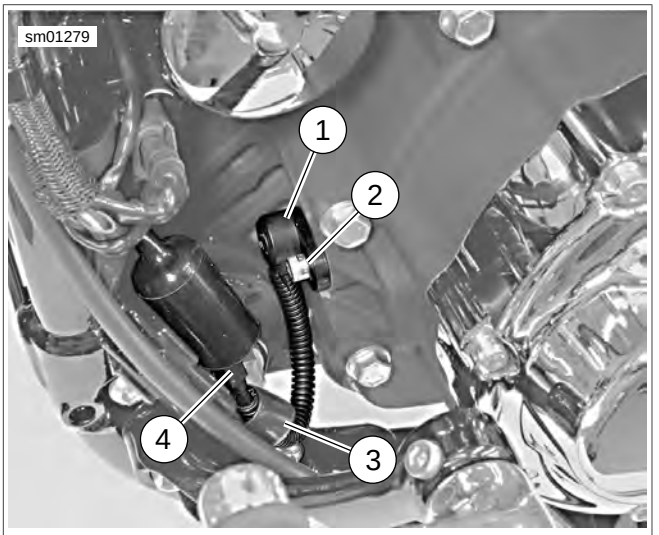
This part cannot be repaired. Replace upon failure.

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 6-88. 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] (under protective rubber boot)**

Figure 6-88. CKP Sensor (typical, XL model shown)

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 6-88. 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 and verify operation.

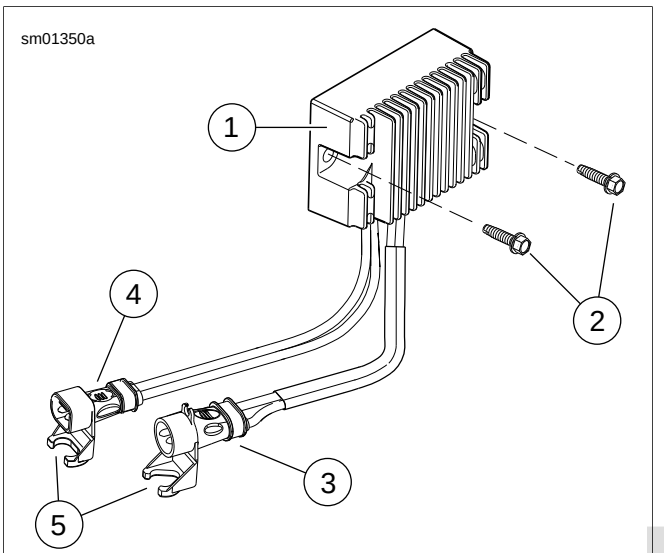
VOLTAGE REGULATOR 6.23

GENERAL

See Figure 6-89. The voltage regulator is located between the frame downtubes at the front of the motorcycle. Verify latch (5) connection to prevent connector separation.

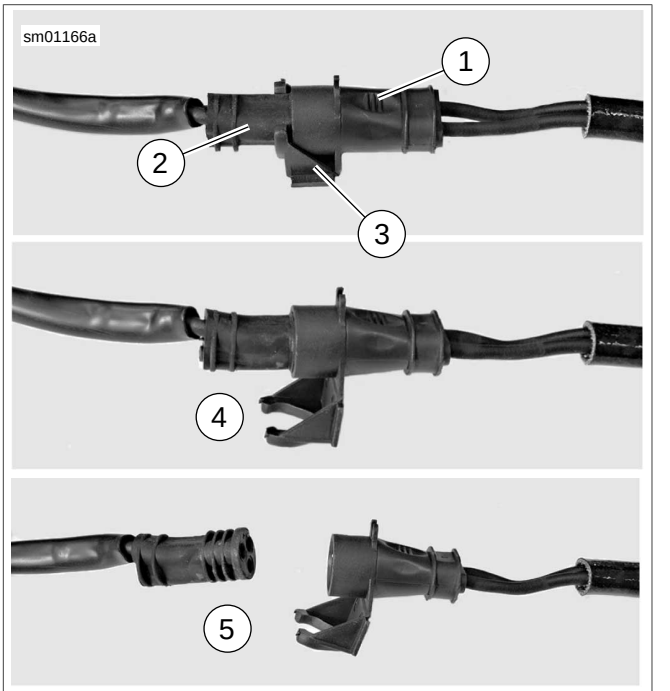
NOTE

This part cannot be repaired. Replace upon failure.



1. **Voltage regulator**
2. **Screw (2)**
3. **Stator pin connector [47A]**
4. **DC output pin connector [77A]**
5. **External latch**

Figure 6-89. Voltage Regulator



1. **Pin connector [47A] (voltage regulator side)**
2. **Socket connector [47B] (stator side)**
3. **External latch**
4. **Open latch**
5. **Separate socket connector from pin connector**

Figure 6-90. Separating Stator Connector Housings

REMOVAL: XL MODELS

⚠WARNING

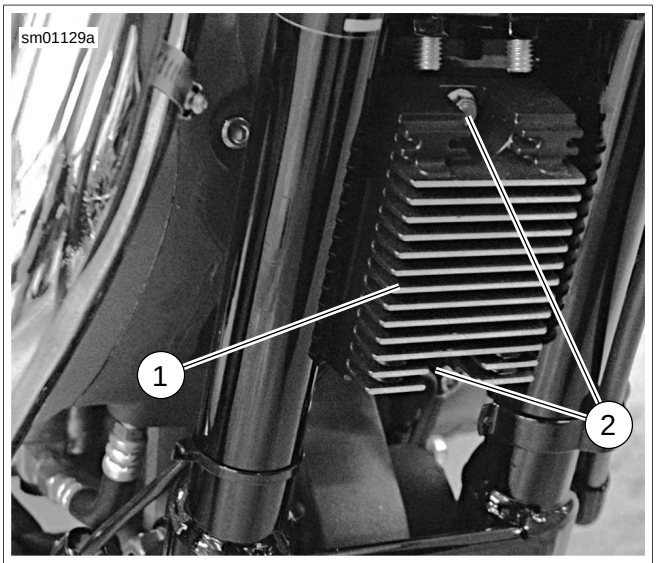
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.

NOTE

Never pull on wiring when unplugging voltage connector.

2. Unplug stator connector [47]. Lift external latch on pin housing and separate connector halves.
3. Lift external latch on DC output connector [77] pin housing and separate connector halves.
4. See Figure 6-91. Remove screws (2) from locations at top and bottom of voltage regulator. Remove regulator from vehicle, carefully threading harnesses through opening in regulator mounting bracket.



1. **Voltage regulator**
2. **Mounting screw (2)**

Figure 6-91. Voltage Regulator Location

INSTALLATION: XL MODELS

FASTENER	TORQUE VALUE	
Voltage regulator mounting screw	36-60 **in-lbs**	4.1-6.8 Nm

1. Position voltage regulator close to mounting bracket. Orient regulator so cooling fins face forward and wiring harnesses exit regulator body toward right side of vehicle.
2. Route stator harness down along between right frame downtube and body of voltage regulator. Route stator harness connector [47A] toward right side of vehicle.
3. Mount voltage regulator on mounting bracket between frame downtubes and secure with mounting screws at two locations. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
4. Plug stator connector [47A] into socket connector [47B]. Fold external locking latch over and lock in place.
5. Plug voltage regulator DC output connector [77A] into socket [77B]. Fold external latch over and lock in place.
6. Install main fuse.
7. Test charging system. See the electrical diagnostic manual.

REMOVAL: XR 1200X

WARNING

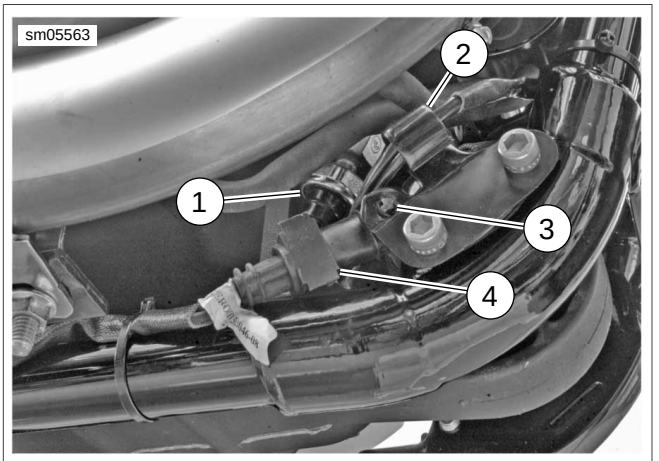
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.

NOTE

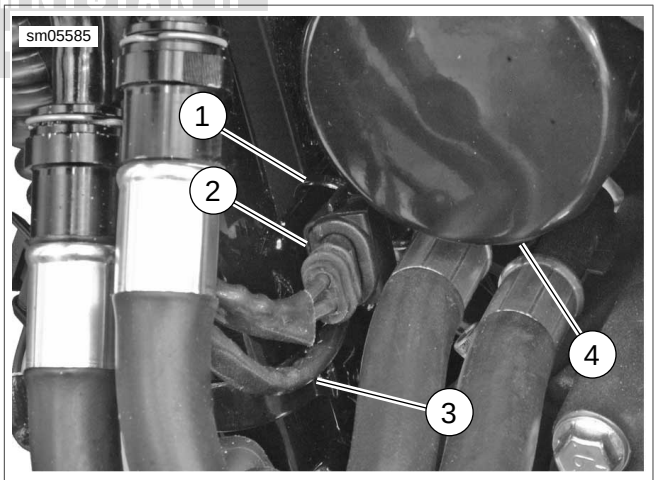
Never pull on wiring when unplugging voltage connector.

2. See Figure 6-92. Unplug stator connector (4). Carefully pull barbed cable strap (3) from frame.
3. See Figure 6-93. Cut cable strap (1). Lift external latch on connector and separate connector halves.
4. See Figure 6-94. Remove screws (1) from locations at top and bottom of voltage regulator (2). Remove regulator from vehicle, carefully threading harnesses through opening in regulator mounting bracket.



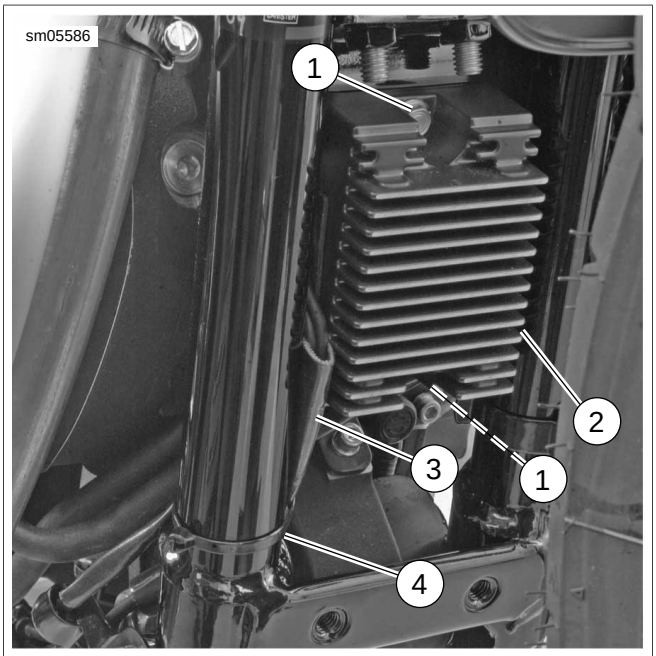
1. **Oil pressure switch**
2. **J-clip**
3. **Barbed cable strap**
4. **Stator connector [47]**

Figure 6-92. Oil Pressure Switch: XR 1200X



1. **Cable strap**
2. **DC output conector**
3. **Oil pressure switch, neutral switch harness**
4. **Oil filter**

Figure 6-93. DC Output Connector: XR 1200X



1. **Screw (2)**
2. **Voltage regulator**
3. **Stator wiring**
4. **Cable strap**

Figure 6-94. Stator Wire Routing: XR 1200X

INSTALLATION: XR 1200X

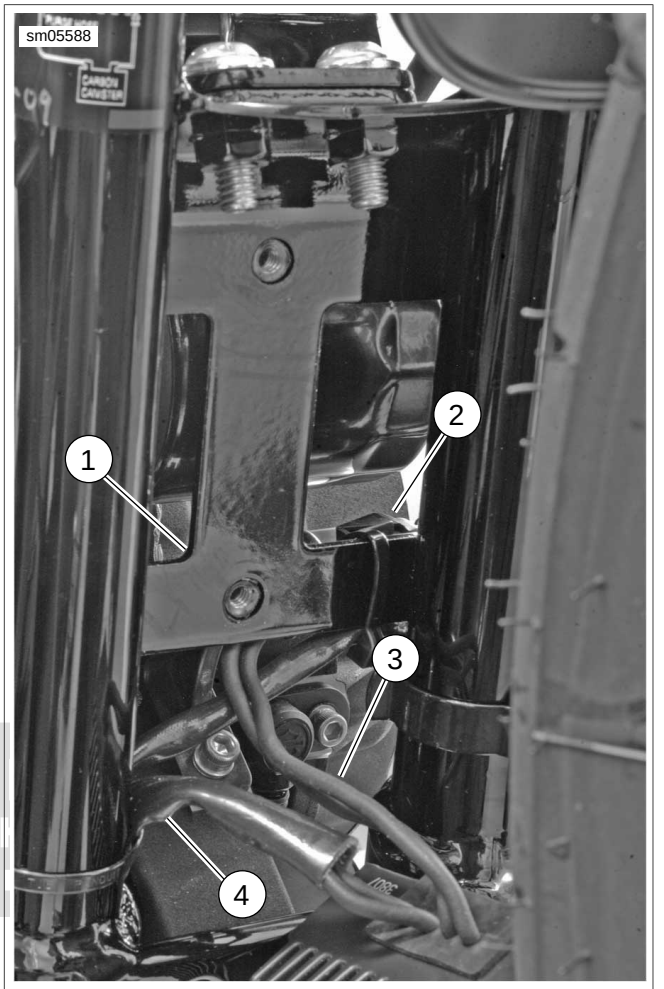
FASTENER	TORQUE VALUE	
Voltage regulator mounting screw	36-60 **in-lbs**	4.1-6.8 Nm

1. See Figure 6-95. Position voltage regulator close to mounting bracket (1). Orient regulator so cooling fins face forward and wiring harnesses exit regulator body toward right side of vehicle.
2. Thread DC output wires below mounting bracket. Route DC output connector (2) toward left side of vehicle.
3. Route stator wires (4) down along between right frame downtube and body of voltage regulator. Route stator harness connector [46A] toward right side of vehicle.

NOTE

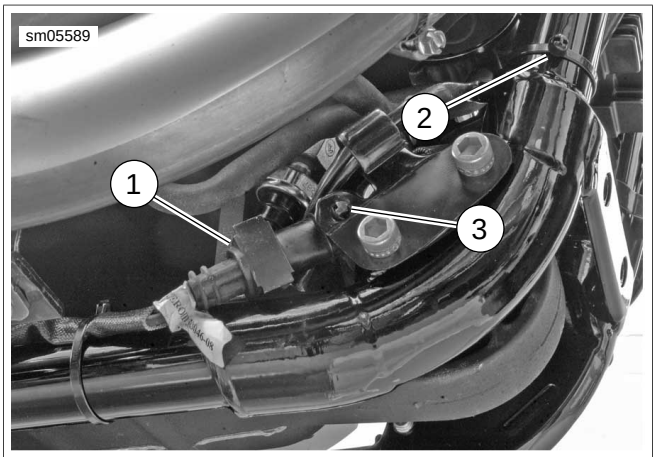
Verify that the wires do not get pinched between bracket and regulator.

4. Secure voltage regulator on mounting bracket with mounting screws. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
5. See Figure 6-96. Connect stator connector (1) and fold external latch over and lock in place. Secure stator connector to bracket with barbed cable strap (3).
6. Secure stator wires to right frame down tube with cable strap (2).
7. See Figure 6-97. Connect voltage regulator DC output connector. Fold external latch over and lock in place.
8. Secure DC output connector (2) along with oil pressure switch, neutral switch harness (3) to voltage regulator bracket with cable strap (1).
9. Install main fuse.
10. Test charging system. See the electrical diagnostic manual.



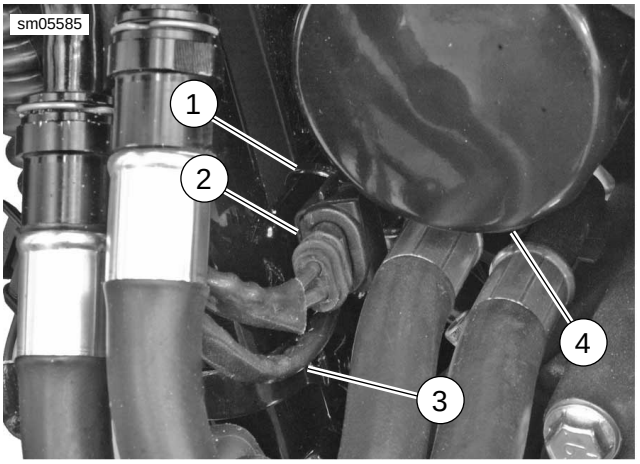
1. **Voltage regulator mounting bracket**
2. **DC output connector**
3. **DC output wires**
4. **Stator wires**

Figure 6-95. Voltage Regulator Wire Routing: XR 1200X



1. Stator connector
2. Cable strap
3. Barbed cable strap

Figure 6-96. Stator Connector: XR 1200X



1. Cable strap
2. DC output conector
3. Oil pressure switch, neutral switch harness
4. Oil filter

Figure 6-97. DC Output Connector: XR 1200X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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 1.22 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: XL MODELS or 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X.
4. Repair components as necessary.

Rotor: XL Models

NOTE

XR 1200X: *The XR 1200X engine sprocket and rotor are not available separately. If either the sprocket or rotor is damaged, the entire assembly must be replaced.*

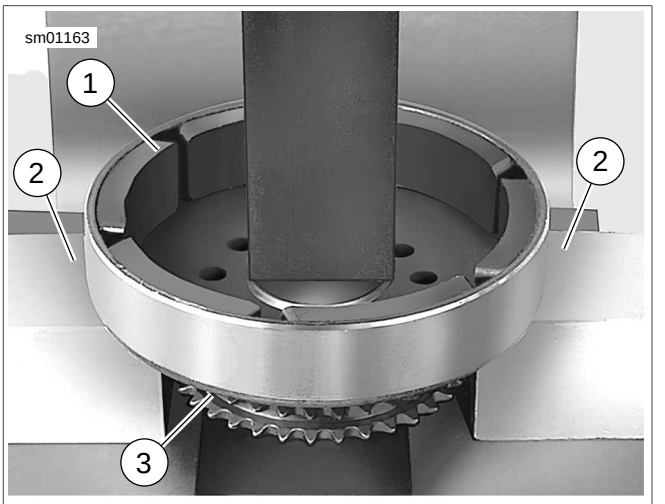
1. Remove bolts securing alternator rotor to engine sprocket.
2. See Figure 6-98. Position blocking (2) under rotor (1). Press sprocket (3) free of rotor.

NOTE

Resistance to sprocket/rotor disassembly is due in part to the magnetic force of the permanent rotor magnets.

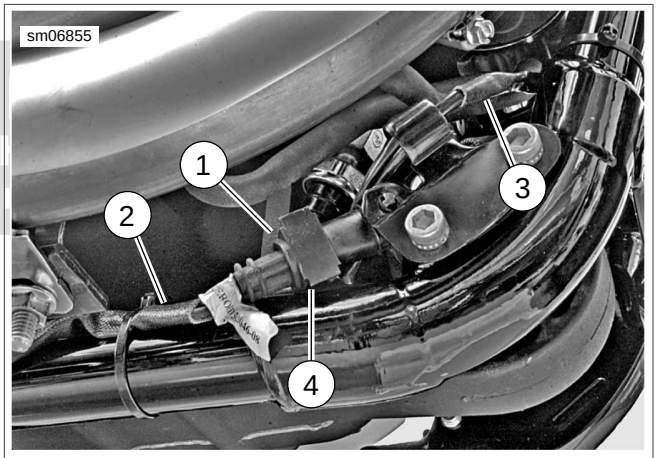
Stator

1. See Figure 6-99. Open external latch (4) and unplug stator harness connector [46B] (2) from voltage regulator harness connector [46A] (3). See 6.23 VOLTAGE REGULATOR.
2. Make note of cable strap positions and remove cable straps from stator harness.
3. Withdraw stator harness from opening between right crankcase half and gear case cover.
4. See Figure 6-100. Using a T-27 TORX driver, remove and discard screws (3) securing stator to left crankcase half.
5. Remove two screws (9) and harness retainer (8).
6. Remove stator harness grommet (10) from left crankcase half.
7. Withdraw stator harness from grommet hole in left crankcase half. Remove stator.



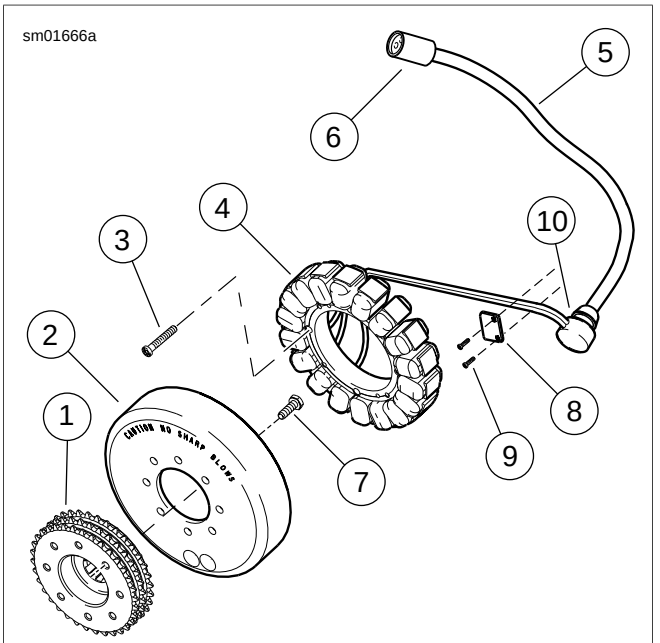
1. **Rotor**
2. **Blocking**
3. **Sprocket**

Figure 6-98. Removing Rotor from Sprocket (XL Models Only)



1. **Stator connector [46]**
2. **Stator harness**
3. **Voltage regulator harness**
4. **External latch**

Figure 6-99. Stator Connector Location



1. **Motor sprocket**
2. **Rotor**
3. **Screw (4)**
4. **Stator**
5. **Stator wiring harness**
6. **Connector [46B]**
7. **Bolt (8)**
8. **Stator harness retainer**
9. **Screw (2)**
10. **Stator harness grommet**

Figure 6-100. Alternator Components

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.

NOTE

Replace parts as necessary.

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. See Figure 6-100. Feed stator wiring harness (5) with attached grommet (10) 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 (4) on left crankcase half. Secure stator using **new** TORX screws. Use TORX driver to tighten screws to 30-40 **in-lbs** (3.4-4.5 Nm).
4. Position stator harness retainer (8) over harness and onto engine crankcase with mounting holes facing aft. Secure with two screws (9). Verify that the harness is not pinched. Tighten to 56 **in-lbs** (6.3 Nm) (maximum). Do not exceed torque specification.
5. Route stator wiring harness across top of crankcase halves to right side of engine. Route stator harness downward through opening between right crankcase half and gear-case cover.
6. Route stator harness forward and then upward along inboard side of right frame downtube.
7. Connect stator harness to voltage regulator harness at connector [46] and lock external latch in place. See 6.23 VOLTAGE REGULATOR for procedure.
8. Secure stator harness and neutral switch with cable straps as noted from stator removal.

Rotor: XL Models

NOTE

XR 1200X rotor assembly is not serviceable. If damaged, replace the entire engine sprocket/rotor assembly.

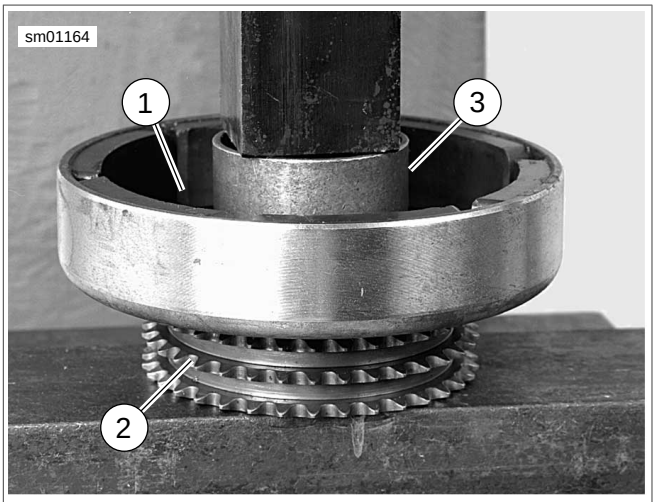
1. See Figure 6-101. Position rotor (1) on sprocket (2). Align holes in sprocket with holes in rotor.
2. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to each mounting bolt. Insert mounting bolts through rotor. Start bolts into tapped holes in sprocket.
3. Position a section 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: XL MODELS or 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

2. Install primary cover, left footrest assembly and gear shift lever. See 5.3 PRIMARY COVER.
3. Connect battery. See 1.22 BATTERY MAINTENANCE.
4. Test charging system. See electrical diagnostic manual.



1. **Rotor**
2. **Sprocket**
3. **Pipe section**

Figure 6-101. Pressing Rotor onto Sprocket (XL Models Only)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

VEHICLE SPEED SENSOR (VSS) 6.25

GENERAL

The VSS is powered and monitored by the ECM. The ECM processes the vehicle speed signal and transmits this signal to the TSM/TSSM and speedometer through serial data.

NOTE

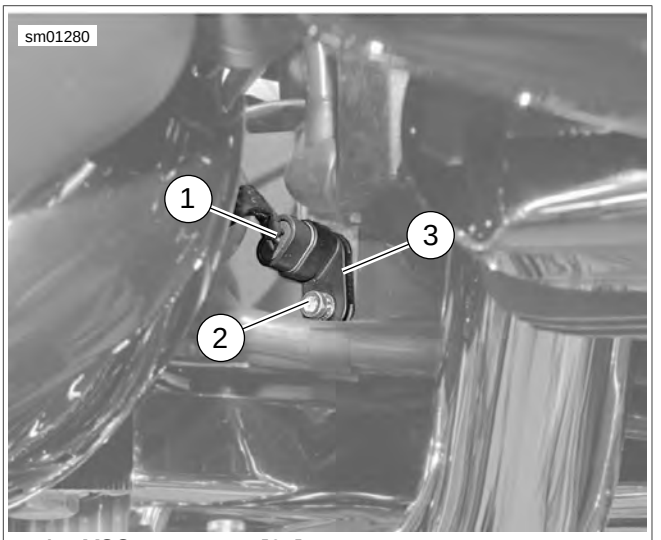
This part cannot be repaired. Replace upon failure.

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 6-102. Disconnect VSS harness connector [65A] (1) from VSS (3) mounted on rear of engine case below starter motor assembly.
3. Remove screw (2). Carefully remove VSS and O-ring from engine crankcase.



1. **VSS connector [65]**
2. **Screw**
3. **VSS**

Figure 6-102. VSS: All Models (XL shown)

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 6-102. Carefully install VSS (3) and 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 the motorcycle.

NEUTRAL INDICATOR SWITCH 6.26

GENERAL

See Figure 6-103. The neutral indicator switch (1) is threaded into the right crankcase half (3) immediately forward of the main drive gear (4). A short jumper wire assembly (2) connects the switch to the harness connector [136] under the engine crankcase.

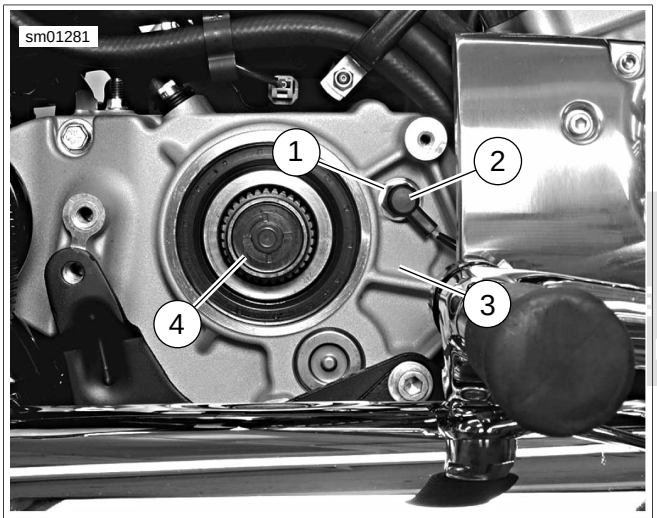
A pin on the shifter drum contacts the neutral indicator switch plunger, completing the neutral indicator circuit.

A motorcycle whose neutral indicator lamp does not light can be tested to determine if the problem can be found:

- 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

This part cannot be repaired. Replace upon failure.



1. **Neutral indicator switch**
2. **Jumper wire connector [136]**
3. **Right crankcase half**
4. **Main drive gear**

Figure 6-103. Neutral Indicator Switch Location: All Models (XL Shown)

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 components:
   a. **XL Models:** Remove rear muffler and exhaust pipe. See 4.13 EXHAUST SYSTEM: XL MODELS.
   b. **XR 1200X:** Remove exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
3. Remove sprocket cover and rear drive belt from transmission sprocket. See 5.6 DRIVE BELT.
4. Remove transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
5. Unplug jumper wire connector from neutral indicator switch. Remove switch with washer from right crankcase half.
6. Note routing of neutral switch jumper wire down between crankcase and rear of gearcase cover.
7. To unplug neutral switch jumper wire from neutral switch harness connector [136], cut cable strap securing neutral switch harness and stator harness to bottom right frame tube under oil pump.
8. Install **new** neutral indicator switch with washer. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
9. Plug **new** neutral switch jumper wire into neutral indicator switch [131]. Route jumper wire in same way that old jumper was routed.
10. 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.
11. Install transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
12. Install secondary drive belt and sprocket cover. See 5.6 DRIVE BELT.
13. Adjust drive belt tension and rear wheel alignment. See 1.24 WHEEL ALIGNMENT.
14. Install exhaust components:
    a. **XL Models:** install rear muffler and exhaust pipe. See 4.13 EXHAUST SYSTEM: XL MODELS.
    b. **XR 1200X:** install exhaust system. See 4.14 EXHAUST SYSTEM: XR 1200X.
15. Install main fuse.
16. Turn ignition switch on. Check the operation of the neutral indicator lamp.

MAIN WIRING HARNESS 6.27

WIRE HARNESS CONNECTORS

See Figure 6-104, Figure 6-105 or Figure 6-106. The main wiring harness can be divided up into four bundles, originating at the ECM caddy (XL models) or H-bracket (XR 1200X) (1). These bundles are:

Lower left bundle (2) including:

- Rear stop lamp switch wires [121B],
- Crankcase ground [GND1],
- Fuel pump connector [141A],
- Siren connector [142B],
- TSM/TSSM/HFSM connector [30B],
- Main fuse holder [5],
- Data link connector [91A],
- Rear oxygen (O2) sensor connector [137B].

Lower right bundle (3) including:

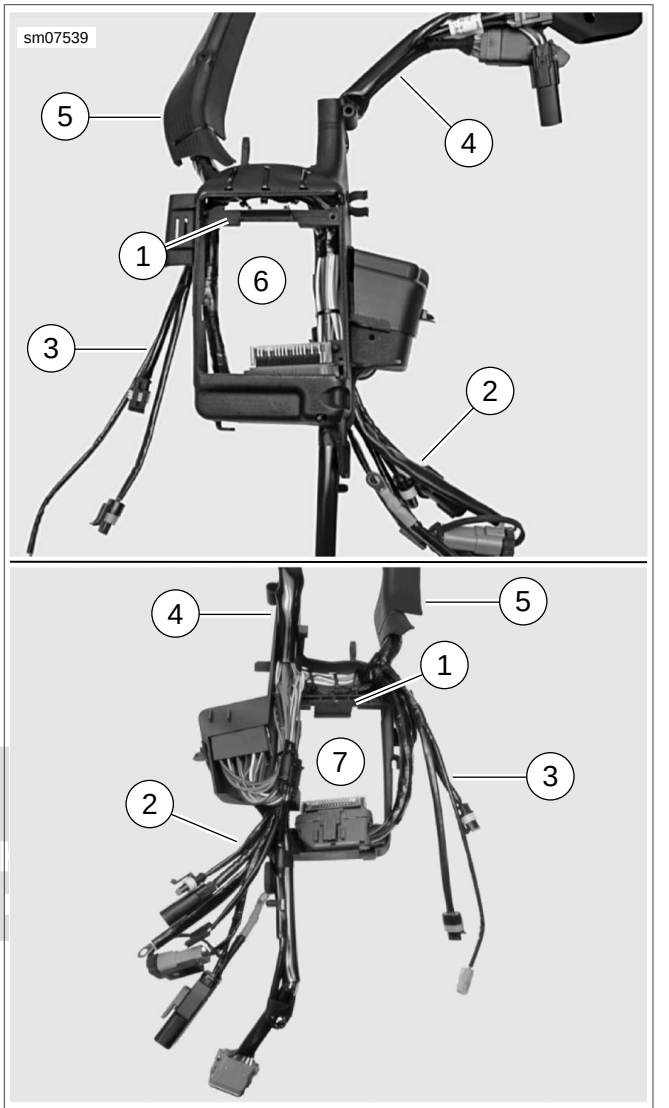
- Vehicle speed sensor (VSS) connector [65B],
- Green starter motor wire [128B],
- Engine Temperature (ET) sensor connector [90B].

Upper rear bundle (4) including:

- ECM connector [78B],
- Engine sub-harness connector [145A],
- P&A battery connector [160B],
- Rear lighting sub-harness connector [7A],
- Fuel sender resistor assembly/connector [200].

Upper front bundle (5) including:

- Hand control connectors [22B], [24B],
- Headlamp connector [38A],
- Front turn signal connector [31A],
- Instruments connector [20B],
- Horn wires [122B],
- Ignition switch [33],
- Coil connector [83B],
- Neutral switch connector [136B],
- Oil pressure switch connector [120B],
- Crank position (CKP) sensor connector [79B],
- Front oxygen (O2) sensor connector [138B],
- Voltage regulator DC output connector [77B].



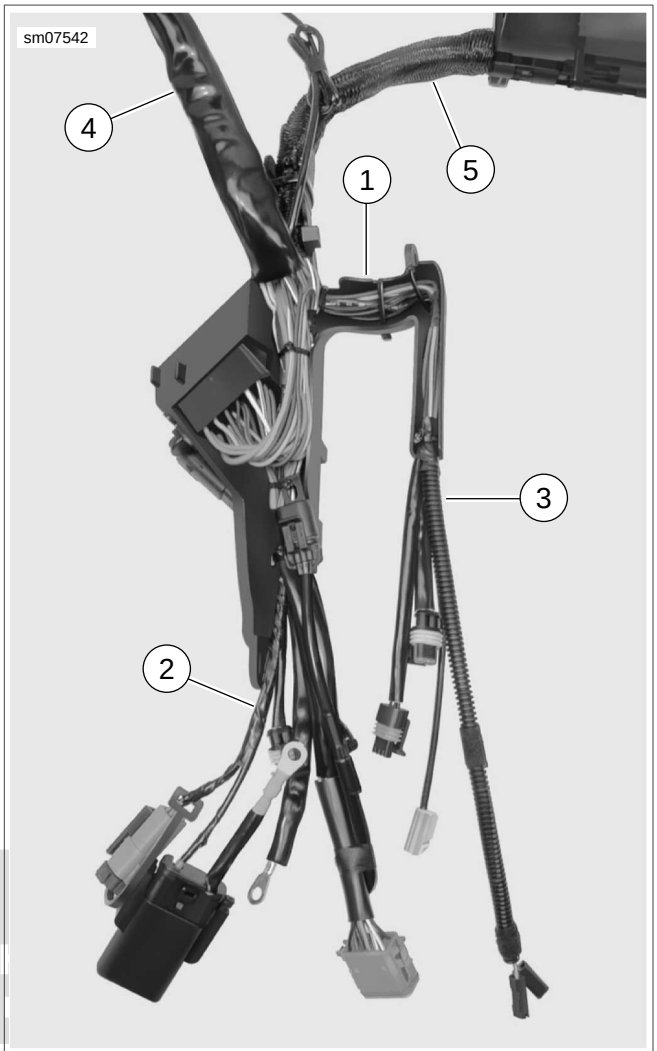
1. **ECM caddy**
2. **Lower left bundle**
3. **Lower right bundle**
4. **Upper rear bundle**
5. **Upper front bundle**
6. **Front view**
7. **Rear view**

Figure 6-104. Main Wiring Harness: XL Models



1. H-bracket
2. Lower left bundle
3. Lower right bundle
4. Upper rear bundle
5. Upper front bundle

Figure 6-105. Main Wiring Harness, Front: XR 1200X



1. H-bracket
2. Lower left bundle
3. Lower right bundle
4. Upper rear bundle
5. Upper front bundle

Figure 6-106. Main Wiring Harness, Rear: XR 1200X

REMOVAL

WARNING

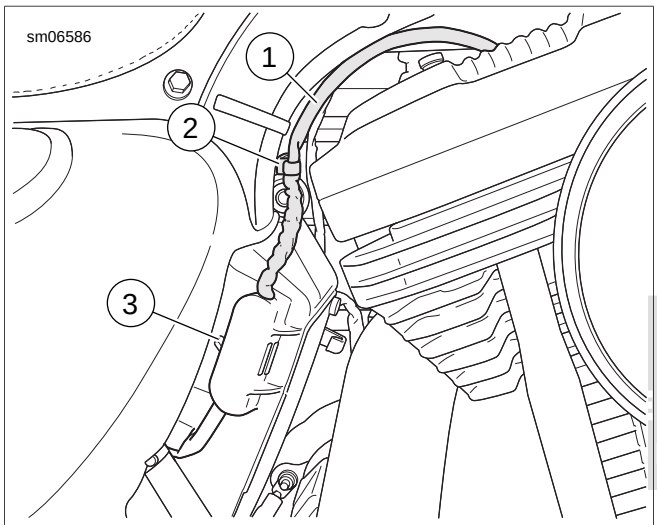
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
2. Remove seat.

⚠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)

3. Remove battery. See 1.22 BATTERY MAINTENANCE.
4. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
5. **XR 1200X:** Remove air cleaner. See 1.7 AIR FILTER, XR 1200X.
6. Remove wire harness caddy. See 6.28 ELECTRICAL CADDIES.
7. See Figure 6-107. Cut cable strap (2) securing ET sensor to harness.



1. **Harness loop**
2. **Barbed cable strap**
3. **Engine temperature sensor connector location**

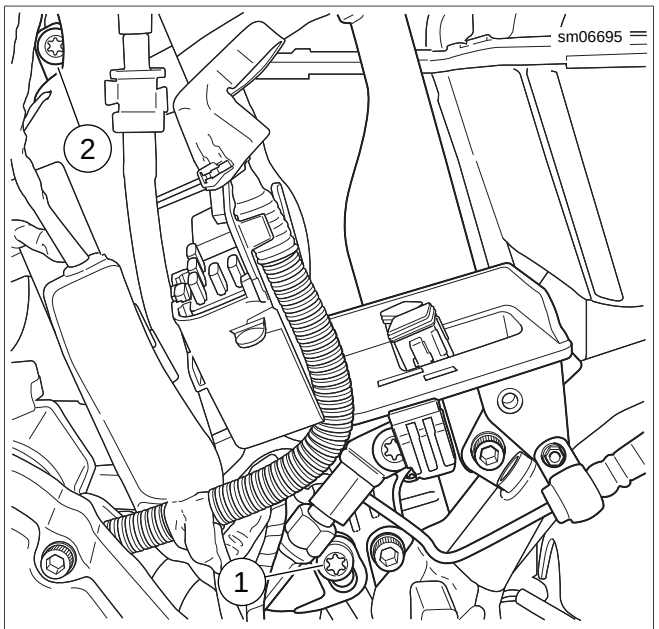
Figure 6-107. ET Sensor Harness: XL Models

8. Unplug the following harness connectors from the main harness:
   a. Oil pressure switch [120B],
   b. Voltage regulator DC output [77B],
   c. Crank Position (CKP) sensor [79B],
   d. Front oxygen (O2) sensor [138B],
   e. Rear oxygen (O2) sensor [137B],
   f. Neutral switch jumper [136B],
   g. Engine temperature (ET) sensor [90B],
   h. Ignition coil [83B],
   i. Horn [122B],
   j. JIffy stand sensor [133] (if equipped),
   k. ECM [78B],
   l. Harness ground wire at engine crankcase [GND1],
   m. Rear stop lamp switch [121B],
   n. Vehicle speed sensor (VSS) [65B],
   o. Green starter motor wire [128B].
   p. **Optional Security Siren:** Unplug security siren connector [142B].
9. Locate engine sub-harness connector [145A] and rear lighting sub-harness connector [7A] on top of oil tank. Unplug both sub-harnesses from main harness.
10. Pull P&A battery harness/connector [160B] and fuel sender resistor assembly/connector [200] out from recess in top left rear corner of oil tank, under frame.
11. Remove TSM/TSSM/HFSM. See 6.7 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM).
    a. Reach under battery tray. Push TSM/TSSM/HFSM up from cavity in bottom of tray.
    b. Unplug harness connector [30B].
    c. **H-DSSS equipped models:** unplug antenna connector [208B].
12. Remove wiring harness from two frame clips on front left frame downtube.
13. Remove vapor valve hose from clip on wiring harness. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
14. Remove battery tray. See 6.9 BATTERY TRAY.

NOTE

XL Models: *Remove both fasteners securing the ECM caddy.*

15. See Figure 6-108. Remove the ECM caddy.
16. Pull harness away from rear frame downtube.
17. Remove main wiring harness from left side. Carefully slide wire harness caddies between rear cylinder and frame.



1. **Lower**
2. **Upper**

Figure 6-108. ECM Caddy Fasteners

INSTALLATION

FASTENER	TORQUE VALUE	
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm

1. See Figure 6-104, Figure 6-105 or Figure 6-106. Loosely position **new** main wiring harness on vehicle. From left side, slide ECM caddy (XL models) or H-bracket (XR 1200X) (1) into position on rear frame downtube. Guide each wire bundle toward its respective area on the vehicle during installation. Verify lower right bundle (3) feeds out toward right side of vehicle.
2. **XL Models:** Verify upper front bundle (5) with wire harness caddies feed out toward right side of vehicle. Install ECM caddy. Verify hook on ECM caddy engages tab on oil tank bracket. Tighten ECM caddy fasteners to 72-96 **in-lbs** (8.1-10.8 Nm). See 6.6 ELECTRONIC CONTROL MODULE (ECM).
3. **XR 1200X:** Press H-bracket onto rear frame downtube until it snaps in place.
4. Feed upper rear bundle (4) up over top of oil tank. Verify engine sub-harness also feeds up into that area.
5. Feed upper front bundle along frame backbone toward front of vehicle.
6. Feed TSM/TSSM/HFSM harness connector into position under battery tray location.

NOTE

The TSM/TSSM/HFSM harness connector MUST be in position before installing battery tray. Verify the harness feeds over the top of the oil tank return hose.

7. Install battery tray. Verify battery tray interlocks with ECM caddy (XL models) or H-bracket (XR 1200X) on left side. Re-attach rear brake hose fasteners and rear brake master cylinder reservoir. See 6.9 BATTERY TRAY.
8. Plug connector [30B] into TSM/TSSM/HFSM. **H-DSSS equipped models:** plug in antenna connector [208B].
9. Lower TSM/TSSM/HFSM into place in bottom of battery tray.
10. Snap vapor valve into clip on left side of ECM caddy (XL models) or H-bracket (XR 1200X). See 4.20 EVAPORATIVE EMISSIONS CONTROL.
11. Slide P&A battery harness and connector [160B] and fuel sender resistor assembly/connector [200] into recess in top left rear corner of oil tank, under frame.
12. Plug rear lighting connector [7B] into main harness connector [7A].
13. Plug engine sub-harness connector [145B] into main harness connector [145A].
14. Slide left wire harness caddy between front cylinder head and frame, from right side of vehicle toward left side.

NOTE

Group the neutral switch connector [136B], CKP sensor connector [79B], oil pressure switch connector [120B], front O2 sensor connector [138B] and voltage regulator DC output connector [77B] into the upper right bundle.

15. Run the upper right bundle down the front left frame downtube.
16. Install wire harness caddy. See 6.28 ELECTRICAL CADDIES.
17. Plug in the following harness connectors:
    a. Oil pressure switch [120B],
    b. Voltage regulator DC output [77B],
    c. Crank Position (CKP) sensor [79B],
    d. Front oxygen (O2) sensor [138B],
    e. Rear oxygen (O2) sensor [137B],
    f. Neutral switch jumper [136B],
    g. Engine temperature (ET) sensor [90B],
    h. Fuel pump [141A],
    i. Ignition coil [83B],
    j. Horn [122B],
    k. ECM [78B],
    l. Harness ground wire at engine crankcase [GND1],
    m. Rear stop lamp switch [121B],
    n. Vehicle speed sensor (VSS) [65B],
    o. Green starter motor wire [128B],
    p. **Optional Security Siren:** Plug in security siren connector [142B],
    q. Jiffy stand sensor (JSS) [133], if equipped.
18. **XL Models:** Secure clutch cable and wiring harness running down left frame downtube with two frame clips. Cap-

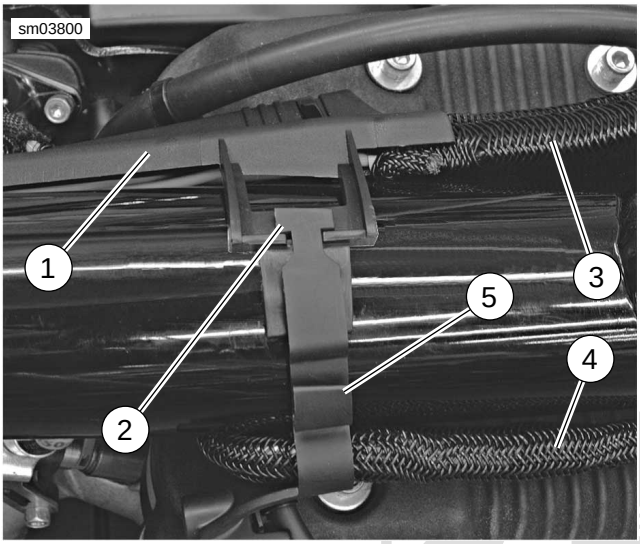
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ture front O2 sensor harness with lower frame clip. Position frame clip close to bottom of upper voltage regulator bracket.

19. **XR 1200X:** Secure wiring harness running down left frame downtube onto both oil cooler bracket clips.
20. Secure ET sensor harness to oil tank mounting bracket with a barbed cable strap. Verify there is a loop in the harness between the ET sensor and the rear cylinder head to avoid damaging harness during vehicle operation.

NOTE

See Figure 6-109. Verify fuel pump harness rests in harness clip (5) on wire harness caddy latch clip (2).



1. **Right wire harness caddy**
2. **Wire harness caddy latch clip**
3. **Main harness**
4. **Engine sub-harness**
5. **Fuel pump harness clip**

Figure 6-109. Right Wire Harness Caddy Latch Clip (typical)

21. Install fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

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)

22. Install battery. See 1.22 BATTERY MAINTENANCE.
23. Install left side cover. See 2.18 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)

24. Install seat. See 2.39 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)

25. Verify the operation of the electrical system.

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ELECTRICAL CADDIES 6.28

WIRE HARNESS CADDY: XL MODELS

FASTENER	TORQUE VALUE	
Ignition switch bracket screw	35-45 **in-lbs**	4.0-5.1 Nm

General

See Figure 6-112. The left and right wire harness caddies are locked together with three tabs and secured with a screw.

See Figure 6-111. The wire harness caddy assembly (1, 2) is secured to the ignition switch bracket (3) with two push-in fasteners (6, 7), and to the frame with mounting tabs hooked onto a bracket under the frame backbone tube.

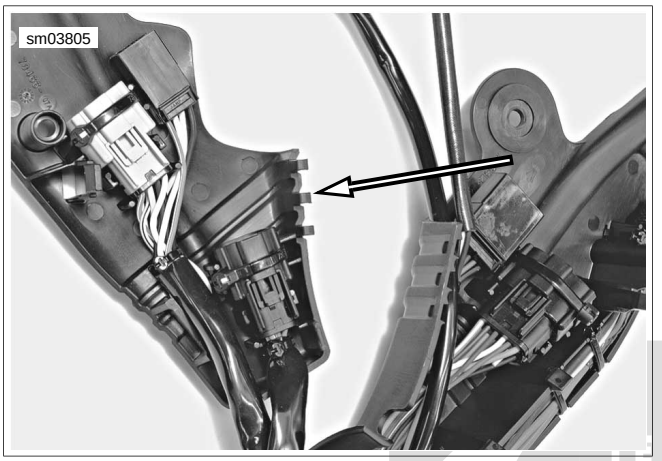
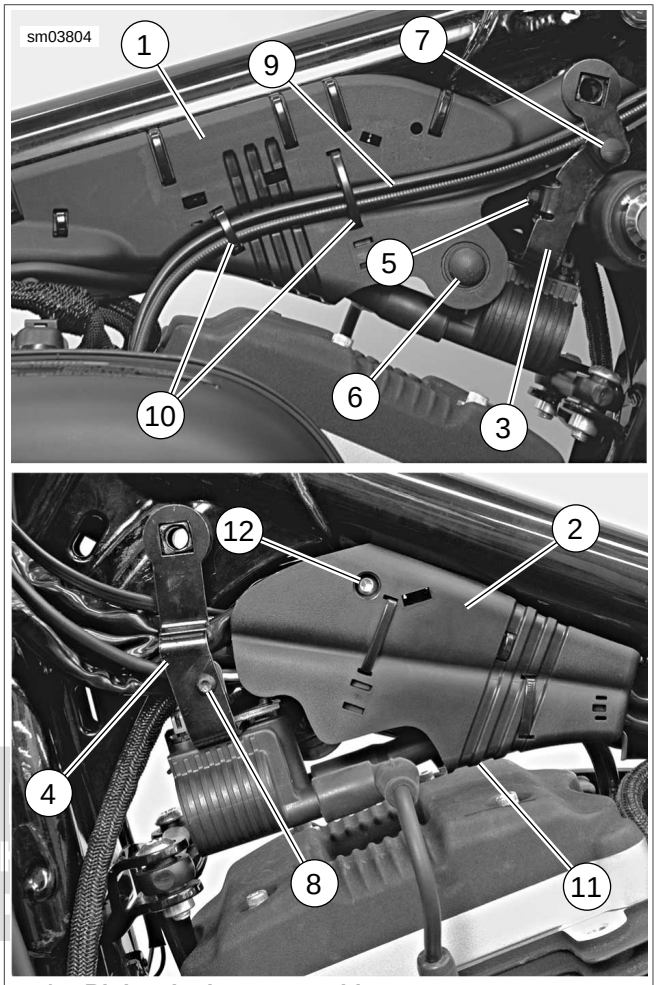


Figure 6-110. Wire Harness Caddy: Locking Tabs



1. **Right wire harness caddy**
2. **Left wire harness caddy**
3. **Ignition switch bracket**
4. **Coil bracket**
5. **Screw w/lockwasher (lockwasher between bracket and switch housing)**
6. **Push-in fastener, large**
7. **Push-in fastener, small**
8. **Screw**
9. **Throttle cable (2)**
10. **Cable strap (2)**
11. **Tab (3) (engage left and right caddies)**
12. **Screw**

Figure 6-111. Wire Harness Caddy Assembly

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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS.

⚠WARNING

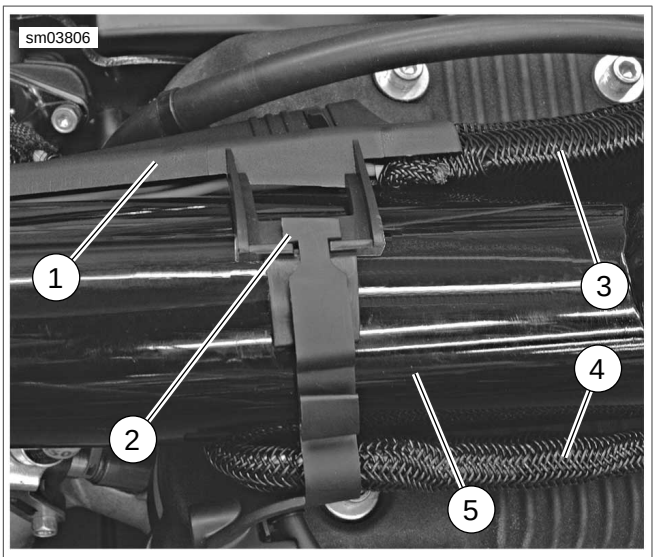
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS.
5. Separate ignition coil connector [83B].
6. See Figure 6-111. Remove screw (8) and disengage coil bracket (4) from mounting boss on frame.
7. See Figure 6-112. Unhook caddy latch clip (2) from right wire harness caddy (1).

NOTE

It is not necessary to remove rear spark plug cable from wire harness caddy latch clip, unless latch clip is being replaced.

8. If necessary, cut cable strap securing rear spark plug cable to caddy latch clip.
9. Remove engine sub-harness from loop in caddy latch clip.
10. See Figure 6-111. Remove screw (12) and carefully disengage left wire harness caddy (2) from right wire harness caddy (1).
11. Cut two cable straps (10) securing throttle cables (9) to right wire harness caddy.
12. Disengage rear spark plug cable from trough in right wire harness caddy. Cut barbed cable strap securing engine sub-harness to right wire harness caddy.
13. **CA Models:** Cut barbed cable strap securing EVAP canister purge hose to rear of right wire harness caddy and cut the barbed cable strap through the bridge caddy.
14. See Figure 6-111. Remove and discard push-in fasteners (6, 7). Unhook right wire harness caddy from frame backbone bracket. Lower ignition switch bracket (3) from mounting bosses on frame to free right wire harness caddy.

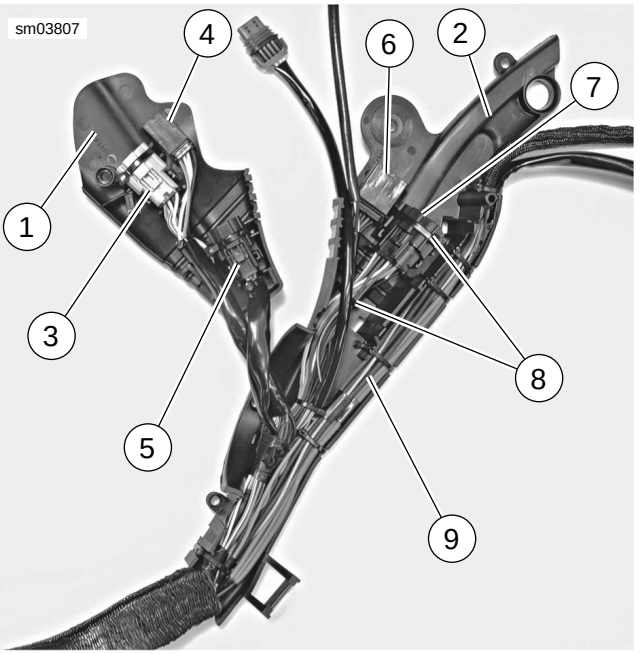


1. **Right wire harness caddy**
2. **Caddy latch clip**
3. **Main harness**
4. **Engine sub-harness**
5. **Frame backbone**

Figure 6-112. Right Wire Harness Caddy Latch Clip

15. See Figure 6-113. Unplug the following connectors:
    a. Headlamp connector [38B] (4),
    b. Left hand control connector (gray) [24B] (3),
    c. Right hand control connector (black) [22B] (5),
    d. Front turn signal connector [31B] (6),
    e. Instruments connector [20A] (7).
16. Make a note of the location of all cable straps securing harnesses and harness connectors to left and right wire harness caddies. Cut cable straps and remove harnesses and connectors from caddies. Remove wire harness caddies from vehicle.

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1. **Left wire harness caddy**
2. **Right wire harness caddy**
3. **Left handlebar control connector [24A]**
4. **Headlamp connector [38A]**
5. **Right handlebar control connector [22A]**
6. **Front turn signals connector [31A]**
7. **Instruments connector [20B]**
8. **Two cable straps securing throttle cables**
9. **Portion of main wiring harness**

Figure 6-113. Wire Harness Caddies

Installation

1. See Figure 6-113. Fit portion of main wiring harness (9) and ignition switch harness along top of right wire harness caddy (2) and secure with cable straps, as shown in the figure.
2. Mount front turn signals connector [31A] (6) onto mounting tab on right wire harness caddy.
3. See Figure 6-111. Place throttle cables (9) in groove in right wire harness caddy (1).
4. See Figure 6-113. Place instruments connector [20B] (7) into right wire harness caddy (2). Secure connector and throttle cables with a cable strap (8). Secure throttle cables and harnesses (as shown in the figure) with a second cable strap.
5. Mount handlebar control connectors [22A], [24A] (5, 3) to left wire harness caddy (1) with cable straps. Mount headlamp connector [38A] (4) onto tab on left wire harness caddy.
6. See Figure 6-111. Hook right wire harness caddy (1) into bracket on frame backbone. Secure front of caddy onto ignition switch bracket mounting boss on right side of frame. Raise ignition switch bracket (3) up into position and mount it onto boss on frame.

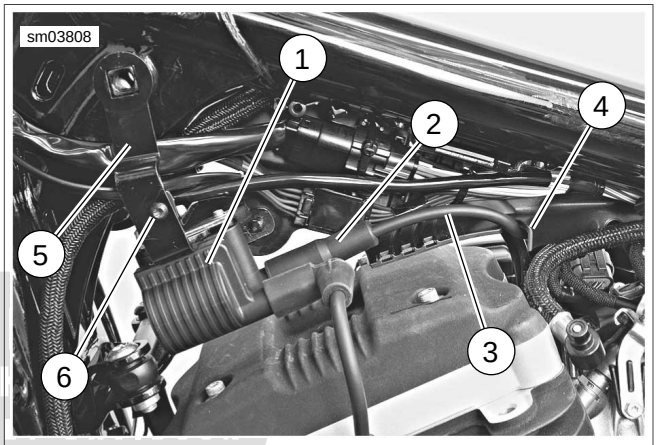
NOTE

Make sure ignition switch bracket upright is outboard of right wire harness caddy and throttle cables on right side of frame.

7. Secure right wire harness caddy to ignition switch bracket with **new** push-in fasteners (6, 7).
8. See Figure 6-112. Install caddy latch clip (2) onto right wire harness caddy (1). Make sure engine sub-harness (4) is routed in loop in caddy latch clip.
9. See Figure 6-114. Raise coil bracket (5) up into position and mount it on boss on left side of frame. Secure coil bracket to ignition switch bracket with screw (6). Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
10. Plug in ignition coil connector [83B].

NOTE

Make sure coil bracket upright is outboard of all wire harnesses leading to front of vehicle on left side of frame.

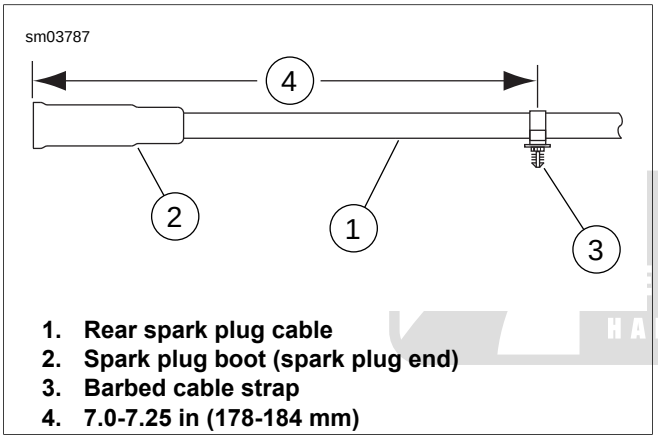


1. **Ignition coil**
2. **Rear spark plug cable boot**
3. **Rear spark plug cable**
4. **Notch in right wire harness caddy**
5. **Coil bracket**
6. **Screw**

Figure 6-114. Rear Spark Plug Cable Routing

11. Route rear spark plug cable (3) from ignition coil (1) tower down through notch (4) in right wire harness caddy.
12. Route rear spark plug cable in right wire harness caddy trough.
13. Route engine sub-harness around trough in right wire harness caddy. Secure sub-harness to caddy trough with a cable strap. Run strap through hole in boss that originally secured engine sub-harness.
14. **California Models:** Secure EVAP canister purge hose to rear of right wire harness caddy with two barbed cable straps.

15. Plug in the following connectors:
    a. Instruments connector [20A] (7),
    b. Front turn signal connector [31B] (6),
    c. Right hand control connector (black) [22B] (5),
    d. Left hand control connector (gray) [24B] (3),
    e. Headlamp connector [38B] (4).
16. See Figure 6-111. Mate left wire harness caddy (2) to right wire harness caddy (1). Secure with screw (12) and tighten.
17. See Figure 6-115. If barbed cable strap (3) securing rear spark plug cable (1) to caddy latch clip was cut, install **new** barbed cable strap 7.0-7.25 in (178-184 mm) from tip of spark plug cable boot (2).
18. Orient cable strap so that spark plug cable is above mounting boss on caddy latch clip when barbed prong on cable strap is inserted in hole in boss. Press cable strap barbed prong firmly into hole in caddy latch clip mounting boss.



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 6-115. Rear Spark Plug Cable and Cable Strap: XL Models

19. Make sure rear spark plug cable is plugged onto rear spark plug.
20. Install fuel tank. See 4.4 FUEL TANK: XL MODELS.

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)

21. Install seat.
22. 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)

23. Verify the operation of the electrical system.

WIRE HARNESS CADDY: XR 1200X

FASTENER	TORQUE VALUE	
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm

Removal

WARNING

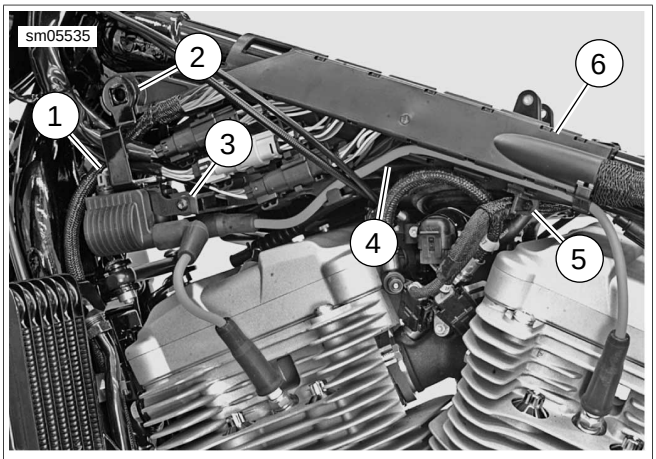
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XR 1200X.

WARNING

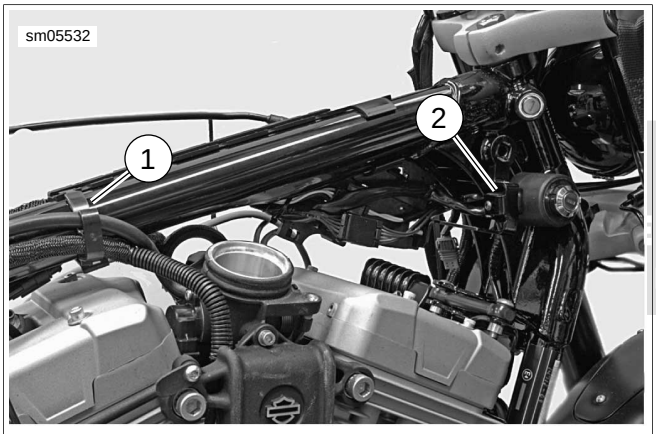
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.5 FUEL TANK: XR 1200X.
5. Remove air box. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
6. See Figure 6-116. Remove screw (3), connector (1) and disengage coil bracket (2) from mounting boss on frame.
7. Remove rear spark plug wire (4) from caddy. Support coil away from engine and caddy.
8. Separate push-in fastener (5) from caddy.
9. See Figure 6-117. Unhook caddy latch clip (1) from right side of frame.
10. See Figure 6-118. Detach connector (2) from right side of caddy.
11. Cut two cable straps (1) from right side of caddy.
12. See Figure 6-116. Remove cover (6) from caddy.
13. See Figure 6-119. Cut remaining five cable straps from left side of caddy.
14. Pull caddy away from frame and move ignition switch away from caddy. Support ignition switch away from engine.
15. Pull connectors from left side of caddy and remove caddy from motorcycle.



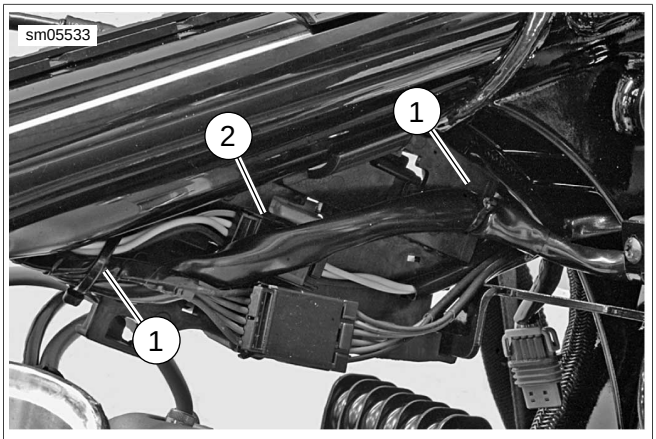
1. Coil connector
2. Coil bracket
3. Screw
4. Rear spark plug wire
5. Push-in fastener
6. Cover

Figure 6-116. XR Caddy Removal



1. Latch clip
2. Ignition switch bracket

Figure 6-117. Caddy Latch Clip



1. Cable strap (2)
2. Connector

Figure 6-118. Right Side Connectors

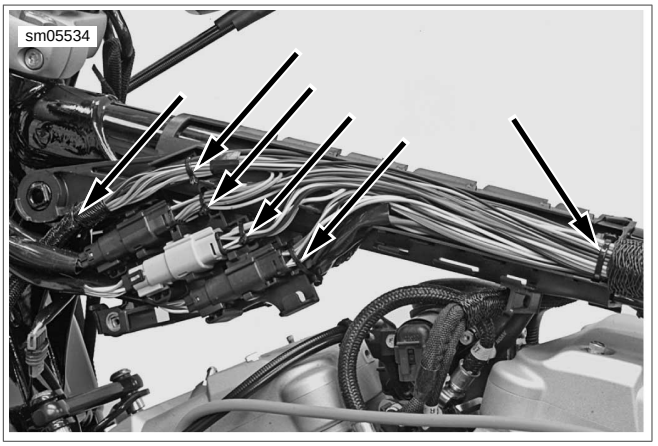


Figure 6-119. Cable Strap Locations

Installation

1. See Figure 6-119. Place caddy in position next to motorcycle frame, Attach ignition switch bracket into position on caddy and place caddy on motorcycle frame.
2. Install connectors on left side of caddy.
3. Install five cable straps to secure connector wires in position on left side of caddy.
4. See Figure 6-118. Attach connector (2) to right side of caddy.
5. Install two cable straps (1) as shown on right side of caddy. Make sure wires on left side of caddy are also secured with the rearward cable strap.
6. See Figure 6-117. Make sure harness and purge hose (California models) are attached to caddy latch clip (1). Install latch clip on right side of frame.
7. See Figure 6-116. Install cover (6) on caddy.
8. Install push-in fastener (5).
9. See Figure 6-116. Slip lower end of coil bracket (2) into caddy slot. make sure coil bracket is flush with end of ignition switch bracket and attach top end of coil bracket to mounting boss on frame.
10. Install connector (1) and then screw (3). Tighten screw (3) to 35-45 **in-lbs** (4.0-5.1 Nm).
11. Install rear spark plug wire (4) on caddy.
12. Install air box. See 4.3 AIR CLEANER ASSEMBLY, XR 1200X.
13. Install fuel tank. See 4.5 FUEL TANK: XR 1200X.

⚠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.
15. 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)

⚠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)

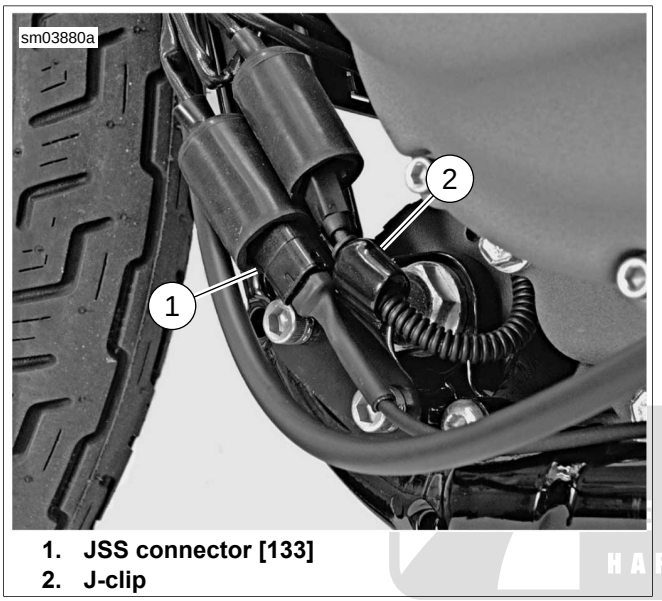
16. Verify the operation of the electrical system.

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JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS 6.29

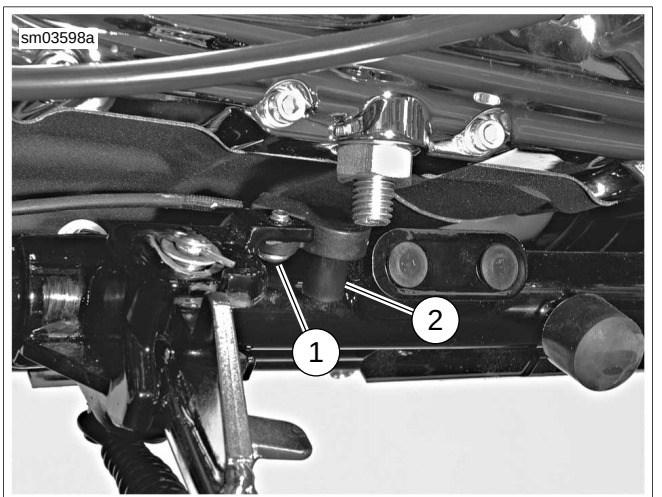
REMOVAL

1. Position motorcycle upright on a suitable lift.
2. See Figure 6-120. Unplug JSS harness connector [133] (1).
3. Cut cable strap securing JSS harness to frame.
4. See Figure 6-121. Remove screw (1). Remove JSS (2) and harness.



1. **JSS connector [133]**
2. **J-clip**

Figure 6-120. JSS Connector



1. **Screw**
2. **JSS**

Figure 6-121. 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 6-122. Align JSS (1) with mounting tab (2) on jiffy stand yoke (3). If sensor is not properly aligned with mounting tab when screw is tightened, sensor or mounting tab may be damaged.

2. See Figure 6-123. 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

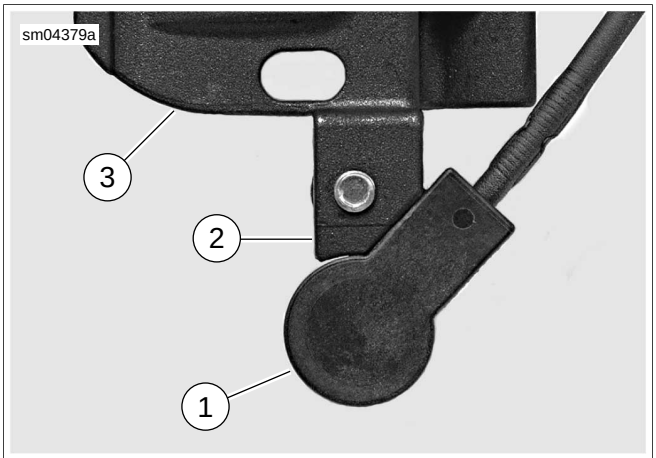
Be sure jiffy stand is fully retracted before riding. If jiffy stand is not fully retracted, it can contact the road surface causing a loss of vehicle control, which could result in death or serious injury. (00007a)

7. Test JSS with jiffy stand down and up:
   a. Turn ignition key to IGNITION.
   b. Shift transmission into gear.
   c. Switch OFF/RUN switch to RUN.
   d. Disengage clutch.
   e. **Jiffy Stand Down:** Press the START button.

Engine should not start. "SidE StAnd" should scroll across the odometer display.

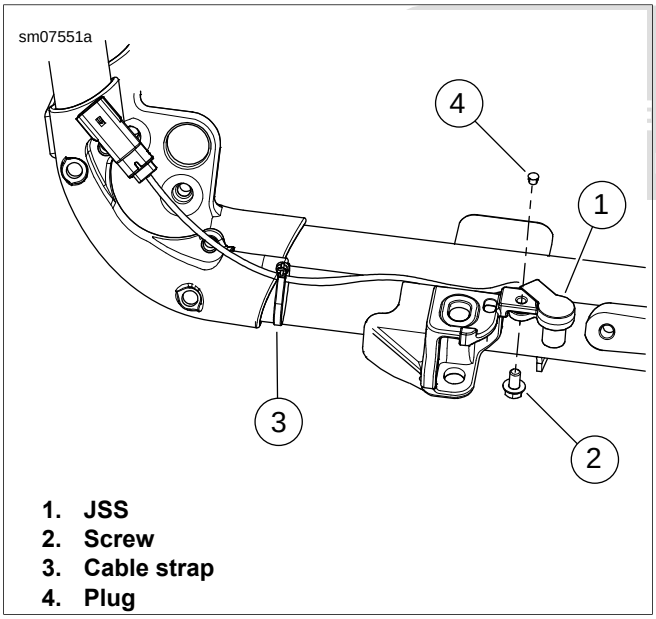
f. **Jiffy Stand Up:** Press the START button.

Engine should start and run. "SidE StAnd" should clear from the odometer display.



1. **JSS**
2. **Mounting tab**
3. **Yoke**

Figure 6-122. JSS Mounting (top view)



1. **JSS**
2. **Screw**
3. **Cable strap**
4. **Plug**

Figure 6-123. JSS Harness Routing

OPERATION

Jiffy Stand Down: Engine Non-Start

See Figure 6-124. The engine will not start if the rider presses the starter button with the transmission in gear and the jiffy stand down. The message "SidE StAnd" (1) will scroll across the odometer display.

Raising the jiffy stand (or putting the transmission in neutral) will permit the engine to run and clear the message.

Jiffy Stand Down: Engine Starts and Stalls

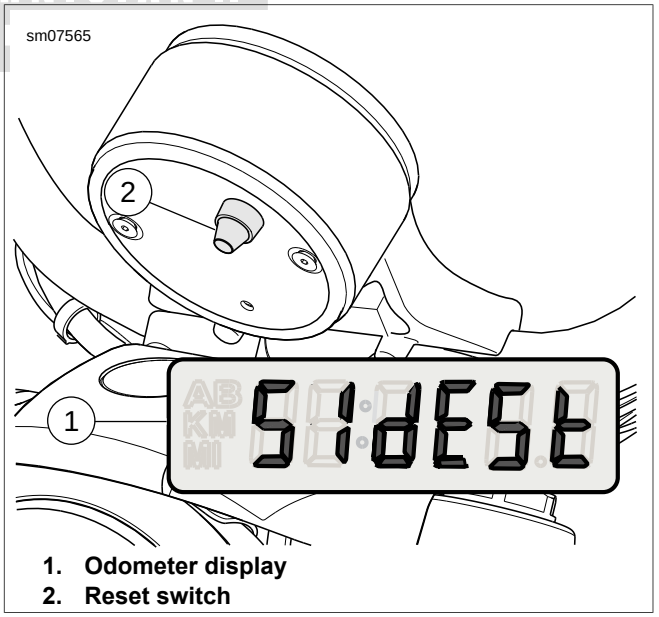
When the jiffy stand is down, the engine starts and runs if the ECM receives a signal from the neutral switch indicating the transmission is in neutral or a signal from the clutch switch indicating the clutch is engaged. The engine will continue to run after disengaging the clutch and shifting into gear. However with the jiffy stand still down, the engine will stall 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 will continue to run.
- The warning indicators will flash twice.
- "SidE StAnd" will scroll across the odometer display.
- The message will remain until the jiffy stand is in the retracted position.

Press the reset switch (2) once while the engine is running to clear the "SidE StAnd" message.



1. **Odometer display**
2. **Reset switch**

Figure 6-124. SidE StAnd Display

SECURITY SYSTEM/OPTIONAL SIREN 6.30

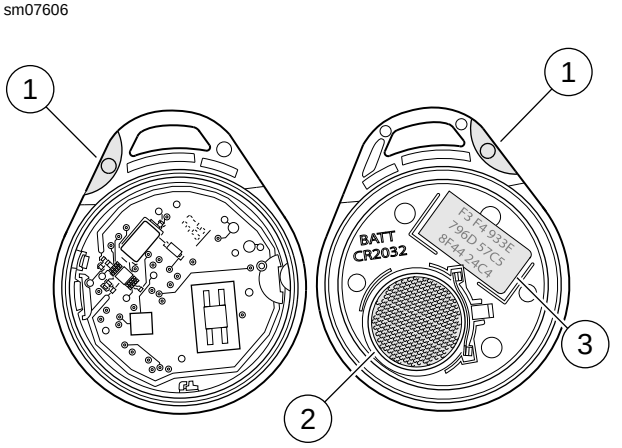
FOB BATTERY

Battery Replacement Schedule

Replace the fob battery every year.

Battery Replacement

1. Open the fob case.
   a. See Figure 6-125. Place a thin blade in the thumbnail slot (1) between the two halves of the case.
   b. Slowly twist the blade.
2. Replace the battery.
   a. Remove the original battery.
   b. Install a **new** battery with the positive (+) side down. Use a Panasonic® 2032 or equivalent.
3. Close the case.
   a. See Figure 6-125. With O-ring (3) in place, align case halves.
   b. Snap case halves together.



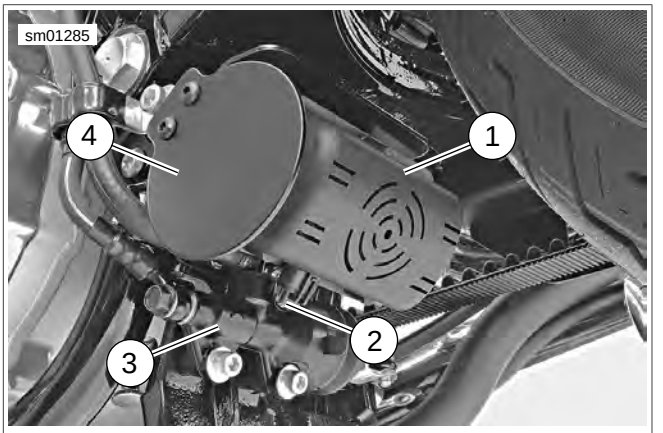
1. **Thumbnail slot**
2. **Battery (Panasonic 2032)**
3. **O-ring**

Figure 6-125. Open Fob: HFSM

OPTIONAL SIREN

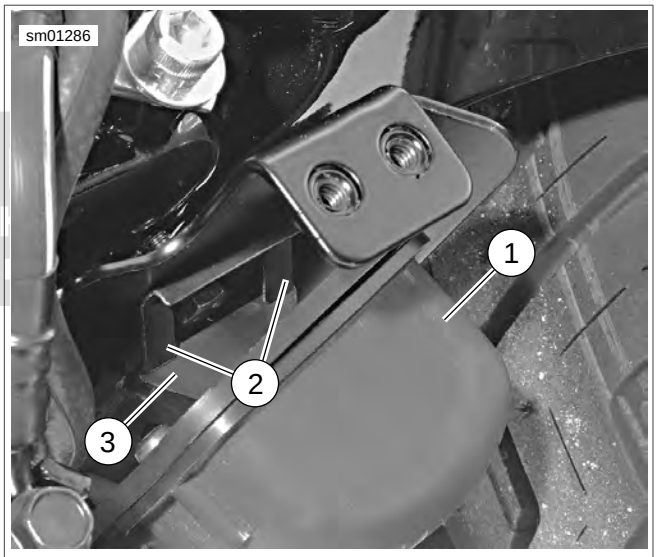
Removal

1. See Figure 6-126. Disarm security system. While system is disarmed, unplug siren harness connector [142B] (2) from siren assembly (1).
2. See Figure 6-127. Gently pry up on two tabs (2) while pulling siren housing (1) toward the left side of the motorcycle. Remove siren.



1. **Security siren assembly**
2. **Siren harness connector [142B]**
3. **Rear brake master cylinder**
4. **Guard**

Figure 6-126. Security Siren

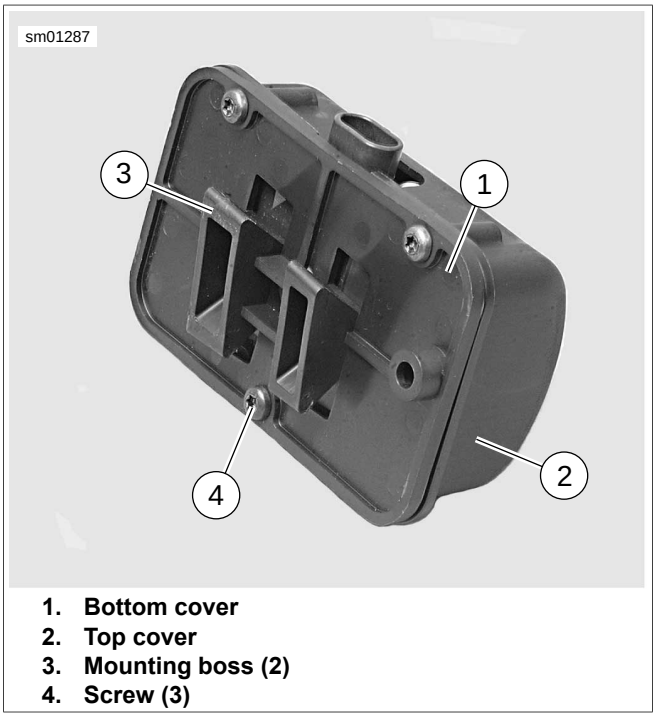


1. **Security siren housing**
2. **Tab (2)**
3. **Siren housing mounting boss (2)**

Figure 6-127. Security Siren Mount (guard removed for clarity)

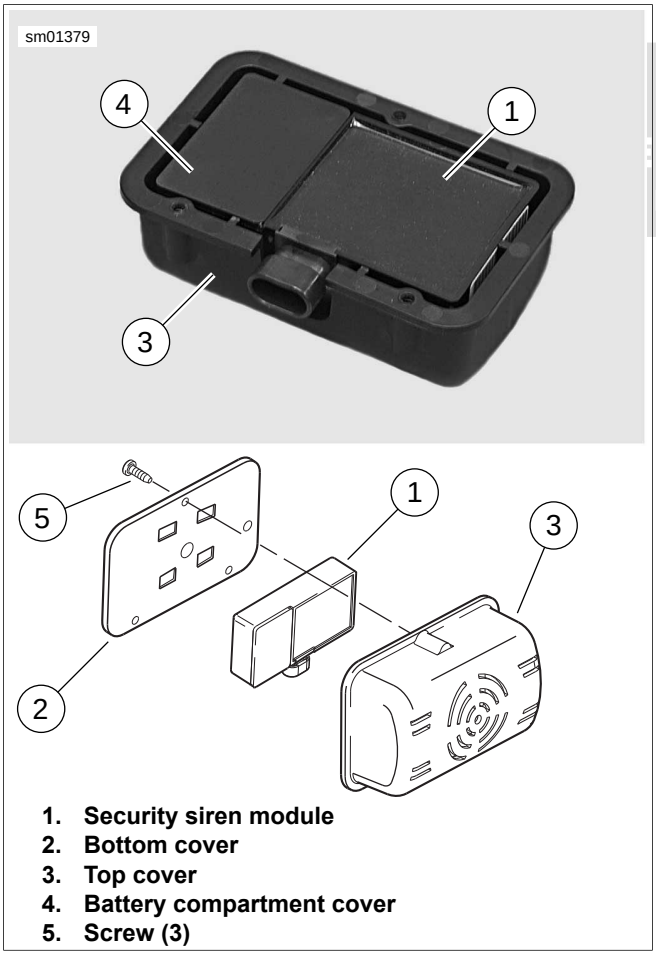
Disassembly

1. See Figure 6-128. Remove three screws (4) and bottom cover (1) from top cover (2) of security siren assembly.
2. See Figure 6-129. Remove security siren (1) from top cover (3).



1. **Bottom cover**
2. **Top cover**
3. **Mounting boss (2)**
4. **Screw (3)**

Figure 6-128. Security Siren Housing



1. **Security siren module**
2. **Bottom cover**
3. **Top cover**
4. **Battery compartment cover**
5. **Screw (3)**

Figure 6-129. Security Siren Assembly

Assembly

1. See Figure 6-129. Place security siren module (1) inside top cover (3) with siren connector [142A] positioned in cutout in cover and siren battery compartment cover (4) visible.
2. See Figure 6-128. Place bottom cover (1) on top cover (2) and secure with three screws (4).

Installation

1. See Figure 6-127. Position siren (1) in mounting bracket so that mounting bosses (3) align with mounting clips in bracket and connector socket [142A] faces rear master cylinder.
2. Slide siren housing to the right until tabs (2) lock siren in place.
3. See Figure 6-126. Plug harness connector [142B] (2) into siren connector socket [142A].
4. Check siren operation. If siren is working properly, it will respond with two chirps after receiving the arm command.

SIREN BATTERY

Battery Replacement Schedule

NOTES

- *The internal siren battery may not charge if the vehicle's battery is less than 12.5 V.*
- *The siren's internal 9 V battery is rechargeable and does not need to be replaced on a regular basis. Battery life under normal conditions is approximately three to six years.*

Battery Replacement

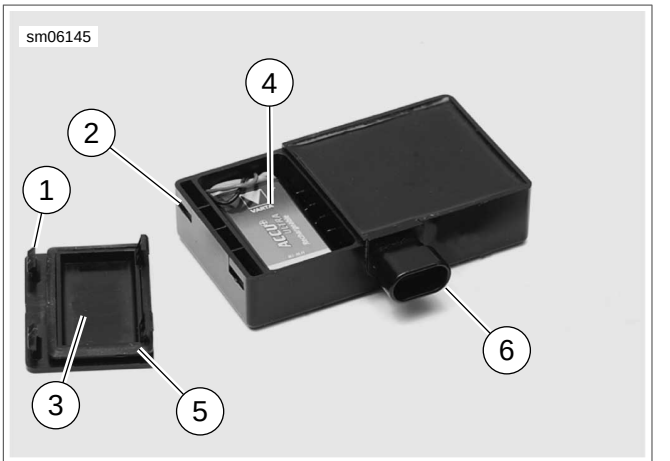
1. Disarm system and remove siren.
2. See Figure 6-130. With a small screwdriver or pick, push the catches (1) in through the two slots (2) in the end of the siren to release the battery cover (3).

NOTES

- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on **new** battery.*
- *Only a 9 V nickel metal hydride battery should be used in the siren.*

3. Replace battery (4) by removing old battery from polarized battery clip.
4. Recharge and install or install a **new** 9 V nickel metal hydride battery.
5. Install battery cover (3).
   a. Carefully replace the rubber seal (5) on the cover.
   b. Align battery cover with case placing round corners on cover away from connector [142A] (6).
   c. Snap cover into place.

6. Install siren and check operation. If siren is working properly, it will respond with two chirps after receiving the arm command.



1. **Catch**
2. **Slot**
3. **Cover**
4. **9 Volt battery**
5. **Rubber seal**
6. **Connector [142A]**

Figure 6-130. Siren Battery Compartment

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

OIL PRESSURE SWITCH 6.31

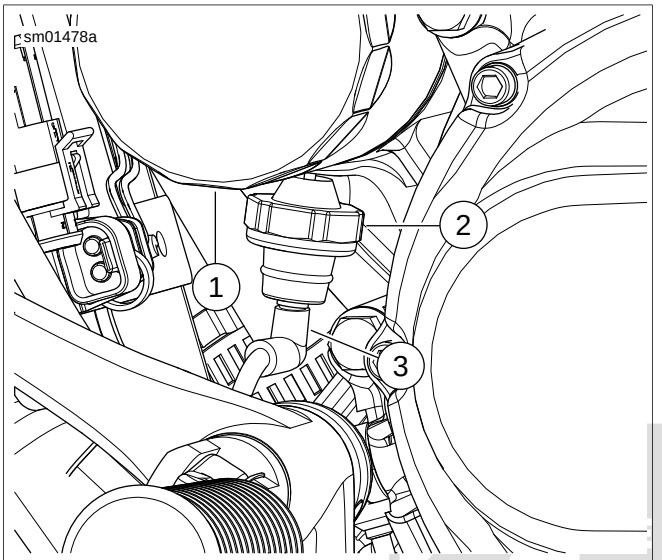
GENERAL

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. This completes the signal lamp circuit causing the indicator lamp to illuminate.

See Figure 6-131. The oil pressure switch is located under the oil filter mount at the front of the engine crankcase.

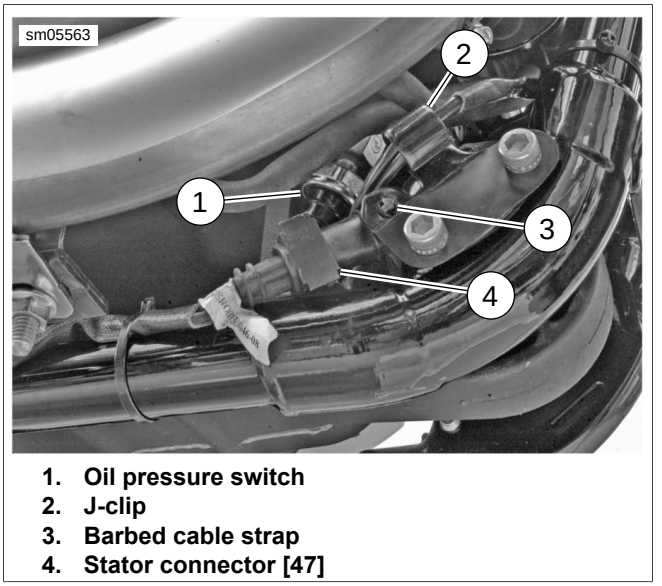
NOTE

This part cannot be repaired. Replace upon failure.



1. **Oil filter**
2. **Oil pressure switch**
3. **Oil pressure switch connector [120]**

Figure 6-131. Oil Pressure Indicator Lamp Switch: XL Models



1. **Oil pressure switch**
2. **J-clip**
3. **Barbed cable strap**
4. **Stator connector [47]**

Figure 6-132. Oil Pressure Switch: XR 1200X

REMOVAL

PART NUMBER	TOOL NAME
HD-41675	OIL PRESSURE SENDING UNIT 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. See Figure 6-131. Remove wiring harness connector [120] (3) by pulling elbow connector straight down from stud on oil pressure switch (2).
3. **XR 1200X:** See Figure 6-132. Disconnect voltage regulator stator connector (4). Reposition neutral switch wire and voltage regulator stator wire as needed.
4. Place a container under the motorcycle to catch any oil that may leak out when oil pressure switch is removed.

NOTE

***XR 1200X:** Hold oil pressure switch adapter with a wrench to prevent the adapter from being removed while removing the oil pressure switch.*

5. Using OIL PRESSURE SENDING UNIT WRENCH (Part No. HD-41675), remove oil pressure switch.

INSTALLATION

PART NUMBER	TOOL NAME
HD-41675	OIL PRESSURE SENDING UNIT WRENCH

FASTENER	TORQUE VALUE	
Oil pressure switch adapter: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm
Oil pressure switch	50-70 **in-lbs**	5.6-7.9 Nm

1. **XR 1200X:** if the oil pressure switch adapter came out with the oil pressure switch, install the adapter:
   a. Separate oil pressure switch from adapter.
   b. Remove and discard old O-ring. Install **new** O-ring.
   c. Install adapter and tighten to 13-17 ft-lbs (17.6-23.0 Nm).

NOTE

*Perform following step only if original oil pressure switch is being re-installed. **New** switches have a sealant contact patch on the mounting threads.*

2. Coat threads of oil pressure switch with LOCTITE 565 HIGH PERFORMANCE PIPE SEALANT with TEFLON.

3. See Figure 6-131. Install oil pressure switch (2). Using OIL PRESSURE SENDING UNIT WRENCH (Part No. HD-41675), tighten switch to 50-70 **in-lbs** (5.6-7.9 Nm).
4. **XR 1200X:** See Figure 6-132.
   a. Reposition neutral switch wire and stator wire.
   b. Secure stator connector (4) to bracket with barbed cable strap (3) and make sure neutral switch wire and oil pressure switch wires are secured in J-clip (2).
   c. Join halves of stator connector [47] and secure with lock.

NOTE

Oil pressure switch connector [120] must always face away from vehicle.

5. Attach wiring harness connector [120] to oil pressure switch. Make sure connector points away from motorcycle.
6. Install main fuse.

NOTE

Replace oil if significant loss.

7. Check oil level in oil tank. See 1.6 ENGINE OIL AND FILTER. Top off oil level if necessary.
8. Start engine and test oil pressure switch for proper operation. Check oil pressure switch for leaks.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

HORN 6.32

TROUBLESHOOTING

If the horn does not sound or sounds weak, check for the following:

- Discharged battery. To charge battery, see 1.22 BATTERY MAINTENANCE.
- Loose, frayed or damaged wiring to horn terminal.

If battery is charged and wiring appears to be in good condition, perform a VOLTAGE TEST for the following:

- Inoperative horn switch.
- Open circuit to horn.
- Open ground to frame.
- Inoperative horn.

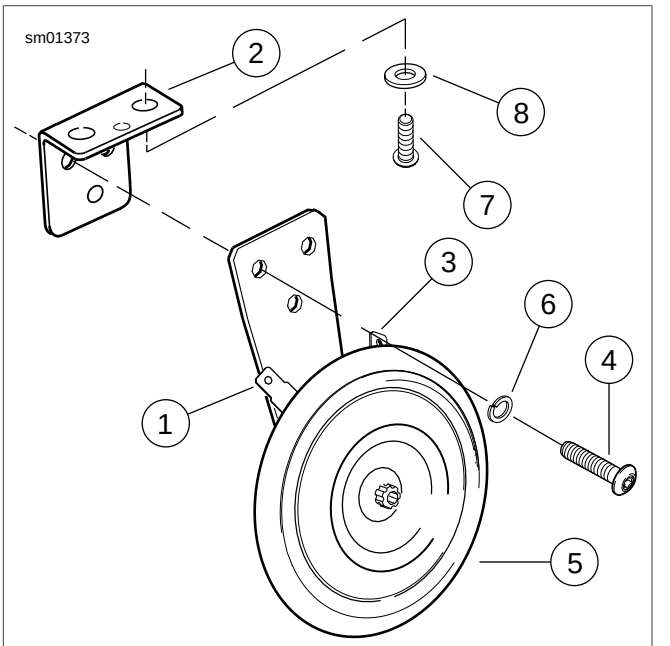
VOLTAGE TEST

1. Remove terminal clips from horn spade connectors.
2. Connect voltmeter leads, positive (+) to wire terminal and negative (-) to ground.
3. Turn ignition switch ON and press horn switch.
4. If battery voltage is not present, check for the following:
   a. Horn switch is inoperative. Replace switch. See 6.35 LEFT HANDLEBAR SWITCHES.
   b. Wiring to horn is open. Repair wiring.
5. If battery voltage is present, check for the following:
   a. Ground is open between mounting hardware or ground wire. Repair wiring.
   b. Horn is inoperative. Replace horn. See 6.32 HORN, Replacement: Front Mount.

REPLACEMENT: FRONT MOUNT

FASTENER	TORQUE VALUE	
Horn mounting screw	36-48 **in-lbs**	4.1-5.4 Nm

1. See Figure 6-133. Remove terminal clips from horn spade connectors (1, 3).
2. Remove screws (4) and lockwashers (6) from horn bracket (2). Remove horn assembly (5).
3. Install horn assembly with screws and washers into horn bracket. Tighten to 36-48 **in-lbs** (4.1-5.4 Nm).
4. Install the yellow wire with black tracer to the left spade connector (3) and the black wire to the right spade connector (1).



1. **Right spade connector**
2. **Horn bracket**
3. **Left spade connector**
4. **Screw (3)**
5. **Horn assembly**
6. **Lockwasher (3)**
7. **Screw (2)**
8. **Washer (2)**

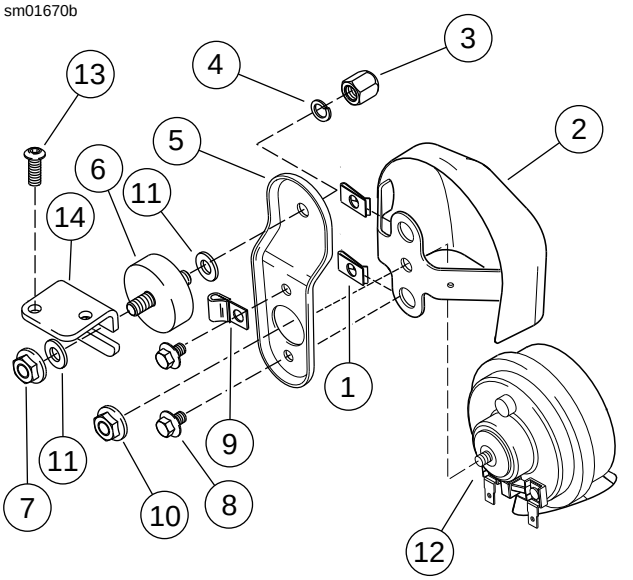
Figure 6-133. Horn Components

REPLACEMENT: SIDE MOUNT

FASTENER	TORQUE VALUE	
Horn, side mounted, stud nut	80-100 **in-lbs**	9.0-11.3 Nm
Horn, side mounted, acorn nut	60-180 **in-lbs**	6.8-20.4 Nm

1. See Figure 6-134. Remove terminal clips from horn spade connections on back of horn (12).
2. Remove acorn nut (3) and lockwasher (4) to free horn assembly from rubber mount (6) stud.
3. Remove wire conduit from clamp (9) at back of support bracket (5).
4. Remove nut (10) from circular recess at back of chrome cover and bracket (2) and remove horn (12) from cover and bracket.
5. Install horn (12) with chrome cover and bracket (2) through hole in horn support bracket (5). Apply two drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to threads of nut (10) and install. Tighten to 80-100 **in-lbs** (9.0-11.3 Nm).
6. Attach the yellow wire with black tracer to front terminal and the black wire to rear terminal. Push wire conduit into clamp (9) at back of horn bracket (5).

7. Install support bracket (5) on rubber mount (6) stud with lockwasher (4) and acorn nut (3). Tighten to 60-180 **in-lbs** (6.8-20.4 Nm).



1. **Clip nut (2)**
2. **Cover and bracket**
3. **Acorn nut**
4. **Lockwasher**
5. **Support bracket**
6. **Rubber mount**
7. **Locknut**
8. **Screw (2)**
9. **Clamp**
10. **Nut**
11. **Washer (2)**
12. **Horn**
13. **Screw (2)**
14. **Mounting bracket**

Figure 6-134. Side Mount Horn Components

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

HANDLEBAR SWITCH ASSEMBLIES 6.33

REPAIR PROCEDURES

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-39969	ULTRA TORCH UT-100
HD-41183	HEAT SHIELD ATTACHMENT

1. Push conduit back to better access wires and avoid damaging conduit with radiant heating device. Secure conduit with extra 7.0 in (177.8 mm) cable strap in kit.
2. Strip 0.5 in (12.7 mm) of insulation off switch wires. Twist stripped ends of switch wires until all strands are tightly coiled.
3. Cut dual wall heat shrink tubing, supplied in repair kit into 1.0 in (25.4 mm) segments. Slide tubing over each wire of **new** switch assembly.
4. Splice existing and **new** switch wires, matching wire colors. Solder the spliced connections. For best results, splice one wire at a time.
5. Center the heat shrink tubing over the soldered splices.

⚠WARNING

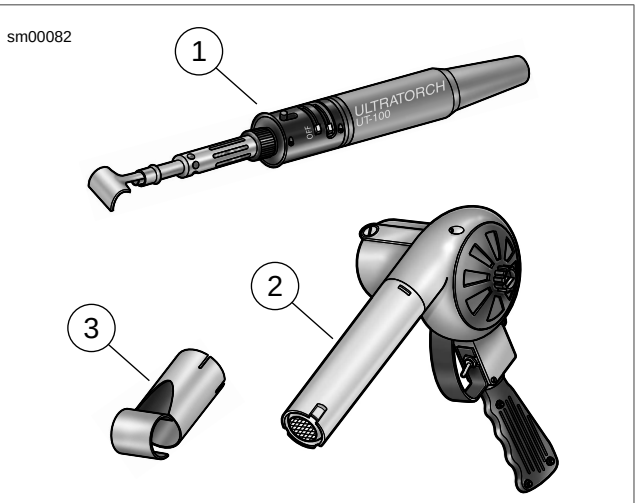
Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)

- Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.
- Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.
- Always keep hands away from tool tip area and heat shrink attachment.

6. See Figure 6-135. Use ULTRA TORCH UT-100 (Part No. HD-39969) or ROBINAIR HEAT GUN (Part No. HD-25070) with HEAT SHIELD ATTACHMENT (Part No. HD-41183) or equivalent. Uniformly heat the heat shrink tubing to insulate and seal the soldered connections. Apply heat just until the meltable sealant exudes out both ends of tubing and assumes a smooth cylindrical appearance.
7. Inspect solder connection.
   a. Inspect the melted sealant for solder beads.
   b. Excess solder or heat may force some solder out with the melted sealant.
   c. Remove any solder found.
   d. Briefly heat the connection to reseal the tubing if solder beads were removed.
   e. Use less solder or reduce heating time or intensity when doing subsequent splices.

⚠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)



1. **Ultra Torch UT-100**
2. **Robinair Heat Gun**
3. **Heat Shield Attachment**

Figure 6-135. Radiant Heating Devices

CONNECTORS

⚠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 the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.

⚠WARNING

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

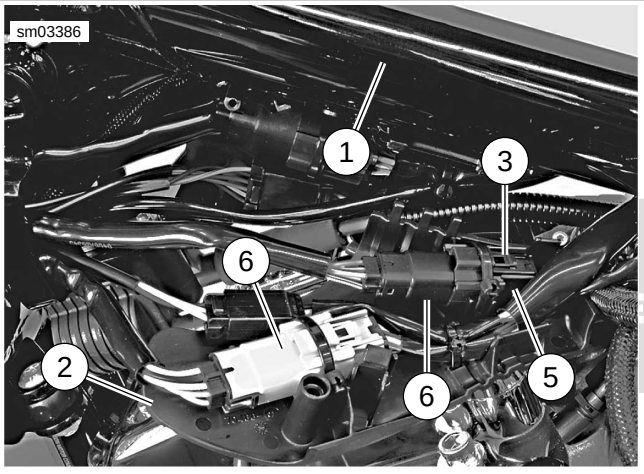
2. Remove main fuse.
3. Remove fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
4. Separate left and right wire harness caddies. See 6.28 ELECTRICAL CADDIES.
5. See Figure 6-136 or Figure 6-137. Locate right handlebar connector [22] (4, 5) mounted on left wire harness caddy (2). Press latch (3) and separate connector halves.

6. In the same manner, locate left handlebar connector [24] (6), press latch and separate connector halves.
7. See A.19 MOLEX MX 150 SEALED CONNECTOR to service connectors [22] and [24].
8. Mate right handlebar connector [22] halves. Mate left handlebar connector [24] halves.
9. Reassemble left and right wire harness caddies. See 6.28 ELECTRICAL CADDIES.
10. Replace fuel tank. See 4.4 FUEL TANK: XL MODELS or 4.5 FUEL TANK: XR 1200X.
11. Install main fuse.

⚠WARNING

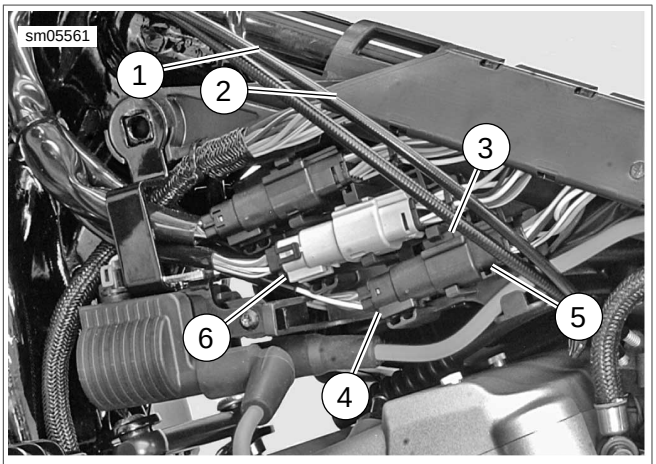
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

12. Verify operation of electrical system.



1. **Frame backbone**
2. **Left wire harness caddy**
3. **Connector latch**
4. **Right handlebar pin connector [22A]**
5. **Right handlebar socket connector [22B]**
6. **Left handlebar control connector [24]**

Figure 6-136. Handlebar Connectors: XL Models



1. **Frame backbone**
2. **Left wire harness caddy**
3. **Connector latch**
4. **Right handlebar pin connector [22A]**
5. **Right handlebar socket connector [22B]**
6. **Left handlebar control connector [24]**

Figure 6-137. Handlebar Connectors: XR 1200X

IGITAL
CHNICIAN II
RLEY-DAVIDSON

RIGHT HANDLEBAR SWITCHES 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.

NOTICE

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

NOTE

Place a 5/32 in (4 mm) thick cardboard insert between the brake lever and lever bracket. Without the insert, the rubber boot and plunger of the front stop lamp switch can be damaged.

2. See Figure 6-138. Place the cardboard insert between the brake lever and lever bracket.
3. Using a T27 TORX drive head, remove the two screws with flat washers securing the handlebar clamp to the master cylinder housing. Remove the brake lever/master cylinder assembly and clamp from the handlebar.
4. Using a T25 TORX drive head, remove the upper and lower switch housing screws.
5. Remove the friction shoe from the end of the tension adjuster screw.

NOTE

The friction screw is a loose fit. It may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

6. Remove the brass ferrules from the notches on the inboard side of the throttle control grip. Remove the ferrules from the cable end fittings.
7. Remove the throttle control grip from the end of the handlebar.
8. Pull the crimped inserts at the end of the throttle and idle control cable housings from the lower switch housing. For best results, use a rocking motion while pulling. Place a drop of light oil on the retaining rings, if necessary. Remove the cables from the switch housing.



Figure 6-138. Install Cardboard Insert

DISASSEMBLY

NOTICE

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

1. Place the cardboard insert between the brake lever and lever bracket.
2. Remove the upper and lower switch housing screws.
3. If replacing lower housing switches, perform steps 4 through 7 before continuing to repair section. If replacing upper housing switches, proceed directly to repair section.
4. See Figure 6-147. Loosen the upper screw (1) securing the handlebar switch clamp to the master cylinder housing. Remove the lower clamp screw with flat washer (2).
5. Remove the brass ferrules from the notches on the inboard side of the throttle control grip. Remove the ferrules from the cable end fittings.
6. Remove the friction shoe from the end of the tension adjuster screw.

NOTE

The friction shoe is a loose fit. It may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

7. Remove the throttle control grip from the end of the handlebar.

SWITCH REPAIR/REPLACEMENT

Switch and Lead Replacement

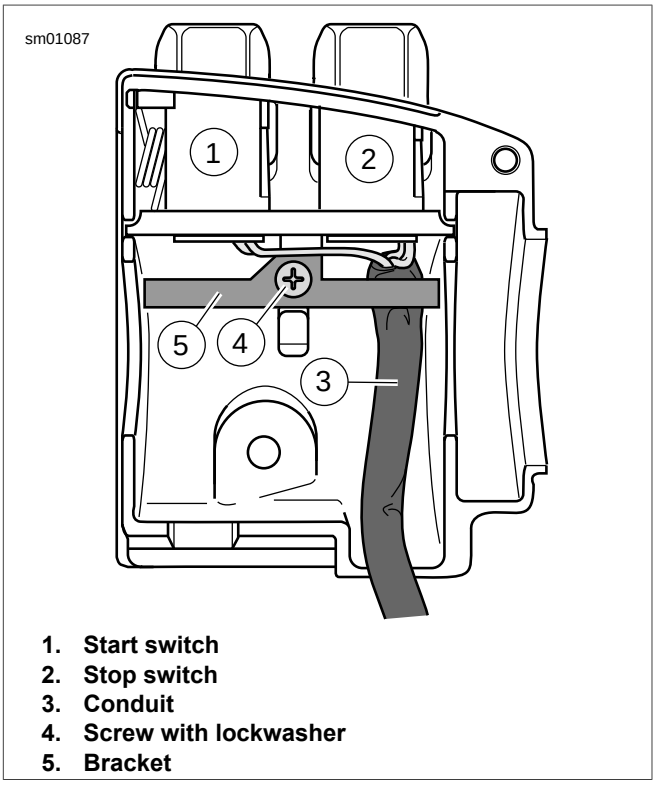
After cutting off the connector terminals, pull the leads of faulty switches through the conduit. Route replacement switch leads through the conduit. Terminate the leads at the connector. If necessary, replace the switches.

Switch Only Replacement: Upper Housing

NOTE

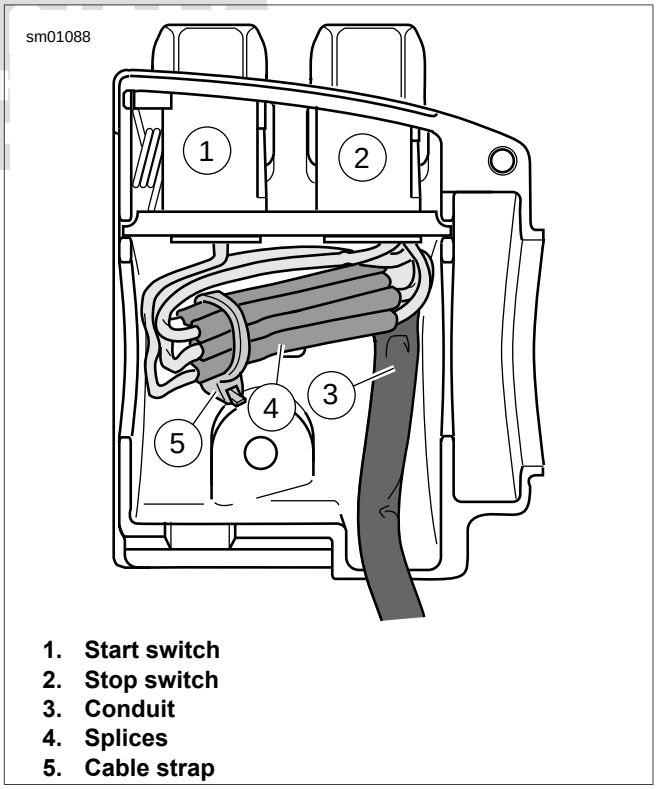
If only one switch is faulty, replace the horn switch and high/low beam switch as a single assembly.

1. See Figure 6-139. From inside the switch housing, remove the screw with lockwasher (4) to release the bracket (5). Remove the bracket and switch assembly from the housing.
2. Move cable conduit (3) from beneath wing of bracket. Cut wires 0.25 in (6.4 mm) from old switches (1, 2). Discard old switch and bracket assembly.
3. Slide conduit forward over cut ends of switch wires and cut off 0.5 in (12.7 mm) of conduit (3) material. Push conduit back to access switch wires.
4. See Figure 6-140. Separate **new** engine stop switch (2) and engine start switch (1) wires into two bundles.
5. See 6.33 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.
6. See Figure 6-140. Loop switch wires and bundle splices.
7. See Figure 6-139. Route wires downstream of splices beneath wing on engine stop switch side of bracket.
8. See Figure 6-140. Install a **new** 7.0 in (177.8 mm) cable strap (5) beneath wing on engine start switch side (1) of bracket and capture wire splices (4).
9. Place switch assembly into upper housing aligning hole in bracket with threaded hole in boss. Seat the bracket. The step at the edge of the boss captures the bottom edge of the bracket. Tabs on each side of the bracket fit in slots cast into the housing.
10. See Figure 6-139. Install screw and lockwasher (4) to secure bracket (5) inside housing. Verify that wing on engine stop switch (2) side of bracket captures edge of conduit (3) as shown.
11. Securely tighten cable strap to draw splices to bracket. Trim cable straps.



1. **Start switch**
2. **Stop switch**
3. **Conduit**
4. **Screw with lockwasher**
5. **Bracket**

Figure 6-139. Upper Housing Without Splices



1. **Start switch**
2. **Stop switch**
3. **Conduit**
4. **Splices**
5. **Cable strap**

Figure 6-140. Upper Housing With Splices

Switch Only Replacement: Lower Housing

1. From inside the switch housing, carefully cut cable strap to free conduit from the turn signal switch bracket.

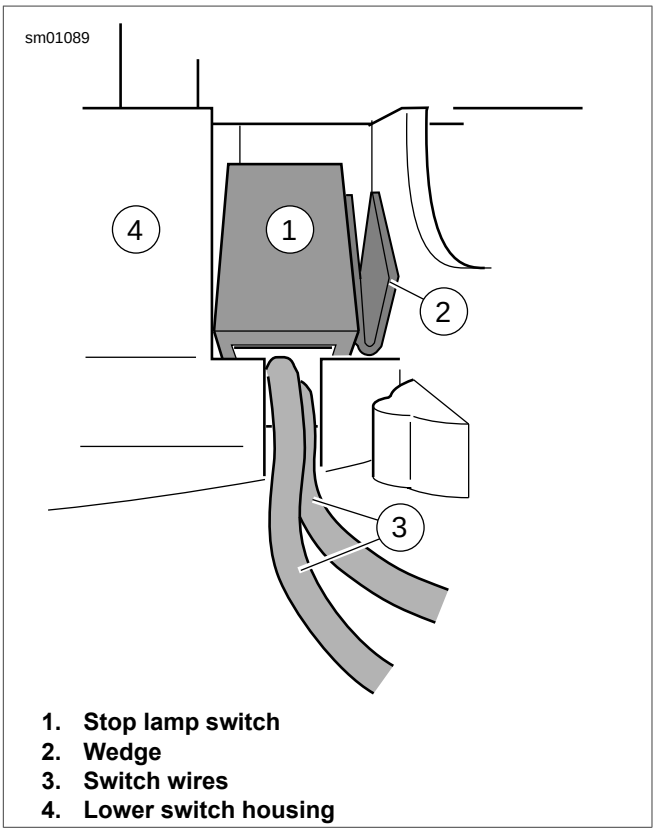
2. Remove the screw with lockwasher to release the turn signal switch bracket. Remove the bracket and switch assembly from the housing.

Turn-Right Signal Switch Only

1. Cut wire 1.5 in (38.1 mm) from old switch. Discard old switch assembly.
2. See 6.33 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.

Front Stop Lamp Switch Only

1. Carefully remove the wedge between the switch and switch housing, if present. To remove the switch from the housing, press the plunger and slowly rotate switch upward while rocking slightly.
2. Cut wires 1.0 in (25.4 mm) from old switch. Discard old switch.
3. See 6.33 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.
4. Carefully press plunger against inside wall of switch housing. With thumb over plunger bore, move switch into the installed position in the switch housing cavity. When plunger is positioned against thumb, slowly rotate switch downward while rocking slightly. Release the plunger only after switch is properly positioned in the cavity.
5. Verify that the plunger is square in the bore and that the boot is not compressed, collapsed or torn. If necessary, gently work the plunger in and out until boot is fully extended.
6. See Figure 6-141. Push down on switch (1) so that it bottoms against housing and wires (3) run in groove at base of cavity. With the concave side facing outward, insert wedge (2) between switch and outboard side of switch housing.
7. Push wedge down until it also bottoms against housing. Verify that the plunger is still square in the bore. Place a drop of RTV SILICONE SEALANT on upper corner of wedge.



1. **Stop lamp switch**
2. **Wedge**
3. **Switch wires**
4. **Lower switch housing**

Figure 6-141. Install Stop Lamp Switch

ASSEMBLY

1. See Figure 6-142. Insert tapered end of **new** 7.0 in (177.8 mm) cable strap (1) into round hole in turn signal switch bracket (2) and then feed back through using the adjacent hole. Reserve the oblong hole for the bracket screw.

NOTE

Be sure that all splices are positioned above the turn signal switch bracket.

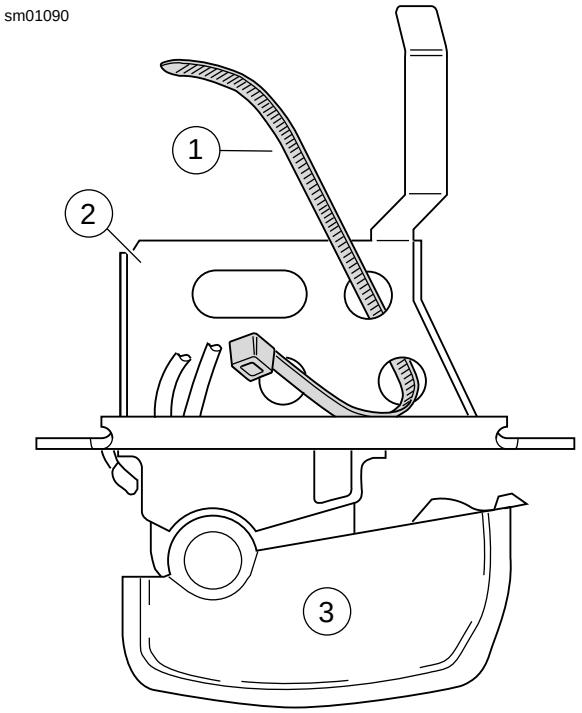
2. Place the turn signal switch assembly into the housing, aligning the oblong hole in the bracket with the threaded hole in the boss. Be sure that the bracket is fully seated. Tabs on each side of bracket are captured in slots cast into switch housing.
3. Start screw with lockwasher to secure bracket inside housing.

NOTICE

If routed incorrectly, wires can be pinched by casting or handlebar resulting in switch failure. (00542b)

4. Loop switch wires so that spliced lengths are positioned across bracket.
5. Capturing conduit about 0.25 in (6.4 mm) from end, securely tighten cable strap to draw conduit to bracket. Trim cable straps.
6. Install second 7.0 in (177.8 mm) cable strap capturing conduit and wire splices. Securely tighten cable strap to draw splices to conduit. Trim cable straps.

7. Tighten screw to secure bracket inside housing.
8. Route wire bundle to upper switch housing by gently pressing conduit into channel next to angular arm of bracket.
9. Secure bundle to arm using third cable strap. Trim cable straps.
10. If necessary, bend angular arm of bracket downward to firmly secure front stop lamp switch in position.



1. **Cable strap**
2. **Bracket**
3. **Right turn signal switch**

Figure 6-142. Insert Cable Strap in Switch Bracket

INSTALLATION

FASTENER	TORQUE VALUE	
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

1. See Figure 6-143. Push the throttle and idle control cables into the lower switch housing until they snap in place. Note the different diameter inserts crimped into the end of the throttle and idle cable housings.
   a. Push the silver insert (2) of throttle cable housing into the hole in front of tension adjuster screw (3).
   b. Push the gold insert (1) of idle cable housing into the hole at the rear of tension adjuster screw (3).

NOTE

To aid assembly, place a drop of light oil on the retaining rings of the crimped inserts. Always replace the retaining rings if damaged or distorted.

2. See Figure 6-144. Route the cable (2) to the upper switch housing as shown.
3. Slide the throttle control grip over the end of the right handlebar until it bottoms against the closed end. Rotate the grip so that the ferrule notches are at the top. To prevent binding, pull the grip back about 1/8 in (3.2 mm).
4. With the concave side facing upward, install the friction shoe so that the pin hole is over the point of the adjuster screw.

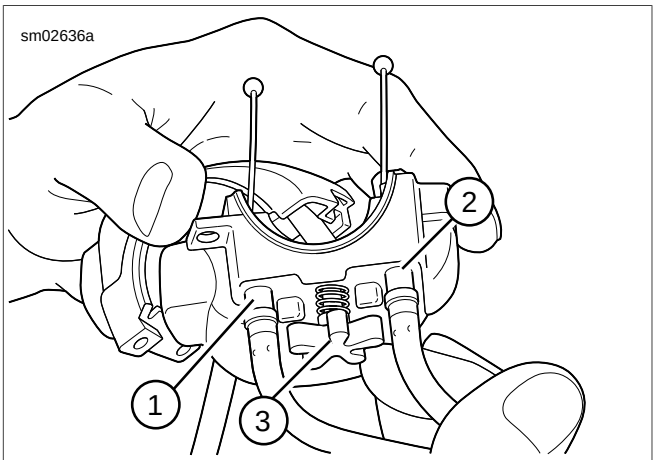
NOTE

The friction shoe is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

5. See Figure 6-145. Position lower switch housing beneath the throttle control grip. Install the brass ferrules (4) onto the cable so that the end fittings seat in the ferrule recess. Seat the ferrules in their respective notches (3) on the throttle control grip. Verify that the cables are captured in the grooves (2) molded into the grip.
6. Position the upper switch housing over the handlebar and lower switch housing.
7. Verify that the wire harness conduit runs in the depression at the bottom of the handlebar. Be sure that the upper switch housing harness will not be pinched under the handlebar when the switch housing screws are tightened.
8. Start the upper and lower switch housing screws, but do not tighten.

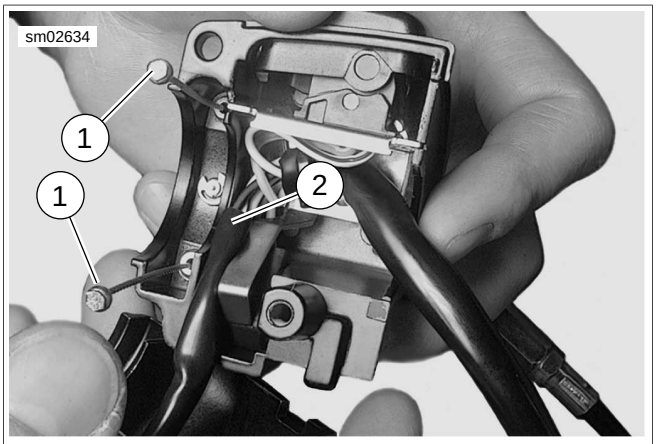
NOTICE

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



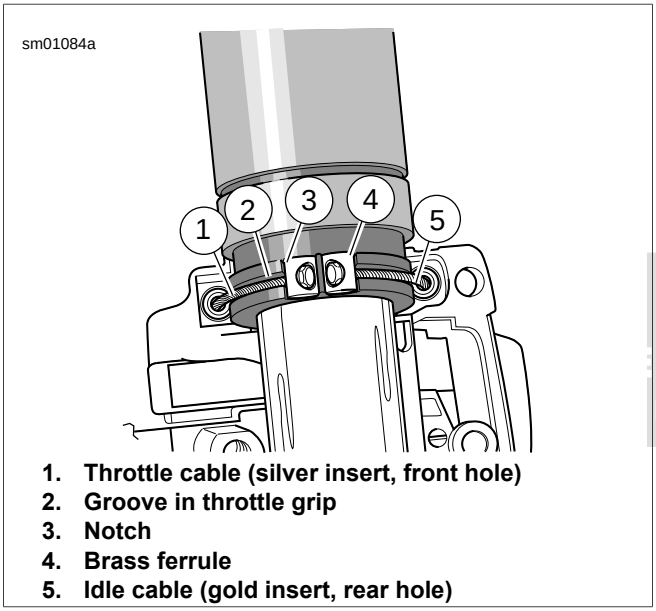
1. **Idle cable insert (gold insert, rear hole)**
2. **Throttle cable insert (silver insert, front hole)**
3. **Tension adjuster screw**

Figure 6-143. Right Lower Module Housing



1. **End fittings**
2. **Upper switch housing cable**

Figure 6-144. Route Cable to Upper Switch Housing



1. **Throttle cable (silver insert, front hole)**
2. **Groove in throttle grip**
3. **Notch**
4. **Brass ferrule**
5. **Idle cable (gold insert, rear hole)**

Figure 6-145. Throttle Cable Attachment

9. See Figure 6-146. Position the brake lever/master cylinder assembly inboard of the switch housing assembly, engaging the tab (2) on the lower switch housing in the groove (3) at the top of the brake lever bracket.
10. Align the holes in the handlebar switch clamp with the master cylinder housing. Start the two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten to specification using a T27 TORX drive head. Refer to Table 6-9.
11. Using a T25 TORX drive head, tighten lower and upper switch housing screws to specification. Refer to Table 6-9.

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch.

Table 6-9. Handlebar Switch Assembly Fasteners

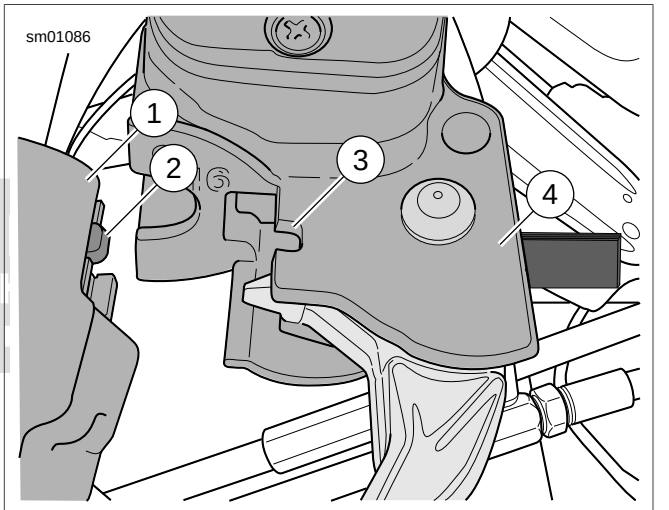
FASTENER	TORQUE
Handlebar clamp screw	108-132 **in-lbs** (12.2-14.9 Nm)
Switch housing screws	35-45 **in-lbs** (4.0-5.1 Nm)

12. Remove the cardboard insert between the brake lever and lever bracket.
13. Adjust throttle cables. See 2.28 THROTTLE CABLES: ALL MODELS
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. Test the switches for proper operation.
16. Secure wire harness to handlebar as necessary.



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

Figure 6-146. Switch Housing Alignment (typical)



1. Upper screw
2. Lower screw and flat washer

Figure 6-147. Handlebar Switch Clamp Screws

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

LEFT HANDLEBAR SWITCHES 6.35

REMOVAL

NOTE

The removal and installation steps listed apply when replacing the entire switch assembly, a switch housing or the handlebar.

⚠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. Using a T25 TORX drive head, loosen but do not remove the upper and lower switch housing screws.
3. Using a T27 TORX drive head, remove the two screws with flat washers securing the handlebar clamp to the clutch lever bracket. Remove the clutch hand lever assembly and clamp from the handlebar.
4. Remove the upper and lower switch housing screws.
5. Remove the left hand grip from the end of the handlebar if damaged. See 2.30 HANDLEBAR, Left Hand Grip.

DISASSEMBLY

1. Remove the upper and lower switch housing screws.
2. If replacing lower housing switches, perform next step before continuing to repair section. If replacing upper housing switches, proceed directly to repair section.
3. Loosen the upper screw securing the handlebar clamp to the clutch lever bracket. Remove the lower clamp screw with flat washer.

SWITCH REPAIR AND REPLACEMENT

Switch and Lead Replacement

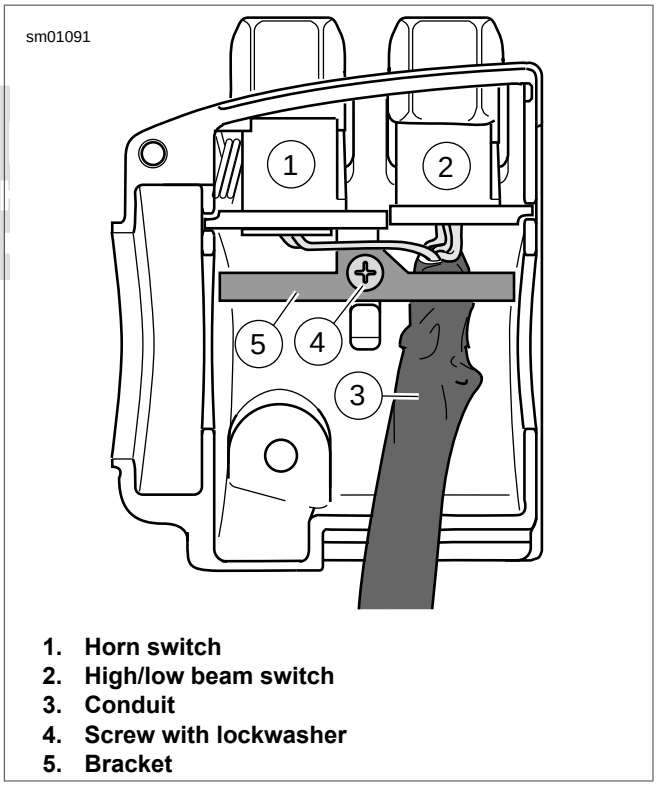
After cutting off the connector terminals, pull the leads of faulty switches through the conduit. Route replacement switch leads through the conduit. Terminate the leads at the connector. If necessary, replace only the switches.

Switch Only Replacement: Upper Housing

NOTE

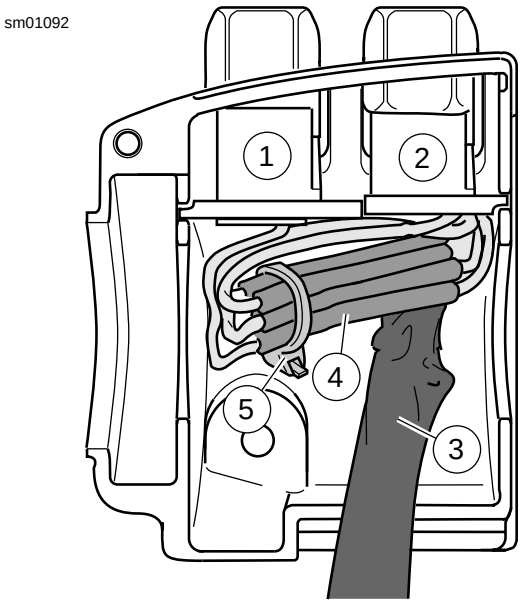
If only one switch is faulty, replace the horn switch and high/low beam switch as a single assembly.

1. See Figure 6-148. From inside the switch housing, remove the screw with lockwasher (4) to release the bracket (5). Remove bracket and switch assembly from the housing.
2. Move cable conduit (3) from beneath wing of bracket. Cut wires 0.25 in (6.4 mm) from old switches (1, 2). Discard old switch and bracket assembly.
3. Slide conduit forward over cut ends of switch wires and cut off 0.5 in (12.7 mm) of conduit (3) material. Push conduit back to access switch wires.
4. Separate the **new** horn switch (1) and high/low beam switch (2) wires into two bundles.
5. See 6.33 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.
6. See Figure 6-149. Loop switch wires.
7. See Figure 6-148. Route wires downstream of splices beneath wing on high/low beam switch side of bracket.
8. See Figure 6-149. Install a **new** 7.0 in (177.8 mm) cable strap (5) beneath wing on horn switch side (1) of bracket and capture wire splices (4).
9. Place switch assembly into upper housing aligning hole in bracket with threaded hole in boss. Be sure that bracket is fully seated. The step at the edge of the boss captures the bottom edge of the bracket. Tabs on each side of the bracket fit in slots cast into the housing.
10. See Figure 6-148. Install screw and lockwasher (4) to secure bracket (5) inside housing. Verify that wing on high/low switch (2) side of bracket captures edge of conduit (3) as shown.
11. Securely tighten cable strap to draw splices to bracket. Trim cable straps.



1. **Horn switch**
2. **High/low beam switch**
3. **Conduit**
4. **Screw with lockwasher**
5. **Bracket**

Figure 6-148. Upper Housing Without Splices



1. **Horn switch**
2. **High/low beam switch**
3. **Conduit**
4. **Splices**
5. **Cable strap**

Figure 6-149. Upper Housing With Splices

Switch Only Replacement: Lower Housing

1. From inside the switch housing, carefully cut cable strap to free conduit from the turn signal switch bracket.
2. Remove screw with lockwasher to release the turn signal switch bracket. Remove the bracket and switch assembly from the housing.

Turn-Left Signal Switch Only

1. Cut wires 1.5 in (38.1 mm) from old turn signal switch. Discard switch assembly.
2. See 6.33 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.

Clutch Interlock Switch Only

1. See Figure 6-150. Cut wires 0.25 in (6.4 mm) from old switch. Discard switch assembly.
2. See 6.33 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.

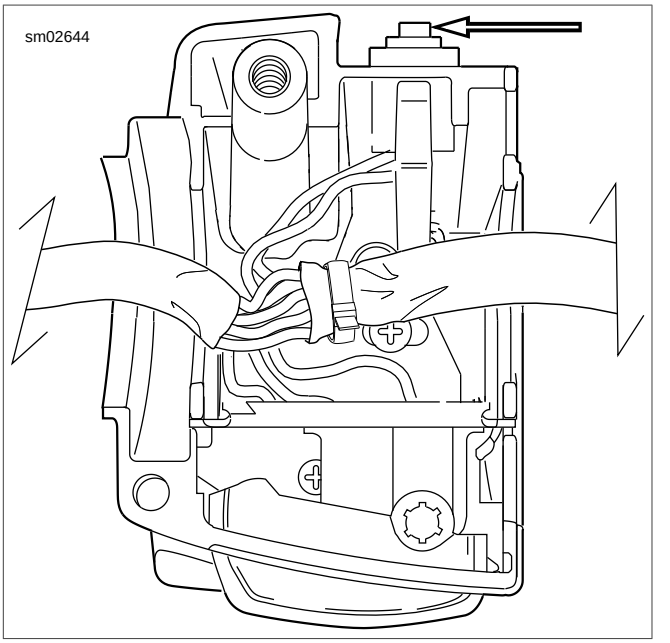


Figure 6-150. Clutch Interlock Switch

ASSEMBLY

1. See Figure 6-151. Insert tapered end of **new** 7.0 in (177.8 mm) cable strap (1) into round hole in turn signal switch bracket (2) and then feed back through using the adjacent hole. Reserve the oblong hole for the bracket screw.

NOTE

Be sure that all splices are positioned above the turn signal switch bracket.

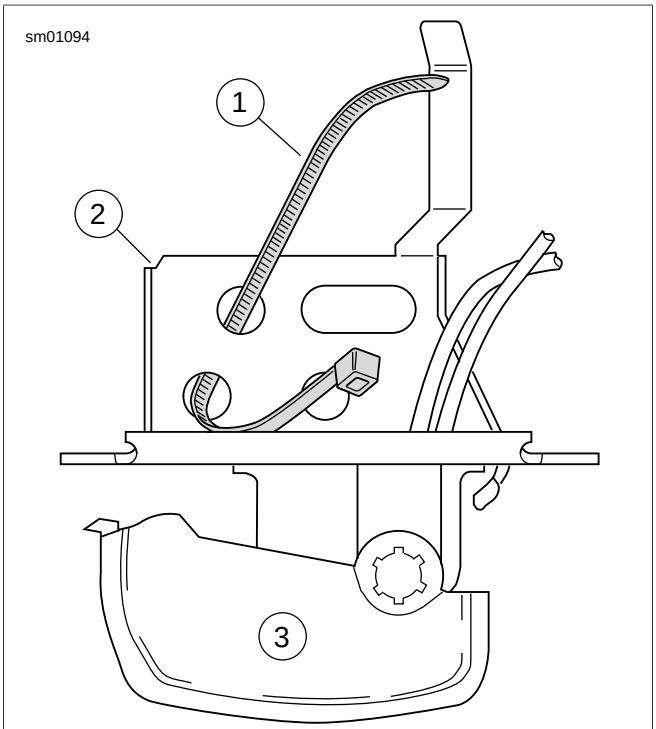
2. Aligning the oblong hole in the bracket with the threaded hole in the boss. Place the turn signal switch assembly (3) into the housing. Fully seat the bracket. Tabs on each side of bracket are captured in slots cast into switch housing.
3. Start screw with lockwasher to secure bracket inside housing.

NOTICE

If routed incorrectly, wires can be pinched by casting or handlebar resulting in switch failure. (00542b)

4. Loop switch wires so that spliced lengths are positioned across bracket.
5. Capturing conduit about 0.25 in (6.4 mm) from end, securely tighten cable strap to draw conduit to bracket. Trim cable straps.
6. Tighten screw to secure bracket inside housing.
7. Route wire bundle to upper switch housing below and then forward of the main wire harness.
8. Position conduit in channel next to angular arm of bracket. Secure bundle to arm using **new** cable strap.
9. Trim cable strap.

DIGITAL TECHNICIAN HARLEY-DAVIDSON®



1. **Cable strap**
2. **Bracket**
3. **Left turn signal switch**

Figure 6-151. Insert Cable Strap in Switch Bracket

INSTALLATION

FASTENER	TORQUE VALUE	
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

1. If the hand grip was removed, install a **new** hand grip. See 2.30 HANDLEBAR, Left Hand Grip.
2. See Figure 6-152. Install upper and lower switch housings on handlebar. Be sure that ribs (2) on outboard side of switch housings fit in grooves (3) molded into grip.
3. Verify that the wire harness conduit runs in the groove at the bottom of the handlebar. Do not pinch the upper switch housing harness under the handlebar when the switch housing screws are tightened.
4. Start the upper and lower switch housing screws, but do not tighten.
5. See Figure 6-153. Position the clutch hand lever assembly inboard of the switch housing assembly, engaging the tab (3) on the lower switch housing in the groove (2) at the bottom of the clutch lever bracket.
6. Align the holes in the handlebar switch clamp with the clutch lever bracket. Start the two screws with flat washers. Position for rider comfort. Beginning with the top screw, tighten screws to specification with a T27 TORX drive head. Refer to Table 6-10.
7. Using a T25 TORX drive head, tighten lower and upper switch housing screws to specification. Refer to Table 6-10.

NOTE

Tighten the lower switch housing screw first. The gap between the upper and lower housings is at the front of the switch.

Table 6-10. Handlebar Switch Assembly Fasteners

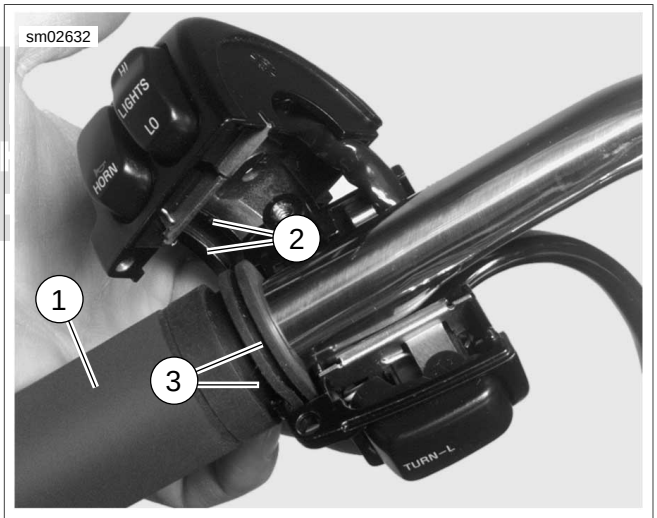
FASTENER	TORQUE
Handlebar clamp screw	108-132 **in-lbs** (12.2-14.9 Nm)
Switch housing screws	35-45 **in-lbs** (4.0-5.1 Nm)

8. Install main fuse.
9. Verify the operation of the clutch interlock switch. See the electrical diagnostic manual.

⚠WARNING

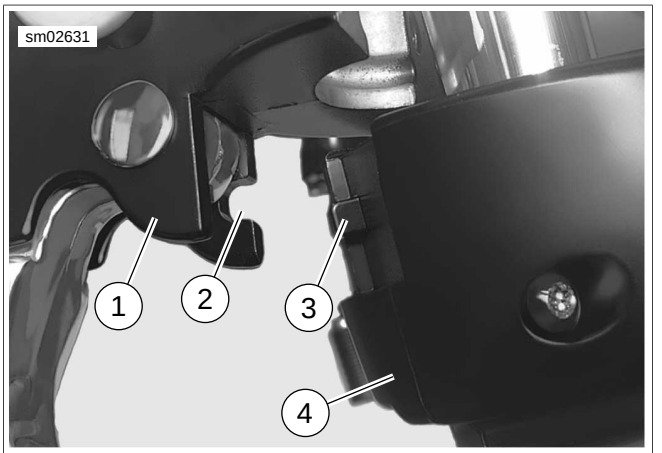
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

10. Test the switches for proper operation.
11. Secure wire harness to handlebar as necessary.



1. **Grip sleeve**
2. **Ribs**
3. **Grooves**

Figure 6-152. Left Handlebar Switch Housings



1. Clutch lever bracket
2. Groove
3. Tab
4. Switch housing assembly

Figure 6-153. Clutch Lever Bracket

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

PERSONAL IDENTIFICATION NUMBER (PIN) 6.36

GENERAL

The PIN consists of five digits. Each digit can be any number from 1 through 9. There can be no zeros (0) in the PIN. Use the PIN to disarm the security system in case the fob becomes unavailable.

INITIAL PIN ENTRY

To enter a PIN on a motorcycle with no PIN previously installed during HFSM actuation, refer to Table 6-11.

Table 6-11. Entering an Initial PIN: HFSM, TSSM

STEP	ACTION	CONFIRMATION
1	Select a five-digit (1 through 9) initial PIN and record in the owner's manual and on the wallet card.	
2	With an assigned fob present, set engine stop switch to **OFF.**	
3	Cycle ignition switch **IGNITION**-OFF-**IGNITION**-OFF-**IGNITION.**	
4	Press **left** turn signal button twice.	Turn signals flash three times.
5	Press **right** turn signal button once.	Five dashes appear in the odometer window. The first dash flashes.
6	Enter first digit (a) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
7	Press **right** turn signal button once.	The digit (a) replaces the dash in the odometer. The second dash flashes.
8	Enter second digit (b) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
9	Press **right** turn signal button once.	The digit (b) replaces the dash in the odometer. The third dash flashes.
10	Enter third digit (c) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
11	Press **right** turn signal button once.	The digit (c) replaces the dash in the odometer. The fourth dash flashes.
12	Enter fourth digit (d) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
13	Press **right** turn signal button once.	The digit (d) replaces the dash in the odometer. The fifth dash flashes.
14	Enter fifth digit (e) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
15	Press **right** turn signal button once.	The digit (e) replaces the dash in the odometer. The first digit flashes.
16	Turn the ignition switch to **OFF.**	

CHANGING THE PIN

The rider can change the PIN at any time. Refer to Table 6-12.

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 6-12. Changing the PIN: HFSM

STEP	ACTION	CONFIRMATION	NOTES
1	Select a five-digit (1 through 9) PIN and record in the owner's manual and on the wallet card.		
2	With fobs present, cycle ignition switch IGNITION-OFF-IGNITION-OFF-IGNITION.		
3	Press **left** turn signal button twice.	Turn signals flash 3 times.	
4	Press **right** turn signal button once.	Current PIN will appear in odometer. The first digit will flash.	
5	Enter first digit (a) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
6	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The second digit flashes.	
7	Enter second digit (b) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
8	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The third digit flashes.	
9	Enter third digit (c) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
10	Press **right** turn signal button once.	The new digit replaces the dash in the odometer. The fourth digit flashes.	
11	Enter fourth digit (d) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
12	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The fifth digit flashes.	
13	Enter fifth digit (e) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
14	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The first digit flashes.	
15	Turn the ignition switch to **OFF.**		Turning ignition switch to OFF stores PIN.

DIGITAL TECHNICIAN II

H-DSSS ACTUATION 6.37

GENERAL

Setting up a vehicle TSM/HFSM depends on whether the vehicle has a TSM or the optional HFSM security system installed.

SIDECAR CONFIGURATION

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

All motorcycles ship with the H-DSSS set for use **without** a sidecar installed. If a motorcycle is equipped with a TSM, no further actuation is required.

ACTUATION

Actuation consists of assigning two fobs to the system, and entering an initial PIN. The PIN can be changed by the rider at any time.

1. Configure vehicles by assigning **both** fobs to the vehicle.
2. Configure vehicles by entering a PIN picked by the owner. The personal code allows the owner to operate the system if the fob is lost or inoperable. Record the PIN in the owner's manual. Instruct the customer to carry a copy (use the wallet card found in the owner's manual). See 6.36 PERSONAL IDENTIFICATION NUMBER (PIN).

Once the system has been activated, it will always "arm" within 5 seconds of turning the ignition switch to **OFF** or **ACC** and no motorcycle motion.

FOB ASSIGNMENT

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Use DIGITAL TECHNICIAN II (Part No. HD-48650) to assign both fobs to the H-DSSS. Follow the menu prompts to scan the fob serial number with the bar code reader. Alternatively, enter the number using the keyboard. The initial PIN entry should be performed using DIGITAL TECHNICIAN II (Part No. HD-48650) in conjunction with fob assignment.

NOTE

Each fob has a unique serial number. Attach fob label to a blank NOTES page in the owner's manual for reference.

POWER DISRUPTION AND CONFIGURING

The following actions may result in a removal of battery voltage from the TSM/HFSM:

- Battery disconnect
- Power drain
- Battery fuse removal
- Connecting a breakout box to the TSM/HFSM connector

After battery voltage has been removed from terminal 1 of the TSM/HFSM, the module will not enter the PIN entry mode on the first attempt. Initialize the PIN entry configuration sequence twice before entering the PIN:

1. Set engine OFF/RUN switch to **OFF**.
2. Cycle the ignition switch:
   a. IGNITION
   b. OFF
   c. IGNITION
   d. OFF
   e. IGNITION
3. Press the left turn signal switch **twice**.
4. Repeat the previous steps.
5. Continue with the PIN entry sequence.

TSM/HFSM: PASSWORD LEARN 6.38

GENERAL

If the ECM or TSM/HFSM is faulty, replace the unit. See 6.6 ELECTRONIC CONTROL MODULE (ECM) or 6.7 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM). Then, to determine if password learn is necessary, refer to Table 6-13.

Table 6-13. Password Learn

DEVICE REPLACED	IS PASSWORD LEARN NECESSARY?
ECM	Yes
TSM	No *
TSM/HFSM	Yes
* If a TSM has been replaced by a HFSM, or a HFSM has been replaced by a TSM, password learn is necessary.	

PASSWORD LEARN

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

To perform the password learn procedure, refer to Table 6-14. When finished, continue with all instructions under 6.37 H-DSSS ACTUATION.

TSM/HFSM: Always perform all appropriate instructions under 6.37 H-DSSS ACTUATION after TSM/HFSM replacement or removal.

TSM/TSSM (Japan/Korea markets): Always perform all appropriate instructions under VEHICLE DELIVERY in the electrical diagnostic manual after TSM/TSSM replacement or removal.

NOTES

- ***HFSM:*** *Fob assignment must be performed at an authorized Harley-Davidson dealer using DIGITAL TECHNICIAN II (Part No. HD-48650).*
- ***TSSM:*** *Do not forget to enter a Personal Identification Number (PIN) for TSSM vehicles. If a code is not assigned and the key fob is lost or damaged while the vehicle is armed, the TSSM must be replaced.*

Table 6-14. Setting TSM/TSSM/HFSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
	Ignition must be turned off for at least 15 seconds.	With Ignition Switch turned off, Check Engine lamp and Security lamp will be off.	
1	Install **new** TSM/TSSM/HFSM or ECM.		
2	Set Engine Stop Switch to **RUN.**		
3	Turn Ignition Switch **ON.**	Verify Check Engine lamp and Security lamp illuminate and then turn off.	TSM/HFSM enables start relay.
4	Attempt normal start one time.	Engine starts and stalls. Check Engine lamp illuminates and stays on.	Password has not been learned. ECM sets DTC P1009.
5	Wait ten seconds. Security lamp will illuminate and stay on.	Security lamp illuminates.	ECM enters Password Learning mode for ten minutes. Do not cycle Ignition Switch or interrupt vehicle power or Password Learn will be unsuccessful.
6	Wait until Security lamp turns off.		This takes ten minutes.
7	Quickly (within two seconds) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
8	Wait until Security lamp turns off.		This takes ten minutes.
9	Quickly (within two seconds) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
10	Wait until Security lamp turns off.		This takes ten minutes.
11	Quickly (within two seconds) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.

Table 6-14. Setting TSM/TSSM/HFSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
12	Turn Ignition Switch **OFF**. Wait 15 seconds before turning Ignition Switch on. Turn Ignition Switch **ON** and start engine to confirm successful Password Learn procedure. Clear DTCs.		
13	**TSM/HFSM:** Perform all steps under 6.37 H-DSSS ACTUATION. **TSM/TSSM (Japan/Korea markets):** Perform all steps under VEHICLE DELIVERY in electrical diagnostic manual.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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.

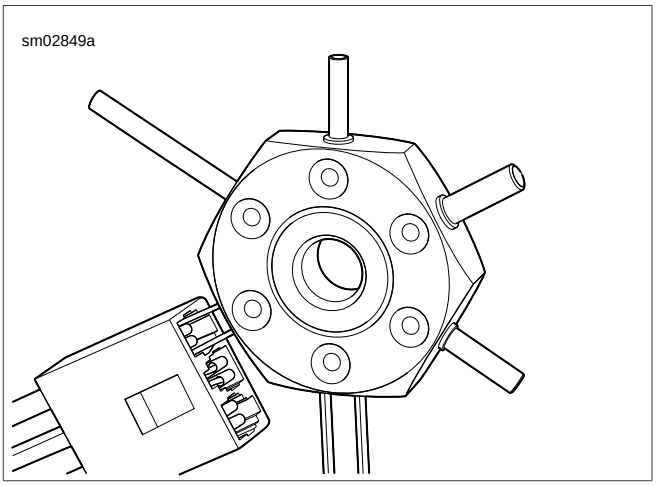


Figure A-1. Removing Autofuse Unsealed Terminal from Ignition Switch

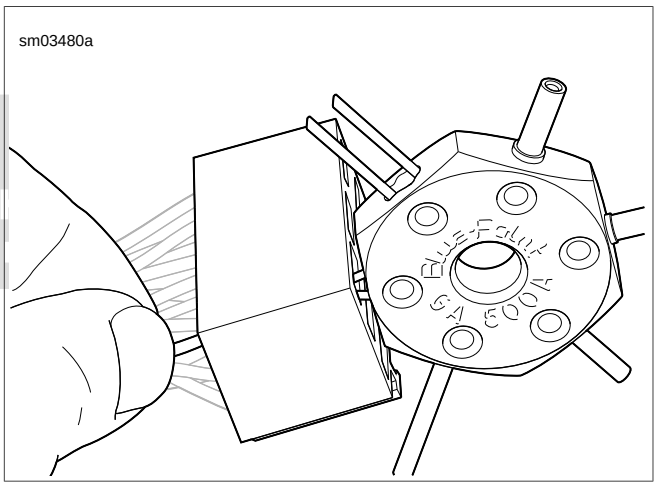


Figure A-2. Removing Autofuse Unsealed Terminal from Fuse Block

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 on all models.

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.

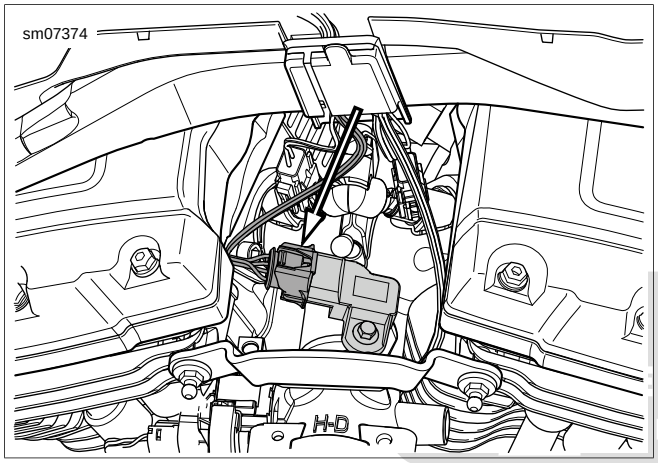


Figure A-3. Bosch Compact 1.1M Connector

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.

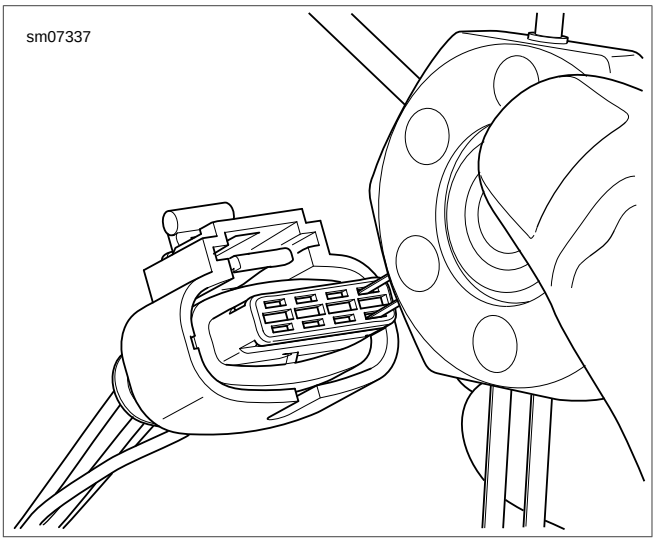


Figure A-4. Terminal Removal: Bosch Compact 1.1M Connector

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.

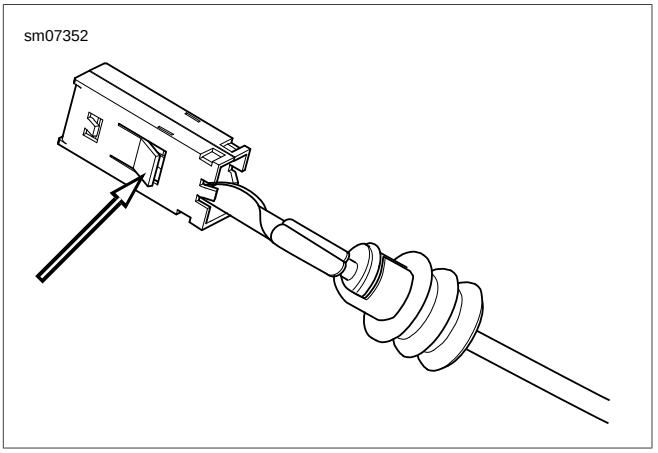


Figure A-5. Tangs: Bosch Compact 1.1M Socket Terminal

DELPHI 100W MICRO-PACK SEALED CONNECTOR A.3

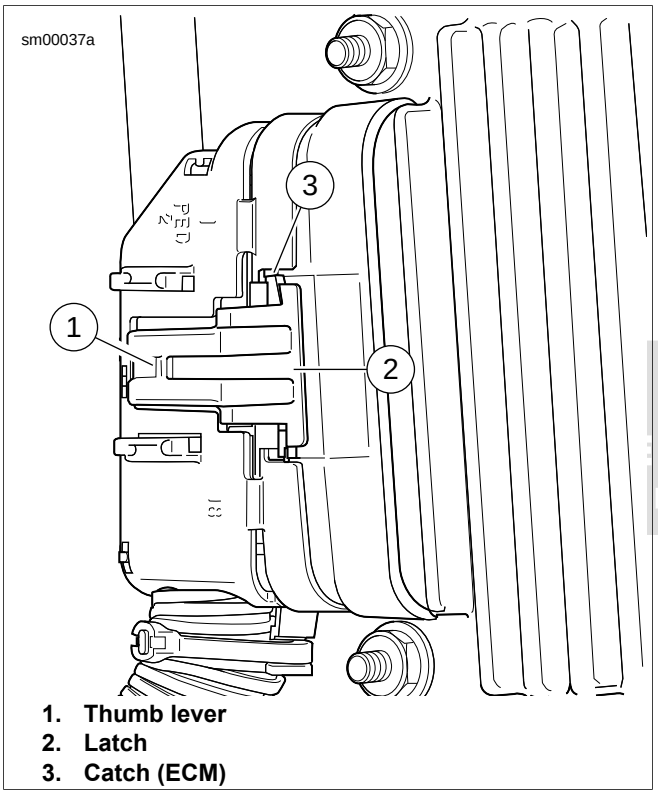
DELPHI 100W MICRO-PACK SEALED CONNECTOR REPAIR

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-6. 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.

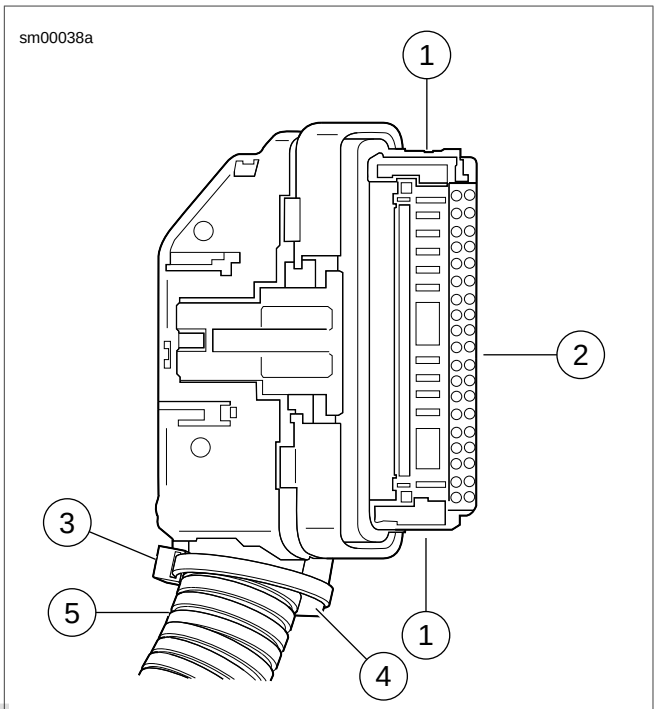


1. **Thumb lever**
2. **Latch**
3. **Catch (ECM)**

Figure A-6. 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**

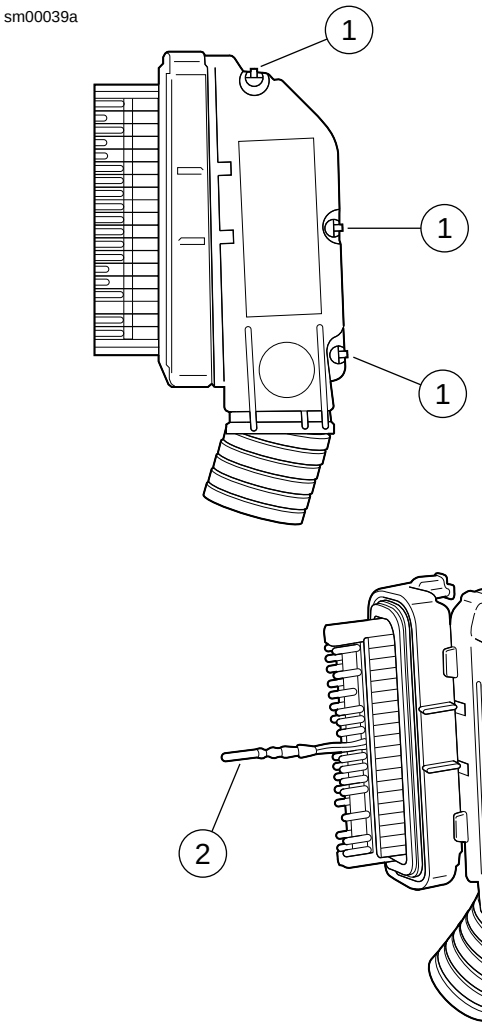
Figure A-7. Delphi 100W Micro-Pack Sealed Connector

Removing Socket Terminal

1. See Figure A-7. 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-8. 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-8. 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	DELPHI 100W MICRO-PACK SEALED DIE

1. Strip the wire insulation to specification. Refer to Table A-1.
2. Install the DELPHI 100W MICRO-PACK SEALED 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.4

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-9 for pull-to-seat connector or Figure A-10 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

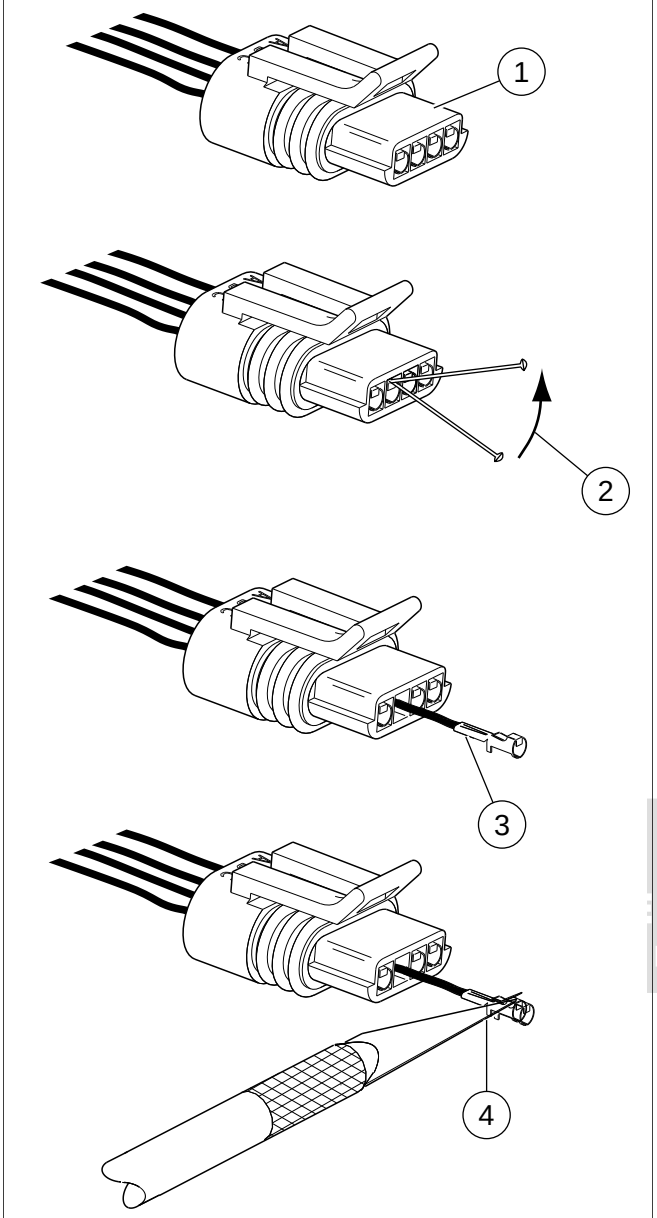
For wire location purposes, alpha characters are stamped into the socket housings.

1. See Figure A-9 for pull-to-seat connector or Figure A-10 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.

   For push-to-seat: See Figure A-10. 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

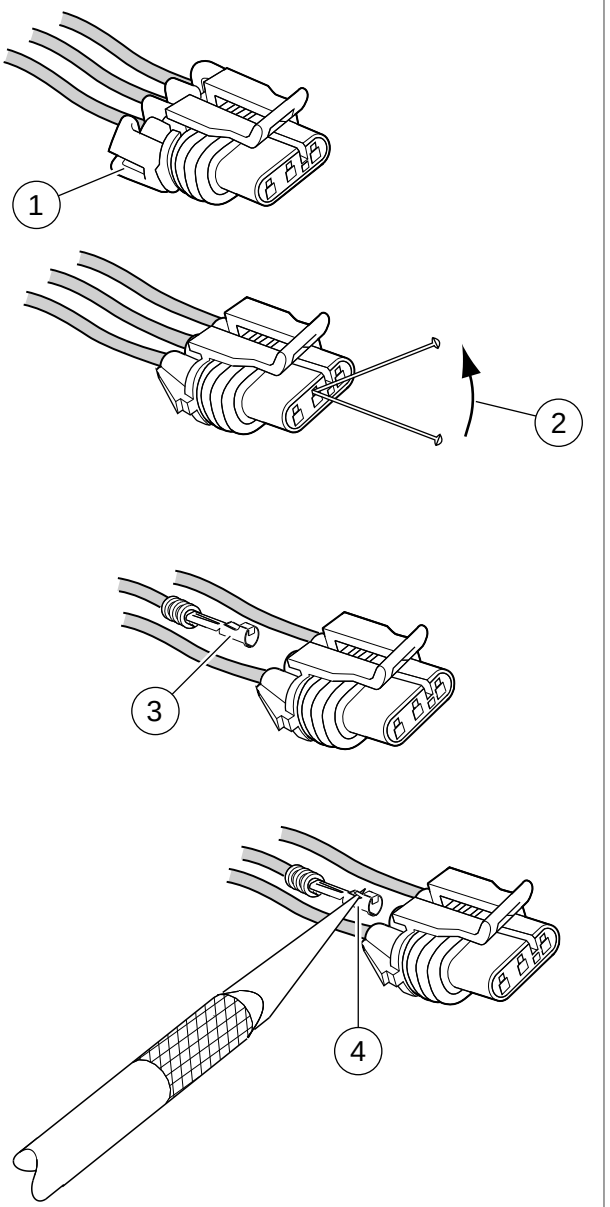
sm00027a



1. Locate tang in chamber
2. Pivot pin to release tang
3. Push to remove
4. Raise tang to install

Figure A-9. 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-10. Delphi 150 Metri-Pack Sealed Connector: Push-to-Seat

DELPHI 280 METRI-PACK UNSEALED CONNECTOR A.5

FUSE BLOCK REPAIR

Removing Socket Terminals

1. See Figure A-11. 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-12. 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 the wire to verify that the terminal is locked in place.
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.

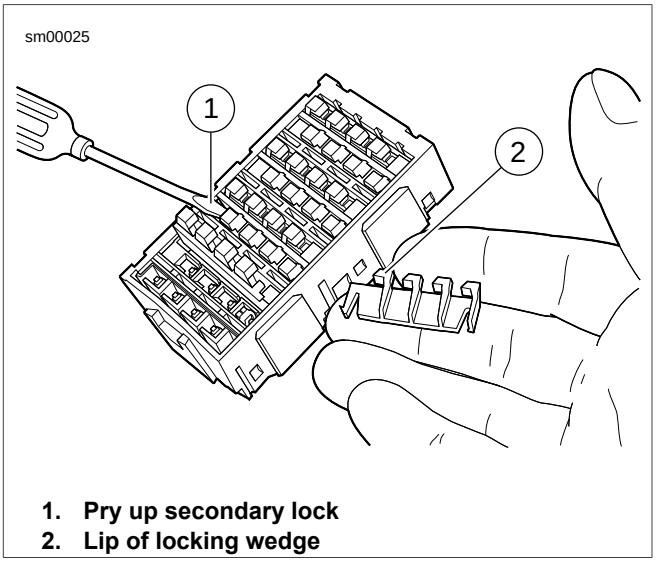
Crimping Terminals

Terminals are crimped twice: once over the wire core and a second time over the insulation/seal.

A correctly crimped terminal may require different crimping dies found on separate crimpers.

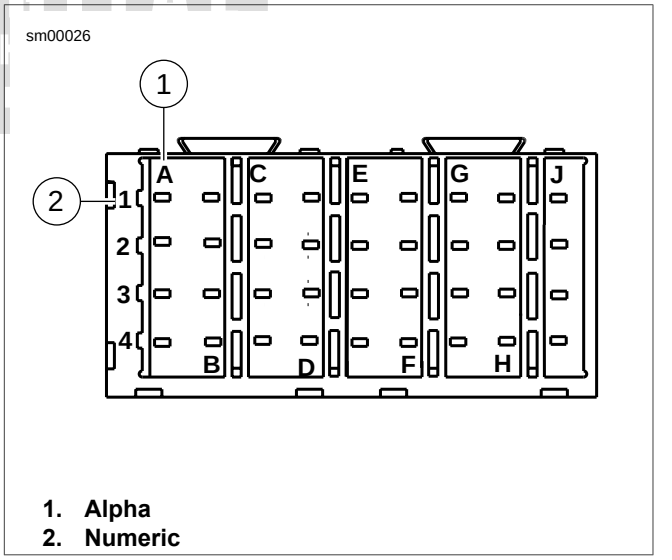
NOTE

The wiring diagram indicates when one socket terminal is be crimped to two wire leads.



1. **Pry up secondary lock**
2. **Lip of locking wedge**

Figure A-11. Fuse Block: Remove Secondary Locks



1. **Alpha**
2. **Numeric**

Figure A-12. Fuse Block: Coordinates (typical)

DELPHI 480 METRI-PACK UNSEALED CONNECTORS A.6

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-13. 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-13. 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

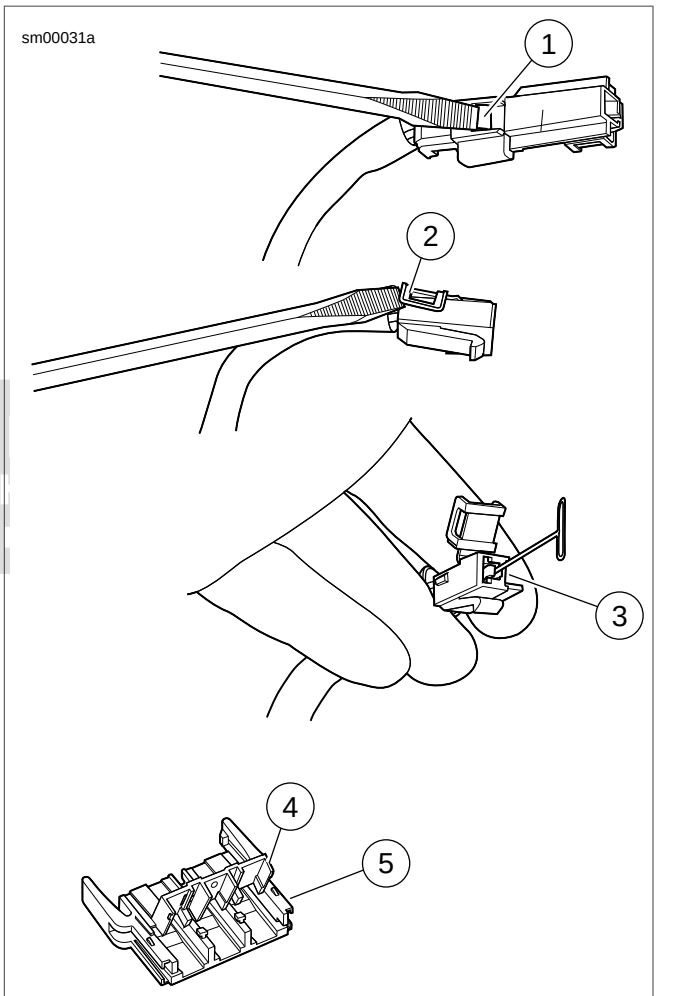
1. See Figure A-13. Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped 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.9 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-13. Delphi 480 Metri-Pack Unsealed Connector: Remove Socket Terminal

DELPHI 630 METRI-PACK UNSEALED CONNECTOR A.7

DELPHI 630 METRI-PACK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
SNAP-ON TT600-3	SNAP-ON PICK

Separating Pin and Socket Housings

NOTE

If necessary, remove connector from barbed anchor or other retaining device.

Bend back the external latch slightly and separate pin and socket halves of the connector.

Mating Pin and Socket Housings

Orient the latch to the catch. Push the pin and socket halves of the connector together until the latch "clicks".

NOTE

If removed, install connector on barbed anchor or other OE retaining device.

Removing Socket Terminal

1. Bend back the latch slightly and free one side of the secondary lock. Repeat the step to unlatch the other side.
2. Rotate the secondary lock outward on hinge to view the terminals in the chambers of the connector housing. The locking tang is on the side opposite the crimp tails and engages a rib in the chamber wall to lock the terminal in place.
3. Moving to the mating end of the connector, find the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. SNAP-ON TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to press the locking tang.
5. Remove the pick and gently tug on the wire to pull the terminal from the wire end of the connector. Repeat steps if the terminal is still locked in place.
6. If necessary, crimp **new** terminals on wires. Refer to A.9 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 the wire end to verify that the terminal is locked in place and will not back out of the chamber.
4. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING A.8

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-14. 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.

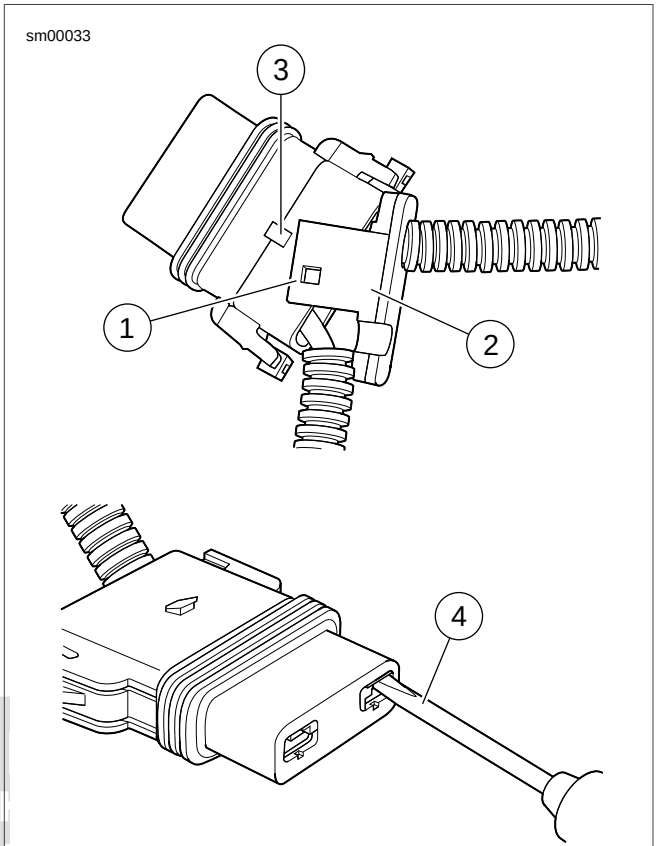
Installing Socket Terminals

1. See Figure A-15. 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-14. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Remove Socket Terminals

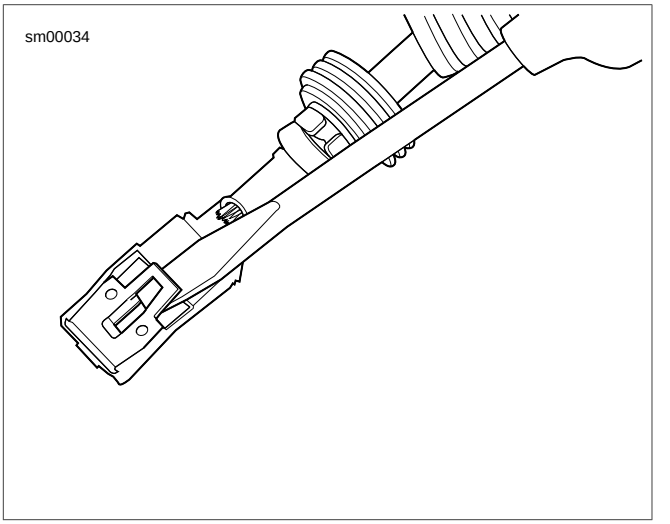


Figure A-15. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Bend Tang

DELPHI METRI-PACK TERMINAL REPAIR A.9

METRI-PACK TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-6	PACKARD TERMINAL CRIMP TOOL
HD-38125-7	PACKARD TERMINAL CRIMPER
HD-38125-8	PACKARD CRIMPING TOOL

Matching Terminal To Crimper

Metri-Pack connectors embossed with the initials P.E.D. require Packard crimp tools to crimp terminals to wire leads.

Terminals are crimped twice to a wire lead, once over the wire core and a second time over the insulation/seal.

See Figure A-16. A crimp can require two crimping dies. The dies are found on the PACKARD TERMINAL CRIMP TOOL (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 CRIMPING TOOL (Part No. HD-38125-8) will also crimp sealed splice connectors in wire gauge sizes 18-20, 14-16 and 10-12.

Preparing Wire Lead

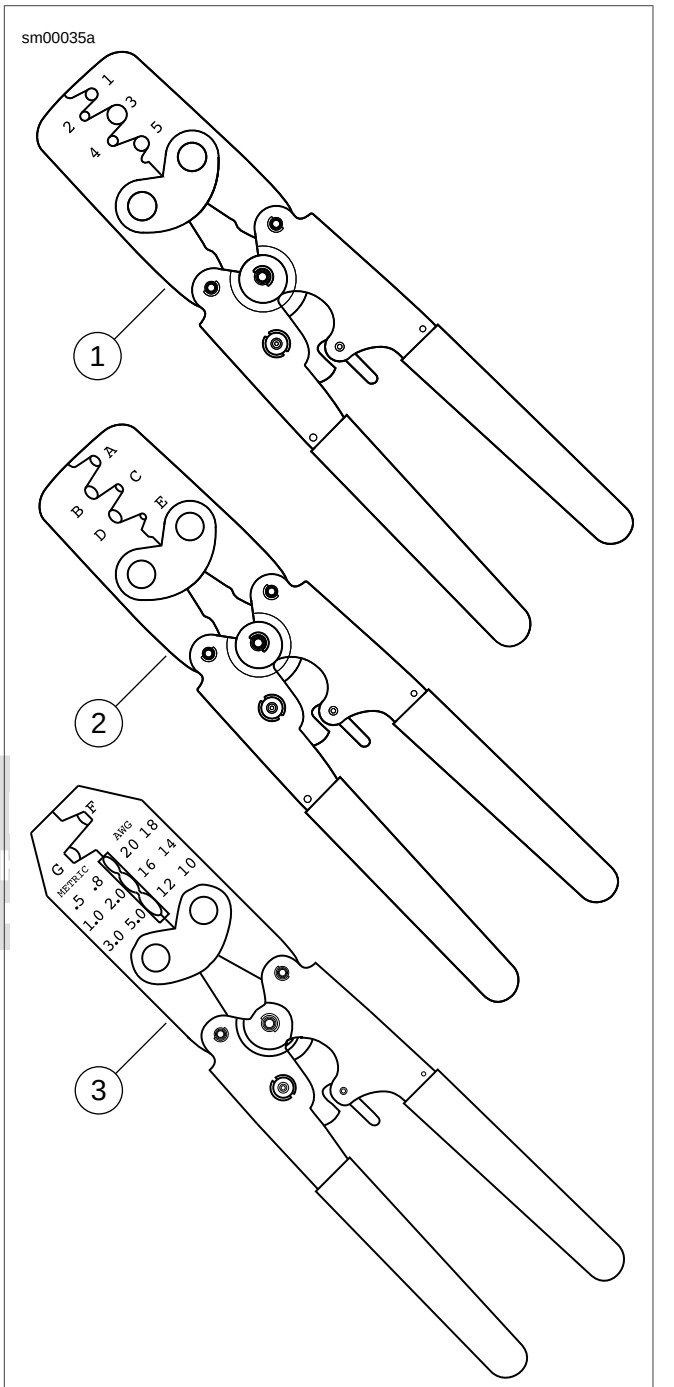
Strip 5/32 in (4.0 mm) of insulation from the wire lead.

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. Be Sure the core crimp tails are facing the forming jaws.
4. Gently squeeze the handles until crimpers just secure the core crimp tails.
5. Insert stripped wire between crimp tails. Verify that wire is positioned so that short pair of crimp tails squeeze core wire strands, while long pair is positioned over the insulation or seal material.
6. Squeeze handles tightly closed. Release grip and the tool will automatically open.



1. **HD-38125-6 sealed terminals**
2. **HD-38125-7 non-sealed terminals**
3. **HD-38125-8 non-sealed terminals**

Figure A-16. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

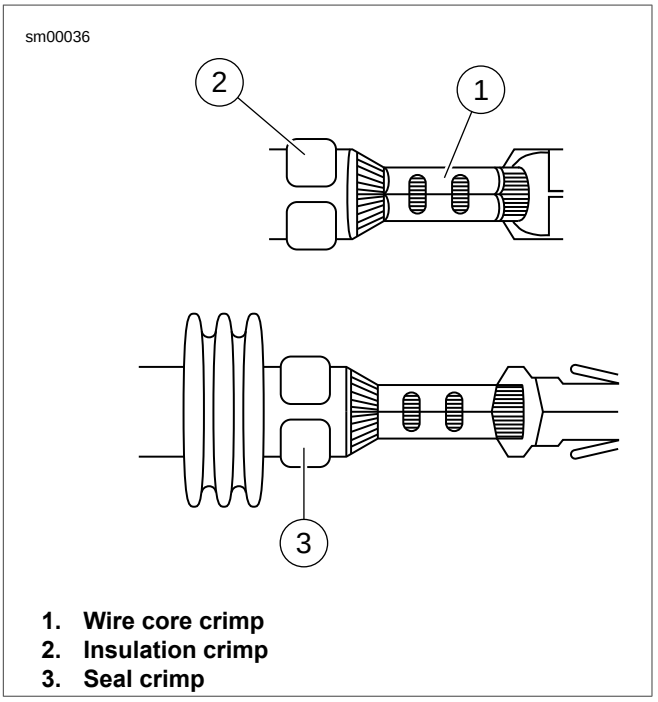
NOTE

*Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.*

1. See Figure A-17. Identify the correct die for the insulation/seal crimp (2).
2. Position the insulation/seal crimp in the nest. Be sure the insulation/seal crimp tails are facing the forming jaws.
3. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimp is complete.

Inspecting Crimps

1. See Figure A-17. Inspect the wire core crimp (1). The tails should be folded in on the wire core without any distortion or excess wire strands.
2. Inspect the insulation (2) or seal (3) crimp. The tails of the terminal should be wrapped around the insulation without distortion.



1. **Wire core crimp**
2. **Insulation crimp**
3. **Seal crimp**

Figure A-17. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI MICRO 64 SEALED CONNECTOR A.10

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

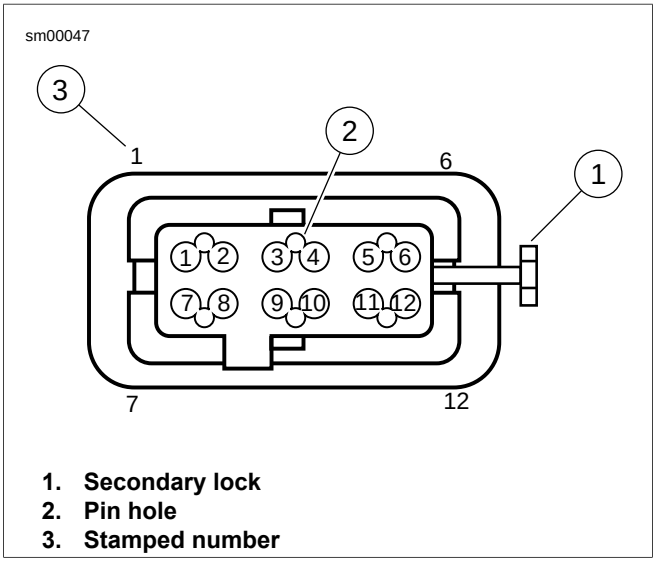
Bend back the external latches slightly and separate the pin and socket housings.

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-18. 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-18. Delphi Micro-64 Sealed Connector: Housing

4. See Figure A-19. Obtain the TERMINAL REMOVER (Part No. HD-45928).
5. See Figure A-20. 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-19. Terminal Remover (HD-45928)

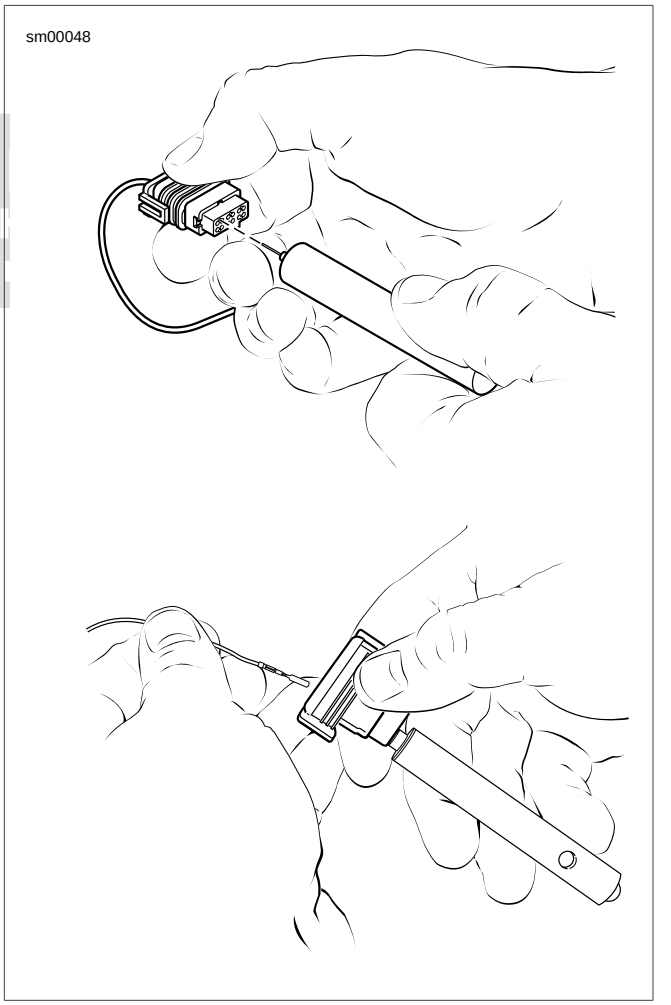


Figure A-20. Delphi Micro-64 Sealed Connector: Insert Tool and Remove Terminal

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-18. 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-22. 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.

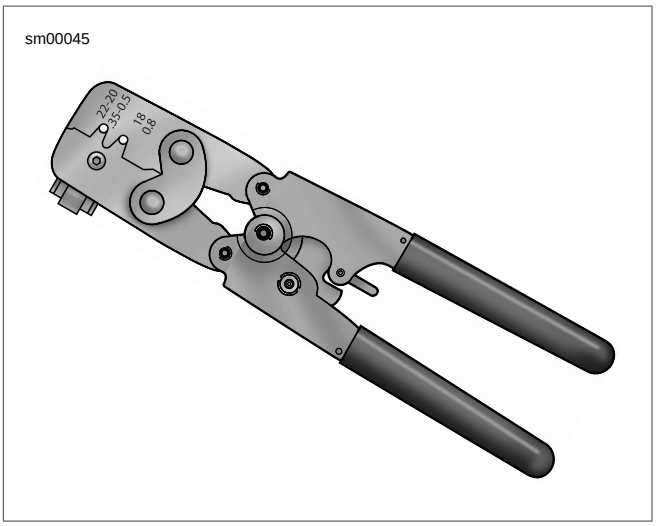


Figure A-21. Terminal Crimper (HD-45929)

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1. **Open position**
2. **Raising locking bar**
3. **Insert terminal**
4. **Crimp terminal**

Figure A-22. Delphi Micro-64 Sealed Connector: Terminal in Crimper

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DELPHI GT 150 SEALED CONNECTOR A.11

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-23. Bend back the external latch(es) slightly and separate pin and socket halves of connector.

Mating Pin and Socket Housings

Push pin and socket halves of connector together until external latch(es) engage.

Removing Socket Terminals

NOTE

Although the parts of the different Delphi connectors vary in appearance, the instructions which follow will work for all.

1. See Figure A-24. 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 from socket 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.

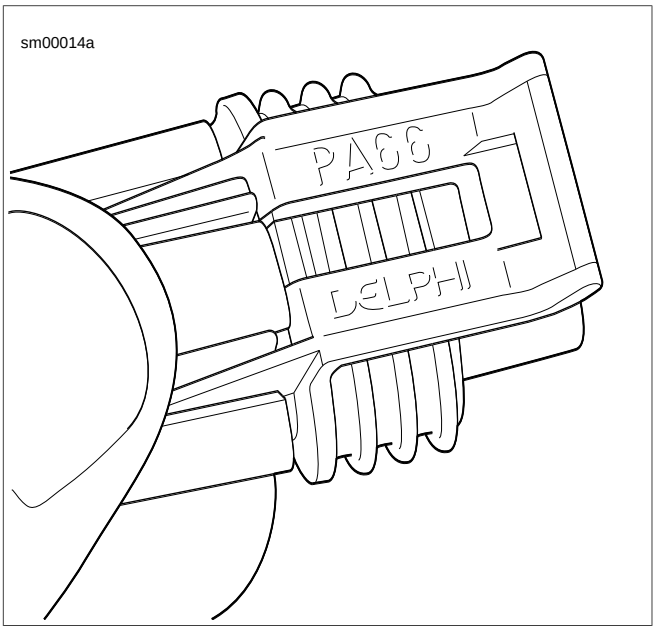
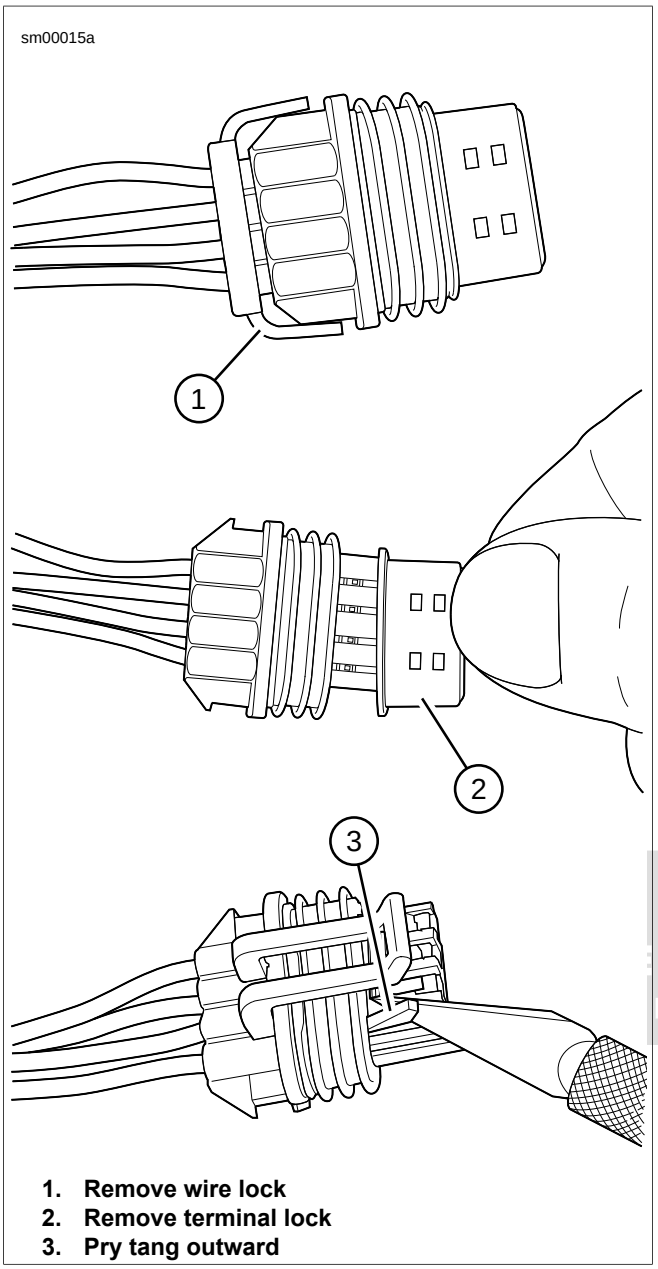


Figure A-23. Delphi GT 150 Sealed Connector: Socket Housing Latch

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1. **Remove wire lock**
2. **Remove terminal lock**
3. **Pry tang outward**

Figure A-24. Delphi GT 150 Sealed Connector: Removing Socket Terminals

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CHNICIAN II
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DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR A.12

DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR

NOTE

Do not operate latch lever when connector is not mated to ECU. Damage will occur.

Separating Socket Housing From ECM

See Figure A-25. Remove strap (1). Press the latch (2). Rotate lock lever to the released position (3).

Mating Socket Housing To ECM

Push the connector into the ECM. Rotate the lock lever to the locked position.

Socket Terminal

1. Cut cable strap to release harness from strain relief collar of connector housing.
2. See Figure A-26. Release latches (4) that retain cover (3) to housing (2) and remove cover.
3. Remove and service the Micro-64 terminals. See A.10 DELPHI MICRO 64 SEALED CONNECTOR.
4. Install connector housing cover. Verify all wires are within the confines of the cover and that the cover latches are engaged.
5. Install **new** cable strap cable to the strain relief of the connector.

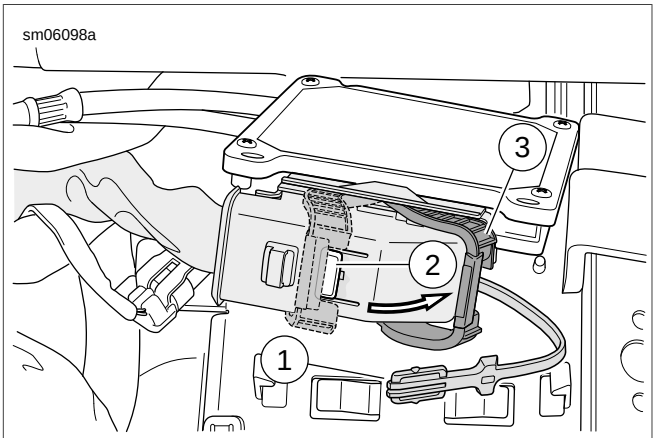
ECM Ground Terminal

1. See Figure A-26. Remove secondary lock (1).
2. See Figure A-27. Using a thin blade screwdriver, gently pry ground terminal retainer from connector housing.
3. See Figure A-28. Using a thin blade screwdriver, release latch and pull ground wire, wire seal and terminal from cover side of housing.
4. Follow instructions in A.9 DELPHI METRI-PACK TERMINAL REPAIR to replace the terminal or wire seal.
5. Push the terminal into place from the cover side of the connector housing until the latch engages. Pull on wire to verify terminal is secure.

NOTE

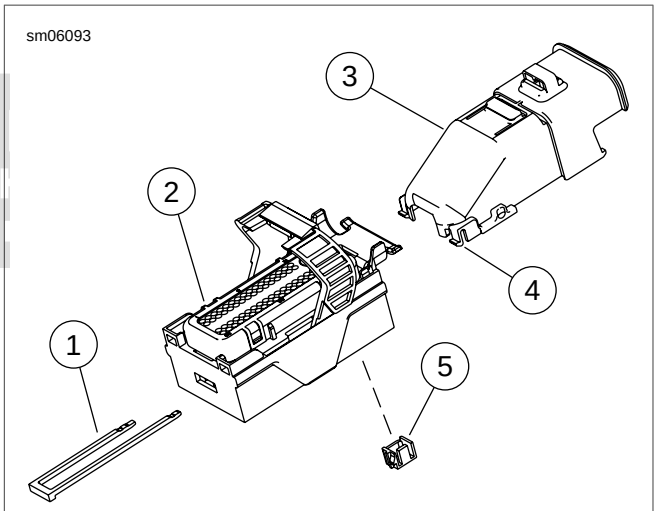
See Figure A-26. Secondary lock has one short leg and one long leg. Install as shown.

6. See Figure A-26. Install ground secondary lock (5) and install secondary lock (1) as shown.



1. **Strap**
2. **Latch**
3. **Lock lever released**

Figure A-25. Unlatch ECM Connector



1. **Secondary lock**
2. **Terminal housing**
3. **Cover**
4. **Cover latch**
5. **Ground secondary lock**

Figure A-26. Delphi 73-Terminal ECM Connector

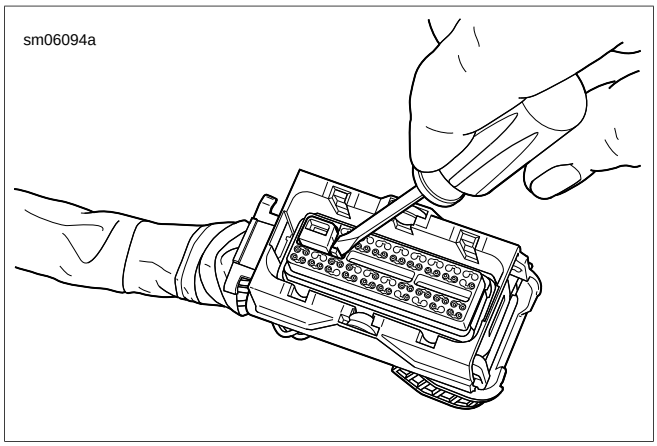


Figure A-27. Remove Ground Secondary Lock

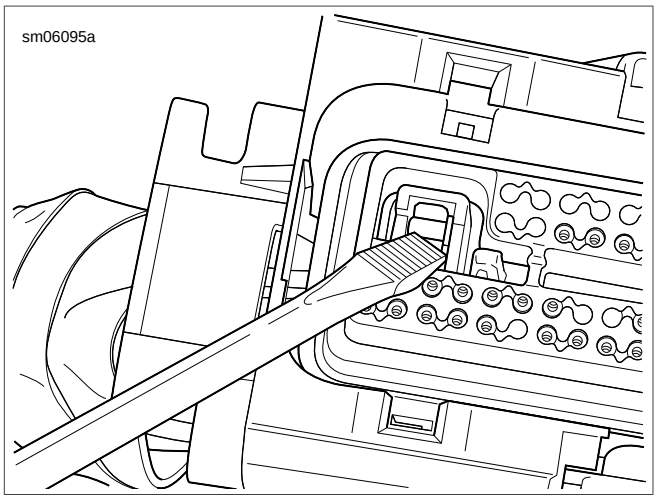


Figure A-28. Remove ECM Ground Terminal

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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**.

NOTE

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-29. 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.*

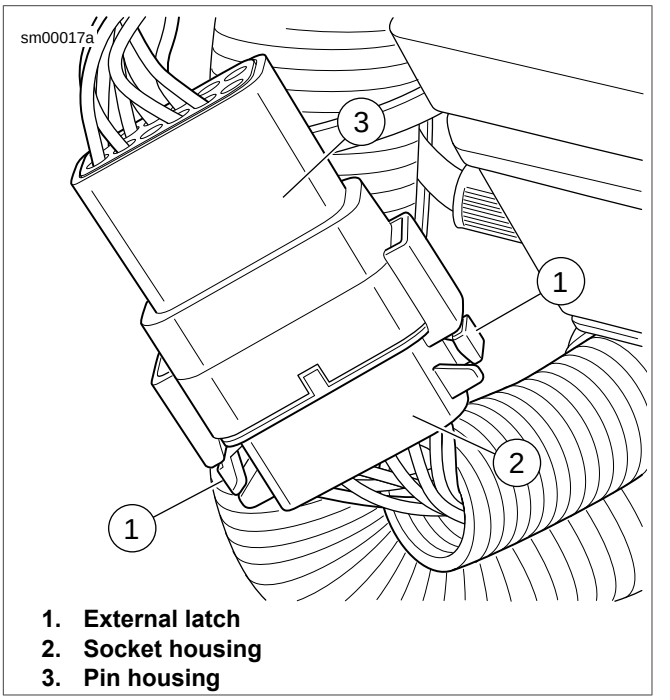
Mating Pin and Socket Housings

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-29. Deutsch DT Sealed Connector

Removing Socket Terminals

1. See Figure A-30. 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-33. 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-32. 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-31. 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.*

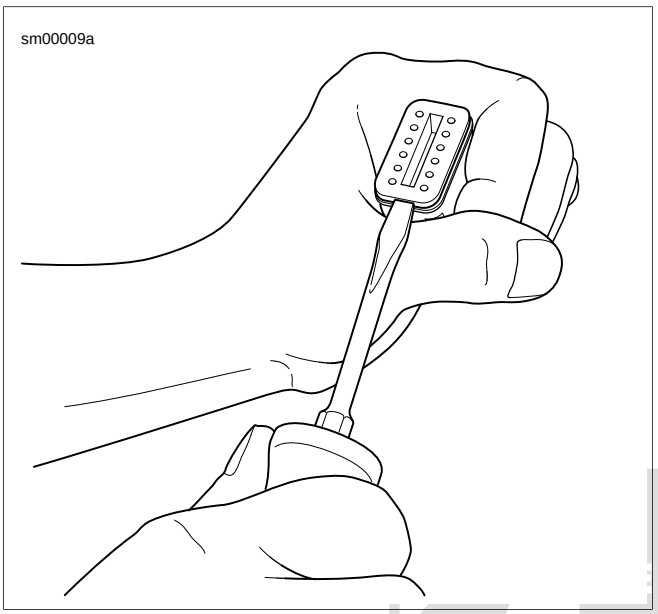
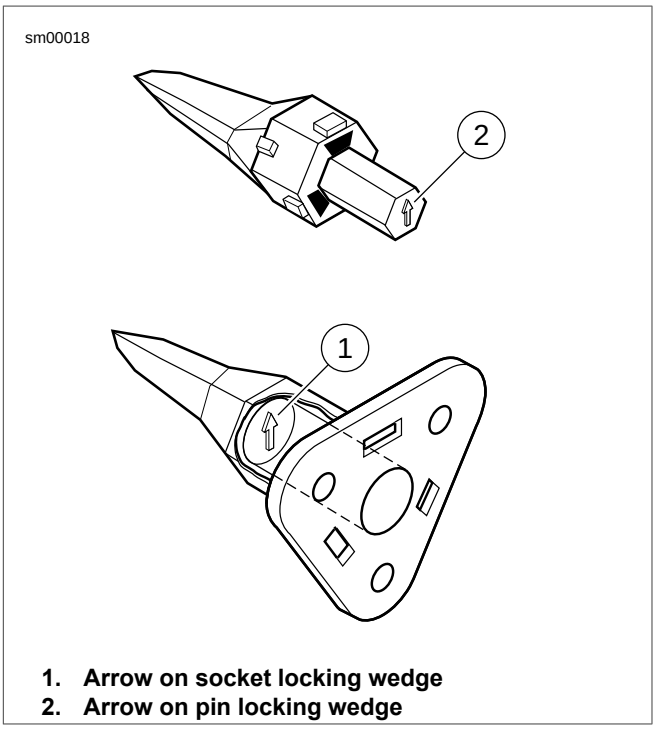


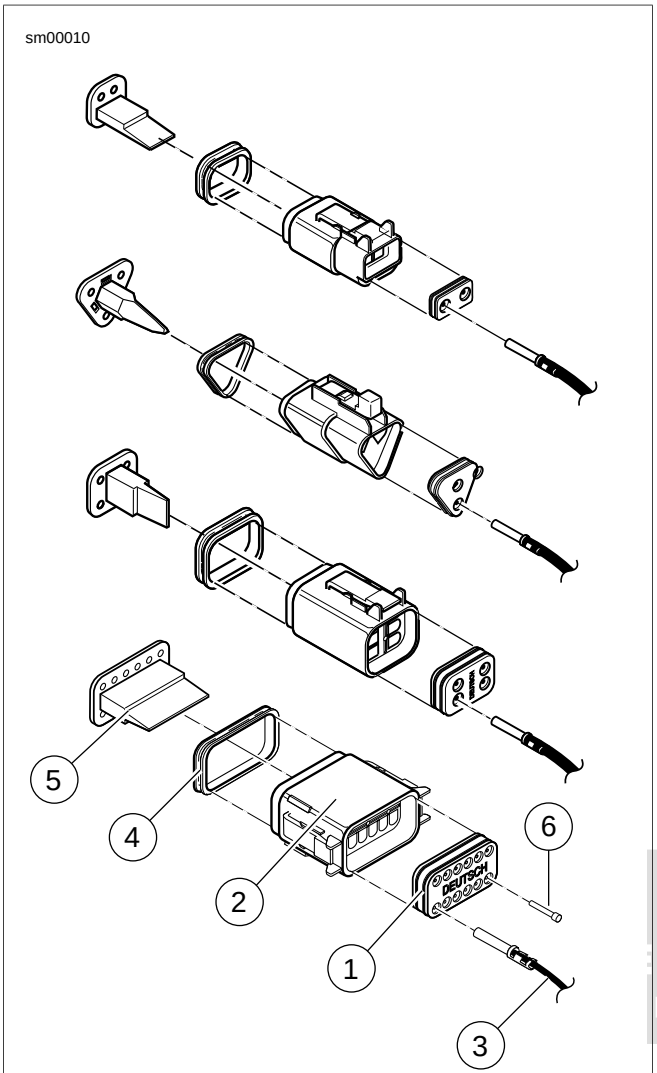
Figure A-30. Deutsch DT Sealed Connector: Remove Secondary Locking Wedge



1. **Arrow on socket locking wedge**
2. **Arrow on pin locking wedge**

Figure A-31. Deutsch DT Sealed Connector: 3-Place Locking Wedges

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1. **Wire seal**
2. **Socket housing**
3. **Wire lead**
4. **Internal seal**
5. **Secondary locking wedge**
6. **Seal plug**

Figure A-32. 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.*

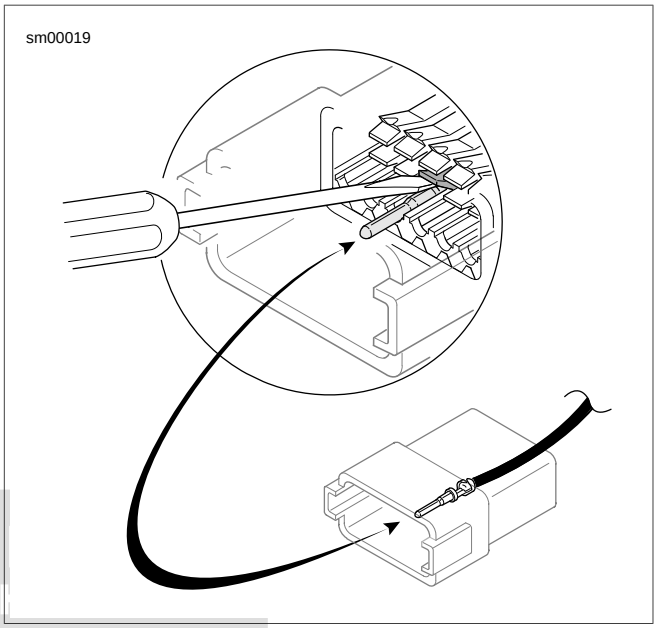


Figure A-33. Deutsch DT Sealed Connector: Press Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See Figure A-34. 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.

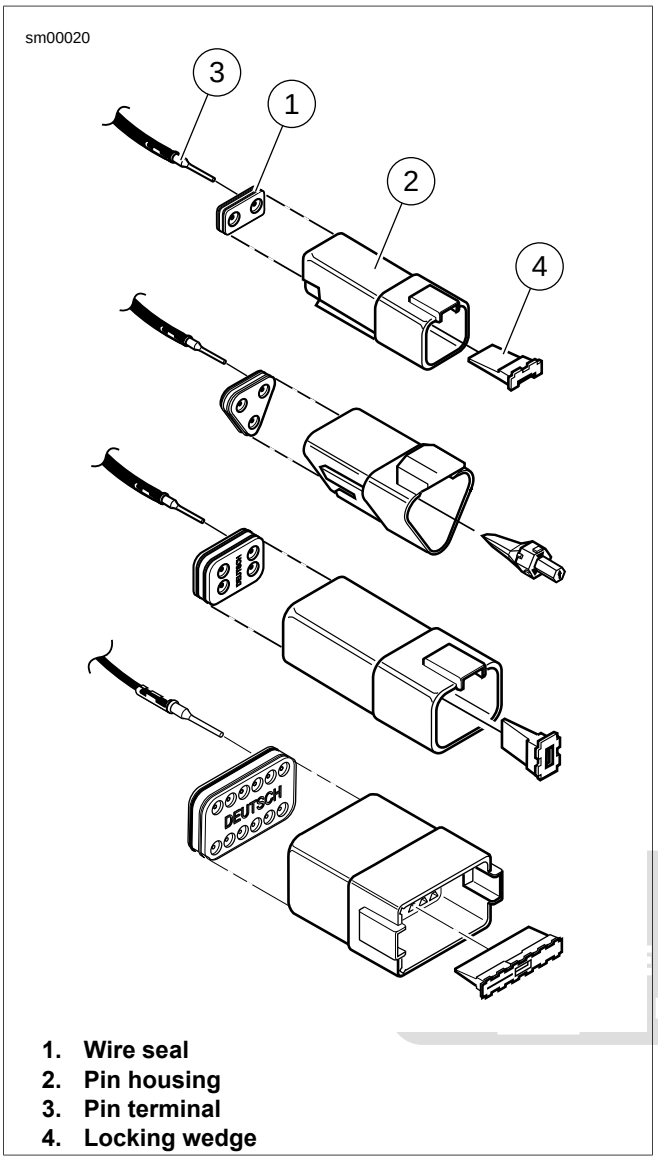
NOTE

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-31. 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-34. 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-35. 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.

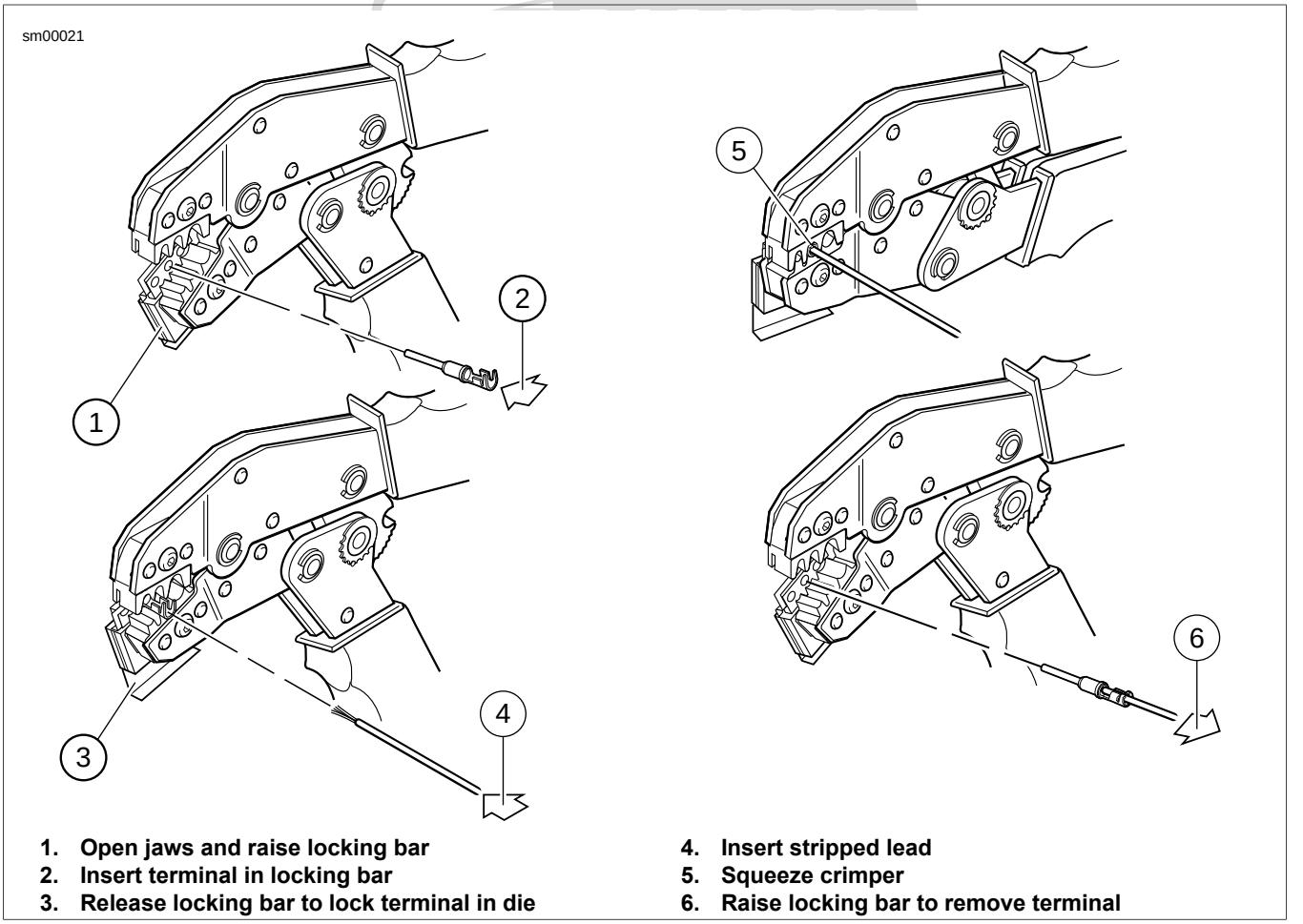
5. Insert stripped wire core between crimp tails until ends make contact with locking bar. Position wire that the wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.
6. Squeeze handle of crimp tool until tightly closed. Tool automatically opens 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-35. 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-36. 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.

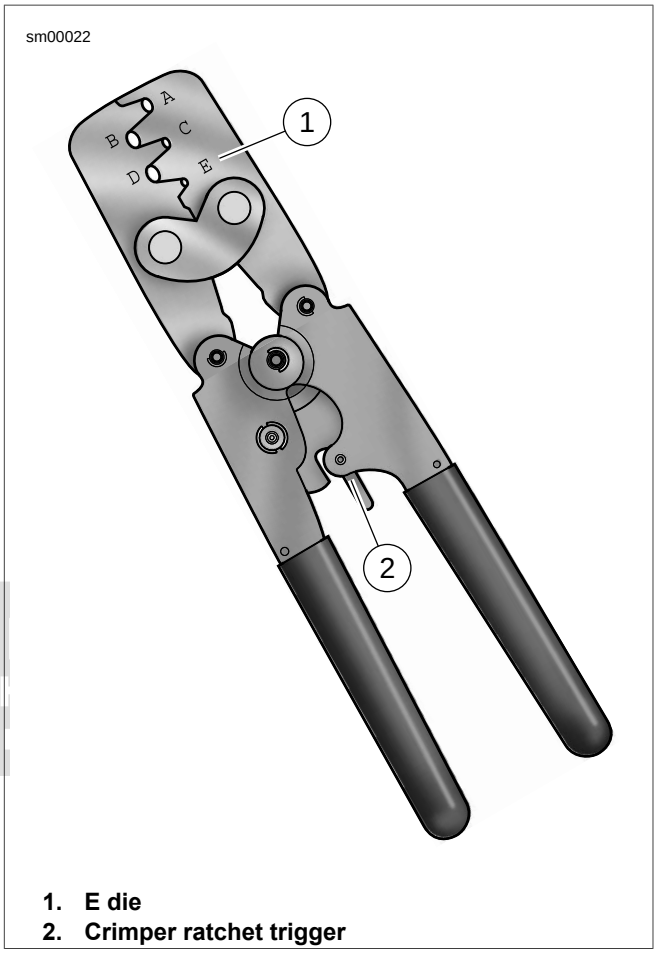
NOTE

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-36. 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-37. 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. Roate 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-38. 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.

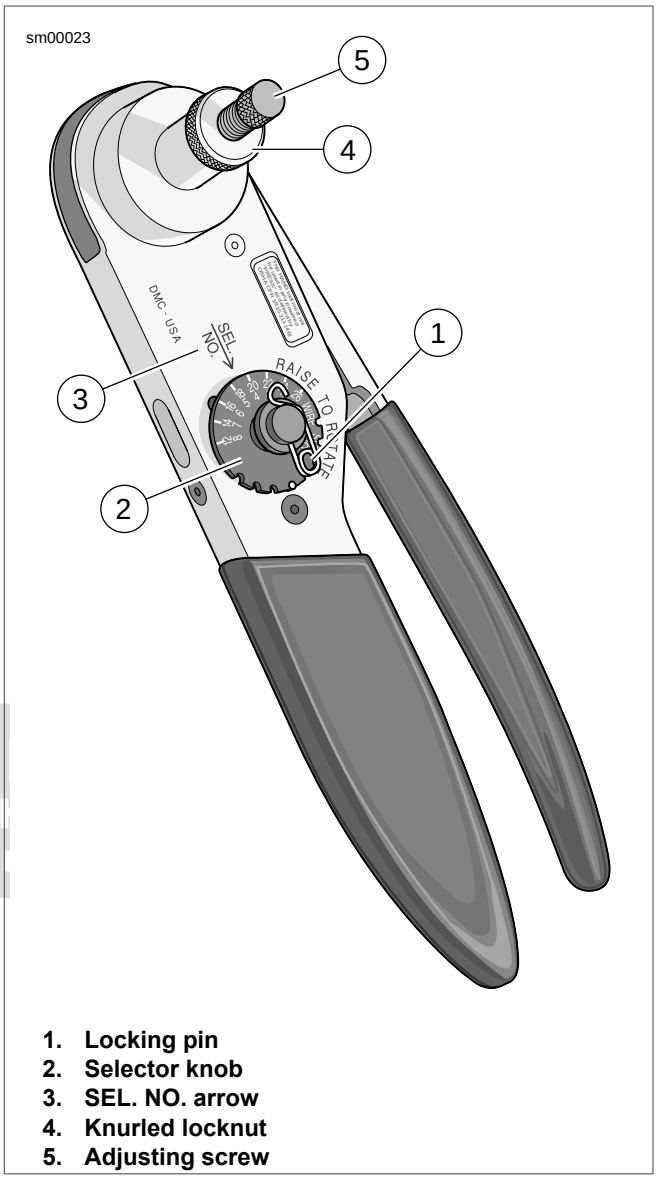
NOTE

Adjust the crimper tool for each contact/wire size.

6. Install pin to lock selector knob.

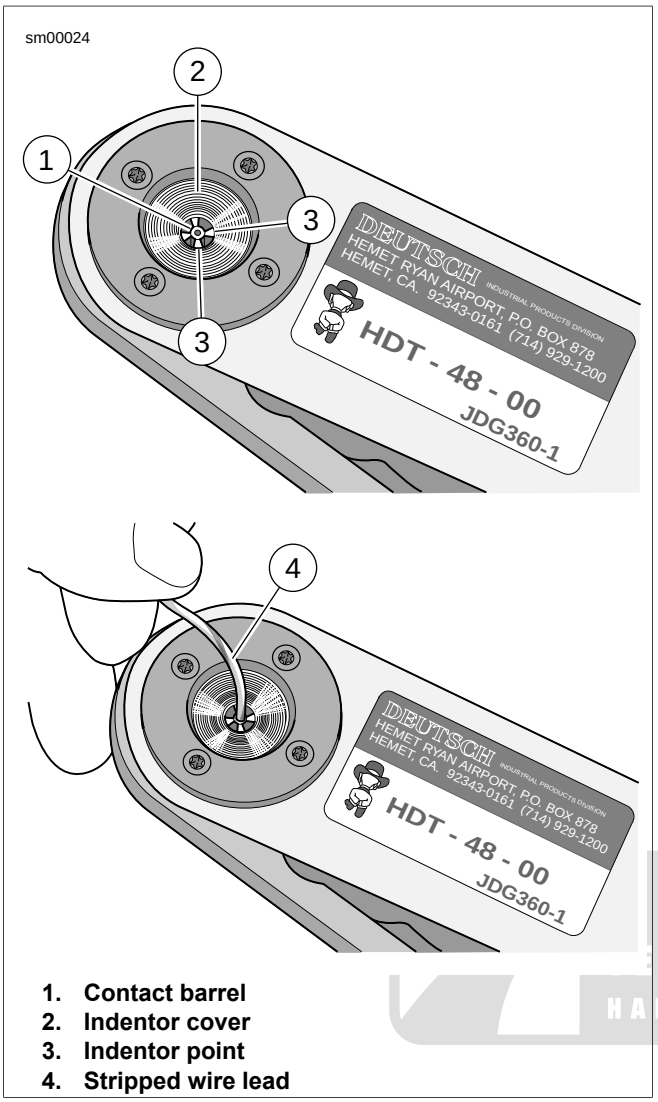
Inspecting Crimps

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-37. Electrical Crimper Tool (HD-42879)



1. **Contact barrel**
2. **Indentor cover**
3. **Indentor point**
4. **Stripped wire lead**

Figure A-38. Deutsch Solid Barrel

IGITAL
CHNICIAN 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-39. 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.

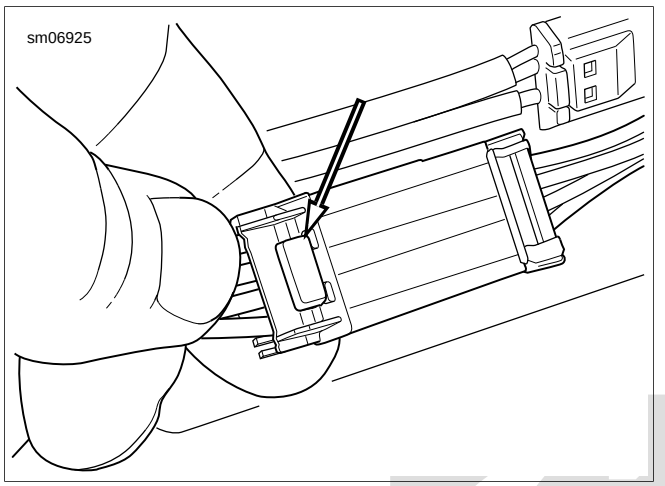


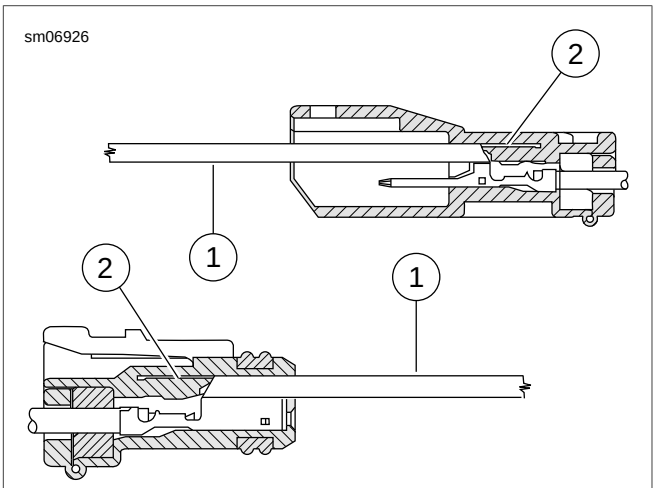
Figure A-39. Release Buttons: JAE MX19 Sealed Connector

Removing Terminals

1. Modify a TERMINAL EXTRACTOR (Part No. B-50085) by filing the front edge to 45 degrees.
2. See Figure A-40. 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-40. 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-41. 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.

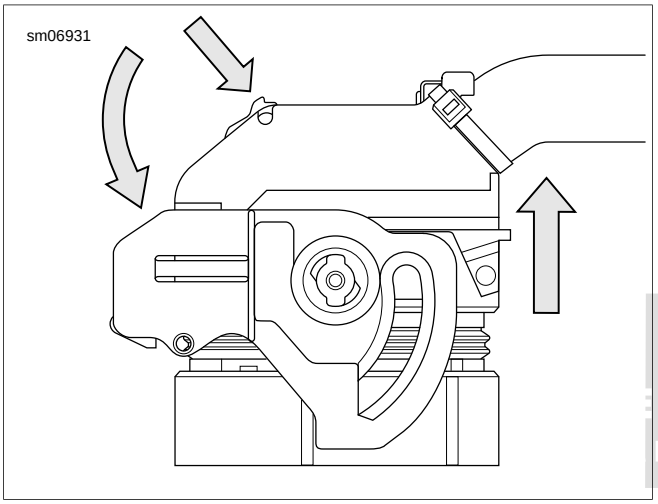


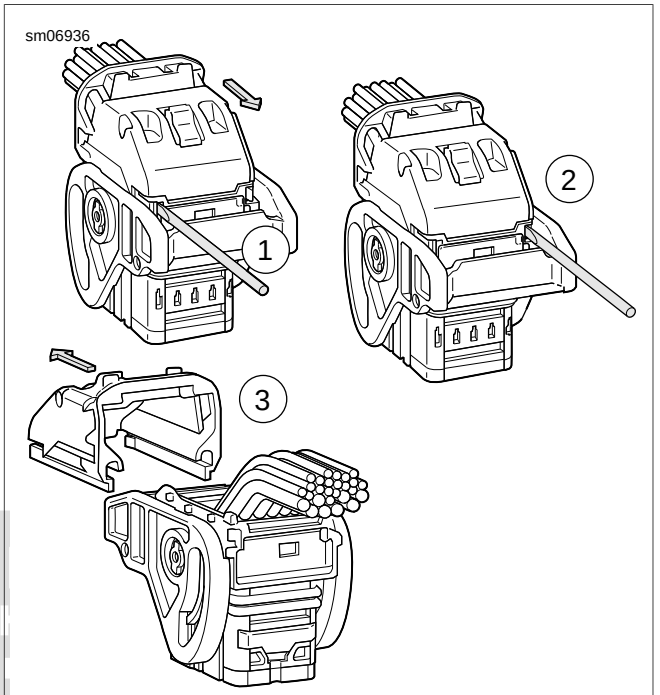
Figure A-41. Release

Removing Terminals

1. With the lever arm open, cut the cable strap around the wire bundle.
2. See Figure A-42. 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-43. Use the screwdriver to open the secondary lock. Pull the locking bar all the way out.
6. See Figure A-44. 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-45. 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-42. Remove the Wire Lead Cap

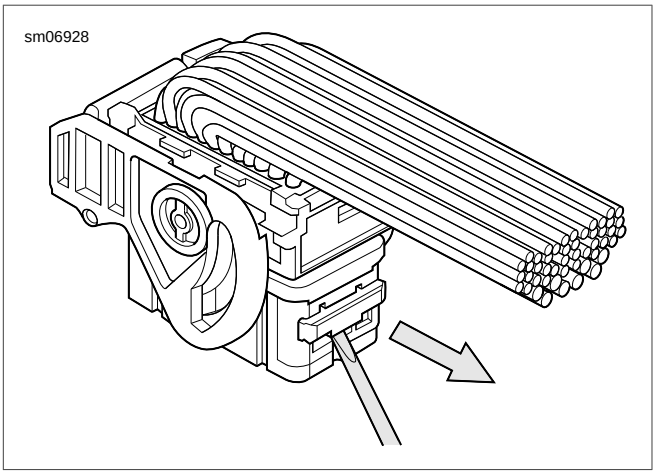
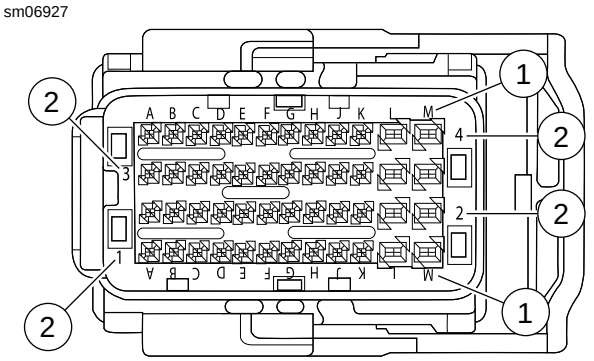
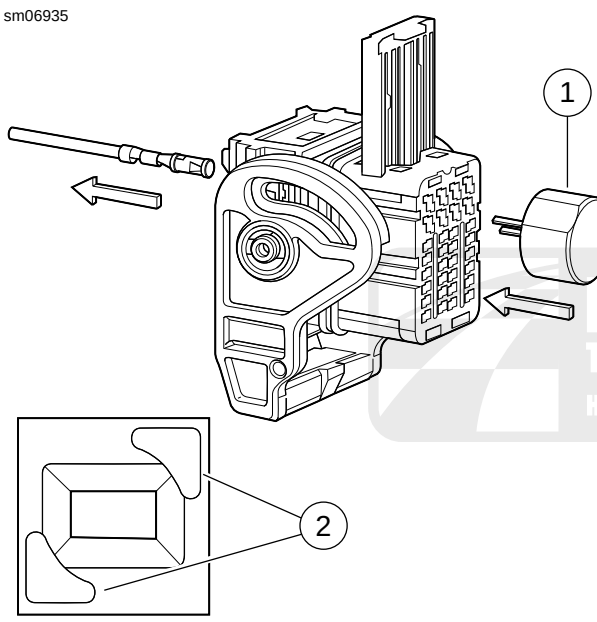


Figure A-43. Molex CMC Sealed Connector Secondary Lock



1. **Alpha**
2. **Numeric**

Figure A-44. Alpha-Numeric Coordinates



1. **Extractor tool**
2. **Access slots**

Figure A-45. 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-46. 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-47. 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-48. 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-49. 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-50. 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.

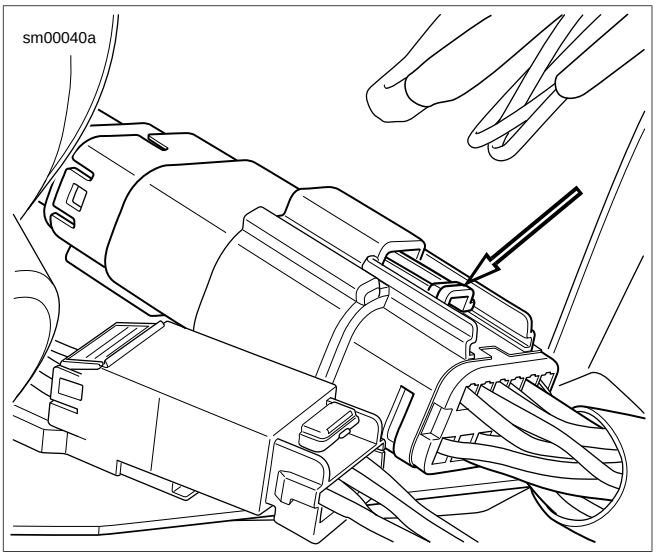


Figure A-46. Molex MX 150 Sealed Connector: Latch

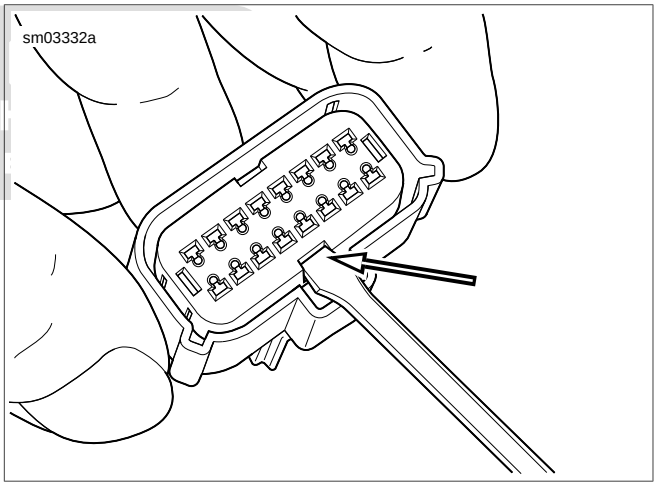


Figure A-47. Secondary Lock Pry Slot (Socket Housing)

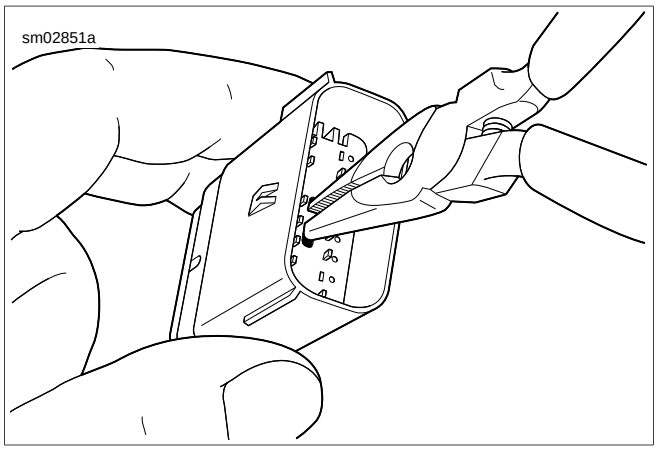


Figure A-48. Pull Up Secondary Lock

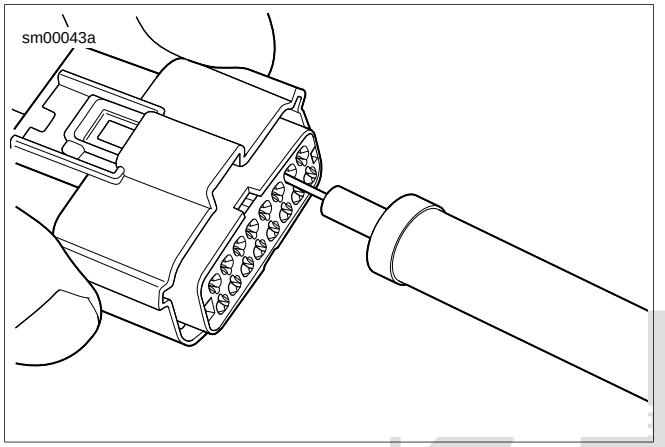
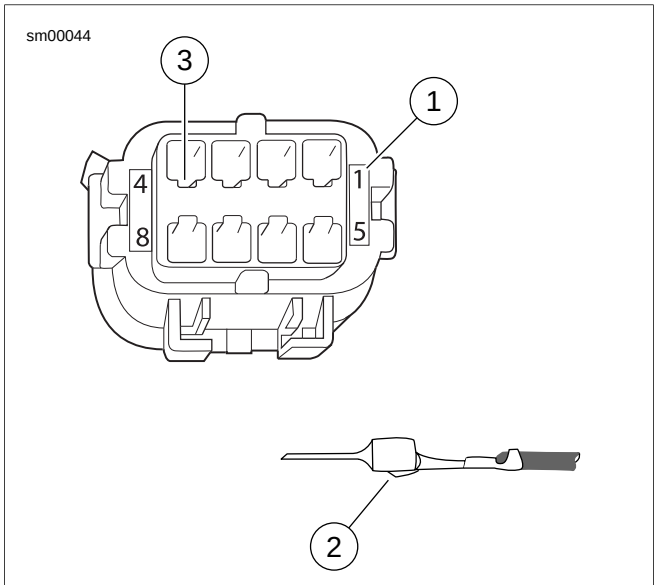


Figure A-49. Molex MX 150 Sealed Connector: Terminal Remover (HD-48114)



1. **Cavity number**
2. **Tang**
3. **Cavity slot**

Figure A-50. 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-51. 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.	

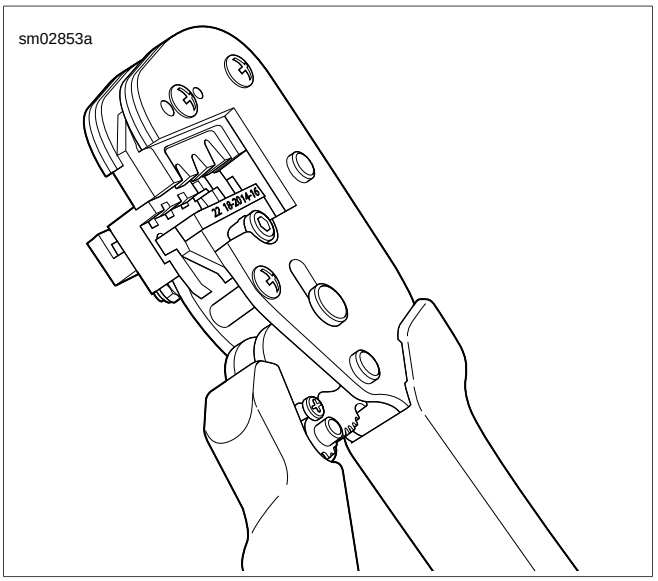
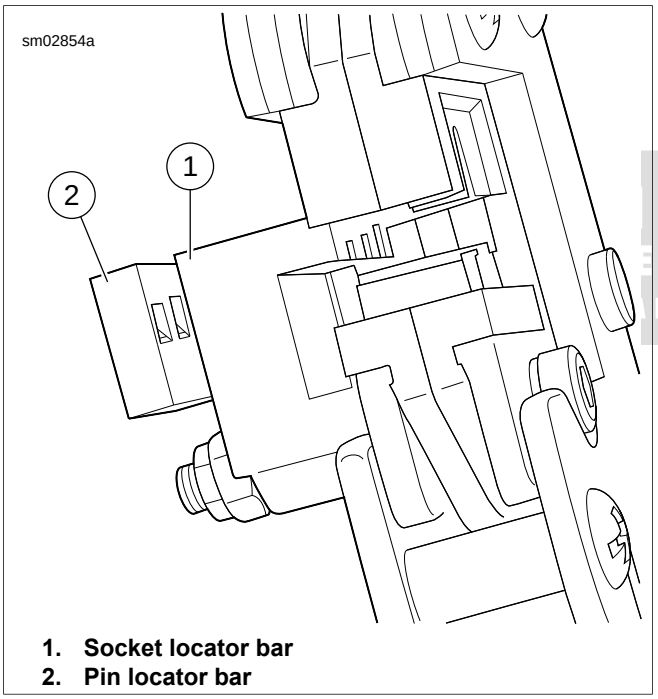


Figure A-51. Open Terminal Crimper (HD-48119) at 45 Degrees



1. **Socket locator bar**
2. **Pin locator bar**

Figure A-52. Terminal Locator Bars

Position Terminal in the Punch/Die

1. See Figure A-53. 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-52. A socket terminal stops against the back face of the socket locator bar (1).
   b. **Pin Terminal:** See Figure A-54. 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-55. Ratchet the handles together until the crimp tails are held in vertical alignment between the punch and the die.

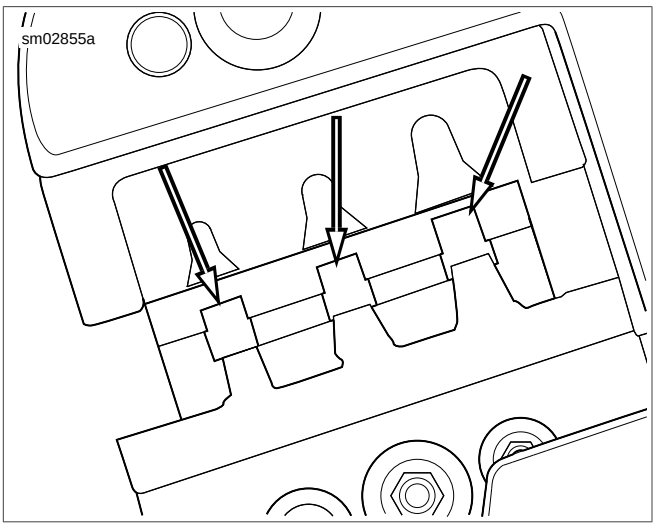


Figure A-53. Square Openings in Socket Locator Bar

Insert Stripped Lead

See Figure A-56. 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.*

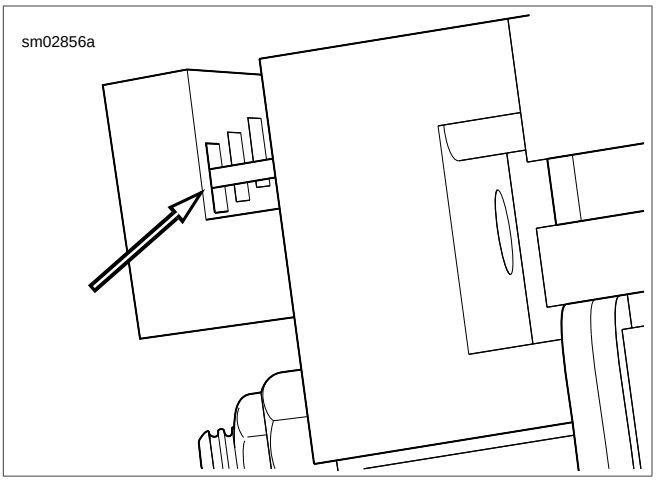


Figure A-54. Pin Terminal against Pin Locator Bar

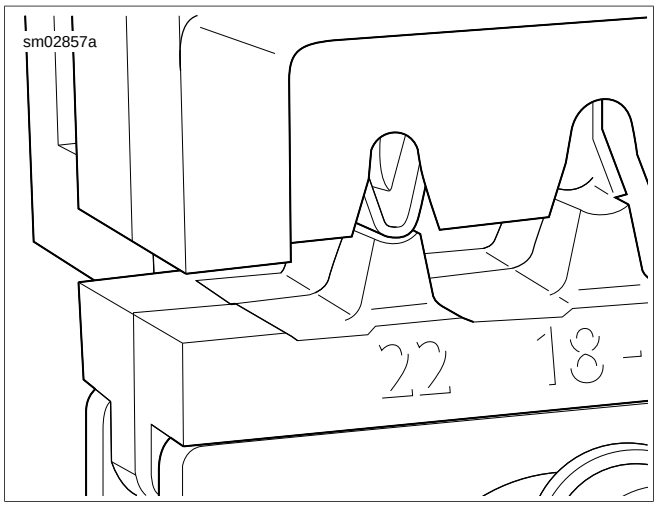


Figure A-55. Crimp Tails in Vertical Alignment between Punch and Die

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.*

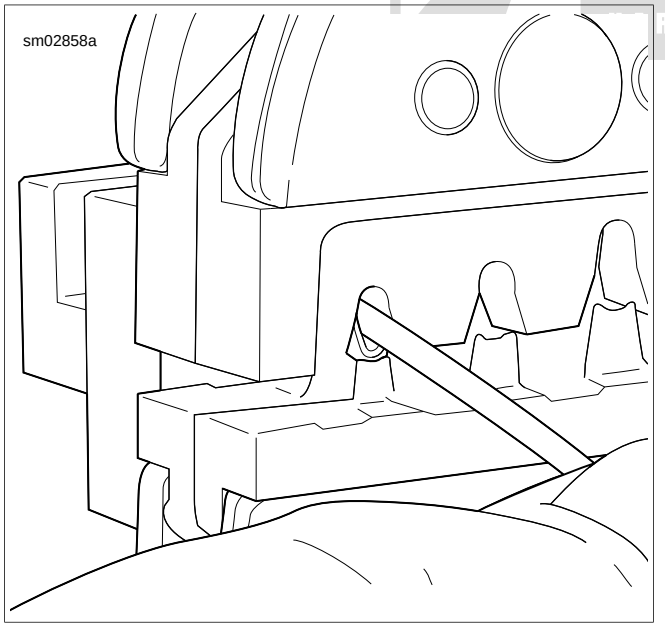
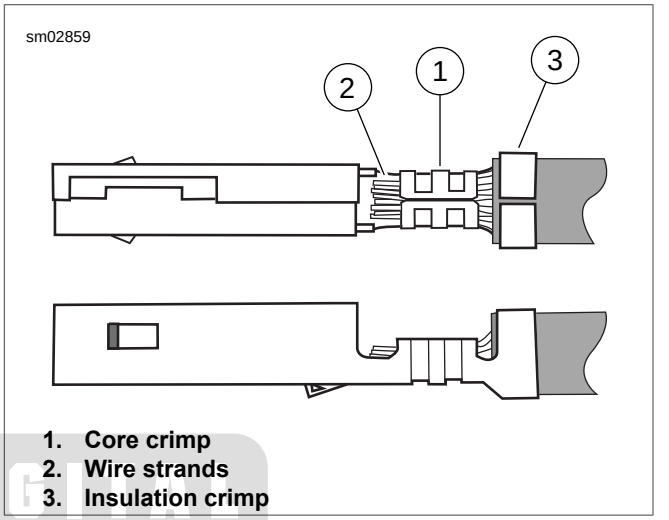


Figure A-56. Stripped Lead at Up Angle

Inspect Crimp

1. **Inspect Crimp:** Inspect the core and insulation crimp.
   a. See Figure A-57. 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-57. Terminal Crimp

TYCO 070 MULTILOCK UNSEALED CONNECTOR A.20

TYCO 070 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41609	AMP MULTI-LOCK CRIMPER
SNAP-ON TT600-3	SNAP-ON PICK

General

Tyco 070 Multilock Unsealed connectors are found between wire harnesses and component wiring and may be either floating or anchored to the frame with attachment clips.

See Figure A-58. Attachment clips (1) on the pin housings are fitted to T-studs on the motorcycle frame. The T-studs identify OE connector locations. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

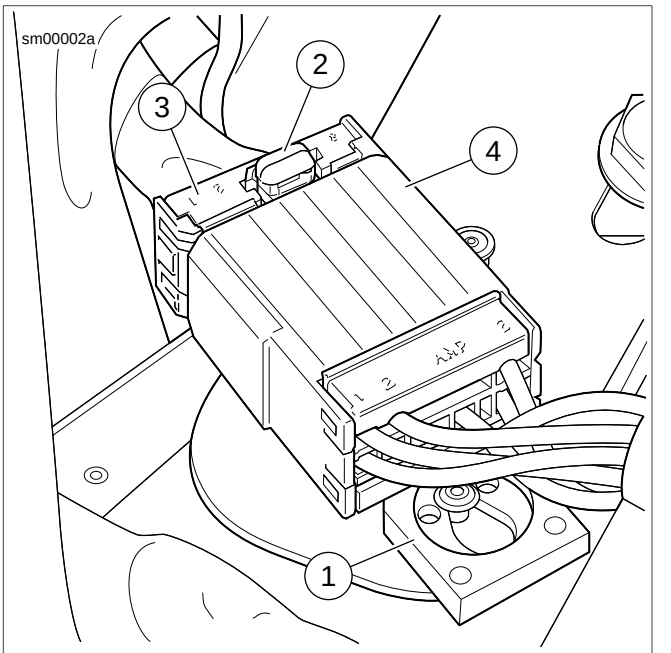
For terminal crimping use the AMP MULTI-LOCK CRIMPER (Part No. HD-41609).

Separating Pin and Socket Housings

1. If necessary, slide connector attachment clip T-stud to the large end of the opening.
2. See Figure A-58. Press the release button (2) on the socket terminal side of the connector and pull the socket housing (3) out of the pin housing (4).

Mating Pin and Socket Housings

1. Hold the housings to match wire color to wire color.
2. Insert the socket housing into the pin housing until it clicks in place.
3. If OE location is a T-stud, fit large opening end of attachment clip over T-stud and slide connector to engage T-stud to small end of opening.



1. **Attachment clip**
2. **Release button**
3. **Socket housing**
4. **Pin housing**

Figure A-58. Tyco 070 Multilock Unsealed Connector

Removing Terminals from Housing

1. See Figure A-59. Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Insert a pick or pin into the terminal cavity until it stops.

NOTE

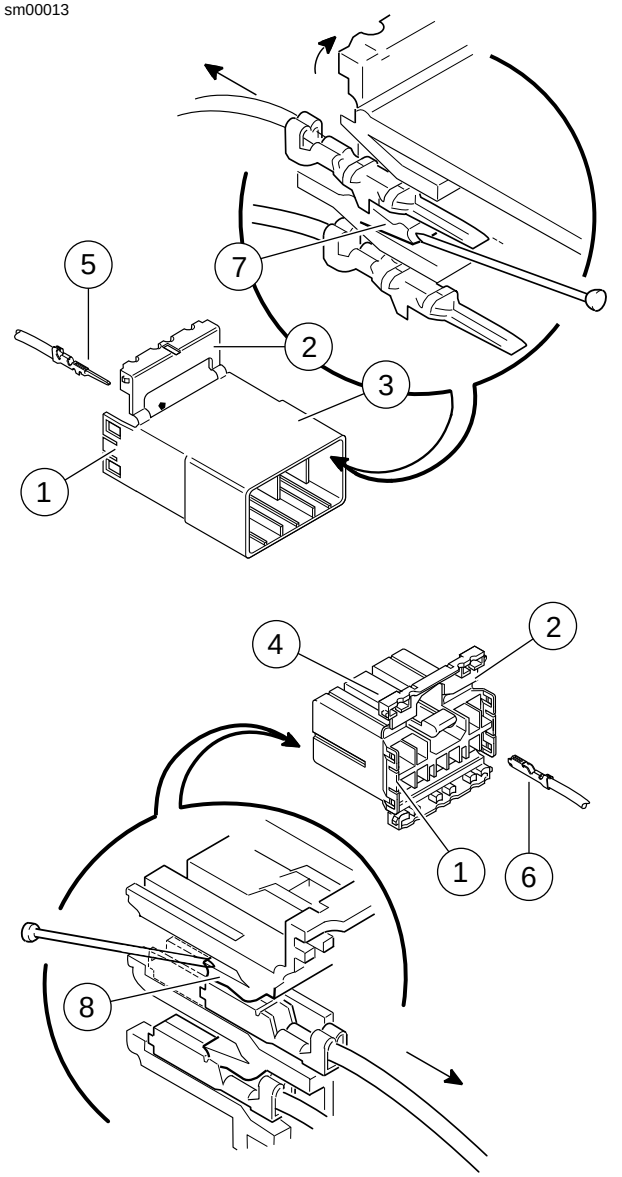
If socket/pin terminal tool is not available, use a push pin/safety pin or a SNAP-ON PICK (Part No. SNAP-ON TT600-3).

4. Press the tang in the housing to release the terminal.
   a. **Socket:** Lift the socket tang (8) up.
   b. **Pin:** Press the pin tang (7) down.

NOTE

A click is heard if the tang is released.

5. Gently tug on wire to pull wire and terminal from cavity.



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-59. Tyco 070 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

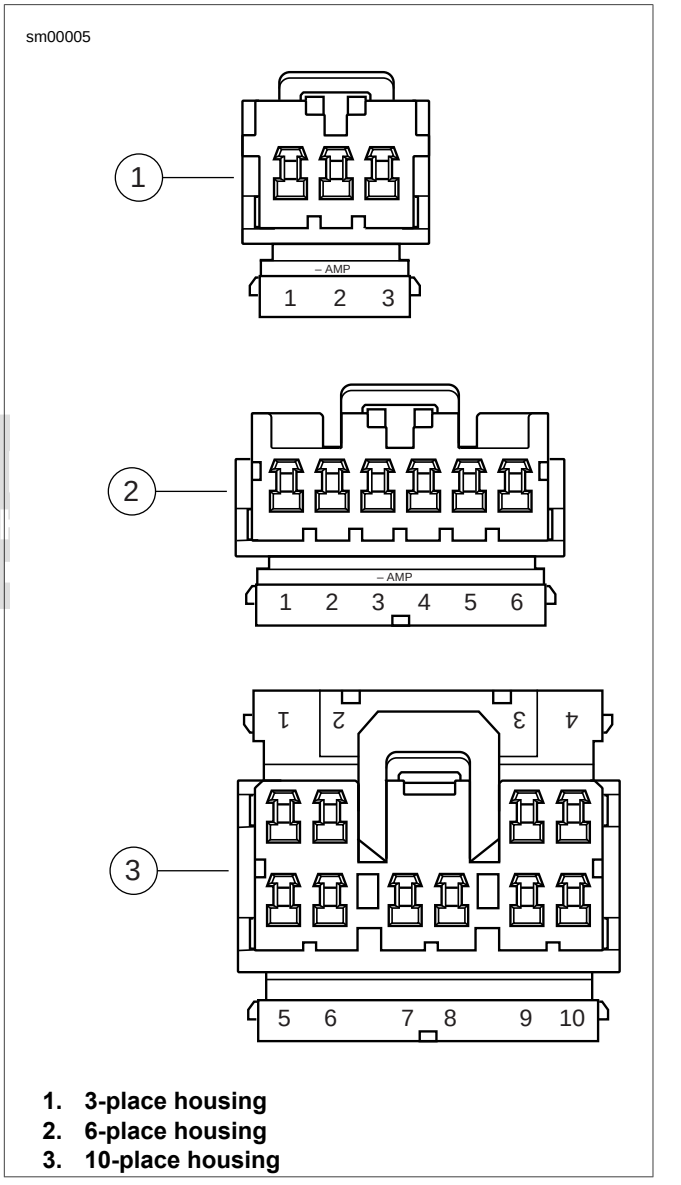
See Figure A-60. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

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, so the slot in the pin terminal (on the side opposite the crimp tails) must face downward.*
- *On the socket side, tangs are at the top of each cavity, so the socket terminal slot (on the same side as the crimp tails) must face upward.*

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



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

Figure A-60. Tyco 070 Multilock Unsealed Connector: Cavity Numbers on Secondary Locks (socket housings shown)

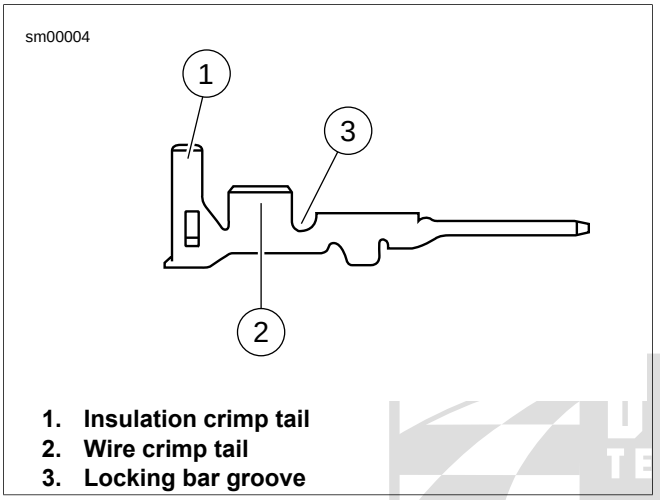
Preparing Wire Leads for Crimping

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

2. See Figure A-61 and Figure A-62. Select the pin/socket terminals from the parts catalog and identify the insulation crimp tails (1) and the wire crimp tails (2) and the groove for the crimp tool locking bar (3).
3. Identify the wire lead gauge and the corresponding crimper tool and nesting die. Refer to Table A-8.

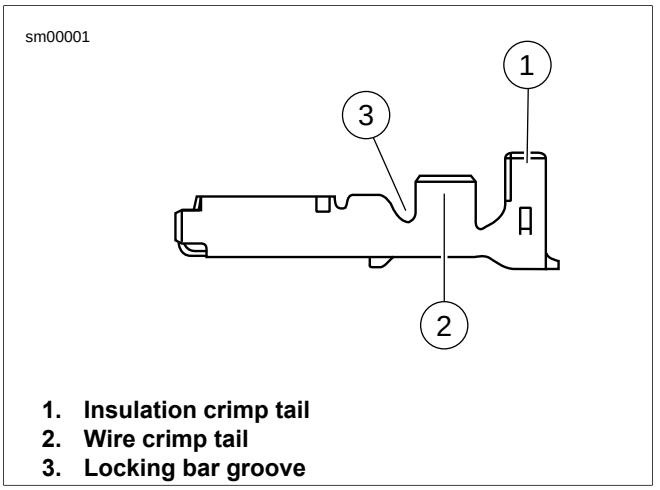
Table A-8. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest

WIRE GAUGE	NEST
20	Front
16	Middle
18	Rear



1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

Figure A-61. Tyco 070 Multilock Unsealed Connector: Pin Terminal



1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

Figure A-62. Tyco 070 Multilock Unsealed Connector: Socket Terminal

Crimping Terminals to Leads

NOTE

Crimping with the AMP Multi-lock Crimper is a one step operation. One squeeze crimps both the wire core and the insulation tails.

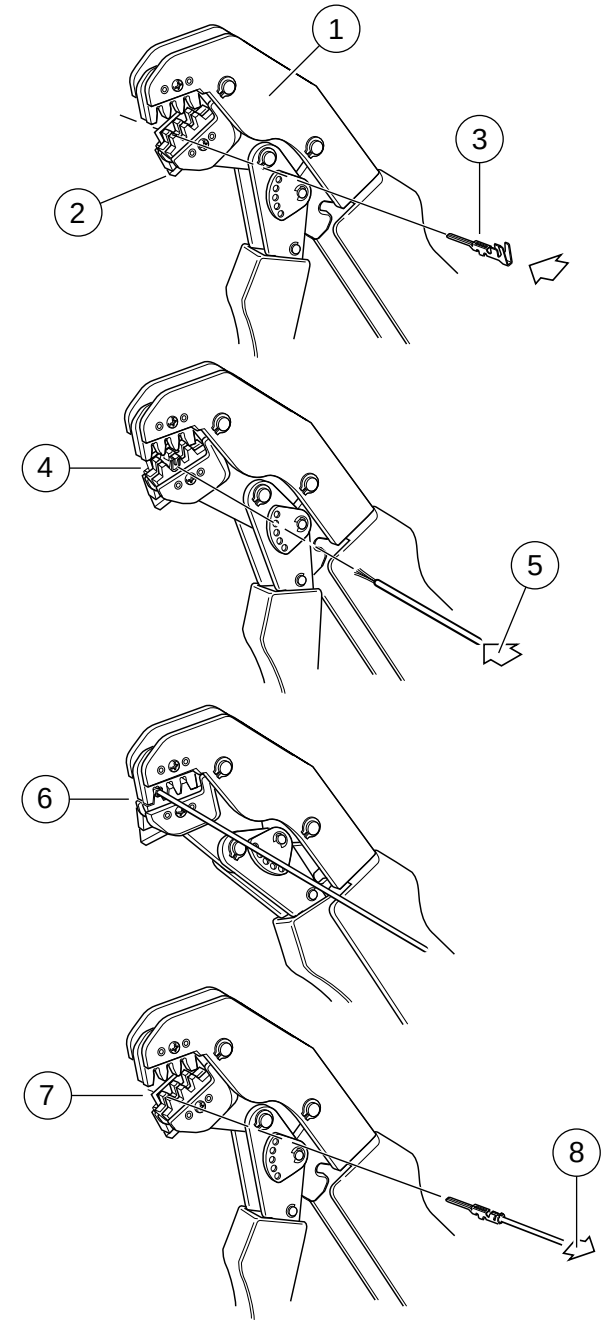
1. See Figure A-63. Squeeze the handles to cycle the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) to the fully open position (1).
2. Raise locking bar by pushing up on bottom flange (2).

NOTE

See Figure A-61 and Figure A-62. Hold the terminal with the insulation crimp tail (1) facing up. The tool will hold the terminal by the locking bar groove (3) and simultaneously crimp around the stripped lead and the insulation.

3. See Figure A-63. With the insulation crimp tail facing upward, insert terminal (pin or socket) (3) through the locking bar, so that the closed side of the terminal rests on the nest of the crimp tool.
4. Release locking bar to lock position of contact (4). When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails.
5. Insert stripped end of lead (5) until ends make contact with locking bar.
6. 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. Tool automatically opens when the crimping sequence is complete.
8. Raise up locking bar (7) to remove crimped terminal.

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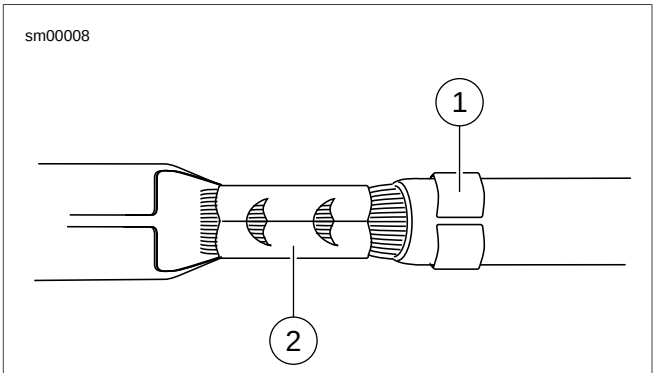


1. Open position
2. Locking bar flange
3. Insert contact
4. Release locking bar
5. Insert lead
6. Squeeze
7. Raise locking bar
8. Remove crimped terminal

Figure A-63. Tyco 070 Multilock Unsealed Connector: Terminal Crimping Procedure

Inspecting Crimped Terminals

See Figure A-64. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. Insulation crimp
2. Wire core crimp

Figure A-64. Tydo 070 Multilock Unsealed Connector: Terminal Crimp

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TYCO GET 64 SEALED CONNECTOR A.21

TYCO GET 64 SEALED CONNECTOR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

General

See Figure A-65. The Tyco GET 64 Sealed connector is found on the ECM of Dyna and Softail Models.

Housings

Separate: Press on the latch. Pull the socket housings off of the ECM.

Join: Align the socket housing latch with the catch on the ECM. Press housing onto ECM.

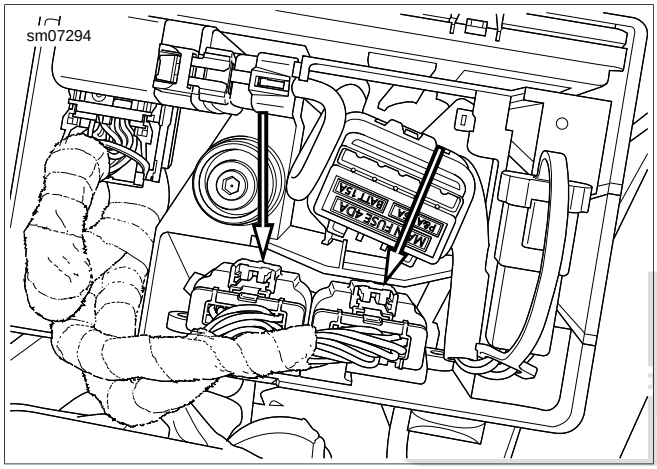


Figure A-65. Tyco GET 64 Sealed Connector Latch

Removing Socket Terminals

1. Remove the black wrap to access the back of the connector.
2. See Figure A-66. Use needle nose pliers to pull the secondary lock out of the housing.
3. See Figure A-67. 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 adjacent to the terminal.
4. Rotate the extractor to release the retention beam and simultaneously pull on the wire lead to remove the terminal.

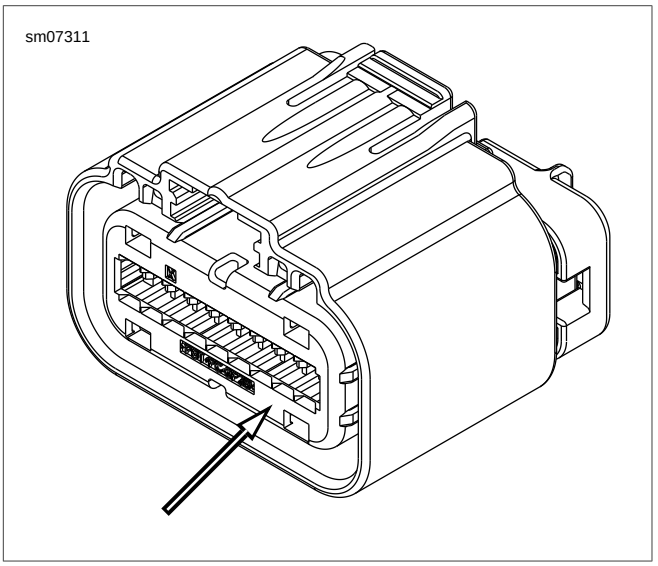
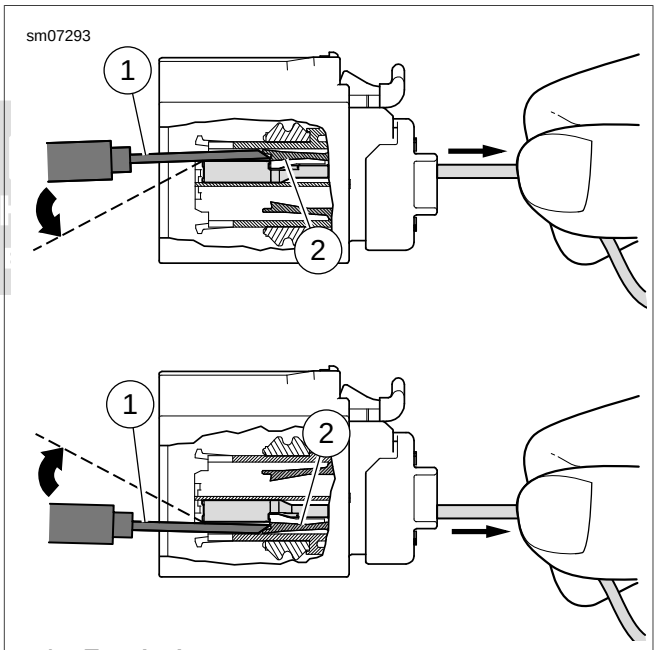


Figure A-66. Tyco GET 64 Secondary Lock



1. **Terminal extractor**
2. **Retention beam**

Figure A-67. Removing Terminals: Tyco GET 64 Sealed Connector

Installing Socket Terminals

1. See Figure A-68. Locate the wire lead cavity by number.
2. See Figure A-69. 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.

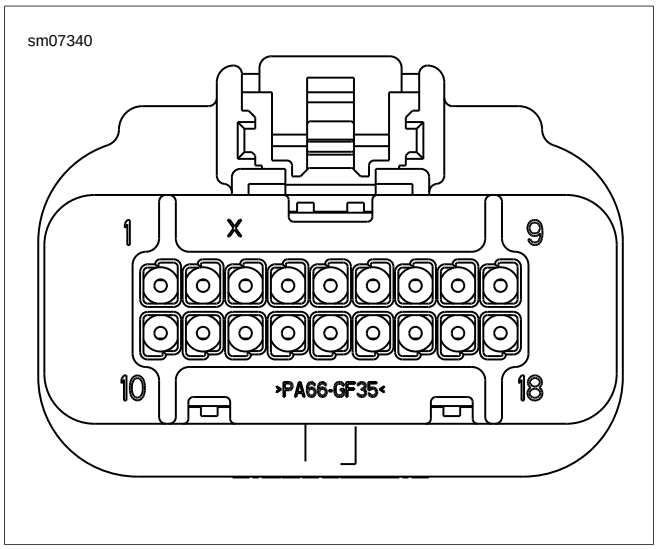


Figure A-68. Cavity Numbers

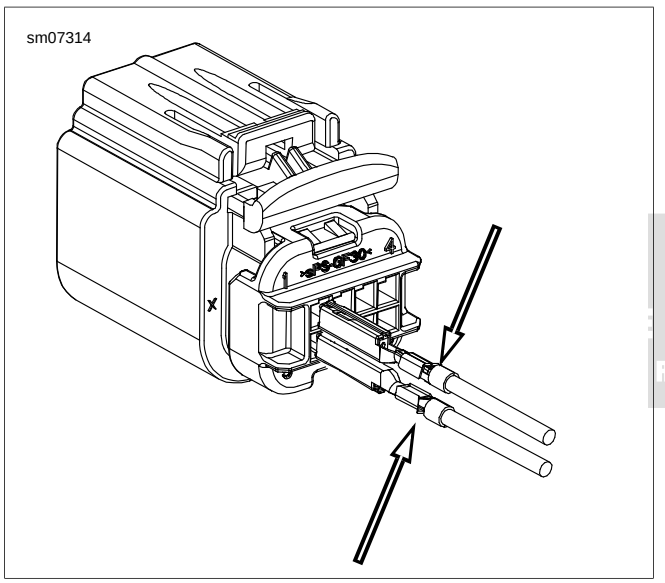


Figure A-69. Socket Terminal Orientation: Crimp Open Side

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-7	TYCO GET 64 DIE

1. Strip the wire insulation. Refer to Table A-9.
2. Install the TYCO GET 64 DIE (Part No. HD-50120-7) in 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. Refer to Table A-9.
4. Insert the wire to the wire stop. Crimp the terminal.
5. Inspect the crimped terminal and wire lead.

Table A-9. Tyco GET 64 Sealed Crimper Die (Part No. HD-50120-7)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Socket: 18-20 AWG	72666-12	0.170	4.4	A

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TYCO MCP SEALED CONNECTOR A.22

TYCO MCP SEALED CONNECTOR

PART NUMBER	TOOL NAME
B-0085	TERMINAL EXTRACTOR
GA500A	SNAP-ON TERMINAL PICK

General

The Tyco MCP sealed connector is used on certain ABS modules.

Housing

Separate: See Figure A-70. 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.

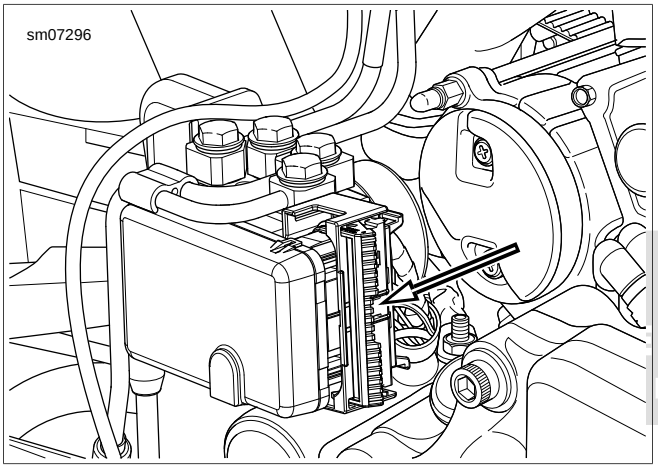


Figure A-70. Tyco MCP Connector Release Bar

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-71. Gently slide the secondary lock out of the connector with a screw driver.
3. See Figure A-72. 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.

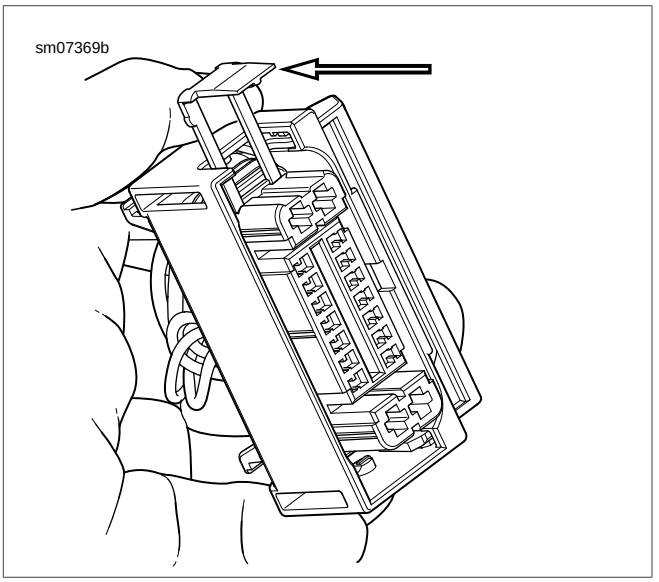


Figure A-71. Tyco MCP Connector Secondary Lock

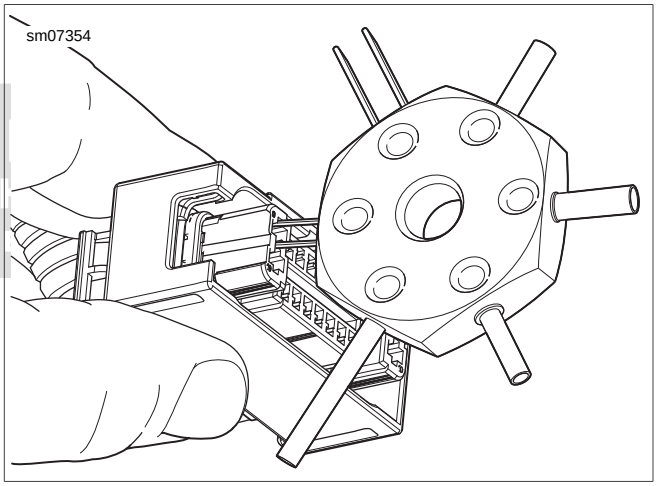


Figure A-72. Removing Large Socket Terminals: Tyco MCP Connector

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-71. Gently slide the secondary lock out of the connector with a screw driver.
3. See Figure A-73. Insert the TERMINAL EXTRACTOR (Part No. B-0085) 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.

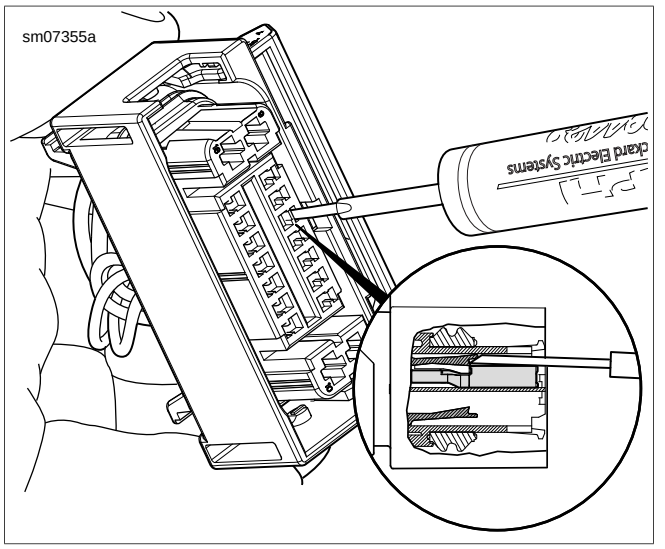


Figure A-73. Removing Small Socket Terminal: Tyco MCP Connector

Installing Terminals

1. See Figure A-74. 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.

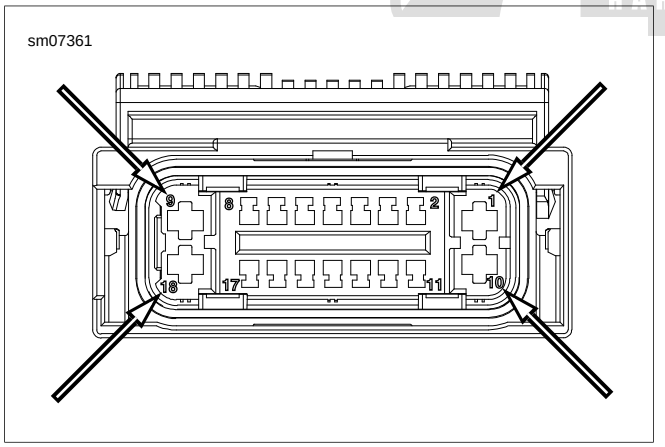


Figure A-74. Tyco MCP Sealed Connector Cavity Numbers

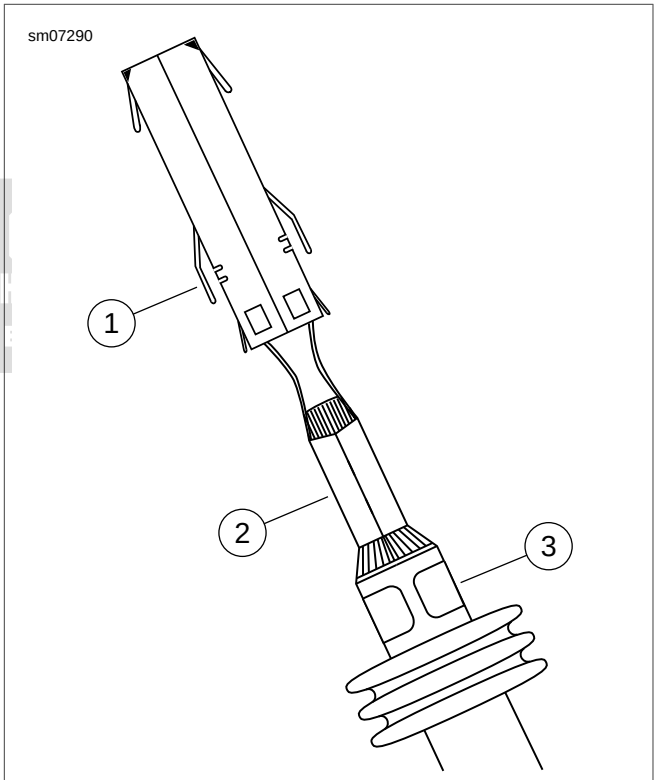
CRIMPING TERMINALS

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-10.
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-10. 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-75. Tyco MCP Socket Terminal Crimp

SEALED SPLICE CONNECTOR A.23

SEALED SPLICE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN
HD-38125-8	PACKARD CRIMPING TOOL
HD-39969	ULTRA TORCH
HD-41183	HEAT SHIELD ATTACHMENT

General

Splice connectors and several OE ring terminal connectors use heat shrink covering to seal the connection.

Preparing Wire Leads

NOTE

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-11.
3. Strip insulation off the the wire lead. Refer to Table A-11.

Table A-11. 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-77. The connector is crimped on one side and then the other.

1. See Figure A-76. Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
2. Match the connector color to the wire gauge crimp die in the jaws. Insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See Figure A-77. 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.

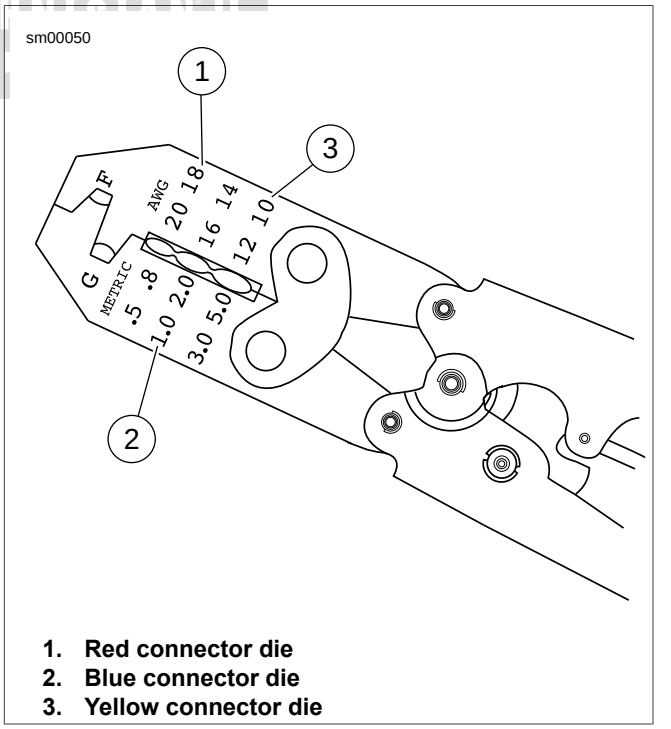
7. Use an ULTRA TORCH (Part No. HD-39969), or a HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

NOTE

It is acceptable for the splice to rest against the heat shrink tool attachment.

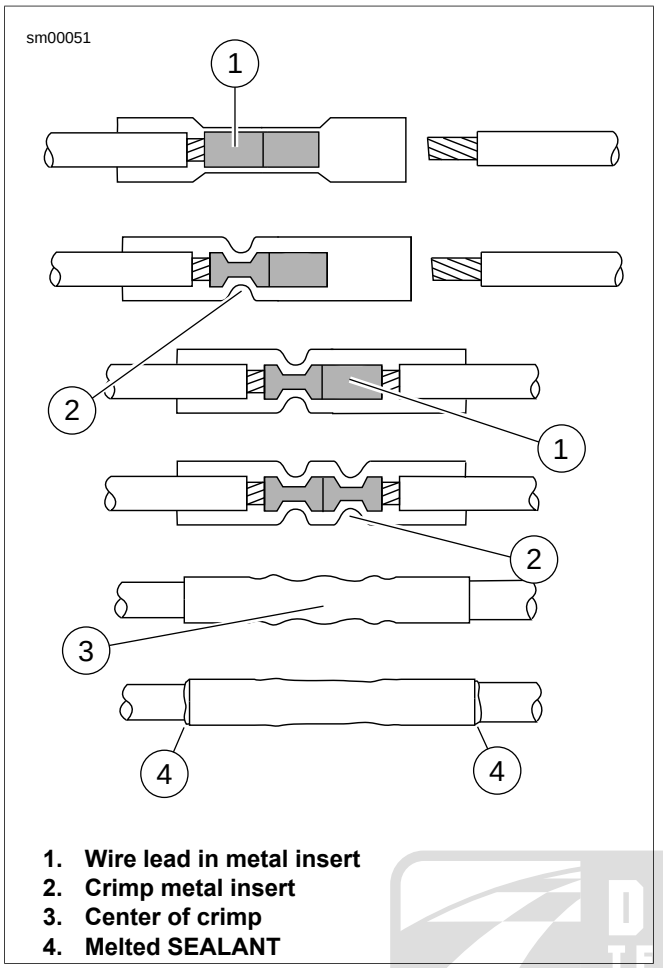
Inspecting Seals

See Figure A-77. 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-76. 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-77. Sealed Splice Connector

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TABLE OF CONTENTS

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B.1 CONNECTORS	B-1
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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
[5]	Main fuse	2-place Delphi 800 Metripack Sealed (BK)	Red	Behind left side cover
[7]	Tail lamp harness to main harness	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Below seat
[18]	Right rear turn signal	2-place Tyco 070 Multilock Unsealed (single stop lamp) 2-place Tyco 070 Multilock Unsealed (W) (LED) 4-place Tyco 070 Multilock Unsealed (BK) (dual stop lamp)	Gray	Inside tail lamp lens (single stop lamp) Under the seat (LED and dual stop lamp)
[19]	Left rear turn signal	2-place Tyco 070 Multilock Unsealed (BK) (single stop lamp) 2-place Tyco 070 Multilock Unsealed (BK) (LED) 4-place Tyco 070 Multilock Unsealed (BK) (dual stop lamp)	Gray	Inside tail lamp lens (single stop lamp) Under the seat (LED and dual stop lamp)
[20]	Instruments	12-place Molex MX 150 Sealed (BK)	Gray	Under fuel tank
[22]	Right hand controls	6-place Molex MX 150 Sealed (BK)	Gray	Under fuel tank
[24]	Left hand controls	8-place Molex MX 150 Sealed (GY)	Gray	Under fuel tank
[30]	TSM, TSSM or HFSM	12-place Deutsch DT Sealed (GY)	Breakout Box	Under battery
[31]	Front turn signals	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Under fuel tank
[38]	Headlamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Under fuel tank
[39]	Speedometer (XL)	12 Delphi Micro 64 Sealed (BK)	Breakout Box	Back of speedometer
[39]	Speedometer (XR)	5-place Delphi 150.2 Sealed (BK)	Gray	Back of speedometer
[40]	License plate lamp	2-place Tyco 070 Multilock Unsealed (BK) 3-place Tyco 070 Multilock Unsealed (BK)	Gray	Under seat
[47]	Voltage regulator to stator	3-place Dekko (BK)	Green	Right side, under gear case cover
[61]	Fuse block	Tyco JR Power Timer Unsealed (BK)	Gray	Behind left side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table B-1. Sportster Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[65]	VSS	3-place Delphi 150.2 Sealed (BK)	Gray	Behind starter
[77]	Voltage regulator	2-place Dekko (BK)	Green	Left side frame, in front of oil filter
[78]	ECM (XL)	36-place Delphi 100W Sealed (GY)	Breakout Box	Behind rear cylinder
[78]	ECM (XR)	36-place Delphi 100W Sealed (GY)	Breakout Box	Under seat
[79]	CKP sensor	2-place Deutsch DTM Sealed (BK)	Brown	Left side frame under oil filter
[80]	TMAP sensor	4-place Bosch 1.1M sealed (BK)	Purple	Top of intake manifold
[83]	Ignition coil	4-place Delphi GT 150 Sealed (BK)	Gray	Under fuel tank
[84]	Front fuel injector	2-place Molex BPT Sealed (BK)	Purple	Top of induction manifold
[85]	Rear fuel injector	2-place Molex BPT Sealed (BK)	Purple	Top of induction manifold
[87]	IAC	4-place Delphi 150.2 sealed (BK)	Gray	Top of induction manifold
[88]	TPS	3-place Delphi 150.2 Sealed (BK)	Gray	Behind air cleaner mounting plate
[90]	ET sensor	2-place Tyco Superseal 1.5 Sealed (BK)	Gray	On right side ECM caddy: XL models On right side H-bracket: XR 1200X
[91]	DLC	4-place Deutsch DT Sealed (GY)	Black	Under left side cover
[93]	Tail/stop lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside tail lamp lens
[94]	Rear turn signal lamp	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside tail lamp lens
[108]	Tachometer (XR)	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Back of tachometer
[120]	Oil pressure switch	Right Angle Push On terminal (BK)		Under oil filter mount
[121]	Rear stop lamp switch	Tyco Insulated Spade terminals (BK)	Red	Left side under battery (XL) Under rear fork (XR)
[122]	Horn	Flag terminals (BK)	Red	Between front frame tubes or on the left side of engine
[128]	Starter solenoid	1-place Delphi 56 Spade terminal (W)	Gray	Right side bottom of starter
[131]	Neutral switch	Right Angle Push On Molded terminals (BK)	Black	Right side under sprocket cover behind transmission sprocket
[133]	JSS (HDI)	3-place Molex MX 150 Sealed (BK)	Gray	Left side frame down tube
[136]	Neutral switch jumper	1-place bullet (BK)		Right side frame, beneath gearcase cover
[137]	Rear O2 sensor	2-place Tyco 070 Multilock Unsealed (BK)	Gray	On left side ECM caddy: XL models On left side H-bracket: XR 1200X
[138]	Front O2 sensor	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Left side frame in front of oil filter

DIGITAL TECHNICIAN II JOHNSON DAVIDSON

Table B-1. Sportster Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[141]	Fuel pump and low fuel switch	4-place Molex MX 150 Sealed (BK)	Gray	On left side of ECM caddy: XL models On left side of H-bracket: XR 1200X
[142]	Security siren	3-place Delphi 150.2 Sealed (BK)	Gray	Under frame
[145]	Engine sensor harness	16-place Molex MX 150 Sealed (BK)	Gray	Under seat
[160]	P&A battery	1-place Delphi 800 Metripack Sealed (GY)	Purple	Under seat
[178]	Active intake solenoid	2-place Tyco Superseal 1.5 Sealed (BK)	Gray	Right side behind air box: XR 1200X
[200]	Fuel sender resistor assembly	3-place Molex MX 150 Sealed (BK)	Gray	Under seat
[208]	HFSM antenna harness	4-place Deutsch DT Sealed (GY)	Black	Under battery
[209]	HFSM antenna	2-place Molex MX 64 Unsealed (BK)	Gray	Under seat
[210]	Fuel Tank Ground (XR)	1-place molded (BK)		Under fuel tank cover
[266]	Anti-theft tracking module	4-place Delphi GT 150 Sealed (BK)	Gray	Under frame
[267]	Anti-theft harness to main harness	3-place Deutsch DT Sealed (BK)	Black	Under battery
[Battery ground]	Battery ground	Ring terminal (BK)		Top of transmission case
[GND 1]	Harness ground	Ring terminal (BK)		Left side behind starter

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.

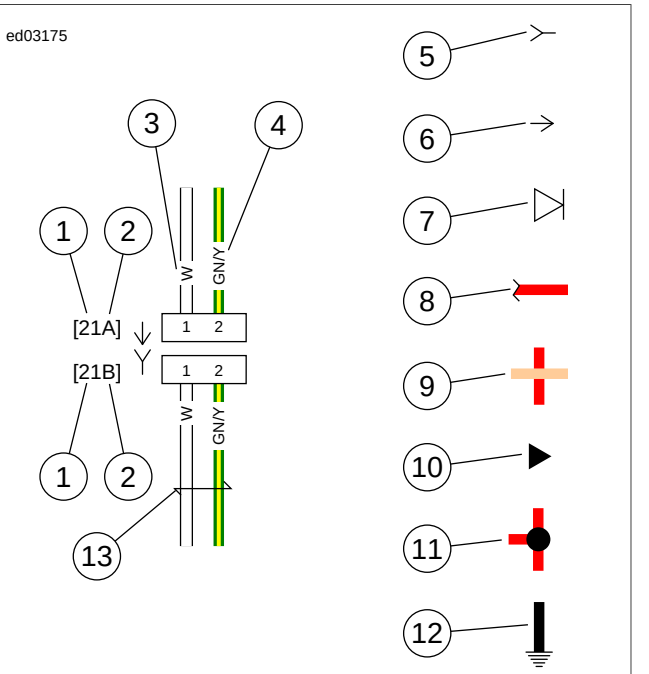
Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules.

NOTE

Clean grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit.

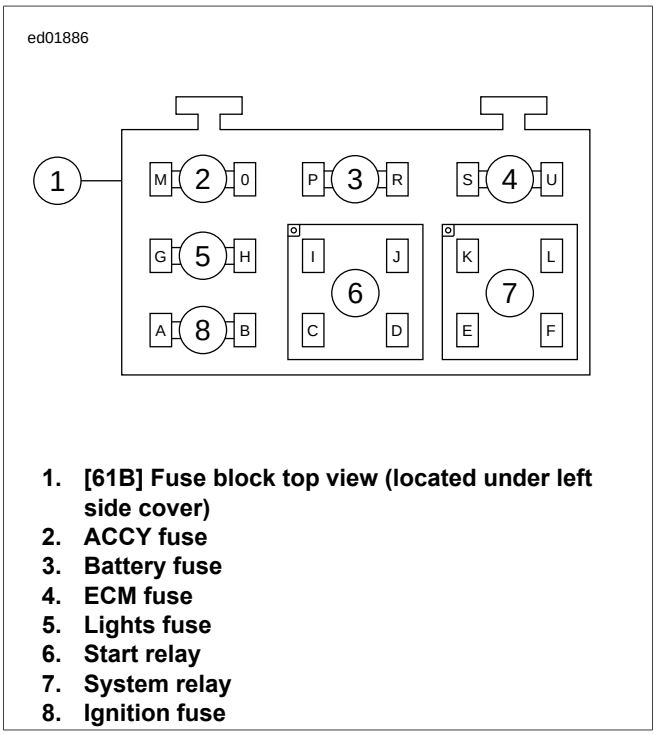
Dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

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. **[61B] Fuse block top view (located under left side cover)**
2. **ACCY fuse**
3. **Battery fuse**
4. **ECM fuse**
5. **Lights fuse**
6. **Start relay**
7. **System relay**
8. **Ignition fuse**

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
LGN	Light Green
O	Orange
PK	Pink
R	Red
TN	Tan
V	Violet
W	White
Y	Yellow

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

2013 SPORTSTER WIRING DIAGRAMS

Refer to the table below for wiring diagram information.

Wiring Diagram List

DIAGRAM	LOCATION
Battery Power	Figure B-3
Ignition Power	Figure B-4
Accessory Power	Figure B-5
Chassis Grounds	Figure B-6
Main Harness: 2013 Sportster	Figure B-7
Engine Management: 2013 Sportster	Figure B-8
Starting and Charging Circuit: 2013 Sportster	Figure B-9
Lighting (1 of 2): 2013 Sportster	Figure B-10
Lighting (2 of 2): 2013 Sportster	Figure B-11
Instrument, Indicators, and Hand Controls: 2013 Sportster	Figure B-12
Security Circuit: 2013 Sportster	Figure B-13
Security Circuit with Anti-Theft Tracking Module: 2013 Sportster	Figure B-14

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

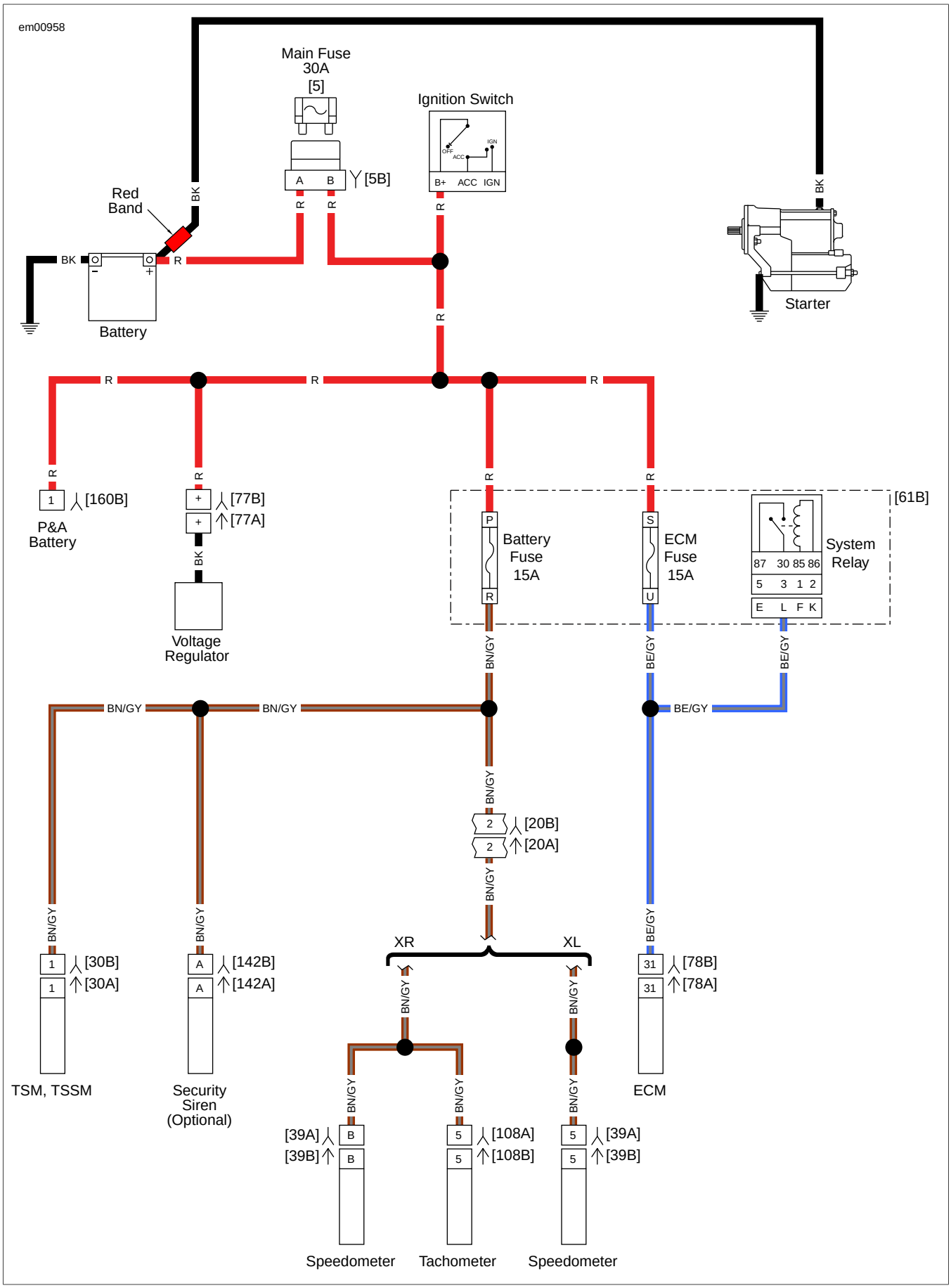


Figure B-3. Battery Power

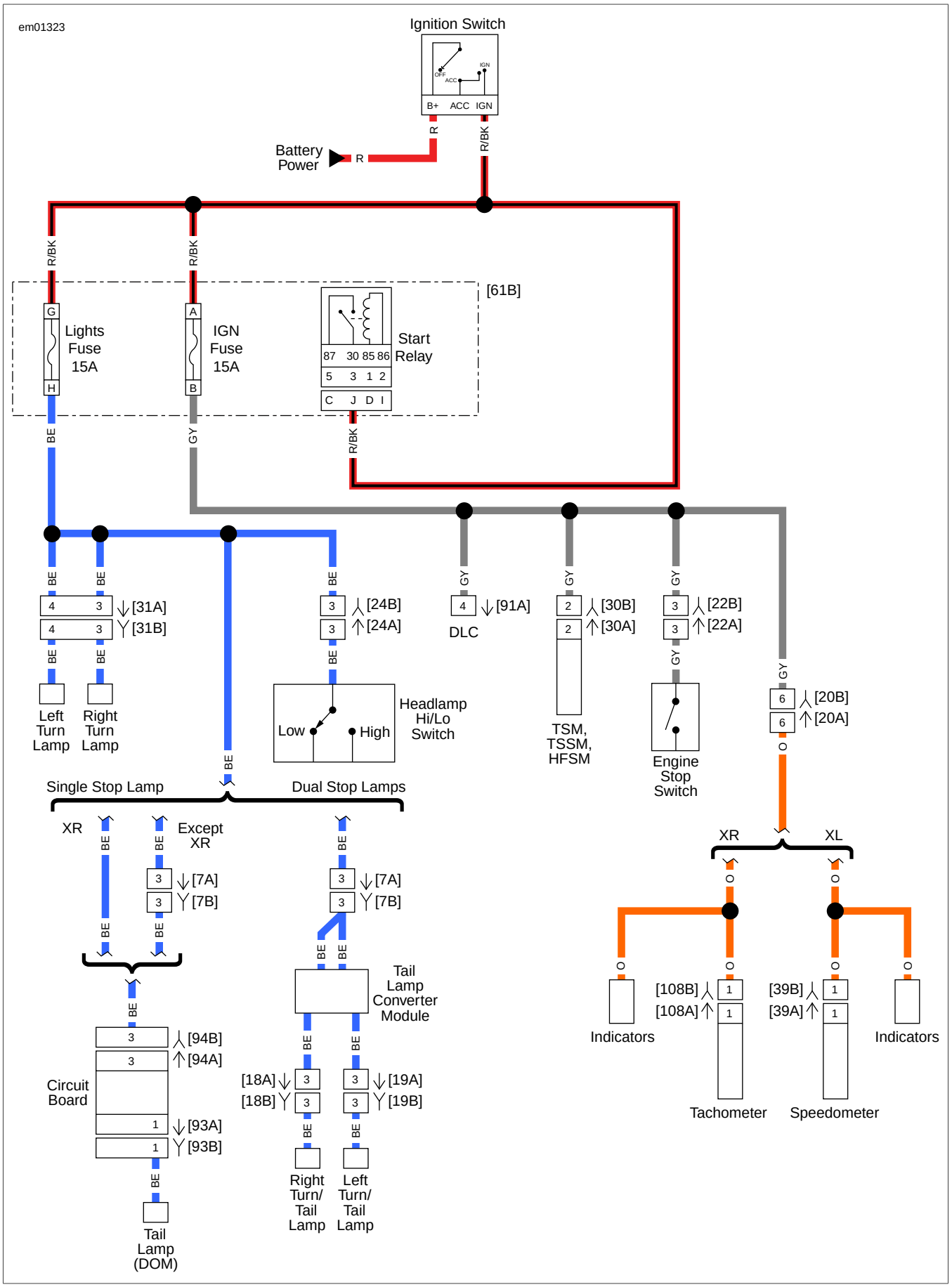


Figure B-4. Ignition Power

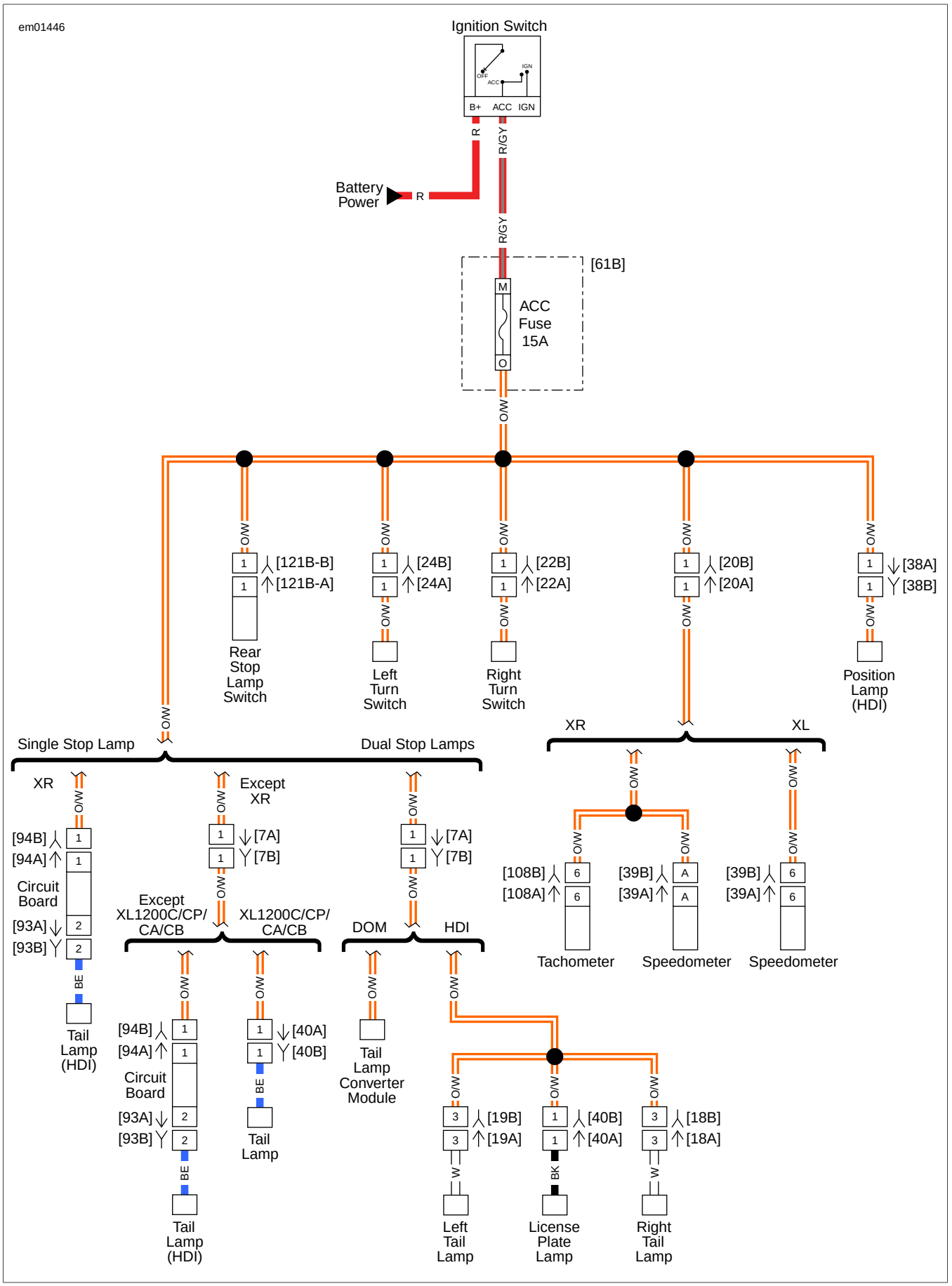


Figure B-5. Accessory Power

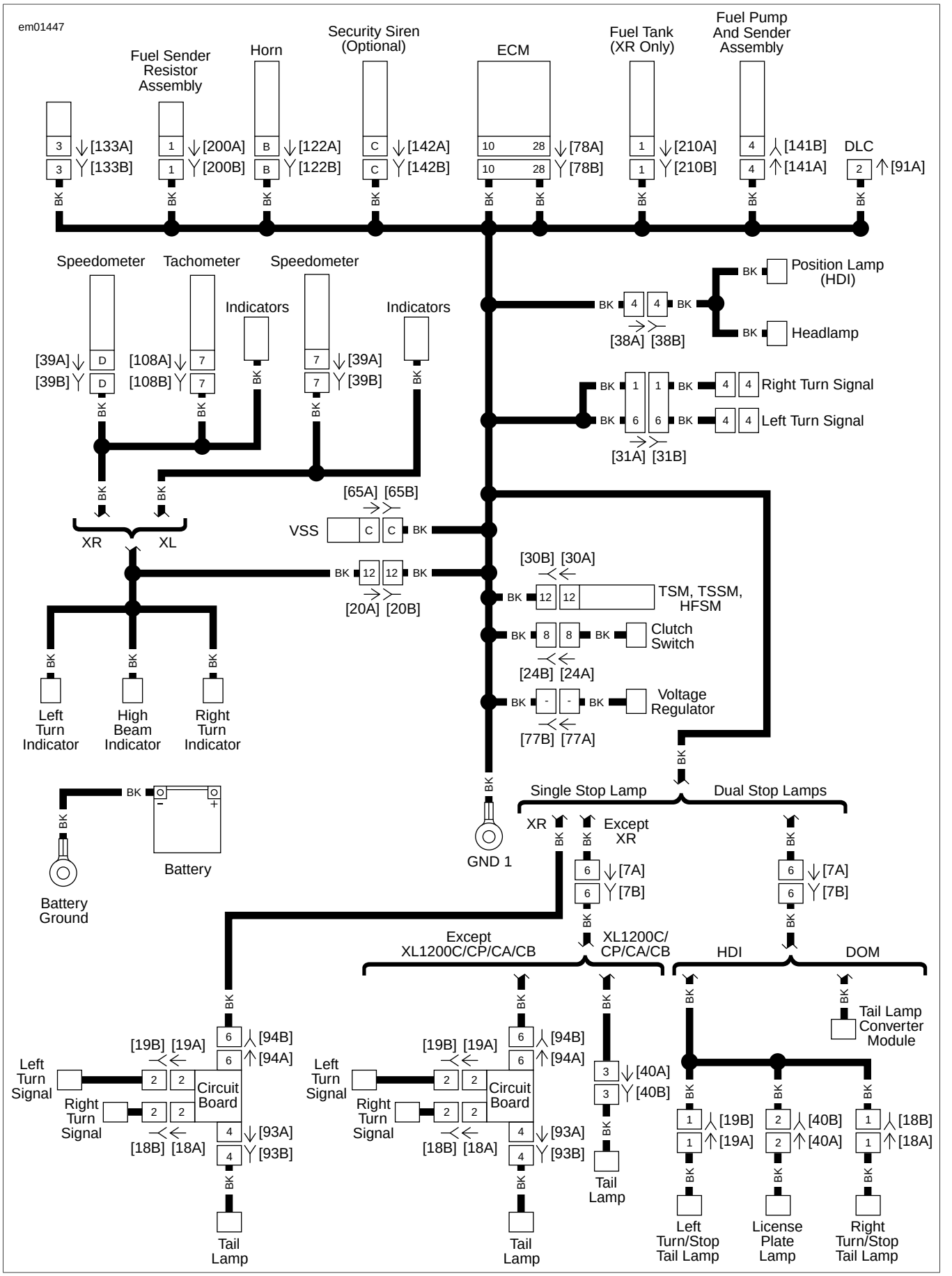


Figure B-6. Chassis Grounds

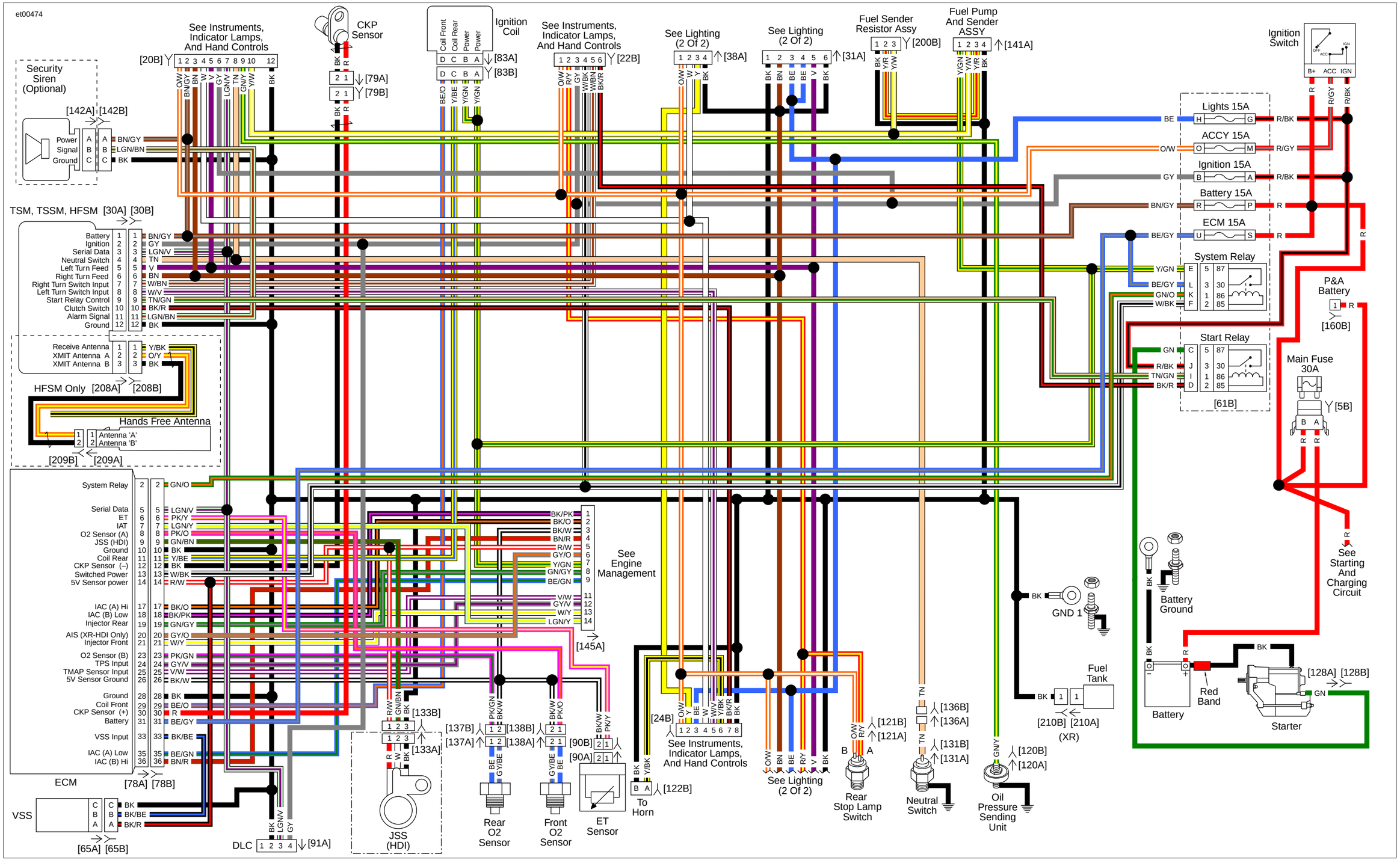


Figure B-7. Main Harness: 2013 Sportster

Figure B-7.
Main Harness: 2013 Sportster

Figure B-7.
Main Harness: 2013 Sportster

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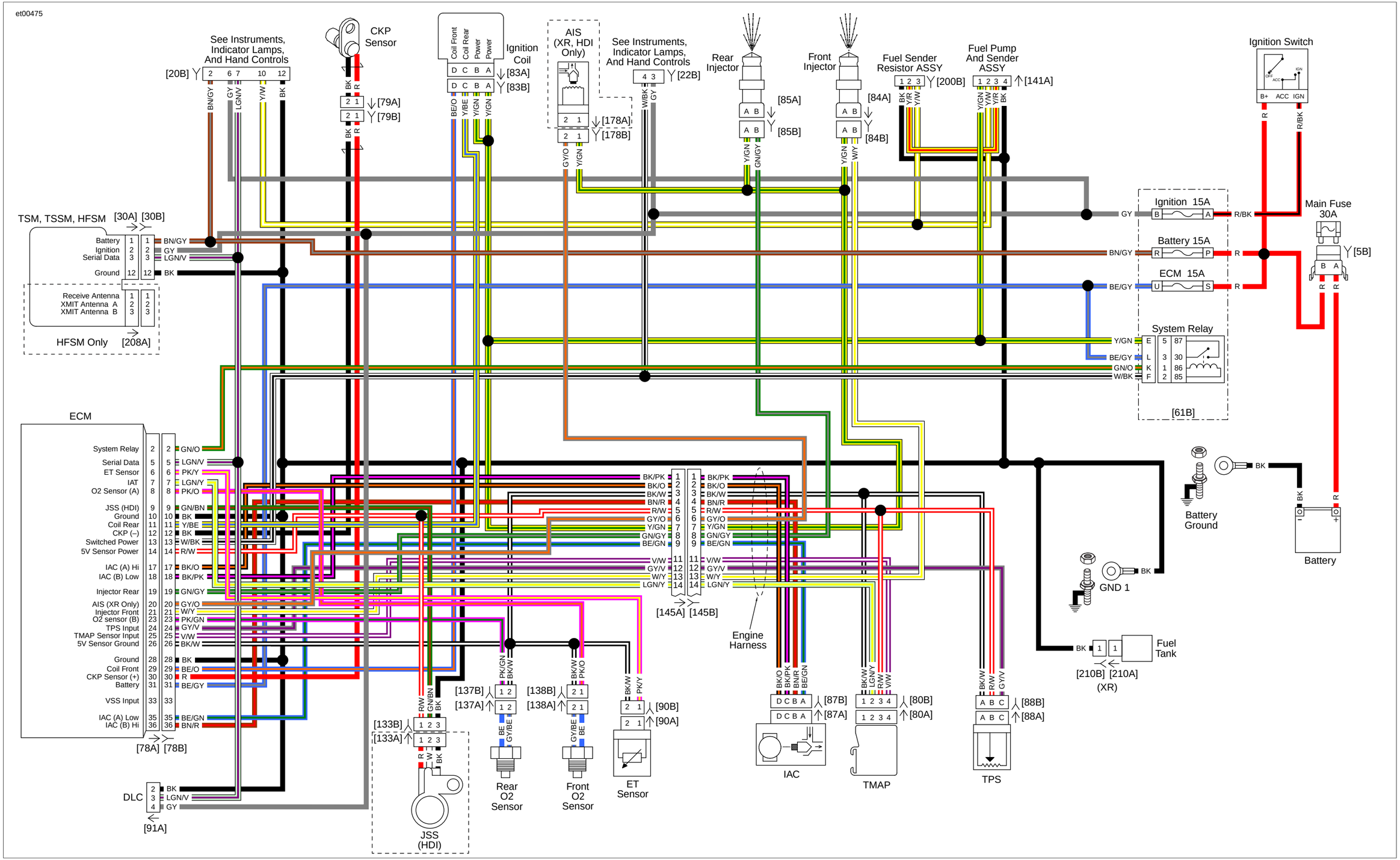


Figure B-8. Engine Management: 2013 Sportster

Figure B-8.
Engine Management: 2013 Sportster

Figure B-8.
Engine Management: 2013 Sportster

et00545

Right Hand Controls
Engine Stop Switch
Start Switch
BK/R
W/BK
GY
6 4 3
[22A]
6 3
[22B]
Ignition Switch
OFF ACC IGN
B+ ACC IGN
Main Fuse 30A
[5B]
B A
Battery Ground
Battery
BK
R
Red Band
[128A] [128B]
GN
Starter
Ignition 15A
GY
B A
R/BK
Battery 15A
BN/GY
R P
R
Start Relay
GN
R/BK
TN/GN
BK/R
C J I D
5 3 1 2
87 30 86 85
[61B]
TSM, TSSM, HFSM
[30A] [30B]
Battery 1 1 BN/GY
Ignition 2 2 GY
Neutral Switch 4 4 TN
Start Relay Control 9 9
Clutch Switch 10 10 BK/R
Chassis Ground 12 12 BK
Receive Antenna 1
XMIT Antenna A 2
XMIT Antenna B 3
4
HFSM Only [208A]
GND 1
TN
[136B]
[136A]
[131B]
[131A]
Neutral Switch
[24B]
[24A]
7 8
BK/R
BK
Clutch Switch
Left Hand Controls
TN/GN
GN
[267B]
[267A]
[266B]
[266A]
D C
Start Relay Input
Start Relay Enable
Anti-Theft Tracking Module (If Equipped)
Starting

Battery Ground
Battery
Stator
Main Fuse 30A
[5B]
Voltage Regulator
[47B]
[47A]
1 2
GND 1
[77B] [77A]
Charging

Figure B-9. Starting and Charging Circuit: 2013 Sportster

Figure B-9.
Starting and Charging Circuit: 2013 Sportster

Figure B-9.
Starting and Charging Circuit: 2013 Sportster

et00477

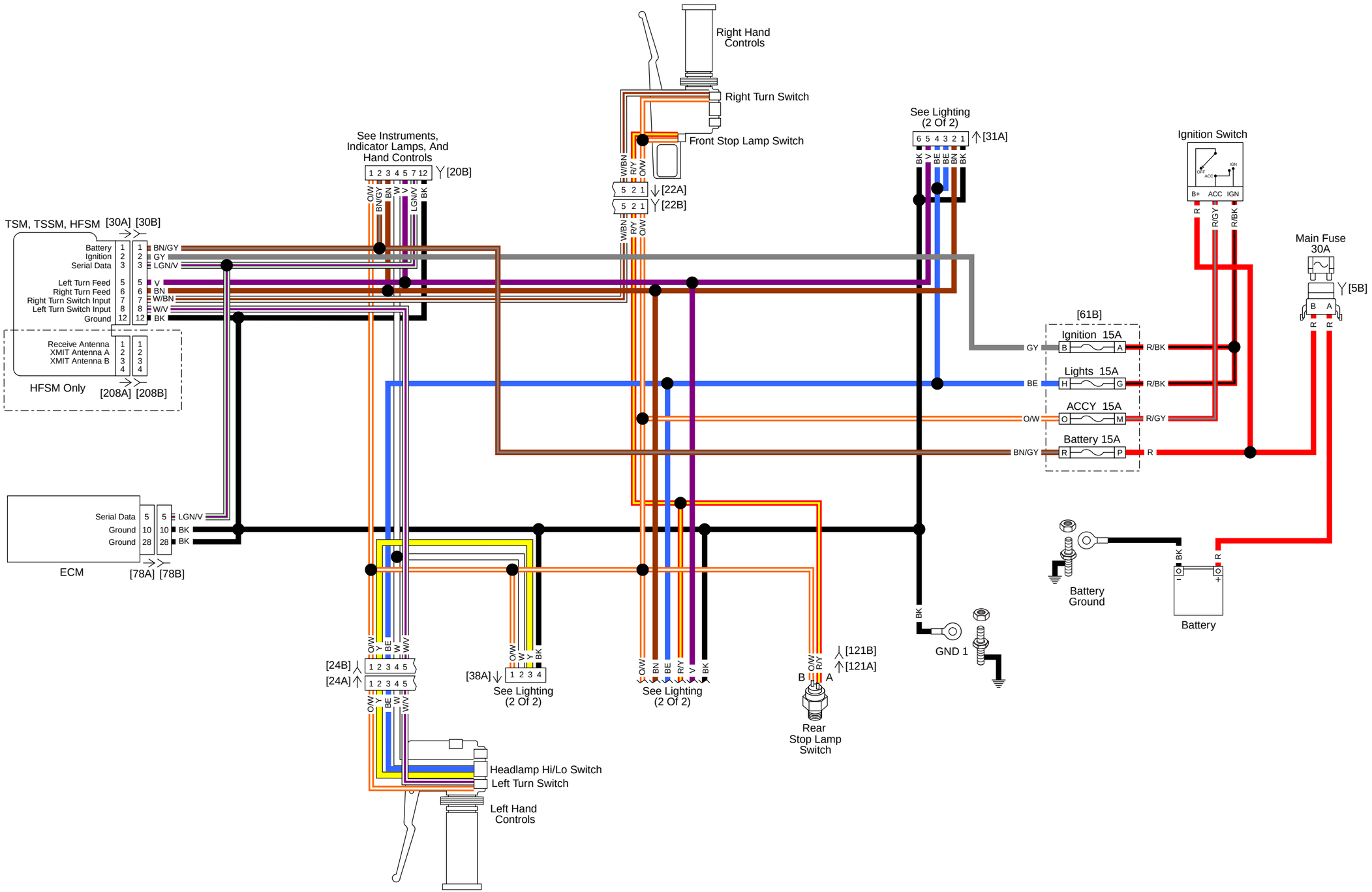


Figure B-10. Lighting (1 of 2): 2013 Sportster

Figure B-10.
Lighting (1 of 2): 2013 Sportster

Figure B-10.
Lighting (1 of 2): 2013 Sportster

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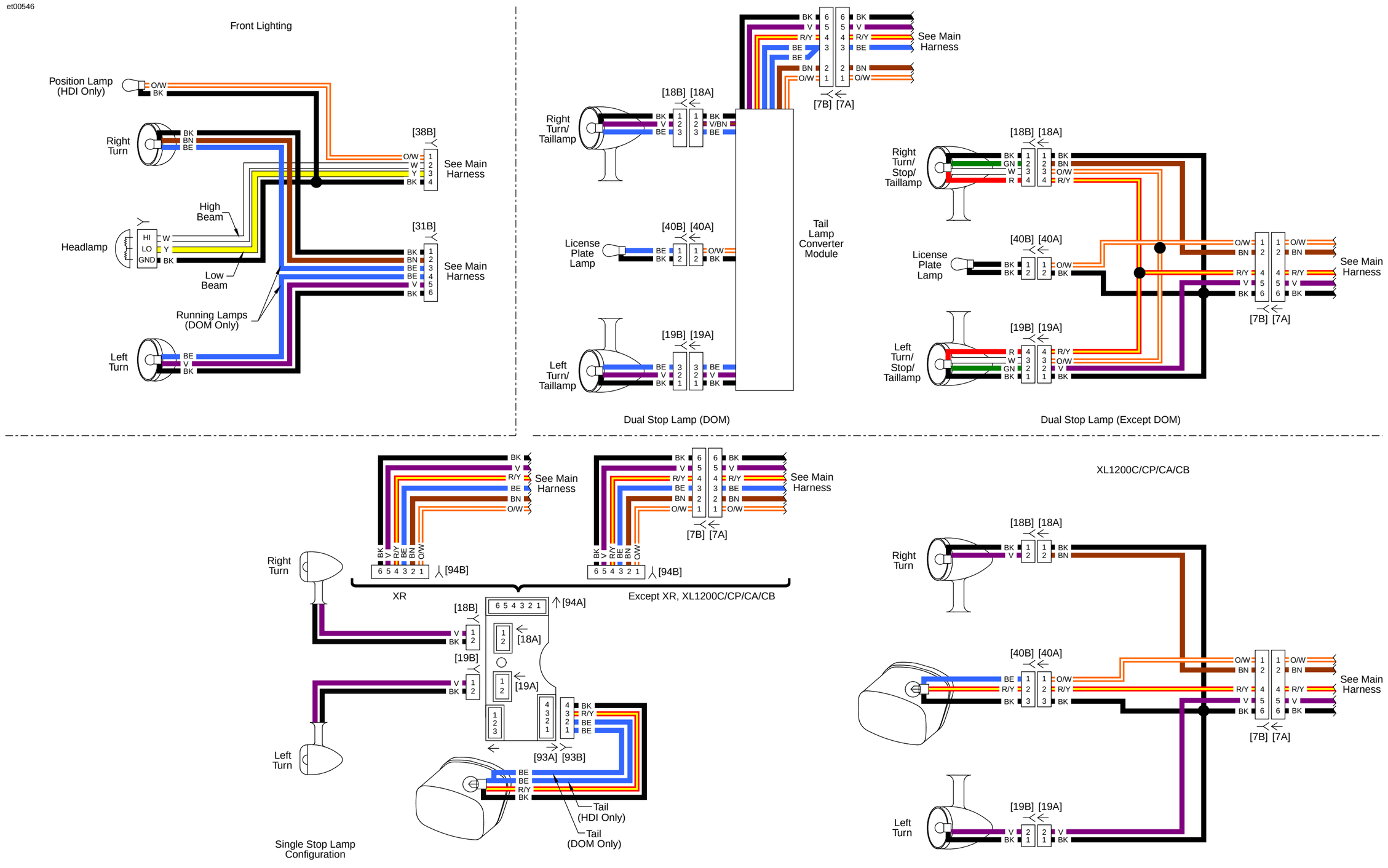
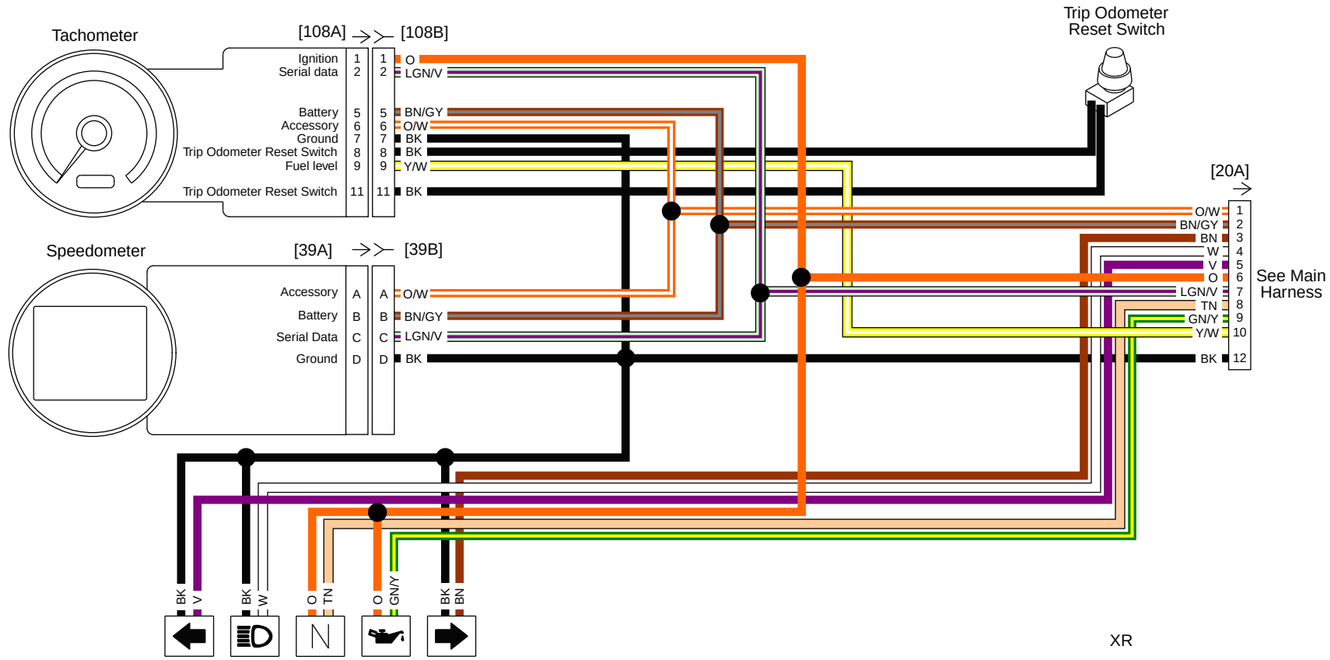


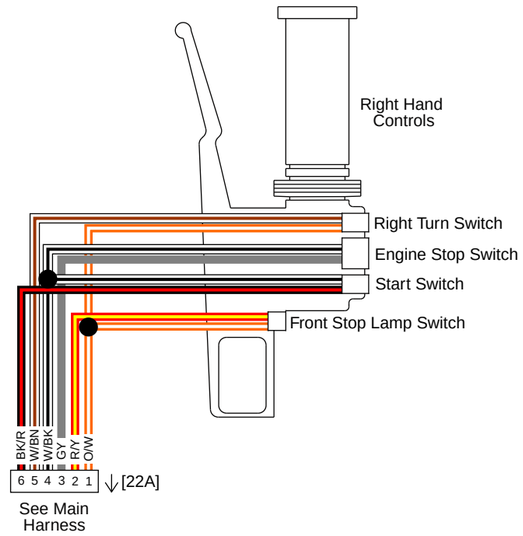
Figure B-11. Lighting (2 of 2): 2013 Sportster

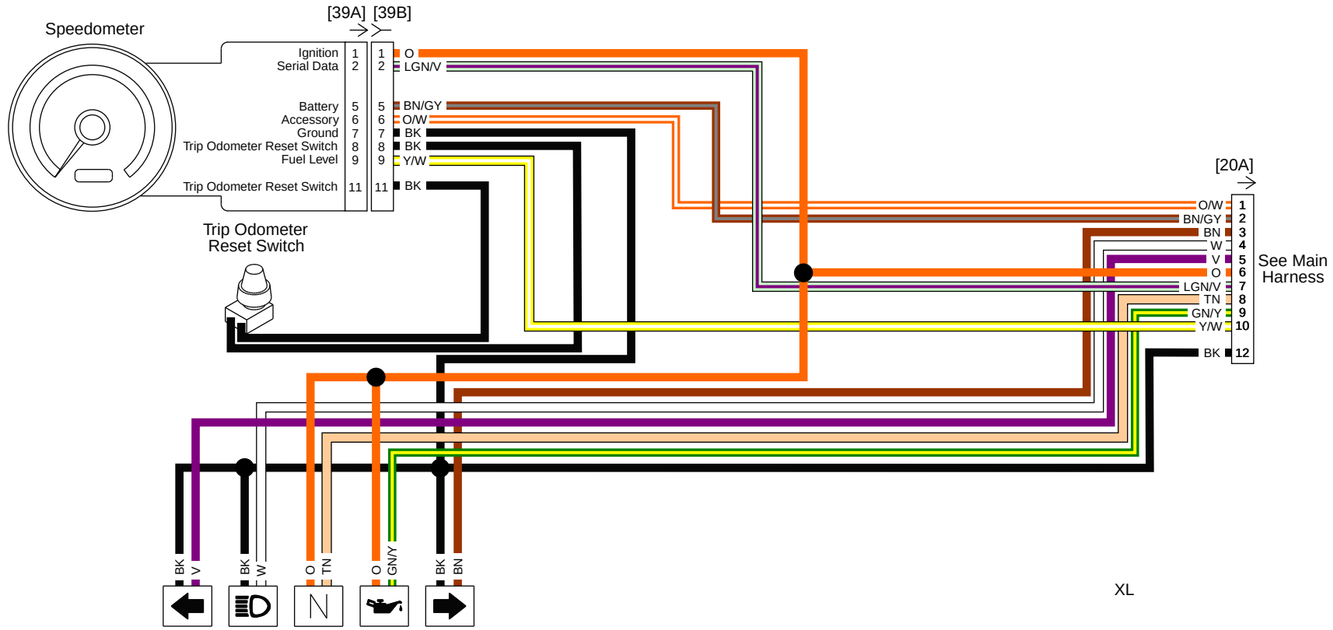
Figure B-11.
Lighting (2 of 2): 2013 Sportster

Figure B-11.
Lighting (2 of 2): 2013 Sportster

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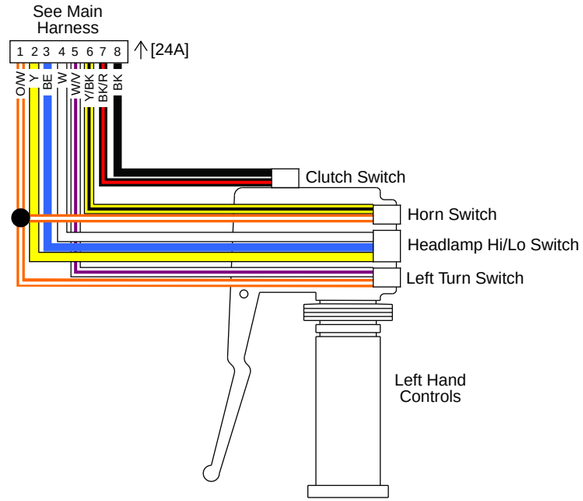


Figure B-12. Instrument, Indicators, and Hand Controls: 2013 Sportster

Figure B-12.
Instrument, Indicators, and Hand Controls: 2013 Sportster

Figure B-12.
Instrument, Indicators, and Hand Controls: 2013 Sportster

et00478

Security Siren (Optional)
[142A] [142B]
Power
Signal
Ground
BN/GY
LGN/BN
BK

Right Hand Controls
Right Turn Switch
Engine Stop Switch
Start Switch

See Instruments, Indicator Lamps, And Hand Controls
[20B]
[22A]
[22B]

See Lighting (2 Of 2)
[31A]

Ignition Switch
B+ ACC IGN

Main Fuse 30A
[5B]

TSM, TSSM, HFSM [30A] [30B]
Battery
Ignition
Serial Data
Left Turn Feed
Right Turn Feed
Right Turn Switch Input
Left Turn Switch Input
Start Relay Control
Alarm Signal
Ground
BN/GY
GY
LGN/V
V
BN
W/BN
W/V
TN/GN
LGN/BN
BK

ACCY 15A
Ignition 15A
Battery 15A
ECM 15A
System Relay
Start Relay
[61B]

Receive Antenna
XMIT Antenna A
XMIT Antenna B
Y/BK
O/Y
BK
HFSM Only [208A] [208B]

[209B] [209A] Hands Free Antenna
O/Y
BK
Antenna 'A'
Antenna 'B'

Battery Ground
Battery
Red Band
Starter
[128A] [128B]
GN
GND 1

System Relay
Serial Data
Ground
Switched Power
Ground
Battery
GN/O
LGN/V
BK
W/BK
BK
BE/GY
ECM [78A] [78B]

[24B]
[24A]
See Lighting (2 Of 2)
Left Turn Switch
Left Hand Controls

Figure B-13. Security Circuit: 2013 Sportster

Figure B-13.
Security Circuit: 2013 Sportster

Figure B-13.
Security Circuit: 2013 Sportster

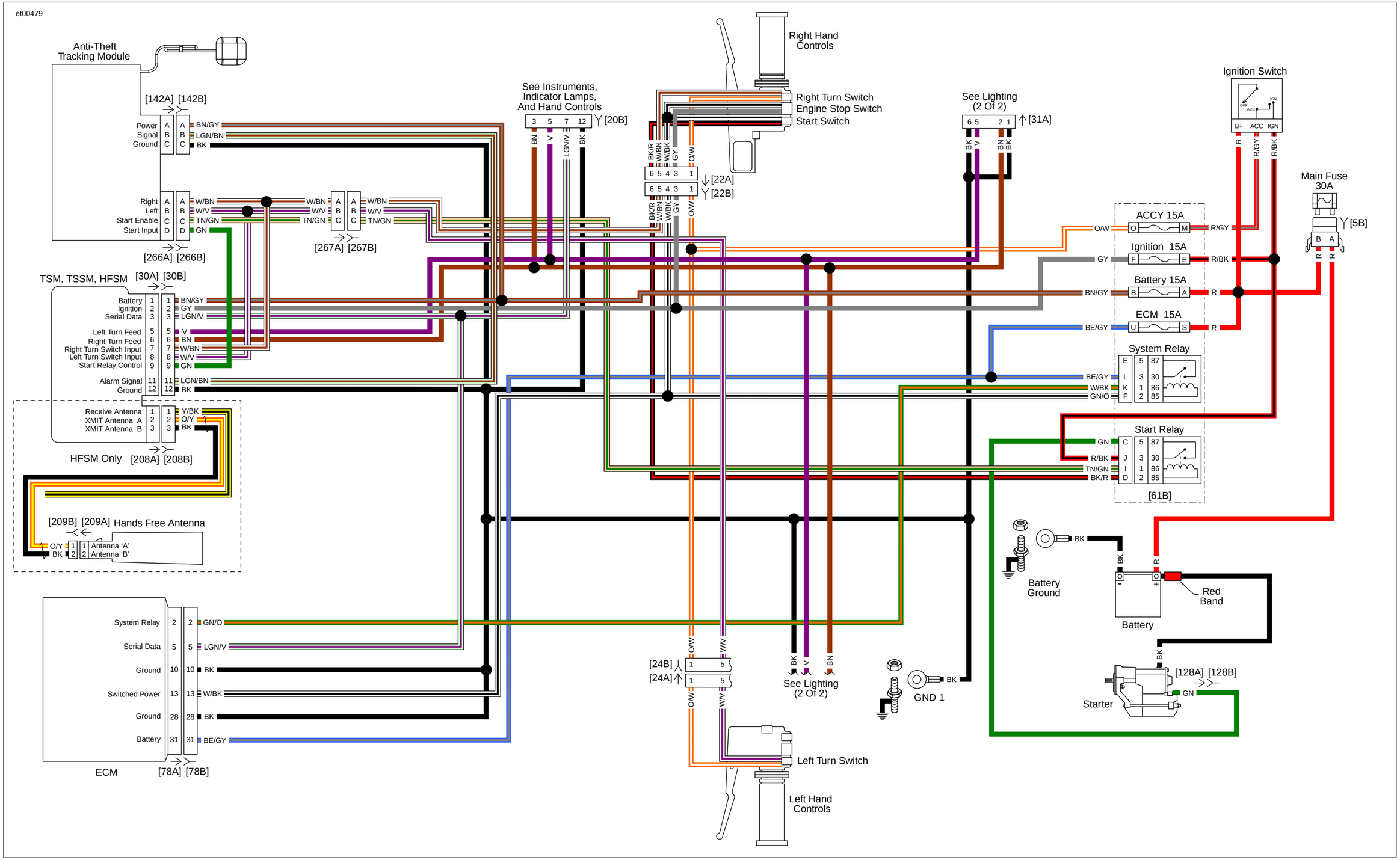


Figure B-14. Security Circuit with Anti-Theft Tracking Module: 2013 Sportster

Figure B-14.
Security Circuit with Anti-Theft Tracking Module: 2013 Sportster

Figure B-14.
Security Circuit with Anti-Theft Tracking Module: 2013 Sportster

TABLE OF CONTENTS

SUBJECT **PAGE NO.**

C.1 COMPENSATING SPROCKET.....C-1

DIGITAL TECHNICIAN® II
HARLEY-DAVIDSON®

NOTES

COMPENSATING SPROCKET C.1

GENERAL

Sportster models sold in certain markets are equipped with a rear wheel compensating sprocket.

Periodic inspection of the compensator components is recommended. This should be done any time the rear wheel is removed.

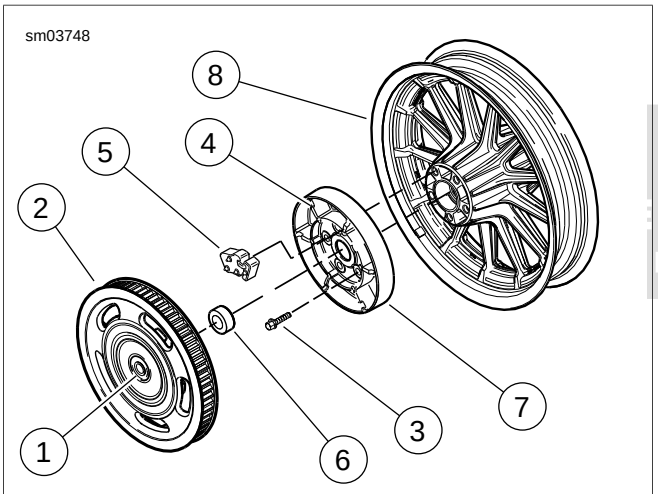
REMOVAL AND DISASSEMBLY

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

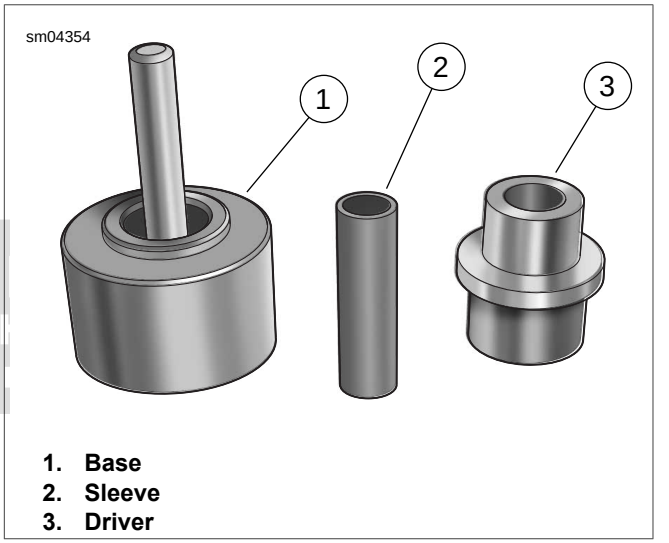
1. See Figure C-1. Wipe inside of compensator bowl (7) and final drive sprocket (2) with a clean, damp cloth.
2. Inspect sprocket bearing (1). If bearing surface is rough or if bearing was leaking grease, replace bearing. See C.1 COMPENSATING SPROCKET, Sprocket Bearing.
3. Inspect sprocket isolators (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

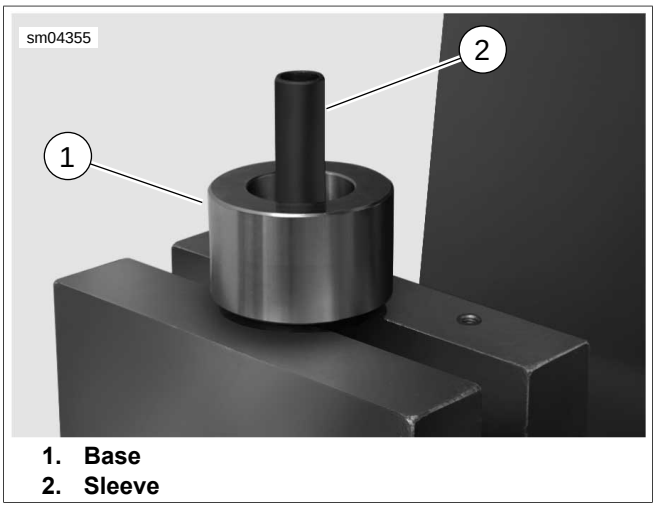
1. Pull sprocket from bowl.
2. See Figure C-2. Obtain the REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921).



1. **Base**
2. **Sleeve**
3. **Driver**

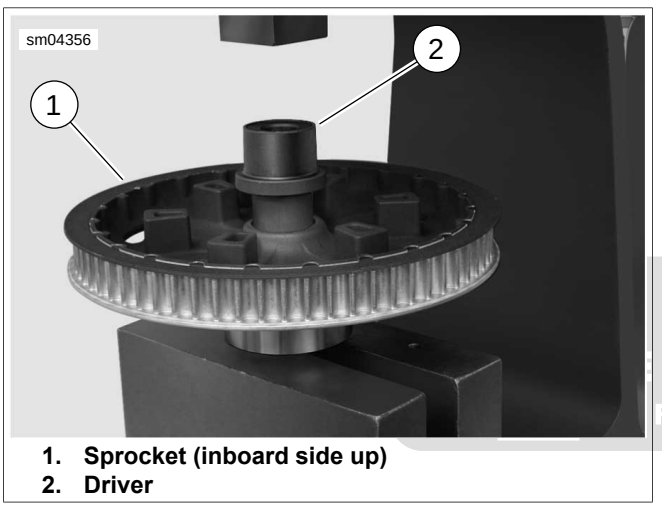
Figure C-2. Rear Wheel Compensator Sprocket Bearing Remover/Installer (Part No. HD-48921)

3. 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.
4. Position base (1) on press blocks with the large OD topside.
5. Slide sleeve (2) over base pin.
6. See Figure C-4. With the inboard side facing up, slide sprocket (1) over sleeve until it rests on base.
7. Slide small OD of driver (2) over sleeve until contact is made with inner race of bearing.
8. 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

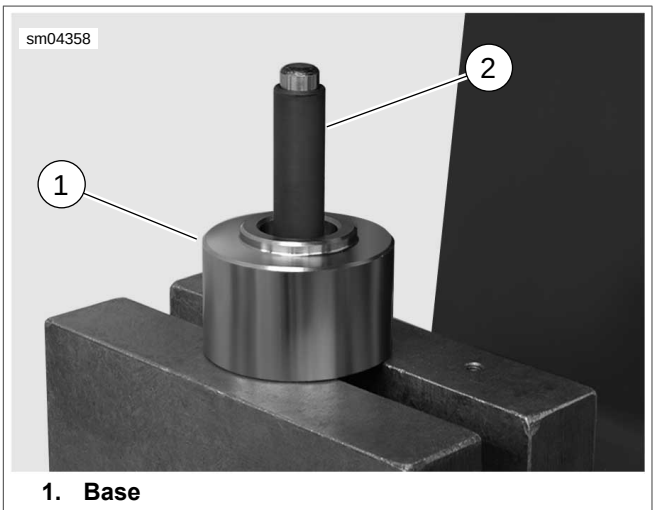


1. **Sprocket (inboard side up)**
2. **Driver**

Figure C-4. Remove Compensator Sprocket Bearing

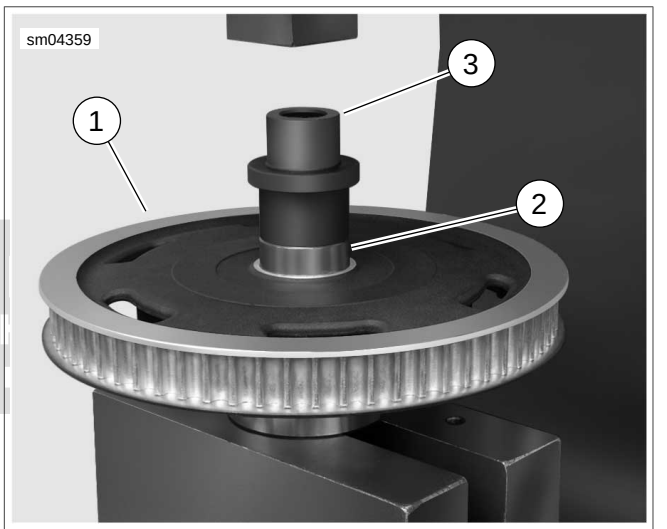
Installation

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 and 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, 1st 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 are equipped with a LOCTITE 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 as follows:
   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 facilitate 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

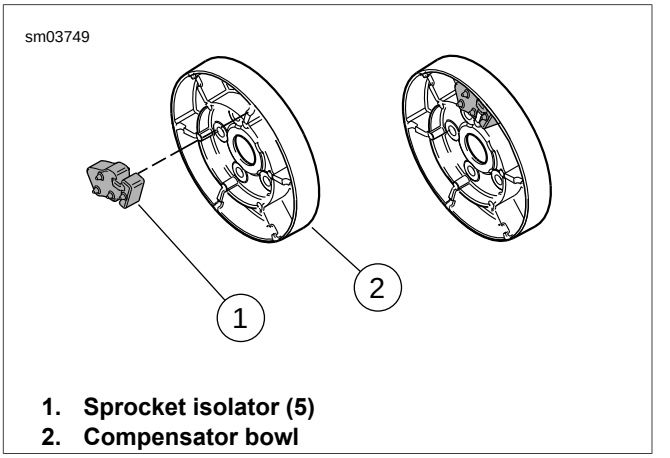
Inner spacer can be identified by a radial groove machined into its surface. Inner spacer is also thicker than outer spacer. Make sure to install the correct spacer between compensator bowl and sprocket.

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 will be 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

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METRIC CONVERSION D.1

CONVERSION TABLE

Table D-1. Metric Conversions

MILLIMETERS to INCHES (MM x 0.03937 = IN)								INCHES to MILLIMETERS (IN x 25.40 = MM)							
mm	in	mm	in	mm	in	mm	in	in	mm	in	mm	in	mm	in	mm
.1	.0039	25	.9842	58	2.283	91	3.582	.001	.025	.6	15.240	1-15/16	49.21	3-5/16	84.14
.2	.0078	26	1.024	59	2.323	92	3.622	.002	.051	5/8	15.875	2	50.80	3-3/8	85.72
.3	.0118	27	1.063	60	2.362	93	3.661	.003	.076	11/16	17.462	2-1/16	52.39	3.4	86.36
.4	.0157	28	1.102	61	2.401	94	3.701	.004	.102	.7	17.780	2.1	53.34	3-7/16	87.31
.5	.0197	29	1.142	62	2.441	95	3.740	.005	.127	3/4	19.050	2-1/8	53.97	3-1/2	88.90
.6	.0236	30	1.181	63	2.480	96	3.779	.006	.152	.8	20.320	2-3/16	55.56	3-9/16	90.49
.7	.0275	31	1.220	64	2.519	97	3.819	.007	.178	13/16	20.638	2.2	55.88	3.6	91.44
.8	.0315	32	1.260	65	2.559	98	3.858	.008	.203	7/8	22.225	2-1/4	57.15	3-5/8	92.07
.9	.0354	33	1.299	66	2.598	99	3.897	.009	.229	.9	22.860	2.3	58.42	3-11/16	93.66
1	.0394	34	1.338	67	2.638	100	3.937	.010	.254	15/16	23.812	2-5/16	58.74	3.7	93.98
2	.0787	35	1.378	68	2.677	101	3.976	1/64	.397	1	25.40	2-3/8	60.32	3-3/4	95.25
3	.1181	36	1.417	69	2.716	102	4.016	.020	.508	1-1/16	26.99	2.4	60.96	3.8	96.52
4	.1575	37	1.456	70	2.756	103	4.055	.030	.762	1.1	27.94	2-7/16	61.91	3-13/16	96.84
5	.1968	38	1.496	71	2.795	104	4.094	1/32	.794	1-1/8	28.57	2-1/2	63.50	3-7/8	98.42
6	.2362	39	1.535	72	2.834	105	4.134	.040	1.016	1-3/16	30.16	2-9/16	65.09	3.9	99.06
7	.2756	40	1.575	73	2.874	106	4.173	.050	1.270	1.2	30.48	2.6	66.04	3-15/16	100.01
8	.3149	41	1.614	74	2.913	107	4.212	.060	1.524	1-1/4	31.75	2-5/8	66.67	4	101.6
9	.3543	42	1.653	75	2.953	108	4.252	1/16	1.588	1.3	33.02	2-11/16	68.26	4-1/16	102.19
10	.3937	43	1.693	76	2.992	109	4.291	.070	1.778	1-5/16	33.34	2.7	68.58	4.1	104.14
11	.4331	44	1.732	77	3.031	110	4.331	.080	2.032	1-3/8	34.92	2-3/4	69.85	4-1/8	104.77
12	.4724	45	1.772	78	3.071	111	4.370	.090	2.286	1.4	35.56	2.8	71.12	4-3/16	106.36
13	.5118	46	1.811	79	3.110	112	4.409	.1	2.540	1-7/16	36.51	2-13/16	71.44	4.2	106.68
14	.5512	47	1.850	80	3.149	113	4.449	1/8	3.175	1-1/2	38.10	2-7/8	73.02	4-1/4	107.95
15	.5905	48	1.890	81	3.189	114	4.488	3/16	4.762	1-9/16	39.69	2.9	73.66	4.3	109.22
16	.6299	49	1.929	82	3.228	115	4.527	.2	5.080	1.6	40.64	2-15/16	74.61	4-5/16	109.54
17	.6693	50	1.968	83	3.268	116	4.567	1/4	6.350	1-5/8	41.27	3	76.20	4-3/8	111.12
18	.7086	51	2.008	84	3.307	117	4.606	.3	7.620	1-11/16	42.86	3-1/16	77.79	4.4	111.76
19	.7480	52	2.047	85	3.346	118	4.645	5/16	7.938	1.7	43.18	3.1	78.74	4-7/16	112.71
20	.7874	53	2.086	86	3.386	119	4.685	3/8	9.525	1-3/4	44.45	3-1/8	79.37	4-1/2	114.30
21	.8268	54	2.126	87	3.425	120	4.724	.4	10.160	1.8	45.72	3-3/16	80.96	4-9/16	115.89
22	.8661	55	2.165	88	3.464	121	4.764	7/16	11.112	1-13/16	46.04	3.2	81.28	4.6	116.84
23	.9055	56	2.205	89	3.504	122	4.803	1/2	12.700	1-7/8	47.62	3-1/4	82.55	4-5/8	117.47
24	.9449	57	2.244	90	3.543	123	4.842	9/16	14.288	1.9	48.26	3.3	83.82	4-11/16	119.06

FLUID CONVERSIONS D.2

UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this service manual are expressed in United States (U.S.) units-of-measure. See below:

- 1 pint (U.S.) = 16 fluid ounces (U.S.)
- 1 quart (U.S.) = 2 pints (U.S.) = 32 fl. oz. (U.S.)
- 1 gallon (U.S.) = 4 quarts (U.S.) = 128 fl. oz. (U.S.)

METRIC SYSTEM

Fluid volume measurements in this service manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). To convert between U.S. units-of-measure and metric units-of-measure, refer to the following:

- fluid ounces (U.S.) x 29.574 = milliliters
- pints (U.S.) x 0.473 = liters
- quarts (U.S.) x 0.946 = liters
- gallons (U.S.) x 3.785 = liters
- milliliters x 0.0338 = fluid ounces (U.S.)
- liters x 2.114 = pints (U.S.)
- liters x 1.057 = quarts (U.S.)
- liters x 0.264 = gallons (U.S.)

BRITISH IMPERIAL SYSTEM

Fluid volume measurements in this service manual do not include the British Imperial (Imp.) system equivalents. The following conversions exist in the British Imperial system:

- 1 pint (Imp.) = 20 fluid ounces (Imp.)
- 1 quart (Imp.) = 2 pints (Imp.)
- 1 gallon (Imp.) = 4 quarts (Imp.)

Although the same unit-of-measure terminology as the U.S. system is used in the British Imperial (Imp.) system, the actual volume of each British Imperial unit-of-measure differs from its U.S. counterpart. The U.S. fluid ounce is larger than the British Imperial fluid ounce. However, the U.S. pint, quart, and gallon are smaller than the British Imperial pint, quart, and gallon, respectively. To convert between U.S. units and British Imperial units, refer to the following:

- fluid ounces (U.S.) x 1.042 = fluid ounces (Imp.)
- pints (U.S.) x 0.833 = pints (Imp.)
- quarts (U.S.) x 0.833 = quarts (Imp.)
- gallons (U.S.) x 0.833 = gallons (Imp.)
- fluid ounces (Imp.) x 0.960 = fluid ounces (U.S.)
- pints (Imp.) x 1.201 = pints (U.S.)
- quarts (Imp.) x 1.201 = quarts (U.S.)
- gallons (Imp.) x 1.201 = gallons (U.S.)

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TORQUE CONVERSIONS D.3

UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this service manual. To convert units, use the following equations:

- foot pounds (ft-lbs) X 12.00000 = inch pounds (**in-lbs**).
- inch pounds (**in-lbs**) X 0.08333 = foot pounds (ft-lbs).

METRIC SYSTEM

All metric torque specifications are written in Newton-meters (Nm). To convert metric to United States units and United States to metric, use the following equations:

- Newton meters (Nm) X 0.737563 = foot pounds (ft-lbs).
- Newton meters (Nm) X 8.85085 = inch pounds (**in-lbs).**
- foot pounds (ft-lbs) X 1.35582 = Newton meters (Nm).
- inch pounds (**in-lbs**) X 0.112985 = Newton meters (Nm).

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GLOSSARY E.1

ACRONYMS AND ABBREVIATIONS

Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
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
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
EHCU	Electro Hydraulic Control Unit
ET	Engine temperature

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Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
EVAP	Evaporative emissions control system
°F	Fahrenheit
FPS	Fuel pressure sensor
ft	Feet
ft-lbs	Foot pounds
fl oz	Fluid ounce
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
H-DSSS	Harley-Davidson smart security system
HFSM	Hands-free security module
Hg	Mercury
H02S	Heated oxygen sensor
hp	Horsepower
hr	Hour
IAC	Idle air control
IAT	Intake air temperature
IC	Instrument cluster
ID	Inside diameter
IGN	Ignition light/key switch position
in	inch
in^3	Cubic inch
INJ PW	Injector pulse width
in-lbs	Inch pounds
JSS	Jiffy stand sensor
kg	Kilogram
km	Kilometer
km/h	Kilometers per hour
kPa	Kilopascal
kW	Kilowatt
L	Liter
lb	Pounds
LCD	Liquid crystal display
LED	Light emitting diode
LH	Left hand
LHCM	Left hand control module
LP	License plate
LT	Left

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Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
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
psi	Pounds per square inch
PWM signal	Pulse width modulated signal
qt	Quart
RCM	Reverse control module
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
SPKR	Speaker
STT	Stop/tail/turn
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
V	Volt
VAC	Volts of alternating current

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Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
VDC	Volts of direct current
VIN	Vehicle identification number
VR	Voice recognition
VSS	Vehicle speed sensor
W	Watt
WSS	Wheel speed sensor

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
94448-82B	SHOCK ADJUSTMENT SPANNER	1.25 SUSPENSION ADJUSTMENTS, Shock Absorber Preload: All Models
98716-87A	STORAGE COVER	1.27 STORAGE, Placing in Storage
99863-01A	GLOBAL BATTERY CHARGER	1.22 BATTERY MAINTENANCE, Storage
A-157C	SNAP-ON BUSHING DRIVER SET	5.12 TRANSMISSION RIGHT CASE BEARINGS, Installation
B-0085	TERMINAL EXTRACTOR	A.22 TYCO MCP SEALED CONNECTOR, Tyco MCP Sealed Connector
B-35758-52A	CUTTER PILOT	3.14 CYLINDER HEAD, Refacing Valve Seats
B-42571	FORK SEAL DRIVER AND DUST BOOT INSTALLER	2.20 FRONT FORK: XR 1200X, Assembly
B-43895-1	REMOVER	5.9 TRANSMISSION REMOVAL AND DISASSEMBLY, Transmission Removal From Left Crankcase
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL	5.9 TRANSMISSION REMOVAL AND DISASSEMBLY, Transmission Removal From Left Crankcase
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL	5.14 TRANSMISSION INSTALLATION, Installation
B-43985-3	INSTALLER	5.14 TRANSMISSION INSTALLATION, Installation
B-43985-4	GUIDE	5.14 TRANSMISSION INSTALLATION, Installation
B-45520	GEAR DETENT ASSEMBLY AID	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
B-45520	GEAR DETENT ASSEMBLY AID	5.14 TRANSMISSION INSTALLATION, Assembling Crankcases
B-45523	VALVE GUIDE REAMER	3.14 CYLINDER HEAD, Replacing Valve Guides
B-45524	VALVE GUIDE REMOVER/INSTALLER	3.14 CYLINDER HEAD, Replacing Valve Guides
B-45525	VALVE GUIDE HONE	3.14 CYLINDER HEAD, Cleaning and Inspection
B-45525	VALVE GUIDE HONE	3.14 CYLINDER HEAD, Replacing Valve Guides
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
B-45655, HD-42720-2, HD-46663	CRANKCASE BEARING REMOVER/INSTALLER WITH ADAPTER	3.19 CRANKCASE, Disassembly
B-45676-A	SPROCKET SHAFT SEAL/SPACER INSTALLER	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
B-45847	CROSS PLATE	5.11 MAIN DRIVE GEAR AND BEARING, Removal
B-45847	CROSS PLATE	5.11 MAIN DRIVE GEAR AND BEARING, Installation
B-45926	CLUTCH SHELL BEARING REMOVER/INSTALLER	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Clutch Shell Bearing Replacement
B-50085	TERMINAL EXTRACTOR	A.17 JAE MX19 SEALED CONNECTOR, JAE MX19 Sealed Connectors
B-50085	TERMINAL EXTRACTOR	A.21 TYCO GET 64 SEALED CONNECTOR, Tyco GET 64 Sealed Connector
B-59000B	OIL LEVEL GAUGE	2.20 FRONT FORK: XR 1200X, Assembly
CJ 114	SNAP-ON BODY DENT PULLER	3.19 CRANKCASE, Disassembly
GA500A	SNAP-ON TERMINAL PICK	A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTOR, Autofuse Unsealed Connector Repair
GA500A	SNAP-ON TERMINAL PICK	A.22 TYCO MCP SEALED CONNECTOR, Tyco MCP Sealed Connector
HD-25070	HEAT GUN	4.8 INDUCTION MODULE: XL MODELS, Disassembly
HD-25070	ROBINAIR HEAT GUN	6.33 HANDLEBAR SWITCH ASSEMBLIES, Repair Procedures

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-25070	HEAT GUN	A.23 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-33223-1	CYLINDER COMPRESSION GAUGE	3.5 TROUBLESHOOTING, Compression Test
HD-33416	UNIVERSAL DRIVER HANDLE	2.21 FORK STEM AND BRACKET ASSEMBLY, Cleaning, Inspection and Repair
HD-33446-86	TORQUE PLATE BOLTS	3.15 CYLINDER AND PISTON, Cleaning, Inspection and Repair
HD-33446-B	CYLINDER TORQUE PLATES	3.15 CYLINDER AND PISTON, Cleaning, Inspection and Repair
HD-34623-C	PISTON PIN LOCK RING REMOVER/INSTALLER	3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston
HD-34623-C	PISTON PIN LOCK RING REMOVER/INSTALLER	3.16 TOP END OVERHAUL: ASSEMBLY, Piston and Cylinder
HD-34736-B	VALVE SPRING COMPRESSOR	3.14 CYLINDER HEAD, Disassembly
HD-34736-B	VALVE SPRING COMPRESSOR	3.14 CYLINDER HEAD, Assembly
HD-34751	VALVE GUIDE CLEANING BRUSH	3.14 CYLINDER HEAD, Cleaning and Inspection
HD-34751	VALVE GUIDE CLEANING BRUSH	3.14 CYLINDER HEAD, Replacing Valve Guides
HD-34751	VALVE GUIDE CLEANING BRUSH	3.14 CYLINDER HEAD, Refacing Valve Seats
HD-34902-7	END CAP	3.19 CRANKCASE, Fitting Pinion Bearings
HD-34902-7	END CAP	3.19 CRANKCASE, Fitting Pinion Bearings
HD-35102	WRIST PIN BUSHING HONE	3.15 CYLINDER AND PISTON, Connecting Rod Bushings
HD-35316-11	RECEIVER CUP	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-12	INSTALLER CUP	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-13	BEARING DRIVER	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-13	BEARING DRIVER	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-4A	8 INCH BOLT	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-4A	8 INCH BOLT	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-4A	8 INCH BOLT	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-4A	8 INCH BOLT	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-7	WASHER	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-7	WASHER	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-8	BEARING DRIVER	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-9	BEARING DRIVER	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-C	MAIN DRIVE GEAR REMOVER AND INSTALLER SET	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET	5.11 MAIN DRIVE GEAR AND BEARING, Removal
HD-35381A	BELT TENSION GAUGE	1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection
HD-35457	BLACK LIGHT LEAK DETECTOR	1.28 TROUBLESHOOTING, Lubrication System
HD-35667-A	CYLINDER LEAKDOWN TESTER	3.5 TROUBLESHOOTING, Cylinder Leakage Test
HD-35758-C	NEWAY VALVE SEAT CUTTER SET	3.14 CYLINDER HEAD, Refacing Valve Seats
HD-36583	FORK SEAL AND BUSHING INSTALLATION TOOL	2.19 FRONT FORK: XL MODELS, Assembly

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-38125-6	PACKARD TERMINAL CRIMP TOOL	A.9 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.9 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 CRIMPING TOOL	A.9 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.23 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Removal
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Installation
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Removal
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation
HD-38515-91	CLUTCH SPRING FORCING SCREW	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Disassembly
HD-38515-91	CLUTCH SPRING FORCING SCREW	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Assembly
HD-38515-91	CLUTCH SPRING FORCING SCREW	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Disassembly
HD-38515-A	SPRING COMPRESSING TOOL	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Disassembly
HD-38515-A	SPRING COMPRESSING TOOL	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Assembly
HD-38515-A	SPRING COMPRESSING TOOL	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Disassembly
HD-38515-A	SPRING COMPRESSING TOOL	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Assembly
HD-38871	CRANKSHAFT BUSHING PLATE PILOT	3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only
HD-39301-A	STEERING HEAD BEARING RACE REMOVAL TOOL	2.21 FORK STEM AND BRACKET ASSEMBLY, Cleaning, Inspection and Repair
HD-39302	STEERING HEAD BEARING RACE INSTALLATION TOOL	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
HD-39782-A	CYLINDER HEAD SUPPORT STAND	3.14 CYLINDER HEAD, Replacing Valve Guides
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.14 CYLINDER HEAD, Replacing Valve Guides
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.14 CYLINDER HEAD, Refacing Valve Seats
HD-39847	REAMER T-HANDLE	3.14 CYLINDER HEAD, Replacing Valve Guides
HD-39964	REAMER LUBRICANT	3.14 CYLINDER HEAD, Replacing Valve Guides
HD-39964	REAMER LUBRICANT	3.15 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 UT-100	6.11 IGNITION SWITCH, Installation

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-39969	ULTRA TORCH UT-100	6.33 HANDLEBAR SWITCH ASSEMBLIES, Repair Procedures
HD-39969	ULTRA TORCH	A.23 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-41142	FUEL PRESSURE GAUGE	4.18 FUEL PRESSURE TEST, Testing
HD-41177	FORK HOLDING TOOL	2.20 FRONT FORK: XR 1200X, Disassembly
HD-41177	FORK HOLDING TOOL	2.20 FRONT FORK: XR 1200X, Assembly
HD-41183	HEAT SHIELD ATTACHMENT	6.33 HANDLEBAR SWITCH ASSEMBLIES, Repair Procedures
HD-41183	HEAT SHIELD ATTACHMENT	A.23 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-41417	PROPANE ENRICHMENT KIT	4.19 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.20 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.20 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-41675	OIL PRESSURE SENDING UNIT WRENCH	6.31 OIL PRESSURE SWITCH, Removal
HD-42310-45	ENGINE SUPPORT CRADLE	5.8 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL, Engine Removal and Disassembly
HD-42310-45	ENGINE CRADLE	5.15 TRANSMISSION SPROCKET, Removal
HD-42311	HARLEY-DAVIDSON OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Filter
HD-42320-A	PISTON PIN REMOVER	3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston
HD-42322	PISTON SUPPORT PLATE	3.13 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston
HD-42322	PISTON SUPPORT PLATE	3.16 TOP END OVERHAUL: ASSEMBLY, Piston and Cylinder
HD-42326-A	CRANKSHAFT GUIDE TOOL	5.14 TRANSMISSION INSTALLATION, Assembling Crankcases
HD-42326-B	CRANKSHAFT GUIDE TOOL	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
HD-42579-6	SPROCKET SHAFT ADAPTER	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
HD-42579-A	SPROCKET SHAFT BEARING/SEAL INSTALLATION TOOL	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
HD-42720-2	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.22 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	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models
HD-44060-C	WHEEL BEARING INSTALLER/REMOVER	2.5 WHEELS, Sealed Wheel Bearings

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-44061	FUEL PRESSURE GAUGE ADAPTER	4.18 FUEL PRESSURE TEST, Testing
HD-44067-A	HARLEY-DAVIDSON OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Filter
HD-45928	TERMINAL REMOVER	A.10 DELPHI MICRO 64 SEALED CONNECTOR, Delphi Micro 64 Sealed Connector Repair
HD-45929	CRIMPING TOOL	6.4 SPEEDOMETER: XL MODELS, Installation
HD-45929	TERMINAL CRIMPER	A.10 DELPHI MICRO 64 SEALED CONNECTOR, Delphi Micro 64 Sealed Connector Repair
HD-45967	SHOP DOLLY	2.27 REAR ENGINE MOUNT/ISOLATOR, Removal
HD-45967	SHOP DOLLY	3.10 REMOVING ENGINE FROM CHASSIS, Procedure: XL Models
HD-45967	SHOP DOLLY	3.10 REMOVING ENGINE FROM CHASSIS, Procedure: XR 1200X
HD-45967	SHOP DOLLY	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
HD-45967	SHOP DOLLY	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
HD-45968	FAT JACK	2.26 FRONT ENGINE MOUNT/ISOLATOR, Removal
HD-45968	FAT JACK	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
HD-45968	FAT JACK	3.10 REMOVING ENGINE FROM CHASSIS, Procedure: XL Models
HD-45968	FAT JACK	3.10 REMOVING ENGINE FROM CHASSIS, Procedure: XR 1200X
HD-45968	FAT JACK	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
HD-45968	FAT JACK	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
HD-45968	FAT JACK	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Removal: Domestic Only
HD-46281	BEARING REMOVER/INSTALLER TOOL	2.23 REAR FORK, Disassembly
HD-46282	TRANSMISSION SPROCKET HOLDING TOOL	5.15 TRANSMISSION SPROCKET, Installation
HD-46282-1A	FINAL DRIVE SPROCKET HOLDING TOOL REACTION ADAPTER	5.15 TRANSMISSION SPROCKET, Removal
HD-46282-1A	SPROCKET HOLDING TOOL ADAPTER	5.15 TRANSMISSION SPROCKET, Installation
HD-46282-1A	SPROCKET HOLDING TOOL ADAPTER	5.15 TRANSMISSION SPROCKET, Installation
HD-46282-A	FINAL DRIVE SPROCKET HOLDING TOOL	5.15 TRANSMISSION SPROCKET, Removal
HD-46283	PRIMARY DRIVE LOCKING TOOL	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Removal
HD-46283	PRIMARY DRIVE LOCKING TOOL	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Installation
HD-46283	PRIMARY DRIVE LOCKING TOOL	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation
HD-46284	ENGINE HOOK	3.10 REMOVING ENGINE FROM CHASSIS, Procedure: XL Models
HD-46284	ENGINE HOOK	3.10 REMOVING ENGINE FROM CHASSIS, Procedure: XR 1200X

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-46284	ENGINE HOOK	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
HD-46285-2	CASE HOLDING FIXTURE	5.14 TRANSMISSION INSTALLATION, Installation
HD-46287	LAPPING TOOL ADAPTER	3.19 CRANKCASE, Lapping Engine Main Bearing Races
HD-46288	MAINSHAFT LOCKNUT WRENCH	5.15 TRANSMISSION SPROCKET, Removal
HD-46288	MAINSHAFT LOCKNUT WRENCH	5.15 TRANSMISSION SPROCKET, Installation
HD-46503	OIL LINE REMOVER, 1/2 INCH	3.12 PRECISION COOLING SYSTEM: XR 1200X, General
HD-46503	OIL LINE REMOVER, 1/2 INCH	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines
HD-47855	INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XL MODELS	5.11 MAIN DRIVE GEAR AND BEARING, Assembly
HD-47856	MAIN DRIVE GEAR SEAL INSTALLER KIT	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-1	INSTALLER	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-2	PILOT	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-4	ADAPTER	5.11 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-5	LARGE NUT	5.11 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	4.7 ENGINE TEMPERATURE (ET) SENSOR, Removal
HD-48119	TERMINAL CRIMPER	A.19 MOLEX MX 150 SEALED CONNECTOR, Crimp Terminal to Lead
HD-48262	OXYGEN SENSOR SOCKET	4.12 OXYGEN (O2) SENSOR, Removal
HD-48262	OXYGEN SENSOR SOCKET	4.12 OXYGEN (O2) SENSOR, Installation
HD-48287	TRIPLE TREE WEDGE TOOL	2.20 FRONT FORK: XR 1200X, Removal
HD-48287	TRIPLE TREE WEDGE TOOL	2.20 FRONT FORK: XR 1200X, Installation
HD-48643	INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XR 1200X	5.11 MAIN DRIVE GEAR AND BEARING, Assembly
HD-48647	OXYGEN SENSOR SOCKET	4.12 OXYGEN (O2) SENSOR, Removal
HD-48647	OXYGEN SENSOR SOCKET	4.12 OXYGEN (O2) SENSOR, Installation
HD-48650	DIGITAL TECHNICIAN II	4.18 FUEL PRESSURE TEST, General
HD-48650	DIGITAL TECHNICIAN II	6.37 H-DSSS ACTUATION, Fob Assignment
HD-48856-A	AXLE ALIGNMENT PLUGS	1.24 WHEEL ALIGNMENT, Wheel Alignment
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER	C.1 COMPENSATING SPROCKET, Sprocket Bearing
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-49096	OIL LINE REMOVER, 3/8 INCH	3.12 PRECISION COOLING SYSTEM: XR 1200X, General
HD-50083	ROD CASE GUIDE SOCKET	2.20 FRONT FORK: XR 1200X, Disassembly
HD-50083	ROD CASE GUIDE SOCKET	2.20 FRONT FORK: XR 1200X, Assembly
HD-50084	FORK CAP WRENCH	2.20 FRONT FORK: XR 1200X, Disassembly

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-50084	FORK CAP WRENCH	2.20 FRONT FORK: XR 1200X, Assembly
HD-50120	UNIVERSAL CRIMPER SET	A.3 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.21 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.22 TYCO MCP SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.3 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.21 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	DELPHI 100W MICRO-PACK SEALED DIE	A.3 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals
HD-50120-7	TYCO GET 64 DIE	A.21 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120-8	TYCO MCP DIE	A.22 TYCO MCP SEALED CONNECTOR, Crimping Terminals
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	2.19 FRONT FORK: XL MODELS, 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
HD-94800-26A	CONNECTING ROD BUSHING REAMER	3.15 CYLINDER AND PISTON, Connecting Rod Bushings
HD-94803-67	REAR INTAKE CAM GEAR BUSHING REAMER	3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only
HD-94804-57	ROCKER ARM BUSHING REAMER	3.14 CYLINDER HEAD, Replacing Rocker Arm Bushings

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PART NUMBER	TOOL NAME	NOTES
HD-94812-1	REAMER	3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only
HD-94812-87	PILOT	3.18 GEARCASE: XL MODELS, Bushing Reaming: XL Only
HD-95637-46B	BEARING RACE PULLER	5.11 MAIN DRIVE GEAR AND BEARING, Disassembly
HD-95760-69A	BUSHING AND BEARING PULLER	3.18 GEARCASE: XL MODELS, Bushing Inspection and Removal: XL Only
HD-95760-69A	BUSHING AND BEARING PULLER	5.12 TRANSMISSION RIGHT CASE BEARINGS, Removal
HD-95765-69A	1/2 INCH COLLET	5.12 TRANSMISSION RIGHT CASE BEARINGS, Removal
HD-95952-33C	CONNECTING ROD CLAMPING TOOL	3.15 CYLINDER AND PISTON, Connecting Rod Bushings
HD-95970-32D	CONNECTING ROD BUSHING REMOVER/INSTALLER	3.15 CYLINDER AND PISTON, Connecting Rod Bushings
HD-96333-51E	PISTON RING COMPRESSOR	3.16 TOP END OVERHAUL: ASSEMBLY, Piston and Cylinder
HD-96710-40C	CRANKCASE MAIN BEARING LAPPING TOOL	3.19 CRANKCASE, Lapping Engine Main Bearing Races
HD-96718-87	CRANKCASE MAIN BEARING LAP	3.19 CRANKCASE, Lapping Engine Main Bearing Races
HD-96796-47	VALVE SPRING TESTER	3.14 CYLINDER HEAD, Cleaning and Inspection
HD-96921-125	OIL PRESSURE GAUGE ADAPTER	3.3 OIL PRESSURE, Checking Oil Pressure
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 STAND	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-99500-80	WHEEL TRUING STAND	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
J-21686-12	FORCING SCREW	3.19 CRANKCASE, Fitting Pinion Bearings
J-21686-12	FORCING SCREW	3.19 CRANKCASE, Fitting Pinion Bearings
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS	3.19 CRANKCASE, Disassembly
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS	5.9 TRANSMISSION REMOVAL AND DISASSEMBLY, Mainshaft Disassembly
J-7830-5	BRIDGE	3.19 CRANKCASE, Fitting Pinion Bearings
J-7830-5	BRIDGE	3.19 CRANKCASE, Fitting Pinion Bearings
PFSX916	SNAP-ON WRENCH	4.13 EXHAUST SYSTEM: XL MODELS, General
PR-36	SNAP-ON SNAP RING PLIERS	5.13 TRANSMISSION LEFT CASE BEARINGS, Removal
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	2.17 BLEEDING BRAKES, Procedure
SNAP-ON TOOLS STOCK NO. CJ950	BEARING SEPARATOR	3.19 CRANKCASE, Fitting Pinion Bearings
SNAP-ON TOOLS STOCK NO. CJ950	BEARING SEPARATOR	3.19 CRANKCASE, Fitting Pinion Bearings

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
SNAP-ON TT600-3	SNAP-ON PICK	A.7 DELPHI 630 METRI-PACK UNSEALED CONNECTOR, Delphi 630 Metri-Pack Unsealed Connector Repair
SNAP-ON TT600-3	SNAP-ON PICK	A.20 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

NOTES

FASTENER	TORQUE VALUE		NOTES
Air box to bracket fasteners: XR 1200X	36-60 **in-lbs**	4.1-6.7 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm	4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm	4.3 AIR CLEANER ASSEMBLY, XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.5 MAINTENANCE SCHEDULE, General
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR FILTER, XL Models except XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR FILTER, XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.5 MAINTENANCE SCHEDULE, General
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.7 AIR FILTER, XL Models except XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.7 AIR FILTER, XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL Models except XL 1200V
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, XL 1200V
Alternator rotor to sprocket screw	120-140 **in-lbs**	13.6-15.8 Nm	6.24 ALTERNATOR, Assembly and Installation
Alternator stator mounting screw	30-40 **in-lbs**	3.4-4.5 Nm	6.24 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, front, nut	60-65 ft-lbs	81-88 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Axle, front, nut	60-65 ft-lbs	81-88 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Axle, front, pinch screw: XL Models	21-27 ft-lbs	28.5-36.6 Nm	2.5 WHEELS, Front Wheel
Axle, front, pinch screw: XL Models	21-27 ft-lbs	28.5-36.6 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Axle, front, pinch screw: XR 1200X	41-48 ft-lbs	55.6-65.1 Nm	2.5 WHEELS, Front Wheel
Axle, front, pinch screw: XR 1200X	41-48 ft-lbs	55.6-65.1 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.24 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: XL Models
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	5.6 DRIVE BELT, Drive Belt: XL Models
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	5.6 DRIVE BELT, Drive Belt: XR 1200X
Battery cable connector nut	55-75 **in-lbs**	6.2-8.5 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery negative cable to crankcase nut	55-75 **in-lbs**	6.2-8.5 Nm	6.8 BATTERY CABLES, Installation
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery negative terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.8 BATTERY CABLES, Installation

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FASTENER	TORQUE VALUE		NOTES
Battery positive cable to starter post locknut	60-85 **in-lbs**	6.8-9.6 Nm	6.8 BATTERY CABLES, Installation
Battery positive terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery positive terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.8 BATTERY CABLES, Installation
Battery strap screw	36-60 **in-lbs**	4.1-6.8 Nm	1.22 BATTERY MAINTENANCE, Battery Installation and Connection
Battery strap screw	36-60 **in-lbs**	4.1-6.8 Nm	6.8 BATTERY CABLES, Installation
Battery tray mounting fasteners	96-156 **in-lbs**	10.9-17.6 Nm	6.9 BATTERY TRAY, Installation
Belt guard screw: XL Models	120-180 **in-lbs**	13.6-20.4 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XL Models
Belt guard screw: XR 1200X	72-96 **in-lbs**	8.1-10.8 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XR 1200X
Brake caliper, front, bridge bolt	12-18 ft-lbs	16.9-24.5 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Assembly
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Assembly
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Assembly
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Brake caliper bleeder valve	35-61 **in-lbs**	4.0-6.9 Nm	2.17 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
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 battery tray screw	30-40 **in-lbs**	3.4-4.5 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake hose clamp to battery tray screw	30-40 **in-lbs**	3.4-4.5 Nm	6.9 BATTERY TRAY, Installation
Brake hose clamp to frame, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm	1.12 DRIVE BELT AND SPROCKETS, Drive Belt Deflection
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake line/switch, rear, tee bracket screw: XL Models	72-120 **in-lbs**	8.14-13.6 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake line/switch, rear, tee bracket screw: XR 1200X	17-22 **in-lbs**	1.9-2.5 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation

FASTENER	TORQUE VALUE		NOTES
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.12 REAR BRAKE MASTER CYLINDER: XR 1200X, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Brake line banjo bolt	20-25 ft-lbs	27.1-33.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line clamp screw, steering stem, XL Models	120-168 **in-lbs**	13.6-19.0 Nm	2.16 BRAKE LINES, Front Brake Line
Brake line clamp screw, steering stem, XR 1200X	96-144 **in-lbs**	11-16 Nm	2.16 BRAKE LINES, Front Brake Line
Brake master cylinder, front, reservoir cover screw	9-17 **in-lbs**	1.0-2.0 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installation
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Front
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Installation
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.17 BLEEDING BRAKES, Procedure
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.5 MAINTENANCE SCHEDULE, General
Brake master cylinder, rear, mounting screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake master cylinder, rear, mounting screw: XR 1200X	72-96 **in-lbs**	8.1-10.9 Nm	2.12 REAR BRAKE MASTER CYLINDER: XR 1200X, Installation
Brake master cylinder, rear, pushrod nut: XR 1200X	130-173 **in-lbs**	14.7-19.6 Nm	2.12 REAR BRAKE MASTER CYLINDER: XR 1200X, Assembly
Brake master cylinder, rear, pushrod shoulder nut	130-173 **in-lbs**	14.7-19.6 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Assembly
Brake master cylinder clamp, front, screw	108-132 **in-lbs**	12.2-14.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Brake master cylinder mounting bracket, rear, screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation
Brake master cylinder mounting bracket, rear, screw: XL Models	17-22 ft-lbs	23.1-29.9 Nm	2.11 REAR BRAKE MASTER CYLINDER: XL MODELS, Installation

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FASTENER	TORQUE VALUE		NOTES
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	2.13 REAR BRAKE MASTER CYLINDER RESERVOIR, Installation: XL Models
Brake master cylinder reservoir, rear, mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	2.13 REAR BRAKE MASTER CYLINDER RESERVOIR, Installation: XR 1200X
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	2.23 REAR FORK, Installation
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Brake master cylinder reservoir, rear, mounting screw	20-25 **in-lbs**	2.3-2.8 Nm	6.21 REAR STOP LAMP SWITCH, Replacement
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Rear
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Front
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installing Brake Pads in Caliper
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	2.10 FRONT BRAKE CALIPER: XR 1200X, Assembly
Brake pad pin	131-173 **in-lbs**	14.8-19.6 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Front
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	1.16 BRAKE PADS AND DISCS: XL MODELS, Brake Pad Replacement: Rear
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	1.17 BRAKE PADS AND DISCS: XR 1200X, Brake Pad Replacement: Rear
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	2.9 FRONT BRAKE CALIPER: XL MODELS, Installing Brake Pads in Caliper
Brake pad pin plug	18-25 **in-lbs**	2.0-2.9 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to bell crank screw	120-180 **in-lbs**	13.6-20.4 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation

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FASTENER	TORQUE VALUE		NOTES
Brake rod to brake pedal screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Brake rod to brake pedal screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Breather screw: XL Models	35-55 **in-lbs**	4.0-6.2 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Caliper bolt pin: XL Models	15-18 ft-lbs	19.6-24.5 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Caliper to mouting bracket: XL Models	87-130 **in-lbs**	9.8-14.7 Nm	2.14 REAR BRAKE CALIPER: XL MODELS, Installation
Chain tensioner nut	20-25 ft-lbs	27.1-33.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Check valve housing fastener: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
Check valve housing fastener: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Check valve plug fitting: XR 1200X	15-21 ft-lbs	20.3-28.5 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
CKP screw	90-120 **in-lbs**	10.3-13.6 Nm	6.22 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	2.29 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/C ANV/CP/CA/CB	45-65 **in-lbs**	4.0-7.3 Nm	6.14 HEADLAMP, Headlamp Mounts
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	1.5 MAINTENANCE SCHEDULE, General
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**	10.3-13.6 Nm	1.11 CLUTCH, Adjustment
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm	2.29 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	2.29 CLUTCH CONTROL, Assembly and Installation
Coil mounting bracket screw	35-45 **in-lbs**	4.0-5.1 Nm	6.13 IGNITION COIL, Installation
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm	6.13 IGNITION COIL, Installation
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm	6.13 IGNITION COIL, Installation
Converter module bracket fasteners, rear lighting	36-60 **in-lbs**	4.1-6.8 Nm	6.20 REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM), Installation
Countershaft retaining screw	33-37 ft-lbs	44.8-50.2 Nm	5.14 TRANSMISSION INSTALLATION, Shifter Shaft Installation

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FASTENER	TORQUE VALUE		NOTES
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	5.14 TRANSMISSION INSTALLATION, Assembling Crankcases
Cylinder headbolts, 1st torque	96-120 **in-lbs**	11-14 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder headbolts, 1st torque	96-120 **in-lbs**	11-14 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder headbolts, final torque	13-15 ft-lbs	18-20 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder headbolts, final torque	13-15 ft-lbs	18-20 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder head exhaust port nut	96-120 **in-lbs**	10.9-13.6 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Cylinder head exhaust port nut	96-120 **in-lbs**	10.9-13.6 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Cylinder head oil feed flare fitting: XR 1200X	22-26 ft-lbs	29.8-35.3 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Cylinder head oil feed flare fitting: XR 1200X	22-26 ft-lbs	29.8-35.3 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Cylinder head oil feed line flare nut: XR 1200X	13-17 ft-lbs	18-23 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Feed Assembly
Cylinder head oil feed line flare nut: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Debris deflector screw: XL Models	36-60 **in-lbs**	4.1-6.8 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XL Models
Debris deflector screw: XR 1200X	72-96 **in-lbs**	8.1-10.8 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector: XR 1200X
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.9 BATTERY TRAY, Installation
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.20 REAR LIGHTING CONVERTER MODULE: XL 883N, XL 1200X/V (DOM), Installation
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.27 MAIN WIRING HARNESS, Installation
ECM cover fastener: XL Models	30-60 **in-lbs**	3.4-6.8 Nm	6.6 ELECTRONIC CONTROL MODULE (ECM), Installation
ECM fasteners: XR 1200X	18-22 **in-lbs**	2.0-2.5 Nm	6.6 ELECTRONIC CONTROL MODULE (ECM), Installation
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Engine mount, front, bolt	95-105 ft-lbs	129 -142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Engine sprocket bolt: XR 1200X	155-165 ft-lbs	210.0-224.0 Nm	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation

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FASTENER	TORQUE VALUE		NOTES
Engine sprocket nut: XL Models	240-260 ft-lbs	326-353 Nm	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Installation
ET sensor	120-168 **in-lbs**	13.6-19.0 Nm	4.7 ENGINE TEMPERATURE (ET) SENSOR, Installation
EVAP canister clip mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
EVAP canister guard screw	35-45 **in-lbs**	4.0-5.1 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
EVAP canister mounting bracket screw	17-22 ft-lbs	23.1-29.9 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
EVAP canister mounting bracket screw	17-22 ft-lbs	23.1-29.9 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
Exhaust clamp, lower nut: XR 1200X	30-33 ft-lbs	40.7-44.7 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Exhaust flange nut: XR 1200X	96-120 **in-lbs**	10.8-13.6 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation/SPECIAL SEQUENCE TO TIGHTEN
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Exhaust pipe clamp bracket fastener: XL Models	30-33 ft-lbs	40.7-44.8 Nm	5.6 DRIVE BELT, Drive Belt: XL Models
Exhaust pipe clamp bracket fastener: XR 1200X	30-33 ft-lbs	40.7-44.8 Nm	5.15 TRANSMISSION SPROCKET, Installation
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Exhaust pipe clamp bracket screw: XL Models	30-33 ft-lbs	40.7-44.8 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Exhaust pipe clamp nut: XL Models	20-30 ft-lbs	27.1-40.7 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Fender, inner screw: XR 1200X	72-120 **in-lbs**	8.1-13.6 Nm	2.35 REAR FENDER: XR 1200X, Installation
Fender, rear, mounting fastener	132-216 **in-lbs**	14.9-24.4 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L
Fender, rear, mounting fastener	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 1200C/C ANV/CP/CA/CB
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm	2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fender bracket to forks, front: XR 1200X	15-19 ft-lbs	21-25 Nm	2.31 FRONT FENDER, All Models
Fender support, rear, screw	132-216 **in-lbs**	14.9-24.4 Nm	2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender support, rear, screw: XL 883N	132-216 **in-lbs**	14.9-24.4 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fender to bracket, front: XR 1200X	30-60 **in-lbs**	4.1-6.8 Nm	2.31 FRONT FENDER, All Models

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FASTENER	TORQUE VALUE		NOTES
Fender to fork brace, front: XL 1200X	30-42 **in-lbs**	3.4-4.7 Nm	2.31 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	2.31 FRONT FENDER, All Models
Filler housing screws	40-45 **in-lbs**	4.5-5.1 Nm	4.5 FUEL TANK: XR 1200X, Assemble Fuel Tank
Footrest bracket fastener: XR 1200X	45-50 ft-lbs	61-68 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Footrest clevis fastener: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Right Footrest and Rear Brake Pedal Assembly
Footrest clevis fastener: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.23 REAR FORK, Installation
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Footrest mount fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Footrest mount fastener	45-50 ft-lbs	61-68 Nm	5.15 TRANSMISSION SPROCKET, Installation
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.19 FRONT FORK: XL MODELS, Installation
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.19 FRONT FORK: XL MODELS, Installation

FASTENER	TORQUE VALUE		NOTES
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.20 FRONT FORK: XR 1200X, Installation
Fork, front, oil drain screw: XL 883N/R	13-17 **in-lbs**	1.5-2.0 Nm	2.19 FRONT FORK: XL MODELS, Changing Fork Oil: XL Models
Fork, front, stem bolt, 1st torque	23-27 ft-lbs	31.2-36.6 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, front, stem bolt, final torque	72-96 **in-lbs**	8.1-10.9 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, lower front, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	2.23 REAR FORK, Installation
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Fork, rear, pivot/engine mount bolt	60-70 ft-lbs	81.4-95.0 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Fork brace to forks: XL 1200X	18-22 ft-lbs	25-30 Nm	2.31 FRONT FENDER, All Models
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	1.19 STEERING HEAD BEARINGS, Fall-Away
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	6.18 FRONT TURN SIGNALS, XL 1200X
Fork cap to outer tube: XR 1200X	21-29 ft-lbs	29-39 Nm	2.20 FRONT FORK: XR 1200X, Assembly
Fork piston rod hex nut: XR 1200X	19-22 ft-lbs	26-30 Nm	2.20 FRONT FORK: XR 1200X, Assembly
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm	2.19 FRONT FORK: XL MODELS, Changing Fork Oil: XL Models
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm	2.19 FRONT FORK: XL MODELS, Installation
Fork slider tube fastener: XL Models	132-216 **in-lbs**	14.9-24.4 Nm	2.19 FRONT FORK: XL MODELS, Assembly
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	1.19 STEERING HEAD BEARINGS, Fall-Away
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.21 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fuel hose retaining bracket screw	60 **in-lbs**	6.8 Nm	4.15 FUEL INJECTORS, Installation
Fuel pump bracket mounting screw	19-36 **in-lbs**	2.1-4.1 Nm	4.16 FUEL PUMP, Assembly
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	1.5 MAINTENANCE SCHEDULE, General
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.16 FUEL PUMP, Installation
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.17 FUEL FILTER ELEMENT, Installation
Fuel tank cover screw: XR 1200X	24-30 **in-lbs**	2.7-3.4 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Fuel tank fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Fuel tank fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK: XR 1200X, Installing Fuel Tank
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm	4.4 FUEL TANK: XL MODELS, Installing Fuel Tank
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm	4.8 INDUCTION MODULE: XL MODELS, Installation
Fuel tank fasteners: XL Models	15-20 ft-lbs	20.3-27.1 Nm	4.15 FUEL INJECTORS, Installation
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X

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FASTENER	TORQUE VALUE		NOTES
Fuel tank mounting screw	15-20 ft-lbs	20.4-27.1 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.21 OIL PUMP: XR 1200X, Assembly
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Gearcase cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Gearcase housing plug	108-156 **in-lbs**	12.2-17.6 Nm	3.21 OIL PUMP: XR 1200X, Assembly
Gear detent assembly screw	90-110 **in-lbs**	10.2-12.4 Nm	5.14 TRANSMISSION INSTALLATION, Installation
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, 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	1.5 MAINTENANCE SCHEDULE, General
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.30 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200X/V, XL 1200CP/CB with Mini-Ape Handlebar/XL883N - Tighten rear first, front second.
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200X/V, XL 1200CP/CB with Mini-Ape Handlebar/Tighten rear first, front second: XL883N.
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XR 1200X
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.30 HANDLEBAR, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.34 RIGHT HANDLEBAR SWITCHES, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.35 LEFT HANDLEBAR SWITCHES, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.30 HANDLEBAR, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.30 HANDLEBAR, Installation
Handlebar riser clamp screw	12-18 ft-lbs	16.3 -24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 1200C/C ANV/CP/CA except with Mini-Ape Handlebar/XL1200C

FASTENER	TORQUE VALUE		NOTES
Handlebar riser clamp screw	12-18 ft-lbs	16.3 -24.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 1200C/C ANV/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm	2.30 HANDLEBAR, Installation
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm	6.15 INDICATOR LAMP MODULE, Replacement: XL 1200C/C ANV/CP/CA except with Mini-Ape Handlebar/XL1200C
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp clamp nut: XL 883L/N/R, XR 1200X	120-240 **in-lbs**	14-27 Nm	1.26 HEADLAMP ALIGNMENT, Headlamp: Adjustment
Headlamp clamp nut: XL 883L/N/R, XR 1200X	120-240 **in-lbs**	14-27 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp horizontal adjustment: XL 1200X/C/C ANV/CP/CA/CB/V	30-35 ft-lbs	40.7-47.5 Nm	1.26 HEADLAMP ALIGNMENT, Headlamp: Adjustment
Headlamp mount: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp mount: XL 1200X	30-35 ft-lbs	41-47 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp upper bracket fasteners: XL 883L/R/N, XR 1200X	120-192 **in-lbs**	14-22 Nm	6.14 HEADLAMP, Headlamp Mounts
Headlamp vertical adjustment: XL 1200X/C/C ANV/CP/CA/CB/V	30-35 ft-lbs	40.7-47.5 Nm	1.26 HEADLAMP ALIGNMENT, Headlamp: Adjustment
Headlamp visor: XL 1200C/C ANV/CP/CA/CB	120-192 **in-lbs**	14-22 Nm	6.14 HEADLAMP, Headlamp Mounts
Horn, side mounted, acorn nut	60-180 **in-lbs**	6.8-20.4 Nm	6.32 HORN, Replacement: Side Mount
Horn, side mounted, stud nut	80-100 **in-lbs**	9.0-11.3 Nm	6.32 HORN, Replacement: Side Mount
Horn mounting screw	36-48 **in-lbs**	4.1-5.4 Nm	6.32 HORN, Replacement: Front Mount
Hub plate mounting screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/XL 883N
IAC mounting screw: XL models	60 **in-lbs**	6.8 Nm	4.10 IDLE AIR CONTROL (IAC), Installation: XL Models
IAC mounting screw: XL Models	60 **in-lbs**	6.8 Nm	4.8 INDUCTION MODULE: XL MODELS, Assembly
IAC mounting screw: XR 1200X	60 **in-lbs**	6.8 Nm	4.9 INDUCTION MODULE: XR 1200X, Assembly
IAC mounting screw: XR 1200X	60 **in-lbs**	6.8 Nm	4.10 IDLE AIR CONTROL (IAC), Installation: XR 1200X
Idler pulley bracket flanged nut: XR 1200X	33-35 ft-lbs	44.7-47.5 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Idler pulley fastener: XR 1200X	70-80 ft-lbs	95-109 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Ignition switch bracket screw	35-45 **in-lbs**	4.0-5.1 Nm	6.28 ELECTRICAL CADDIES, Wire Harness Caddy: XL Models
Ignition switch mounting screw	34-45 **in-lbs**	4.0-5.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Ignition switch mounting screw	34-45 **in-lbs**	4.0-5.1 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm	6.11 IGNITION SWITCH, Installation
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm	6.28 ELECTRICAL CADDIES, Wire Harness Caddy: XR 1200X

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FASTENER	TORQUE VALUE		NOTES
Induction module cable bracket screw: XL Models	60 **in-lbs**	6.8 Nm	4.8 INDUCTION MODULE: XL MODELS, Assembly
Induction module cover to cylinder head fastener: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Induction module cover to cylinder head fastener: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X
Induction module cover to cylinder head sockethead bolts: XR 1200X	20-24 ft-lbs	27.1-32.5 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Induction module cover to induction module fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Induction module cover to induction module fastener: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Induction module cover to induction module fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X
Induction module cover to wire form fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Induction module cover to wire form fastener: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Induction module mounting bracket screw: XL models	90-120 **in-lbs**	10.2-13.6 Nm	4.8 INDUCTION MODULE: XL MODELS, Installation
Induction module screw: XL models	35 **in-lbs**	4.0 Nm	4.8 INDUCTION MODULE: XL MODELS, Assembly
Induction module screw: XL Models	35 **in-lbs**	4.0 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XL Models
Intake manifold mounting screw: XL models	96-120 **in-lbs**	10.9-13.6 Nm	4.8 INDUCTION MODULE: XL MODELS, Installation
Intake manifold mounting screw: XR 1200X	90-120 **in-lbs**	10.3-13.6 Nm	4.9 INDUCTION MODULE: XR 1200X, Installation
Interconnect bracket to frame fastener: XR 1200X	30-33 ft-lbs	40.7-44.7 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 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: XL Models
Isolator mount, front, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
JSS screw	96-120 **in-lbs**	10.9-13.6 Nm	6.29 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS, Installation

FASTENER	TORQUE VALUE		NOTES
License plate, rear, keps nut, XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 1200C/C ANV/CP/CA/CB
License plate bolt	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 883R/L
License plate bracket, rear, fasteners: XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 1200C/C ANV/CP/CA/CB
License plate fasteners, front: XL 1200X/C/C ANV (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.32 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate: XL Models (India)
License plate fasteners, front: XL 883L/N/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.32 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate: XL Models (India)
License plate lamp housing screw: XL 883N	14-16 **in-lbs**	1.2-1.3 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
License plate screw: XL 883L/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.37 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate: XL Models (India)
License plate screw: XL 883N, XL 1200X (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.37 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate: XL Models (India)
License plate support bracket screws	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, License Plate Bracket: XL 883R/L
Master cylinder mounting bracket, rear, screw: XL models	17-22 ft-lbs	23.0-29.8 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL, Charcoal Canister
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.8 FRONT BRAKE MASTER CYLINDER, Installation
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Muffler bracket to footrest bracket screw: XR 1200X	15-19 ft-lbs	20.4-25.8 Nm	2.43 PASSENGER FOOTRESTS, XR 1200X
Muffler interconnect bracket mounting screw: XL Models	30-33 ft-lbs	40.7-44.7 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Muffler interconnect bracket mounting screw: XR 1200X	30-33 ft-lbs	40.7-44.8 Nm	5.15 TRANSMISSION SPROCKET, Installation
Muffler mount to frame, front fastener: XR 1200X	45-50 ft-lbs	61.0-67.8 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler mount to frame, rear fastener: XR 1200X	15-20 ft-lbs	20.3-27.1 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler to front muffler mount fastener: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler to interconnect bracket screw: XL Models	15-19 ft-lbs	20.4-25.8 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Muffler to muffler bolt: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Muffler torca clamp nut	38-43 ft-lbs	51.6-58.4 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Muffler to rear muffler mount fastener: XR 1200X	120-180 **in-lbs**	13.6-20.3 Nm	4.14 EXHAUST SYSTEM: XR 1200X, Installation
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	5.14 TRANSMISSION INSTALLATION, Assembling Crankcases

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FASTENER	TORQUE VALUE		NOTES
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	6.26 NEUTRAL INDICATOR SWITCH, Replacement
O2 sensor	29-44 ft-lbs	39.3-59.7 Nm	4.12 OXYGEN (O2) SENSOR, Installation
O2 sensor	29-44 ft-lbs	39.3-59.7 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Oil cooler fastener: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Oil cooler fastener: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Cooler/Apply LOCTITE 243 MEDIUM STRENGHT THREADLOCKER AND SEALANT (blue)
Oil deflector plate screw: XR 1200X	38-48 **in-lbs**	4.3-5.4 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
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 filter adapter	18-22 ft-lbs	24.4-29.8 Nm	3.23 OIL FILTER MOUNT, Assembly
Oil line quick connect fitting, cylinder head return: XR 1200X	108-156 **in-lbs**	12.2-17.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines
Oil line retainer, front, nut: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines
Oil pressure switch	50-70 **in-lbs**	5.6-7.9 Nm	6.31 OIL PRESSURE SWITCH, Installation
Oil pressure switch adapter: XR 1200X	13-17 ft-lbs	17.6-23.0 Nm	6.31 OIL PRESSURE SWITCH, Installation
Oil pump cover screws	70-80 **in-lbs**	7.9-9.0 Nm	3.20 OIL PUMP: XL MODELS, Assembly
Oil pump feed fitting	100-120 **in-lbs**	11.3-13.6 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil pump high pressure feed hose fitting nut	85-105 **in-lbs**	9.6-11.8 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil pump high pressure feed hose to crankcase fitting	60-90 **in-lbs**	6.8-10.2 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil pump quick connect fitting: XR 1200X	108-156 **in-lbs**	12.2-17.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines
Oil pump rotor cover screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	3.21 OIL PUMP: XR 1200X, Assembly
Oil pump rotor cover screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X
Oil pump to crankcase screw	125-150 **in-lbs**	14.1-16.9 Nm	3.20 OIL PUMP: XL MODELS, Installation
Oil rigid line retainer, rear, screw: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines
Oil rigid line retainer, rear, screw: XR 1200X	90-120 **in-lbs**	10.2-13.6 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Oil Pump Lines
Oil tank mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	3.24 OIL TANK, Installation
Passenger footrest support bracket fastener: XL Models	45-50 ft-lbs	61-68 Nm	2.43 PASSENGER FOOTRESTS, XL Models
Passenger footrest support bracket fastener: XR 1200X	45-50 ft-lbs	61-68 Nm	2.43 PASSENGER FOOTRESTS, XR 1200X
Passenger pillion retainer post screw: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	2.35 REAR FENDER: XR 1200X, Installation

FASTENER	TORQUE VALUE		NOTES
Pinion shaft locking nut: XR 1200X	19-21 ft-lbs	26-29 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models/ plus an additional 15-19 degrees of rotation
Pinion shaft locking nut: XR 1200X	19-21 ft-lbs	26-29 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X/ plus 15-19 degrees of rotation
Piston oil jet screw	38-48 **in-lbs**	4.3-5.4 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
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	1.5 MAINTENANCE SCHEDULE, General
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 screw	100-120 **in-lbs**	11.3-13.6 Nm	5.3 PRIMARY COVER, Installation
Primary chain inspection cover	90-120 **in-lbs**	10.2-13.6 Nm	1.5 MAINTENANCE SCHEDULE, General
Primary chain inspection cover	90-120 **in-lbs**	10.2-13.6 Nm	1.9 PRIMARY CHAIN, Free Play Adjustment
Rear caliper mounting bolt	14-18 ft-lbs	19.6-24.5 Nm	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Rear caliper pin bolt	14-18 ft-lbs	19.6-24.5 Nm	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Retainer plate, lower front, fastener	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Return oil manifold screw: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	3.12 PRECISION COOLING SYSTEM: XR 1200X, Return Oil Manifold
Rider footrest support bracket mounting screw	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Rocker cover, inner, large bolt	18-22 ft-lbs	24.4-29.8 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, screw	135-155 **in-lbs**	15.3-17.5 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, small bolt	135-155 **in-lbs**	15.3-17.5 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, outer, screw	120-168 **in-lbs**	13.5-19.0 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rod guide case to inner tube: XR 1200X	66 ft-lbs	90 Nm	2.20 FRONT FORK: XR 1200X, Assembly
Saree guard, left-front, passenger footrest support bracket fastener	16-20 ft-lbs	21.7-27.1 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Seat mounting screw: XL Models	20-40 **in-lbs**	2.3-4.5 Nm	2.39 SEAT, Seat: XL Models
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 1200C/C ANV/CP/CA/CB

FASTENER	TORQUE VALUE		NOTES
Seat post bolt	96-156 **in-lbs**	10.9-17.6 Nm	2.34 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	2.40 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shift linkage fastener	120-180 **in-lbs**	13.6-20.3 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly
Shift linkage pivot bolt	120-180 **in-lbs**	13.6-20.3 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Shift pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Adjusting Shift Pedal: Forward Controls Models
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Adjusting Shift Lever
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm	2.41 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Adjusting Shift Pedal: Forward Controls Models
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm	2.42 RIDER FOOT CONTROLS: XR 1200X, Adjusting Shift Lever
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	2.15 REAR BRAKE CALIPER: XR 1200X, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.22 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard: XL Models
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.24 SHOCK ABSORBERS, Installation/Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads.
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.24 SHOCK ABSORBERS, Installation

FASTENER	TORQUE VALUE		NOTES
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)/Saree Guards: Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT to the threads.
Shock absorber mounting bolt	45-50 ft-lbs	61.0-67.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: Domestic Only
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.17 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Single caliper cast front wheel hub plate screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Sealed Wheel Bearings
Siren/canister bracket rear brake line fastener	17-22 ft-lbs	23.0-29.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	6.10 STARTER, Solenoid
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.18 SPARK PLUGS, Installation
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm	6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Speedometer Installation
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm	6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Trip Odometer Reset Switch Replacement/XL 1200X
Speedometer and tachometer mounting screw: XR 1200X	12-18 **in-lbs**	1.4-2.0 Nm	6.5 SPEEDOMETER AND TACHOMETER: XR 1200X, Tachometer Installation/XL 1200X
Speedometer backplate fasteners: XL models	8-12 **in-lbs**	0.9-1.4 Nm	6.4 SPEEDOMETER: XL MODELS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	1.5 MAINTENANCE SCHEDULE, General
Spoke nipple	55 **in-lbs**	6.2 Nm	1.8 TIRES AND WHEELS, Wheel Spokes
Spoke nipple	55 **in-lbs**	6.2 Nm	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Sprocket compensator bowl bolt, 1st torque	60 ft-lbs	81.3 Nm	C.1 COMPENSATING SPROCKET, Assembly and Installation/Tighten in a star pattern
Sprocket compensator bowl bolt, final torque	80 ft-lbs	108.5 Nm	C.1 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	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	2.27 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: XL Models
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X

FASTENER	TORQUE VALUE		NOTES
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	4.13 EXHAUST SYSTEM: XL MODELS, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.6 DRIVE BELT, Drive Belt: XL Models
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.6 DRIVE BELT, Drive Belt: XR 1200X
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.15 TRANSMISSION SPROCKET, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.15 TRANSMISSION SPROCKET, Installation
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.7 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	5.6 DRIVE BELT, Idler Pulley: XR 1200X
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	5.6 DRIVE BELT, Drive Belt: XR 1200X
Sprocket cover, rear screw	30-33 ft-lbs	40.7-44.8 Nm	5.15 TRANSMISSION SPROCKET, Installation
Sprocket mounting screw, 1st torque	60 ft-lbs	81.3 Nm	2.5 WHEELS, Rear Wheel
Sprocket mounting screw, final torque	80 ft-lbs	108.0 Nm	2.5 WHEELS, Rear Wheel
Stabilizer link, lower, frame bracket, front, mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link, lower, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.16 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	2.25 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Stabilizer link cylinder head bracket	55-65 ft-lbs	74.6-88.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models

FASTENER	TORQUE VALUE		NOTES
Stabilizer link cylinder head bracket	55-65 ft-lbs	74.6-88.2 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.25 STABILIZER LINKS, Rear Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.26 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.27 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X
Starter motor oil line clamp fastener	16-21 **in-lbs**	1.8-2.4 Nm	6.10 STARTER, Installation
Starter mounting bolt	13-20 ft-lbs	17.6-27.1 Nm	6.10 STARTER, Installation
Starter positive terminal nut	60-85 **in-lbs**	6.8-9.6 Nm	6.10 STARTER, Installation
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	6.10 STARTER, Solenoid
Stator harness retainer screw	56 **in-lbs**	6.3 Nm	6.24 ALTERNATOR, Assembly and Installation/Screw must be flush with plate. Do not exceed torque specification.
Stop lamp, rear, switch: XL Models	132-168 **in-lbs**	14.9-18.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XL Models
Stop lamp, rear, switch: XR 1200X	132-168 **in-lbs**	14.9-18.9 Nm	2.16 BRAKE LINES, Rear Brake Line: XR 1200X
Stop lamp switch bracket screw	72-120 **in-lbs**	8.1-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models
Stop lamp switch bracket screw	72-120 **in-lbs**	8.1-13.6 Nm	6.9 BATTERY TRAY, Installation
Stop lamp switch to tee nut	132-168 **in-lbs**	14.9-18.9 Nm	6.21 REAR STOP LAMP SWITCH, Replacement
Strut cover fastener	96-156 **in-lbs**	10.9-17.6 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Strut cover fastener	96-156 **in-lbs**	10.9-17.6 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Strut cover screw	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883R/L

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FASTENER	TORQUE VALUE		NOTES
Strut cover screw	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.5 MAINTENANCE SCHEDULE, General
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	2.28 THROTTLE CABLES: ALL MODELS, Assembly and Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.30 HANDLEBAR, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.30 HANDLEBAR, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.34 RIGHT HANDLEBAR SWITCHES, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.35 LEFT HANDLEBAR SWITCHES, Installation
Tail lamp base mounting screw: XL Models	45-48 **in-lbs**	5.1-5.4 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X
Tail lamp base mounting screw: XR 1200X	36-60 **in-lbs**	4.1-6.8 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X
Tail lamp LED base fasteners: XL 1200C/C ANV/CP/CA/CB	40-50 **in-lbs**	4.5-5.6 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB
Tail lamp LED screws: XL 1200C/C ANV/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/C ANV/CP/CA/CB
Tail lamp lens screw	20-24 **in-lbs**	2.3-2.7 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Bulb Replacement Except XL 1200C/C ANV/CP/CA/CB
Tail lamp lens screw	20-24 **in-lbs**	2.3-2.7 Nm	6.16 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L and XR 1200X
Tailsection bolts: XR 1200X	72-120 **in-lbs**	8.1-13.6 Nm	2.35 REAR FENDER: XR 1200X, Installation
Tappet cover, anti-rotation mounting screw	90-120 **in-lbs**	10.2-13.6 Nm	3.22 BOTTOM END OVERHAUL: ASSEMBLY, Tappets
Tappet cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.16 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods
Throttle cable bracket screw: XR 1200X	60 **in-lbs**	6.8 Nm	4.9 INDUCTION MODULE: XR 1200X, Assembly
TMAP sensor screw	80 **in-lbs**	9.0 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X
TPS screw: XL Models	35 **in-lbs**	4.0 Nm	4.6 THROTTLE POSITION SENSOR (TPS), Installation: XL Models
TPS screw: XR 1200X	29 **in-lbs**	3.3 Nm	4.6 THROTTLE POSITION SENSOR (TPS), Installation: XR 1200X
Transmission mainshaft nut: XL Models	50-60 ft-lbs	67.8-81.3 Nm	5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS, Installation
Transmission mainshaft nut: XR 1200X	50-60 ft-lbs	67.8-81.3 Nm	5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Installation

FASTENER	TORQUE VALUE		NOTES
Transmission sprocket lockplate fastener	90-120 **in-lbs**	10.3-13.6 Nm	5.15 TRANSMISSION SPROCKET, Installation
Transmission sprocket nut	50 ft-lbs	68 Nm	5.15 TRANSMISSION SPROCKET, Installation/Initial torque plus 30-40 degrees.
Turn signal, front, ball head studs	96-144 **in-lbs**	10.8-16.3 Nm	6.18 FRONT TURN SIGNALS, All Except XL 1200X
Turn signal clamp, front, screw	96-120 **in-lbs**	10.9-13.6 Nm	2.29 CLUTCH CONTROL, Assembly and Installation
Turn signal clamp, front, screw	96-120 **in-lbs**	10.8-13.6 Nm	6.18 FRONT TURN SIGNALS, All Except XL 1200X
Turn signal housing, rear, screws: XR 1200X	30-40 **in-lbs**	3.4-4.5 Nm	6.19 REAR TURN SIGNALS, XR 1200X
Turn signal housing to bracket: XL 1200X	12-16 ft-lbs	16.3-21.7 Nm	6.18 FRONT TURN SIGNALS, XL 1200X
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.19 REAR TURN SIGNALS, XL 883R/L
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.19 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	6.19 REAR TURN SIGNALS, XL 1200C/C ANV/CP/CA/CB
Turn signal stalk locknut	132-216 **in-lbs**	14.9-24.4 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 883R/L
Turn signal stalk locknut	96-156 **in-lbs**	10.9-17.6 Nm	2.33 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200X/V, XL 1200C/C ANV/CP/CA/CB
Turn signal stalk locknut	132-216 **in-lbs**	14.9-24.4 Nm	2.34 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Turn signal stalk locknut	96-156 **in-lbs**	10.9-17.6 Nm	2.36 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C/C ANV (India)
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883R/L
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 1200C/C ANV/CP/CA/CB
Turn signal stalk nut	132-216 **in-lbs**	14.9-24.4 Nm	6.19 REAR TURN SIGNALS, XL 1200C/C ANV/CP/CA/CB
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	36-60 **in-lbs**	4.1-6.8 Nm	6.23 VOLTAGE REGULATOR, Installation: XL Models
Voltage regulator mounting screw	36-60 **in-lbs**	4.1-6.8 Nm	6.23 VOLTAGE REGULATOR, Installation: XR 1200X
VSS screw	90-120 **in-lbs**	10.2-13.6 Nm	6.25 VEHICLE SPEED SENSOR (VSS), Installation
Wire form to induction module cover fastener: XR 1200X	84-108 **in-lbs**	9.5-12.2 Nm	4.11 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation: XR 1200X

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