# 2009 Buell 1125 Models Service Manual

## 99491-09Y

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# IMPORTANT NOTICE

**Buell 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.**

**Buell Motorcycle Company**

# 2009 Buell 1125 Models Service Manual

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http://www.buell.com

# READER COMMENTS

**The Buell Motorcycle Company maintains a continuous effort to improve the quality and usefulness of its publications. To do this effectively, we need user feedback - your critical evaluation of this manual.**

**Please comment on the completeness, accuracy, organization, usability, and readability of this manual.**

**Please list the page, item, and part number(s) of any errors you find in this manual.**

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**2009 Buell 1125 Models Service Manual (99491-09Y)**

**Please clip out and mail to:**
**Service Communications Department**
**Buell Motorcycle Company**
**P.O. Box 653**
**Milwaukee, WI USA 53201**

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# NOTES

# ABOUT THIS MANUAL

## GENERAL

This Service Manual has been prepared with two purposes in mind. First, it will acquaint the user with the construction of the Buell product and assist in the performance of basic maintenance and repair. Secondly, it will introduce to the professional Buell Technician the latest field-tested and factory-approved major repair methods. We sincerely believe that this Service Manual will make your association with Buell 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 | Cooling System |
| 6 | Drive/Transmission |
| 7 | Electrical |
| A | Appendix A Connector Repair |
| B | Appendix B Wiring |
| C | Appendix C Valve Lash |
| 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. Sections and topics in this manual are sequentially numbered for easy navigation.

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

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

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

## PREPARATION FOR SERVICE

**⚠WARNING**

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

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

*NOTES*

- *To avoid unnecessary disassembly, carefully read all relative service information before repair work is started.*
- *In figure legends, the number which follows the name of a part indicates the quantity necessary for one complete assembly.*

## SERVICE BULLETINS

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

## USE GENUINE REPLACEMENT PARTS

**⚠WARNING**

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

To verify satisfactory and lasting repairs, carefully follow the manual instructions and use only genuine Buell replacement parts. 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)**

**CAUTION**

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

*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, please remember that these warnings are not all-inclusive. Inadequate safety precautions could result in death or serious injury.

Since Buell Motorcycle Company 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 Buell Motorcycle Company must first thoroughly satisfy himself that neither his nor the operator's safety will be jeopardized as a result. Failure to do so could result in death or serious injury.

## PRODUCT REFERENCES

**⚠WARNING**

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

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

### Kent-Moore Products

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

### Loctite Sealing and Threadlocking Products

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

## PRODUCT REGISTERED MARKS

Alcantara S.p.A., Allen, Amp Multilock, Bluetooth, Brembo, Delphi, Deutsch, Dunlop, Dynojet, Fluke, G.E. Versilube, Gunk, Hydroseal, Hylomar, Kevlar, Lexan, Loctite, Lubriplate, Keps, K&N, Magnaflux, Marson Thread-Setter Tool Kit, MAXI fuse, Molex, MPZ, Mulitilock, Novus, Packard, Pirelli, Permatex, Philips, PJ1, Pozidriv, Robinair, S100, Sems, Snap-on, Teflon, Threadlocker, Torca, Torco, TORX, Tufoil, Tyco, Ultratorch, Velcro, X-Acto, and XM Satellite Radio are among the trademarks of their respective owners.

## H-D MICHIGAN, INC. TRADEMARK INFORMATION

1125CR, 1125R, Blast, Buell, Firebolt, Glaze, Gloss, Harley, Harley-Davidson, HD, H-D, Lightning, Sunwash, Tender, Triple Tail, Thunderstorm, Ulysses, Uniplanar, ZTL and ZTL-2 are among the trademarks of H-D Michigan, Inc.

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All photographs, illustrations and procedures in this manual 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, Buell Motorcycle Company 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 |
|---|---|---|---|
| Axle, front | 53-56 Nm | 39-41 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Axle pinch bolts, front | 27-30 Nm | 20-22 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 1.14 BATTERY MAINTENANCE, Installation and Connection |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 1.14 BATTERY MAINTENANCE, Installation and Connection |
| Brake caliper fasteners, front | 48-50 Nm | 35-37 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement/LOCTITE 271 (red) |
| Brake caliper mounting fasteners, rear | 24-27 Nm | 18-20 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Brake fluid line P-clamp fastener, rear | 9.7-11.0 Nm | 84-96 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Brake pedal adjuster locknut | 14.7-19.6 Nm | 11-15 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pedal Adjustment |
| Brake pin hanger set, front | 14.7-19.6 Nm | 11-15 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Brake reservoir cover screws, front | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Brake reservoir cover screws, front | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Bleeding Brakes |
| Brake reservoir cover screws, front | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Caliper bleeder valve, front | 3.9-6.9 Nm | 35-63 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Bleeding Brakes |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Bleeding Brakes |
| Clutch fluid bleeder valve | 5 Nm | 44 **in-lbs** | 1.9 BLEEDING CLUTCH FLUID LINE, Bleeding |
| Clutch reservoir banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 1.9 BLEEDING CLUTCH FLUID LINE, Bleeding |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.9 BLEEDING CLUTCH FLUID LINE, Hydraulic Clutch: Buell 1125 Models |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.9 BLEEDING CLUTCH FLUID LINE, Bleeding |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Checking Fluid Level |
| Engine oil drain plug, left | 25 Nm | 18 ft-lbs | 1.3 MAINTENANCE SCHEDULE, General |
| Engine oil drain plug, left | 25 Nm | 18 ft-lbs | 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models |
| Engine oil drain plug, right | 15 Nm | 11 ft-lbs | 1.3 MAINTENANCE SCHEDULE, General |
| Engine oil drain plug, right | 15 Nm | 11 ft-lbs | 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Fender fasteners, front | 8.4-9.2 Nm | 74-82 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Handlebar lever bracket clamp screw | 9.0-10.2 Nm | 80-90 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Ignition coil fastener | 12 Nm | 106 **in-lbs** | 1.12 SPARK PLUGS, Replacement |
| Intake cover fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Intake cover fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 1.6 AIR FILTER ELEMENT, Intake Cover |
| Oil filter cover fasteners | 11 Nm | 97 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Oil filter cover fasteners | 11 Nm | 97 **in-lbs** | 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models/TORX |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 1.15 ENGINE COOLANT, Coolant Level: Buell 1125 Models |
| Spark plug | 11 Nm | 97 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Spark plug | 11 Nm | 97 **in-lbs** | 1.12 SPARK PLUGS, Replacement |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 1.17 STEERING HEAD BEARINGS, Resistance Test |
| Steering stem pinch bolt | 27-29 Nm | 20-21 ft-lbs | 1.17 STEERING HEAD BEARINGS, Resistance Test |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Triple clamp fasteners, lower | 27-30 Nm | 20-22 ft-lbs | 1.17 STEERING HEAD BEARINGS, Resistance Test |

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# GENERAL 1.2

## SERVICING A NEW MOTORCYCLE

**⚠WARNING**

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

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

The performance of new motorcycle initial service is required to keep warranty in force and to verify proper emissions systems operation. See 1.3 MAINTENANCE SCHEDULE.

## SAFE OPERATING MAINTENANCE

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

Check:

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

## SHOP PRACTICES

### Repair Notes

General maintenance practices are given in this section.

*NOTES*

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

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

All required parts or materials can be found in the appropriate parts catalog.

### Safety

Safety is always the most important consideration when performing any job. Be sure you have a complete understanding of the task to be performed. Use common sense. Use the proper tools. Protect yourself and bystanders with approved eye protection. Don't just do the job - do the job safely.

### Removing Parts

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

**⚠WARNING**

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

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

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

### Cleaning

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

When you are instructed in a step to clean fastener threads or threaded holes, proceed as follows: Clean all LOCTITE 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 PJ-1 cleaner or equivalent to remove all traces of oil and contaminants from threads. Blow out all threaded holes with low pressure compressed air.

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

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

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

### Disassembly and Assembly

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

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

## Checking Torques on Fasteners with Lock Patches

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

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

## Magnetic Parts Trays

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

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

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

# REPAIR AND REPLACEMENT PROCEDURES

## Hardware and Threaded Parts

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

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

Replace all damaged or missing lubrication fittings.

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

## Threadlocking Agents

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

## Wiring, Hoses and Lines

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

## Instruments and Gauges

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

## Bearings

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

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

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

When bearings are installed against shoulders, be sure that the chamfered side of the bearing always faces the shoulder. Lubricate bearings and all metal contact surfaces before pressing into place. Only apply pressure on the part of the bearing that makes direct contact with the mating part. Install bearings with numbered side facing out.

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

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

## Bushings

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

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

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

## Gaskets

Always discard gaskets after removal. Replace with **new** gaskets. Never use the same gasket twice. Be sure that gasket holes match up with holes in the mating part. But be aware that sections of a gasket may be used to seal passages.

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

## Lip Type Seals

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

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

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

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

## O-Rings (Preformed Packings)

Always discard O-rings after removal. Replace with **new** O-ring. To prevent leaks, lubricate the O-rings before installation. Apply the same type of lubricant as that being sealed. Be sure

that all gasket, O-ring and seal mating surfaces are thoroughly clean before installation.

### Gears

Always check gears for damaged or worn teeth.

Remove burrs and rough spots with a honing stone or crocus cloth before installation.

Lubricate mating surfaces before pressing gears on shafts.

### Shafts

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

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

Clean all rust from the machined surfaces of new parts.

### Part Replacement

Always replace worn or damaged parts with **new** parts.

### Exhaust System Leakage

In the event of an exhaust system leak at a muffler or header pipe connection location, disassemble and clean all mating surfaces. Replace any damaged components. If leak still exists, disassemble and repair the leak by applying a bead of Harley-Davidson High-Performance Sealant (Part No. 99650-02) (or an equivalent 02 Sensor/Catalyst-safe alternative). Reassemble components, wipe off any excess sealant and allow adequate curing time following sealant product instructions before operating vehicle.

## CLEANING

### Part Protection

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

### Cleaning Process

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

### Rust or Corrosion Removal

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

### Bearings

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

**⚠WARNING**

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

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

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

## 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 lets go.
- Never cock a wrench.
- Never use a hammer on any wrench other than a STRIKING FACE wrench.
- Discard any wrench with broken or battered points.
- Never use a pipe wrench to bend, raise or lift a pipe.

### Pliers/Cutters/Pry bars

- Plastic- or vinyl-covered pliers handles are not intended to act as insulation. Do not use 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.
- Discard hammer if face is chipped or mushroomed.
- Wear approved eye protection when using striking tools.
- Protect bystanders with approved eye protection.

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## Punches/Chisels

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

## Screwdrivers

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

## Ratchets and Handles

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

## Sockets

- Never use hand sockets on power or impact wrenches.
- Select the right size socket for the job.
- Never cock any wrench or socket.
- Select only impact sockets for use with air or electric impact wrenches.
- Replace sockets showing cracks or wear.
- Keep sockets clean.
- Always use approved eye protection when using power or impact sockets.

## Storage Units

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

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# MAINTENANCE SCHEDULE 1.3

## GENERAL

**Table 1-1. Regular Service Intervals: 2009 Buell 1125 Models**

| ITEM SERVICED | PROCEDURE | 620 MI 1000 KM | 6,200 MI 10,000 KM | 12,400 MI. 20,000 KM | 18,600 MI 30,000 KM | 24,800 MI 40,000 KM | 31,000 MI 50,000 KM | 37,200 MI 60,000 KM | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| Engine oil | Replace | X | X | X | X | X | X | X | 1 |
| Engine oil filter cartridge | Replace | X | | X | | X | | X | |
| Air cleaner | Replace filter element as required | | | X | | X | | X | |
| Crankcase breather | Clean or replace | | | X | | X | | X | |
| Tires | Check condition, check pressure and tread | X | X | X | X | X | X | X | |
| Clutch fluid | Check level | X | X | X | X | X | X | X | 3 |
| Rear belt and sprocket | Inspect | X | X | X | X | X | X | X | 2 |
| Throttle, brake, clutch controls, sidestand | Inspect, service as required | X | X | X | X | X | X | X | 2 |
| Brake fluid | Check levels and condition | X | X | X | X | X | X | X | 3 |
| Brake pads and discs | Inspect for wear | X | X | X | X | X | X | X | |
| Spark plugs | Replace | | | X | | X | | X | 2 |
| Electrical switches and equipment | Check operation | X | X | X | X | X | X | X | |
| Front fork oil | Replace | | | | X | | | X | 2 |
| Exhaust system | Inspect for leaks, cracks, and loose or missing fasteners or heat shields | X | X | X | X | X | X | X | 5 |
| Battery | Check battery and clean connections | | | | | | | | 5 |
| Cooling system | Inspect level, check clamps for tightness | X | X | X | X | X | X | X | 2 |
| Coolant | | Replace every 50,000 km (31,000 mi) | | | | | | | 2, 6 |
| Radiators and oil cooler fins | Clean | X | X | X | X | X | X | X | |
| Brake system and oil lines | Inspect for leaks | X | X | X | X | X | X | X | 2 |
| Critical fasteners | Check tightness | | | X | | X | | X | 2 |
| Valve clearance | Inspect | | | X | | X | | X | 4, 2 |
| Road test | Verify component and system functions | X | X | X | X | X | X | X | |

**NOTES:**
1. Perform annually or at specified interval, whichever comes first.
2. Should be performed by an authorized Buell dealer, unless you have the proper tools, service data and are mechanically qualified.
3. Change D.O.T. 4 fluid and flush brake and clutch systems every two (2) years.
4. Could vary with frequency of operation and riding style.
5. Perform annually.
6. Perform every two years or at specified interval, whichever comes first.

**Table 1-2. Quick Reference Maintenance Chart: 1125 Models**

| ITEM SERVICED | SPECIFICATION | DATA |
|---|---|---|
| Engine oil and filter | Left engine oil drain plug torque | 25 Nm (18 ft-lbs) Use **new** aluminum washer. |
| | Right engine oil drain plug | 15 Nm (11 ft-lbs) Use **new** aluminum washer. |
| | Oil capacity without filter change | 2.3 L (2.4 qt) |
| | Oil capacity with filter change | 2.6 L (2.7 qt) |
| | Filter cover fasteners | 11 Nm (97 **in-lbs**) |

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**Table 1-2. Quick Reference Maintenance Chart: 1125 Models**

| ITEM SERVICED | SPECIFICATION | DATA |
|---|---|---|
| Tires | Solo rider | Front: 234 kPa (34 psi)<br>Rear: 248 kPa (36 psi) |
| | Rider and passenger | Same as solo |
| | Wear | Replace tire if 0.8 mm (1/32 in) or less tread remains. (Tread wear indicator bars appear.) |
| Brake fluid reservoir level | D.O.T. 4 hydraulic brake fluid part no. | 99953-99A (12 oz), 99973-05 (gal) |
| | Fluid level | Front brake fluid reservoir: Between the LOWER line and the top of the sight gauge.<br>Rear brake fluid reservoir: Between the upper and lower lines. |
| | Front brake fluid reservoir cover | 1.0-1.5 Nm (9-13 **in-lbs**) |
| Clutch fluid reservoir | D.O.T. 4 hydraulic brake fluid | Part No. 99953-99A (12 oz)<br>Part No. 99973-05 (gal) |
| | Fluid level | Clutch fluid reservoir: Between the LOWER line and the top of the sight gauge. |
| | Clutch fluid reservoir cover | 1.0-1.5 Nm (9-13 **in-lbs**) |
| Brake pads and discs | Minimum brake pad thickness | 1.0 mm (0.040 in) or less |
| | Minimum brake disc thickness | 4.5 mm (0.18 in) or less |
| Intake cover | Intake cover fasteners | 13.0-14.5 Nm (115-128 **in-lbs**) |
| Throttle cables | Lubricant | LUBIT-8 TUFOIL CHAIN AND CABLE LUBE (Part No. HD-94968-85TV) |
| | Handlebar lever bracket clamp screws | 9.0-10.2 Nm (80-90 **in-lbs**) |
| | Handlebar switch housing screws | 3-4 Nm (27-35 **in-lbs**) |
| Spark plugs | Type | NGK CR9EKB |
| | Gap | 0.7- 0.9 mm (0.027-0.035 in) |
| | Torque | 11 Nm (97 **in-lbs**) |
| Engine idle | Idle speed | 1250 rpm |
| Front fork oil | Oil type | HYDRAULIC FORK OIL (TYPE E)<br>Part No. 99884-80 |
| | Oil level | 117 mm (4.61 in) From the top of the fork tube. |
| Battery | Lubricant | ELECTRICAL CONTACT LUBRICANT<br>Part No. 99861-02 (1 oz) |
| | Battery terminals | 6.8-7.9 Nm (60-70 **in-lbs**) |

# FUEL AND OIL 1.4

## FUEL

Refer to Table 1-3. Always use a good quality unleaded gasoline. Octane ratings are usually found on the pump.

**⚠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 1-3. Octane Ratings**

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

## GASOLINE BLENDS: BUELL MODELS

Your motorcycle was designed to get the best performance and efficiency using unleaded gasoline. Most gasoline sold 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.

**CAUTION**

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

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

You may find that some gasoline blends adversely affect the starting, drivability or fuel efficiency of your bike. If you experience one or more of these problems, we recommend you try a different brand of gasoline or higher octane rating.

## ENGINE LUBRICATION

**CAUTION**

**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 1-4. Your authorized dealer has the proper oil to suit your requirements.

**Table 1-4. Recommended Engine Oils**

| H-D TYPE | VISCOSITY | H-D RATING | LOWEST AMBIENT TEMPERATURE | COLD WEATHER STARTS BELOW 50 °F (10 °C) |
|---|---|---|---|---|
| Screamin' Eagle SYN3 Synthetic Motorcycle Lubricant | SAE 20W50 | HD 360 | Above 4 °C (40 °F) | Excellent |
| H-D Multi-grade | SAE 10W40 | HD 360 | Below 4 °C (40 °F) | Excellent |
| H-D Multi-grade | SAE 20W50 | HD 360 | Above 4 °C (40 °F) | Good |

# ENGINE OIL AND FILTER 1.5

## CHECKING OIL LEVEL

An accurate engine oil level reading can be obtained with the engine cold or at normal operating temperature. The engine will require a longer warm up period in colder temperatures if using the hot check procedure.

*NOTES*

- *As part of the pre-ride inspection, verify that there are no oil leaks from the oil filter cover or oil lines prior to operating the motorcycle.*
- *The motorcycle should be upright when checking oil level.*
- *Refer to Table 1-4. Use only recommended oil specified.*

**CAUTION**

**Do not allow oil level to fall below MIN mark on dipstick. Doing so can result in equipment damage and/or equipment malfunction. (00573c)**

**CAUTION**

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

**CAUTION**

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

### Oil Level Cold Check

Perform engine oil level **COLD CHECK** as follows:

*NOTE*

*For an accurate cold check, you must wait a minimum of four hours after the motorcycle has been run.*

1. See Figure 1-1. Loosen the dipstick.
2. Hold the motorcycle upright for one minute.
3. While continuing to hold the motorcycle upright, remove and wipe off the dipstick.
4. Insert dipstick into oil filler hole, screwing dipstick in completely.
5. See Figure 1-1. Unscrew and remove dipstick and note oil level. An indicated oil level between MIN and MAX is acceptable for safe engine operation. Oil should be added in 0.1 L (3.4 fl oz) increments, depending on how far the level is from the MAX reading. If oil was added, proceed to the Oil Level Hot Check procedure.

### Oil Level Hot Check

Perform engine oil level **HOT CHECK** as follows:

1. Ride motorcycle for approximately 10 minutes. Ride at least 8 km (5 mi) to verify the oil is hot and the engine is at normal operating temperature. Readings taken with colder oil could lead to an overfull engine condition.
2. Stand the motorcycle upright (not leaning on sidestand) on a firm level surface. An uneven surface will produce a false oil reading.
3. Idle the motorcycle for three minutes. Shut off the motorcycle.
4. See Figure 1-1. Loosen the dipstick.
5. Wait for 3-4 minutes after shutdown (with vehicle still upright) before reading the oil level, or false readings may result.
6. Unscrew and remove dipstick from oil filler hole. Wipe dipstick clean.
7. Insert dipstick into oil filler hole, screwing dipstick in completely.
8. See Figure 1-2. Unscrew and remove dipstick and note oil level. An indicated oil level between MIN and MAX (measured after performing steps 1 through 7) is acceptable for safe engine operation. Oil should be added in 0.1 L (3.4 fl oz) increments, depending on how far the level is from the MAX reading. Confirm oil level by repeating steps 1 through 8.

*NOTE*

*If the oil level is at (or above) the OVERFULL mark, drain oil at 0.2 L (6.8 fl oz) increments until the oil level is between the MIN and MAX marks on the dipstick. Repeat steps 1 though 8 to confirm proper level.*

9. Hand tighten dipstick into oil filler hole.

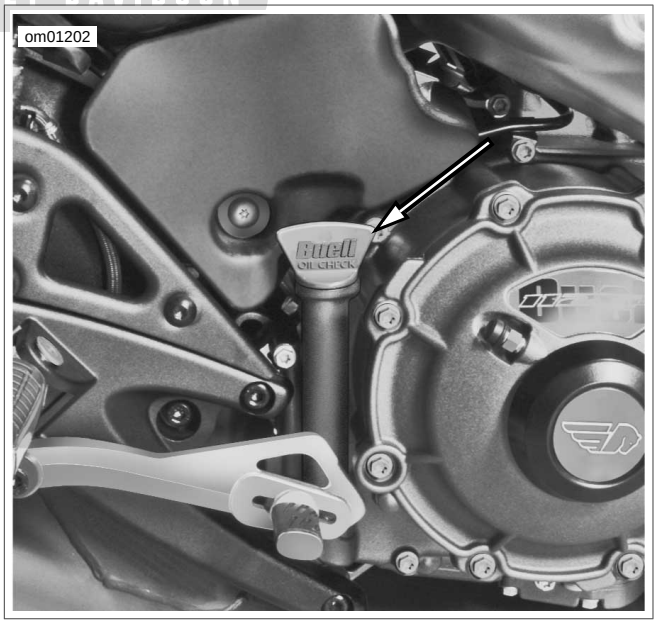
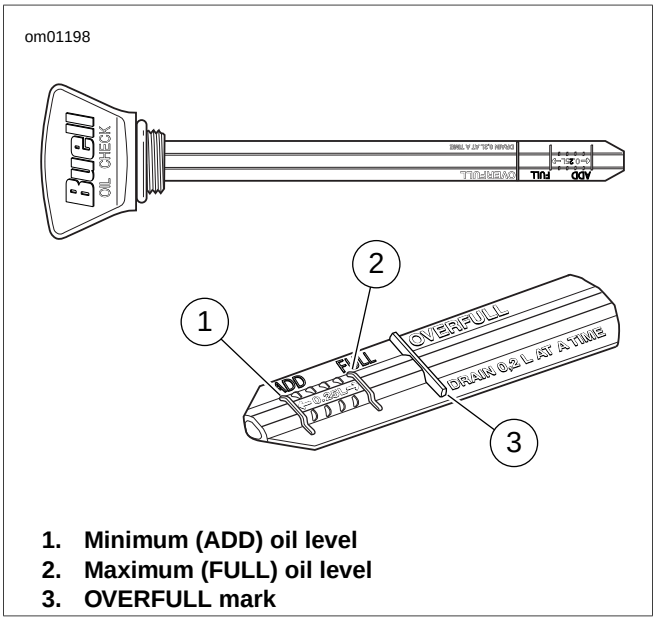
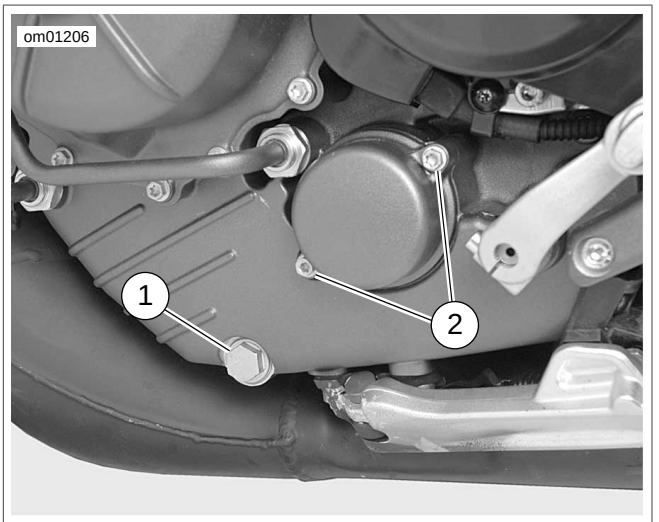



**Figure 1-1. Filler Plug/Dipstick Location**




1. **Minimum (ADD) oil level**
2. **Maximum (FULL) oil level**
3. **OVERFULL mark**

**Figure 1-2. Oil Dipstick Proper Operating Range**




1. **Crankcase oil drain plug**
2. **Oil cartridge cover fasteners**

**Figure 1-3. Crankcase Oil Drain Plug (Left Side): Buell 1125 Models**

## ENGINE OIL CHANGE: BUELL 1125 MODELS

**CAUTION**

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

**WARNING**

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

*NOTE*

*The engine oil also lubricates the clutch and transmission.*

Ride motorcycle for approximately 10 minutes to verify the oil is hot and the engine is at normal operating temperature. Turn engine off.

1. Place a suitable container under the motorcycle.
2. See Figure 1-1. Unscrew and remove dipstick from oil fill hole. Replace O-ring if torn or damaged.
3. See Figure 1-3. Remove the left engine oil drain plug located in the crankcase. Wipe any accumulated debris from magnetic tip on drain plug and replace the aluminum washer.
4. See Figure 1-4. Remove the right oil drain plug located under the clutch cover. Wipe any accumulated debris from plug and replace the aluminum washer.
5. After all oil has drained, tilt vehicle to right side to drain any remaining oil from the right side of engine.

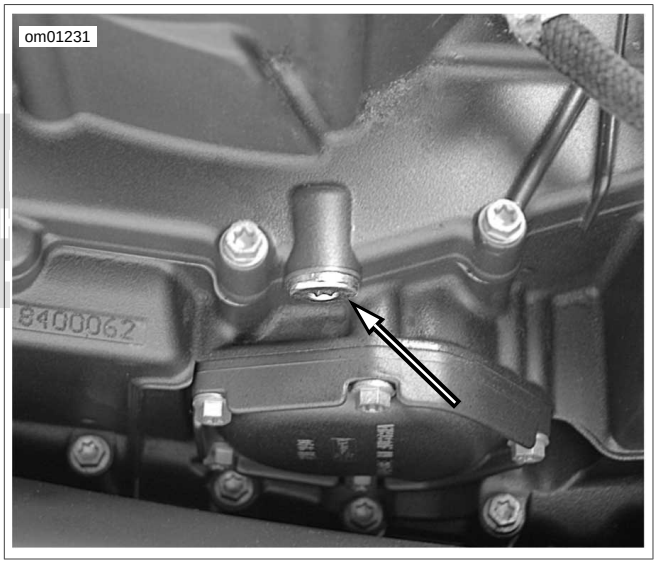



**Figure 1-4. Engine Oil Drain Plug (Right Side): Buell 1125 Models**

*NOTE*

*Refer to Table 1-1 to determine if the oil filter cartridge needs to be replaced.*

6. If replacing the oil filter cartridge, perform the following:
   a. See Figure 1-3. Remove the two screws to detach the oil filter cover. Remove filter cartridge from cover.
   b. Clean the cover and inside the oil filter recess in the crankcase. Remove any debris.
7. Install both drain plugs after oil is thoroughly drained.
   a. Tighten left engine oil drain plug to 25 Nm (18 ft-lbs).
   b. Tighten right engine oil drain plug to 15 Nm (11 ft-lbs).

*NOTE*

*The rubber contact surface goes into the engine case cavity to seal the filter to the oil passages in the case.*

8. Install **new** oil filter cartridge (Part No. Q1064.1AM), if removed.
   a. Apply a light film of clean engine oil to the rubber contact surface on the new oil filter cartridge.
   b. See Figure 1-5. Push new oil filter cartridge into cover until properly seated.
   c. Install oil filter cover (with filter) onto crankcase with two screws. Tighten screws to 11 Nm (97 **in-lbs**).
9. Fill oil through filler (dipstick) hole using recommended oil from Table 1-4. Always verify proper hot oil level on dipstick. Do not overfill.
   a. Oil capacity **with** filter change is approximately 2.6 L (2.7 qt).
   b. Oil capacity **without** filter change is approximately 2.3 L (2.4 qt).
10. Install (screw in) dipstick into oil fill hole. Make sure dipstick is screwed in completely.

*NOTE*

*For ease of installation, apply a light film of clean engine oil to the dipstick O-ring.*

**⚠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)**

11. Inspect oil cooler fins for debris or damage. Blow out any debris from fins with compressed air from the inside of the cooler.
12. Wipe up any spilled oil on vehicle.
13. Start engine. Verify that oil pressure signal lamp on instrument panel turns off after a few seconds when engine speed is 1000 RPM or above.
14. Check oil filter cover, drain plugs, hoses and oil cooler for leaks.
15. Check (hot) oil level. See 1.5 ENGINE OIL AND FILTER, Checking Oil Level.




**Figure 1-5. Oil Filter Cartridge: Buell 1125 Models**

# AIR FILTER ELEMENT 1.6

## INTAKE COVER

### Removal

1. Remove seat.
2. See Figure 1-6. Remove the rear fasteners (1) and nylon washers (2).
3. Remove front fasteners and nylon washers.
4. Remove intake cover.

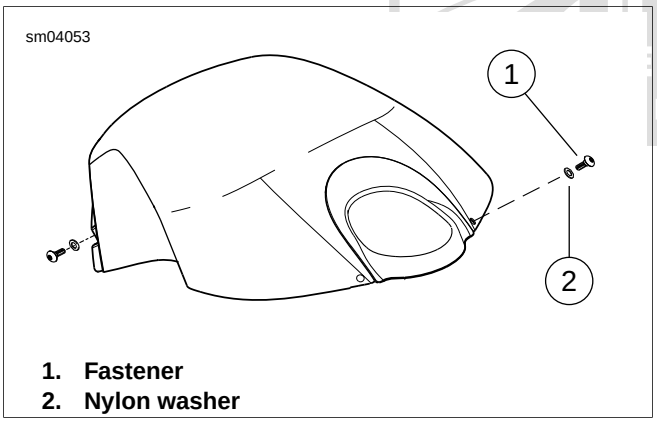
### Installation

1. Position intake cover assembly over air cleaner.
2. Loosely install front fasteners with nylon washers.
3. Install the rear fasteners and nylon washers.
4. Tighten all fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).

**WARNING**

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

5. Install seat.




1. **Fastener**
2. **Nylon washer**

**Figure 1-6. Intake Cover**

## REMOVAL

**CAUTION**

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

Air filter element service:

1. See 1.6 AIR FILTER ELEMENT, Intake Cover. Remove intake cover.
2. Pull the vent hose from the groove in the top of the air filter cover.
3. See Figure 1-7. Lift release latches (five on each side) to remove the air filter cover.
4. See Figure 1-8. Pull the tabs to stretch the air filter retainer off of the rubber seal strip of the element.
5. See Figure 1-9. Pull the element seal strip out of the groove in the air box baseplate.
6. Cover the throttle body openings so nothing can drop into the motor.
7. Inspect and replace as required.

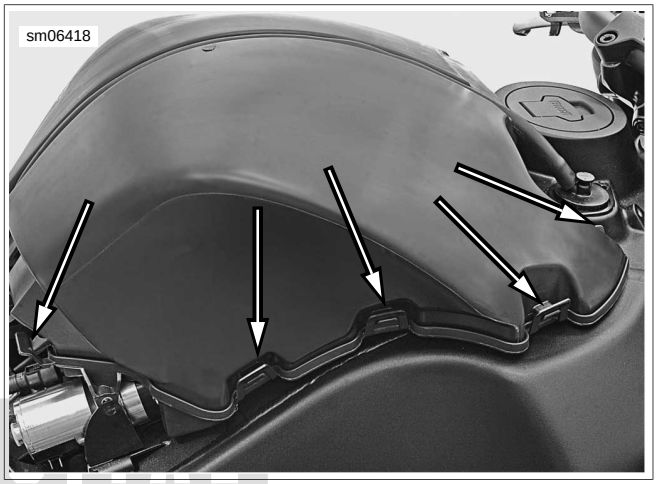



**Figure 1-7. Air Filter Cover Release Latches**

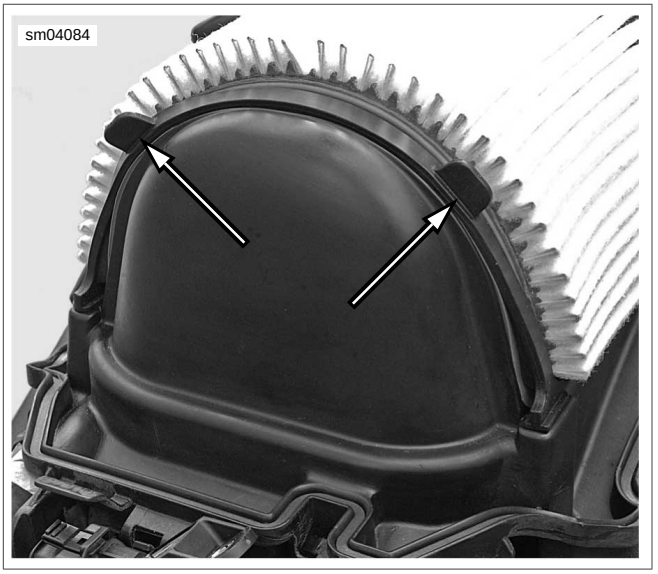



**Figure 1-8. Air Filter Retainer**




**Figure 1-9. Air Box Baseplate**

## CLEANING AND INSPECTION

**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)**

1. To inspect filter element, hold element up to strong light source. The element can be considered sufficiently clean if light is uniformly visible through the element.
2. Thoroughly clean baseplate and inside of air filter cover.
3. See Figure 1-10. Clean the opening from the intake snorkel of any debris.

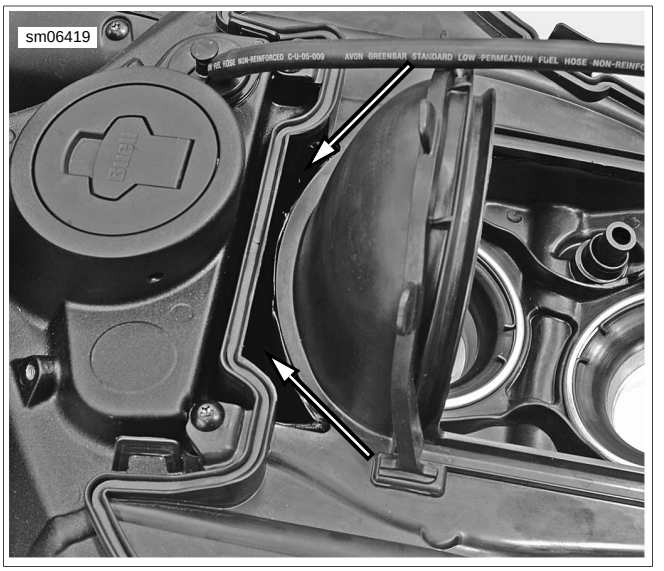



**Figure 1-10. Opening from Intake Snorkel**

## INSTALLATION

1. Remove any coverings over the throttle intakes.
2. See Figure 1-11. Insert the air filter element seal into one end of the air box baseplate.
3. Press the air filter element seal into the groove and seal with the air filter retainers.

*NOTE*

*See Figure 1-12. The retainer is seated when the triangular extrusions at the ends of the hold down strap complete the arc of the strap to the arc of the element seal.*

4. Install the air filter cover.
5. Verify that each latch snaps into place.
6. Route the vent hose and press the hose into the groove in the air box cover.
7. See 1.6 AIR FILTER ELEMENT, Intake Cover. Install intake cover.




**Figure 1-11. Installing the Air Filter Element**

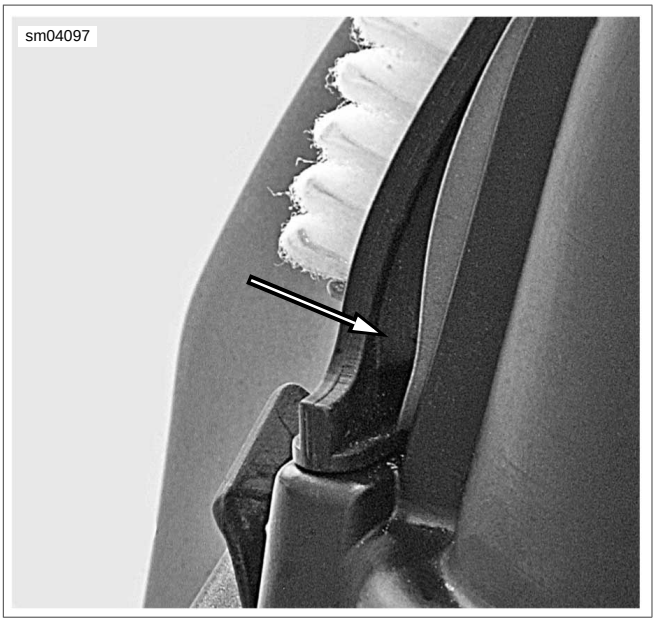



**Figure 1-12. Retainer Extrusion**

# THROTTLE CABLES 1.7

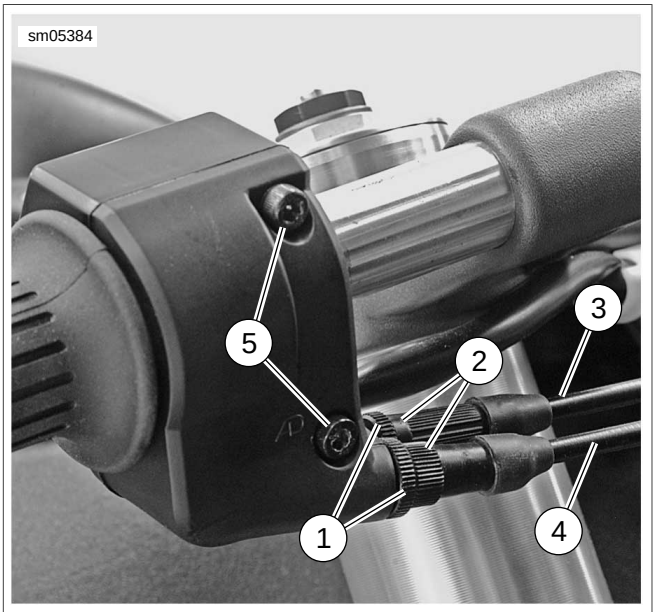
## THROTTLE CABLE ADJUSTMENT

**⚠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)**

With engine running, turn handlebars through full range of travel. If engine speed changes during this maneuver, turn engine OFF and adjust throttle cables as follows:

1. See Figure 1-13. Loosen cable adjuster lock (1) on each cable.
2. Turn adjusters (2) in direction which will shorten cable housings to minimum length.
3. Point front wheel straight ahead. Twist throttle control grip to fully open position; hold in position.
4. Turn adjuster on throttle control cable (4) until throttle cam stop touches stop plate. Tighten cable adjuster lock (1) on throttle control cable adjuster; release throttle control grip.
5. Turn handlebars fully to right. Turn adjuster on idle control cable (3) until end of cable housing just touches the cable guide.
6. Twist and release throttle control grip a few times. Throttle plate must return to idle position each time throttle grip is released. If this is not the case, turn adjuster on idle control cable (shortening cable housing) until throttle control functions properly.
7. Tighten cable adjuster lock on idle control cable. Recheck operation of throttle control.




1. **Cable adjuster locks**
2. **Cable adjusters**
3. **Idle control cable**
4. **Throttle control cable**
5. **Right switch housing fasteners**

**Figure 1-13. Throttle Cable Adjusters**

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## TIRE REPLACEMENT: BUELL PIRELLI TIRES

### Inspection

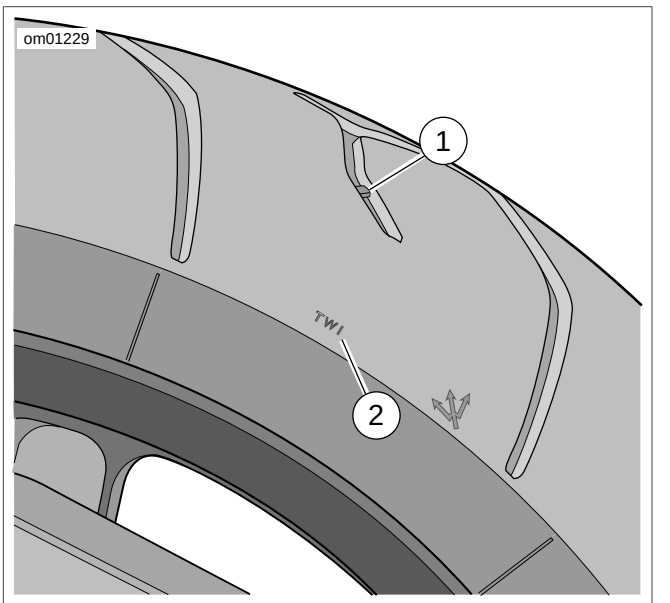
Tread wear indicator bars will appear on tire tread surfaces when 0.8 mm (1/32 in) or less of tire tread remains. Always replace tires before the tread wear indicator bars appear on the surface of the tire.

See Figure 1-14. The location of tread wear indicator bars are identified by the TWI marks on the tire sidewalls.

### When To Replace Tires

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

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




**1. Tread wear indicator bar**
**2. Sidewall 'TWI' marking**

**Figure 1-14. Tread Wear Indicator: Pirelli Diablo Corsa III**

## WHEEL BEARINGS

**WARNING**

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

Check front and rear wheel bearings for wear:

- Every time a wheel is removed.
- When storing or removing the motorcycle for the season.

Check wheel bearings for wear and corrosion. Excessive play or roughness indicates worn bearings. Replace bearings in sets only.

# BLEEDING CLUTCH FLUID LINE 1.9

## HYDRAULIC CLUTCH: BUELL 1125 MODELS

### General

The clutch is hydraulically actuated. Squeezing the left hand lever actuates the clutch master cylinder applying hydraulic pressure through the clutch fluid line to the secondary clutch actuator. The secondary actuator acts on the clutch pressure plate compressing the clutch springs and disengaging the clutch.

The Hydraulic Vacuum Assist (HVA) slipper action clutch uses engine vacuum to boost clutch lever action. The slipper action reduces undesired engine braking when the engine is downshifted at speed.

### Checking Fluid Level

Refer to Table 1-1. Check the fluid level as follows:

1. Stand the motorcycle upright (not leaning on the sidestand) on a level surface, turn handlebar so the clutch master cylinder reservoir is level.
2. Verify the fluid level in the sight gauge on the fluid reservoir.
3. If the fluid level is at or below the LOWER line, rotate the front forks to access the fluid reservoir and remove the cover, stiffener and diaphragm.
4. Inspect the cover, stiffener and diaphragm for damage. Replace the diaphragm if necessary.

**CAUTION**

**D.O.T. 4 hydraulic brake fluid is used in the hydraulic clutch. Do not use other types of fluids as they are not compatible and could cause equipment damage. (00353a)**

**CAUTION**

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

**⚠CAUTION**

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

**CAUTION**

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

5. Add D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) until the level is above the LOWER line.

*NOTE*

*Do not overfill the clutch master cylinder reservoir. Leave sufficient volume in the reservoir to accommodate the rise in fluid level as the clutch friction discs wear.*

6. Carefully place the diaphragm, stiffener and cover on the master cylinder reservoir and secure with the cover screws.
7. Tighten the screws to 1.0-1.5 Nm (9-13 **in-lbs**).

## BLEEDING

**⚠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)**

**CAUTION**

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

**⚠CAUTION**

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

**CAUTION**

**D.O.T. 4 hydraulic brake fluid is used in the hydraulic clutch. Do not use other types of fluids as they are not compatible and could cause equipment damage. (00353a)**

**CAUTION**

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

### Reservoir Banjo Bolt

*NOTE*

*When filling an empty clutch fluid line, a Snap-on BASIC VACUUM BRAKE BLEEDER with a fitting that mates to the secondary clutch actuator bleeder screw threads can be used to initially draw the fluid down the clutch line.*

1. Rotate the front forks to access the clutch fluid reservoir and remove the cover.

2. Stand motorcycle upright and square handlebars to level clutch reservoir.

*NOTE*

*Do not overfill clutch reservoir. Clutch fluid volume increases with clutch wear and can damage seals causing damage to clutch or clutch system.*

3. See Figure 1-15. If necessary, add D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) to the reservoir. Initial fluid level should not exceed the top of the sight gauge.

*NOTE*

*Loosen the banjo bolt only enough to allow air bubbles to escape.*

4. While holding reservoir cover in place:
   a. Pump clutch hand lever five times.
   b. Hold clutch hand lever against handlebar.
   c. Hold shop towel under fitting and loosen the banjo bolt. Clutch fluid under pressure can squirt a steady stream several feet.
   d. Watch banjo fitting for air bubbles.
   e. Tighten the banjo bolt.
   f. Release hand lever.
   g. Fill reservoir as required.

5. Repeat three or more times until only a steady flow of clutch fluid escapes banjo fitting and fluid level in reservoir is at the top of the sight gauge with motorcycle in an upright position.

## Bleeder Valve

1. Cover exhaust with towel and place a suitable pan under right side case to catch excess clutch fluid.
2. While holding reservoir cover in place:
   a. Pump clutch hand lever 5 times.
   b. Hold clutch hand lever against handlebar.
   c. Remove the rubber cap and install the plastic tubing.
   d. See Figure 1-16. Loosen secondary clutch actuator bleeder valve.
   e. Watch the bleeder valve for air bubbles.
   f. Tighten the bleeder valve.
   g. Release hand lever.

   *NOTE*

   *Do not overfill clutch reservoir. Clutch fluid volume increases with clutch wear and can damage seals causing damage to clutch or clutch system.*

   h. Fill reservoir as required.
3. Repeat three more times until only a steady flow of clutch fluid escapes bleeder valve and fluid level in reservoir is at the top of the sight gauge with the motorcycle in an upright position.
4. Test pressure by squeezing clutch hand lever.

*NOTE*

*If continued repetition does not build pressure in line and maintain the reservoir fluid level, there is a leak in the clutch system.*

5. Tighten fasteners as follows:
   a. Reservoir banjo bolt to 21.7-27.1 Nm (16-20 ft-lbs).
   b. Reservoir cover screws to 1.0-1.5 Nm (9-13 **in-lbs**).
   c. Bleed valve to 5 Nm (44 **in-lbs**).
6. Test ride the motorcycle. Incorrect clutch fluid pressure can cause:
   a. Dragging clutch.
   b. Hard shifting.




**Figure 1-15. Clutch Fluid Reservoir**

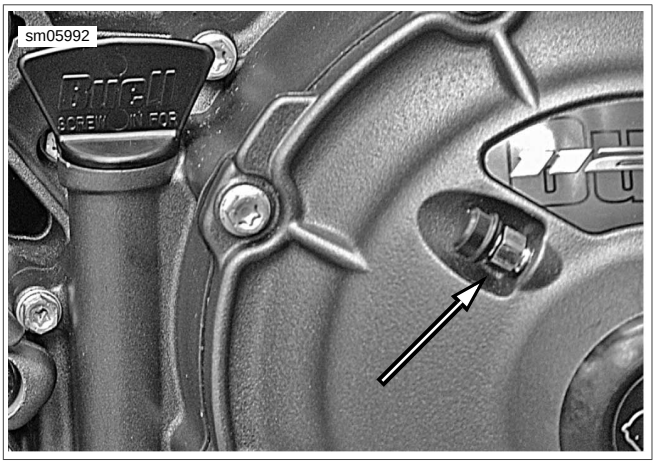



**Figure 1-16. Clutch Fluid Bleeder Valve**

# DRIVE BELT MAINTENANCE 1.10

## INSPECTION

### Rear Sprocket

*NOTE*

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

1. Inspect each tooth of rear sprocket for:
   a. Major tooth damage.
   b. Coating chips larger than 6.35 mm (0.25 in.) missing/removed.
   c. Gouges caused by hard objects.
2. Replace rear sprocket if major tooth damage or coating chips larger than specification.

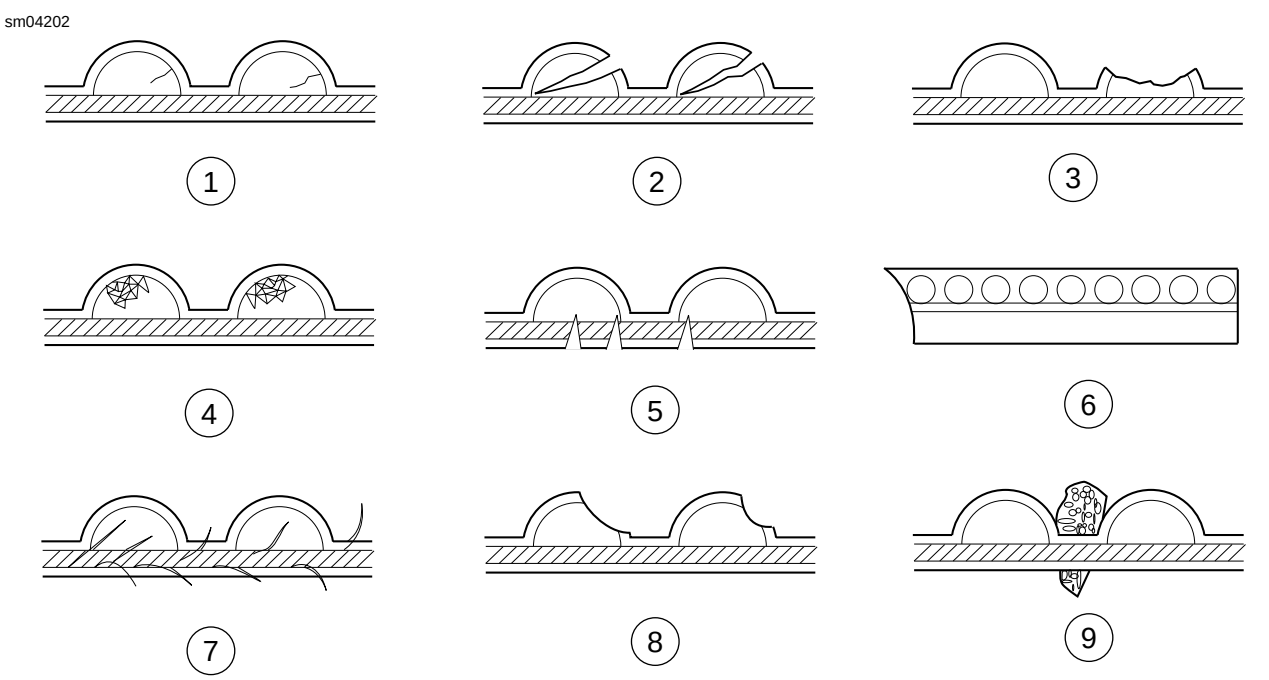
### Drive Belt

*NOTE*

*The drive belt tension on a new belt will loosen after approximately 1600 km (1000 mi). The drive belt tension is automatically set by the idler pulley. Axle alignment is not adjustable.*

Refer to Table 1-5. Inspect drive belt.

- Cuts or unusual wear patterns on both sides of belt.
- Outside edge bevelling. Some bevelling is common, but it indicates that sprockets are misaligned.
- Outside surface for signs of stone puncture. If cracks/damage exists near edge of belt, replace belt immediately. Damage to center of belt will require belt replacement eventually, but when cracks extend to edge of belt, belt failure is imminent.
- Inside (toothed portion) of belt for exposed tensile cords (normally covered by facing fabric). 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.




1. **Internal tooth cracks - monitor**
2. **External tooth cracks - replace belt**
3. **Missing teeth - replace belt**
4. **Chipping - monitor**
5. **Cracks in back - replace belt**
6. **Bevel (outboard edge) wear - monitor**
7. **Fuzzy edge cord - monitor**
8. **Hook wear - replace belt**
9. **Stone damage - replace belt if damage on edge**

**Figure 1-17. Drive Belt Wear Patterns**

**Table 1-5. Potential Limits to Belt Drive Service Life**

| CONDITION | ROOT CAUSE | REQUIRED ACTION |
|---|---|---|
| Excessive edge wear (mistracking) | Misalignment or bent drive structure | Check structure (bad bearing, bent members, etc.). |
| | Bent or rough flange | Repair flange/replace sprocket. |
| | Damage due to handling (pry on, etc.) | Follow proper handling/installation procedure. |
| | Debris damage to edge of belt | Inspect/replace belt. |
| | | Inspect for damaged or missing guards. |
| | Belt hitting obstruction | Check structure (bad bearing, bent members, etc.). |
| | | Inspect for loose or missing fasteners. |
| | | Inspect for damaged or missing guards. |
| | Bent or loose idler bracket | Replace idler assembly. |
| | | Inspect for loose or missing fasteners. |
| | Broken or loose guards | Check structure (bad bearing, bent members, etc.). |
| | | Inspect for loose or missing fasteners. |
| | | Inspect for damaged or missing guards. |
| Excessive tooth wear | Rough or damaged sprocket | Inspect/replace sprocket. |
| | Worn sprocket | Inspect/replace sprocket. |
| | Debris in sprocket | Clean and protect drive. |
| | | Inspect for damaged or missing guards. |
| | Abrasive environment | Eliminate or control exposure. |
| | | Inspect for damaged or missing guards. |
| Apparent belt stretch<br>NOTE:<br>Tension on a new belt will loosen after approximately 1600 km (1000 mi). | Worn sprocket | Inspect/replace sprocket. |
| | Debris in sprocket | Clean and protect drive. |
| | | Inspect for damaged or missing guards. |
| | Idler bearing failure | Replace idler assembly. |
| | Aggressive riding/hard use | Inform operator. |
| | Exposure to oils, solvents, harsh chemicals | Eliminate or control exposure. |
| | | Clean and protect drive. |
| Cracks in back of belt | Idler/bearing binding | Replace idler assembly. |
| | Exposure to oils, solvents, harsh chemicals | Eliminate or control exposure. |
| | | Clean and protect drive. |
| | Cut by sharp debris (not at belt edge) | Inspect/replace sprocket. |
| | | Continue to run, but monitor condition frequently. |
| | Cut by sharp debris at belt edge | Inspect/replace sprocket. |
| | | Inspect/replace belt. |
| Tooth shear/cracks | Excessive load/shock load | Inspect/replace belt. |
| | | Inform operator. |
| | Worn sprocket | Inspect/replace sprocket. |
| | Debris damage | Inspect/replace sprocket. |
| | | Clean and protect drive. |
| | | Inspect/replace belt. |
| | | Continue to run, but monitor condition frequently. |
| | | Inspect for damaged or missing guards. |

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**Table 1-5. Potential Limits to Belt Drive Service Life**

| CONDITION | ROOT CAUSE | REQUIRED ACTION |
|---|---|---|
| Belt breakage | Excessive load/shock load | Inspect/replace belt. |
| | | Inform operator. |
| | Damage due to handling (pry-on, etc.) | Follow proper handling/installation procedure. |
| | Debris in sprocket or belt | Inspect/replace sprocket. |
| | | Clean and protect drive. |
| | | Inspect/replace belt. |
| Excessive drive noise | Worn/damaged sprocket | Inspect/replace sprocket. |
| | | Replace damaged or missing belt guards. |
| | Damaged flange | Repair flange/replace sprocket. |
| | Damaged idler | Check structure (bad bearing, bent members, etc.). |
| | | Replace idler assembly. |
| | Damaged belt | Follow proper handling/installation procedure. |
| | | Inspect/replace belt. |
| | Debris stuck in belt | Inspect/replace sprocket. |
| | | Clean and protect drive. |
| | | Inspect/replace belt. |
| | | Replace damaged or missing belt guards. |
| | Debris stuck in sprocket | Inspect/replace sprocket. |
| | | Follow proper handling/installation procedure. |
| | | Inspect/replace belt. |
| | | Replace damaged or missing belt guards. |

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## Idler Pulley

1. Inspect idler pulley for signs of uneven wear. Roughness indicates worn bearings.
2. See Figure 1-18. Measure idler pulley runout with a dial indicator. Refer to Table 1-6.
3. As required, replace idler pulley. See 6.11 DRIVE BELT AND IDLER PULLEY.

**Table 1-6. Idler Pulley Maximum Lateral Runout**

| IDLER PULLEY | mm | in |
|---|---|---|
| Lateral runout | 0.5 (max) | 0.020 (max) |




**Figure 1-18. Measuring Lateral Side Play on Idler Pulley**

# BRAKE SYSTEM MAINTENANCE 1.11

## GENERAL

Front brake hand lever and rear brake foot pedal must have a firm feel when brakes are applied. If not, bleed brake fluid. Refer to Table 1-7.

**Table 1-7. Brake Troubleshooting**

| CONDITION | CHECK FOR | REMEDY |
|---|---|---|
| Excessive lever/pedal travel or spongy feel | Air in system<br>Master cylinder fluid low | Bleed brake(s).<br>Fill master cylinder with approved brake fluid. |
| Brake fade | Moisture in system | Bleed brake(s).<br>Replace fluid in master cylinder with approved brake fluid. |
| Chattering sound when brake is applied | Worn pads<br>Worn D shape bushings<br>Loose mounting bolts<br>Warped rotor | Replace brake pads.<br>Replace rotor and bushings as a set.<br>Tighten bolts.<br>Replace rotor and bushings as a set. |
| Ineffective brake, lever/pedal travels to limit | Low fluid level<br>Piston cup not functioning | Fill master cylinder with approved brake fluid.<br>Rebuild cylinder. |
| Ineffective brake, lever/pedal travel normal | Distorted or glazed rotor<br>Distorted, glazed or contaminated brake pads | Replace rotor and bushings as a set.<br>Replace brake pads. |
| Brake pads drag on rotor, will not retract | Cup in master cylinder not uncovering relief port<br>Rear brake pedal linkage out of adjustment | Inspect master cylinder.<br>Adjust brake pedal linkage. |

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## CHECKING FLUID LEVEL

**CAUTION**

**D.O.T. 4 hydraulic brake fluid is used in the hydraulic clutch. Do not use other types of fluids as they are not compatible and could cause equipment damage. (00353a)**

**CAUTION**

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

**⚠CAUTION**

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

**CAUTION**

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

### Front Brake Fluid Reservoir

1. Stand the motorcycle upright, turn handlebar so the brake fluid reservoir is level.
2. Verify the fluid level in the sight gauge.
3. See Figure 1-19. If the fluid level in the sight glass is at or below the LOWER line on the front of the reservoir, rotate the front forks to access the fluid reservoir and remove the cover, stiffener and diaphragm.
4. Add D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) to raise the fluid level above the LOWER line when the reservoir is level.
5. Carefully place the diaphragm, stiffener and cover on the reservoir and install the cover screws. Torque screws to 1.0-1.5 Nm (9-13 **in-lbs**).

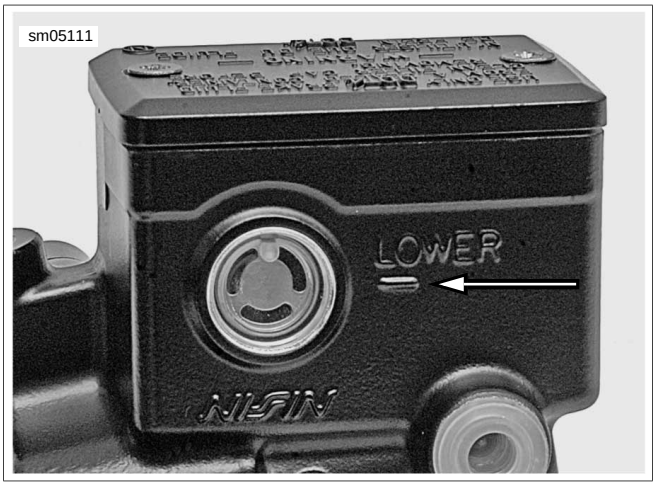



**Figure 1-19. Brake Fluid Reservoir LOWER Line**

## Rear Brake Fluid Reservoir

1. Remove the rider seat.
2. See Figure 1-20. Verify the fluid level in the reservoir.
3. If the fluid level is at or below the LOWER level line, remove the cap, stiffener and diaphragm.
4. Add D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) to raise the fluid level above the LOWER line.
5. Replace the reservoir cap, stiffener and diaphragm.

**⚠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 the seat.

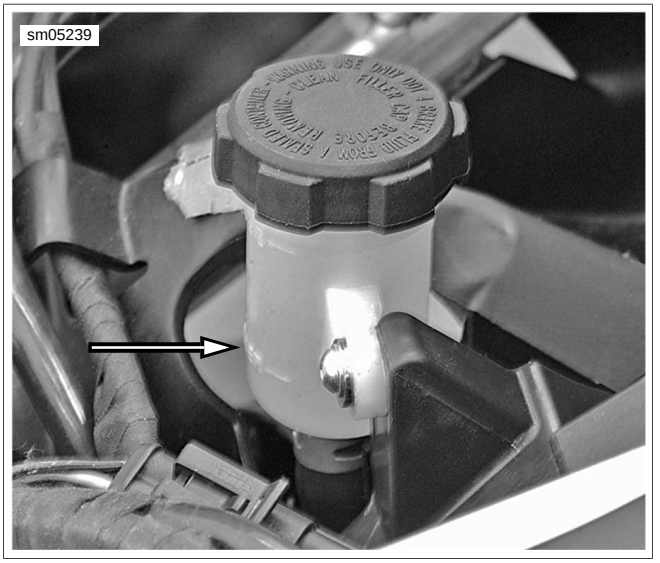



**Figure 1-20. Rear Brake Fluid Reservoir LOWER Level**

# BLEEDING BRAKES

**⚠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)**

**⚠WARNING**

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

**⚠WARNING**

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

**CAUTION**

**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)**

## Bleeding Front Brake

*NOTE*

*Hydraulic brake fluid bladder-type pressure equipment can be used to fill the brake master cylinder through the bleeder valve if master cylinder reservoir cover is removed to prevent pressurization.*

1. Cover body surfaces, handlebar switches and instrument module to protect from spillage.
2. See Figure 1-21. Remove protective cap and install end of plastic tubing over front caliper bleeder valve; place other end in a clean container.
3. See Figure 1-22. Rotate the handlebars for access and remove the two fasteners from the reservoir cover and remove the cover (1), stiffener (2) and diaphragm (3).

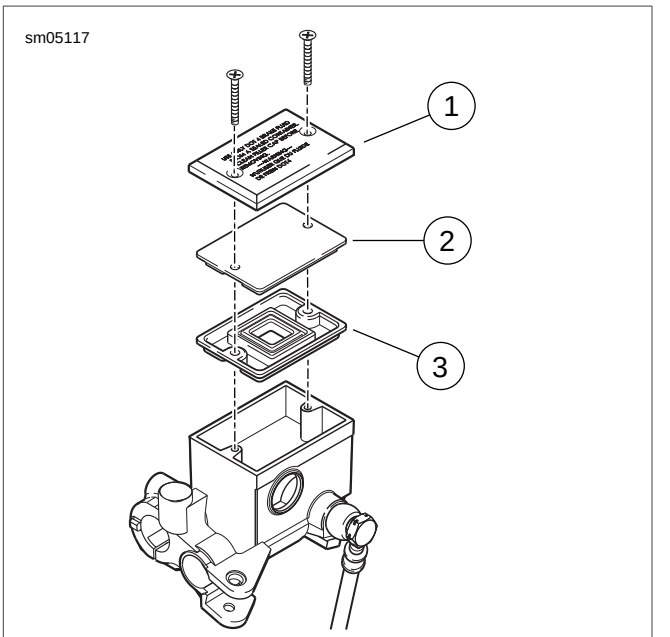
*NOTE*

*Do not reuse brake fluid.*

4. Repeat the following steps until all air bubbles are purged and brake fluid flows from the plastic tubing.
   a. Add D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) to reservoir. Raise fluid level above LOWER line on front of reservoir.
   b. Slowly squeeze and release brake lever several times to build up hydraulic pressure, then squeeze or apply pressure to brake lever.
   c. Open bleeder valve about 1/2-turn counterclockwise. Brake fluid will flow from bleeder valve and through tubing into container.
   d. When brake lever has moved 1/2 to 3/4 of its range of travel, close bleeder valve (clockwise).
5. Tighten front caliper bleeder valve (metric) to 3.9-6.9 Nm (35-63 **in-lbs**).
6. Verify fluid is above LOWER line when reservoir is level.
7. Check that brake lever feels firm. Repeat bleeding procedure as necessary.
8. Attach cover to reservoir and tighten fasteners to 1.0-1.5 Nm (9-13 **in-lbs**).
9. Remove plastic tubing from bleeder and install protective cap.
10. Remove protective cover from molded-in color surfaces, right handlebar switches and instrument panel.




**Figure 1-21. Front Caliper Bleeder Valve**




1. **Cover**
2. **Stiffener**
3. **Diaphragm**

**Figure 1-22. Brake Fluid Reservoir**

## Bleeding Rear Brake

*NOTE*

*Hydraulic brake fluid bladder-type pressure equipment can be used to fill the brake master cylinder through the bleeder valve if master cylinder reservoir cover is removed to prevent pressurization.*

1. See Figure 1-23. Remove rubber cap and install end of plastic tubing over rear caliper bleeder valve. Place other end of tubing in a clean container.

**CAUTION**

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

2. Remove seat.
3. See Figure 1-24. Unscrew cap from rear brake reservoir and remove the cap (1), stiffener (2) and diaphragm (3).

*NOTE*

*Do not reuse brake fluid.*

4. Repeat the following until all air bubbles are purged and only brake fluid flows from the plastic tubing.
   a. Add D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) to reservoir with motorcycle upright (not on sidestand). Bring fluid level between upper and lower marks on reservoir.
   b. Slowly press and release brake pedal several times to build up hydraulic pressure, then hold brake pedal in the depressed position.
   c. While pressing on brake pedal, open bleeder valve about 1/2-turn counterclockwise. Brake fluid will flow from bleeder valve and through tubing into clean container.
   d. When brake pedal has moved 1/2 to 3/4 of its full range of travel, close bleeder valve (clockwise). Allow brake pedal to return slowly to its released position.
5. Tighten rear caliper bleeder valve (metric) to 7.3-9.6 Nm (65-85 **in-lbs**) and replace rubber cap on valve.
6. Verify brake fluid level is between the upper and lower lines on the side of the reservoir.
7. Install diaphragm and stiffener and thread cap on reservoir. Tighten securely.
8. Check that the brake pedal feels firm when depressed. Repeat bleeding procedure as necessary.

**⚠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, if removed.

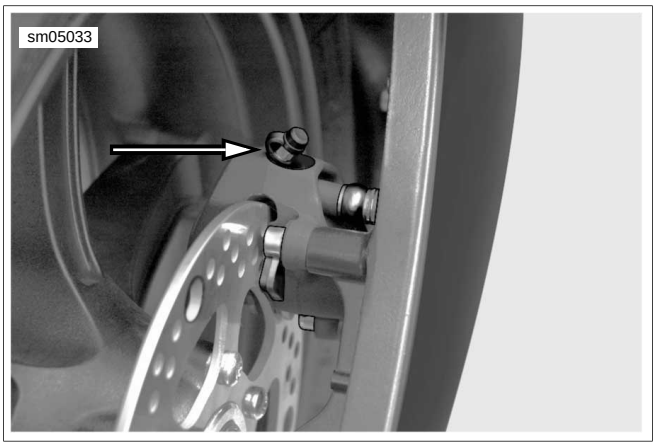
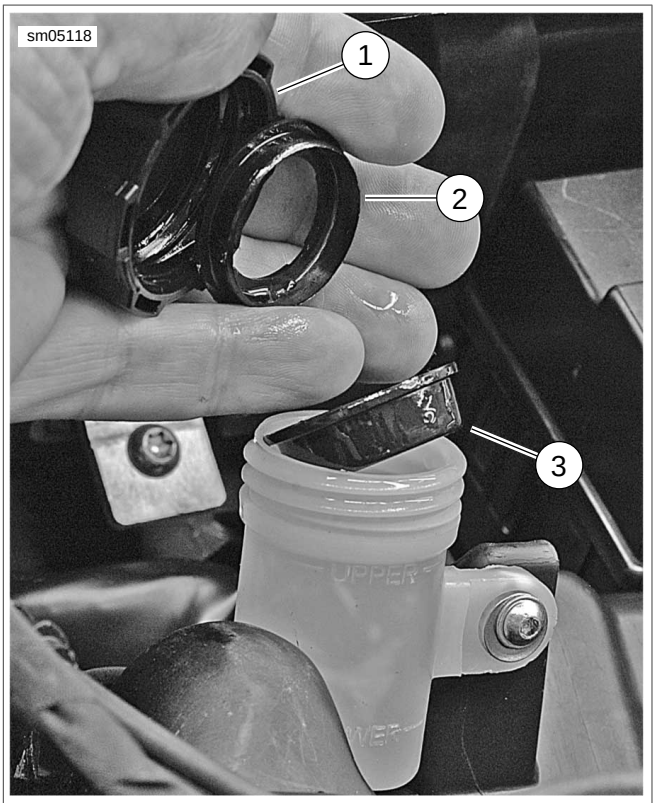



**Figure 1-23. Rear Brake Fluid Line Bleeder Valve**




1. **Cap**
2. **Stiffener**
3. **Diaphragm**

**Figure 1-24. Rear Brake Fluid Reservoir**

## BRAKE PEDAL ADJUSTMENT

**⚠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)**

*NOTES*

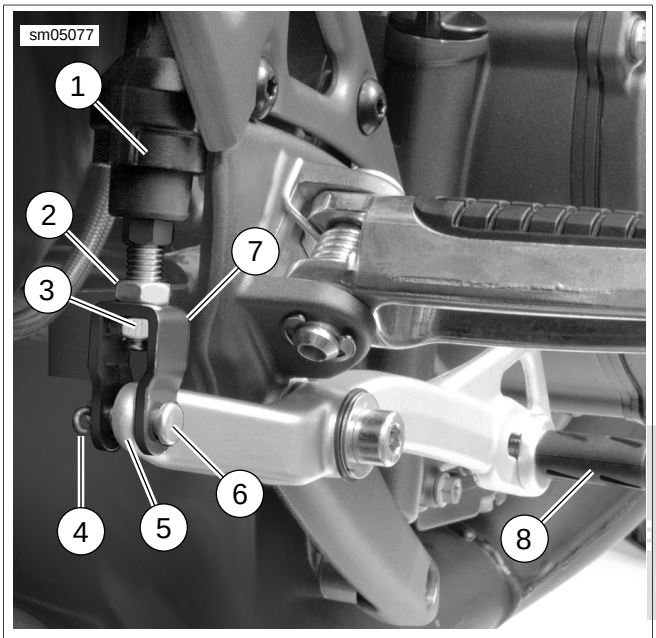
- *Check rear brake pedal operation before every ride.*
- *Brake pedal has no freeplay adjustment.*
- *See Figure 1-25. On the end of the threaded brake rod are an upper locknut (2) and lower locknut (3). To verify proper thread engagement with the clevis (7), the threads must extend below the lower locknut between 0.76-5.84 mm ( 0.030-0.230 in).*

**⚠WARNING**

**Threaded rod should not be adjusted to the point of contacting brake pedal. Improper adjustment could result in death or serious injury. (00559c)**

1. See Figure 1-26. Inspect for minimum and maximum brake rod engagement in brake clevis. Adjust as required.

2. Adjust brake pedal.
   a. See Figure 1-25. Loosen upper locknut (2). Move locknut away from top surface of clevis (7).
   b. Remove cotter pin (4) and clevis pin (6) from brake pedal (5).
   c. Rotate clevis until proper thread engagement is achieved.
   d. Install clevis pin through brake pedal and clevis.
   e. Install **new** cotter pin through clevis pin.
   f. Tighten upper locknut to 14.7-19.6 Nm (11-15 ft-lbs).




1. **Bottom of master cylinder**
2. **Upper locknut**
3. **Lower locknut**
4. **Cotter pin**
5. **Brake pedal**
6. **Clevis pin**
7. **Clevis**
8. **Footpeg**

**Figure 1-25. Pedal Adjustment**

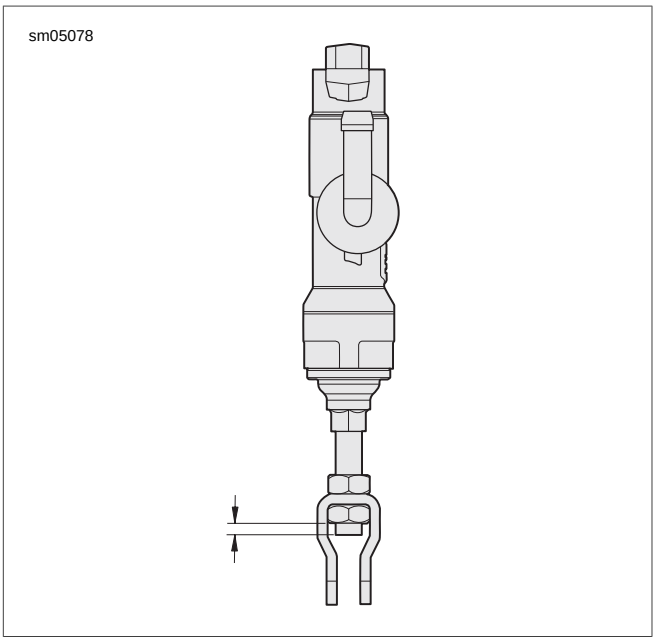



**Figure 1-26. 0.76-5.84 mm (0.030-0.230 in) Thread Extension**

## BRAKE PAD THICKNESS

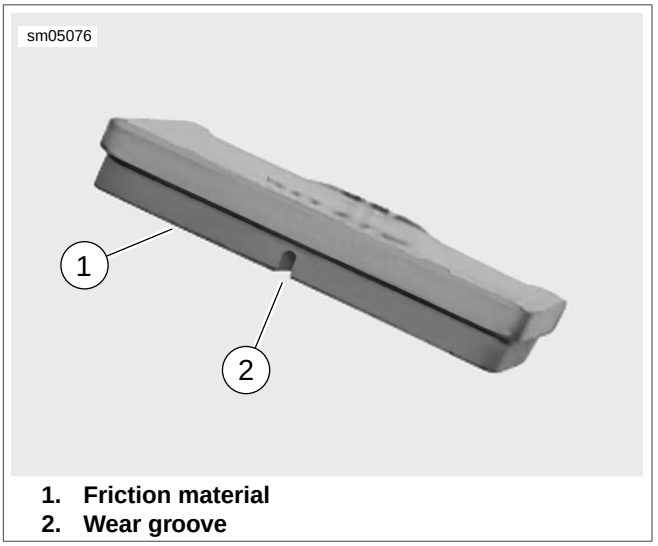
**WARNING**

**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 1-27. Inspect both front and rear brake pads for wear and damage. If the friction material (1) of a pad is worn past the wear groove (2) or if a pad is damaged, replace both pads as a set. Refer to Table 1-8.

**Table 1-8. Brake Pad Wear: 1125R**

| SERVICE | mm | in |
|---|---|---|
| Minimum pad thickness | 1.0 | 0.040 |




1. **Friction material**
2. **Wear groove**

**Figure 1-27. Brake Pad**

## BRAKE ROTOR THICKNESS

**⚠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)**

See Figure 1-28 and Figure 1-29. Inspect and measure both front and rear brake rotors for minimum thickness:

1. Inspect rotor. Replace rotor if warped or badly scored.
2. Measure rotor thickness. Replace rotor if minimum thickness is less than 4.5 mm (0.18 in). See 2.6 WHEELS.




**Figure 1-28. Front Brake Rotor**

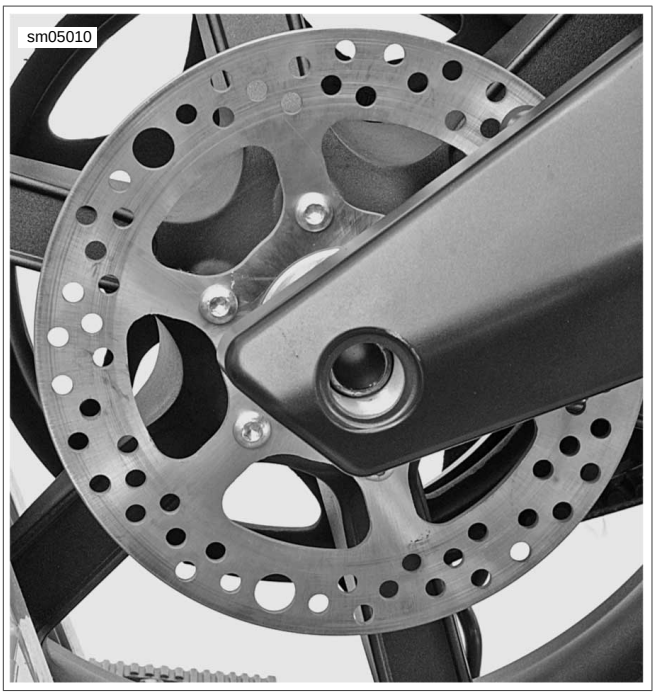



**Figure 1-29. Rear Brake Rotor**

## BRAKE PAD REPLACEMENT

### Front Pad Removal

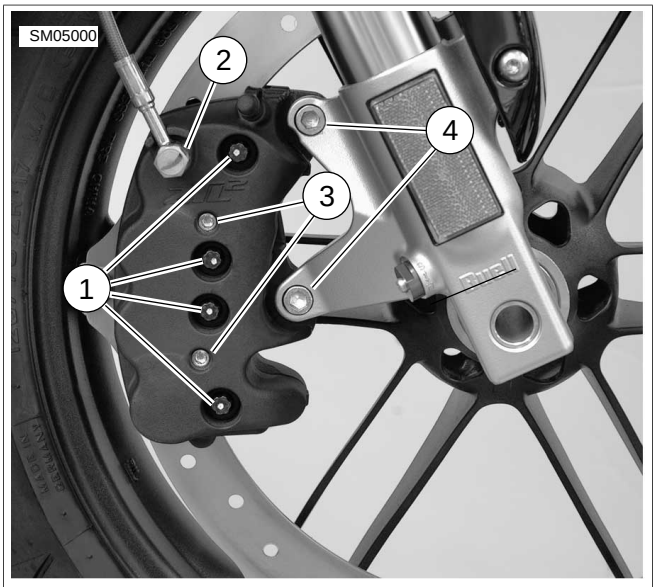
*NOTES*

- *Vehicle should be placed onto the lift with rear tire in the wheel vise in order to successfully perform this procedure.*
- *Support engine with a wide scissors jack and secure rear of vehicle to lift with tie-down straps.*
- *Raise front wheel to achieve neutral suspension load.*
- *Place masking tape on front wheel surface in order to prevent cosmetic damage when caliper is removed.*
- *It will not be necessary to disconnect the brake line from the front caliper for pad replacement.*

1. Remove the front master cylinder reservoir cap.

*NOTES*

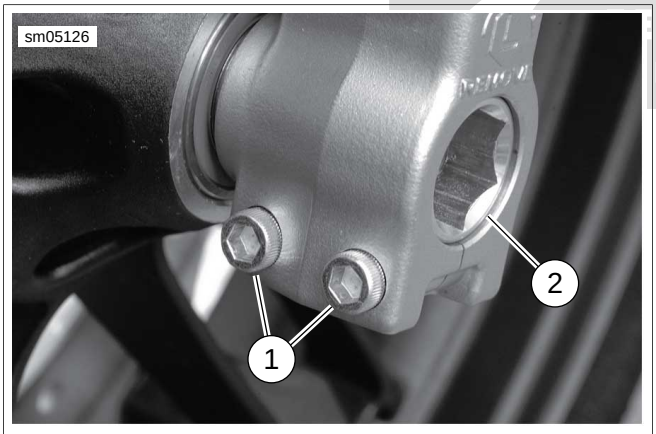
- *To verify proper brake pad-to-brake rotor clearance when the caliper is installed, pistons must be pressed all the way into bore whenever **new** brake pads are used.*
- *As the pistons are pushed back into the caliper, fluid level may rise more than 3.2 mm (1/8 in) and overflow the reservoir. Watch the fluid level as the pistons are retracted and remove fluid from the reservoir if necessary.*




1. **Caliper fasteners (4)**
2. **Banjo bolt**
3. **Pin hangers (2)**
4. **Caliper mounting fasteners (2)**

**Figure 1-30. Front Brake Caliper**

2. See Figure 1-30. Loosen caliper mounting fasteners (4) but do not remove.
3. Loosen pin hangers (3) but do not remove.




1. **Front axle pinch fasteners (2)**
2. **Front axle (left hand thread)**

**Figure 1-31. Front Wheel Mounting**

4. See Figure 1-31. Loosen front axle pinch fasteners (1).

*NOTES*

- *The front axle threads are left handed. There is an icon cast into the front fork indicating thread direction.*
- *Prior to removing axle, rotate wheel so that two spokes of the front wheel line up approximately with the reliefs cast into the back of the brake caliper.*

5. Remove right side fasteners and washers securing fender to front fork.
6. Loosen and remove front axle (2).

*NOTE*

*Before removing front brake caliper, verify that the reliefs in the rear of the caliper align with wheel spokes.*

7. Using scissors jack, raise the vehicle until the front wheel can be moved to allow right fork lower to be turned counter clockwise in order to slide the caliper from rotor and remove.
8. See Figure 1-30. Remove both caliper mounting fasteners (4) that secure caliper to fork lower.
9. Before removing brake pads push caliper pistons in with suitable tool until fully seated in bore.
10. Remove both pin hangers (3) from caliper.
11. Turn bottom of caliper in order to access brake pads.
12. Now that pin hangers have been removed, slide the brake pads out and away from caliper.

## Front Pad Installation

1. Install the **new** brake pads and pin hangers one set at a time. Place an object approximately 1/4 inch thick between the pads in order to maintain their alignment on the pad springs while installing the pin hangers. Leave the pin hangers loose.

*NOTE*

*Press inward on the brake pads to overcome the pad springs when installing the pin hangers making sure pins engage holes on both pads.*

2. Position wheel for installation.
3. Slide the caliper over the rotor and up to the mount and install caliper on caliper mount. Apply LOCTITE 271 (red) to mounting fasteners (4), install and leave loose.

*NOTE*

*The front axle threads are left handed.*

4. See Figure 1-31. Install front axle (2).
   a. Apply LOCTITE ANTI-SEIZE LUBRICANT to axle.
   b. With front wheel in place and pinch fasteners (1) loose. Insert threaded end of axle (2) through left side fork, wheel hub and thread into right fork.
   c. Tighten the axle (2) to 53-56 Nm (39-41 ft-lbs ).
   d. Tighten the front axle pinch fasteners (1) to 27-30 Nm (20-22 ft-lbs).
5. Install right side fasteners and washers securing fender to front fork and tighten to 8.4-9.2 Nm (74-82 **in-lbs**).
6. Remove scissors jack.
7. See Figure 1-30. Tighten caliper mounting fasteners (4) to 48-50 Nm (35-37 ft-lbs).
8. Tighten pin hangers (3) to 14.7-19.6 Nm (11-15 ft-lbs).
9. Slowly pump brake hand lever to move pistons out until they contact both brake pads. Verify piston location against pads. If the front wheel is off the ground, rotate wheel to check for excessive brake pad drag.

10. Check brake fluid level and install front master cylinder reservoir cap and tighten screws to 1.0-1.5 Nm (9-13 **in-lbs**).

*NOTE*

*Avoid making hard stops for the first 322 km (200 mi) to allow **new** brake pads to "wear in" properly with the rotor.*

## Rear Pad Removal

*NOTES*

- *See Figure 1-34 and Figure 1-35. On the rear brake caliper, the brake pads have a hole in the backing plate (1) that fits on a lug on the back of the piston. There is an area manufactured onto the brake pad backing plate that allows a brake pad retaining spring (2) to lock into the backing plate. The brake pad fits onto a lug on the back of the caliper piston and locks into the retaining spring.*
- *For pad replacement the brake caliper needs to be removed from the vehicle but the brake line does not need to be disconnected.*

1. See Figure 1-36. Remove rear master cylinder reservoir cover.

*NOTES*

- *To verify proper brake pad-to-brake rotor clearance when the caliper is installed, pistons must be pressed all the way into bore whenever **new** brake pads are used.*
- *As the pistons are pushed back into the caliper, fluid level may rise more than 3.2 mm (1/8 in) and overflow the reservoir. Watch the fluid level as the pistons are retracted and remove fluid from the reservoir if necessary.*

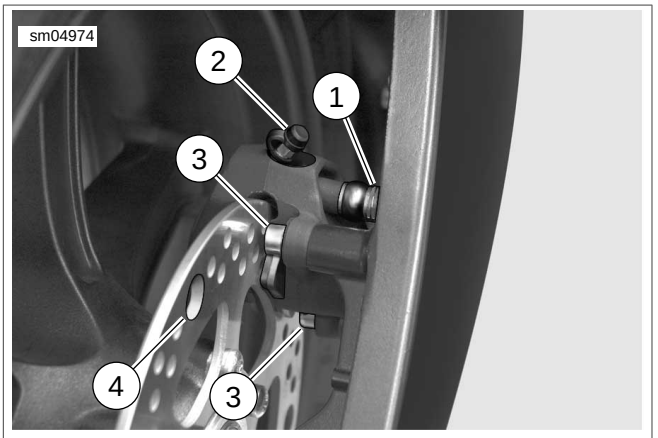



**Figure 1-32. Rear Brake Line P-clamp**

*NOTE*

*In order to remove the P-clamp securing the brake line to the swingarm, closest to the axle, it will be necessary to modify an hex key to avoid contact with rear wheel and tire.*

2. See Figure 1-32. Remove the rear P-clamp (closest to the rear axle) securing the brake line to the swingarm.




1. **Banjo bolt**
2. **Brake bleeder w/ cap**
3. **Caliper mounting fasteners (2)**
4. **Caliper mounting bolt access hole in brake rotor**

**Figure 1-33. Rear Brake Caliper**

*NOTE*

*To access the rear caliper mounting fasteners, raise the rear wheel off the lift.*

3. See Figure 1-33. Rotate the rear wheel until one of the three large holes (4) in the brake disc lines up with one of the caliper mounting fasteners (3).
4. Remove two mounting fasteners (3) securing brake caliper to the inside of the swingarm.
5. Remove caliper from rotor.
6. Before removing brake pads push caliper pistons in with suitable tool until fully seated in bore.
7. Once caliper has been removed from the vehicle, turn the caliper upside down to remove the brake pads.
8. See Figure 1-37. To remove the brake pad, push the pad away from the piston and up on the bottom of the pad releasing it from the spring clip. Then slide it out through the bottom of the caliper.

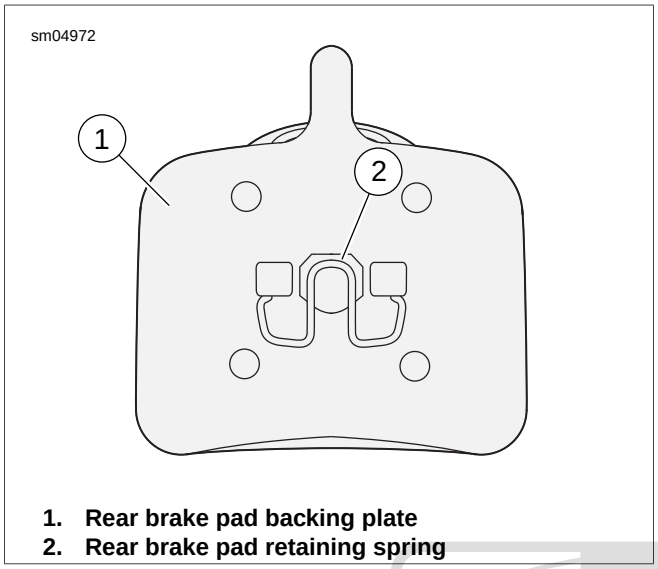
## Rear Pad Installation

1. See Figure 1-34. Check to verify that the retaining spring (2) is installed properly on the brake pad backing plate (1).
2. Install **new** inner and outer brake pads the same way they were removed and fit the retaining spring onto the lug on the back of the piston.
3. Pushing down on the brake pad from the top to lock the brake pad onto the piston via the retaining spring.
4. Install brake caliper on rotor.
5. See Figure 1-33. Install two mounting fasteners (3) through brake disc into swingarm and tighten to 24-27 Nm (18-20 ft-lbs).
6. See Figure 1-32. Install fasteners securing P-clamps and brake line assembly to swingarm and tighten to 9.7-11.0 Nm (84-96 **in-lbs**).

7. Slowly pump brake pedal to move pistons out until they contact both brake pads. Verify piston location against pads.
8. Check brake fluid level and install master cylinder reservoir cap and tighten cap securely.

*NOTE*

*Avoid making hard stops for the first 322 km (200 mi) to allow **new** brake pads to "wear in" properly with the rotor.*




1. **Rear brake pad backing plate**
2. **Rear brake pad retaining spring**

**Figure 1-34. Rear Brake Pad Retaining Spring**

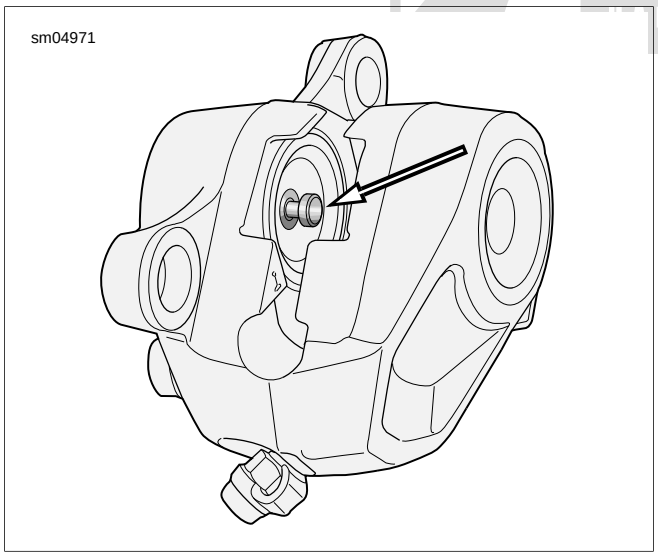



**Figure 1-35. Rear Caliper Piston Lug for Pad Retaining Spring**

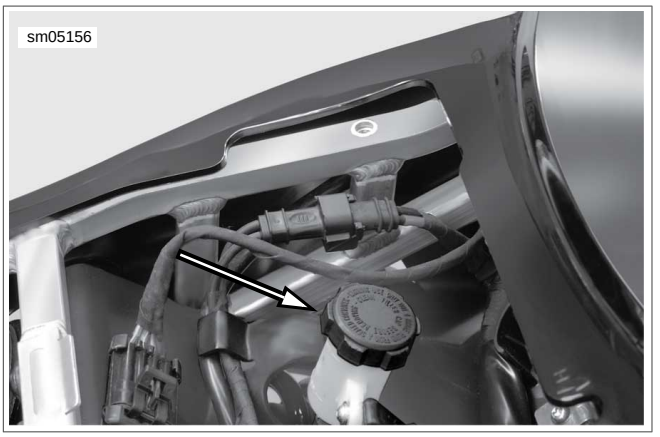



**Figure 1-36. Rear Master Cylinder Reservoir**




**Figure 1-37. Bottom View of Rear Caliper and Brake Pads**

# SPARK PLUGS 1.12

## SPARK PLUG CLEAN

### Automatic

Starting the engine without running it up to operating temperature can foul the spark plugs. To execute a spark plug clean, the ECM rapidly fires the spark plug up to three times without enabling a start.

The ECM records the number of starts without running up to operating temperature. After five starts without running up to operating temperature, the ECM will automatically execute a spark plug clean before starting the engine.

### Manual

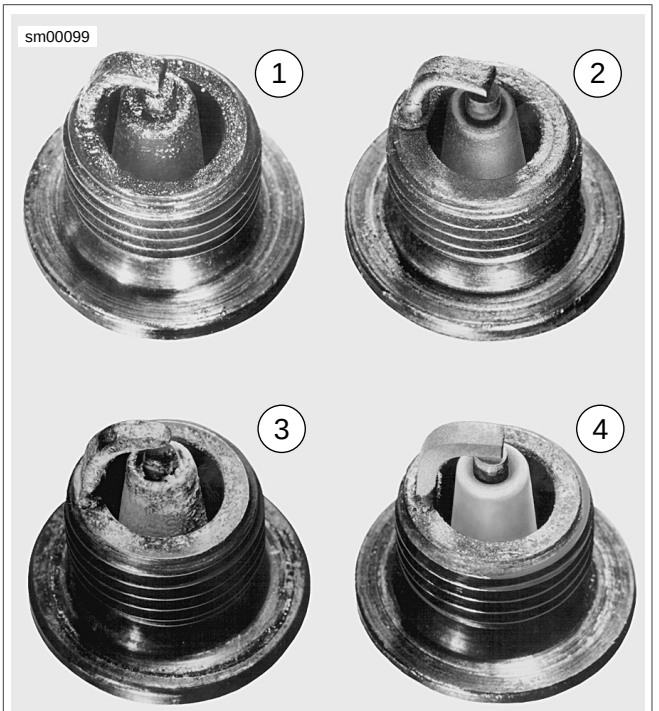
If fouled plugs are suspected, a spark plug clean can be initiated manually. Repeat the following sequence three times:

1. Roll and hold the throttle wide open.
2. Turn the ignition to ON.
3. Wait three seconds.
4. Release the throttle grip.
5. Turn the ignition to OFF.

## PLUG DEPOSITS

See Figure 1-38. Compare your observations of the plug deposits with the descriptions below:

1. A plug with a white, yellow, tan or rusty brown powdery deposit indicates balanced combustion.
2. A wet, black and shiny deposit on plug base, electrodes and ceramic insulator tip indicates an oil fouled plug. The condition may be caused by the following: worn pistons, worn piston rings, worn valves, worn valve guides, worn valve seals, a weak battery or a faulty ignition system.
3. A dry, fluffy or sooty black deposit indicates an air-fuel mixture that is too rich and/or engine idling for excessive periods.
4. A light brown, glassy deposit indicates an overheated plug. This condition may be accompanied by cracks in the insulator or by erosion of the electrodes and is caused by an air-fuel mixture that is too lean, a hot-running engine, valves not seating or improper ignition timing. The glassy deposit on the spark plug is a conductor when hot and may cause high-speed misfiring. A plug with eroded electrodes, heavy deposits or a cracked insulator must be replaced.




1. **Oil-fouled**
2. **Sooty black deposits**
3. **Overheated**
4. **Balanced combustion**

**Figure 1-38. Typical Spark Plug Deposits**

## REPLACEMENT

### Removal

1. See Figure 1-39. To access the rear spark plug, remove the air cleaner baseplate.
2. See Figure 1-40. To access the front spark plug, rotate the engine. See 3.4 ENGINE ROTATION.
3. See Figure 1-41. Lift the latch (1) on the connectors to the coils and separate the socket housings from the coils.
4. Remove the coil fasteners (2).
5. Pull the coils straight up and out of the cylinder head.
6. Using a socket and extension, remove the spark plugs.




**Figure 1-39. Rear Spark Plug Location**

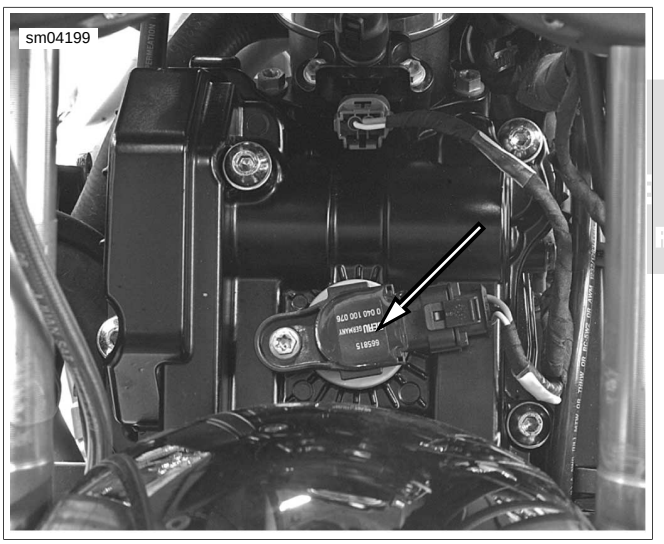
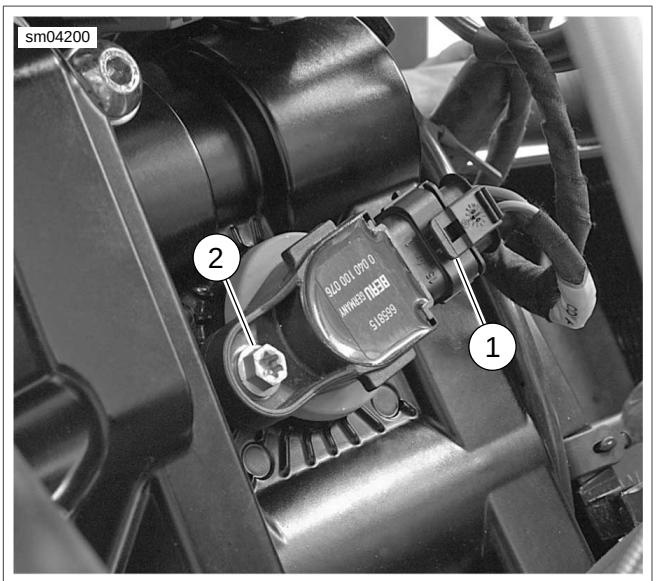



**Figure 1-40. Front Spark Plug Location (engine rotated)**




1. **Connector latch**
2. **Fastener**

**Figure 1-41. Spark Plug Coil**

## Installation

*NOTES*

- *Use only NGK CR9EKB spark plugs.*
- *When checking spark plug gap, **both** electrodes of each plug must be measured.*

1. See Figure 1-42. Measure electrode gap with a wire-type feeler gauge.
2. If necessary adjust the electrodes to specification. Refer to Table 1-9.
3. Start spark plug threads with a 3/8 inch fuel hose. Do not cross thread the spark plug.
4. Tighten spark plugs to 11 Nm (97 **in-lbs**).
5. Lubricate the coil seals with CCI Number 20 Brake Grease (Part No. 42830-05).
6. Push the coils down over the top of the spark plugs until they click into place.
7. Install and tighten fasteners to 12 Nm (106 **in-lbs**).
8. Rotate the engine up. See 3.4 ENGINE ROTATION.

**Table 1-9. Spark Plug Gap Specifications**

| SPARK PLUG | mm | in |
|---|---|---|
| NGK CR9EKB | 0.7-0.9* | 0.027-0.035* |
| * Maximum wear limit: 1.1 mm (0.0433 in). | | |

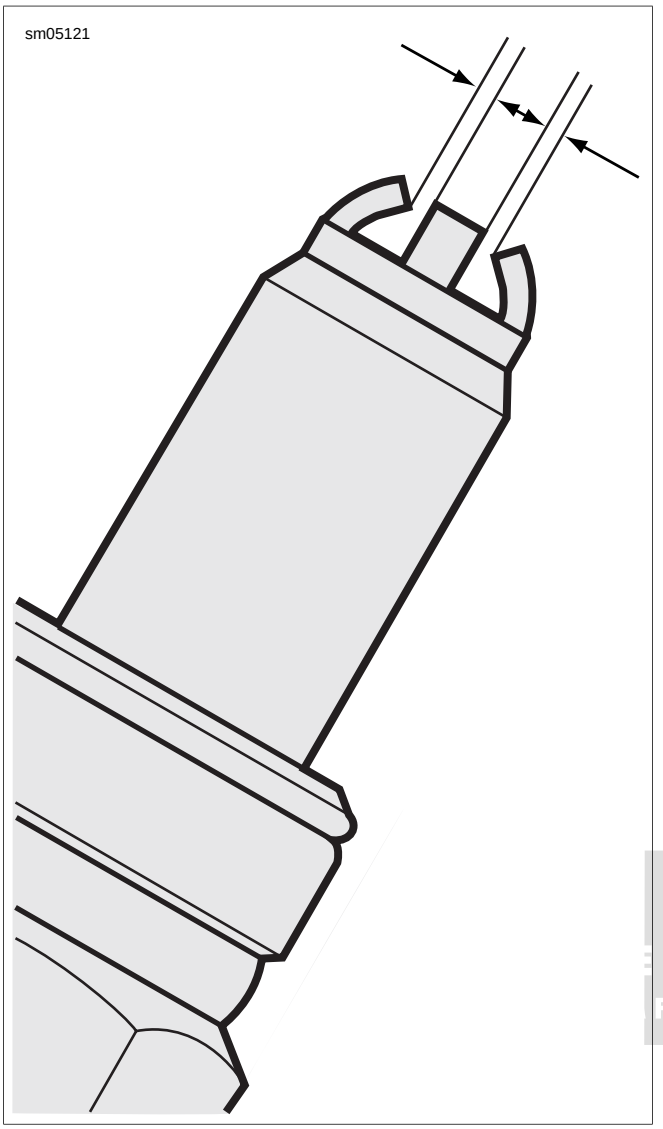



**Figure 1-42. Spark Plug Gap**

## 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)**

1. If replacement plugs are not available, clean the spark plug:
   a. Degrease firing end using ELECTRICAL CONTACT CLEANER.
   b. Dry plug with compressed air.
   c. Flatten spark plug electrodes with a thin file.

*NOTE*

*A spark plug with sharp edges on its electrodes requires 25-40% less firing voltage than one with rounded edges.*

2. Check electrode gap with a wire-type feeler gauge. Gap should be 0.7-0.9 mm (0.027-0.035 in) between the anode and each electrode.

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# HEADLAMP 1.13

## HEADLAMP ALIGNMENT

**WARNING**

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

*NOTE*

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

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

*NOTE*

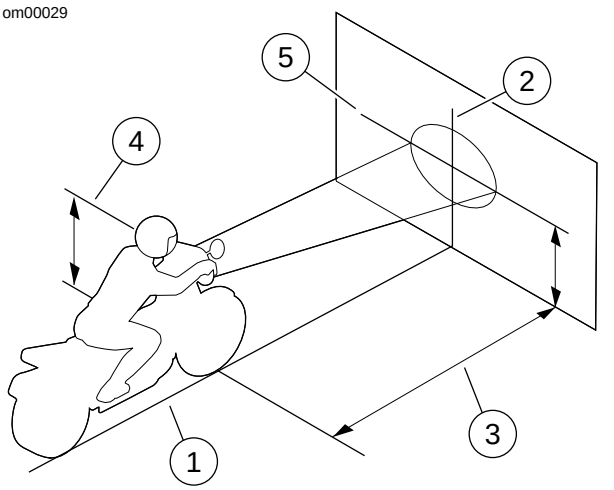
*See Figure 1-43. To aid in properly placing the motorcycle, a perpendicular line (1) can be drawn on the floor. For best results, choose an area with minimum light.*

3. See Figure 1-43. Draw a vertical line (2) on the wall.
4. Position motorcycle so that front axle is 7.6 meters (25 feet) from wall.

*NOTE*

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

5. With the vehicle laden and upright, point the front wheel straight forward at wall and measure the distance (4) from the floor to the center of the HIGH BEAM bulb.
6. Draw a horizontal line (5) through the vertical line on the wall that is 53.3 mm (2.1 in.) lower than the measured bulb centerline.




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

**Figure 1-43. Checking Headlamp Alignment**

*NOTE*

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

7. See Figure 1-43. Verify headlamp alignment. Turn the ignition switch to IGNITION and set the headlamp switch to HIGH beam.
   a. The center of the hot spot (brightest area of light beam) should be centered where the two lines intersect.
   b. Adjust headlamp alignment if necessary.

## HEADLAMP ADJUSTMENT: 1125 MODELS

### Horizontal Adjustment

Horizontal adjusters are located behind the fairing/headlamp assembly.

### Vertical Adjustment (1125R)

See Figure 1-44. For 1125R, vertical headlamp adjusters are located on the left and right headlamp assemblies.

- To lower beam, turn adjuster clockwise.
- To raise beam, turn adjuster counterclockwise.




**Figure 1-44. Vertical Headlamp Adjustment Screw: 1125R**




**Figure 1-45. Vertical Headlamp Adjustment Screw: 1125CR**

## Vertical Adjustment (1125CR)

See Figure 1-45. For 1125CR, a vertical headlamp adjuster is located in the bottom of the headlamp assembly.

- To lower beam, turn adjuster counterclockwise.
- To raise beam, turn adjuster clockwise.

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# BATTERY MAINTENANCE 1.14

## GENERAL

**⚠WARNING**

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

**⚠WARNING**

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

**⚠WARNING**

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

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

*NOTE*

*For charging information, see 1.14 BATTERY MAINTENANCE, Charging Battery. For testing information, see the electrical diagnostic manual.*

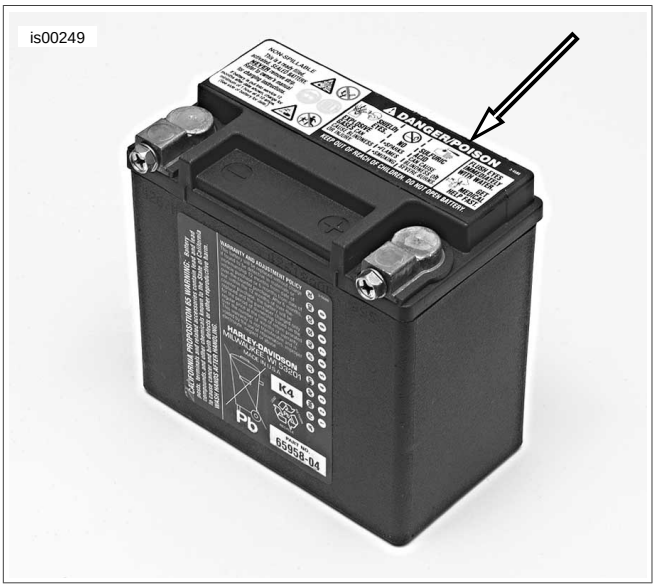
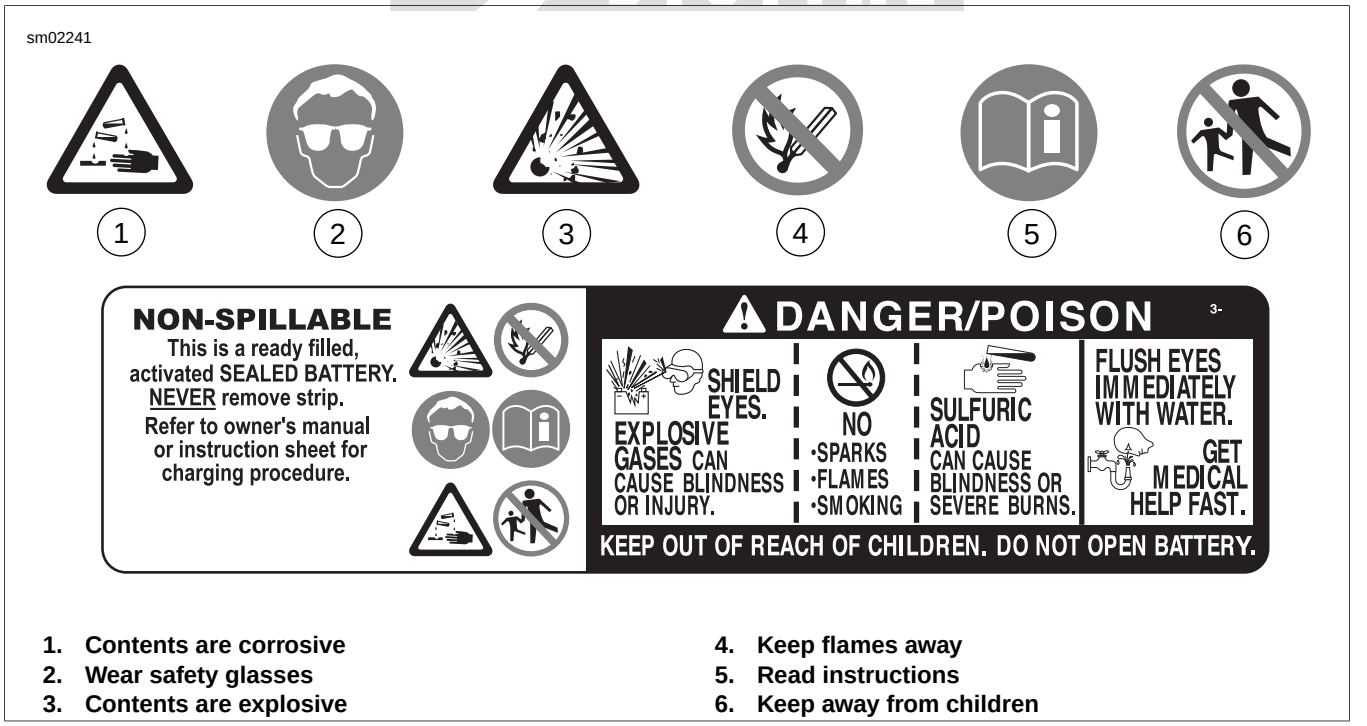



**Figure 1-46. AGM Battery with Warning Label**




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

**Figure 1-47. Battery Warning label**

**Table 1-10. Antidotes for Battery Acid**

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

## CLEANING AND INSPECTION

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

## 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

Refer to Table 1-11. The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is in a 100% fully charged condition. If the open circuit (disconnected) voltage reading is below 12.6V, charge the battery and then recheck the voltage after the battery has set for one to two hours. If the voltage reading is 12.7V or above, perform a load test. See the electrical diagnostic manual for the load test procedure.

**Table 1-11. Voltmeter Test For Battery Charge Conditions**

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

## CHARGING BATTERY

### Safety Precautions

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

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

### Using a Battery Charger

Charge the battery if any of the following conditions exist:

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

**WARNING**

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

**CAUTION**

**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)**

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

*NOTE*

*The figures listed in the table assume that the battery is charging at room temperature. If warmer than room temperature, use a slightly shorter charging time. If colder, use a slightly longer charging time.*

**Table 1-12. Battery Charging Rates/Times (Approximate)**

| BATTERY AMP HOUR | STATE OF CHARGE | | 3 AMP CHARGER | 6 AMP CHARGER | 10 AMP CHARGER | 20 AMP CHARGER |
|---|---|---|---|---|---|---|
| | VOLTAGE | % OF CHARGE | | | | |
| 19 | 12.7 | 100% | - | - | - | - |
| | 12.6 | 75% | 1.75 hours | 50 minutes | 30 minutes | 15 minutes |
| | 12.3 | 50% | 3.5 hours | 1.75 hours | 1 hour | 30 minutes |
| | 12.0 | 25% | 5 hours | 2.5 hours | 1.5 hours | 45 minutes |
| | 11.8 | 0% | 6 hours, 40 minutes | 3 hours, 20 minutes | 2 hours | 1 hour |

*NOTE*

*The use of constant current chargers to charge sealed maintenance-free batteries is not recommended. Any overcharge will cause dry-out and premature battery failure. If a constant current charger is the only type available, do **not** exceed the charge times listed above and do **not** continue charging the battery if it gets hot. When charging, never exceed 15 volts for more than 30 minutes.*

**⚠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)**

**CAUTION**

**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 of the battery.
3. Connect 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.*

4. Step away from the battery and turn on the charger. See the charging instructions in Table 1-12.

**⚠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)**

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

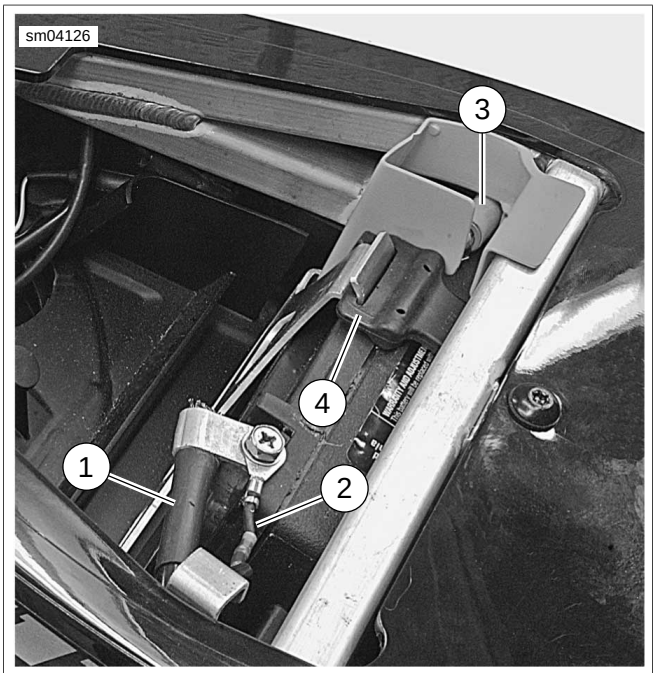
## DISCONNECTION AND REMOVAL

1. Remove the pillion.
2. Remove the seat.

**⚠WARNING**

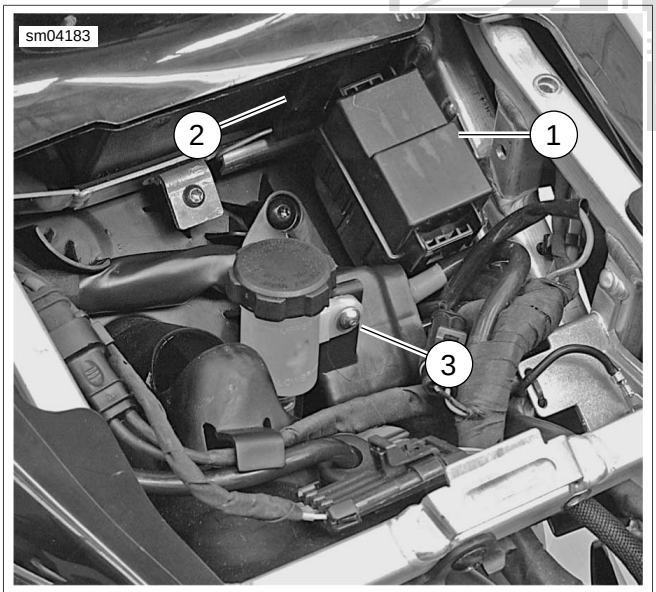
**Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)**

3. See Figure 1-48. Unthread fastener and remove the black negative cable (1) and regulator lead (2) from the negative (-) battery terminal.
4. Unthread fastener and remove the red positive cable (3) from the positive (+) battery terminal.
5. Remove the tail section body.
6. Unhook strap (4).
7. See Figure 1-49. Release the latch holding the fuse block to the metal tab on the subframe.
8. Lift the battery out of its bracket.
9. Holding the fuse block out of the way, work the battery forward to exit the rider seat cavity.




1. Negative cable
2. Regulator lead
3. Positive cable
4. Battery strap

**Figure 1-48. Battery Terminals**




1. Fuse block
2. Battery strap
3. Rear brake fluid reservoir

**Figure 1-49. Component Clearance**

## STORAGE

| PART NUMBER | TOOL NAME |
|---|---|
| 94654-98 | SUPERSMART BATTERY TENDER |

**⚠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)**

**CAUTION**

**Do not allow battery to completely discharge. The electrolyte in a discharged battery will freeze. The more discharged a battery is, the more easily it can freeze and crack the battery case. (00218a)**

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

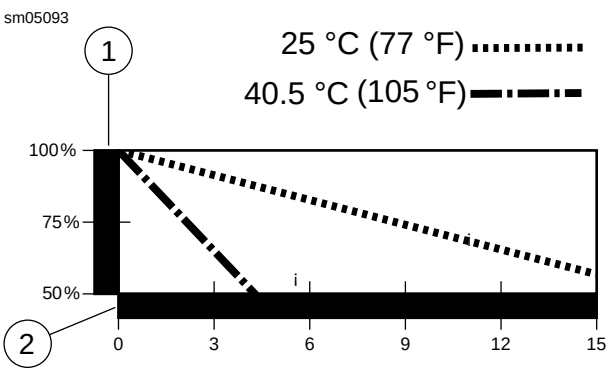
See Figure 1-50. Self-discharge is a normal condition and occurs continuously at a rate that depends on the ambient temperature and the battery's state of charge. Batteries discharge at a faster rate at higher ambient temperatures. To reduce the self-discharge rate, store battery in a cool (not freezing), dry place.

Charge the battery every month if stored at temperatures below 16 °C (60 °F). Charge the battery more frequently if stored in a warm area above 16 °C (60 °F).

*NOTE*

*The SUPERSMART BATTERY TENDER (Part No. 94654-98) may be used to maintain battery charge for extended periods of time without risk of overcharging or boiling.*

When returning a battery to service after storage, fully charge the battery.




1. Capacity
2. Months of stand

**Figure 1-50. Battery Self-Discharge Rate**

## INSTALLATION AND CONNECTION

1. See Figure 1-51. If removed, orient the positive terminal shield to the subframe rails and snap into place.
2. Verify that the positive cable is routed through the positive terminal shield.
3. Holding the fuse block out of the way, work the battery from the rider seat cavity into the bracket.
4. Hook the rubber strap ring onto the lip on the bracket.
5. Align and press the fuse block down over the tab until it snaps in place.
6. Thread the strap between the subframe rail and the battery and stretch over the hook.
7. Install the tail section body. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.

**CAUTION**

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

**WARNING**

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

**CAUTION**

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

8. Insert fastener through battery positive cable (red) into threaded hole of battery positive (+) terminal and tighten fastener to 6.8-7.9 Nm (60-70 **in-lbs**).
9. Insert fastener through the ring on the regulator lead and through the ring of the negative cable.
10. Thread the fastener into the battery negative (-) terminal and tighten to 6.8-7.9 Nm (60-70 **in-lbs**).
11. Apply a light coat of petroleum jelly or corrosion retardant material to both battery terminals.

**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 the seat.
13. Install the pillion.

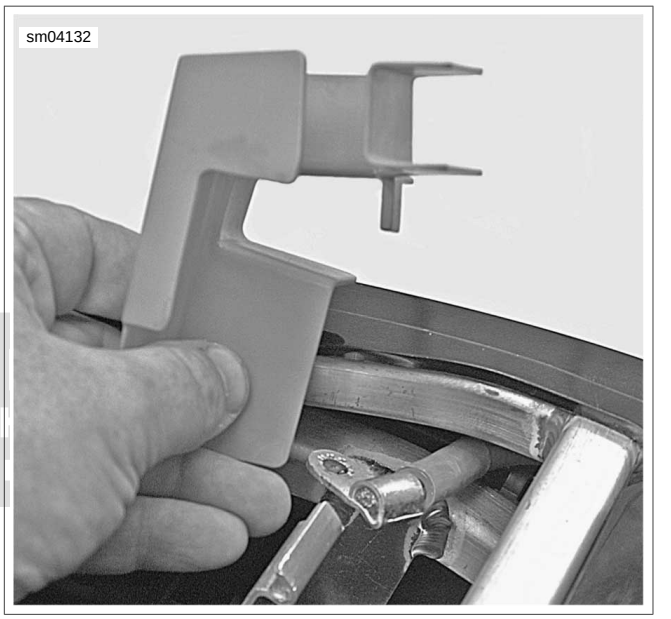



**Figure 1-51. Positive Terminal Shield**

## COOLANT LEVEL: BUELL 1125 MODELS

### Coolant Type

GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTI-FREEZE & COOLANT (Part No. 99822-02) provides protection to -36.7 °C (-34 °F). In climates where the temperature falls below -36.7 °C (-34 °F), consult a local Buell dealer for the proper mixture.

**CAUTION**

**Use only Genuine Harley-Davidson Extended Life Antifreeze and Coolant. Use of other coolants/mixtures may lead to engine damage. (00179b)**

If you find yourself in a location where Genuine Harley-Davidson Extended Life Antifreeze & Coolant is not available, you may use 50-50 mixture of de-ionized water and Ethylene Glycol-based Antifreeze.

**CAUTION**

**De-ionized water must be used with the antifreeze in the cooling system. Hard water can cause scale accumulation in water passages which reduces cooling system efficiency, leading to overheating and engine damage. (00195a)**

### Checking Level in Coolant Sight Gauge (Quick Check)

See Figure 1-52. A coolant sight gauge is located inside the right radiator cowling along its outer wall. The sight gauge shows whether the coolant level is near the COLD FULL line on the expansion tank.

With the coolant cool and the motorcycle on its sidestand, look inside the right radiator cowling. If fluid is visible in the sight gauge, the coolant level is at or above the COLD FULL line.

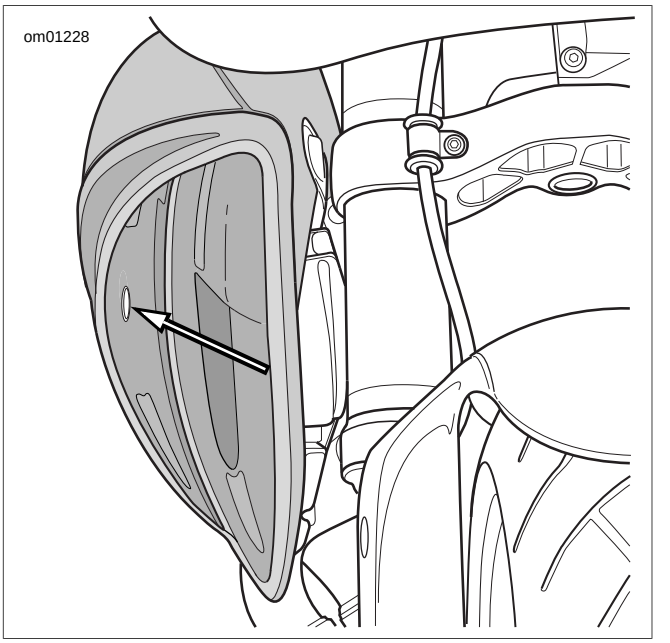



**Figure 1-52. Coolant Sight Gauge**

### Checking and Adding Coolant in Expansion Tank

1. See Figure 1-53. Remove six screws from the outer shroud of the right cowling. Remove the outer shroud.

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

**⚠CAUTION**

**At operating temperature, the radiator and oil cooler contain hot fluids. Contact with the radiator or oil cooler can result in minor or moderate burns. (00141a)**

2. See Figure 1-54. Check coolant level in expansion tank with coolant cold and motorcycle on its sidestand.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

*NOTE*

*Only fill coolant into expansion tank. Do NOT remove cap from the radiator. See a Buell dealer if additional cooling system service is required.*

3. If level is below COLD FULL line on tank, remove cap from expansion tank. Add HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT (Part No. 99822-02) until fluid level reaches the COLD FULL line.

*NOTE*

*Genuine Harley-Davidson Extended Life Antifreeze & Coolant is pre-diluted and ready to use full-strength. Do NOT add water.*

4. Replace the cap on the expansion tank.
5. Install outer shroud on right radiator cowling. Tighten six screws to 9.0-9.9 Nm (80-88 **in-lbs**).

*NOTE*

*If the coolant expansion tank is empty when the engine is cold, it is possible that air has been drawn into the cooling system. The system must be purged of any trapped air and refilled with coolant. See the service manual for instructions on the correct procedure.*

**CAUTION**

**Clean the inlet surface of the radiator regularly. Leaves and other debris can collect on the radiator surface and degrade radiator performance which could lead to engine overheating and engine damage. (00197c)**

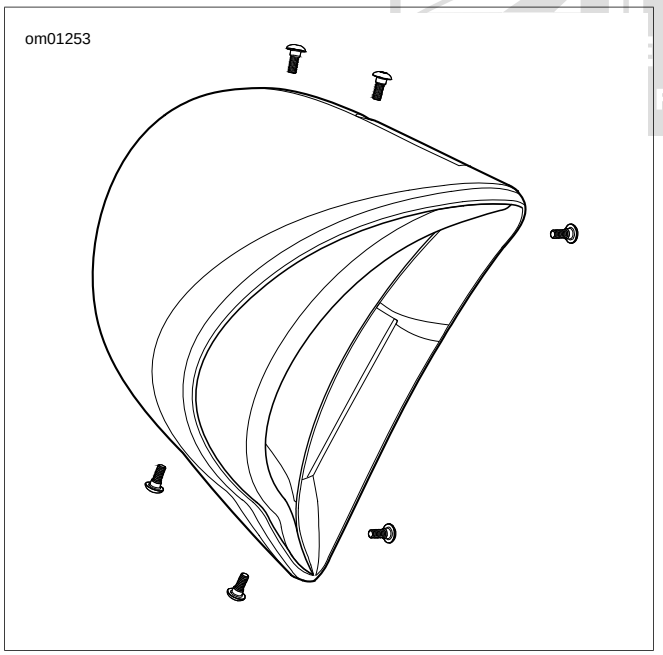
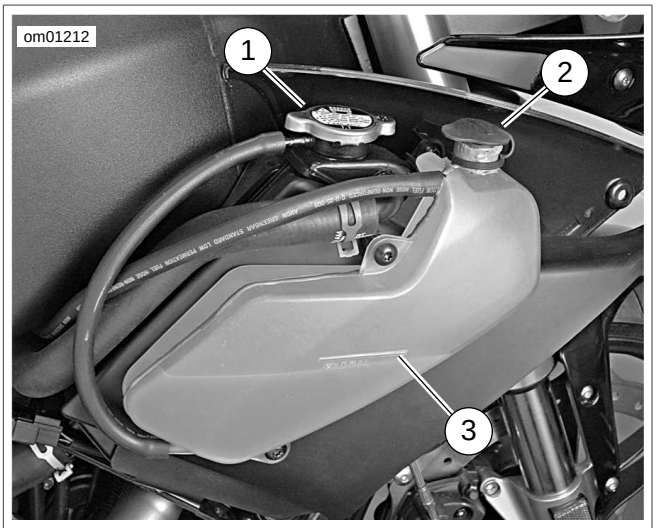



**Figure 1-53. Outer Shroud Fasteners**




1. **Radiator cap**
2. **Expansion tank filler cap**
3. **COLD FULL line**

**Figure 1-54. Coolant Expansion Tank**

## BLEEDING COOLANT

1. Allow the engine to cool.
2. See Figure 1-55. Remove the radiator cap and wrap the filler neck with a shop towel to contain spilled coolant.
3. Fill the filler neck with coolant. Use only GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT (Part No. 99822-02).

*NOTE*

*Reving the engine will draw more air into the system. If reved, shut off the engine and restart the bleeding.*

4. Start the engine and run at an idle.

*NOTE*

*To bleed air from the system, the thermostat must be open. The thermostat opens at 73.9 °C (165 °F).*

5. As air bubbles up through the filler neck add coolant to maintain the coolant level at the bottom of the filler neck.
6. Continue until no air bubbles are escaping the filler neck.
7. With the cap off, allow the engine to cool.
8. Top off the filler neck with coolant as necessary.
9. Install the filler cap.
10. Top off the overflow bottle.

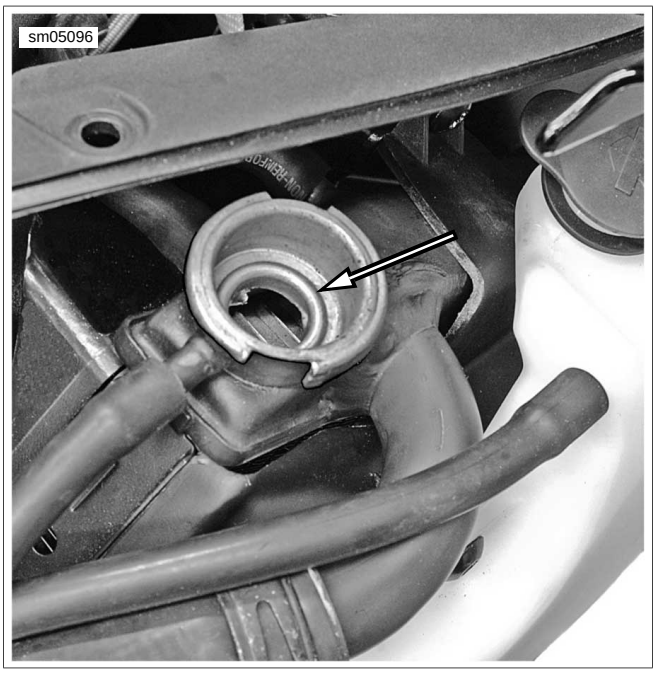



**Figure 1-55. Radiator Filler Neck**

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# VALVE CLEARANCE 1.16

## VALVE LASH

| PART NUMBER | TOOL NAME |
|---|---|
| B-49259 | VALVE LASH FEELER GAUGE |

## Lash Measurement

1. Rotate engine for service. See 3.4 ENGINE ROTATION.

*NOTE*

*Do not interchange the front and rear stick coils.*

2. Remove the front coil and spark plug. See 1.12 SPARK PLUGS.
3. Rotate the engine up to allow for rear cylinder valve lash inspection.
4. Remove the ignition cover sealing sleeve. See 3.11 ALTERNATOR SIDE, Sealing Sleeve.
5. Remove the rear valve cover fasteners and rear valve cover. See 3.8 CYLINDER HEADS.
6. Remove rear coil and spark plug. See 1.12 SPARK PLUGS.

*NOTES*

- *While turning engine, do not damage ignition cover.*
- *For a better fit on end of crankshaft, face end of socket so all flats of socket are flush with end.*
- *See Figure 1-56. Turn engine by rotating rotor fastener on end of crankshaft.*

7. Gauge valve lash.
   a. Turn engine in direction of rotation until lobes of either intake or exhaust cam are 180 degrees from valve stems.
   b. See Figure 1-57. Using the VALVE LASH FEELER GAUGE (Part No. B-49259) gauge the valve clearance by inserting feeler gauge (2) between cam follower (1) and adjustment shim (3). Gauge will determine if lash is within specifications.
   c. Turn engine until lobes of opposite cam are 180 degrees from valve stems.
8. Gauge lash of remaining rear cylinder valves.
9. Adjust lash as required.
10. Install rear valve cover. See 3.8 CYLINDER HEADS.
11. Rotate engine down to allow for access to front cylinder.
12. Remove front valve cover. See 3.8 CYLINDER HEADS.
13. Measure valve lash of all four valves.
14. Adjust lash as required.
15. Install front valve cover.
16. Install front spark plug and coil. See 1.12 SPARK PLUGS.
17. Rotate engine into position. See 3.4 ENGINE ROTATION.
18. Install rear spark plug and coil.
19. Install ignition cover sealing sleeve. See 3.11 ALTERNATOR SIDE, Sealing Sleeve.

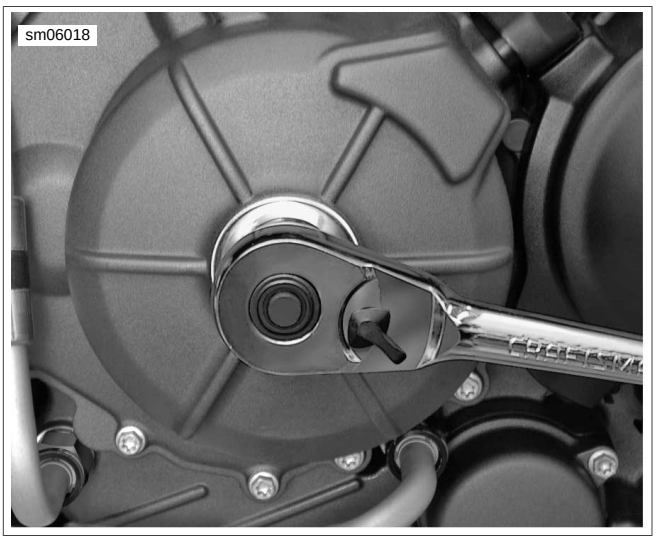
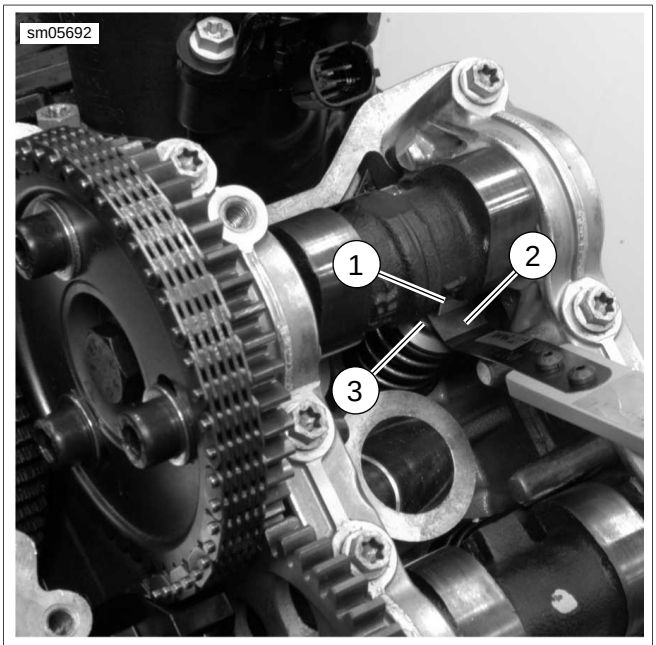



**Figure 1-56. Turning Engine**

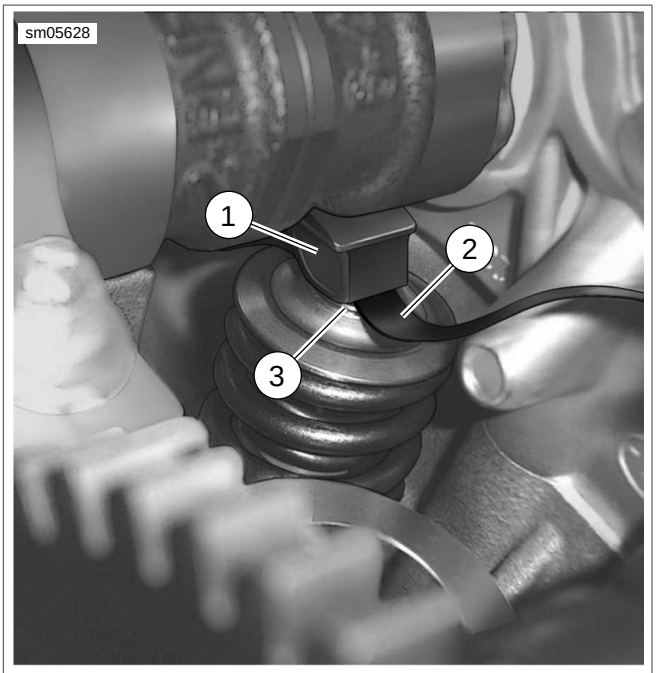
**Table 1-13. Valve Lash Specifications**

| ITEM | | mm | in |
|---|---|---|---|
| Intake | Max | 0.22 | 0.009 |
| | Min | 0.15 | 0.006 |
| Exhaust | Max | 0.34 | 0.013 |
| | Min | 0.27 | 0.010 |




1. **Cam follower**
2. **Feeler gauge**
3. **Shim**

**Figure 1-57. Gauging Valve Lash**




1. **Cam follower**
2. **Feeler gauge**
3. **Shim**

**Figure 1-58. Measuring Valve Lash**

## Lash Adjustment

1. See Figure 1-58. Use feeler gauge to determine valve lash measurement.

*NOTE*

*A valve lash calculation worksheet is provided in C.2 VALVE LASH CALCULATION WORKSHEET 1 to record the valve lash data. Use this sheet to determine the correct shim selection. Incorrect lash adjustment can cause serious engine damage.*

2. Copy the D.2 VALVE LASH CALCULATION WORKSHEET 1. in C.2 VALVE LASH CALCULATION WORKSHEET 1.
3. Adjust clearance if necessary by using proper shim.
4. Turn engine until lobes of opposite cam are 180 degrees from valve stems.
5. Remove plastic follower spacer.
   a. Intake: See Figure 1-59. Remove intake follower spacer.
   b. Exhaust: See Figure 1-60. Remove exhaust follower spacer.

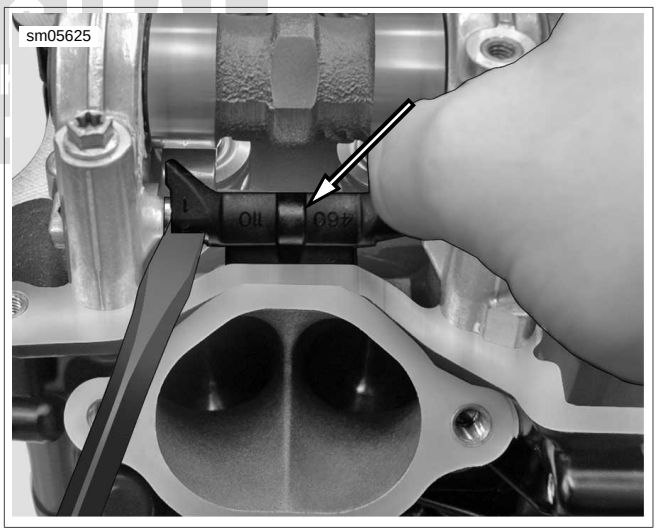



**Figure 1-59. Intake Follower Spacer Removal**

6. See Figure 1-61. Move cam follower (2) to the middle of cylinder head.
7. See Figure 1-62. Remove valve shim (2) using magnet (1).

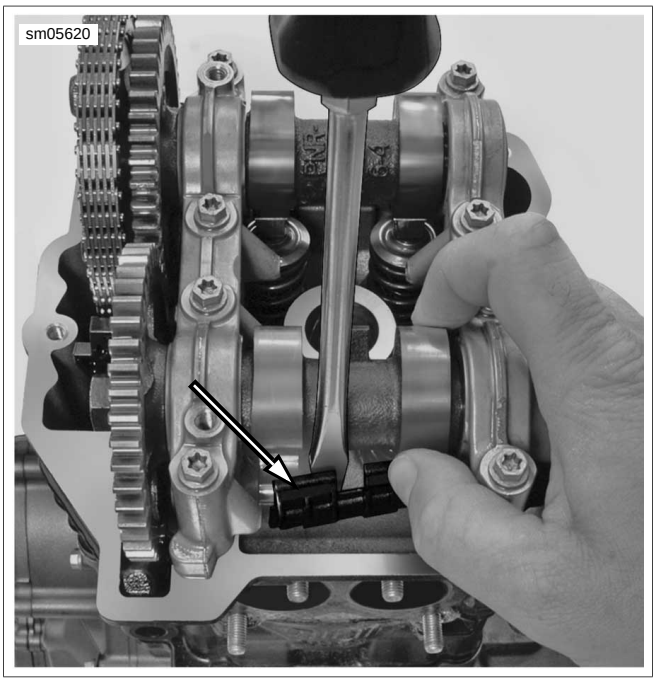
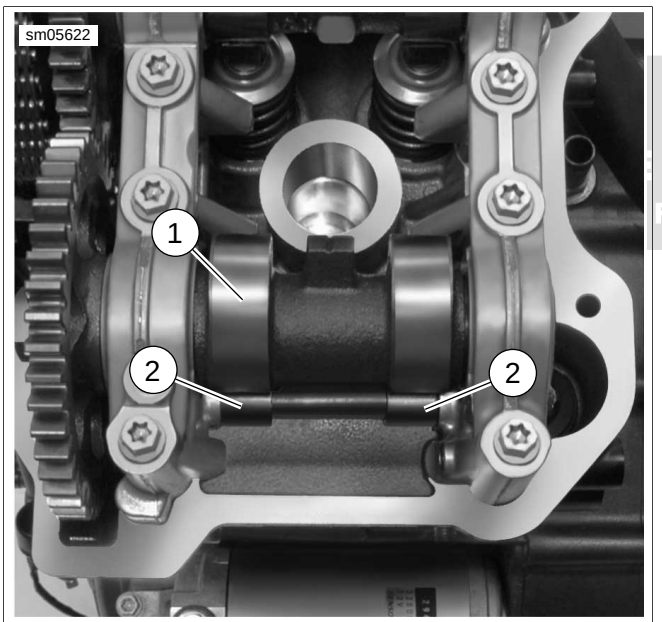


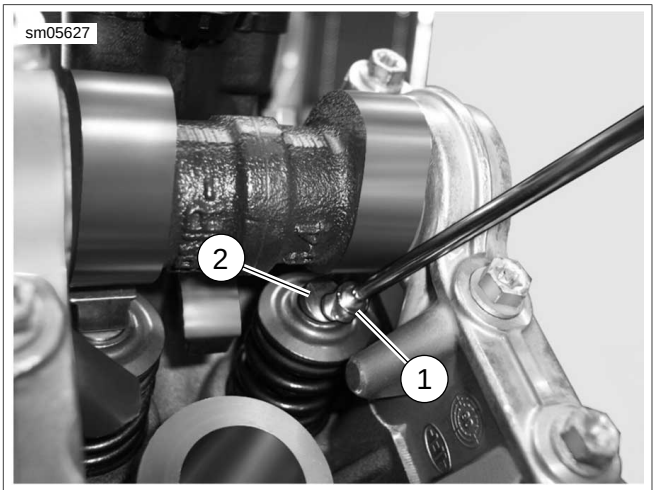

**Figure 1-60. Exhaust Follower Spacer Removal**




1. **Cam**
2. **Cam follower**

**Figure 1-61. Cam Followers**

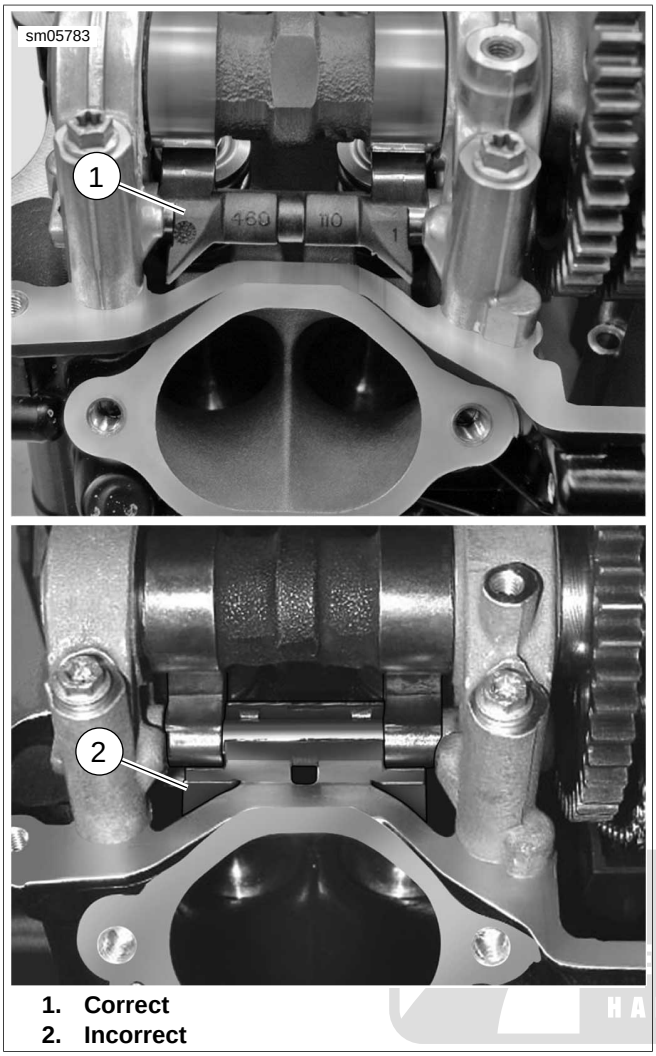
8. Measure a new shim with a micrometer to verify size.
9. Install shim with the stamped side facing down.
10. Move cam followers into position over shim.
11. Replace follower spacers.
    a. **Intake:** See Figure 1-63. Install intake follower spacer.
    b. **Exhaust:** See Figure 1-64. Install exhaust follower spacer.
12. After installing shims, turn motor one revolution and re-check gap. This verifies shim is seated in upper spring collar.




1. **Magnet**
2. **Valve shim**

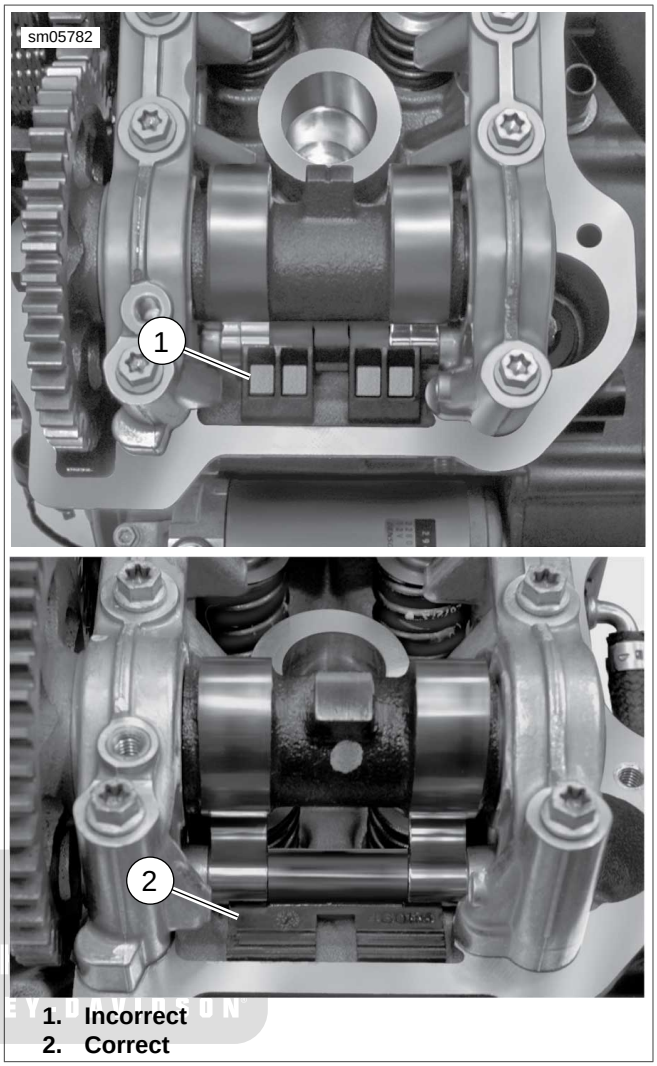
**Figure 1-62. Removing Valve Shim**

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1. Correct
2. Incorrect

**Figure 1-63. Intake Follower Spacer Installation**




1. Incorrect
2. Correct

**Figure 1-64. Exhaust Follower Spacer Installation**

# STEERING HEAD BEARINGS 1.17

## INSPECTION

The steering head bearings are sealed and do not require lubrication.

1. Remove clutch lever assembly at handlebar.
2. Place a scissor jack under jacking point and raise front wheel off ground.
3. Verify that throttle cables are not binding front fork movement.

**⚠ WARNING**

**Do not operate motorcycle with loose, worn or damaged steering or suspension systems. Contact a Buell dealer for repairs. Loose, worn or damaged steering or suspension components can adversely affect stability and handling, which could result in death or serious injury. (00113a)**

4. To check for smooth operation, turn front wheel full right and then full left.
5. To check for excessive steering head play, hold both fork tube axle clamps and press forward and backward.
6. Test bearing resistance.
7. If required, replace steering head bearings. See 2.10 STEERING HEAD BEARINGS.
8. Install the clutch lever assembly.
9. Remove scissor jack.

## RESISTANCE TEST

1. Loosen steering stem pinch fastener at upper triple clamp.
2. Loosen the steering stem capnut and back off several turns.
3. Loosen the pairs of triple clamp pinch bolts.
4. Tighten the capnut to 51.5-56.9 Nm (38-42 ft-lbs).
5. Turn the front wheel all the way to the right.
6. Hook a spring scale into the front axle.
7. See Figure 1-65. Pull front wheel to center position and read the scale. Refer to Table 1-14.
8. Replace bearings that do not meet specification. See 2.10 STEERING HEAD BEARINGS.
9. Verify steering head bearing resistance.
10. Install steering stem pinch fastener and tighten to 27-29 Nm (20-21 ft-lbs).
11. Install lower triple clamp fasteners and tighten to 27-30 Nm (20-22 ft-lbs).

**Table 1-14. Steering Head Resistance**

| MODEL | kg | lb |
|---|---|---|
| 1125 | 0.5-3.2 | 1-7 |

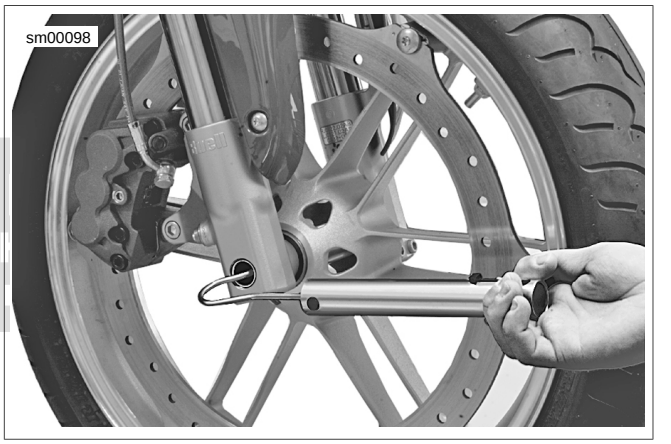



**Figure 1-65. Measuring Steering Head Bearing Resistance (Typical)**

# STORAGE 1.18

## GENERAL

**⚠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)**

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

1. Warm motorcycle to operating temperature. Perform an oil change.
2. Fill fuel tank and add a gasoline stabilizer. Use one of the commercially available gasoline stabilizers following the manufacturer's instructions.
3. Run engine until treated gasoline has had a chance to reach fuel injectors. Stop engine.
4. Remove battery and charge as needed to maintain the correct voltage. See 1.14 BATTERY MAINTENANCE.
5. Check tire inflation. See 1.8 TIRES AND WHEELS. If the motorcycle will be stored for an extended period of time, securely support the motorcycle 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)**

6. Wash and polish molded-in-color, painted and chrome-plated surfaces.
7. If motorcycle is to be covered, use a material that will breathe, such as light canvas. Plastic materials that do not breathe promote the formation of condensation.

## 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. See 1.14 BATTERY MAINTENANCE.
2. Inspect air filter element. Replace if necessary. See 1.6 AIR FILTER ELEMENT.
3. If fuel tank was drained, fill fuel tank with fresh gasoline.
4. Start the engine and run until it reaches normal operating temperature. Check fluids and refill to proper levels if required.
5. Check engine oil level. See 1.5 ENGINE OIL AND FILTER.
6. Perform all of the checks in the PRE-RIDING CHECK LIST in the Owner's Manual.

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# TROUBLESHOOTING 1.19

## GENERAL

*NOTE*

*The troubleshooting section of this manual is a guide to diagnose problems. Read the appropriate sections of this manual before performing any work.*

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

For further troubleshooting information see the electrical diagnostic manual for this motorcycle.

## ENGINE

### Starter Motor Does Not Operate or Does Not Turn Engine Over

1. Ignition switch not in ON position.
2. Engine run switch in OFF position.
3. Discharged battery, loose or corroded connections.
4. Starter control circuit, relay, or solenoid faulty.
5. Electric starter pinion gear not engaging or overrunning clutch slipping.
6. Crankshaft locking pin is in place.
7. Blown fuse.
8. BAS tripped and ignition switch not cycled OFF then ON.
9. Clutch lever not squeezed against handlebar or transmission not in neutral.
10. Friction or sprag clutch slips.

### Engine Turns Over But Does Not Start

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

*NOTE*

*For cold weather starts, always disengage clutch.*

5. Loose wire connection at coil, battery, or ECM connector.
6. Ignition timing incorrect due to faulty coil, ECM or faulty sensors.
7. BAS tripped and ignition switch not cycled OFF then ON.
8. Fuel filter clogged.
9. Sticking or damaged valve.
10. Fuel pump inoperative.
11. Plugged fuel injectors.
12. Fuse blown.
13. Incorrect valve timing.

### Starts Hard

1. Spark plugs in bad condition or have improper gap or are partially fouled.
2. Battery nearly discharged.
3. Loose wire connection at one of the battery terminals, coil or ECM connector.
4. Water or dirt in fuel system.
5. Intake air leak.
6. Fuel tank vent hose and vapor valve plugged.
7. Engine lubricant too heavy (winter operation).

*NOTE*

*For cold weather starts, always disengage clutch.*

8. Ignition not functioning properly (possible sensor failure).
9. Faulty ignition coil.
10. Valves sticking or valves too tight.
11. Partially plugged fuel injectors.

### Starts But Runs Irregularly or Misses

1. Spark plugs in bad condition or partially fouled.
2. Spark plug gap too close or too wide.
3. Faulty ignition coil, ECM, or sensor.
4. Battery nearly discharged.
5. Damaged wire or loose connection at battery terminals, coil or ECM connector.
6. Intermittent short circuit due to damaged wire insulation.
7. Water or dirt in fuel system.
8. Fuel tank vent system plugged.
9. Air leak at intake manifold or air cleaner.
10. Loose or dirty ECM connector.
11. Faulty sensor(s).
12. Incorrect valve timing.
13. Weak or inoperative valve springs.
14. Damaged intake or exhaust valve.
15. Partially plugged fuel injectors.

### Spark Plug Fouls Repeatedly

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

### Pre-Ignition or Detonation (Knocks or Pings)

1. Fuel octane rating too low.

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2. Faulty spark plugs.
3. Incorrect spark plug for the kind of service.
4. Excessive carbon deposit on piston head or in combustion chamber.
5. Ignition timing advanced due to faulty sensor inputs.
6. Incorrect heat range spark plug.
7. Intake manifold vacuum leak.

### Overheating

1. Insufficient oil supply or oil not circulating.
2. Insufficient air flow over engine.
3. Heavy carbon deposits.
4. Ignition timing retarded due to faulty sensor(s).
5. Leaking valve.
6. Radiator dirty, plugged.
7. Insufficient coolant supply.
8. Cooling system vent hose crimped.
9. Air in cooling system.

### Valve Train Noise

1. Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.
2. Valve sticking in guide.
3. Chain tensioner not functioning properly or shoe worn.
4. Cam timing incorrect.
5. Cam, cam gears, or cam bushings worn.

### Excessive Vibration

1. Wheels not aligned, rims bent, or tires worn or damaged.
2. Ignition timing advanced due to faulty sensor inputs/poorly tuned engine.
3. Internal engine problem.
4. Damaged frame.
5. Engine counterbalancing system out of time.

### Check Engine Light Illuminates During Operation

Fault detected. See the electrical diagnostic manual.

## LUBRICATION SYSTEM

| PART NUMBER | TOOL NAME |
|---|---|
| HD-35457 | BLACK LIGHT LEAK DETECTOR |

### Engine Uses Too Much Oil Or Smokes Excessively

1. Restricted breather operation.
2. Restricted oil filter.
3. Piston rings badly worn or damaged.
4. Valve guides or seals worn.
5. Oil diluted with gas.

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

1. Loose parts.
2. Imperfect seal at gaskets, washers, etc. To aid locating leaks, use BLACK LIGHT LEAK DETECTOR (Part No. HD-35457).
3. Restricted breather hose to air cleaner.
4. Restricted oil filter.
5. Porosity.

### Low Oil Pressure

1. Low oil level.
2. Faulty low oil pressure switch.
3. Worn oil pump gerotor(s).
4. Oil diluted with gas.
5. Open in oiling circuit.

### High Oil Pressure

1. Oil level too high.
2. Bypass valve stuck in closed position.

## ELECTRICAL SYSTEM

*NOTE*

*For diagnostic information, see the electrical diagnostic manual for this motorcycle.*

### Alternator Does Not Charge

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

### Alternator Charge Rate Is Below Normal

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

### Speedometer Operates Erratically

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

## TRANSMISSION

### Shifts Hard

1. Clutch dragging slightly.
2. Shifter return spring (inside transmission) bent or broken.

3. Bent shifter rod.
4. Shifter forks (inside transmission) sprung.
5. Corners worn off transmission gear dogs (inside transmission).
6. Hydraulic clutch circuit not bled correctly.

### Jumps Out Of Gear

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

### Clutch Slips

1. Insufficient clutch spring tension.
2. Worn friction discs.

### Clutch Drags Or Does Not Release

1. Insufficient clutch spring tension.
2. Clutch discs warped.
3. Clutch spacer missing or installed backwards.

### Clutch Chatters

1. Friction discs or steel discs worn, warped or dragging.

## CLUTCH

### Slips

1. Insufficient clutch spring tension.
2. Worn friction plates.

### Drags or Does Not Release

Clutch plates warped.

### Chatters

Friction or steel plates worn, warped or dragging.

## CHASSIS

### Irregular/Inadequate Brake Action

1. Master cylinder low on fluid.
2. Brake line contains air bubbles or moisture.
3. Master or wheel cylinder piston worn.
4. Brake pads covered with grease or oil.
5. Brake pads badly worn to minimum lining thickness.
6. Brake rotor badly worn or warped.
7. Brake pads dragging or excessive braking (brake fades due to heat buildup).
8. Insufficient brake pedal or hand lever freeplay (brake drags).

### Handling Irregularities

1. Tires improperly inflated. See 1.8 TIRES AND WHEELS. Do not overinflate.
2. Loose wheel axle. See 2.6 WHEELS.
3. Excessive wheel hub bearing play.
4. Rims and tires out-of-true sideways: tire runout should not be more than 2.03 mm (0.080 in).
5. Rims and tires out-of-round or eccentric with hub: tire runout should not be more than 1.5 mm (0.060 in).
6. Irregular or peaked front tire tread wear.
7. Tire and wheel unbalanced or weights on wrong side of wheel (Front wheel weights must be on brake rotor side of wheel.).
8. Steering head bearings improperly tightened or worn. See 1.17 STEERING HEAD BEARINGS. Check for proper torque and replace worn bearings. See 2.9 FRONT FORK.
9. Shock absorber or front forks not functioning normally due to incorrect adjustment.
10. 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.

## COOLING SYSTEM

### Overheats

1. Air flow through the radiator is obstructed.
2. The radiator is internally plugged.
3. Insufficient coolant.
4. Cooling fans not operating.
5. Thermostat stuck closed.

## SUSPENSION

When making adjustments, remember there are two mediums in setting up a motorcycle, geometry and suspension. Both components work together because suspension is a part of geometry. In order to solve handling problems, it is important to diagnose the problem's true nature.

Chattering, sliding or an uncomfortable feeling are suspension-related. Handling and a swinging fork are geometry-related, but often these unwanted characteristics can be solved by suspension adjustments.

The following tables list possible suspension and operating troubles and their probable causes.

**Table 1-15. General Suspension Problems**

| TROUBLESHOOTING CONDITION | ADJUSTMENT SOLUTION |
|---|---|
| Motorcycle wallows through turns.<br>Feels loose or vague after bumps.<br>Wheel tends to "pogo" after passing over a bump. This is noticeable by watching the motorcycle continue to bounce as it travels over multiple bumps. | Increase rebound damping. |
| Wheel responds to bump, but doesn't return to ground quickly after bumps. This is more pronounced over a series of bumps and is often referred to as "packing down". | Reduce rebound damping. |
| The motorcycle bottoms out or dips while cornering.<br>Motorcycle has excessive brake dive. | Increase compression damping. |
| Harsh ride particularly over washboard surfaces.<br>Bumps kick through handlebars or seat.<br>Suspension seems not to respond to bumps. This is evidenced by tire chattering (a movement with short stroke and high frequency) through corners or by jolting the rider over rough roads. | Reduce compression damping. |

**Table 1-16. Rear Suspension Problems**

| TROUBLESHOOTING CONDITION | ADJUSTMENT SOLUTION |
|---|---|
| "Pumping on the Rear" when accelerating out of a corner: movement with a long stroke and a high frequency | The shock is too soft. Increase compression damping. If the adjuster is already set to the maximum, add more preload to the spring (one turn maximum). |
| "Pumping on the Rear" when accelerating out of a corner: movement with a short stroke and high frequency | The shock is too hard. Decrease compression damping. |
| Chattering during braking | Decrease the compression damping. If the problem persists, decrease rebound damping for a faster rebound rate. Less spring preload may also help. |
| Lack of tire feedback | The suspension is too soft. Increase compression damping. |
| Sliding during cornering<br>(Sliding may occur going into the corner or accelerating out of the corner.) | The suspension is too hard. Decrease compression damping. |

**Table 1-17. Front Suspension Problems**

| TROUBLESHOOTING CONDITION | ADJUSTMENT SOLUTION |
|---|---|
| Not absorbing bumps. | A good suspension is a balance between damping and track condition. Finding this balance requires exploring all possible compression settings. |
| Lack of tire feedback. | Increase compression damping. |
| Tire slides. | Decrease compression damping. |

# 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 |
|---|---|---|---|
| Air flow guide fastener | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Axle, front | 53-56 Nm | 39-41 ft-lbs | 2.6 WHEELS, Front Wheel/LOCTITE ANTI-SEIZE, left handed thread |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 2.6 WHEELS, Rear Wheel/Initial torque, back off 2 turns, final torque. |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 2.12 SWINGARM AND BRACE, Brace |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider/Initial torque, back off 2 turns, final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 2.6 WHEELS, Rear Wheel/Initial torque, back off 2 turns, final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 2.12 SWINGARM AND BRACE, Brace/After initial torque, back off two turns and tighten to final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider/Initial torque, back off 2 turns, final torque. |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 2.6 WHEELS, Rear Wheel |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 2.12 SWINGARM AND BRACE, Brace |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Axle pinch bolts, front | 27-30 Nm | 20-22 ft-lbs | 2.6 WHEELS, Front Wheel/Alternate twice between bolts. |
| Axle slider fastener | 7.9-8.8 Nm | 70-78 **in-lbs** | 2.12 SWINGARM AND BRACE, Axle Sliders |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Belt guard aluminum plate fasteners (front three), lower | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard aluminum plate fasteners (rear one), lower | 2.3-2.5 Nm | 20-22 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard fasteners, lower | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard fasteners, upper | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Brake caliper bleeder valve | 4-7 Nm | 36-60 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Brake caliper mounting bolts, rear | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.6 WHEELS, Rear Wheel |
| Brake fluid line P-clamp fastener, rear (at front of swingarm) | 9.6-10.6 Nm | 7-8 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Brake fluid line P-clamp fastener, rear (at rear of swingarm) | 24.4-27.1 Nm | 18-20 ft-lbs | 2.6 WHEELS, Rear Wheel |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Brake fluid line P-clamp fastener, rear (at rear of swingarm) | 24.4-27.1 Nm | 18-20 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Brake lever pivot bolt | 0.5-1.5 Nm | 4.4-13.2 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Hand Lever |
| Brake lever pivot bolt nut | 4.9-6.9 Nm | 43-61 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Hand Lever |
| Brake light switch/reservoir banjo bolt, rear | 22-27 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Master Cylinder/Reservoir: Installation |
| Brake light switch fastener, front | 0.8-1.1 Nm | 7-10 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake line P-clamp, front | 4-7 Nm | 36-60 **in-lbs** | 2.6 WHEELS, Front Wheel |
| Brake line P-clamp, front | 4-7 Nm | 36-60 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Brake line P-clamp, front | 9.5-10.9 Nm | 7-8 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| Brake line P-clamp, rear | 24.4-27.1 Nm | 18-20 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| Brake master cylinder to footpeg support | 9.6-10.6 Nm | 84-96 **in-lbs** | 2.8 REAR BRAKE, Master Cylinder/Reservoir: Installation |
| Brake pedal fastener, rear | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.8 REAR BRAKE, Rear Brake Pedal/Apply LOCTITE 271 (red). |
| Brake pin hanger set, front | 14.7-19.6 Nm | 11-15 ft-lbs | 2.7 FRONT BRAKE, Caliper: Removal and Installation |
| Brake reservoir/light switch banjo bolt, rear | 21.7-27.1 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Brake reservoir banjo bolt, front | 22-27 Nm | 16-20 ft-lbs | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir banjo bolt, front | 22-27 Nm | 16-20 ft-lbs | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Brake reservoir clamp fasteners, front | 9.0-10.2 Nm | 80-90 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir clamp fasteners, front | 9.0-10.2 Nm | 80-90 **in-lbs** | 2.17 HANDLEBARS: 1125R, Right Clip-on |
| Brake reservoir clamp fasteners, front | 9.0-10.2 Nm | 80-90 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Right Side |
| Brake reservoir cover fasteners, front | 1-2 Nm | 9-18 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir fastener, rear | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.8 REAR BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir fasteners, rear | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Brake rotor fasteners, rear | 34-37 Nm | 25-27 ft-lbs | 2.6 WHEELS, Repair |
| Caliper banjo bolt, front | 22-27 Nm | 16-20 ft-lbs | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Caliper banjo bolt, rear | 21.7-27.1 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Caliper banjo bolt, rear | 21.7-27.1 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Caliper |
| Caliper bleeder valve, front | 3.9-6.9 Nm | 35-61 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Removal |
| Caliper bleeder valve, front | 3.9-6.9 Nm | 35-61 **in-lbs** | 2.7 FRONT BRAKE, Caliper: Removal and Installation |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 2.8 REAR BRAKE, Master Cylinder/Reservoir Removal |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 2.8 REAR BRAKE, Brake Fluid Line |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 2.8 REAR BRAKE, Caliper |
| Caliper fasteners, front | 24.5-29.4 Nm | 18-22 ft-lbs | 2.7 FRONT BRAKE, Caliper: Repair |
| Caliper mounting fasteners, front | 48-50 Nm | 35-37 ft-lbs | 2.6 WHEELS, Front Wheel |
| Caliper mounting fasteners, front | 47-50 Nm | 35-37 ft-lbs | 2.7 FRONT BRAKE, Caliper: Removal and Installation/LOCTITE 271 (red) |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Caliper mounting large fastener, rear | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.8 REAR BRAKE, Caliper |
| Center cap bolt | 27-40.6 Nm | 20-30 ft-lbs | 2.9 FRONT FORK, Assembly |
| Clip-on fastener | 33-35 Nm | 24-26 ft-lbs | 2.17 HANDLEBARS: 1125R, Left Clip-On |
| Clip-on fastener | 33-35 Nm | 24-26 ft-lbs | 2.17 HANDLEBARS: 1125R, Right Clip-on |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 2.17 HANDLEBARS: 1125R, Left Clip-On |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Left Side |
| Damper rod jamnut | 30-41 Nm | 22-30 ft-lbs | 2.9 FRONT FORK, Assembly |
| Drive sprocket fasteners | 48-50 Nm | 35-37 ft-lbs | 2.6 WHEELS, Repair |
| Fairing fasteners, lower | 8.1-9.5 Nm | 72-84 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Fairing fasteners, lower | 8.1-9.5 Nm | 72-84 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing |
| Fairing support bracket fasteners | 21.7-24.4 Nm | 16-18 ft-lbs | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Fender fasteners, front | 8.4-9.3 Nm | 74-82 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Fender fasteners, front | 8.4-9.3 Nm | 74-82 **in-lbs** | 2.6 WHEELS, Front Wheel |
| Fender fasteners, rear | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Footpeg mount fasteners, passenger | 34-38 Nm | 25-28 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger/LOCTITE 271 (red) |
| Footpeg mount fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Footpeg mount fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Fork cap | 30-41 Nm | 22-30 ft-lbs | 2.9 FRONT FORK, Assembly |
| Fork tube clamp bolts | 27.1-29.8 Nm | 20-22 ft-lbs | 2.9 FRONT FORK, Installation/Tighten upper bolt, lower bolt and repeat upper bolt on both sides. |
| Fork tube clamp bolts | 27.1-29.8 Nm | 20-22 ft-lbs | 2.10 STEERING HEAD BEARINGS, Installation |
| Handlebar clamp fasteners, 1125CR | 13.6-16.3 Nm | 10-12 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR |
| Handlebar clamp fasteners, 1125CR | 13.6-16.3 Nm | 120-144 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Handlebar |
| Handlebar fastener | 32.5-35.2 Nm | 24-26 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125R |
| Headlamp assembly fasteners | 6.1-7.5 Nm | 54-66 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Headlamp Assembly |
| Headlamp assembly fasteners | 6.1-7.5 Nm | 54-66 **in-lbs** | 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR, Headlamp Assembly |
| Headlamp module | 9.6-10.6 Nm | 85-94 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Heel guard fasteners, passenger | 5-8 Nm | 48-72 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger |
| Heel guard fasteners, rider | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Idler pulley locknut | 27.1-31.2 Nm | 20-23 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Ignition switch mounting fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR |
| Instrument cluster nuts | 1.4-4.1 Nm | 12-36 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Intake cover fasteners | 6.1-6.8 Nm | 54-60 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| K-bracket to engine fasteners | 46-51 Nm | 34-38 ft-lbs | 2.13 FRAME, K-Brackets |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| K-bracket to frame fasteners | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.13 FRAME, K-Brackets |
| Motor mount fasteners | 46-51 Nm | 34-38 ft-lbs | 2.13 FRAME, Motor Mounts |
| Motor mount pinch bolts | 24.5-27.0 Nm | 18-20 ft-lbs | 2.13 FRAME, Motor Mounts |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Pillion latch plate fasteners | 6.8-10.9 Nm | 60-96 **in-lbs** | 2.20 SEAT, Pillion Lock |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Rider seat screws | 9.6-10.6 Nm | 85-94 **in-lbs** | 2.20 SEAT, Installation |
| Rotor mounting fasteners, front | 34-37 Nm | 25-27 ft-lbs | 2.6 WHEELS, Inspection and Repair/Metric, replace with new |
| Shock mount fastener, lower | 20-23 Nm | 15-17 ft-lbs | 2.11 SHOCK ABSORBER, Replacement |
| Shock mount fastener, lower | 20-23 Nm | 15-17 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| Shock mount fastener, upper | 46.1-51.5 Nm | 34-38 ft-lbs | 2.11 SHOCK ABSORBER, Replacement |
| Shock mount fastener, upper | 46.1-51.5 Nm | 34-38 ft-lbs | 2.14 SUBFRAME, Subframe |
| Sidestand bracket fasteners | 46.1-51.5 | 34-38 ft-lbs | 2.21 SIDESTAND, Sidestand |
| Sidestand stop bracket fastener | 9.5-10.8 Nm | 84-96 **in-lbs** | 2.21 SIDESTAND, Sidestand Stop Bracket |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 36-60 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125R |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 2.10 STEERING HEAD BEARINGS, Installation |
| Steering stem pinch bolt | 27-30 Nm | 20-22 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125R/LOCTITE 271 (red) |
| Steering stem pinch bolt | 27-30 Nm | 20-22 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR/LOC-TITE 271 (red) |
| Steering stem pinch bolt | 27.1-29.8 Nm | 20-22 ft-lbs | 2.10 STEERING HEAD BEARINGS, Installation |
| Subframe battery tray pan fastener | 7.3-8.2 Nm | 65-73 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Subframe fastener | 28.5-31.2 Nm | 21-23 ft-lbs | 2.14 SUBFRAME, Subframe/Apply LOCTITE 268 (red). |
| Subframe front pan fastener | 13.0-14.4 Nm | 115-128 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Swingarm brace fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 2.12 SWINGARM AND BRACE, Brace |
| Swingarm pivot shaft | 60-62 Nm | 44-46 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation/ANTI-SEIZE |
| Swingarm pivot shaft pinch bolt | 27.1-29.8 Nm | 20-22 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation/LOCTITE 271 (red) |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.17 HANDLEBARS: 1125R, Left Clip-On |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.17 HANDLEBARS: 1125R, Right Clip-on |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Left Side |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Right Side |
| Tail section fasteners | 3.9-4.3 Nm | 34-38 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Tail section fasteners | 3.9-4.3 Nm | 34-38 **in-lbs** | 2.14 SUBFRAME, Tail Section |
| Turn signal/mirror mounting fasteners, 1125CR | 24.4-27.0 Nm | 18-20 ft-lbs | 2.18 HANDLEBARS: 1125CR, Left Side |
| Turn signal/mirror mounting fasteners, 1125CR | 24.4-27.0 Nm | 18-20 ft-lbs | 2.18 HANDLEBARS: 1125CR, Right Side |
| Turn signal/mirror mounting nuts, 1125R | 24.4-27.0 Nm | 18-20 ft-lbs | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Turn signal/mirror mounting nuts, 1125R | 8.1-10.8 Nm | 72-96 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing |
| Valve stem nut | 4.5-4.9 Nm | 40-44 **in-lbs** | 2.5 TIRES, Mounting: Diablo Corsa III |
| Wear peg | 4.1-5.4 Nm | 36-48 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider/Apply LOCTITE 271 (red) to 4 threads min. |
| Windscreen fasteners, 1125CR | 5.6-6.1 Nm | 50-54 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Windscreen fasteners, 1125CR | 5.6-6.1 Nm | 50-54 **in-lbs** | 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR, Windscreen |
| Windshield fasteners, 1125R | 1.0-1.5 Nm | 10-12 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Windshield |
| Wire guide/fuel pump cover | 4.6-5.1 Nm | 41-45 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

# SPECIFICATIONS 2.2

## 1125 MODELS

**Table 2-1. Dimensions: 2009 1125 Models**

| ITEM | 1125R | | 1125CR | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Length (without rider) | 1996 | 78.60 | 2066 | 81.3 |
| Width (without mirrors) | 716 | 28.20 | 744 | 29.3 |
| Wheel base (without rider) | 1387 | 54.60 | 1385 | 54.5 |
| Seat height (with 81.6 kg (180 lb) rider) | 775 | 30.5 | 775 | 30.5 |
| Ground clearance (without rider) | 114 | 4.50 | 138 | 5.43 |
| Trail | 84 | 3.30 | 84 | 3.30 |
| Rake | 21° | | | |

**Table 2-2. Weights: 2009 1125 Models**

| ITEM | kg | lb |
|---|---|---|
| Weight (dry) | 170 | 375 |
| GVWR | 386 | 850 |
| GAWR front | 168 | 370 |
| GAWR rear | 231 | 510 |
| Load capacity | 177 | 390 |

*NOTE*

*Gross Vehicle Weight (GVWR) (maximum allowable loaded vehicle weight) and corresponding Gross Axle Weight Ratings (GAWR) are given on an information decal located on the steering head.*

**Table 2-3. Capacities: 1125 Models**

| ITEM | METRIC | U.S. |
|---|---|---|
| Fuel tank total (including reserve) | 20.1 L | 5.30 gal |
| Reserve fuel capacity | 3.03 L | 0.8 gal |
| Oil capacity | 2.66 L | 2.7 qt |

## SUSPENSION SETTINGS

**WARNING**

**Be sure tires are properly inflated, balanced and have adequate tread. Inspect your tires regularly and see a Buell dealer for replacements. Riding with excessively worn, unbalanced or under-inflated tires can adversely affect stability and handling, which could result in death or serious injury. (00114a)**

**WARNING**

**Do not operate motorcycle with loose, worn or damaged steering or suspension systems. Contact a Buell dealer for repairs. Loose, worn or damaged steering or suspension components can adversely affect stability and handling, which could result in death or serious injury. (00113a)**

**WARNING**

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

**WARNING**

**Both forks should be adjusted equally. Forks that are not properly adjusted can lead to loss of control, which could result in death or serious injury. (00124b)**

**Table 2-4. Recommended Suspension Settings: 2009 Buell 1125 Models**

| LOAD*** | | FRONT FORKS | | | REAR SHOCK | | |
|---|---|---|---|---|---|---|---|
| LB. | KG | PRELOAD: TURNS IN FROM MINIMUM* | COMPRESSION: TURNS OUT FROM MAXIMUM** | REBOUND: TURNS OUT FROM MAXIMUM** | PRELOAD: NOTCH (#1 IS LIGHTEST SETTING) | COMPRESSION: CLICKS OUT FROM MAXIMUM** | REBOUND: TURNS OUT FROM MAXIMUM** |
| Less than 170 | Less than 77 | 6 | 1-3/4 | 1-3/4 | 3 | 20 | 1-1/4 |
| 170-190 | 77-86 | 7 | 1-5/8 | 1-1/2 | 4 | 18 | 1 |
| 190-210 | 86-95 | 7 | 1-1/2 | 1-1/2 | 5 | 16 | 1 |
| 210-230 | 95-104 | 7 | 1-1/2 | 1-1/2 | 6 | 14 | 7/8 |
| 230-250 | 104-113 | 7-1/2 | 1-3/8 | 1-3/8 | 7 | 12 | 3/4 |
| 250-270 | 113-122 | 7-1/2 | 1-3/8 | 1-3/8 | 8 | 10 | 1/2 |

**Table 2-4. Recommended Suspension Settings: 2009 Buell 1125 Models**

| LOAD*** | | FRONT FORKS | | | REAR SHOCK | | |
|---|---|---|---|---|---|---|---|
| LB. | KG | PRELOAD: TURNS IN FROM MIN-IMUM* | COMPRES-SION: TURNS OUT FROM MAXIMUM** | REBOUND: TURNS OUT FROM MAX-IMUM** | PRELOAD: NOTCH (#1 IS LIGHTEST SETTING) | COMPRES-SION: CLICKS OUT FROM MAXIMUM** | REBOUND: TURNS OUT FROM MAX-IMUM** |
| 270 to GVWR | 122 to GVWR | 8 | 1-1/4 | 1-1/4 | 9 | 10 | 1/2 |

*Front spring preload is set by loosening adjuster counterclockwise until it stops at minimum, then counting the number of turns in to get to the desired setting.
**All damping adjuster settings are done by tightening adjuster clockwise until it stops at maximum setting, then counting the turns counterclockwise to the desired setting.
***Load includes rider, passenger, cargo, accessories and riding gear.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# VEHICLE IDENTIFICATION NUMBER (VIN) 2.3

## VEHICLE IDENTIFICATION NUMBER: BUELL 1125 MODELS

See Figure 2-1 and Table 2-5. The full 17-digit serial number or Vehicle Identification Number (V.I.N.) is stamped on the right front of the frame near the steering head. A label with the V.I.N. is also affixed at the same location.

A Motor Identification Number is stamped at the base of the rear cylinder on the right side of the vehicle. This number includes the motorcycle type code, engine type, market configuration, model year, model, and sequential build number.

**Example:** HL049B00456

*NOTE*

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

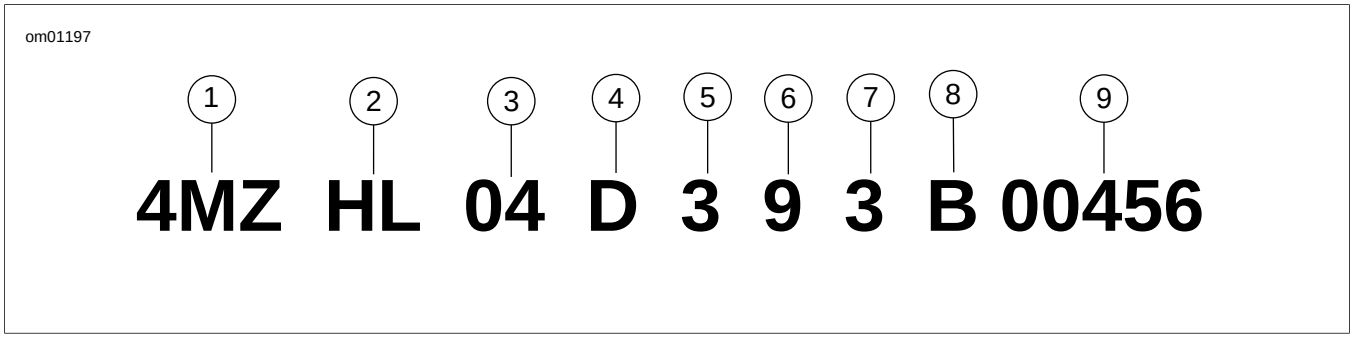



**Figure 2-1. Typical V.I.N.: 2009 Buell 1125 Models**

**Table 2-5. Buell V.I.N. Breakdown: 2009 Models**

| POSITION | DESCRIPTION | POSSIBLE VALUES |
|---|---|---|
| 1 | Market designation (WMI code) | 4MZ = Buell vehicles originally manufactured for sale **within** the United States<br>5MZ = Buell vehicles originally manufactured for sale **outside** the United States<br>95Z = Buell vehicles originally manufactured for sale in Brazil at Manaus CKD plant |
| 2 | Motorcycle type code | KP=Blast®<br>AX=Firebolt®<br>JX=Lightning® Long<br>KX=Lightning® CityX<br>WX=Lightning® Scg<br>DB=Ulysses™ Police XB12XP<br>DX=Ulysses™ XB12X<br>FX=Ulysses™ XB12XT<br>HL=1125R<br>YL=1125CR |
| 3 | Engine type | 01=492 cc<br>02=984 cc Thunderstorm®<br>03=1203 cc Thunderstorm®<br>04=1125 cc Helicon™<br>06=1125 cc Helicon™ (105 HP, France) |
| 4 | Market configuration | A=Australia<br>B=Brazil<br>Z=Brazil CKD<br>L=California<br>N=Canada<br>D=Domestic<br>E=England<br>R=Europe<br>J=Japan |
| 5 | V.I.N. check digit | Can be 0-9 or X |
| 6 | Model year | 9=2009 |

**Table 2-5. Buell V.I.N. Breakdown: 2009 Models**

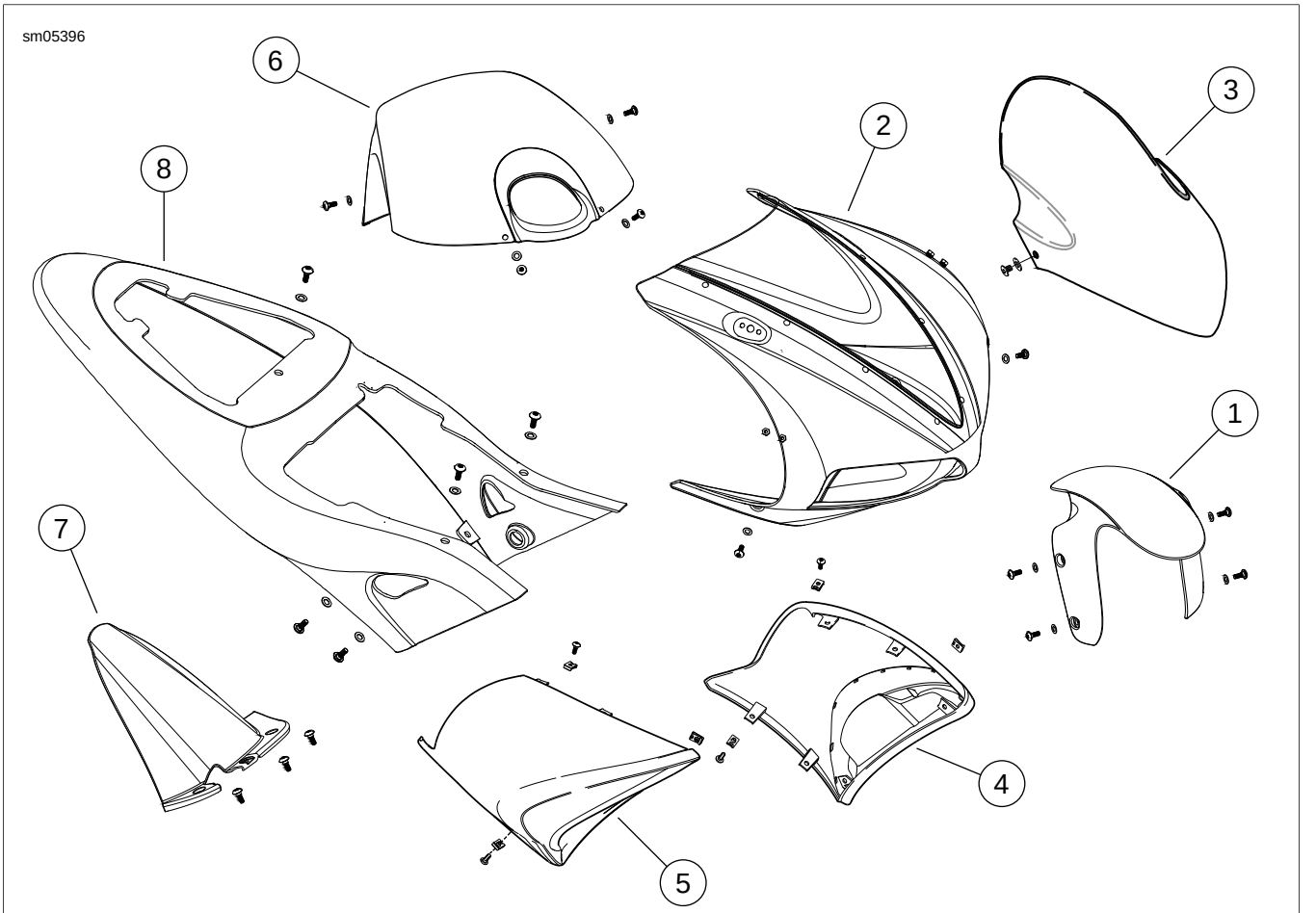
| POSITION | DESCRIPTION | POSSIBLE VALUES |
|---|---|---|
| 7 | Assembly plant | 3=East Troy, WI U.S.A.<br>M=H-D Brazil-Manaus, Brazil (CKD) |
| 8 | Model | 0=Blast<br>2=XB9SX<br>3=XB12R<br>5=XB12Scg<br>6=XB12Ss<br>7=XB12X<br>9=XB12XP<br>A=XB12XT<br>B=1125R<br>C=1125CR<br>D=1125R, 105 HP France<br>E=1125CR, 105 HP France |
| 9 | Sequential number (last five digits) | Varies |

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

# BODY WORK, COVERS, GUARDS AND GUIDES 2.4

## BODY WORK

See Figure 2-2. Fit body work and loosely thread all fasteners and washers in place. Tighten to specification. Refer to Table 2-6.




1. **Front fender**
2. **Fairing: 1125R**
3. **Windscreen: 1125CR**
4. **Left outer radiator shroud**
5. **Right outer radiator shroud**
6. **Intake cover**
7. **Rear fender**
8. **Tail section**

**Figure 2-2. Body Work**

**Table 2-6. Body Work**

| CALLOUT | COMPONENT | TORQUE | NOTES |
|---|---|---|---|
| 1 | Front fender | 8.4-9.3 Nm (74-82 **in-lbs**) | Fasteners with nylon washers. |
| 2 | Fairing: 1125R | 8.1-9.5 Nm (72-84 **in-lbs**) | Lower front fasteners with nylon washers. |
| | | 24.4-27.0 Nm (18-20 ft-lbs) | Flanged nuts for turn signal/mirrors. See 7.12 TURN SIGNALS. |
| 3 | Windscreen: 1125CR | 5.6-6.1 Nm (50-54 **in-lbs**) | Fasteners with nylon washers. |
| 4 | Left radiator shroud | 9.0-9.9 Nm (80-88 **in-lbs**) | Fasteners with nylon washers and speed nuts. See 7.24 COOLING FANS. |

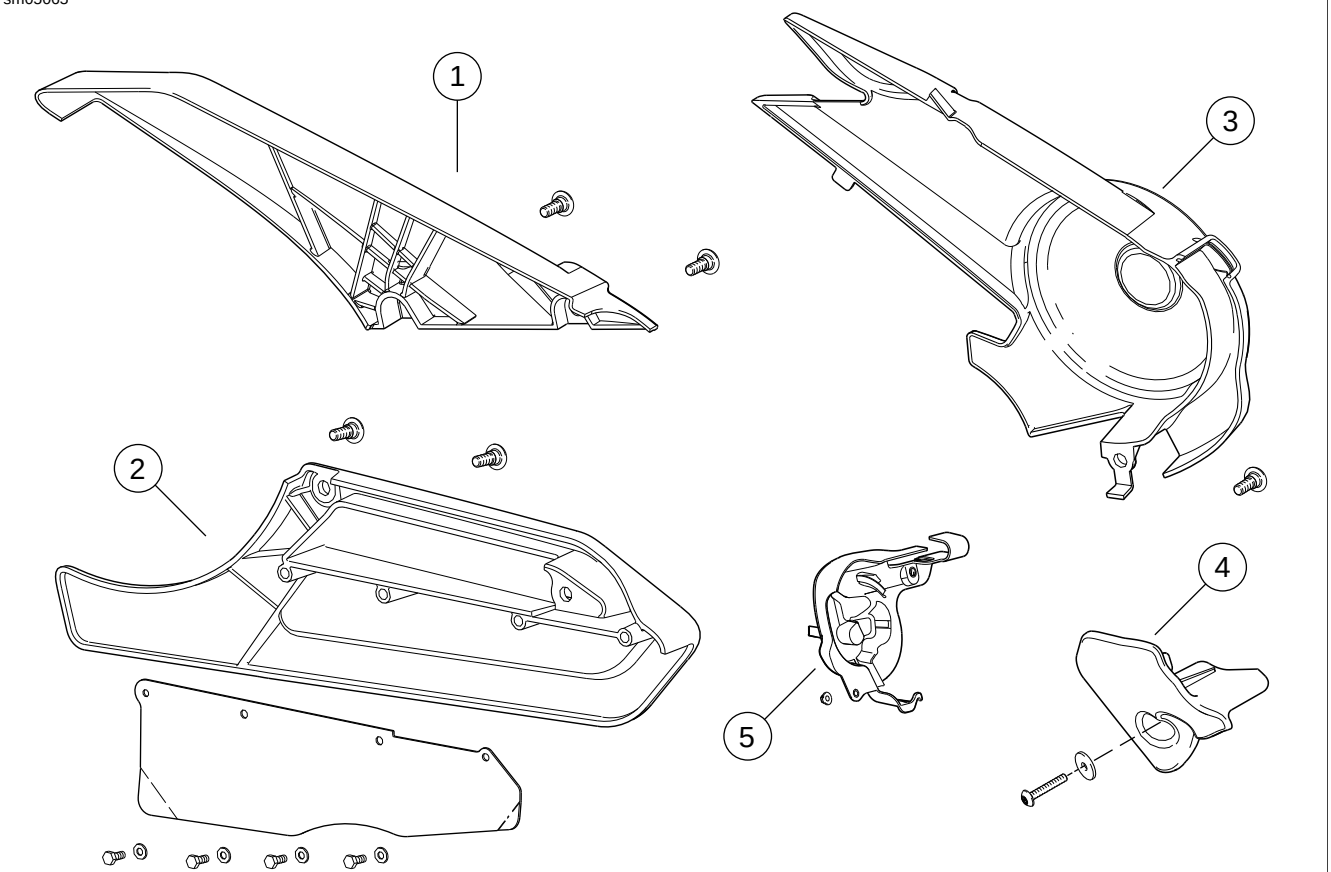
**Table 2-6. Body Work**

| CALLOUT | COMPONENT | TORQUE | NOTES |
|---|---|---|---|
| 5 | Right outer radiator shroud | 9.0-9.9 Nm (80-88 **in-lbs**) | Fasteners with nylon washers and speed nuts. See 7.24 COOLING FANS. |
| 6 | Intake cover | 6.1-6.8 Nm (54-60 **in-lbs**) | Fasteners with nylon washers. |
| 7 | Rear fender | 13.0-14.5 Nm (115-128 **in-lbs**) | Fasteners with nylon washers. |
| 8 | Tail section | 3.9-4.3 Nm (34-38 **in-lbs**) | For pillion lock, see 2.14 SUBFRAME, Tail Section. |

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

## COVERS, GUARDS AND GUIDES

See Figure 2-3. Fit component and loosely install fasteners and washers. Tighten to specification. Refer to Table 2-7.




1. **Upper belt guard**
2. **Lower belt guard**
3. **Sprocket cover**
4. **Air flow guide**
5. **Fuel pump wire guide**

**Figure 2-3. Covers, Guards and Guides**

**Table 2-7. Covers, Guards and Guides**

| CALLOUT | COMPONENT | TORQUE | NOTES |
|---|---|---|---|
| 1 | Upper belt guard | 13.0-14.5 Nm (115-128 **in-lbs**) | Fasteners with nylon washers. The 90 degree tool found in the tool kit fits the fastener behind the passenger footrest. |
| 2 | Lower belt guard | 13.0-14.5 Nm (115-128 **in-lbs**) | Fastens to swingarm |
| | | 3.6-4.1 Nm (32-36 **in-lbs**) | Front three aluminum guide plate fasteners |
| | | 2.3-2.5 Nm (20-22 **in-lbs**) | See Figure 2-4. Rear aluminum guide plate fastener |
| 3 | Sprocket cover | 13.0-14.5 Nm (115-128 **in-lbs**) | See Figure 2-5. Fit upper tab (1) into notch in frame and lower tab (2) behind heel guard. Snap cover into place and secure with a single fastener. |
| 4 | Air flow guide | 3.6-4.1 Nm (32-36 **in-lbs**) | Fastener and washer |
| 5 | Wire guide<br>Fuel pump cover | 4.6-5.1 Nm (41-45 **in-lbs**) | See Figure 2-6. Cover nut (1) |
| | | 9.6-10.6 Nm (85-94 **in-lbs**) | Battery ground nut (2). See 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover. |

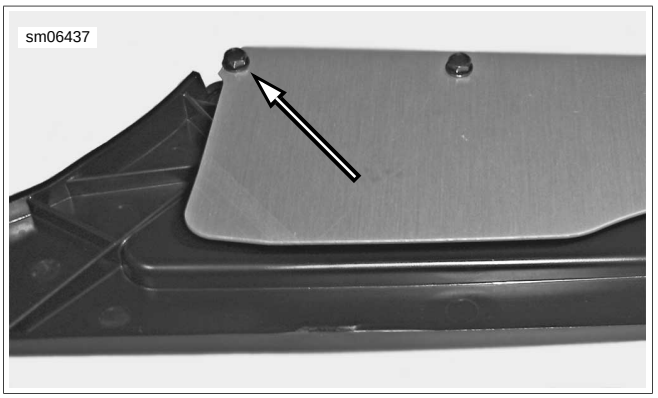
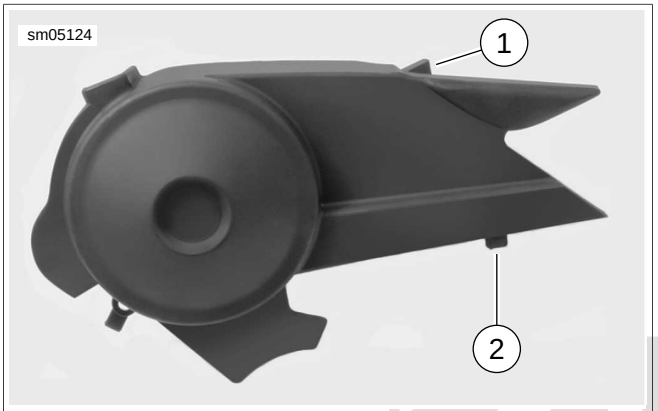
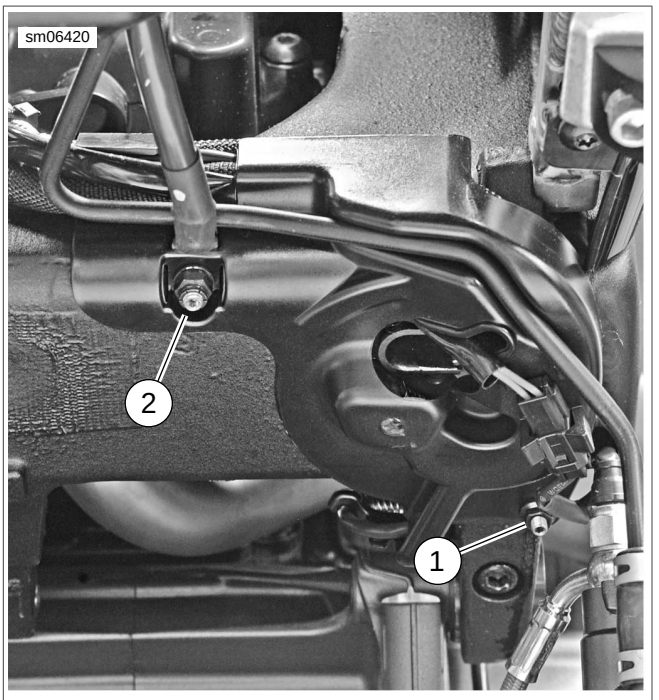



Figure 2-4. Rear Aluminum Guide Plate Fastener




1. Upper tab
2. Lower tab

Figure 2-5. Sprocket Cover




1. Cover nut
2. Battery ground nut

Figure 2-6. Wire Guide/Fuel Pump Cover




Figure 2-7. Wire Guide/Fuel Pump Cover

# TIRES 2.5

## GENERAL

| PART NUMBER | TOOL NAME |
|---|---|
| HD-21000 | TIRE SPREADER |

### New Tires

New tires should be stored in a horizontal tire rack. Avoid stacking new tires in a vertical stack. The weight of the stack compresses the tires and closes down the beads.

**⚠WARNING**

**Use only Buell approved tires. See a Buell dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00133a)**

Replace worn or damaged tires with original equipment tires. Tires other than those specified can affect handling. See 2.5 TIRES, Specifications.

### Repair

Tires should be inspected for punctures, cuts, breaks and wear at least weekly.

**⚠WARNING**

**Replace punctured or damaged tires. In some cases, small punctures in the tread area may be repaired from within the demounted tire by a Buell dealer. Speed should NOT exceed 50 mph (80 km/h) for the first 24 hours after repair, and the repaired tire should NEVER be used over 80 mph (130 km/h). Failure to follow this warning could result in death or serious injury. (00118a)**

Tubeless tires may be repaired in the tread area only if the puncture is 6.4 mm (1/4 in) or smaller. All repairs must be made from inside the tire.

*NOTES*

- *Do not repair a tire with less than 1.6 mm (1/16 in) tread depth.*
- *Do not patch or vulcanize a tire casing. This weakens the casing and increases the risk of a blowout.*
- *Acceptable repair methods include a patch and plug combination, chemical or hot vulcanizing patches or head-type plugs. When repairing tubeless tires, use TIRE SPREADER (Part No. HD-21000) to spread the tire sidewalls.*

**⚠WARNING**

**Be sure tires are properly inflated, balanced and have adequate tread. Inspect your tires regularly and see a Buell dealer for replacements. Riding with excessively worn, unbalanced or under-inflated tires can adversely affect stability and handling, which could result in death or serious injury. (00114a)**

**⚠WARNING**

**Tires are a critical safety component. Contact a Buell dealer for tire repair or replacement. Improper tire service can adversely affect stability and handling, which could result in death or serious injury. (00134a)**

### Troubleshooting

Check the tire pressure at least once each week. Keep tires inflated to the recommended air pressures. At the same time inspect the tread for punctures, cuts, breaks and other damage. See 1.8 TIRES AND WHEELS.

Always locate and eliminate the cause of an original tire failure.

Wheel and tire symptoms can be caused by other chassis components as well. Refer to Table 2-8.

**Table 2-8. Tire and Wheel Troubleshooting: 1125R**

| INSPECT FOR | REMEDY |
|---|---|
| Loose axles | Tighten axles. |
| Excessive side or up-and-down play in wheel hubs | Replace wheel bearings. |
| Mis-aligned wheels | Replace swingarm. |
| Excessive wheel and tire wobble (lateral runout) | Replace tires and/or wheels. |
| Wheels and tires out-of-round or eccentric (radial runout) | Replace tires and/or wheels. |
| Irregular or peaked front tire wear | Replace tires. |
| Incorrect tire pressure | Inflate tires to correct pressure. |
| Unbalanced wheel and tire | Dynamic balance wheels and tires. |
| Rough steering head bearings | Replace pitted or worn bearings. |
| Stiff fork rotation | Adjust fall-away. |
| Leaking fork damper tubes | Replace seals. |
| Shock absorber damping action | Repair or replace. |
| Loose swingarm | Tighten swingarm pivot and/or replace swingarm bearings. |

## SPECIFICATIONS

**⚠WARNING**

**Use only Buell approved tires. See a Buell dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00133a)**

### Tire Size

See Figure 2-8. Tire sizes are molded on the tire sidewalls. Refer to Table 2-9.




**Figure 2-8. Tire Size: 1125R (rear)**

### Rim Size

See Figure 2-9. Rim size and contour are marked on the rim of the front wheel and inside a spoke on the rear wheel. Refer to Table 2-9.

Example: **J17X3.50 X 17.0 MT DOT**

- **17.0** is the normal diameter of the rim in inches, measured at the bead seat diameter.
- **3.50** is the width of the bead seat measured in inches.
- **MT** designates the rim contour.
- **DOT** means that the rim meets Department of Transportation Federal Motor Vehicle Safety Standards.

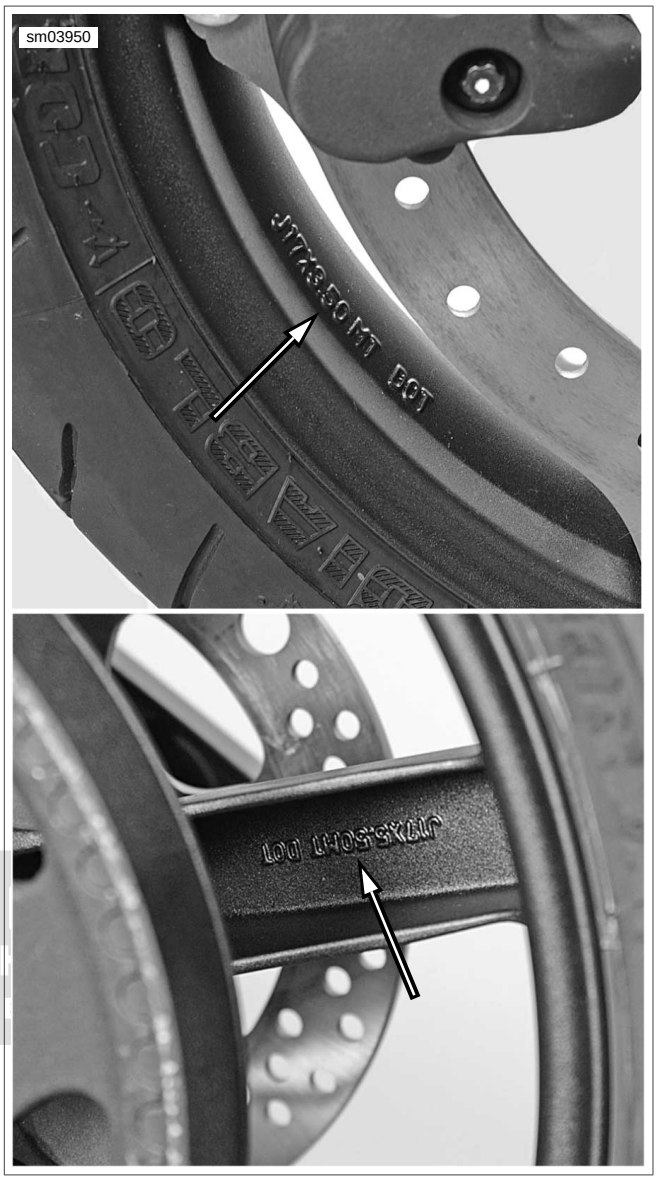



**Figure 2-9. Rim Size and Contour Markings**

**Table 2-9. Tire Fitment-Tubeless Cast Wheels: 1125R**

| WHEEL SIZE | CONTOUR & RIM SIZE | VALVE STEM HOLE DIA | TIRE SIZE |
|---|---|---|---|
| Front: 17 in | 17.0 X 3.50 MT DOT | 8.4 mm (0.33 in) | Pirelli Diablo Corsa III 120/70 ZR17 |
| Rear: 17 in | 17.0 X 5.50 MT DOT | 8.4 mm (0.33 in) | Pirelli Diablo Corsa III 180/55 ZR17 |

## DISMOUNTING

1. Remove the wheel. See 2.6 WHEELS.
2. Deflate the tire.
3. See Figure 2-10. Use the tire machine to loosen both tire beads from the rim flange.
4. See Figure 2-11. Push the lower bead into the rim well on one side and insert tire tool underneath the bead from the opposite side.
5. Pry the bead over the rim edge. Remove the tire from the rim.

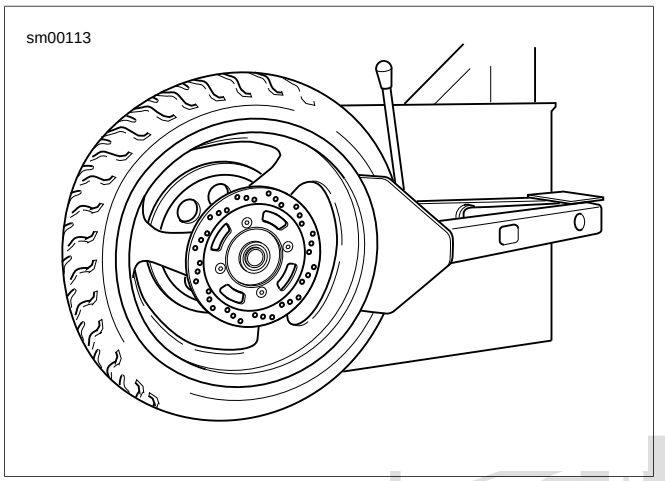



**Figure 2-10. Loosening Beads from Rim Flange**

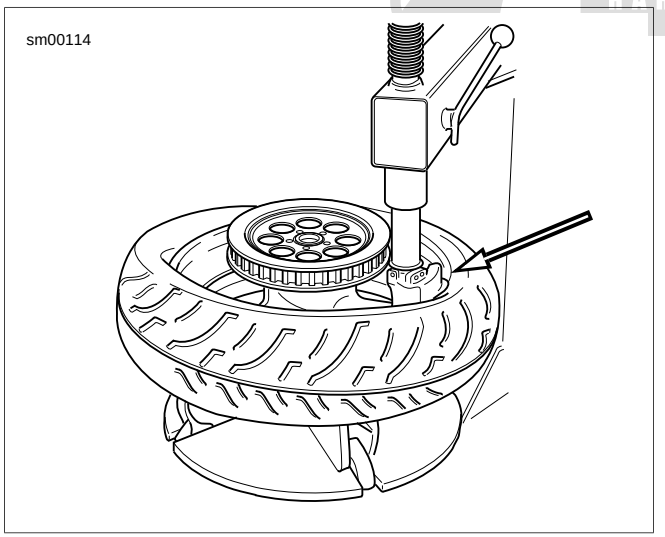



**Figure 2-11. Pry Bead Over Rim Edge**

## CLEANING AND INSPECTION

| PART NUMBER | TOOL NAME |
|---|---|
| HD-21000 | TIRE SPREADER |

1. Mount tire on TIRE SPREADER (Part No. HD-21000) for cleaning and inspection.
2. Clean inside of tire with dry rag.
3. If rim is dirty or corroded, clean with a stiff wire brush.
4. Inspect tire for wear and damage. Replace worn or damaged tires.

## MOUNTING: DIABLO CORSA III

### Wheel and Valve Stems

**⚠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. Inspect the wheel for damage and runout. See 2.6 WHEELS, Wheel Rim Runout.
2. Remove a damaged or leaking valve stem from the wheel.
3. See Figure 2-12. Install a **new** valve stem and tighten the nut to 4.5-4.9 Nm (40-44 **in-lbs**).

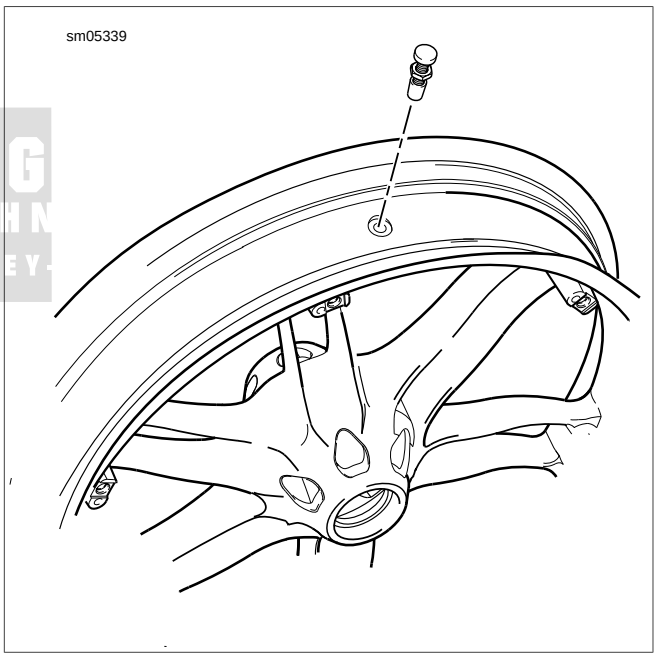



**Figure 2-12. Valve Stem**

### Using the Tire Machine

**⚠WARNING**

**Use only Buell approved tires. See a Buell dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00133a)**

**⚠WARNING**

**Tires are a critical safety component. Contact a Buell dealer for tire repair or replacement. Improper tire service can adversely affect stability and handling, which could result in death or serious injury. (00134a)**

**⚠WARNING**

**Buell 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. (00512b)**

1. Locate the paint dot on the inside of the rim. Mark location of paint dot on the outside of the rim using a grease pencil or a piece of masking tape.
2. Clamp the wheel in the tire machine.
3. Lubricate both rim flanges and both beads of tire with tire lubricant.
4. See Figure 2-13. Identify the direction of rotation arrow and set the tire against the rim with the arrow pointing in the forward direction of rotation with the tire balance dots up.
5. Fit the guide foot to the wheel rim and fit the tire bead to the guide foot.
6. See Figure 2-14. Rotate the wheel to start the lower bead into the rim well.
7. Maintain the tire to guide shoe position and use tire tools to guide the bead into the well of the wheel rim.
8. See Figure 2-15. When the lower bead is completely in the wheel well, rotate the tire balance dots 180 degrees from the wheel rim balance dot to counterbalance the wheel/tire assembly.
9. Fit the guide shoe to the rim and the upper bead.
10. See Figure 2-16. Keep the lower bead in the center of the wheel well and feed the upper bead onto the rim.

*NOTES*

- *While rotating the wheel, use tire tools to guide the bead into the wheel well.*
- *If necessary, stop feeding the bead and lift the lower bead back into the wheel well.*

11. To prevent cosmetic damage, support the tire and wheel and release the wheel clamps.




**Figure 2-13. Direction of Rotation Arrow**




**Figure 2-14. Tire Bead at Bottom of Rim Well**

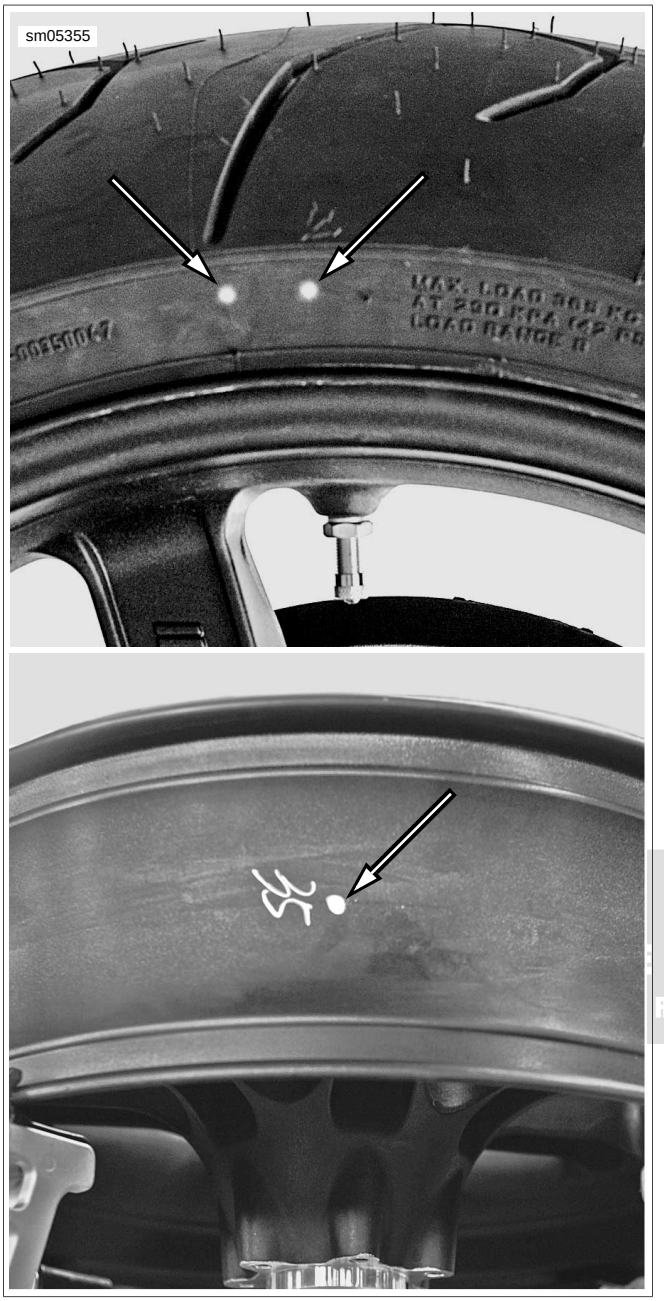



Figure 2-15. Tire and Wheel Balance Dots




Figure 2-16. Feeding the Upper Bead onto the Rim

## Inflate Tire

**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)**

1. To seat the beads to the rim, inflate the tire to 275.8 kPa (40 PSI) maximum.
2. Inspect the bead around both sides of the rim.

**WARNING**

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

3. Install the valve stem and inflate the tire. Refer to Table 2-10.
4. Install the valve cap.
5. Inspect the tire for runout. See 2.5 TIRES, Runout.
6. Balance the wheel and tire. See 2.5 TIRES, Tire Balancing.

**Table 2-10. Tire Pressures: All Models**

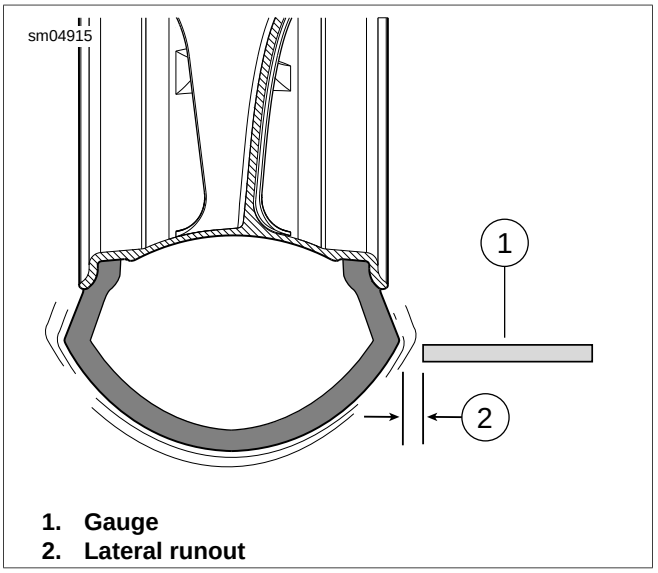
| TIRE | PRESSURE FOR SOLO RIDING | | PRESSURE AT GVWR |
|---|---|---|---|
| Front | 234 kPa | 34 psi | Same as Solo Riding |
| Rear | 248 kPa | 36 psi | Same as Solo Riding |

# RUNOUT

## Lateral

1. See Figure 2-17. Mount the wheel and tire in a wheel stand or in the swingarm and fix a gauge (1) to measure runout.
2. Spin the wheel and measure tire lateral runout (2). Refer to Table 2-11.

3. If the tire lateral runout is greater than specification, remove the tire from the rim and measure the wheel rim lateral runout. Replace the rim if out of specification. See 2.6 WHEELS.



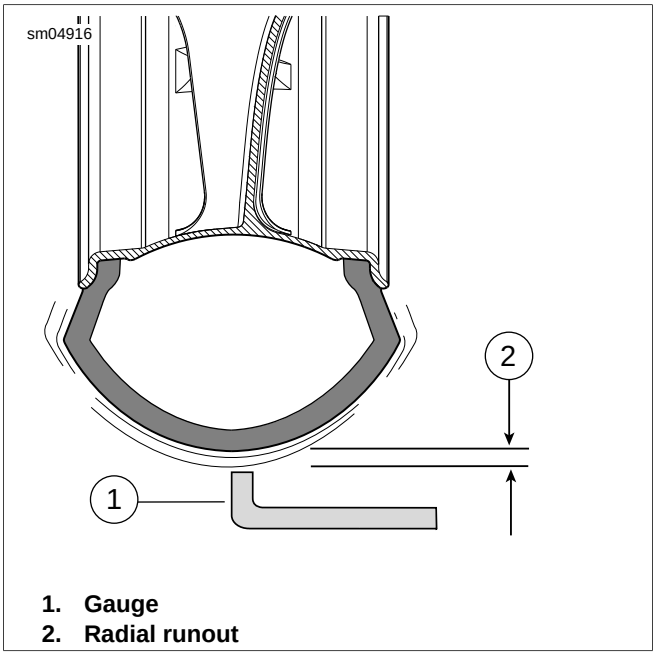

1. **Gauge**
2. **Lateral runout**

**Figure 2-17. Lateral Runout**

## Radial

See Figure 2-18. Turn wheel on axle and measure tire radial runout. Refer to Table 2-11.

If radial runout is greater than specification, remove tire from rim and measure the wheel rim radial runout. Replace the rim if out of specification. See 2.6 WHEELS.




1. **Gauge**
2. **Radial runout**

**Figure 2-18. Radial Runout**

**Table 2-11. Tire Runout: 1125R**

| RUNOUT | mm | in |
|---|---|---|
| Radial | 1.3 | 0.051 |
| Lateral | 1.3 | 0.051 |

## TIRE BALANCING

Tires should be balanced to within 7 g (1/4 oz) at 97 km/h (60 mph). Dynamic tire balancing is recommended to improve handling and reduce vibration, especially at high road speeds. Follow the instructions supplied with the balance machine.

1. On the front wheel, locate the flat surface on the **right side** of the wheel rim opposite the heavy side. On the rear wheel locate a flat surface on either side of the rim.
2. Clean oil and grease from the flat surface.

*NOTES*

- *See Figure 2-19. Use only WHEEL WEIGHTS (Part No. 43692-94Y) with self-adhesive backings.*
- *For additional adhesive strength, apply three drops of LOCTITE SUPERBONDER 420 to adhesive side of weight.*

3. Remove paper backing and press weight firmly in place. holding for ten seconds. For maximum balance weight, refer to Table 2-12.
4. Allow eight hours for adhesive to cure.

*NOTE*

*If wheel assembly is out of specification rotate tire on rim and rebalance until wheel is within specification.*

**Table 2-12. Maximum Weight Applied To Cast Wheels**

| WHEEL | MAXIMUM WEIGHT | |
|---|---|---|
| | METRIC | U.S. |
| Front | 28 g | 1.0 oz |
| Rear | 56 g | 2.0 oz |

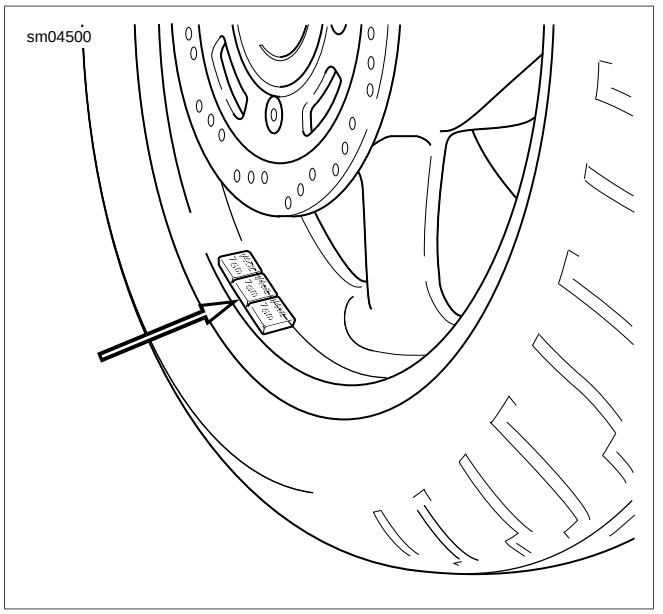



**Figure 2-19. Wheel Weights**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## TROUBLESHOOTING

Regularly inspect tires and wheels for damage and wear. If the motorcycle handles erratically, refer to Table 2-8.

## FRONT WHEEL

| PART NUMBER | TOOL NAME |
|---|---|
| B-46279 | AXLE WRENCH |

### Removal

1. Place a scissors jack under a jacking point and raise front wheel to a neutral point off ground.

*NOTE*

*See Figure 2-20. For clearance and to prevent cosmetic damage, rotate the wheel to match the slots on the back of the caliper to the wheel spokes.*

2. Remove the front fender.
3. Remove the brake line P-clamp fasteners to allow caliper to move.
4. Loosen the two caliper mounting fasteners.
5. Loosen the two pin hangers.
6. See Figure 2-21. Loosen front axle pinch bolts (1) on front fork.

*NOTE*

*See Figure 2-22. The front axle is a left hand thread.*

7. Use the AXLE WRENCH (Part No. B-46279) to loosen the front axle.
8. Remove the axle (2).

*NOTE*

*Do not operate the front brake lever when removing the caliper or the caliper pistons may be forced out. Installing the pistons requires caliper disassembly.*

9. See Figure 2-23. Remove the mounting bolts and rotate the fork leg caliper mounting lugs to clear the caliper.
10. Slide the caliper off of the rotor and remove the wheel.
11. Support the caliper to relieve tension on the brake fluid line.

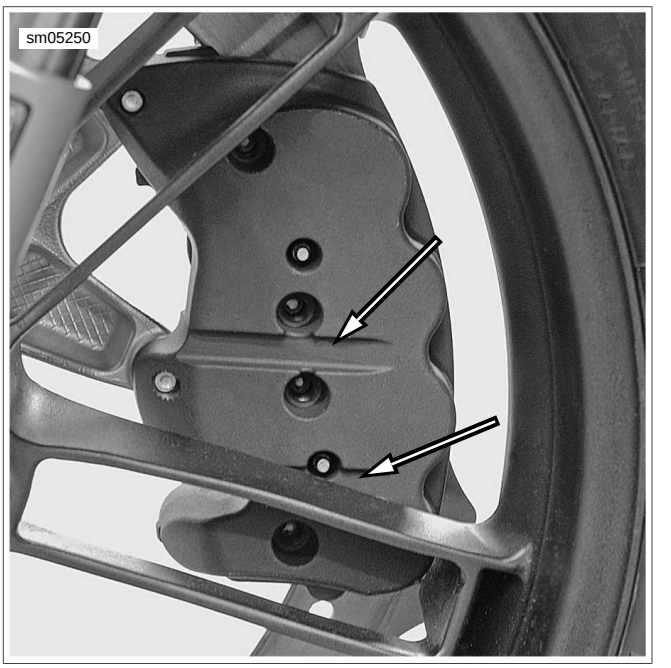
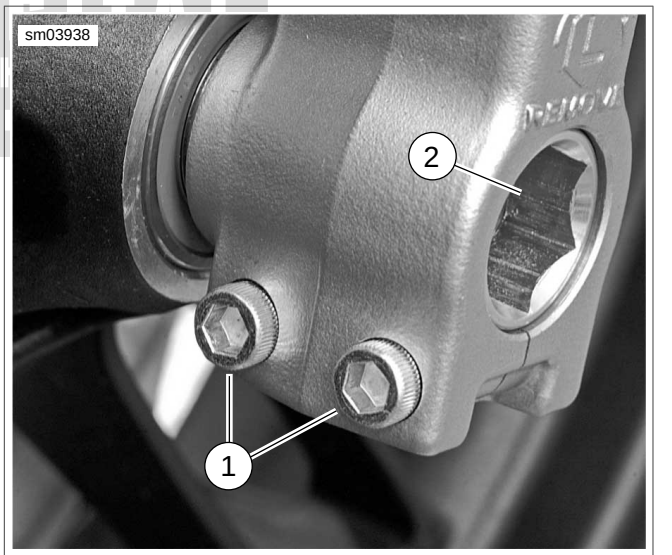



**Figure 2-20. Caliper to Spoke Clearance Slots**




1. **Pinch bolts**
2. **Axle (LH thread)**

**Figure 2-21. Front Wheel Axle**




**Figure 2-22. LH Thread Axle**

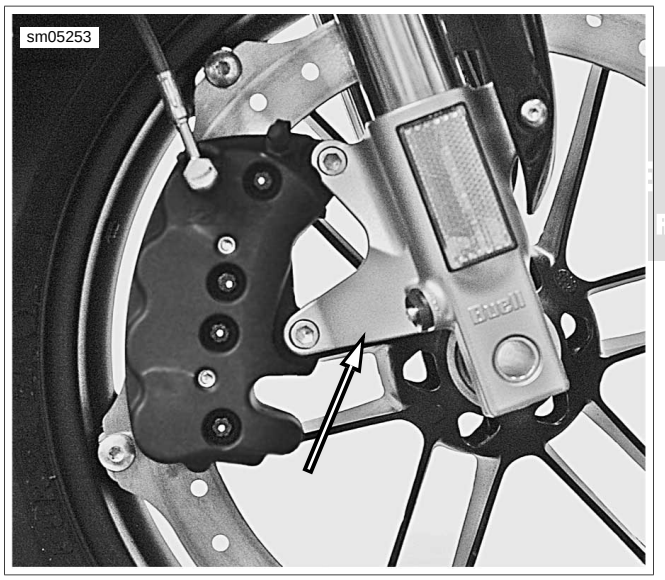



**Figure 2-23. Brake Caliper Mounting Lugs**

## Installation

1. Fit the wheel between the fork legs and move it toward the rear and up to allow clearance for the caliper to fit between the hub and the front rotor.
2. Install caliper.
   a. Align wheel so that the notches on back of caliper align with wheel spokes.
   b. Fit the caliper over the rotor and slide toward the rear.
   c. Rotate right front fork to align the caliper mounting lugs with the caliper.
   d. Install and finger tighten the caliper mounting bolts.

*NOTE*

*The front axle thread is a left hand thread.*

3. Install front axle.
   a. See Figure 2-24. Apply a light coat of LOCTITE ANTI-SEIZE LUBRICANT to the threads and bearing surfaces of the axle and the right and left wheel bearing bores.
   b. With pinch fasteners loose, insert threaded end of axle through left side fork, wheel hub and thread into right fork.
   c. Thread in the front axle.
4. Install and finger tighten the front fenders fasteners.
5. Compress the front suspension to center the components and to check for binding.
6. Install the P-clamp fastener.
7. Tighten the fasteners:
   a. Caliper mounting bolts to 48-50 Nm (35-37 ft-lbs)
   b. Axle to 53-56 Nm (39-41 ft-lbs)
   c. Alternating between bolts, axle pinch bolts to 27-30 Nm (20-22 ft-lbs)
   d. Front fender fasteners to 8.4-9.3 Nm (74-82 **in-lbs**)
   e. P-clamp fastener to 4-7 Nm (36-60 **in-lbs**)

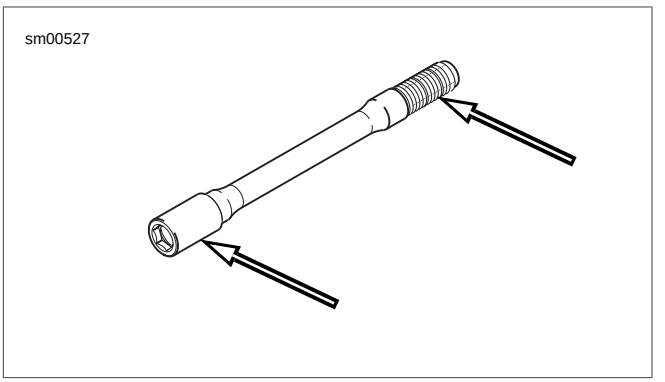



**Figure 2-24. Anti-Seize Lubricant Location**

## INSPECTION AND REPAIR

### 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 rotor and pads. See 2.7 FRONT BRAKE.
3. Measure rotor thickness. Refer to Table 2-13.
4. Measure radial and lateral rotor runout. Refer to Table 2-14.

**Table 2-13. Brake Rotor Thickness**

| DIMENSION | mm | in |
|---|---|---|
| Rotor thickness | 4.5 | 0.18 |

**Table 2-14. Front Rotor Runout**

| RUNOUT | mm | in |
|---|---|---|
| Radial | 0.45 | 0.0177 |
| Lateral | 0.63 | 0.0248 |

### Wheel Bearings

*NOTE*

*The wheel bearings are designed as sealed bearings which are not intended to be disassembled, serviced or cleaned with solvents.*

If necessary, replace wheel bearings. See 2.6 WHEELS, Wheel Bearings.

### Brake Rotor

1. See Figure 2-25. Remove and discard rotor mounting fasteners (1).
2. Remove and inspect brake rotor (2) for wear and warping. See 2.7 FRONT BRAKE.
3. Remove drive bushings (3) and discard.
4. Remove washers (4) and discard.
5. Remove front brake springs (5) and discard.
6. Install **new** springs.
7. Install **new** washers.
8. Install **new** drive bushings with rounded end facing the wheel hub.

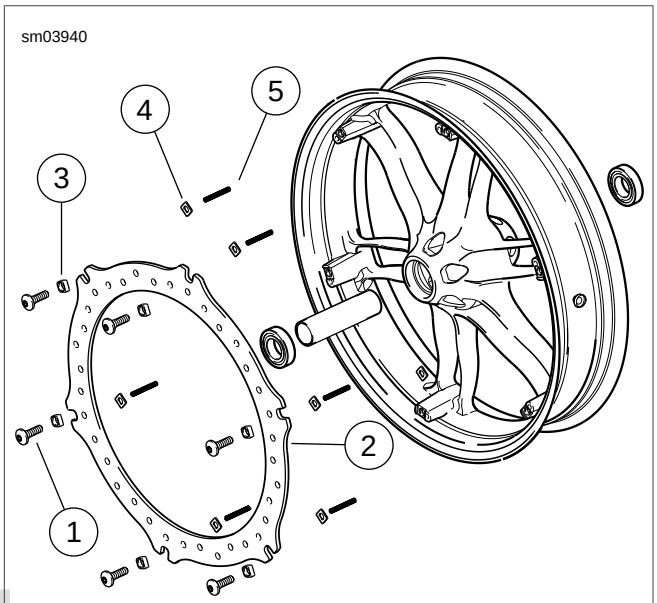
**CAUTION**

**Do not re-use brake disc screws. Re-using disc screws can result in torque loss and damage to rotor and/or brake assembly. (00319b)**

9. Install **new** rotor mounting fasteners in a crisscross pattern around the wheel. Tighten to 34-37 Nm (25-27 ft-lbs).

**⚠WARNING**

**Rotor mounting fasteners must be seated into drive bushings and drive bushings must be fitted into rotor properly. Failure to comply can affect braking ability and lead to brake failure which could result in death or serious injury. (00499b)**




1. **Rotor mounting fastener**
2. **Brake rotor**
3. **Drive bushing**
4. **Washer**
5. **Brake spring**

**Figure 2-25. Front Wheel**

## REAR WHEEL

| PART NUMBER | TOOL NAME |
|---|---|
| B-46279 | AXLE WRENCH |

### Removal

1. Raise the rear wheel off the ground with a scissor jack placed under a jacking point on the muffler.

*NOTE*

*The 90 degree tool found in the tool kit fits the fastener behind the passenger footrest.*

2. See Figure 2-26. Remove the upper belt guard.

*NOTE*

*Grind a hex key to fit space between wheel and P-clamp.*

3. Remove the brake caliper.
   a. Cover wheel spoke and rim surfaces that could be damaged by the caliper.
   b. See Figure 2-27. Remove the rear brake fluid line P-clamp.
   c. See Figure 2-28. Through the holes in the brake rotor, remove the caliper mounting bolts.
   d. Pull the caliper down and out of the wheel rim.
   e. See Figure 2-29. Support the caliper and the fluid line.
4. See Figure 2-30. Loosen the rear axle pinch bolt (1).

*NOTE*

*The rear axle is a left hand thread.*

5. Use the AXLE WRENCH (Part No. B-46279) to remove the rear axle.
6. As the wheel slides forward on the taper of the axle, remove the drive belt from the sprocket.

*NOTE*

*Do not press on the rear brake pedal with the rear wheel removed. Pressure in the brake fluid line pushes the pistons out of the caliper. Pistons can only be seated by disassembling the caliper.*

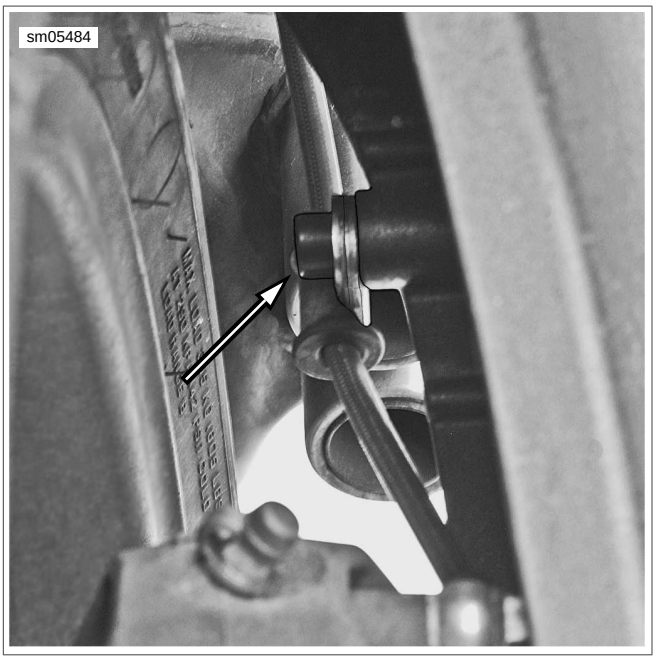



**Figure 2-27. Brake Fluid Line P-Clamp**




**Figure 2-26. Upper Belt Guard Fasteners**

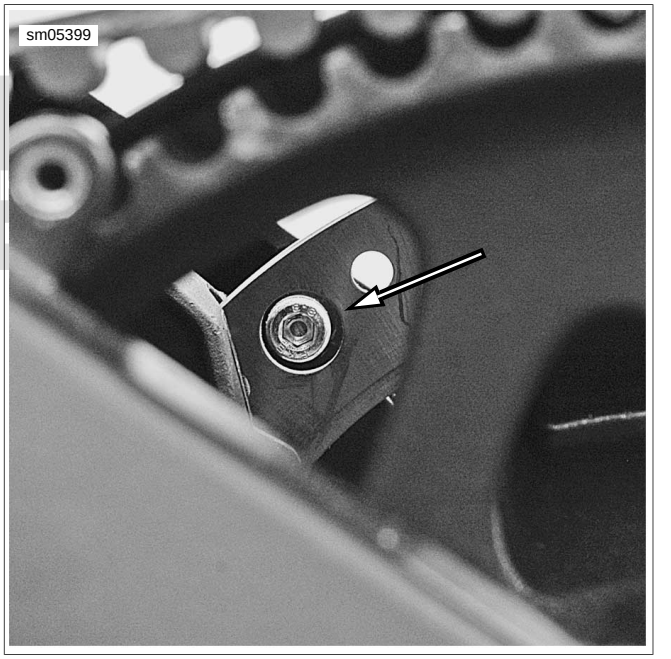



**Figure 2-28. Caliper Mounting Bolt Through Sprocket**

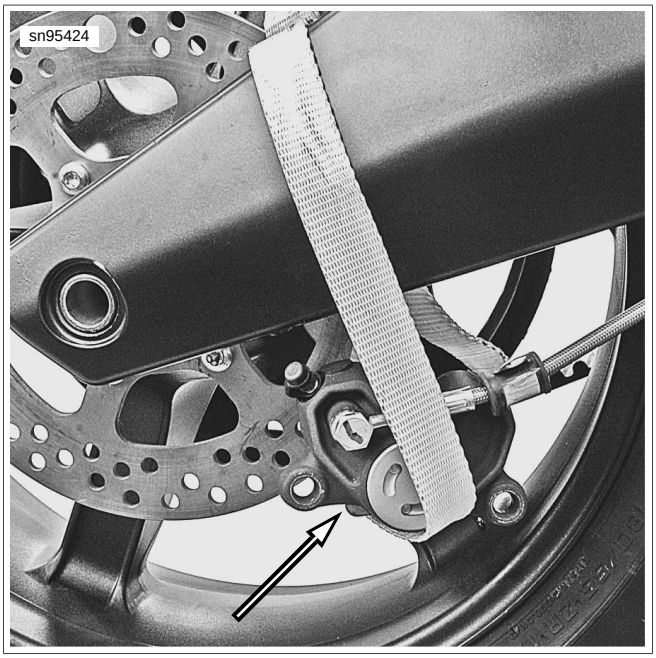
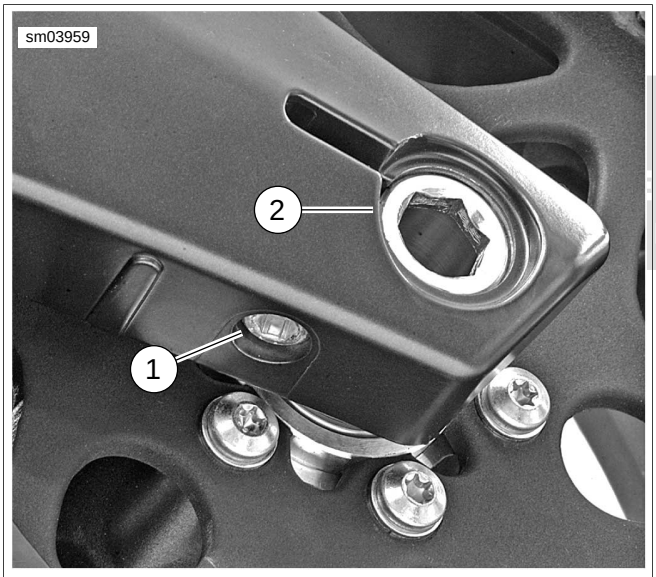



**Figure 2-29. Support Brake Caliper and Fluid Line**




1. **Pinch bolt**
2. **Axle**

**Figure 2-30. Rear Axle: 1125R**

## Installation

1. See Figure 2-31. Apply a light coat of LOCTITE ANTI-SEIZE LUBRICANT to the wheel bearing inner race, and the bore of the spacer.
2. See Figure 2-32. Coat the axle with LOCTITE ANTI-SEIZE LUBRICANT.
3. Center wheel to swingarm and work drive belt over sprocket.

*NOTES*

*It may be necessary to raise or lower the motorcycle with the scissors jack to align the swingarm axle holes.*

4. Slide the axle through left side of swingarm and wheel hub and thread (left hand threads) into the swingarm with the AXLE WRENCH (Part No. B-46279).
5. Slide the brake caliper inside the rim and over the rotor.
6. Install the caliper mounting bolts through holes in rotor.
7. Tighten to 31.8-35.3 Nm (23.5-26.0 ft-lbs).
8. Install P-clamp fastener.
9. Tighten to 24.4-27.1 Nm (18-20 ft-lbs).
10. Tighten the rear axle.
    a. Initially tighten to 31.2-36.6 Nm (23-27 ft-lbs).
    b. Back off two turns (720 degrees).
    c. Final tighten to 65.1-70.5 Nm (48-52 ft-lbs).
    d. Tighten pinch bolt to 54-61 Nm (40-45 ft-lbs).
11. Install upper belt guards. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
12. Press brake pedal several times to seat pads on rotor.
13. Check brake fluid level.

**WARNING**

**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

14. Test brake light.

**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)**

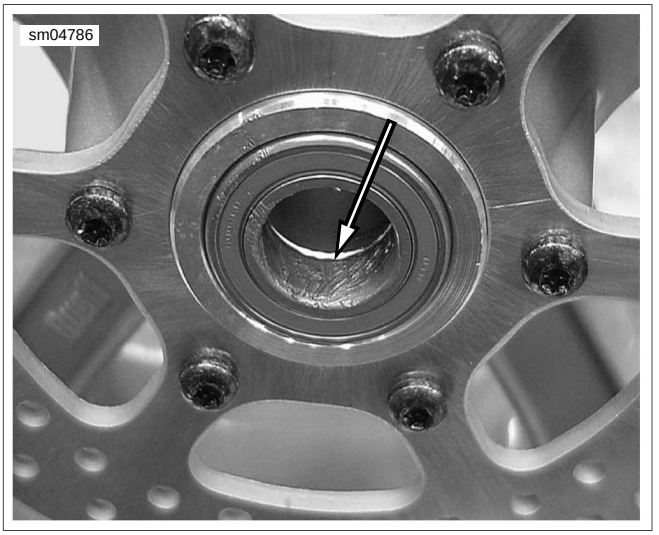



**Figure 2-31. Anti-Seize in Wheel Bearing Inner Race**

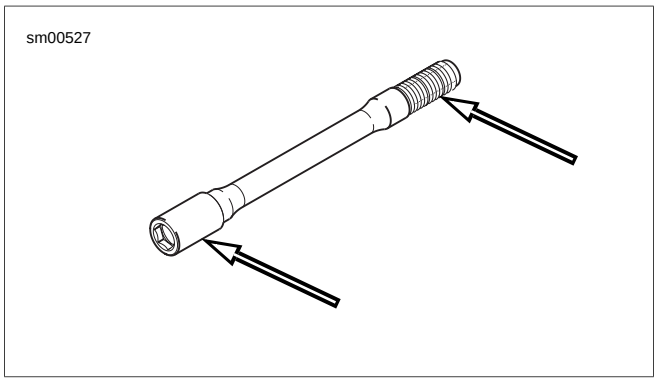



**Figure 2-32. Anti-Seize Lubricant Location**

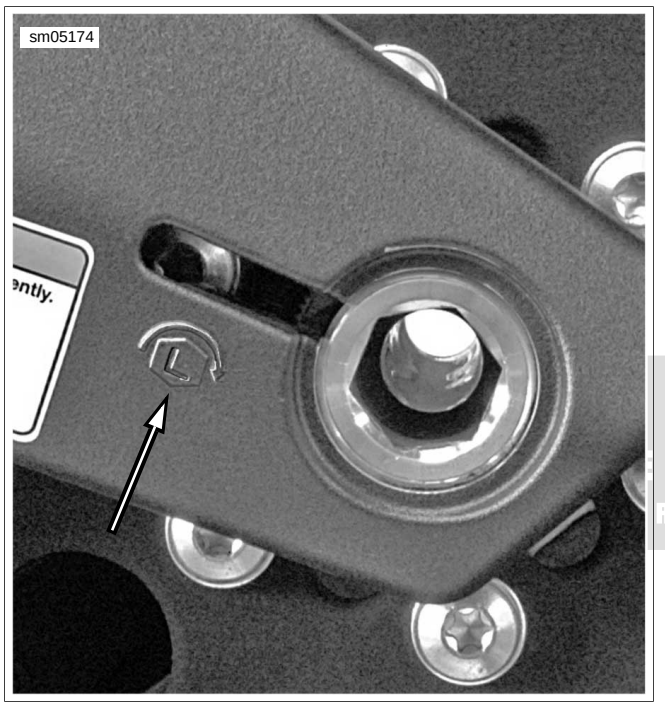



**Figure 2-33. Left Hand Thread Icon**

## REPAIR

### Inspection

**WARNING**

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

1. Inspect all parts for damage or excessive wear.
2. Measure rotor thickness. Refer to Table 2-15.
3. Measure radial and lateral rotor runout. Refer to Table 2-16.
4. Replace rotor as required.

**Table 2-15. Brake Rotor Thickness**

| DIMENSION | mm | in |
|---|---|---|
| Rotor thickness | 4.5 | 0.18 |

**Table 2-16. Rear Rotor Runout: 1125R**

| RUNOUT | mm | in |
|---|---|---|
| Radial | 0.450 | 0.0177 |
| Lateral | 0.390 | 0.0154 |

### Drive Sprocket

**CAUTION**

**Do not re-use sprocket mounting screws. Re-using sprocket mounting screws can result in torque loss and damage to the sprocket and/or belt assembly. (00480b)**

1. See Figure 2-34. To remove drive sprocket, remove sprocket fasteners and washers. Discard the fasteners.
2. With the lip of the sprocket facing the inside, position the sprocket on the wheel.
3. Install **new** fasteners and washers.
4. Tighten to 48-50 Nm (35-37 ft-lbs).




**Figure 2-34. Drive Sprocket Fasteners**

### Brake Rotor

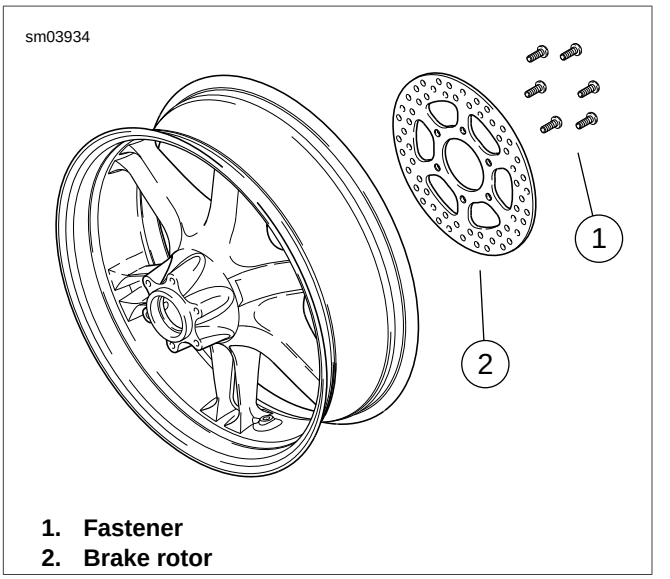
**CAUTION**

**Do not re-use brake disc screws. Re-using disc screws can result in torque loss and damage to rotor and/or brake assembly. (00319b)**

1. See Figure 2-35. To remove brake rotor (2), remove and discard rotor fasteners (1).
2. Install brake rotor with **new** fasteners.
3. Tighten to 34-37 Nm (25-27 ft-lbs).

## Wheel Bearings

To replace rear wheel bearings (4), see 2.6 WHEELS, Wheel Bearings.




1. **Fastener**
2. **Brake rotor**

**Figure 2-35. Rear Brake Rotor and Wheel**

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## WHEEL RIM RUNOUT

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

### Lateral Runout

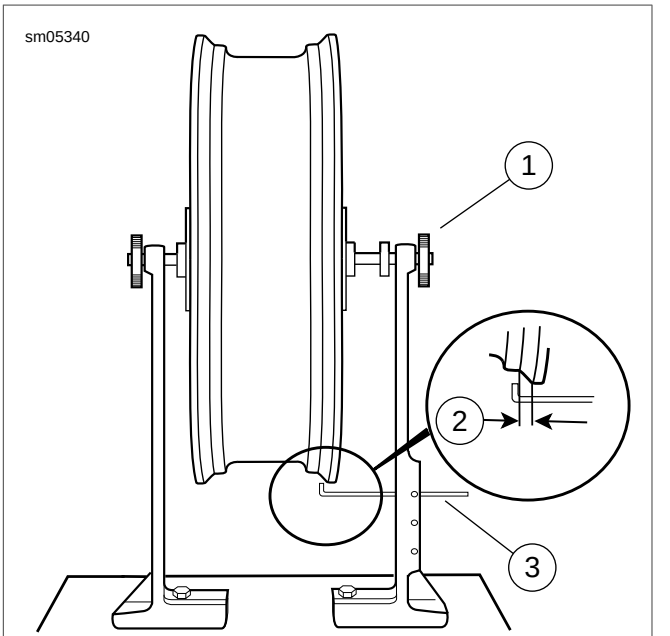
1. See Figure 2-36. Install truing arbor in wheel hub and place wheel in the WHEEL TRUING AND BALANCING STAND (Part No. HD-99500-80).
2. Tighten arbor nuts so hub will turn on its bearings.
3. Measure rim lateral runout by placing a gauge rod or dial indicator near the rim bead. Replace wheel if lateral runout exceeds specification. Refer to Table 2-17.

### Radial Runout

1. See Figure 2-37. Install truing arbor in wheel hub and place wheel in the WHEEL TRUING AND BALANCING STAND (Part No. HD-99500-80).
2. Tighten arbor nuts so hub will turn on its bearings.
3. Measure radial runout as shown. Replace wheel if runout exceeds specification. Refer to Table 2-17.

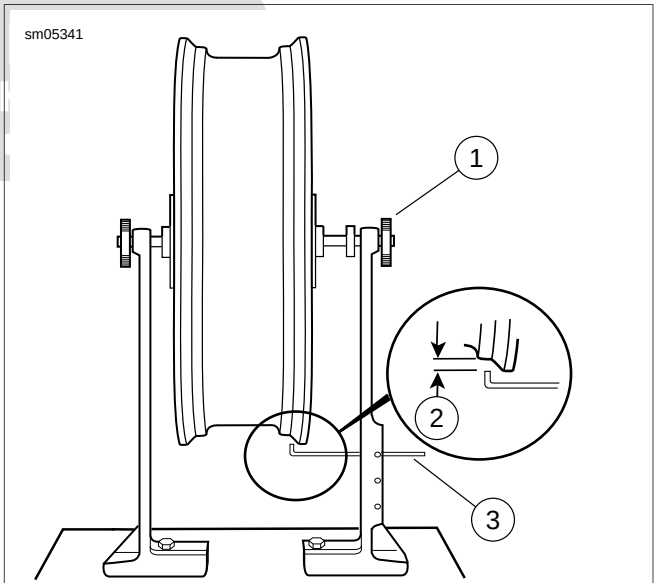
**Table 2-17. Wheel Rim Runout**

| RUNOUT | mm | in |
|---|---|---|
| Lateral | 0.76 | 0.030 |
| Radial | 0.76 | 0.030 |




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

**Figure 2-36. Checking Wheel Rim Lateral Runout**




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

**Figure 2-37. Checking Wheel Rim Radial Runout**

## WHEEL BEARINGS

| PART NUMBER | TOOL NAME |
|---|---|
| B-43993-11 | BACKING PLATE |
| B-43993-7 | FRONT WHEEL BEARING REMOVER COLLET |
| B-43993-9 | FRONT BEARING INSTALLER |
| HD-44060-A | WHEEL BEARING INSTALLER AND REMOVER |
| J-23444-A | EXTREME PRESSURE LUBRICANT |

### Removal

*NOTE*

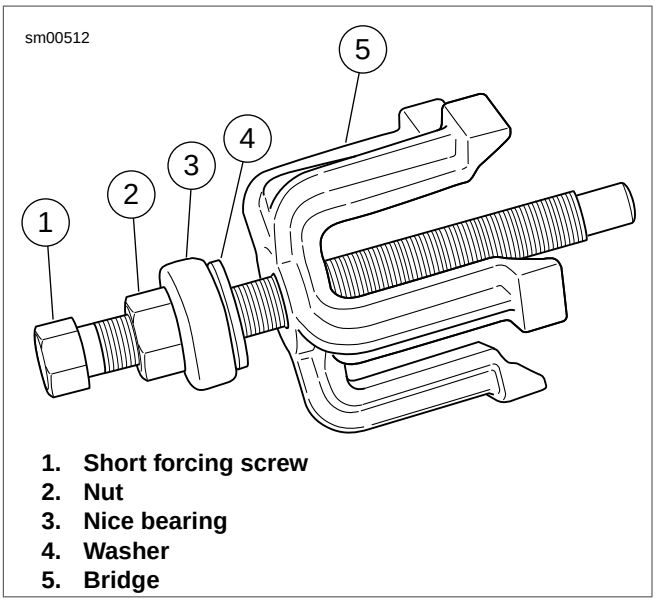
*Remove the brake rotor side bearing first.*

1. See Figure 2-38. Assemble the short forcing screw (1), nut (2), Nice bearing (3), washer (4) and bridge (5) from the WHEEL BEARING INSTALLER AND REMOVER (Part No. HD-44060-A).
2. Sparingly apply EXTREME PRESSURE LUBRICANT (Part No. J-23444-A) to the threads of the short forcing screw (1) to prolong service life and verify smooth operation.
3. See Figure 2-39. Insert the FRONT WHEEL BEARING REMOVER COLLET (Part No. B-43993-7) (from kit Part No. B-43993-50A) into the wheel bearing until it fully seats against the bearing.
4. Insert the ball bearing (2) into the collet (1).
5. See Figure 2-40. Thread the puller assembly (1) into the collet (2).
6. Hold the collet (2), and turn the forcing screw (3) to expand the collet.
7. See Figure 2-41. Place the bridge (1) against the wheel hub.
8. Hold the forcing screw (3), and turn the nut (2) clockwise until the bearing is free of the hub.

*NOTE*

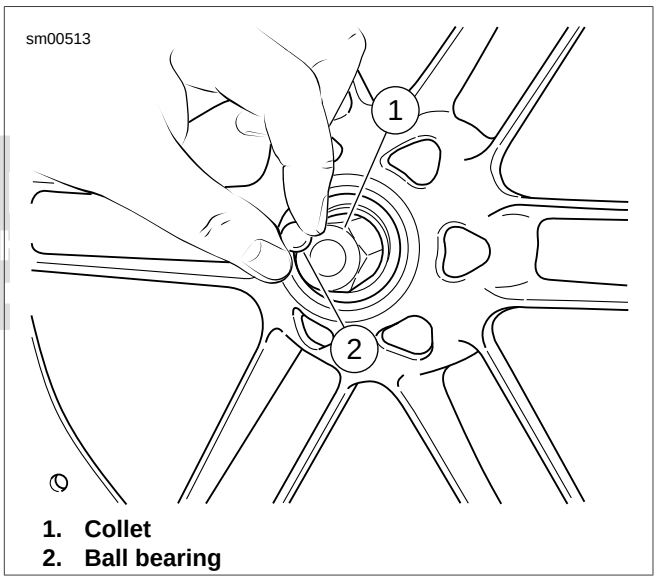
*Wheel bearings are sealed bearings. The bearings are not intended to be disassembled, serviced or cleaned with solvents.*

9. See Figure 2-42. Loosen the nut (1), and back off the bridge (2). Hold the forcing screw (3) while holding the collet (4) to remove the forcing screw from the collet.
10. Remove the ball bearing (5) and wheel bearing (6) from the collet (4).
11. See Figure 2-43. Remove the spacer.



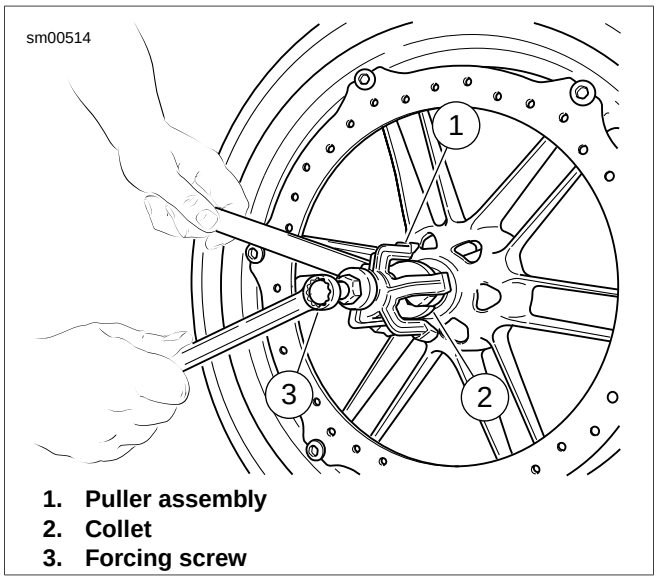

1. **Short forcing screw**
2. **Nut**
3. **Nice bearing**
4. **Washer**
5. **Bridge**

**Figure 2-38. Assemble Puller**



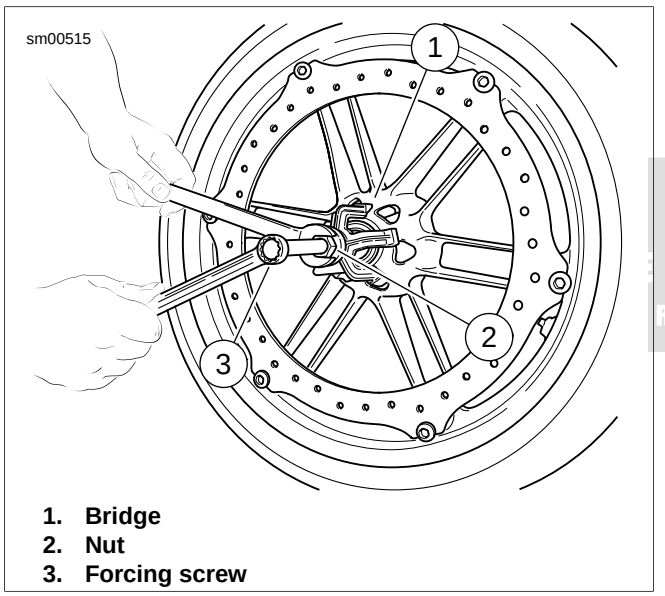

1. **Collet**
2. **Ball bearing**

**Figure 2-39. Install Collet and Ball Bearing**



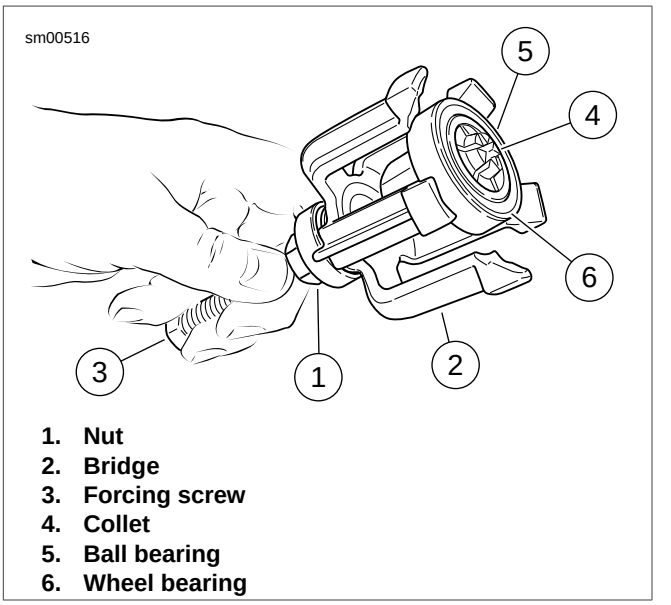

1. **Puller assembly**
2. **Collet**
3. **Forcing screw**

**Figure 2-40. Expand the Collet**




1. **Bridge**
2. **Nut**
3. **Forcing screw**

**Figure 2-41. Remove the Bearing**




1. **Nut**
2. **Bridge**
3. **Forcing screw**
4. **Collet**
5. **Ball bearing**
6. **Wheel bearing**

**Figure 2-42. Removing Bearing from Puller**

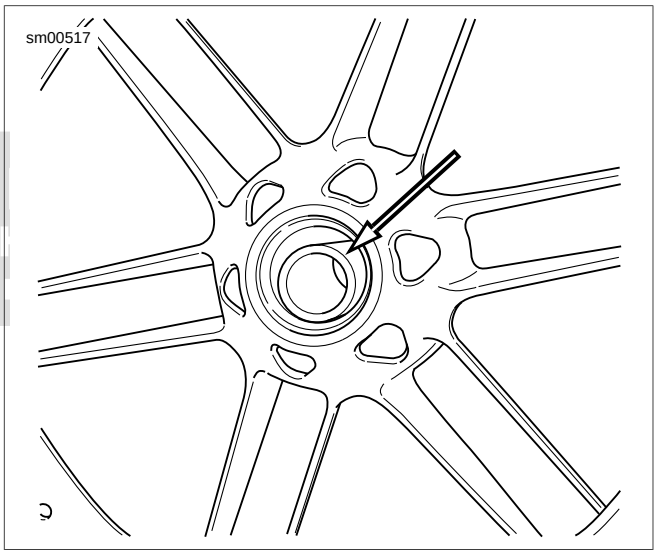



**Figure 2-43. Remove the Spacer**

## Installation: Rotor Side Bearing

**⚠WARNING**

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

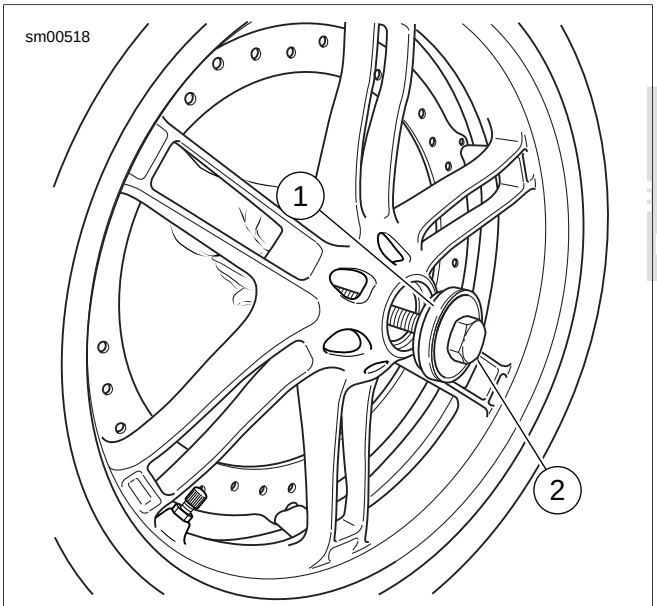
*NOTES*

- *First, press the rotor side bearing against the shoulder in the hub. Then press the opposite side bearing until it contacts the spacer.*
- *Always install the rotor side bearing first with the lettering engraved in the race facing out.*

1. See Figure 2-44. Install the BACKING PLATE (Part No. B-43993-11) (1) onto the long forcing screw (2) from the

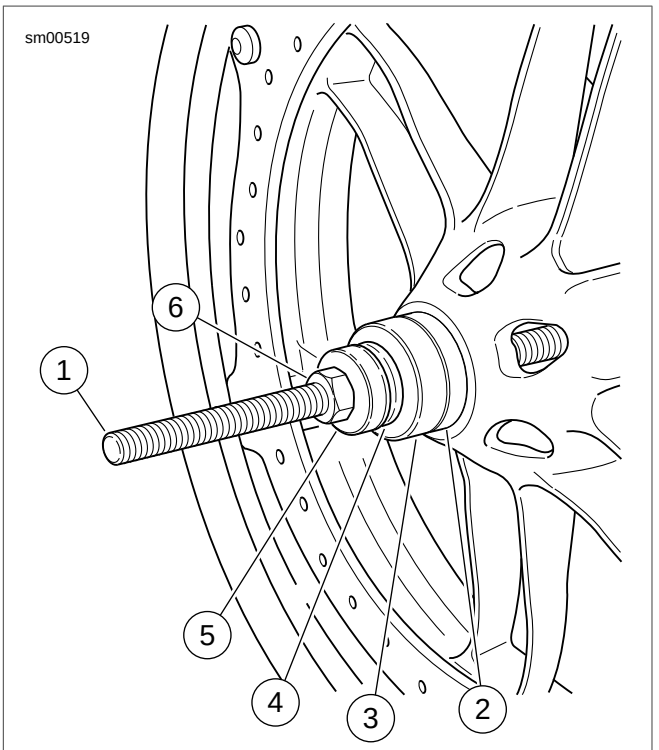
WHEEL BEARING INSTALLER AND REMOVER (Part No. HD-44060-A), with the smaller diameter toward the wheel hub.

2. Insert the forcing screw and backing plate into the wheel hub.
3. See Figure 2-45. Sparingly apply EXTREME PRESSURE LUBRICANT (Part No. J-23444-A) to the threads of the long forcing screw (1).
4. Insert a **new** wheel bearing (2) squarely into the hub, with the lettered side facing out (away from the wheel).
5. Slide the FRONT BEARING INSTALLER (Part No. B-43993-9) (3) (from kit Part No. B-43993-50A) onto the forcing screw (1), with the smaller diameter toward the bearing bore.
6. Install a washer (4), Nice bearing (5) and nut (6) onto the forcing screw (1).
7. While holding the forcing screw (1), tighten the nut (6) until the bearing is seated firmly against the shoulder inside the bearing bore in the wheel hub.
8. Remove the nut, bearing, washer, front bearing installer, and forcing screw.



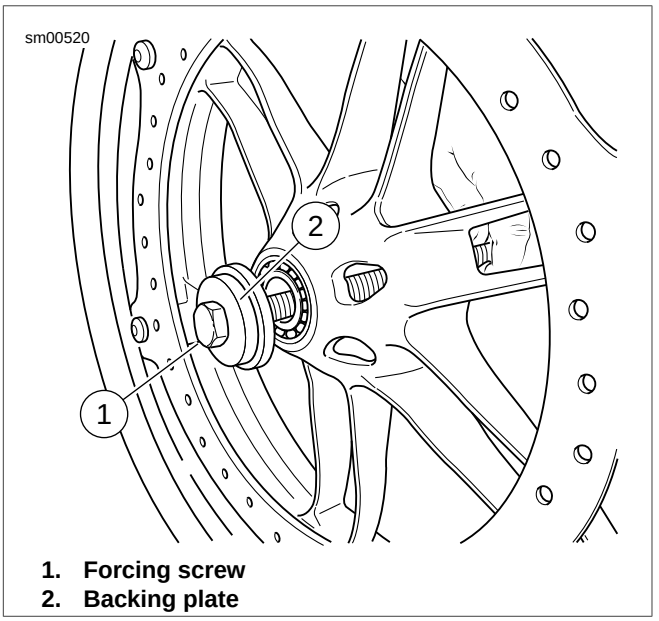

1. **Backing plate**
2. **Forcing screw**

**Figure 2-44. Install the Backing Plate (B-43993-12) and Forcing Screw**




1. **Long forcing screw**
2. **Wheel bearing**
3. **Front wheel bearing installer**
4. **Washer**
5. **Nice bearing**
6. **Nut**

**Figure 2-45. Installing Wheel Bearings**




1. **Forcing screw**
2. **Backing plate**

**Figure 2-46. Insert Forcing Screw and Backing Plate**

## Installation: Opposite Side Bearing

1. See Figure 2-46. Remove the backing plate (2) from the long forcing screw (1). Install the backing plate onto the

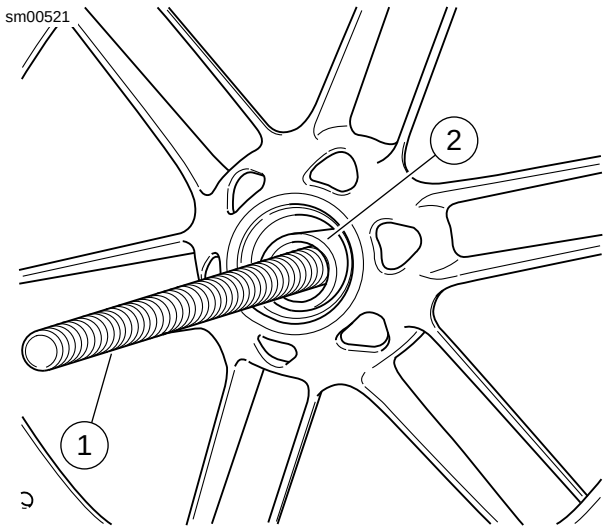
forcing screw, with the smaller diameter toward the hex head.

2. Insert the forcing screw through the wheel hub on the opposite side of the wheel.
3. See Figure 2-47. Install the spacer (2).

*NOTE*

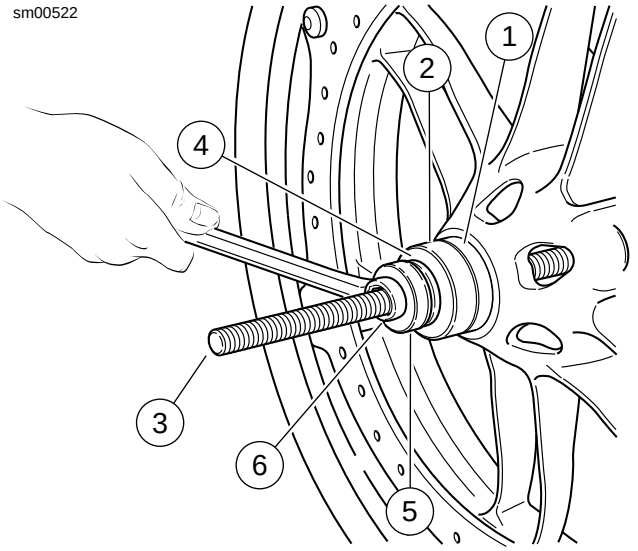
*Center the spacer while installing the wheel bearing. Failure to center the spacer could cause the bearing not to pull in straight.*

4. See Figure 2-48. Insert a **new** wheel bearing (1) squarely into the hub, with the lettered side facing out (away from the wheel).
5. Slide the FRONT BEARING INSTALLER (Part No. B-43993-9) (2) onto the forcing screw (3), with the smaller diameter toward the bearing bore.
6. Install a washer (4), Nice bearing (5) and nut (6) onto the forcing screw (3).
7. While holding the forcing screw (3), tighten the nut (6) until the bearing contacts the spacer.




**1. Forcing screw**
**2. Spacer**

**Figure 2-47. Install the Spacer**



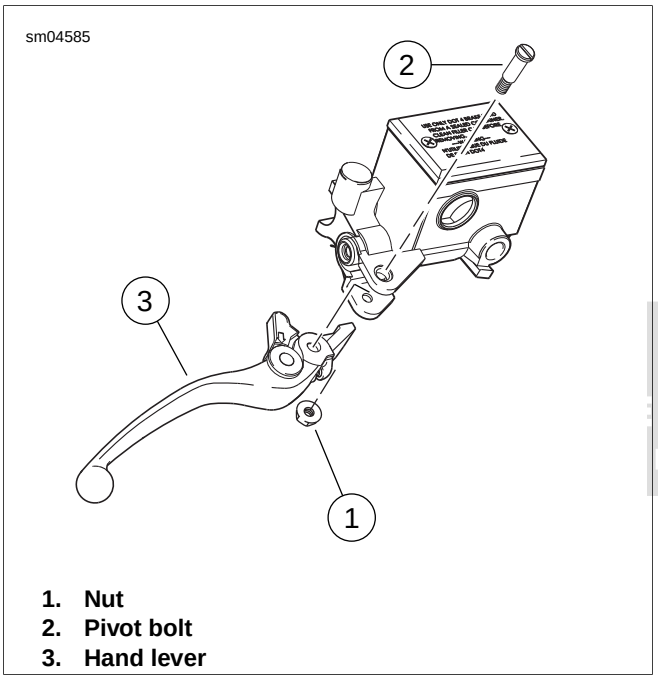

**1. Wheel bearing**
**2. Front wheel bearing installer**
**3. Forcing screw**
**4. Washer**
**5. Nice bearing**
**6. Nut**

**Figure 2-48. Install the Bearing**

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## FRONT BRAKE HAND LEVER

1. See Figure 2-49. Remove pivot bolt nut (1) and pivot bolt (2) to detach the brake hand lever (3).
2. To install, lubricate pivot bolt with LOCTITE ANTI-SEIZE.
3. Align hole in hand lever with pivot hole in master cylinder/reservoir bracket.
4. Install pivot bolt through bracket and hand lever and thread into bracket.
5. Tighten pivot bolt to 0.5-1.5 Nm (4.4-13.2 **in-lbs**).
6. Thread nut onto pivot bolt and tighten nut to 4.9-6.9 Nm (43-61 **in-lbs**).




1. **Nut**
2. **Pivot bolt**
3. **Hand lever**

**Figure 2-49. Front Brake Lever**

## MASTER CYLINDER/RESERVOIR: REMOVAL

*NOTE*

*It is not necessary to drain the brake fluid to remove the master cylinder assembly from the handlebars. Do not disassemble the master cylinder unless problems are experienced.*

**⚠CAUTION**

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

**CAUTION**

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

1. Drain brake fluid into a suitable container. Discard used fluid according to local laws.
   a. Install a length of clear plastic tubing over caliper bleeder valve. Place free end in the container.
   b. Open bleeder valve approximately 1/2-turn.
   c. Pump brake hand lever to drain brake fluid.
   d. Tighten bleeder valve to 3.9-6.9 Nm (35-61 **in-lbs**).
2. See Figure 2-50. Disconnect the brake light switch spade connectors from the brake light switch.

*NOTE*

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

3. See Figure 2-51. Remove the banjo bolt and two copper washers to disconnect brake line from master cylinder. Discard copper washers.
4. See Figure 2-52. Remove mounting clamp fasteners to detach master cylinder/reservoir from handlebar.




**Figure 2-50. Brake Light Switch Spade Connectors**




**Figure 2-51. Master Cylinder/Reservoir Banjo Bolt**

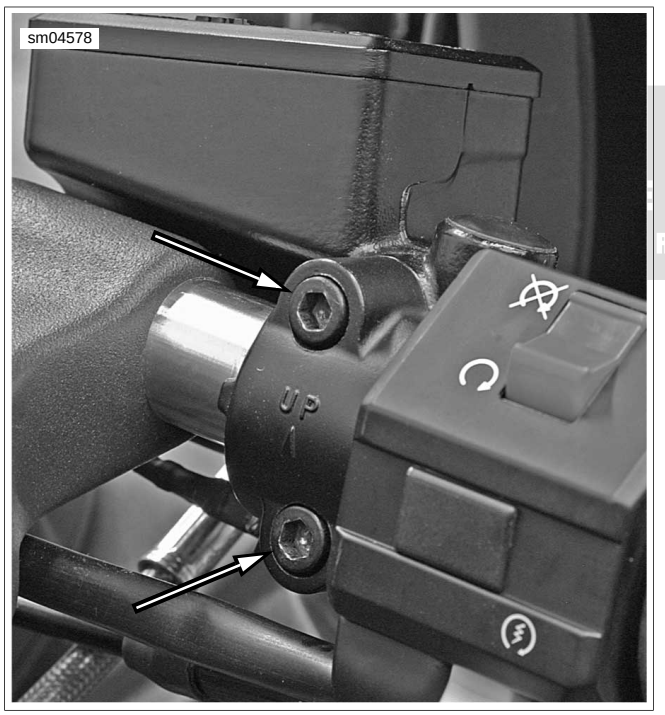



**Figure 2-52. Handlebar Clamps**

## MASTER CYLINDER/RESERVOIR: REPAIR

### Disassembly

1. Remove reservoir cover by removing cover fasteners.
2. Drain and discard remaining brake fluid according to local laws.
3. Remove rubber boot and discard.
4. See Figure 2-53. Press piston assembly (1) and remove internal circlip (2) and discard.
5. Remove piston and spring from master cylinder and discard.




1. **Piston assembly**
2. **Circlip**

**Figure 2-53. Piston Assembly in 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. Clean all parts with denatured alcohol or **D.O.T. 4 brake fluid**.

*NOTE*

*Do not contaminate with mineral oil or other solvents.*

2. Wipe dry with a clean, lint free cloth.
3. See Figure 2-54. Blow out the fluid passages and piston bore with compressed air.

*NOTE*

*See Figure 2-55. Do not use a wire or similar instrument to clean the drilled passages (1) in the bottom of the reservoir.*

4. Inspect the piston bore in master cylinder housing. Replace the housing if any scoring, pitting or corrosion is present.
5. Inspect the outlet port that mates with the fluid line banjo fitting. Replace the housing if any scratches, dents or other damage is present.
6. Clean the reservoir diaphragm, stiffener and cover.
7. Clean the pressure relief channels (2) in the cover.

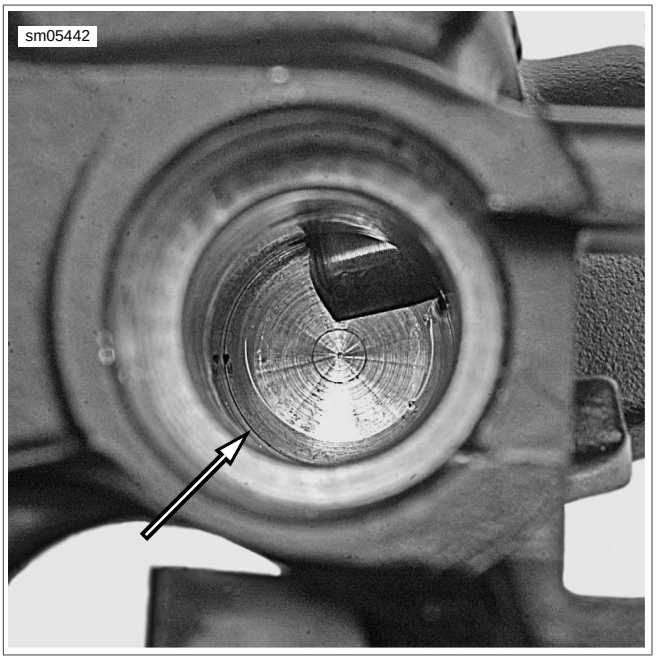
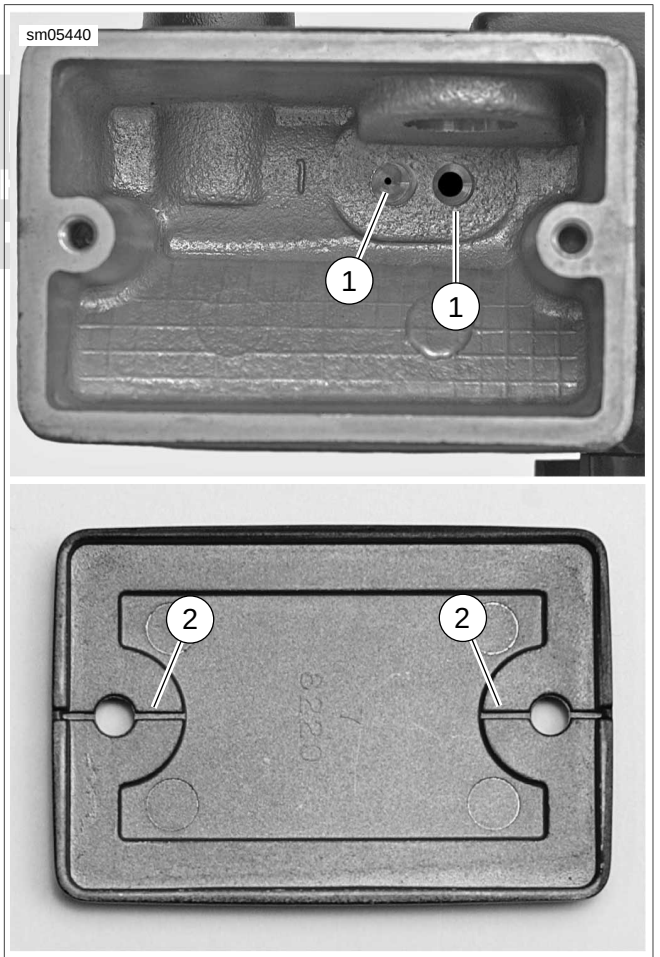



**Figure 2-54. Piston Bore and Fluid Passages**




1. **Drilled passages**
2. **Pressure relief channels**

**Figure 2-55. Fluid Passages and Relief Channels**

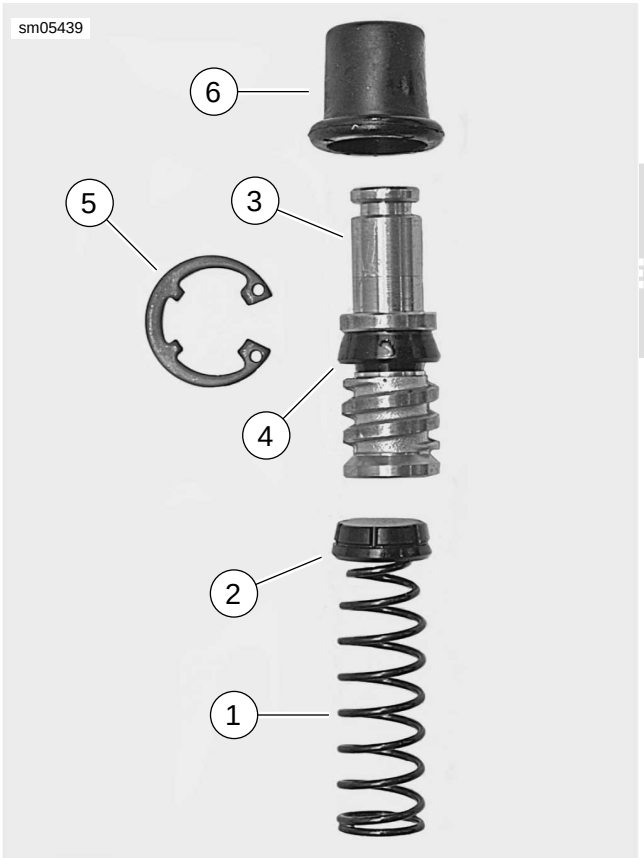
## Assembly

1. Lubricate master cylinder bore, piston and piston seals with D.O.T. 4 brake fluid.
2. Push the rubber seal onto the piston of a master cylinder piston set.
3. Fit the rubber cap to the small end of the spring.

**⚠WARNING**

**Be sure circlip snaps in place. An unsecured circlip can cause brake failure, which could result in death or serious injury. (00513b)**

4. See Figure 2-56. Insert the spring (1) with cap (2) into master cylinder bore.
5. Insert the piston (3) with seal (4).
6. Secure the piston with circlip (5).
7. Fit rubber boot (6) over the piston and work the top ridge on the rubber boot into the groove in the piston.




1. **Spring**
2. **Rubber cap**
3. **Piston**
4. **Rubber seal**
5. **Circlip**
6. **Rubber boot**

**Figure 2-56. Piston Set**

## MASTER CYLINDER/RESERVOIR: INSTALLATION

1. />See Figure 2-57. Install master cylinder/reservoir to handlebar with clamp (1) and fasteners (2).
2. See Figure 2-58. Position split of clamp and reservoir over etched line (1) on handlebar and tighten to 9.0-10.2 Nm (80-90 **in-lbs**).
3. If removed, install the front brake light switch (3).
   a. Install brake light switch fastener (4) and washer (5).
   b. Tighten to 0.8-1.1 Nm (7-10 **in-lbs**).
   c. Push brake light socket connectors into brake light switch spade terminals.
   d. Test switch action. Tang on switch must release when hand lever is moved.

**CAUTION**

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

4. Connect the brake fluid line (6) to the master cylinder/reservoir using two **new** copper washers (7) and banjo bolt (8) and tighten to 22-27 Nm (16-20 ft-lbs).

*NOTE*

*Use only **new** copper crush banjo washers with D.O.T. 4 brake fluid. Earlier silver banjo washers are not compatible with D.O.T. 4 fluid and will not seal properly over time.*

**CAUTION**

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

5. Protect the body work from the brake fluid.
6. With the master cylinder in a level position, add D.O.T. 4 brake fluid until the level is above the LOWER line on the sight gauge.

**⚠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)**

7. To verify operation of the relief port, actuate the brake lever with the reservoir cover removed. A spurt of fluid will break the surface if the relief port is open.
8. Bleed the front brake fluid lines. See 1.11 BRAKE SYSTEM MAINTENANCE.
9. Attach reservoir cover (9), gasket (10) and diaphragm (11). Tighten cover fasteners (12) to 1-2 Nm (9-18 **in-lbs**).

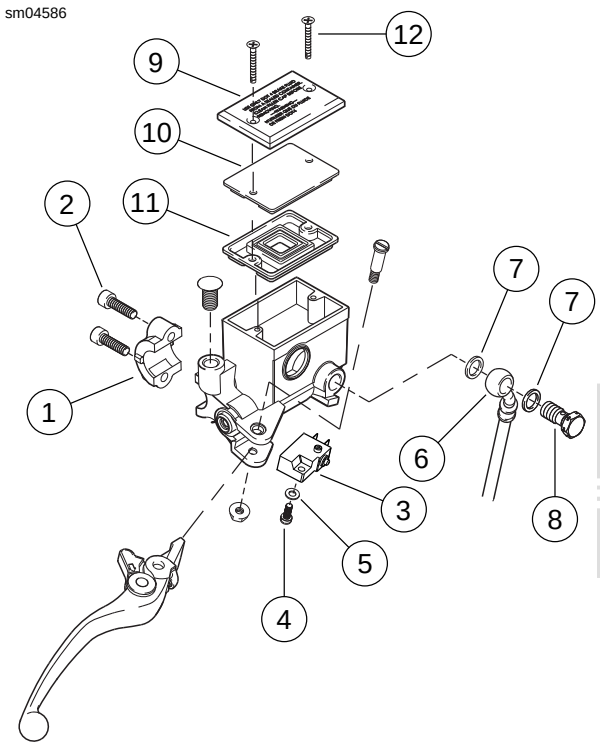
**⚠WARNING**

**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)**

**⚠WARNING**

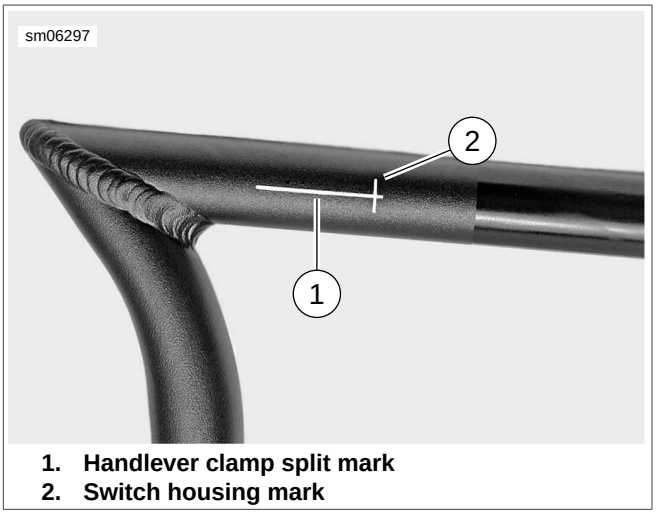
**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

10. Test the brake light.




1. **Clamp**
2. **Fasteners**
3. **Brake light switch**
4. **Fastener**
5. **Washer**
6. **Brake line**
7. **Copper washers**
8. **Banjo bolt**
9. **Reservoir cover**
10. **Gasket**
11. **Diaphragm**
12. **Fasteners**

**Figure 2-57. Master Cylinder/Reservoir Brake Lever Assembly**




1. **Handlever clamp split mark**
2. **Switch housing mark**

**Figure 2-58. Hand Lever Clamp and Switch Housing Alignment Marks**

## FRONT BRAKE FLUID LINE

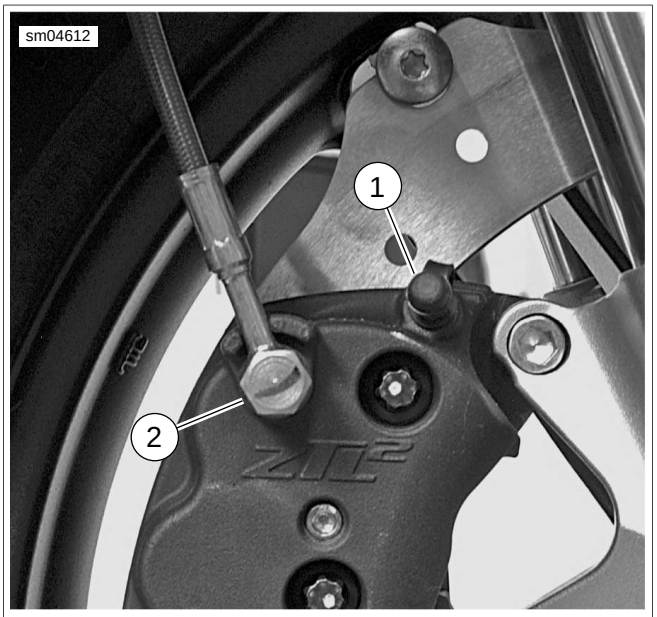
### Removal

1. Drain brake fluid. Discard used fluid according to local laws.
   a. See Figure 2-59. Remove the bleeder valve cap and install a length of plastic tubing over valve (1). Place the free end in the collection pan.
   b. Open the bleeder valve about 1/2-turn.
   c. Pump the hand lever to drain the brake fluid.
   d. Tighten the bleeder valve to 4-7 Nm (36-60 **in-lbs**).

*NOTE*

*Damaged banjo bolt seating surfaces will leak when reassembled. Carefully remove banjo bolts to prevent damage to seating surfaces.*

2. Remove caliper banjo bolt (2) and two copper washers to disconnect brake line from caliper. Discard copper washers.
3. Remove master cylinder banjo bolt and two copper washers to disconnect brake line from master cylinder/reservoir. Discard copper washers.
4. Remove P-clamp attaching brake line to right side of lower fork clamp.
5. Carefully inspect the brake fluid line for dents, cuts, chaffing or other defects. Replace damaged brake lines.




1. **Bleeder valve**
2. **Banjo bolt**

**Figure 2-59. Bleeder Valve and Banjo Bolt**

## Installation

1. See Figure 2-60. Connect the brake fluid line to master cylinder/reservoir using two **new** copper washers (1) and a banjo bolt (2).
2. Finger tighten the banjo bolt into master cylinder/reservoir.
3. See Figure 2-61. Route the fluid line from the master cylinder to the caliper in front of the lower fork clamp and around the outside of the fork tube.

*NOTE*

*Use only **new** copper crush washers with D.O.T. 4 brake fluid.*

**CAUTION**

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

4. Connect the brake fluid line to caliper using two **new** copper washers and a banjo bolt.
5. Finger tighten the banjo bolt into the front caliper.
6. Tighten the master cylinder/reservoir banjo bolt to 22-27 Nm (16-20 ft-lbs).
7. Tighten the caliper banjo bolt to 22-27 Nm (16-20 ft-lbs).

**WARNING**

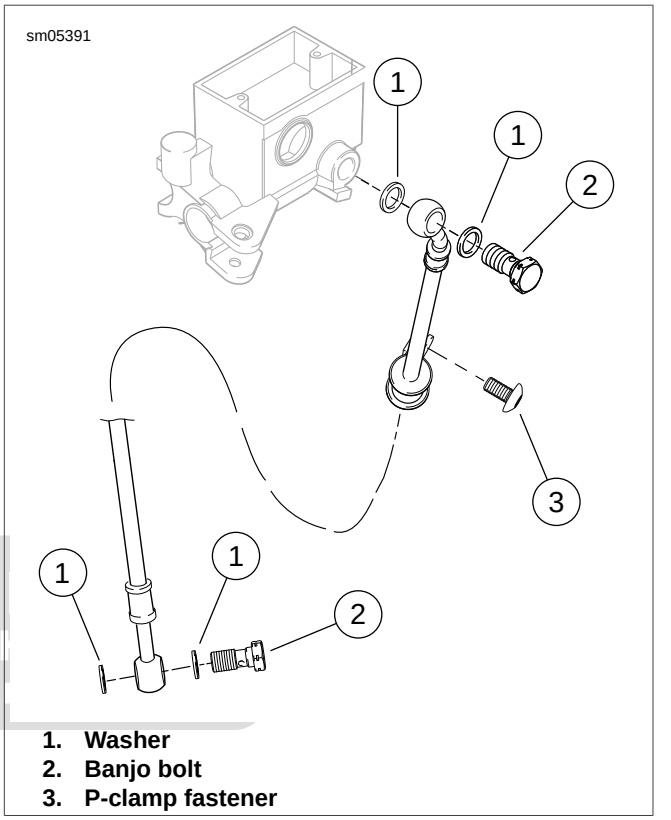
**After repairing the brake system, test brakes at low speed. If brakes are not operating properly, testing at high speeds can cause loss of control, which could result in death or serious injury. (00289a)**

8. Fill the master cylinder/reservoir and bleed the brakes. See 1.11 BRAKE SYSTEM MAINTENANCE.
9. Install and tighten the P-clamp on the front fork clamp. Tighten to 4-7 Nm (36-60 **in-lbs**).

**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 brake light.




1. **Washer**
2. **Banjo bolt**
3. **P-clamp fastener**

**Figure 2-60. Brake Fluid Line**

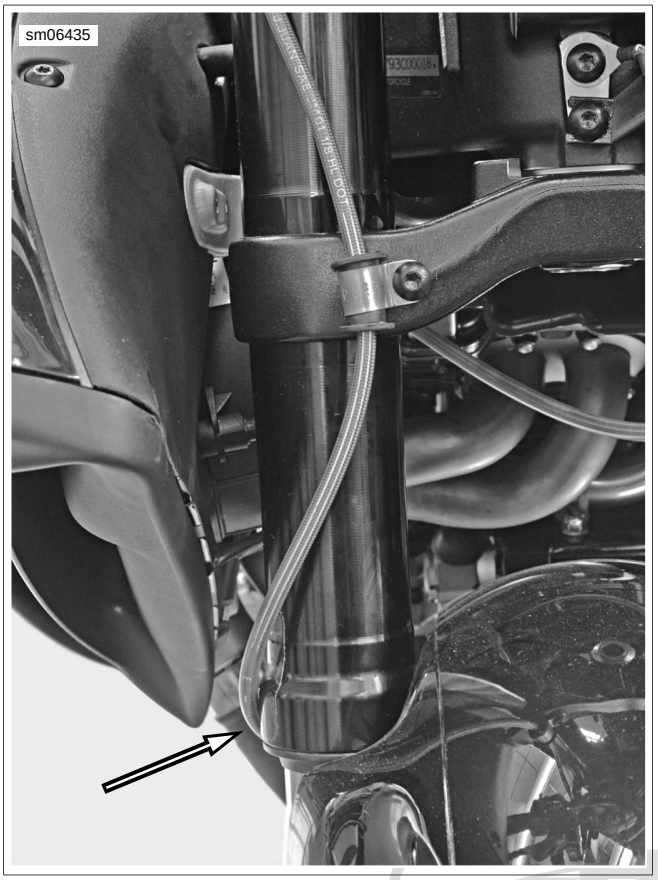
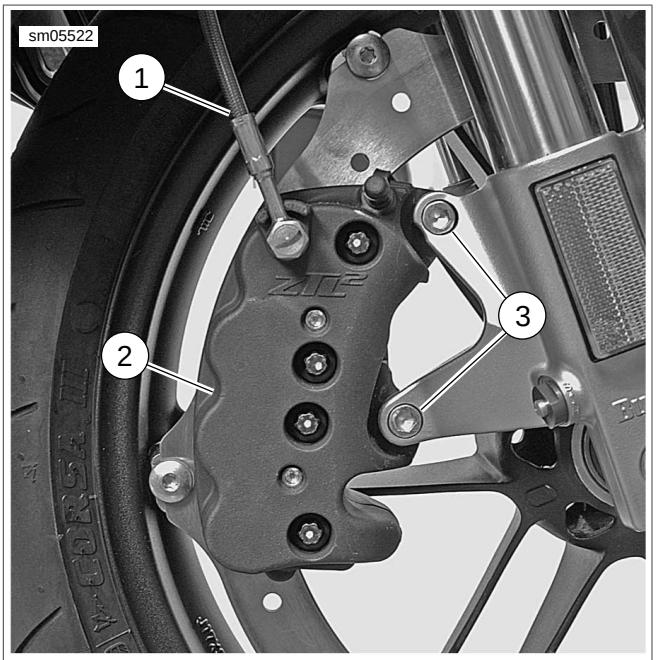



Figure 2-61. Brake Fluid Line Routing




1. **Brake line**
2. **Front brake caliper**
3. **Caliper mounting fastener (2)**

**Figure 2-62. Front Brake Caliper Mounts**

## CALIPER: REMOVAL AND INSTALLATION

### Removal

1. Drain brake fluid into a suitable container. Discard used fluid according to local laws.
   a. Install a length of plastic tubing over caliper bleeder valve. Place free end in a suitable container.
   b. Open bleeder valve (metric) about 1/2-turn.
   c. Pump brake hand lever to drain brake fluid.
   d. Tighten bleeder valve to 3.9-6.9 Nm (35-61 **in-lbs**).

**CAUTION**

**Remove brake line components carefully. Damage to seating surfaces can cause leakage. (00320a)**

2. See Figure 2-62. Disconnect brake line (1) at caliper (2).
3. Remove caliper mounting fasteners (3).
4. Slide caliper down the rotor to clear fork lower and then remove off rotor.

### Installation

1. If removed, install pad spring and brake pads.
2. Tighten pin hanger set to 14.7-19.6 Nm (11-15 ft-lbs).
3. Fit pads to rotor and slide the caliper over the rotor up to the mount.
4. Apply LOCTITE 271 (red) to fasteners and install caliper.
5. Tighten caliper mounting fasteners to 47-50 Nm (35-37 ft-lbs).

**CAUTION**

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

6. Install the brake fluid line to the caliper. See 2.7 FRONT BRAKE, Front Brake Fluid Line.
7. Bleed the fluid line. See 1.11 BRAKE SYSTEM MAINTENANCE, 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)**

**⚠WARNING**

**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

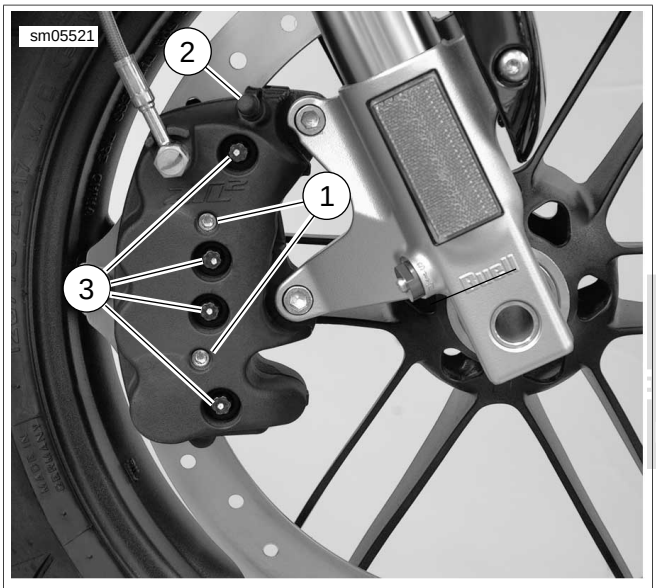
8. Test the brake light.

## CALIPER: REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| B-42887 | BRAKE CALIPER PISTON REMOVER |

## Disassembly

1. See Figure 2-63. Remove pin hanger set (1), brake pads and caliper pad spring.
2. Split caliper by removing caliper fasteners (3).
3. See Figure 2-65. Remove and discard two small stopper O-rings (11) on the pin hangers.
4. See Figure 2-64. Remove pistons using a BRAKE CALIPER PISTON REMOVER (Part No. B-42887).
5. See Figure 2-65. Remove and discard piston O-rings (6).




1. **Front caliper pin hanger (2)**
2. **Bleeder valve**
3. **Caliper fasteners (4)**

**Figure 2-63. Brake Pad Pin Hangers**




**Figure 2-64. Removing Pistons**

## Clean and Inspect

**CAUTION**

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

**CAUTION**

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

*NOTE*

*Do not contaminate with mineral oil or other solvents.*

1. Clean all parts with denatured alcohol or D.O.T. 4 BRAKE FLUID (Part No. 99955-99A).

**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 bore with a clean air supply.
3. Wipe dry with a clean, lint free cloth.
4. Carefully inspect all components. Replace any parts that appear damaged or worn. Do not hone caliper piston bore.

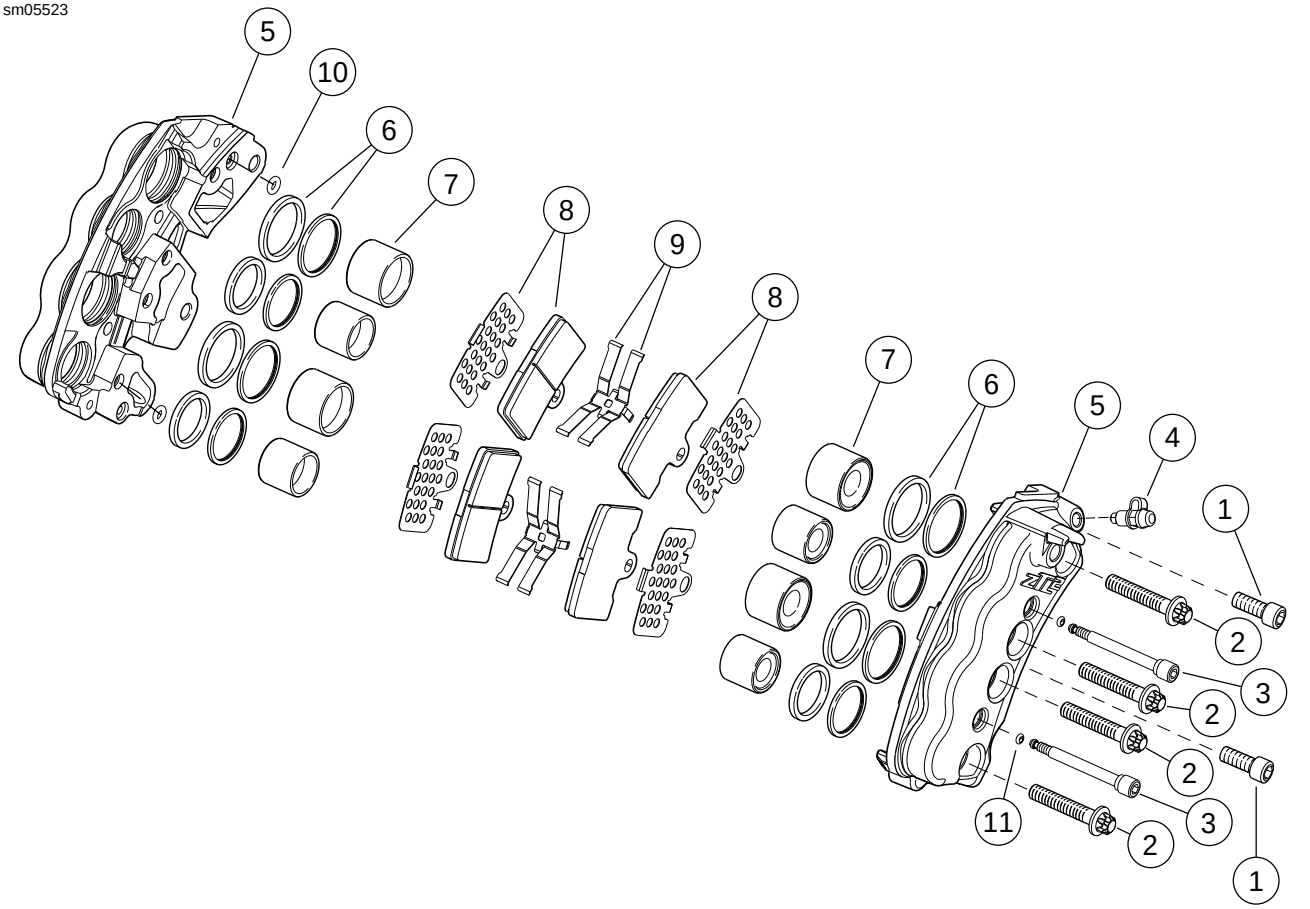
**WARNING**

**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. Measure and inspect brake pads and rotor. Replace as required. See 1.11 BRAKE SYSTEM MAINTENANCE.

## Assembly

1. See Figure 2-65. Lubricate **new** O-rings (6), pistons (7) and caliper piston bores with D.O.T. 4 BRAKE FLUID (Part No. 99955-99A).
2. Install two **new** O-rings in grooves of each piston bore.
3. Install pistons in each piston bore.
4. Install **new** O-rings (10) between caliper halves.
5. Clamp caliper together with caliper fasteners (2) and tighten to 24.5-29.4 Nm (18-22 ft-lbs).
6. Install two **new** stopper O-rings on the pin hangers.




1. **Caliper mounting fasteners (2)**
2. **Caliper fasteners (4)**
3. **Pin hanger set**
4. **Bleeder valve**
5. **Caliper**
6. **Piston O-rings**
7. **Pistons**
8. **Brake pads (4)**
9. **Pad spring (2)**
10. **O-rings, (between caliper halves)**
11. **Stoppers**

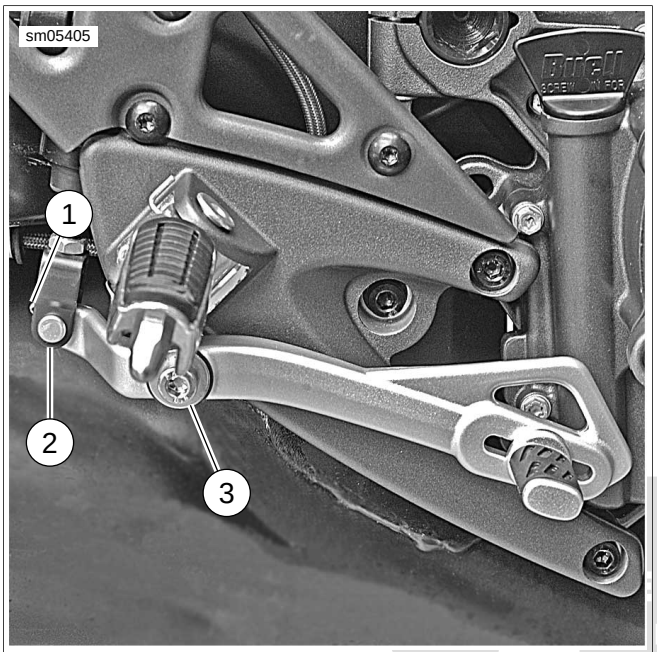
**Figure 2-65. Front Caliper Assembly**

# REAR BRAKE 2.8

## REAR BRAKE PEDAL

### Removal

1. See Figure 2-66. Remove cotter pin (1) and discard.
2. Remove clevis pin (2).
3. Remove pedal fastener (3) and washer to remove the pedal.

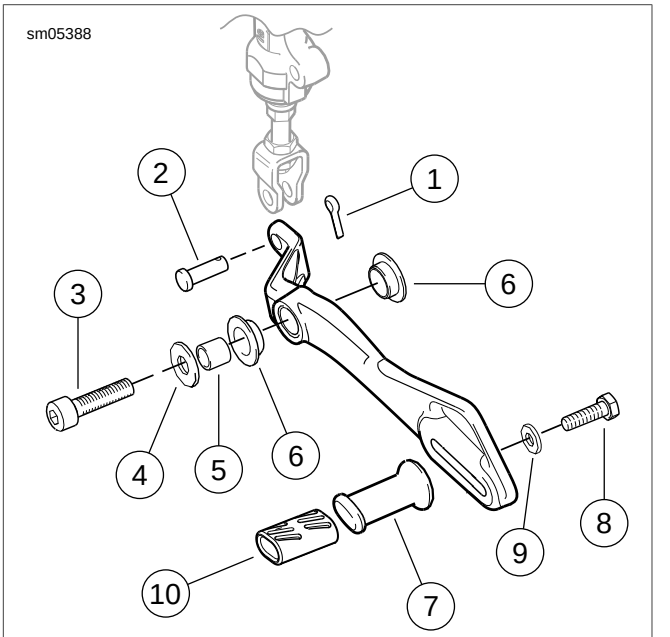



1. **Cotter pin**
2. **Clevis pin**
3. **Brake pedal fastener**

**Figure 2-66. Rear Brake Pedal**

### Installation

1. See Figure 2-67. Replace toepeg (7) and rubber (10) as necessary.
2. Fit pedal bushings (6) and sleeve (5) to pedal.
3. Loosely install brake pedal with fastener (3) and washer (4).
4. Install clevis pin (2).
5. Install **new** cotter pin (1).
6. Apply LOCTITE 271 (red) to threads and tighten fastener (3) to 31.8-35.3 Nm (23.5-26.0 ft-lbs).




1. **Cotter pin**
2. **Clevis pin**
3. **Brake pedal fastener**
4. **Washer**
5. **Sleeve**
6. **Bushing**
7. **Toepeg**
8. **Fastener**
9. **Washer**
10. **Rubber**

**Figure 2-67. Rear Brake Pedal Assembly**

## MASTER CYLINDER/RESERVOIR REMOVAL

### Master Cylinder

1. See Figure 2-68. Drain brake fluid into a container.
   a. Install a length of plastic tubing over the caliper bleeder valve. Place the free end in the container.
   b. Open the bleeder valve (metric) about 1/2 turn.
   c. Pump the brake foot pedal to drain the brake fluid.
   d. Tighten the bleeder valve to 7.3-9.6 Nm (65-85 **in-lbs**).
   e. Discard used fluid according to local laws.
2. See Figure 2-69. Separate the rear brake switch connector [121] housings clipped to the fuel pump cover.
3. See Figure 2-70. Remove the rear brake light switch and the two copper crush washers to separate the brake fluid line from the master cylinder. Discard the copper crush washers.
4. See Figure 2-71. Remove the cotter pin (1) and the clevis pin (2) from the brake pedal (3).

5. Remove the two fasteners (4) in the rider heel guard that capture the master cylinder.

**CAUTION**

**Remove brake line components carefully. Damage to seating surfaces can cause leakage. (00320a)**

6. Open spring clamp (5) on the brake reservoir hose to separate the brake fluid line from the master cylinder.




**Figure 2-68. Rear Brake Caliper Bleeder Valve**

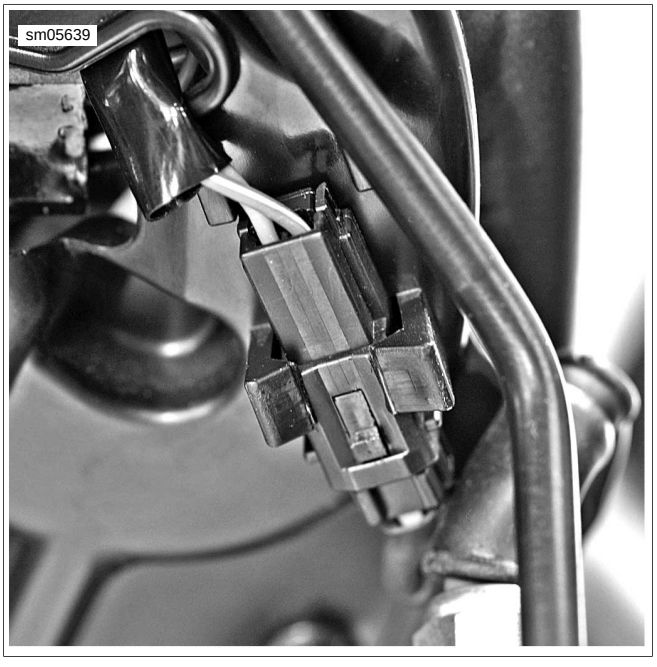



**Figure 2-69. Brake Light Switch Connector [121]**

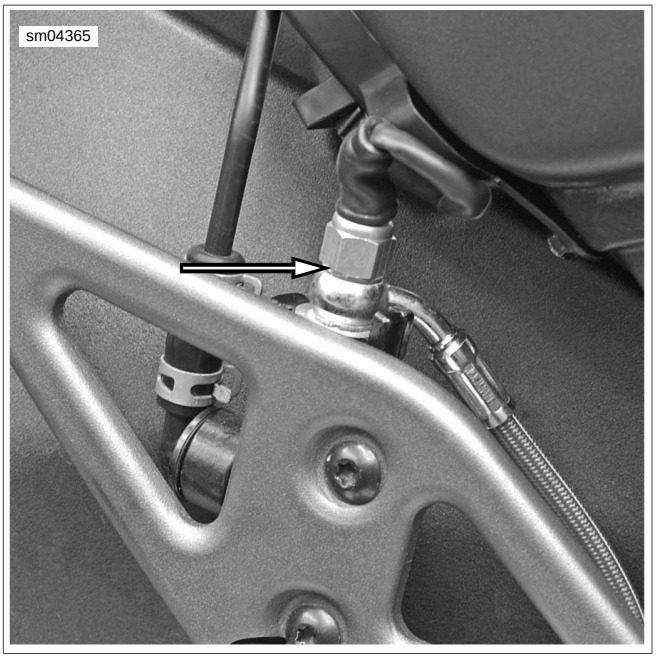
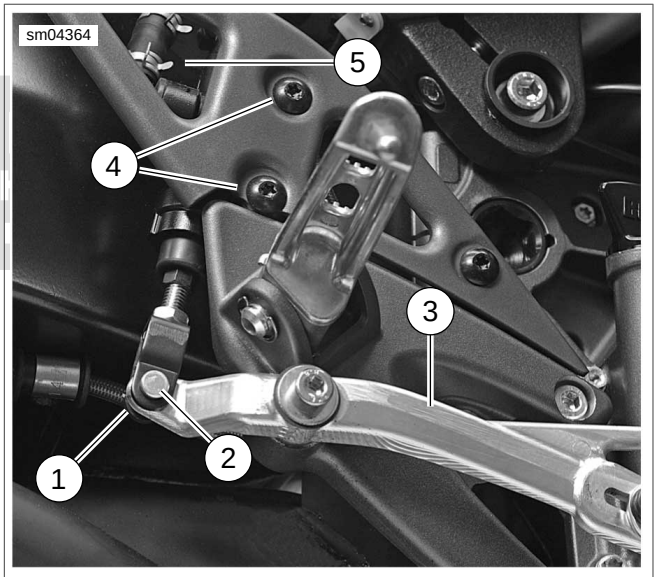



**Figure 2-70. Brake Light Switch**




1. **Cotter pin**
2. **Clevis pin**
3. **Rear brake pedal**
4. **Heel guard fasteners**
5. **Spring clamp**

**Figure 2-71. Master Cylinder to Brake Pedal Clevis**

## Reservoir

1. Remove the seat.
2. See Figure 2-72. Remove the fastener and washer securing the reservoir to starter solenoid cover.
3. See Figure 2-73. Lift the reservoir up and guide the brake fluid line from the fuel pump cover up through the sub-frame.




**Figure 2-72. Brake Fluid Reservoir Fastener**

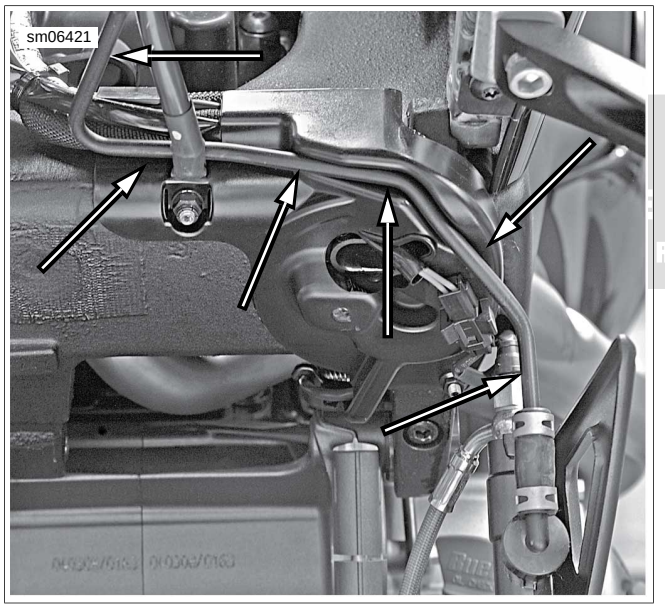



**Figure 2-73. Brake Fluid Reservoir Line**

## MASTER CYLINDER/RESERVOIR: INSTALLATION

### Reservoir

**CAUTION**

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

1. See Figure 2-74. Thread the brake fluid line (5) up through the subframe.
2. Clamp the line to the reservoir with a short piece of hose (4).
3. Attach the remote reservoir (3) to the starter solenoid cover with the screw (1) and washer (2). Tighten to 3.6-4.1 Nm (32-36 **in-lbs**).

### Master Cylinder

1. Clamp rear brake fluid line from remote reservoir to short piece of hose (4).
2. Install rear brake switch (10) and brake fluid line with **new** copper crush washers. Tighten to 22-27 Nm (16-20 ft-lbs).

*NOTE*

*Use only **new** copper crush banjo washers with D.O.T. 4 brake fluid.*

3. Mate brake line switch connector halves.
4. Install heel guard through footpeg mount to master cylinder. Tighten fasteners (7) to 9.6-10.6 Nm (84-96 **in-lbs**).
5. Fit master cylinder clevis over the brake pedal.
6. Install the clevis pin (8) and cotter pin (9).
7. Adjust rear brake pedal. See 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pedal Adjustment.

**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. Add brake fluid and bleed the rear brake fluid line. See 1.11 BRAKE SYSTEM MAINTENANCE.

**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)**

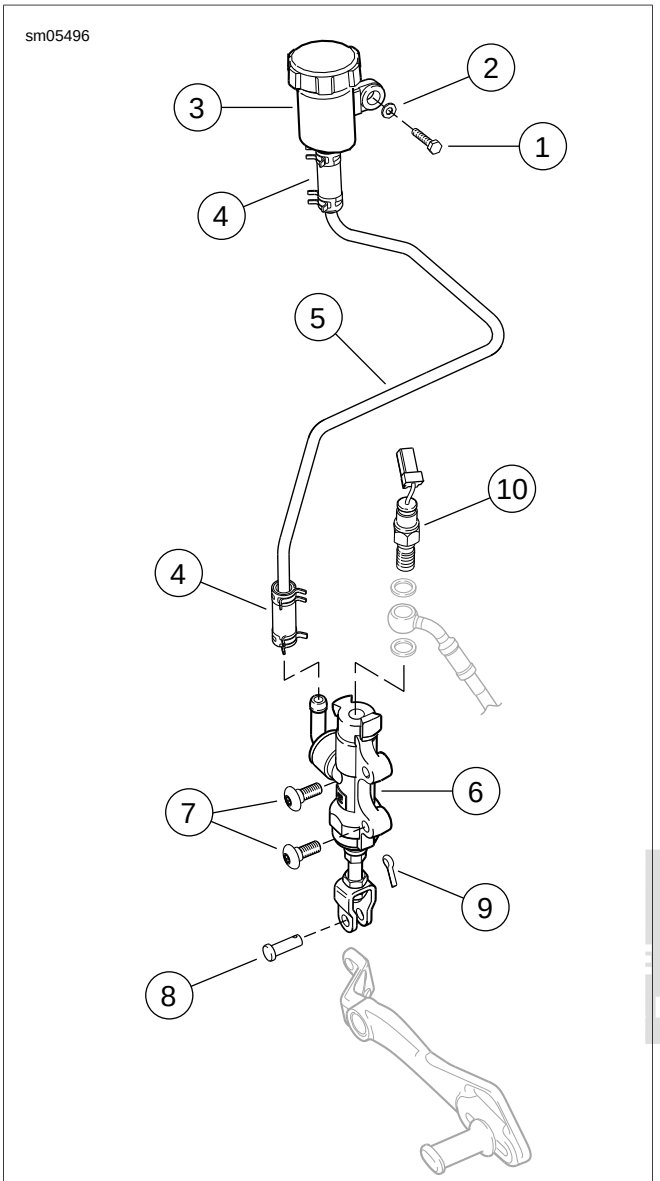
**WARNING**

**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 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.




1. **Screw**
2. **Washer**
3. **Reservoir**
4. **Hose and clamps**
5. **Fluid line**
6. **Master cylinder**
7. **Fasteners**
8. **Clevis pin**
9. **Cotter pin**
10. **Brake light switch**

**Figure 2-74. Master Cylinder/Reservoir Assembly**

## BRAKE FLUID LINE

### Removal

1. Drain brake fluid.
   a. Install a length of plastic tubing over caliper bleeder valve. Place free end in a container.
   b. Open bleeder valve about 1/2-turn.
   c. Pump brake foot pedal to drain brake fluid.
   d. Tighten bleeder valve to 7.3-9.6 Nm (65-85 **in-lbs**).
2. See Figure 2-75. Access the rear brake light connector clipped in the fuel pump cover and separate the connector halves.
3. Remove the brake light switch/banjo bolt from rear master cylinder. Discard copper washers.

*NOTE*

*Grind down a hex key to fit the space between the P-clamp fastener and the wheel.*

4. See Figure 2-76. Remove P-clamps securing brake fluid line beneath the right side of swingarm.
5. See Figure 2-77. Remove banjo bolt from rear caliper. Discard copper washers.

**CAUTION**

**Remove brake line components carefully. Damage to seating surfaces can cause leakage. (00320a)**

6. Remove the brake line.

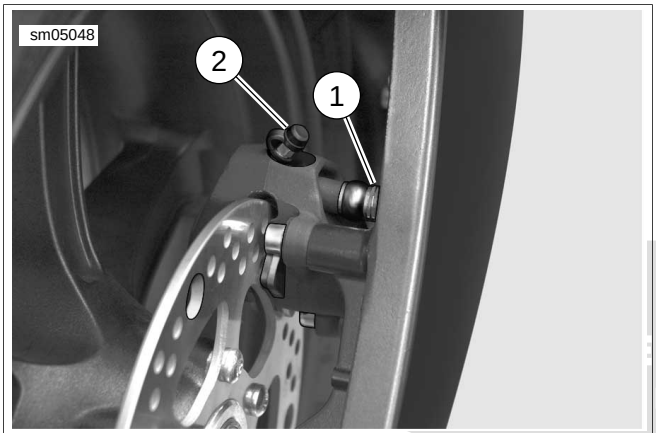



**Figure 2-75. Rear Brake Light Switch Connector [121]**




1. **Rear brake line**
2. **P-clamp (2)**

**Figure 2-76. Rear Brake Line**




1. **Banjo bolt**
2. **Bleeder valve**

**Figure 2-77. Rear Brake Caliper/Banjo Bolt**

## Installation

1. Route the brake fluid line between the master cylinder and the caliper.
2. Install the master cylinder/light switch banjo bolt with **new** washers.
3. Install the caliper banjo bolt with **new** washers.
4. Route the brake fluid line and loosely install the P-clamp fasteners.
5. Tighten the fasteners:
   a. Master cylinder/light switch banjo bolt 21.7-27.1 Nm (16-20 ft-lbs)
   b. Caliper banjo bolt 21.7-27.1 Nm (16-20 ft-lbs)
   c. Rear brake fluid line P-clamp fastener at front of swingarm 9.6-10.6 Nm (7-8 ft-lbs)
   d. Rear brake fluid line P-clamp fastener at rear of swingarm 24.4-27.1 Nm (18-20 ft-lbs)

**CAUTION**

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

6. Fill and bleed the fluid line. See 1.11 BRAKE SYSTEM MAINTENANCE.

**⚠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)**

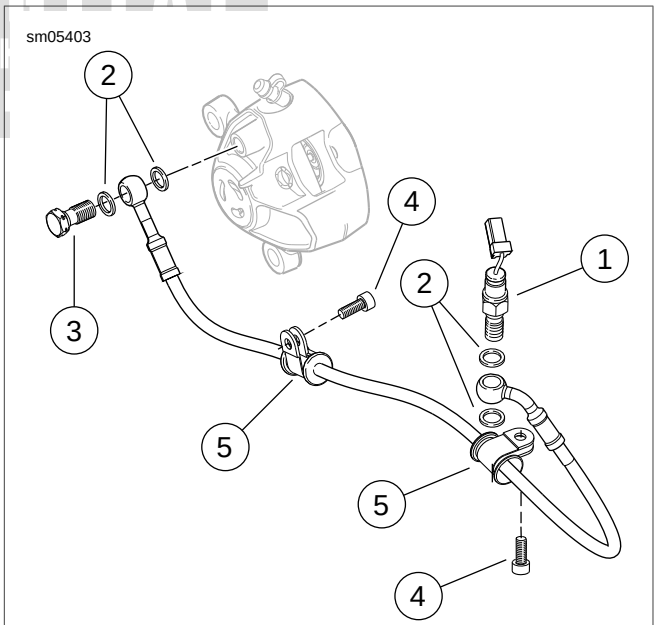
**⚠WARNING**

**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)**

7. Test the brake light.

**⚠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. **Banjo bolt/brake light switch**
2. **Washer**
3. **Banjo bolt**
4. **P-clamp fastener**
5. **P-clamp**

**Figure 2-78. Rear Brake Fluid Line**

## CALIPER

### Removal

**CAUTION**

**Remove brake line components carefully. Damage to seating surfaces can cause leakage. (00320a)**

1. Drain brake fluid into a suitable container. Discard used fluid according to local laws.
   a. Install a length of plastic tubing over caliper bleeder valve. Place free end in a suitable container.
   b. Open bleeder valve about 1/2-turn.
   c. Pump brake foot pedal to drain brake fluid.
2. Remove the banjo bolt connecting brake fluid line to the caliper.
3. Remove the upper belt guard.
4. See Figure 2-79. Remove caliper mounting fasteners through access holes in rotor.
5. Rotate caliper around brake rotor and remove.

*NOTE*

*The rear brake caliper can not be rebuilt.*

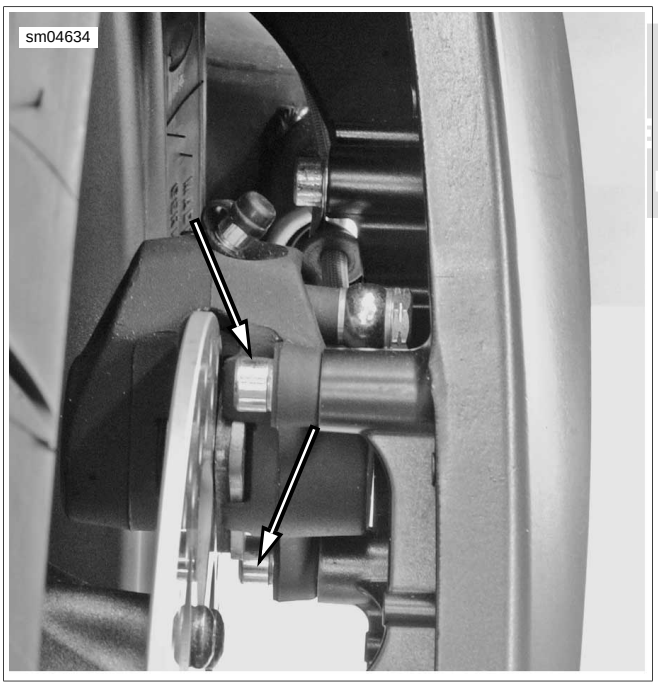



**Figure 2-79. Rear Brake Caliper Fasteners**

### Installation

1. If installing a bleeder valve, tighten bleeder valve to 7.3-9.6 Nm (65-85 **in-lbs**).

*NOTE*

*Use only **new** copper crush banjo washers with D.O.T. 4 brake fluid.*

2. Install washers and fasteners to mount caliper to swingarm.
3. Tighten to 31.8-35.3 Nm (23.5-26.0 ft-lbs).
4. Connect brake fluid line to caliper using two **new** copper washers and banjo bolt. Tighten to 21.7-27.1 Nm (16-20 ft-lbs).
5. If removed, install rear brake fluid line P-clamp fasteners. See 2.8 REAR BRAKE, Brake Fluid Line.
6. Install the upper belt guard.

**CAUTION**

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

7. Fill and bleed the rear brake fluid line. See 1.11 BRAKE SYSTEM MAINTENANCE.
8. Press the brake pedal several times to set the 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)**

**⚠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 the brake light.

**⚠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)**

*NOTE*

*If replacing brake pads, avoid hard stops for the first 322 km (200 mi) to allow the pads to wear in with the brake rotor.*

# FRONT FORK 2.9

## REMOVAL

1. Remove the seat and remove the battery fuse.

*NOTE*

*The upper and lower fork clamp pinch bolts can be accessed from above and by turning the forks to full lock.*

2. Remove the front fender. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
3. Remove the front wheel and caliper mounting bolts with caliper and support the caliper and brake line. See 2.6 WHEELS.
4. See Figure 2-80. Loosen the upper and lower fork clamp pinch bolts.
5. See Figure 2-81. Remove fork from upper fork clamp and slide the stopper ring up and over the top of the fork.
6. Slide the fork tube through the lower fork clamp and remove the fork.

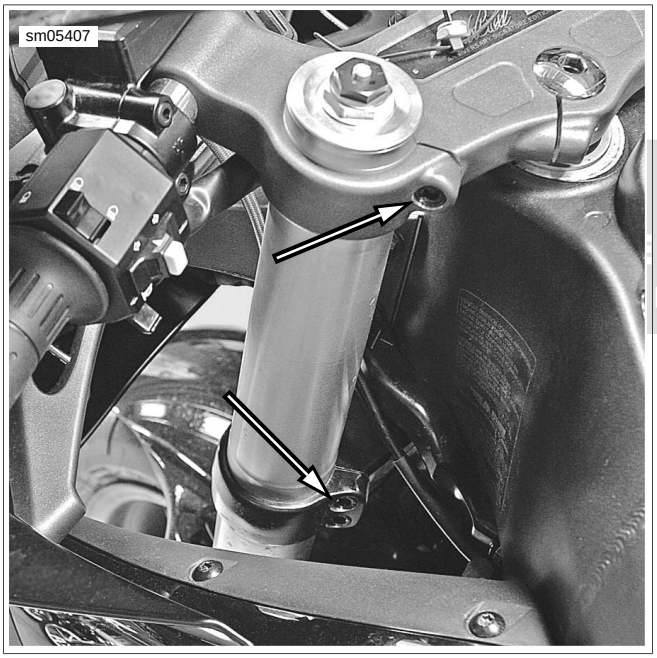



**Figure 2-80. Fork Clamp Pinch Bolts**

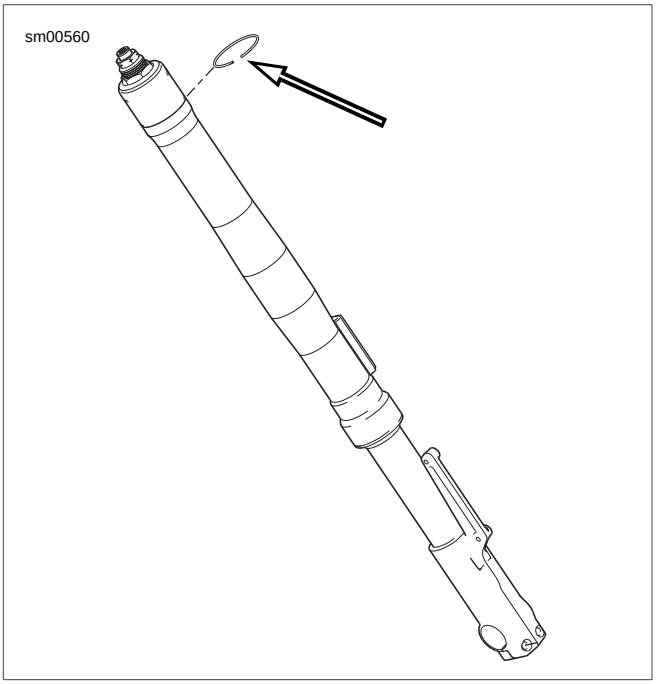



**Figure 2-81. Stopper Ring**

## DISASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| HD-41177 | FORK HOLDING TOOL |
| HD-45966 | FRONT FORK COMPRESSOR |

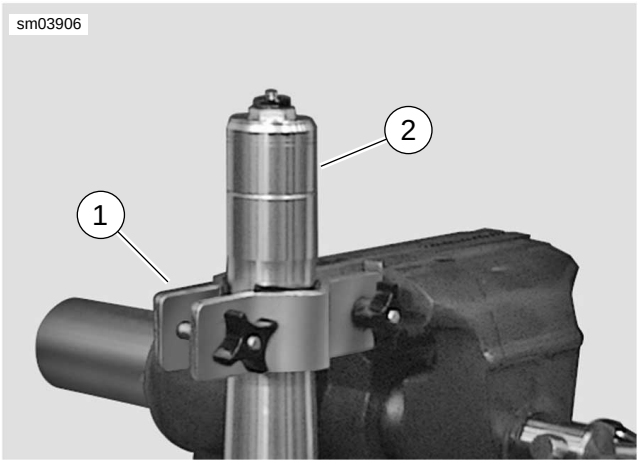
### Drain the Fork Oil

1. See Figure 2-82. Clamp the FORK HOLDING TOOL (Part No. HD-41177) in a vise and install the upper part of the front fork in the holding tool.

*NOTES*

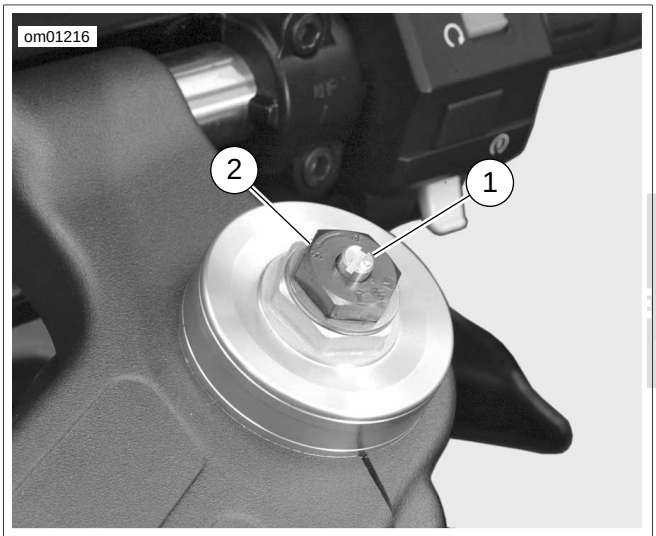
- *See Figure 2-83. Record rider suspension settings before disassembly.*
- *Always turn rebound adjuster (1) clockwise until it lightly bottoms out before beginning the disassembly process.*
- *Always turn preload adjuster (2) counterclockwise until it lightly bottoms out before beginning the disassembly process.*

2. See Figure 2-84. Loosen the fork cap and pull up the spring collar to expose the preload and rebound assembly.
3. Remove the fork assembly from the fork holding tool.
4. Holding the fork assembly upside down over a drain pan, pump the spring collar in the outer fork tube until there is no resistance.




1. **Fork Holding Tool (HD-41177)**
2. **Fork tube**

**Figure 2-82. Fork Tube in Fork Holding Tool (HD-41177)**




1. **Rebound adjuster screw**
2. **Preload adjuster nut**

**Figure 2-83. Front Fork Preload and Rebound Adjuster**

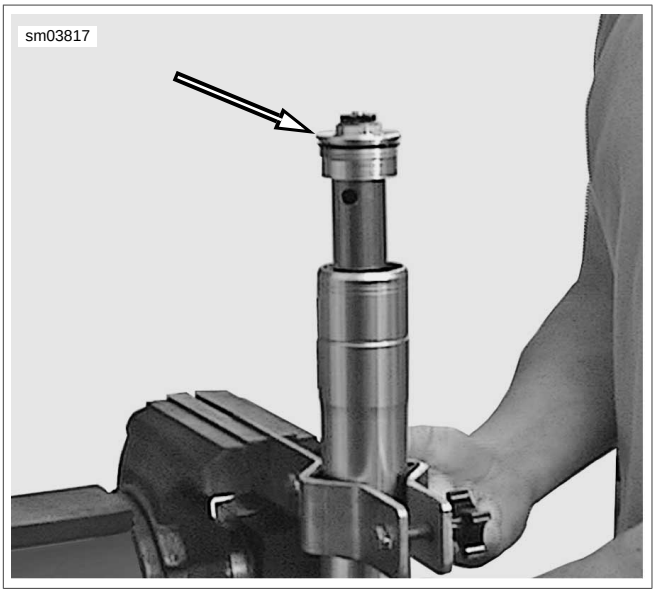



**Figure 2-84. Fork Cap: 1125R**

## Fork Disassembly

*NOTES*

- *The front fork compressor comes with a cup and screw that are for FLT models only. Do not use the cup and screw for Buell models.*
- *Be sure not to bind the outer fork tube on the fork compressor.*

1. See Figure 2-86. Fit the lower peg of the FRONT FORK COMPRESSOR (Part No. HD-45966) to hole in the bottom of the axle clamp and the screw clamp to the hole in the spring collar of the assembly.
2. See Figure 2-87. Compress the fork spring until the jamnut on the bottom of the fork cap is exposed.

*NOTE*

*The bottom of the fork cap (1) is round with two flats. A wrench (2) can be used to break the jamnut (3) loose on the damper rod (4).*

3. Loosen the damper rod assembly jamnut and back it off all the way to the bottom.
4. Hold damper rod assembly jamnut and remove fork cap.

*NOTE*

*See Figure 2-88. Inside the damper rod assembly is a fork pushrod that is tapered on one end to control the movement of fluid in the front fork increasing and decreasing the damping properties.*

5. See Figure 2-89. Remove the fork pushrod (5) from the fork cap (1).
6. Remove fork assembly from spring compressor and remove the spring collar (11), spring joint (12) and fork spring (13).
7. Remove the slider fork (22) from the outer tube (15).
8. Remove dust seal (21) to access oil seal stopper ring (20).

9. Remove the oil seal stopper ring (20) from the outer tube with a small pry tool.

*NOTE*

*After removing the dust seal and oil seal stopper ring, place tape on the edge of the outer tube to protect against cosmetic damage when prying.*

10. Remove oil seal (19) and seal spacer (18) from outer tube.

*NOTES*

- *The guide bushing is no longer removed during the disassembly process.*
- *The slide bushing is incorporated into the outer tube and is non-replaceable.*




**Figure 2-85. Front Fork Outer Tube Guide Bushing**

11. See Figure 2-85. Check the guide bushing for excessive wear or scratches. Replace if damaged or worn.
12. Push the damper rod (7) all the way down in order to seat it and prevent it from spinning in order to remove the center bolt (10) and washer (9).
13. Remove damper rod assembly.

*NOTE*

*See Figure 2-89. The centering plate (8) on the bottom of the damper rod assembly (7) could fall off. Before final assembly make sure the centering plate is on the damper rod assembly.*

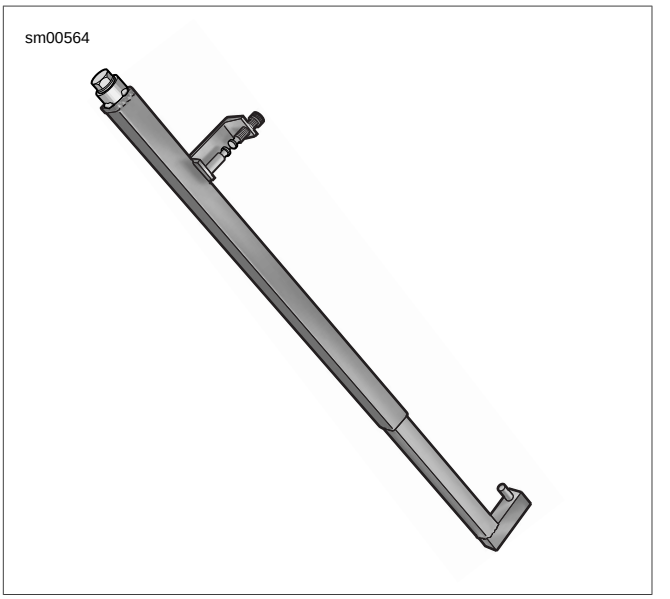
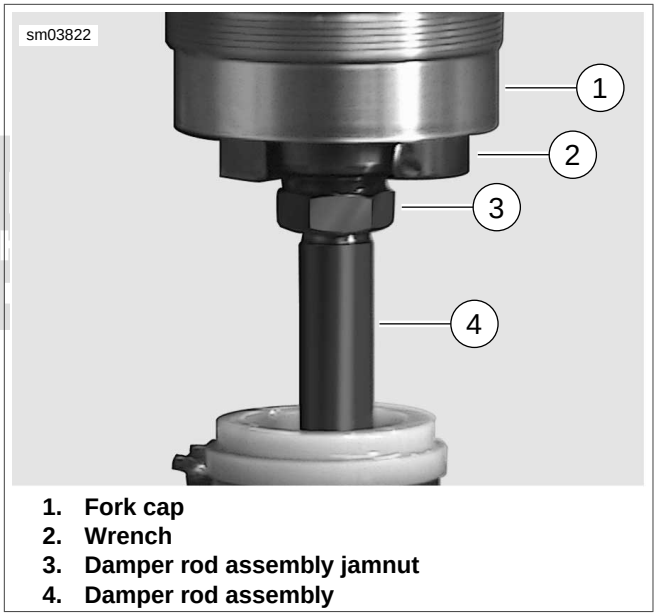



**Figure 2-86. Front Fork Compressor**

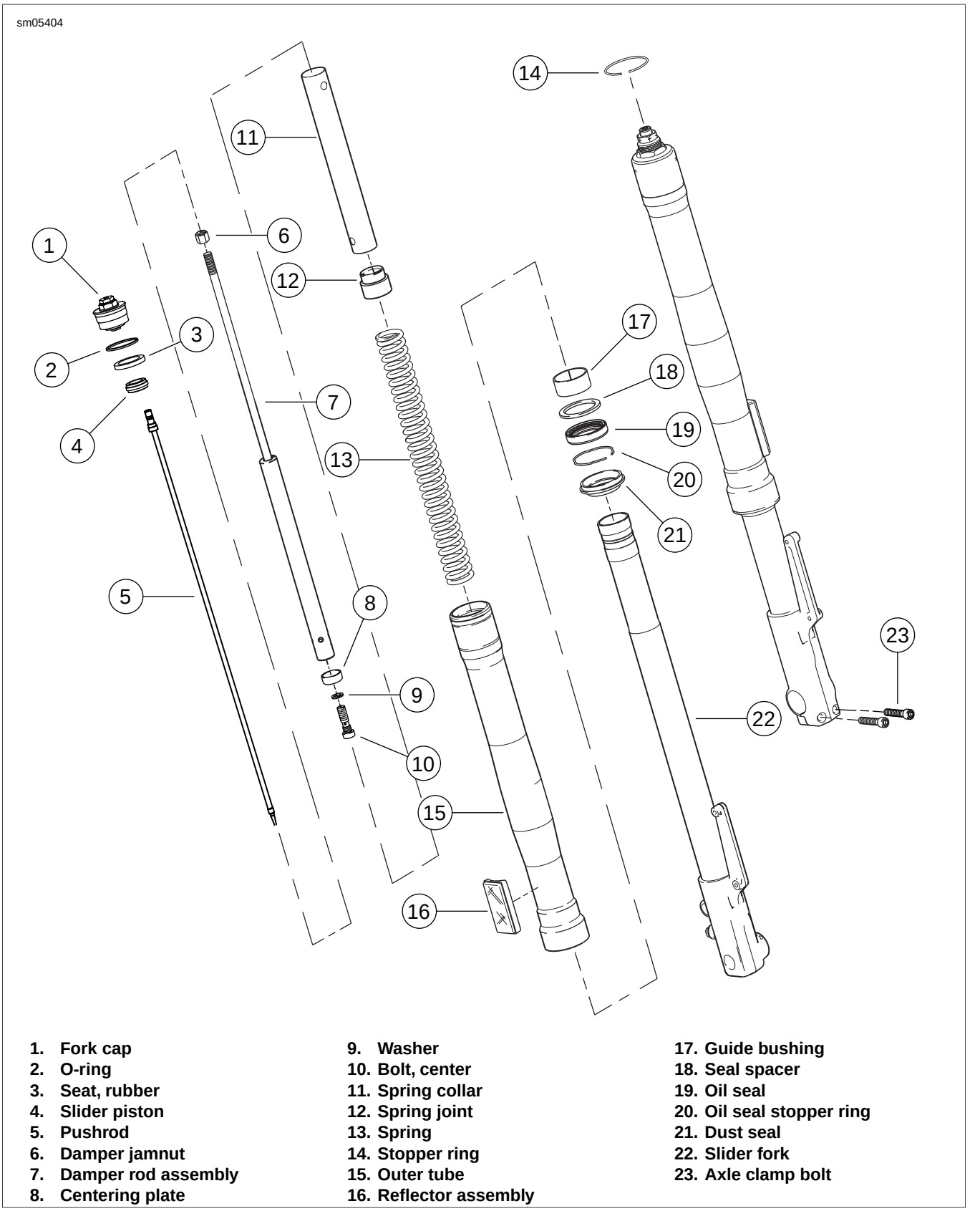



1. **Fork cap**
2. **Wrench**
3. **Damper rod assembly jamnut**
4. **Damper rod assembly**

**Figure 2-87. Holding Damper Rod Assembly**




**Figure 2-88. Fork Pushrod**




1. Fork cap
2. O-ring
3. Seat, rubber
4. Slider piston
5. Pushrod
6. Damper jamnut
7. Damper rod assembly
8. Centering plate
9. Washer
10. Bolt, center
11. Spring collar
12. Spring joint
13. Spring
14. Stopper ring
15. Outer tube
16. Reflector assembly
17. Guide bushing
18. Seal spacer
19. Oil seal
20. Oil seal stopper ring
21. Dust seal
22. Slider fork
23. Axle clamp bolt

**Figure 2-89. Front Fork Assembly: 1125R**

## CLEANING AND INSPECTION

1. Clean and inspect all parts. Replace any parts that are bent or damaged.
2. Check the slider fork and outer tube for score marks, scratches and excessive or abnormal wear. Replace if worn or damaged.
3. Inspect the stopper ring. Replace the stopper ring if distorted.
4. Measure spring free length. Replace the springs if they are shorter than the service wear limit. Refer to Table 2-18.
5. See Figure 2-90. Measure slider tube runout. Replace slider tube if the runout exceeds the service wear limit. Refer to Table 2-18.

**Table 2-18. Front Fork Service Wear Limits: 1125R**

| SPECIFICATION | mm | in |
|---|---|---|
| Fork spring free length | 362.8 | 14.28 |
| Fork tube runout | 0.2 | 0.008 |

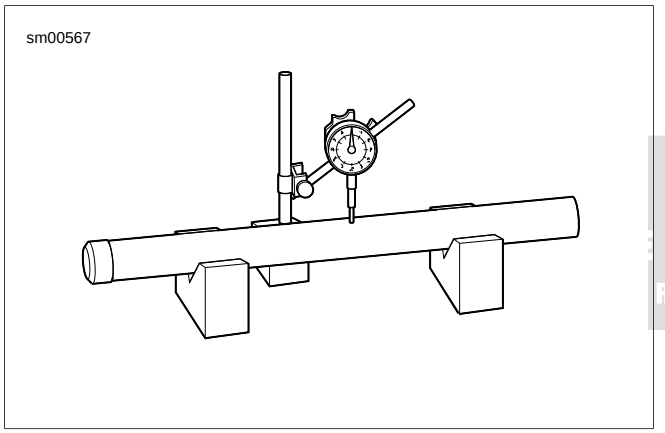



**Figure 2-90. Slider Fork Runout**

## ASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| B-48867-47MM | FORK SEAL DRIVER AND DUST BOOT INSTALLER |
| B-59000A | FRONT FORK OIL LEVEL GAUGE |
| TBFT 02S | FORK BLEED TOOL SET |

### Preassembly

1. Install the bottom of the slider tube in the vise using soft jaws.
2. See Figure 2-89. Coat the sealing lips of a **new** oil seal (19) with fork oil or sealing grease and install onto the slider fork with its spring side facing the dust seal (21).
3. Coat the guide bushing (17) with fork oil. Install the seal spacer (18) onto the slider fork (22).
4. Install the outer tube (15) over the fork slider and remove assembly from vise.
5. On the workbench, using the FORK SEAL DRIVER AND DUST BOOT INSTALLER (Part No. B-48867-47MM), drive the seal spacer (18) and oil seal (19) into the outer tube using the fork seal driver until the oil seal is firmly seated.

*NOTE*

*Be sure to lube the outside of the dust seal with oil and then it can be installed by hand.*

6. Install the oil seal stopper ring (20) and a **new** dust seal (21).
7. See Figure 2-92. Make sure the centering plate is on the damper rod assembly and install into the slider tube. Push to the bottom of the slider.
8. See Figure 2-89. Install the center cap bolt (10) with a **new** sealing washer (9) and tighten to 27-40.6 Nm (20-30 ft-lbs).

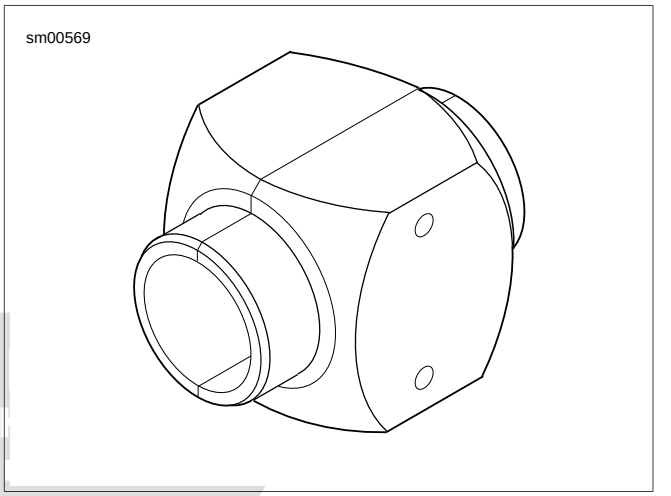



**Figure 2-91. Fork Seal Driver**

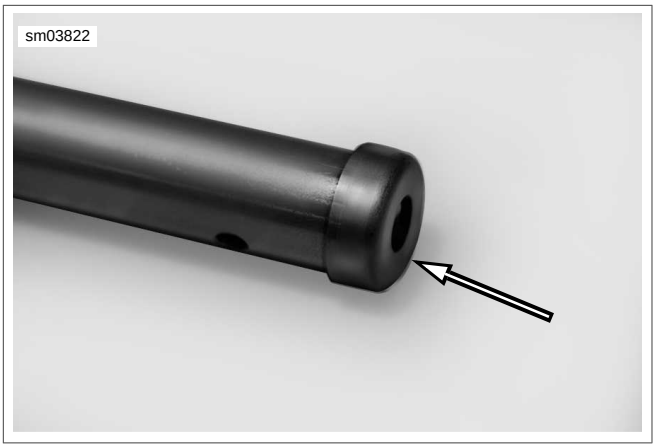



**Figure 2-92. Centering Plate on Bottom of Damper Rod**

### Fill with Fork Oil

1. Install the bottom of the slider tube in the vise using soft jaws.

*NOTE*

- *The recommended fork oil is HARLEY-DAVIDSON FORK OIL TYPE E (Part No. HD-99884-80).*
- *The fork spring should not be installed for this part of the procedure.*

2. With the fork fully collapsed, fill the fork with oil until it reaches the threads on the outer tube.
3. See Figure 2-93. Thread damper rod retrieval tool found in the Race Tech Inc. FORK BLEED TOOL SET (Part No. TBFT 02S) onto end of damper rod assembly.

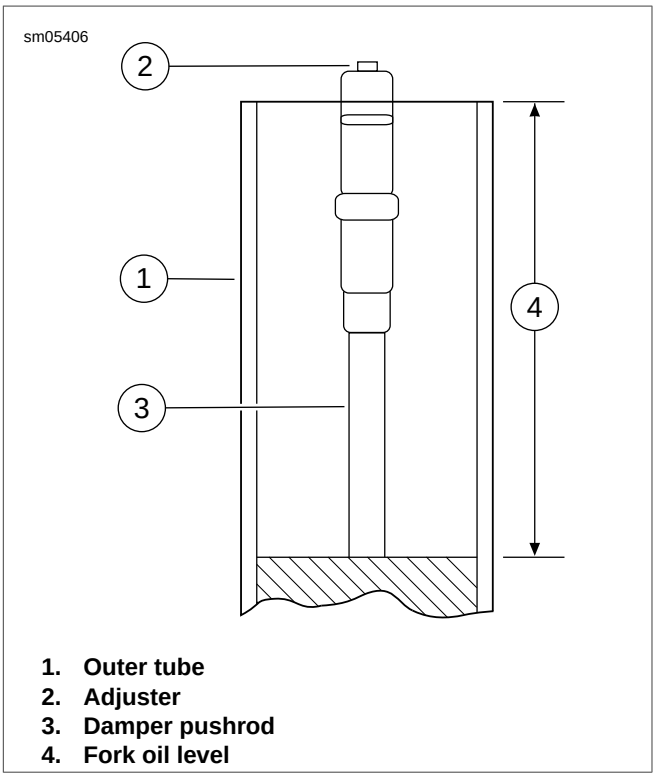
*NOTE*

*While pumping the outer tube up and down be sure not to exceed the travel of the fork assembly.*

4. Pump the damper rod assembly approximately 12 to 15 times or until resistance is felt.
5. Collapse the fork again and once bubbling has stopped, pump the damping rod up and down its full stroke until consistent resistance is felt for the entire stroke.
6. See Figure 2-94. With fork completely collapsed, adjust fork oil level with FRONT FORK OIL LEVEL GAUGE (Part No. B-59000A) to the specified level below the top of the fork tube. Refer to Table 2-19.




**Figure 2-93. Damper Rod Retrieval Tool**




1. **Outer tube**
2. **Adjuster**
3. **Damper pushrod**
4. **Fork oil level**

**Figure 2-94. Fork Oil Level**

**Table 2-19. Fork Oil Level**

| MODEL | mm | in |
|---|---|---|
| 1125R | 94 | 3.70 |

## Final Assembly

*NOTE*

*When installing the fork spring verify that the tighter wound portion of the spring is installed down.*

1. See Figure 2-89. Install the fork spring (13), fork spring joint (12) and fork spring collar (11) over the damper rod retrieval tool.

*NOTE*

*Be sure to never over compress the fork assembly.*

2. Remove the fork slider from the vise and install the fork assembly in the front fork compressor.
3. Compress the fork spring to access the damper rod assembly with jamnut.
4. While holding onto the damper rod, remove the damper rod retrieval tool.

*NOTE*

*See Figure 2-95. Make sure the damper rod jamnut is turned to the bottom of the threads.*

5. See Figure 2-89. If the fork push rod (5) has been removed from the fork cap (1) install at this time.
6. When installing the fork push rod with fork cap, insert it into the damper rod and allow it to float down until it stops.

7. Thread the fork cap onto the damper rod until it stops. Do not tighten.

*NOTE*

*Before tightening the damper rod jamnut, back the rebound adjuster out 1/4 turn to prevent damage to the tapered end of the fork push rod.*

8. Thread the damper rod jamnut until it bottoms lightly on the rebound adjuster assembly in the fork cap.
9. Tighten the damper rod jamnut to 30-41 Nm (22-30 ft-lbs).
10. Remove the fork assembly from the front fork compressor and install in the fork holding tool in vise.
11. Thread fork cap into fork tube and tighten to 30-41 Nm (22-30 ft-lbs).

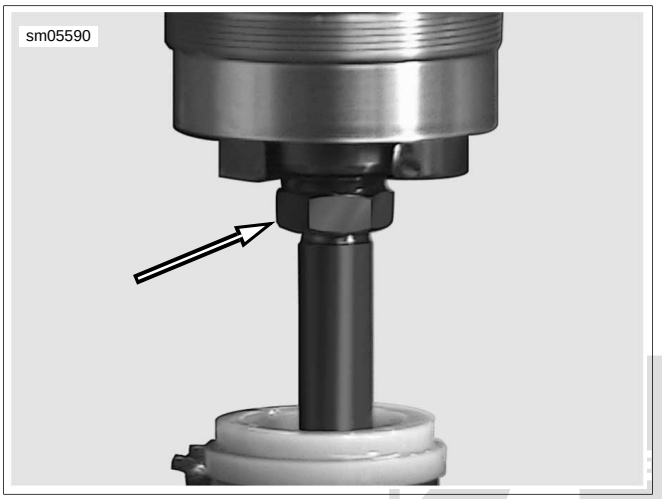



**Figure 2-95. Damper Rod Jamnut**

## FORK CLAMPS: 1125R

### Removal

*NOTE*

*Place shop towel over fairing, right and left sides, to prevent cosmetic damage from handlebars when placed there after removal.*

1. See Figure 2-96. Remove wire guide from upper fork clamp.
2. Remove bolt securing right handlebar to upper fork clamp and support the handlebar on the fairing.
3. Repeat this procedure for the left side, being sure to protect the fairing with a shop towel.
4. Unplug the ignition switch.
5. Remove the ignition switch from the upper fork clamp. See 7.3 IGNITION SWITCH/FORK LOCK: 1125R.
6. Remove steering stem pinch fastener (4).
7. Hold or brace the lower fork clamp and remove steering stem capnut (3).
8. Remove the upper fork clamp.
9. Remove the steering stem and lower fork clamp assembly.
10. If steering head bearings need replacing, see 2.10 STEERING HEAD BEARINGS.

### Installation

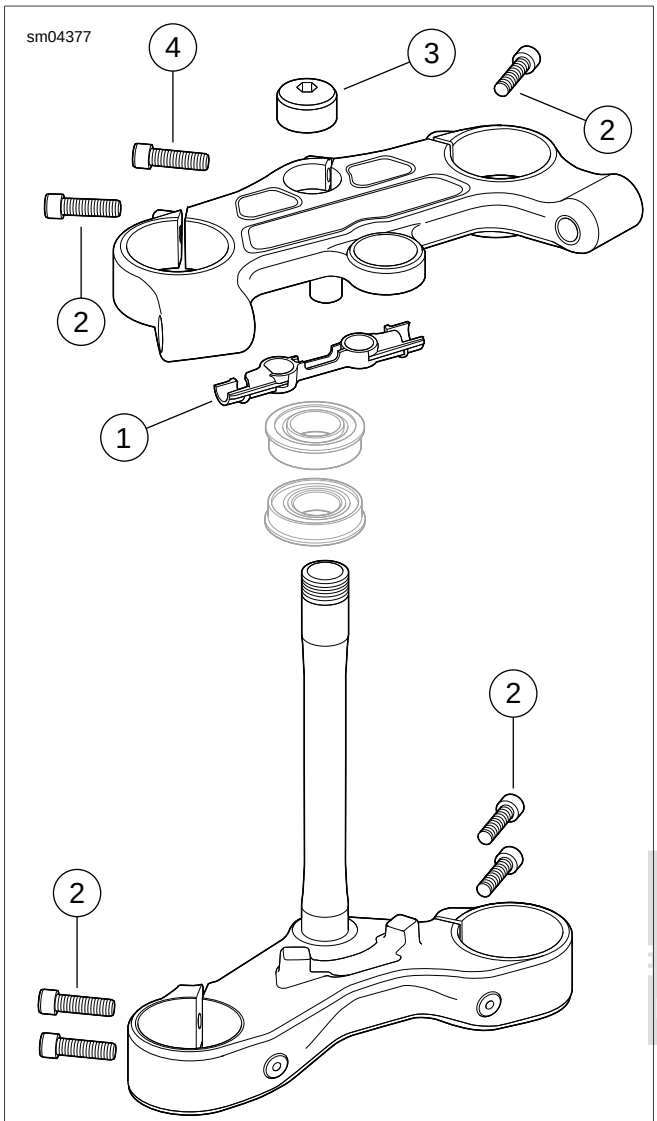
1. Install the lower fork clamp into the steering stem bore and install the upper fork clamp.
2. Install the steering stem capnut. Thread on by hand but do not torque.
3. Install the ignition switch in the upper fork clamp. See 7.3 IGNITION SWITCH/FORK LOCK: 1125R.
4. Tighten steering stem capnut to 51.5-56.9 Nm (38-42 ft-lbs).
5. Apply LOCTITE 271 (red) to the steering stem pinch bolt and tighten to 27-30 Nm (20-22 ft-lbs).

*NOTE*

*When installing the handlebars, verify the alignment tabs in the end of handlebars are lined up with the corresponding notches in the upper fork clamp.*

6. Install right handlebar to upper fork clamp and tighten fastener to 32.5-35.2 Nm (24-26 ft-lbs).
7. Repeat this procedure for the left side handlebar.
8. Route the wire bundles for the switch housings through the nylon guide on the left side of the vehicle beneath the frame/fuel tank.
9. Connect the ignition switch.
10. See Figure 2-96. Install wire guide unto upper fork clamp.

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1. **Wire guide**
2. **Fork tube pinch bolts**
3. **Stem capnut**
4. **Stem pinch bolt**

**Figure 2-96. Fork Clamp Steering Stem Assembly: 1125R**

## FORK CLAMPS: 1125CR

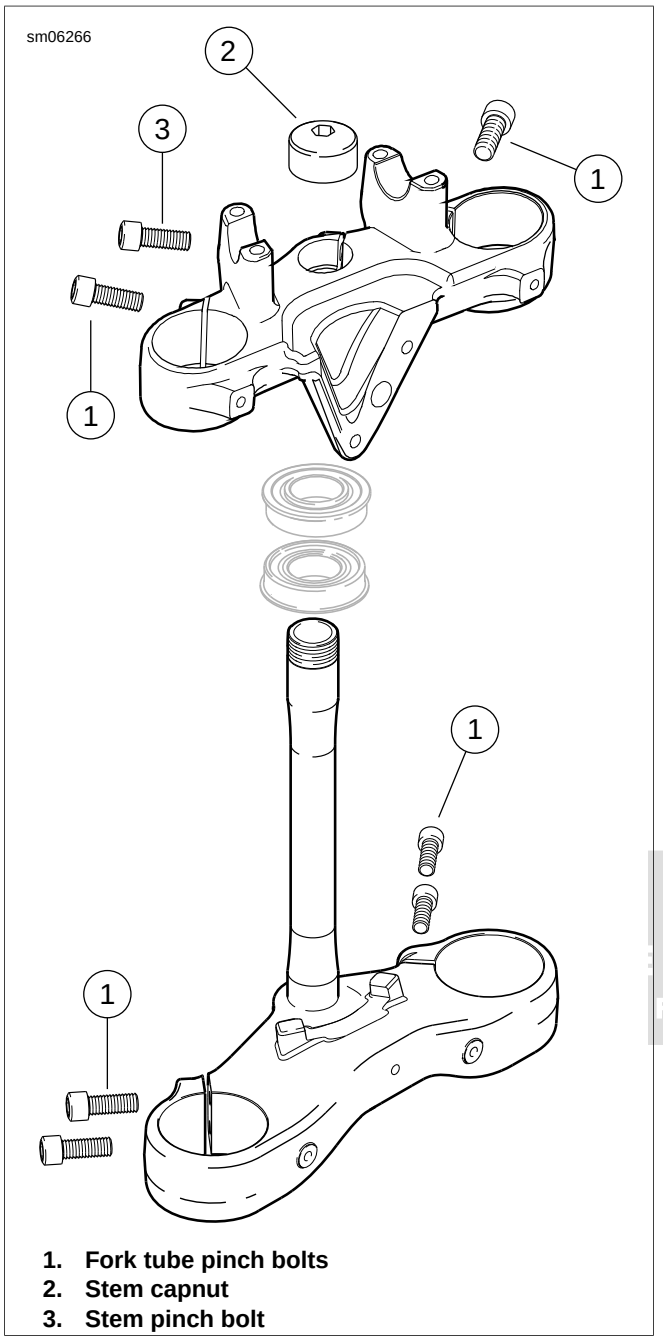
### Removal

1. Remove the windscreen and headlamp assembly.
2. Separate the ignition switch connector [38] housing and remove the ignition switch from the upper fork clamp. See 7.4 IGNITION SWITCH/FORK LOCK: 1125CR.
3. See Figure 2-97. Remove the steering stem pinch fastener (3).
4. Hold or brace the lower fork clamp and remove steering stem capnut (2).
5. Remove the upper fork clamp.
6. Remove the steering stem and lower fork clamp assembly.
7. If steering head bearings need replacing, see 2.10 STEERING HEAD BEARINGS.

### Installation

1. Install the lower fork clamp and steering stem into the steering stem bore and install the upper fork clamp.
2. Install the steering stem capnut. Thread on but do not tighten.
3. Tighten steering stem capnut to 51.5-56.9 Nm (38-42 ft-lbs).
4. Apply LOCTITE 271 (red) to the steering stem pinch bolt and tighten to 27-30 Nm (20-22 ft-lbs).
5. Install the handlebar assembly to the upper fork clamp.
6. Fit the handlebar clamp over the handlebars.
7. Tighten the fasteners to 13.6-16.3 Nm (10-12 ft-lbs).
8. Install the ignition switch in the upper fork clamp. See 7.4 IGNITION SWITCH/FORK LOCK: 1125CR.
9. Tighten the ignition switch/fork lock mounting fasteners to 24.4-27.1 Nm (18-20 ft-lbs).
10. Join the ignition switch connector [38].

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1. **Fork tube pinch bolts**
2. **Stem capnut**
3. **Stem pinch bolt**

**Figure 2-97. Fork Clamp Steering Stem Assembly: 1125CR**

## INSTALLATION

1. Install one fork tube assembly into the lower fork clamp.
2. Slide the stopper ring over top of the fork assembly and into the groove.
3. Slide the fork tube into upper fork clamp.
4. Repeat previous steps on second front fork.
5. Temporarily install the front axle through the axle clamps to verify alignment.

**⚠WARNING**

**Both forks should be adjusted equally. Forks that are not properly adjusted can lead to loss of control, which could result in death or serious injury. (00124b)**

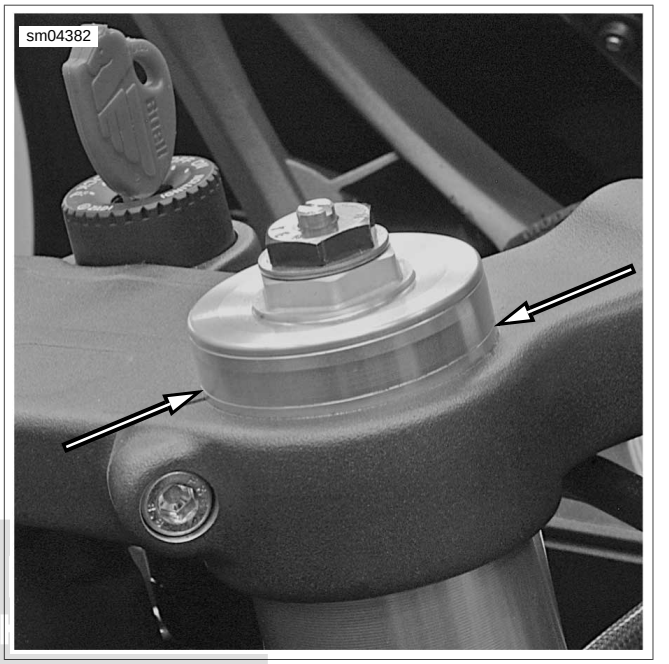


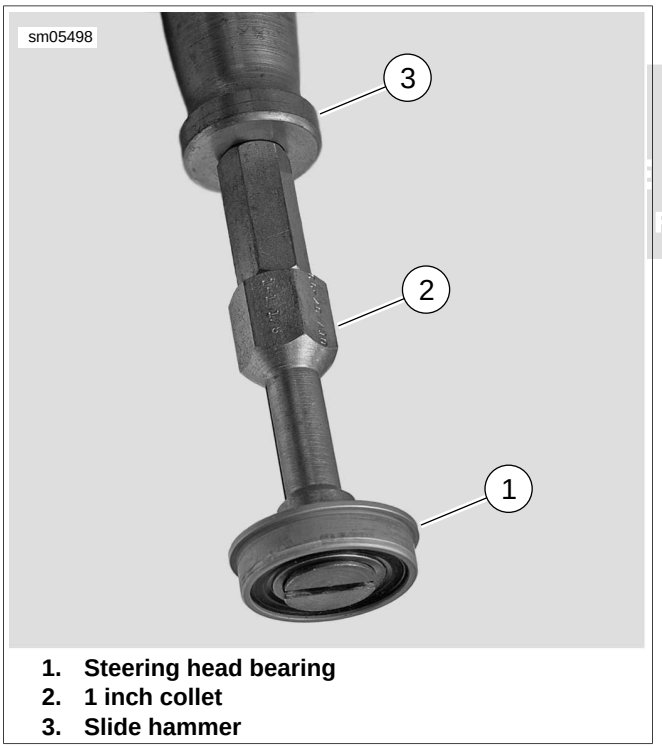

**Figure 2-98. Alignment Line**

6. See Figure 2-98. Position both forks with same number alignment lines visible and reflectors facing to the sides. Do not tighten.
7. Use LOCTITE 271 (red) on upper and lower fork clamp fasteners. Tighten upper and lower fork clamp fasteners to 27.1-29.8 Nm (20-22 ft-lbs).
8. Tighten upper clamp fasteners a second time.
9. Install front wheel and front brake caliper. See 2.7 FRONT BRAKE.
10. Turn rebound and preload adjusters to recorded settings.
11. Install front fender. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
12. Install battery fuse and seat.
13. Check headlamp alignment. See 1.13 HEADLAMP.

# STEERING HEAD BEARINGS 2.10

## REMOVAL

1. Place a scissor jack under a jacking point and raise the front wheel off the ground.
2. Protect body with a shop towel and remove handlebars or clip-ons.
3. Remove the ignition switch from the upper fork clamp. See 7.3 IGNITION SWITCH/FORK LOCK: 1125R or 7.4 IGNITION SWITCH/FORK LOCK: 1125CR.
4. Remove the front forks, the lower fork clamp and the front wheel as an assembly. See 2.9 FRONT FORK.
   a. Loosen the steering stem pinch fastener and upper fork clamp pinch fasteners.
   b. Brace the wheel to remove the steering stem capnut fastener.
   c. Remove the upper fork clamp and handlebars with the throttle grip and support it in the fairing.
   d. Remove the lower fork clamp, forks and front wheel assembly.




1. **Steering head bearing**
2. **1 inch collet**
3. **Slide hammer**

**Figure 2-99. Steering Head Bearing Removal**

5. Remove upper and lower steering head bearings.
   a. Install a 1 inch collet attached to a slide hammer through the ID of the upper bearing.
   b. Using the slide hammer, remove the upper steering head bearing.

*NOTE*

*Discard the bearings. Steering head bearings are not reusable.*

## INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| B-43993-12 | BACKING PLATE |
| B-45521 | STEERING HEAD BEARING INSTALLER |
| HD-39302 | STEERING HEAD BEARING RACE INSTALLER |
| J-23444-A | EXTREME PRESSURE LUBRICANT |

*NOTES*

- *Steering head bearings should be installed one at a time in order to verify proper alignment of bearing in bore.*
- *Use the backing plate for wheel bearing installation (B-43993-12) on the opposite side of the frame neck. By placing the large diameter of the backing plate against the frame neck it will prevent damage to the frame.*
- *Lubricate the outer bearing with engine oil prior to installing into steering stem bore.*

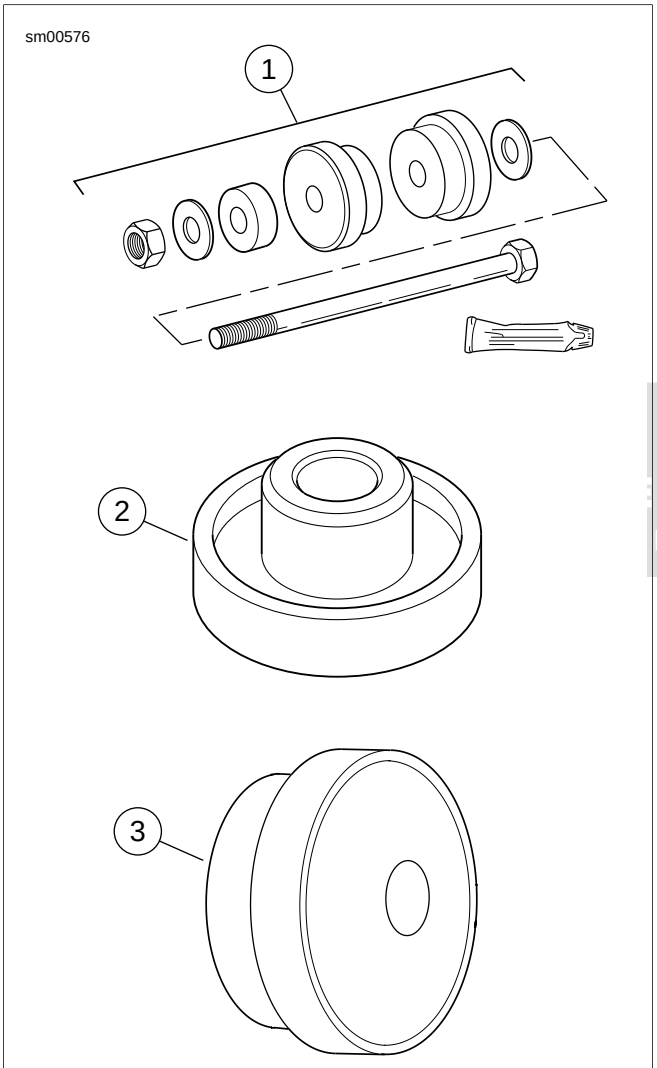
1. See Figure 2-100. Install **new** upper steering head bearing into the frame neck using STEERING HEAD BEARING RACE INSTALLER (Part No. HD-39302), the STEERING HEAD BEARING INSTALLER (Part No. B-45521) and BACKING PLATE (Part No. B-43993-12) from the wheel bearing installation kit.
   a. See Figure 2-101. Place the upper bearing squarely in the steering stem bore with the inner race lip pointing away from the steering head.
   b. See Figure 2-100. Insert the steering head bearing installation tool into the upper bearing, with the shoulder into the bearing bore.
   c. Insert the forcing screw from the steering head bearing race installer through the steering head bearing installation tool.

*NOTE*

*For ease of steering head bearing installation, lubricate the outside of the steering head bearings.*

2. See Figure 2-102. Sparingly apply EXTREME PRESSURE LUBRICANT (Part No. J-23444-A) to the threads of the forcing screw (1) from the race installer, to prolong service life and verify smooth operation. Insert the forcing screw (1) through the installation tool.
3. Place the backing plate with the large diameter facing the frame over the forcing screw.
4. Install the bearing (3), washer (2) and nut (7) from the race installer onto the forcing screw (1).
5. Tighten the nut (7) by hand, until the bearing is started into the bore in the steering head.
6. See Figure 2-103. Hold the forcing screw while tightening the nut to draw the bearing into the steering head. Continue tightening until the bearing is fully seated.
7. Repeat this process for the lower bearing.

8. Install the upper fork clamp and capnut.
9. Install forks, front wheel, and lower fork clamp/steering stem as an assembly. See 2.9 FRONT FORK.
10. Tighten steering stem capnut to 51.5-56.9 Nm (38-42 ft-lbs).
11. Tighten the steering stem pinch bolt to 27.1-29.8 Nm (20-22 ft-lbs).
12. Tighten the fork tube clamp bolts to 27.1-29.8 Nm (20-22 ft-lbs).
13. Install the ignition switch. See 7.3 IGNITION SWITCH/FORK LOCK: 1125R or 7.4 IGNITION SWITCH/FORK LOCK: 1125CR.




1. **Steering head bearing race installer**
2. **Steering head bearing installer**
3. **Wheel bearing backing plate**

**Figure 2-100. Steering Head Bearing Installation Tools**

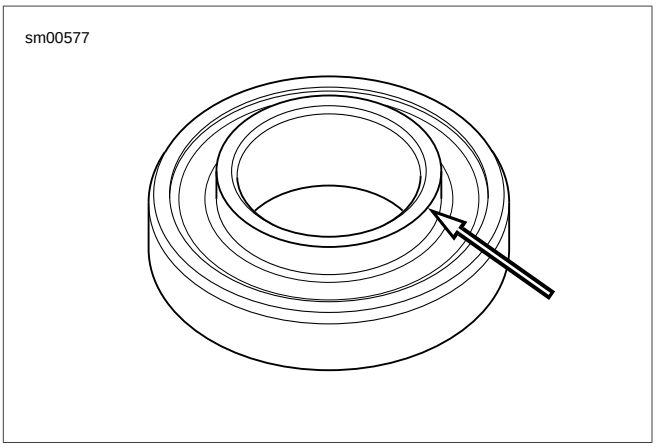
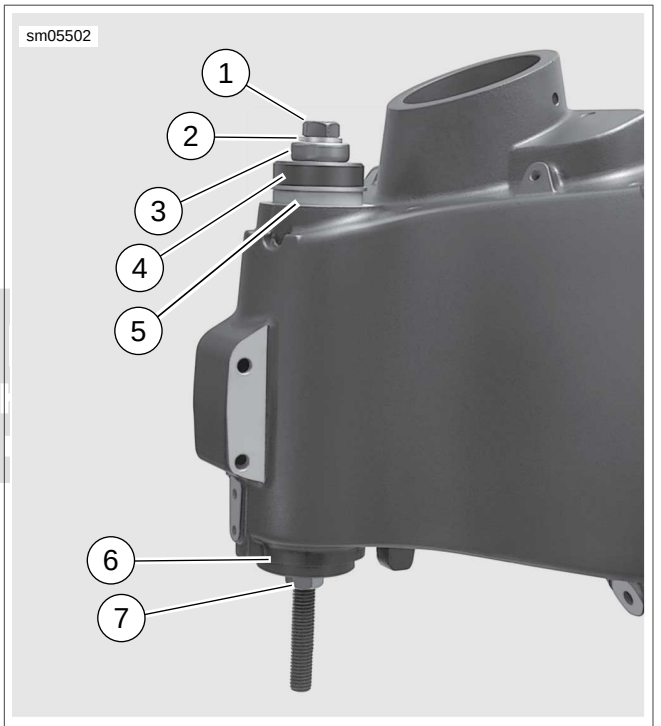
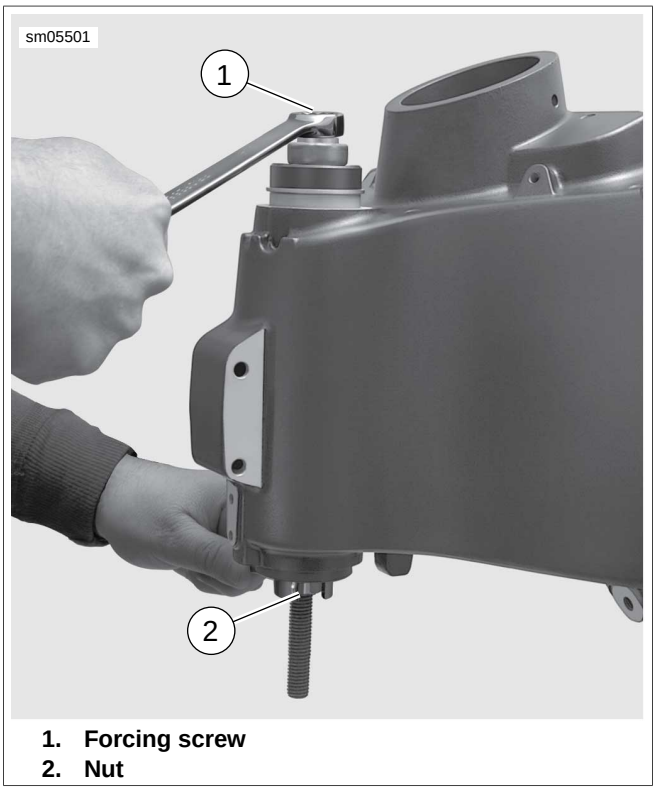



**Figure 2-101. Steering Head Bearing Lip**




1. **Forcing screw**
2. **Washer**
3. **Bearing**
4. **Steering head bearing installation tool**
5. **Upper bearing**
6. **Wheel bearing backing plate**
7. **Nut**

**Figure 2-102. Upper Bearing**




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

**Figure 2-103. Install Bearings**

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# SHOCK ABSORBER 2.11

## REPLACEMENT

### Removal

1. Remove seat.
2. Remove the battery fuse.
3. Fit a scissor jack under jacking point and raise rear wheel off ground.
4. See Figure 2-104. Remove lower shock mount locknut, washers, bolt and sleeve.
5. See Figure 2-105. Remove upper shock mount fastener and washer.
6. Raise motorcycle up approximately an additional 51 mm (2.0 in).
7. Lift and guide shock up to remove shock through the top of the tail section.




**Figure 2-104. Lower Shock Mount**

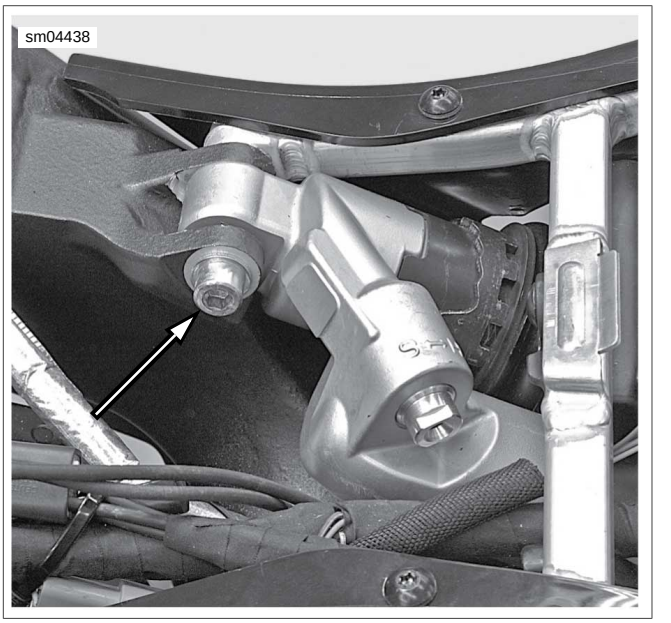



**Figure 2-105. Upper Shock Mount**

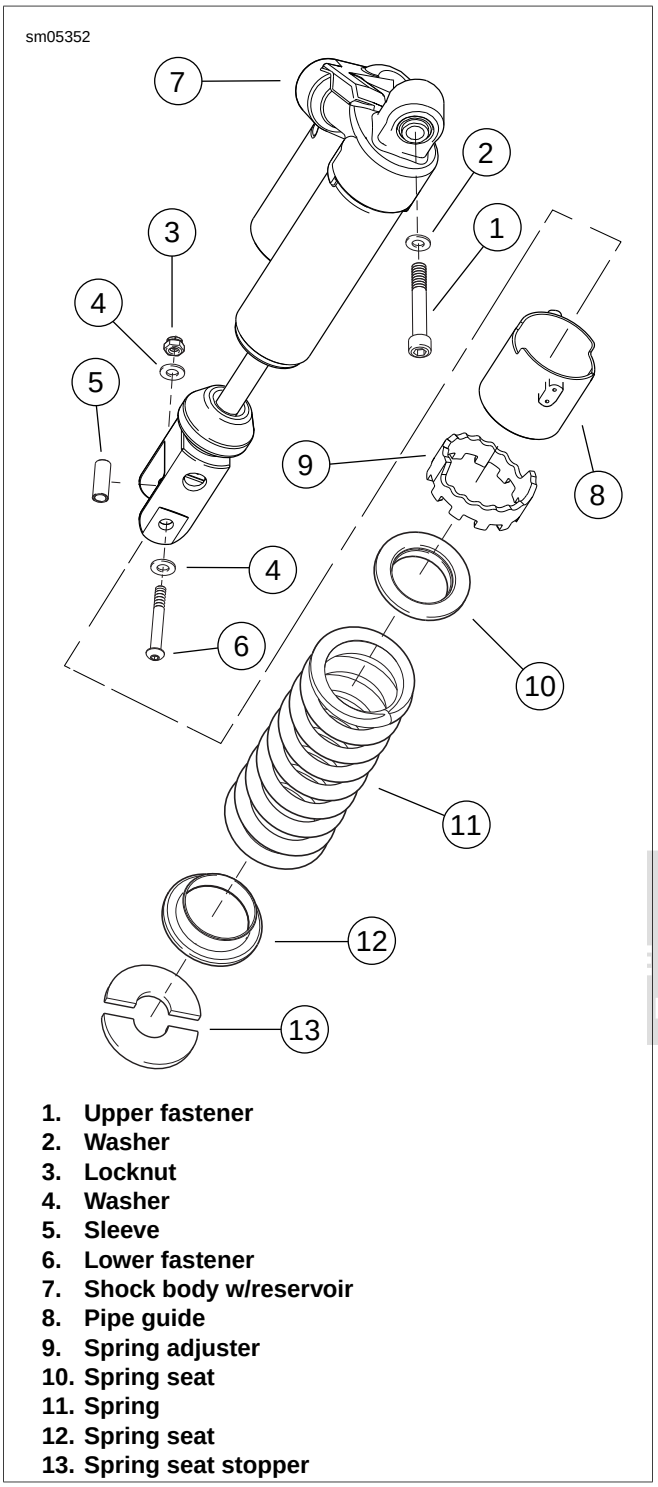
### Installation

1. Guide shock assembly down between shock shroud and engine.
2. See Figure 2-106. Verify that the lower shock mount sleeve (5) is in place in the swingarm mount and slide the mounting bolt (6) with washer (4) through the shock and the swingarm mount.
3. Add the washer (4) and the locknut (3).
4. Thread the upper fastener (1) with washer (2) into position.
5. Tighten the lower mount to 20-23 Nm (15-17 ft-lbs).
6. Tighten the upper mount to 46.1-51.5 Nm (34-38 ft-lbs).
7. Lower the motorcycle.
8. Install the battery 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)**

9. Install the seat.




1. **Upper fastener**
2. **Washer**
3. **Locknut**
4. **Washer**
5. **Sleeve**
6. **Lower fastener**
7. **Shock body w/reservoir**
8. **Pipe guide**
9. **Spring adjuster**
10. **Spring seat**
11. **Spring**
12. **Spring seat**
13. **Spring seat stopper**

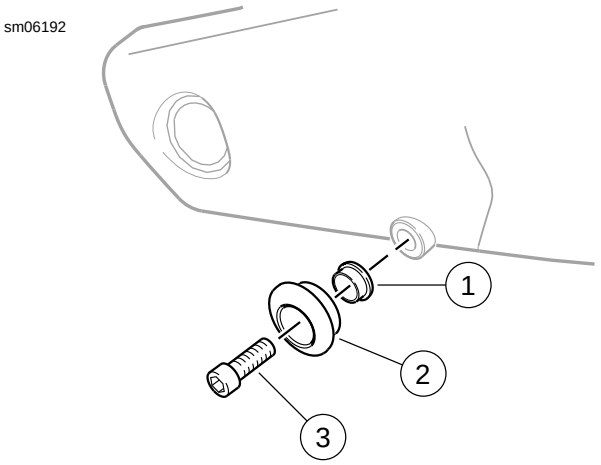
**Figure 2-106. Rear Shock Assembly**

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# SWINGARM AND BRACE 2.12

## AXLE SLIDERS

1. See Figure 2-107. Assemble the bushing (1) with the slider (2) and install with the fastener (3).
2. Tighten to 7.9-8.8 Nm (70-78 **in-lbs**).




1. **Bushing**
2. **Slider**
3. **Fastener**

**Figure 2-107. Axle Slider**

## BRACE

1. Remove rear fender.
2. Loosen rear axle pinch bolt.
3. Loosen rear axle approximately 15 rotations to allow partial tension to be removed from rear drive system.
4. See Figure 2-108. Remove swingarm brace fasteners and brace.
5. Remove swingarm brace.
6. Install swingarm brace with fasteners. Do not tighten.
7. Tighten swingarm brace fasteners to 24.4-27.1 Nm (18-20 ft-lbs).
8. Tighten rear axle to 31.2-36.6 Nm (23-27 ft-lbs). Back off two turns and then tighten to 65.1-70.5 Nm (48-52 ft-lbs).
9. Tighten rear axle pinch bolt to 54-61 Nm (40-45 ft-lbs).
10. Install rear fender.

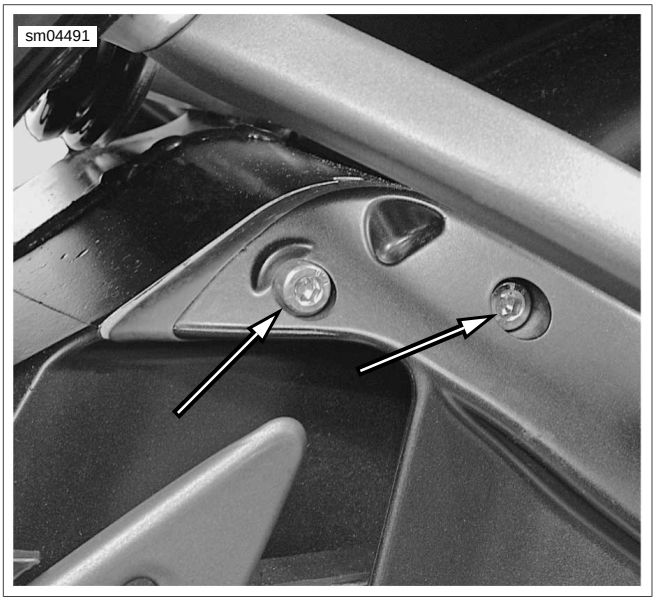



**Figure 2-108. Swingarm Brace Fasteners**

## SWINGARM: REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| B-46279 | AXLE WRENCH |

1. Remove seat.

**⚠WARNING**

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

2. Disconnect negative battery cable.
3. Remove rear wheel. See 2.6 WHEELS.
4. See Figure 2-109. Remove P-clamps connecting brake fluid line to swingarm.
5. Remove the rear brake caliper and support caliper and brake line. See 2.8 REAR BRAKE.
6. Remove rear fender and the drive belt guard.
7. Remove the swingarm brace and the drive belt. See 6.11 DRIVE BELT AND IDLER PULLEY.
8. With vehicle supported remove lower shock mounting fastener and spacer from shock absorber and swingarm.
9. See Figure 2-110. Remove the two fasteners securing the rider peg mount and master cylinder.
10. See Figure 2-111. Loosen pivot shaft pinch bolt in engine clamp.
11. Remove pivot shaft with the AXLE WRENCH (Part No. B-46279) (a hex tool also found in the owners tool kit).
12. Remove swingarm.

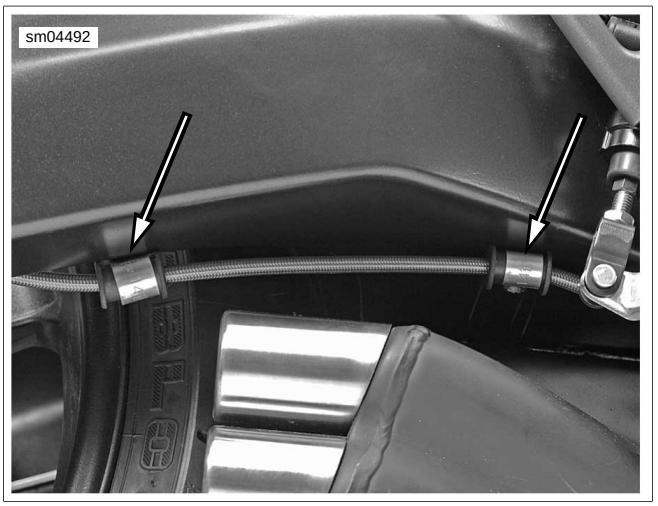
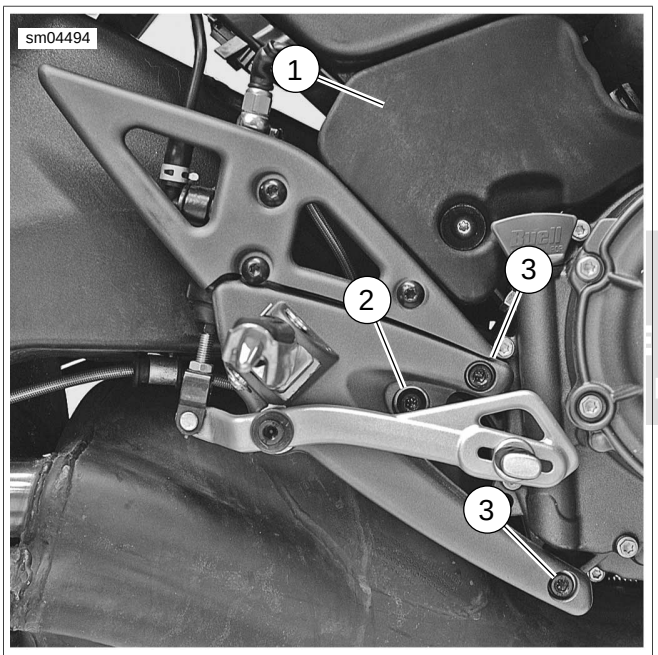



**Figure 2-109. Brake Fluid Line P-clamps**




1. **Air flow guide**
2. **Muffler fastener**
3. **Mount fastener**

**Figure 2-110. Rider Footpeg Mount**

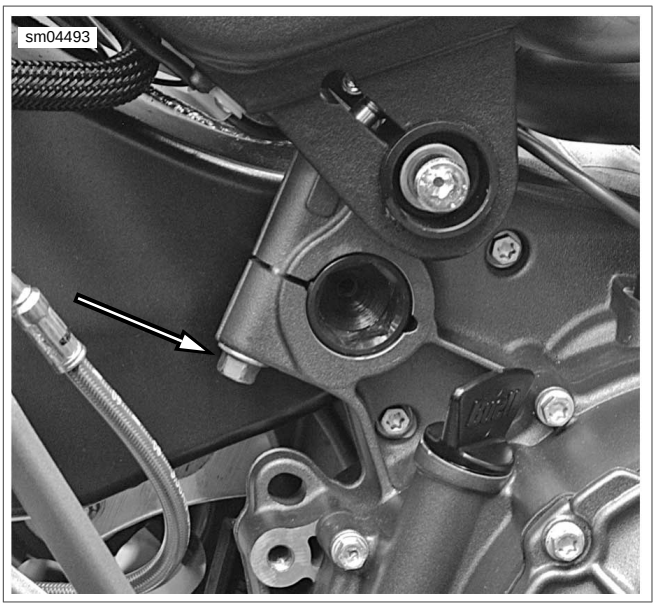



**Figure 2-111. Swingarm Pivot Pinch Bolt**

## SWINGARM: REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| HD-44060-A | WHEEL BEARING REMOVER AND INSTALLER |
| SNAP-ON CJ1275 | SLIDE HAMMER |

*NOTE*

*See Figure 2-112. Remove the swingarm bearings (5) only if replacement is required. Mark all components so they may be correctly installed. Both bearings must be replaced as a unit. Do not intermix new and used components.*

1. Remove swingarm bearings using SLIDE HAMMER (Part No. SNAP-ON CJ1275) or equivalent and a 3/4 inch bearing remover and spacer (6).
2. Remove shock mount bushings (3).
3. Thoroughly 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)**

4. Blow dry with compressed air.
5. Carefully inspect all bearing components for wear and/or corrosion. Replace both bearings if any component is damaged.
6. Check that swingarm is not bent or twisted. Replace if damaged.

*NOTES*

*The left side bearing must be installed first and fully seated before installing the spacer and the right side bearing.*

7. Install **new** shock mount bushings.

8. Install **new** bearings and spacer with WHEEL BEARING REMOVER AND INSTALLER (Part No. HD-44060-A).

## SWINGARM: INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| B-46279 | AXLE WRENCH |

1. See Figure 2-112. Apply LOCTITE ANTI-SEIZE to threads, shaft and large diameter on socket end of the pivot shaft (7).
2. Apply LOCTITE ANTI-SEIZE to mating inner races of swingarm bearings (5).
3. Align swingarm in pivot of engine crankcase.
4. Install the pivot shaft with an AXLE WRENCH (Part No. B-46279) (a hex tool also found in the owners tool kit). Tighten to 60-62 Nm (44-46 ft-lbs).
5. Apply LOCTITE 271 (red) to the threads of the pivot shaft pinch bolt (4). Install and tighten fastener to 27.1-29.8 Nm (20-22 ft-lbs).
6. Install spacer in the lower shock mount.
7. Install lower shock absorber washers, fastener and locknut. Tighten to 20-23 Nm (15-17 ft-lbs).
8. Install the P-clamps that secure brake fluid line to swingarm. Tighten front P-clamps to 9.5-10.9 Nm (7-8 ft-lbs). Tighten rear P-clamps to 24.4-27.1 Nm (18-20 ft-lbs).
9. Install the rear brake caliper. See 2.8 REAR BRAKE.
10. Install rear wheel. See 2.6 WHEELS.
11. Install rear fender and debris deflector. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
12. Install the drive belt. See 6.11 DRIVE BELT AND IDLER PULLEY.
13. Install swingarm brace.

**⚠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)**

14. Connect negative battery cable.

**⚠WARNING**

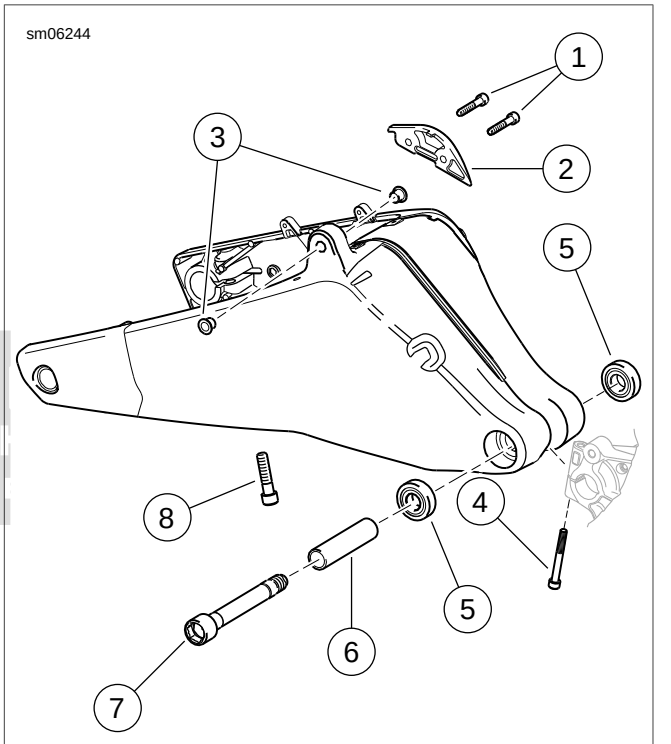
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

15. Install seat.

**⚠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)**

16. Check rear brake operation.




1. **Brace fastener**
2. **Brace**
3. **Shock mount bushings**
4. **Pivot shaft pinch bolt**
5. **Bearing**
6. **Spacer**
7. **Pivot shaft**
8. **Rear axle pinch bolt**

**Figure 2-112. Swingarm Assembly**

# FRAME 2.13

## SERVICE

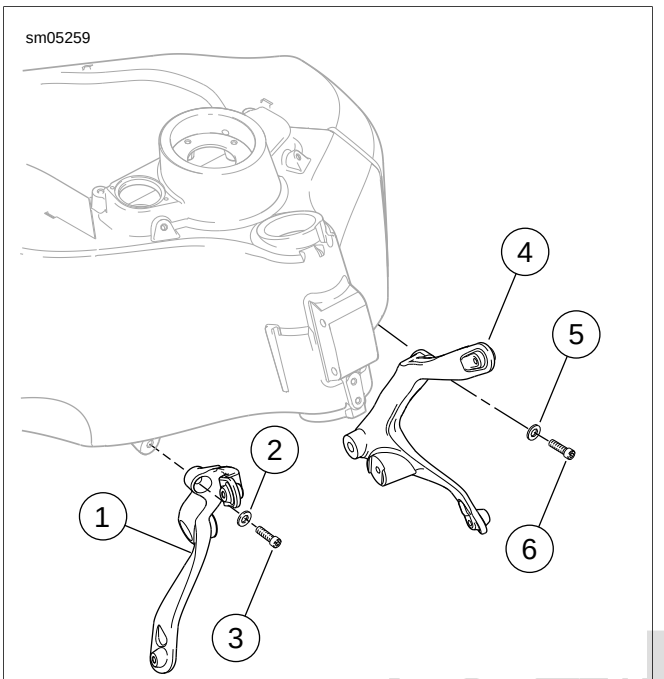
**Table 2-20. Frame Service**

| SERVICE PROCEDURE | COMPONENT PROCEDURE |
|---|---|
| Prepare the motorcycle. | |
| | Remove the battery. |
| | Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY. |
| Separate chassis components from frame. | |
| | **1125R:** Remove the fairing and headlamp assembly. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.<br>**1125CR:** Remove the windscreen and headlamp assembly. See 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR. |
| | Clamp the rear wheel in the lift and support the motorcycle. |
| | Remove the front forks. See 2.9 FRONT FORK. |
| | Remove the fork clamps. See 2.9 FRONT FORK, Fork Clamps: 1125R. |
| | Remove the main wire harness. See 7.23 MAIN WIRE HARNESS. |
| | Remove the tail section and subframe. See 2.14 SUBFRAME. |
| Separate the frame from the engine. | |
| | Remove the shock absorber. See 2.11 SHOCK ABSORBER. |
| | Remove the frame/fuel tank from the engine. See 2.13 FRAME, Motor Mounts and 2.13 FRAME, K-Brackets. |
| Disassemble and repair the frame/fuel tank as required. | |
| | As required, disassemble and repair active intake components. See 4.6 ACTIVE INTAKE. |
| | As required, disassemble and repair the fuel tank components. See 4.8 FUEL TANK. |
| Install the frame/fuel tank on the engine. | |
| | Install the frame/fuel tank on the engine. See 2.13 FRAME, Motor Mounts and 2.13 FRAME, K-Brackets. |
| | Install the shock absorber to the frame. See 2.11 SHOCK ABSORBER. |
| Install the chassis components to the frame. | |
| | Install the tail section and subframe. See 2.14 SUBFRAME. |
| | Install the main wire harness. See 7.23 MAIN WIRE HARNESS. |
| | Install the fork clamps. See 2.9 FRONT FORK, Fork Clamps: 1125R. |
| | Install the front forks. See 2.9 FRONT FORK. |
| | **1125R:** Install the fairing and headlamp assembly. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.<br>**1125CR:** Install the windscreen and headlamp assembly. See 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR. |
| Return the motorcycle to service. | |
| | Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY. |
| | Install the battery. |

DIGITAL HARLEY-DAVIDSON

## K-BRACKETS

1. See Figure 2-113. Install K-bracket to frame fasteners and washers and tighten to 31.8-35.3 Nm (23.5-26.0 ft-lbs).
2. Install K-bracket to engine fasteners and washers and tighten to 46-51 Nm (34-38 ft-lbs).

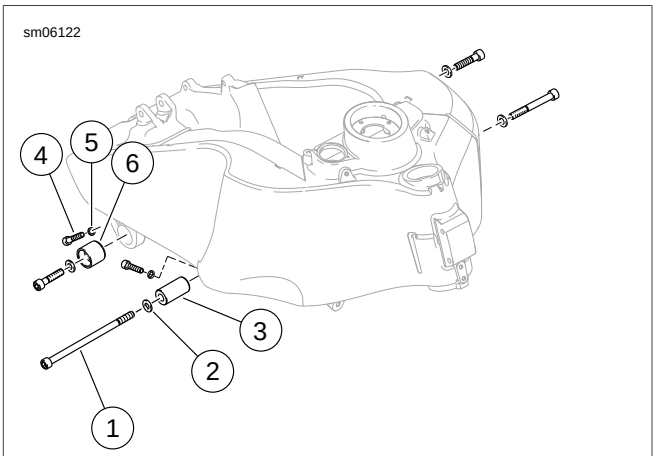



1. **Right K-bracket**
2. **Lockwasher**
3. **Fastener**
4. **Left K-bracket**
5. **Lockwasher**
6. **Fastener**

**Figure 2-113. K-Brackets**

## MOTOR MOUNTS

1. See Figure 2-114. Install pinch spool (3) in right center motor mount.
2. Install pinch spool (6) in right rear motor mount.
3. See Figure 2-114. Install bolts (1) and washers (2) and tighten motor mount fasteners to 46-51 Nm (34-38 ft-lbs).
4. Install pinch bolts (4) and washers (5) and tighten to 24.5-27.0 Nm (18-20 ft-lbs).




1. **Bolt**
2. **Washer**
3. **Pinch spool, right center**
4. **Pinch bolt**
5. **Washer**
6. **Pinch spool, right rear**

**Figure 2-114. Motor Mounts**

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# SUBFRAME 2.14

## TAIL SECTION

1. Remove the seat.
2. Remove the pillion.
3. Remove the five tail section fasteners.
4. Spread the tail section and rotate it to the left as it comes off the subframe.
5. See Figure 2-115. Pull the retaining clip and remove the barrel and cable, the seat lock plate and the lock from the tail section.
6. See Figure 2-116. To install the lock:
   a. Fit the lock (1) through the tail section and seat lock plate (2).
   b. Fit the cable to the plate and the cable barrel to the lock.
   c. Snap in the retainer (3).
7. Spread the body over the subframe and install the fasteners (5) and washers (4).
8. Tighten the fasteners to 3.9-4.3 Nm (34-38 **in-lbs**).
9. Install the pillion.

**⚠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 the seat.

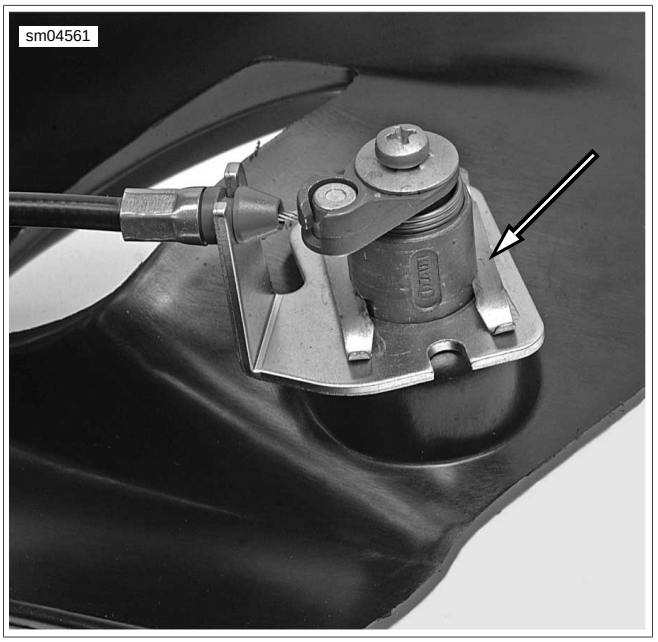
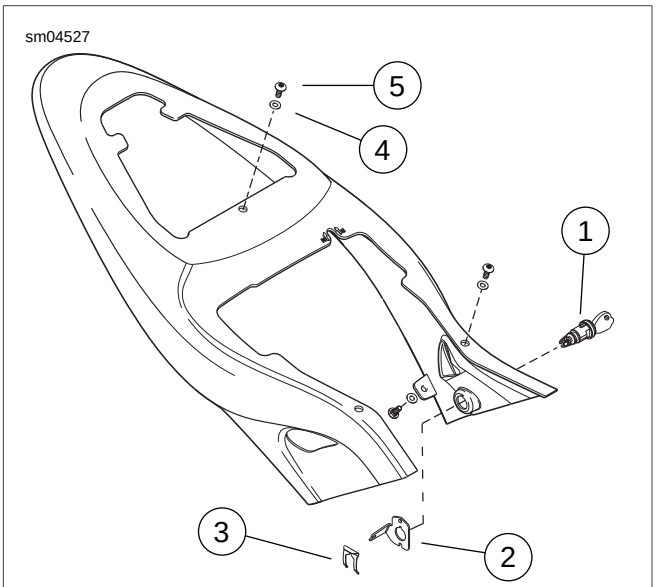



**Figure 2-115. Pillion Lock Retainer**




1. **Pillion lock**
2. **Seat lock plate**
3. **Retainer**
4. **Washer**
5. **Fasteners**

**Figure 2-116. Tail Section**

## SUBFRAME PAN

### Removal

1. Remove the body. See 2.14 SUBFRAME, Tail Section.
2. Remove the negative battery cable.
3. See Figure 2-117. Remove the attachment clips and the negative battery cable and ground wire.
4. See Figure 2-118. Separate the license plate lamp barrel connectors.
5. See Figure 2-119. Separate the turn signal barrel connectors (1).
6. Separate the socket spade connectors (2) from the tail lamp.

*NOTE*

*The tail lamp lens and housing can be removed before or after the pan is removed.*

7. Remove the turn signal and license plate bracket. See 7.12 TURN SIGNALS and 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Bracket.
8. See Figure 2-120. Remove the brake fluid reservoir fastener (1) and the solenoid relay cover fastener (2).

*NOTE*

*The starter relay can be pulled out of its cavity and suspended from its harness.*

9. Lift the latch (3) to separate the socket and pin housings of the fuel pump connector [86].

*NOTE*

*Lift the latch under the pin housing away from the housing to slide the housing off of the attachment clip.*

10. Pull the main wire harness from the guide (4) on the pan.
11. Pull the negative battery cable and grommet (5) through the opening in the pan.
12. Remove the remaining pan screws, one at front of battery tray (6) and one at front (7), and the pan.

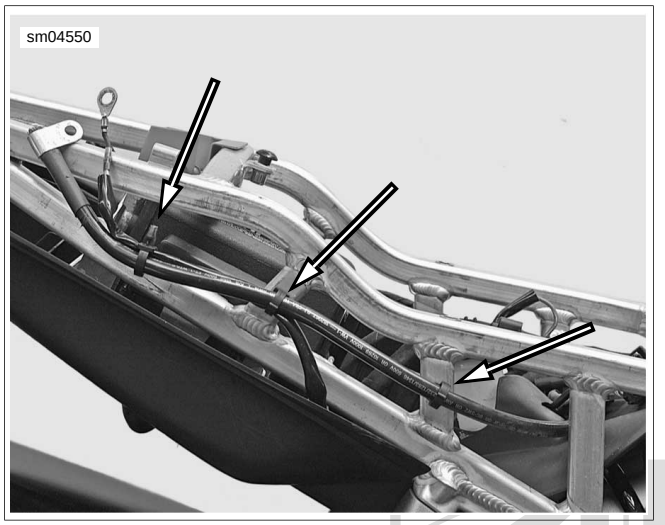



**Figure 2-117. Negative Battery Cable Attachment Clips**

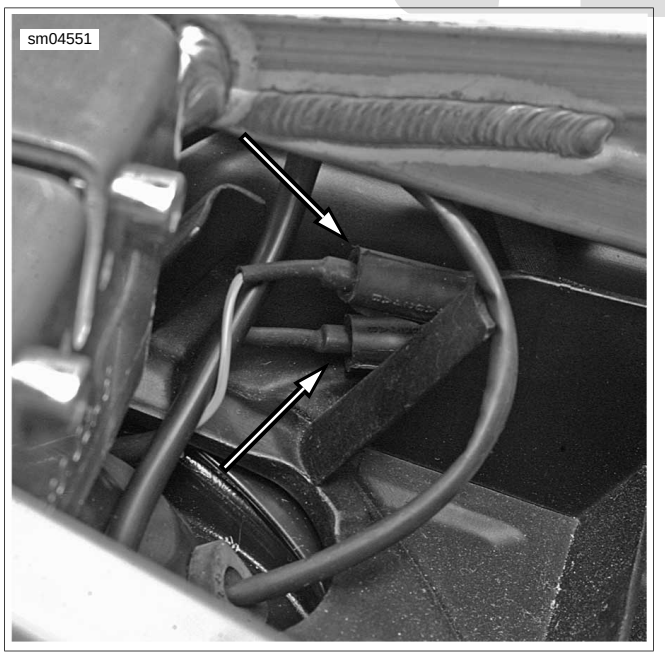
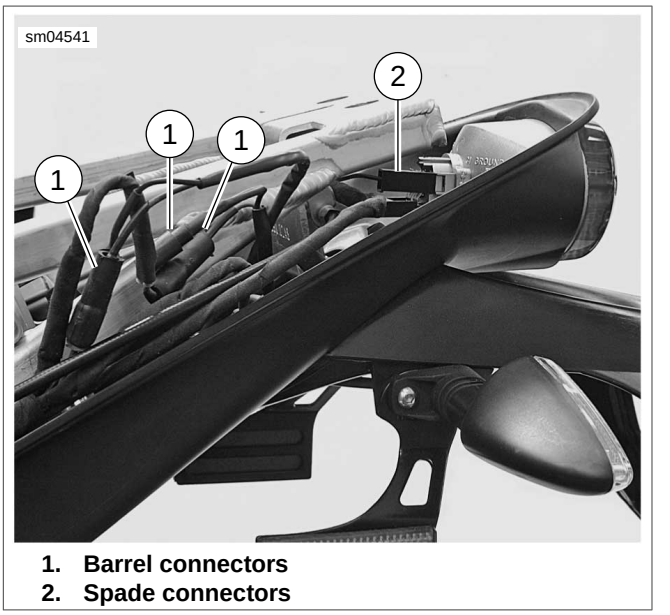
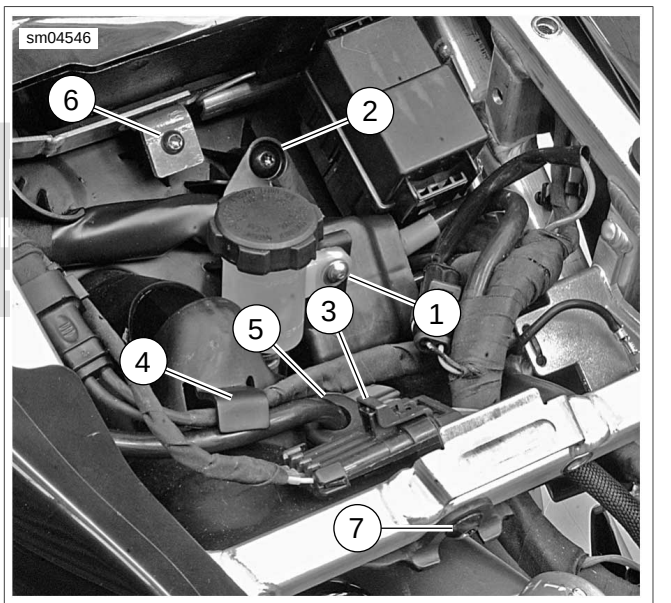



**Figure 2-118. License Plate Lamp Connectors**




1. **Barrel connectors**
2. **Spade connectors**

**Figure 2-119. Turn Signal/Tail Lamp Connectors**




1. **Reservoir fastener**
2. **Solenoid cover fastener**
3. **Fuel pump connector [86] latch**
4. **Main harness guide**
5. **Negative battery cable grommet**
6. **Battery tray pan fastener**
7. **Pan front fastener**

**Figure 2-120. Under Seat**

## Installation

1. Support the pan against the subframe.
2. Fit the front pan screw and tighten to 13.0-14.4 Nm (115-128 **in-lbs**).
3. Fit the battery tray fastener and tighten to 7.3-8.2 Nm (65-73 **in-lbs**).

4. Thread the negative battery cable up through the pan and outside of the subframe through the attachment clips along with the ground wire.
5. Slide the fuel pump connector [86] onto the attachment clip.
6. Mate the connector pin and socket housings.
7. Press the starter solenoid and all wire harnesses into the guides.
8. Install the starter solenoid cover. Tighten to 4.1-6.8 Nm (36-60 **in-lbs**).
9. Install the brake fluid reservoir. Tighten to 3.6-4.1 Nm (32-36 **in-lbs**).
10. Install the turn signal and license plate bracket. See 7.12 TURN SIGNALS and 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Bracket.
11. Join the license plate lamp [45] connectors.
12. Join the turn signal barrel [18] [19] connectors.
13. Join the tail lamp spade [93] connectors.
14. Install the subframe body. See 2.14 SUBFRAME, Tail Section.
15. Connect the negative battery cable.

## SUBFRAME

### Removal

1. Remove the seat.
2. Remove the pillion.
3. Remove the passenger footpeg supports. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger.
4. Remove the tail section body. See 2.14 SUBFRAME, Subframe Pan.
5. Remove the battery. See 1.14 BATTERY MAINTENANCE.
6. See Figure 2-121. Remove the fasteners and the pillion latch. Remove the cable from the attachment clip.
7. Remove the subframe pan. See 2.14 SUBFRAME, Subframe Pan.
8. See Figure 2-122. Remove the positive cable attachment clips.
9. Remove the negative cable attachment clips.
10. Pull the fuse block from its tab on the subframe.
11. Pull the relay block from its tab on the subframe.
12. Remove the regulator. See 7.9 VOLTAGE REGULATOR.
13. Support the motorcycle with a scissors jack.
14. Remove the upper shock mount.
15. Remove the bolt supporting the subframe.
16. Remove the subframe while guiding and supporting the wire harness and electrical components.




**Figure 2-121. Pillion Latch Fasteners**

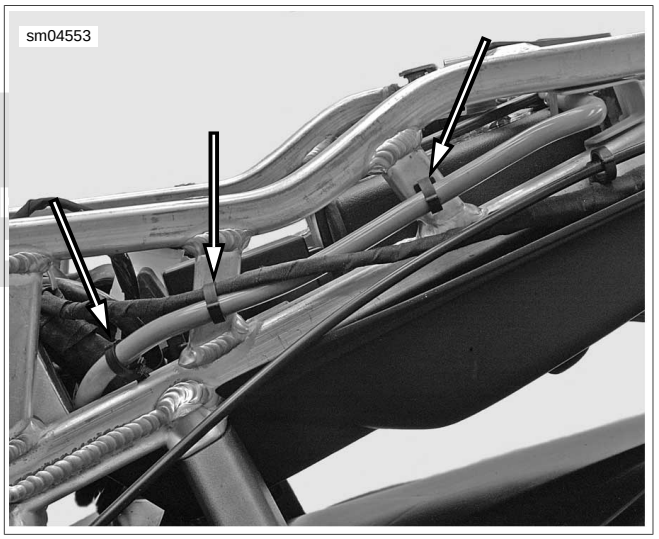



**Figure 2-122. Positive Battery Cable Attachment Clips**

### Installation

1. Fit the subframe to the frame.
2. Apply LOCTITE 268 (red) to the subframe fasteners and secure the subframe.
3. Tighten the subframe fasteners to 28.5-31.2 Nm (21-23 ft-lbs).
4. Fit the upper shock mounting bolt though the subframe and the upper shock mount.
5. Tighten the upper shock mounting bolt to 46.1-51.5 Nm (34-38 ft-lbs).
6. Thread the wire harness up through the subframe and route each wire bundle to its electrical component.
7. Clip the relay block onto its subframe clip.

8. Clip the fuse block onto its subframe clip.
9. Install the voltage regulator. See 7.9 VOLTAGE REGULATOR.
10. Install the passenger footpeg supports. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger.
11. Install the battery. See 1.14 BATTERY MAINTENANCE.
12. Install the tail section pan. See 2.14 SUBFRAME, Subframe Pan.
13. Install the tail section body. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger.
14. Install the seat.

**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)**

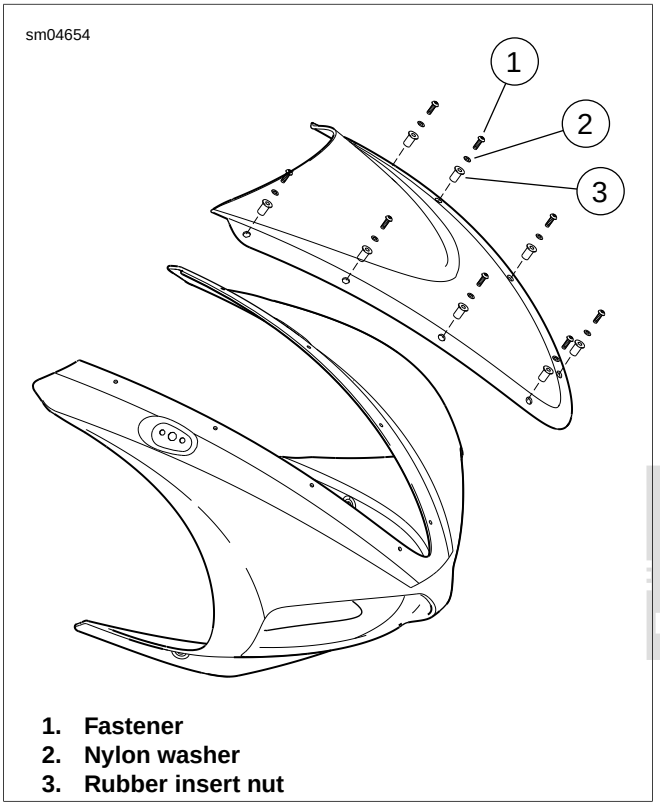
15. Install the pillion.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# FAIRING AND HEADLAMP ASSEMBLY: 1125R 2.15

## WINDSHIELD

1. To remove the windshield, remove the eight fasteners.
2. See Figure 2-123. To install a windshield, run the fasteners (1) with a nylon washer (2) through the top of the fairing to sandwich the windshield between the fairing and the rubber insert nuts (3).
3. Tighten to 1.0-1.5 Nm (10-12 **in-lbs**).




1. **Fastener**
2. **Nylon washer**
3. **Rubber insert nut**

**Figure 2-123. Windshield**

## CLEANING

**CAUTION**

**Polycarbonate windscreens/windshields require proper attention and care to maintain. Failure to maintain polycarbonate properly can result in damage to the windscreen/windshield. (00483d)**

Use Harley Softcloths with the following products to clean the windscreen. To minimize swirl marks, clean the windshield when motorcycle is cool and out of the sun.

- HARLEY-DAVIDSON BUG REMOVER (Part No. 94657-98).
- HARLEY-DAVIDSON SUNWASH (Part No. 94659-98).
- NOVUS 1 CLEANER/PROTECTANT (Part No. 99837-94T).
- NOVUS 2 SCRATCH REMOVER (Part No. 99836-94T).
- HARLEY GLAZE (Part No. 99701-84) to polish and seal after cleaning.

*NOTE*

*Faint swirl marks are normal and may be more visible on tinted than on clear windshields.*

## FAIRING

### Removal

1. Separate the left [31L] and the right [31R] turn signal barrel connectors under the fairing.
2. Remove the mirror/turn signals.
3. To remove the fairing, remove the two lower fasteners.

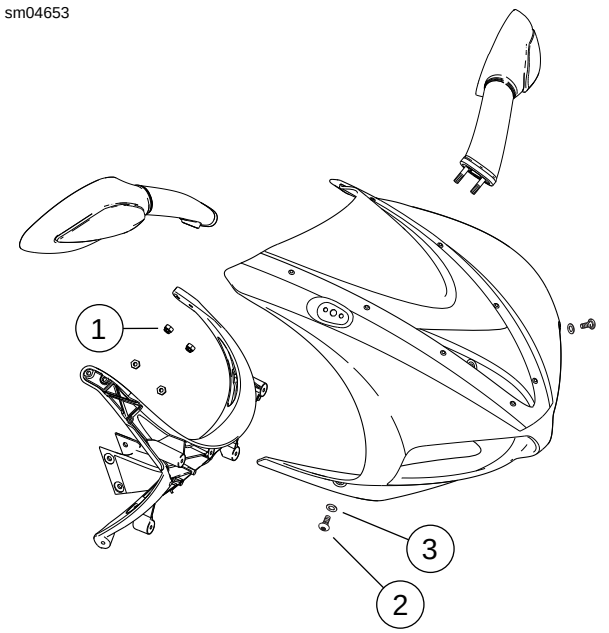
### Installation

1. See Figure 2-124. Position fairing on the headlamp module.
2. Install mirror/turn signals with nuts (1) on the backside of the bracket.
3. Join the left [31L] and right [31R] turn signal barrel connectors.

*NOTE*

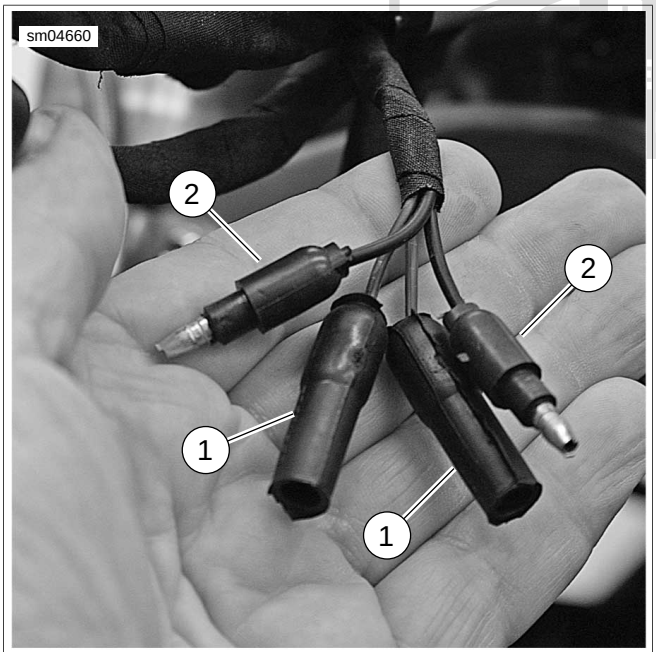
*See Figure 2-125. Join the socket housings (1) with colored leads from the main wiring harness to the pin terminals from the turn signals. Join the pin housings (2) on the main wiring harness to the black lead socket terminals from the turn signals. Refer to Table 2-21.*

4. Install the two lower fasteners (2) with nylon washers (3).
5. Tighten turn signal/mirror mounting nuts to 8.1-10.8 Nm (72-96 **in-lbs**).
6. Tighten lower fasteners to 8.1-9.5 Nm (72-84 **in-lbs**).




1. **Turn signal nuts**
2. **Lower fastener**
3. **Nylon washer**

**Figure 2-124. Fairing**




1. **Socket housing**
2. **Pin housing**

**Figure 2-125. Turn Signal Barrel Connectors**

**Table 2-21. Turn Signal Main Harness Lead Colors**

| SIDE | SOCKET | PIN |
|---|---|---|
| LH turn signal | V | BK |
| RH turn signal | BN | BK |

## HEADLAMP ASSEMBLY

### Removal

1. Remove the pillion.
2. Disconnect the negative battery cable.
3. Remove the turn signals and fairing.
4. See Figure 2-126. Separate the headlamp connector [38] pin and socket housings.
5. Remove the six fasteners.




**Figure 2-126. Headlamp Connector [38]**

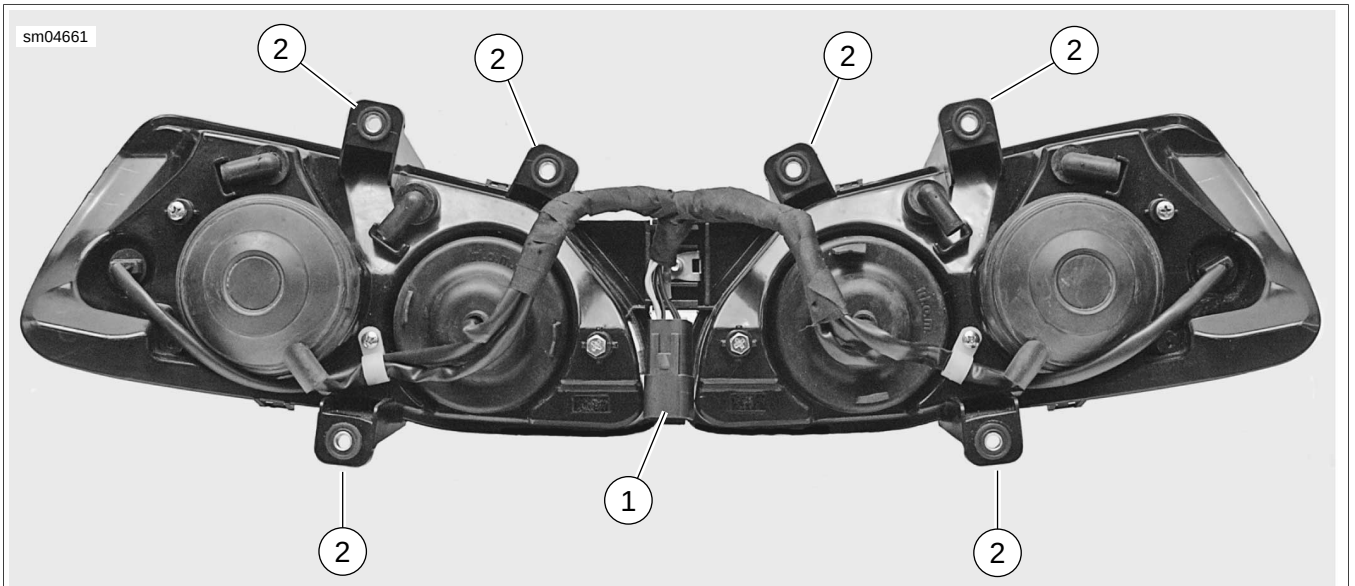
### Installation

1. See Figure 2-127. Verify that the wire harness, clamps and vent elbows are in place.
2. See Figure 2-128. Verify that the and mounting grommets (1) with bushings (2) are in place in the headlamp assembly mounting lugs.
3. Install the headlamp assembly. Tighten to 6.1-7.5 Nm (54-66 **in-lbs**).
4. Join the pin (1) and socket housings of the headlamp connector [38].
5. Install the turn signals and fairing.
6. Connect the negative battery cable.
7. Install the pillion.

**WARNING**

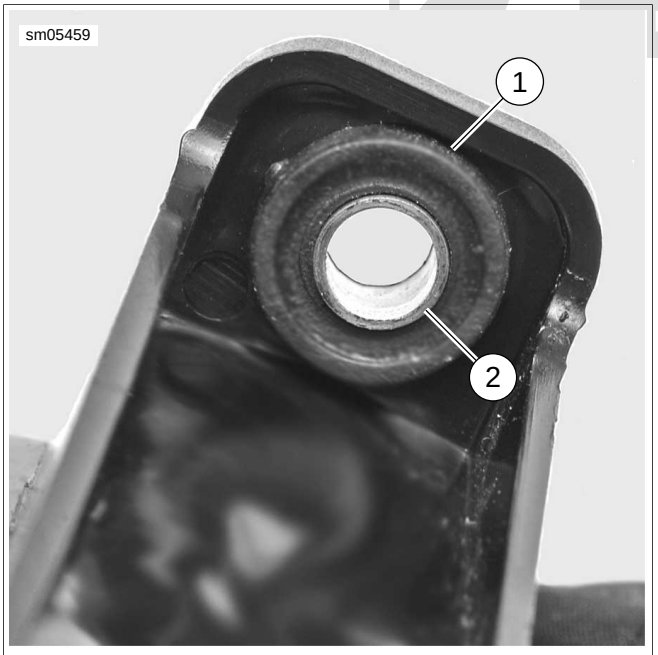
**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

8. Test the headlamps, turn signals and brake light.




1. **Headlamp module connector [38]**
2. **Mounting bolt boss**

**Figure 2-127. Headlamp Module**




1. **Grommet**
2. **Bushing**

**Figure 2-128. Headlamp Assembly Mounting Lug**

## SUPPORT BRACKET

### Removal

1. Remove pillion.

**WARNING**

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

2. Disconnect the negative battery cable.
3. Remove the fairing. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing.
4. Remove the headlamp module. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Headlamp Assembly.
5. See Figure 2-129. Press on the top latch to separate the socket housing from the instrument module.
6. See Figure 2-130. Rotate the forks to the left to access and loosen the bracket fastener nuts.

*NOTE*

*See Figure 2-131. Rotate the forks to the right to remove the two bracket fasteners and washers.*

7. If necessary, remove the instrument cluster.

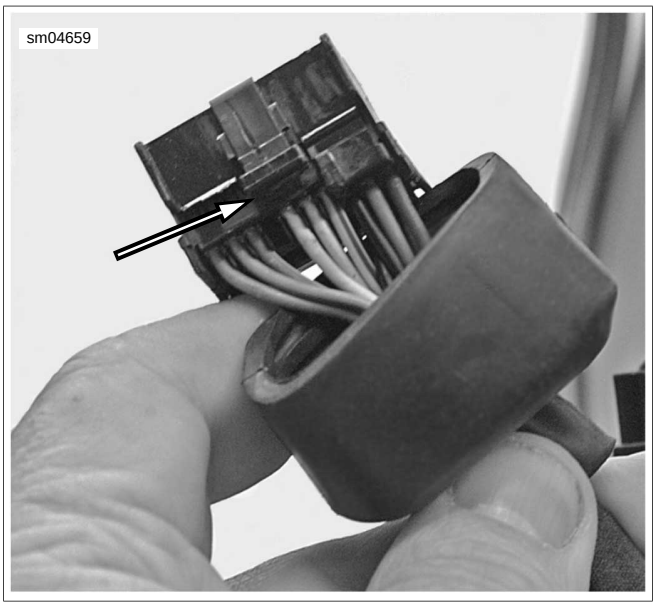



**Figure 2-129. Instrument Module Connector Latch**

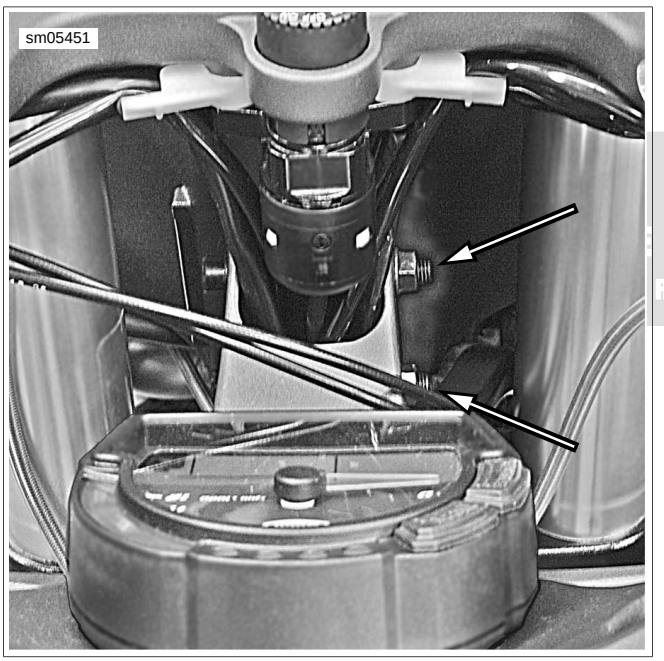



**Figure 2-130. Bracket Fastener Nuts**




**Figure 2-131. Bracket Fastener Hex Heads**

## Installation

*NOTE*

*Pass the lower fastener through the front wire harness bracket.*

1. See Figure 2-132. Install fairing support bracket with bolts (1), washers (2) and nuts (3).
2. Tighten to 21.7-24.4 Nm (16-18 ft-lbs).
3. If removed, install instrument cluster (4) with rubber grommets (5) and secure with nuts (6). Tighten to 1.4-4.1 Nm (12-36 **in-lbs**).
4. Join the socket connector [39] housing to the instrument module.
5. Tightly fit the rubber weather boot to the connector.
6. Install the headlamp module. Tighten to 9.6-10.6 Nm (85-94 **in-lbs**).
7. Join the headlamp connector [38] pin and socket housings.
8. Install front fairing and turn signals. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing.
9. Connect the negative battery cable. Tighten to 6.8-7.9 Nm (60-70 **in-lbs**).

**⚠WARNING**

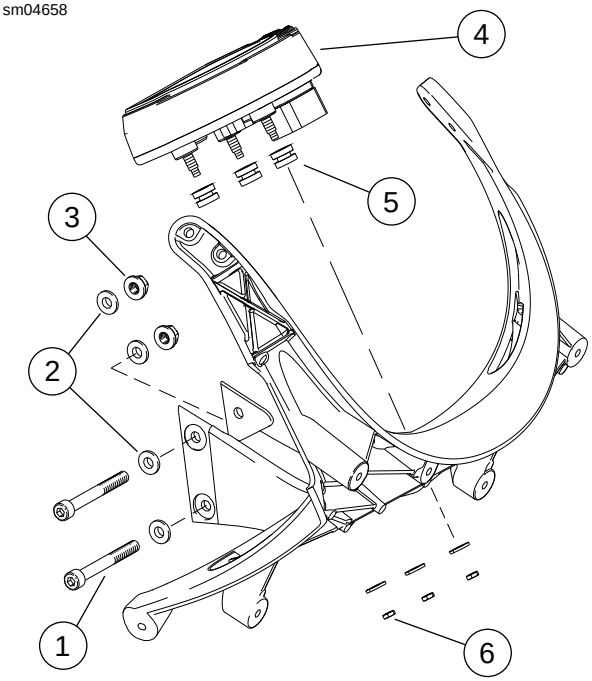
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

10. Install the pillion.

**⚠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 headlamps, turn signals and brake light.




1. **Bolt**
2. **Washer**
3. **Nut**
4. **Instrument module**
5. **Grommet**
6. **Nut**

**Figure 2-132. Fairing Support Bracket**

## HEADLAMP/FAIRING SUPPORT BRACKET

### Removal

*NOTE*

*The headlamp assembly, instrument module and support bracket can be removed as a unit.*

1. Remove the pillion.
2. Disconnect the negative battery cable.
3. Remove the turn signals and fairing. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing.
4. Separate the electrical connector pin and socket housings:
   a. The headlamp connector [38]
   b. The instrument module connector [39]
5. Support the headlamp assembly and support bracket and remove the bracket fasteners. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing.

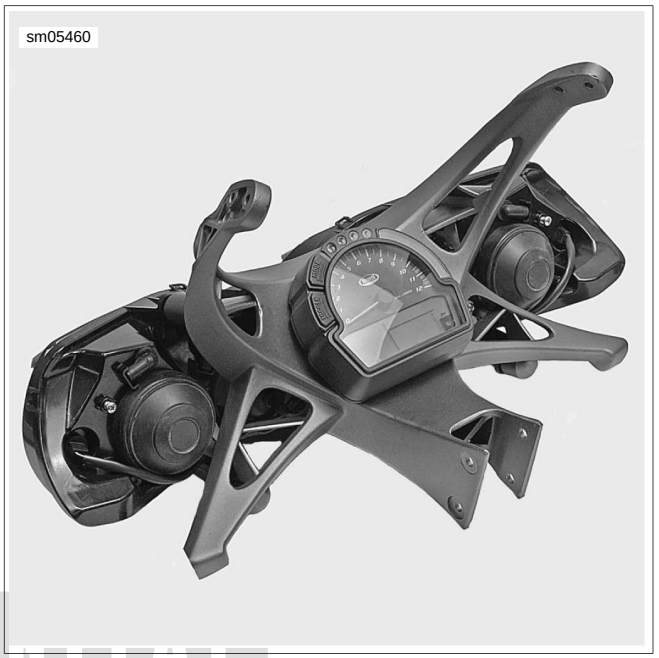



**Figure 2-133. Headlamp Assembly/Support Bracket**

### Installation

1. Support the unit and install the support bracket bolts, washers and nuts. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing.
2. Mate the pin and socket connector housings:
   a. The headlamp connector [38]
   b. The instrument module connector [39]
3. Install the turn signals and fairing. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing.
4. Connect the negative battery cable.
5. Install the pillion.

**⚠WARNING**

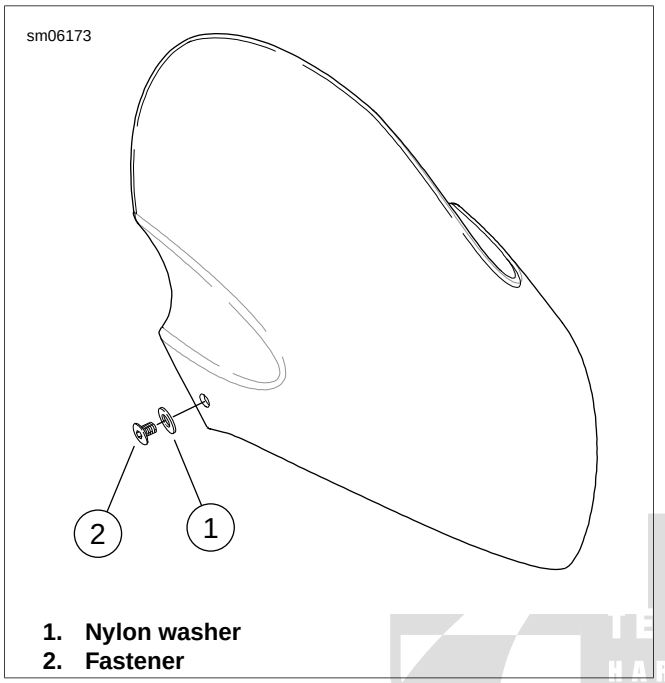
**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

6. Test the headlamps, turn signals and brake light.

# WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR 2.16

## WINDSCREEN

1. See Figure 2-134. Install the nylon washers (1) and the fasteners (2).
2. Tighten to 5.6-6.1 Nm (50-54 **in-lbs** ).



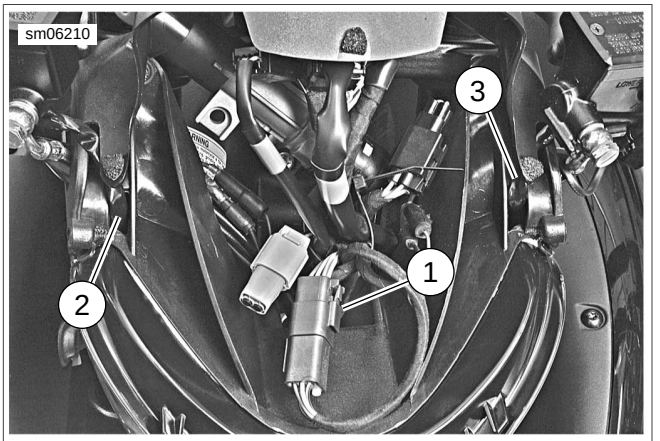

**1. Nylon washer**
**2. Fastener**

**Figure 2-134. Windscreen: 1125CR**

## HEADLAMP ASSEMBLY

### Removal

1. Remove the windscreen.
2. See Figure 2-135. Separate the headlamp connector [38] (1) housings.
3. Remove the spade connectors [170] from the front brake light switch.
4. Remove the connector [95] from the clutch switch.
5. See Figure 2-136. Remove the fasteners securing the headlamp assembly to the upper fork clamp.
6. See Figure 2-137. Remove the headlamp assembly while threading the brake light switch (2) and clutch switch (3) wire leads through the guides in the assembly.




**1. Headlamp connector [38]**
**2. Brake light switch wire leads**
**3. Clutch switch wire leads**

**Figure 2-135. Headlamp Assembly**

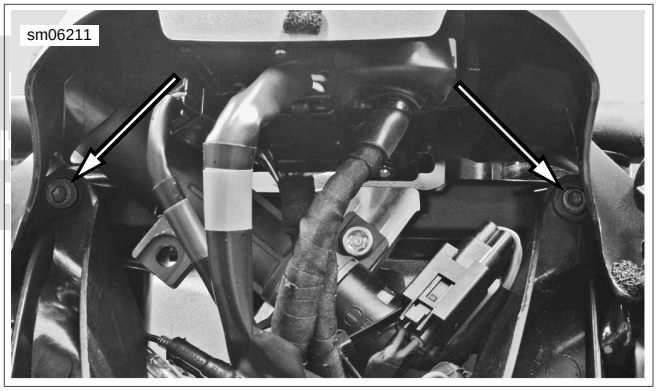



**Figure 2-136. Headlamp Assembly Fasteners**




**Figure 2-137. Headlamp Assembly**

## Installation

1. Thread the front brake light switch spade connectors [170] and wire leads up through the guide in the assembly.
2. Thread the clutch switch connector [95] and wire leads up through the guide in the assembly.
3. See Figure 2-138. Press the rubber grommets into the lower fork clamp.
4. Install the headlamp fasteners through the headlamp assembly into the upper fork clamp.
5. Join the spade connectors [170] to the front brake light switch.
6. Join the connector [95] to the clutch switch.
7. Join the headlamp connector [38] housings.
8. Tighten the headlamp fasteners to 6.1-7.5 Nm (54-66 **in-lbs** ).
9. Install the windscreen.

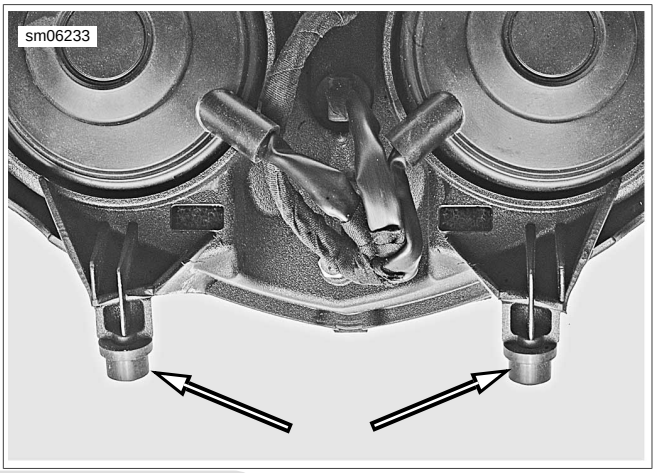



**Figure 2-138. Rubber Grommets**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# HANDLEBARS: 1125R 2.17

## LEFT CLIP-ON

### Removal

1. Remove battery fuse.
2. Remove the two fasteners and the clutch master cylinder/reservoir clamp.
3. Remove the two fasteners and the switch housing.
4. Remove the clip-on.
5. Drive the end cap off the clip-on with a socket extension through the clip-on fastener hole.
6. If necessary replace the hand grip. See 2.17 HANDLEBARS: 1125R, Left Hand Grip: All Models.

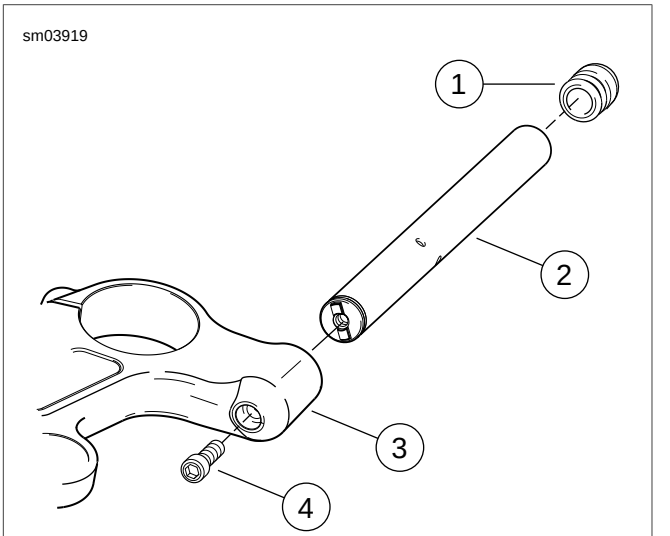
### Installation

1. See Figure 2-140. Push an end cap (1) into the clip-on end.

*NOTE*

*Align the switch housing holes toward the front and match the clip-on tabs to the fork clamp notches.*

2. Install left clip-on into upper fork clamp (3) and tighten fastener (4) to 33-35 Nm (24-26 ft-lbs).
3. See Figure 2-140. Fit switch housings up against grip on the clip-on. Housing will snap flush when tab in the housing aligns with the hole in the clip-on.
4. Thread in the two fasteners: short on top and long on the bottom.
5. Install clutch lever master cylinder/reservoir assembly and clamp.
6. Tighten switch housing fasteners to 3-4 Nm (27-35 **in-lbs**).
7. Position clutch hand lever to rider posture and tighten fastener to 7.8-12.7 Nm (69-112 **in-lbs**).
8. Install battery fuse.




1. **End cap**
2. **Clip-On**
3. **Upper fork clamp**
4. **Fastener**

**Figure 2-139. Clip-On (Left Shown)**

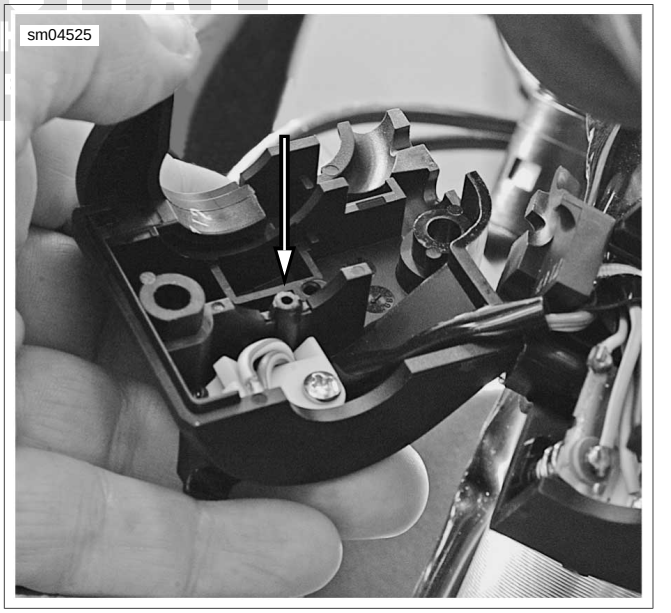



**Figure 2-140. Switch Housing Alignment Tab**

## LEFT HAND GRIP: ALL MODELS

1. To remove the left hand grip, slice the hand grip open with a sharp knife and peel the grip off the handlebar.

*NOTE*

*Remove the clip-on from the upper fork clamp and remove the end cap from the clip-on.*

2. Use emery cloth to rough the grip end of the clip-on.

3. Clean the clip-on with acetone to remove all residue.

*NOTE*

*The clip-on can be installed for support as the hand grip is twisted on. It will need to be removed again to install the end cap.*

4. Apply LOCTITE 770 PRISM PRIMER to inside of the left hand grip. Wipe off excess with a clean cloth.
5. Wait two minutes for prism primer to set and apply LOCTITE 411 PRISM INSTANT ADHESIVE to inside of the grip. Apply the adhesive from the end of the grip to a line 25.4 mm (1 in) from the open end.
6. Immediately, push the grip onto the clip-on with a twisting motion until it stops. Pull the grip back until the end of the grip is 3.175 mm (1/8 in) from the end of the handlebar.

*NOTE*

*LOCTITE 411 PRISM sets in four minutes and cures in 24 hours.*

## RIGHT CLIP-ON

### Removal

1. Remove the battery fuse.
2. See Figure 2-141. Remove the two fasteners and the front brake master cylinder/reservoir and lever assembly.
3. See Figure 2-142. Remove the two fasteners and the switch housing.
4. Remove the cable barrels from the throttle twist grip and remove the grip.
5. See Figure 2-143. Remove the fastener and the right clip-on.
6. To remove the end cap, drive the end cap out with a socket extension.

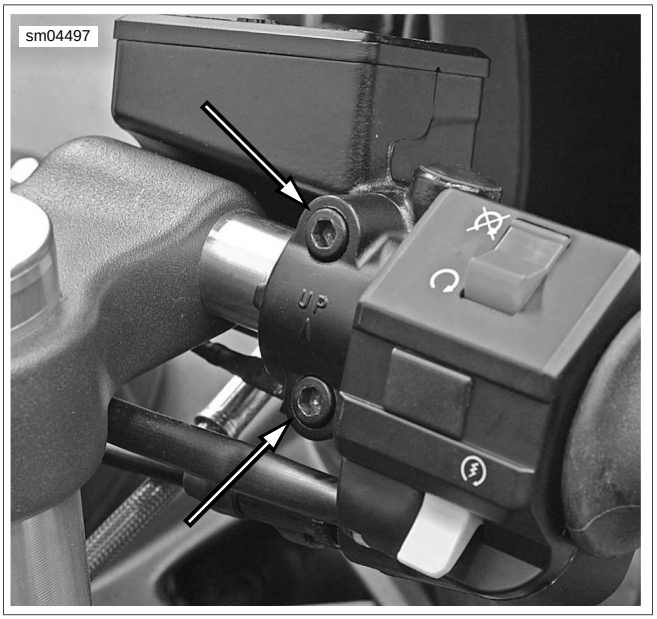



**Figure 2-141. Master Cylinder/Reservoir Clamp**

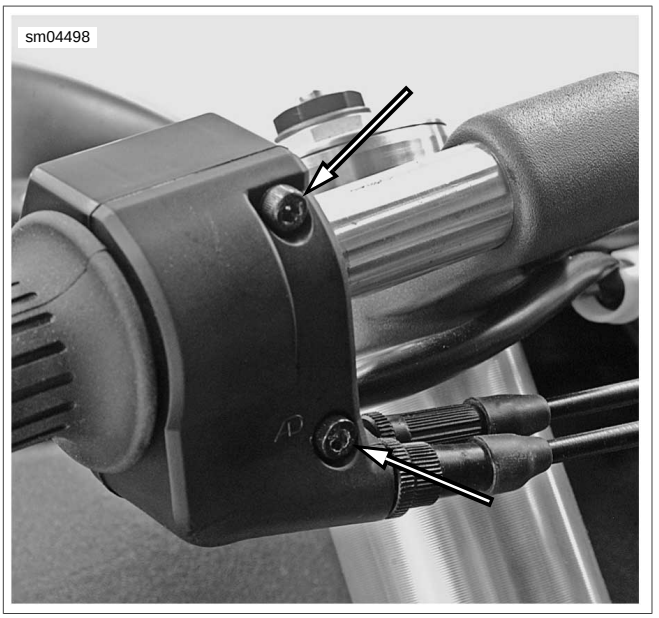



**Figure 2-142. Switch Housing Fasteners**




**Figure 2-143. Clip-On Bolt**

### Installation

1. Install an end cap on the clip-on.

*NOTE*

*See Figure 2-144. Match the tabs on the end of the clip-on to the notches in the fork clamp.*

2. See Figure 2-145. Orient the clip-on switch housings holes forward and install the clip-on.
3. Tighten fastener to 33-35 Nm (24-26 ft-lbs).
4. Slide grip onto the clip-on and fit the throttle cable barrels to the throttle twist grip.

5. Fit switch housing around throttle grip and fit back clamp. Housing will snap flush when bosses in housings line up with holes in clip-on.
6. Thread in the two housing fasteners: short on top and long on bottom.
7. Tighten switch housing fasteners to 3-4 Nm (27-35 **in-lbs**).
8. Clamp brake master cylinder/reservoir lever assembly onto clip-on with embossed UP up. Tighten but do not torque.
9. Position front brake master cylinder/reservoir lever to rider posture and tighten fasteners to 9.0-10.2 Nm (80-90 **in-lbs**).
10. Install the battery fuse.




**Figure 2-145. Switch Housing Alignment Holes**

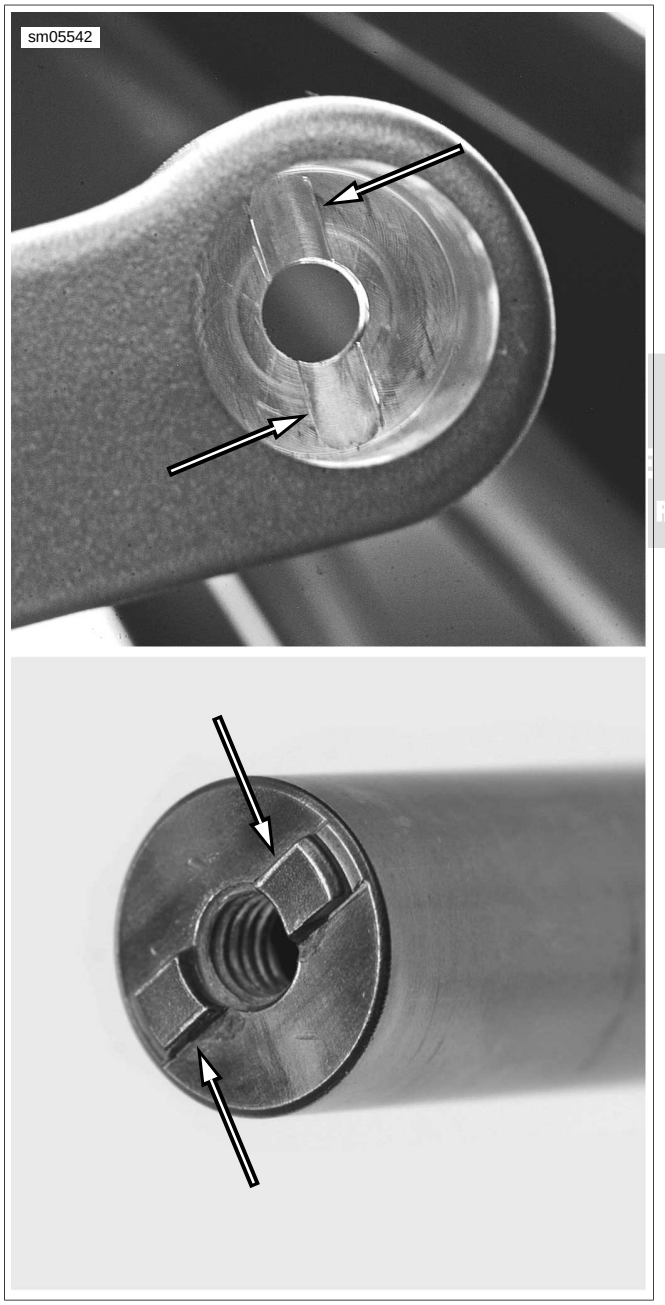



**Figure 2-144. Clip-On Tabs to Fork Clamp Notches**

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# HANDLEBARS: 1125CR 2.18

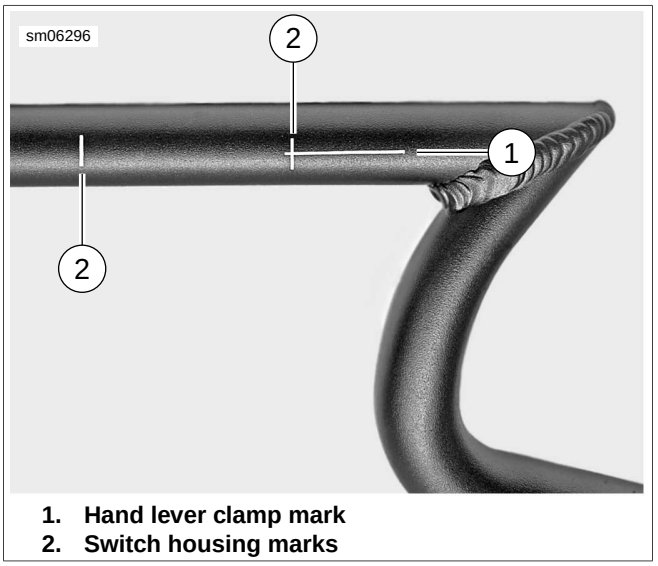
## LEFT SIDE

### Removal

1. Remove the battery fuse.
2. Separate the right [31R] and left [31L] turn signal connectors.
3. Remove the fasteners and the right and left turn signal/mirrors.
4. Remove the two fasteners and the clutch master cylinder/reservoir clamp.
5. Remove the two fasteners and the switch housing.
6. If necessary, replace the hand grip. See 2.17 HANDLEBARS: 1125R, Left Hand Grip: All Models.

### Installation

1. See Figure 2-146. Fit switch housings up against grip on the handlebar between the alignment marks (2).
2. Thread in the two housing fasteners: short on top and long on bottom.
3. Install clutch lever master cylinder/reservoir assembly and clamp. Position the split between the clamp and the lever bracket over the mark (1) on the handlebars.
4. Tighten switch housing fasteners to 3-4 Nm (27-35 **in-lbs**).
5. Position clutch hand lever to rider posture and tighten fasteners to 7.8-12.7 Nm (69-112 **in-lbs**).
6. Install the left turn signal/mirror and tighten to 24.4-27.0 Nm (18-20 ft-lbs).
7. Connect the left [31L] turn signal connectors.
8. Install the battery fuse.




1. **Hand lever clamp mark**
2. **Switch housing marks**

**Figure 2-146. Hand Lever Clamp and Switch Housing Marks: 1125CR**

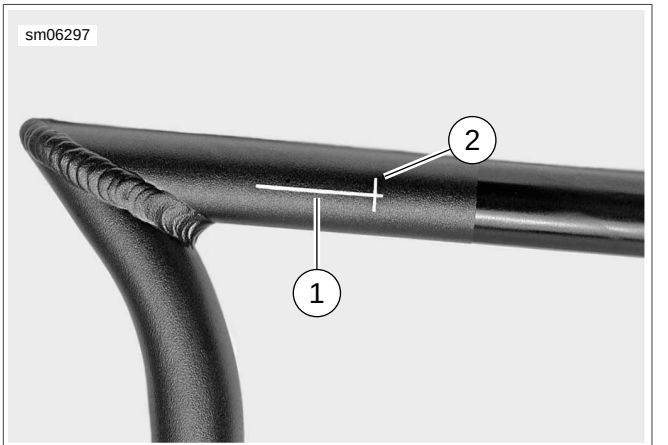
## RIGHT SIDE

### Removal

1. Remove the battery fuse.
2. Separate the right [31R] turn signal connectors.
3. Remove the fasteners and the turn signal/mirror.
4. Remove the two fasteners and the front brake master cylinder/reservoir and lever assembly.
5. Remove the two fasteners and the switch housing.
6. Remove the cable barrels from the throttle twist grip and remove the grip.

### Installation

1. Slide grip onto the handlebar and fit the throttle cable barrels to the throttle twist grip.
2. Fit switch housing around throttle grip and fit back clamp.
3. Thread in the two housing fasteners: short on top and long on bottom.
4. See Figure 2-147. Position the switch housing to the mark (2) on the handlebar.
5. Tighten switch housing fasteners to 3-4 Nm (27-35 **in-lbs**).
6. Clamp brake master cylinder/reservoir lever assembly onto handlebar with embossed UP up. Tighten but do not torque.
7. Position the split between the clamp and the front brake master cylinder/reservoir lever to the line (1) on the handlebars and tighten fasteners to 9.0-10.2 Nm (80-90 **in-lbs**).
8. Install the right turn signal/mirror and tighten the fasteners to 24.4-27.0 Nm (18-20 ft-lbs).
9. Connect the right [31R] turn signal connectors.
10. Install the battery fuse.




1. **Handlever clamp split mark**
2. **Switch housing mark**

**Figure 2-147. Hand Lever Clamp and Switch Housing Alignment Marks**

## HANDLEBAR

1. To prevent cosmetic damage, remove the windscreen.
2. See Figure 2-148. To remove, remove the handlebar clamp fasteners and washers.
3. See Figure 2-149. To install, fit the handlebar to clamps on triple clamp, aligning etchings on handlebar with split between the upper and lower clamp.
4. See Figure 2-150. Install the washers (3) and fasteners (4) and finger tighten.
5. Tighten fasteners to 13.6-16.3 Nm (120-144 **in-lbs**).
6. Install the windscreen.




**Figure 2-148. Handlebar Assembly: 1125CR**

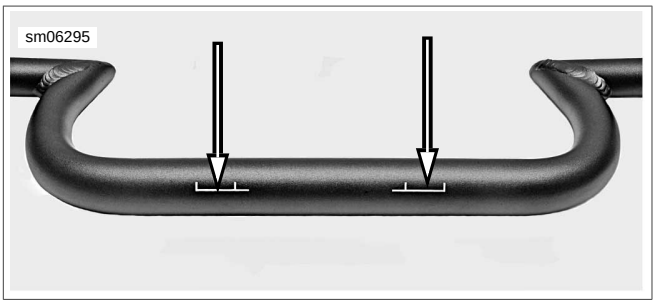
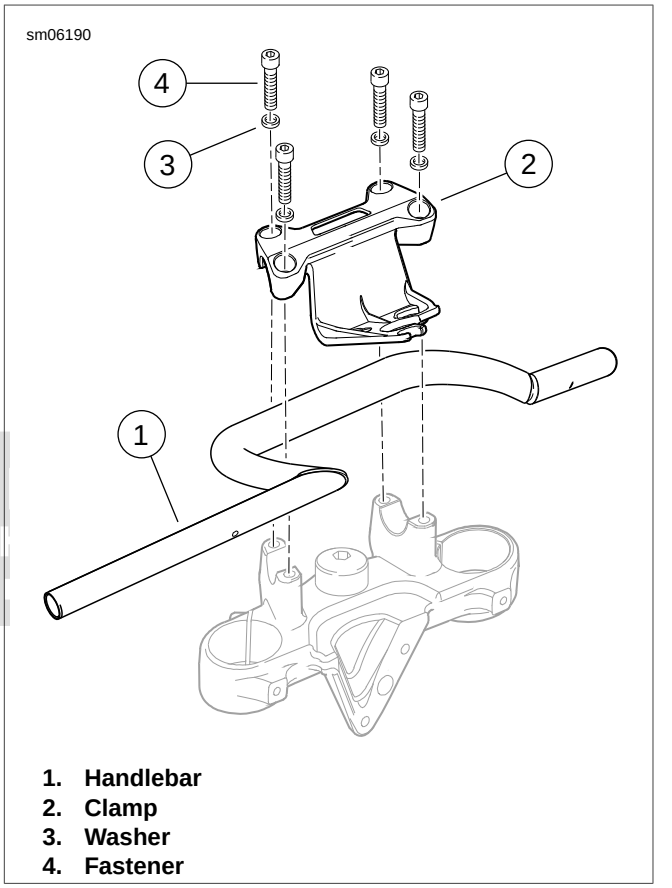



**Figure 2-149. Clamp Alignment Marks**




1. **Handlebar**
2. **Clamp**
3. **Washer**
4. **Fastener**

**Figure 2-150. Handlebar Assembly**

# FOOTPEGS, HEEL GUARDS AND MOUNTS 2.19

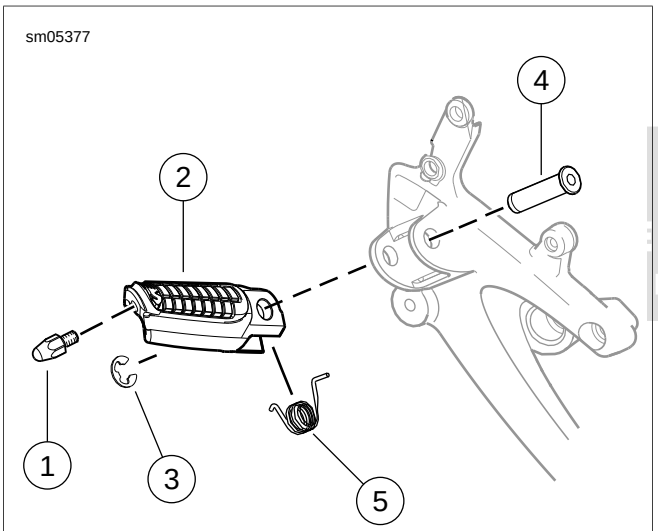
## RIDER

### Wear Peg

1. See Figure 2-151. Unscrew the wear peg (1) from the footpeg (2).
2. To install, apply LOCTITE 271 (red) and tighten to 4.1-5.4 Nm (36-48 **in-lbs**).

### Footpeg

1. See Figure 2-151. Remove E-clip (3).
2. Remove footpeg pin (4).
3. Remove footpeg and spring (5).
4. Position spring in footpeg.
5. Position footpeg and spring in footpeg mount.
6. Install footpeg pin.
7. Install E-clip.




1. **Wear peg**
2. **Footpeg**
3. **E-clip**
4. **Pin**
5. **Spring**

**Figure 2-151. Footpeg**

### Heel Guards

1. See Figure 2-152. Remove heel guard fasteners and heel guard.
2. To install, position heel guard onto footpeg mount.

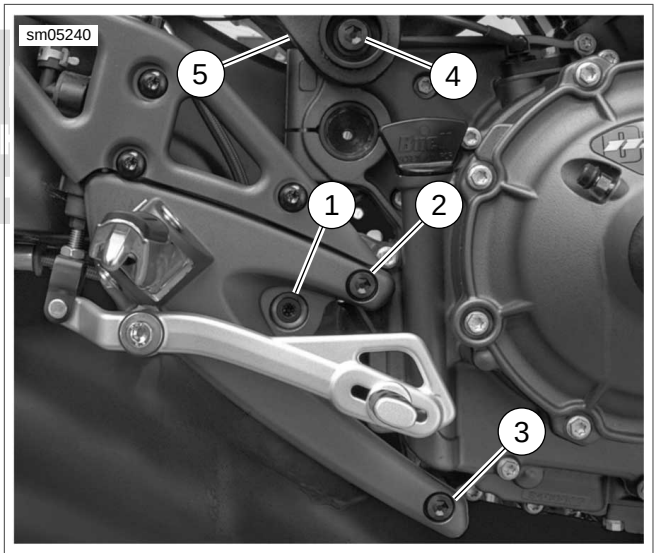
*NOTE*

*See Figure 2-153. The rear brake fluid reservoir is mounted to the back of the right side heel guard with the same fasteners.*

3. Install fasteners and tighten to 13.0-14.5 Nm (115-128 **in-lbs**).




**Figure 2-152. Left Side Footpeg Mount**




1. **Muffler fastener**
2. **Upper footpeg support fastener**
3. **Lower footpeg support fastener**
4. **Rear motor mount fastener**
5. **Pinch screw**

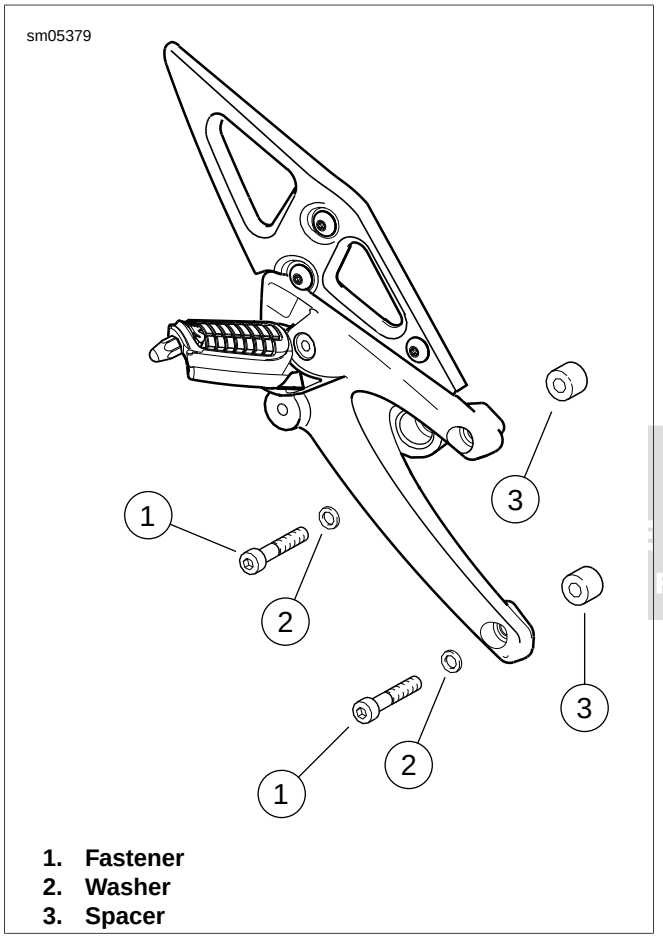
**Figure 2-153. Right Rider Footpeg Support**

### Right Side Rider Footpeg Mount

*NOTES*

*The right side mount can be removed with the heel guard, the brake fluid reservoir, the brake lever and the footpeg attached. If removing the rear brake master cylinder and the heel guard, remove the brake lever from the footpeg mount or from the master cylinder. See 2.8 REAR BRAKE.*

1. Remove the through bolt to the muffler.
2. See Figure 2-154. Remove the footpeg mount fasteners, washers and spacers.
3. Remove the footpeg mount.
4. To install, position the footpeg mount and install the fasteners, washers and the spacers between the mount and the engine.
5. Tighten to 24.5-27.0 Nm (18-20 ft-lbs).
6. Install the muffler through bolt.
7. Tighten to 24.5-27.0 Nm (18-20 ft-lbs ).




1. **Fastener**
2. **Washer**
3. **Spacer**

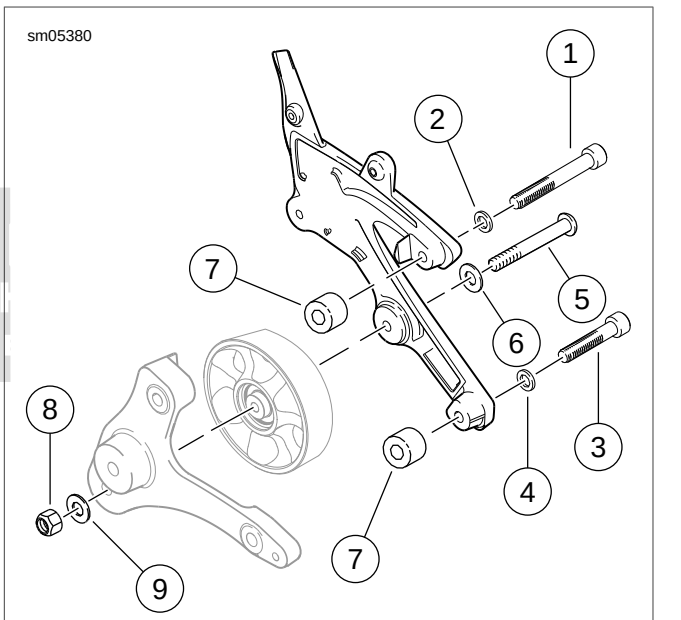
**Figure 2-154. Right Side Rider Footpeg Mount**

## Left Side Rider Footpeg Mount

*NOTES*

*The mount can be removed with the idler pulley and bracket attached.*

1. Remove the sprocket cover.
2. Loosen the rear axle pinch bolts and release the tension on the drive belt by backing off the rear axle approximately 15 turns.
3. Remove the two fasteners securing the footpeg mount to the engine.
4. See Figure 2-155. To install, fit the drive belt idler pulley between the footpeg mount and the idler bracket with the bolt (5) and washer (6). See 6.11 DRIVE BELT AND IDLER PULLEY, Idler.
5. Fit the washer (9) and thread on the locknut (8).
6. Tighten the bolt and locknut to 27.1-31.2 Nm (20-23 ft-lbs).
7. Install the mount fasteners (1, 3) and washers (2, 4) through the spacers (5) into the idler bracket.
8. Tighten to 24.5-27.0 Nm (18-20 ft-lbs).
9. Tighten the rear axle.
   a. Initially tighten to 31.2-36.6 Nm (23-27 ft-lbs).
   b. Back off two turns (720 degrees).
   c. Final tighten to 65.1-70.5 Nm (48-52 ft-lbs).
   d. Tighten pinch bolt to 54-61 Nm (40-45 ft-lbs).
10. Install the sprocket cover. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).




1. **Screw**
2. **Washer**
3. **Bolt**
4. **Washer**
5. **Screw**
6. **Washer**
7. **Spacer**
8. **Nut**
9. **Washer**

**Figure 2-155. Left Side Rider Footpeg Mount**

# PASSENGER

## Footpeg

1. See Figure 2-157. Remove clip (1).
2. Remove footpeg pin (2).
3. Remove footpeg, detent plate (3), ball (4) and spring (5).

4. To install, position the footpeg, detent plate, ball and spring on footpeg mount.
5. Install the footpeg pin.
6. Install the clip.
7. Verify that the footpeg clicks in the up and down position.

## Heel Guard

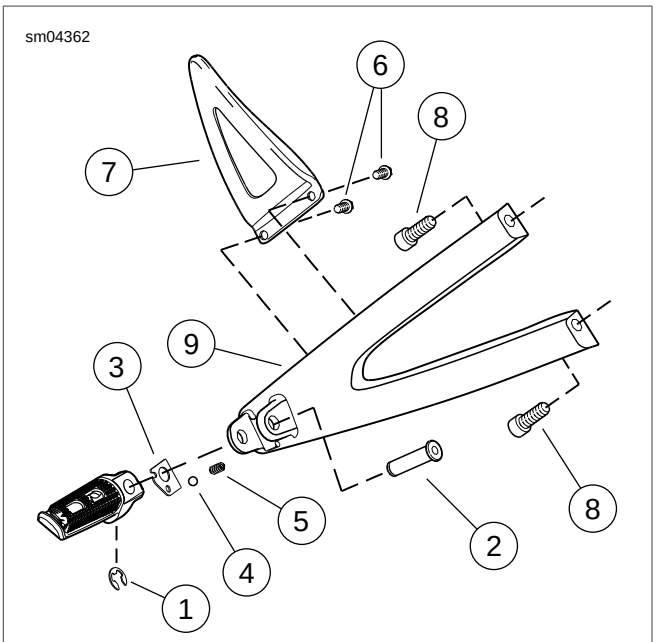
1. See Figure 2-157. Remove heel guard fasteners (6) and heel guard (7).
2. To install, position heel guard onto footpeg mounts.
3. Install heel guard.
4. Tighten heel guard fasteners to 5-8 Nm (48-72 **in-lbs**).

## Mount

1. See Figure 2-157. Remove footpeg mount fasteners (8).
2. Remove footpeg mount (9).
3. To install, position footpeg mount onto subframe tail assembly.
4. Install footpeg mount. Using LOCTITE 271 tighten, fasteners to 34-38 Nm (25-28 ft-lbs).




**Figure 2-156. Passenger Footpeg Mount**




1. **Clip**
2. **Pin**
3. **Detent plate**
4. **Ball**
5. **Spring**
6. **Fastener**
7. **Heel guard**
8. **Fastener**
9. **Mount**

**Figure 2-157. Passenger Footpeg Assembly**

## REMOVAL

### Rider Seat

1. See Figure 2-158. Turn the rear corners of the seat and remove the two fasteners.
2. Pull the seat back over tail section and remove.




**Figure 2-158. Rider Seat Screws: 1125 Models**

### Pillion

*NOTE*

*The trunk is located under the pillion.*

1. See Figure 2-159. Insert ignition key into pillion lock located on left side of motorcycle and turn key clockwise to disengage the latch.

**CAUTION**

**Do not place keys in underseat storage area. If seat is installed, keys will not be accessible. (00236a)**

2. Lift and slide the pillion to remove.

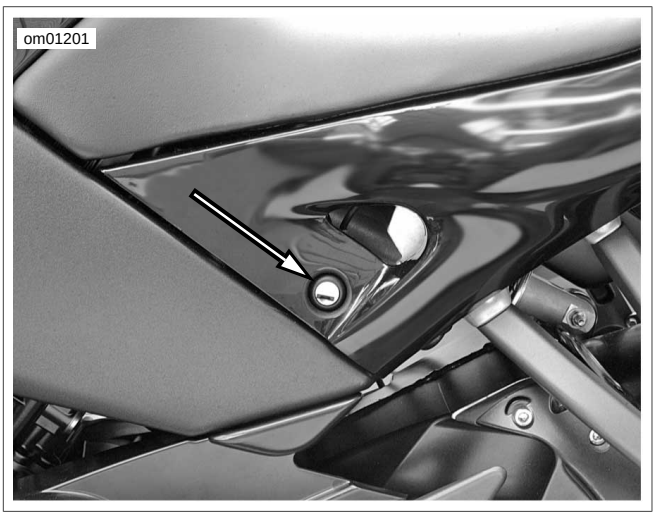



**Figure 2-159. Pillion Lock: 1125 Models**

## INSTALLATION

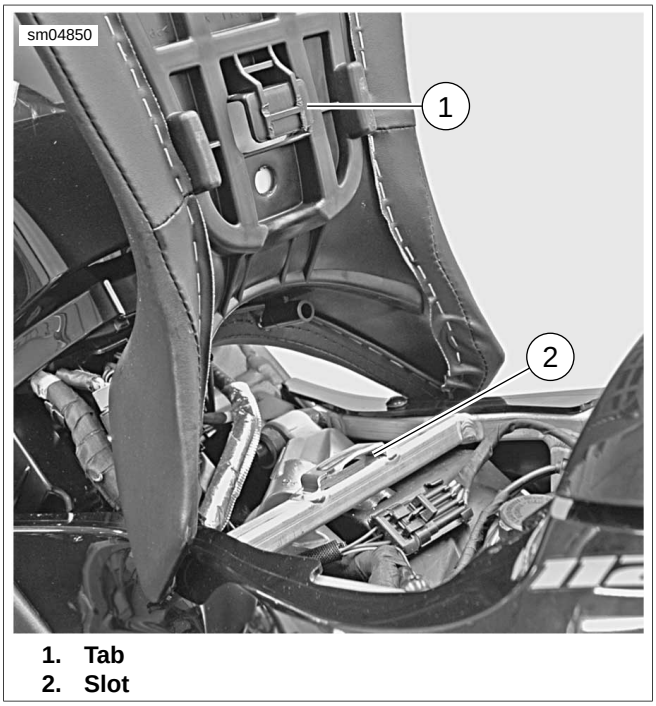
### Rider Seat

1. See Figure 2-160. Position seat in mounting position with center tab aligned with slot on frame crossmember.
2. Slide the seat forward to engage center tab in slot. Pull up on front of seat to verify tab/slot engagement.

**WARNING**

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

3. See Figure 2-161. Pull up the rear corners of the seat and tighten the two fasteners to 9.6-10.6 Nm (85-94 **in-lbs**).




1. Tab
2. Slot

**Figure 2-160. Seat Tab to Frame Slot: 1125 Models**

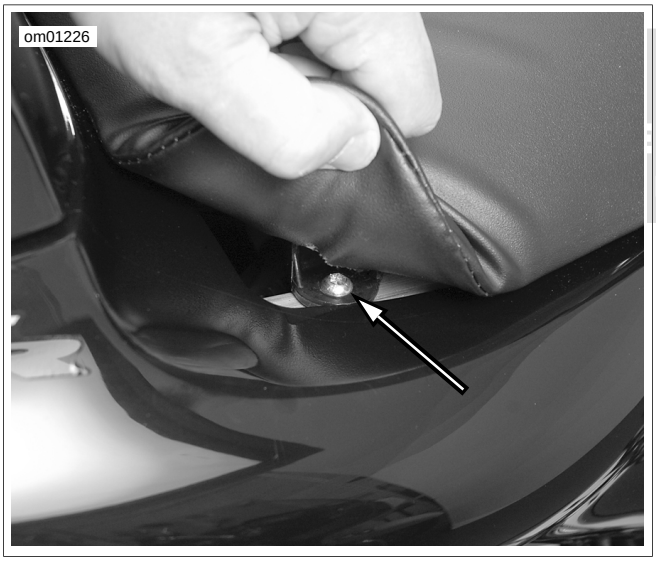
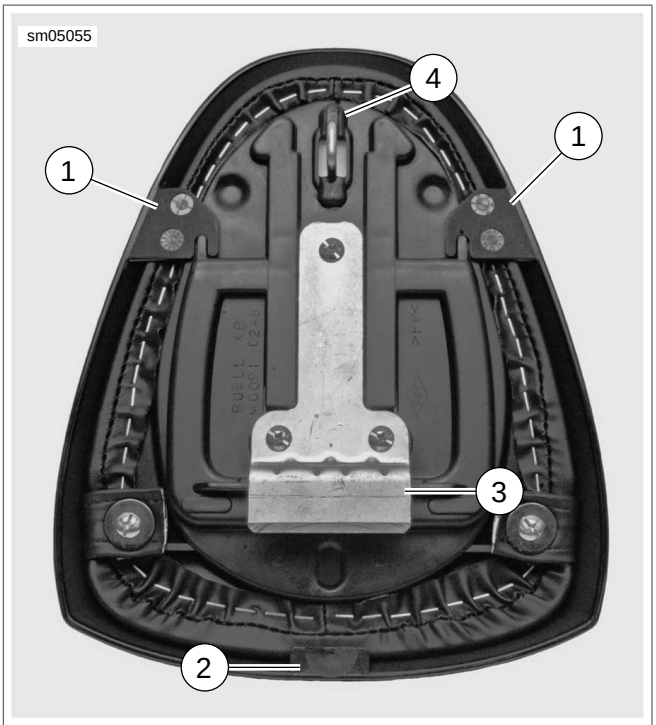



**Figure 2-161. Rider Seat Screws: 1125 Models**

## Pillion

1. See Figure 2-162. Slide the pillion under and into the two slots in the tabs (1) in the pillion cover and snap the pillion under the front tab (2).
2. Install pillion by sliding metal locating tongue (3) on front underside of the pillion into opening on the subframe.
3. Align the rear catch (4) with the latch slot at rear of motorcycle.
4. Press down firmly on rear of pillion to engage latch. Pull up on rear of pillion to make sure latch is engaged.



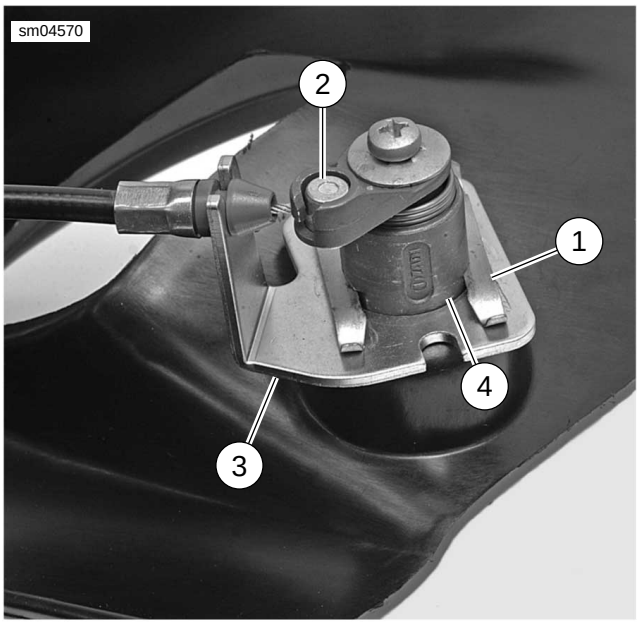

1. Cover slotted tabs
2. Cover front tab
3. Pillion tongue
4. Catch

**Figure 2-162. Pillion and Cover**

## PILLION LOCK

### Removal

1. Remove the battery fuse.
2. Remove the subframe body. See 2.14 SUBFRAME.
3. See Figure 2-163. Pull the spring clip (1) and remove the cable barrel (2), the retaining plate (3) and the tumbler (4).
4. See Figure 2-164. Remove the cable attachment clip along the left side of the subframe.
5. See Figure 2-165. Remove the two fasteners and the latch plate from the subframe.




1. **Spring clip**
2. **Cable barrel**
3. **Retaining plate**
4. **Tumbler**

**Figure 2-163. Subframe Body w/Pillion Lock Tumbler**



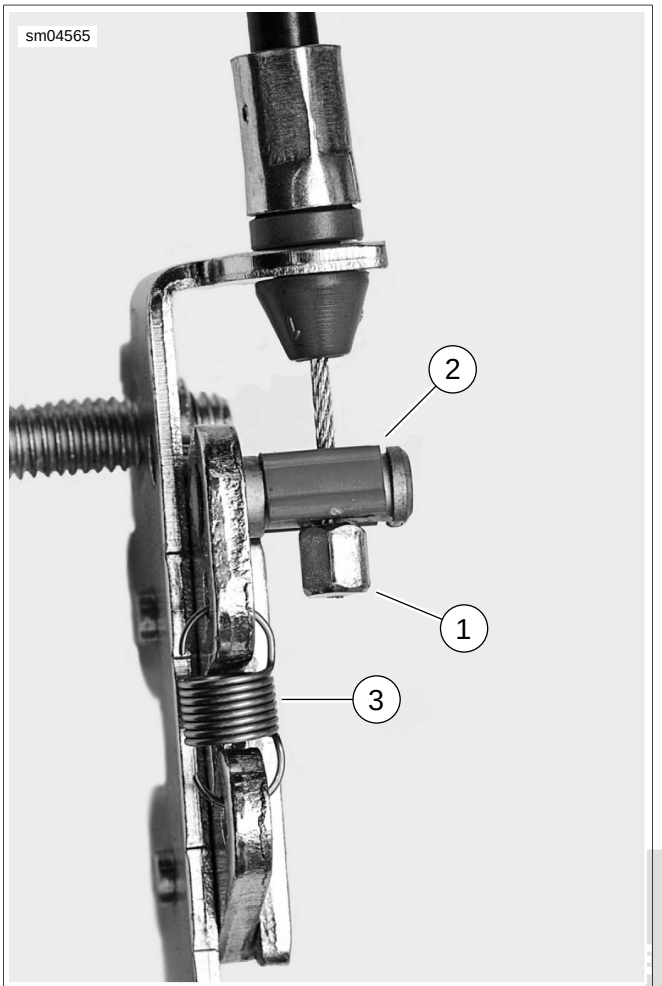

**Figure 2-164. Cable Attachment Clip**




**Figure 2-165. Pillion Latch Fasteners**

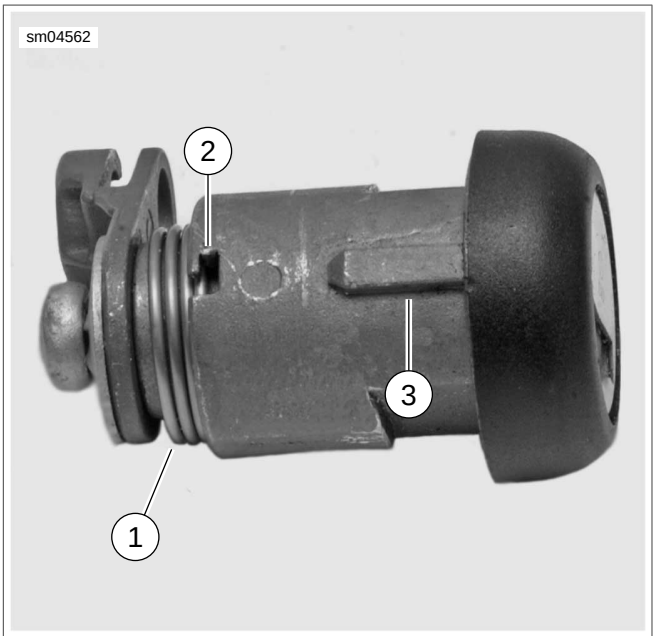
## Installation

1. See Figure 2-166. Verify that the barrel (1) on the end of the cable is secured in the latch lever with the plastic clip (2).
2. Verify that the latch spring (3) is in place.
3. Install the latch plate. Tighten to 6.8-10.9 Nm (60-96 **in-lbs**).
4. Secure the cable to the left side of the subframe with an attachment clip.
5. See Figure 2-167. Verify that the arm spring (1) is in the hook (2) of the tumbler.
6. Align the tongue (3) on the tumbler with the groove in the alignment plate and the groove in the subframe body.
7. Fit the cable barrel in the arm and press the cable guide into the notch in the alignment plate.
8. Snap the retaining clip into place.
9. Install the subframe body. See 2.14 SUBFRAME.
10. Install the battery fuse.




1. Cable barrel
2. Plastic clip
3. Latch spring

**Figure 2-166. Pillion Lock Plate**




1. Arm spring
2. Hook
3. Tongue

**Figure 2-167. Pillion Lock Tumbler**

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## SIDESTAND

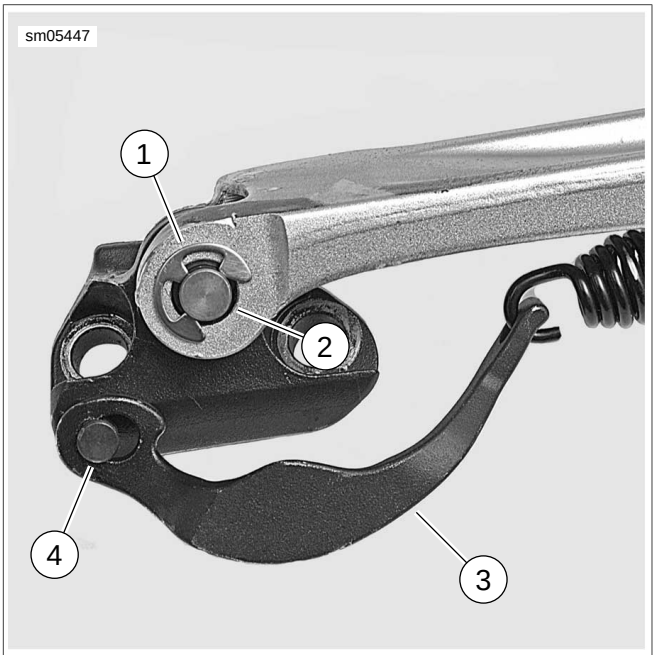
| PART NUMBER | TOOL NAME |
|---|---|
| HE-52B | SNAP-ON SPRING TOOL |

### Removal and Disassembly

1. See Figure 2-168. Remove the sidestand bracket fasteners and the sidestand assembly.
2. See Figure 2-169. Remove the retaining clip (1) from the sidestand pivot pin (2) and remove the pivot pin.
3. See Figure 2-170. Disassemble the sidestand leg, bushings, spring, spring plate and bracket pivot.
4. Clean and replace as necessary.

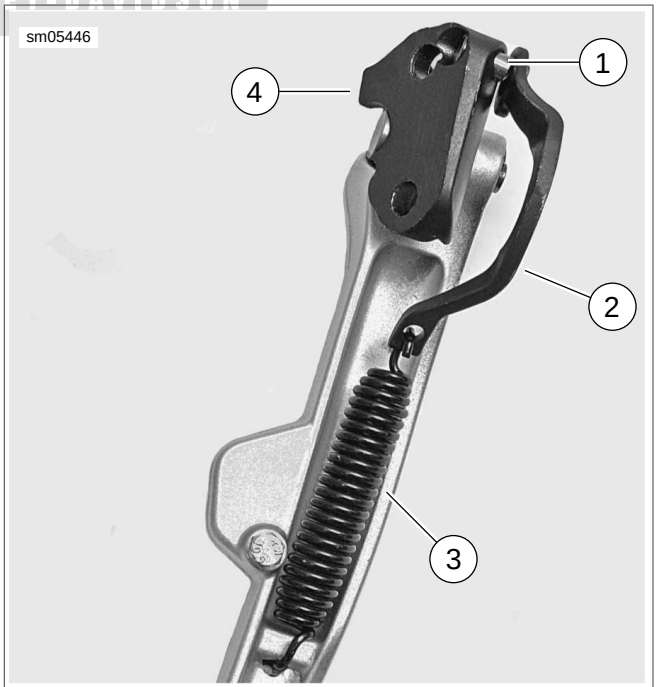



**Figure 2-168. Sidestand Fasteners**




1. **Retainer**
2. **Pivot pin**
3. **Spring plate**
4. **Bracket pivot pin**

**Figure 2-169. Pivot Pin and Retainer**




1. **Bracket pivot pin**
2. **Spring plate**
3. **Spring**
4. **Bracket**

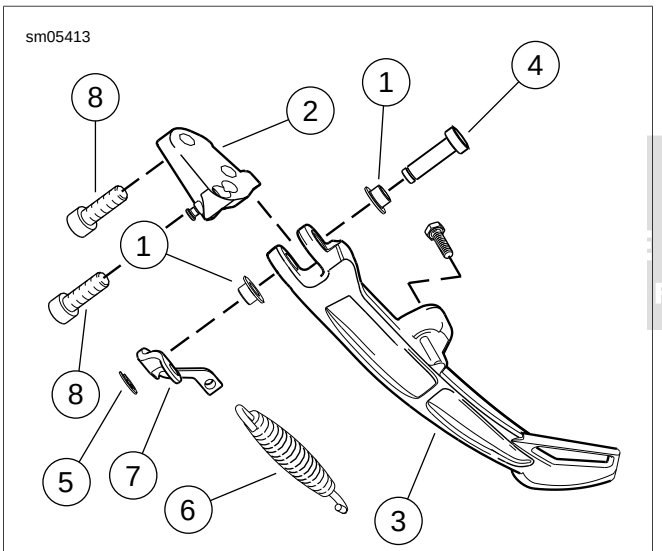
**Figure 2-170. Sidestand Assembly**

## Assembly and Installation

1. See Figure 2-171. Install the bushings (1) in the sidestand bracket (2) and fit the leg (3).
2. Slide in the pivot pin (4) and secure with the retaining clip (5).
3. Hook the spring (6) in the leg and fit the spring plate (7) to the bracket pivot on the bracket.
4. Stretch spring to hook into spring plate with SNAP-ON SPRING TOOL (Part No. HE-52B).
5. Install sidestand assembly to engine.
6. Tighten fasteners to 46.1-51.5 (34-38 ft-lbs).
7. Check operation by extending and retracting leg.

**⚠WARNING**

**This motorcycle does NOT have a locking sidestand. Park the motorcycle on a level, firm surface. An unbalanced motorcycle can fall, which could result in death or serious injury. (00122a)**




1. **Bushing**
2. **Bracket**
3. **Leg**
4. **Pivot pin**
5. **Retaining clip**
6. **Spring**
7. **Spring plate**
8. **Fasteners**

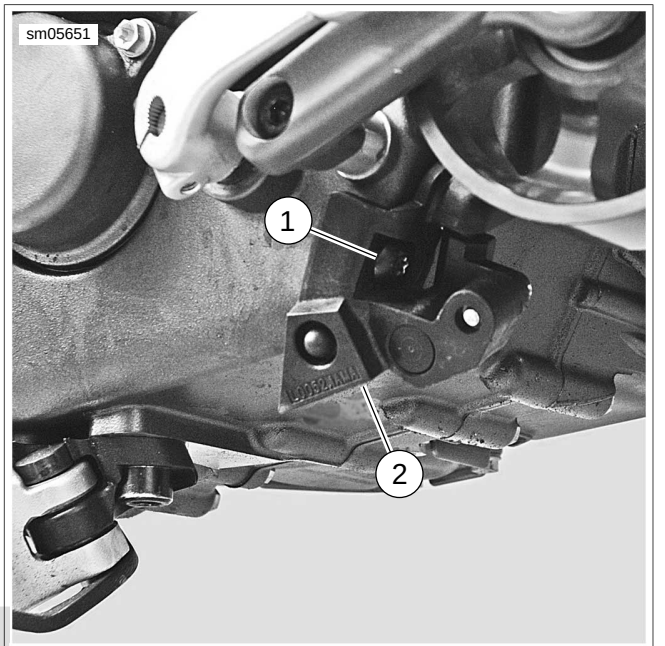
**Figure 2-171. Sidestand Assembly**

## SIDESTAND STOP BRACKET

*NOTE*

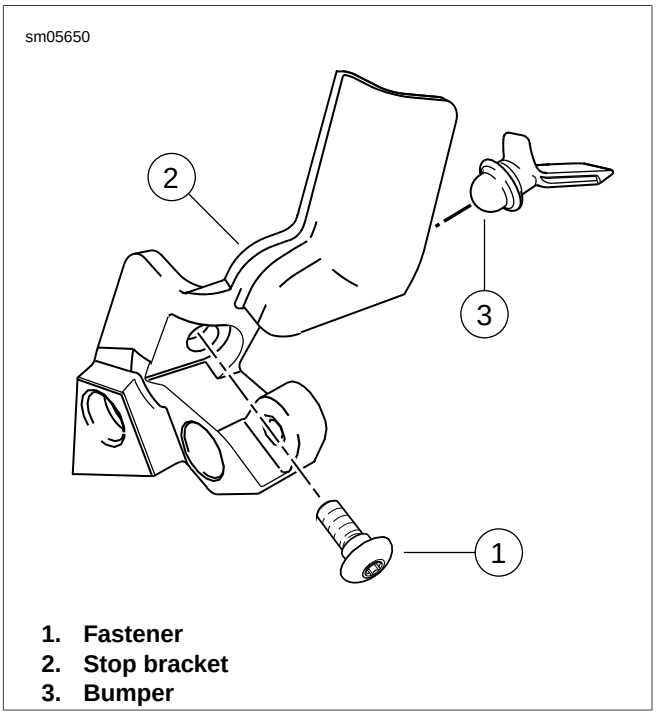
*The sidestand stop bracket is present on all models. The sidestand switch is present only on HDI models. See 7.17 SWITCHES AND CONNECTORS, Sidestand Sensor (HDI).*

1. See Figure 2-172. Remove the fastener (1) and the sidestand stop bracket (2).
2. See Figure 2-173. If damaged, press the bumper (1) out of the stop bracket and press in a new bumper.
3. Install sidestand stop bracket (2). Tighten fastener (3) to 9.5-10.8 Nm (84-96 **in-lbs**).




1. **Stop bracket fastener**
2. **Stop bracket**

**Figure 2-172. Sidestand Stop Bracket**




1. **Fastener**
2. **Stop bracket**
3. **Bumper**

**Figure 2-173. Sidestand Stop Bracket**

# NOTES

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

# NOTES

# FASTENER TORQUE VALUES 3.1

## FASTENER TORQUE VALUES IN THIS CHAPTER

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

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation/Initial torque, back off 2 turns, final torque. |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation/Initial torque, back off 2 turns, final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation/Apply LOCTITE ANTI-SEIZE LUBRICANT. Back off 2 turns and final torque. |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Belt guard fasteners, lower | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Belt guard fasteners, upper | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Brake reservoir fasteners, rear | 3.6-4.1 Nm | 32-36 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Breather hose fitting | 5 Nm | 44 **in-lbs** | 3.11 ALTERNATOR SIDE, Crankcase Breather |
| Camshaft bracket fastener | 10 Nm | 89 **in-lbs** | 3.7 CAMSHAFT ASSEMBLY, Installation (If camshafts or cam sprocket were not removed) |
| Camshaft bracket fastener | 10 Nm | 89 **in-lbs** | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| Camshaft chain tensioner plug | 30 Nm | 22 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Installation (If camshafts or cam sprocket were not removed) |
| Camshaft chain tensioner plug | 30 Nm | 22 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| Camshaft gear fasteners | 40 Nm | 30 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation/Tighten then turn +80 degrees. |
| Camshaft sprocket fastener | 30 Nm | 22 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| Case plug: clutch shaft bearing, left case | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Case plug: oil nozzle, left case | 21 Nm | 15.5 ft-lbs | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Case plug: oil nozzle, right case | 21 Nm | 15.5 ft-lbs | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Case plug: pressure cavity, left case | 12 Nm | 106 **in-lbs** | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Chain guide fasteners | 11 Nm | 97 **in-lbs** | 3.12 VALVE TRAIN DRIVE, Front Cylinder |
| Chain guide fasteners | 11 Nm | 97 **in-lbs** | 3.12 VALVE TRAIN DRIVE, Rear Cylinder |
| Clutch cover fasteners | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Cover/Tighten the starting fastener first and last. |
| Clutch line banjo bolt (engine) | 21.7-27.1 Nm | 16-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Clutch line P-clamp fastener | 4.1-6.9 Nm | 36-60 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Connecting rod fasteners (initial torque) | 28-32 Nm | 21-23 ft-lbs | 3.14 CRANKSHAFT, Assembly/See special method to tighten. |
| Crankcase bolts | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Join Crankcase Halves |
| Crankshaft nut | 220 Nm | 162 ft-lbs | 3.10 CLUTCH SIDE, Balancer: Bottom/Apply LOCTITE 648 (green) to the crankshaft threads. |
| Cylinder head fasteners, large | 35 Nm | 26 ft-lbs | 3.8 CYLINDER HEADS, Cylinder Head: Installation/1. Finger tighten 2. Tighten to spec. 3. Turn 90 degrees. 4. Turn 20 degrees. |
| Cylinder head fasteners, small | 11 Nm | 97 **in-lbs** | 3.8 CYLINDER HEADS, Cylinder Head: Installation |
| Engine sprocket cover fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Engine sprocket cover fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Fender fasteners, front | 8.4-9.2 Nm | 74-82 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Fender fasteners, front | 8.4-9.2 Nm | 74-82 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Friction clutch cover fasteners | 11 Nm | 97 **in-lbs** | 3.11 ALTERNATOR SIDE, Starter Friction Clutch |
| Header flange nuts | 20 Nm | 15 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Heat deflector fastener | 3.6-4.1 Nm | 32-36 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Heat deflector fastener | 3.6-4.1 Nm | 32-36 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Idler pulley bracket fastener | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Idler pulley bracket fastener | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Ignition cover fasteners | 11 Nm | 97 **in-lbs** | 3.11 ALTERNATOR SIDE, Ignition Cover |
| Intake snorkel fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Intake snorkel fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| K-bracket to engine fasteners | 46-51 Nm | 34-38 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| K-bracket to engine fasteners | 46-51 Nm | 34-38 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| K-bracket to frame fasteners | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| K-bracket to frame fasteners | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Motor mount fasteners | 46-51 Nm | 34-38 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Motor mount fasteners | 46-51 Nm | 34-38 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Motor mount pinch screws | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Motor mount pinch screws | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Muffler Torca clamps | 9.5-10.8 Nm | 84-96 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Muffler Torca clamps | 9.5-10.8 Nm | 84-96 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Oil duct cover fasteners | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Oil Sump |
| Oil filter cover fasteners | 11 Nm | 97 **in-lbs** | 3.11 ALTERNATOR SIDE, Oil Filter |
| Oil nozzle | 21 Nm | 15.5 ft-lbs | 3.13 CRANKCASE, Oil Nozzles |
| Oil pressure signal lamp switch | 15 Nm | 133 **in-lbs** | 3.3 TROUBLESHOOTING, Oil Pressure Test |
| Oil pump cover screws | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Oil Pump |
| Oil strainer cover fasteners | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Oil Strainer |
| Oil sump baffle fasteners | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Oil Sump |
| Overflow tank fasteners | 4.75-6.10 Nm | 42-54 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| P-clamp fastener, clutch cover | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, P-Clamp |
| P-clamp fastener, engine | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, P-Clamp |
| Pressure retaining valve | 30 Nm | 22 ft-lbs | 3.11 ALTERNATOR SIDE, Pressure Retaining Valve |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Shift lever fastener | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Shift lever fastener | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Shock mount fastener, lower | 20-23 Nm | 15-17 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Sidestand bracket fasteners | 46.1-51.5 Nm | 34-38 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Sidestand stop bracket fastener | 9.5-10.8 Nm | 84-96 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Starter cable | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 36-60 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 36-60 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Swingarm pivot shaft | 60-62 Nm. | 44-46 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation/Apply LOCTITE ANTI-SEIZE LUBRICANT. |
| Swingarm pivot shaft pinch bolt | 27.1-29.8 Nm | 20-22 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation/Apply LOCTITE 271 (red). |
| Valve cover fasteners | 9 Nm | 77 **in-lbs** | 3.7 CAMSHAFT ASSEMBLY, Valve Covers |
| Vent tube banjo bolt | 14 Nm | 124 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Case Vent Tube |
| Vent tube banjo bolt | 14 Nm | 124 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Cover |
| Vent tube fastener | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Case Vent Tube |
| Water pump cover fasteners | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Cover |

# SPECIFICATIONS 3.2

## GENERAL

**Table 3-1. General Engine Specifications**

| ITEM | SPECIFICATION | |
|---|---|---|
| Type | 2 cylinder, water cooled, four-stroke 72 degree V-twin | |
| Compression ratio | 12.3:1 | |
| Bore | 103 mm | 4.055 in |
| Stroke | 67.5 mm | 2.657 in |
| Engine displacement | 1125 cc | 68.65 $in^3$ |
| Idle speed | 1250 rpm | |
| Rev limit | 10500 rpm | |
| Oil capacity (with filter change) | 2.6 L | 2.7 qt |
| Oil capacity (without filter change) | 2.3 L | 2.4 qt |

**Table 3-2. Oil Pump Specifications**

| OIL PUMP | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | METRIC | U.S. | METRIC | U.S. |
| Oil pressure @ idle (1250 rpm) | 69-296 kPa @ 100 °C | 10-43 psi @ 212 °F | 60 kPa @ 100 °C (min) | 8.7 psi @ 212 °F (min) |
| Oil pressure @ 4000 RPM | 248-599 kPa @ 100 °C | 36-87 psi @ 212 °F | 220 kPa @ 100 °C (min) | 32 psi @ 212 °F (min) |
| Radial clearance, pressure pump outer rotor to oil pump housing | 0.080-0.200 mm | 0.003-0.008 in | 0.250 mm (max) | 0.010 in (max) |
| Radial clearance, scavenge pump outer rotor to crankcase | 0.080-0.200 mm | 0.003-0.008 in | 0.250 mm (max) | 0.010 in (max) |
| Max. clearance between inner and outer rotor (pressure/scavenge) | 0.150 mm | 0.006 in | 0.250 mm (max) | 0.010 in (max) |

**Table 3-3. Valve Specifications**

| VALVES | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Intake valve stem fit in valve guide (loose) | 0.020-0.047 | 0.0008-0.0018 | 0.069 (max) | 0.0027 (max) |
| Exhaust valve stem fit in valve guide (loose) | 0.030-0.057 | 0.0012-0.0023 | 0.079 (max) | 0.0031 (max) |

**Table 3-4. Valve Spring Specifications**

| SPRING | NEW COMPONENT | | WEAR LIMITS | |
|---|---|---|---|---|
| | METRIC | U.S. | METRIC | U.S. |
| Inner length | 32.900-33.500 mm | 1.298-1.319 in | 32.000 mm | 1.260 in |
| Outer length | 36.400-37.000 mm | 1.433-1.457 in | 35.00 mm | 1.378 in |
| Inner force at length (min) | N/A | N/A | 70 N @ 27.1 mm | 15.74 lbf @ 1.067 in |
| Outer force at length (min) | N/A | N/A | 172 N @ 30.1 mm | 38.67 lbf @ 1.185 in |

**Table 3-5. Camshaft Specifications**

| CAMSHAFT | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Camshaft journal fit to bracket bore (loose) | 0.027-0.053 | 0.0010-0.0021 | 0.090 (max) | 0.0035 (max) |
| Camshaft end play | 0.150-0.350 | 0.006-0.014 | 0.500 (max) | 0.020 (max) |
| Swingarm fit to shaft (loose) | 0.026-0.071 | 0.001-0.003 | 0.089 (max) | 0.004 (max) |
| Chain tension guide and chain guide wear groove depth | N/A | N/A | 1.000 (max) | 0.039 (max) |

**Table 3-6. Cylinder Head Specifications**

| CYLINDER HEAD | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Intake valve seat width | 1.000-1.400 | 0.039-0.055 | 2.000 (max) | 0.079 (max) |
| Exhaust valve seat width | 1.250-1.550 | 0.049-0.061 | 2.600 (max) | 0.102 (max) |
| Warpage, base (gasket surfaces) | N/A | N/A | 0.030 (max) | 0.001 (max) |
| Warpage, top (gasket surfaces) | N/A | N/A | 0.030 (max) | 0.001 (max) |

**Table 3-7. Piston Ring and Piston Pin Specifications**

| PISTON | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Compression ring gap, rectangular (top) | 0.200-0.035 | 0.008-0.014 | 1.000 (max) | 0.039 (max) |
| Compression ring gap, tapered (2nd) | 0.35-0.55 | 0.014-0.022 | 1.000 (max) | 0.039 (max) |
| Oil control ring rail gap | 0.2-0.7 | 0.008-0.028 | 1.000 (max) | 0.039 (max) |
| Rectangular (top) compression ring side clearance | 0.03-0.07 | 0.001-0.003 | 0.12 (max) | 0.005 (max) |
| Tapered (2nd) compression ring side clearance | 0.02-0.06 | 0.001-0.002 | 0.11 (max) | 0.004 (max) |
| Oil control ring side clearance | 0.010-0.045 | 0.0004-0.0017 | N/A | N/A |
| Piston pin fit (loose) | 0.008-0.022 | 0.0003-0.0009 | 0.035 (max) | 0.0014 (max) |

**Table 3-8. Connecting Rod Specifications**

| CONNECTING ROD | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Piston pin fit (loose) | 0.006-0.025 | 0.0002-0.0010 | 0.035 (max) | 0.0014 (max) |
| Side play between counterweights | 0.25-0.55 | 0.010-0.022 | 0.7 (max) | 0.028 (max) |
| Fit on journal (loose) | 0.010-0.049 | 0.0004-0.0019 | 0.07 (max) | 0.0028 (max) |
| Connecting rod bearing journal | 41.996-42.02 | 1.6534-1.6543 | 41.97 (min) | 1.6524 (min) |

**Table 3-9. Cylinder Specifications**

| CYLINDER | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Warpage, top (gasket surfaces) | N/A | N/A | 0.03 | 0.001 |
| Warpage, base (gasket surfaces) | N/A | N/A | 0.03 | 0.001 |
| Bore diameter ±0.0003 in., standard | 103 ±0.007 | 4.055 | 103.03 | 4.056 |

**Table 3-10. Balancer Shaft and Balance Drive Specifications**

| BALANCER SHAFT/BALANCE DRIVE | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Bottom balancer shaft fit (loose) (bearing journal, both sides) | 0.020-0.054 | 0.00079-0.00213 | 0.110 (max) | 0.00433 (max) |
| Top balance drive shaft fit (loose) (crankcase side bearing journal) | 0.020-0.054 | 0.00079-0.00213 | 0.110 (max) | 0.00433 (max) |
| Freewheel gear (53T) bore fit to top balance drive gear (40T) bearing journal (loose) | 0.050-0.089 | 0.00197-0.00350 | 0.150 (max) | 0.00591 (max) |

**Table 3-11. Crankshaft and Crankcase Specifications**

| CRANKSHAFT/CRANKCASE | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Crankshaft main bearing journal-to main bearing clearance (loose) | 0.025-0.05 | 0.001-0.002 | 0.10 | 0.0039 |
| Crankshaft end play | 0.01-0.45 | 0.0004-0.0177 | 0.65 | 0.0256 |
| Main bearing journal eccentricity (between centers) | 0.01 | 0.0004 | 0.06 | 0.0024 |
| Crankcase main bearing bore diameter | 50.005-50.015 | 1.9687-1.9691 | 50.05 | 1.9705 |
| Crankshaft main bearing journal diameter | 49.966-49.980 | 1.9671-1.9677 | 49.95 (min) | 1.9665 (min) |

# TROUBLESHOOTING 3.3

## COMPRESSION TEST

| PART NUMBER | TOOL NAME |
|---|---|
| HD-33223-1 | CYLINDER COMPRESSION GAUGE |

Combustion chamber leakage can result in unsatisfactory engine performance. A compression test can help determine the source of cylinder leakage. Use CYLINDER COMPRESSION GAUGE (Part No. HD-33223-1).

A proper compression test should be performed with the engine at normal operating temperature when possible. Proceed as follows:

*NOTE*

*After completing the compression test(s), make sure that the throttle plate is in the closed position before starting engine. Engine will start at an extremely high RPM if throttle plate is left open.*

1. Disconnect spark plug wire. Clean around plug base and remove spark plug.
2. Connect compression tester to cylinder.
3. With throttle body throttle plate in wide open position, crank engine continuously through 5-7 full compression strokes.
4. Note gauge readings at the end of the first and last compression strokes. Record test results.
5. Compression is normal if final readings are 827 kPa (120 psi) or more.
6. Inject approximately 15 ml (1/2 oz.) of SAE 30 oil into cylinder and repeat the compression test. Readings that are considerably higher during the second test indicate worn piston rings.

**Table 3-12. Compression Test Results**

| DIAGNOSIS | TEST RESULTS |
|---|---|
| Ring trouble | Compression low on first stroke; tends to build up on the following strokes but does not reach normal; improves considerably when oil is added to cylinder. |
| Valve trouble | Compression low on first stroke; does not build up much on following strokes; does not improve considerably with the addition of oil. |
| Head gasket leak | Same reaction as valve trouble. |

## DIAGNOSING SMOKING ENGINE OR HIGH OIL CONSUMPTION

Perform the Compression Test. See 3.3 TROUBLESHOOTING, Compression Test.

If further testing is needed, remove the suspect cylinder heads and inspect the following:

- Oil level
- Valve guide seals
- Valve guide-to-valve stem clearance
- Gasket surface of both the cylinder head and the cylinder
- Piston ring wear

## OIL PRESSURE TEST

| PART NUMBER | TOOL NAME |
|---|---|
| MT37A | SNAP-ON ENGINE OIL PRESSURE GAUGE SET |

1. See Figure 3-1. Unplug connector from oil pressure indicator lamp switch located under the oil pump next to the oil filter mount.
2. Remove oil pressure switch from crankcase.
3. Install an 1/8-27 to M10-1.0 adapter from a SNAP-ON ENGINE OIL PRESSURE GAUGE SET (Part No. MT37A) (or similar gauge) in the oil pressure switch mounting hole. Tighten adapter snugly. DO NOT OVERTIGHTEN.

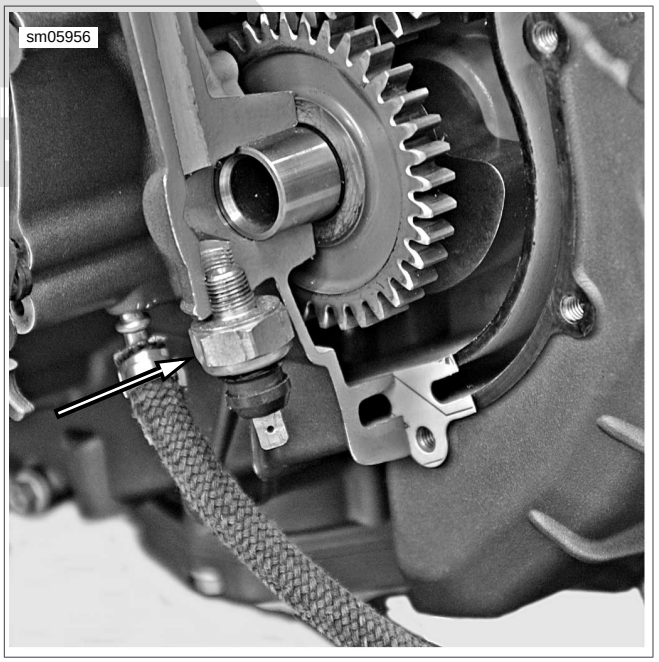



**Figure 3-1. Oil Pressure Switch (cut-away engine)**

**Table 3-13. Troubleshooting Oil Pressure Signal Lamp**

| OIL PRESSURE SIGNAL LAMP | PROBABLE CAUSES |
|---|---|
| Stays on at speeds above idle | Empty oil reservoir |
| | Grounded oil switch wire |
| | Malfunctioning signal switch |
| | Diluted oil |
| | Malfunctioning or improperly installed pressure relief valve |
| Flickers at idle | Incorrect idle speed |
| | Malfunctioning or improperly installed pressure relief valve |
| Does not glow when ignition is turned on (prior to operating engine) | Malfunctioning signal switch |
| | Malfunction in wiring |
| | Burned-out signal bulb |
| | Dead battery |

4. Assemble banjo bolt (4), washer (5), oil pressure gauge (1) banjo fitting and second washer onto adapter and tighten.
5. Temporarily secure oil pressure gauge and hose to motorcycle frame with cable straps. Make sure gauge and hose assembly do not interfere with normal operation.
6. Start engine and ride motorcycle at least 32 km (20 mi) at or above 80 km/h (50 mph) to allow engine to reach operating temperature of 82 °C (180 °F).
   a. At 4000 RPM, oil pressure will vary from 250-600 kPa (36-87 psi).
   b. At idle speed (1250 rpm), oil pressure will vary from 70-300 kPa (10-43 psi).
7. Stop engine.
8. Remove oil pressure gauge assembly from oil pressure indicator lamp switch mounting hole in crankcase. Cut cable straps installed previously, and remove banjo bolt, gauge assembly, washers and adapter from vehicle.
9. Install oil pressure switch and tighten to 15 Nm (133 **in-lbs**).
10. Plug in electrical connector (3) by pushing elbow connector straight onto stud on oil pressure switch.

*NOTE*

*If oil leaked out when the oil pressure switch was removed, replaced with fresh oil.*

11. Check oil level in oil tank. See 1.5 ENGINE OIL AND FILTER.
12. Start engine and test oil pressure switch for proper operation. Check oil pressure switch for leaks.

## TROUBLESHOOTING TABLES

**Table 3-14. Troubleshooting: Engine Noise or Vibration**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Engine vibrates | Loose engine mounts | Secure engine mounts. |
| | Worn bearing or bearing seat | Replace bearing or worn component. |
| | Incorrect balancer shaft timing | Properly set balancer shaft timing. |
| Excessive noise while cranking | Worn friction clutch, sprag clutch, sprag clutch housing or freewheel gear | Replace friction clutch, sprag clutch, sprag clutch housing or freewheel gear. |
| | Worn starter motor teeth, friction clutch or freewheel gear | Replace starter motor, friction clutch or freewheel gear. |
| | Inoperative or damaged chain tensioner | Noise disappears after engine started when oil pressure is available. |
| Excessive noise from valve train area | Valve clearance below specification | Adjust valve clearance:<br>Intake: 0.15-0.22 mm (0.0059-0.0086 in)<br>Exhaust: 0.27-0.34 mm (0.0106-0.0133 in) |
| | Inoperative or damaged chain tensioner | Replace chain tensioner. |
| | Worn camshaft or camshaft brackets | Replace camshafts and/or brackets. |
| | Worn camshaft drive or camshaft sprockets and camshaft gears loose | Tighten or replace camshaft gears or camshaft sprocket. |
| | Worn camshaft chain, chain guide or chain tension guide | Replace camshaft chain, chain guide or chain tension guide. |
| Excessive noise from piston area | Worn piston or cylinder | Replace piston or cylinder. |
| | Worn piston pin bore or piston pin | Replace piston and/or piston pin. |
| | Worn piston rings grooves or damaged piston rings | Replace piston and/or piston rings. |

**Table 3-15. Troubleshooting: Engine Does Not Crank, Cranks But Does Not Start or Starts Hard**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Engine cranks but does not start or starts hard | Loose spark plugs | Tighten spark plugs. |
| | Incorrect or worn spark plugs | Replace spark plugs (NGK CR9EKB). |
| | Fouled or wet spark plugs | Clean or replace spark plugs. |
| | Discharged battery, cranking rpm too low | Check/replace battery, connections and charging system. |
| | Inadequate fuel supply | Check fuel level in tank, add if necessary. Check/replace fuel filter, fuel supply lines, fuel pump, fuel pressure sensor and fuel injectors. |
| | Improper valve clearance | Adjust valve clearance:<br>Intake: 0.15-0.22 mm (0.0059-0.0086 in)<br>Exhaust: 0.27-0.34 mm (0.0106-0.0133 in) |
| | Incorrect valve timing | Adjust position of camshaft gears and camshaft sprocket. |
| | Inoperative or damaged ignition coil(s) | Replace ignition coil(s). |
| | Inoperative or damaged CKP or ECM | Check/replace CKP and/or ECM. |
| | Leaking cylinder head gasket(s) | Replace cylinder head gasket(s). |
| | Valve and/or valve guides worn or imperfect valve seat | Replace valves, rework valve seats or replace cylinder head if necessary. |
| | Worn piston rings and/or cylinder bore | Replace piston rings and cylinders if necessary. |
| | Improper viscosity oil for ambient temperature conditions | Change engine oil and refill with correct viscosity oil for ambient temperature. |

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**Table 3-16. Troubleshooting: Engine Performance**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Engine runs irregularly at idle | Excessive spark plug electrode gap | Set gap properly or replace spark plugs. |
| | Valve clearance below specification | Adjust valve clearance:<br>**Intake:**0.15-0.22 mm (0.0059-0.0086 in)<br>**Exhaust:**0.27-0.34 mm (0.0106-0.0133 in) |
| | Intake air leak | Tighten intake flange, replace gasket or replace intake flange if necessary. |
| | Malfunctioning ignition unit or incorrect ignition timing | Check CKP and ECM, replace if necessary. |
| | Valve and/or valve guides worn or imperfect valve seat | Replace valves, rework valve seats or replace cylinder head if necessary. |
| | Refer to Table 3-15 for additional possible causes. | |
| Engine runs irregularly at higher speed | Fuel pressure too low | Check fuel pressure sensor, fuel pump and fuel supply. |
| | Intake air leak | Tighten intake flange, replace gasket or replace intake flange if necessary. |
| | Worn camshafts | Check and replace if necessary. |
| | Refer to Table 3-15 for additional possible causes. | |

**Table 3-16. Troubleshooting: Engine Performance**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Insufficient engine performance | Intake air leak | Tighten intake flange, replace gasket or replace intake flange if necessary. |
| | Incorrect or worn spark plugs | Replace spark plugs (NGK CR9EKB). |
| | Improper valve clearance | Adjust valve clearance:<br>**Intake:**0.15-0.22 mm (0.0059-0.0086 in)<br>**Exhaust:**0.27-0.34 mm (0.0106-0.0133 in) |
| | Incorrect valve timing | Adjust position of camshaft gears and camshaft sprocket. |
| | Insufficient ignition voltage | Check/replace ignition coil(s). |
| | Inoperative or damaged CKP or ECM | Check/replace CKP and/or ECM. |
| | Valve and/or valve guides worn or imperfect valve seat | Replace valves, rework valve seats or replace cylinder head if necessary. |
| | Slipping friction clutch | Refer to Table 3-17. |
| | Inadequate fuel supply | Check fuel level in tank, add if necessary.<br>Check/replace fuel filter, fuel supply lines, fuel pump, fuel pressure sensor and fuel injectors. |
| | Restricted air filter | Replace air filter. |
| | Restricted exhaust system | Replace restricted exhaust system components. |
| | Worn piston rings and/or cylinder bore | Replace piston rings and cylinders if necessary. |
| | Leakage of scavenge pump circuit | Check/replace:<br>Transmission mainshaft oil seal<br>Transmission mainshaft bearing (clutch side)<br>Shift shaft oil seal (clutch side)<br>Shift drum bearing (clutch side)<br>Both transmission clutch shaft bearings<br>VSS O-ring<br>Both front valve cover gaskets<br>Clutch cover gasket<br>Secondary clutch actuator inner diaphragm oil seal and gasket |
| | Incorrect or contaminated engine oil | Change engine oil and refill with correct viscosity oil for ambient temperature. |
| Engine knocks or pings | Fuel has octane rating that is too low | Use correct octane fuel (min. 93 octane or ROZ 95). |
| | Incorrect or worn spark plugs | Replace spark plugs (NGK CR9EKB). |
| | Intake air leak | Tighten intake flange, replace gasket or replace intake flange if necessary. |
| | Malfunctioning ignition unit or incorrect ignition timing | Check CKP and ECM, replace if necessary. |

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**Table 3-16. Troubleshooting: Engine Performance**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Engine overheats | Low coolant level<br>Cooling system leaking<br>Air in cooling system | Refill coolant, pressure test cooling system. |
| | Inoperative cooling fan motor(s) | Replace cooling fan motor(s). |
| | Low engine oil | Fill engine oil to the proper level. |
| | Debris in radiator fins | Remove debris from radiator(s). |
| | Malfunctioning thermostat | Replace thermostat. |
| | Malfunctioning ignition unit or incorrect ignition timing | Check CKP and ECM, replace if necessary. |
| | Inoperative water pump or water pump drive | Replace water pump and/or repair water pump drive. |
| | Inoperative oil pump or oil pump drive<br>Damaged or improperly installed oil pump drive gear retaining ring<br>Restricted oil circuit | Replace oil pump and/or oil pump drive components.<br>Install oil pump drive gear retaining ring.<br>Clean oil circuit. |
| | Leaking cylinder head gasket(s) | Replace cylinder head gasket(s). |
| | Intake air leak | Tighten intake flange, replace gasket or replace intake flange if necessary. |
| Engine coolant temperature too low | Malfunctioning thermostat | Replace thermostat. |

**Table 3-17. Troubleshooting: Engine Oiling System**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Blue smoke from exhaust or engine uses too much oil | Leaking clutch diaphragm and inner diaphragm cover oil seal | Replace diaphragm and oil seal. |
| | Engine oil overfilled (oil in air cleaner assembly) | Adjust engine oil to proper level. |
| | Leaking cylinder head gasket(s) | Replace cylinder head gasket(s). |
| | Valve stem seals leaking | Replace valve stem seals. |
| | Clutch hydraulic piston, secondary actuator cover piston bore or O-rings leaking | Replace piston, O-rings and/or secondary actuator cover if necessary. |
| | Engine oil contaminated with fuel, worn piston rings and/or cylinder bore(s) | Replace piston rings and/or cylinder(s). |
| | Engine oil contaminated with fuel, engine does not regularly reach normal operating temperature (short trips) | Operate vehicle for long distances in between short trips. |
| Engine oil quantity increases | Engine oil contaminated with fuel, engine does not regularly reach normal operating temperature (short trips) | Operate vehicle for long distances in between short trips. |
| | Engine oil contaminated with fuel, worn piston rings and/or cylinder bore(s) | Replace piston rings and/or cylinder(s). |

**Table 3-17. Troubleshooting: Engine Oiling System**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Low or no engine oil pressure - oil pressure warning lamp illuminates | Engine oil level low | Fill oil to proper level. |
| | Malfunctioning oil pressure switch | Replace oil pressure switch. |
| | Malfunctioning pressure retaining valve (bypass valve stuck in open position) | Check/replace pressure retaining valve. |
| | Inoperative oil pump or oil pump drive<br>Damaged or improperly installed oil pump drive gear retaining ring<br>Restricted oil circuit | Replace oil pump and/or oil pump drive components.<br>Install oil pump drive gear retaining ring.<br>Clean oil circuit. |
| | Leaking ignition cover gasket (oil pressure circuit leaking internally) | Replace ignition cover gasket and torque to specifications. |
| | Worn oil pump | Replace oil pump. |
| | Engine oil contaminated with fuel, engine does not regularly reach normal operating temperature (short trips) | Operate vehicle for long distances in between short trips. |
| | Engine oil contaminated with fuel, worn piston rings and/or cylinder bore(s) | Replace piston rings and/or cylinder(s). |
| | Restricted oil strainer | Clean/replace oil strainer. |
| High engine oil pressure | Malfunctioning pressure retaining valve (bypass valve stuck in closed position) | Check/replace pressure retaining valve. |
| | Restricted oil circuit | Clean oil ducts. |

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# ENGINE ROTATION 3.4

## DOWN ROTATION

### Prepare the Motorcycle

1. Remove the seat.
2. See Figure 3-2. To purge the fuel lines, separate the fuel pump connector [86] and run the engine until it is out of fuel.

**⚠WARNING**

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

3. Disconnect negative battery cable. See 1.14 BATTERY MAINTENANCE.
4. Clamp the rear wheel into chock.
5. Remove the intake cover and the air filter element.
6. Remove air box baseplate. See 4.2 AIR CLEANER ASSEMBLY.
7. Cover throttle body to prevent objects from falling into the intake.

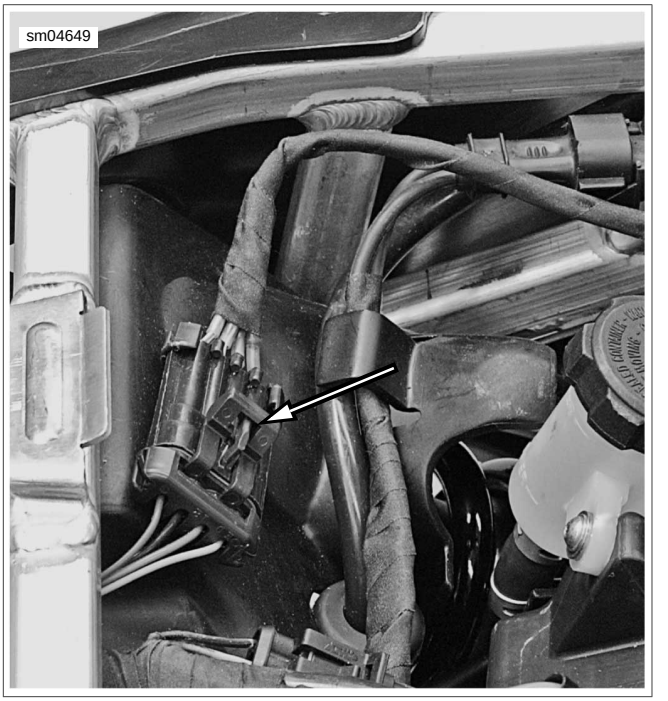



**Figure 3-2. Fuel Pump Connector [86]**

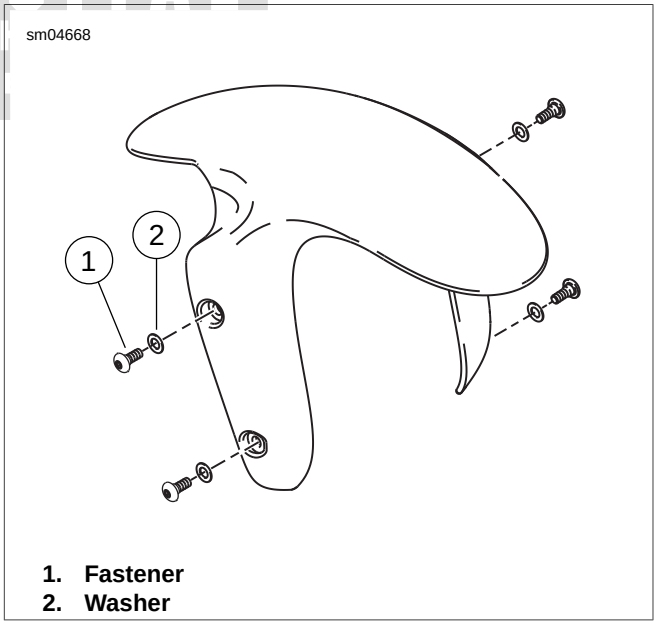
### Front of Motorcycle

1. See Figure 3-3. Remove fasteners (1) and washers (2) securing the front fender to front forks.
2. Disconnect the front O2 sensor connector.
3. See Figure 3-4. Remove IAT sensor (3) from intake snorkel.
4. Remove fastener (1) and intake snorkel (2).
5. Disconnect horn connectors.

*NOTE*

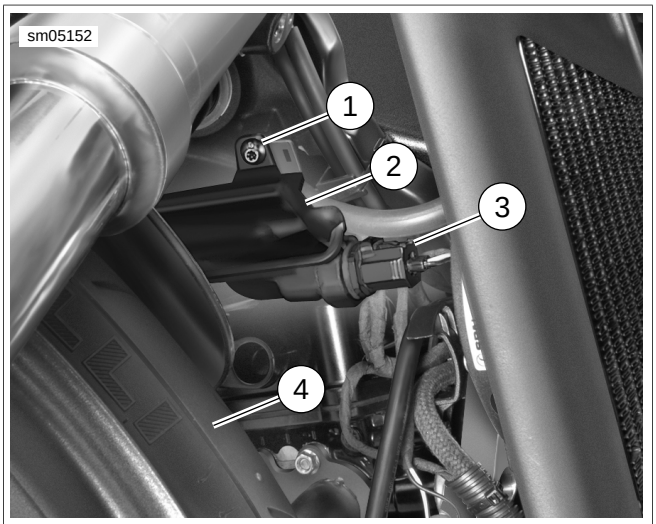
*Secure clutch master cylinder after removing to prevent cosmetic damage.*

6. Disconnect clutch master cylinder (left side) from handlebars.
7. Remove fastener securing clutch hydraulic line clamp to lower triple tree.



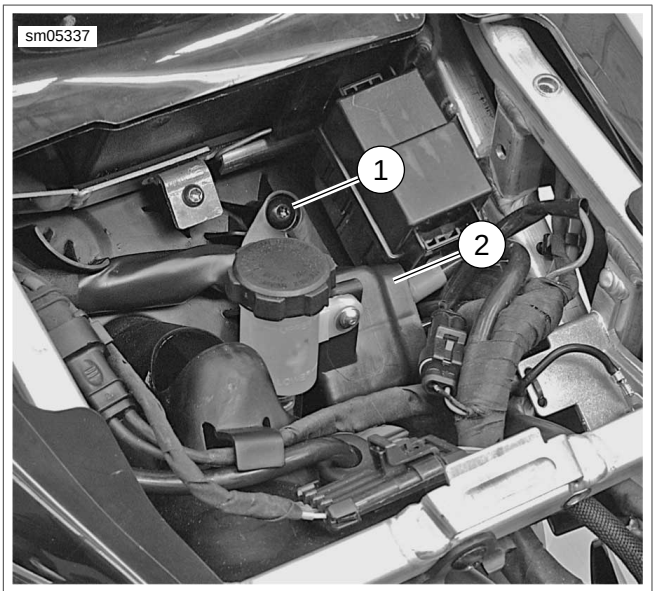

**1. Fastener**
**2. Washer**

**Figure 3-3. Front Fender**




1. **Fastener**
2. **Intake snorkel**
3. **IAT sensor**
4. **Front tire**

**Figure 3-4. Intake Snorkel**




1. **Fastener**
2. **Starter solenoid cover**

**Figure 3-5. Starter Solenoid Cover**

## Upper Engine

1. Disconnect the intake solenoid cable at throttle body.
2. Unclip the fuse block and lift up to allow additional slack in the harness.
3. See Figure 3-5. Remove the starter solenoid fastener (1) and cover (2) to allow additional slack in harness.
4. See Figure 3-6. Disconnect the fuel line.
5. See Figure 3-7. Remove outer shroud fasteners and outer shrouds.
6. Remove the radiator inlet ducts.
7. See Figure 3-8. Remove radiator mounting duct fasteners (1) on both sides of motorcycle.
8. See Figure 3-16. To allow access to fasteners (3, 6), remove fasteners securing radiator outlet ducts to K-brackets (1, 4).




**Figure 3-6. Fuel Line Connector**

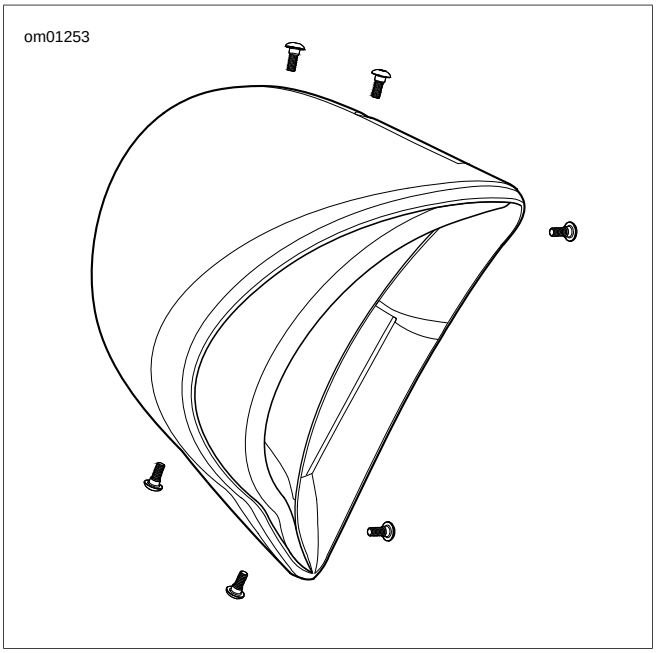
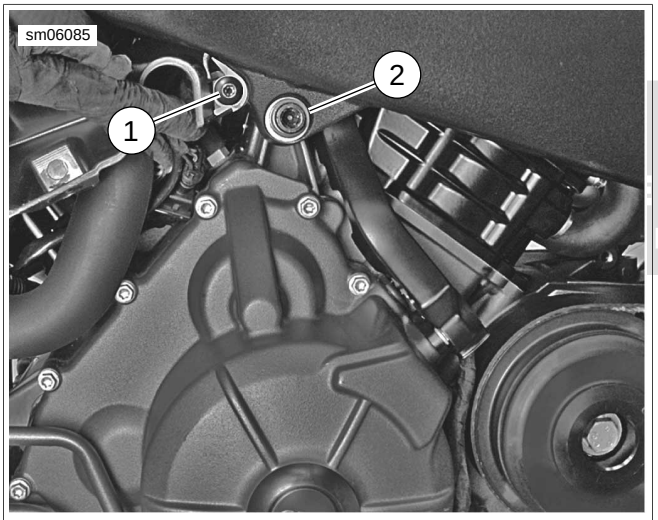



**Figure 3-7. Outer Shroud Fasteners**

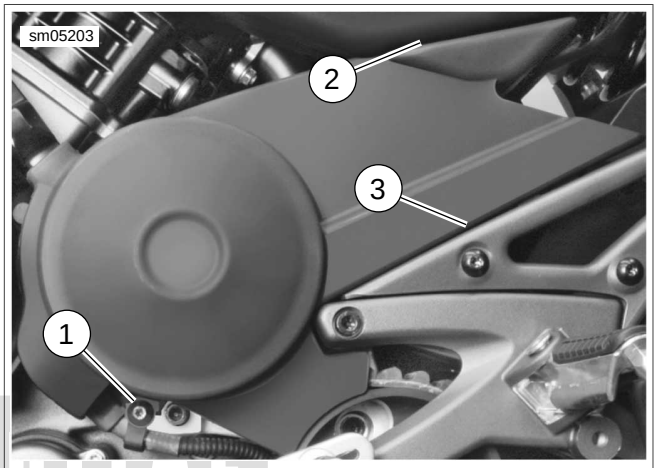



1. **Radiator mounting duct fastener**
2. **Motor mount fastener**

**Figure 3-8. Left Center Motor Mount**

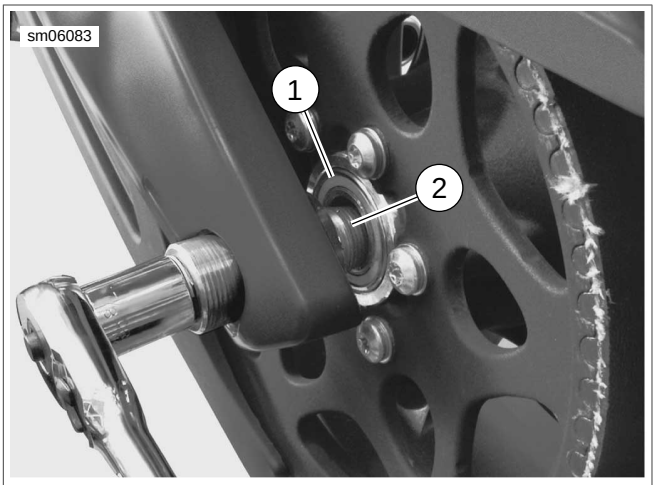
## Left Side

1. See Figure 3-9. Remove fastener (1) and remove engine sprocket cover.
2. Cut cable strap from VSS wiring. Remove the air flow guide.
3. See Figure 3-10. Loosen rear axle (2) until taper is out of bearing (1).
4. Remove shift lever.
5. Remove left footpeg support assembly.
   a. See Figure 3-11. Rotate idler pulley (4) until muffler fastener (5) is accessible.
   b. Remove muffler fastener.
   c. Remove idler pulley bracket fastener (1).
   d. Remove upper (3) and lower (2) footpeg support fasteners.
   e. See Figure 3-12. To allow clearance for the front drive belt, scissor the idler pulley bracket (1) away from left footpeg support (2).
   f. Remove left footpeg support.



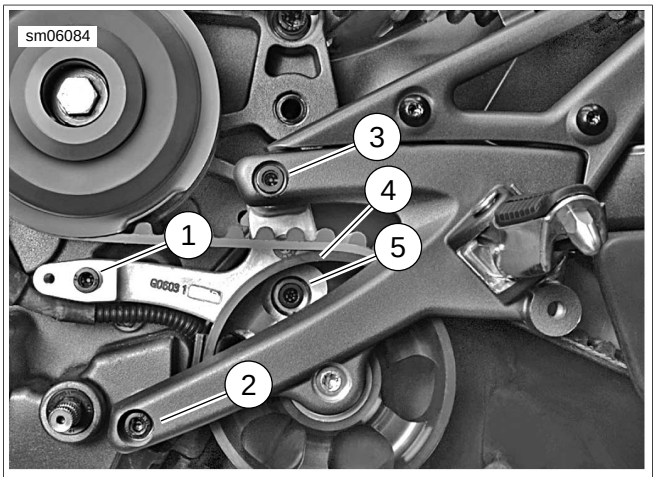

1. **Fastener**
2. **Upper tab location**
3. **Lower tab location**

**Figure 3-9. Engine Sprocket Cover**



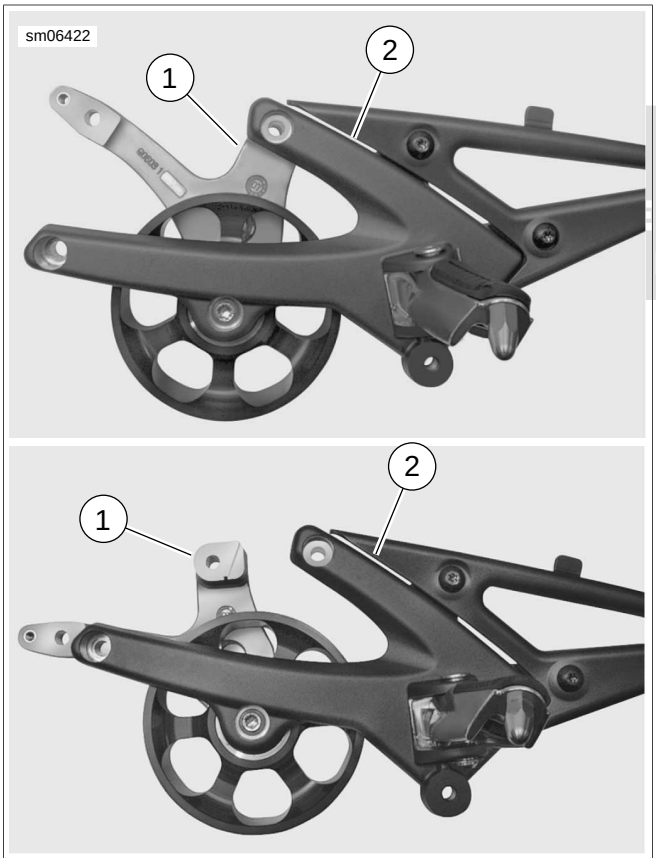

1. **Wheel bearing**
2. **Axle**

**Figure 3-10. Rear Axle**




1. Idler pulley bracket fastener
2. Lower footpeg support fastener
3. Upper footpeg support fastener
4. Idler pulley
5. Muffler fastener

**Figure 3-11. Rider Footpeg Support (Left)**

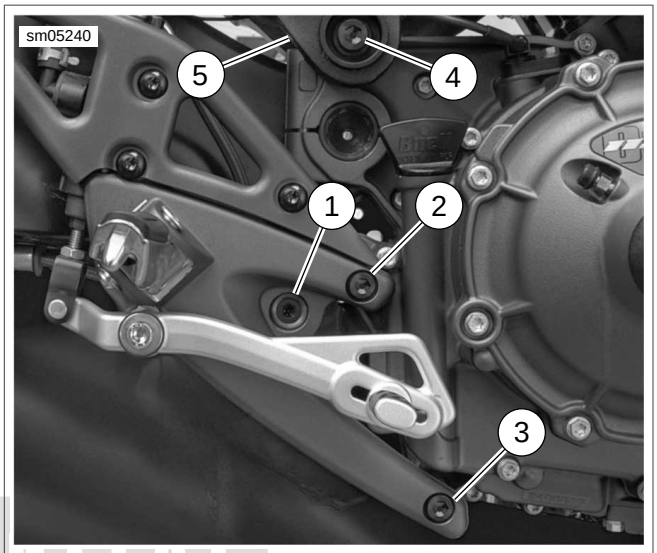



1. Idler bracket
2. Footpeg support

**Figure 3-12. Scissor the Footpeg Support and Idler Bracket**

## Right Side

1. Remove right footpeg support assembly.
   a. See Figure 3-13. Remove muffler fastener (1).
   b. Remove upper (2) and lower (3) footpeg support fasteners.
   c. Remove right footpeg support.
   d. Move support assembly away from engine and secure.




1. Muffler fastener
2. Upper footpeg support fastener
3. Lower footpeg support fastener
4. Rear motor mount fastener
5. Pinch screw

**Figure 3-13. Right Rider Footpeg Support**

## Muffler

1. See Figure 3-14. Remove the right front muffler fastener.
2. Remove the left front muffler fastener, washer and nut.
3. See Figure 3-15. Loosen muffler clamps (2).
4. Remove the muffler.

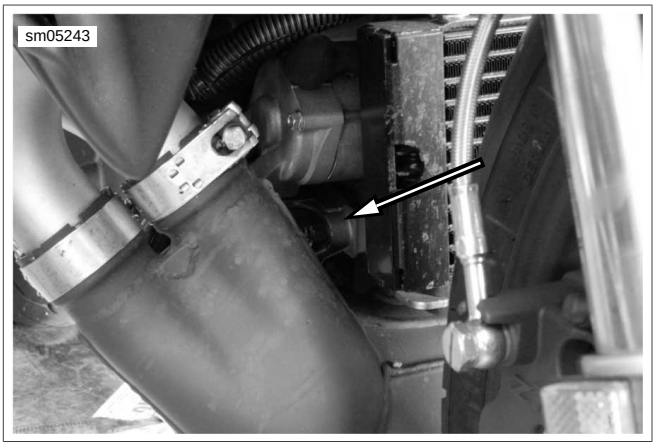
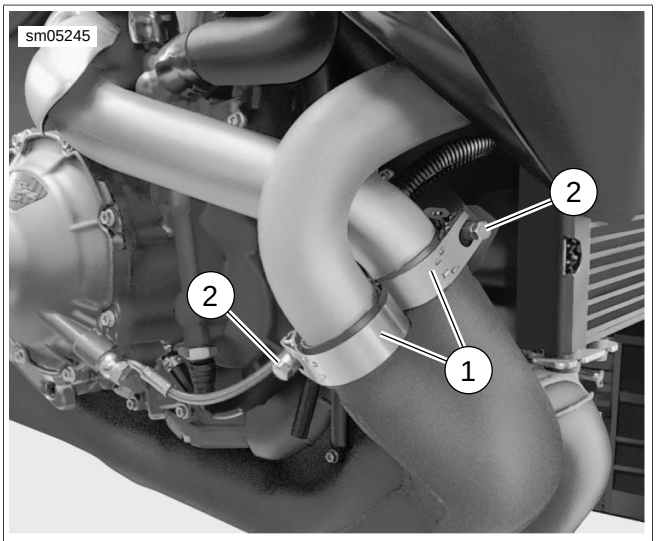



**Figure 3-14. Front Muffler Fastener (Right)**

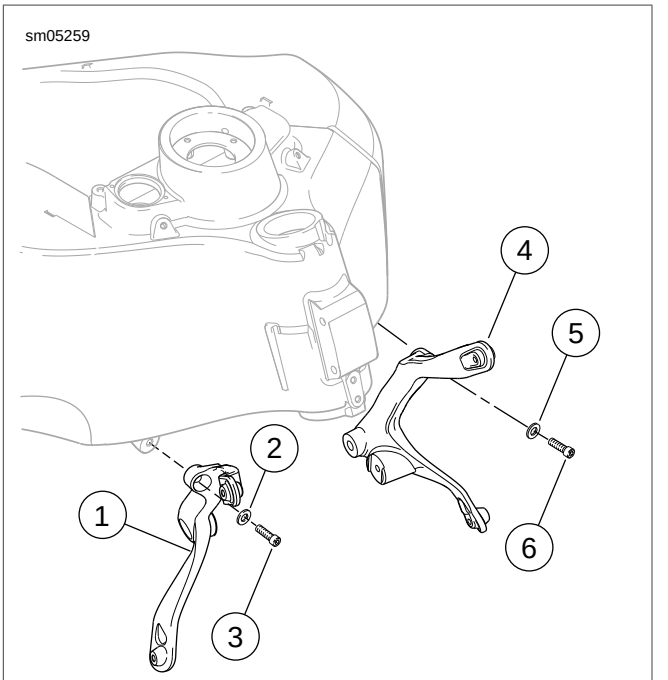



1. **Muffler clamps**
2. **Muffler clamp fasteners**

**Figure 3-15. Muffler Clamps**

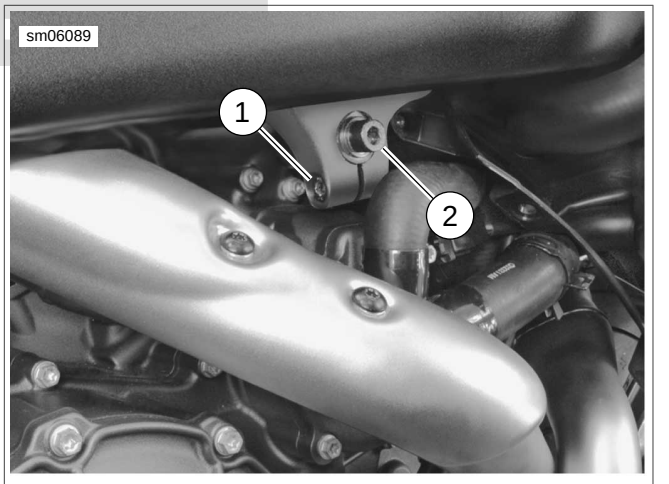
## Rotate Engine

1. Support engine with wide scissors jack.
2. See Figure 3-16. Remove fastener (3) and lockwasher (2) from right K-bracket (1). Remove fastener (6) and lockwasher (5) from left K-bracket (4).
3. See Figure 3-17. Loosen pinch bolt (1). Remove motor mount fastener (2).
4. See Figure 3-8. Loosen center motor mount pinch bolt and remove center motor mount fastener (2).
5. See Figure 3-13. Loosen, but do not remove rear motor mount fasteners (4) on each side of vehicle.
6. Rotate the engine.




1. **Right K-bracket**
2. **Lockwasher**
3. **Fastener**
4. **Left K-bracket**
5. **Lockwasher**
6. **Fastener**

**Figure 3-16. K-Brackets**




1. **Pinch screw**
2. **Fastener**

**Figure 3-17. Right Motor Mount**

## UP ROTATION

### Rotate Engine

1. Rotate engine up.
2. See Figure 3-13. Install rear motor mount fastener (4) on each side of vehicle. Do not tighten at this time.
3. See Figure 3-8. Install left center motor mount fastener (2). Do not tighten at this time.
4. See Figure 3-17. Install right center motor mount pinch spool and fastener (2). Do not tighten at this time.
5. See Figure 3-16. Install fastener (3) and lockwasher (2) into right K-bracket (1). Install fastener (6) and lockwasher (5) into left K-bracket (4). Do not tighten at this time.
6. Tighten motor mount fasteners to 46-51 Nm (34-38 ft-lbs):
   a. Left rear motor mount fastener.
   b. See Figure 3-8. Left center motor mount fastener.
   c. See Figure 3-13. Right rear motor mount fastener (4).
   d. Right center motor mount fastener.
7. Tighten rear and center pinch bolts (1) to 24.5-27.0 Nm (18-20 ft-lbs).
8. Tighten engine mount K-bracket fasteners to 46-51 Nm (34-38 ft-lbs).
9. Tighten frame mount K-bracket fasteners to 31.8-35.3 Nm (23.5-26.0 ft-lbs).

### Muffler

1. Install left footpeg support assembly.
   a. See Figure 3-11. Install left footpeg support assembly over belt. Rotate idler pulley bracket (1) until hole in bracket lines up with hole in left footpeg support (2).
   b. See Figure 3-11. Install upper (3) and lower (2) footpeg support fasteners. Do not tighten fasteners at this time.
   c. Install idler pulley bracket fastener (1). Do not tighten at this time.
   d. Rotate idler pulley (4) until muffler fastener cavity is accessible.
2. Install right footpeg support assembly.
   a. See Figure 3-13. Install upper (2) footpeg support fastener.
   b. Install lower (3) footpeg support fastener.
   c. Do not tighten fasteners at this time.
3. Install muffler.
   a. Install **new** exhaust gaskets in muffler.
   b. Install muffler on headers.
   c. See Figure 3-14. Install front right muffler fastener. Do not tighten at this time.
   d. Install front left muffler fastener (1), washer and nut. Do not tighten at this time.
   e. See Figure 3-13. Install rear muffler fastener (1). Do not tighten at this time.
   f. See Figure 3-11. Install rear muffler fastener (1). Do not tighten at this time.
   g. Tighten muffler clamps to 9.5-10.8 Nm (84-96 **in-lbs**).
   h. Tighten front and rear muffler fasteners to 24.5-27.0 Nm (18-20 ft-lbs).
4. See Figure 3-13. Tighten fasteners (2, 3) to 24.5-27.0 Nm (18-20 ft-lbs).
5. See Figure 3-11. Tighten fasteners (2, 3) to 24.5-27.0 Nm (18-20 ft-lbs).
6. Tighten idler pulley bracket fastener (1) to 24.5-27.0 Nm (18-20 ft-lbs).

### Left Side

*NOTE*

*In next step, shift lever should be installed at same angle as lower portion of rider footpeg support bracket.*

1. Install shift lever.
2. Install shift lever fastener and tighten to 9.6-10.6 Nm (85-94 **in-lbs**).
3. Tighten the rear axle.
   a. Tighten the rear axle to 31.2-36.6 Nm (23-27 ft-lbs).
   b. Back axle out two full turns and retighten axle to 65.1-70.5 Nm (48-52 ft-lbs).
   c. Tighten rear axle pinch bolt to 54-61 Nm (40-45 ft-lbs).
4. Install cable strap to secure VSS wiring to frame. Install heat deflector and fastener. Tighten fastener to 3.6-4.1 Nm (32-36 **in-lbs**).

*NOTES*

- *See Figure 3-9. In next step, be sure upper tab (2) of engine sprocket cover engages frame and lower tab (3) engages rider footpeg support.*
- *In next step, be sure wire clip at bottom of engine sprocket cover engages sidestand sensor wiring.*
- *In next step, be sure wire guard engages sidestand sensor wiring, neutral switch wiring and engine case fasteners.*

5. Install engine sprocket cover. Install engine sprocket cover fastener (1) and tighten to 13.0-14.5 Nm (115-128 **in-lbs**).

## Front of Motorcycle

1. See Figure 3-8. Install radiator outlet duct fasteners (1) on both sides of vehicle. Tighten fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).
2. Install radiator inlet ducts. Tighten fasteners to 8.2-9.2 Nm (73-82 **in-lbs**).
3. See Figure 3-7. Install outer shrouds and fasteners on both sides of vehicle. Tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).
4. Connect horn connectors.
5. Install intake snorkel.
   a. See Figure 3-4. Install intake snorkel (2) on end of air box baseplate assembly. Install fastener (1) and tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
   b. Install IAT sensor (3) into intake snorkel.
   c. Connect front O2 sensor connector.
6. Install clutch master cylinder to handlebars. Tighten fasteners to 7.8-12.7 Nm (69-112 **in-lbs**).
7. Install clutch line and clamp using fastener. Tighten to 4.1-6.9 Nm (36-60 **in-lbs**).
8. See Figure 3-3. Put front fender in position. Install washers (2) and fasteners (1). Tighten front fender fasteners to 8.4-9.2 Nm (74-82 **in-lbs**).

## Upper Engine

1. Install starter solenoid cover. Tighten fastener to 4.1-6.8 Nm (36-60 **in-lbs**).
2. Connect intake solenoid cable at throttle body.
3. Clip fuse block into place.
4. See Figure 3-6. Connect fuel line.
5. See Figure 3-2. Connect fuel pump electrical connector.

## Return to Service

*NOTE*

*In next step, be sure IAC hose protrudes 10-11 mm (0.39-0.43 in) above air box baseplate.*

1. Install air box baseplate. See 4.2 AIR CLEANER ASSEMBLY.
2. Install air filter element and intake cover. See 1.6 AIR FILTER ELEMENT.
3. Connect negative battery cable. Tighten fastener to 6.8-7.9 Nm (60-70 **in-lbs**).

**WARNING**

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

4. Install the seat.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# ENGINE REPLACEMENT 3.5

## ENGINE REMOVAL

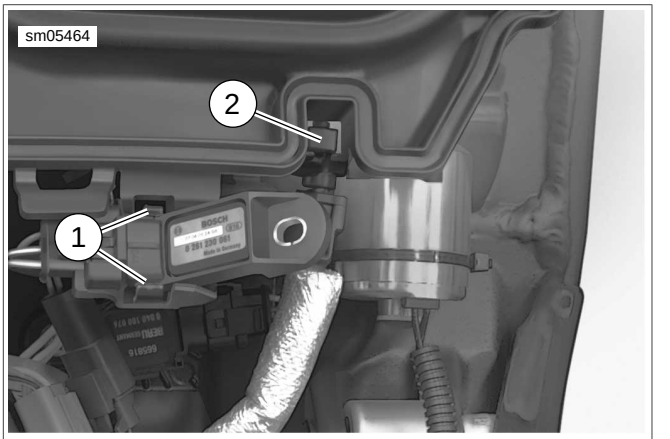
### Preparation

1. Remove the seat.
2. Purge the fuel supply line of high pressure gasoline.
   a. See Figure 3-18. Separate the fuel pump connector [86] housings.
   b. Run the engine in neutral.
   c. When the engine stalls, press the starter button for 3 seconds to remove any remaining fuel from the line.
3. Clamp the rear wheel into the lift chock.

**WARNING**

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

4. Disconnect the negative battery cable.
5. Remove the intake cover and the air filter element.
6. See Figure 3-19. Disconnect the BARO sensor (1) and fuel line from the baseplate (2) hook.
7. Remove the air cleaner assembly and the throttle mount gasket. See 4.2 AIR CLEANER ASSEMBLY.
8. Remove the front fender.
9. See Figure 3-20. Remove the left and the right outer radiator shrouds.




1. Attachment points for the barometer sensor
2. Attachment point for the fuel line

**Figure 3-19. Baseplate Attachments/Barometer Sensor and Fuel Line**

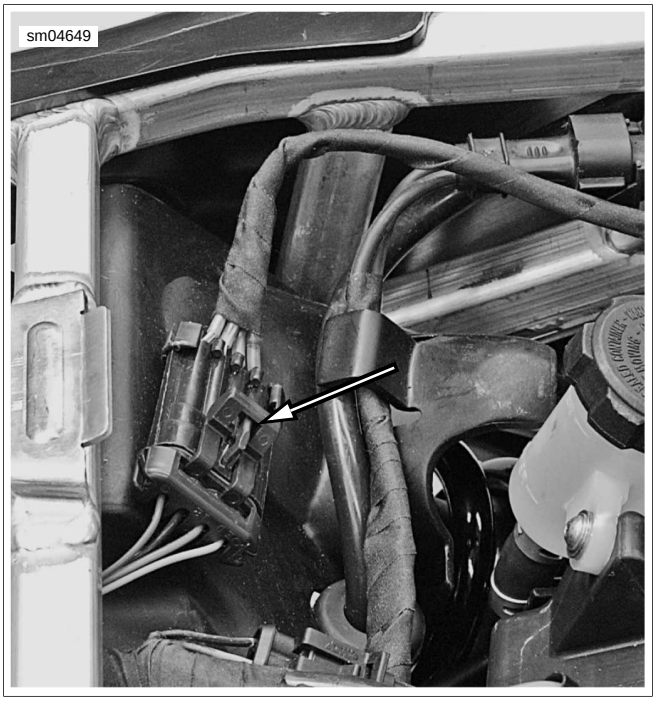



**Figure 3-18. Fuel Pump Connector [86]**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

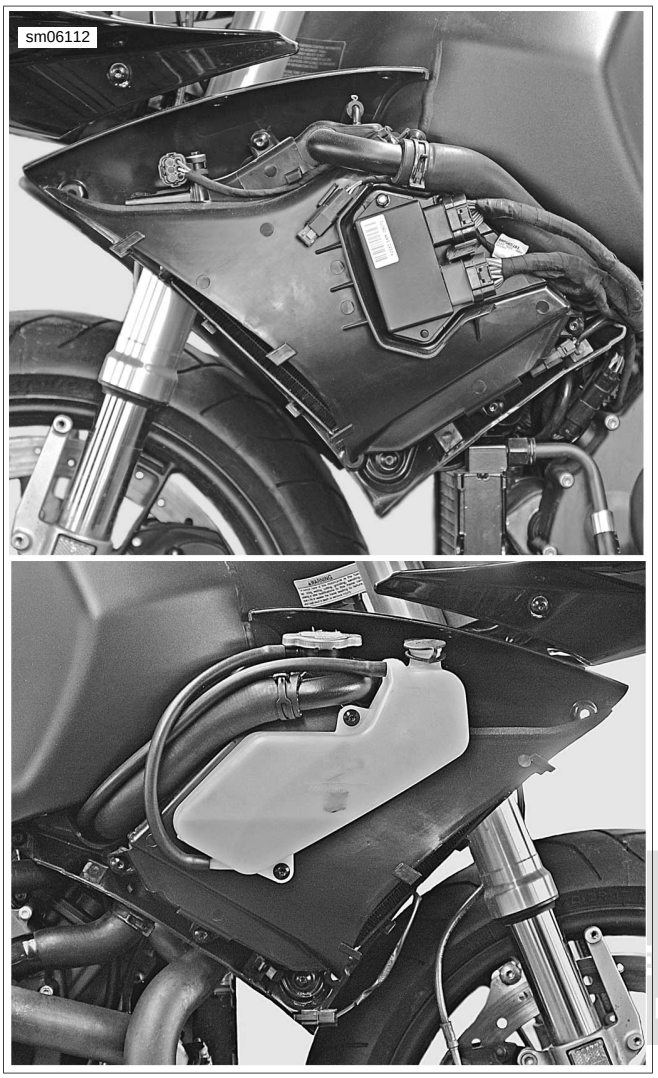



**Figure 3-20. Remove Left (top) and Right (bottom) Outer Radiator Shrouds**




**Figure 3-21. Fuel Line Connector**

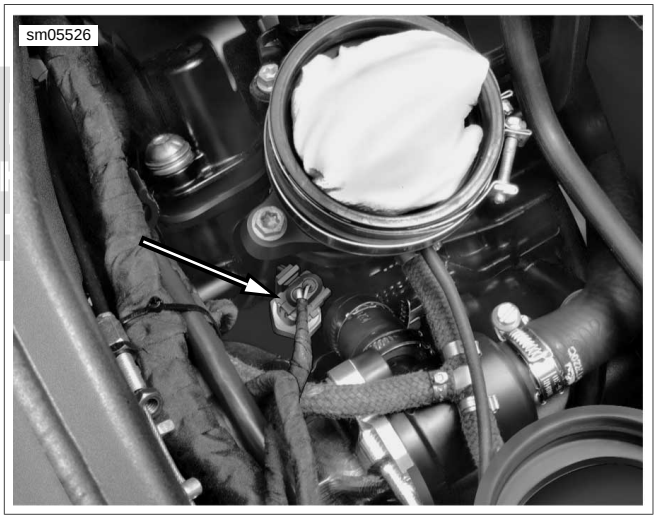
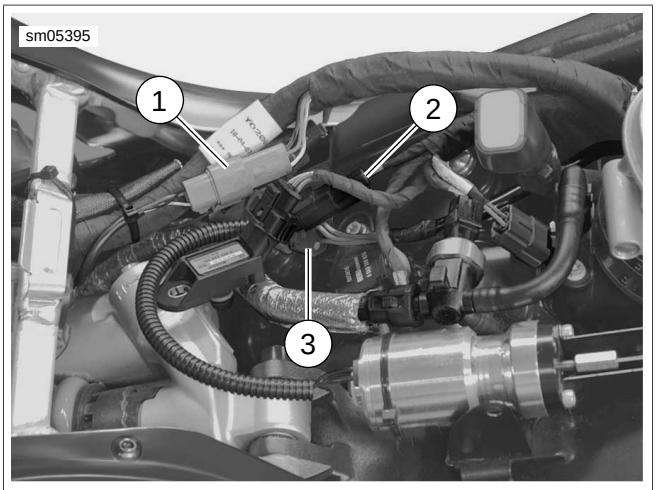



**Figure 3-22. Engine Temperature Sensor**

## Upper Engine

1. See Figure 3-21. Separate the fuel line connectors and remove the fuel rail. See 4.5 THROTTLE BODY, Fuel Rail.
2. Disconnect the active intake solenoid cable and the throttle cables from the throttle body bracket.
3. Separate the connector housings:
   a. TP [88]
   b. IAC [87]
4. Remove the throttle body. See 4.5 THROTTLE BODY.
5. Cover the intake flange throats.
6. See Figure 3-22. Remove the ECT sensor connector.
7. See Figure 3-23. Separate connector housings:
   a. Active intake solenoid [178] (2)
   b. Stator plug [46] (3)
   c. VSS [65 ] (1)




1. **VSS connector**
2. **Active intake solenoid connector**
3. **Stator connector**

**Figure 3-23. Connectors Under Seat**

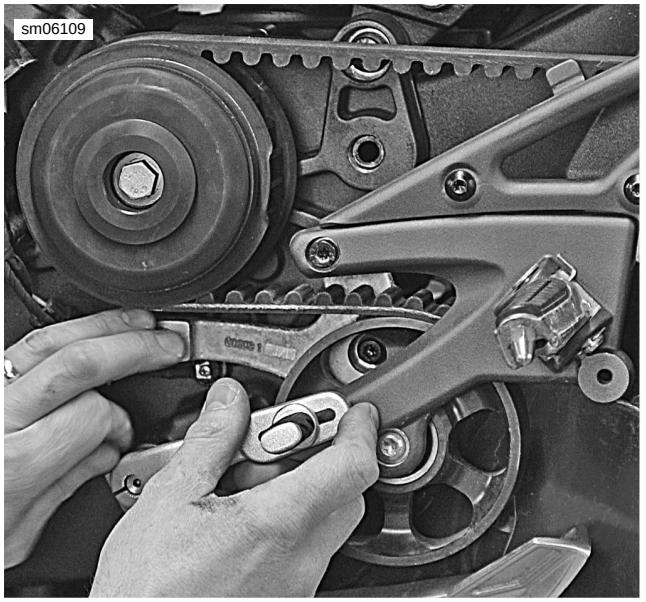
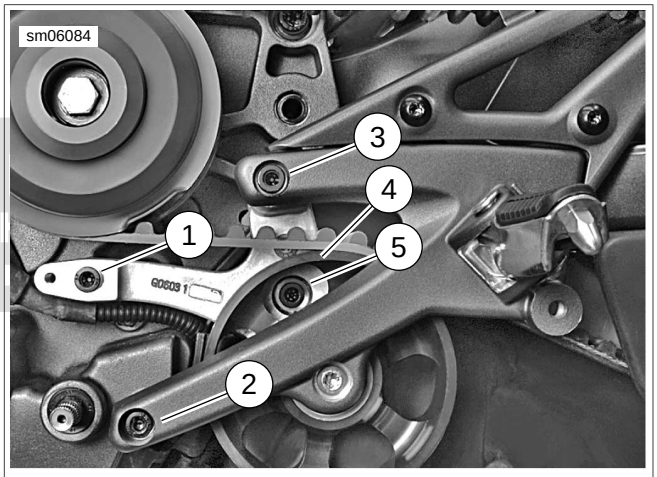



**Figure 3-24. Shift Lever**

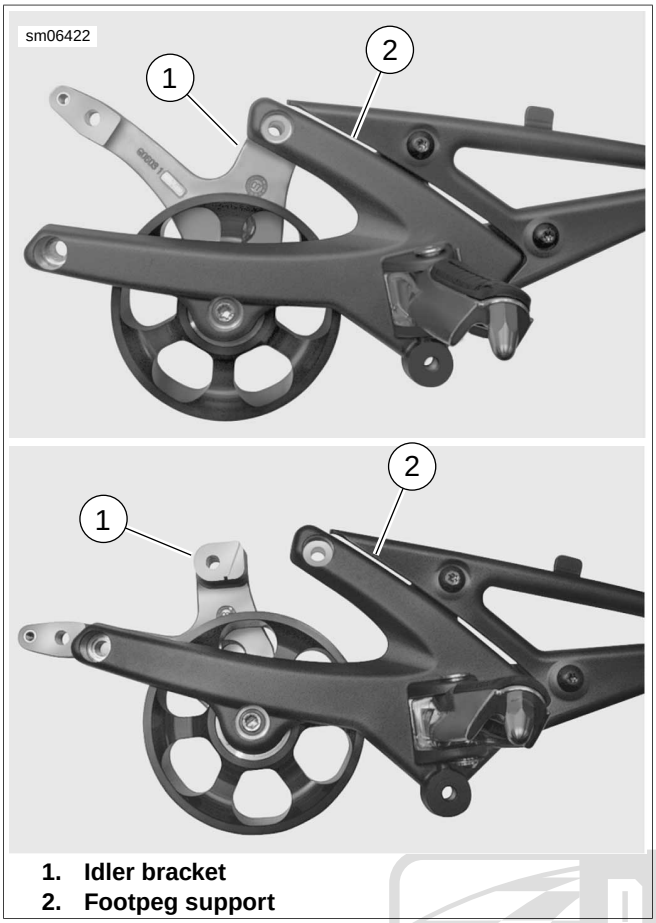
## Left Side

1. Remove upper belt guard.
2. Remove lower belt guard.
3. Remove the fastener and the engine sprocket cover.
4. See Figure 3-24. Note its position and remove the shift lever.
5. Remove the drive belt.
   a. Loosen the rear axle pinch bolt.
   b. Loosen (15 turns) the rear axle.
   c. Remove the belt from the rear sprocket.
   d. Tighten rear axle (snug).
   e. See Figure 3-25. Remove the left rider footpeg bracket and idler pulley bracket assembly. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS.
   f. See Figure 3-26. Scissor the idler pulley bracket and the footpeg bracket to remove the belt.
   g. Rotate the drive sprocket notch forward and remove the belt from the drive pulley.
6. Remove the muffler. See 4.7 EXHAUST SYSTEM.




1. **Idler pulley bracket fastener**
2. **Lower footpeg support fastener**
3. **Upper footpeg support fastener**
4. **Idler pulley**
5. **Muffler fastener**

**Figure 3-25. Rider Footpeg Support (Left)**

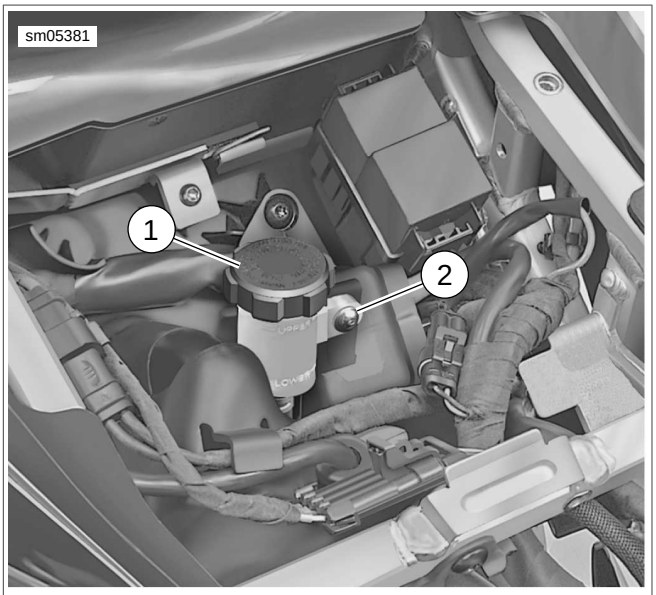



1. **Idler bracket**
2. **Footpeg support**

**Figure 3-26. Scissor the Footpeg Support and Idler Bracket**

## Right Side

1. Tape the swingarm to protect the finish.
2. See Figure 3-27. Remove the rear brake fluid reservoir fastener and rotate the reservoir to pass through the tail section pan.
3. Separate the brake light connector [121] housings.
4. Remove the right footpeg support assembly complete with the rear brake master cylinder and reservoir. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS.
5. Lower the assembly guiding the reservoir and brake fluid line through the tail section pan.
6. Support the assembly from the rear passenger footpeg.
7. Remove the negative battery cable on the frame/fuel tank.
8. See Figure 3-28. Remove the wire guide/fuel pump cover fastener and the cover.
9. Separate the rear O2 sensor connector [137] housings.
10. Remove heat deflector from the rear exhaust header.




1. **Rear brake fluid reservoir**
2. **Fastener**

**Figure 3-27. Rear Brake Fluid Reservoir**

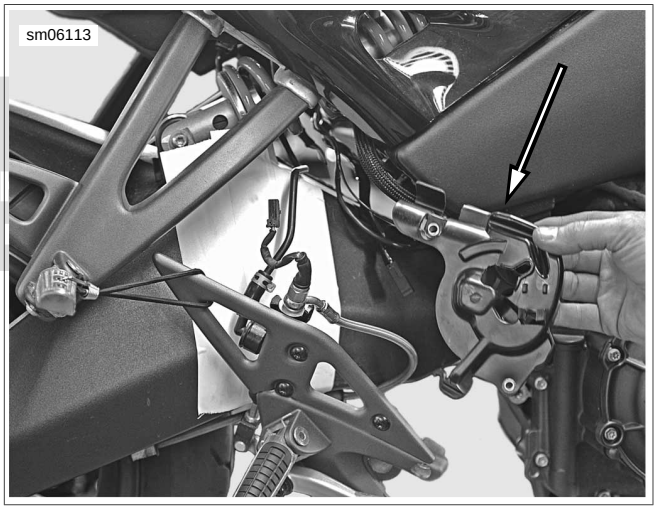



**Figure 3-28. Wire Guide/Fuel Pump Cover**

## Drain the Fluids/Oil Cooler

1. See Figure 3-29. Remove the sidestand.
2. Remove the sidestand stop bracket.
3. Drain the engine oil.
4. Remove the oil filter cap to access oil line fittings.
5. Remove the oil lines from the crankcase and the oil cooler. See 5.9 OIL COOLER.
6. Remove the oil fittings.
7. Replace the oil filter cap.
8. See Figure 3-30. Plug the case oil fittings holes with plastic plugs from a new engine.

9. See Figure 3-31. Remove the clutch fluid reservoir cover and use a vacuum to drain the clutch fluid through the bleeder valve.
10. Remove the banjo bolt and the clutch fluid line at the engine.
11. Cap the clutch fluid line and pull the line through the P-clamp.

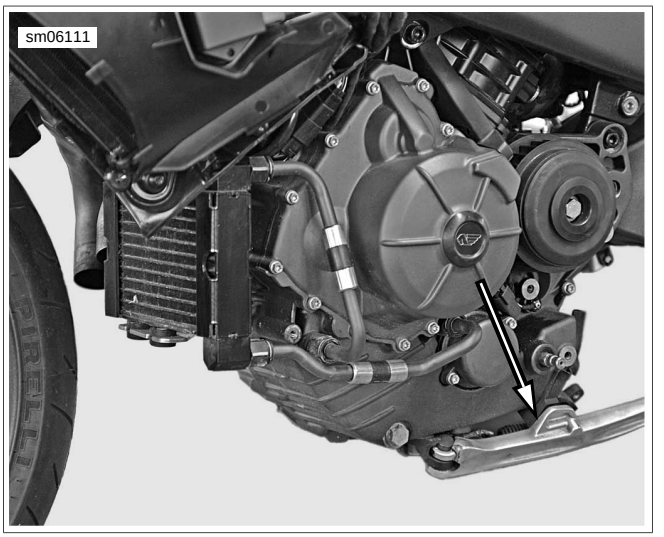



**Figure 3-29. Sidestand and Sidestand Stop Bracket**

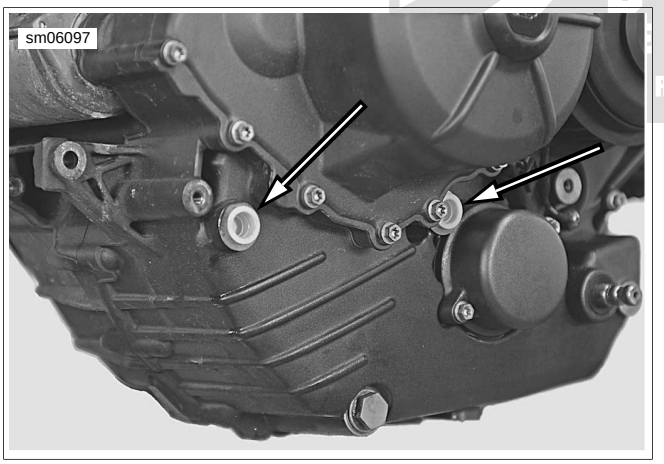



**Figure 3-30. Oil Fitting Plugs**

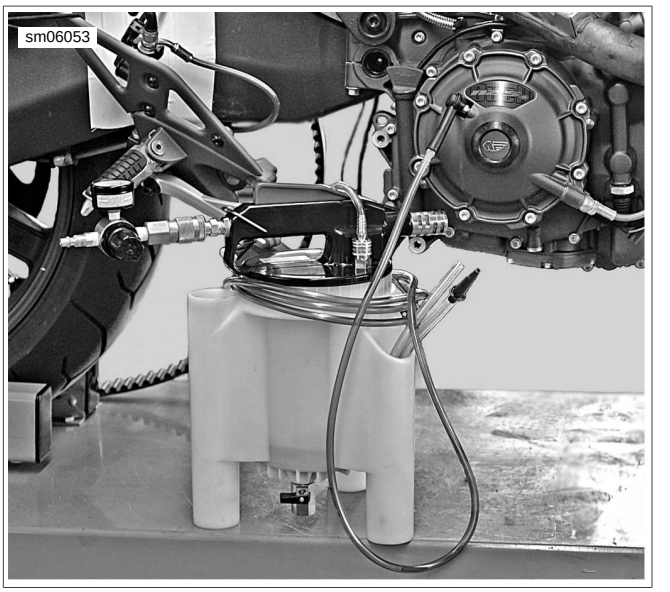



**Figure 3-31. Drain the Clutch Fluid**

## K-Brackets

*NOTES*

- *See Figure 3-32. In order to remove the inner radiator duct fasteners on the right side, it will be necessary to remove the overflow tank without disconnecting it.*
- *See Figure 3-33. In order to remove the radiator duct fasteners on the left side, it will be necessary to remove the radiator without disconnecting it.*

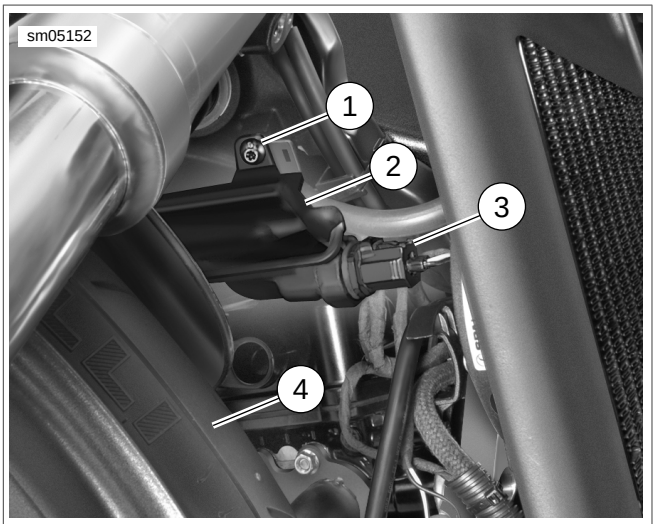
1. Remove the outer and inner radiator duct fasteners.
2. See Figure 3-34. Remove IAT sensor (3) from intake snorkel.
3. Remove the fastener (1) and intake snorkel (2).
4. Disconnect the front O2 [138] sensor.
5. Remove two cable straps securing the horn wiring harness to the horn bracket.
6. Disconnect the horn [122] connectors.
7. Remove the starter cable from starter.
8. See Figure 3-38. Place scissor jacks under engine and swingarm pivot as required.
9. Remove the tail section body work and support the sub-frame from above.
10. See Figure 3-35. Remove fastener (3) and lockwasher (2) from right K-bracket (1).
11. See Figure 3-36. Remove fastener and lockwasher from left K-bracket.
12. Cut cable straps on left side of motorcycle securing main wiring harness to engine wiring harness.
13. See Figure 3-37. Separate connector housings:
    a. Engine to main harness [145 ] (1)
    b. Fan sub-harness [234] (2)




Figure 3-32. Remove Overflow Tank

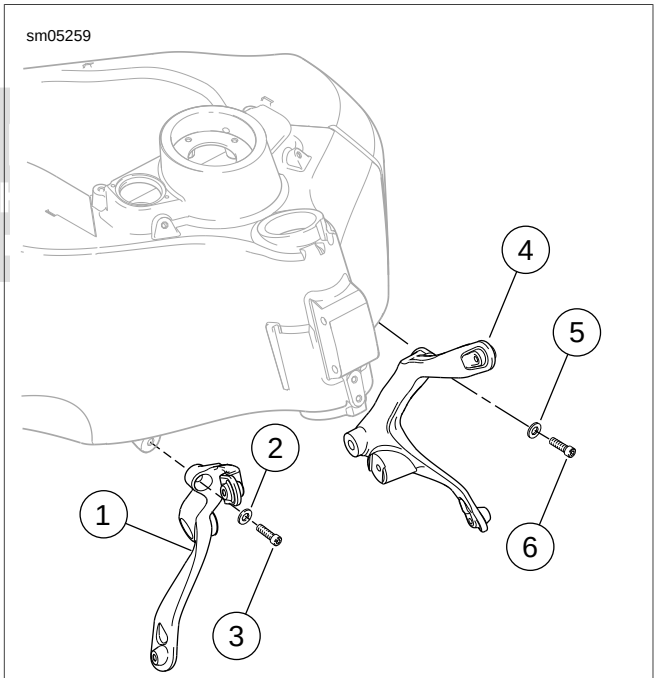



Figure 3-33. Removing the Radiator




1. Fastener
2. Intake snorkel
3. IAT sensor
4. Front tire

Figure 3-34. Intake Snorkel

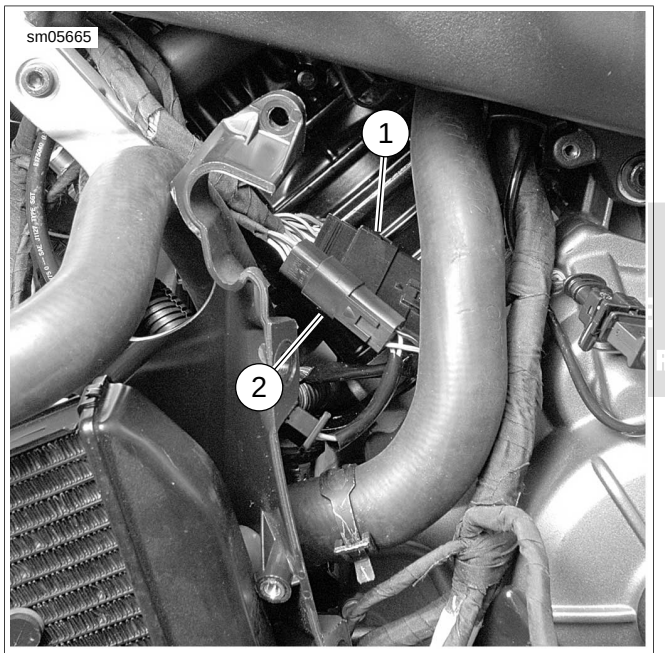



1. Right K-bracket
2. Lockwasher
3. Fastener
4. Left K-bracket
5. Lockwasher
6. Fastener

Figure 3-35. K-Brackets




**Figure 3-36. K-Bracket to Frame Fastener**




1. **Engine harness interconnect connector [145]**
2. **Cooling fan sub-harness connector [234]**

**Figure 3-37. Fan and Engine Harness Connectors**

## Motor Mounts

1. For slack in wire harness, remove the starter solenoid cover fastener.
2. Cut remaining cable straps:
   a. VSS wire harness to the frame
   b. VSS harness to the main harness
   c. O2 sensor wire
3. Remove the lower shock absorber bolt.
4. See Figure 3-39. Loosen right side pinch bolts on center motor mounts. Remove fasteners (2) from each side.
5. See Figure 3-40. Loosen right side pinch screw on rear motor mounts. Remove fasteners from each side.
6. See Figure 3-41. Lift the chassis off the engine/swingarm.

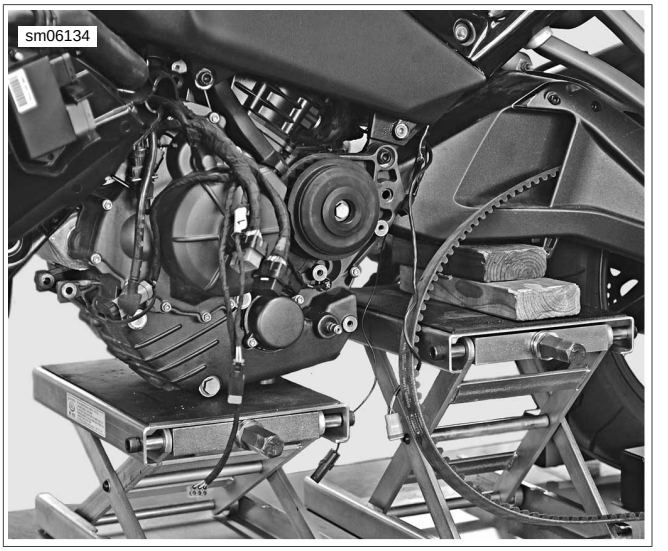
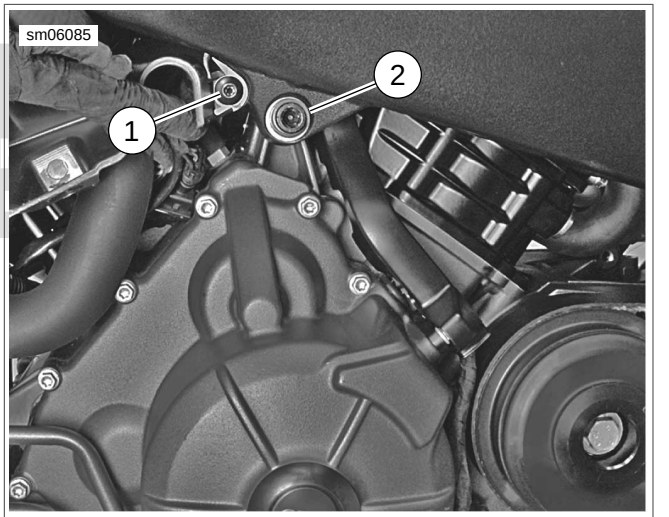
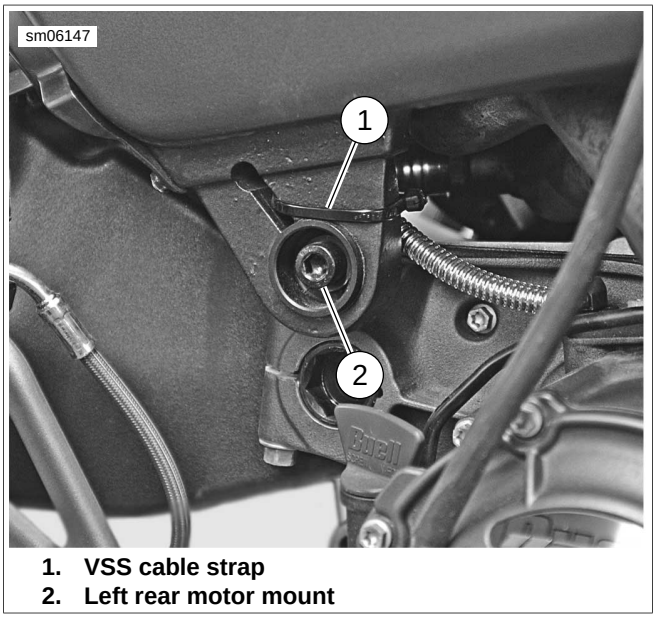



**Figure 3-38. Support Engine and Swingarm**




1. **Radiator mounting duct fastener**
2. **Motor mount fastener**

**Figure 3-39. Left Center Motor Mount**




1. VSS cable strap
2. Left rear motor mount

**Figure 3-40. Right Rear Motor Mount**

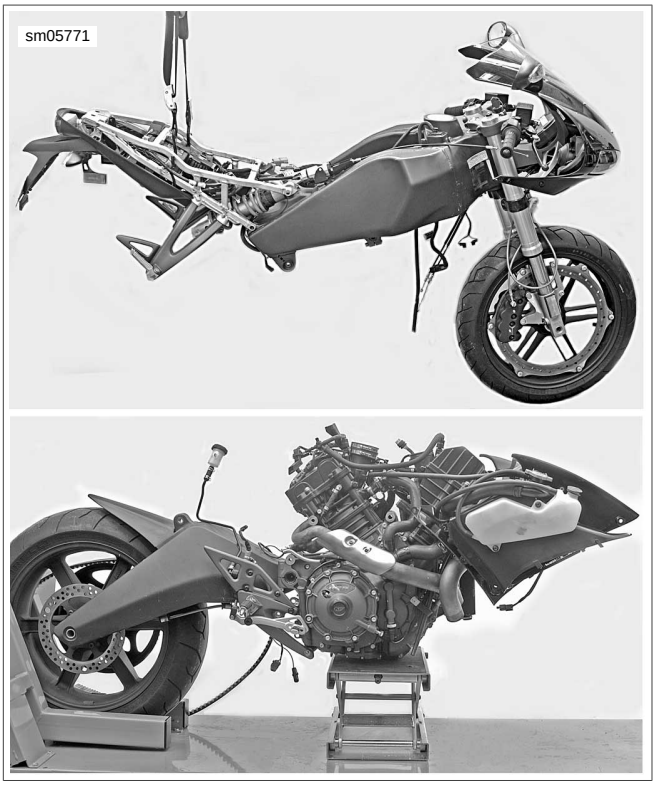



**Figure 3-41. Chassis and Engine Assemblies**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## ENGINE DISASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| B-42310-60 | ENGINE CRADLE |

1. See Figure 3-42. Drain the cooling system. See 5.4 ENGINE COOLANT.

*NOTE*

*See Figure 3-43. The left and right radiators with inlet/outlet ducts can be removed as an assembly connected by the crossover tube.*

2. Remove the cooling system including the thermostat assembly. See 5.9 OIL COOLER and 5.7 COOLANT PIPES AND HOSES.
3. See Figure 3-44. Remove the headers.
4. Remove the K-brackets.
5. Support the engine and swingarm.
6. Loosen the swingarm pivot shaft pinch bolt.
7. Remove the swingarm pivot shaft to separate the swingarm from the engine.

*NOTE*

*See Figure 3-45. Engine can be crated for shipping or mounted in ENGINE CRADLE (Part No. B-42310-60) for service.*

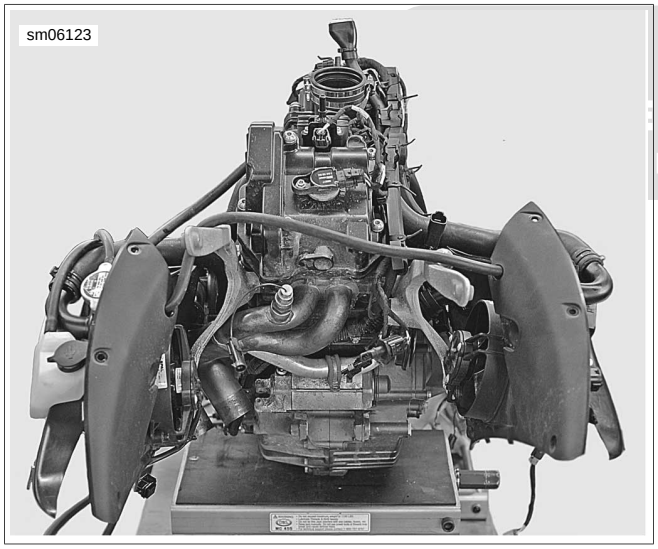



**Figure 3-42. Engine and Cooling System**

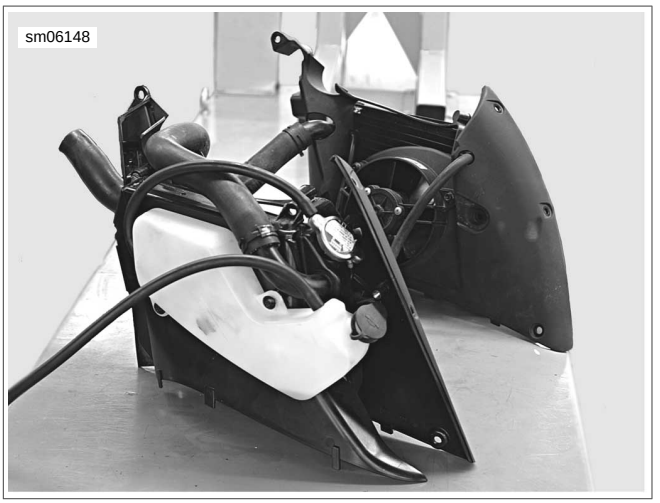



**Figure 3-43. Radiators and Inlet/Outlet Ducts Assembly**

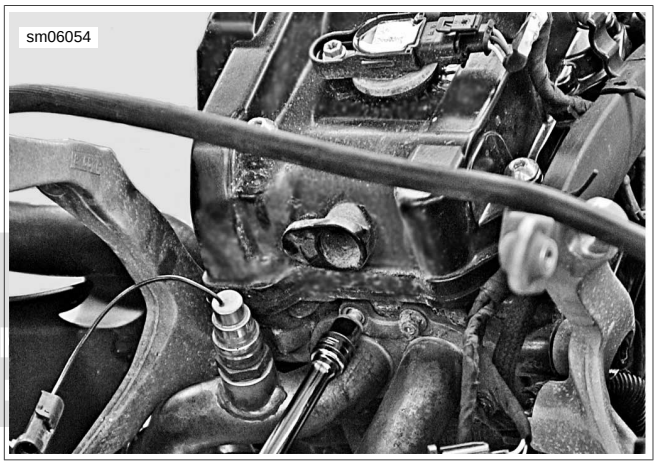



**Figure 3-44. Removing Headers**

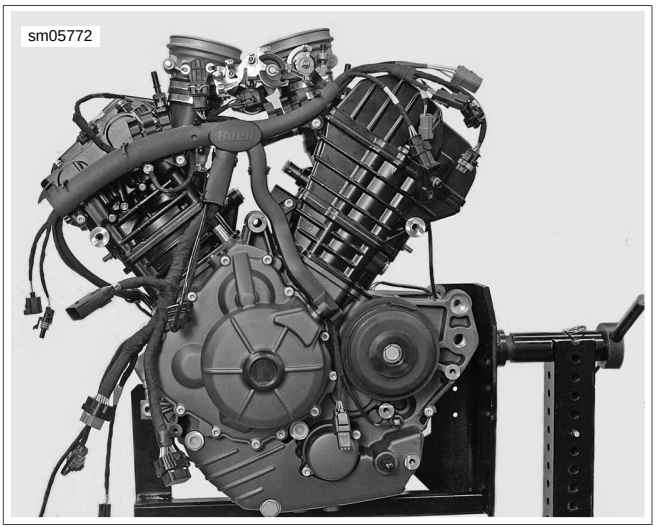



**Figure 3-45. Engine in Engine Cradle**

## ENGINE ASSEMBLY

1. With the rear wheel clamped in the lift chock, support and assemble the swingarm to the engine.
2. Install the swingarm pivot shaft. Do not tighten.
3. Install the engine headers. See 4.7 EXHAUST SYSTEM, Headers.
4. Loosely install the K-brackets.

*NOTE*

*The cooling system will be filled after the engine and chassis are assembled.*

5. Install the cooling system. See 5.4 ENGINE COOLANT and 5.9 OIL COOLER.

## ENGINE INSTALLATION

### Motor Mounts and K-Brackets

1. See Figure 3-46. Install rear motor mount fastener (4) on each side of vehicle. Do not tighten.
2. See Figure 3-47. Install left center motor mount fastener (2). Do not tighten.
3. See Figure 3-48. Install right center motor mount pinch spool and fastener (2) Do not tighten.
4. See Figure 3-49. Install fastener (3) and lockwasher (2) into right K-bracket (1). Install fastener (6) and lockwasher (5) into left K-bracket (4). Do not tighten.

*NOTE*

*The right footpeg support bracket will be final tighten when installing the muffler.*

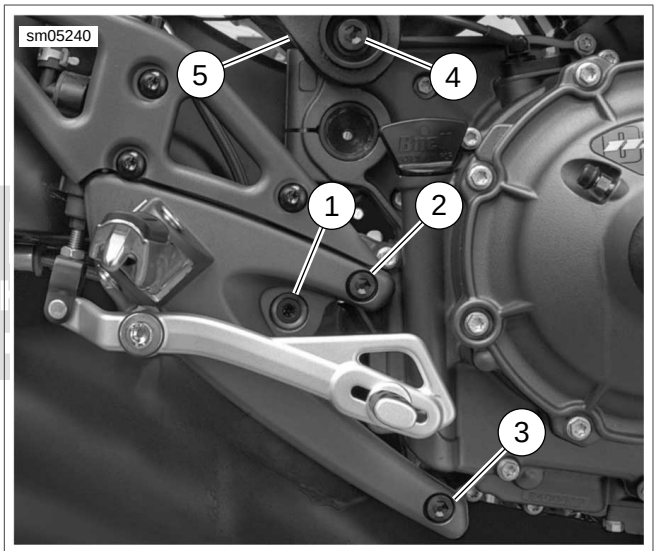
5. Route the rear brake reservoir through the tail section pan while loosely installing the right footpeg support bracket fasteners.

*NOTE*

*Before final tightening motor mounts and K-brackets, check for pinched hoses and wires. Verify the routing of the following:*

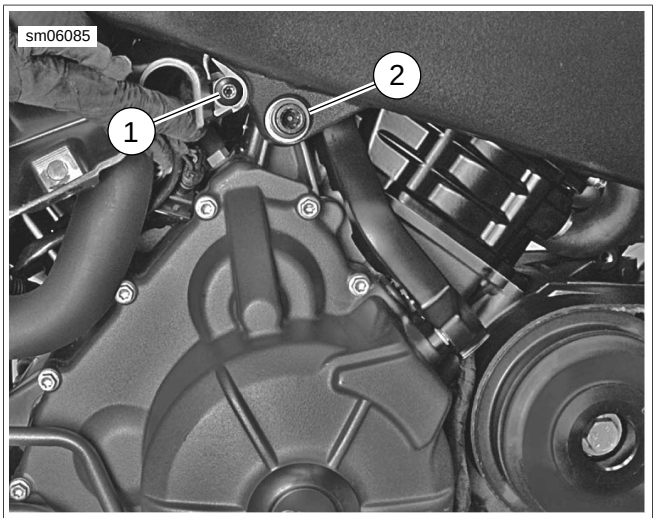
- *Rear O2 sensor wire*
- *Main wire harness*
- *Tank vent hose*
- *Crankcase breather hose*
- *VSS [65] sensor lead*
- *Stator wire*
- *Throttle cables*
- *Main harness to fan sub-harness*
- *Radiator vent hose*
- *Clutch fluid line*
- *Vacuum assist hose*

6. Tighten motor mount fasteners to 46-51 Nm (34-38 ft-lbs):
   a. Left rear motor mount fastener.
   b. See Figure 3-47. Left center motor mount fastener.
   c. See Figure 3-46. Right rear motor mount fastener (4).
   d. Right center motor mount fastener (2).
7. Tighten rear and center pinch bolts (1) to 24.5-27.0 Nm (18-20 ft-lbs).
8. Tighten engine mount K-bracket fasteners to 46-51 Nm (34-38 ft-lbs).
9. Tighten frame mount K-bracket fasteners to 31.8-35.3 Nm (23.5-26.0 ft-lbs).
10. Tighten the swingarm pivot to 60-62 Nm. (44-46 ft-lbs).
11. Apply LOCTITE 271 (red) and tighten the swingarm pivot pinch bolt to 27.1-29.8 Nm (20-22 ft-lbs).
12. Install lower shock absorber bolt and tighten to 20-23 Nm (15-17 ft-lbs).



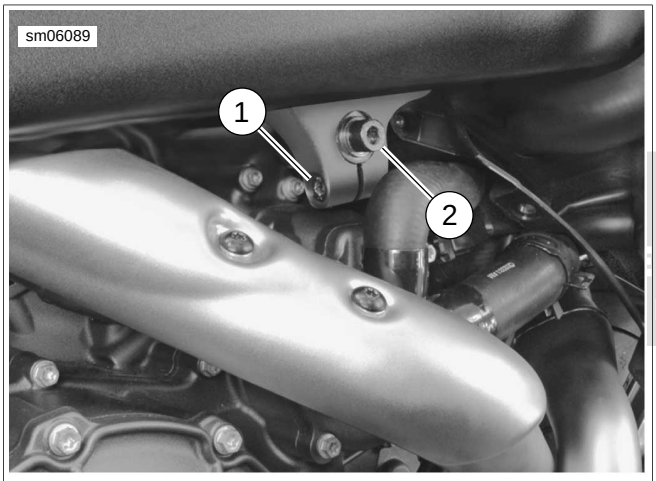

1. **Muffler fastener**
2. **Upper footpeg support fastener**
3. **Lower footpeg support fastener**
4. **Rear motor mount fastener**
5. **Pinch screw**

**Figure 3-46. Right Rider Footpeg Support**



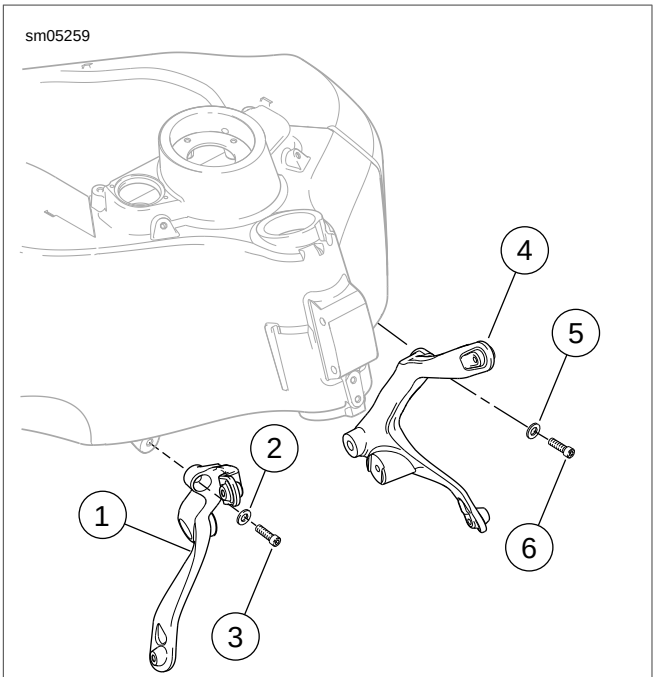

1. **Radiator mounting duct fastener**
2. **Motor mount fastener**

**Figure 3-47. Left Center Motor Mount**




1. **Pinch screw**
2. **Fastener**

**Figure 3-48. Right Motor Mount**




1. **Right K-bracket**
2. **Lockwasher**
3. **Fastener**
4. **Left K-bracket**
5. **Lockwasher**
6. **Fastener**

**Figure 3-49. K-Brackets**

## Right Side

1. Connect the rear O2 [137] sensor.
2. Tape the VSS [65] lead to the inside of the wire guide/fuel pump cover.
3. Route the VSS [65] lead.
4. Adjust fuel line routing and install the fuel pump cover. See 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover and 1.9 BLEEDING CLUTCH FLUID LINE.
5. Install the battery ground fastener and tighten to 9.6-10.6 Nm (85-94 **in-lbs**).
6. Fit the rear brake fluid line to the wire guide/fuel pump cover.
7. Join the rear brake light [121] connector housings and clip the connector into the wire guide/fuel pump cover.

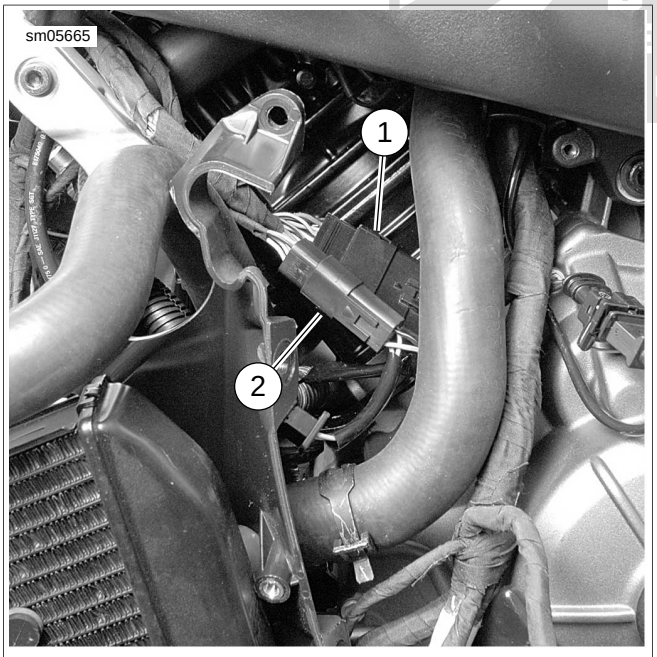
*NOTE*

*Always use **new** banjo bolt washers when connecting clutch line.*

8. Connect clutch line to engine. Tighten banjo bolt to 21.7-27.1 Nm (16-20 ft-lbs).
9. Install right footpeg support assembly. Do not tighten lower footpeg support fastener or rear muffler fastener at this time. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS.

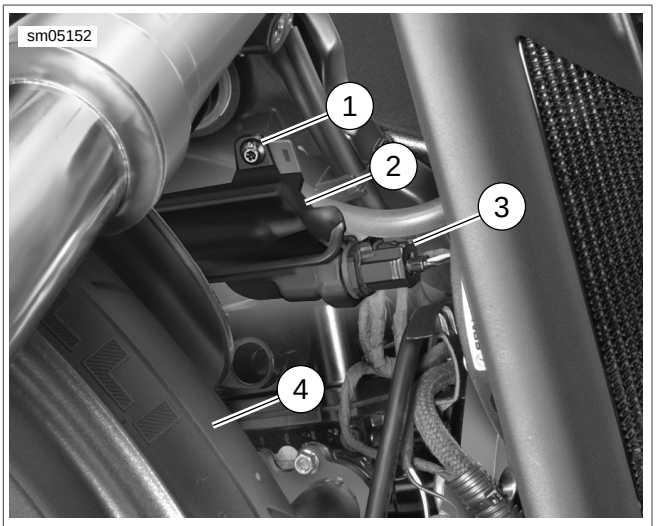
## Front of Engine

1. See Figure 3-50. Connect engine harness interface connector [145] (1).
2. Connect fan sub-harness connector [234 ] (2).
3. Install starter cable. Tighten fastener to 9.6-10.6 Nm (85-94 **in-lbs**).
4. See Figure 3-47. Install radiator outlet duct fasteners (1) to K-brackets. Tighten fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).
5. Install radiator inlet ducts. Tighten fasteners to 8.2-9.2 Nm (73-82 **in-lbs**).
6. Install overflow tank to right inlet duct. Tighten to 4.75-6.10 Nm (42-54 **in-lbs**).
7. Install left outer shroud. Tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).
8. Install intake snorkel.
   a. See Figure 3-51. Install intake snorkel (2) and fastener (1). Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
   b. Install IAT [89] sensor (3) into intake snorkel.
   c. Connect the front O2 sensor.
9. Connect horn [122] connectors.
10. Install front fender and tighten fasteners to 8.4-9.2 Nm (74-82 **in-lbs**).




**1. Engine harness interconnect connector [145]**
**2. Cooling fan sub-harness connector [234]**

**Figure 3-50. Fan and Engine Harness Connectors**

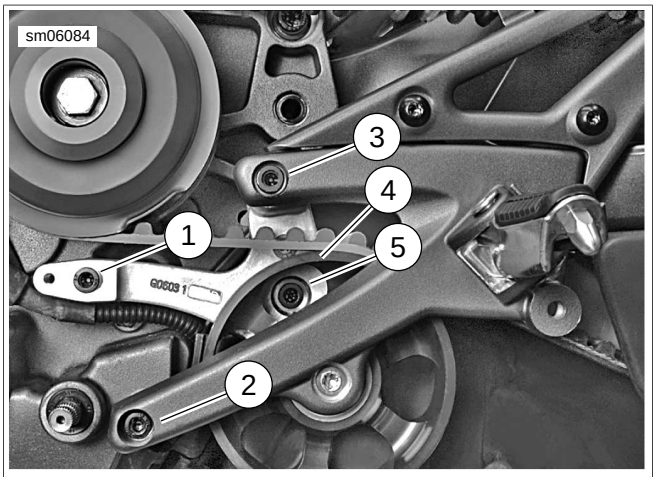



**1. Fastener**
**2. Intake snorkel**
**3. IAT sensor**
**4. Front tire**

**Figure 3-51. Intake Snorkel**

## Left Side

1. Loosen, but do not remove rear axle.
2. Install sidestand stop and fasteners. Tighten sidestand stop fasteners to 9.5-10.8 Nm (84-96 **in-lbs**).
3. Install sidestand and fasteners. Tighten sidestand fasteners to 46.1-51.5 Nm (34-38 ft-lbs).
4. Install muffler. Loosely install front muffler fasteners. See 4.7 EXHAUST SYSTEM.
5. Align drive sprocket and install belt on front sprocket.
6. See Figure 3-52. Install left footpeg support assembly. Do not tighten footpeg support fasteners, idler pulley bracket fasteners or rear muffler fastener. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS.
7. Install shift lever at same angle as lower portion of rider footpeg support bracket.
8. Install shift lever fastener and tighten to 9.6-10.6 Nm (85-94 **in-lbs**).
9. Install drive belt on rear pulley.
10. Apply LOCTITE ANTI-SEIZE LUBRICANT and tighten the rear axle.
    a. Tighten the rear axle to 31.2-36.6 Nm (23-27 ft-lbs).
    b. Back axle out two full turns and retighten axle to 65.1-70.5 Nm (48-52 ft-lbs).
11. Tighten rear axle pinch bolt to 54-61 Nm (40-45 ft-lbs).
12. Install engine sprocket cover and tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
13. Loosely install muffler. See 4.7 EXHAUST SYSTEM.




1. **Idler pulley bracket fastener**
2. **Lower footpeg support fastener**
3. **Upper footpeg support fastener**
4. **Idler pulley**
5. **Muffler fastener**

**Figure 3-52. Rider Footpeg Support (Left)**

## Final Tighten Exhaust System

*NOTE*

*The footpeg support bracket fasteners include the left and right muffler bolts.*

1. See Figure 3-46. Tighten fasteners (2, 3) to 24.5-27.0 Nm (18-20 ft-lbs).
2. See Figure 3-52. Tighten fasteners (2, 3) to 24.5-27.0 Nm (18-20 ft-lbs).
3. Tighten idler pulley bracket fastener (1) to 24.5-27.0 Nm (18-20 ft-lbs).
4. If loose, tighten the remaining muffler fasteners:
   a. Tighten the left and right muffler fasteners to 24.5-27.0 Nm (18-20 ft-lbs).
   b. The header flange nuts to20 Nm (15 ft-lbs).
   c. Torca clamps to 9.5-10.8 Nm (84-96 **in-lbs**).
5. Install heat deflector and fastener. Tighten fastener to 3.6-4.1 Nm (32-36 **in-lbs**).

*NOTES*

- *Be sure wire clip at bottom of engine sprocket cover engages sidestand sensor wiring.*
- *Be sure wire guard engages sidestand sensor wiring, neutral switch wiring and engine case fasteners.*

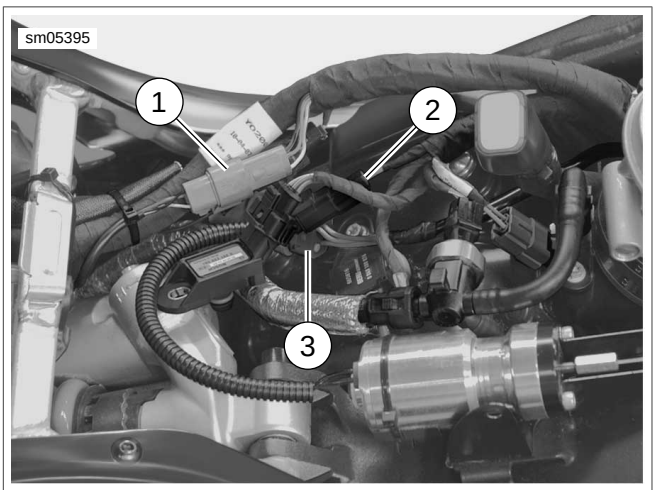
6. Install upper belt guard. Tighten fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).
7. Install lower belt guard. Tighten fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).

## Upper Engine

1. See Figure 3-53. Connect ECT [90] sensor connector.
2. See Figure 3-54. Connect active intake solenoid [178] connector (2).
3. Connect stator [46] plug (3).
4. Connect VSS [65] connector (1).
5. Connect the following:
   a. TP [88] sensor
   b. IAC [87]
6. Install the throttle body. See 4.5 THROTTLE BODY.
7. Connect throttle cables.
8. Connect active intake solenoid cable.
9. Verify throttle operation.
10. See Figure 3-56. Install the fuel rail.
11. Install starter solenoid cover. Tighten fastener to 4.1-6.8 Nm (36-60 **in-lbs**).
12. See Figure 3-55. Install the rear brake fluid reservoir fastener. Tighten to 3.6-4.1 Nm (32-36 **in-lbs**).

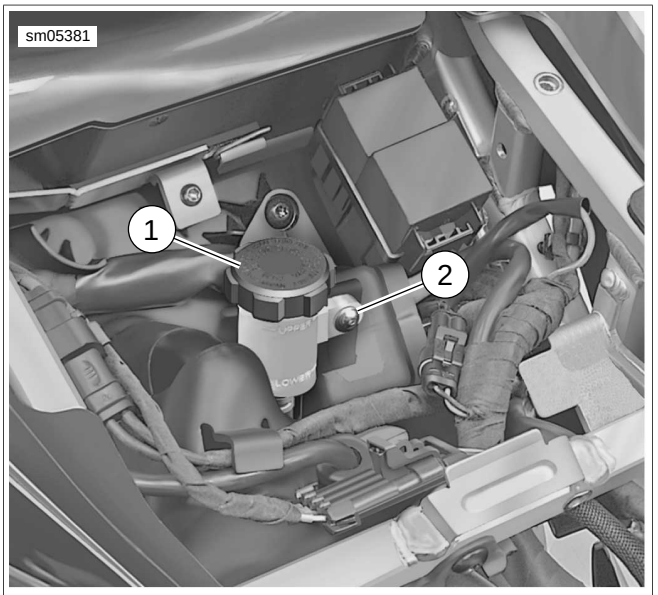



**Figure 3-53. Engine Temperature Sensor**




1. **VSS connector**
2. **Active intake solenoid connector**
3. **Stator connector**

**Figure 3-54. Connectors Under Seat**




1. **Rear brake fluid reservoir**
2. **Fastener**

**Figure 3-55. Rear Brake Fluid Reservoir**




**Figure 3-56. Fuel Line Connector**

## Return to Service

1. Install the air cleaner assembly. See 1.6 AIR FILTER ELEMENT.
2. Pull IAC hose 10-11 mm (0.39-0.43 in) above air box baseplate.
3. Connect fuel pump electrical connector [86].
4. Connect the negative battery cable. Tighten fastener to 6.8-7.9 Nm (60-70 **in-lbs**).
5. Install the tail section body work.
6. Add fluid to clutch master cylinder reservoir and bleed system. See 1.9 BLEEDING CLUTCH FLUID LINE.
7. Add engine oil. See 1.5 ENGINE OIL AND FILTER.
8. Add engine coolant. See 1.15 ENGINE COOLANT.
9. Verify engine coolant level and install right side radiator shroud. Tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# REBUILD TIMING INSTRUCTIONS 3.6

## TIMING

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |

### Front Cylinder TDC

Sequence both the disassembly and assembly of engine components to the TDC timing of the front and rear cylinders. Refer to Table 3-18.

To begin a top end disassembly or assembly , lock the front cylinder at TDC compression with the CRANKSHAFT LOCKING TOOL (Part No. B-48858).

See Figure 3-57. To confirm TDC compression, check the position of the front cylinder camshaft lobes.

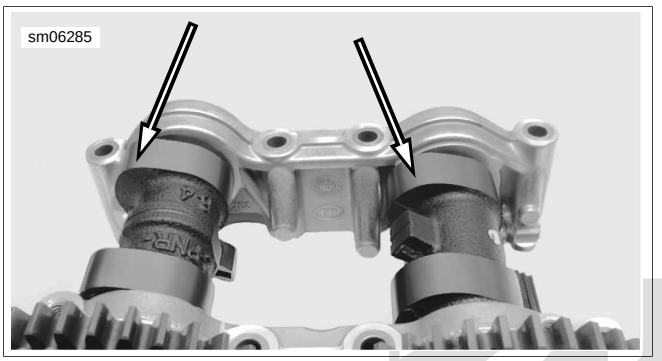



**Figure 3-57. Front Cylinder Camshaft Lobe Position at TDC Compression**

### 270 Degree Rotation

In sequence, remove the camshaft locking tool and rotate the engine in the direction of rotation 270 degrees to rear cylinder TDC compression.

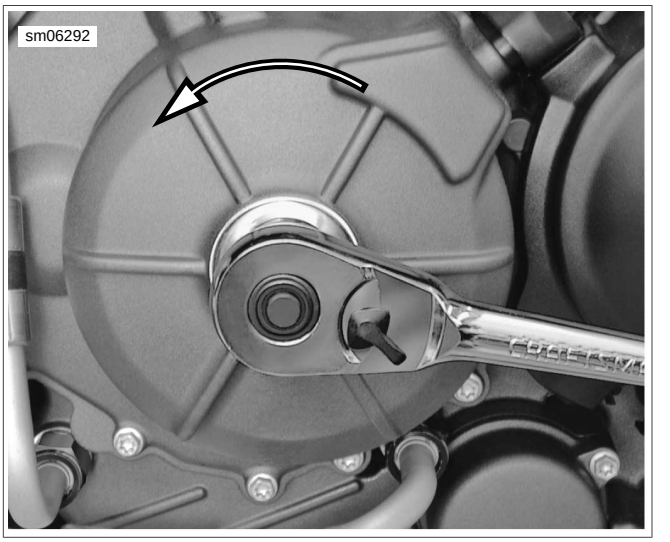



**Figure 3-58. Rear TDC 270 Degrees from Front TDC**

### Rear Cylinder TDC

Lock the rear cylinder at TDC with the CRANKSHAFT LOCKING TOOL (Part No. B-48858).

See Figure 3-59. To confirm TDC, check the position of the rear cylinder camshaft lobes.

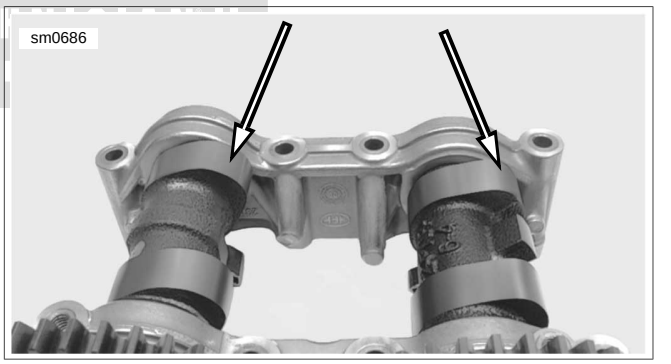



**Figure 3-59. Rear Cylinder Camshaft Lobe Position at TDC Compression**

**Table 3-18. Engine Rebuild Sequence by Component**

| DISASSEMBLY | ASSEMBLY |
|---|---|
| Coils | Transmission gears |
| Spark plugs | Install transmission |
| Throttle body/intake flanges | Connection rods |
| Valve covers | Crankshaft assembly |
| TDC: front cylinder | Crankcases |
| Front camshaft assembly | TDC: front cylinder |
| Front cylinder head | Shift shaft |
| Front cylinder | Oil pump |
| Front piston | Balancer/chain/tensioner (clutch side) |
| Water pump cover | Clutch hub |
| Clutch diaphragm outer cover | Clutch pack |
| Clutch diaphragm | Clutch cover |
| Clutch cover | Clutch diaphragm |
| Clutch pack | Clutch diaphragm outer cover |
| Clutch hub | Water pump cover |
| Balancer/chain/tensioner (clutch side) | Front piston |
| Oil pump | Front cylinder |
| Shift shaft | Front cylinder head |
| TDC: rear cylinder | Front camshaft assembly |
| Rear cam assembly | Bypass valve |
| Rear cylinder head | Oil filter |
| Rear cylinder | Starter |
| Rear piston | Balancer/chain/tensioner (alternator side) |
| Ignition cover | Rotor |
| Rotor | Ignition cover |
| Balancer/chain/tensioner (alternator side) | TDC: rear cylinder |
| Starter | Rear piston |
| Oil filter | Rear cylinder |
| Bypass valve | Rear cylinder head |
| Split cases | Rear camshaft assembly |
| Crankshaft assembly | Valve covers |
| Connecting rods | Intake flanges/throttle bodies |
| Transmission assembly | Spark plugs |
| Transmission gears | Coils |

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## TOP DEAD CENTER (TDC)

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |

### General

This section describes how to set the cylinders at TDC of the compression stroke. This is achieved by using the crankshaft locking tool.

### Locking Crankshaft

1. Drain engine oil. See 1.5 ENGINE OIL AND FILTER.
2. Rotate engine. See 3.4 ENGINE ROTATION.
3. Remove spark plugs. See 1.12 SPARK PLUGS.
4. Remove ignition cover sealing sleeve. See 3.11 ALTERNATOR SIDE.
5. Remove valve covers. See 3.7 CAMSHAFT ASSEMBLY, Valve Covers.
6. See Figure 3-60. Remove crankcase access plug (3).

*NOTES*

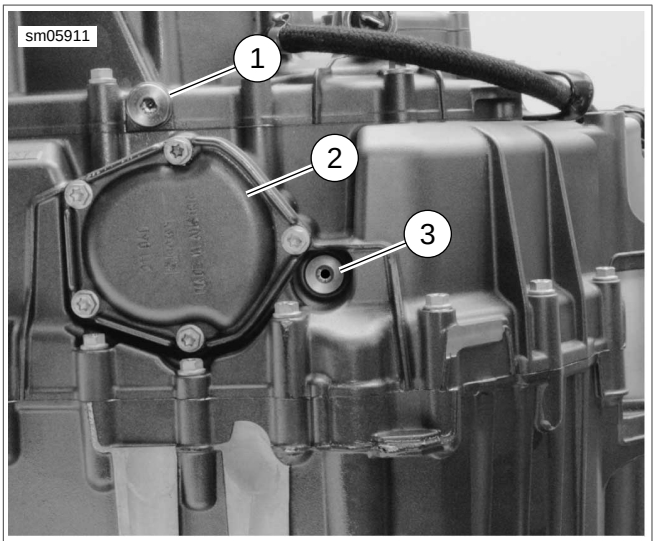
- *While turning engine, do not damage ignition cover.*
- *Turn engine by rotating rotor fastener on end of crankshaft.*

7. Turn engine until cylinder is at TDC of the compression stroke.
   a. While turning engine in direction of rotation, watch intake valves open then close.
   b. Watch in spark plug hole for piston to rise to top of cylinder.

*NOTE*

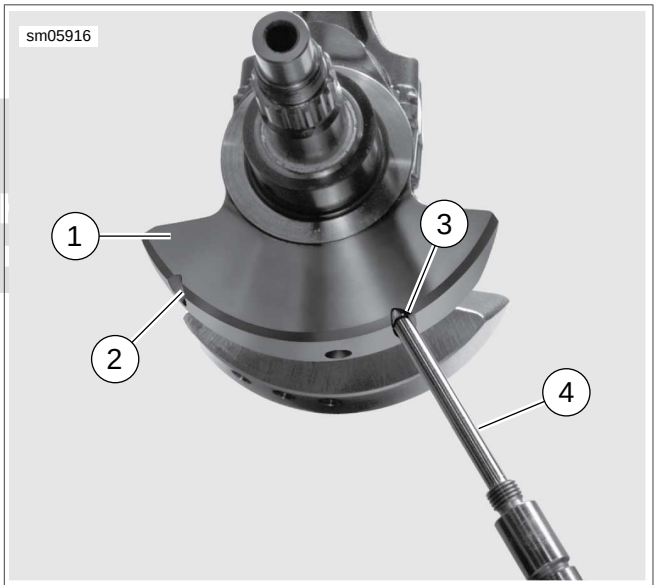
*Turn engine back and forth slightly while treading crankshaft locking tool into crankshaft. Both sides of notch should be felt to verify tool is fully engaged in notch.*

   c. See Figure 3-61. Thread CRANKSHAFT LOCKING TOOL (Part No. B-48858) into crankcase until end of tool engages notch in crankshaft.




1. **Engine oil drain plug**
2. **Oil strainer cover**
3. **Crankshaft access plug**

**Figure 3-60. Crankshaft Access Plug**




1. **Crankshaft**
2. **Front cylinder notch**
3. **Rear cylinder notch**
4. **Crankshaft locking tool**

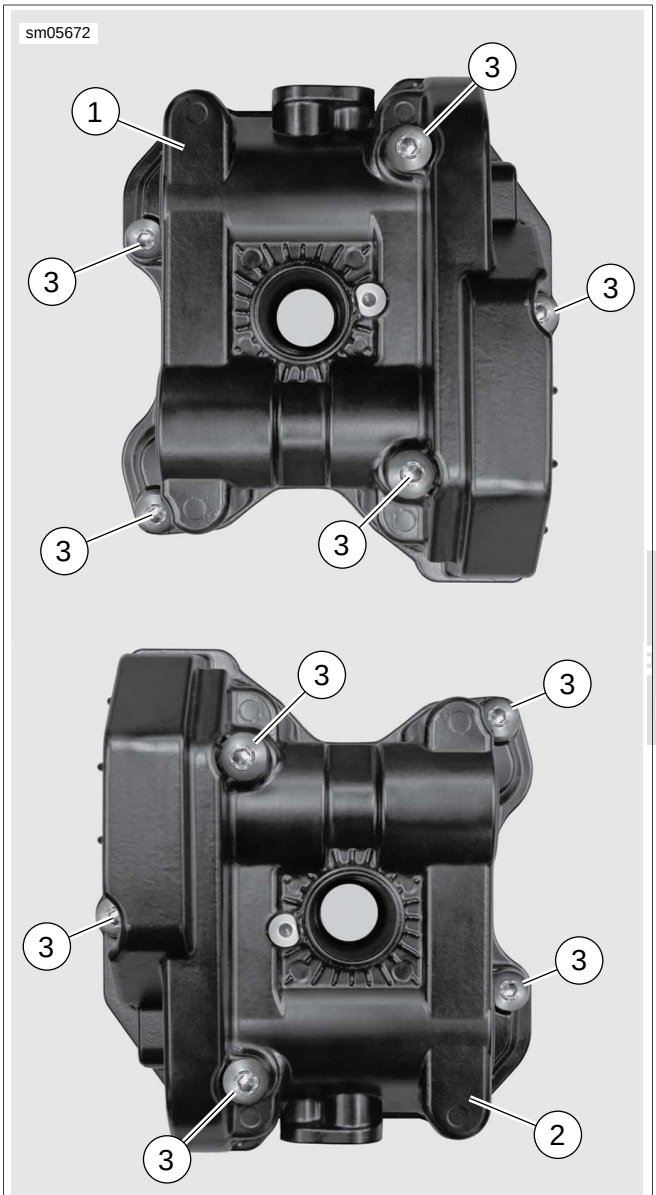
**Figure 3-61. Locking Crankshaft**

# CAMSHAFT ASSEMBLY 3.7

## VALVE COVERS

### Removal

1. See Figure 3-62. Loosen the valve cover fasteners (3).
2. Remove the front (1) and rear (2) valve covers.




1. **Front valve cover**
2. **Rear valve cover**
3. **Valve cover fastener**

**Figure 3-62. Front and Rear Valve Cover Orientation**

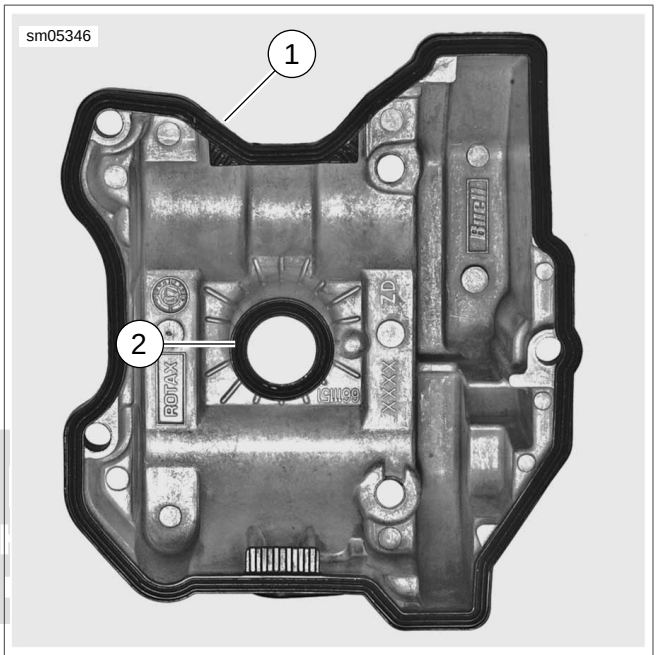
### Installation

1. See Figure 3-63. Inspect the cover gasket seals (1). Replace if damaged or torn.
2. Inspect the coil gasket seals (2). Replace if damaged or torn.
3. See Figure 3-62. Orient the covers to the cylinder heads.

*NOTE*

*See Figure 3-64. The fastener stop will bottom against the cylinder head.*

4. Install and finger tighten the valve cover fasteners.
5. See Figure 3-65. In sequence, tighten to 9 Nm (77 **in-lbs**).




1. **Cover gasket**
2. **Coil gasket**

**Figure 3-63. Valve Cover**




**Figure 3-64. Cylinder Head Stop**

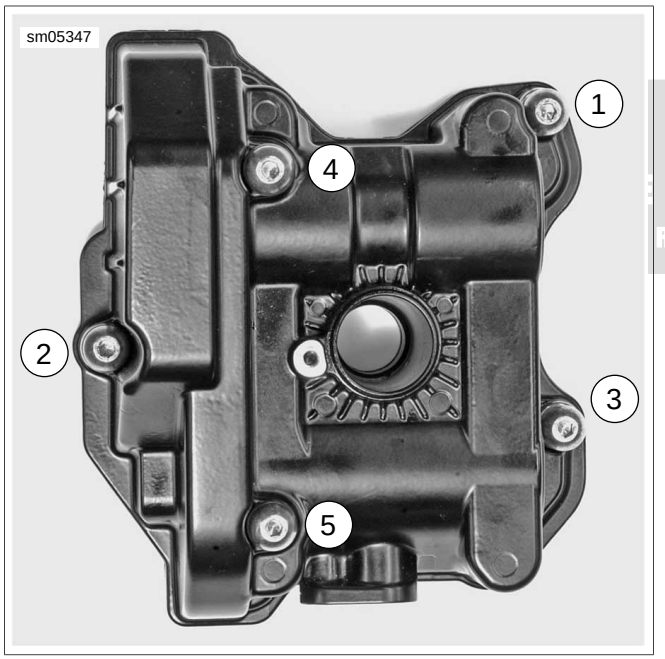



**Figure 3-65. Valve Cover Torque Sequence**

## REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |

1. Rotate engine. See 3.5 ENGINE REPLACEMENT.
2. Remove valve covers. See 3.7 CAMSHAFT ASSEMBLY, Valve Covers.
3. Measure and record the valve lash of all valves. See 1.16 VALVE CLEARANCE.
4. Measure camshaft endplay by inserting feeler gauge between cam lobe and camshaft bracket. Refer to Table 3-5 for specifications and service wear limits.
5. Set piston of cylinder to be worked on to TDC. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).

*NOTES*

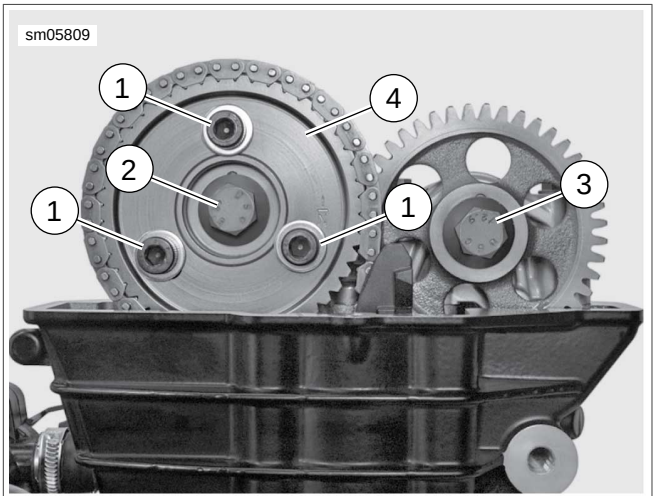
- *Before loosening any camshaft fasteners, use the CRANKSHAFT LOCKING TOOL (Part No. B-48858) to lock the camshafts.*
- *See Figure 3-66. If servicing camshaft sprocket (4) or camshafts, loosen sprocket fasteners (1), intake camshaft fastener (2) and exhaust camshaft fastener (3) before camshaft assembly removal. Put shop towel in cylinder to prevent fasteners from falling into engine.*
- *Mark camshaft assembly parts during disassembly to maintain same orientation during assembly.*

6. See Figure 3-67. Remove camshaft chain tensioner plug of cylinder being serviced.
7. See Figure 3-68. Remove camshaft chain tensioner using magnet on unmachined surface (1) of tensioner.
8. See Figure 3-69. Remove camshaft chain guide from cylinder.
9. See Figure 3-70. Loosen camshaft bracket fasteners in reverse order of torque sequence.
10. Remove camshaft bracket fasteners.

*NOTES*

- *Camshaft assembly can fall apart on removal. To prevent damage to components, hold assembly together during removal.*
- *During camshaft assembly removal, be sure camshaft bracket dowels do not fall in cylinder.*

11. See Figure 3-71. Remove camshaft assembly by sliding camshaft chain (1) off of sprocket (2) while lifting assembly.




1. **Sprocket fasteners**
2. **Intake camshaft fastener**
3. **Exhaust camshaft fastener**
4. **Camshaft sprocket**

**Figure 3-66. Camshaft Fasteners**

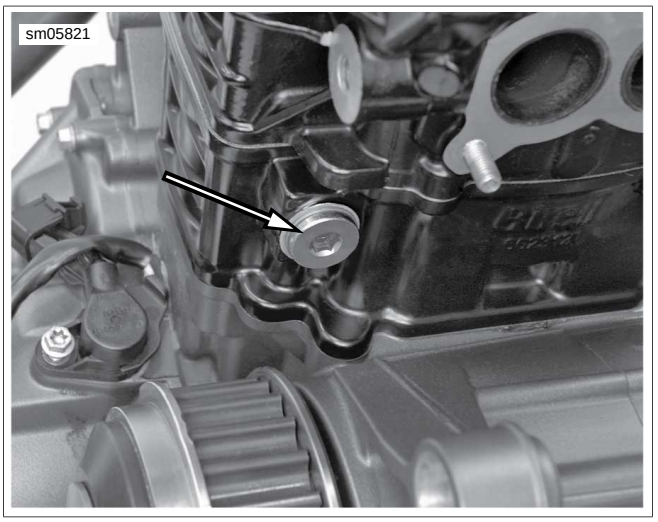



**Figure 3-67. Camshaft Chain Tensioner Plug**

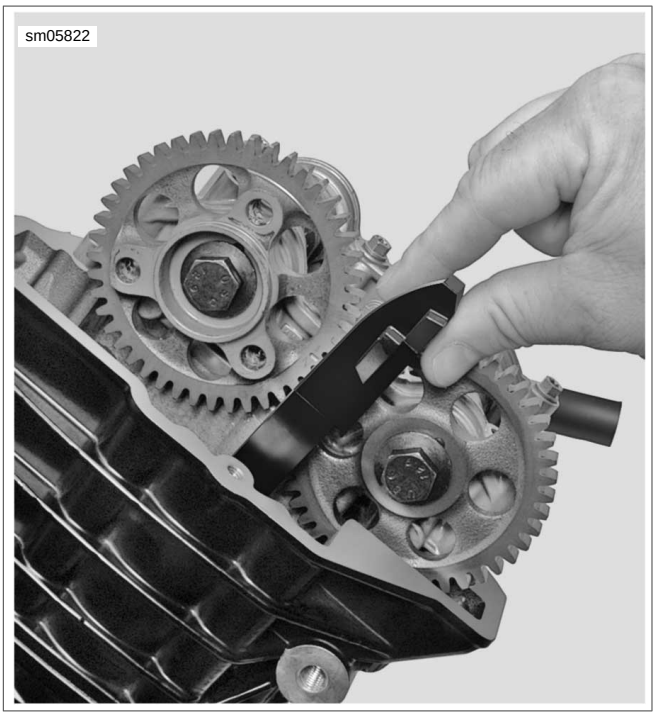
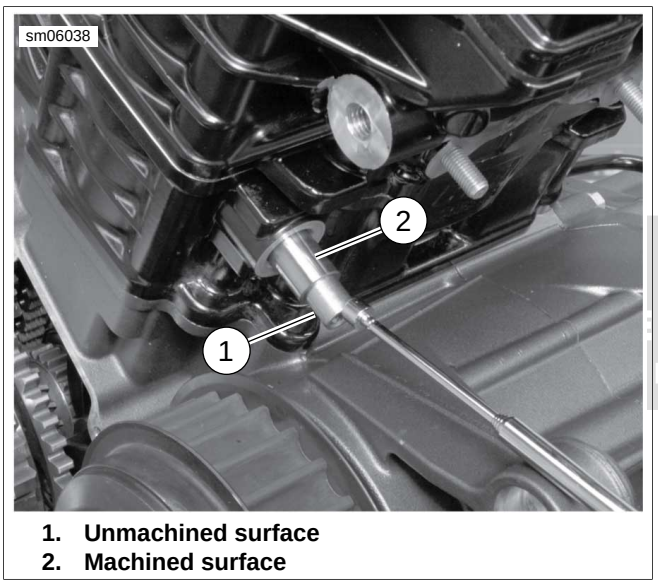



**Figure 3-69. Camshaft Chain Guide**




1. **Unmachined surface**
2. **Machined surface**

**Figure 3-68. Camshaft Chain Tensioner**

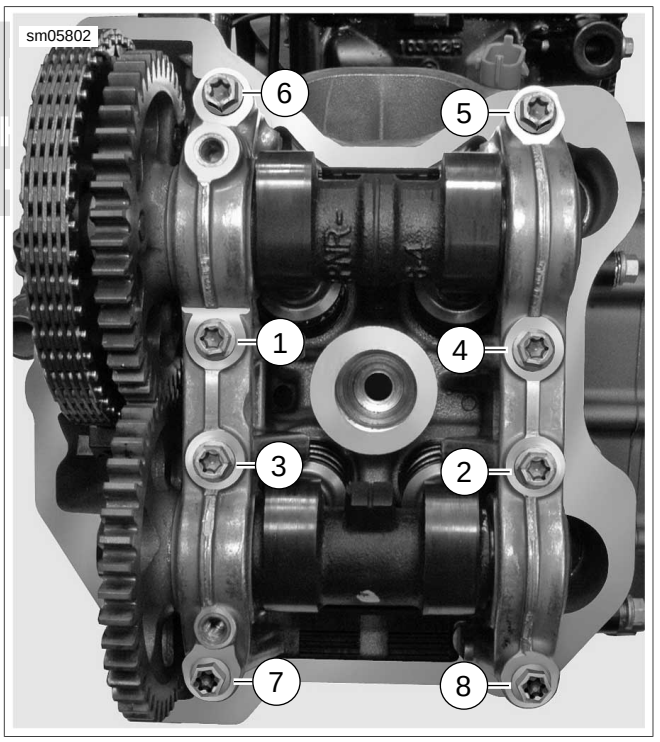
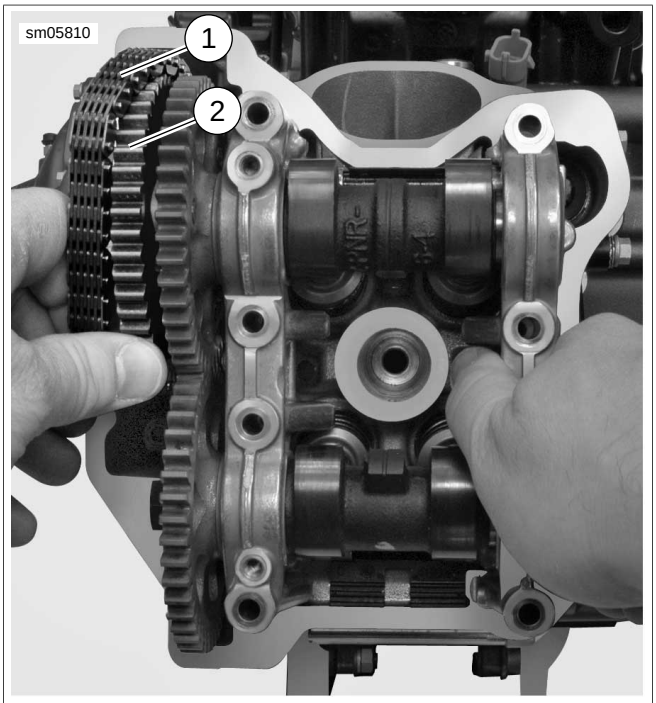



**Figure 3-70. Camshaft Assembly Torque Sequence**




1. **Chain**
2. **Sprocket**

**Figure 3-71. Camshaft Assembly Removal**

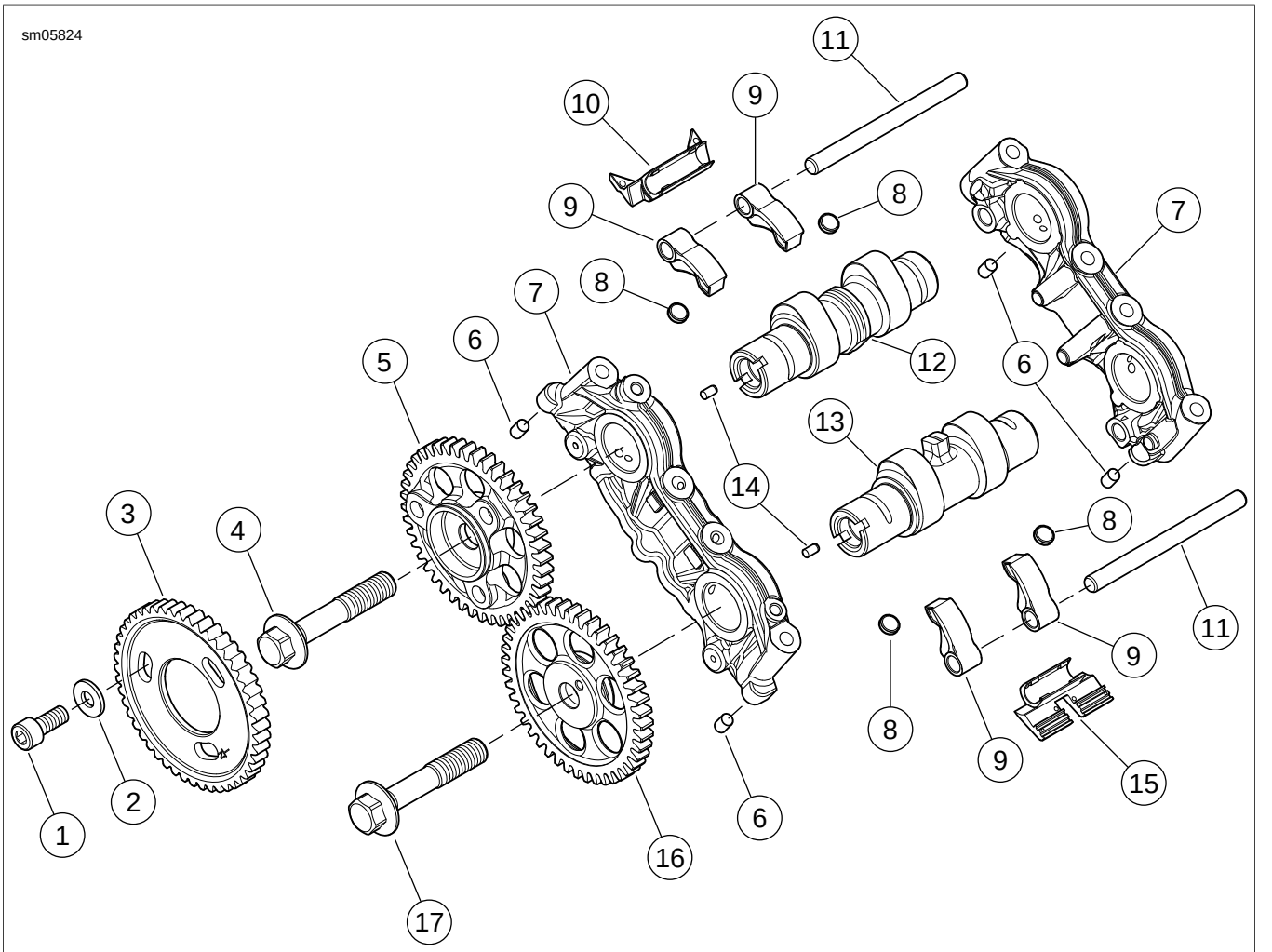
## DISASSEMBLY

*NOTE*

*Mark location of parts during disassembly so they can be installed in same location during reassembly.*

1. See Figure 3-72. Remove sprocket fasteners (1), washers (2) and camshaft sprocket (3).
2. Remove intake camshaft gear fastener (4) and intake camshaft gear (5). Discard fastener.
3. Remove exhaust camshaft gear fastener (17) and exhaust camshaft gear (16). Discard fastener.
4. Remove intake follower spacer (10) and exhaust follower spacer (15).
5. Remove one of the camshaft brackets (7) from intake (12) and exhaust (13) camshafts.
6. Remove cam follower shafts (11) and cam followers (9) from camshaft bracket.
7. Remove camshafts from remaining camshaft bracket.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON




1. **Sprocket fastener (3)**
2. **Washer (3)**
3. **Camshaft sprocket**
4. **Intake camshaft gear fastener**
5. **Intake camshaft gear**
6. **Camshaft bracket dowel**
7. **Camshaft bracket**
8. **Shim**
9. **Cam follower**
10. **Intake follower spacer**
11. **Cam follower shaft**
12. **Intake camshaft**
13. **Exhaust camshaft**
14. **Camshaft pin**
15. **Exhaust follower spacer**
16. **Exhaust camshaft gear**
17. **Exhaust camshaft gear fastener**

**Figure 3-72. Camshaft Assembly**

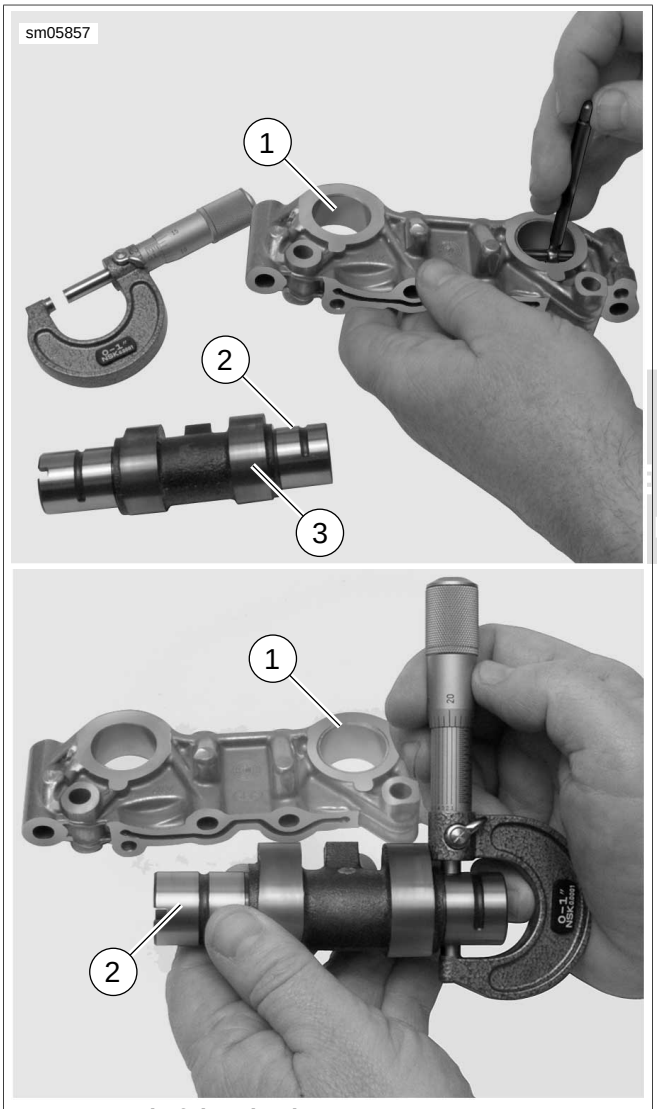
## CLEANING AND INSPECTION

**⚠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)**

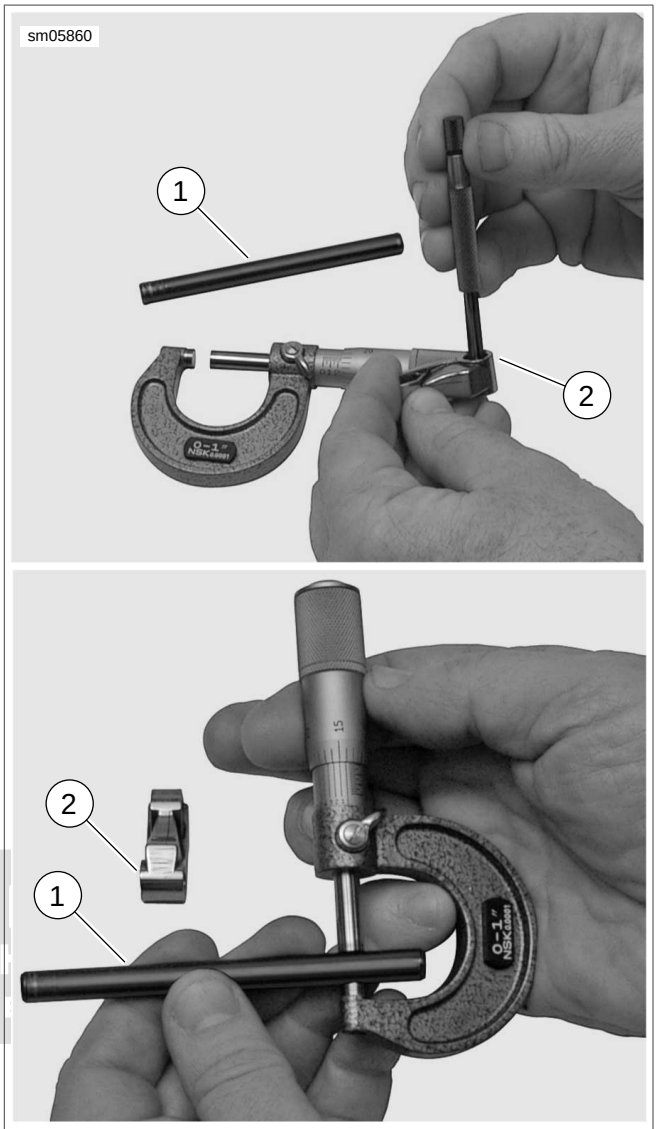
1. Wash all parts in non-flammable cleaning solvent. Blow parts dry with low pressure compressed air.
2. See Figure 3-73. Obtain camshaft clearance measurement by measuring camshaft bracket bore (1) and corresponding camshaft journal (2).
   a. Subtract the camshaft journal measurement from the camshaft bracket bore measurement to calculate the running clearance. Replace if necessary.
   b. For clearance specifications and service wear limits, refer to Table 3-5.
3. Inspect camshaft bracket bores, camshaft journals and camshaft lobes for excessive wear. Replace if necessary.

4. See Figure 3-74. Obtain cam follower clearance measurement by measuring cam follower bore (2) and corresponding cam follower shaft (1).
   a. Subtract the cam follower shaft measurement from the cam follower bore measurement to calculate the running clearance. Replace if necessary.
   b. For clearance specifications and service wear limits, refer to Table 3-5.
   c. Inspect cam followers and cam follower shafts for excessive wear. Replace if necessary.
5. Inspect chain tension guide and chain guide groove depths for wear. Refer to Table 3-5 for specifications and service wear limits.




1. **Camshaft bracket bore**
2. **Camshaft journal**
3. **Camshaft lobe**

**Figure 3-73. Measuring Camshaft Clearance**




1. **Cam follower shaft**
2. **Cam follower**

**Figure 3-74. Measuring Cam Follower Clearance**

## INSTALLATION (IF CAMSHAFTS OR CAM SPROCKET WERE NOT REMOVED)

*NOTES*

- *If camshaft assembly has been disassembled, see 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation.*
- *Before installing camshaft assembly, be sure valve shims are installed in proper locations in the top of each valve spring retainer with lettered side down.*
- *Before installing camshaft assembly, be sure camshaft bracket dowels are installed in cylinder head.*
- *After camshaft assembly installation, be sure intake and exhaust follower spacers are in correct position. See 1.16 VALVE CLEARANCE for proper follower positions.*

1. Verify that piston of cylinder to be worked on is at TDC compression. See 3.8 CYLINDER HEADS.

2. Lubricate lobes of camshafts with a thin film of LUBRIPLATE No. 105 Motor Assembly Grease. In addition apply a thin film of clean engine oil to lobes.
3. With timing marks lined up and while holding cam followers in position, install camshaft assembly on cylinder head making sure camshaft bracket dowels engage camshaft brackets.
4. While keeping timing marks lined up, install camshaft chain on camshaft sprocket.
5. See Figure 3-75. Install camshaft bracket fasteners and tighten in sequence shown to 10 Nm (89 **in-lbs**).
6. Install camshaft chain guide.
7. Install camshaft chain tensioner.
8. See Figure 3-76. Check sealing ring for damage, replace if necessary. Install camshaft chain tensioner plug. Tighten to 30 Nm (22 ft-lbs).

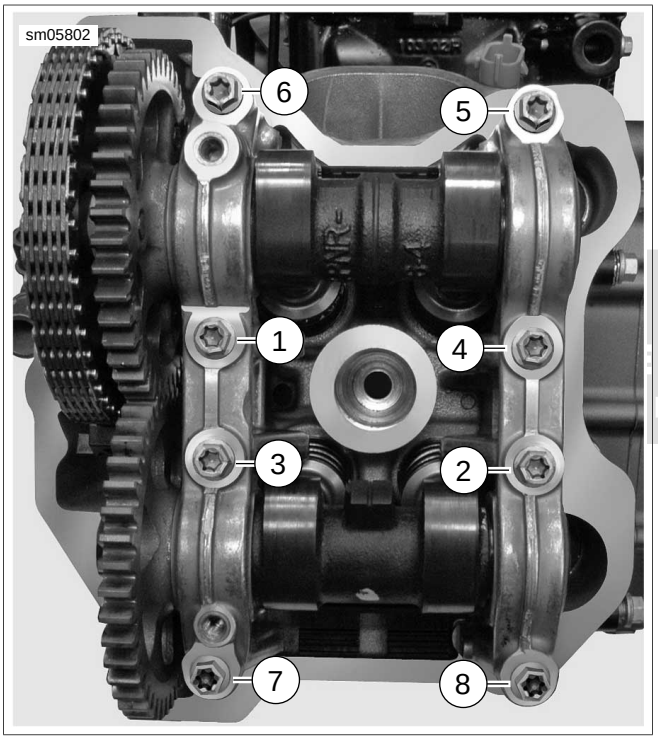



**Figure 3-75. Camshaft Assembly Torque Sequence**

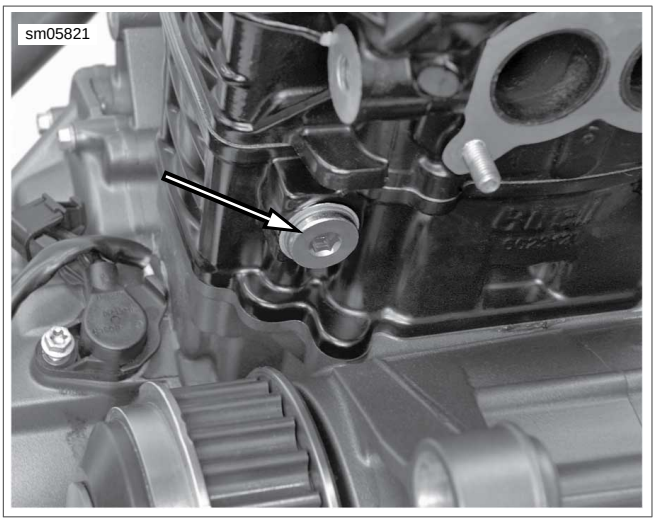



**Figure 3-76. Camshaft Chain Tensioner Plug**

## ASSEMBLY/INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| B-49258 | CAMSHAFT LOCKING TOOL |

*NOTES*

- *Before installing camshaft assembly, verify that piston of cylinder being worked on is at TDC compression. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).*
- *Before installing camshaft assembly, be sure valve shims (8) are installed in proper locations in the top of each valve spring retainer with lettered side down.*
- *See Figure 3-77. The camshaft bracket identification mark is located in one of the positions shown. Use identification marks when assembling camshaft assemblies.*
- *See Figure 3-78 and Figure 3-79. Front camshafts have grooves. Rear camshafts do not have grooves.*

1. Assemble camshafts.
   a. Lubricate journals and lobes of camshafts with a thin film of LUBRIPLATE No. 105 Motor Assembly Grease. In addition, apply a thin film of clean engine oil to cam journals and lobes.
   b. Insert cams into one of the camshaft brackets.
   c. Insert cam follower shafts into camshaft bracket containing cams.
   d. Slide cam followers onto cam follower shafts.
   e. Slide opposite camshaft bracket onto camshafts and cam follower shafts.

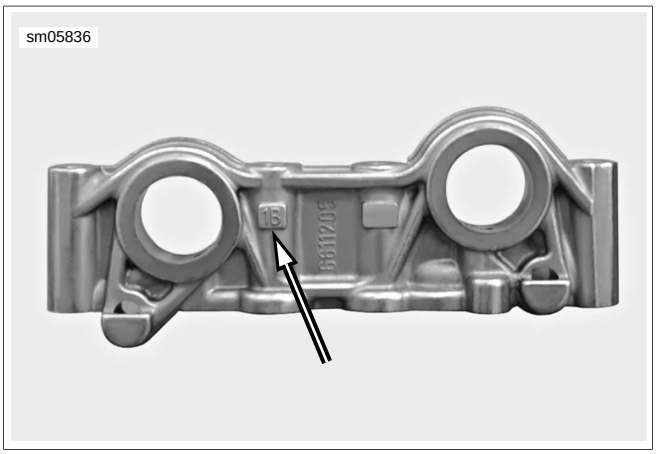
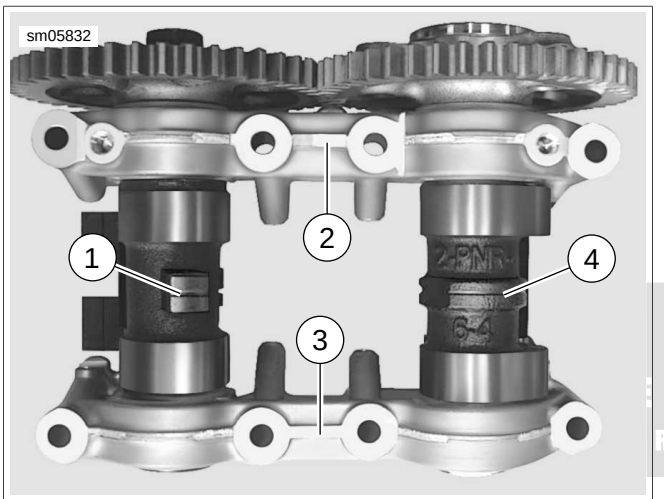
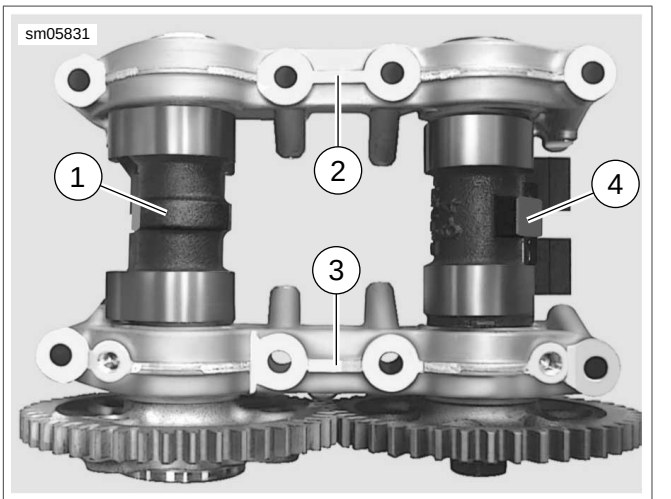



**Figure 3-77. Camshaft Bracket Identification**




1. **Front exhaust camshaft (groove)**
2. **Camshaft bracket (1A)**
3. **Camshaft bracket (1B)**
4. **Front intake camshaft (groove)**

**Figure 3-78. Front Camshaft Assembly**




1. **Rear intake camshaft (no groove)**
2. **Camshaft bracket (2B)**
3. **Camshaft bracket (2A)**
4. **Rear exhaust camshaft (no groove)**

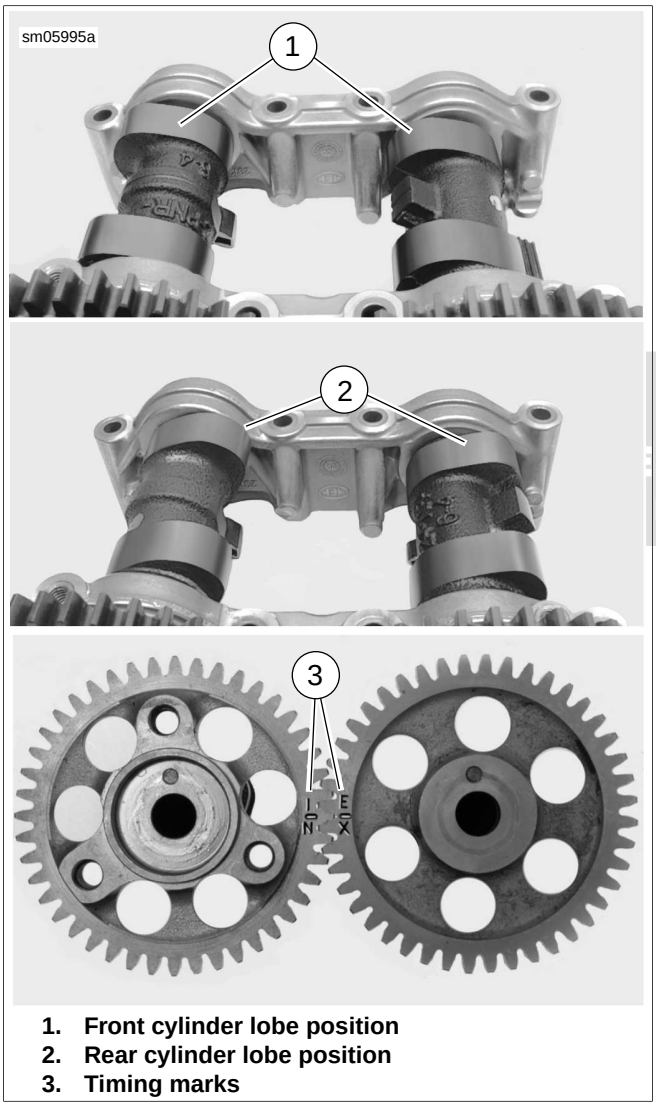
**Figure 3-79. Rear Camshaft Assembly**

*NOTE*

*Camshaft gear can be installed on camshafts in two different positions. If camshaft gear is installed on camshaft in the wrong position, cam timing will be incorrect.*

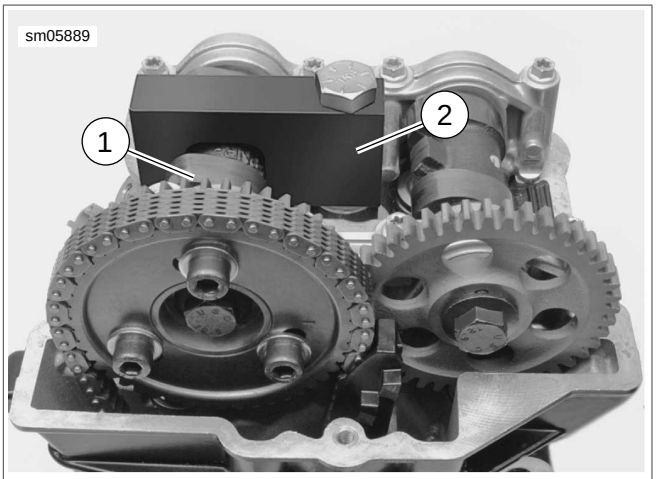
2. Assemble camshaft gears on camshaft.
   a. See Figure 3-80. Install camshaft gears on camshafts. Camshaft lobes (1, 2) must be in positions shown, and timing marks (3) on gears must line up.
   b. Install **new** intake and exhaust camshaft gear fasteners (finger tight.
   c. Install camshaft sprocket so timing mark lines up with timing mark on exhaust camshaft gear.
   d. Apply LOCTITE 243 (blue) to the threads of sprocket fasteners.
   e. Loosely install sprocket fasteners and washer. Do not tighten at this time.
3. With timing marks lined up and while holding cam followers in position, install camshaft assembly on cylinder head. Make sure camshaft bracket dowels engage camshaft brackets.
4. Keep timing marks lined up, and install camshaft chain on camshaft sprocket.
5. See Figure 3-75. Install camshaft bracket fasteners and tighten in sequence to 10 Nm (89 **in-lbs**).
6. Install camshaft chain guide.
7. See Figure 3-81. Install CAMSHAFT LOCKING TOOL (Part No. B-49258) (2) to lock camshafts in proper position.
8. Lubricate camshaft chain tensioner with clean engine oil and install.

9. See Figure 3-76. Check sealing ring for damage. Replace if necessary. Install camshaft chain tensioner plug. Tighten to 30 Nm (22 ft-lbs).
10. Install camshaft gear fasteners.
    a. Tighten to 40 Nm (30 ft-lbs).
    b. Turn each fastener +80 degrees.
11. Tighten camshaft sprocket fasteners to 30 Nm (22 ft-lbs).
12. Remove camshaft locking tool.
13. Remove crankshaft locking tool. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).
14. Install valve covers. See 3.7 CAMSHAFT ASSEMBLY, Valve Covers.




1. **Front cylinder lobe position**
2. **Rear cylinder lobe position**
3. **Timing marks**

**Figure 3-80. Camshaft Timing**




1. **Intake camshaft**
2. **Camshaft locking tool**

**Figure 3-81. Camshaft Locking Tool**

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RLEY-DAVIDSON

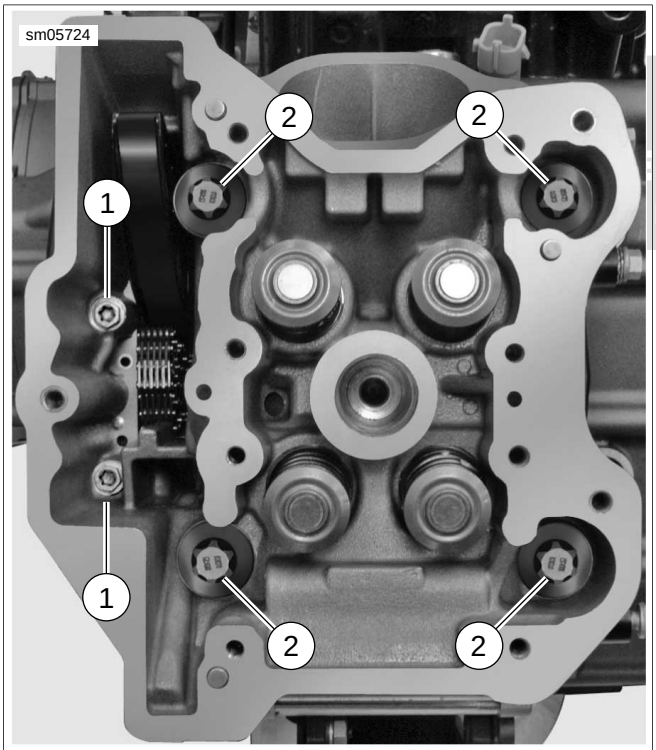
# CYLINDER HEADS 3.8

## CYLINDER HEAD: REMOVAL

*NOTE*

*Record the size and location of each valve shim before removal.*

1. Remove engine from frame. See 3.5 ENGINE REPLACEMENT.
2. Remove camshaft assembly. See 3.7 CAMSHAFT ASSEMBLY.
3. Verify cylinder head being removed is locked at TDC. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).
4. Remove the thermostat assembly. See 5.5 THERMOSTAT.
5. See Figure 3-82. Remove small cylinder head fasteners (1).
6. See Figure 3-83. Loosen large cylinder head fasteners in cross pattern.
7. Remove large cylinder head fasteners and cylinder head.




1. **Small cylinder head fasteners**
2. **Large cylinder head fasteners**

**Figure 3-82. Cylinder Head Fasteners**

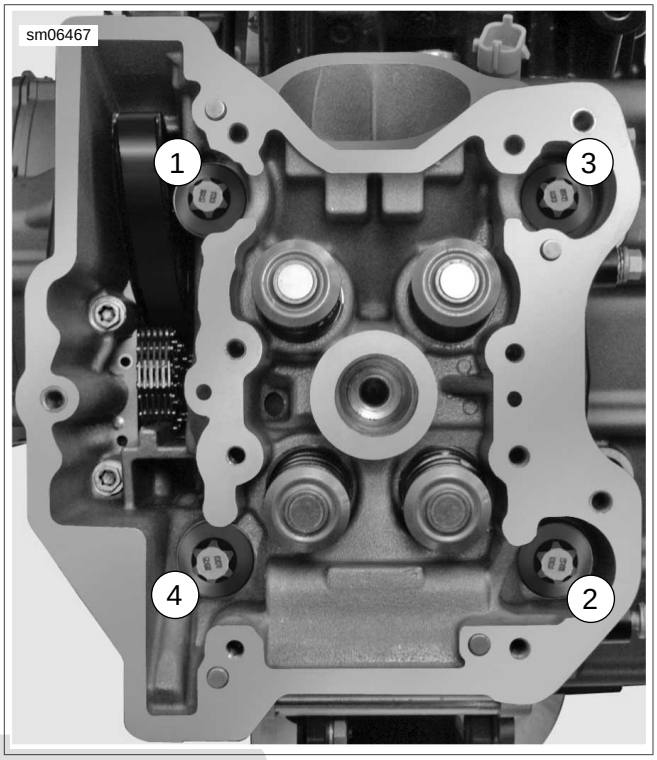



**Figure 3-83. Fastener Cross Pattern**

## DISASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| B-49312 | CYLINDER HEAD HOLDING FIXTURE |
| HD-34736-B | VALVE SPRING COMPRESSOR |

*NOTE*

*When disassembling each cylinder head it is important to correctly mark all components in order to install them in their original locations.*

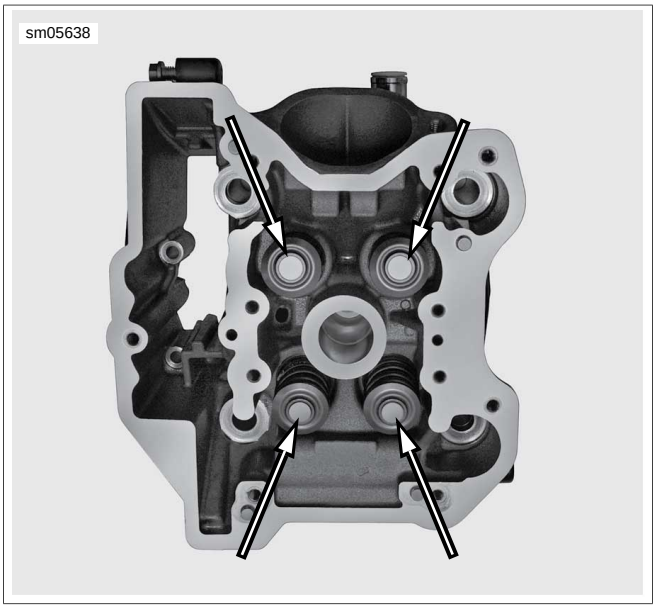
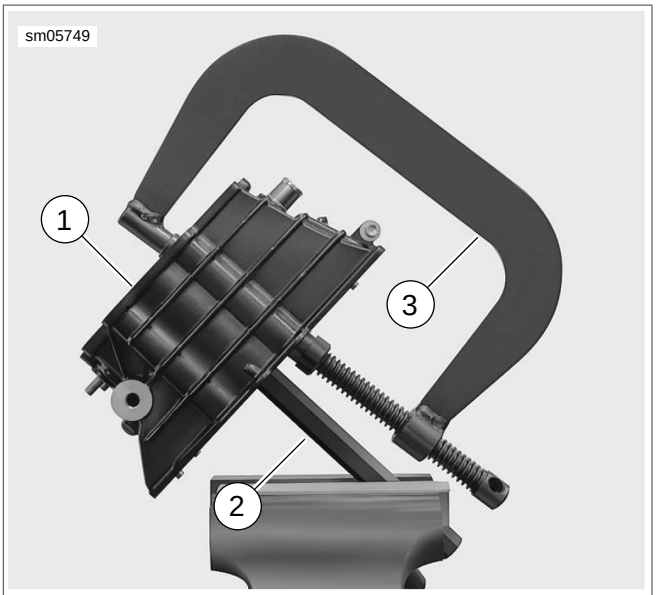



**Figure 3-84. Valve Shims**

1. See Figure 3-84. Remove shims from the valve spring retainers and record measurement and location using worksheet provided in 1.16 VALVE CLEARANCE.
2. See Figure 3-85. Secure cylinder head for service.
   a. Thread 10 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. B-49312) (2) into cylinder head (1) spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.
3. Place VALVE SPRING COMPRESSOR (Part No. HD-34736-B) (3) over cylinder head (1). Center blunt end on the valve head. Seat adapter at end of forcing screw on the valve spring retainer.
   a. Rotate forcing screw to compress valve spring.
   b. See Figure 3-87. Remove valve retainers (4).
   c. Rotate forcing screw to release the valve spring compression.
   d. Remove valve spring retainer (5) and valve springs (6, 7).
4. See Figure 3-86. Remove valve guide seal.
5. Remove valve and support collar for valve spring being sure to keep parts organized.
6. Mark valve to make sure it will be reassembled in the same location.




1. **Cylinder head**
2. **Holding fixture**
3. **Valve spring compressor**

**Figure 3-85. Cylinder Head, Holding Fixture and Valve Spring Compressor**

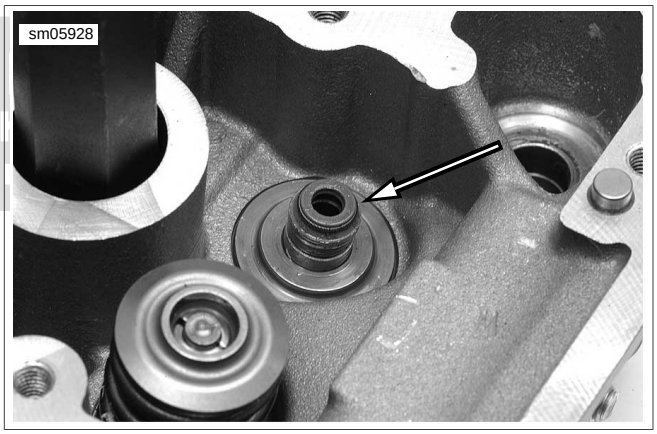
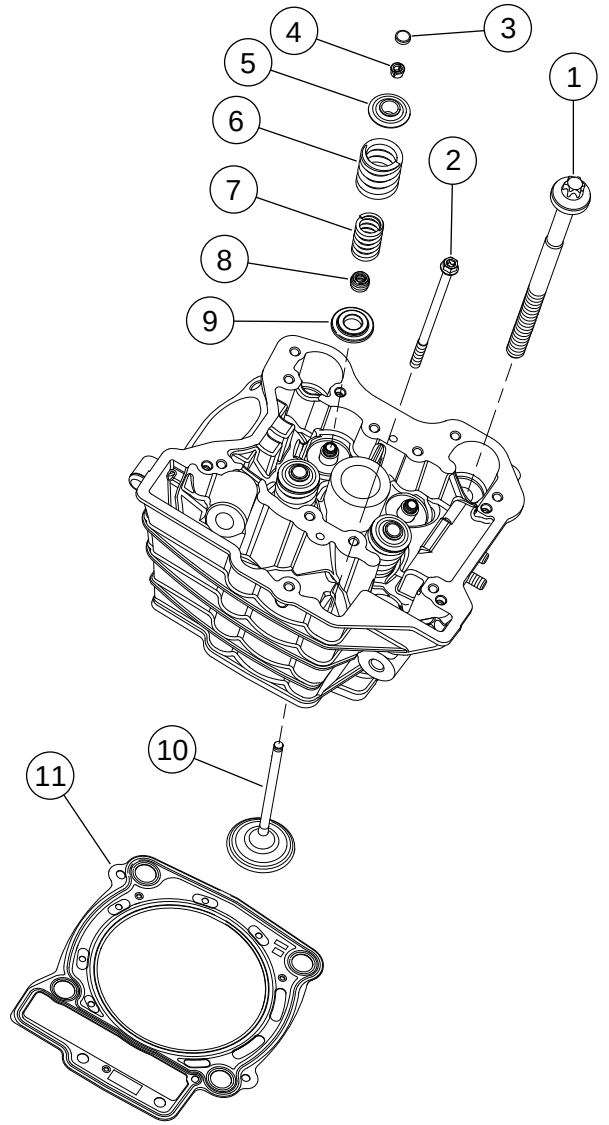



**Figure 3-86. Valve Guide Seal**




1. **Headbolt (4)**
2. **Screw (2)**
3. **Valve shim**
4. **Valve retainers (8)**
5. **Retainer, valve spring (4)**
6. **Valve spring A (4)**
7. **Valve spring (4)**
8. **Seal, valve stem (4)**
9. **Support, valve spring (4)**
10. **Valve**
11. **Gasket, cylinder head**

**Figure 3-87. Cylinder Head**

## CLEANING AND INSPECTION

### 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, top of cylinder and valve ports. Be careful to avoid scratching or nicking cylinder head and 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.

*NOTE*

*Never clean cylinder head valves with a file or other hardened tool, which could scratch or nick valves.*

3. Clean cylinder head.
   a. Wash all parts in non-flammable solvent, then thoroughly wash with hot, soapy water.
   b. Blow out oil passages in head. Be sure they are free of sludge and carbon particles.
   c. Remove loosened carbon from valve head and stem using a wire wheel.
   d. Polish valve stem with very fine emery cloth or steel wool.
4. Check head gasket surface on head for flatness. Replace any head which exceeds SERVICE WEAR LIMIT of 0.152 mm (0.006 in).

### Spark Plug Threads

Inspect spark plug threads for damage. If damaged, install a special thread repair insert from a 10 mm spark plug repair kit.

### Valves

1. Replace the valve if burned or cracked.
2. Inspect the end of the valve stem for pitting or uneven wear. Replace the valve if either of these conditions are found.
3. Inspect for burrs around the valve stem retainer groove. Remove burrs with a fine tooth file if found.

### Valve Seats

*NOTE*

*Valve seats are subject to wear. To determine if valve seat is too deep for use, see 1.16 VALVE CLEARANCE.*

1. Inspect seats for cracking, chipping or burning. Replace head(s) if any evidence of these conditions is found.
2. Wipe valve seats and valve faces clean.

## Valve Guides

*NOTE*

*Valve guides are non-replaceable. If the valve guide is worn beyond specification, the head must be replaced.*

## Valve Springs

1. Inspect valve springs for damaged or discolored coils.
2. See Figure 3-88. Measure the free length of the valve springs. If a spring length is shorter than specification, replace the spring. If necessary, replace all the valve springs in the head. Refer to Table 3-19.
3. See Figure 3-89. Measure the spring force at the specified length. If a spring force is less than specification, replace the spring. If necessary, replace all the valve springs in the head. Refer to Table 3-19.

**Table 3-19. Valve Spring Specifications**

| SPRING | WEAR LIMITS | |
|---|---|---|
| | METRIC | U.S. |
| Inner length (min) | 32.000 mm | 1.260 in |
| Outer length (min) | 35.000 mm | 1.378 in |
| Inner force at length (min) | 70 N @ 27.1 mm | 15.74 lbf @ 1.067 in |
| Outer force at length (min) | 172 N @ 30.1 mm | 38.67 lbf @ 1.185 in |

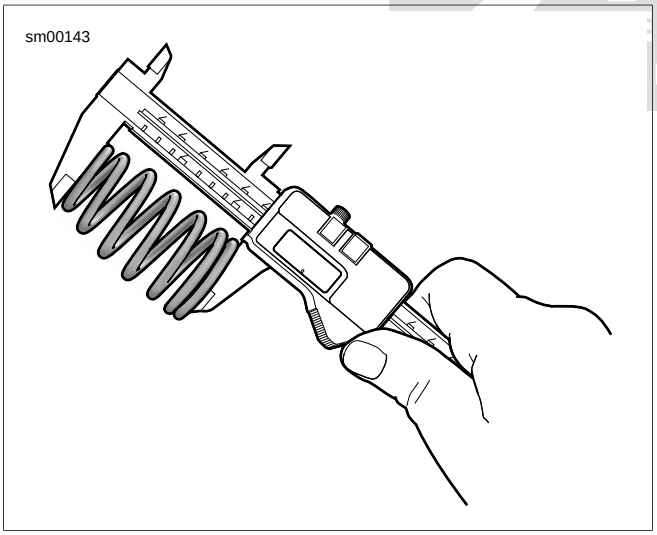



**Figure 3-88. Checking Spring Free Length**

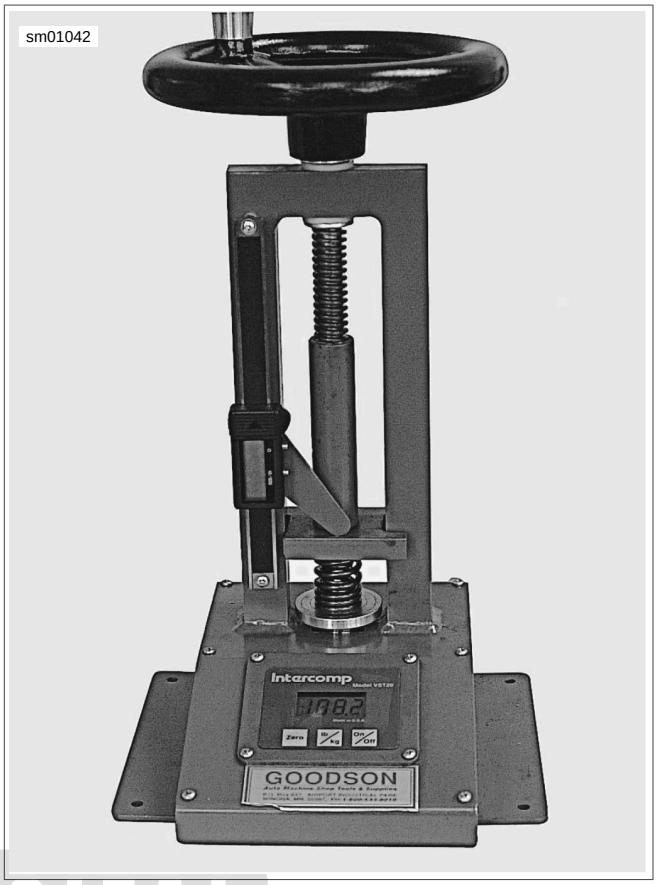



**Figure 3-89. Testing Valve Spring**

## CUTTING VALVE SEATS

| PART NUMBER | TOOL NAME |
|---|---|
| B-35788-55 | 5.5 MM VALVE SEAT CUTTER PILOT |
| HD-35758-C | NEWAY VALVE SEAT CUTTER SET |
| HD-39786 | CYLINDER HEAD HOLDING FIXTURE |

*NOTES*

- *Verify correct valve stem to valve guide clearance before refacing. Refer to Table 3-3. Replace head(s) if valve guide measurement is greater than recommended specification.*
- *This procedure is not based on the lapping of valves. The end result is an interference fit between the valve of 45 degrees and the valve seat which will be 45 degrees.*

1. Determine amount of valve seat material that can be removed.
   a. If valve lash was within specifications before disassembly, subtract the original valve shim size from the smallest available valve shim size. This will determine the maximum amount of material that may be removed.
   b. If valve lash was not within specifications before disassembly, use the Valve Lash Calculation Worksheet to determine the correct shim size. Proceed with previous step. See C.2 VALVE LASH CALCULATION WORKSHEET 1.
   c. If proper valve lash cannot be obtained, replace the cylinder head.
2. Secure cylinder head for service.
   a. Thread 10 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp tool in vise and further tighten cylinder head onto the fixture to prevent any movement during operation.
   c. Place cylinder head at a 45 degree angle or one that offers a comfortable working position.
3. Obtain the NEWAY VALVE SEAT CUTTER SET (Part No. HD-35758-C) and cut valve seat angle to 45 degrees. Do not remove any more metal than is necessary to clean up the seat (that is, to provide a uniform finish and remove pitting).
4. In order to determine the correct location of the 45 degree valve seat in the head, measure the diameter of the valve head to be used and subtract 2.032 mm (0.080 in) from that number.
5. Set your dial caliper to the lesser measurement and lock down for quick reference. This is the location of your valve seat.
6. Use a permanent magic marker to highlight the valve seat area that is going to be cut and be sure to highlight all 3 angles. Allow marker to dry before proceeding.

*NOTES*

- *Always verify cutter blades and cutter pilot are clean before beginning the cutting process. The correct cleaning brush is supplied with the Neway tool set.*
- *Also verify the inside of the valve guide is clean.*

7. Install the valve seat cutter pilot, 5.5 MM VALVE SEAT CUTTER PILOT (Part No. B-35788-55), into the valve guide hole and securely seat the pilot by pushing down and turning using the installation tool supplied in the tool set.
8. Choose the proper 45 degree cutter (intake or exhaust) and gently slide the cutter onto the pilot being careful not to drop the cutter onto the seat.
9. While applying a constant and consistent pressure, remove just enough material to show a complete clean-up on the 45 degree angle.

*NOTES*

- *If the width of the clean-up angle is greater on one side of the seat than the other, the head may need to be replaced.*
- *After making the 45 degree cut, if you discover a groove cut completely around the seat this means the blades of the cutter are in alignment and need to be staggered. This is accomplished by loosening all of the blades from the cutter body and moving each blade slightly in it's cradle in opposite directions on the cutter. The tool needed to loosen the blades is supplied in the tool set. A permanent magic marker mark every 90 degree will help in determining where new angles are.*

10. With your dial caliper locked to the predetermined setting, measure the 45 degree cut at the outermost edge at the widest point of the circle to determine what cut needs to be made next.
    a. If the 45 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 45 degree cut is too low, use the 70 degree cutter to raise the valve seat or move it away from the port.

*NOTES*

- *Due to using the top measurement of our valve seat as a reference point it will usually be necessary to use the 31 degree cutter following the initial 45 degree cut.*
- *Always highlight the valve seat with the permanent magic marker in order to verify the location of the 45 degree valve seat.*

11. If the location of the valve seat is not correct, repeat two previous steps.
12. When you accomplish a complete clean-up of the 45 degree angle and the width is at least 1.575 mm (0.062 in), proceed to the next step.
13. Select the proper 70 degree cutter and gently slide the cutter down the cutter pilot to the valve seat.
14. Remove just enough material to provide an even valve seat width of 1.016-1.575 mm (0.040-0.062 in).
15. Remove cutter pilot and wash head thoroughly and dry completely.
16. Insert valve to be used in the valve guide and bottom on the valve seat. Positioning the cylinder head port upwards and with slight thumb pressure against the valve, completely fill the port with solvent to verify proper seal between the valve and the valve seat.

*NOTE*

*Hold pressure against the valve for a minimum of 10 seconds. If any leakage occurs, examine the valve seat for irregularities or defects and if necessary repeat the above cutting process.*

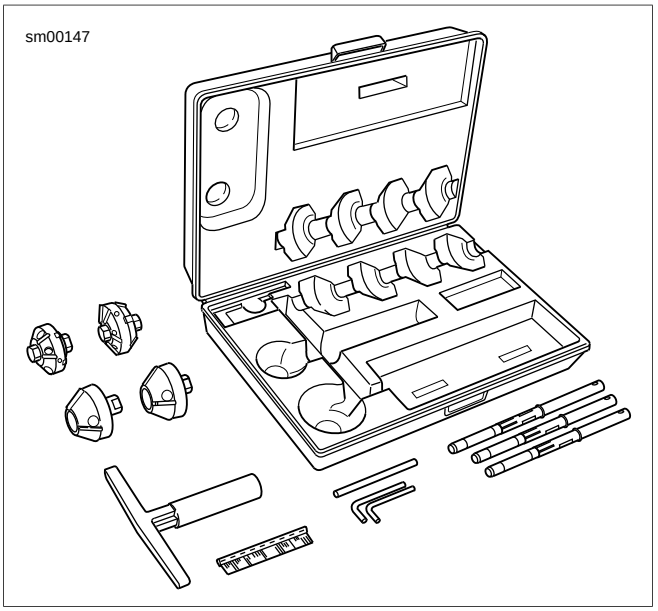
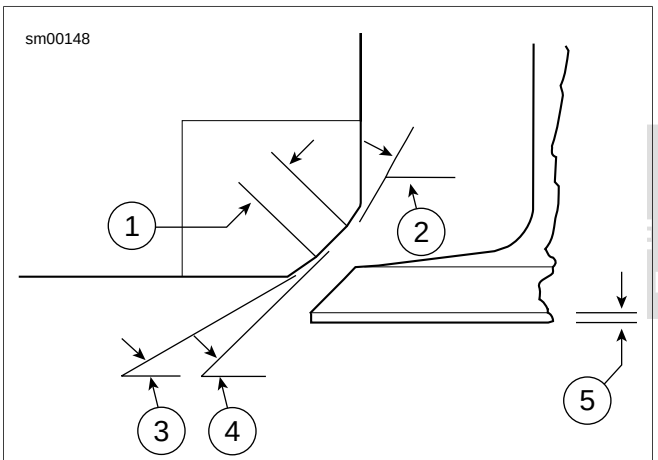



**Figure 3-90. Neway Valve Seat Cutter**




1. **Minimum: 0.040 in (1.016 mm) / Maximum: 0.062 in (1.575 mm)**
2. **70 degrees**
3. **31 degrees**
4. **45 degrees**
5. **Margin**

**Figure 3-91. Valve and Seat Dimensions**

## ASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| B-49053 | VALVE GUIDE SEAL INSTALLER |
| HD-34736B | VALVE SPRING COMPRESSOR |

1. Thoroughly clean head before beginning assembly.
2. Install valve spring lower support.
3. Lubricate valve with Harley-Davidson Motorcycle Oil 20W50 and position in head.

*NOTE*

*Failure to place the tapered pin over the valve stem keeper groove when installing the valve stem seal will result in damage to the seal causing leakage around the valve stem, excessive oil consumption and valve sticking.*

4. See Figure 3-92. Place VALVE GUIDE SEAL INSTALLER (Part No. B-49053) tapered pin over valve stem and position **new** seal on the tapered pin. Drive seal into position.

*NOTES*

- *The seal is completely installed when it contacts the lower collar.*
- *Do not remove valve after seal is installed. Repeated installations will damage seal.*

5. Install valve spring and valve spring retainer.
6. See Figure 3-85. Compress spring with VALVE SPRING COMPRESSOR (Part No. HD-34736B).
7. Insert valve retainers into valve spring retainer, making sure they engage grooves in valve stem.
8. Release and remove from VALVE SPRING COMPRESSOR.

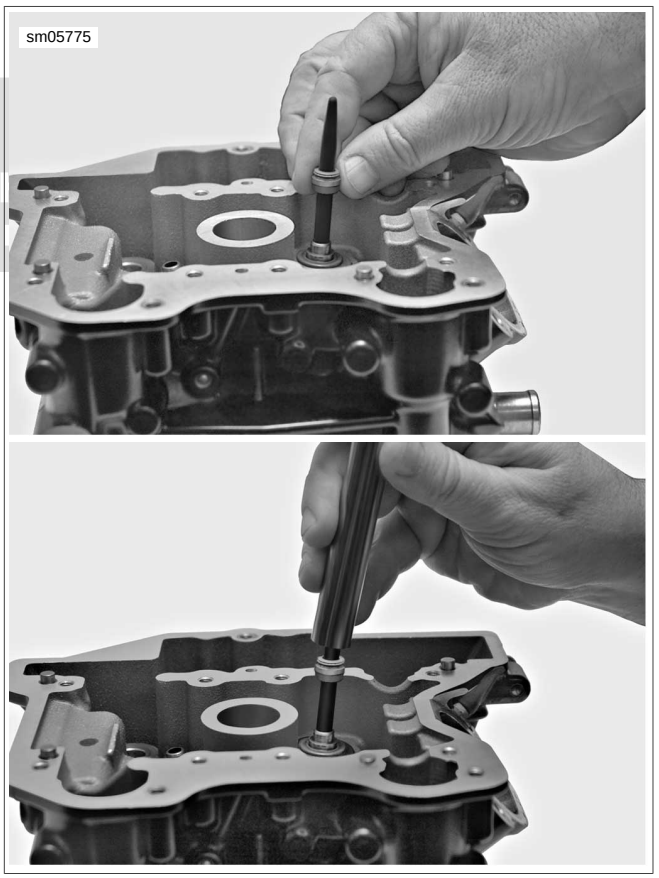



**Figure 3-92. Valve Seal Installation**

## CYLINDER HEAD: INSTALLATION

1. Install **new** cylinder head gasket on cylinder.
2. Install cylinder head on gasket.

3. See Figure 3-93. Tighten large cylinder head fasteners.
   a. In sequence, turn each large cylinder head fastener finger tight.
   b. In sequence, tighten the cylinder headbolts to 35 Nm (26 ft-lbs).
   c. In sequence, turn each fastener 1/4 turn or 90 degrees.
   d. In sequence, turn each fastener 20 degrees.
4. Install two small cylinder head fasteners. Tighten to 11 Nm (97 **in-lbs**).
5. Install camshaft assembly. See 3.5 ENGINE REPLACEMENT.
6. Install the thermostat assembly. See 5.5 THERMOSTAT.
7. Install engine in frame. See 3.5 ENGINE REPLACEMENT.

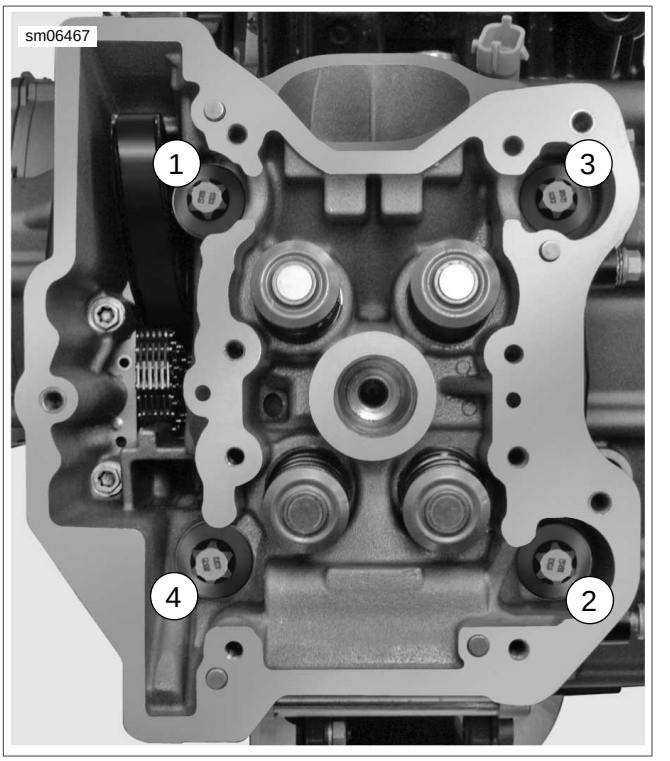



**Figure 3-93. Large Fastener Torque Sequence**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## REMOVAL AND DISASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| B-42320-6 | PISTON PIN EXTRACTOR ADAPTER |
| B-49133 | PISTON SUPPORT PLATE |
| HD-42320-A | PISTON PIN EXTRACTOR |
| PRS10 | SNAP-ON PISTON RING EXPANDER |

1. Remove engine. See 3.5 ENGINE REPLACEMENT.

*NOTE*

*Before removing cylinders verify that piston of cylinder being removed is at TDC or damage to rings may occur. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).*

2. Remove cylinder head. See 3.8 CYLINDER HEADS.
3. Clean crankcase around cylinder base to prevent dirt and debris from entering crankcase while removing cylinder.
4. See Figure 3-94. To prevent coolant from draining into crankcase, suction the coolant from left and right cylinder side (clutch side and alternator side) by using a syringe.

*NOTE*

*In some cases it will not possible to prevent coolant from draining down into the crankcase area. In such cases, remove the TDC locking pin on the bottom of the crankcase and allow the coolant to drain out.*

5. Place a clean towel under piston to prevent any foreign matter from falling into crankcase.

*NOTE*

*If cylinder does not come loose, lightly tap a plastic hammer perpendicular to the cylinder fins. Never try to pry up a cylinder.*

**CAUTION**

**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)**

6. See Figure 3-95. Install PISTON SUPPORT PLATE (Part No. B-49133) (1) under piston to prevent piston from falling against any components of the engine.
7. Carefully lift cylinder off of piston.

**⚠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)**

*NOTES*

- *It is not necessary to remove **both** piston pin circlips during piston removal. Leave the second circlip in the pin bore.*
- *DO NOT re-use piston pin circlips. Removal may weaken circlip causing circlip to break or dislodge if subsequently installed, resulting in engine damage.*

8. Remove piston pin circlip.

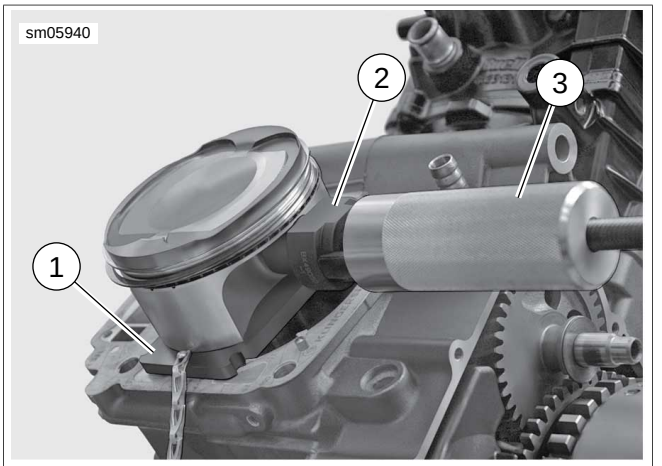
*NOTES*

- *Piston pin is a loose fit in the piston, the pin should easily slide out.*
- *If piston pin can not be removed by hand, use PISTON PIN EXTRACTOR ADAPTER (Part No. B-42320-6) (2) in conjunction with PISTON PIN EXTRACTOR (Part No. HD-42320-A) (3) to remove piston pin.*

9. Remove piston pin from piston and lift piston from connecting rod.
10. Remove piston rings using SNAP-ON PISTON RING EXPANDER (Part No. PRS10).




**Figure 3-94. Coolant Suction from Cylinder Prior to Removal**




1. **Piston support plate**
2. **Piston pin extractor adapter**
3. **Piston pin extractor**

**Figure 3-95. Piston Support Plate and Pin Extractor**

## CLEANING AND INSPECTION

| PART NUMBER | TOOL NAME |
|---|---|
| RC500 | SNAP-ON RING GROOVE CLEANER |

### Clean and Inspect Piston and Cylinder

**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. Soak cylinder and piston in an aluminum-compatible cleaner/solvent until deposits are soft, then clean with a soft brush. Blow off loosened carbon and dirt particles and wash in solvent.
2. Clean piston ring grooves with SNAP-ON RING GROOVE CLEANER (Part No. RC500) and wash with solvent.
3. Examine piston and cylinder for cracks, burned spots, grooves and gouges. If either component is worn or damaged, replace both cylinder and piston with **new** components.

### Checking Piston Pin

1. Inspect piston pin and connecting rod piston pin bore for evidence of grooving, pitting or scoring. Replace worn parts as necessary.
2. Measure piston pin-to-connecting rod clearance.
   a. See Figure 3-96. Measure piston pin diameter and record value.
   b. See Figure 3-97. Measure connecting rod piston pin bore diameter and record value.
   c. Subtract piston pin diameter from connecting rod piston pin bore diameter. The result is the piston pin-to-connecting rod clearance.
3. Measure piston pin-to-piston bore clearance.
   a. See Figure 3-98. Measure piston pin bore diameter and record value.
   b. Subtract piston pin diameter from piston pin bore diameter. The result is the piston pin-to-piston bore clearance.
4. Replace parts that do not meet specifications with **new** components. Refer to Table 3-20.




**Figure 3-96. Piston Pin Diameter Measurement**




**Figure 3-97. Connecting Rod Piston Pin Bore Measurement**




**Figure 3-98. Piston Pin Bore Diameter Measurement**

**Table 3-20. Piston Pin Specifications**

| PISTON PIN | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Piston pin-to-connecting rod clearance | 0.006-0.025 | 0.0002-0.0010 | 0.035 | 0.0014 |
| Piston pin-to-piston bore clearance | 0.008-0.022 | 0.0003-0.0009 | 0.035 | 0.0014 |
| Piston pin diameter | 21.995-22.004 | 0.8659-0.8663 | 21.98 | 0.8654 |
| Piston pin bore diameter | 22.012-22.017 | 0.8666-0.8668 | 22.03 | 0.8673 |
| Connecting rod piston pin bore diameter | 22.010-22.020 | 0.8665-0.8669 | 22.04 | 0.8677 |

## Checking Lower Connecting Rod Bearing

*NOTE*

*Checking the lower connecting rod bearing using the following procedure is a general method of assessing the condition of the connecting rod, crankshaft rod bearing journal and bearings. If damage or wear is suspected, a thorough inspection of these components is necessary and requires crankcase disassembly. See 3.13 CRANKCASE.*

1. Check connecting rod lower bearing for excessive wear by exerting an up and down force perpendicular to the centerline of the crankshaft.

*NOTE*

*Use caution not to apply a force to the connecting rod that is parallel to the centerline of the crankshaft, as this will yield a false indication of the bearing's condition.*

2. Replace worn parts that do not meet specifications with **new** components. Refer to Table 3-21.

**Table 3-21. Connecting Rod Specifications**

| CONNECTING ROD | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Connecting rod-to-crankshaft clearance | 0.010-0.049 | 0.0004-0.0019 | 0.07 (max) | 0.0028 (max) |

## Checking Cylinder Gasket Surface

1. Remove any burrs from the cylinder gasket surfaces.
2. Check cylinder head gasket surface for flatness.
   a. Lay a straightedge across the gasket surface.
   b. Try to insert a feeler gauge between the straightedge and the gasket surface.
3. Check cylinder base gasket surface for flatness.
   a. Lay a straightedge across the surface.
   b. Try to insert a feeler gauge between the straightedge and the gasket surface.
4. If either cylinder gasket surface is not flat within specifications, replace cylinder and piston with **new** components. Refer to Table 3-22.

**Table 3-22. Cylinder Gasket Surface Specifications**

| CYLINDER | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Warpage, top (gasket surfaces) | 0.03 | 0.001 | 0.03 (max) | 0.001 (max) |
| Warpage, base (gasket surfaces) | 0.03 | 0.001 | 0.03 (max) | 0.001 (max) |

## Measuring Cylinder Bore and Cylinder-to-Piston Clearance

1. Measure Cylinder-to-Piston Clearance.
   a. See Figure 3-99. Measure cylinder bore 30 mm (1.18 in) from top of cylinder, measuring from front to rear and then side to side. Record readings.
   a. See Figure 3-100. Measure piston diameter 16 mm (0.630 in) from bottom of piston skirt and perpendicular to the piston pin bore.
   b. Subtract cylinder bore measurement from piston diameter measurement. The result is the piston-to-cylinder clearance.
2. If cylinder and piston are not damaged and are within specifications, deglaze the cylinder. Refer to Table 3-23.

3. If cylinder and piston are damaged or are not within specifications, replace cylinder and piston with **new** components.




**Figure 3-99. Measuring Cylinder Bore**




**Figure 3-100. Measuring Piston Diameter**

**Table 3-23. Piston and Cylinder Bore Specifications**

| DIMENSION | NEW | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Piston-to-cylinder clearance | 0.010-0.038 | 0.0004-0.0015 | 0.08 (max) | 0.0031 (max) |
| Piston diameter | 102.969-102.983 | 4.0539-4.0544 | 102.920 (min) | 4.0520 (min) |
| Bore diameter | 103 (±0.007) | 4.055 (±0.0003) | 103.03 (max) | 4.056 (max) |

## Deglazing Cylinder

*NOTE*

*Deglazing removes wear patterns, minor scuff marks and scratches without enlarging the bore diameter.*

1. Lightly swab cylinder bore with a cloth dipped in clean engine oil.
2. Use a 240-grit flexible ball-type deglazing tool with a bristle tip or a finishing stone arrangement capable of producing a 60 degree crosshatch pattern.
3. Install deglazing tool in a slow-speed drill. The speed at which the tool rotates determines the rate at which it must be stroked up and down the cylinder bore in order to produce a 35 ±15 degree crosshatch pattern.
4. Starting at bottom of cylinder, move deglazing tool up and down the entire length of the cylinder bore for 10 to 12 complete strokes never allowing the tool to exit the cylinder more than half its working length.

*NOTE*

*Stop to examine cylinder bore and/or take measurements. Obtaining a precise 35 ±15 degree crosshatch pattern in piston travel area is critical.*

**CAUTION**

**The angular cross hatch pattern ensures an even flow of oil onto the cylinder walls and promotes longer cylinder, piston and ring life. An incorrect cross hatch pattern will result in insufficient oil retention and possible piston seizure and/or high oil consumption. (00536b)**

**CAUTION**

**Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537b) .**

5. Thoroughly wash cylinder bore using liquid dishwashing soap and warm water to remove all abrasive particles and residual grit. Continue cleaning until a clean cloth shows no evidence of dirt or debris.
6. Lightly oil a white, lint-free paper towel and wipe cylinder bore. Discard paper towel and repeat process until towel remains white and shows no evidence of contamination. The cylinder is now clean.
7. Hot rinse cylinder and dry with moisture-free compressed air.

8. Immediately apply a coating of clean engine oil to cylinder bore using a clean, lint-free paper towel.

## ASSEMBLY AND INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| B-49050 | PISTON PIN CLIP INSTALLER |
| B-49133 | PISTON SUPPORT PLATE |
| B-96333-107 | PISTON RING COMPRESSOR |
| PRS10 | SNAP-ON RING EXPANDER |

### Installing Piston Rings

1. Identify and properly orient piston rings.
   a. Compression rings are stamped with an "N", identifying the surface that faces up toward the top of the piston.
   b. First compression ring has square edges.
   c. See Figure 3-101. Second compression ring has a tapered edge.

*NOTE*

*Match each ring set to a cylinder. Measure end gap in the matching cylinder.*

2. See Figure 3-102. For each ring, measure ring end gap.
   a. Install piston ring in cylinder.
   b. Align ring in cylinder by inserting piston upside down into top of cylinder and applying an even downward force. Push ring into cylinder approximately 25.4 mm (1 in).
   c. Remove piston and measure ring end gap using a feeler gauge. Record measurement.
   d. Carefully remove ring from cylinder.
3. Carefully install piston rings onto piston using SNAP-ON RING EXPANDER (Part No. PRS10).
4. See Figure 3-103. Measure piston ring side clearance for each compression ring in their corresponding grooves on piston using a feeler gauge.
5. Replace parts that are not within specifications. Refer to Table 3-24.

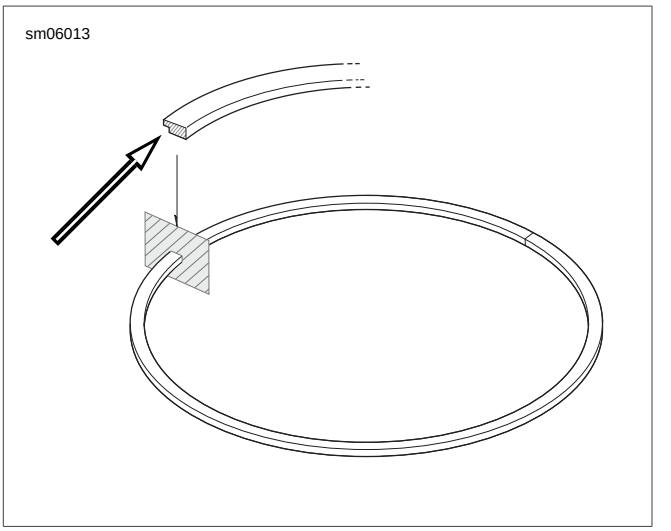



**Figure 3-101. Second Compression Ring**

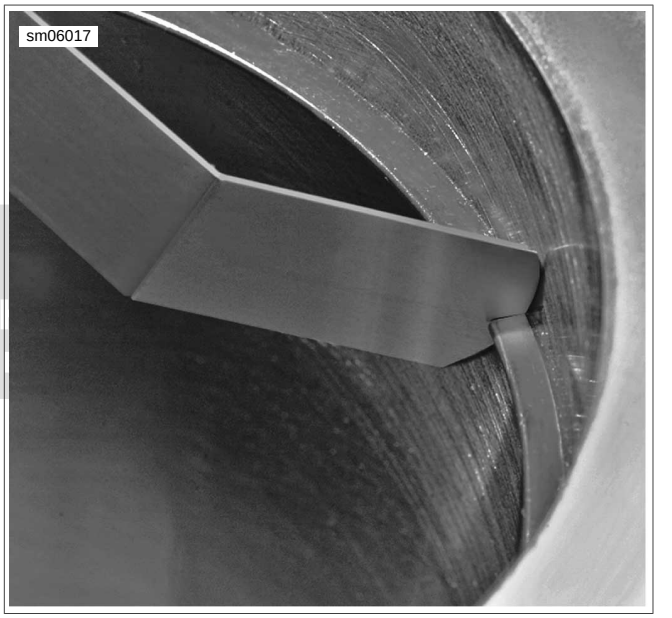



**Figure 3-102. Ring End Gap**




**Figure 3-103. Ring Side Clearance**

**Table 3-24. Piston Ring Specifications**

| PISTON AND RINGS | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| First compression ring end gap | 0.20-0.35 | 0.008-0.014 | 1.00 (max) | 0.039 (max) |
| Second compression ring end gap | 0.35-0.55 | 0.014-0.022 | 1.00 (max) | 0.039 (max) |
| Oil ring end gap | 0.20-0.70 | 0.008-0.028 | 1.00 (max) | 0.039 (max) |
| First compression ring side clearance | 0.03-0.07 | 0.001-0.003 | 0.12 (max) | 0.005 (max) |
| Second compression ring side clearance | 0.02-0.06 | 0.001-0.002 | 0.11 (max) | 0.004 (max) |
| Oil control ring side clearance | 0.010-0.045 | 0.0004-0.0017 | N/A | N/A |

## Installing Piston

1. See Figure 3-104. Lubricate piston pin bore, piston pin and connecting rod bore with engine oil and install piston to connecting rod with indicator mark pointing toward the rear of the engine.
2. Align piston and connecting rod bores and install piston pin.
3. Cover crankcase opening below piston.

**⚠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)**

4. Install a **new** piston pin circlip using PISTON PIN CLIP INSTALLER (Part No. B-49050).
5. See Figure 3-105. Position first compression ring (1), second compression ring (2) and oil control ring (3) end gaps as shown. Front piston (4) and rear piston (5) ring end gap positions are mirror images of each other.

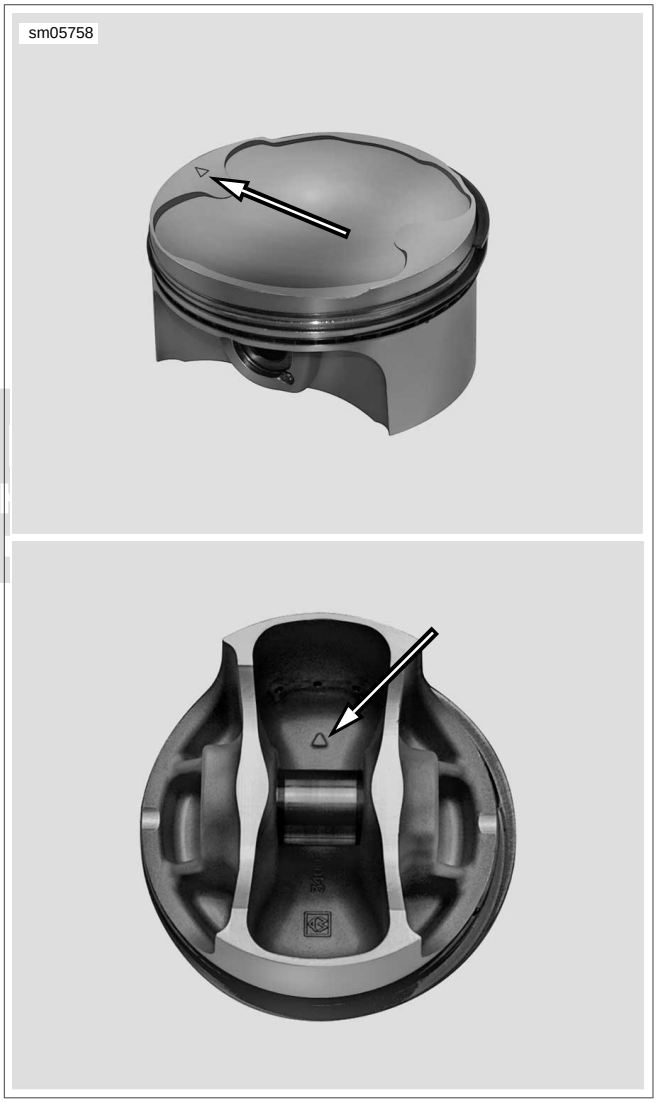
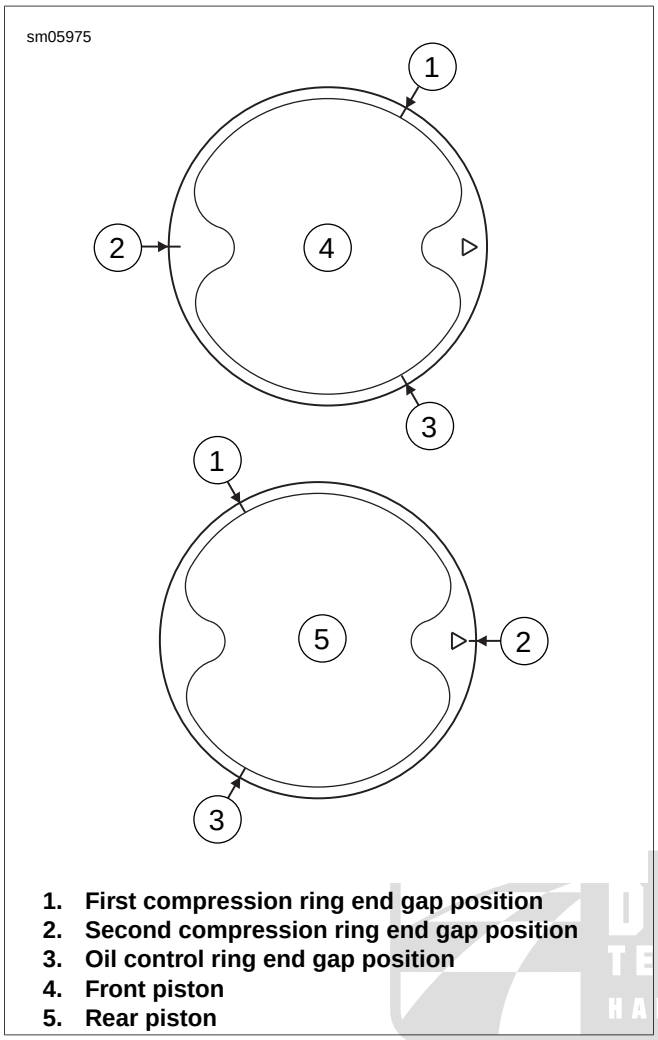



**Figure 3-104. Piston Orientation**




1. **First compression ring end gap position**
2. **Second compression ring end gap position**
3. **Oil control ring end gap position**
4. **Front piston**
5. **Rear piston**

**Figure 3-105. Piston Ring End Gap Orientation**

## Installing Cylinder

1. Verify piston of cylinder being installed is at TDC or damage to rings and cylinder may occur. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).
2. Verify cylinder gasket surfaces and crankcase gasket surfaces are clean and free of oil.
3. Install a **new** cylinder base gasket onto the crankcase gasket surface.
4. See Figure 3-106. Carefully install PISTON SUPPORT PLATE (Part No. B-49133) (1) under piston using caution not to damage cylinder base gasket.

*NOTE*

*Cutting the heads off a set of head bolts and then threading bolts into crankcase is helpful for guiding cylinder during installation.*

5. Lubricate piston skirt, piston rings and PISTON RING COMPRESSOR (Part No. B-96333-107) (2) with engine oil.

*NOTE*

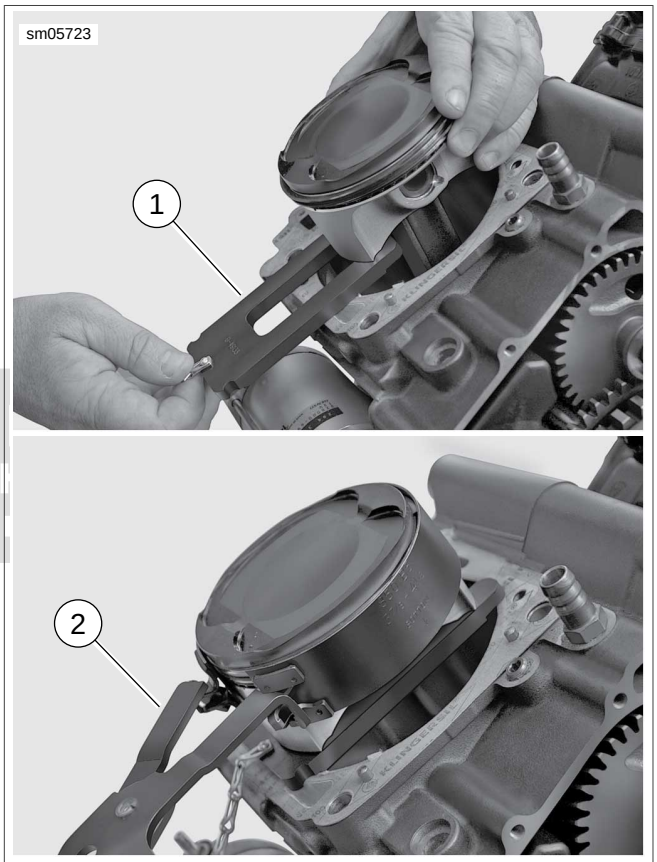
*Verify piston ring end gaps are oriented to the piston.*

6. Clamp piston ring compressor onto piston using sufficient pressure to compress the rings but still allowing piston to slip out of tool.
7. See Figure 3-107. Carefully install cylinder onto piston using a firm, quick motion until cylinder bore slides below piston rings.
8. Remove piston ring compressor and piston support plate.
9. Push cylinder down until cylinder mates with crankcase.

*NOTE*

*Remove headbolt guides if used during cylinder installation.*

10. Install cylinder heads. See 3.8 CYLINDER HEADS.
11. Install engine. See 3.5 ENGINE REPLACEMENT.




1. **Piston support plate**
2. **Piston ring compressor**

**Figure 3-106. Piston Support Plate and Piston Ring Compressor**

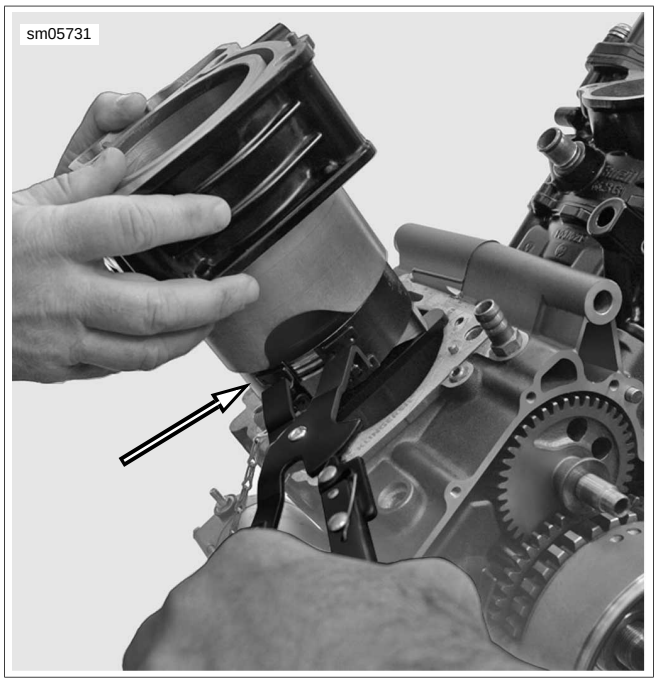



**Figure 3-107. Installing Cylinder**

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## CLUTCH CASE VENT TUBE

### Removal

1. See Figure 3-108. Remove the vent tube banjo bolt and copper washers.
2. See Figure 3-109. Remove the clutch cover fastener that captures the vent tube support bracket.
3. See Figure 3-110. Remove the vent tube fastener.
4. If necessary, cut the clamps securing the low pressure hose between the vent tube and the fitting on the cylinder head.




**Figure 3-108. Vent Tube Banjo Bolt**

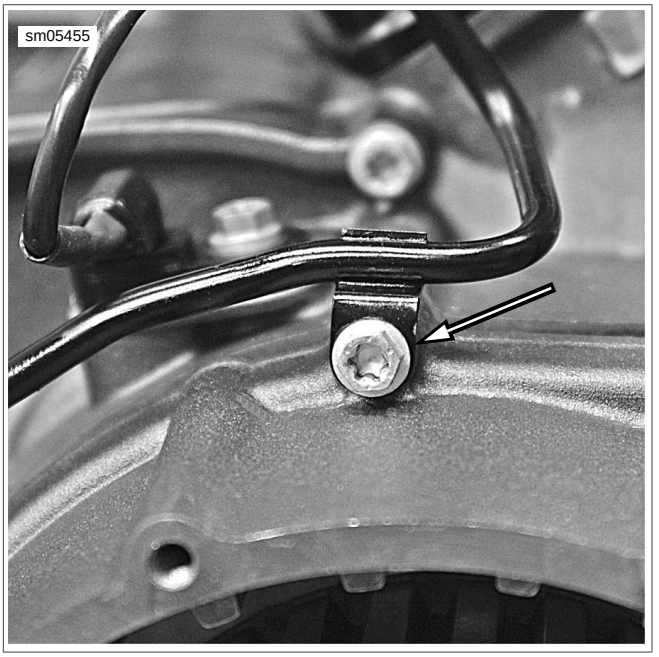



**Figure 3-109. Vent Tube Support**

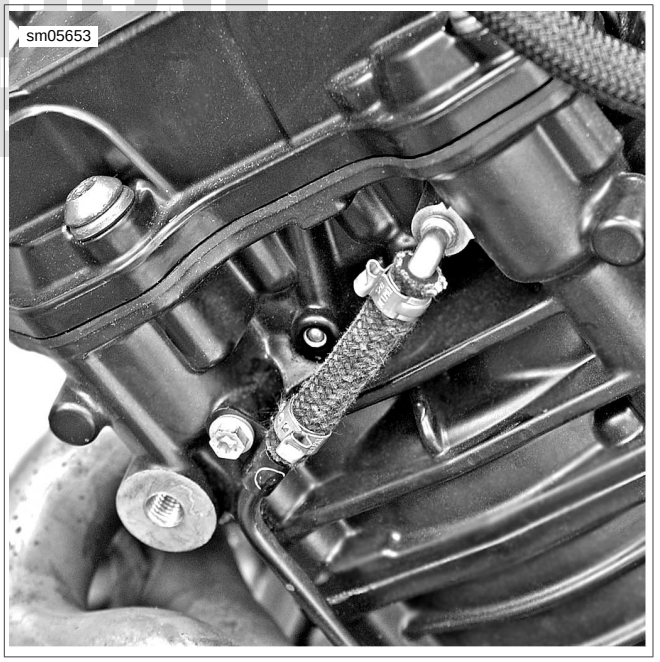
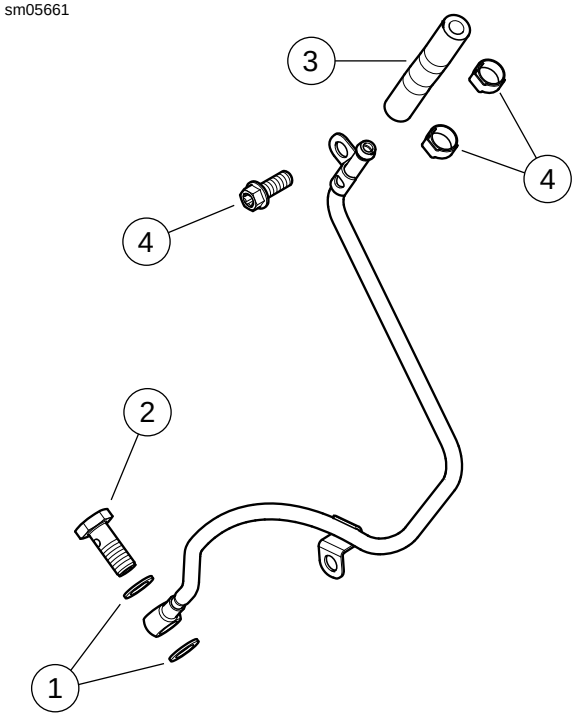



**Figure 3-110. Vent Tube Low Pressure Hose**

### Installation

1. See Figure 3-111. If necessary replace the low pressure hose (3) and clamps (4) between the vent tube and the fitting on the head.
2. Install the vent tube banjo bolt (2) and two **new** copper washers (1).

3. Install the clutch cover fastener through the vent tube support bracket.
4. Install the vent tube fastener (4) into the cylinder head.
5. Tighten the banjo bolt to 14 Nm (124 **in-lbs**).
6. Tighten the clutch cover fastener to specification. See 3.10 CLUTCH SIDE, Clutch Cover.
7. Tighten the vent tube fastener to 11 Nm (97 **in-lbs**).




1. **Sealing ring (copper washer)**
2. **Screw**
3. **Low pressure hose**
4. **Vent tube fastener**

**Figure 3-111. Clutch Cover Vent Tube**

## CLUTCH COVER

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |
| B-49140 | WATER PUMP TIMING PIN |

### Removal

1. Drain the engine oil.
2. Drain the engine coolant.
3. Rotate the engine. See 3.4 ENGINE ROTATION.
4. With the front cylinder at TDC, install the CRANKSHAFT LOCKING TOOL (Part No. B-48858).
5. Remove the secondary clutch actuator/cover.
6. Remove the oil pressure switch spade connector.
7. If necessary, cut the clamp and remove the vacuum assist line.
8. If necessary, remove the P-clamp and cover fastener.

*NOTE*

*The water pump cover can be removed without removing the coolant hoses.*

9. Remove the water pump cover.
10. Remove the 15 cover fasteners including the one securing the vent tube support and the one with a sealing ring adjacent to the water pump.
11. Remove the cover and gasket.

### Installation

1. See Figure 3-112. Verify that the two cover locating pins are in place in the crankcase.
2. Fit a gasket to the crankcase.

*NOTE*

*See Figure 3-113. Clean the oil passages in the clutch cover bottom balancer support (1) and the crankshaft support (2) before assembly.*

3. Lubricate the bottom balancer shaft and the crankshaft in the cover with LUBRIPLATE No. 105 Motor Assembly Grease.
4. Install the WATER PUMP TIMING PIN (Part No. B-49140) to time the water pump balancer shaft to the crankshaft. See 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft.
5. Align the water pump shaft to the case bearing and fit the cover to the crankcase.
6. Loosely install the vent tube banjo bolt with **new** copper washers.
7. Loosely thread a cover fastener through the vent tube support tab and the P-clamp.
8. See Figure 3-114. Fit a sealing ring to a cover fastener (2) and install in torque sequence position three.
9. Loosely install the remaining cover fasteners.
10. Install the water pump cover with a **new** gasket.
11. Fit a sealing ring to a water pump cover fastener (1) and install.
12. Install the remaining water pump cover fasteners.

*NOTE*

*See Figure 3-115. Tighten the starting fastener twice: first (1) and last (16).*

13. Tighten the cover fasteners in sequence to 11 Nm (97 **in-lbs**).
14. Tighten the water pump fasteners in a cross pattern to 11 Nm (97 **in-lbs**).
15. Install with **new** sealing gaskets and tighten the vent tube banjo bolt to 14 Nm (124 **in-lbs**).
16. If removed, install the vacuum line with a clamp.
17. Install the secondary actuator/cover. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.
18. Connect the oil pressure spade connector.
19. Fill the engine with coolant and with engine oil.

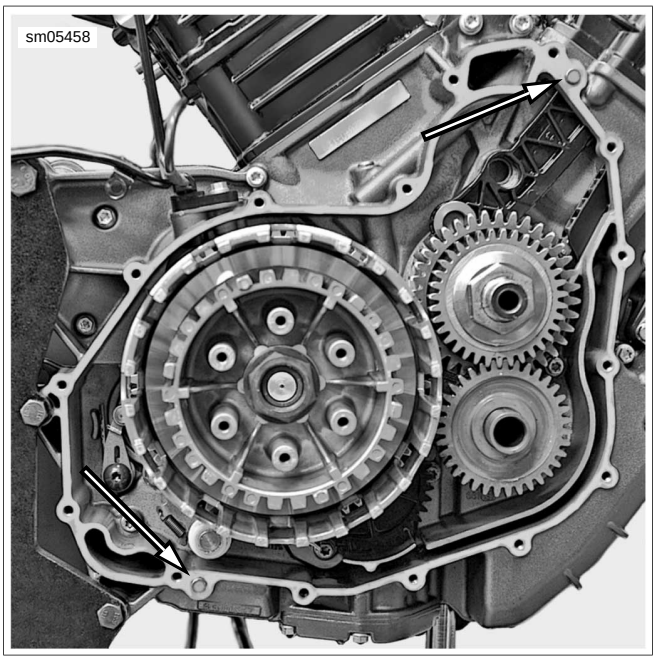
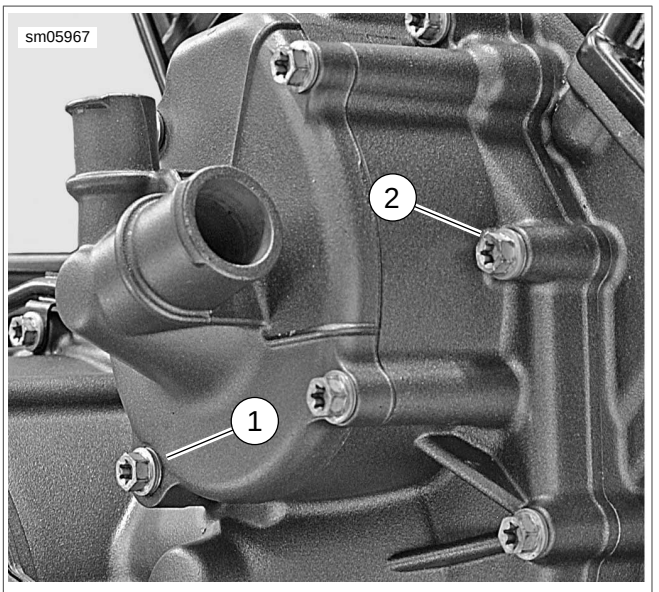
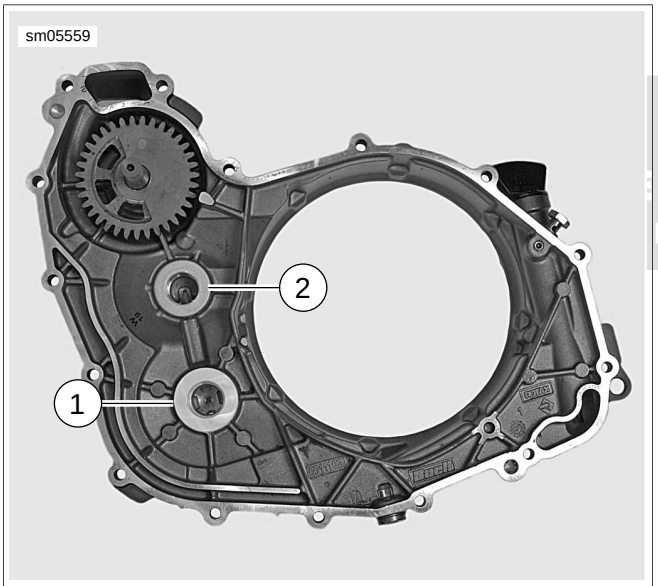



Figure 3-112. Clutch Cover Locating Pins




1. Water pump cover/drain screw
2. Clutch cover screw

Figure 3-114. Copper Sealing Rings




1. Bottom balancer shaft support
2. Crankshaft support

Figure 3-113. Clutch Cover

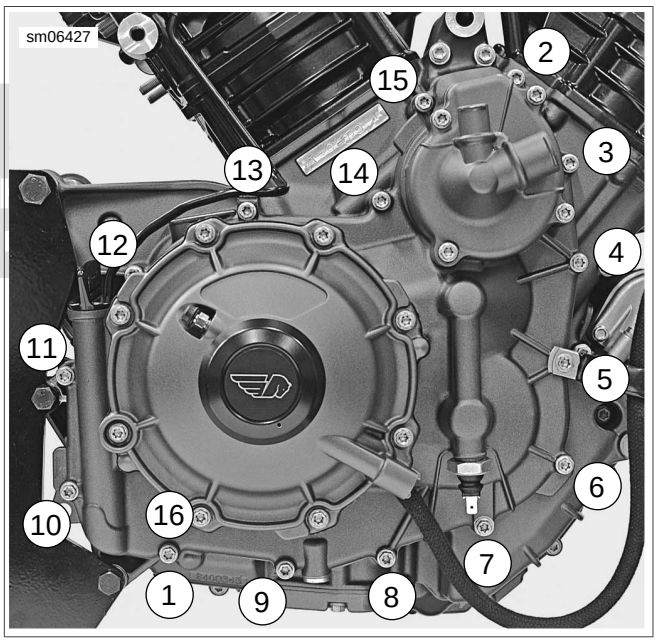



Figure 3-115. Clutch Cover Torque Sequence

## P-CLAMP

See Figure 3-116. Install the P-clamp and fastener. Tighten to 11 Nm (97 **in-lbs**).




**Figure 3-116. Clutch Cover P-Clamp Fastener**

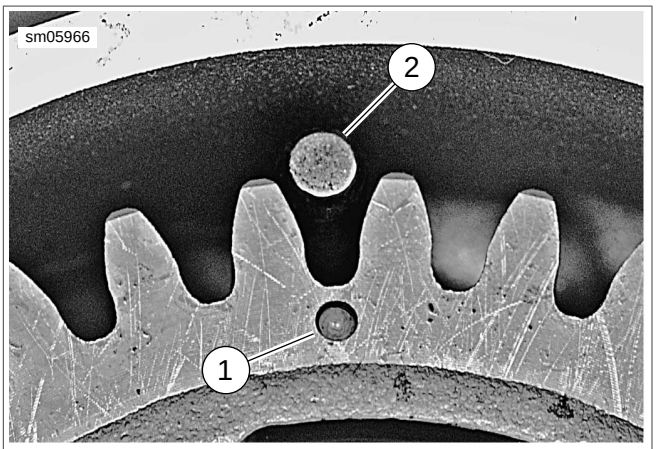
## BALANCER: WATER PUMP SHAFT

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |
| B-49140 | WATER PUMP TIMING PIN |

*NOTE*

*Captured by the water pump in the clutch cover, the water pump shaft is also a balancer. Time the shaft to the crankshaft during installation of the clutch cover.*

1. Verify that the front cylinder is locked at TDC with the CRANKSHAFT LOCKING TOOL (Part No. B-48858). See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).
2. See Figure 3-117. Rotate the shaft in the water pump housing until the timing mark on the gear aligns with the timing pin hole.
3. See Figure 3-118. Insert the WATER PUMP TIMING PIN (Part No. B-49140) to index the shaft to the crankshaft at TDC.
4. Install the clutch cover and remove the timing pin. See 3.10 CLUTCH SIDE, Clutch Cover.




**1. Timing mark**
**2. Water pump timing pin**

**Figure 3-117. Match Timing Mark to Pin**

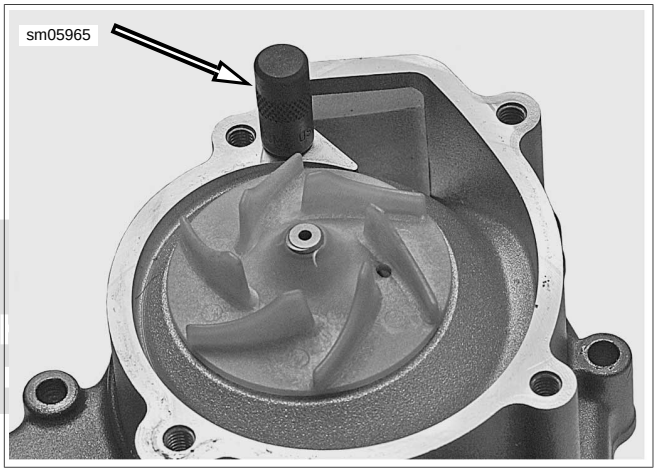


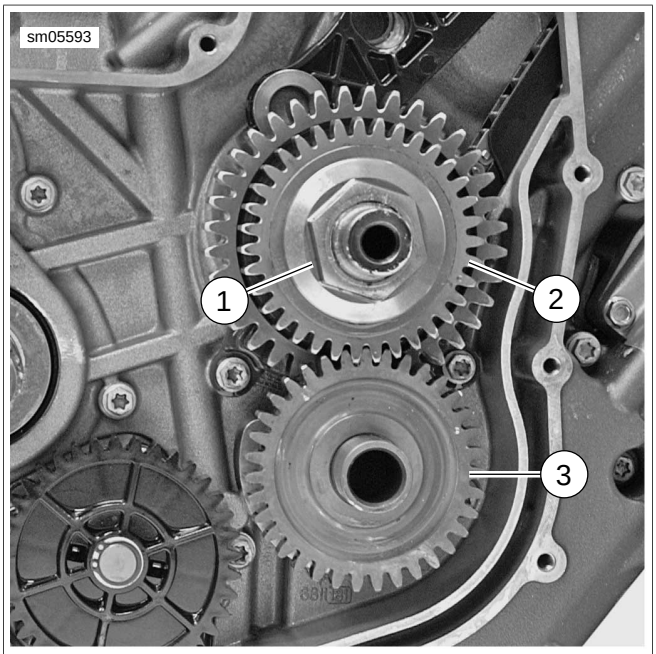

**Figure 3-118. Water Pump Timing Pin**

## BALANCER: BOTTOM

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |

### Removal

1. See Figure 3-119. With the engine locked at front cylinder TDC, remove the crankshaft nut (1).
2. Slide the balancer drive gear (2) off the crankshaft.
3. Slip out the balancer (3).
4. If necessary, remove the needle pin from the primary drive engine sprocket.




1. **Crankshaft nut**
2. **Drive gear**
3. **Balancer**

**Figure 3-119. Bottom Balancer**




**Figure 3-120. Balancer Shaft Support**

## Installation

1. Lock the engine at front cylinder TDC with the CRANKSHAFT LOCKING TOOL (Part No. B-48858).
2. See Figure 3-120. Verify that the passages in the balancer shaft support are open and that the bearing surface is not damaged.
3. See Figure 3-121. Apply LUBRIPLATE No. 105 Motor Assembly Grease to the splines on the crankshaft, the balancer support surface in the crankcase and both ends of the balancer shaft.
4. Fit the balancer shaft to the support in the engine case.
5. See Figure 3-122. Verify that the needle pin is in place in the primary drive engine sprocket.

*NOTE*

*See Figure 3-123. The balancer is timed to the front cylinder at TDC when the timing marks are in alignment.*

6. Match the timing marks on the engine primary drive sprocket with balancer.
7. See Figure 3-124. Slide the matched gears over the crankshaft engaging the balancer drive gear (2) with the needle pin (4) on the primary drive engine sprocket.
8. Apply LOCTITE 648 (green) to the threads of the crankshaft nut (1).
9. Tighten the crankshaft nut to 220 Nm (162 ft-lbs).



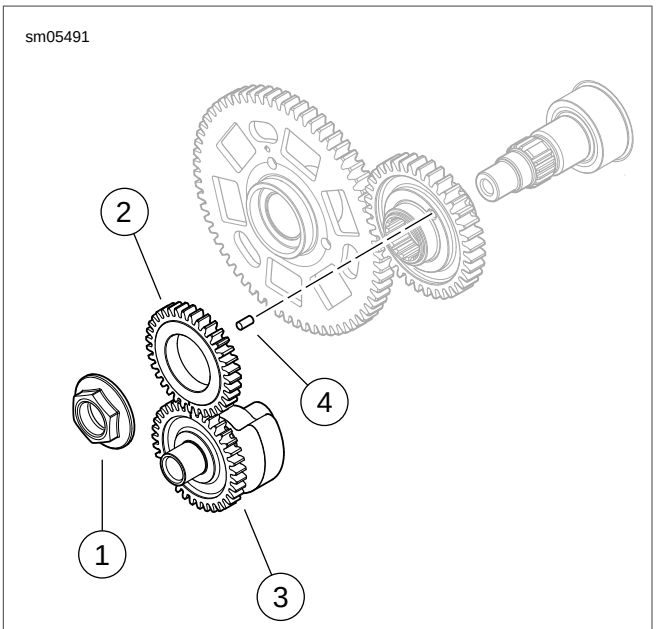

**Figure 3-121. Bottom Balancer**




**Figure 3-122. Balancer Drive Gear Needle Pin**




**Figure 3-123. Balancer Timing Marks**




1. **Crankshaft nut**
2. **Drive gear**
3. **Balancer**
4. **Needle pin**

**Figure 3-124. Balancer Assembly**

## OIL PUMP

### Removal

1. Remove clutch pack. See 6.5 CLUTCH, Clutch Pack.
2. Remove clutch basket. See 6.5 CLUTCH, Clutch Basket.

*NOTE*

*See Figure 3-126. Pin securing oil pump gear to shaft may fall out after removing oil pump gear. Make sure to recover pin if it does fall out of shaft.*

3. See Figure 3-125. Remove retaining ring (2) and oil pump gear (1).
4. See Figure 3-126. Remove pin (2), short screws (3) and long screws (4).

*NOTE*

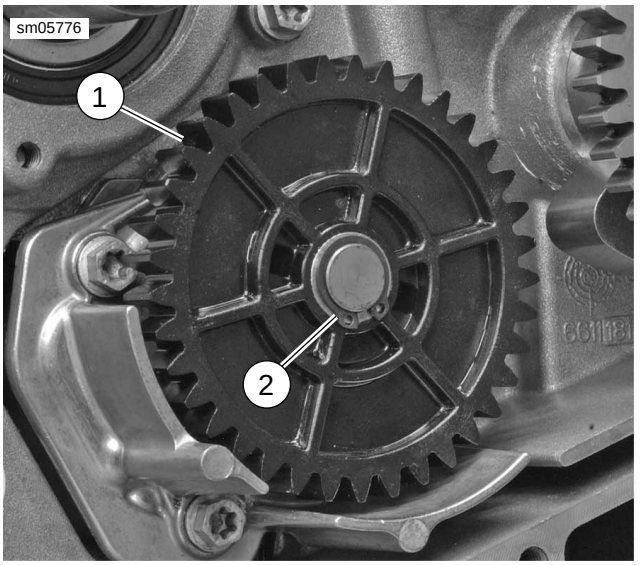
*The oil pump cover (1) is sealed to the oil pump housing with LOCTITE 515.*

5. Remove oil pump cover (1).

*NOTES*

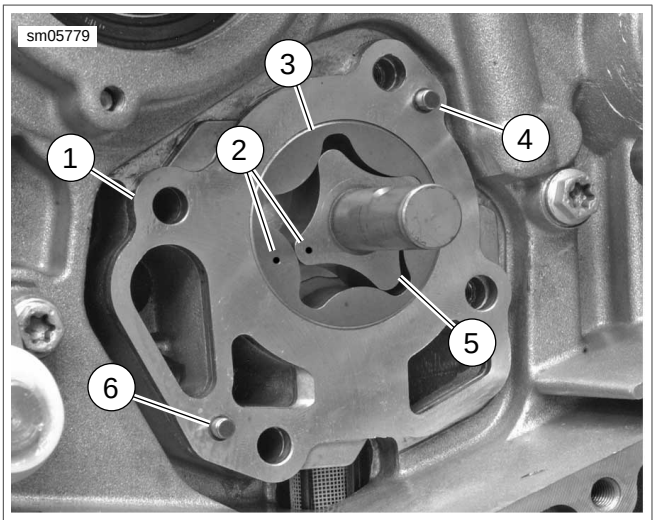
- *See Figure 3-127. The oil pump housing (1) is sealed to the crankcase with LOCTITE 515.*
- *Alignment pin (4) is secured to the oil pump housing. Alignment pin (6) is secured to the crankcase.*

6. Remove oil pump housing (1) and both oil pump gerotors.



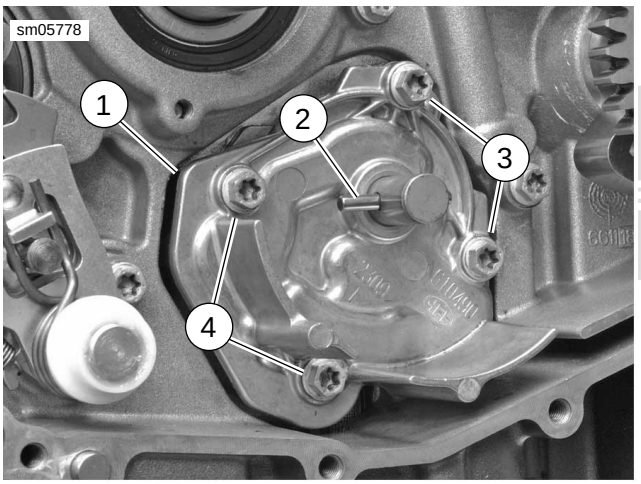

1. Oil pump gear
2. Retaining ring

**Figure 3-125. Oil Pump Gear**



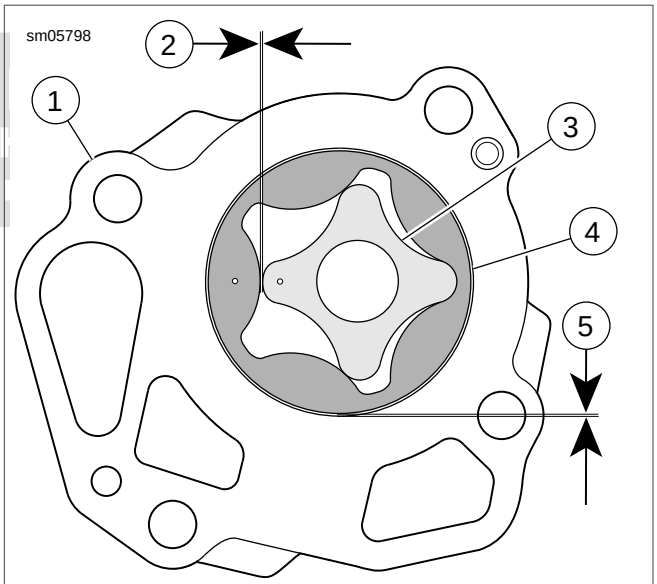

1. Oil pump housing
2. Reference marks
3. Outer pressure gerotor
4. Alignment pin
5. Inner pressure gerotor
6. Alignment pin

**Figure 3-127. Oil Pump**




1. Oil pump cover
2. Pin
3. Short screws
4. Long screws

**Figure 3-126. Oil Pump Cover**




1. Oil pump housing
2. Inner rotor-to-outer rotor measurement
3. Inner rotor
4. Outer rotor
5. Outer rotor radial measurement

**Figure 3-128. Gerotor Wear Measurements**

## Inspection

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

**⚠ WARNING**

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

2. Blow parts dry with low pressure compressed air. Verify that all oil passages are clean and open.
3. Look for scoring, gouging or cracking caused by foreign material that may have passed through the oil pump.
4. Look for grooves or scratches on the machined surfaces of the oil pump cover and oil pump housing.
5. Check for excessive wear or damage on lobes of outer gerotor gears and between lobes on inner gerotor gears.
6. See Figure 3-128. Check gerotor wear as follows:
   a. Mesh pieces of one gerotor set together.
   b. Use a feeler gauge to determine clearance between tips of lobes on inner and outer gerotors.
   c. Replace gerotors as a set if inner rotor-to-outer rotor measurement (2) exceeds 0.2500 mm (0.0098 in).
7. Place the pressure gerotor set in the oil pump housing with the reference marks facing outward. Check the outer rotor radial measurement (5) between the pump and oil pump housing. Replace the gerotor set if the measurement exceeds 0.25 mm (0.0098 in).
8. Place the scavenge gerotor set in the crankcase housing with the reference marks facing inward. Check the outer rotor radial measurement (5) between the pump and crankcase housing. Replace the gerotor set if the measurement exceeds 0.25 mm (0.0098 in).

## Installation

*NOTE*

*Apply clean engine oil to oil pump parts before assembly. Be sure oil and LOCTITE do not mix.*

1. See Figure 3-129. Install outer scavenge pump rotor (1) so that the reference mark on the rotor faces in toward the engine.

*NOTE*

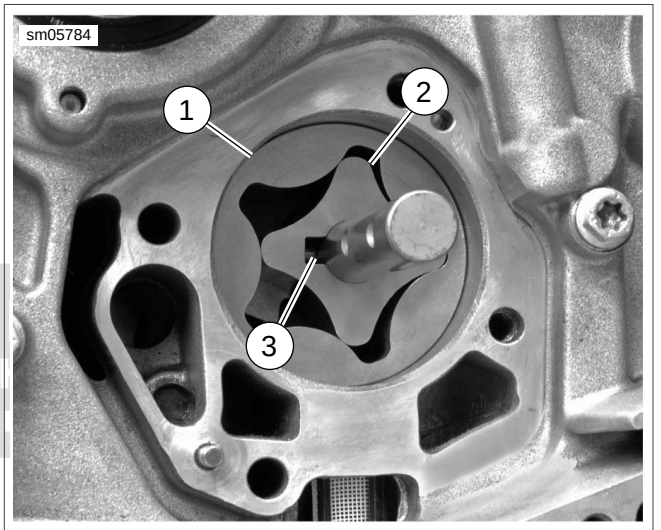
*Pin (3) for the scavenge pump has a wider diameter than the other pins that will be assembled into the oil pump shaft.*

2. Place pin (3) in oil pump shaft and install inner scavenge pump rotor (2) on the shaft so that the reference mark on the rotor faces in toward the engine. Install oil pump shaft with inner rotor.
3. See Figure 3-130. Apply a sparing amount of LOCTITE 515 to seal the crankcase to the oil pump housing (1). Install oil pump housing firmly against crankcase.

*NOTE*

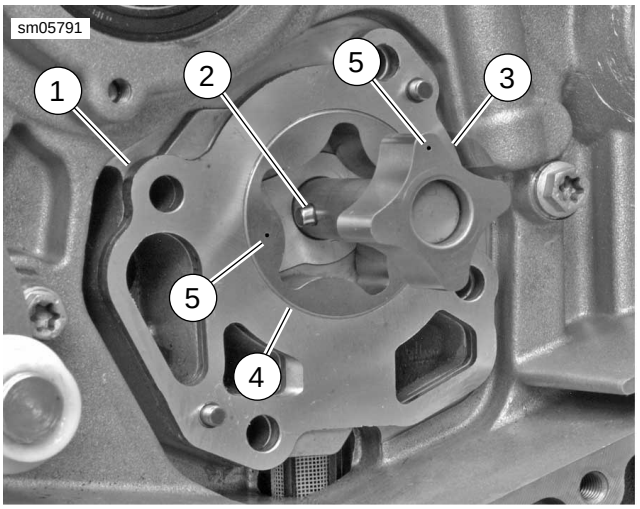
*When installing pressure pump, make sure reference marks are facing away from the engine.*

4. Place pin (2) in oil pump shaft and install inner pressure pump rotor (3) over pin.
5. Install outer pressure pump rotor (4).
6. See Figure 3-126. Apply a sparing amount of LOCTITE 515 to seal the oil pump cover (1) to the oil pump housing. Install oil pump cover with short screws (3) and long screws (4). Tighten screws to 11 Nm (97 **in-lbs**).
7. Place pin (2) in oil pump shaft.
8. See Figure 3-125. Install oil pump gear (1) over pin until it snaps into place. Install **new** retaining ring (2).
9. Install clutch basket. See 6.5 CLUTCH, Clutch Basket.
10. Install clutch pack. See 6.5 CLUTCH, Clutch Pack.




1. **Outer scavenge pump rotor**
2. **Inner scavenge pump rotor**
3. **Pin**

**Figure 3-129. Scavenge Pump**




1. **Oil pump housing**
2. **Pin**
3. **Inner pressure pump rotor**
4. **Outer pressure pump rotor**
5. **Reference marks**

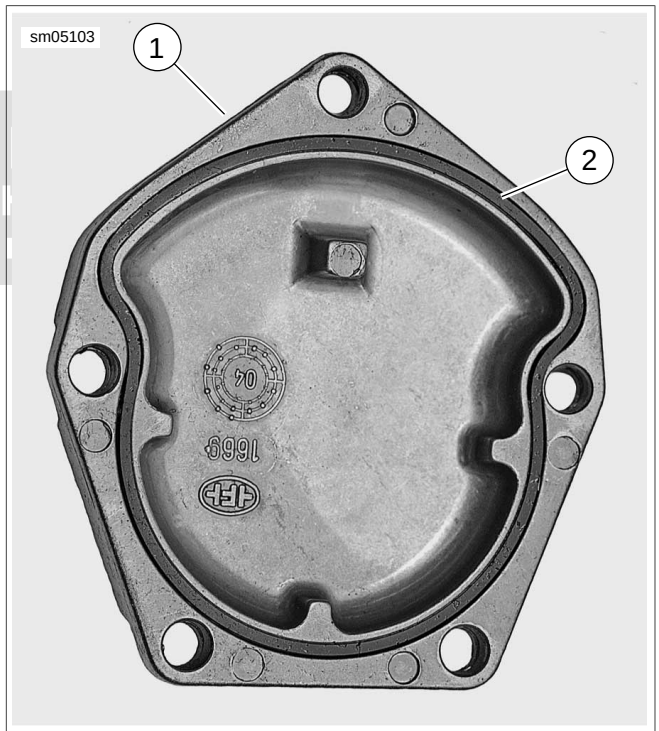
**Figure 3-130. Oil Pump Housing**




**Figure 3-131. Oil Strainer O-ring**

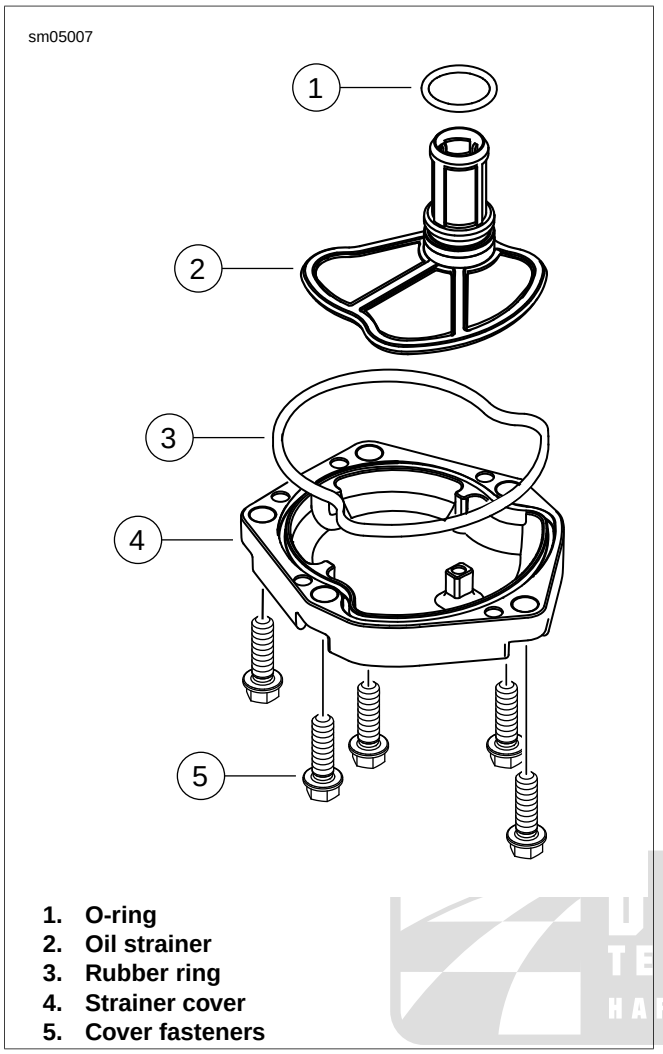
## OIL STRAINER

1. Remove the muffler to access the oil strainer cover. See 4.7 EXHAUST SYSTEM.
2. Remove the fasteners and the oil strainer cover.
3. Remove the oil strainer.
4. See Figure 3-131. Remove the O-ring and discard.
5. Clean the strainer of debris and inspect the strainer for damage. Replace if damaged.
6. See Figure 3-132. Discard the rubber gasket (2).
7. Clean inside the cover (1).
8. See Figure 3-133. Verify **new** O-ring (1) is seated in groove on strainer. Apply a thin film of clean engine oil on O-ring.
9. Push the strainer (2) into the crankcase.
10. Install the **new** rubber ring (3) and the cover (4).
11. See Figure 3-134. In sequence, tighten the cover fasteners (5) to 11 Nm (97 **in-lbs**).




1. **Cover**
2. **Gasket**

**Figure 3-132. Oil Strainer Cover**




1. O-ring
2. Oil strainer
3. Rubber ring
4. Strainer cover
5. Cover fasteners

**Figure 3-133. Oil Strainer Assembly**

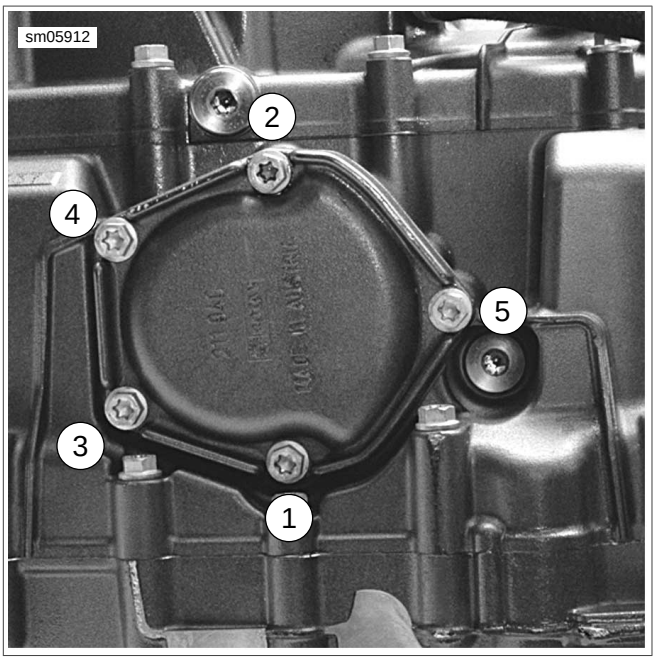



**Figure 3-134. Oil Strainer Torque Sequence**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# ALTERNATOR SIDE 3.11

## OIL FILTER

*NOTE*

*Determine if the oil filter cartridge is to be replaced according to the service interval. Refer to Table 1-1.*

1. See Figure 3-135. Remove the two fasteners to remove the oil filter cover.
2. Drain the oil from the filter and remove the filter from the cover.
3. Clean inside the oil filter recess in the crankcase. Remove any debris.
4. See Figure 3-136. Apply a light film of clean engine oil to a **new** O-ring and fit the O-ring to the cover.
5. See Figure 3-137. Push a **new** oil filter into the cover until it seats.
6. See Figure 3-138. Apply a light film of clean engine oil to the rubber seal on the filter.
7. Install the filter (rubber seal first) into the crankcase.
8. Install the cover and tighten the fasteners to 11 Nm (97 **in-lbs**).

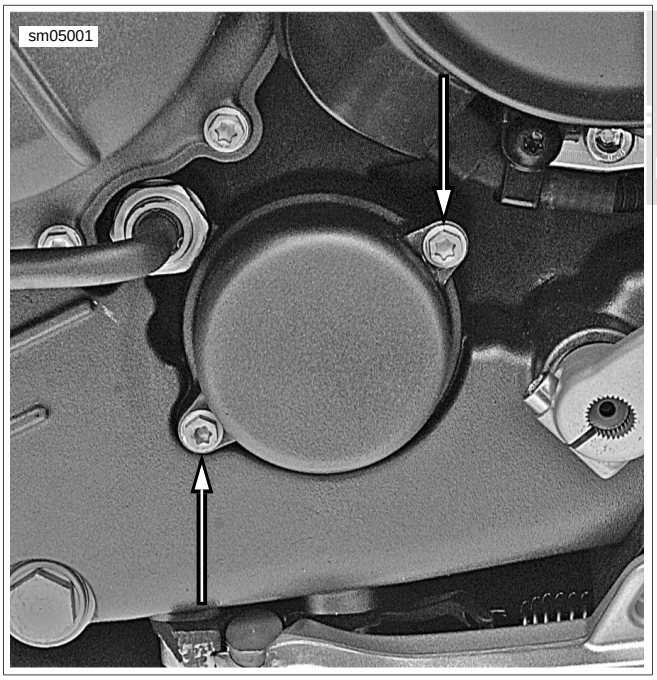



**Figure 3-135. Oil Filter Cover Fasteners**

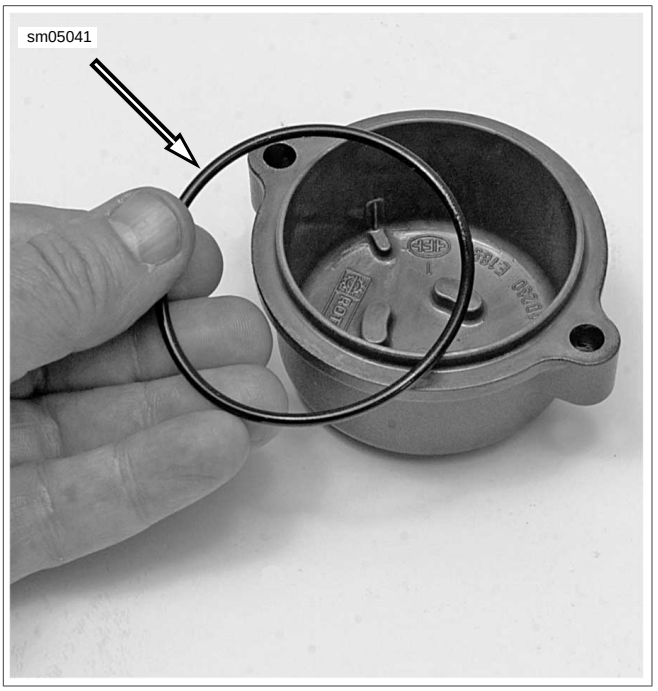



**Figure 3-136. Oil Filter Cover O-ring**




**Figure 3-137. Oil Filter and Cover**




**Figure 3-138. Rubber Seal**

## PRESSURE RETAINING VALVE

See Figure 3-139 and Figure 3-140. Tighten to 30 Nm (22 ft-lbs).

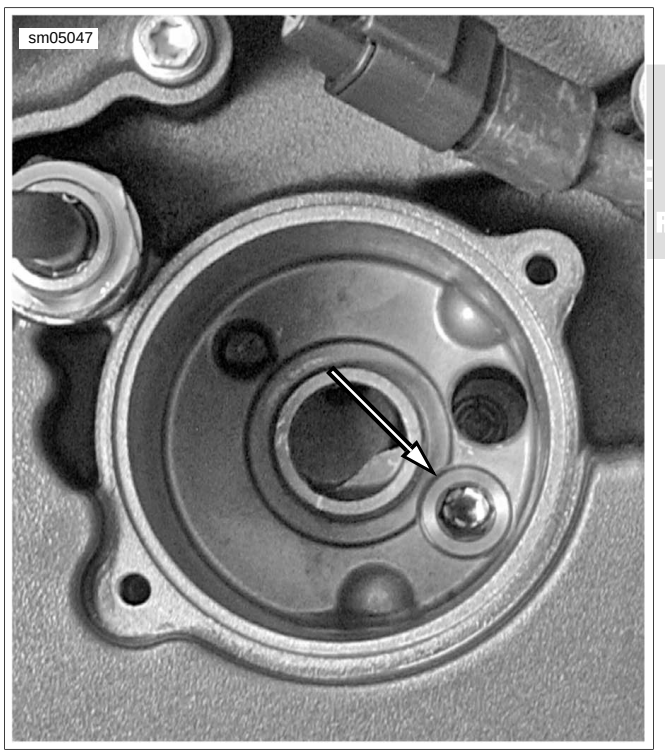



**Figure 3-139. Pressure Retaining Valve**



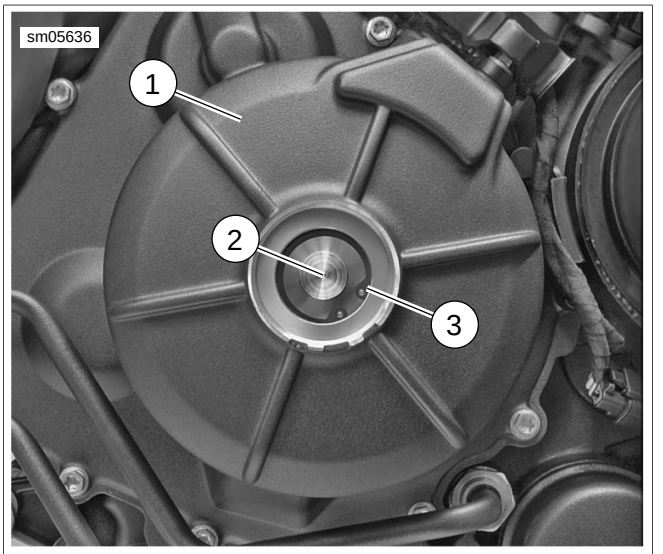

**Figure 3-140. Pressure Relief Valve**

## SEALING SLEEVE

1. See Figure 3-141. Remove ignition cover plug.
2. See Figure 3-142. Remove retaining ring (3) securing sealing sleeve (2).
3. See Figure 3-143. Remove sealing sleeve. Discard O-ring.
4. Coat **new** sealing sleeve O-ring with a thin layer of clean engine oil. Install sealing sleeve.
5. See Figure 3-142. Install retaining ring (3).
6. Install ignition cover plug.




**Figure 3-141. Ignition Cover Plug**




1. Ignition cover
2. Sealing sleeve
3. Retaining ring

**Figure 3-142. Sealing Sleeve Retaining Ring**

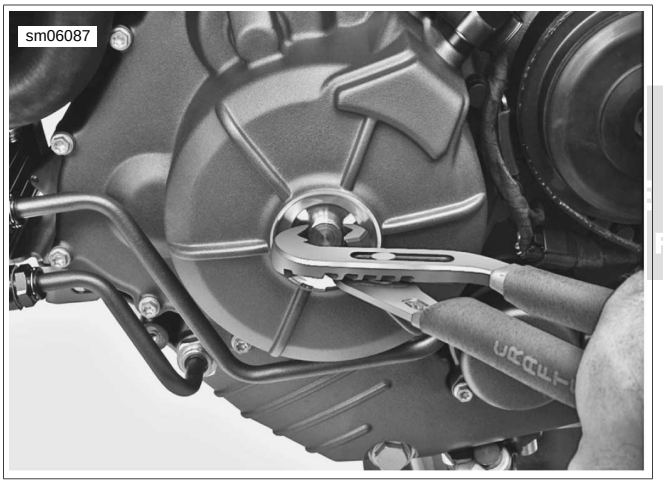



**Figure 3-143. Sealing Sleeve Removal**

## IGNITION COVER

| PART NUMBER | TOOL NAME |
|---|---|
| HD-45340 | GASKET ALIGNMENT DOWELS |

### Removal

1. Remove the seat and pillion.

**⚠WARNING**

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

2. Disconnect the negative battery cable.
3. See Figure 3-144. Under the seat, separate the stator connector [46] pin and socket housings.

*NOTE*

*See Figure 3-145. The wire terminals can be removed from the connector socket housing and taped to a length of mechanics wire to guide the leads through the engine wire harness support. Lubricate the stator lead with silicon spray.*

4. See Figure 3-146. Pull the engine harness support back from the CKP sensor and remove the fastener.
5. Remove the CKP sensor and wire clamp from the ignition cover. Separate out the stator wire harness from the wire clamp.
6. Remove the oil cooler return and supply lines. See 5.9 OIL COOLER.
7. Remove the ignition cover.

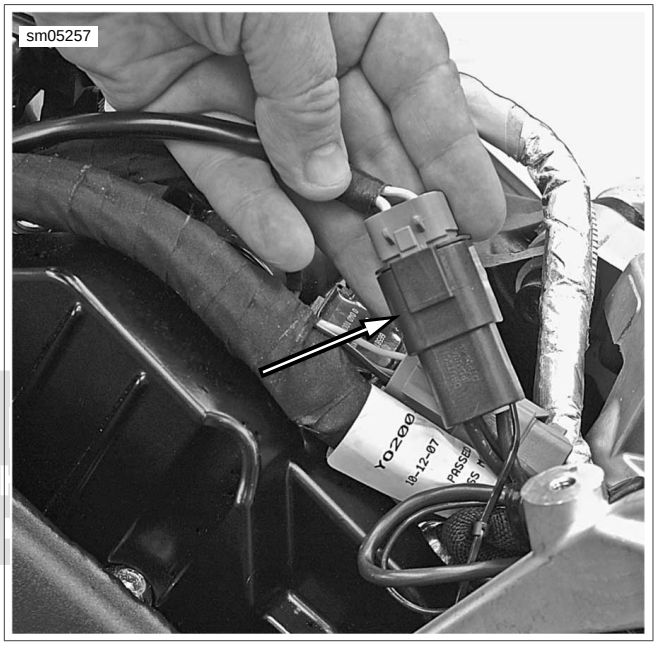



**Figure 3-144. Stator Connector [46]**




**Figure 3-145. Mechanics Wire Lead**




**Figure 3-146. CKP Sensor Fastener**

## Installation

1. See Figure 3-147. Check the locating pins (1) in the case.
2. Thread GASKET ALIGNMENT DOWELS (Part No. HD-45340) (2) into their locations.
3. Fit a **new** gasket (3) over the dowels and the locating pins.

*NOTE*

*Remove the dowels after the cover has been installed with a flatblade screwdriver.*

4. Slide the cover over the dowels and pins.

*NOTE*

*The fastener with the brass washer threads into the torque sequence position eight.*

5. Loosely thread in the cover fasteners.
6. Route the stator wire harness through the clip with the CKP sensor wire harness and snap in place.
7. Wrap the stator leads around the mechanics wire left as a leader through the engine support. Lubricate with silicon spray and pull the leads through the support.
8. See Figure 3-148. In sequence, tighten the cover fasteners to 11 Nm (97 **in-lbs**).
9. Install the oil cooler lines. See 5.9 OIL COOLER.

*NOTE*

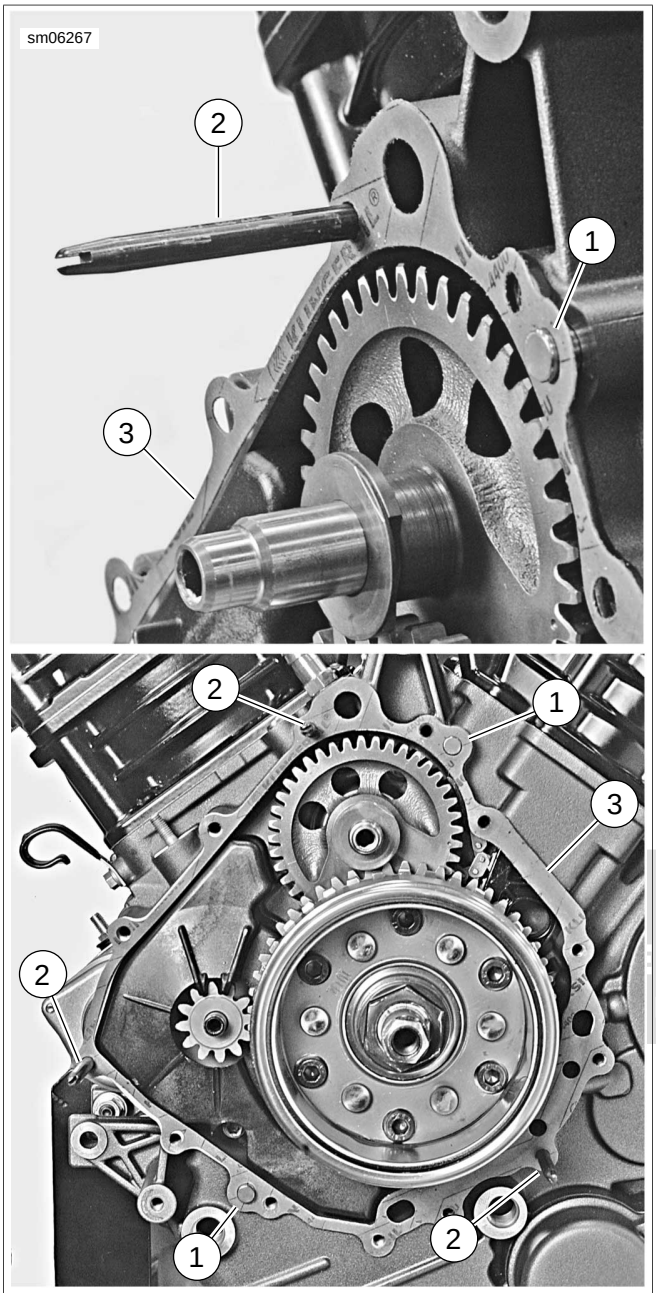
*Route the stator wire harness alongside the engine harness in the support channel and secure with a support rubber band.*

10. Cable strap the stator wire harness to the engine harness and the main harness under the seat.
11. Install the socket terminals in the housing and mate the stator connector [46] pin and socket housings.
12. Connect the negative battery cable.

**WARNING**

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

13. Install the seat.




1. **Locating pin**
2. **Dowel**
3. **Gasket**

**Figure 3-147. Alignment Dowel and Locating Pin Locations**

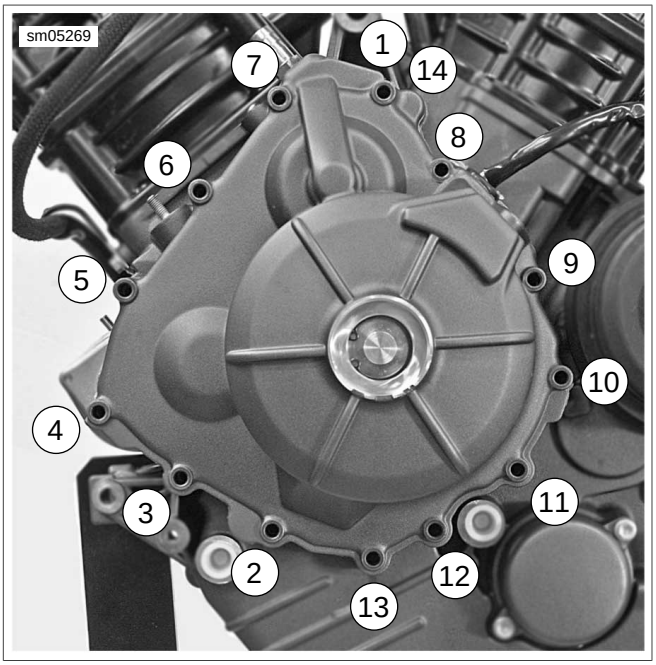



**Figure 3-148. Ignition Cover Torque Sequence**

## BALANCER: TOP

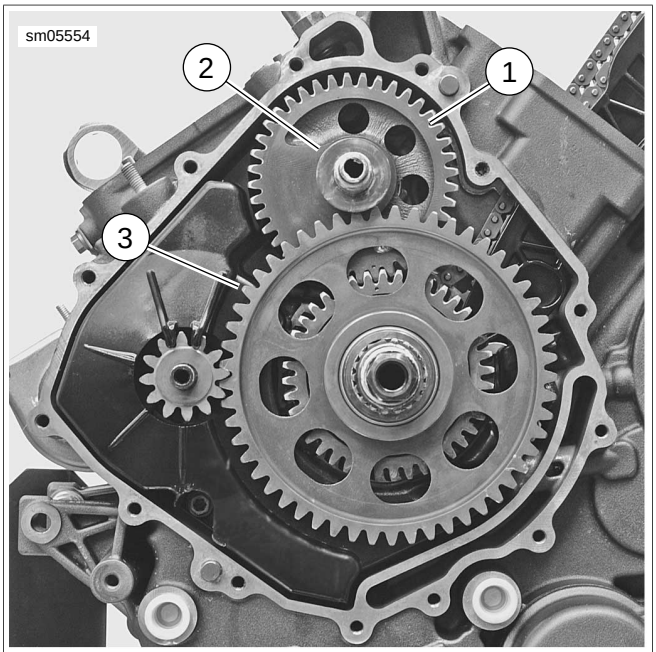
| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |
| B-48862 | TOP BALANCER BEARING INSTALLER |
| B-49194 | SEAL INSTALLER |
| HD-95760-69A | BUSHING AND BEARING PULLER |
| HD-95766-69A | COLLET, 5/8" |

### Removal

*NOTE*

*To rotate the gears for clearance, remove the crankshaft locking tool.*

1. See Figure 3-149. Remove the washer (2) from the balancer shaft (1).
2. Remove the starter ring gear (3).
3. Remove the balancer shaft and the rear washer.




1. **Balancer**
2. **Washer**
3. **Starter ring gear**

**Figure 3-149. Balancer and Starter Ring Gear**



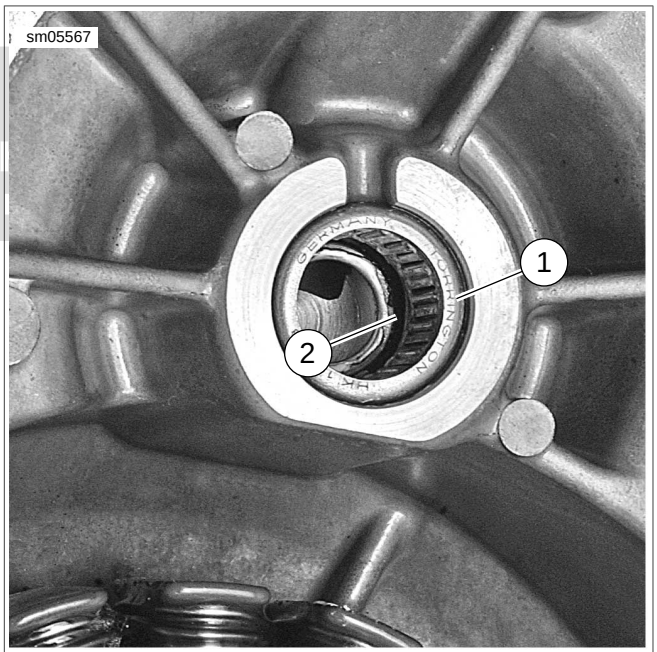

**Figure 3-150. Oil Passage in Balancer Support in Crankcase**

## Bearing and Oil Seal

*NOTE*

*The balancer shaft is supported between the bearing surface in the crankcase and the needle bearing in the ignition cover.*

1. See Figure 3-150. Inspect the bearing surface in the crankcase.
2. Clean the oil passages.
3. See Figure 3-151. Inspect the needle bearing (1) and oil seal (2) in the ignition cover. Replace as required:
   a. See Figure 3-152. Use the BUSHING AND BEARING PULLER (Part No. HD-95760-69A) with the COLLET, 5/8" (Part No. HD-95766-69A) to remove the bearing from the cover.
   b. Use the puller and collet to remove the seal from the cover.
   c. See Figure 3-153. With the spring side facing in toward the top balancer, use a SEAL INSTALLER (Part No. B-49194) to seat the **new** seal in the cover.
   d. See Figure 3-154. With the bearing numbers up, use the TOP BALANCER BEARING INSTALLER (Part No. B-48862) to press the needle bearing to the correct depth in the ignition cover.
4. Clean the ignition cover oil passages.




1. **Needle bearing**
2. **Seal**

**Figure 3-151. Balancer Shaft Support in Ignition Cover**




**Figure 3-152. Bushing and Bearing Puller**




**Figure 3-153. Top Balancer Seal Installer**




**Figure 3-154. Top Balancer Needle Bearing Installer**

## Installation

*NOTE*

*Lubricate inner washer, bearings and bearing surfaces with a thin film of LUBRIPLATE No. 105 Motor Assembly Grease. In addition apply a thin film of clean engine oil to bearings and bearing surfaces.*

1. Lock the engine at front cylinder TDC with the CRANKSHAFT LOCKING TOOL (Part No. B-48858).
2. See Figure 3-155. Install the inner washer on the balancer crankcase side shaft.

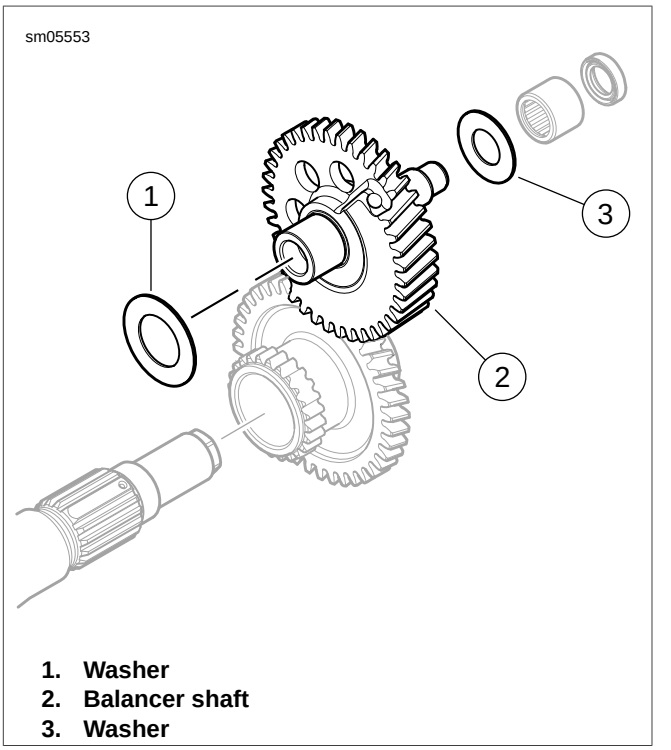
*NOTE*

*See Figure 3-156. Match the timing mark on the balancer with the timing mark on the valve train drive gear.*

3. See Figure 3-157. Install the inner washer (1) and the balancer (2).
4. Install the outer washer (3).
5. Install the starter ring gear.




**Figure 3-155. Top Balancer**




1. **Washer**
2. **Balancer shaft**
3. **Washer**

**Figure 3-157. Top Balancer Assembly**

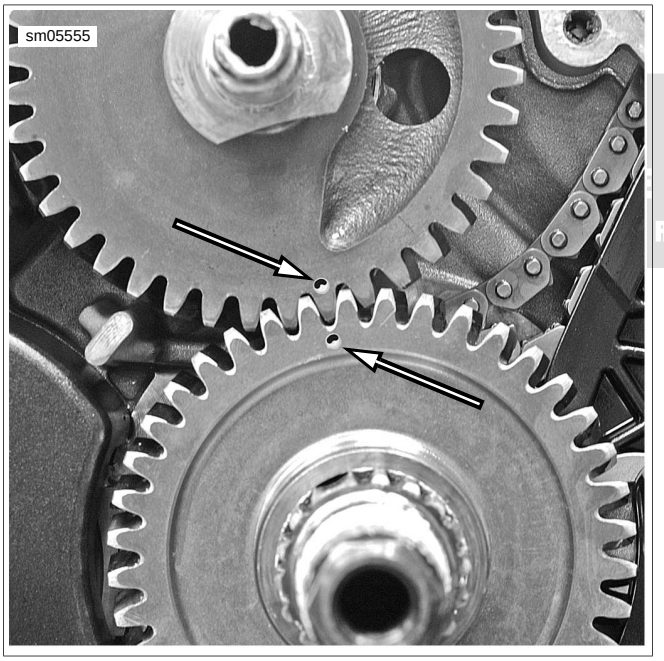
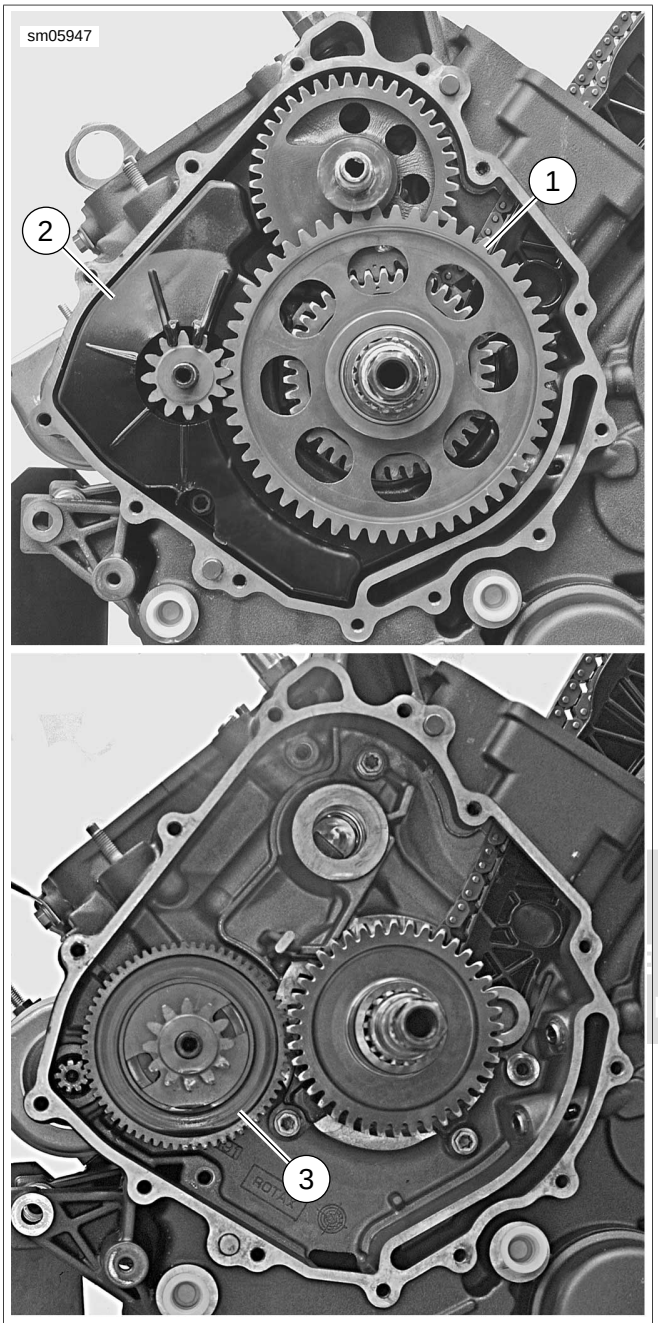



**Figure 3-156. Timing Marks**

## STARTER FRICTION CLUTCH

### Removal

1. Remove alternator rotor. See 7.10 ALTERNATOR.
2. See Figure 3-158. Remove the starter ring gear (1).
3. Remove top balancer. See 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft.
4. Remove friction clutch cover fasteners and shoulder screw.
5. Remove friction clutch cover.
6. Remove rear cylinder valve train drive. See 3.12 VALVE TRAIN DRIVE, Rear Cylinder.
7. See Figure 3-159. Remove friction clutch.




1. **Starter ring gear**
2. **Cover**
3. **Friction clutch**

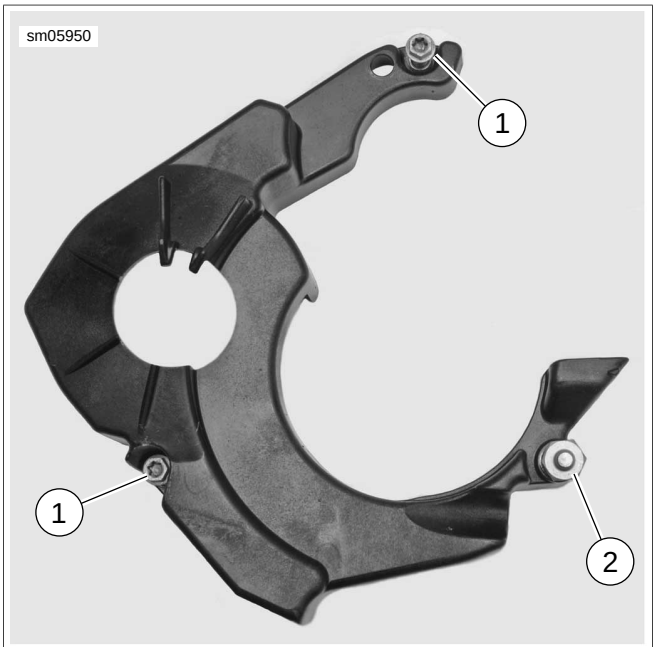
**Figure 3-158. Access to Friction Clutch**




**Figure 3-159. Friction Clutch**

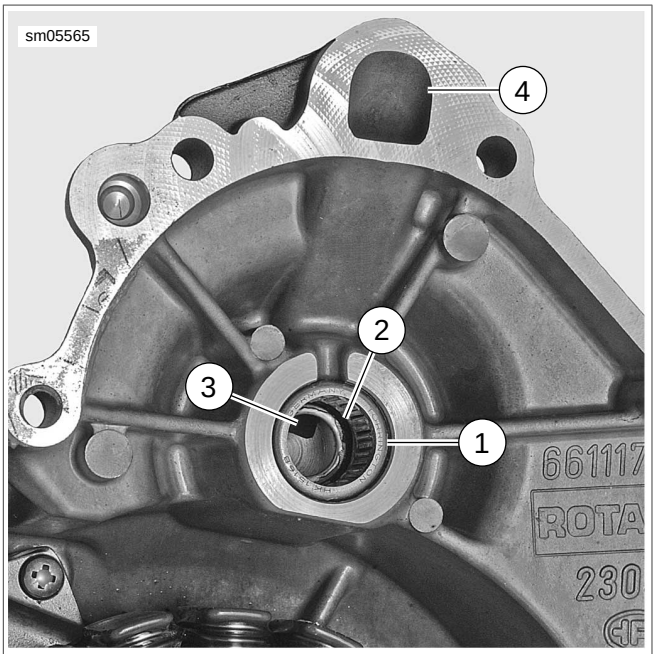
## Installation

1. Install friction clutch.
2. Install rear cylinder valve train drive. See 3.12 VALVE TRAIN DRIVE, Rear Cylinder.
3. See Figure 3-160. Place friction clutch cover in position over friction clutch.
4. Install fasteners (1) and shoulder screw (2). Tighten fasteners and shoulder screw to 11 Nm (97 **in-lbs**).
5. Install top balancer. See 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft.
6. Install alternator rotor. See 7.10 ALTERNATOR.
7. Install ignition cover. See 3.11 ALTERNATOR SIDE, Ignition Cover.




1. **Fastener**
2. **Shoulder screw**

**Figure 3-160. Friction Clutch Cover**




1. **Bearing**
2. **Seal**
3. **Breather passage**
4. **Breather passage to crankcase**

**Figure 3-161. Alternator Cover Top Balancer Support**

## CRANKCASE BREATHER

### General

Crankcase air and oil mist enters the hollow balancer shaft from passages in the crankcase support. As the balancer spins, heavier oil is separated from the mist and returned to the oil sump through the hole in the counterweight.

See Figure 3-161. The remaining oil mist flows through the balancer shaft and up through the transfer passage in the alternator cover. The mist is transferred to a cavity in the crankcase which is plumbed with a brass fitting. A breather hose from the fitting is routed to the air cleaner baseplate.

See Figure 3-162. The breather hose gasket fits over a filtered opening on the bottom of the air cleaner baseplate. Additional oil is trapped in the filter and any remaining oil mist is drawn into the combustion chambers through the throttle bodies.

### Replacement

1. See Figure 3-163. To replace the breather hose fitting (1):
   a. Apply LOCTITE 243 (blue) to the threads of the fitting.
   b. Tighten to 5 Nm (44 **in-lbs**).
2. Press the hose (2) over the fitting.
3. Replace the filter (3) in the baseplate as necessary.

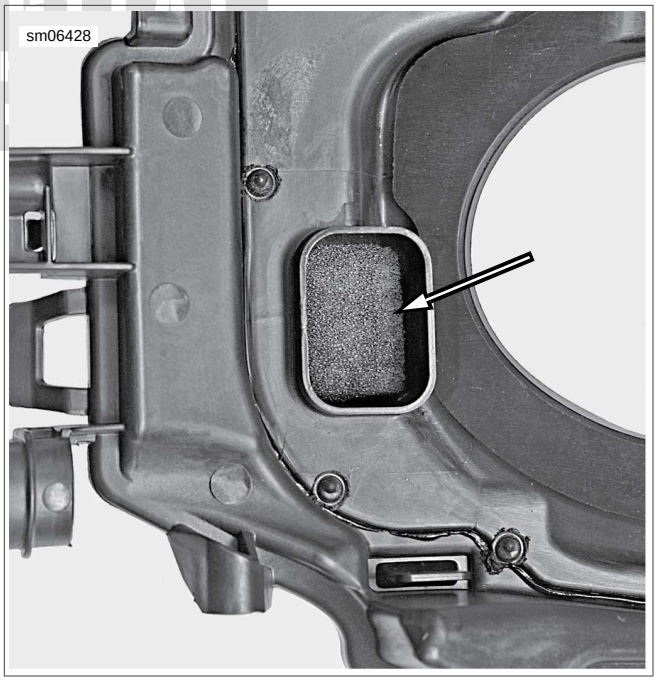
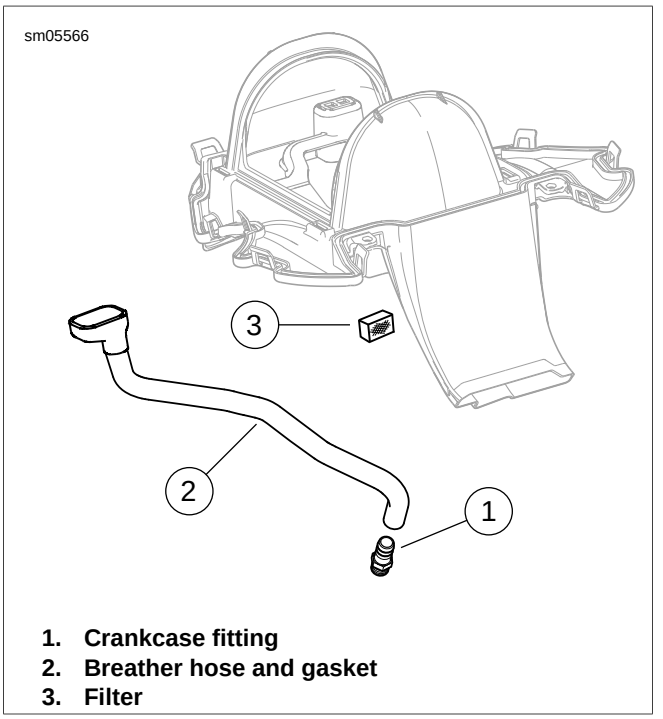



**Figure 3-162. Air Cleaner Baseplate with Breather Filter**




1. **Crankcase fitting**
2. **Breather hose and gasket**
3. **Filter**

**Figure 3-163. Crankcase Breather Hose**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## FRONT CYLINDER

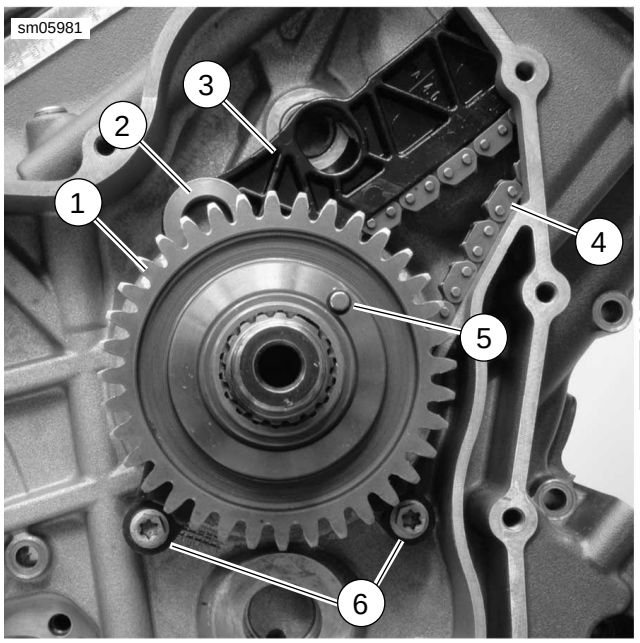
### Removal

1. Remove bottom balancer. See 3.10 CLUTCH SIDE, Balancer: Bottom.
2. See Figure 3-164. Remove chain guide fasteners (6).
3. Remove primary drive gear (1).

*NOTE*

*In next step, mark camshaft chain (4) so original orientation is maintained.*

4. Remove camshaft chain.
5. Remove sleeve (2) and chain tension guide (3). Inspect chain tension guide for excessive wear. See 3.2 SPECIFICATIONS, General.




1. **Primary drive gear**
2. **Sleeve**
3. **Chain tension guide**
4. **Camshaft chain**
5. **Needle roller**
6. **Chain guide fasteners**

**Figure 3-164. Primary Drive Gear**

### Installation

1. See Figure 3-164. Install chain tension guide (3) and sleeve (2).
2. Maintaining original orientation, install camshaft chain (4) over crankshaft. Route chain along chain tension guide.

*NOTE*

*In next step, splines on crankshaft and primary drive gear are indexed.*

3. Install primary drive gear (1) on crankshaft. be sure chain engages gear sprocket teeth.
4. See Figure 3-165. Install chain guide.
   a. See Figure 3-164. Install chain guide into position.
   b. Apply LOCTITE 243 (blue) to the threads of chain guide fasteners.
   c. Install chain guide fasteners. Tighten fasteners to 11 Nm (97 **in-lbs**).
5. Install bottom balancer. See 3.10 CLUTCH SIDE, Balancer: Bottom.




**Figure 3-165. Chain Guide front and rear cylinder)**

## REAR CYLINDER

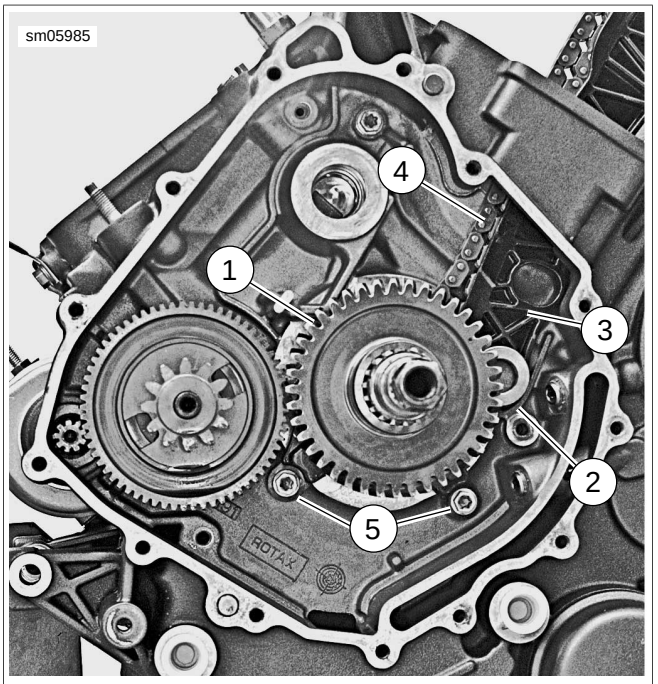
### Removal

1. Remove top balancer. See 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft.
2. Remove friction clutch cover. See 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft.
3. See Figure 3-166. Remove chain guide fasteners (5).
4. Remove primary drive gear (1).

*NOTE*

*In next step, mark camshaft chain (4) so original orientation is maintained.*

5. Remove camshaft chain.
6. Remove sleeve (2) and chain tension guide (3). Inspect chain tension guide for excessive wear. See 3.11 ALTERNATOR SIDE, Starter Friction Clutch.




1. **Timing chain gear**
2. **Sleeve**
3. **Chain tension guide**
4. **Camshaft chain**
5. **Chain guide fasteners**

**Figure 3-166. Timing Chain Gear**

## Installation

1. See Figure 3-166. Install chain tension guide (3) and sleeve (2).
2. Maintaining original orientation, install camshaft chain (4) over crankshaft. Route chain along chain tension guide.

*NOTE*

*In next step, splines on crankshaft and timing chain gear are indexed.*

3. Install timing chain gear (1) on crankshaft. be sure chain engages gear sprocket teeth.
4. Install chain guide.
   a. See Figure 3-166. Install chain guide into position.
   b. Apply LOCTITE 243 (blue) to the threads of chain guide fasteners.
   c. Install chain guide fasteners. Tighten fasteners to 11 Nm (97 **in-lbs**).
5. Install friction clutch cover. See 3.11 ALTERNATOR SIDE, Starter Friction Clutch.
6. Install top balancer. See 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# CRANKCASE 3.13

## SPLIT CRANKCASE

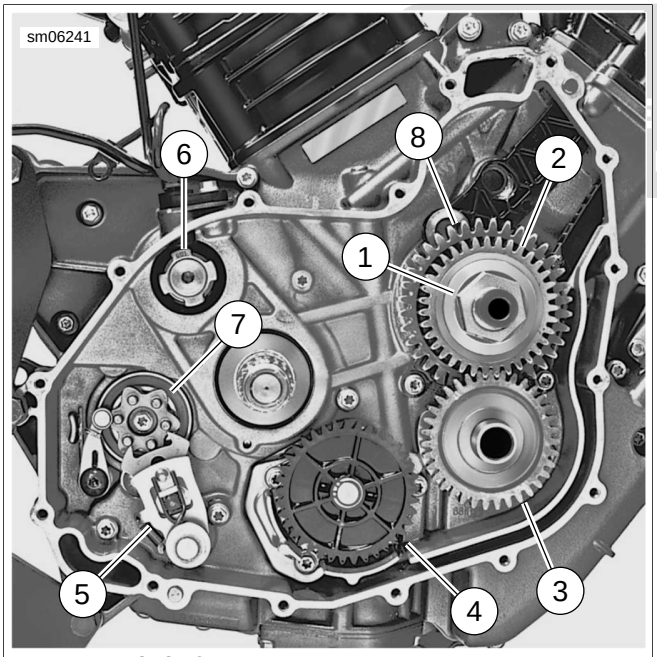
*NOTE*

*Replacement crankcases will have all bearings and dowel pins pre-installed.*

Remove engine from frame. See 3.5 ENGINE REPLACEMENT.

## Clutch Side Components Removal

1. Remove front cylinder head. See 3.8 CYLINDER HEADS.
2. Remove front cylinder. Remove front piston if necessary. See 3.9 CYLINDERS AND PISTONS.
3. Remove clutch cover. See 3.10 CLUTCH SIDE.
4. Remove primary drive. See 6.5 CLUTCH, Clutch Basket.
5. Remove front cylinder valve train drive. See 3.12 VALVE TRAIN DRIVE, Front Cylinder.
6. Remove oil pump. See 3.10 CLUTCH SIDE, Oil Pump.
7. Remove shift linkage, including index shim. See 6.7 SHIFT LINKAGE.
8. Remove VSS trigger wheel. See 6.8 TRANSMISSION, VSS Trigger Wheel.

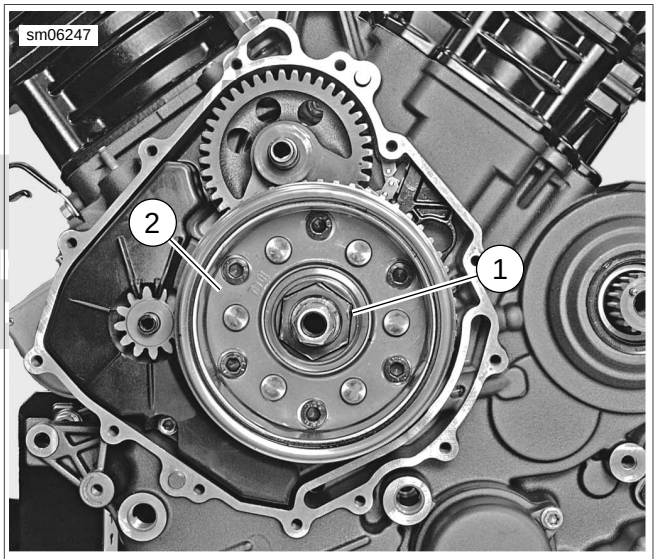



1. **Crankshaft nut**
2. **Balancer drive gear**
3. **Bottom balancer**
4. **Oil pump**
5. **Shift shaft**
6. **VSS trigger wheel**
7. **Index shim**
8. **Drive and chain sprockets**

**Figure 3-167. Clutch Side**

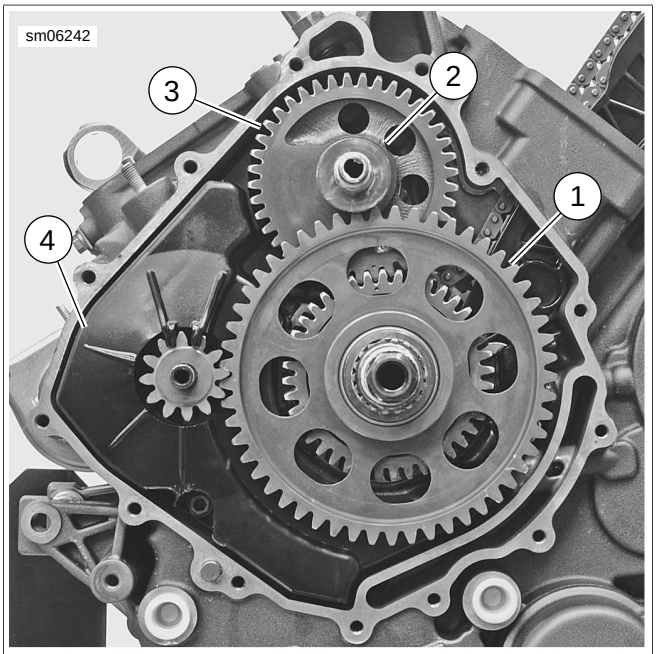
## Alternator Side Components Removal

1. Remove rear cylinder head.
2. Remove rear cylinder. Remove rear piston if necessary. See 3.9 CYLINDERS AND PISTONS.
3. Remove ignition cover. See 3.11 ALTERNATOR SIDE, Ignition Cover.
4. See Figure 3-168. Remove nut (1) and alternator rotor (2). See 7.10 ALTERNATOR.
5. See Figure 3-169. Remove starter ring gear (1), friction clutch cover (4), thrust washer (2) and top balancer (3).
6. See Figure 3-170. Remove timing chain gear (3), friction clutch (2) and starter drive gear (1).
7. Remove rear cylinder valve train drive. See 3.12 VALVE TRAIN DRIVE, Rear Cylinder.
8. Remove starter. See 7.8 STARTER.



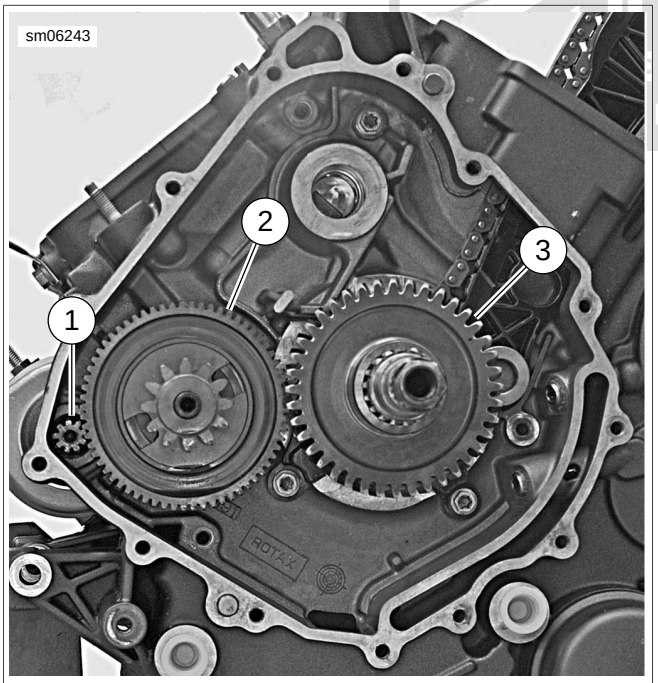

1. **Nut**
2. **Alternator rotor**

**Figure 3-168. Ignition**




1. Starter ring gear
2. Thrust washer
3. Top balancer
4. Friction clutch cover

**Figure 3-169. Alternator Side**




1. Starter drive gear
2. Friction clutch
3. Timing chain gear

**Figure 3-170. Alternator Side**

## Disassembly

1. See Figure 3-169. Loosen and remove crankcase fasteners in reverse order of assembly.
2. See Figure 3-171. Remove the left side crankcase from the right side crankcase.
3. Remove the transmission assembly. See 6.8 TRANSMISSION.
4. Remove crankshaft.

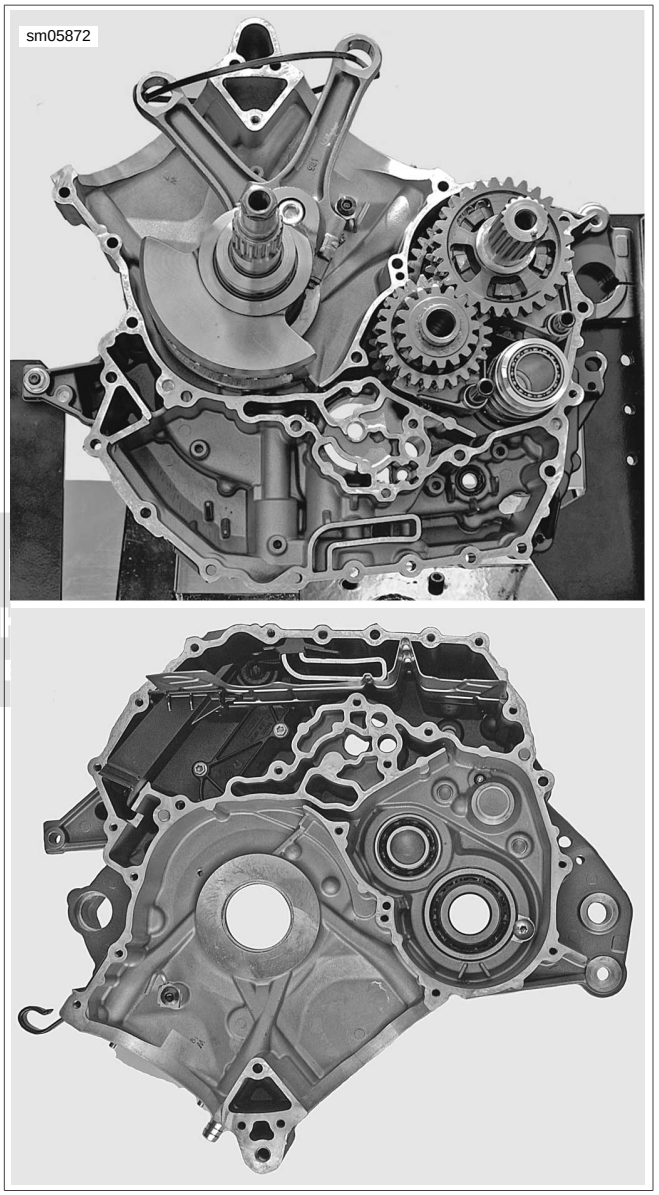



**Figure 3-171. Split Crankcases**

## OIL SUMP

### Removal

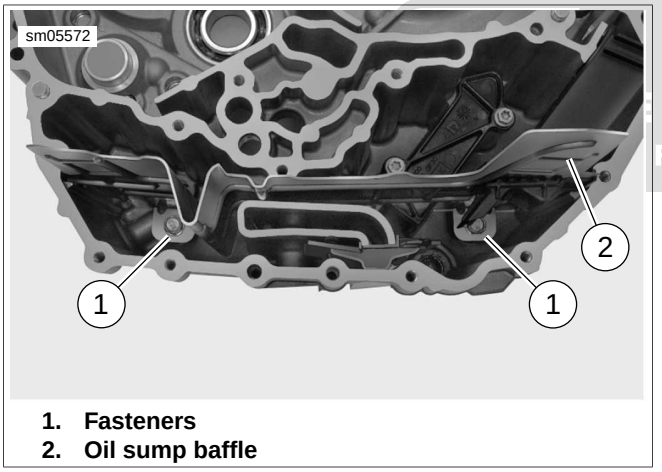
1. See Figure 3-172. Remove fasteners (1) and pull oil sump baffle (2) from crankcase.
2. See Figure 3-173. Press tab (2) and slide oil collector (1) from oil sump baffle (3).
3. See Figure 3-174. Remove fasteners (1) to release oil duct cover (2) from crankcase.
4. See Figure 3-175. Pull oil suction adapter out of crankcase.

### Installation

*NOTE*

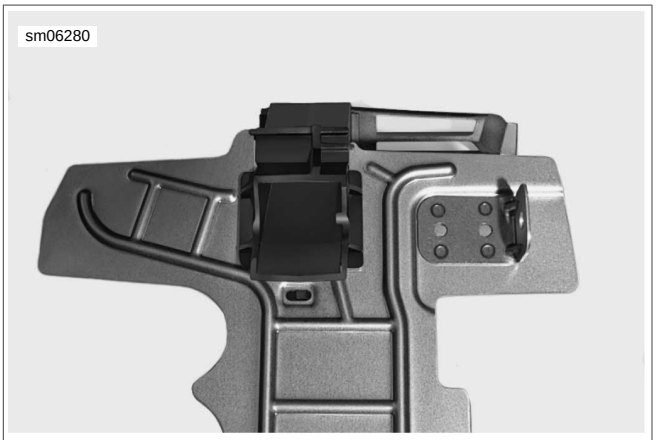
*Apply LOCTITE 243 (blue) to fasteners before installation.*

1. See Figure 3-175. Slide oil suction adapter into crankcase.
2. See Figure 3-174. Place oil duct cover (2) into position on crankcase. Install fasteners (1) and tighten to 11 Nm (97 **in-lbs**).
3. See Figure 3-173. Slide oil collector (1) on oil sump baffle (3) until tab (2) is engaged.
4. See Figure 3-172. Place oil sump baffle (2) into position on crankcase. Install fasteners (1) and tighten to 11 Nm (97 **in-lbs**).



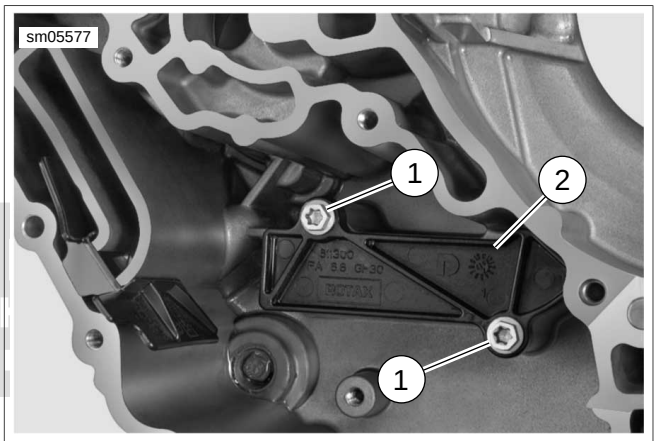

**1. Fasteners**
**2. Oil sump baffle**

**Figure 3-172. Oil Sump Baffle**




**1. Oil collector**
**2. Tab**
**3. Oil sump baffle**

**Figure 3-173. Oil Collector**




**1. Fastener**
**2. Oil duct cover**

**Figure 3-174. Oil Duct Cover**

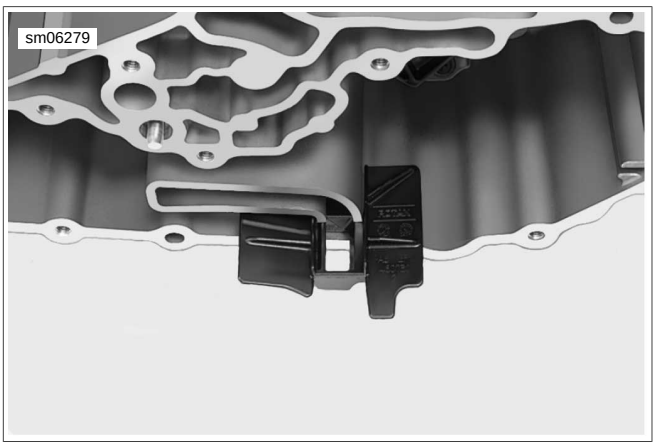


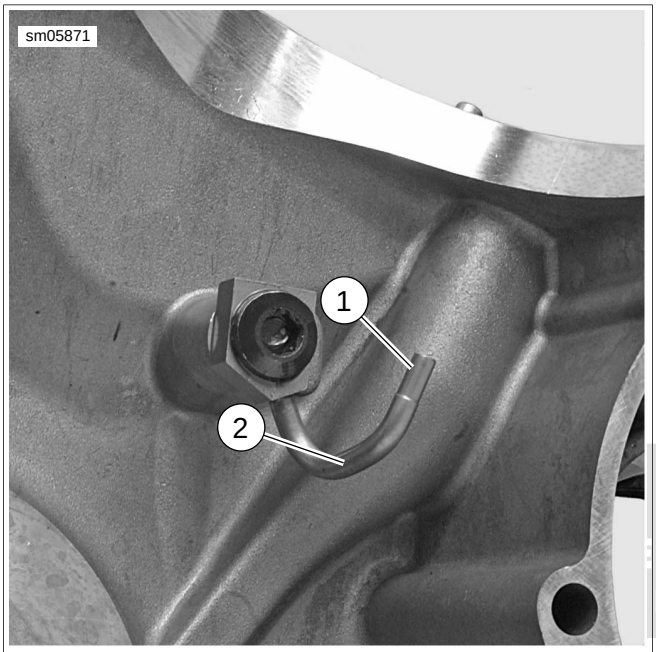

**Figure 3-175. Oil Suction Adapter**

## OIL NOZZLES

*NOTES*

- *Do not reuse oil nozzle fasteners. Always install **new** oil nozzle fasteners.*
- *See Figure 3-176. The rear cylinder oil nozzle (1) has a line (groove) inscribed around it (2) for identification purposes.*

1. See Figure 3-177. Fit the oil nozzles to the shoulder on the case mounts.
2. Tighten to 21 Nm (15.5 ft-lbs).




1. **Rear cylinder oil nozzle**
2. **Notch**

**Figure 3-176. Rear Cylinder Oil Nozzle**




**Figure 3-177. Oil Nozzle Mount Shoulder**

## OIL PASSAGE PLUGS

### Clutch Shaft Bearing: Left Case

See Figure 3-178. Hand tighten the threaded jet (1) into the clutch shaft bearing.

Apply LOCTITE 243 (blue) to the plug (2) threads and tighten to 11 Nm (97 **in-lbs**).

### Pressure Cavity: Left Case

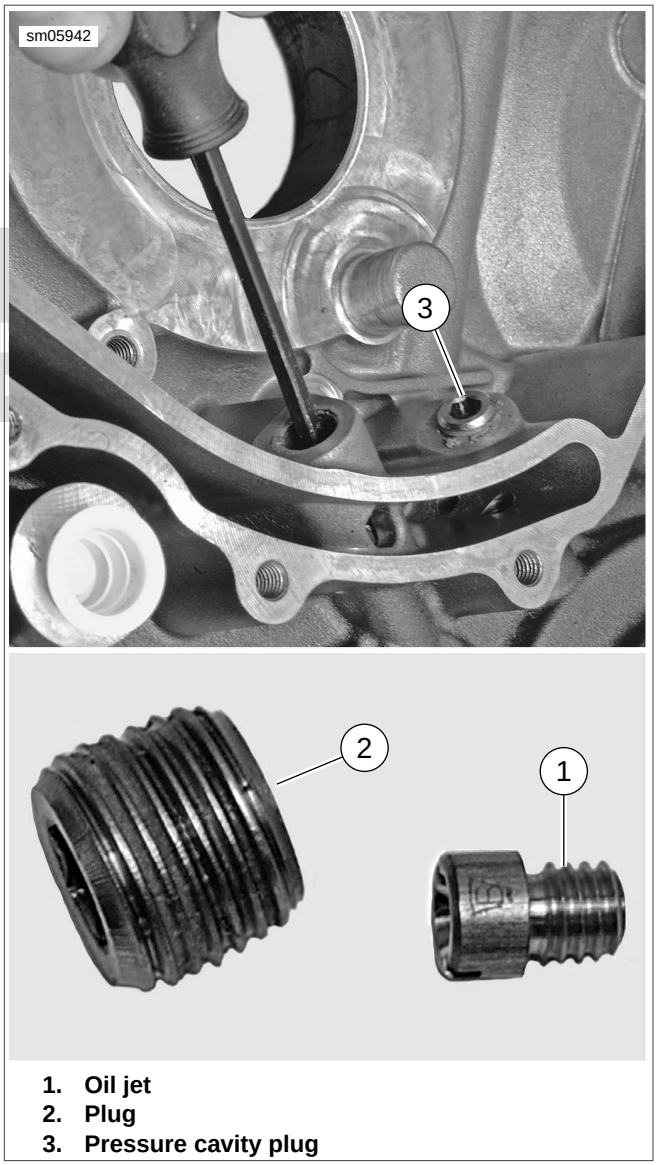
See Figure 3-178. Apply LOCTITE 243 (blue) to the plug (3) threads and tighten to 12 Nm (106 **in-lbs**).

### Oil Nozzle: Left Case

See Figure 3-179. Apply LOCTITE 243 (blue) to the plug threads and tighten to 21 Nm (15.5 ft-lbs).

### Oil Nozzle: Right Case

See Figure 3-180. Apply LOCTITE 243 (blue) to the plug threads and tighten to 21 Nm (15.5 ft-lbs).




1. **Oil jet**
2. **Plug**
3. **Pressure cavity plug**

**Figure 3-178. Clutch Shaft Bearing and Pressure Cavity Oil Plugs: Left Case**

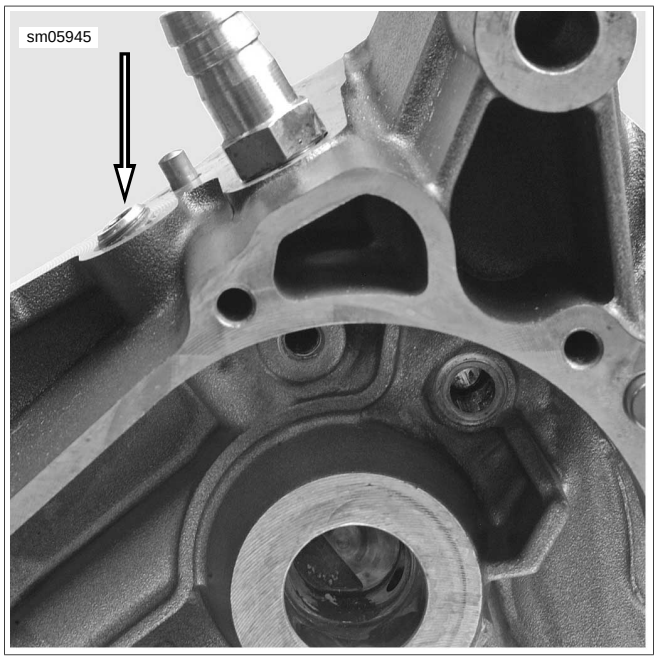



**Figure 3-179. Oil Nozzle Plug: Left Case**




**Figure 3-180. Oil Nozzle Plug: Right Case**

## WATER PUMP SHAFT BEARING

| PART NUMBER | TOOL NAME |
|---|---|
| B-49403 | WATER PUMP SHAFT CASE BEARING INSTALLER |
| HD-95760-69A | BUSHING & BEARING PULLER |
| HD-95765-69A | COLLET, 1/2" |

### Removal

See Figure 3-181. Use the BUSHING & BEARING PULLER (Part No. HD-95760-69A) with a COLLET, 1/2" (Part No. HD-95765-69A) to remove the bearing.




**Figure 3-181. Remove the Water Pump Shaft Case Bearing**

### Installation

See Figure 3-182. Use the WATER PUMP SHAFT CASE BEARING INSTALLER (Part No. B-49403).




**Figure 3-182. Water Pump Shaft Case Bearing Installer (B-49403)**

## MAIN BEARINGS

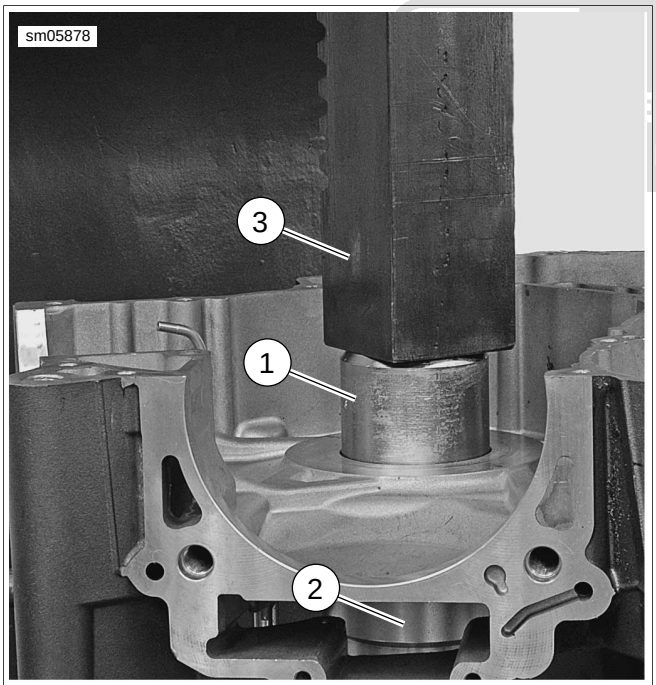
| PART NUMBER | TOOL NAME |
|---|---|
| B-49055 | MAIN BEARING REMOVER/INSTALLER |

### Removal

*NOTE*

*The main bearing split line needs to be oriented within 5 degrees of horizontal to the "V" of cylinders.*

1. To aid installation, mark the split in the main bearings to the case before removal.
2. See Figure 3-183.
3. Obtain the MAIN BEARING REMOVER/INSTALLER (Part No. B-49055).
4. Place support tube (2) on hydraulic press table with the "A" end up. Note that the sides of the support tube are stamped to be certain of proper orientation.
5. With the inboard side of the crankcase half facing upward, position main bearing bore over support tube.
6. Slide pilot/driver (1) through bearing into support tube.
7. Center pilot/driver under ram (3) of press. Apply pressure to pilot/driver until bearing is free. Discard bearing.




1. **Pilot/driver**
2. **Support tube**
3. **Ram**

**Figure 3-183. Main Bearing Remover/Installer Driver B-49055-3**

2. See Figure 3-184. Spread a thin film of clean engine oil on O.D. of **new** main bearings. Place bearings in tool.
   a. Slide collar towards top of tool.
   b. Place bearings (1) in tool with split (2) in bearings lined up with stop (4) in collar (3).
   c. Slide collar down over bearings until collar contacts stop.
   d. Keep bearings in place with fingers.
3. See Figure 3-185. Turn support tube (2) over so that the "B" end is up. The sides of the support tube are stamped "A" and "B" to be certain of proper orientation.
4. With the inboard side of the crankcase half facing upward, position main bearing bore over support tube.
5. While holding bearings in installation tool, slide bearing installation tool (1) through bearing into support tube.
6. See Figure 3-186. Using the stop (3) as a guide, align the split (1) in the main bearings with the original marked (2) location.
7. See Figure 3-185. Center pilot/driver under ram of press. Apply pressure to installation tool (1) until resistance is felt and bearing is bottomed on the support tube (2).
8. Remove installation tool and crankcase half from support tube.

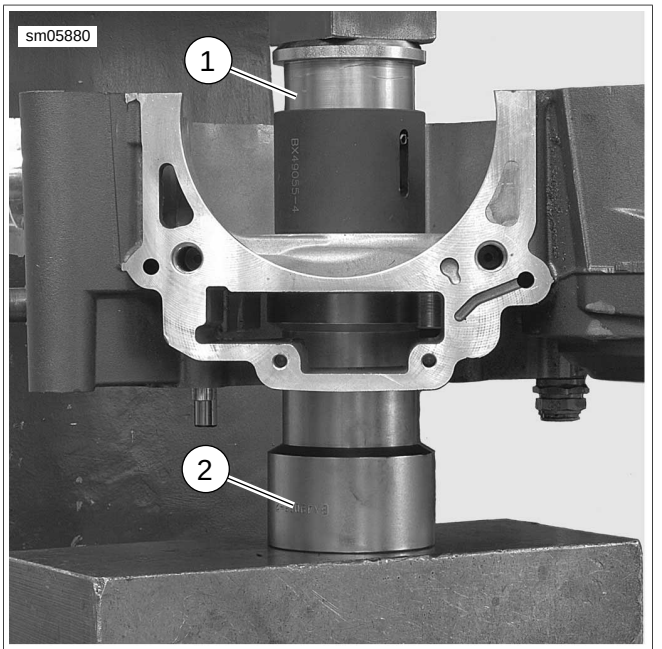



1. **Bearings**
2. **Split**
3. **Collar**
4. **Stop**

**Figure 3-184. Bearing Installation Tool**

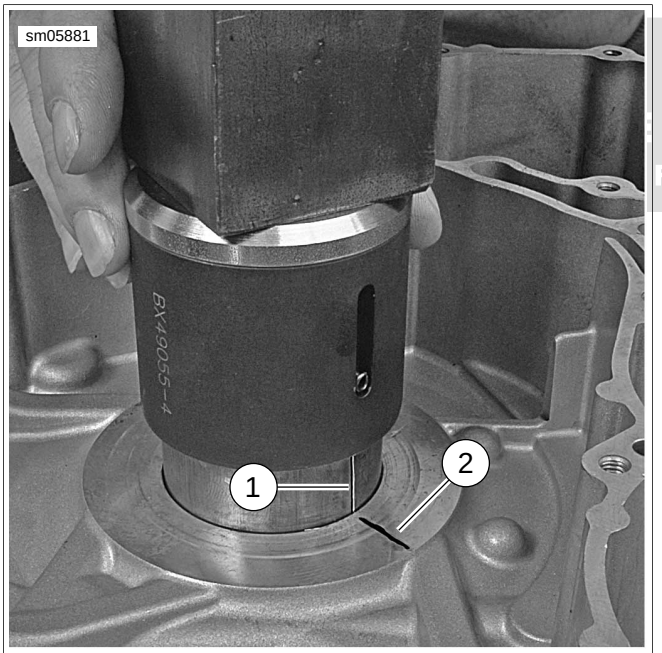
### Installation

1. Obtain the MAIN BEARING REMOVER/INSTALLER (Part No. B-49055).




1. **Bearing installation tool**
2. **Support tube**

**Figure 3-185. Installing Main Bearings**




1. **Split in main bearing shells**
2. **Mark (original location of split)**
3. **Stop**

**Figure 3-186. Main Bearings**

## P-CLAMP

See Figure 3-187. Install the P-clamp and fastener. Tighten to 11 Nm (97 **in-lbs** ).

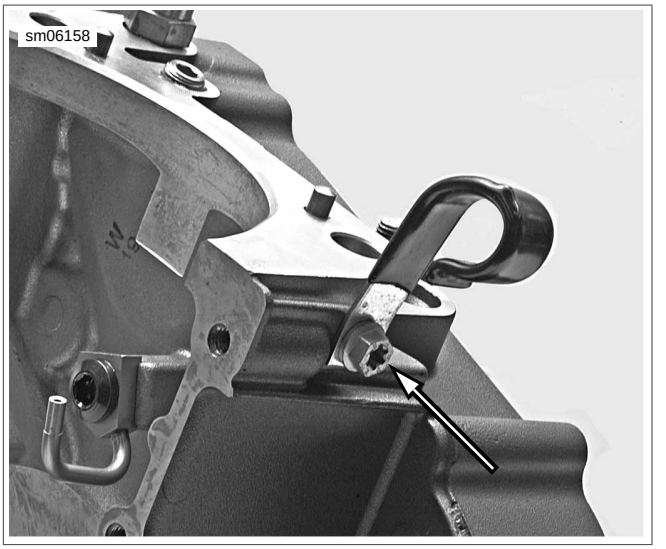



**Figure 3-187. Engine Case P-Clamp Fastener**

## JOIN CRANKCASE HALVES

| PART NUMBER | TOOL NAME |
|---|---|
| B-42310-60 | ENGINE CRADLE |

### Assembly

*NOTE*

*Inspect crankcase gasket surfaces. Repair surfaces if necessary. Replace crankcases if gasket surfaces cannot be repaired.*

1. Place right side crankcase in ENGINE CRADLE (Part No. B-42310-60).
2. Install crankshaft in right side crankcase. See 6.7 SHIFT LINKAGE.
3. Install the transmission assembly. See 6.5 CLUTCH.
4. Place **new** crankcase gasket on the left crankcase half.

*NOTE*

*Before installing left case half, apply a thin layer of clean engine oil to all moving parts.*

5. Install the left crankcase half on the right half. If necessary, tap lightly around transmission bearing to aid in installation.
6. See Figure 3-188. Loosely install long, medium and short crankcase fasteners in positions shown.

*NOTE*

*The first three crankcase fasteners are torqued twice, once at the beginning of the sequence and once towards the end.*

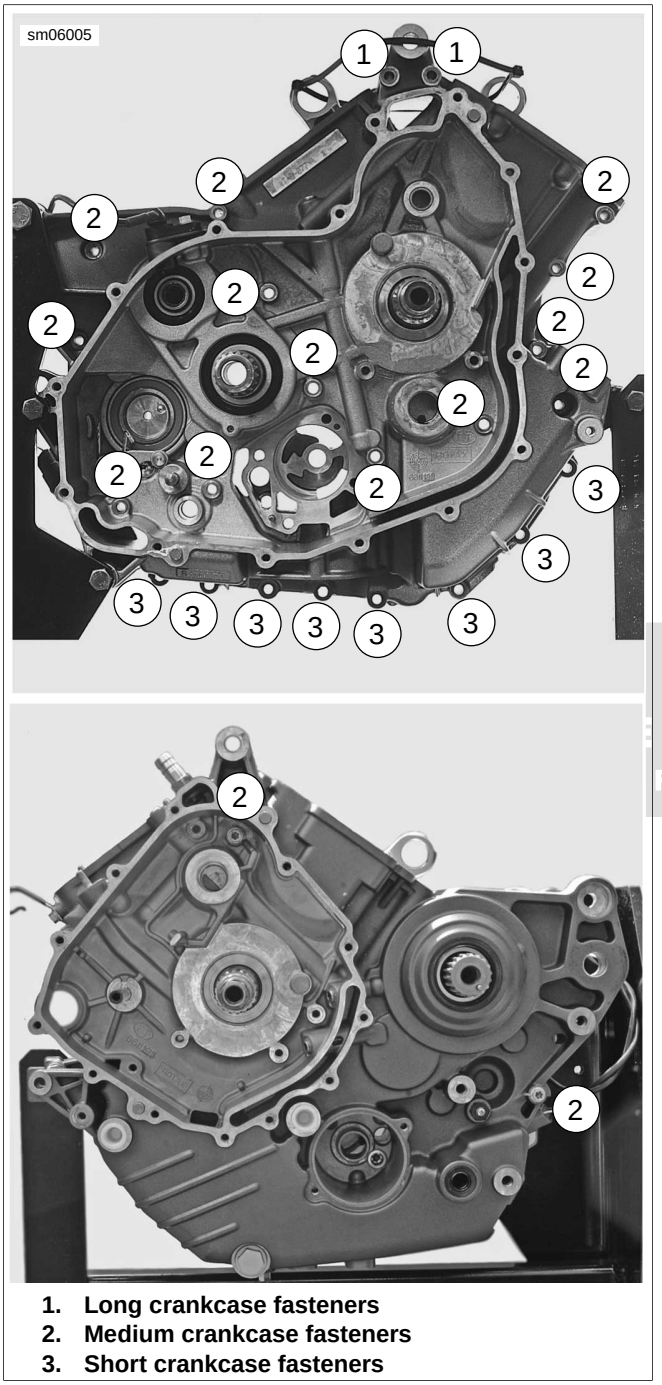
7. See Figure 3-189. Tighten crankcase fasteners in sequence shown to 11 Nm (97 **in-lbs**).

### Crankcase Gasket

*NOTE*

*Place shop towel in cylinder cavities to prevent debris from falling into engine.*

1. See Figure 3-190. Snap off crankcase gasket (2) protruding from front and rear cylinders. Using a honing stone, dress crankcase seam (1).
2. Apply a thin coating of LOCTITE 515 GASKET ELIMINATOR to area of crankcase seam area where gasket was removed.




1. **Long crankcase fasteners**
2. **Medium crankcase fasteners**
3. **Short crankcase fasteners**

**Figure 3-188. Crankcase Fasteners**

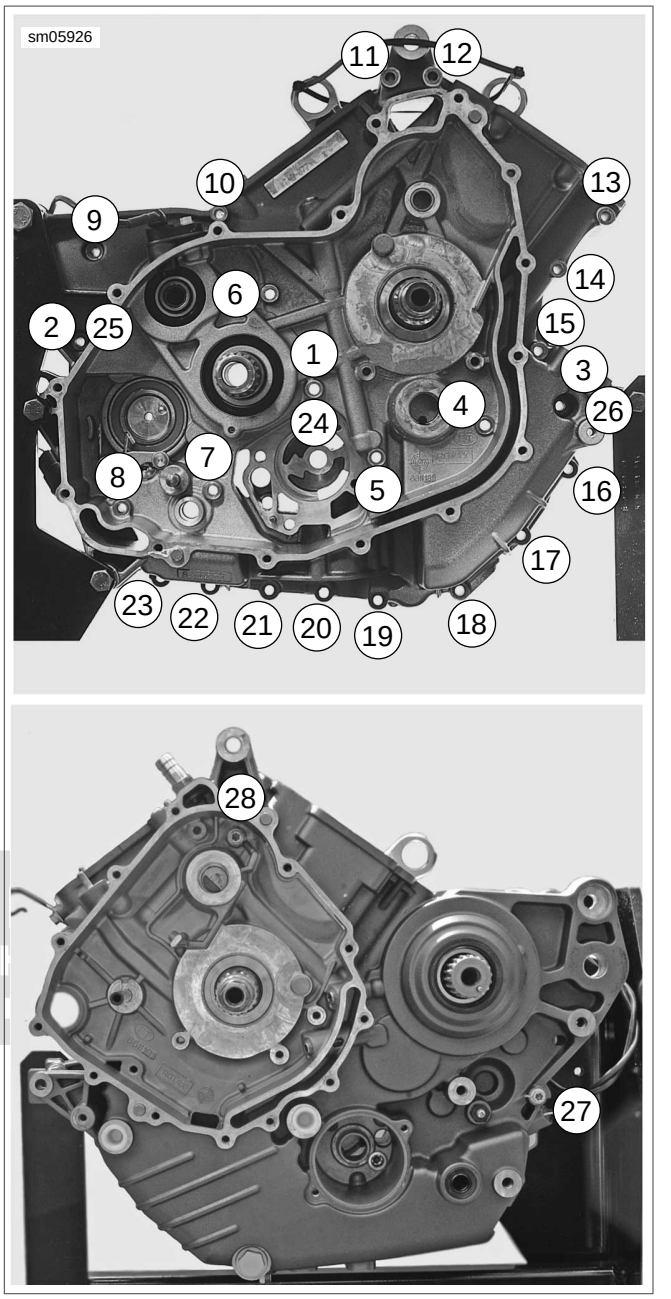
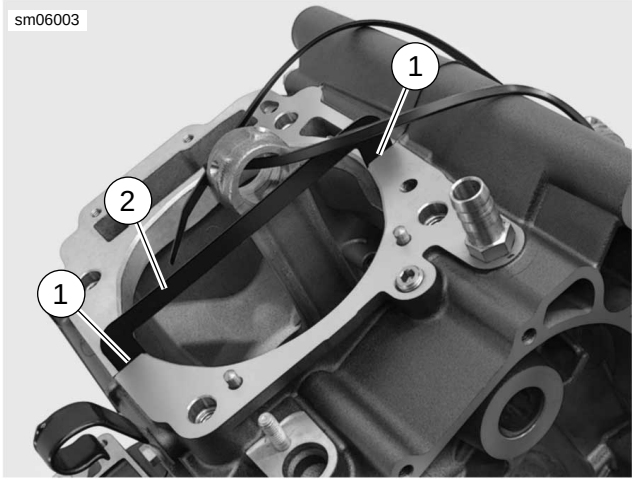



**Figure 3-189. Crankcase Torque Sequence**




1. **Crankcase seam**
2. **Crankcase gasket**

**Figure 3-190. Crankcase Gasket**

## Clutch Side Components Installation

1. Set front cylinder to TDC. See 3.6 REBUILD TIMING INSTRUCTIONS, Top Dead Center (TDC).
2. Install index shim and shift linkage. See 6.7 SHIFT LINKAGE.
3. Install VSS trigger wheel. See 6.8 TRANSMISSION, VSS Trigger Wheel.
4. Install oil pump. See 3.10 CLUTCH SIDE, Oil Pump.
5. Install front cylinder valve train drive. See 3.12 VALVE TRAIN DRIVE, Front Cylinder.
6. Install bottom balancer. See 3.10 CLUTCH SIDE, Balancer: Bottom.
7. Install primary drive. See 3.11 ALTERNATOR SIDE, Starter Friction Clutch.
8. Install clutch cover. See 3.10 CLUTCH SIDE.
9. Install front:
   a. Cylinder: See 3.8 CYLINDER HEADS.
   b. Cylinder head: See 3.7 CAMSHAFT ASSEMBLY.
   c. Camshaft assembly and valve covers: See 3.7 CAMSHAFT ASSEMBLY.

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## Alternator Side Components Installation

1. Install starter. See 7.8 STARTER.
2. Install rear cylinder valve train drive. See 3.12 VALVE TRAIN DRIVE, Rear Cylinder.
3. Install friction clutch and friction clutch cover. See 3.11 ALTERNATOR SIDE, Starter Friction Clutch.
4. Install top balancer. See 3.11 ALTERNATOR SIDE, Balancer: Top.
5. Install alternator rotor. See 7.10 ALTERNATOR.
6. Install ignition cover. See 3.11 ALTERNATOR SIDE, Ignition Cover.
7. Install rear cylinder, cylinder head, camshaft assembly and valve covers.

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# CRANKSHAFT 3.14

## REMOVAL

1. Separate crankcases. See 3.5 ENGINE REPLACEMENT.
2. Remove the crankshaft from the right crankcase half.

## DISASSEMBLY

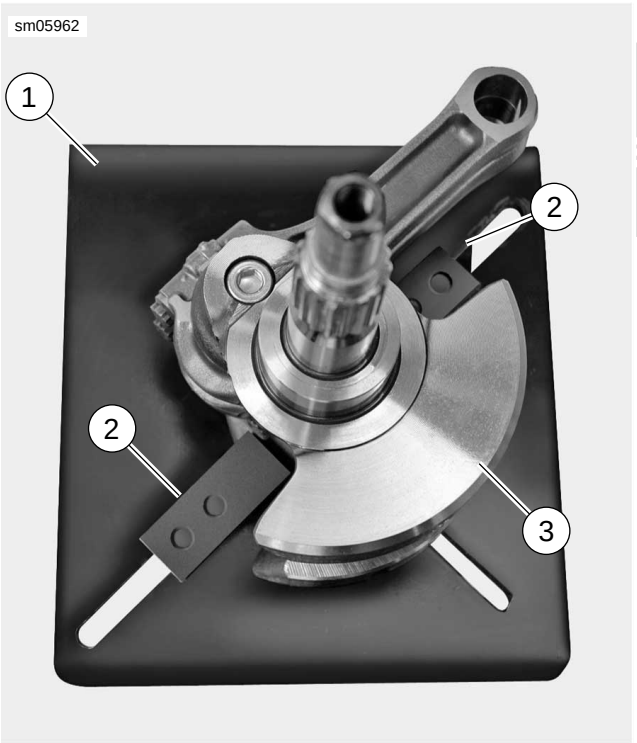
| PART NUMBER | TOOL NAME |
|---|---|
| HD-44358 | FLYWHEEL SUPPORT FIXTURE |

1. See Figure 3-191. Place the FLYWHEEL SUPPORT FIXTURE (Part No. HD-44358) in a vice. Attach crankshaft (3) to the fixture (1) using hold down assemblies (2).

*NOTE*

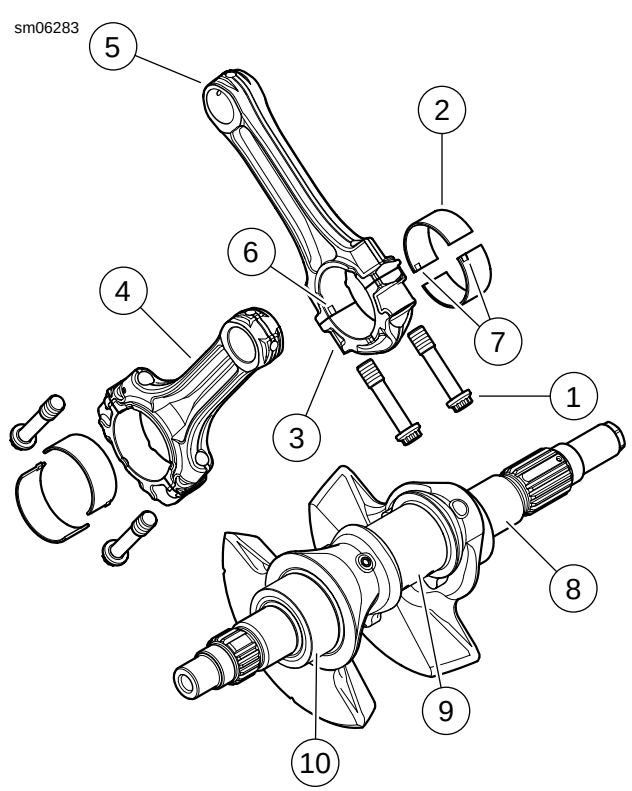
*See Figure 3-192. To keep track of connecting rod and end cap position and orientation. Mark connecting rods (4, 5) and end caps (3) before removal.*

2. Remove connecting rod end cap fasteners (1). Discard fasteners.
3. Remove connecting rod end caps.
4. Remove connecting rod bearings (2). Discard bearings.




1. **Fixture**
2. **Hold down assembly**
3. **Crankshaft**

**Figure 3-191. Crankshaft In Fixture**




1. **Connecting rod fastener**
2. **Connecting rod bearing**
3. **Connecting rod cap**
4. **Front connecting rod**
5. **Rear connecting rod**
6. **Connecting rod notch**
7. **Bearing notch**
8. **Main bearing journal (alternator side)**
9. **Connecting rod journal**
10. **Main bearing journal (clutch side)**

**Figure 3-192. Crankshaft 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. Wash all parts in non-flammable cleaning solvent. Blow parts dry with low pressure compressed air.
2. See Figure 3-192. Inspect connecting rod journal (9) and bearing surfaces for excessive wear or discoloration. Replace if necessary.
3. Inspect connecting rods for excessive wear or discoloration. Replace if necessary.
4. Verify oil passages are clean and free of obstructions.

## ASSEMBLY

1. See Figure 3-191. Place crankshaft in fixture.

*NOTE*

*See Figure 3-192. When installing the connecting rod bearings (2), be sure notches in bearings (7) fit into notches in connecting rods (6).*

2. Install the connecting rod bearings in the connecting rods and caps.
3. Lubricate with a thin film of LUBRIPLATE No. 105 Motor Assembly Grease and a thin film of motor oil:
   a. Connecting rod bearings
   b. Connecting rod journal (9)

*NOTE*

*See Figure 3-193. Dots on front connecting rod face the clutch cover. Dots on rear connecting rod face alternator cover.*

4. See Figure 3-192. Install front connecting rod (4) and cap (3) on clutch side of connecting rod journal (9). Install rear connecting rod (5) and cap on alternator side of connecting rod journal.
5. Install **new** connecting rod fasteners (1) in end caps.
   a. Tighten connecting rod fasteners to 28-32 Nm (21-23 ft-lbs).
   b. Turn each fastener 73-77 degrees.
6. Remove crankshaft from fixture.

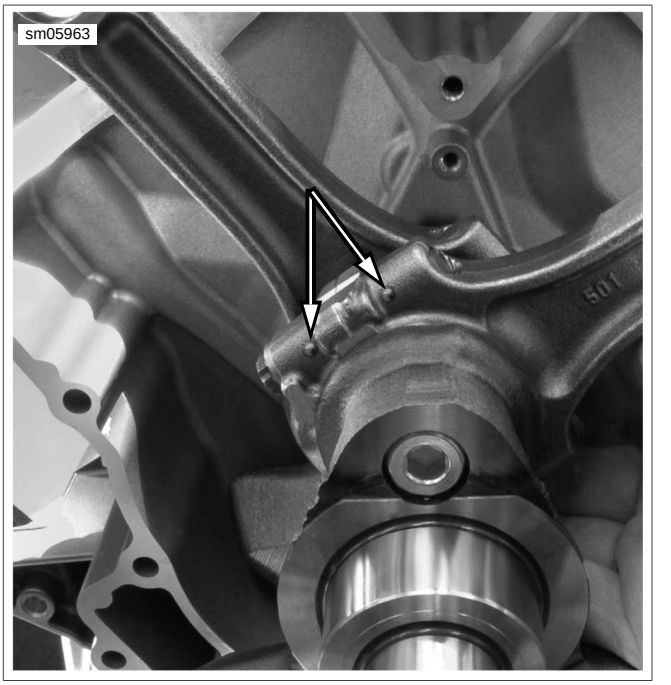



**Figure 3-193. Connecting Rod Dots**

## INSTALLATION

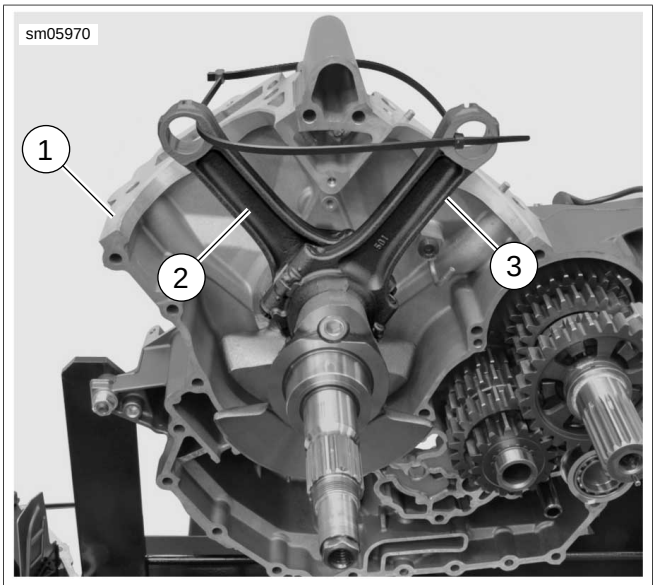
1. Lubricate crankcase main bearings and crankshaft bearings with a thin film of LUBRIPLATE No. 105 Motor Assembly Grease and a thin film of clean engine oil.

*NOTES*

- *See Figure 3-194. When installing crankshaft and crankcase, be sure front connecting rod (2) faces front cylinder and rear connecting rod (3) faces rear cylinder.*
- *Be sure not to damage crankshaft bearings when installing crankshaft in crankcase.*

2. Install clutch side of crankshaft into right crankcase half.

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1. **Right crankcase half**
2. **Front connecting rod**
3. **Rear connecting rod**

**Figure 3-194. Connecting Rod Orientation**

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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 |
|---|---|---|---|
| Active intake bracket fastener | 10.6-11.8 Nm | 94-104 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Active intake cable connector | 4.1-4.5 Nm | 36-40 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Active intake cable jamnut | 5.4-6.7 Nm | 48-60 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Active intake solenoid fasteners | 2.7-3.0 Nm | 23.5-26.0 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Air cleaner baseplate fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 4.2 AIR CLEANER ASSEMBLY, Baseplate |
| BAS | 3.6-4.1 Nm | 32-36 **in-lbs** | 4.3 SENSORS, Bank Angle Sensor (BAS) |
| Battery cable fastener | 6.8-7.9 Nm | 60-70 **in-lbs** | 4.9 FUEL PUMP, Fuel Pump: Installation |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover |
| Battery ground set screw | 6.1-6.8 Nm | 54-60 **in-lbs** | 4.8 FUEL TANK, Tank Set Screws/Set screw w/lock patch |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 4.8 FUEL TANK, Vent Valve |
| Fuel cap retaining ring fasteners | 7-8 Nm | 62-71 **in-lbs** | 4.8 FUEL TANK, Fuel Cap Retaining Ring |
| Fuel injector jet holder fastener | 10 Nm | 88 **in-lbs** | 4.5 THROTTLE BODY, Fuel Injectors |
| Fuel pressure sensor | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.3 SENSORS, Fuel Pressure Sensor |
| Fuel pressure sensor | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.5 THROTTLE BODY, Fuel Rail |
| Fuel pump cover set screw | 4.6-5.1 Nm | 41-45 **in-lbs** | 4.8 FUEL TANK, Tank Set Screws |
| Fuel tank drain plug | 8.1-10.8 Nm | 72-96 **in-lbs** | 4.8 FUEL TANK, Draining the Fuel Tank |
| Fuel tank vent valve fasteners | 3.6-4.0 Nm | 32-36 **in-lbs** | 4.8 FUEL TANK, Vent Valve |
| Header flange nuts | 20 Nm | 15 ft-lbs | 4.7 EXHAUST SYSTEM, Headers |
| Header flange nuts | 20 Nm | 14.8 ft-lbs | 4.7 EXHAUST SYSTEM, Headers |
| Header flange nuts | 20 Nm | 15 ft-lbs | 4.7 EXHAUST SYSTEM, Muffler: Installation |
| Header heat shield fasteners | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.7 EXHAUST SYSTEM, Headers |
| Heat deflector fastener | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.3 SENSORS, Oxygen Sensors (O2) |
| IAC screws | 2.7-3.2 Nm | 24-28 **in-lbs** | 4.4 THROTTLE CONTROL, Idle Air Control (IAC) |
| Intake flange screws | 18 Nm | 13 ft-lbs | 4.5 THROTTLE BODY, Throttle Body Installation |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 4.7 EXHAUST SYSTEM, Muffler: Installation |
| Muffler Torca clamps | 9.5-10.8 Nm | 84-96 **in-lbs** | 4.7 EXHAUST SYSTEM, Muffler: Installation |
| O2 sensor, front | 54-61 Nm | 40-45 ft-lbs | 4.3 SENSORS, Oxygen Sensors (O2)/ANTI-SEIZE |
| O2 sensor, rear | 54-61 Nm | 40-45 ft-lbs | 4.3 SENSORS, Oxygen Sensors (O2)/ANTI-SEIZE |
| Radiator inlet duct fasteners | 9.7-10.9 Nm | 86-96 **in-lbs** | 4.3 SENSORS, Oxygen Sensors (O2) |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 4.3 SENSORS, Bank Angle Sensor (BAS) |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 4.3 SENSORS, Oxygen Sensors (O2) |
| Ram air intake snorkel fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 4.2 AIR CLEANER ASSEMBLY, Ram Air Intake Snorkel |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 4.8 FUEL TANK, Draining the Fuel Tank |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 4.4 THROTTLE CONTROL, Throttle Control |
| Throttle body intake neck clamps | 2 Nm | 18 **in-lbs** | 4.5 THROTTLE BODY, Throttle Body Installation |
| Throttle cable jamnuts at throttle body | 4.0-4.6 Nm | 36-40 **in-lbs** | 4.4 THROTTLE CONTROL, Throttle Cable Replacement |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Vent hose extension P-clamp | 6.4-7.1 Nm | 57-63 **in-lbs** | 4.8 FUEL TANK, Vent Hose Routing |
| Wire guide/fuel pump cover | 4.6-5.1 Nm | 41-45 **in-lbs** | 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover |

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# AIR CLEANER ASSEMBLY 4.2

## RAM AIR INTAKE SNORKEL

1. **To remove:** Press the latch to separate the IAT connector housing or pull the IAT sensor from the ram air intake snorkel. See 4.3 SENSORS, Intake Air Temperature Sensor (IAT).
2. See Figure 4-1. Remove the fastener and the snorkel.

*NOTE*

*See Figure 4-2. Verify that the strip seal is intact all the way around the connecting joint.*

3. **To install:** Press the snorkel connecting joint against the duct to the air box.
4. Install and tighten the fastener to 13.0-14.5 Nm (115-128 **in-lbs**).
5. Press the IAT into the grommet in the snorkel or mate the socket housing to the sensor.

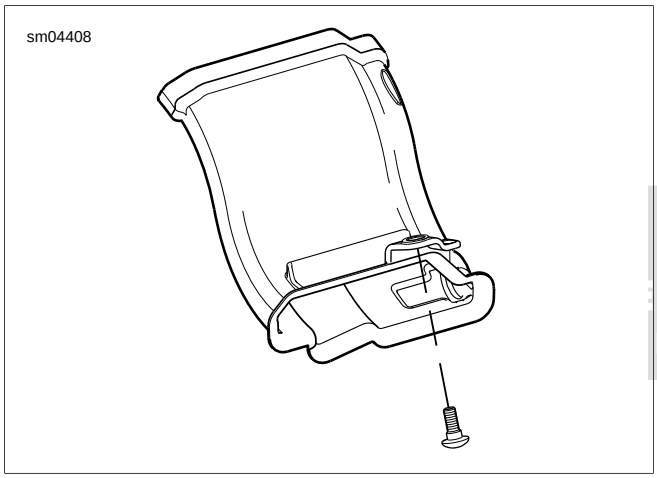



**Figure 4-1. Ram Air Intake Snorkel**

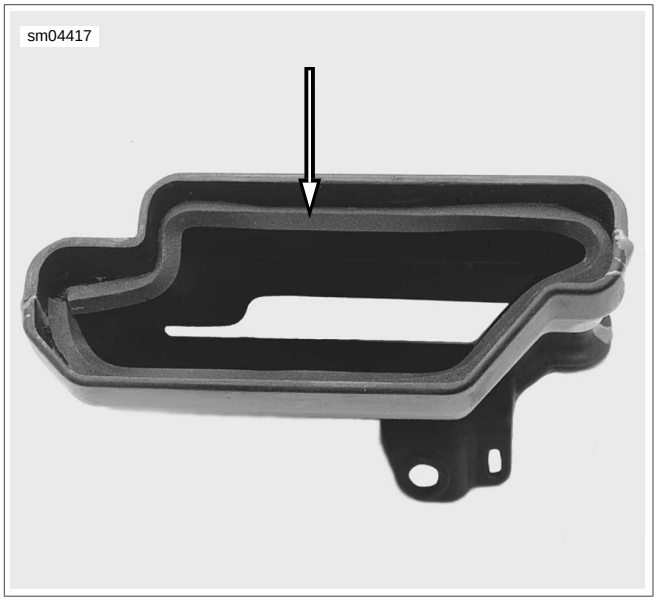



**Figure 4-2. Seal Strip**

## BASEPLATE

### Removal

1. Remove the seat.
2. Remove the intake cover.
3. Unlatch lock tabs and remove air cleaner cover from baseplate.
4. Remove the filter element from the baseplate.
5. See Figure 4-6. Separate the BARO sensor (1) and the fuel rail (2) from the baseplate.
6. See Figure 4-3. Remove the baseplate fasteners.
7. Remove baseplate from the rubber throttle body mount gasket.

*NOTE*

*See Figure 4-4. Wash the crankcase breather filter in soapy water, air dry and replace.*

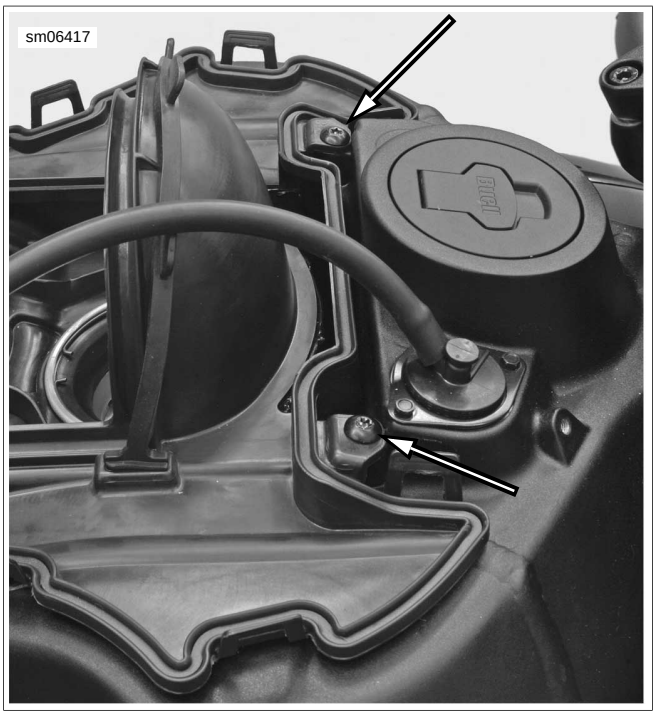



**Figure 4-3. Baseplate Fasteners**




**Figure 4-4. Breather Filter in Air Cleaner Baseplate**

## Installation

1. See Figure 4-7. Verify that the rubber strip seal (1) is intact all the way around the channel on the outside edge of the baseplate (2).
2. Fit the throttle mount gasket (3) to the baseplate. Verify seal around the perimeter of the mount gasket.
3. Position baseplate.
4. Install the crankcase breather filter into the recess at the rear of the baseplate. See 3.11 ALTERNATOR SIDE, Crankcase Breather.
5. See Figure 4-5. Work the IAC air vent tube up through the baseplate and leave approximately 10 mm (0.40 in.) extending above the plate.
6. See Figure 4-7. Install fasteners (4) and tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
7. See Figure 4-6. Install the BARO sensor (1) and the fuel rail (2) to the baseplate.
8. Wrap air filter element (5) over bubble of baseplate and secure with the hold down straps (6).
9. Install air filter cover (7) to baseplate and latch six latches to secure.
10. Install intake 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.

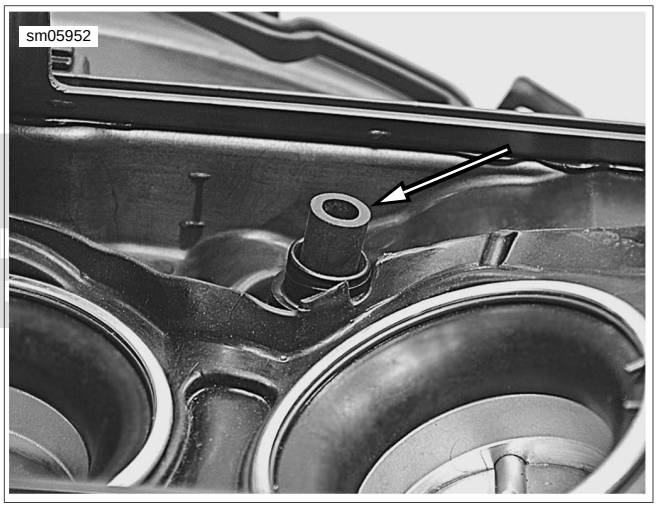
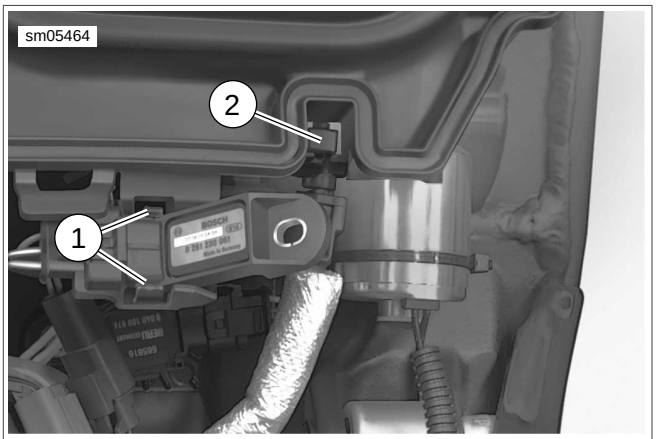
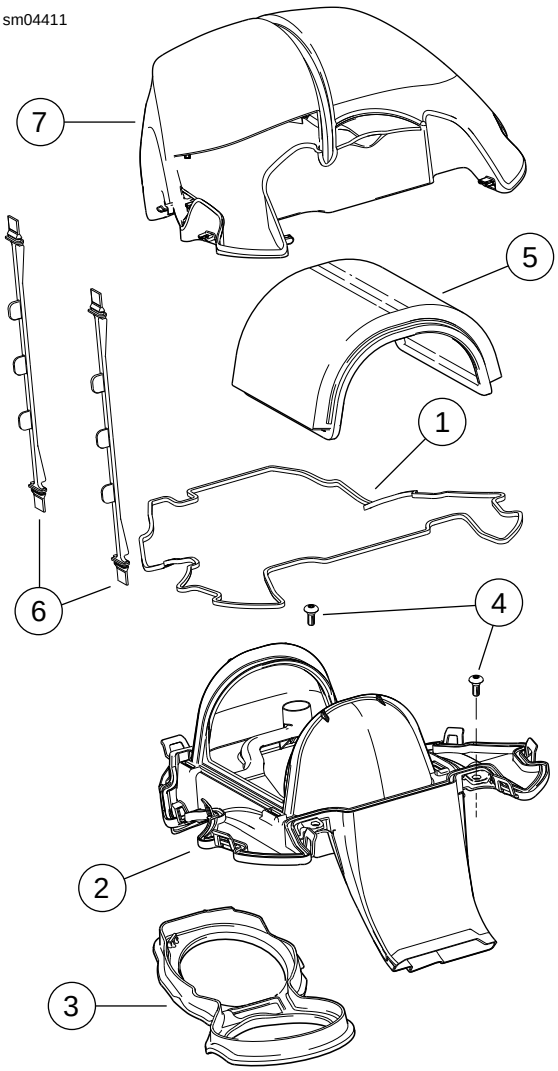



**Figure 4-5. IAC Tube**




1. **BARO sensor**
2. **Fuel rail**

**Figure 4-6. BARO Sensor and Fuel Rail**




1. **Seal**
2. **Baseplate**
3. **Throttle mount gasket**
4. **Fasteners**
5. **Air filter element**
6. **Hold down straps**
7. **Air filter cover**

**Figure 4-7. Air Cleaner Assembly**

## THROTTLE MOUNT GASKET

### Removal

Remove the mounting gasket from the throttle body.

### Installation

See Figure 4-8. To ease installation, apply a small amount of soapy water to the inside diameter and to the grooved edge of the gasket.




**Figure 4-8. Throttle Mount Gasket**

# SENSORS 4.3

## BANK ANGLE SENSOR (BAS)

### Replacement

*NOTE*

*The BAS transmits lean angle data to the ECM. When the lean angle exceeds the limit, the ECM shuts off power to the ignition and fuel pump.*

1. Remove the left side radiator shroud.
2. See Figure 4-9. Remove the fasteners securing the BAS.
3. See Figure 4-10. Lift the latch (1) to release the socket housing from the BAS.
4. Install the BAS with the embossed UP (2) up.
5. Tighten the fasteners to 3.6-4.1 Nm (32-36 **in-lbs**).
6. Mate the socket housing to the BAS.
7. Install the radiator shroud. Tighten the cowling fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).

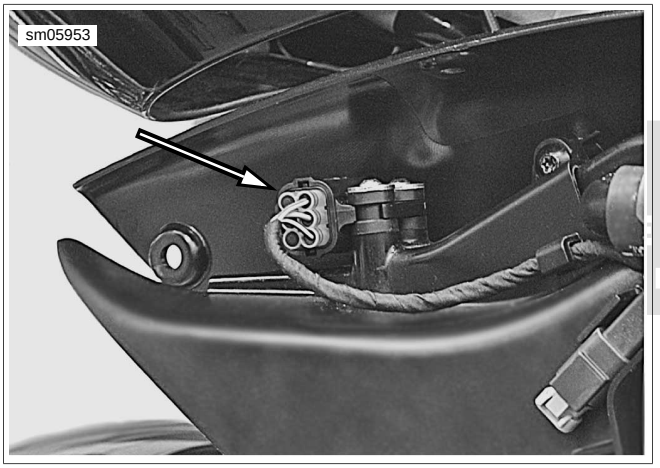
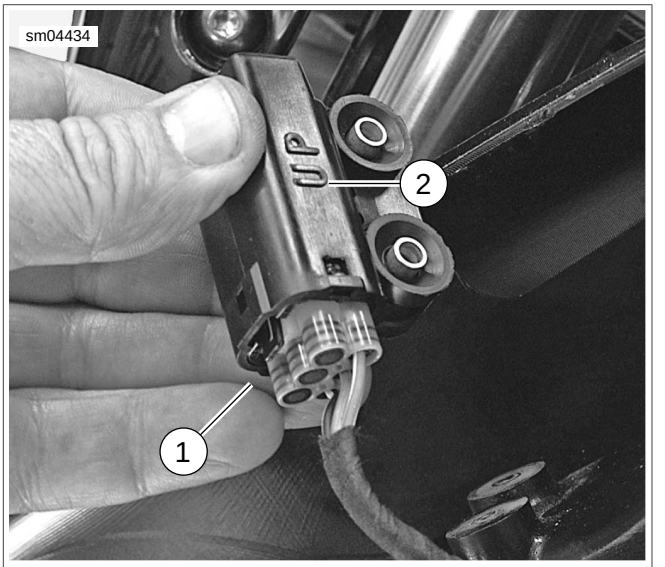



**Figure 4-9. Bank Angle Sensor**




**1. Latch**
**2. UP**

**Figure 4-10. Bank Angle Sensor**

## BAROMETRIC PRESSURE SENSOR (BARO)

1. Remove the seat.
2. See Figure 4-11. Remove the BARO from the clip on the air cleaner assembly baseplate.
3. Separate the BARO connector [228] housing from the BARO sensor.
4. Join the connector [228] to the BARO sensor.
5. Snap the BARO onto the air cleaner assembly baseplate.

**⚠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 the seat.

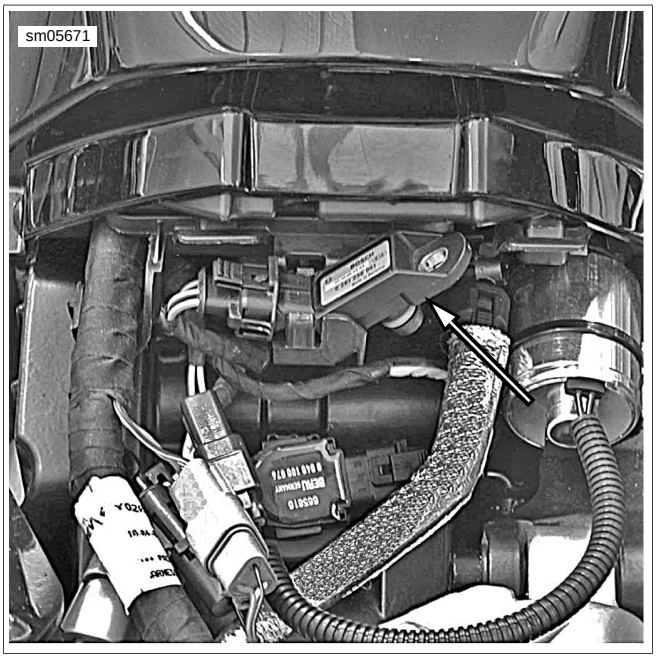



**Figure 4-11. Barometric Pressure (BARO) Sensor**

## FUEL PRESSURE SENSOR

1. Remove the seat.

**⚠WARNING**

**To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)**

2. Purge the fuel supply line of high pressure gasoline:
   a. Separate the fuel pump connector [86] housings.
   b. Run the engine until the engine stalls.
   c. Run the starter for three seconds to remove the remaining fuel.
3. Remove the battery fuse.
4. Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
5. See Figure 4-12. Separate the connector [227] housing from the fuel pressure sensor.
6. Support the fuel rail and remove the sensor.

### Installation

1. Thread in the sensor.
2. Support the fuel rail and tighten to 6.8-8.1 Nm (60-72 **in-lbs**).
3. Join the connector [227] to the sensor.
4. Join the fuel pump connector [86] housings.
5. Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
6. Install the battery fuse.

**⚠WARNING**

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

7. Install the seat.




**Figure 4-12. Fuel Pressure Sensor**

## INTAKE AIR TEMPERATURE SENSOR (IAT)

### Removal

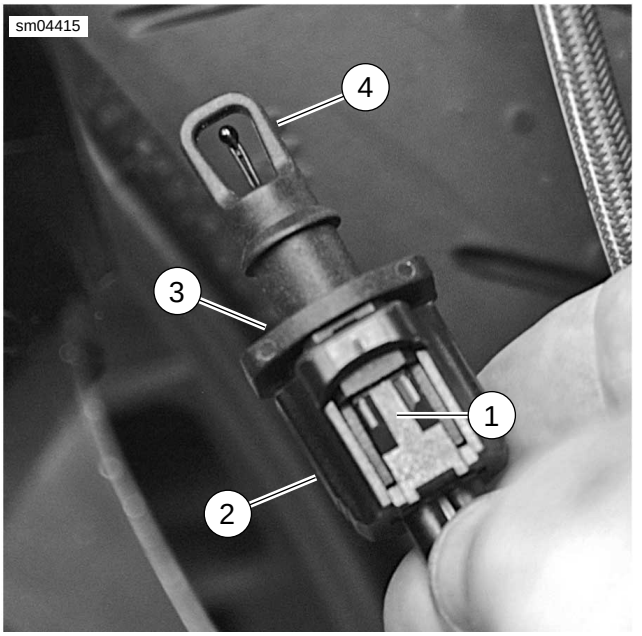
*NOTE*

*The Intake Air Temperature (IAT) sensor measures the incoming air temperature. From the measurement, the Electronic Control Module (ECM) calculates the air density of the air entering the air cleaner assembly.*

**⚠WARNING**

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

1. Pull IAT sensor from grommet in the ram air scoop.
2. See Figure 4-13. Press the latch (1) to separate the socket housing (2) from the IAT sensor (4).
3. Inspect sensor grommet for damage and replace as required.




1. **Latch**
2. **Socket housing**
3. **Pin housing**
4. **IAT sensor**

**Figure 4-13. Intake Air Temperature (IAT)**

## Installation

1. Mate IAT sensor to the socket housing on the engine wiring harness.
2. See Figure 4-14. Push IAT sensor into grommet in ram air scoop.

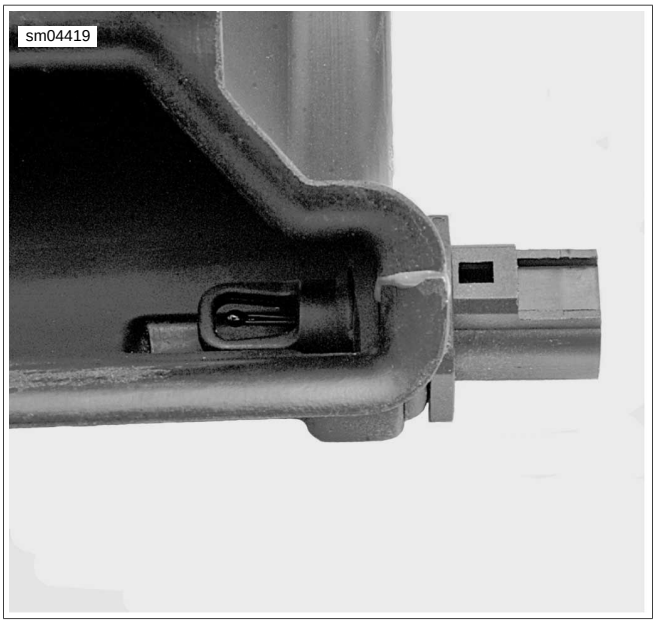



**Figure 4-14. Intake Air Temperature (IAT) Sensor**

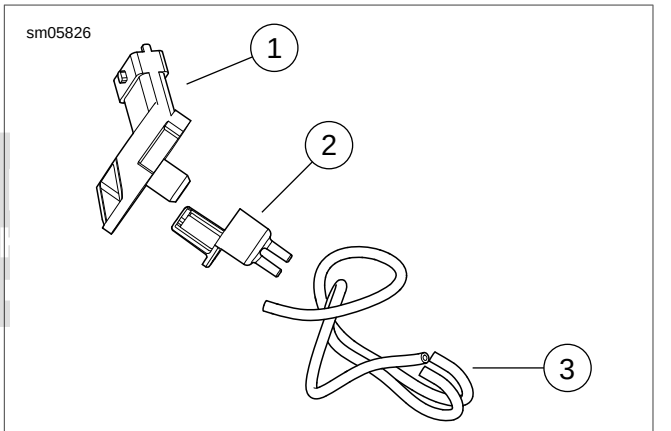
# MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP)

## Removal

1. Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
2. Remove the throttle body. See 4.5 THROTTLE BODY.
3. Separate the MAP connector [80] housing from the sensor.
4. See Figure 4-15. Remove the hoses (3) from the intake flanges and service the manifold (2) and sensor (1) as required.

## Installation

1. Press the hoses onto the barbed brass tubes on the intake flanges.
2. Set the sensor into the cavity.
3. Install the throttle body. See 4.5 THROTTLE BODY.
4. Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.




1. **MAP sensor**
2. **Manifold**
3. **Hose**

**Figure 4-15. MAP Sensor Assembly**

# OXYGEN SENSORS (O2)

| PART NUMBER | TOOL NAME |
|---|---|
| HD-48262 | O2 SENSOR WRENCH |

## General

The O2 sensors monitor oxygen content in the exhaust and convert it to a voltage level output. The ECM controls the air/fuel ratio during closed loop operation based upon the O2 sensor output.

## Front

1. Remove the right radiator shroud.
2. Remove the inlet duct fasteners as required to access and remove the outlet duct fasteners.

3. See Figure 4-16. Pull the radiator assembly away from the motorcycle to access the O2 sensor from the front.
4. Lift the latch and separate the O2 connector [138] socket and pin housings.
5. Use a O2 SENSOR WRENCH (Part No. HD-48262) to remove the O2 sensor from the front exhaust header.

*NOTE*

*Do not install sensors that have been dropped or impacted by other components. Damage to the sensing element may have occurred. Replacement sensor assemblies have threads coated with anti-seize lubricant and new seal rings. Do not use any other grease or sealant product.*

6. If reusing a sensor, apply LOCTITE ANTI-SEIZE LUBRICANT (Part No. 98960-97) to threads.
7. Thread the sensor into exhaust header. Tighten sensor to 54-61 Nm (40-45 ft-lbs).
8. Join the O2 sensor connector [138] housings.
9. Install the inlet duct and outlet duct radiator assembly. Tighten to 9.7-10.9 Nm (86-96 **in-lbs**).
10. Install the radiator shroud. Tighten to 9.0-9.9 Nm (80-88 **in-lbs**).




**Figure 4-16. Front O2 Sensor**

## Rear

1. See Figure 4-17. Lift the latch on the oxygen sensor connector [137] and separate the housings.
2. For access, remove the heat deflector from the header.
3. Remove the sensor from exhaust header using O2 SENSOR WRENCH (Part No. HD-48262).

*NOTE*

*Do not install sensors that have been dropped or impacted by other components. The sensing element can be damaged. Replacement sensor threads are coated with anti-seize lubricant and have new seal rings. Do not use any other grease or sealant product.*

4. If reusing a sensor, apply LOCTITE ANTI-SEIZE LUBRICANT (Part No. 98960-97) to threads of the sensor.
5. See Figure 4-18. Thread the sensor into exhaust header.
6. Use the O2 SENSOR WRENCH (Part No. HD-48262) and tighten sensor to 54-61 Nm (40-45 ft-lbs).
7. Mate the O2 sensor pin connector [137] to the wiring harness socket connector.
8. Install the heat deflector. Tighten to 6.8-8.1 Nm (60-72 **in-lbs**).

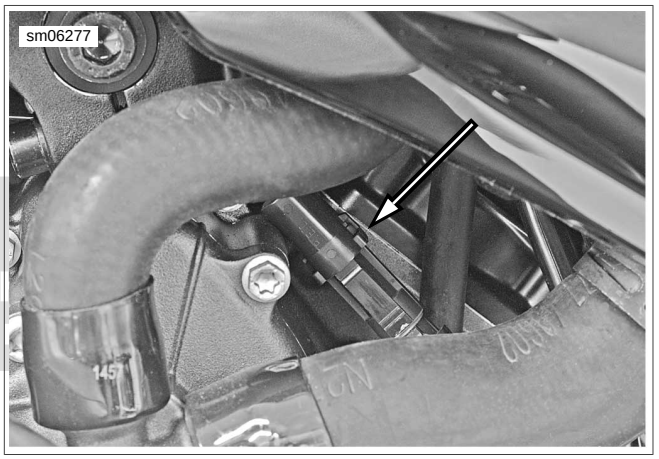



**Figure 4-17. Rear O2 Sensor Connector [137]**

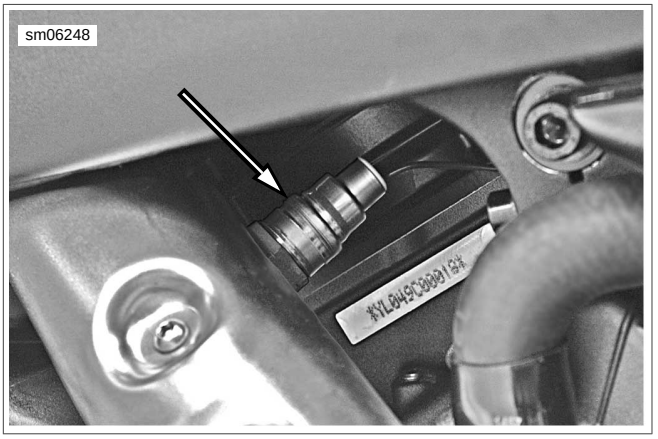



**Figure 4-18. Rear O2 Sensor**

## THROTTLE POSITION SENSOR (TPS)

### Replacement

For diagnostic troubleshooting, see the electrical diagnostic manual.

To replace the TPS, the throttle body must be replaced. See 4.2 AIR CLEANER ASSEMBLY.

After installation, reset the TPS through Digital Technician or manually.

### Manual TPS Reset

1. Verify throttle cable adjustment.
2. Repeat three times:
   a. Turn the ignition switch from OFF to ON.
   b. Roll the throttle wide open and hold for one second.
   c. Close the throttle and hold for one second.
   d. Turn the ignition switch to OFF.

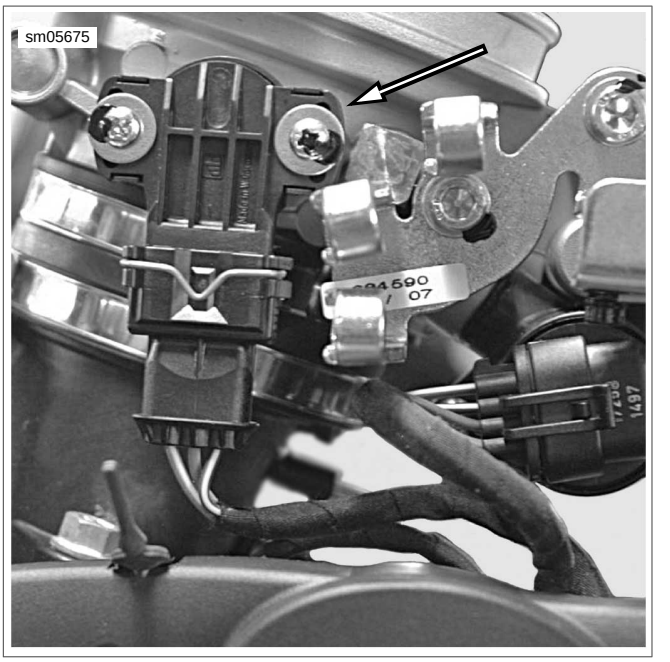



**Figure 4-19. Throttle Position Sensor (TPS) [88]**

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# THROTTLE CONTROL 4.4

## THROTTLE CONTROL

### Removal and Disassembly

1. See Figure 4-20. Loosen cable adjuster lock (thick disc) (1) on each cable.
2. Turn adjusters (2) in direction which will shorten cable housings to minimum length.
3. See Figure 4-21. Remove fasteners (1, 5) on right switch housing and separate housing from handlebar.
4. Remove cables (2, 3) from notches in front housing (4).
5. Remove cables (2, 3) and ferrules (6) from cable wheel (7).

### Cleaning and Inspection

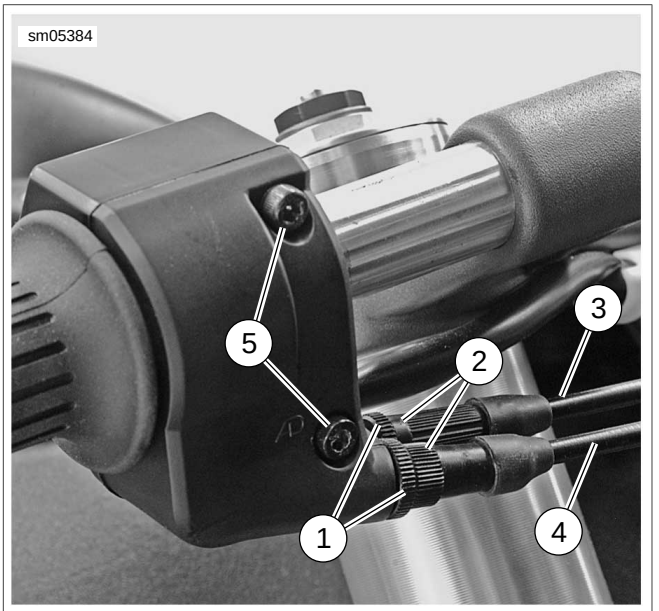
**⚠WARNING**

**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 except cables in a non-flammable cleaning solvent. Blow dry with compressed air. Replace cables if frayed, kinked or bent.

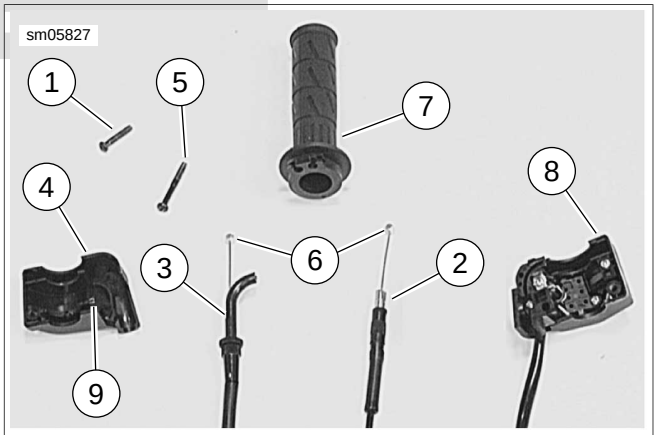
### Assembly and Installation

1. Install throttle grip and position ferrules into cable wheel.
2. Insert idle control into front switch housing.
3. Slide switch housing over throttle.
4. Insert throttle cable into front switch housing.
5. Attach switch and position housings.
   a. Attach rear switch housing and position housings on right handlebar by engaging locating pin on front housing with hole in handlebar.
   b. Attach housings with two fasteners, installing longer fastener on bottom. Tighten to 3-4 Nm (27-35 **in-lbs**).
6. Adjust cables.




1. **Cable adjuster locks**
2. **Cable adjusters**
3. **Idle control cable**
4. **Throttle control cable**
5. **Right switch housing fasteners**

**Figure 4-20. Throttle Cable Adjusters**




1. **Screw (short, top)**
2. **Idle control cable**
3. **Throttle control cable with molded end**
4. **Front housing**
5. **Screw (long, bottom)**
6. **Ferrules**
7. **Cable wheel**
8. **Rear housing**
9. **Locating pin**

**Figure 4-21. Cable Connections**

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# THROTTLE CABLE REPLACEMENT

## Removal

*NOTE*

*The throttle cables have threaded adjustments on both ends of the cable.*

1. Remove seat.
2. Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.

*NOTE*

*See Figure 4-22. Prior to removing the old throttle cables, it will be necessary to cut the cable strap securing the throttle cables to the wire guide on the left side of the vehicle beneath the frame/fuel tank.*

3. Remove cable strap.
4. Remove the old throttle cables.

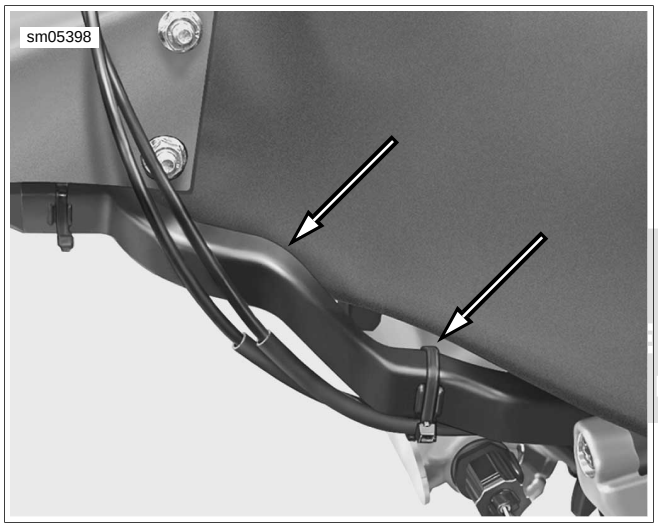



**Figure 4-22. Wire Guide**

## Installation

1. Connect **new** throttle cables to the right hand grip.

*NOTE*

*This is to verify the cables can be routed correctly with no binding and to maintain proper orientation.*

2. Route both cables along the handlebar, under and through the instrument cluster area, along the front wire guide and up under the frame to the throttle body bracket.

*NOTES*

- *Keep the throttle cables parallel all the way along their path so they do not become twisted. If the cables are not kept parallel it can create binding when everything is tightened in place.*
- *The idle control cable is the one with the two black nuts on the adjuster.*

3. See Figure 4-23. Position the lower idle control cable barrel in the throttle cam wheel of the throttle body, and then slip the adjuster into the lower throttle cable bracket. Adjust the front nut against the long adjuster and thread the rear jamnut against the cable bracket.
4. Position the throttle control cable barrel in the throttle cam wheel of the throttle body, and then slip the adjuster into the upper throttle cable bracket. Install the rear jamnut on the adjuster.
5. With the cable adjusters installed on the throttle body cable brackets, tighten the jamnuts to 4.0-4.6 Nm (36-40 **in-lbs**).

*NOTE*

*See Figure 4-22. After the throttle cables have been installed, it will be necessary to secure cables to wire guide on the left side of the vehicle beneath the frame/fuel tank with a cable strap.*

6. Install cable strap.
7. With the throttle cables secure at the throttle body, adjust the cables at the right hand grip.

*NOTE*

*When the adjustment is complete, turn the handlebars full left lock and full right lock to verify there is no binding.*

8. Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.

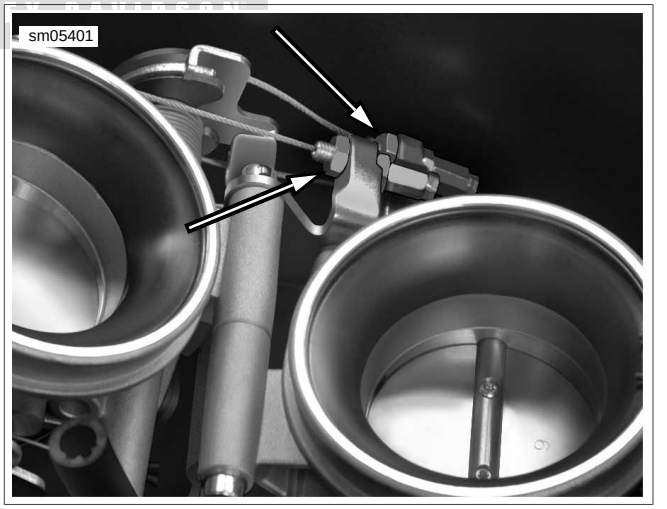



**Figure 4-23. Throttle Cable Adjuster Jamnuts at Throttle Body**

# IDLE AIR CONTROL (IAC)

## Removal

1. Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
2. Remove the throttle body. See 4.5 THROTTLE BODY.
3. Inspect the IAC hose. Replace as required.

*NOTE*

*For troubleshooting, see the electrical diagnostic manual.*

4. See Figure 4-24. Separate the IAC connector [87] housings from the IAC.
5. See Figure 4-25. Remove the IAC.

## Installation

1. See Figure 4-26. Inspect the pintle (1) on the actuator and the seat in the throttle body housing. Replace as required.
2. Check the O-ring (2) on the actuator. Replace as required.
3. Install the actuator and tighten the screws to 2.7-3.2 Nm (24-28 **in-lbs** ).
4. Install the throttle body. See 4.5 THROTTLE BODY.
5. Join the connector [87] to the actuator.
6. Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.




**Figure 4-24. Idle Air Control [87]**

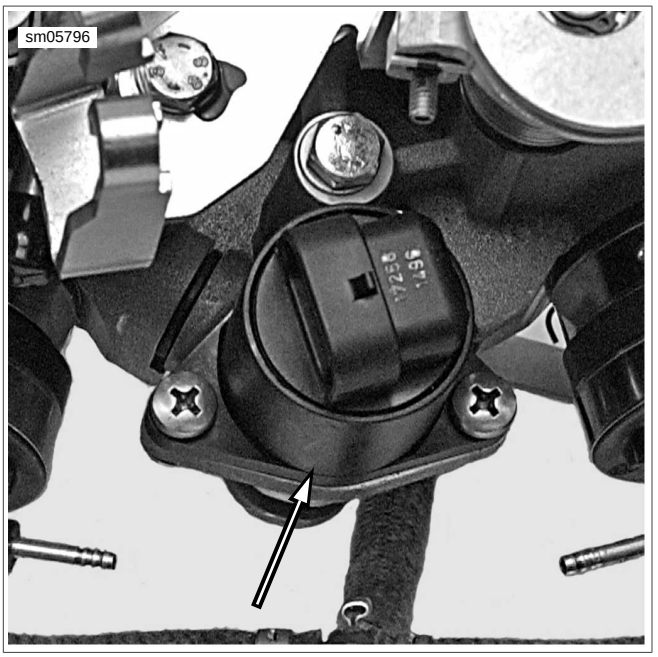



**Figure 4-25. IAC on Throttle Body**




1. **Pintle**
2. **O-ring**

**Figure 4-26. IAC Actuator**

# THROTTLE BODY 4.5

## INTAKE LEAK TEST

| PART NUMBER | TOOL NAME |
|---|---|
| HD-41417 | PROPANE ENRICHMENT KIT |

### Leak Tester

**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)**

1. See Figure 4-27. Make sure the valve (1) of the PROPANE ENRICHMENT KIT (Part No. HD-41417) is closed.
2. Screw the valve assembly (2) onto a standard 14 oz. propane cylinder (3).
3. Press and hold the trigger button (4).
4. Slowly open valve until pellet in flow gauge (5) rises to between 5 and 10 cubic feet per hour at standard conditions (SCFH) and release the trigger button.

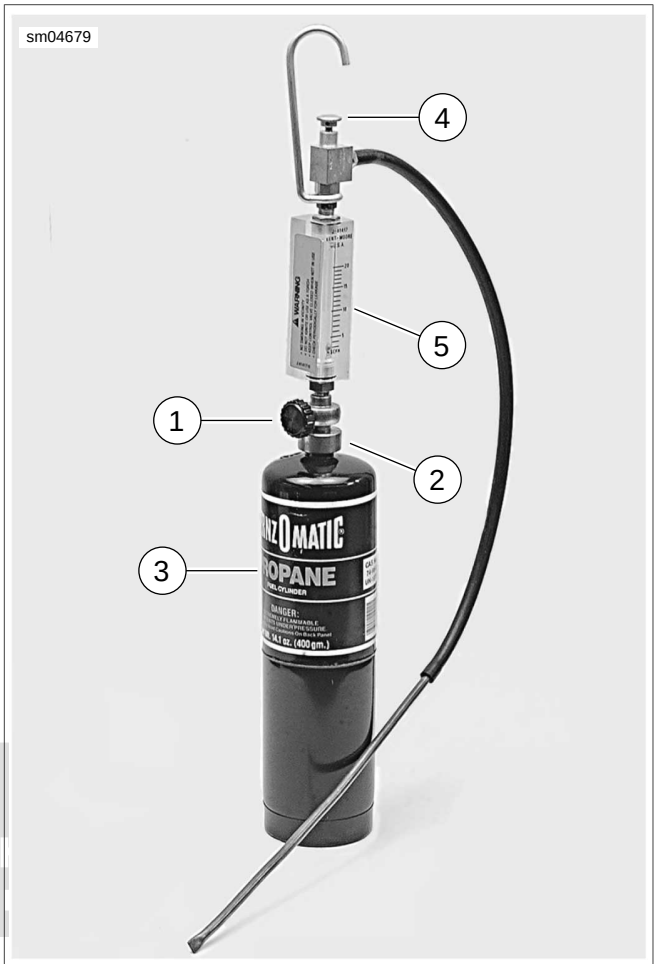
### Test

1. Start engine and warm engine up to operating temperature.

*NOTE*

*Do not aim propane at air cleaner. The tone of the engine will change as If the propane had entered at a leak.*

2. See Figure 4-28. Aim and move the nozzle along the entire air intake tract. Press and release the trigger button to spray propane.
3. Listen for changes in engine tone that indicates a leak.
4. When finished, close the valve.




1. **Valve knob**
2. **Valve assembly**
3. **Propane cylinder**
4. **Trigger button**
5. **Flow gauge**

**Figure 4-27. Leak Tester**




**Figure 4-28. Intake Leak Test**

## INJECTOR LEAK TEST

1. Remove air cleaner cover and air cleaner. See 4.2 AIR CLEANER ASSEMBLY.
2. Test for injector leaks.
   a. Turn key ON for two seconds.
   b. Turn key OFF for two seconds.
   c. Repeat, ignition key ON/OFF for two seconds, five times.
   d. Roll on the throttle and inspect for raw fuel in the throat of the throttle body, the intake flange or in the intake ports. Replace the fuel injectors if there is any evidence of raw fuel.
3. Install air cleaner and cover. See 4.2 AIR CLEANER ASSEMBLY.

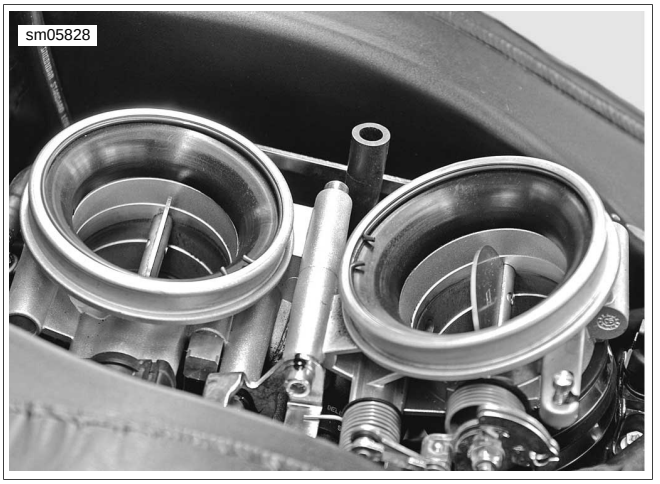



**Figure 4-29. Injector Leak Test**

## FUEL RAIL

### Removal

1. Remove the seat.

**⚠WARNING**

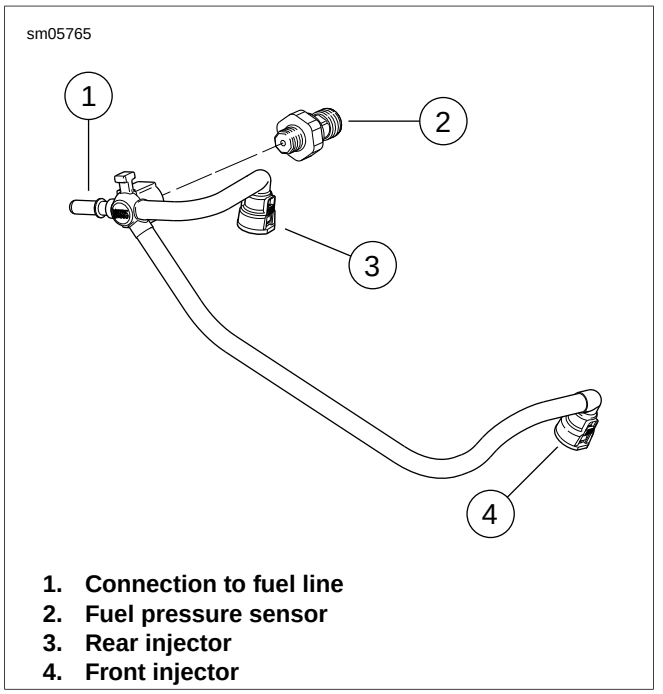
**To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)**

2. Purge the fuel supply line of high pressure gasoline.
   a. Separate the fuel pump connector [86] housings.
   b. Run the engine until the engine stalls.
   c. Run the starter for three seconds to remove remaining fuel.
3. Remove the battery fuse.
4. Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
5. Separate the connector [227] from the fuel pressure sensor.
6. Separate the fuel line from the fuel rail.
7. Separate the front and rear connections from the fuel injectors and remove the fuel rail.
8. Remove the fuel pressure sensor. See 4.3 SENSORS, Fuel Pressure Sensor.

### Installation

1. Install the fuel pressure sensor (2) and tighten to 6.8-8.1 Nm (60-72 **in-lbs**). See 4.3 SENSORS, Fuel Pressure Sensor.
2. See Figure 4-30. To install, snap the front (4) and rear (3) fuel connections onto the fuel injectors.
3. Join the connector [227] to the fuel pressure sensor.
4. Join the fuel line from the fuel pump to the connection (1) on the fuel rail.
5. Join the fuel pump connector [86] housings.
6. Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
7. Install the battery fuse.
8. Install the seat.

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1. **Connection to fuel line**
2. **Fuel pressure sensor**
3. **Rear injector**
4. **Front injector**

**Figure 4-30. Fuel Rail**

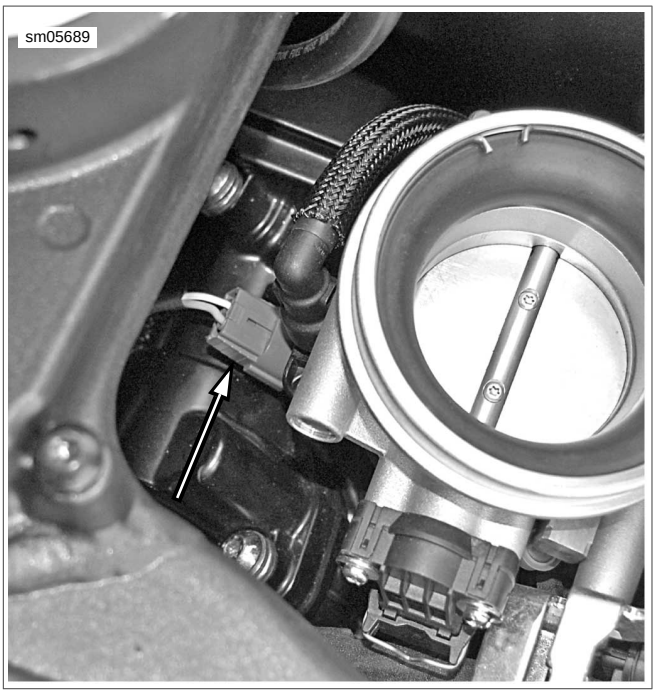



**Figure 4-31. Front Fuel Injector [84]**

## FUEL INJECTORS

### Removal

1. See Figure 4-31. Remove the fuel rail. See 4.5 THROTTLE BODY, Fuel Rail.
2. Separate the connectors from the injectors.
   a. See Figure 4-31. Front fuel injector [84]
   b. See Figure 4-32. Rear fuel injector [85]
3. See Figure 4-33. Remove the fasteners and the jet holders.
4. Remove the injection valves.

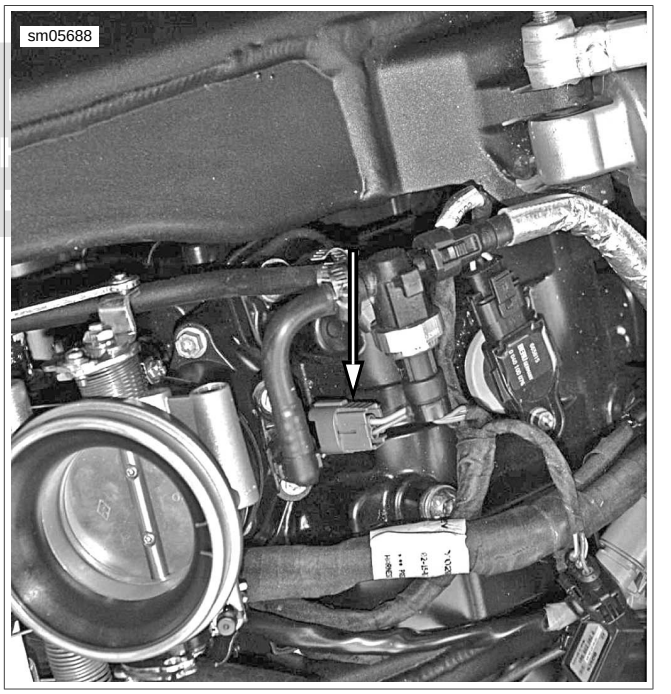
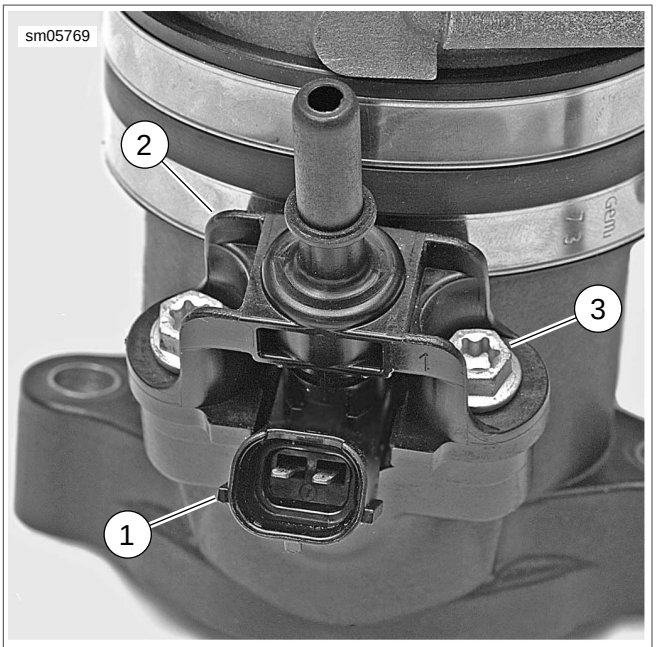



**Figure 4-32. Rear Fuel Injector [85]**




1. **Injector valve**
2. **Jet holder**

**Figure 4-33. Fuel Injector**




1. **Injector valve**
2. **Jet holder**
3. **Fastener**

**Figure 4-34. Fuel Injector**

## Installation

1. See Figure 4-34. Install the injector valves (1).
2. Fit the jet holders (2) to the injection valves and thread in the fasteners (3).
3. Tighten to 10 Nm (88 **in-lbs**).
4. Join the fuel injection connectors:
   a. Front fuel injector [84]
   b. Rear fuel injector [85]
5. Install the fuel rail. See 4.5 THROTTLE BODY, Fuel Rail.

# THROTTLE BODY REMOVAL

## Removal

1. Remove the seat and pillion.

**⚠WARNING**

**To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)**

2. Purge the fuel supply line of high pressure gasoline.
   a. Separate the fuel pump connector [86] housings.
   b. Run the engine until the engine stalls.
   c. Run the starter for three seconds to remove any remaining fuel.
3. Remove the battery fuse.
4. Remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
5. Separate the following connector housings:
   a. IAC [89]
   b. TPS [88]
6. See Figure 4-35. Remove the solenoid cable (1). See 4.6 ACTIVE INTAKE.
7. Remove the barrels of the throttle control cables (2) from the throttle cam. See 4.4 THROTTLE CONTROL.
8. Remove the cables from the throttle cable bracket (3).

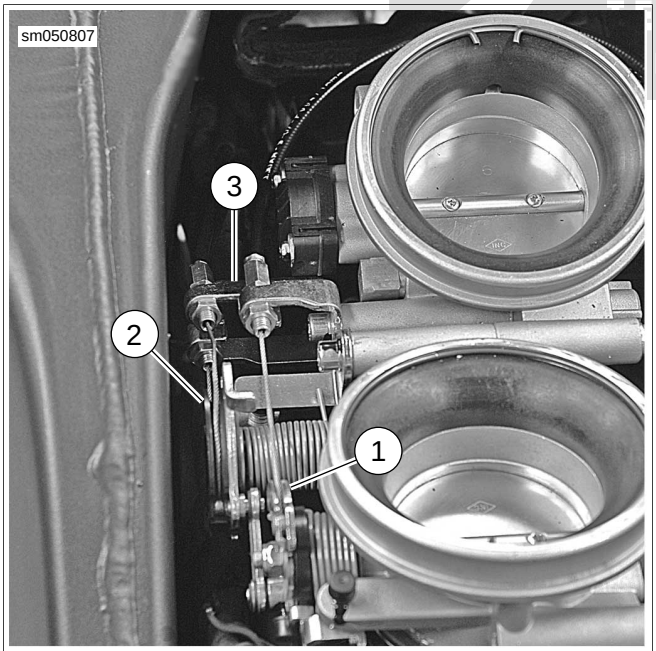
9. See Figure 4-36. Loosen the intake neck clamps:
   a. Loosen the lower front clamp (1).
   b. Loosen the upper rear clamp (2).
10. Remove the throttle body with the front neck.

## Inspection and Disassembly

1. Remove the IAC controller if required. See 4.4 THROTTLE CONTROL, Idle Air Control (IAC).
2. Inspect the IAC hose. Replace as required.
3. Inspect the intake necks. Replace as required.
4. Inspect intake funnels. Remove snap rings to access intake funnels. Replace as required.

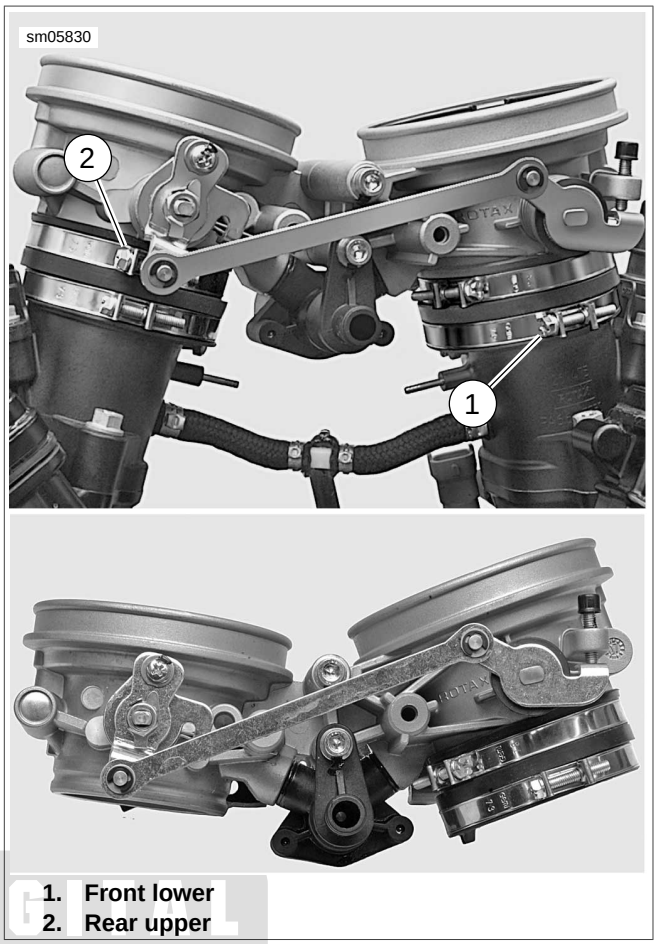
## Intake Flanges

1. Separate the fuel rail from both injectors.
2. Separate the following connector housings:
   a. Front injector [84]
   b. Rear injector [85]
3. Remove the MAP sensor tubes.
4. Cut the vacuum assist hose clamps and remove the vacuum assist hoses. See 6.5 CLUTCH, Vacuum Assist Hose.
5. Remove the fasteners and the intake flanges from the cylinder heads.




1. **Active intake solenoid cable**
2. **Throttle control cables**
3. **Cable bracket**

**Figure 4-35. Throttle Body Cable Connections**




1. **Front lower**
2. **Rear upper**

**Figure 4-36. Loosen Hose Clamps to Remove Throttle Body (IAC hose removed)**

## THROTTLE BODY INSTALLATION

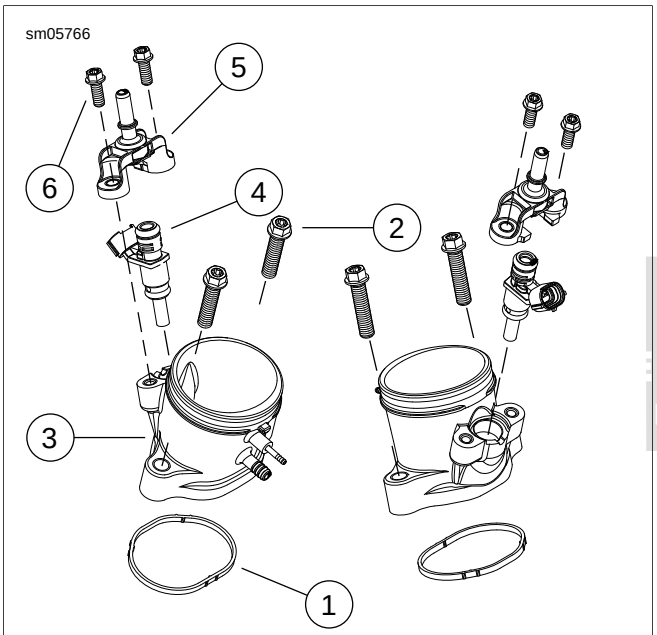
| PART NUMBER | TOOL NAME |
|---|---|
| HD-44750 | DIGITAL TECHNICIAN |
| HD-97087-658 | HOSE CLAMP PLIERS |

## Intake Flanges

1. See Figure 4-37. Place a **new** gasket in the groove of each intake flange.
2. See Figure 4-38. Align the holes in the intake flanges with those in cylinder heads and start the screws.
3. Tighten the intake flange screws to 18 Nm (13 ft-lbs).
4. Install and route the clutch vacuum hose. See 6.5 CLUTCH, Vacuum Assist Hose.
5. Fit a hose clamp on the line and use the HOSE CLAMP PLIERS (Part No. HD-97087-658) to clamp the vacuum hose to the clutch housing.
6. **For California Models:** Connect fuel lines and EVAP hose to port at bottom of throttle body.
7. Push the MAP sensor tubes over the brass tubes in the throttle flanges.
8. If removed, install the injection valves and the jet holders. See 4.5 THROTTLE BODY, Fuel Injectors.




**Figure 4-37. Intake Flange Gasket**

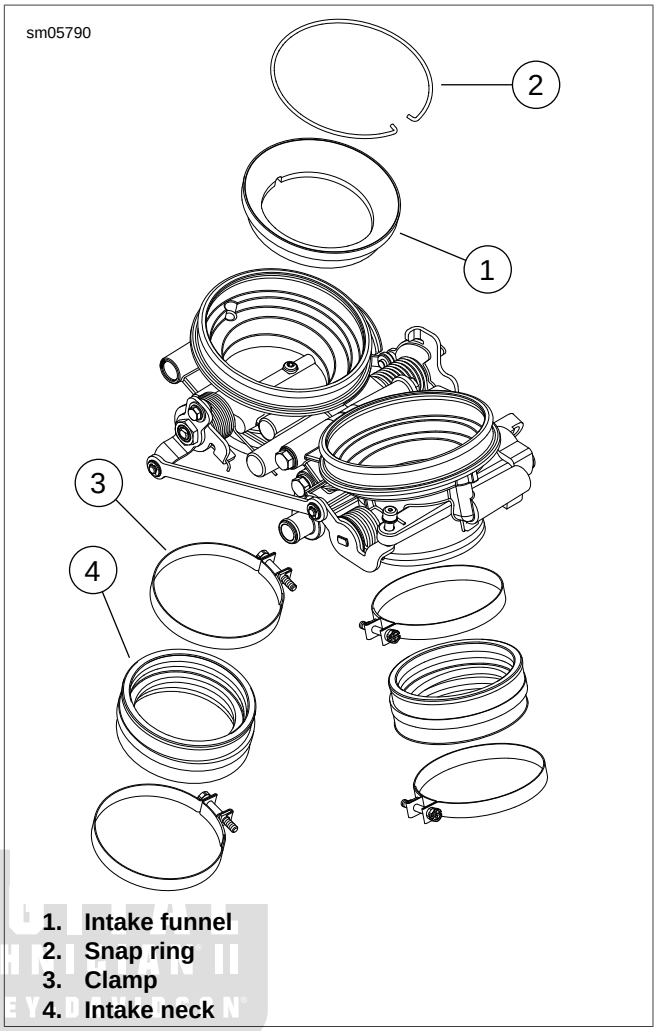



1. **Gasket**
2. **Fastener**
3. **Intake flange**
4. **Injection valve**
5. **Fastener**
6. **Jet holder**

**Figure 4-38. Intake Flange, Injection Valve and Jet Holder**

## Assembly

1. If removed, install the IAC controller. See 4.4 THROTTLE CONTROL, Idle Air Control (IAC).
2. If removed, replace the IAC hose.
3. See Figure 4-39. If removed, replace the intake funnels (1) and snap rings (2).
4. Fit the intake necks (4) and the clamps (3).
5. See Figure 4-40. Rotate the intake neck tabs to fit MAP sensor tubes.




1. **Intake funnel**
2. **Snap ring**
3. **Clamp**
4. **Intake neck**

**Figure 4-39. Throttle Body Assembly**

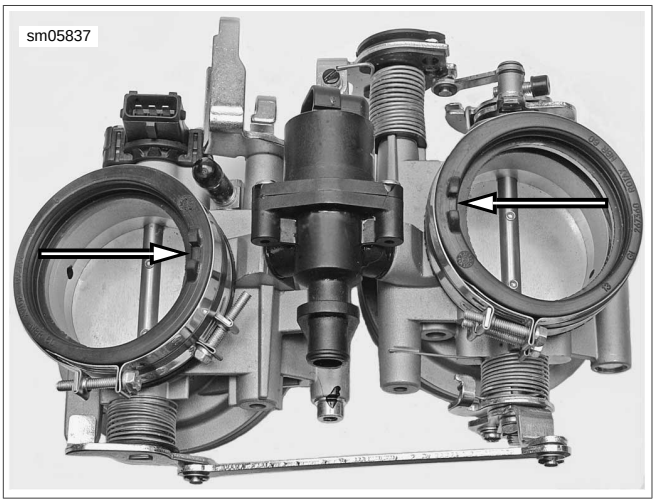



**Figure 4-40. Neck Tabs Over MAP Sensor Tubes**

## Throttle Body

*NOTE*

*If removed, install MAP sensor lines to the intake flanges before throttle body is installed.*

1. Press the throttle body into the throttle necks.
2. See Figure 4-41. To avoid interference with the throttle controls, orient the clamp screws and tighten the clamps to 2 Nm (18 **in-lbs**).
3. Mate the socket to the pin housings.
   a. Front injector [84]
   b. Rear injector [85]
   c. IAC [89]
   d. TPS [88]
4. Route the throttle pull and return cables through the throttle cable bracket.
5. Fit the barrels of the throttle pull and return throttle cables to the throttle cam. See 4.4 THROTTLE CONTROL.
6. Fit the solenoid cable to the solenoid cable bracket.
7. Fit the barrel of the cable to the solenoid cam.
8. Fit the fuel rail to the fuel injectors.
9. Verify active intake and throttle cable adjustment.
10. Calibrate TPS, using DIGITAL TECHNICIAN (Part No. HD-44750) or manually. See 4.3 SENSORS, Throttle Position Sensor (TPS).
11. Install air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.




**Figure 4-41. Intake Neck Clamp Orientation**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## CABLE ADJUSTMENT

1. Remove cosmetic intake cover assembly, functional air cleaner cover and baseplate assembly. See 4.2 AIR CLEANER ASSEMBLY.
2. See Figure 4-42. Inspect for proper retraction freeplay in solenoid shaft:
   a. Roll the throttle to the completely open stop, push solenoid shaft (1) inward to the fully retracted position.
   b. While slowly rolling off the throttle, move the solenoid shaft slightly inward until the shaft bottoms out. This slight travel will be the retraction freeplay.
   c. If there is no travel in the shaft, adjust cable housing (4) away from the solenoid bracket (3) until freeplay is achieved.

*NOTE*

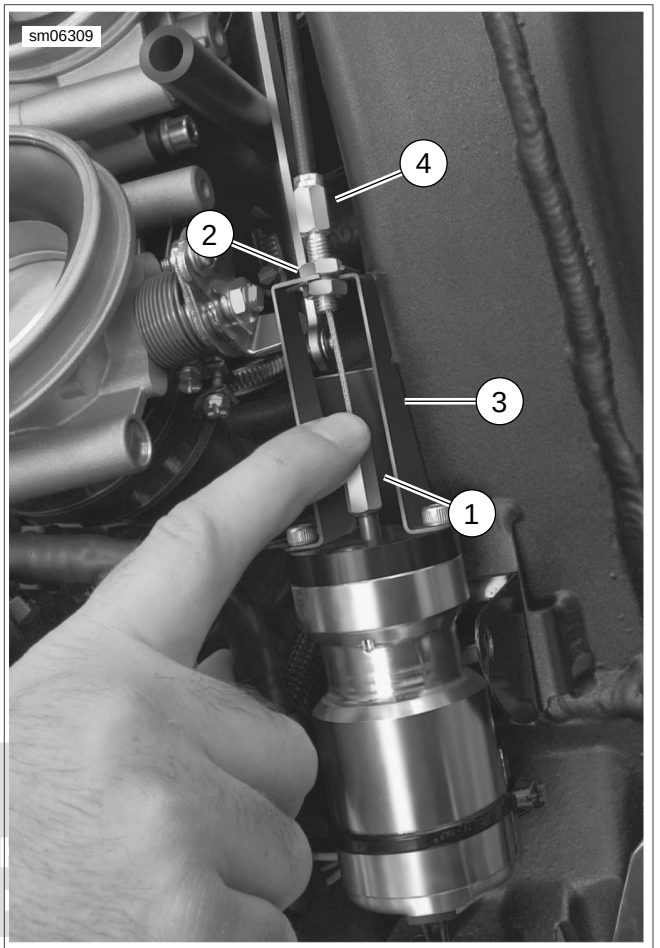
*Fully retracted solenoid shaft freeplay is 0.79 mm (1/32 in.) or greater.*

3. See Figure 4-43. Inspect for proper extension freeplay in solenoid shaft:
   a. Roll the throttle to the completely open stop.
   b. Pull solenoid shaft (1) outward to the fully extended position.
   c. If there is no travel in the shaft, loosen jamnuts (2) and adjust cable housing (4) towards the solenoid bracket (3) until freeplay is achieved.

*NOTE*

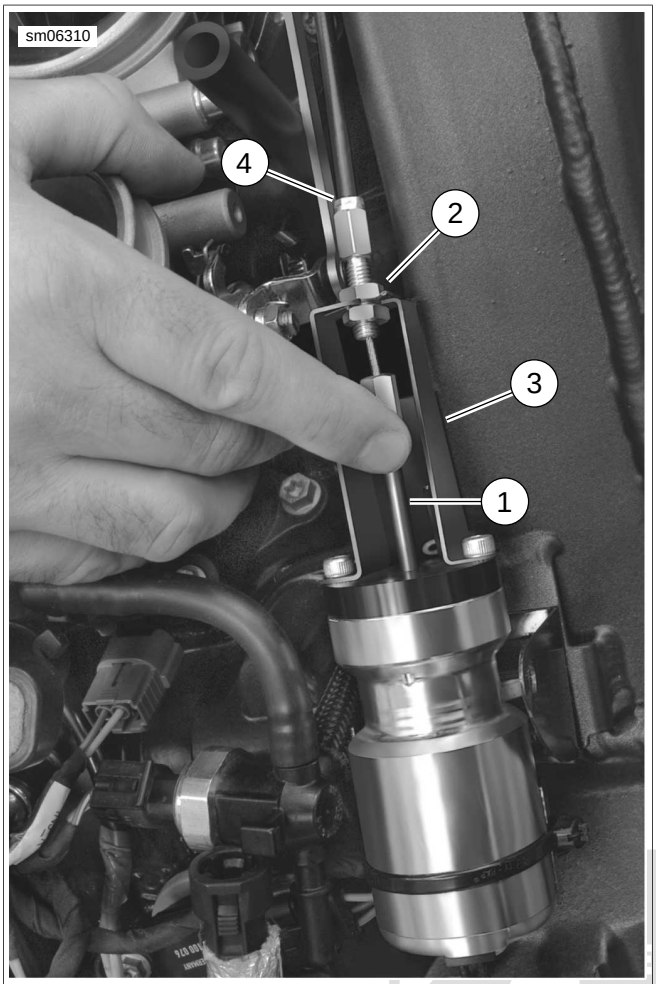
*Fully extended solenoid shaft freeplay is 0.79 mm (1/32 in.) or greater.*

4. Once freeplay is set, verify settings and adjustments again. See electrical diagnostic manual.




1. **Solenoid shaft**
2. **Cable adjusting and jamnuts**
3. **Solenoid bracket**
4. **Cable housing**

**Figure 4-42. Solenoid Shaft Freeplay: Fully Retracted**




1. **Solenoid shaft**
2. **Cable adjuster jamnut**
3. **Solenoid Bracket**
4. **Cable housing**

**Figure 4-43. Solenoid Shaft Freeplay: Fully Extended**

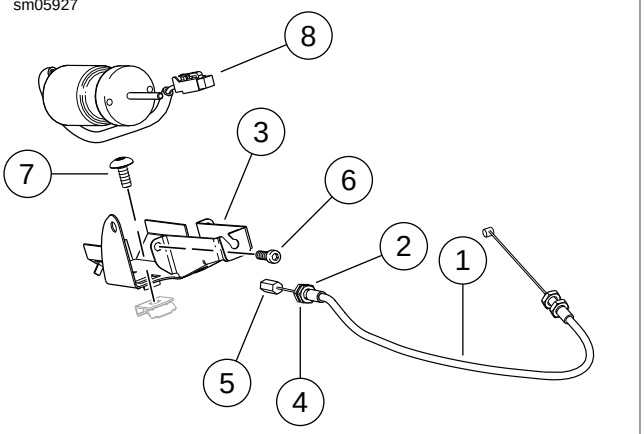
## REMOVAL

1. See Figure 4-44. Disconnect electrical connector [178] (8).
2. Hold solenoid shaft by flat spot provided and break cable connector (5) loose.
3. Unthread cable connector and disconnect cable from solenoid.
4. Loosen jamnut (4) and disconnect cable (1) from bracket (3).

*NOTE*

*Follow next step only if solenoid is to be replaced.*

5. Remove cable strap securing solenoid to rear of bracket (3).
6. Remove the two fasteners (6) at the front on the solenoid bracket and lift solenoid out of bracket.
7. If the active cable needs to be replaced, disconnect from cable wheel.




1. **Active intake cable**
2. **Cable adjusting nut**
3. **Bracket**
4. **Active cable jamnut**
5. **Cable connector**
6. **Fasteners (2), bracket to solenoid**
7. **Bracket fastener**
8. **Wire harness with connector [178]**

**Figure 4-44. Active Intake Solenoid and Components**

## INSTALLATION

*NOTES*

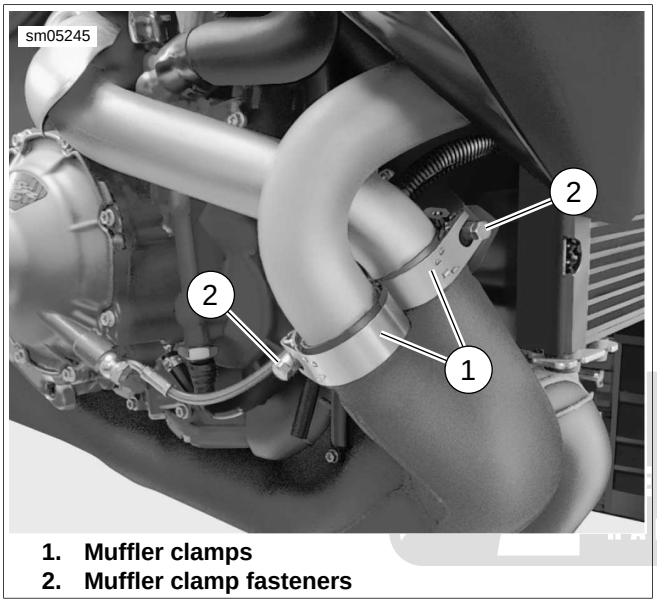
- *See Figure 4-44. Install solenoid bracket and tighten fastener (7) to 10.6-11.8 Nm (94-104 **in-lbs**).*
- *Follow the next step only if solenoid was removed.*

1. Install solenoid into bracket (3) and tighten bracket to solenoid fasteners (6) to 2.7-3.0 Nm (23.5-26.0 **in-lbs**).
2. Install cable strap securing rear of the solenoid to bracket.
3. Install active cable (1) into bracket (3) and leave jamnut (4) loose until the setting can be verified.
4. Connect active cable to solenoid shaft and tighten cable connector (5) to 4.1-4.5 Nm (36-40 **in-lbs**).
5. Connect electrical connector [178] (8).
6. See 4.6 ACTIVE INTAKE, Cable Adjustment and verify active cable setting.
7. Tighten jamnuts to 5.4-6.7 Nm (48-60 **in-lbs**).

## MUFFLER: REMOVAL

### Right Side

1. If necessary, slide scissors jack under muffler for support.
2. See Figure 4-45. Loosen the muffler clamp fasteners on the headers.
3. See Figure 4-46. Remove the right side bolt and washer from the oil cooler bracket.
4. See Figure 4-47. Remove the muffler bolt in the right side rider footpeg.




1. **Muffler clamps**
2. **Muffler clamp fasteners**

**Figure 4-45. Muffler Clamps**

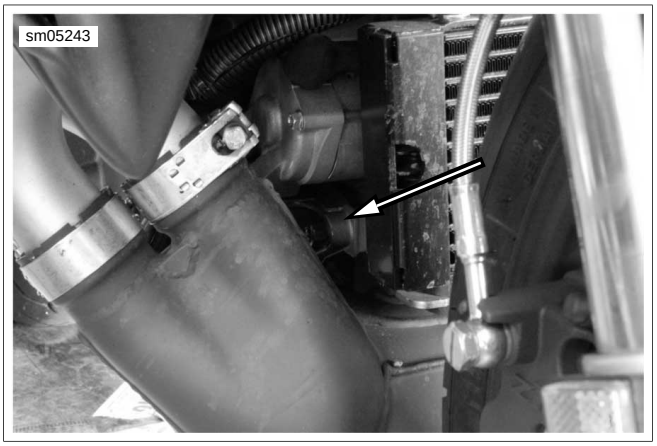



**Figure 4-46. Front Muffler Fastener (Right)**




**Figure 4-47. Muffler Bolt through Footpeg Mount**

### Left Side

1. See Figure 4-48. Remove the bolt and washer through the oil cooler bracket into the engine.
2. See Figure 4-49. Remove the rear muffler bolt through a hole in the idler wheel.

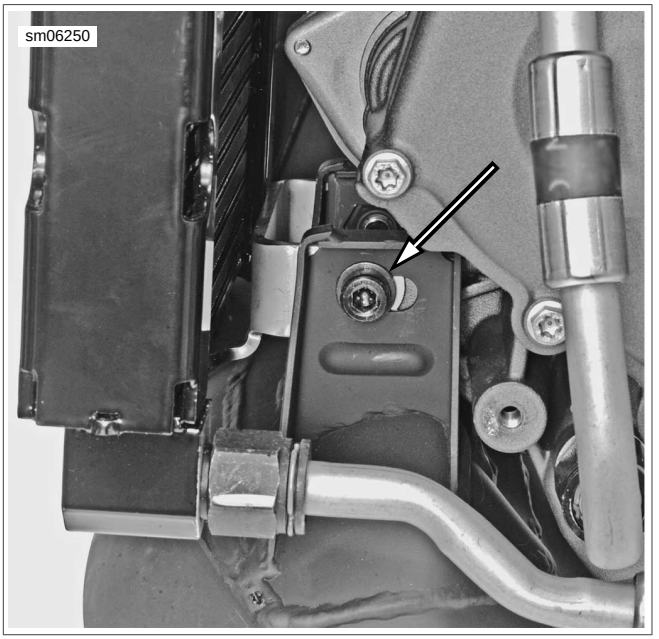



**Figure 4-48. Left Side Muffler Mounting Bolt**




**Figure 4-49. Muffler Bolt Through Idler Wheel Bracket**

## HEADERS

### Removal

1. To access the rear header flange nuts, rotate the engine. See 3.4 ENGINE ROTATION.
2. Separate the front and rear O2 sensor socket housing from the oxygen sensors.
3. Remove the front head flange nuts and the header.
4. Remove the rear header flange nuts and the header.
5. If necessary, remove the heat shield nuts and remove the heat shield from the rear header.
6. Service the O2 sensors as required. See 4.3 SENSORS.

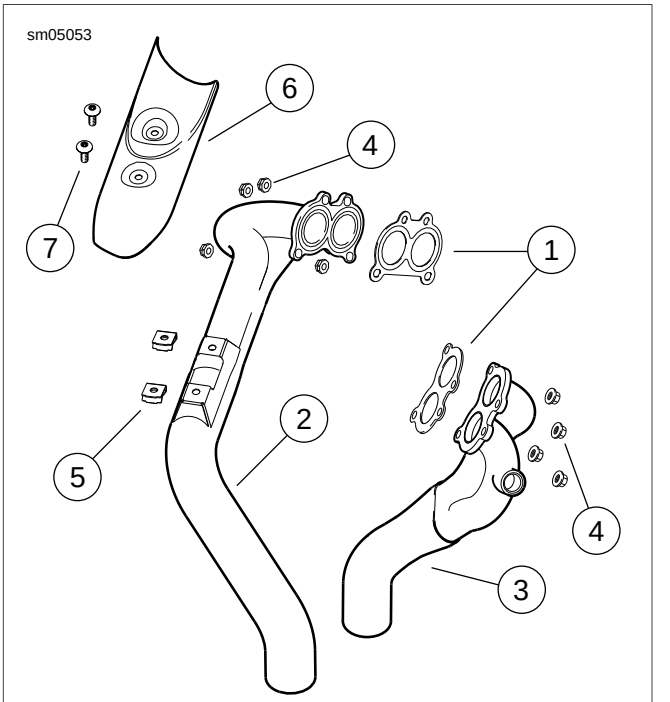
### Installation

1. See Figure 4-50. Install **new** header gaskets (1).
2. Install the rear header (2) on the rear cylinder head studs.
3. Install the front header (3) on the front cylinder head studs.
4. Thread on the header flanged nuts (4).
5. Tighten the rear cylinder flange nuts to 20 Nm (15 ft-lbs).

*NOTE*

*To ease muffler installation, leave the front cylinder head flange nuts loose.*

6. Mate the O2 sensor connectors.
7. If removed, install the rear header heat shield (6) with the fasteners (7) and captured nuts (4). Tighten the heat shield fasteners to 6.8-8.1 Nm (60-72 **in-lbs**).
8. Rotate the engine. See 3.4 ENGINE ROTATION.
9. Install the muffler. See 4.7 EXHAUST SYSTEM, Muffler: Removal.
10. When finished, tighten the front cylinder flange nuts to 20 Nm (14.8 ft-lbs).




1. **Gasket**
2. **Rear cylinder header**
3. **Front cylinder header**
4. **Nuts**
5. **Captured nuts**
6. **Heat deflector**
7. **Fasteners**

**Figure 4-50. Exhaust Headers**

## MUFFLER: INSTALLATION

### Right Side

1. See Figure 4-51. Install muffler flange gaskets (1) in the muffler inlets.

*NOTE*

*To positively seal the headers to the muffler, use **new** Torca clamps (2).*

2. Install **new** Torca clamps over the muffler inlet flanges.

*NOTES*

- *If necessary, loosen the front header flanged nuts to allow the header and muffler to flex during installation.*
- *If necessary, jack the muffler into place while aligning the four muffler mounting bolts.*

3. Fit the muffler (3) to the headers and onto the clamping surfaces at the front of the engine.
4. Install bolt (7) through washer (6), right front of muffler into the captured nut.
5. Fit the muffler mounting tabs between the clamping surfaces at the rear. Slide the captured nuts to match the through holes in the footpeg bracket.

6. Install the bolt through a washer, the right rider footrest bracket and spacer and thread into the captured nut in the muffler.

## Left Side

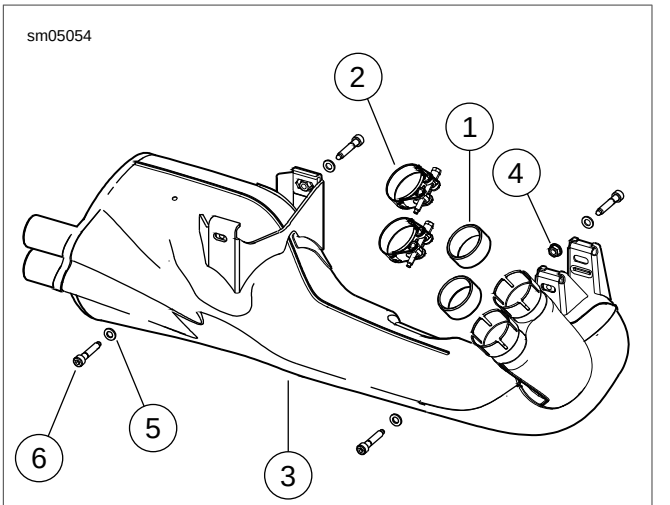
*NOTE*

*Push the oil cooler mounting tab up tight against the oil cooler bracket.*

1. See Figure 4-51. Install the bolt through a washer, the left front of the muffler, the oil cooler mounting tab and onto the flanged nut.
2. Install the bolt through the idler wheel into the captured nut in the muffler.

## Final Tighten

1. If loosened, tighten the header flange nuts to 20 Nm (15 ft-lbs).
2. Tighten left and right side muffler bolts to 24.5-27.0 Nm (18-20 ft-lbs).
3. Tighten Torca clamps to 9.5-10.8 Nm (84-96 **in-lbs**).




1. **Gasket**
2. **Torca clamps**
3. **Muffler**
4. **Flanged nut**
5. **Washer**
6. **Bolt**

**Figure 4-51. Muffler Assembly**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

## DRAINING THE FUEL TANK

**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. Separate the fuel pump connector [86] housings.
   b. Run the engine until the engine stalls.
   c. Run the starter for three seconds to remove any remaining fuel.
2. Remove the negative battery cable.
3. Remove the sprocket cover.

**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)**

4. See Figure 4-52. Remove the drain plug and drain fuel into appropriate container. Discard the plug.
5. Before filling the fuel tank, replace with a **new** drain plug. Tighten to 8.1-10.8 Nm (72-96 **in-lbs**).
6. Install the sprocket cover and tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
7. Connect the negative battery cable.

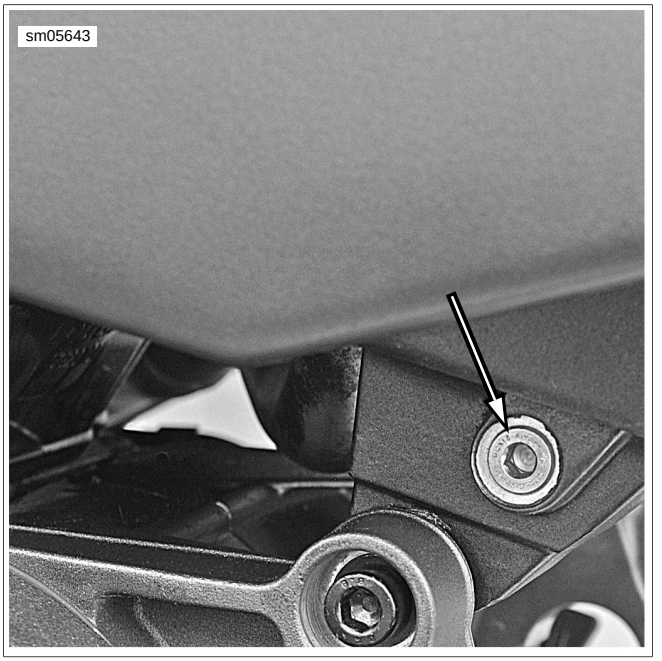



**Figure 4-52. Fuel Tank Drain Plug**

## FUEL CAP RETAINING RING

### Removal

*NOTE*

*The fuel tank must be drained to remove the retaining ring.*

1. Drain fuel tank. See 4.8 FUEL TANK, Draining the Fuel Tank.
2. Remove fuel filler cap.
3. See Figure 4-53. Remove fasteners securing fuel cap retaining ring to fuel filler neck.
4. Remove fuel cap retaining ring and O-ring. Discard O-ring.

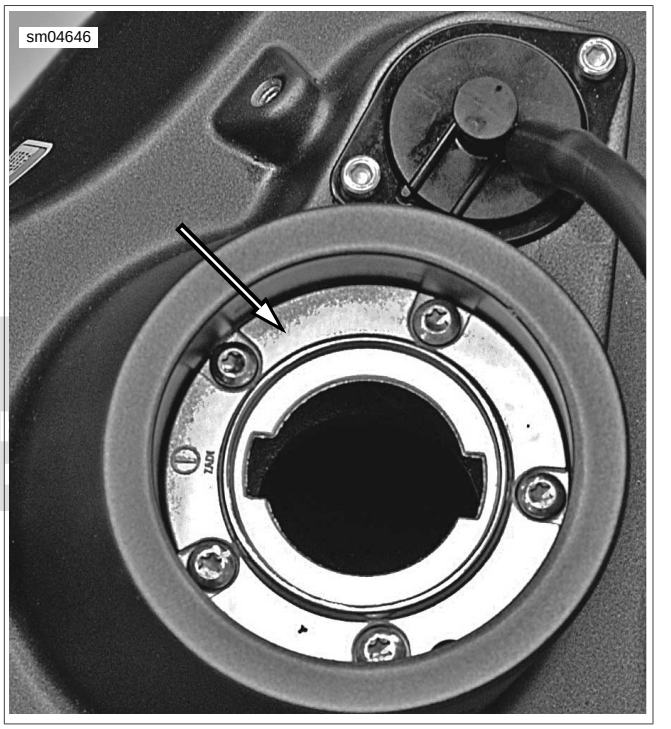



**Figure 4-53. Fuel Tank Filler Neck**

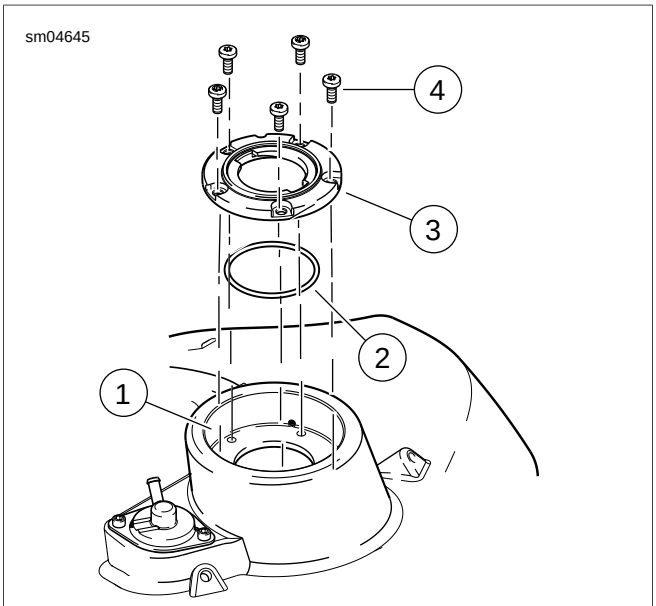
### Installation

1. See Figure 4-54. Coat **new** O-ring (2) with thin film of clean engine oil.
2. Place O-ring into groove in underside of fuel cap retaining ring (3).

*NOTE*

*Be sure O-ring remains in groove of fuel cap retaining ring during installation.*

3. Insert fuel cap retaining ring into fuel filler neck.
4. Install fasteners (4). Tighten to 7-8 Nm (62-71 **in-lbs**).
5. Install fuel filler cap.




1. **Fuel filler neck**
2. **O-ring**
3. **Fuel cap retaining ring**
4. **Fastener (5)**

**Figure 4-54. Fuel Cap Retaining Ring**

## VENT VALVE

### General

The fuel tank vent valve opens to vent gas vapor to either the atmosphere or to a charcoal canister (EVAP-equipped) and closes to prevent gasoline from leaking if the motorcycle leans at an extreme angle.

### Removal

1. Remove the pillion.

**⚠WARNING**

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

2. Disconnect the negative battery cable.
3. Remove the intake cover.
4. Remove the air cleaner cover. See 1.6 AIR FILTER ELEMENT, Intake Cover.

*NOTE*

*The fuel tank must be drained to remove the fuel tank vent.*

5. Drain the fuel tank. See 4.8 FUEL TANK, Draining the Fuel Tank.
6. Remove the vent valve line from the vent valve.
7. See Figure 4-55. Remove the fasteners.
8. Remove the bracket, fuel tank vent valve and O-ring from the fuel tank/frame.

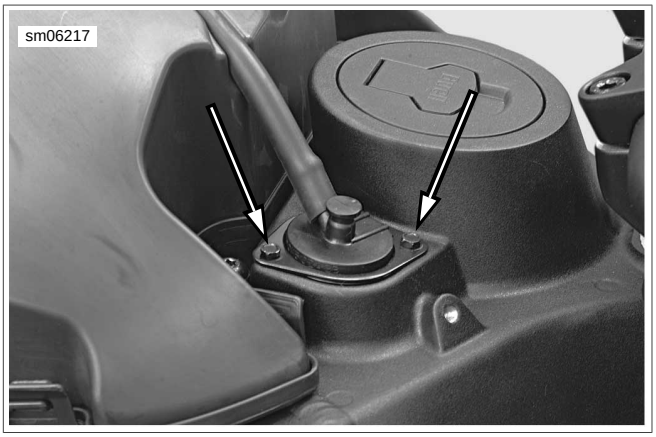



**Figure 4-55. Fuel Vent Valve Fasteners**

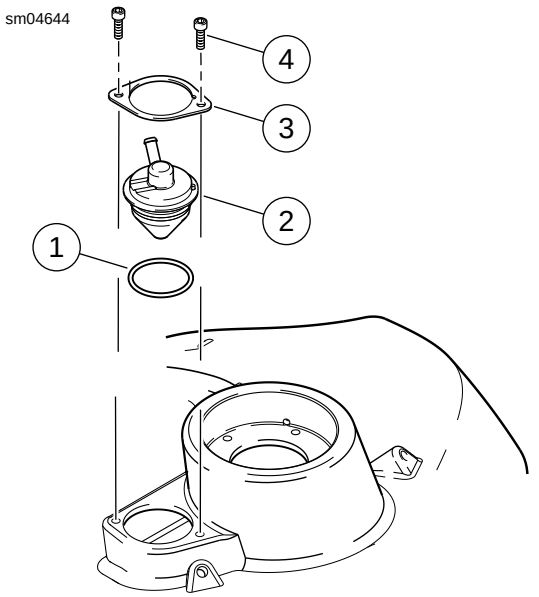
### Installation

1. See Figure 4-56. Install **new** O-ring (1).
2. Install the fuel tank vent valve (2) into the fuel tank/frame with the vent valve nozzle at 7 o'clock.
3. Install bracket (3) over vent valve. Slot in bracket should line up with notch in valve.
4. Install and tighten fasteners (4) to 3.6-4.0 Nm (32-36 **in-lbs**).
5. Connect vent valve soft line to the vent valve.
6. Route the vent valve hose. See 4.8 FUEL TANK, Vent Hose Routing.
7. Install the air filter cover and the intake cover. See 4.2 AIR CLEANER ASSEMBLY.
8. Connect the negative battery cable. Tighten to 6.8-7.9 Nm (60-70 **in-lbs**).

**⚠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 pillion.




1. **O-ring**
2. **Fuel tank vent valve**
3. **Bracket**
4. **Fastener**

**Figure 4-56. Fuel Tank Vent Valve Assembly**

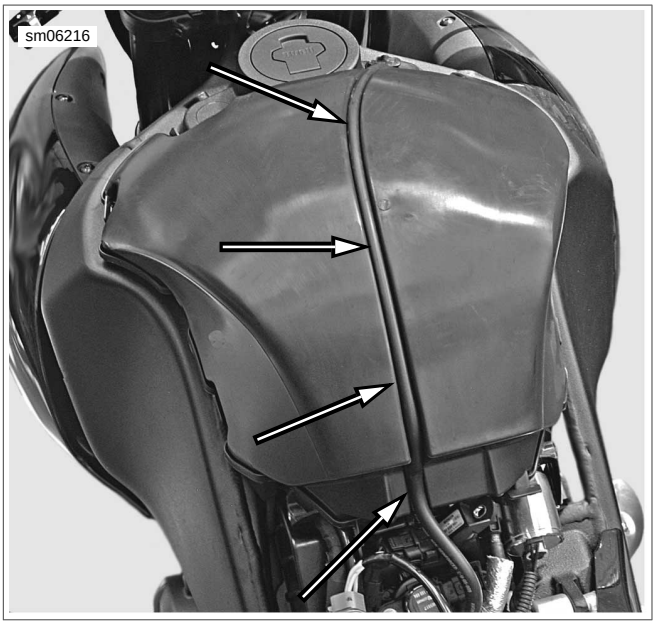



**Figure 4-57. Vent Valve Hose Routing**

## VENT HOSE ROUTING

1. Push the soft vent hose on to the barbed fitting on the vent valve.
2. See Figure 4-57. Route the soft hose up and over the air filter cover.
3. Push the hose into the groove in the air filter cover.
4. See Figure 4-58. Route the hard hose through the sub-frame.
5. Push the soft hose over the end of the hard hose.
6. See Figure 4-59. Route the hard hose (1) down the inside of the left passenger mount and attach with a P-clamp (2).
7. Tighten to 6.4-7.1 Nm (57-63 **in-lbs**).

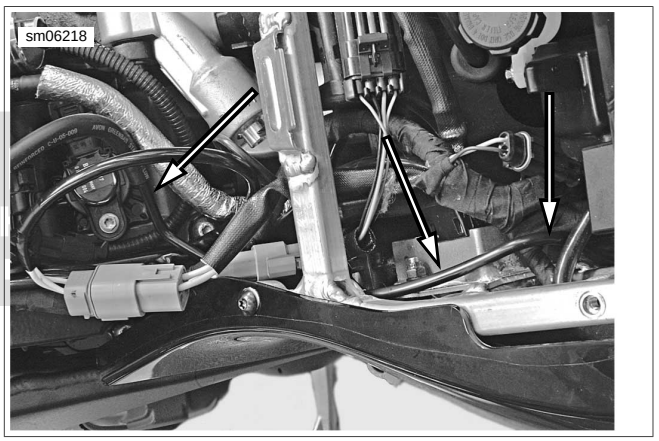
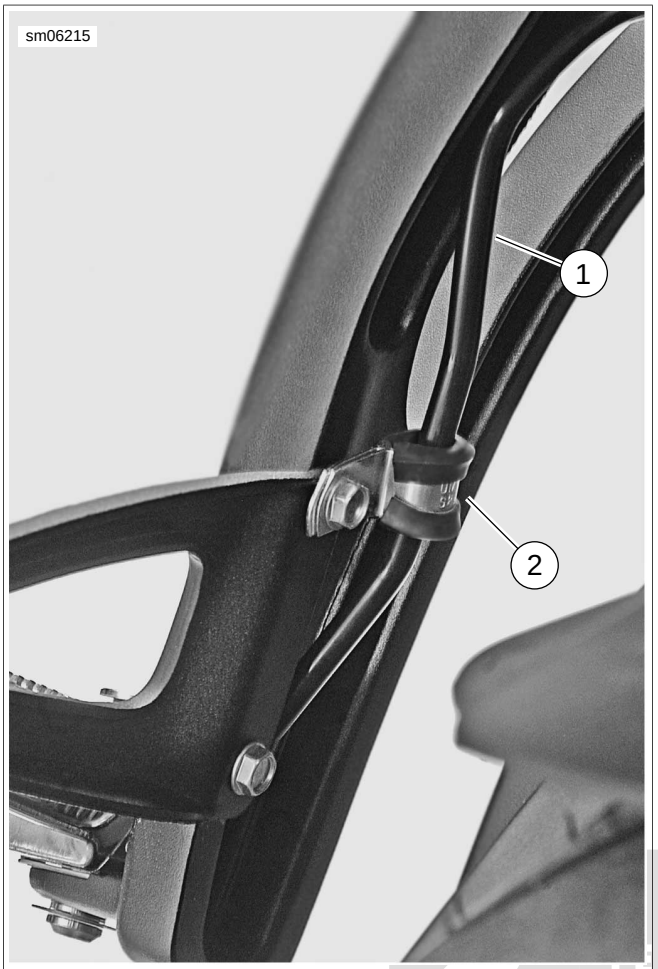



**Figure 4-58. Hard Line Through Subframe**




1. Hard line routing
2. P-clamp

**Figure 4-59. Vent Valve Hard Line and P-Clamp**




**Figure 4-60. Battery Ground Set Screw**




**Figure 4-61. Fuel Pump Cover Set Screw**

## TANK SET SCREWS

### Battery Ground

See Figure 4-60. The battery ground set screw is a hex screw with lock patch. Tighten to 6.1-6.8 Nm (54-60 **in-lbs**).

### Wire Guide/Fuel Pump Cover

See Figure 4-61. The fuel pump cover set screw is a hex screw. Tighten to 4.6-5.1 Nm (41-45 **in-lbs**).

# FUEL PUMP 4.9

## FUEL PRESSURE TEST

| PART NUMBER | TOOL NAME |
|---|---|
| B-45522 | FUEL PRESSURE GAUGE ADAPTER |
| HD-41182 | FUEL PRESSURE GAUGE |

**⚠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. Remove air cleaner assembly and throttle mount gasket. See 4.2 AIR CLEANER ASSEMBLY.
2. Purge the fuel supply line of high pressure gasoline.
   a. See Figure 4-62. Disconnect the 4-place fuel pump connector [86].
   b. With the motorcycle in neutral, start the engine and allow vehicle to run.
   c. When the engine stalls, press the starter button for 3 seconds to remove any remaining fuel from fuel line.

**⚠WARNING**

**Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)**

3. See Figure 4-63. Press button of fuel line connector and disconnect the fuel line from throttle body inlet.
4. See Figure 4-64. Attach FUEL PRESSURE GAUGE ADAPTER (Part No. B-45522) (2) to throttle body inlet (1).
5. Connect the fuel line (3) to fuel pressure gauge adapter.

*NOTE*

*See Figure 4-65. Verify that fuel valve (2) and air bleed petcock (5) on the gauge are closed.*

6. Attach FUEL PRESSURE GAUGE (Part No. HD-41182) (4) to fuel pressure gauge adapter (1).
7. See Figure 4-62. Attach fuel pump connector [86] to main wiring harness.
8. See Figure 4-65. Pressurize the fuel system.
   a. Start and idle engine to pressurize the fuel system.
   b. Open fuel valve (2) on fuel pressure gauge to allow fuel to flow down the gauge hose.
   c. Position the air bleed tube (3) into proper container.
   d. Open and close the air bleed petcock (5) to purge the fuel pressure gauge and hose of air. Repeat this step several times until only solid fuel (without bubbles) flows from the air bleed tube.
   e. Close the air bleed petcock.
9. Note the reading on the pressure gauge at idle and at 4000 RPM.
   a. If the fuel pressure is approximately 517 kPa (75 PSI) at ignition ON, and fluctuates between 380-415 kPa (55-60 PSI) at idle and at 4000 RPM, then system is operating within limits.
   b. If pressure is not within limits, see the electrical diagnostic manual.

**⚠WARNING**

**Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)**

10. See Figure 4-65. Turn engine off. Detach pressure gauge (4) from adapter (1).
    a. Open the air bleed petcock (5) to relieve fuel system pressure and purge the pressure gauge of gasoline.
    b. Remove adapter from vehicle.
11. Detach adapter from vehicle.
12. Connect fuel line to throttle body inlet.

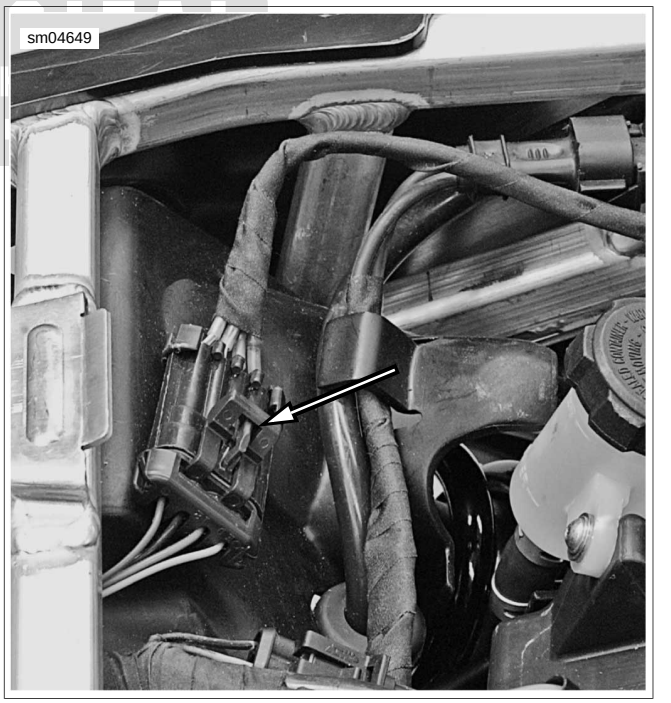
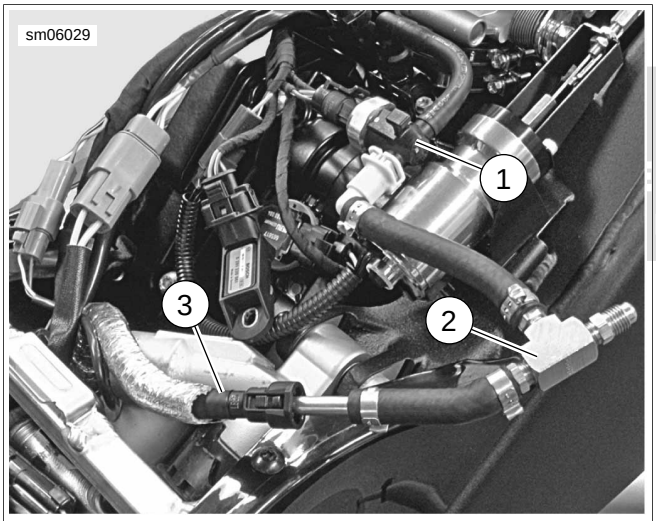



**Figure 4-62. Fuel Pump Connector [86]**

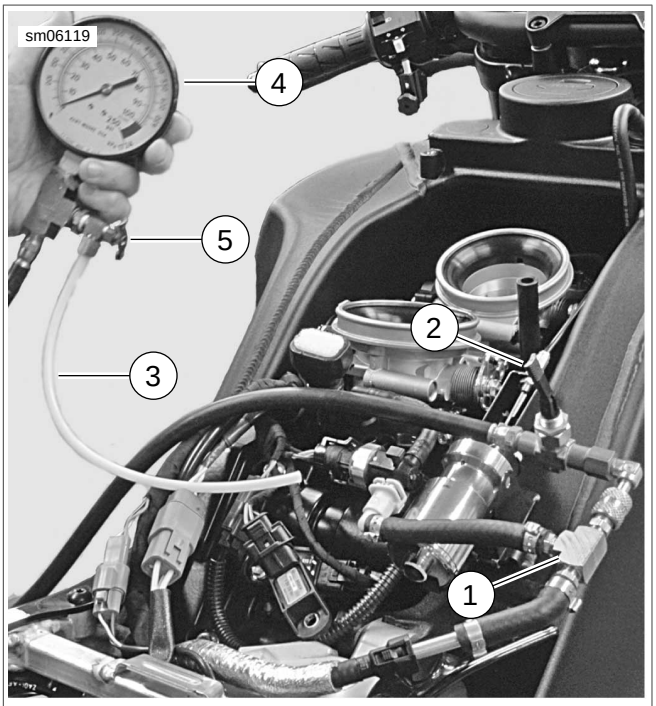



**Figure 4-63. Fuel Line Connector**




1. **Throttle body inlet**
2. **Fuel pressure gauge adapter**
3. **Fuel line**

**Figure 4-64. Fuel Pressure Gauge Adapter**



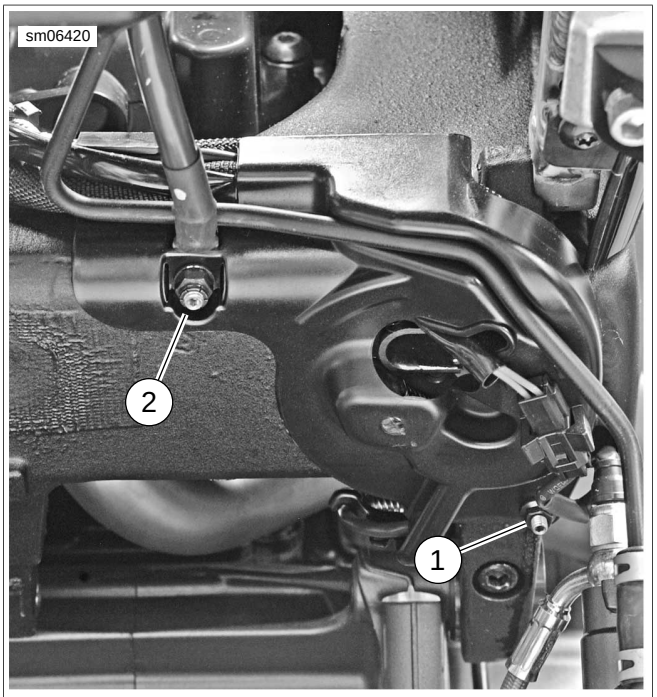

1. **Fuel pressure gauge adapter**
2. **Fuel valve (open position)**
3. **Air bleed tube**
4. **Fuel pressure gauge**
5. **Air bleed petcock**

**Figure 4-65. Fuel Pressure Gauge**

## WIRE GUIDE/FUEL PUMP COVER

### Removal

1. See Figure 4-66. Remove the cover nut (1) and the battery ground nut (2).
2. Separate the brake light connector [121] housings.
3. Work the wire and fuel line bundle out of the guides at the top of the cover.
4. Work the cover out from behind the brake fluid reservoir line.

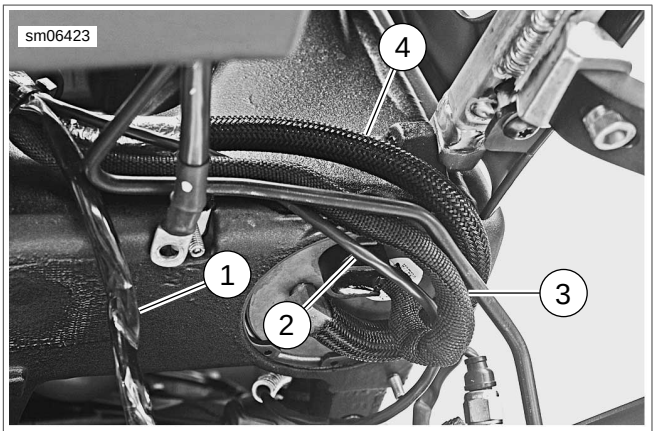



1. **Cover nut**
2. **Battery ground nut**

**Figure 4-66. Wire Guide/Fuel Pump Cover**

## Installation

1. The fuel pump wire harness and the fuel line are looped up into the space behind the ground wire.
2. See Figure 4-67. The brake switch lead (1), the VSS wire lead (2), the fuel pump wire lead (3) and the fuel line (4) are bundled and routed through the top guide into the back of the cover.
3. The brake light connector [121] is passed through the Y-opening in the front of the cover.
4. See Figure 4-68. The VSS lead is taped to the narrow channel in the bottom of the cover.
5. Fit the cover to the battery ground set screw and to the cover set screw and thread on the nuts.
6. Tighten:
   a. Battery ground nut to 9.6-10.6 Nm (85-94 **in-lbs**).
   b. Fuel pump cover nut to 4.6-5.1 Nm (41-45 **in-lbs**).
7. See Figure 4-69. Join the brake light switch connector housings and snap onto the cover.
8. See Figure 4-70. Route the brake fluid reservoir line in the channel on the cover.




1. **Brake light switch lead**
2. **VSS lead**
3. **Fuel pump wire leads**
4. **Fuel line**

**Figure 4-67. Bundle for Cover Guide**




**Figure 4-68. VSS Lead Taped in Cover**

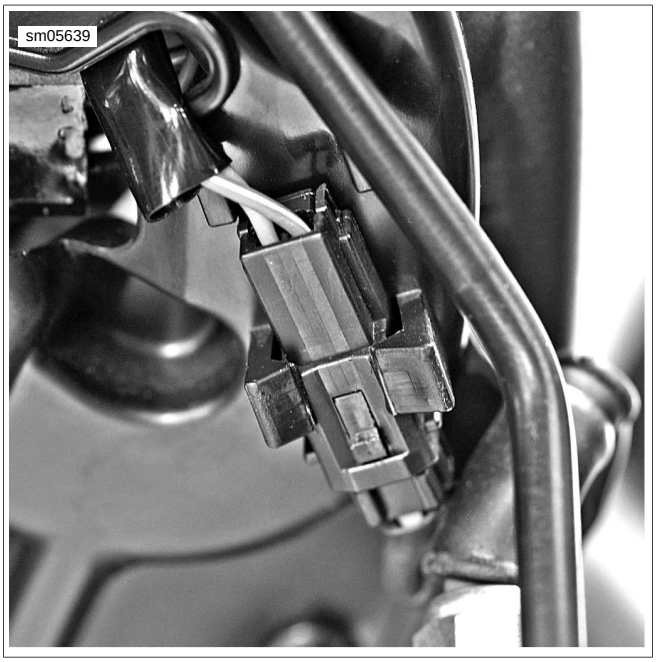



**Figure 4-69. Brake Light Switch Connector [121]**

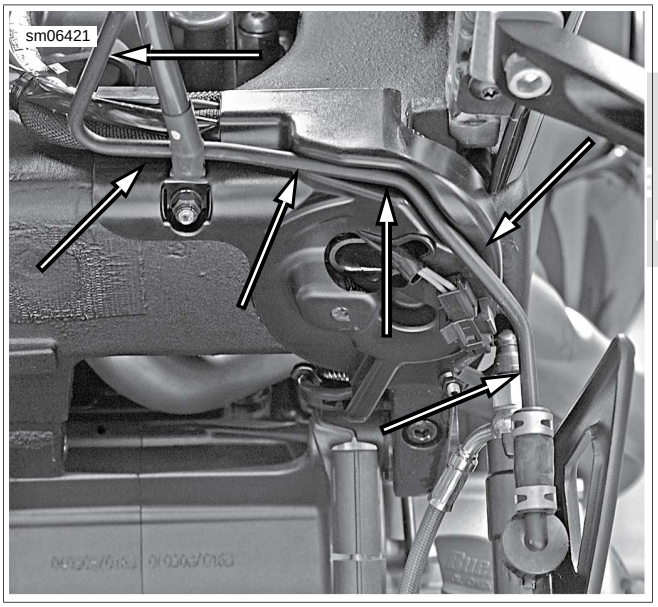



**Figure 4-70. Brake Fluid Reservoir Line**

## FUEL PUMP: REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| B-45657-1-A | FUEL PUMP PULLER |
| PR7 | SNAP-ON RETAINING RING PLIERS |

**⚠WARNING**

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

1. Remove seat.

**⚠WARNING**

**To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)**

2. Purge the system of high pressure gasoline:
   a. Separate the fuel pump connector [86] housing.
   b. Run the engine until the engine stalls.
   c. Run the starter for three seconds to remove the remaining fuel.
3. Disconnect negative battery cable.

*NOTES*

- *Cover cosmetic and painted surfaces during disassembly and assembly to protect from damage.*
- *Vehicle should be placed onto lift with front tire placed in wheel vise in order to successfully perform this procedure.*
- *Place a scissor jack under jacking point and raise until vehicle weight is removed from rear wheel.*

4. Drain fuel from fuel tank into suitable container. See 4.8 FUEL TANK, Draining the Fuel Tank.

**⚠WARNING**

**With fuel tank drained, gasoline can spill from bore when supply valve is loosened or 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. (00277a)**

5. Remove rear wheel assembly. See 2.6 WHEELS.
6. Remove rear swingarm. See 2.12 SWINGARM AND BRACE.
7. Remove the fuel pump cover.
8. Disconnect the fuel line connector at the fuel rail.
9. See Figure 4-71. Use the SNAP-ON RETAINING RING PLIERS (Part No. PR7) to remove the snap ring.
10. See Figure 4-72. Use the FUEL PUMP PULLER (Part No. B-45657-1-A) to remove the fuel pump from fuel tank.
11. See Figure 4-73. Replace the fuel pump as required.

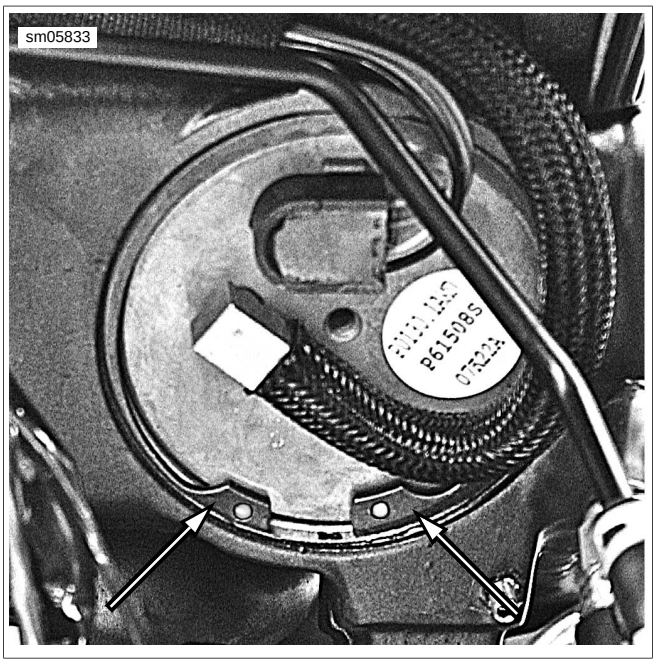
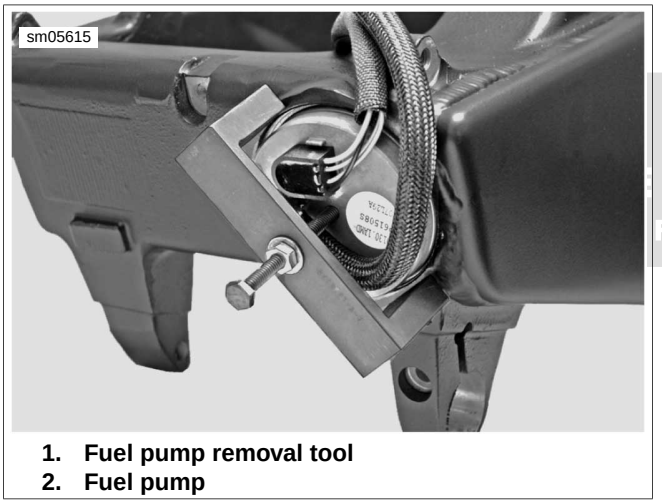



**Figure 4-71. Fuel Pump Retaining Ring**




1. **Fuel pump removal tool**
2. **Fuel pump**

**Figure 4-72. Fuel Pump Removal**




**Figure 4-73. Fuel Pump**

## FUEL PUMP: INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| PR7 | SNAP-ON RETAINING RING PLIERS |

1. See Figure 4-74. Lubricate fuel pump O-rings (6) with clean engine oil.

*NOTE*

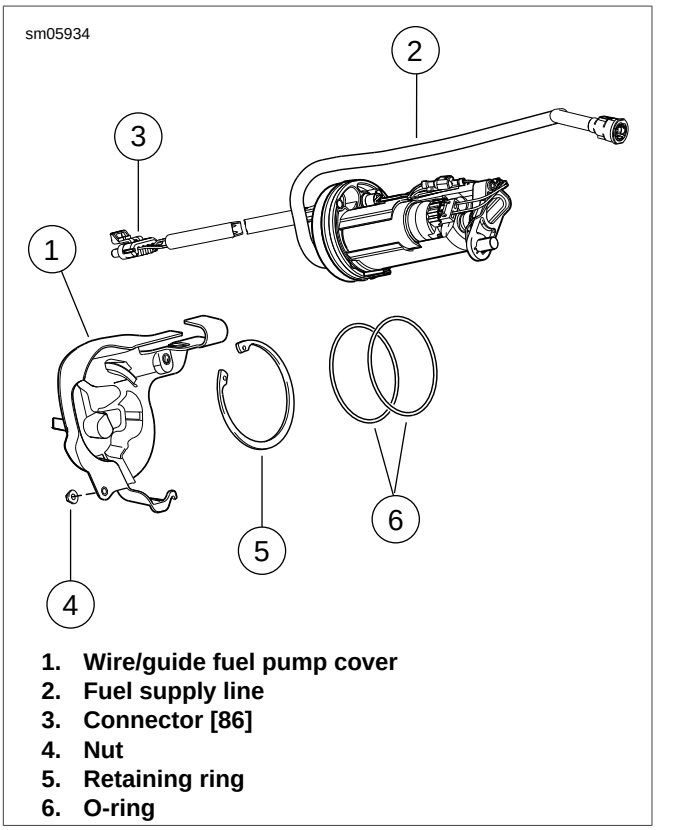
*In next step, be sure tab on pump assembly lines up with slot in fuel tank.*

2. Insert fuel pump assembly into fuel tank/frame until resistance is felt.
3. Use a SNAP-ON RETAINING RING PLIERS (Part No. PR7) to install retaining ring (5) securing fuel pump in fuel tank.
4. Connect the fuel supply line (2) to the fuel rail.
5. Join the fuel pump connector [86] (3) housings.
6. Fill fuel tank with a small amount of fuel and check for leaks.
7. Install the wire guide/fuel pump cover. See 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover.
8. Install swingarm onto motorcycle. See 2.12 SWINGARM AND BRACE.
9. Install rear wheel. See 2.6 WHEELS.
10. Install ram air baseplate and air box cover. See 4.2 AIR CLEANER ASSEMBLY, Baseplate.

**⚠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. Connect negative battery cable. Tighten fastener to 6.8-7.9 Nm (60-70 **in-lbs**).
13. Remove motorcycle from scissor jack.




1. **Wire/guide fuel pump cover**
2. **Fuel supply line**
3. **Connector [86]**
4. **Nut**
5. **Retaining ring**
6. **O-ring**

**Figure 4-74. Fuel Pump Components**

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# EVAPORATIVE EMISSIONS CONTROL (EVAP): CA MODELS 4.10

## GENERAL

Buell motorcycles sold in the state of California are equipped with an evaporative emissions control (EVAP) system. The EVAP system meets the California Air Resource Board (CARB) regulations in effect at the time of manufacture.

In the EVAP system, hydrocarbon vapors in the fuel tank are vented through the vent valve and routed to a carbon canister. From the canister, the vapors are drawn through the canister vent hose by venturi negative pressure (vacuum) into the throttle body and are burned in the engine combustion.

## REPAIR

### Vent Hose Routing

**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**

**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)**

1. Route the fuel tank valve vent hose from the vent valve over the intake cover and to the barbed connector on the carbon canister marked TANK.
2. Press the hose into the slot on the top of the intake cover.
3. From the barbed connector on the canister marked CARB, route the canister vent hose inside the subframe body and pan to the vacuum fitting on the throttle body.

### Canister Removal

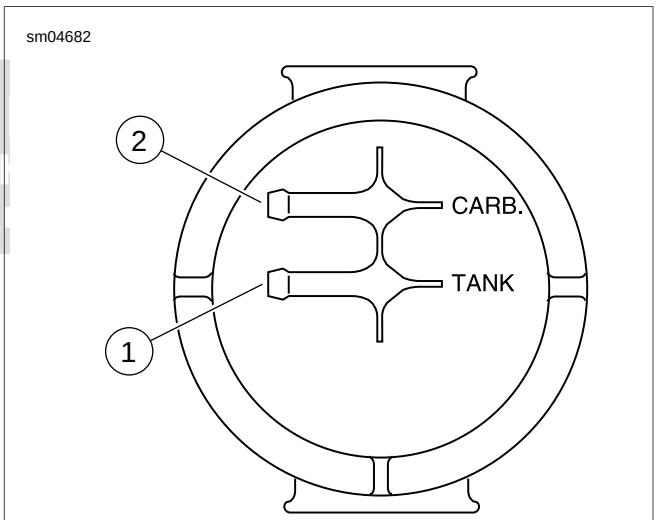
1. Remove the tail section. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
2. Label and disconnect the fuel tank vent hose (1) and canister vent hose (2) from the canister connections.
3. Slide the canister off the mounting bracket.

### Canister 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)**

1. With the canister hose barbs facing the left and the barb holes facing toward the front, slide the tongue of the canister along the bracket until it locks in place.
2. See Figure 4-75. Push the fuel tank vent hose over the barb of the fuel tank vent valve hose connector (1).
3. Push the canister vent hose over the barb of the canister vent hose connection (2).
4. Install the tail section. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.




**1. Fuel tank vent valve hose**
**2. Canister vent hose**

**Figure 4-75. Carbon Canister Hose Connections**

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| 5.4 ENGINE COOLANT | 5-8 |
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# NOTES

# FASTENER TORQUE VALUES 5.1

## FASTENER TORQUE VALUES IN THIS CHAPTER

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

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Engine coolant temperature (ECT) sensor | 18 Nm | 13.3 ft-lbs | 5.3 COOLANT FLOW, Engine Coolant Temperature (ECT) Sensor |
| Hose clamps | 3.2-3.5 Nm | 28-31 **in-lbs** | 5.5 THERMOSTAT, Installation |
| Oil cooler top mounting bolt | 24.5-27.0 Nm | 18-20 ft-lbs | 5.9 OIL COOLER, Installation |
| Oil line fitting | 14.9-17.6 Nm | 11-13 ft-lbs | 5.9 OIL COOLER, Oil Line Fittings |
| Overflow tank fasteners | 4.75-6.10 Nm | 42-54 **in-lbs** | 5.8 RADIATORS, Installation |
| Overflow tank fasteners | 4.75-6.10 Nm | 42-54 **in-lbs** | 5.8 RADIATORS, Overflow Tank |
| Radiator bypass bracket nut | 8.2-9.2 Nm | 73-82 **in-lbs** | 5.9 OIL COOLER, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.4 ENGINE COOLANT, Freeze Point Test |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.4 ENGINE COOLANT, Replacing Coolant |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.4 ENGINE COOLANT, Replacing Coolant |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.8 RADIATORS, Installation |
| Thermostat housing fasteners | 10.2-11.3 Nm | 90-100 **in-lbs** | 5.5 THERMOSTAT, Installation |
| Water pump cover fasteners | 11 Nm | 97 **in-lbs** | 5.6 WATER PUMP, Installation |
| Water pump housing drain screw | 11 Nm | 97 **in-lbs** | 5.4 ENGINE COOLANT, Replacing Coolant/Use new brass sealing ring. |

# SPECIFICATIONS 5.2

## GENERAL

**Table 5-1. Capacities**

| ITEM | L | qt |
|---|---|---|
| Engine coolant | 3.0 | 3.2 |
| Engine oil w/ filter | 2.55 | 2.7 |

**Table 5-2. Coolant Pressure**

| ITEM | kPa | psi |
|---|---|---|
| Cap lower limit | 96 | 14 |
| Rated cap pressure | 110 | 16 |
| Cap upper limit | 124 | 18 |
| System pressure | 103 | 15 |

**Table 5-3. Coolant Temperatures**

| ITEM | °C | °F |
|---|---|---|
| Thermostat initially opens | 70-72 | 157-162 |
| Thermostat fully open | 83 | 182 |
| Engine temperature lamp | 110 | 230 |
| Antifreeze protection | -36.7 | -34 |

**Table 5-4. Fan Operation**

| STATUS | FAN ON | | FAN OFF | |
|---|---|---|---|---|
| | °C | °F | °C | °F |
| Key On | 77 | 170.6 | 71 | 159.8 |
| Key Off | 87 | 188.6 | 76 | 168.8 |

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# COOLANT FLOW 5.3

## DESCRIPTION

### Water Pump

An impeller type water pump circulates the ethylene-glycol coolant through the engine and radiators. The coolant is pumped through the crankcase and around the cylinder liners removing the heat build-up caused by the motion of the piston rings. From the cylinder liners, the coolant flows up through the cylinder head and around the exhaust valves and combustion chamber. After the coolant passes around the combustion chamber, it then flows back through cylinder through thermostat hose to the thermostat.

### Warm Up and the Thermostat

If the thermostat is closed, the coolant is re-circulated through the cylinders and combustion chamber in the cylinder heads. The thermostat blocks the passage to the radiator to recirculate the coolant through the cylinders and cylinder heads. This flow continues until the coolant reaches 70-72 °C (157-162 °F) and the thermostat opens.

Once the coolant exceeds 83 °C (182 °F), the thermostat remains open and blocks the by-pass between the entrance and exit ports from the cylinders.

### Operating Temperature and the Radiators

If the thermostat is open, the coolant flows into the left side radiator. The coolant temperature is reduced as it flows through the left side radiator.

From the left side radiator, the coolant passes through the crossover tube and into the right side radiator. The coolant then exits the bottom right of the right side radiator and flows to the coolant pump inlet.

### Cooling Fans

To increase the amount of air flowing through the radiators, (with key on) two cooling fans will turn on when the coolant temperature exceeds 77 °C (170.6 °F) and will turn off when the temperature drops below 71 °C (159.8 °F). If key is off, fans will turn on when coolant temperature exceeds 87 °C (188.6 °F) and will turn off when the temperature drops below 76 °C (168.8 °F).

### Pressure Cap

The pressure cap and radiator filler neck pressurize the coolant system. Coolant pressure determines the coolant boiling point. The boiling point rises with the pressure. At the rate system pressure of 103 kPa (15 psi) the boiling point rises to over 121 °C (250 °F).

The pressure cap lower limit of 96 kPa (14 psi) and an upper limit of 124 kPa (18 psi). When the coolant pressure exceeds the pressure cap lower limit of 96 kPa (14 psi), the lower valve opens and the excess pressure and expanded coolant flow to the overflow tank through the overflow tube.

### Overflow Tank

The overflow tank is vented to the atmosphere through a long tube which loops down below the coolant level. When the pressure drops, the pressure cap vacuum valve opens to draw coolant back into the coolant inlet pipe from the overflow tank.

*NOTE*

*If the coolant overflow tank is empty when the engine is cold, it is possible that air has been drawn into the cooling system. The system must be purged of any trapped air and re-filled with coolant. See 1.15 ENGINE COOLANT.*

# ENGINE COOLANT TEMPERATURE (ECT) SENSOR

## Skip Spark

An engine coolant temperature (ECT) sensor is mounted in the front cylinder head. If the temperature exceeds 110 °C (230 °F), the ECT indicator on the instrument cluster illuminates.

**Soft Skip Spark:** At this temperature and above, the ECM commands a soft skip spark (one of four removed).

**Hard Skip Spark:** At this temperature and above and when the engine is above a specific RPM and throttle position threshold, the ECM commands a hard skip spark (one of two removed).

## Replacement

1. See Figure 5-1. Separate the connector [90] from the ECT.
2. Remove the ECT.
3. Install and tighten to 18 Nm (13.3 ft-lbs).
4. Join the connector [90] housing to the ECT.

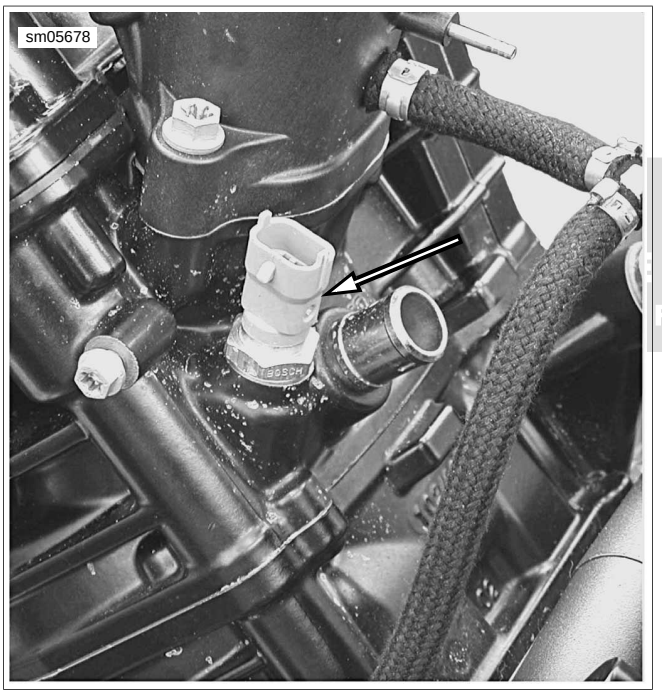



**Figure 5-1. Engine Coolant Temperature (ECT) Sensor**

# TROUBLESHOOTING

**⚠CAUTION**

**Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)**

**⚠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)**

## Low Engine Temperature

1. Open thermostat.
2. Defective engine coolant sensor.
3. Defective cooling fan(s).

## High Engine Temperature

1. Stuck thermostat.
2. Blocked hoses, pipes or passages.
3. Defective cooling fan(s).
4. Faulty water pump.
5. Low coolant level.
6. Air in hoses, pipe or passages.
7. Defective pressure cap.
8. Defective engine coolant sensor.

## Coolant Leaks

1. Damaged pressure cap gasket.
2. Faulty water pump.
3. Deteriorated O-rings on water pump.
4. Damaged engine gasket.
5. Leaking hose or hose connection.

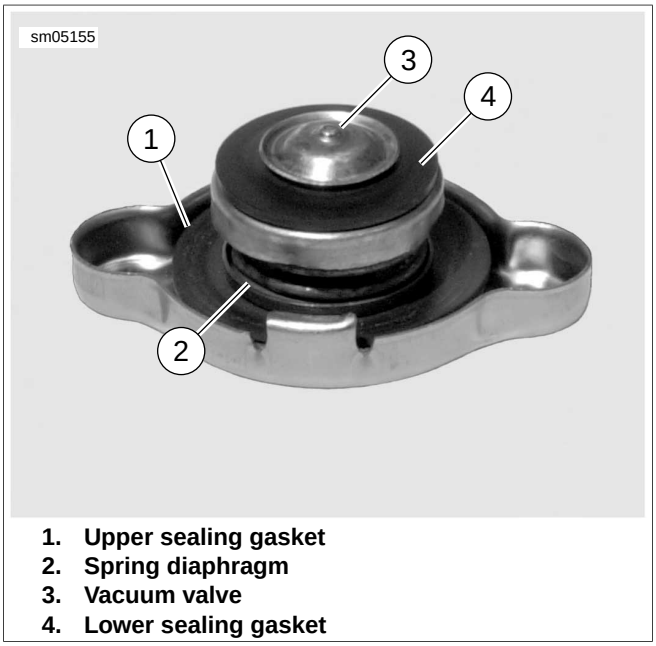
# PRESSURE CAP

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

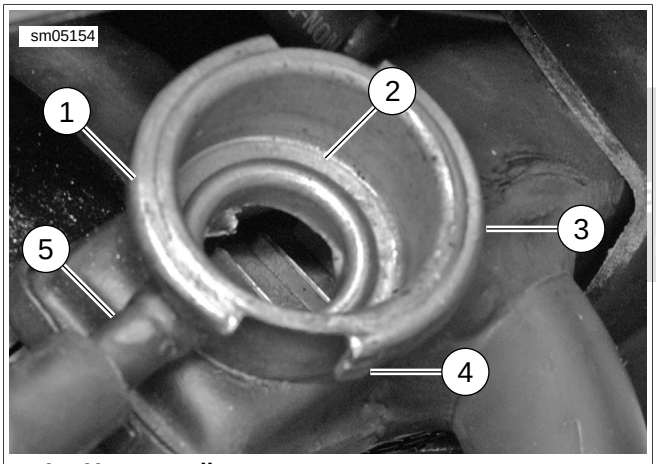
See Figure 5-2 and Figure 5-3.The pressure cap's upper spring diaphragm gasket seals to the upper sealing seat in the filler neck. The lower pressure limiting valve in the pressure cap seals to the lower seat. The overflow tube is between the upper and lower sealing seat.

Rising pressure compresses the spring and the lower valve opens. Excess pressure and expanded coolant flow to the overflow tank through the overflow tube. When the pressure drops, the vacuum valve opens to draw coolant back into the radiator.




1. **Upper sealing gasket**
2. **Spring diaphragm**
3. **Vacuum valve**
4. **Lower sealing gasket**

**Figure 5-2. Pressure Cap**




1. **Upper sealing seat**
2. **Lower sealing seat**
3. **Cam**
4. **Safety stop**
5. **Overflow tube**

**Figure 5-3. Filler Neck**

## PRESSURE CAP TEST

| PART NUMBER | TOOL NAME |
|---|---|
| HD-45335 | COOLANT SYSTEM PRESSURE TESTER |

Test the pressure cap for operating range every time the coolant is changed or after any cooling system maintenance.

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

1. With cloth, turn cap 1/4 turn counterclockwise (CCW) to safety stop (4). Let pressure escape. Press down and turn cap to pass over safety stops and remove.
2. Inspect cap for gasket deterioration and corroded springs.
3. See Figure 5-4. Turn butterfly valve parallel to boss on COOLANT SYSTEM PRESSURE TESTER (Part No. HD-45335) head and turn pressure cap adapter onto tester head. Turn butterfly valve perpendicular to seal tester head.

*NOTE*

*To test new caps, wet the upper sealing gasket before turning onto adapter.*

4. Turn pressure cap onto adapter. Rotate to safety stops.
5. Pump handle to pressurize pressure limiting valve in cap. Stop pumping when pressure valve in cap opens.
6. Replace pressure cap if:
   a. Leaks below low limit, 96 kPa (14 psi).
   b. Opens above high limit, 124 kPa (18 psi).
   c. Pressure falls rapidly when pressurized within range.
7. Open butterfly valve and remove adaptor and cap.




**Figure 5-4. Pressure Cap Test**

## SYSTEM PRESSURE TEST

| PART NUMBER | TOOL NAME |
|---|---|
| HD-45335 | COOLANT SYSTEM PRESSURE TESTER |

Pressure test to identify a coolant leak or to verify a blown head gasket.

1. Before troubleshooting cooling system, be sure engine coolant level is at COLD FULL mark on overflow bottle when the motorcycle is on the sidestand.
2. With cloth, turn cap 1/4 turn counterclockwise to safety stop. Let pressure escape. Press down and turn cap to pass over safety stops and remove.
3. Clean and inspect filler neck, upper and lower sealing seats, overflow tube and overflow bottle.

*NOTE*

*Bent filler neck cams and safety stops can cause cap to leak or affect pressure limiting valve. Replace radiator as required.*

4. See Figure 5-5. Turn butterfly valve parallel to boss on COOLANT SYSTEM PRESSURE TESTER (Part No. HD-45335) head and turn adapter onto head. Turn butterfly valve perpendicular to seal head to adapter.

*NOTE*

*Wet the upper sealing surfaces before turning adapter onto tester head.*

5. Turn double ended pressure cap onto the end of the adapter and onto filler neck. Rotate to the safety stops.

*NOTE*

*Do not exceed the upper limit rating of the pressure cap. Excessive pressure can rupture cooling pipes, hoses and radiator.*

6. Pump tester until pressure reaches 103 kPa (15 psi).
7. Refer to Table 5-5. Match movement of needle to system pressure.
8. Release pressure in system by turning butterfly pressure valve perpendicular to head. Wait until pressure is released before removing double ended cap from filler neck.

**Table 5-5. System Pressure Test**

| NEEDLE MOVEMENT | LEAK | ACTION |
|---|---|---|
| Holds steady for 2 minutes | None | None |
| Drops slowly | Small | Dye test |
| Drops quickly | Major | Visual |




**Figure 5-5. System Pressure Test**

## LEAK DETECTION DYE TEST

| PART NUMBER | TOOL NAME |
|---|---|
| HD-29545-6 | COOLANT FLUORESCENT LEAK DETECTION DYE |
| HD-35457 | BLACK LIGHT LEAK DETECTOR |

*NOTE*

*If the coolant overflow bottle is empty when the engine is cold, it is possible that air has been drawn into the coolant system. The system must be purged of any trapped air and refilled with coolant.*

1. Verify engine coolant level is at COLD FULL.

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

2. Using a cloth over pressure cap, turn cap 1/4 turn counter-clockwise (CCW) to safety stop. Let pressure escape. Press down and turn cap to pass over safety stops of filler neck and remove.
3. If filler neck is full of coolant, remove an amount of coolant equal to the amount of dye.
4. See Figure 5-6. Pour COOLANT FLUORESCENT LEAK DETECTION DYE (Part No. HD-29545-6) into filler neck.

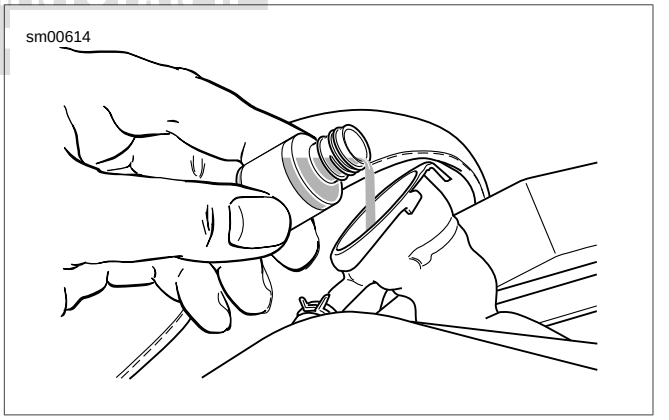



**Figure 5-6. Pouring Dye into Filler Neck (typical)**

5. Install pressure cap and run engine for 10 minutes.
6. Use BLACK LIGHT LEAK DETECTOR (Part No. HD-35457) to illuminate entire cooling system. A yellow fluorescence at any spot indicates a leak.
7. Remove oil dipstick and inspect engine oil for yellow dye.

*NOTE*

*Dye in the oil may indicate a damaged engine head gasket. Draining and replacing coolant contaminated oil will be necessary as part of engine service.*

## TESTS FOR BLOWN GASKET

| PART NUMBER | TOOL NAME |
|---|---|
| HD-45335 | COOLANT SYSTEM PRESSURE TESTER |

If a pressure test indicates a leak but there is no visible leak, even after a leak detection dye test, perform the following tests to verify a damaged engine gasket.

1. Start and run cold engine. White smoke from exhaust system indicates a blown gasket.
2. Run engine. Shut off engine.
   a. Remove oil level dipstick. Light colored foam on dipstick indicates a blown gasket.
   b. Open oil drain plug and drain a small amount of oil. Water or coolant will drain out first if gasket is blown.

*NOTES*

- *Do not allow pressure to build up past the maximum for system. If pressure rises past, turn off engine and turn butterfly pressure valve perpendicular to tester head to release pressure.*
- *Do not continue to run engine unattended with COOLANT SYSTEM PRESSURE TESTER (Part No. HD-45335) installed. There is no safety valve with the pressure cap removed and the coolant system pressure tester installed.*

3. With coolant system pressure tester installed, start cold engine and idle engine to normal operating temperature.
   a. If gauge indicates fast pressure build up, a gasket is blown.
   b. If pressure does not build up immediately, pump tester to system pressure. If gauge needle vibrates, there is a compression or combustion leak. Disconnect one spark plug at a time. The needle will stop vibrating when spark is removed from leaking cylinder.

*NOTE*

*After replacing an engine head gasket, draining and replacing contaminated oil will be necessary as part of engine service.*

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# ENGINE COOLANT 5.4

## FREEZE POINT TEST

| PART NUMBER | TOOL NAME |
|---|---|
| HD-23688 | COOLANT TESTER (F) |
| HD-26568 | COOLANT TESTER (C) |

1. Allow engine to cool.
2. Remove the right radiator outer shroud. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.

**WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

3. With cloth, turn pressure cap 1/4 clockwise to safety stop. Let pressure escape. Press down and turn cap to pass over safety stops and remove.
4. Drop a few drops of coolant from the filler neck of the radiator on the prism of either the COOLANT TESTER (C) (Part No. HD-26568) or the COOLANT TESTER (F) (Part No. HD-23688).
5. Hold the prism up to a light.
6. See Figure 5-7. Read the mark on the ETHYLENE GLYCOL temperature scale (1) where the dark area (2) begins. This is the freeze point of the coolant.

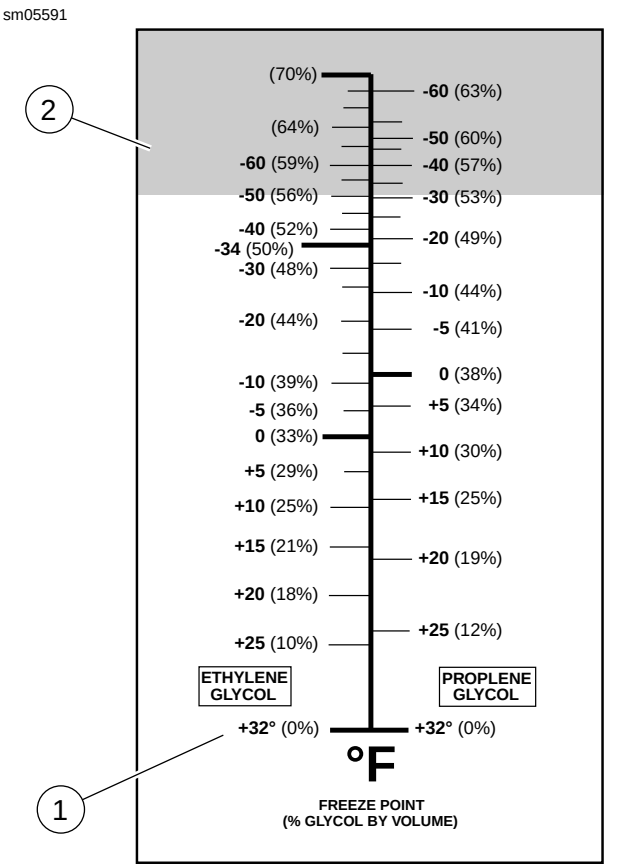
**WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

**CAUTION**

**Use only Genuine Harley-Davidson Extended Life Antifreeze and Coolant. Use of other coolants/mixtures may lead to engine damage. (00179b)**

7. Compare the freeze point of the coolant to the anticipated operating or storage temperatures. Replace as required. See 5.4 ENGINE COOLANT, Replacing Coolant.
   a. If the indicated freeze point is less than that specified on the container, replace with GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT (HD-99822-02).
   b. To match anticipated cold temperatures that exceed that specified for the Harley-Davidson antifreeze, replace with a mixture of de-ionized water and undiluted ethylene glycol according to the directions on the container of the undiluted ethylene glycol.
8. Replace the pressure cap.
9. Install the right radiator outer shroud. Tighten to 9.0-9.9 Nm (80-88 **in-lbs**).




1. **Ethylene glycol scale**
2. **Dark area**

**Figure 5-7. Coolant Tester Calibration Scale (Fahrenheit)**

## REPLACING COOLANT

### Drain the Coolant: Right Side Radiator

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

**⚠CAUTION**

**At operating temperature, the radiator and oil cooler contain hot fluids. Contact with the radiator or oil cooler can result in minor or moderate burns. (00141a)**

1. Allow the engine to cool.
2. Remove the right side radiator shroud.
3. Open the overflow bottle.
4. With cloth, turn radiator cap 1/4 clockwise to safety stop. Let pressure escape. Press down and turn cap to pass over safety stops and remove.
5. Place a pan under the right side radiator and water pump.

*NOTE*

*Protect the finish by covering painted surfaces.*

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

6. See Figure 5-8. Remove and direct the hose from the radiator filler neck to the pan to drain the overflow bottle.
7. See Figure 5-9. Remove the lower screw with the brass washer from the water pump housing.
8. Allow the coolant to drain into the pan.
9. After the coolant has drained:
   a. Install hose from the overflow bottle to the radiator filler neck.
   b. Install the water pump housing drain screw with a **new** sealing ring. Tighten to 11 Nm (97 **in-lbs**).




**Figure 5-8. Overflow Bottle Hose**

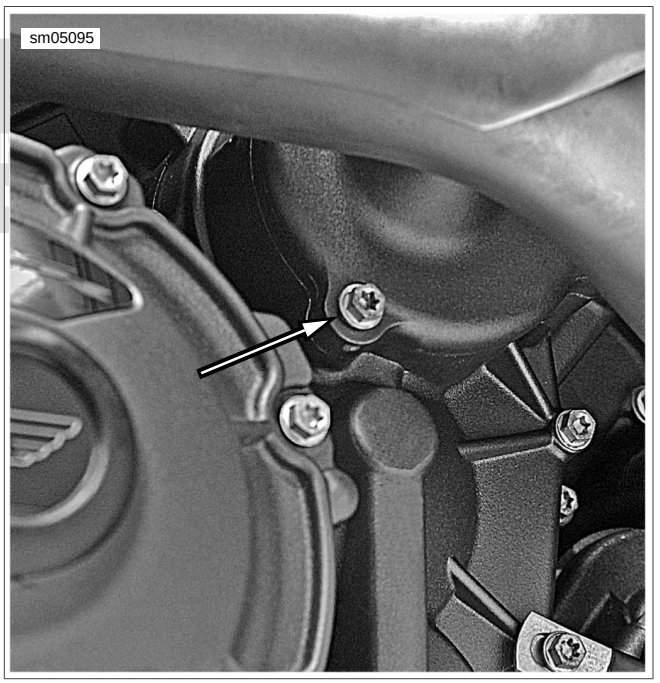



**Figure 5-9. Coolant Drain Screw**

### Drain the Coolant: Left Side Radiator

1. Remove the left side radiator shroud.
2. Place a pan under the left side radiator.

*NOTE*

*Protect the finish by covering painted surfaces.*

3. See Figure 5-10. Squeeze the clamp to remove the left radiator hose.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

4. Allow the radiator to drain from the hose into the pan.
5. Install the radiator hose.
6. Install the left outer radiator shroud and tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).




**Figure 5-10. Radiator Hose Clamp**

## Fill with Coolant

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

**CAUTION**

**Use only Genuine Harley-Davidson Extended Life Antifreeze and Coolant. Use of other coolants/mixtures may lead to engine damage. (00179b)**

1. Fill the filler neck with coolant. Use only GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT (Part No. 99822-02).
2. Continue to fill with coolant until the radiators are full to the filler neck and the expansion bottle is full to the COLD FILL line.
3. Start the engine and bleed the coolant. See 1.15 ENGINE COOLANT, Bleeding Coolant.
4. Continue to bleed the coolant until the radiators are purged of air bubbles and the filler neck and the coolant in the overflow bottle is above the COLD FULL line.
5. Close the expansion bottle and install the radiator cap.
6. Install the right side radiator shroud and tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).

# THERMOSTAT 5.5

## REMOVAL

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

1. Allow cooling system and engine to cool.
2. Remove seat.
3. Disconnect negative battery cable. See 1.14 BATTERY MAINTENANCE, Disconnection and Removal.
4. With a cloth, remove the radiator cap.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

5. Drain the engine coolant into a suitable container. See 5.4 ENGINE COOLANT, Replacing Coolant.
6. To access the thermostat:
   a. Remove the air box cover, air filter and baseplate. See 4.2 AIR CLEANER ASSEMBLY.
   b. Remove the throttle body. See 4.5 THROTTLE BODY.

*NOTE*

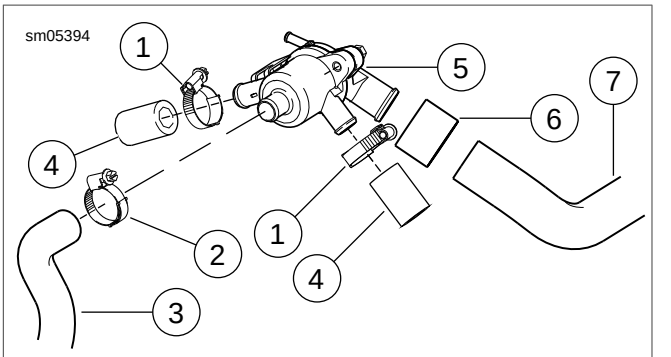
*Cover cosmetic and painted surfaces during disassembly and assembly to protect from damage.*

7. See Figure 5-11. Loosen clamps (1) on cylinder to thermostat hoses (4).
8. Loosen clamp (2) on thermostat to pump hose (3) and remove hose from thermostat housing assembly (5).
9. Gently remove thermostat housing assembly from cylinder to thermostat hoses on engine.
10. Remove left side radiator shroud.
11. Disconnect lower radiator hose (7) from left side radiator.
12. Remove thermostat housing assembly (with left lower radiator hose attached) from motorcycle.

*NOTE*

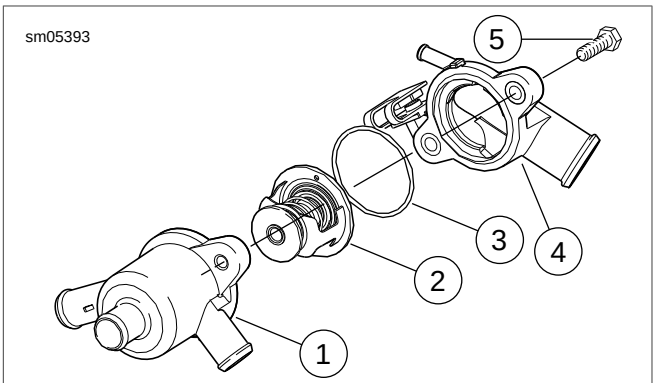
*Check condition of hoses during thermostat service. Replace hoses as necessary. If disassembly of thermostat housing is necessary, see Figure 5-12.*

13. If replacing entire thermostat housing assembly, remove heat shrink clamp (6) from hose (7). If replacing O-ring in thermostat housing, leave hose (7) attached to thermostat housing assembly.




1. **Clamp**
2. **Clamp**
3. **Hose, thermostat to water pump**
4. **Hose, thermostat to cylinder head**
5. **Thermostat housing assembly**
6. **Heat shrink clamp**
7. **Hose, lower radiator, left side**

**Figure 5-11. Thermostat Housing Assembly**




1. **Thermostat housing-half (right side)**
2. **Thermostat**
3. **O-ring**
4. **Thermostat housing-half (left side)**
5. **Fastener (2)**

**Figure 5-12. Thermostat, Housing, and Components**

## INSTALLATION

1. See Figure 5-12. If installing **new** O-ring into thermostat housing, use engine coolant to lubricate parts, install O-ring, thermostat, assemble thermostat housing halves, install fasteners (5) and tighten fasteners to 10.2-11.3 Nm (90-100 **in-lbs**). If installing **new** thermostat housing assembly, proceed to next step.

*NOTES*

- *Check condition of clamps during thermostat service. Replace clamps as necessary.*
- *See Figure 5-11. If replacing thermostat housing assembly, be sure to install lower radiator hose (7) to housing using **new** heat shrink clamp (6). Orient hose in the same manner as it was from the factory for proper fitment.*

2. Install thermostat housing assembly with hose (7) attached into position on motorcycle. Be sure that hose orientation is exactly as it was mounted from the factory.
3. See Figure 5-11. Use a small amount of engine coolant and lubricate open hose ends and ports of thermostat housing assembly. Insert outlets of thermostat housing (5) into thermostat to cylinder head hoses (4).
4. Position and tighten all hose clamps removed during disassembly to 3.2-3.5 Nm (28-31 **in-lbs**).
5. Install throttle body, baseplate, air filter and air box cover. See 4.5 THROTTLE BODY and 1.6 AIR FILTER ELEMENT.
6. Connect negative battery cable. See 1.14 BATTERY MAINTENANCE.

**WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

7. Fill and bleed cooling system according to procedure. See 1.15 ENGINE COOLANT.

**WARNING**

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

8. Install seat.
9. Run motorcycle, check for leaks and verify proper cooling system function.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# WATER PUMP 5.6

## REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| A157C | SNAP-ON DRIVER SET |

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

1. Allow cooling system to cool.
2. Remove passenger seat.
3. Disconnect negative battery cable.
4. Drain oil from motorcycle.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

*NOTE*

*Screw in lower left position of water pump cover functions as coolant drain. Removing this bolt from water pump housing will cause coolant to drain from engine.*

5. Place a suitable container under right side of engine and remove screw with sealing ring from water pump housing to drain coolant from engine. See 5.4 ENGINE COOLANT, Replacing Coolant.
6. Perform engine rotation. See 3.4 ENGINE ROTATION, Down Rotation.
7. Separate the rear O2 sensor connector [137].
8. Remove the rear header.
9. Remove clutch actuator. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.

*NOTE*

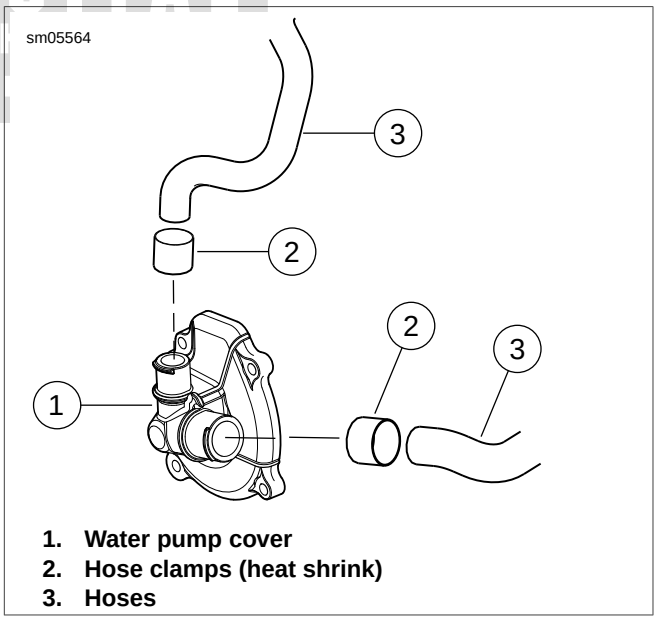
*If water pump hoses need to be replaced at time of water pump service, remove heat clamps using a soldering iron by carefully melting a slice through the heat clamps and then removing hoses from water pump cover. If hoses are not being replaced, leave them connected and remove water pump cover with hoses attached.*

10. See Figure 5-13. Remove remaining screws and remove water pump housing from engine. Using a soft mallet, tap on side of water pump housing to loosen and remove water pump housing from engine. Move water pump cover upward and out of the way from engine side cover.
11. See Figure 5-14. Remove water pump cover gasket (4) from engine side cover.
12. Remove clutch cover assembly from right side of engine. See 3.10 CLUTCH SIDE, Clutch Cover.
13. Disassemble water pump components by unscrewing impeller (5) from shaft assembly (10). Remove shaft assembly and thrust washer (9) from side cover.
14. Using a brass punch or wood dowel, carefully tap rotary seal (6) and oil seal (7) from side cover.

*NOTE*

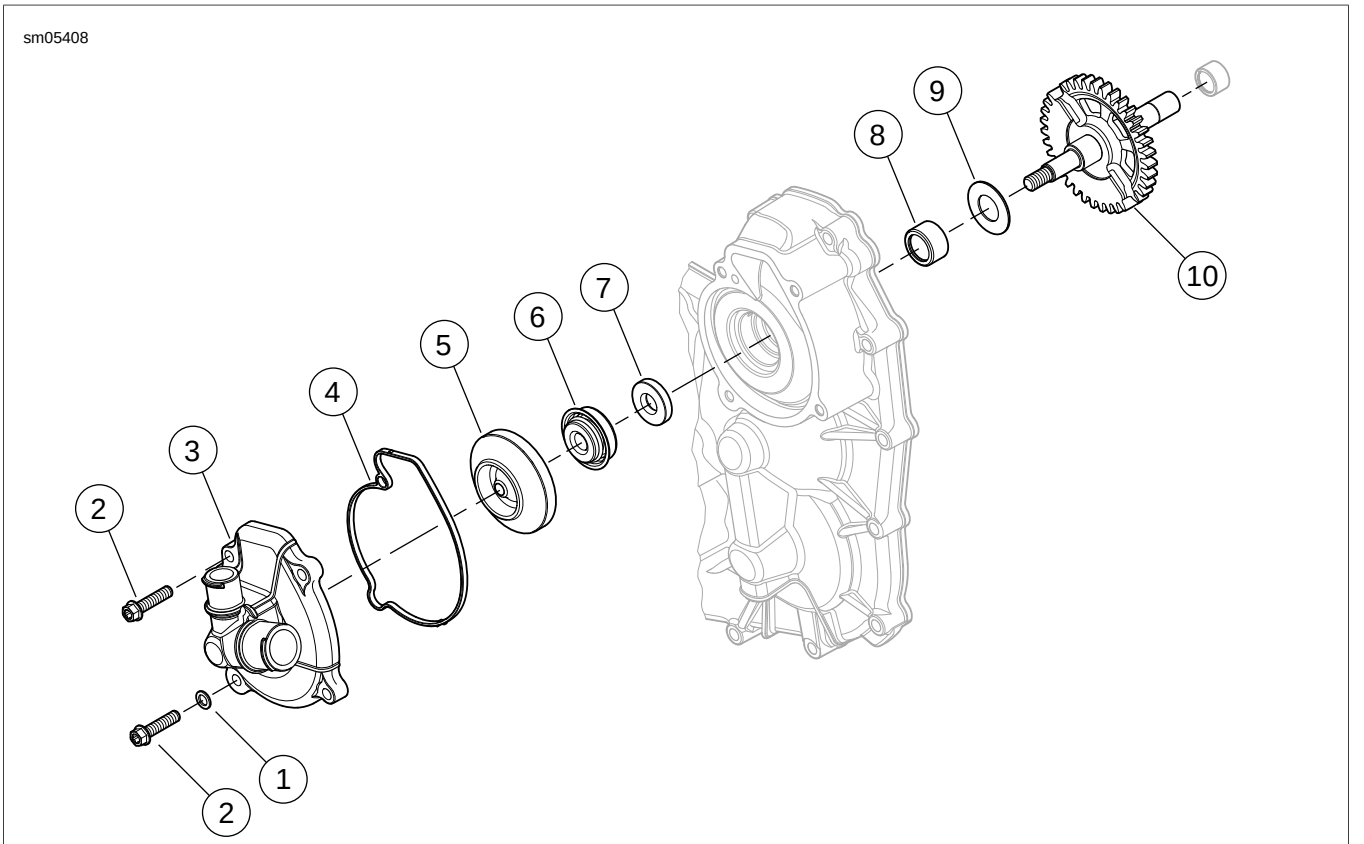
*Support side cover on blocks in press for the following step.*

15. Using SNAP-ON DRIVER SET (Part No. A157C), press bearing (8) free from side cover.
16. Inspect all parts for wear or damage. Replace as necessary.




1. **Water pump cover**
2. **Hose clamps (heat shrink)**
3. **Hoses**

**Figure 5-13. Water Pump Cover and Hoses**




1. **Sealing ring**
2. **Screw (4)**
3. **Water pump housing**
4. **Gasket**
5. **Impeller**
6. **Rotary (water) seal**
7. **Oil seal**
8. **Needle bushing**
9. **Thrust washer**
10. **Shaft assembly**

**Figure 5-14. Water Pump Components**

## INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| B-49141-2 | WATER PUMP OIL SEAL INSTALLER |
| B-49141-3 | WATER PUMP WATER SEAL INSTALLER |
| B-49141-4 | WATER PUMP SEAL INSTALLER BASE TOOL |
| B-49196 | WATER PUMP NEEDLE BEARING INSTALLER |

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

1. Place engine side-cover on wood blocks in press.

*NOTE*

*When installing water pump bearing, be sure to press bearing into side cover from the lettered side.*

2. See Figure 5-15. Use the WATER PUMP NEEDLE BEARING INSTALLER (Part No. B-49196) to press a **new** bearing into the clutch cover.

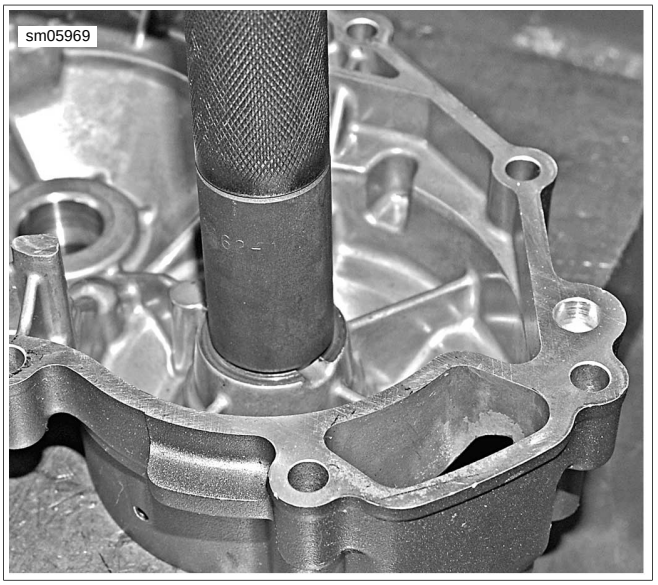



**Figure 5-15. Water Pump Needle Bearing Installer (B-49196)**

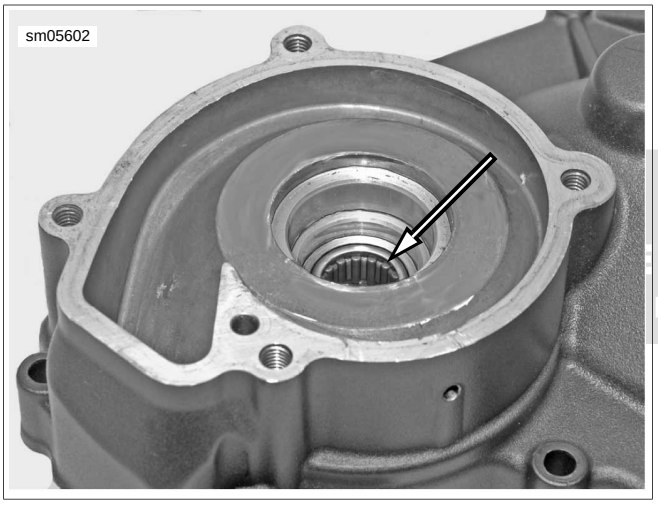



**Figure 5-16. Bearing in Side Cover**

3. Coat the thrust washer and the face of the drive shaft with engine oil.

*NOTE*

*See Figure 5-17. Verify that the tabs of the thrust washer fit the machined recesses and not the cast recesses.*

4. Fit the thrust washer to the clutch cover so that the tabs of the washer fit the machined recesses in the bearing support.

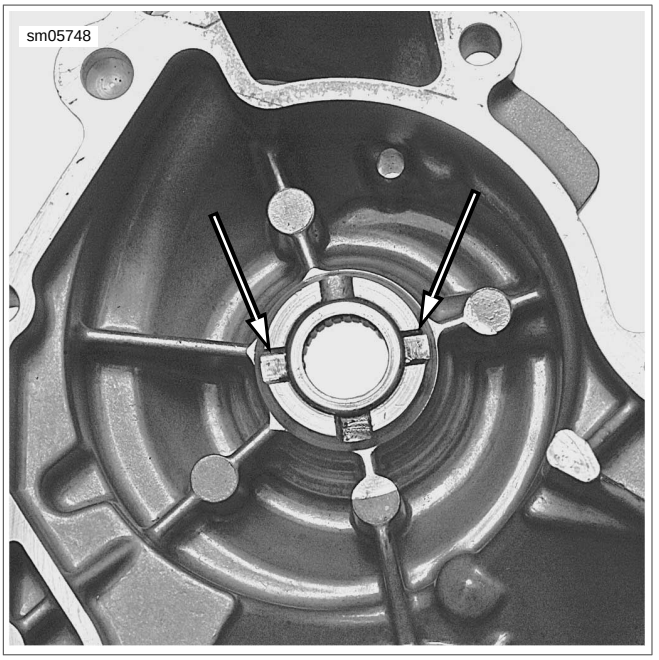



**Figure 5-17. Thrust Washer Tab Recesses**

5. Insert the water pump drive shaft.

6. See Figure 5-18. Position water pump base toolWATER PUMP SEAL INSTALLER BASE TOOL (Part No. B-49141-4) over water pump drive shaft and invert assembly onto press table.

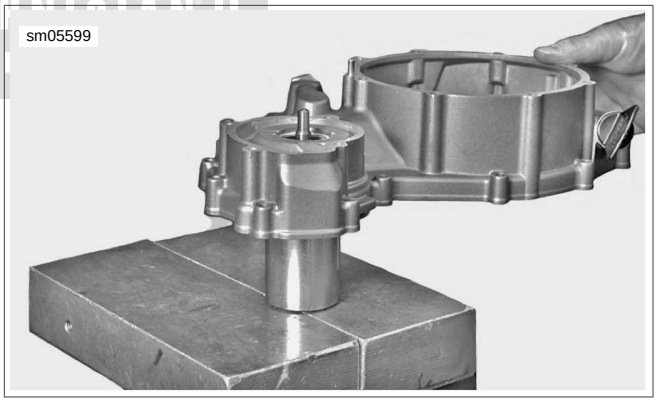



**Figure 5-18. Clutch Cover Assembly in Position**

7. See Figure 5-19. Position oil seal onto water pump drive shaft with hollow side of seal facing in toward side cover (side with writing facing up).

*NOTE*

*WATER PUMP OIL SEAL INSTALLER (Part No. B-49141-2) is designed with a shoulder to stop at the proper depth.*

8. See Figure 5-20. Using WATER PUMP OIL SEAL INSTALLER (Part No. B-49141-2) (shoulder side down), install seal until tool gently stops against side cover.

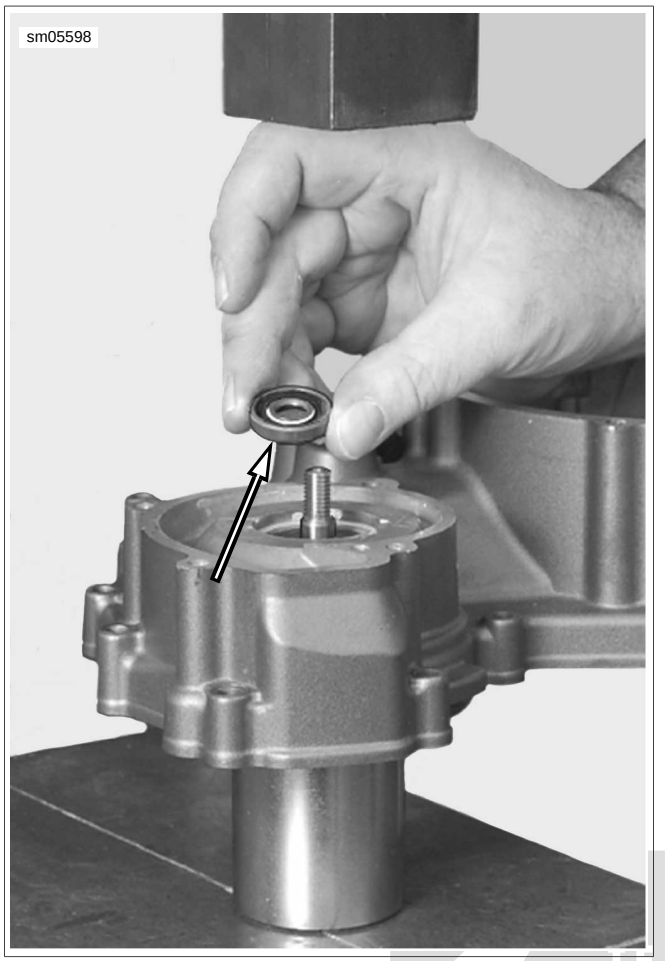



**Figure 5-19. Inner Oil Seal**

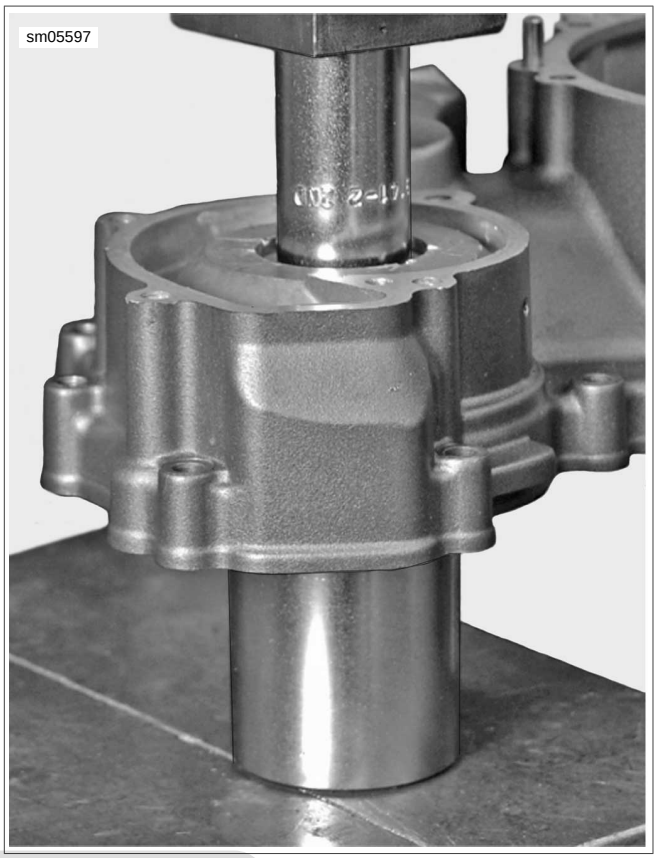
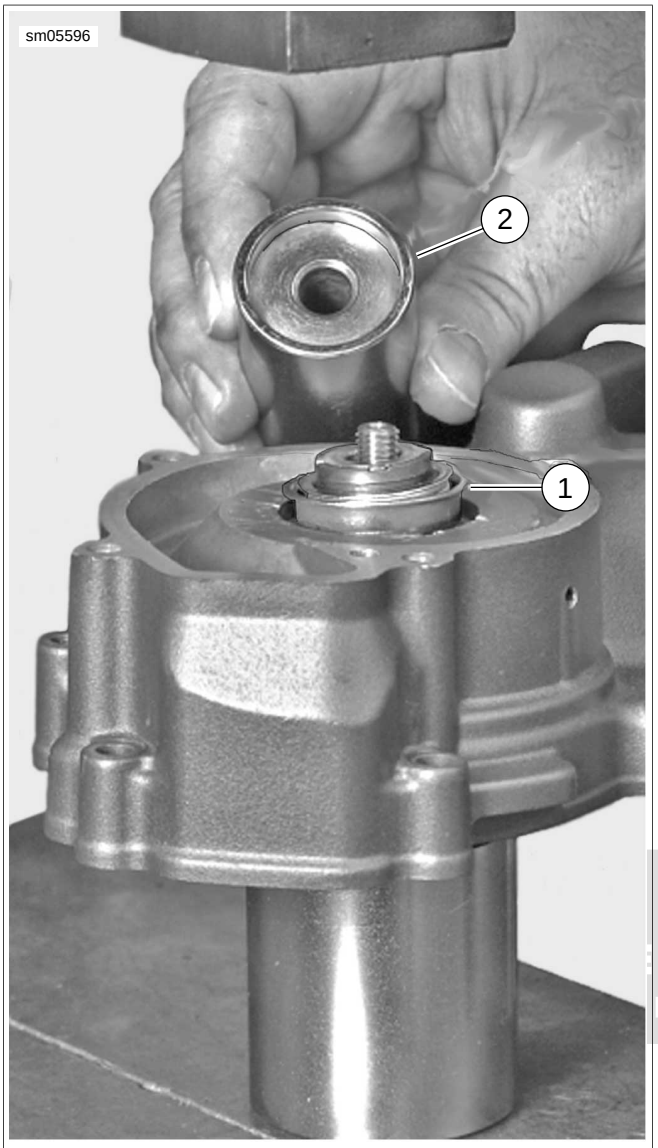



**Figure 5-20. Installing Inner Oil Seal**

*NOTE*

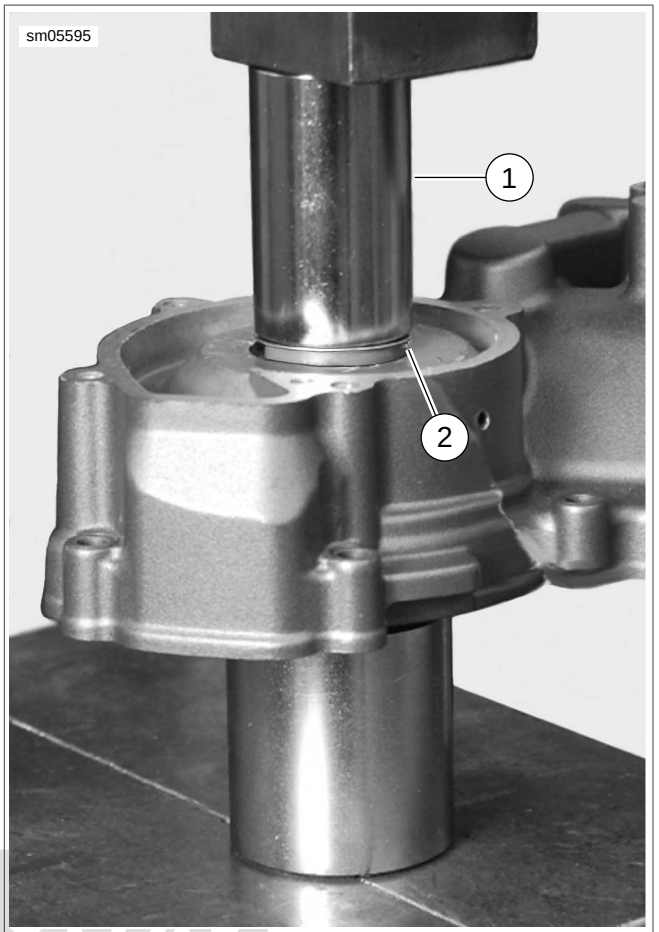
*Installer tool is designed with a shoulder to stop at the proper depth.*

9. See Figure 5-21. Position rotary seal on shaft as shown.
10. See Figure 5-22. Using WATER PUMP WATER SEAL INSTALLER (Part No. B-49141-3) (shoulder side down), install seal until tool gently stops against side cover.




1. **Water pump outer water seal**
2. **Water pump water seal installer**

**Figure 5-21. Position of Outer Water Seal and Installer Shoulder**




1. **Water pump water seal installer**
2. **Water pump water seal**

**Figure 5-22. Installing Water Pump Water Seal**

*NOTE*

*Be sure to properly time water pump drive shaft during side cover installation.*

11. Install side cover to engine. See 3.10 CLUTCH SIDE, Clutch Cover.
12. Thread impeller onto water pump shaft assembly and tighten by hand.
13. Fit a **new** gasket and install water pump cover.
14. Fit sealing ring to one cover fastener and install in drain position and install remaining fasteners.
15. Tighten fasteners to 11 Nm (97 **in-lbs**).
16. Install rear exhaust header.
17. Join rear O2 sensor connector [137].
18. Perform engine rotation installation. See 3.4 ENGINE ROTATION.
19. Install secondary clutch actuator. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.
20. Fill engine with oil.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

21. Fill cooling system with coolant. See 5.4 ENGINE COOLANT, Replacing Coolant.
22. Install negative battery cable.

**⚠WARNING**

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

23. Install seat.
24. Start the engine and bleed the coolant.
25. Check for cooling system leaks and verify cooling fan operation.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

# COOLANT PIPES AND HOSES 5.7

## REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| SDD1410 | SNAP-ON SCREWDRIVER |

1. Allow cooling system to cool.

*NOTE*

*Note locations and unique routings of all hoses before removal.*

2. Remove seat.

**WARNING**

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

**WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

3. Disconnect negative battery cable. See 1.14 BATTERY MAINTENANCE, Disconnection and Removal.

*NOTE*

*When removing outer radiator shrouds, leave speed nuts in place for assembly process.*

4. Remove six fasteners from each outer radiator shroud and remove both radiator outer shrouds from motorcycle.

5. Remove radiator cap.

**WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

6. See Figure 5-23. Place a suitable container under right side of engine and remove coolant drain screw from water pump cover to drain cooling system.

7. Remove throttle body. See 4.5 THROTTLE BODY.

8. Remove front intake flange, leaving all low pressure hoses intact, and move intake flange for clearance to gain access to thermostat and hoses.

9. Disconnect and remove hose from overflow tank.

10. Disconnect end of overflow hose at top of right side radiator. Using hose, drain contents of overflow tank in to suitable container. See 5.8 RADIATORS, Overflow Tank.

11. See Figure 5-24. Remove clamps (5) and disconnect hose (13) from thermostat housing assembly and right side radiator.

*NOTE*

*Note routing of hose (12) through radiator outlet ducts.*

12. Remove hose clamps (6), disconnect and remove hose (12) from left side radiator and right side radiator.

13. Use a long thin SNAP-ON SCREWDRIVER (Part No. SDD1410) to loosen clamps (3).

14. Loosen clamp (4) at top of left side radiator.

15. Slowly remove thermostat assembly from cylinder to thermostat hoses (8) and gently pull thermostat assembly radiator hose (10) from motorcycle.

*NOTES*

- *Before removing radiator hose from thermostat housing, be sure to make a clock positioning mark on the thermostat housing and **new** hose to verify proper orientation of hose upon assembly.*
- *To remove heat shrink clamps without cutting, use a soldering iron and carefully, melt a slice through the clamp.*

16. Lightly apply a hot soldering iron to heat shrink clamp (3) of radiator hose and remove hose from thermostat assembly.

17. Remove hose clamps (3) and cylinder to thermostat hoses (8) from motorcycle.

*NOTE*

*Before removing hoses from water pump cover, be sure to make a clock positioning mark on water pump housing and **new** hoses to verify proper orientation of hoses upon assembly.*

18. Lightly apply a hot soldering iron to heat shrink clamps (2) of thermostat to water pump hoses and remove hose (9) and hose (14). Remove hoses from water pump cover.

19. Remove hose clamp (6) and remove right side lower radiator hose (11) from radiator.

20. Remove hose clamp (4) and remove left side lower radiator hose (14) from radiator.

*NOTES*

- *Note locations and unique routings of all hoses before removal.*
- *To remove heat shrink clamps without cutting, use a soldering iron and carefully melt a slice in the clamp.*

21. Leave crossover tube (16) in place, and melt heat shrink clamps (3) with a soldering iron and remove hose (14) and hose (15) from motorcycle.

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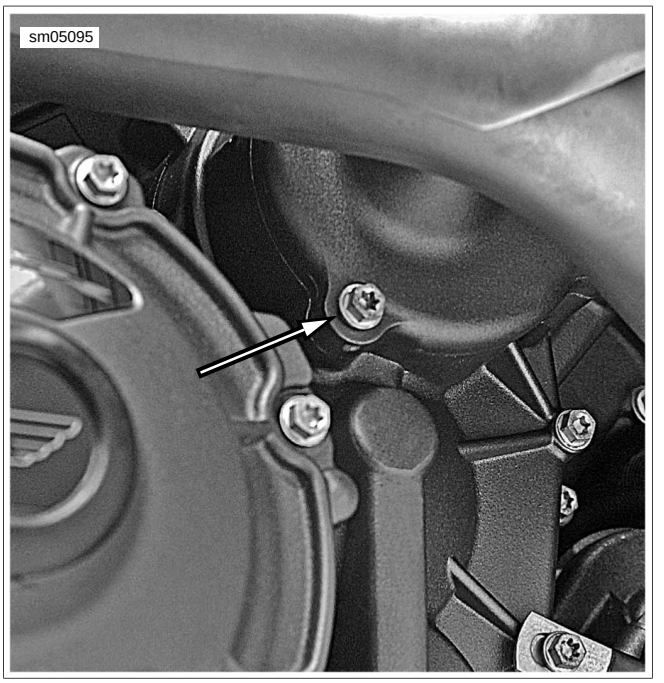



**Figure 5-23. Coolant Drain Screw**

## INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| HD-25070 | ROBINAIR HEAT GUN |

**⚠WARNING**

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

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

*NOTES*

- *Install hoses exactly as noted during disassembly, in their original locations and routings. Before beginning installation process, make sure **new** hoses are marked with alignment marks in same locations as old hoses to verify accurate installation.*
- *A small amount of coolant may be used to lubricate the radiator hoses during installation.*
- *DO NOT use open flame to shrink clamps. Using an open flame could cause uncontrolled melting of clamp.*

1. See Figure 5-24. Using **new** heat shrink clamps (3) and **new** hose clamps (4), install **new** hoses. Install radiator hoses to crossover tube (16) and hose (14) to left lower radiator outlet and hose (15) to right side upper radiator outlets.
2. Using a ROBINAIR HEAT GUN (Part No. HD-25070) or a similar tool, apply heat to shrink clamps. Move heat continuously around clamp to prevent burning.
3. Using a **new** heat clamp (3), install **new** radiator hose (10) to thermostat housing assembly and install other end of radiator hose to upper outlet of left side radiator using **new** hose clamp (4).

*NOTE*

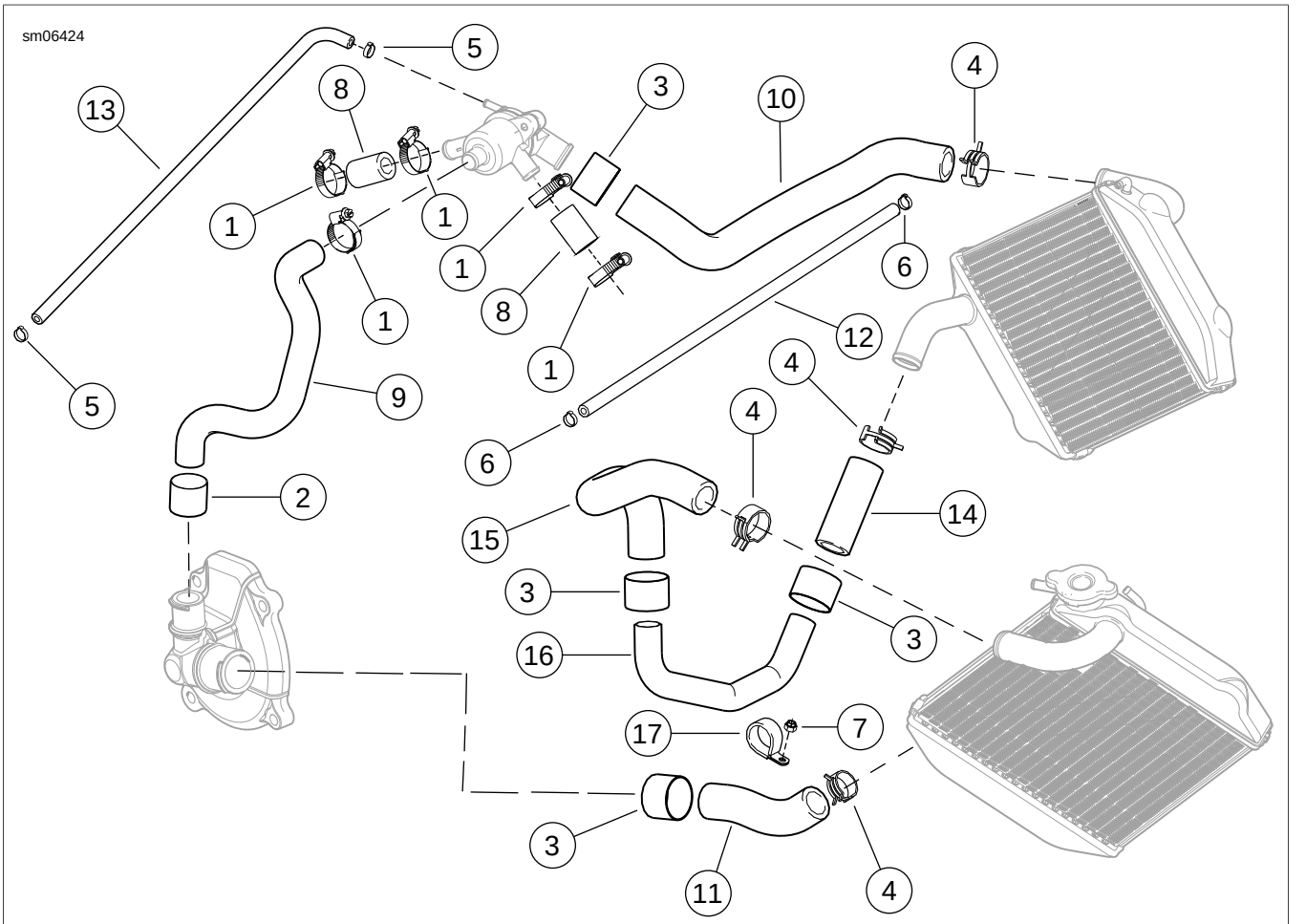
*Be sure to install hose clamps (1) exactly as noted during disassembly.*

4. Install **new** cylinder to thermostat hoses (8) to thermostat housing assembly and tighten clamps.
5. Install thermostat housing with attached hoses to cylinder heads using clamps (1). Tighten clamps.
6. Using **new** clamp (2), install radiator hose (9) to top outlet of water pump cover and attach other end of radiator hose to outlet of thermostat housing assembly using clamp. Tighten clamp.
7. Using **new** clamps (5) install thermostat bleed hose (13) from thermostat housing assembly to angled fitting on top inner side of right side radiator.
8. Attach overflow tank inlet hose to bottom of overflow tank and to straight fitting on right side radiator filler neck. See 5.8 RADIATORS, Overflow Tank.
9. Connect hose (12) to straight fitting on inner side of right side radiator and route hose through passages in both radiator outlet ducts. Connect other end of hose to angled fitting located at top of left side radiator.
10. Using a **new** heat shrink clamp (3), install hose (11) to outlet on water pump cover and attach to lower right side radiator using **new** clamp (4).
11. Verify all clamps are in the proper location, orientation and a tightened to specification.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

12. Fill and bleed cooling system according to procedure.
13. Install radiator cap.
14. Install radiator outer shrouds.
15. Install throttle body and air cleaner assembly and air intake snorkel. See 4.5 THROTTLE BODY and 4.2 AIR CLEANER ASSEMBLY.
16. Connect negative battery cable.
17. Verify proper function of cooling system and cooling fans.
18. Install seat.




1. Clamp (5)
2. Hose clamp
3. Heat shrink clamp (4)
4. Hose clamp (4)
5. Hose clamp (2)
6. Hose clamp (4)
7. Locknut
8. Cylinder to thermostat hose (2)
9. Thermostat to water pump hose
10. Thermostat to left radiator hose
11. Right lower radiator hose
12. Hose
13. Thermostat bleed hose
14. Left lower radiator hose
15. Right upper radiator hose
16. Crossover tube
17. Crossover tube clamp

**Figure 5-24. Coolant Pipes, Hoses and Overflow Bottle**

# RADIATORS 5.8

## REMOVAL

### Left Side

1. Remove passenger seat.

**⚠WARNING**

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

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

**⚠CAUTION**

**Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)**

2. Disconnect negative battery cable. See 1.14 BATTERY MAINTENANCE, Disconnection and Removal.
3. Allow cooling system to cool.
4. See Figure 5-25. Remove six fasteners (2) from left side radiator outer shroud (4) and remove shroud from motorcycle. Leave speed nuts (3) in place on outer shroud.
5. Place suitable container under left side of motorcycle.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

6. Remove radiator cap from right side radiator.
7. Remove lower radiator clamp and hose at bottom of radiator and drain coolant from radiator.
8. Remove upper radiator hose and remaining hoses from radiator.
9. Cap off open radiator hoses to contain remainder of coolant in cooling system.
10. Remove four fasteners (2) from radiator inlet duct (5) and pull duct away to reveal radiator.

*NOTE*

*Note routing of fan wiring harness connector installed location prior to disassembly to verify correct installation of fan during radiator component assembly.*

11. Remove radiator from between ducts.

### Right Side

1. Remove passenger seat.

**⚠WARNING**

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

**⚠WARNING**

**Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)**

**⚠CAUTION**

**Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)**

2. Disconnect negative battery cable. See 1.14 BATTERY MAINTENANCE, Disconnection and Removal.
3. Allow cooling system to cool.
4. See Figure 5-27. Remove six fasteners (2) from right side radiator outer shroud (4) and remove shroud from motorcycle. Leave speed nuts (3) in place on outer shroud.
5. Place suitable container under right side of motorcycle.
6. Remove radiator cap, remove clamp and hose from bottom of radiator and drain coolant from radiator.
7. Remove upper radiator hose and remaining hoses from radiator.
8. Cap off open radiator hoses to contain remainder of coolant in cooling system.
9. If necessary, remove the fasteners securing the overflow tank and the overflow tank.
10. Remove four fasteners (2) from radiator inlet duct (7) and pull duct away to reveal radiator.

*NOTE*

*Note routing of fan wiring harness connector installed location prior to disassembly to verify correct installation of fan during radiator component assembly.*

11. Remove radiator from between ducts.

## INSTALLATION

### Left Side

1. See Figure 5-25. Seat radiator (6) in pocket of radiator outlet duct (7) and enclose radiator with radiator inlet duct (5).

*NOTES*

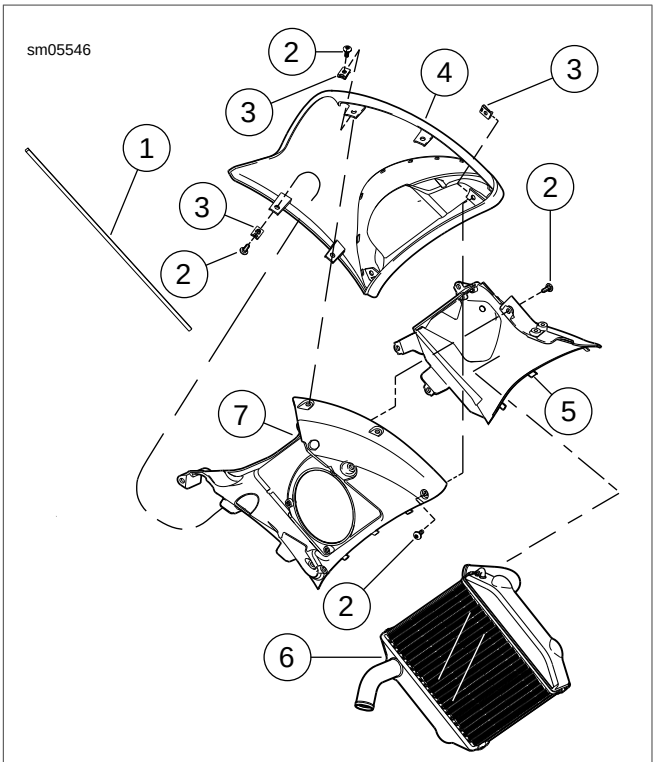
- *Be sure cooling fan wiring harness is installed as from the factory and wiring harness connector is clear of fan blades.*
- *Check condition of foam (1) on radiator ducts and replace as necessary. If installing new components or foam, be sure to install foam as it was installed on original components.*

2. Install fasteners (2) and tighten fasteners to 8.2-9.2 Nm (73-82 **in-lbs**).
3. Install radiator hoses to radiator and tighten clamps.
4. Connect negative battery cable. See 1.14 BATTERY MAINTENANCE.
5. Fill and bleed cooling system according to procedure. See 1.15 ENGINE COOLANT.

**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. Run motorcycle, check for leaks and verify proper cooling system function.
8. Install radiator outer shroud (4) and secure with fasteners (2). Tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).




1. **Foam**
2. **Fastener**
3. **Speed nut**
4. **Radiator outer shroud (left)**
5. **Radiator inlet duct (left)**
6. **Radiator (left)**
7. **Radiator outlet duct (left)**

**Figure 5-25. Left Side Radiator Components**

### Right Side

1. See Figure 5-27. Seat radiator (6) in pocket of radiator outlet duct (5) and enclose radiator with radiator inlet duct (7).

*NOTES*

- *Be sure cooling fan wiring harness is installed as from the factory and wiring harness connector is clear of fan blades.*
- *Check condition of foam (1) on radiator ducts and replace as necessary. If installing new components or foam, be sure to install foam as it was installed on original components.*

2. Install fasteners (2) and tighten fasteners to 8.2-9.2 Nm (73-82 **in-lbs**).
3. Install radiator hoses to radiator and tighten clamps.
4. See Figure 5-26. If removed, install overflow tank. Tighten to 4.75-6.10 Nm (42-54 **in-lbs** ).
5. Connect negative battery cable. See 1.14 BATTERY MAINTENANCE.

**⚠WARNING**

**Coolant mixture contains toxic chemicals, which may be fatal if swallowed. If swallowed, do not induce vomiting; call a physician immediately. Use in a well ventilated area. Irritation to skin or eyes can occur from vapors or direct contact. In case of skin or eye contact, flush thoroughly with water and go to hospital, if necessary. Dispose of used coolant according to federal, state and local regulations. (00092a)**

6. Fill and bleed cooling system according to procedure. See 1.15 ENGINE COOLANT.

**⚠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. Run motorcycle, check for leaks and verify proper cooling system function.
9. Install radiator outer shroud (4) and secure with fasteners (2). Tighten fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).

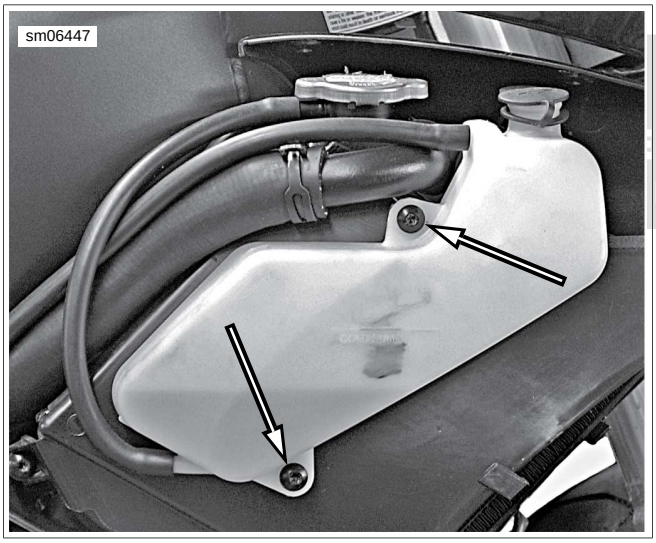
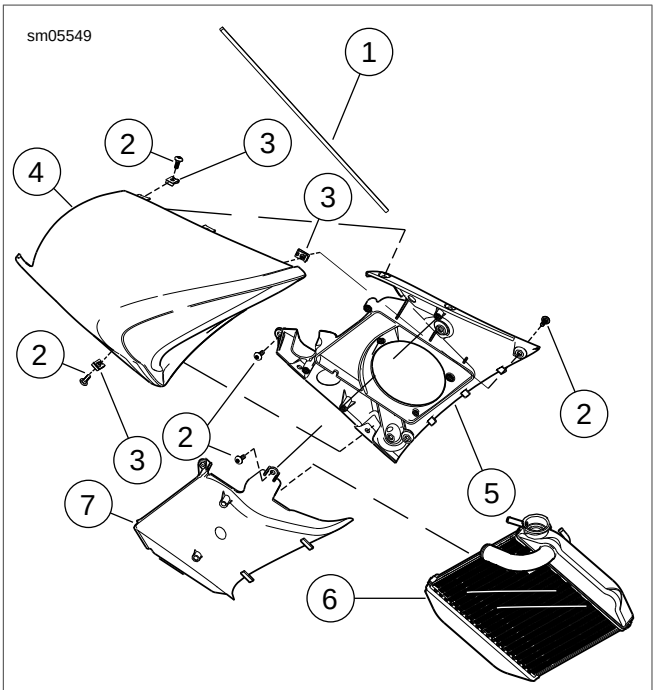



**Figure 5-26. Overflow Tank Fasteners**

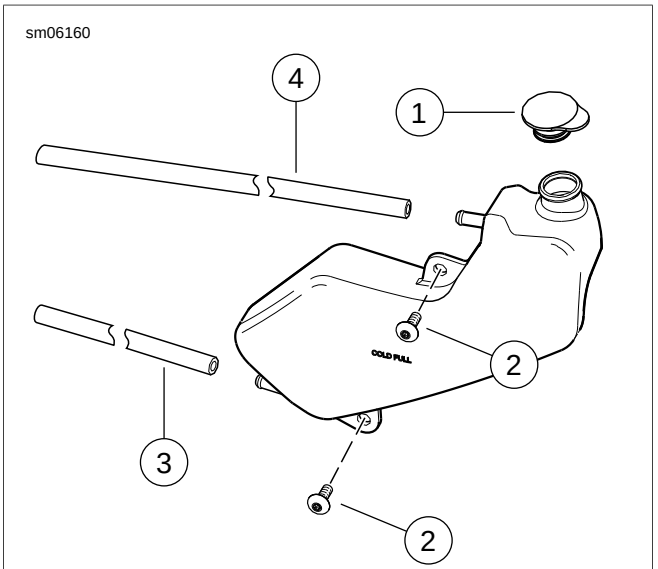



1. **Foam**
2. **Fasteners**
3. **Speed nuts**
4. **Radiator outer shroud (right)**
5. **Radiator outlet duct (right)**
6. **Radiator (right)**
7. **Radiator inlet duct (right)**

**Figure 5-27. Right Side Radiator Components**

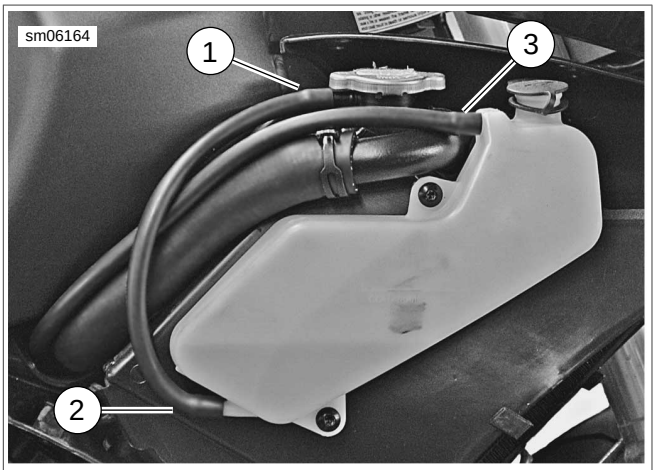
## OVERFLOW TANK

1. See Figure 5-28. Install overflow tank to right side radiator inlet duct.
2. Tighten fasteners to 4.75-6.10 Nm (42-54 **in-lbs** ).
3. See Figure 5-29. Push the coolant out hose over the fitting at the overflow tank neck.
4. Route the out hose over the top of the radiator hose and down through the P-clamp on the clutch cover.
5. Push the coolant in hose over the fitting on the radiator neck.
6. Route the in hose over the top of the out hose and push the in hose over the fitting at the bottom of the overflow tank.




1. Cap
2. Fastener
3. Hose, in
4. Hose, out

**Figure 5-28. Overflow Tank Assembly**




1. Hose, in at radiator neck
2. Hose, in at overflow tank
3. Hose, out at overflow tank

**Figure 5-29. Overflow Tank Hose Routing**

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# OIL COOLER 5.9

## REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| HD-46503 | OIL LINE REMOVER |

1. Allow engine to cool.

**⚠WARNING**

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

2. Remove passenger seat.
3. Remove negative battery cable. See 1.14 BATTERY MAINTENANCE, Disconnection and Removal.
4. Drain oil from motorcycle. See 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models.
5. See Figure 5-30. Close the OIL LINE REMOVER (Part No. HD-46503) over the oil line. Match the notches in the tool flange to the U-bends in the spring clip.
6. See Figure 5-31. Rotate the tool to expand the spring clip out of the groove in the oil fitting.
7. With a cup under the fitting, use finger and thumb to hold the OIL LINE REMOVER (Part No. HD-46503) 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.
8. Pull the oil line and the tool from the fitting.
9. See Figure 5-33. Remove nut (9) and washer (8) from top of oil cooler assembly, disconnect bypass bracket and hose.
10. Plug oil line holes until oil lines are replaced.
11. Remove bolt (10) and washer (11) from oil cooler (2).
12. Supporting the oil cooler, pull far enough forward to remove oil cooler from lower bracket/grommet assembly (3) located at bottom of cooler and remove oil cooler from motorcycle.




**Figure 5-30. Oil Line Remover**

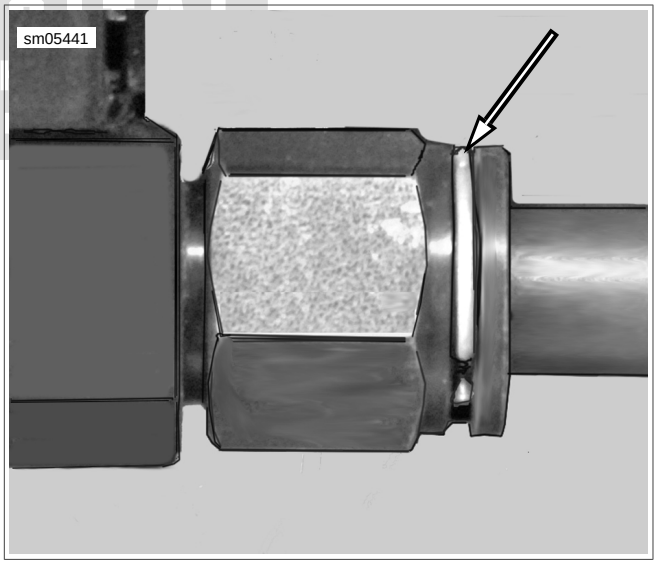
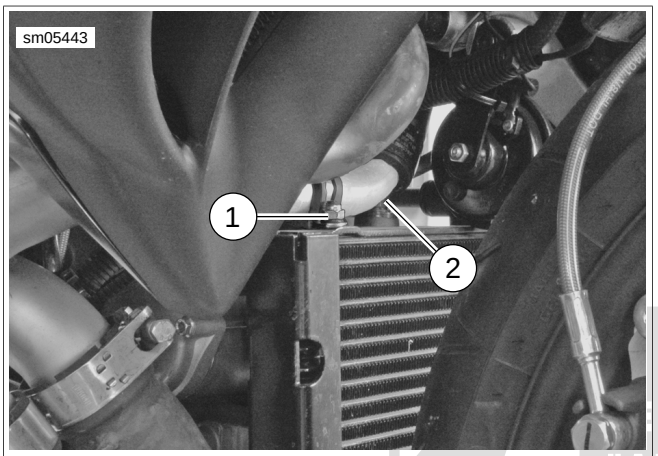



**Figure 5-31. Oil Line Spring Clip**

## INSTALLATION

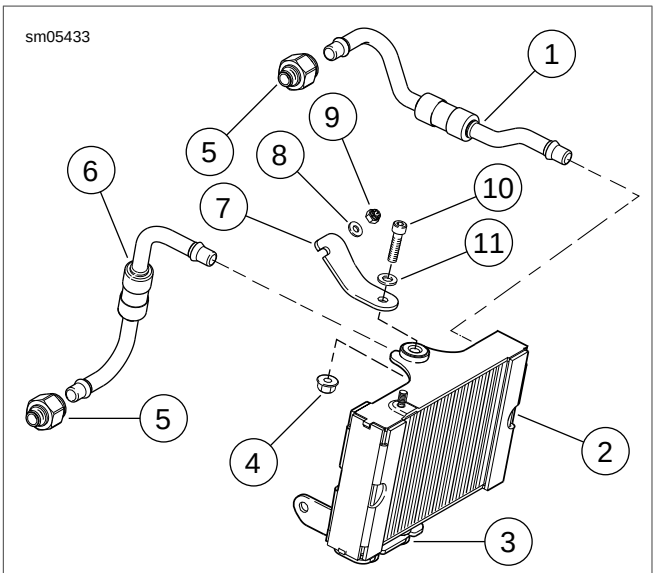
1. See Figure 5-33. Supporting the oil cooler (2), guide into place in lower bracket/grommet assembly (3). Tip oil cooler into place and retain with washer (11) and bolt (10).
2. Tighten to 24.5-27.0 Nm (18-20 ft-lbs).
3. See Figure 5-32. Install radiator hose bypass (2) to top of oil cooler and retain with washer and nut (1).
4. Tighten to 8.2-9.2 Nm (73-82 **in-lbs**).

5. See Figure 5-33. Install oil cooler supply line (1) and return line (6).
6. Push the flanged oil line into the crankcase fitting until it clicks in place under the spring clip.
7. Lightly tug on oil line to verify that it is securely locked to fitting.
8. Check oil level and add oil if required.
9. Install negative battery cable. See 1.14 BATTERY MAINTENANCE, Installation and Connection.
10. Install passenger seat.
11. Start and run engine.
    a. Inspect oil fittings for oil leaks.
    b. Check oil level.




1. **Radiator hose bypass**
2. **Washer and nut**

**Figure 5-32. Radiator Hose Bypass to Oil Cooler Mounting**




1. **Oil line, supply**
2. **Oil cooler**
3. **Lower bracket/grommet assembly**
4. **Nut**
5. **Fitting (4)**
6. **Oil line, return**
7. **Bracket, oil cooler mounting**
8. **Washer**
9. **Nut**
10. **Bolt**
11. **Washer**

**Figure 5-33. Oil Cooler Components**

## OIL LINE FITTINGS

To install, tighten to 14.9-17.6 Nm (11-13 ft-lbs).

# NOTES

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# NOTES

# FASTENER TORQUE VALUES 6.1

## FASTENER TORQUE VALUES IN THIS CHAPTER

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

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Belt guard fasteners, lower | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Belt guard fasteners, upper | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Clutch fluid bleeder valve | 5 Nm | 44 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Clutch hub nut | 170 Nm | 125 ft-lbs | 6.5 CLUTCH, Clutch Basket |
| Clutch interlock switch fastener | 0.8-1.1 Nm | 7-10 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch lever pivot bolt | 0.5-1.5 Nm | 4-13 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Lever Removal and Installation |
| Clutch lever pivot bolt nut | 4.9-6.9 Nm | 36-60 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Lever Removal and Installation |
| Clutch master cylinder banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch master cylinder banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Clutch release pin spherical nut | 14 Nm | 124 **in-lbs** | 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator/LOCTITE 243 (blue) |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch shaft bearing retaining screw | 11 Nm | 97 **in-lbs** | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft/Apply LOCTITE 243 (blue). |
| Clutch spring fasteners | 10 Nm | 89 **in-lbs** | 6.5 CLUTCH, Clutch Pack/Bottom fastener and then tighten. |
| Detent wheel fastener | 11 Nm | 97 **in-lbs** | 6.7 SHIFT LINKAGE, Detent Wheel/Apply LOCTITE 243 (blue). |
| Diaphragm clutch release pin nut | 15 Nm | 133 **in-lbs** | 6.5 CLUTCH, Vacuum Assist Diaphragm/LOCTITE 243 (blue) |
| Fender fasteners, rear | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Final drive sprocket bolt | 110 Nm | 81 ft-lbs | 6.10 FINAL DRIVE SPROCKET, Pulley Assembly |
| Footpeg support bracket fasteners, rider/idler pulley support bracket fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Fork drum bearing retaining screw | 11 Nm | 97 **in-lbs** | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Fork Drum/Apply LOCTITE 243 (blue). |
| Idler pulley locknut | 27.1-31.2 Nm | 20-23 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Index shim fastener | 11 Nm | 97 **in-lbs** | 6.7 SHIFT LINKAGE, Index Shim/Apply LOCTITE 243 (blue) |
| Mainshaft bearing retaining screw, left case | 11 Nm | 97 **in-lbs** | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft/Apply LOCTITE 243 (blue). |
| P-clamp fastener, clutch fluid line | 4-7 Nm | 36-60 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Primary drive assembly fasteners (final torque) | 30 Nm | 22.1 ft-lbs | 6.6 PRIMARY DRIVE, Primary Drive Assembly |
| Primary drive assembly fasteners (initial torque) | 12 Nm | 106 **in-lbs** | 6.6 PRIMARY DRIVE, Primary Drive Assembly/Apply LOCTITE 648 (green) |
| Secondary actuator banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Secondary clutch actuator bleeder valve | 5 Nm | 44.3 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir: Removal |
| Secondary clutch actuator cover fasteners | 10 Nm | 89 **in-lbs** | 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator |
| Shift lever screw | 9.6-10.6 Nm | 85-94 **in-lbs** | 6.7 SHIFT LINKAGE, Shift Lever |
| Shift lever screw | 9.6-10.6 Nm | 85-94 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Shift lever toepeg screw | 5.4-8.1 Nm | 48-72 **in-lbs** | 6.7 SHIFT LINKAGE, Shift Lever |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Swingarm brace fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| VSS trigger wheel | 30 Nm | 22 ft-lbs | 6.8 TRANSMISSION, VSS Trigger Wheel/Apply LOCTITE 243 (blue). |

# SPECIFICATIONS 6.2

## GENERAL

**Table 6-1. Clutch Specifications**

| CLUTCH | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Friction plate thickness | 3.420-3.580 | 0.1346-0.1409 | 3.309 (min) | 0.1299 (min) |
| Nine friction plates thickness | 30.780-32.220 | 1.2118-1.2685 | 29.800 (min) | 1.1732 (min) |
| Warpage, single plate (fiber or steel) | 0.150 (max) | 0.0059 (max) | 0.150 (max) | 0.0059 (max) |
| Friction outer tooth spline width | 14.015-14.050 | 0.5518-0.5531 | 13.7 (min) | 0.539 (min) |
| Clutch gear bore | 35.015-35.035 | 1.3785-1.3793 | 35.06 (max) | 1.3803 (max) |

**Table 6-2. Clutch Spring Specifications**

| FEATURE | DIMENSION | | SERVICE WEAR LIMIT | |
|---|---|---|---|---|
| | METRIC | U.S. | METRIC | U.S. |
| Free length | 59.95 mm | 2.3602 in | 57 mm (min) | 2.244 in (min) |
| Force at length | 224-250 N @ 26.4 mm | 50.4-56.2 lb @ 1.039 in | 190 N @ 26.4 mm | 42.71 lb @ 1.039 in |

DIGITAL

**Table 6-3. Transmission Specifications**

| TRANSMISSION | NEW COMPONENTS | | SERVICE WEAR LIMITS | |
|---|---|---|---|---|
| | mm | in | mm | in |
| Mainshaft bearing fit (tight) to case, alternator side | 0.052-0.085 | 0.00205-0.00335 | 0.01 | 0.00039 |
| Mainshaft bearing fit to shaft journal, alternator side | 0.005 (tight)-0.018 (loose) | 0.00020 (tight)-0.00071 (loose) | 0.03 (loose) | 0.00118 (loose) |
| Mainshaft bearing fit (tight) to case, clutch side | 0.045-0.054 | 0.00177-0.00213 | 0.01 | 0.00039 |
| Mainshaft bearing fit to shaft journal, clutch side | 0.008 (tight)-0.013 (loose) | 0.00032 (tight)-0.00051 (loose) | 0.03 (loose) | 0.00118 (loose) |
| Clutch shaft bearing fit (tight) to case, alternator side | 0.032-0.065 | 0.00126-0.00256 | 0.01 | 0.00039 |
| Clutch shaft bearing fit to shaft journal, alternator side | 0.010 (tight)-0.013 (loose) | 0.00039 (tight)-0.00051 (loose) | 0.03 (loose) | 0.00118 (loose) |
| Clutch shaft bearing fit (tight) to case, clutch side | 0.034-0.065 | 0.00134-0.00256 | 0.01 | 0.00039 |
| Clutch shaft bearing fit to shaft journal, clutch side | 0.006 (tight)-0.013 (loose) | 0.00024 (tight)-0.00051 (loose) | 0.03 (loose) | 0.00118 (loose) |
| Free pinion fit, 5th gear (loose) | 0.026-0.059 | 0.00102-0.00232 | 0.09 | 0.00354 |

**Table 6-4. Gear Ratios**

| GEAR | RATIO |
|---|---|
| First | 2.46 |
| Second | 1.75 |
| Third | 1.38 |
| Fourth | 1.17 |
| Fifth | 1.04 |
| Sixth | 0.96 |

**Table 6-5. Sprocket Teeth: 2009 Buell 1125 Models**

| DRIVE | ITEM | NUMBER OF TEETH | |
|---|---|---|---|
| | | 1125R | 1125CR |
| Primary | Engine | 36 | 36 |
| | Clutch | 65 | 65 |
| Final | Transmission | 27 | 27 |
| | Rear wheel | 70 | 76 |
| | Belt | 145 | 149 |

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# TROUBLESHOOTING 6.3

## GENERAL

**Table 6-6. Noisy Drive Train: Troubleshooting**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Clutch side | Worn friction plates and/or clutch drum | Replace friction plates and/or clutch drum. |
| | Excessive or insufficient backlash of the teeth of the primary drive gears | Replace primary drive assembly. |
| | Worn clutch drum, clutch hub or pressure plate | Replace clutch drum, clutch hub or pressure plate. |
| | Worn clutch gear bearing | Replace primary drive assembly. |
| | Worn disc spring (69x52x1.35 mm) of primary drive assembly | Replace disc spring (69x52x1.35 mm) and thrust washer. |
| | Worn springs and retainers of primary drive assembly | Replace springs and retainers. |
| With clutch engaged | Worn pressure plate ball bearing | Replace ball bearing. |
| Transmission | Worn tooth flanks of the gears | Check gears and shafts, replace as necessary. |
| | Worn main and counter shaft ball and/or needle bearings | Replace bearings. |

**Table 6-7. Clutch: Troubleshooting**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Clutch slips | Incorrect clutch fluid level | Fill and bleed clutch fluid. |
| | Leaking hydraulic piston | Replace piston, piston linings and/or sleeve O-rings. |
| | Clutch spring failure | Replace clutch springs. |
| | Worn or warped clutch plates | Replace clutch plates. |
| | Incorrect engine oil | Change oil. |
| Clutch disengagement (inconsistent)<br>Clunky gear shifts | Incorrect engine oil | Change oil. |
| | Warped clutch plates | Change the clutch plates. |
| | Stuck clutch plates | Clean or change clutch plates. |
| | Clutch fluid contaminated or full of air bubbles | Fill with new and bleed clutch fluid line. |
| Clutch drags | Worn or warped clutch plates | Change the clutch plates. |
| | Worn guide slots in clutch drum | Replace clutch drum. |
| | Worn guide slots in clutch hub | Replace clutch hub. |

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**Table 6-8. Gears: Troubleshooting**

| CONDITION | CHECK | REMEDY |
|---|---|---|
| Gears do not engage (pops out of gear on start) (pops out of gear under acceleration) | Incomplete gear shift | Lift lever until it stops. |
| | Misadjusted gear shift lever | Adjust gear shift lever. |
| | Loose shift lever fastener | Tighten fastener. |
| | Bent gear shift lever | Replace gear shift lever. |
| | Malfunctioning index spring or lever | Replace spring and/or lever. |
| | Incorrect gear shift pawl adjustment | Adjust pawl spring and replace if necessary. |
| | Worn gear teeth or windows | Replace gears and/or shafts as required. |
| | Worn or bent shift forks | Replace forks. |
| | Worn or damaged gears | Replace gears and/or shafts as required. |

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# CLUTCH ACTUATOR 6.4

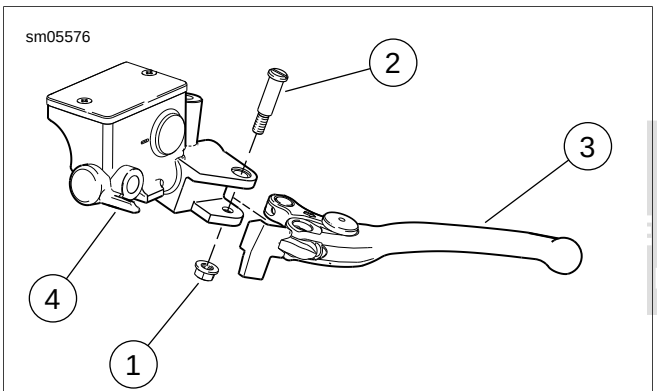
## CLUTCH LEVER REMOVAL AND INSTALLATION

### Removal

1. See Figure 6-1. Remove pivot bolt nut (1).
2. Remove pivot bolt (2), then remove hand lever (3) from clutch master cylinder/reservoir (4).

### Installation

1. Lubricate pivot bolt with LOCTITE ANTI-SEIZE.
2. Align hole in hand lever with pivot hole in clutch master cylinder/reservoir.
3. Install pivot bolt through clutch master cylinder/reservoir and hand lever.
4. Tighten pivot bolt to 0.5-1.5 Nm (4-13 **in-lbs**).
5. Install pivot bolt nut and tighten to 4.9-6.9 Nm (36-60 **in-lbs**).




1. **Pivot bolt nut**
2. **Pivot bolt**
3. **Hand lever**
4. **Clutch master cylinder**

**Figure 6-1. Clutch Lever Assembly**

## CLUTCH MASTER CYLINDER/RESERVOIR: REMOVAL

*NOTE*

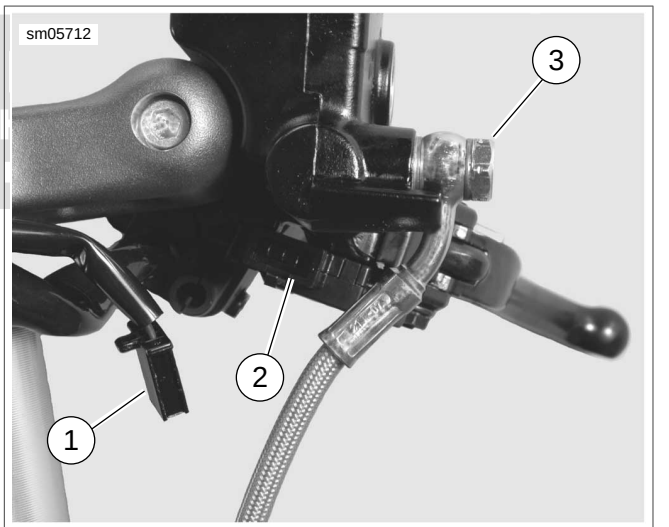
*It is not necessary to drain the brake fluid to remove the clutch master cylinder assembly from the handlebars. Do not disassemble the clutch master cylinder unless problems are experienced.*

1. Drain brake fluid into a suitable container. Discard used fluid according to local laws.
   a. Install a length of clear plastic tubing over secondary clutch actuator bleeder valve. Place free end in the container.
   b. Open bleeder valve approximately 1/2-turn.
   c. Pump clutch hand lever to drain brake fluid.
   d. Tighten bleeder valve to 5 Nm (44.3 **in-lbs**).
2. See Figure 6-2. Disconnect the clutch interlock switch connector (1) from the clutch interlock switch (2).

*NOTE*

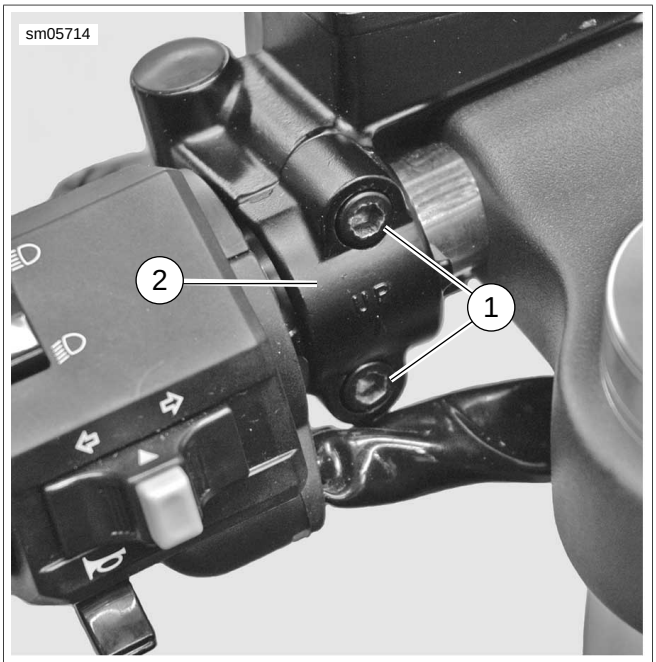
*Damaged banjo bolt seating surfaces will leak when assembled. Prevent damage to seating surfaces by carefully removing clutch fluid line components.*

3. Remove the banjo bolt (3) and two copper washers to disconnect clutch fluid line from clutch master cylinder. Discard copper washers.
4. See Figure 6-3. Remove mounting clamp fasteners (1) and mounting clamp (2) to detach clutch master cylinder/reservoir from handlebar.



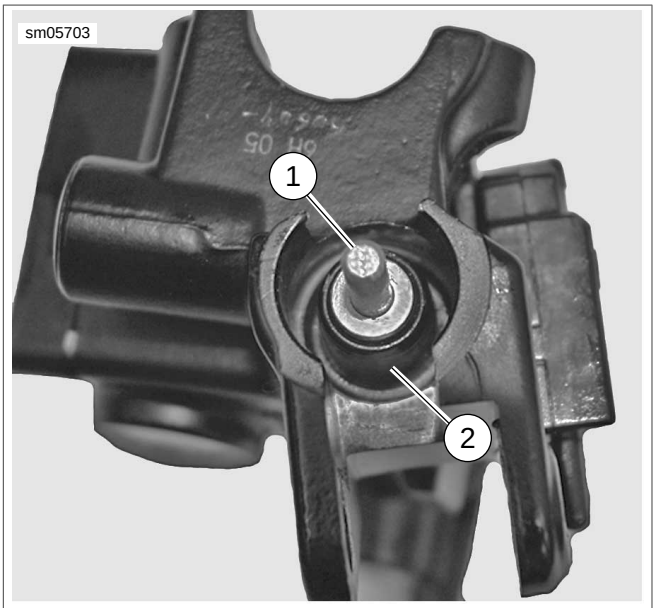

1. **Clutch interlock switch connector**
2. **Clutch interlock switch**
3. **Banjo bolt**

**Figure 6-2. Clutch Interlock Switch Connector and Banjo Bolt Removal**




1. **Mounting clamp Fasteners**
2. **Mounting clamp**

**Figure 6-3. Mounting Clamp Fasteners**



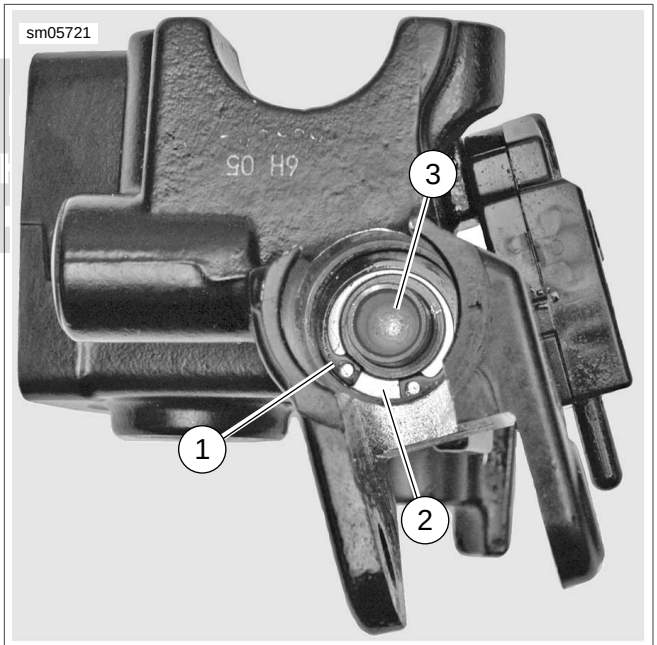

1. **Pushrod**
2. **Boot**

**Figure 6-4. Boot and Pushrod**

## CLUTCH MASTER CYLINDER/RESERVOIR: REPAIR

### Disassembly

1. Remove clutch lever. See 6.4 CLUTCH ACTUATOR, Clutch Lever Removal and Installation.
2. Remove reservoir cover fasteners and reservoir cover.
3. Drain and discard remaining brake fluid according to local laws.
4. See Figure 6-4. Remove pushrod (1) and rubber boot (2) and discard.
5. See Figure 6-5. Press on piston assembly (3), remove internal circlip (1) and discard.
6. Remove stop plate (2), piston assembly and spring from master cylinder and discard.




1. **Circlip**
2. **Stop plate**
3. **Piston**

**Figure 6-5. Piston in Master Cylinder**

## Cleaning and Inspection

**WARNING**

**Use denatured alcohol to clean clutch 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 clutch failure, which could result in death or serious injury. (00296a)**

1. Clean all parts with denatured alcohol or **D.O.T. 4 brake fluid**.

*NOTE*

*Do not contaminate with mineral oil or other solvents.*

2. Wipe 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. See Figure 6-6. Blow out fluid passages and piston bore with compressed air.

*NOTE*

*See Figure 6-7. Do not use a wire or similar instrument to clean drilled passages (1) in bottom of reservoir.*

4. Inspect piston bore in the clutch master cylinder housing. Replace housing if any scoring, pitting or corrosion is present.
5. Inspect the outlet port that mates with the fluid line banjo fitting. Replace housing if any scratches, dents or other damage is present.
6. Clean reservoir diaphragm, stiffener and cover.
7. Clean the pressure relief channels (2) in the cover.

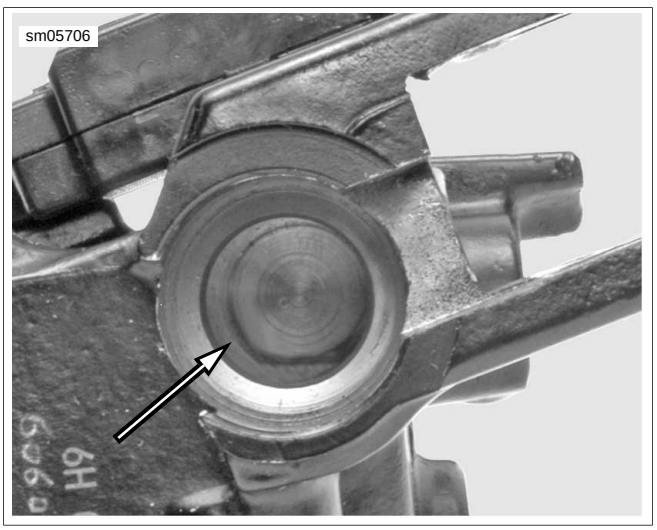
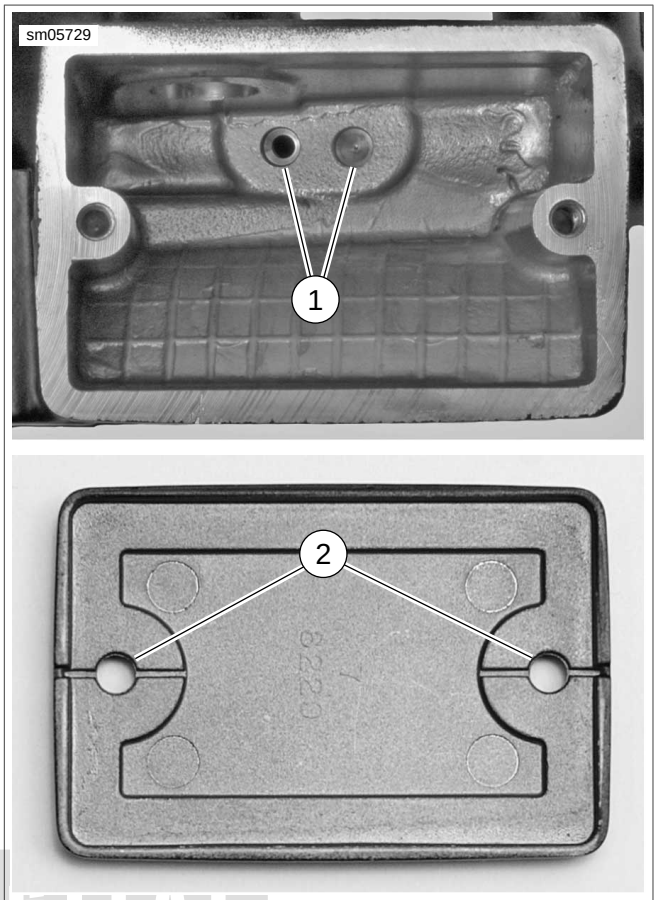



**Figure 6-6. Piston Bore and Fluid Passages**




1. **Drilled passages**
2. **Relief channels**

**Figure 6-7. Drilled Passages and Relief Channels**

## Assembly

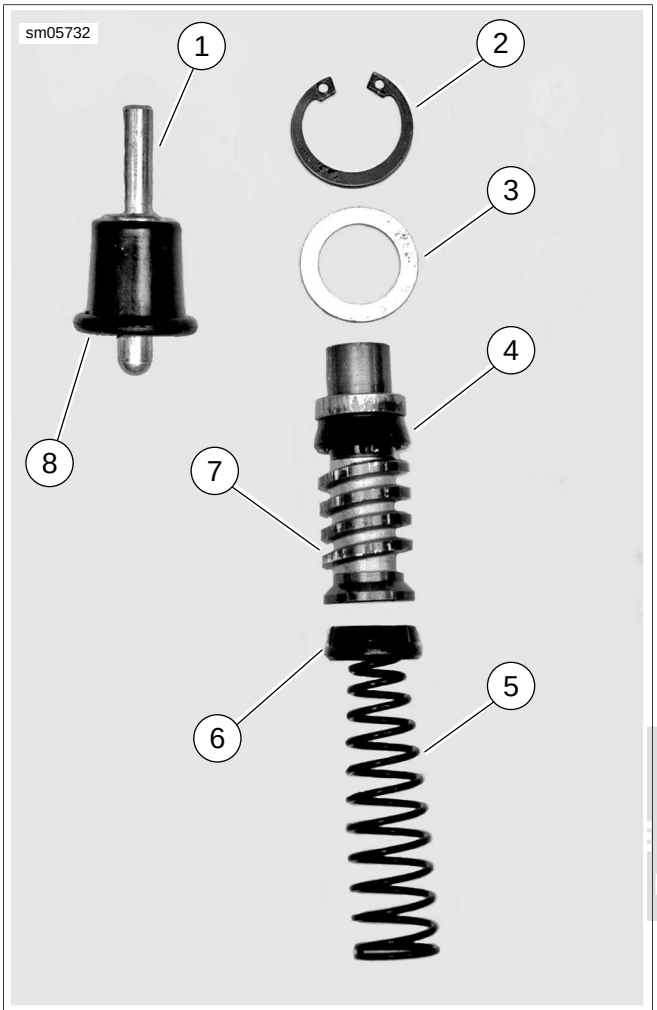
1. See Figure 6-8. Lubricate master cylinder bore, piston (7) and piston lip seals (4 and 6) with D.O.T. 4 brake fluid.
2. Install secondary lip seal (4) onto piston.
3. Install primary lip seal (6) to small end of spring (5).
4. Install spring with primary lip seal into bore of clutch master cylinder, large end of spring first.
5. Insert piston and secondary lip seal assembly into clutch master cylinder bore.
6. Install stop plate (3) onto piston assembly.

**WARNING**

**Be sure circlip snaps in place. An unsecured circlip can cause clutch failure, which could result in death or serious injury. (00584b)**

7. Press piston assembly into clutch master cylinder bore and install circlip (2).
8. Install rubber boot (8) onto pushrod (1) as shown.
9. Apply LOCTITE ANTI-SEIZE to top area of piston that pushrod contacts.

10. Install rubber boot and pushrod into clutch master cylinder housing. Verify boot is seated securely and pushrod engages piston properly.




1. **Pushrod**
2. **Circlip**
3. **Stop Plate**
4. **Secondary Lip Seal**
5. **Spring**
6. **Primary Lip Seal**
7. **Piston**
8. **Boot**

**Figure 6-8. Piston Set**

## CLUTCH MASTER CYLINDER/RESERVOIR INSTALLATION

1. See Figure 6-6. Install clutch master cylinder/reservoir to handlebar with clamp (1) and fasteners (2).
2. Position for rider posture and tighten to 7.8-12.7 Nm (69-112 **in-lbs**).
3. If removed, install the clutch interlock switch (3).
   a. Install clutch interlock switch fastener (4).
   b. Tighten to 0.8-1.1 Nm (7-10 **in-lbs**).
   c. Install clutch interlock switch connector into clutch interlock switch.
   d. Test switch action. Plunger on switch must extend when hand lever is released.

**CAUTION**

**Avoid leakage. Be sure gaskets, banjo bolt(s) and clutch line are clean and undamaged before assembly. (00329a)**

*NOTE*

*Use only **new** copper crush banjo washers with D.O.T. 4 brake fluid. Earlier silver banjo washers are not compatible with D.O.T. 4 fluid and will not seal properly over time.*

4. Install clutch fluid line (5) to clutch master cylinder/reservoir using two **new** copper washers (6) and banjo bolt (7).
5. Tighten to 21.7-27.1 Nm (16-20 ft-lbs).

**CAUTION**

**DOT 4 brake fluid will damage painted and body panel surfaces it comes in contact with. Always use caution and protect surfaces from spills whenever clutch work is performed. Failure to comply can result in cosmetic damage. (00582b)**

6. With the clutch master cylinder in a level position, add D.O.T. 4 brake fluid until the level is above the LOWER line on the sight gauge.
7. Bleed the hydraulic clutch system. See 1.9 BLEEDING CLUTCH FLUID LINE.

**⚠WARNING**

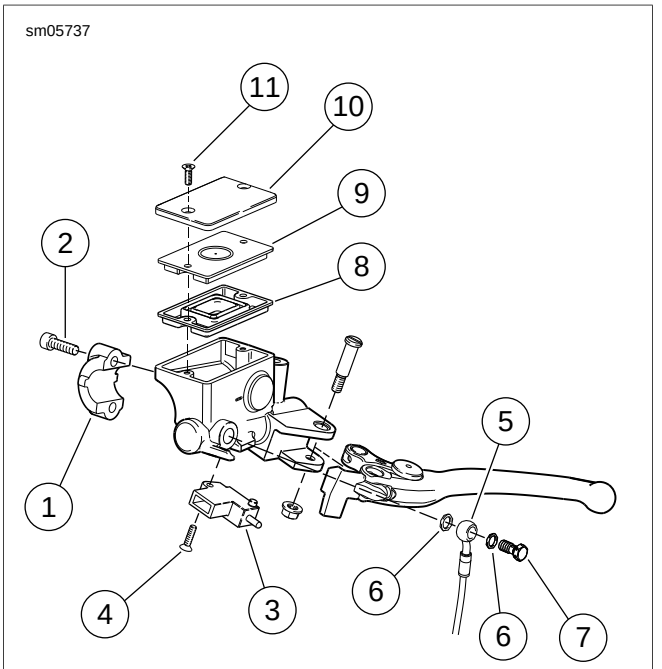
**A plugged or covered relief port can cause clutch drag, which could lead to loss of control, resulting in death or serious injury. (00583b)**

8. Verify operation of the relief port. Actuate clutch lever with reservoir cover removed. A slight spurt of fluid will break the surface if relief port is open.
9. Install diaphragm (8), stiffener (9) and reservoir cover (10). Tighten cover fasteners (11) to 1.0-1.5 Nm (9-13 **in-lbs**).

**⚠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 proper operation of clutch interlock switch.




1. **Clamp**
2. **Fastener (2)**
3. **Clutch interlock switch**
4. **Fastener**
5. **Clutch fluid line**
6. **Copper washer**
7. **Banjo bolt**
8. **Diaphragm**
9. **Stiffener**
10. **Reservoir cover**
11. **Fastener (2)**

**Figure 6-9. Clutch Master Cylinder/Reservoir Assembly**

## CLUTCH FLUID LINE

### Removal

1. Remove brake fluid from clutch system.
   a. See Figure 6-10. Remove bleeder valve cap and install a length of plastic tubing over valve. Place the free end in a suitable container.
   b. Open bleeder valve approximately 1/2-turn.
   c. Pump hand lever to drain brake fluid.
   d. Tighten bleeder valve to 5 Nm (44 **in-lbs**).

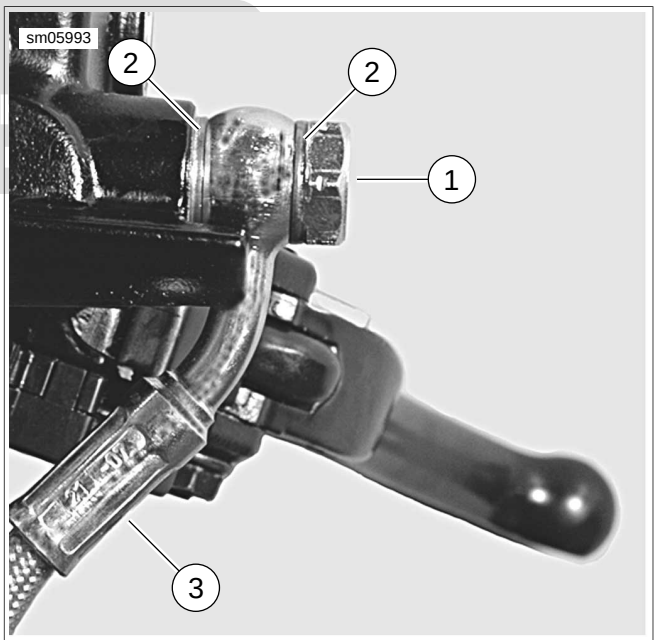
*NOTE*

*Damaged banjo bolt seating surfaces will leak when assembled. Prevent damage to seating surfaces by carefully removing clutch fluid line components.*

2. See Figure 6-11. Remove banjo bolt (1), copper washers (2) and clutch fluid line (3) from clutch master cylinder. Discard copper washers.
3. See Figure 6-12. Remove P-clamp bolt.
4. See Figure 6-13. Remove banjo bolt (1), copper washers (2) and clutch fluid line (3) from secondary actuator cover. Discard copper washers.
5. Note the routing of the clutch fluid line and remove clutch fluid line from motorcycle.
6. Inspect clutch fluid line for dents, cuts, chaffing or other defects. Replace clutch fluid line if damaged.




**Figure 6-10. Clutch Fluid Bleeder Valve**




1. **Banjo bolt**
2. **Copper washers (2)**
3. **Clutch fluid line**

**Figure 6-11. Clutch Master Cylinder Banjo Bolt**

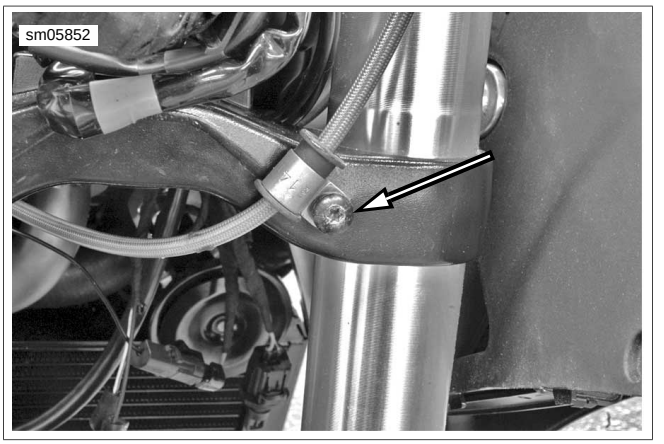
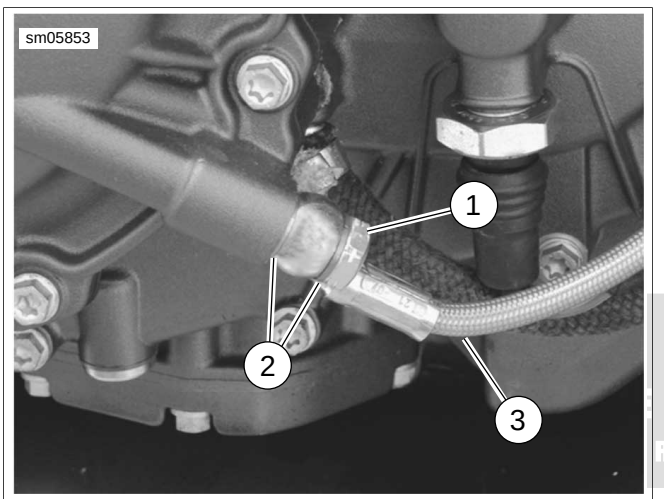



**Figure 6-12. Clutch Fluid Line P-Clamp Bolt**




1. **Banjo bolt**
2. **Copper washers (2)**
3. **Clutch fluid line**

**Figure 6-13. Clutch Secondary Actuator Banjo Bolt**

## Installation

1. Carefully route clutch fluid line into original position on motorcycle.

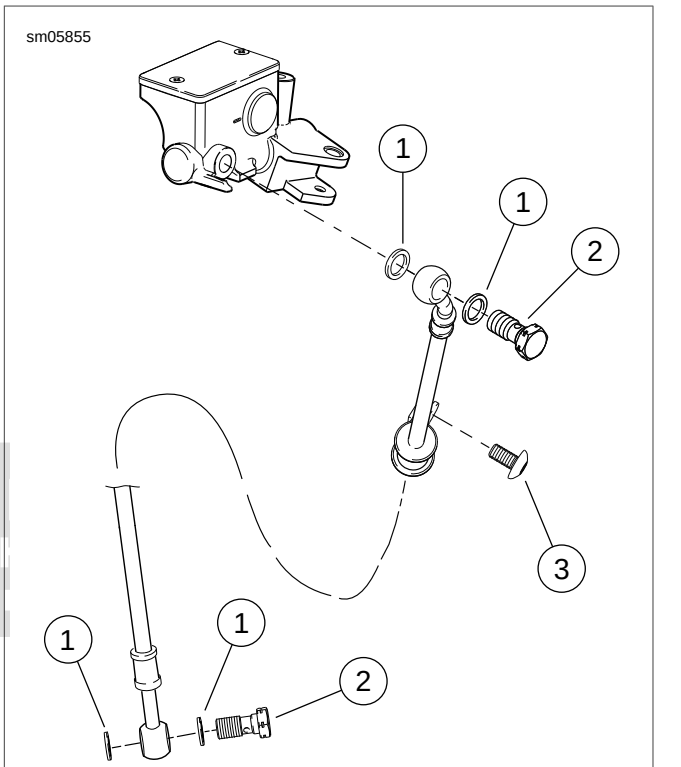
**CAUTION**

**Avoid leakage. Be sure gaskets, banjo bolt(s) and clutch line are clean and undamaged before assembly. (00329a)**

*NOTE*

*Use only **new** copper crush banjo washers with D.O.T. 4 brake fluid. Earlier silver banjo washers are not compatible with D.O.T. 4 fluid and will not seal properly over time.*

2. See Figure 6-14. Install clutch fluid line to clutch master cylinder using two **new** copper washers (1) and banjo bolt (2).
3. Finger tighten banjo bolt.
4. Install P-clamp bolt (3). Do not tighten.
5. Install clutch fluid line to secondary actuator cover using two **new** copper washers (1) and banjo bolt (2).
6. Finger tighten banjo bolt.
7. Tighten clutch master cylinder banjo bolt to 21.7-27.1 Nm (16-20 ft-lbs).
8. Tighten secondary actuator banjo bolt to 21.7-27.1 Nm (16-20 ft-lbs).
9. Tighten P-clamp bolt to 4-7 Nm (36-60 **in-lbs**).
10. Bleed clutch system. See 1.9 BLEEDING CLUTCH FLUID LINE.




1. **Copper washer (4)**
2. **Banjo bolt (2)**
3. **Bolt**

**Figure 6-14. Clutch Fluid Line Components**

## SECONDARY CLUTCH ACTUATOR

| PART NUMBER | TOOL NAME |
|---|---|
| B-49125 | CLUTCH RELEASE TOOL |

## 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)**

**CAUTION**

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

1. Place an oil pan under the engine.
2. Attach a tube to the clutch fluid line bleeder valve and run to the pan.
3. Drain the clutch fluid line. See 1.9 BLEEDING CLUTCH FLUID LINE.
4. See Figure 6-15. Pry out the plastic plug from the cover.

*NOTE*

*See Figure 6-16. A spherical nut (2) holds the actuator piston (3) to the clutch release nut.*

5. See Figure 6-17. Use a hex wrench to prevent the clutch release pin from rotating, and use the CLUTCH RELEASE TOOL (Part No. B-49125) to loosen the spherical nut.

*NOTE*

*The piston is under tension from the return spring. Hold the piston in the bore while turning the spherical nut out by hand then slowly release the piston.*

6. See Figure 6-18. Remove the spherical nut (1), the piston (2) and the spring (3).
7. Remove clutch fluid line.
8. Remove the cover fasteners in sequence and remove cover.
9. Perform secondary clutch actuator repair procedure before installing components. See 6.4 CLUTCH ACTUATOR, Secondary Actuator Repair.

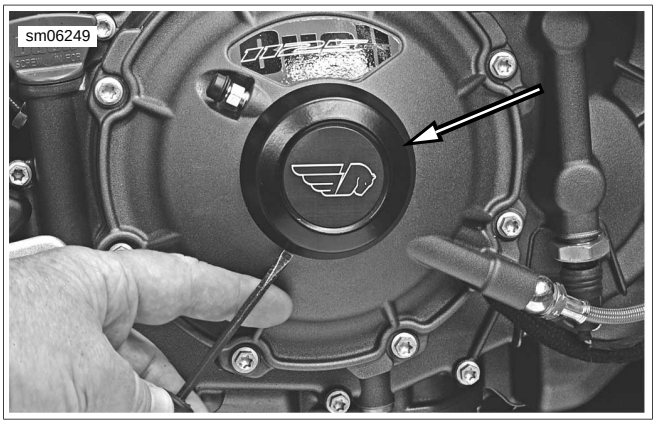
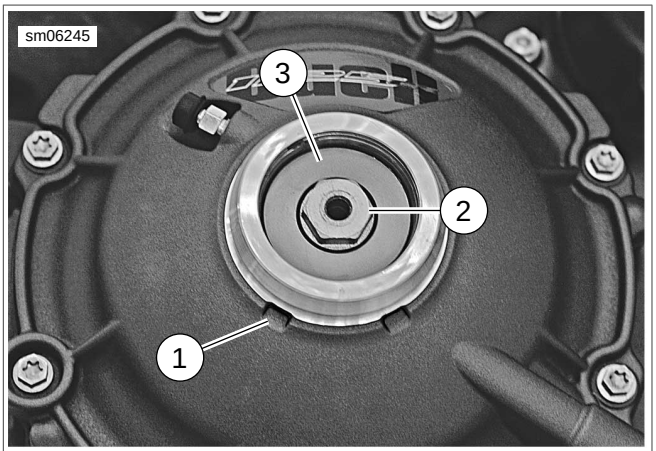



**Figure 6-15. Secondary Clutch Actuator Cover Plug**




1. **Pry slot**
2. **Spherical nut**
3. **Actuator piston**

**Figure 6-16. Clutch Release Pin Nut and Actuator Piston**

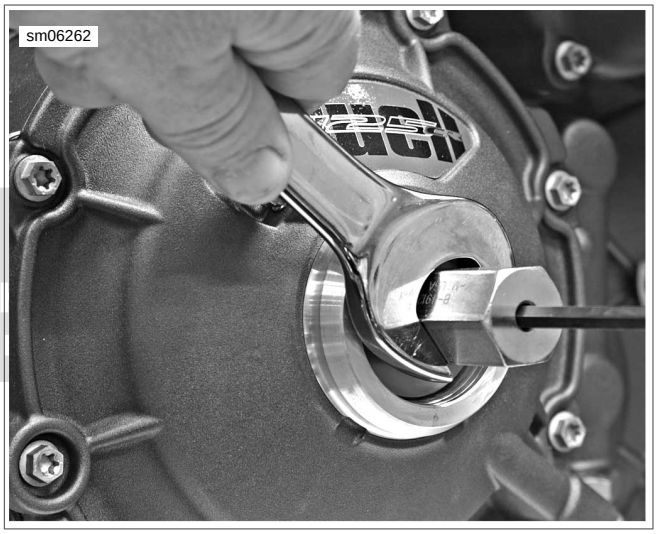
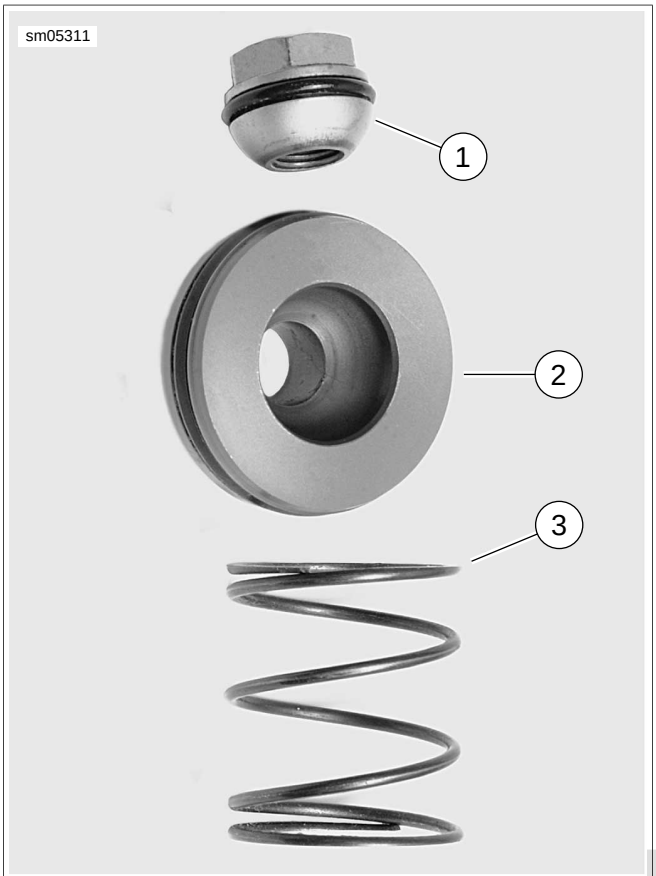


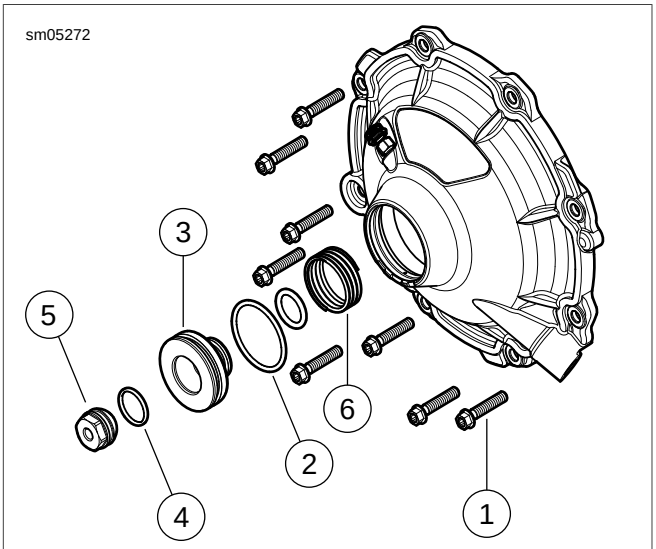

**Figure 6-17. Removing Secondary Actuator Piston Spherical Nut**




1. **Spherical nut**
2. **Piston**
3. **Spring**

**Figure 6-18. Actuator Components**

11. Fill and bleed the clutch fluid line. See 1.9 BLEEDING CLUTCH FLUID LINE.




1. **Fasteners**
2. **Piston O-rings**
3. **Piston**
4. **Spherical nut O-ring**
5. **Spherical nut**
6. **Spring**

**Figure 6-19. Secondary Clutch Actuator Cover Assembly**

## Installation

1. See Figure 6-19. Fit the secondary cover with the slot fastener opening and needle pin holes matching those on the clutch cover.
2. Install and finger tighten the cover fasteners (1).
3. Lubricate the two O-rings (2) and actuator piston (3) with D.O.T. 4 brake fluid.
4. Lubricate the O-ring (4) with D.O.T. 4 brake fluid.
5. Apply LOCTITE 243 (blue) to the threads of the clutch release pin.
6. Compress the spring (6) and hold the piston and thread spherical nut (5) onto the clutch release pin.

*NOTE*

*Use a hex wrench to prevent the clutch release pin from rotating.*

7. Use the clutch release tool to tighten the spherical nut to 14 Nm (124 **in-lbs**).
8. See Figure 6-20. Tighten the secondary clutch actuator cover fasteners in sequence to 10 Nm (89 **in-lbs**).
9. If necessary, replace the O-ring on the plastic plug.
10. Orient the logo on the plug and press into the cover.

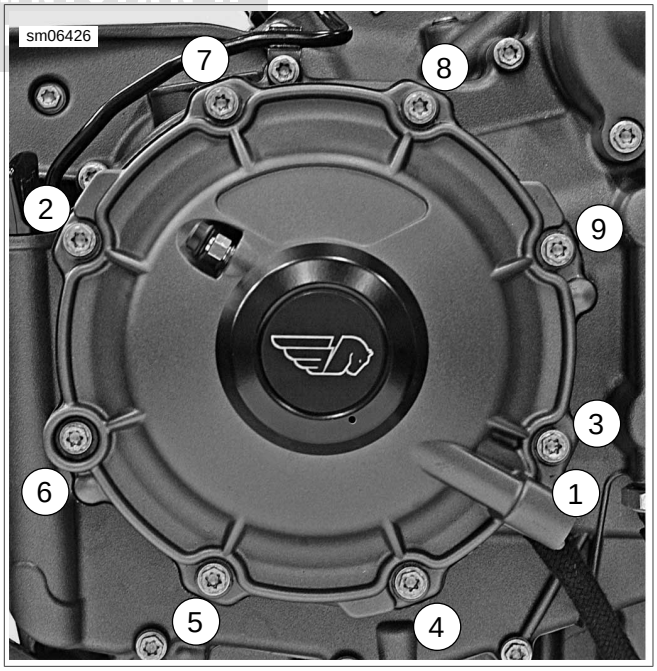



**Figure 6-20. Secondary Actuator Cover Torque Sequence**

## SECONDARY ACTUATOR REPAIR

### Disassembly

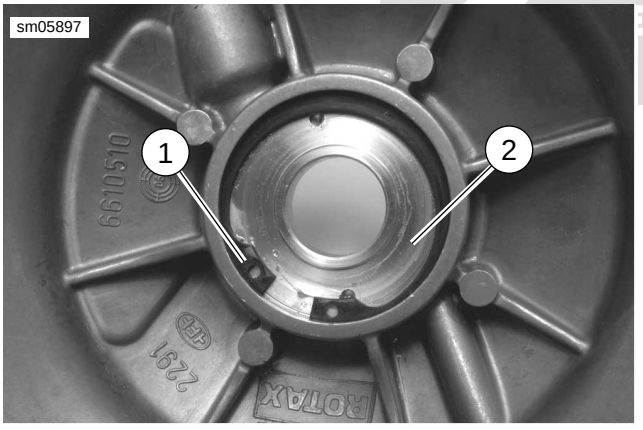
**⚠CAUTION**

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

**CAUTION**

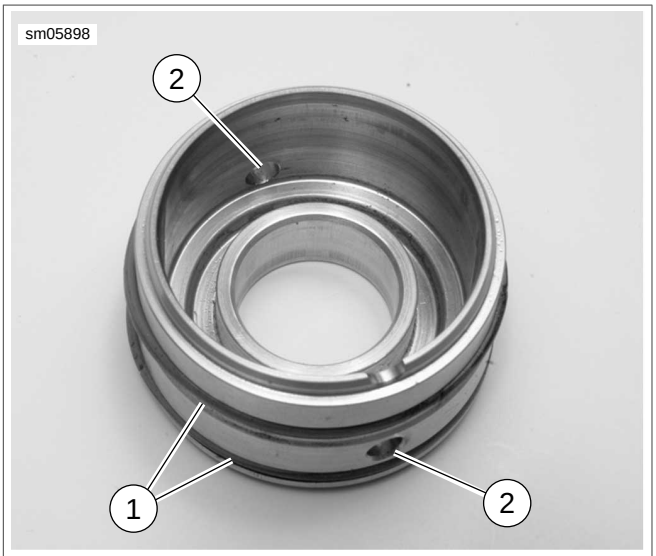
**DOT 4 brake fluid will damage painted and body panel surfaces it comes in contact with. Always use caution and protect surfaces from spills whenever clutch work is performed. Failure to comply can result in cosmetic damage. (00582b)**

1. Remove spherical nut O-ring and discard.
2. Remove two piston O-rings and discard.
3. See Figure 6-21. Remove circlip (1).
4. Remove piston sleeve (2) from secondary actuator cover using even pressure.
5. See Figure 6-22. Remove two O-rings (1) from piston sleeve and discard.




**1. Circlip**
**2. Piston sleeve**

**Figure 6-21. Piston Sleeve Circlip**




**1. O-ring (2)**
**2. Piston sleeve port (2)**

**Figure 6-22. Piston Sleeve**

### Cleaning and Inspection

**⚠WARNING**

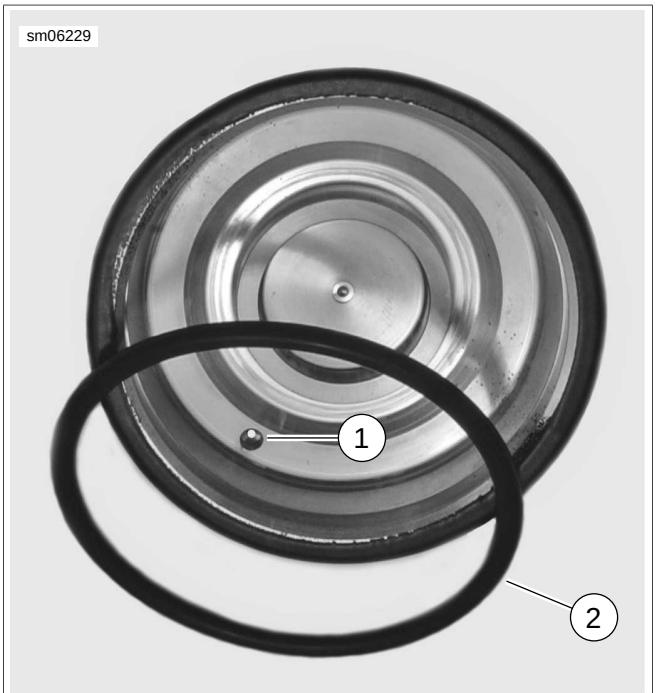
**Compressed air can pierce the skin and flying debris from compressed air could cause serious eye injury. Wear safety glasses when working with compressed air. Never use your hand to check for air leaks or to determine air flow rates. (00061a)**

1. Verify piston sleeve ports (2) are free from obstructions. Clear ports using compressed air.
2. See Figure 6-23. Remove O-ring (1) from the cover plug and discard.
3. See Figure 6-24. Inspect secondary actuator cover banjo bolt port (1), bleeder port (2) and vacuum assist port (3) for obstruction. Clean ports using compressed air.
4. Inspect pressure relief hole in cover for obstruction. Clear port using compressed air.

**⚠WARNING**

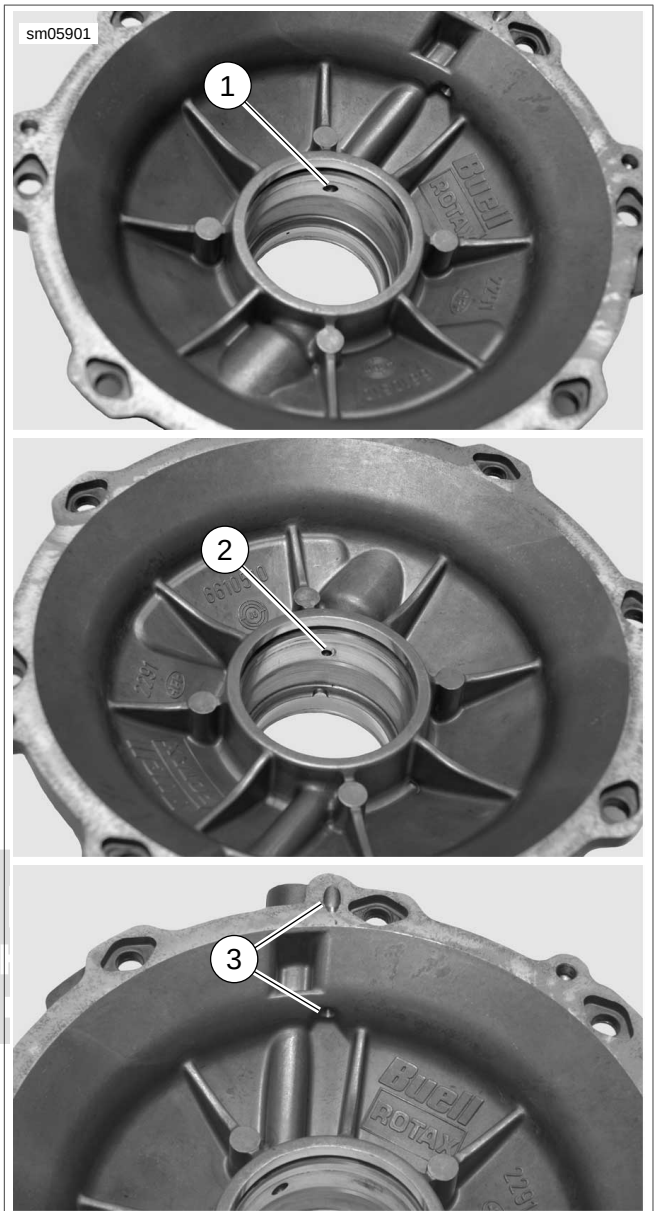
**Use denatured alcohol to clean clutch system components. Do not use mineral-based solvents (such as gasoline or paint thinner), which will deteriorate rubber parts even after assembly. Deterioration of these components can cause clutch failure, which could result in death or serious injury. (00296a)**

5. Wash all components in clean D.O.T. 4 brake fluid or denatured alcohol.
6. Inspect piston, piston sleeve, secondary actuator cover, spring and spherical nut for scoring, pitting or other damage. Replace as necessary.




1. Vent
2. O-ring

**Figure 6-23. Cover Plug and O-ring**




1. Banjo bolt port
2. Bleeder port
3. Vacuum assist port

**Figure 6-24. Secondary Actuator Cover Ports**

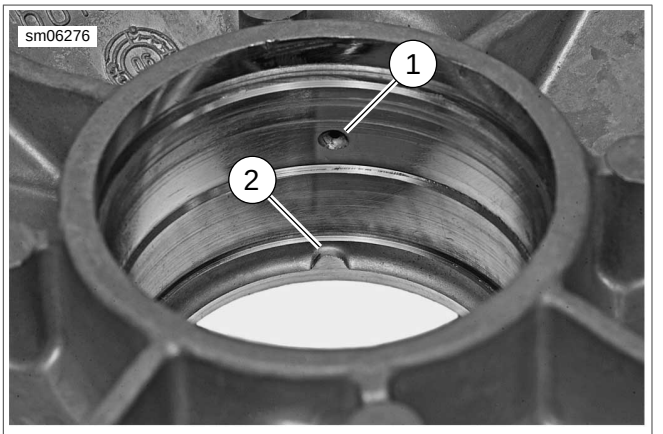
## Assembly

1. Lubricate all components and **new** O-rings with D.O.T. 4 brake fluid.
2. Install two **new** O-rings on the piston sleeve.
3. See Figure 6-25. Inspect pressure relief hole for obstruction.
4. Align piston sleeve notch (2) with indexing tab (3) on secondary actuator cover and install sleeve into cover using steady pressure.

**⚠WARNING**

**Be sure circlip snaps in place. An unsecured circlip can cause clutch failure, which could result in death or serious injury. (00584b)**

5. Install circlip.
6. Install two **new** piston O-rings.
7. Install **new** spherical nut O-ring.
8. Install **new** cover plug O-ring.




1. **Clutch fluid port**
2. **Sleeve index tab**

**Figure 6-25. Actuator Sleeve Bore**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# CLUTCH 6.5

## VACUUM ASSIST HOSE

1. See Figure 6-26. Clamp short hoses to the throttle body fittings. Use **new** clamps.
2. See Figure 6-27. Clamp (2) the short hoses to a T-connector (1).
3. Clamp a long hose (3) on the T-connector.
4. Route the hose across to the engine support and band the hose inside the support channel under the center guide below the engine wire harness.
5. See Figure 6-28. Along with the oil pressure switch lead (1) and the right cooling fan sub-harness (2), route the hose through the large convolute tubing (3) and secure with cable straps.
6. Route the hose through the P-clamp.
7. Clamp the hose to the fitting on the clutch cover.

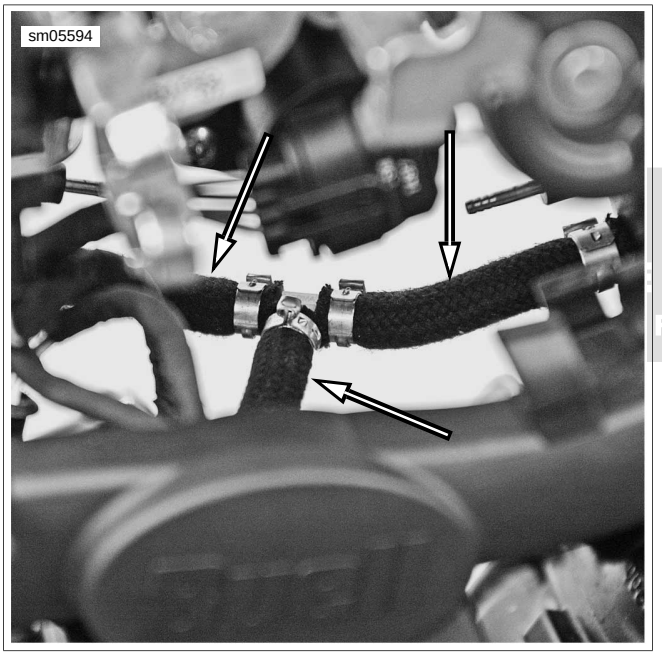
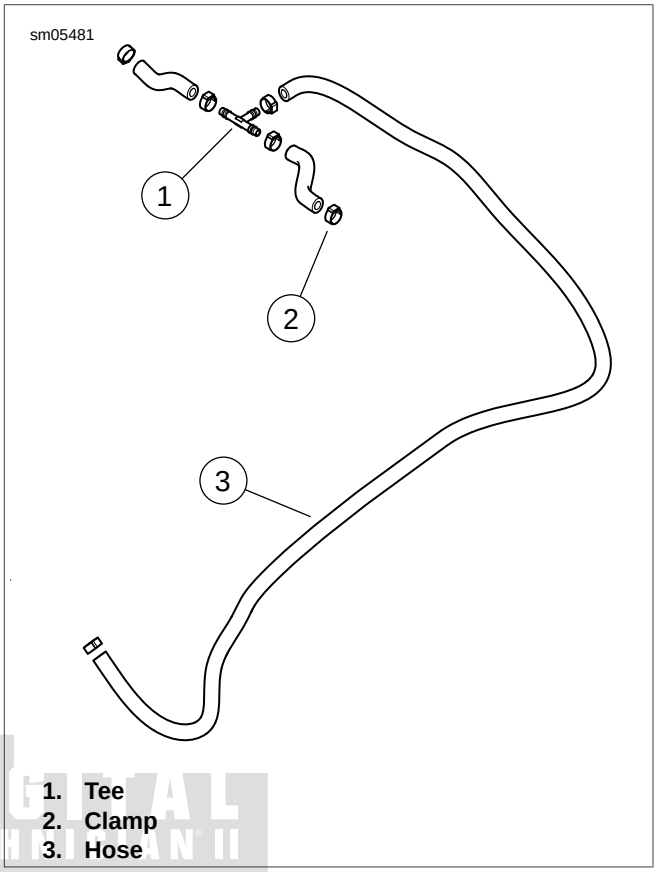
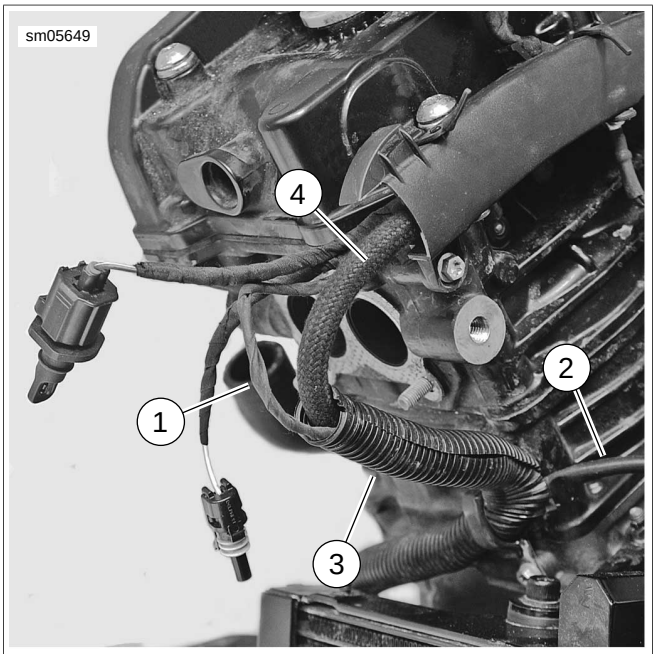



**Figure 6-26. Vacuum Assist Hoses and Clamps at Throttle Body**




1. **Tee**
2. **Clamp**
3. **Hose**

**Figure 6-27. Vacuum Assist Hose**




1. **Oil pressure lead**
2. **Right side fan sub-harness**
3. **Convolute tubing**
4. **Vacuum assist hose**

**Figure 6-28. Vacuum Assist Hose**

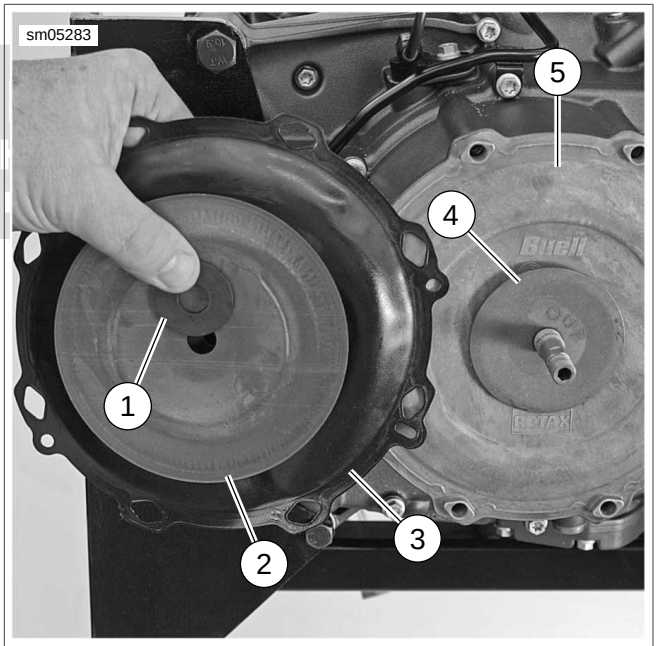



**Figure 6-29. Removing the Neck Nut from the Clutch Release Pin**

## VACUUM ASSIST DIAPHRAGM

### Removal

1. Remove the secondary clutch actuator and the cover. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.
2. See Figure 6-29. Hold the flat on the clutch release pin and turn off the nut.
3. See Figure 6-30. Remove the thrust washer (1), the outer disc plate (2), the diaphragm (3) and the inner disc plate (4).
4. Remove the inner clutch diaphragm cover (5).




1. **Thrust washer**
2. **Outer disc plate**
3. **Diaphragm**
4. **Inner disc plate**
5. **Inner cover**

**Figure 6-30. Vacuum Assist Diaphragm Components**

### Installation

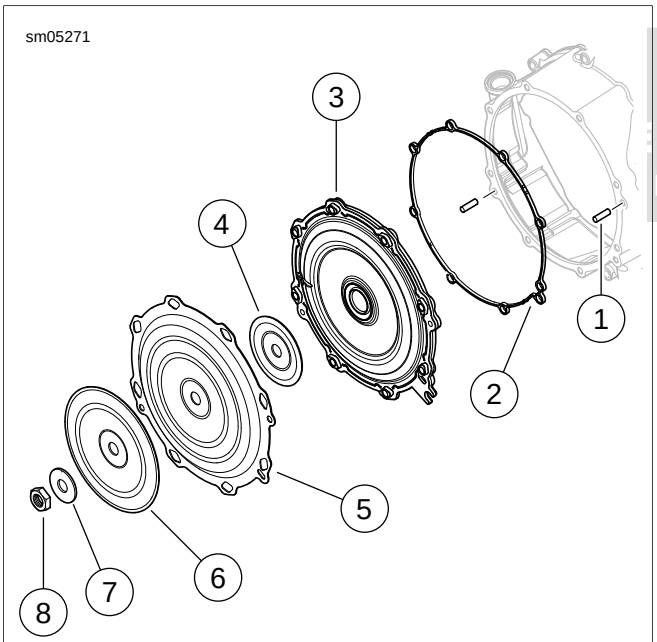
1. See Figure 6-31. Verify that the two needle pins (1) are in place in the clutch cover.
2. If removed, fit the gasket (2) to the inner cover.

3. Apply LUBRIPLATE No. 105 Motor Assembly Grease to the bore of the inner diaphragm cover.
4. Fit the diaphragm cover (3) with the embossed BUELL side out.
5. See Figure 6-32. Fit the inner disc plate (4) with the stamped word OUT side out.

*NOTE*

*See Figure 6-33. When fitting the inner cover and the diaphragm to the clutch cover, align the slotted features. The paired fastener holes and the clutch fluid line support fork on the inner cover should be in alignment.*

6. See Figure 6-31. Fit the open bowl shape of the diaphragm (5) to the inner disc plate and the cover.
7. See Figure 6-34. Fit the outer disc plate with the stamped word OUT side out.
8. Fit the thrust washer (7).
9. Apply LOCTITE 243 (blue) to the threads of the diaphragm clutch release pin nut.
10. Thread on the nut (8). Holding the flat of the clutch release pin, tighten to 15 Nm (133 **in-lbs**).
11. Install the secondary actuator and cover. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.




1. **Needle pin**
2. **Gasket**
3. **Inner diaphragm cover**
4. **Inner disc plate**
5. **Diaphragm**
6. **Outer disc plate**
7. **Thrust washer**
8. **Nut**

**Figure 6-31. Diaphragm Assembly**

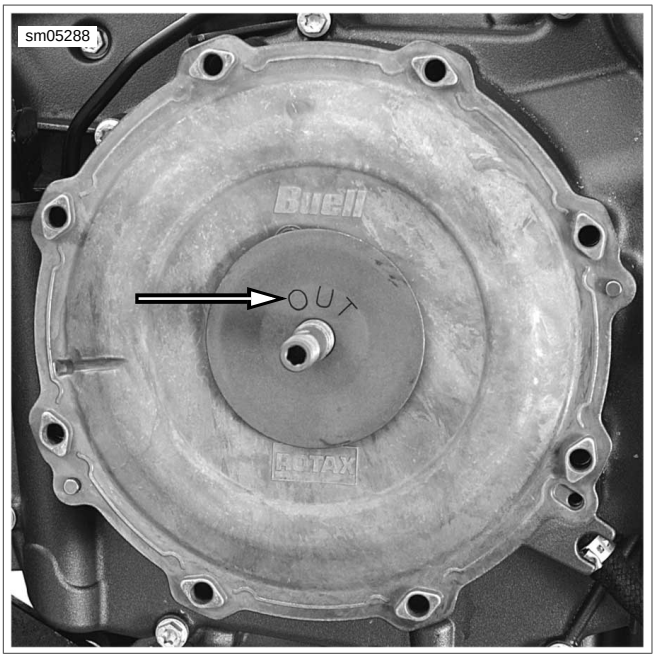



**Figure 6-32. Inner Diaphragm Cover and Disc Plate**

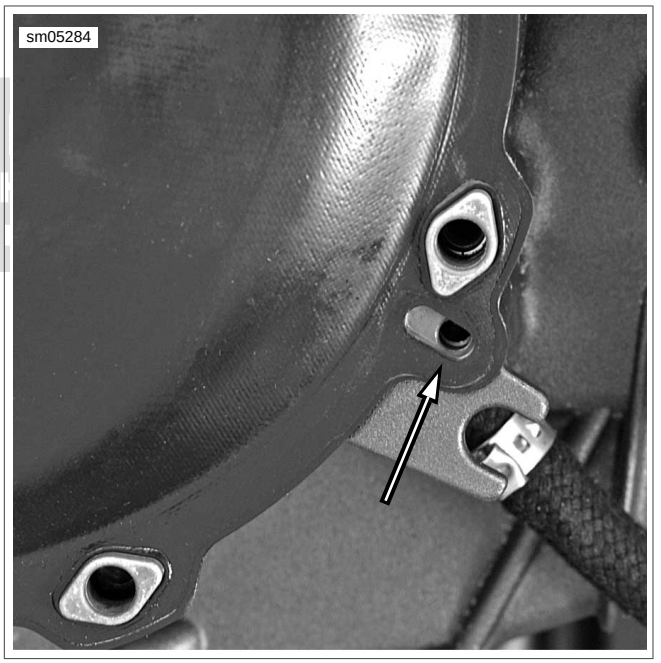



**Figure 6-33. Gasket, Inner Cover and Diaphragm Alignment**

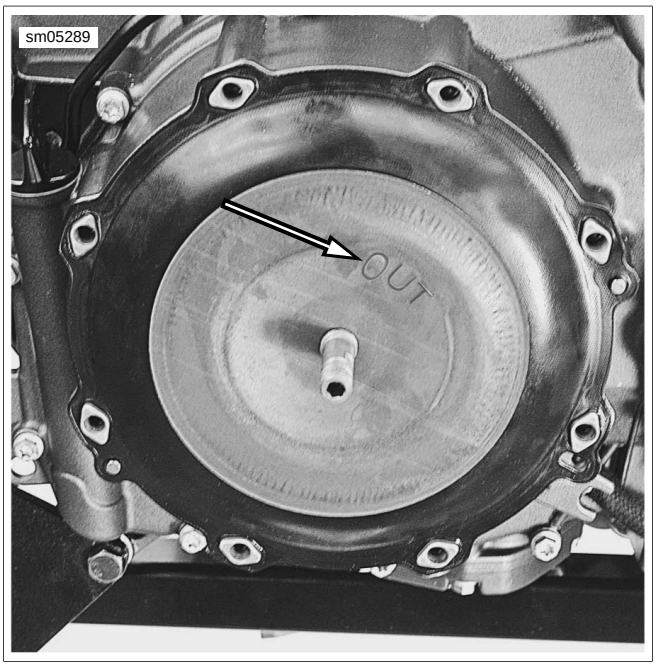



**Figure 6-34. Diaphragm and Outer Disc Plate**

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

## INNER DIAPHRAGM COVER OIL SEAL

| PART NUMBER | TOOL NAME |
|---|---|
| B-48863 | DIAPHRAGM OIL SEAL INSTALLER |
| HD-45907 | 4" UNIVERSAL DRIVER HANDLE |

1. Inspect the inner diaphragm cover and gasket. Remove if damaged.
2. See Figure 6-35. Pry the seal out of the cover.
3. Support the cover on the base of the DIAPHRAGM OIL SEAL INSTALLER (Part No. B-48863).
4. See Figure 6-36. Use the driver with any driver handle such as the 4" UNIVERSAL DRIVER HANDLE (Part No. HD-45907) and install the oil seal.
5. See Figure 6-37. If removed, fit a **new** gasket matching the double fastener rings with the double through holes on the cover.




**Figure 6-35. Diaphragm Oil Seal**

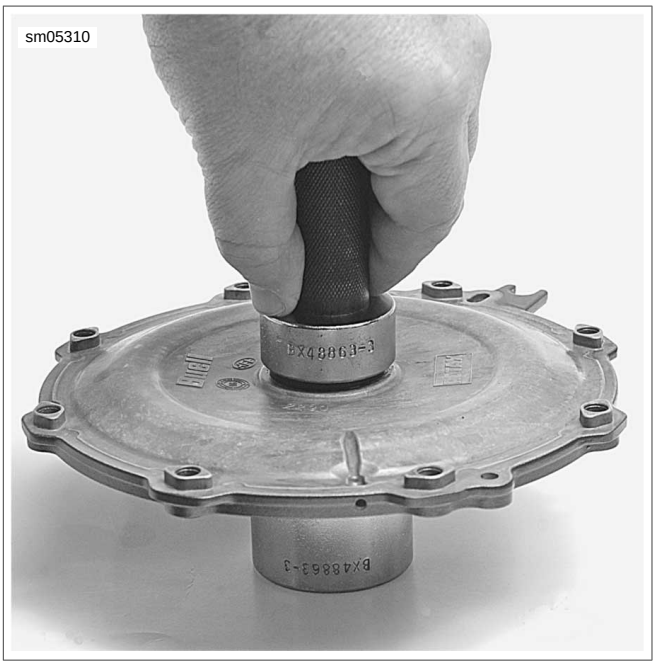



**Figure 6-36. Installing the Diaphragm Oil Seal**




**Figure 6-37. Gasket to Cover Matching Features**

## OIL JET

See Figure 6-38. The clutch shaft oil jet precisely meters oil flow from the transmission to the clutch cavity.

**⚠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 necessary, clean the orifice of the oil jet of debris with compressed air.

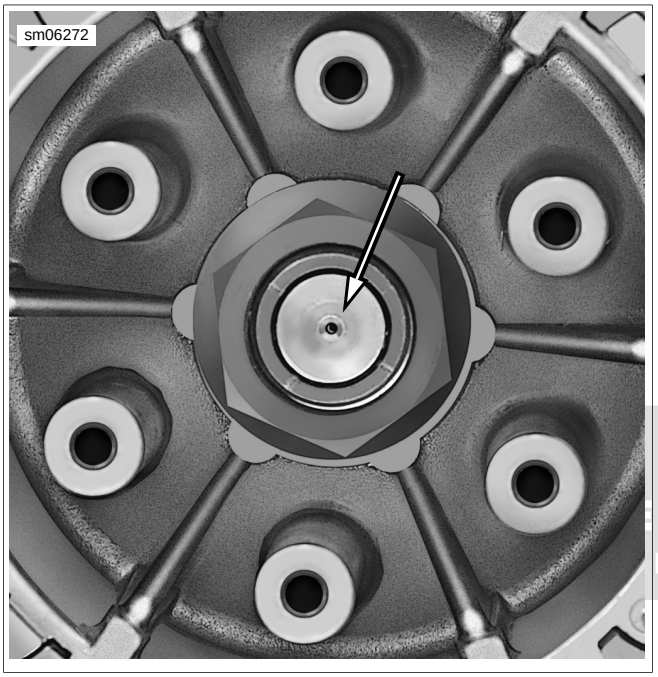
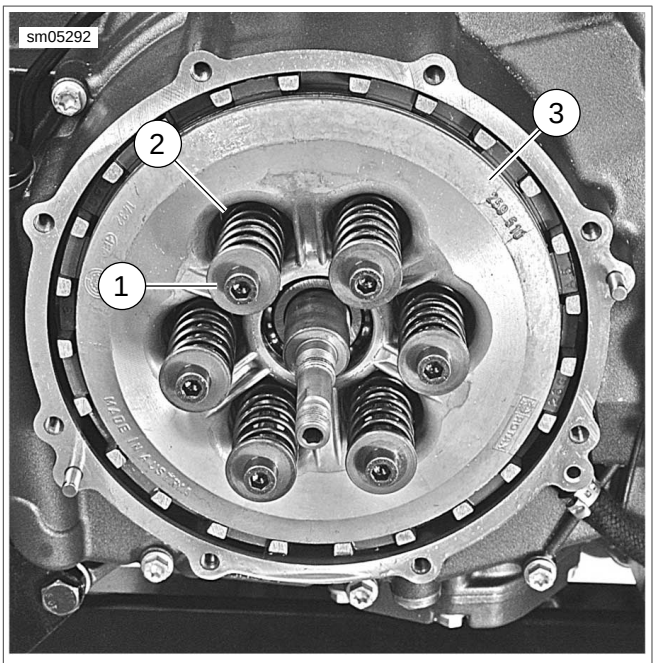



**Figure 6-38. Clutch Shaft Oil Jet**

## CLUTCH PACK

### Removal

1. Remove the secondary clutch actuator cover. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.
2. Remove the vacuum assist diaphragm. See 6.5 CLUTCH, Vacuum Assist Diaphragm.
3. See Figure 6-39. Slowly loosen (2-3 turns at a time) the spring fasteners in a crisscross pattern.
4. Remove the fasteners (1), springs (2) and the pressure plate (3).
5. See Figure 6-40. Remove the friction and steel plates from the clutch basket.




1. **Fasteners**
2. **Springs**
3. **Pressure plate**

**Figure 6-39. Clutch Springs and Pressure Plate**

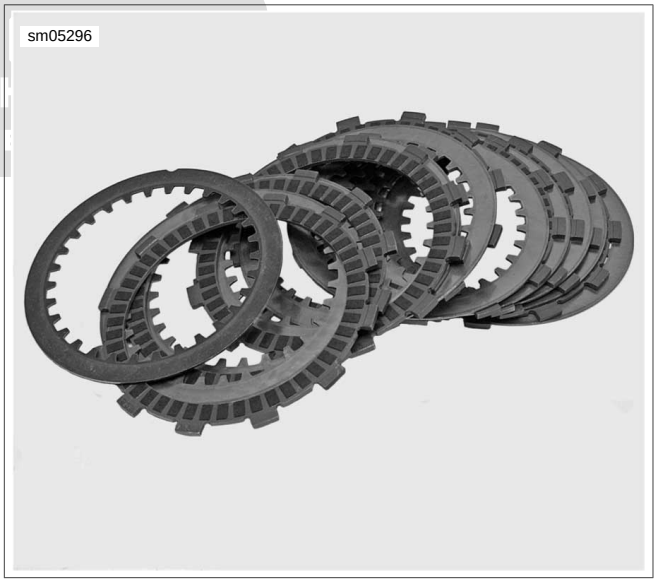



**Figure 6-40. Friction and Steel Clutch Plates**

### Clutch Springs

1. See Figure 6-41. Measure the free length of the clutch springs. If any one free length is less than specification, replace the set (6) of springs. Refer to Table 6-9.
2. See Figure 6-42. Measure the spring force at the specified length. If any one spring is less than specification, replace the set (6) of springs. Refer to Table 6-9.

**Table 6-9. Clutch Spring Specifications**

| FEATURE | METRIC | U.S. |
|---|---|---|
| Free length (min) | 57 mm | 2.244 in |
| Force at length | 190 N @ 26.4 mm | 42.71 lb @ 1.039 in |

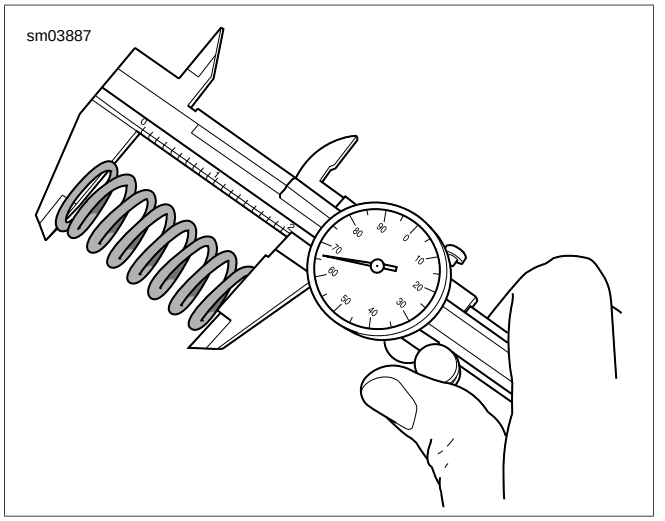



**Figure 6-41. Measure Clutch Spring Free Length**

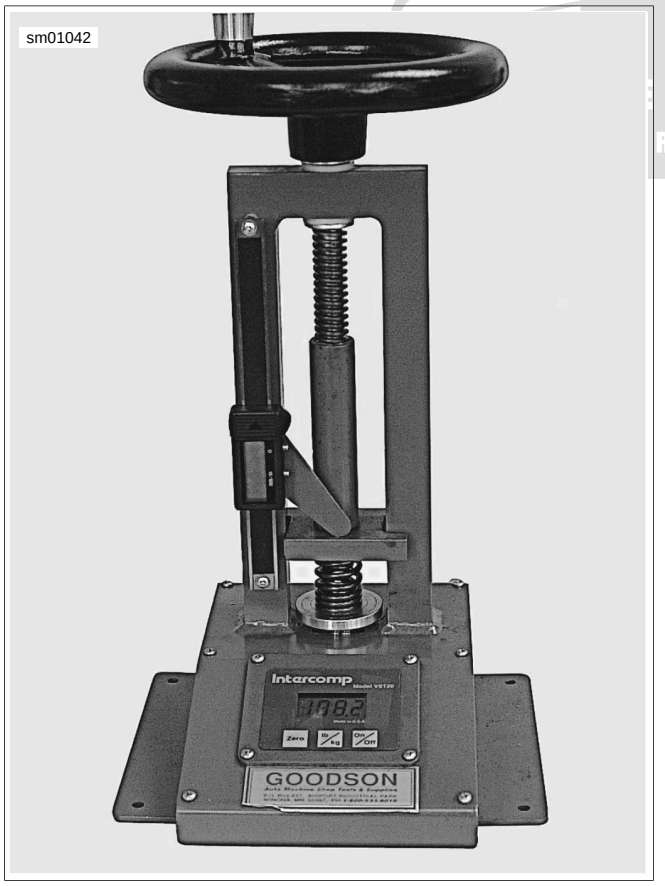



**Figure 6-42. Testing Valve Spring**

## Friction Plates

**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*

*Replace all nine friction plates if a single plate is worn or damaged.*

1. Blow off all lubricant from the friction plates. Do not wipe off with a rag.
2. Inspect (both sides) for worn or damaged fiber surface material.
3. Measure the thickness of the nine plate stack with a dial caliper or micrometer.
4. If the thickness is less than specification, discard all the plates, friction and steel and replace with **new** plates. Refer to Table 6-10.

## Steel Plates

*NOTE*

*Replace all nine steel plates if a single plate is worn or damaged.*

1. Inspect for grooved or blued plates. Replace as necessary.
2. Lay each plate on a precision flat surface. Identify the feeler gauge size that fits between the plate and the surface. If the gauge size exceeds specification, replace the plate. Refer to Table 6-10.

**Table 6-10. Clutch Plate Specifications**

| FEATURE | mm | in |
|---|---|---|
| Stacked (9) friction plate thickness (min) | 29.80 | 1.1730 |
| Steel plate warp allowance (max) | 0.15 | 0.0059 |

## Installation

*NOTE*

*Before assembly, soak the friction plates in engine oil for a minimum of 30 minutes.*

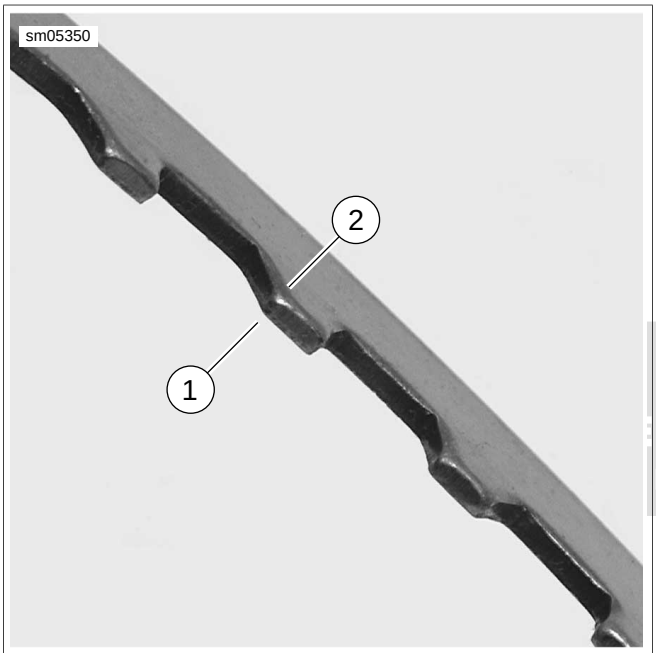
1. See Figure 6-44. Identify the steel plate with the extra notch on its circumference.

*NOTE*

*See Figure 6-43. All steel plates are installed with the sharp edge (1) inward and the rounded edge (2) outward.*

2. See Figure 6-45. Fit the notched steel plate in the clutch basket.
3. See Figure 6-46. Alternate friction and steel plates until the ears of eight friction plates are installed in the long slots (1) in the clutch basket.
4. Add a steel plate.

5. Stagger the last friction plate from the first eight so its ears sit in the short slots (2).
6. See Figure 6-47. Add the final steel plate.
7. Install the pressure plate.
8. See Figure 6-48. Fit the stepped washers and fasteners to the springs and install the springs.
9. Tighten the springs in a cross pattern until the fasteners bottom.
10. Tighten the fasteners to 10 Nm (89 **in-lbs**).
11. Install the vacuum assist diaphragm. See 6.5 CLUTCH, Vacuum Assist Diaphragm.
12. Install the secondary clutch actuator and cover. See 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator.




1. **Sharp edge**
2. **Rounded Edge**

**Figure 6-43. Sharp and Rounded Edge Steel Plate**




**Figure 6-44. Notch in First Steel Plate**

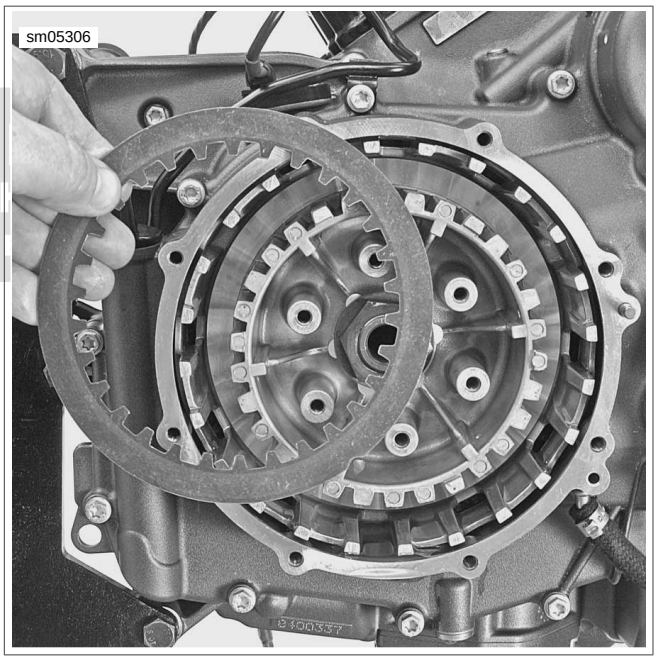
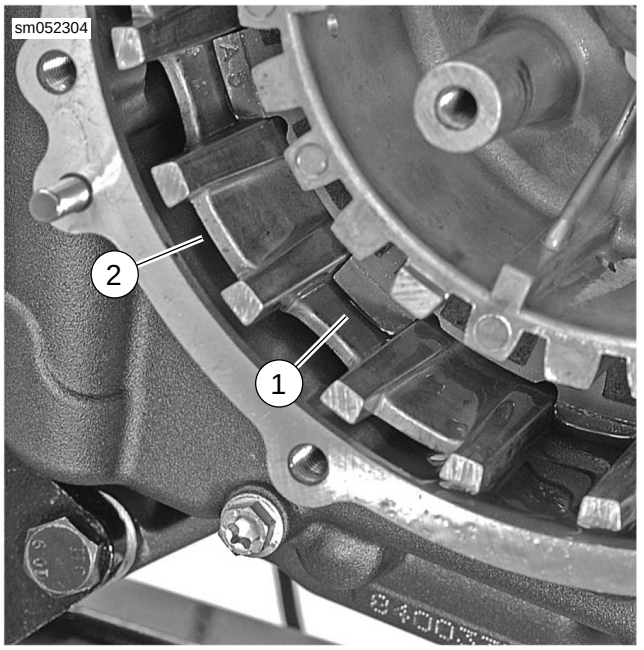



**Figure 6-45. Fit Notched Plate to Clutch Basket**




1. **Long slot**
2. **Short slot**

**Figure 6-46. Friction Plates in Basket Slots**

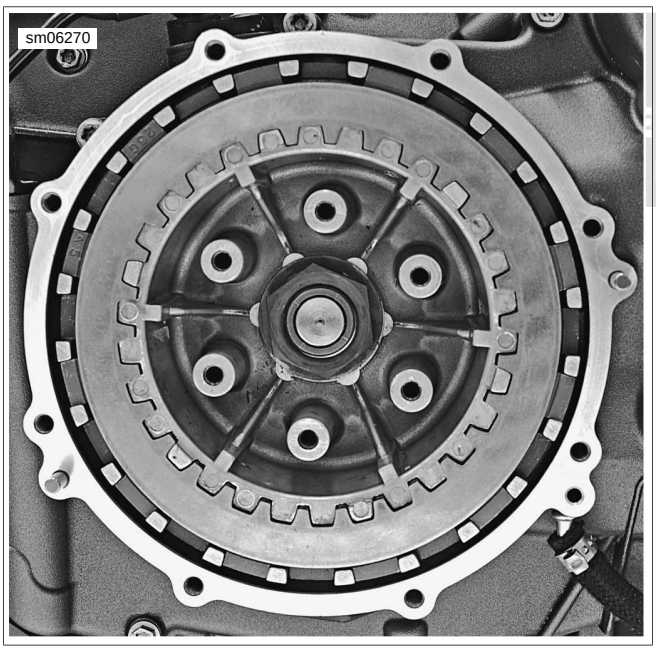



**Figure 6-47. Clutch Pack in Clutch Basket**

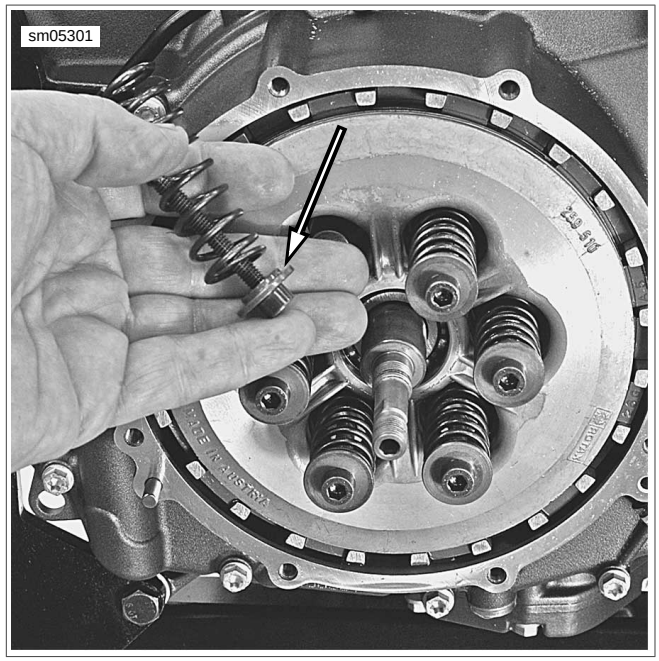



**Figure 6-48. Stepped Washers**

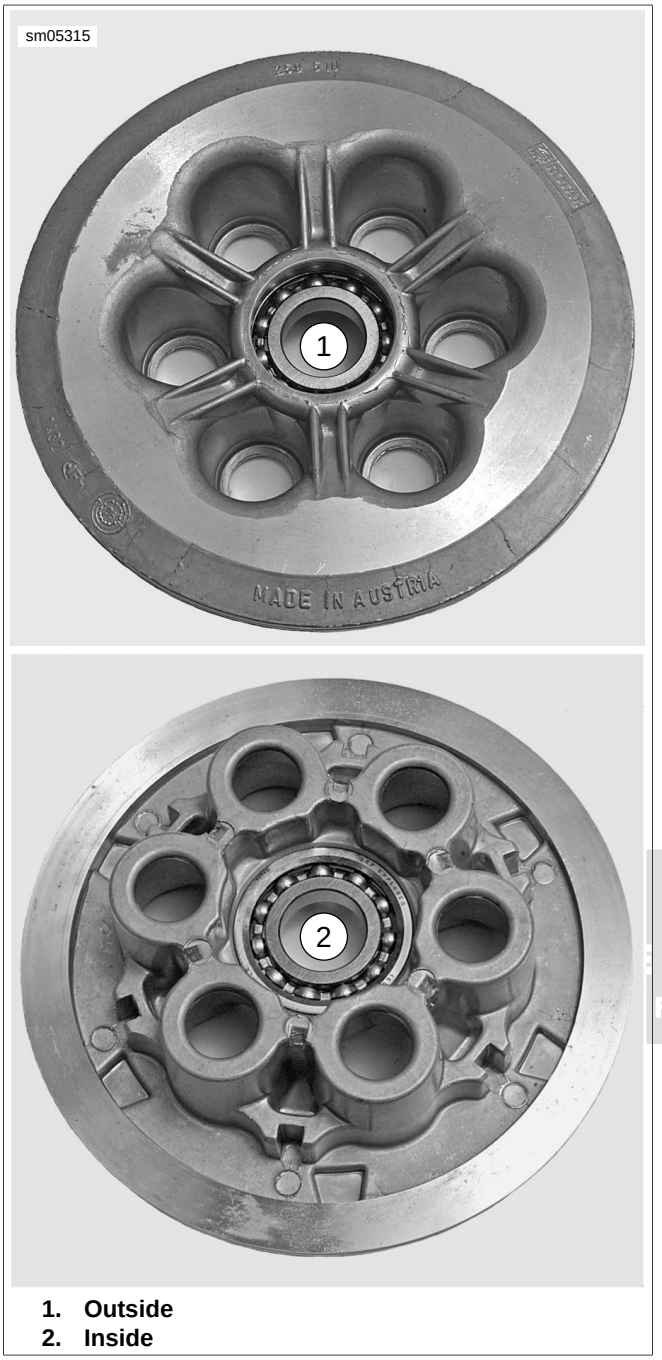
## PRESSURE PLATE BEARING

1. Spin the clutch release pin in the pressure plate bearings. If the bearing is damaged or turns rough, replace the pin and the bearing.
2. See Figure 6-49. Drive out the bearing from the outside.

*NOTE*

*The bearing is pressed in with the part numbers on the race facing toward the driver.*

3. Identify a correspondingly sized driver and drive the bearing until it seats from the inside of the plate.




1. **Outside**
2. **Inside**

**Figure 6-49. Pressure Plate Bearing**

## CLUTCH BASKET

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |
| B-48859 | CLUTCH HUB LOCKING TOOL |

### Removal

1. Lock the crankshaft with the CRANKSHAFT LOCKING TOOL (Part No. B-48858).
2. See Figure 6-50. Use the CLUTCH HUB LOCKING TOOL (Part No. B-48859) to lock the clutch hub to the clutch drum.
3. See Figure 6-51. Fit the locking tool in the long slots of the clutch drum engaging the teeth of the tool with the slots in the clutch drum.
4. Remove the transmission mainshaft nut.
5. Lift off the clutch basket assembly with the spring washer, the thrust ring, the oil pump gear drive and the thrust washer.

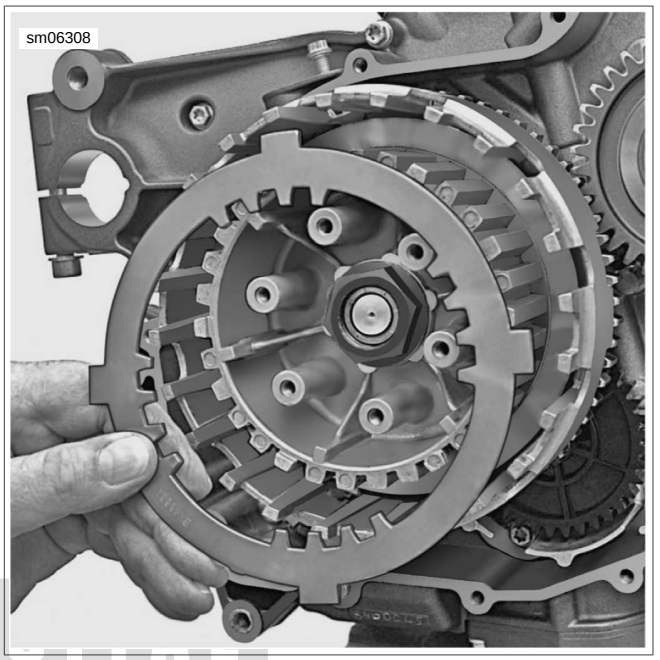



**Figure 6-50. Clutch Hub Locking Tool**

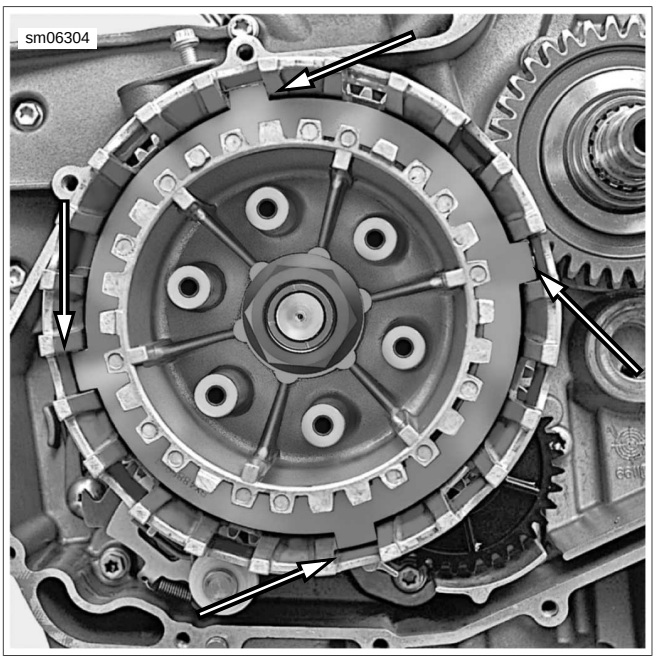
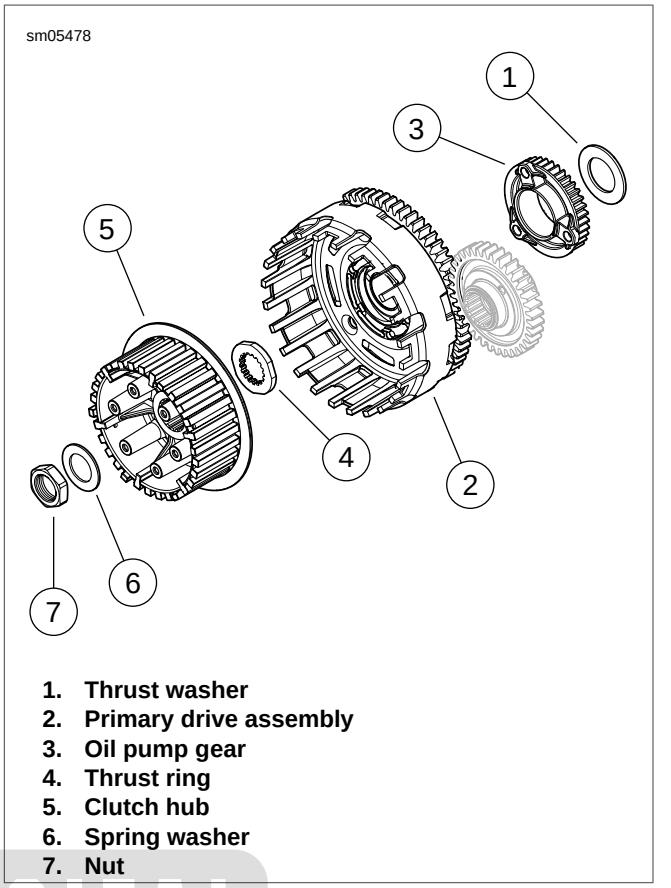



**Figure 6-51. Clutch Hub Locking Tool Installed**

## Installation

1. Liberally apply LUBRIPLATE No. 105 Motor Assembly Grease to the splines of the mainshaft, the splines of the primary drive assembly and to the thrust washer and ring.
2. See Figure 6-52. Fit the thrust washer (1) over the mainshaft.
3. Slide the primary drive assembly (2) with the oil pump gear (3) over the splines engaging the primary drive engine sprocket.
4. Fit the thrust ring (4) over the splines inside the primary drive assembly.
5. Slide the clutch hub (5) over the splines inside the clutch drum.
6. Add the spring washer (6).
7. Apply LOCTITE 648 (green) to the threads of the mainshaft nut (7).
8. Install and tighten the clutch hub nut to 170 Nm (125 ft-lbs).




1. **Thrust washer**
2. **Primary drive assembly**
3. **Oil pump gear**
4. **Thrust ring**
5. **Clutch hub**
6. **Spring washer**
7. **Nut**

**Figure 6-52. Clutch Basket Assembly**

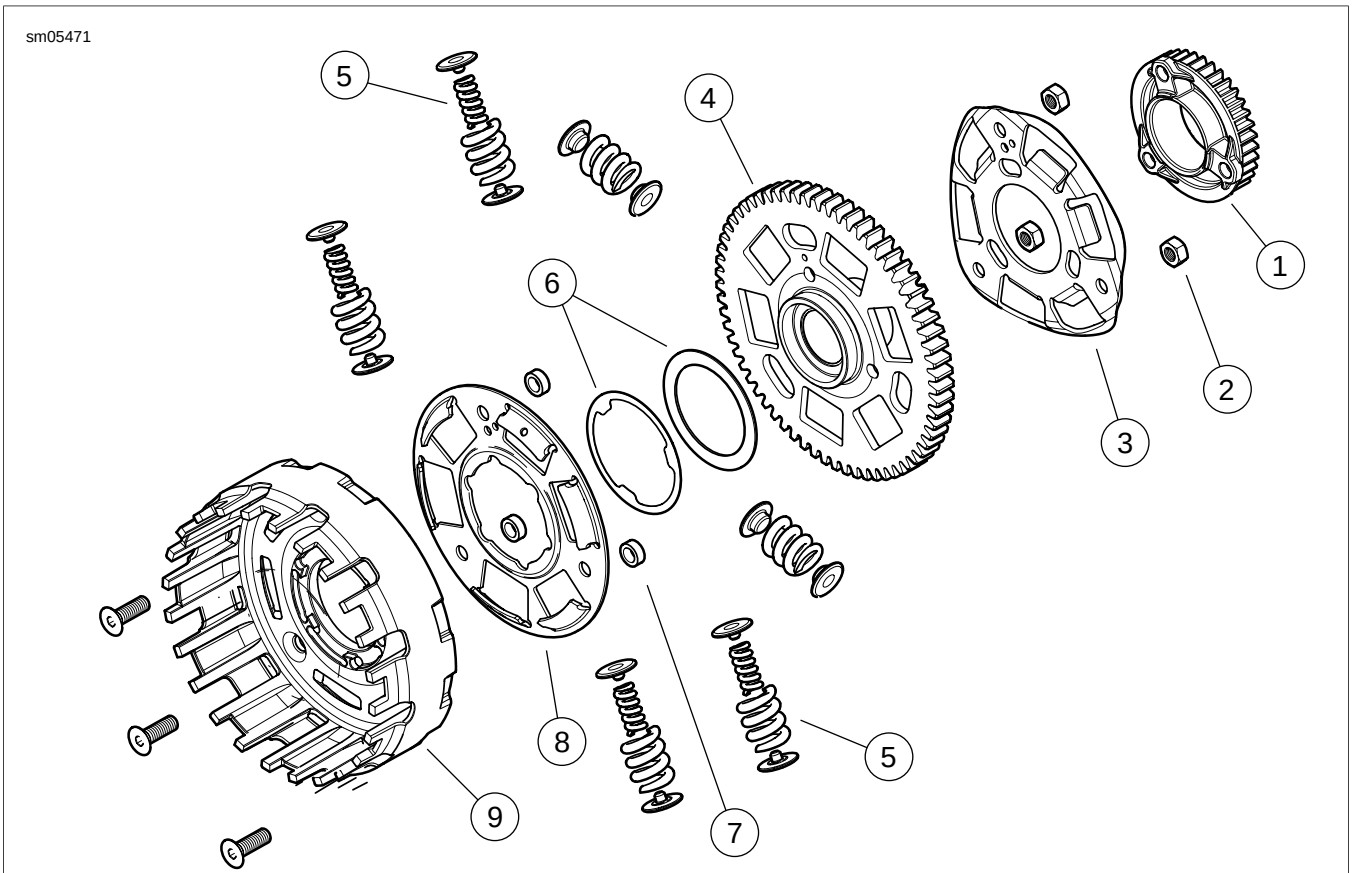
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# PRIMARY DRIVE 6.6

## PRIMARY DRIVE ASSEMBLY

### Disassembly

1. See Figure 6-53. Slide the oil pump gear (1) off the assembly.
2. Remove the three nuts (2).
3. Disassemble the outer support plate (3), the primary drive gear (4), the spring stacks (5), the drive washers (6), the fastener sleeves (7) and the inner support plate (8) from the clutch drum (9).
4. Inspect and replace as necessary.




1. **Oil pump gear**
2. **Nuts**
3. **Outer support plate**
4. **Primary drive gear**
5. **Spring stack**
6. **Drive washers**
7. **Sleeves**
8. **Inner support plate**
9. **Clutch drum**

**Figure 6-53. Primary Drive Assembly**

### Assembly

1. Lubricate all parts with engine oil.
2. See Figure 6-54. Fit the lower spring cage to the clutch drum.

*NOTE*

*See Figure 6-55. Fit the locating hole on the spring cage to the pin on the clutch drum.*

3. See Figure 6-56. Assemble the four double spring stacks.
4. See Figure 6-57. Assemble the two single spring stacks.
5. See Figure 6-58. From the locating hole (1), place the four double spring stacks (2) and the two single spring stacks (3). The spring stacks must be oriented as shown.
6. Fit the three stand off sleeves.

7. See Figure 6-59. Fit the primary drive washer with the three tabs and the cupped washer facing the clutch drum.
8. Fit the primary drive gear over the spring stacks with the locating hole matching the locating hole on the inner support plate and with the locating pins for the oil pump facing out.
9. Fit the outer support plate over the primary drive gear and the spring stacks.
10. Apply LOCTITE 648 (green) to the threads of the assembly screws.
11. Fit the screws through the clutch drum, inner support plate, the sleeves and the outer support plate. Thread on the nuts.
12. Initial tighten the fasteners to 12 Nm (106 **in-lbs**).
13. Final tighten the fasteners to 30 Nm (22.1 ft-lbs).
14. See Figure 6-60. Match the holes on the inside of the oil pump gear to the pegs on the primary drive gear.




**Figure 6-54. Inner Support Plate and Clutch Drum**

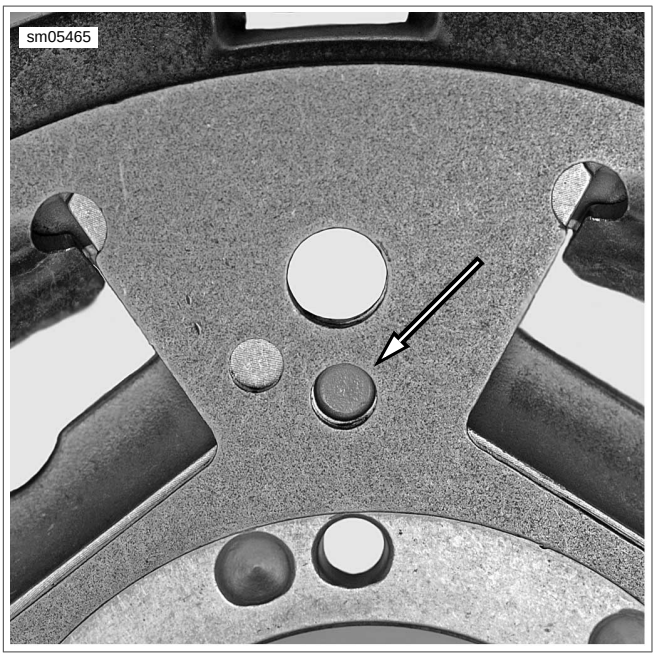



**Figure 6-55. Alignment Peg**

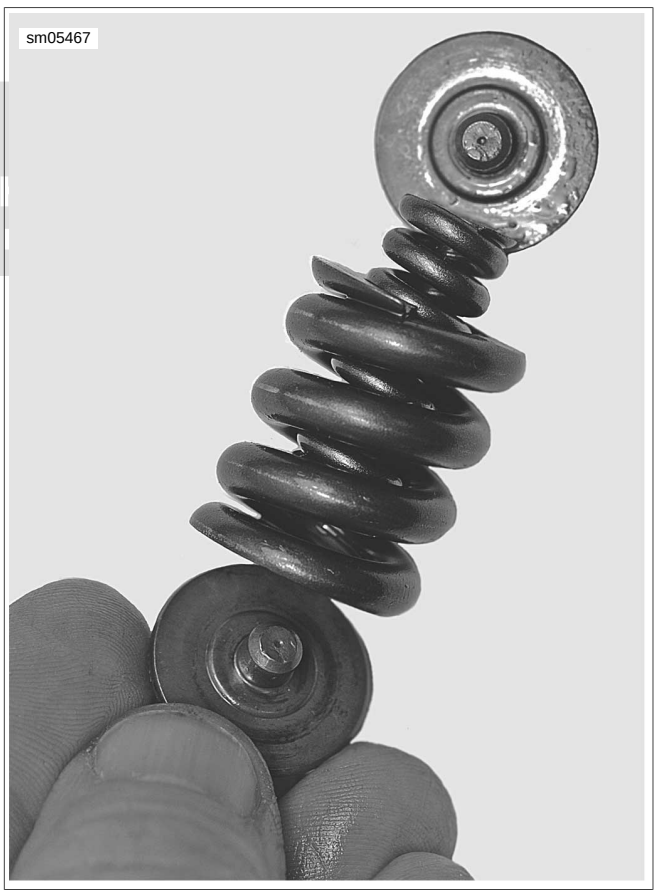


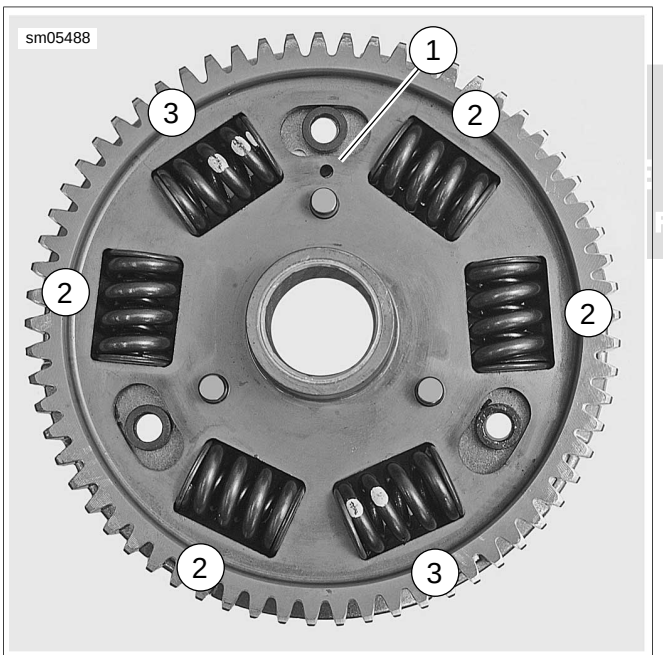

**Figure 6-56. Double Springs and Button Washers**




**Figure 6-57. Single Spring Stack with Large Button Washers**




**Figure 6-59. Cupped Primary Drive Washer**




1. **Locating hole**
2. **Double spring**
3. **Single spring**

**Figure 6-58. Spring Arrangement**

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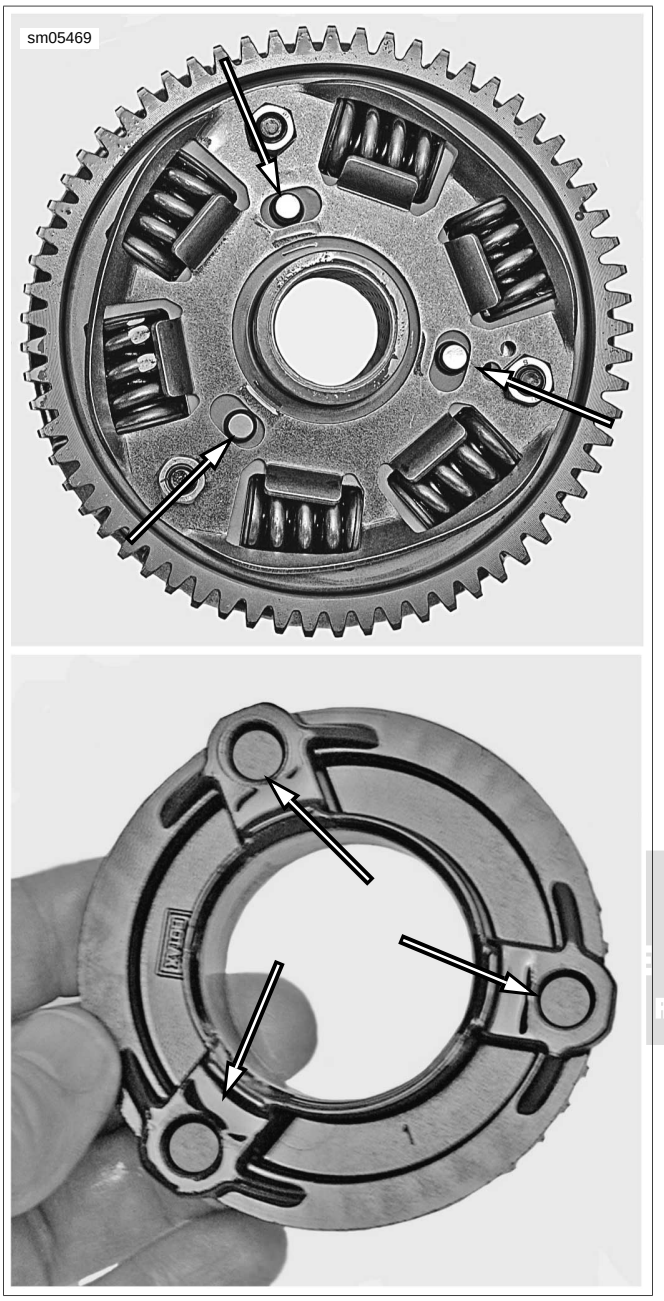
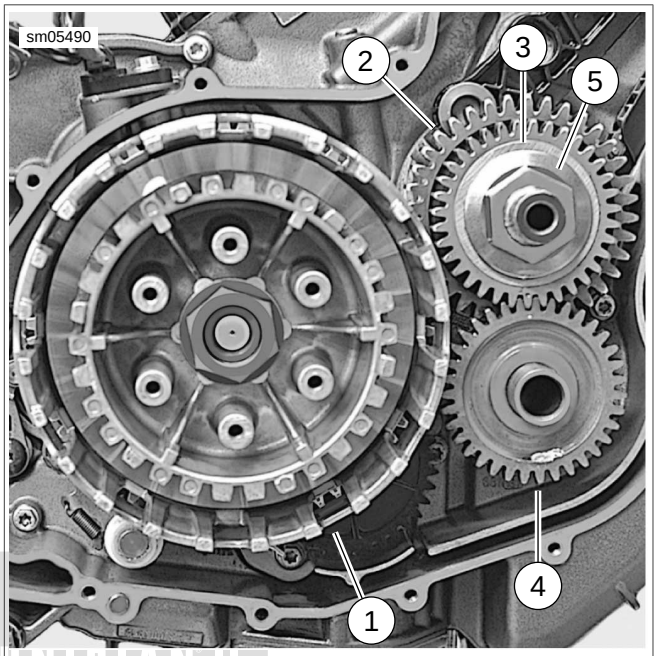



Figure 6-60. Matching Oil Pump Gear Features

## PRIMARY DRIVE ENGINE SPROCKET

See Figure 6-61. The primary drive assembly (1) can be removed without removing the engine sprocket (2). The engine sprocket is located behind and pinned to the drive gear (3).

The engine sprocket is a double sprocket. The second sprocket is the front cylinder cam chain drive sprocket. To remove the primary sprocket, disassemble the cam chain drive. See 3.12 VALVE TRAIN DRIVE.



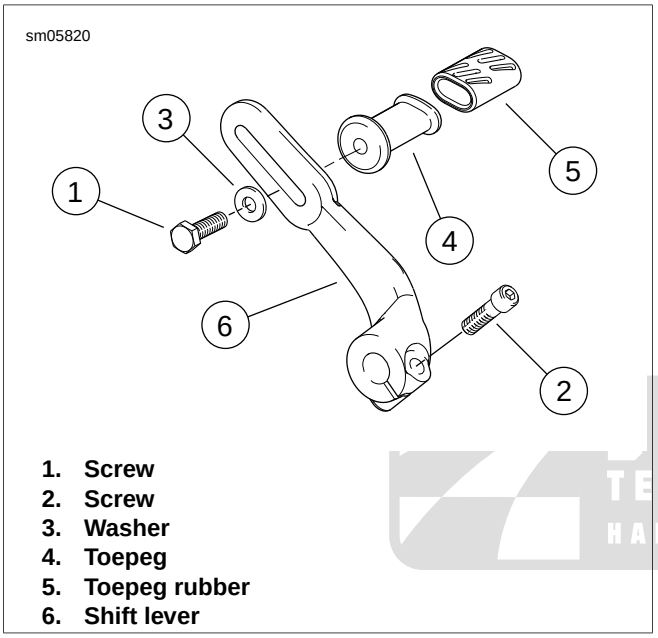

1. Primary drive assembly
2. Engine sprocket
3. Balancer drive gear
4. Bottom balancer
5. Crankshaft nut

Figure 6-61. Primary Drive

# SHIFT LINKAGE 6.7

## SHIFT LEVER

1. See Figure 6-62. Remove screw (2) from shift lever (6).
2. Remove screw (1) and washer (3) to remove toepeg (4).
3. To assemble shift lever, install screw (1) through washer, shift lever and toepeg. Tighten to 5.4-8.1 Nm (48-72 **in-lbs**).
4. To install shift lever, fit end of shift lever onto protruding end of gear shift shaft, interlocking splines.
5. Install screw (2) and tighten to 9.6-10.6 Nm (85-94 **in-lbs**).




1. **Screw**
2. **Screw**
3. **Washer**
4. **Toepeg**
5. **Toepeg rubber**
6. **Shift lever**

**Figure 6-62. Gear Shift Lever**

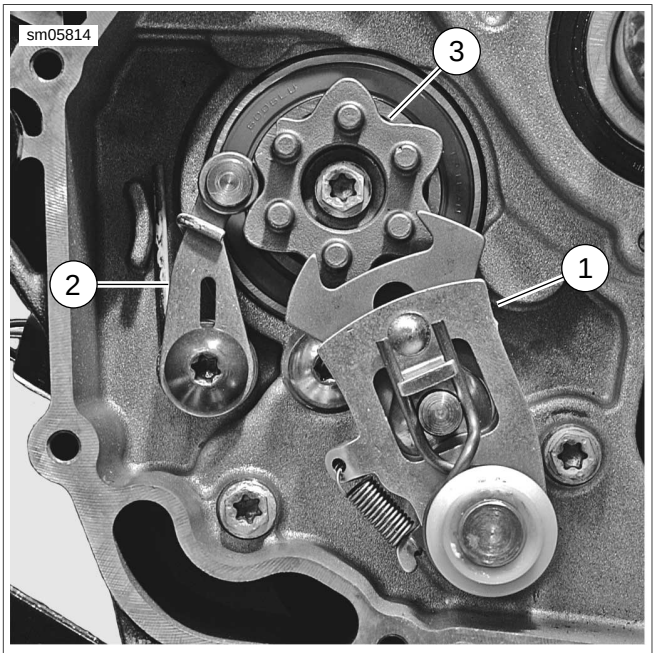
## SHIFT SHAFT

### Removal and Disassembly

1. See Figure 6-63. Remove pin and shift shaft assembly from crankcase.
2. See Figure 6-64. Remove retaining ring (2) and step ring (3) from shift shaft (1).
3. Remove spring (5), then remove shift pawl (4), step sleeve (7) and spring (6) from the shaft.

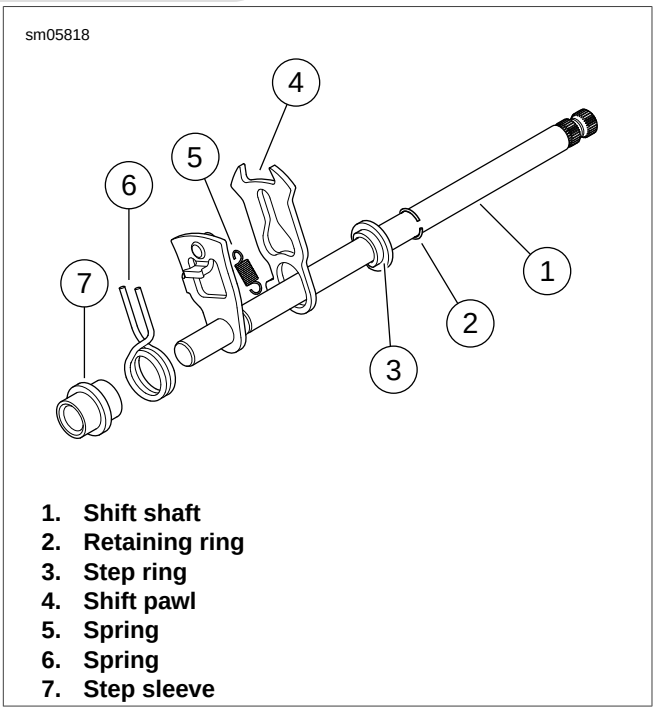
### Assembly and Installation

1. See Figure 6-65. Install large spring and step sleeve as shown.
2. Install shift pawl and hook over knob on shaft weldment.
3. Attach small spring to shaft weldment and shift pawl.
4. See Figure 6-64. Install step ring onto shaft.
5. Install a **new** retaining ring in groove in shaft.
6. Grease splined end of shaft and insert into crankcase.
7. Install pin through shift pawl and shift shaft weldment into crankcase.




1. **Shift shaft**
2. **Detent wheel**
3. **Index shim**

**Figure 6-63. Shift Linkage**




1. **Shift shaft**
2. **Retaining ring**
3. **Step ring**
4. **Shift pawl**
5. **Spring**
6. **Spring**
7. **Step sleeve**

**Figure 6-64. Shift Shaft Assembly**

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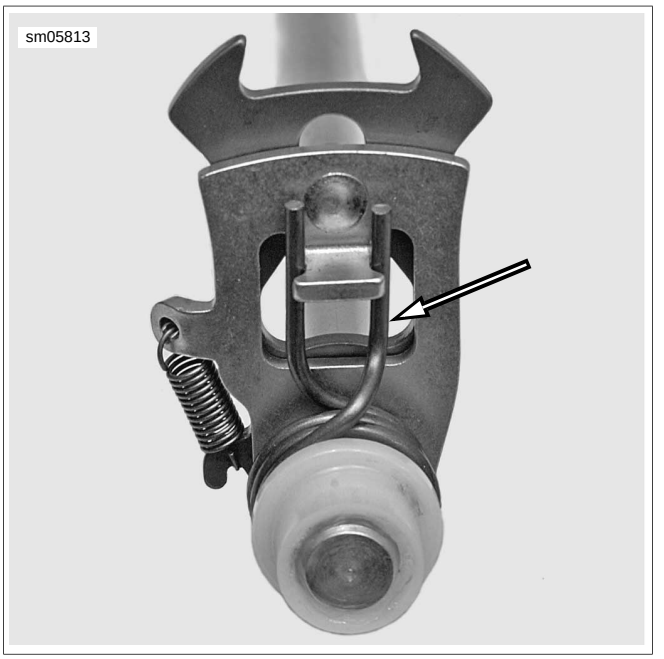



Figure 6-65. Shift Shaft Spring

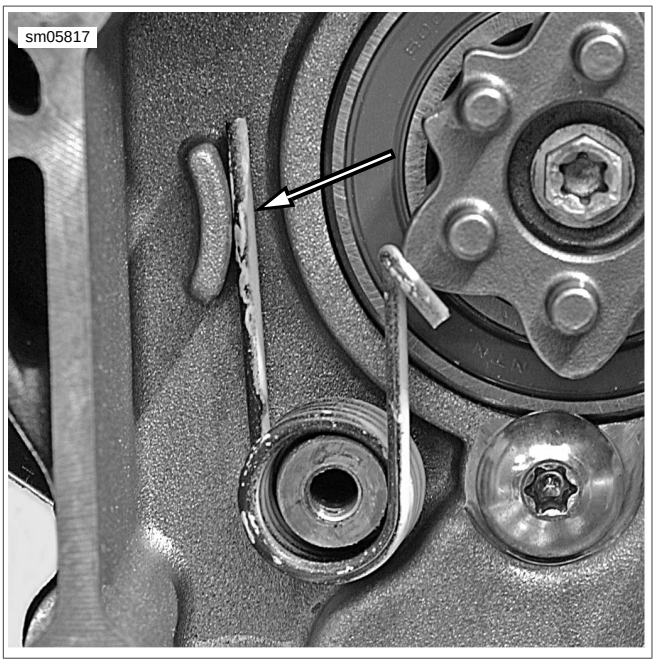



Figure 6-67. Spring Lever Arm in Front of Stop

## DETENT WHEEL

1. See Figure 6-66. Remove fastener, index lever, step ring and spring.
2. See Figure 6-67. To install, position spring on crankcase bore.
3. See Figure 6-68. Install step ring (2) and index lever (3), and secure with fastener (4). Tighten to 11 Nm (97 **in-lbs**).

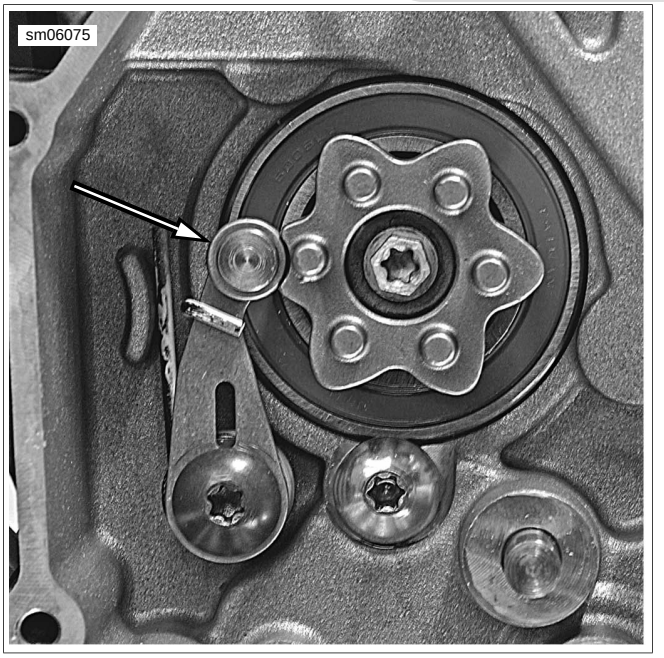
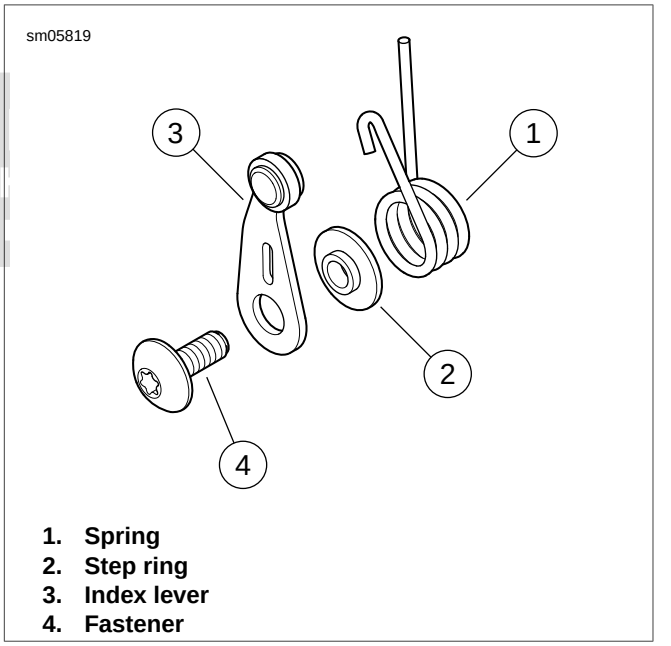



Figure 6-66. Detent Wheel




1. **Spring**
2. **Step ring**
3. **Index lever**
4. **Fastener**

Figure 6-68. Detent Wheel and Index Lever

## INDEX SHIM

1. See Figure 6-70. Remove fastener (1) and index shim (2).
2. See Figure 6-69. To install, fit index shim locating pin to shift drum bore.
3. Apply LOCTITE 243 (blue) to the index shim fastener.
4. Secure index shim to shift drum. Tighten to 11 Nm (97 **in-lbs**).

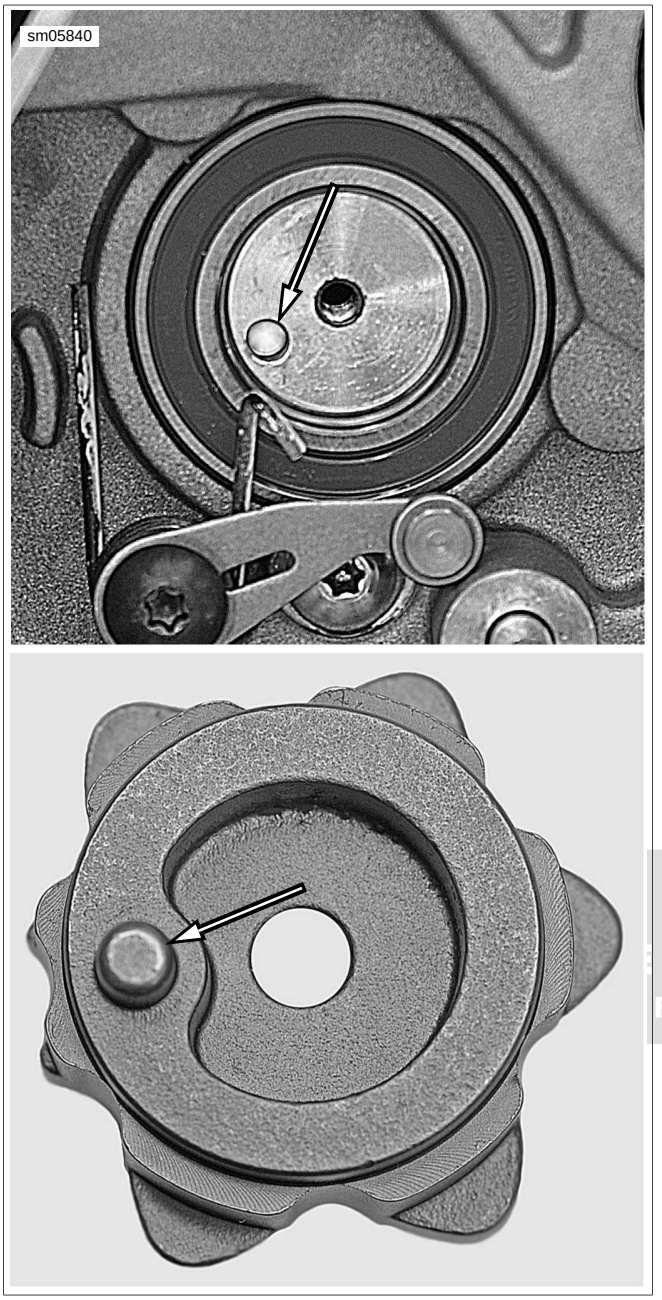
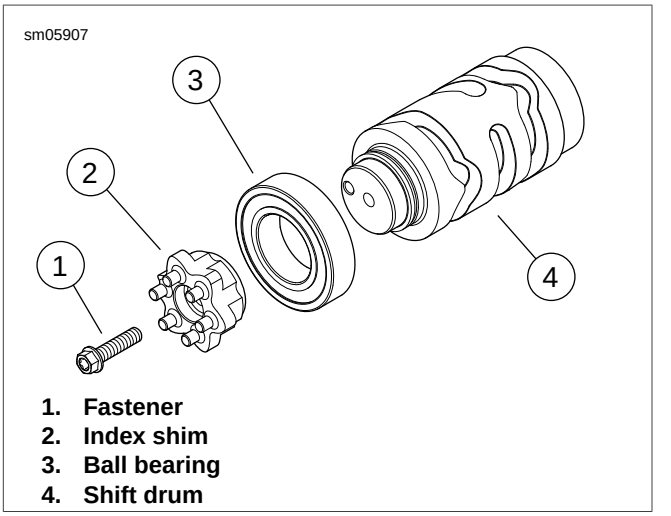



Figure 6-69. Index Shim/Fork Drum Locating Pin




1. **Fastener**
2. **Index shim**
3. **Ball bearing**
4. **Shift drum**

Figure 6-70. Index Shim and Shift Drum

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## VSS TRIGGER WHEEL

### Removal

1. Lock the final drive. See 6.10 FINAL DRIVE SPROCKET, Pulley Assembly.
2. See Figure 6-71. Remove fastener and trigger wheel.

### Installation

1. See Figure 6-72. Position trigger wheel on ball bearing in crankcase.
2. See Figure 6-73. Apply LOCTITE 243 (blue) to the fastener and install the trigger wheel with OUT facing cover.
3. Tighten to 30 Nm (22 ft-lbs).




Figure 6-71. Trigger Wheel

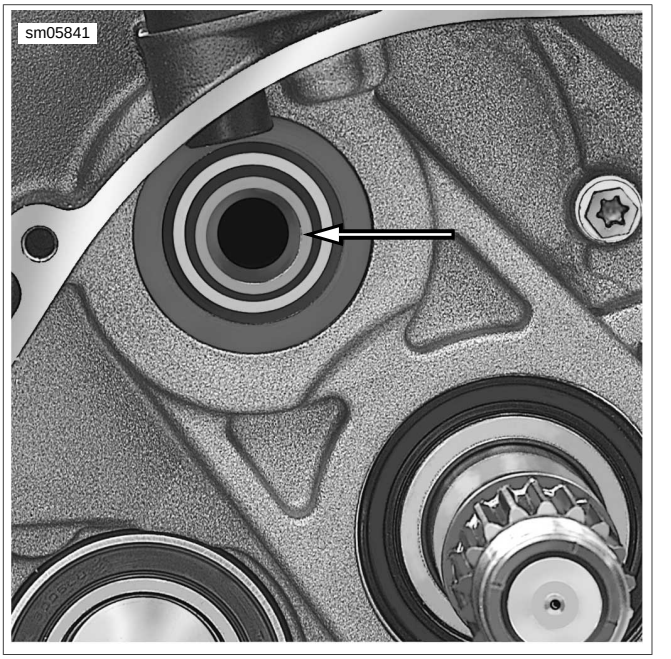



Figure 6-72. Mainshaft/VSS Trigger Wheel Location



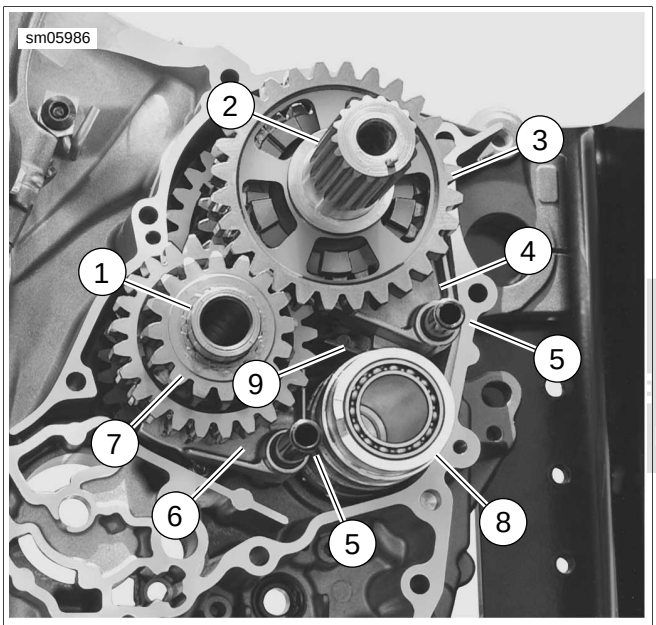

Figure 6-73. VSS Trigger Wheel and Fastener

## TRANSMISSION: REMOVAL

*NOTES*

*Always replace the shift shaft seals located in each crankcase half when the cases are separated.*

1. See Figure 6-74. Remove the fork spindles (5).
2. Tap lightly on the alternate ends of the clutch shaft and mainshaft with a plastic hammer to access components.
3. Remove the 2nd-4th fork (4).
4. Swing the 5th-6th fork out and away from shift drum.
5. Pull the shift drum (8) out until the 1st-3rd shift fork swings free from the shift drum and remove the shift drum and forks.
6. Tap lightly on alternate ends of the clutch shaft and mainshaft to remove the shafts.




1. **Clutch shaft**
2. **Mainshaft**
3. **Mainshaft free pinion, 28T**
4. **2nd-4th fork**
5. **Fork spindles**
6. **5th-6th fork**
7. **Clutch shaft gear, 16T**
8. **Shift drum**
9. **1st-3rd fork**

**Figure 6-74. Transmission Assembly**

## MAINSHAFT

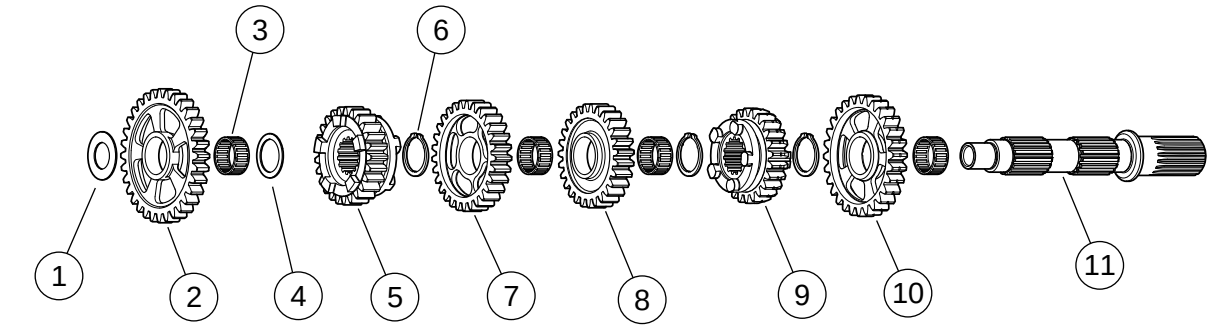
| PART NUMBER | TOOL NAME |
|---|---|
| J-5586A | TRANSMISSION SHAFT RETAINING RING PLIERS |

### 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)**

1. See Figure 6-75. Remove shim (1) and 32 tooth free pinion (2).
2. Remove needle bearing (3) and thrust washer (4).
3. Remove 25 tooth gear pinion (5) from mainshaft (11).
4. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A), expand and remove retaining ring (6). Discard retaining ring.
5. Remove 29 tooth free pinion (7) and needle bearing (3) from mainshaft.
6. Remove 27 tooth free pinion (8) and needle bearing (3) from mainshaft.
7. Expand and remove retaining ring (6). Discard retaining ring.
8. Remove 24 tooth gear pinion (9) from mainshaft.
9. Expand and remove final retaining ring (6) on mainshaft. Discard retaining ring.
10. Remove 28 tooth free pinion (10) and needle bearing (3) from mainshaft.




1. **Shim**
2. **32 tooth free pinion**
3. **Needle bearing**
4. **Thrust washer**
5. **25 tooth gear pinion**
6. **Retaining ring**
7. **29 tooth free pinion**
8. **27 tooth free pinion**
9. **24 tooth gear pinion**
10. **28 tooth free pinion**
11. **Mainshaft**

**Figure 6-75. Transmission Mainshaft**

## Assembly

*NOTE*

*Apply a light film of clean engine oil to the crankshaft, bearings and bearing surfaces.*

1. See Figure 6-75. Install **new** needle bearing (3) in 2nd gear position on mainshaft (11).
2. Install 28 tooth free pinion (10).
3. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A), expand and install **new** retaining ring (6).
4. Install 24 tooth gear pinion (9).
5. Expand and install **new** retaining ring (6).
6. Install **new** needle bearing in 4th gear position on mainshaft.
7. Install 27 tooth free pinion (8).
8. Install **new** needle bearing in 3rd gear position on mainshaft.
9. Install 29 tooth free pinion (7).
10. Expand and install **new** retaining ring (6).
11. Install 25 tooth gear pinion (5).
12. Install thrust washer (4).
13. Install **new** needle bearing in 1st gear position on mainshaft.
14. Install 32 tooth free pinion (2) with shim (1).

## CLUTCH SHAFT

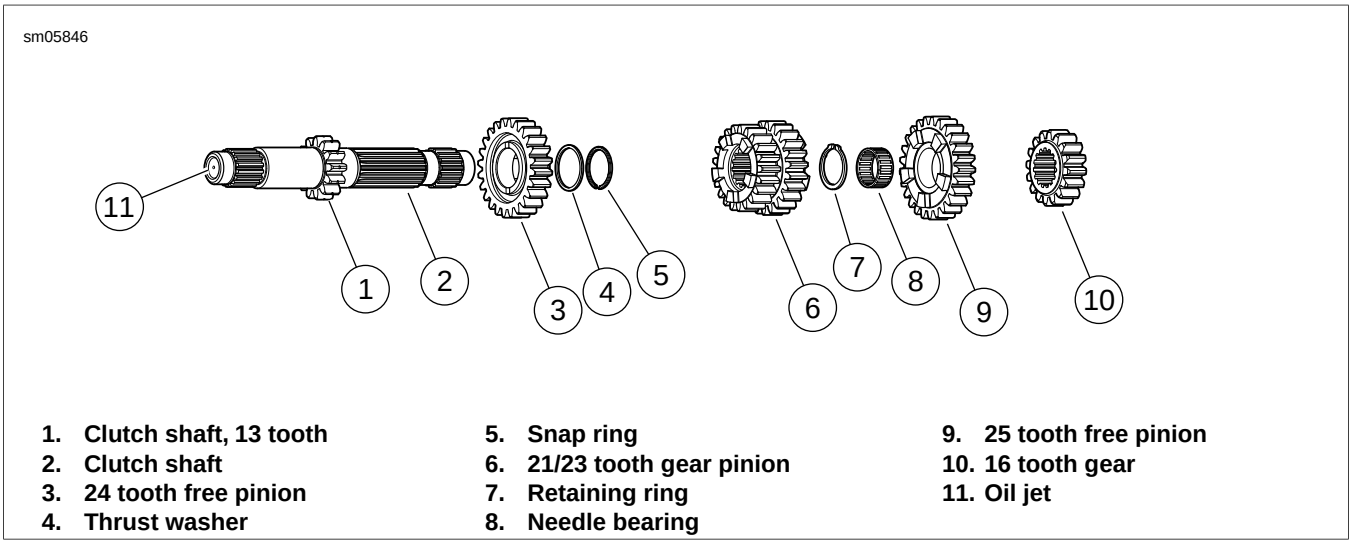
| PART NUMBER | TOOL NAME |
|---|---|
| J-5586A | TRANSMISSION SHAFT RETAINING RING PLIERS |

## 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)**

1. See Figure 6-76. Remove the 16 tooth gear (10) from the end of the clutch shaft (2).
2. Remove the 25 tooth free pinion (9) along with needle bearing (8) from the clutch shaft.
3. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A), expand and remove the retaining ring (7). Discard the retaining ring.
4. Remove the 21/23 tooth gear pinion (6).
5. Expand and remove the snap ring (5). Discard the snap ring.
6. Remove the thrust washer (4) and 24 tooth free pinion (3) from the clutch shaft.
7. As necessary, clean the oil jet (11).




1. **Clutch shaft, 13 tooth**
2. **Clutch shaft**
3. **24 tooth free pinion**
4. **Thrust washer**
5. **Snap ring**
6. **21/23 tooth gear pinion**
7. **Retaining ring**
8. **Needle bearing**
9. **25 tooth free pinion**
10. **16 tooth gear**
11. **Oil jet**

**Figure 6-76. Transmission Clutch Shaft**

## Assembly

*NOTE*

*Apply a light film of clean engine oil to the clutch shaft, bearings and bearing surfaces.*

1. See Figure 6-76. Install the 24 tooth free pinion (3) onto clutch shaft (2).
2. Install the thrust washer (4).
3. Expand and install a **new** snap ring (5).
4. Install the 21/23 gear pinion (6).
5. See Figure 6-77. Expand and install a **new** retaining ring.
6. See Figure 6-76. Install a **new** needle bearing (8) in 6th gear position on clutch shaft.
7. Install the 25 tooth free pinion (9).
8. Install the 2nd gear pinion (10).

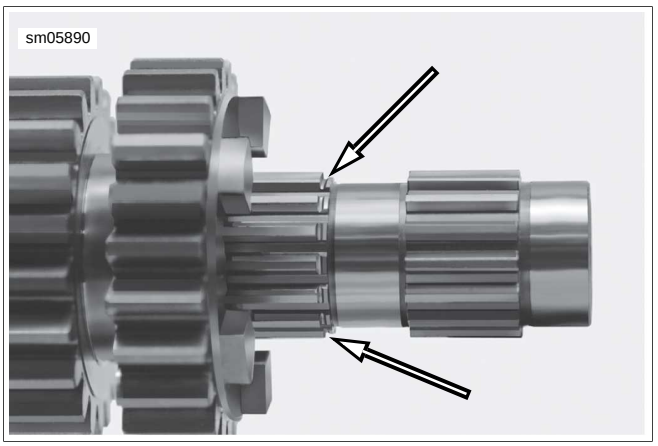
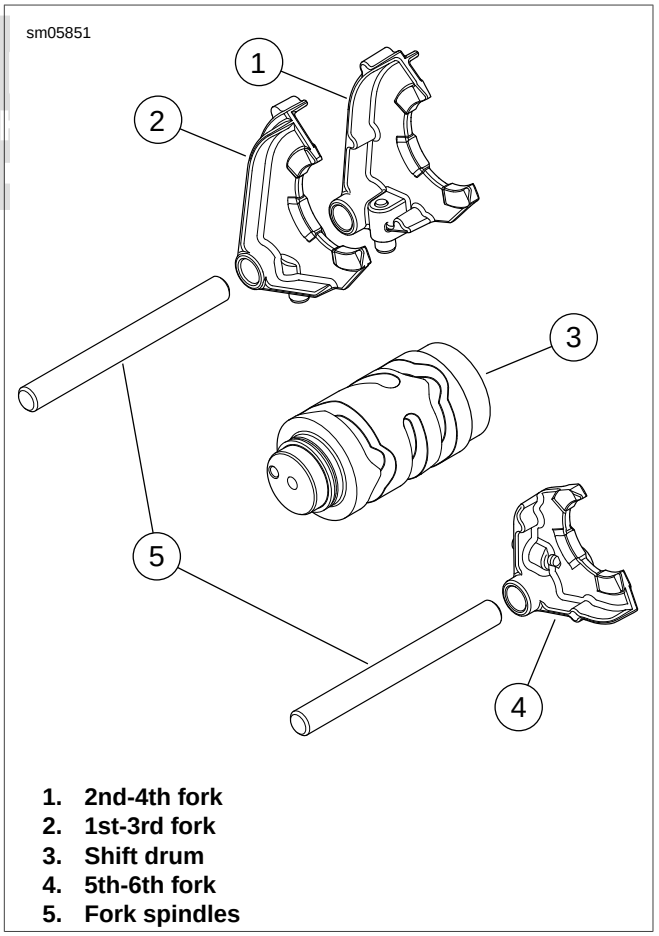



**Figure 6-77. Clutch Shaft Retaining Ring Groove (21/23T Gear Pinion)**

## SHIFT DRUM AND FORKS

See Figure 6-78. The 1st-3rd fork (2) and the 2nd-4th fork (1) face each other like clamshells. The 5th-6th fork (4) can only be installed one way.




1. **2nd-4th fork**
2. **1st-3rd fork**
3. **Shift drum**
4. **5th-6th fork**
5. **Fork spindles**

**Figure 6-78. Shift Drum and Forks**

# TRANSMISSION: INSTALLATION

## Assembly

*NOTE*

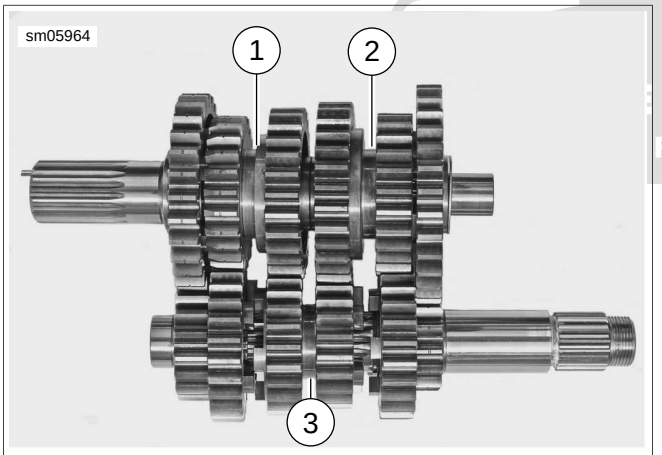
*Apply a light film of clean engine oil to the shift drum, fork spindles and shift forks.*

1. See Figure 6-74. Engage the gears of the mainshaft and clutch shaft.

*NOTES*

*Support the right case in the engine cradle and tap on the end of the clutch shaft and/or the mainshaft with a plastic hammer to seat the shafts in the bearings.*

2. See Figure 6-80. Fit the mainshaft and clutch shaft into the right crankcase bearings.
3. See Figure 6-81. Install the 1st-3rd fork (1) into the dog ring on the 25T gear on the mainshaft.
4. Install the 5th-6th fork (2) in the slot between the 21T and 23T clutch shaft gears.
5. See Figure 6-82. Install the shift drum fitting the rollers on the forks to the slots on the drum.
6. Install the 2nd-4th fork (1) in the dog ring on the 24T gear on the mainshaft and fit the roller to the slot on the drum.
7. Install the fork spindles (2).




1. **2nd-4th dog ring**
2. **1st-3rd dog ring**
3. **5th-6th slot 21/23T gear**

**Figure 6-79. Mainshaft and Clutch Shaft w/Fork Locations**

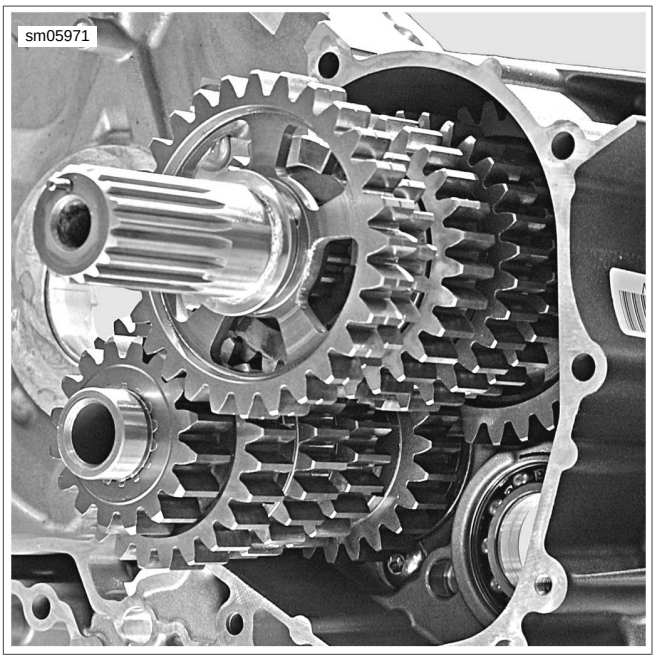
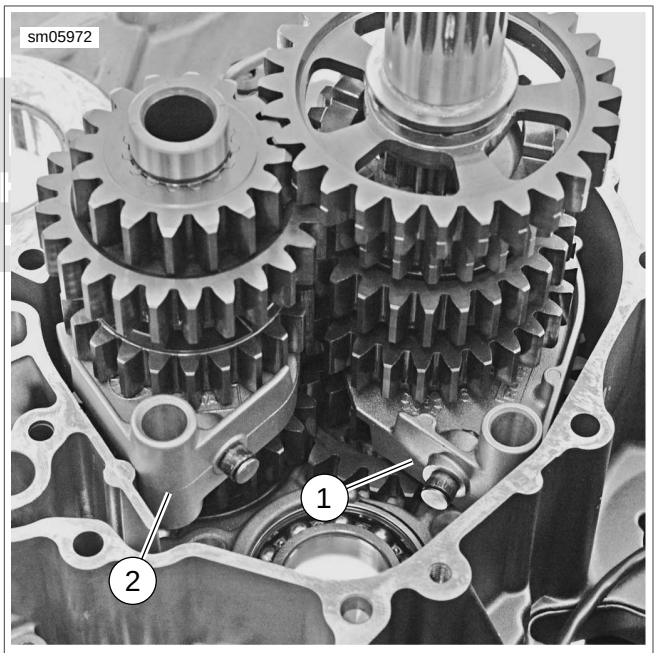
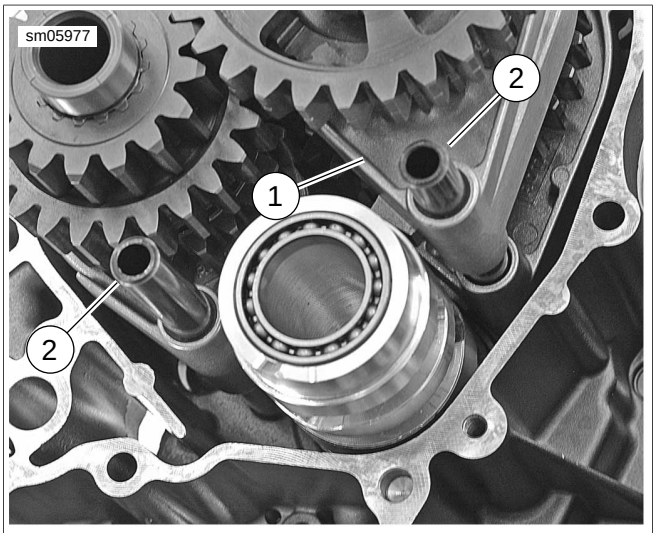



**Figure 6-80. Mainshaft and Clutch Shaft in Right Case**




1. **1st-3rd fork**
2. **5th-6th fork**

**Figure 6-81. Shift Forks**




1. **2nd-4th fork**
2. **Fork spindles**

**Figure 6-82. Fork Spindles and Shift Fork**

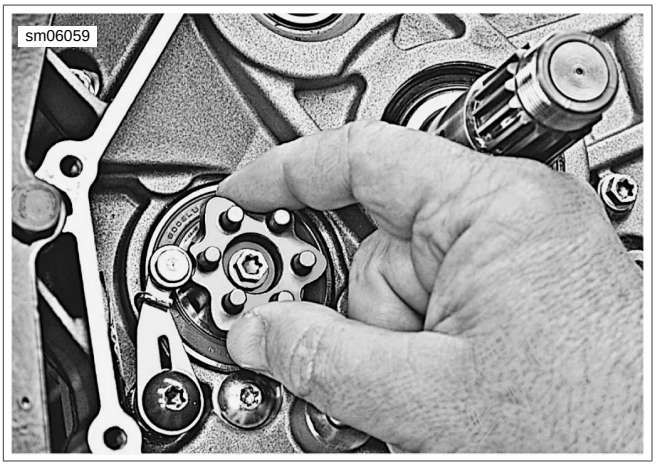



**Figure 6-83. Index Shim in Neutral**




**Figure 6-84. Spinning the Clutch Shaft**

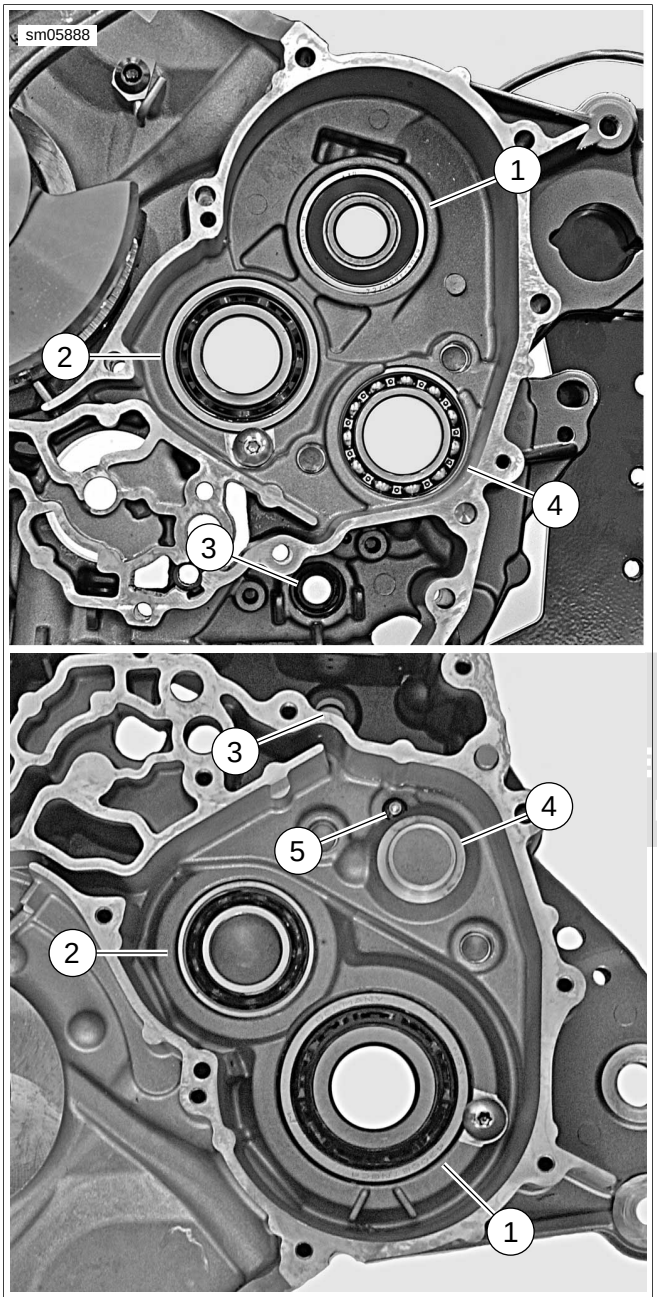
## Verify Operation

1. Mate the engine cases to support the transmission shafts and fork spindles. Temporarily secure the cases with a couple of bolts.
2. Install the index shim. See 6.7 SHIFT LINKAGE, Index Shim.
3. If removed, install the detent wheel. See 6.7 SHIFT LINKAGE, Detent Wheel.
4. See Figure 6-83. By hand, turn the index shim to shift up and down through each gear.
5. See Figure 6-84. With the detent wheel in the neural notch, both shafts should turn independent of each other.

# TRANSMISSION CASE BEARINGS AND SEALS 6.9

## LOCATION

See Figure 6-85. Identify the bearing/seal and the case half.




1. **Mainshaft**
2. **Clutch shaft**
3. **Shift shaft seal**
4. **Fork drum**
5. **Neutral indicator switch**

**Figure 6-85. Transmission Case Bearings and Seals: Right Case (upper) and Left Case (lower)**

## SHIFT SHAFT SEALS

| PART NUMBER | TOOL NAME |
|---|---|
| B-48860 | SHIFT SHAFT OUTER SEAL INSTALLER/GUIDE |
| B-49058 | INNER SHIFT SHAFT SEAL INSTALLER |

### Right Case Seal (Inner)

**To remove:** See Figure 6-86. Use a standard seal extractor.

*NOTE*

*Install the **new** inner case seal from inside the right case with the closed end of the seal facing out.*

**To install:** Use the INNER SHIFT SHAFT SEAL INSTALLER (Part No. B-49058) to seat the seal.




**Figure 6-86. Right Case Seal (inner)**

### Left Case Seal (Outer)

*NOTE*

*The outer case seal can be replaced without having to split the cases.*

**To remove:** See Figure 6-87. Use a standard seal extractor.

**To install:** Use the SHIFT SHAFT OUTER SEAL INSTALLER/GUIDE (Part No. B-48860) to seat the seal.

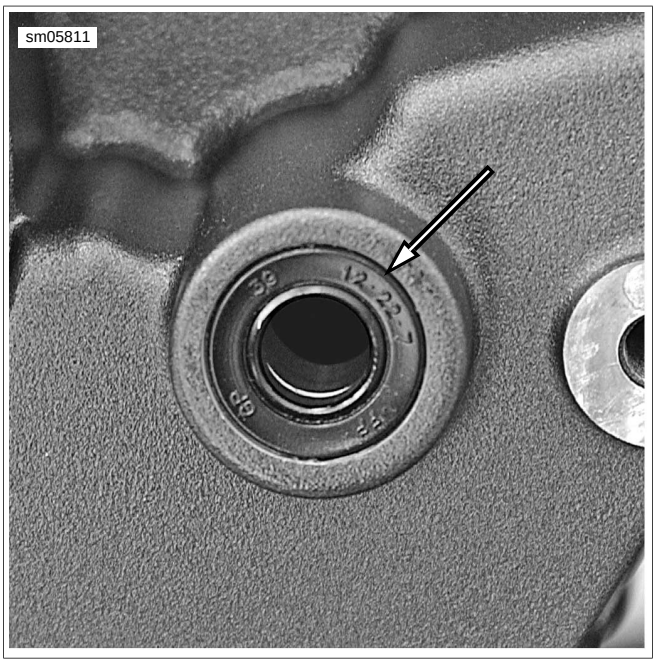



Figure 6-87. Left Case Seal (outer)

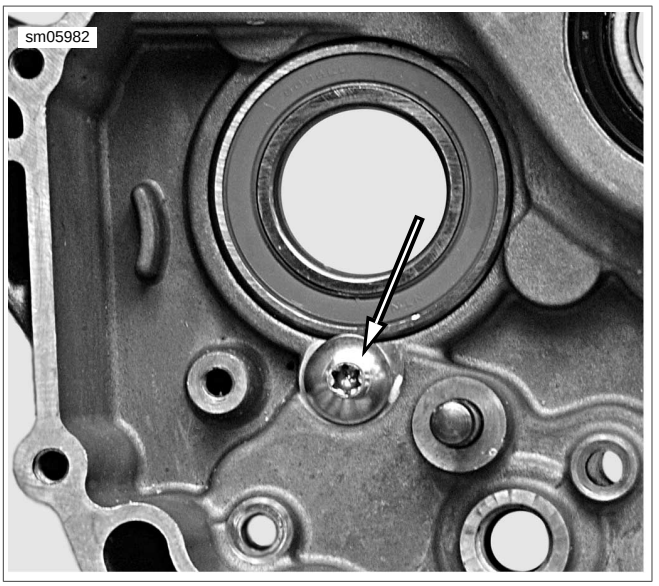



Figure 6-88. Fork Drum Bearing Retaining Screw

## FORK DRUM

| PART NUMBER | TOOL NAME |
|---|---|
| HD-39540-05A | BUSHING/BEARING DRIVER SET (DRIVER) |
| HD-39540-08A | BUSHING/BEARING DRIVER SET |

### Right Case Bearing

**To remove:** See Figure 6-88 and Figure 6-89. Remove the fork drum bearing retaining screw from outside the right case and use the 05A driver from the BUSHING/BEARING DRIVER SET (DRIVER) (Part No. HD-39540-05A).

**To install:** See Figure 6-90. Use the 08A driver from the BUSHING/BEARING DRIVER SET (Part No. HD-39540-08A). Apply LOCTITE 243 (blue) and tighten the fork drum bearing retaining screw to 11 Nm (97 **in-lbs**).

### Left Bearing

See Figure 6-91. The drum and left bearing are replaced as one.

See Figure 6-92. In the left case, the fork drum bearing rides on a boss cast into the case. If the boss is damaged, replace the case.

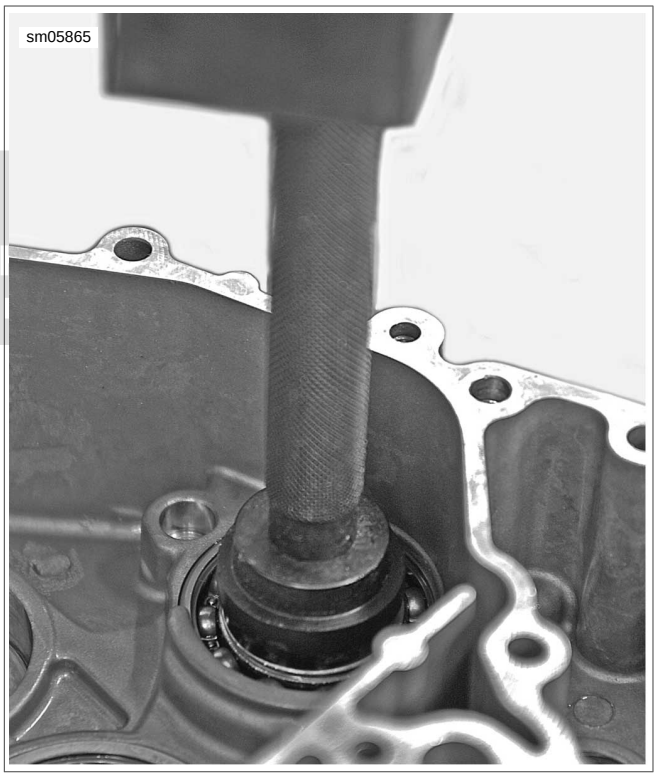



Figure 6-89. Fork Drum Bearing Removal: Right Case

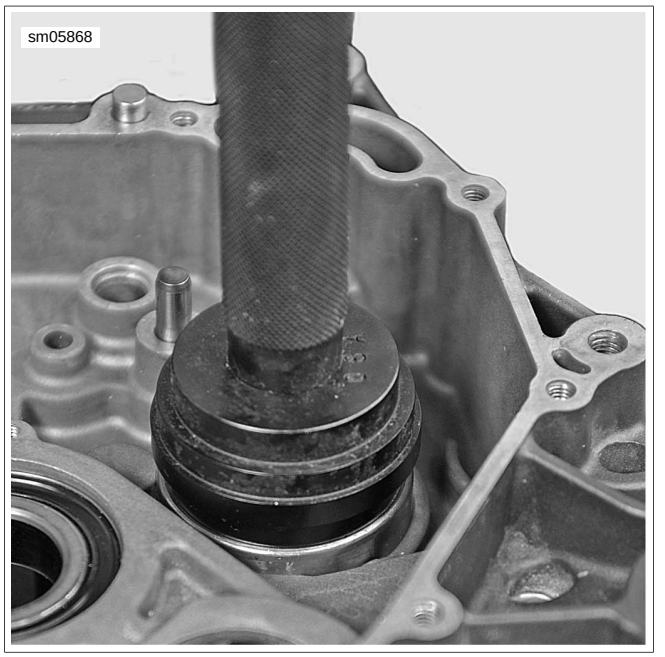



Figure 6-90. Fork Drum Bearing Installation: Right Case




Figure 6-91. Fork Drum Bearing

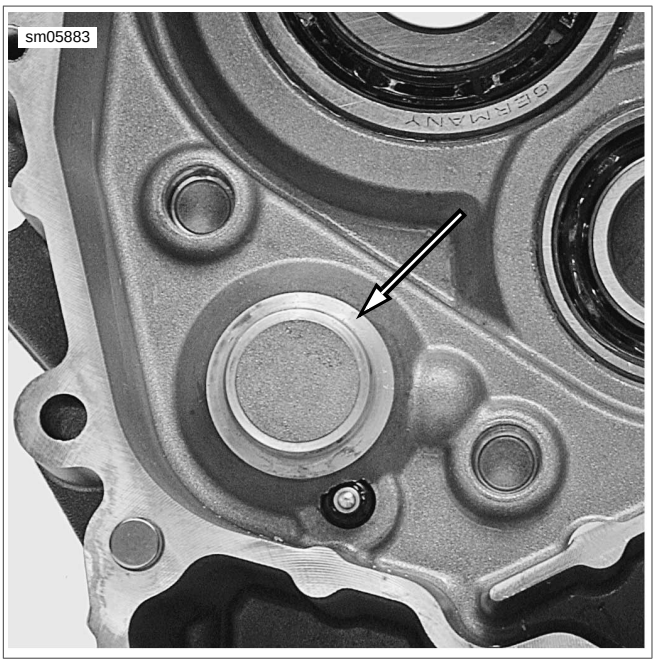



Figure 6-92. Fork Drum Bearing Boss: Left Case

## MAINSHAFT

| PART NUMBER | TOOL NAME |
|---|---|
| B-49130 | TRANSMISSION MAINSHAFT SEAL INSTALLER |
| HD-39540-05A | BUSHING/BEARING DRIVER SET (DRIVER) |
| HD-39540-07A | BUSHING/BEARING DRIVER SET (DRIVER) |
| HD-39540-08B | BUSHING/BEARING DRIVER SET |
| HD-39540-11B | BUSHING/BEARING DRIVER SET (DRIVER) |
| HD-45907 | 4" UNIVERSAL DRIVER HANDLE |

### Right Case Bearing

*NOTE*

*Removal will destroy the right case bearing. Use any correctly sized driver.*

**To remove:** See Figure 6-93. Use the 05A driver from the BUSHING/BEARING DRIVER SET (DRIVER) (Part No. HD-39540-05A).

**To install:** See Figure 6-94. Use the 08B driver from the BUSHING/BEARING DRIVER SET (Part No. HD-39540-08B).

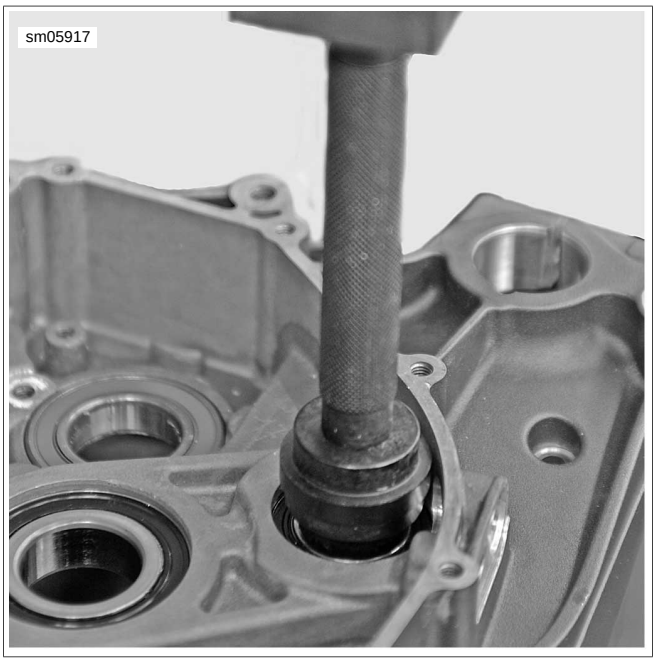



**Figure 6-93. Mainshaft Bearing Removal: Right Crankcase**

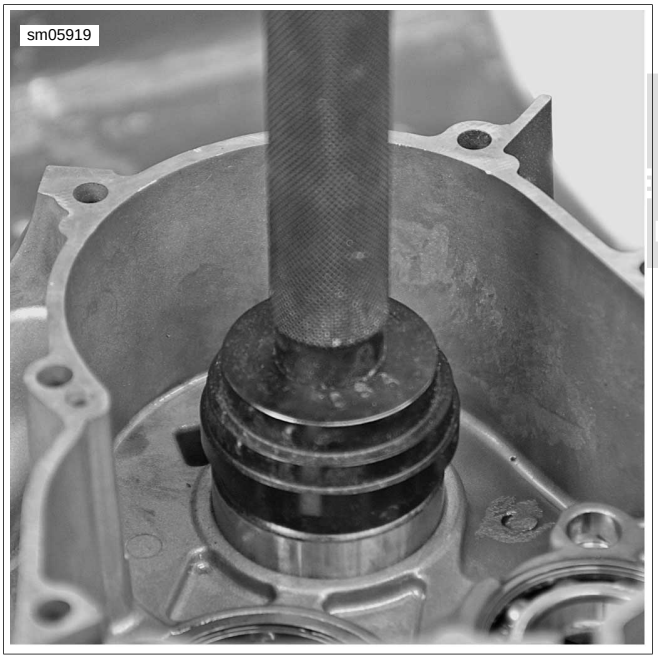



**Figure 6-94. Mainshaft Bearing Installation: Right Case**

## Mainshaft Seal

*NOTE*

*The seal can be replaced with the mainshaft installed.*

1. Use a standard seal extractor to remove the seal.
2. With the garter spring facing toward the case, fit a **new** seal on the TRANSMISSION MAINSHAFT SEAL INSTALLER (Part No. B-49130).
3. See Figure 6-95. Install a 4" UNIVERSAL DRIVER HANDLE (Part No. HD-45907) on the driver.
4. See Figure 6-96. Position the driver squarely over the bore and drive the seal flush with the transmission case.




**Figure 6-95. Installing Mainshaft Seal**

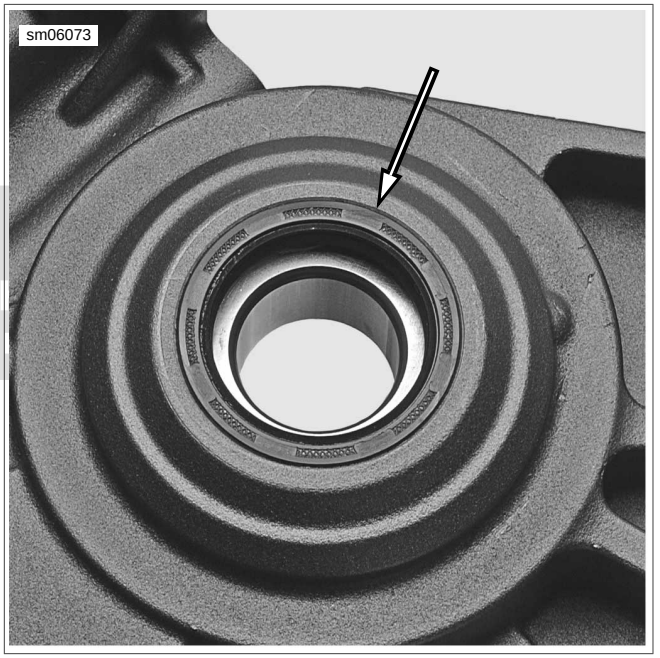



**Figure 6-96. Mainshaft Seal**

## Left Case Bearing

*NOTE*

*Removal will destroy the left case bearing. Use any correctly sized driver.*

**To remove:** See Figure 6-97 and Figure 6-98. Remove the bearing retaining screw and use the 07A driver from the BUSHING/BEARING DRIVER SET (DRIVER) (Part No. HD-39540-07A).

**To install:** See Figure 6-99. Use the 11B driver from the BUSHING/BEARING DRIVER SET (DRIVER) (Part No. HD-39540-11B). Apply LOCTITE 243 (blue) and tighten the retaining screw to 11 Nm (97 **in-lbs**).

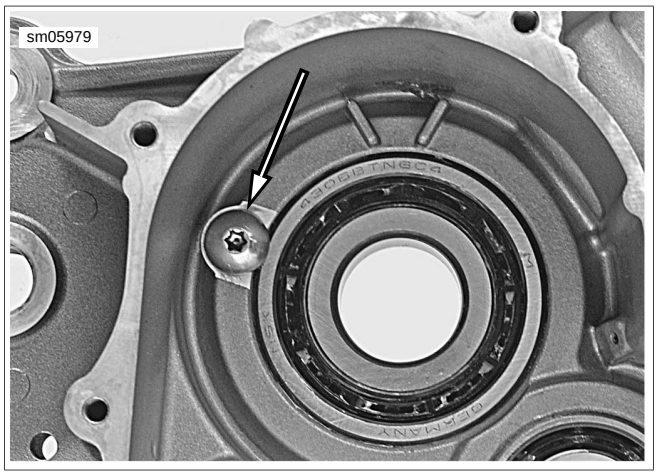



**Figure 6-97. Bearing Retaining Screw**

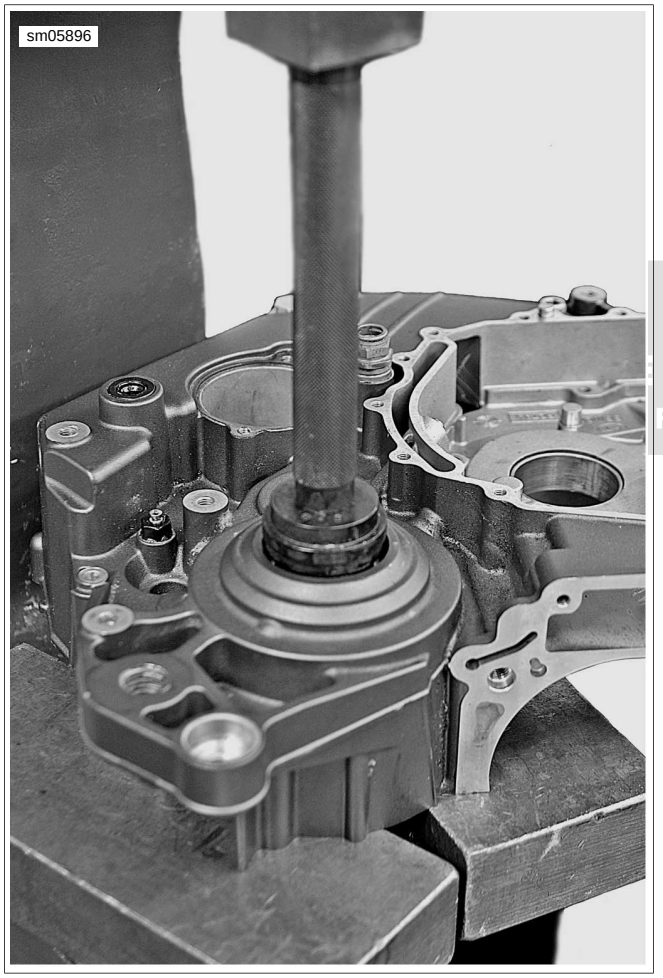



**Figure 6-98. Mainshaft Bearing Removal: Left Case**




**Figure 6-99. Mainshaft Bearing Installation: Left Case**

## CLUTCH SHAFT

| PART NUMBER | TOOL NAME |
|---|---|
| HD-39540-07A | BUSHING/BEARING DRIVER SET (DRIVER) |
| HD-39540-08B | KENT-MOORE DRIVER SET |
| HD-39540-09B | BUSHING/BEARING DRIVER SET |
| HD-95760-69A | BUSHING AND BEARING PULLER |
| HD-95769-69 | COLLET, 1-1/8" |

### Right Case Bearing

*NOTE*

*Removal will destroy the right case clutch shaft bearing. Use any correctly sized driver to remove.*

**To remove:** See Figure 6-100 and Figure 6-101. Remove the retaining screw from inside the right case and use the 07A driver from the BUSHING/BEARING DRIVER SET (DRIVER) (Part No. HD-39540-07A).

**To install:** See Figure 6-102. Use the 09B driver from the BUSHING/BEARING DRIVER SET (Part No. HD-39540-09B). Apply LOCTITE 243 (blue) to the threads of the retaining screw and tighten to 11 Nm (97 **in-lbs**).

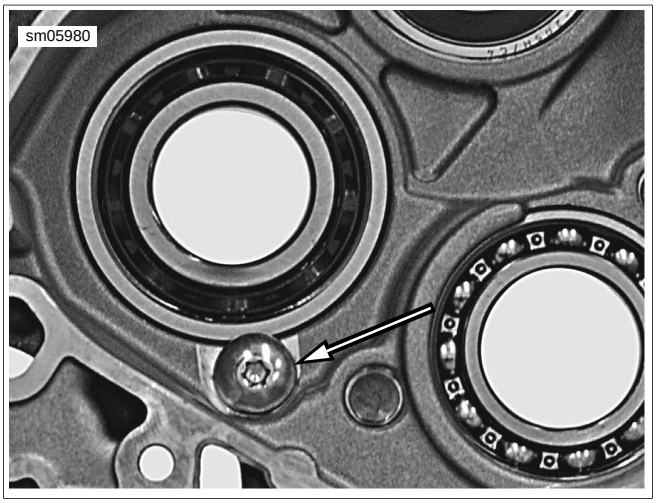



**Figure 6-100. Clutch Shaft Bearing Retaining Screw**

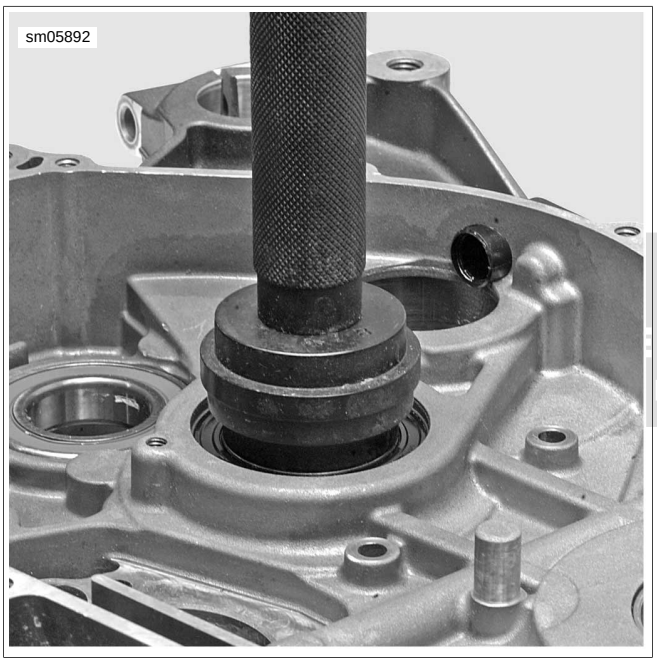



**Figure 6-101. Clutch Shaft Bearing Removal: Right Case**

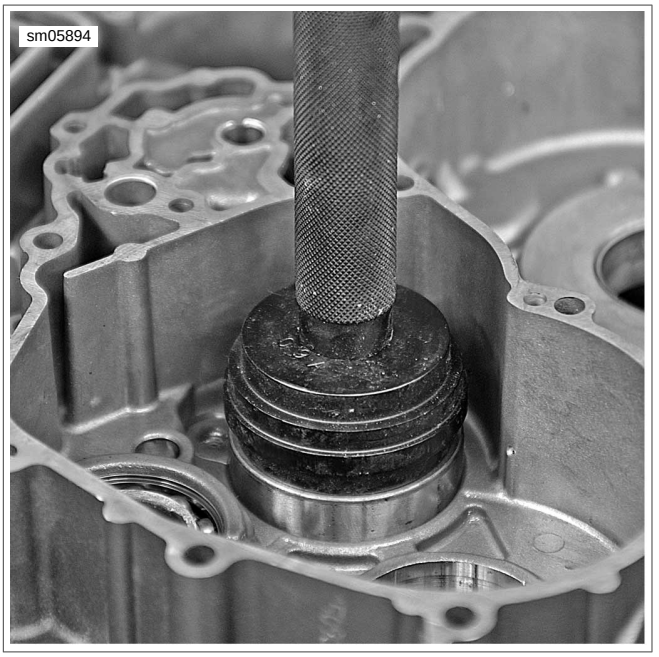



**Figure 6-102. Clutch Shaft Bearing Installation: Right Case**

## Left Case Bearing

**To remove:** Use the BUSHING AND BEARING PULLER (Part No. HD-95760-69A) and COLLET, 1-1/8" (Part No. HD-95769-69).

**To install:** See Figure 6-103. Use the 08B driver with the KENT-MOORE DRIVER SET (Part No. HD-39540-08B).

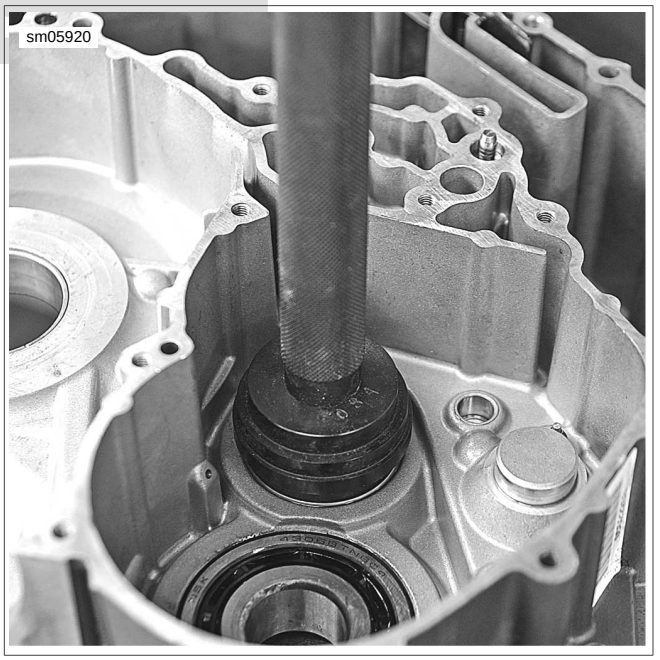



**Figure 6-103. Clutch Shaft Bearing Installation: Left Case**

# FINAL DRIVE SPROCKET 6.10

## PULLEY ASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| HD-49149 | FINAL DRIVE SPROCKET LOCKING TOOL |

### Removal

*NOTE*

*If the engine has been removed from the chassis, install the swingarm pivot shaft to support the locking tool support pin.*

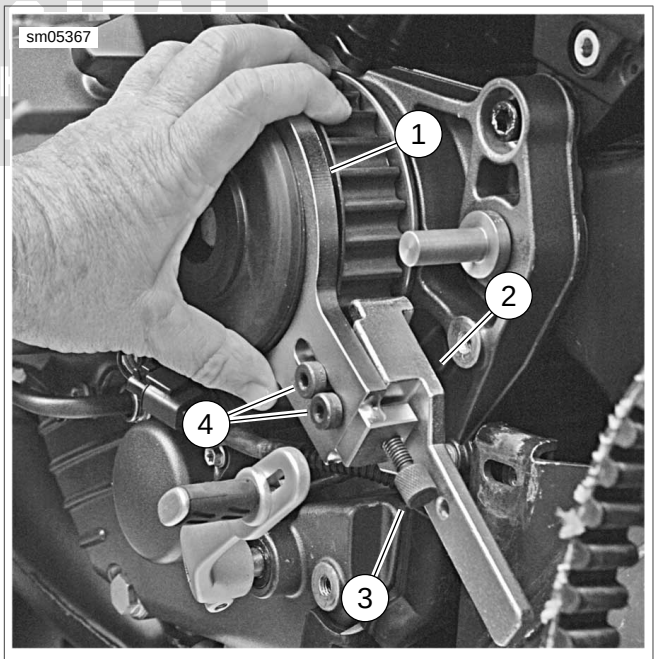
1. See Figure 6-104. Insert the support pin from the FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-49149) into the hollow swingarm pivot shaft.
2. See Figure 6-105. Fit the support ring (1) over the sprocket and engage the teeth of the engagement bar (2) to the teeth of the sprocket.
3. Finger tighten the thumbscrew (3) and snug down the slider screws (4).
4. See Figure 6-106. Position the tool to the support pin in the direction of rotation and remove the sprocket bolt.

### Installation

1. Apply LUBRIPLATE No. 105 Motor Assembly Grease to the splines of the mainshaft.
2. See Figure 6-107. Verify that the needle pin is in place in the end of the mainshaft.
3. Remove the inner ring from the sprocket assembly.
4. Slide the sprocket over the splines of the mainshaft.
5. See Figure 6-108. Match the hole in the inner ring with the needle pin and slide on the inner ring.
6. Clean the counter sink in the inner face of the inner ring.
7. See Figure 6-109. Verify that the O-ring is undamaged under the head of the sprocket bolt and coat the O-ring with engine oil.
8. Apply LOCTITE 243 (blue) to the threads and thread in the sprocket bolt.
9. See Figure 6-106. Install the sprocket locking tool and the support pin for the direction of rotation.
10. Tighten the sprocket bolt to 110 Nm (81 ft-lbs).




**Figure 6-104. Sprocket Locking Tool Support Pin**




1. **Support ring**
2. **Tooth engagement bar**
3. **Thumbscrew**
4. **Slider screws**

**Figure 6-105. Final Drive Sprocket Locking Tool (HD-49149)**

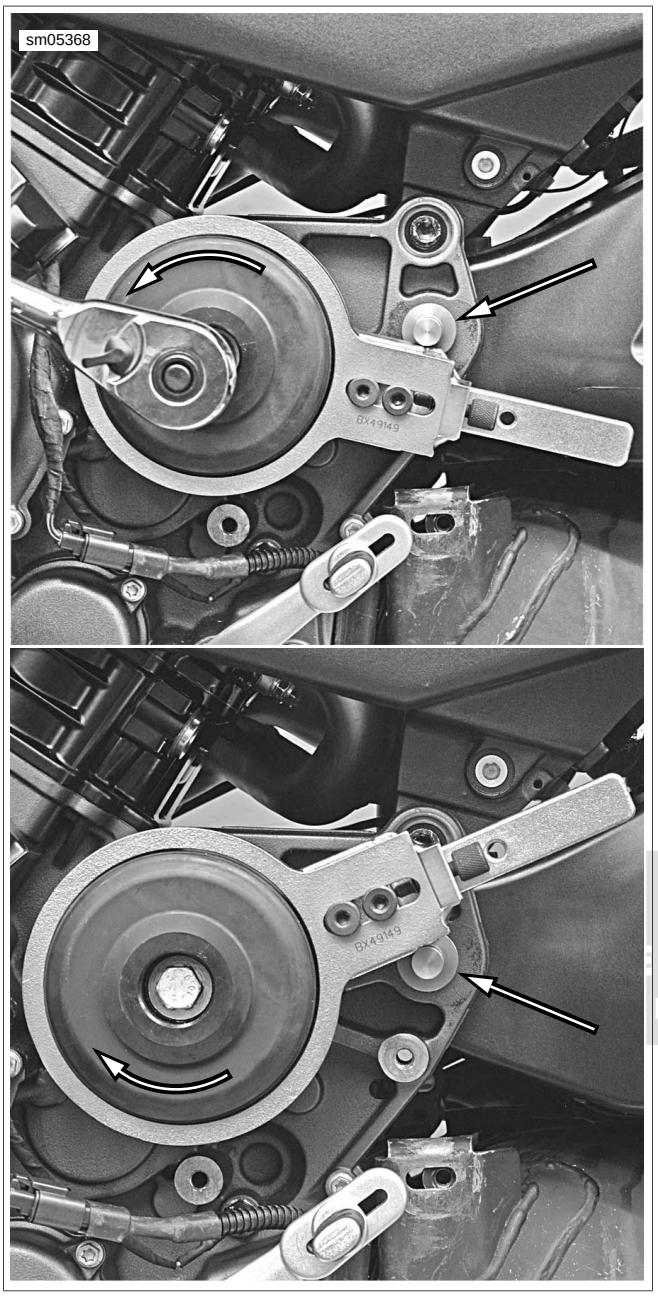



Figure 6-106. Sprocket Bolt: Remove (top) and Install (bottom)

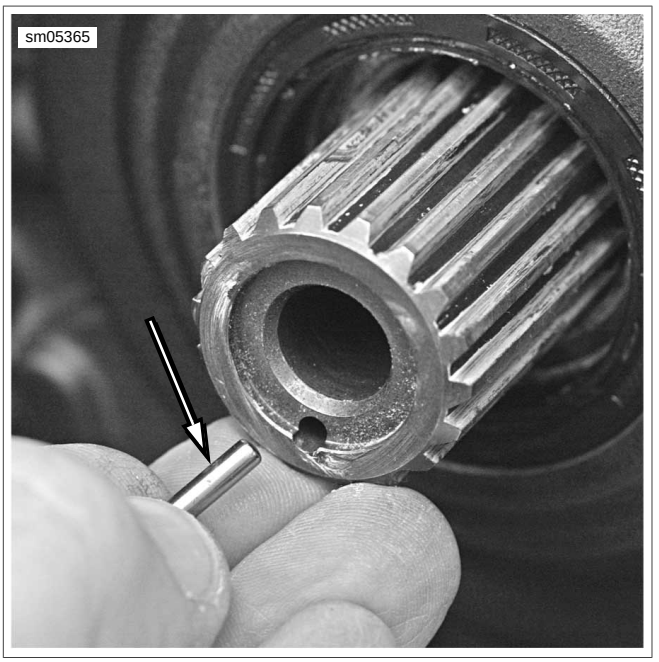


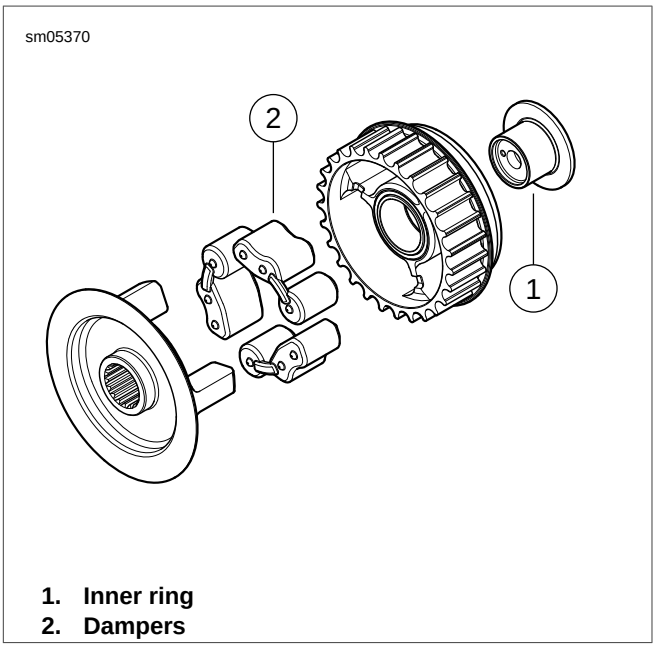

Figure 6-107. Needle Pin




Figure 6-108. Needle Pin Hole in Inner Ring




Figure 6-109. O-Ring




1. **Inner ring**
2. **Dampers**

Figure 6-110. Pulley Assembly

## RUBBER COMPENSATOR DAMPERS

1. See Figure 6-110. Remove the inner ring (1) from the final drive sprocket pulley assembly.
2. Inspect the roller bearing and cage. Replace the pulley assembly if damaged.
3. See Figure 6-111. Use a soft tool like a plastic handle to press out the splined carrier to separate the two halves of the pulley assembly.
4. See Figure 6-112. Remove the rubber dampers.
5. Install **new** dampers.
6. Press the two halves of the pulley assembly together.




Figure 6-111. Separating the Pulley Assembly

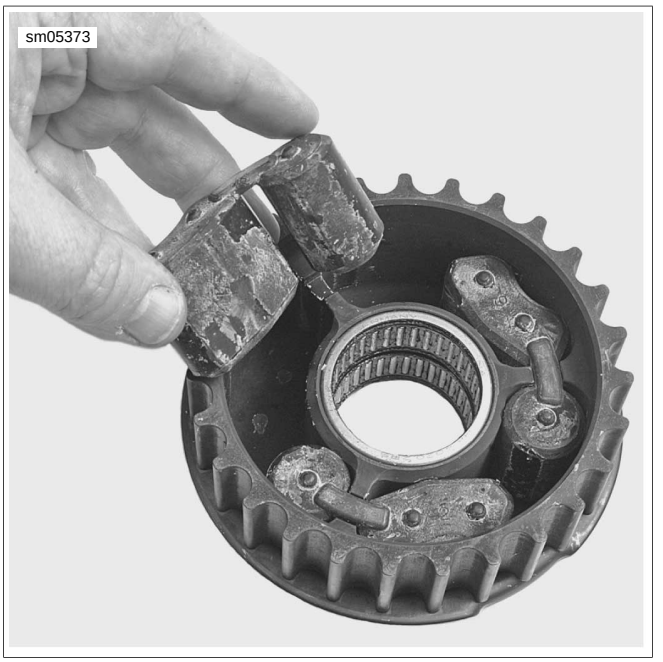



**Figure 6-112. Rubber Compensator Dampers**

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

# DRIVE BELT AND IDLER PULLEY 6.11

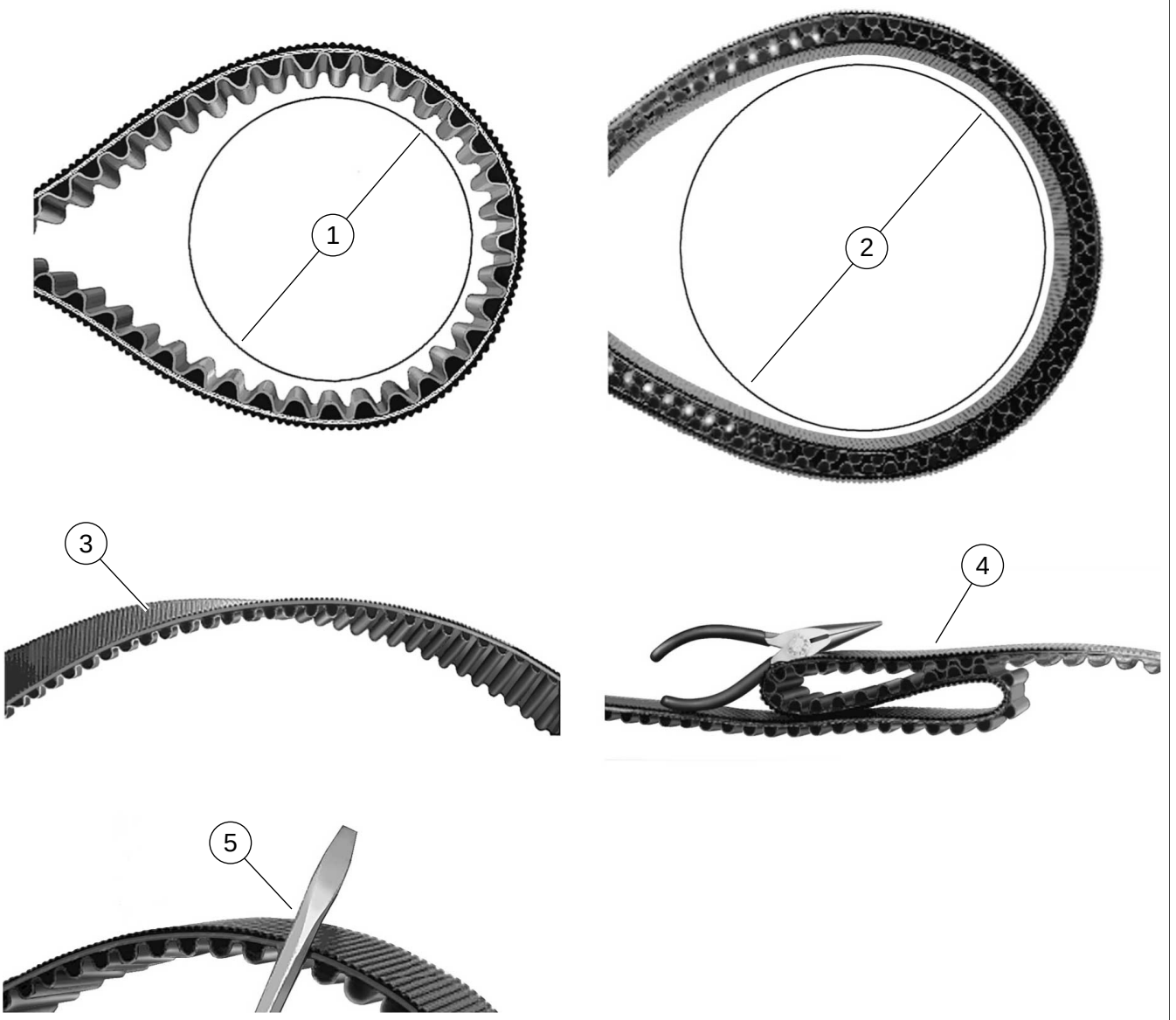
## GENERAL

### Drive Belt Tension

Drive belt tension through suspension travel is maintained by a fixed idler wheel. Drive belt adjustment is not required.

### Belt Handling

See Figure 6-113. To avoid belt failure, do not over bend, twist, crimp, pinch, kink or pry on the drive belt when replacing the belt.




1. **Do not loop to less than 127 mm (5 in.) dia.**
2. **Do not bend bundled lengths to less than 254 mm (10 in.) dia.**
3. **Do not twist belt.**
4. **Do not crimp, pinch or kink belt.**
5. **Do not pry on belt.**

**Figure 6-113. Drive Belt Handling**

## DRIVE BELT REMOVAL

1. Place the vehicle on the lift with the front wheel in the wheel vise.
2. Place a scissor jack under one of the welds to the rear of the muffler and raise rear wheel off lift.
3. Remove upper belt guard and rear fender. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
4. Remove lower belt guard and stone guard.
5. Remove engine sprocket cover. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
6. Remove shift lever.
7. See Figure 6-114. Loosen rear axle pinch bolt.
8. Loosen rear axle approximately 15 rotations to allow partial tension to be removed from rear drive system.

*NOTE*

*See Figure 6-115. It will be necessary to rotate drive belt in order to align an opening in the idler pulley with a fastener for the idler pulley bracket.*

9. Remove left side rider footpeg support bracket with idler pulley and slide idler pulley bracket aside in order to remove from belt.

*NOTE*

*See Figure 6-116. Rotate belt drive system until the indented spot on the engine sprocket is located at the 9 o'clock position. This will allow the belt to be removed without removing the engine sprocket.*

10. See Figure 6-117. Remove swingarm brace fasteners and swingarm brace.
11. Slide belt from rear wheel drive sprocket.
12. Remove belt from front engine sprocket.

*NOTE*

*Turn the belt slightly to remove it through the swingarm brace opening. Never bend, twist or kink the belt.*

13. Remove belt from vehicle.

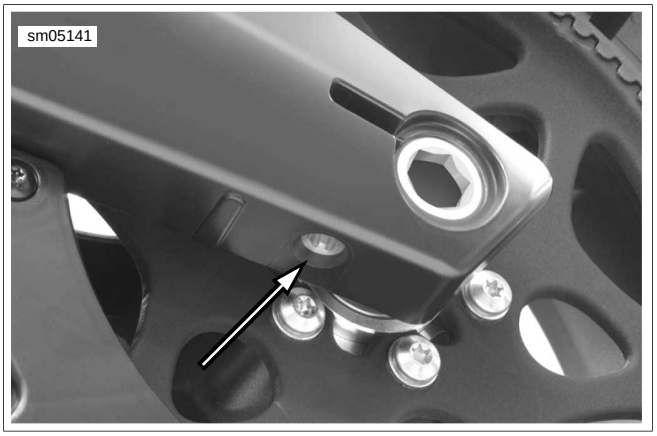



**Figure 6-114. Rear Axle**




**Figure 6-115. Location/Idler Pulley Bracket Fastener**

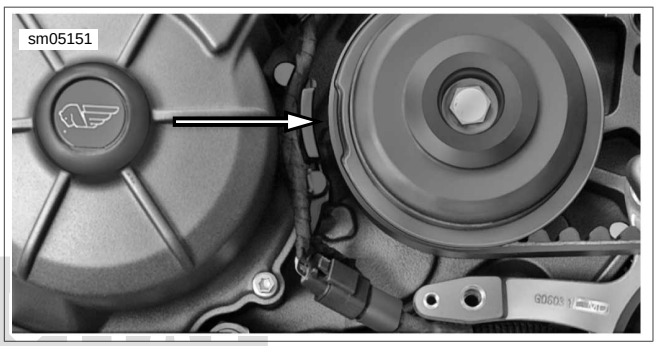



**Figure 6-116. Engine Sprocket Indent at 9 O'clock**




**Figure 6-117. Swingarm Brace Fasteners**

## DRIVE BELT INSTALLATION

*NOTES*

- *Before reassembling, verify that the neutral switch and sidestand switch harnesses are secure in the wire guard which mounts behind the sprocket cover.*
- *When removing or installing drive belt, do not bend or twist belt. Partially slide belt onto sprocket and rotate wheel or belt damage will occur.*
- *Never tighten rear axle with swingarm brace removed.*

1. Without twisting drive belt, thread belt though swingarm brace opening.

*NOTE*

*Before installing drive belt on engine sprocket, be sure that the indented spot on the sprocket is at the 9 o'clock position. This will allow the belt to be installed without removing the engine sprocket.*

2. Install drive belt onto front engine sprocket.
3. Slide drive belt onto wheel sprocket and fit belt teeth to top of drive sprocket.
4. Rotate wheel sprocket to mesh teeth of belt to both sprockets belt.
5. See Figure 6-117. Install swingarm brace and tighten fasteners to 24.4-27.1 Nm (18-20 ft-lbs).

*NOTES*

- *It will be necessary to grasp top and bottom of belt and squeeze together until belt teeth are fully seated in rear sprocket.*
- *If the drive belt is not fully seated in rear sprocket, it is difficult to install the idler.*

6. See Figure 6-114. Install drive belt onto idler pulley along with left side rider footpeg support bracket and install onto vehicle. Tighten fasteners to 24.4-27.1 Nm (18-20 ft-lbs).

*NOTE*

*Rear axle is left handed thread.*

7. Apply ANTI-SEIZE LUBRICANT to hole in left side of swingarm where rear axle slides through.
8. Tighten the rear axle to 31.2-36.6 Nm (23-27 ft-lbs), back off two full turns and then retighten to 65.1-70.5 Nm (48-52 ft-lbs).
9. Tighten rear axle pinch fastener (2) to 54-61 Nm (40-45 ft-lbs).
10. Install front sprocket cover. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**). See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
11. Install shift lever and tighten fastener to 9.6-10.6 Nm (85-94 **in-lbs**).
12. Install rear fender. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**). See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
13. Install lower belt guard and stone guard. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
14. Install upper belt guard. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).
15. Lower motorcycle and remove the scissor jack.

## IDLER

### Removal

1. Remove front sprocket cover.
2. Loosen rear axle pinch bolt.
3. Unthread axle approximately 15 rotations to release tension from drive belt.
4. Spin idler to inspect for damage and idler wheel bearing wear. See 1.10 DRIVE BELT MAINTENANCE, Inspection.

*NOTE*

*The pulley bearings can not be replaced.*

5. Loosen idler bolt by holding locknut on inside of idler bracket.
6. See Figure 6-118. Remove idler bolt, washers and locknut.
7. Slide idler out of gap between ride footpeg mount and idler bracket.

### Installation

1. See Figure 6-119. Hold the idler wheel (1) in place between the footpeg bracket (2) and the idler bracket (3).
2. Install the washer (4) and bolt (5) through the footpeg bracket, the idler pulley and the idler pulley bracket.
3. Install the washer (6) and the locknut (7).
4. Tighten the locknut to 27.1-31.2 Nm (20-23 ft-lbs).
5. Install sprocket cover. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.

*NOTE*

*Never tighten rear axle with swingarm brace removed.*

6. Tighten rear axle:
   a. Initially tighten to 31.2-36.6 Nm (23-27 ft-lbs).
   b. Back off two full turns and then retighten to 65.1-70.5 Nm (48-52 ft-lbs).
7. Tighten rear axle pinch bolt to 54-61 Nm (40-45 ft-lbs).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

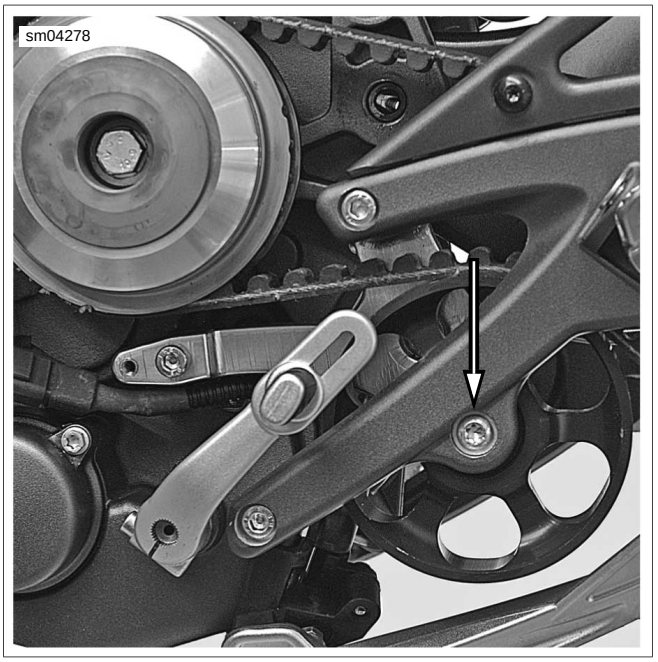
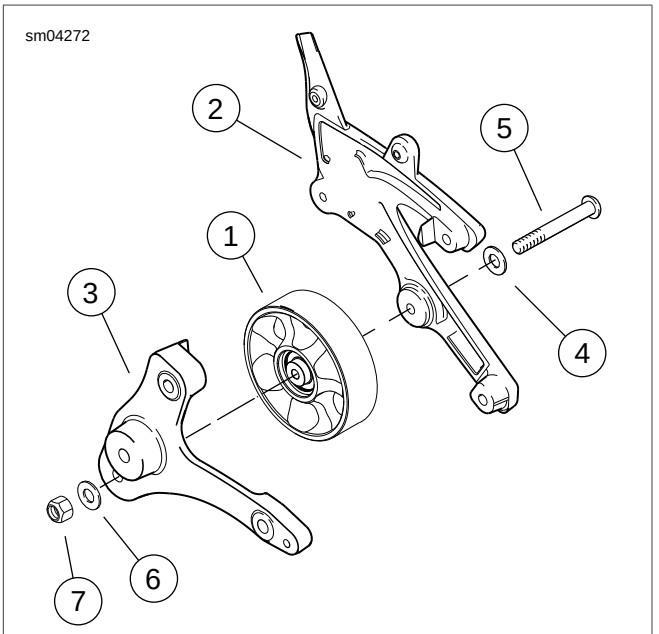



Figure 6-118. Idler Bolt




1. Idler wheel
2. Footpeg bracket
3. Idler bracket
4. Washer
5. Bolt
6. Washer
7. Locknut

Figure 6-119. Idler Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# NOTES

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DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

# NOTES

# FASTENER TORQUE VALUES 7.1

## FASTENER TORQUE VALUES IN THIS CHAPTER

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

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Battery cable fastener | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.24 COOLING FANS, Fuel Pump: Installation |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 7.7 BATTERY CABLES, Negative Battery Cable |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.7 BATTERY CABLES, Negative Battery Cable |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.7 BATTERY CABLES, Positive Battery Cable |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.7 BATTERY CABLES, Positive Battery Cable |
| Brake light switch, rear | 22-27 Nm | 16-20 ft-lbs | 7.17 SWITCHES AND CONNECTORS, Brake Light Switch: Rear |
| Brake light switch fastener, front | 0.8-1.1 Nm | 7-10 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Brake Light Switch: Front |
| Brake light switch fastener, front | 0.8-1.1 Nm | 7-10 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Clutch Interlock Switch |
| Brake reservoir fastener, rear | 5.7-6.4 Nm | 50.6-56.2 **in-lbs** | 7.8 STARTER, Solenoid |
| CKP fastener | 11 Nm | 97 **in-lbs** | 7.22 ENGINE HARNESS, Installation |
| CKP sensor screw | 11 Nm | 97 **in-lbs** | 7.18 CRANKSHAFT POSITION SENSOR (CKP), Installation |
| Cooling fan fasteners | 9.7-10.9 Nm | 86-96 **in-lbs** | 7.24 COOLING FANS, Installation |
| Cooling fan fasteners | 9.7-10.9 Nm | 86-96 **in-lbs** | 7.24 COOLING FANS, Installation |
| Crankshaft locking tool plug | 15 Nm | 11 ft-lbs | 7.10 ALTERNATOR, Assembly and Installation |
| Crankshaft nut | 280-290 Nm | 207-214 ft-lbs | 7.10 ALTERNATOR, Assembly and Installation |
| ECM locknut | 4.0-4.5 Nm | 36-40 **in-lbs** | 7.5 ELECTRONIC CONTROL MODULE (ECM), Replacement |
| Engine wire harness ground | 10 Nm | 89 **in-lbs** | 7.22 ENGINE HARNESS, Installation |
| Engine wire harness support fasteners | 11 Nm | 97 **in-lbs** | 7.22 ENGINE HARNESS, Installation |
| Horn fastener | 8.1-10.8 Nm | 72-96 **in-lbs** | 7.11 HORN, Installation |
| Ignition coil fastener | 11 Nm | 97 **in-lbs** | 7.6 IGNITION COILS, Front |
| Ignition coil fastener | 11 Nm | 97 **in-lbs** | 7.6 IGNITION COILS, Rear |
| Ignition switch fasteners | 1.4-4.1 Nm | 13-36 **in-lbs** | 7.3 IGNITION SWITCH/FORK LOCK: 1125R, Repair |
| Ignition switch mounting fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 7.3 IGNITION SWITCH/FORK LOCK: 1125R, Replacement |
| Ignition switch mounting fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 7.4 IGNITION SWITCH/FORK LOCK: 1125CR, Replacement |
| Instrument cluster nuts | 1.4-4.1 Nm | 12-36 **in-lbs** | 7.21 INSTRUMENT CLUSTER, Replacement: 1125R |
| Instrument cluster nuts | 1.4-4.1 Nm | 12-36 **in-lbs** | 7.21 INSTRUMENT CLUSTER, Replacement: 1125CR |
| License plate lamp lens fasteners | 2.7-3.0 Nm | 24-27 **in-lbs** | 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Lamp |
| Neutral indicator switch | 2-3 Nm | 18-27 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Neutral Indicator Switch/LOCTITE 5331 Sealant |
| Oil pressure switch | 15 Nm | 133 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Oil Pressure Switch/Apply LOCTITE 243 (red). |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 7.5 ELECTRONIC CONTROL MODULE (ECM), Replacement |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 7.24 COOLING FANS, Installation |
| Rotor to sprag clutch housing fasteners | 30 Nm | 22 ft-lbs | 7.10 ALTERNATOR, Assembly and Installation/Apply LOCTITE 648 (green). |
| Sidestand sensor fastener | 10-13 Nm | 96-144 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Sidestand Sensor (HDI) |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Neutral Indicator Switch |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Sidestand Sensor (HDI) |
| Starter cable | 9.6-10.6 Nm | 85-94 **in-lbs** | 7.8 STARTER, Starter: Installation |
| Starter cable | 9.6-10.6 Nm | 85-94 **in-lbs** | 7.23 MAIN WIRE HARNESS, Installation |
| Starter fasteners | 11 Nm | 97 **in-lbs** | 7.8 STARTER, Starter: Installation |
| Starter solenoid cover fastener | 4.1-6.9 Nm | 36-60 **in-lbs** | 7.8 STARTER, Solenoid |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 37-60 **in-lbs** | 7.23 MAIN WIRE HARNESS, Installation |
| Starter solenoid nuts | 5.7-6.4 Nm | 51-56 **in-lbs** | 7.7 BATTERY CABLES, Positive Battery Cable |
| Starter solenoid nuts | 5.7-6.4 Nm | 51-56 **in-lbs** | 7.8 STARTER, Solenoid |
| Starter solenoid nuts | 5.7-6.4 Nm | 51-56 **in-lbs** | 7.23 MAIN WIRE HARNESS, Installation |
| Stator cable cover fasteners | 4 Nm | 35 **in-lbs** | 7.10 ALTERNATOR, Assembly and Installation/LOCTITE 243 (blue |
| Stator fasteners | 11 Nm | 97 **in-lbs** | 7.10 ALTERNATOR, Assembly and Installation/LOCTITE 243 (blue) |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 7.20 HANDLEBAR SWITCH HOUSINGS, Left Switch Housing |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 7.20 HANDLEBAR SWITCH HOUSINGS, Right Switch Housing |
| Tail lamp fasteners | 0.7-0.8 Nm | 6-7 **in-lbs** | 7.15 TAIL AND LICENSE PLATE LAMP, Tail Lamp |
| Turn signal/mirror mounting fasteners, 1125CR | 24.4-27.0 Nm | 18-20 ft-lbs | 7.12 TURN SIGNALS, Front Turn Signals/Mirrors: 1125CR |
| Turn signal/mirror mounting nuts, 1125R | 8.1-10.8 Nm | 72-96 **in-lbs** | 7.12 TURN SIGNALS, Front Turn Signals/Mirrors: 1125R |
| Turn signal nut, rear | 2.8-3.2 Nm | 25-28 **in-lbs** | 7.12 TURN SIGNALS, Rear Turn Signals |
| Voltage regulator mounting nut | 8.0-9.5 Nm | 71-84 **in-lbs** | 7.9 VOLTAGE REGULATOR, Installation/Spread Wacker P12 Silicone Heat Compound on back of regulator |
| VSS fastener | 11 Nm | 97 **in-lbs** | 7.19 VEHICLE SPEED SENSOR (VSS), Installation |
| Wire harness front bracket fastener, 1125CR | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.23 MAIN WIRE HARNESS, Wire Harness Front Bracket |
| Wire harness front bracket fastener, 1125R | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.23 MAIN WIRE HARNESS, Wire Harness Front Bracket |

# SPECIFICATIONS 7.2

## GENERAL

**Table 7-1. Battery Specifications**

| BATTERY | SPECIFICATIONS |
|---|---|
| Size | 12 VDC/12 AH/200CCA |
| Type | Sealed, AGM |

**Table 7-2. Spark Plug Specifications**

| SPARK PLUG | SPECIFICATIONS | |
|---|---|---|
| Size | 10 mm | |
| Type | NGK CR9EKB | |
| Gap | 0.7-0.9 mm | 0.027-0.035 in |
| Torque | 12 Nm | 106 **in-lbs** |

**Table 7-3. Alternator Specifications**

| MEASUREMENT | VALUE |
|---|---|
| AC voltage output | 38 Amp three phase |
| Stator coil resistance | 0.1-0.3 Ohms |

**Table 7-4. Regulator Specifications**

| MEASUREMENT | VALUE |
|---|---|
| Voltage @ 3600 RPM | 14.3-14.7 VDC @ 24 °C (75 °F) |
| Amperes @ 3600 RPM | 45 Amps, three phase shunt |

**Table 7-5. Ignition Coil Specifications**

| WINDING | RESISTANCE |
|---|---|
| Primary winding | 0.5-1.0 Ohms |
| Secondary winding | Internal diode not accurately measurable with DVOM |

**Table 7-6. System Fuses**

| FUSE | AMPHERES |
|---|---|
| Main fuse/battery fuse | 30 |
| Ignition fuse | 15 |
| Light fuse | 15 |
| Accessory fuse | 10 |
| Brake/horn | 10 |
| ECM fuse | 10 |
| Key switch fuse | 15 |
| Cooling fan fuse | 15 |
| Auxiliary power | 10 |
| Fuel pump | 15 |
| **Note:** Spare fuses are located in the tool kit. | |

**Table 7-7. Temperature Specifications**

| RANGE | VALUE | |
|---|---|---|
| | °C | °F |
| Normal operating | 60-104 | 140-220 |
| Over-temperature threshold (lamp lit) | 110 | 230 |
| Fans on @ | 77 | 170 |
| Fans off @ | 71 | 160 |

**Table 7-8. Bulb Chart: 2009 Buell 1125 Models**

| BULBS | | BULBS REQUIRED | WATTS | AMPS | PART NUMBER |
|---|---|---|---|---|---|
| Headlamps | Bulb, low beam (1125R) | 2 | 35 | 2.6 | Y0025.1AM |
| | Bulb, high beam (1125R) | 2 | 35 | 2.6 | Y0025.1AM |
| | Bulb, low beam (1125CR) | 1 | 55 | 4.58 | Y0148.1AD |
| | Bulb, high beam (1125CR) | 1 | 55 | 4.58 | Y0148.1AD |
| | Bulb, running lamp | 2 | 5 | 0.37 | 53436-97 |
| Marker lamps | Tail/stop lamp | 1 | 5/21 | 0.42/1.75 | 68169-90A |
| | License plate lamp | 1 | 5 | 0.37 | 53436-97 |
| | Front and rear turn signal lamps | LED assembly. Replace entire assembly upon failure. | | | |
| Instrument cluster | LED assembly. Replace entire assembly upon failure. | | | | |

# IGNITION SWITCH/FORK LOCK: 1125R 7.3

## REPLACEMENT

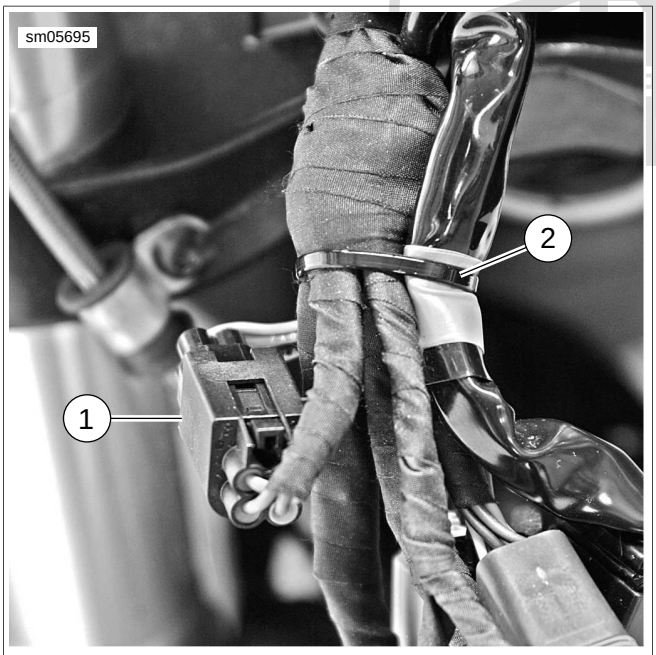
| PART NUMBER | TOOL NAME |
|---|---|
| FTXR45E | SNAP-ON TAMPER-RESISTANT T45 TORX DRIVE |

### Removal

*NOTE*

*See Figure 7-3. The fork locking pin (2) is part of the ignition switch. When extended, the locking pin fits a recess in the frame. To repair the fork lock, replace the ignition switch.*

1. Remove the fairing and headlamp assembly. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Headlamp/Fairing Support Bracket.
2. See Figure 7-1. Separate the ignition switch connector housings (1).
3. Cut the cable strap (2) securing the ignition switch wire lead to the main wire harness.
4. See Figure 7-2 and Figure 7-3. Use a SNAP-ON TAMPER-RESISTANT T45 TORX DRIVE (Part No. FTXR45E) to remove the ignition switch mounting fasteners.
5. Remove the switch assembly and the wire guide.

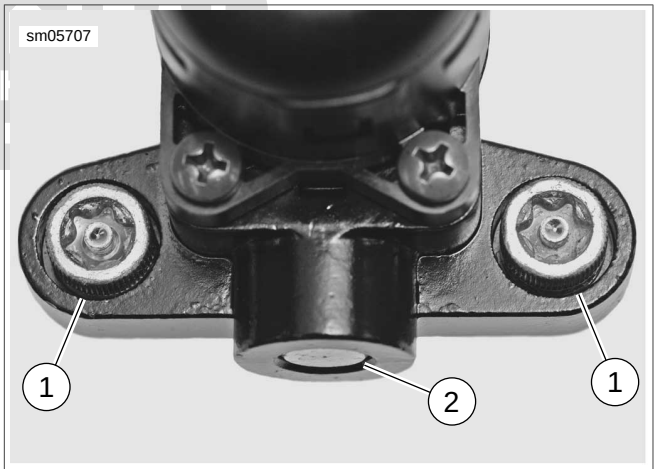



1. **Connector [33]**
2. **Cable strap**

**Figure 7-1. Ignition Switch Connector [33]**




**Figure 7-2. Ignition Switch Mounting Fasteners**




1. **Tamper-resistant fastener**
2. **Fork locking pin**

**Figure 7-3. Ignition Switch/Fork Lock**

### Installation

1. Fit the wire guide to the switch housing wire leads and the triple clamp.
2. With the OFF position facing front, insert the ignition switch into the triple clamp.
3. Route the switch housing leads through each side arm of the wire guide.
4. Install the mounting fasteners and tighten to 24.4-27.1 Nm (18-20 ft-lbs).

5. Route the ignition switch wire lead under the main wire harness and secure with a cable strap.
6. Join the ignition switch connector [33] housings.
7. Install the headlamp assembly and fairing bracket. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Headlamp/Fairing Support Bracket.

## REPAIR

### Disassembly

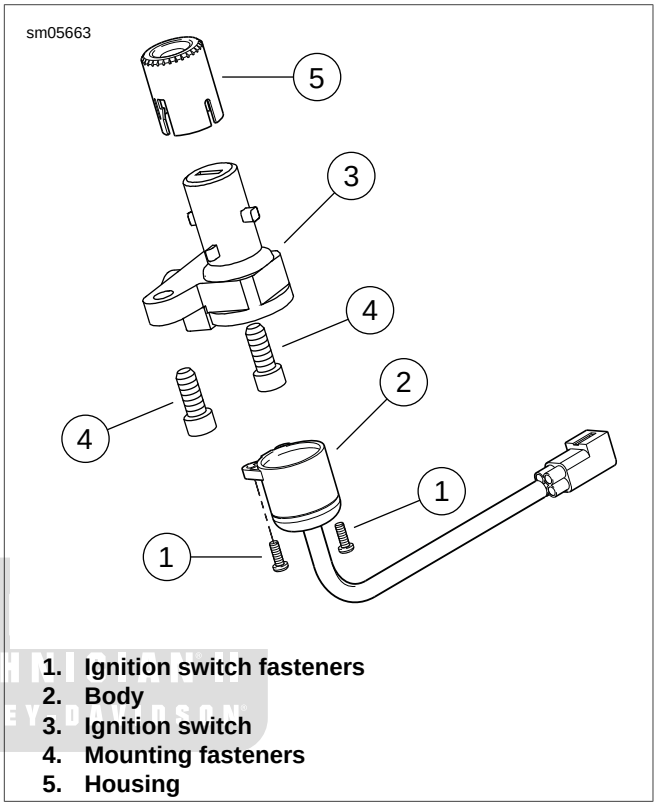
1. See Figure 7-4. On opposite sides of the switch housing, simultaneously pry on the latches and pull the housing from the switch.
2. Remove the ignition switch fasteners to separate the ignition switch from the body.




**Figure 7-4. Key Switch Housing Latch**

### Assembly

1. See Figure 7-5. Match the slots in the housing (5) to the bosses on the switch (3) and push the housing onto the ignition switch.
2. Join the ignition switch to the ignition switch body (2).
3. Install fasteners (1) and tighten to 1.4-4.1 Nm (13-36 **in-lbs**).




1. **Ignition switch fasteners**
2. **Body**
3. **Ignition switch**
4. **Mounting fasteners**
5. **Housing**

**Figure 7-5. Ignition Switch Assembly**

# IGNITION SWITCH/FORK LOCK: 1125CR 7.4

## REPLACEMENT

| PART NUMBER | TOOL NAME |
|---|---|
| FTXR45E | SNAP-ON TAMPER-RESISTANT T45 TORX DRIVE |

### Removal

*NOTE*

*The fork locking pin is part of the ignition switch. When in LOCK, the locking pin fits a recess in the frame. To repair the fork lock, replace the ignition switch.*

1. Remove the windscreen. See 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR, Headlamp Assembly.
2. See Figure 7-6. Separate the ignition switch connector [33] housings.
3. See Figure 7-7. Use a SNAP-ON TAMPER-RESISTANT T45 TORX DRIVE (Part No. FTXR45E) to remove the ignition switch mounting fasteners.
4. Remove the switch assembly.

### Installation

1. Fit the switch housing to the triple clamp.
2. With the OFF position facing front, insert the ignition switch into the triple clamp.
3. Route the switch housing leads through each side arm of the wire guide.
4. Install the mounting fasteners and tighten to 24.4-27.1 Nm (18-20 ft-lbs).
5. Join the ignition switch connector [33] housings.
6. Install the windscreen. See 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR, Headlamp Assembly.




**Figure 7-6. Ignition Key Switch Connector [33]: 1125CR**




**Figure 7-7. Ignition Key Switch Fasteners**

# ELECTRONIC CONTROL MODULE (ECM) 7.5

## REPLACEMENT

1. Remove the pillion.

**⚠WARNING**

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

2. Remove the negative battery cable.
3. Remove the fasteners and the left radiator shroud.
4. See Figure 7-8. Press the locking tabs and separate the pin and socket housings:
   a. ECM Connector [10] (black) (1)
   b. ECM Connector [11] (gray) (2)
5. Remove the locknut, washer (3) and the ECM (4).

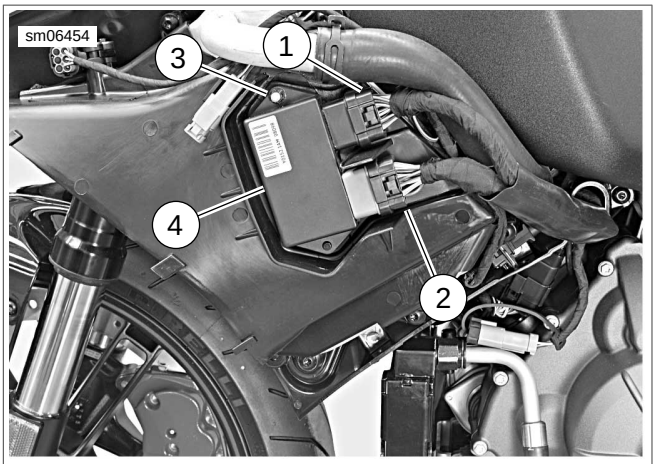
*NOTE*

*The ECM fits over the shank of a mounting stud. It may be necessary to gently pry the ECM past the shank.*

6. See Figure 7-9. To replace, align the tunnels in the socket housings with the rails in the pin housings of the ECM.
7. Snap the connectors into place.
8. Slide the ECM over the mounting stud and install the washer and locknut.
9. Tighten the locknut to 4.0-4.5 Nm (36-40 **in-lbs**).
10. Install the radiator shroud and tighten the fasteners to 9.0-9.9 Nm (80-88 **in-lbs**).
11. Install the negative battery cable.
12. Install the pillion.

*NOTES*

- *Turning the ignition ON and OFF will initiate password learn and the ECM will acquire the VIN stored in the instrument cluster.*
- *After installing a replacement ECM, calibrate the ECM with Digital Technician and perform a TPS reset either through Digital Technician or manually. For a manual TPS reset, see 4.3 SENSORS, Throttle Position Sensor (TPS).*




1. **ECM connector [10] (black)**
2. **EDM connector [11] (gray)**
3. **Locknut and washer**
4. **ECM**

**Figure 7-8. Inside the Radiator Shroud**

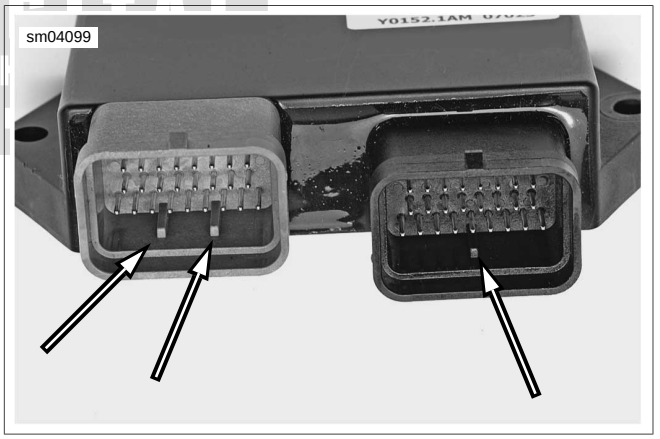



**Figure 7-9. Connector Alignment Rails**

# IGNITION COILS 7.6

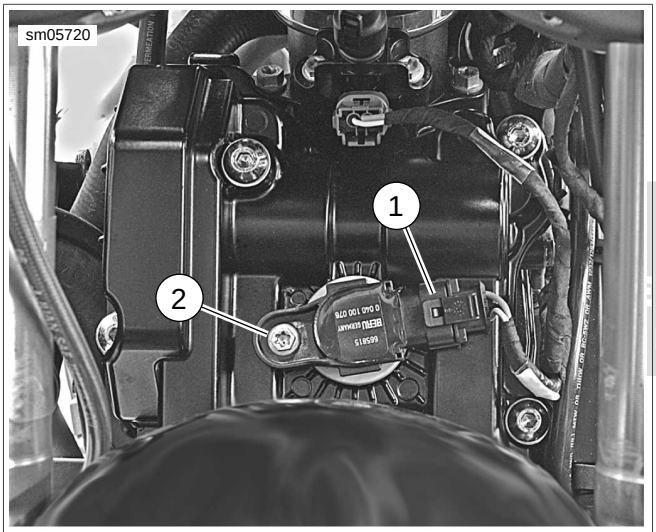
## FRONT

1. To access the front coil, rotate the engine down. See 3.4 ENGINE ROTATION.
2. See Figure 7-10. Separate the coil connector [83F] (1) housings.
3. Remove the fastener (2) and pull the coil off the spark plug.

*NOTE*

*See Figure 7-11. Both front and rear ignition coils are the same.*

4. To install, apply CCI Number 20 Brake Grease (Part No. 42830-05) to the sealing rings.
5. Push the coil over the spark plug until it clicks into place.
6. Install the fastener and tighten to 11 Nm (97 **in-lbs**).
7. Rotate the engine up. See 3.4 ENGINE ROTATION.




1. **Connector [83F]**
2. **Fastener**

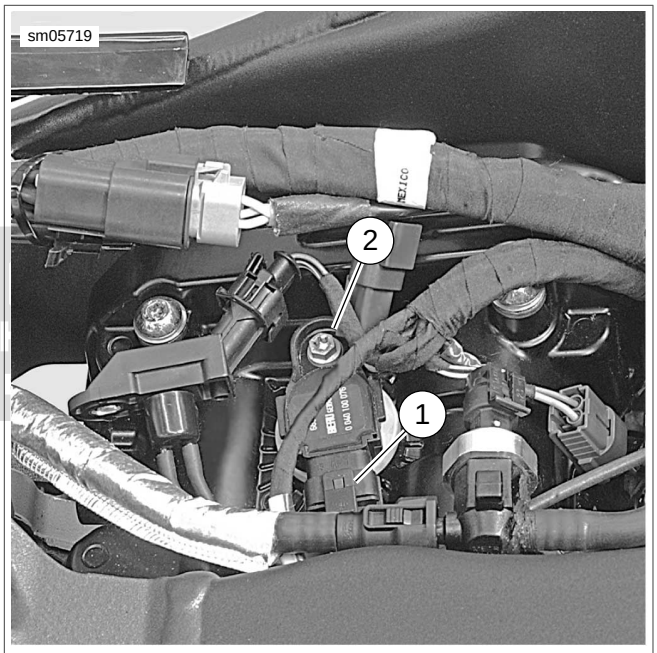
**Figure 7-10. Front Ignition Coil (engine rotated)**




**Figure 7-11. Ignition Coil**

## REAR

1. To access the rear coil, remove the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.
2. See Figure 7-12. Separate the coil connector [83R] (1) housings.
3. Remove the fastener (2) and pull the coil off the spark plug.
4. To install, apply CCI Number 20 Brake Grease (Part No. 42830-05) to the sealing rings.
5. Push the coil over the spark plug until it clicks into place.
6. Install the fastener and tighten to 11 Nm (97 **in-lbs**).
7. Install the air cleaner assembly. See 4.2 AIR CLEANER ASSEMBLY.




1. **Connector [83R]**
2. **Ignition coil fastener**

**Figure 7-12. Rear Ignition Coil**

# BATTERY CABLES 7.7

## NEGATIVE BATTERY CABLE

### Removal

1. Remove the seat and the pillion.

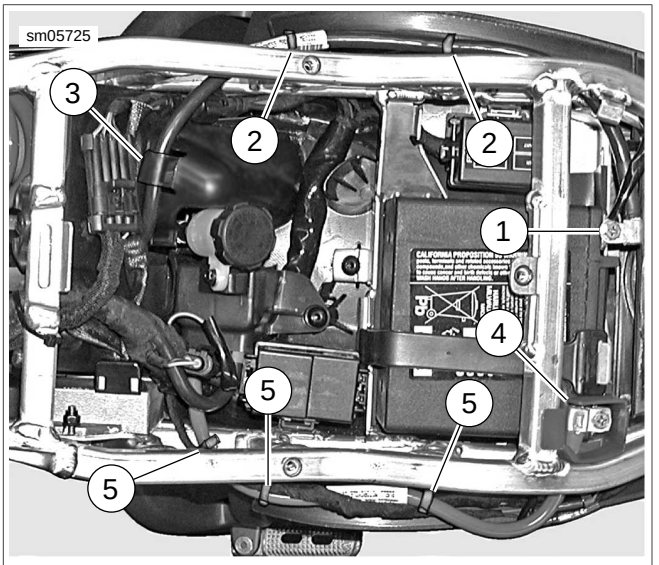
**⚠WARNING**

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

2. Remove the main harness ground and the negative battery cable from the battery terminal.
3. Remove the tail section body work. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
4. See Figure 7-13. Remove the nut and the negative battery cable at the frame ground.
5. Pull the rubber grommet and cable from the subframe pan.
6. See Figure 7-14. Pull the cable attachment clips and negative battery cable from the subframe.




**Figure 7-13. Negative Battery Cable Ground**




1. **Negative battery terminal**
2. **Cable strap**
3. **Cable guide**
4. **Positive battery terminal**
5. **Cable strap (positive cable)**

**Figure 7-14. Battery Cable Routing**

### Installation

1. Slide a rubber grommet over the negative battery cable.
2. See Figure 7-15. Thread the cable down the shock opening in the subframe pan, and press the grommet into the pan edges.
3. See Figure 7-16. Loop the cable out under the cable guide and through the subframe.
4. Fit the cable attachment clips to the cable and the battery ground lead.
5. Press the clips into the holes in the subframe.
6. Tighten the battery ground fastener to 9.6-10.6 Nm (85-94 **in-lbs**).
7. Install the tail section body work. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
8. Fit the cable and the battery ground ring terminals to the battery and tighten the fastener to 6.8-7.9 Nm (60-70 **in-lbs**).

**⚠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 the seat and the pillion.

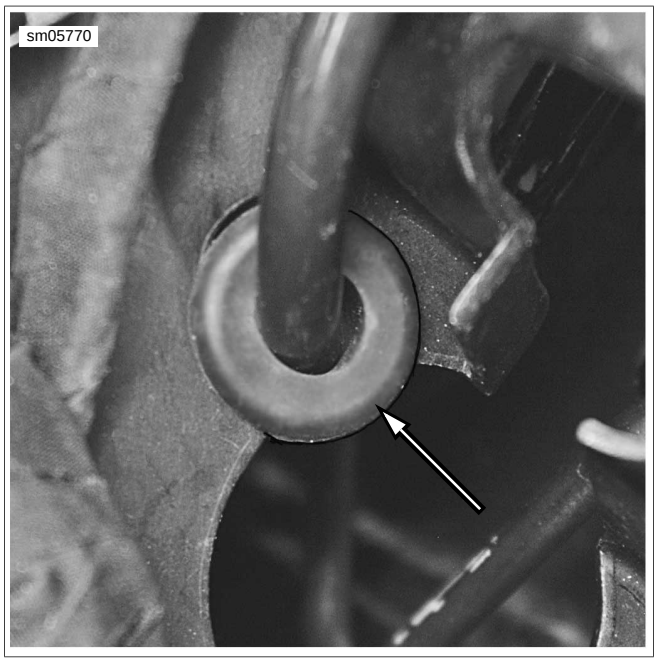
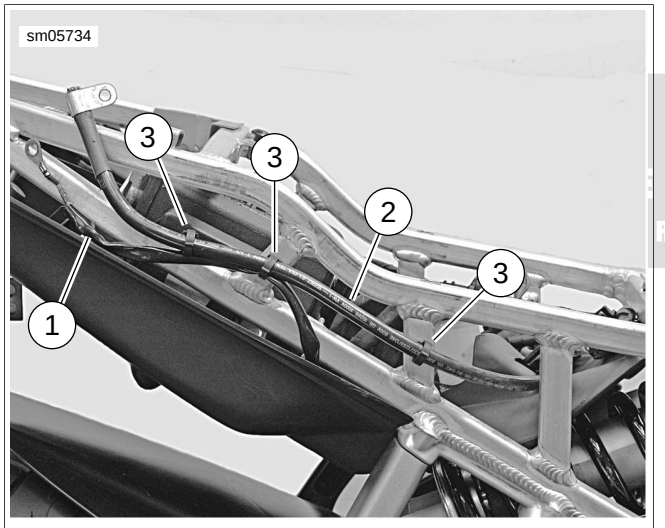



**Figure 7-15. Negative Battery Cable Grommet**




1. **Ground**
2. **Negative battery cable**
3. **Cable attachment clip**

**Figure 7-16. Negative Battery Cable Routing**

## POSITIVE BATTERY CABLE

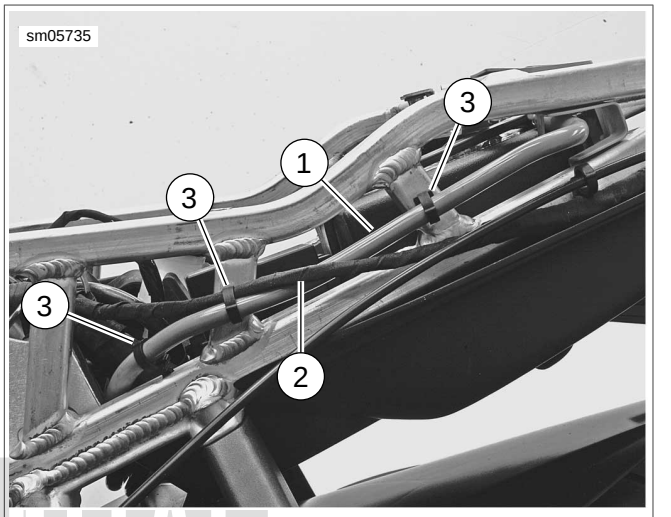
### Removal

1. Remove the seat and the pillion.

**⚠WARNING**

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

2. Remove the ground lead and the negative battery cable from the battery terminal.
3. Remove the tail section body work. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
4. Remove the positive battery cable and the positive terminal shield.
5. Remove the starter solenoid cover. See 7.8 STARTER, Solenoid.
6. Remove the starter solenoid nut and the battery fuse lead ring terminal and the positive battery cable ring terminal.
7. See Figure 7-17. Pull the cable attachment clips to remove the positive battery cable from the side of the subframe.




1. **Positive battery cable**
2. **Tail lamp wire lead**
3. **Cable attachment clip**

**Figure 7-17. Positive Battery Cable Routing**

### Installation

*NOTE*

*Route the straight ring terminal through the subframe to the solenoid and the L-bracket ring terminal to the battery.*

1. Fit the straight ring terminal to the front stud of the starter solenoid. Fit the battery fuse lead ring terminal and the washer on top of the battery cable ring terminal.
2. Route the cable alongside the subframe and along the tail light wire leads.
3. Fit the cable attachment clips to the battery cable. Capture the tail light lead with the center clip.
4. Press the cable attachment clips into the subframe holes.
5. Install the solenoid nut and tighten to 5.7-6.4 Nm (51-56 **in-lbs**).
6. Install the starter solenoid cover. See 7.8 STARTER, Solenoid.
7. Install the tail section body work. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.

**CAUTION**

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

**CAUTION**

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

**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)**

8. See Figure 7-18. Install the positive battery cable with the positive terminal shield.
9. Tighten the fastener to 6.8-7.9 Nm (60-70 **in-lbs**).
10. Install the negative battery cable and the ground lead.
11. Tighten the fastener to 6.8-7.9 Nm (60-70 **in-lbs**).

**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 the seat and the pillion.




**Figure 7-18. Positive Battery Cable Terminal**

DIGITAL TECHNICIAN HARLEY-DAVIDSON

## SOLENOID

### Removal

1. Remove the seat and pillion.

**⚠ WARNING**

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

2. Disconnect the negative battery cable.
3. See Figure 7-19. Separate the solenoid connector [128] housings.
4. See Figure 7-20. Remove the brake fluid reservoir.
5. Remove the solenoid cover fastener and the cover.
6. Remove the nuts.
7. See Figure 7-21. Remove the battery cable (1) and the starter cable (2).
8. Remove the solenoid assembly.
9. See Figure 7-22. Remove the bottom (2) and pull the solenoid (1) out of the boot (3).

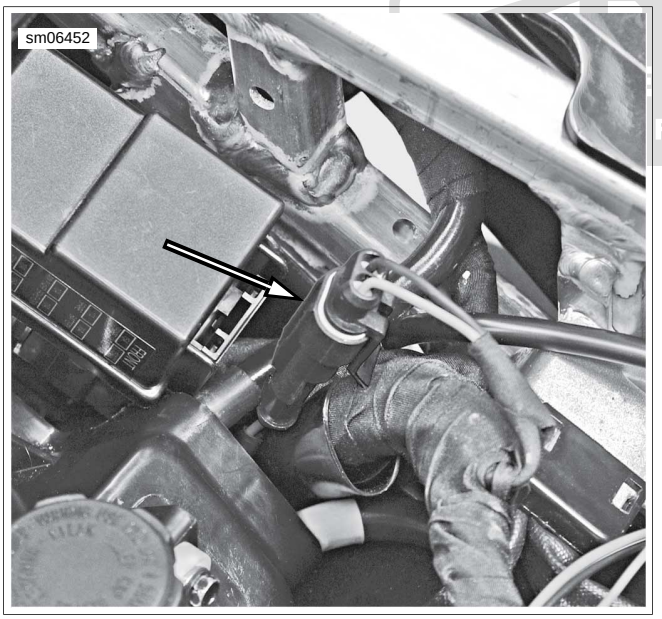
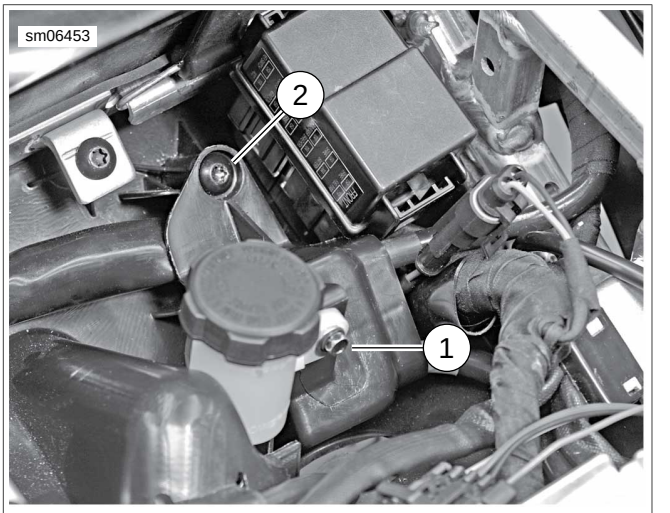
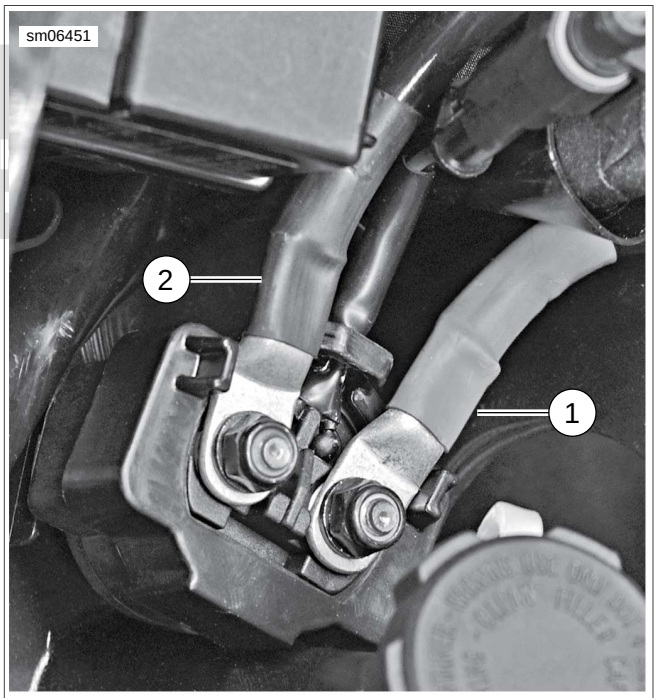



**Figure 7-19. Solenoid Connector [128]**



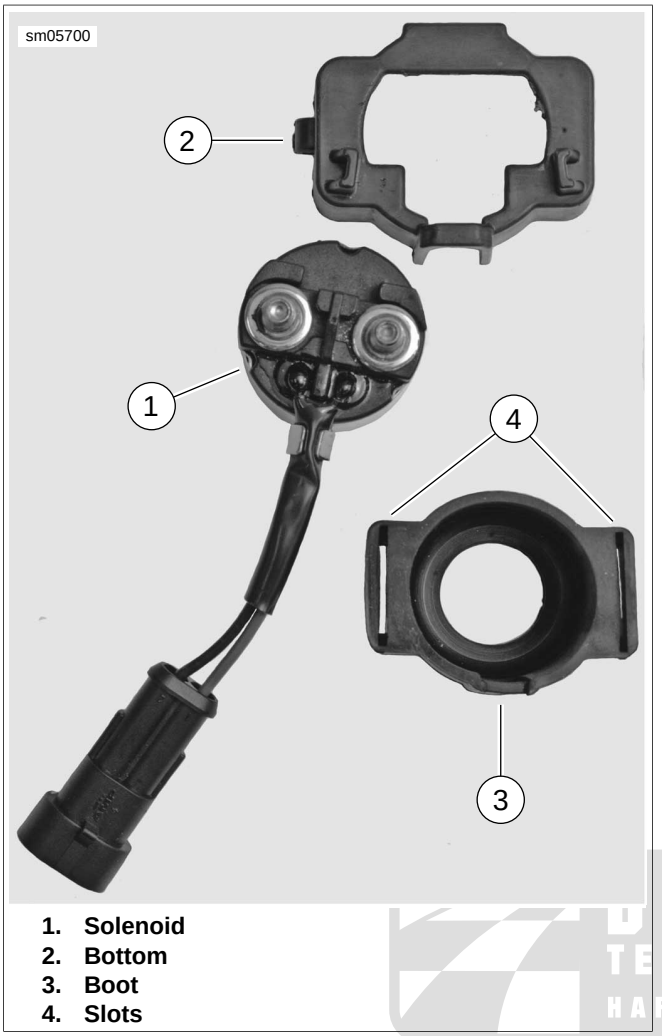

1. **Brake fluid reservoir fastener**
2. **Cover fastener**

**Figure 7-20. Solenoid Cover**




1. **Battery cable**
2. **Starter cable**

**Figure 7-21. Starter Solenoid**




1. **Solenoid**
2. **Bottom**
3. **Boot**
4. **Slots**

**Figure 7-22. Solenoid**

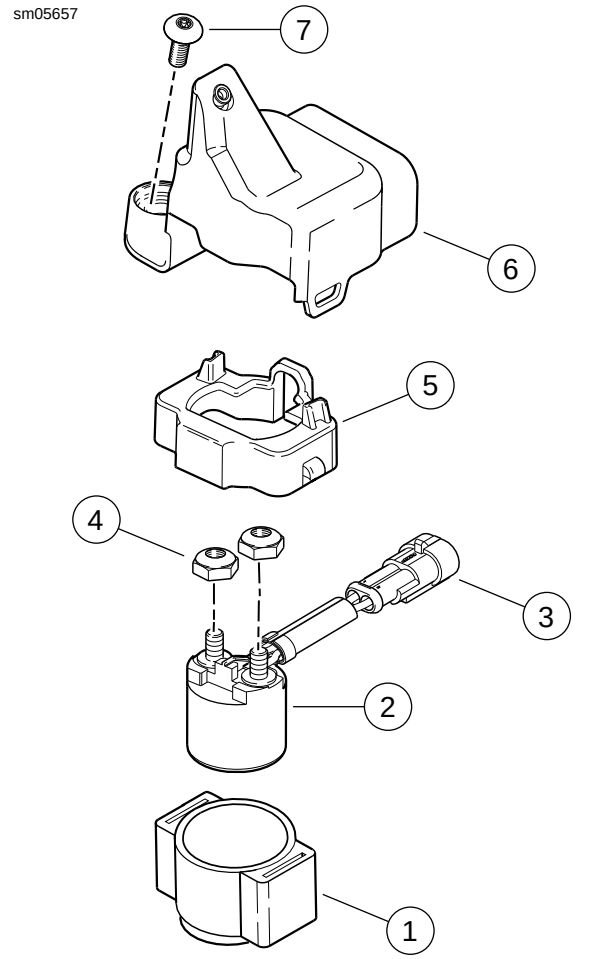
## Installation

1. See Figure 7-23. Fit the solenoid (2) to the boot (1).
2. Fit the bottom (5) over the solenoid and boot.
3. See Figure 7-24. Orient the solenoid and push the boot slots over the tabs on the pan of the subframe.
4. Fit the positive battery cable ring terminal to the front solenoid stud.
5. Verify that the main wire harness is routed between the cables, and fit the starter cable to the rear solenoid stud and loop it forward toward the starter.
6. See Figure 7-23. Install solenoid nuts (4) and tighten to 5.7-6.4 Nm (51-56 **in-lbs**).
7. Join the connector [128] (3) housings.
8. Snap the solenoid cover (6) over the bottom.
9. Install and tighten the cover fastener to 4.1-6.9 Nm (36-60 **in-lbs**).
10. Install the brake reservoir and tighten to 5.7-6.4 Nm (50.6-56.2 **in-lbs**).
11. Connect the negative battery cable.

**⚠WARNING**

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

12. Install the seat.




1. **Boot**
2. **Solenoid**
3. **Connector [128]**
4. **Locknut**
5. **Bottom**
6. **Top/brake reservoir mount**
7. **Fastener**

**Figure 7-23. Starter Solenoid**

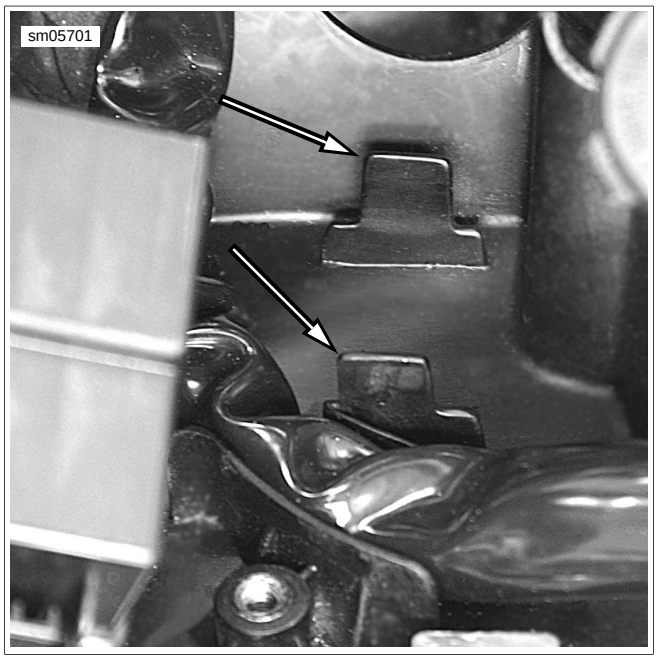



Figure 7-24. Solenoid Tabs




Figure 7-25. Power Cable Connection Rubber Boot

## STARTER: REMOVAL

**WARNING**

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

1. Disconnect the negative battery cable.
2. Remove the oil cooler. See 5.9 OIL COOLER.
3. See Figure 7-25. Pull the rubber boot off of the power cable connection.
4. Remove the nut, washer and the power cable.
5. See Figure 7-26. Remove the fasteners and pull the starter out to clear the crankcase.

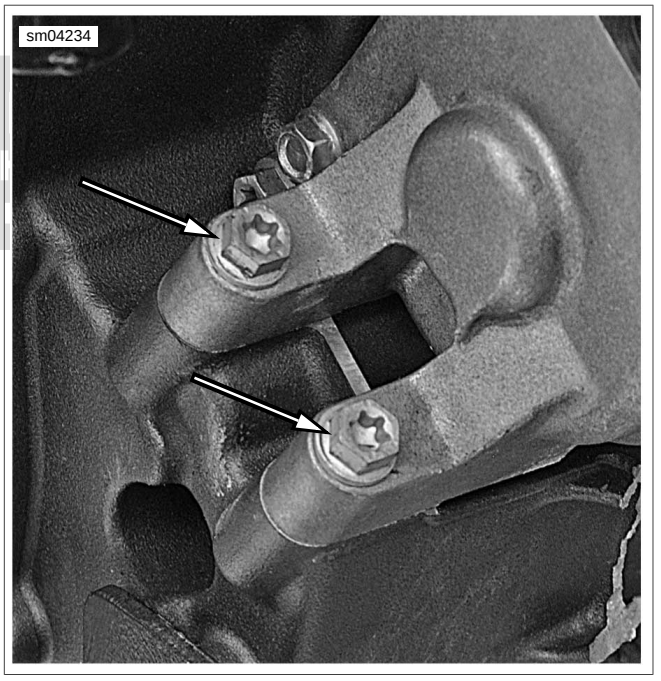



Figure 7-26. Starter Fasteners

## STARTER: INSTALLATION

1. See Figure 7-27. Inspect the starter O-ring. Replace as required.
2. Coat the starter gear O-ring surface and the mating crankcase bearing surface with LUBRIPLATE No. 105 Motor Assembly Grease.
3. See Figure 7-28. Engage the starter gear to the ring gear in the crankcase and thread in the hex head TORX fasteners.
4. Tighten to 11 Nm (97 **in-lbs**).
5. Slip the ring terminal of the power cable over the starter power stud.
6. Install the washer and nut.
7. Tighten to 9.6-10.6 Nm (85-94 **in-lbs**).
8. Pull the rubber boot over the connection.
9. Install the oil cooler. See 5.9 OIL COOLER.

**⚠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)**

10. Connect the negative battery cable.




**Figure 7-27. Starter O-ring**




**Figure 7-28. Starter Gear**

# VOLTAGE REGULATOR 7.9

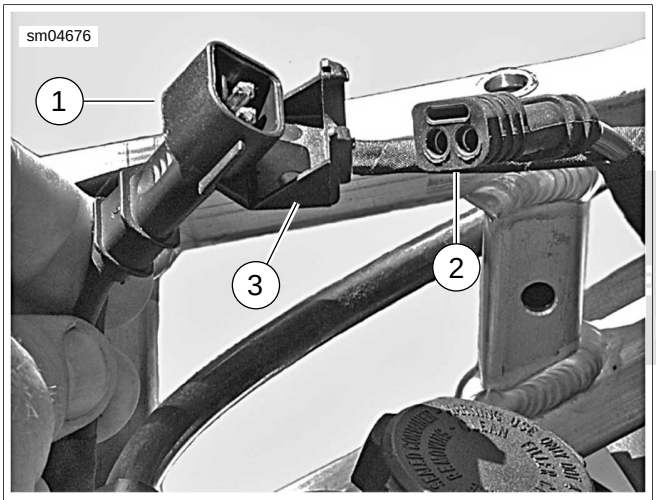
## REMOVAL

1. Remove the pillion and seat.

**⚠WARNING**

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

2. Disconnect the negative battery cable.
3. Separate the stator connector [46] housings and cut the cable strap around the wire harnesses.
4. See Figure 7-29. To separate the voltage regulator connector [77] pin (1) and socket (2) housings, press the clamp (3) away from the socket housing.
5. See Figure 7-30. Remove the nut, washer and the voltage regulator.




1. **Pin housing**
2. **Socket housing**
3. **Clamp**

**Figure 7-29. Regulator Connector [77]**

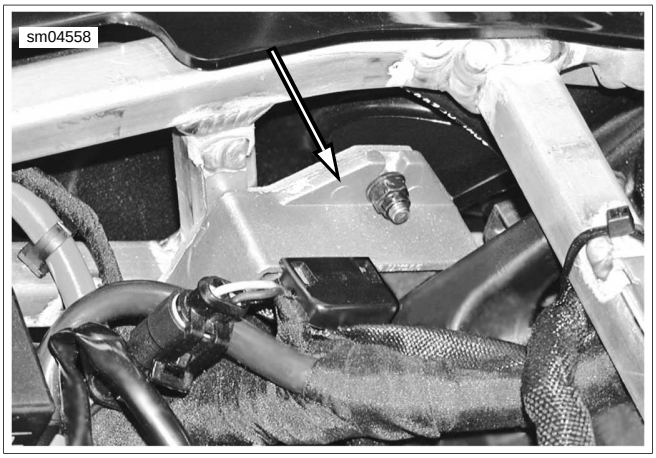



**Figure 7-30. Voltage Regulator**

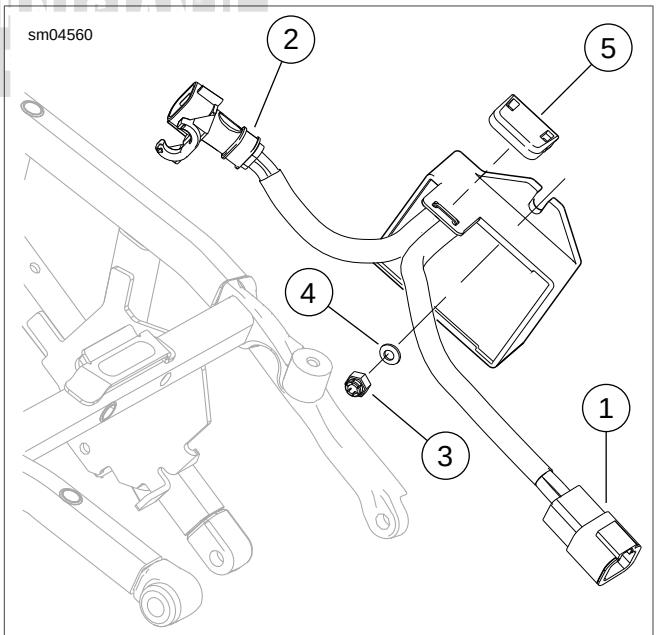
## INSTALLATION

1. Spread a layer of high temperature silicon heat-sink compound on the back of the voltage regulator.
2. See Figure 7-31. Fasten the **new** voltage regulator to subframe bracket with a washer (4) and nut (3).
3. Tighten the locknut to 8.0-9.5 Nm (71-84 **in-lbs**).
4. Slide on the protective cap (5).
5. Secure the stator wire lead to the main harness with a cable strap, and join the stator connector [46] housings.
6. Route the regulator wire lead across the subframe and mate the voltage regulator connector [77] (2) pin and socket housings.
7. Connect the negative battery cable.

**⚠WARNING**

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

8. Install the seat.
9. Test the charging system. See the electrical diagnostic manual.




1. **Stator connector [46]**
2. **Regulator connector [77]**
3. **Nut**
4. **Washer**
5. **Cap**

**Figure 7-31. Voltage Regulator Assembly**

# ALTERNATOR 7.10

## REMOVAL AND DISASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| B-48857 | ALTERNATOR ROTOR REMOVER |
| B-48858 | CRANKSHAFT LOCKING TOOL |

### Rotor

1. Drain the engine oil.
2. Remove the seat.

**⚠WARNING**

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

3. Remove the negative battery cable.
4. Separate the stator connector [46] pin and socket housings.

*NOTE*

*Remove the wire terminals from the socket housing and tape a length of mechanics wire to the leads. Lubricate the leads with silicon spray and guide the leads through the engine wire harness support.*

5. Remove the CKP sensor. See 7.18 CRANKSHAFT POSITION SENSOR (CKP), Removal.
6. Remove the ignition cover. See 3.11 ALTERNATOR SIDE, Ignition Cover.

*NOTE*

*To remove the flywheel crankshaft nut, it will be necessary to remove the plug for the crankshaft locking tool.*

7. Remove the plug and lock the crankshaft with the CRANKSHAFT LOCKING TOOL (Part No. B-48858).
8. Remove the flywheel crankshaft nut.
   a. Use a hot air gun at 500 °C (932 °F) to soften threadlocker.
   b. With a breaker bar, turn nut back and forth to clean threads of threadlocker.
   c. Remove crankshaft nut.
9. See Figure 7-32. Fit the end cap to the crankshaft and thread the ALTERNATOR ROTOR REMOVER (Part No. B-48857) onto the flywheel hub. Turn the forcing screw to remove the rotor from the crankshaft splines.
10. See Figure 7-33. Remove the starter gear from the rotor assembly.
11. Remove the six hex key bolts to remove the rotor from the sprag clutch housing.

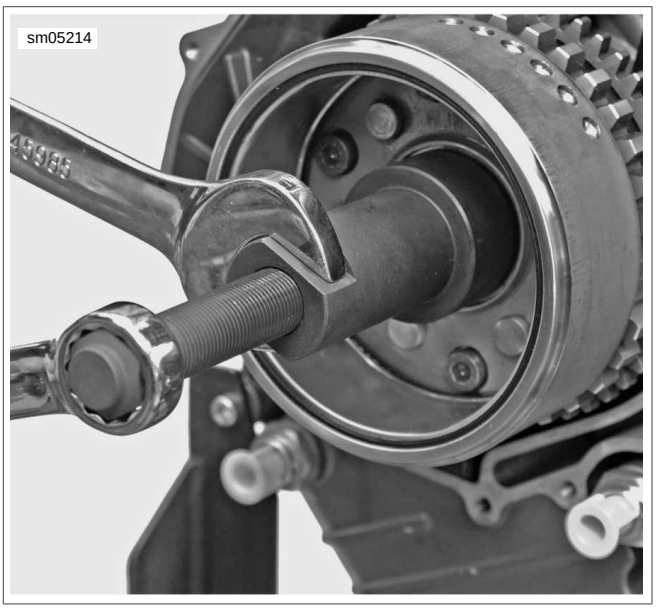
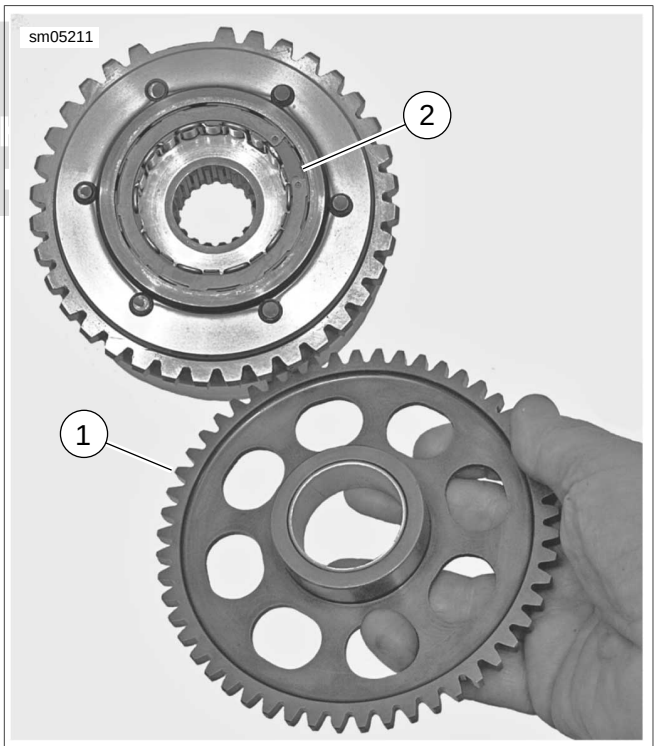



**Figure 7-32. Alternator Rotor Remover**




1. **Starter gear**
2. **Sprag clutch**

**Figure 7-33. Sprag Clutch on Rotor and Starter Gear**

### Stator

1. See Figure 7-34. Remove the stator wire harness from the clip on the top of the ignition cover.

2. See Figure 7-35. Remove the two screws (1) securing the cable holder (2).
3. Remove the three screws (3) securing the stator to the ignition cover.
4. Slide the rubber seal (4) out of the slot in the ignition cover.

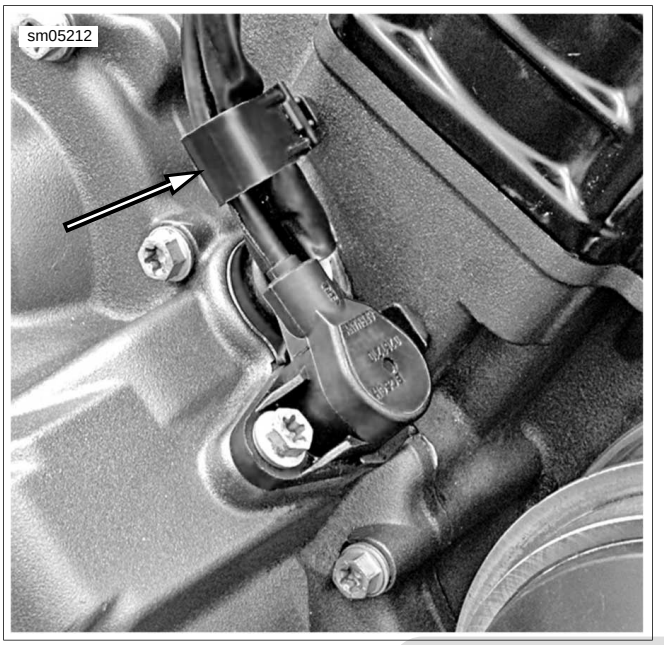
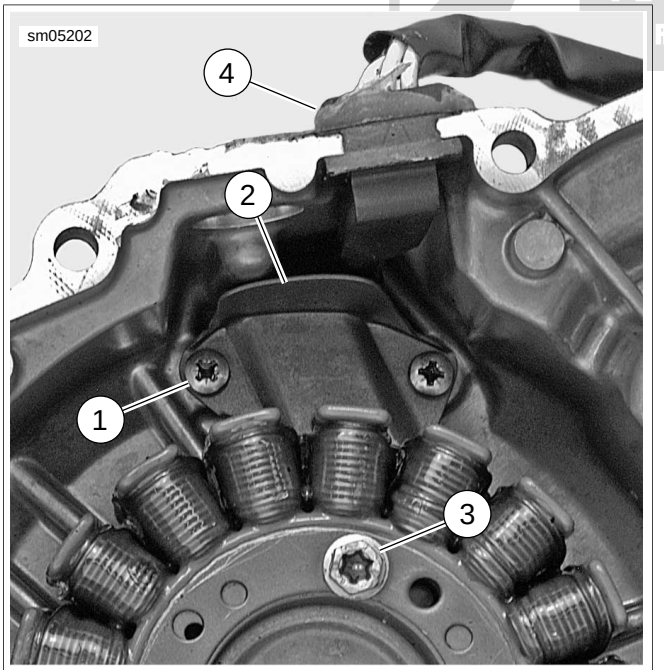



**Figure 7-34. Stator and CKP Sensor Wire Harness Clip**




1. **Screw**
2. **Cable holder**
3. **Screw**
4. **Seal**

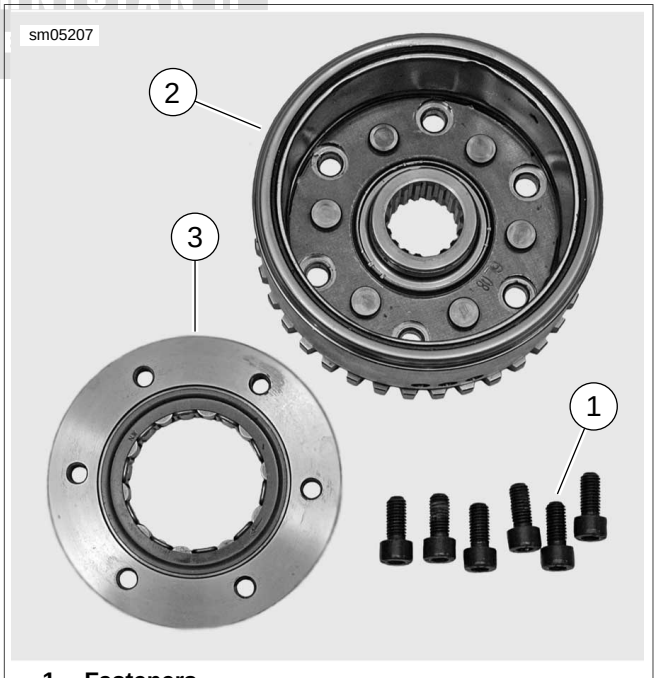
**Figure 7-35. Stator**

## ASSEMBLY AND INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| B-48858 | CRANKSHAFT LOCKING TOOL |

### Rotor

1. Apply LOCTITE 648 (green) to the sprag clutch fasteners.
2. See Figure 7-36. Install the six hex key fasteners (1) through the rotor (2) into the sprag clutch housing (3).
3. Tighten to 30 Nm (22 ft-lbs).
4. See Figure 7-37. Fit starter gear to sprag clutch and rotate slightly until starter gear hub drops into sprag clutch.
5. See Figure 7-38. Match the double tooth spline on the crankshaft with the gap in splines in the rotor hub and slide the rotor hub onto the crankshaft.
6. Rotate the starter gear and the freewheeling gear until the teeth mesh.
7. Clean the threads of the crankshaft and the crankshaft nut.
8. Apply LOCTITE 648 (green) to threads of crankshaft nut.
9. Install the crankshaft nut.
10. Tighten to 280-290 Nm (207-214 ft-lbs).
11. Remove the CRANKSHAFT LOCKING TOOL (Part No. B-48858).
12. Install the plug and tighten to 15 Nm (11 ft-lbs).




1. **Fasteners**
2. **Rotor**
3. **Sprag clutch housing**

**Figure 7-36. Alternator Rotor/Flywheel**




**Figure 7-37. Rotate Starter Gear to Fit Sprag Clutch**

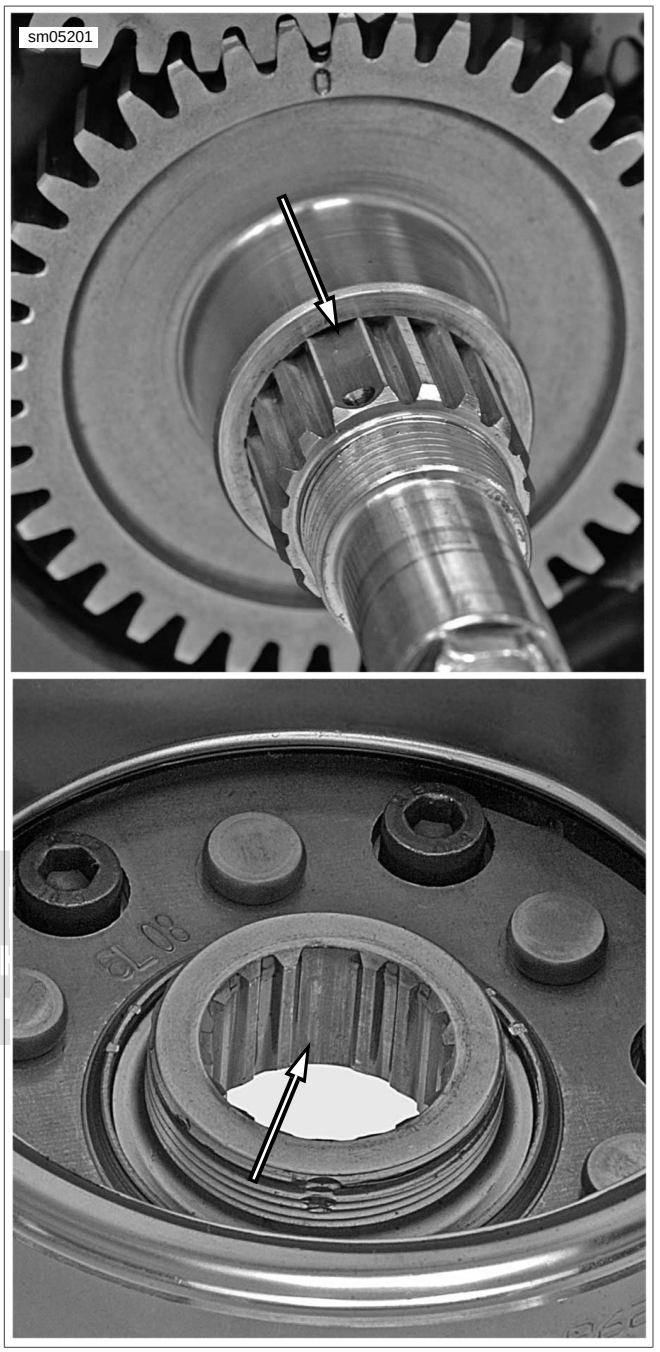



**Figure 7-38. Crankshaft Spline Double Tooth and Gap in Splines in Rotor**

## Stator

1. See Figure 7-39. Fill groove of rubber seal (2) with H-D HIGH-PERFORMANCE SEALANT, GRAY (Part No. 99650-02) and slide into groove in the ignition cover.
2. Apply LOCTITE 243 (blue) to the threads of the three shouldered flange bolts.
3. Install the flange bolts through the stator into the ignition cover and tighten to 11 Nm (97 **in-lbs**).
4. Apply LOCTITE 243 (blue) to the threads of the two cable cover fasteners.
5. Install the cable cover over the stator cable with the fasteners.
6. Tighten to 4 Nm (35 **in-lbs**).
7. Install the ignition cover. See 3.11 ALTERNATOR SIDE, Ignition Cover.
8. Wrap the stator leads around the mechanics wire and lubricate with silicon spray.
9. Pull the stator leads through the engine wire harness support and install the socket terminals and join the stator connector [46] pin and socket housings.
10. Cable strap the stator wire harness to the engine and main harness under the seat.

*NOTE*

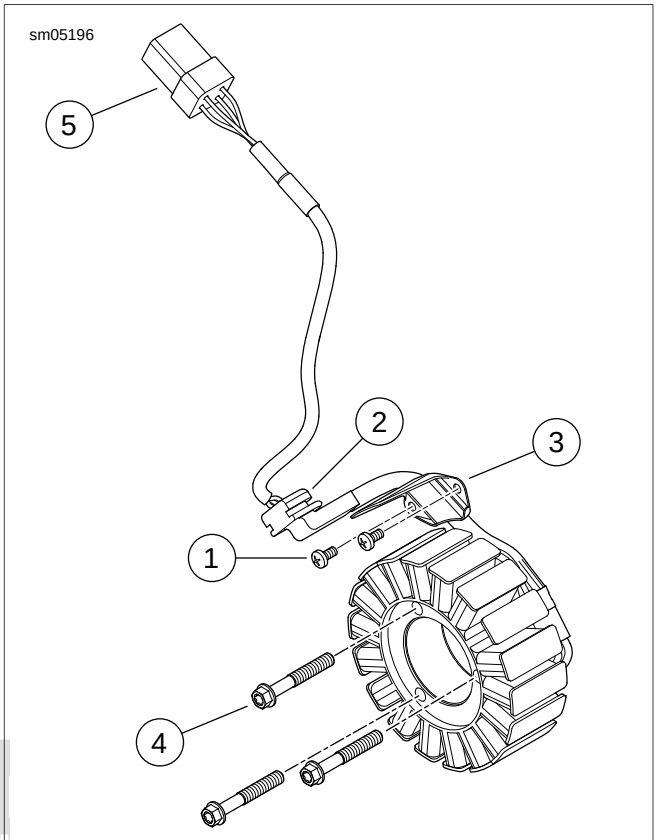
*If removed, install the muffler. See 4.7 EXHAUST SYSTEM, Muffler: Installation.*

11. Connect the negative battery cable.

**WARNING**

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

12. Install the seat.
13. If drained, fill with engine oil.




1. **Cable holder fasteners**
2. **Rubber seal**
3. **Cable holder**
4. **Shoulder bolts**
5. **Stator connector [46]**

**Figure 7-39. Stator Assembly**

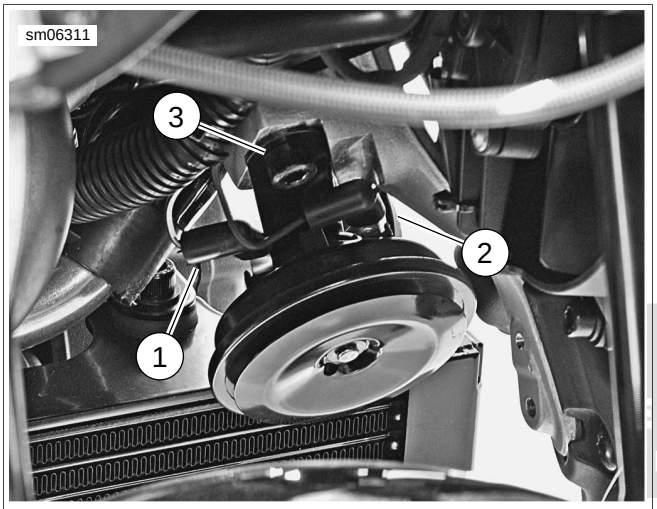
# HORN 7.11

## REMOVAL

**⚠WARNING**

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

1. Remove the rider seat and remove the main fuse.
2. See Figure 7-40. Separate the power lead (1) and the ground lead (2) from the spade terminals.
3. Remove the horn fastener (3).
4. Remove the horn from the K-bracket.




1. **Power lead**
2. **Ground lead**
3. **Fastener**

**Figure 7-40. Horn**

## INSTALLATION

1. See Figure 7-41. Attach horn to K-bracket using fastener. Tighten to 8.1-10.8 Nm (72-96 **in-lbs**).

*NOTE*

*Wire polarity is not important.*

2. Connect the power lead and ground lead to the spade terminals.

**⚠WARNING**

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

3. Install the main fuse and the seat.
4. If horn does not sound, see the electrical diagnostic manual.

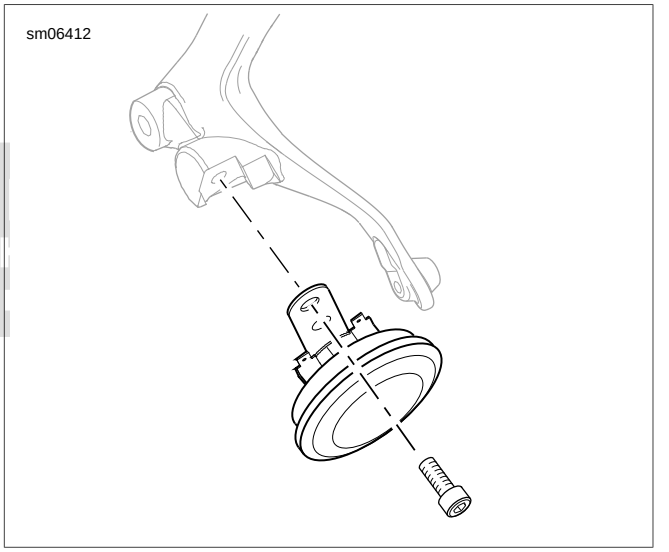



**Figure 7-41. Horn Assembly**

# TURN SIGNALS 7.12

## FRONT TURN SIGNALS/MIRRORS: 1125R

### Removal

*NOTE*

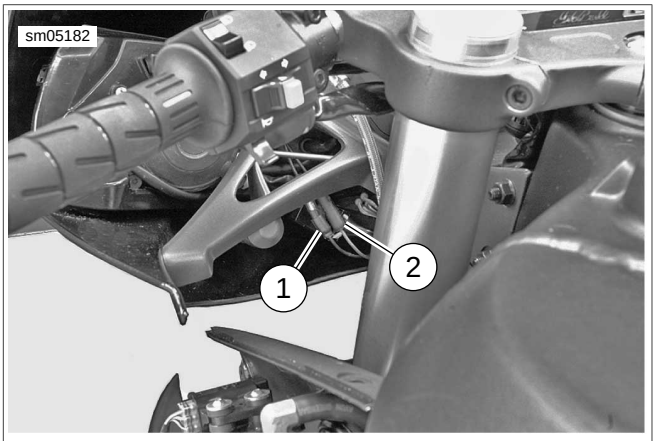
*The turn signals are integrated into the mirror housings and are non-repairable LED lights. If a front turn signal fails, replace the mirror with the turn signal.*

1. See Figure 7-42. Disconnect bullet connectors (1, 2) located behind the front fairing.

*NOTE*

*Take note of turn signal wire lead routing for reference during assembly.*

2. See Figure 7-43. Remove the two nuts (1) that retain the turn signal/mirror to the fairing support bracket (2).
3. Remove mirror (3) while pulling turn signal wire leads through the hole in fairing.




1. **Ground wire bullet connector**
2. **Power wire bullet connector**

**Figure 7-42. Front Turn Signal Connectors: 1125R**

### Installation

*NOTE*

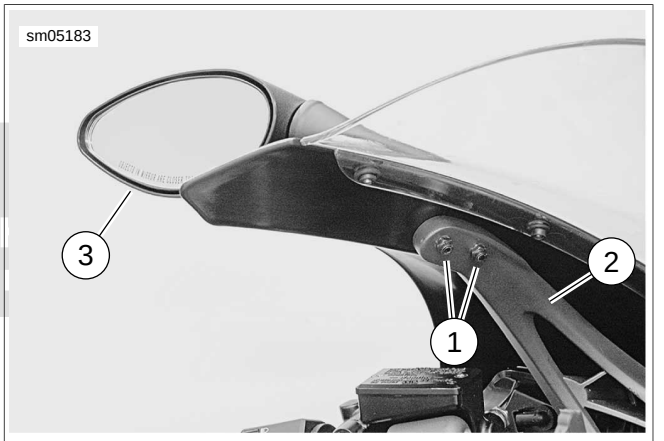
*Leave slack in the wire leads above the mounting bracket to allow the turn signal/mirrors to fold.*

1. Thread the turn signal wire leads through the hole in the fairing.
2. To prevent damage to the wires, locate the leads in the relief in the fairing support bracket.
3. Fit the turn signal/mirror studs through the fairing and support bracket.
4. Install nuts and tighten to 8.1-10.8 Nm (72-96 **in-lbs**).
5. Connect the bullet connectors.

**WARNING**

**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

6. Check the left and right front and rear turn signals.




1. **Nuts**
2. **Fairing support bracket**
3. **Mirror and turn signal assembly**

**Figure 7-43. Turn/Signal Installation: 1125R**

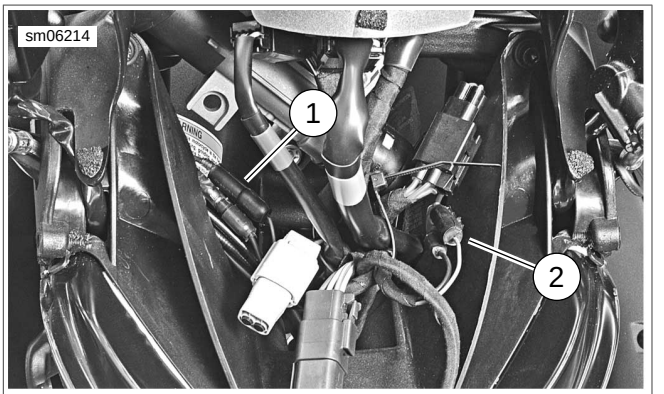
# FRONT TURN SIGNALS/MIRRORS: 1125CR

## Removal

*NOTE*

*The turn signals are integrated into the mirror housings and are non-repairable LED lights.*

1. Remove the windscreen.
2. See Figure 7-44. Separate the right pair [31RB] (1) and the left pair [31LB] (2) turn signal barrel connectors.
3. Remove the two fasteners retaining the right turn signal/mirror.
4. Pull the turn signal wire leads.
5. Remove the fastener retaining the left turn signal/mirror.
6. Pull the turn signal wire leads.




**1. Right turn signal connectors [31RB]**
**2. Left turn signal connectors [31LB]**

**Figure 7-44. Turn Signal Barrel Connectors: 1125CR**

## Installation

*NOTE*

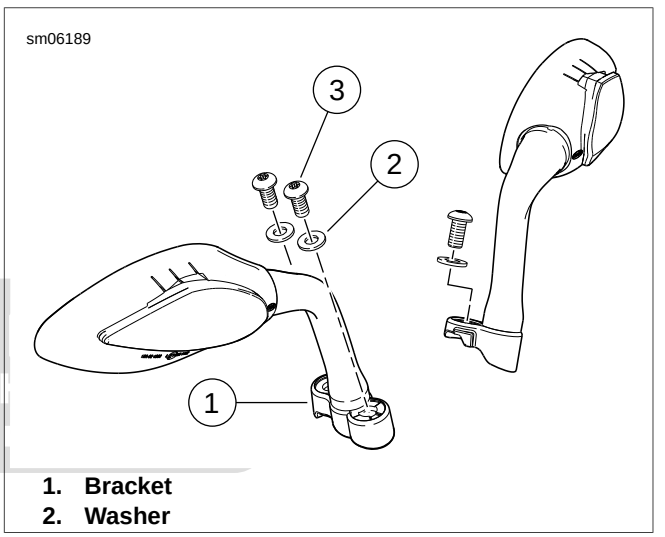
*Leave slack in the wire leads to allow the turn signal/mirrors to fold.*

1. See Figure 7-45. Thread the turn signal wire leads through the V-slot in the side of the windscreen.
2. Install the fasteners (3) with washers (2).
3. Push the barrel connectors [31RB] [31LB] together.
4. Tighten the fasteners to 24.4-27.0 Nm (18-20 ft-lbs).
5. Install the windscreen.

**⚠WARNING**

**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

6. Check the right and left, front and rear, turn signals.




**1. Bracket**
**2. Washer**

**Figure 7-45. Turn Signals/Mirrors: 1125CR**

## REAR TURN SIGNALS

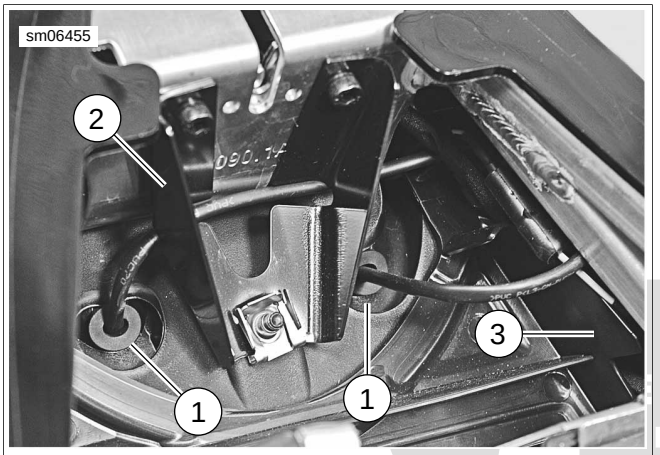
### Removal

1. Remove the pillion.
2. Disconnect the negative battery cable.

*NOTE*

*See Figure 7-46. Rear turn signal and tail light wire connectors are located behind the shield (3) within the trunk.*

3. Remove the tail section to access the connectors. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
4. Separate the bullet connectors of the turn signal leads.
5. Pull the wires out through the grommet (1).
6. See Figure 7-47. Remove nut (4) and lockwasher (3).
7. Remove turn signal assembly (1) from tail section (5).




1. **Grommet**
2. **Wire retainer**
3. **Shield**

**Figure 7-46. Turn Signal Wire Routing**

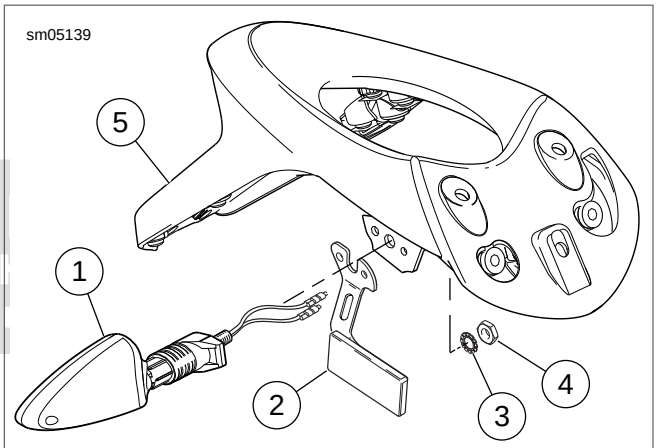
### Installation

1. See Figure 7-47. Insert the bullet connectors through the mounting hole in the tail section (5).
2. Loosely attach the turn signal with a lockwasher (3) and nut (4).
3. Hold the reflector (2) in place while securing turn signal.
4. Tighten nut (4) to 2.8-3.2 Nm (25-28 **in-lbs**).
5. See Figure 7-46. Insert the bullet connectors through grommet (1) and join the connector housings.
6. Route the right turn signal wire under the retainer (2).
7. Tuck wires behind shield (3) and connect battery.

**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. Check the left and right, front and rear turn signals.
9. Install the tail section. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
10. Install the pillion.




1. **Right rear turn signal**
2. **Reflector**
3. **Lockwasher**
4. **Nut**
5. **Tail section**

**Figure 7-47. Rear Turn Signals**

# HEADLAMP: 1125R 7.13

## BULBS

### Marker Lamp

**WARNING**

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

1. Remove the pillion.
2. Disconnect the negative battery cable.
3. Remove the headlamp assembly. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.
4. See Figure 7-48. Pull the marker light socket out of the headlamp module.
5. See Figure 7-49. Pull the bulb out of the socket.
6. Push a bulb into the socket and push the socket into the headlamp module.
7. Connect the negative battery cable.

*NOTE*

*The marker lights are illuminated with the two inner low beam headlamps.*




**Figure 7-48. Marker Lamp**

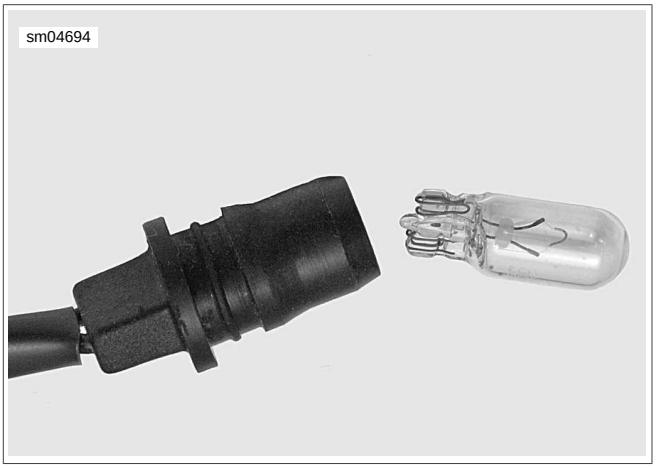



**Figure 7-49. Marker Lamp Bulb and Socket**

### Headlamp Bulb

**WARNING**

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

**WARNING**

**Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)**

*NOTE*

*The two inner lights are the low beam. The two outer lights are the high beam.*

1. Disconnect the negative battery cable.
2. Pull the rubber boot off of the headlamp socket.
   Rotate the connector to remove the bulb from the socket.
3. See Figure 7-50. Spread connector latches and remove bulb.
4. Snap a **new** bulb into socket.
5. Match three tabs on the bulb to three slots in the socket and rotate the bulb to lock it into the socket.
6. Replace the rubber boot.
7. Install the headlamp assembly. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.
8. Connect the negative battery cable.
9. Install the pillion.

**⚠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 headlamp with ignition ON.
    a. Switch between low beam and high beam.
    b. With low beam, press passing lamp switch.

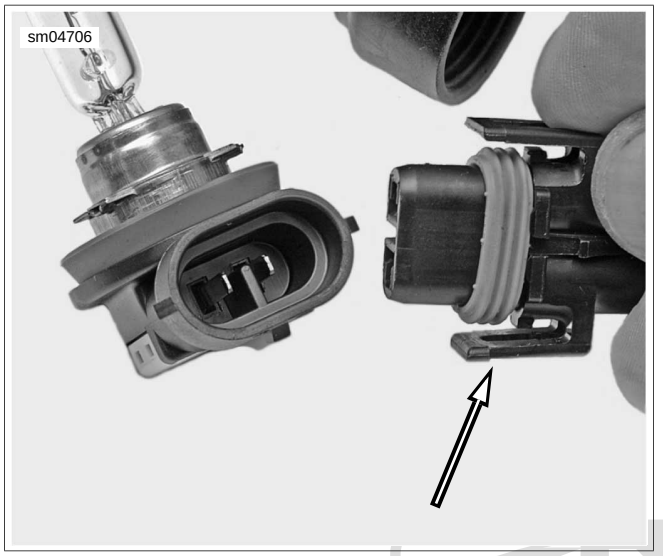



**Figure 7-50. Headlamp Bulb Connector Latch**

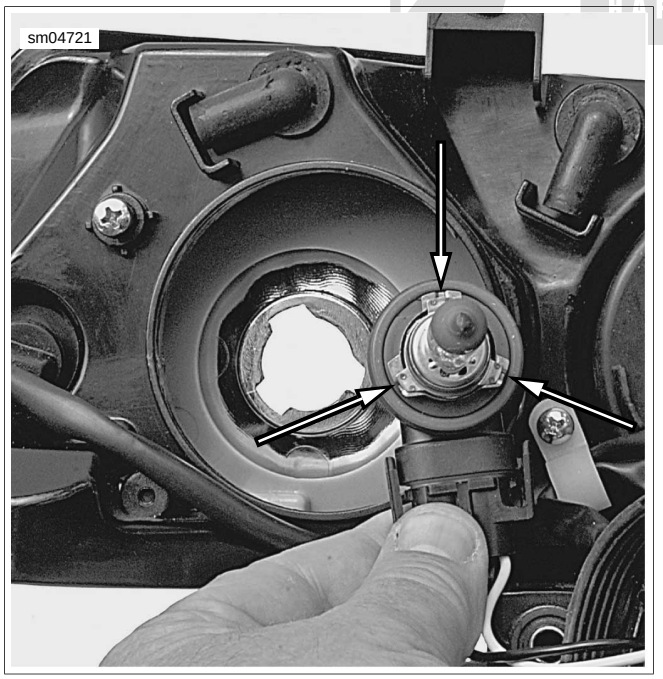



**Figure 7-51. Headlamp Bulb Tabs**

## WIRE HARNESS

### Removal

1. Remove the pillion.

**⚠WARNING**

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

2. Disconnect the negative battery cable.
3. Remove the fairing and headlamp module. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.
4. See Figure 7-53. Remove the wire harness nylon clips (2) and the wire harness (1).

**⚠WARNING**

**Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)**

5. Remove the marker light bulbs and the headlamp bulbs.
6. Separate the bulbs from the socket connectors.
7. See Figure 7-52. If necessary, cut the cable straps on the wire conduit inside the headlamp boots.

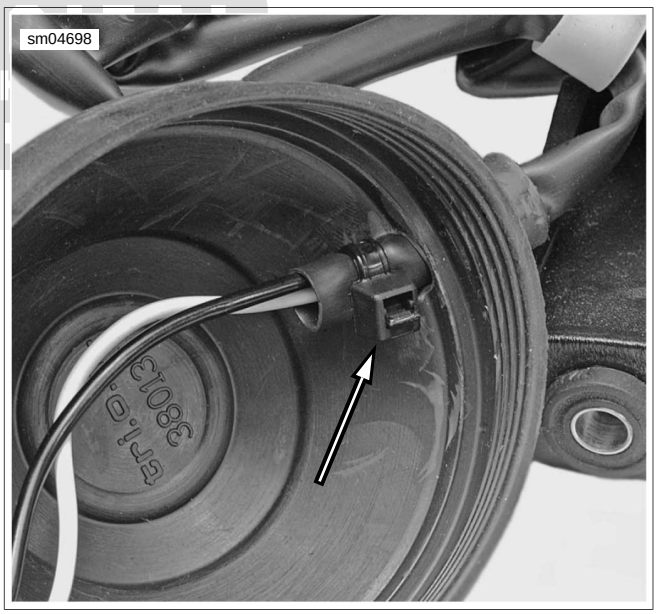
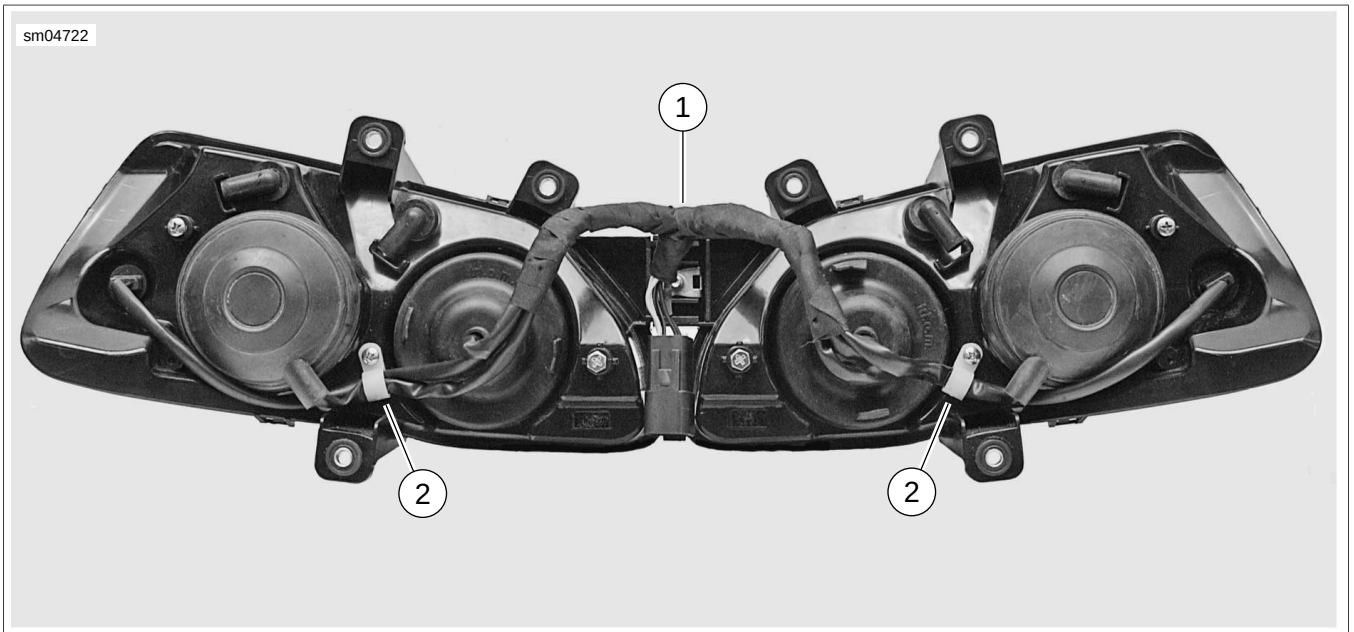



**Figure 7-52. Conduit Cable Strap**




1. **Wire harness**
2. **Nylon clip**

**Figure 7-53. Headlamp Module**

## Installation

1. If necessary, secure conduit inside headlamp boots with cable straps.
2. Route the harness with the pin connector [38] in the center.
3. Install and firmly tighten the two nylon clips.
4. Install headlamp bulbs and rotate to lock into position in the headlamp module.
5. Install the marker light bulbs and push into headlamp module.
6. Install the headlamp module and fairing. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.
7. Connect the negative battery cable.
8. Install the pillion.

**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 headlamp with ignition ON.
   a. Switch between low beam and high beam.
   b. With low beam, press passing lamp switch.
10. Check headlamp alignment.

# HEADLAMP: 1125CR 7.14

## BULBS

### High Beam

1. Remove the headlamp assembly. See 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR.
2. Remove the rubber boot from the right hand bulb.
3. See Figure 7-54. Turn the bulb receptacle counterclockwise to remove.
4. Pull the bulb from the receptacle.

*NOTE*

*Wrap the bulb in a soft cloth to prevent body oil from getting on the bulb.*

5. See Figure 7-55. Fit a **new** bulb matching the tab on the bulb holder to the tab in the receptacle.
6. Install the receptacle and turn clockwise to snap into place.
7. With the wire harness tube fitting the notch, fit the rubber boot over the socket opening.

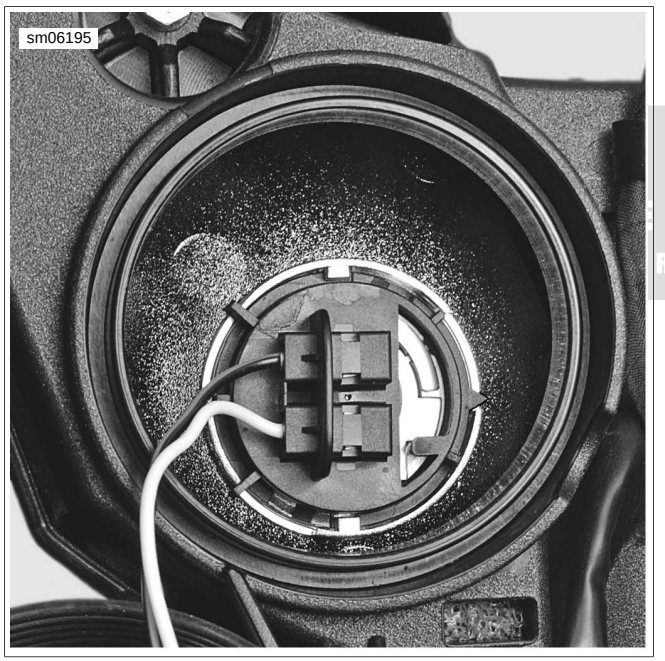



**Figure 7-54. LH Headlamp Bulb Socket**

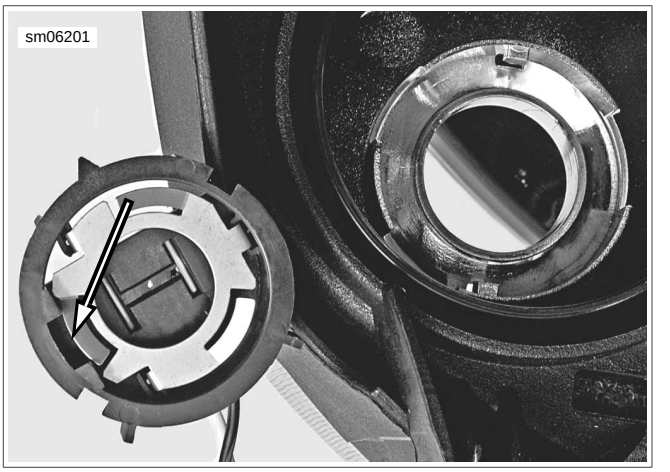



**Figure 7-55. Notch for Bulb Tab: RH Bulb Receptacle**

### Marker Lamp

1. See Figure 7-56. Pull the marker lamp out of the headlamp shell.
2. Replace with a **new** bulb and install.

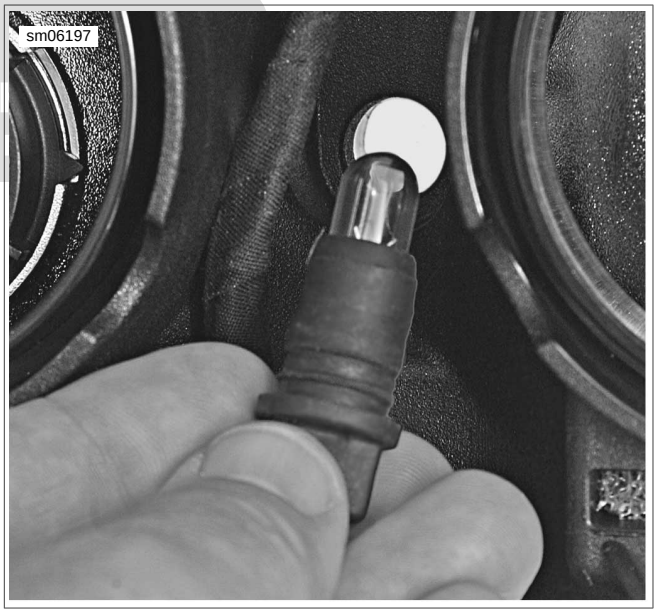
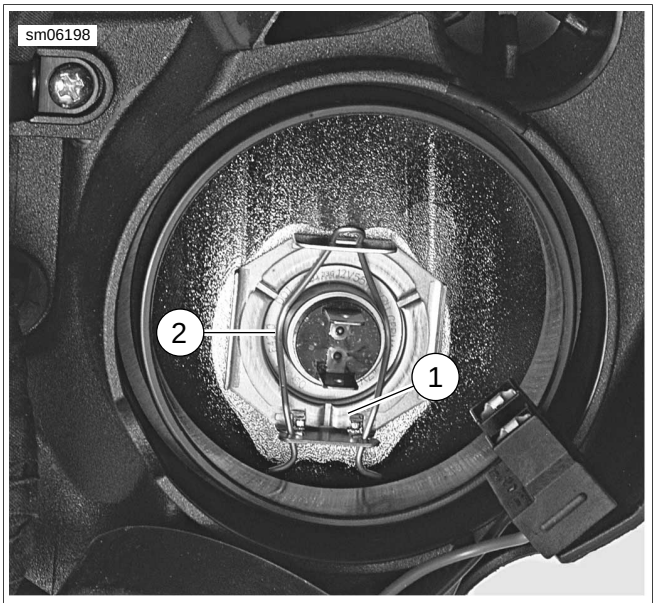



**Figure 7-56. Marker Lamp**

### Low Beam

1. Remove the rubber boot from the left hand bulb.
2. See Figure 7-57. Remove the spring clip (1) and the bulb.
3. Install the new bulb with the tab located in the bottom notch (2).
4. With the wire harness tube fitting the notch, fit the rubber boot over the socket opening.

5. Install the headlamp assembly. See 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR.




1. **Spring clip**
2. **Bulb tab**

**Figure 7-57. RH Headlamp Bulb Socket**

## Horizontal Alignment

See Figure 7-58. Use the adjustment screws to make horizontal adjustments in the high and low beams.




**Figure 7-58. Horizontal Adjusters**

## WIRE HARNESS

1. See Figure 7-59. Cable strap the wire harness where in enters the rubber boot from the routing tube.
2. See Figure 7-60. Assemble the headlamp as required.
3. See Figure 7-61. Route the harness and tighten the P-clamp.

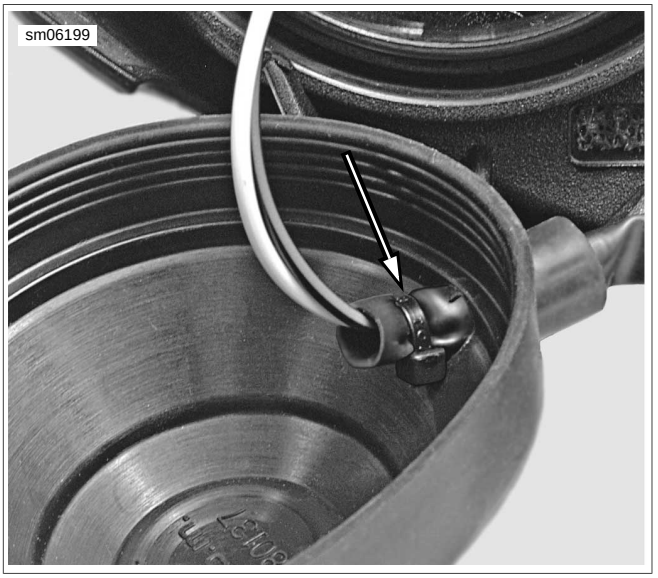
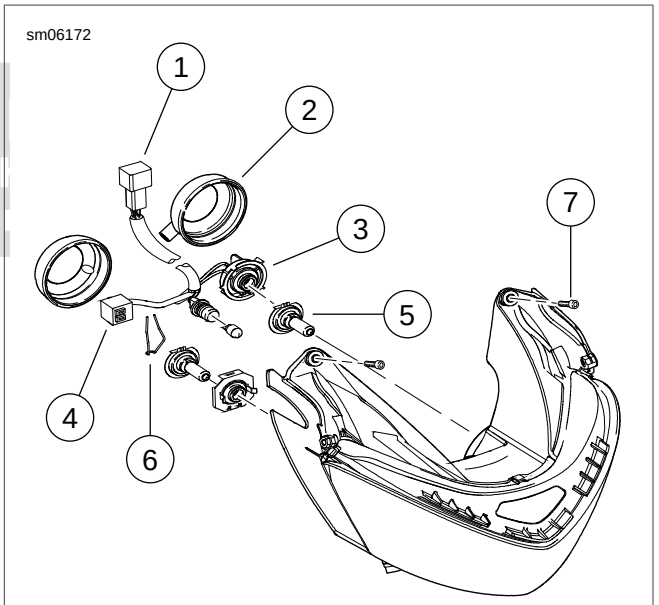



**Figure 7-59. Cable Strap**




1. **Connector [38]**
2. **Rubber boot**
3. **LH headlamp holder**
4. **RH headlamp connector**
5. **Bulb**
6. **Spring clip**
7. **Headlamp assembly fastener**

**Figure 7-60. Headlamp Assembly: 1125CR**

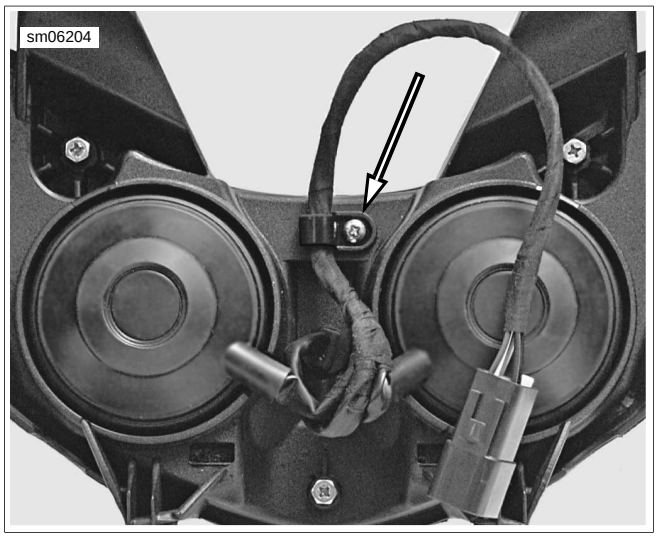



**Figure 7-61. Headlamp Wire Harness P-Clamp**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# TAIL AND LICENSE PLATE LAMP 7.15

## TAIL LAMP

### Removal

1. See Figure 7-62. Remove two screws (2) to detach tail lamp lens (4) and tail lamp (1). If replacing bulb (3), turn counterclockwise and remove.
2. Disconnect tail lamp harness (5) connectors [32, 33].

### Installation

1. See Figure 7-62. Attach the tail lamp harness (5) connectors [32, 33].

*NOTE*

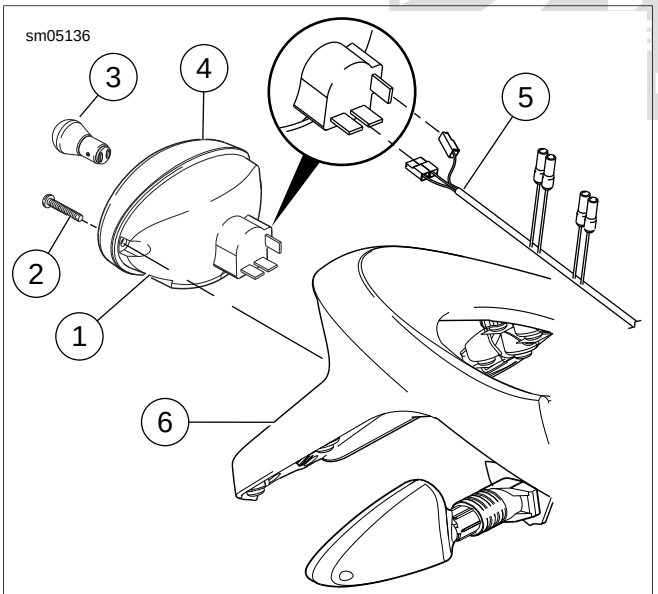
*The R/Y wire is installed facing the left side of the vehicle.*

2. If removed, install tail lamp bulb (3). Turn bulb clockwise to install.
3. Install tail lamp lens (4) and tail lamp (1) with two screws (2). Tighten to 0.7-0.8 Nm (6-7 **in-lbs**).

**⚠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)**

4. Check the tail lamp.



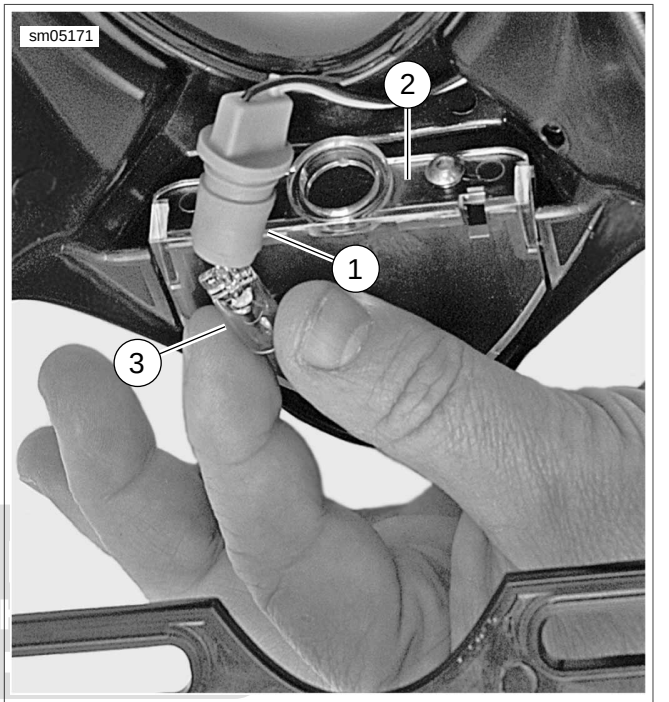

1. **Tail lamp housing**
2. **Screw (2)**
3. **Bulb**
4. **Lens**
5. **Wiring harness**
6. **Center tail section**

**Figure 7-62. Tail Lamp Assembly**

## LICENSE PLATE LAMP

### Bulb Replacement

1. See Figure 7-63. Pull socket (1) from lens (2).
2. Pull bulb (3) from socket.
3. Replace bulb and push socket into lens.




1. **Socket**
2. **Lens**
3. **Bulb**

**Figure 7-63. License Plate Bulb**

### Wire Harness and Lens

1. Remove pillion.
2. See Figure 7-67. Separate license plate lamp barrel connectors.
3. See Figure 7-64. Remove license plate lamp lens and socket, then pull socket leads through license plate bracket.
4. See Figure 7-65. To install, push terminals and leads into access hole and through the J-shaped opening in license plate bracket.
5. Install lens with fasteners. Tighten to 2.7-3.0 Nm (24-27 **in-lbs**).
6. Push socket and bulb into lens.
7. See Figure 7-66. Mate license plate lamp barrel connectors.
8. Install pillion.

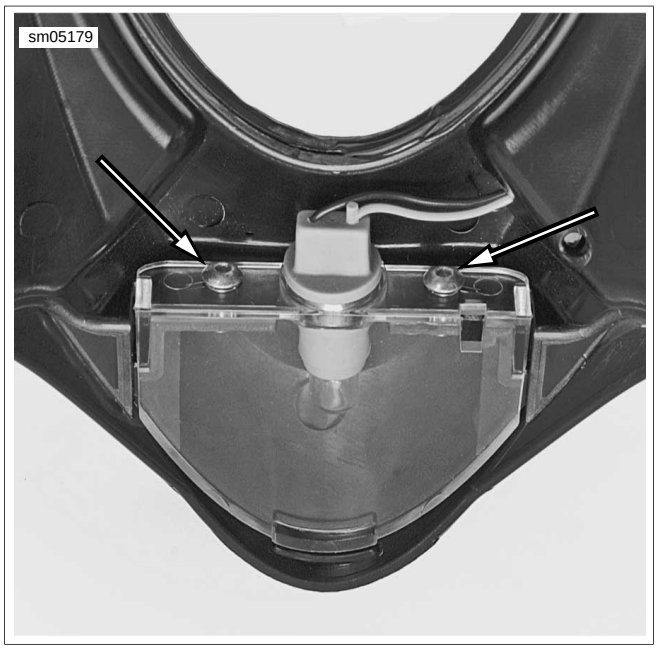



**Figure 7-64. License Plate Lamp Lens Fasteners**




**Figure 7-65. License Plate Wiring Through J-shaped Opening**

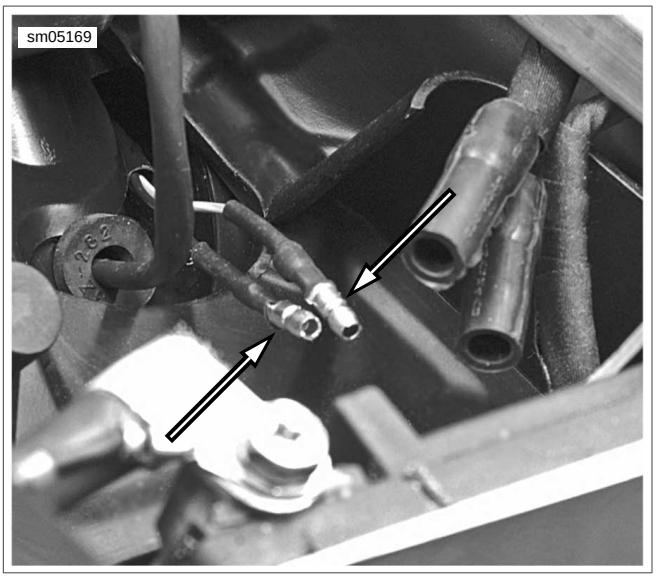



**Figure 7-66. License Plate Lamp Barrel Connectors**

## LICENSE PLATE BRACKET

### Removal

1. Remove pillion.
2. Remove the tail section. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
3. Separate turn signal barrel connectors.
4. See Figure 7-67. Separate license plate lamp barrel connectors.
5. Remove the three license plate bracket fasteners and license plate bracket.
6. Remove rear reflector bracket, if required.
7. Remove rear turn signals with left and right reflector brackets, if required. See 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Lamp.

*NOTE*

*See Figure 7-68. If it is necessary to access the wire lead routing, remove the 12 fasteners to separate stiffener from bracket.*

8. Remove license plate bulb, lens and socket, if required. See 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Lamp.




**Figure 7-67. License Plate Lamp Barrel Connectors**

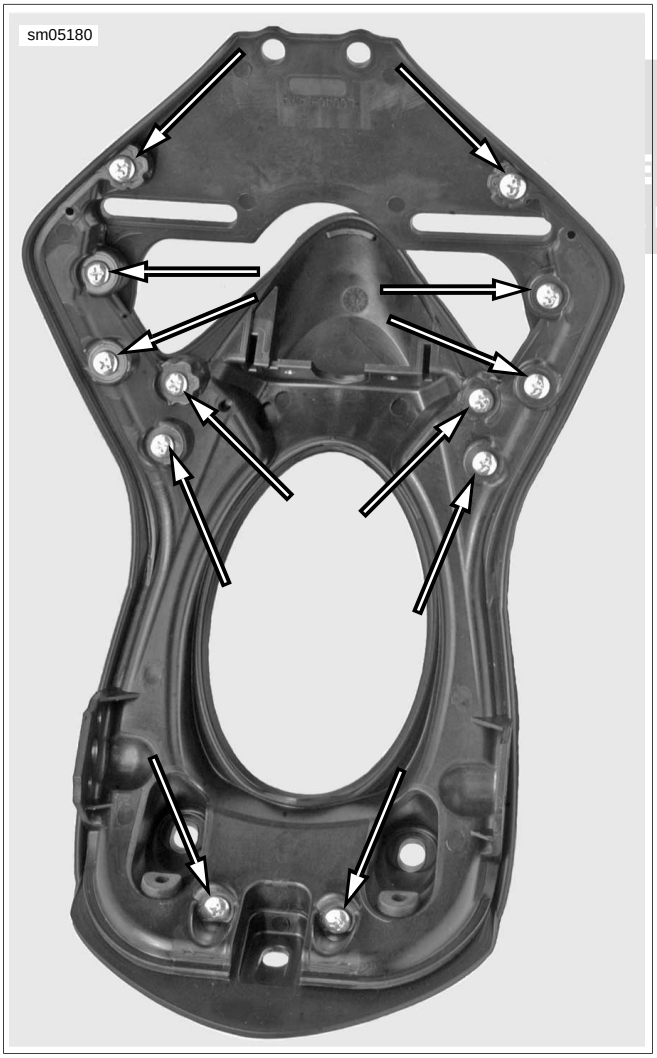


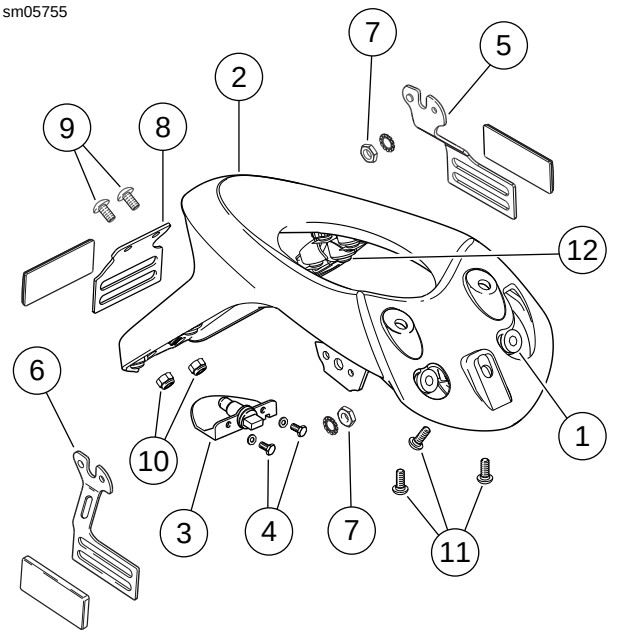

**Figure 7-68. License Plate Bracket Stiffener Fasteners**

## Installation

1. See Figure 7-69. If removed, install grommets (1) for turn signal leads to license plate bracket (2).
2. If removed, install the license plate lamp lens (3), socket and wiring into license plate bracket and secure with fasteners (4). See 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Lamp.
3. Install turn signals with left (5) and right (6) reflector brackets using fasteners (7). See 7.12 TURN SIGNALS, Rear Turn Signals.
4. Install rear reflector bracket (8) and secure with fasteners (9 and 10).
5. Tighten fasteners to specification. Refer to Table 7-9.
6. Install license plate bracket to the subframe.
7. Install and tighten license plate bracket fasteners (11) to specification.
8. Mate turn signal barrel connectors.
9. Mate license plate lamp barrel connectors.
10. Install the tail section. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
11. Install pillion.

**Table 7-9. License Plate Bracket Torque Specifications**

| NO. | FASTENER | Nm | in-lbs |
|---|---|---|---|
| 4 | License plate lamp fasteners | 2.7-3.0 | 24-27 |
| 12 | Stiffener to shell fasteners | 1.6-1.7 | 14-15 |
| 10 | Rear reflector bracket fasteners | 10.6-11.8 | 94-104 |
| 7 | Left/right reflector bracket and turn signal fasteners | 2.8-3.2 | 25-28 |
| 11 | License plate bracket fasteners | 10.6-11.8 | 94-104 |




1. **Grommet**
2. **License plate bracket**
3. **License plate lamp lens**
4. **Bolt (2)**
5. **Left reflector bracket**
6. **Right reflector bracket**
7. **Nut (2)**
8. **Rear reflector bracket**
9. **Bolt (2)**
10. **Locknut (2)**
11. **Bolt (3)**
12. **Bolt (12)**

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**Figure 7-69. License Plate Bracket Assembly**

# FUSES AND RELAYS 7.16

## FUSE BLOCK

### Fuses

1. Remove the seat.
2. See Figure 7-70. Squeeze the latches to remove the fuse block cover.
3. See Figure 7-71. Remove the suspect fuse and inspect for continuity.
4. Replace the fuse as necessary.

*NOTE*

*Always determine the cause of a blown fuse before replacing it.*

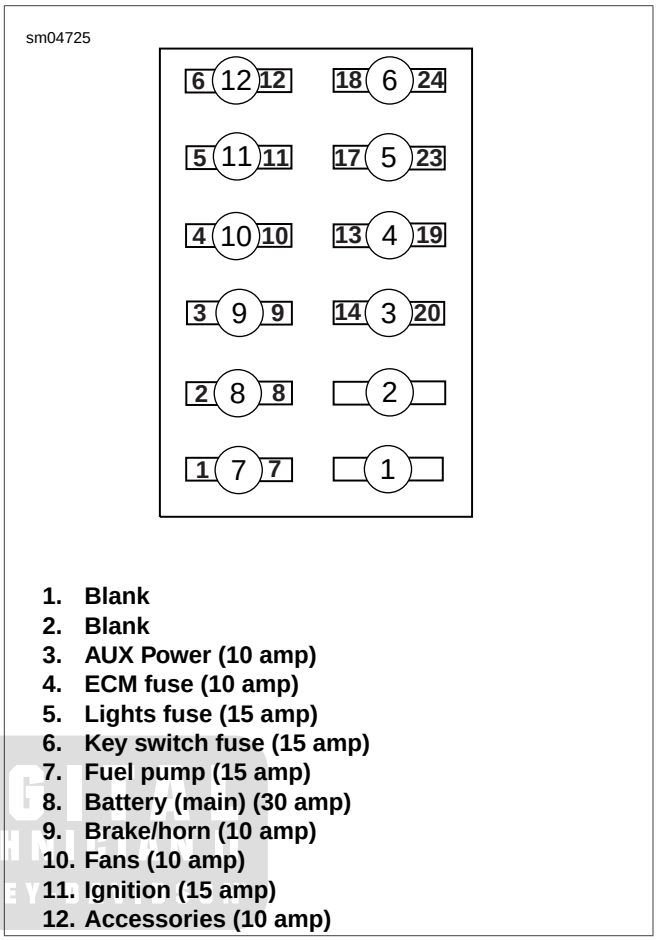
5. To remove the fuse block, pry the latch open and slide the fuse block off of the metal tab on the subframe.
6. Press the fuse block over the subframe tab until it clicks in place.
7. Snap the cover over the block.
8. Install the seat.

### Battery (Main) Fuse

See Figure 7-72. To disable the motorcycle's ignition system, remove the battery fuse.




**Figure 7-70. Fuse Block: 1125R**




1. **Blank**
2. **Blank**
3. **AUX Power (10 amp)**
4. **ECM fuse (10 amp)**
5. **Lights fuse (15 amp)**
6. **Key switch fuse (15 amp)**
7. **Fuel pump (15 amp)**
8. **Battery (main) (30 amp)**
9. **Brake/horn (10 amp)**
10. **Fans (10 amp)**
11. **Ignition (15 amp)**
12. **Accessories (10 amp)**

**Figure 7-71. Fuse Block Schematic: 1125R**

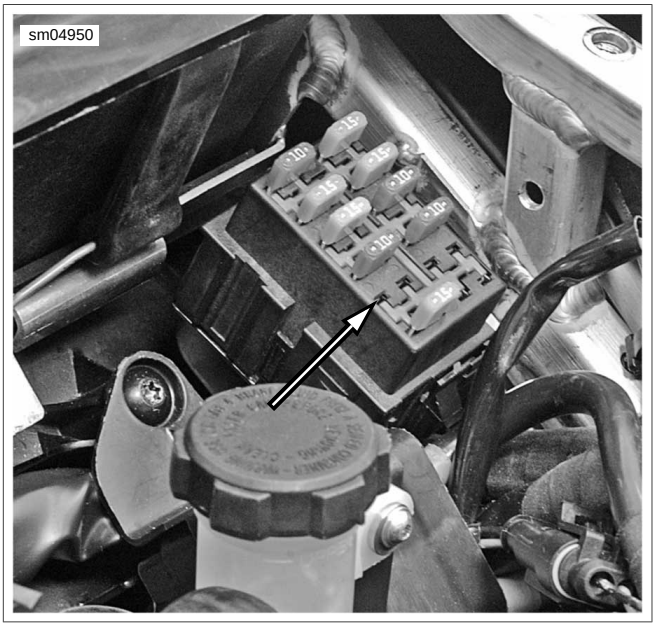



**Figure 7-72. Main (Battery) Fuse Location: 1125 Models**

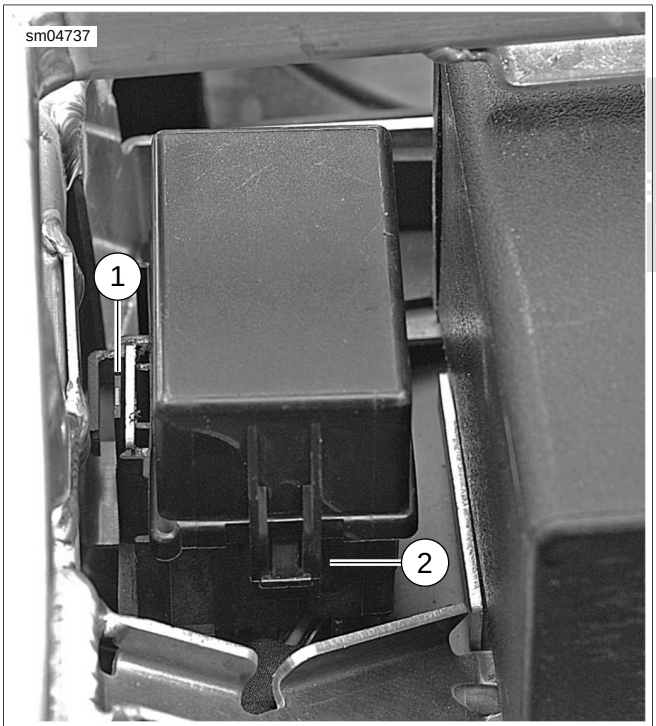
## RELAYS

1. Remove the pillion.
2. Remove the seat.
3. See Figure 7-73. To remove the relay block, pry the latch (1) open and slide the fuse block off of the metal tab on the subframe.
4. To remove the relay cover, spread the end latches (2).
5. See Figure 7-74. Replace the relay as necessary.
6. Press the relay block over the subframe tab until it clicks in place.
7. Snap the cover over the block.

**⚠WARNING**

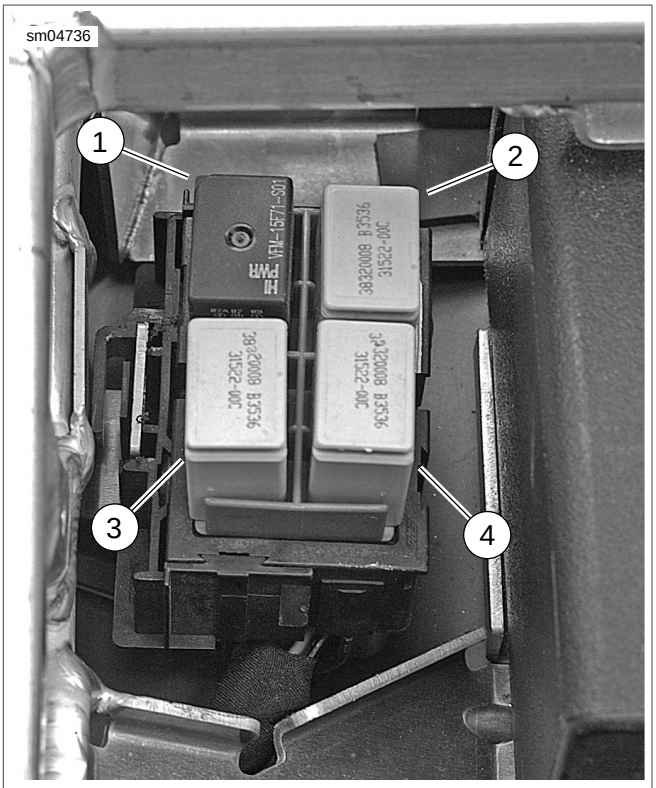
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

8. Install the seat.
9. Install the pillion.




1. **Frame tab latch**
2. **Cover end latch**

**Figure 7-73. Relay Block**




1. **Key switch**
2. **Starter**
3. **Ignition**
4. **Auxiliary**

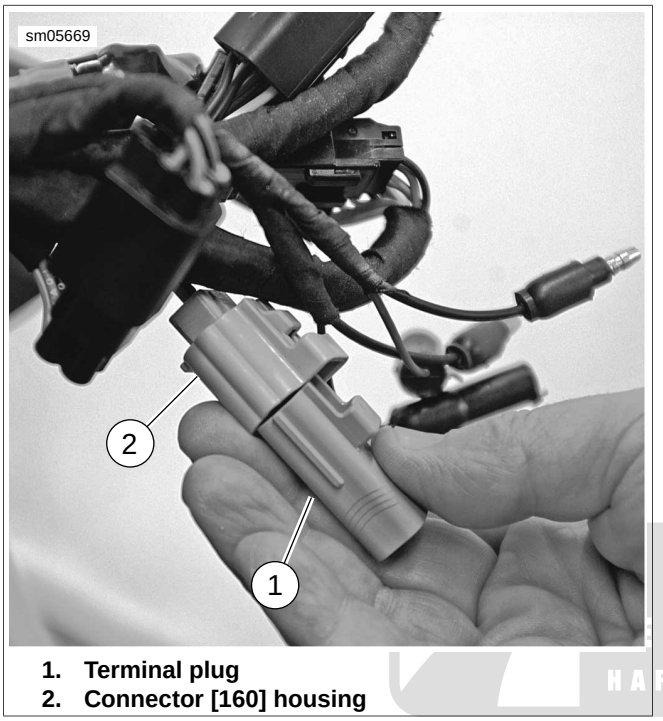
**Figure 7-74. Relays**

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## AUXILIARY CONNECTOR [160]

Located in the main harness bundle with the turn signal and headlamp connectors, the auxiliary power connector [160] provides 12 V power for accessories.

See Figure 7-75. Install the terminal plug (1) in the connector housing (2) when not in use.




1. **Terminal plug**
2. **Connector [160] housing**

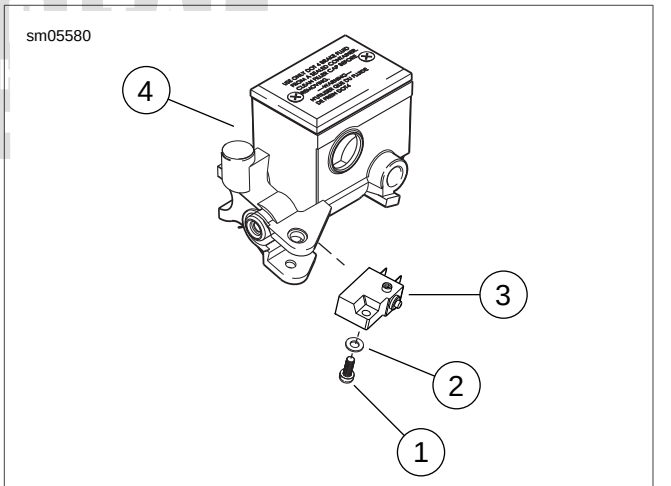
**Figure 7-75. Auxiliary Power Terminal Plug [160]**

## BRAKE LIGHT SWITCH: FRONT

1. See Figure 7-76. Remove fastener and washer to detach front brake light switch from front master cylinder.
2. To install, insert fastener through washer and switch into front master cylinder. See Figure 7-77.
3. Tighten screw to 0.8-1.1 Nm (7-10 **in-lbs**).




**Figure 7-76. Front Brake Light Switch Fastener**




1. **Fastener**
2. **Washer**
3. **Front brake light switch**
4. **Master cylinder**

**Figure 7-77. Front Brake Light Switch Assembly**

## BRAKE LIGHT SWITCH: REAR

1. See Figure 7-78. Remove rear brake light switch, rear brake line and two washers from the rear master cylinder.

*NOTE*

*Always replace the sealing washers on the banjo bolt with new.*

2. To install, insert rear brake light switch through rear brake line and two **new** washers into master cylinder. See Figure 7-79.

3. Tighten switch to 22-27 Nm (16-20 ft-lbs).

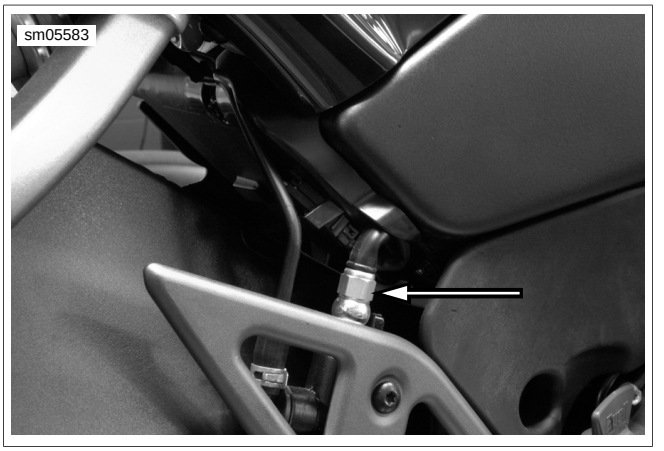
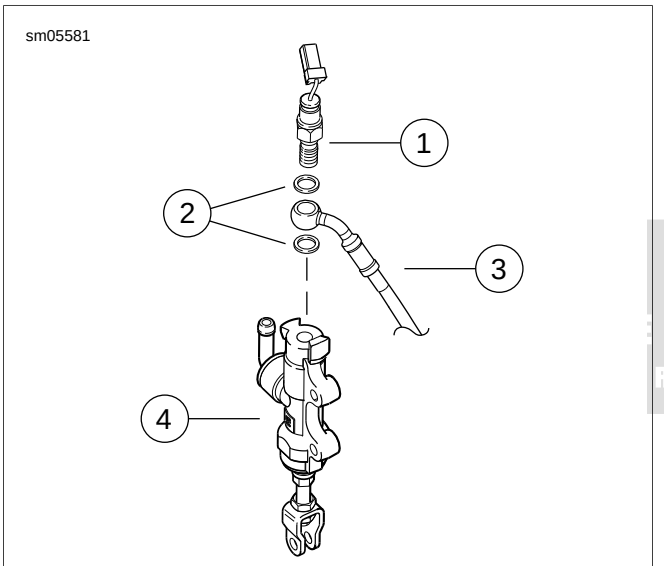



**Figure 7-78. Rear Brake Light Switch**




1. **Rear brake light switch**
2. **Washer**
3. **Rear brake line**
4. **Rear master cylinder**

**Figure 7-79. Rear Brake Light Switch Assembly**

## CAN BUS CONNECTOR

See Figure 7-80. A Controller Area Network (CAN) bus connector is located above the Engine Control Modules (ECM).

See Figure 7-81. The CAN bus connector [243] is terminated with a resistor plug.

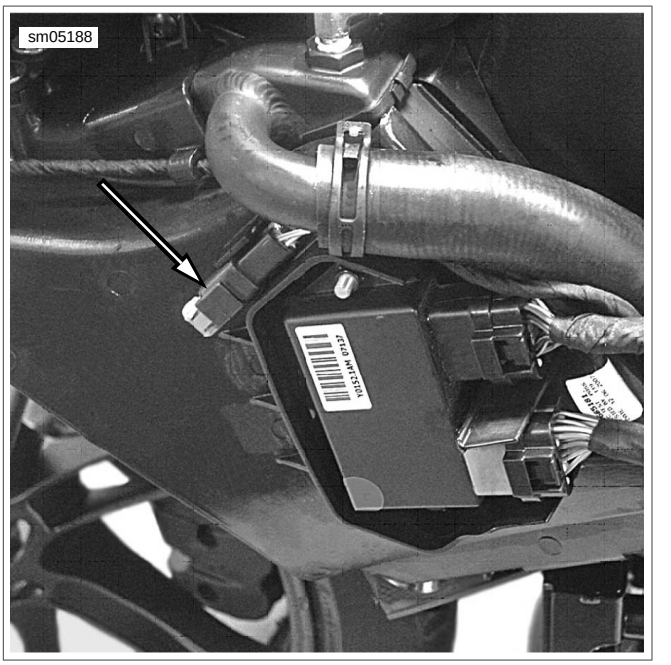



**Figure 7-80. CAN Connector [243]**

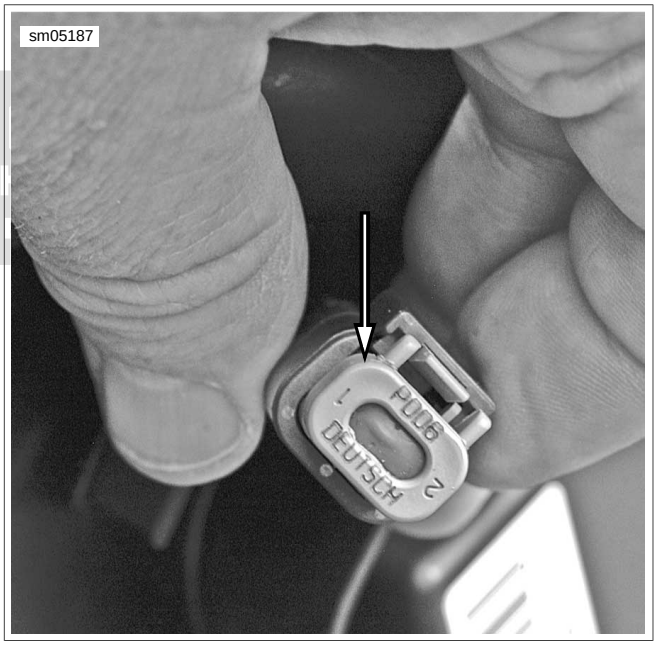



**Figure 7-81. Resistor Plug in CAN Bus Connector [243]**

## CLUTCH INTERLOCK SWITCH

1. See Figure 7-82. Remove screw to detach clutch interlock switch from master cylinder.
2. To install, align hole in clutch interlock switch with hole in master cylinder. See Figure 7-83.
3. Install fastener through switch to master cylinder.
4. Tighten screw to 0.8-1.1 Nm (7-10 **in-lbs**).

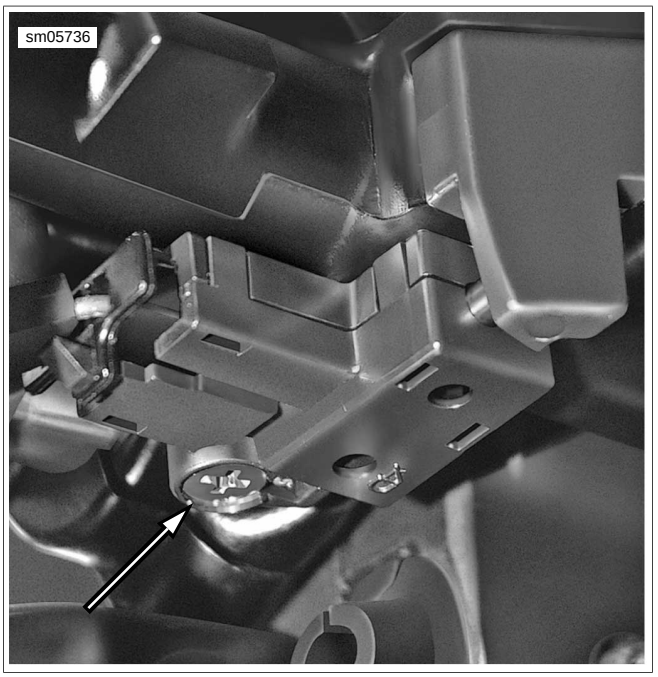
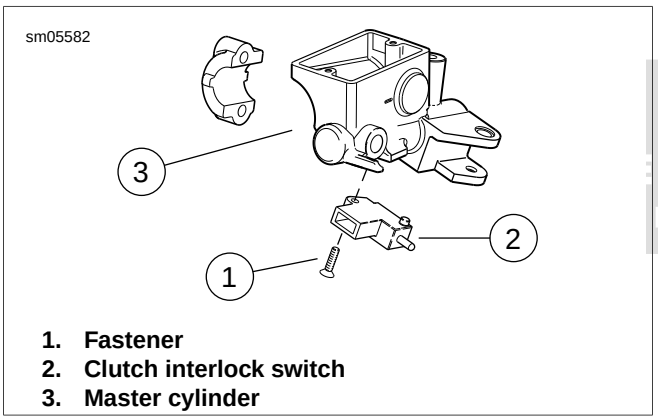



**Figure 7-82. Clutch Interlock Switch Fastener**




1. **Fastener**
2. **Clutch interlock switch**
3. **Master cylinder**

**Figure 7-83. Clutch Interlock Switch Assembly**

## NEUTRAL INDICATOR SWITCH

### Test

*NOTE*

*A pin on the shift drum contacts the neutral indicator switch plunger to complete the neutral indicator circuit. Replace the switch if it malfunctions.*

1. Remove the sprocket cover.
2. Remove the rider footpeg mount. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider.
3. See Figure 7-84. Loosen the screw on the switch and separate the wire lead from the neutral indicator switch.
4. Turn the ignition key switch to ON and touch the neutral indicator wire lead to a ground.
   a. If the indicator lamp lights, the problem is the indicator switch. Replace the switch.
   b. If the indicator lamp does not light, see the electrical diagnostic manual.

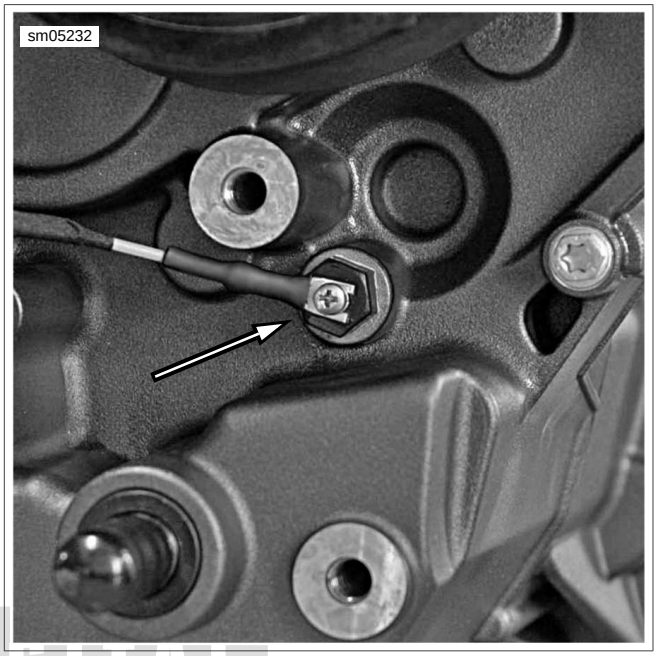



**Figure 7-84. Neutral Indicator Switch Lead**

### Removal

1. Turn the ignition key switch to OFF.
2. Remove the neutral indicator switch.

### Installation

1. See Figure 7-85. Apply a light coating of LOCTITE 5331 Sealant to the threads of the switch.
2. Install the switch in the crankcase and tighten to 2-3 Nm (18-27 **in-lbs**).
3. Fit the open spade connector under the lockwasher and tighten the screw.
4. Route the neutral indicator switch wire lead to the area ahead of drive sprocket.
5. Install the rider footpeg mount. See 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider.
6. Install the sprocket cover. Tighten the fastener to 13.0-14.5 Nm (115-128 **in-lbs**).




**Figure 7-85. Neutral Indicator Switch [131]**

## OIL PRESSURE SWITCH

1. Remove the spade terminal from the oil pressure switch and remove the switch.
2. Apply LOCTITE 243 (red) to the threads of the switch and install the switch.
3. Tighten to 15 Nm (133 **in-lbs**).
4. Connect the spade connectors of the oil pressure switch lead.
5. Push the boot over the connectors.




**Figure 7-86. Oil Pressure Switch**

## SIDESTAND SENSOR (HDI)

*NOTE*

*The sidestand sensor is present only on HDI models. The sidestand stop bracket is present on all models. See 2.21 SIDESTAND.*

1. Remove the sprocket cover.
2. See Figure 7-87. Separate the sidestand sensor [133] connector housings.
3. See Figure 7-88. Remove the fastener (1) and the sidestand sensor (2).
4. See Figure 7-89. Fit the sidestand sensor (2) to the hole in stop bracket.
5. Install fastener (1) and tighten to 10-13 Nm (96-144 **in-lbs**).
6. Join the sidestand sensor connector [133] housings.
7. Tuck the sidestand sensor lead convolute under and install the sprocket cover. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).

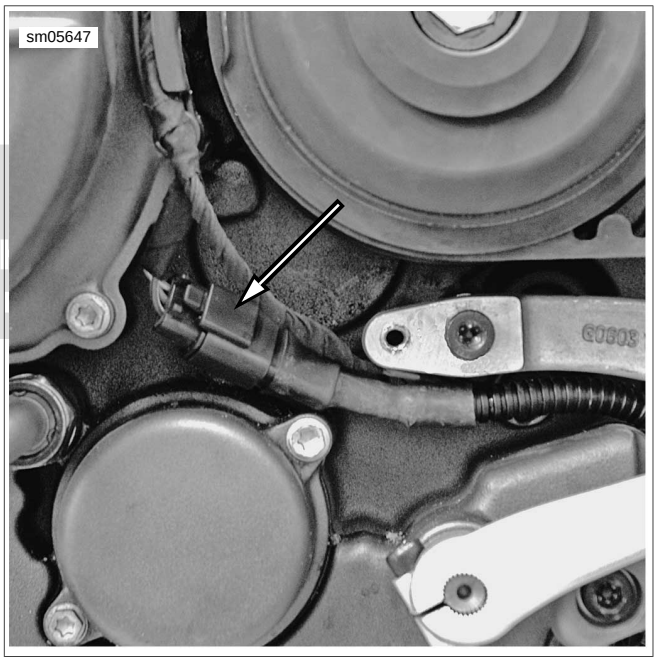
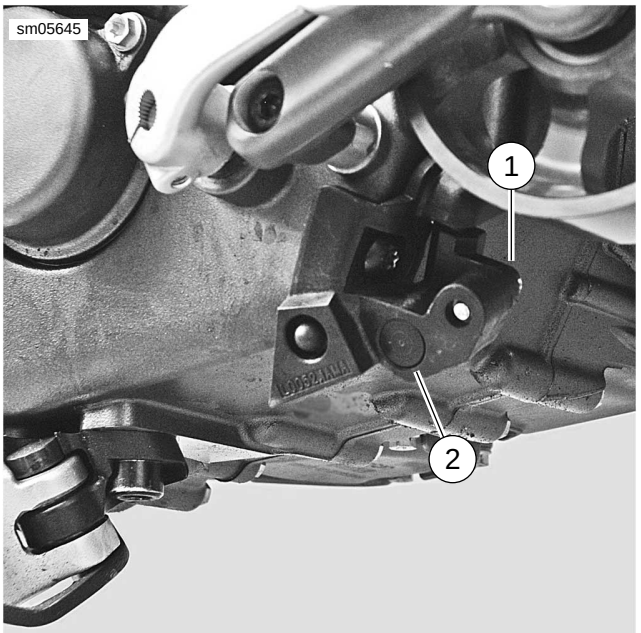
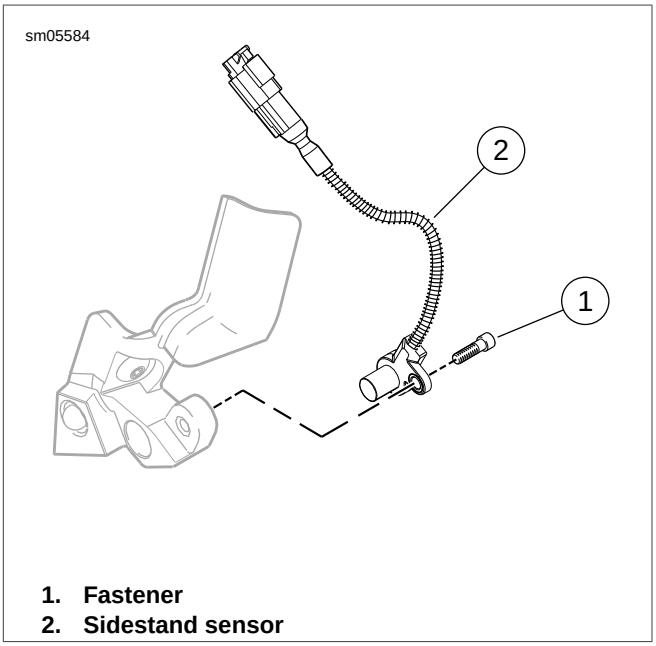



**Figure 7-87. Sidestand Sensor Connector [133]**




1. Sensor fastener
2. Sensor

**Figure 7-88. Sidestand Sensor (HDI)**




1. Fastener
2. Sidestand sensor

**Figure 7-89. Sidestand Sensor**

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# CRANKSHAFT POSITION SENSOR (CKP) 7.18

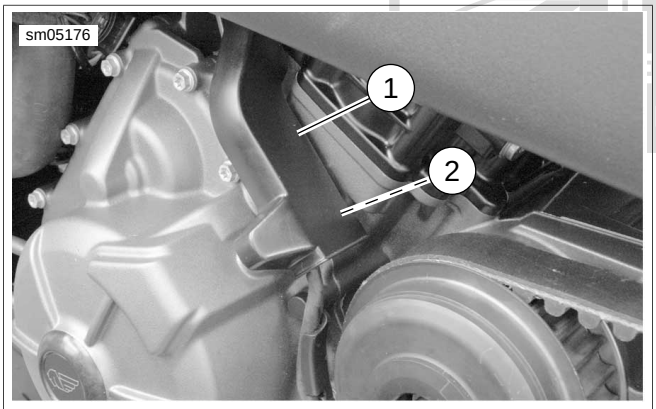
## REMOVAL

1. Remove seat.
2. Remove the battery fuse.
3. Remove the sprocket cover.
4. See Figure 7-90. Lift up the engine wire harness support.
5. See Figure 7-91. Open wire clamp (3) to release the sidestand sensor and neutral indicator switch leads.
6. Remove fastener (1) securing the CKP sensor (2). Carefully remove CKP sensor and O-ring from engine crankcase.
7. Remove the rubber bands securing the CKP lead in the support channels.
8. Pull the CKP lead from the rear and center engine wire harness support channels.

*NOTE*

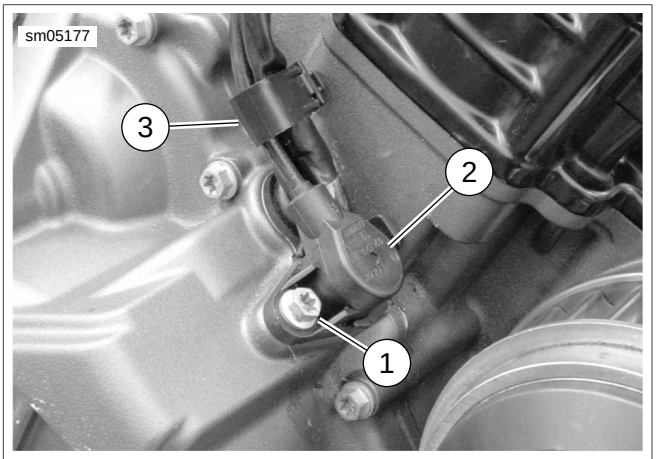
*The engine must be rotated to disconnect the CKP from the engine harness. See 3.4 ENGINE ROTATION.*

9. See Figure 7-92. Remove the radiator shroud to access the CKP connector [79].
10. Disconnect the CKP connector [79] from engine harness.




**1. Engine harness support**
**2. CKP (hidden)**

**Figure 7-90. Crank Position Sensor (CKP) Location**




**1. Fastener**
**2. CKP**
**3. Wire clamp**

**Figure 7-91. Crank Position Sensor (CKP)**

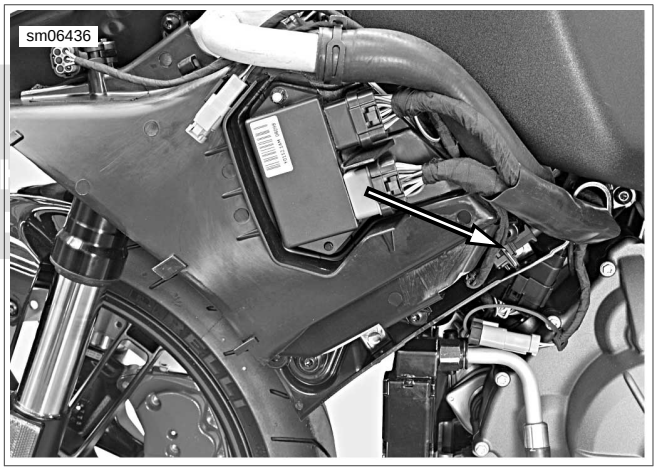



**Figure 7-92. CKP Sensor Connector [79]**

## INSTALLATION

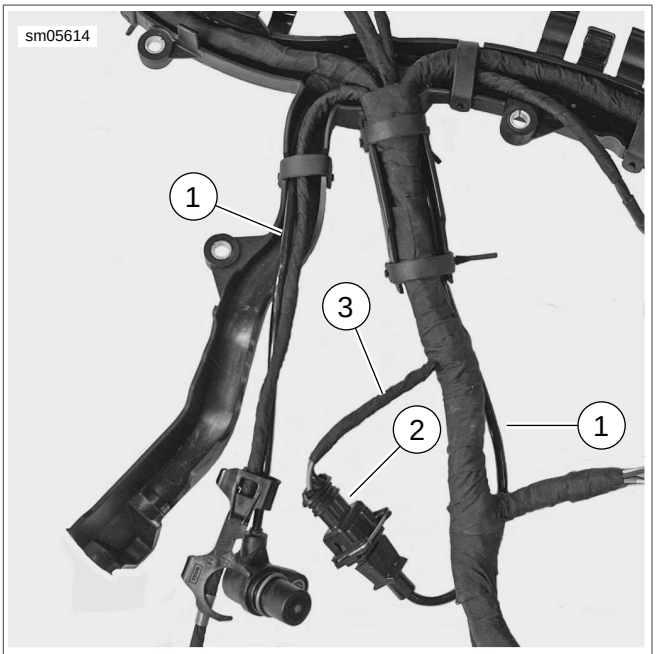
1. Inspect CKP O-ring and replace if necessary. Apply a light coat of engine oil to the CKP O-ring.
2. See Figure 7-93. Install the plastic wire clamp (3) on the CKP lead.
3. Secure the sidestand sensor lead in the wire clamp.
4. Carefully install CKP and O-ring (1) into engine crankcase along with the wire clamp.
5. Install and tighten fastener to 11 Nm (97 **in-lbs**).

6. If the engine was rotated to access the CKP connector [79]:
   a. See Figure 7-94. Remove the rubber bands and route the CKP lead (1) up the support channel and back down the harness main stem channel.
   b. Connect the CKP connector [79] (2) to the engine harness lead (3).
   c. Secure the engine harness and CKP lead with the rubber bands.
   d. Rotate the engine up. See 3.4 ENGINE ROTATION.
7. Install the radiator shroud.
8. Install the sprocket cover. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
9. Install the battery 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 the seat.




1. **Lead**
2. **Connector [79]**
3. **Engine Wire Harness Lead**

**Figure 7-94. CKP Lead Routing**




1. **O-ring**
2. **Sidestand/neutral indicator switch lead**
3. **Wire clamp**

**Figure 7-93. CKP and Wire Clamp**

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# VEHICLE SPEED SENSOR (VSS) 7.19

## REMOVAL

1. Remove passenger pillion.
2. Remove rider seat.
3. Remove the tail section. It is not necessary to disconnect trunk cable. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
4. Remove air flow guide from right side of motorcycle. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
5. Remove the wire guide/fuel pump cover. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
6. See Figure 7-95. Disconnect 3-place Deutsch connector [20] (1) located under rider seat. Note location of cable straps (2) retaining the VSS cable and cut cable straps.
7. See Figure 7-96. Remove fastener (1) to detach VSS (2) from crankcase.

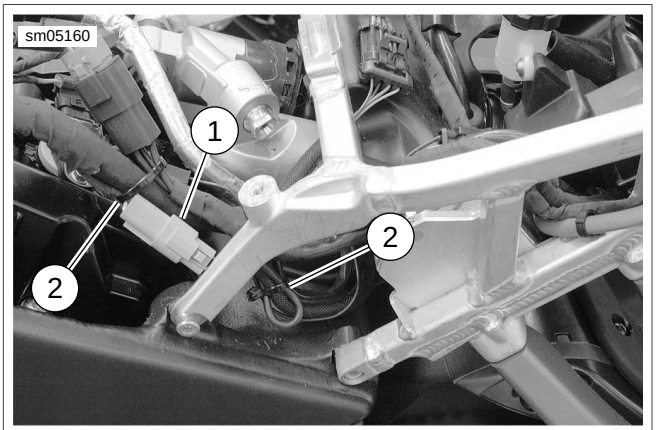
## INSTALLATION

1. Inspect VSS O-ring and replace if necessary. Lubricate O-ring with engine oil.
2. See Figure 7-96. Install VSS (2) to crankcase and secure with fastener (1). Tighten fastener to 11 Nm (97 **in-lbs**).
3. See Figure 7-95. Connect VSS connector [20] (1) to wiring harness.
4. Fit the VSS wire leads to the wire guide/fuel pump cover and install the cover. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
5. Install the air flow guide. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
6. Install the tail section. See 2.14 SUBFRAME, Tail Section.

**⚠WARNING**

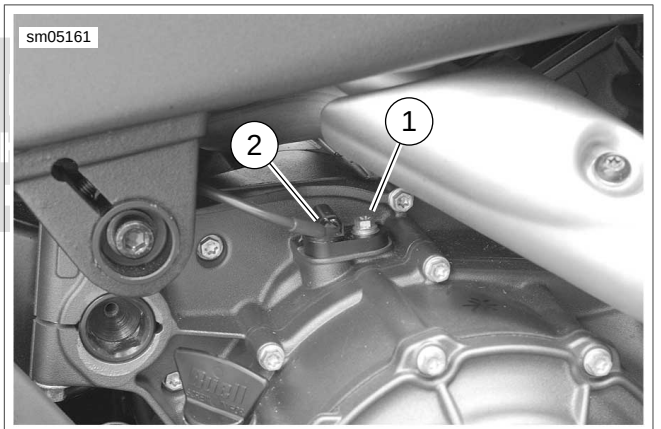
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

7. Install the seat.
8. Install the pillion.




**1. Connector**
**2. Cable strap**

**Figure 7-95. VSS Connector**




**1. Fastener**
**2. VSS**

**Figure 7-96. Vehicle Speed Sensor**

# HANDLEBAR SWITCH HOUSINGS 7.20

## LEFT SWITCH HOUSING

### Removal

*NOTE*

*Individual handlebar switches are not repairable. If a switch fails, replace the switch housing.*

1. Remove the seat.
2. Remove the battery fuse.
3. **1125R:** See Figure 7-97. Access 8-place left handlebar switch connector [24] under the fairing and press the button to separate the housings.

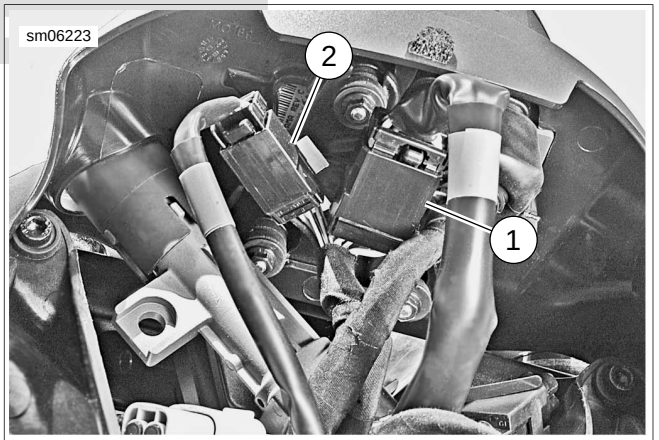
   **1125CR:** See Figure 7-99. Remove the windscreen to access the left handlebar switch housing connector [24] and slide the connector off the tab on the dash. Separate the housings.
4. Cut the cable strap that bundles under the fairing connectors.
5. See Figure 7-98. Loosen and remove the housing screws.
6. See Figure 7-100. Pull switch housing, wire leads and socket housing from the fairing/windscreen headlamp assembly.




**Figure 7-97. Left Handlebar Switch Housing Connector [24] Release Button**




**Figure 7-98. Left Handlebar Switch Housing Fasteners**




1. **Left switch housing connector [24]**
2. **Right switch housing connector [22]**

**Figure 7-99. Switch Housing Connectors: 1125CR**

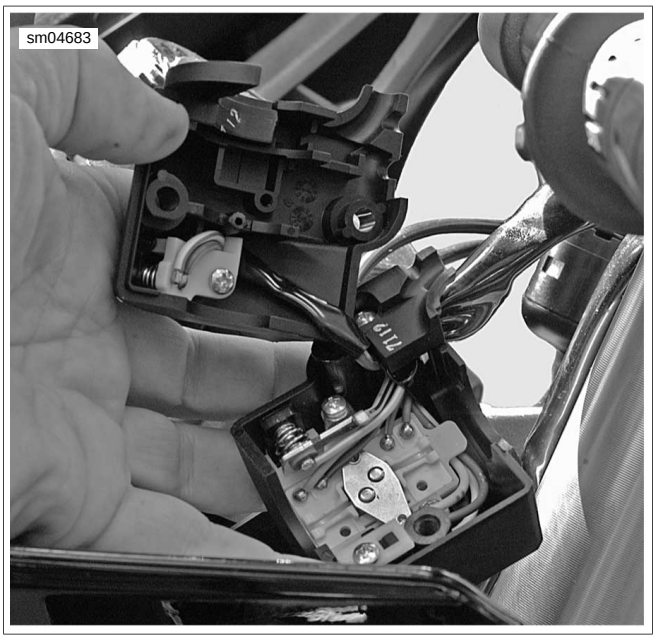



**Figure 7-100. Left Handlebar Switch Housing**

## Installation

1. Thread the socket housing up under the fairing and mate with the pin housing.
2. Route the switch wire harness up along handlebar.
3. Fit the switch housings to the handlebar.

   **1125R:** Fit the switch side housing boss to the holes in the handlebar.

   **1125CR:** See Figure 7-101. Adjust the switch housings to align the housing between the two etched lines (2) on the handlebar.
4. Install the fasteners.
5. Tighten to 3-4 Nm (27-35 **in-lbs**).
6. Join the connector [24] housings.
7. Install a **new** cable strap around the wire harness bundle under the fairing.
8. **1125CR:** Install the windscreen.
9. Verify that the clutch interlock switch is intact.
10. Install the battery fuse.

**WARNING**

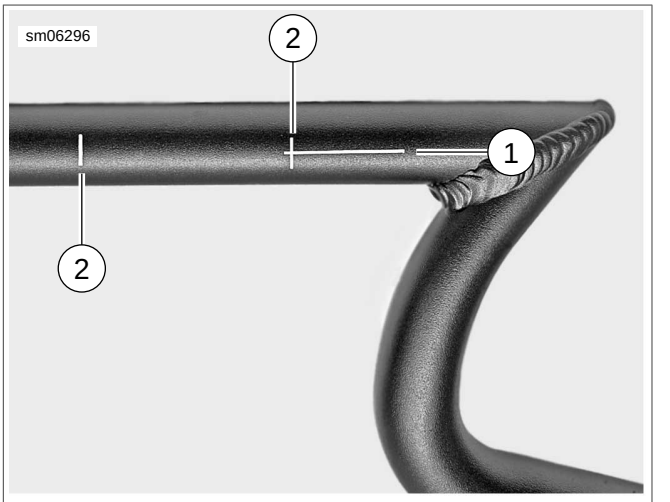
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

11. Install 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)**

12. Test switch operation:
    a. Left and right turn signals
    b. Low and high beam
    c. High beam flash
    d. Horn
    e. Does the engine start in gear without pulling in the clutch lever?




**1. Hand lever clamp mark**
**2. Switch housing marks**

**Figure 7-101. Hand Lever Clamp and Switch Housing Marks: 1125CR**

# RIGHT SWITCH HOUSING

## Removal

*NOTE*

*Individual handlebar switches are not repairable. If a switch fails, replace the switch housing.*

1. Remove the seat.
2. Remove the battery fuse.
3. **1125R:** See Figure 7-102. Access 4-place right handlebar switch connector [22] under the fairing and press the button to separate housings.

   **1125CR:** See Figure 7-99. Access the connector [22] and separate the housings.
4. See Figure 7-103. Cut the cable strap that bundles under the fairing connectors.
5. Loosen and remove the housing screws.
6. Lift the housings off of the throttle twist grip and cables.
7. Pull switch housing, wire leads and socket housing from the fairing.

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**Figure 7-102. Right Handlebar Switch Connector [22] Release Button**




**Figure 7-103. Wire Harness Bundle Cable Strap**

## Installation

1. Thread the socket housing up under the fairing and mate with the pin housing.
2. Route the switch wire harness up along handlebar.
3. Fit the switch side housing to the throttle twist grip and throttle cables.
4. Snap the throttle guide into place and mate the housing back.
5. See Figure 7-104. Install the short fastener (1) in the top and the long fastener (2) in the bottom screw hole.
6. Tighten to 3-4 Nm (27-35 **in-lbs**).
7. Join the switch connector [22] housings.
8. Install a **new** cable strap around the wire harness bundle under the fairing.
9. **1125CR:** Install the windscreen.
10. Verify that the brake light switch and blade connectors are intact.
11. Install the battery fuse.

**WARNING**

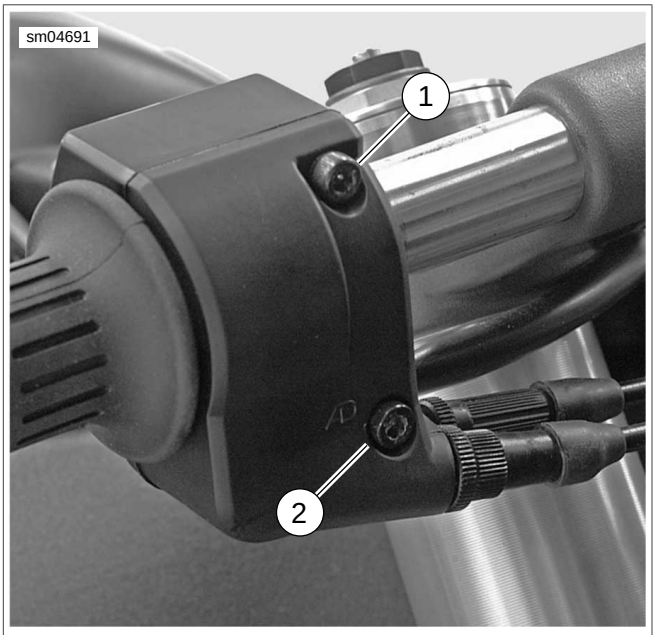
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

12. Install 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)**

13. Test switch operation:
    a. Attempt to start the engine with the clutch lever out.
    b. Squeeze in the clutch lever and start the engine.
    c. Turn off the engine with the engine run/stop switch.
    d. Test the brake light with the front brake lever.




1. **Short**
2. **Long**

**Figure 7-104. Right Handlebar Switch Housing Fasteners**

# INSTRUMENT CLUSTER 7.21

## REPLACEMENT: 1125R

*NOTE*

*There are no replaceable bulbs or LEDs in the instrument cluster. Before replacing the unit, verify that the problem is not caused by an incomplete wire connection.*

1. Remove the pillion.
2. Disconnect the negative battery cable.
3. Remove the fairing/windscreen.
4. See Figure 7-105. Pull the weather boot from around the instrument cluster connector (1).
5. Press down on the latch to separate the connector [39] socket housing from the instrument cluster.
6. To remove the unit, remove the three nuts and washers (2) from the front of the fairing bracket.
7. See Figure 7-106. To install the instrument cluster (1), verify that the rubber grommets (2) are in place in the fairing bracket and push the cluster studs through the grommets.
8. Install the washers (3) and nuts (4). Tighten to 1.4-4.1 Nm (12-36 **in-lbs**).
9. Snap the instrument cluster socket connector housing into the instrument cluster.
10. Fit the weather boot tightly around the cluster pin connector.
11. Install the fairing/windscreen.
12. Connect the negative battery cable.

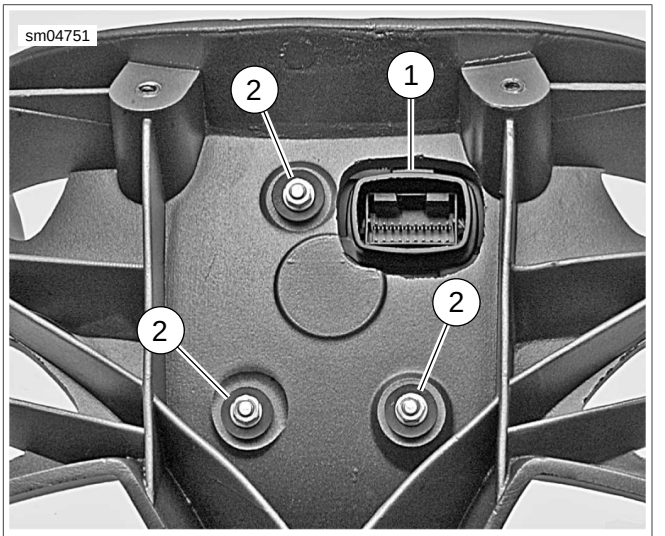
*NOTE*

*After 30 minutes, the instrument cluster is locked to the motorcycle VIN and mileage. If installed on another motorcycle, the instrument cluster will be disabled and will display a theft error. See the electrical diagnostic manual.*

**WARNING**

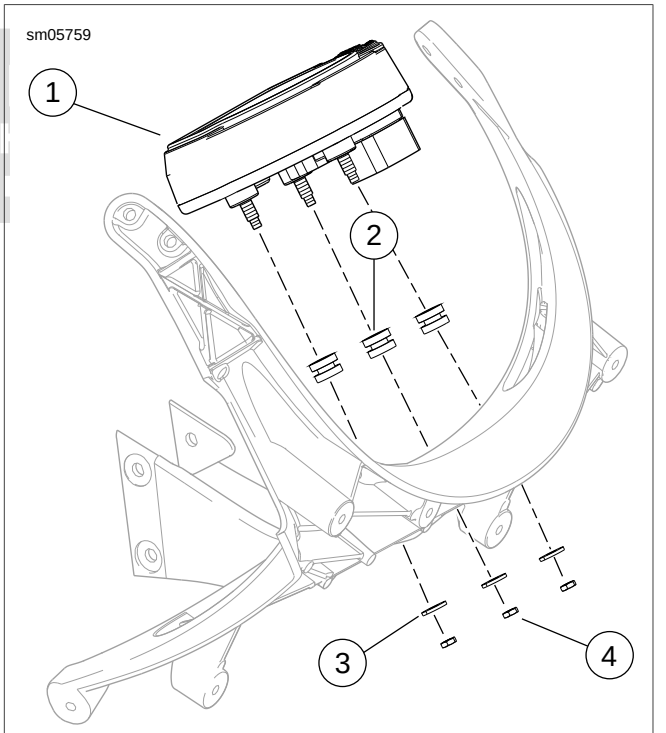
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

13. Install the pillion.




1. **Connector [39]**
2. **Nut and washer**

**Figure 7-105. Instrument Cluster Mounting**




1. **Instrument cluster**
2. **Rubber grommet (3)**
3. **Washer (3)**
4. **Nut (3)**

**Figure 7-106. Instrument Cluster: 1125R**

## REPLACEMENT: 1125CR

*NOTE*

*There are no replaceable bulbs or LEDs in the instrument cluster. Before replacing the unit, verify that the problem is not caused by an incomplete wire connection.*

1. Remove the pillion.
2. Disconnect the negative battery cable.
3. Remove the windscreen.
4. Pull the weather boot from around the instrument cluster connector.
5. Press down on the latch to separate the connector [39] socket housing from the instrument cluster.
6. To remove the unit, remove the three nuts and washers from the dash.
7. See Figure 7-107. To install the instrument cluster, verify that the rubber grommets are in place in the dash and push the cluster studs through the grommets.
8. Install the washers and nuts. Tighten to 1.4-4.1 Nm (12-36 **in-lbs**).
9. Snap the instrument cluster socket connector housing into the instrument cluster.
10. Fit the weather boot tightly around the cluster pin connector.
11. Install the windscreen.
12. Connect the negative battery cable.

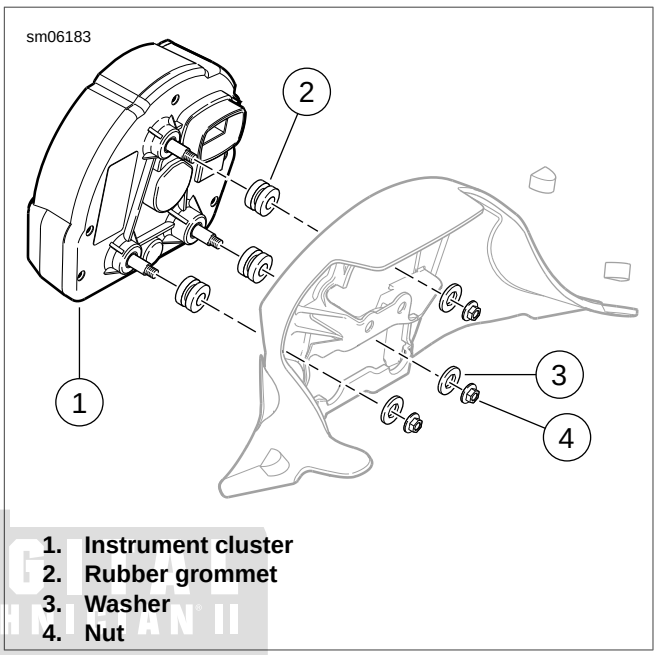
*NOTE*

*After 30 minutes, the instrument cluster is locked to the motorcycle VIN and mileage. If installed on another motorcycle, the instrument cluster will be disabled and will display a theft error. See the electrical diagnostic manual.*

**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 the pillion.




1. **Instrument cluster**
2. **Rubber grommet**
3. **Washer**
4. **Nut**

**Figure 7-107. Instrument Cluster: 1125CR**

# ENGINE HARNESS 7.22

## REMOVAL

### Remove the Engine from the Chassis

To access the final bolt on the wire harness support, support the chassis and separate the engine from the frame. See 3.5 ENGINE REPLACEMENT.

### Wire Harness Support

1. At the left rear of the engine, remove the connectors from the following:
   a. Sidestand sensor [133]
   b. Neutral indicator switch [131]
2. Remove the CKP [79] sensor from the alternator cover.
3. To remove the wire harness and support from the engine:
   a. See Figure 7-108. Remove the engine ground connection.
   b. See Figure 7-109. Remove the wire harness support fasteners.

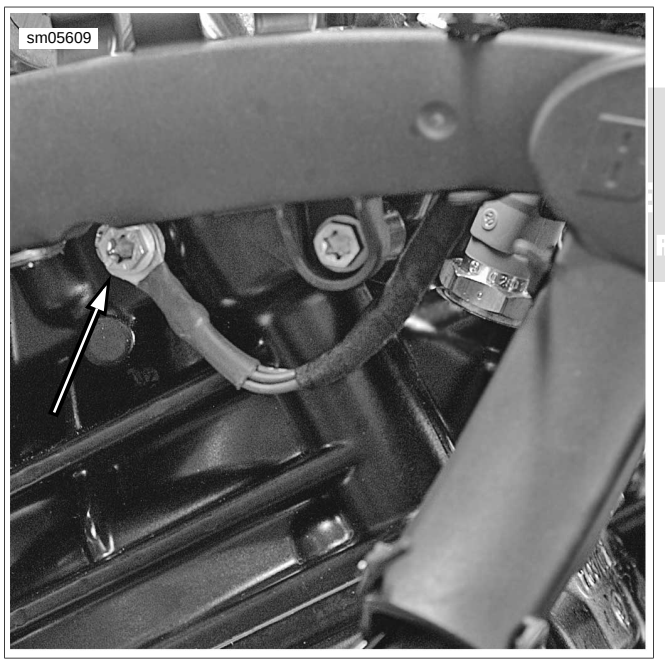



**Figure 7-108. Engine Ground Connection**

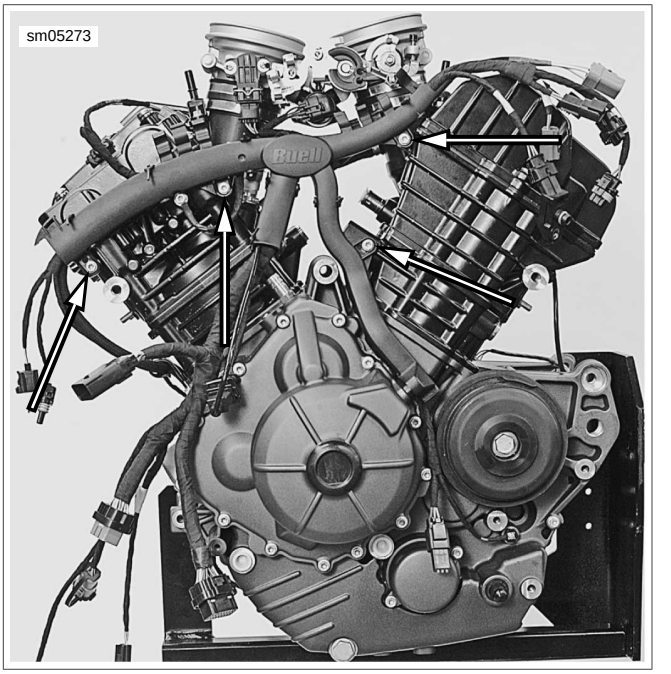
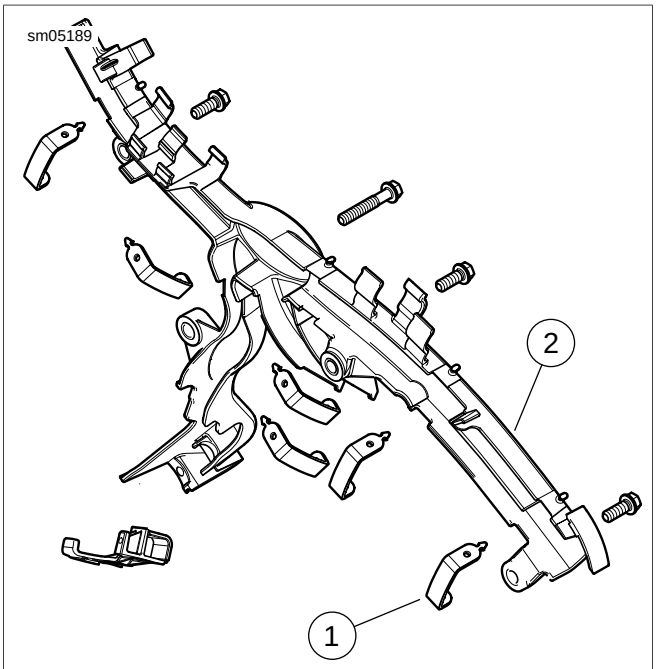



**Figure 7-109. Engine Wire Harness Support Fasteners**

## REPAIR

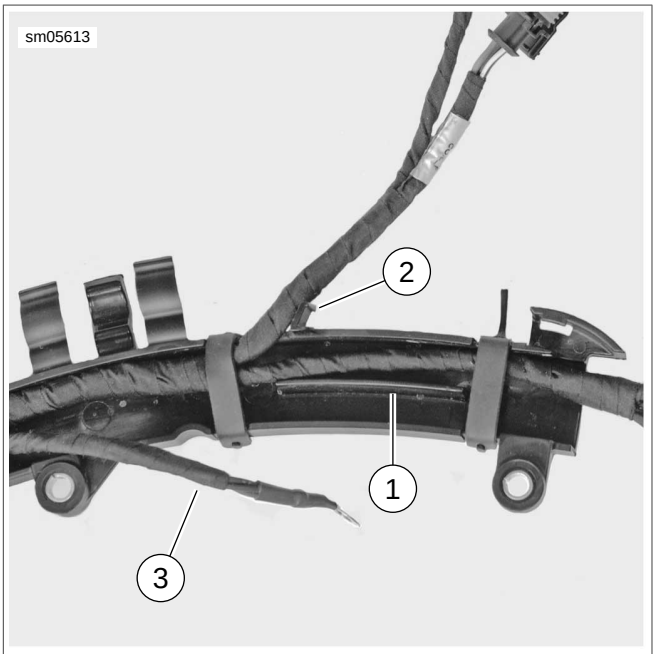
### Disassembly

1. See Figure 7-110. Remove the rubber bands (1) from the support channel (2) and remove the wire harness.
2. Separate the connector housings and remove the CKP [79] sensor.
3. If necessary, remove any remaining sensors:
   a. MAP [80]
   b. IAT [89]
   c. BARO [228]




1. **Rubber band**
2. **Support**

**Figure 7-110. Engine Wire Harness Support**

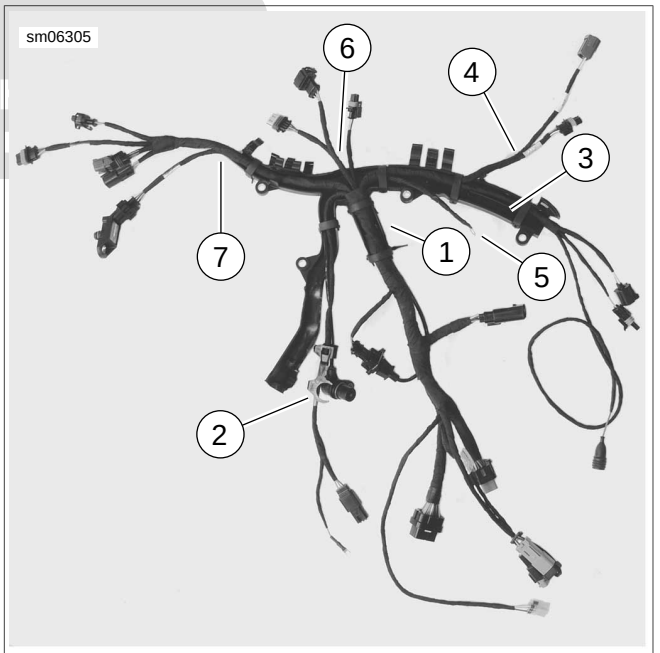



1. **Center guide**
2. **Notch**
3. **Ground lead**

**Figure 7-111. Engine Harness Support Front Channel**

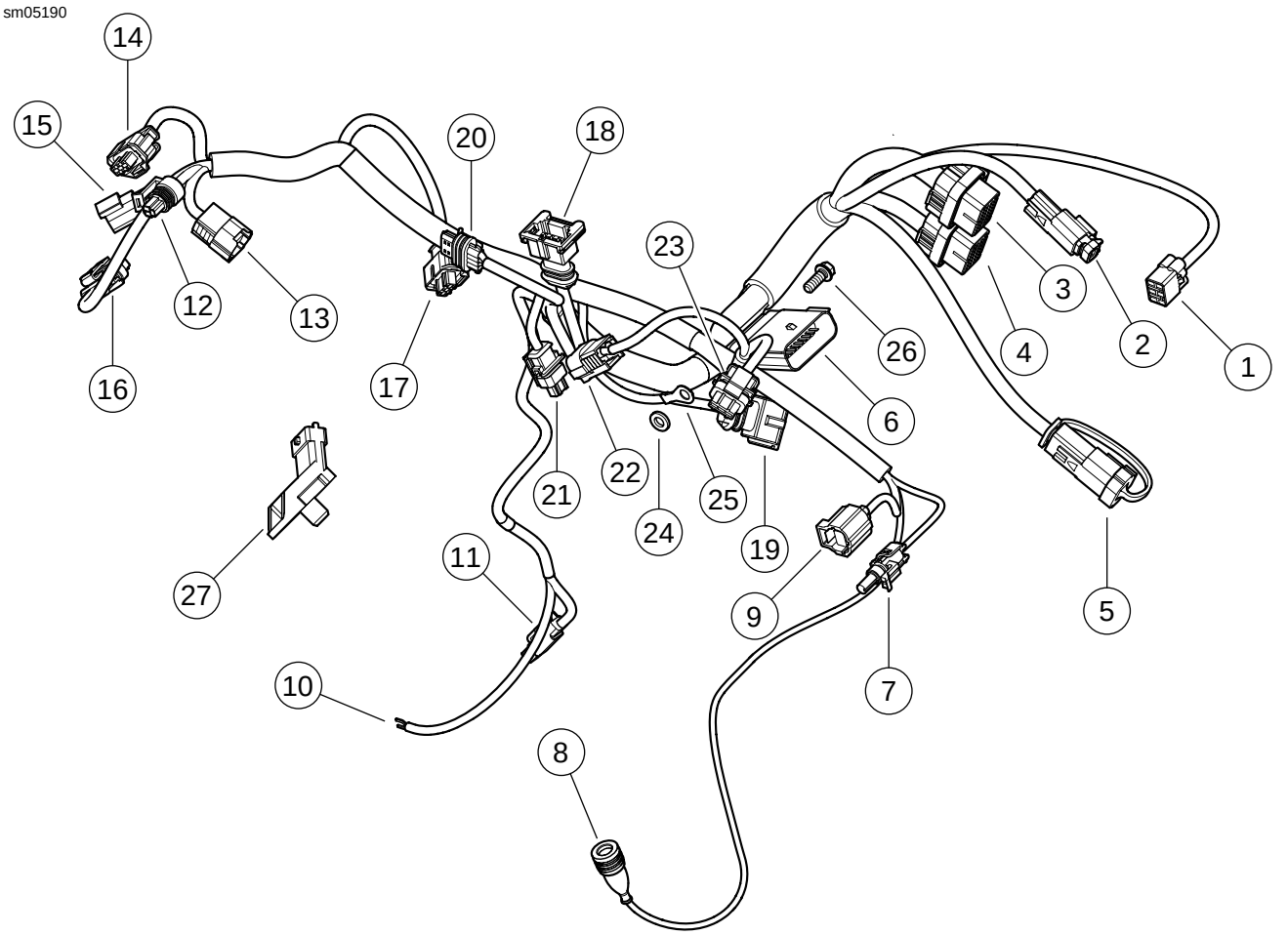
## Assembly

1. Join the CKP connector [79] pin housing to the CKP socket housing on the wire harness.
2. Loop the CKP lead up the main branch of the engine harness and down along the sidestand lead.
3. See Figure 7-112. Fit the harness to the support channels:
   a. The harness stem over the CKP lead in the short center channel (1).
   b. The sidestand/neutral indicator switch lead and CKP lead down the channel (2) to the left rear of the engine.
   c. The front branch with the front O2, the IAT and the oil pressure switch leads running over the top of the center guide and out the front channel (3).
   d. The coil and front fuel injector connector leads up the notch (4) half way down the front channel.
   e. The engine ground lead under the front channel (5).
   f. The TP sensor lead, the IAC lead and the water temperature sensor lead straight up (6).
   g. The remaining branch with connectors down the rear support channel (7).
4. Rubber band the harness to the support.
5. If necessary, join any remaining sensors:
   a. MAP [80]
   b. IAT [89]
   c. BARO [228]




1. **Harness stem**
2. **Sidestand/neutral indicator and CKP**
3. **O2/IAT/oil pressure switch**
4. **Coil and front fuel injector**
5. **Ground**
6. **TPS/IAC and ECT**
7. **Rear support channel**

**Figure 7-112. Wire Harness to Support**




1. **BAS [134]**
2. **CAN bus connector [ 243]**
3. **ECM [10] (black)**
4. **ECM [11] (gray)**
5. **Data link [91]**
6. **Interface connector to main harness [145]**
7. **Front O2 sensor [138]**
8. **Oil pressure switch [120]**
9. **IAT sensor [89]**
10. **Neutral switch [131]**
11. **Sidestand sensor [133]**
12. **Fuel pressure sensor [227]**
13. **Rear fuel injector [85]**
14. **MAP sensor [80]**
15. **Active intake solenoid [178]**
16. **Rear cylinder coil [83R]**
17. **BARO sensor [228]**
18. **TPS [88]**
19. **CKP sensor [79]**
20. **IAC [87]**
21. **ECT sensor [90]**
22. **Front fuel injector [84]**
23. **Front ignition coil [83F]**
24. **Washer**
25. **Ground lead**
26. **Fastener**

**Figure 7-113. Engine Wire Harness Connectors**

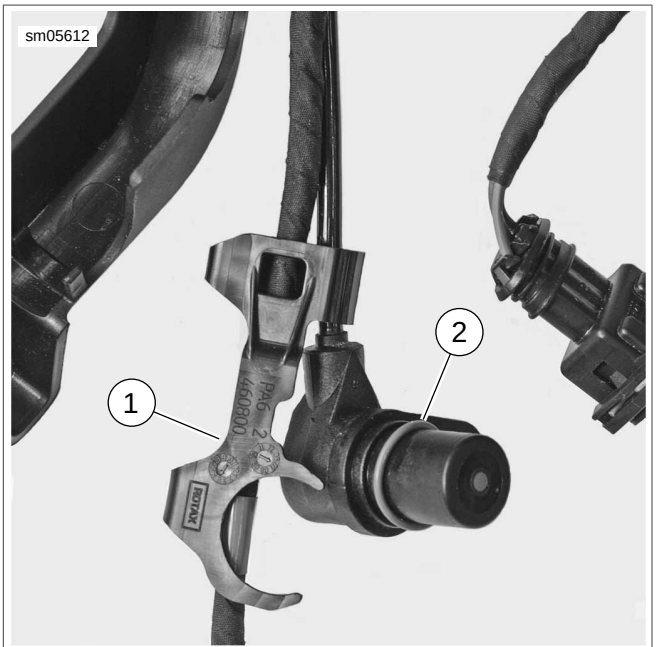
## INSTALLATION

### Mount the Wire Harness

1. Fit the wire harness and support to the engine.
2. Loosely install the four support fasteners.
3. Install the ground fastener through the ground lead ring into the cylinder head.
4. See Figure 7-114. Verify that the plastic guide (1) is clipped around the CKP and sidestand leads. Verify that the O-ring seal (2) is on the CKP and loosely install the CKP with the fastener.
5. Route the stator lead behind the engine harness and inside the rubber band.
6. Tighten the following to:
   a. Tighten the ground fastener to 10 Nm (89 **in-lbs**).
   b. Tighten the CKP fastener to 11 Nm (97 **in-lbs**).
   c. Tighten the support fasteners to 11 Nm (97 **in-lbs**).

## Install Engine

Install the engine into the chassis. See 3.5 ENGINE REPLACEMENT.




1. **Plastic guide**
2. **O-ring**

**Figure 7-114. Plastic Guide - CKP Sensor**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

# MAIN WIRE HARNESS 7.23

## REMOVAL

### Access the Tail Section

*NOTE*

*The wire harness runs from the front of the motorcycle to the tail section. Note wire routing and cable strap locations before removing main wire harness.*

1. Remove seat and pillion.

**⚠WARNING**

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

2. Disconnect and remove battery.
3. Remove air cleaner assembly and base. See 4.2 AIR CLEANER ASSEMBLY.
4. Remove tail section body work. See 2.4 BODY WORK, COVERS, GUARDS AND GUIDES.
5. Remove subframe pan. See 2.14 SUBFRAME.
6. Remove the throttle body. See 4.5 THROTTLE BODY.

### Separate Connectors and Connections

1. See Figure 7-115. Separate the following connectors:
   a. Left hand turn signal [19] (1)
   b. Right hand turn signal [18] (2)
   c. License plate lamp [45] (3)
   d. Tail/stop lamp [93] (4)
2. Pull the tail lamp and the turn signal wire leads through the subframe and lay near the relay block.
3. See Figure 7-116. Remove solenoid cover. Disconnect positive battery cable (5), battery fuse lead (4) and starter cable from the solenoid.
4. Disconnect starter solenoid primary harness connector [128] (3).

*NOTE*

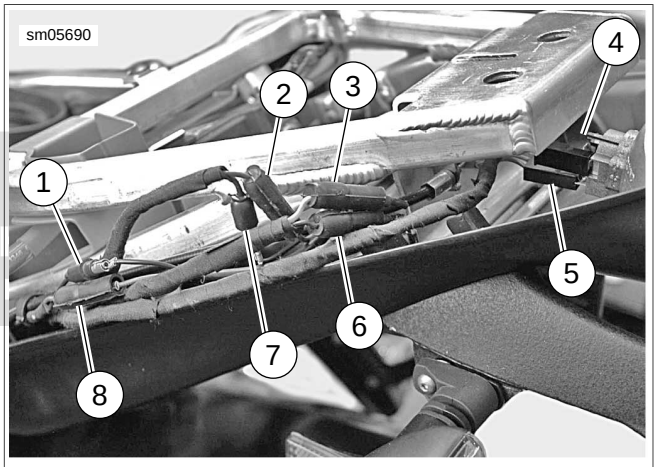
*Remove cables and harnesses from cable attachment clips and cut cable straps as required. Make note of harness routing and locations of clips and cable straps.*

5. Move relay block (9), harness and harness ground wire from under framework and into center of subframe assembly.

*NOTE*

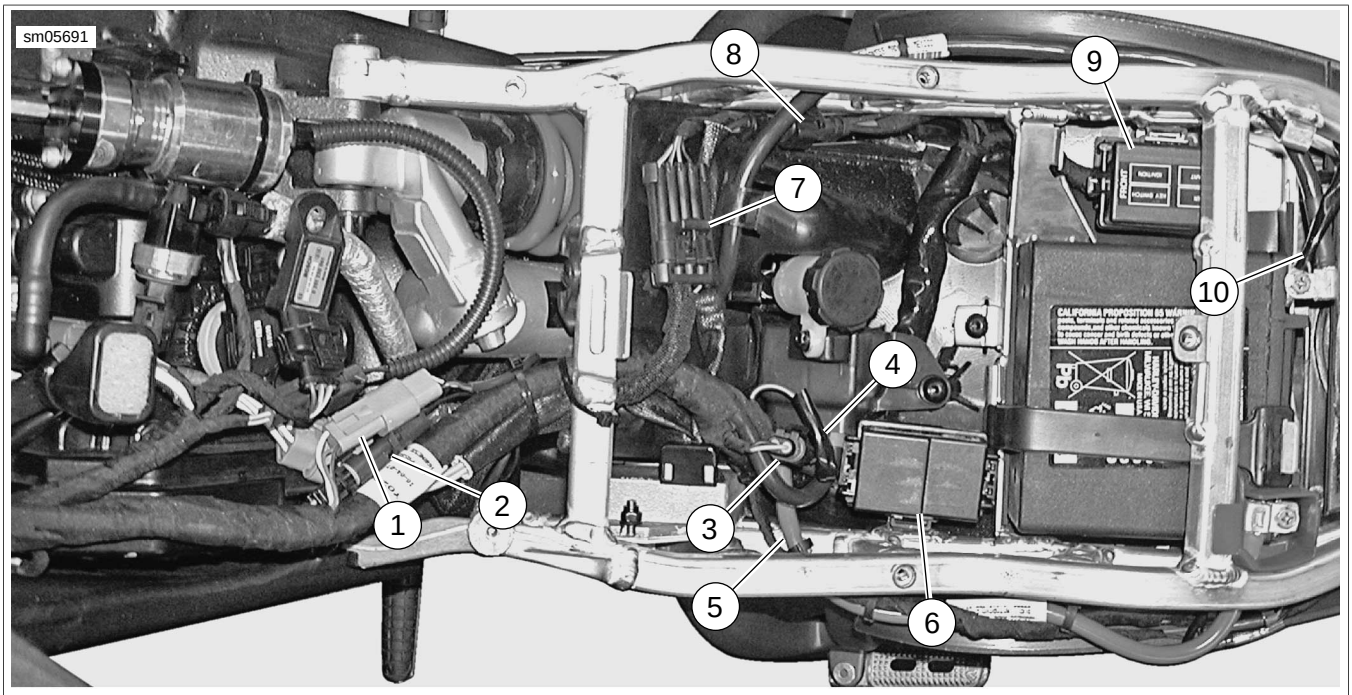
*The rear brake light switch connector is located beneath the rear shock absorber on the fuel pump cover.*

6. Separate the following connectors:
   a. Fuel pump [86] (7)
   b. Rear brake switch [121]
   c. Voltage regulator [77] (8)
   d. VSS [65] (1)
   e. Rear O2 sensor [137]




1. **Left rear turn signal [19] (GND)**
2. **Right rear turn signal [18] (Power)**
3. **License plate lamp [45] (Power)**
4. **Tail/stop lamp [93] (Power)**
5. **Tail/stop lamp [93] (GND)**
6. **License plate lamp [45] (GND)**
7. **Right rear turn signal [18] (GND)**
8. **Left rear turn signal [19] (Power)**

**Figure 7-115. Rear Lamp Connectors**



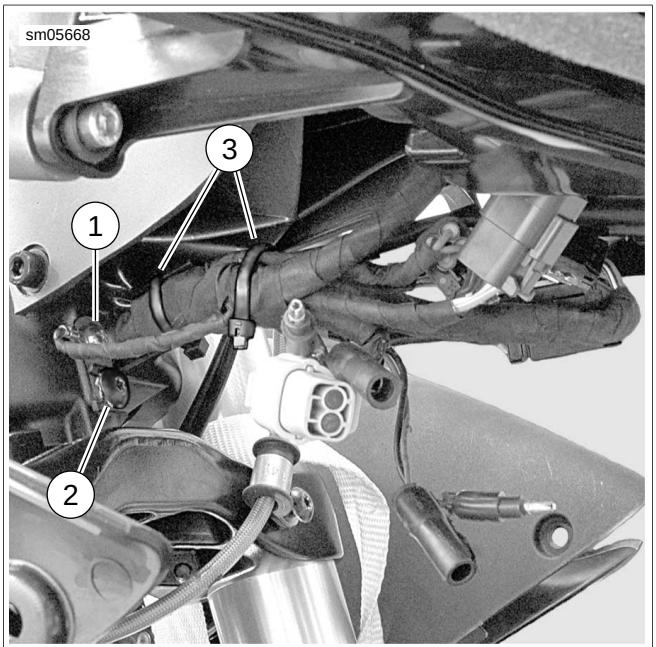

1. **VSS [65]**
2. **Rear O2 [137]**
3. **Starter solenoid [128]**
4. **Battery fuse lead**
5. **Positive battery cable**
6. **Fuse block [61]**
7. **Fuel pump [86]**
8. **Voltage regulator [77]**
9. **Relay block [62]**
10. **Battery ground**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

**Figure 7-116. Main Harness Connectors and Connections**

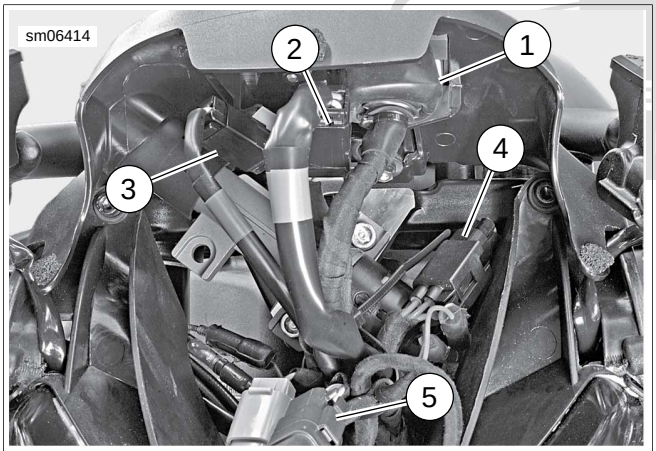
## Access Front Harness

1. Remove fairing and headlamp assembly/windscreen. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R or 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR.
2. Remove cable strap securing harnesses and throttle cables to front cable guard. Release throttle cables from cable guard retainer and move aside.
3. See Figure 7-117 or Figure 7-118. Remove cable straps. Loosen screw securing front harness guard and move guard aside.
4. Separate remaining connectors located below headlight assembly:
   a. Right hand switch housing [22]
   b. Left hand switch housing [24]
   c. Headlamp connector [38]
   d. Ignition switch [33]
5. Cut any remaining cable straps.
6. Pull boot back and disconnect instrument cluster connector [12].
7. Separate the following connectors:
   a. Front brake light switch [170]
   b. Clutch interlock switch [95]
   c. Horn [122]
8. Push harness and connectors back through opening between steering head and left fork.




1. **Front harness ground screw**
2. **Cable guard attachment screw**
3. **Cable straps**

**Figure 7-117. Main Harness Front Connectors: 1125R**




1. **Instrument cluster [39]**
2. **Left hand controls [24]**
3. **Right hand controls [22]**
4. **Ignition switch [33]**
5. **Headlamp [38]**

**Figure 7-118. Main Harness Front Connectors: 1125CR**

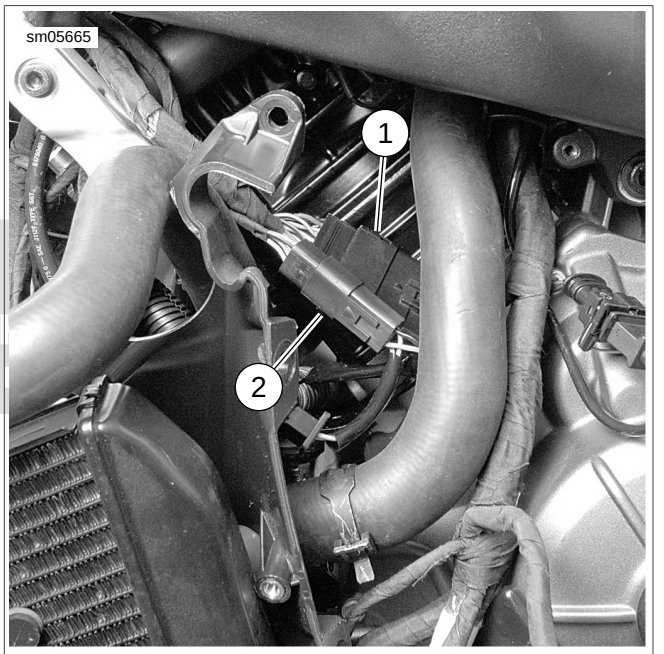
## Remove from Engine

1. Disconnect starter cable from starter.
2. Remove ground screw and tooth washer from front of steering head.
3. Remove wire harness guard from steering neck.
4. Remove the left radiator outer shroud.
5. Remove fasteners securing fan, ECM and left radiator mount. Allow components to hang out of the way. See 7.24 COOLING FANS.
6. See Figure 7-119. Separate the following connectors:
   a. Cooling fan sub-harness [234] (2)
   b. Engine harness interface connector [145] (1)
7. Push connectors and harnesses forward through opening between engine and fuel tank.
8. See Figure 7-120. Remove upper (4) and lower cable strap (3). Pull harness (1) with starter cable (2) up and back past engine.
9. Pull harness back through subframe.

*NOTE*

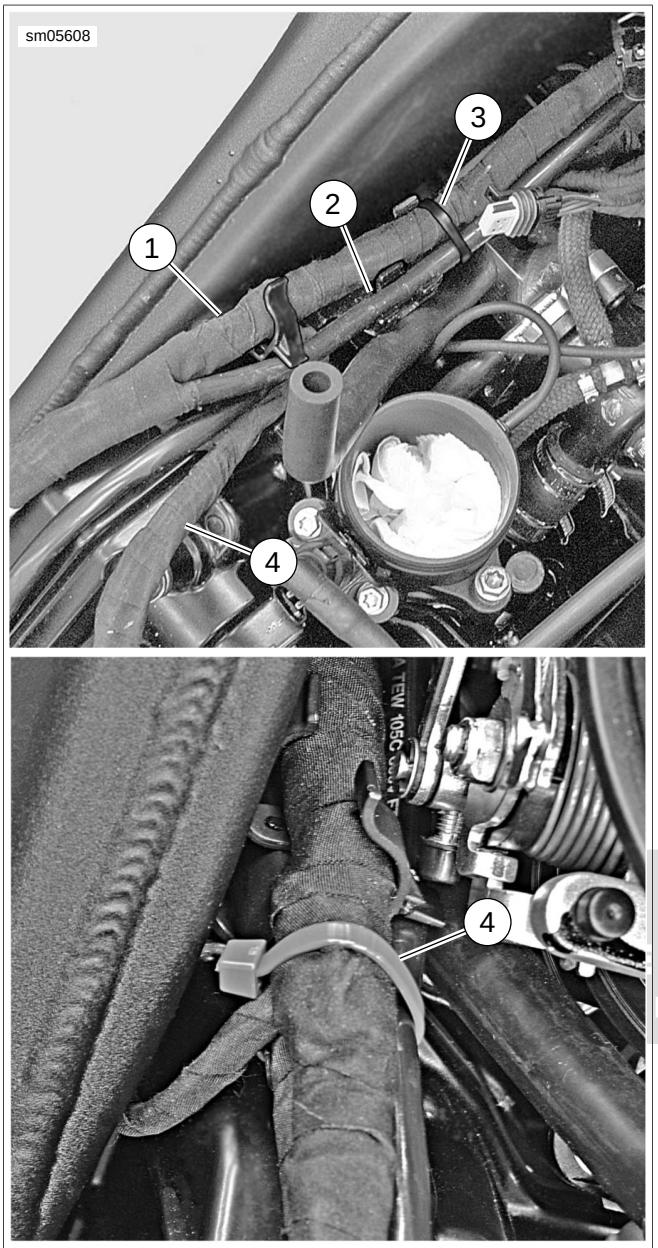
*Do not leave any piece of the wire attachment clips in the frame.*

10. Remove wire attachment clips.




1. **Engine harness interconnect connector [145]**
2. **Cooling fan sub-harness connector [234]**

**Figure 7-119. Fan and Engine Harness Connectors**




1. **Main harness**
2. **Starter cable**
3. **Lower cable strap**
4. **Engine harness**
5. **Upper cable strap**

**Figure 7-120. Main Harness**

## WIRE HARNESS FRONT BRACKET

### 1125R

See Figure 7-121. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).

### 1125CR

See Figure 7-122. Tighten to 13.0-14.5 Nm (115-128 **in-lbs**).

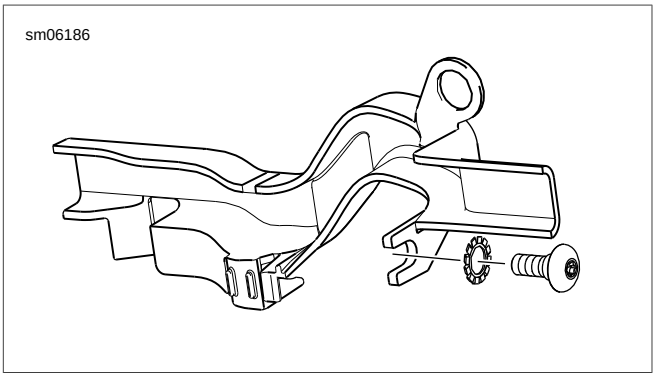



**Figure 7-121. Front Wire Harness: 1125R**

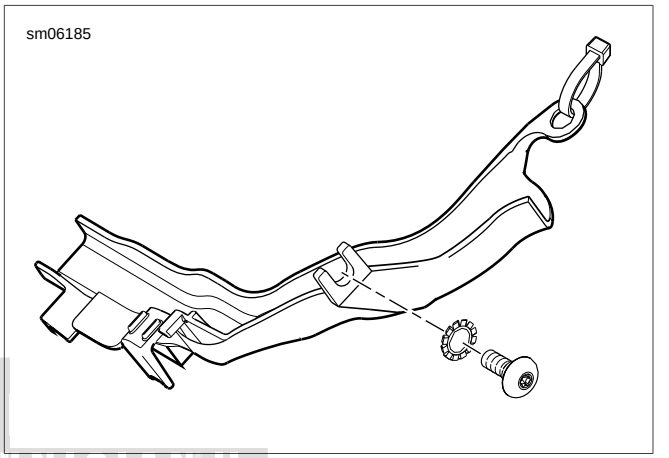



**Figure 7-122. Wire Harness Front Bracket: 1125CR**

## INSTALLATION

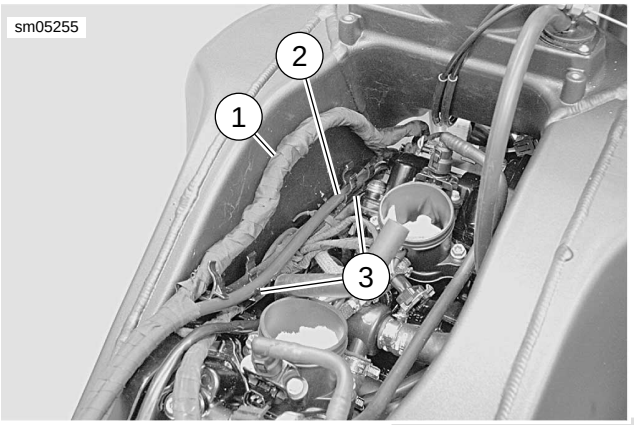
### Fit to Engine

*NOTES*

*Main wire harness is installed from rear of vehicle through subframe.*

1. Route harness forward under cross member and along left side of engine.
2. See Figure 7-123. Pull harness (1) with starter cable (2) forward past engine.
3. Route the starter cable below the main harness.
4. Feed the right hand switch housing [22], the left hand switch housing [24], the headlamp [38], and the ignition switch [33] connectors through the opening between the steering head and the left fork. Pass the harness above the coolant crossover hose.
5. See Figure 7-119. Position the engine harness interface [145] and the fan sub-harness connector [234] inboard of the lower coolant hose.
6. Feed the cooling fan sub-harness and the engine harness interface connector wire leads through the opening between the engine and the fuel tank.

7. Mate the connector housings:
   a. Cooling fan sub-harness [234]
   b. Engine harness interface connector [145]
8. Install left radiator mount with fan and ECM. See 7.24 COOLING FANS.
9. Position wire harness guard in steering neck.
10. Secure front harness ground connection to front of steering head using screw and tooth washer.
11. Connect starter cable to starter. Tighten to 9.6-10.6 Nm (85-94 **in-lbs**).




1. **Main harness**
2. **Starter cable**
3. **Harness/cable retainer**

**Figure 7-123. Harness Routing at Engine**

## Front Harness

1. Route front brake light switch and clutch switch wire leads up through the triple clamp.
2. Join the following connectors:
   a. Brake light switch [170]
   b. Clutch interlock switch [95]
   c. Horn [122]
3. Secure front harness guard with screw.
4. Connect instrument cluster connector [39] and install boot.
5. Install headlamp assembly. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Headlamp Assembly.
6. Join the following connectors:
   a. Right hand switch housing [22]
   b. Left hand switch housing [24]
   c. Headlamp [38]
   d. Ignition switch [33]
7. Install cable straps around the main harness bundle in front of the steering head.
8. Place throttle cables in cable guard retainer and install cable strap securing harnesses and throttle cables to front cable guard.
9. Install the fairing. See 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R.

## Install Rear Harness

1. Lay main harness in position and install the lower and upper cable straps.

*NOTES*

- *The brake light switch connector is located on the rear master cylinder.*
- *Install cable straps and attachment clips during installation.*

2. Route relay block and harness ground wire under the subframe. Mount the relay block to the tab on the sub-frame.
3. Route the harness ground wire outside the right side of subframe along battery negative cable.
4. Secure the battery cable and wire harness with cable straps and wire attachment clips.
5. Mount the fuse block to the tab on the subframe.
6. See Figure 7-124. Connect the positive battery cable and the battery fuse lead (4) to the front solenoid stud.
7. Connect the starter cable (2) to rear stud of solenoid.
8. Install and tighten nuts to 5.7-6.4 Nm (51-56 **in-lbs**).
9. Connect starter solenoid primary harness connector [28] (13).
10. Install subframe pan. See 2.14 SUBFRAME, Subframe Pan.
11. Install solenoid on tabs of subframe pan and secure with solenoid cover. Tighten fastener to 4.1-6.8 Nm (37-60 **in-lbs** ).
12. Join the following connectors:
    a. Fuel pump [86]
    b. Brake light switch [121]
    c. VSS [65]
    d. Rear O2 sensor [137]
13. See Figure 7-125. Secure with cable straps.
14. See Figure 7-126. Route the lamp and turn signal (1) harness outboard of subframe and secure, along with positive battery cable, with cable attachment clips (2).
15. Join the following connectors:
    a. Left rear turn signal [19]
    b. Right rear turn signal [18]
    c. License plate lamp [45]
    d. Tail lamp/brake light [93]
16. Install tail frame upper body work. See 2.14 SUBFRAME, Tail Section.
17. Install throttle body. See 4.5 THROTTLE BODY.

18. Install air cleaner assembly and base. See 4.2 AIR CLEANER ASSEMBLY.

**⚠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)**

19. Install and connect battery.

**⚠WARNING**

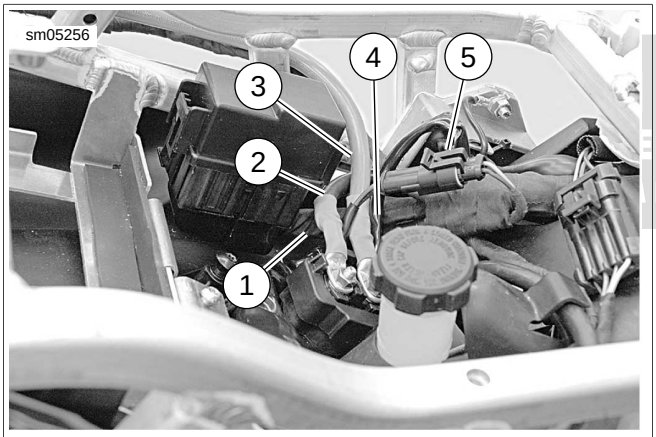
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

20. Install seat and pillion.

**⚠WARNING**

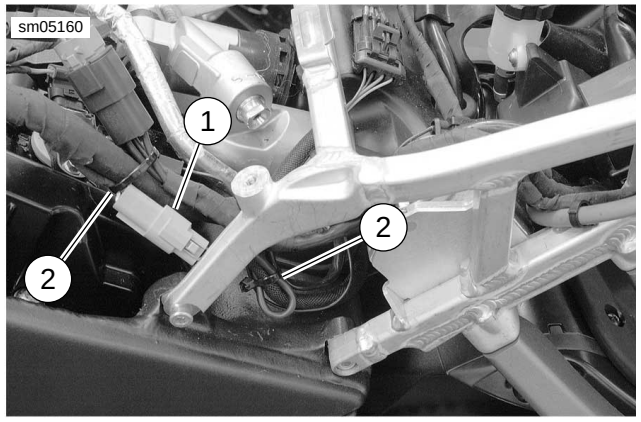
**Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)**

21. Test ride motorcycle.



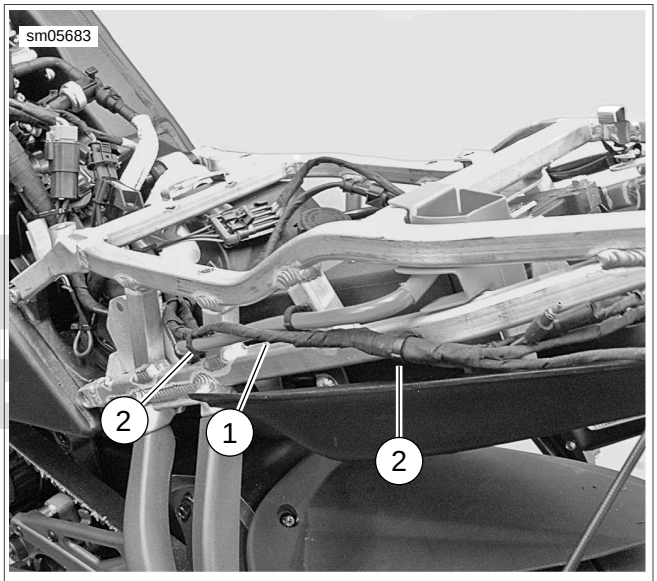

1. **Fuse center harness**
2. **Starter cable**
3. **Battery positive (+) cable**
4. **Fuse center power wire**
5. **Solenoid primary connector**

**Figure 7-124. Cable Routing at Solenoid**




1. **Connector**
2. **Cable strap**

**Figure 7-125. VSS Connector**




1. **Tail/turn signal harness**
2. **Cable attachment clips**

**Figure 7-126. Tail Lamp Harness Routing**

# COOLING FANS 7.24

## REMOVAL

### Left Side

1. Remove passenger seat.

**⚠WARNING**

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

**⚠CAUTION**

**Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)**

2. Disconnect negative battery cable.
3. See Figure 7-127. Remove six fasteners (4) from left radiator outer shroud (7) and remove shroud from motorcycle. Leave speed nuts (6) in place on outer shroud.

*NOTE*

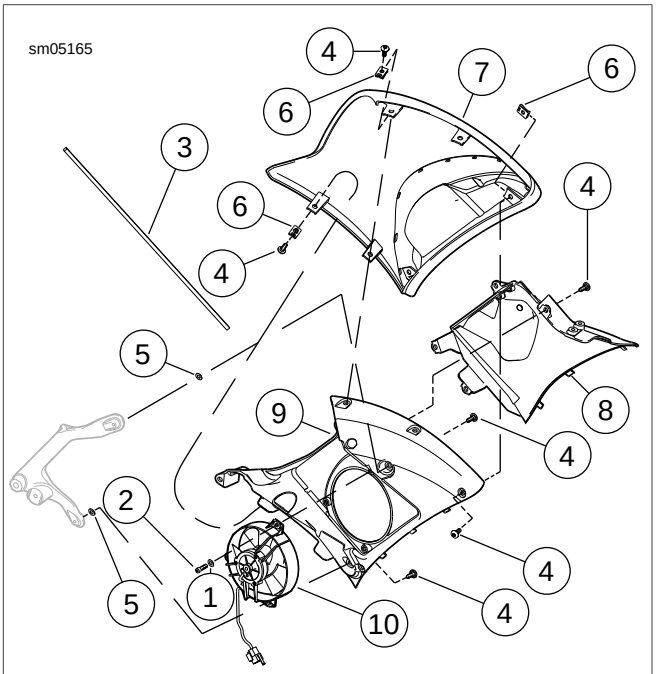
*Note quantity and positioning of any spacer washers (5) between inner duct and K-bracket during disassembly. Spacer washers must be installed exactly as disassembled to verify proper alignment of cooling fan assembly.*

4. Remove four fasteners (4) from radiator inlet duct (8).
5. Remove two fasteners (4) from radiator outlet duct (9) and gently pull duct away from motorcycle to reveal cooling fan.

*NOTE*

*Note wiring harness routing and connector installed location before removing cooling fan from duct to verify correct installation of fan during assembly.*

6. Disconnect fan from wiring harness and remove three fasteners (2) and washers (1) from cooling fan (10).
7. Remove fan from motorcycle.




1. **Washer (3)**
2. **Fastener (3)**
3. **Foam**
4. **Fastener (11)**
5. **Washer**
6. **Speed nut (11)**
7. **Radiator outer shroud (left)**
8. **Radiator inlet duct (left)**
9. **Radiator outlet duct (left)**
10. **Cooling fan**

**Figure 7-127. Left Side Cooling Fan Components**

### Right Side

1. Remove passenger seat.

**⚠WARNING**

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

**⚠CAUTION**

**Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)**

2. Disconnect negative battery cable.
3. See Figure 7-128. Remove six fasteners (6) from right radiator shroud (10) and remove shroud from motorcycle. Leave speed nuts in place on outer shroud.

*NOTE*

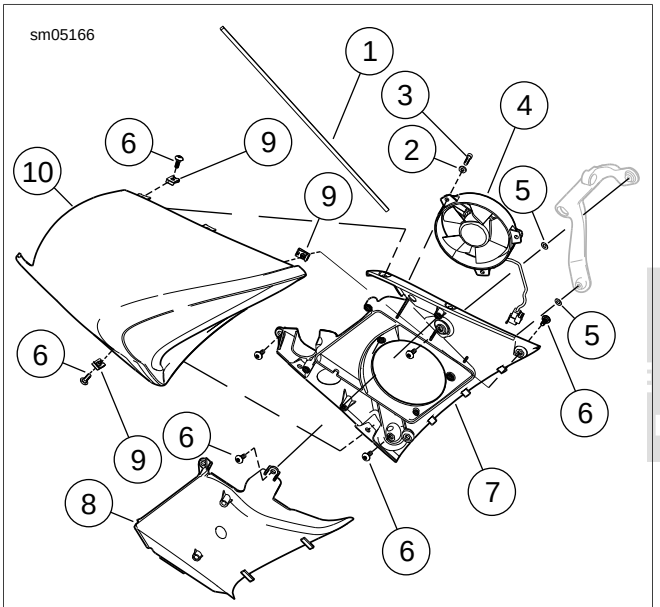
*Note quantity and positioning of any spacer washers (5) between inner duct and K-bracket during disassembly. Spacer washers must be installed exactly as disassembled to verify proper alignment of cooling fan assembly.*

4. Remove four fasteners (6) from radiator inlet duct (8).
5. Remove two fasteners (6) from radiator outlet duct (7) and gently pull duct away from motorcycle to reveal cooling fan.

*NOTE*

*Note wiring harness routing and connector installed location before removing cooling fan from duct to verify correct installation of fan during assembly.*

6. Disconnect fan from wiring harness and remove three fasteners (3) and washers (2) from cooling fan (4).
7. Remove fan from motorcycle.




1. **Foam**
2. **Washer (3)**
3. **Fastener (3)**
4. **Cooling fan**
5. **Washer**
6. **Fastener (11)**
7. **Radiator outlet duct (right)**
8. **Radiator inlet duct (right)**
9. **Speed nut (11)**
10. **Radiator outer shroud (right)**

**Figure 7-128. Right Side Cooling Fan Components**

## FUEL PUMP: INSTALLATION

| PART NUMBER | TOOL NAME |
|---|---|
| PR7 | SNAP-ON RETAINING RING PLIERS |

1. See Figure 7-129. Lubricate fuel pump O-rings (6) with clean engine oil.

*NOTE*

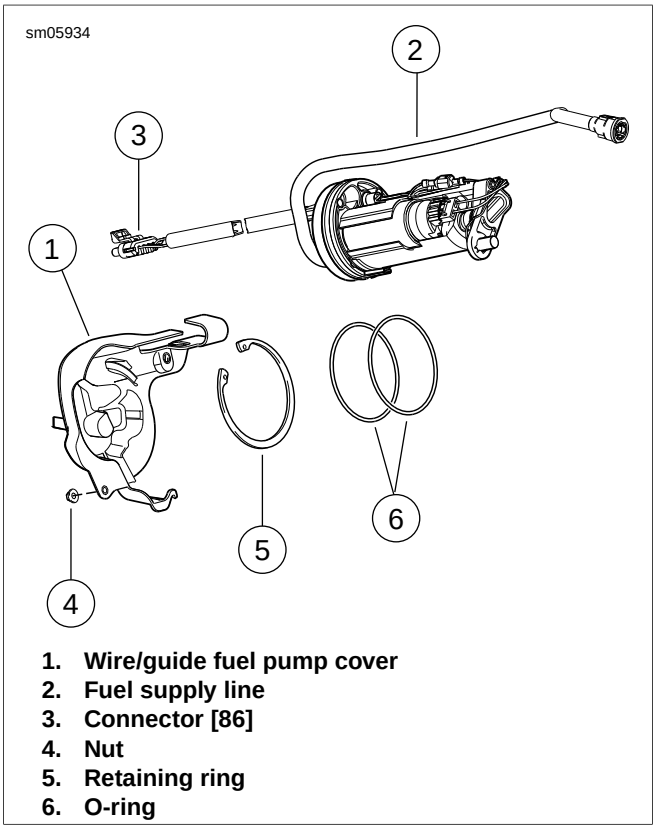
*In next step, be sure tab on pump assembly lines up with slot in fuel tank.*

2. Insert fuel pump assembly into fuel tank/frame until resistance is felt.
3. Use a SNAP-ON RETAINING RING PLIERS (Part No. PR7) to install retaining ring (5) securing fuel pump in fuel tank.
4. Connect the fuel supply line (2) to the fuel rail.
5. Join the fuel pump connector [86] (3) housings.
6. Fill fuel tank with a small amount of fuel and check for leaks.
7. Install the wire guide/fuel pump cover. See 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover.
8. Install swingarm onto motorcycle. See 2.12 SWINGARM AND BRACE.
9. Install rear wheel. See 2.6 WHEELS.
10. Install ram air baseplate and air box cover. See 4.2 AIR CLEANER ASSEMBLY, Baseplate.

**⚠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. Connect negative battery cable. Tighten fastener to 6.8-7.9 Nm (60-70 **in-lbs**).
13. Remove motorcycle from scissor jack.




1. **Wire/guide fuel pump cover**
2. **Fuel supply line**
3. **Connector [86]**
4. **Nut**
5. **Retaining ring**
6. **O-ring**

**Figure 7-129. Fuel Pump Components**

## INSTALLATION

### Left Side

1. See Figure 7-130. Install cooling fan (10).
2. Install cooling fan washers (1) and fasteners (2) and tighten fasteners to 9.7-10.9 Nm (86-96 **in-lbs**).
3. Route cooling fan wiring harness as noted during disassembly and connect to cooling fan wiring harness connector.

*NOTE*

*When installing fan components and wiring, be certain that wiring and connectors are properly routed and visible. Confirm correct routing before continuing installation process.*

4. Position radiator outlet duct (9) and install fasteners (4). Tighten fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).

*NOTE*

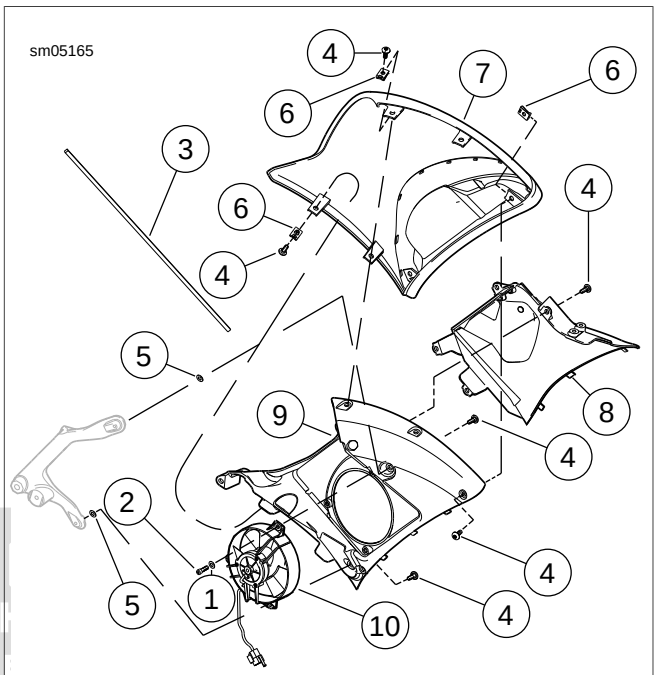
*Check condition of foam (3) on radiator ducts and replace as necessary. If installing new components, be sure to install foam as it was installed on original components.*

5. Seat radiator in radiator outlet duct and enclose radiator with radiator inlet duct (8).
6. Secure radiator inlet duct with fasteners (4). Tighten to 8.2-9.2 Nm (73-82 **in-lbs**).
7. Install radiator outer shroud (7) and secure with fasteners (4). Tighten to 9.0-9.9 Nm (80-88 **in-lbs**).
8. Connect negative battery cable.

**WARNING**

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

9. Install seat.
10. Start motorcycle, check for coolant leaks and verify proper cooling fan function.




1. **Washer (3)**
2. **Fastener (3)**
3. **Foam**
4. **Fastener (11)**
5. **Washer**
6. **Speed nut (11)**
7. **Radiator outer shroud (left)**
8. **Radiator inlet duct (left)**
9. **Radiator outlet duct (left)**
10. **Cooling fan**

**Figure 7-130. Left Side Cooling Fan Components**

### Right Side

1. See Figure 7-131. Install cooling fan (4).
2. Install cooling fan washers (2) and fasteners (3), and tighten fasteners to 9.7-10.9 Nm (86-96 **in-lbs**).
3. See Figure 7-132. Route cooling fan wiring harness (1) downward, outside of foam (2) and connect to cooling fan wiring harness connector (3).

*NOTE*

*When installing fan components and wiring, be certain that wiring and connectors are properly routed and visible. Confirm correct routing before continuing installation process.*

4. See Figure 7-131. Position radiator outlet duct (7) and install fasteners (6). Tighten fasteners to 13.0-14.5 Nm (115-128 **in-lbs**).

*NOTE*

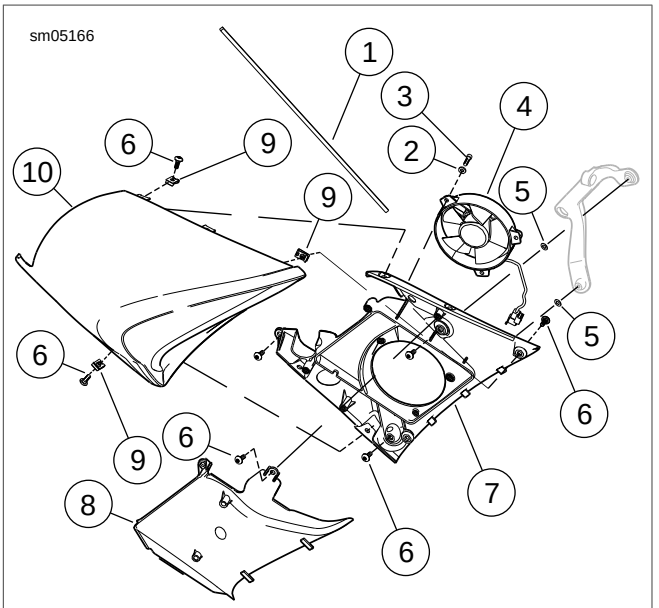
*Check condition of foam (1) on radiator ducts and replace as necessary. If installing new components, be sure to install foam as it was installed on original components.*

5. Seat radiator in radiator outlet duct and enclose radiator with radiator inlet duct (8).
6. Secure radiator inlet duct with fasteners (6). Tighten to 8.2-9.2 Nm (73-82 **in-lbs**).
7. Install radiator outer shroud (10) and secure with fasteners (6). Tighten to 9.0-9.9 Nm (80-88 **in-lbs**).
8. Connect negative battery cable.

**WARNING**

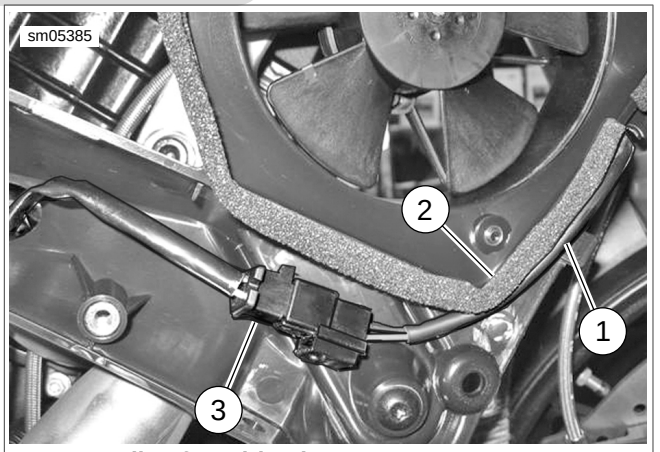
**After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)**

9. Install seat.
10. Start motorcycle, check for coolant leaks and verify cooling fan function.




1. **Foam**
2. **Washer (3)**
3. **Fastener (3)**
4. **Cooling fan**
5. **Washer**
6. **Fastener (11)**
7. **Radiator outlet duct (right)**
8. **Radiator inlet duct (right)**
9. **Speed nut (11)**
10. **Radiator outer shroud (right)**

**Figure 7-131. Right Side Cooling Fan Components**




1. **Cooling fan wiring harness**
2. **Foam**
3. **Cooling fan wiring harness connector**

**Figure 7-132. Right Side Cooling Fan Wiring Harness Routing**

# NOTES

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# NOTES

# AMP MULTILOCK CONNECTORS A.1

## AMP MULTILOCK CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| HD-41609 | AMP MULTILOCK CRIMPER |
| SNAP-ON TT600-3 | PICK |

### General

AMP Multilock 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-1. 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*

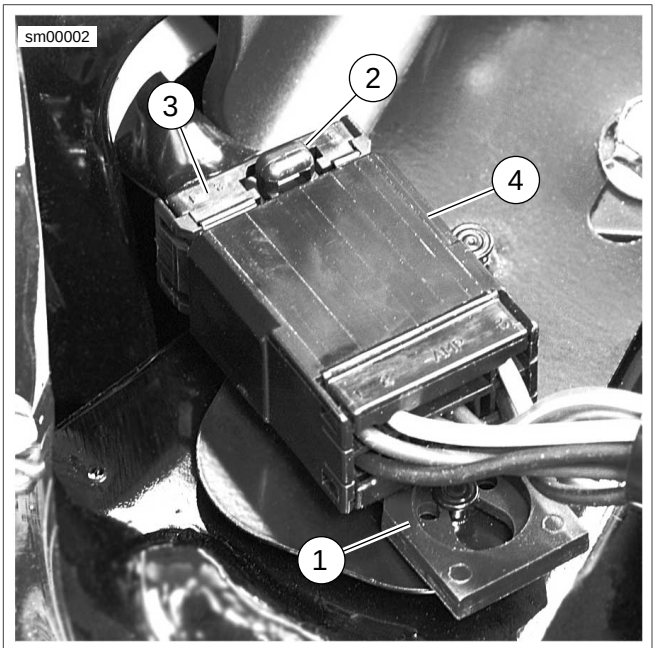
*For terminal crimping use the AMP MULTILOCK CRIMPER (Part No. HD-41609).*

### 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-1. Depress the release button (2) on the socket terminal side of the connector and pull the socket housing (3) out of the pin housing (4).

### Mating Pin and Socket Housings

1. Hold the housings to match wire color to wire color.
2. Insert the socket housing into the pin housing until it snaps in place.
3. If OE location is a T-stud, fit large opening end of attachment clip over T-stud and slide connector to engage T-stud to small end of opening.




1. **Attachment clip**
2. **Release button**
3. **Socket housing**
4. **Pin housing**

**Figure A-1. AMP Multilock Connector**

### Removing Terminals from Housing

1. See Figure A-2. Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Insert a pick or pin into the terminal cavity until it stops.

*NOTE*

*If socket/pin terminal tool is not available, a push pin/safety pin or a PICK (Part No. SNAP-ON TT600-3) may be used.*

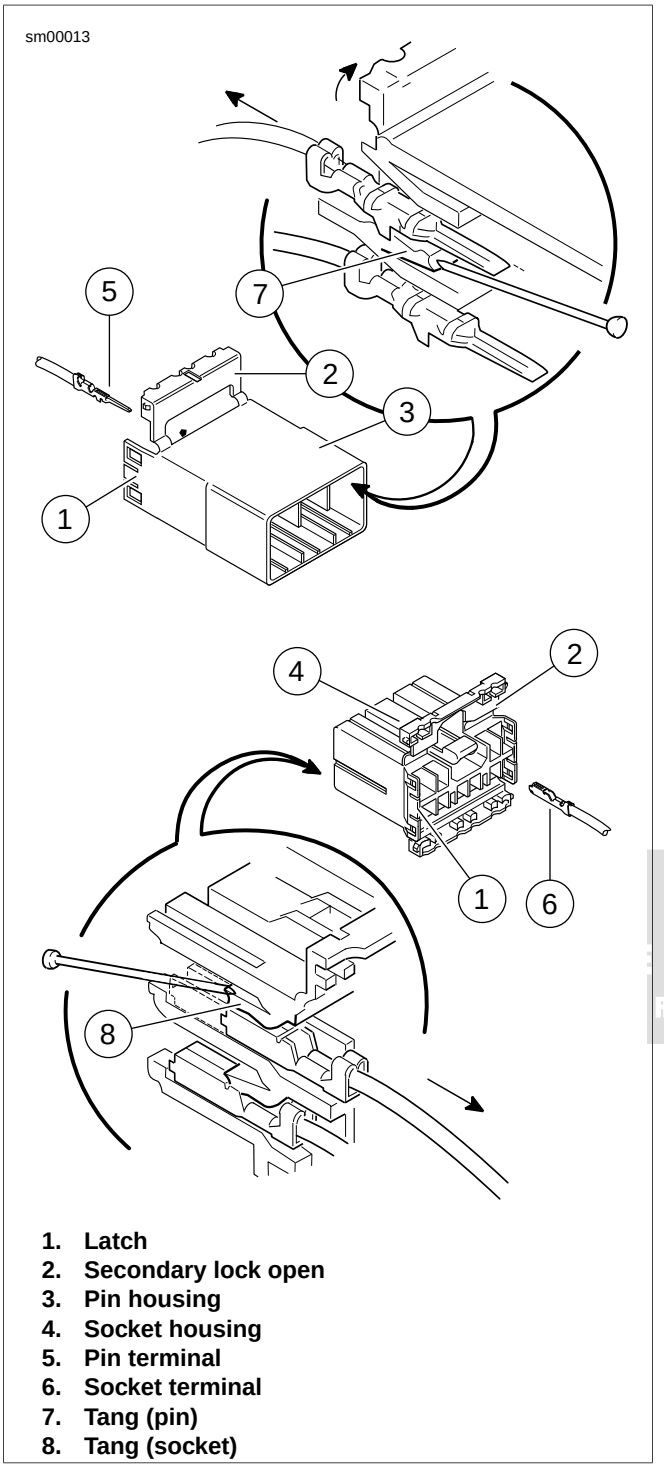
4. Press the tang in the housing to release the terminal.
   a. **Socket:** Lift the socket tang (8) up.
   b. **Pin:** Press the pin tang (7) down.

*NOTE*

*A "click" is heard if the tang is released.*

5. Gently tug on wire to pull wire and terminal from cavity.

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

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

## Inserting Terminals into Housing

*NOTE*

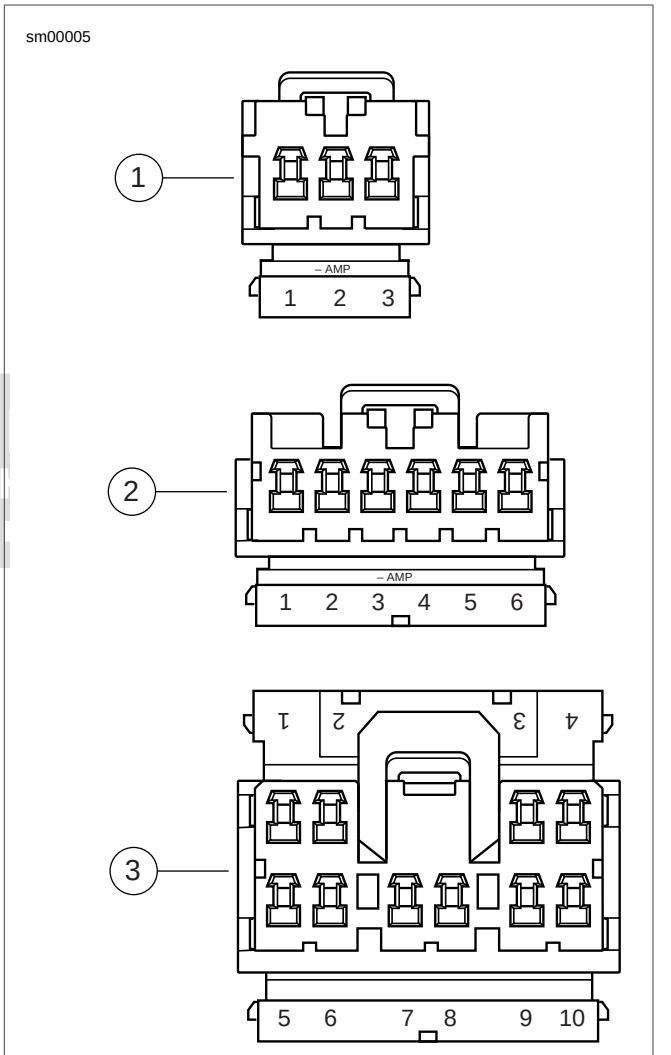
*See Figure A-3. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.*

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

*NOTES*

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

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




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

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

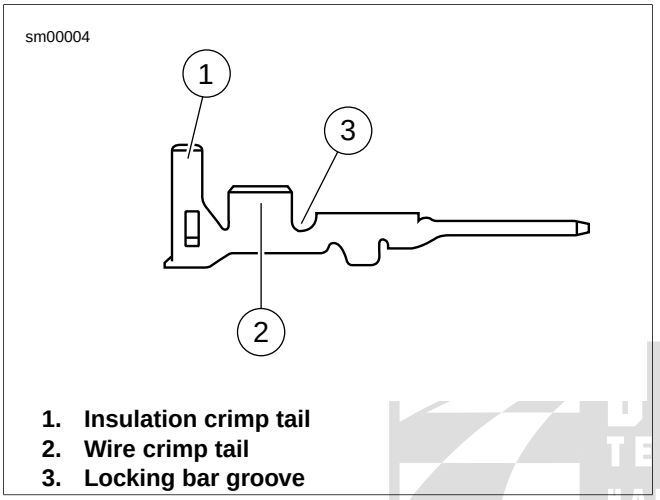
## Preparing Wire Leads for Crimping

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

2. See Figure A-4 and Figure A-5. 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-1.

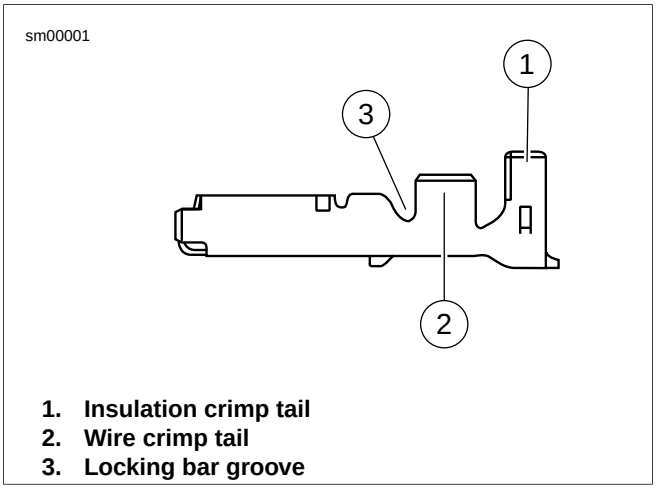
**Table A-1. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest**

| WIRE GAUGE | NEST |
|---|---|
| 20 | Front |
| 16 | Middle |
| 18 | Rear |




1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

**Figure A-4. AMP Multilock Connector: Pin Terminal**




1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

**Figure A-5. AMP Multilock Connector: Socket Terminal**

## Crimping Terminals to Leads

*NOTE*

*Crimping with an Amp Multilock tool is a one step operation. One squeeze crimps both the wire core and the insulation tails.*

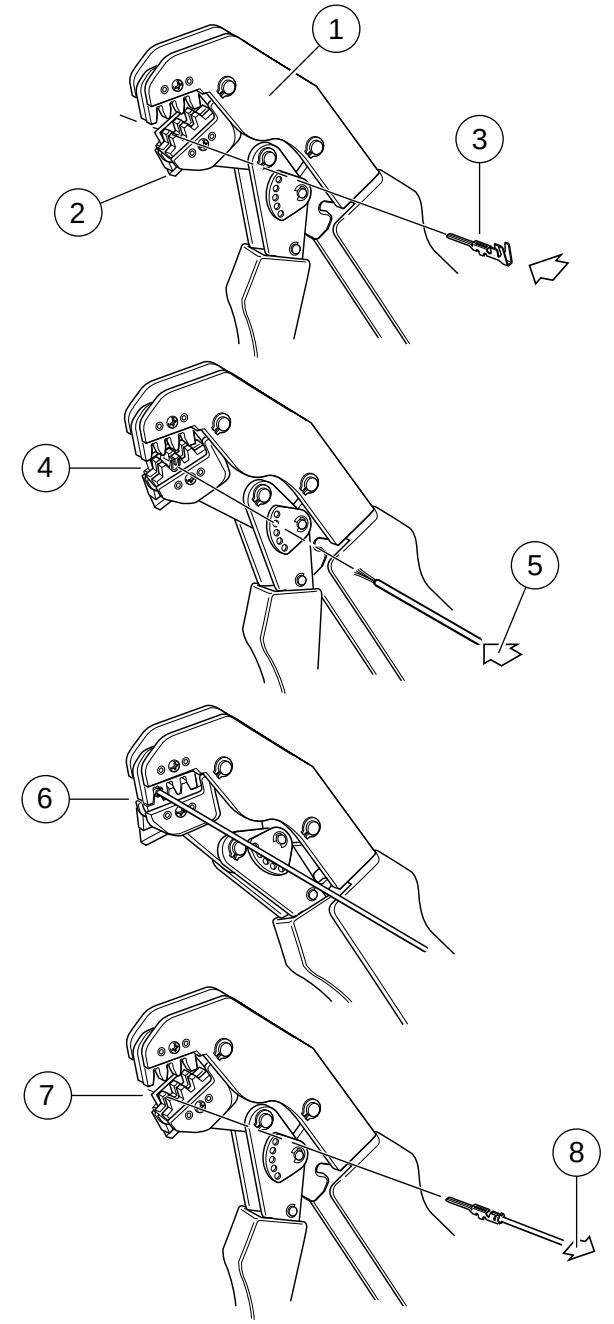
1. See Figure A-6. Squeeze the handles to cycle the AMP MULTILOCK CRIMPER (Part No. HD-41609) to the fully open position (1).
2. Raise locking bar by pushing up on bottom flange (2).

*NOTE*

*See Figure A-4 and Figure A-5. Hold the terminal with the insulation crimp tail (1) facing up. The tool will hold the terminal by the locking bar groove (3) and crimp the wire crimp tail (2) around the bare wire of the stripped lead and the insulation crimp tail around the insulation.*

3. See Figure A-6. With the insulation crimp tail facing upward, insert terminal (pin or socket) (3) through the locking bar, so that the closed side of the terminal rests on the nest of the crimp tool.
4. Release locking bar to lock position of contact (4). When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails.
5. Insert stripped end of lead (5) until ends make contact with locking bar.
6. Verify that wire is positioned so that wire crimp tails squeeze bare wire strands, while insulation crimp tails fold over the wire lead insulation.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
8. Raise up locking bar (7) and remove crimped terminal.

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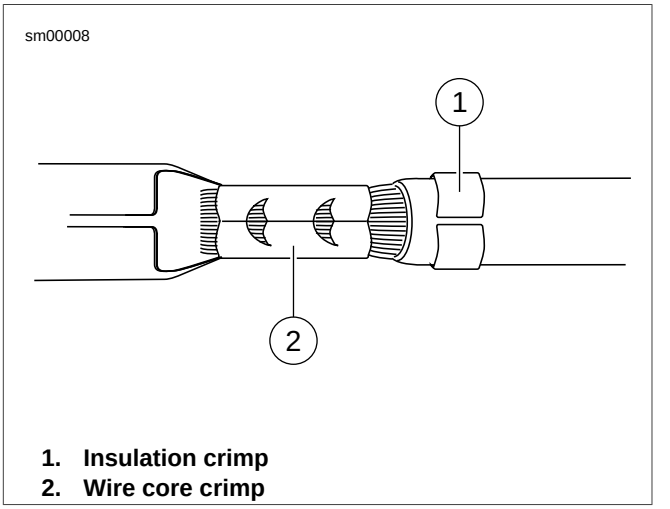



1. Open position
2. Locking bar flange
3. Insert contact
4. Release locking bar
5. Insert lead
6. Squeeze
7. Raise locking bar
8. Remove crimped terminal

**Figure A-6. AMP Multilock Connector: Terminal Crimping Procedure**

## Inspecting Crimped Terminals

See Figure A-7. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.




1. Insulation crimp
2. Wire core crimp

**Figure A-7. AMP Multilock Connector: Terminal Crimp**

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# AUTOFUSE ELECTRICAL CONNECTORS A.2

## AUTOFUSE CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| GA500A | SNAP-ON TERMINAL PICK |

### General

Autofuse electrical connector terminals are found in ignition switches and some fuse blocks.

### Disassembly

1. Obtain SNAP-ON TERMINAL PICK (Part No. GA500A).
2. See Figure A-8 or Figure A-9. Insert smallest pair of pins into chamber on mating end of socket housing to depress tangs on each side of terminal simultaneously.
3. Gently pull on wire to remove terminal from wire end of socket housing.
4. If necessary, crimp **new** terminals on wires.

### Assembly

1. Using a thin flat blade, like that on a hobby knife, carefully bend tang on each side of terminal outward away from terminal body.
2. With the open side of the terminal facing rib on wire end of socket housing, insert terminal into chamber until it locks in place.

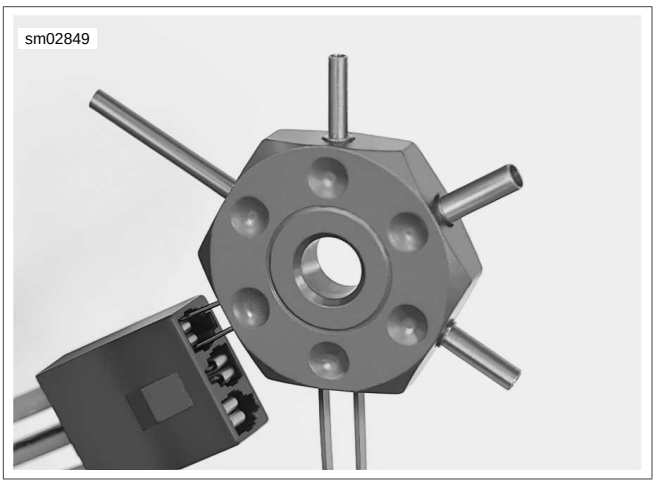



**Figure A-8. Removing Autofuse Terminal from Ignition Switch**

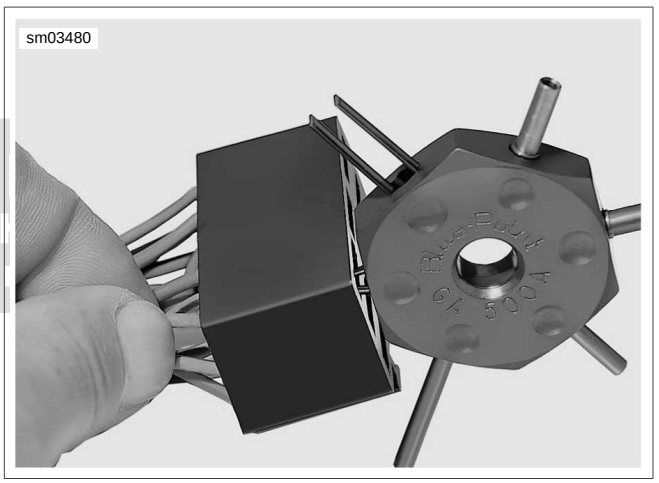



**Figure A-9. Removing Autofuse Terminal from Fuse Block**

# DELPHI CONNECTORS A.3

## DELPHI CONNECTOR REPAIR

### General

Delphi connectors are embossed with the brand name, Delphi, on the housing latch.

### Separating Pin and Socket Housings

See Figure A-10. 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. The only exception is the oil pressure sender connector [139B], the terminals of which are removed like the Packard push-to-seat connectors. Therefore, see A.10 PACKARD 150 METRI-PACK CONNECTORS to remove/install terminals in this connector.*

1. See Figure A-11. If present, free one side of wire lock (1) from ear on wire end of socket housing, then release the other side. Release wires from channels in wire lock and remove from socket housing.
2. Use a fingernail to pry colored terminal lock (2) loose and then remove from mating end of socket housing.
3. Using a thin flat blade, like the unsharpened edge of a hobby knife, gently pry tang (3) outward away from terminal, and then tug on wire to back terminal out wire end of chamber. Do not pull on wire until tang is released or terminal will be difficult to remove.

### Installing Socket Terminals

*NOTE*

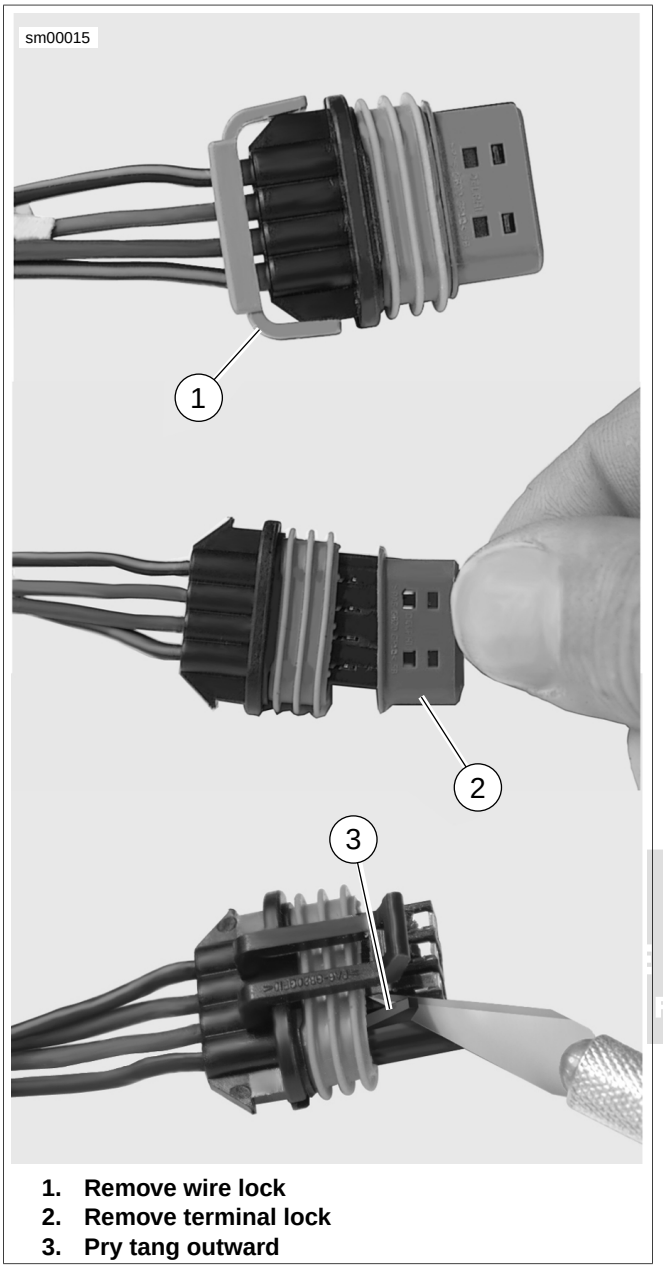
*For wire location purposes, alpha or numeric characters are stamped into the wire end of each socket housing.*

1. Gently push tang on socket housing inward toward chamber. With the open side of the terminal facing the tang, push terminal into chamber at wire end of socket housing.
2. Gently tug on wire to verify that terminal is locked and will not back out of chamber. If necessary, use fingernail to push tang into engagement with terminal.
3. Install colored terminal lock onto mating end of socket housing.
4. If present, seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.




**Figure A-10. Delphi Connector: Socket Housing Latch**

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1. **Remove wire lock**
2. **Remove terminal lock**
3. **Pry tang outward**

**Figure A-11. Delphi Connector: Removing Socket Terminals**

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# DELPHI MAIN FUSE HOUSING A.4

## DELPHI MAIN FUSE HOUSING REPAIR

### General

A Delphi Main fuse connector completes the circuit through the main fuse.

### Removing Main Fuse

1. See Figure A-12. Depress latches on main fuse cover (1) and then slide cover off of connector (2).
2. Holding the connector (fuse holder), pull the main fuse out of the connector.

### Installing Main Fuse

1. Insert the blade terminals of the main fuse into the sockets of the connector and press the main fuse into the connector.
2. Slide the cover over the fuse until the cover clicks into place.

*NOTE*

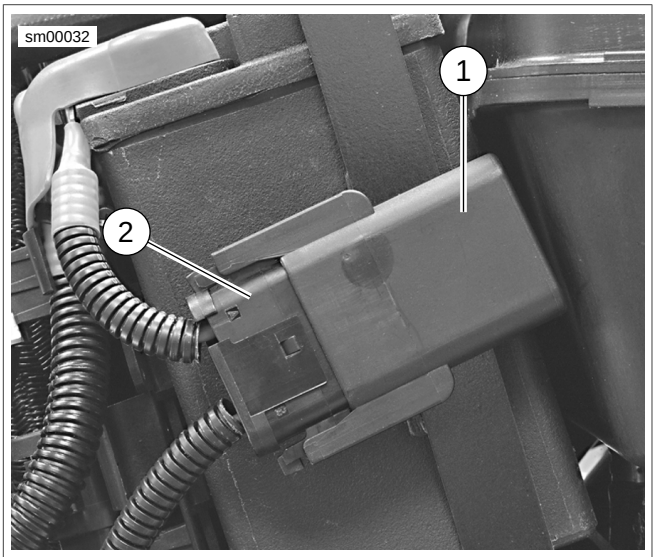
*If removed from an OE attachment such as a grooved fuse block cover, engage cover and slide into place.*

### Removing Socket Terminals

1. Disconnect battery. See 1.14 BATTERY MAINTENANCE.
2. See Figure A-13. 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.

### Installing Socket Terminals

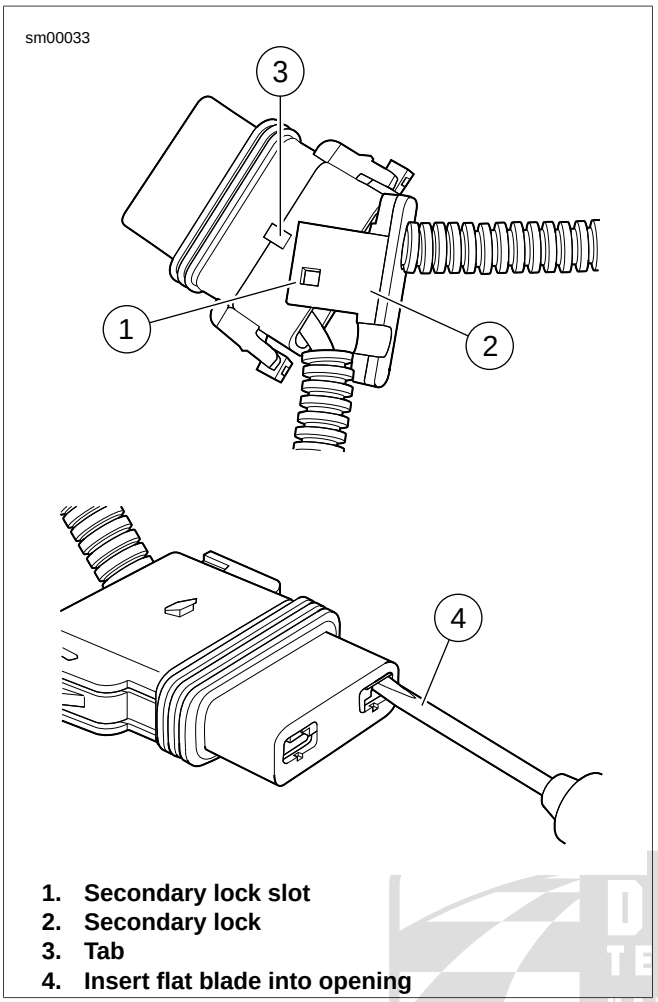
1. See Figure A-14. Carefully bend tang outward away from the terminal body.
2. Properly orient terminal to the cavity in the housing and push terminal into connector housing until it clicks in place. Verify that socket will not back out of chamber.
3. Push rubber seal into connector housing.
4. Repeat to install remaining socket terminal.
5. Install secondary lock onto connector housing. be sure slots engage tabs on sides of connector housing.
6. Connect battery cables. See 1.14 BATTERY MAINTENANCE.




**1. Main fuse cover**
**2. Delphi main fuse housing**

**Figure A-12. Delphi Connector Housing: Main Fuse**

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1. Secondary lock slot
2. Secondary lock
3. Tab
4. Insert flat blade into opening

**Figure A-13. Delphi Main Fuse Housing: Remove Socket Terminals**

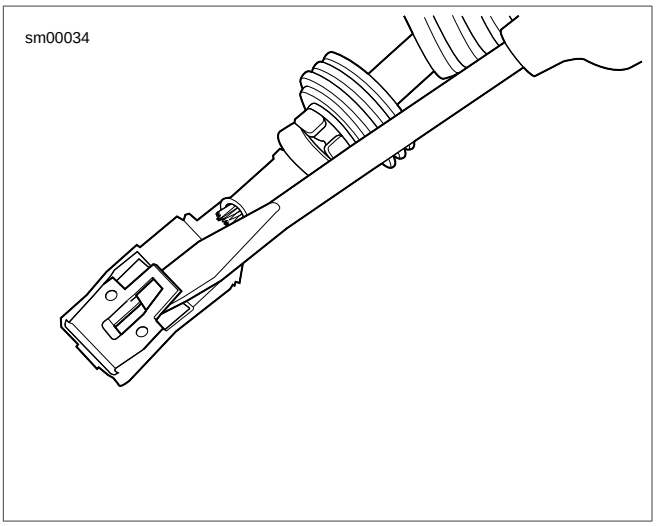



**Figure A-14. Delphi Main Fuse Housing: Bend Tang**

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# DEUTSCH ELECTRICAL CONNECTORS A.5

## DEUTSCH CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| HD-41475 | DEUTSCH CONNECTOR SERVICE KIT |
| HD-41475-100 | FLAT BLADE L-HOOK |

### General

Deutsch connectors are colored coded for location purposes. Those connectors associated with **left** side accessories, such as the front and rear **left** turn signals, are **gray**. All other connectors, including those associated with right side accessories, are **black**.

*NOTE*

*A DEUTSCH CONNECTOR SERVICE KIT (Part No. HD-41475) contains a selection of wire seals, internal seals, seal plugs, secondary locking wedges, attachment clips and socket/pin terminals. Also included is a compartmented storage box, carrying case and a FLAT BLADE L-HOOK (Part No. HD-41475-100) is used for the removal of all types of locking wedges.*

### Separating Pin and Socket Housings

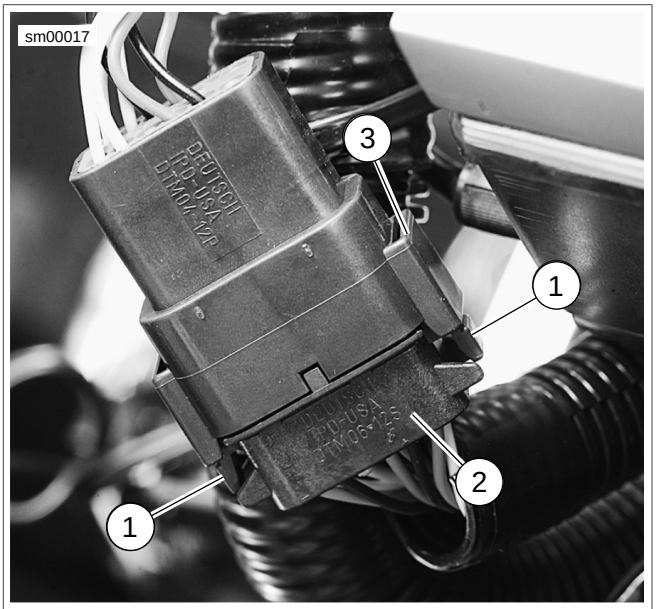
See Figure A-15. To separate the connector halves, depress the external latch(es) (1) on the socket housing (2) while rocking the pin (3) and socket housings.

*NOTES*

- *Generally, the socket housing is found on the accessory side, while the pin housing is plumbed to the wiring harness.*
- *Two-, three-, four- and six-place Deutsch connectors have one latch on the connector.*
- *Eight- and twelve-place connectors have a latch on each side. Simultaneously press both latches to separate the connector.*

### Mating Pin and Socket Housings

1. Align the connectors to match the wire lead colors.
   a. **For One External Latch:** Two-, three-, four- and six-place Deutsch connectors have one external latch on the socket half of the connector. To fit the halves of the connector together, the latch on the socket side must be aligned with the latch cover on the pin side.
   b. **For Two External Latches:** (8-place and 12-place) Align the tabs on the socket housing with the grooves on the pin housing.
2. Insert socket housing into pin housing until it snaps or clicks into place.
   **For Two External Latches:** (8-place and 12-place) If latches do not click (latch), press on one side of the connector until that latch engages, then press on the opposite side to engage the other latch.
3. If necessary, fit the attachment clip to the pin housing.
4. Place large end of slot on attachment clip over T-stud on frame. Push assembly forward to engage small end of slot.




1. **External latch**
2. **Socket housing**
3. **Pin housing**

**Figure A-15. Deutsch Connector**

### Removing Socket Terminals

1. See Figure A-16. 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-19. Use a pick or small screwdriver to depress 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-18. Fit rear wire seal (1) into back of socket housing (2), if removed.
3. Grasp wire lead (3) approximately 25.4 mm (1.0 in.) 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.

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*NOTE*

*Seal plugs (6) are installed through the wire seals of unused chambers. If removed, seal plugs must be replaced to seal the connector.*

5. Install internal seal (4) on lip of socket housing, if removed.
6. Insert tapered end of secondary locking wedge (5) into socket housing and press down until it snaps in place. The wedge fits into the center groove within the socket housing and holds the terminal latches tightly closed.

*NOTES*

- *See Figure A-17. While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-place connector must be installed with the arrow (1) pointing toward the external latch.*
- *If the secondary locking wedge does not slide into the installed position easily, verify that all terminals are fully installed in the socket housing. The lock indicates when terminals are not properly installed by not entering its fully installed position.*

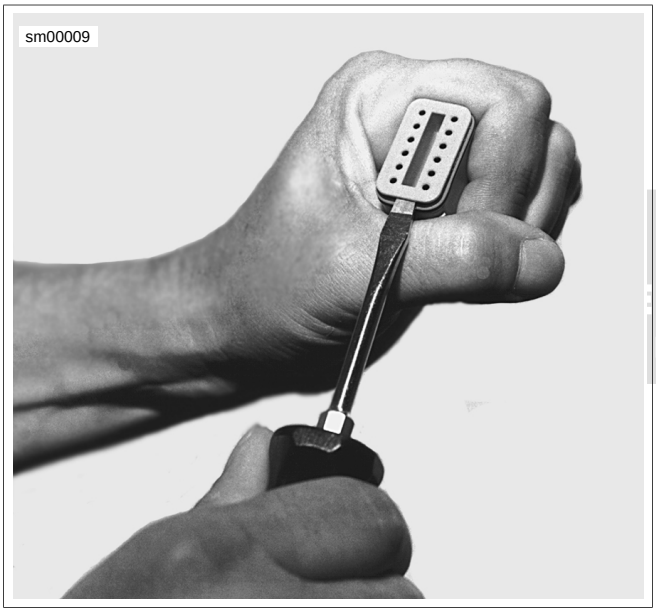
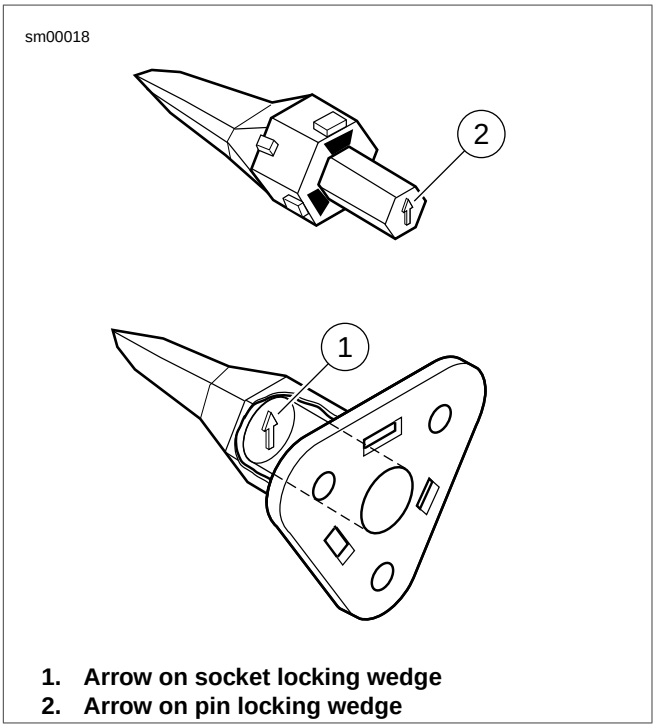


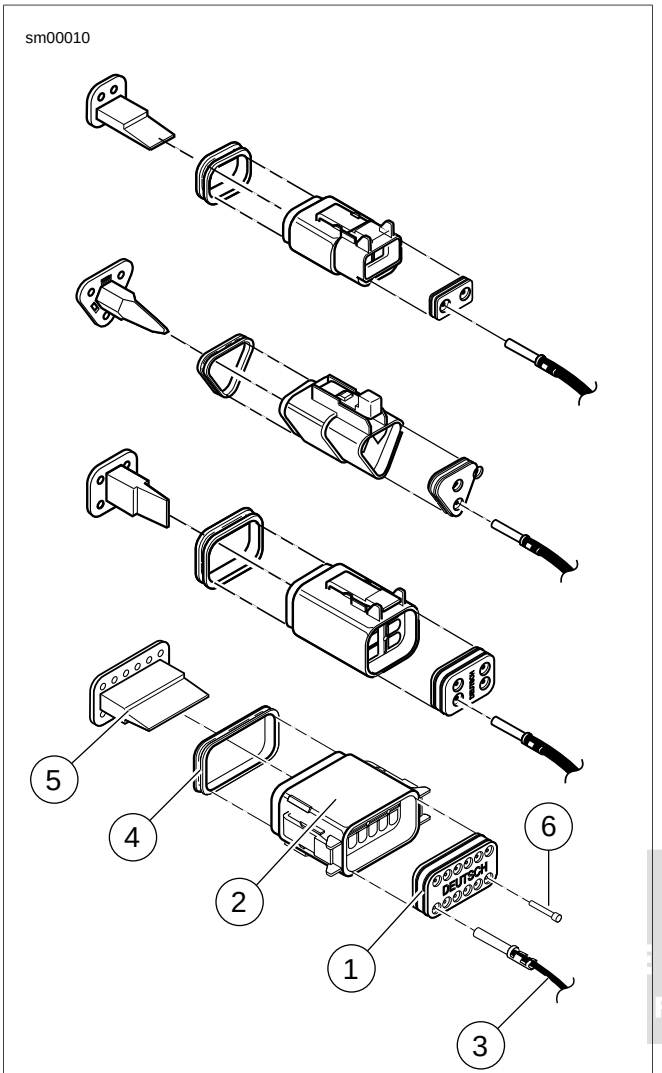

**Figure A-16. Deutsch Connector: Remove Secondary Locking Wedge**




**1. Arrow on socket locking wedge**
**2. Arrow on pin locking wedge**

**Figure A-17. Deutsch 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-18. Deutsch 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 depress terminal latches inside pin housing and back out pins through holes in wire seal.

*NOTES*

- *If wire leads require **new** terminals, see the instructions for crimping terminals.*
- *If it should become necessary to replace a pin or socket housing, please note that the 8-place and 12-place gray and black connectors are not interchangeable. Since location of the alignment tabs differ between the black and gray connectors, plugs or receptacles must be replaced by those of the same color.*
- *When replacing both socket and pin housings, then the black may be substituted for the gray, and vice versa. The socket and pin housings of all other connectors are interchangeable, that is, the black may be mated with the gray, since the alignment tabs are absent and the orientation of the external latch is the same.*

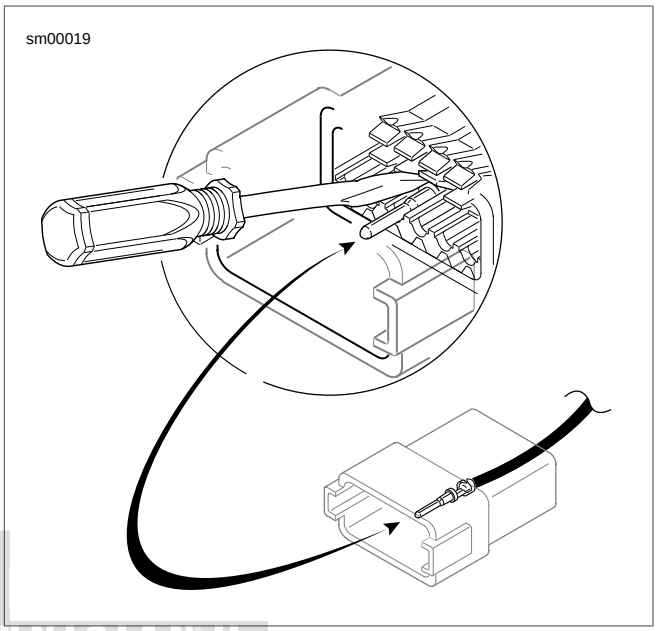



**Figure A-19. Deutsch Connector: Depress Terminal Latch and Back Out Pin**

## Installing Pin Terminals

1. See Figure A-20. Fit wire seal (1) into back of pin housing (2).
2. Grasp wire lead approximately 25.4 mm (1.0 in.) behind the pin terminal (3). Gently push pin through holes in wire seal into its respective numbered chamber until it "clicks" in place.

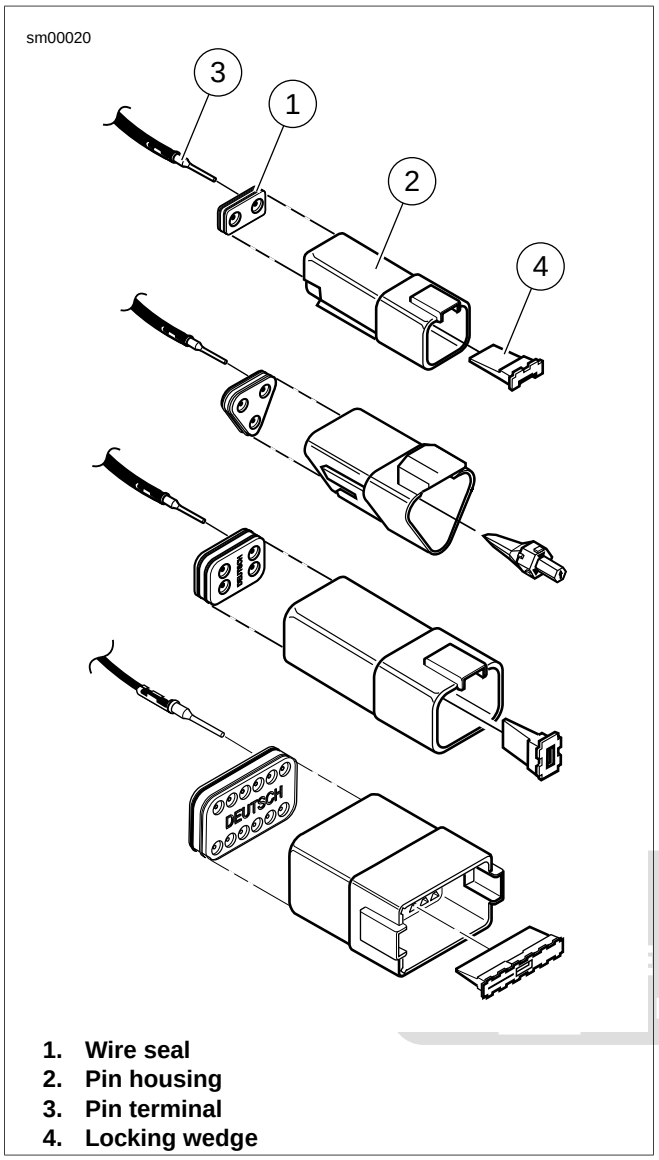
*NOTE*

*A tug on the wire lead will confirm that a pin is locked in place.*

3. Insert tapered end of secondary locking wedge (4) into pin housing and press down until it snaps in place.

*NOTES*

- *The wedge fits in the center groove of the pin housing and holds the terminal latches tightly closed.*
- *See Figure A-17. While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-place connector must be installed with the arrow (2) pointing toward the external latch.*
- *If the secondary locking wedge does not slide into the installed position easily, verify that all terminals are fully installed in the pin housing. The lock indicates when terminals are not properly installed by not entering its fully installed position.*




1. **Wire seal**
2. **Pin housing**
3. **Pin terminal**
4. **Locking wedge**

**Figure A-20. Deutsch Connector: 2, 3, 4 and 12-Place Pin Housings**

## Crimping Terminals

Identify which of the types of Deutsch terminals are used with the connector and follow the corresponding crimping instructions. Refer to Table A-2.

**Table A-2. Deutsch Connector: Terminal Crimping Instructions**

| TYPE | CRIMPING INSTRUCTIONS |
|---|---|
| Standard (with crimp tails) | A.6 DEUTSCH STANDARD TERMINAL REPAIR |
| Mini Terminal (solid barrel) | A.7 DEUTSCH SOLID BARREL MINI TERMINAL REPAIR |
| Mini Terminal (with crimp tails) | A.8 DEUTSCH MINI TERMINAL REPAIR |

# DEUTSCH STANDARD TERMINAL REPAIR A.6

## DEUTSCH STANDARD TERMINAL CRIMPS

| PART NUMBER | TOOL NAME |
|---|---|
| HD-39965-A | DEUTSCH TERMINAL CRIMP TOOL |

### Preparing Wire Leads for Crimping

1. Use a shop gauge to determine gauge of wire lead.
2. Strip lead removing 4.0 mm (5/32 in.) of insulation.

### Crimping Terminal to Lead

1. See Figure A-21. Squeeze the handles of the DEUTSCH TERMINAL CRIMP TOOL (Part No. HD-39965-A) to open the jaws. Push the locking bar (1) up.
2. Insert (2) terminal (socket/pin) through hole of the locking bar, so that the rounded side of the contact barrel rests in the nest (concave split level area) with the crimp tails facing upward. To match the wire gauge to the crimp tool die, refer to Table A-3.
3. Release locking bar to lock terminal in die.

*NOTE*

*If the crimp tails are slightly out of vertical alignment, the crimp tool automatically rotates the terminal so that the tails face straight upward. When positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.*

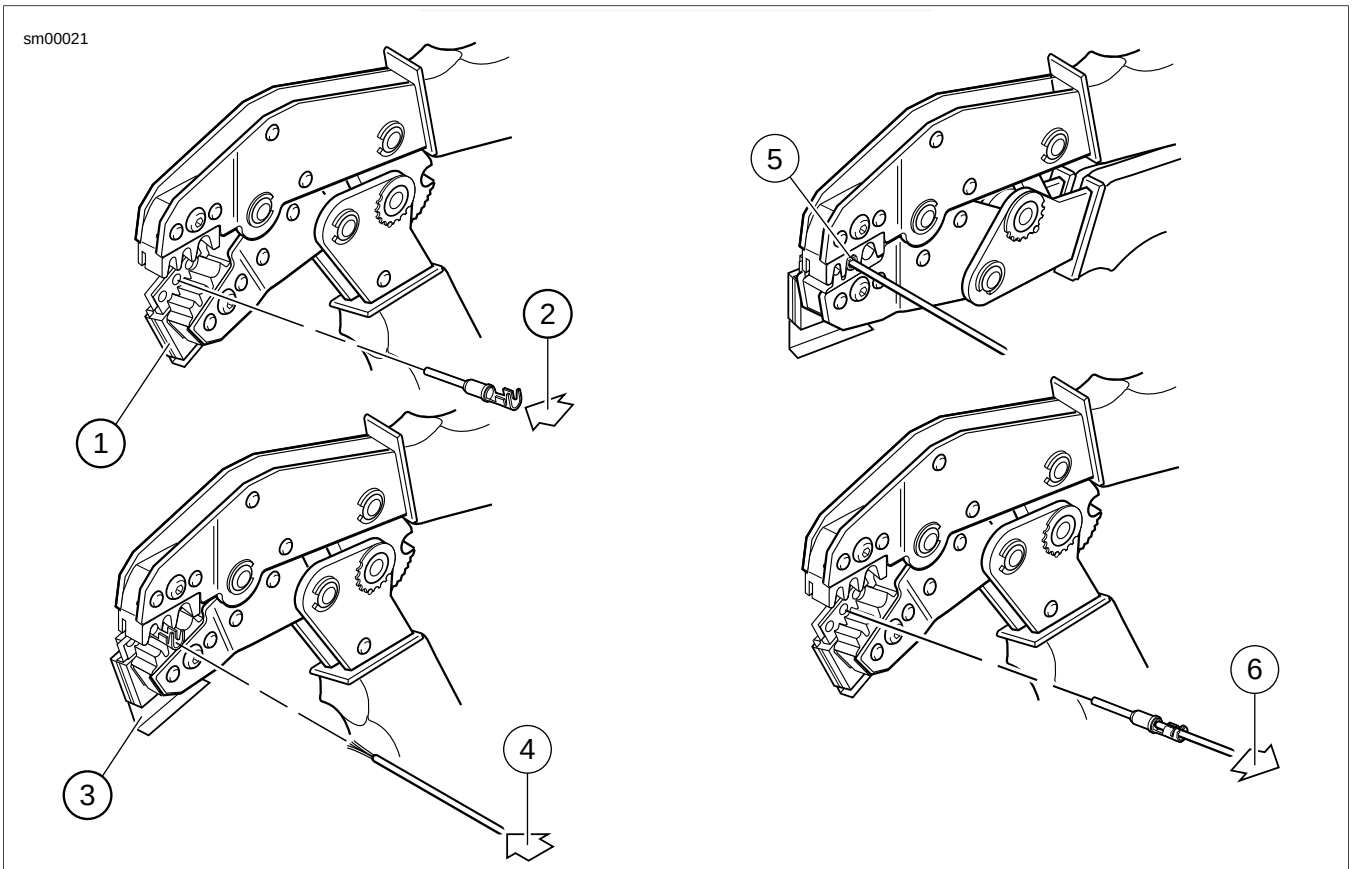
4. Insert stripped wire core between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that short pair of crimp tails squeeze bare wire strands, while long pair folds over the insulation.
5. Squeeze handle of crimp tool until tightly closed. Tool automatically opens after the terminal is crimped.
6. Raise locking bar up and remove wire lead and terminal.

### Inspecting Crimps

Inspect the wire core and insulation crimps. Distortion should be minimal.

**Table A-3. Deutsch Standard Terminal Crimp: Wire Gauge To Die**

| WIRE GAUGE (AWG) | CRIMP TOOL DIE |
|---|---|
| 20 | Front |
| 16-18 | Middle |




1. **Open jaws and raise locking bar**
2. **Insert terminal in locking bar**
3. **Release locking bar to lock terminal in die**
4. **Insert stripped lead**
5. **Squeeze crimper**
6. **Raise locking bar and remove terminal**

**Figure A-21. Crimping a Deutsch Standard Terminal**

# DEUTSCH SOLID BARREL MINI TERMINAL REPAIR A.7

## DEUTSCH SOLID BARREL TERMINAL CRIMPS

| PART NUMBER | TOOL NAME |
|---|---|
| HD-42879 | ELECTRICAL CRIMPER TOOL |

### Preparing Wire Leads For Crimping

For size 20, 16 and 12 contacts, wire ranges 26-12 AWG.

Strip wire lead removing 6.4 mm (1/4 in.) of insulation.

### Adjusting Crimper Tool

1. See Figure A-22. Squeeze the ELECTRICAL CRIMPER TOOL (Part No. HD-42879) handles to cycle the crimp tool to open.
2. Remove locking pin (1) from selector knob (2).
3. Raise selector knob and rotate until selected wire size stamped on wheel is aligned with "SEL. NO." arrow (3).
4. Loosen knurled locknut (4) and turn adjusting screw (5) clockwise (in) until it stops.

### Crimping a Barrel Contact To Wire Lead

1. See Figure A-23. Turn tool over and drop contact barrel (1) into indentor cover (2) hole with the wire end out.
2. Turn adjusting screw counterclockwise (out) until contact is flush with bottom of depression in indentor cover. Tighten knurled locknut.
3. Slowly squeeze handles of crimp tool until contact is centered between the four indentor points (3).
4. Insert bare wire core strands of stripped wire lead (4) into contact barrel. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
5. Remove wire lead with crimped contact from indentor.

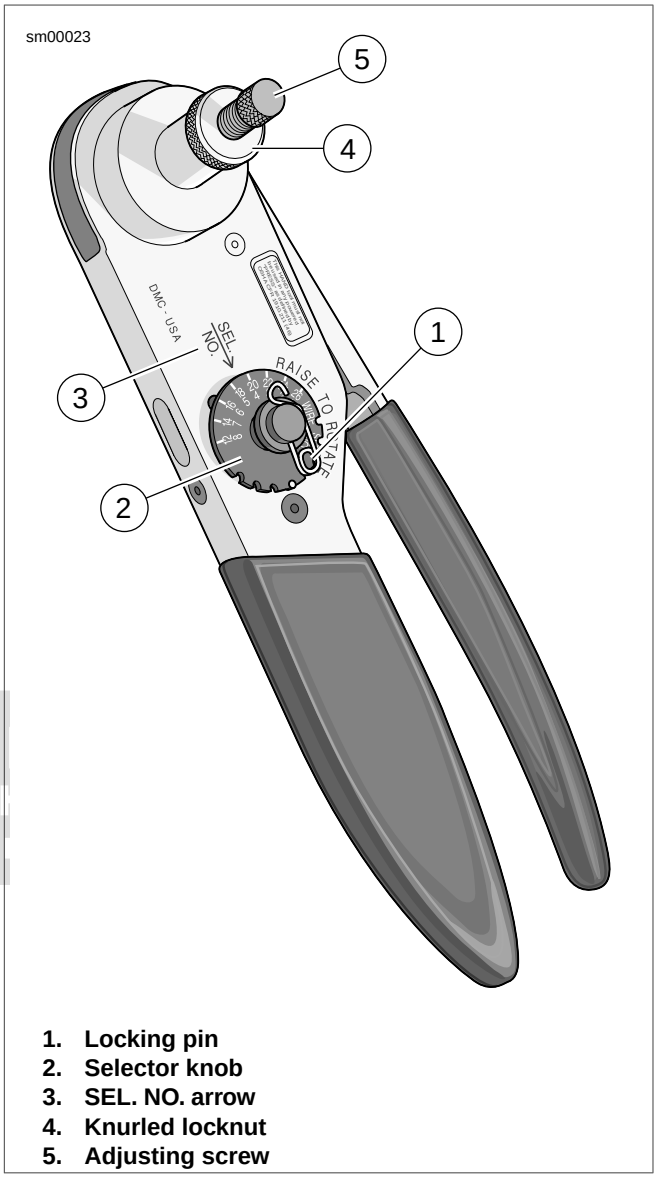
*NOTE*

*Tool must be readjusted when changing contact size/type.*

6. Install pin to lock selector knob.

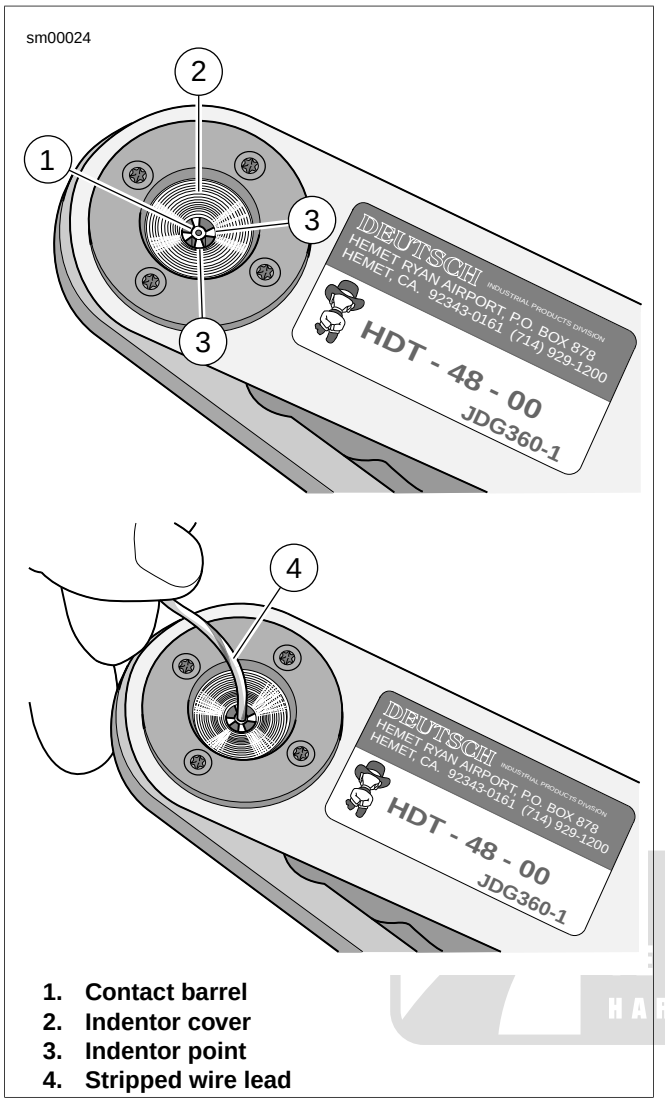
### Inspecting Crimps

Inspect the crimp. All core wire strands are to be crimped in the barrel.




1. **Locking pin**
2. **Selector knob**
3. **SEL. NO. arrow**
4. **Knurled locknut**
5. **Adjusting screw**

**Figure A-22. Electrical Crimper Tool (HD-42879)**




1. **Contact barrel**
2. **Indentor cover**
3. **Indentor point**
4. **Stripped wire lead**

**Figure A-23. Deutsch Solid Barrel**

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# DEUTSCH MINI TERMINAL REPAIR A.8

## DEUTSCH MINI TERMINAL CRIMPS

| PART NUMBER | TOOL NAME |
|---|---|
| HD-38125-7 | PACKARD TERMINAL CRIMPER |

## Preparing Wire Leads for Crimping

Strip wire lead removing 4.0 mm (5/32 in.) of insulation.

## Crimping a Mini Terminal to Wire Lead

1. See Figure A-24. Compress the handles of PACKARD TERMINAL CRIMPER (Part No. HD-38125-7) until the ratchet (2) automatically opens.

*NOTE*

*Always perform core crimp before insulation crimp.*

2. Position the core crimp on die E (1) of the crimper. Be sure the core crimp tails are facing the forming jaws.
3. Gently apply pressure to handles of tool until crimpers just secure the core crimp tails.
4. Insert stripped wire core stands between crimp tails. Position wire so that short pair of crimp tails squeeze bare wire strands, while long pair squeeze over the insulation.
5. Squeeze handle of crimper until tightly closed. Tool automatically opens when the crimping sequence is complete.

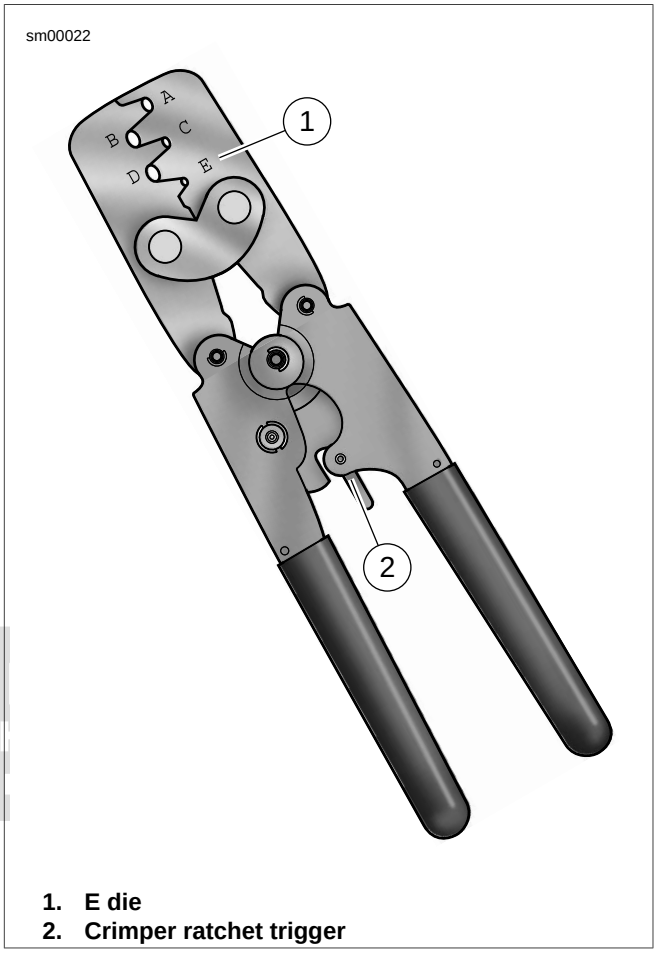
*NOTE*

*If the crimper does not open, it can be opened by squeezing the ratchet trigger (2).*

6. Position the insulation crimp on nest C of the crimper. Be sure the insulation crimp tails are facing the forming jaws.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.

## Inspecting Crimps

Inspect the core and insulation crimps. Distortion should be minimal.




**1. E die**
**2. Crimper ratchet trigger**

**Figure A-24. Packard Terminal Crimper (HD-38125-7)**

# MOLEX CONNECTORS A.9

## MOLEX CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| HD-48114 | MOLEX ELECTRICAL CONNECTOR TERMINAL REMOVER |

### Separating Pin and Socket Housings

See Figure A-25. Depress 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 4.8 mm (3/16 in.), until it stops.
   a. **Socket Housing:** See Figure A-26. 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-27. 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-28. Insert MOLEX ELECTRICAL CONNECTOR 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-29. From the wiring diagram, match the wire color to its numbered terminal cavity.

*NOTE*

*Cavity numbers (1) are stamped on the housing at the ends of the cavity rows. The cavity number can be determined by counting the cavities up or down along the row from each stamped number.*

2. Orient the terminal so that the tang (2) opposite the open crimp engages the slot (3) in the cavity.
3. Push the terminal into the cavity.
4. Gently tug on wire to verify that the terminal is captured by the secondary lock.
5. With all terminals installed, push the secondary lock into the socket housing to lock the wire terminals into the housing.

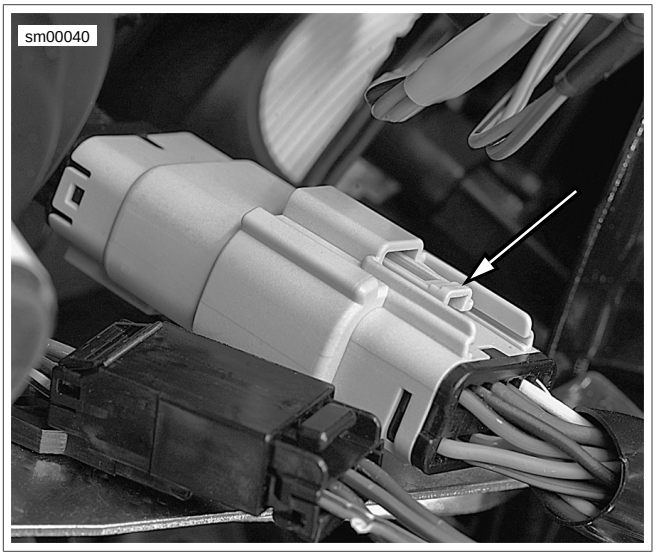



**Figure A-25. Molex Connector: Latch**

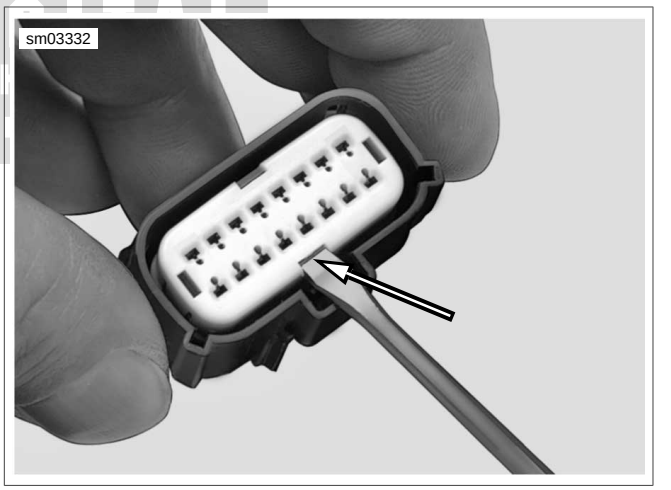



**Figure A-26. Secondary Lock Pry Slot (Socket Housing)**

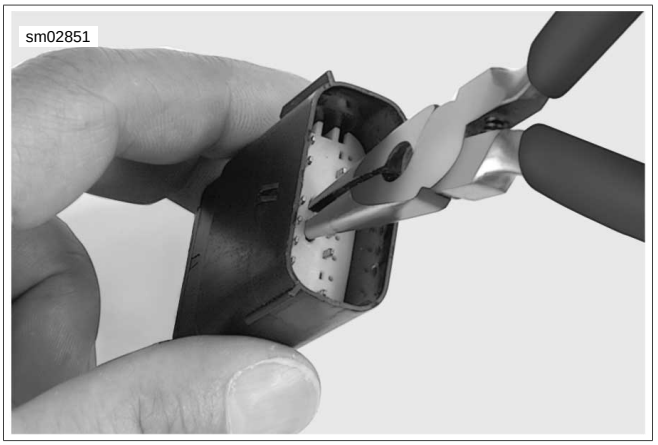



**Figure A-27. Pull Up Secondary Lock (Pin Housing)**

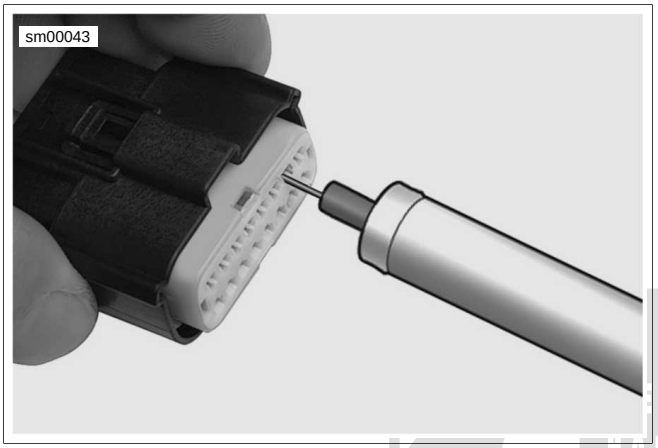
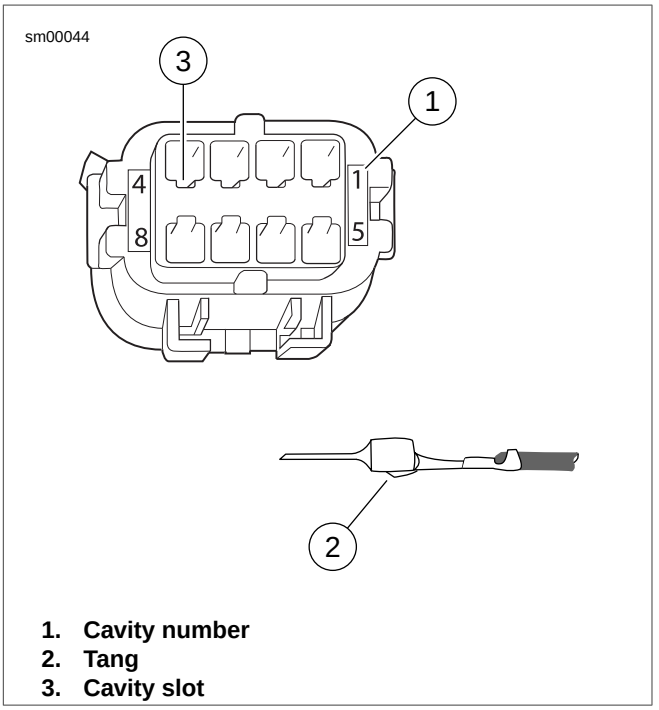



**Figure A-28. Molex Connector: Terminal Remover (HD-48114)**




1. **Cavity number**
2. **Tang**
3. **Cavity slot**

**Figure A-29. Molex Connector: Pin Cavities and Wire Terminal**

## CRIMP TERMINAL TO LEAD

| PART NUMBER | TOOL NAME |
|---|---|
| HD-48119 | ELECTRICAL CRIMP TOOL |

### Prepare Lead

1. Cut the damaged terminal close to the back of the terminal to leave as much wire length as possible.
2. Strip approximately 4.70-5.60 mm (3/16 in.) of insulation from the end of the wire lead.

*NOTE*

*The strip length is the same for both pin and socket terminals and for wire gauges from 22 to 14.*

### Prepare Tool

1. Identify the punch/die in the jaws of the ELECTRICAL CRIMP TOOL (Part No. HD-48119) for the wire gauge. Refer to Table A-4.
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-30. 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-4. 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. | |

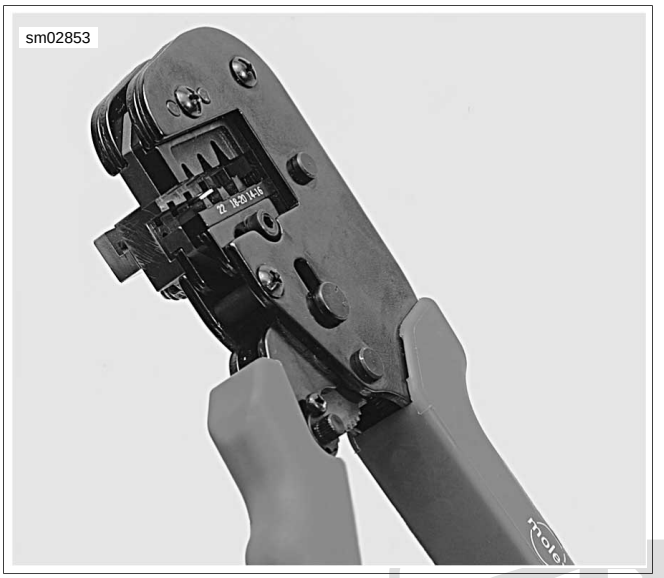
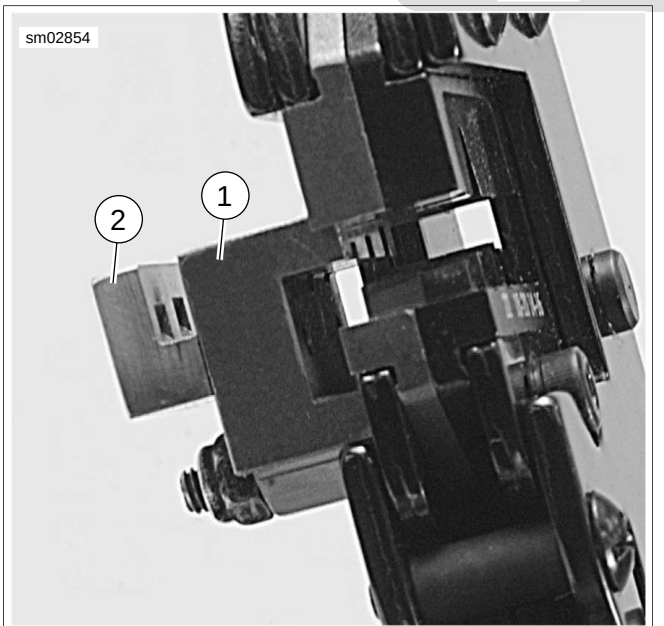



**Figure A-30. Open Electrical Crimp Tool (HD-48119) at 45 Degrees**




1. **Socket locator bar**
2. **Pin locator bar**

**Figure A-31. Terminal Locator Bars**

## Position Terminal in the Punch/Die

1. See Figure A-32. 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-31. A socket terminal stops against the back face of the socket locator bar (1).
   b. **Pin Terminal:** See Figure A-33. 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-34. Ratchet the handles together until the crimp tails are held in vertical alignment between the punch and the die.

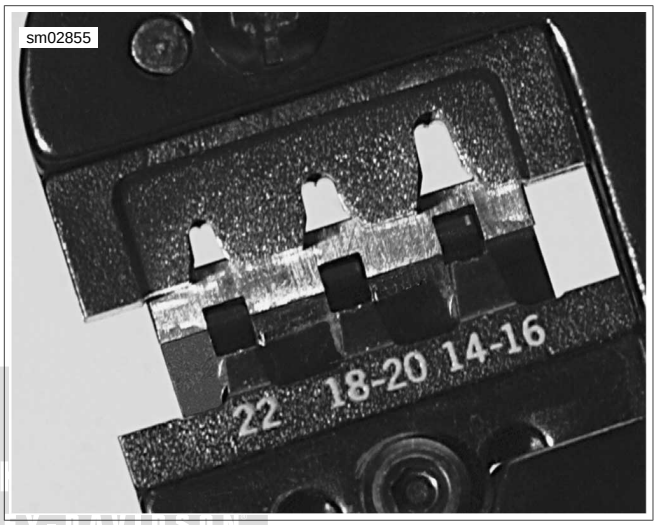



**Figure A-32. Square Openings in Socket Locator Bar**

## Insert Stripped Lead

See Figure A-35. 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.*

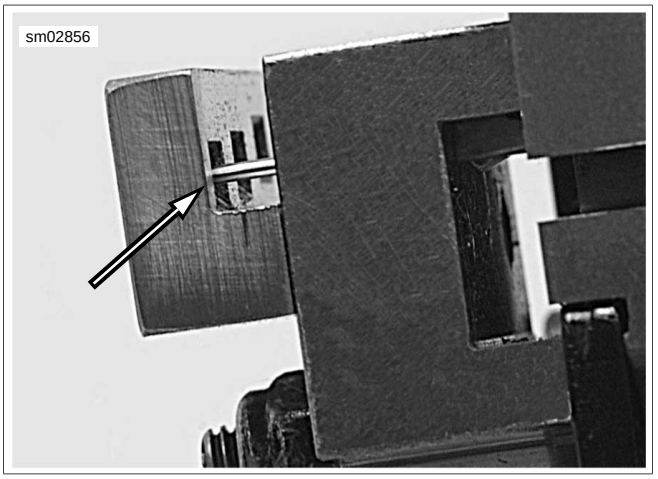



**Figure A-33. Pin Terminal against Pin Locator Bar**

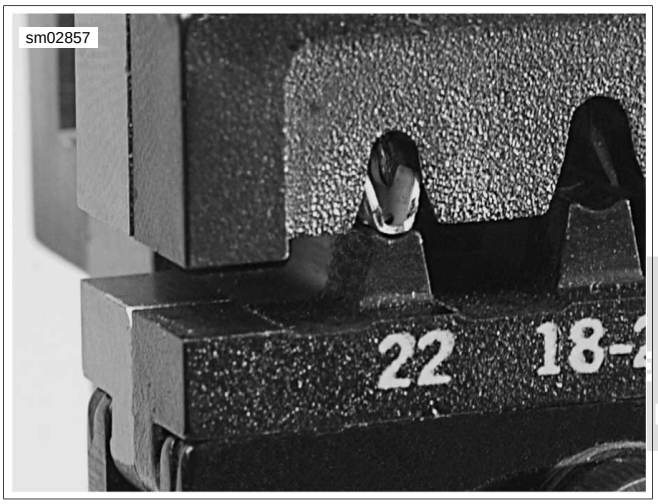



**Figure A-34. Crimp Tails in Vertical Alignment between Punch and Die**

## Crimp Terminal to Lead

1. Holding the wire lead in position touching the locator face at an angle, quickly and smoothly squeeze the crimp tool closed.
2. Final squeeze the handles to open the tool and release the terminal.

*NOTE*

*A stuck or jammed tool can be opened by pressing the ratchet release lever found between the handles. Do **not** force the handles open or closed.*

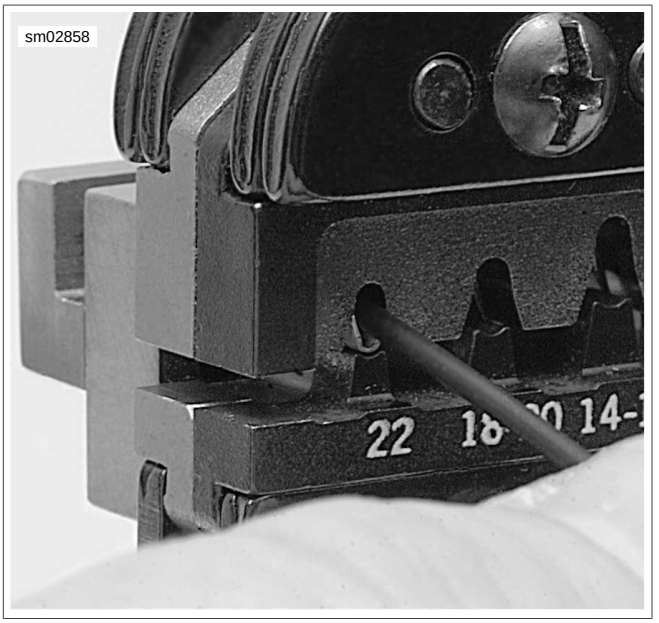
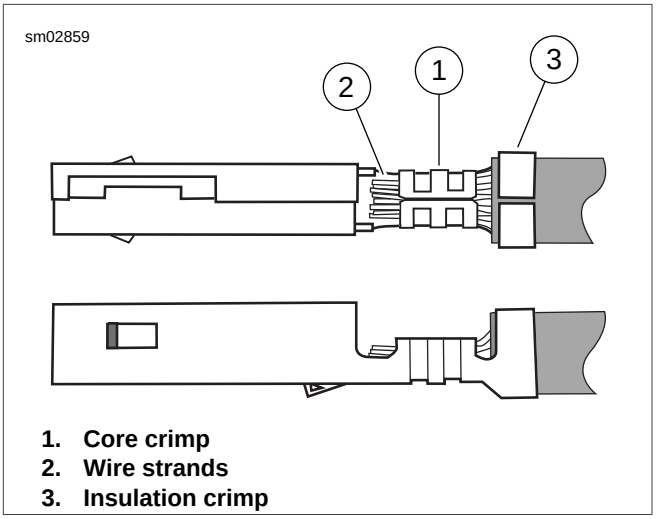



**Figure A-35. Stripped Lead at Up Angle**

## Inspect Crimp

1. **Inspect Crimp:** Inspect the core and insulation crimp.
   a. See Figure A-36. The core tails should be creased into the wire strands at the core crimp (1).
   b. Strands (2) of wire should be visible beyond the core crimp but not forward into the terminal shell.
   c. The insulation tails should be folded into the insulation (3) without piercing or cutting the insulation.
   d. Distortion should be minimal.
2. **Test Crimp:** Hold the terminal and pull the lead.




1. **Core crimp**
2. **Wire strands**
3. **Insulation crimp**

**Figure A-36. Terminal Crimp**

# PACKARD 150 METRI-PACK CONNECTORS A.10

## 150 METRI-PACK CONNECTOR REPAIR

### General

Metri-Pack connectors are embossed with the initials (P.E.D.).

There are two types of connectors in this series:

- Pull-to-Seat
- Push-to-Seat

### Separating Pin and Socket Housings

Bend back the external latch slightly and separate the pin and socket halves of the connector.

### Mating Pin and Socket Housings

Align the wire colors and push the pin and socket halves of the connector together.

### Removing Socket Terminal

1. See Figure A-37 for pull-to-seat connector or Figure A-38 for push to seat connector. Remove wire lock (1) from wire end of socket housing on push-to-seat type connectors.

*NOTE*

*For best results, free one side of wire lock first and then release the other side.*

2. Find the locking tang in the mating end of the connector.

*NOTE*

*The tangs are always positioned in the middle of the chamber and are on the same side as the external latch.*

3. Gently insert a safety pin into the chamber about 3.2 mm (1/8 in.).
   a. **For pull-to-seat:** Stay between the terminal and the chamber wall and pivot the end of the pin toward the terminal body.
   b. **For push-to-seat:** There is a small opening for the pin.
4. When a click is heard, remove the pin and repeat the procedure.

*NOTE*

*The click is the sound of the tang returning to the locked position as it slips from the point of the pin.*

5. Pick at the tang until the clicking stops and the pin seems to slide in deeper than it had previously. This is an indication that the tang has been depressed.

*NOTE*

*On those terminals that have been extracted on multiple occasions, the click may not be heard, but pivot the pin as if the click was heard at least 3 times.*

6. Remove the pin.
   a. **For pull-to-seat:** Push on the lead to extract the terminal from the mating end of the connector.
   b. **For push-to-seat:** Pull on the lead to draw the terminal out the wire end.

### Inserting Socket Terminal

*NOTE*

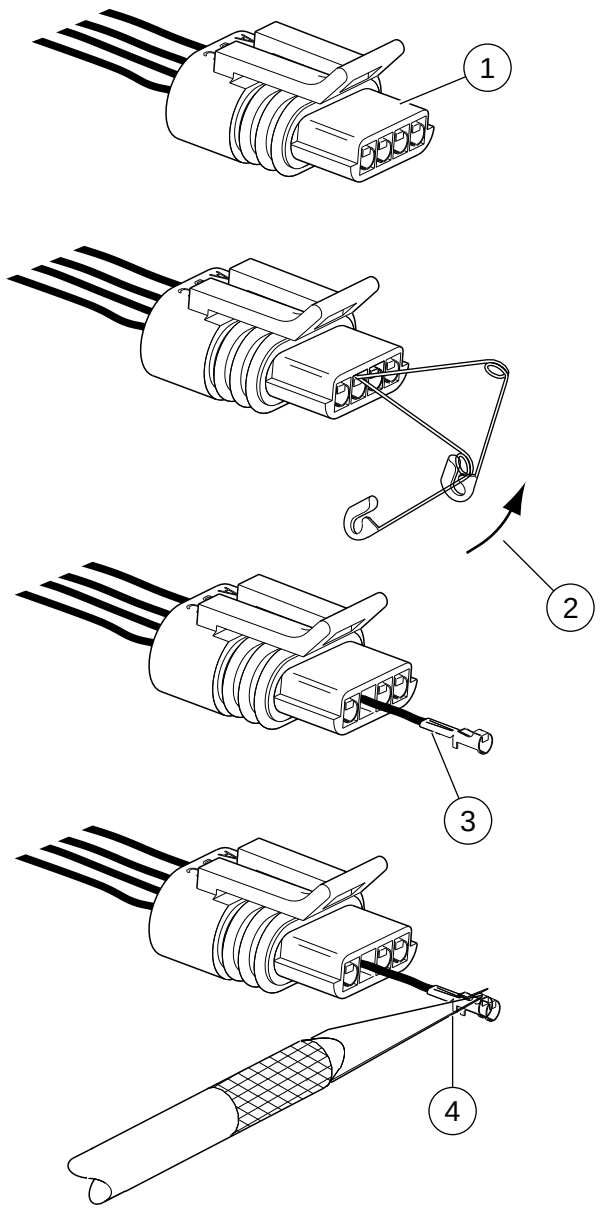
*For wire location purposes, alpha characters are stamped into the socket housings.*

1. See Figure A-37 for pull-to-seat connector or Figure A-38 for push to seat connector. Using a thin flat blade, like that on a hobby knife, carefully bend the tang outward away from the terminal body.
2. Gently pull or push on the lead to install the terminal back into the chamber. A click is heard when the terminal is properly seated.
3. Gently pull or push on the lead to verify that the terminal is locked in place.

   **For push-to-seat:** See Figure A-38. Seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.

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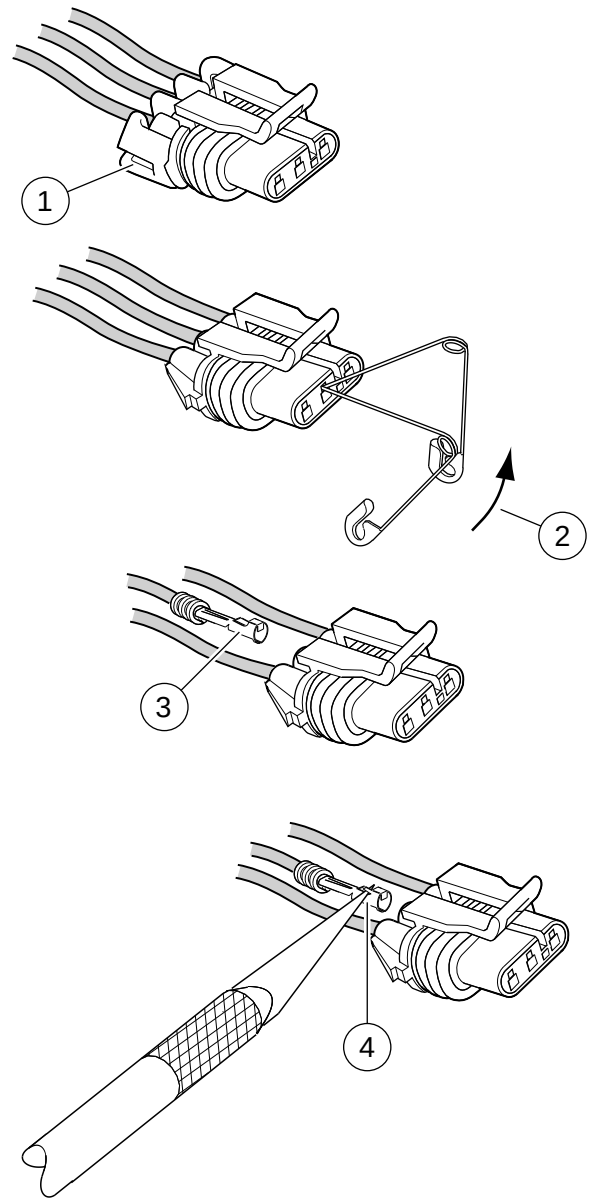
sm00027




1. Locate tang in chamber
2. Pivot pin to depress tang
3. Push to remove
4. Raise tang to install

**Figure A-37. 150 Metri-Pack Connector: Pull-to-Seat**

sm00028




1. Remove wire lock
2. Pivot pin to depress tang
3. Pull to remove
4. Raise tang to install

**Figure A-38. 150 Metri-Pack Connector: Push-to-Seat**

# PACKARD 280 METRI-PACK RELAY AND FUSE BLOCK CONNECTORS A.11

## FUSE BLOCK REPAIR

### Removing Socket Terminals

1. See Figure A-39. To remove secondary locks, insert end of small flat blade screwdriver (1) under lip of locking wedge (2) and gently pry up secondary lock.

*NOTE*

*For best results, start with locking wedge on outboard side of secondary lock.*

2. Looking into chamber at top of fuse block, note the tang next to each socket terminal.
3. Using a thin flat blade, like that on a hobby knife, gently push tang away from terminal, and then tug on wire to back terminal out.

### Installing Socket Terminals

1. Match the wire lead color to the fuse block terminal cavity.

*NOTES*

- *Refer to the main harness wiring diagram for wire lead color codes.*
- *See Figure A-40. The main fuse block terminal cavity is identified as alpha (1) and numeric (2) coordinates. Refer to the main harness wiring diagram for fuse block terminal cavity coordinates.*

2. With the open side of the socket terminal facing the tang, push lead into chamber at the wire end of the fuse block. A click is heard when the terminal is properly engaged.
3. Gently tug on the wire to verify that the terminal is locked in place and will not back out of the chamber.
4. Install the secondary locks. With the locking wedges positioned above the tangs in each chamber, slide flat side of secondary lock into slot (between rows), and push down until it bottoms.

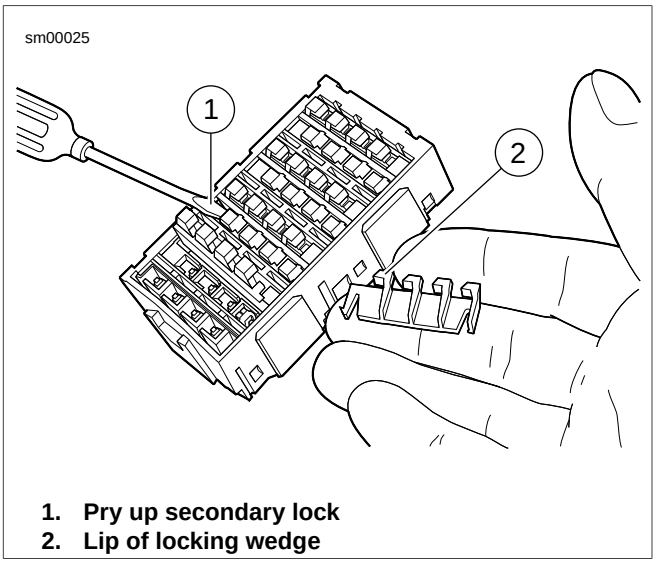
### Crimping Terminals

Terminals are crimped twice; once over the wire core and a second time over the insulation/seal.

A correctly crimped terminal may require different crimping dies found on separate crimpers.

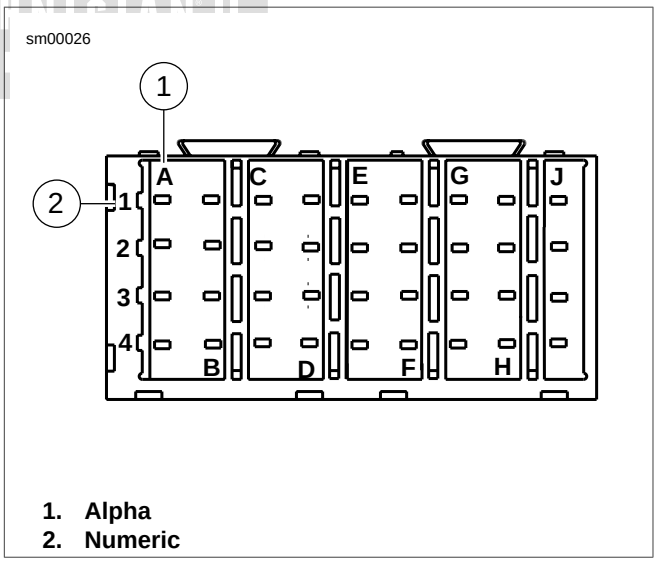
*NOTE*

*The wiring diagram indicates when one socket terminal is be crimped to two wire leads.*




**1. Pry up secondary lock**
**2. Lip of locking wedge**

**Figure A-39. Fuse Block: Remove Secondary Locks**




**1. Alpha**
**2. Numeric**

**Figure A-40. Fuse Block: Coordinates (typical)**

# PACKARD 480 METRI-PACK CONNECTORS A.12

## 480 METRI-PACK CONNECTOR REPAIR

### General

A 480 Metri-Pack (P.E.D.) connector is frequently used for the B+ (battery voltage) connector to power P&A accessories.

Referred to as Packard connectors, Metri-Pack connectors are embossed with the initials P.E.D.

See Figure A-41. An AFL housing (5) is used on many ignition/light switches. The secondary lock (4) must be opened before removing the terminal from the housing.

### Separating Pin and Socket Housings

*NOTE*

*Cut any cable strap anchoring the wire conduits of the pin (accessory connector housing) and the socket (B+) housing.*

See Figure A-41. 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

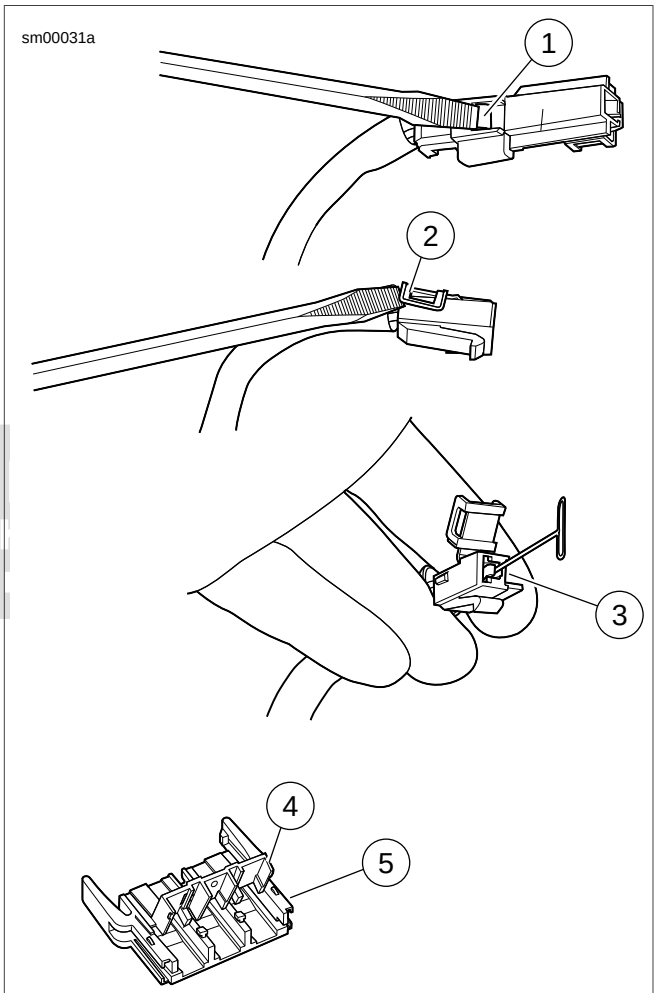
1. See Figure A-41. Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped 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.14 PACKARD METRI-PACK TERMINALS.

### Installing Socket Terminals

1. Carefully bend the tang outward away from the terminal body.
2. With the tang on the same side as the square shaped opening in the mating end of the connector housing, feed terminal into wire end of connector housing until it "clicks" in place.
3. Verify that terminal will not back out of the chamber. A slight tug on the cable will confirm that it is locked.
4. Rotate the hinged secondary lock inward until latches fully engage tabs on both sides of connector housing.

*NOTE*

*If removed, install **new** anchored cable strap in O.E. location. Tighten cable strap to capture conduit of both accessory connector and B+ connector approximately 25.4 mm (1.0 in.) 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-41. 480 Metri-Pack Connector: Remove Socket Terminal**

# PACKARD 630 METRI-PACK CONNECTORS A.13

## 630 METRI-PACK CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| SNAP-ON TT600-3 | SNAP-ON PICK |

### General

Referred to as Packard connectors, Metri-Pack 630 series connectors are embossed with the initials P.E.D.

### Separating Pin and Socket Housings

*NOTE*

*If necessary, remove connector from barbed anchor or other retaining device.*

Bend back the external latch slightly and separate pin and socket halves of the connector.

### Mating Pin and Socket Housings

Orient the latch to the catch and push the pin and socket halves of the connector together until the latch "clicks".

*NOTE*

*If removed, install connector on barbed anchor or other OE retaining device.*

### Removing Socket Terminal

1. Bend back the latch slightly and free one side of the secondary lock. Repeat the step to unlatch the other side.
2. Rotate the secondary lock outward on hinge to view the terminals in the chambers of the connector housing. The locking tang is on the side opposite the crimp tails and engages a rib in the chamber wall to lock the terminal in place.
3. Moving to the mating end of the connector, take note of the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. SNAP-ON TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to depress 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.14 PACKARD METRI-PACK TERMINALS.

### Installing Socket Terminal

*NOTE*

*Refer to the wiring diagrams to match wire lead colors to alpha characters molded into the secondary locks of each connector housing.*

1. Using a thin flat blade, like that of a hobby knife, carefully bend the tang outward away from the terminal body.
2. With the tang facing the chamber wall, push the lead into the chamber at the wire end of the connector. A click is heard when the terminal is properly seated.
3. Gently tug on the wire end to verify that the terminal is locked in place and will not back out of the chamber.
4. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

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# PACKARD METRI-PACK TERMINALS A.14

## 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-42. A completed crimp may require two different crimping dies found on PACKARD TERMINAL CRIMP TOOL (Part No. HD-38125-6) and/or PACKARD TERMINAL CRIMPER (Part No. HD-38125-7). The terminal (pin or socket) and the wire lead gauge will determine the core crimp die and the insulator/seal die.

*NOTE*

*The PACKARD CRIMPING TOOL (Part No. HD-38125-8) will also crimp sealed splice connectors in wire gauge sizes 18-20, 14-16 and 10-12.*

### Preparing Wire Lead

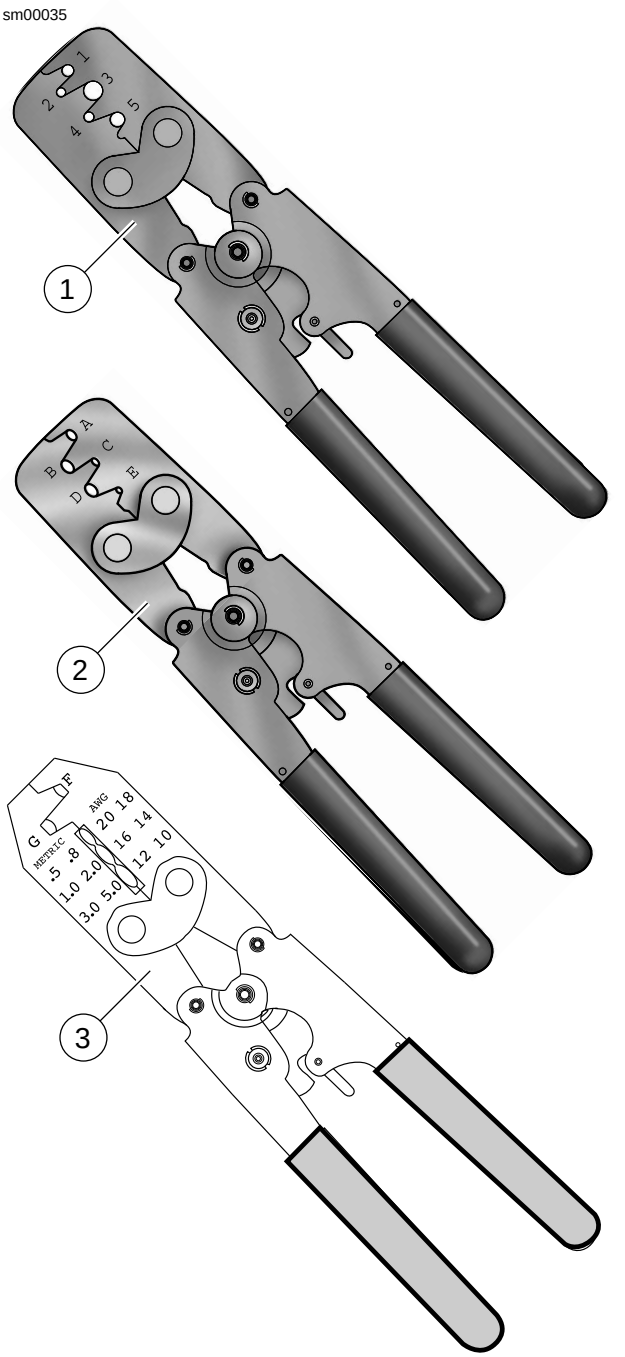
Use a wire striper to strip off the insulation and expose 4.0 mm (5/32 in.) of wire core.

### Crimping Wire Core

*NOTE*

*Metri-Pack terminal crimps require two steps. Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.*

1. Squeeze and release handles until ratchet automatically opens.
2. Identify the corresponding sized nest for the core crimp.
3. Position the core crimp in the die. Be Sure the core crimp tails are facing the forming jaws.
4. Gently squeeze the handles until crimpers just secure the core crimp tails.
5. Insert stripped wire between crimp tails. Verify that wire is positioned so that short pair of crimp tails squeeze core wire strands, while long pair is positioned over the insulation or seal material.
6. Squeeze handles tightly closed. Release grip and the tool will automatically open.




1. **HD-38125-6 sealed terminals**
2. **HD-38125-7 non-sealed terminals**
3. **HD-38125-8 non-sealed terminals**

**Figure A-42. Metri-Pack Terminal Crimp Tools**

### Crimping Insulation/Seal

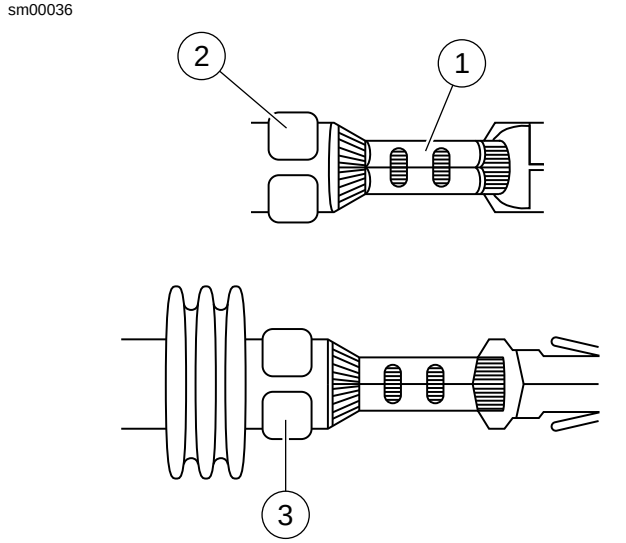
*NOTE*

*Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.*

1. See Figure A-43. 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-43. 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-43. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps**

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# PACKARD ECM CONNECTOR A.15

## PACKARD 100W CONNECTOR REPAIR

### General

A Packard 100W connector connects the electronic control module (ECM) to the main harness.

*NOTE*

*For vehicles with 73-pin connectors, see A.16 PACKARD MICRO-64 CONNECTORS and A.14 PACKARD METRI-PACK TERMINALS.*

### Separating Socket Housing From ECM

See Figure A-44. While pressing the connector into the ECM, press the thumb lever (1) against the connector until the latch (2) pops out of the catch (3) on the ECM.

### Mating Socket Housing To ECM

Push the connector into the ECM until the latch is captured by the catch on the ECM.

### Removing Socket Terminal

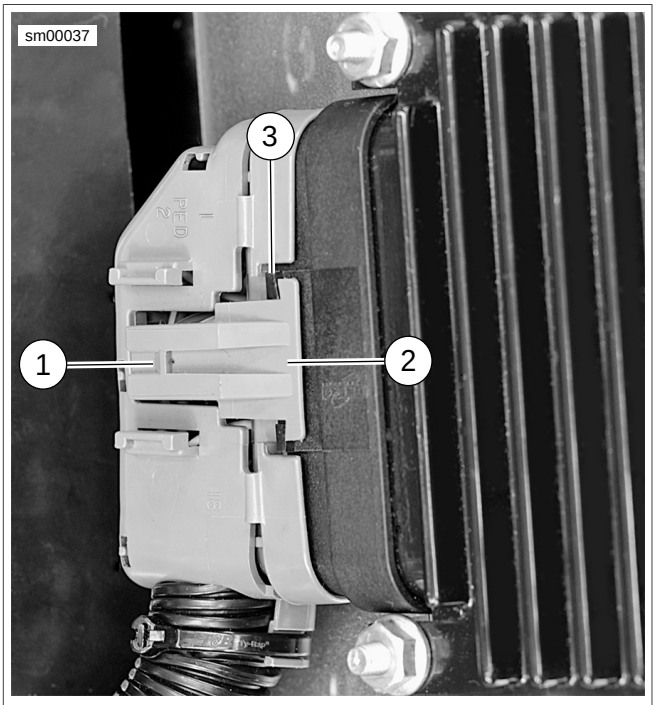
1. See Figure A-45. Gently press latch (1) on each side of the clear plastic secondary lock (2) and remove. For best results, release one side at a time.
2. Carefully cut cable strap (3) to free strain relief collar (4) from conduit (5).
3. See Figure A-46. Using a thin blade, gently pry at seam at back of socket housing to release three plastic pins (1) from slots in housing. Separate and spread halves of socket housing.
4. Push on wire lead to free terminal from chamber.

### Installing Socket Terminal

1. From inside socket housing, gently pull on wire to draw terminal into chamber.
2. Exercising caution to avoid pinching wires, press halves of socket housing together until three plastic pins fully engage slots in housing.
3. Install **new** cable strap in groove of strain relief collar capturing cable conduit.
4. With the two ribs on the secondary lock on the same side as the external latch, install over terminals until latches lock in place.

### Crimping Terminals

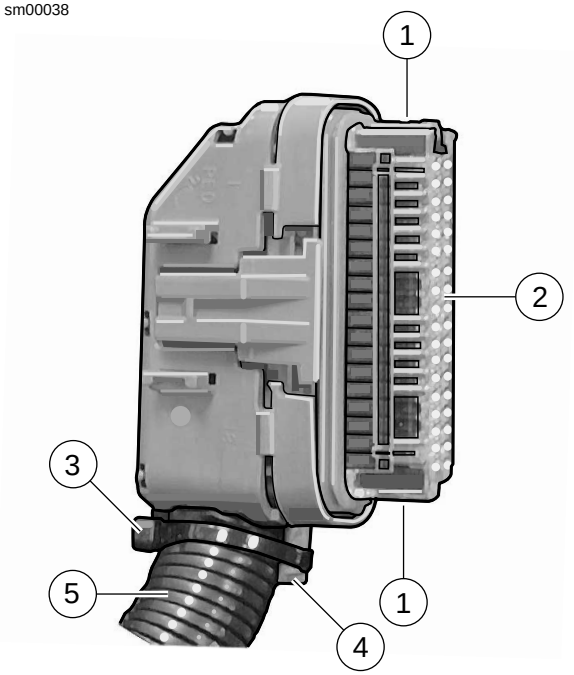
If necessary, crimp new terminals on wire leads. See A.14 PACKARD METRI-PACK TERMINALS.




1. **Thumb lever**
2. **Latch**
3. **Catch (ECM)**

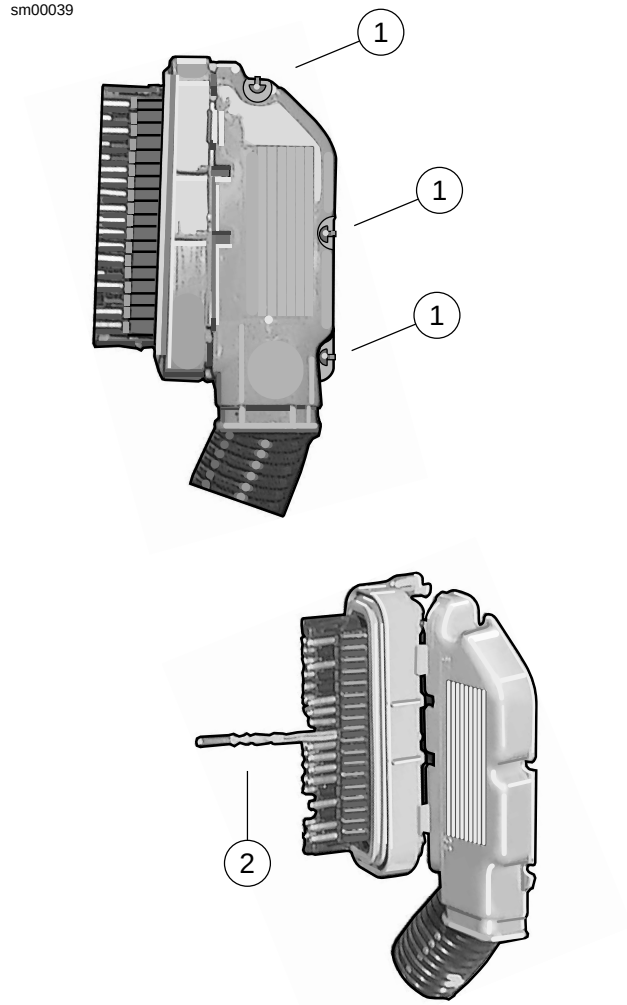
**Figure A-44. Packard 100W to ECM (Typical)**

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1. Latch
2. Secondary lock
3. Cable strap
4. Strain relief collar
5. Conduit

**Figure A-45. Packard 100W Connector**




1. Pins
2. Socket terminal

**Figure A-46. Packard 100W Connector: Separate Halves of Socket Housing**

# PACKARD MICRO-64 CONNECTORS A.16

## PACKARD MICRO-64 CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| HD-45928 | PACKARD MICRO-64 TERMINAL REMOVER |
| HD-45929 | PACKARD MICRO-64 TERMINAL CRIMPER |

### General

Packard Micro-64 connectors are frequently found on speedometers, tachometers and the ECM of Touring Models. For pin 73 of these ECMs, see A.10 PACKARD 150 METRI-PACK CONNECTORS.

### Separating Pin and Socket Housings

Bend back the external latches slightly and separate the pin and socket housings.

### Mating Pin and Socket Housings

Orient the wire lead colors and push the pin and socket housings of the connector together until the latches click.

### Removing Terminal

1. See Figure A-49. 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.
4. See Figure A-47. Obtain the PACKARD MICRO-64 TERMINAL REMOVER (Part No. HD-45928).
5. See Figure A-48. 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.

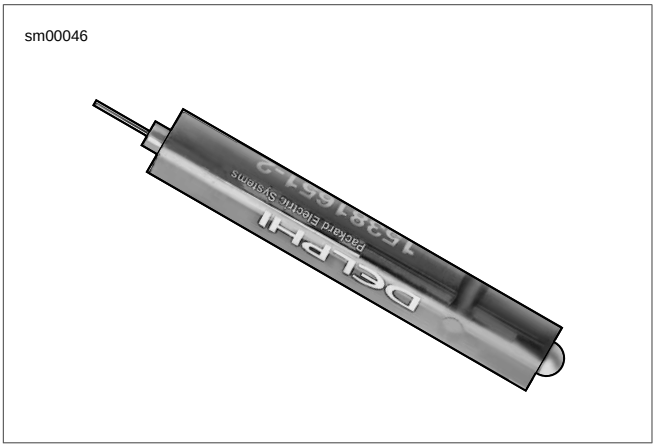



**Figure A-47. Packard Micro 64 Terminal Remover (HD-45928)**

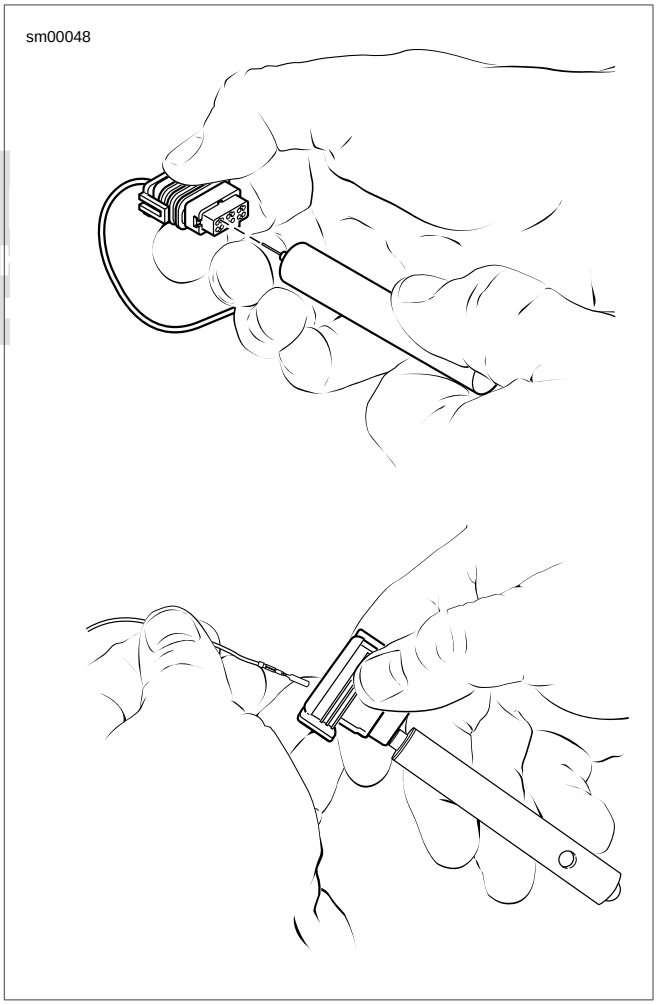



**Figure A-48. Packard Micro 64 Connector: Insert Tool and Remove Terminal**

## 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-49. For wire location purposes, the corners of the socket housing are stamped (3) with the numbers 1, 6, 7 and 12, representing terminals 1-6 on one side, and 7-12 on the other.*

2. Bottom the terminal in the chamber and then gently tug on the wire to verify that it is locked in place.

*NOTE*

*Once the terminal is removed it may not lock in place when first reinstalled. Until the lock engages, move the terminal back and forth slightly while wiggling the lead.*

3. Since the terminal remover tool releases two terminals simultaneously, repeat step 2 on the adjacent terminal even if it was not pulled from the connector housing.

4. With the center ear on the head of the secondary lockpin facing the mating end of the connector, push secondary lock in until head is flush with the connector housing.

## Preparing Wire Leads for Crimping

Strip lead removing 3.0 mm (1/8 in.) of insulation.

## Crimping Terminals

1. Inspect **new** socket terminal for bent or deformed contact and crimp tails. Replace as necessary.

2. See Figure A-51. Squeeze the handles of the PACKARD MICRO-64 TERMINAL CRIMPER (Part No. HD-45929) to cycle the tool to the fully open position (1).

3. Raise locking bar and barrel holder by pushing up on bottom tab with index finger (2).

4. With the crimp tails facing upward, insert terminal through locking bar into front hole in barrel holder (20-22 gauge wire) (3).

5. Release locking bar to lock position of contact. When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails and the closed side of the terminal rests on the outer nest of the crimp tool.

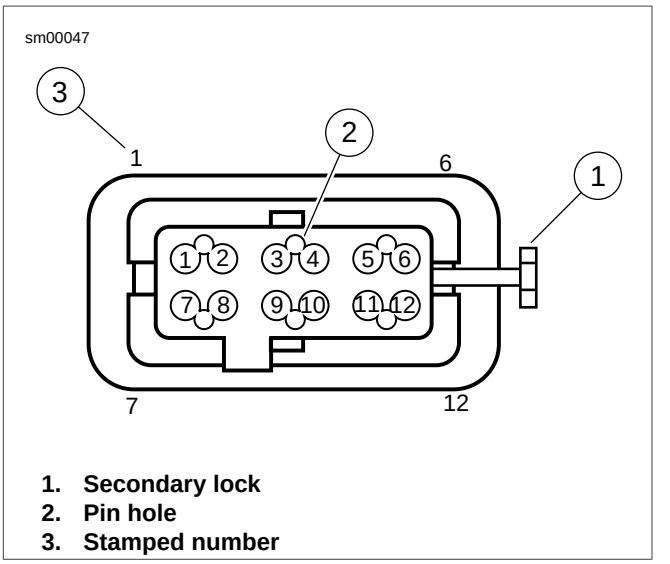
6. Insert wires between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.

7. Squeeze handle of crimp tool until tightly closed (4). Tool automatically opens when the crimping sequence is complete.

8. Raise locking bar and barrel holder to remove contact.

## Inspecting Crimps

Inspect the quality of the core and insulation crimps. Distortion should be minimal.




1. **Secondary lock**
2. **Pin hole**
3. **Stamped number**

**Figure A-49. Packard Micro 64 Connector: Housing**

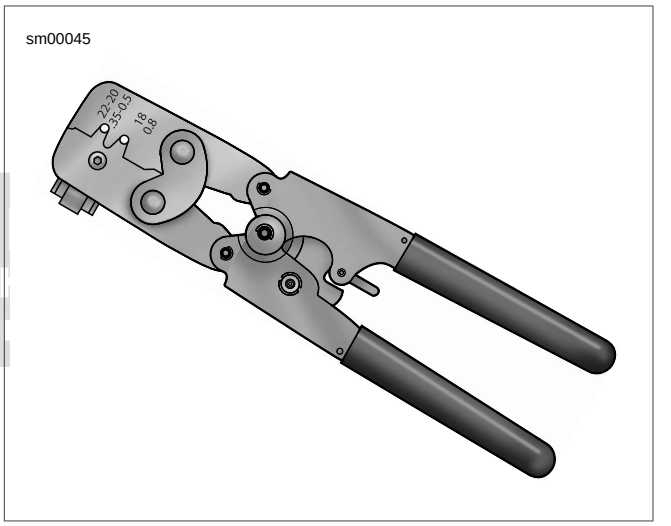
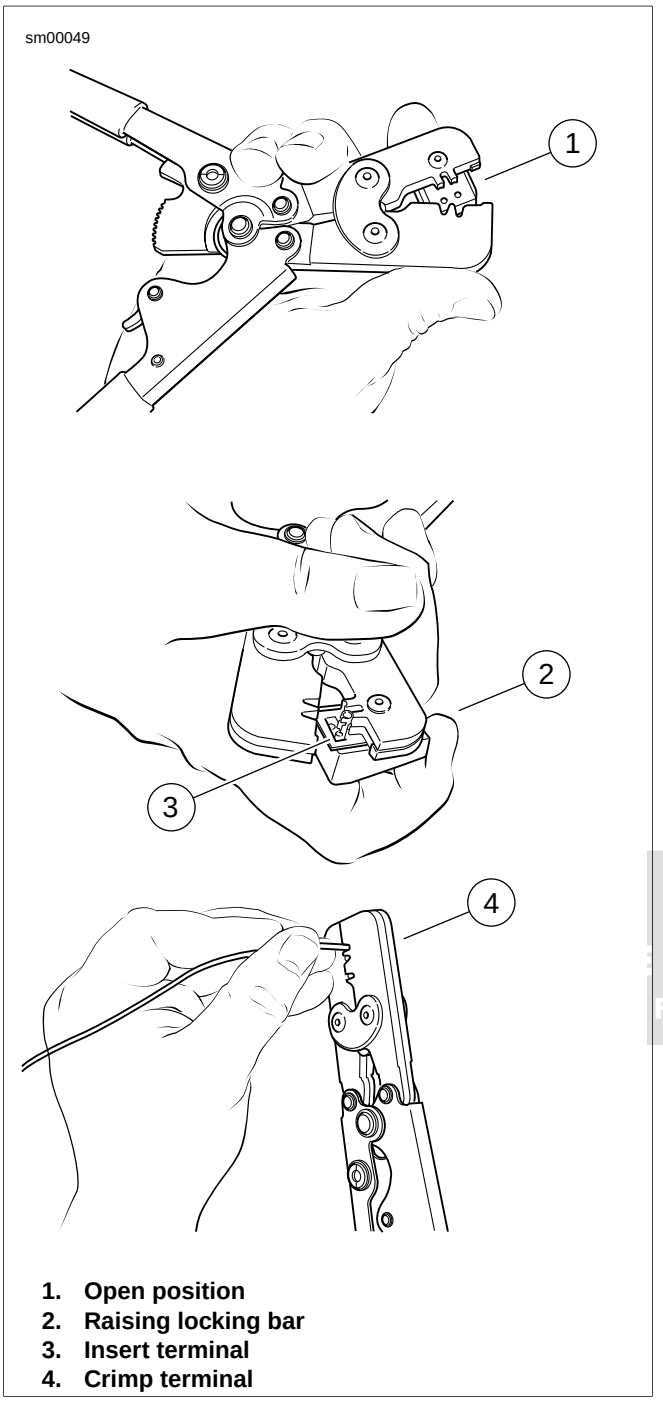



**Figure A-50. Packard Micro 64 Terminal Crimper (HD-45929)**




1. **Open position**
2. **Raising locking bar**
3. **Insert terminal**
4. **Crimp terminal**

**Figure A-51. Packard Micro 64 Connector: Terminal in Crimper**

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# SEALED SPLICE CONNECTORS A.17

## SEALED SPLICE CONNECTOR REPAIR

| PART NUMBER | TOOL NAME |
|---|---|
| HD-25070 | ROBINAIR HEAT GUN |
| HD-38125-8 | PACKARD CRIMPING TOOL |
| HD-39969 | ULTRA TORCH UT-100 |
| HD-41183 | HEAT SHIELD ATTACHMENT |

### General

Splice connectors and several OE ring terminal connectors use heat shrink covering to seal the connection.

### Preparing Wire Leads

*NOTE*

*If adjacent wires are to be spliced, stagger the splices so that the sealed splice connectors will not touch each other but are located at different positions along the length of the wires.*

1. Using a shop gauge, identify the gauge of the wire.
2. Match the wire gauge to a sealed splice connector by color and part number. Refer to Table A-5.
3. Using a wire stripper, cut and strip a length of insulation off the wire ends. Refer to Table A-5 for the strip length.

**Table A-5. Sealed Splice Connectors**

| WIRE GAUGE | COLOR | PART NO. | STRIP LENGTH |
|---|---|---|---|
| 18-20 (0.5-0.8 mm) | Red | 70585-93 | 9.5 mm (3/8 in.) |
| 14-16 (1.0-2.0 mm) | Blue | 70586-93 | 9.5 mm (3/8 in.) |
| 10-12 (3.0-5.0 mm) | Yellow | 70587-93 | 9.5 mm (3/8 in.) |

*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-53. The connector is crimped twice - one side and then the other.*

1. See Figure A-52. Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
2. Match the connector color to the wire gauge crimp die in the jaws and insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See Figure A-53. Feed the stripped end of a wire into the connector until the wire stops inside the metal insert (1).
5. Squeeze the handles tightly closed to crimp the lead in the insert (2). The tool automatically opens when the crimping is complete.
6. Slide the connector to the other half of the metal insert. Insert the stripped wire lead (1) until it stops, and crimp the lead in the insert (2).

**⚠WARNING**

**Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)**

- Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.
- Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.
- Always keep hands away from tool tip area and heat shrink attachment.

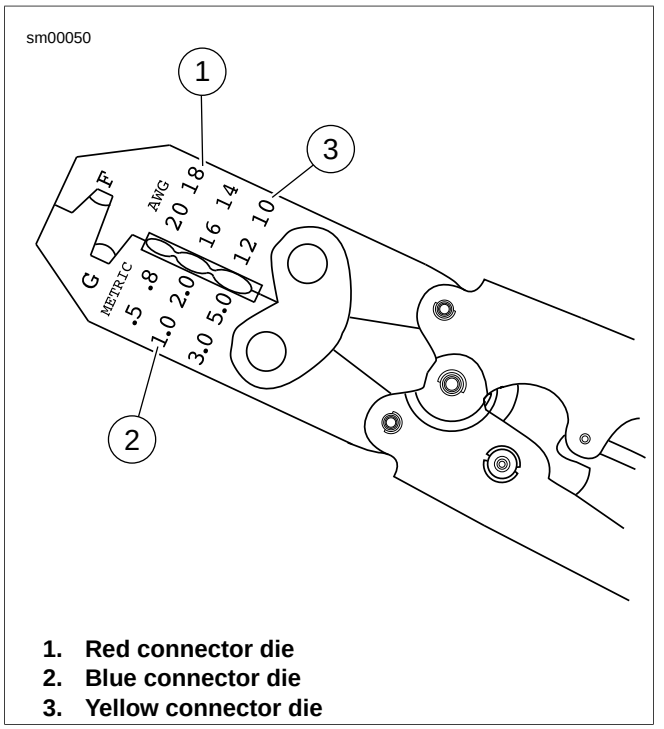
7. Use an ULTRA TORCH UT-100 (Part No. HD-39969), or a ROBINAIR HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

*NOTE*

*It is acceptable for the splice to rest against the heat shrink tool attachment.*

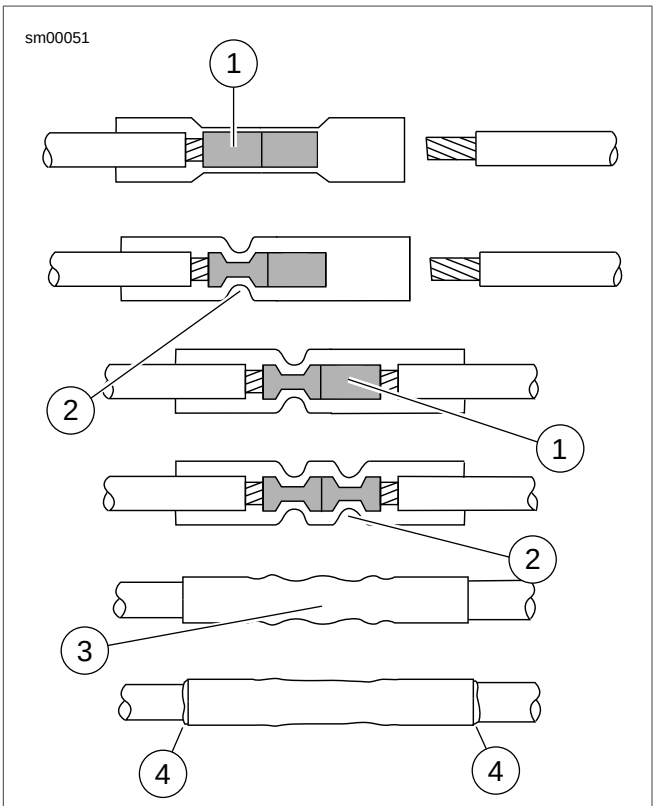
### Inspecting Seals

See Figure A-53. 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-52. 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-53. Sealed Splice Connector**

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# NOTES

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B.2 WIRING DIAGRAMS.....B-3

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# NOTES

# CONNECTORS B.1

## CONNECTOR LOCATIONS

### Function/Location

On the motorcycle, a connector can be identified by its function and location. Refer to Table B-1.

### Place and Color

The place (number of wire cavities of a connector housing) and color of the connector can also aid identification.

### Connector Number

On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets.

### Repair Instructions

The repair instructions in Appendix A are by connector type. Refer to Table B-1.

**Table B-1. 2009 1125 Connector Locations**

| NO. | DESCRIPTION | TYPE | LOCATION |
|---|---|---|---|
| [10] | Electronic Control Module (ECM) (black) | 34-place Amp (Tyco) | Inside left radiator shroud |
| [11] | Electronic Control Module (ECM) (gray) | 34-place Amp (Tyco) | Inside left radiator shroud |
| [18] | Right rear turn signal | 2 1-place bullet | Under tail section |
| [19] | Left rear turn signal | 2 1-place bullet | Under tail section |
| [22] | Right hand controls | 4-place Amp (Tyco) | Behind fairing |
| [24] | Left hand controls | 8-place Amp (Tyco) | Behind fairing |
| [31R] | Right front turn signal | 2 1-place bullet | Behind fairing |
| [31L] | Left front turn signal | 2 1-place bullet | Behind fairing |
| [33] | Ignition switch | 4-place Amp (Tyco) | Behind fairing |
| [38] | Headlamp connector | 6-place Deutsch | Behind fairing |
| [39] | Instrument cluster | 20-place Amp (Tyco) | Behind fairing |
| [45] | License plate lamp | 2 1-place bullet | Under tail section |
| [46] | Stator | 4-place Deutsch | Under seat |
| [61] | Fuse block | Socket terminals | Under seat |
| [62] | Relay block | Spade terminals | Under seat |
| [65] | Vehicle Speed Sensor (VSS) | 3-place Deutsch | Under seat |
| [77] | Voltage regulator | 2-place Dekko | Under seat |
| [79] | Crankshaft Position (CKP) sensor | 2-place Amp (Tyco) | Inside left radiator shroud |
| [80] | Manifold Absolute Pressure (MAP) sensor | 3-place Bosch | Under throttle body, between cylinders |
| [83F] | Front ignition coil | 3-place Bosch | Front cylinder head |
| [83R] | Rear ignition coil | 3-place Bosch | Rear cylinder head |
| [84] | Front fuel injector | 2-place Sumitomo | Front intake flange |
| [85] | Rear fuel injector | 2-place Sumitomo | Rear intake flange |
| [86] | Fuel pump | 4-place Delphi | Right side of frame |
| [87] | Idle Air Control (IAC) | 4-place Delphi | Left side of throttle body |
| [88] | Throttle Position (TP) sensor | 3-place Bosch | Left side of throttle body |
| [89] | Intake Air Temperature (IAT) sensor | 2-place Amp (Tyco) | Left side of intake snorkel |
| [90] | Engine Coolant Temperature (ECT) sensor | 2-place Bosch | Front cylinder head, under throttle body |
| [91A] | Data link connector | 4-place Deutsch | Behind left radiator shroud |
| [93] | Tail/stop lamp | 2-place Amp (Tyco) and 1-place Amp (Tyco) | Back of tail lamp, under tail section |
| [95] | Clutch switch | 2-place Sumitomo | Underside of clutch lever assembly |
| [97] | Cooling fan #1 (right) | 2-place Sumitomo | Inside right radiator shroud |
| [120] | Oil pressure switch | Spade terminal | Right side of engine |
| [121] | Rear brake switch | 2-place Amp (Tyco) | Right side forward of rear wheel |

**Table B-1. 2009 1125 Connector Locations**

| NO. | DESCRIPTION | TYPE | LOCATION |
|---|---|---|---|
| [122] | Horn | 2 1-place Fargo | Behind left radiator shroud, under fan |
| [128] | Starter solenoid | 2-place Amp (Tyco) | Under seat |
| [131] | Neutral switch | 1-place slotted spade | Under sprocket cover |
| [133] | Sidestand sensor | 3-place Deutsch | Under sprocket cover |
| [134] | Bank Angle Sensor (BAS) | 6-place Sumitomo | Inside left radiator shroud |
| [137] | Oxygen sensor, rear | 1-place Delphi | Right side of engine, above water pump |
| [138] | Oxygen sensor, front | 1-place Delphi | Behind right fan |
| [145] | Interface connector | 20-place Molex | Behind left radiator shroud |
| [160] | 12V Auxiliary Connector | 2-place Sumitomo | Behind fairing |
| [170] | Front brake switch | 2 1-place spade | Underside of front brake assembly |
| [178] | Active intake solenoid | 2-place Deutsch | Under seat |
| [215] | Cooling fan #2 (left) | 2-place Sumitomo | Inside left radiator shroud |
| [227] | Fuel pressure sensor | 3-place Delphi | Fuel line aft of throttle body |
| [228] | Barometric (BARO) pressure sensor | 3-place Bosch | Under seat, rear of airbox |
| [234] | Fan sub-harness connector | 4-place Deutsch | Behind left radiator shroud |
| [243] | CAN connector | 2-place Deutsch | Behind left radiator shroud |

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# 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 (3).

**For Striped Wires:** The code is written with a slash (/) between the solid color code and the stripe code (4). For example, a trace labeled GN / Y is a green wire with a yellow stripe.

### Wiring Diagram Symbols

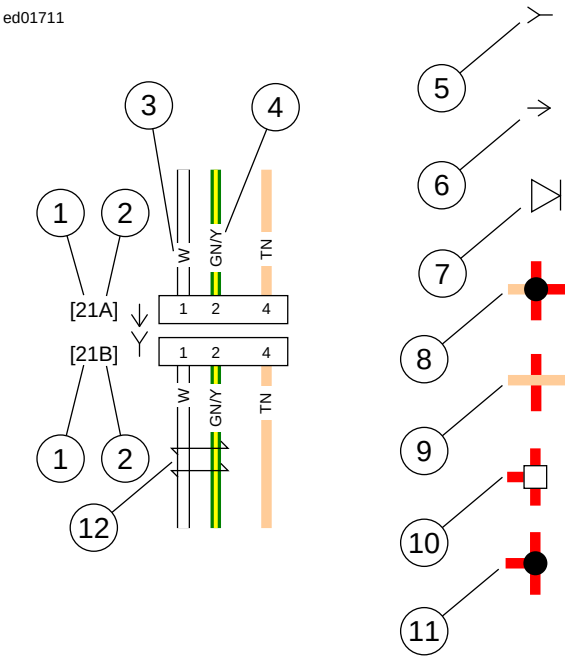
See Figure B-1. On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets (1). The letter (2) inside the brackets identifies whether the housing is a socket or pin housing.

**A=Pin:** The letter A after a connector number and the pin symbol (6) identifies a pin housing.

**B=Socket:** The letter B after a connector number and the socket symbol (5) identifies a socket housing.

Other symbols found on the wiring diagrams include the symbol for a diode (7), a symbol for a wire-to-wire connection (8), a symbol verifying that no connection (9) between two wire traces exists, symbols for actual (10) and virtual (11) splices, and a symbol identifying two wires that are twisted together (12).

Actual splices (10) are splices where two wires are connected together at a specific location along a wire. Virtual splices (11) are splices shown connected anywhere along a wire, usually used in a wiring or schematic diagram for clarity.




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. **Connection**
9. **No connection**
10. **Virtual splice**
11. **Physical splice**
12. **Twisted pair**

**Figure B-1. Connector/Wiring Diagram Symbols (typical)**

**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 |

## 2009 1125 WIRING DIAGRAMS

# Wiring Diagram List

| DIAGRAM | LOCATION |
|---|---|
| Battery Power Distribution: 2009 1125 Models | Figure B-2 |
| Ignition and Accessory Power: 2009 1125 Models | Figure B-3 |
| Sensor Grounds: 2009 1125 Models | Figure B-4 |
| ECM Power Grounds: 2009 1125 Models | Figure B-5 |
| Chassis Grounds: 2009 1125 Models | Figure B-6 |
| Main Chassis Wiring Harness: 2009 1125 Models | Figure B-7 |
| Main Engine Wiring Harness: 2009 1125 Models | Figure B-8 |
| Component Wiring Diagrams (Headlamp Assembly Sub-Harness, Cooling Fan Sub-Harness, and Hand Control Switches): 2009 1125 Models | Figure B-9 |

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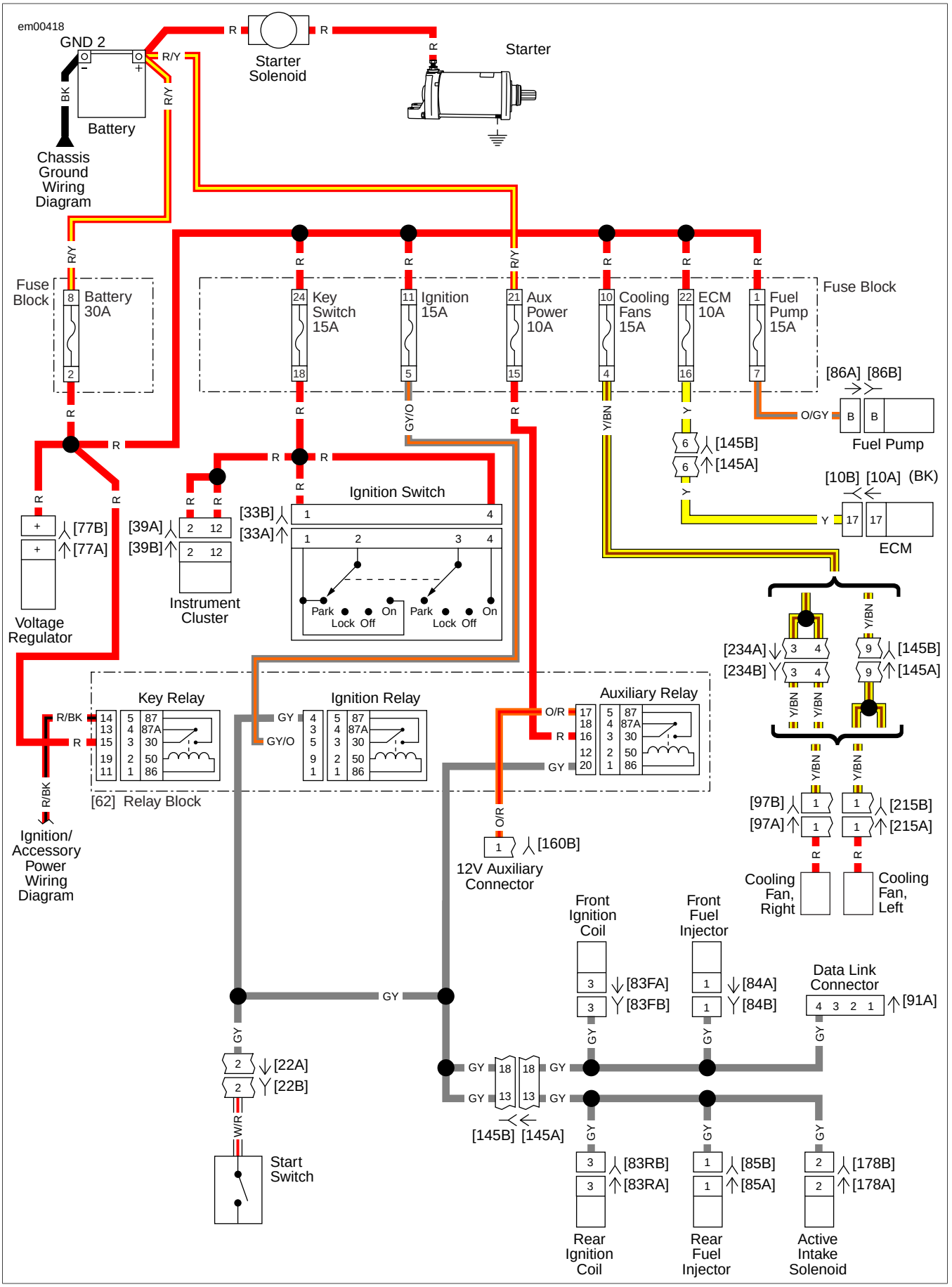



**Figure B-2. Battery Power Distribution: 2009 1125 Models**

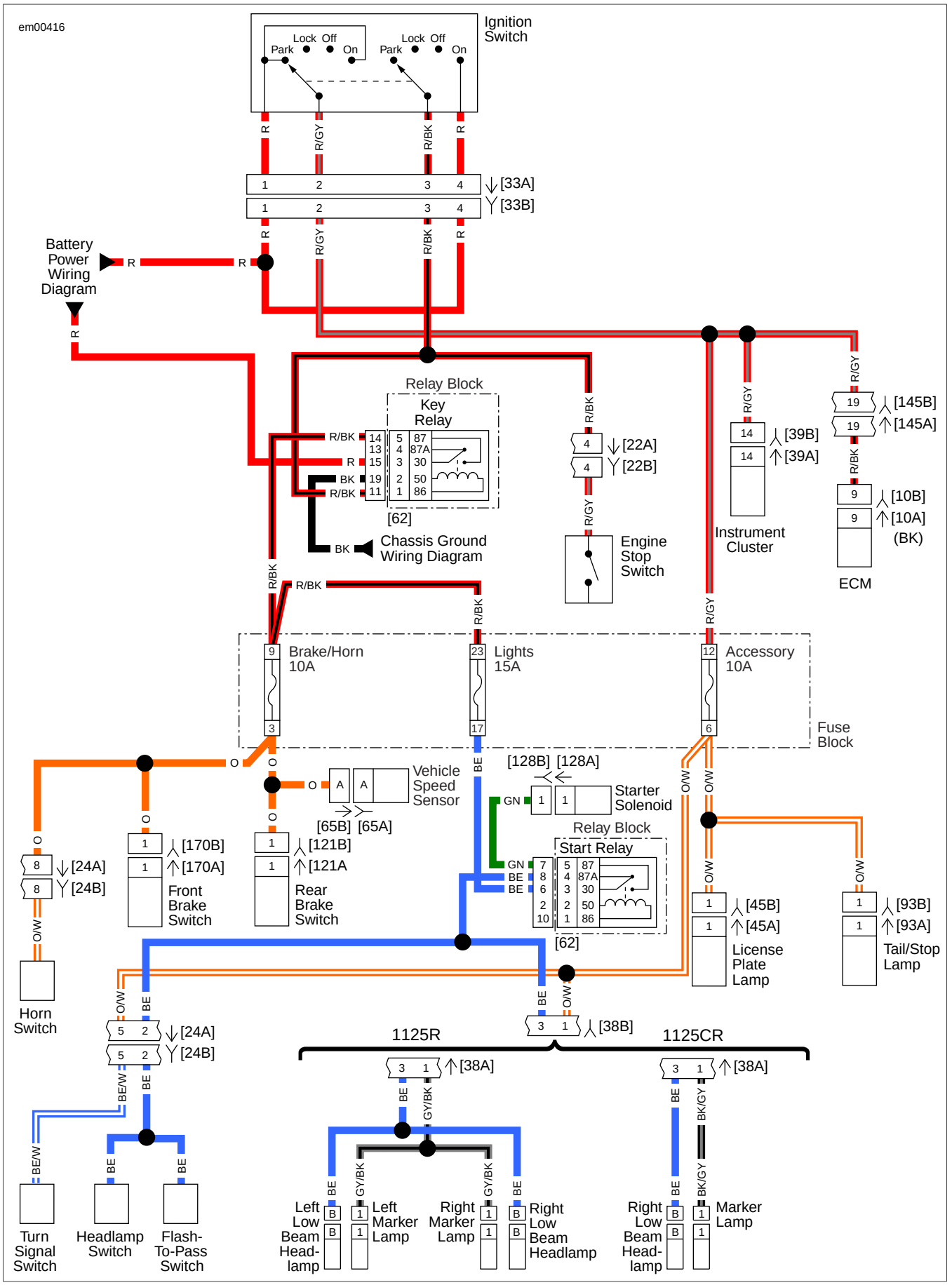



**Figure B-3. Ignition and Accessory Power: 2009 1125 Models**

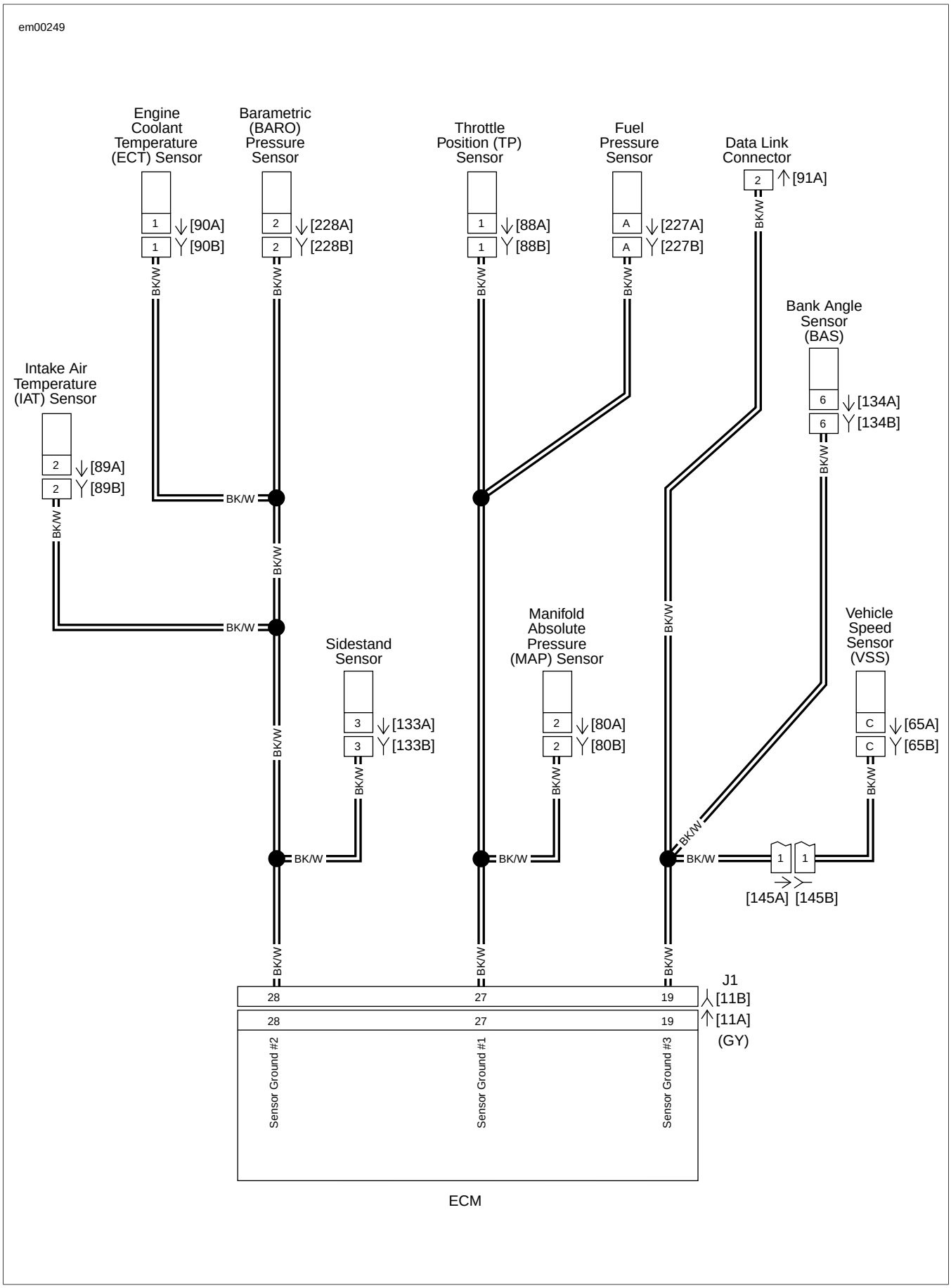



**Figure B-4. Sensor Grounds: 2009 1125 Models**

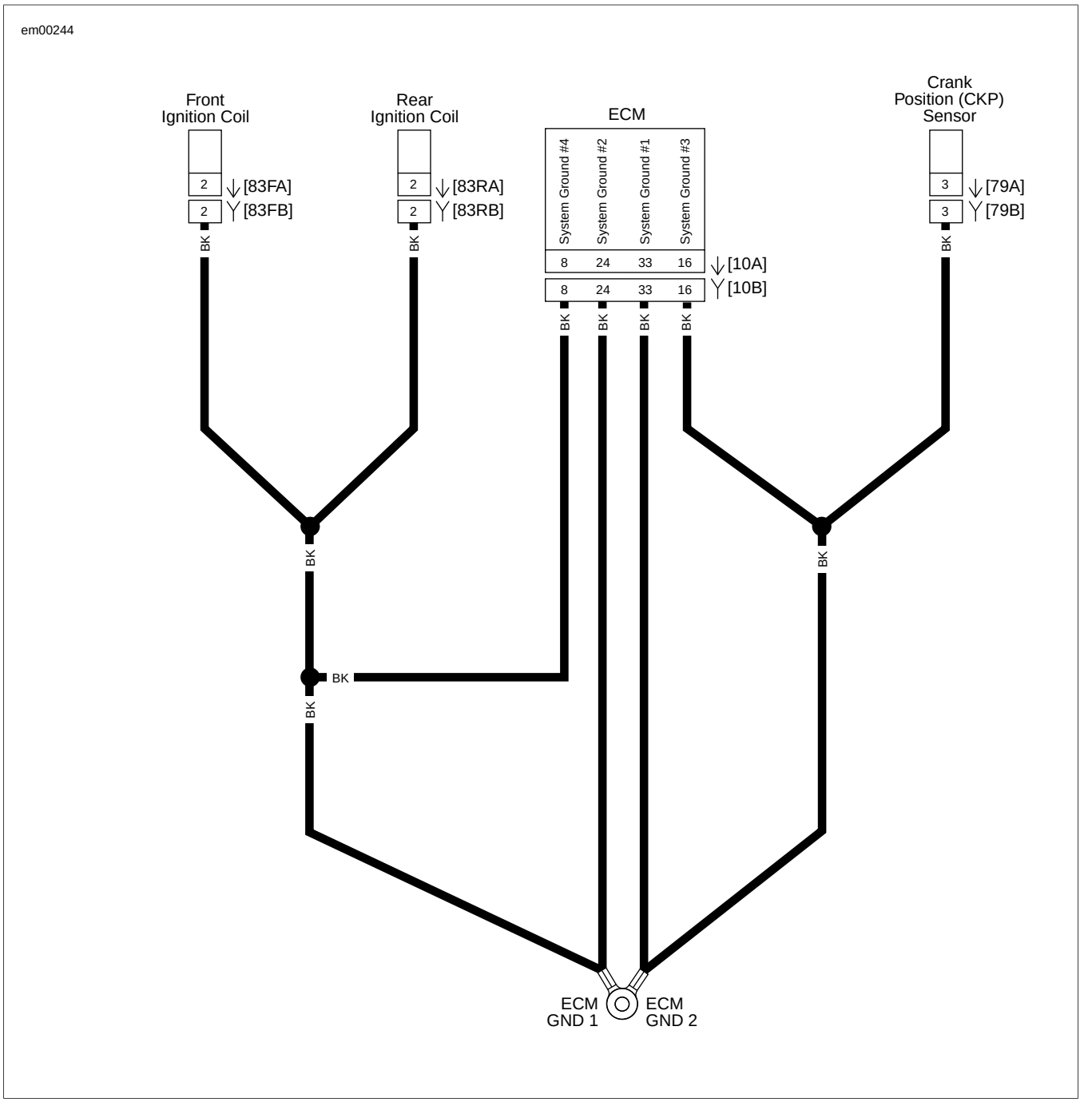



**Figure B-5. ECM Power Grounds: 2009 1125 Models**

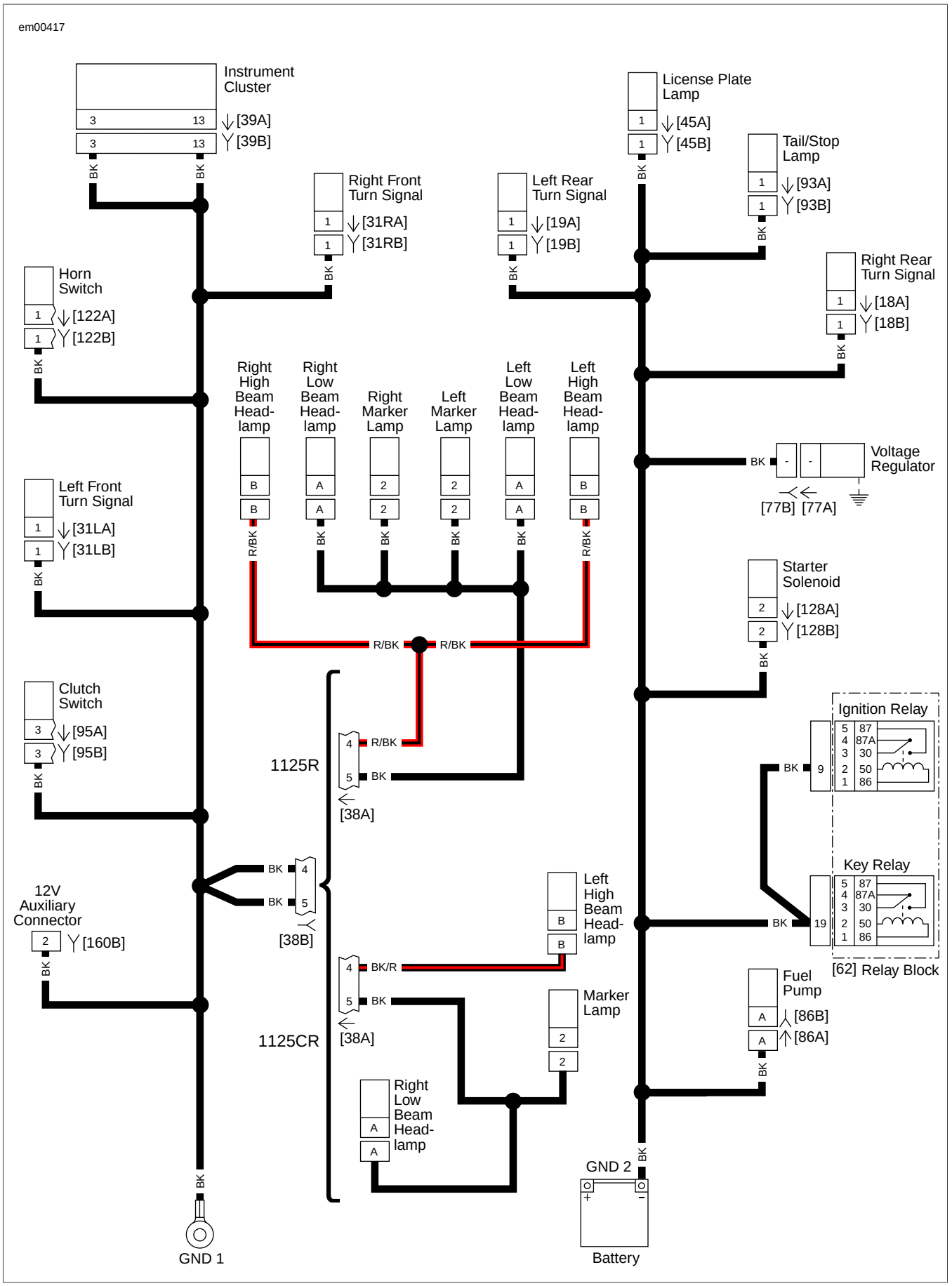



**Figure B-6. Chassis Grounds: 2009 1125 Models**

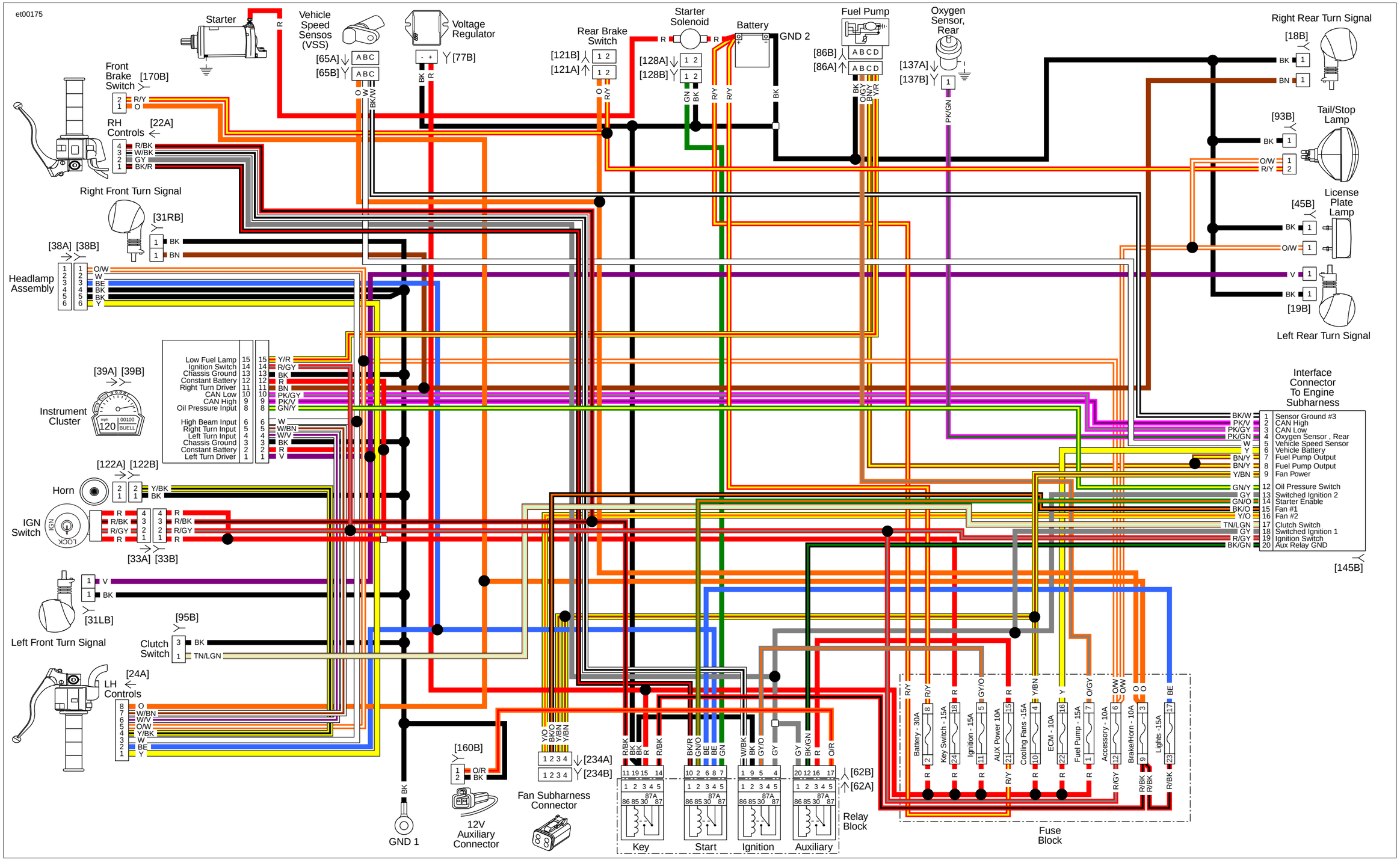



**Figure B-7. Main Chassis Wiring Harness: 2009 1125 Models**

**Figure B-7.**
**Main Chassis Wiring Harness: 2009 1125 Models**

**Figure B-7.**
**Main Chassis Wiring Harness: 2009 1125 Models**

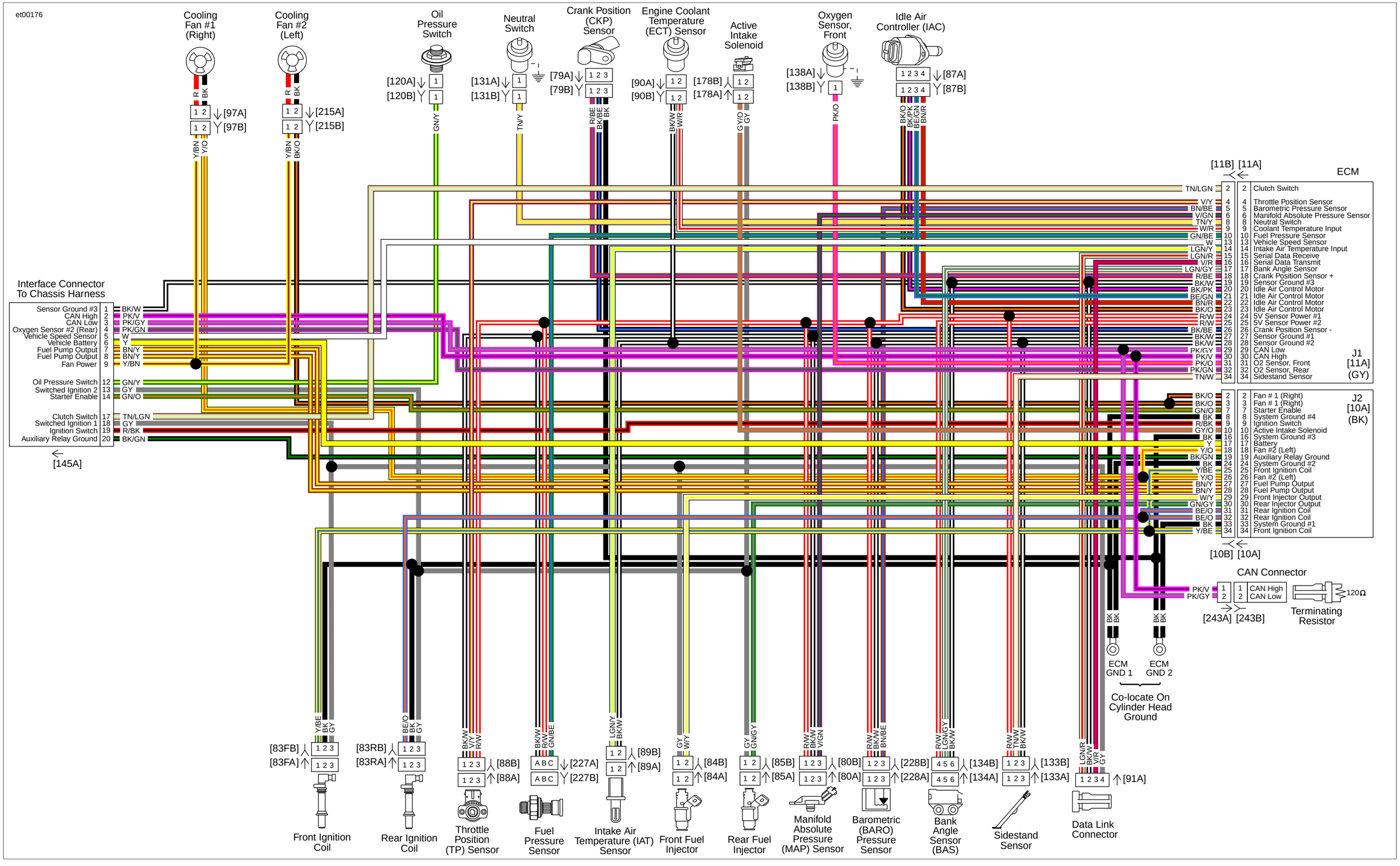



**Figure B-8. Main Engine Wiring Harness: 2009 1125 Models**

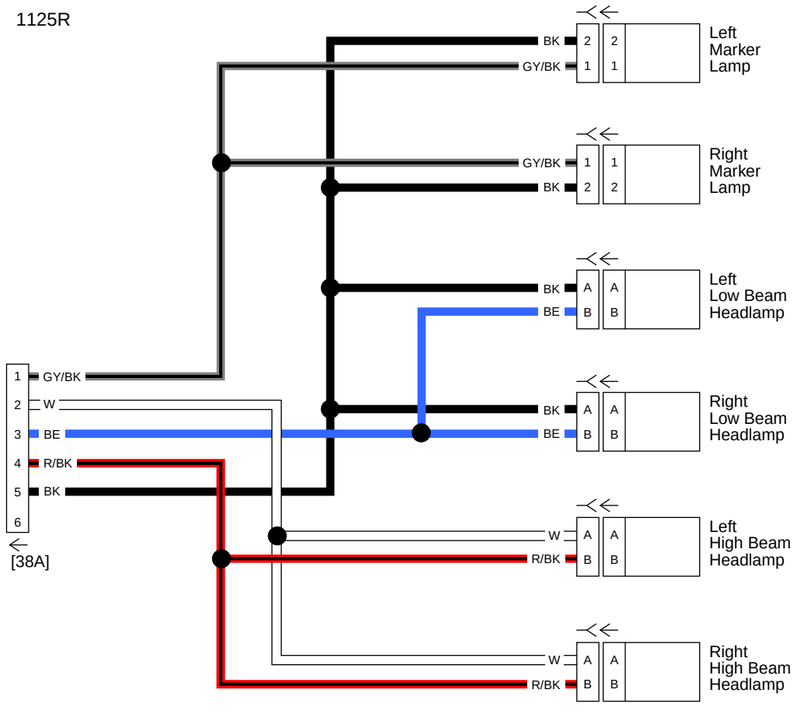
**Figure B-8.**
**Main Engine Wiring Harness: 2009 1125 Models**

**Figure B-8.**
**Main Engine Wiring Harness: 2009 1125 Models**

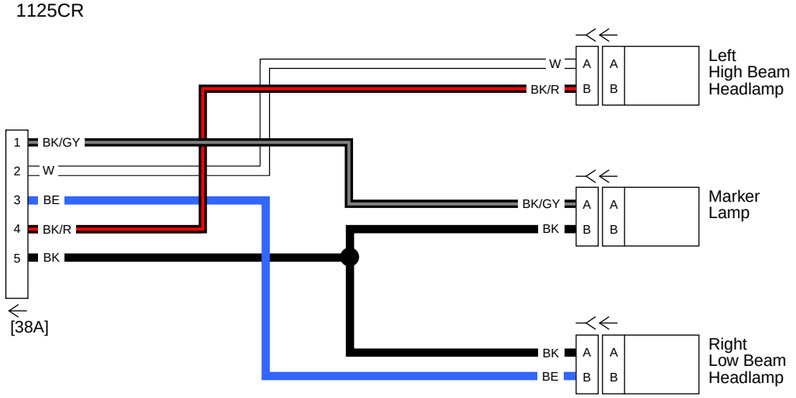
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## Headlamp Assembly Subharness

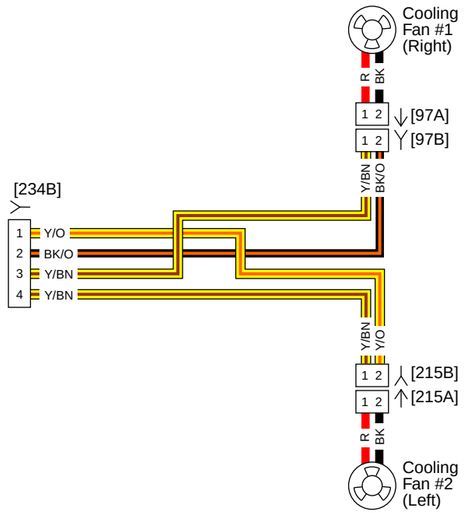
### 1125R



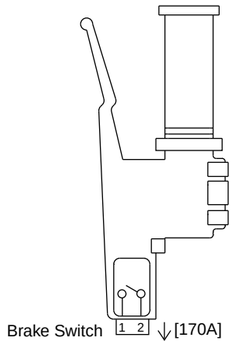

### 1125CR

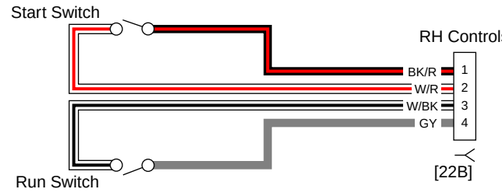


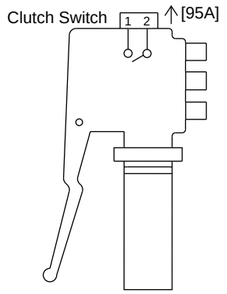

## Cooling Fan Subharness (If Equipped)




## Hand Control Switches



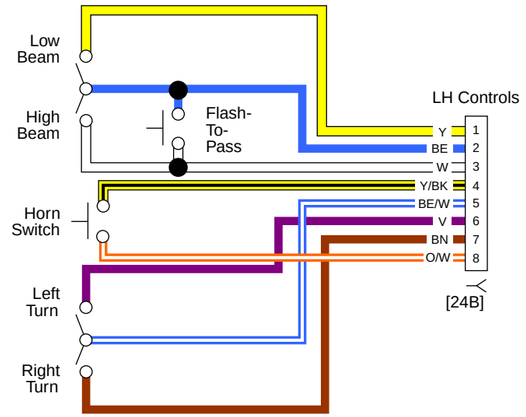




**Figure B-9. Component Wiring Diagrams (Headlamp Assembly Sub-Harness, Cooling Fan Sub-Harness, and Hand Control Switches): 2009 1125 Models**

**Figure B-9.**
**Component Wiring Diagrams (Headlamp Assembly Sub-Harness, Cooling Fan Sub-Harness, and Hand Control Switches): 2009 1125 Models**

**Figure B-9.**
**Component Wiring Diagrams (Headlamp Assembly Sub-Harness, Cooling Fan Sub-Harness, and Hand Control Switches): 2009 1125 Models**

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C.2 VALVE LASH CALCULATION WORKSHEET 1....C-2
C.3 VALVE LASH CALCULATION WORKSHEET 2....C-4

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# NOTES

# VALVE TAPPET SHIMS C.1

## TABLES

**Table C-1. Case 1 Valve Tappet Shims**

| Part No. | Shim Thickness |
|---|---|
| H-D 18666-01K | 2.000 mm |
| H-D 18624-01K | 2.025 mm |
| H-D 18667-01K | 2.050 mm |
| H-D 18625-01K | 2.075 mm |
| H-D 18668-01K | 2.100 mm |
| H-D 18626-01K | 2.125 mm |
| H-D 18669-01K | 2.150 mm |
| H-D 18627-01K | 2.175 mm |
| H-D 18670-01K | 2.200 mm |
| H-D 18628-01K | 2.225 mm |
| H-D 18671-01K | 2.250 mm |
| H-D 18629-01K | 2.275 mm |
| H-D 18672-01K | 2.300 mm |
| H-D 18630-01K | 2.325 mm |
| H-D 18673-01K | 2.350 mm |
| H-D 18631-01K | 2.375 mm |
| H-D 18674-01K | 2.400 mm |

**Table C-2. Case 2 Valve Tappet Shims**

| Part No. | Shim Thickness |
|---|---|
| H-D 18632-01K | 2.425 mm |
| H-D 18675-01K | 2.450 mm |
| H-D 18638-01K | 2.475 mm |
| H-D 18676-01K | 2.500 mm |
| H-D 18639-01K | 2.525 mm |
| H-D 18677-01K | 2.550 mm |
| H-D 18655-01K | 2.575 mm |
| H-D 18678-01K | 2.600 mm |
| H-D 18656-01K | 2.625 mm |
| H-D 18679-01K | 2.650 mm |
| H-D 18657-01K | 2.675 mm |
| H-D 18680-01K | 2.700 mm |
| H-D 18658-01K | 2.725 mm |
| H-D 18681-01K | 2.750 mm |
| H-D 18659-01K | 2.775 mm |
| H-D 18682-01K | 2.800 mm |
| H-D 18692-01K | 2.825 mm |
| H-D 18683-01K | 2.850 mm |
| H-D 18693-01K | 2.875 mm |
| H-D 18684-01K | 2.900 mm |
| H-D 18694-01K | 2.925 mm |
| H-D 18685-01K | 2.950 mm |
| H-D 18695-01K | 2.975 mm |
| H-D 18686-01K | 3.000 mm |

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# VALVE LASH CALCULATION WORKSHEET 1 C.2

## WORKSHEET 1

**Table C-3. Valve Lash: Front Cylinder (Measurements)**

| Valve Number | Valve Type | Initial Lash Measurement (1) | Installed Shim Measurement (2) | Valve Lash Upper Limit, mm (in) (3) | Valve Lash Lower Limit, mm (in) (4) |
|---|---|---|---|---|---|
| 1 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 2 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 3 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |
| 4 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |

**Table C-4. Valve Lash: Front Cylinder (Calculations)**

| VALVE NUMBER | VALVE TYPE | NEW SHIM LOWER LIMIT CALCULATE COLUMNS (1)+(2)-(3) (L) | NEW SHIM UPPER LIMIT CALCULATE COLUMNS (1)+(2)-(4) (U) | DESIRED SHIM SIZE CALCULATE COLUMNS ((L)+(U))/(2) = (S) (S) | SHIM SIZE CHOSEN (CLOSEST TO COLUMN S) | FINAL LASH READING |
|---|---|---|---|---|---|---|
| 1 | Exhaust | | | | | |
| 2 | Exhaust | | | | | |
| 3 | Intake | | | | | |
| 4 | Intake | | | | | |

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**Table C-5. Valve Lash: Rear Cylinder (Measurements)**

| Valve Number | Valve Type | Initial Lash Measurement (1) | Installed Shim Measurement (2) | Valve Lash Upper Limit, mm (in) (3) | Valve Lash Lower Limit, mm (in) (4) |
|---|---|---|---|---|---|
| 1 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 2 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 3 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |
| 4 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |

**Table C-6. Valve Lash: Rear Cylinder (Calculations)**

| VALVE NUMBER | VALVE TYPE | NEW SHIM LOWER LIMIT CALCULATE COLUMNS (1)+(2)-(3) (L) | NEW SHIM UPPER LIMIT CALCULATE COLUMNS (1)+(2)-(4) (U) | DESIRED SHIM SIZE CALCULATE COLUMNS ((L)+(U))/(2) = (S) (S) | SHIM SIZE CHOSEN (CLOSEST TO COLUMN S) | FINAL LASH READING |
|---|---|---|---|---|---|---|
| 5 | Intake | | | | | |
| 6 | Intake | | | | | |

**Table C-6. Valve Lash: Rear Cylinder (Calculations)**

| VALVE NUMBER | VALVE TYPE | NEW SHIM LOWER LIMIT CALCULATE COLUMNS (1)+(2)-(3) (L) | NEW SHIM UPPER LIMIT CALCULATE COLUMNS (1)+(2)-(4) (U) | DESIRED SHIM SIZE CALCULATE COLUMNS ((L)+(U))/(2) = (S) (S) | SHIM SIZE CHOSEN (CLOSEST TO COLUMN S) | FINAL LASH READING |
|---|---|---|---|---|---|---|
| 7 | Exhaust | | | | | |
| 8 | Exhaust | | | | | |

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# VALVE LASH CALCULATION WORKSHEET 2 C.3

## WORKSHEET 2

**Table C-7. Valve Lash: Front Cylinder (Measurements)**

| Valve Number | Valve Type | Initial Lash Measurement (1) | Installed Shim Measurement (2) | Valve Lash Upper Limit, mm (in) (3) | Valve Lash Lower Limit, mm (in) (4) |
|---|---|---|---|---|---|
| 1 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 2 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 3 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |
| 4 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |

**Table C-8. Valve Lash: Front Cylinder (Calculations)**

| VALVE NUMBER | VALVE TYPE | NEW SHIM LOWER LIMIT CALCULATE COLUMNS (1)+(2)-(3) (L) | NEW SHIM UPPER LIMIT CALCULATE COLUMNS (1)+(2)-(4) (U) | DESIRED SHIM SIZE CALCULATE COLUMNS ((L)+(U))/(2) = (S) (S) | SHIM SIZE CHOSEN (CLOSEST TO COLUMN S) | FINAL LASH READING |
|---|---|---|---|---|---|---|
| 1 | Exhaust | | | | | |
| 2 | Exhaust | | | | | |
| 3 | Intake | | | | | |
| 4 | Intake | | | | | |

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**Table C-9. Valve Lash: Rear Cylinder (Measurements)**

| Valve Number | Valve Type | Initial Lash Measurement (1) | Installed Shim Measurement (2) | Valve Lash Upper Limit, mm (in) (3) | Valve Lash Lower Limit, mm (in) (4) |
|---|---|---|---|---|---|
| 1 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 2 | Exhaust | | | 0.34 (0.013) | 0.27 (0.01) |
| 3 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |
| 4 | Intake | | | 0.22 (0.009) | 0.15 (0.006) |

**Table C-10. Valve Lash: Rear Cylinder (Calculations)**

| VALVE NUMBER | VALVE TYPE | NEW SHIM LOWER LIMIT CALCULATE COLUMNS (1)+(2)-(3) (L) | NEW SHIM UPPER LIMIT CALCULATE COLUMNS (1)+(2)-(4) (U) | DESIRED SHIM SIZE CALCULATE COLUMNS ((L)+(U))/(2) = (S) (S) | SHIM SIZE CHOSEN (CLOSEST TO COLUMN S) | FINAL LASH READING |
|---|---|---|---|---|---|---|
| 5 | Intake | | | | | |
| 6 | Intake | | | | | |

**Table C-10. Valve Lash: Rear Cylinder (Calculations)**

| VALVE NUMBER | VALVE TYPE | NEW SHIM LOWER LIMIT CALCULATE COLUMNS (1)+(2)-(3) (L) | NEW SHIM UPPER LIMIT CALCULATE COLUMNS (1)+(2)-(4) (U) | DESIRED SHIM SIZE CALCULATE COLUMNS ((L)+(U))/(2) = (S) (S) | SHIM SIZE CHOSEN (CLOSEST TO COLUMN S) | FINAL LASH READING |
|---|---|---|---|---|---|---|
| 7 | Exhaust | | | | | |
| 8 | Exhaust | | | | | |

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# NOTES

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# NOTES

# LENGTH CONVERSION D.1

## CONVERSION TABLE

**Table D-1. Metric Conversions**

| MILLIMETERS to INCHES (MM x 0.03937 = IN) | | | | | | | | INCHES to MILLIMETERS (IN x 25.40 = MM) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | in | mm | in | mm | in | mm | in | in | mm | in | mm | in | mm | in | mm |
| .1 | .0039 | 25 | .9842 | 58 | 2.283 | 91 | 3.582 | .001 | .025 | .6 | 15.240 | 1-15/16 | 49.21 | 3-5/16 | 84.14 |
| .2 | .0078 | 26 | 1.024 | 59 | 2.323 | 92 | 3.622 | .002 | .051 | 5/8 | 15.875 | 2 | 50.80 | 3-3/8 | 85.72 |
| .3 | .0118 | 27 | 1.063 | 60 | 2.362 | 93 | 3.661 | .003 | .076 | 11/16 | 17.462 | 2-1/16 | 52.39 | 3.4 | 86.36 |
| .4 | .0157 | 28 | 1.102 | 61 | 2.401 | 94 | 3.701 | .004 | .102 | .7 | 17.780 | 2.1 | 53.34 | 3-7/16 | 87.31 |
| .5 | .0197 | 29 | 1.142 | 62 | 2.441 | 95 | 3.740 | .005 | .127 | 3/4 | 19.050 | 2-1/8 | 53.97 | 3-1/2 | 88.90 |
| .6 | .0236 | 30 | 1.181 | 63 | 2.480 | 96 | 3.779 | .006 | .152 | .8 | 20.320 | 2-3/16 | 55.56 | 3-9/16 | 90.49 |
| .7 | .0275 | 31 | 1.220 | 64 | 2.519 | 97 | 3.819 | .007 | .178 | 13/16 | 20.638 | 2.2 | 55.88 | 3.6 | 91.44 |
| .8 | .0315 | 32 | 1.260 | 65 | 2.559 | 98 | 3.858 | .008 | .203 | 7/8 | 22.225 | 2-1/4 | 57.15 | 3-5/8 | 92.07 |
| .9 | .0354 | 33 | 1.299 | 66 | 2.598 | 99 | 3.897 | .009 | .229 | .9 | 22.860 | 2.3 | 58.42 | 3-11/16 | 93.66 |
| 1 | .0394 | 34 | 1.338 | 67 | 2.638 | 100 | 3.937 | .010 | .254 | 15/16 | 23.812 | 2-5/16 | 58.74 | 3.7 | 93.98 |
| 2 | .0787 | 35 | 1.378 | 68 | 2.677 | 101 | 3.976 | 1/64 | .397 | 1 | 25.40 | 2-3/8 | 60.32 | 3-3/4 | 95.25 |
| 3 | .1181 | 36 | 1.417 | 69 | 2.716 | 102 | 4.016 | .020 | .508 | 1-1/16 | 26.99 | 2.4 | 60.96 | 3.8 | 96.52 |
| 4 | .1575 | 37 | 1.456 | 70 | 2.756 | 103 | 4.055 | .030 | .762 | 1.1 | 27.94 | 2-7/16 | 61.91 | 3-13/16 | 96.84 |
| 5 | .1968 | 38 | 1.496 | 71 | 2.795 | 104 | 4.094 | 1/32 | .794 | 1-1/8 | 28.57 | 2-1/2 | 63.50 | 3-7/8 | 98.42 |
| 6 | .2362 | 39 | 1.535 | 72 | 2.834 | 105 | 4.134 | .040 | 1.016 | 1-3/16 | 30.16 | 2-9/16 | 65.09 | 3.9 | 99.06 |
| 7 | .2756 | 40 | 1.575 | 73 | 2.874 | 106 | 4.173 | .050 | 1.270 | 1.2 | 30.48 | 2.6 | 66.04 | 3-15/16 | 100.01 |
| 8 | .3149 | 41 | 1.614 | 74 | 2.913 | 107 | 4.212 | .060 | 1.524 | 1-1/4 | 31.75 | 2-5/8 | 66.67 | 4 | 101.6 |
| 9 | .3543 | 42 | 1.653 | 75 | 2.953 | 108 | 4.252 | 1/16 | 1.588 | 1.3 | 33.02 | 2-11/16 | 68.26 | 4-1/16 | 102.19 |
| 10 | .3937 | 43 | 1.693 | 76 | 2.992 | 109 | 4.291 | .070 | 1.778 | 1-5/16 | 33.34 | 2.7 | 68.58 | 4.1 | 104.14 |
| 11 | .4331 | 44 | 1.732 | 77 | 3.031 | 110 | 4.331 | .080 | 2.032 | 1-3/8 | 34.92 | 2-3/4 | 69.85 | 4-1/8 | 104.77 |
| 12 | .4724 | 45 | 1.772 | 78 | 3.071 | 111 | 4.370 | .090 | 2.286 | 1.4 | 35.56 | 2.8 | 71.12 | 4-3/16 | 106.36 |
| 13 | .5118 | 46 | 1.811 | 79 | 3.110 | 112 | 4.409 | .1 | 2.540 | 1-7/16 | 36.51 | 2-13/16 | 71.44 | 4.2 | 106.68 |
| 14 | .5512 | 47 | 1.850 | 80 | 3.149 | 113 | 4.449 | 1/8 | 3.175 | 1-1/2 | 38.10 | 2-7/8 | 73.02 | 4-1/4 | 107.95 |
| 15 | .5905 | 48 | 1.890 | 81 | 3.189 | 114 | 4.488 | 3/16 | 4.762 | 1-9/16 | 39.69 | 2.9 | 73.66 | 4.3 | 109.22 |
| 16 | .6299 | 49 | 1.929 | 82 | 3.228 | 115 | 4.527 | .2 | 5.080 | 1.6 | 40.64 | 2-15/16 | 74.61 | 4-5/16 | 109.54 |
| 17 | .6693 | 50 | 1.968 | 83 | 3.268 | 116 | 4.567 | 1/4 | 6.350 | 1-5/8 | 41.27 | 3 | 76.20 | 4-3/8 | 111.12 |
| 18 | .7086 | 51 | 2.008 | 84 | 3.307 | 117 | 4.606 | .3 | 7.620 | 1-11/16 | 42.86 | 3-1/16 | 77.79 | 4.4 | 111.76 |
| 19 | .7480 | 52 | 2.047 | 85 | 3.346 | 118 | 4.645 | 5/16 | 7.938 | 1.7 | 43.18 | 3.1 | 78.74 | 4-7/16 | 112.71 |
| 20 | .7874 | 53 | 2.086 | 86 | 3.386 | 119 | 4.685 | 3/8 | 9.525 | 1-3/4 | 44.45 | 3-1/8 | 79.37 | 4-1/2 | 114.30 |
| 21 | .8268 | 54 | 2.126 | 87 | 3.425 | 120 | 4.724 | .4 | 10.160 | 1.8 | 45.72 | 3-3/16 | 80.96 | 4-9/16 | 115.89 |
| 22 | .8661 | 55 | 2.165 | 88 | 3.464 | 121 | 4.764 | 7/16 | 11.112 | 1-13/16 | 46.04 | 3.2 | 81.28 | 4.6 | 116.84 |
| 23 | .9055 | 56 | 2.205 | 89 | 3.504 | 122 | 4.803 | 1/2 | 12.700 | 1-7/8 | 47.62 | 3-1/4 | 82.55 | 4-5/8 | 117.47 |
| 24 | .9449 | 57 | 2.244 | 90 | 3.543 | 123 | 4.842 | 9/16 | 14.288 | 1.9 | 48.26 | 3.3 | 83.82 | 4-11/16 | 119.06 |

# FLUID CONVERSION D.2

## UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this Service Manual are expressed in United States (U.S.) units-of-measure. See below:

- 1 pint (U.S.) = 16 fluid ounces (U.S.)
- 1 quart (U.S.) = 2 pints (U.S.) = 32 fl. oz. (U.S.)
- 1 gallon (U.S.) = 4 quarts (U.S.) = 128 fl. oz. (U.S.)

## METRIC SYSTEM

Fluid volume measurements in this Service Manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). Should you need to convert from U.S. units-of-measure to metric units-of-measure (or vice versa), refer to the following:

- fluid ounces (U.S.) x 29.574 = milliliters
- pints (U.S.) x 0.473 = liters
- quarts (U.S.) x 0.946 = liters
- gallons (U.S.) x 3.785 = liters
- milliliters x 0.0338 = fluid ounces (U.S.)
- liters x 2.114 = pints (U.S.)
- liters x 1.057 = quarts (U.S.)
- liters x 0.264 = gallons (U.S.)

## BRITISH IMPERIAL SYSTEM

Fluid volume measurements in this Service Manual do not include the British Imperial (Imp.) system equivalents. The following conversions exist in the British Imperial system:

- 1 pint (Imp.) = 20 fluid ounces (Imp.)
- 1 quart (Imp.) = 2 pints (Imp.)
- 1 gallon (Imp.) = 4 quarts (Imp.)

Although the same unit-of-measure terminology as the U.S. system is used in the British Imperial (Imp.) system, the actual volume of each British Imperial unit-of-measure differs from its U.S. counterpart. The U.S. fluid ounce is larger than the British Imperial fluid ounce. However, the U.S. pint, quart, and gallon are smaller than the British Imperial pint, quart, and gallon, respectively. Should you need to convert from U.S. units to British Imperial units (or vice versa), refer to the following:

- fluid ounces (U.S.) x 1.042 = fluid ounces (Imp.)
- pints (U.S.) x 0.833 = pints (Imp.)
- quarts (U.S.) x 0.833 = quarts (Imp.)
- gallons (U.S.) x 0.833 = gallons (Imp.)
- fluid ounces (Imp.) x 0.960 = fluid ounces (U.S.)
- pints (Imp.) x 1.201 = pints (U.S.)
- quarts (Imp.) x 1.201 = quarts (U.S.)
- gallons (Imp.) x 1.201 = gallons (U.S.)

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# TORQUE CONVERSION D.3

## UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this 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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# NOTES

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# NOTES

# GLOSSARY E.1

## ACRONYMS AND ABBREVIATIONS

**Table E-1. Acronyms and Abbreviations**

| ACRONYM OR ABBREVIATION | DESCRIPTION |
|---|---|
| A | Amperes |
| ABS | Anti-lock Braking System |
| Ah | Ampere hour |
| AC | Alternating Current |
| ACC | Accessory position on ignition switch |
| ACR | Automatic Compression Release |
| AGM | Absorbed Glass Mat (battery) |
| AWG | American Wire Gauge |
| B+ | Battery voltage |
| bar | Bar |
| BAS | Bank Angle Sensor |
| BTDC | Before Top Dead Center |
| °C | Celsius (Centigrade) |
| CA | California |
| CAL | Calibration |
| cc | Cubic Centimeters |
| cm | Centimeters |
| $cm^3$ | Cubic centimeters |
| CCA | Cold Cranking Amps |
| CKP | Crankshaft Position |
| cm | Centimeter |
| CCW | Counterclockwise |
| cu in | Cubic inches |
| CW | Clockwise |
| DC | Direct Current |
| DLC | Data Link Connector |
| DOM | Domestic |
| DTC | Diagnostic Trouble Code |
| DOT | Department of Transportation |
| DVOM | Digital Volt Ohm Meter |
| ECM | Electronic Control Module |
| ECT | Engine Coolant Temperature |
| EEPROM | Electrically Erasable Programmable Read Only Memory |
| EFI | Electronic Fuel Injection |
| ET | Engine Temperature |
| EVAP | Evaporative Emissions Control System |
| °F | Fahrenheit |
| ft-lbs | Foot-Pounds |
| fl oz | Fluid Ounce |
| g | Gram |

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**Table E-1. Acronyms and Abbreviations**

| ACRONYM OR ABBREVIATION | DESCRIPTION |
|---|---|
| gal | Gallon |
| GAWR | Gross Axle Weight Rating |
| GPS | Global Positioning System |
| GND | Ground (electrical) |
| GVWR | Gross Vehicle Weight Rating |
| HDI | Harley-Davidson International |
| H-DSSS | Harley-Davidson Smart Security System |
| HFSM | Hands Free Security Module |
| Hg | Mercury |
| Hg | Mercury |
| 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 |
| kg | Kilogram |
| km | Kilometer |
| kPa | Kilopascal |
| km/hr | Kilometers per Hour |
| kW | Kilowatt |
| L | Liter |
| lb | Pounds |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| L | Liter |
| mA | Milliampere |
| MAP | Manifold Absolute Pressure |
| max | Maximum |
| mi | Mile |
| ml | Milliliter |
| min | Minimum |
| mL | Milliliter |
| mm | Millimeter |
| mph | Miles per Hour |
| ms | millisecond |
| Nm | Newton meter |
| N/A | Not Applicable |

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**Table E-1. Acronyms and Abbreviations**

| ACRONYM OR ABBREVIATION | DESCRIPTION |
|---|---|
| O2 | Oxygen |
| OD | Outside Diameter |
| OEM | Original Equipment Manufacturer |
| oz | Ounce |
| P&A | Parts and Accessories |
| Part No. | Part Number |
| psi | Pounds per Square Inch |
| PWM signal | Pulse Width Modulated signal |
| qt | Quart |
| RES | Reserve mark on fuel supply valve |
| RPM | Revolutions per Minute |
| s | seconds |
| SCFH | Cubic Feet per Hour at Standard Conditions |
| TCA | Throttle Control Actuator |
| TDC | Top Dead Center |
| TGS | Twist Grip Sensor |
| TMAP | Intake Air Temperature/Manifold Absolute Pressure |
| TPS | Throttle Position Sensor |
| TSM | Turn Signal Module |
| TSSM | Turn Signal/Security Module |
| V | Volt |
| VAC | Volts of Alternating Current |
| VDC | Volts of Direct Current |
| VIN | Vehicle Identification Number |
| VSS | Vehicle Speed Sensor |
| W | Watt |

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# NOTES

# Tools Used in This Manual

| PART NUMBER | TOOL NAME | NOTES |
|---|---|---|
| 94654-98 | SUPERSMART BATTERY TENDER | 1.14 BATTERY MAINTENANCE, Storage |
| A157C | SNAP-ON DRIVER SET | 5.6 WATER PUMP, Removal |
| B-35788-55 | 5.5 MM VALVE SEAT CUTTER PILOT | 3.8 CYLINDER HEADS, Cutting Valve Seats |
| B-42310-60 | ENGINE CRADLE | 3.5 ENGINE REPLACEMENT, Engine Disassembly |
| B-42310-60 | ENGINE CRADLE | 3.13 CRANKCASE, Join Crankcase Halves |
| B-42320-6 | PISTON PIN EXTRACTOR ADAPTER | 3.9 CYLINDERS AND PISTONS, Removal and Disassembly |
| B-42887 | BRAKE CALIPER PISTON REMOVER | 2.7 FRONT BRAKE, Caliper: Repair |
| B-43993-11 | BACKING PLATE | 2.6 WHEELS, Wheel Bearings |
| B-43993-12 | BACKING PLATE | 2.10 STEERING HEAD BEARINGS, Installation |
| B-43993-7 | FRONT WHEEL BEARING REMOVER COLLET | 2.6 WHEELS, Wheel Bearings |
| B-43993-9 | FRONT BEARING INSTALLER | 2.6 WHEELS, Wheel Bearings |
| B-45521 | STEERING HEAD BEARING INSTALLER | 2.10 STEERING HEAD BEARINGS, Installation |
| B-45522 | FUEL PRESSURE GAUGE ADAPTER | 4.9 FUEL PUMP, Fuel Pressure Test |
| B-45657-1-A | FUEL PUMP PULLER | 4.9 FUEL PUMP, Fuel Pump: Removal |
| B-46279 | AXLE WRENCH | 2.6 WHEELS, Front Wheel |
| B-46279 | AXLE WRENCH | 2.12 SWINGARM AND BRACE, Swingarm: Removal |
| B-46279 | AXLE WRENCH | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| B-48857 | ALTERNATOR ROTOR REMOVER | 7.10 ALTERNATOR, Removal and Disassembly |
| B-48858 | CRANKSHAFT LOCKING TOOL | 3.6 REBUILD TIMING INSTRUCTIONS, Timing |
| B-48858 | CRANKSHAFT LOCKING TOOL | 3.10 CLUTCH SIDE, Clutch Cover |
| B-48858 | CRANKSHAFT LOCKING TOOL | 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft |
| B-48858 | CRANKSHAFT LOCKING TOOL | 3.10 CLUTCH SIDE, Balancer: Bottom |
| B-48858 | CRANKSHAFT LOCKING TOOL | 3.11 ALTERNATOR SIDE, Balancer: Top |
| B-48858 | CRANKSHAFT LOCKING TOOL | 6.5 CLUTCH, Clutch Basket |
| B-48858 | CRANKSHAFT LOCKING TOOL | 7.10 ALTERNATOR, Removal and Disassembly |
| B-48858 | CRANKSHAFT LOCKING TOOL | 7.10 ALTERNATOR, Assembly and Installation |
| B-48859 | CLUTCH HUB LOCKING TOOL | 6.5 CLUTCH, Clutch Basket |
| B-48860 | SHIFT SHAFT OUTER SEAL INSTALLER/GUIDE | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Shift Shaft Seals |
| B-48862 | TOP BALANCER BEARING INSTALLER | 3.11 ALTERNATOR SIDE, Balancer: Top |
| B-48863 | DIAPHRAGM OIL SEAL INSTALLER | 6.5 CLUTCH, Inner Diaphragm Cover Oil Seal |
| B-48867-47MM | FORK SEAL DRIVER AND DUST BOOT INSTALLER | 2.9 FRONT FORK, Assembly |
| B-49050 | PISTON PIN CLIP INSTALLER | 3.9 CYLINDERS AND PISTONS, Assembly and Installation |
| B-49053 | VALVE GUIDE SEAL INSTALLER | 3.8 CYLINDER HEADS, Assembly |
| B-49055 | MAIN BEARING REMOVER/INSTALLER | 3.13 CRANKCASE, Main Bearings |
| B-49058 | INNER SHIFT SHAFT SEAL INSTALLER | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Shift Shaft Seals |
| B-49125 | CLUTCH RELEASE TOOL | 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator |
| B-49130 | TRANSMISSION MAINSHAFT SEAL INSTALLER | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft |
| B-49133 | PISTON SUPPORT PLATE | 3.9 CYLINDERS AND PISTONS, Removal and Disassembly |
| B-49133 | PISTON SUPPORT PLATE | 3.9 CYLINDERS AND PISTONS, Assembly and Installation |

# Tools Used in This Manual

| PART NUMBER | TOOL NAME | NOTES |
|---|---|---|
| B-49140 | WATER PUMP TIMING PIN | 3.10 CLUTCH SIDE, Clutch Cover |
| B-49140 | WATER PUMP TIMING PIN | 3.10 CLUTCH SIDE, Balancer: Water Pump Shaft |
| B-49141-2 | WATER PUMP OIL SEAL INSTALLER | 5.6 WATER PUMP, Installation |
| B-49141-3 | WATER PUMP WATER SEAL INSTALLER | 5.6 WATER PUMP, Installation |
| B-49141-4 | WATER PUMP SEAL INSTALLER BASE TOOL | 5.6 WATER PUMP, Installation |
| B-49194 | SEAL INSTALLER | 3.11 ALTERNATOR SIDE, Balancer: Top |
| B-49196 | WATER PUMP NEEDLE BEARING INSTALLER | 5.6 WATER PUMP, Installation |
| B-49258 | CAMSHAFT LOCKING TOOL | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| B-49259 | VALVE LASH FEELER GAUGE | 1.16 VALVE CLEARANCE, Valve Lash |
| B-49312 | CYLINDER HEAD HOLDING FIXTURE | 3.8 CYLINDER HEADS, Disassembly |
| B-49403 | WATER PUMP SHAFT CASE BEARING INSTALLER | 3.13 CRANKCASE, Water Pump Shaft Bearing |
| B-59000A | FRONT FORK OIL LEVEL GAUGE | 2.9 FRONT FORK, Assembly |
| B-96333-107 | PISTON RING COMPRESSOR | 3.9 CYLINDERS AND PISTONS, Assembly and Installation |
| FTXR45E | SNAP-ON TAMPER-RESISTANT T45 TORX DRIVE | 7.3 IGNITION SWITCH/FORK LOCK: 1125R, Replacement |
| GA500A | SNAP-ON TERMINAL PICK | A.2 AUTOFUSE ELECTRICAL CONNECTORS, Autofuse Connector Repair |
| HD-21000 | TIRE SPREADER | 2.5 TIRES, General |
| HD-23688 | COOLANT TESTER (F) | 5.4 ENGINE COOLANT, Freeze Point Test |
| HD-25070 | ROBINAIR HEAT GUN | 5.7 COOLANT PIPES AND HOSES, Installation |
| HD-25070 | ROBINAIR HEAT GUN | A.17 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair |
| HD-26568 | COOLANT TESTER (C) | 5.4 ENGINE COOLANT, Freeze Point Test |
| HD-29545-6 | COOLANT FLUORESCENT LEAK DETECTION DYE | 5.3 COOLANT FLOW, Leak Detection Dye Test |
| HD-33223-1 | CYLINDER COMPRESSION GAUGE | 3.3 TROUBLESHOOTING, Compression Test |
| HD-34736B | VALVE SPRING COMPRESSOR | 3.8 CYLINDER HEADS, Assembly |
| HD-34736-B | VALVE SPRING COMPRESSOR | 3.8 CYLINDER HEADS, Disassembly |
| HD-35457 | BLACK LIGHT LEAK DETECTOR | 1.19 TROUBLESHOOTING, Lubrication System |
| HD-35457 | BLACK LIGHT LEAK DETECTOR | 5.3 COOLANT FLOW, Leak Detection Dye Test |
| HD-35758-C | NEWAY VALVE SEAT CUTTER SET | 3.8 CYLINDER HEADS, Cutting Valve Seats |
| HD-38125-6 | PACKARD TERMINAL CRIMP TOOL | A.14 PACKARD METRI-PACK TERMINALS, Metri-Pack Terminal Crimps |
| HD-38125-7 | PACKARD TERMINAL CRIMPER | A.8 DEUTSCH MINI TERMINAL REPAIR, Deutsch Mini Terminal Crimps |
| HD-38125-7 | PACKARD TERMINAL CRIMPER | A.14 PACKARD METRI-PACK TERMINALS, Metri-Pack Terminal Crimps |
| HD-38125-8 | PACKARD CRIMPING TOOL | A.14 PACKARD METRI-PACK TERMINALS, Metri-Pack Terminal Crimps |
| HD-38125-8 | PACKARD CRIMPING TOOL | A.17 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair |

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# Tools Used in This Manual

| PART NUMBER | TOOL NAME | NOTES |
|---|---|---|
| HD-39302 | STEERING HEAD BEARING RACE INSTALLER | 2.10 STEERING HEAD BEARINGS, Installation |
| HD-39540-05A | BUSHING/BEARING DRIVER SET (DRIVER) | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Fork Drum |
| HD-39540-05A | BUSHING/BEARING DRIVER SET (DRIVER) | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft |
| HD-39540-07A | BUSHING/BEARING DRIVER SET (DRIVER) | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft |
| HD-39540-07A | BUSHING/BEARING DRIVER SET (DRIVER) | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft |
| HD-39540-08A | BUSHING/BEARING DRIVER SET | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Fork Drum |
| HD-39540-08B | BUSHING/BEARING DRIVER SET | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft |
| HD-39540-08B | KENT-MOORE DRIVER SET | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft |
| HD-39540-09B | BUSHING/BEARING DRIVER SET | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft |
| HD-39540-11B | BUSHING/BEARING DRIVER SET (DRIVER) | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft |
| HD-39786 | CYLINDER HEAD HOLDING FIXTURE | 3.8 CYLINDER HEADS, Cutting Valve Seats |
| HD-39965-A | DEUTSCH TERMINAL CRIMP TOOL | A.6 DEUTSCH STANDARD TERMINAL REPAIR, Deutsch Standard Terminal Crimps |
| HD-39969 | ULTRA TORCH UT-100 | A.17 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair |
| HD-41177 | FORK HOLDING TOOL | 2.9 FRONT FORK, Disassembly |
| HD-41182 | FUEL PRESSURE GAUGE | 4.9 FUEL PUMP, Fuel Pressure Test |
| HD-41183 | HEAT SHIELD ATTACHMENT | A.17 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair |
| HD-41417 | PROPANE ENRICHMENT KIT | 4.5 THROTTLE BODY, Intake Leak Test |
| HD-41475 | DEUTSCH CONNECTOR SERVICE KIT | A.5 DEUTSCH ELECTRICAL CONNECTORS, Deutsch Connector Repair |
| HD-41475-100 | FLAT BLADE L-HOOK | A.5 DEUTSCH ELECTRICAL CONNECTORS, Deutsch Connector Repair |
| HD-41609 | AMP MULTILOCK CRIMPER | A.1 AMP MULTILOCK CONNECTORS, AMP Multilock Connector Repair |
| HD-41609 | AMP MULTILOCK CRIMPER | A.1 AMP MULTILOCK CONNECTORS, AMP Multilock Connector Repair |
| HD-42320-A | PISTON PIN EXTRACTOR | 3.9 CYLINDERS AND PISTONS, Removal and Disassembly |
| HD-42879 | ELECTRICAL CRIMPER TOOL | A.7 DEUTSCH SOLID BARREL MINI TERMINAL REPAIR, Deutsch Solid Barrel Terminal Crimps |
| HD-44060-A | WHEEL BEARING INSTALLER AND REMOVER | 2.6 WHEELS, Wheel Bearings |
| HD-44060-A | WHEEL BEARING INSTALLER AND REMOVER | 2.6 WHEELS, Wheel Bearings |
| HD-44060-A | WHEEL BEARING REMOVER AND INSTALLER | 2.12 SWINGARM AND BRACE, Swingarm: Repair |

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# Tools Used in This Manual

| PART NUMBER | TOOL NAME | NOTES |
|---|---|---|
| HD-44358 | FLYWHEEL SUPPORT FIXTURE | 3.14 CRANKSHAFT, Disassembly |
| HD-44750 | DIGITAL TECHNICIAN | 4.5 THROTTLE BODY, Throttle Body Installation |
| HD-45335 | COOLANT SYSTEM PRESSURE TESTER | 5.3 COOLANT FLOW, Pressure Cap Test |
| HD-45335 | COOLANT SYSTEM PRESSURE TESTER | 5.3 COOLANT FLOW, Tests for Blown Gasket |
| HD-45340 | GASKET ALIGNMENT DOWELS | 3.11 ALTERNATOR SIDE, Ignition Cover |
| HD-45907 | 4" UNIVERSAL DRIVER HANDLE | 6.5 CLUTCH, Inner Diaphragm Cover Oil Seal |
| HD-45907 | 4" UNIVERSAL DRIVER HANDLE | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft |
| HD-45928 | PACKARD MICRO-64 TERMINAL REMOVER | A.16 PACKARD MICRO-64 CONNECTORS, Packard Micro-64 Connector Repair |
| HD-45929 | PACKARD MICRO-64 TERMINAL CRIMPER | A.16 PACKARD MICRO-64 CONNECTORS, Packard Micro-64 Connector Repair |
| HD-45966 | FRONT FORK COMPRESSOR | 2.9 FRONT FORK, Disassembly |
| HD-46503 | OIL LINE REMOVER | 5.9 OIL COOLER, Removal |
| HD-48114 | MOLEX ELECTRICAL CONNECTOR TERMINAL REMOVER | A.9 MOLEX CONNECTORS, Molex Connector Repair |
| HD-48119 | ELECTRICAL CRIMP TOOL | A.9 MOLEX CONNECTORS, Crimp Terminal to Lead |
| HD-48262 | O2 SENSOR WRENCH | 4.3 SENSORS, Oxygen Sensors (O2) |
| HD-49149 | FINAL DRIVE SPROCKET LOCKING TOOL | 6.10 FINAL DRIVE SPROCKET, Pulley Assembly |
| HD-95760-69A | BUSHING AND BEARING PULLER | 3.11 ALTERNATOR SIDE, Balancer: Top |
| HD-95760-69A | BUSHING & BEARING PULLER | 3.13 CRANKCASE, Water Pump Shaft Bearing |
| HD-95760-69A | BUSHING AND BEARING PULLER | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft |
| HD-95765-69A | COLLET, 1/2" | 3.13 CRANKCASE, Water Pump Shaft Bearing |
| HD-95766-69A | COLLET, 5/8" | 3.11 ALTERNATOR SIDE, Balancer: Top |
| HD-95769-69 | COLLET, 1-1/8" | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft |
| HD-97087-658 | HOSE CLAMP PLIERS | 4.5 THROTTLE BODY, Throttle Body Installation |
| HD-99500-80 | WHEEL TRUING AND BALANCING STAND | 2.6 WHEELS, Wheel Rim Runout |
| HE-52B | SNAP-ON SPRING TOOL | 2.21 SIDESTAND, Sidestand |
| J-23444-A | EXTREME PRESSURE LUBRICANT | 2.6 WHEELS, Wheel Bearings |
| J-23444-A | EXTREME PRESSURE LUBRICANT | 2.6 WHEELS, Wheel Bearings |
| J-23444-A | EXTREME PRESSURE LUBRICANT | 2.10 STEERING HEAD BEARINGS, Installation |
| J-5586A | TRANSMISSION SHAFT RETAINING RING PLIERS | 6.8 TRANSMISSION, Mainshaft |
| MT37A | SNAP-ON ENGINE OIL PRESSURE GAUGE SET | 3.3 TROUBLESHOOTING, Oil Pressure Test |
| PR7 | SNAP-ON RETAINING RING PLIERS | 4.9 FUEL PUMP, Fuel Pump: Removal |
| PR7 | SNAP-ON RETAINING RING PLIERS | 4.9 FUEL PUMP, Fuel Pump: Installation |
| PR7 | SNAP-ON RETAINING RING PLIERS | 7.24 COOLING FANS, Fuel Pump: Installation |
| PRS10 | SNAP-ON PISTON RING EXPANDER | 3.9 CYLINDERS AND PISTONS, Removal and Disassembly |
| PRS10 | SNAP-ON RING EXPANDER | 3.9 CYLINDERS AND PISTONS, Assembly and Installation |

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# Tools Used in This Manual

| PART NUMBER | TOOL NAME | NOTES |
|---|---|---|
| RC500 | SNAP-ON RING GROOVE CLEANER | 3.9 CYLINDERS AND PISTONS, Cleaning and Inspection |
| SDD1410 | SNAP-ON SCREWDRIVER | 5.7 COOLANT PIPES AND HOSES, Removal |
| SNAP-ON CJ1275 | SLIDE HAMMER | 2.12 SWINGARM AND BRACE, Swingarm: Repair |
| SNAP-ON TT600-3 | PICK | A.1 AMP MULTILOCK CONNECTORS, AMP Multilock Connector Repair |
| SNAP-ON TT600-3 | SNAP-ON PICK | A.13 PACKARD 630 METRI-PACK CONNECTORS, 630 Metri-Pack Connector Repair |
| TBFT 02S | FORK BLEED TOOL SET | 2.9 FRONT FORK, Assembly |

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# NOTES

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Active intake bracket fastener | 10.6-11.8 Nm | 94-104 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Active intake cable connector | 4.1-4.5 Nm | 36-40 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Active intake cable jamnut | 5.4-6.7 Nm | 48-60 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Active intake solenoid fasteners | 2.7-3.0 Nm | 23.5-26.0 **in-lbs** | 4.6 ACTIVE INTAKE, Installation |
| Air cleaner baseplate fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 4.2 AIR CLEANER ASSEMBLY, Baseplate |
| Air flow guide fastener | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Axle, front | 53-56 Nm | 39-41 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Axle, front | 53-56 Nm | 39-41 ft-lbs | 2.6 WHEELS, Front Wheel/LOCTITE ANTI-SEIZE, left handed thread |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 2.6 WHEELS, Rear Wheel/Initial torque, back off 2 turns, final torque. |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 2.12 SWINGARM AND BRACE, Brace |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider/Initial torque, back off 2 turns, final torque. |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation/Initial torque, back off 2 turns, final torque. |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Axle, rear (final torque) | 65.1-70.5 Nm | 48-52 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 2.6 WHEELS, Rear Wheel/Initial torque, back off 2 turns, final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 2.12 SWINGARM AND BRACE, Brace/After initial torque, back off two turns and tighten to final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider/Initial torque, back off 2 turns, final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation/Initial torque, back off 2 turns, final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation/Apply LOCTITE ANTI-SEIZE LUBRICANT. Back off 2 turns and final torque. |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Axle, rear (initial torque) | 31.2-36.6 Nm | 23-27 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 2.6 WHEELS, Rear Wheel |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 2.12 SWINGARM AND BRACE, Brace |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Axle pinch bolt, rear | 54-61 Nm | 40-45 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Axle pinch bolts, front | 27-30 Nm | 20-22 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |

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| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Axle pinch bolts, front | 27-30 Nm | 20-22 ft-lbs | 2.6 WHEELS, Front Wheel/Alternate twice between bolts. |
| Axle slider fastener | 7.9-8.8 Nm | 70-78 **in-lbs** | 2.12 SWINGARM AND BRACE, Axle Sliders |
| BAS | 3.6-4.1 Nm | 32-36 **in-lbs** | 4.3 SENSORS, Bank Angle Sensor (BAS) |
| Battery cable fastener | 6.8-7.9 Nm | 60-70 **in-lbs** | 4.9 FUEL PUMP, Fuel Pump: Installation |
| Battery cable fastener | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.24 COOLING FANS, Fuel Pump: Installation |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover |
| Battery ground nut | 9.6-10.6 Nm | 85-94 **in-lbs** | 7.7 BATTERY CABLES, Negative Battery Cable |
| Battery ground set screw | 6.1-6.8 Nm | 54-60 **in-lbs** | 4.8 FUEL TANK, Tank Set Screws/Set screw w/lock patch |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 1.14 BATTERY MAINTENANCE, Installation and Connection |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 1.14 BATTERY MAINTENANCE, Installation and Connection |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 4.8 FUEL TANK, Vent Valve |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.7 BATTERY CABLES, Negative Battery Cable |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.7 BATTERY CABLES, Positive Battery Cable |
| Battery terminal fasteners | 6.8-7.9 Nm | 60-70 **in-lbs** | 7.7 BATTERY CABLES, Positive Battery Cable |
| Belt guard aluminum plate fasteners (front three), lower | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard aluminum plate fasteners (rear one), lower | 2.3-2.5 Nm | 20-22 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard fasteners, lower | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard fasteners, lower | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Belt guard fasteners, lower | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Belt guard fasteners, upper | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Belt guard fasteners, upper | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Belt guard fasteners, upper | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Brake caliper bleeder valve | 4-7 Nm | 36-60 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Brake caliper fasteners, front | 48-50 Nm | 35-37 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement/LOCTITE 271 (red) |
| Brake caliper mounting bolts, rear | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.6 WHEELS, Rear Wheel |
| Brake caliper mounting fasteners, rear | 24-27 Nm | 18-20 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Brake fluid line P-clamp fastener, rear | 9.7-11.0 Nm | 84-96 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Brake fluid line P-clamp fastener, rear (at front of swingarm) | 9.6-10.6 Nm | 7-8 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Brake fluid line P-clamp fastener, rear (at rear of swingarm) | 24.4-27.1 Nm | 18-20 ft-lbs | 2.6 WHEELS, Rear Wheel |
| Brake fluid line P-clamp fastener, rear (at rear of swingarm) | 24.4-27.1 Nm | 18-20 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Brake lever pivot bolt | 0.5-1.5 Nm | 4.4-13.2 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Hand Lever |
| Brake lever pivot bolt nut | 4.9-6.9 Nm | 43-61 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Hand Lever |
| Brake light switch, rear | 22-27 Nm | 16-20 ft-lbs | 7.17 SWITCHES AND CONNECTORS, Brake Light Switch: Rear |
| Brake light switch/reservoir banjo bolt, rear | 22-27 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Master Cylinder/Reservoir: Installation |
| Brake light switch fastener, front | 0.8-1.1 Nm | 7-10 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake light switch fastener, front | 0.8-1.1 Nm | 7-10 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Brake Light Switch: Front |
| Brake light switch fastener, front | 0.8-1.1 Nm | 7-10 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Clutch Interlock Switch |
| Brake line P-clamp, front | 4-7 Nm | 36-60 **in-lbs** | 2.6 WHEELS, Front Wheel |
| Brake line P-clamp, front | 4-7 Nm | 36-60 **in-lbs** | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Brake line P-clamp, front | 9.5-10.9 Nm | 7-8 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| Brake line P-clamp, rear | 24.4-27.1 Nm | 18-20 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| Brake master cylinder to footpeg support | 9.6-10.6 Nm | 84-96 **in-lbs** | 2.8 REAR BRAKE, Master Cylinder/Reservoir: Installation |
| Brake pedal adjuster locknut | 14.7-19.6 Nm | 11-15 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pedal Adjustment |
| Brake pedal fastener, rear | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.8 REAR BRAKE, Rear Brake Pedal/Apply LOC-TITE 271 (red). |
| Brake pin hanger set, front | 14.7-19.6 Nm | 11-15 ft-lbs | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Brake pin hanger set, front | 14.7-19.6 Nm | 11-15 ft-lbs | 2.7 FRONT BRAKE, Caliper: Removal and Installation |
| Brake reservoir/light switch banjo bolt, rear | 21.7-27.1 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Brake reservoir banjo bolt, front | 22-27 Nm | 16-20 ft-lbs | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir banjo bolt, front | 22-27 Nm | 16-20 ft-lbs | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Brake reservoir clamp fasteners, front | 9.0-10.2 Nm | 80-90 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir clamp fasteners, front | 9.0-10.2 Nm | 80-90 **in-lbs** | 2.17 HANDLEBARS: 1125R, Right Clip-on |
| Brake reservoir clamp fasteners, front | 9.0-10.2 Nm | 80-90 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Right Side |
| Brake reservoir cover fasteners, front | 1-2 Nm | 9-18 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir cover screws, front | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |

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| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Brake reservoir cover screws, front | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Bleeding Brakes |
| Brake reservoir cover screws, front | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Brake reservoir fastener, rear | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.8 REAR BRAKE, Master Cylinder/Reservoir: Installation |
| Brake reservoir fastener, rear | 5.7-6.4 Nm | 50.6-56.2 **in-lbs** | 7.8 STARTER, Solenoid |
| Brake reservoir fasteners, rear | 3.6-4.1 Nm | 32-36 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Brake reservoir fasteners, rear | 3.6-4.1 Nm | 32-36 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Brake rotor fasteners, rear | 34-37 Nm | 25-27 ft-lbs | 2.6 WHEELS, Repair |
| Breather hose fitting | 5 Nm | 44 **in-lbs** | 3.11 ALTERNATOR SIDE, Crankcase Breather |
| Caliper banjo bolt, front | 22-27 Nm | 16-20 ft-lbs | 2.7 FRONT BRAKE, Front Brake Fluid Line |
| Caliper banjo bolt, rear | 21.7-27.1 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Brake Fluid Line |
| Caliper banjo bolt, rear | 21.7-27.1 Nm | 16-20 ft-lbs | 2.8 REAR BRAKE, Caliper |
| Caliper bleeder valve, front | 3.9-6.9 Nm | 35-63 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Bleeding Brakes |
| Caliper bleeder valve, front | 3.9-6.9 Nm | 35-61 **in-lbs** | 2.7 FRONT BRAKE, Master Cylinder/Reservoir: Removal |
| Caliper bleeder valve, front | 3.9-6.9 Nm | 35-61 **in-lbs** | 2.7 FRONT BRAKE, Caliper: Removal and Installation |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Bleeding Brakes |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 2.8 REAR BRAKE, Master Cylinder/Reservoir Removal |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 2.8 REAR BRAKE, Brake Fluid Line |
| Caliper bleeder valve, rear | 7.3-9.6 Nm | 65-85 **in-lbs** | 2.8 REAR BRAKE, Caliper |
| Caliper fasteners, front | 24.5-29.4 Nm | 18-22 ft-lbs | 2.7 FRONT BRAKE, Caliper: Repair |
| Caliper mounting fasteners, front | 48-50 Nm | 35-37 ft-lbs | 2.6 WHEELS, Front Wheel |
| Caliper mounting fasteners, front | 47-50 Nm | 35-37 ft-lbs | 2.7 FRONT BRAKE, Caliper: Removal and Installation/LOCTITE 271 (red) |
| Caliper mounting large fastener, rear | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.8 REAR BRAKE, Caliper |
| Camshaft bracket fastener | 10 Nm | 89 **in-lbs** | 3.7 CAMSHAFT ASSEMBLY, Installation (If camshafts or cam sprocket were not removed) |
| Camshaft bracket fastener | 10 Nm | 89 **in-lbs** | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| Camshaft chain tensioner plug | 30 Nm | 22 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Installation (If camshafts or cam sprocket were not removed) |
| Camshaft chain tensioner plug | 30 Nm | 22 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| Camshaft gear fasteners | 40 Nm | 30 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation/Tighten then turn +80 degrees. |
| Camshaft sprocket fastener | 30 Nm | 22 ft-lbs | 3.7 CAMSHAFT ASSEMBLY, Assembly/Installation |
| Case plug: clutch shaft bearing, left case | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Case plug: oil nozzle, left case | 21 Nm | 15.5 ft-lbs | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Case plug: oil nozzle, right case | 21 Nm | 15.5 ft-lbs | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Case plug: pressure cavity, left case | 12 Nm | 106 **in-lbs** | 3.13 CRANKCASE, Oil Passage Plugs/Apply LOCTITE 243 (blue). |
| Center cap bolt | 27-40.6 Nm | 20-30 ft-lbs | 2.9 FRONT FORK, Assembly |
| Chain guide fasteners | 11 Nm | 97 **in-lbs** | 3.12 VALVE TRAIN DRIVE, Front Cylinder |
| Chain guide fasteners | 11 Nm | 97 **in-lbs** | 3.12 VALVE TRAIN DRIVE, Rear Cylinder |
| CKP fastener | 11 Nm | 97 **in-lbs** | 7.22 ENGINE HARNESS, Installation |
| CKP sensor screw | 11 Nm | 97 **in-lbs** | 7.18 CRANKSHAFT POSITION SENSOR (CKP), Installation |
| Clip-on fastener | 33-35 Nm | 24-26 ft-lbs | 2.17 HANDLEBARS: 1125R, Left Clip-On |
| Clip-on fastener | 33-35 Nm | 24-26 ft-lbs | 2.17 HANDLEBARS: 1125R, Right Clip-on |
| Clutch cover fasteners | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Cover/Tighten the starting fastener first and last. |
| Clutch fluid bleeder valve | 5 Nm | 44 **in-lbs** | 1.9 BLEEDING CLUTCH FLUID LINE, Bleeding |
| Clutch fluid bleeder valve | 5 Nm | 44 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Clutch hub nut | 170 Nm | 125 ft-lbs | 6.5 CLUTCH, Clutch Basket |
| Clutch interlock switch fastener | 0.8-1.1 Nm | 7-10 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch lever pivot bolt | 0.5-1.5 Nm | 4-13 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Lever Removal and Installation |
| Clutch lever pivot bolt nut | 4.9-6.9 Nm | 36-60 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Lever Removal and Installation |
| Clutch line banjo bolt (engine) | 21.7-27.1 Nm | 16-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Clutch line P-clamp fastener | 4.1-6.9 Nm | 36-60 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Clutch master cylinder banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch master cylinder banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Clutch release pin spherical nut | 14 Nm | 124 **in-lbs** | 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator/LOCTITE 243 (blue) |
| Clutch reservoir banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 1.9 BLEEDING CLUTCH FLUID LINE, Bleeding |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 2.17 HANDLEBARS: 1125R, Left Clip-On |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Left Side |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Clutch reservoir clamp fasteners | 7.8-12.7 Nm | 69-112 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.9 BLEEDING CLUTCH FLUID LINE, Hydraulic Clutch: Buell 1125 Models |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.9 BLEEDING CLUTCH FLUID LINE, Bleeding |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Checking Fluid Level |
| Clutch reservoir cover screws | 1.0-1.5 Nm | 9-13 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir Installation |
| Clutch shaft bearing retaining screw | 11 Nm | 97 **in-lbs** | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Clutch Shaft/Apply LOCTITE 243 (blue). |
| Clutch spring fasteners | 10 Nm | 89 **in-lbs** | 6.5 CLUTCH, Clutch Pack/Bottom fastener and then tighten. |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Connecting rod fasteners (initial torque) | 28-32 Nm | 21-23 ft-lbs | 3.14 CRANKSHAFT, Assembly/See special method to tighten. |
| Cooling fan fasteners | 9.7-10.9 Nm | 86-96 **in-lbs** | 7.24 COOLING FANS, Installation |
| Cooling fan fasteners | 9.7-10.9 Nm | 86-96 **in-lbs** | 7.24 COOLING FANS, Installation |
| Crankcase bolts | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Join Crankcase Halves |
| Crankshaft locking tool plug | 15 Nm | 11 ft-lbs | 7.10 ALTERNATOR, Assembly and Installation |
| Crankshaft nut | 220 Nm | 162 ft-lbs | 3.10 CLUTCH SIDE, Balancer: Bottom/Apply LOCTITE 648 (green) to the crankshaft threads. |
| Crankshaft nut | 280-290 Nm | 207-214 ft-lbs | 7.10 ALTERNATOR, Assembly and Installation |
| Cylinder head fasteners, large | 35 Nm | 26 ft-lbs | 3.8 CYLINDER HEADS, Cylinder Head: Installation/1. Finger tighten 2. Tighten to spec. 3. Turn 90 degrees. 4. Turn 20 degrees. |
| Cylinder head fasteners, small | 11 Nm | 97 **in-lbs** | 3.8 CYLINDER HEADS, Cylinder Head: Installation |
| Damper rod jamnut | 30-41 Nm | 22-30 ft-lbs | 2.9 FRONT FORK, Assembly |
| Detent wheel fastener | 11 Nm | 97 **in-lbs** | 6.7 SHIFT LINKAGE, Detent Wheel/Apply LOCTITE 243 (blue). |
| Diaphragm clutch release pin nut | 15 Nm | 133 **in-lbs** | 6.5 CLUTCH, Vacuum Assist Diaphragm/LOCTITE 243 (blue) |
| Drive sprocket fasteners | 48-50 Nm | 35-37 ft-lbs | 2.6 WHEELS, Repair |
| ECM locknut | 4.0-4.5 Nm | 36-40 **in-lbs** | 7.5 ELECTRONIC CONTROL MODULE (ECM), Replacement |
| Engine coolant temperature (ECT) sensor | 18 Nm | 13.3 ft-lbs | 5.3 COOLANT FLOW, Engine Coolant Temperature (ECT) Sensor |
| Engine oil drain plug, left | 25 Nm | 18 ft-lbs | 1.3 MAINTENANCE SCHEDULE, General |
| Engine oil drain plug, left | 25 Nm | 18 ft-lbs | 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models |
| Engine oil drain plug, right | 15 Nm | 11 ft-lbs | 1.3 MAINTENANCE SCHEDULE, General |
| Engine oil drain plug, right | 15 Nm | 11 ft-lbs | 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models |
| Engine sprocket cover fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Engine sprocket cover fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Engine wire harness ground | 10 Nm | 89 **in-lbs** | 7.22 ENGINE HARNESS, Installation |
| Engine wire harness support fasteners | 11 Nm | 97 **in-lbs** | 7.22 ENGINE HARNESS, Installation |
| Fairing fasteners, lower | 8.1-9.5 Nm | 72-84 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Fairing fasteners, lower | 8.1-9.5 Nm | 72-84 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing |
| Fairing support bracket fasteners | 21.7-24.4 Nm | 16-18 ft-lbs | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Fender fasteners, front | 8.4-9.2 Nm | 74-82 **in-lbs** | 1.11 BRAKE SYSTEM MAINTENANCE, Brake Pad Replacement |
| Fender fasteners, front | 8.4-9.3 Nm | 74-82 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Fender fasteners, front | 8.4-9.3 Nm | 74-82 **in-lbs** | 2.6 WHEELS, Front Wheel |
| Fender fasteners, front | 8.4-9.2 Nm | 74-82 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Fender fasteners, front | 8.4-9.2 Nm | 74-82 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Fender fasteners, rear | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Fender fasteners, rear | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Final drive sprocket bolt | 110 Nm | 81 ft-lbs | 6.10 FINAL DRIVE SPROCKET, Pulley Assembly |
| Footpeg mount fasteners, passenger | 34-38 Nm | 25-28 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger/LOCTITE 271 (red) |
| Footpeg mount fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Footpeg mount fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Footpeg support bracket fasteners, rider | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Footpeg support bracket fasteners, rider/idler pulley support bracket fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Fork cap | 30-41 Nm | 22-30 ft-lbs | 2.9 FRONT FORK, Assembly |
| Fork drum bearing retaining screw | 11 Nm | 97 **in-lbs** | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Fork Drum/Apply LOCTITE 243 (blue). |
| Fork tube clamp bolts | 27.1-29.8 Nm | 20-22 ft-lbs | 2.9 FRONT FORK, Installation/Tighten upper bolt, lower bolt and repeat upper bolt on both sides. |
| Fork tube clamp bolts | 27.1-29.8 Nm | 20-22 ft-lbs | 2.10 STEERING HEAD BEARINGS, Installation |
| Friction clutch cover fasteners | 11 Nm | 97 **in-lbs** | 3.11 ALTERNATOR SIDE, Starter Friction Clutch |
| Fuel cap retaining ring fasteners | 7-8 Nm | 62-71 **in-lbs** | 4.8 FUEL TANK, Fuel Cap Retaining Ring |
| Fuel injector jet holder fastener | 10 Nm | 88 **in-lbs** | 4.5 THROTTLE BODY, Fuel Injectors |
| Fuel pressure sensor | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.3 SENSORS, Fuel Pressure Sensor |
| Fuel pressure sensor | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.5 THROTTLE BODY, Fuel Rail |
| Fuel pump cover set screw | 4.6-5.1 Nm | 41-45 **in-lbs** | 4.8 FUEL TANK, Tank Set Screws |
| Fuel tank drain plug | 8.1-10.8 Nm | 72-96 **in-lbs** | 4.8 FUEL TANK, Draining the Fuel Tank |
| Fuel tank vent valve fasteners | 3.6-4.0 Nm | 32-36 **in-lbs** | 4.8 FUEL TANK, Vent Valve |
| Handlebar clamp fasteners, 1125CR | 13.6-16.3 Nm | 10-12 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR |
| Handlebar clamp fasteners, 1125CR | 13.6-16.3 Nm | 120-144 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Handlebar |
| Handlebar fastener | 32.5-35.2 Nm | 24-26 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125R |
| Handlebar lever bracket clamp screw | 9.0-10.2 Nm | 80-90 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Header flange nuts | 20 Nm | 15 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Header flange nuts | 20 Nm | 15 ft-lbs | 4.7 EXHAUST SYSTEM, Headers |
| Header flange nuts | 20 Nm | 14.8 ft-lbs | 4.7 EXHAUST SYSTEM, Headers |
| Header flange nuts | 20 Nm | 15 ft-lbs | 4.7 EXHAUST SYSTEM, Muffler: Installation |
| Header heat shield fasteners | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.7 EXHAUST SYSTEM, Headers |
| Headlamp assembly fasteners | 6.1-7.5 Nm | 54-66 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Headlamp Assembly |
| Headlamp assembly fasteners | 6.1-7.5 Nm | 54-66 **in-lbs** | 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR, Headlamp Assembly |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Headlamp module | 9.6-10.6 Nm | 85-94 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Heat deflector fastener | 3.6-4.1 Nm | 32-36 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Heat deflector fastener | 3.6-4.1 Nm | 32-36 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Heat deflector fastener | 6.8-8.1 Nm | 60-72 **in-lbs** | 4.3 SENSORS, Oxygen Sensors (O2) |
| Heel guard fasteners, passenger | 5-8 Nm | 48-72 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Passenger |
| Heel guard fasteners, rider | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Horn fastener | 8.1-10.8 Nm | 72-96 **in-lbs** | 7.11 HORN, Installation |
| Hose clamps | 3.2-3.5 Nm | 28-31 **in-lbs** | 5.5 THERMOSTAT, Installation |
| IAC screws | 2.7-3.2 Nm | 24-28 **in-lbs** | 4.4 THROTTLE CONTROL, Idle Air Control (IAC) |
| Idler pulley bracket fastener | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Idler pulley bracket fastener | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Idler pulley locknut | 27.1-31.2 Nm | 20-23 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Idler pulley locknut | 27.1-31.2 Nm | 20-23 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Idler |
| Ignition coil fastener | 12 Nm | 106 **in-lbs** | 1.12 SPARK PLUGS, Replacement |
| Ignition coil fastener | 11 Nm | 97 **in-lbs** | 7.6 IGNITION COILS, Front |
| Ignition coil fastener | 11 Nm | 97 **in-lbs** | 7.6 IGNITION COILS, Rear |
| Ignition cover fasteners | 11 Nm | 97 **in-lbs** | 3.11 ALTERNATOR SIDE, Ignition Cover |
| Ignition switch fasteners | 1.4-4.1 Nm | 13-36 **in-lbs** | 7.3 IGNITION SWITCH/FORK LOCK: 1125R, Repair |
| Ignition switch mounting fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR |
| Ignition switch mounting fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 7.3 IGNITION SWITCH/FORK LOCK: 1125R, Replacement |
| Ignition switch mounting fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 7.4 IGNITION SWITCH/FORK LOCK: 1125CR, Replacement |
| Index shim fastener | 11 Nm | 97 **in-lbs** | 6.7 SHIFT LINKAGE, Index Shim/Apply LOCTITE 243 (blue) |
| Instrument cluster nuts | 1.4-4.1 Nm | 12-36 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Support Bracket |
| Instrument cluster nuts | 1.4-4.1 Nm | 12-36 **in-lbs** | 7.21 INSTRUMENT CLUSTER, Replacement: 1125R |
| Instrument cluster nuts | 1.4-4.1 Nm | 12-36 **in-lbs** | 7.21 INSTRUMENT CLUSTER, Replacement: 1125CR |
| Intake cover fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Intake cover fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 1.6 AIR FILTER ELEMENT, Intake Cover |
| Intake cover fasteners | 6.1-6.8 Nm | 54-60 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Intake flange screws | 18 Nm | 13 ft-lbs | 4.5 THROTTLE BODY, Throttle Body Installation |
| Intake snorkel fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Intake snorkel fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| K-bracket to engine fasteners | 46-51 Nm | 34-38 ft-lbs | 2.13 FRAME, K-Brackets |
| K-bracket to engine fasteners | 46-51 Nm | 34-38 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| K-bracket to engine fasteners | 46-51 Nm | 34-38 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| K-bracket to frame fasteners | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 2.13 FRAME, K-Brackets |
| K-bracket to frame fasteners | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| K-bracket to frame fasteners | 31.8-35.3 Nm | 23.5-26.0 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| License plate lamp lens fasteners | 2.7-3.0 Nm | 24-27 **in-lbs** | 7.15 TAIL AND LICENSE PLATE LAMP, License Plate Lamp |
| Mainshaft bearing retaining screw, left case | 11 Nm | 97 **in-lbs** | 6.9 TRANSMISSION CASE BEARINGS AND SEALS, Mainshaft/Apply LOCTITE 243 (blue). |
| Motor mount fasteners | 46-51 Nm | 34-38 ft-lbs | 2.13 FRAME, Motor Mounts |
| Motor mount fasteners | 46-51 Nm | 34-38 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Motor mount fasteners | 46-51 Nm | 34-38 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Motor mount pinch bolts | 24.5-27.0 Nm | 18-20 ft-lbs | 2.13 FRAME, Motor Mounts |
| Motor mount pinch screws | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Motor mount pinch screws | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 3.4 ENGINE ROTATION, Up Rotation |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Muffler fasteners | 24.5-27.0 Nm | 18-20 ft-lbs | 4.7 EXHAUST SYSTEM, Muffler: Installation |
| Muffler Torca clamps | 9.5-10.8 Nm | 84-96 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Muffler Torca clamps | 9.5-10.8 Nm | 84-96 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Muffler Torca clamps | 9.5-10.8 Nm | 84-96 **in-lbs** | 4.7 EXHAUST SYSTEM, Muffler: Installation |
| Neutral indicator switch | 2-3 Nm | 18-27 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Neutral Indicator Switch/LOCTITE 5331 Sealant |
| O2 sensor, front | 54-61 Nm | 40-45 ft-lbs | 4.3 SENSORS, Oxygen Sensors (O2)/ANTI-SEIZE |
| O2 sensor, rear | 54-61 Nm | 40-45 ft-lbs | 4.3 SENSORS, Oxygen Sensors (O2)/ANTI-SEIZE |
| Oil cooler top mounting bolt | 24.5-27.0 Nm | 18-20 ft-lbs | 5.9 OIL COOLER, Installation |
| Oil duct cover fasteners | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Oil Sump |
| Oil filter cover fasteners | 11 Nm | 97 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Oil filter cover fasteners | 11 Nm | 97 **in-lbs** | 1.5 ENGINE OIL AND FILTER, Engine Oil Change: Buell 1125 Models/TORX |
| Oil filter cover fasteners | 11 Nm | 97 **in-lbs** | 3.11 ALTERNATOR SIDE, Oil Filter |
| Oil line fitting | 14.9-17.6 Nm | 11-13 ft-lbs | 5.9 OIL COOLER, Oil Line Fittings |
| Oil nozzle | 21 Nm | 15.5 ft-lbs | 3.13 CRANKCASE, Oil Nozzles |
| Oil pressure signal lamp switch | 15 Nm | 133 **in-lbs** | 3.3 TROUBLESHOOTING, Oil Pressure Test |
| Oil pressure switch | 15 Nm | 133 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Oil Pressure Switch/Apply LOCTITE 243 (red). |
| Oil pump cover screws | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Oil Pump |
| Oil strainer cover fasteners | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Oil Strainer |
| Oil sump baffle fasteners | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, Oil Sump |
| Overflow tank fasteners | 4.75-6.10 Nm | 42-54 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Overflow tank fasteners | 4.75-6.10 Nm | 42-54 **in-lbs** | 5.8 RADIATORS, Installation |
| Overflow tank fasteners | 4.75-6.10 Nm | 42-54 **in-lbs** | 5.8 RADIATORS, Overflow Tank |
| P-clamp fastener, clutch cover | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, P-Clamp |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| P-clamp fastener, clutch fluid line | 4-7 Nm | 36-60 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| P-clamp fastener, engine | 11 Nm | 97 **in-lbs** | 3.13 CRANKCASE, P-Clamp |
| Pillion latch plate fasteners | 6.8-10.9 Nm | 60-96 **in-lbs** | 2.20 SEAT, Pillion Lock |
| Pressure retaining valve | 30 Nm | 22 ft-lbs | 3.11 ALTERNATOR SIDE, Pressure Retaining Valve |
| Primary drive assembly fasteners (final torque) | 30 Nm | 22.1 ft-lbs | 6.6 PRIMARY DRIVE, Primary Drive Assembly |
| Primary drive assembly fasteners (initial torque) | 12 Nm | 106 **in-lbs** | 6.6 PRIMARY DRIVE, Primary Drive Assembly/Apply LOCTITE 648 (green) |
| Radiator bypass bracket nut | 8.2-9.2 Nm | 73-82 **in-lbs** | 5.9 OIL COOLER, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator inlet duct fasteners | 9.7-10.9 Nm | 86-96 **in-lbs** | 4.3 SENSORS, Oxygen Sensors (O2) |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator inlet duct fasteners | 8.2-9.2 Nm | 73-82 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator outlet duct fasteners | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 1.15 ENGINE COOLANT, Coolant Level: Buell 1125 Models |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 4.3 SENSORS, Bank Angle Sensor (BAS) |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 4.3 SENSORS, Oxygen Sensors (O2) |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.4 ENGINE COOLANT, Freeze Point Test |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.4 ENGINE COOLANT, Replacing Coolant |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.4 ENGINE COOLANT, Replacing Coolant |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 5.8 RADIATORS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 7.5 ELECTRONIC CONTROL MODULE (ECM), Replacement |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 7.24 COOLING FANS, Installation |
| Radiator shroud fasteners | 9.0-9.9 Nm | 80-88 **in-lbs** | 7.24 COOLING FANS, Installation |
| Ram air intake snorkel fastener | 13.0-14.5 Nm | 115-128 **in-lbs** | 4.2 AIR CLEANER ASSEMBLY, Ram Air Intake Snorkel |
| Rider seat screws | 9.6-10.6 Nm | 85-94 **in-lbs** | 2.20 SEAT, Installation |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Rotor mounting fasteners, front | 34-37 Nm | 25-27 ft-lbs | 2.6 WHEELS, Inspection and Repair/Metric, replace with new |
| Rotor to sprag clutch housing fasteners | 30 Nm | 22 ft-lbs | 7.10 ALTERNATOR, Assembly and Installation/Apply LOCTITE 648 (green). |
| Secondary actuator banjo bolt | 21.7-27.1 Nm | 16-20 ft-lbs | 6.4 CLUTCH ACTUATOR, Clutch Fluid Line |
| Secondary clutch actuator bleeder valve | 5 Nm | 44.3 **in-lbs** | 6.4 CLUTCH ACTUATOR, Clutch Master Cylinder/Reservoir: Removal |
| Secondary clutch actuator cover fasteners | 10 Nm | 89 **in-lbs** | 6.4 CLUTCH ACTUATOR, Secondary Clutch Actuator |
| Shift lever fastener | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Shift lever fastener | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Shift lever screw | 9.6-10.6 Nm | 85-94 **in-lbs** | 6.7 SHIFT LINKAGE, Shift Lever |
| Shift lever screw | 9.6-10.6 Nm | 85-94 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Shift lever toepeg screw | 5.4-8.1 Nm | 48-72 **in-lbs** | 6.7 SHIFT LINKAGE, Shift Lever |
| Shock mount fastener, lower | 20-23 Nm | 15-17 ft-lbs | 2.11 SHOCK ABSORBER, Replacement |
| Shock mount fastener, lower | 20-23 Nm | 15-17 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation |
| Shock mount fastener, lower | 20-23 Nm | 15-17 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Shock mount fastener, upper | 46.1-51.5 Nm | 34-38 ft-lbs | 2.11 SHOCK ABSORBER, Replacement |
| Shock mount fastener, upper | 46.1-51.5 Nm | 34-38 ft-lbs | 2.14 SUBFRAME, Subframe |
| Sidestand bracket fasteners | 46.1-51.5 | 34-38 ft-lbs | 2.21 SIDESTAND, Sidestand |
| Sidestand bracket fasteners | 46.1-51.5 Nm | 34-38 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Sidestand sensor fastener | 10-13 Nm | 96-144 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Sidestand Sensor (HDI) |
| Sidestand stop bracket fastener | 9.5-10.8 Nm | 84-96 **in-lbs** | 2.21 SIDESTAND, Sidestand Stop Bracket |
| Sidestand stop bracket fastener | 9.5-10.8 Nm | 84-96 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Spark plug | 11 Nm | 97 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Spark plug | 11 Nm | 97 **in-lbs** | 1.12 SPARK PLUGS, Replacement |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 4.8 FUEL TANK, Draining the Fuel Tank |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Neutral Indicator Switch |
| Sprocket cover | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.17 SWITCHES AND CONNECTORS, Sidestand Sensor (HDI) |
| Starter cable | 9.6-10.6 Nm | 85-94 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Starter cable | 9.6-10.6 Nm | 85-94 **in-lbs** | 7.8 STARTER, Starter: Installation |
| Starter cable | 9.6-10.6 Nm | 85-94 **in-lbs** | 7.23 MAIN WIRE HARNESS, Installation |
| Starter fasteners | 11 Nm | 97 **in-lbs** | 7.8 STARTER, Starter: Installation |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 36-60 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Starter solenoid cover fastener | 4.1-6.8 Nm | 36-60 **in-lbs** | 3.4 ENGINE ROTATION, Up Rotation |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 36-60 **in-lbs** | 3.5 ENGINE REPLACEMENT, Engine Installation |
| Starter solenoid cover fastener | 4.1-6.9 Nm | 36-60 **in-lbs** | 7.8 STARTER, Solenoid |
| Starter solenoid cover fastener | 4.1-6.8 Nm | 37-60 **in-lbs** | 7.23 MAIN WIRE HARNESS, Installation |
| Starter solenoid nuts | 5.7-6.4 Nm | 51-56 **in-lbs** | 7.7 BATTERY CABLES, Positive Battery Cable |
| Starter solenoid nuts | 5.7-6.4 Nm | 51-56 **in-lbs** | 7.8 STARTER, Solenoid |
| Starter solenoid nuts | 5.7-6.4 Nm | 51-56 **in-lbs** | 7.23 MAIN WIRE HARNESS, Installation |
| Stator cable cover fasteners | 4 Nm | 35 **in-lbs** | 7.10 ALTERNATOR, Assembly and Installation/LOCTITE 243 (blue |
| Stator fasteners | 11 Nm | 97 **in-lbs** | 7.10 ALTERNATOR, Assembly and Installation/LOCTITE 243 (blue) |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 1.17 STEERING HEAD BEARINGS, Resistance Test |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125R |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR |
| Steering stem capnut | 51.5-56.9 Nm | 38-42 ft-lbs | 2.10 STEERING HEAD BEARINGS, Installation |
| Steering stem pinch bolt | 27-29 Nm | 20-21 ft-lbs | 1.17 STEERING HEAD BEARINGS, Resistance Test |
| Steering stem pinch bolt | 27-30 Nm | 20-22 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125R/LOCTITE 271 (red) |
| Steering stem pinch bolt | 27-30 Nm | 20-22 ft-lbs | 2.9 FRONT FORK, Fork Clamps: 1125CR/LOCTITE 271 (red) |
| Steering stem pinch bolt | 27.1-29.8 Nm | 20-22 ft-lbs | 2.10 STEERING HEAD BEARINGS, Installation |
| Subframe battery tray pan fastener | 7.3-8.2 Nm | 65-73 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Subframe fastener | 28.5-31.2 Nm | 21-23 ft-lbs | 2.14 SUBFRAME, Subframe/Apply LOCTITE 268 (red). |
| Subframe front pan fastener | 13.0-14.4 Nm | 115-128 **in-lbs** | 2.14 SUBFRAME, Subframe Pan |
| Swingarm brace fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 2.12 SWINGARM AND BRACE, Brace |
| Swingarm brace fasteners | 24.4-27.1 Nm | 18-20 ft-lbs | 6.11 DRIVE BELT AND IDLER PULLEY, Drive Belt Installation |
| Swingarm pivot shaft | 60-62 Nm | 44-46 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation/ANTI-SEIZE |
| Swingarm pivot shaft | 60-62 Nm. | 44-46 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation/Apply LOCTITE ANTI-SEIZE LUBRICANT. |
| Swingarm pivot shaft pinch bolt | 27.1-29.8 Nm | 20-22 ft-lbs | 2.12 SWINGARM AND BRACE, Swingarm: Installation/LOCTITE 271 (red) |
| Swingarm pivot shaft pinch bolt | 27.1-29.8 Nm | 20-22 ft-lbs | 3.5 ENGINE REPLACEMENT, Engine Installation/Apply LOCTITE 271 (red). |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.17 HANDLEBARS: 1125R, Left Clip-On |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.17 HANDLEBARS: 1125R, Right Clip-on |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Left Side |
| Switch housing fasteners | 3-4 Nm | 27-35 **in-lbs** | 2.18 HANDLEBARS: 1125CR, Right Side |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 1.3 MAINTENANCE SCHEDULE, General |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 4.4 THROTTLE CONTROL, Throttle Control |
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 7.20 HANDLEBAR SWITCH HOUSINGS, Left Switch Housing |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Switch housing screws | 3-4 Nm | 27-35 **in-lbs** | 7.20 HANDLEBAR SWITCH HOUSINGS, Right Switch Housing |
| Tail lamp fasteners | 0.7-0.8 Nm | 6-7 **in-lbs** | 7.15 TAIL AND LICENSE PLATE LAMP, Tail Lamp |
| Tail section fasteners | 3.9-4.3 Nm | 34-38 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Tail section fasteners | 3.9-4.3 Nm | 34-38 **in-lbs** | 2.14 SUBFRAME, Tail Section |
| Thermostat housing fasteners | 10.2-11.3 Nm | 90-100 **in-lbs** | 5.5 THERMOSTAT, Installation |
| Throttle body intake neck clamps | 2 Nm | 18 **in-lbs** | 4.5 THROTTLE BODY, Throttle Body Installation |
| Throttle cable jamnuts at throttle body | 4.0-4.6 Nm | 36-40 **in-lbs** | 4.4 THROTTLE CONTROL, Throttle Cable Replacement |
| Triple clamp fasteners, lower | 27-30 Nm | 20-22 ft-lbs | 1.17 STEERING HEAD BEARINGS, Resistance Test |
| Turn signal/mirror mounting fasteners, 1125CR | 24.4-27.0 Nm | 18-20 ft-lbs | 2.18 HANDLEBARS: 1125CR, Left Side |
| Turn signal/mirror mounting fasteners, 1125CR | 24.4-27.0 Nm | 18-20 ft-lbs | 2.18 HANDLEBARS: 1125CR, Right Side |
| Turn signal/mirror mounting fasteners, 1125CR | 24.4-27.0 Nm | 18-20 ft-lbs | 7.12 TURN SIGNALS, Front Turn Signals/Mirrors: 1125CR |
| Turn signal/mirror mounting nuts, 1125R | 24.4-27.0 Nm | 18-20 ft-lbs | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |
| Turn signal/mirror mounting nuts, 1125R | 8.1-10.8 Nm | 72-96 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Fairing |
| Turn signal/mirror mounting nuts, 1125R | 8.1-10.8 Nm | 72-96 **in-lbs** | 7.12 TURN SIGNALS, Front Turn Signals/Mirrors: 1125R |
| Turn signal nut, rear | 2.8-3.2 Nm | 25-28 **in-lbs** | 7.12 TURN SIGNALS, Rear Turn Signals |
| Valve cover fasteners | 9 Nm | 77 **in-lbs** | 3.7 CAMSHAFT ASSEMBLY, Valve Covers |
| Valve stem nut | 4.5-4.9 Nm | 40-44 **in-lbs** | 2.5 TIRES, Mounting: Diablo Corsa III |
| Vent hose extension P-clamp | 6.4-7.1 Nm | 57-63 **in-lbs** | 4.8 FUEL TANK, Vent Hose Routing |
| Vent tube banjo bolt | 14 Nm | 124 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Case Vent Tube |
| Vent tube banjo bolt | 14 Nm | 124 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Cover |
| Vent tube fastener | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Case Vent Tube |
| Voltage regulator mounting nut | 8.0-9.5 Nm | 71-84 **in-lbs** | 7.9 VOLTAGE REGULATOR, Installation/Spread Wacker P12 Silicone Heat Compound on back of regulator |
| VSS fastener | 11 Nm | 97 **in-lbs** | 7.19 VEHICLE SPEED SENSOR (VSS), Installation |
| VSS trigger wheel | 30 Nm | 22 ft-lbs | 6.8 TRANSMISSION, VSS Trigger Wheel/Apply LOCTITE 243 (blue). |
| Water pump cover fasteners | 11 Nm | 97 **in-lbs** | 3.10 CLUTCH SIDE, Clutch Cover |
| Water pump cover fasteners | 11 Nm | 97 **in-lbs** | 5.6 WATER PUMP, Installation |
| Water pump housing drain screw | 11 Nm | 97 **in-lbs** | 5.4 ENGINE COOLANT, Replacing Coolant/Use new brass sealing ring. |
| Wear peg | 4.1-5.4 Nm | 36-48 **in-lbs** | 2.19 FOOTPEGS, HEEL GUARDS AND MOUNTS, Rider/Apply LOCTITE 271 (red) to 4 threads min. |
| Windscreen fasteners, 1125CR | 5.6-6.1 Nm | 50-54 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Body Work |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Windscreen fasteners, 1125CR | 5.6-6.1 Nm | 50-54 **in-lbs** | 2.16 WINDSCREEN AND HEADLAMP ASSEMBLY: 1125CR, Windscreen |
| Windshield fasteners, 1125R | 1.0-1.5 Nm | 10-12 **in-lbs** | 2.15 FAIRING AND HEADLAMP ASSEMBLY: 1125R, Windshield |
| Wire guide/fuel pump cover | 4.6-5.1 Nm | 41-45 **in-lbs** | 2.4 BODY WORK, COVERS, GUARDS AND GUIDES, Covers, Guards and Guides |
| Wire guide/fuel pump cover | 4.6-5.1 Nm | 41-45 **in-lbs** | 4.9 FUEL PUMP, Wire Guide/Fuel Pump Cover |
| Wire harness front bracket fastener, 1125CR | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.23 MAIN WIRE HARNESS, Wire Harness Front Bracket |
| Wire harness front bracket fastener, 1125R | 13.0-14.5 Nm | 115-128 **in-lbs** | 7.23 MAIN WIRE HARNESS, Wire Harness Front Bracket |

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

## 1

150 Metri-Pack Connector
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## 4

480 Metri-Pack Connector
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## 6

630 Metri-Pack Connector
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