

FLHX, FLTRX MODELS

2024 HARLEY-DAVIDSON® SERVICE MANUAL

94001162

IMPORTANT NOTICE

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

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

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

Harley-Davidson Motor Company

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NOTES

GENERAL

This manual has been created to inform Harley-Davidson technicians about the construction of Harley-Davidson products and the latest tested and approved maintenance and repair techniques.

MANUAL LAYOUT

Safety

Refer to the Safety section before performing any procedures on a vehicle.

Sections

This service manual is organized into chapters, sections and topics. Each section is laid out in the following manner:

- Prepare
- Remove
- Install
- Disassemble (if applicable)
- Clean/Inspect (if applicable)
- Assemble (if applicable)
- Complete

Topics

The purpose of the **Prepare** topics is to to provide an outline of procedures required before beginning a specific task. Links to the necessary procedures are provided in the topic.

The **Remove** and **Install** topics allow the technician to only remove and install the component - which may be all that is required. If a component can be repaired, **Disassemble**, **Assemble** and **Clean/Inspect** topics are provided as appropriate.

Complete topics provide a list of procedures that need to be performed to return the vehicle to ride-ready condition. If additional removal procedures need to be performed, move to the next section without performing the Complete topics in the current section.

Procedural Steps

Each topic contains steps to complete the procedure. These steps are laid out in numeric and alpha steps.

The purpose of the numeric steps is to provide the experienced technician with high-level information to complete the procedure.

The alpha steps provide a less-experienced technician with step-by-step instructions to perform the procedure.

Symbol Identification

Symbols are used in some graphics to provide information about parts. Refer to Table 1 for symbol definitions.

Table 1. Symbols

Symbol	Description
	**Apply Lubricant:** Indicates a part that should be lubricated during installation.
	**Discard/Do Not Reuse:** Indicates a part that must be replaced with a **new** part during installation.
	**Apply Sealant:** Indicates a part that must be installed with a threadlocker or sealant.
	**Special Tool:** Indicates that a special tool is recommended.
	**Measure:** Indicates a part that should be measured or gauged to verify that it is within specification.

HOW TO USE THIS SERVICE MANUAL

Cross-References and Page Numbers

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

All pages contain a chapter number followed by a page number. For example, **page 3-5** refers to page 5 in Chapter 3.

Item References and Quantities

In figure legends and tables, the number in parentheses that follows the part name indicates the quantity of that part necessary for one complete assembly.

Example:

2. Screw (4)

In a procedure step or paragraph, the number in parentheses that follows a part name indicates the legend item of the part in the figure referenced by the text.

Example:

1. Remove screws (2).

Acronyms and Abbreviations

Acronyms and abbreviations are used in this document. See the GLOSSARY > ACRONYMS AND ABBREVIATIONS (Page A-1) for a list of acronyms, abbreviations and definitions.

PREPARATION FOR SERVICE

- Start each job with a clean work area.
- Clean the motorcycle before work begins.
- Gather any tools, instruments and parts needed for the job before work begins.
- Carefully read all related service information, including service bulletins, before service work begins.

USE GENUINE REPLACEMENT PARTS

⚠ WARNING

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

To achieve satisfactory and lasting repairs, carefully follow the service manual instructions and use **only** genuine Harley-Davidson replacement parts.

SHOP PRACTICES

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

Removing Parts

Always use blocking or proper stands to support the part that has been hoisted. If a part cannot be removed, verify that all bolts and attaching hardware have been removed. Verify that no parts are in the way of the part being removed.

Always tag hoses, wiring or tubes to verify proper installation.

Cleaning

Thoroughly clean all parts to be reused before assembly. Clean parts promote better component operation and longer life. Seals, filters and covers used in this vehicle keep out extraneous dirt and dust. Keep these items in good condition to guarantee satisfactory operation. See FOREWORD > CLEANING (Page II).

Checking Torques on Fasteners and Threadlocking Agents

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

If it has a threadlocking agent, clean all material from the threaded hole. See Cleaning Threads and Threaded Holes later in this section. Replace the fastener with a **new** one or clean the original fastener threads. Use the threadlocker stated in the appropriate procedure. If no threadlocker is indicated, use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97) or equivelent. Install and tighten the fastener to specification.

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

CLEANING

General

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.

Always clean around lines or covers before they are removed. When cleaning parts:

- Plug, tape or cap holes and openings to keep out dirt, dust and debris.
- Clean and inspect all parts as they are removed.
- Cover all clean parts with clean lint-free cloth, paper or other material.
- Verify that the part is clean when installed.

Cleaning Threads and Threaded Holes

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.

To attain proper clamp load, always clean fastener threads and threaded holes prior to assembly.

NOTE

Never use a thread-cutting tap or die to clean threads.

- Clean all threadlocking material from fastener threads and threaded holes.
- Use a wire brush or thread-chasing die to clean fastener threads.
- Use a thread chaser to clean threaded holes.
- Use a mixture of 50 percent isopropyl alcohol and 50 percent distilled water or equivalent to remove all traces of oil and contaminants from threads.
- Clear all threaded holes with low-pressure compressed air.

Cleaning Plastic and Rubber Parts

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

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.

Rust or Corrosion Removal

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

Bearings

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

⚠ WARNING

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

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

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

DISPOSAL AND RECYCLING

Many communities maintain facilities for recycling used fluids, plastics and metals. Dispose of or recycle used oil, lubricants, fuel, coolant, brake fluid and batteries in accordance with local regulations.

TOOLS AND MATERIALS

⚠ WARNING

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

Some service procedures require the use of tools designed for a specific purpose. These tools should be used when and as recommended.

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

Special Tools

Special tools mentioned in this manual with a part number that begins with an "HD", "J" or "B" must be purchased, serviced or warrantied through a Harley-Davidson dealer.

Specific use of special tools is not discussed in this manual. Refer to the tool instruction sheet for instructions. If the tool instructions are misplaced, a copy can be obtained online at H-Dnet.com > My Toolbox > Edit > Bosch Tool Site.

LOCTITE Sealing and Threadlocking Products

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

PRODUCT REGISTERED MARKS

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

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

Content Applicability

Certain areas within this manual may have tables designating model or feature applicability. Refer to Table 2.

Table 2. Sample Applicability Table

APPLICABILITY	
☑	• Content applies to model or feature listed
☐	• Content does not apply to model or feature listed

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NOTES

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1.1 SAFETY.....1-1

NOTES

SAFETY

Harley-Davidson service manuals are intended for use by professional, qualified and experienced technicians. Attempting the procedures found within this manual without the proper training, tools and equipment could result in death or injury to you or others. This could also damage the vehicle, or cause the vehicle to operate improperly.

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

- Always have a complete understanding of the task.
- Use common sense.
- Use proper tools for the task.
- Protect yourself and bystanders with approved eye protection.

Harley-Davidson does not evaluate or advise the technicians of every way in which service might be performed, or all possible hazardous consequences of every method, or undertaken such a broad evaluation. Before using a tool not recommended by Harley-Davidson, make sure that technician or rider safety will not be jeopardized as a result.

Warnings against the use of specific service methods which could damage the motorcycle or render it unsafe are stated in this manual. **These warnings are not all-inclusive.** Inadequate safety precautions could result in death or serious injury.

Safety Messages

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

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. (08704a)

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

NOTE

Refers to important information. It is recommended that you take special notice of these items.

Customer Safety

⚠ WARNING

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

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 and are essential to your customer's safety and the reliable and safe operation of your customer's vehicle.

Personal Protection

⚠ WARNING

- **Always wear safety glasses or goggles when performing service or maintenance procedures. Flying objects or materials can cause serious eye injury or death.**
- **Wear protective gear that is appropriate to the situation. Helmets, gloves, boots and other protective clothing can prevent serious injury or death.**
- **Wear ear protection when loud noises are present. Loud noises can damage ears and cause hearing loss.**

(00628b)

Tool Safety

Some of these service operations require the use of tools specially designed for the purpose. Follow the manufacturer's suggested usage and safety instructions. If using a tool other than that recommended by Harley-Davidson, be sure that the tool is appropriate for the service or maintenance procedure and is being used in accordance with the tool's safety instructions.

Product Safety

⚠ 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 to a specific brand name product, tool or instrument, an equivalent product, tool or instrument may be substituted.
- Some referenced or recommended products contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm as indicated on the product label or at the point of purchase.

Hazardous Materials

⚠ WARNING

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

- Keep hazardous products out of the reach of children.
- Many products (oils, lubricants, solvents, sealants and cleaners, etc.) can cause death or serious injury if inhaled, absorbed, injected, ingested or improperly contacted. If hazardous contact is made with a product, follow the instructions on the product label and, if necessary, contact poison control or a medical facility.
- Some products are flammable and/or explosive as indicated on the product label or at the point of purchase. Keep these products away from flame and intense heat.
- Some products are corrosive as indicated on the product label. Wear appropriate protective gear to prevent skin contact. Use service covers to prevent damage to cosmetic surfaces on the motorcycle.
- Some products contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm as indicated on the product label or at the point of purchase.

Fuel

⚠ WARNING

Keep gasoline away from ignition sources. Gasoline is extremely flammable and highly explosive and, if ignited, could result in death or serious injury. (00634b)

- Stop the engine when refueling or servicing the fuel system.
- Do not allow open flame, sparks, radiant heat or other ignition sources near gasoline.
- Do not store motorcycle with gasoline in tank within the home or garage where ignition sources, such as open flames, pilot lights, sparks or electric motors are present.
- Do not overfill fuel tank. Allow for fuel expansion .
- Do not use gasoline as a cleaner or solvent.
- Gasoline can leak or drain from loosened or improperly tightened fuel fittings or from removed fuel components.
- Clean spilled gasoline immediately. Dispose of waste materials properly.

Battery

⚠ WARNING

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

- 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 out of the reach of children.
- Do not remove warning label attached to top of battery.
- 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.

⚠ WARNING



CONTAINS BUTTON OR COIN CELL BATTERY. KEEP OUT OF REACH OF CHILDREN.

Ingestion can result in death or serious injury. Choking, chemical burns and perforation of soft tissue may result. Severe burns can occur within 2 hours of ingestion or placement in any part of the body. Seek medical attention immediately. (13105b)

Coolant

- Coolant contains toxic chemicals which could cause death or serious injuries if ingested. Do not induce vomiting. Call a physician immediately.
- Irritation to skin or eyes can occur from vapors or direct contact. Flush thoroughly with water if contact is made.
- Use in a well ventilated area.

Hydraulic (Brake) Fluid

- Direct contact with brake fluid to the eyes can cause irritation. Flush thoroughly with water if contact is made.
- Do not swallow brake fluid. Swallowing brake fluid can cause digestive discomfort. Call a physician immediately.
- Brake fluid will cause cosmetic damage to painted surfaces. Always use caution and protect surfaces from spills whenever brake work is performed.

Engine Oil

- Prolonged or repeated contact with used motor oil may be harmful to skin and could cause skin cancer. Promptly wash affected areas with soap and water.
- Do not swallow oil. If swallowed, do not induce vomiting. Contact a physician immediately.
- Direct contact with eyes can cause irritation. Flush thoroughly with water if contact is made. Contact a physician if irritation persists.

Electrical Systems

⚠ WARNING

Improper service or maintenance of the electrical system can cause damage to the electrical system. This may result in component failure. In certain situations, a component failure during operation could lead to a loss of control, which could result in death or serious injury. (00637b)

- Always use replacement fuses that are of the specified type and amperage rating.
- Do NOT pull on electrical wires. Pulling on electrical wires may damage wire conductivity.

- Route wires and harnesses properly to prevent chafing, stripping, pinching, crimping or cutting wires. Damaged wires can cause short circuits and component damage or failure.
- Do NOT overload the vehicle's charging system. If the electrical accessories consume more electrical current than the charging system can produce, the battery may be discharged and cause damage to the motorcycle's electrical system.
- Do NOT exceed the maximum amperage rating of the fuse or circuit breaker protecting a modified circuit.
- Avoid directly heating electrical system components other than the connectors on which heat shrink work is being performed.

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FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Air cleaner cover screw	92–102 **in-lbs**	10.4–11.5 N·m	2.22 INSPECT AIR FILTER, Install
Battery cable screws	60–70 **in-lbs**	6.8–7.9 N·m	2.24 INSPECT BATTERY, Install
Battery cable screws	60–70 **in-lbs**	6.8–7.9 N·m	2.24 INSPECT BATTERY, Install
Brake pad pin	75–102 **in-lbs**	8.5–11.5 N·m	2.10 INSPECT BRAKES, Replace Front Brake Pads
Brake pad pin	75–102 **in-lbs**	8.5–11.5 N·m	2.10 INSPECT BRAKES, Replace Rear Brake Pads
Clutch hub jamnut	74–120 **in-lbs**	8.4–13.6 N·m	2.12 CHECK AND ADJUST CLUTCH, Check and Adjust
Clutch inspection cover screws	84–108 **in-lbs**	9.5–12.2 N·m	2.6 REPLACE PRIMARY CHAINCASE LUBRICANT, Change Primary Chaincase Lubricant Torque sequence
Engine oil drain plug	14–21 ft-lbs	19–28.5 N·m	2.5 REPLACE ENGINE OIL AND FILTER, Change Oil and Oil Filter
Primary chaincase drain plug	14–21 ft-lbs	19–28.5 N·m	2.6 REPLACE PRIMARY CHAINCASE LUBRICANT, Change Primary Chaincase Lubricant
Rear axle cone nut, 1st torque	15–20 ft-lbs	20–27 N·m	2.18 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt For belt adjustment only
Rear axle cone nut, final torque	135–145 ft-lbs	183–197 N·m	2.18 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt
Spark plug	80–106 **in-lbs**	9–12 N·m	2.25 CLEAN, INSPECT, REPLACE SPARK PLUGS, Install
Steering stem, final torque: FLHX models	4.4 ft-lbs	5.9 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLHXSE models	3.9 ft-lbs	5.3 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLTRX models	8.9 ft-lbs	12 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLTRXSE, FLTRXSTSE models	8.3 ft-lbs	11.2 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem torque step 1	18 ft-lbs	24.4 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Transmission drain plug	14–21 ft-lbs	19–28.5 N·m	2.7 REPLACE TRANSMISSION LUBRICANT, Change Transmission Lubricant
Transmission filler plug/dipstick	25–75 **in-lbs**	2.8–8.5 N·m	2.7 REPLACE TRANSMISSION LUBRICANT, Check Transmission Lubricant
Transmission filler plug/dipstick	25–75 **in-lbs**	2.8–8.5 N·m	2.7 REPLACE TRANSMISSION LUBRICANT, Change Transmission Lubricant
Triple clamp fork pinch screws	15–18 ft-lbs	19.7–24.4 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Upper fork stem pinch screw	15–18 ft-lbs	19.7–24.4 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust

SERVICING A NEW MOTORCYCLE

⚠ WARNING

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

Perform necessary set-up tasks before customer delivery. See applicable model year predelivery and set-up instructions.

The performance of new motorcycle initial service is required to keep warranty in force and to verify proper emissions systems operation. See MAINTENANCE > MAINTENANCE SCHEDULE (Page 2-3).

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

Perform all of the checks in the PRE-RIDING CHECKLIST in the owner's manual following any service procedure. Operate the motorcycle to perform any final check or adjustments. If all is correct, the vehicle is ready to return to the customer.

SECURE THE MOTORCYCLE FOR SERVICE

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

⚠ 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 motorcycle.

Set Motorcycle Upright

1. Place motorcycle upright on a level surface or suitable lift if available.
2. Verify that motorcycle is level.
3. Secure with tie-downs.

Raise Front or Rear Wheel for Service

1. Verify that motorcycle is level.
2. Use a FAT JACK (PART NUMBER: HD-45968) or similar to raise the motorcycle to service a front or rear wheel.
3. Secure with tie-downs.

GENERAL

Regular Service Intervals

Service must be performed at specified intervals to keep your Harley-Davidson motorcycle operating at peak performance. See the Regular Service Intervals table below.

NOTE

- *The use of parts and service procedures other than Harley-Davidson approved parts and service procedures may void the limited warranty. Any alterations to the emission system components, such as the intake and exhaust system, may be in violation of motor vehicle laws.*
- *Some countries, such as Brazil, may require all regular maintenance to be performed by an authorized Harley-Davidson dealer for your limited warranty to remain in effect. Check with your authorized Harley-Davidson dealer.*
- *Some countries, such as Brazil, may require additional annual (or semi-annual) regular maintenance steps to be performed to keep your limited warranty in effect and/or comply with vehicle regulations. Check with your authorized Harley-Davidson dealer as well as the motorcycle regulations in your country.*
- *After completing the final service interval, repeat the service schedule starting at the 8000 km (5000 mi) interval.*
- *Whenever a vehicle is in for maintenance, always check for and complete recalls and open product programs.*
- *Whenever a vehicle is in for maintenance, always verify that the latest calibration is installed.*

Table 2-1. Regular Service Intervals: Harley-Davidson Touring Models

COMPONENT	ACTION	1600 KM 1000 MI	8000 KM 5000 MI	16000 KM 10000 MI	24000 KM 15000 MI	32000 KM 20000 MI	40000 KM 25000 MI	48000 KM 30000 MI	56000 KM 35000 MI	64000 KM 40000 MI	72000 KM 45000 MI	80000 KM 50000 MI	NOTES
Service Intervals													
Electrical equipment and switches	Inspect	x	x	x	x	x	x	x	x	x	x	x	
Front tire pressure and tread	Check	x	x	x	x	x	x	x	x	x	x	x	1
Front wheel spoke tightness (if equipped)	Check	x	x			x			x			x	2, 4, 3
Front brake fluid level	Inspect	x	x	x	x	x	x	x	x	x	x	x	7
Clutch cable	Lubricate	x	x	x	x	x	x	x	x	x	x	x	8
Clutch cable	Adjust	x	x	x	x	x	x	x	x	x	x	x	6, 2
Front brake fluid moisture content	Check	x	x	x	x	x	x	x	x	x	x	x	1, 2
Hand control switch housing screw torque	Tighten	x		x		x		x		x		x	1, 2, 5
Clutch lever handlebar clamp screw torque	Tighten	x		x		x		x		x		x	1, 2, 5
Front brake handlebar clamp screw torque	Tighten	x		x		x		x		x		x	1, 2, 5
Steering head bearings	Lubricate						x					x	2
Air cleaner filter	Inspect		x	x	x	x	x	x	x	x	x	x	3
Breather hose	Inspect		x	x	x	x	x	x	x	x	x	x	3, 6
Breather hose	Clean		x	x	x	x	x	x	x	x	x	x	10
Engine oil and filter	Replace	x	x	x	x	x	x	x	x	x	x	x	1, 3
Engine coolant	Check	x	x	x	x	x	x	x	x	x	x	x	9
Engine coolant	Replace										x		2
Radiators or oil cooler	Clean	x	x	x	x	x	x	x	x	x	x	x	
Primary chaincase lubricant	Replace	x		x		x		x		x		x	3
Transmission lubricant	Replace	x				x				x			3
Oil and brake lines	Inspect	x	x	x	x	x	x	x	x	x	x	x	1, 2, 6
Fuel lines and fittings	Inspect	x	x	x	x	x	x	x	x	x	x	x	1, 2, 6
Rear brake fluid level	Inspect	x	x	x	x	x	x	x	x	x	x	x	7

NOTES

1. Perform annually or at specified intervals, whichever comes first.
2. Should be performed by an authorized Harley-Davidson dealer, unless you have the proper tools, service data and are mechanically qualified.
3. Perform maintenance more frequently in severe riding conditions. This includes extreme temperatures, dusty environments, mountainous or rough roads, long storage conditions, short runs, heavy stop/go traffic or poor fuel quality.
4. Perform spoke tension check at 1,000 mi (2,000 km), 5,000 mi (8,000 km), 20,000 mi (32,000 km) services and every 15,000 mi (24,000 km) interval thereafter. Not all vehicles have spoked wheels. Consult appropriate topic in the service manual.
5. For torque instructions, see Shop Practices in the service manual.
6. Check for leaks, contact or abrasion.
7. Brake fluid level drops as brake pads wear.
8. Use HARLEY LUBE.
9. Check coolant level, freeze point and inspect for leaks.
10. Clean build up from breather barb and hose to prevent blockage.

Table 2-1. Regular Service Intervals: Harley-Davidson Touring Models

COMPONENT	ACTION	1600 KM 1000 MI	8000 KM 5000 MI	16000 KM 10000 MI	24000 KM 15000 MI	32000 KM 20000 MI	40000 KM 25000 MI	48000 KM 30000 MI	56000 KM 35000 MI	64000 KM 40000 MI	72000 KM 45000 MI	80000 KM 50000 MI	NOTES
DOT4 rear brake fluid moisture content	Check	x	x	x	x	x	x	x	x	x	x	x	1, 2
Brake systems	Replace	**Flush brake systems and replace DOT 4 hydraulic brake fluid every two years or sooner if moisture content is 3 percent or greater.**											2
Brake pads and discs	Inspect	x	x	x	x	x	x	x	x	x	x	x	
Front axle nut torque	Tighten	x		x		x		x		x		x	1, 2, 5
Jiffy stand	Lubricate	x	x	x	x	x	x	x	x	x	x	x	2, 3
Brake and clutch controls	Lubricate	x	x	x	x	x	x	x	x	x	x	x	2, 8
Rear wheel spoke tightness (if equipped)	Check	x	x			x			x			x	2, 3, 4
Rear tire pressure and tread	Check	x	x	x	x	x	x	x	x	x	x	x	1
Drive belt and sprockets	Inspect	x	x	x	x	x	x	x	x	x	x	x	2
Drive belt	Adjust	x	x	x	x	x	x	x	x	x	x	x	2
Rear sprocket isolators	Inspect	**Inspect rear sprocket isolators for wear at each rear tire change.**											
Rear axle nut torque	Tighten	x		x		x		x		x		x	1, 2, 5
Exhaust system, fasteners and shields	Inspect	x	x	x	x	x	x	x	x	x	x	x	1, 3
12 volt battery	Check	**Check battery, terminal torque and clean connections annually. Lubricate terminals with ELECTRICAL CONTACT LUBRICANT.**											1
Spark plugs	Replace	**Replace spark plugs every two years or every 30,000 mi (48,000 km), whichever comes first.**											
Fuel door hinge and latch	Lubricate	x	x	x	x	x	x	x	x	x	x	x	8
Front forks	Rebuild											x	2
Fuel filter	Replace	**Replace fuel filter element every 100,000 mi (161,000 km).**											2, 3
Component and system functions	Road Test	x	x	x	x	x	x	x	x	x	x	x	

NOTES

1. Perform annually or at specified intervals, whichever comes first.
2. Should be performed by an authorized Harley-Davidson dealer, unless you have the proper tools, service data and are mechanically qualified.
3. Perform maintenance more frequently in severe riding conditions. This includes extreme temperatures, dusty environments, mountainous or rough roads, long storage conditions, short runs, heavy stop/go traffic or poor fuel quality.
4. Perform spoke tension check at 1,000 mi (2,000 km), 5,000 mi (8,000 km), 20,000 mi (32,000 km) services and every 15,000 mi (24,000 km) interval thereafter. Not all vehicles have spoked wheels. Consult appropriate topic in the service manual.
5. For torque instructions, see Shop Practices in the service manual.
6. Check for leaks, contact or abrasion.
7. Brake fluid level drops as brake pads wear.
8. Use HARLEY LUBE.
9. Check coolant level, freeze point and inspect for leaks.
10. Clean build up from breather barb and hose to prevent blockage.

FUEL

Always use a good quality unleaded gasoline. Octane ratings are usually found on the pump. Refer to Table 2-2.

⚠ WARNING

Avoid spills. Slowly open fuel 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. (00028b)

⚠ 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. This can cause air entrapment and pressurization.

Table 2-2. Octane Rating

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

GASOLINE BLENDS

Harley-Davidson motorcycles are designed to get the best performance and efficiency using unleaded gasoline. Most gasoline is blended with alcohol and/or ether to create oxygenated blends. The type and amount of alcohol or ether added to the fuel is important.

NOTICE

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

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

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

ENGINE LUBRICATION

⚠ CAUTION

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

⚠ CAUTION

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

NOTICE

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

Engine oil is a major factor in the performance and service life of the engine. Use the proper grade of oil for the lowest temperature expected before the next oil change. Refer to Table 2-3.

This motorcycle was originally equipped with GENUINE HARLEY-DAVIDSON H-D 360 MOTORCYCLE OIL 20W50. If operation under extreme cold or heat are expected, refer to Table 2-3 for alternative choices.

If H-D 360 or SYN3 is not available, add oil certified for diesel engines. Acceptable designations include: CH-4, CI-4 and CJ-4. The preferred viscosities, in descending order are: 20W50, 15W40 and 10W40.

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

Table 2-3. Recommended Engine Oils

TYPE	VISCOSITY	LOWEST AMBIENT TEMPERATURE	COLD-WEATHER STARTS BELOW 50 °F (10 °C)
Screamin' Eagle SYN3 Full Synthetic Motorcycle Lubricant	SAE 20W50	Above 30.2 °F (-1 °C)	Excellent
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 20W50	Above 39.2 °F (4 °C)	Good
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 50	Above 60.8 °F (16 °C)	Poor
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 60	Above 80.6 °F (27 °C)	Poor

WINTER LUBRICATION

Change engine oil often in colder climates. If motorcycle is frequently ridden less than 15 mi (24 km), in ambient temperatures below 60 °F (16 °C), reduce oil change intervals to 1500 mi (2,400 km).

NOTE

Lower ambient temperatures require more frequent oil changes.

Water vapor is a normal by-product of combustion . During cold-weather operation, some water vapor condenses to liquid form on the cool surfaces inside the engine. In freezing weather, this water becomes slush or ice. If the engine is not warmed to operating temperature, accumulated slush or ice blocks the oil lines and causes engine damage. Over time, water will accumulate, mix with the engine oil and form a sludge that is harmful to the engine.

If the engine is allowed to warm to normal operating temperature, most of the water evaporates and exits through the crankcase breather.

CHECK ENGINE OIL LEVEL

⚠ CAUTION

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

NOTICE

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

NOTE

- *Oil level can be checked with motorcycle upright or on jiffy stand. Both marks are on the same side of the dipstick. Carefully read dipstick when checking oil level.*
- *Check engine oil level at each complete fuel refill.*

Oil Level Cold Check

1. Place vehicle on level ground resting on the jiffy stand.

NOTE

Oil level on a cold engine should never be above the midway point.

2. See Figure 2-1. Check engine oil level.
   a. Remove filler plug/dipstick.
   b. Wipe off the dipstick.
   c. Insert the dipstick and tighten into the fill spout.
   d. Remove filler plug/dipstick.
   e. See Figure 2-2. Check oil level. The correct cold oil level is midway (2) between the ADD QT (1) and FULL HOT (3) marks on the dipstick.
3. If oil level is at or below the ADD QT mark, add only enough oil to bring the level to the ADD QT mark.
4. Start and idle engine on jiffy stand for two minutes. Turn off engine.
5. Check oil level. Add only enough to bring level midway between the ADD QT (1) and FULL HOT (3).

Oil Level Hot Check

NOTICE

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

NOTE

Perform engine oil level hot check only with engine oil at normal operating temperature.

1. Ride motorcycle until engine oil reaches at least 200 °F (93 °C) or higher.
2. Allow engine to idle for 1-2 minutes on jiffy stand. Turn off engine.
3. See Figure 2-1. Check oil level.
   a. Remove filler plug/dipstick.
   b. Wipe off the dipstick.
   c. Insert the dipstick and tighten into the fill spout.
   d. Remove filler plug/dipstick.
   e. See Figure 2-2. Check oil level. Oil level must register between the ADD QT and FULL HOT marks on the dipstick.
4. If oil level is at or below the ADD QT mark, add only enough oil to bring the level to the FULL HOT mark. Do not overfill.

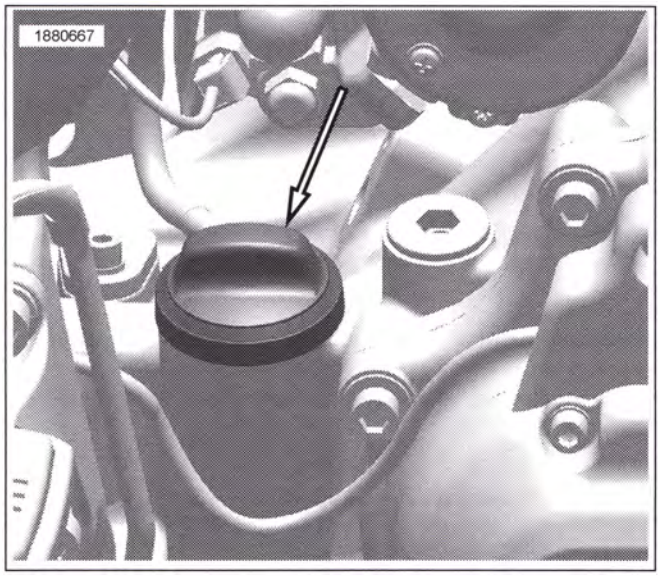
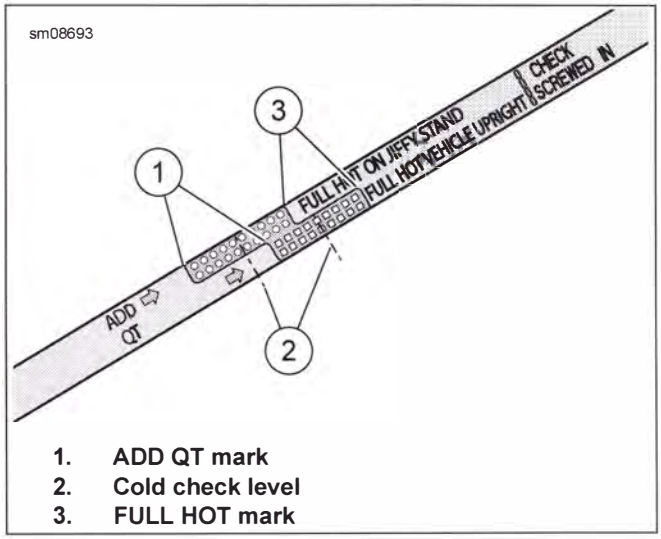


Figure 2-1. Engine Oil Filler Plug



1. **ADD QT mark**
2. **Cold check level**
3. **FULL HOT mark**

Figure 2-2. Engine Oil Dipstick

CHANGE OIL AND OIL FILTER

PART NUMBER	TOOL NAME
94686-00	OIL FILTER WRENCH
94863-10	OIL FILTER WRENCH

FASTENER	TORQUE VALUE	
Engine oil drain plug	14–21 ft-lbs	19–28.5 N·m

⚠ WARNING

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

NOTICE

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

- Change engine oil at the first 1000 mi (1,600 km) for a **new** engine. After initial service, change oil at regular intervals in normal service at warm or moderate temperatures. See MAINTENANCE > GENERAL (Page 2-2).
- Change oil at more frequent intervals in cold weather or severe operating conditions. See MAINTENANCE > FUEL AND OIL (Page 2-5).

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

2. See Figure 2-1. Remove filler plug/dipstick.

3. See Figure 2-3. Drain engine oil.

NOTE

Use P&A Oil Catcher (Part No. 62700199) or equivalent to keep drain oil off crankcase when removing oil filter. Residual drain oil could falsely appear as a crankcase oil leak at a later time.

   a. Remove oil drain plug (3).

   b. Remove O-ring (2) and discard.

   c. Allow oil to drain completely.

4. Remove oil filter using oil filter wrench and hand tools. Do not use with air tools.

   Special Tool: OIL FILTER WRENCH (94863-10)
   Special Tool: OIL FILTER WRENCH (94686-00)

5. Clean oil filter mount flange.

6. Clean any residual oil from crankcase and transmission housing.

7. See Figure 2-4. Install oil filter.

   a. Lubricate gasket with a thin film of clean engine oil.

   b. Install **new** oil filter.

   c. Hand-tighten oil filter one-half to three-quarters of a turn after gasket first contacts filter mounting surface. Do NOT use oil filter wrench for installation.

8. Install engine oil drain plug and **new** O-ring.

   Torque: 14–21 ft-lbs (19–28.5 N·m) *Engine oil drain plug*

NOTE

Use proper grade of oil for lowest temperature expected before next oil change. Refer to Table 2-3.

9. Add an initial volume of engine oil. Refer to Table 2-4.

Table 2-4. Initial Oil Fill

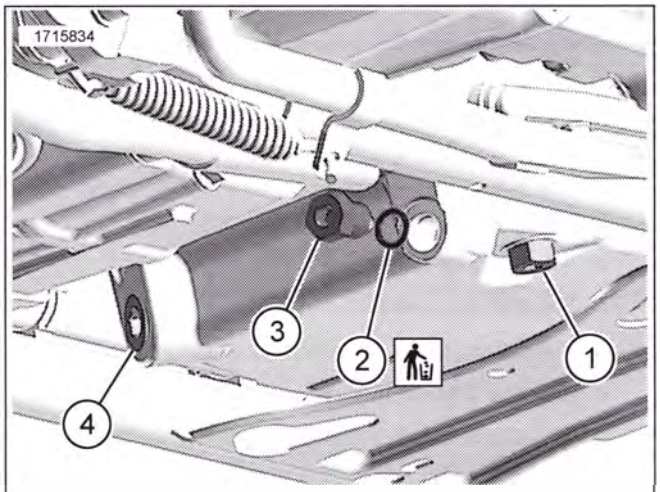
ITEM	QUANTITY
Engine oil initial fill	4.0 qt (3.8 L)

10. Verify proper oil level. See REPLACE ENGINE OIL AND FILTER > CHECK ENGINE OIL LEVEL (Page 2-7).

    a. Perform engine oil level **cold check**.

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

    c. Perform engine oil level **hot check**.



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

Figure 2-3. Oil Pan

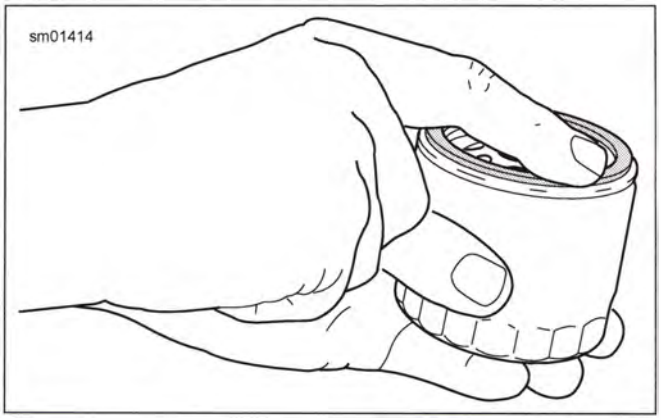


Figure 2-4. Lubricating New Oil Filter Gasket

CHANGE PRIMARY CHAINCASE LUBRICANT

FASTENER	TORQUE VALUE	
Clutch inspection cover screws	84–108 **in-lbs**	9.5–12.2 N·m
Primary chaincase drain plug	14–21 ft-lbs	19–28.5 N·m

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

⚠ WARNING

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

2. Secure motorcycle upright (not leaning on jiffy stand) on a level surface.

3. See Figure 2-5. Drain primary chaincase.

4. Clean drain plug magnet. If plug has excessive debris, inspect the condition of chaincase components.

5. Install drain plug and **new** O-ring. Tighten.

   Torque: 14–21 ft-lbs (19–28.5 N·m) *Primary chaincase drain plug*

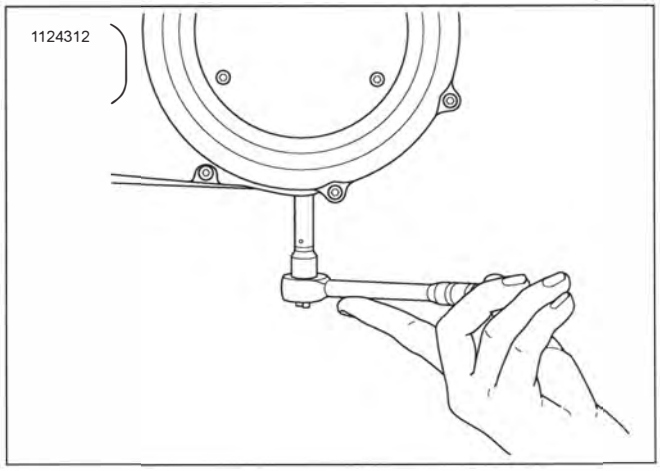


Figure 2-5. Removal/Installation of Chaincase Drain Plug

6. See Figure 2-7. Remove screws (3) and clutch inspection cover (2).

7. Remove seal (1). Wipe oil from groove in chaincase cover and mounting surface.

NOTICE

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

8. Add lubricant.

   a. Pour specified amount of FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50 through clutch inspection cover opening. Refer to Table 2-5.

   b. See Figure 2-6. Proper level is approximately at bottom of pressure plate OD.

Table 2-5. Primary Chaincase Lubricant

ITEM	DRY FILL[2]		WET FILL[3]	
	Oz	L	Oz	L
Amount[1]	34	1.0	30	0.9

(1) Amount is approximate. Fill to bottom of pressure plate OD with vehicle upright.
(2) Cover was removed and installed.
(3) Lubricant was drained through the drain plug only.

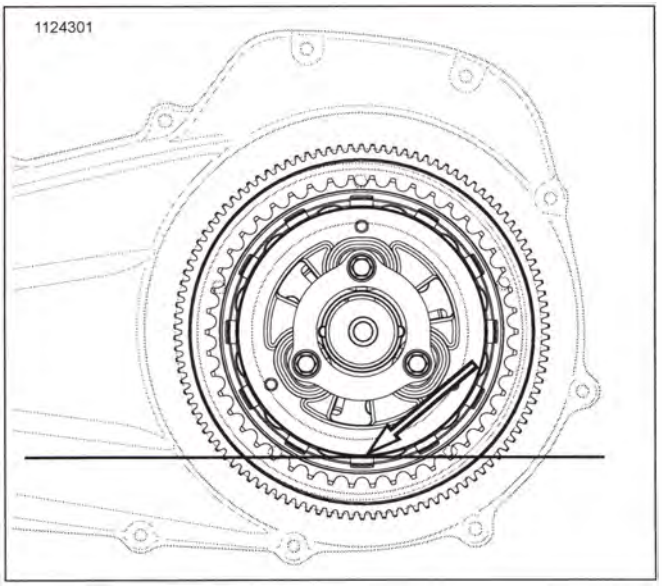


Figure 2-6. Primary Lubricant Level

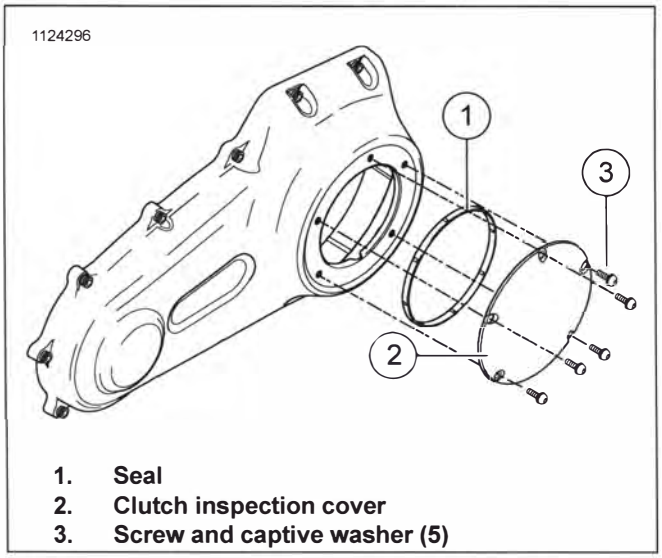
9. Install clutch inspection cover and **new** seal:

   a. Thoroughly wipe all lubricant from cover mounting surface and groove in chaincase cover.

   b. See Figure 2-7. Position **new** seal (1) in groove in clutch inspection cover (2). Press each of the nubs on seal into the groove.

   c. Secure clutch inspection cover (2) with screws with captive washers (3).

   d. See Figure 2-8. Tighten in sequence shown to 84–108 **in-lbs** (9.5–12.2 N·m).



1. Seal
2. Clutch inspection cover
3. Screw and captive washer (5)

Figure 2-7. Clutch Cover (Typical)

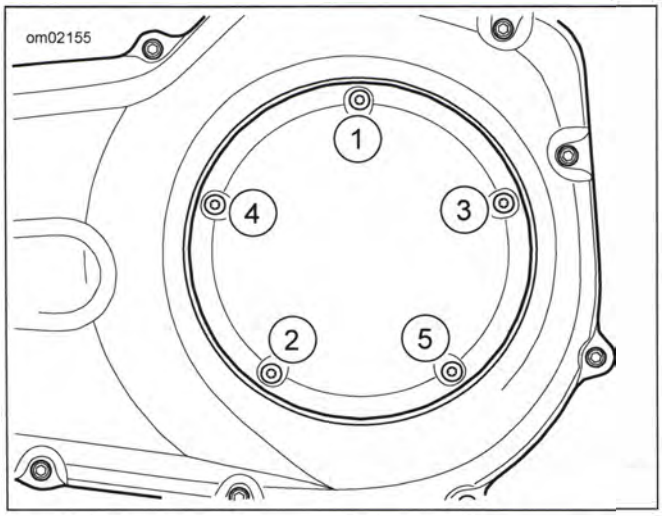


Figure 2-8. Clutch Cover Tightening Sequence

CHECK TRANSMISSION LUBRICANT

FASTENER	TORQUE VALUE	
Transmission filler plug/dip-stick	25–75 **in-lbs**	2.8–8.5 N·m

NOTE

Check transmission fluid with the motorcycle at ambient temperature. Inspect transmission dipstick O-ring. Replace if necessary.

1. Park motorcycle on a level surface on jiffy stand.
2. See Figure 2-9. Remove transmission filler plug/dipstick. Wipe dipstick clean.
3. Install filler plug/dipstick until O-ring contacts the case. Do not tighten.
4. See Figure 2-10. Remove filler plug/dipstick. Check lubricant level on dipstick. Proper oil level is between the Add (A) (1) and Full (F) (2) marks.
5. If lubricant level is low, add recommended Harley-Davidson lubricant to bring level to between the A mark and the F marks. Refer to Table 2-6.
6. Install filler plug/dipstick. Tighten to specification.

   Torque: 25–75 **in-lbs** (2.8–8.5 N·m) *Transmission filler plug/dipstick*

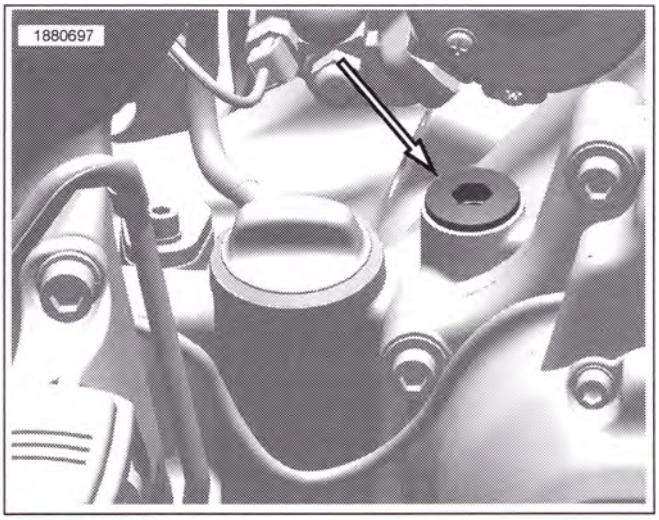
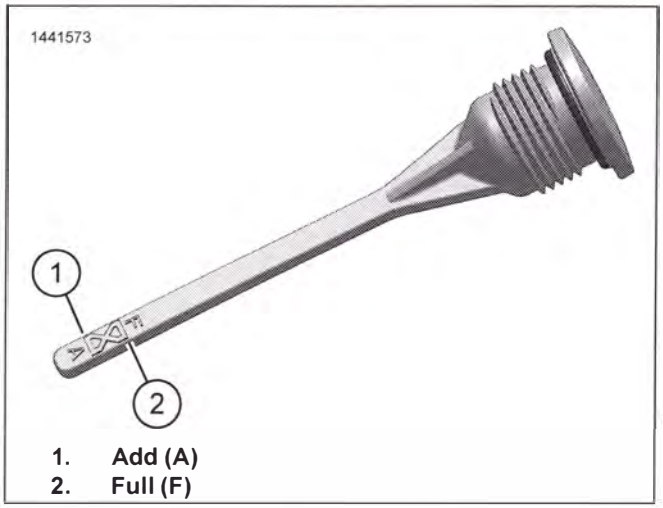


Figure 2-9. Transmission Filler Plug/Dipstick Location



1. Add (A)
2. Full (F)

Figure 2-10. Transmission Lubricant Level

Table 2-6. Transmission Lubricant

MODEL	LUBRICANT
All	FORMULA+ TRANSMISSION AND PRIMARY CHAIN LUBRICANT or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50

CHANGE TRANSMISSION LUBRICANT

FASTENER	TORQUE VALUE	
Transmission drain plug	14–21 ft-lbs	19–28.5 N·m
Transmission filler plug/dip-stick	25–75 **in-lbs**	2.8–8.5 N·m

1. See Figure 2-9. Remove transmission filler plug/dipstick.

⚠ WARNING

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

2. See Figure 2-11. Remove transmission drain plug. Drain transmission.
3. Clean and inspect drain plug and O-ring.

NOTICE

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

4. Install drain plug with **new** O-ring. Tighten. Do not over-tighten.

   Torque: 14–21 ft-lbs (19–28.5 N·m) *Transmission drain plug*

5. Fill the transmission to specification with recommended Harley-Davidson lubricant. Refer to Table 2-6.

   Volume: 28 fl oz (0.83 L)

6. Check lubricant level. Add enough lubricant to bring the level between the add (A) and full (F) marks. See Figure 2-10.

7. Install filler plug/dipstick. Tighten.

   Torque: 25–75 **in-lbs** (2.8–8.5 N·m) *Transmission filler plug/dipstick*

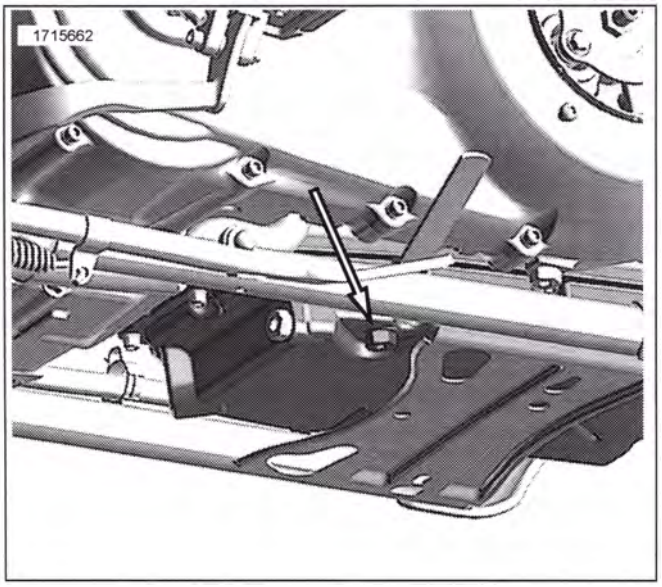


Figure 2-11. Transmission Drain Plug

GENERAL

⚠ WARNING

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

⚠ WARNING

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

NOTE

- *Tubeless tires are used on all Harley-Davidson cast wheels.*
- *Store **new** tires on a horizontal tire rack. Avoid stacking **new** tires in a vertical stack. The weight of the stack compresses the tires and crushes the beads.*

Tire Pressure

⚠ WARNING

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

Tire pressures should be set using information in Table 2-7 and Table 2-8. Tires are considered Cold Tires if vehicle has not been recently ridden. Tire pressure increases as the tire warms. Tires can warm due to both riding and high ambient air temperatures. Tires can remain warm for up to 2 hours after riding. For most accurate reading, check tire pressures with a good gauge before riding while tires are cold.

Check tire pressure:

NOTE

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

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

  For Cold Tires with an Ambient Air Temp of 68.0 °F (20 °C) or less: See Figure 2-16.

Table 2-7. Specified Tires

MOUNT	SIZE	APPROVED TIRE	PRESSURE (COLD 68 °F (20 °C))	
			psi	kPa
Front	19 in	Dunlop D408F BW 130/60B19 M/C 61H	36	248
Rear	18 in	Dunlop D407T BW 180/55B18 M/C 80H	40	276

- Do not use the TPMS as a pressure gauge when adding or removing air from a tire. Sensor data is sent to the TPMS at varying intervals which does not refresh immediately when adding or removing air from the tire. Over-inflation or under-inflation can result.
- The TPMS sensor will not communicate pressures above 50.0–60.0 psi (345–414 kPa) depending on altitude.
- Air is used to calibrate the TPMS. Use of 100 percent nitrogen may affect the accuracy of the system.
- Rotating valve stems from their properly installed positions can affect the valve stem seal and result in a slow leak. Do not rotate valve stems.
- Do not use liquid tire balancers or sealing agents in wheels with a TPMS sensor. Damage to the sensor can result.

Table 2-8. Tire Pressure Adjustment

AMBIENT AIR TEMPERATURE	MOTORCYCLE NOT RIDDEN FOR 2 HOURS OR MORE: ADD TO FRONT AND REAR PRESSURES IN SPECIFIED TIRES TABLE	MOTORCYCLE RECENTLY RIDDEN: ADD TO FRONT AND REAR PRESSURES IN SPECIFIED TIRES TABLE
68 °F (20 °C) or less	0 psi (0 kPa)	5 psi (34 kPa)
79 °F (26 °C)	1 psi (7 kPa)	6 psi (41 kPa)
88 °F (31 °C)	2 psi (14 kPa)	7 psi (48 kPa)
99 °F (37 °C)	3 psi (21 kPa)	8 psi (55 kPa)
108 °F (42 °C) or higher	4 psi (28 kPa)	9 psi (62 kPa)

For Cold Tires with an Ambient Air Temp higher than 68.0 °F (20 °C): Refer to first column in Table 2-8 to determine tire pressure adjustments. For example: If motorcycle has not been ridden for 2 hours or more and ambient temperature is 87.8 °F (31 °C), recommended front and rear pressures are Table 2-7 pressures plus 2.0 psi (14 kPa).

Tires warm due to riding which increases tire pressure. If vehicle has been recently ridden, refer to second column in Table 2-8 to determine tire pressure adjustment. For example: If motorcycle has been recently ridden and ambient temperature is 87.8 °F (31 °C), recommended front and rear pressures are Table 2-7 pressures plus 7.0 psi (48 kPa).

If a tire pressure adjustment is made when vehicle has been recently ridden, re-adjust tire pressure per recommendations when tires have cooled. Tires can remain warm for up to 2 hours after riding.

Inspecting Tires

⚠ WARNING

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

Check tire tread:

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

  Inspect each tire for punctures, cuts and breaks.

  Harley-Davidson tires are equipped with wear bars that run horizontally across the tread.

  A tire is considered worn when wear bars are visible or if only 0 in (1 mm) tread depth remains. A worn tire can:

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

See Figure 2-12, Figure 2-13 and Figure 2-14. Always replace tires before tread wear bars appear

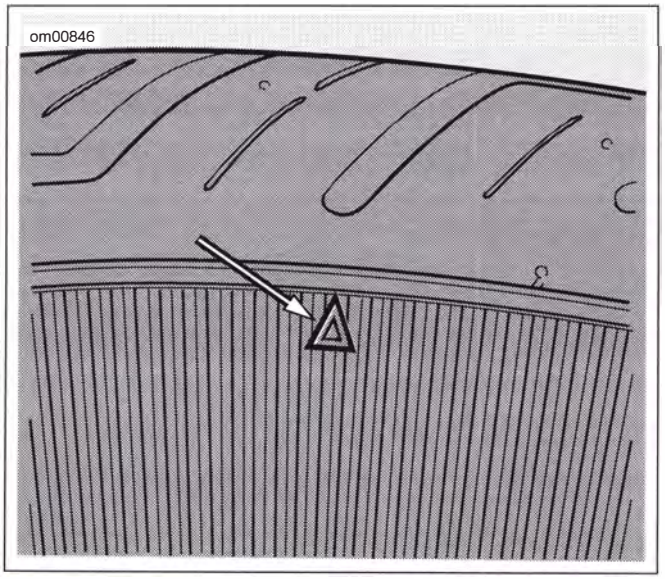


Figure 2-12. Dunlop Sidewall Tread Wear Indicator Bar Locator

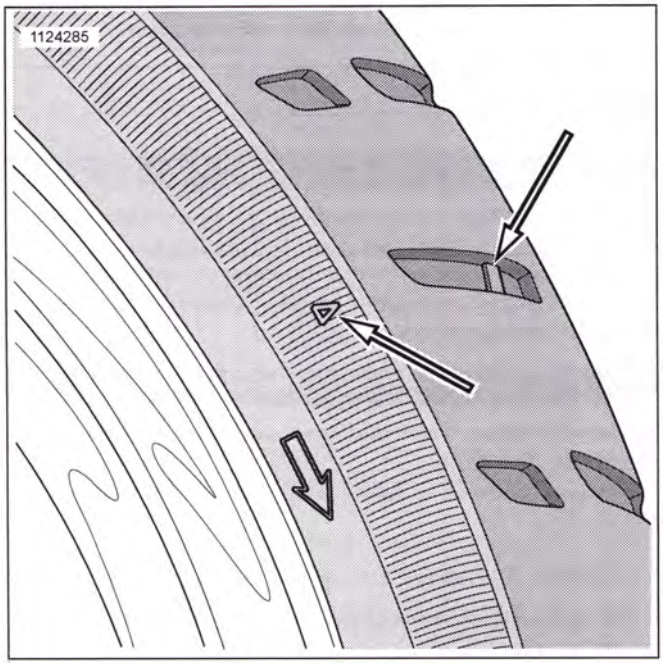


Figure 2-13. Tire Sidewall Wear Bar Locator

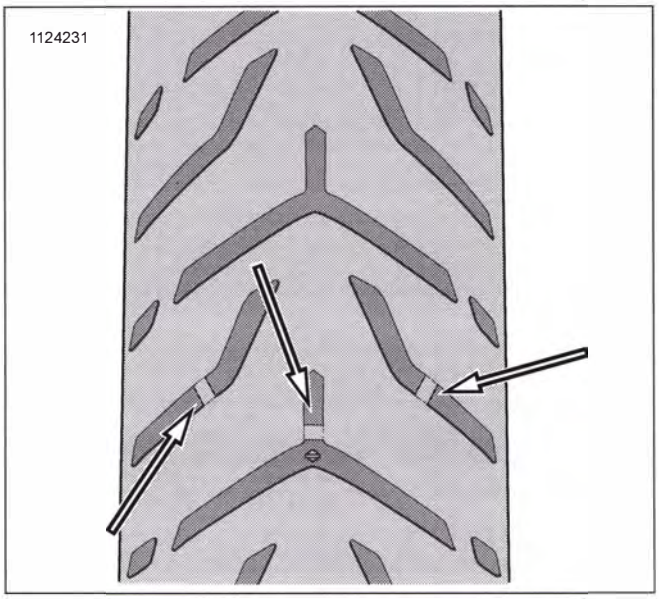


Figure 2-14. Wear Bar Appearance

TIRES

When to Replace Tires

New tires are needed if:

- Tread wear indicators become visible on tread surfaces.
- Tire cords or fabric become visible through cracked sidewalls, snags or deep cuts.
- A bump, bulge or split in tire.
- A puncture, cut or other damage to the tire that cannot be repaired.

WHEEL BEARINGS

NOTE

Replace bearings in sets only. See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).

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

GENERAL

Inspect and lubricate the following items according to MAINTENANCE > MAINTENANCE SCHEDULE (Page 2-3).

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

LUBRICATION POINTS

CONSUMABLE	PART NUMBER
CCI #20 BRAKE GREASE	42830-05
HARLEY LUBE	94968-09
ANTI-SEIZE LUBRICANT	98960-97
SPECIAL PURPOSE GREASE	99857-97A

Inspect and lubricate the following components according to the maintenance schedule. Refer to MAINTENANCE > MAINTENANCE SCHEDULE (Page 2-3).

Use HARLEY LUBE unless otherwise specified.

1. **Front brake hand lever:** Use grease on front brake lever pivot pin hole and end of piston that contacts brake lever. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).

   Consumable: CCI #20 BRAKE GREASE (42830-05)

NOTE

HARLEY LUBE (94968-09) are formulated to be compatible with the clutch cable lining. Use of other lubricants could damage clutch cable lining.

2. **Clutch cable:** See CHASSIS > CLUTCH CONTROL (Page 3-79).

   Consumable: HARLEY LUBE (94968-09)

3. **Clutch hand lever:** See CHASSIS > CLUTCH CONTROL (Page 3-79).

   Consumable: HARLEY LUBE (94968-09)

4. **Jiffy stand:** Lubricate clevis pin and spring hook groove. See CHASSIS > JIFFY STAND (Page 3-136).

   Consumable: ANTI-SEIZE LUBRICANT (98960-97)

5. **Steering head bearings:** Lubricate steering head bearings. See MAINTENANCE > ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-30).

   Consumable: SPECIAL PURPOSE GREASE (99857-97A)

6. **Foot shift lever pivot:** See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).

   Consumable: HARLEY LUBE (94968-09)

7. **Rear brake lever pivot:** See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).

   Consumable: HARLEY LUBE (94968-09)

8. **Hinges and latches (such as fuel door and footrests).**

   Consumable: HARLEY LUBE (94968-09)

9. **Locks, as required.**

   Consumable: HARLEY LUBE (94968-09)

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

INSPECT

PART NUMBER	TOOL NAME
HD-48497-A	DOT 4 BRAKE FLUID MOISTURE TESTER

CONSUMABLE	PART NUMBER
Harley-Davidson Platinum Label DOT 4 Brake Fluid	41800xxx

NOTICE

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

NOTE

- *At every service, check moisture content of fluid using DOT 4 BRAKE FLUID MOISTURE TESTER (PART NUMBER: HD-48497-A). Follow the instructions included with tool.*
- *Flush brake system and replace Harley-Davidson Platinum Label DOT 4 Brake Fluid (41800xxx) fluid every two years or sooner if brake fluid test shows moisture content is 3% or greater.*
- *Fluid should never need to be added or removed from the system during normal wear, except for fluid replacement as specified in the maintenance schedule.*
- *Fluid level in reservoir will decrease with brake wear. Reservoir volume is adequate to provide fluid to the wear limits of the pads and rotors.*

Check brake pads and discs:

- At every scheduled service interval.
- When removed during service procedures.

NOTE

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

Brake Pads

⚠ WARNING

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

⚠ WARNING

Contact with DOT 4 brake fluid can have serious health effects. Failure to wear proper skin and eye protection could result in death or serious injury.

- **If inhaled: Keep calm, remove to fresh air, seek medical attention.**
- **If on skin: Remove contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. If irritation develops, seek medical attention.**
- **If in eyes: Wash affected eyes for at least 15 minutes under running water with eye lids held open. If irritation develops, seek medical attention.**
- **If swallowed: Rinse mouth and then drink plenty of water. Do not induce vomiting. Contact Poison Control. Immediate medical attention required.**
- **See Safety Data Sheet (SDS) for more details available at sds.harley-davidson.com**

(00240e)

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

1. Inspect for grit and debris buildup at caliper piston areas. Clean if necessary.
   a. Rinse area with warm soapy water.
   b. Dry using low-pressure compressed air.
2. *NOTE*

   Always replace both pads in a caliper as a set.

   See Figure 2-15. Measure brake pad thickness.
   a. Replace brake pads (3) if friction material thickness is equal to or less than dimension.

      0.016 in (0.4 mm)
   b. See MAINTENANCE > INSPECT BRAKES (Page 2-17).

Brake Disc

NOTE

Minimum acceptable thickness is stamped on side of disc.

1. Measure thickness.
   a. Measure thickness with a micrometer.
   b. Replace disc if disc is scored or measured thickness is less minimum.

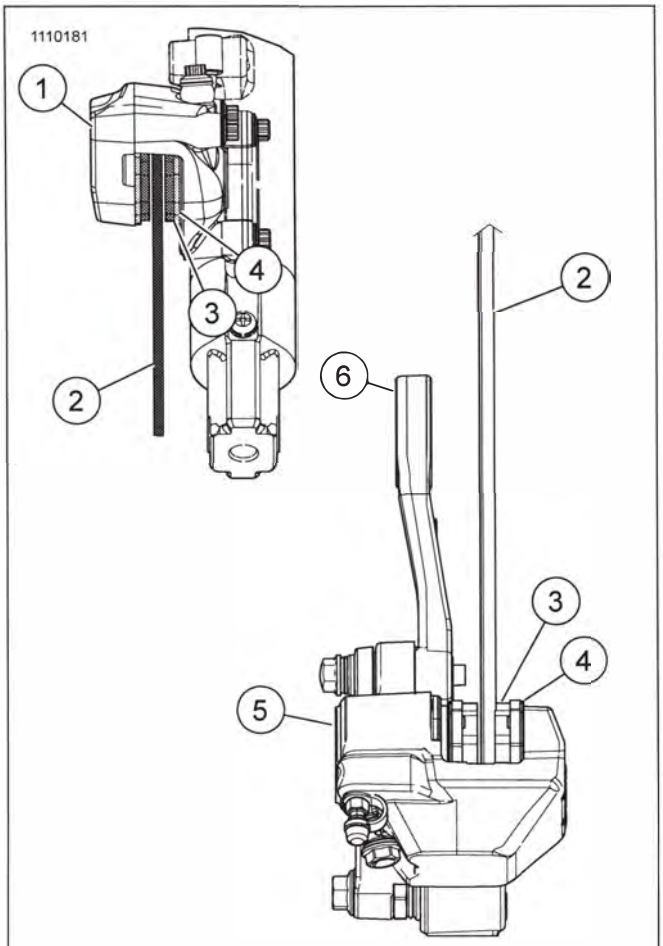
2. Measure runout.

   a. Measure runout near the outside diameter of the disc using a dial indicator.

   b. Replace disc if runout meets or exceeds dimension.

      0.008 in (0.2 mm)

Replace disc if warped, badly scored or worn beyond service limit. See CHASSIS > FRONT WHEEL (Page 3-10) or CHASSIS > REAR WHEEL (Page 3-12).



1. **Front brake caliper (viewed from below)**
2. **Brake disc**
3. **Brake pads**
4. **Backplate**
5. **Rear brake caliper (viewed from above)**
6. **Rear brake caliper mounting bracket**

Figure 2-15. Brake Pad Inspection

REPLACE FRONT BRAKE PADS

FASTENER	TORQUE VALUE	
Brake pad pin	75–102 **in-lbs**	8.5–11.5 N·m

Remove

1. Remove caliper. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).

2. *NOTE*

Do not operate the brakes with the brake caliper removed. The caliper pistons can be forced out.

   Loosen master cylinder reservoir cap. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).

3. Remove grit and debris from caliper piston area.

   a. Rinse area with warm soapy water.

   b. Dry using low-pressure compressed air.

4. *NOTE*

As pistons are pushed back into the caliper, fluid level may overflow reservior. Remove fluid from reservoir if necessary.

   See Figure 2-16. Remove pads

   a. Remove screen (3) from caliper.

   b. Using the old brake pad and a C-clamp, retract the pistons fully into the caliper.

   c. Remove retaining clip (4).

   d. Discard pad pin (5) (metric).

   e. Remove brake pads.

   f. Inspect pad spring (7). Replace if needed.

Install

⚠ 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)

1. See Figure 2-16. Install pad spring (7). Replace if removed.

   a. Install on flat in caliper so clips on spring engage indentations in caliper.

   b. Make sure that forked end is on pad pin side of caliper.

2. Install **new** brake pads.

   a. See Figure 2-17. Insert each brake pad with square corner (1) in slot of caliper.

   b. Push pad pin tab (2) into caliper.

   c. See Figure 2-16. Install **new** pad pin. Tighten.

      Torque: 75–102 **in-lbs** (8.5–11.5 N·m) *Brake pad pin*

   d. Install clip (4).

   e. Install screen (3). Engage prongs of screen on forked end of pad spring (7). Push on opposite side of screen until engaged.

3. Tighten master cylinder reservoir cap. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).

4. Install caliper. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).

5. Pump brakes to move pistons out until brake pads contact rotor. Verify piston location against pads. If front wheel is off the ground, rotate wheel to check for excessive brake pad drag.

6. Check fluid level in brake master cylinder reservoir. See MAINTENANCE > CHECK AND REPLACE BRAKE FLUID (Page 2-22).

⚠ 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)

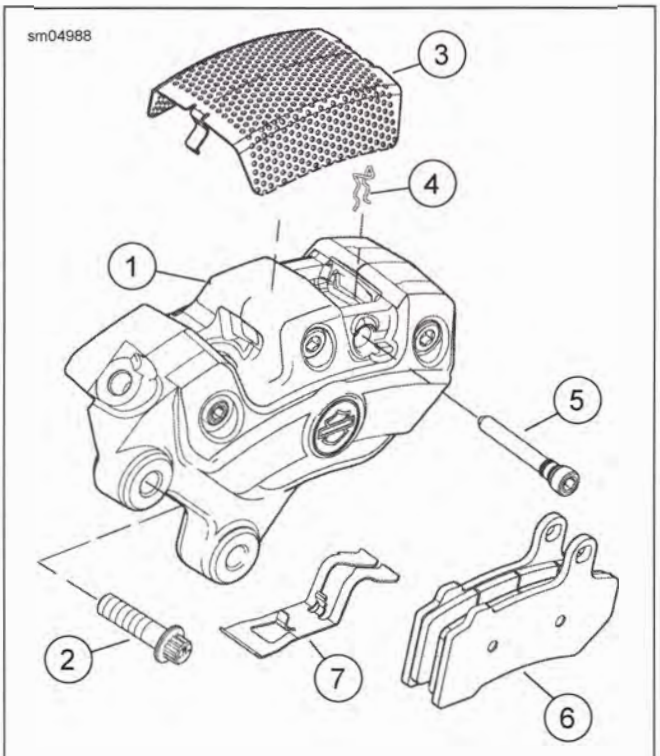
7. *NOTE*

Avoid making hard stops for the first 100mi (160 km) in order to wear in the brakes properly.

Test brakes.

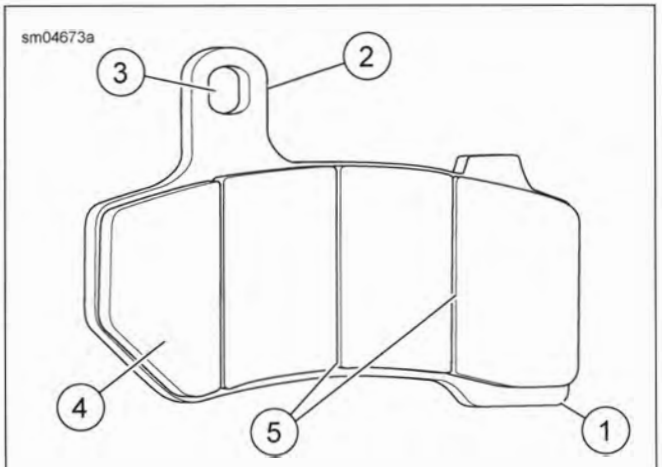
a. Turn ignition switch ON. Check operation of rear lamps.

b. Test ride motorcycle. If brakes feel spongy, bleed brakes. See MAINTENANCE > CHECK AND REPLACE BRAKE FLUID (Page 2-22).



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

Figure 2-16. Front Brake Caliper Assembly



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

Figure 2-17. Brake Pad

REPLACE REAR BRAKE PADS

FASTENER	TORQUE VALUE	
Brake pad pin	75–102 **in-lbs**	8.5–11.5 N·m

Remove

1. Remove caliper. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).

2. *NOTE*

Do not operate the brakes with the brake caliper removed. The caliper pistons can be forced out.

Loosen master cylinder reservoir cap. See .

3. Remove grit and debris from caliper piston area.

   a. Rinse area with warm soapy water.

   b. Dry using low-pressure compressed air.

4. *NOTE*

As pistons are pushed back into the caliper, fluid level may overflow reservior. Remove fluid from reservoir if necessary.

See Figure 2-18. Remove pads

   a. Using the old brake pad and a C-clamp, retract the pistons fully into the caliper.

   b. Remove retaining clip (4).

   c. Discard pad pin (5) (metric).

   d. Remove brake pads.

   e. Inspect pad spring (7). Replace if needed.

Install

⚠ 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)

1. See Figure 2-18. Install pad spring (7). Replace if removed.

   a. Install on flat in caliper so clips on spring engage indentations in caliper.

   b. Make sure that forked end is on pad pin side of caliper.

2. Install **new** brake pads.

   a. Apply paste supplied in kit to back of brake pads.

   b. See Figure 2-19. Insert each brake pad with square corner (1) in slot of caliper.

   c. Push pad pin tab (2) into caliper.

   d. See Figure 2-18. Install **new** pad pin. Tighten.

      Torque: 75–102 **in-lbs** (8.5–11.5 N·m) *Brake pad pin*

   e. Install clip (4).

3. Tighten rear master cylinder reservoir cap. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).

4. Install caliper. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).

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

6. Check fluid level in brake master cylinder reservoir. See MAINTENANCE > CHECK AND REPLACE BRAKE FLUID (Page 2-22).

⚠ 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)

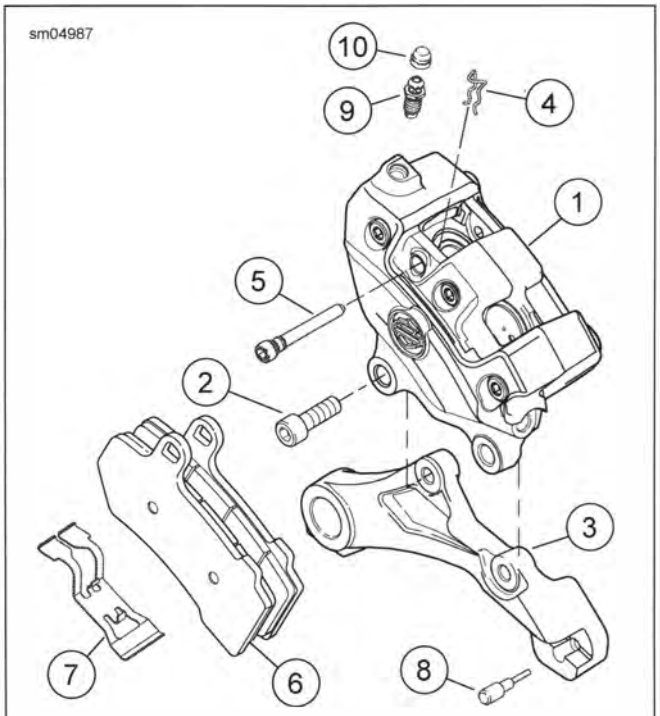
7. *NOTE*

Avoid making hard stops for the first 100mi (160 km) in order to wear in the brakes properly.

Test brakes.

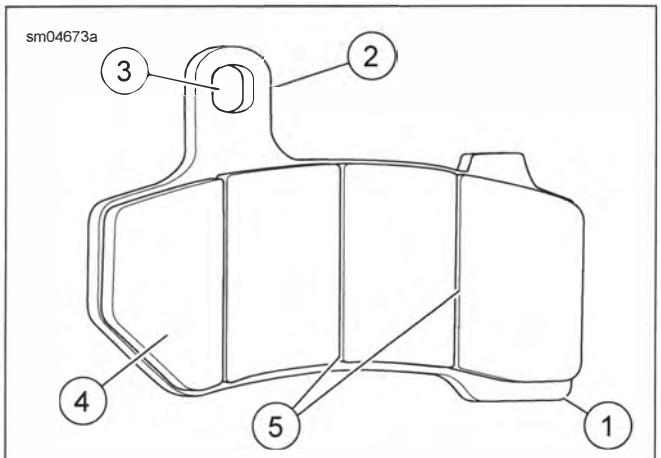
   a. Turn ignition switch ON. Check operation of rear lamps.

   b. Test ride motorcycle. If brakes feel spongy, bleed brakes. See MAINTENANCE > CHECK AND REPLACE BRAKE FLUID (Page 2-22).



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

Figure 2-18. Rear Brake Caliper Assembly



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

Figure 2-19. Brake Pad

CHECK BRAKE FLUID LEVEL

PART NUMBER	TOOL NAME
HD-48497-A	DOT 4 BRAKE FLUID MOISTURE TESTER

CONSUMABLE	PART NUMBER
Harley-Davidson Platinum Label DOT 4 Brake Fluid	41800xxx

⚠ WARNING

Clean reservoir filler cap or cover before removing. Use only DOT 4 brake fluid from a sealed container. Contaminated fluid can adversely affect braking or clutch disengagement, which could result in death or serious injury. (00504d)

⚠ WARNING

Contact with DOT 4 brake fluid can have serious health effects. Failure to wear proper skin and eye protection could result in death or serious injury.

- **If inhaled: Keep calm, remove to fresh air, seek medical attention.**
- **If on skin: Remove contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. If irritation develops, seek medical attention.**
- **If in eyes: Wash affected eyes for at least 15 minutes under running water with eye lids held open. If irritation develops, seek medical attention.**
- **If swallowed: Rinse mouth and then drink plenty of water. Do not induce vomiting. Contact Poison Control. Immediate medical attention required.**
- **See Safety Data Sheet (SDS) for more details available at sds.harley-davidson.com**

(00240e)

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTICE

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

NOTE

- *At every service, check moisture content of fluid using DOT 4 BRAKE FLUID MOISTURE TESTER (PART NUMBER: HD-48497-A). Follow the instructions included with tool.*
- *Flush brake system and replace Harley-Davidson Platinum Label DOT 4 Brake Fluid (41800xxx) fluid every two years or sooner if brake fluid test shows moisture content is 3% or greater.*
- *Fluid should never need to be added or removed from the system during normal wear, except for fluid replacement as specified in the maintenance schedule.*
- *Fluid level in reservoir will decrease with brake wear. Reservoir volume is adequate to provide fluid to wear limits of pads and rotors.*

1. Check front brake lever and foot pedal. Each must have a firm feel when applied. Repeat bleeding procedure if brakes feel spongy. See CHASSIS > BLEED BRAKES (Page 3-58).

2. Position vehicle on a flat level surface.

   a. **Front brake:** Position motorcycle and handlebar so that master cylinder reservoir is level.

   b. **Rear brake:** Position motorcycle so that master cylinder reservoir is level.

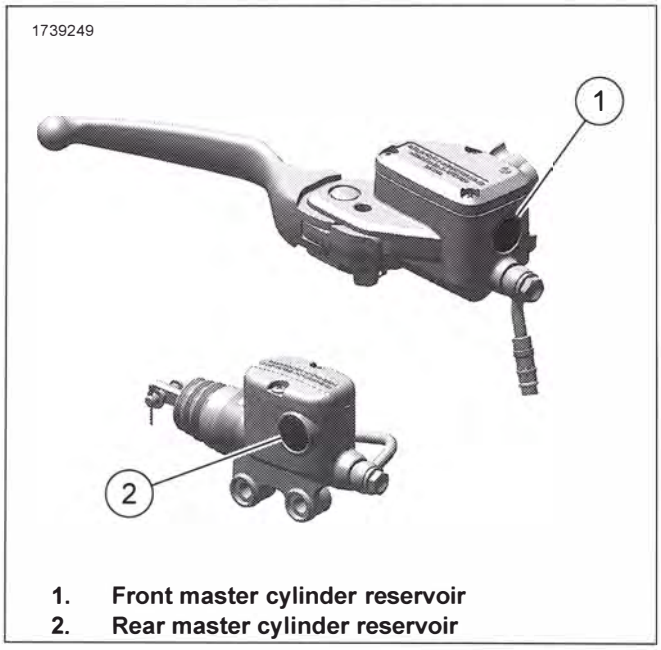
3. See Figure 2-20. View reservoir sight glass. Fluid level must be at or above bottom of sight glass. If fluid level is below bottom of sight glass:

   a. Check brake system for fluid leaks.

   b. Check that brake pads and rotors are properly installed and not worn beyond service wear limits. See MAINTENANCE > INSPECT BRAKES (Page 2-17).

   c. Check fluid level in brake reservoir. If necessary, add to brake fluid to reservoir.

      Harley-Davidson Platinum Label DOT 4 Brake Fluid (41800xxx)



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

Figure 2-20. Sight Glass Minimum Marks

DRAIN AND REPLACE FLUID

For this scheduled maintenance procedure, see CHASSIS > BLEED BRAKES (Page 3-58).

INSPECT BRAKE LINES

Inspect brake lines for leaks, contact or abrasion. Refer to Table 2-9.

Table 2-9. Brake Line Inspection

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

CHECK AND ADJUST

FASTENER	TORQUE VALUE	
Clutch hub jamnut	74–120 **in-lbs**	8.4–13.6 N·m

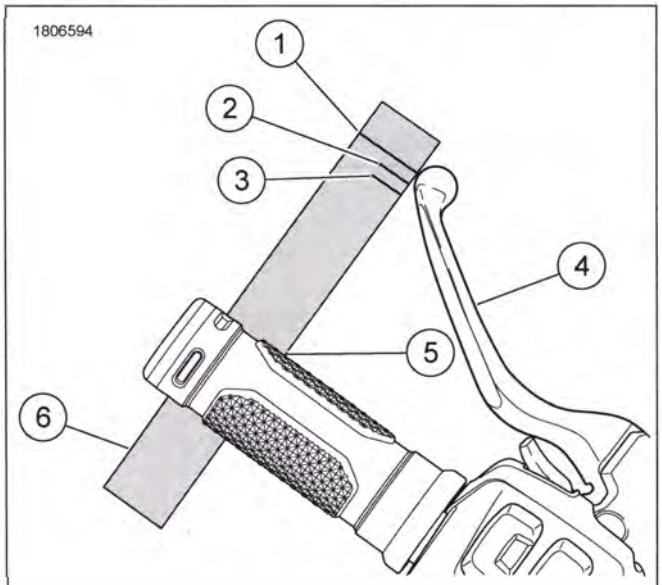
Clutch Cable Only Check

1. Rotate front wheel straight ahead.
2. See Figure 2-21. Make a freeplay adjustment scale.
   a. Using a piece of cardboard (6) make first line (1).
   b. Make second line (2) on cardboard specified distance from first line.
      Length/Dimension/Distance: 0.300 in (7.62 mm)
   c. Make third line (3) on cardboard specified distance from first line.
      Length/Dimension/Distance: 0.630 in (16 mm)
3. See Figure 2-28. Verify clutch lever (4) is fully extended.
4. See Figure 2-21. Check free play.

NOTE

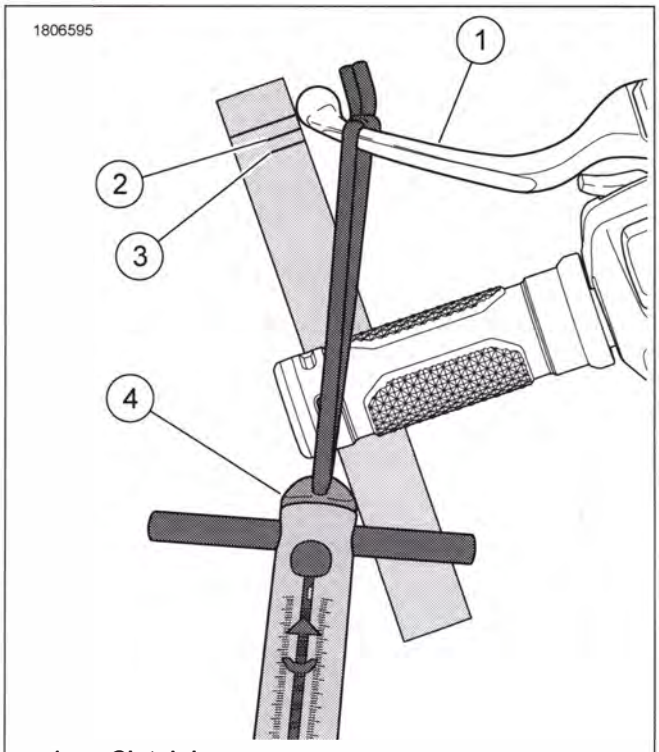
This procedure uses a 25 lb pull force scale with a peak hold feature.

   a. See Figure 2-22. Place force scale (4) attachment on clutch lever (1).
   b. See Figure 2-21. Line up freeplay adjustment scale first line under fully retracted clutch lever.
   c. Align freeplay adjustment scale along pivot angle (5) as shown.
   d. Hold freeplay adjustment scale to hand grip.
   e. See Figure 2-22. Apply 4 lb (1.8 kg) of pull force.
   f. Clutch lever should end up between second line (2) and third line (3).
   g. Adjust clutch if not within specifications. See Adjust in this section.



1. **First line**
2. **Second line, 0.300 in (7.62 mm)**
3. **Third line, 0.630 in (16 mm)**
4. **Clutch lever**
5. **Pivot angle**
6. **Cardboard**

Figure 2-21. Freeplay Adjustment Scale



1. **Clutch lever**
2. **Second line, 0.300 in (7.62 mm)**
3. **Third line, 0.630 in (16 mm)**
4. **Force scale**

Figure 2-22. Clutch Lever Freeplay Adjustment

Adjust

1. Stand motorcycle upright (not leaning on jiffy stand) on a level surface. Front wheel straight ahead.

2. Remove Lower fairing if equipped. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

3. Access two piece clutch cable.

NOTE

- *Before removing/installing cable from clips, cover must be over adjuster mechanism.*
- *Do not remove coolant reservoir cap.*

a. See Figure 2-23. Remove and secure coolant reservoir (1) from clip (2).

b. Release left side of clip from left frame down tube.

NOTE

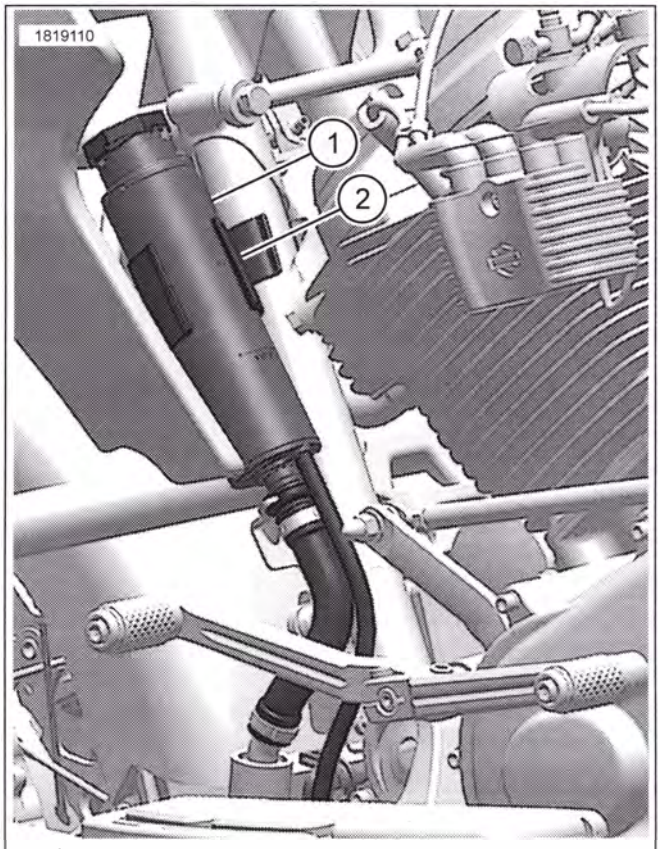
Clip could be damaged if not released from down tube.

c. See Figure 2-24. Remove clutch cable from clip (1).

d. Remove middle clip (4).

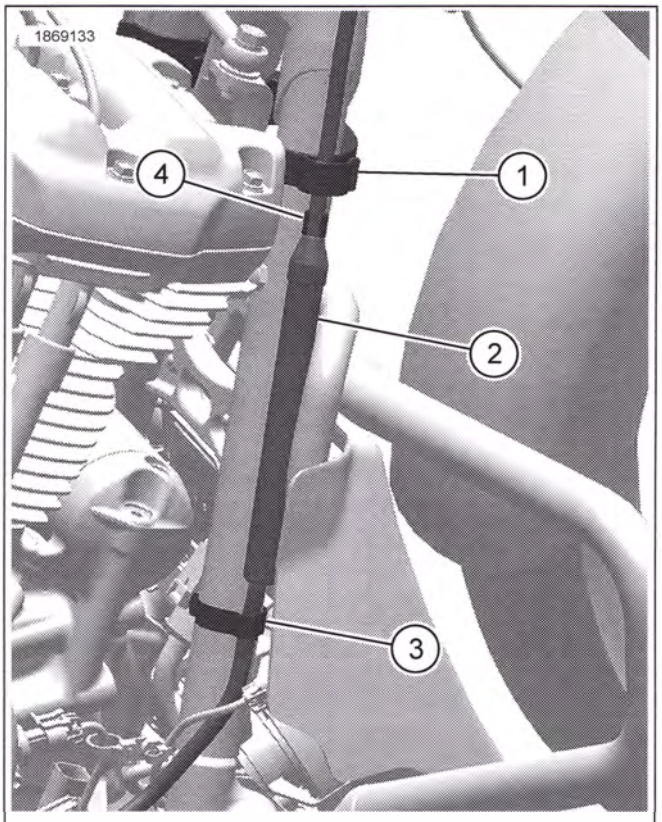
e. Remove lower clip (3).

f. Slide cover (2) up.



1. Coolant reservoir
2. Clip

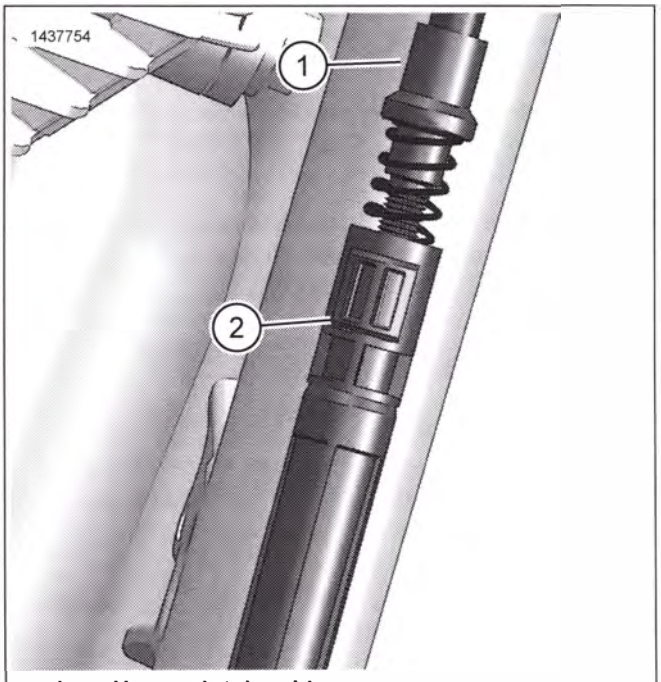
Figure 2-23. Coolant Reservoir Clip



1. Clip
2. Cover
3. Lower clip
4. Middle clip

Figure 2-24. Clutch Adjuster Location

4. See Figure 2-25. Identify upper clutch cable (1) and red lock button (2).



1. Upper clutch cable
2. Lock button

Figure 2-25. Lock Button

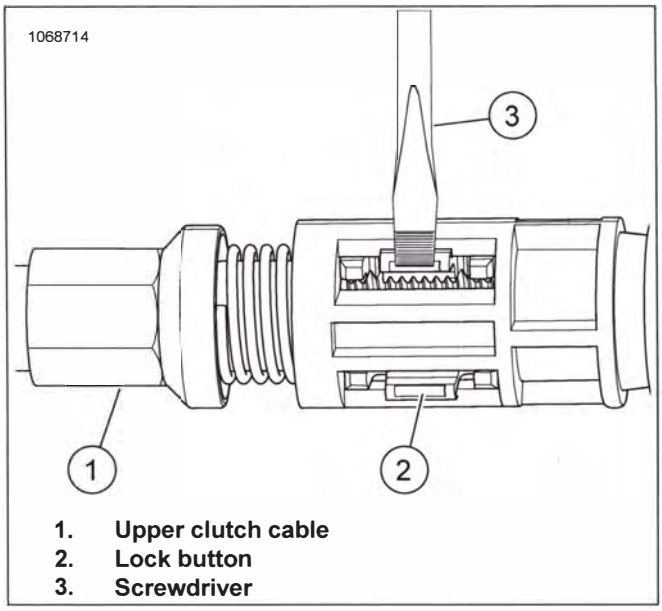
5. *NOTE*

Inspect tabs on lock button (2). Replace if damaged.

See Figure 2-26. Unlock upper clutch cable (1).

a. Push tabs on lock button (2) slightly inboard and then down to disengage.

6. Fully collapse cable (spring compressed) and push button in. This releases cable tension.



1. Upper clutch cable
2. Lock button
3. Screwdriver

Figure 2-26. Compressed Upper Clutch Cable

NOTE

Perform clutch adjustment with motorcycle at room temperature. Clearance at adjuster screw increases as powertrain temperature increases. If adjustment is made when hot, clearance at pushrod bearing could be insufficient when cold. Clutch slippage could occur.

7. Adjust clearance at hub.

a. Remove clutch inspection cover from primary chaincase cover. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

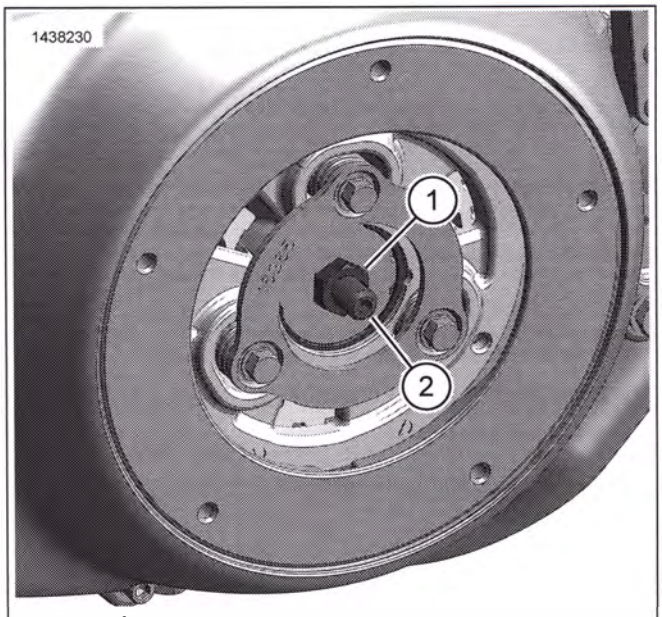
b. See Figure 2-27. Loosen jamnut (1) on clutch adjuster screw. Turn adjuster screw (2) inward (clockwise) until lightly seated.

c. Squeeze clutch lever to maximum limit three times to set release mechanism.

d. Back out adjuster screw one-half to one full turn. While holding adjuster screw, tighten jamnut.

Torque: 74–120 **in-lbs** (8.4–13.6 N·m) *Clutch hub jamnut*

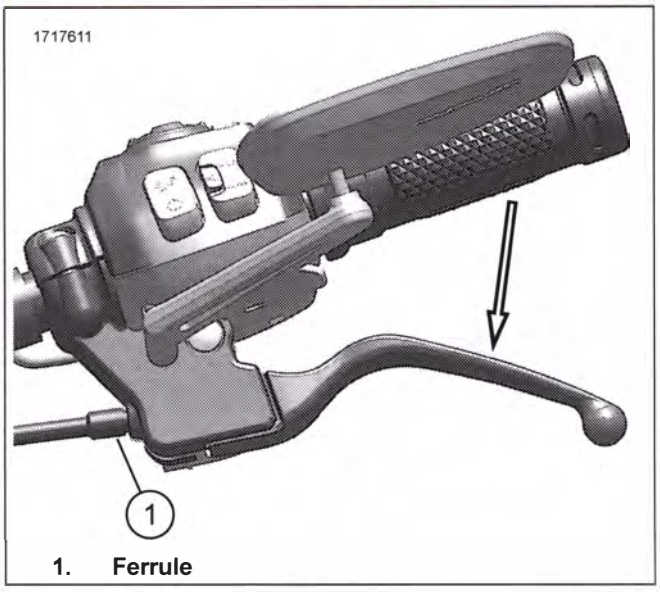
e. Secure clutch inspection cover. Tighten in sequence. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).



1. Jamnut
2. Clutch adjuster screw

Figure 2-27. Clutch Adjuster Screw

8. See Figure 2-28. Ensure clutch lever is in full open position and that ferrule (1) is correctly seated in housing.



1. Ferrule

Figure 2-28. Clutch Lever Full Open

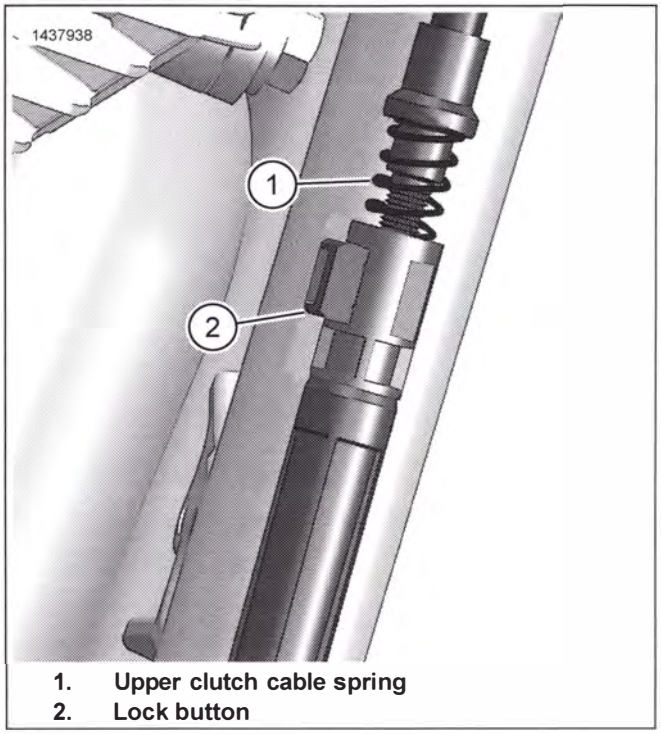
9. See Figure 2-26. Disengage lock button (2) allowing upper clutch cable spring (1) to set free-play at clutch lever.

NOTE

Inspect lock button. Replace if damaged.

10. Push in lock button (2).

a. Make sure lock button is properly engaged and secure. See Proper Button Engagement.



1. **Upper clutch cable spring**
2. **Lock button**

Figure 2-29. Secure Lock Button

11. See Figure 2-21. Check free-play (3) at clutch lever.

    a. If free-play is not to specification, check for proper clutch cable routing.

    b. Repeat steps 8 and 9.

12. Check clutch operation.

13. See Figure 2-24. Slide cover (2) down.

14. Attach two piece clutch cable to frame.

NOTE

Before removing/installing cable from clips, cover must be over adjuster mechanism.

    a. Install clutch cable to clip (1).

    b. Install left side of clip to frame.

    c. Install middle clip (4).

    d. Install lower clip (3).

15. See Figure 2-23. Install coolant reservoir (1) to clip (2).

Proper Button Engagement

NOTE

- *There should be minimal effort to push-in lock button.*
- *Use only one finger to push-in lock button.*
- *Improperly installed lock button with tabs misaligned, tabs not properly engaged or upper clutch cable interfering with lock button, is a sign of incorrect internal adjustment.*
- *Adjust clutch if needed.*

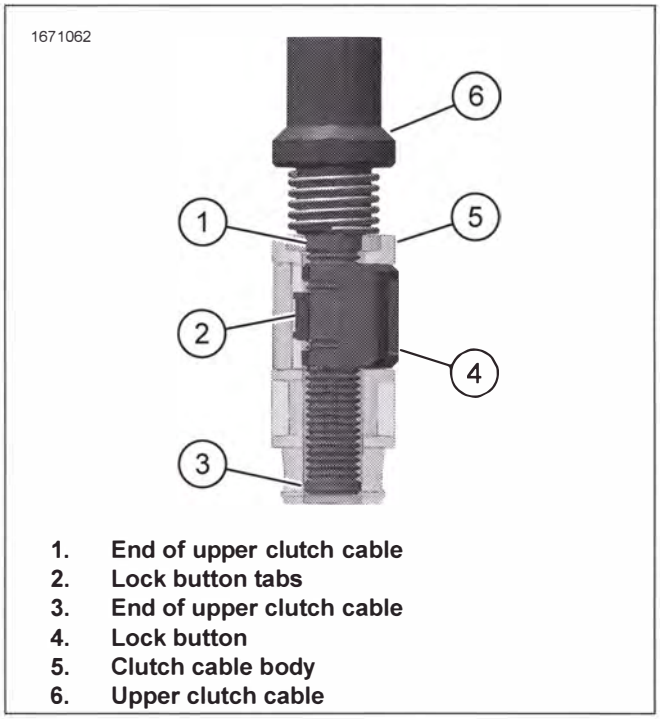
1. See Figure 2-30. Make sure lock button (4) is installed between ends of upper clutch cable (1, 3).

    a. Adjust clutch if end of upper clutch cable (3) is interfering with lock button (4).

2. See Figure 2-31. Make sure lock button (1) is aligned and semi-flush with the rest of the cable clutch assembly.

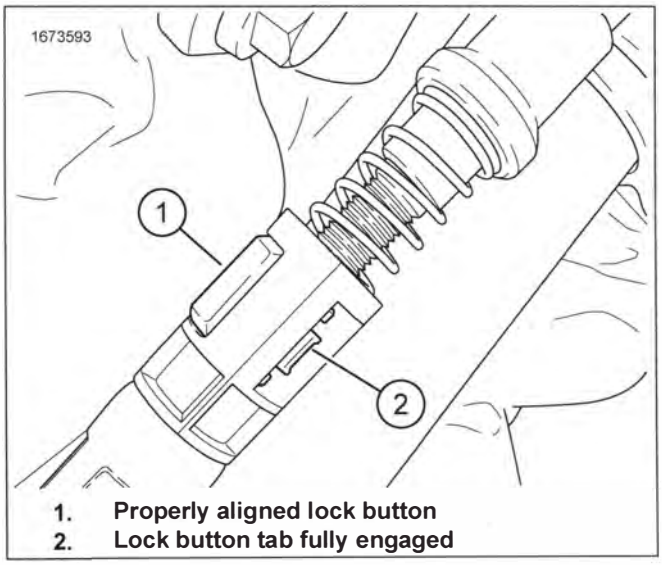
3. See Figure 2-32. Make sure lock button tabs are fully engaged (2) to clutch cable body (1).

4. Install lower fairing if equipped. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).



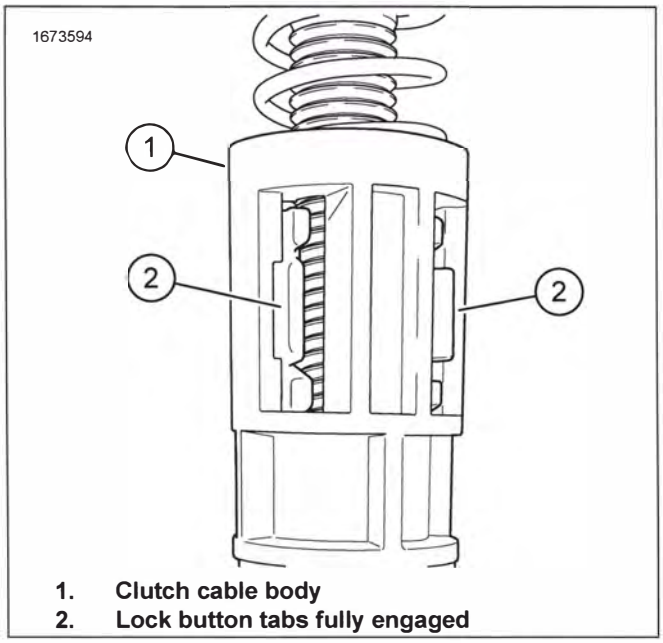
1. **End of upper clutch cable**
2. **Lock button tabs**
3. **End of upper clutch cable**
4. **Lock button**
5. **Clutch cable body**
6. **Upper clutch cable**

Figure 2-30. Proper Button Engagement



1. **Properly aligned lock button**
2. **Lock button tab fully engaged**

Figure 2-31. Lock Button Alignment



1. Clutch cable body
2. Lock button tabs fully engaged

Figure 2-32. Lock Button Tabs

REBUILD AND REPLACE FORK OIL

For this scheduled maintenance procedure, see CHASSIS > FRONT FORK (Page 3-62).

CHECK AND ADJUST

FASTENER	TORQUE VALUE	
Triple clamp fork pinch screws	15–18 ft-lbs	19.7–24.4 N·m
Upper fork stem pinch screw	15–18 ft-lbs	19.7–24.4 N·m

⚠ WARNING

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

NOTICE

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

NOTE

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

Measure Swing-Back

NOTE

Vehicle must be in original equipment configuration.

1. Remove all accessory weight, such as a windshield bag and contents or handlebar-mounted navigation unit. These items can influence the way the front fork swings.

NOTE

***Do not** remove clutch cable from hand control.*

2. **Frame mounted fairing:** Remove nacelle. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: NACELLE (Page 3-104).

3. **Frame mounted fairing:** Place handlebar limit of travel away from the rider in the most forward position. See CHASSIS > HANDLEBAR (Page 3-119).

4. Raise vehicle.

   a. Lift entire vehicle until tires are off ground.

   b. Place a block under rear tire.

   c. Gently lower vehicle until tire contacts block.

5. Using a level, verify lower frame rails are level front to rear and left to right.

NOTE

Lower frame rails MUST be level in both directions for a valid check.

6. Swing front end from stop-to-stop to check for smooth movement.

NOTE

A clunk indicates loose fork stem.

7. Verify there is no clunk.

   a. Grasp both forks near front axle.

   b. Shake forks front to rear checking for a clunk. If clunk is heard, see Lubricate in this section.

8. Attach lightweight cardboard to fender.

   a. Obtain a lightweight cardboard piece of specified length.

      8–10 in (20–25 cm)

   b. Tape cardboard to front fender centered and even with fender tip.

9. Place a stationary pointer tip near the cardboard. With front wheel straight forward, center pointer on cardboard.

NOTE

To avoid confusion, use three different colors to make the following marks.

10. See Figure 2-33. Make initial marks.

    a. Lightly tap front tire to the left until it just begins to swing back toward center.

    b. Using the first color, mark point (1) where it began to swing back.

    c. Repeat by lightly tapping front tire to the right.

    d. Using the first color, mark point (1) where it began to swing back.

11. Repeat two more times in each direction to validate marks.

12. Add measured points (2).

    a. Measure outboard specified distance from each mark (1).

       1 in (25.4 mm)

    b. Using second color, mark these points (2).

13. Mark the swing-back stops.

NOTE

If upon releasing front end from marks 2(L) and 2(R), marks 3(L) and 3(R) pass each other, steering is too loose. Proceed to Adjusting Swing-Back later in this section.

    a. Turn front end until pointer is at left mark (2) and release.

    b. Using third color, mark where swing-back stops (3).

c. Turn front end until pointer is at right mark (2) and release.

d. Using third color, mark where swing-back stops (3).

14. Repeat two more times in each direction to validate marks.

15. Measure distance (4) between final swing-back marks (3). Readings must be within values specified. Refer to Table 2-10.

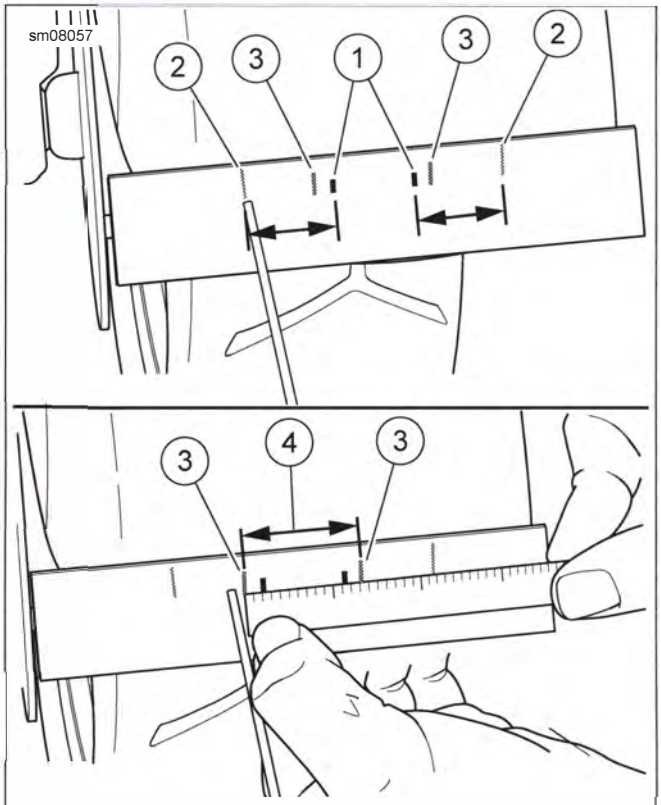
NOTE

A measurement greater than specification indicates steering stem is too tight. A measurement less than specification indicates steering stem is too loose. To adjust, see Adjusting Swing-Back below.

16. If measurements are within specifications.

a. **Frame mounted fairing:** Move handlebars back to desired position. See CHASSIS > HANDLEBAR (Page 3-119).

b. **Frame mounted fairing:** Install nacelle. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: NACELLE (Page 3-104).



1. Initial swing-back marks
2. Measure out 1 in (25.4 mm)
3. Final swing-back marks
4. Final dimension

Figure 2-33. Marking and Measuring Swing Points

Table 2-10. Steering Swing-Back

MODEL	SPECIFICATION
FLHX	1.2–1.9 in (3.0–4.8 cm)
FLTRX	3.7–4.9 in (9.4–12.4 cm)
FLHXSE	0.51–0.91 in (1.3–2.3 cm)

Table 2-10. Steering Swing-Back

MODEL	SPECIFICATION
FLTRXSE	1.48–2.61 in (3.8–6.6 cm)
FLTRXSTSE	2.2–5.6 in (5.6–14.2 cm)

Adjust Swing-Back

NOTE

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

Protect front fender from damage.

1. Disassemble motorcycle:

a. **Fork-mounted fairing models:** Remove media tray and outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

b. **Frame-mounted fairing models:** Remove steering nacelle. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: NACELLE (Page 3-104).

c. **Frame-mounted fairing models:** Place handlebar limit of travel away from the rider in the most forward position. See Refer to CHASSIS > HANDLEBAR (Page 3-119).

2. Adjust steering stem:

a. See Figure 2-34. Loosen upper fork pinch screws (2,4).

b. Based on swing-back dimension, tighten stem screw (3) (to increase dimension) or loosen stem screw (to decrease dimension) a few degrees.

NOTE

Fork mounted fairing:*See Figure 2-35. Access stem screw (3) through opening in media compartment opening (1).*

c. See Figure 2-34. Tighten upper fork stem bracket pinch screw (2).

Torque: 15–18 ft-lbs (19.7–24.4 N·m) *Upper fork stem pinch screw*

d. Tighten triple clamp fork pinch screws (4).

Torque: 15–18 ft-lbs (19.7–24.4 N·m) *Triple clamp fork pinch screws*

NOTE

It is important that all original mass be in place to accurately measure swing-back.

3. Temporarily install all removed original equipment components. Do not tighten fasteners.

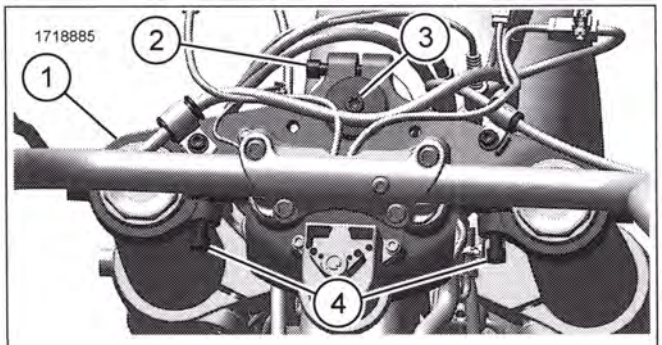
4. Check swing-back. Repeat until swing-back is within specification. Refer to Table 2-10.

5. Assemble motorcycle:

   a. **Fork-mounted fairing models:** Install media tray and outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

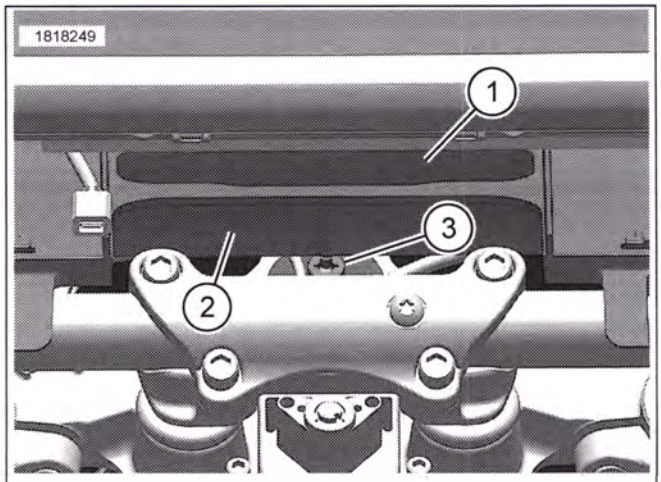
   b. **Frame-mounted fairing models:** Install steering nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

6. Install any accessories removed earlier.



1. **Upper fork stem bracket**
2. **Fork stem pinch screw**
3. **Stem screw**
4. **Triple clamp fork pinch screw (2)**

Figure 2-34. Upper Fork Stem Bracket



1. **Media tray compartment opening**
2. **Media tray compartment**
3. **Stem screw**

Figure 2-35. Fork Mounted Fairing Stem Screw Access (dash removed for clarity)

LUBRICATE

FASTENER	TORQUE VALUE	
Steering stem torque step 1	18 ft-lbs	24.4 N·m
Steering stem, final torque: FLHX models	4.4 ft-lbs	5.9 N·m
Steering stem, final torque: FLHXSE models	3.9 ft-lbs	5.3 N·m
Steering stem, final torque: FLTRX models	8.9 ft-lbs	12 N·m
Steering stem, final torque: FLTRXSE, FLTRXSTSE models	8.3 ft-lbs	11.2 N·m

1. Prepare:

   a. **Fork-mounted fairing models:** Remove media tray. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

   b. **Frame-mounted fairing models:** Remove steering nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

2. Raise front end until tire is just touching surface.

3. Remove upper fork bracket and handlebar as an assembly. Support out of the way. See CHASSIS > STEERING HEAD (Page 3-68).

NOTE

Upper fork bracket acts as a fork stop. Place wooden block between lower fork bracket and frame to avoid damage.

4. Remove steering stem. See CHASSIS > STEERING HEAD (Page 3-68).

5. Raise motorcycle until lower bearing has exited far enough to clean grease from bearing cup and cone.

NOTE

Remove grease with a clean cloth or finger. Do not use solvent.

6. Wipe grease from upper and lower bearing cups and cones. Inspect parts for wear or damage.

7. Pack bearings with SPECIAL PURPOSE GREASE.

8. Lower motorcycle until lower bearing just seats. Do not place entire weight of vehicle on bearing.

NOTE

Lower motorcycle until forks begin to compress.

9. Install upper bearing and dust shield

10. Install upper fork bracket and handlebar. Assemble motorcycle. See CHASSIS > STEERING HEAD (Page 3-68).

11. Install steering stem screw. Tighten.

    Torque: 18 ft-lbs (24.4 N·m) *Steering stem torque step 1*

12. Raise motorcycle.

13. Loosen steering stem 180 degrees.

14. Tighten steering stem to specification. Refer to Table 2-11.

15. Check swing-back. See MAINTENANCE > ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-30).

16. Complete:

    a. **Fork-mounted fairing models:** Install media tray. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

b. Frame-mounted fairing models: Install steering nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

Table 2-11. Steering Stem Torque Specification

MODEL	TORQUE
FLHX	4.4 ft-lbs (5.9 N·m)
FLTRX	8.9 ft-lbs (12 N·m)
FLHXSE	3.9 ft-lbs (5.3 N·m)
FLTRXSE, FLTRXSTSE	8.3 ft-lbs (11.2 N·m)

GENERAL

NOTICE

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

GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE AND COOLANT is pre-diluted and ready to use full strength. It provides temperature protection to -34° F (-36.7° C). DO NOT add water.

NOTICE

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 motorcycle damage. (00195b)

If GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE AND COOLANT is unavailable, a mixture of de-ionized water and ethylene glycol-based antifreeze may be used. At the first opportunity, change back to GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE AND COOLANT.

CLEAN RADIATOR

⚠ CAUTION

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

NOTICE

Using a pressure washer to clean radiators or oil coolers can damage cooling fins and reduce airflow. Reduced airflow can lead to overheating, resulting in motorcycle damage. (00056c)

NOTICE

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 overheating and motorcycle damage. (00197d)

1. Position vehicle on level ground resting on jiffy stand.
2. Allow motorcycle to cool.
3. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
4. See Figure 2-36. Clean debris from radiator fins.
5. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

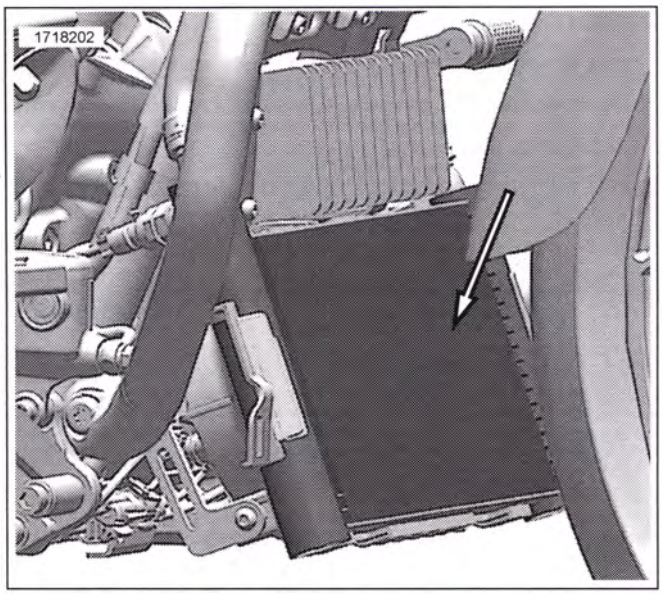


Figure 2-36. Radiator Fins

INSPECT

Check Coolant Level

For this scheduled procedure, see COOLING SYSTEM > COOLANT (Page 7-9).

Check Freeze Point

For this scheduled maintenance procedure, see COOLING SYSTEM > DIAGNOSE AND TEST (Page 7-5).

Check for leaks

For this scheduled maintenance procedure, see COOLING SYSTEM > DIAGNOSE AND TEST (Page 7-5).

DRAIN AND FILL COOLING SYSTEM

For this scheduled maintenance procedure, see COOLING SYSTEM > COOLANT (Page 7-9).

INSPECT

For this scheduled maintenance procedure, see FUEL AND EXHAUST > FUEL LINE (Page 6-7).

INSPECT AND LUBRICATE

For this scheduled maintenance procedure, see CHASSIS > JIFFY STAND (Page 3-136).

INSPECT

General

⚠ WARNING

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

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

Cleaning

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

Sprockets

1. See Figure 2-37. Inspect each tooth (1) of rear sprocket for:
   a. Major tooth damage
   b. Large chrome chips with sharp edges
   c. Gouges caused by hard objects
   d. Excessive loss of chrome plating (see next step)
2. Check for worn chrome plating. Drag a sharp object across the bottom of a groove (2) using medium pressure.
   a. If sharp object slides across groove without digging in or leaving a visible mark, chrome plating is still good.
   b. If sharp object digs in and leaves a visible mark, it is cutting the bare aluminum. The chrome plating is worn.
3. Replace rear sprocket if major tooth damage or loss of chrome exists.



1. Tooth
2. Groove

Figure 2-37. Rear Sprocket

Drive Belt

See Figure 2-38 and Refer to Table 2-12. Inspect drive belt for:

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

NOTE

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

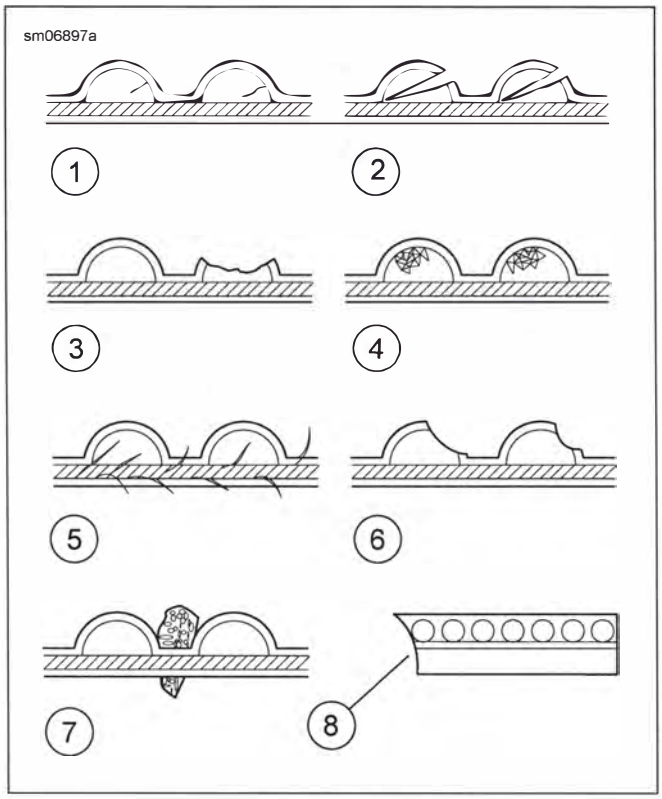


Figure 2-38. Drive Belt Wear Patterns

Table 2-12.

NO.	CONDITION	REQUIRED ACTION
1	Internal tooth cracks (hairline)	OK to run, but monitor condition.
2	External tooth cracks	Replace belt.
3	Missing teeth	Replace belt.
4	Chipping (not serious)	OK to run, but monitor condition.
5	Fuzzy edge cord	OK to run, but monitor condition.
6	Hook wear	Replace belt and sprocket.
7	Stone damage	Replace belt if damage is on the edge.
8	Bevel wear (outboard edge only)	OK to run, but monitor condition.

MEASURE DRIVE BELT DEFLECTION

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

NOTE

Always use BELT TENSION GAUGE (PART NUMBER: HD-35381-A) to measure belt deflection. Failure to use tension gauge may cause under-tensioned belts. Loose belts can fail due to "ratcheting" (jumping a tooth) which causes tensile cord crimping and breakage.

Check deflection:

- With transmission in neutral.
- With motorcycle at ambient temperature.
- With motorcycle upright and rear wheel suspended off of the ground.
- With vehicle unladen: no rider, no luggage and empty saddlebags.

⚠ WARNING

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

1. Disarm security system. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Shift transmission to neutral.
3. Raise vehicle until rear wheel is suspended.

NOTE

*When adjusting a **new** belt, rotate rear wheel a few revolutions prior to setting the tension.*

4. See Figure 2-39. Measure belt deflection using BELT TENSION GAUGE (PART NUMBER: HD-35381-A):
   a. Slide O-ring (4) to zero mark (3).
   b. Fit belt cradle (2) against bottom of drive belt in line with belt deflection window.
   c. Press upward on knob (6) until O-ring slides down to 10 lb (4.54 kg) mark (5) and hold steady.

NOTE

Measure belt tension four times, rotating the rear wheel 90 degrees between each measurement. Average the four measurements for accurate belt deflection.

5. See Figure 2-40. Measure belt deflection:
   a. Measure belt deflection as viewed through belt deflection viewing window while holding gauge steady. Each deflection graduation is approximately 1/16 in (1.6 mm).

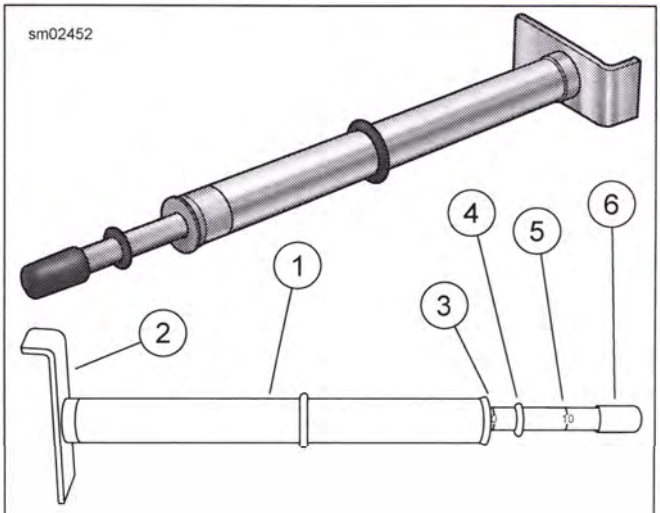
NOTE

Service belt tension specification is for belts with more than 1000 mi (1,600 km). Set belt to new belt tension specification if belt has less than 1000 mi (1,600 km).

6. Compare with specifications. Refer to Table 2-13. If not within specifications, see a Harley-Davidson dealer.
7. Install main fuse.

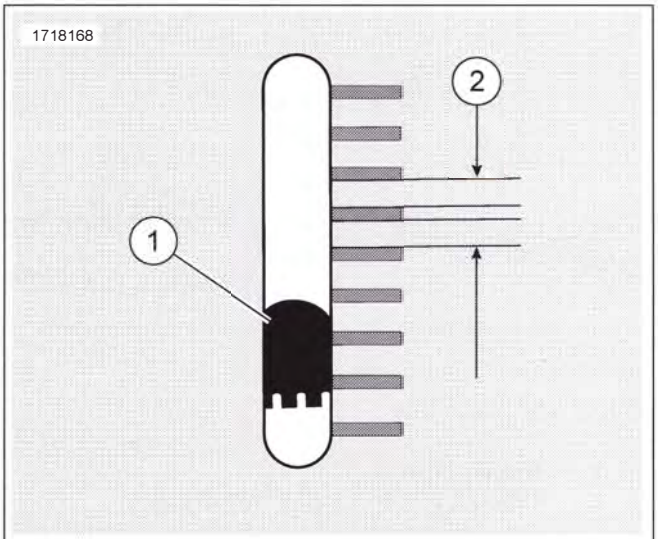
Table 2-13. Belt Deflection

MODEL	NEW	SERVICE INTERVAL
FLHX, FLTRX, FLHXSE, FLTRXSE	0.13–0.37 in (3.3–9.5 mm)	0.25–0.44 in (6.4–11.1 mm)



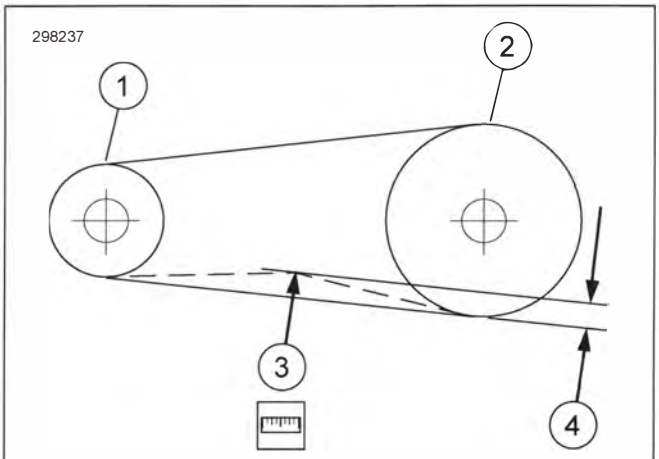
1. Belt tension gauge
2. Belt cradle
3. 0 lb (0 kg) mark
4. O-ring
5. 10 lb (4.5 kg) mark
6. Knob

Figure 2-39. Belt Tension Gauge



1. Drive belt
2. Deflection graduations (Approx: 1.5 mm (1/16-in)

Figure 2-40. Belt Deflection Window



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

Figure 2-41. Checking Belt Deflection

ADJUST BELT

PART NUMBER	TOOL NAME
HD-47925-A	AXLE NUT TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Rear axle cone nut, 1st torque	15–20 ft-lbs	20–27 N·m
Rear axle cone nut, final torque	135–145 ft-lbs	183–197 N·m

Prepare

1. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144)
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7)
4. Remove both mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26)

Adjust

1. See Figure 2-43. Remove and discard E-clip (7).
2. See Figure 2-42. Install adapter perpendicular to breaker bar.

   Special Tool: AXLE NUT TORQUE ADAPTER (HD-47925-A)
3. Loosen cone nut.

NOTE

Torque wrench must be perpendicular to torque adapter to obtain proper torque.

4. Install adapter on torque wrench, perpendicular to torque wrench.

   Special Tool: AXLE NUT TORQUE ADAPTER (HD-47925-A)

5. See Figure 2-43. Push wheel forward. Verify that cam (5) contacts boss (4) on both sides of rear fork.

6. Snug cone nut (6).

   Torque: 15–20 ft-lbs (20–27 N·m) *Rear axle cone nut, 1st torque*

7. *NOTE*

- *It is beneficial to use a second AXLE NUT TORQUE ADAPTER (PART NUMBER: HD-47925-A) to rotate and hold weld nut. Position of breaker bar or ratchet in relation to tool is not important.*
- *Check belt deflection as adjustment is made. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS > MEASURE DRIVE BELT DEFLECTION (Page 2-38).*

   See Figure 2-43. Adjust belt tension.

   a. Rotate weld nut (3) on left side to adjust belt tension. Turn clockwise to tighten or counterclockwise to loosen.

   b. If loosening belt tension, push wheel forward.

   c. Verify both cams (5) touch bosses (4) on both sides after weld nut is rotated.

Assemble

NOTE

Do not allow weld nut to rotate once belt tension is correct.

1. Hold weld nut and tighten cone nut.

   Torque: 135–145 ft-lbs (183–197 N·m) *Rear axle cone nut, final torque*

2. Again, verify cams touch bosses on both sides of rear fork and that belt deflection is still within specification.

3. With flat side out, install **new** E-clip in groove on right side of axle.

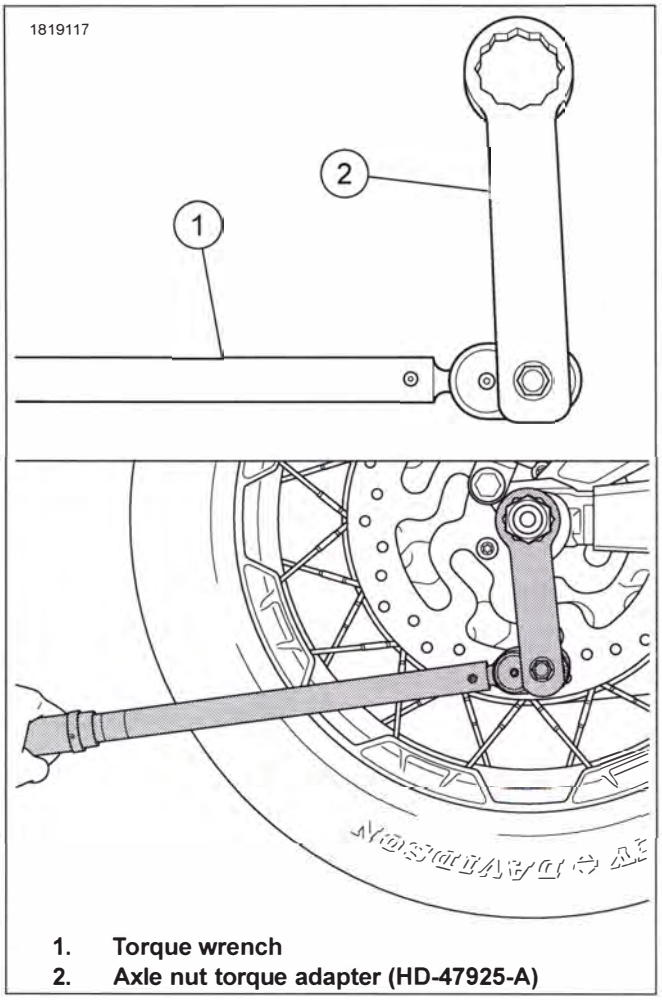
Complete

1. Install both mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).

2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

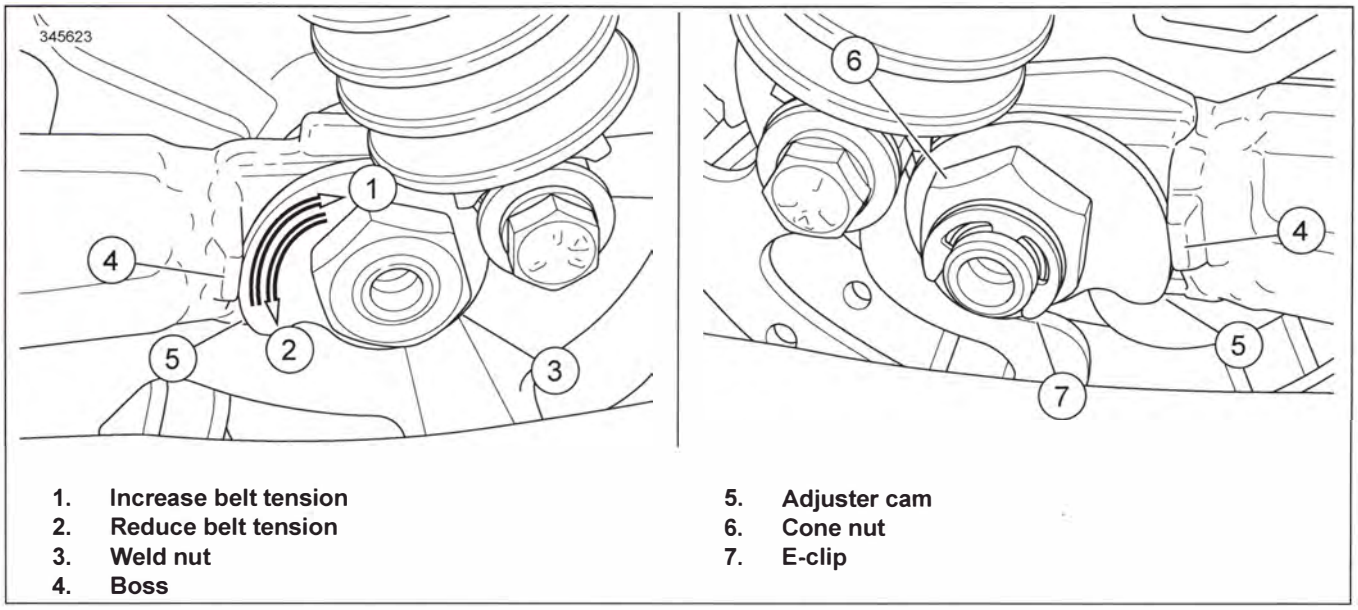
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

4. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).



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

Figure 2-42. Install Tool Perpendicular to Torque Wrench



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

Figure 2-43. Rear Wheel Adjuster Cams

INSPECT

1. Support the vehicle in an upright position in neutral. Do not lift the wheels off the ground.
2. Remove left saddlebag.
3. See Figure 2-44. Hang a weighted string (1) on the left axle spacer as close as possible to, but not touching, the rear sprocket.
4. Place a piece of masking tape on the face of the sprocket where the marks will be drawn.

NOTE

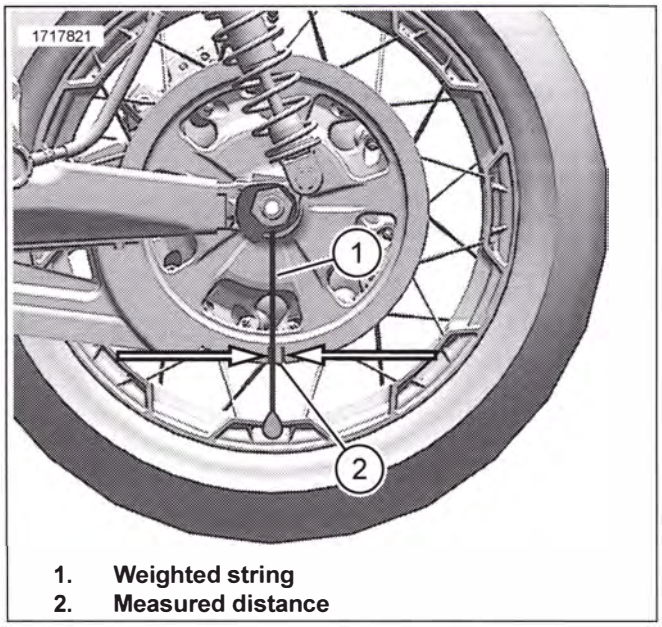
Do not allow the rear wheel to rotate when rotating the sprocket. A false measurement will occur.

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

NOTE

Visually inspect components when disassembled. See CHASSIS > REAR WHEEL COMPENSATOR (Page 3-17) to repair the rear wheel compensator.

- *Excessive play in the compensator components is caused by deteriorated rubber segments.*
- *Wear on the raised "nubs" or small amounts of rubber debris are normal. This type of wear does not indicate a worn out isolator.*



1. Weighted string
2. Measured distance

Figure 2-44. Check Compensator Wear

ADJUST SHOCK ABSORBER

NOTE

Do not overtighten shock absorber adjusters. Overtightening could result in damage to shock absorbers.

Preload Adjustment

Adjust the shock absorber preload for the total weight the motorcycle is to carry.

- Increase the preload to accommodate more weight.
- Reduce the preload if carrying less weight.

Suspension preload is set via two preload adjusters:

Threaded Preload Adjuster (Right Shock Absorber): Used to set the suspension preload for the primary loading condition. This includes:

- Rider only
- Rider + Passenger
- Rider + Tour-Pak
- Rider + Passenger + Tour-Pak

Hydraulic Preload Adjuster (Left Shock Absorber): Used to set the suspension preload for an additional 100 lb (45 kg) of cargo loading. Additionally, the hydraulic preload adjuster can also be used for short term passenger adjustments with minimal cargo.

Set threaded preload adjuster for the primary loading condition (Rider/Passenger/Tour-Pak).

1. Remove the right saddlebag. Refer to SADDLEBAGS > REMOVE (Page 3-144).
2. Determine the primary loading condition that the vehicle will most often be used in (Rider Only, Rider + Passenger, Rider + Tour-Pak or Rider + Passenger + Tour-Pak).
3. Refer to Table 2-14. Calculate preload distance for the threaded preload adjuster for primary loading condition.
4. For vehicles with a Tour-Pak, add a preload distance to the calculated primary loading condition preload setting.

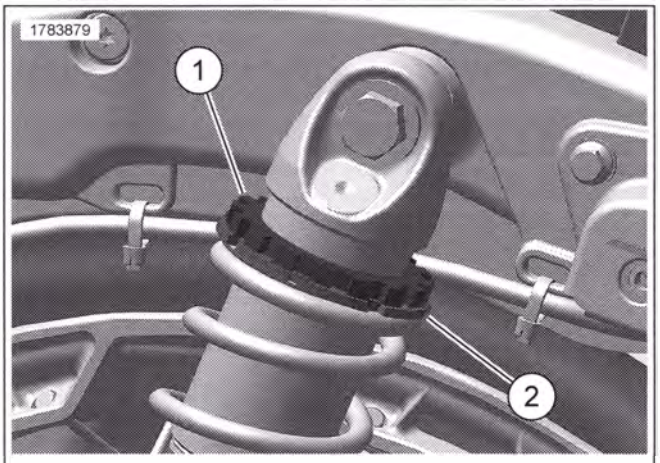
   Length/Dimension/Distance: 0.59 in (15 mm)
5. See Figure 2-45. Using the provided spanner wrench, turn the lock ring (1) on right shock counterclockwise (CCW) to minimum (MIN).
6. Turn the adjustment ring (2) clockwise (CW) until the distance from the top of the adjustment ring to the bottom of the lock ring (in mm) matches the calculated preload distance determined in steps 3 and 4, above.
7. Holding adjustment ring in place, turn lock ring CW and tighten against adjustment ring using the spanner wrench.
8. Install the right saddlebag. Refer to SADDLEBAGS > INSTALL (Page 3-144).

Set preload for cargo weight.

1. Determine the weight of all cargo.
2. See Figure 2-46. Turn the adjustment knob (2) on the left shock fully CCW to MIN.
3. Refer to Table 2-15. Turn the adjustment knob CW the number of full turns listed in the table for that cargo weight.

NOTE

The hydraulic preload adjuster can be used for short term passenger adjustments with minimal cargo. Turn the hydraulic adjustment knob CW to maximum (MAX) when the passenger is on the vehicle.



1. Lock ring
2. Adjustment ring

Figure 2-45. Threaded Adjuster (Right Side Shock Absorber)

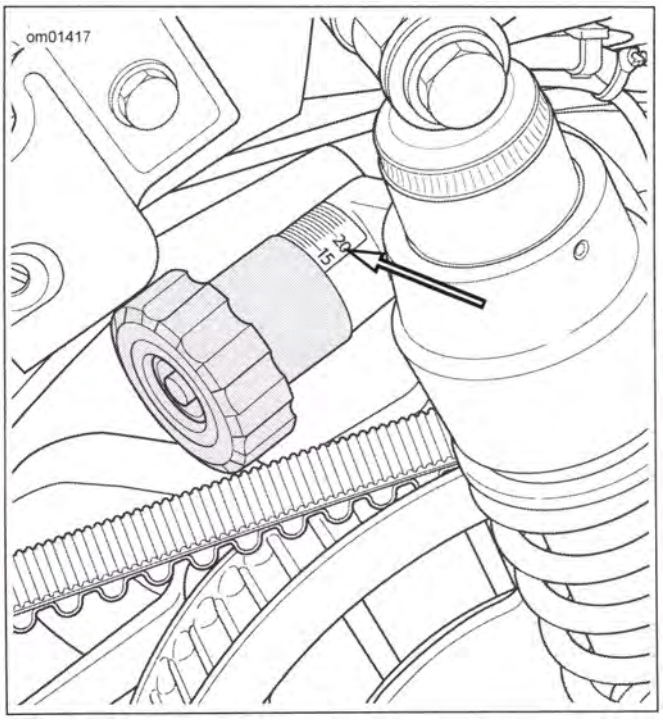


Figure 2-46. Preload Adjustment Knob

Table 2-14. Right Shock Absorber Threaded Preload Adjuster Settings for Rider/Passenger

		ADDITIONAL WEIGHT OF PASSENGER																		
	LB	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
	KG	0	5	9	14	18	23	27	32	36	41	45	50	54	59	64	68	73	77	82
RIDER WEIGHT																				
LB	KG	mm Between Top of Adjuster Ring and Bottom of Lock Ring																		
150	68	0	2	5	7	10	12	14	17	19	22	24	26	29	31	34	36	38	41	43
160	73	0	2	5	7	10	12	14	17	19	22	24	26	29	31	34	36	38	41	43
170	77	0	2	5	7	10	12	14	17	19	22	24	26	29	31	34	36	38	41	43
180	82	0	2	5	7	10	12	14	17	19	22	24	26	29	31	34	36	38	41	43
190	86	2	4	7	9	11	14	16	19	21	23	26	28	31	33	35	38	40	43	45
200	91	4	6	8	11	13	16	18	20	23	25	28	30	32	35	37	40	42	44	47
210	95	5	8	10	12	15	17	20	22	24	27	29	32	34	37	39	41	44	46	49
220	100	7	9	12	14	17	19	21	24	26	29	31	33	36	38	41	43	45	48	50
230	104	9	11	14	16	18	21	23	26	28	30	33	35	38	40	42	45	47	50	52
240	109	11	13	15	18	20	23	25	27	30	32	35	37	39	42	44	47	49	51	54
250	113	12	15	17	19	22	24	27	29	31	34	36	39	41	44	46	48	51	53	56
260	118	14	16	19	21	24	26	28	31	33	36	38	40	43	45	48	50	52	55	57
270	122	16	18	21	23	25	28	30	33	35	37	40	42	45	47	49	52	54	57	59
280	127	18	20	22	25	27	30	32	34	37	39	42	44	46	49	51	54	56	58	61
290	131	19	22	24	26	29	31	34	36	39	41	43	46	48	51	53	55	58	60	60

Table 2-15. Left Shock Absorber Hydraulic Preload Adjuster Settings for Cargo

CARGO WEIGHT		Turns from MIN
LB	KG	
0	0	0
10	5	2
20	9	4
30	14	6
40	18	9
50	23	11
60	27	14
70	32	17
80	36	20
90	41	20
100	45	20

LEAK CHECK

1. Check exhaust system for obvious signs of leakage such as carbon tracks and marks at pipe joints.
   a. Check for loose or missing fasteners.
   b. Check for cracked pipe clamps or brackets.
   c. Check for loose or cracked exhaust shields.
2. Check exhaust system for audible signs of leakage.
   a. Start engine.
   b. Cover end of muffler with clean, dry shop towel.
   c. Listen for signs of exhaust leakage.
3. Correct any detected leaks.
   a. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27). Disassemble exhaust system.
   b. Clean all mating surfaces.
   c. Repair or replace damaged components.
   d. Assemble exhaust system.

NOTE

If leak continues, disassemble and apply PERMATEX ULTRA COPPER or LOCTITE 5920 FLANGE SEALANT or equivalent oxygen sensor/catalyst-safe alternative to mating surfaces.

REMOVE

1. See Figure 2-47. Remove air cleaner cover.
   a. Remove screw (1).
   b. Remove cover (2).
2. Remove filter element.
   a. Lubricate element seal with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.
   b. Rotate element to loosen.
   c. Move filter element (4) to rear at an upward angle to disengage from snorkel.
   d. Remove filter element.
   e. Remove seal (3). Inspect for damage or wear.

CLEAN AND INSPECT

⚠ WARNING

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

⚠ WARNING

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

NOTE

Do not strike filter element on a hard surface to dislodge dirt.

1. Wash paper/wire mesh filter element in lukewarm water and mild detergent.

NOTE

Do NOT use air cleaner filter oil on the Harley-Davidson air filter element.

2. Allow filter element to air dry or use low-pressure compressed air from the inside of the filter.

NOTE

The element is sufficiently clean when light is uniformly visible through the media.

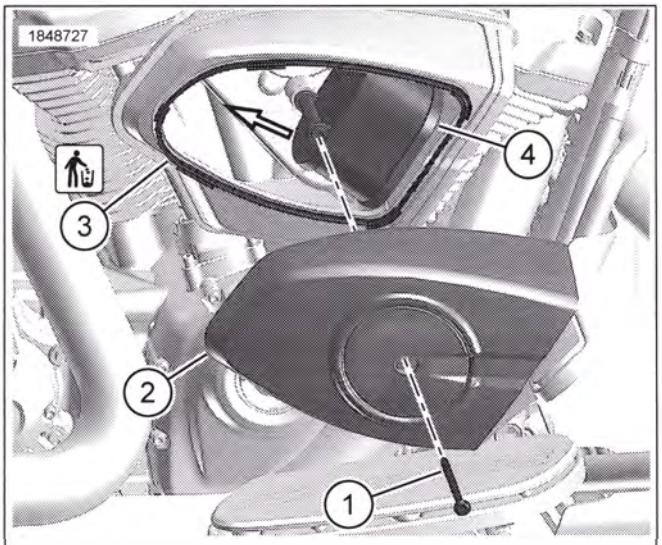
3. Hold filter element up to a strong light to check progress.
4. Replace filter element if element cannot be adequately cleaned or if element is damaged.

INSTALL

FASTENER	TORQUE VALUE	
Air cleaner cover screw	92–102 **in-lbs**	10.4–11.5 N·m

1. Clean seal location groove of all residual oil and debris
2. See Figure 2-47. Replace seal (3) if damaged or worn.
3. Install filter element.
   a. Lubricate element seal and snorkel with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.
   b. Rotate filter element (**4**) onto snorkel and press forward into position.
   c. Align seal (3) with groove in air filter housing. Install seal.
   d. Verify seal is not twisted.
4. Install air cleaner cover.
   a. Lubricate seal (3) with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water to help prevent seal from rolling.
   b. Install cover (2).
   c. Install screw (1). Tighten

      Torque: 92–102 **in-lbs** (10.4–11.5 N·m) *Air cleaner cover screw*



1. **Screw**
2. **Cover**
3. **Seal**
4. **Filter element**

Figure 2-47. Air Filter Element

CLEAN AND INSPECT

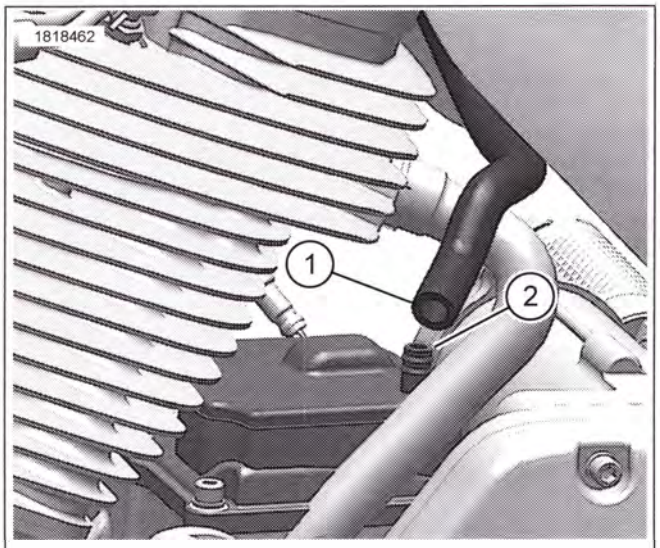
1. See Figure 2-48. Remove breather hose (1) from breather barb (2).

2. Clean and inspect breather hose.

   a. Inspect hose for cracks or leaks and replace if necessary. See ENGINE > BREATHER (Page 4-20).

   b. Remove any build up inside hose and barbed fitting.

3. See Figure 2-48. Install breather hose (1) on breather barbed fitting (2).



1. **Breather hose**
2. **Breather barb**

Figure 2-48. Transmission Breather Barb

PREPARE

1. Remove seat. See CHASSIS > SEAT (Page 3-139).
2. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
3. Remove BCM and BCM caddy. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).

REMOVE

1. See Figure 2-49. Remove battery.
   a. Disconnect negative cable (3).
   b. Disconnect positive cable (2).
   c. Pull up on battery strap (1) to raise battery.
   d. Remove battery.

INSTALL

FASTENER	TORQUE VALUE	
Battery cable screws	60–70 **in-lbs**	6.8–7.9 N·m

CONSUMABLE	PART NUMBER
ELECTRICAL CONTACT LUBRICANT	11300004

1. Install battery.
   a. Run battery strap rearward across bottom of battery tray, then up and across the frame crossmember.
   b. Verify battery strap is routed properly.

NOTE

Battery removal is very difficult without battery strap correctly positioned.

   c. See Figure 2-49. Place battery into battery tray, terminal side forward.

⚠ WARNING

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

NOTICE

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

NOTICE

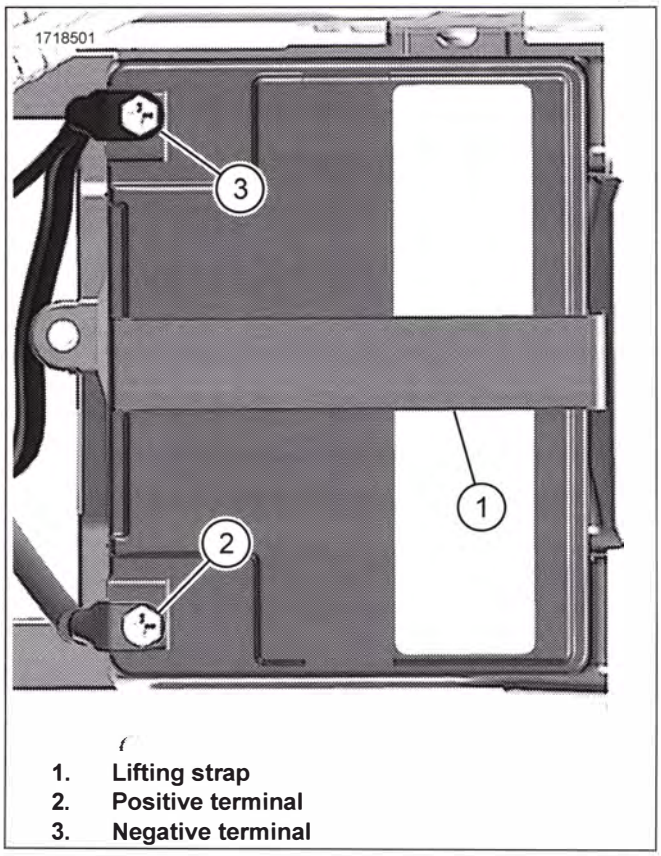
Do not over-tighten bolts on battery terminals. Use recommended torque values. Over-tightening battery terminal bolts could result in damage to battery terminals. (00216a)

2. Connect battery cables.
   a. Connect positive battery cable. Tighten.
      Torque: 60–70 **in-lbs** (6.8–7.9 N·m) *Battery cable screws*
   b. Connect negative battery cable. Tighten.
      Torque: 60–70 **in-lbs** (6.8–7.9 N·m) *Battery cable screws*

NOTICE

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

3. Apply a light coat of petroleum or electrical contact lubricant to both battery terminals.
   Consumable: ELECTRICAL CONTACT LUBRICANT (11300004)
4. Fold battery strap over top of battery.



1. **Lifting strap**
2. **Positive terminal**
3. **Negative terminal**

Figure 2-49. Battery Compartment

CLEAN AND INSPECT

NOTE

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

1. Clean battery top.
   a. Mix a solution of five teaspoons of baking soda (sodium bicarbonate) per liter or quart of water.
   b. Apply to battery top.
2. When the solution stops bubbling, rinse off battery with clean water.
3. Clean cable connectors and battery terminals with a wire brush or sandpaper. Remove any oxidation.
4. Inspect the battery terminal screws and cables for breakage, loose connections and corrosion.
5. Check the battery terminals for melting or damage.
6. Inspect the battery for discoloration, raised top or a warped or distorted case. Replace as necessary.
7. Inspect the battery case for cracks or leaks.

VOLTAGE TEST

The voltage test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is fully charged. Refer to Table 2-16.

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

Table 2-16. Voltage 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%

STORAGE

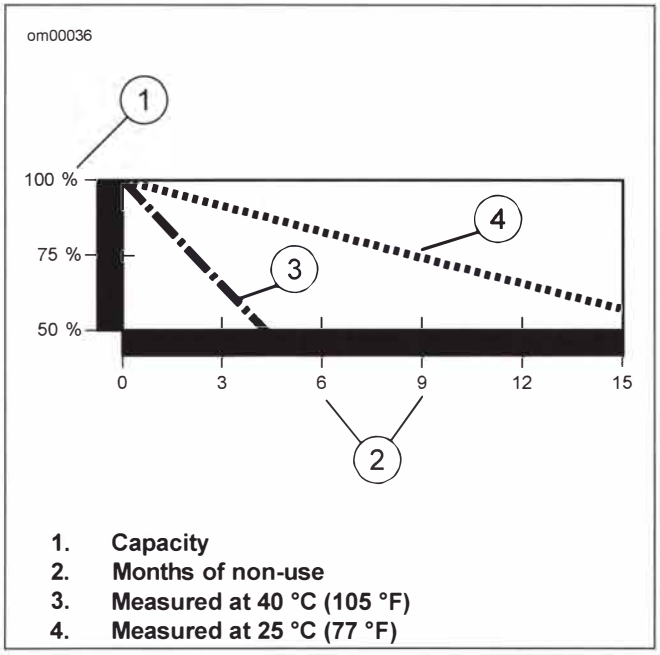
See Figure 2-50. A battery is affected by self-discharge whether stored in or out of the vehicle. A battery that is stored in the vehicle is also affected by parasitic loads. A parasitic load is caused by things like diode leakage or maintaining computer memory with the vehicle turned off.

Batteries self-discharge at a faster rate at higher ambient temperatures. Store battery in a cool, dry place to reduce the self-discharge rate.

Charge the battery every two weeks if stored in the vehicle. Charge the battery once per month if removed the vehicle.

NOTE

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



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

Figure 2-50. Effective Rate of Temperature on Battery Self-discharging Rate

COMPLETE

1. Install BCM caddy and BCM. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
2. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
3. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

NOTE

Fuel tank removal improves access to the right spark plugs.

2. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

PART NUMBER	TOOL NAME
HD-52006	ADJUSTABLE SPARK PLUG WIRE PULLER

⚠ WARNING

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

NOTE

- *Never remove spark plugs until heads have cooled.*
- *Use ADJUSTABLE SPARK PLUG WIRE PULLER (PART NUMBER: HD-52006) to remove stubborn spark plug boots.*

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

CLEAN AND INSPECT

NOTE

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

See Figure 2-51. Compare plug deposits to Table 2-17.

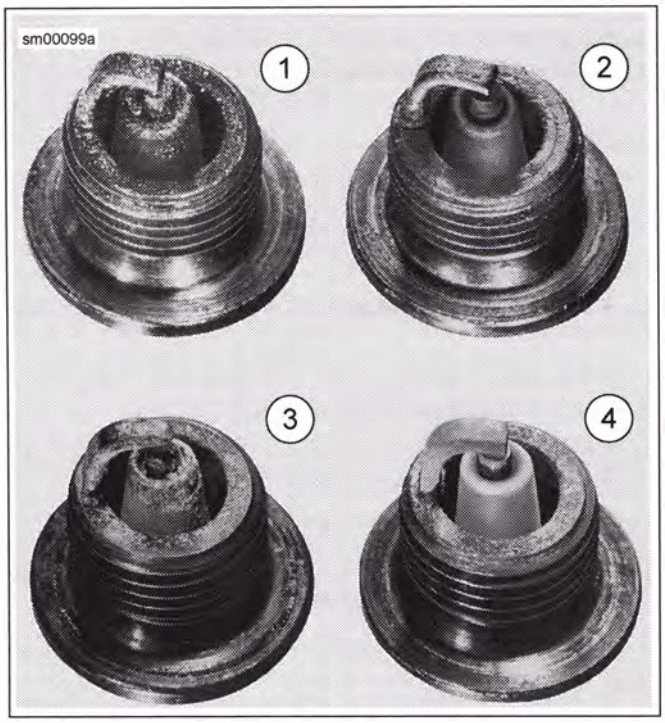


Figure 2-51. Spark Plug Deposits

Table 2-17. Spark Plug Deposit Analysis

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

INSTALL

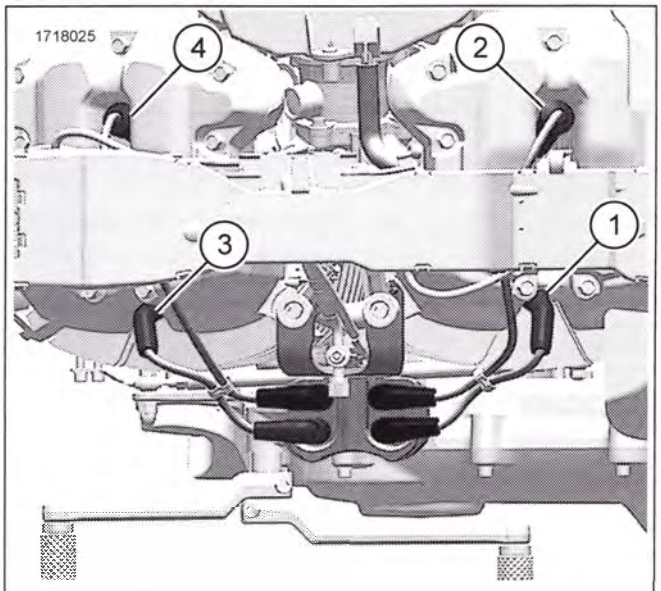
FASTENER	TORQUE VALUE	
Spark plug	80–106 **in-lbs**	9–12 N·m

1. Verify proper gap before installing **new** or cleaned spark plugs.
   a. Select a wire-type feeler gauge within specification. Refer to Table 2-18.
   b. Pass the wire gauge between the electrodes.
   c. Use the proper tool to bend the outer electrode to bring the gap to within specification.

2. Verify that spark plug threads are clean and dry.
3. Install spark plug. Tighten. Refer to Table 2-18.
4. See Figure 2-52. Connect spark plug cables. Check connections at coil, spark plugs and anchor clips or harness caddies.

Table 2-18. Spark Plug

MODELS	TYPE	GAP	TORQUE
All Models	HD-6R10	0.031–0.035 in (0.8–0.9 mm)	80–106 **in-lbs** (9–12 N·m)



1. **Left rear**
2. **Right rear**
3. **Left front**
4. **Right front**

Figure 2-52. Spark Plug Cables

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PLACE IN STORAGE

⚠ WARNING

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

1. Change engine oil and filter. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).

2. Check transmission lubricant level. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).

⚠ WARNING

Avoid spills. Slowly open fuel 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. (00028b)

⚠ WARNING

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

1. Prepare fuel tank.
   a. Fill fuel tank.
   b. Add fuel stabilizer.
2. Lubricate cylinders.
   a. Remove spark plugs. See MAINTENANCE > CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-50).
   b. Inject a few squirts of engine oil into each cylinder.
   c. Crank engine for 5-6 revolutions.
   d. Install spark plugs. See MAINTENANCE > CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-50).
3. Inspect drive belt deflection. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
4. Inspect drive belt and sprockets. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
5. Inspect air cleaner filter. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).
6. Lubricate controls. See MAINTENANCE > LUBRICATE CABLES AND CHASSIS (Page 2-16).
7. Check tire inflation and inspect tires for wear and/or damage. See MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13).
8. If the motorcycle will be stored for an extended period of time, securely support the motorcycle under the frame so that all weight is off the tires.
9. Inspect operation of all electrical equipment and switches.

⚠ WARNING

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

1. Wash painted and chrome-plated surfaces. Apply a light film of oil to exposed unpainted surfaces.

⚠ WARNING

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

⚠ WARNING

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

1. Battery maintenance.
   a. Remove battery from vehicle. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
   b. Charge battery until the correct voltage is obtained.
   c. Charge the battery every other month if it is stored at temperatures below specification.
      Temperature: 60 °F (16 °C)
2. Charge battery once a month if it is stored at temperatures above specification.
   Temperature: 60 °F (16 °C)

⚠ 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)

1. Covering the motorcycle.
   a. If the motorcycle is to be covered, use a material that will breathe, such as a Harley-Davidson storage cover or light canvas.

b. Plastic materials that do not breathe promote the formation of condensation, which leads to corrosion.

REMOVE 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 battery.
2. Install battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
3. Inspect spark plugs. See MAINTENANCE > CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-50).
4. Fill fuel tank, if empty.
5. Start engine. Run until it reaches normal operating temperature.
6. Check engine oil level. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
7. Check transmission lubricant level. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).
8. Perform all of the checks in the PRE-RIDING CHECKLIST in the owner's manual.

GENERAL

⚠ WARNING

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

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

NOTE

- *See the electrical diagnostic manual for additional information.*
- *See COOLING SYSTEM > DIAGNOSE AND TEST (Page 7-5) for additional cooling system troubleshooting.*

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

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

Engine Turns Over But Does Not Start

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

NOTE

For cold-weather starts, always disengage clutch.

5. Spark plug cables in bad condition and shorting, cable connections loose or cables connected to incorrect cylinders.
6. Damaged wire or loose wire connection at ignition coil, battery or ECM connector.
7. Ignition timing incorrect due to faulty ignition coil, ECM or sensors (follow any current DTC's in order of priority).
8. Bank Angle Sensor tripped and ignition switch not cycled OFF then back to IGNITION.
9. Fuel filter clogged (verify fuel pressure meets specification).
10. Sticking or damaged valve(s) or wrong length pushrod(s) (verify leak down and compression meet specifications).
11. Plugged fuel injectors.

Starts Hard

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

NOTE

For cold-weather starts, always disengage clutch.

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

Starts But Runs Irregularly or Misses

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

15. Damaged intake or exhaust valve (verify leak down and compression meet specifications).
16. Partially plugged fuel injector(s).

A Spark Plug Fouls Repeatedly

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

Pre-Ignition or Detonation (Knocks or Pings)

1. Fuel octane rating too low.
2. Faulty spark plugs.
3. Incorrect spark plug for the kind of service.
4. Excessive carbon deposit on piston head or in combustion chamber.
5. Ignition timing advanced due to faulty sensor inputs (TMAP and/or CKP).
6. Ignition timing advanced due to ECM or sensors (CKP, ET or TMAP) defective.
7. Intake manifold vacuum leak.

Overheating

1. Insufficient oil supply or oil not circulating.
2. Insufficient air flow over engine.
3. Heavy carbon deposits.
4. Ignition timing retarded due to defective ECM or faulty sensor(s) (TMAP and/or CKP).
5. Leaking valve(s).
6. Low coolant level. *
7. Restricted radiator air flow. *
8. Coolant pump or fans inoperative. *
9. Vent hose crimped. *
10. Air in coolant. *

* Twin-Cooled only

Valve Train Noise

NOTE

Some valve train noise at start-up is normal until lifters fill with oil.

1. Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.
2. Faulty hydraulic lifter(s).
3. Bent pushrod(s).
4. Incorrect pushrod length.
5. Rocker arm binding on shaft.
6. Valve sticking in guide.
7. Chain tensioning spring or shoe worn.
8. Cam(s), cam gear(s) or cam bushing(s) worn.
9. Cam timing incorrect.
10. Valve seat loose in head.
11. Cam bearing in crankcase or cam support plate clearance excessive.

Excessive Vibration

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

Check Engine Light Illuminates During Operation

Fault detected. For diagnostic information see the electrical diagnostic manual.

LUBRICATION SYSTEM

Oil Does Not Return To Oil Reservoir

1. Oil reservoir empty.
2. Oil pump not functioning.
3. Restricted oil lines or fittings.
4. Restricted oil filter.
5. O-ring damaged or missing from oil pump/crankcase junction (also results in poor engine performance).

Engine Uses Too Much Oil Or Smokes Excessively

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

9. Plugged crankcase scavenge port.
10. Oil diluted with gasoline.

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

1. Loose parts.
2. Imperfect seal at gaskets, pushrod covers, washers, etc.
3. Restricted breather passages or hose to air cleaner.
4. Restricted oil filter.
5. Oil reservoir overfilled.
6. Lower rocker housing gasket installed incorrectly (upside down).
7. Restricted oil return line to oil reservoir.
8. Porosity.

Low Oil Pressure

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

High Oil Pressure

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

ELECTRICAL SYSTEM

NOTE

For diagnostic information see the electrical diagnostic manual.

Alternator Does Not Charge

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

Alternator Charge Rate Is Below Normal

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

Speedometer Operates Erratically

1. Loose connections.

TRANSMISSION

Shifts Hard

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

Jumps Out Of Gear

1. Shifter rod improperly adjusted.
2. Shifter drum improperly adjusted or damaged/worn.
3. Shifter engaging parts badly worn and rounded.
4. Bent shifter forks .
5. Damaged gears.

Clutch Slips

1. Clutch lever not returning completely.
2. Damaged or binding secondary clutch actuator.
3. Insufficient clutch spring tension.
4. Worn friction discs.

Clutch Drags Or Does Not Release

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

Clutch Chatters

Friction discs or steel discs worn or warped.

HANDLING

Irregularities

1. Improperly loaded motorcycle. Non-standard equipment such as heavy radio receivers, extra lighting equipment excess or unsecured luggage may cause unstable handling.
2. Load (people and gear) exceeds maximum GVWR.
3. Damaged tire(s) or improper front-rear tire combination.
4. Irregular or peaked front tire tread wear.
5. Incorrect tire pressure.
6. Shock absorber not functioning normally.
7. Incorrect suspension adjustment.
8. Loose wheel axle nuts. Tighten to recommended torque specification.

9. Excessive wheel hub bearing play.
10. Rear wheel out of alignment with frame and front wheel.
11. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races.
12. Loose spokes (laced wheel vehicles only).
13. Tire and wheel unbalanced.
14. Rims and tires out-of-round or eccentric with hub.
15. Rims and tires out-of-true sideways.
16. Rear fork pivot assembly: improperly tightened or assembled, or loose/pitted or damaged pivot bearings.
17. Engine mounts and/or stabilizer links loose, worn or damaged.
18. Incorrect, non-specified tire mounted on front or rear wheel.

BRAKES

Brake Does Not Hold Normally

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

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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
ABS module, caliper, banjo bolts, 10mm	17–19 ft-lbs	23–26 N·m	3.17 ABS MODULE, Install
ABS module, master cylinder, banjo bolts, 12mm	28–30 ft-lbs	38–41 N·m	3.17 ABS MODULE, Install
ABS module locknuts	53–89 **in-lbs**	6–10 N·m	3.17 ABS MODULE, Install
Air deflector screw	13–15 ft-lbs	17.5–20 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Air Deflector Assembly
Air deflector screws frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.31 AIR DEFLECTORS, Frame Mounted Fairing
Axle, front	70–75 ft-lbs	95–102 N·m	3.4 FRONT WHEEL, Install
Axle, front, pinch screw	18–22 ft-lbs	24–30 N·m	3.4 FRONT WHEEL, Install
Banjo bolt, master cylinder, front	18–19 ft-lbs	24–26 N·m	3.12 FRONT BRAKE MASTER CYLINDER, Install
Banjo bolt, master cylinder, rear	21–22 ft-lbs	28–30 N·m	3.14 REAR BRAKE MASTER CYLINDER, Install
Brake bleeder screw, rear	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake bleeder screw, rear	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake caliper, front, bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m	3.13 FRONT BRAKE CALIPER, Install
Brake caliper, front, mounting screws	28–38 ft-lbs	38–52 N·m	3.13 FRONT BRAKE CALIPER, Install
Brake caliper, front, screws	28–38 ft-lbs	38–52 N·m	3.13 FRONT BRAKE CALIPER, Install
Brake caliper, rear, banjo bolt	18–19 ft-lbs	24–26 N·m	3.15 REAR BRAKE CALIPER, Install
Brake caliper, rear, mounting screws	43–48 ft-lbs	58–65 N·m	3.15 REAR BRAKE CALIPER, Install
Brake caliper, rear, mounting screws	43–48 ft-lbs	58–65 N·m	3.15 REAR BRAKE CALIPER, Install
Brake disc, front, screws	20–22 ft-lbs	27–30 N·m	3.4 FRONT WHEEL, Assemble
Brake disc, rear, screws	30–45 ft-lbs	41–61 N·m	3.5 REAR WHEEL, Assemble
Brake lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m	3.12 FRONT BRAKE MASTER CYLINDER, Install
Brake lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m	3.12 FRONT BRAKE MASTER CYLINDER, Install
Brake line, front, master cylinder P-clamp	62–80 **in-lbs**	7–9 N·m	3.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Brake line, front, master cylinder P-clamp	62–80 **in-lbs**	7–9 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Brake line, front caliper, bracket, center screw	12–18 **in-lbs**	1.4–2 N·m	3.16 BRAKE LINES, Brake Line: Front Caliper to ABS Module
Brake line, front caliper bracket, screws	45–50 **in-lbs**	5.1–5.7 N·m	3.16 BRAKE LINES, Brake Line: Front Caliper to ABS Module
Brake line, master cylinder, rear, multi-clamp screw	20–25 **in-lbs**	2.3–2.8 N·m	3.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake line, master cylinder, rear, P-clamp screw	80–97 **in-lbs**	9–11 N·m	3.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake master cylinder, front, reservoir cover screws	9–11 **in-lbs**	1–1.2 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake master cylinder, front, reservoir cover screws	9–11 **in-lbs**	1–1.2 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake master cylinder, rear, reservoir cover screws	12–15 **in-lbs**	1.4–1.7 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake master cylinder, rear, reservoir cover screws	12–15 **in-lbs**	1.4–1.7 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake pedal, nut	15–20 ft-lbs	20–27 N·m	3.14 REAR BRAKE MASTER CYLINDER, Install
Clutch cable, P-clamp, screw	62–80 **in-lbs**	7–9 N·m	3.26 CLUTCH CONTROL, Install
Clutch cable, P-clamp, screw	62–80 **in-lbs**	7–9 N·m	3.26 CLUTCH CONTROL, Install

FASTENER	TORQUE VALUE		NOTES
Clutch cable, P-clamp screw	62–80 **in-lbs**	7–9 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Clutch lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m	3.26 CLUTCH CONTROL, Install
Clutch lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m	3.26 CLUTCH CONTROL, Install
Clutch switch cover screw	53 **in-lbs**	6 N·m	3.26 CLUTCH CONTROL, Install
Debris deflector, screws	62–89 **in-lbs**	7–10 N·m	3.24 BELT GUARDS, Install
Engine guard, lower, screws	15–20 ft-lbs	20–27 N·m	3.30 ENGINE GUARD, Install
Engine guard, upper, screws	90–110 **in-lbs**	10.2–12.4 N·m	3.30 ENGINE GUARD, Install
Engine mount, front bracket, screws	42–48 ft-lbs	57–65 N·m	3.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Fairing bracket to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Disassemble and Assemble: Inner Fairing Assembly
Fairing mount to steering head locknuts: Frame-mounted fairing	20–30 ft-lbs	27–41 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Mounting Bracket
Fairing support to fairing: Frame-mounted fairing	48–60 **in-lbs**	5.4–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing support to fork: Frame-mounted fairing	22–28 ft-lbs	30–38 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing vent to inner fairing: fork mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Air Duct Cover Assembly
Footboard mounting screws	60–80 **in-lbs**	6.8–9 N·m	3.39 RIDER FOOTRESTS, Assemble
Footboard support bracket screws	36–42 ft-lbs	49–57 N·m	3.39 RIDER FOOTRESTS, Install
Footpeg lower shoulder screw, passenger	44–71 **in-lbs**	5–8 N·m	3.40 PASSENGER FOOTRESTS, Install
Footpeg pad screw	15–20 ft-lbs	20.3–27.1 N·m	3.40 PASSENGER FOOTRESTS, Assemble
Footpeg upper screw, passenger	36–42 ft-lbs	49–57 N·m	3.40 PASSENGER FOOTRESTS, Install
Fork, tube plug	22–59 ft-lbs	30–80 N·m	3.21 FRONT FORK, Assemble
Fork bracket, lower, pinch screws	15–18 ft-lbs	19.7–24.4 N·m	3.21 FRONT FORK, Install
Fork bracket, upper pinch screw	15–18 ft-lbs	19.7–24.4 N·m	3.21 FRONT FORK, Install
Fork bracket to fork pinch screw	15–18 ft-lbs	19.7–24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork bracket to steer stem pinch screw	15–18 ft-lbs	19.7–24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork cover screws	24–48 **in-lbs**	2.7–5.4 N·m	3.21 FRONT FORK, Install
Fork mounted dash panel screw (side)	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Dash Panel
Fork mounted dash panel screw (top)	10–20 **in-lbs**	1.1–2.3 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Dash Panel
Fork mounted headlamp screw	96–119 **in-lbs**	10.8–13.5 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Headlamp Assembly
Fork mounted inner fairing screws	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Inner Fairing Shell
Fork mounted inner fairing to upper fork screws	155–177 **in-lbs**	17.5–20 N·m	3.27 FAIRING: FORK MOUNTED, Detach Fairing For Service
Fork mounted outer fairing shell screw	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Outer Fairing Shell
Fork slider assembly screw	30–37 ft-lbs	40–50 N·m	3.21 FRONT FORK, Assemble
Fork stem screw, 1st torque	18 ft-lbs	24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork stem screw, 1st torque	18 ft-lbs	24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Front brake caliper bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Drain
Front fender mounting screw	16–20 ft-lbs	21.7–27.1 N·m	3.35 FRONT FENDER, Install

FASTENER	TORQUE VALUE		NOTES
Handlebar, fork mounted fairing, clamp screws	16–20 ft-lbs	21.7–27.1 N·m	3.33 HANDLEBAR, Remove and Install: Fork Mounted Fairing
Handlebar, frame mounted fairing, clamp screws	16–18 ft-lbs	21.7–24.4 N·m	3.33 HANDLEBAR, Remove and Install: Frame Mounted Fairing
Handlebar, ground jump connector, screw	25–35 **in-lbs**	2.8–3.9 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Handlebar, ground jump connector, screw	25–35 **in-lbs**	2.8–3.9 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Handlebar riser screws	30–40 ft-lbs	40.7–54.2 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Inner fairing screws (near speakers): frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Inner fairing support screws, frame-mounted fairing	48–60 **in-lbs**	5.4–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Assembly
Inner fairing-to-mount screws, frame-mounted fairing	97–142 **in-lbs**	11–16 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Assembly
Jiffy stand bracket screws	36–42 ft-lbs	49–57 N·m	3.41 JIFFY STAND, Install
Jiffy stand leg stop screw	15–20 ft-lbs	20.3–27.1 N·m	3.41 JIFFY STAND, Install
Jiffy stand sensor screw	97–124 **in-lbs**	11–14 N·m	3.41 JIFFY STAND, Install
LH inner speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
LH outer speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
License plate module mounting screw	60–80 **in-lbs**	6.8–9 N·m	3.38 REAR LICENSE PLATE BRACKET, Install
Lower air vent halves	9–13 **in-lbs**	1–1.5 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Lower Vents
Master cylinder, rear, mounting screws	10–13 ft-lbs	14–17 N·m	3.14 REAR BRAKE MASTER CYLINDER, Install
Mid frame air deflector screws	25–35 **in-lbs**	2.8–4 N·m	3.31 AIR DEFLECTORS, Remove and Install: Mid Frame Deflectors
Mirror flange nut	29–35 **in-lbs**	3.3–4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Mirrors
Mirror stem acorn nut	10–12 ft-lbs	14–16 N·m	3.34 MIRRORS, Install
Muffler screws	14–18 ft-lbs	19–24 N·m	3.45 SADDLEBAG SUPPORTS, Install
Muffler screws	14–18 ft-lbs	19–24 N·m	3.45 SADDLEBAG SUPPORTS, Install
Nacelle to ignition switch screws	10–20 **in-lbs**	1.1–2.3 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Nacelle
Outer fairing lower screws: frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Outer fairing upper front: frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Outer nacelle to fork bracket screws	53–80 **in-lbs**	6–9 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Nacelle
Rear brake caliper bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Drain
Rear fender, support bracket, nut	44–89 **in-lbs**	5–10 N·m	3.36 REAR FENDER, Assemble
Rear fender mounting nut	16–20 ft-lbs	21.7–27.1 N·m	3.36 REAR FENDER, Assemble
Rear fender mounting screw	16–20 ft-lbs	21.7–27.1 N·m	3.36 REAR FENDER, Install
Rear fork, bracket, pivot shaft screws	55–65 ft-lbs	75–88 N·m	3.23 REAR FORK, Install
Rear fork bracket screws	55–65 ft-lbs	75–88 N·m	3.23 REAR FORK, Install
Rear frame to main frame screws	40–45 ft-lbs	54–61 N·m	3.43 REAR FRAME, Install
Rear shock, adjuster knob, screw	26–43 **in-lbs**	2.9–4.9 N·m	3.25 REAR SHOCK ABSORBERS, Assemble
Rear shock absorber mounting bolt	63–70 ft-lbs	85–95 N·m	3.25 REAR SHOCK ABSORBERS, Install
Rear shock mounting screws	63–70 ft-lbs	85–95 N·m	3.23 REAR FORK, Install

FASTENER	TORQUE VALUE		NOTES
RH inner speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
RH outer speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
Saddlebag, face plate, screws	12–15 **in-lbs**	1.41–1.75 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, latch assembly, screws	30–35 **in-lbs**	3.4–4 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lever, screw	50–60 **in-lbs**	5.65–6.78 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lock, nut	25–35 **in-lbs**	2.82–3.95 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lock, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lower support, front, screw	32–36 ft-lbs	43–49 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, lower support, front, screw	32–36 ft-lbs	43–49 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, lower support to fender support, screw	15–20 ft-lbs	20–27 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, lower support to fender support, screw	15–20 ft-lbs	20–27 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, lower support to support casting, screw	30–37 ft-lbs	40.7–50.2 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, strike, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, support casting, captivated washer,screw	15–20 ft-lbs	20–27 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, support casting, flange screw	10–12 ft-lbs	14–16 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, tether, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, tether, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag hinge screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag support, insert, screws	18–22 ft-lbs	24–30 N·m	3.45 SADDLEBAG SUPPORTS, Install
Seat, two-up one-piece, seat screw	44–71 **in-lbs**	5–8 N·m	3.42 SEAT, Install
Seat, two-up one-piece, strap screw	44–71 **in-lbs**	5–8 N·m	3.42 SEAT, Install
Speaker enclosure screws	50–60 **in-lbs**	5.6–6.8 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Speaker Enclosure
Speaker enclosure screws	50–60 **in-lbs**	5.6–6.8 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Speaker Enclosure
Steering stem, final torque: FLHX models	4.4 ft-lbs	5.9 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Steering stem, final torque: FLHXSE models	3.9 ft-lbs	5.3 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Steering stem, final torque: FLTRX models	8.9 ft-lbs	12 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Steering stem, final torque: FLTRXSE, FLTRXSTSE models	8.3 ft-lbs	11.2 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Storage compartment cover to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Storage Compartment Doors and Hinges
Storage compartment to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Storage Compartments
Upper air duct screws	23–30 **in-lbs**	2.6–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Upper Air Duct
Valve stem screw	23–27 **in-lbs**	2.6–3 N·m	3.9 TIRE PRESSURE MONITORING SYSTEM (TPMS), Install
Windshield, air duct vane, screws: Frame mounted fairing	8–11 **in-lbs**	0.9–1.2 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Air Duct Vane Assembly
Windshield bracket screws	22–32 **in-lbs**	2.5–3.6 N·m	3.27 FAIRING: FORK MOUNTED, Disassemble and Assemble: Air Duct Cover Assembly

FASTENER	TORQUE VALUE		NOTES
Windshield mount screws fairing: Frame mounted fairing	20–35 **in-lbs**	2.3–4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Air Duct Cover and Air Duct Bezel
Windshield screws: Fork-mounted fairing models	13–15 **in-lbs**	1.5–1.7 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Windshield
Windshield screws: Frame-mounted fairing models	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Windshield

CHASSIS

Chassis Specifications

Table 3-1. Dimensions

ITEM	Street Glide® (FLHX)		Road Glide® (FLTRX)	
	in	mm	in	mm
Length	94.9	2410	94.9	2410
Overall Width	38.4	975	37.2	945
Overall height	53.1	1350	51.8	1315
Wheel base	64.0	1625	64.0	1625
Road clearance	5.5	140	5.7	145
Seat height[1]	26.1	664	25.9	658
(1) With 180 lb (81.6 kg) rider on seat				

Table 3-2. Weights

ITEM	Street Glide® (FLHX)		Road Glide® (FLTRX)	
	lb	kg	lb	kg
Running weight[1]	811	368	838	380
Maximum added weight allowed[2]	549	249	522	237
GVWR	1360	617	1360	617
GAWR front	500	227	500	227
GAWR rear	927	420	927	420
(1) The total weight of the motorcycle as delivered with all oil/fluids and approximately 90% of fuel.				
(2) The total weight of accessories, cargo, riding gear, passenger and rider must not exceed this weight.				

Table 3-3. Specified Tires

MODEL	MOUNT	SIZE	SPECIFIED TIRE	PRESSURE COLD	
				psi	kPa
Street Glide ® (FLHX) Road Glide® (FLTRX)	Front	19 in	Dunlop D408F BW 130/60B19 M/C 61H	36 psi	248 kPa
Street Glide® (FLHX) Road Glide® (FLTRX)	Rear	18 in	Dunlop D407T BW 180/55B18 M/C 80H	40 psi	276 kPa

⚠ WARNING

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

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

NOTE

- *The maximum additional weight allowed on the motorcycle equals the Gross Vehicle Weight Rating (GVWR) minus the running weight. For example, a motorcycle with GVWR of 1,199.30 lb (544 kg) having a running weight of 800.27 lb (363 kg), would allow a maximum of an additional 399.03 lb (181 kg) combined weight of the rider, passenger, riding gear, cargo and installed accessories.*
- *For important information regarding tire data and tire inflation, see .*

Tire Specifications

⚠ WARNING

Harley-Davidson recommends the use of its specified tires. Harley-Davidson vehicles are not designed for operation with non-specified tires, including snow, moped and other special-use tires. Use of non-specified tires can adversely affect stability, handling or braking and lead to loss of vehicle control, which could result in death or serious injury. (00024d)

NOTE

ABS equipped motorcycles must always use tires and wheels that are the same as the original equipment. ABS monitors rotational speed of the wheels through individual wheel speed sensors to determine the application of ABS. Changing to different diameter wheels or different size tires can alter the rotational speed. This will upset the system calibration and have an adverse effect on its ability to detect and prevent lockups. Operating with inflation pressure other than those specified can reduce ABS performance.

VEHICLE IDENTIFICATION NUMBER (VIN)

General

See Figure 3-2. A unique 17-digit serial or Vehicle Identification Number (VIN) is assigned to each motorcycle. Refer to Table 3-4.

Location

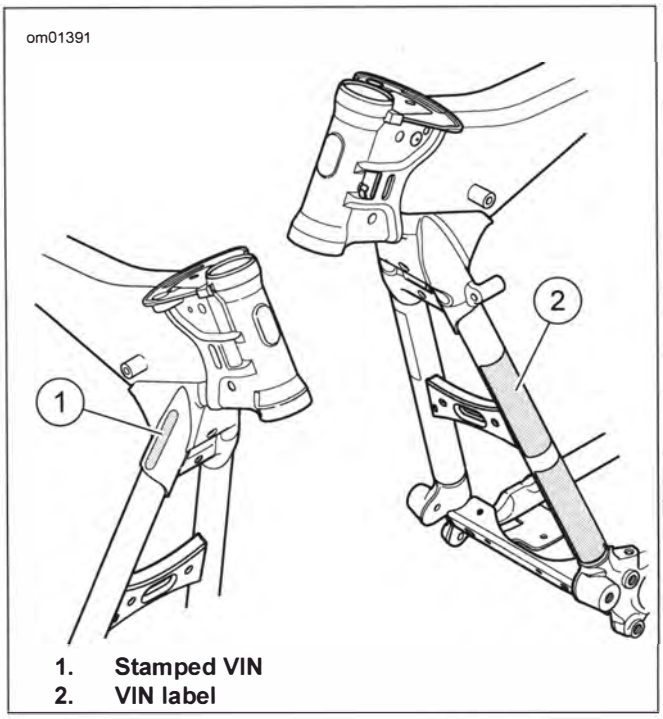
See Figure 3-1. The full 17-digit VIN is stamped on the right side of the frame near the steering head. In some destinations, a printed VIN label is also attached on the front downtube.

Abbreviated VIN

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

NOTE

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



1. Stamped VIN
2. VIN label

Figure 3-1. VIN Locations

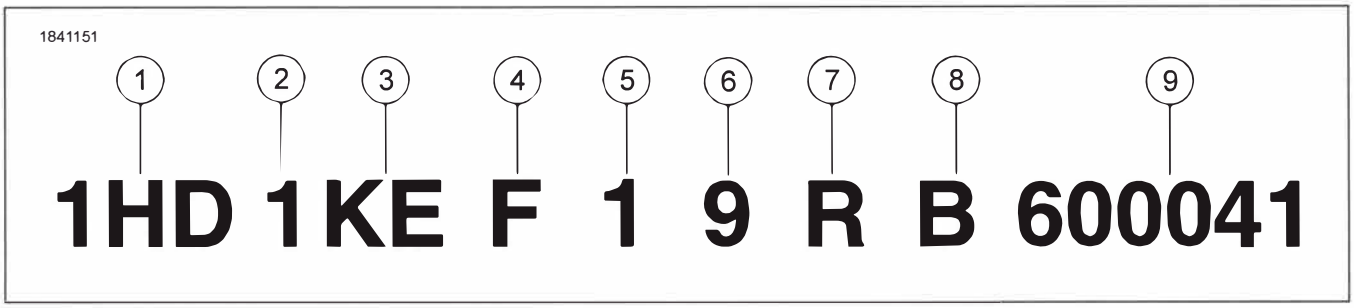


Figure 3-2. Typical Harley-Davidson VIN: 2024 Harley-Davidson Touring Models

Table 3-4. VIN Model Codes: Touring Models

CODE	MODEL	CODE	MODEL
KB	Street Glide®™ (FLHX)®	KH	Road Glide®™ (FLTRX)®

Table 3-5. Harley-Davidson VIN Breakdown: 2024 Touring Models

POSITION	DESCRIPTION	POSSIBLE VALUES
1	World manufacturer identifier	1HD=Originally manufactured in the United States 5HD=Originally manufactured in the United States or Thailand for sale outside of the United States 932=Originally manufactured in Brazil MLY=Originally manufactured in Thailand
2	Motorcycle type	1=Heavyweight motorcycle (901 cm^3 or larger)
3	Model	See VIN model table
4	Engine type	L=Milwaukee-Eight™ 117 Engine, 1923 cm^3

Table 3-5. Harley-Davidson VIN Breakdown: 2024 Touring Models

POSITION	DESCRIPTION	POSSIBLE VALUES
5	Calibration/configuration, introduction	1=Domestic (DOM) 2=California (CAL) 3=Canada (CAN) 4=ENG/EN2/HDI/HD2/HD4 5=Japan (JPN) 6=Australia (AUS/AU2) 7=Brazil (BRZ) 8=Asia Pacific (APC) 9=IN2 0=ASEAN (AZN) A=China (CHN) G=HD3
6	VIN check digit	Can be 0-9 or X
7	Model year	R=2024
8	Assembly plant	B=York, PA U.S.A. D=H-D Brazil-Manaus, Brazil (CKD) S=Tasit, Pluagdang, Rayong, Thailand
9	Sequential number	Varies

PREPARE

1. Raise front wheel. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).
2. Check wheel bearings. See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).
3. Measure brake disc runout. See MAINTENANCE > INSPECT BRAKES (Page 2-17).
4. Detach front brake calipers from fork. Support calipers. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).

REMOVE

NOTE

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

1. See Figure 3-3. Remove wheel.

NOTE

- *Never pull WSS cable taut or use to retain wheel, axle or other components.*
- *Always keep WSS and ABS encoder bearing away from magnetic fields. Items such as magnetic parts trays, magnetic base dial indicators, alternator rotors will damage sensor.*

   a. Loosen pinch screw (4).

   b. Remove axle (5).

   c. Remove front wheel (3).

   d. Remove spacer (4).

   e. Secure WSS (2).

2. Clean and inspect axle pinch bore.

INSTALL

FASTENER	TORQUE VALUE	
Axle, front	70–75 ft-lbs	95–102 N·m
Axle, front, pinch screw	18–22 ft-lbs	24–30 N·m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

1. Install front wheel.

   a. See Figure 3-3. Apply light coat of anti-seize to axle (5), bearing bores and bore of spacer (1).

   ANTI-SEIZE LUBRICANT (98960-97)

   b. See Figure 3-5. Install WSS (1) with index pin (3) on outboard side.

   c. See Figure 3-4. Install spacer (3) with grooves (2) facing right front fork (1).

   d. See Figure 3-3. Hold spacer (1) and WSS (2) while sliding axle (5) through front wheel (3) bearings.

   e. Start threading axle. Do not tighten.

   f. See Figure 3-5. Rotate WSS (1) until it contacts rear of fork (4). Back off enough to maintain a gap (2) between WSS wire stem and fork (4).

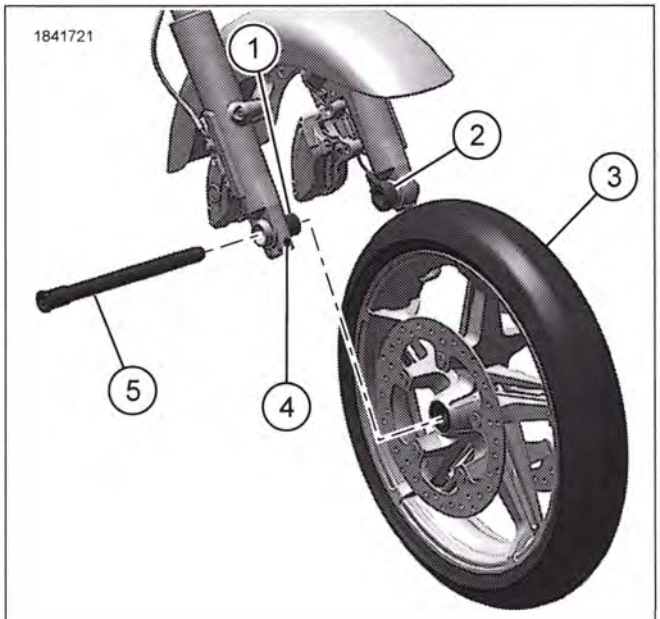
2. See Figure 3-3. Tighten axle.

   Torque: 70–75 ft-lbs (95–102 N·m) *Axle, front*

3. Verify WSS cable is not pinched or kinked.

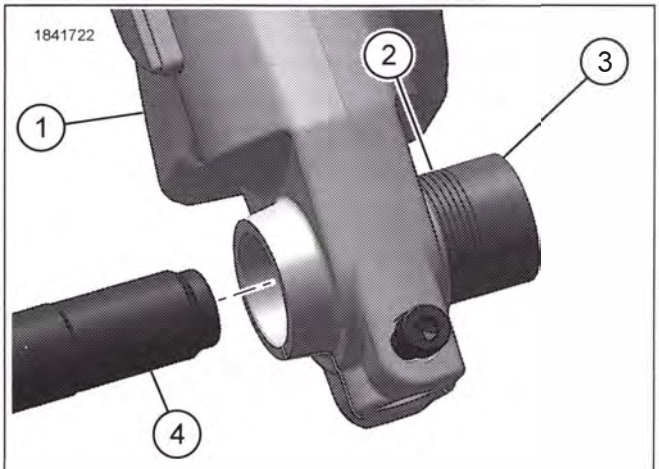
4. Push and hold right fork slider inboard until it contacts spacer (1). Tighten pinch screw (4).

   Torque: 18–22 ft-lbs (24–30 N·m) *Axle, front, pinch screw*



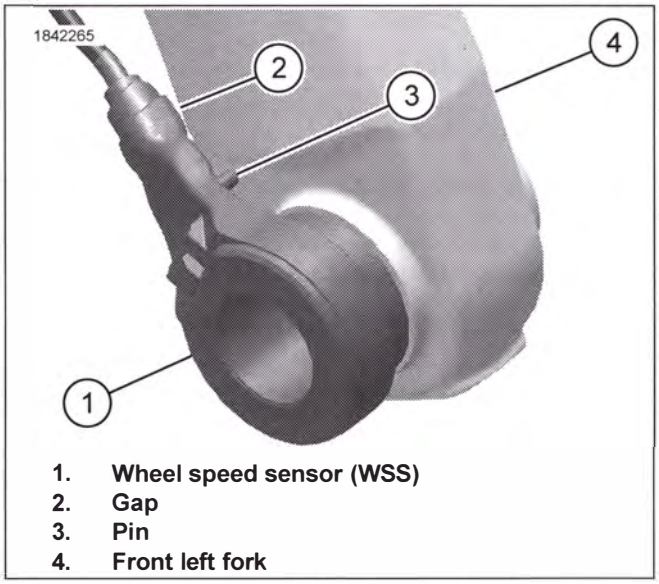
1. **Spacer**
2. **Wheel speed sensor (WSS)**
3. **Front wheel**
4. **Pinch screw**
5. **Axle**

Figure 3-3. Front Wheel Mount



1. **Front right fork**
2. **Spacer grooves**
3. **Spacer**
4. **Axle**

Figure 3-4. Front Wheel Spacer



1. **Wheel speed sensor (WSS)**
2. **Gap**
3. **Pin**
4. **Front left fork**

Figure 3-5. Front WSS

DISASSEMBLE

1. See Figure 3-6. Remove front brake discs.
   a. Remove and discard screws (5).
   b. Remove front brake discs.
2. Remove and discard sealed wheel bearings (1,4). See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19)
3. Remove bearing spacer (2).
4. Remove and discard valve stem (3). See CHASSIS > TIRE PRESSURE MONITORING SYSTEM (TPMS) (Page 3-22).
5. Clean all parts for inspection, except bearings and WSS.

CLEAN AND INSPECT

1. Clean all parts thoroughly.
2. Inspect front wheel for damage. Replace or repair as necessary.
3. Check wheel lateral and radial runout before installing a new tire. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

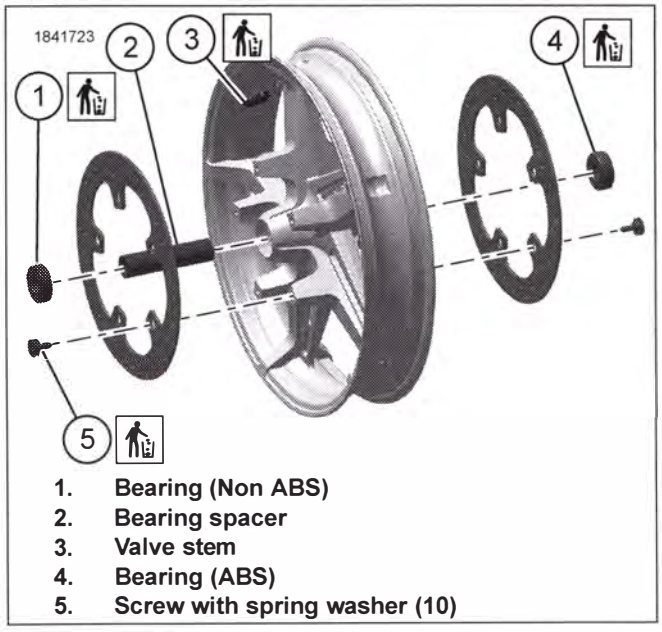
ASSEMBLE

FASTENER	TORQUE VALUE	
Brake disc, front, screws	20–22 ft-lbs	27–30 N·m

NOTICE

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

1. Install bearing spacer (2).
2. Install **new** sealed wheel bearings (1,4). See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).
3. Install **new** valve stem (3). See CHASSIS > TIRE PRESSURE MONITORING SYSTEM (TPMS) (Page 3-22).
4. Install front brake disc.
   a. Align front brake discs with mounting holes.
   b. Install **new** brake disc screws (5).
   c. Tighten screws in crosswise pattern.
      Torque: 20–22 ft-lbs (27–30 N·m) *Brake disc, front, screws*



1. **Bearing (Non ABS)**
2. **Bearing spacer**
3. **Valve stem**
4. **Bearing (ABS)**
5. **Screw with spring washer (10)**

Figure 3-6. Front Wheel Components

COMPLETE

1. Attach brake calipers. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).
2. Lower front wheel.

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Raise rear of motorcycle. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).
3. Inspect wheel bearings. See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).
4. Measure brake disc runout. See MAINTENANCE > INSPECT BRAKES (Page 2-17).
5. Measure sprocket isolator wear. See CHASSIS > REAR WHEEL COMPENSATOR (Page 3-17).
6. Remove left and right mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).
7. Release rear Wheel Speed Sensor (WSS) cable from rear brake hose.
8. Remove rear brake caliper. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).

REMOVE

PART NUMBER	TOOL NAME
HD-47925-A	AXLE NUT TORQUE ADAPTER

NOTE

- *Always keep wheel speed sensor (5) and ABS wheel bearing (8) away from magnetic fields.*
- *Never pull WSS cable taut or use to retain wheel, axle or other components.*

1. See Figure 3-7. Remove axle.
   a. Remove and dispose of E-clip (1).
   b. See Figure 3-10. Using special tool, hold weld nut on left side and loosen cone nut (2).
      Special Tool: AXLE NUT TORQUE ADAPTER (HD-47925-A)
   c. See Figure 3-7. Remove cone nut.
   d. Remove adjuster cam (3).
   e. Rotate weld nut on axle to loosen drive belt.
   f. Remove axle. Catch external spacer (16), caliper bracket (4) and rear WSS (5).
2. Remove caliper bracket from anchor weldment on rear fork.
3. Remove belt from compensator sprocket (13).

NOTE

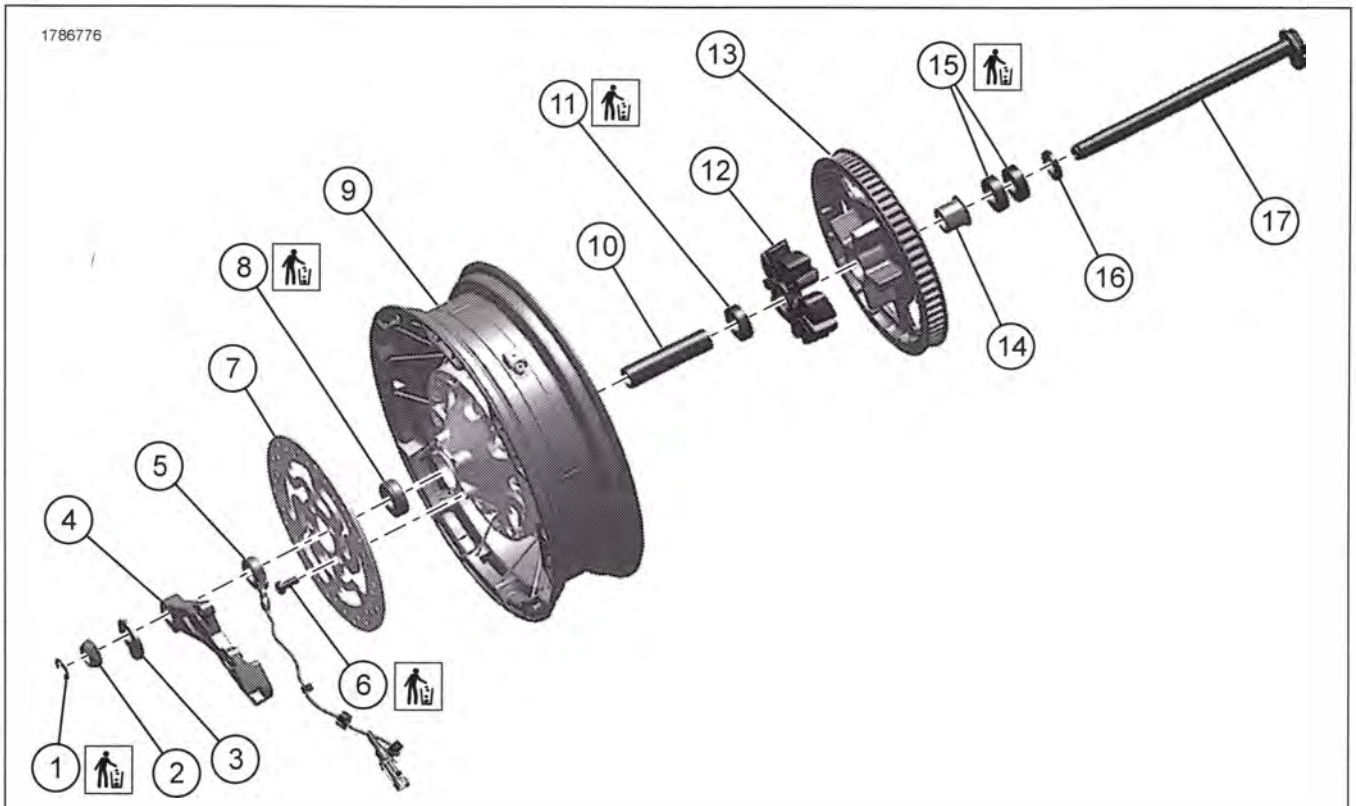
Hold sprocket to prevent it from dropping.

4. Remove wheel.

INSTALL

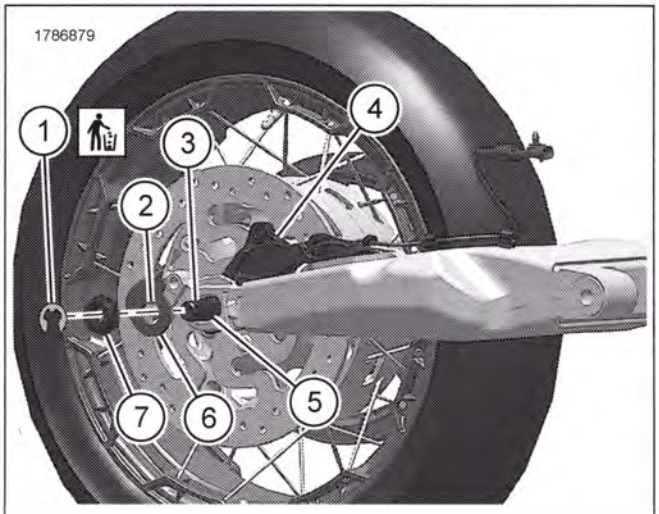
CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

1. See Figure 3-9. Inspect caliper bracket. Replace rubber bumper (2) if necessary.
2. See Figure 3-7. Install rear wheel.
   a. Verify sprocket (13) is fully seated in wheel.
   b. Place wheel in rear fork.
   c. Install belt over sprocket.
   d. Seat caliper bracket on anchor weldment of rear fork.
   e. Apply anti-seize lubricant to axle (17), bearing bores and bore of spacer sleeve (10).
      ANTI-SEIZE LUBRICANT (98960-97)
   f. Slide axle through left side of rear fork, external spacer (thin) (16), sprocket (13), wheel hub, rear WSS, caliper bracket (4) and right side of rear fork.
   g. See Figure 3-8. Rotate axle (5) with flat (3) on threaded end topside.
   h. Apply a light coat of anti-seize lubricant to inboard face of cone nut (7). Avoid contact with threads.
      ANTI-SEIZE LUBRICANT (98960-97)
   i. Install adjuster cam (6) and cone nut. Finger-tighten only.
3. Route WSS cable.
   a. Route cable forward and outboard of caliper bracket (4). Then along top of rear fork.
   b. Rotate WSS counterclockwise until index pin contacts caliper bracket.
4. Snug cone nut.
5. Adjust drive belt. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
6. See Figure 3-7. Install **new** E-clip (1).



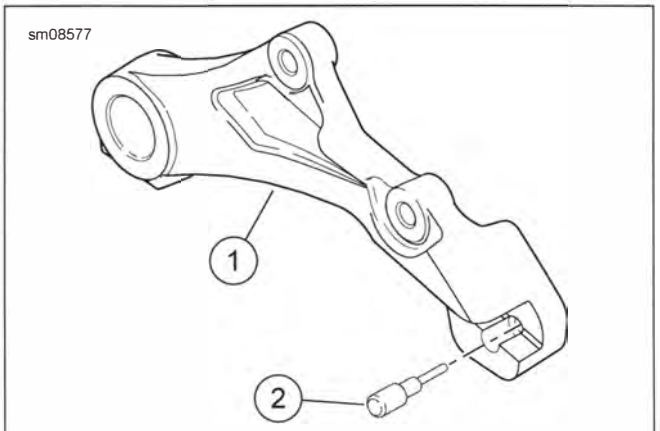
1. E-clip
2. Cone nut
3. Adjuster cam
4. Caliper bracket
5. Rear wheel speed sensor
6. Screw (5)
7. Brake disc
8. Right ABS wheel bearing
9. Wheel, typical
10. Bearing spacer
11. Left wheel bearing, standard
12. Isolator
13. Compensator sprocket
14. Spacer, compensator
15. Sprocket bearing (2)
16. External spacer
17. Axle

Figure 3-7. Rear Wheel Assembly



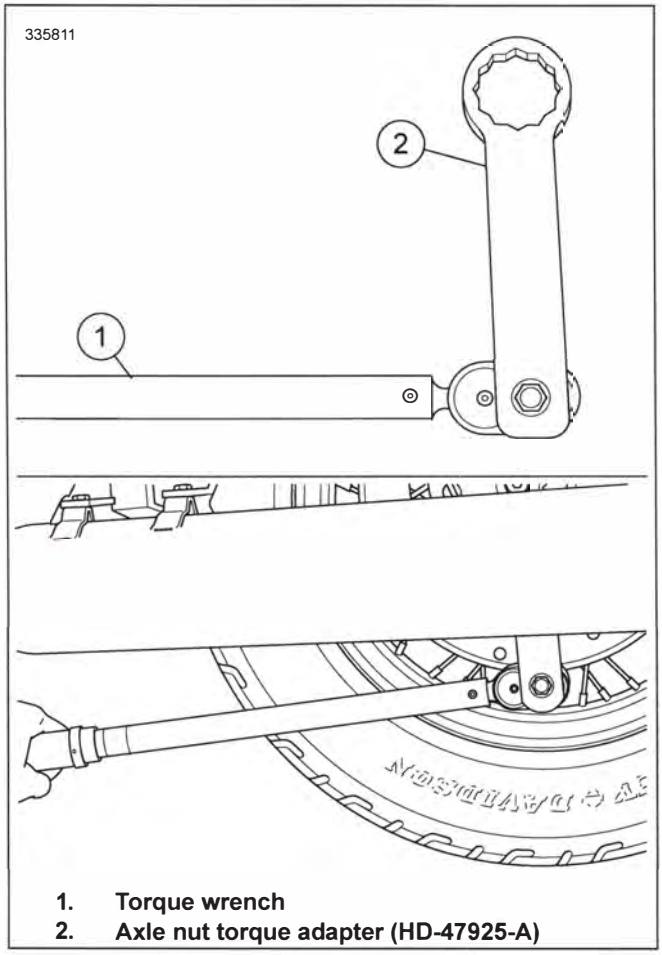
1. E-clip
2. Flat spot, adjuster cam
3. Flat spot, Axle
4. Caliper bracket
5. Axle
6. Adjuster cam
7. Cone nut

Figure 3-8. Rear Wheel Adjuster Cam (typical)



1. Caliper bracket
2. Rubber bumper

Figure 3-9. Caliper Bracket



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

Figure 3-10. Install Tool Perpendicular to Torque Wrench

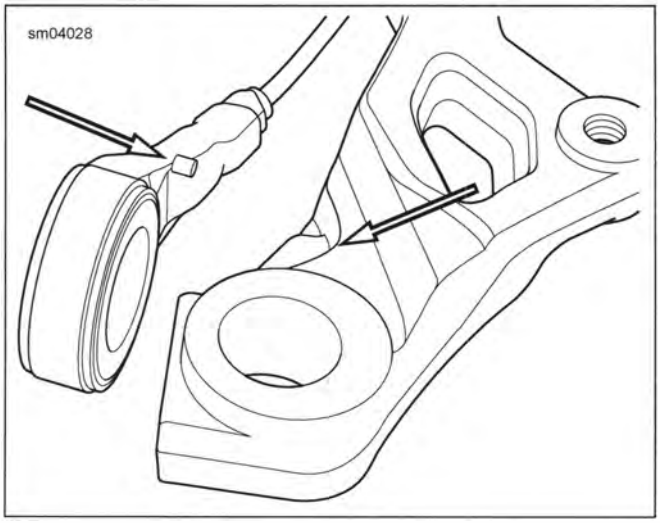


Figure 3-11. Rear Wheel Speed Sensor Index Pin (ABS Equipped)

DISASSEMBLE

1. Remove sprocket (13) and isolator (12). See CHASSIS > REAR WHEEL COMPENSATOR (Page 3-17).
2. Remove tire. See CHASSIS > TIRES (Page 3-24).
3. Remove brake disc (7).
   a. If wheel is assembled with same disc, mark both wheel and disc so that it can be installed in its original position.
   b. Remove and discard screws (6).
   c. Remove brake disc.
4. Remove bearings and bearing spacer. See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).

CLEAN AND INSPECT

1. Clean all parts thoroughly.
2. Inspect rear wheel for damage. Replace or repair as necessary.
3. Check wheel runout. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

ASSEMBLE

FASTENER	TORQUE VALUE	
Brake disc, rear, screws	30–45 ft-lbs	41–61 N·m

NOTICE

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

1. Install bearings and bearing spacer. See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).
2. Install brake disc.
   a. Install brake disc (7) in its original position.
   b. Install **new** screws (6). Tighten screws in a cross-wise pattern.

      Torque: 30–45 ft-lbs (41–61 N·m) *Brake disc, rear, screws*
   c. Install tire. See CHASSIS > TIRES (Page 3-24).
   d. Install isolator (12) and sprocket (13). See CHASSIS > REAR WHEEL COMPENSATOR (Page 3-17).

COMPLETE

1. Install rear brake caliper. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).
2. Secure rear WSS cable to brake hose.
3. Adjust drive belt deflection. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
4. Install left and right mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).
5. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
6. Lower motorcycle.

GENERAL

Check wheels for lateral and radial runout before installing a **new** tire.

Cast wheels having excess runout must be replaced. Never attempt to straighten cast wheels.

Always check condition of wheel bearings before checking wheel runout. See CHASSIS > SEALED WHEEL BEARINGS (Page 3-19).

CHECKING WHEEL RUNOUT

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

Check wheels for both radial runout and lateral runout. If either measurement is not within specification replace wheel.

Checking Radial Runout

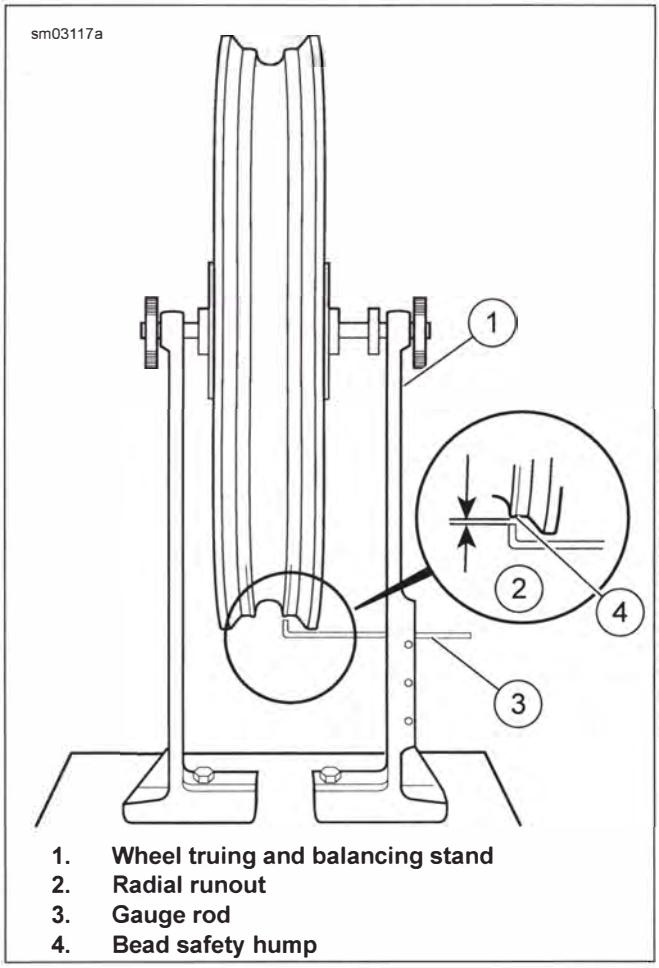
1. See Figure 3-12. Mount wheel in truing stand.

   Special Tool: WHEEL TRUING STAND (HD-99500-80)

2. Adjust gauge rod or dial indicator to the rim's tire bead safety hump.

3. Rotate wheel and measure distance at several locations. Runout must not exceed dimension.

   0.030 in (0.76 mm)



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

Figure 3-12. Checking Radial Runout

Checking Lateral Runout

1. See Figure 3-13. Mount wheel in truing stand.

   Special Tool: WHEEL TRUING STAND (HD-99500-80)

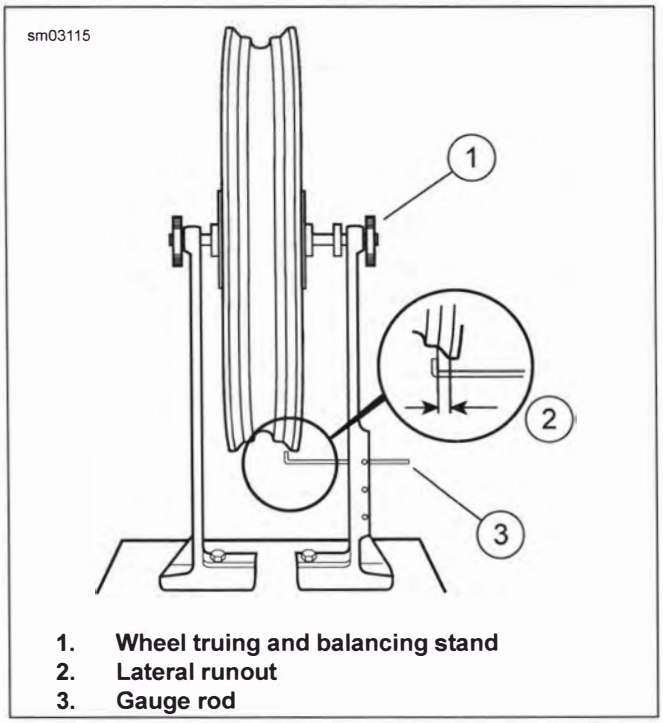
2. *NOTE*

Dial indicators are more accurate than gauge rods.

   Place a gauge rod near, or dial indicator on the rim bead flange.

3. Measure distance at several locations. Lateral runout must not exceed dimension.

   0.030 in (0.76 mm)



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

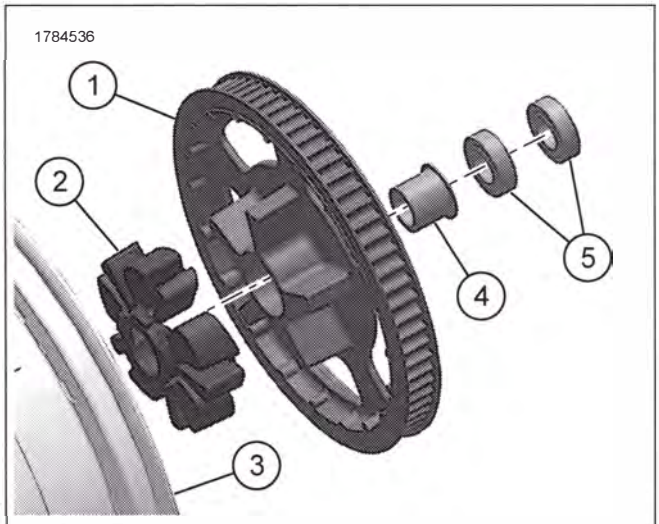
Figure 3-13. Checking Lateral Runout

PREPARE

1. Remove rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).

REMOVE

1. See Figure 3-14. Remove rear wheel compensator.
   a. Pull sprocket (1) from rear wheel (3).
   b. Remove isolator (2) from wheel. Discard isolator.

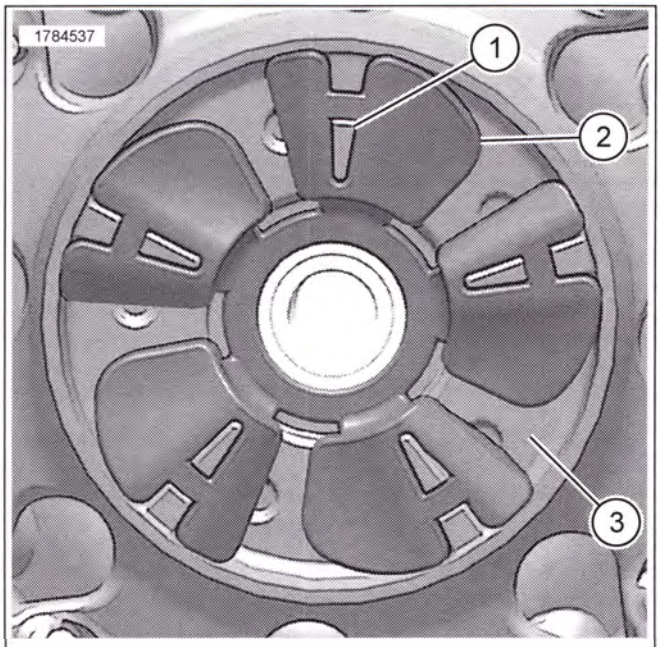


1. **Rear sprocket**
2. **Isolator**
3. **Rear wheel**
4. **Spacer**
5. **Sprocket bearing (2)**

Figure 3-14. Rear Wheel Compensator

INSTALL

1. Install **new** rear wheel compensator.
   a. See Figure 3-15. Lubricate each segment (2) of **new** isolator with equal mix of isopropyl alcohol and water.
   b. Push **new** isolator into wheel. Verify that each isolator segment is completely installed and is flush with each rib (1).
   c. See Figure 3-14 . Push sprocket (1) onto wheel (3).



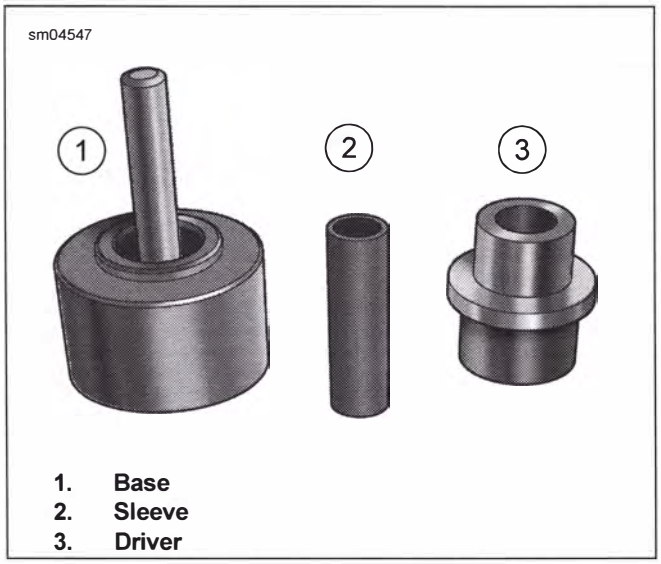
1. **Rib**
2. **Isolator segment**
3. **Sprocket lug gap**

Figure 3-15. Isolator in Wheel

DISASSEMBLE

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

1. See Figure 3-14 . Remove sprocket bearings (5).
   a. See Figure 3-16. Support the base (1) of REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (PART NUMBER: HD-48921) on a suitable press with the large OD facing up and the long pin facing down.
   b. Slide sleeve (2) over the short pin.
   c. Slide the sprocket inboard side up over the sleeve until it rests on the base.
   d. Slide the small OD of driver (3) over the sleeve until it contacts the spacer.
   e. Apply pressure to the driver until bearings drop into base.
2. Remove tool.
3. See Figure 3-14 . Discard bearings (5).



1. **Base**
2. **Sleeve**
3. **Driver**

Figure 3-16. Rear Wheel Compensator Bearing Remover/Installer (HD-48921)

CLEAN AND INSPECT

1. Clean all parts thoroughly. Verify that sprocket bearing bore is clean and dry.

2. Inspect each tooth of the rear wheel sprocket for wear or damage. Replace as necessary.

ASSEMBLE

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

1. See Figure 3-14 . Install spacer (4) and **new** sprocket bearings (5).
   a. See Figure 3-16 . Support the base (1) of REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (PART NUMBER: HD-48921) on a suitable press with the large OD facing up and the long pin facing down.
   b. Slide sleeve (2) over the short pin.
   c. Slide the sprocket outboard side up over the sleeve until it rests on the base.
   d. Install spacer in the sprocket with the small diameter facing down.
   e. Set first **new** bearing in place.
   f. Center the large OD of driver (3) onto the bearing. Verify that the driver contacts complete radius of the outer bearing race.
   g. Apply pressure to the driver until the bearing is firmly seated in the counterbore of the sprocket.
   h. Repeat for second **new** bearing.

COMPLETE

1. Install rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).

PREPARE

1. Remove left side saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove wheel if removing wheel bearings. See
   a. CHASSIS > FRONT WHEEL (Page 3-10).
   b. CHASSIS > REAR WHEEL (Page 3-12).

INSPECT

NOTICE

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

1. Raise wheel.
2. Turn wheel through several rotations.

NOTE

- *Keep wheel speed sensor and ABS encoder bearing away from magnetic fields.*
- *When checking end play, pull or push on the wheel not the brake disc. Pulling or pushing brake disc can distort disc causing a false end play reading.*

3. Check end play.
   a. See Figure 3-17. Mount a magnetic base dial indicator to brake disc.
   b. Set indicator contact point on end of axle.
   c. Firmly push wheel to one side. Zero dial indicator gauge.
   d. Firmly pull wheel back. Note reading on dial indicator.
   e. Repeat procedure to verify reading.
   f. Replace bearings if end play exceeds0.002 in (0.051 mm) or if there is drag, rough rotation or abnormal noise.

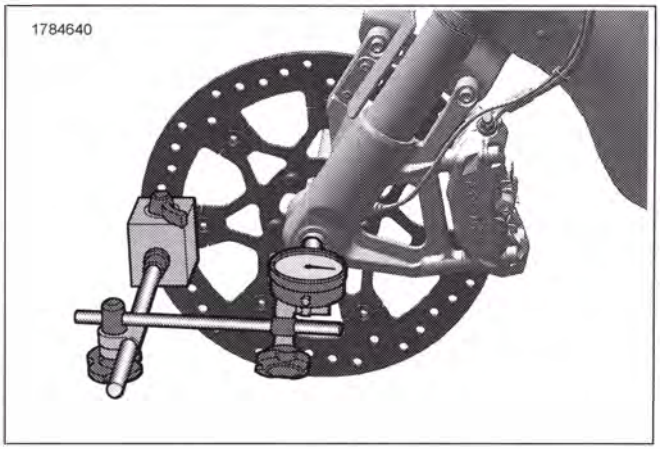


Figure 3-17. Wheel Bearing Inspection (Front Wheel Shown)

REMOVE

PART NUMBER	TOOL NAME
HD-44060	WHEEL BEARING INSTALLER/REMOVER
HD-44060-11A	COLLET

NOTE

- ***Front wheel:** Left side is primary side.*
- ***Rear wheel:** Right or rotor side is primary side.*
- *Remove primary side bearing first for front and rear wheel.*
- *See Figure 3-19. If puller bridge does not have adequate support, place a scrap brake disc having small center hole to support puller bridge.*
- *OE disc removal is not necessary. Place scrap disc directly over OE disc mounting screws.*
- *If OE disc has been removed, place tape or other protective material between hub and scrap disc to prevent cosmetic damage.*

1. See Figure 3-18. Install wheel bearing remover.

   Special Tool: WHEEL BEARING INSTALLER/REMOVER (HD-44060)

   a. Lubricate forcing screw (1).
   b. Install nut (2), washer (3) and nice bearing (4) on screw.
   c. Insert assembly through hole in bridge (5).

NOTE

Choose appropriate collet to remove bearing.COLLET (PART NUMBER: HD-44060-11A)

   d. Install ball bearing inside collet (6).
   e. Fasten collet and ball bearing to forcing screw (1).
   f. Install collet into bearing bore.

2. Remove bearings.

   a. Hold end of forcing screw (1) and turn collet (6) to expand edges of collet.

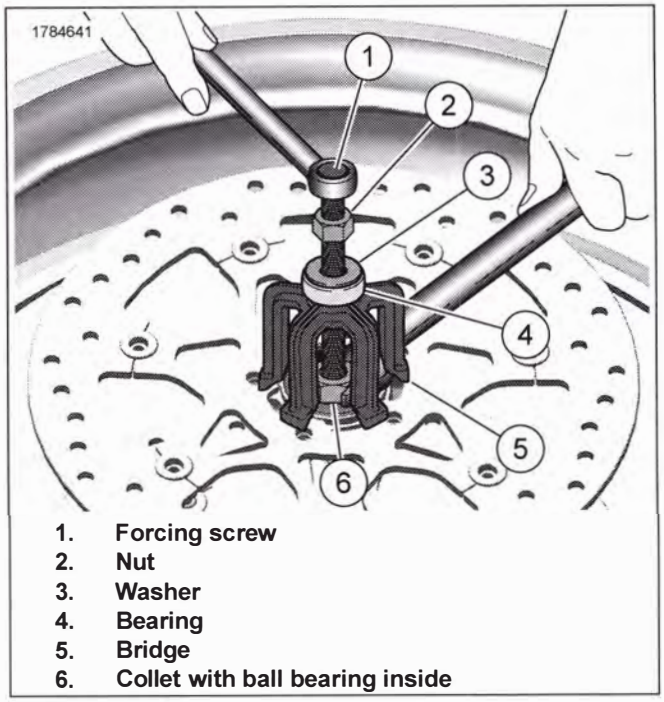
   b. See Figure 3-20. Hold forcing screw (1) and turn nut (2).

   c. Remove bearing.

   d. See Figure 3-21. Remove bearing spacer (6) from inside wheel hub.

   e. Repeat on opposite side.

   f. Discard bearings.



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

Figure 3-18. Wheel Bearing Removal Tool

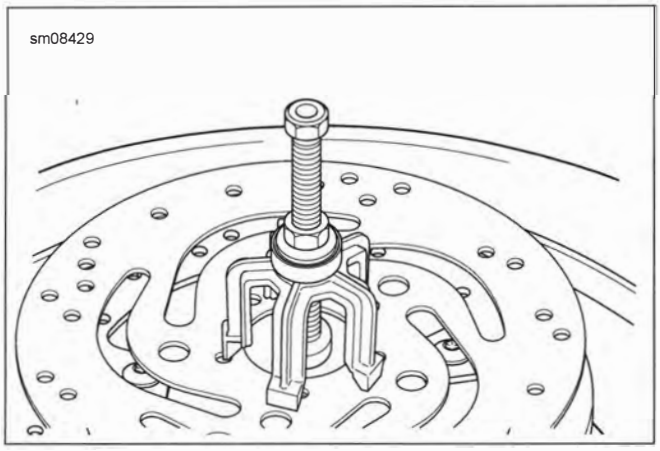
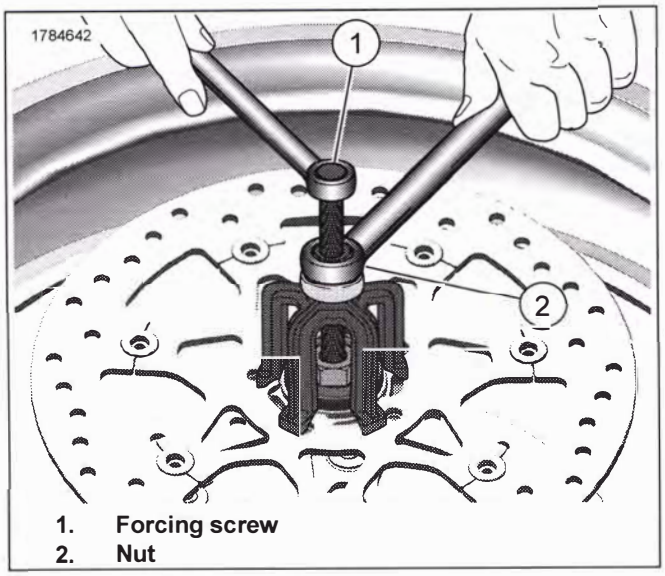
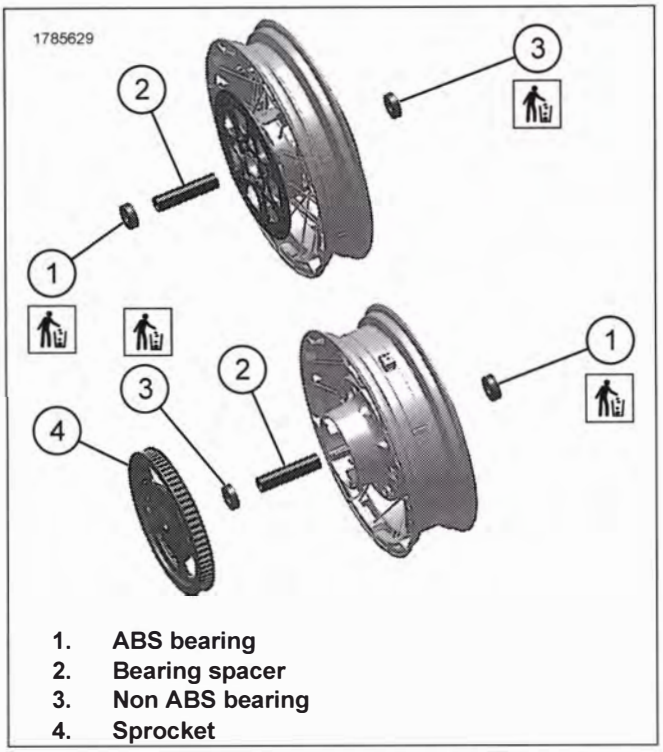


Figure 3-19. Using Scrap Brake Disc



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

Figure 3-20. Removing Bearing



1. **ABS bearing**
2. **Bearing spacer**
3. **Non ABS bearing**
4. **Sprocket**

Figure 3-21. Wheel Bearing Assemblies

INSTALL

PART NUMBER	TOOL NAME
HD-44060	WHEEL BEARING INSTALLER/REMOVER
HD-44060-8	1 INCH INSTALLER

NOTICE

Replace both bearing assemblies even if one assembly appears to be good. Mismatched bearings can lead to excessive wear and premature replacement. (00532c)

NOTE

- *Primary side of wheel is brake rotor side. For dual disc front wheels, primary side is left side.*
- *Install ABS bearing on primary side first.*

1. Install wheel bearing installer/remover.

   Special Tool: WHEEL BEARING INSTALLER/REMOVER (HD-44060)

   a. Lubricate threaded rod.

   b. Install support plate (2) onto rod (1).

   c. Insert assembly through wheel from side opposite primary brake side.

NOTE

Bearing orientation is important.

2. Place **new** bearing on rod.

   a. **Non-ABS bearing: Lettered side against installer (5).**

   b. **ABS bearing: Red side against wheel.**

   c. Place 1-inch installer (5), bearing (4), washer (3) and nut (2) over rod.

      Special Tool: 1 INCH INSTALLER (HD-44060-8)

3. Install bearings.

   a. Hold hex end of threaded rod (1) and turn nut (2).

   b. Bearing is fully seated when nut can no longer be turned.

   c. Remove tool.

   d. Install bearing spacer inside wheel hub.

   e. Reverse tool.

   f. Install opposite side bearing until bearing contacts bearing spacer.

4. **Rear wheel:** Install sprocket.

COMPLETE

1. Install wheel if removed. See

   a. CHASSIS > FRONT WHEEL (Page 3-10).

   b. CHASSIS > REAR WHEEL (Page 3-12).

2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60)

4. Install left side saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144)

GENERAL

General

Sensors mounted in each tire measure and report tire pressure data to the BCM. The BCM monitors the data and displays each tire pressure both in the Boom! Audio system information screen as well as in the odometer trip display. See the electrical diagnostic manual for more information and diagnostics.

NOTE

- *Do not use the TPMS as a pressure gauge when adding or removing air from a tire. Sensor transmissions vary with conditions and may not react immediately when adding or removing air from the tire. Over-inflation or under-inflation can result.*
- *The TPMS sensor will not communicate pressures above 50–60 psi (345–414 kPa) depending on altitude.*
- *TPMS has been calibrated to use air in the tire. Use of 100% nitrogen may affect the accuracy of the system.*

PREPARE

1. Remove wheel. See CHASSIS > FRONT WHEEL (Page 3-10) or CHASSIS > REAR WHEEL (Page 3-12).
2. Remove tire. See CHASSIS > TIRES (Page 3-24).
3. Check wheels for lateral and radial runout. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

REMOVE

1. See Figure 3-22. Remove sensor.
   a. Remove and discard screw (1).
   b. Remove and discard valve stem (5) and o-ring (3).
   c. Remove tire pressure sensor (2) from wheel.

INSTALL

FASTENER	TORQUE VALUE	
Valve stem screw	23–27 **in-lbs**	2.6–3 N·m

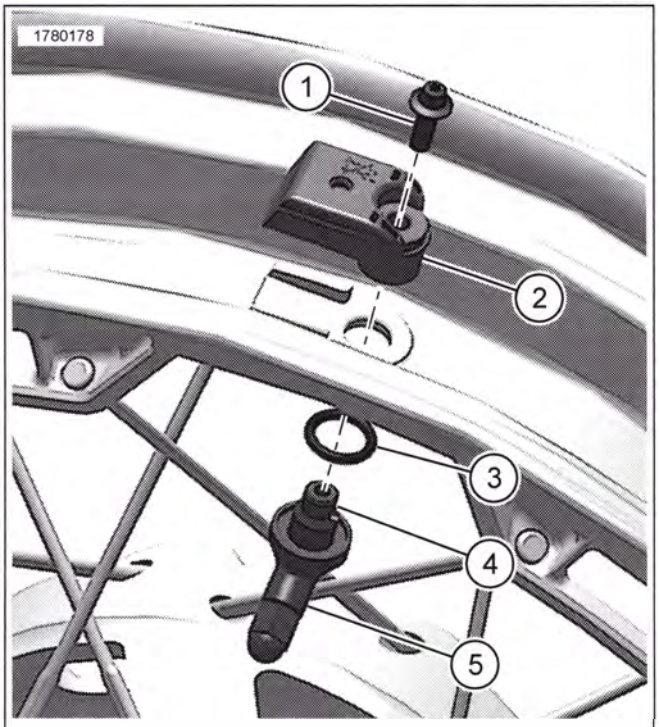
Install Sensor

1. Clean valve stem mounting location.

NOTE

- *Tire pressure sensors are designed for use with the wheels specified for the motorcycle. Attempting to use sensors on other wheels can result in lack of proper fitment, TPMS malfunction and air leakage.*
- *Sensors with good batteries can be reused.*
- *Never install a used valve stem, O-ring or screw.*
- *See Figure 3-22. **New** screw (1) has pre-applied threadlocker.*
- *Orientation slot (4) engages orientation rail inside tire pressure sensor.*
- *Install tire pressure sensor so valve stem aims toward right side of wheel when complete.*

2. Install **new** valve stem and sensor in wheel.
   a. Install tire pressure sensor (2).
   b. Install **new** O-ring (3) on **new** valve stem (5).
   c. Install **new** valve stem.
   d. Install **new** screw (1).
   e. While holding valve stem aligned with wheel, tighten.
      Torque: 23–27 **in-lbs** (2.6–3 N·m) *Valve stem screw*
   f. Do not attempt to rotate valve stem once it is installed on wheel.



1. **Screw**
2. **Tire pressure sensor**
3. **O-ring**
4. **Orientation slot**
5. **Valve stem**

Figure 3-22. Tire Fill Valve/TPMS

COMPLETE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II
HD-51794	TPMS ACTIVATION TOOL

1. Install tire. See CHASSIS > TIRES (Page 3-24).

2. *NOTE*

The sensor must be in PARK mode (have been at rest for approximately 7 minutes) to assign to the vehicle. This includes spin balancing or riding the motorcycle.

New sensor: Before riding motorcycle, assign using TPMS activation tool with Digital Technician II (DT II).

Special Tool: TPMS ACTIVATION TOOL (HD-51794)

Special Tool: DIGITAL TECHNICIAN II (HD-48650)

a. Connect Digital Technician II to vehicle.

b. Go to Toolbox > Vehicle Setup > TPMS > Configure. Select sensor assignment.

c. Follow the online instructions to configure system to recognize sensors.

GENERAL

⚠ WARNING

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

Always maintain proper tire pressure. See MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13). Do not load tires beyond GAWR. Refer to tables in CHASSIS > SPECIFICATIONS (Page 3-6). Underinflated, over-inflated or overloaded tires can fail.

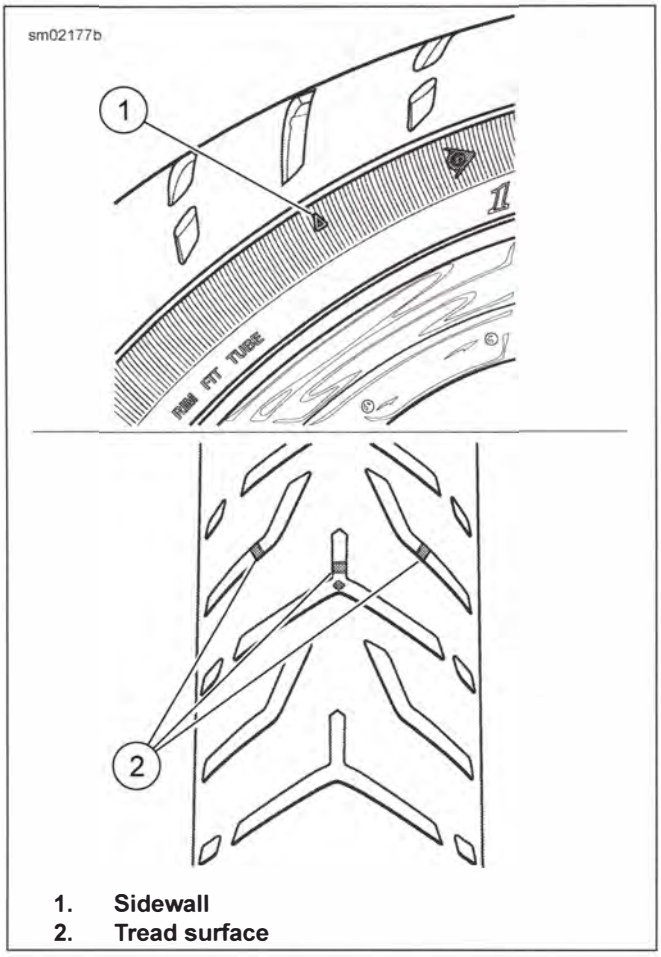
NOTE

- *Check runout on wheel before installing a **new** tire. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).*
- *Store **new** tires on a horizontal tire rack. Storing in a vertical stack compresses the tires and closes the beads.*
- *Inspect tires for punctures, cuts, breaks and wear at least weekly.*
- *See Figure 3-23. The tread wear indicators appear when 1/32 in (0.8 mm) or less tread remains. Always replace tires before tread is worn to the indicators.*

Replace tire if:

- Tread is worn to the tire wear indicators.
- Tire cords or fabric are visible.
- Tire has a bump, bulge or split.
- Puncture that cannot be repaired.

Refer to MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13) for recommended tires.



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

Figure 3-23. Tread Wear Indicators (Typical)

NOTE

ABS models must use properly inflated tires and wheels that are the same as the original equipment. The ABS monitors rotational speed of the wheels through individual wheel speed sensors to determine the application of ABS.

Different diameter wheels or tires can:

- *Alter the rotational speed which can upset the calibration of the ABS.*
- *Adversely affect its ability to detect and prevent lockups.*

Operating with over- or under-inflated tires can reduce ABS performance.

PREPARE

1. Remove wheel. See CHASSIS > FRONT WHEEL (Page 3-10) or CHASSIS > REAR WHEEL (Page 3-12).
2. Check wheels for lateral and radial runout. See MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13).

REMOVE

NOTE

- *Wheels equipped with tire pressure sensors require special tire mounting and dismounting procedures. Failure to follow these procedures results in damaged sensors.*

- *Never allow tire machine spoon, tire iron or tire bead to contact sensor. Sensor damage will occur.*

NOTE

Take care when replacing tire to prevent cosmetic damage to wheel.

Tubeless-Type With TPMS

1. *NOTE*

Break the bead being careful to not damage tire pressure sensor.

   See Figure 3-24. Engage tire machine spoon (1) 30 degrees (4) from valve stem (2) in direction of tire machine rotation (3).

2. While rotating wheel away from valve stem, remove the first bead.

3. Repeat with remaining bead. Remove tire.

CLEAN, INSPECT AND REPAIR

1. Clean.

   a. Clean the inside of tire.

   b. Clean rim bead area with a stiff wire brush.

2. Inspect.

   a. Verify wheel is true. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

   b. Check tire tread depth.

   c. Inspect tire for punctures or tears. Small punctures can be repaired.

⚠ WARNING

Replace punctured or damaged tires. In some cases, small punctures in the tread area may be repaired from within the removed tire by a Harley-Davidson dealer. Speed should NOT exceed 50 mph (80 km/h) for the first 24 hours after repair, and the repaired tire should NEVER be used over 80 mph (129 km/h). Failure to follow this warning could lead to tire failure and result in death or serious injury. (00015b)

1. Repair.

   a. Repair tread on tubeless tires if puncture is at dimension or smaller.

      ¼ in (6.4 mm)

   b. Make repairs from inside the tire.

   c. Always combine a patch and plug when repairing tire.

INSTALL

⚠ WARNING

Harley-Davidson recommends the use of its specified tires. Harley-Davidson vehicles are not designed for operation with non-specified tires, including snow, moped and other special-use tires. Use of non-specified tires can adversely affect stability, handling or braking and lead to loss of vehicle control, which could result in death or serious injury. (00024d)

⚠ WARNING

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

⚠ WARNING

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

For tire pressures, refer to MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13).

NOTE

- *Mount tires with arrows molded into tire sidewall pointing in direction of forward rotation.*
- *If tire has a balance dot on sidewall, align balance dot with valve stem.*

Tubeless-Type With TPMS

1. *NOTE*

- *Wheels equipped with tire pressure sensors require special tire mounting and dismounting procedures. Failure to follow these procedures results in damaged sensors.*
- *Never allow tire machine spoon, tire iron or tire bead to contact sensor. Sensor damage will occur.*

   See Figure 3-24. Install tire on wheel.

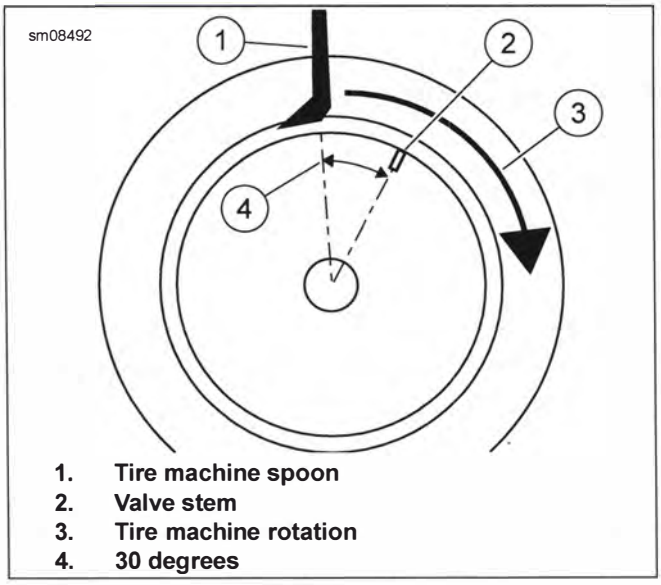
2. Start first bead opposite from valve stem.

3. Install first bead.

4. Engage second bead 30 degrees from valve stem in direction of machine rotation.

5. While rotating away from valve stem, install second bead.

6. Inflate to correct pressure. Refer to MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13).



1. **Tire machine spoon**
2. **Valve stem**
3. **Tire machine rotation**
4. **30 degrees**

Figure 3-24. Tire Machine Operation

CHECK TIRE RUNOUT

Lateral Runout

NOTE

- *Measure runout with wheel installed on motorcycle or using a wheel stand.*
- *Avoid measuring on raised letters or vents.*

1. Check tire pressure.
2. See Figure 3-25. Spin the wheel and measure lateral runout from a fixed point to a smooth area on the tire sidewall.
3. If lateral runout exceeds dimension shown, remove tire from rim and check rim lateral runout. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

   0.090 in (2.29 mm)

   a. If rim runout is within specification, replace faulty tire.

   b. If rim runout is not within specification, replace wheel. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

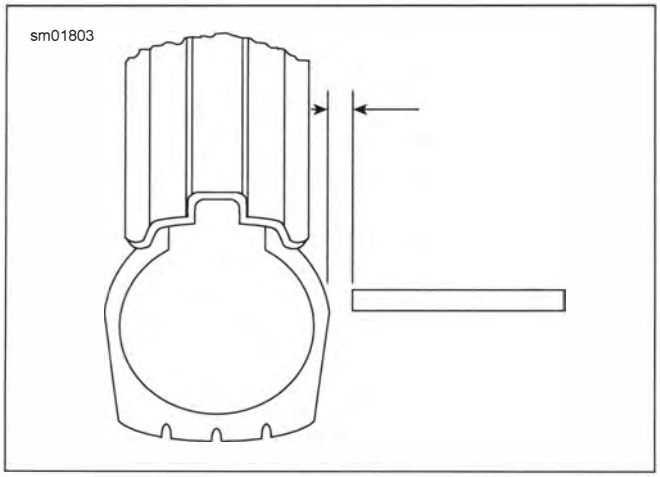


Figure 3-25. Checking Tire Lateral Runout

Radial Runout

1. Check tire pressure.
2. See Figure 3-26. Spin the wheel on the axle and measure radial runout at the tread centerline.
3. If tire runout exceeds dimension, remove tire from rim and check rim radial runout. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

   0.090 in (2.29 mm)

   a. If rim runout is within specification, replace faulty tire.

   b. If rim runout is not within specification, replace wheel. See CHASSIS > CHECKING AND TRUING WHEELS (Page 3-15).

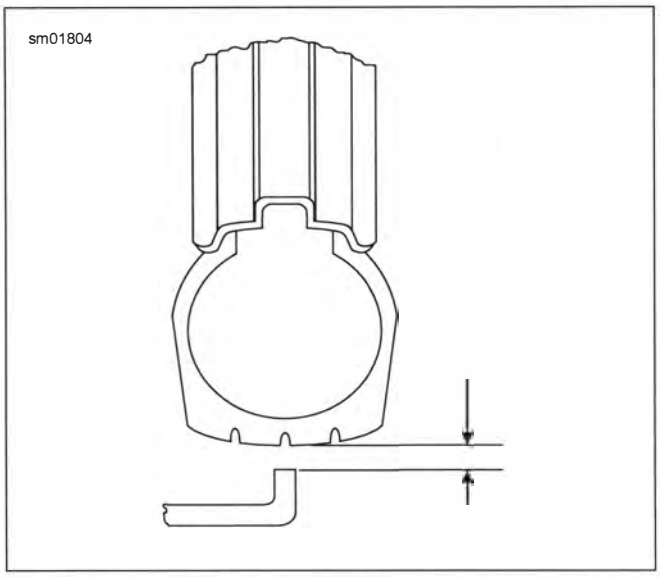


Figure 3-26. Checking Tire Radial Runout

BALANCE

Static versus Dynamic

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

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

Weights

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

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

NOTE

- *If adding more than 1.5 oz (43 g) of weight at one location, divide the amount so that half is applied to each side of rim.*

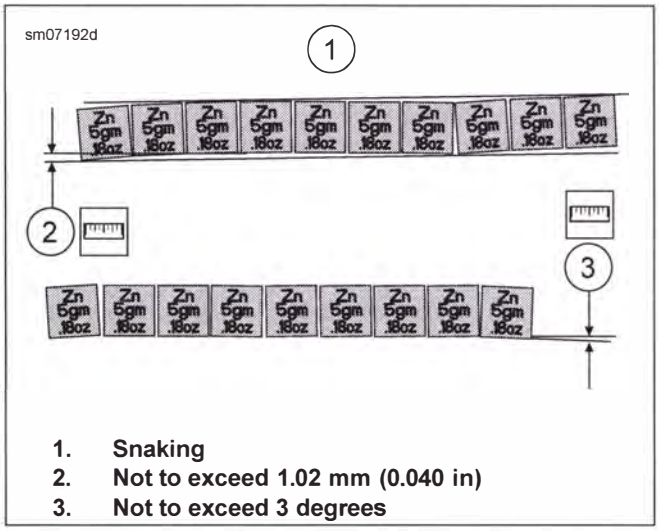
- *On cast wheels without a flat area near the bead, place the weights crosswise through the opening.*

1. See Figure 3-28. Place weights on a smooth surface of the wheel rim such that centrifugal force will help keep them in place. Make sure the area of application is completely clean, dry, and free of oil and grease.

NOTE

See Figure 3-27. When installing wheel weights, consider cosmetics. Keep snaking (1) within 0.040 in (1.02 mm) (2) of straight. Also keep the angle alignment of individual segments (3) within 3 degrees.

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



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

Figure 3-27. Weight Segment Alignment

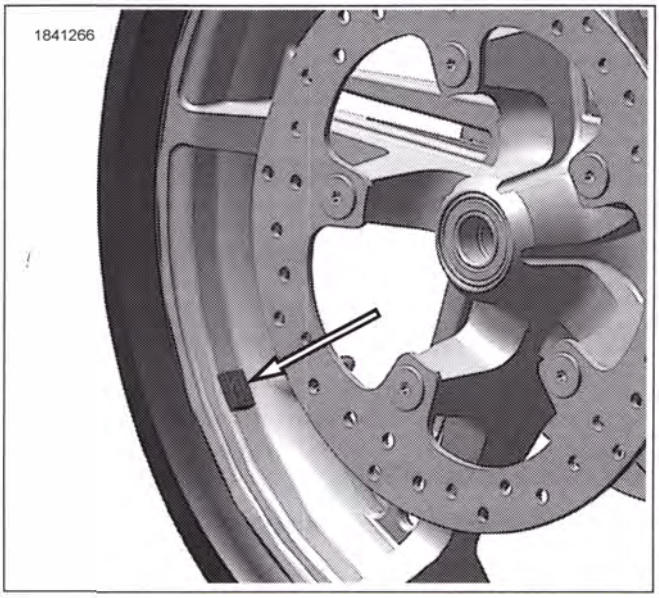


Figure 3-28. Wheel Weight Placement (typical)

COMPLETE

1. Install wheel. See CHASSIS > FRONT WHEEL (Page 3-10) or CHASSIS > REAR WHEEL (Page 3-12).

RIDER ENHANCEMENTS

Linked Braking with Anti-Lock Brake System (ABS)

For information about the ABS system, see CHASSIS > ABS MODULE (Page 3-53).

Cornering Rider Safety Enhancement Components

Cornering Rider Safety Enhancement use several components to match performance to available traction and enhance the rider's control of the vehicle.

The braking system includes the following:

Wheel Speed Sensor (WSS) (front and rear): Reports wheel speed data directly to the ABS module.

Inertial Measurement Unit (IMU): Reports lateral, longitudinal, and vertical acceleration, as well as roll, yaw, and pitch to ABS module, ECM and BCM.

ABS Module: The ABS Module collects data from IMU and each WSS. Communicates with ECM and BCM to manage brake application under extreme stopping and cornering conditions. Controls Linking function described below.

When ABS is activated, the solenoid valves decrease, hold or increase hydraulic fluid pressure to control the individual calipers of each wheel to prevent wheel slipping.

Traction Control System (TCS)

Traction control is selectable and can be turned off.

The cornering traction control system stored in the ABS module constantly monitors the IMU and WSSs to observe the vehicles lean angle during turns, and will adjust torque to the drive wheel by sending a signal to the ECM to reduce throttle input when it senses excessive rear wheel slip, or when necessary to improve vehicle control while cornering.

During start up, the traction-control and ABS lamps flash simultaneously indicating that both systems are waiting for the vehicle to complete a wheel speed sensor check. The traction control system is operational after startup even during the wheel speed sensor check. The traction control lamp should turn off when the sensor check is complete.

Propulsive Torque Management (PTM)

PTM functionality follows traction control status.

PTM limits the rate of torque increase available as a function of the vehicle position, such as under a cornering condition (lean angle). PTM works off of inputs from the IMU and WSSs and is a function of TCS. When system detects that excessive throttle is being applied for conditions, the ABS module will request a reduction in engine torque.

Drag-Torque Slip Control System (DSCS)

The ABS module monitors rear wheel slip via the WSSs during a downshift or with throttle closed. When the ABS module detects this condition, a torque command signal is sent to the ECM until the rear wheel is no longer slipping. DSCS functions at speeds over approximately 10 mph (16 km/h) and works with the ABS system to balance vehicle deceleration and rider control. DSCS is not selectable and cannot be disabled.

If the DSCS senses rear wheel slip because of powertrain deceleration it may decrease drag torque, by increasing engine rpm (Revolutions per minute), to limit slip and maintain control.

DSCS function is not adjusted for lean angle, performance of this feature was developed for straight-line use.

Vehicle Hold Control (VHC)

VHC uses the ABS module to hold brake pressure to keep the motorcycle from rolling backward when it is stopped on an incline.

The ABS module senses the additional brake line pressure applied by the rider to activate VHC. VHC will activate when WSSs sense that vehicle is not moving, jiffy stand is up (vehicles equipped with jiffy stand sensor), transmission is in gear (vehicles not equipped with jiffy stand sensor) and engine is running.

The system holds brake pressure until deactivated by rider pulling away from stop, lowering jiffy stand (vehicles equipped with jiffy stand sensor), shifting into neutral (vehicles not equipped with jiffy stand sensor), engine shutting off or auto deactivation from time or excessive heat in system.

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove front brake switch. See ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23).
5. Frame-mounted fairing: Remove right side mirror. See CHASSIS > MIRRORS (Page 3-125).
6. Drain brake fluid. See CHASSIS > BLEED BRAKES (Page 3-58).

REMOVE

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

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

Front brake master cylinder is a non serviceable part do not disassemble.

1. See Figure 3-29. Remove brake line.
   a. Remove banjo bolt (5).
   b. Remove and discard gasket washers (6).
   c. Remove brake line (4).
2. Remove master cylinder.
   a. Remove screws (3).
   b. Remove washers (2).
   c. Remove brake lever bracket (1).

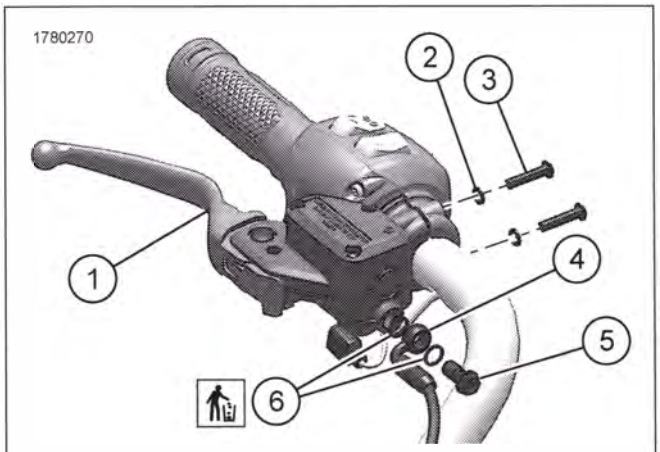
INSTALL

FASTENER	TORQUE VALUE	
Banjo bolt, master cylinder, front	18–19 ft-lbs	24–26 N·m
Brake lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m
Brake lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m

NOTICE

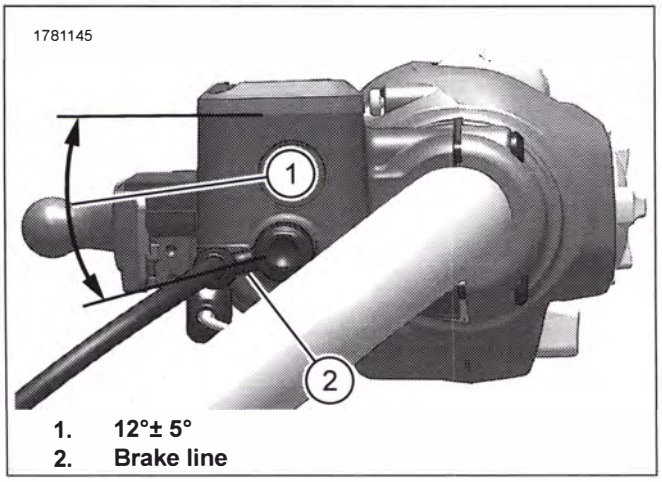
Avoid leakage. Be sure gaskets, banjo bolt(s), brake line and master cylinder bore are clean and undamaged before assembly. (00322a)

1. See Figure 3-29. Install master cylinder.
   a. Install brake lever bracket (1).
   b. Install washers (2) and screws (3). Do not tighten.
   c. Align bracket with line on handlebar.
   d. Tighten top screw first.
      Torque: 89–97 **in-lbs** (10–11 N·m) *Brake lever, top, bracket screw*
   e. Tighten bottom screw.
      Torque: 89–97 **in-lbs** (10–11 N·m) *Brake lever, bottom, bracket screw*
2. Install brake line.
   a. Install brake line (4) and **new** gasket washers (6).
   b. Install banjo bolt (5). Do not tighten.
   c. See Figure 3-30. Position brake line as shown.
   d. Verify brake line does not touch handlebar or fairing when handlebar is turned. Adjust as needed and tighten banjo bolt.
      Torque: 18–19 ft-lbs (24–26 N·m) *Banjo bolt, master cylinder, front*



1. **Brake lever bracket**
2. **Washer (2)**
3. **Screw (2)**
4. **Brake line**
5. **Banjo bolt**
6. **Gasket washer (2)**

Figure 3-29. Front Master Cylinder (typical)



1. 12°± 5°
2. Brake line

Figure 3-30. Front Master Cylinder Brake Line Location

CLEAN AND INSPECT

⚠ 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)

- Even residual mineral-based oils and grease can deteriorate rubber brake components.
- Wash hands before handling brake components.
- Never use oily rags to wipe brake components.

1. Clean all parts thoroughly. Do not use a wire or similar instrument.
2. Inspect parts for wear or damage.
   a. Inspect banjo seating surface for scratches or nicks.
   b. Inspect dust boot.
   c. Inspect reservoir cover gasket.
   d. Inspect lever and pivot pin.

COMPLETE

1. Fill and bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
2. Frame-mounted fairing: Install right side mirror. See CHASSIS > MIRRORS (Page 3-125).
3. Install front brake switch. See ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
6. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. **Caliper servicing only:** Drain brake fluid from front brake system. See CHASSIS > BLEED BRAKES (Page 3-58).

REMOVE

⚠ WARNING

Contact with DOT 4 brake fluid can have serious health effects. Failure to wear proper skin and eye protection could result in death or serious injury.

- **If inhaled: Keep calm, remove to fresh air, seek medical attention.**
- **If on skin: Remove contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. If irritation develops, seek medical attention.**
- **If in eyes: Wash affected eyes for at least 15 minutes under running water with eye lids held open. If irritation develops, seek medical attention.**
- **If swallowed: Rinse mouth and then drink plenty of water. Do not induce vomiting. Contact Poison Control. Immediate medical attention required.**
- **See Safety Data Sheet (SDS) for more details available at sds.harley-davidson.com**

(00240e)

NOTICE

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

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

- *Right side is similar.*
- *If only replacing brake pads, see MAINTENANCE > INSPECT BRAKES (Page 2-17).*

Remove Caliper to Remove Front Wheel or Replacing Brake Pads

1. See Figure 3-31. Remove caliper.
   a. Remove caliper screws (1).
   b. Remove caliper (7) and secure.

Remove Caliper for Service

1. See Figure 3-31. Remove brake line.
   a. Remove cap (4).
   b. Remove bleeder screw (5).
   c. Remove front brake line (2).
   d. Remove and dispose of gasket washers (6).
2. Remove caliper.
   a. Remove caliper screws (1).
   b. Remove brake caliper (7).

INSTALL

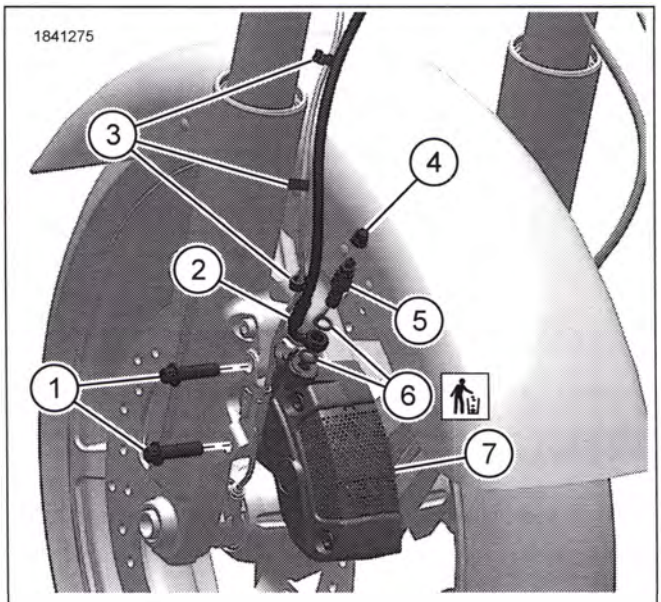
FASTENER	TORQUE VALUE	
Brake caliper, front, bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m
Brake caliper, front, mounting screws	28–38 ft-lbs	38–52 N·m
Brake caliper, front, screws	28–38 ft-lbs	38–52 N·m

Install Caliper After Service

1. See Figure 3-31. Install front brake line.
   a. Install **new** gasket washers (6) and front brake line (2).
   b. Install bleeder screw (5). Do not tighten.
   c. See Figure 3-32. Position front brake line (1) against or 10° off of brake line stop (2).
   d. Tighten bleeder screw.
      Torque: 75–102 **in-lbs** (8.5–11.5 N·m) *Brake caliper, front, bleeder screw*
2. See Figure 3-31. Install front caliper.
   a. Install front caliper (7).
   b. Install caliper screws (1). Do not tighten.
   c. Apply brake pressure.
   d. Tighten front caliper screws.
      Torque: 28–38 ft-lbs (38–52 N·m) *Brake caliper, front, screws*

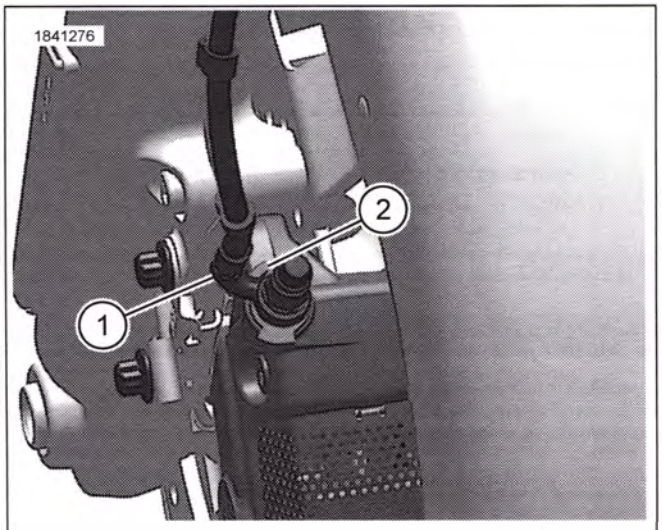
Install Caliper after Installing Front Wheel or Brake Pad Replacement

1. See Figure 3-31. Install front caliper.
   a. Install front caliper (7).
   b. Install caliper screws (1). Do not tighten.
   c. Apply brake pressure.
   d. Tighten front caliper screws.
      Torque: 28–38 ft-lbs (38–52 N·m) *Brake caliper, front, mounting screws*



1. Caliper screw (2)
2. Front brake line
3. Clip (3)
4. Cap
5. Bleeder screw
6. Gasket washer (2)
7. Caliper

Figure 3-31. Front Brake Caliper



1. Front brake line
2. Brake line stop

Figure 3-32. Front Brake Line Location

COMPLETE

1. If drained: Fill and bleed front brake system. See CHASSIS > BLEED BRAKES (Page 3-58).

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
5. Remove right side rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
6. Drain brake fluid. See CHASSIS > BLEED BRAKES (Page 3-58).

REMOVE

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTICE

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

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

1. See Figure 3-33. Remove rear brake line.
   a. Remove Banjo bolt (3).
   b. Remove and dispose of gasket washers (2).
   c. Remove rear brake line (4).
2. Remove screws (5).
3. See Figure 3-34. Remove foot brake pedal with rear master cylinder.
   a. Remove and dispose of locknut (8).
   b. Remove washer (7).
   c. Remove foot brake pedal (9) and rear master cylinder (6).
   d. Remove and dispose of O-rings (5).
4. Remove master cylinder from foot brake pedal.
   a. Remove and dispose of cotter pin (2).
   b. Remove clevis pin (3) and washer (1).
   c. Remove master cylinder (6).

INSTALL

FASTENER	TORQUE VALUE	
Banjo bolt, master cylinder, rear	21–22 ft-lbs	28–30 N·m
Brake pedal, nut	15–20 ft-lbs	20–27 N·m
Master cylinder, rear, mounting screws	10–13 ft-lbs	14–17 N·m

CONSUMABLE	PART NUMBER
WHEEL BEARING GREASE	99855-89

NOTICE

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

1. See Figure 3-34. Install master cylinder to foot brake pedal.
   a. Install master cylinder (6) onto brake pedal flange.
   b. Install clevis pin (3) from outboard side.
   c. Install washer (1).
   d. Install **new** cotter pin (2).
2. Install foot brake pedal/master cylinder assembly.
   a. Apply a light coat of wheel bearing grease to brake pedal shaft (4) and bore.
      WHEEL BEARING GREASE (99855-89)
   b. Install **new** O-rings (5) on each side of bore.
   c. Install brake pedal/master cylinder assembly on brake pedal shaft.
   d. Install washer (7).
   e. Install **new** locknut (8). Do not tighten.
3. See Figure 3-33. Install screws (5). Tighten.
   Torque: 10–13 ft-lbs (14–17 N·m) *Master cylinder, rear, mounting screws*
4. Tighten front brake pedal locknut.
   Torque: 15–20 ft-lbs (20–27 N·m) *Brake pedal, nut*

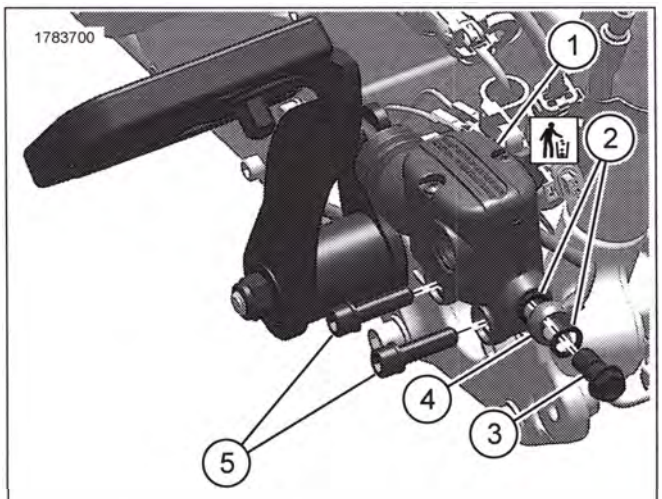
5. Connect brake line.

   a. Install **new** gasket washers (2).

   b. Install brake line (4).

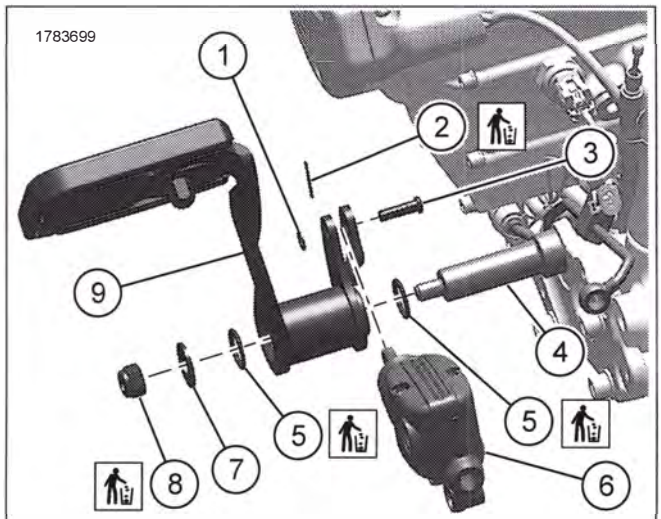
   c. Install banjo bolt (3). Tighten.

      Torque: 21–22 ft-lbs (28–30 N·m) *Banjo bolt, master cylinder, rear*



1. **Rear master cylinder**
2. **Gasket washer (2)**
3. **Banjo bolt**
4. **Brake line**
5. **Screw (2)**

Figure 3-33. Rear Master Cylinder



1. **Washer**
2. **Cotter pin**
3. **Clevis pin**
4. **Brake pedal shaft**
5. **O-ring (2)**
6. **Rear master cylinder**
7. **Washer**
8. **Locknut**
9. **Foot brake pedal**

Figure 3-34. Rear Master Cylinder/Brake Pedal Assembly

DISASSEMBLE

NOTE

Do not scratch or nick banjo sealing surface during handling

1. See Figure 3-35. Disassemble piston assembly.

   a. Remove dust boot (1).

   b. Apply pressure to pushrod (5).

   c. Remove E-clip (2).

   d. Release pressure to pushrod.

   e. Remove washer (3).

   f. Remove pedal return spring (4).

   g. Apply pressure to pushrod (5).

   h. Remove and discard retaining ring (6).

   i. Release pressure to pushrod.

   j. Remove washer (7).

   k. Remove piston (8) and return spring (9). Discard.

2. Remove cover.

   a. Remove screws (13).

   b. Remove cover (14).

   c. Remove gasket (15).

3. Remove sight glass.

   a. Press out sight glass (11).

   b. Remove and discard O-ring (12).

CLEAN AND INSPECT

⚠ 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)

- Even residual mineral-based oils and grease can deteriorate rubber brake components.
- Wash hands before handling brake components.
- Never use oily rags to wipe brake components.

1. Clean all parts thoroughly.

2. Verify that reservoir is free of dust, dirt or residue.

3. Using a clean air supply, clear piston bore, reservoir and drilled passages. Do not use a wire or similar instrument.

4. Inspect parts for wear or damage.

   a. Inspect banjo seating surface for scratches or nicks.

b. Inspect piston bore.

c. Inspect dust boot retaining groove.

d. Inspect dust boot and reservoir cover gasket.

e. Inspect E-clip for wear or distortion.

f. Inspect retaining ring groove and E-clip groove for damage.

g. Inspect springs for stretching, distortion, kinks, cracks or fractured coils.

ASSEMBLE

CONSUMABLE	PART NUMBER
Harley-Davidson Platinum Label DOT 4 Brake Fluid	41800xxx

NOTE

Never install a used piston assembly or spring. Always install new parts.

1. See Figure 3-35. Lightly lubricate piston bore and OD of piston seals with DOT 4 BRAKE FLUID.

   Consumable: Harley-Davidson Platinum Label DOT 4 Brake Fluid (41800xxx)

2. Install **new** piston assembly.

   a. Install spring (9) and piston assembly (8).

   b. Install washer (7).

   c. Install pushrod (5).

   d. Press on pushrod and install **new** retaining ring (6).

   e. Install pedal return spring (4).

   f. Install washer (3).

   g. Press on pushrod and install E-clip (2).

   h. Install dust boot (1).

3. Install sight glass.

   a. Install O-ring (12).

   b. Install sight glass (11).

4. Install cover.

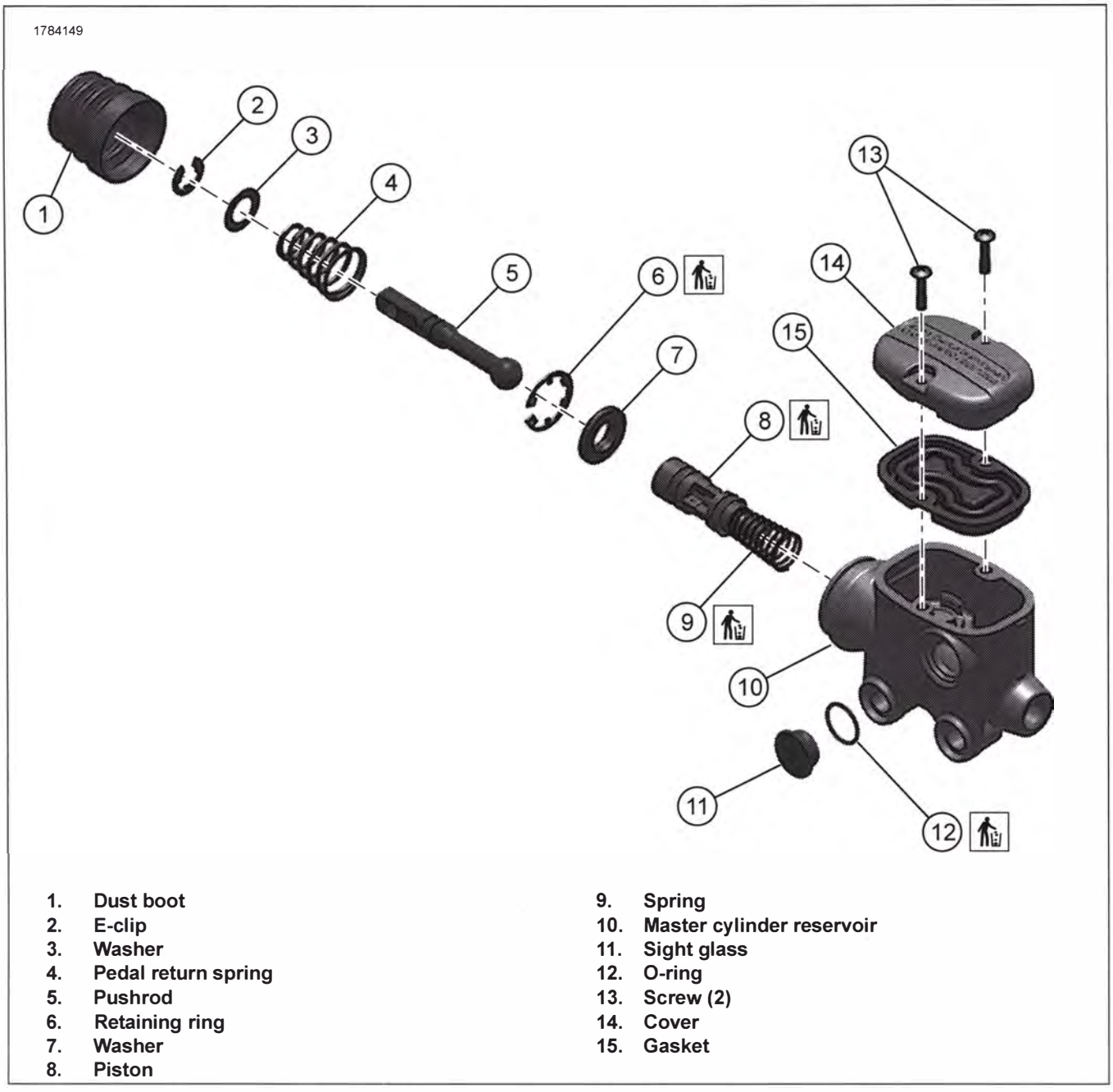
   a. Install gasket (15).

   b. Install cover (14).

   c. Install screws (13). Do not tighten.

NOTE

Cover will be tightened when filled.



1. **Dust boot**
2. **E-clip**
3. **Washer**
4. **Pedal return spring**
5. **Pushrod**
6. **Retaining ring**
7. **Washer**
8. **Piston**
9. **Spring**
10. **Master cylinder reservoir**
11. **Sight glass**
12. **O-ring**
13. **Screw (2)**
14. **Cover**
15. **Gasket**

Figure 3-35. Rear Master Cylinder Assembly

COMPLETE

1. Fill and bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
2. Install right side rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
6. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove right side saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. **Caliper servicing only:** Drain brake fluid from rear brake system. See CHASSIS > BLEED BRAKES (Page 3-58).

REMOVE

⚠ WARNING

Contact with DOT 4 brake fluid can have serious health effects. Failure to wear proper skin and eye protection could result in death or serious injury.

- **If inhaled: Keep calm, remove to fresh air, seek medical attention.**
- **If on skin: Remove contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. If irritation develops, seek medical attention.**
- **If in eyes: Wash affected eyes for at least 15 minutes under running water with eye lids held open. If irritation develops, seek medical attention.**
- **If swallowed: Rinse mouth and then drink plenty of water. Do not induce vomiting. Contact Poison Control. Immediate medical attention required.**
- **See Safety Data Sheet (SDS) for more details available at sds.harley-davidson.com**

(00240e)

NOTICE

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

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

If only replacing brake pads, see MAINTENANCE > INSPECT BRAKES (Page 2-17).

Remove Caliper to Remove Rear Wheel or Replacing Brake Pads

1. See Figure 3-36. Remove caliper.
   a. Remove caliper screws (5).
   b. Remove caliper (1) and secure.

Remove Caliper for Service

1. See Figure 3-37. Remove brake line.
   a. Remove banjo bolt (3).
   b. Remove and dispose of gasket washers (4).
   c. Remove rear brake line (2).
2. Remove caliper.
   a. Remove caliper screws (5).
   b. Remove brake caliper (1)

INSTALL

FASTENER	TORQUE VALUE	
Brake caliper, rear, banjo bolt	18–19 ft-lbs	24–26 N·m
Brake caliper, rear, mounting screws	43–48 ft-lbs	58–65 N·m

Install Caliper After Service

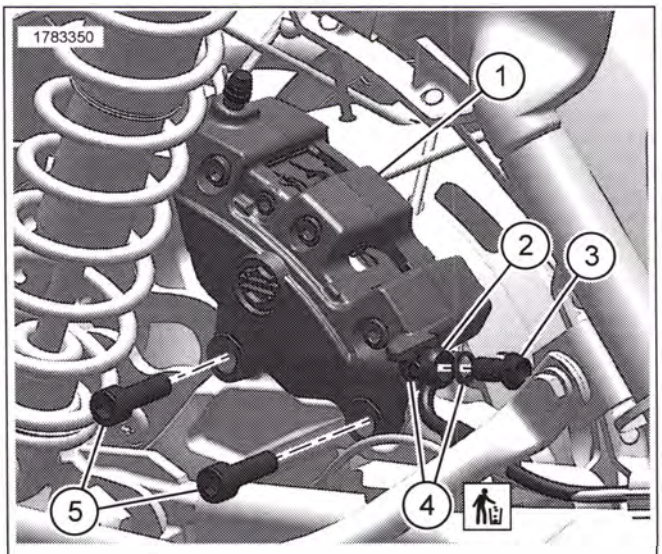
1. See Figure 3-36. Install rear brake line.
   a. Install **new** gasket washers (4) and rear brake line (2).
   b. Install banjo bolt (3). Do not tighten.
   c. See Figure 3-37. Rotate alignment pin (4) against brake line stop (1).
   d. Tighten banjo bolt (2).
      Torque: 18–19 ft-lbs (24–26 N·m) *Brake caliper, rear, banjo bolt*
2. See Figure 3-36. Install rear caliper.
   a. Install rear caliper (1).
   b. Install caliper screws (5). Do not tighten.
   c. Apply brake pressure.
   d. Tighten rear caliper screws (5).
      Torque: 43–48 ft-lbs (58–65 N·m) *Brake caliper, rear, mounting screws*

Install Caliper after Installing Rear Wheel or Brake Pad Replacement

1. See Figure 3-36. Install rear caliper.
   a. Install rear caliper (1).
   b. Install caliper screws (5). Do not tighten.
   c. Apply brake pressure.

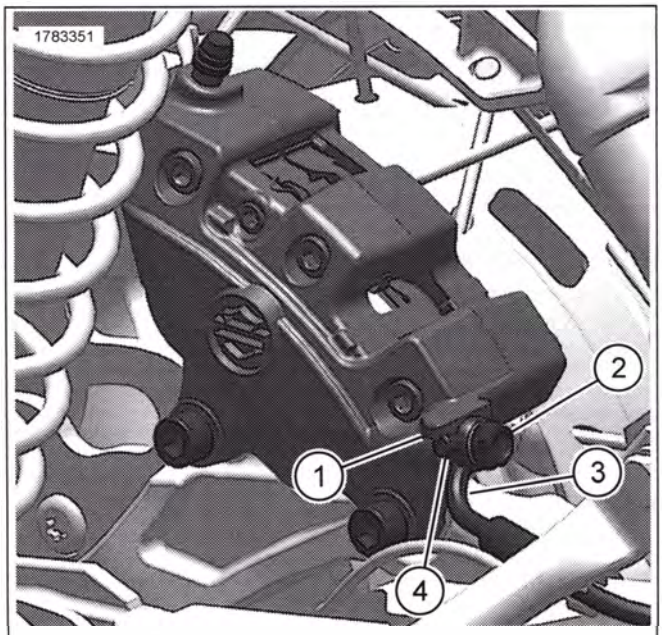
d. Tighten rear caliper screws (5).

Torque: 43–48 ft-lbs (58–65 N·m) *Brake caliper, rear, mounting screws*



1. Caliper
2. Rear brake line
3. Banjo bolt
4. Gasket washer (2)
5. Caliper screw (2)

Figure 3-36. Rear Brake Caliper



1. Brake line stop
2. Banjo bolt
3. Rear brake line
4. Alignment pin

Figure 3-37. Rear Brake Line Location

COMPLETE

1. If drained: Fill and bleed rear brake system. See CHASSIS > BLEED BRAKES (Page 3-58).

2. Install right side saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

BRAKE LINE: FRONT MASTER CYLINDER TO ABS MODULE

FASTENER	TORQUE VALUE	
Brake line, front, master cylinder P-clamp	62–80 **in-lbs**	7–9 N·m

Prepare

1. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Remove seat. See CHASSIS > SEAT (Page 3-139).
6. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
7. Remove fuel tank and console. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
8. **Frame mounted fairing:** Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
9. **Fork mounted fairing:** Remove dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
10. **Frame-mounted fairing:** Remove right side lower fairing. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
11. Remove outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87) or CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
12. Drain front brake lines. See CHASSIS > BLEED BRAKES (Page 3-58).

Remove

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

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

1. Remove brake line from front master cylinder. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).
2. Remove brake line from ABS module. See CHASSIS > ABS MODULE (Page 3-53).
3. See Figure 3-38 or Figure 3-39. Remove brake line from steering head caddy.
   a. Remove and discard cable strap (4).
   b. Disconnect WSS connector (2).
   c. Pull tab (1).
   d. Rotate top of retainer (3) out and lift from pocket in caddy.
   e. Remove brake lines from retainer.
4. See Figure 3-40 or Figure 3-41. Remove screw (4).
5. Detach brake line from wire trough.
   a. Detach brake line from clip (8).
   b. Pull tab (10), remove brake triangle bracket (11).
   c. Remove brake line from brake triangle bracket.
   d. Remove and dispose of cable strap (12).
   e. See Figure 3-42. Release brake line from trough cover clip (3).
   f. Lift brake line retainers (4) and remove brake line.
   g. Remove brake line from retainer (5).
6. Remove front master cylinder brake line.

Install

1. See Figure 3-40 or Figure 3-41. Route brake line (9) rearward along steering head and wire trough.
2. See Figure 3-38 or Figure 3-39. Secure brake line to steering head caddy.
   a. Install brake line in retainer (3).
   b. Insert retainer into pocket in caddy.
   c. Rotate top of retainer in until latched.

NOTE

The order in which lines are arranged is important. Arrange as shown.

   d. Connect WSS connector (3).
   e. Install **new** cable strap (4).

3. See Figure 3-40 or Figure 3-41. Secure brake line to wire trough

   a. Install brake line in clip (8).

   b. Install brake line in brake triangle bracket (11).

   c. Install brake triangle bracket in tab (10).

   d. Install **new** cable strap (12).

   e. See Figure 3-42. Install brake line in retainers (4).

   f. Install retainers in slots.

   g. Install brake line under trough cover clip (3).

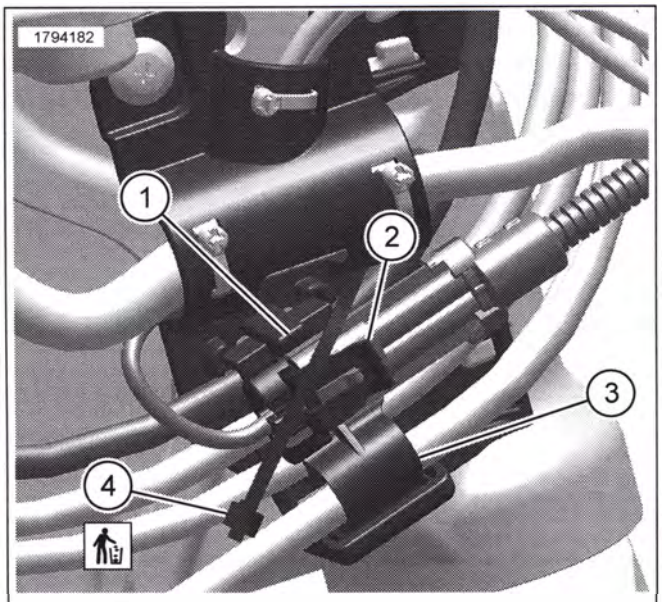
   h. Verify brake line is inside retainer (5).

4. See Figure 3-40 or Figure 3-41. Install P-clip and screw. Tighten.

   Torque: 62–80 **in-lbs** (7–9 N·m) *Brake line, front, master cylinder P-clamp*

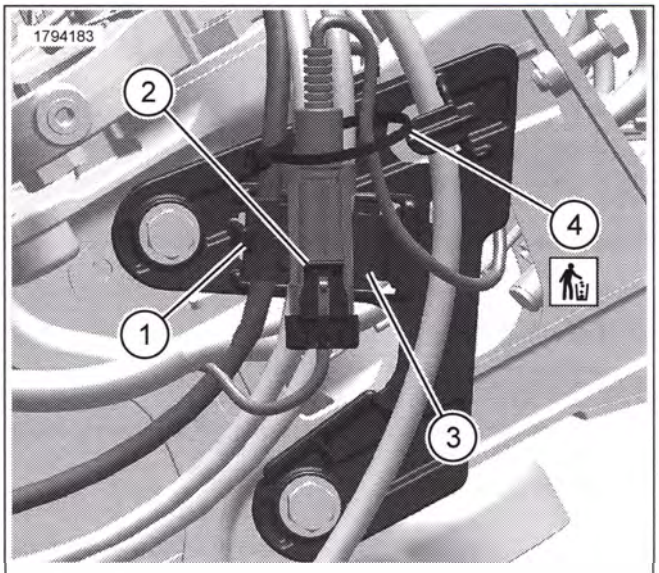
5. Install brake line to ABS module. See CHASSIS > ABS MODULE (Page 3-53).

6. Install brake line to front master cylinder. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).



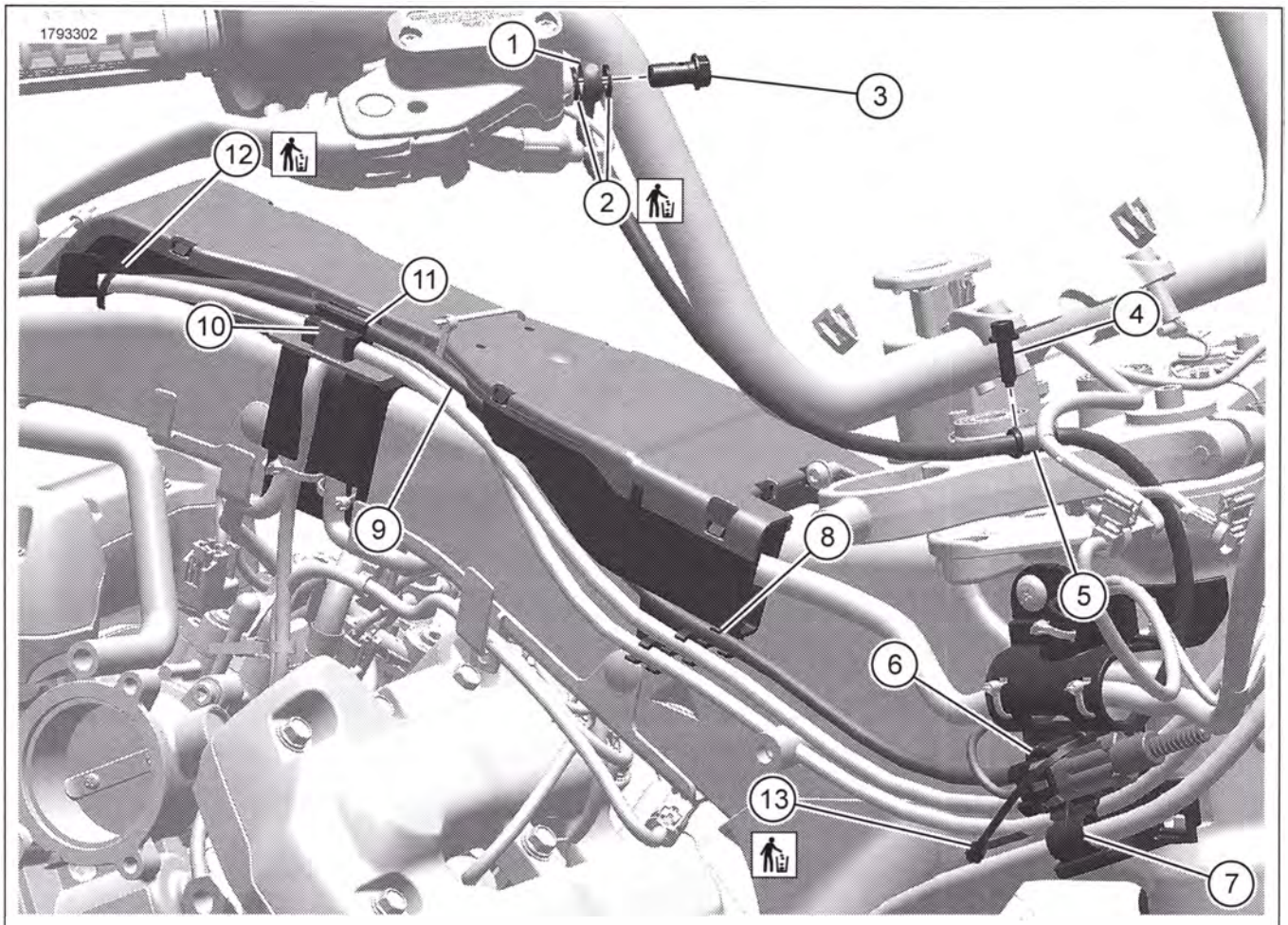
1. **Tab**
2. **Wheel Speed Sensor (WSS) connector**
3. **Brake line retainer**
4. **Cable strap**

Figure 3-38. Fork-Mounted Fairing Steering Head Caddy



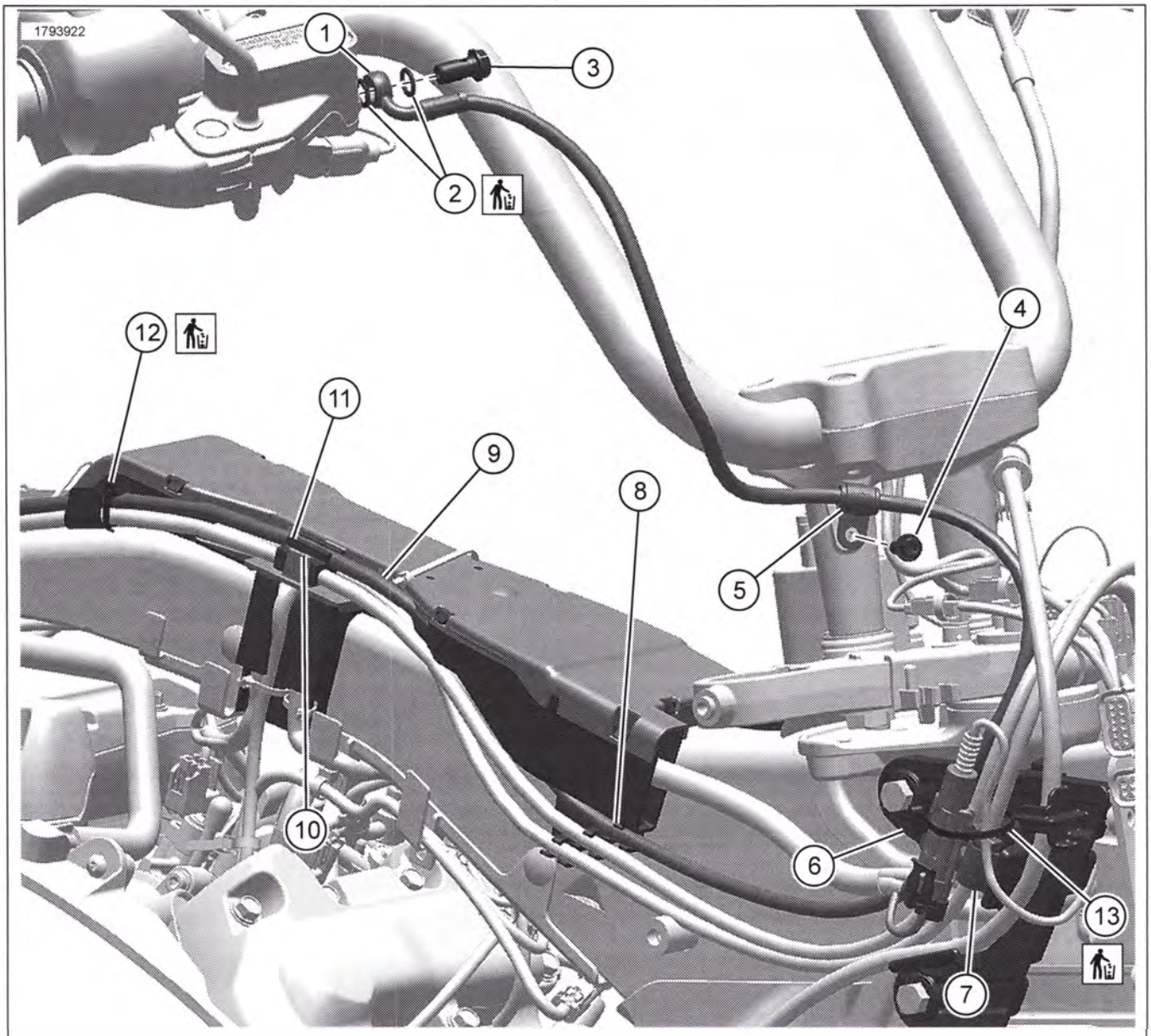
1. **Tab**
2. **Wheel Speed Sensor (WSS) connector**
3. **Brake line retainer**
4. **Cable strap**

Figure 3-39. Frame-Mounted Fairing Steering Head Caddy



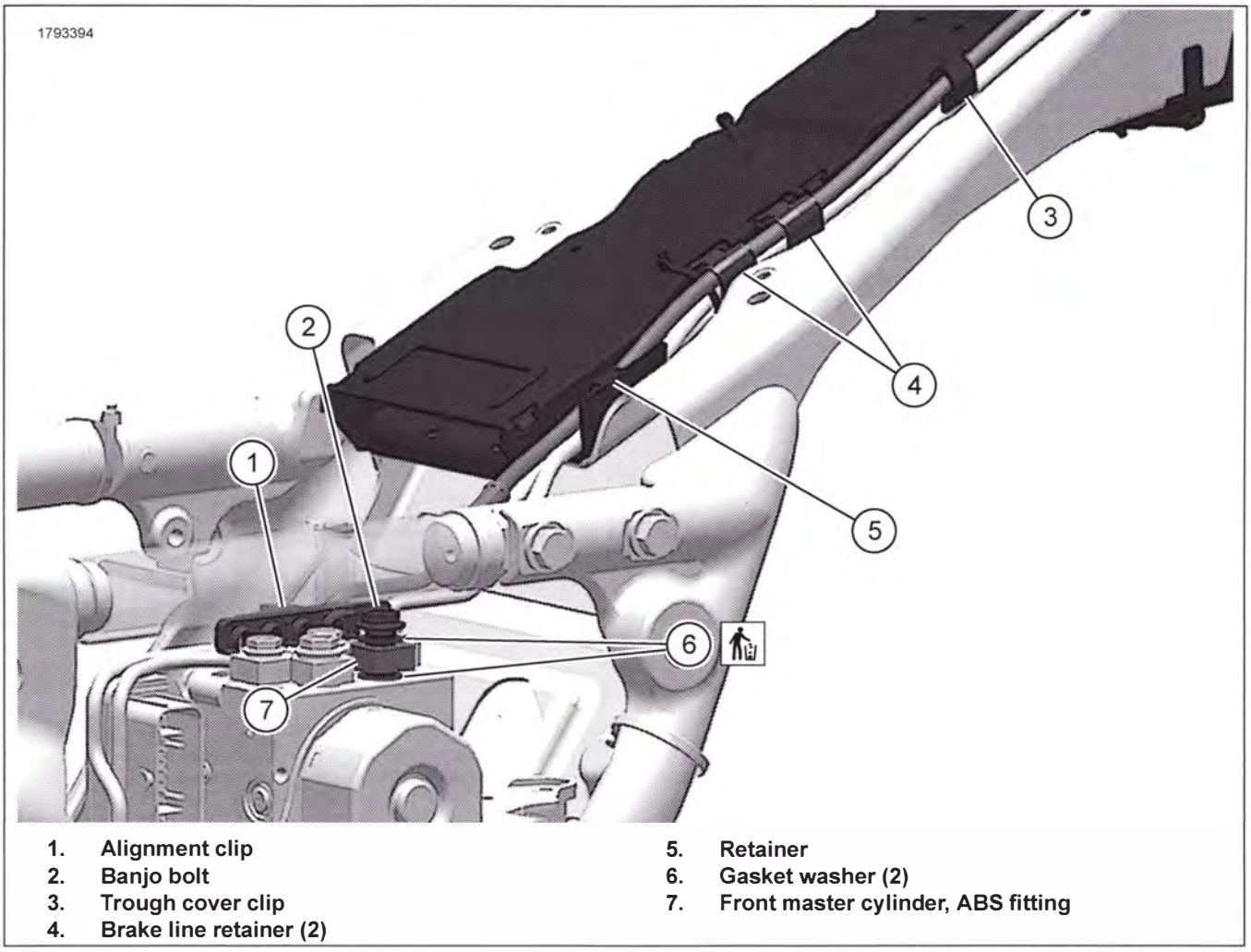
1. Front master cylinder, fitting
2. Gasket washer (2)
3. Banjo bolt
4. Screw
5. P-clamp
6. Tab
7. Brake line retainer
8. Clip
9. Front master cylinder brake line
10. Tab
11. Brake triangle bracket
12. Cable strap
13. Cable strap

Figure 3-40. Fork-Mounted Fairing Front Master Cylinder Brake Line



1. Front master cylinder, fitting
2. Gasket washer (2)
3. Banjo bolt
4. Screw
5. P-clamp
6. Tab
7. Brake line retainer
8. Clip
9. Front master cylinder brake line
10. Tab
11. Brake triangle bracket
12. Cable strap
13. Cable strap

Figure 3-41. Frame-Mounted Fairing Front Master Cylinder Brake Line



1. **Alignment clip**
2. **Banjo bolt**
3. **Trough cover clip**
4. **Brake line retainer (2)**
5. **Retainer**
6. **Gasket washer (2)**
7. **Front master cylinder, ABS fitting**

Figure 3-42. ABS Module Brake Line Connections

Complete

⚠ WARNING

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

1. Secure front master cylinder brake line to master cylinder. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).
2. Fill and Bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
3. **Frame mounted fairing:** Install nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
4. **Fork mounted fairing:** Install dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87)
5. Install fuel tank and console. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
6. Install outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87) or CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
7. **Frame-mounted fairing:** Install right side lower fairing. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
8. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
9. Install seat. See CHASSIS > SEAT (Page 3-139).
10. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
11. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
12. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

BRAKE LINE: FRONT CALIPER TO ABS MODULE

FASTENER	TORQUE VALUE	
Brake line, front caliper bracket, screws	45–50 **in-lbs**	5.1–5.7 N·m

FASTENER	TORQUE VALUE	
Brake line, front caliper, bracket, center screw	12–18 **in-lbs**	1.4–2 N·m

Prepare

NOTE

This system has separate brake lines to each front caliper. Replacement is similar for both.

1. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
6. Remove fuel tank and console. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
7. **Frame mounted fairing:** Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
8. **Fork mounted fairing:** Remove dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
9. **Frame-mounted fairing:** Remove lower fairings. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
10. Remove outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87) or CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
11. Drain front brake lines. See CHASSIS > BLEED BRAKES (Page 3-58).

Remove

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

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

1. Remove brake line from front calipers. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).
2. Remove brake line from ABS module. See CHASSIS > ABS MODULE (Page 3-53)
3. See Figure 3-43. Detach clips (1) from brake line (6).
4. See Figure 3-44. Detach front caliper brake lines from brake line bracket.
   a. Remove and discard cable straps (3).
   b. Remove screw (1).
   c. Open cover.
   d. See Figure 3-45. Detach left brake line (1) and right brake line (2) from bracket (4).
5. Remove front caliper brake line bracket if needed.
   a. Remove screws (3).
   b. Remove bracket (4).
6. See Figure 3-48.**Fork mounted fairing:** Remove and discard cable straps (3).
7. See Figure 3-46 or Figure 3-47. Remove front caliper brake lines from steering head caddy.
   a. Remove and discard cable strap (10).
   b. Detach WSS connector (6).
   c. Lift tab (5).
   d. Rotate top of retainer (7) out and lift from pocket in caddy.
   e. Remove lines from retainer.
8. Detach brake lines from wire trough.
   a. Detach brake lines (4,9) from clip (8).
   b. Remove and discard cable strap (1).
   c. Pull tab (3), remove brake triangle bracket (2).
   d. Remove brake lines from brake triangle bracket.
   e. See Figure 3-49. Remove brake lines from trough cover clip (4).
   f. Lift brake line retainers (3) and remove brake lines.
   g. Remove brake lines from retainer (2).
9. Remove caliper brake lines.

Install

NOTE

The order in which lines are arranged is important. Arrange as shown.

1. Route brake lines rearward along right side of steering head and wire trough.

2. See Figure 3-45. Install front caliper brake line bracket if removed.

   a. Place bracket (4) on lower triple clamp.

   b. Install screws (3). Tighten.

      Torque: 45–50 **in-lbs** (5.1–5.7 N·m) *Brake line, front caliper bracket, screws*

3. Attach brake lines to brake line bracket (4).

   a. Attach brake lines to appropriate clips.

   b. Rotate cover closed.

   c. See Figure 3-44. Install screw (1). Tighten.

      Torque: 12–18 **in-lbs** (1.4–2 N·m) *Brake line, front caliper, bracket, center screw*

   d. Install **new** cable straps (3).

4. See Figure 3-43. Secure brake line (6) with clips (1).

5. See Figure 3-48.**Fork mounted fairing:** Install **new** cable straps (3) securing brake cable (1) to Wheel speed sensor (2).

6. See Figure 3-49. Secure brake lines to wire trough.

   a. Install brake lines in retainers (3).

   b. Install retainers in slots.

   c. Install brake lines under trough cover clip (4).

   d. Install brake lines inside retainer (2).

   e. See Figure 3-46 or Figure 3-47 Install **new** cable strap (1).

   f. Install brake lines in brake triangle bracket (2).

   g. Install brake triangle bracket in tab (3).

   h. Install brake lines in clip (8).

7. Secure brake line to steering head caddy.

   a. Install lines in retainer (7).

   b. Insert retainer into pocket in caddy.

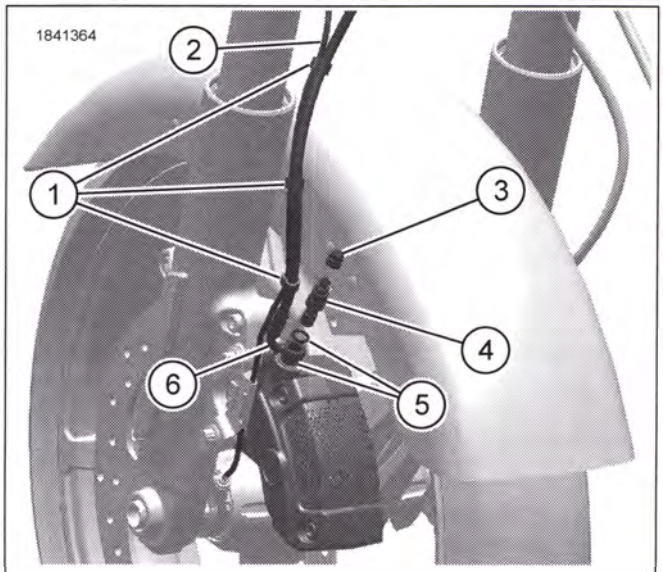
   c. Rotate top of retainer in until latched.

   d. Attach WSS connector (6).

   e. Install **new** cable strap (10).

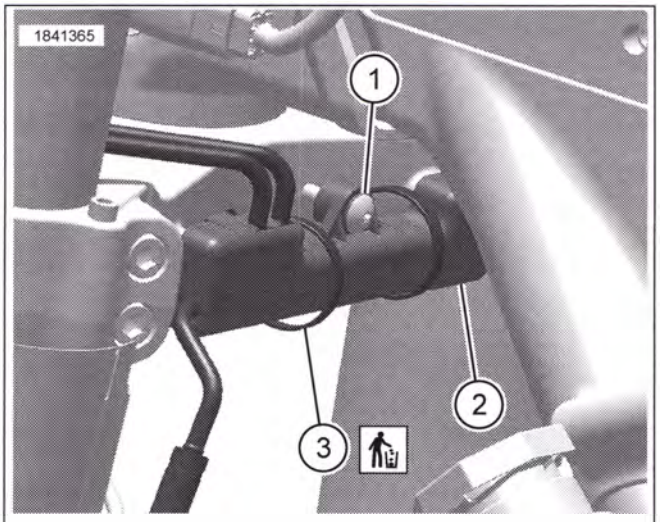
8. Install brake line to ABS module. See CHASSIS > ABS MODULE (Page 3-53).

9. Install brake line to front calipers. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).



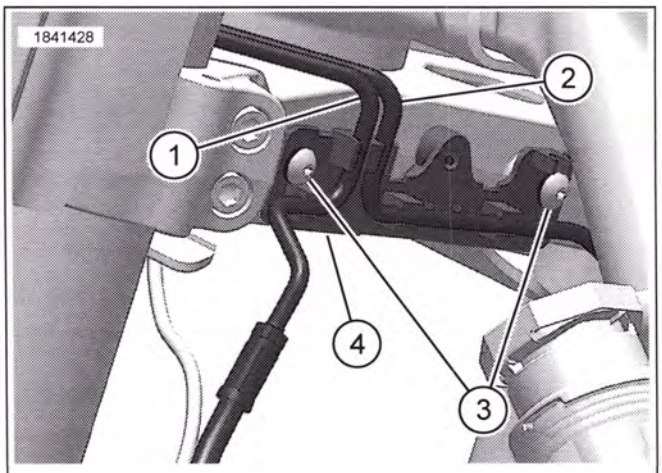
1. **Clip (3)**
2. **Front WSS cable**
3. **Cap**
4. **Bleeder screw**
5. **Gasket washer (2)**
6. **Front caliper brake line**

Figure 3-43. Front Brake Line to Caliper



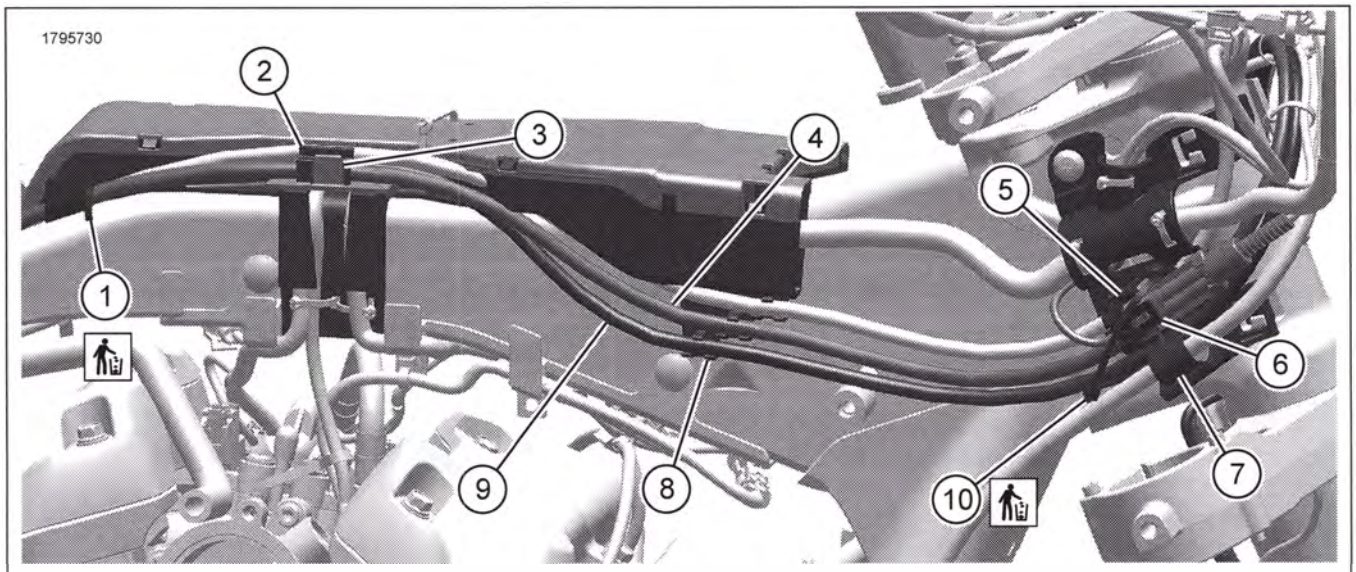
1. **Screw**
2. **Front caliper brake line bracket cover**
3. **Cable strap (2)**

Figure 3-44. Front Caliper Brake Line Bracket Cover



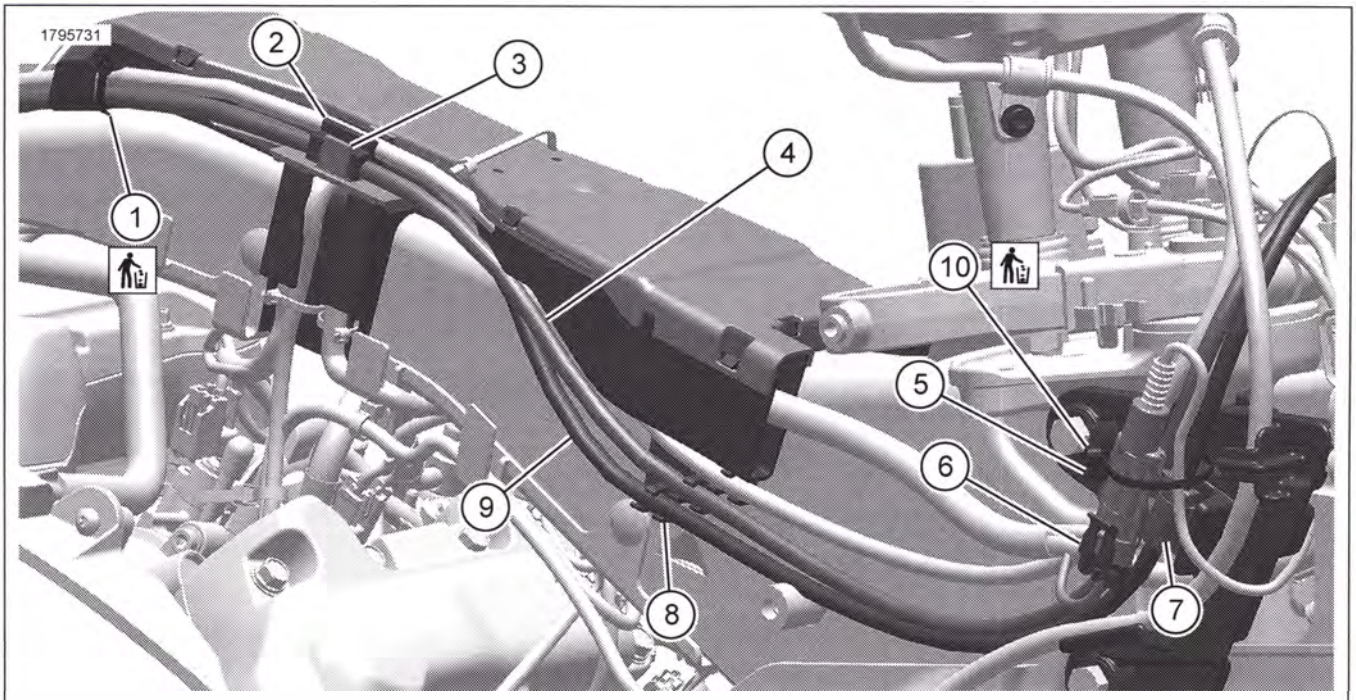
1. Left caliper brake line
2. Right caliper brake line
3. Screw (2)
4. Front caliper brake line bracket

Figure 3-45. Front Caliper Brake Line Bracket



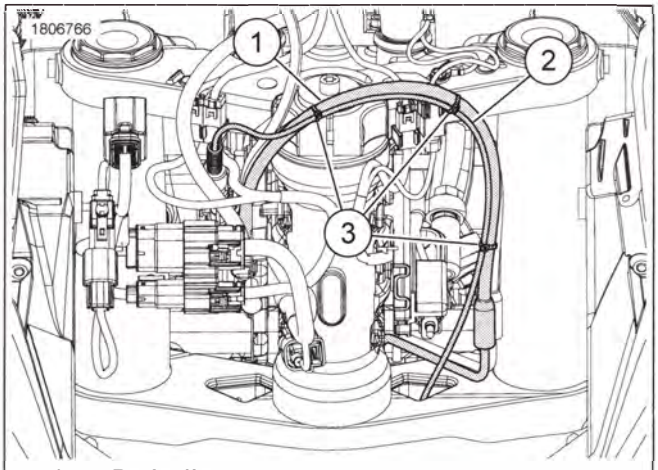
1. Cable strap
2. Brake triangle bracket
3. Tab
4. Left caliper brake line
5. Tab
6. Wheel Speed Sensor (WSS) connector
7. Brake line retainer
8. Clip
9. Right caliper brake line
10. Cable strap

Figure 3-46. Fork-Mounted Fairing Brake Line Routing



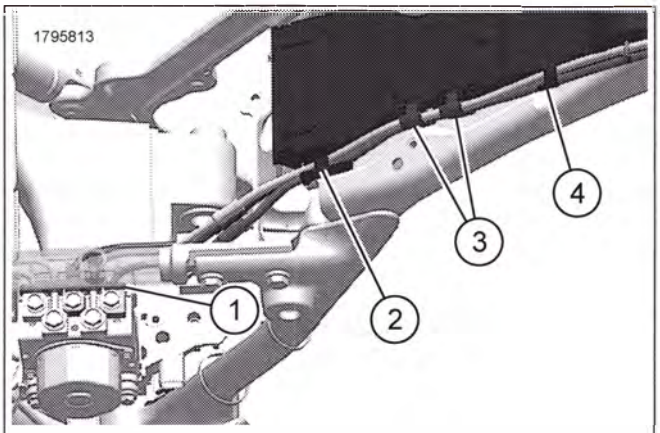
1. Cable strap
2. Brake triangle bracket
3. Tab
4. Left caliper brake line
5. Tab
6. Wheel Speed Sensor (WSS) connector
7. Brake line retainer
8. Clip
9. Right caliper brake line
10. Cable strap

Figure 3-47. Frame-Mounted Fairing Brake Line Routing



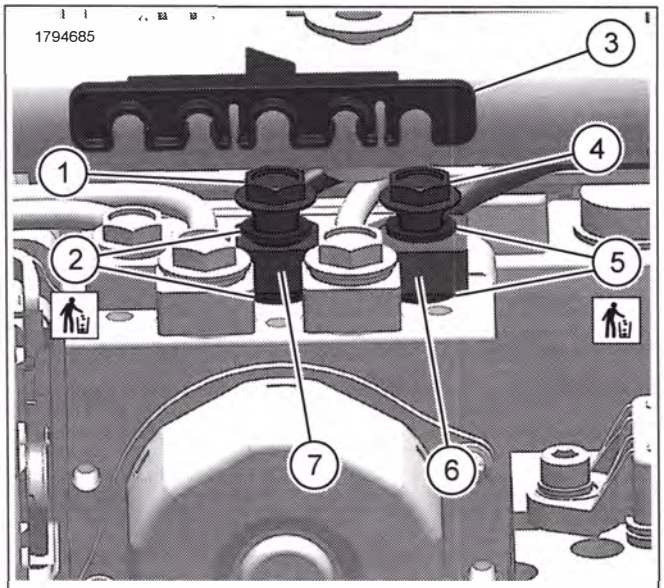
1. Brake line
2. Wheel speed sensor
3. Cable strap (3)

Figure 3-48. Fork Mounted Fairing Brake Line Routing



1. Alignment clip
2. Retainer
3. Brake line retainer (2)
4. Trough cover clip

Figure 3-49. Front Caliper Brake Line to ABS Module



1. **Banjo bolt**
2. **Gasket washer (2)**
3. **Alignment clip**
4. **Banjo bolt**
5. **Gasket washer (2)**
6. **Left caliper brake line**
7. **Right caliper brake line**

Figure 3-50. Front Caliper Brake Lines to ABS Module

Complete

⚠ WARNING

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

1. Fill and Bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
2. **Frame mounted fairing:** Install nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
3. **Fork mounted fairing:** Install dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
4. Install fuel tank and console. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Install outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87) or CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
6. **Frame-mounted fairing:** Install lower fairings. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
7. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
8. Install seat. See CHASSIS > SEAT (Page 3-139).
9. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
10. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
11. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

BRAKE LINE: REAR MASTER CYLINDER TO ABS MODULE

FASTENER	TORQUE VALUE	
Brake line, master cylinder, rear, P-clamp screw	80–97 **in-lbs**	9–11 N·m
Brake line, master cylinder, rear, multi-clamp screw	20–25 **in-lbs**	2.3–2.8 N·m
Engine mount, front bracket, screws	42–48 ft-lbs	57–65 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

Prepare

1. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139)
5. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
6. Remove right side passenger footrest. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
7. Drain rear brake lines. See CHASSIS > BLEED BRAKES (Page 3-58).

Remove

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

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

1. Remove brake line from rear master cylinder. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).

2. Remove brake line from ABS module. See CHASSIS > ABS MODULE (Page 3-53).

3. See Figure 3-51. Remove right footrest/brake pedal assembly.

   a. Support front of engine.

   b. Remove screws (5).

   c. Remove footrest/brake pedal assembly (1).

4. See Figure 3-53. Remove brake line from multi-clamp.

   a. Remove HO2 sensor wire from multi-clamp (14).

   b. Remove screw (13).

   c. Lift tab (8) and remove brake line (7).

5. Remove and dispose of cable straps (3,4,12).

6. Remove brake line from retaining clips.

   a. Remove brake line from anchored conduit clips (6).

   b. Remove brake line from brake line frame brackets (16).

7. See Figure 3-54. Remove connectors (1) from stop lamp switch (2).

8. Remove brake line.

Install

1. If installing a new rear stop lamp switch. See ELECTRICAL > REAR STOPLAMP SWITCH (Page 8-41).

2. Route brake line master cylinder end between engine and master cylinder.

3. See Figure 3-53. Secure brake line.

   a. Install brake line (7) in brake line frame brackets (16)

   b. Secure P-clamp (5) with screw (15). Tighten

      Torque: 80–97 **in-lbs** (9–11 N·m) *Brake line, master cylinder, rear, P-clamp screw*

   c. Install brake line in anchored conduit clips (6).

4. Install brake line to multi-clip.

   a. Install brake line in upper passage of multi-clamp (14).

   b. Close multi-clamp to secure brake line and clutch line.

   c. Apply threadlocker to screw (13).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

   d. Install screw (13). Tighten.

      Torque: 20–25 **in-lbs** (2.3–2.8 N·m) *Brake line, master cylinder, rear, multi-clamp screw*

   e. Install front HO2 sensor wire in clip on clamp.

5. Install footrest/brake pedal assembly with master cylinder attached.

   a. See Figure 3-54. Connect connectors (1) onto rear stop lamp switch (2).

   b. See Figure 3-51. Apply threadlocker to screws (5).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install footrest/brake pedal assembly (1).

   d. Install screw (5). Tighten.

      Torque: 42–48 ft-lbs (57–65 N·m) *Engine mount, front bracket, screws*

   e. Remove support under front of engine.

6. See Figure 3-53. Install cable straps.

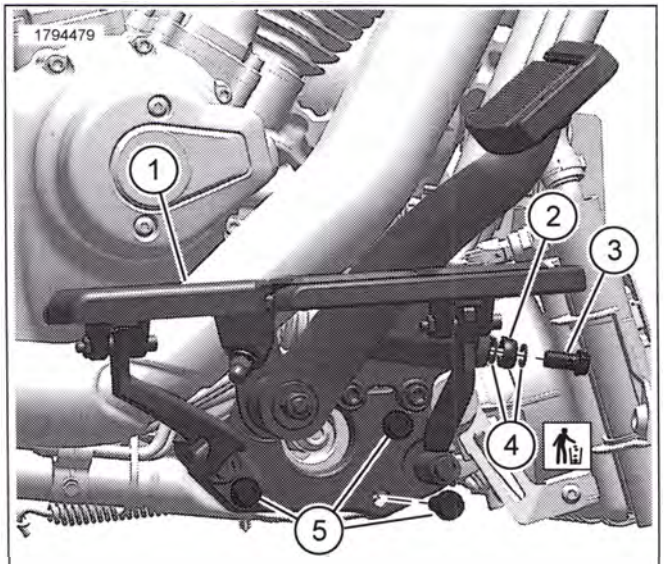
   a. Install **new** cable straps (3) securing brake line and HO2 sensor wires

   b. Install **new** cable strap (4) securing brake line to frame bracket.

   c. Install **new** cable strap (12) securing brake line and clutch cable.

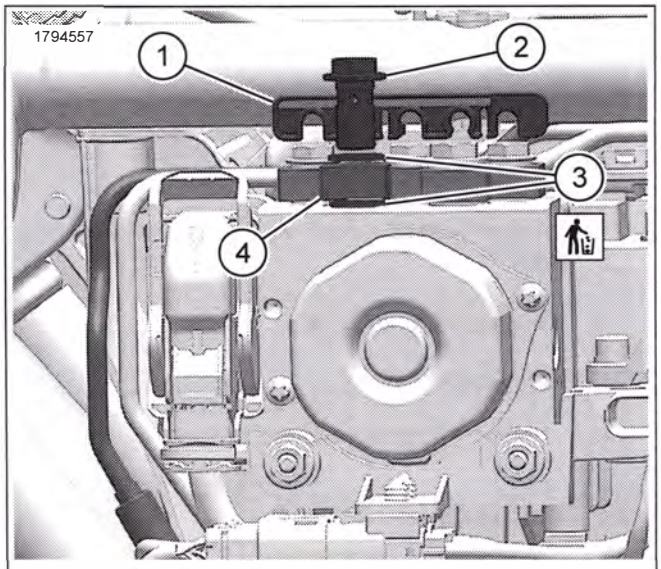
7. Install brake line to ABS module. See CHASSIS > ABS MODULE (Page 3-53).

8. Install brake line to rear master cylinder. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).



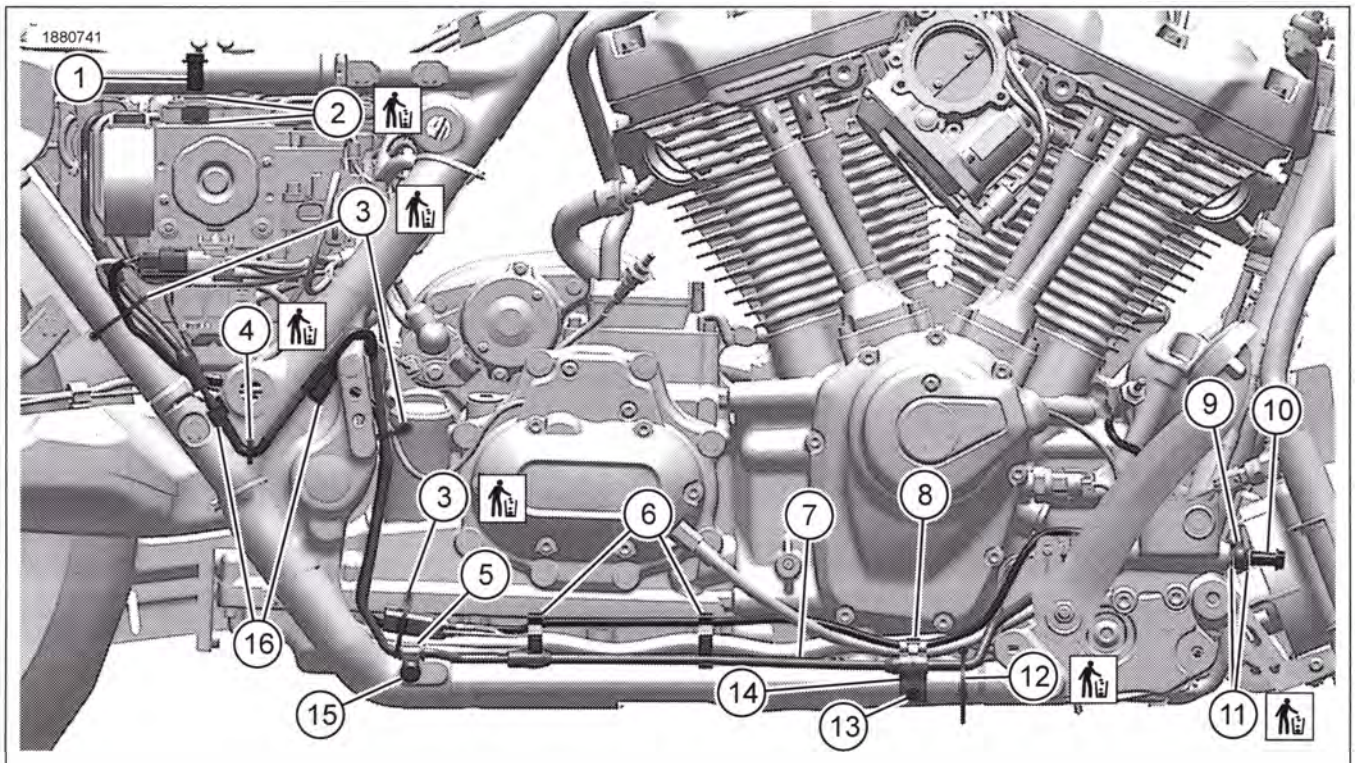
1. Footrest/brake pedal assembly
2. Rear master cylinder, fitting
3. Gasket washer (2)
4. Banjo bolt
5. Screw (3)

Figure 3-51. Footrest/Brake Pedal Assembly (typical)



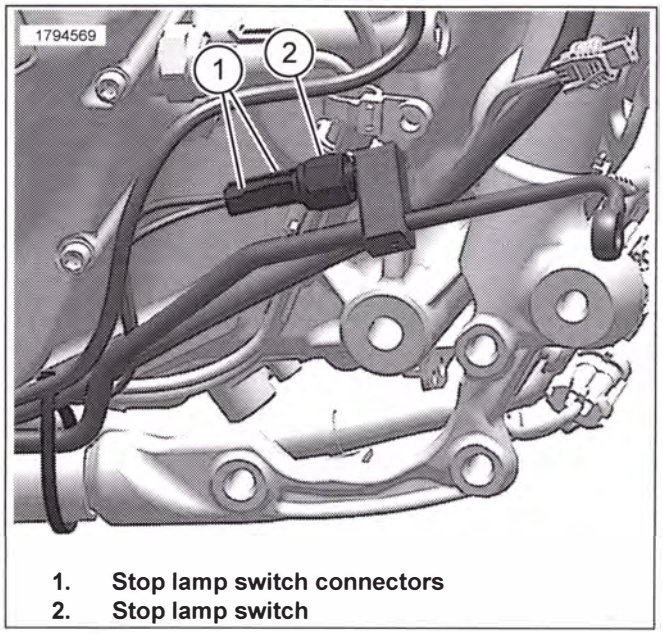
1. Alignment clip
2. Banjo bolt
3. Gasket washer (2)
4. Rear master cylinder, ABS fitting

Figure 3-52. Rear Master Cylinder Line to ABS Module



1. Banjo bolt
2. Gasket washer (2)
3. Cable strap (3)
4. Cable strap
5. P-clamp
6. Anchored conduit clip (2)
7. Rear master cylinder brake line
8. Tab
9. Rear master cylinder, fitting
10. Banjo bolt
11. Gasket washer (2)
12. Cable strap
13. Screw
14. Multi-clamp
15. Screw
16. Brake line frame bracket (2)

Figure 3-53. Rear Master Cylinder Brake Line (exhaust removed for clarity)(typical)



1. **Stop lamp switch connectors**
2. **Stop lamp switch**

Figure 3-54. Stop Lamp Switch Connectors

Complete

⚠ WARNING

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

1. Fill and Bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
2. Install right passenger footrest. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
3. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
4. Install seat. See CHASSIS > SEAT (Page 3-139).
5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
7. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

BRAKE LINE: REAR CALIPER TO ABS MODULE

Prepare

1. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
6. Remove power lock relay housing. See ELECTRICAL > RIGHT SIDE CADDY (Page 8-83).
7. Drain rear brake lines. See CHASSIS > BLEED BRAKES (Page 3-58).

Remove

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

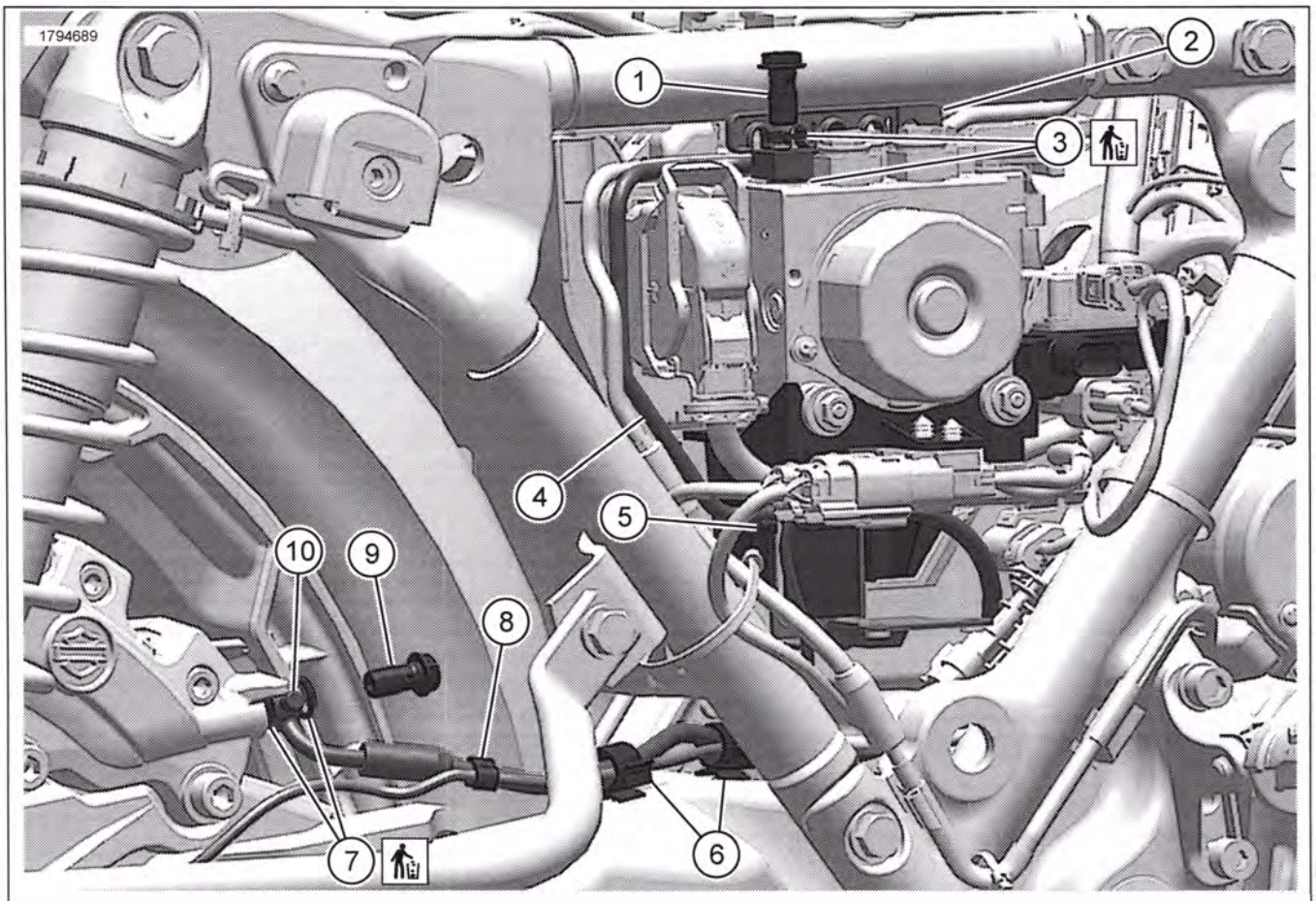
NOTE

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

1. Remove brake line from rear caliper. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).
2. Remove brake line from ABS module. See CHASSIS > ABS MODULE (Page 3-53).
3. See Figure 3-55. Remove brake line from retaining clips.
   a. Remove clip (8).
   b. Remove brake line (4) from anchored clamps (6).
   c. Remove brake line from brake line clip (5).
4. Remove brake line.

Install

1. See Figure 3-55. Route brake line in position.
2. Secure brake line.
   a. Secure brake line (4) to brake line clip (5).
   b. Install brake line in anchored clamps (6).
   c. Attach clip (8) to WSS and brake line.
3. Install brake line to ABS module. See CHASSIS > ABS MODULE (Page 3-53).
4. Install brake line to rear caliper. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).



1. **Banjo bolt**
2. **Alignment clip**
3. **Gasket washer (2)**
4. **Rear caliper brake line**
5. **Brake line clip**
6. **Anchored clamp (2)**
7. **Gasket washer (2)**
8. **Clip**
9. **Banjo bolt**
10. **Alignment pin**

Figure 3-55. Rear Caliper Brake Line

Complete

⚠ WARNING

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

1. Install power lock relay housing. See ELECTRICAL > RIGHT SIDE CADDY (Page 8-83).
2. Fill and Bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
3. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
4. Install seat. See CHASSIS > SEAT (Page 3-139).
5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
7. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

GENERAL

The ABS module consists of the HCU (Hydraulic control unit) and the ECU (Electronic control unit). The two are not serviced separately.

Reflex™ Linked Brakes With ABS Operation

This ABS braking system is an electronically linked brake system. Front and rear brakes are dynamically linked through the electronic ABS module. "Linked" means that both front and rear brakes are applied at the same time. Electronic linking provides maximum braking for all riders while allowing the more experienced rider flexibility. Braking is more responsive and allows more balanced braking under a wider range of conditions.

- Reflex™ Linked Brakes is designed and tuned to provide a seamless and predictable braking response.
- Linking is electronically controlled to achieve an optimized brake balance based on the amount of brake applied and vehicle speed. The amount of linking is dynamically adjusted to provide maximum benefit in heavier braking and is reduced or eliminated for light braking and low speed.
- Linking can occur in any braking situation above 32–40 km/h (20–25 mph) whether only the front brake, rear brake or both brakes are applied. When applying both brakes, the rider may detect slight feedback in the front brake lever or rear brake pedal while the dynamic balancing occurs.
- The amount of linking is programmed to provide a good balance of stopping and rider feel.
- Front and rear brake systems are still hydraulically independent.
- If an ABS event occurs, the ABS unit will pulse the brakes to help prevent wheel lockup.

PREPARE

1. Remove seat. See CHASSIS > SEAT (Page 3-139).
2. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
6. Drain brake fluid from system. See CHASSIS > BLEED BRAKES (Page 3-58).

REMOVE

NOTICE

This device is sensitive to electrostatic discharge (ESD). To prevent damage to the device, always touch the motorcycle frame or a grounded surface before handling. (00588c)

NOTE

Loosen and tighten banjo bolts while ABS module is secured.

1. See Figure 3-56. Disconnect ABS module.
   a. Disconnect EHCU connector (1).
   b. Loosen banjo bolts (3,4). Do not remove.
   c. Remove alignment clip (6).
   d. Remove banjo bolts.
   e. Discard all gasket washers (2,5).
2. Detach brake line (9) from clip (8).
3. Remove module.
   a. Loosen locknuts (7).
   b. See Figure 3-57. Pry between bottom of ABS module (10) and caddy (11) to release stud (15) from grommet (14).
   c. Remove module.
4. Inspect rubber mounts (12) and grommet (14) for damage or deterioration. Replace parts if necessary.

INSTALL

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
ABS module locknuts	53–89 **in-lbs**	6–10 N·m
ABS module, caliper, banjo bolts, 10mm	17–19 ft-lbs	23–26 N·m
ABS module, master cylinder, banjo bolts, 12mm	28–30 ft-lbs	38–41 N·m

NOTICE

This device is sensitive to electrostatic discharge (ESD). To prevent damage to the device, always touch the motorcycle frame or a grounded surface before handling. (00588c)

1. See Figure 3-58. Install ABS module.

   a. Apply a mixture of 50 percent isopropyl alcohol and 50 percent distilled water to stud (3) to ease installation of stud into grommet.

   b. See Figure 3-57. Align stud (15) with grommet (14).

   c. Align rubber mounts (12) with right side caddy (11).

   d. Install ABS module (10).

   e. Verify that stud and rubber mounts are fully seated in caddy and grommet.

   f. Tighten locknuts (13).

      Torque: 53–89 **in-lbs** (6–10 N·m) *ABS module locknuts*

2. Connect master cylinder brake fittings.

   a. Install **new** gasket washers (1).

   b. Install banjo bolts (4) and brake fittings (7,9). Do not tighten.

NOTE

Master cylinder banjo bolts are 12 mm.

3. Connect brake caliper fittings.

   a. Install **new** gasket washers (5).

   b. Install banjo bolts (3) and brake caliper fittings (2,6,8). Do not tighten.

NOTE

Caliper banjo bolts are 10 mm.

4. See Figure 3-56. Install alignment clip (6).

5. Tighten banjo bolts.

   a. Banjo bolt (3) 10mm.

      Torque: 17–19 ft-lbs (23–26 N·m) *ABS module, caliper, banjo bolts, 10mm*

   b. Banjo bolt (4) 12mm.

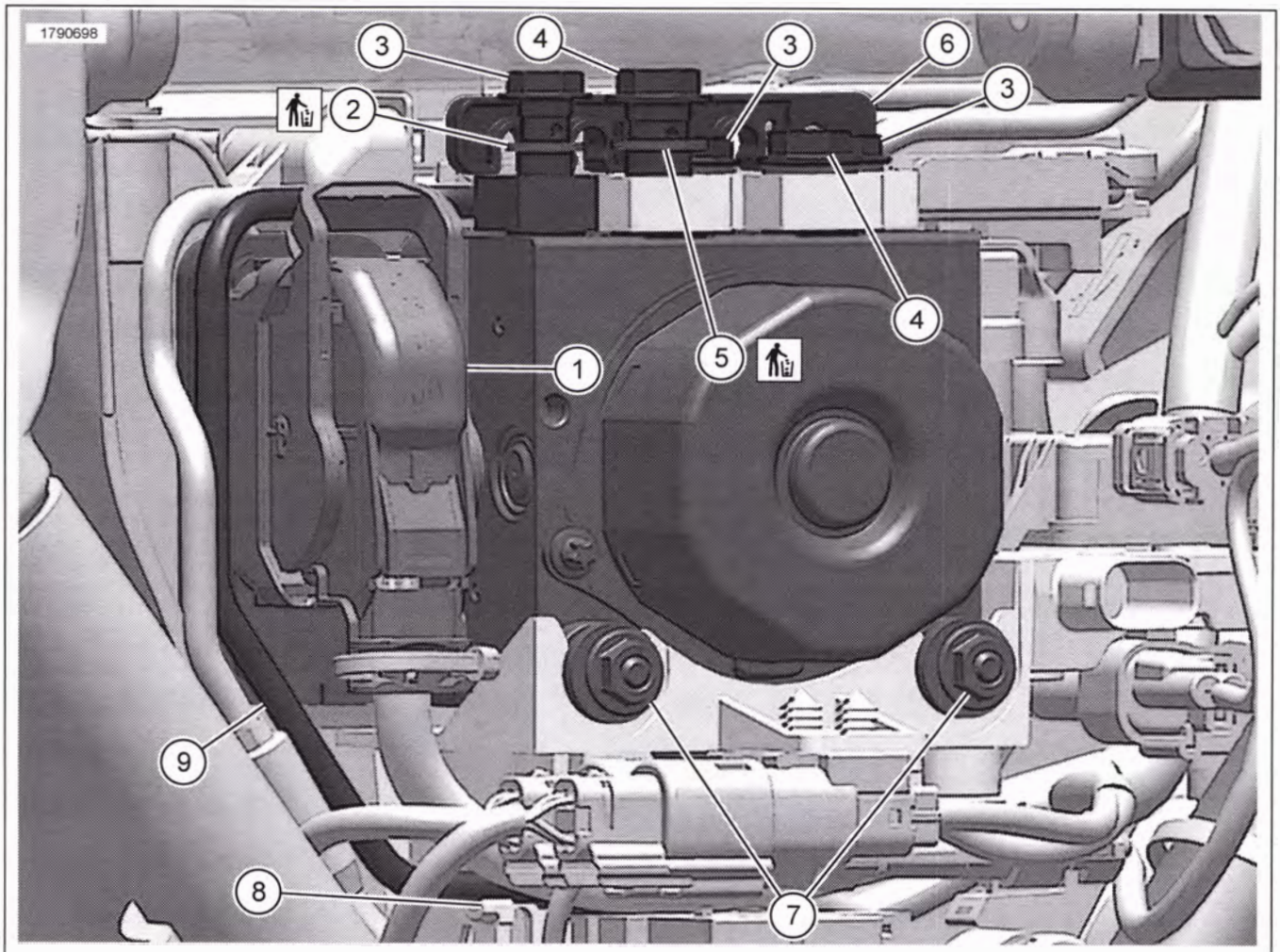
      Torque: 28–30 ft-lbs (38–41 N·m) *ABS module, master cylinder, banjo bolts, 12mm*

6. Attach brake line (9) to clip (8).

7. Connect EHCU connector (1).

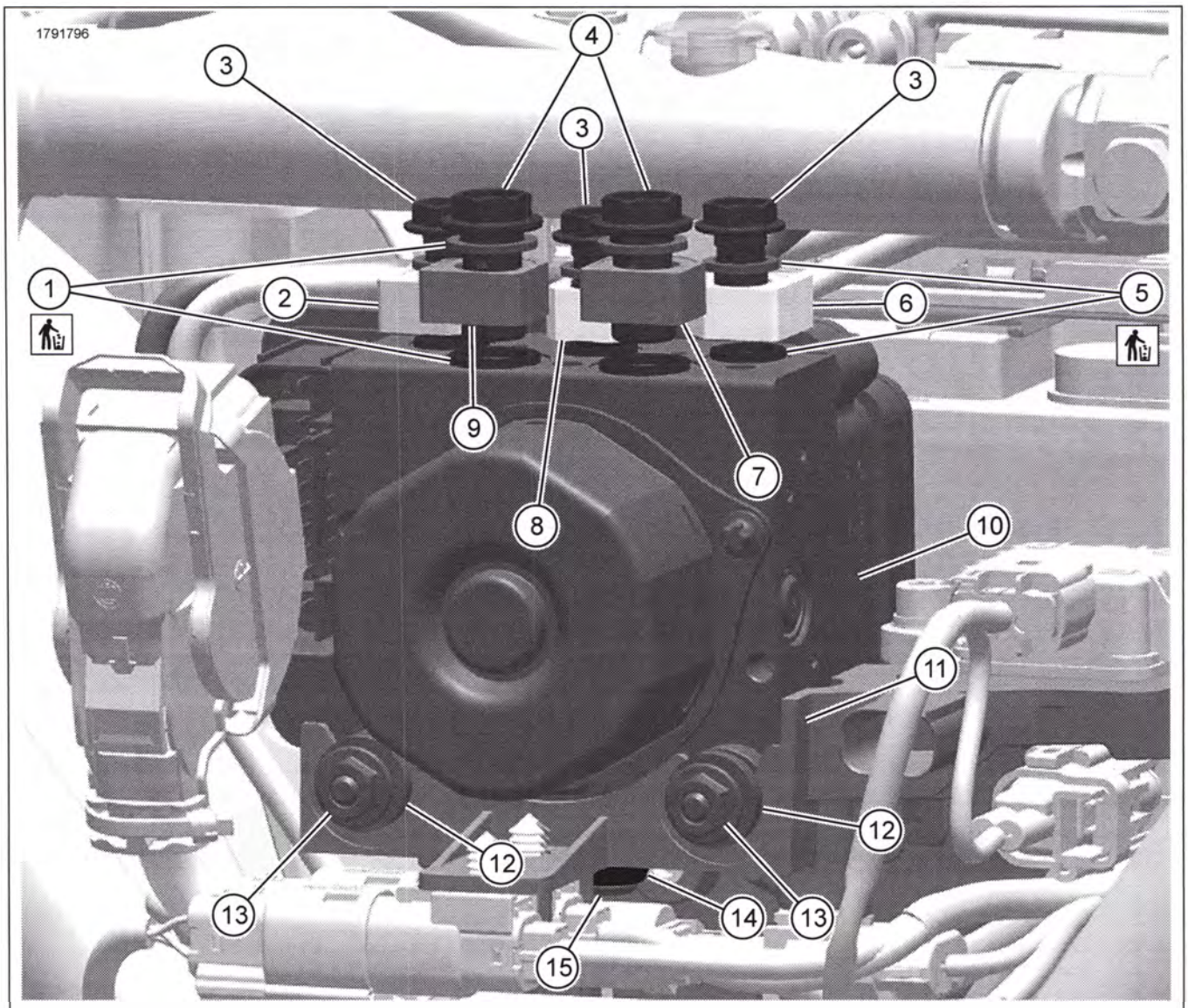
8. If installing a new ABS module, it must be set up using:

   Special Tool: DIGITAL TECHNICIAN II (HD-48650)



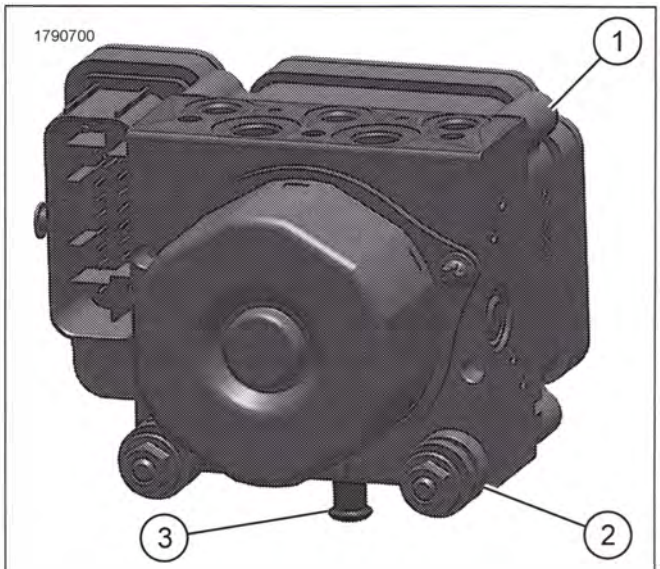
1. EHCU connector
2. Gasket washer, M10 (3)
3. Banjo Bolt,10mm (3)
4. Banjo Bolt,12mm (2)
5. Gasket washer, M12 (2)
6. Alignment clip
7. Locknut (2)
8. Brake line clip
9. Rear master cylinder, brake line

Figure 3-56. ABS Module Brake Line Connections



1. Master cylinder gasket washer, M12 (2)
2. ABS module to rear caliper, fitting
3. Banjo bolt,10mm (3)
4. Banjo bolt, 12mm (2)
5. Caliper gasket washer, M10 (3)
6. ABS module to front-left caliper, fitting
7. Front master cylinder, fitting
8. ABS module to front-right caliper,fitting
9. Rear master cylinder, fitting
10. ABS module
11. Right side caddy
12. Rubber mount (2)
13. Locknut (2)
14. Grommet
15. Stud

Figure 3-57. ABS Module Mounting



1. ABS module
2. Rubber mount (2)
3. Stud

Figure 3-58. ABS Module

COMPLETE

⚠ WARNING

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

1. Install brake fluid and bleed brakes. See CHASSIS > BLEED BRAKES (Page 3-58).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
5. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
6. Install seat. See CHASSIS > SEAT (Page 3-139).

⚠ 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. Operate motorcycle at low speeds to verify that braking systems operate properly.

DRAIN

PART NUMBER	TOOL NAME
BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Front brake caliper bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m
Rear brake caliper bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

NOTE

- *Procedure for draining brake fluid is the same for both the front and the rear brake systems.*
- *Both front and rear brake systems are affected when removing ABS module.*

1. Remove master cylinder reservoir cap of the affected system.
2. See Figure 3-59. Remove cap (1) from bleeder screw (2).
3. Using vacuum brake bleeder to drain system.

   Special Tool: BASIC VACUUM BRAKE BLEEDER (BB200A)

   a. Attach vacuum brake bleeder to a caliper bleeder screw. Loosen screw 3/4 turn.

   b. Operate vacuum bleeder to evacuate all fluid from master cylinder and line.

   c. **If needed:** Repeat with remaining calipers.
4. Using brake lever or pedal to drain system.

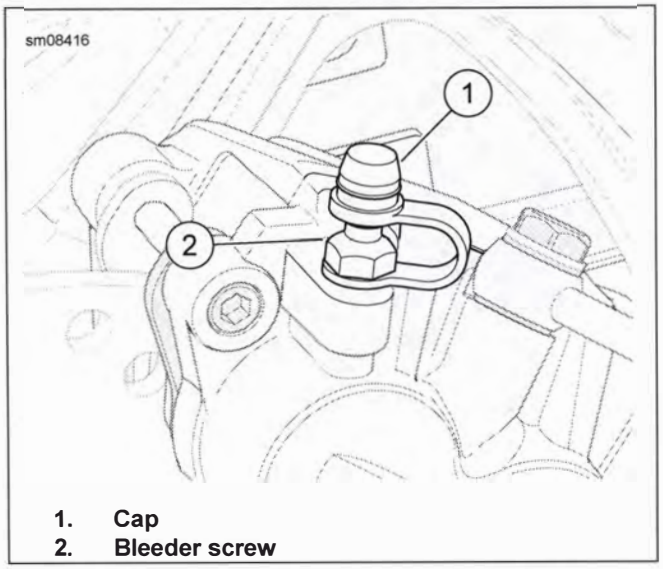
   a. Install a length of clear plastic tubing over bleeder screw.

   b. Place free end of tubing in a suitable container.

   c. Open bleeder screw one-half turn.

   d. Pump brake lever or pedal repeatedly to drain brake fluid.
5. Close bleeder screw. Tighten.

   Torque: 75–102 **in-lbs** (8.5–11.5 N·m) *Front brake caliper bleeder screw*
   Torque: 75–102 **in-lbs** (8.5–11.5 N·m) *Rear brake caliper bleeder screw*
6. Wipe out any remaining fluid inside master cylinder reservoir with a clean, lint-free cloth.



1. **Cap**
2. **Bleeder screw**

Figure 3-59. Bleeder Screw (Typical)

FILL AND BLEED

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

FASTENER	TORQUE VALUE	
Brake bleeder screw, rear	75–102 **in-lbs**	8.5–11.5 N·m
Brake master cylinder, front, reservoir cover screws	9–11 **in-lbs**	1–1.2 N·m
Brake master cylinder, rear, reservoir cover screws	12–15 **in-lbs**	1.4–1.7 N·m

CONSUMABLE	PART NUMBER
Harley-Davidson Platinum Label DOT 4 Brake Fluid	41800xxx

⚠ 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)

⚠ WARNING

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

NOTICE

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 brake work is performed. Failure to comply can result in cosmetic damage. (00239c)

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

NOTICE

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

NOTE

- *Procedure for filling and bleeding brake fluid is the same for both front and rear brake systems.*
- *For best results use BASIC VACUUM BRAKE BLEEDER (PART NUMBER: BB200A). If a vacuum brake bleeder is not available, use the following procedure.*
- *Even with the use of a vacuum bleeder, a final manual bleed may be required.*

1. Verify brake system operation.
   a. Verify master cylinder is level.
   b. Remove cover from master cylinder reservoir.
   c. Fill reservoir with brake fluid. Refer to Table 3-6.

      Harley-Davidson Platinum Label DOT 4 Brake Fluid (41800xxx)
   d. Verify proper operation of master cylinder relief port by actuating brake pedal or lever. Fluid will break the fluid surface in reservoir if internal components are working properly.

NOTE

- *Monitor fluid level in master cylinder reservoir. Add fluid before it empties to avoid drawing air into brake lines.*
- ***Dual caliper front brake system:** Bleed both calipers.*

2. Bleed brake system.
   a. Remove cap from bleeder screw.
   b. Install end of clear plastic tubing over bleeder screw.
   c. Place opposite end of clear plastic tubing in a clear container.
   d. Operate brake lever or pedal to build hydraulic pressure.
   e. Hold pressure with brake lever or pedal.
   f. Open bleeder screw three-quarters of a turn.
   g. Close bleeder screw as soon as brake lever or pedal has moved full range of travel.
   h. Allow brake lever or pedal to return slowly to its released position.
   i. Repeat until all air bubbles are purged and a solid column of fluid is observed in the bleeder tube.
   j. Tighten bleeder screw to specification. Refer to Table 3-7. Install bleeder screw cap.
   k. Fill reservoir with brake fluid. Refer to Table 3-6.

      Harley-Davidson Platinum Label DOT 4 Brake Fluid (41800xxx)
3. Refer to Table 3-7. Install master cylinder reservoir cover:
   a. Verify master cylinder cover gasket bellows is not extended.
   b. Verify gasket and sealing surfaces are free of debris.
   c. **Front master cylinder reservoir:** Install cover with vent holes facing rear. Install cover screws. Tighten.

      Torque: 9–11 **in-lbs** (1–1.2 N·m) *Brake master cylinder, front, reservoir cover screws*
   d. **Rear master cylinder reservoir:** Install cover screws. Tighten.

      Torque: 12–15 **in-lbs** (1.4–1.7 N·m) *Brake master cylinder, rear, reservoir cover screws*
4. ABS models: Connect DT II and perform "ABS Service" procedure.

   Special Tool: DIGITAL TECHNICIAN II (HD-48650)

⚠ WARNING

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

5. Check operation of brake lamp.

⚠ WARNING

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

⚠ WARNING

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

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

Table 3-6. Fluid Level

ITEM	SPECIFICATION
Front reservoir	Boss or ridge with range window
Rear reservoir	Ledge or range window

Table 3-7. Torque Specifications

COMPONENT	TORQUE
Bleeder screw, front	75–102 **in-lbs** (8.5–11.5 N·m)
Bleeder screw, rear	75–102 **in-lbs** (8.5–11.5 N·m)
Front cover	9–11 **in-lbs** (1–1.2 N·m)
Rear cover	12–15 **in-lbs** (1.4–1.7 N·m)

PREPARE

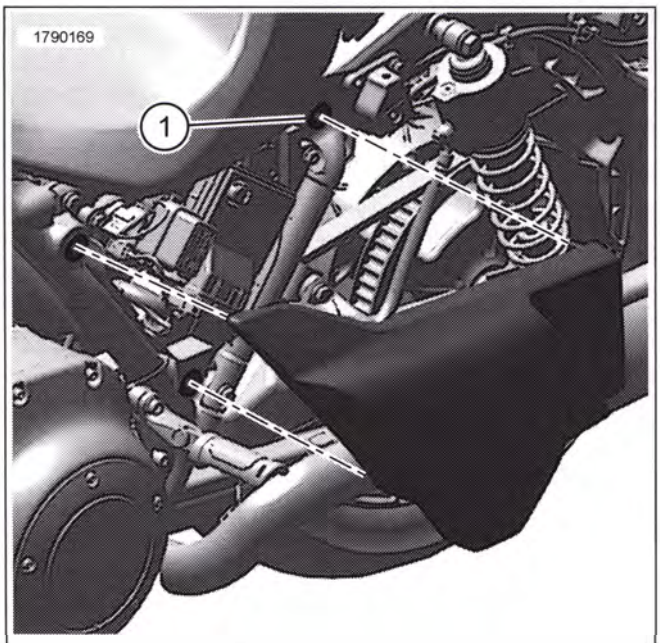
1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE

1. See Figure 3-60. Pull side cover away to release mounting studs from grommets (1).

INSTALL

1. Install side cover.
   a. Align side cover with grommets (1).
   b. Press side cover until fully seated.



1. Grommet (3)

Figure 3-60. Left Side Cover (typical)

COMPLETE

1. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

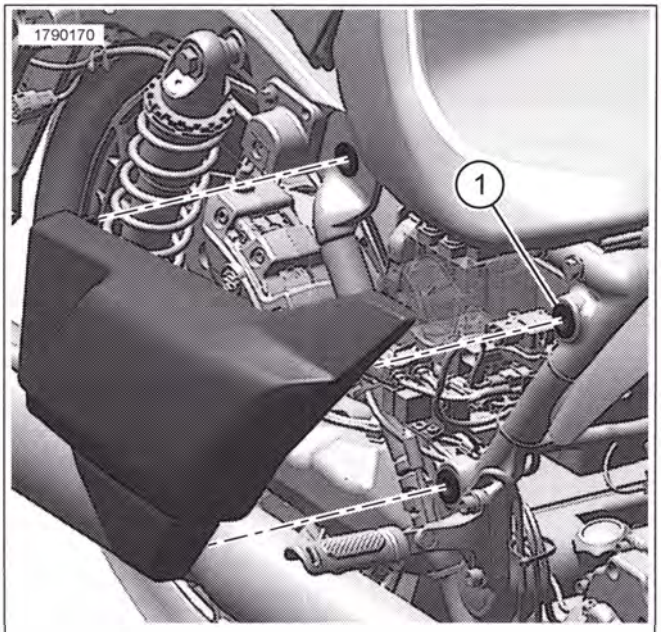
1. Remove right saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144)

REMOVE

1. See Figure 3-61. Pull side cover away to release mounting studs from grommets (1).

INSTALL

1. Install side cover.
   a. Align side cover with grommets (1).
   b. Press side cover until fully seated.



1. Grommet (3)

Figure 3-61. Right Side Cover (typical)

COMPLETE

1. Install right saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

CHECK FOR OIL LEAK

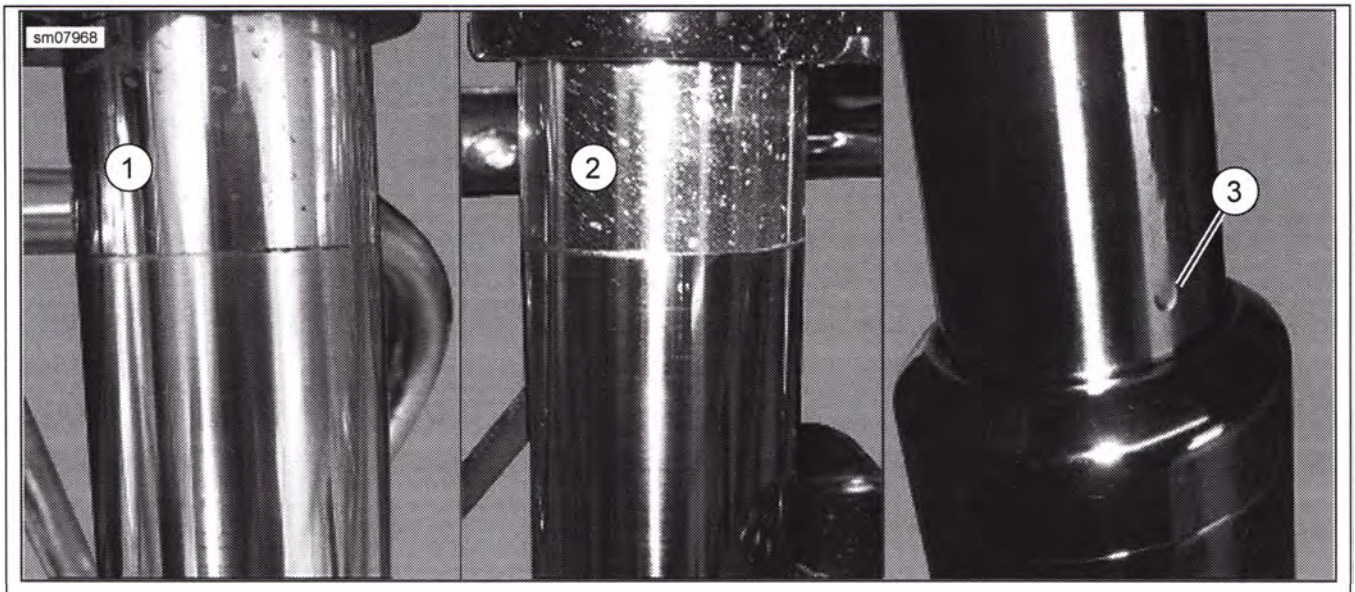
Fork Oil Seals

The fork oil seal allows a fine film of oil to lubricate the fork sliding surface.

- The oil film is more visible after continuous high-speed compression and rebound movement.
- Due to greater lubrication needs, larger forks have a greater amount of oil film than smaller forks.

Check Oil Leak

1. Observe oil ring.
2. Wipe fork clean.
3. Ride motorcycle over bumpy road or complete six braking events.
4. See Figure 3-62. Check fork slider tube for oil.
   a. If a normal oil/dust film (1, 2) is present, there is no leak.
   b. If an oil run or drip (3) is present, perform procedure two or three more times to confirm oil leak.



1. **Normal oil/dust film**
2. **Normal oil/dust film**
3. **Drip**

Figure 3-62. Front Forks

PREPARE

NOTICE

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

1. Raise front wheel. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).
2. Remove nacelle or media tray and dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87) or CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
3. Remove front fender. See CHASSIS > FRONT FENDER (Page 3-126).
4. Detach front brake calipers and secure out of the way. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31).
5. Remove front wheel. See CHASSIS > FRONT WHEEL (Page 3-10).

REMOVE

1. See Figure 3-63. Loosen upper pinch screw (1) but do not remove.
2. Remove fork.
   a. Hold fork slider to prevent fork from dropping.
   b. Loosen lower pinch screws (6).
   c. Slide fork tube (7) down to remove.
3. If necessary, remove screws (2). Remove slider cover (5).

INSTALL

FASTENER	TORQUE VALUE	
Fork bracket, lower, pinch screws	15–18 ft-lbs	19.7–24.4 N·m
Fork bracket, upper pinch screw	15–18 ft-lbs	19.7–24.4 N·m
Fork cover screws	24–48 **in-lbs**	2.7–5.4 N·m

CONSUMABLE	PART NUMBER
LOCTITE 246 HIGH TEMPERATURE MEDIUM STRENGTH BLUE THREADLOCKER	Loctite 246

1. See Figure 3-63. If removed, install fork covers.

   a. Apply threadlocker to threads of screws (2).

      LOCTITE 246 HIGH TEMPERATURE MEDIUM STRENGTH BLUE THREADLOCKER (Loctite 246)

   b. Tighten.

      Torque: 24–48 **in-lbs** (2.7–5.4 N·m) *Fork cover screws*

2. Install front fork tube assembly.

   a. Insert fork tube assembly (7) through lower fork bracket (4) and upper fork bracket.

   b. Measure distance (3) from top of fork tube (7) to top of lower fork bracket (4) to set fork height. Refer to Table 3-8.

3. Tighten fork mount screws.

   a. Tighten lower fork bracket pinch screws (6) alternately (top fastener, bottom fastener, repeat) until specification is maintained.

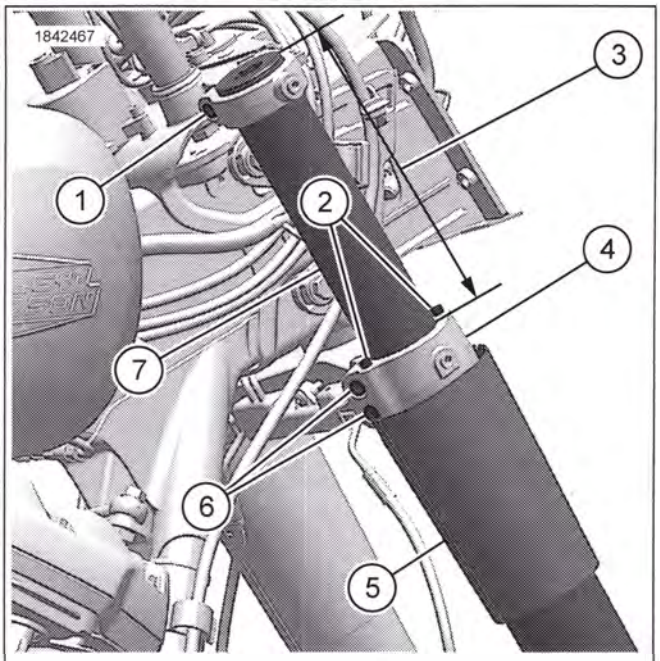
      Torque: 15–18 ft-lbs (19.7–24.4 N·m) *Fork bracket, lower, pinch screws*

   b. Tighten upper fork bracket pinch screw (1).

      Torque: 15–18 ft-lbs (19.7–24.4 N·m) *Fork bracket, upper pinch screw*

Table 3-8. Fork Installation Distance

FORK INSTALLATION DISTANCE	IN	MM
Distance	8.26-8.38	209.8-212.8



1. **Upper fork bracket pinch screw**
2. **Fork cover screw (2)**
3. **Distance**
4. **Lower fork bracket**
5. **Fork cover**
6. **Lower pinch screws (2)**
7. **Fork tube assembly**

Figure 3-63. Front Fork Mount

DISASSEMBLE

PART NUMBER	TOOL NAME
HD-41177	FORK TUBE HOLDER

Initial Disassembly

NOTE

Always use soft jaws when placing any fork components into vise.

1. See Figure 3-64. If performing complete disassembly, clamp lower end of fork slider in a soft-jawed vise. Loosen lower screw (18). Do not remove now.

2. Install fork tube in fork tube holder with fork vertical.

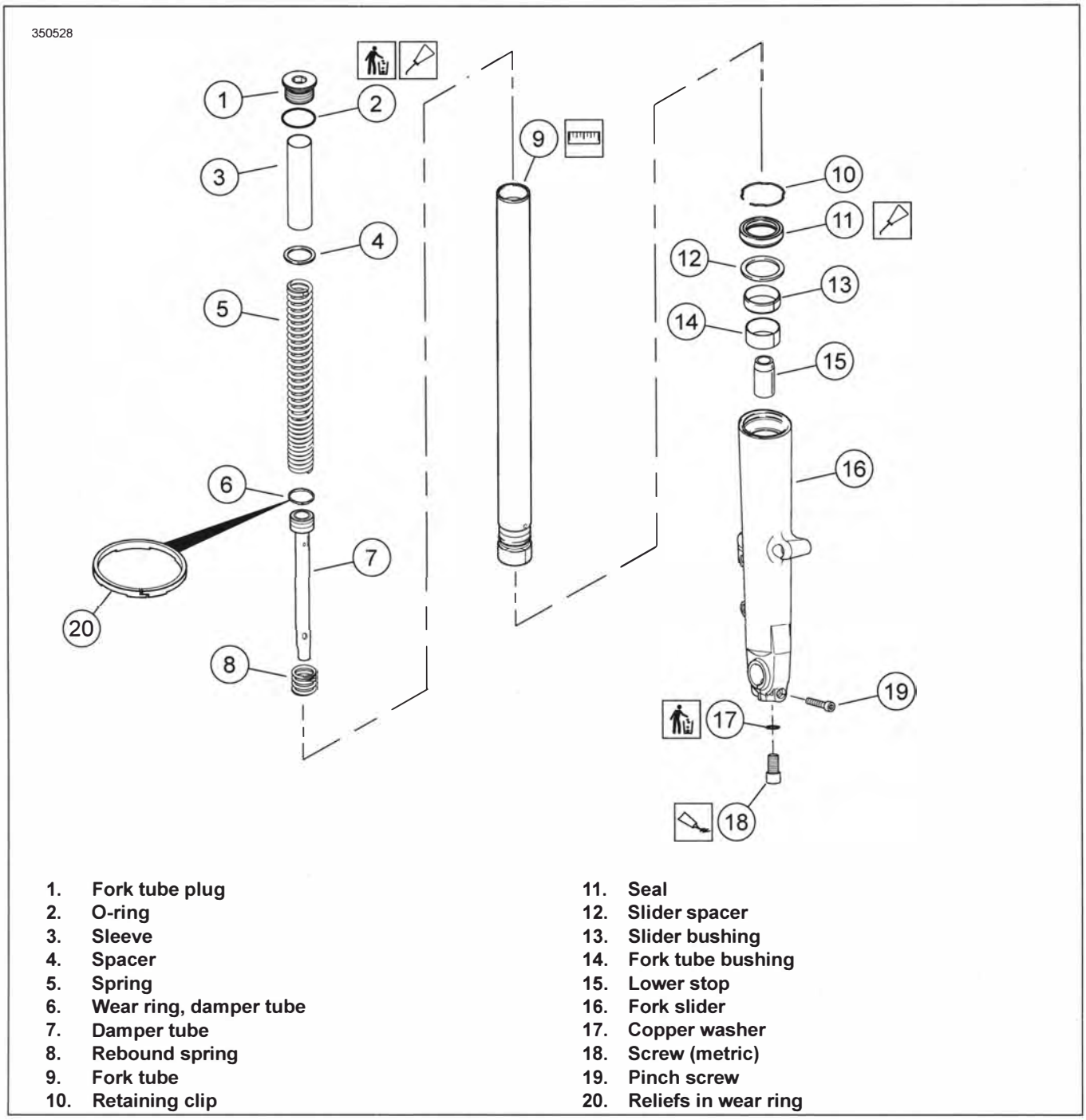
   Special Tool: FORK TUBE HOLDER (HD-41177)

3. Remove fork tube plug (1).

   a. Fork tube plug is under spring pressure. Have a firm grasp on plug as it is removed.

   b. Remove and discard O-ring (2).

4. Remove sleeve (3), spacer (4) and spring (5) from fork assembly.



1. **Fork tube plug**
2. **O-ring**
3. **Sleeve**
4. **Spacer**
5. **Spring**
6. **Wear ring, damper tube**
7. **Damper tube**
8. **Rebound spring**
9. **Fork tube**
10. **Retaining clip**
11. **Seal**
12. **Slider spacer**
13. **Slider bushing**
14. **Fork tube bushing**
15. **Lower stop**
16. **Fork slider**
17. **Copper washer**
18. **Screw (metric)**
19. **Pinch screw**
20. **Reliefs in wear ring**

Figure 3-64. Fork Assembly

Fork Drain

1. *NOTE*

Drain fork oil into a suitable container.

If only performing a fork oil change, go to FRONT FORK > ASSEMBLE (Page 3-65), Final Fill.

Drain fork oil.

a. Slowly pump fork tube and slider at least ten times.

b. Allow 10-15 minutes for fork to drain completely.

Complete Disassembly

1. Remove screw (18).

a. Position fork horizontal.

b. Temporarily install spring, spacer and sleeve.

c. Apply pressure to spring to prevent damper from rotating and remove screw (18).

d. Remove copper washer (17). Discard washer.

e. Remove sleeve, spacer and spring.

2. Remove fork tube.

   a. Remove retaining clip (10).

   b. Expand fork slider and tube against each other repeatedly (in a slide-hammer effect) to remove fork tube.

   c. Remove fork tube bushing (14), slider bushing (13), spacer (12), seal (11) and retaining clip (10) from fork tube.

   d. Remove lower stop (15) from end of fork tube.

3. Tip fork tube upside down to remove damper tube (7) with rebound spring (8).

4. Remove rebound spring (8) and wear ring (6) from damper tube.

CLEAN AND INSPECT

1. Clean all parts.

2. Inspect parts for wear or damage. Replace parts if necessary.

3. Inspect OD of slider bushing and ID of fork tube bushing.

   a. If coating is worn through (metallic substrate showing), replace bushing.

   b. Inspect for distortion.

   c. If deep scratches or scoring are found, replace bushing. Also inspect mating components for similar wear. Replace or repair as necessary.

4. Check fork tube and slider for scoring, scratches and abnormal wear.

5. Inspect fork tube for nicks from stones and road debris, especially in area where seal contacts it. Replace if necessary.

6. See Figure 3-65. Check runout with a dial indicator.

   a. Set fork tube on V-blocks.

   b. Replace fork if runout exceeds:

      0.008 in (0.2 mm)

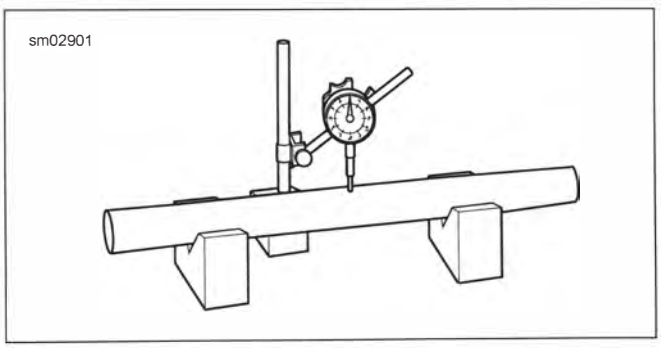


Figure 3-65. Measure Fork Tube Runout

ASSEMBLE

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

FASTENER	TORQUE VALUE	
Fork slider assembly screw	30–37 ft-lbs	40–50 N·m
Fork, tube plug	22–59 ft-lbs	30–80 N·m

CONSUMABLE	PART NUMBER
TYPE "E" HYDRAULIC FORK OIL	62600026
LOCTITE 565 THREAD SEALANT	99818-97

Initial Assembly

NOTE

Lubricate all seal lips, quad rings and O-rings with HARLEY-DAVIDSON SEAL GREASE during assembly.

1. See Figure 3-64. Assemble fork tube.

   a. Coat OD of slider bushing (13) and fork tube bushing (14) with clean fork oil.

   b. Expand slider bushing only enough to slip into groove of fork tube (9).

   c. Install fork tube bushing and slider spacer (12) onto fork tube. Slide down until they contact slider bushing (13).

   d. Wrap masking tape over edge of fork tube to protect fork oil seal during installation.

   e. With the garter spring side toward fork slider (16), slide **new** fork oil seal (11) down fork tube until it contacts slider spacer (12).

   f. Remove masking tape from fork tube.

NOTE

Screw (18) can be reused unless damaged.

2. Install damper tube (7).

   a. Install fork tube horizontally in fork tube holder.

      Special Tool: FORK TUBE HOLDER (HD-41177)

   b. Install new wear ring (6) in groove of damper tube (7). Install with reliefs (23) down.

   c. Install rebound spring (8) on opposite end.

   d. Slide damper tube into fork tube, small end first, until it passes through hole at bottom of fork tube. Install lower stop (15) at end of damper tube.

   e. Install fork spring (5) with the tightly wound coils toward the bottom.

   f. Install spacer (4) and sleeve (3).

g. Slide fork slider onto fork tube.

h. Apply threadlocker to screw (18). Loosely install screw and new copper washer (17).

LOCTITE 565 THREAD SEALANT (99818-97)

i. Remove from fork holder.

j. While compressing spring, tighten screw (18).

Torque: 30–37 ft-lbs (40–50 N·m) *Fork slider assembly screw*

3. See Figure 3-66. Install fork oil seal.

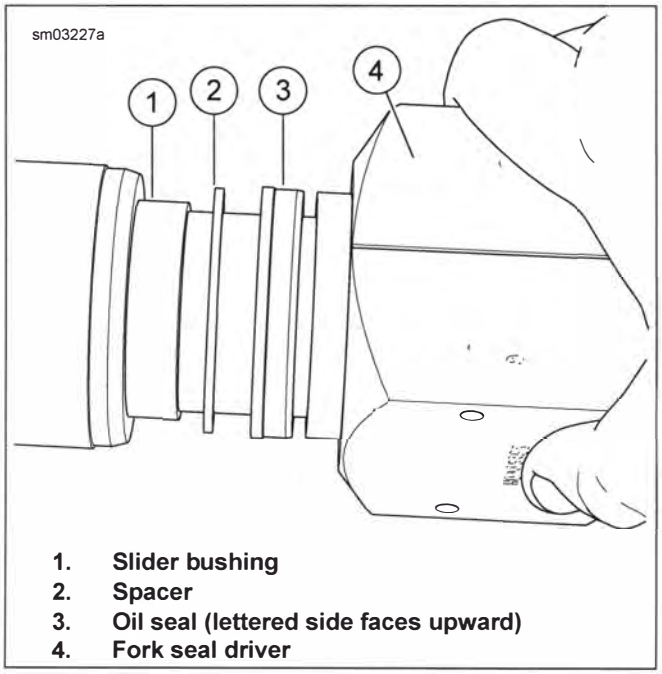
a. Clamp lower end of fork slider in a soft-jawed vise.

b. Using FORK SEAL DRIVER (PART NUMBER: HD-45305) like a slide hammer, drive fork oil seal down until installer contacts fork slider.

c. Remove tool.

d. See Figure 3-64. Install retaining clip (10) in fork slider groove.

4. Loosely install axle holder (22) with flat washers (21), lockwashers (20) and nuts (19) on right fork slider.



1. Slider bushing
2. Spacer
3. Oil seal (lettered side faces upward)
4. Fork seal driver

Figure 3-66. Assembled Fork Seal Driver

Final Fill

1. Clamp fork slider vertically in fork tube holder.

Special Tool: FORK TUBE HOLDER (HD-41177)

2. See Figure 3-64. Remove fork sleeve (3), spacer (4) and spring (5) from fork tube.

3. Pour hydraulic fork oil directly into fork tube.

Volume: 24 fl oz (710 ml)
Consumable: TYPE "E" HYDRAULIC FORK OIL (62600026)

4. Slowly pump fork tube until some resistance is felt. Then pump a few more times.

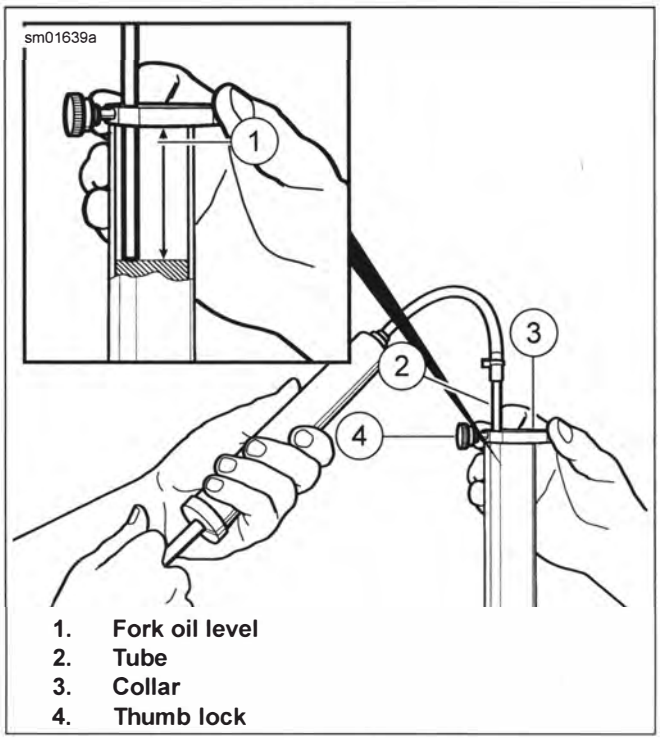
5. See Figure 3-67. Adjust fork oil level.

a. Adjust collar (3) of fork oil level gauge to: Dimension: 3.94 in (100 mm).

Special Tool: FORK OIL LEVEL GAUGE (HD-59000B)

b. With fork tube bottomed in fork slider, insert tube (2) of gauge until collar (3) rests flat on top of fork tube.

c. Draw excess oil from fork with plunger. If no oil is drawn out, add a small amount to fork tube and repeat.



1. Fork oil level
2. Tube
3. Collar
4. Thumb lock

Figure 3-67. Oil Level Gauge

Complete Assembly

1. See Figure 3-64. Extend the fork. Install fork spring (5), spacer (4) and sleeve (3) into fork tube with tighter wound coils at the bottom.

2. Remove fork slider from fork holding tool. Clamp fork tube into fork holding tool.

3. Install new O-ring (2) onto fork tube plug (1). Install fork tube plug. Tighten.

Torque: 22–59 ft-lbs (30–80 N·m) *Fork, tube plug*

4. Install fork and assemble motorcycle. See FRONT FORK > INSTALL (Page 3-62).

COMPLETE

1. Install front wheel. See CHASSIS > FRONT WHEEL (Page 3-10).

2. Install front brake calipers. See CHASSIS > FRONT BRAKE CALIPER (Page 3-31)

3. Install front fender. See CHASSIS > FRONT FENDER (Page 3-126).

4. Install nacelle or media tray and dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87) or CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

PREPARE

1. Frame mounted fairing:
   a. Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
2. Fork mounted fairing:
   a. Remove media tray. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. Remove outer and inner fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

REMOVE

Upper Fork Bracket

1. See Figure 3-68.**Frame-Mounted Fairing:** Disconnect connectors.
   a. Remove brake line and clutch line retention P-clamps (4).
   b. Disconnect RHCM connector (9).
   c. Disconnect TGS connector (8).
   d. Disconnect LHCM connector (7).
   e. Disconnect ground connector (6).
2. See Figure 3-69.**Fork-Mounted Faring:**
   a. Remove brake line and clutch line P-clamp screw (4).
   b. Remove ground screw (6).
3. *NOTE*
Leave hand controls and switches installed on handlebar.

   If necessary, separate handlebar from upper fork bracket.
   a. Separate handlebar from handlebar risers. See CHASSIS > HANDLEBAR (Page 3-119).
   b. Carefully lay on protected fuel tank.
4. See Figure 3-68 or Figure 3-69. Remove upper fork bracket.
   a. Loosen pinch screw (5).
   b. Loosen pinch screws (1).
   c. Remove stem screw (2).
   d. Remove washer (3).
   e. Lift off upper fork bracket and handlebar as an assembly if not removed in a previous step.
   f. Carefully lay assembly on protected fuel tank.
5. If necessary, disassemble upper fork bracket.
   a. Remove handlebar risers and handlebar. See CHASSIS > HANDLEBAR (Page 3-119).
   b. Remove fork lock. See ELECTRICAL > FORK LOCK (Page 8-29).

Lower Fork Bracket

1. Remove front forks. See CHASSIS > FRONT FORK (Page 3-62).
2. Release brake lines front caliper brake line bracket. See BRAKE LINES > BRAKE LINE: FRONT CALIPER TO ABS MODULE (Page 3-43).
3. *NOTE*
Leave hand controls and switches assembled to handlebar.

   See Figure 3-70. Remove upper fork bracket with handlebar attached. Secure assembly with elastic cords on a well-padded fuel tank. See **Upper Fork Bracket** in this section.
4. Remove dust seal (6).
5. Remove upper bearing (7).
6. Remove lower steering stem/fork bracket assembly (13).

Steering Head Bearings

1. See Figure 3-70. Remove dust seals (6,12).
2. *NOTE*
*Removing bearings destroys them. Always install **new** bearings upon assembly.*

   Remove and discard bearings (7,11).

   NOTE
Internal reliefs in steering head allow punch access to the bearing cups.
3. Drive out both bearing cups (8,10). Discard cups.
4. Inspect bores in steering head.
   a. Remove any paint, rust or burrs.

INSTALL

PART NUMBER	TOOL NAME
HD-51727	STEERING HEAD BEARING INSTALLER

FASTENER	TORQUE VALUE	
Fork bracket to fork pinch screw	15–18 ft-lbs	19.7–24.4 N·m
Fork bracket to steer stem pinch screw	15–18 ft-lbs	19.7–24.4 N·m
Fork stem screw, 1st torque	18 ft-lbs	24.4 N·m
Steering stem, final torque: FLHX models	4.4 ft-lbs	5.9 N·m
Steering stem, final torque: FLHXSE models	3.9 ft-lbs	5.3 N·m
Steering stem, final torque: FLTRX models	8.9 ft-lbs	12 N·m
Steering stem, final torque: FLTRXSE, FLTRXSTSE models	8.3 ft-lbs	11.2 N·m

CONSUMABLE	PART NUMBER
SPECIAL PURPOSE GREASE	99857-97A

⚠ WARNING

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

⚠ WARNING

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

Steering Head Bearings

NOTICE

Replace both bearing assemblies even if one assembly appears to be good. Mismatched bearings can lead to excessive wear and premature replacement. (00532c)

1. See Figure 3-71 and Figure 3-70. Install **new** bearing cups (8,10).

   Special Tool: STEERING HEAD BEARING INSTALLER (HD-51727)

2. See Figure 3-70. Assemble steering head.

   a. Install **new** bearing (7).

   b. Install **new** upper dust shield (6).

3. Assemble lower steer stem.

   a. Install **new** bearing (11).

   b. Install **new** lower dust shield (12).

Lower Fork Bracket

1. See Figure 3-70. Grease cups (8,10) and steering head bearings (7,11).

   Consumable: SPECIAL PURPOSE GREASE (99857-97A)

2. Install lower fork bracket assembly (13) into steering head (9).

3. Install upper bearing (7) and dust shield (6).

4. Install upper fork bracket (1).

   a. Hold lower fork bracket assembly up against steering head.

   b. Install upper fork bracket (1) or handlebar assembly if handlebars were not removed from bracket.

   c. Install washer (3).

   d. Install fork stem screw (4). Hand tighten.

   e. Verify lower fork bearing (11) is seated in lower bearing cup (10).

5. Install front forks and set fork height. See CHASSIS > FRONT FORK (Page 3-62).

6. Tighten fork stem screw to specification.

   a. Lower motorcycle until forks begin to compress.

   b. Tighten fork stem screw.

      Torque: 18 ft-lbs (24.4 N·m) *Fork stem screw, 1st torque*

   c. Loosen fork stem screw 180 degrees.

   d. Tighten fork stem to specification. Refer to Table 3-9.

   e. Measure swing back. See MAINTENANCE > ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-30).

Table 3-9. Steering Stem Torque Specification

MODEL	TORQUE
FLHX	4.4 ft-lbs (5.9 N·m)
FLTRX	8.9 ft-lbs (12 N·m)
FLHXSE	3.9 ft-lbs (5.3 N·m)
FLTRXSE, FLTRXSTSE	8.3 ft-lbs (11.2 N·m)

Upper Fork Bracket

1. Assemble upper fork stem bracket if disassembled.

   a. Install handlebar and risers. See CHASSIS > HANDLEBAR (Page 3-119).

   b. Install fork lock. See ELECTRICAL > FORK LOCK (Page 8-29).

2. Check front fork height. Use the measurement method. See CHASSIS > FRONT FORK (Page 3-62).

3. Verify upper bearing and dust shield are in place and seated.

4. See Figure 3-70. Install upper fork bracket.

   a. Place upper fork bracket (1) with handlebar onto fork stem (13).

   b. Tap upper fork bracket onto upper steering stem with plastic deadblow hammer if necessary.

   c. Hold upper fork bracket down tight against upper dust shield (6).

   d. Install washer (3) and fork stem screw (4).

   e. Lower motorcycle until forks begin to compress.

   f. Tighten fork stem screw.

      Torque: 18 ft-lbs (24.4 N·m) *Fork stem screw, 1st torque*

   g. Loosen fork stem screw 180 degrees.

   h. Tighten fork stem to specification. Refer to Table 3-9.

   i. Verify upper fork bracket is evenly positioned on both forks.

   j. Tighten pinch screw (5).

      Torque: 15–18 ft-lbs (19.7–24.4 N·m) *Fork bracket to steer stem pinch screw*

   k. Tighten upper fork pinch screws (1).

      Torque: 15–18 ft-lbs (19.7–24.4 N·m) *Fork bracket to fork pinch screw*

5. Install handlebar. See CHASSIS > HANDLEBAR (Page 3-119).

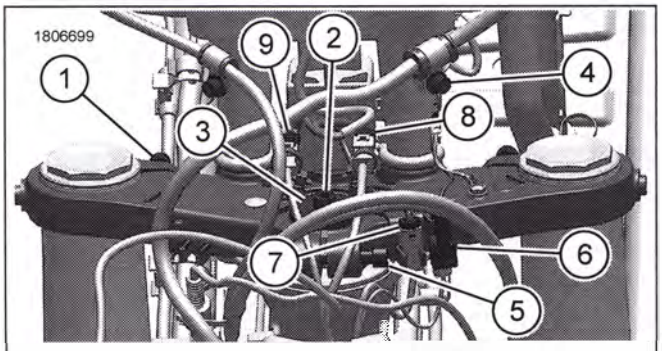
6. **Frame-Mounted Fairing:** Connect connectors.

   a. Connect ground connector (6).

   b. Connect LHCM connector (7).

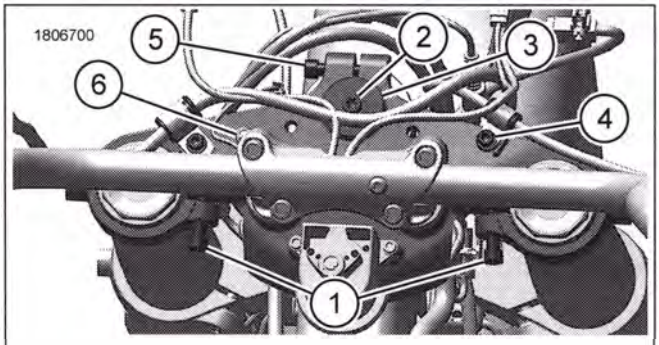
   c. Connect TGS connector (8).

   d. Connect RHCM connector (9).



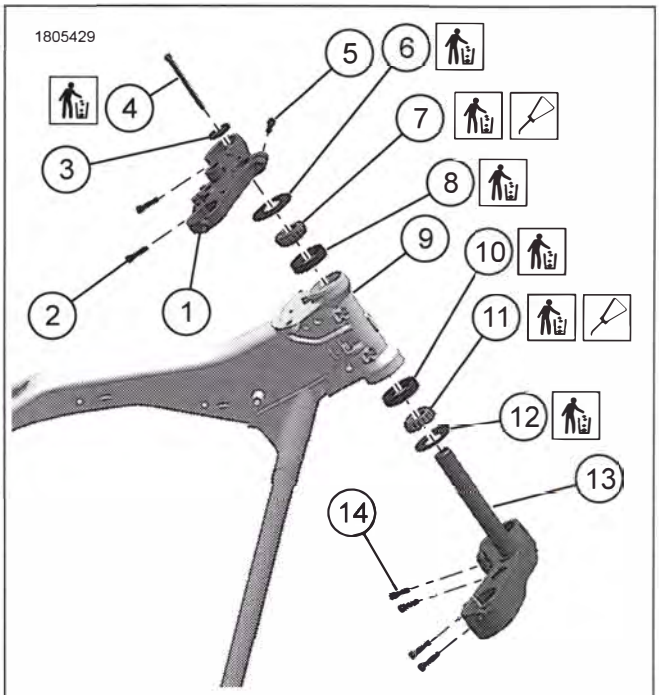
1. **Triple clamp fork pinch screw (2)**
2. **Fork stem screw**
3. **Stem washer**
4. **Screw (2)**
5. **Fork stem pinch screw**
6. **Ground connector**
7. **LHCM connector**
8. **Twist grip sensor connector**
9. **RHCM connector**

Figure 3-68. Frame- Mounted Fairing Upper Triple Clamp



1. **Triple clamp fork pinch screw (2)**
2. **Fork stem screw**
3. **Stem washer**
4. **P-clamp screw (2)**
5. **Fork stem pinch screw**
6. **Ground screw**

Figure 3-69. Fork- Mounted Fairing Upper Triple Clamp



1. **Upper fork stem bracket**
2. **Pinch screw, upper fork bracket (2)**
3. **Washer**
4. **Fork stem screw**
5. **Pinch screw, upper fork stem (2)**
6. **Dust seal**
7. **Steering head bearing**
8. **Bearing cup**
9. **Steering head**
10. **Bearing cup**
11. **Steering head bearing**
12. **Dust seal**
13. **Fork stem and lower fork bracket assembly**
14. **Pinch screw, lower fork bracket (4)**

Figure 3-70. Fork Stem and Brackets

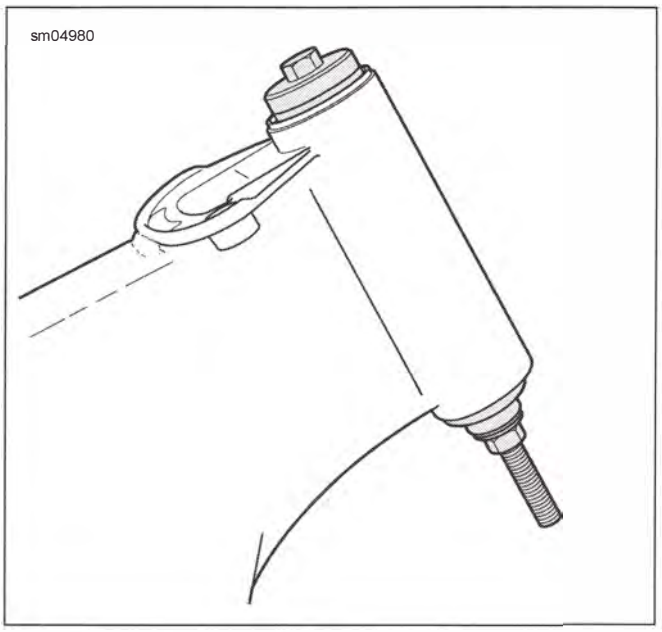


Figure 3-71. Install Steering Head Bearing Cups

COMPLETE

1. Frame mounted fairing:
   a. Install nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
   b. Measure swing-back. See MAINTENANCE > ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-30).
2. Fork mounted fairing:
   a. Install media tray. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. Install Inner and outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
3. Measure swing-back. See MAINTENANCE > ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-30).

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove belt guard. See CHASSIS > BELT GUARDS (Page 3-76).
5. Remove rear brake caliper and secure. See CHASSIS > REAR BRAKE CALIPER (Page 3-37).
6. Remove rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).

REMOVE

1. See Figure 3-72. Remove fork bracket.
   a. Remove screws (12).
   b. Remove fork bracket (11).
2. Remove cables from rear fork.
   a. Remove WSS cable (4) from clip.
   b. Remove brake cable (not shown) from clip.
3. Remove plug (1) from right side.
4. Remove pivot shaft.

NOTE

- *For best results, use an air impact wrench to remove right side screw. Applying heat to right side screw also improves removal.*
- *A 6-point socket is recommended to remove pivot shaft screws.*

   a. Secure left side hex cup (9) and remove right side screw (2).
   b. Remove right hex cup (3).
   c. Remove screw (10), left hex cup (9), rubber mount (8) and outer spacer (7) from left side as an assembly.
5. Remove lower shock absorber screws (13).
6. See Figure 3-73. Work rear fork (4) free of transmission mount (1) and rubber mount (2).
7. Remove right outer spacer (3).

INSTALL

FASTENER	TORQUE VALUE	
Rear fork bracket screws	55–65 ft-lbs	75–88 N·m
Rear fork, bracket, pivot shaft screws	55–65 ft-lbs	75–88 N·m
Rear shock mounting screws	63–70 ft-lbs	85–95 N·m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

1. See Figure 3-74. Install right side rubber mount.
   a. Align slot (3) with tab (2).
   b. Install right side rubber mount (4) fully into right side frame (1).
2. Install fork.
   a. See Figure 3-73. Install right side outer spacer (3) in right side fork tube.
   b. Move fork (4) into position.
   c. Work rear fork between transmission mount (1) and right rubber mount (2).
   d. See Figure 3-72. Install rear shock lower screws (13). Do not tighten.
   e. Apply anti-seize to pivot shaft (6).

ANTI-SEIZE LUBRICANT (98960-97)

NOTE

Avoid getting anti-seize in threads of pivot shaft.

   f. Install pivot shaft (6) from left side through fork and transmission mount.
   g. Guide end of pivot shaft through right rubber mount.
3. Install left side components.
   a. Install outer spacer (7) until seated against shoulder of pivot shaft.
   b. Install left hex cup (9).
   c. See Figure 3-75. Align slot (1) with tab (2).
   d. Install left rubber mount (4) with flat side inboard to fork bracket (3).

e. See Figure 3-72. Apply threadlocker to fork bracket screws (12).

LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

f. Install left side fork bracket (11) aligning index tab into slot of rubber mount.

g. Install screws (12). Tighten.

Torque: 55–65 ft-lbs (75–88 N·m) *Rear fork bracket screws*

4. Install pivot shaft screws.

a. Apply threadlocker to pivot shaft screws (2, 10).

LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

b. Install pivot shaft screws. Tighten.

Torque: 55–65 ft-lbs (75–88 N·m) *Rear fork, bracket, pivot shaft screws*

c. Verify that rear fork assembly moves freely.

d. Install plugs (1).

5. Secure rear shock lower screws.

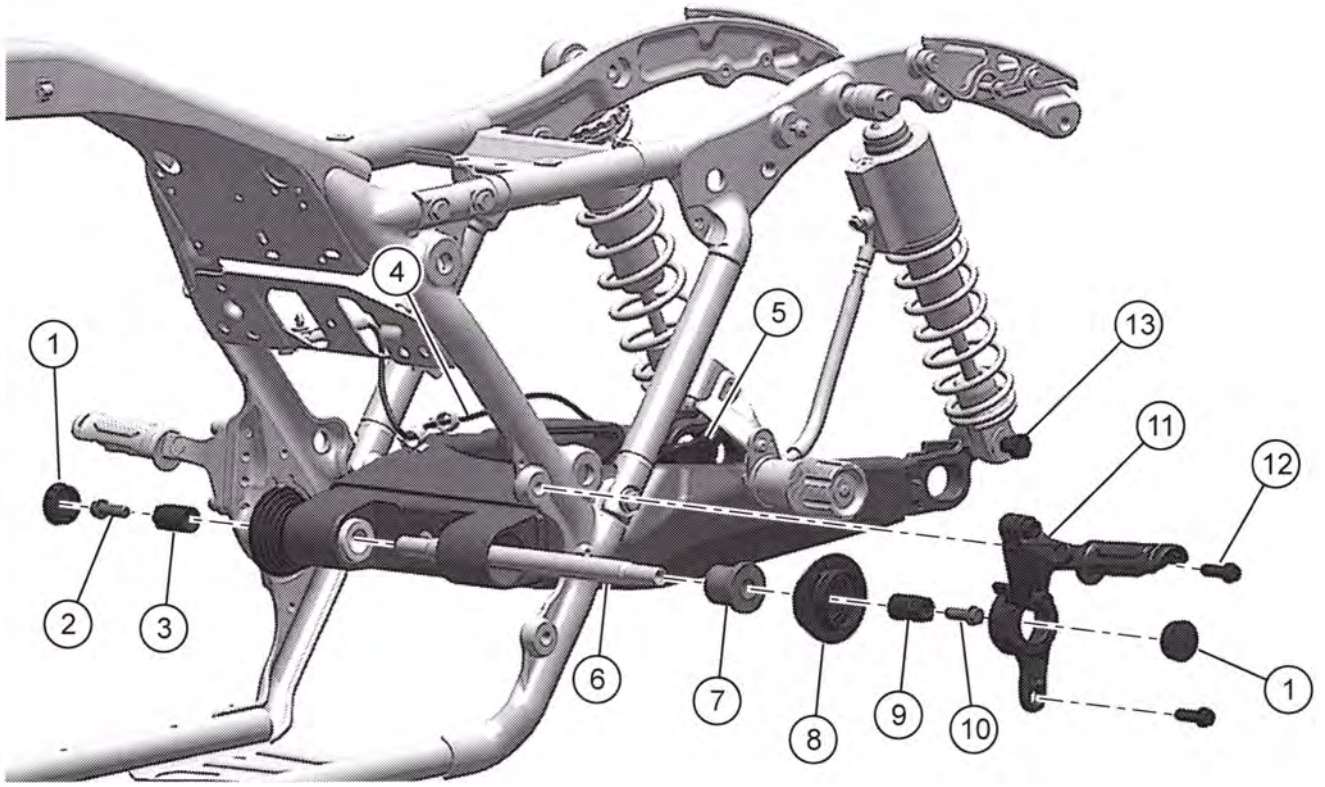
a. Remove rear shock lower screws (13).

b. Apply threadlocker to screws.

LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

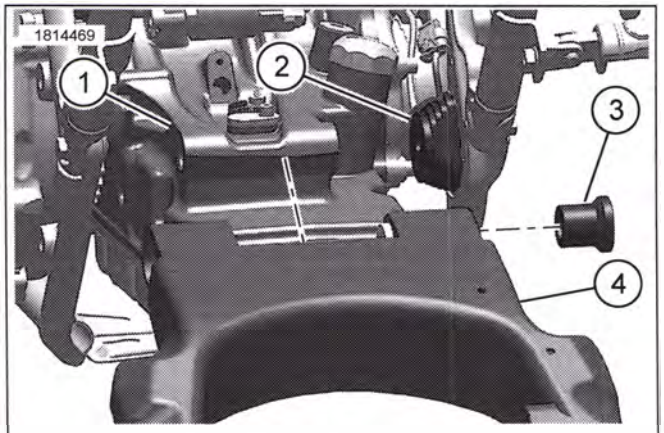
c. Install rear shock lower washers and screws. Tighten.

Torque: 63–70 ft-lbs (85–95 N·m) *Rear shock mounting screws*



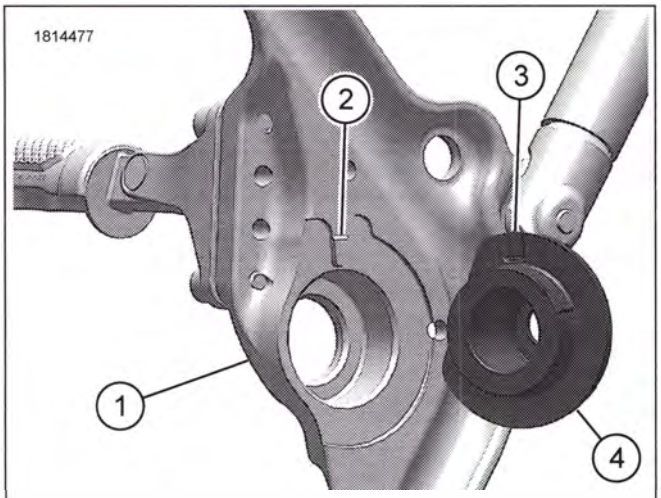
1. **Plug (2)**
2. **Pivot shaft screw**
3. **Right hex cup**
4. **WSS cable**
5. **WSS**
6. **Pivot shaft**
7. **Left outer spacer**
8. **Left rubber mount**
9. **Left hex cup**
10. **Pivot shaft screw**
11. **Fork bracket**
12. **Screw (2)**
13. **Rear shock lower screw (2)**

Figure 3-72. Rear Fork Mounting (typical)



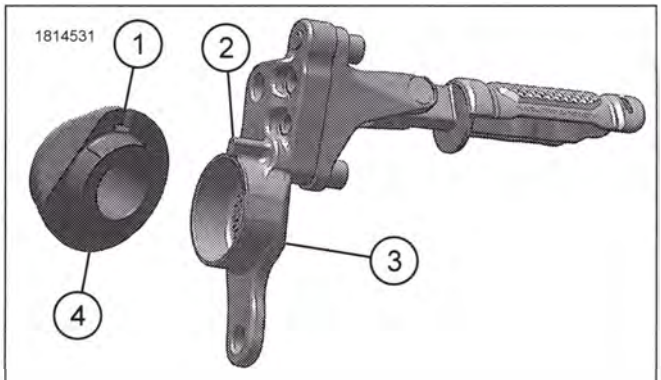
1. **Transmission mount**
2. **Right rubber mount**
3. **Right outer spacer**
4. **Rear fork**

Figure 3-73. Rear Fork to Transmission



1. **Right side frame**
2. **Tab**
3. **Slot**
4. **Right side rubber mount**

Figure 3-74. Right Side Rubber Mount



1. **Slot**
2. **Tab**
3. **Fork bracket**
4. **Left side rubber mount**

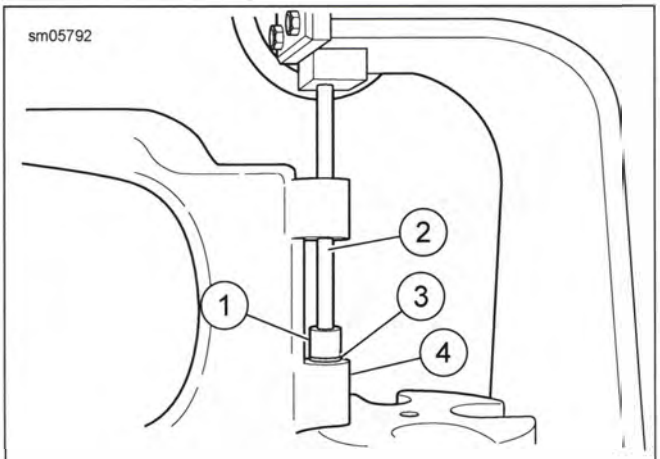
Figure 3-75. Left Side Rubber Mount

DISASSEMBLE

See Figure 3-76. Tools needed

- Driver (1) slightly smaller than bearing spacer collar.
- Rod (2) long enough to allow pressing through upper bearing.

1. Remove fork bearings.
   a. Support fork (4) in a press with brake anchor weldment on top.
   b. Slide rod through brake side bearing against driver.
   c. Verify that assembly is square and bearing bore is vertical.
   d. Press bearing/spacer assembly (3) from rear fork.
   e. Turn over fork. Press out brake side bearing in same manner.
   f. Press spacers out and retain for later use.
   g. Dispose of bearings.



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

Figure 3-76. Remove Rear Fork Bearing

ASSEMBLE

PART NUMBER	TOOL NAME
HD-45327	REAR SWINGARM BEARING INSTALLER

NOTE

Bearings and spacers must be assembled before installation.

1. Assemble rear fork bearings and spacers.
   a. Place **new** bearing on press plate.
   b. See Figure 3-77. With collar topside, start spacer (1) into bearing (2).
   c. Press spacer until it bottoms against press plate.
2. Coat bearing bores in rear fork with grease.
3. Install **new** bearings.

NOTE

Shoulder on press tool should not contact fork tube.

a. Support fork squarely on press bed with brake anchor weldment on top.

b. Insert bearing into fork assembly with spacer down.

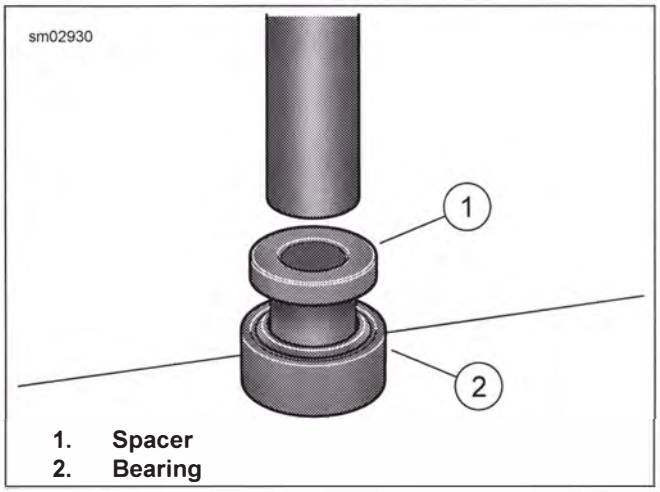
c. Use bearing installer (1) stamped Brake Side. Press bearing until shoulder on tool contacts fork tube (2).

Special Tool: REAR SWINGARM BEARING INSTALLER (HD-45327)

d. Turn rear fork over.

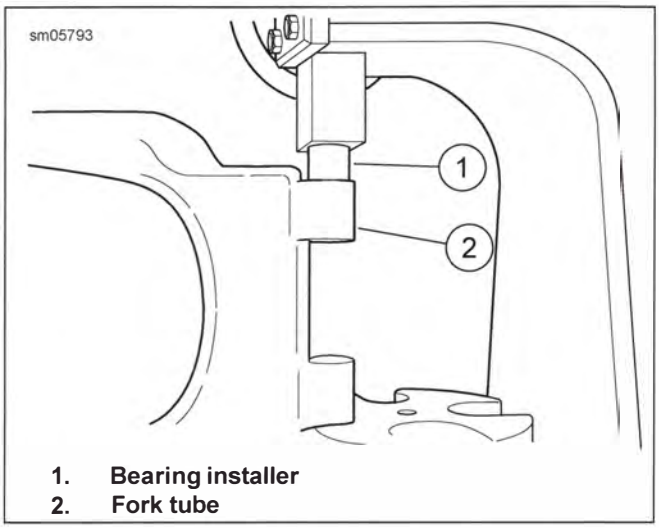
e. Repeat process with remaining bearing using tool stamped **Drive Side**.

f. Press bearing until it bottoms.



1. Spacer
2. Bearing

Figure 3-77. Press Spacer into Bearing



1. Bearing installer
2. Fork tube

Figure 3-78. Install Rear Fork Bearing (typical)

COMPLETE

1. Install rear wheel. See CHASSIS > REAR WHEEL (Page 3-12)

2. Install belt guard. See CHASSIS > BELT GUARDS (Page 3-76).

3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

5. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

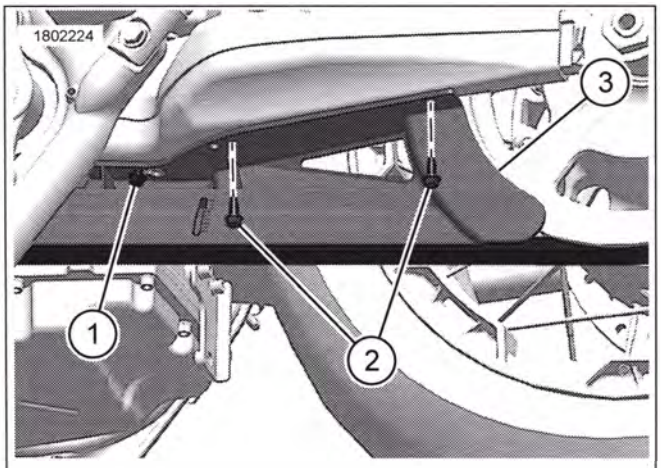
REMOVE

1. See Figure 3-79. Remove debris deflector.
   a. Loosen screw (1).
   b. Remove screws (2).
   c. Slide debris deflector (3) forward.
   d. Remove debris deflector.

INSTALL

FASTENER	TORQUE VALUE	
Debris deflector, screws	62–89 **in-lbs**	7–10 N·m

1. See Figure 3-79. Install debris deflector.
   a. Install debris deflector (3) on front screw (1).
   b. Install screws (2).
   c. Tighten all screws.
      Torque: 62–89 **in-lbs** (7–10 N·m) *Debris deflector, screws*



1. Screw
2. Screw (2)
3. Debris deflector

Figure 3-79. Debris Deflector

COMPLETE

1. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

NOTE

Remove and install one shock absorber at a time.

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Raise rear of motorcycle if necessary. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).

REMOVE

1. See Figure 3-81. Remove shock.
   a. Remove screws (3).
   b. Remove washers (2).
   c. Remove shock (1).

CLEAN AND INSPECT

1. Inspect shock absorber for signs of leakage. Replace both shock absorbers if leak is found.
2. Inspect bushings for cracks and wear. Replace as necessary.

INSTALL

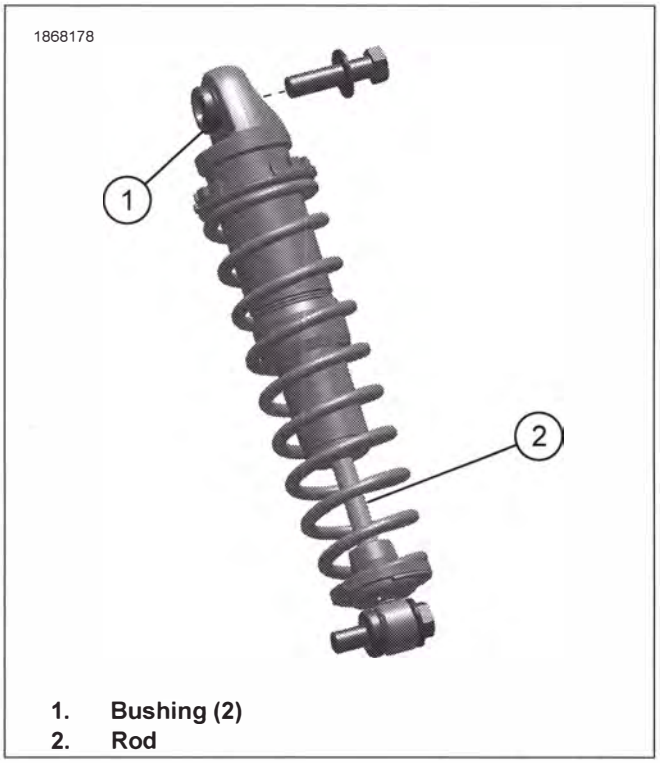
FASTENER	TORQUE VALUE	
Rear shock absorber mounting bolt	63–70 ft-lbs	85–95 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

NOTE

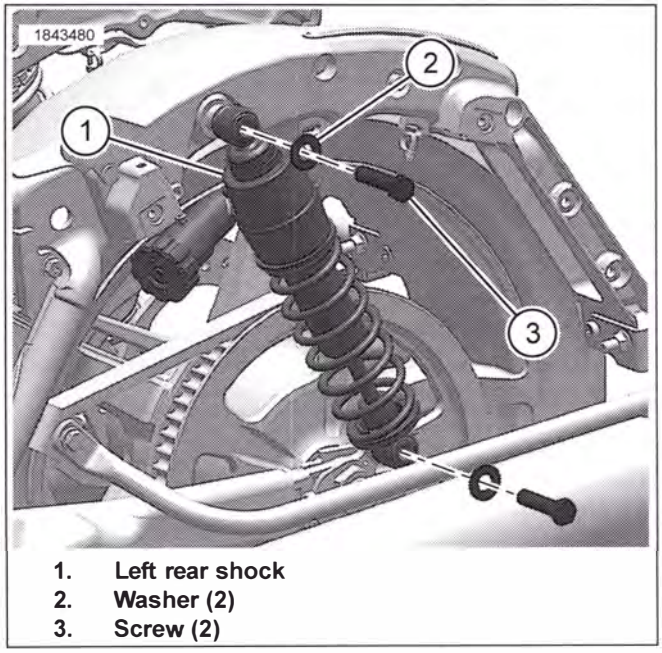
- *See Figure 3-80. Install right shock absorber with the rod (2) end down.*
- *Install right shock absorber with thicker bushing (1) facing frame.*
- *See Figure 3-81. Install left shock absorber (2) with the knob topside and facing forward.*

1. See Figure 3-81. Install shock absorber.
   a. Install washers (3) on screws (2).
   b. Apply threadlocker to screws.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install shock absorber (1) with mounting screws and washers. Tighten.
      Torque: 63–70 ft-lbs (85–95 N·m) *Rear shock absorber mounting bolt*



1. **Bushing (2)**
2. **Rod**

Figure 3-80. Right Rear Shock



1. **Left rear shock**
2. **Washer (2)**
3. **Screw (2)**

Figure 3-81. Left Rear Shock

DISASSEMBLE

Remove Shock Adjuster Knob

1. See Figure 3-82. Remove shock adjuster knob.

   a. Remove screw (3) and washer (2).

   b. Hold a rag wrapped around adjuster housing and knob (1) to prevent loss of detent ball (6) and spring (5). Carefully remove knob.

   c. Remove detent ball and spring.

ASSEMBLE

FASTENER	TORQUE VALUE	
Rear shock, adjuster knob, screw	26–43 **in-lbs**	2.9–4.9 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

Install Shock Adjuster Knob

1. See Figure 3-82. Install shock adjuster knob.

   a. Install spring (5).

   b. Install ball (6) onto end of spring (5).

   c. Compress and hold ball and spring into adjuster housing.

   d. Install knob (1) on adjuster housing.

   e. Apply threadlocker to screw (3).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

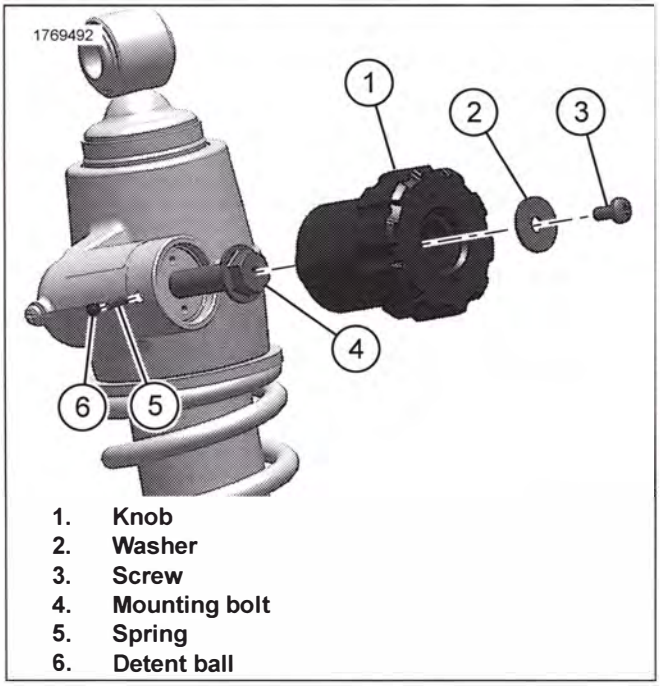
   f. Install washer (2) and screw (3). Tighten

      Torque: 26–43 **in-lbs** (2.9–4.9 N·m) *Rear shock, adjuster knob, screw*

   g. Rotate knob to verify that the detent is properly assembled.

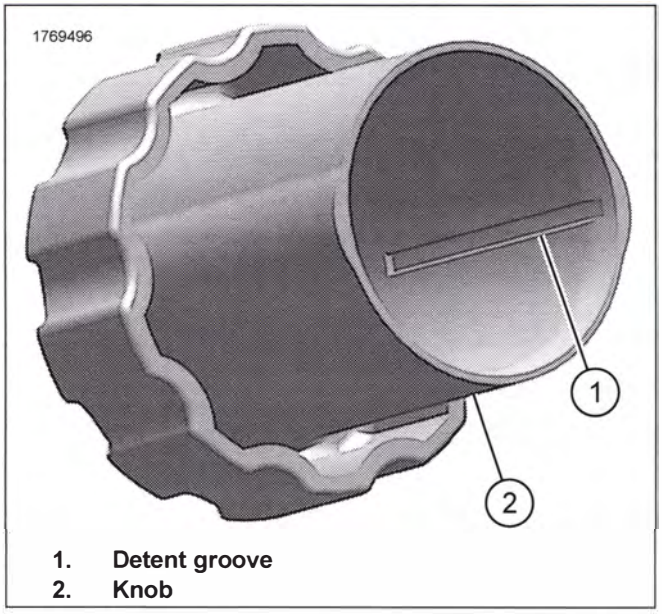
NOTE

Clicks are heard every half rotation when ball engages detent groove.



1. **Knob**
2. **Washer**
3. **Screw**
4. **Mounting bolt**
5. **Spring**
6. **Detent ball**

Figure 3-82. Rear Shock Adjuster



1. **Detent groove**
2. **Knob**

Figure 3-83. Rear Shock Adjuster Knob

COMPLETE

1. Lower rear wheel if raised. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).

2. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove outer fairing if removing upper cable. See
   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

REMOVE

Clutch Cable Disconnect

NOTE

- *The two cable halves should only be taken apart if replacing upper clutch cable or housing. Otherwise disconnect at clutch lever and leave two halves assembled.*
- *Before removing/installing cable from clips, cover must be over adjuster mechanism.*
- *Do not remove coolant reservoir cap.*

1. Access two piece clutch cable.
   a. See Figure 3-84. Remove and secure coolant reservoir (1) from clip (2).
   b. Release left side of clip from left frame down tube.

NOTE

Clip could be damaged if not released from down tube.

   c. See Figure 3-85. Remove clutch cable from clip (1).
   d. Remove middle clip (4).
   e. Remove lower clip (3).
   f. Slide cover (2) up.
2. See Figure 3-86. Identify upper clutch cable (1) and red lock button (2).
3. *NOTE*

Inspect lock button (2). Replace if damaged.

   See Figure 3-87. Unlock upper clutch cable (1).
   a. Push lock button tabs (2) slightly inboard and then down to disengage.
4. Fully collapse cable (spring compressed) and push button in.
5. See Figure 3-88. Lift locking tab (1) from swaged ball end (2).
6. See Figure 3-89. Push swaged ball end (2) out from coupler (1) opposite side and slightly pull clutch lever in until locking tab is at top of window. Remove swaged ball end from coupler.
7. See Figure 3-90. Pry flex fingers (3) open and slide lower clutch cable (2) from housing (1).

Clutch Cable: Lower End

1. Remove clutch cable.
   a. Disconnect clutch cable at release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).
   b. Disconnect clutch cable. See Clutch Cable Disconnect in this section.

Clutch Cable: Upper End

1. Disconnect clutch cable. See Clutch Cable Disconnect in this section.

NOTE

Note location of cable straps.

2. **Frame mounted fairing:**See Figure 3-91. Disconnect clutch cable from steering head.
   a. Remove screw (3).
   b. Remove P-clamp (2).
   c. Remove upper clutch cable (1) from steering head caddy (5).
3. **Fork mounted fairing:**See Figure 3-92. Disconnect clutch cable from steering head.
   a. Remove screw (3).
   b. Remove P-clamp (2).
   c. Remove and discard Cable strap (7).
   d. Lift tab (4).
   e. Remove retainer (5).
   f. Remove upper clutch cable (1) from retainer.
4. See Figure 3-93. Remove clutch cable from clutch lever.
   a. Remove screw (9).

b. Remove clutch switch cover (8).

c. Remove and discard retaining ring (10).

d. Remove pivot pin (4).

e. Remove clutch hand lever.

f. Remove cable anchor from clutch hand lever.

g. Remove clutch cable (3).

Clutch Hand Control

1. Remove clutch hand control assembly.

   a. Remove screws (1) and washers (2).

   b. Remove clutch bracket (5).

CLEAN AND INSPECT

CONSUMABLE	PART NUMBER
HARLEY LUBE	94968-09

NOTICE

The clutch control cable must be oiled and adjusted periodically to compensate for lining wear. Failure to oil and adjust the clutch control cable can result in equipment damage. (00203c)

1. Lubricate clutch cable and hand lever pivot pin hole.

   Consumable: HARLEY LUBE (94968-09)

2. Inspect clutch lever and cable for wear or damage. Replace or repair as necessary.

3. Inspect clutch cable. Replace as necessary.

INSTALL

FASTENER	TORQUE VALUE	
Clutch cable, P-clamp, screw	62–80 **in-lbs**	7–9 N·m
Clutch lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m
Clutch lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m
Clutch switch cover screw	53 **in-lbs**	6 N·m

Clutch Hand Control

1. See Figure 3-93. Install clutch hand control assembly.

   a. Install clutch bracket (5).

   b. Install washers (2) and screws (1). Do not tighten.

   c. Align LHCM gap with alignment mark on handlebar.

   d. Tighten top screw first.

      Torque: 89–97 **in-lbs** (10–11 N·m) *Clutch lever, top, bracket screw*

   e. Tighten bottom screw.

      Torque: 89–97 **in-lbs** (10–11 N·m) *Clutch lever, bottom, bracket screw*

Clutch Cable: Lower End

1. Install clutch cable.

   a. Connect clutch cable at release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).

   b. Connect clutch cable. See Clutch Cable Connect in this section.

Clutch Cable: Upper End

1. See Figure 3-94. Install clutch cable.

   a. Slide barrel (1) and cable (4) between opening (3).

   b. Press up on cable until barrel is seated and cable can be turned to position.

2. See Figure 3-95. Install clutch lever assembly to clutch bracket.

NOTE

Do not damage clutch switch contacts with clutch lever actuator (6).

   a. Slide clutch lever assembly (1) into clutch bracket.

   b. Align pivot bushing with hole on clutch lever bracket.

   c. Verify spring (3) engages the groove (4) on clutch bracket.

   d. Install pivot pin (2).

   e. Install **new** retaining ring (5).

   f. See Figure 3-93. Install clutch switch cover (8).

   g. Install screw (9). Tighten.

      Torque: 53 **in-lbs** (6 N·m) *Clutch switch cover screw*

3. See Figure 3-91.**Frame mounted fairing:**Secure clutch cable to steering head.

   a. Route cable over cable support (6).

   b. Attach to steering head caddy (5) clip.

NOTE

Cable is to be routed in front of brake lines (4).

   c. Install P-clamp (2) and screw (3). Tighten.

      Torque: 62–80 **in-lbs** (7–9 N·m) *Clutch cable, P-clamp, screw*

4. See Figure 3-92.**Fork mounted fairing:** Secure clutch cable to steering head.

NOTE

The order in which lines are arranged is important. Arrange as shown.

a. Install cable (1) in retainer (5).

b. Insert retainer into pocket in caddy (6).

c. Rotate top of retainer in until latched.

d. Install **new** cable strap (7).

e. Align P-clamp (2) with notch on upper fork bracket.

f. Install screw (3). Tighten.

Torque: 62–80 **in-lbs** (7–9 N·m) *Clutch cable, P-clamp, screw*

5. Connect clutch cable. See Clutch Cable Connect in this section.

Clutch Cable Connect

1. See Figure 3-90. Install lower clutch cable (2) into housing (1).

2. See Figure 3-89. Pull clutch cable swaged ball end (2) out slightly from window and manipulate clutch lever to align coupler (1) with swaged ball end, then release.

NOTE

Replace upper clutch cable if locking tab is damaged or missing.

3. See Figure 3-88. Secure locking tab (1) over swaged ball end (2).

4. Ensure clutch hand lever is in full open position and ferrule is correctly seated in clutch lever bracket.

NOTE

See Figure 3-87. Inspect lock button (2). Replace if damaged.

5. Disengage lock button allowing upper clutch cable spring to set free-play at clutch lever.

6. See Figure 3-86. Push in lock button (2).

7. Check clutch operation.

8. See Figure 3-85. Slide cover (2) down.

NOTE

Before removing/installing cable from clips, cover must be over adjuster mechanism.

9. Attach two piece clutch cable to frame.

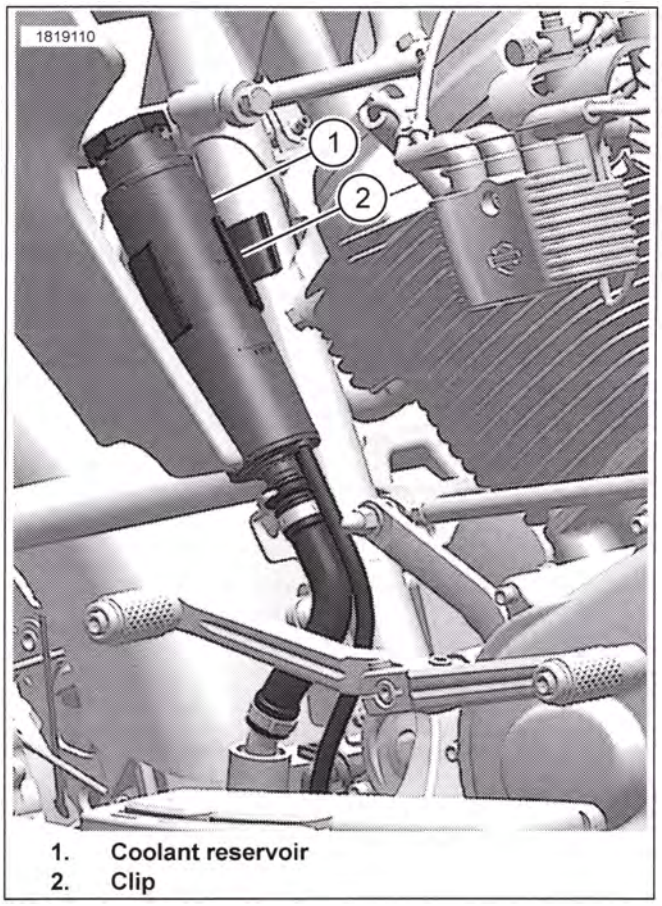
a. Install clutch cable to clip (1).

b. Install left side of clip to frame.

c. Install middle clip (4).

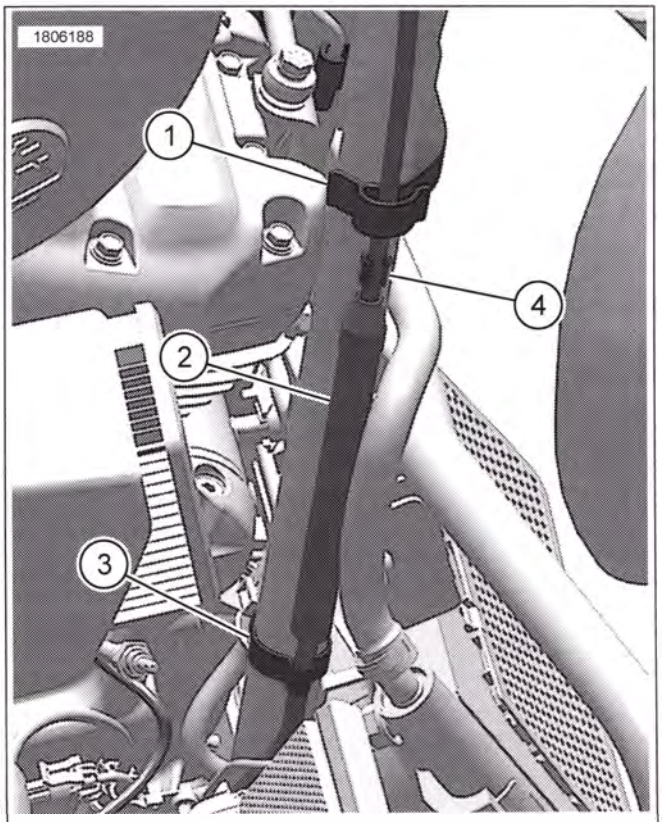
d. Install lower clip (3).

10. See Figure 3-84.. Install coolant reservoir (1) to clip (2).



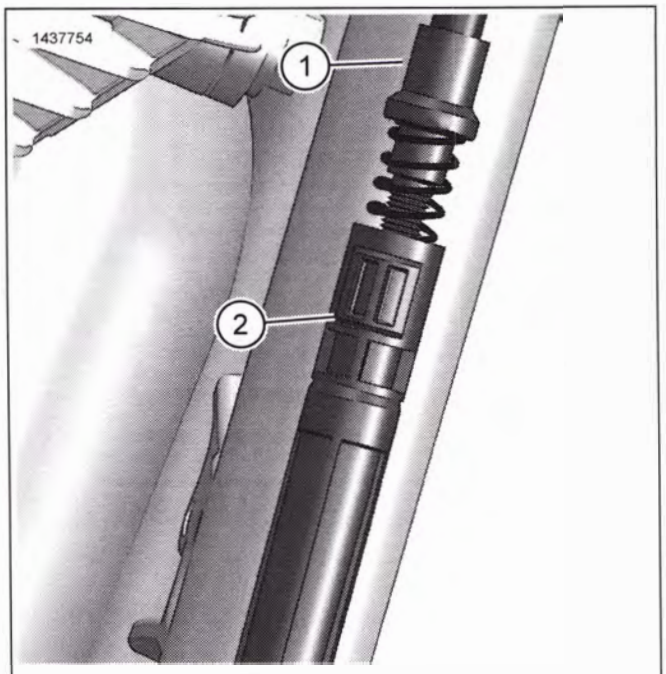
1. Coolant reservoir
2. Clip

Figure 3-84. Coolant Reservoir Clip



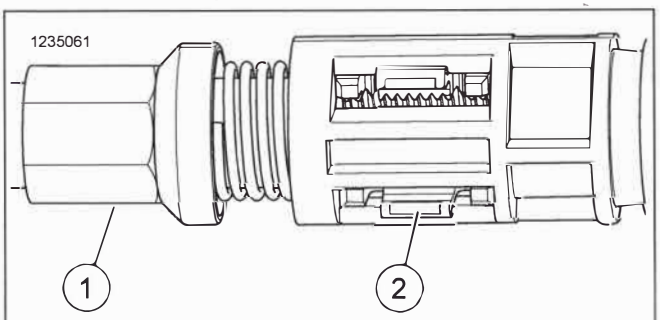
1. Upper clip
2. Cover
3. Lower clip
4. Middle clip

Figure 3-85. Clutch Adjuster Location



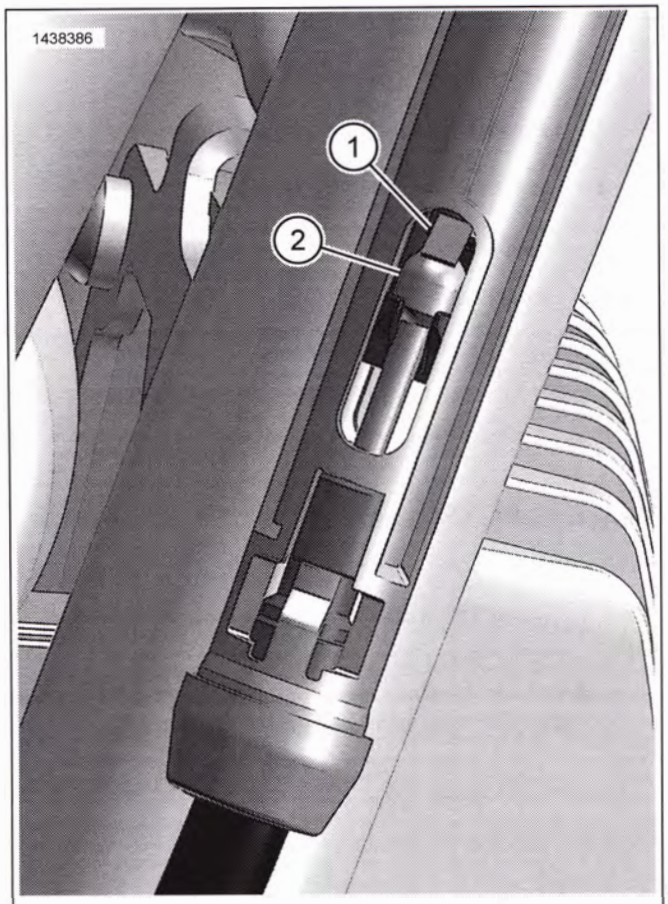
1. Upper clutch cable
2. Lock button

Figure 3-86. Lock Button



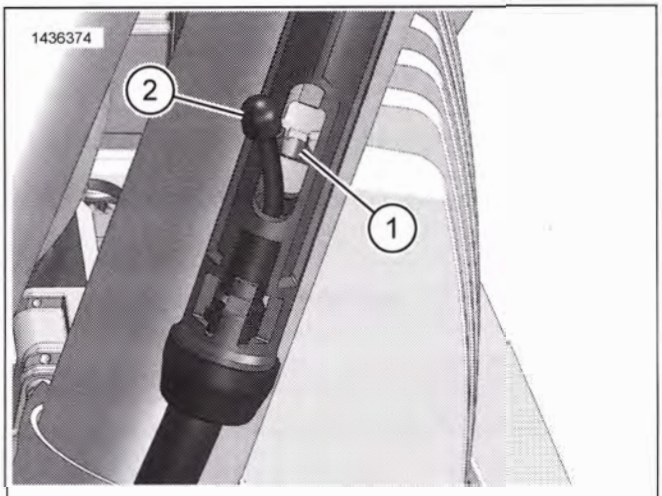
1. Upper clutch cable
2. Lock button

Figure 3-87. Compressed Upper Clutch Cable



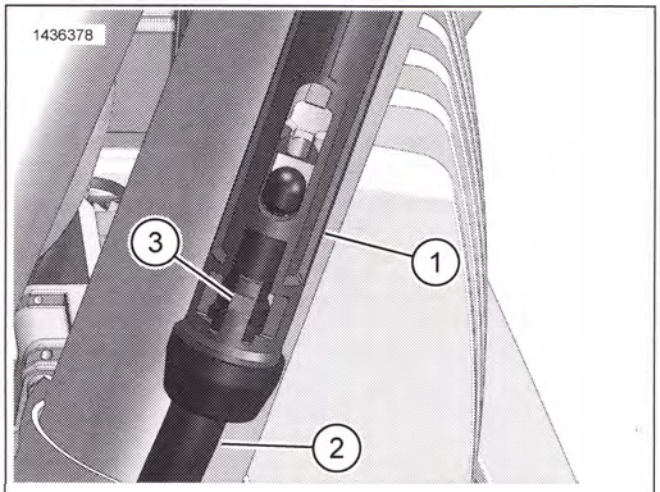
1. Locking tab
2. Swaged ball end

Figure 3-88. Locking Tab



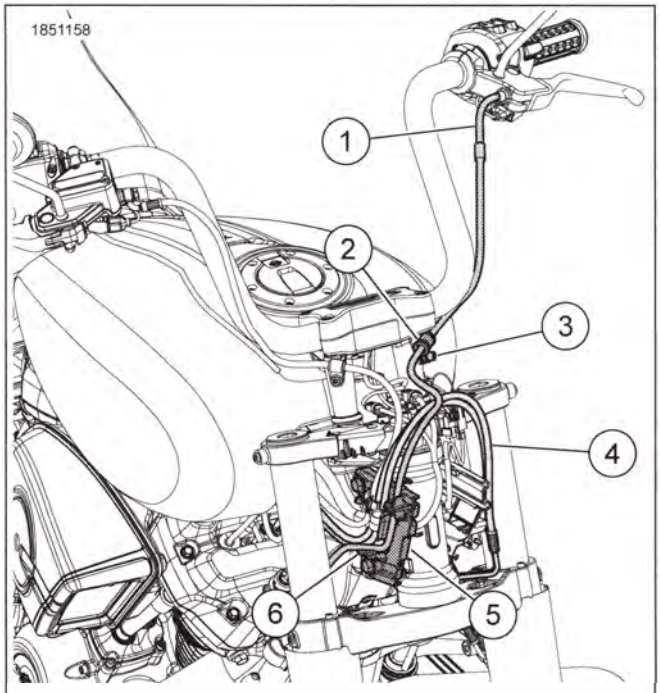
1. Coupler
2. Swaged ball end

Figure 3-89. Coupler Disengagement



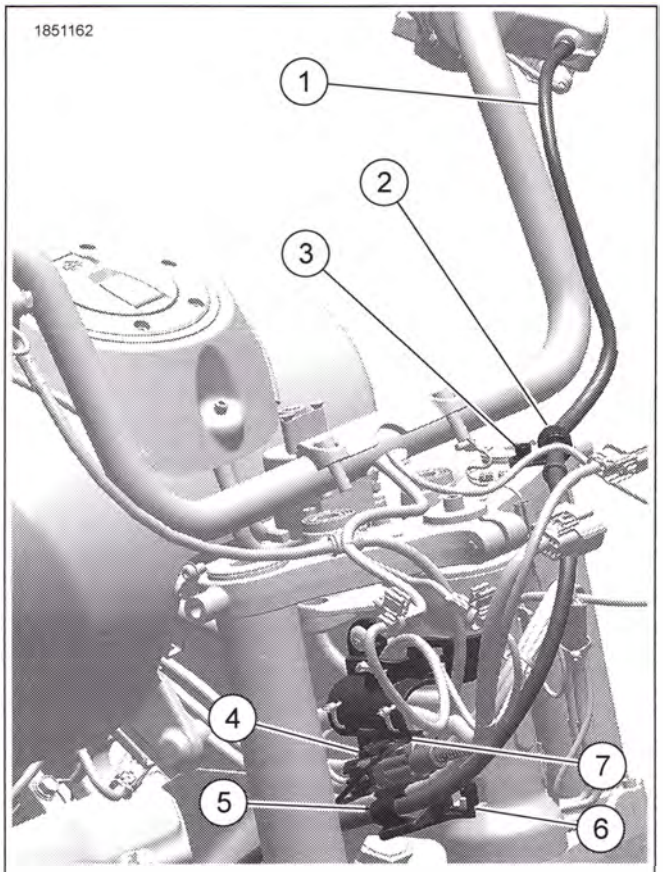
1. Housing
2. Lower clutch cable
3. Flex finger (2)

Figure 3-90. Lower Clutch Cable



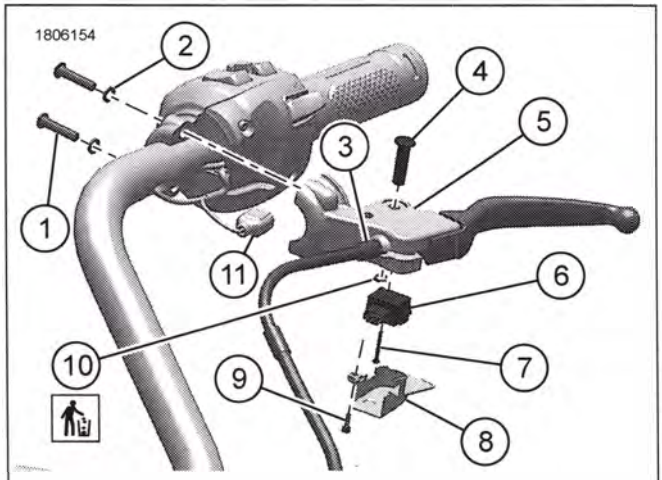
1. Clutch cable
2. P-clamp
3. Screw
4. Brake lines
5. Steering head caddy
6. Cable support

Figure 3-91. Frame-Mounted Fairing Upper Clutch Cable Routing (typical)



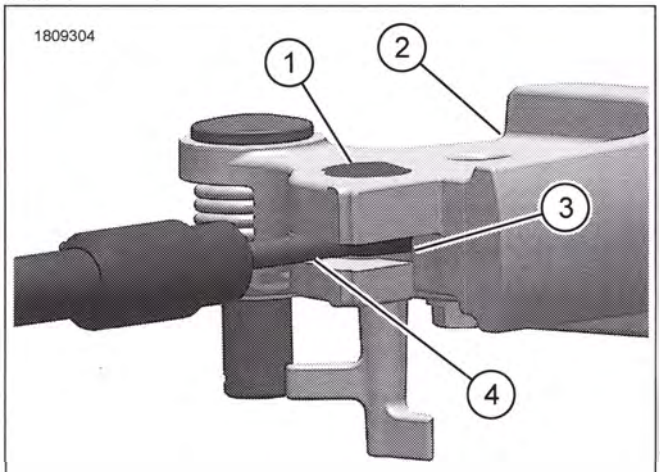
1. Clutch cable
2. P-clamp
3. Screw
4. Tab
5. Retainer
6. Steering head caddy.
7. Cable strap

Figure 3-92. Fork-Mounted Fairing Upper Clutch Cable Routing



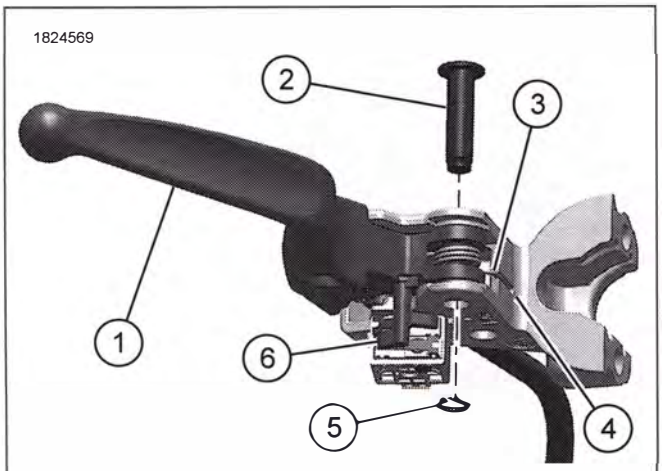
1. Screw (2)
2. Washer (2)
3. Clutch cable
4. Pivot pin
5. Clutch bracket
6. Clutch switch
7. Clutch switch screw
8. Clutch switch cover
9. Screw
10. Retaining ring
11. Clutch switch connector

Figure 3-93. Clutch Lever Mount



1. Barrel
2. Clutch lever
3. Opening
4. Cable

Figure 3-94. Clutch Cable to Lever



1. Clutch lever
2. Pivot pin
3. Spring
4. Groove
5. Retaining ring
6. Clutch lever actuator

Figure 3-95. Clutch Lever Assembly

DISASSEMBLE

Lock Button

NOTE

Before removing/installing cable from clips, cover must be over adjuster mechanism

1. See Figure 3-85. Access two piece clutch cable.

NOTE

*See Figure 3-98. Upper clutch cable (1) spring must be **uncompressed**.*

   a. Remove spring clip (3).

   b. Remove clutch cable from upper clip (1).

   c. Remove small clip above cover.

   d. Slide cover (2) up.

2. Unlock upper clutch cable (1).

   a. Push lock button tabs (2) slightly inboard and then down to disengage.

3. Remove lock button.

Housing

1. Disconnect clutch cable. See Clutch Cable Disconnect in this section.

2. Remove housing (4) from upper housing (3).

Clutch Lever

1. See Figure 3-96. Disassemble clutch lever.

   a. Push out pivot bushing (2).

b. Remove spring (1).

c. Remove screw (5).

d. Remove clutch lever activator switch (3).

ASSEMBLE

Clutch Lever

1. See Figure 3-96. Assemble clutch lever.

   a. Install clutch lever actuator switch (3).

   b. Install screw (5). Tighten.

   c. Install spring (1) in hole in clutch lever (4).

   d. Install pivot bushing (2) flush with bottom of clutch lever.

Housing

1. See Figure 3-97. Align coupler guide (2) with the guide in housing.

2. See Figure 3-98. Install housing (4) to upper housing (3).

3. Connect clutch cable. See Clutch Cable Connect in this section.

Lock Button

NOTE

Upper clutch cable (1) spring must be uncompressed.

1. See Figure 3-98. Install lock button (2).

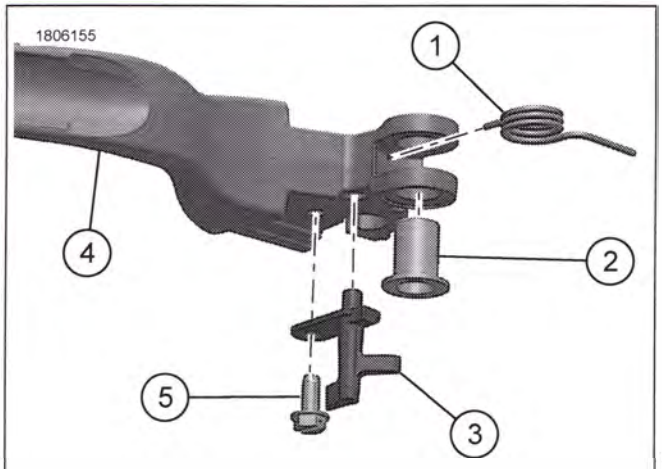
2. See Figure 3-85. Install cover.

   a. Slide cover (2) down.

   b. Install clutch cable in upper clip (1).

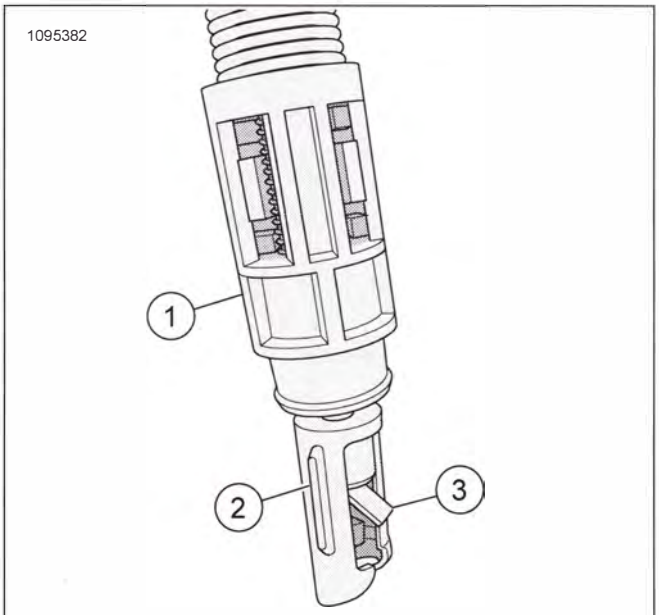
   c. Install small clip above cover.

   d. Install spring clip (3).



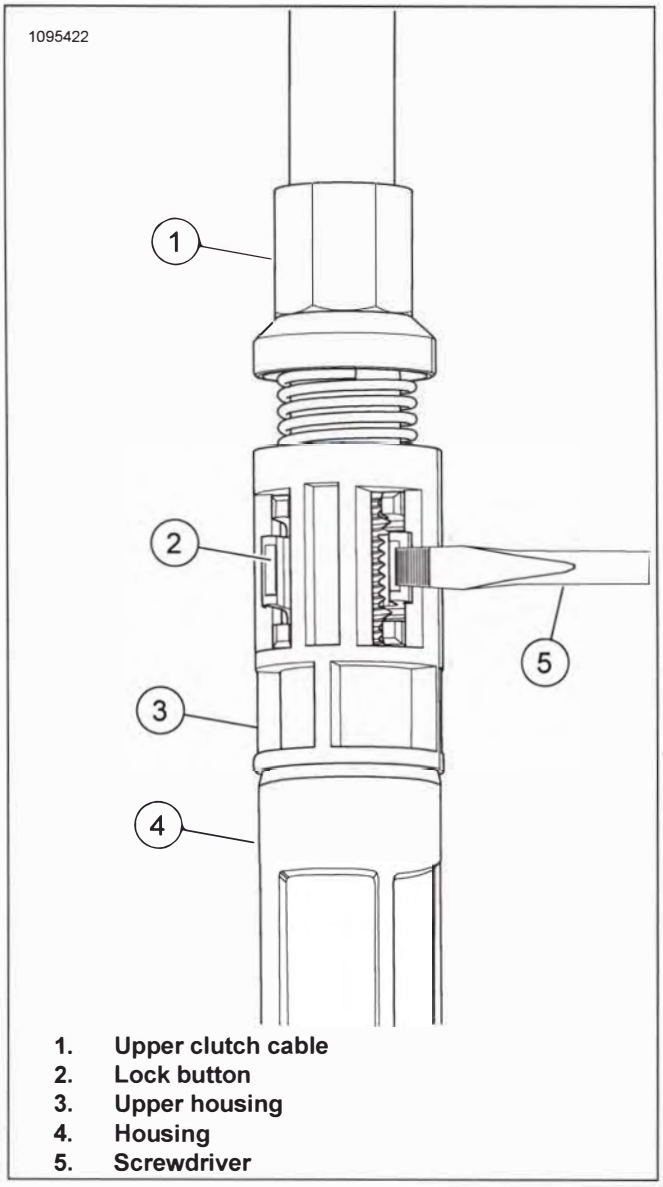
1. **Spring**
2. **Pivot bushing**
3. **Clutch lever actuator switch**
4. **Clutch lever**
5. **Screw**

Figure 3-96. Clutch Lever



1. **Upper housing**
2. **Coupler guide**
3. **Locking tab**

Figure 3-97. Upper Housing



1. **Upper clutch cable**
2. **Lock button**
3. **Upper housing**
4. **Housing**
5. **Screwdriver**

Figure 3-98. Upper Clutch Cable Compressed

COMPLETE

1. Install outer fairing if removing upper cable. See

   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

5. Check and adjust clutch. See MAINTENANCE > CHECK AND ADJUST CLUTCH (Page 2-24).

REMOVE AND INSTALL: WINDSHIELD

FASTENER	TORQUE VALUE	
Windshield screws: Fork-mounted fairing models	13–15 **in-lbs**	1.5–1.7 N·m

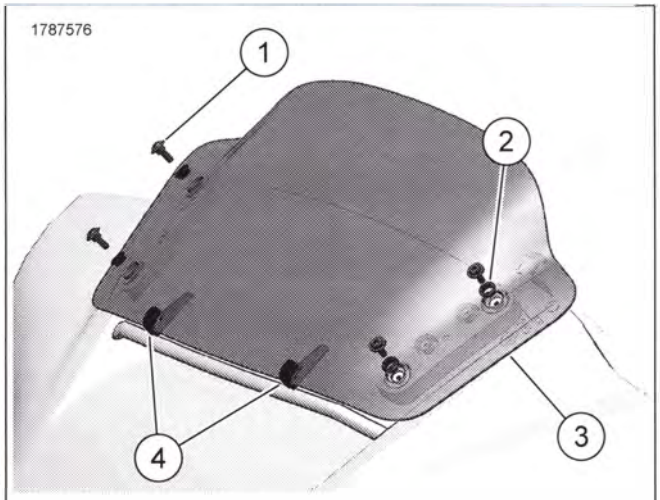
Remove

1. See Figure 3-99. Remove screws and washers (1, 2).
2. Remove windshield (3).

Install

1. See Figure 3-99. Align windshield (3) with windshield mounts (4).
2. Install washers (2) and screws (1). Tighten.

   Torque: 13–15 **in-lbs** (1.5–1.7 N·m) *Windshield screws: Fork-mounted fairing models*



1. **Windshield screws (4)**
2. **Windshield washers (4)**
3. **Windshield**
4. **Windshield mounts (2)**

Figure 3-99. Windshield: Fork Mounted

REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY

Prepare

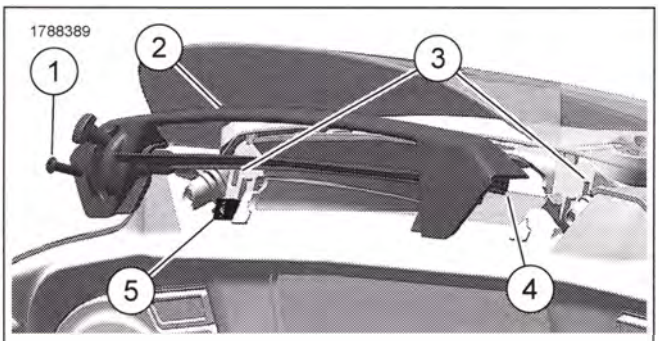
1. Remove windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).
2. Remove air duct cover assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

Remove

1. See Figure 3-100. Remove screw (1).
2. Release latches (4). Remove bezel (2).

Install

1. See Figure 3-100. Verify clips (4) are in place.
2. Verify fairing clip (5) is in place.
3. Align bezel (2) with latches (3), push to install.



1. **Screw**
2. **Air duct bezel assembly**
3. **Latches (2)**
4. **Clips (2)**
5. **Fairing clip**

Figure 3-100. Air Duct Bezel Assembly

Complete

1. Install air duct cover assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).
2. Install windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

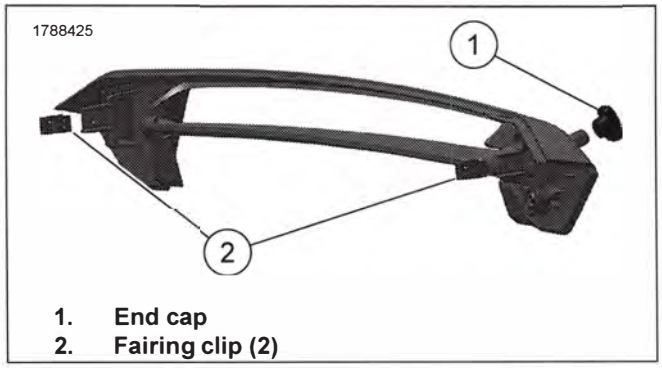
DISASSEMBLE AND ASSEMBLE: AIR DUCT BEZEL ASSEMBLY

Disassemble

1. See Figure 3-101. Remove the end cap (1).
2. If necessary, remove fairing clip (2).

Assemble

1. See Figure 3-101. If necessary, install fairing clip (2).
2. Install end cap (1).



1. **End cap**
2. **Fairing clip (2)**

Figure 3-101. Air Duct Bezel Disassembly

REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY

FASTENER	TORQUE VALUE	
Fairing vent to inner fairing: fork mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m

Prepare

1. Remove windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

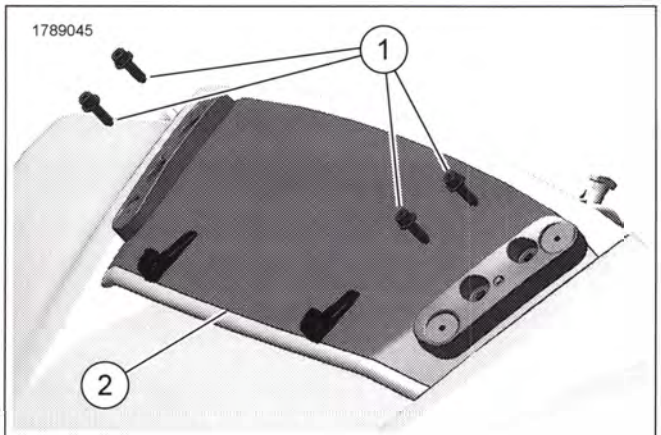
Remove

1. See Figure 3-102. Remove screws (1).
2. Remove air duct cover assembly (2).

Install

1. See Figure 3-102. Install air duct cover assembly (2).
2. Install screws (1). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Fairing vent to inner fairing: fork mounted fairing*



1. **Screws**
2. **Air duct cover assembly**

Figure 3-102. Air Duct Cover Assembly

Complete

1. Install windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

DISASSEMBLE AND ASSEMBLE: AIR DUCT COVER ASSEMBLY

FASTENER	TORQUE VALUE	
Windshield bracket screws	22–32 **in-lbs**	2.5–3.6 N·m

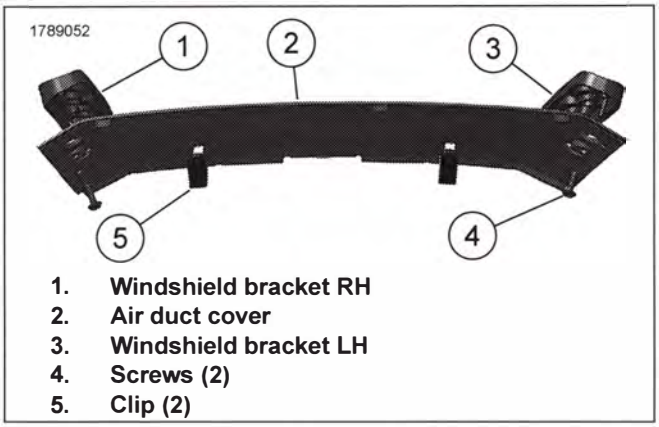
Disassemble

1. See Figure 3-103. Remove screws (4).
2. Remove RH and LH windshield brackets (1, 3).
3. If required, remove windshield mounts (5).

Assemble

1. See Figure 3-103. If required, install windshield mounts (5) on air duct cover (2).
2. Position RH and LH windshield brackets (1, 3).
3. Install screws (4). Tighten.

   Torque: 22–32 **in-lbs** (2.5–3.6 N·m) *Windshield bracket screws*



1. **Windshield bracket RH**
2. **Air duct cover**
3. **Windshield bracket LH**
4. **Screws (2)**
5. **Clip (2)**

Figure 3-103. Air Duct Cover Assembly

REMOVE AND INSTALL: OUTER FAIRING SHELL

FASTENER	TORQUE VALUE	
Fork mounted outer fairing shell screw	25–30 **in-lbs**	2.8–3.4 N·m

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

5. Remove air duct cover assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

6. Remove air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).

Remove

1. See Figure 3-104. Remove four screws (1).

2. Remove two short screws (2).

3. See Figure 3-105. Support outer fairing shell (3) and remove screws (1).

4. Pull the outer fairing forward and separate headlamp connector (2).

5. Remove outer fairing shell.

Install

1. See Figure 3-105. Position outer fairing shell (3).

2. Mate headlamp connector (2). Install outer fairing.

3. Install screws (1).

4. See Figure 3-104. Start two long screws (1).

NOTE

Confirm that correct screws are installed in each location. If wrong screws are used damage may occur to outer fairing.

5. Start two short screws (2). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Fork mounted outer fairing shell screw*

Complete

1. Install air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).

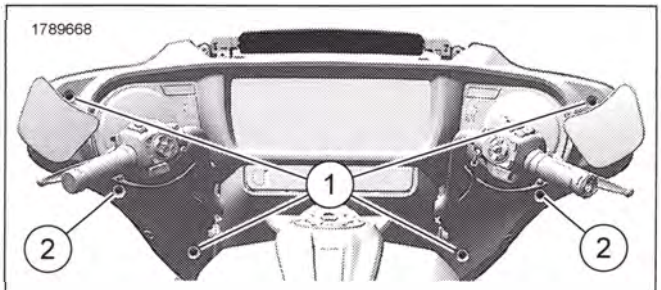
2. Install air duct cover assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

3. Install windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

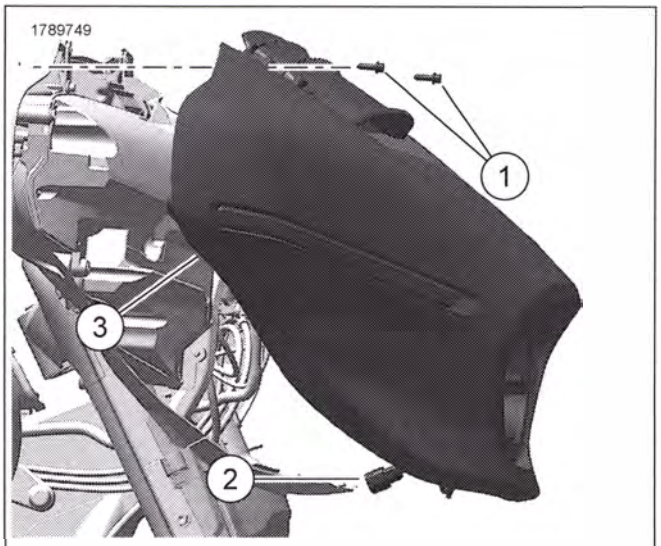
5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

6. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).



1. Fairing outer screws, long (4)
2. Fairing outer screws, short (2)

Figure 3-104. Outer Fairing Screws, Rear



1. Screws (2)
2. Headlamp connector
3. Outer fairing shell

Figure 3-105. Outer Fairing

DISSEMBLE AND ASSEMBLE: OUTER FAIRING SHELL

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Remove outer fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

5. Remove upper air duct. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: UPPER AIR DUCT (Page 3-91).

6. Remove head lamp assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: HEADLAMP ASSEMBLY (Page 3-92).

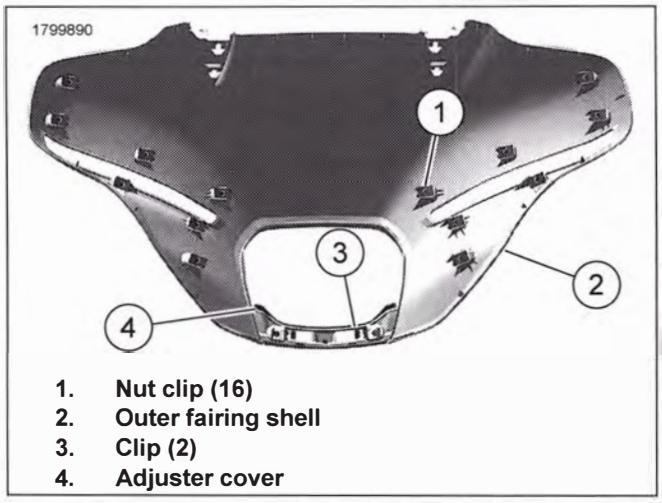
7. Remove front turn signal lamps. See ELECTRICAL > FRONT TURN SIGNAL LAMPS (Page 8-37).

Disassemble

1. See Figure 3-106. Remove nut clips (1).
2. Remove adjuster cover (4) and verify clips (3) were removed from outer fairing shell (2).

Assemble

1. See Figure 3-106. Install adjuster cover (4).
2. Install nut clips (1) on outer fairing shell (2).



1. **Nut clip (16)**
2. **Outer fairing shell**
3. **Clip (2)**
4. **Adjuster cover**

Figure 3-106. Outer Fairing Shell Disassembly

Complete

1. Install front turn signal lamps. See ELECTRICAL > FRONT TURN SIGNAL LAMPS (Page 8-37).
2. Install head lamp assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: HEADLAMP ASSEMBLY (Page 3-92).
3. Install upper air duct. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: UPPER AIR DUCT (Page 3-91).
4. Install outer fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).
5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
7. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE AND INSTALL: MIRRORS

FASTENER	TORQUE VALUE	
Mirror flange nut	29–35 **in-lbs**	3.3–4 N·m

Prepare

1. Remove windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).
2. Remove air duct cover. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).
3. Remove air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).
4. Remove outer fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

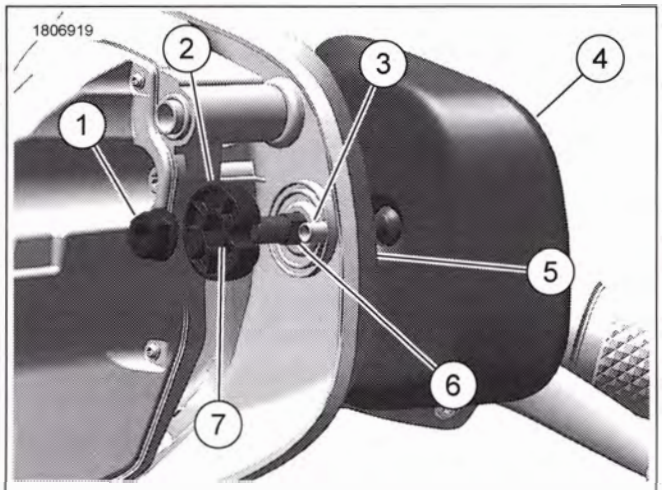
Remove

1. See Figure 3-107. Remove flange nut (1), mirror washer (2) and mirror (4).

Install

1. See Figure 3-107. Position mirror (4) through inner fairing (5).
2. Align mirror washer (2) so the flat (7) lines up with shaft flat (6) install mirror washer.
3. Install flange nut (1). Tighten.

   Torque: 29–35 **in-lbs** (3.3–4 N·m) *Mirror flange nut*



1. **Flange nut**
2. **Mirror washer**
3. **Fairing locator pin**
4. **Mirror**
5. **Inner fairing**
6. **Shaft flat**
7. **Mirror washer flat**

Figure 3-107. Mirror

Complete

1. Install outer fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

2. Install air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).

3. Install air duct cover. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

4. Install windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

REMOVE AND INSTALL: UPPER AIR DUCT

FASTENER	TORQUE VALUE	
Upper air duct screws	23–30 **in-lbs**	2.6–3.4 N·m

Prepare

1. Remove windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

2. Remove air duct cover. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

3. Remove air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).

4. Remove outer fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

Remove

1. See Figure 3-108. Place outer fairing shell on a non scratch surface.

2. From the inside of fairing (1), loosen screws (3).

3. Slide upper air duct (2) forward to remove from slots (5).

Install

1. See Figure 3-108. Verify screws (4) are installed in outer fairing (1).

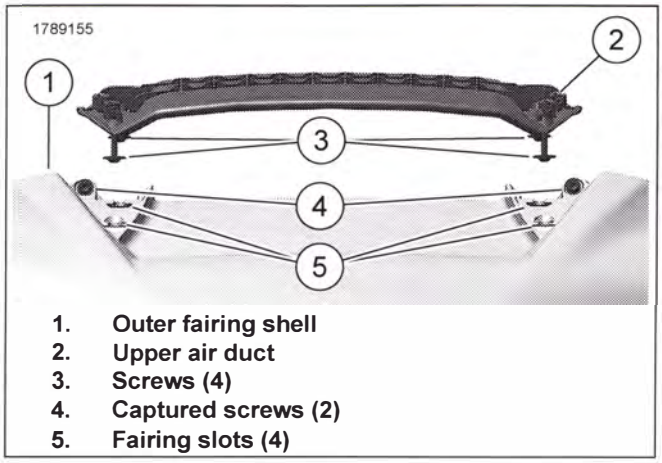
2. Align screws (3) with slots (5), install upper air duct (2).

3. From the inside of fairing (1), tighten screws (3).

   Torque: 23–30 **in-lbs** (2.6–3.4 N·m) *Upper air duct screws*

NOTE

Avoid bending the duct or applying pressure (pushing on) the fairing when tightening.



1. **Outer fairing shell**
2. **Upper air duct**
3. **Screws (4)**
4. **Captured screws (2)**
5. **Fairing slots (4)**

Figure 3-108. Upper Air Duct

Complete

1. Install outer fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

2. Install air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).

3. Install air duct cover. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

4. Install windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY

FASTENER	TORQUE VALUE	
Air deflector screw	13–15 ft-lbs	17.5–20 N·m

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Remove outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

Remove

1. See Figure 3-109. Remove air deflector assembly.

   a. Remove screws (2).

   b. Carefully pry the air deflector (5) away from the fork (4).

c. Remove air deflector assembly.

Install

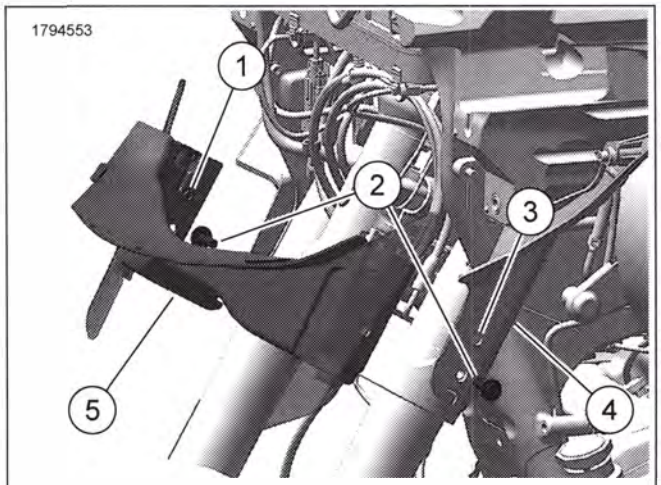
1. See Figure 3-109. Install air deflector assembly.

   a. Align pins (1) on air deflector with holes (3) in front fork (4) and install air deflector (5).

   b. Install deflector screw.

   c. Install two screws (4). Tighten.

      Torque: 13–15 ft-lbs (17.5–20 N·m) *Air deflector screw*



1. **Alignment pin (2)**
2. **Screws (2)**
3. **Alignment hole (2)**
4. **Front fork**
5. **Air deflector assembly**

Figure 3-109. Air Deflector Assembly

Complete

1. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

4. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE AND INSTALL: AIR DEFLECTOR WING

Remove

1. See Figure 3-110. Rotate air deflector wing (1) forward.

2. Pry snap hinge plug (6) downward and out of snap hinge (4).

3. Pry the snap hinge (4) up to remove.

4. Pull down to remove air deflector wing.

5. Remove torque hinge (3).

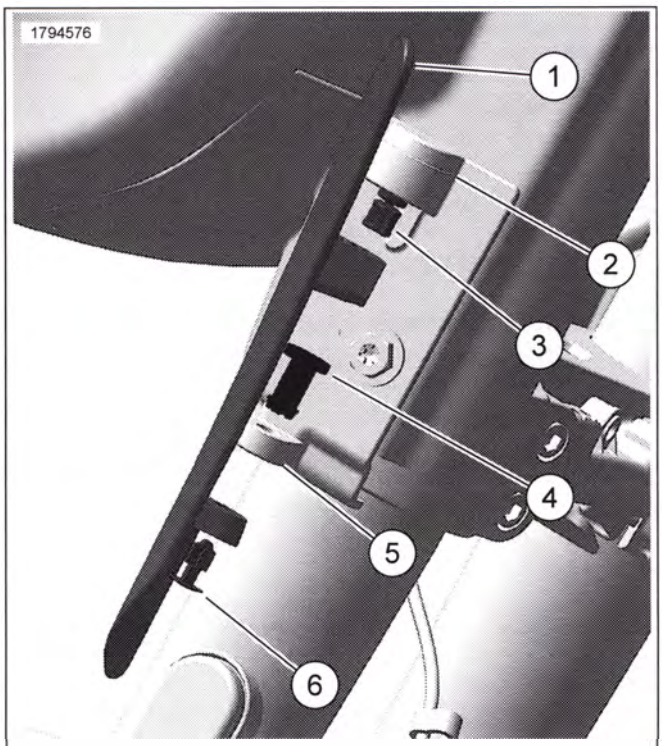
Install

1. See Figure 3-110. Install torque hinge (3).

2. Align torque hinge (3) with air deflector (2). Install air deflector wing (1).

3. Install snap hinge (4) into lower pivot (5).

4. Install snap hinge plug (6).



1. **Air deflector wing**
2. **Air deflector assembly**
3. **Torque hinge**
4. **Snap hinge**
5. **Lower pivot**
6. **Snap hinge plug**

Figure 3-110. Air Deflector Wing

REMOVE AND INSTALL: HEADLAMP ASSEMBLY

FASTENER	TORQUE VALUE	
Fork mounted headlamp screw	96–119 **in-lbs**	10.8–13.5 N·m

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Remove outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

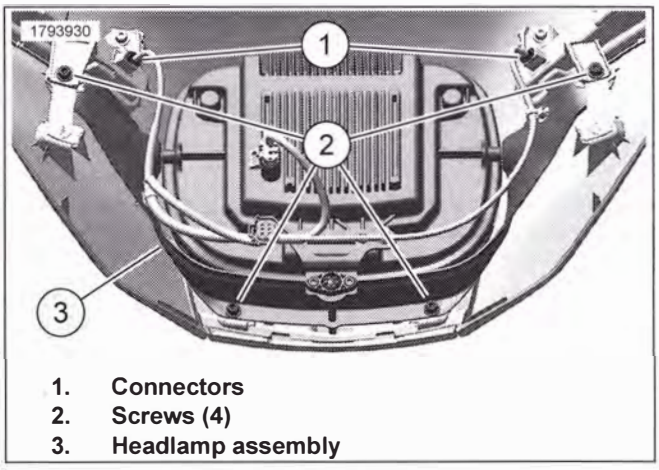
Remove

1. See Figure 3-111. Disconnect electrical connectors (1).
2. Remove screws (2).
3. Remove headlamp assembly (3). If needed, remove headlamp from mount (2). See ELECTRICAL > HEADLAMP (Page 8-32).

Install

1. See Figure 3-111. Install headlamp assembly (3).
2. Install screws (2). Tighten.

   Torque: 96–119 **in-lbs** (10.8–13.5 N·m) *Fork mounted headlamp screw*
3. Connect electrical connectors (1).



1. **Connectors**
2. **Screws (4)**
3. **Headlamp assembly**

Figure 3-111. Headlamp Mount

Complete

1. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE AND INSTALL: DASH PANEL

FASTENER	TORQUE VALUE	
Fork mounted dash panel screw (side)	25–30 **in-lbs**	2.8–3.4 N·m
Fork mounted dash panel screw (top)	10-–20 **in-lbs**	1.1–2.3 N·m

Prepare

1. Remove media compartment tray. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: MEDIA COMPARTMENT (Page 3-97).

Remove

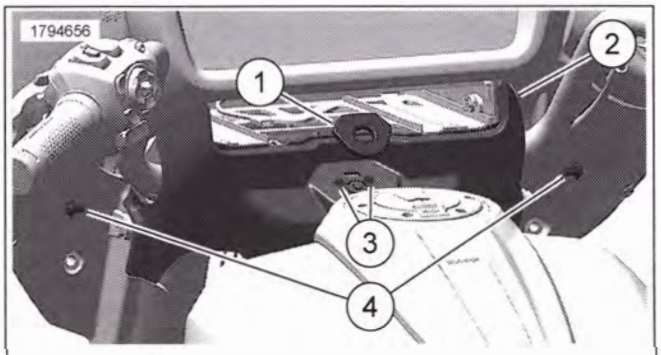
1. See Figure 3-112. Pry up on the ignition trim ring (1) and remove.
2. Remove screws (3).
3. Remove screws (4).
4. Carefully pull rearward to release clips and remove dash panel (2).

Install

1. See Figure 3-112. Verify clips are in place on back side of dash panel (4). Align clips.
2. Install dash panel over ignition lock housing.
3. Install two screws (4) to secure dash panel. Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Fork mounted dash panel screw (side)*
4. Install two screws (3). Tighten.

   Torque: 10-–20 **in-lbs** (1.1–2.3 N·m) *Fork mounted dash panel screw (top)*



1. **Ignition trim ring**
2. **Dash panel**
3. **Screws (2) (top)**
4. **Screws (2) (side)**

Figure 3-112. Dash Panel Screws

Complete

1. Install media compartment tray. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: MEDIA COMPARTMENT (Page 3-97).

DETACH FAIRING FOR SERVICE

FASTENER	TORQUE VALUE	
Fork mounted inner fairing to upper fork screws	155–177 **in-lbs**	17.5–20 N·m

Prepare

1. Remove outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

2. Remove air deflector assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY (Page 3-91).

3. Remove dash panel. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: DASH PANEL (Page 3-93).

Detach

1. See Figure 3-113. Disconnect harness connectors (1).

2. Remove wire ties (2).

3. See Figure 3-114. Remove screws (1).

4. Remove fairing (3). Place fairing on non scratch surface.

Attach

1. See Figure 3-114. Install fairing (3) onto guide pins (2).

2. Install screws (1).

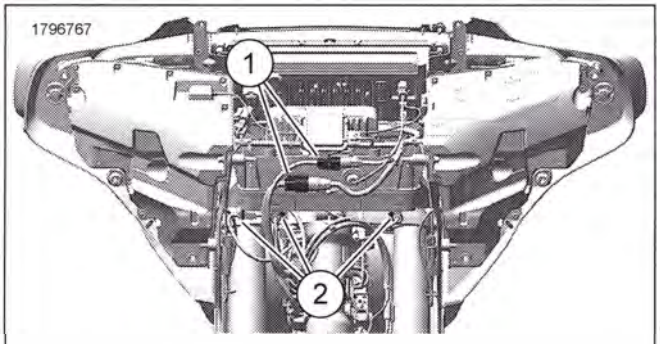
3. See Figure 3-113. Connect connectors (1).

4. Install **new** wire ties (2).

5. See Figure 3-114. Align fairing mounting holes.

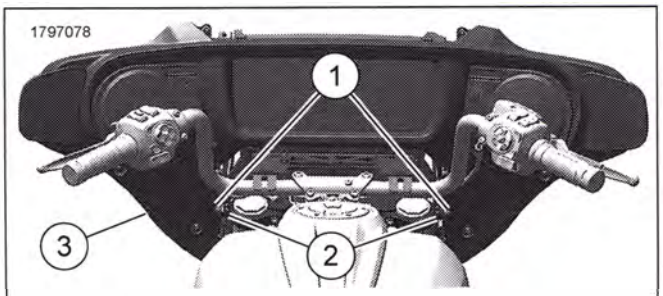
6. Install screws (1). Tighten.

   Torque: 155–177 **in-lbs** (17.5-–20 N·m) *Fork mounted inner fairing to upper fork screws*



1. **Connectors (2)**
2. **Wire ties (3)**

Figure 3-113. Inner Fairing Fasteners



1. **Screws (2)**
2. **Guide pins (2)**
3. **Fairing**

Figure 3-114. Fairing Fasteners

Complete

1. Install dash panel. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: DASH PANEL (Page 3-93).

2. Install air deflector assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY (Page 3-91).

3. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

REMOVE AND INSTALL: INNER FAIRING SHELL

FASTENER	TORQUE VALUE	
Fork mounted inner fairing screws	25–30 **in-lbs**	2.8–3.4 N·m

Prepare

1. Remove mirrors. See CHASSIS > MIRRORS (Page 3-125).

2. Detach fairing for service. See FAIRING: FORK MOUNTED > DETACH FAIRING FOR SERVICE (Page 3-93).

3. Remove speaker covers. See FRONT SPEAKERS > REMOVE AND INSTALL: FORK MOUNTED FAIRING (Page 8-45).

Remove

1. See Figure 3-115. Remove screws (2).

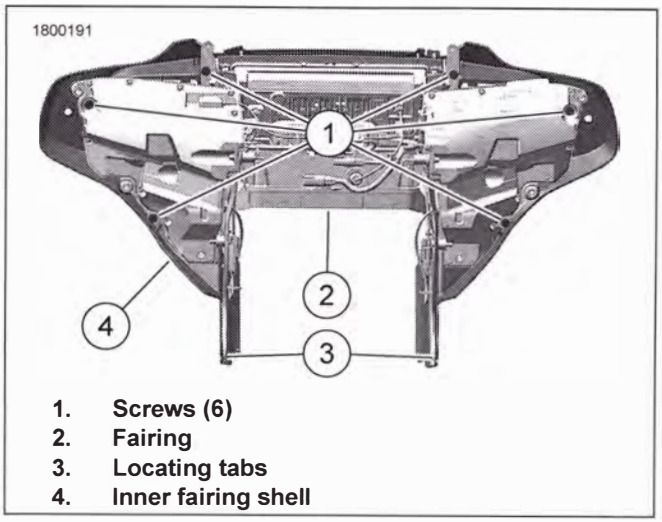
2. Release locator pins (3) and remove fairing (2) from inner fairing shell (4).

Install

1. See Figure 3-115. Position fairing (2) into inner fairing shell (4) and align locating pins (3).

2. Install screws (1). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Fork mounted inner fairing screws*



1. **Screws (6)**
2. **Fairing**
3. **Locating tabs**
4. **Inner fairing shell**

Figure 3-115. Inner Fairing Shell: Fork Mounted Fairing

Complete

1. Attach fairing. See FAIRING: FORK MOUNTED > DETACH FAIRING FOR SERVICE (Page 3-93).

2. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

3. Install speaker covers. See FRONT SPEAKERS > REMOVE AND INSTALL: FORK MOUNTED FAIRING (Page 8-45).

REMOVE AND INSTALL: UPPER SUPPORT BRACKET

Prepare

1. Remove air deflector assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY (Page 3-91).

2. Remove outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

3. Remove inner fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: INNER FAIRING SHELL (Page 3-94).

4. Remove fairing wire harness. See ELECTRICAL > FAIRING WIRE HARNESS (Page 8-91).

5. Remove front speakers. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

6. Remove audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

7. Remove IFCU display. See ELECTRICAL > IFCU DISPLAY (Page 8-27).

8. Remove speaker enclosures. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-98).

Remove

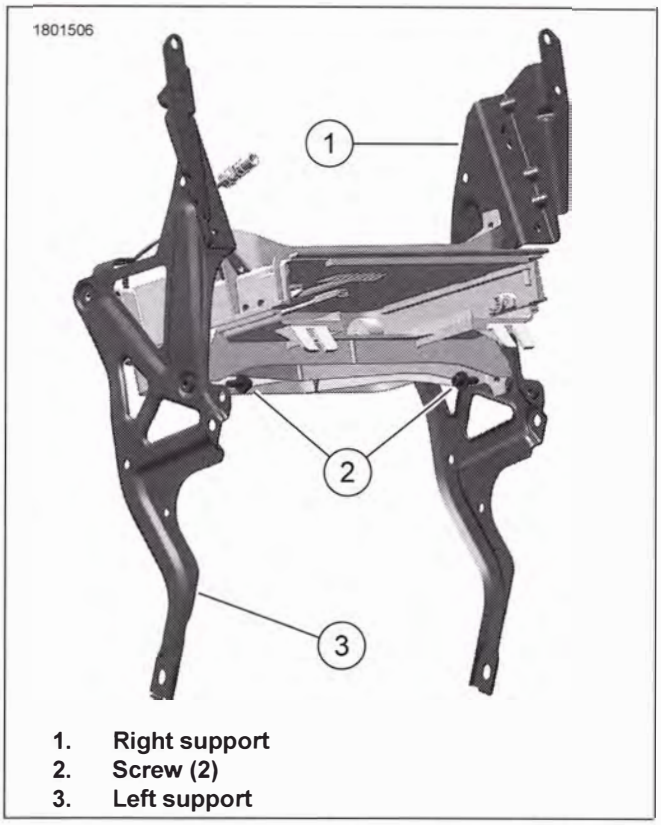
1. See Figure 3-116. Remove required screw (2).

2. Remove required support (1, 3).

Install

1. See Figure 3-116. Place upper support bracket (1, 3) into position.

2. Loosely install screw (2).



1. **Right support**
2. **Screw (2)**
3. **Left support**

Figure 3-116. Upper Support Brackets

Complete

1. Install speaker enclosures. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-98).

2. Install IFCU display. See ELECTRICAL > IFCU DISPLAY (Page 8-27).

3. Install audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

4. Install front speakers. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

5. Install fairing wire harness. See ELECTRICAL > FAIRING WIRE HARNESS (Page 8-91).

6. Install inner fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: INNER FAIRING SHELL (Page 3-94).

7. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

8. Install air deflector assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY (Page 3-91).

REMOVE AND INSTALL: MEDIA TRAY

Remove

1. See Figure 3-117. Release tray latch (3).

2. Compress tabs (1) on both sides to release tray.

3. Gently pull tray (2) straight out.

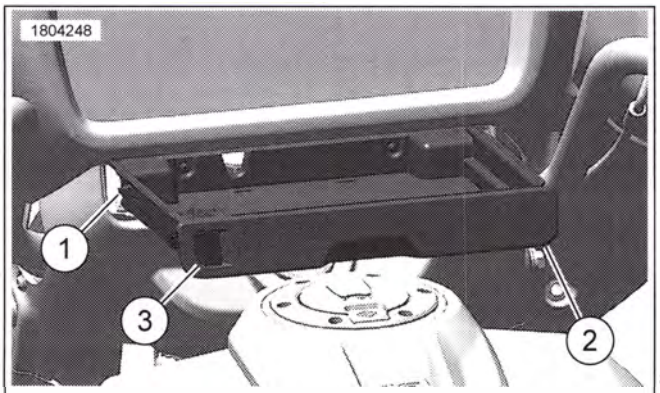
Install

1. See Figure 3-118. Position tray (7) in front of the opening so the pin (3) is behind the foam gasket (1) and the USB cable (2) is routed through the slot (6).

2. Align both sliding tracks (5) with the grooves (4) in the opening.

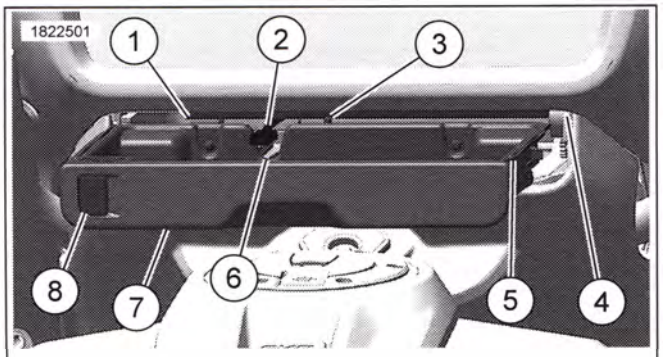
3. Gently insert the tray straight into the opening (angling the tray left or right can cause unwanted contact with the dampers).

4. Push tray in until latched (8).



1. **Tabs (2)**
2. **Media tray**
3. **Latch**

Figure 3-117. Media Tray Removal



1. **Foam seal**
2. **USB cable**
3. **Pin**
4. **Grooves**
5. **Sliding tracks**
6. **Slot**
7. **Tray**
8. **Latch**

Figure 3-118. Media Tray Install

DISASSEMBLE AND ASSEMBLE: MEDIA TRAY

Replace Door

NOTE

This procedure can be performed with media compartment installed. Use care to avoid cosmetic damage.

1. See Figure 3-119. Use a thin putty knife between the media tray and door (2). Carefully pry door off.

2. Align door clips on the bottom of the tray first. Then rotate the door into place, clipping all five clips on the top of the door to the tray.

Replace Latch

1. Open media tray.

2. Remove door.

3. See Figure 3-119. Release upper and lower catches on latch (3).

4. Push latch out of housing.

5. Install new latch (3). Verify that catches are securely hooked.

6. Install door.

7. Close and open tray to verify operation.

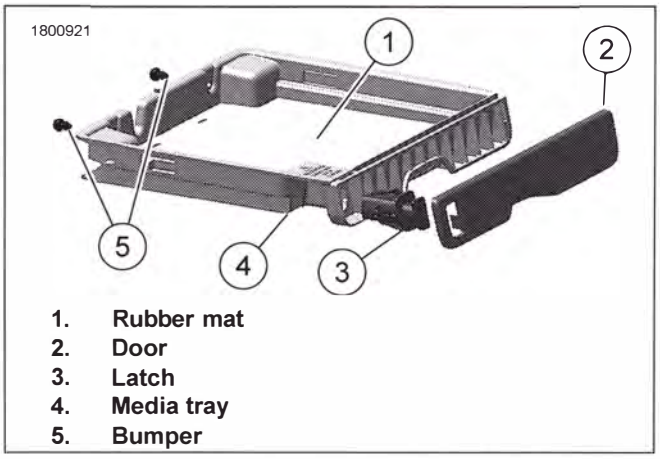
Replace Bumper

1. Remove media tray.

2. See Figure 3-119. Remove bumpers (5).

3. Install bumpers.

4. Install media tray.



1. **Rubber mat**
2. **Door**
3. **Latch**
4. **Media tray**
5. **Bumper**

Figure 3-119. Media Tray

REMOVE AND INSTALL: MEDIA COMPARTMENT

Prepare

1. Remove air deflector assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY (Page 3-91).

2. Remove outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

3. Remove inner fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: INNER FAIRING SHELL (Page 3-94).

4. Remove fairing wire harness. See ELECTRICAL > FAIRING WIRE HARNESS (Page 8-91).

5. Remove audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

6. Remove IFCU display. See ELECTRICAL > IFCU DISPLAY (Page 8-27).

7. Remove speaker enclosures. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-98).

8. Remove upper support bracket. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: UPPER SUPPORT BRACKET (Page 3-95).

9. Remove media compartment.

Complete

1. Install media compartment.

2. Install upper support bracket. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: UPPER SUPPORT BRACKET (Page 3-95).

3. Install speaker enclosures. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-98).

4. Install IFCU display. See ELECTRICAL > IFCU DISPLAY (Page 8-27).

5. Install audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

6. Install fairing wire harness. See ELECTRICAL > FAIRING WIRE HARNESS (Page 8-91).

7. Install inner fairing shell. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: INNER FAIRING SHELL (Page 3-94).

8. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

9. Install air deflector assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DEFLECTOR ASSEMBLY (Page 3-91).

DISASSEMBLE AND ASSEMBLE: MEDIA COMPARTMENT

Replace Cable

1. Remove outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

2. Remove media tray.

3. See Figure 3-121. Separate media cable connector (7) from radio.

4. Remove cable from retaining feature (2).

5. Push cable grommet (1) into media compartment to remove.

6. Route cable through mounting hole from inside compartment.

NOTE

Apply small amount of window cleaner to aid installation.

7. Use pliers to pull grommet (1) into hole until seated. Secure cable to retaining feature (2).

8. Install cable retainer.

9. Connect media cable connector (7) to radio.

10. Install media tray.

11. Install outer fairing. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-88).

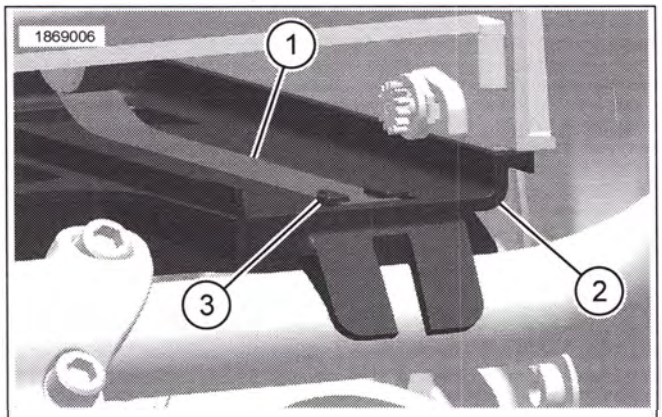
Replace Spring and Spool

1. See Figure 3-120. Remove spring (1) from retaining feature (3).

NOTE

Do note bend "T" feature on end of spring.

2. Install spring (1) "T" feature into retaining feature (3) so coil is above spring and rolls out flat across floor of housing.



1. **Spring and spool**
2. **Media compartment**
3. **Retaining feature**

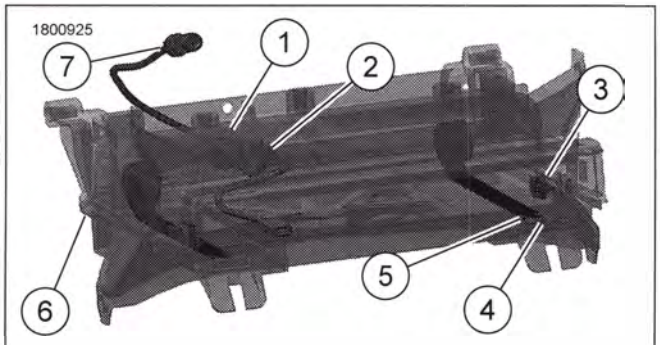
Figure 3-120. Spring and Spool

Replace Damper

1. See Figure 3-122. Remove media tray (4).

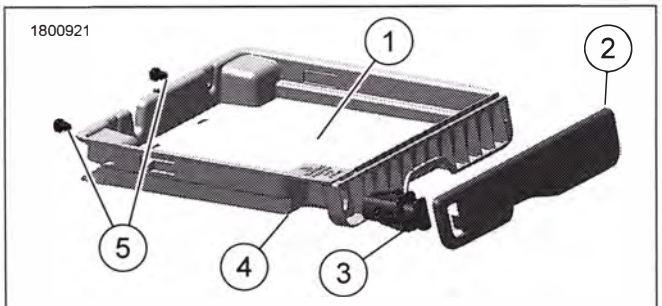
2. See Figure 3-121. Remove damper (3).

3. Align tabs, install damper.



1. **USB-C cable and grommet**
2. **Cable retainers**
3. **Damper**
4. **Retaining feature**
5. **Spring and spool**
6. **Media compartment**
7. **Radio connector**

Figure 3-121. Media Compartment



1. **Rubber mat**
2. **Door**
3. **Latch**
4. **Media tray**
5. **Bumper**

Figure 3-122. Media Tray

REMOVE AND INSTALL: SPEAKER ENCLOSURE

FASTENER	TORQUE VALUE	
Speaker enclosure screws	50–60 **in-lbs**	5.6–6.8 N·m

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Remove windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).

5. Remove air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).

6. Remove air duct cover assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).

7. Remove audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

8. Remove speaker grille. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

9. **Left Side Speaker Enclosure** Remove hidden antenna. See ELECTRICAL > HIDDEN ANTENNA (Page 8-48).

Remove

Right Side Speaker Enclosure

1. See Figure 3-123. Disconnect IFCU connector (2).

2. Disconnect the speaker connector (5) and release connector locator (6).

3. Remove screws (1), remove speaker enclosure (7).

4. If necessary, remove the grommet (3).

5. If necessary, remove front speaker. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

6. Remove wire harness (4).

Left Side Speaker Enclosure

1. See Figure 3-124. Disconnect USB connector (1).

2. Disconnect the speaker connector (5) and release connector locator (4).

3. Remove screws (2), remove speaker enclosure (3).

4. If necessary, remove the grommet (7).

5. If necessary, remove front speaker. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

6. Remove wire harness (6).

Install

Right Side Speaker Enclosure

1. See Figure 3-123. Install wire harness (4).

2. If necessary, install front speaker. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

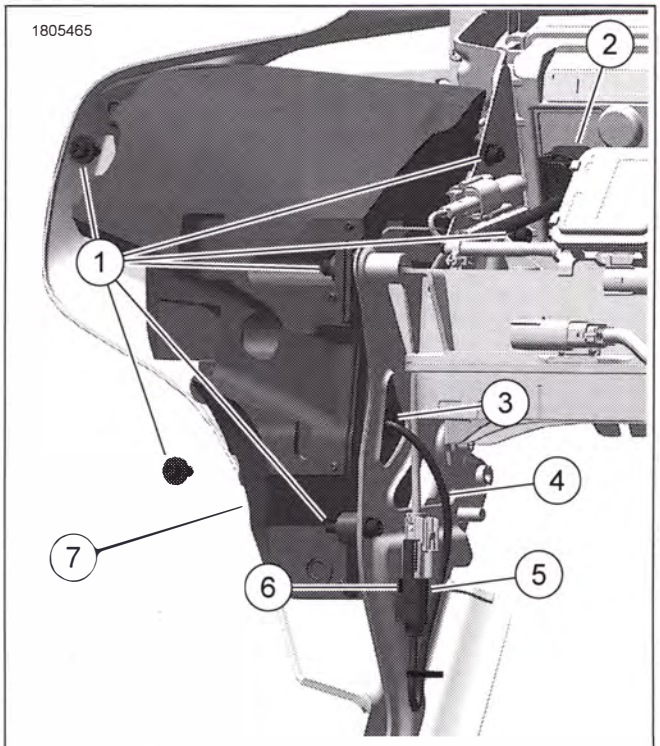
3. If necessary, install the grommet (3).

4. Position speaker enclosure (7), install screws (1). Tighten.

   Torque: 50–60 **in-lbs** (5.6–6.8 N·m) *Speaker enclosure screws*

5. Connect the speaker connector (5) and install connector locator (6).

6. Connect IFCU connector (2).



1. **Screws (6)**
2. **IFCU connector**
3. **Grommet**
4. **Wire harness**
5. **Connector**
6. **Locator**
7. **Speaker enclosure**

Figure 3-123. Right Front Speaker Enclosure

Left Side Speaker Enclosure

1. See Figure 3-124. Install wire harness (6).

2. If necessary, install front speaker. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

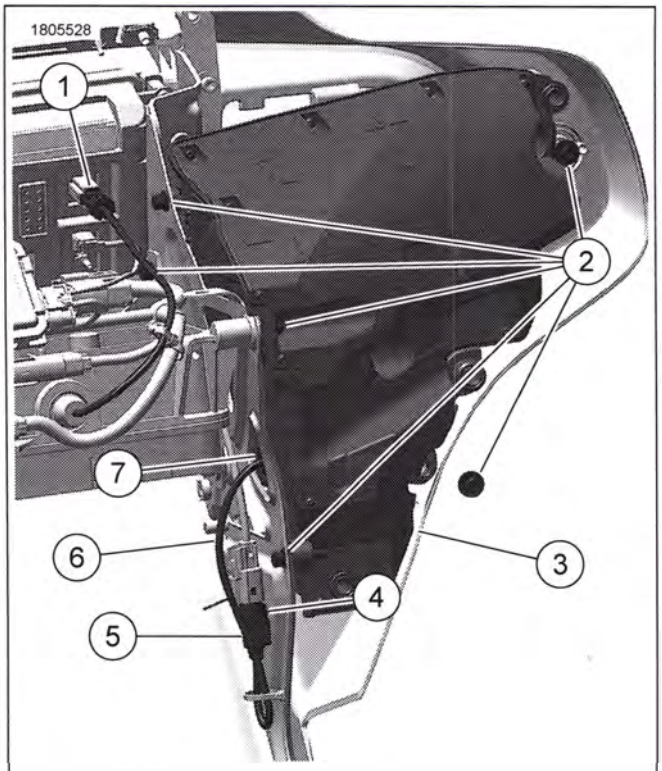
3. If necessary, install the grommet (7).

4. Position speaker enclosure (3), install screws (2). Tighten.

   Torque: 50–60 **in-lbs** (5.6–6.8 N·m) *Speaker enclosure screws*

5. Connect the speaker connector (5) and install connector locator (4).

6. Connect USB connector (1).



1. **USB connector**
2. **Screws (6)**
3. **Speaker enclosure**
4. **Locator**
5. **Connector**
6. **Wire harness**
7. **Grommet**

Figure 3-124. Left Front Speaker Enclosure

Complete

1. Install speaker grille. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
2. Install audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).
3. Install air duct cover assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER ASSEMBLY (Page 3-88).
4. Install air duct bezel assembly. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: AIR DUCT BEZEL ASSEMBLY (Page 3-87).
5. Install windshield. See FAIRING: FORK MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-87).
6. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
7. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
8. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE AND INSTALL: WINDSHIELD

FASTENER	TORQUE VALUE	
Windshield screws: Frame-mounted fairing models	25–30 **in-lbs**	2.8–3.4 N·m

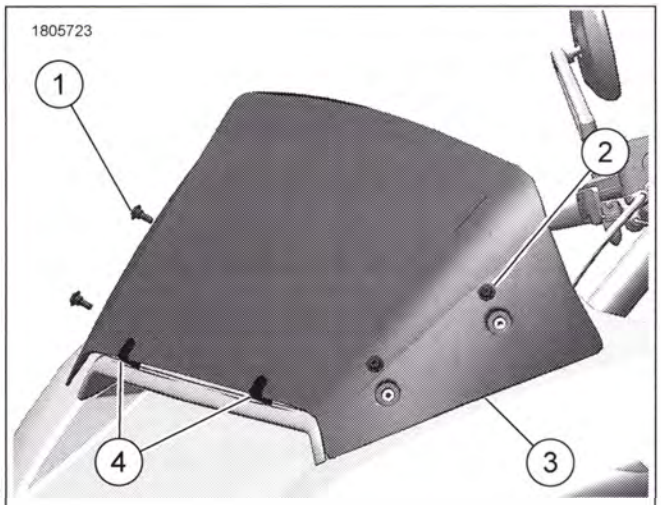
Remove

1. See Figure 3-125. Remove screws and washers (1, 2).
2. Remove windshield (3).

Install

1. See Figure 3-125. Align windshield (3) with windshield mounts (4).
2. Install washers (2) and screws (1). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Windshield screws: Frame-mounted fairing models*



1. **Windshield screws (4)**
2. **Windshield washers (4)**
3. **Windshield**
4. **Windshield mounts (2)**

Figure 3-125. Windshield: Frame Mounted

REMOVE AND INSTALL: AIR DEFLECTORS

Remove

1. See Figure 3-110. Rotate air deflector wing (1) forward.
2. Pry snap hinge plug (6) downward and out of snap hinge (4).
3. Pry the snap hinge (4) up to remove.
4. Pull down to remove air deflector wing.
5. Remove torque hinge (3).

Install

1. See Figure 3-110. Install torque hinge (3).
2. Align torque hinge (3) with air deflector (2). Install air deflector wing (1).
3. Install snap hinge (4) into lower pivot (5).
4. Install snap hinge plug (6).

REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL

FASTENER	TORQUE VALUE	
Windshield mount screws fairing: Frame mounted fairing	20–35 **in-lbs**	2.3–4 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

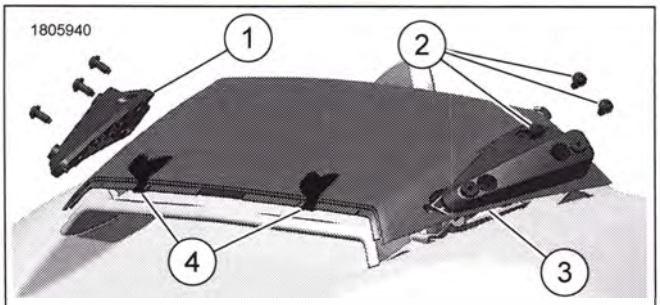
Remove

1. See Figure 3-126. Remove screws (2).
2. Remove windshield mounts (1).
3. See Figure 3-128. Insert non marring pry bar into opening (1), lift to release clip and separate air duct cover (3) and air duct bezel (2).
4. Repeat using opening (4). Remove air duct cover and air duct bezel.
5. See Figure 3-126. Remove air duct cover assembly (3).
6. If required, remove isolator mounts (4).

Install

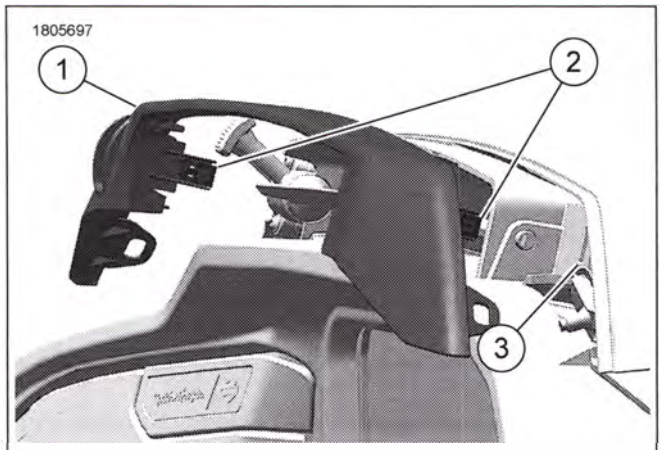
1. See Figure 3-126. If required, install isolator mounts (4).
2. Install air duct cover assembly (3).
3. See Figure 3-127. Verify clips (2) are in place.
4. Align bezel (1) with latches (3), push to install.
5. See Figure 3-126. Install windshield mounts (1).
6. Install screws (1). Tighten.

   Torque: 20–35 **in-lbs** (2.3–4 N·m) *Windshield mount screws fairing: Frame mounted fairing*



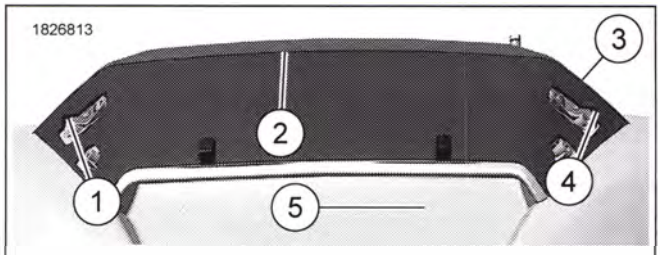
1. **Windshield mount (2)**
2. **Screws (6)**
3. **Air duct cover assembly**
4. **Isolator mount (2)**

Figure 3-126. Air Duct Cover Assembly



1. **Air duct bezel assembly**
2. **Clips (2)**
3. **Latches (2)**

Figure 3-127. Air Duct Bezel Assembly



1. **Left side pry point**
2. **Air duct bezel**
3. **Air duct cover**
4. **Right side pry point**
5. **Outer fairing**

Figure 3-128. Air Duct Bezel Release Points

REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY

FASTENER	TORQUE VALUE	
Windshield, air duct vane, screws: Frame mounted fairing	8–11 **in-lbs**	0.9–1.2 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

Remove

1. See Figure 3-129. Remove screws (1) and vane block (4).

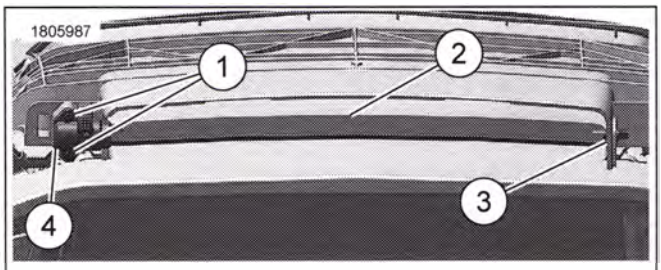
2. Remove air duct vane assembly (2).

Install

1. See Figure 3-129. Align air duct vane assembly (2) with upper air duct (3).

2. Install vane block (4) and screws (1). Tighten.

   Torque: 8–11 **in-lbs** (0.9–1.2 N·m) *Windshield, air duct vane, screws: Frame mounted fairing*



1. **Screws (2)**
2. **Air duct vane**
3. **Upper air duct**
4. **Vane block**

Figure 3-129. Air Duct Vane Removal and Install

Complete

1. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

2. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

DISASSEMBLE AND ASSEMBLE: AIR DUCT VANE ASSEMBLY

Remove

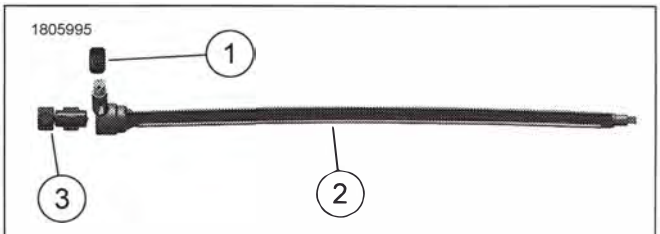
1. See Figure 3-130. Remove end cap (1).

2. Remove torque hinge (3) from air duct vane (2).

Install

1. See Figure 3-130. Install torque hinge (3) to air duct vane (2).

2. Install end cap (1).



1. **Endcap**
2. **Air duct vane**
3. **Torque hinge**

Figure 3-130. Air Duct Vane Disassemble and Assemble

REMOVE AND INSTALL: OUTER FAIRING SHELL

FASTENER	TORQUE VALUE	
Inner fairing screws (near speakers): frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m
Outer fairing lower screws: frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m
Outer fairing upper front: frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).
2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
3. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
4. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

Remove

1. See Figure 3-131. Remove screws (2).
2. See Figure 3-132. Remove two upper screws (2).
3. Remove two lower screws (1).
4. Pull outer fairing forward to remove (3).

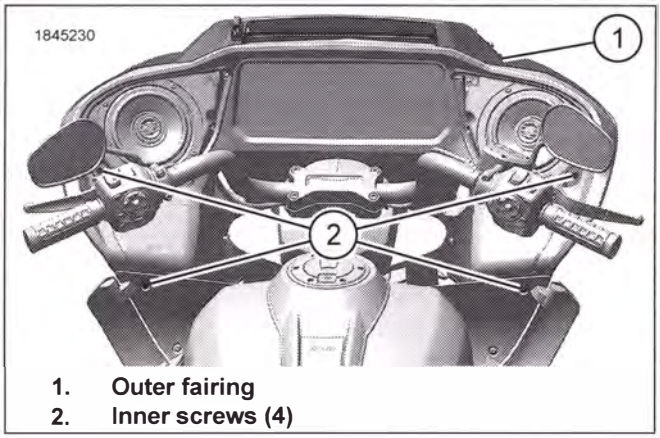
Install

1. See Figure 3-132. Engage alignment features while sliding outer fairing (3) back into position. Loosely install two upper screws (2) to prevent fairing from falling.
2. Install lower screws (1).
3. See Figure 3-131. Start two screws (2). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Inner fairing screws (near speakers): frame mounted fairing*
4. See Figure 3-132. Install lower screws (1). Tighten.

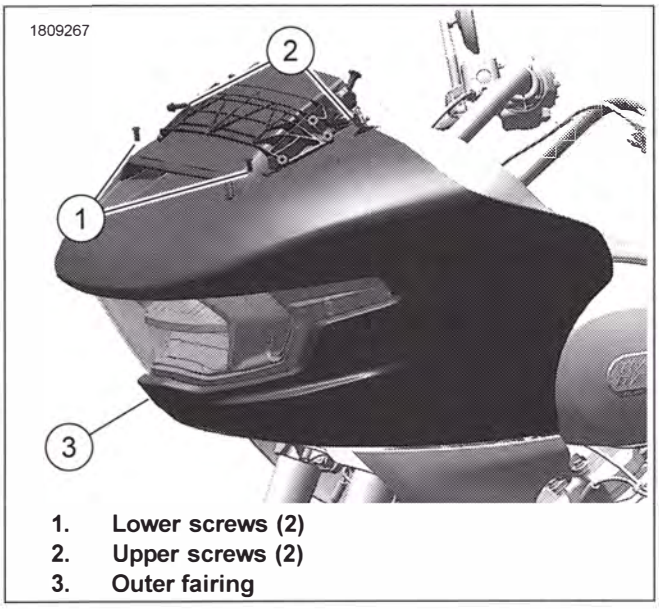
   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Outer fairing lower screws: frame mounted fairing*
5. Install upper screws (1). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Outer fairing upper front: frame mounted fairing*



1. **Outer fairing**
2. **Inner screws (4)**

Figure 3-131. Outer Fairing Screws



1. **Lower screws (2)**
2. **Upper screws (2)**
3. **Outer fairing**

Figure 3-132. Outer Fairing

Complete

1. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
2. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
3. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
4. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

REMOVE AND INSTALL: LOWER VENTS

FASTENER	TORQUE VALUE	
Lower air vent halves	9–13 **in-lbs**	1–1.5 N·m

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).
5. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
6. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
7. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
8. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).
9. Remove headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

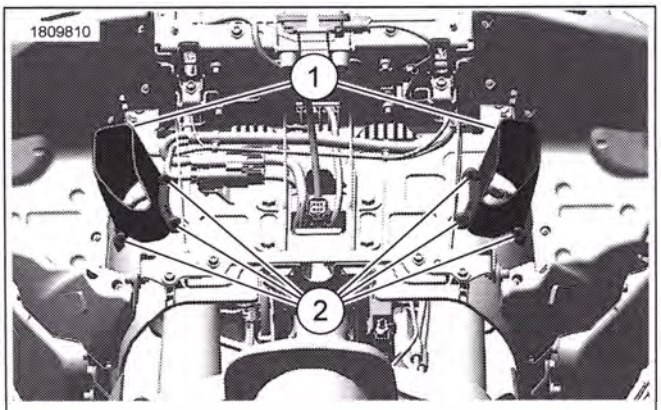
Remove

1. See Figure 3-133. Remove screws (2) on required vent (1), and remove vent.

Install

1. See Figure 3-133. Install vent (1), install screws (2). Tighten.

   Torque: 9–13 **in-lbs** (1–1.5 N·m) *Lower air vent halves*



1. **Vent assembly (2)**
2. **Screw (6)**

Figure 3-133. Lower Air Vent Assembly

Complete

1. Install headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).
2. Install outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).
3. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
4. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
5. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
6. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).
7. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
8. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
9. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE AND INSTALL: NACELLE

FASTENER	TORQUE VALUE	
Nacelle to ignition switch screws	10–20 **in-lbs**	1.1–2.3 N·m
Outer nacelle to fork bracket screws	53–80 **in-lbs**	6–9 N·m

Remove

NOTE

To remove instrument nacelle with inner fairing installed, handlebars must be able to turn.

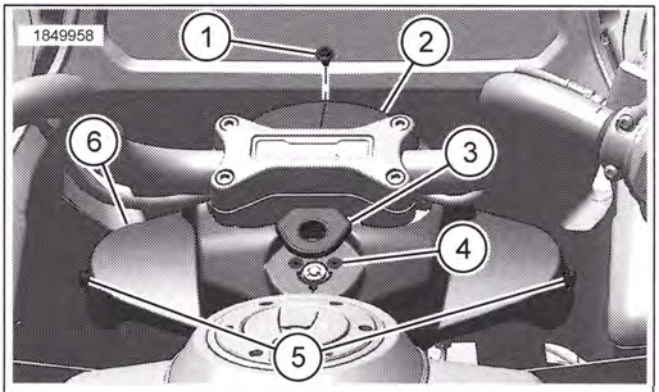
1. See Figure 3-134. Remove ignition trim ring (3).
2. Remove front nacelle scrivet (1).
3. Remove nacelle to ignition switch screws (4).
4. Remove outer screws (5), remove RH (2) and LH (6) nacelle halves.

Install

1. See Figure 3-134. Place nacelle halves (2, 6) into position.
2. Install screws (5). Tighten.

   Torque: 53–80 **in-lbs** (6–9 N·m) *Outer nacelle to fork bracket screws*
3. Install nacelle to ignition switch screws (4). Tighten.

   Torque: 10–20 **in-lbs** (1.1–2.3 N·m) *Nacelle to ignition switch screws*
4. Push to install front nacelle scrivet (1).
5. Install Ignition trim ring (3).



1. **Scrivet**
2. **RH nacelle half**
3. **Ignition trim ring**
4. **Screws (2)**
5. **Screws (2)**
6. **LH nacelle half**

Figure 3-134. Nacelle

REMOVE AND INSTALL: INNER FAIRING ASSEMBLY

FASTENER	TORQUE VALUE	
Inner fairing support screws, frame-mounted fairing	48–60 **in-lbs**	5.4–6.8 N·m
Inner fairing-to-mount screws, frame-mounted fairing	97–142 **in-lbs**	11–16 N·m

Prepare

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).
5. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
6. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
7. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
8. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).
9. Remove headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

Remove

1. Place protective material on top of front fender to protect paint.
2. See Figure 3-135. Release wire locator (1) and route headlamp wire (8) out of inner fairing assembly (3).
3. Disconnect two main harness connectors (7).
4. Draw branches of main harness out of inner fairing through openings in fairing bracket.
5. Remove inner fairing support screws (5).
6. Remove inner fairing mount screws (2).
7. Raise the inner fairing assembly (3) off the inner fairing mounting bracket (4) and remove.

Install

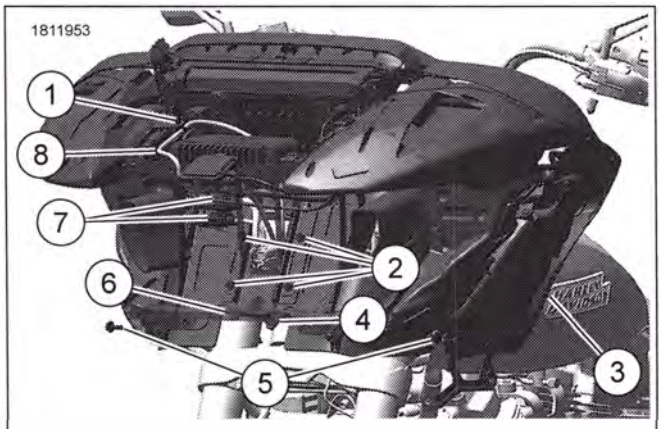
1. Place protective material on top of front fender to protect paint. Rest inner fairing assembly on front fender.
2. See Figure 3-135. Move inner fairing assembly (3) into place, align the fairing main support bracket (6) with the inner fairing mount bracket (4).
3. Feed the end of harnesses (8) through opening.
4. Install inner fairing mount screws (2). Tighten.

   Torque: 97–142 **in-lbs** (11–16 N·m) *Inner fairing-to-mount screws, frame-mounted fairing*
5. Install inner fairing support screws (5). Tighten.

   Torque: 48–60 **in-lbs** (5.4–6.8 N·m) *Inner fairing support screws, frame-mounted fairing*

6. Connect two main harness connectors (7).

7. Route headlamp wiring (8) through inner fairing assembly (3) and install wire locator (1).



1. **Wire locator**
2. **Screws (4)**
3. **Inner fairing assembly**
4. **Inner fairing mounting bracket**
5. **Screws (2)**
6. **Fairing main support bracket**
7. **Main harness connectors (2)**
8. **Headlamp harness**

Figure 3-135. Inner Fairing Assembly

Complete

1. Install headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

2. Install outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

3. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

4. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

5. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

6. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

7. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

8. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

9. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

DISASSEMBLE AND ASSEMBLE: INNER FAIRING ASSEMBLY

FASTENER	TORQUE VALUE	
Fairing bracket to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m

Prepare

1. Prepare a protective work surface large enough for inner fairing assembly.

2. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

4. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

5. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

6. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

7. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

8. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

9. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

10. Remove headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

11. Remove inner fairing shell. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: INNER FAIRING ASSEMBLY (Page 3-105). Lay on protective surface with gauge faces down.

Disassemble

1. Remove speakers. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

2. Remove lower vents. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: LOWER VENTS (Page 3-104).

3. Remove hidden antenna. See ELECTRICAL > HIDDEN ANTENNA (Page 8-48).

4. Remove GPS antenna. See ELECTRICAL > GPS ANTENNA (Page 8-50).

5. Remove right and left speaker enclosures. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-111).

6. Remove audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

7. Remove storage compartment. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: STORAGE COMPARTMENTS (Page 3-109).

8. Remove storage compartment doors and hinges. FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: STORAGE COMPARTMENT DOORS AND HINGES (Page 3-108).

9. See Figure 3-136. Release wire retainers (3) and remove wire retainers (4).

10. Disconnect connectors (2). Route harness (7) out of fairing bracket (6).

11. Remove screws (1, 5) and inner fairing mounting bracket (6).

Assemble

1. Install storage compartment doors and hinges. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: STORAGE COMPARTMENT DOORS AND HINGES (Page 3-108).

2. Install storage compartment. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: STORAGE COMPARTMENTS (Page 3-109).

3. Install inner fairing mounting bracket (6) and screws (1, 5). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *Fairing bracket to fairing screws*

4. Route harness (7) into fairing bracket (6). Connect connectors (2).

5. Install audio amplifier. See ELECTRICAL > AUDIO AMPLIFIER (Page 8-44).

6. Install right and left speaker enclosures. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-111).

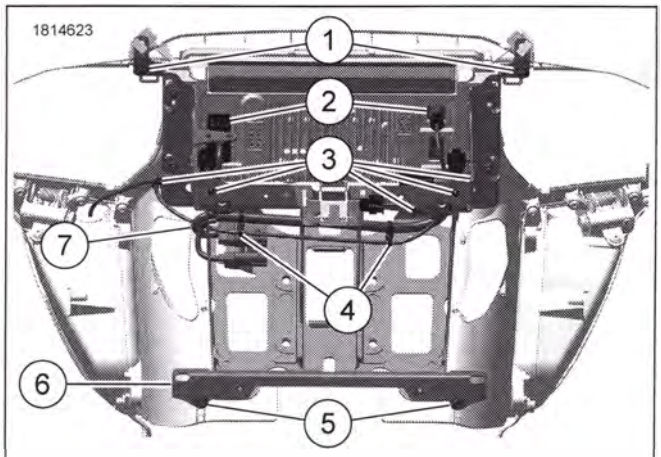
7. See Figure 3-136. Install wire retainers (3) and install wire retainers (4).

8. Install GPS antenna. See ELECTRICAL > GPS ANTENNA (Page 8-50).

9. Install hidden antenna. See ELECTRICAL > HIDDEN ANTENNA (Page 8-48).

10. Install lower vents. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: LOWER VENTS (Page 3-104).

11. Install speakers. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).



1. **Screws (2)**
2. **Connectors (2)**
3. **Wire locators (5)**
4. **Wire ties (2)**
5. **Screws (2)**
6. **Inner fairing mounting bracket**
7. **Harness**

Figure 3-136. Inner Fairing Shell

REMOVE AND INSTALL: MOUNTING BRACKET

FASTENER	TORQUE VALUE	
Fairing mount to steering head locknuts: Frame-mounted fairing	20–30 ft-lbs	27–41 N·m

Prepare

1. Remove inner fairing assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: INNER FAIRING ASSEMBLY (Page 3-105).

Remove

1. See Figure 3-137. Remove locknuts (3) and screws (5).

2. Position aside RH and LH main wire harness guides (1, 4).

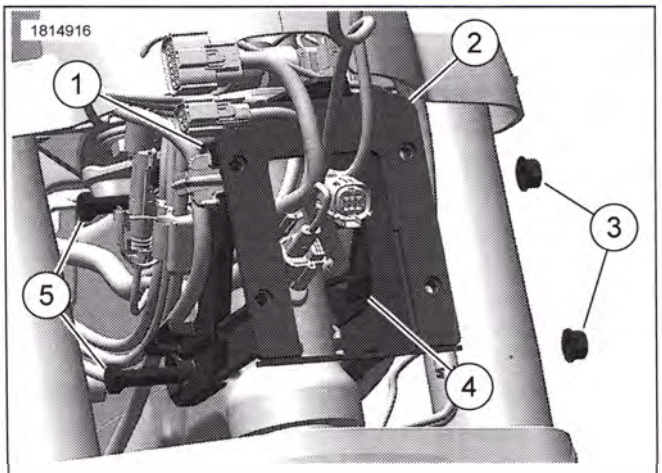
3. Remove mounting bracket (2).

Install

1. See Figure 3-137. Position mounting bracket (2).

2. Position left (4) and right (1) main harness guides. Install screws (5) from right side. Install flange locknuts (3). Tighten.

   Torque: 20–30 ft-lbs (27–41 N·m) *Fairing mount to steering head locknuts: Frame-mounted fairing*



1. **Right main harness guide**
2. **Mounting bracket**
3. **Flange locknut (2)**
4. **Left main harness guide**
5. **Screw (2)**

Figure 3-137. Mounting Bracket

Complete

1. Install inner fairing assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: INNER FAIRING ASSEMBLY (Page 3-105).

REMOVE AND INSTALL: FAIRING SUPPORTS

FASTENER	TORQUE VALUE	
Fairing support to fairing: Frame-mounted fairing	48–60 **in-lbs**	5.4–6.8 N·m
Fairing support to fork: Frame-mounted fairing	22–28 ft-lbs	30–38 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).
2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
3. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
4. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
5. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

Remove

1. See Figure 3-138. Remove screws (1) and washers (2).
2. Remove screws (3) and fairing support (4).

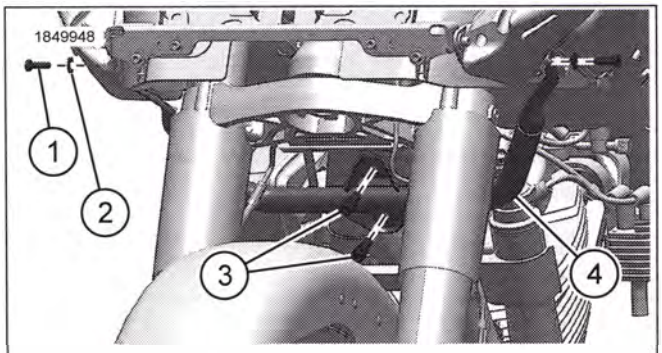
Install

1. See Figure 3-138. Install fairing support (4) and screws (3). Tighten.

   Torque: 22–28 ft-lbs (30–38 N·m) *Fairing support to fork: Frame-mounted fairing*

2. Install washers (2) and screws (1). Tighten.

   Torque: 48–60 **in-lbs** (5.4–6.8 N·m) *Fairing support to fairing: Frame-mounted fairing*



1. **Screws (2)**
2. **Washers (2)**
3. **Screws (2)**
4. **Fairing support**

Figure 3-138. Fairing Support

Complete

1. Install outer fairing. FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).
2. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).
3. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).
4. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).
5. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

REMOVE AND INSTALL: STORAGE COMPARTMENT DOORS AND HINGES

FASTENER	TORQUE VALUE	
Storage compartment cover to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).
2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

3. Remove air duct cover assembly. See .

4. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

5. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

6. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

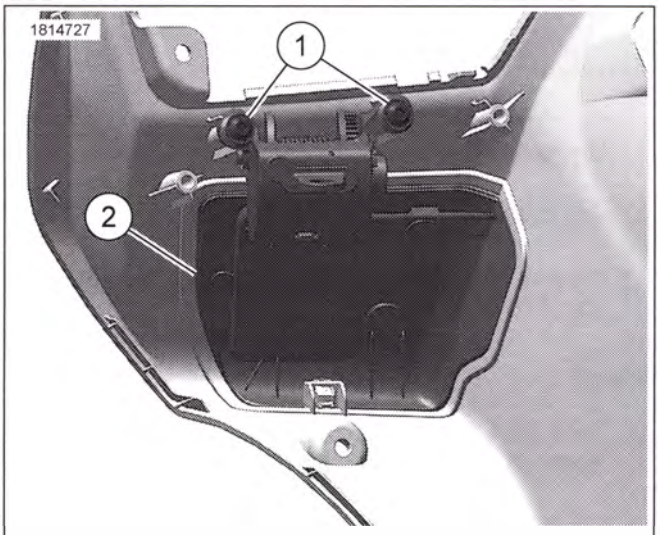
Remove

1. See Figure 3-139. Remove screws (1) and storage compartment cover (2).

Install

1. See Figure 3-139. Install storage compartment cover (2) and screws (1). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *Storage compartment cover to fairing screws*



1. **Screws (2)**
2. **Storage compartment cover**

Figure 3-139. Storage Compartment Cover

Complete

1. Install outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

2. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

3. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

4. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

5. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

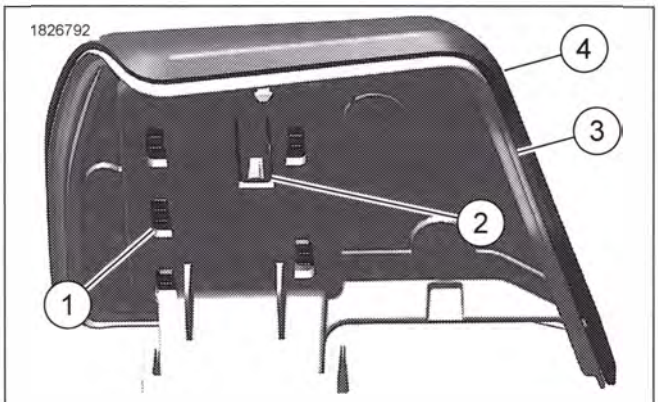
REMOVE AND INSTALL: STORAGE COMPARTMENT DOOR COSMETIC COVER

Remove

1. See Figure 3-140. Release latch (2) and slide storage compartment door cosmetic cover (4) away from storage compartment cover (3).

Install

1. See Figure 3-140. Install storage compartment door cosmetic cover (4), align slots (1) slide back to latch (2).



1. **Alignment slot**
2. **Latch**
3. **Storage compartment cover**
4. **Storage compartment door cosmetic cover**

Figure 3-140. Storage Compartment Door Cosmetic Cover

REMOVE AND INSTALL: STORAGE COMPARTMENTS

FASTENER	TORQUE VALUE	
Storage compartment to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

3. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

4. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

5. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

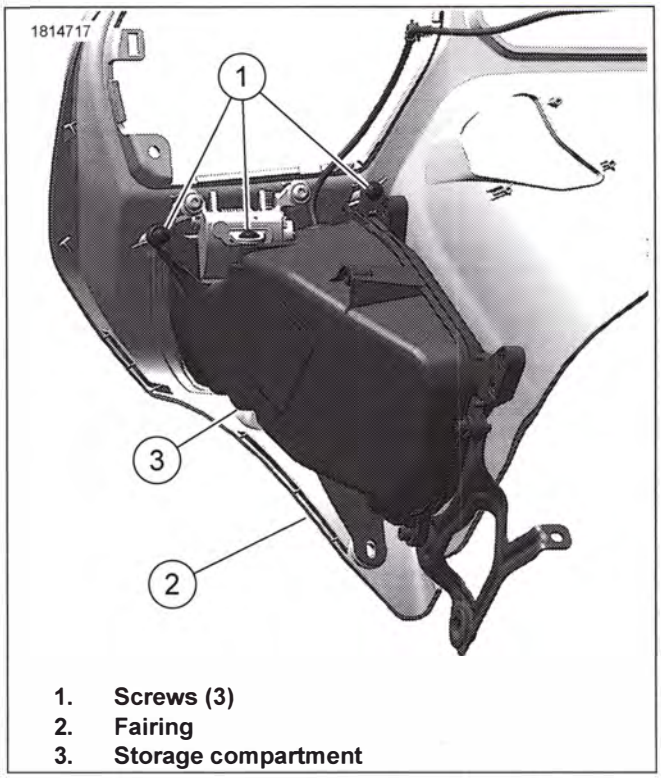
Remove

1. See Figure 3-141. Remove screws (1) and storage compartment (3).

Install

1. See Figure 3-141. Install storage compartment (3) and screws (1). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *Storage compartment to fairing screws*



1. **Screws (3)**
2. **Fairing**
3. **Storage compartment**

Figure 3-141. Storage Compartment

Complete

1. Install outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

2. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

3. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

4. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

5. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

REMOVE AND INSTALL: MEDIA CABLE

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

3. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

4. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

5. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

6. Remove RH speaker enclosure. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-111).

Remove

1. See Figure 3-142. Discard wire locator (2) and disconnect connector (1).

2. See Figure 3-143. Discard wire locators (1).

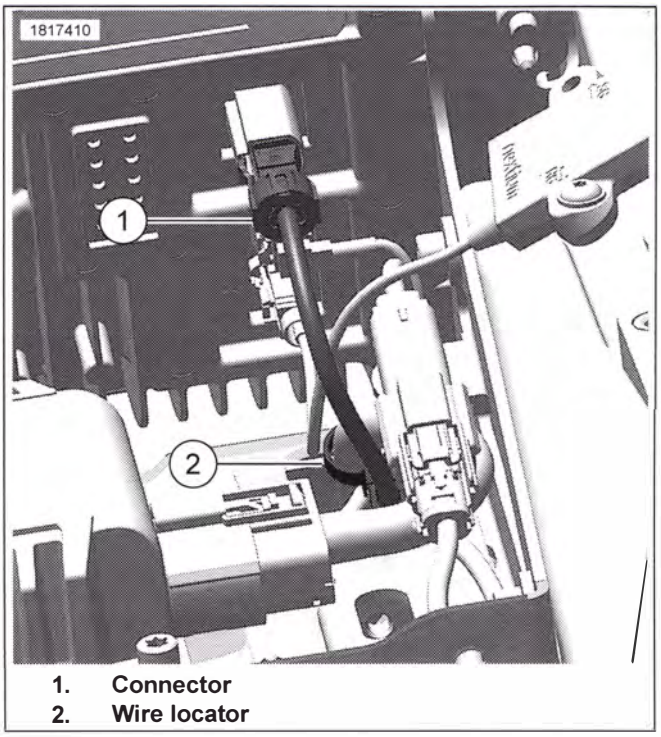
3. Pry grommet (4) from right side storage compartment (3) and remove media cable (2).

Install

1. See Figure 3-143. Route media cable (2), install grommet (4) into storage compartment (3).

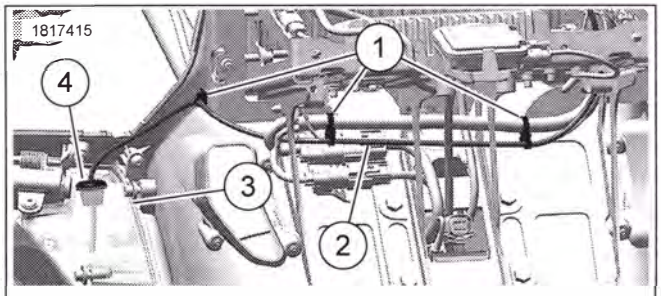
2. See Figure 3-142. Route media cable, install connector (1).

3. Install new wire locator (2).



1. **Connector**
2. **Wire locator**

Figure 3-142. Media Cable Connector



1. **Wire locator**
2. **Media cable**
3. **Storage compartment**
4. **Grommet**

Figure 3-143. Media Cable

Complete

1. Install RH speaker enclosure. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: SPEAKER ENCLOSURE (Page 3-111).

2. Install outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

3. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

4. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

5. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

6. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

REMOVE AND INSTALL: SPEAKER ENCLOSURE

FASTENER	TORQUE VALUE	
LH inner speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m
LH outer speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m
RH inner speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m
RH outer speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m

Prepare

1. Remove windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

2. Remove air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

3. Remove air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

4. Remove left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

5. Remove outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

6. **RH Speaker enclosure:** Remove ELECTRICAL > GPS ANTENNA (Page 8-50).

Remove

RH Speaker Enclosure:

1. See Figure 3-144. Disconnect wire locator (2), disconnect connector (4).

2. Remove screws (3).

3. See Figure 3-145. Remove screws (1) and RH speaker enclosure (2).

LH Speaker Enclosure:

1. See Figure 3-146. Disconnect wire locator (4), disconnect connector (3).

2. Remove screws (1).

3. See Figure 3-147. Remove screws (2) and speaker enclosure (1).

Install

LH Speaker Enclosure:

1. See Figure 3-147. Install speaker enclosure (1) and install screws (2). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *LH outer speaker enclosure to fairing screws*

2. See Figure 3-146. Install wire locator (4), connect connector (3).

3. Install screws (1). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *LH inner speaker enclosure to fairing screws*

RH Speaker Enclosure:

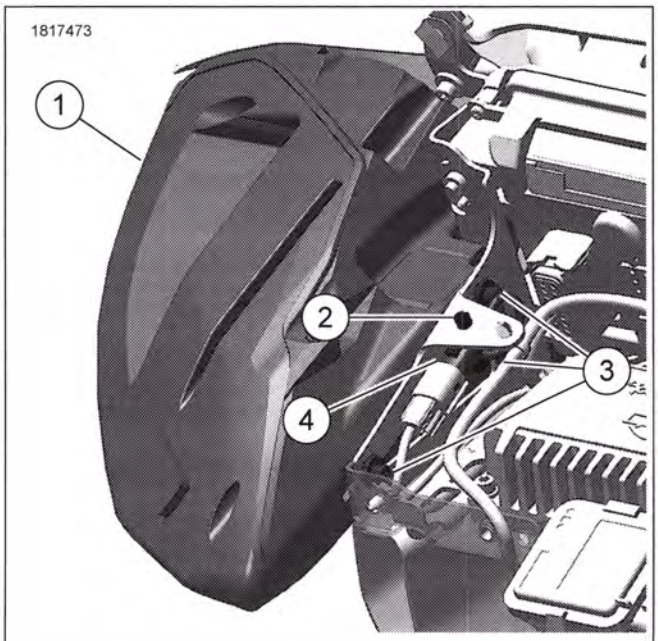
1. See Figure 3-145. Install speaker enclosure (2) and install screws (1). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *RH outer speaker enclosure to fairing screws*

2. See Figure 3-144. Install wire locator (2), connect connector (4).

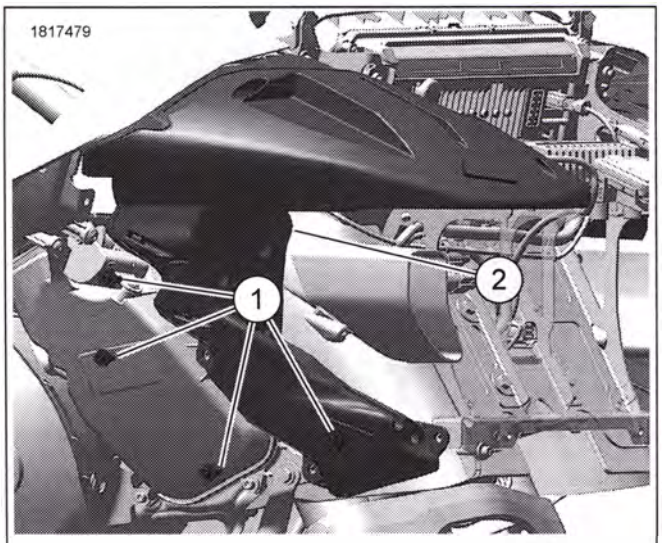
3. Install screws (3). Tighten.

   Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *RH inner speaker enclosure to fairing screws*



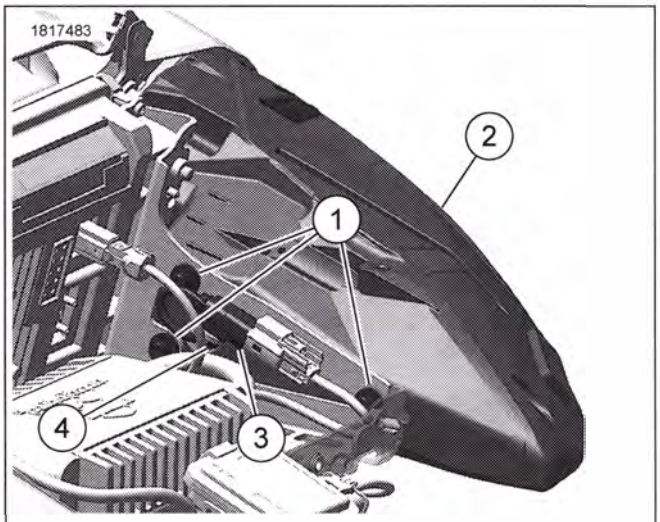
1. **RH speaker enclosure**
2. **Wire locator**
3. **Screws (3)**
4. **Connector**

Figure 3-144. RH Speaker Enclosure Connector



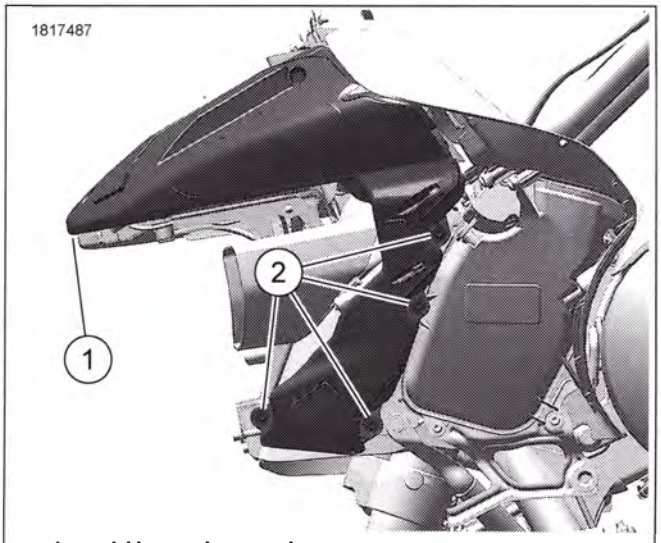
1. **Screws (4)**
2. **RH speaker enclosure**

Figure 3-145. RH Speaker Enclosure Connector



1. **Screws (3)**
2. **LH speaker enclosure**
3. **Connector**
4. **Wire locator**

Figure 3-146. LH Speaker Enclosure Connector



1. **LH speaker enclosure**
2. **Screws (4)**

Figure 3-147. LH Speaker Enclosure

Complete

1. Install outer fairing. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: OUTER FAIRING SHELL (Page 3-103).

2. Install left and right speaker grilles. See ELECTRICAL > FRONT SPEAKERS (Page 8-45).

3. Install air duct vane assembly. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT VANE ASSEMBLY (Page 3-102).

4. Install air duct cover and air duct bezel. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: AIR DUCT COVER AND AIR DUCT BEZEL (Page 3-101).

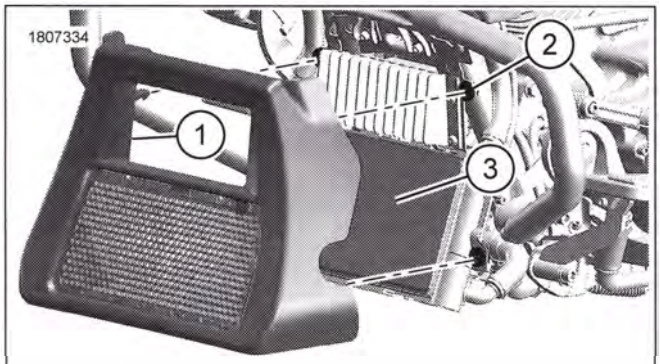
5. Install windshield. See FAIRING: FRAME MOUNTED > REMOVE AND INSTALL: WINDSHIELD (Page 3-101).

REMOVE

1. See Figure 3-148. Remove radiator shroud.
   a. With motorcycle on jiffy stand, turn forks left.
   b. Pull radiator shroud (1) straight forward.

INSTALL

1. See Figure 3-148. Install radiator shroud.
   a. With motorcycle on jiffy stand, turn forks left.
   b. Lubricate barbed studs on radiator shroud with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.
   c. Align barbed studs on radiator shroud with grommets (3).
   d. Push in to secure.



1. Radiator shroud
2. Grommet (4)
3. Radiator

Figure 3-148. Radiator Shroud

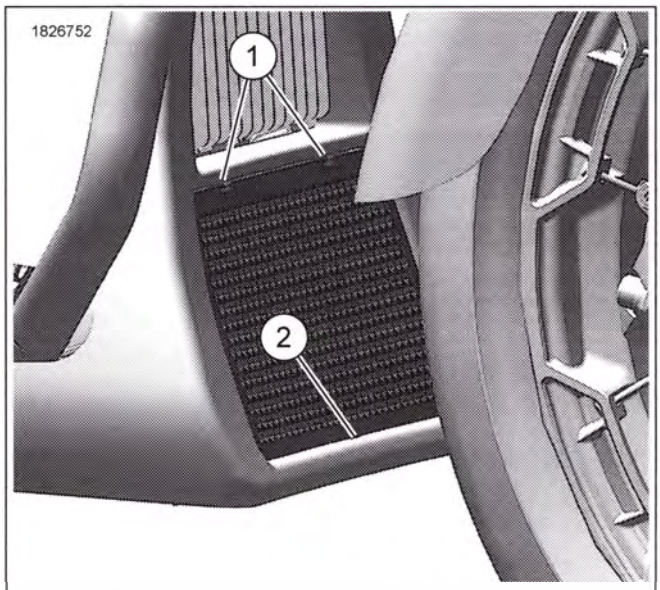
RADIATOR SHROUD SCREEN

Remove

1. See Figure 3-149. Remove radiator shroud screen.
   a. With motorcycle on jiffy stand, turn forks left.
   b. Release locking tabs (1), remove screen.

Install

1. See Figure 3-149. Install radiator shroud screen.
   a. With motorcycle on jiffy stand, turn forks left.
   b. Align locators (2) and install screen.
   c. Push in to secure.



1. Locking tabs (2)
2. Locating tabs (3)

Figure 3-149. Radiator Shroud Screen

PREPARE

1. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

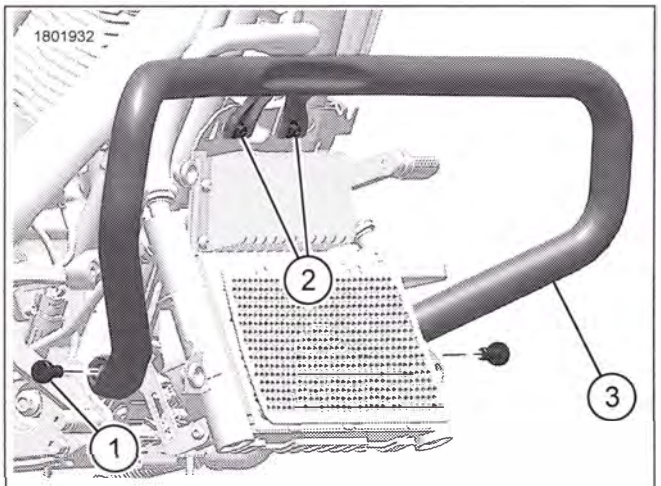
REMOVE

1. See Figure 3-150. Remove engine guard.
   a. Loosen screws (2).
   b. Remove screws (1).
   c. Remove engine guard (3).

INSTALL

FASTENER	TORQUE VALUE	
Engine guard, lower, screws	15–20 ft-lbs	20–27 N·m
Engine guard, upper, screws	90–110 **in-lbs**	10.2–12.4 N·m

1. See Figure 3-150. Install engine guard.
   a. Install engine guard on upper screws (2).
   b. Install lower screws (1). Tighten.
      Torque: 15–20 ft-lbs (20–27 N·m) *Engine guard, lower, screws*
   c. Tighten upper screws (2).
      Torque: 90–110 **in-lbs** (10.2–12.4 N·m) *Engine guard, upper, screws*



1. Screw, lower (2)
2. Screw, upper (2)
3. Engine guard

Figure 3-150. Engine Guard

COMPLETE

1. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

FRAME MOUNTED FAIRING

FASTENER	TORQUE VALUE	
Air deflector screws frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m

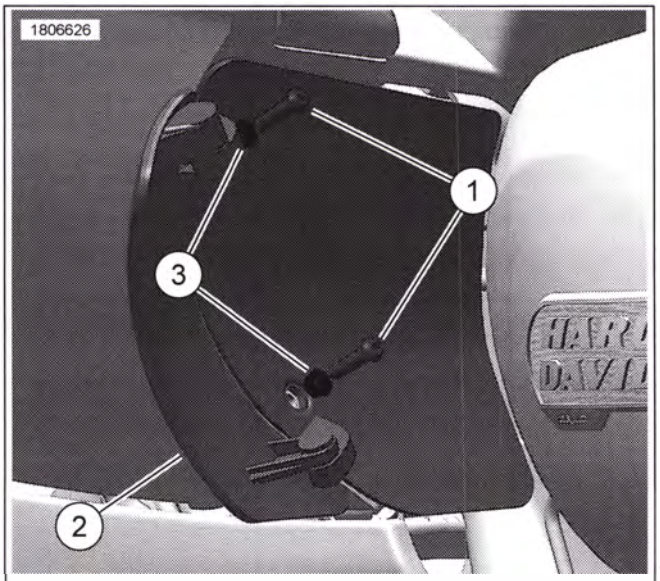
Remove

1. See Figure 3-151. Remove screws (1) and washers (3), remove air deflector assembly (2).

Install

1. See Figure 3-151. Install air deflector assembly (1).
2. Install washers (3) and screws (1). Tighten.

   Torque: 25–30 **in-lbs** (2.8–3.4 N·m) *Air deflector screws frame mounted fairing*



1. **Screws (2)**
2. **Air deflector assembly**
3. **Washers (2)**

Figure 3-151. Air Deflector: Frame Mounted Fairing

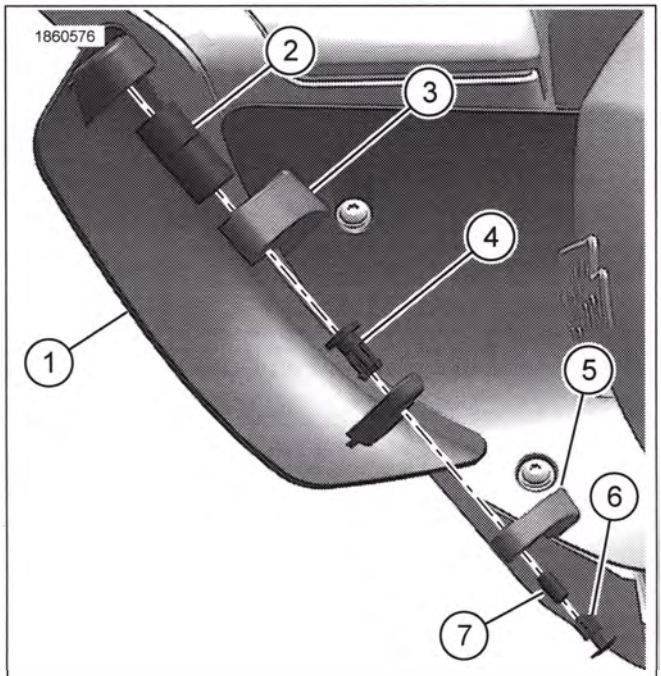
REMOVE AND INSTALL: AIR DEFLECTOR WING

Remove

1. See Figure 3-152. Rotate air deflector wing (1) forward.
2. Pry snap hinge plug (6) downward to remove, if equipped.
3. Remove set screw (7), if equipped.
4. Pry snap hinge (4) up to remove.
5. Pull up to remove air deflector wing.
6. Remove torque hinge (2).

Install

1. See Figure 3-152. Install torque hinge (2).
2. Align torque hinge (2) with air deflector (3). Install air deflector wing (1).
3. Install snap hinge (4).
4. Install set screw (7) flush with hinge or 0.07 in (1.8 mm) lower than hinge, if equipped.
5. Install snap hinge plug (6), if equipped.



1. **Air deflector wing**
2. **Torque hinge**
3. **Air deflector**
4. **Snap hinge**
5. **Lower pivot**
6. **Snap hinge plug (if equipped)**
7. **Set screw (if equipped)**

Figure 3-152. Air Deflector Wings

REMOVE AND INSTALL: MID FRAME DEFLECTORS

FASTENER	TORQUE VALUE	
Mid frame air deflector screws	25–35 **in-lbs**	2.8–4 N·m

Remove

1. See Figure 3-153. Remove deflectors.
   a. Remove screws (6), washer (5) and washer (4) (if equipped).
   b. Remove mid frame deflectors (1 or 2).

Install

1. See Figure 3-153. Install deflectors.

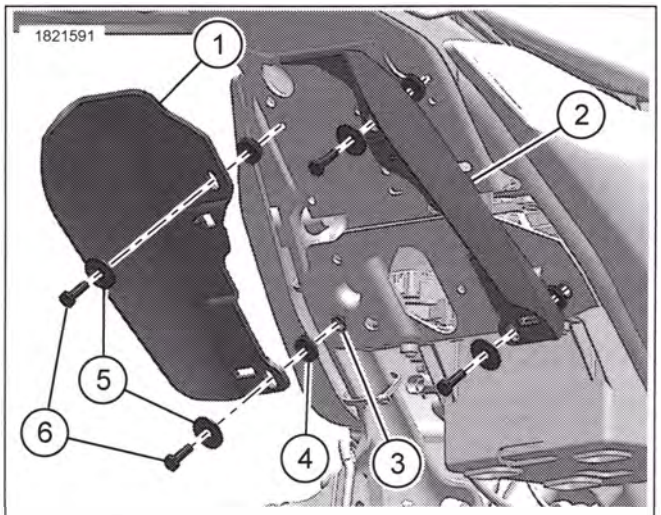
   a. Install upper screw (6) through large washer (5), air deflector (1 or 2) and small washer (4) (if equipped).

   b. Install air deflector. Do not tighten screw.

   c. Install remaining screw (6) through large washer (5), air deflector (1 or 2) and small washer (4) (if equipped).

   d. Tighten screws.

      Torque: 25–35 **in-lbs** (2.8–4 N·m) *Mid frame air deflector screws*



1. **Right air deflector**
2. **Left air deflector**
3. **Clinch nut (2)**
4. **Small washer (4) (if equipped)**
5. **Large washer(4)**
6. **Screw (4)**

Figure 3-153. Mid-Frame Air Deflector

GENERAL

See ELECTRICAL > LEFT HAND CONTROL MODULE (LHCM) (Page 8-19) or ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23) for hand grip procedures.

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove master cylinder/brake lever assembly from handlebar. Do not disconnect. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).

NOTE

Secure master cylinder so it doesn't get placed upside down.

5. Remove clutch hand control bracket assembly from handlebar. Do not disconnect. See CHASSIS > CLUTCH CONTROL (Page 3-79).

REMOVE AND INSTALL: FORK MOUNTED FAIRING

FASTENER	TORQUE VALUE	
Handlebar, fork mounted fairing, clamp screws	16–20 ft-lbs	21.7–27.1 N·m

Prepare

1. Remove outer fairing, dash panel and media tray. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

Remove

1. Note wire routing and reposition wires out from under media tray to allow handlebar removal.
2. See Figure 3-154. Remove handlebar assembly.
   a. Remove handlebar clamp screw (1).
   b. Remove handlebar clamp (2).
   c. Remove handlebar (6).

Install

1. See Figure 3-154. Install handlebar assembly.
   a. Install handlebar (6) on risers (5).
   b. See Figure 3-155. Align pin with alignment hole in handlebar.
   c. See Figure 3-154. Install handlebar clamp (2).
   d. Install clamp screws (1) hand tight.
   e. Adjust handlebar to desired position.

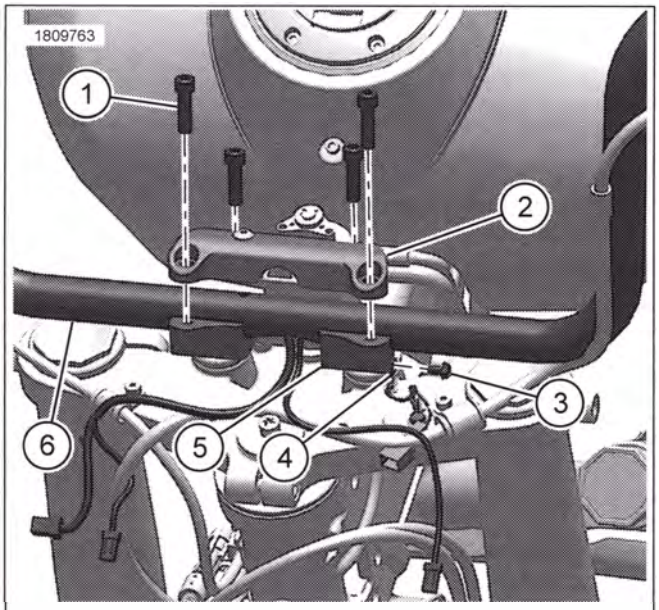
NOTE

There is limited movement due to alignment pin.

   f. See Figure 3-156. Tighten screws in sequence.

   Torque: 16–20 ft-lbs (21.7–27.1 N·m) *Handlebar, fork mounted fairing, clamp screws*

2. Route wires under media tray and reposition.



1. **Handlebar clamp screw (4)**
2. **Handlebar clamp**
3. **Screw**
4. **Ground jump connector**
5. **Riser (2)**
6. **Handlebar**

Figure 3-154. Fork Mounted Fairing Handlebar

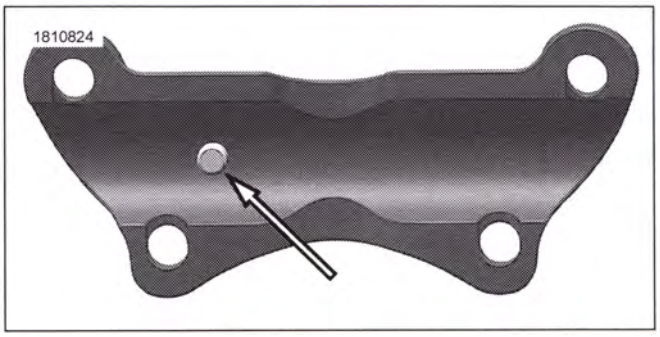


Figure 3-155. Handlebar Clamp Alignment Pin

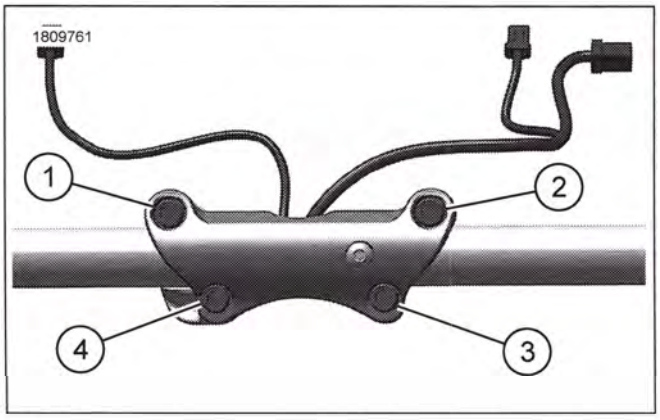


Figure 3-156. Handlebar Clamp Tightening Sequence

Complete

1. Install media tray, dash panel and outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

REMOVE AND INSTALL: FRAME MOUNTED FAIRING

FASTENER	TORQUE VALUE	
Handlebar, frame mounted fairing, clamp screws	16–18 ft-lbs	21.7–24.4 N·m

Prepare

1. Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

Remove

1. See Figure 3-158. Disconnect connectors.
   a. Disconnect RHCM connector (5).
   b. Disconnect LHCM connector (11).
   c. Disconnect twist grip sensor connector (6).
2. Remove handlebar assembly.
   a. Remove handlebar clamp screws (2).
   b. Remove handlebar clamp (3).
   c. Guide cables while removing handlebar (1).

Install

1. See Figure 3-158. Install handlebar assembly.

NOTE

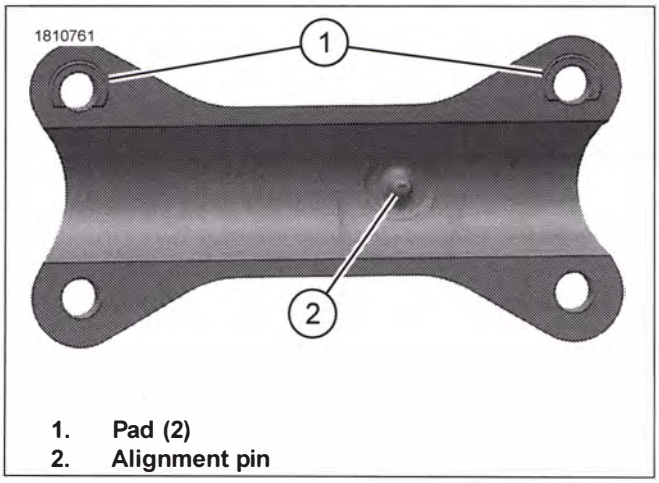
See Figure 3-157. Handlebar pads (1) should be touching riser when tightened.

   a. Guide cables through opening in riser (14).
   b. Install handlebar (1).
   c. See Figure 3-157 and Figure 3-158. Align pin (2) with alignment hole (4).
   d. Install handlebar clamp (3).
   e. Install clamp screws (2) hand tight.
   f. Adjust handlebar to desired position.

NOTE

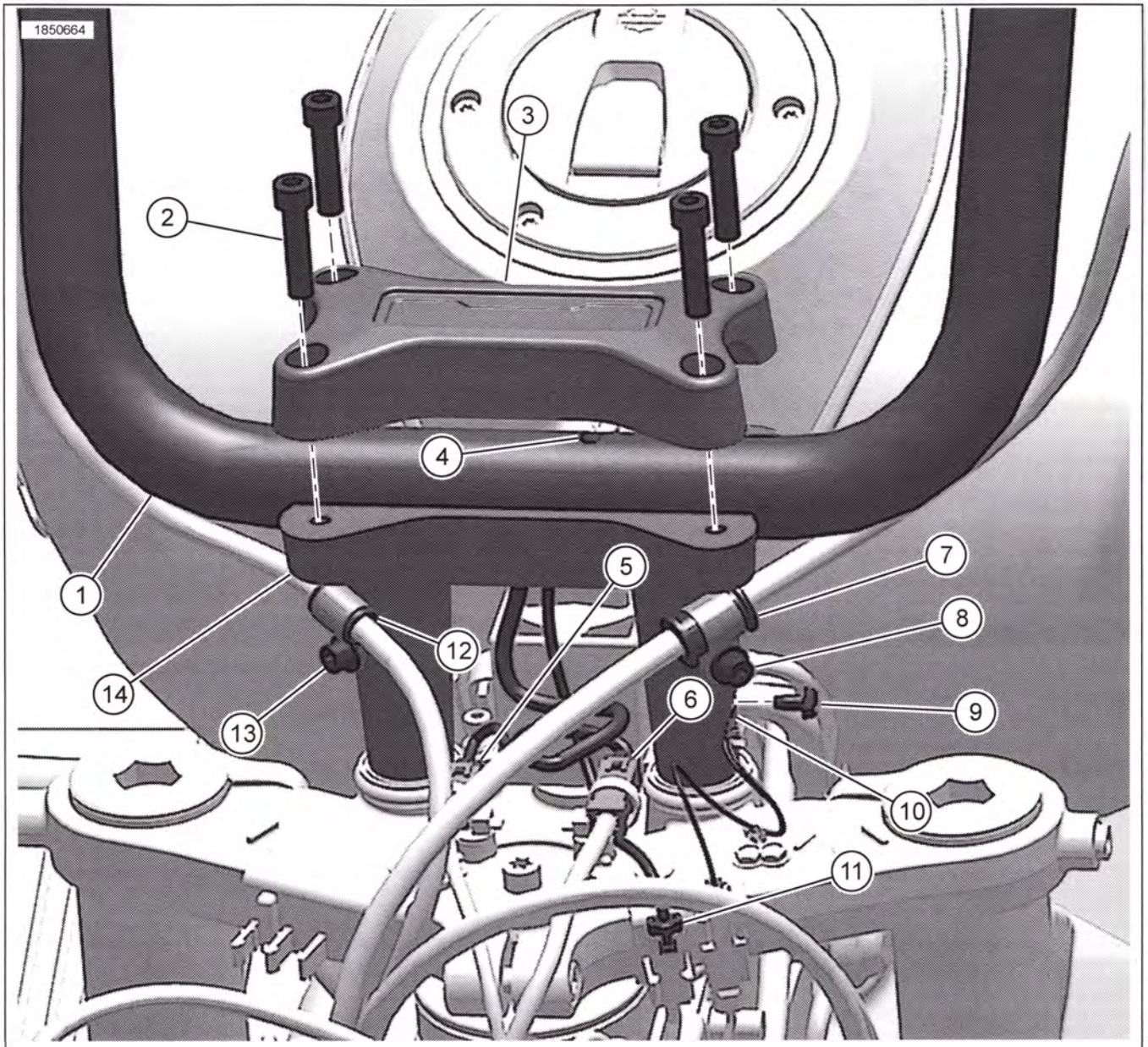
There is limited movement due to alignment pin.

   g. See Figure 3-159. Tighten screws in sequence.
      Torque: 16–18 ft-lbs (21.7–24.4 N·m) *Handlebar, frame mounted fairing, clamp screws*
2. See Figure 3-158. Connect connectors.
   a. Connect twist grip sensor connector (6).
   b. Connect LHCM connector (11).
   c. Connect RHCM connector (5).



1. Pad (2)
2. Alignment pin

Figure 3-157. Handlebar Clamp Alignment Pin



1. Handlebar
2. Handlebar clamp screw (4)
3. Handlebar clamp
4. Alignment hole
5. RHCM connector
6. Twist grip sensor connector
7. P-clamp
8. Screw
9. Screw
10. Ground jump connector
11. LHCM connector
12. P-clamp
13. Screw
14. Riser

Figure 3-158. Frame Mounted Fairing Handlebar

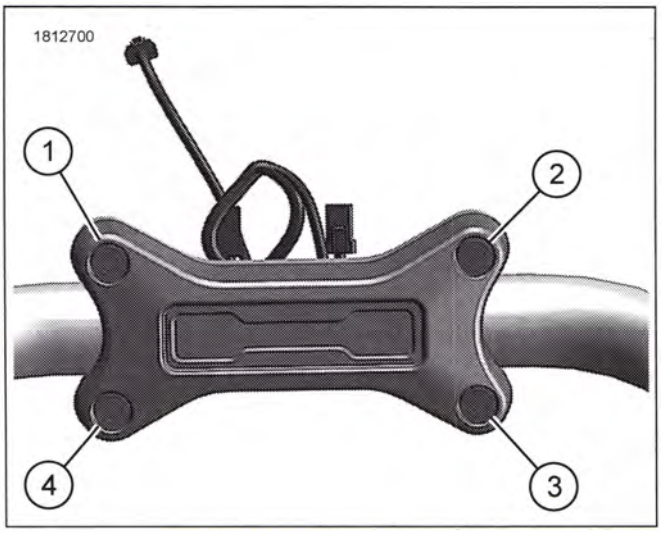


Figure 3-159. Handlebar Clamp Tightening Sequence

Complete

1. Install nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

REMOVE AND INSTALL: WIRE HARNESS

Prepare

1. Remove LHCM cover. See ELECTRICAL > LEFT HAND CONTROL MODULE (LHCM) (Page 8-19).

2. Remove RHCM cover. See ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23).

Fork Mounted Fairing:

1. Remove outer fairing, dash panel, media drawer. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

Frame Mounted Fairing

1. Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

Remove

NOTE

- *Harnesses can be replaced with handlebar installed or removed.*

1. See Figure 3-160. Attach chaser wire.

   a. Cut a length of chaser wire for each harness.

NOTE

Only remove one harness at a time.

   b. Attach chaser wire to end of harness (3 or 4).

   c. Wrap end of each wiring harness and chaser wire tightly with electrical tape.

2. Disconnect RHCM connectors (1) and LHCM connector (2) if removing both harnesses.

3. Lubricate wires with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.

4. Remove harness.

   a. Pull harness while feeding chaser wire into handlebar.

   b. Remove electrical tape when it is pulled through opening.

   c. Leave chaser wire in handlebar for installation.

   d. Remove harness.

Install

1. See Figure 3-160. Attach chaser wire.

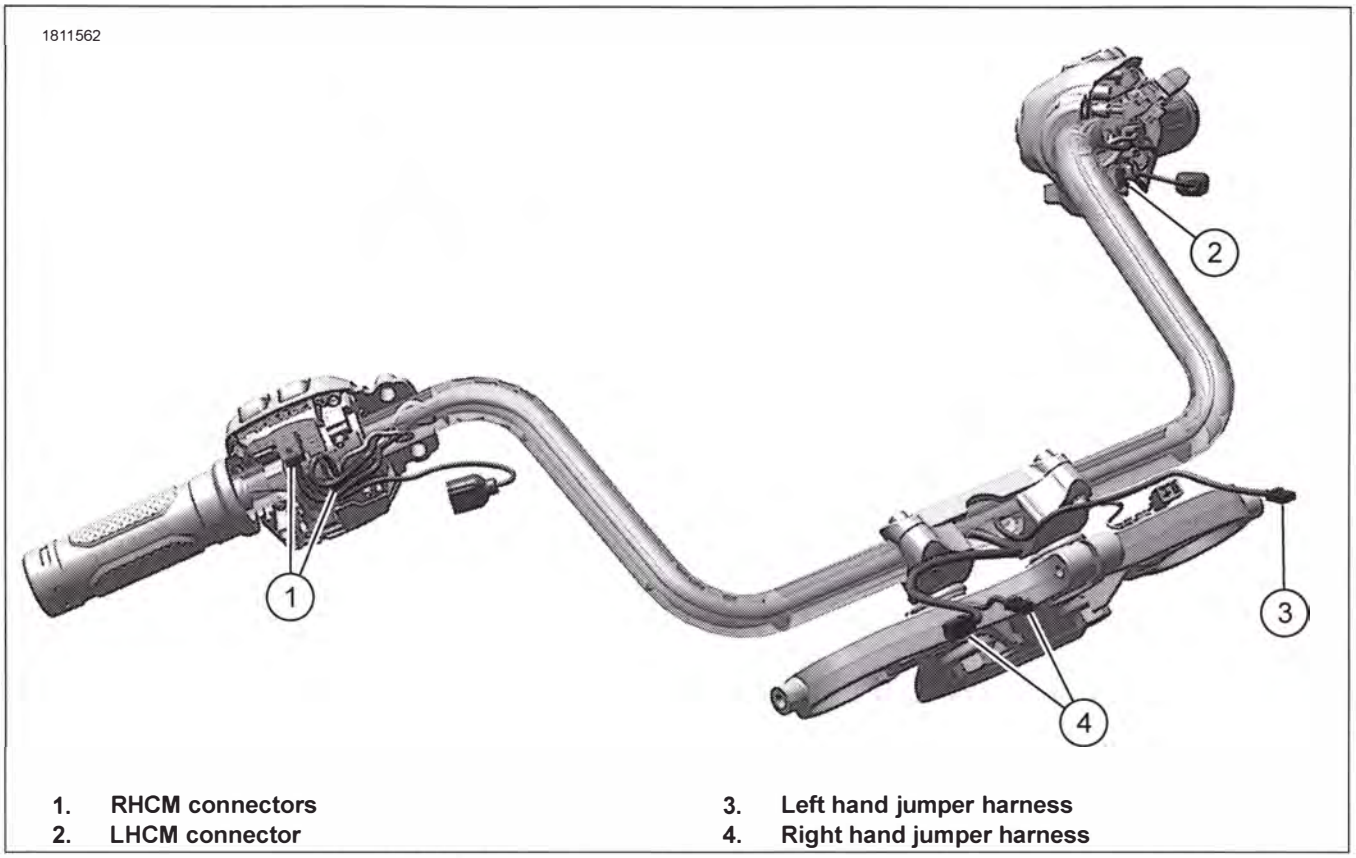
   a. Wrap chaser wire and harness tightly with electrical tape.

   b. Lubricate wires with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.

2. Carefully feed harnesses into handlebar with one hand while pulling other end of chaser wire.

3. Remove electrical tape when it is pulled through opening.

4. Connect RHCM connectors (1) and LHCM connector (2) if both harnesses were removed.



1. **RHCM connectors**
2. **LHCM connector**
3. **Left hand jumper harness**
4. **Right hand jumper harness**

Figure 3-160. Handlebar Jumper Harness (typical)

Complete

1. Install RHCM cover. See ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23).
2. Install front master cylinder bracket. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).
3. Install LHCM cover. See ELECTRICAL > LEFT HAND CONTROL MODULE (LHCM) (Page 8-19).
4. Install clutch hand control bracket. See CHASSIS > CLUTCH CONTROL (Page 3-79).

DISASSEMBLE AND ASSEMBLE

FASTENER	TORQUE VALUE	
Brake line, front, master cylinder P-clamp	62–80 **in-lbs**	7–9 N·m
Clutch cable, P-clamp screw	62–80 **in-lbs**	7–9 N·m
Handlebar riser screws	30–40 ft-lbs	40.7–54.2 N·m
Handlebar, ground jump connector, screw	25–35 **in-lbs**	2.8–3.9 N·m

Disassemble

1. **Fork mounted fairing:** See Figure 3-154.
   a. Remove screw (3).
2. **Frame mounted fairing:** See Figure 3-158.
   a. Remove screws (8,13).
   b. Remove screw (9).
3. See Figure 3-161 or Figure 3-162. Remove riser(s).
   a. Remove screws (7).
   b. Remove riser(s) (2).
   c. Remove cup washers (3).
   d. Remove bushings (5).
   e. Remove spacers (4).

Assemble

1. See Figure 3-161 or Figure 3-162 Install riser(s).
   a. Install lower bushings (5) until flush onto upper fork stem bracket (6).
   b. Install upper bushings (5).

NOTE

When fully seated a gap will be present on upper bushings.

   c. Lubricate spacers (4) with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.
   d. Install spacers until flush with upper bushings.
   e. Install cup washers (3).
   f. Install screws (7).

g. Install riser(s) (2).

h. Tighten screws (7).

Torque: 30–40 ft-lbs (40.7–54.2 N·m) *Handlebar riser screws*

2. See Figure 3-154. **Frame mounted fairing:**

a. Install ground jump connector (4) and screw (3). Tighten.

Torque: 25–35 **in-lbs** (2.8–3.9 N·m) *Handlebar, ground jump connector, screw*

3. See Figure 3-158. **Frame mounted fairing:**

a. Install ground jump connector (10) and screw (9). Tighten.

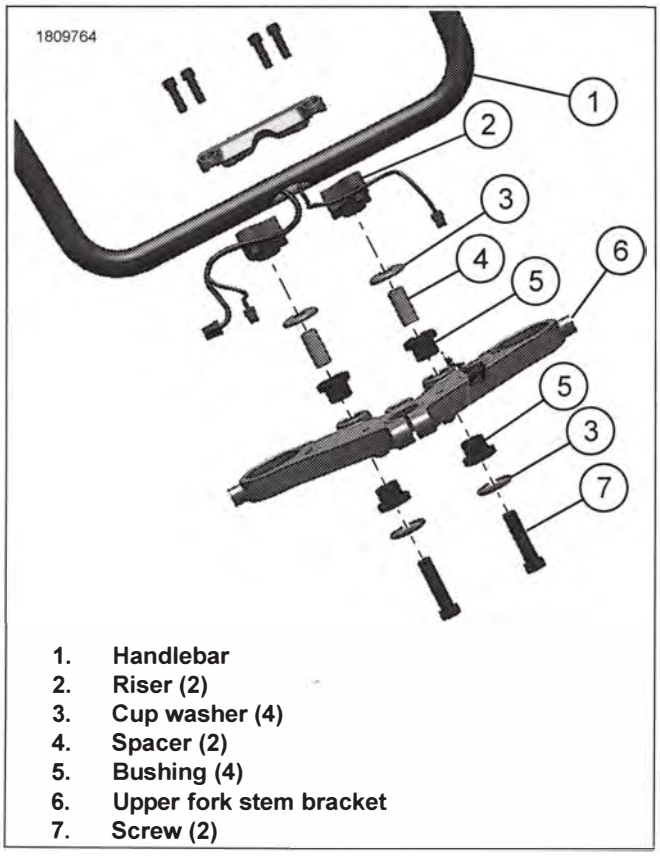
Torque: 25–35 **in-lbs** (2.8–3.9 N·m) *Handlebar, ground jump connector, screw*

b. Install clutch cable P-clamp (7) and screw (8). Tighten.

Torque: 62–80 **in-lbs** (7–9 N·m) *Clutch cable, P-clamp screw*

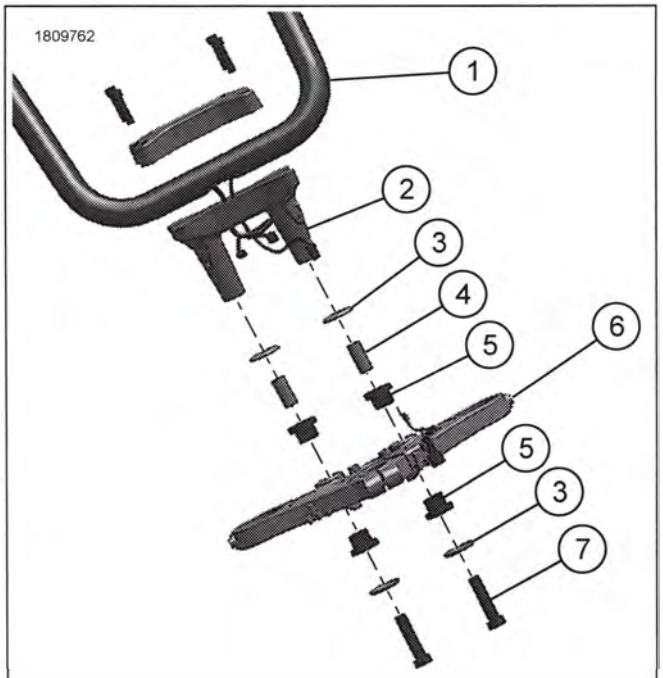
c. Install brake cable P-clamp (12) and screw (13). Tighten.

Torque: 62–80 **in-lbs** (7–9 N·m) *Brake line, front, master cylinder P-clamp*



1. **Handlebar**
2. **Riser (2)**
3. **Cup washer (4)**
4. **Spacer (2)**
5. **Bushing (4)**
6. **Upper fork stem bracket**
7. **Screw (2)**

Figure 3-161. Fork Mounted Fairing Handlebar Risers



1. **Handlebar**
2. **Riser**
3. **Cup washer (4)**
4. **Spacer (2)**
5. **Bushing (4)**
6. **Upper fork stem bracket**
7. **Screw (2)**

Figure 3-162. Frame Mounted Fairing Handlebar Riser

COMPLETE

1. Install master cylinder/brake lever assembly. See CHASSIS > FRONT BRAKE MASTER CYLINDER (Page 3-29).

2. Install clutch hand control bracket assembly. See CHASSIS > CLUTCH CONTROL (Page 3-79).

3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

5. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE

NOTE

For replacing the mirrors on a fork mounted fairing, see FAIRING: FORK MOUNTED > REMOVE AND INSTALL: MIRRORS (Page 3-90).

1. See Figure 3-163. Remove acorn nut (3) and lockwasher (2).

2. Remove mirror (3). and washer (5).

INSTALL

FASTENER	TORQUE VALUE	
Mirror stem acorn nut	10–12 ft-lbs	14–16 N·m

NOTE

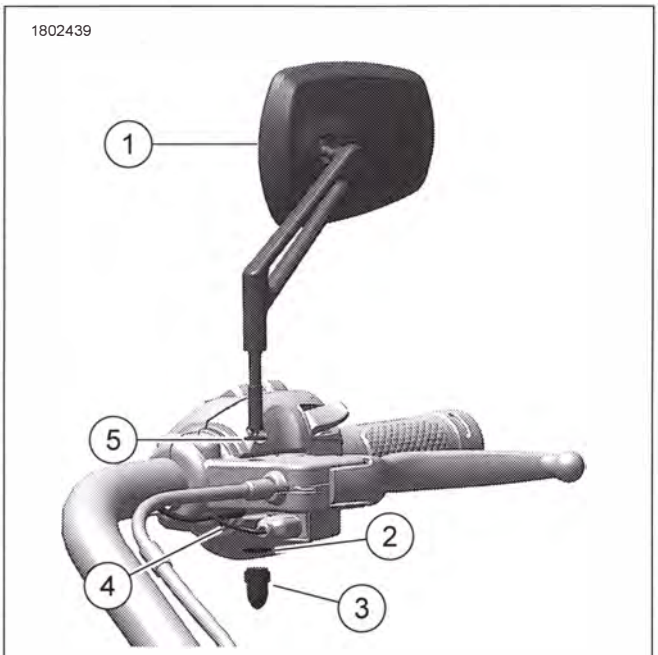
Do not damage clutch wire (4) when installing mirror.

1. Insert threaded stem of mirror (1) with washer (5) into hole in clutch or brake lever bracket.

2. Install lockwasher (2) and acorn nut (3).

3. Adjust mirror as necessary and tighten acorn nut.

   Torque: 10–12 ft-lbs (14–16 N·m) *Mirror stem acorn nut*



1. **Mirror**
2. **Lockwasher**
3. **Acorn nut**
4. **Clutch wire**
5. **Washer**

Figure 3-163. Mirror Assembly (typical)

REMOVE

1. See Figure 3-164. Remove screws (1). Remove fender (2).

INSTALL

FASTENER	TORQUE VALUE	
Front fender mounting screw	16–20 ft-lbs	21.7–27.1 N·m

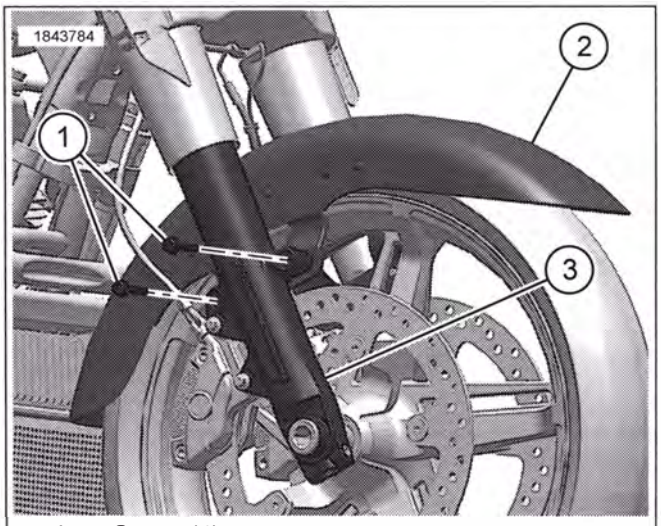
CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

NOTE

- *The contact area of the fork and fender mounting surfaces must be free from any paint or foreign substance. It must be metal-to-metal contact. Paint or debris in this area can result in loosening of fastener torque.*
- *If reusing the screws, apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97) to properly cleaned screws.*
- *If fender is being installed as part of a fork or wheel installation, tighten fender screws after all other components are installed.*
- *If fender appears twisted or misaligned, loosen screws and retighten.*

1. See Figure 3-164. Install fender (2) on fork sliders (3). Start screws (1). Tighten.

   Torque: 16–20 ft-lbs (21.7–27.1 N·m) *Front fender mounting screw*



1. **Screw (4)**
2. **Fender**
3. **Fork slider**

Figure 3-164. Front Fender Removal/Installation

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove saddlebag supports and support castings. See CHASSIS > SADDLEBAG SUPPORTS (Page 3-150).

REMOVE

1. See Figure 3-165. Disconnect rear lights connector at front of rear fender. Release connector from fender.

NOTE

Fender drops when screws are removed. Support fender while removing screws to avoid damaging paint.

2. See Figure 3-166. Remove fender mounting screws.
3. Carefully roll fender back and out of frame.

INSTALL

FASTENER	TORQUE VALUE	
Rear fender mounting screw	16–20 ft-lbs	21.7–27.1 N·m

1. Carefully install fender into frame.
2. See Figure 3-166. Install screws. Tighten.

   Torque: 16–20 ft-lbs (21.7–27.1 N·m) *Rear fender mounting screw*
3. See Figure 3-165. Connect rear lights connector at front of rear fender. Attach connector to fender.

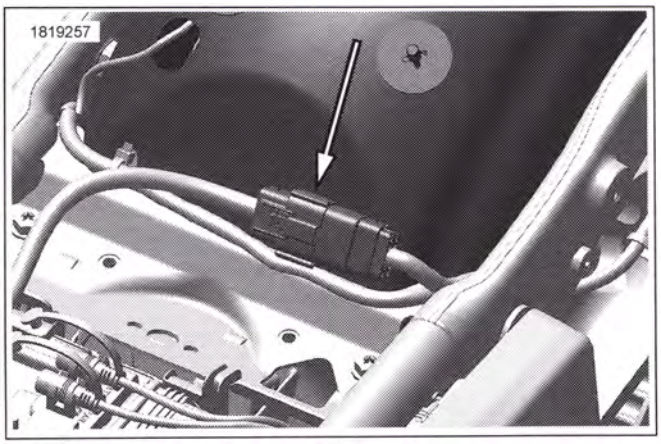


Figure 3-165. Rear Fender Lights Connector

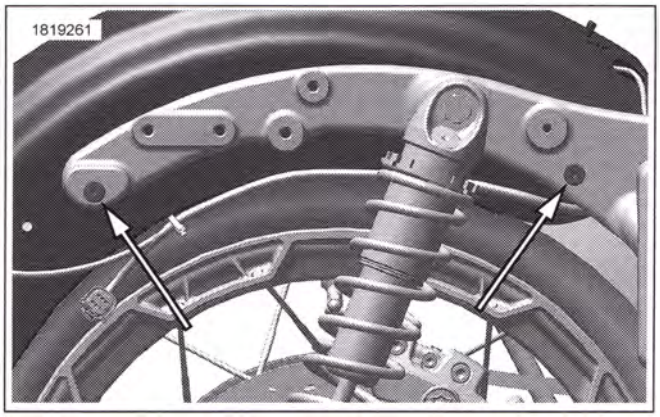


Figure 3-166. Rear Fender Mounting Screws

DISASSEMBLE

1. Remove tail/turn lamp assemblies. See ELECTRICAL > TAIL LAMP (Page 8-39).
2. Remove license plate bracket assembly. See CHASSIS > REAR LICENSE PLATE BRACKET (Page 3-131).
3. See Figure 3-167. Remove nuts (2), washers (3) and mounting bosses (8).
4. Remove nylon retaining washers (6) and stud plate (7).
5. Remove rear fender wire harness.
   a. Remove wire terminals from harness connectors. See electrical diagnostic manual.
   b. Remove wire harness from conduit.
6. See Figure 3-168. Remove fender support bracket.
   a. Remove nut (5) and washer (4).
   b. Remove fender support bracket (3).
   c. Remove rubber spacers (6) if necessary.
7. Remove tail lamp stud plates (2) if necessary.

ASSEMBLE

FASTENER	TORQUE VALUE	
Rear fender mounting nut	16–20 ft-lbs	21.7–27.1 N·m
Rear fender, support bracket, nut	44–89 **in-lbs**	5–10 N·m

1. See Figure 3-168. Install tail lamp stud plates (2) if removed.
2. Install fender support bracket.
   a. Install rubber spacers (6) if removed.
   b. Install fender support bracket (3).

c. Install washer (4).

d. Install nut (5). Tighten.

Torque: 44–89 **in-lbs** (5–10 N·m) *Rear fender, support bracket, nut*

3. If necessary, replace wire conduit. See CHASSIS > REAR FENDER WIRE CONDUIT (Page 3-129).

4. Install rear fender wire harness.

a. Install wire harness into conduit.

b. Install wire terminals into harness connectors. See the electrical diagnostic manual.

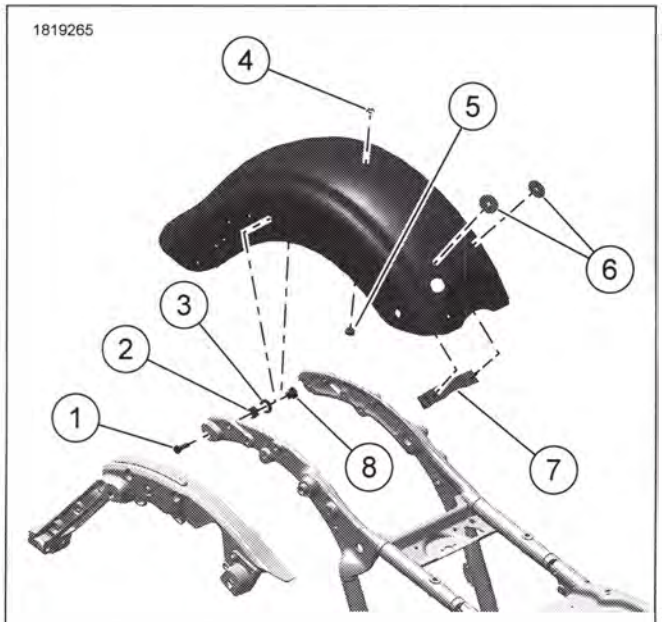
5. See Figure 3-167. Install stud plate (7). Secure with nylon retaining washers (6).

6. Install mounting bosses (8), washers (3) and nuts (2). Tighten nuts.

Torque: 16–20 ft-lbs (21.7–27.1 N·m) *Rear fender mounting nut*

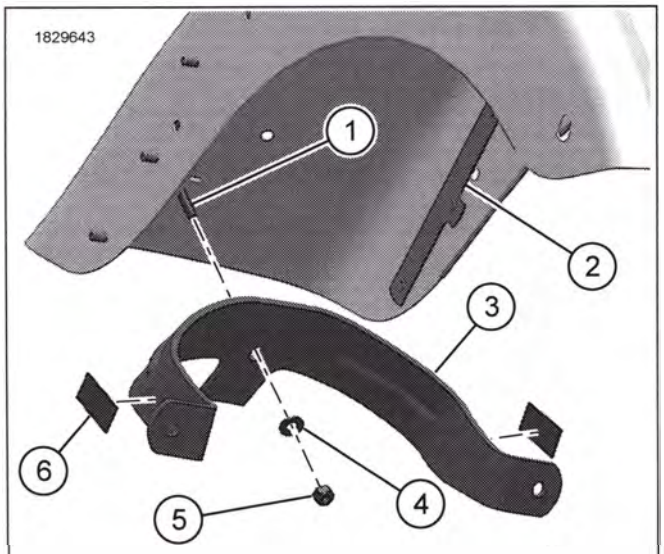
7. Install license plate bracket assembly. See CHASSIS > REAR LICENSE PLATE BRACKET (Page 3-131).

8. Install tail/turn lamp assemblies. See ELECTRICAL > TAIL LAMP (Page 8-39).



1. **Screw, fender to rear frame (4)**
2. **Nut (4)**
3. **Washer (4)**
4. **Retaining ring**
5. **Seat retention nut**
6. **Nylon retaining washer (2)**
7. **Stud plate**
8. **Mounting boss (4)**

Figure 3-167. Rear Fender Assembly



1. **Stud**
2. **Tail lamp stud plate (2)**
3. **Fender support bracket**
4. **Washer**
5. **Nut**
6. **Rubber spacer (2)**

Figure 3-168. Rear Fender Support Bracket

COMPLETE

1. Install saddlebag supports and support castings. See CHASSIS > SADDLEBAG SUPPORTS (Page 3-150).

2. Install seat. See CHASSIS > SEAT (Page 3-139).

3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

5. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

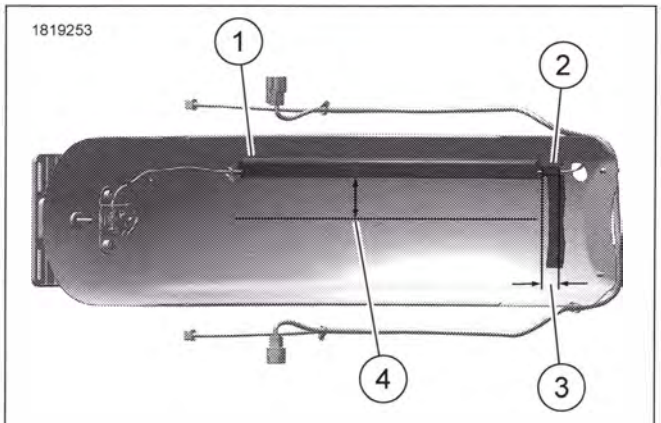
1. Remove rear fender. See CHASSIS > REAR FENDER (Page 3-127)..
2. Remove rear fender wire harness. See electrical diagnostic manual.
   a. Remove wire terminals from harness connectors.
   b. Remove wire harness from conduit.

REMOVE

1. See Figure 3-169. Remove wire conduit (1).
   a. Pull conduit from fender.
   b. Thoroughly clean inside surface of fender with soap and water until it is free of dirt, oil or other debris. Dry thoroughly.

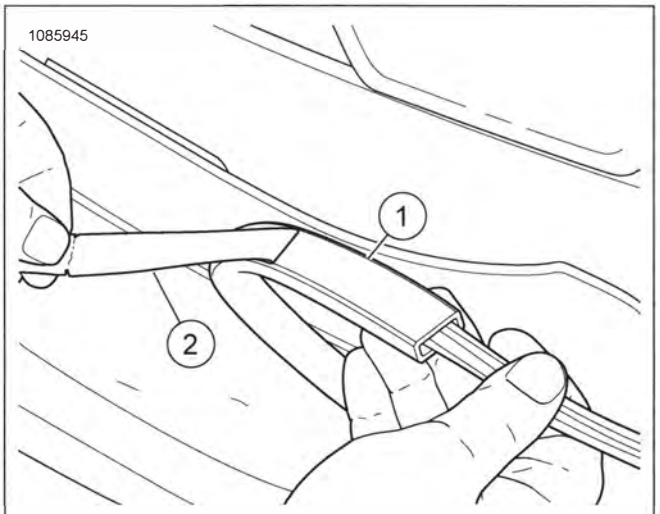
INSTALL

1. Install wiring conduit.
   a. Clean mounting surface. See CHASSIS > MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-153).
   b. See Figure 3-169. With adhesive backing still in place, test fit conduit (1), observing distances from stud plate (2) and fender centerline (4).
   c. See Figure 3-170. Remove adhesive backing (2) from conduit (1).
   d. Lightly position conduit in place.
   e. See Figure 3-171. Using a wallpaper roller, (4), roll along conduit (3) to purge air from between adhesive and fender.



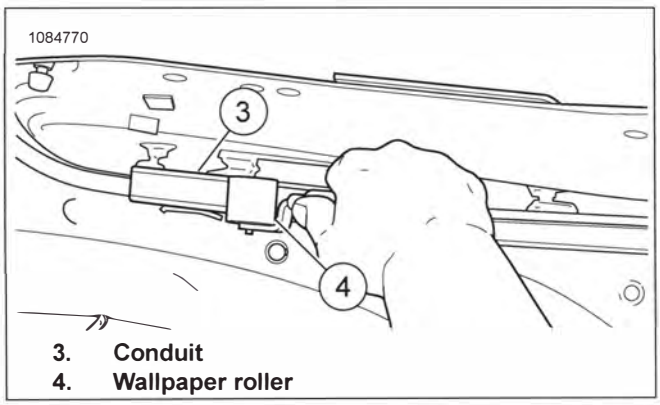
1. **Wire conduit**
2. **Stud plate**
3. **Distance 0.5 in (12.7 mm)**
4. **Distance 1.9 in (47.6 mm)**

Figure 3-169. Fender Conduit Placement



1. **Conduit**
2. **Adhesive backing**

Figure 3-170. Removing Protective Strip from Conduit



3. **Conduit**
4. **Wallpaper roller**

Figure 3-171. Purging Air Between Adhesive and Fender

COMPLETE

1. Install wiring harness.
   a. Slide wiring harness through new conduit.

b. Install wire terminals into connector housings. See the electrical diagnostic manual.

2. Install connectors to proper component and install rear fender. See CHASSIS > REAR FENDER (Page 3-127)

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove customer's license plate (if installed).

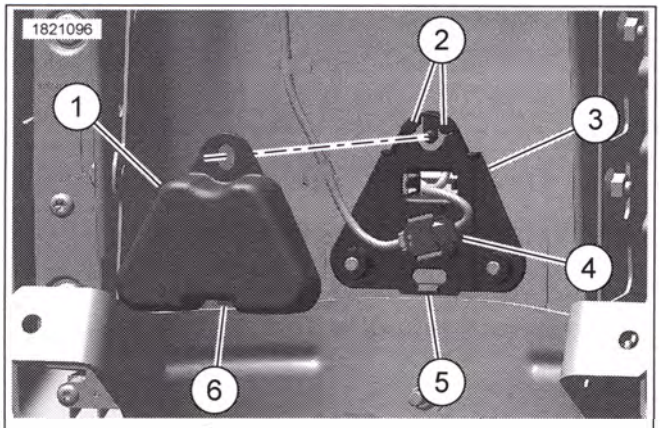
REMOVE

1. See Figure 3-172. On underside of rear fender, remove connector cover (1).
   a. Push up on bottom of connector cover to disengage cover tab (6) from latch (5).
   b. Disengage top of connector cover from mounting bracket tabs (2).
2. Disconnect license plate lamp connector (4). Release connector from LPM mounting bracket (3).
3. See Figure 3-173. Remove license plate reflector bracket (5).
4. Remove screws (4) and washers (3).
5. Remove LPM (6) and gasket (2).
6. Squeeze tabs together and remove LPM mounting bracket (1).

INSTALL

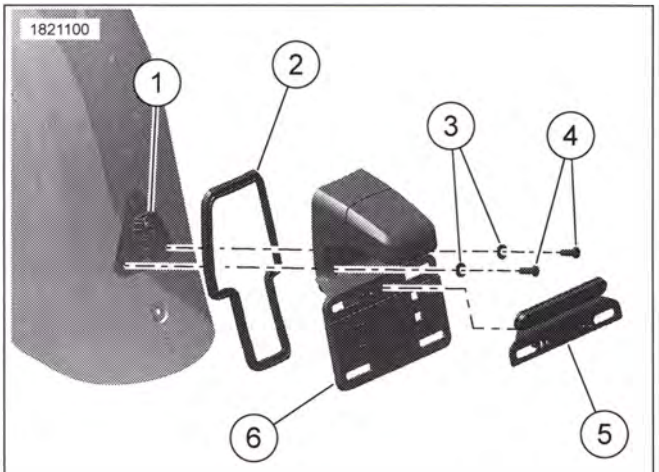
FASTENER	TORQUE VALUE	
License plate module mounting screw	60–80 **in-lbs**	6.8–9 N·m

1. See Figure 3-173. Install LPM mounting bracket (1) from inside of fender. Make sure bracket tabs snap in position and engage fender hole.
2. Holding gasket (2) in position on fender, install LPM (6). Secure with washers (3) and screws (4). Tighten.
   Torque: 60–80 **in-lbs** (6.8–9 N·m) *License plate module mounting screw*
3. See Figure 3-172. Connect license plate lamp connector (4). Attach connector to LPM mounting bracket (3).
4. Install connector cover (1).
   a. Push top of connector cover under mounting bracket tabs (2).
   b. Press bottom of cover until cover tab snaps into mounting bracket latch (5).
5. See Figure 3-174. Line up retention tabs (2) on license plate reflector bracket with holes in LPM (3). Press reflector bracket onto LPM.



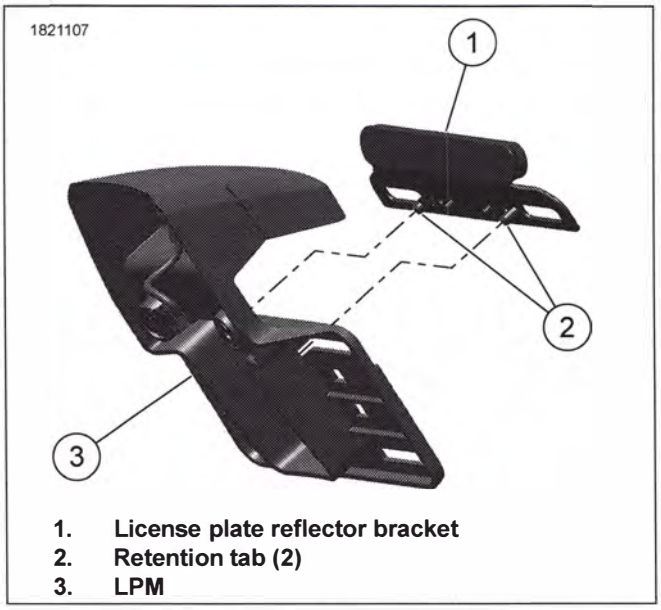
1. **Connector cover**
2. **Mounting bracket tabs**
3. **LPM mounting bracket**
4. **Connector**
5. **Latch**
6. **Cover tab**

Figure 3-172. Removing Connector Cover from License Plate Module (LPM)



1. **LPM mounting bracket**
2. **Gasket**
3. **Washer (2)**
4. **Screw (2)**
5. **License plate reflector bracket**
6. **LPM**

Figure 3-173. License Plate Module (LPM) Assembly



1. **License plate reflector bracket**
2. **Retention tab (2)**
3. **LPM**

Figure 3-174. License Plate Reflector Bracket Retention Feature

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Test license plate lamp function.
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
5. Install customer's license plate (if removed).

PREPARE

NOTICE

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

1. Set motorcycle upright on a suitable lift. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).

REMOVE

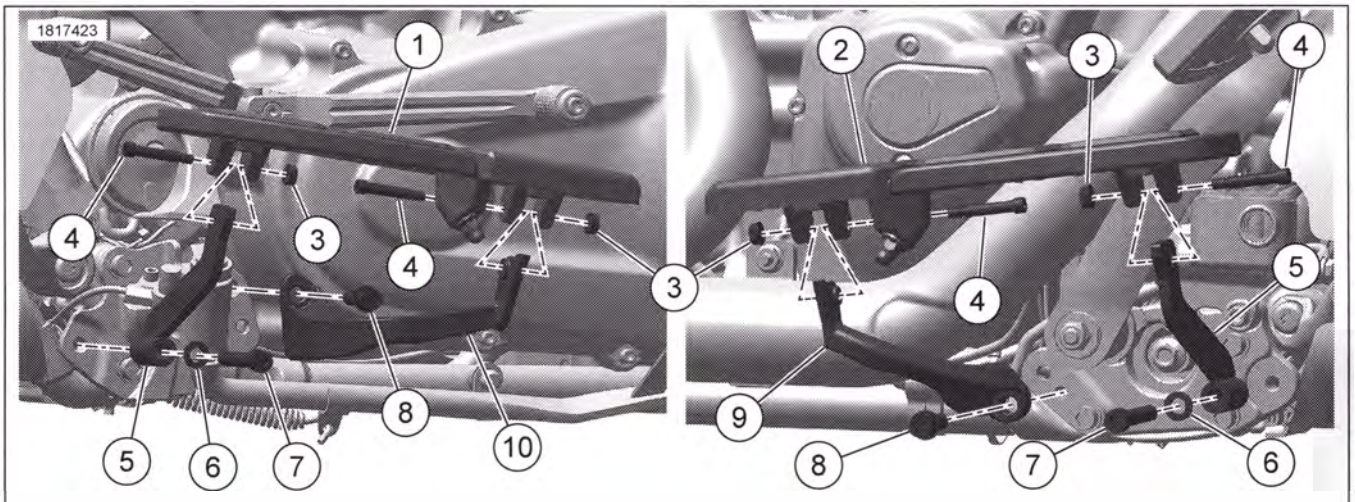
1. See Figure 3-175. Remove short socket head screw (8).
2. Remove long socket head screw (7) and lockwasher (6).
3. Remove footboard and support bracket assembly.

INSTALL

FASTENER	TORQUE VALUE	
Footboard support bracket screws	36–42 ft-lbs	49–57 N·m

1. See Figure 3-175. Install footboard and support bracket assembly.
2. Install short socket head screw (8), long socket head screw (7) and lockwasher (6). Tighten.

   Torque: 36–42 ft-lbs (49–57 N·m) *Footboard support bracket screws*



1. **Footboard, left**
2. **Footboard, right**
3. **Flange locking nut (2)**
4. **Shoulder screw (2)**
5. **Forward support bracket**
6. **Lockwasher**
7. **Socket head screw, long**
8. **Socket head screw, short**
9. **Rear support bracket, right**
10. **Rear support bracket, left**

Figure 3-175. Rider Footboards (typical) (quantities shown are for each footboard)

DISASSEMBLE

1. See Figure 3-175. Remove flange locking nuts (3) and shoulder screws (4) from underside of footboard (1, 2).
2. Remove support brackets from footboard.

ASSEMBLE

FASTENER	TORQUE VALUE	
Footboard mounting screws	60–80 **in-lbs**	6.8–9 N·m

NOTE

See Figure 3-175. Left and right forward support brackets (5) are identical. Left (10) and right (9) rear support brackets are different.

1. See Figure 3-175. Install support brackets onto footboard (1, 2).
2. Install shoulder screws (4) and flange locking nuts (3). Tighten.

   Torque: 60–80 **in-lbs** (6.8–9 N·m) *Footboard mounting screws*

COMPLETE

1. Remove motorcycle from lift. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).

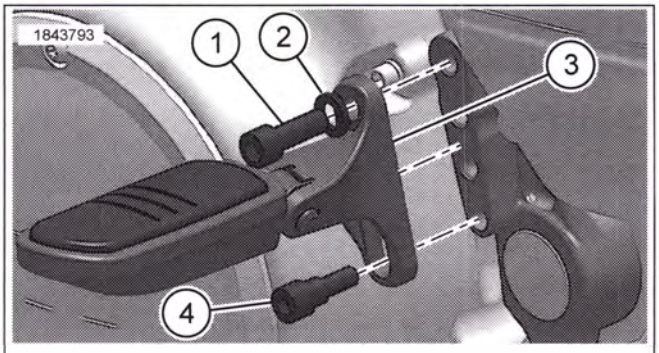
REMOVE

1. See Figure 3-176. Remove Footpeg.
   a. Remove shoulder screw (4).
   b. Remove screw (1) and lockwasher (2).
   c. Remove Footpeg (3).

INSTALL

FASTENER	TORQUE VALUE	
Footpeg lower shoulder screw, passenger	44–71 **in-lbs**	5–8 N·m
Footpeg upper screw, passenger	36–42 ft-lbs	49–57 N·m

1. See Figure 3-176. Install footpeg.
   a. Install footpeg (3), screw (1) and lockwasher (2). Do not tighten.
   b. Install shoulder screw (4). Tighten.
      Torque: 44–71 **in-lbs** (5–8 N·m) *Footpeg lower shoulder screw, passenger*
   c. Tighten screw (1).
      Torque: 36–42 ft-lbs (49–57 N·m) *Footpeg upper screw, passenger*



1. **Socket screw**
2. **Lockwasher**
3. **Footpeg**
4. **Shoulder screw**

Figure 3-176. Passenger Footpeg

DISASSEMBLE

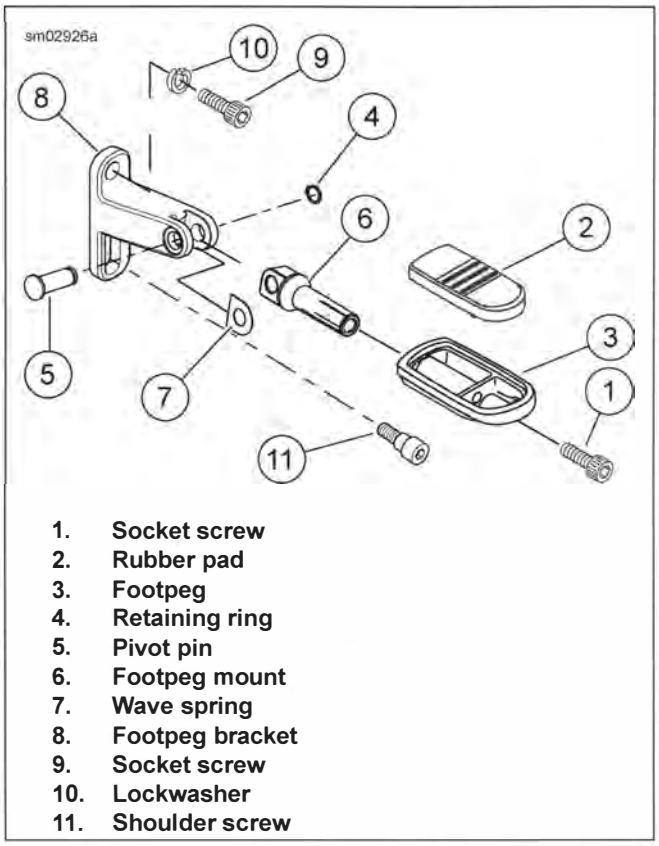
1. See Figure 3-177. Disassemble footpeg.
   a. Remove socket screw (1).
   b. Remove rubber pad (2).
   c. Remove footpeg (3).
2. Remove footpeg mount.
   a. Remove and dispose of retaining ring (4).
   b. Remove pivot pin (5).
   c. Remove footpeg mount (6) and wave spring (7).

ASSEMBLE

FASTENER	TORQUE VALUE	
Footpeg pad screw	15–20 ft-lbs	20.3–27.1 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

1. See Figure 3-177. Assemble footpeg.
   a. Position wave spring (7) with concave side against bracket (8).
   b. Install footpeg (3) as shown.
   c. Install pivot pin (5). Secure with **new** retaining ring (4).
   d. Install footpeg (3) onto footrest mount (6).
   e. Install rubber pad (2) into footpeg (3). Rotate footpeg so rubber pad is topside.
   f. Apply a drop of loctite to threads of socket screw (1) and install. Tighten
      Torque: 15–20 ft-lbs (20.3–27.1 N·m) *Footpeg pad screw*
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)



1. Socket screw
2. Rubber pad
3. Footpeg
4. Retaining ring
5. Pivot pin
6. Footpeg mount
7. Wave spring
8. Footpeg bracket
9. Socket screw
10. Lockwasher
11. Shoulder screw

Figure 3-177. Passenger Footpeg Assembly

PREPARE

NOTICE

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

1. Set motorcycle upright on a suitable lift. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).
2. Remove left side rider footrest and bracket assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

REMOVE

Jiffy Stand Sensor

1. See Figure 3-178. Remove jiffy stand sensor harness connector anchor (2) from frame bracket.
2. Unplug connector (3).
3. See Figure 3-179. Swing jiffy stand leg (8) outward to its fully extended position.
4. Remove screw (2) and jiffy stand sensor (11).

Jiffy Stand Leg

1. See Figure 3-179. Remove screw (3), washer (4) and leg stop (5).
2. Swing jiffy stand leg (8) outward past its normal extended stop position, to relieve tension on spring (10).
3. Disengage spring from tab (9) on jiffy stand leg. Note orientation of other end of spring on frame weldment. Remove spring.
4. Remove jiffy stand leg from jiffy stand bracket (6).
5. Inspect parts for wear or damage. Replace as necessary.

Jiffy Stand Bracket

1. Remove jiffy stand sensor. See Jiffy Stand Sensor above.
2. Remove jiffy stand leg. See Jiffy Stand Leg above.
3. See Figure 3-179. Remove screws (1) and jiffy stand bracket (6).

INSTALL

FASTENER	TORQUE VALUE	
Jiffy stand bracket screws	36–42 ft-lbs	49–57 N·m
Jiffy stand leg stop screw	15–20 ft-lbs	20.3–27.1 N·m
Jiffy stand sensor screw	97–124 **in-lbs**	11–14 N·m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

Jiffy Stand Bracket

1. See Figure 3-179. Place jiffy stand bracket (6) into position. Temporarily install left rider footrest rear fastener to align rear of jiffy stand bracket but do not tighten.
2. Secure front screws (1). Tighten.

   Torque: 36–42 ft-lbs (49–57 N·m) *Jiffy stand bracket screws*
3. Remove left rider footrest rear fastener.

Jiffy Stand Leg

1. Install jiffy stand bracket. See Jiffy Stand Bracket above.
2. See Figure 3-179. Apply lubricant to area of jiffy stand leg (8) that rotates within bracket (6).

   Consumable: ANTI-SEIZE LUBRICANT (98960-97)
3. Insert jiffy stand leg into jiffy stand bracket.
4. Swing jiffy stand leg outward past its normal extended stop position.
5. Install one end of spring (10) onto frame weldment making sure its orientation is as previously noted.
6. Install the other end of spring into tab (9) on jiffy stand leg.

NOTE

See Figure 3-180. Verify that end of spring enters jiffy stand tab hole from front of tab. If end of spring enters hole from rear of tab, spring coil will rub on leg when extended.

7. Hold jiffy stand leg in its normal extended stop position.

⚠ WARNING

If leg stop is incorrectly installed, excessive wear can allow vehicle to fall when rested on jiffy stand, which could result in death or serious injury. (00479b)

8. See Figure 3-181. Install leg stop (1). Verify that longer side of leg stop faces rear of motorcycle.
9. See Figure 3-179. Install washer (4) and screw (3). Tighten.

   Torque: 15–20 ft-lbs (20.3–27.1 N·m) *Jiffy stand leg stop screw*

10. Verify that jiffy stand leg swings freely to fully extended and retracted positions.

Jiffy Stand Sensor

1. Install jiffy stand bracket. See Jiffy Stand Bracket above.

2. Install jiffy stand leg. See Jiffy Stand Leg above.

3. Swing jiffy stand leg to its normal fully extended position.

4. See Figure 3-179. Install jiffy stand sensor (11). Secure with screw (2). Tighten.

   Torque: 97–124 **in-lbs** (11–14 N·m) *Jiffy stand sensor screw*

5. See Figure 3-178. Route sensor harness along underside of motorcycle as shown in the figure.

6. Connect sensor connector (3) and press connector anchor (2) into hole in frame bracket.

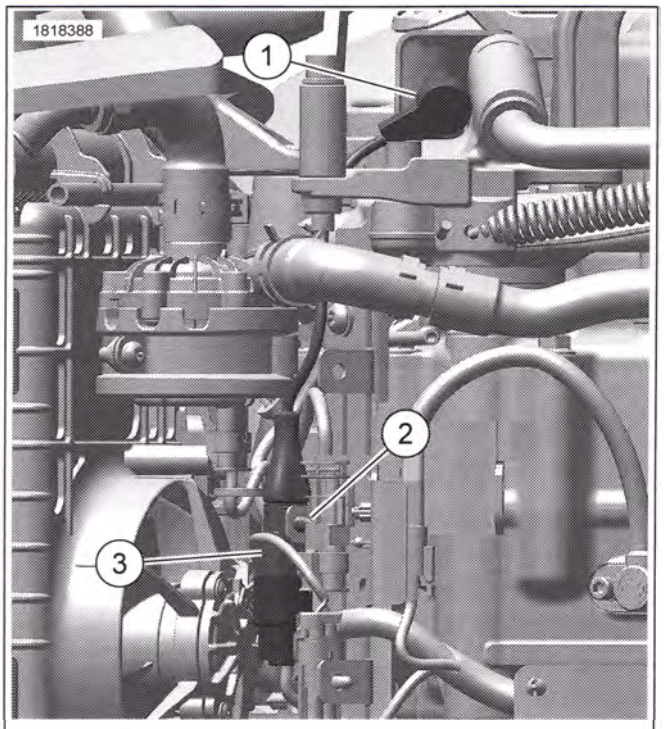
7. See Figure 3-179. Check gap between leg stop (5) and jiffy stand sensor (11) housing.

   a. Slowly swing jiffy stand to fully extended (down) position. Then slowly swing jiffy stand to fully retracted (up) position. Make sure leg stop does not contact sensor housing.

   b. Measure gap between top of sensor housing and underside of leg stop. Gap should be less than 0.18 in (4.6 mm). Adjust parts as necessary to attain proper gap.

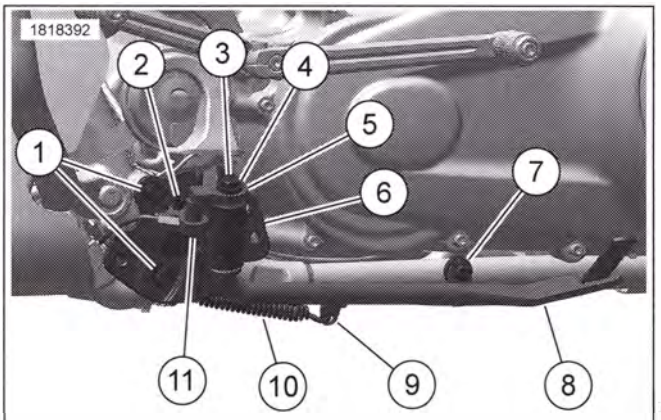
NOTE

See Figure 3-180. Verify that bumper is installed in weldment hole in jiffy stand leg to prevent damage to painted finish.



1. **Jiffy stand sensor**
2. **Connector anchor**
3. **Jiffy stand sensor connector**

Figure 3-178. Jiffy Stand Sensor Assembly (viewed from bottom of motorcycle)



1. **Screw (2)**
2. **Screw**
3. **Screw**
4. **Washer**
5. **Leg stop**
6. **Jiffy stand bracket**
7. **Bumper**
8. **Jiffy stand leg**
9. **Tab**
10. **Spring**
11. **Jiffy stand sensor**

Figure 3-179. Jiffy Stand Assembly

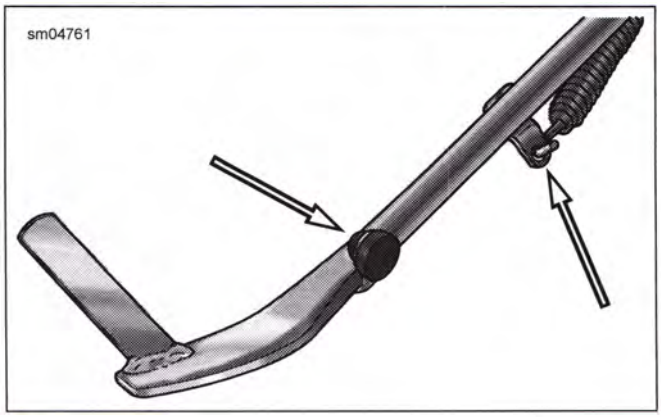
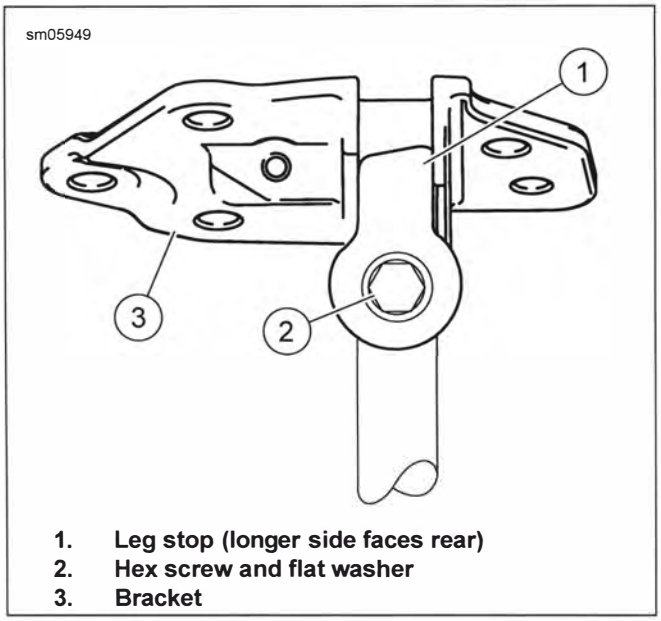


Figure 3-180. Bumper and Spring Orientation



1. **Leg stop (longer side faces rear)**
2. **Hex screw and flat washer**
3. **Bracket**

Figure 3-181. Leg Stop Orientation in Full Forward (Down) Position

COMPLETE

1. Install left side rider footrest assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

2. Remove motorcycle from lift. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).

3. Test jiffy stand sensor operation. See the electrical diagnostic manual.

REMOVE

Remove Seat

1. Open either saddlebag.
2. See Figure 3-182. Remove strap.
   a. Remove screw (5).
   b. Remove strap (2) from strap opening (4).
3. Remove seat.
   a. Remove seat screw (3).
   b. Raise rear of seat (1).
   c. Pull seat rearward.
   d. Remove seat.

Seat Retention Nut

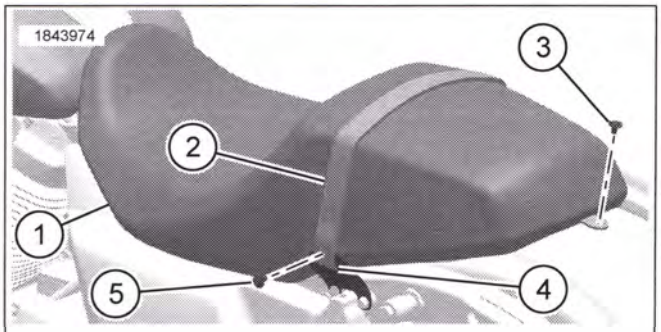
1. See Figure 3-184. Remove seat retention nut.
   a. Remove retention washer (4).
   b. Remove retention nut (2).

INSTALL

FASTENER	TORQUE VALUE	
Seat, two-up one-piece, seat screw	44–71 **in-lbs**	5–8 N·m
Seat, two-up one-piece, strap screw	44–71 **in-lbs**	5–8 N·m

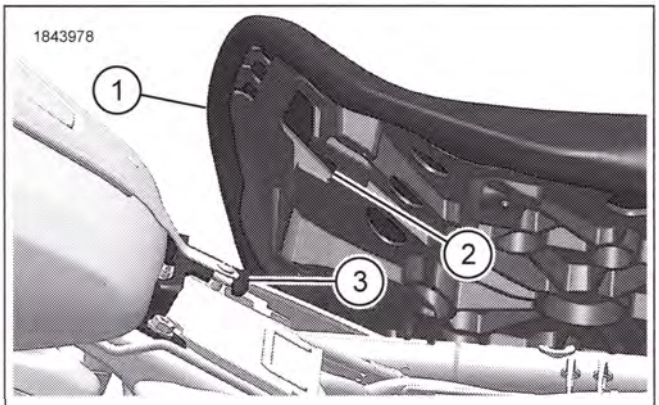
Install Seat

1. Install seat.
   a. See Figure 3-183. Align seat mounting slot (2) with seat tongue (3).
   b. Slide seat (1) downward and forward.
   c. See Figure 3-182. Install seat screw (3). Tighten.
      Torque: 44–71 **in-lbs** (5–8 N·m) *Seat, two-up one-piece, seat screw*
2. Install strap.
   a. Tuck strap (2) into strap opening (4).
   b. Install strap screw (5). Tighten.
      Torque: 44–71 **in-lbs** (5–8 N·m) *Seat, two-up one-piece, strap screw*
3. Pull up on seat to verify that it is secure.
4. Close saddlebag.



1. **Seat**
2. **Strap**
3. **Seat screw**
4. **Strap opening**
5. **Strap screw**

Figure 3-182. Two-Up One-Piece Seat

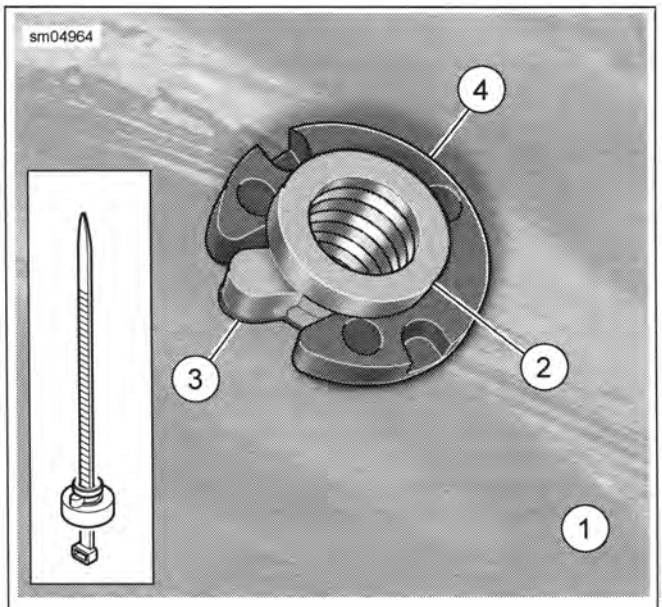


1. **Seat**
2. **Seat mounting slot**
3. **Seat tongue**

Figure 3-183. Seat Tongue

Seat Retention Nut

1. See Figure 3-184. Install seat retention nut.
   a. Slide **new** retention nut (2) onto cable strap.
   b. Insert into fender hole and hold with cable strap
   c. Align tab (3) on retention nut and hold nut snug against underside of rear fender.
   d. Align and install retention washer (4).
   e. Remove cable strap.



1. Rear fender
2. Retention nut
3. Tab
4. Retention washer

Figure 3-184. Install Seat Retention Nut

PREPARE

NOTICE

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

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
5. Raise rear of motorcycle.
6. Remove seat. See CHASSIS > SEAT (Page 3-139).
7. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
8. Remove BCM. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
9. Remove battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
10. *NOTE*

Record cable strap locations for assembly.

Cut cable straps securing harnesses to rear frame. Move harnesses aside.

11. Remove saddlebag supports and inserts. See CHASSIS > SADDLEBAG SUPPORTS (Page 3-150).
12. Remove rear fender. See CHASSIS > REAR FENDER (Page 3-127).
13. Remove shock absorbers. See CHASSIS > REAR SHOCK ABSORBERS (Page 3-77).
14. Remove two rear battery tray fasteners. See ELECTRICAL > BATTERY TRAY (Page 8-88).
15. Remove left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).

REMOVE

1. See Figure 3-185. Remove rear frame.
   a. Remove screws (2) and washers (3).
   b. Remove rear frame (1).

Thread Repair

NOTE

- *Never re-tap threaded holes in rear frame to repair damaged threads. Always use the following procedure to provide repair.*
- *If more than one threaded hole is damaged on a given side, or if a thread repair has previously been done, replace rear frame. Never repair more than one hole per side.*

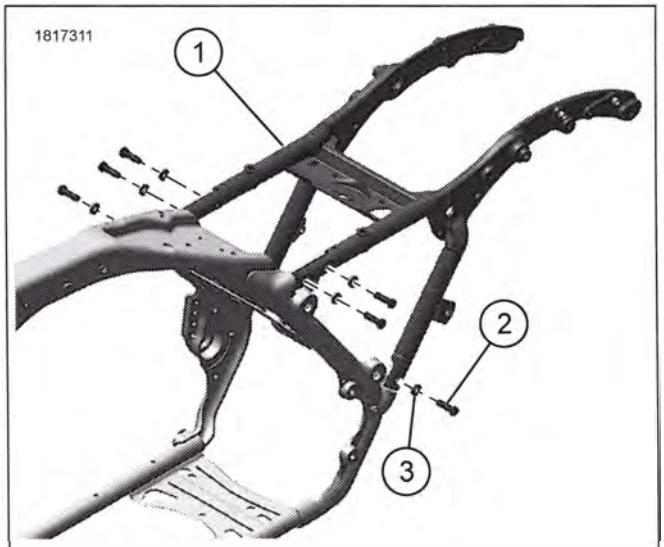
1. Repair thread.
   a. Remove damaged screw.
   b. Drill out damaged threads.
   c. Install appropriate size thread repair insert.
   d. Install **new** screw with **hardened** washer. Tighten to specified torque.

INSTALL

FASTENER	TORQUE VALUE	
Rear frame to main frame screws	40–45 ft-lbs	54–61 N·m

1. See Figure 3-185. Install rear frame.
   a. Hold rear frame in position.
   b. Install **hardened** washers (3) and screws (2).
   c. See Figure 3-186. Tighten screws in sequence.

   Torque: 40–45 ft-lbs (54–61 N·m) *Rear frame to main frame screws*



1. **Rear frame**
2. **Screw (6)**
3. **Hardened washer (6)**

Figure 3-185.

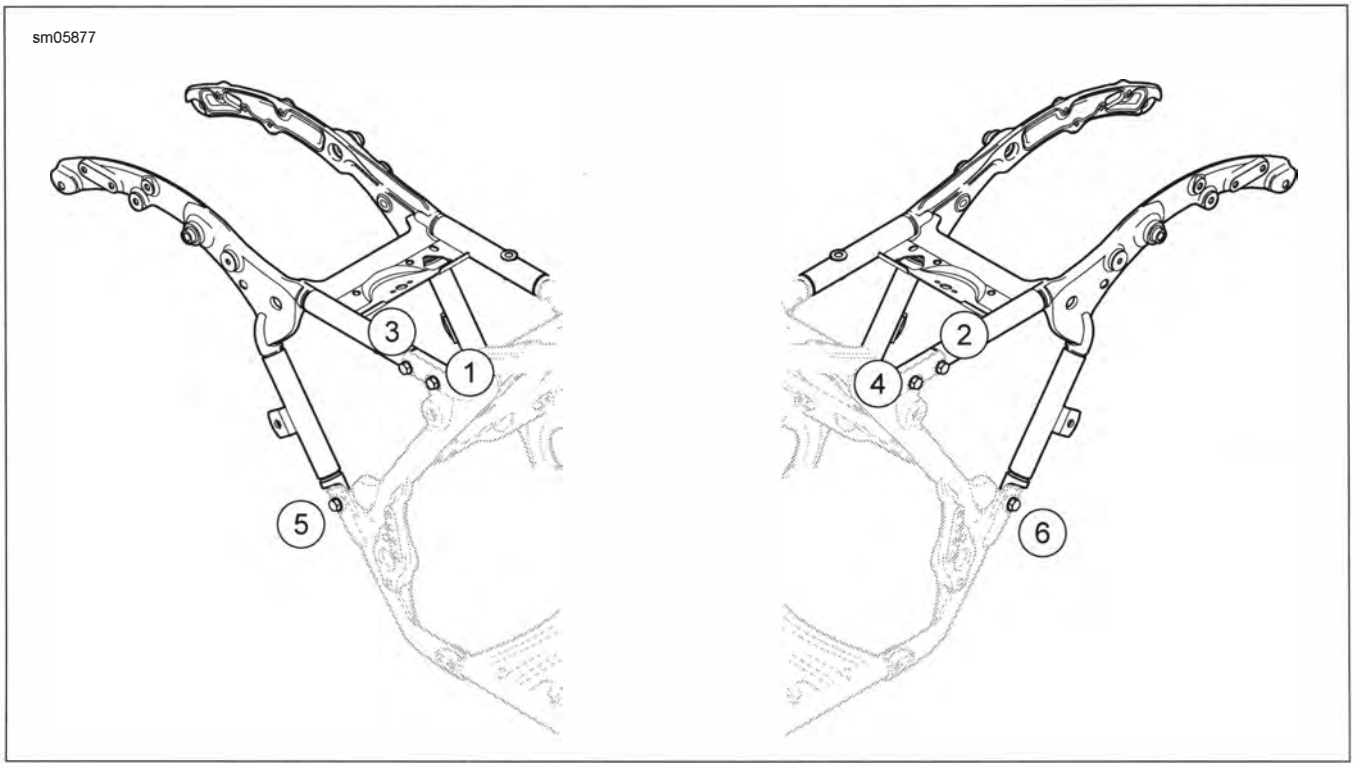


Figure 3-186. Rear Frame Torque Sequence

COMPLETE

1. Install left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).
2. Secure upper battery tray to rear frame. See ELECTRICAL > BATTERY TRAY (Page 8-88).
3. Install shock absorbers. See CHASSIS > REAR SHOCK ABSORBERS (Page 3-77).
4. Install rear fender. See CHASSIS > REAR FENDER (Page 3-127).
5. Install saddlebag supports and inserts. See CHASSIS > SADDLEBAG SUPPORTS (Page 3-150).
6. Install battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
7. Install BCM. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
8. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
9. *NOTE*

Locate straps as noted during disassembly.

Secure harnesses to rear frame with **new** cable straps.

10. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).

11. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

12. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

13. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

14. Lower motorcycle.

REMOVE

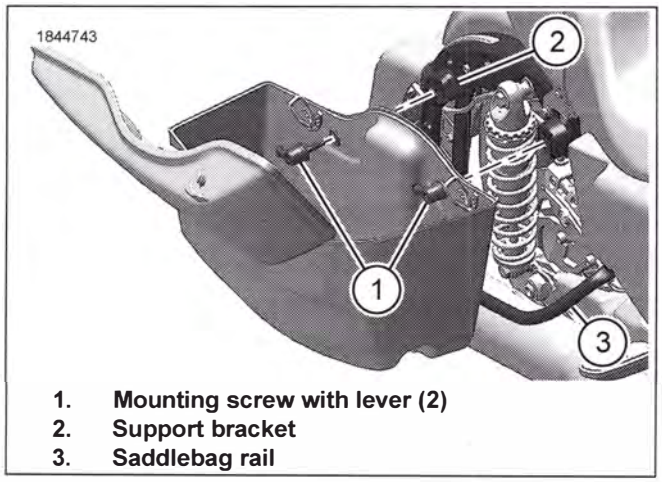
1. Open saddlebag.
2. See Figure 3-187. Remove saddlebag.
   a. Turn the mounting screw levers (1) counterclockwise.
   b. Support saddlebag.
3. Lift saddlebag from saddlebag rail.

NOTE

Do not drag or scrape saddlebags on ground. Improper care can damage saddlebags.

INSTALL

1. See Figure 3-187. Place saddlebag in position on saddlebag rail (3).
2. Align mounting grommets with support bracket (2).
3. Install saddlebag.
   a. Install mounting screws (1) through grommets into support bracket (2).
   b. Turn levers clockwise until secure.
   c. Levers should point between 3 o'clock and 9 o'clock positions as shown.
4. Verify saddlebag is secure.



1. **Mounting screw with lever (2)**
2. **Support bracket**
3. **Saddlebag rail**

Figure 3-187. Saddlebag Removal/Installation

DISASSEMBLE

NOTE

- *Saddlebag can remain installed when servicing most of the following components.*
- *When removing screws from cover, support cover.*

Lock

1. See Figure 3-188. Remove lock.
   a. Remove nut (3).
   b. Remove cable assembly cam (6).
   c. Remove screws (2).
   d. Remove lock (1).

Face Plate

1. See Figure 3-188. Remove face plate.
   a. Remove face plate screws (4).
   b. Remove face plate (5).

Strikes

1. Remove saddlebag. See SADDLEBAGS > REMOVE (Page 3-144).
2. See Figure 3-191. Remove strikes.
   a. Remove screws (9).
   b. Remove strike (8).

Tether

1. See Figure 3-191. Remove tether.
   a. Support cover.
   b. Remove screws (1,10).
   c. Remove tether (2).

Cover

1. See Figure 3-191. Remove tether screws (1).
2. Remove face plate.
   a. Remove face plate screws (7).
   b. Remove face plate.
3. Remove cover.
   a. Remove latch assembly screws (5).
   b. Remove cover (4).

Cover Seal

1. See Figure 3-189. Remove seal.
   a. Remove old seal (4). Discard if cut or worn.
   b. Remove all residual adhesive using 3M GENERAL PURPOSE ADHESIVE REMOVER.

Hinge

1. See Figure 3-191. Remove tether screws (1).
2. Remove cover and hinge as an assembly.
   a. Remove saddlebag hinge screws (3).
   b. Remove cover (4).
3. Remove hinge.
   a. Remove face plate screws (7).
   b. Remove face plate.
   c. Remove latch assembly screws (5).
   d. Remove hinge (6).

Lever

1. See Figure 3-189. Remove lever.
   a. Remove screw (1).
   b. Remove lever (2).
   c. Remove Grommet (3) if necessary. Discard if damaged or worn.

Cushions

1. See Figure 3-192. Remove cushions and check for damage.

ASSEMBLE

FASTENER	TORQUE VALUE	
Saddlebag hinge screws	20--30 **in-lbs**	2.26–3.39 N·m
Saddlebag, face plate, screws	12–15 **in-lbs**	1.41–1.75 N·m
Saddlebag, latch assembly, screws	30–35 **in-lbs**	3.4–4 N·m
Saddlebag, lever, screw	50--60 **in-lbs**	5.65–6.78 N·m
Saddlebag, lock, nut	25–35 **in-lbs**	2.82–3.95 N·m
Saddlebag, lock, screws	20--30 **in-lbs**	2.26–3.39 N·m
Saddlebag, strike, screws	20–30 **in-lbs**	2.26–3.39 N·m
Saddlebag, tether, screws	20–30 **in-lbs**	2.26–3.39 N·m

Lock

1. See Figure 3-188. Install lock.
   a. Install lock (1).
   b. Install screws (2). Tighten.
      Torque: 20–30 **in-lbs** (2.26–3.39 N·m) *Saddlebag, lock, screws*
   c. Install cable assembly cam (6).
   d. Install nut (3). Tighten.
      Torque: 25–35 **in-lbs** (2.82–3.95 N·m) *Saddlebag, lock, nut*

Strikes

1. See Figure 3-191. Install strike.
   a. Install strike (8).
   b. Install screws (9). Tighten.
      Torque: 20–30 **in-lbs** (2.26–3.39 N·m) *Saddlebag, strike, screws*

Cover

NOTE

*If installing a new cover, install **new** seal included. See procedure later in this section.*

1. See Figure 3-189. Install **new** seal (4) if discarded or install used seal if in good condition.
2. See Figure 3-191. Install cover.
   a. While holding cover (4) in place, install saddlebag hinge screws (3). Tighten.
      Torque: 20–30 **in-lbs** (2.26–3.39 N·m) *Saddlebag hinge screws*
   b. Install tether (2) and screws (1). Tighten.
      Torque: 20–30 **in-lbs** (2.26–3.39 N·m) *Saddlebag, tether, screws*

Cover Seal

NOTE

Do not touch cleaned area with fingers after cleaning.

1. See Figure 3-189. Clean seal mounting area.
   a. Clean seal mounting area with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.
   b. Allow to dry completely.
2. See Figure 3-190. Install seal.

NOTE

Align seal leg into rib channel (2) on lid.

   a. Peel back a few inches of backing material.
   b. Place end of seal (3) flush to, no greater than0.2 in (0.5 cm) (1) away from hinge area.
   c. Work seal on to mounting area a few inches at a time.

NOTE

Do not stretch seal.

d. Cut seal squarely flush to, no greater than0.2 in (0.5 cm) from hinge.

e. After entire seal is installed, go back around entire seal and press firmly in place.

f. Verify seal is securely adhered.

Hinge

1. See Figure 3-191. Install hinge to cover.

   a. Align hinge (6).

   b. Install latch assembly screws (5). Tighten.

      Torque: 30–35 **in-lbs** (3.4–4 N·m) *Saddlebag, latch assembly, screws*

   c. Align face plate.

   d. Install face plate screws (7). Tighten.

      Torque: 12–15 **in-lbs** (1.41–1.75 N·m) *Saddlebag, face plate, screws*

Tether

1. See Figure 3-191. Install tether.

   a. Place logo on tether (2) facing up and facing you when opening up saddlebag.

   b. Install screws (1,10). Tighten.

      Torque: 20–30 **in-lbs** (2.26–3.39 N·m) *Saddlebag, tether, screws*

Lever

1. See Figure 3-189. Install lever.

   a. Install **new** grommet (3) if worn or damaged.

   b. Install lever (2).

   c. Install screw (1). Tighten.

      Torque: 50–60 **in-lbs** (5.65–6.78 N·m) *Saddlebag, lever, screw*

Cushions

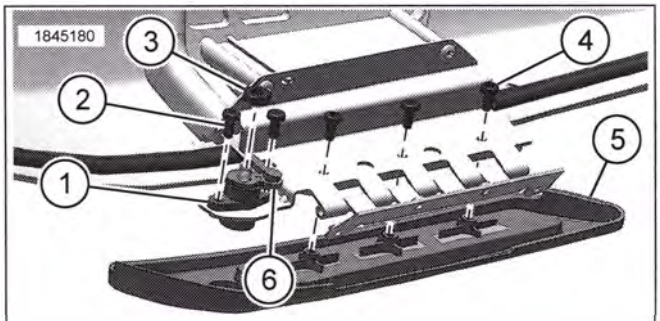
1. See Figure 3-192. Install cushions.

   a. Clean cushion mounting area.

   b. Apply a mixture of 50 percent isopropyl alcohol and 50 percent distilled water to cushion tabs to ease installation.

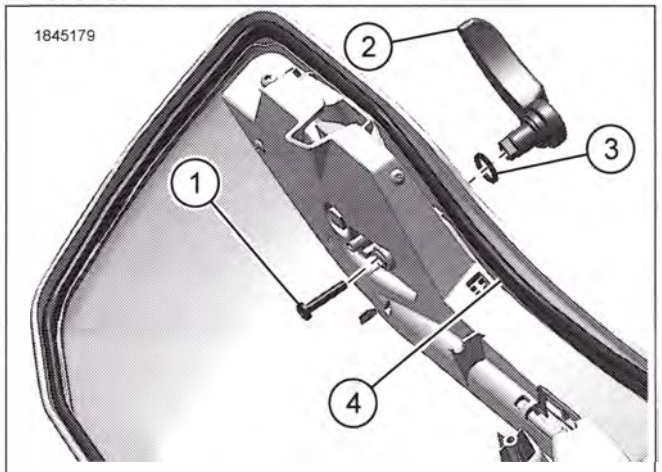
   c. Install cushions.

   d. Verify cushions are completely installed.



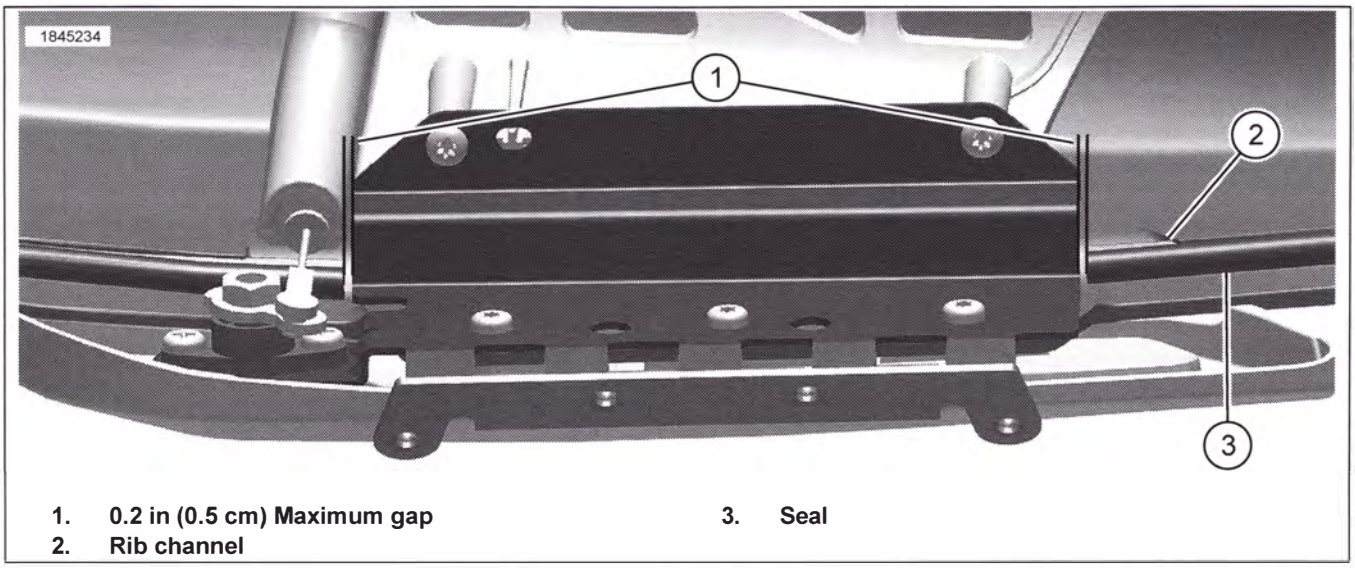
1. **Saddle bag lock**
2. **Saddle bag lock screw (2)**
3. **Nut**
4. **Face plate screw (3)**
5. **Face plate**
6. **Cable assembly cam**

Figure 3-188. Saddlebag Lock



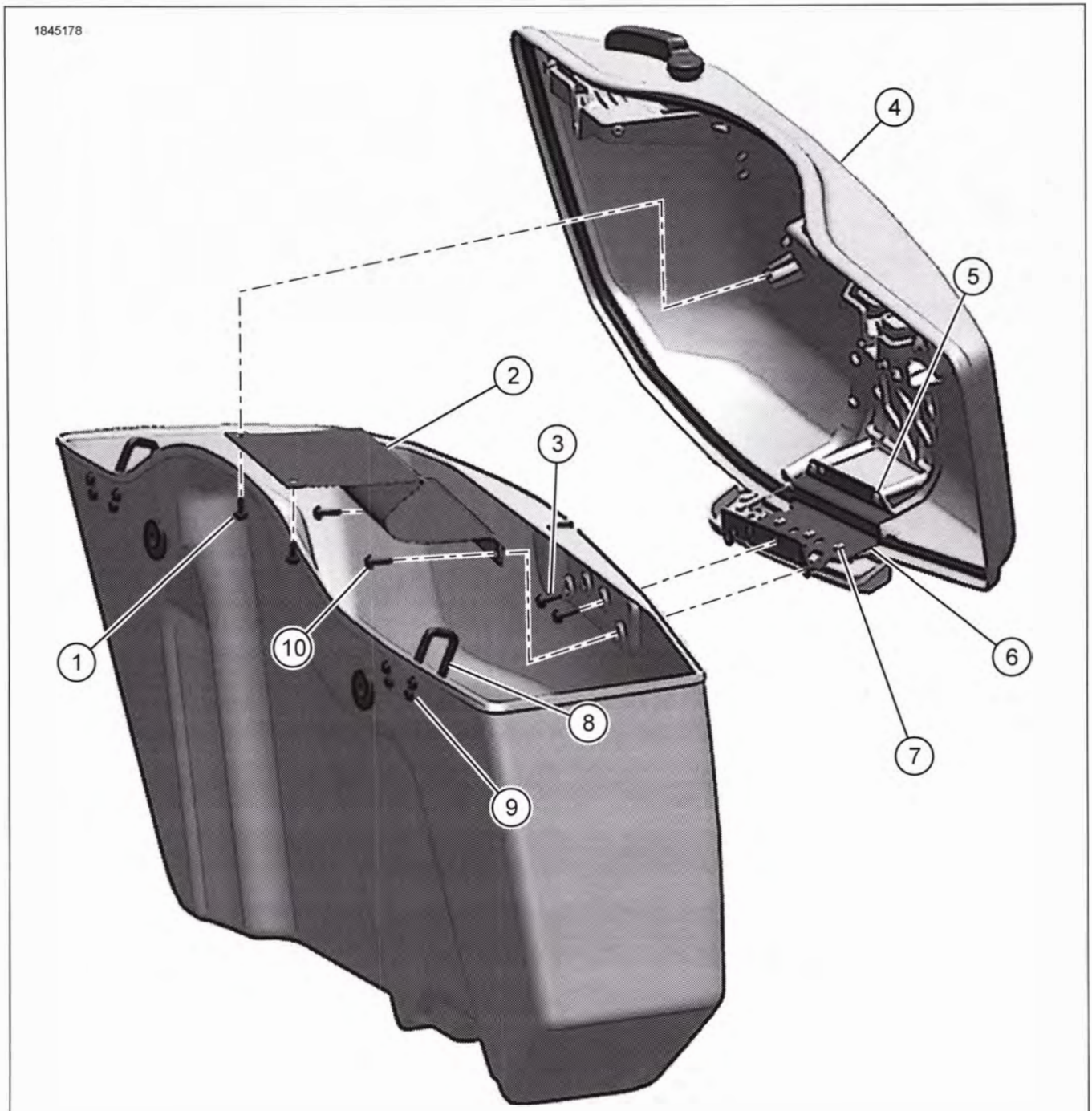
1. **Lever screw**
2. **Lever**
3. **Grommet**
4. **Seal**

Figure 3-189. Saddlebag Lever



1. 0.2 in (0.5 cm) Maximum gap
2. Rib channel
3. Seal

Figure 3-190. Saddlebag Seal Positioning



1. Tether screw (2)
2. Tether
3. Saddlebag hinge screw (2)
4. Cover
5. Latch assembly screw (long)(2)
6. Hinge
7. Face plate screw (short)(3)
8. Strike (2)
9. Strike screw (8)
10. Tether screw (2)

Figure 3-191. Saddlebag Hinge

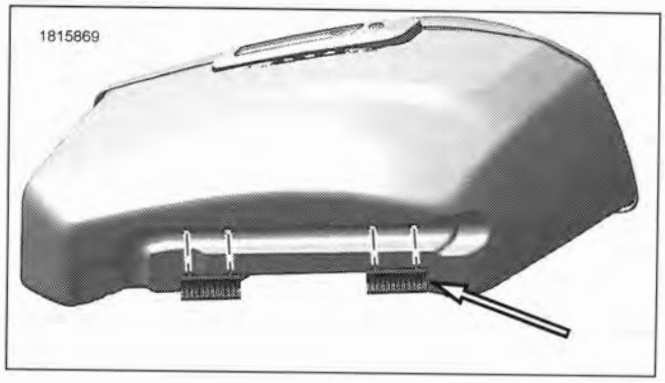


Figure 3-192. Saddlebag Cushions

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).

REMOVE

Saddlebag support can be either taken out as an assembly or just lower saddlebag support.

Saddlebag Support Insert.

1. See Figure 3-194. Remove saddlebag support insert.
   a. Remove screws (3).
   b. Remove insert (4).

Lower Saddlebag Support

1. See Figure 3-194. Remove lower saddlebag support.
   a. Remove screws (15) and washers (14).
   b. Remove nut (17) and screw (18).
   c. Remove nut (13) and screw (16).
   d. Remove nut (9), screw (11) and washer (10).
   e. Remove saddlebag support (12).

Saddlebag Support Assembly

1. See Figure 3-194. Disconnect connector (1).
2. Remove and dispose of cable straps (5).
3. Remove saddlebag support assembly.
   a. Remove screws (15) and washers (14).
   b. Remove nut (9), screw (11) and washer (10).
   c. Remove nut (17) and screw (18).
   d. Remove screw (8) and washer (7).
   e. Remove screw (20).
   f. Remove saddlebag support assembly.
4. Disassemble as needed.
   a. Remove nut (13) and screw (16).
   b. Remove mounting clips (19).

INSTALL

FASTENER	TORQUE VALUE	
Muffler screws	14–18 ft-lbs	19–24 N·m
Saddlebag support, insert, screws	18–22 ft-lbs	24–30 N·m
Saddlebag, lower support to fender support, screw	15–20 ft-lbs	20–27 N·m
Saddlebag, lower support to support casting, screw	30–37 ft-lbs	40.7–50.2 N·m
Saddlebag, lower support, front, screw	32–36 ft-lbs	43–49 N·m
Saddlebag, support casting, captivated washer,screw	15–20 ft-lbs	20–27 N·m
Saddlebag, support casting, flange screw	10–12 ft-lbs	14–16 N·m

Saddlebag Support Insert.

1. See Figure 3-194. Install saddlebag support insert.
   a. Install insert (4).
   b. Install screws (3). Tighten.
      Torque: 18–22 ft-lbs (24–30 N·m) *Saddlebag support, insert, screws*

Lower Saddlebag Support

NOTE

Do not tighten any screws until all are installed.

1. See Figure 3-194. Install lower saddlebag support.
   a. Align saddlebag support (12) in position.
   b. Install screw (18) and nut (17).
   c. Install screw (16) and nut (13).
   d. Install washers (14) and screws (15).
   e. Install washer (10), screw (11) and nut (9). Tighten.
      Torque: 32–36 ft-lbs (43–49 N·m) *Saddlebag, lower support, front, screw*
   f. Tighten screw (18).
      Torque: 15–20 ft-lbs (20–27 N·m) *Saddlebag, lower support to fender support, screw*
   g. Tighten screw (16).
      Torque: 30–37 ft-lbs (40.7–50.2 N·m) *Saddlebag, lower support to support casting, screw*

h. Tighten screws (15).

Torque: 14–18 ft-lbs (19–24 N·m) *Muffler screws*

Saddlebag Support Assembly

NOTE

Do not tighten any screws until all are installed.

1. See Figure 3-193. Verify that rubber cushion is in place and not damaged. If damaged replace.
2. See Figure 3-194. Install mounting clips if removed.
3. Install saddlebag support assembly.
   a. Install washer (7) and screw (8).
   b. Install screw (20).
   c. Install screw (18) and nut (17).
   d. Install washer (14) and screws (15).
   e. Install washer (10), screw (11) and nut (9). Tighten.

      Torque: 32–36 ft-lbs (43–49 N·m) *Saddlebag, lower support, front, screw*
   f. Tighten screw (18).

      Torque: 15–20 ft-lbs (20–27 N·m) *Saddlebag, lower support to fender support, screw*
   g. Tighten screw (8).

      Torque: 10–12 ft-lbs (14–16 N·m) *Saddlebag, support casting, flange screw*
   h. Tighten screw (20).

      Torque: 15–20 ft-lbs (20–27 N·m) *Saddlebag, support casting, captivated washer,screw*
   i. Tighten screws (15).

      Torque: 14–18 ft-lbs (19–24 N·m) *Muffler screws*
4. Connect and secure harness.
   a. Route harness through opening in support casting.
   b. Connect connector (1).
   c. Install **new** cable straps (5).
5. Install saddlebag support insert. See previous section.

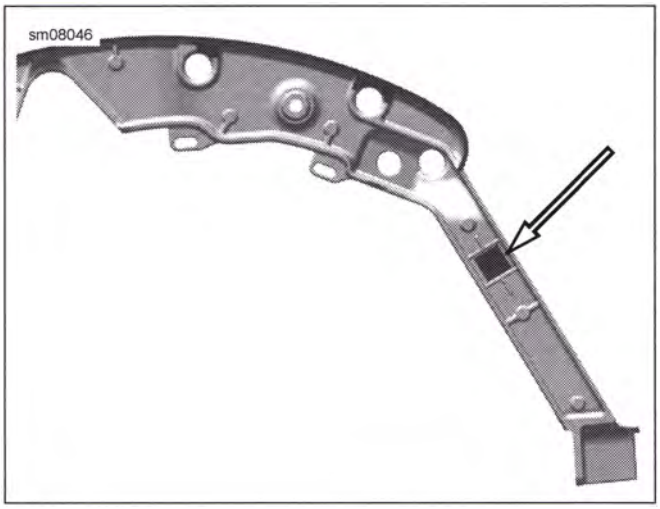
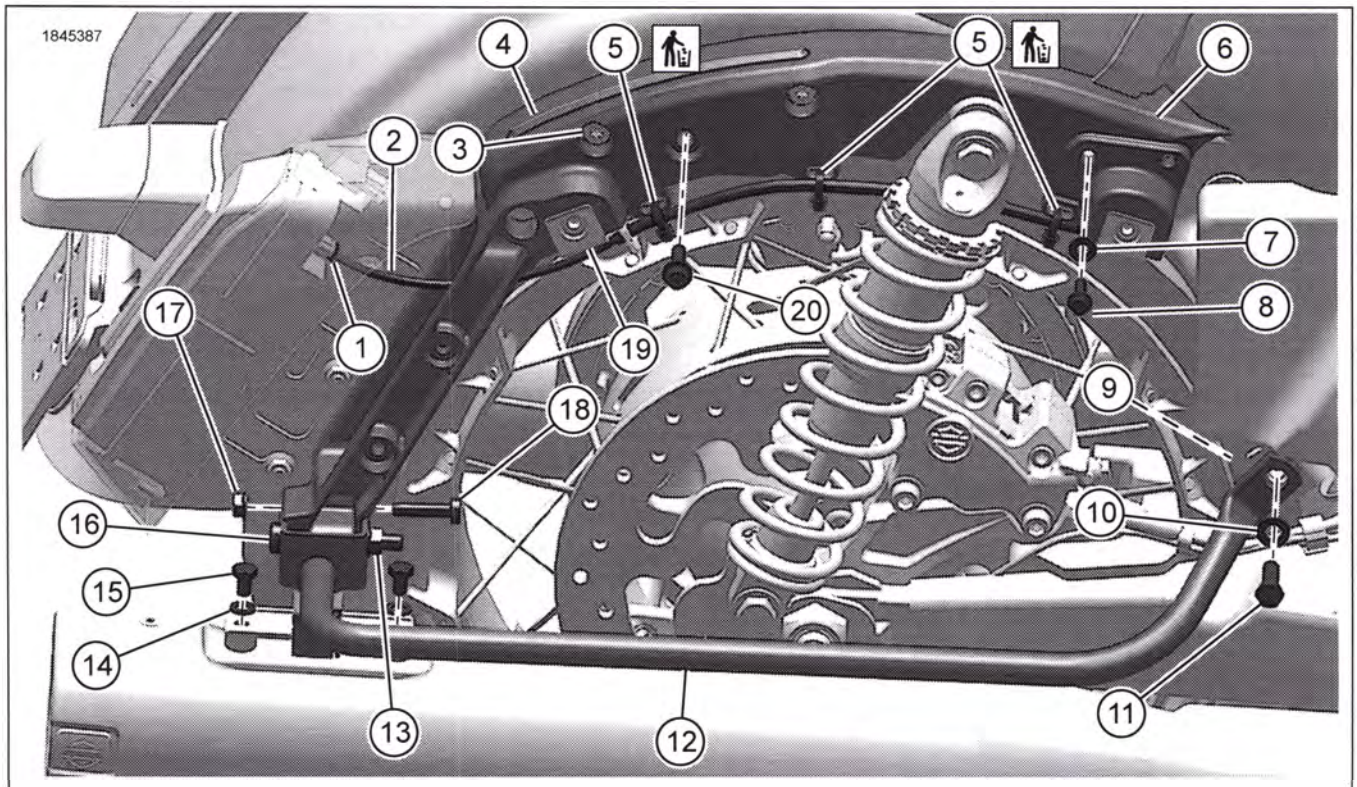


Figure 3-193. Saddlebag Supports Cushion



1. **Connector**
2. **Harness**
3. **Saddlebag insert screw (2)**
4. **Saddlebag insert**
5. **Cable strap (3)**
6. **Support casting**
7. **Washer**
8. **Screw**
9. **Nut (not shown)**
10. **Washer**
11. **Saddlebag support screw**
12. **Saddlebag support**
13. **Nut**
14. **Lock washer (2)**
15. **Screw (2)**
16. **Support-to-support casting screw**
17. **Nut**
18. **Support casting-to-fender screw**
19. **Mounting clip (2)**
20. **Screw**

Figure 3-194. Saddlebag Support RH

COMPLETE

1. Install seat. See CHASSIS > SEAT (Page 3-139).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE

CONSUMABLE	PART NUMBER
3M GENERAL PURPOSE ADHESIVE REMOVER	

1. Mark location of emblem with masking tape.
2. Remove emblem using fishing line or waxed dental floss.

NOTE

Wear protective gloves.

3. Remove remaining foam backing tape and adhesive from mounting surface.

   Consumable: 3M GENERAL PURPOSE ADHESIVE REMOVER ()

NOTE

- *Do not clean with denatured alcohol, mineral spirits or other solvents. Damage to components may occur.*
- *For maximum bond, surface must be clean and dry.*

4. Clean with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.

INSTALL

NOTE

- *Apply in ambient temperatures between 70–100 °F (21–38 °C).*
- *Parts cannot be repositioned after initial installation. Do not remove protective film from adhesive until ready to apply.*
- *Do not bend emblem to fit contour of mounting surface.*
- *Allow at least 24 hours after application before exposing the area to vigorous washing, strong water spray or extreme weather.*
- *The adhesive bond will increase to maximum strength after about 72 hours at normal room temperature.*

1. Test fit medallion.
   a. Check medallion against curve of mounting surface.
   b. Match left and right sides of fuel tank or top cover, as applicable.
2. Remove protective film from back of medallion.

NOTE

- *Protect adhesive from grease, oil, dust, dirt and fingerprints.*
- *Once applied, do not shift medallion.*

3. Apply even pressure across entire surface. Hold in place for 15 seconds.
4. Wait 20 minutes before touching medallion.

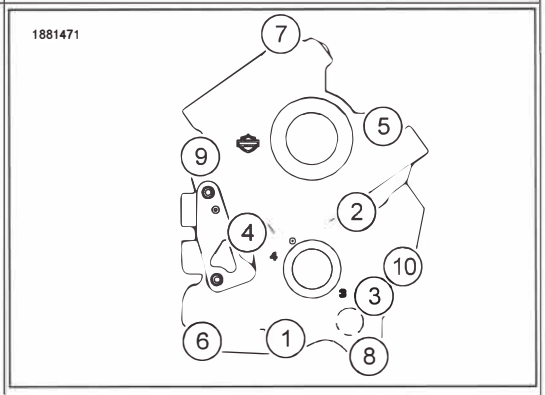
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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Balancer bearing screw	80–110 **in-lbs**	9–12.4 N·m	4.21 CRANKCASE, Repair Right Crankcase Half
Balancer bearing screw	80–110 **in-lbs**	9–12.4 N·m	4.21 CRANKCASE, Repair Left Crankcase Half
Breather cover screws	11–13 ft-lbs	14.91–17.63 N·m	4.11 BREATHER, Install
Cam chain tensioner fasteners	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Cam needle bearing installation maximum torque	25 ft-lbs	33.9 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Camshaft Needle Bearings
Camshaft cover screws	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Remove and Install: Camshaft Cover
Camshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install See procedure to verify alignment specification before tightening. Apply LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red).
Camshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install See procedure to verify alignment specification before tightening.
Camshaft sprocket screw, final torque	34 ft-lbs	46.1 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Cam support plate screws	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Crankcase oil check valve or plug with O-ring	18–22 ft-lbs	24.4–29.8 N·m	4.21 CRANKCASE, Plugs and Oil Fittings
Crankcase screws, 1st torque	10 ft-lbs	13.6 N·m	4.21 CRANKCASE, Assemble
Crankcase screws, final torque	15–19 ft-lbs	20.3–25.8 N·m	4.21 CRANKCASE, Assemble
Crankcase tapered plugs	10–12 ft-lbs	13.6–16.3 N·m	4.21 CRANKCASE, Plugs and Oil Fittings
Crankshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install Apply LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red)
Crankshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install See procedure to verify alignment specification before tightening.
Crankshaft sprocket screw, final torque	24 ft-lbs	32.5 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Cylinder head nut torque step 1.	20–30 ft-lbs	27.1–40.7 N·m	4.15 CYLINDER HEADS, Install Apply ENGINE OIL to cylinder head nut washers and threaded portion of new cylinder head nuts. See procedure for torque sequence.
Cylinder head nut torque step 2. Loosen one turn.	-360°	-360°	4.15 CYLINDER HEADS, Install
Cylinder head nut torque step 3.	9–11 ft-lbs	12.2–14.9 N·m	4.15 CYLINDER HEADS, Install
Cylinder head nut torque step 4.	18–20 ft-lbs	24.4–27.1 N·m	4.15 CYLINDER HEADS, Install
Cylinder head nut torque step 5. Tighten additional degree value.	90°	90°	4.15 CYLINDER HEADS, Install
Cylinder stud	10–20 ft-lbs	13.6–27.1 N·m	4.21 CRANKCASE, Cylinder Studs

FASTENER	TORQUE VALUE		NOTES
Engine mount, lower front, end cap screws	42–48 ft-lbs	57–65 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount, lower front, flange nut	50–55 ft-lbs	68–75 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount, upper front, stabilizer link screws	30–35 ft-lbs	41–47 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine oil drain plug	14–21 ft-lbs	19–28.5 N·m	4.23 OIL PAN, Install
Engine stabilizer bracket screws	45–50 ft-lbs	61–68 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Lifter anti-rotation device screw	90–120 **in-lbs**	10.2–13.6 N·m	4.14 PUSHRODS, LIFTERS AND COVERS, Install
Lifter cover screws	11–13 ft-lbs	14.9–17.6 N·m	4.14 PUSHRODS, LIFTERS AND COVERS, Install
Oil pan screws	11–13 ft-lbs	14.9–17.6 N·m	4.23 OIL PAN, Install
Oil pump screws, 1st torque	12–60 **in-lbs**	1.4–6.8 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Oil pump screws (1-4), final torque	90–120 **in-lbs**	10.2–13.6 N·m	 **Figure 4-51. Cam Support Plate Tightening Sequence**
Piston jet screws	25–35 **in-lbs**	2.8–3.9 N·m	4.21 CRANKCASE, Repair Right Crankcase Half
Rocker cover, lower, screws	90–120 **in-lbs**	10.2–13.6 N·m	4.12 LOWER ROCKER COVERS, Install
Rocker cover, lower, stud	90–120 **in-lbs**	10.2–13.6 N·m	4.12 LOWER ROCKER COVERS, Install
Rocker cover, upper, screws	10–12 ft-lbs	13.6–15.8 N·m	4.10 UPPER ROCKER COVERS, Install
Rocker cover, upper, stud	90–120 **in-lbs**	10.2–13.6 N·m	4.10 UPPER ROCKER COVERS, Install
Rocker shaft screw, step 1	59–83 **in-lbs**	6.7–9.4 N·m	4.13 ROCKER ARMS, Install
Rocker shaft screw, step 2	23–27 ft-lbs	31.2–36.6 N·m	4.13 ROCKER ARMS, Install
Spark plug	84–108 **in-lbs**	9.5–12.2 N·m	4.7 TROUBLESHOOTING, Compression Test
Transmission drain plug	14–21 ft-lbs	19–28.5 N·m	4.23 OIL PAN, Install

ENGINE

Table 4-1. Engine: Twin-Cooled™ Milwaukee-Eight 117™

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-type Single camshaft Single balance shaft	
Compression ratio	10.3:1	
Bore	4.075 in	103.5 mm
Stroke	4.500 in	114.3 mm
Displacement	117 in^3	1923 cm^3
Fuel requirement	Premium unleaded	
Lubrication system	Pressurized, dry sump	
Cooling system	Liquid-cooled cylinder heads with frame mounted radiator and electric pump, oil cooled crankcase	

Table 4-2. Engine Idle Characteristics

CONDITION	DOM (1)	ALL OTHERS(1)
Cold start	1,450 rpm	1,700 rpm
Hot idle	1,000 rpm	
Hot idle; EITMS engaged	1,000 rpm	
Low voltage	200 rpm increase from normal	
(1) All values are approximate		

Table 4-3. Oiling System

ITEM	SPECIFICATION
Capacity with filter	Service oil change (all): 4.8 qt (4.5 L)
Recommended oil	Genuine Harley-Davidson H-D 360 Motorcycle Oil or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50
Pump	Twin gerotor, dual scavenge, crank mounted and driven, internal oil pump, dry sump
Pressure	35--45 psi (241–310 kPa) at 2000 RPM and normal operating temperature of 230 °F (110 °C)
Filtration	5 micron media, filtered between pump and engine
Cooling	Air cooled

Table 4-4. Rocker Arms Specifications

ROCKER ARMS	IN	MM
Shaft fit in bushing (loose)	0.0005-0.0022	0.013-0.056
End clearance	0.004-0.015	0.10-0.38

Table 4-5. Rocker Arm Shaft Specifications

ROCKER ARM SHAFTS	IN	MM
Diameter	0.5538-0.5543	14.067-14.079

Table 4-6. Hydraulic Lifter Specifications

HYDRAULIC LIFTERS	IN	MM
Fit in crankcase (loose)	0.0009-0.0026	0.023-0.066

Table 4-7. Cylinder Head Specifications

CYLINDER HEAD	IN	MM
Head gasket surface (flatness)	0-0.003	0-0.08

Table 4-8. Valve Specifications

VALVES	IN	MM
Exhaust: fit in guide	0.001-0.003	0.0254-0.0762
Intake: fit in guide	0.001-0.003	0.0254-0.0762
Seat width	0.040-0.080	1.02-2.03
Stem protrusion from cylinder head boss	1.714-1.721	43.54-43.71
Valve lash *	0.000-0.003	0.00-0.08
* Variation between valve pairs operated by a common rocker arm.		

Table 4-9. Valve Spring Specifications

VALVE SPRINGS	IN	MM
Closed	64 lbs @ 1.535 in.	285 N @ 39.0 mm
Open	220 lbs @ 1.024 in.	980 N @ 26.0 mm
Free length	1.745 in.	44.32 mm

Table 4-10. Piston

PISTON		MEASURE 1.34 in (34 mm)DOWN THE CYLINDER BORE FOR RING END GAP	
		IN	MM
Fit in cylinder		0.0022-0.0036	0.056-0.091
Piston pin fit (loose)		0.0002-0.0005	0.005-0.013
Ring end gap	Top compression	0.0118-0.0197	0.30-0.50
	2nd compression	0.0315-0.0394	0.80-1.00
	Oil control ring	0.0098-0.0295	0.25-0.70
Ring side clearance	Top compression	0.0012-0.0031	0.030-0.079
	2nd compression	0.0009-0.0025	0.023-0.064
	Oil control rails	0.0004-0.0075	0.010-0.190

Table 4-11. Connecting Rod Specifications

CONNECTING ROD	IN	MM
Piston pin fit (loose)	0.0007-0.0012	0.018-0.030
Side play between flywheels	greater than 0.005	greater than 0.13

Table 4-12. Flywheel Specifications

FLYWHEELS	IN	MM
Runout (shaft measured in case)	0.000-0.010	0.0-0.254
Runout (measured in truing stand)	0.000-0.004	0.0-0.102
End play	0.003-0.013	0.076-0.330

Table 4-13. Crankshaft/Sprocket Shaft Bearing Specifications

CRANKSHAFT/SPROCKET SHAFT BEARINGS	IN	MM
Roller bearing fit (loose)	0.0002-0.0015	0.005-0.038
Bearing fit in crankcase (tight)	0.0038-0.0054	0.097-0.137
Bearing inner race on crankshaft (tight)	0.0004-0.0014	0.010-0.036

SERVICE WEAR LIMITS

Wear limits are given here as a guideline for measuring used engine components. Replace components when they exceed these values.

Table 4-14. Rocker Arm/Rocker Arm Shaft

ROCKER ARM/ROCKER ARM SHAFT	REPLACE IF WEAR EXCEEDS	
	IN	MM
Shaft fit in bushing	0.006	0.152
End clearance	0.025	0.635

Table 4-15. Hydraulic Lifter

HYDRAULIC LIFTER	REPLACE IF WEAR EXCEEDS	
	IN	MM
Fit in crankcase	0.006	0.152
Roller fit	0.0015	0.038
Roller end clearance	0.022	0.559

Table 4-16. Cam Support Plate

ITEM	REPLACE IF WEAR EXCEEDS	
	IN	MM
Cam chain tensioner shoe thickness	0.060 min.	1.52 min.
Crankshaft bore maximum ID	0.8545	21.704
Camshaft bore	1.1023	27.998
Flatness	0.010	0.25

Table 4-17. Oil Pump

OIL PUMP	REPLACE IF WEAR EXCEEDS	
	IN	MM
Rotor tip clearance	0.004	0.10
Rotor thickness variation	0.001	0.025

Table 4-18. Cylinder Head

CYLINDER HEAD	REPLACE IF	
	IN	MM
Valve seat width (max)	0.080	2.03
Valve margin (min)	0.031	0.80
Valve stem protrusion (max)	1.752	44.50
Cylinder head warpage (max)	0.006	0.152
Valve lash (max) *	0.008	0.20
* Variation between valve pairs operated by a common rocker arm.		

Table 4-19. Valve Stem to Guide

VALVE STEM TO GUIDE	REPLACE IF WEAR EXCEEDS	
	IN	MM
Intake	0.0038	0.0965
Exhaust	0.0038	0.0965

Table 4-20. Valve Springs

VALVE SPRINGS	IN	MM
Closed	56-70 lbs @ 1.535 in	251-312 N @ 39.0 mm
Open	205-232 lbs @ 1.024 in	914-1033 N @ 26.0 mm
Free length	1.745 in	44.32 mm

Table 4-21. Cylinder

CYLINDER	REPLACE IF WEAR EXCEEDS	
	IN	MM
Warpage of gasket surface: top	0.006	0.152
Warpage of gasket surface: base	0.004	0.102

Table 4-22. Piston

PISTON		• REPLACE IF WEAR EXCEEDS • MEASURE 1.34 in (34 mm)DOWN THE CYLINDER BORE FOR RING END GAP	
		IN	MM
Fit in cylinder (loose)		0.0036	0.091
Piston pin fit (loose)		0.0005	0.012
Ring end gap	Top compression	0.0197	0.500
	Second compression	0.0394	1.000
	Oil control rails	0.0295	0.749
Ring side clearance	Top compression	0.0031	0.079
	Second compression	0.0025	0.064
	Oil control rails	0.0075	0.191

Table 4-23. Connecting Rod

CONNECTING ROD	REPLACE IF WEAR EXCEEDS	
	IN	MM
Piston pin fit (loose)	0.002	0.051

Table 4-24. Flywheel

FLYWHEEL	REPLACE IF WEAR EXCEEDS	
	IN	MM
Runout (shaft measured in case)	0.012	0.305
Runout (measured in truing stand)	0.005	0.127
End play	0.013	0.330

Table 4-25. Crankshaft Roller Bearing

CRANKSHAFT ROLLER BEARING	REPLACE IF	
	IN	MM
Roller bearing fit (loose)	More than 0.0015	More than 0.038
Bearing fit in crankcase (tight)	Less than 0.0038	Less than 0.097
Inner race on crankshaft (tight)	Less than 0.0004	Less than 0.010

OPERATION

Milwaukee-Eight engines are dry sump engines meaning they have external oil reservoirs.

Internal Oil Distribution

1. See Figure 4-1.

   a. Oil from oil pan (1) is pulled through ports in oil pan (not shown), transmission housing and crankcase

   b. Oil enters oil pump feed gerotors.

   c. Oil exits pump and passes oil pressure switch (5) and head to oil filter (6).

   d. Oil exits filter and is directed back into cam support plate where its split between crankshaft, hydraulic chain tensioner (13), variable valve timing, and lifters (8).

   e. Crankshaft oil travels through crankshaft to crankpin and rod bearings (10).

   f. Flow toward lifters splits to cam plain bearing (7), variable valve timing, lifters and to piston jets (9).

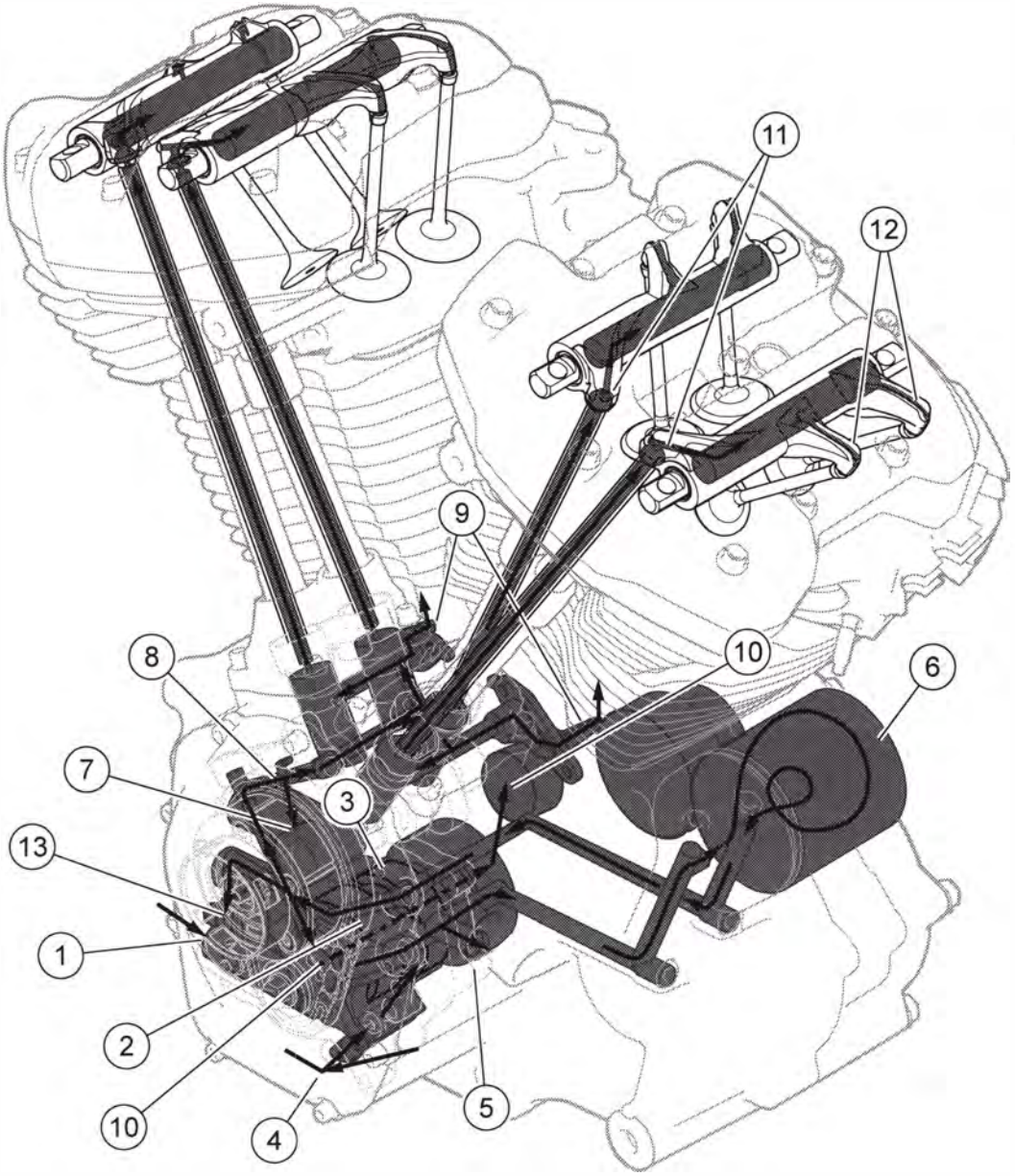
   g. Oil flows from lifters up through pushrods to rocker arms (11).

   h. Oil exits rocker arms to lubricate valve stems via spillover (12).

   i. Oil drains through passages in heads to cylinders, back to camchest cavity. Residual oil in camchest cavity and crankcase cavity is picked up through scavenge port (4) in pump. Return oil is fed through scavenge gerotors and case passages back to oil pan.

   j. Main bearings, balancer bearing and left cam bearing are lubricated by oil splash.

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1. Oil in from oil pan
2. Oil pump feed rotors
3. Oil pump scavenge rotors
4. Scavenge oil in from cam chest
5. Oil pressure switch
6. Oil filter
7. Cam plain bearing
8. Oil to camshaft, lifters and piston jets
9. Piston jets
10. Oil through crankshaft to crankpin and rod bearings
11. Oil through pushrods to rocker arms
12. Oil spillover to lubricate valve stems
13. Hydraulic chain tensioner

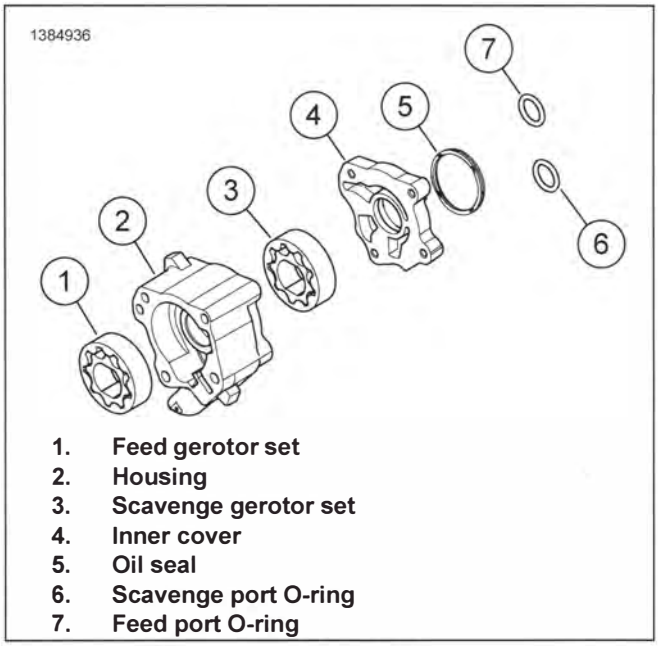
Figure 4-1. Internal Engine Oil Flow

GENERAL

See Figure 4-2. The oil pump has two crankshaft driven gerotor gear sets.

- The feed gerotor set distributes engine oil.
- The scavenge gerotor set draws oil from the cam and flywheel compartments and returns it to the oil pan.

Each gerotor gear set has an inner and outer gerotor. The inner and outer gerotors have fixed centers that are slightly offset to one another. The inner gerotor has one less tooth.



1. Feed gerotor set
2. Housing
3. Scavenge gerotor set
4. Inner cover
5. Oil seal
6. Scavenge port O-ring
7. Feed port O-ring

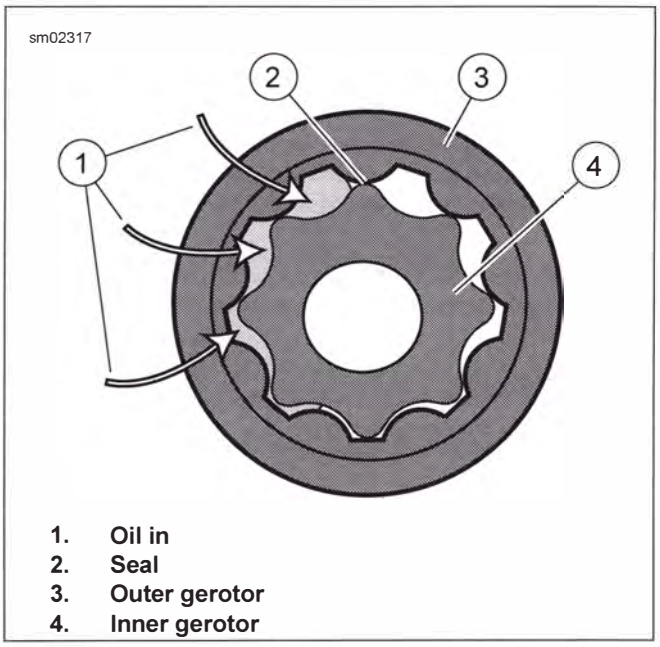
Figure 4-2. Oil Pump

OPERATION

The oil pump is crankshaft driven. Pump inlet and outlet sides are sealed by tips and lobes of inner and outer gerotors, preventing outlet side (high pressure) oil from being transferred to the inlet side.

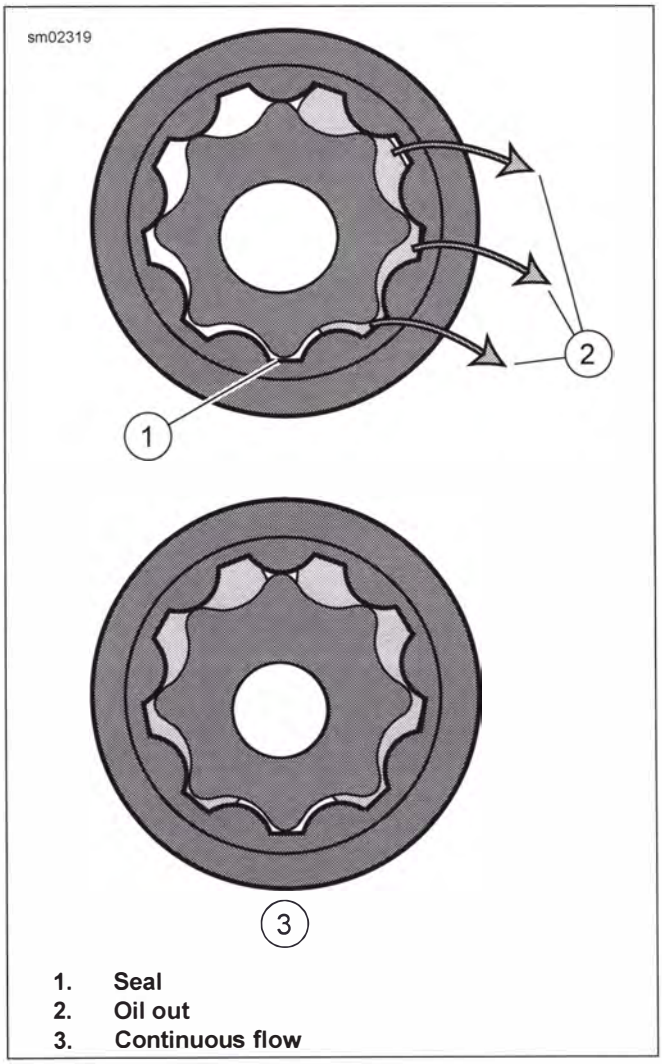
See Figure 4-3. As gerotors rotate, cavity volume increases between inner and outer gerotors on pump inlet side. A vacuum is created causing oil to be drawn in. The cavity increases until the volume is equivalent to that of missing tooth on inner gerotor.

See Figure 4-4. As oil moves to pump outlet side, the cavity decreases in volume. Pressurized oil is forced out the discharge port. In operation, gerotors provide continuous oil flow.



1. Oil in
2. Seal
3. Outer gerotor
4. Inner gerotor

Figure 4-3. Inlet Side Oil Flow



1. Seal
2. Oil out
3. Continuous flow

Figure 4-4. Outlet Side Oil Flow

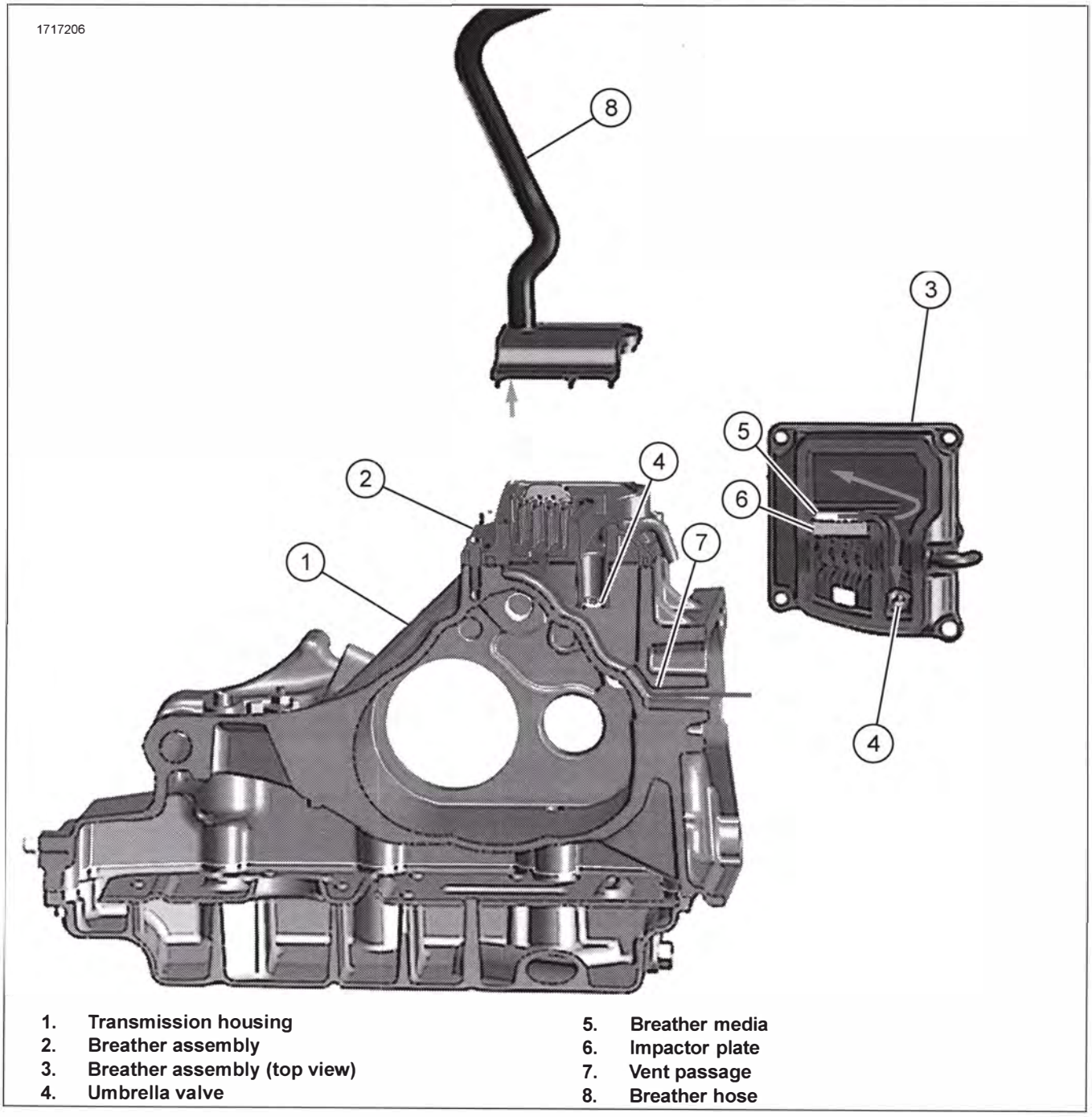
GENERAL

See Figure 4-5. A breather assembly (2) is mounted to the top of the transmission housing (1) to prevent a buildup of pressure caused by the downward force of the pistons & combustion pressure leaking past the piston rings. Burning crankcase vapor eliminates pollutants normally discharged from the crankcase.

As pistons push downward, displaced air in the crankcase is vented through the crankshaft roller bearing into the cam compartment. It then travels out of the engine crankcases and into the transmission case via the crankcase vent passage (7). The moving air absorbs a small amount of oil vapor as it travels through the engine. The oil/air vapor passes through an opening in the breather assembly.

In the breather assembly (3), the flow of air passes upward through a labyrinth where the larger oil particles are separated from the air mixture. It then moves upward through the impactor plate (6) & breather media (5) where the remaining oil is removed. The oil (orange arrow) drains through an umbrella valve (4) in the bottom of the breather housing allowing the separated oil to drain into the oil reservoir located at the bottom of the transmission case.

The air vapor (green arrow) passes through a breather hose (8) located on top of the breather housing and flows to the air box. It passes into the air box where it combines with the intake air stream and is burned during normal combustion.



1. Transmission housing
2. Breather assembly
3. Breather assembly (top view)
4. Umbrella valve
5. Breather media
6. Impactor plate
7. Vent passage
8. Breather hose

Figure 4-5. Breather Air Flow

OPERATION

See Figure 4-6. The red OIL PRESSURE indicator lamp illuminates to warn of improper engine oil pressure. The lamp illuminates when the ignition is initially turned on (before engine is started), but should extinguish once engine is running.

NOTICE

If the oil pressure indicator lamp remains lit, always check the oil supply first. If the oil supply is normal and the lamp is still lit, stop the engine at once and do not ride further until the trouble is located and the necessary repairs are made. Failure to do so may result in engine damage. (00157a)

If indicator lamp does not extinguish, it may be caused by low oil level or diluted oil supply. Other conditions that may cause lamp to remain lit are:

- Faulty lamp wiring
- Faulty oil pressure sending unit
- Damaged oil pump
- Plugged oil filter element
- Incorrect oil viscosity for operating temperature
- Incorrectly installed O-rings in engine

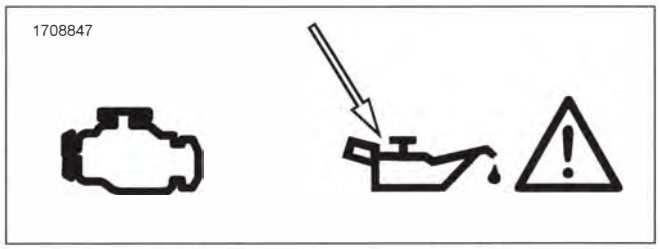


Figure 4-6. Oil Pressure Indicator Lamp

OIL PRESSURE CHECK

PART NUMBER	TOOL NAME
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT

1. Verify that engine oil is at the proper level. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
2. Run motorcycle until engine oil reaches specification.

   Temperature: 230 °F (110 °C)
3. Stop Engine.
4. Remove oil pressure switch from crankcase. See ELECTRICAL > OIL PRESSURE SWITCH (Page 8-30).
5. See Figure 4-7. Install test kit.

   Special Tool: OIL PRESSURE TEST GAUGE KIT (HD-96921-52D)

   a. Hand-tighten adapter HD-96921-106 (2) in oil pressure switch mounting hole.

   b. Assemble banjo bolt (3), washer (4), oil pressure gauge (1), banjo fitting and second washer onto adapter. Hand-tighten.
6. Check oil pressure.

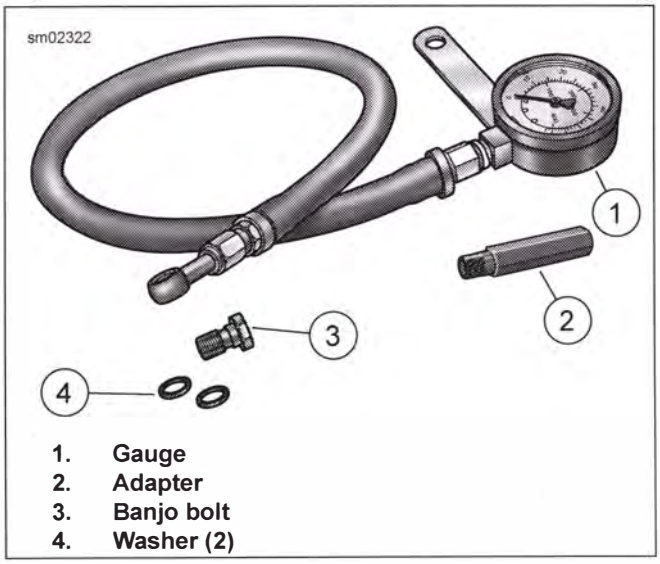
   a. Operate engine at various speeds.

   b. Record results.

   c. Stop engine.
7. Verify that oil pressure is within specifications. Refer to Table 4-26.
8. Remove oil pressure gauge assembly.
9. Install oil pressure switch. See ELECTRICAL > OIL PRESSURE SWITCH (Page 8-30).

Table 4-26. Oil Pressure

CHECK	SPECIFICATION *	
	SAE	METRIC
Oil pressure - min at idle	5 psi	34.5 kPa
Oil pressure - normal at 2000 rpm	35-45 psi	242-310 kPa
Oil pressure - max	50 psi	345 kPa
* With oil at normal operating temperature of 230 °F (110 °C)		



1. **Gauge**
2. **Adapter**
3. **Banjo bolt**
4. **Washer (2)**

Figure 4-7. Oil Pressure Gauge Set

TYPICAL SYMPTOMS

Typical Symptoms

Symptoms indicating a need for engine repair are often misleading. If more than one symptom is present, possible causes can be narrowed to make at least a partial diagnosis.

For example, an above normal consumption of oil could be caused by several mechanical faults. However when accompanied by blue-gray smoke from the exhaust and low compression, it indicates piston rings need replacing. Low compression by itself is more likely to be caused by improperly seated or burned valves, not worn rings.

Certain knocking noises may occur because of loose bearings, others by piston slap. Piston slap is a condition where piston or cylinder or both are out of tolerance. This excessive clearance allows the piston to slap the cylinder as it moves up and down.

Most frequently, valves, rings, pins, bushings and bearings need attention at about the same time. If symptoms indicate any mentioned components are worn, service all related parts.

COMPRESSION TEST

PART NUMBER	TOOL NAME
HD-33223-1	CYLINDER COMPRESSION GAUGE
HD-50549	BORESCOPE

FASTENER	TORQUE VALUE	
Spark plug	84–108 **in-lbs**	9.5–12.2 N·m

1. Purge fuel lines. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove all spark plug cables.
3. Remove one spark plug from each cylinder.

NOTE

Never use a metal object to hold throttle plate open.

4. Open throttle plate.
   a. Remove air cleaner cover and filter. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).
   b. Disconnect TCA connector [211] from induction module.
   c. Mechanically hold throttle plate open.
5. Test compression.
   a. Connect compression tester to front cylinder.

      Special Tool: CYLINDER COMPRESSION GAUGE (HD-33223-1)
   b. Crank engine continuously through 5-7 full compression strokes.
   c. Note gauge readings at end of first and last compression strokes. Record test results.
   d. Disconnect ACR and repeat test.
   e. Connect ACR.
6. Repeat test on rear cylinder.
7. Compare with specifications. Refer to Table 4-27
   a. If compression is within specifications and variance between cylinders is less than 10%, compression is normal.
   b. If readings do not meet specifications, inject engine oil into each cylinder and repeat test on both cylinders. Readings that are considerably higher during second test indicate worn piston rings.

      Volume: 0.5 fl oz (15 ml)
   c. Refer to Table 4-28 for possible causes of low compression.
8. Inspect cylinder using borescope. See CYLINDERS > CLEAN AND INSPECT (Page 4-38) for more detail.

   Special Tool: BORESCOPE (HD-50549)
9. Release throttle plate.
10. Connect TCA connector.
11. Assemble air cleaner. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).
12. Install spark plugs. Connect spark plug wires.

    Torque: 84–108 **in-lbs** (9.5–12.2 N·m) *Spark plug*

Table 4-27. Compression Specifications

ACR STATUS	PSI	kPa
ACR connected	90 (min)	621 (min)
ACR disconnected	175 (min)	1207 (min)

Table 4-28. Compression Test Results

TEST RESULTS	DIAGNOSIS
• Compression low on first stroke. • Compression builds on the following strokes, but does not reach normal. • Improves considerably when oil is added to cylinder.	- Ring trouble
• Compression low on first stroke. • Compression does not build much on following strokes. • Does not improve considerably with the addition of oil.	- Head gasket leak - Incorrect valve lash - Valve trouble

CYLINDER LEAKDOWN TEST

PART NUMBER	TOOL NAME
HD-35667-A	CYLINDER LEAKDOWN TESTER
HD-50549	BORESCOPE
HD-52252	CRANKSHAFT LOCKING TOOL

1. Verify that leakdown tester is free from leakage.

   Special Tool: CYLINDER LEAKDOWN TESTER (HD-35667-A)

   a. Connect cylinder leakdown tester to compressed air source.

   b. Apply a soap/water solution around all tester fittings.

   c. Inspect connections for bubbles indicating leaks.

2. *NOTE*

Perform test with ignition switch turned OFF.

   Remove one spark plug per cylinder.

3. Set piston in cylinder being tested at top dead center (TDC) of compression stroke (all valves closed).

4. Lock the crankshaft.

   a. Remove CKP. See ELECTRICAL > CRANKSHAFT POSITION SENSOR (CKP) (Page 8-63).

   b. Install crankshaft locking tool.

      Special Tool: CRANKSHAFT LOCKING TOOL (HD-52252)

5. Perform leakdown test.

   a. Record percent of leakage.

   b. Listen for air leaks at throttle body, exhaust pipe, oil fill spout and head gasket.

6. Verify that piston is still at TDC. Repeat test if moved.

7. Results:

   a. Leakage greater than 25 percent indicates further diagnosis is warranted.

   b. Air escaping through throttle body indicates leaking past intake valves.

   c. Air escaping through exhaust pipe indicates leaking past exhaust valves.

   d. Air sound from oil fill spout indicates leaking past piston rings.

   e. Inspect cylinder using borescope. Refer to CYLINDERS > CLEAN AND INSPECT (Page 4-38) for more detail.

      Special Tool: BORESCOPE (HD-50549)

8. Remove crankshaft locking tool.

MEASURE CRANKSHAFT ENDPLAY

NOTE

- *Measure crankshaft/flywheel endplay before removing compensator or any related components.*
- *Check can be done with engine either installed or removed.*
- *Dial indicators must be 90 degrees when viewed from the end and from the side.*
- *Never secure dial indicator base to vehicle frame. Movement within engine mounts will result in false readings.*
- *While moving crankshaft/flywheel in and out, indicator needle may move to both minus and plus sides of zero. Total indicator reading is the value to record.*

1. Secure a dial indicator base with dial indicator to a stable location (crankcase, engine stand, etc.).

2. Adjust indicator to zero.

3. Move crankshaft/flywheel out and in.

4. Record total endplay movement.

5. Refer to Table 4-29. If total indicator reading exceeds service wear limit, replace crankshaft/flywheel assembly.

Table 4-29. Crankshaft/Flywheel

CRANKSHAFT/FLYWHEEL	REPLACE IF WEAR EXCEEDS	
	IN	MM
End play	0.013	0.330

MEASURE CRANKSHAFT RUNOUT

Flywheel Assembly Installed

NOTE

- *Perform the following checks during engine disassembly as a method to determine flywheel assembly suitability for reuse.*
- *The checks can be done with engine either installed or removed.*
- *Dial indicators must be 90 degrees when viewed from the end and from the side.*
- *For a reliable reading, only measure on the cam support plate bushing machined surface of the crankshaft, never on a shaft adapter.*
- *Never secure dial indicator base to vehicle frame. Movement within engine mounts will result in false readings.*
- *While rotating crankshaft, indicator needle may move to both minus and plus sides of zero. Total indicator reading is the value to record.*

Right Side

1. Remove one spark plug from each cylinder.

2. Remove cam support plate. See ENGINE > CAM COMPARTMENT AND COMPONENTS (Page 4-46).

3. Secure a dial indicator base with dial indicator to a stable location (crankcase, engine stand, etc.).

4. See Figure 4-8. Adjust dial indicator position to measure runout at cam plate bearing contact area (4).

5. Adjust indicator to zero.

6. Slowly rotate flywheel assembly one complete revolution. Record total needle movement.

7. Refer to Table 4-30. If total indicator reading exceeds service wear limit, remove flywheel assembly to check on truing stand.

Left Side

1. Remove one spark plug from each cylinder.

2. Remove primary cover and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).

3. Secure a dial indicator base with dial indicator to a stable location (crankcase, engine stand, etc.).

4. See Figure 4-8. Adjust dial indicator position to measure "high" part of splines (5) on shaft.

5. Adjust indicator to zero.

6. Slowly rotate crankshaft one complete revolution. Record total difference of raised spline measurements.

7. Refer to Table 4-30. If total indicator reading exceeds service wear limit, remove flywheel assembly to check on truing stand.

Flywheel Assembly Removed

NOTE

- *Verify bearing races are in good condition before performing this inspection.*

1. See Figure 4-8. Mount flywheel asembly in truing stand with bearing races (1) on roller supports (2).

2. Secure dial indicator (3) and mount near each end of flywheel assembly.

3. Set up each indicator (3) to measure the machined surface (4) on one end and splines (5) on the other.

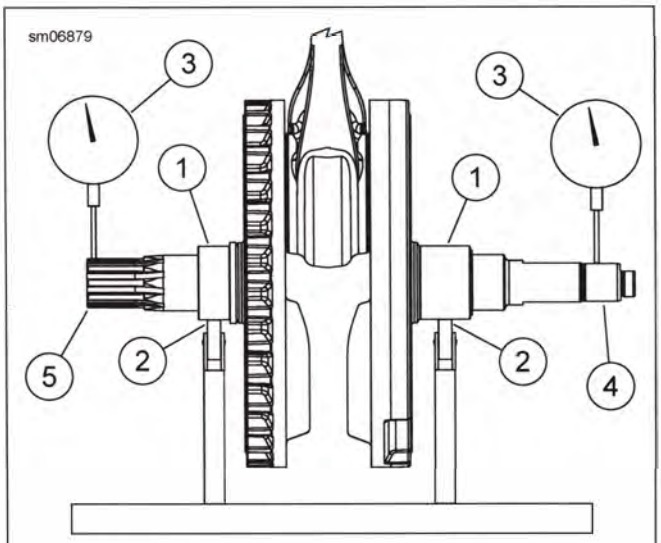
4. Adjust both indicators to zero.

5. Slowly rotate flywheel assembly while observing total indicator reading.

6. Refer to Table 4-30. Compare measurements.

   a. If total indicator reading exceeds service wear limit, replace flywheel assembly.

   b. If total indicator reading **does not** exceed service wear limit, examine left and right main bearings. See ENGINE > CRANKCASE (Page 4-58).



1. Main bearing inner race
2. Roller support
3. Dial indicator
4. Cam plate bearing contact area
5. Spline

Figure 4-8. Checking Crankshaft Runout

Table 4-30. Flywheel

FLYWHEEL	REPLACE IF WEAR EXCEEDS	
	IN	MM
Runout (shaft measured in case)	0.012	0.305
Runout (measured in truing stand)	0.005	0.127
End play	0.013	0.330

DIAGNOSE VALVE TRAIN NOISE

1. *NOTE*

Some valve train noise at start-up is normal until lifters fill with oil. Continuous noise requires diagnosis.

With engine and oil at normal operating temperature, check oil pressure at 2000 rpm.

2. Check oil pressure. See OIL PRESSURE > OIL PRESSURE CHECK (Page 4-9).

3. If oil pressure is outside of range, inspect following:

   a. Oil pump wear

   b. Crankcase passages for blockages

   c. Oil hoses for blockages

4. If oil-starved hydraulic lifters are suspected, remove lifters and inspect. See PUSHRODS, LIFTERS AND COVERS > INSPECT LIFTERS (Page 4-27).

   a. Clean lifter bore of all foreign material.

5. Inspect pushrod, lifter and lifter bore for improper fit and unusual wear.

6. Visually inspect camshaft lobes for abnormal wear.

7. Check top end components.

   a. Check for excess rocker arm end play or binding.

   b. Inspect valve stems for scuffing. Check stem to guide clearance.

   c. Check for loose valve seats or signs of shifting.

8. Grind valves and valve seats. See CYLINDER HEADS > VALVE AND SEAT REPAIR (Page 4-33).

DIAGNOSE SMOKING ENGINE OR HIGH OIL CONSUMPTION

Initail Tests

1. Perform compression test and cylinder leakage test. See TROUBLESHOOTING > COMPRESSION TEST (Page 4-10) and TROUBLESHOOTING > CYLINDER LEAKDOWN TEST (Page 4-11).

Check Before Cylinder Head Removal

1. Oil level too high
2. Oil carryover
3. Restricted breather hose
4. Restricted oil filter

Check After Cylinder Head Removal

1. Clogged oil return passages
2. Valve guide seals
3. Valve guide to valve stem clearance
4. Gasket surfaces of head and cylinder
5. Cylinder head casting porosity allowing oil to drain into combustion chamber
6. O-ring damaged or missing from oil pump/crankcase junction
7. If above checks do not reveal cause:

   a. Remove cylinder.

   b. Verify piston ring gaps are properly staggered.

   c. Inspect for excess piston ring wear.

REMOVE

Removal

NOTE

Pry overlap to release crimp clamps. If clamps must be cut, use a sharp high-quality wire cutter. To prevent breaking plastic fittings, do not twist clamp while cutting.

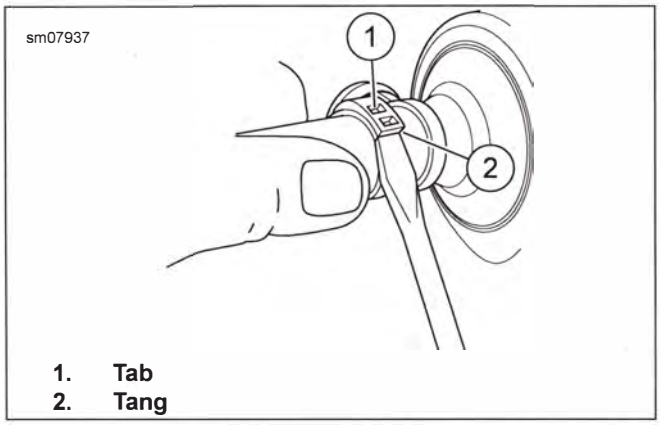
1. See Figure 4-9. Push tip of small screwdriver under end of tang (2).

2. *NOTE*

Plastic fittings are fragile. Use care when removing clamp.

   Pry until tang is free of tab (1).

3. Remove clamp.



1. Tab
2. Tang

Figure 4-9. Removing Crimp Clamp

INSTALL

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

Installation

1. Install **new** clamp.

2. Tighten clamp using hose clamp pliers.
   Special Tool: HOSE CLAMP PLIERS (HD-41137)

PREPARE

NOTE

Following steps are if you are removing lower front engine mount.

1. Remove right side rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133)
2. Remove rear brake master cylinder and pedal. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).
3. Remove jiffy stand. See CHASSIS > JIFFY STAND (Page 3-136).

REMOVE AND INSTALL: LOWER FRONT ENGINE MOUNT

FASTENER	TORQUE VALUE	
Engine mount, lower front, end cap screws	42–48 ft-lbs	57–65 N·m
Engine mount, lower front, flange nut	50–55 ft-lbs	68–75 N·m

Remove

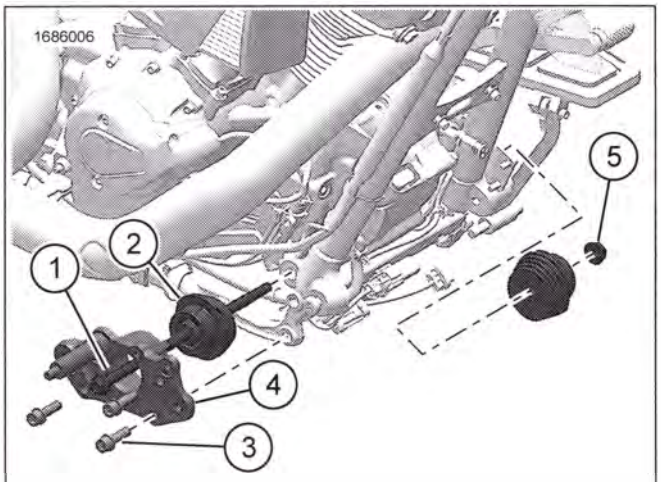
1. Support engine with a jack under crankcase. Use a wooden block to distribute pressure.
2. See Figure 4-10. Remove engine mount assembly.
   a. Remove nut (5).
   b. Remove screw (1).
   c. Remove screws (3).
   d. Remove end cap (4).
3. Remove right engine mount (2).
4. Remove left engine mount (2).
   a. Disconnect upper stabilizer link. See FRONT ENGINE MOUNT > REMOVE AND INSTALL: UPPER FRONT ENGINE MOUNT (Page 4-15).
   b. Raise engine. Hold engine toward right side of frame.
   c. Remove left engine mount.

Install

1. See Figure 4-10. Install left mount (2).
   a. Hold engine toward right side of frame.
   b. Install left engine mount (2).
   c. Align notch in engine mount with tab on frame.
2. Install right engine mount (2).
   a. Assemble screw (1), end cap (4) and engine mount (2).
   b. Align notch in engine mount with tab on end cap.
   c. Install assembly until engine mount screw exits left side.
   d. Verify notches and tabs of engine mounts are aligned.
   e. Start screws (3).
   f. Install nut (5). Tighten.

      Torque: 50–55 ft-lbs (68–75 N·m) *Engine mount, lower front, flange nut*
3. Tighten screws (1).

   Torque: 42–48 ft-lbs (57–65 N·m) *Engine mount, lower front, end cap screws*
4. Connect stabilizer link. See FRONT ENGINE MOUNT > REMOVE AND INSTALL: UPPER FRONT ENGINE MOUNT (Page 4-15).



1. **Screw**
2. **Engine mount (2)**
3. **Screw (3)**
4. **End cap**
5. **Nut**

Figure 4-10. Lower Front Engine Mount

REMOVE AND INSTALL: UPPER FRONT ENGINE MOUNT

FASTENER	TORQUE VALUE	
Engine mount, upper front, stabilizer link screws	30–35 ft-lbs	41–47 N·m
Engine stabilizer bracket screws	45–50 ft-lbs	61–68 N·m

Remove

1. See Figure 4-12. Remove stabilizer link.
   a. Remove screws (1, 2) and washer (6).
   b. Remove stabilizer link (3).

Inspect

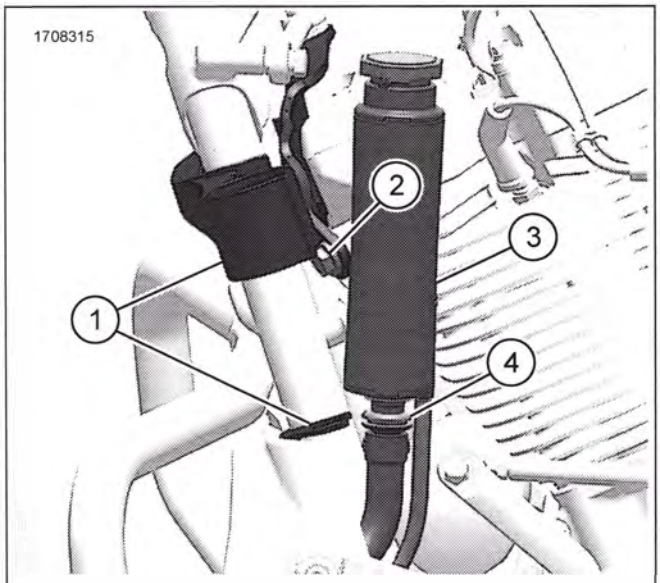
1. Check each end of stabilizer link for excessive wear.
   a. Spherical ball end may rotate freely, but should not have any lateral movement.
   b. Replace link if lateral movement exists.

Install

1. See Figure 4-12. Install stabilizer link.
   a. Install washer (6).
   b. Install stabilizer link with screws (1, 2). Tighten.
      Torque: 30–35 ft-lbs (41–47 N·m) *Engine mount, upper front, stabilizer link screws*

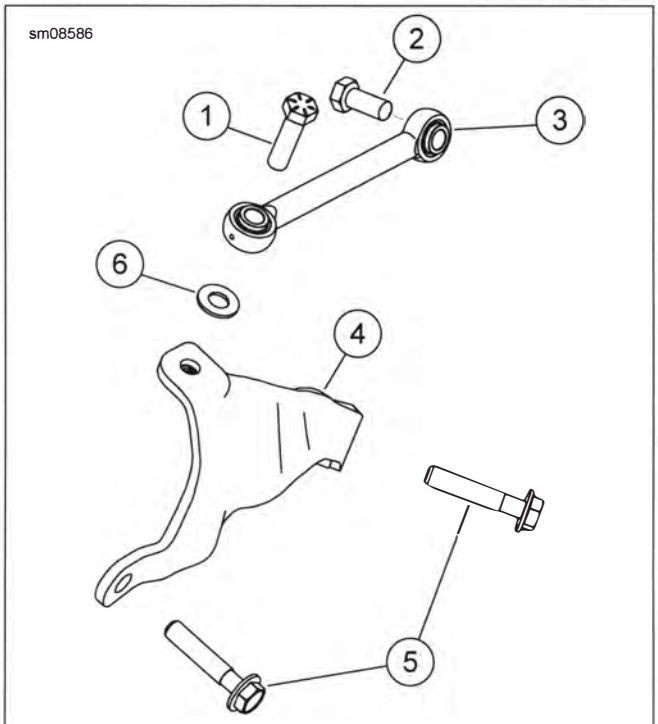
Stabilizer Link Bracket

1. See Figure 4-11. Remove stabilizer link bracket.
   a. Pull coolant reservoir (3) from clips (1).
   b. See Figure 4-12. Remove screws (5).
   c. Remove bracket (4).
2. Install stabilizer link bracket.
   a. Install bracket (4).
   b. Install screws (5). Tighten.
      Torque: 45–50 ft-lbs (61–68 N·m) *Engine stabilizer bracket screws*
3. Install coolant reservoir
   a. Align grommet (4) with lower clip (1).
   b. Press coolant reservoir (3) securely in clips (1).



1. **Clip (2)**
2. **Screw**
3. **Coolant reservoir**
4. **Grommet**

Figure 4-11. Coolant Reservoir Unclipped



1. **Screw, link to bracket**
2. **Screw, link to frame**
3. **Stabilizer link**
4. **Bracket**
5. **Screw (2)**
6. **Washer**

Figure 4-12. Engine Stabilizer

COMPLETE

NOTE

Following steps are if you are installing lower front engine mount.

1. Install jiffy stand. See CHASSIS > JIFFY STAND (Page 3-136).

2. Install brake pedal and rear master cylinder. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).
3. Install right side rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
6. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
7. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
8. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
9. Disconnect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).
10. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

REMOVE

1. See Figure 4-13. Remove screws (3).
   a. Secure stud (4) while removing center screw.
2. Remove upper rocker cover (2).
3. Discard gasket (1).
4. Clean threadlocker from threads and threaded Holes. See FOREWORD > CLEANING (Page II).

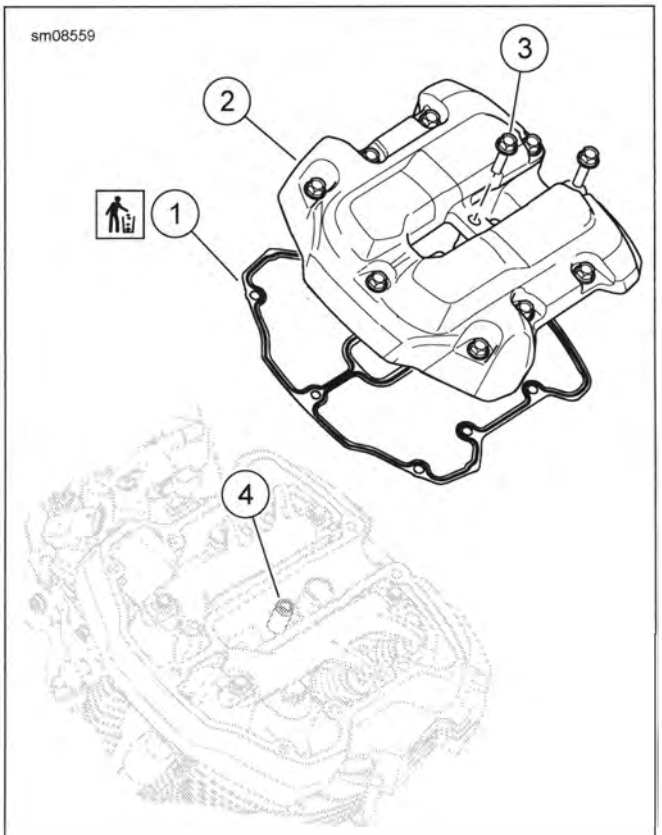
INSTALL

FASTENER	TORQUE VALUE	
Rocker cover, upper, screws	10–12 ft-lbs	13.6–15.8 N·m
Rocker cover, upper, stud	90–120 **in-lbs**	10.2–13.6 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM	99642-97

CONSUMABLE	PART NUMBER
STRENGTH THREADLOCKER AND SEALANT (BLUE)	

1. See Figure 4-13. Tighten stud (4).
   Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Rocker cover, upper, stud*
2. Install **new** gasket (1).
3. Install upper rocker cover (2).
   a. Apply threadlocker to 5-7 screw threads.
   LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Start all screws.
   c. Secure stud (4) to prevent rotation when tightening center screw.
   d. See Figure 4-14. Tighten in sequence shown.
   Torque: 10–12 ft-lbs (13.6–15.8 N·m) *Rocker cover, upper, screws*



1. **Gasket**
2. **Upper rocker cover**
3. **Screw (10)**
4. **Stud**

Figure 4-13. Rocker Cover Screws

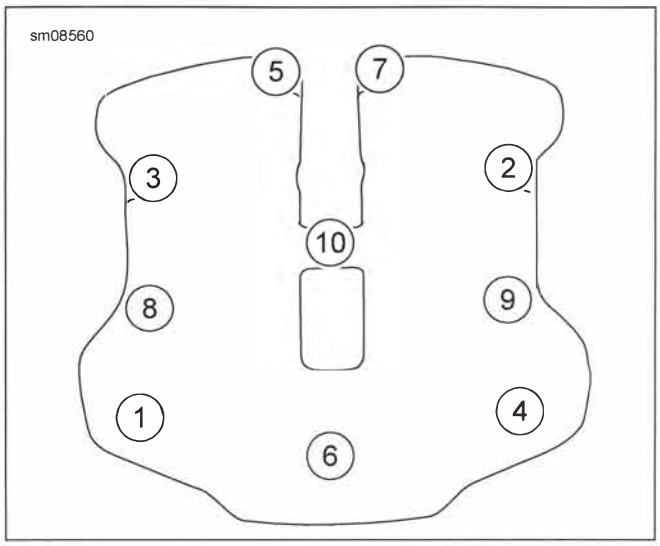


Figure 4-14. Rocker Cover Tightening Sequence

COMPLETE

1. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
2. Connect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).
3. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
4. Connect breather hose. See ENGINE > BREATHER (Page 4-20).
5. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
6. Install mid-frame air deflectors, if equipped. See CHASSIS > AIR DEFLECTORS (Page 3-116).
7. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
8. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
9. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

Follow these steps if removing complete breather hose.

1. Remove seat. See CHASSIS > SEAT (Page 3-139).
2. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
3. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
4. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

Breather Hose

1. See Figure 4-15. Remove breather hose.
   a. Disconnect breather hose (2) from breather (1).
   b. Disconnect breather hose from air cleaner backplate connector (4).
   c. Remove breather hose.

Breather Cover

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. See Figure 4-16. Remove breather cover.
   a. Remove breather hose (2).
   b. Remove screws (1).
   c. Remove breather cover (3).
3. See Figure 4-17. Disassembly breather cover.
   a. Remove gasket (3) and discard.
   b. Remove vent hose (2).
   c. Clean cover (1) and gasket groove.

INSTALL

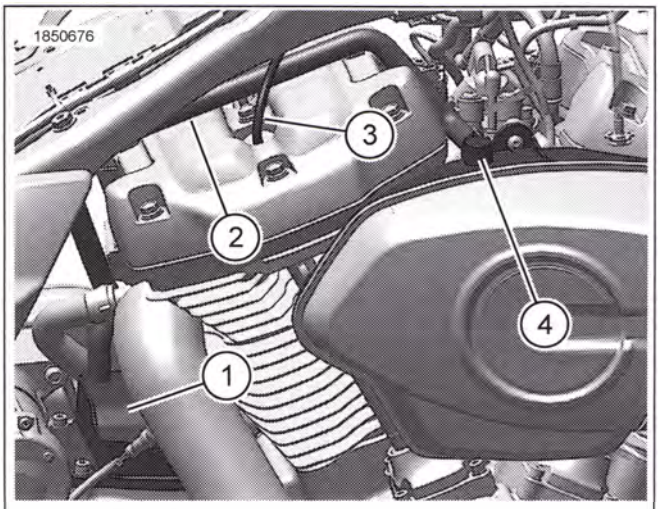
FASTENER	TORQUE VALUE	
Breather cover screws	11–13 ft-lbs	14.91–17.63 N·m

Breather Cover

1. See Figure 4-17. Assembly breather cover.
   a. Clean groove in breather cover from all residual oil and debris.
   b. Install vent hose (2).
   c. Line up nub on gasket (3) with opening on breather cover (1).
   d. Install gasket in groove.
   e. Verify gasket is secure in cover.
2. See Figure 4-16. Install breather cover.
   a. Install breather cover (3) with vent hose facing the engine.
   b. Install screws (1).
      Torque: 11–13 ft-lbs (14.91–17.63 N·m) *Breather cover screws*
3. Install breather hose (2).

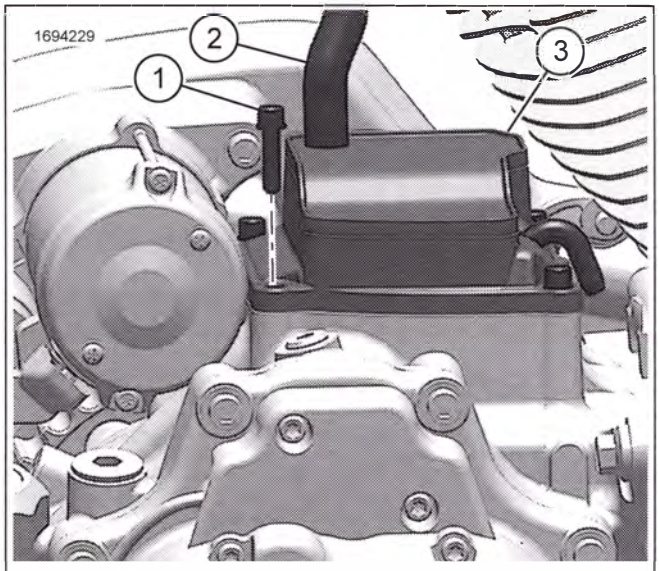
Breather Hose

1. See Figure 4-15. Install breather hose.
   a. Route breather hose (2) between spark plug wire (3).
   b. Connect breather hose to breather (1).
   c. Connect breather hose to air cleaner backplate connector (4).



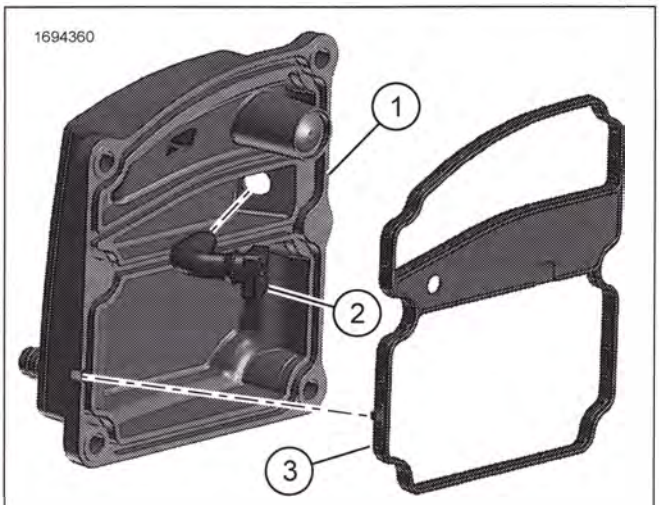
1. Breather
2. Breather hose
3. Spark plug wire
4. Air cleaner backplate connector

Figure 4-15. Breather Hose



1. Screw (4)
2. Breather hose
3. Breather cover

Figure 4-16. Breather Assembly



1. Breather cover
2. Vent hose
3. Gasket

Figure 4-17. Breather Gasket

COMPLETE

Follow these steps if breather hose was completely removed.

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
5. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
6. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
7. Disconnect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).
8. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
9. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
10. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
11. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

REMOVE

1. See Figure 4-18. Remove lower rocker cover.
   a. Remove screws (3) and stud (4).

   NOTE

   Engine may need to be rotated to provide clearance.

   b. Remove lower rocker cover (2).
   c. Discard gasket (1).

INSTALL

FASTENER	TORQUE VALUE	
Rocker cover, lower, screws	90–120 **in-lbs**	10.2–13.6 N·m
Rocker cover, lower, stud	90–120 **in-lbs**	10.2–13.6 N·m

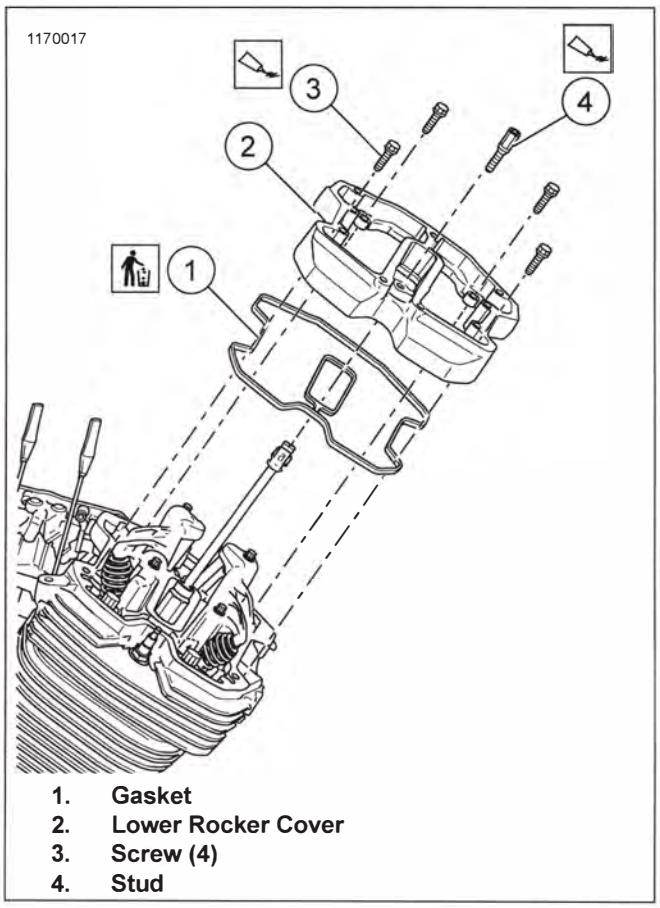
CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

1. See Figure 4-18. Install lower rocker cover.
   a. Clean groove in lower rocker cover (2) from all residual oil and debris.
   b. Install **new** gasket (1).
   c. Install lower rocker cover.
   d. Apply threadlocker to screws (3) and stud (4).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

   e. See Figure 4-19. Install screws (3) and stud (4). Tighten in sequence shown.

      Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Rocker cover, lower, screws*
      Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Rocker cover, lower, stud*



1. **Gasket**
2. **Lower Rocker Cover**
3. **Screw (4)**
4. **Stud**

Figure 4-18. Lower Rocker Cover

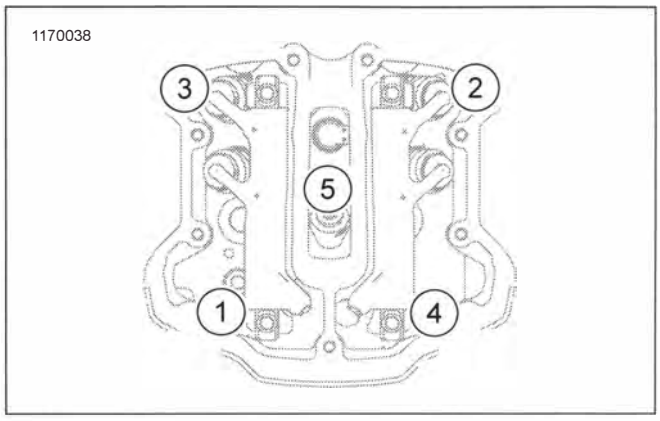


Figure 4-19. Lower Rocker Cover Torque Sequence

COMPLETE

1. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

2. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

3. Connect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).

4. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

5. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

6. Connect breather hose. See ENGINE > BREATHER (Page 4-20).

7. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

8. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

9. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

10. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
6. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
7. Disconnect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).
8. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
9. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
10. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
11. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
12. Remove lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

REMOVE

1. Remove rocker arms.
   a. Set piston at TDC on compression stroke.
   b. See Figure 4-20. Alternately loosen screws (1) until screws can be turned by hand.
   c. Remove screws.
   d. Remove rocker shaft (2) and rocker arm (3).

CLEAN AND INSPECT

1. Clean all parts.
2. Inspect for wear. Replace or repair as necessary.
   a. Measure rocker arm bore.
   b. Measure rocker arm shaft for excessive wear.
   c. Inspect valve contact areas for excessive wear.
   d. Inspect pushrod pocket for excessive wear.
   e. Verify that oil holes in rocker arms are clean and open.

INSTALL

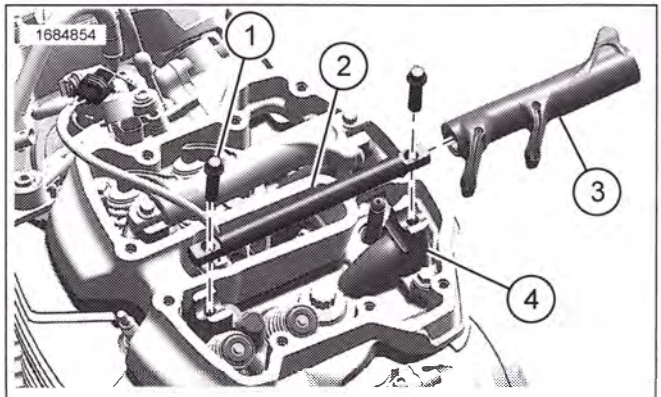
FASTENER	TORQUE VALUE	
Rocker shaft screw, step 1	59–83 **in-lbs**	6.7–9.4 N·m
Rocker shaft screw, step 2	23–27 ft-lbs	31.2–36.6 N·m

1. Set piston at approximate BDC of power stroke.
2. Install rocker arms.
   a. Verify lifters are on base circle of camshaft lobe.
   b. See Figure 4-20. Install rocker arm (3) and rocker shaft (2).
   c. Place rocker assembly on rocker towers (4).
   d. Verify rocker shaft is seated in both towers.
   e. Install screws (1).
   f. Alternately tighten screws to pull rocker shaft down evenly.
      Torque: 59–83 **in-lbs** (6.7–9.4 N·m) *Rocker shaft screw, step 1*
      Torque: 23–27 ft-lbs (31.2–36.6 N·m) *Rocker shaft screw, step 2*
   g. Repeat with remaining rocker arms.
3. *NOTE*

   Do not rotate crankshaft until lifters have bled down. Rotating crankshaft sooner could result in valve-to-piston contact resulting in damage.

   Allow lifters to bleed down. When lifters have bled down, pushrods can be rotated by hand.
4. Check valve lash.
   a. Position crankshaft at TDC of compression stroke. All valves will be closed.
   b. While holding rocker arm against valves, attempt to slide a feeler gauge between each valve stem tip and the rocker arm.
   c. A measurement in excess of maximum requires disassembly and repair of cylinder head assembly. Maximum allowable lash on a common rocker arm.

      0.008 in (0.2 mm)



1. **Screw (2)**
2. **Rocker arm shaft**
3. **Rocker arm**
4. **Rocker arm mounting tower (2)**

Figure 4-20. Rocker Arm

COMPLETE

1. Install lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

2. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

3. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

4. Connect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).

5. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

6. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

7. Connect breather hose. See ENGINE > BREATHER (Page 4-20).

8. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

9. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

10. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

11. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
6. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
7. Disconnect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).
8. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
9. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
10. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
11. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
12. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
13. Remove rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

REMOVE

PART NUMBER	TOOL NAME
94086-09	PUSHROD TUBE CLIP REMOVER AND INSTALLER
HD-25070	ROBINAIR HEAT GUN

Pushrods

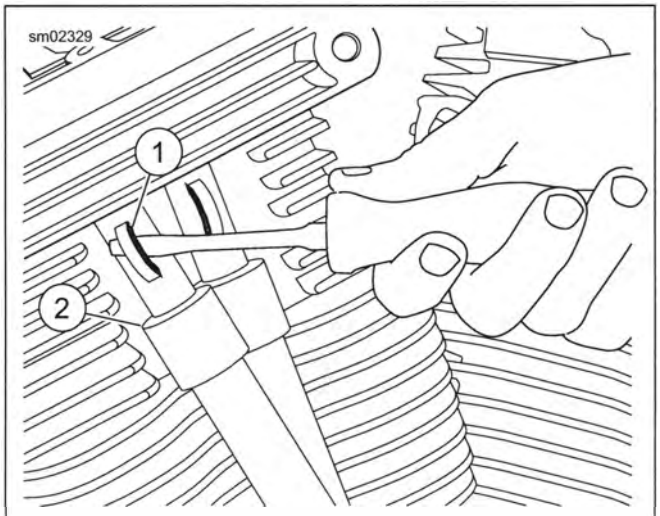
NOTE

Mark parts for location and orientation during removal.

1. Remove pushrods.

Pushrod Covers

1. Figure 4-21 Remove spring cap retainer.
   a. Insert blade of a screwdriver in tab (1) of spring cap retainer.
   b. While pushing down on spring cap (2) with special tool, rotate bottom of retainer outboard.
      Special Tool: PUSHROD TUBE CLIP REMOVER AND INSTALLER (94086-09)
   c. Remove spring cap retainer.
2. Remove pushrod covers.
   a. Collapse upper and lower pushrod covers.
   b. Remove pushrod covers.
3. Disassemble pushrod cover assemblies.
4. Discard O-rings.



1. Tab
2. Spring cap

Figure 4-21. Removing Spring Cap Retainer

Lifters

1. See Figure 4-22. Remove lifter covers.
   a. Remove screws (1).
   b. Remove lifter cover (2) and gasket (3). Discard gasket.
2. Remove lifters.

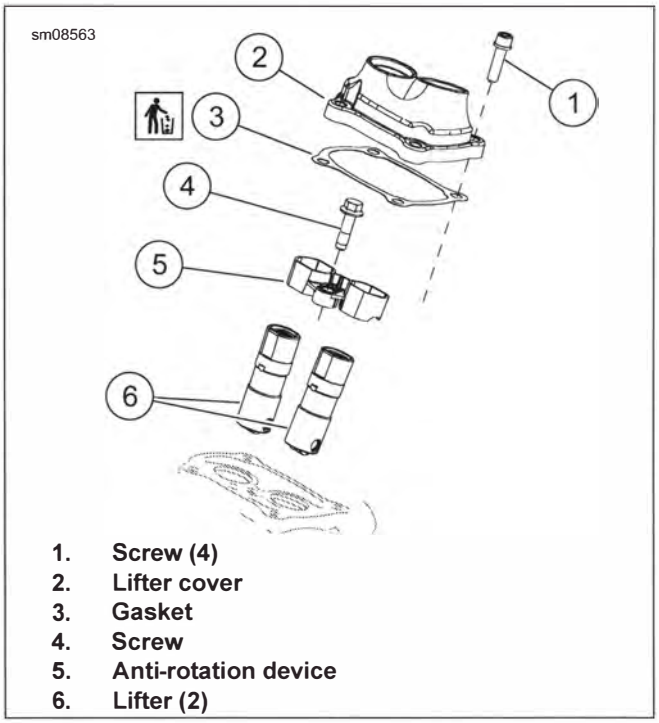
NOTE

Heat lifter anti-rotation device screw (4) to soften thread sealant with ROBINAIR HEAT GUN (PART NUMBER: HD-25070). Do not use an open flame.

   a. Remove screw (4).

b. Remove anti-rotation device (5).

c. Remove lifters (6) and place in clean plastic bags to prevent contamination.



1. **Screw (4)**
2. **Lifter cover**
3. **Gasket**
4. **Screw**
5. **Anti-rotation device**
6. **Lifter (2)**

Figure 4-22. Lifter Cover

CLEAN AND INSPECT

1. Except for hydraulic lifters, clean all parts in a non-volatile cleaning solution or solvent.

⚠ WARNING

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

2. Dry parts with low-pressure, compressed air.

3. Verify that O-ring seats and contact surfaces of pushrod covers are completely clean.

4. Verify that all oil holes are clean and open.

5. Replace pushrods that are bent, dented, damaged, discolored, or have excessively worn or damaged ends.

6. Cover all parts to protect them from dust and dirt.

INSPECT LIFTERS

1. Measure lifter outer diameter. Record measurement.

2. Measure lifter bore. Subtract this measurement from recorded lifter measurement to determine clearance.

   a. Clearance when **new**.

      0.0009–0.0026 in (0.023--0.066 mm)

   b. Install **new** lifters and/or replace crankcases if clearance exceeds service wear limit.

      0.006 in (0.152 mm)

3. Check lifter roller end clearance.

   a. Allowable end clearance.

      0.008–0.022 in (0.203–0.559 mm)

   b. Replace lifters if end clearance exceeds service wear limit.

      0.022 in (0.559 mm)

4. Soak lifters in clean engine oil. Keep covered until assembly.

5. Examine lifter rollers. If damaged, examine the associated cam lobe.

   a. Verify hydraulic lifter rollers turn freely.

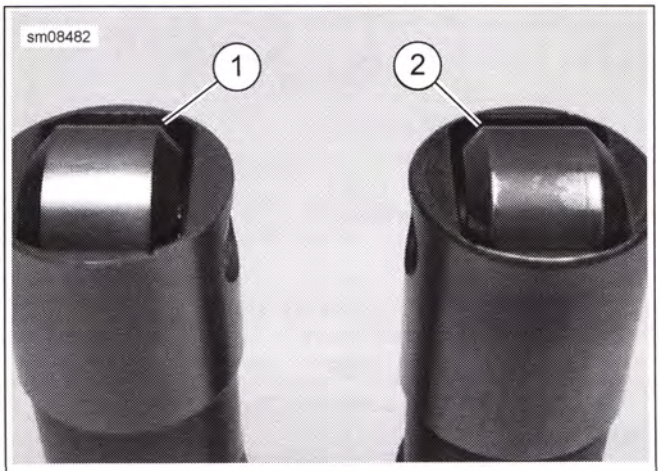
   b. Check for flat spots, scuff marks and pitting.

   c. See Figure 4-23. A dull lifter roller surface is called frosting (2). Frosting is a cosmetic condition and does not affect function.

6. Inspect lifter for signs of wear.

   a. Verify plunger is fully extended against C-clip.

   b. Pump plunger to verify operation.



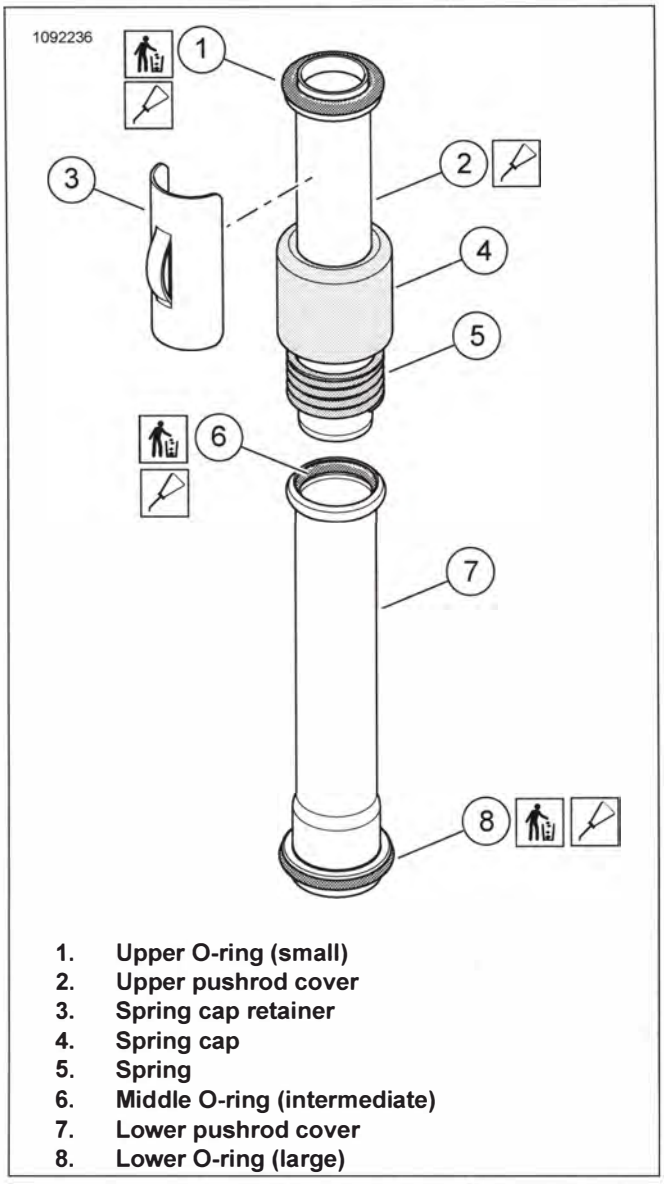
1. **Normal roller**
2. **Frosted roller**

Figure 4-23. Roller Inspection

ASSEMBLE PUSHROD COVER

1. See Figure 4-24. Apply clean engine oil to **new** O-rings (1, 6 and 8).
2. Install upper O-ring (1) on upper pushrod cover (2).
3. Slide spring cap (4) and spring (5) onto body of upper pushrod cover. Move parts up until spring cap contacts upper O-ring seat.

4. Install middle O-ring (6) into groove on top of lower pushrod cover (7).
5. Apply clean engine oil on upper pushrod cover.
6. Slide straight end of upper pushrod cover into top end of lower pushrod cover.
7. Wipe pushrod covers clean.
8. Install lower O-ring (8) on lower pushrod cover.



1. **Upper O-ring (small)**
2. **Upper pushrod cover**
3. **Spring cap retainer**
4. **Spring cap**
5. **Spring**
6. **Middle O-ring (intermediate)**
7. **Lower pushrod cover**
8. **Lower O-ring (large)**

Figure 4-24. Assembled Pushrod Cover

INSTALL

PART NUMBER	TOOL NAME
94086-09	PUSHROD TUBE CLIP REMOVER AND INSTALLER

FASTENER	TORQUE VALUE	
Lifter anti-rotation device screw	90–120 **in-lbs**	10.2–13.6 N·m
Lifter cover screws	11–13 ft-lbs	14.9–17.6 N·m

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

Lifters

NOTE

Anti-rotation devices are marked "F" (front) and "R" (rear).

1. Install lifters.
   a. Apply assembly lube to outer surface of each lifter. Pour a small amount onto each cam lobe.

      SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

   b. Rotate crankshaft until both cam lobes are visible in lifter bores.
   c. Carefully install lifters in lifter bores. **Do not** drop lifters onto cam lobes.
   d. See Figure 4-22 . Install anti-rotation device.
   e. Install screw (4). Tighten.

      Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Lifter anti-rotation device screw*

2. Install lifter cover (2), **new** gasket (3) and screws (1). Tighten in a cross-wise pattern.

   Torque: 11–13 ft-lbs (14.9–17.6 N·m) *Lifter cover screws*

Pushrod Covers

1. Install pushrod covers.
   a. Assemble pushrod covers with **new** O-rings.
   b. Install **new** O-rings on each end of pushrod cover.
   c. Compress pushrod cover assembly and fit into lifter cover bore.
   d. Extend assembly into cylinder head bore.
   e. Verify ends of pushrod cover fit snugly into cylinder head and lifter cover bores.
2. Install spring cap retainers.
   a. Insert upper edge of spring cap retainer into cylinder head bore.
   b. See Figure 4-25. Insert blade of small screwdriver between bottom edge of spring cap retainer and top of spring cap.
   c. Press spring cap down with special tool and slide bottom edge of retainer toward tip of screwdriver.

      Special Tool: PUSHROD TUBE CLIP REMOVER AND INSTALLER (94086-09)

   d. Verify spring cap retainer seats tightly against upper pushrod cover.



Figure 4-25. Install Spring Cap Retainers

Pushrods

1. Apply assembly lube to pushrod ends.

   Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

2. *NOTE*

If installing original pushrods, install in original location and orientation. Use 10.301 inch long (light blue stripes) as intake and 10.531 inch long (yellow stripes) as exhaust.

   Install pushrods.

COMPLETE

1. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
2. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
3. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
4. Connect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).
5. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
6. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
7. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
8. Connect breather hose. See ENGINE > BREATHER (Page 4-20).
9. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
10. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
11. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
12. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).
5. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
6. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
7. Remove knock sensors, ignition coil and ignition coil bracket. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
8. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
9. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
10. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
11. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
12. **Front cylinder head:** Disconnect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
13. Remove induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
14. Remove head to head coolant hose. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
15. Disconnect coolant in/out hoses from heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
16. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
17. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
18. Remove lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).
19. Remove rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
20. Remove pushrods and pushrod covers. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).
21. Remove right rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
22. Remove exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

REMOVE

1. See Figure 4-26. Remove cylinder head nuts.
   a. Loosen each cylinder head nuts (1) in sequence shown.
   b. Discard head nuts.
2. See Figure 4-27. Remove cylinder head.
   a. Lift cylinder head (2) from dowel pins (4).
   b. Discard gasket (3).

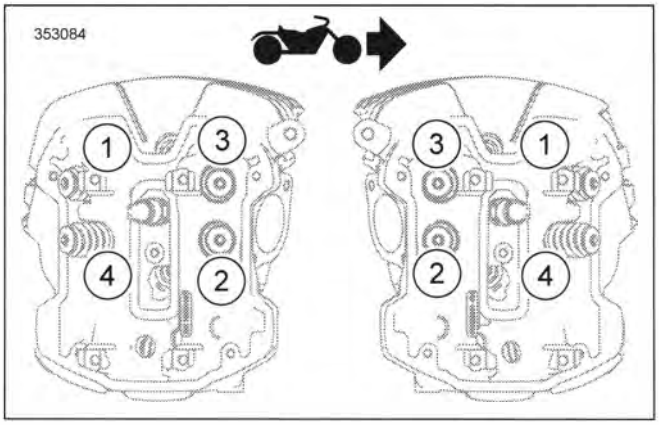
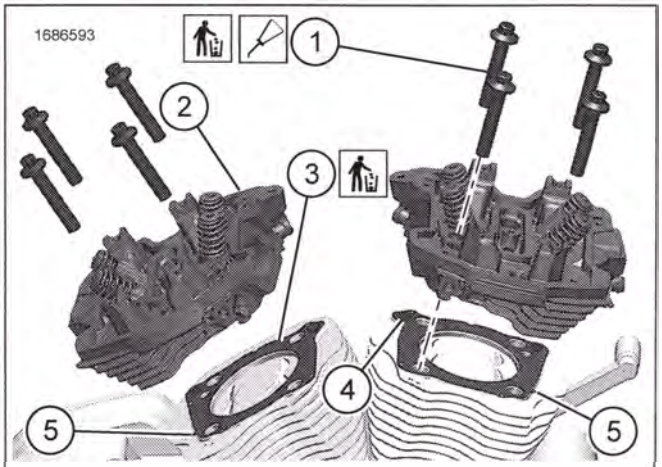


Figure 4-26. Tightening Sequence



1. **Cylinder head nut (8)**
2. **Cylinder head (2)**
3. **Head gasket (2)**
4. **Dowel pin (4)**
5. **Tab (2)**

Figure 4-27. Cylinder Head

CLEAN

NOTE

Avoid getting debris in coolant and oil passages during gasket removal and cleaning.

1. Remove old gasket material from cylinder head. Do not cause scratches or nicks.

NOTE

Bead blasting materials could enter threaded holes, adversely affecting fastener engagement and torque indication. Cover all threaded holes before bead blasting.

NOTICE

Do not use glass or sand to bead blast surfaces exposed to engine oil. Blasting materials can lodge in pores of the casting. Heat expansion releases this material which can contaminate oil resulting in engine damage. (00534b)

2. Remove all carbon deposits from combustion chamber and machined surfaces of cylinder head. Do not remove any metal.

3. Soften stubborn deposits by soaking cylinder head in a carbon and gum dissolving agent.

4. Repeat as necessary.

5. Thoroughly clean cylinder head, spring retainers, tapered keepers, valves and valve springs in a non-volatile cleaning solution or solvent.

6. Wash in hot soapy water.

7. Flush all passages to remove debris.

⚠ WARNING

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

8. Dry parts with low-pressure, compressed air.

9. *NOTE*

Cover exposed internal engine area to prevent contamination.

Clean threadlocker from all screws and threaded holes. See Cleaning Fastener Threads.

INSTALL

FASTENER	TORQUE VALUE	
Cylinder head nut torque step 1.	20–30 ft-lbs	27.1–40.7 N·m
Cylinder head nut torque step 2. Loosen one turn.	-360°	-360°
Cylinder head nut torque step 3.	9–11 ft-lbs	12.2–14.9 N·m
Cylinder head nut torque step 4.	18–20 ft-lbs	24.4–27.1 N·m
Cylinder head nut torque step 5. Tighten additional degree value.	90°	90°

1. Clean all gasket surfaces.

2. Thoroughly flush all passages to remove loose debris.

3. See Figure 4-27. Install cylinder head.

   a. Install **new** gasket (3) with tab (5) placed as shown.

   b. Install cylinder head (2) on dowel pins (4).

4. Install **new** cylinder head flange nuts.

   a. Apply **new** engine oil to flanges of cylinder head nuts (1).

   b. Install cylinder head nuts.

5. See Figure 4-27. Tighten head nuts in five stages following sequence shown.

   a. Tighten.

   Torque: 20–30 ft-lbs (27.1–40.7 N·m) *Cylinder head nut torque step 1.*

   b. Loosen one full turn.

   Torque: -360° (-360°) *Cylinder head nut torque step 2. Loosen one turn.*

   c. Tighten.

   Torque: 9–11 ft-lbs (12.2–14.9 N·m) *Cylinder head nut torque step 3.*

d. Tighten.

Torque: 18–20 ft-lbs (24.4–27.1 N·m) *Cylinder head nut torque step 4.*

e. Tighten to final torque.

Torque: 90° (90°) *Cylinder head nut torque step 5. Tighten additional degree value.*

DISASSEMBLE

PART NUMBER	TOOL NAME
B-49312	CYLINDER HEAD HOLDING FIXTURE
HD-34736-B	VALVE SPRING COMPRESSOR

1. See Figure 4-30. Secure cylinder head for service.
   a. Remove spark plugs.
   b. Turn 10 mm end of fixture (1) into cylinder head (2) spark plug hole.
      Special Tool: CYLINDER HEAD HOLDING FIXTURE (B-49312)
   c. Clamp tool in vise.
2. Remove ACR. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
3. Remove ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
4. See Figure 4-31. Remove valves.
   a. Use valve spring compressor to compress valve spring.
      Special Tool: VALVE SPRING COMPRESSOR (HD-34736-B)
   b. Remove tapered keepers (1).
   c. Slowly release valve spring compression.
   d. Remove spring retainer (2) and valve spring (3).
   e. Remove valve (6).
5. Remove valve stem seal assembly (4).
6. Remove retainer ring (5) if needed.
7. Identify components.
   a. Mark valve head for location.
   b. Place tapered keepers, valve spring and spring retainer in a plastic bag with identification.
8. Remove remaining valves and components.

CLEAN AND INSPECT

PART NUMBER	TOOL NAME
B-45525	VALVE GUIDE HONE
HD-34751	CLEANING BRUSH

Cylinder Head

1. Check all gasket sealing surfaces for scratches and nicks.
2. Check head flatness with feeler gauge.
   a. Using a straightedge, check gasket surface for warpage.
   b. Replace head if warpage exceeds specification.
      0.006 in (0.152 mm)
3. Verify all passages are clean and open.

Valve Guides

1. Inspect external surfaces for cracks.
2. Prepare valve guides for inspection.
   a. Lightly hone bore.
      Special Tool: VALVE GUIDE HONE (B-45525)
   b. Scrub bore.
      Special Tool: CLEANING BRUSH (HD-34751)
   c. Polish valve stem with fine emery cloth or steel wool to remove carbon buildup.
3. Check valve stem to guide clearance. See Table 4-19.
   a. Measure valve guide **inside** diameter.
   b. Measure valve stem **outside** diameter.
   c. If stem to guide clearance exceeds service limits, repeat measurements with a **new** valve to determine worn components.
   d. If stem to guide clearance exceeds service limits with a **new** valve, replace cylinder head.

Valves and Valve Seats

1. With valves removed, inspect sealing surface of valve face and valve seat.
   a. Sealing surfaces must be smooth and even around entire contact area.
   b. If sealing contact area is uneven or shows evidence of pitting, carbon tracking, or other indications of combustion gas leakage, recondition valve and seat, or replace cylinder head assembly. See CYLINDER HEADS > VALVE AND SEAT REPAIR (Page 4-33).
2. Inspect valve for burning, cracking, carbon tracking, or other indications of combustion gas leakage.
3. Inspect top of valve stem for pitting or uneven wear.
4. Remove burrs around valve stem keeper groove with a fine tooth file.

5. To determine if valve stem is excessively worn, see valve guide inspection.

Valve Springs

1. Inspect springs for cracked or discolored coils.
2. Check for squareness.
3. Check free length. See Table 4-20.
4. Load test using a commercially available valve spring tester.

Tapered Keepers

Install **new** keepers any time valves are installed.

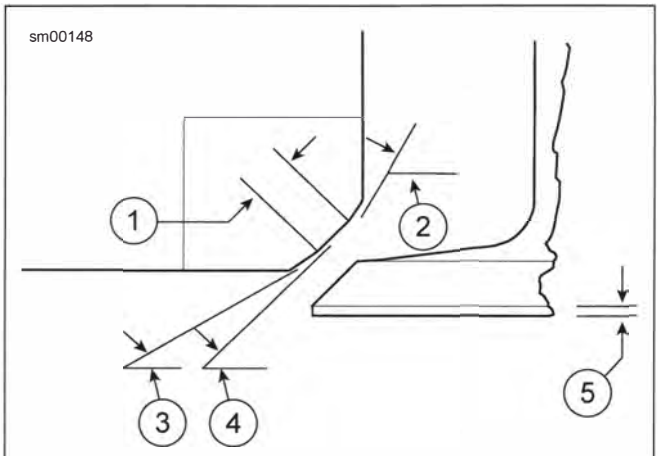
Valve Seats

1. Inspect seats for cracking, chipping or burning, carbon tracking, or other indications of combustion gas leakage.
2. Check seat wear by measuring valve stem protrusion. See CYLINDER HEADS > VALVE AND SEAT REPAIR (Page 4-33).
3. Replace cylinder head if seats are damaged or worn excessively.

VALVE AND SEAT REPAIR

NOTE

- *Verify correct valve stem to valve guide clearance before refacing. Refer to Table 4-31.*
- *The correct finished angles are 45 degree valve face and 46 degree valve seat eliminating the need to lap.*
- *Finish valve seat to an even width of 0.040–0.062 in (1.016–1.575 mm).*
- *See Figure 4-28. Replace the valve if margin (5) is less than 0.0313 in (0.795 mm).*
- *Refurbish valves and seats in pairs. Valve stem protrusion of a pair operated by the same rocker arm must be equal. Verify that valve lash is within specification. See ROCKER ARMS > INSTALL (Page 4-24).*
- *If valve stem protrusion exceeds 1.752 in (44.5 mm), replace the valve or cylinder head as necessary.*



1. **0.040-0.080 in (1.02-2.03 mm)**
2. **60 degrees**
3. **31 degrees**
4. **46 degrees**
5. **Margin: 0.031 in (0.79 mm) minimum**

Figure 4-28. Valve and Seat Dimensions

Table 4-31. Valve Stem to Guide Clearance

VALVE	IN	MM
Intake	0.001-0.003	0.0254-0.0762
Exhaust	0.001-0.003	0.0254-0.0762

ASSEMBLE

PART NUMBER	TOOL NAME
B-49312	CYLINDER HEAD HOLDING FIXTURE
HD-34736-B	VALVE SPRING COMPRESSOR
HD-34751	CLEANING BRUSH
HD-45322	VALVE GUIDE SEAL INSTALLER

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

1. See Figure 4-30. Secure cylinder head for service.
   a. Turn 10 mm end of head holding fixture into spark plug hole.
      Special Tool: CYLINDER HEAD HOLDING FIXTURE (B-49312)
   b. Clamp tool in vise.

NOTE

Install all parts in their original location.

2. See Figure 4-31. Install valve.
   a. Clean valve guide.
      Special Tool: CLEANING BRUSH (HD-34751)
   b. Generously apply assembly lube to valve stem.
      SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)
   c. Install valve (6) into cylinder head.
   d. Spin valve while installing to distribute lubricant.

e. Remove valve and apply a second coat of SCREAMIN' EAGLE ASSEMBLY LUBE. Install valve.

3. See Figure 4-29. Install **new** valve stem seal.

   a. Install retaining ring (3) if removed.

   b. Slide installer over valve stem tip.

      Special Tool: VALVE GUIDE SEAL INSTALLER (HD-45322)

   c. Generously apply assembly lube to installer.

      SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

   d. See Figure 4-29. Slide **new** valve stem seal assembly (1) over installer and down valve stem until seated against cylinder head casting.

   e. Remove installer from valve stem tip.

4. See Figure 4-31. Install valve spring.

   a. Generously apply assembly lube to valve stem tip and keeper groove.

      SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

   b. Install valve spring (3) with smaller diameter coils topside.

   c. Place spring retainer (2) on top of valve spring.

5. Install **new** keepers.

   a. Compress valve spring.

      Special Tool: VALVE SPRING COMPRESSOR (HD-34736-B)

   b. Install keepers.

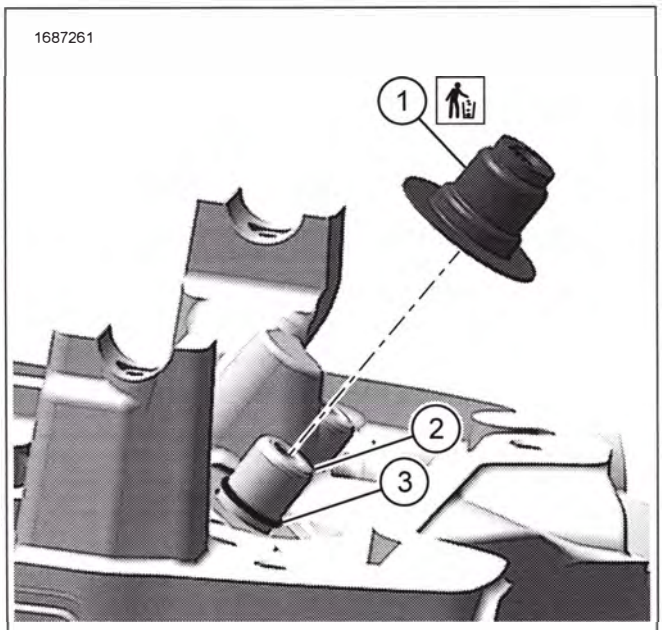
   c. Slowly release valve spring compressor.

   d. Tap end of valve stem twice with a soft mallet to make sure tapered keepers are tightly seated.

6. Install remaining valves.

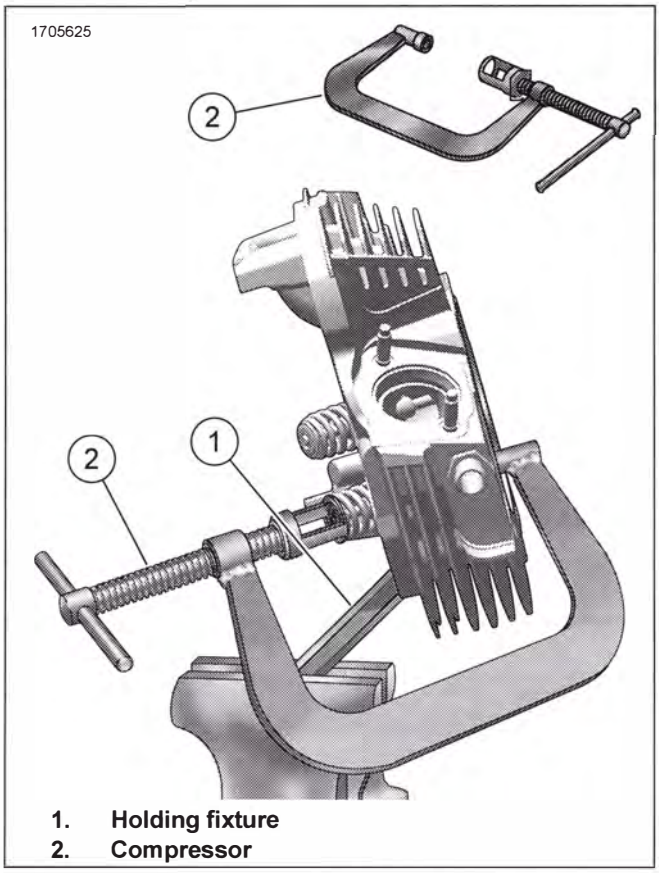
7. Install ACR. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

8. Install ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).



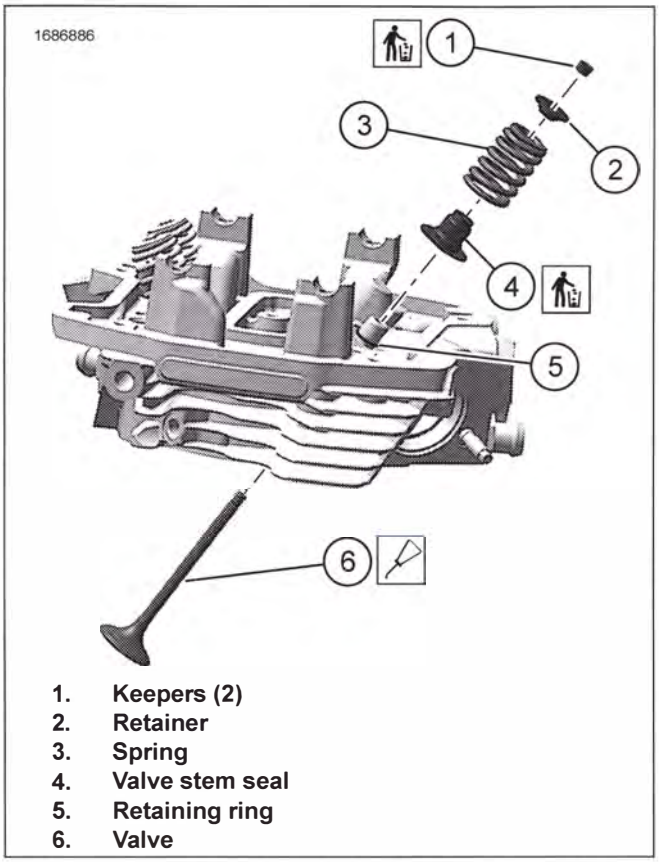
1. Valve stem seal
2. Valve guide
3. Retaining ring

Figure 4-29. Valve Stem Seal Assembly



1. Holding fixture
2. Compressor

Figure 4-30. Valve Spring Compressor



1. **Keepers (2)**
2. **Retainer**
3. **Spring**
4. **Valve stem seal**
5. **Retaining ring**
6. **Valve**

Figure 4-31. Valve Components

COMPLETE

1. Install pushrods and pushrod covers. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).
2. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
3. Install lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).
4. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
5. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
6. Connect coolant in/out hoses to heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
7. Install head to head coolant hose. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
8. Install induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
9. **Front cylinder head:** Connect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
10. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
11. Install breather hose. See ENGINE > BREATHER (Page 4-20).
12. Install ignition coil bracket, ignition coil and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
13. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
14. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
15. Install exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
16. Install rider right footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
17. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
18. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
19. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
20. Install seat. See CHASSIS > SEAT (Page 3-139).
21. Fill and bleed coolant system. See COOLING SYSTEM > COOLANT (Page 7-9).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).
5. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
6. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
7. Remove knock sensors, ignition coil and ignition coil bracket. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
8. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
9. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
10. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
11. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
12. **Front cylinder head:** Disconnect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
13. Remove induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
14. Remove head to head coolant hose. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
15. Disconnect coolant in/out hoses from heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
16. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
17. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
18. Remove lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).
19. Remove rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
20. Remove pushrods and pushrod covers. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).
21. Remove right rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
22. Remove exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
23. Remove cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).

REMOVE

NOTE

Do not bend cylinder studs.

1. Remove cylinder.
   a. Raise cylinder (1) and place clean shop towels under piston (2).
   b. Hold piston to prevent touching studs (3).
   c. Lift cylinder clear of piston.
2. Slide plastic tubing, rubber hose or conduit over each cylinder stud to protect cylinder studs and piston from damage.
3. See Figure 4-32. Discard gasket (4).



1. **Cylinder**
2. **Piston**
3. **Studs (4)**
4. **Gasket**

Figure 4-32. Cylinder Assembly

INSTALL

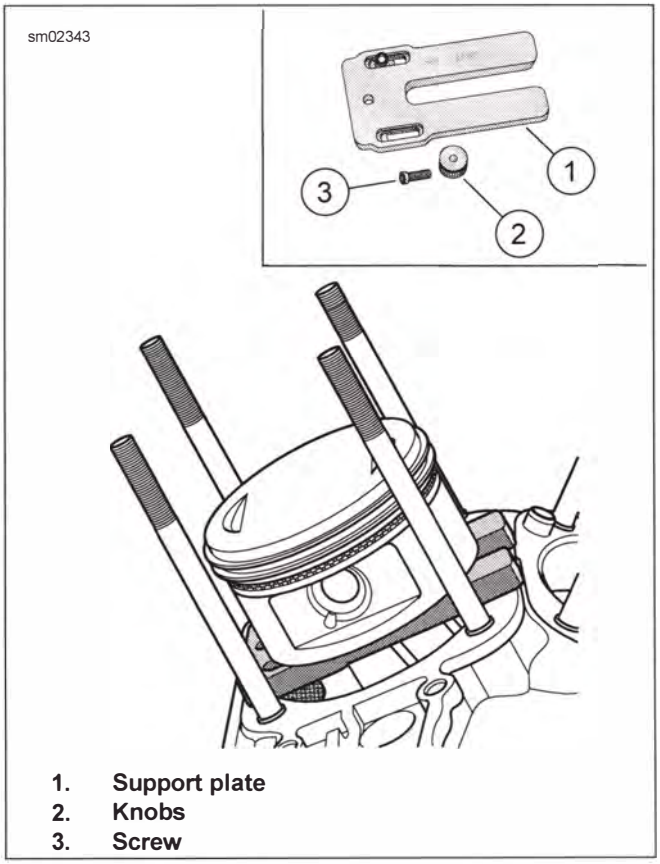
PART NUMBER	TOOL NAME
HD-52020	CYLINDER HOLD-DOWN NUTS
HD-52185	PISTON SUPPORT PLATE
HD-96333-51F	PISTON RING COMPRESSOR

NOTE

Front and rear cylinders are unique. Install in correct locations.

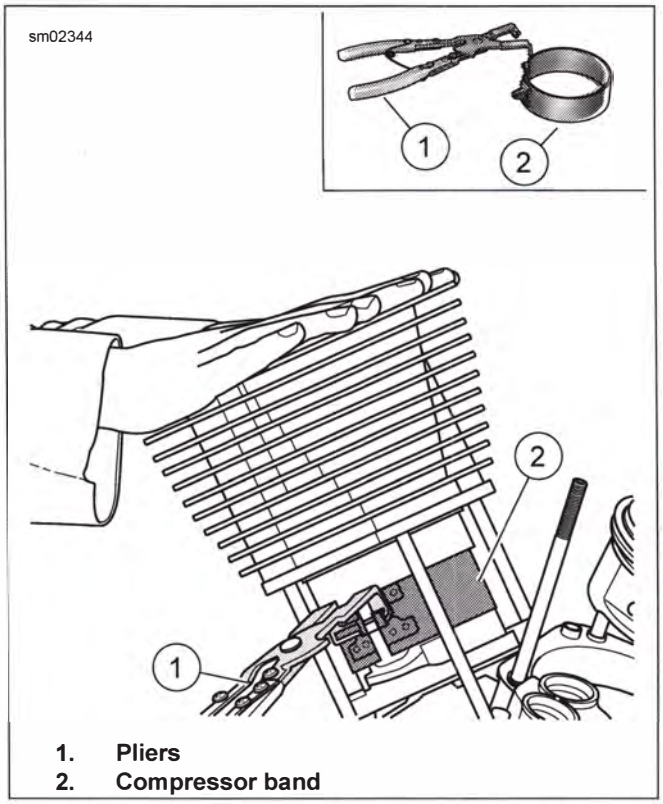
When a cylinder is replaced, piston rings need to be replaced also.

1. Prepare for cylinder installation.
   a. Install **new** base gasket to crankcase.
   b. See Figure 4-45 . Verify piston ring alignment.
   c. Apply clean engine oil to piston, piston rings and cylinder bore.
   d. Rotate crankshaft until piston is at top dead center.
2. Remove protective covers from cylinder studs.
3. See Figure 4-33. Install support plate under piston.
   Special Tool: PISTON SUPPORT PLATE (HD-52185)
4. Rotate crankshaft until piston skirt is centered and firmly seated on top of support plate.
5. See Figure 4-34. Compress piston rings.
   Special Tool: PISTON RING COMPRESSOR (HD-96333-51F)
   a. Align top of tool with center of piston ring land above top piston ring.
   b. Compress piston rings.
6. Align cooling fin indents to right side of engine.
7. Slide cylinder over studs and piston until it rests on top of ring compressor.
8. Push down on cylinder with a sharp, quick motion using the palms of both hands.
9. Remove pliers and piston support plate.
10. Remove shop towels from around the crankcase bore.
11. Push down on the cylinder until it is fully seated in crankcase bore.
12. See Figure 4-35. Install hold-down nuts onto cylinder studs.
    Special Tool: CYLINDER HOLD-DOWN NUTS (HD-52020)



1. **Support plate**
2. **Knobs**
3. **Screw**

Figure 4-33. Piston Support Plate



1. **Pliers**
2. **Compressor band**

Figure 4-34. Piston Ring Compressor

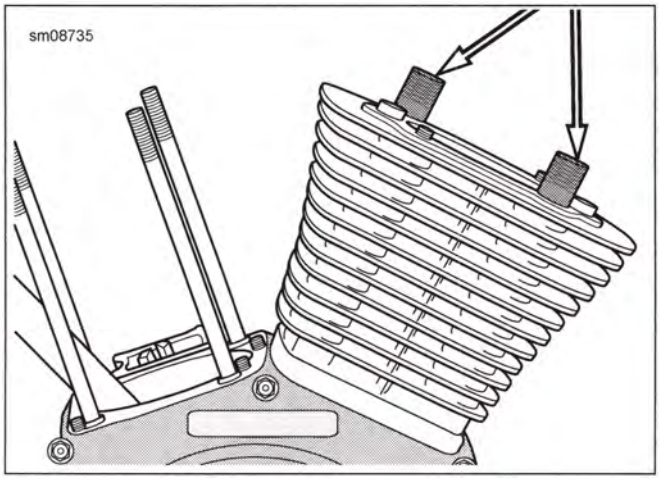


Figure 4-35. Install Threaded Cylinders to Studs

CLEAN AND INSPECT

1. Clean all gasket material from cylinder.

2. Clean parts in a non-volatile cleaning solution. Dry parts with low-pressure, compressed air.

3. Inspect cylinder bore for defects or damage in ring travel area.

   a. Light scratches less than piston travel length are considered normal. Hone pattern should travel through scratches. This cylinder is fit for operation.

   b. Run a fingernail across scratches. If a scratch catches a fingernail, cylinder must be replaced.

   c. Scoring or broad bands that are piston travel length, or evidence that material transferred between piston and cylinder, cylinder must be replaced.

4. Deglaze cylinders. See CYLINDERS > DEGLAZE CYLINDER (Page 4-38).

5. Verify all oil holes are clean and open.

6. Remove any nicks or burrs from machined gasket surfaces.

7. Check gasket surfaces for flatness. Measure with a straightedge and feeler gauge.

   a. Check cylinder-to-head gasket surface. Record measurements.

   b. Check cylinder-to-lower gasket surface. Record measurements.

   c. Discard cylinder if either gasket surface flatness is not within wear limits. See ENGINE > SPECIFICATIONS (Page 4-3)

DEGLAZE CYLINDER

1. Lightly swab cylinder bore with a cloth dipped in clean engine oil.

NOTE

A precise 60 degree crosshatch pattern in the piston travel area is important.

NOTICE

The angular crosshatch 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. (00536c)

2. Deglaze cylinder with a 240 grit flexible ball-type deglazing tool. Create a 60 degree crosshatch.

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537c)

3. Thoroughly wash cylinder bore with liquid dishwashing soap and hot water. Continue cleaning until a clean cloth shows no evidence of dirt or debris.

   a. Hot rinse cylinder and dry with moisture free compressed air.

   b. Immediately apply a thin film of clean engine oil to a clean white paper towel and thoroughly wipe inside of cylinder.

   c. Repeat wiping process until a **new** towel remains white.

COMPLETE

1. Install cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).

2. Install pushrods and pushrod covers. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).

3. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

4. Install lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

5. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

6. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

7. Connect coolant in/out hoses to heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).

8. Install head to head coolant hose. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).

9. Install induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).

10. **Front cylinder head:** Connect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).

11. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).

12. Install breather hose. See ENGINE > BREATHER (Page 4-20).

13. Install ignition coil bracket, ignition coil and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).

14. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

15. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

16. Install exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

17. Install rider right footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

18. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

19. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

20. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

21. Install seat. See CHASSIS > SEAT (Page 3-139).

22. Fill and bleed coolant system. See COOLING SYSTEM > COOLANT (Page 7-9).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).
5. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
6. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
7. Remove knock sensors, ignition coil and ignition coil bracket. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
8. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
9. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
10. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
11. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
12. **Front cylinder head:** Disconnect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
13. Remove induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
14. Remove head to head coolant hose. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
15. Disconnect coolant in/out hoses from heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
16. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
17. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
18. Remove lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).
19. Remove rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
20. Remove pushrods and pushrod covers. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).
21. Remove right rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
22. Remove exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
23. Remove cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).
24. Remove cylinders. See ENGINE > CYLINDERS (Page 4-36).

REMOVE

PART NUMBER	TOOL NAME
HD-42320-D	PISTON PIN EXTRACTOR
HD-51069	PISTON PIN CLIP REMOVER/INSTALLER KIT
HD-51069-17	NOSE ADAPTER

1. *NOTE*

It is not necessary to remove both piston pin retaining rings for piston removal.

Place clean shop towels over crankcase bore to prevent the piston pin retaining ring from falling into crankcase.

2. See Figure 4-36. Remove and discard one piston pin retaining ring.

Special Tool: PISTON PIN CLIP REMOVER/INSTALLER KIT (HD-51069)
Special Tool: NOSE ADAPTER (HD-51069-17)

3. See Figure 4-37. Remove piston.

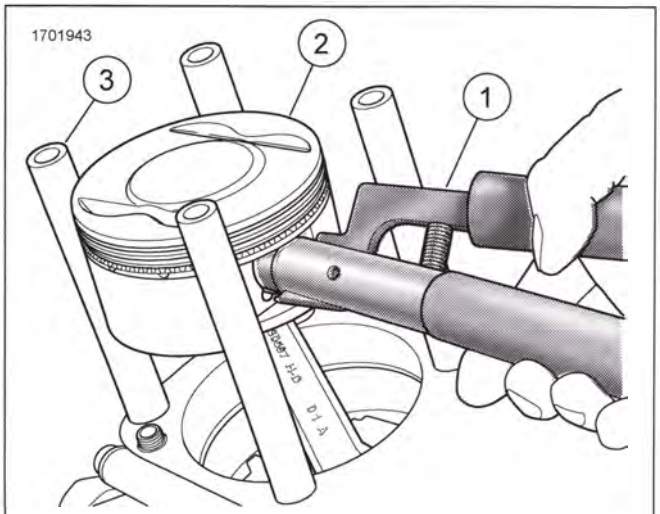
4. *NOTE*

Prevent connecting rod from striking crankcase.

Remove piston pin.

Special Tool: PISTON PIN EXTRACTOR (HD-42320-D)

5. Wrap connecting rod to prevent damage.
6. Mark piston location on piston underside.



1. **Piston pin retaining ring installer**
2. **Piston**
3. **Protective material over cylinder studs**

Figure 4-36. Piston Pin Retaining Ring Removal

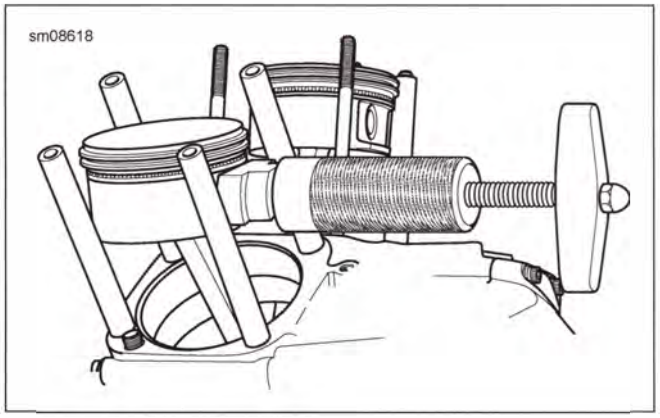


Figure 4-37. Remove Piston Pin

INSTALL

PART NUMBER	TOOL NAME
HD-51069-17	NOSE ADADPTER
HD-51069-2	PISTON PIN RETAINING RING INSTALLER

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

⚠ WARNING

Failure to properly install and inspect piston pin retaining rings will result in engine failure and possible rear wheel lockup, which could result in death or serious injury. (03406a)

1. *NOTE*

Do not reuse piston pin retaining rings.

See Figure 4-38. Install one **new** piston pin retaining ring.

Special Tool: PISTON PIN RETAINING RING INSTALLER (HD-51069-2)

Special Tool: NOSE ADAPTER (HD-51069-17)

a. See Figure 4-40. Insert tool (2) into piston pin bore until claw is aligned with slot (3) in piston.

b. See Figure 4-39. Verify retaining ring end gap (3) is opposite from opening (2).

c. Verify retaining ring is fully seated in groove.

2. Install piston.

a. Apply assembly lube to piston pin, piston pin bores and upper connecting rod bore.

SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

b. Remove protective wrap from connecting rod.

c. See Figure 4-40. Place piston over rod end with arrow (1) pointing toward front of engine.

d. Insert piston pin through piston and connecting rod until it contacts installed retaining ring.

e. Cover crankcase openings.

3. See Figure 4-38. Install **new** retaining ring.

Special Tool: PISTON PIN RETAINING RING INSTALLER (HD-51069-2)
Special Tool: NOSE ADAPTER (HD-51069-17)

a. See Figure 4-39. Verify retaining ring end gap (3) is opposite from opening (2).

b. Verify retaining ring is fully seated in groove.

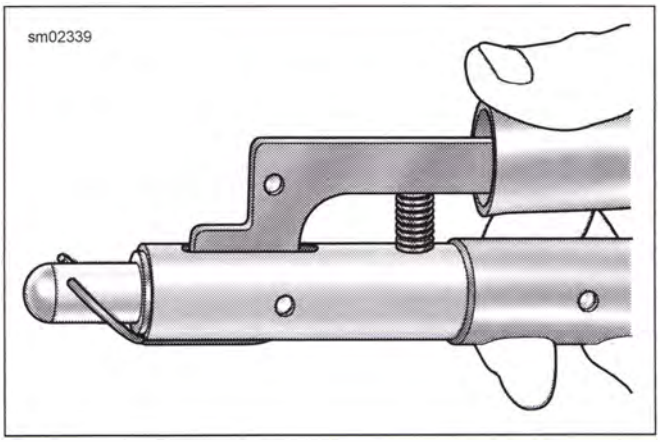
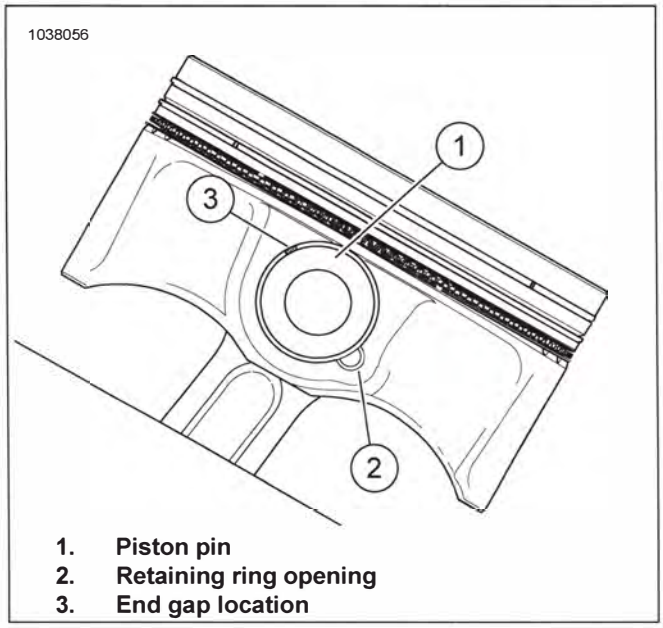
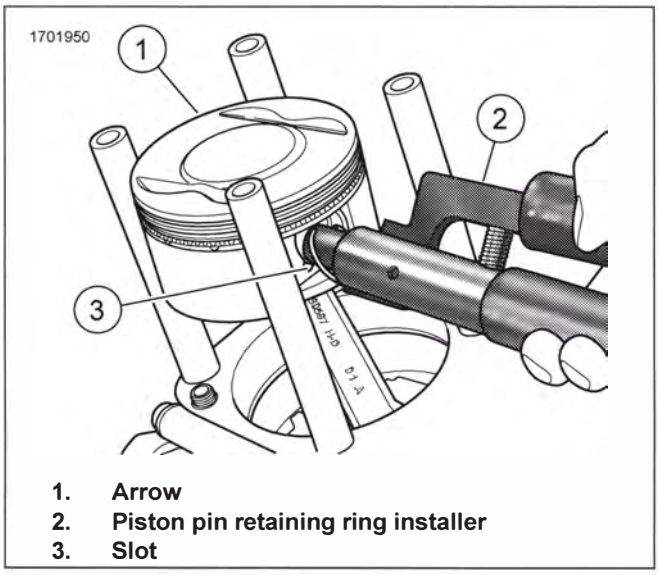


Figure 4-38. Aligning Retaining Ring



1. **Piston pin**
2. **Retaining ring opening**
3. **End gap location**

Figure 4-39. Pre-Installed Retaining Ring



1. **Arrow**
2. **Piston pin retaining ring installer**
3. **Slot**

Figure 4-40. Install Pin Retaining Ring

DISASSEMBLE

1. Remove piston rings.

CLEAN AND INSPECT

Clean

⚠ WARNING

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

1. *NOTE*

- *Do not sandblast or glass bead blast pistons. Bead blasting rounds off ring lands.*
- *Do not damage or enlarge holes.*
- *Do not use a wire brush to clean oil holes.*
- *Avoid scratching sides of the piston ring grooves.*

Remove all combustion deposits.

a. Soak pistons in hot water with dishwashing liquid or a cleaner designed to remove carbon and does not corrode aluminum.

b. Thoroughly rinse pistons.

c. Clean oil drain holes in oil control ring groove with a small bristle brush.

d. Dry parts with low-pressure, compressed air.

2. Verify that all oil holes are clean and open.

3. *NOTE*

A portion of a compression ring properly ground to a sharp chisel-like edge works well to clean piston ring grooves.

Thoroughly clean the three piston ring grooves of all carbon deposits.

Inspect

1. Check piston running clearance.

a. Insert a lightly oiled good piston pin into piston pin bore to feel for proper fit. The pin should slide in and out without binding, pivoting or rocking.

b. Measure pin and pin bore diameters to determine running clearance. Replace piston and/or pin if clearance exceeds specified dimension.

0.0008 in (0.02 mm)

2. *NOTE*

Pistons with superficial wear marks, minor scratching or mild scoring are acceptable for use.

Carefully inspect pistons for damage or excessive wear. Discard if any following conditions are found:

a. Using dye penetrant, inspect pistons for surface cracks. Particularly examine area around pin bores, ring lands and oil drain holes beneath piston crown.

NOTE

Thoroughly wash usable pistons to remove traces of dye.

b. Cracked, worn or bent ring lands.

c. Cracks, gouges, deep scratches or heavy scoring.

d. Evidence of burning, etching or melting.

e. Marks or imprints caused by contact with valves.

3. Lightly file to remove any dings, nicks or burrs around edge of piston crown.

4. See Figure 4-41. Measure piston ring side clearance.

   a. Insert edge of a **new** ring into piston ring groove.

   b. Insert a feeler gauge between upper surface of ring and ring land.

   c. Repeat this check at several locations around piston.

   d. Discard piston if side clearance of either compression ring exceeds specified dimension.

      0.004 in (0.102 mm)

   e. Discard piston if oil control ring side clearance exceeds specified dimension.

      0.010 in (0.25 mm)

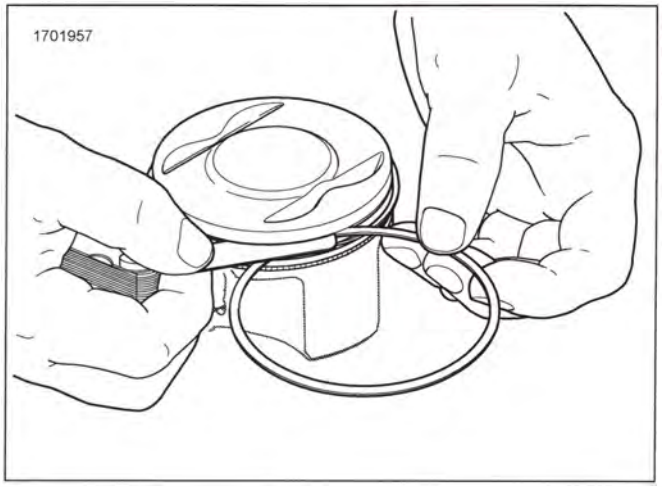


Figure 4-41. Measure Ring Clearance

5. *NOTE*

- *Check piston clearance in the cylinder in which that piston will run. Cylinder must be deglazed. See Deglaze Cylinder in ENGINE > CYLINDERS (Page 4-36).*
- *This inspection is very heat-sensitive.*
  - *Both piston and cylinder must be at room temperature before proceeding.*
  - *Do not check piston running clearance immediately after honing or deglazing cylinder.*
  - *Even holding the piston for too long can cause measurements to vary by as much as Dimension: 0.0002 in (0.0051 mm).*
- *See upper frame of Figure 4-42. The coating has an oval-shaped opening (1) on each side of the piston for proper micrometer placement.*
- *See lower frame of Figure 4-42. Use a blade or ball anvil style micrometer to measure piston.*

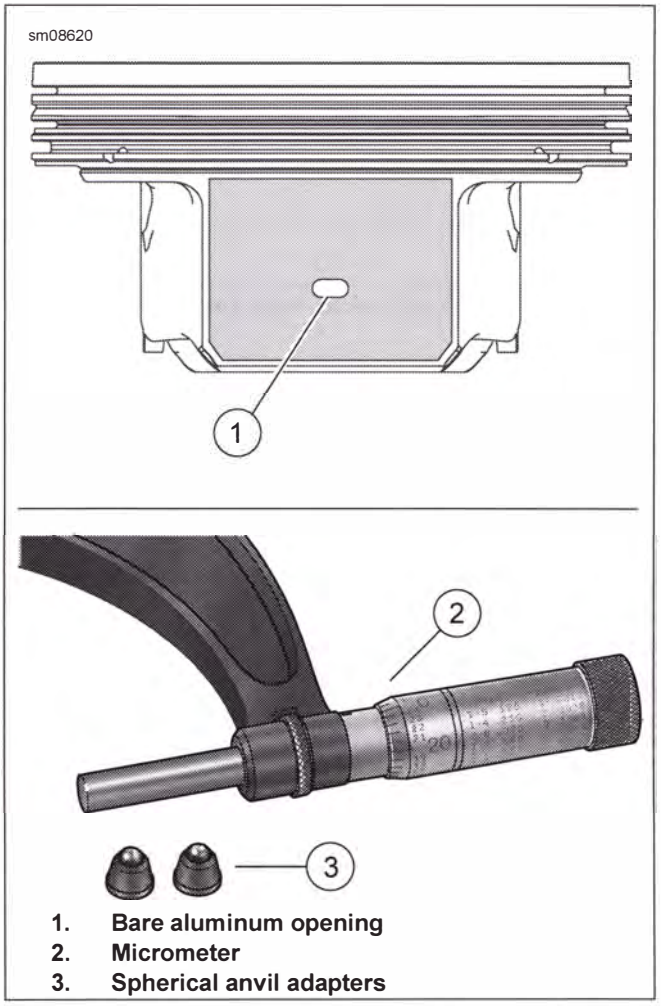
See Figure 4-42. Measure running clearance of pistons:

   a. Measure piston skirt at bare aluminum openings (1).

   b. Transfer measurement to dial bore gauge.

   c. Measure at top and middle of piston ring travel zone. Measure parallel and perpendicular to crankshaft.

   d. Replace piston and/or cylinder if running clearance exceeds service wear limit. See ENGINE > SPECIFICATIONS (Page 4-3).



1. **Bare aluminum opening**
2. **Micrometer**
3. **Spherical anvil adapters**

Figure 4-42. Measure Piston Running Clearance

CHECK PISTON RING GAP

1. *NOTE*

- *Always install **new** piston rings.*
- *Always deglaze the cylinder before installing **new** rings.*
- *Insufficient ring gap may cause the ends to touch at operating temperatures. This causes ring breakage, cylinder scuffing and/or piston seizure.*
- *Excessive ring gap causes high oil consumption and blow-by of exhaust gases resulting in contaminated oil and reduced engine efficiency.*

See Figure 4-43. Check ring end gaps before installing on piston.

a. Place ring in cylinder.

b. Align piston ring in cylinder with upside down piston.

c. Measure ring end gap with feeler gauge. Refer to Table 4-10 .

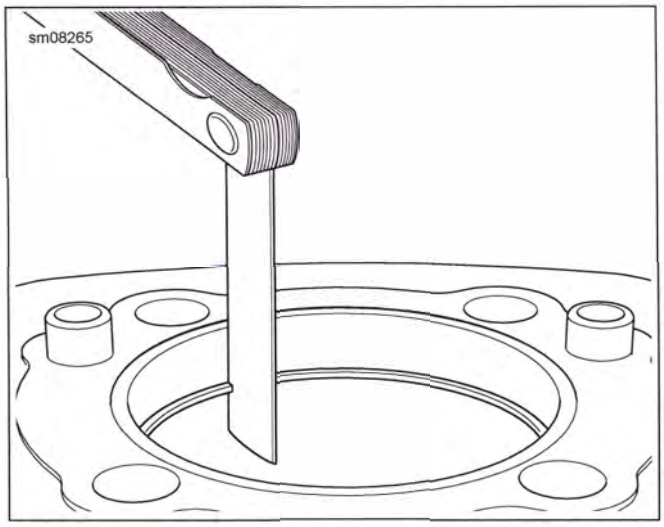


Figure 4-43. Measuring Ring Gap

ASSEMBLE

1. *NOTE*

Piston ring position is identical for both pistons.

See Figure 4-44. Install three-piece oil control ring.

a. Install expander ring (1) with ends facing up (see inset).

b. Install bottom oil rail (2).

c. Install top oil rail (3).

2. *NOTE*

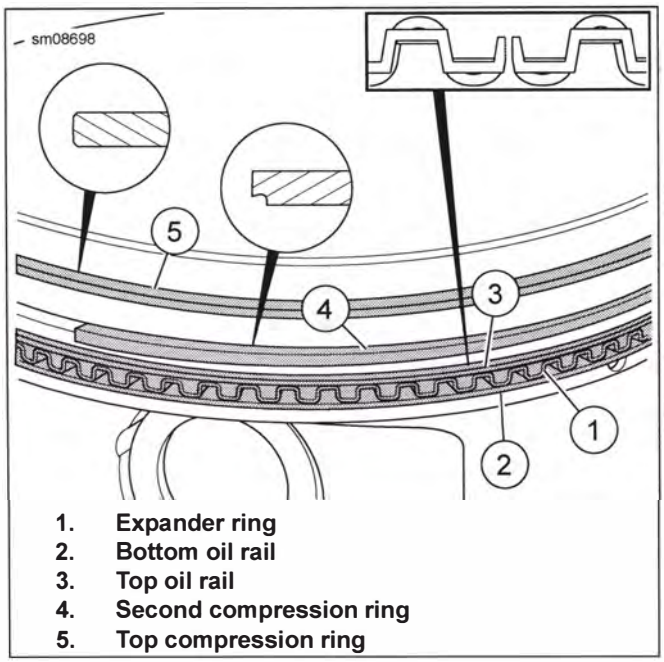
- *Position "N" marking on compression rings up.*
- *Top ring face has chamfered corners. Second ring has a sharp upper corner and a groove cut around lower edge.*

Install second compression ring (4).

3. Install top compression ring (5).

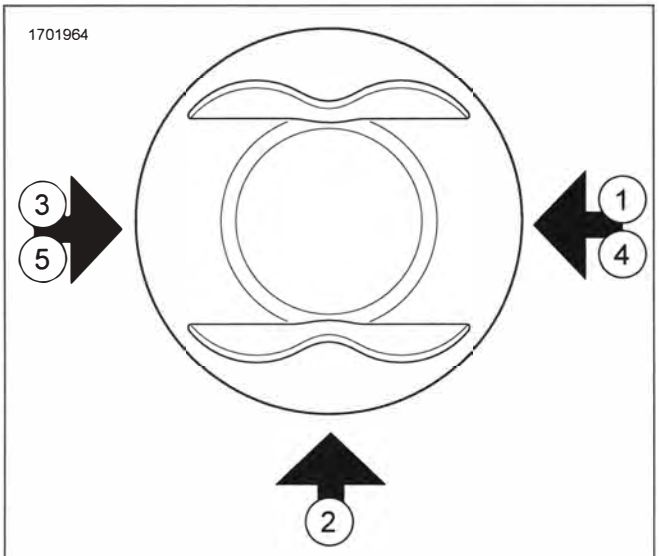
4. Verify all piston rings rotate freely.

5. See Figure 4-45. Arrange gaps as shown.



1. Expander ring
2. Bottom oil rail
3. Top oil rail
4. Second compression ring
5. Top compression ring

Figure 4-44. Piston Rings



1. Expander ring
2. Bottom oil rail
3. Top oil rail
4. Second compression ring
5. Top compression ring

Figure 4-45. Piston Ring Order of Assembly and Gap Alignment

COMPLETE

1. Install cylinders. See ENGINE > CYLINDERS (Page 4-36).

2. Install cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).

3. Install pushrods and pushrod covers. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).

4. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

5. Install lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

6. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

7. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

8. Connect coolant in/out hoses to heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).

9. Install head to head coolant hose. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).

10. Install induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).

11. **Front cylinder head:** Connect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).

12. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).

13. Install breather hose. See ENGINE > BREATHER (Page 4-20).

14. Install ignition coil bracket, ignition coil and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).

15. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

16. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

17. Install exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

18. Install rider right footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

19. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

20. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

21. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

22. Install seat. See CHASSIS > SEAT (Page 3-139).

23. Fill and bleed coolant system. See COOLING SYSTEM > COOLANT (Page 7-9).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. **If replacing just camshaft cover:**

   a. Remove right side rider footrest. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

   b. Remove exhaust. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

   c. Proceed to remove and install camshaft cover in this section.

NOTE

Do not proceed with following steps in prepare section if only replacing camshaft cover.

2. Use low-pressure compressed air to clean exterior surfaces of engine.

3. Remove seat. See CHASSIS > SEAT (Page 3-139).

4. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

5. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

6. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

7. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

8. Remove knock sensors, ignition coil and ignition coil bracket. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).

9. Disconnect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).

10. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

11. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).

12. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).

13. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

14. Remove right side foot board and bracket assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

15. Remove exhaust header pipe. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

16. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

17. Loosen rocker arm screws to relieve tension on pushrods. See ENGINE > ROCKER ARMS (Page 4-24).

REMOVE AND INSTALL: CAMSHAFT COVER

FASTENER	TORQUE VALUE	
Camshaft cover screws	90–120 **in-lbs**	10.2–13.6 N·m

Remove

1. See Figure 4-46. Remove camshaft cover.

   a. Disconnect connector (4)

   b. Remove screws (1).

   c. Remove camshaft cover (2).

   d. Discard gasket (3).

Install

1. See Figure 4-46. Install camshaft cover.

   a. Install **new** gasket (3).

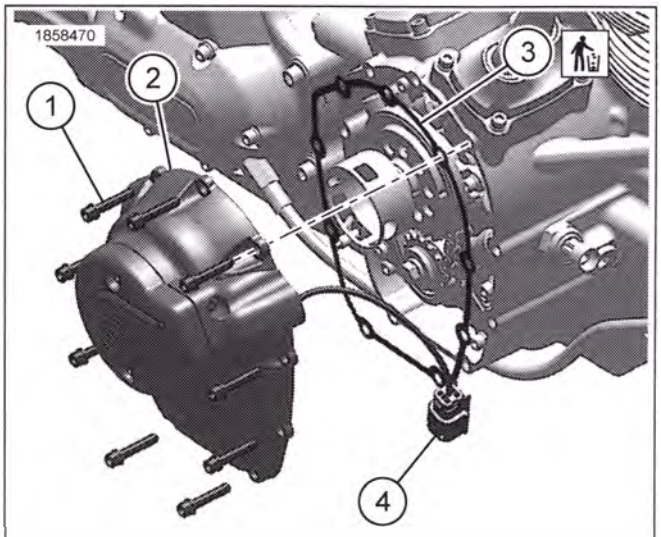
   b. Install camshaft cover (2).

   c. Install screws (1). Hand tighten.

   d. See Figure 4-47. Tighten screws in sequence shown.

   Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Camshaft cover screws*

2. See Figure 4-46. Connect connector (4).



1. **Screw (9)**
2. **Camshaft cover**
3. **Gasket**
4. **Connector**

Figure 4-46. Camshaft Cover

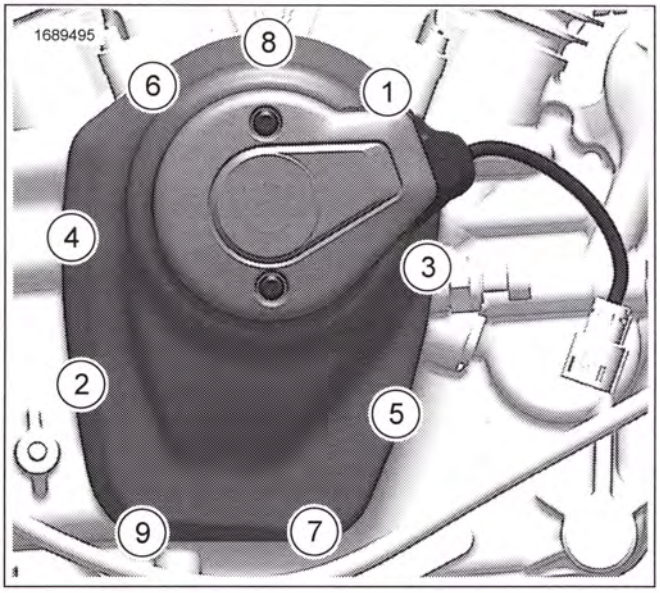


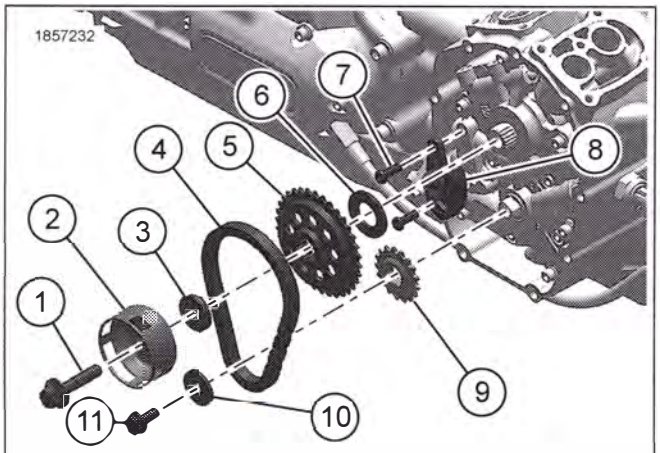
Figure 4-47. Camshaft Cover Tightening Sequence

REMOVE

PART NUMBER	TOOL NAME
93979-10	MAGNETIC LIFTER HOLDERS
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

Camshaft Drive

1. See Figure 4-48. Remove chain and sprockets.
   a. Mark one chain link.
   b. Remove screws (7) and cam chain tensioner (8).
   c. Install sprocket locking tool between cam sprocket (5) and crank sprocket (9).
      Special Tool: CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (HD-47941)
   d. Remove cam sprocket screw (1).
   e. Remove cam position rotor (2) and washer (3).
   f. Remove crank sprocket screw (11) and washer (10).
   g. Remove sprocket locking tool.
   h. Remove both sprockets and chain.
   i. Remove spacer (6).



1. **Cam sprocket screw**
2. **Cam position rotor**
3. **Washer**
4. **Cam chain**
5. **Cam sprocket**
6. **Spacer**
7. **Screw (2)**
8. **Cam chain tensioner**
9. **Crank sprocket**
10. **Washer**
11. **Crank sprocket screw**

Figure 4-48. Camshaft Drive

Camshaft

1. Remove camshaft.
   a. See Figure 4-49. Support lifters.
      Special Tool: MAGNETIC LIFTER HOLDERS (93979-10)
   b. See Figure 4-50. Remove four screws (5).
   c. Remove screws (1).
   d. Remove cam support plate (2).
   e. Remove camshaft (3).
   f. Remove O-ring (4).

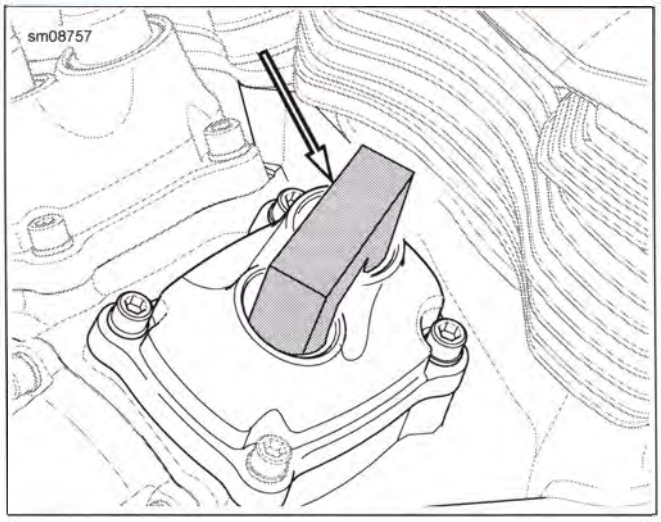
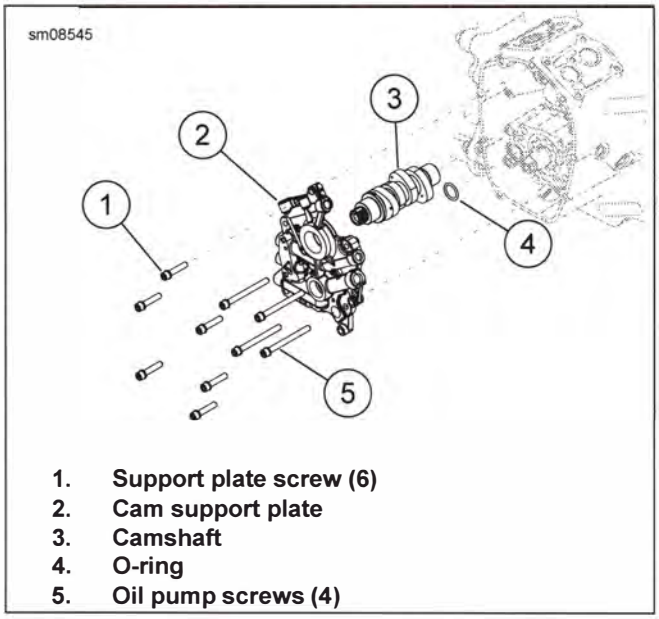


Figure 4-49. SCREAMIN' EAGLE Magnetic Lifter Holder



1. **Support plate screw (6)**
2. **Cam support plate**
3. **Camshaft**
4. **O-ring**
5. **Oil pump screws (4)**

Figure 4-50. Cam Support Plate

INSPECT CAM COMPONENT

NOTE

See ENGINE > SPECIFICATIONS (Page 4-3) for specifications.

Camshaft

1. Inspect lobes for abnormal wear or discoloration.
2. Inspect bearing surfaces for scoring or discoloration.
3. Measure bearing journals.
4. If desired, remove and inspect lifters.
   a. Mark lifters for installation in original location and orientation.
   b. Remove lifters through camshaft cavity.
   c. Measure lifters.

Cam Support Plate

1. Measure camshaft and crankshaft bores.
2. Measure support plate flatness.
3. Inspect gerotor area for excessive wear or deep grooves.
4. Verify all oil passages are clean and open.

Cam Drive Components

1. Inspect sprockets and chain for wear.
2. Inspect cam chain tensioner for wear.

INSTALL

PART NUMBER	TOOL NAME
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

FASTENER	TORQUE VALUE	
Cam chain tensioner fasteners	90–120 **in-lbs**	10.2–13.6 N·m
Cam support plate screws	90–120 **in-lbs**	10.2–13.6 N·m
Camshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N·m
Camshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N·m
Camshaft sprocket screw, final torque	34 ft-lbs	46.1 N·m
Crankshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N·m
Crankshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N·m
Crankshaft sprocket screw, final torque	24 ft-lbs	32.5 N·m
Oil pump screws (1-4), final torque	90–120 **in-lbs**	10.2–13.6 N·m
Oil pump screws, 1st torque	12–60 **in-lbs**	1.4–6.8 N·m

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002
LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (RED)	94759-99

1. Apply assembly lube to all bearing surfaces and bearings.
   Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)
2. See Figure 4-50. Install cam and cam support plate.
   a. Install camshaft in crankcase.
   b. Install **new** O-ring (4) into crankcase feed oil port.
   c. Apply assembly lube to cam support plate feed oil port.

SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

d. Slide cam support plate over shafts and mate to crankcase.

e. Verify cam support plate is fully seated.

f. Start all screws.

3. See Figure 4-51. Tighten screws in sequence.

a. Tighten screws (1-4) in sequence shown.

Torque: 12–60 **in-lbs** (1.4–6.8 N·m) *Oil pump screws, 1st torque*

b. Rotate crankshaft one full revolution (360 degrees).

c. Tighten screws (5-10) in sequence shown.

Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Cam support plate screws*

d. Tighten screws (1-4) to final torque in sequence shown.

Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Oil pump screws (1-4), final torque*

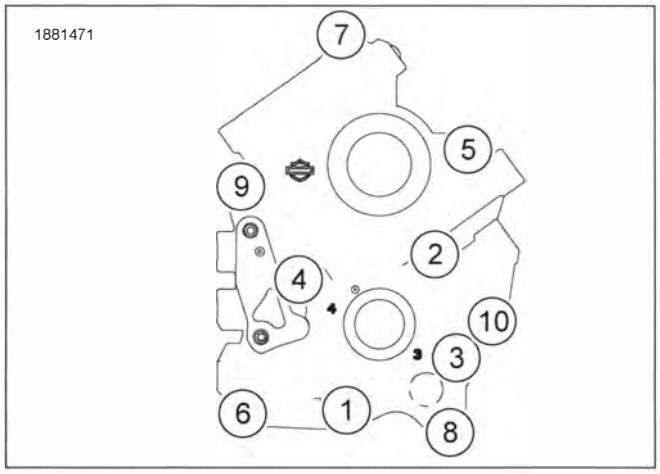


Figure 4-51. Cam Support Plate Tightening Sequence

4. *NOTE*

*Check sprocket alignment if any following parts are **new**:*

- *Cam sprocket*
- *Cam support plate*
- *Camshaft*
- *Crankshaft sprocket*
- *Flywheel assembly*

Check sprocket alignment.

a. See Figure 4-48. Install original cam sprocket spacer (6).

b. Install cam sprocket (5) without chain using screw (1) and washer (3).

c. Install crankshaft sprocket without chain using screw (11) and a smaller diameter flat washer from bulk inventory.

d. Install sprocket locking tool between sprockets.

Special Tool: CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (HD-47941)

e. Tighten camshaft sprocket screw.

Torque: 15.0 ft-lbs (20.3 N·m) *Camshaft sprocket screw, alignment check torque*

f. Tighten crankshaft sprocket screw.

Torque: 15.0 ft-lbs (20.3 N·m) *Crankshaft sprocket screw, alignment check torque*

g. Remove sprocket locking tool.

h. Push on crankshaft and camshaft to eliminate end play.

i. Place a straightedge across sprocket faces. Alignment offset maximum.

Length/Dimension/Distance: 0.009 in (0.23 mm)

j. Remove cam sprocket.

k. Install appropriate spacer (6) using Table 4-32 as a guide.

l. Check alignment with **new** spacer installed.

m. Remove both sprockets.

Table 4-32. Cam Sprocket Spacers

PART NO.	IN	MM
25729-06	0.100	2.54
25731-06	0.110	2.79
25734-06	0.120	3.05
25736-06	0.130	3.30
25737-06	0.140	3.56
25738-06	0.150	3.81

5. Install camshaft drive.

a. Apply assembly lube to camshaft and crankshaft.

SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

b. Install cam sprocket spacer (6).

c. See Figure 4-52. Assemble sprockets and chain with timing marks aligned. Verify marked chain link is on the same side as the timing marks.

d. Rotate camshaft until keyed spline is up.

e. Rotate crankshaft until flat is up.

f. Install sprockets and chain.

g. Verify that timing marks on sprockets are aligned.

h. If reusing screws, clean old threadlocker from screws and mating components.

i. Apply threadlocker (red) to both screws.

LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (RED) (94759-99)

j. Apply a film of oil to bottom of both sprocket screw heads and washers.

k. Loosely install screws and washers.

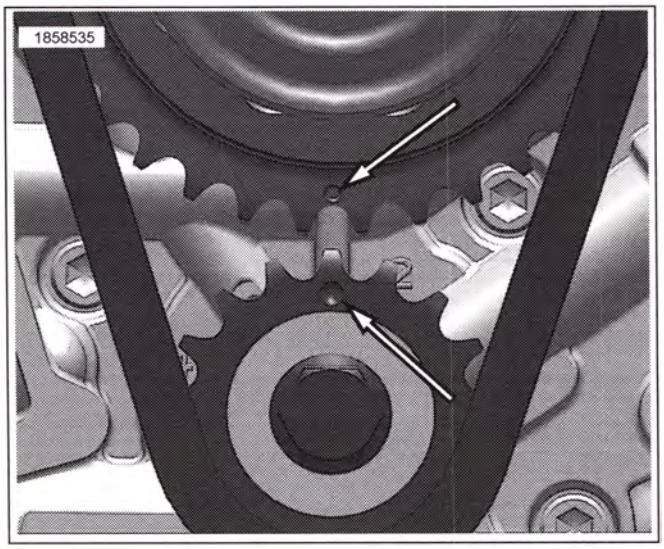


Figure 4-52. Timing Marks

6. Tighten sprocket screws.

   a. Position sprocket locking tool between sprockets.

      Special Tool: CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (HD-47941)

   b. Tighten camshaft sprocket screw.

      Torque: 15.0 ft-lbs (20.3 N·m) *Camshaft sprocket screw, 1st torque*

   c. Tighten crankshaft sprocket screw.

      Torque: 15.0 ft-lbs (20.3 N·m) *Crankshaft sprocket screw, 1st torque*

   d. Loosen both screws one revolution (360 degrees).

   e. Final tighten camshaft sprocket screw.

      Torque: 34 ft-lbs (46.1 N·m) *Camshaft sprocket screw, final torque*

   f. Final tighten crankshaft sprocket screw.

      Torque: 24 ft-lbs (32.5 N·m) *Crankshaft sprocket screw, final torque*

   g. Remove sprocket locking tool.

7. Install primary cam chain tensioner. Tighten.

   Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Cam chain tensioner fasteners*

8. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to chain and sprockets.

COMPLETE

1. **If only camshaft cover was removed:**

   a. Install exhaust. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

   b. Install right side rider footrest. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

2. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

3. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

4. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

5. Connect fuel injector connectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).

6. Install ignition coil bracket, ignition coil and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).

7. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

8. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

9. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).

10. Install breather hose. See ENGINE > BREATHER (Page 4-20).

11. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

12. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

13. Install exhaust header pipe. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

14. Install right side footboard and bracket assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

15. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

16. Install seat. See CHASSIS > SEAT (Page 3-139).

CAMSHAFT NEEDLE BEARINGS

PART NUMBER	TOOL NAME
HD-42325-C	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER

FASTENER	TORQUE VALUE	
Cam needle bearing installation maximum torque	25 ft-lbs	33.9 N·m

Remove

1. See Figure 4-53. Remove camshaft bearing.

   Special Tool: CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER (HD-42325-C)

2. Hold flat on collet. Turn hex at end to expand collet.

3. Turn hex nut to remove bearing.

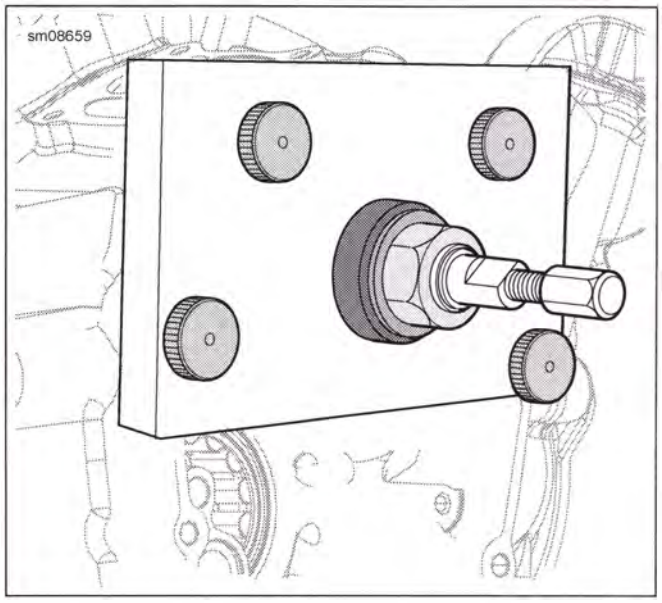


Figure 4-53. Remove Camshaft Needle Bearing

Install

1. Calculate bearing installed depth.

   a. Measure support plate thickness.

   b. Add support plate thickness to 3.737 in (94.92 mm). Record this value.

2. See Figure 4-53. Install bearing.

   Special Tool: CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER (HD-42325-C)

   a. Place **new** needle bearing on installer with letters facing installer.

   b. Install support plate.

3. See Figure 4-54. Turn forcing screw to press needle bearing to depth calculated earlier ± 0.020 in (0.54 mm).

   a. Do not exceed torque specification during needle bearing installation or damage to crankcase will occur.

      Torque: 25 ft-lbs (33.9 N·m) *Cam needle bearing installation maximum torque*

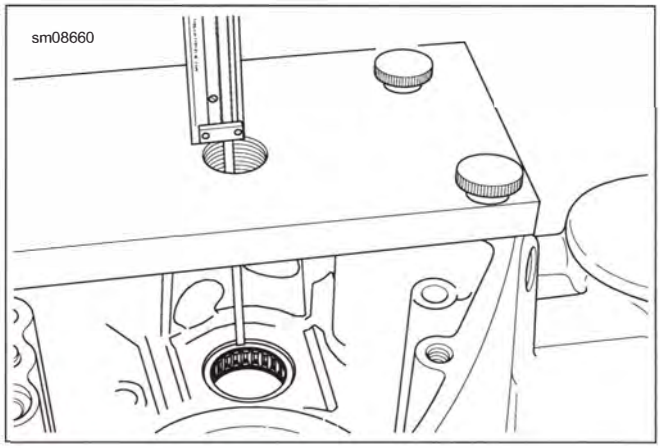


Figure 4-54. Measure from Top of Support Plate to Edge of Needle Bearing

PREPARE

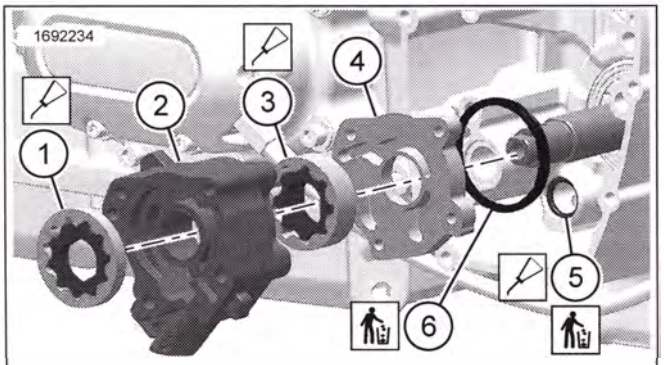
NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
6. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
7. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
8. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
9. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
10. Remove upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
11. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
12. Loosen rocker arm screws to relieve tension on pushrods. See ENGINE > ROCKER ARMS (Page 4-24).
13. Remove right side foot board and bracket assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
14. Remove exhaust header pipe. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
15. Remove camshaft cover and cam support plate. See ENGINE > CAM COMPARTMENT AND COMPONENTS (Page 4-46).

REMOVE

1. See Figure 4-55. Remove oil pump assembly from camshaft compartment.
2. Discard oil seal (6).
3. Discard O-ring (5).



1. **Feed gerotor set**
2. **Oil pump housing**
3. **Scavenge gerotor set**
4. **Back housing**
5. **Scavenge port O-ring**
6. **Oil seal**

Figure 4-55. Oil Pump

DISASSEMBLE AND INSPECT

1. See Figure 4-55 . Remove gerotors (1, 3).
2. See Figure 4-56. Remove pressure relief valve.
   a. Hold spring (1) compressed.
   b. Drive out roll pin (3).
   c. Carefully release spring pressure.
   d. Remove spring and piston (2).
3. Clean parts in a non-volatile cleaning solution.
4. Dry parts using low-pressure compressed air.
5. Inspect housing.
   a. Verify oil holes are clean and open.
   b. Inspect relief valve piston and seat for damage.
   c. Inspect oil pump housing bores for scoring, gouging or cracking.
   d. See Figure 4-55 . Inspect for grooves or scratches on cam support plate and back housing (4).
6. See Figure 4-57. Check gerotor wear.
   a. Check lobes of gerotors for damage.
   b. Mesh gerotor sets together.
   c. Measure distance between tips of lobes on inner and outer feed gerotor set.

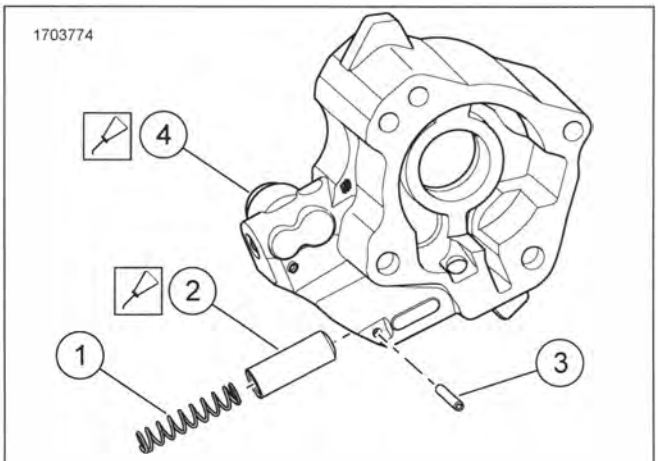
d. Measure distance between tips of lobes on inner and outer scavenge gerotor set.

e. Refer to Table 4-33. Compare measurements to maximum specification.

f. Measure and compare thickness of each rotor in feed gerotor set.

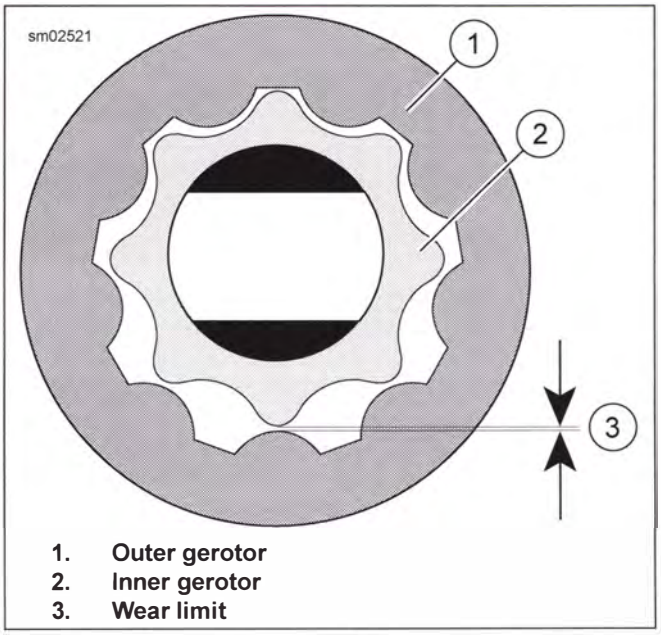
g. Measure and compare thickness of each rotor in scavenge gerotor set.

h. Refer to Table 4-33. Compare measurements to maximum specification.



1. **Spring**
2. **Piston**
3. **Roll pin**
4. **Scavenge port spigot**

Figure 4-56. Oil Pressure Relief Valve



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

Figure 4-57. Measure Gerotor Sets for Wear

Table 4-33. Oil Pump Feed and Scavenge Gerotor Tolerances

MAXIMUM LOBE CLEARANCE	MAXIMUM THICKNESS DIFFERENCE
0.004 in (0.1 mm)	0.001 in (0.025 mm)

ASSEMBLE

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

1. Figure 4-56 Install pressure relief valve.

   a. Apply assembly lube to piston (2) and bore.

   SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

   b. Install piston and spring (1).

   c. Hold spring compressed and install roll pin (3).

INSTALL

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

1. See Figure 4-55. Verify grove in back housing (4) is free from all residual oil and debris.
2. Lubricate all parts with assembly lube during assembly.

   Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)
3. Install **new** oil seal (6) on back housing.
4. Install back housing and scavenge gerotor set (3) onto crankshaft.
5. Install **new** O-ring (5) in crankcase scavenge port.
6. See Figure 4-56. Apply assembly lube to scavenge port spigot (4).

   Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)
7. See Figure 4-55. Slide oil pump housing (2) onto crankshaft while fitting scavenge port into O-ring.

   a. Firmly push on oil pump housing to fully seat.
8. Install feed gerotor set (1).

COMPLETE

1. Install cam support plate and camshaft cover. See ENGINE > CAM COMPARTMENT AND COMPONENTS (Page 4-46).
2. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
3. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
4. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).

5. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).

6. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

7. Install breather hose. See ENGINE > BREATHER (Page 4-20).

8. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).

9. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).

10. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

11. Install exhaust header pipe. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

12. Install right side footboard and bracket assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

13. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

14. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

Prepare

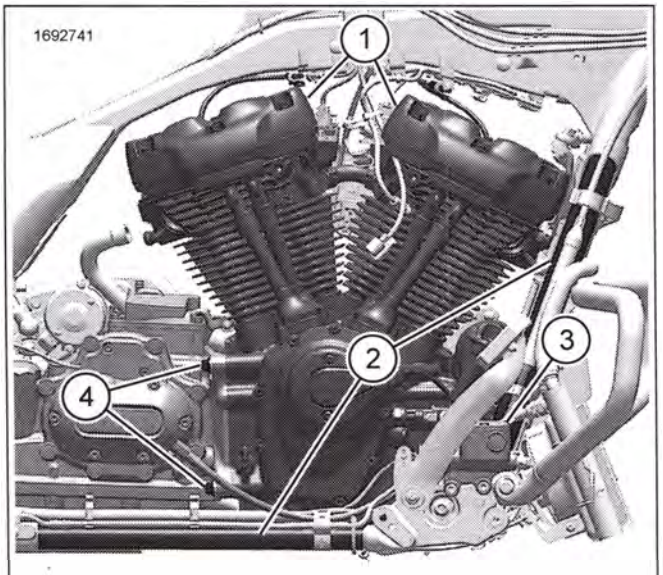
1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Secure motorcycle on lift. See MAINTENANCE > GENERAL (Page 2-2).
5. Remove seat. See CHASSIS > SEAT (Page 3-139).
6. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
7. **Frame mounted fairing:** Remove lower fairing. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
8. Drain coolant, remove coolant reservoir from mount and secure out of the way. See COOLING SYSTEM > COOLANT (Page 7-9).
9. Drain engine oil and discard filter. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
10. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
11. Disconnect spark plug cables from spark plugs. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
12. Remove knock sensors, ignition coil and ignition coil bracket. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
13. Disconnect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
14. Remove mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
15. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
16. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
17. **Front cylinder head:** Disconnect ET sensor connector. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
18. Remove induction module assembly. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
19. Disconnect coolant in/out hoses from heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
20. Remove rider left and right footrests. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
21. Remove exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
22. Disconnect CKP sensor connector. See ELECTRICAL > CRANKSHAFT POSITION SENSOR (CKP) (Page 8-63).
23. Remove voltage regulator. See ELECTRICAL > VOLTAGE REGULATOR (Page 8-14).
    a. Release stator harness anchor.
24. Remove primary chaincase. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
25. Remove alternator rotor. See ELECTRICAL > ALTERNATOR (Page 8-11).
26. Release main harness and brake line from lower frame rail.
    a. Allow to hang below frame.

REMOVE

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

Remove

1. See Figure 4-58. Wrap rear master cylinder (3) with protective padding.
2. Wrap rocker covers (1) and frame rails (2) with protective padding.
3. Support transmission.
   Special Tool: FAT JACK (HD-45968)
4. Remove transmission to engine bolts (4).
5. Remove upper front engine mount and bracket. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
6. Remove lower front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
7. Remove engine from chassis.
   a. Move engine forward to clear dowels.
   b. Remove engine from right side.



1. **Rocker cover (2)**
2. **Frame rail**
3. **Rear master cylinder**
4. **Transmission to engine bolt (4)**

Figure 4-58. Engine Assembly

INSTALL

Install

1. Make sure motorcycle is secure on lift.
2. Install powertrain into chassis.
   a. Install engine from right side.
   b. Position in chassis.
   c. Move engine rearward to engage transmission dowels.
3. Install lower front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
4. Install transmission to engine bolts. See DRIVE AND TRANSMISSION > TRANSMISSION CASE (Page 5-49).
5. Remove transmission support.
6. Install upper front engine mount. See ENGINE > FRONT ENGINE MOUNT (Page 4-15).
7. See Figure 4-58. Remove protective padding from rear master cylinder, rocker covers and frame rails.

COMPLETE

Complete

1. Secure main harness and brake line to lower frame rail.
2. Install alternator rotor and stator. See ELECTRICAL > ALTERNATOR (Page 8-11).
3. Install primary chaincase. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
4. Install voltage regulator. See ELECTRICAL > VOLTAGE REGULATOR (Page 8-14).
5. Connect CKP sensor connector. See ELECTRICAL > CRANKSHAFT POSITION SENSOR (CKP) (Page 8-63).
6. Install exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
7. Install rider left and right footrests. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
8. Connect coolant in/out hoses to heads. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
9. Install induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
10. **Front cylinder head:** Connect ET sensor. See ELECTRICAL > ENGINE TEMPERATURE (ET) SENSOR (Page 8-66).
11. Install air cleaner assembly. FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
12. Install breather hose. See ENGINE > BREATHER (Page 4-20).
13. Install ignition coil bracket, ignition coil and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
14. Connect spark plug cables. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
15. Connect ACR connectors. See ELECTRICAL > AUTOMATIC COMPRESSION RELEASE (ACR) (Page 8-68).
16. Install mid-frame air deflectors. See CHASSIS > AIR DEFLECTORS (Page 3-116).
17. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
18. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
19. Install seat. See CHASSIS > SEAT (Page 3-139).
20. Fill engine oil and install new filter. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
21. Install coolant reservoir, fill and bleed coolant system. See COOLING SYSTEM > COOLANT (Page 7-9).
22. **Frame mounted fairing:** Install lower fairing. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

23. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

24. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

25. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

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

    a. Check clutch operation. Adjust if needed.

    b. Check instrument lamps.

    c. Check for leaks.

    d. Check engine oil level (hot).

PREPARE

1. Remove engine. See ENGINE > REPLACE ENGINE (Page 4-55).

2. *NOTE*

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

Use low-pressure compressed air to clean exterior surfaces of engine.

3. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

4. Remove lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

5. Remove rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

6. Remove pushrods. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).

7. Remove cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).

8. Remove cylinders. See ENGINE > CYLINDERS (Page 4-36).

9. Remove pistons. See ENGINE > PISTONS (Page 4-40).

DISASSEMBLE

PART NUMBER	TOOL NAME
HD-52065	BALANCER SCISSOR GEAR ALIGNMENT TOOL

⚠ CAUTION

Do not rotate crankcase half in engine stand when flywheel is installed. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00552c)

1. Position crankcase with cam compartment facing down.

NOTE

Never move or lift crankcase by grasping cylinder studs.

2. *NOTE*

Prevent balancer gear from raising when lifting off left crankcase. Scissor gear may unload.

See Figure 4-59. Separate crankcase halves.

a. Remove crankcase screws in sequence shown.

b. Separate case halves.

c. See Figure 4-60. Lift left crankcase half (2) off end of crankshaft.

3. Remove two dowel pins in split line face of right case half.

4. Remove balancer (4).

Special Tool: BALANCER SCISSOR GEAR ALIGNMENT TOOL (HD-52065)

a. Install Balancer scissor gear alignment tool.

b. Lift balancer from crankcase.

5. Remove flywheel assembly (3).

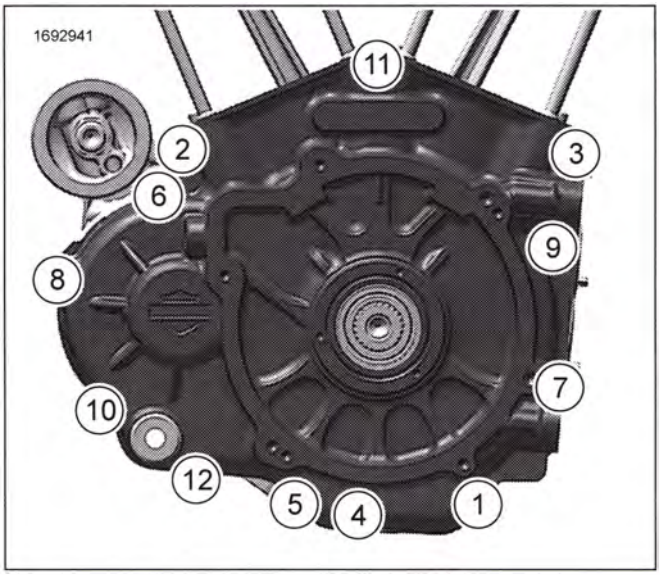
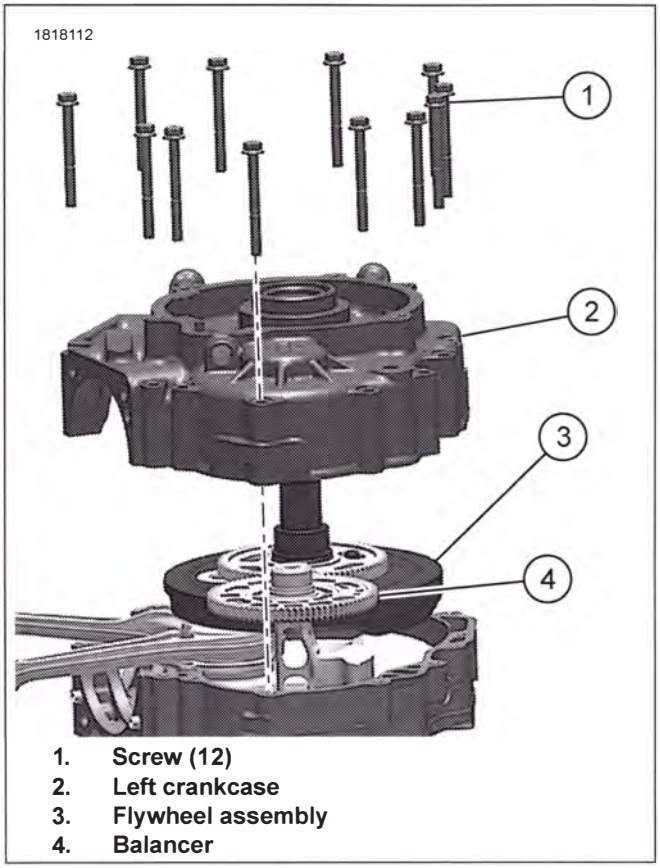


Figure 4-59. Crankcase Torque Sequence



1. **Screw (12)**
2. **Left crankcase**
3. **Flywheel assembly**
4. **Balancer**

Figure 4-60. Separate Crankcase Halves

CLEAN AND INSPECT

1. Remove all gasket material from crankcase flanges.
2. Clean all parts in a non-volatile cleaning solution or solvent.

⚠ WARNING

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

3. Dry parts with moisture-free compressed air.
4. Verify oil holes are clean and open.
5. Check ring dowels for looseness, wear or damage. Replace if necessary.
6. Use file to carefully remove any nicks or burrs from machined surfaces.
7. Clean tapped holes and damaged threads.
8. Check top of crankcase for flatness with a straightedge and feeler gauge. Replace if warped.
9. Spray all machined surfaces with clean engine oil.
10. Inspect crankshaft/flywheel assembly. See ENGINE > FLYWHEEL AND CONNECTING RODS (Page 4-68).

ASSEMBLE

PART NUMBER	TOOL NAME
HD-42326-B	CRANKSHAFT GUIDE
HD-52064	LEFT MAIN BEARING OIL SEAL INSTALLATION TOOL
HD-52065	BALANCER SCISSOR GEAR ALIGNMENT TOOL
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

FASTENER	TORQUE VALUE	
Crankcase screws, 1st torque	10 ft-lbs	13.6 N·m
Crankcase screws, final torque	15–19 ft-lbs	20.3–25.8 N·m

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002
HARLEY-DAVIDSON HIGH PERFORMANCE SEALANT - GRAY	99650-02

1. Position right crankcase with cam compartment facing down.
2. Install flywheel assembly.
   a. Work generous amount of assembly lube into both main and balancer bearings.
      SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)
   b. Slide crankshaft guide onto flywheel sprocket shaft.
      Special Tool: CRANKSHAFT GUIDE (HD-42326-B)
   c. Slide flywheel assembly into right crankcase half.
   d. Remove crankshaft guide tool.
3. *NOTE*
   - *See Figure 4-61. When aligning timing marks match dash to dash.*
   - *Timing marks may not align exactly. Align to closest tooth.*

   See Figure 4-61. Install balancers.
   a. Rotate flywheel so crankpin is at BDC.
   b. Install balancer while aligning timing marks (2).
4. Remove alignment tool.
   Special Tool: BALANCER SCISSOR GEAR ALIGNMENT TOOL (HD-52065)
   a. Rotate gear teeth slightly with screwdriver to unload pressure on tool.
   b. Remove tool.

5. *NOTE*

The balancer shaft may splay away from crankshaft. Wiggle crankcase during installation to help fully seat balancer shaft in bearing.

Mate crankcase halves.

a. Verify that both dowel pins are installed in split line face of right case half.

b. See Figure 4-62. Apply specified bead of sealant to split line face of right crankcase half.

0.06 in (1.52 mm)HARLEY-DAVIDSON HIGH PERFORMANCE SEALANT - GRAY (99650-02)

c. Place crankshaft guide over end of crankshaft until it contacts shoulder on shaft.

Special Tool: CRANKSHAFT GUIDE (HD-42326-B)

d. Mate case halves. Keep crankcase splitline parallel as left crankcase is lowered into place.

e. Wiggle crankcase during installation to help fully seat balancer shafts in bearing.

f. Remove crankshaft guide.

6. See Figure 4-59. Install crankcase screws.

a. Finger-tighten each screw.

b. Tighten screws in sequence shown.

Torque: 10 ft-lbs (13.6 N·m) *Crankcase screws, 1st torque*

c. Loosen, then following same sequence, final tighten.

Torque: 15–19 ft-lbs (20.3–25.8 N·m) *Crankcase screws, final torque*

7. Rotate crankcase assembly so sprocket shaft is pointing straight up.

8. Install thrust washer on sprocket shaft with "THIS SIDE OUT" facing out (chamfer inboard). If using original part without markings, position to preserve existing wear pattern.

9. See Figure 4-63. Install **new** sprocket shaft oil seal using components from following tools.

Special Tool: SPROCKET SHAFT BEARING INSTALLER (HD-97225-55C)
Special Tool: LEFT MAIN BEARING OIL SEAL INSTALLATION TOOL (HD-52064)

a. Verify lip garter spring is in place on both sides of oil seal.

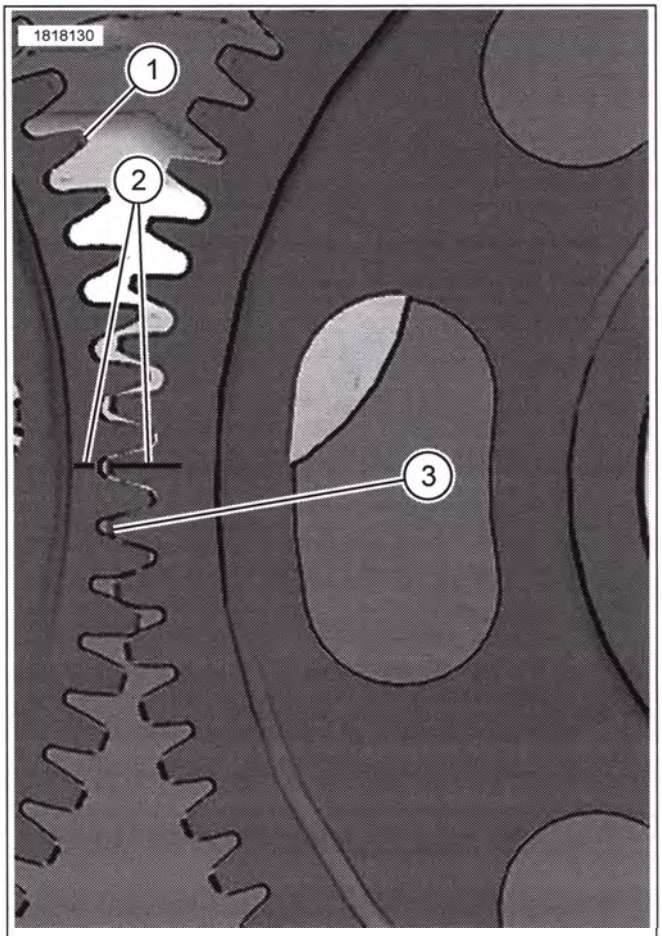
b. Install sprocket shaft spacer.

c. Install oil seal with the rounded feature of metal casing facing in and the sharp edge facing out.

10. Rotate crankcase so that cam compartment is facing up.

11. Apply generous amount of assembly lube to main bearing. Rotate flywheel assembly to distribute lube.

Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)



1. Balancer gear
2. Timing marks
3. Flywheel gear

Figure 4-61. Balancer Timing Marks

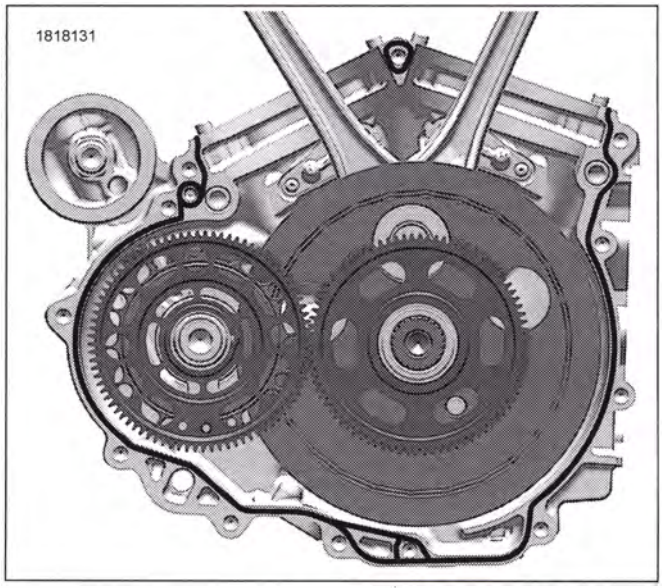


Figure 4-62. Sealant

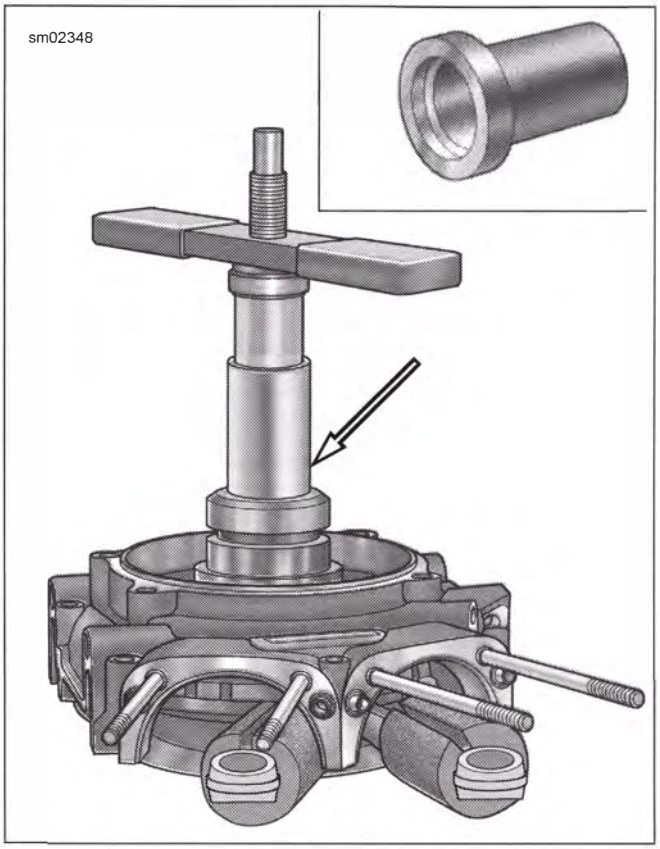


Figure 4-63. Sprocket Shaft Oil Seal Installer

REPAIR RIGHT CRANKCASE HALF

PART NUMBER	TOOL NAME
HD-52071	MAIN BEARING REMOVER AND INSTALLER

FASTENER	TORQUE VALUE	
Balancer bearing screw	80–110 **in-lbs**	9–12.4 N·m
Piston jet screws	25–35 **in-lbs**	2.8–3.9 N·m

CONSUMABLE	PART NUMBER
LOCTITE 222 LOW STRENGTH THREADLOCKER (PURPLE)	99811-97

Remove Main Bearing

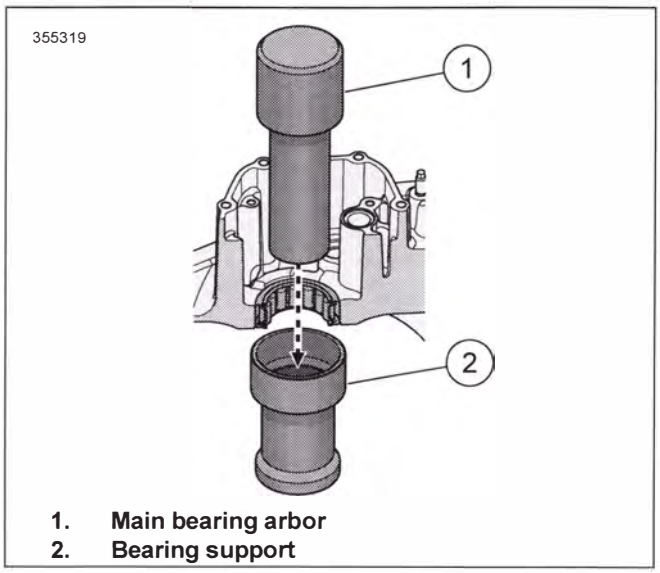
1. *NOTE*
Never move or lift crankcase by grasping cylinder studs.

   See Figure 4-64. Remove bearing.

   Special Tool: MAIN BEARING REMOVER AND INSTALLER (HD-52071)

   a. Press bearing from cam side into flywheel side of crankcase.

2. Discard bearing.



1. **Main bearing arbor**
2. **Bearing support**

Figure 4-64. Remove Right Main Bearing

Install Main Bearing

1. See Figure 4-65. Install bearing.

   Special Tool: MAIN BEARING REMOVER AND INSTALLER (HD-52071)

   a. Place crankcase with flywheel side facing up on main bearing support (4).

   b. Spread clean engine oil on OD of **new** bearing (3).

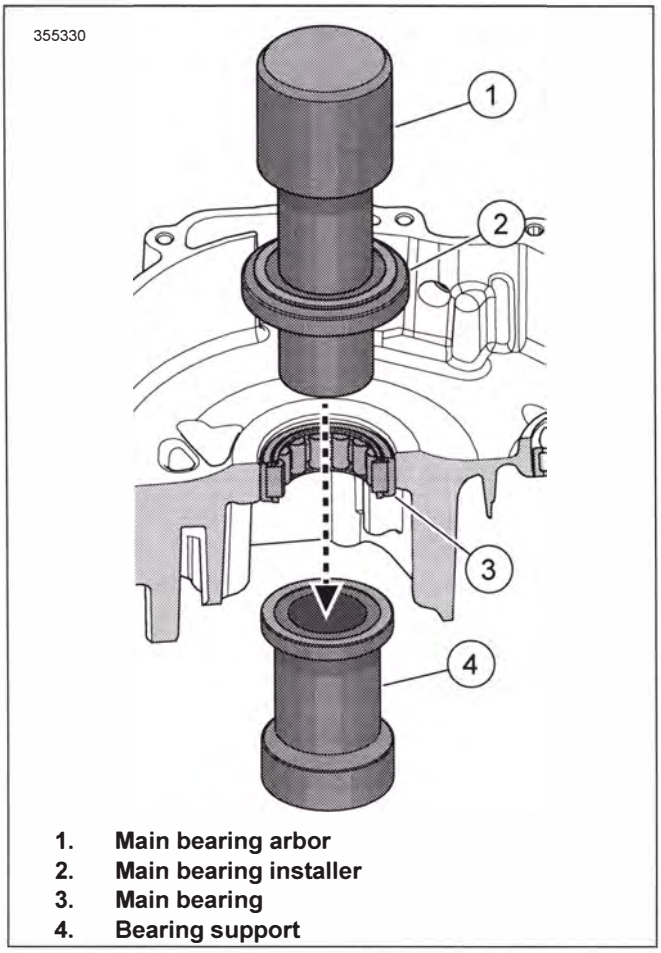
   c. Place bearing on bearing bore with lettering facing up.

   d. Place main bearing installer (2) with side marked RIGHT against bearing.

   e. Place main bearing arbor (1) through main bearing installer and bearing into bearing support.

   f. Press until main bearing installer contacts machined surface.

2. Check installed depth. Refer to Table 4-34.



1. **Main bearing arbor**
2. **Main bearing installer**
3. **Main bearing**
4. **Bearing support**

Figure 4-65. Right Main Bearing Installation

Table 4-34. Right Crankcase Bearing Installed Depth

BEARING LOCATION	DEPTH from SPLIT LINE
Right side main	2.160–2.180 in (54.86–55.37 mm)
Right side balancer	2.070–2.090 in (52.58–53.09 mm)

Remove Balancer Bearing

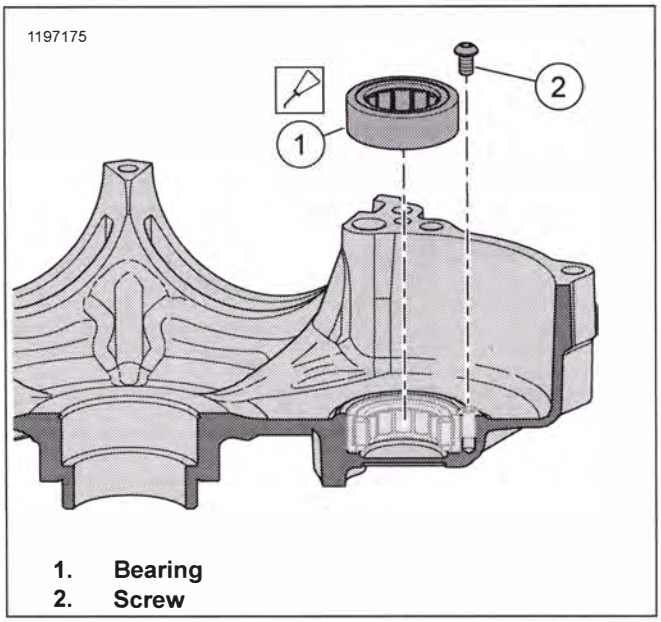
1. See Figure 4-66. Remove retaining screw (2).

2. *NOTE*

Non-open flame heat may be applied to vicinity of bearing to assist in removal.

Use appropriate puller to remove bearing (1) from bore.

3. Discard bearing.



1. **Bearing**
2. **Screw**

Figure 4-66. Balancer Bearing (typical)

Install Balancer Bearing

1. Apply engine oil to OD of **new** bearing.

2. *NOTE*

Install bearings with lettering facing up.

Properly support area of crankcase where bearing is being installed.

Do not use screw to draw bearing in.

Using a press, install **new** bearing until fully seated in bore.

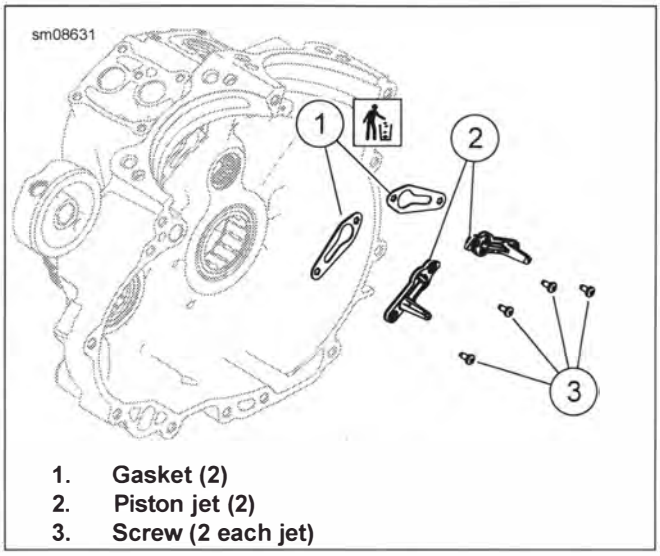
3. Install retaining screw. Tighten.

Torque: 80–110 **in-lbs** (9–12.4 N·m) *Balancer bearing screw*

Remove Piston Jets

1. See Figure 4-67. Remove screws (3) to free piston jet (2) from crankcase.

2. Discard gasket (1).



1. **Gasket (2)**
2. **Piston jet (2)**
3. **Screw (2 each jet)**

Figure 4-67. Piston Jets

Install Piston Jets

1. *NOTE*

If piston jet screws are being reused, apply threadlocker to screws. LOCTITE 222 LOW STRENGTH THREADLOCKER (PURPLE) (99811-97)

See Figure 4-67. Install piston jets.

a. Install **new** gasket (1).

b. With jet pointed up, secure piston jet (2) and gasket with screws (3).

c. Tighten. 25–35 **in-lbs** (2.8–3.9 N·m).

REPAIR LEFT CRANKCASE HALF

PART NUMBER	TOOL NAME
HD-52071	MAIN BEARING REMOVER AND INSTALLER

FASTENER	TORQUE VALUE	
Balancer bearing screw	80–110 **in-lbs**	9–12.4 N·m

Remove Main Bearing

⚠ CAUTION

Do not rotate crankcase half in engine stand when flywheel is installed. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00552c)

1. *NOTE*

- *Never move or lift crankcase by grasping cylinder studs.*
- *Always replace sprocket shaft bearing inner race whenever left main bearing is replaced. See CRANKCASE > SPROCKET SHAFT BEARING INNER RACE (Page 4-64).*

Remove thrust washer from outboard side of crankcase half by pulling it past oil seal. Set thrust washer aside for inspection or reuse.

2. Remove oil seal.

3. Remove bearing.

Special Tool: MAIN BEARING REMOVER AND INSTALLER (HD-52071)

a. See Figure 4-68. Remove bearing retaining ring.

b. See Figure 4-69. Press bearing from stator side into flywheel side of crankcase.

4. Discard bearing.

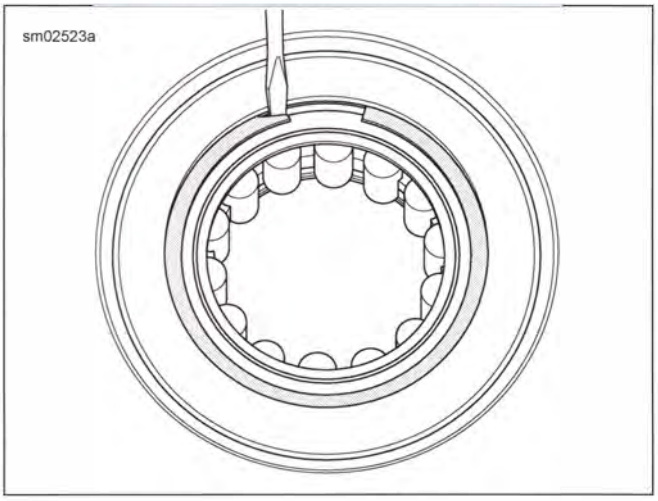
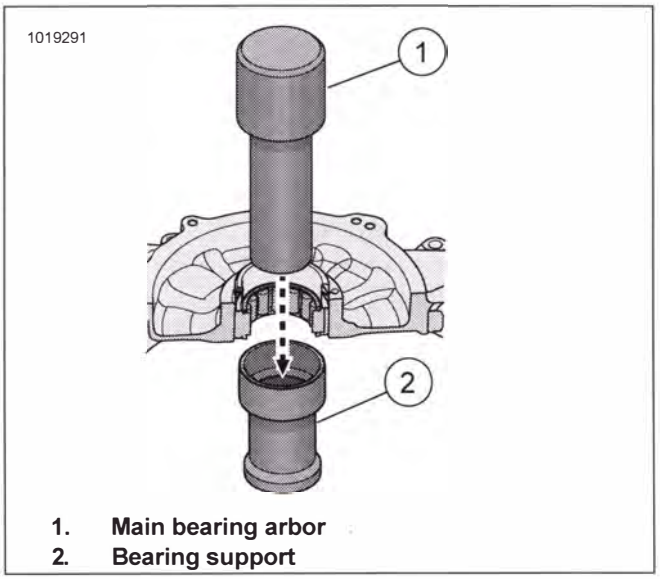


Figure 4-68. Remove Retaining Ring



1. **Main bearing arbor**
2. **Bearing support**

Figure 4-69. Remove Left Main Bearing

Install Main Bearing

1. *NOTE*

Alternator stator may be left installed when main bearing press adapter is used.

See Figure 4-70. Install bearing.

Special Tool: MAIN BEARING REMOVER AND INSTALLER (HD-52071)

a. Place main bearing press adapter (3) on bearing support (4).

b. Place crankcase on main bearing press adapter (3) with flywheel side facing up.

c. Spread clean engine oil on OD of **new** bearing.

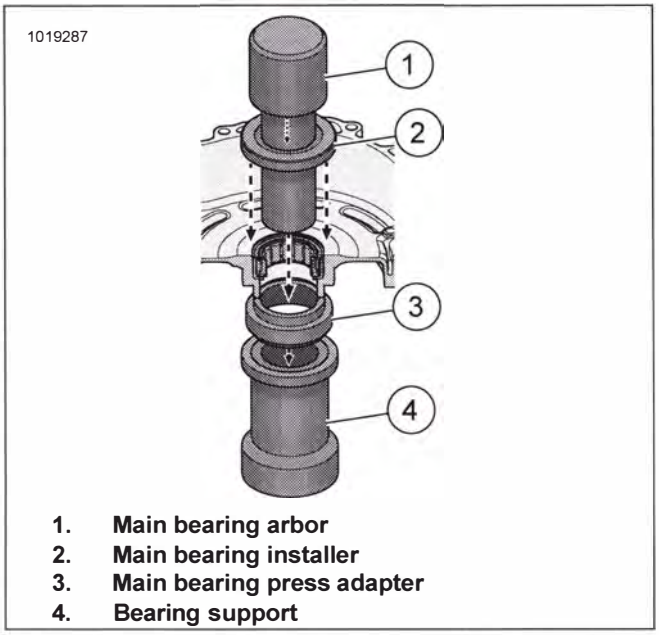
d. Place bearing on bearing bore with lettering facing up.

e. Place main bearing installer (2) with side marked LEFT against bearing.

f. Place main bearing arbor (1) through main bearing installer (2) and bearing into main bearing press adapter (3) and bearing support (4).

g. Press until main bearing installer contacts machined surface.

2. Install **new** retaining ring. Make sure retaining ring is fully seated in groove.



1. **Main bearing arbor**
2. **Main bearing installer**
3. **Main bearing press adapter**
4. **Bearing support**

Figure 4-70. Install Left Main Bearing

Remove Balancer Bearing

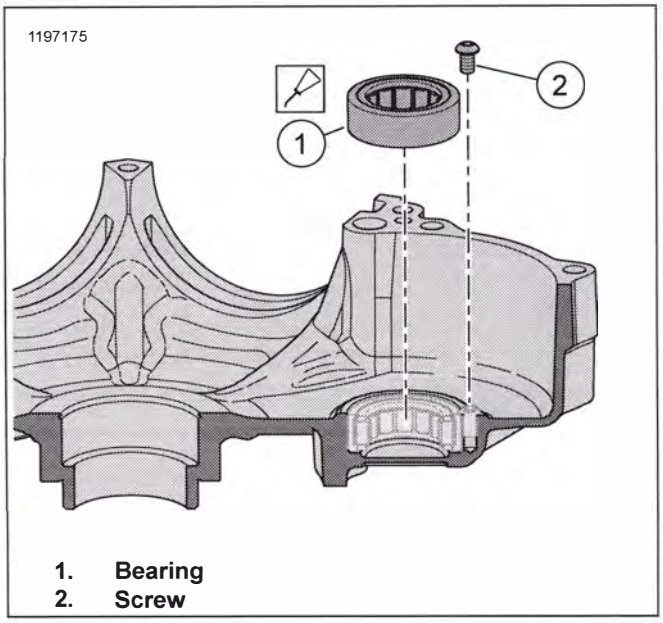
1. See Figure 4-71. Remove retaining screw (2).

2. *NOTE*

Non-open flame heat may be applied to vicinity of bearing to assist in removal.

Use appropriate puller to remove bearing (1) from bore.

3. Discard bearing.



1. **Bearing**
2. **Screw**

Figure 4-71. Balancer Bearing (typical)

Install Balancer Bearing

1. Apply engine oil to OD of **new** bearing.

2. *NOTE*

Install bearings with lettering facing up.

Properly support area of crankcase where bearing is being installed.

Using a press, install **new** bearing until fully seated in bore.

3. Install retaining screw. Tighten.

Torque: 80–110 **in-lbs** (9–12.4 N·m) *Balancer bearing screw*

SPROCKET SHAFT BEARING INNER RACE

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-34902-B	BIG-TWIN MAINSHAFT PRIMARY BEARING RACE REMOVER AND INSTALLER
HD-44358	FLYWHEEL SUPPORT FIXTURE
HD-95637-46B	WEDGE ATTACHMENT
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

Remove

1. *NOTE*

For proper clamping force, hold-down clamp must not be tilted. Rotate hex on outboard stud until clamp is level.

See Figure 4-72. Secure flywheel assembly.

Special Tool: FLYWHEEL SUPPORT FIXTURE (HD-44358)

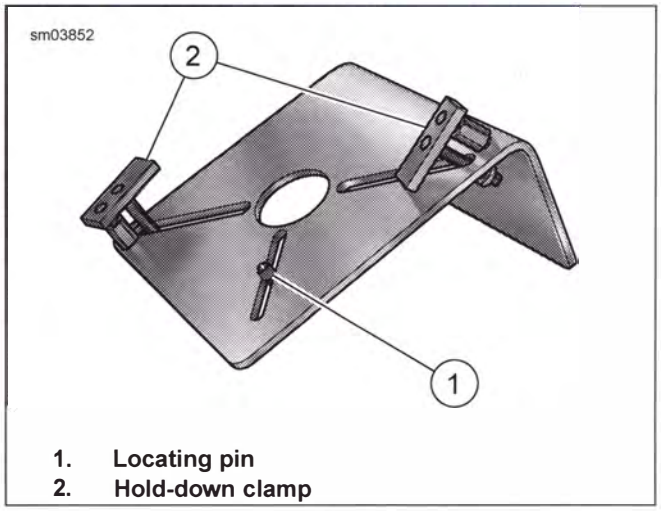
a. Secure fixture in vise.

b. Insert crankshaft end through hole, resting flywheel assembly on fixture.

c. Engage knurled locating pin in crank pin hole.

d. Hand-tighten locating pin.

e. Secure flywheel with hold-down clamps (2).



1. Locating pin
2. Hold-down clamp

Figure 4-72. Flywheel Holding Fixture

NOTICE

Install wedge attachment only so far as necessary to ensure positive contact with bearing inner race. Installing tool with more contact than necessary will result in damage to the flywheel (00500b)

2. See Figure 4-73. Install pulling tool.

   a. Position wedge attachment (5) on inboard side of thrust washer.

      Special Tool: WEDGE ATTACHMENT (HD-95637-46B)

   b. Draw wedge halves together evenly.

   c. Secure bridge and forcing screw from bearing race remover and installer to wedge attachment with flat washers and two 3/8-16 x 7-1/2 in bolts.

      Special Tool: BIG-TWIN MAINSHAFT PRIMARY BEARING RACE REMOVER AND INSTALLER (HD-34902-B)

   d. Place hardened washer between end of sprocket shaft and forcing screw.

⚠ WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

3. *NOTE*

*To assist removal **without** heat, apply light penetrating oil to shaft and leading edge of bearing inner race.*

   Uniformly heat bearing inner race for approximately 30 seconds using heat gun.

   Special Tool: ROBINAIR HEAT GUN (HD-25070)

4. See Figure 4-73. Remove bearing race.

   a. Turn forcing screw until thrust washer and bearing inner race move minimum distance.

      0.126 in (3.2 mm)

   b. Reposition attachment to pull on bearing inner race only.

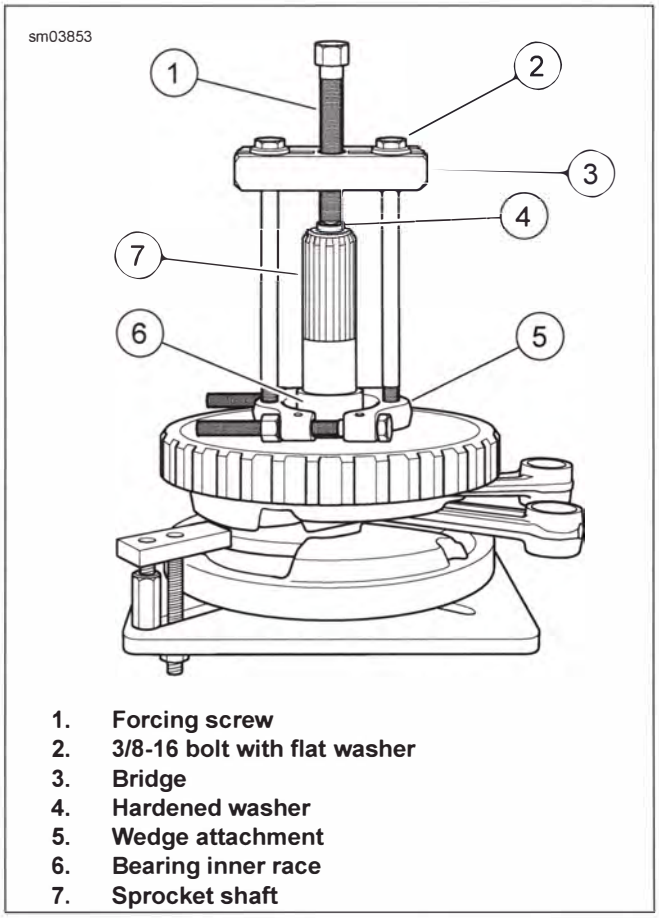
      Special Tool: WEDGE ATTACHMENT (HD-95637-46B)

   c. Verify tool assembly is square.

   d. Heat bearing inner race for approximately 30 seconds.

   e. Turn forcing screw until bearing inner race is loose.

   f. Remove thrust washer from sprocket shaft.



1. Forcing screw
2. 3/8-16 bolt with flat washer
3. Bridge
4. Hardened washer
5. Wedge attachment
6. Bearing inner race
7. Sprocket shaft

Figure 4-73. Remove Inner Race from Sprocket Shaft

Install

1. Place **new** thrust washer over sprocket shaft.

⚠ WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

2. *NOTE*

*To assist installation **without** heat, apply light penetrating oil to shaft and leading edge of bearing inner race.*

Uniformly heat **new** bearing inner race for approximately 60 seconds using heat gun.

Special Tool: ROBINAIR HEAT GUN (HD-25070)

3. Place bearing inner race squarely over sprocket shaft.
4. See Figure 4-74. Seat bearing race using installer.

   Special Tool: SPROCKET SHAFT BEARING INSTALLER (HD-97225-55C)
5. Verify thrust washer cannot be rotated by hand.

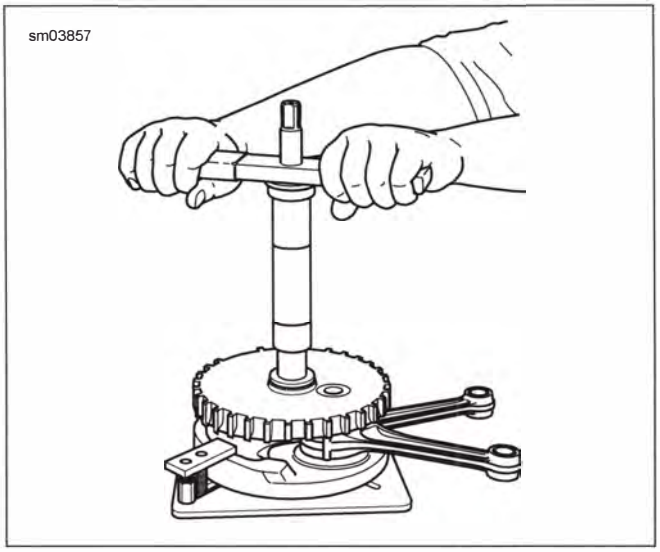


Figure 4-74. Press Inner Race onto Sprocket Shaft: Operation

CYLINDER STUDS

FASTENER	TORQUE VALUE	
Cylinder stud	10–20 ft-lbs	13.6–27.1 N·m

Remove

1. Tighten two nuts together on threads of stud.
2. Place wrench on lower nut. Turn to remove stud.

Install

1. Place a steel ball inside a cylinder head screw.
2. Put head screw on long end of cylinder stud.
3. Install stud using air gun until collar reaches crankcase.
4. Tighten.

   Torque: 10–20 ft-lbs (13.6–27.1 N·m) *Cylinder stud*
5. Remove cylinder head screw using air gun.

PLUGS AND OIL FITTINGS

FASTENER	TORQUE VALUE	
Crankcase oil check valve or plug with O-ring	18–22 ft-lbs	24.4–29.8 N·m
Crankcase tapered plugs	10–12 ft-lbs	13.6–16.3 N·m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

Remove

See Figure 4-75. Turn pipe plug or oil check valve counterclockwise to remove.

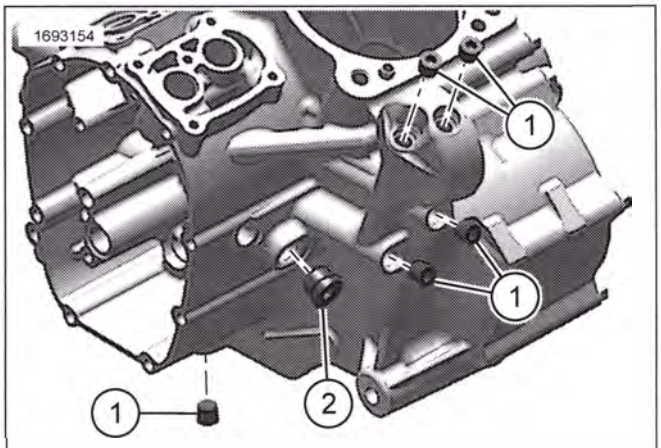
Install

1. See Figure 4-75. Install tapered plug (1).
   a. Apply thread sealant to threads.

      LOCTITE 565 THREAD SEALANT (99818-97)
   b. Install and tighten.

      Torque: 10–12 ft-lbs (13.6–16.3 N·m) *Crankcase tapered plugs*
2. Install oil check valve (2) or plug with O-ring (3).
   a. Install **new** O-ring.
   b. Install and tighten.

      Torque: 18–22 ft-lbs (24.4–29.8 N·m) *Crankcase oil check valve or plug with O-ring*



1. **Tapered plug (5)**
2. **Plug with O-ring**

Figure 4-75. Crankcase Pipe Plugs

COMPLETE

1. Install pistons. See ENGINE > PISTONS (Page 4-40).
2. Install cylinders. See ENGINE > CYLINDERS (Page 4-36).
3. Install cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).
4. Install pushrods. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).
5. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).
6. Install lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

7. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).
8. Install engine. See ENGINE > REPLACE ENGINE (Page 4-55).

SYMPTOMS

Overview

Flywheels that shift out of true at the crank pin generally exhibit one of two symptoms: no oil pressure or vibration. This condition is also known as scissored flywheels.

No Oil Pressure

Oil pump damage may occur when flywheels shift more than 0.015 in (0.381 mm).

If a low or no oil pressure condition is confirmed, inspect oil pump and cam support plate. Bound or damaged oil pump gerotors are likely from a contaminant running through the pump or a shifted/scissored flywheels. If this type of damage is found, always replace oil lines and clean all debris from entire lubrication system. For general diagnostics of low oil pressure, see MAINTENANCE > TROUBLESHOOTING (Page 2-54).

Vibration

Vibration caused by flywheel/connecting rod assembly runout becomes noticeable to rider after runout exceeds 0.020 in (0.508 mm).

See MAINTENANCE > TROUBLESHOOTING (Page 2-54).

When correct chassis set-up has been verified and other items have been eliminated, checking left crankshaft runout is appropriate. See ENGINE > TROUBLESHOOTING (Page 4-10).

PREPARE

1. Remove engine. See ENGINE > REPLACE ENGINE (Page 4-55).

2. *NOTE*

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

   Use low-pressure compressed air to clean exterior surfaces of engine.

3. Remove upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

4. Remove lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

5. Remove rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

6. Remove pushrods. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).

7. Remove cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).

8. Remove cylinders. See ENGINE > CYLINDERS (Page 4-36).

9. Remove pistons. See ENGINE > PISTONS (Page 4-40).

10. Separate crankcase halves. See ENGINE > CRANKCASE (Page 4-58).

INSPECT

NOTE

- *Do not attempt to straighten connecting rods. Damage to upper bushing and lower bearing will occur.*
- *Zones of resistance when connecting rods are rotated through their range of motion alone is not an indication of a performance or durability concern. Connecting rod bearing failures generally exhibit noise, visible clearance, piston to valve contact, and/or secondary damage in the form of a high level of steel debris circulating throughout the engine. Verify that one or more of these symptoms is present before attempting to qualify the rod bearing condition.*
- *Connecting rods when placed in limit conditions, defined as positions outside the normal rod operating position (pinched together or spread to the extent of separation), may exhibit areas of resistance.*
- *The induction heat treat operation on Milwaukee-Eight® connecting rods will "blue" the lower end of the rod. "Blueing" on the lower rod end only is normal.*

1. Inspect flywheel/connecting rod assembly if any of the following are evident.

NOTE

Replace assembly if any of the following conditions are noted.

   a. Rod knock noise

   b. Steel debris in oil filter

   c. Piston skirt scoring/scuffing with material transfer

   d. Worn oil pump scavenge rotor and housing

   e. Piston to valve contact

   f. Damage to flywheel left or right main bearing inner races

   g. Bent or twisted connecting rods

   h. Sprocket teeth are worn in an irregular pattern or chipped

   i. Main bearing inner races are burnt, scored, blued or damaged

   j. Flywheel, connecting rods or right side bearing inner race require replacement

2. Measure crankshaft runout if crankshaft is suspected of being out-of-true. See ENGINE > TROUBLESHOOTING (Page 4-10).

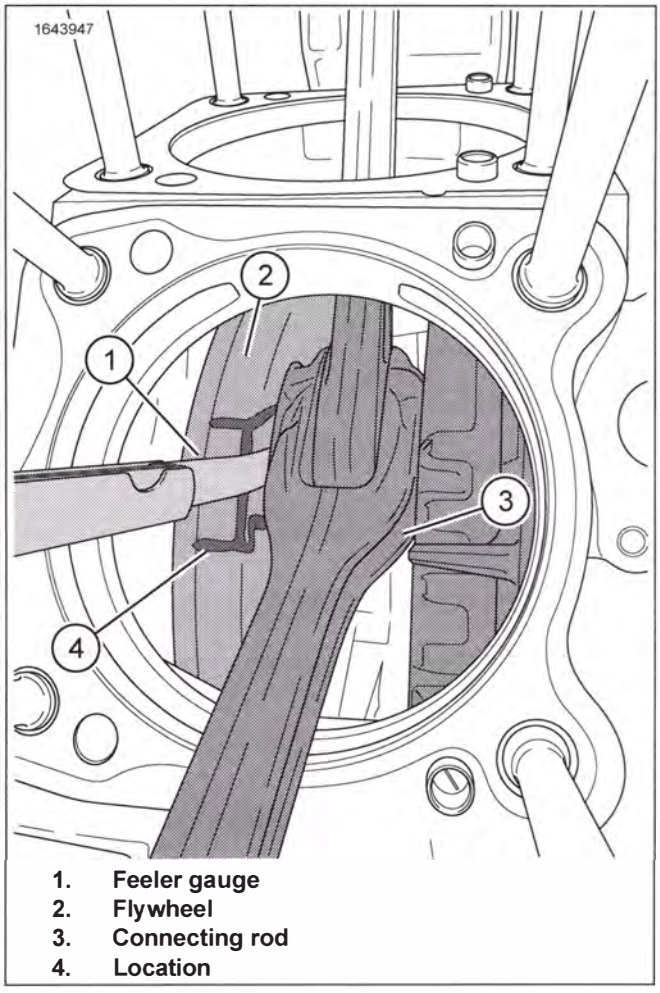
3. See Figure 4-76. Measure connecting rod side play.

   a. Position connecting rod (3) as shown.

   b. Measure connecting rod side play using a feeler gauge (1) at location (4) shown.

   c. Side play should be at or greater than.

      0.005 in (0.13 mm)



1. Feeler gauge
2. Flywheel
3. Connecting rod
4. Location

Figure 4-76. Connecting Rod Side Play

COMPLETE

1. Install flywheel and connecting rods. Assemble crankcase. See ENGINE > CRANKCASE (Page 4-58).

2. Install pistons. See ENGINE > PISTONS (Page 4-40).

3. Install cylinders. See ENGINE > CYLINDERS (Page 4-36).

4. Install cylinder heads. See ENGINE > CYLINDER HEADS (Page 4-30).

5. Install pushrods. See ENGINE > PUSHRODS, LIFTERS AND COVERS (Page 4-26).

6. Install rocker arms. See ENGINE > ROCKER ARMS (Page 4-24).

7. Install lower rocker covers. See ENGINE > LOWER ROCKER COVERS (Page 4-22).

8. Install upper rocker covers. See ENGINE > UPPER ROCKER COVERS (Page 4-18).

9. Install engine. See ENGINE > REPLACE ENGINE (Page 4-55).

PREPARE

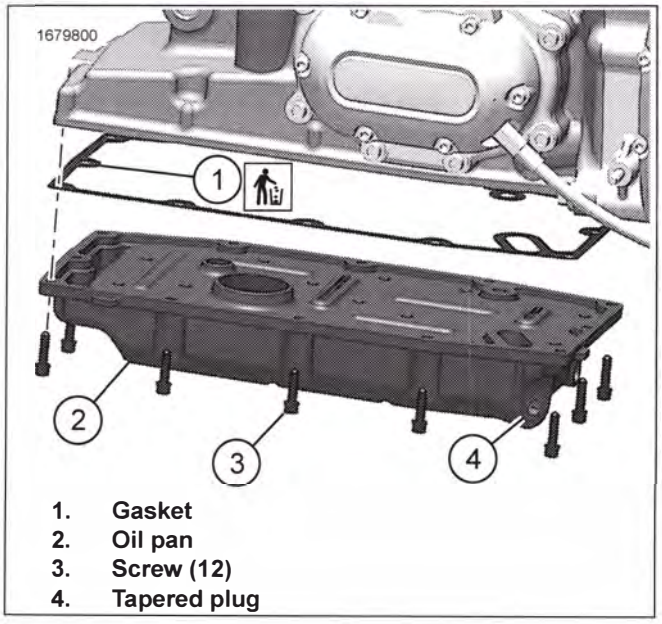
1. Secure motorcycle on lift. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2).
2. Drain engine oil. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
3. Drain transmission lubricant. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).
4. Remove left muffler, exhaust cross-over pipe and cross-over pipe clamp bracket from transmission. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
5. Remove rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).

REMOVE

1. Remove engine oil fill plug/dipstick.
2. See Figure 4-77. Remove oil pan.
   a. Remove screws (3).
   b. Slide oil pan (2) rearward to remove.
   c. Discard oil pan gasket (1).
   d. If necessary, remove tapered plug (4).
3. If debris is found, replace oil pan, oil cooler, oil lines and oil filter. Inspect check valves. Clean or replace as necessary.

NOTE

Debris that remains in pan can cause a repeat failure.



1. **Gasket**
2. **Oil pan**
3. **Screw (12)**
4. **Tapered plug**

Figure 4-77. Oil Pan Assembly

INSTALL

FASTENER	TORQUE VALUE	
Engine oil drain plug	14–21 ft-lbs	19–28.5 N·m
Oil pan screws	11–13 ft-lbs	14.9–17.6 N·m
Oil pan tapered plug	30–36 ft-lbs	40.7–48.8 N·m
Transmission drain plug	14–21 ft-lbs	19–28.5 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97
HYLOMAR GASKET AND THREAD SEALANT	99653-85
LOCTITE 565 THREAD SEALANT	99818-97

1. Clean and examine all flange surfaces.
2. Clean engine oil and transmission lubricant drain plugs.
   a. Replace O-rings as required.
3. Install transmission drain plug and O-ring. Tighten.
   Torque: 14–21 ft-lbs (19–28.5 N·m) *Transmission drain plug*
4. Install engine oil drain plug and O-ring. Tighten.
   Torque: 14–21 ft-lbs (19–28.5 N·m) *Engine oil drain plug*
5. See Figure 4-77. If removed, install tapered plug (4).
   a. Apply thread sealant.
      LOCTITE 565 THREAD SEALANT (99818-97)
   b. Install and tighten.
      Torque: 30–36 ft-lbs (40.7–48.8 N·m) *Oil pan tapered plug*
6. Install oil pan.
   a. Apply thin coat of sealant to oil pan flange.
      HYLOMAR GASKET AND THREAD SEALANT (99653-85)
   b. Apply threadlocker to used oil pan screws.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Place **new** gasket (1) on oil pan flange. Allow sealant to dry until tacky.
   d. Position oil pan with gasket on bottom of transmission.

e. Loosely install screws (3).

f. See Figure 4-78. Tighten screws in sequence shown. Torque: 11–13 ft-lbs (14.9–17.6 N·m) *Oil pan screws*

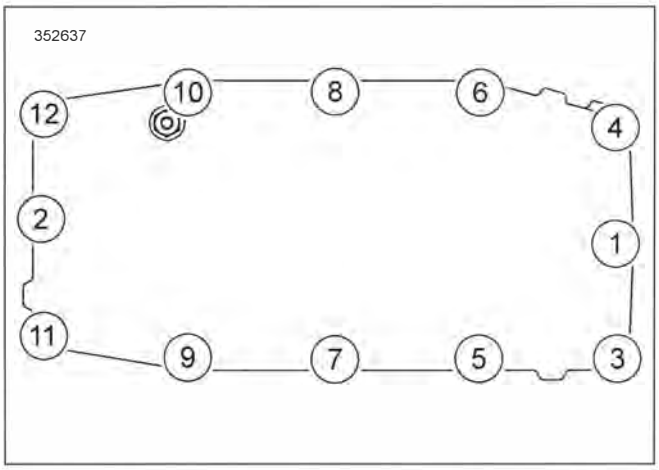


Figure 4-78. Oil Pan Tightening Sequence

COMPLETE

1. Install rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).

2. Remove motorcycle from lift. See GENERAL > SECURE THE MOTORCYCLE FOR SERVICE (Page 2-2)

3. Install exhaust. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

4. Add fluids.

   a. Add transmission lubricant. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).

   b. Install **new** engine oil filter.

   c. Fill engine oil. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).

NOTES

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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Battery ground cable to transmission, nut	72–96 **in-lbs**	8.1–10.8 N·m	5.15 TRANSMISSION CASE, Install
Clutch, stopper plate bolts	71–106 **in-lbs**	8–12 N·m	5.10 CLUTCH, Disassemble and Assemble: Clutch Pack
Clutch cable fitting	90–120 **in-lbs**	10.2–13.6 N·m	5.6 CLUTCH RELEASE COVER, Install
Clutch hub mainshaft nut	70–80 ft-lbs	95–108.5 N·m	5.9 DRIVE COMPONENTS, Install
Clutch release cover screws	11–13 ft-lbs	14.9–17.6 N·m	5.6 CLUTCH RELEASE COVER, Install
Compensating sprocket bolt, 1st torque	100 ft-lbs	135.6 N·m	5.9 DRIVE COMPONENTS, Install Loosen then final tighten
Compensating sprocket bolt, final torque	175 ft-lbs	237.3 N·m	5.9 DRIVE COMPONENTS, Install
Primary chaincase sealing screws	26–28 ft-lbs	35.3–38 N·m	5.11 PRIMARY CHAINCASE HOUSING, Install
Primary chain tensioner fasteners	21–24 ft-lbs	28.5–33 N·m	5.9 DRIVE COMPONENTS, Install
Primary cover screws	12–13 ft-lbs	16.3–17.6 N·m	5.8 PRIMARY CHAINCASE COVER, Install See sequence in the procedure
Shift drum detent screw	120–150 **in-lbs**	13.6–17 N·m	5.13 TRANSMISSION, Assemble
Shift drum lock plate screws	50–70 **in-lbs**	5.6–7.9 N·m	5.13 TRANSMISSION, Assemble
Shifter pawl centering screw	18–23 ft-lbs	24.4–31.2 N·m	5.15 TRANSMISSION CASE, Assemble
Shifter peg screw	96–144 **in-lbs**	10.9–16.3 N·m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Shifter rod ball stud	70–99 **in-lbs**	7.9–11.2 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Rear
Shifter rod jamnut	80–120 **in-lbs**	9–13.6 N·m	5.5 SHIFTER LINKAGE, Shifter Rod
Shifter rod lever pinch screw	18–22 ft-lbs	24.4–29.8 N·m	5.15 TRANSMISSION CASE, Assemble
Shifter rod lever pinch screw, front lever	132–156 **in-lbs**	14.9–17.6 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Shifter rod lever pinch screw, rear lever	13–16 ft-lbs	18–22 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Rear
Shifter rod nut	8–12 ft-lbs	11–16 N·m	5.5 SHIFTER LINKAGE, Shifter Rod
Shifter rod nut	8–12 ft-lbs	11–16 N·m	5.5 SHIFTER LINKAGE, Shifter Rod
Shifter rod nut	8–12 ft-lbs	11–16 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Shift lever pinch screw	9.0–12.0 ft-lbs	12.2–16.3 N·m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Transmission, top plug, screw	100–120 **in-lbs**	11.3–13.6 N·m	5.15 TRANSMISSION CASE, Assemble
Transmission bearing housing screw	22–25 ft-lbs	29.8–33.9 N·m	5.13 TRANSMISSION, Install
Transmission mainshaft/countershaft locknuts	85–95 ft-lbs	115.3–128.8 N·m	5.13 TRANSMISSION, Assemble
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 N·m	5.15 TRANSMISSION CASE, Install
Transmission mounting bolts, final torque	34–39 ft-lbs	46.1–52.9 N·m	5.15 TRANSMISSION CASE, Install
Transmission sprocket lockplate screws	100–120 **in-lbs**	11.3–13.6 N·m	5.12 TRANSMISSION SPROCKET, Install Lock patch, use 3-5 times
Transmission sprocket nut step 1	100 ft-lbs	135.6 N·m	5.12 TRANSMISSION SPROCKET, Install
Transmission sprocket nut step 2. Loosen one turn		360°	5.12 TRANSMISSION SPROCKET, Install
Transmission sprocket nut step 3	35 ft-lbs	47.5 N·m	5.12 TRANSMISSION SPROCKET, Install
Transmission sprocket nut step 4. Additional		35–45°	5.12 TRANSMISSION SPROCKET, Install Do not loosen to align lockplate screws.

DRIVE SPECIFICATIONS

FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT and SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50 are both acceptable lubricants.

Table 5-1. Primary Chaincase Lubricant

ITEM	DRY FILL[2]		WET FILL[3]	
	Oz	L	Oz	L
Amount[1]	34	1.0	30	0.9

(1) Amount is approximate. Fill to bottom of pressure plate OD with vehicle upright.
(2) Cover was removed and installed.
(3) Lubricant was drained through the drain plug only.

Table 5-2. Sprocket Teeth

DRIVE	ITEM	NUMBER OF TEETH
Primary	Engine	34
	Clutch	46
Final	Transmission	32
	Rear wheel	68

Table 5-3. Overall Drive Ratios

GEAR	RATIO
First	9.593
Second	6.650
Third	4.938
Fourth	4.000
Fifth	3.407
Sixth	2.875

NOTE

Overall gear ratios indicate number of engine revolutions required to drive rear wheel one revolution.

TRANSMISSION SPECIFICATIONS

Table 5-4. Transmission Specifications

TRANSMISSION	DATA
Type	6-speed forward constant mesh
FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT	Part No. 99851-05 (qt)
SYN3 20W50 Oil	Part No. 99824-03/00QT (qt)
Capacity * (approximate)	32 fl oz (0.95 L)
* Add additional fluid as necessary to bring level within specification.	

Table 5-5. Transmission Gear Ratios

GEAR	GEAR RATIO
First (low)	3.34
Second	2.31
Third	1.72
Fourth	1.39
Fifth	1.19
Sixth (high)	1.00

NOTE

Final gear ratios indicate the number of mainshaft revolutions required to drive the output sprocket one revolution.

SERVICE WEAR LIMITS

Table 5-6. Main Drive Gear Specifications

MAIN DRIVE GEAR (sixth)	IN	MM
Bearing fit in transmission case (loose)	0.0003-0.0017	0.0076-0.043
Fit in bearing (press-fit)	0.001-0.003	0.025-0.076
End play: Two row bearing	none	none
End play: Single row bearing	0.000-0.012	0.000-0.305

Table 5-7. Mainshaft Tolerance Specifications

MAINSHAFT TOLERANCE	IN	MM
Mainshaft runout	0.000-0.003	0.00-0.08
Mainshaft end play	none	none
Fifth gear end play (axial)	0.002-0.026	0.05-0.66
Fifth gear clearance (radial)	0.0004-0.0020	0.009-0.052
Main drive gear (sixth) fit	0.0009-0.0022	0.023-0.056

Table 5-8. Countershaft Tolerance Specifications

COUNTERSHAFT TOLERANCE	IN	MM
Countershaft runout	0.000-0.003	0.00-0.08
Countershaft end play	0.001-0.003	0.025-0.08
First gear end play (axial)	0.001-0.023	0.03-0.58
First gear clearance (radial)	0.0004-0.0020	0.010-0.052
Second gear end play (axial)	0.001-0.40	0.03-1.02
Second gear clearance (radial)	0.0004-0.0020	0.010-0.052
Third gear end play (axial)	0.001-0.042	0.03-1.07
Third gear clearance (radial)	0.0004-0.0020	0.010-0.052
Fourth gear end play (axial)	0.001-0.028	0.03-0.71
Fourth gear clearance (radial)	0.0004-0.0020	0.010-0.052

Table 5-9. Shifter Dog Clearance Specifications

SHIFTER DOG	IN	MM
First	0.013-0.121	0.33-3.07
Second	0.016-0.138	0.41-3.51
Third	0.010-0.125	0.25-3.17
Fourth	0.018-0.129	0.46-3.28
Fifth	0.007-0.117	0.18-2.97
Sixth	0.022-0.131	0.56-3.33

Table 5-10. Bearing Housing Bearing Specifications

BEARING HOUSING BEARING	IN	MM
Fit in bearing housing (tight)	0.0001-0.0014	0.0025-0.0356
Fit on countershaft (tight)	-0.0004	-0.010
Fit on countershaft (loose)	+0.0012	+0.030
Fit on mainshaft (tight)	-0.0004	-0.010
Fit on mainshaft (loose)	+0.0012	+0.030

Table 5-11. Shifter Fork Specifications

SHIFTER FORKS	IN	MM
Shifter fork to cam groove end play	0.004-0.012	0.102-0.305
Shifter fork to dog ring end play	0.004-0.016	0.102-0.4060
First and second gear shift fork pad thickness wear limit	0.258	6.55

Table 5-11. Shifter Fork Specifications

SHIFTER FORKS	IN	MM
Third and fourth gear shift fork pad thickness wear limit	0.198	5.03
Fifth and sixth gear shift fork pad thickness wear limit	0.258	6.55

POWER FLOW

See Figure 5-1. The 6-speed transmission consists of two parallel shafts supporting six gears each. The longer, or mainshaft (7), also supports the clutch and serves as the input shaft. The shorter shaft is called the countershaft (8).

Each gear on the mainshaft is in constant mesh with a corresponding gear on the countershaft. Each of these six pairs of gears makes up a different speed in the transmission.

The transmission gears are divided into two types, gears that rotate with the shaft, and gears that spin freely on the shaft. A gear that rotates with the shaft always meshes with a freewheeling gear. Also, three dog rings are able to slide sideways on the shaft. These dog rings are used to change transmission speeds. The dogs on the sides of dog rings engage dogs on adjacent freewheeling gears, transmitting power through the transmission.

Gear shifting is accomplished by three forks which fit into grooves machined into the dog rings that slide on the guide hubs. The position of the shifter forks is controlled by a drum-shaped shifter cam located in the transmission bearing housing.

Neutral

Power is introduced to the transmission through the clutch. In neutral, with the clutch engaged, the mainshaft first, second, third and fourth gears are rotating. No power is transferred to the countershaft since countershaft first, second, third and fourth gears are freewheeling gears.

First Gear

When the transmission is shifted into first gear, the dog ring between countershaft first and second, which rotates with the countershaft, engages countershaft first, which has been spinning freely on the countershaft driven by mainshaft first.

Now countershaft first is no longer freewheeling, but locked to the countershaft causing the countershaft and countershaft sixth to turn. Countershaft sixth transmits the power to the main drive gear and the sprocket as shown (1).

Second Gear

Second gear is engaged when the dog ring between countershaft first and second is shifted out of countershaft first and engages countershaft second. This locks countershaft second to the countershaft to complete the power flow as shown (2).

Third Gear

Two shifter forks are used to make the shift from second to third. One fork moves the dog ring between countershaft first and second to its neutral position. At the same time another fork engages the dog ring between countershaft third and fourth with countershaft third. This locks countershaft third to the countershaft to complete the power flow as shown (3).

Fourth Gear

Fourth gear is engaged when the dog ring between countershaft third and fourth is shifted out of countershaft third and engages countershaft fourth. This locks countershaft fourth to the countershaft to complete the power flow as shown (4).

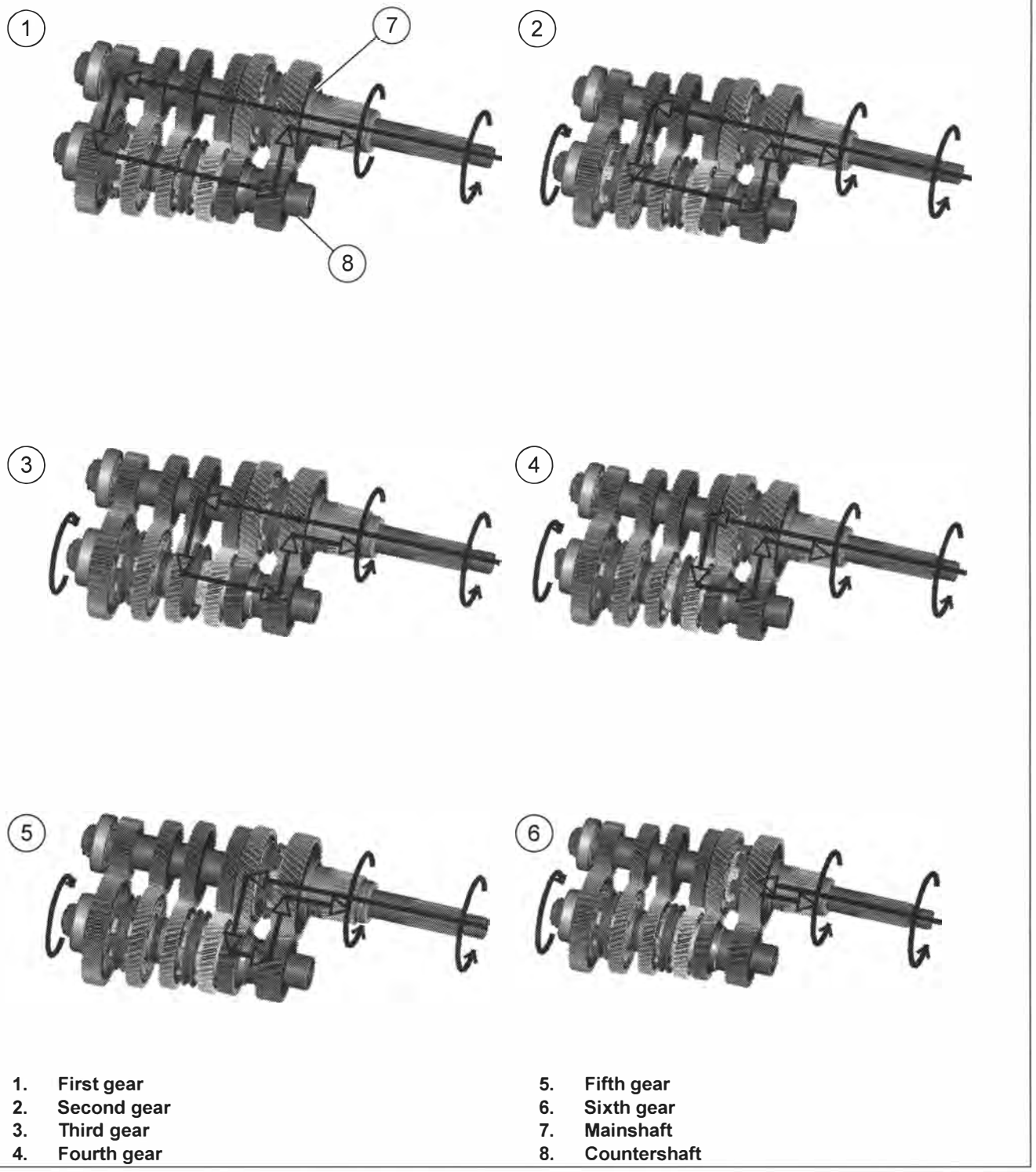
Fifth Gear

Two shifter forks are used to make the shift from fourth to fifth. One fork moves the dog ring between countershaft third and fourth to its neutral position. At the same time another fork engages the dog ring between mainshaft fifth and sixth with mainshaft fifth. This locks mainshaft fifth to the mainshaft to complete the power flow as shown (5).

Sixth Gear

The shift from fifth to sixth gear occurs when the dog ring between mainshaft fifth and sixth is shifted out of mainshaft fifth. It is shifted directly into the main drive gear (sixth gear). The main drive gear is locked to the mainshaft. this results in a direct one-to-one drive ratio from the clutch to the sprocket as shown (6).

sm00068a



1. First gear
2. Second gear
3. Third gear
4. Fourth gear
5. Fifth gear
6. Sixth gear
7. Mainshaft
8. Countershaft

Figure 5-1. Transmission Power Flow

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left passenger footrest. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
4. Remove rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).
5. Remove rear fork. See CHASSIS > REAR FORK (Page 3-72).
6. Remove primary chain, clutch, engine compensating sprocket and chain adjuster. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
7. Remove primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).

REMOVE

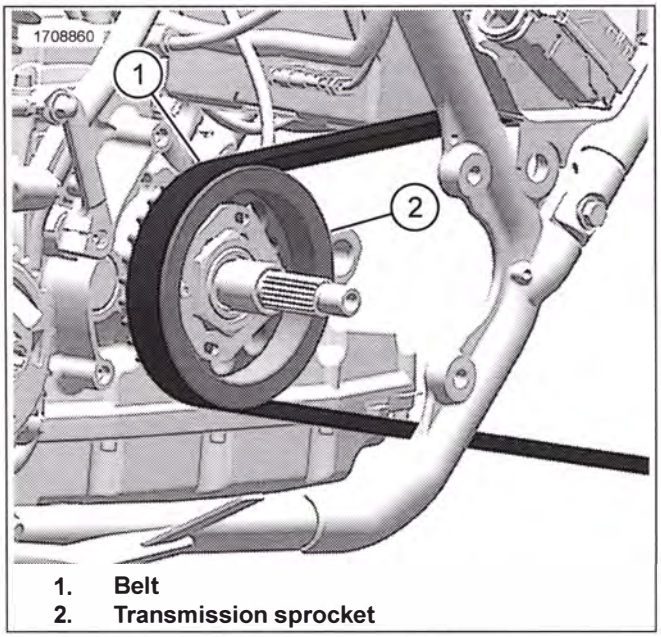
1. See Figure 5-2. Remove belt (1) from transmission sprocket (2).

INSTALL

⚠ WARNING

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

1. See Figure 5-2. Install belt (1) over transmission sprocket (2).



1. Belt
2. Transmission sprocket

Figure 5-2. Drive Belt

COMPLETE

1. Install primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
2. Install primary chain, clutch, engine compensating sprocket and chain adjuster. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
3. Install rear fork. See CHASSIS > REAR FORK (Page 3-72).
4. Install left passenger footrest. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
5. Install rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).
6. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
7. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

SHIFTER ROD

FASTENER	TORQUE VALUE	
Shifter rod jamnut	80–120 **in-lbs**	9–13.6 N·m
Shifter rod nut	8–12 ft-lbs	11–16 N·m

Remove

1. See Figure 5-3. Remove shifter rod.
   a. Remove ball stud (14) from rear shifter rod lever.
   b. Remove nut (11) and washer (12).
   c. Remove shifter rod (2).

Install

1. See Figure 5-3. Install shifter rod.
   a. Install rear ball stud (14) to rear shifter rod lever.
   b. Install front of shifter rod (2) through shifter rod lever (13).
   c. Install washer (12) on ball stud.
   d. Install nut (11). Tighten.
      Torque: 8–12 ft-lbs (11–16 N·m) *Shifter rod nut*

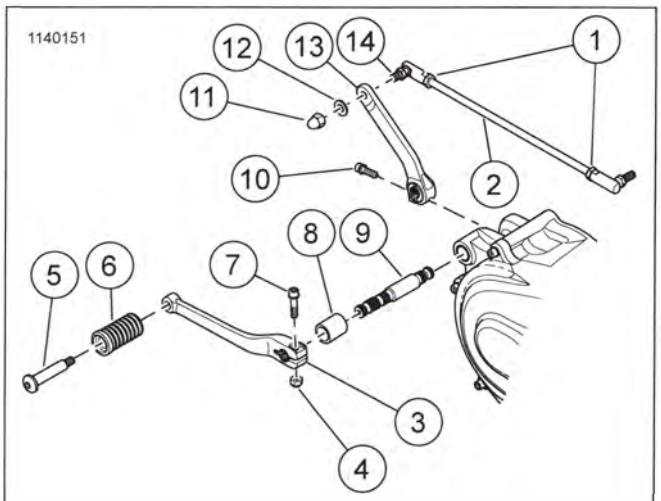
Adjustment

1. *NOTE*

- *The shifter rod should not require adjustment under normal circumstances. However, if full gear engagement or full lever travel is not achieved, adjust shifter rod.*
- *Do not allow shift levers to contact footboard when shifting. This prevents proper gear engagement. Contact may also damage transmission.*

See Figure 5-3. Adjust shifter rod.

   a. Loosen jamnuts (1).
   b. Remove nut (11) and washer (12).
   c. Remove front of shifter rod (2).
   d. Adjust rod as necessary.
   e. Install front of shifter rod through shifter rod lever (13).
   f. Install washer on ball stud (14).
   g. Install nut (11). Tighten.
      Torque: 8–12 ft-lbs (11–16 N·m) *Shifter rod nut*
   h. Tighten jamnuts (1).
      Torque: 80–120 **in-lbs** (9–13.6 N·m) *Shifter rod jamnut*



1. **Jamnut (2)**
2. **Shifter rod**
3. **Shift lever (2)**
4. **Nut (2)**
5. **Peg screw (2)**
6. **Peg (2)**
7. **Shift lever pinch screw (2)**
8. **Spacer**
9. **Shift lever shaft**
10. **Shift rod lever pinch screw**
11. **Nut**
12. **Washer**
13. **Shifter rod lever**
14. **Ball stud (2)**

Figure 5-3. Shifter Linkage

FOOT SHIFT LEVER

FASTENER	TORQUE VALUE	
Shift lever pinch screw	9.0–12.0 ft-lbs	12.2–16.3 N·m
Shifter peg screw	96–144 **in-lbs**	10.9–16.3 N·m

Remove

1. See Figure 5-3 Remove shifter lever.
   a. Mark position of lever (3) in relation to shaft (9).
   b. Remove screw (7) and nut (4).
   c. Remove lever from shaft.
   d. Remove spacer (8).
2. Remove peg.
   a. Remove screw (5).
   b. Remove peg (6).

Install

1. See Figure 5-3. Install pegs.
   a. Install screw (5) through peg (6).

b. Install screw to lever (3). Tighten.

Torque: 96–144 **in-lbs** (10.9–16.3 N·m) *Shifter peg screw*

2. Install shifter lever.

a. Install spacer (8) on shaft (9).

b. Align and install lever (3) to mark made during removal.

NOTE

Shift lever peg height is a customer preference. During installation, check operation of shift lever. To achieve proper gear engagement and to avoid damage to transmission, peg must not contact footboard when shifting.

c. Install screw (7) and nut (4). Tighten.

Torque: 9.0–12.0 ft-lbs (12.2–16.3 N·m) *Shift lever pinch screw*

3. Verify shift lever operation.

SHIFTER ROD LEVER, FRONT

FASTENER	TORQUE VALUE	
Shifter rod lever pinch screw, front lever	132–156 **in-lbs**	14.9–17.6 N·m
Shifter rod nut	8–12 ft-lbs	11–16 N·m

Remove

1. See Figure 5-3. Remove shifter rod.

a. Remove nut (11) and washer (12).

b. Remove shifter rod (2).

2. Remove shifter rod lever.

a. Mark position of shifter rod lever (13) in relation to shaft (9).

b. Remove screw (10).

c. Slide shaft (9) out enough to remove shift rod lever.

Install

1. See Figure 5-3. Install shifter rod lever.

a. Align and install lever (13) to marks made on shifter shaft (9) during removal.

b. Slide shifter shaft through lever.

c. Install screw (10). Tighten.

Torque: 132–156 **in-lbs** (14.9–17.6 N·m) *Shifter rod lever pinch screw, front lever*

2. Install shifter rod.

a. Install shifter rod (1) through shifter rod lever (13).

b. Install washer (12) on shifter rod stud.

c. Install nut (11). Tighten.

Torque: 8–12 ft-lbs (11–16 N·m) *Shifter rod nut*

3. Verify shift lever operation.

SHIFTER ROD LEVER, REAR

FASTENER	TORQUE VALUE	
Shifter rod ball stud	70–99 **in-lbs**	7.9–11.2 N·m
Shifter rod lever pinch screw, rear lever	13–16 ft-lbs	18–22 N·m

Remove

1. See Figure 5-4. Remove rear shifter rod lever.

a. Mark position of rear shifter rod lever (2) in relation to shifter pawl shaft (4).

b. remove ball stud (1).

c. Remove screw (3).

d. Remove rear shifter rod lever (2).

Install

1. See Figure 5-4. Install rear shifter rod lever.

a. Align and install lever (5) to marks made on shifter pawl shaft (4) during removal.

b. Slide lever so hole in lever lines up with groove on shifter pawl shaft.

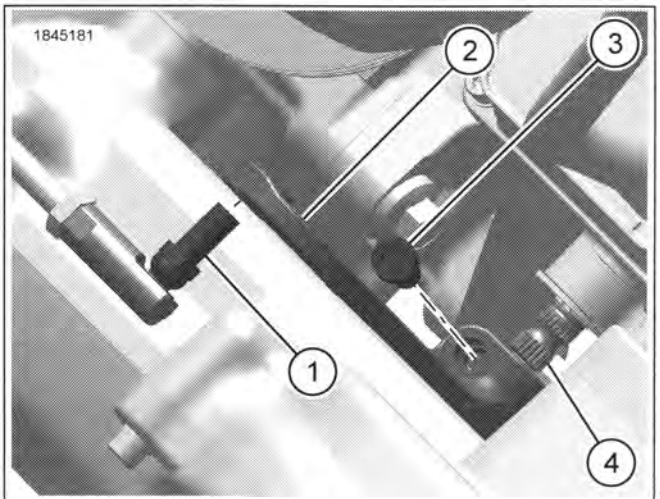
c. Install screw (3). Tighten.

Torque: 13–16 ft-lbs (18–22 N·m) *Shifter rod lever pinch screw, rear lever*

2. Install shifter rod.

a. Install ball stud to shifter rod (2). Tighten.

Torque: 70–99 **in-lbs** (7.9–11.2 N·m) *Shifter rod ball stud*



1. Ball stud
2. Shifter rod lever
3. Screw
4. Shifter pawl shaft

Figure 5-4. Rear Shifter Rod Lever

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove exhaust system as needed. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
3. Drain transmission. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).
4. Remove gear position sensor cover and sensor. See ELECTRICAL > GEAR POSITION SENSOR (Page 8-70).

REMOVE

NOTE

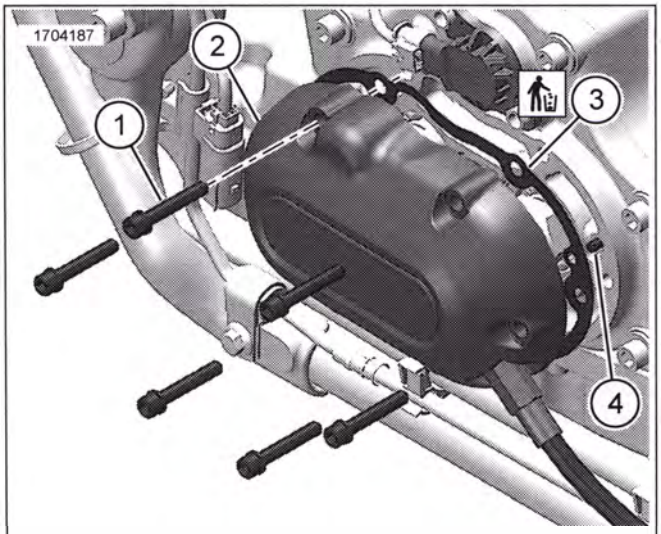
Actuating clutch hand lever after removing screws will help break cover free.

1. See Figure 5-5. Remove clutch release cover.
   a. Remove screws (1).
   b. Remove clutch release cover (2).
   c. Discard gasket (3).

INSTALL

FASTENER	TORQUE VALUE	
Clutch cable fitting	90–120 **in-lbs**	10.2–13.6 N·m
Clutch release cover screws	11–13 ft-lbs	14.9–17.6 N·m

1. See Figure 5-5. Install clutch release cover.
   a. Verify two alignment pins (4) are in place on transmission bearing housing flange.
   b. Install **new** gasket (3).
   c. Install clutch release cover (2).
   d. Install screws (1).
   e. See Figure 5-6. Tighten screws in sequence shown.
      Torque: 11–13 ft-lbs (14.9–17.6 N·m) *Clutch release cover screws*
   f. Tighten clutch cable fitting, if removed.
      Torque: 90–120 **in-lbs** (10.2–13.6 N·m) *Clutch cable fitting*



1. **Screw (6)**
2. **Clutch release cover**
3. **Gasket**
4. **Alignment pin (2)**

Figure 5-5. Clutch Release Cover

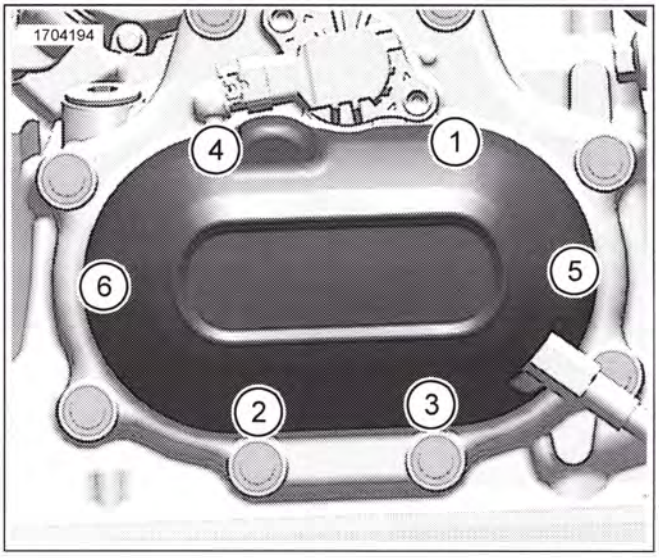


Figure 5-6. Clutch Release Cover Torque Sequence

DISASSEMBLE

NOTE

Do not separate clutch cable halves.

1. Add free play to clutch cable. See MAINTENANCE > CHECK AND ADJUST CLUTCH (Page 2-24).

⚠ WARNING

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

2. See Figure 5-9. Disconnect clutch cable.
   a. Remove retaining ring (4).

b. Lift inner ramp (5) and ramp coupling (3) out of clutch release cover.

c. Disconnect clutch cable end (2) from ramp coupling (3).

3. Remove coupling (3) from inner ramp.

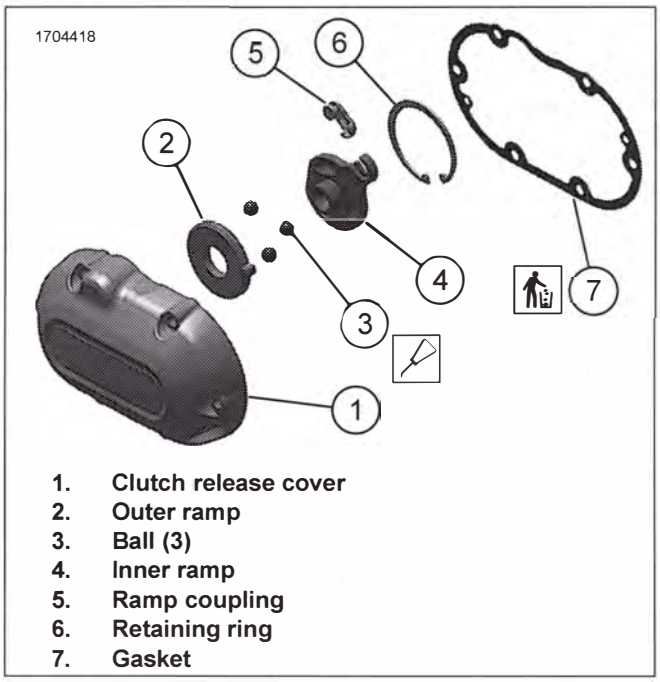
4. See Figure 5-10. Remove balls (4) and outer ramp (2).

5. See Figure 5-9. Remove cable fitting (1) from clutch release cover.

6. See Figure 5-8. Discard O-ring (2).

CLEAN AND INSPECT

1. See Figure 5-7. Wash ball and ramp mechanism components in cleaning solvent.
2. Inspect the three balls (3) and ball socket surfaces on ramps (2, 4) for wear, pitting, surface breakdown and other damage. Replace as necessary.
3. Check fit of ramp coupling (5) on inner ramp (4). Replace both parts if there is excessive wear.
4. Inspect retaining ring (6) for damage or distortion.
5. Check clutch cable end for frayed or worn ends. Replace cable if damaged or worn.
6. Check bore in clutch release cover (1) where ramps (2, 4) are retained. There should be no wear that would cause ramps to tilt, causing improper clutch adjustment.



1. **Clutch release cover**
2. **Outer ramp**
3. **Ball (3)**
4. **Inner ramp**
5. **Ramp coupling**
6. **Retaining ring**
7. **Gasket**

Figure 5-7. Clutch Release Assembly

ASSEMBLE

1. See Figure 5-8. Install **new** O-ring (2).

2. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads on clutch cable fitting (1).

3. See Figure 5-10. Install clutch cable fitting in clutch release cover. Leave fasteners loose.

4. Place outer ramp (2) with ball socket side up in clutch release cover. Confirm outer ramp tab (3) is in clutch release cover slot.

5. Apply a multi-purpose grease to balls (4) and outer ramp sockets. Place a ball in each of outer ramp sockets.

6. See Figure 5-9. Connect clutch cable.

   a. Connect clutch cable end (2) to ramp coupling (3).

   b. Install coupling on inner ramp (5).

   c. Place inner ramp and coupling in position in clutch release cover.

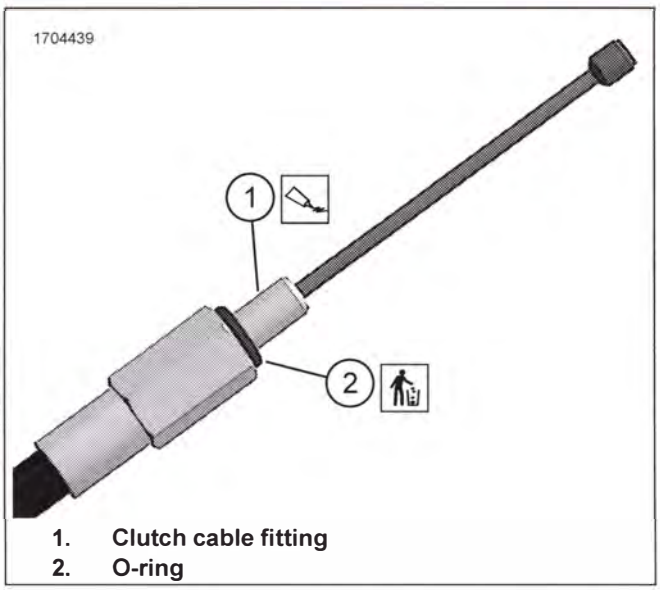
⚠ WARNING

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

7. Install retaining ring.

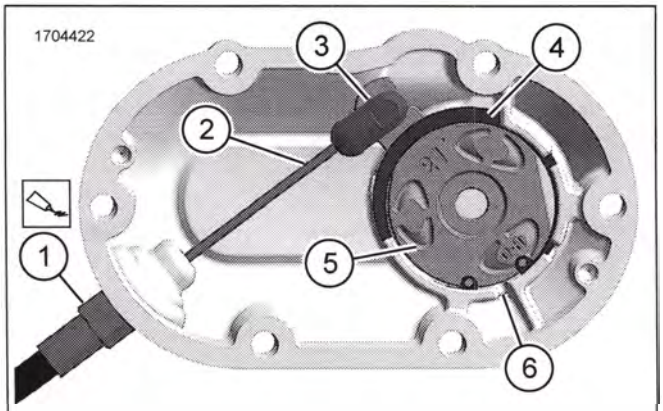
   a. Center retaining ring opening (6) above break in ribbing at bottom of clutch release cover.

   b. Install retaining ring (4).



1. **Clutch cable fitting**
2. **O-ring**

Figure 5-8. Clutch Cable to Clutch Release Cover



1. Cable fitting
2. Clutch cable end
3. Ramp coupling
4. Retaining ring
5. Inner ramp
6. Retaining ring opening

Figure 5-9. Clutch Cable Connection



1. Inner ramp
2. Outer ramp
3. Outer ramp tab
4. Balls (3)
5. Ramp coupling

Figure 5-10. Coupling and Ramp Assembly

COMPLETE

1. Install gear position sensor and cover. See ELECTRICAL > GEAR POSITION SENSOR (Page 8-70).

2. Fill transmission. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).

3. Adjust clutch. See MAINTENANCE > CHECK AND ADJUST CLUTCH (Page 2-24).

4. Install exhaust system if removed. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7)

PREPARE

1. Remove clutch inspection cover. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
2. **If necessary:**
   a. Drain transmission lubricant. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).
   b. Remove mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).
   c. Remove exhaust system if needed. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
   d. Remove clutch release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).

REMOVE

Right Side

1. See Figure 5-12. Remove oil slinger (4).
2. Disassemble oil slinger.
   a. Remove retaining ring (1).
   b. Remove throw out bearing (3) with thrust washers (2).
3. If necessary, remove push rod (5).

Left Side

1. See Figure 5-11. Loosen jamnut (4).
2. Loosen adjuster screw (5).
3. Remove retaining ring (3).
4. Remove release plate (2).
5. If necessary, remove push rod (1).

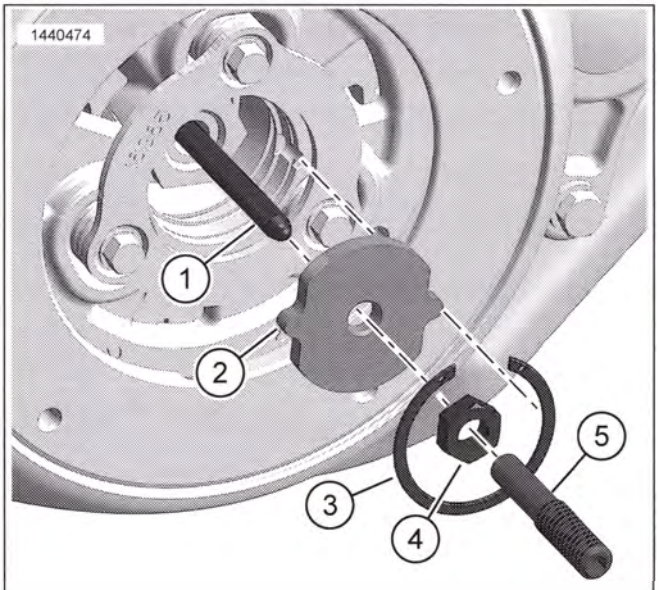
INSTALL

Left Side

1. See Figure 5-11. Verify push rod (1) is installed.
2. Install release plate (2).
3. Install retaining ring (3).
4. Install adjuter screw (5).
5. Install jam nut (4).

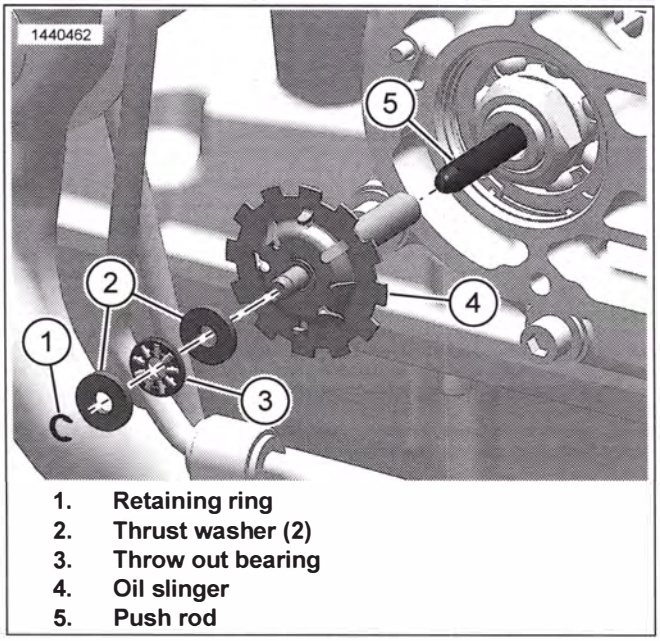
Right Side

1. See Figure 5-12. Verify push rod (5) is installed.
2. Assemble bearing on oil slinger.
   a. Install one thrust washer (2) on oil slinger (4).
   b. Install throw out bearing (3) on oil slinger.
   c. Install second thrust washer on oil slinger.
   d. Install retaing ring (1) in groove.
3. Install assembly in transmission input shaft.



1. Push rod
2. Release plate
3. Retaining ring
4. Jamnut
5. Adjuster screw

Figure 5-11. Left Side Clutch Push Rod



1. **Retaining ring**
2. **Thrust washer (2)**
3. **Throw out bearing**
4. **Oil slinger**
5. **Push rod**

Figure 5-12. Right Side Clutch Push Rod

COMPLETE

1. **If necessary:**

   a. Install clutch release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).

   b. Fill transmission. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).

   c. Install exhaust system if removed. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

   d. Install mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).

2. Adjust clutch. See MAINTENANCE > CHECK AND ADJUST CLUTCH (Page 2-24).

3. Install clutch inspection cover. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7)
2. Remove passenger left footboard and bracket if necessary. See CHASSIS > RIDER FOOTRESTS (Page 3-133)
3. Remove rider left footboard and bracket. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
4. Remove heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
5. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9)

REMOVE

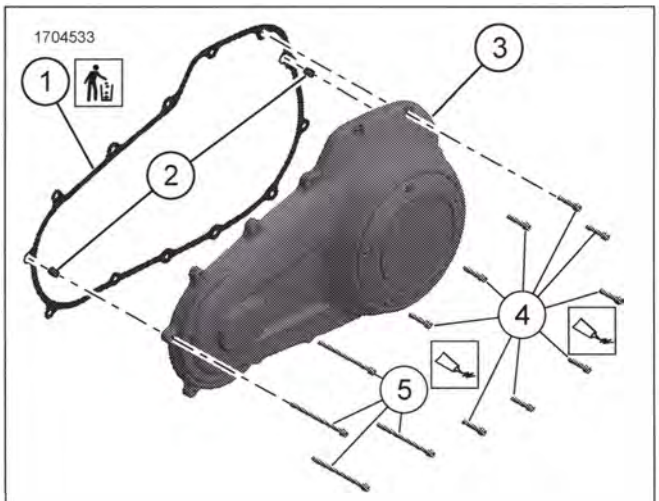
1. See Figure 5-13. Remove primary chaincase cover.
   a. Remove cover screws (4, 5).
   b. Remove cover (3).
   c. Remove and discard gasket (1).

INSTALL

FASTENER	TORQUE VALUE	
Primary cover screws	12–13 ft-lbs	16.3–17.6 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

1. See Figure 5-13. Verify all debris is washed from inside ribs of cover.
2. Verify hollow dowels (2) are installed properly.
3. Install **new** cover gasket (1).
4. Install cover.
   a. Apply a drop of threadlocker to threads of screws (4, 5).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install cover with screws in positions shown.
   c. See Figure 5-14. Tighten in sequence shown.
      Torque: 12–13 ft-lbs (16.3–17.6 N·m) *Primary cover screws*



1. **Gasket**
2. **Hollow dowel (2)**
3. **Cover**
4. **Screws, short (9)**
5. **Screws, long (4)**

Figure 5-13. Primary Chaincase Cover

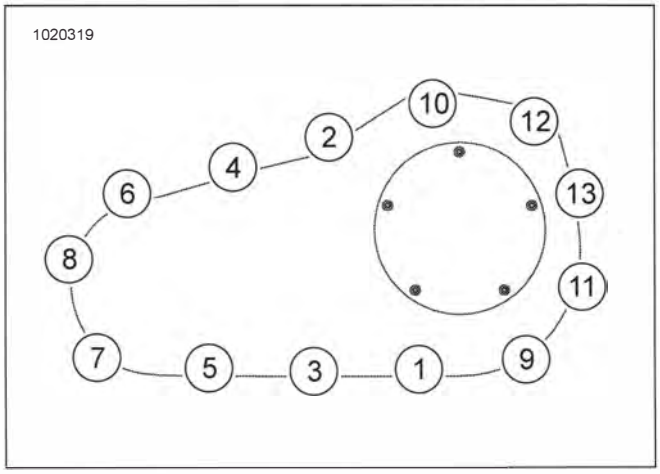


Figure 5-14. Primary Chaincase Cover Torque Sequence

COMPLETE

1. Install heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
2. Install rider footboard and bracket, if removed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Fill primary chaincase with oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

4. Install negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove rider left footboard and bracket. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Remove heel shifter lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
4. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove clutch release plate and pushrod. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).
6. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).

REMOVE

PART NUMBER	TOOL NAME
HD-48219	PRIMARY DRIVE LOCKING TOOL

1. See Figure 5-15. Remove chain tensioner.
   a. Install cable strap (2) as shown. Exposed portion of cable strap below cover indicates need for removal before cover installation.
   b. See Figure 5-16. Remove chain tensioner fasteners (2).
   c. Remove chain tensioner (1).
2. Mark one link on primary chain for reference during installation.
3. *NOTE*
   Release plate and clutch hub do not need to be removed if only removing compensating sprocket.
   Remove release plate. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).
4. *NOTE*
   Mainshaft nut has left-hand threads.
   See Figure 5-17. Remove mainshaft nut.
   a. Place special tool between sprockets as shown.
      Special Tool: PRIMARY DRIVE LOCKING TOOL (HD-48219)
   b. Rotate clutch hub mainshaft nut (4) clockwise and remove.
5. See Figure 5-18. Remove compensating sprocket bolt.
   a. Place primary drive locking tool (2) between sprockets as shown.
   b. Rotate compensating sprocket bolt (1) counterclockwise and remove.
   c. See Figure 5-19. Remove retainer (8) and thrust washer (7).
6. Inspect thrust washers for damage.
7. Remove clutch assembly, primary chain and compensating sprocket assembly as a single unit.
8. Clean sprocket retainer (8). Verify that oil holes are clear.

INSTALL

PART NUMBER	TOOL NAME
HD-48219	PRIMARY DRIVE LOCKING TOOL

FASTENER	TORQUE VALUE	
Clutch hub mainshaft nut	70–80 ft-lbs	95–108.5 N·m
Compensating sprocket bolt, 1st torque	100 ft-lbs	135.6 N·m
Compensating sprocket bolt, final torque	175 ft-lbs	237.3 N·m
Primary chain tensioner fasteners	21–24 ft-lbs	28.5–33 N·m

CONSUMABLE	PART NUMBER
LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (RED)	94759-99

NOTE
O-ring inside shaft extension is for manufacturing assembly only and has no replacement part number.

1. See Figure 5-19 Install spring pack (3) on rotor hub (1).
2. Install extension shaft.
   a. Apply a thin layer of primary chaincase oil to flywheel shaft (2).

b. Apply a thin layer of primary chaincase oil to shaft extension (4).

c. Install shaft extension.

3. Install sliding cam (5).

4. Install primary chain, compensating sprocket and clutch as an assembly.

5. Lightly lubricate thrust washer (7) and Install.

6. Install sprocket retainer (8).

7. Install **new** bolt (9). Hand tighten.

NOTE

Clutch hub mainshaft nut has left-hand threads.

8. See Figure 5-20. Install mainshaft nut.

   a. Clean and prime threads of clutch hub mainshaft nut (2).

   b. Apply threadlocker to nut threads.

      LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (RED) (94759-99)

   c. Install nut onto mainshaft. Hand-tighten.

9. See Figure 5-21. Tighten compensating sprocket bolt.

   a. Place special tool between sprockets as shown.

      Special Tool: PRIMARY DRIVE LOCKING TOOL (HD-48219)

   b. Tighten compensating sprocket bolt (1).

      Torque: 100 ft-lbs (135.6 N·m) *Compensating sprocket bolt, 1st torque*

   c. Loosen one-half turn.

   d. Final torque.

      Torque: 175 ft-lbs (237.3 N·m) *Compensating sprocket bolt, final torque*

10. See Figure 5-20. Tighten clutch hub mainshaft nut.

    a. Place special tool between sprockets as shown.

       Special Tool: PRIMARY DRIVE LOCKING TOOL (HD-48219)

    b. Tighten clutch hub mainshaft nut (2).

       Torque: 70–80 ft-lbs (95–108.5 N·m) *Clutch hub mainshaft nut*

11. Install release plate. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).

12. If primary chain tensioner becomes disassembled, assemble in order shown.

NOTE

- *Primary chain tensioner is non-repairable. If tensioner is worn or damaged, replace assembly.*
- *Chain tensioner is not interchangable with previous model year parts. Shoe color is black.*

    a. See Figure 5-22. Locate end of spring rod (2) on roll pin (3).

    b. See Figure 5-23. Slide wedge (2) of primary chain tensioner in direction of arrow until all travel is removed.

    c. See Figure 5-15. Push shoe (1) down until it contacts wedge. Keep tension on shoe so wedge stays in place.

    d. Attach cable strap (2) as shown to hold wedge in place. Verify that end of cable strap hangs below primary chain tensioner. Cable strap serves as a reminder to remove before installing primary cover.

13. See Figure 5-16. Install primary chain tensioner.

    a. Install primary chain tensioner (1) with fasteners (2). Tighten.

       Torque: 21–24 ft-lbs (28.5–33 N·m) *Primary chain tensioner fasteners*

    b. Remove cable strap.

14. Set preliminary chain tension.

    a. Check tension at the top span while pulling down on chain midway between sprockets. Correct tension is

       0.500–0.625 in (12.7–15.88 mm)

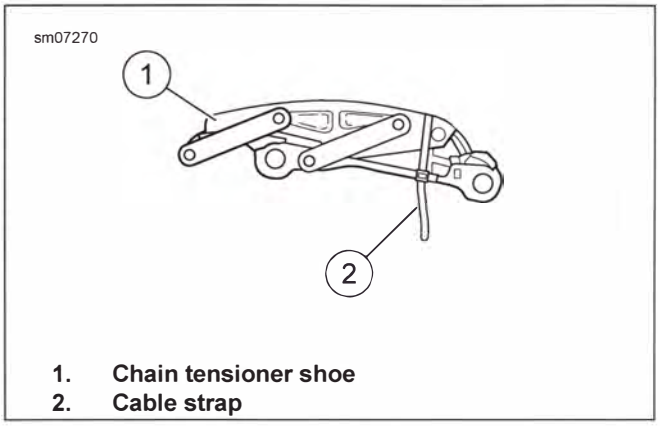
    b. If chain is loose, move chain adjuster one notch. Check tension.

    c. Repeat steps until tension is within specification.

NOTE

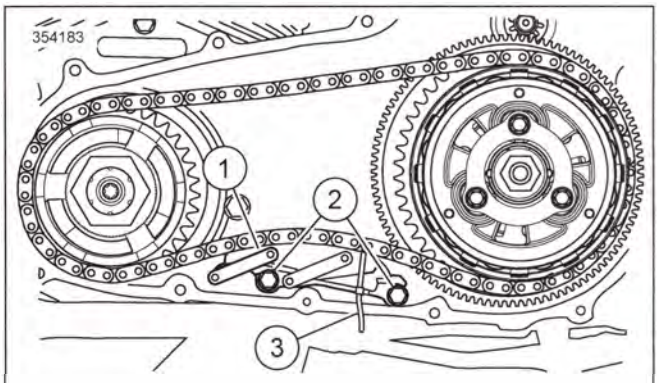
Primary chain tensioner will not complete chain adjustment until vehicle is ridden.

15. Test ride vehicle after tensioner removal/installation to provide proper adjustment.



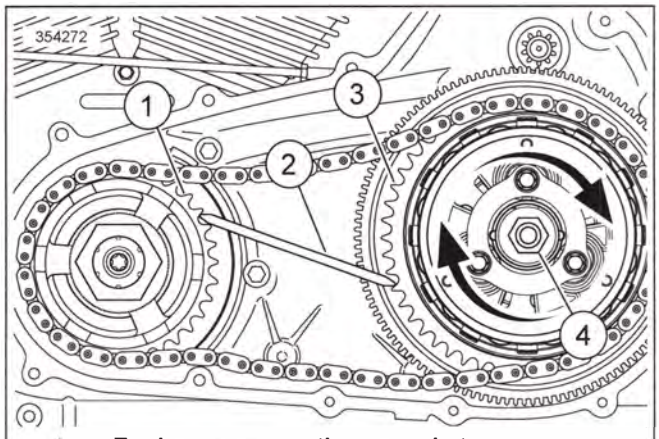
1. Chain tensioner shoe
2. Cable strap

Figure 5-15. Securing Chain Tensioner



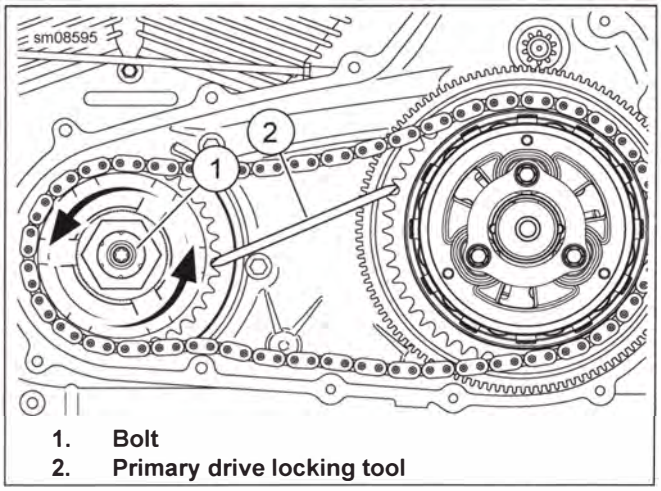
1. Chain tensioner
2. Chain tensioner fasteners
3. Cable strap

Figure 5-16. Chain Tensioner



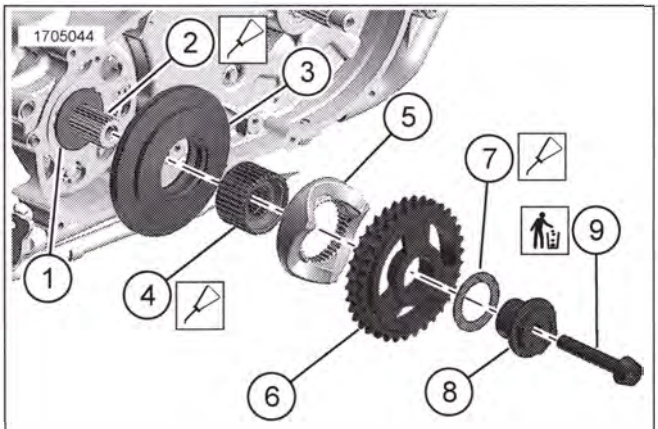
1. Engine compensating sprocket
2. Primary drive locking tool
3. Clutch sprocket
4. Clutch hub mainshaft nut

Figure 5-17. Removing Clutch Hub Mainshaft Nut



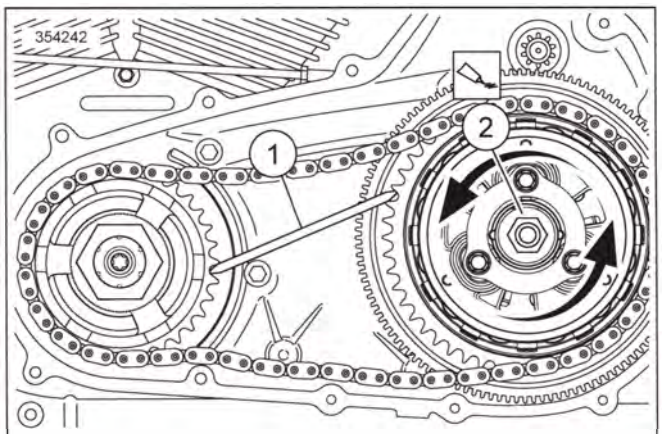
1. Bolt
2. Primary drive locking tool

Figure 5-18. Removing Engine Compensating Sprocket Bolt



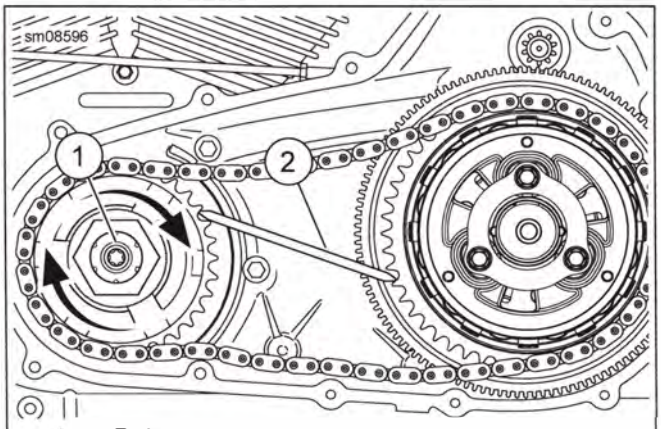
1. Rotor hub
2. Flywheel shaft
3. Spring pack
4. Shaft extension
5. Sliding cam
6. Compensating sprocket
7. Thrust washer
8. Sprocket retainer
9. Bolt

Figure 5-19. Engine Compensating Sprocket Assembly



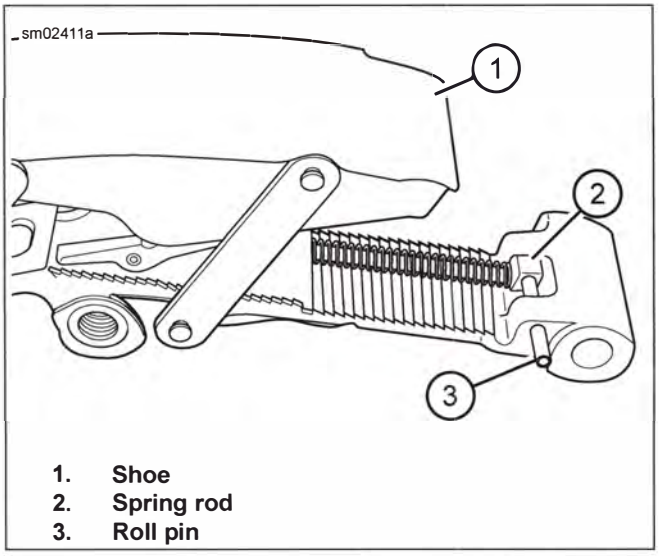
1. Primary drive locking tool
2. Clutch hub mainshaft nut

Figure 5-20. Installing Clutch Hub Mainshaft Nut



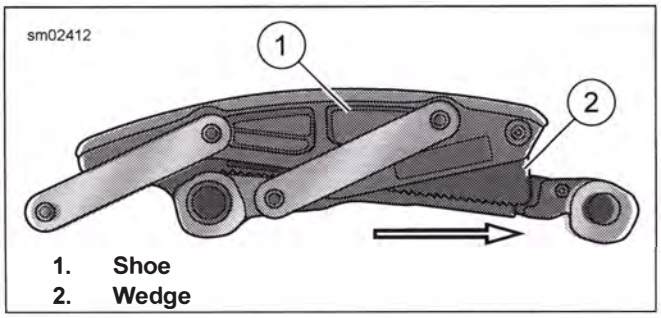
1. Bolt
2. Primary drive locking tool

Figure 5-21. Installing Engine Compensating Sprocket Bolt



1. Shoe
2. Spring rod
3. Roll pin

Figure 5-22. Spring Rod Location



1. Shoe
2. Wedge

Figure 5-23. Primary Chain Tensioner

COMPLETE

1. Install primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).

2. Install clutch release plate and pushrod. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).

3. Fill primary chaincase with oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

4. Install heel shifter lever. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

5. Install rider left footboard and bracket. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

6. Install negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove rider left footboard and bracket, if necessary. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Remove heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
4. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
6. Remove clutch release plate. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).

DISASSEMBLE AND ASSEMBLE: CLUTCH PACK

FASTENER	TORQUE VALUE	
Clutch, stopper plate bolts	71–106 **in-lbs**	8–12 N·m

This procedure can be performed without removing clutch shell or hub. To replace entire clutch assembly, see DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).

Disassemble

1. See Figure 5-24. Remove pressure plate.
   a. Remove bolts (1) alternating each bolt 1-2 turn while removing.
   b. Remove stopper plate (2).
   c. Remove springs (4).
   d. Remove spring seats (5).
   e. Remove pressure plate (6).
2. Remove friction and steel plates.
   a. Remove narrow friction plates (7) and narrow steel plate (8).
   b. Remove wide steel plates (9) and wide friction plates (10).
   c. Remove narrow friction plate (7).
3. Remove damper spring.
   a. Remove damper spring (11).
   b. Remove damper spring seat (12).

Clean and Inspect

⚠ 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
Friction and steel plates are only sold as a set.

1. *NOTE*
Do not wash friction plates or hub bearing with cleaning solvent.

   Wash parts in cleaning solvent. Dry with low-pressure compressed air.
2. Check friction plates.

NOTE
Do not use a rag to clean friction plates.

   a. Remove lubricant using compressed air.
   b. Measure thickness of each plate.
   c. If thickness of any plate is less than specification, replace entire clutch disc set. Refer to Table 5-12.
   d. Look for worn or damaged fiber surface material (both sides).
3. Check steel plates for distortion.
   a. Replace entire clutch disc set if any steel plates are grooved.
   b. Lay plate on a precision flat surface.
   c. Using a feeler gauge, check for distortion in several places.
   d. If any steel plate is warped beyond specification, replace entire clutch disc set.

      0.006 in (0.15 mm)
4. Check clutch hub bearing for smooth operation. Replace if necessary. See Disassemble and Assemble: Hub in this section.
5. Check clutch shell chain sprocket and starter ring gear. Replace if worn or damaged.

6. Check clutch hub and shell steel plate slots for wear or damage. Replace if necessary.

7. Check coil springs and stopper plate for wear or damage. Replace if necessary.

Table 5-12. FRICTION PLATE MINIMUM THICKNESS

FRICTION PLATE	MM	IN
Wide Plate	2.82	0.111
Narrow Plate	3.62	0.143

Assemble

1. Submerge and soak all friction plates in primary chaincase lubricant for at least five minutes.

2. See Figure 5-24. Install Damper spring.

   a. Install damper spring seat (12) into clutch hub (13).

   b. Install damper spring (11) onto damper spring seat with concave side facing outside of motorcycle.

3. Install friction and steel plates.

   a. Install one narrow friction plate (7) into clutch hub.

   b. Install one wide steel plate (9) onto narrow friction plate and damper spring (11).

   c. Beginning with a wide friction plate (10), alternate remaining wide friction plates with wide steel plates.

   d. Install narrow friction plate (7), narrow steel plate (8) and remaining narrow friction plate.

4. Install pressure plate.

   a. Install spring seats (5).

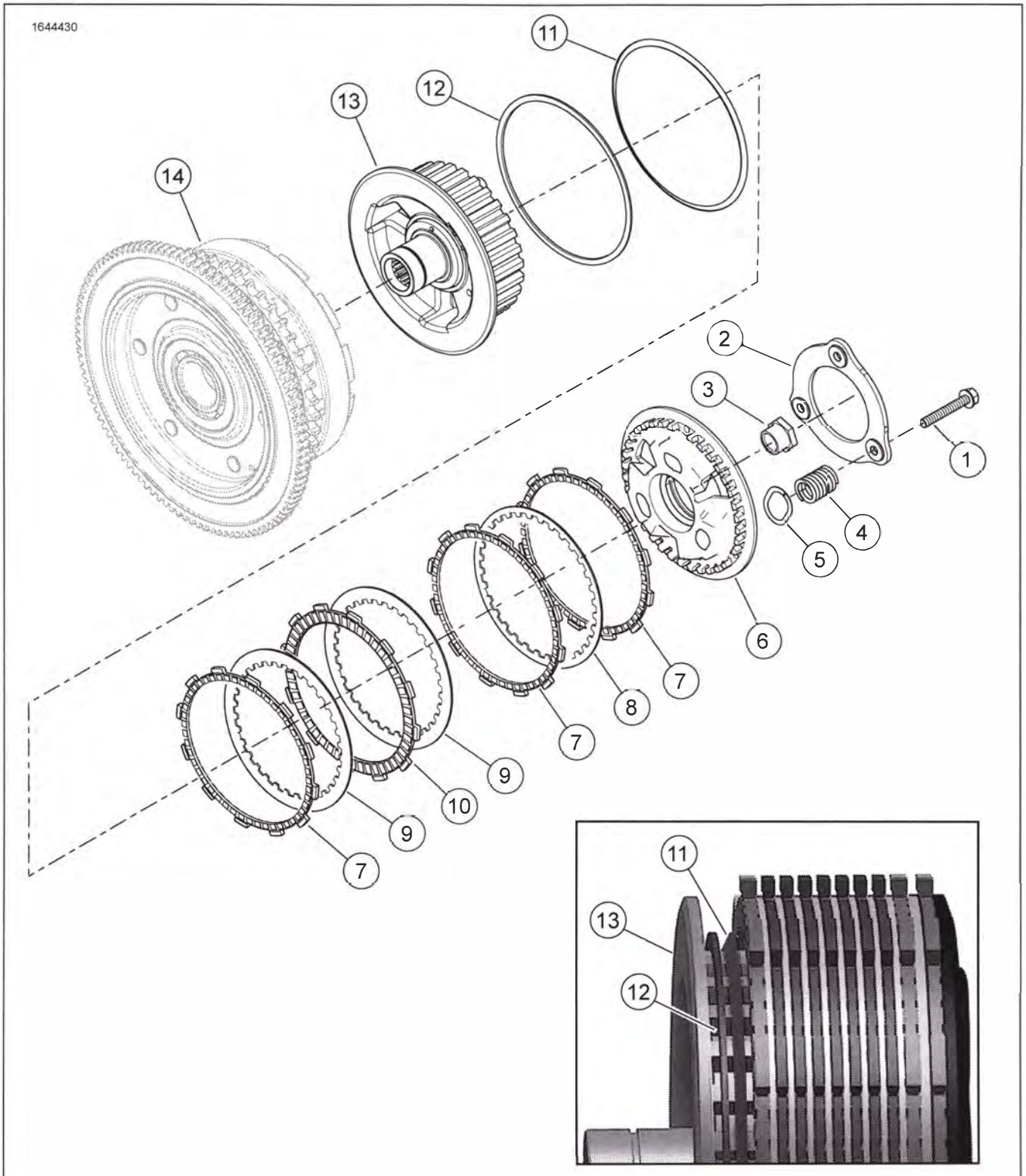
   b. Align and install pressure plate (6) onto clutch hub (13).

   c. Install springs (4).

   d. Install stopper plate (2).

   e. Install bolts (1). Alternate tightening bolts 1-2 turns to prevent damage to stopper plate.

      Torque: 71–106 **in-lbs** (8–12 N·m) *Clutch, stopper plate bolts*



1. Bolt (3)
2. Stopper plate
3. Mainshaft nut
4. Coil spring (3)
5. Seat (3)
6. Pressure plate
7. Narrow friction plate (3)
8. Narrow steel plate (1)
9. Wide steel plate (8)
10. Wide friction plate (7)
11. Damper spring
12. Damper spring seat
13. Clutch hub
14. Clutch shell

Figure 5-24. Clutch Shell Assembly

DISASSEMBLE AND ASSEMBLE: HUB

Disassemble

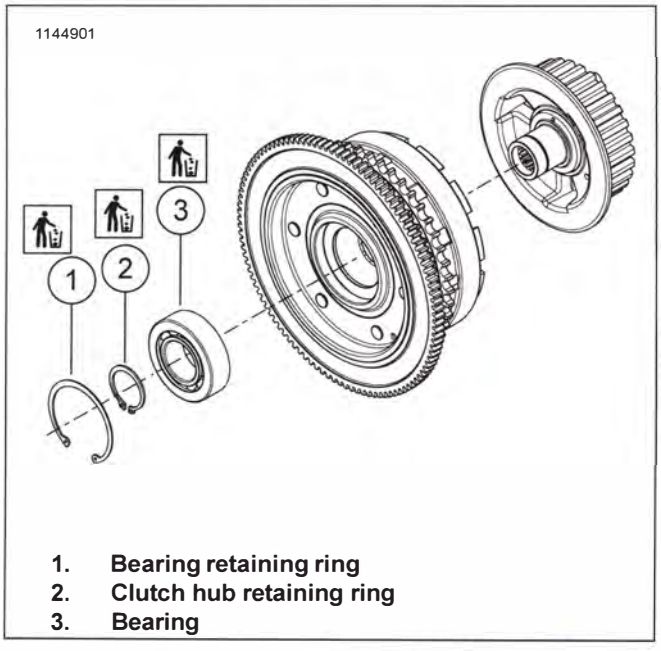
⚠ WARNING

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

NOTE

Do not disassemble clutch shell and hub assembly unless bearing, hub or shell require replacement. Replace bearing if disassembled.

1. See Figure 5-25. Press out clutch hub.
   a. Remove and discard clutch hub retaining ring (2).
   b. See Figure 5-26. Support clutch shell in press with ring gear side up.
   c. Press hub from bearing in clutch shell.
2. See Figure 5-25. Remove bearing.
   a. Remove and discard bearing retaining ring (1).
   b. See Figure 5-27. Support clutch shell in press with ring gear side is down.
   c. Use a suitable press plug to remove bearing.
3. Clean and inspect components. See CLUTCH > DISASSEMBLE AND ASSEMBLE: CLUTCH PACK (Page 5-21).



1. **Bearing retaining ring**
2. **Clutch hub retaining ring**
3. **Bearing**

Figure 5-25. Clutch Retaining Rings

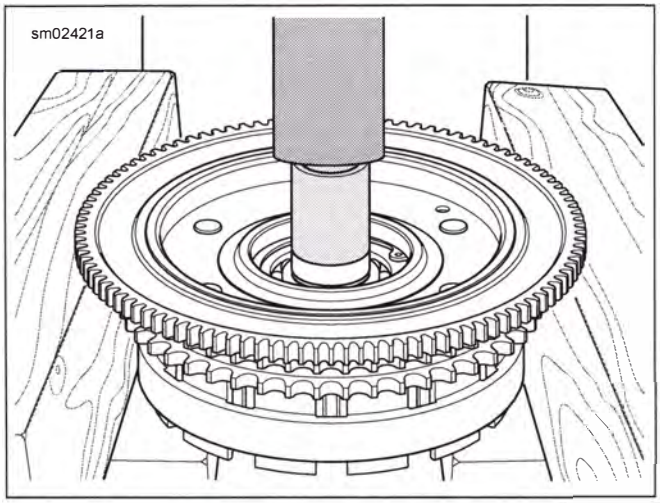


Figure 5-26. Pressing Clutch Hub From Bearing

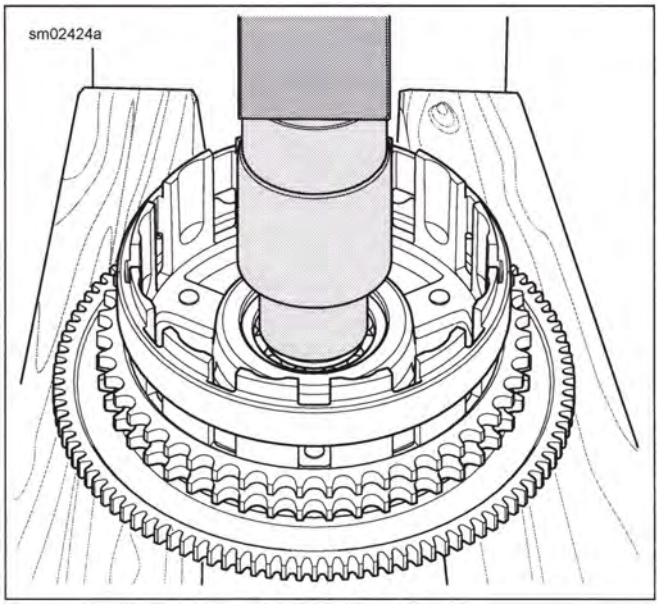


Figure 5-27. Pressing Bearing From Clutch Shell

Assemble

1. See Figure 5-26 Install **new** bearing.
   a. Place clutch shell in press with ring gear side up.
   b. Support clutch shell bore on sprocket side to avoid damage to ears on clutch basket.
   c. Using a suitable press plug, press against outer race until bearing contacts shoulder in clutch shell bore.

⚠ WARNING

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

   d. See Figure 5-25. Install **new** bearing retaining ring (1) with flat side toward bearing.
2. Install clutch hub.
   a. Place clutch shell in press with sprocket side up.

b. Center hub in bearing.

c. Support bearing inner race with a sleeve on transmission side.

d. Press hub into bearing until shoulder contacts bearing inner race.

e. Install clutch hub retaining ring (2) in groove of clutch hub.

COMPLETE

1. Install clutch release plate. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).

2. Install primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).

3. Fill primary chaincase with oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

4. Install heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).

5. Install rider footboard and bracket, if removed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

6. Install negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

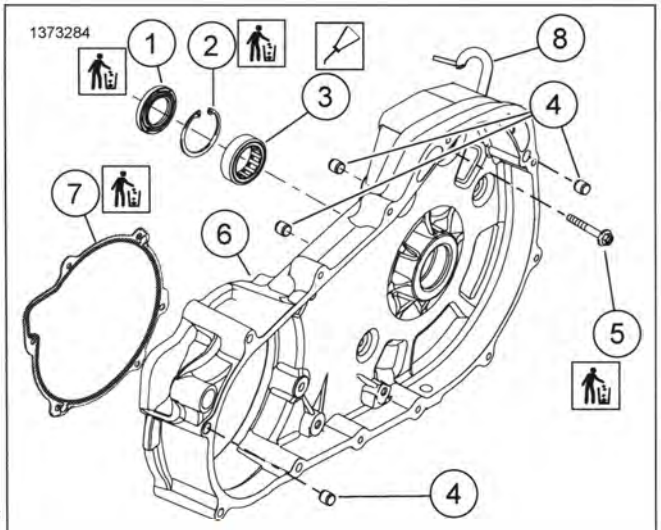
⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove rider footboard and bracket, if needed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Remove foot shifter levers and front shifter rod lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
4. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
6. Remove starter. See ELECTRICAL > STARTER (Page 8-9).
7. Remove primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).

REMOVE

1. See Figure 5-28. Remove primary chaincase housing.
   a. Remove and discard screws (5).
   b. Remove primary chaincase housing (6).
   c. Discard gasket (7).



1. **Seal**
2. **Retaining ring**
3. **Bearing**
4. **Hollow dowel (4)**
5. **Sealing screw (5)**
6. **Primary chaincase housing**
7. **Crankcase gasket**
8. **Vent hose**

Figure 5-28. Primary Chaincase Housing

INSPECT

1. Inspect primary chaincase for cracks or damaged gasket surface.
2. Check mainshaft bearing. Replace if bearing does not rotate freely. See PRIMARY CHAINCASE HOUSING > MAINSHAFT BEARING AND SEAL (Page 5-27).
3. Replace oil seal. See PRIMARY CHAINCASE HOUSING > MAINSHAFT BEARING AND SEAL (Page 5-27).
4. Inspect shifter shaft bushing. Replace if necessary. See PRIMARY CHAINCASE HOUSING > SHIFTER SHAFT BUSHING (Page 5-29).

INSTALL

FASTENER	TORQUE VALUE	
Primary chaincase sealing screws	26–28 ft-lbs	35.3–38 N·m

NOTE

Cover mainshaft clutch hub splines with tape to prevent splines from damaging primary housing inner oil seal.

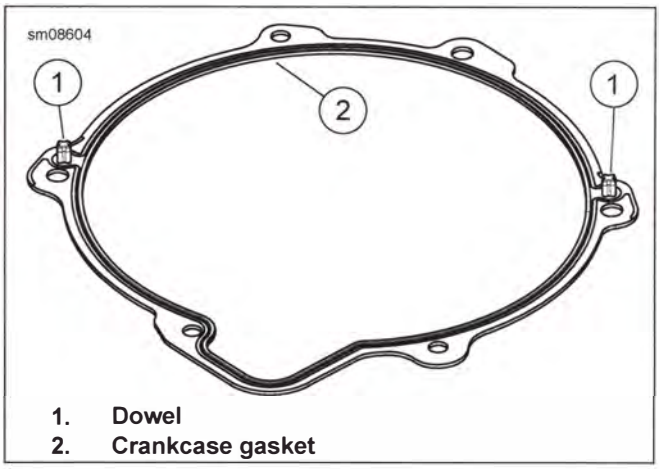
1. See Figure 5-30. Install primary chaincase housing.
   a. Install gasket on surface (2). Verify dowels in gasket engage dowel holes (3).
   b. Spread a film of oil on mainshaft oil seal lip and rubber portion of crankcase gasket.

c. See Figure 5-28 Install primary chaincase housing (6).

d. See Figure 5-31. Install **new** sealing screws.

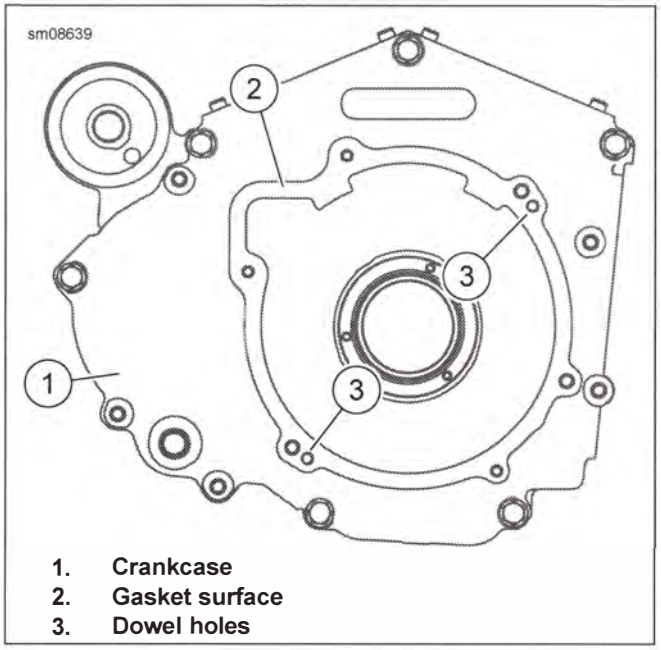
e. See Figure 5-32. Tighten in sequence shown.

Torque: 26–28 ft-lbs (35.3–38 N·m) *Primary chaincase sealing screws*



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

Figure 5-29. Crankcase Gasket



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

Figure 5-30. Crankcase

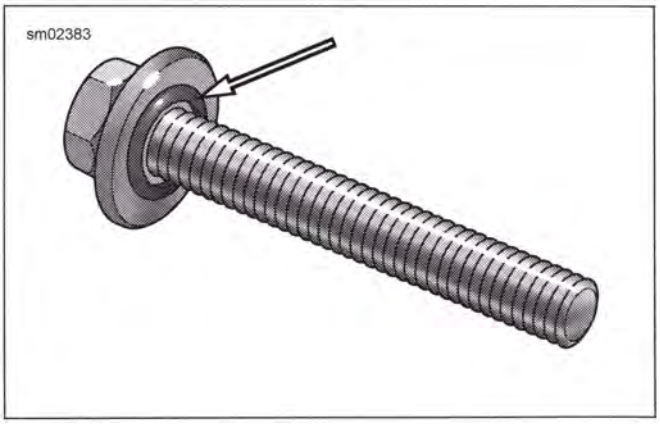


Figure 5-31. Primary Chaincase Sealing Screw

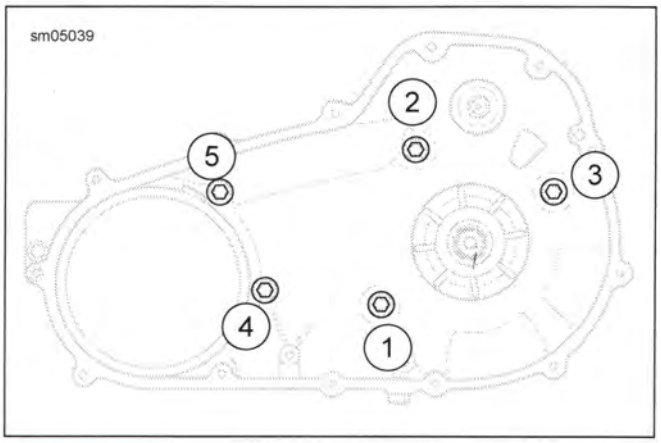


Figure 5-32. Sealing Screw Tightening Sequence

MAINSHAFT BEARING AND SEAL

Remove

1. Remove seal with a seal remover or rolling head pry bar for best results.

⚠ WARNING

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

2. See Figure 5-33. Remove and discard retaining ring (1).

NOTE

Support the bearing support area on transmission side of primary chaincase while pressing out bearing.

3. Place inner primary chaincase in a press with clutch side up.

4. Press out bearing from clutch side.

Install

1. Verify that bearing bore is clean and smooth.

NOTE

Support the bearing support area on clutch side of primary chaincase while pressing bearing.

2. Place primary chaincase in a press with transmission side up.

3. Install **new** bearing with letter side up.

   a. Apply a thin film of oil to outer diameter of bearing.

   b. Press outer race until it makes solid contact with bearing support area.

4. See Figure 5-33. Install **new** retaining ring.

   a. Install retaining ring on groove on chaincase.

NOTE

Retaining ring (1) must not block oil passage (2).

b. Verify that ring is fully seated in groove.

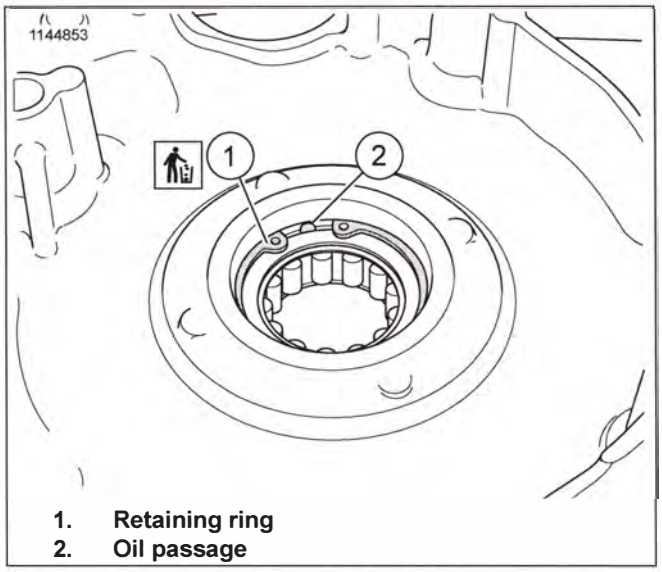
5. Install mainshaft oil seal.

   a. Lubricate OD of **new** seal with SCREAMIN' EAGLE ASSEMBLY LUBE.

   b. Place over bore with lip garter spring side (stamped "OIL SIDE") facing toward bearing.

   c. Press against outer rim of oil seal until seal is flush with machined surface of inner primary housing.

6. Lubricate bearing and seal lip with multi-purpose grease or SCREAMIN' EAGLE ASSEMBLY LUBE.



1. Retaining ring
2. Oil passage

Figure 5-33. Retaining Ring Orientation

MAINSHAFT BEARING INNER RACE

PART NUMBER	TOOL NAME
HD-34902-C	BEARING RACE REMOVER AND INSTALLER KIT

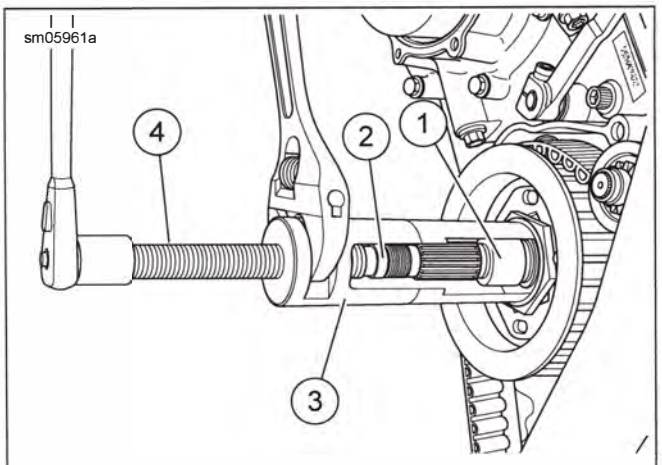
Remove

NOTE

Use only BEARING RACE REMOVER AND INSTALLER KIT (PART NUMBER: HD-34902-C).

1. See Figure 5-34. Remove bearing inner race.

   Special Tool: BEARING RACE REMOVER AND INSTALLER KIT (HD-34902-C)



1. Bearing inner race
2. End cap
3. Puller
4. Forcing screw

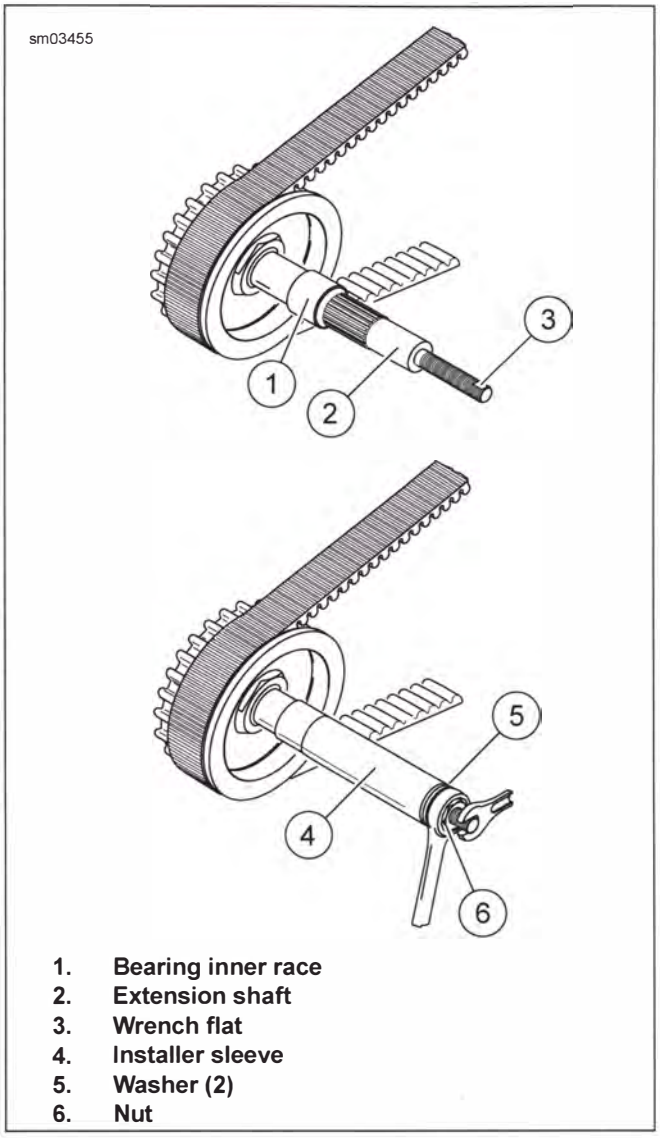
Figure 5-34. Pulling Mainshaft Inner Bearing Race

Install

1. See Figure 5-35. Install bearing inner race (1) onto mainshaft until edge of race contacts step on shaft.

   Special Tool: BEARING RACE REMOVER AND INSTALLER KIT (HD-34902-C)

2. Lubricate race with SCREAMIN' EAGLE ASSEMBLY LUBE.

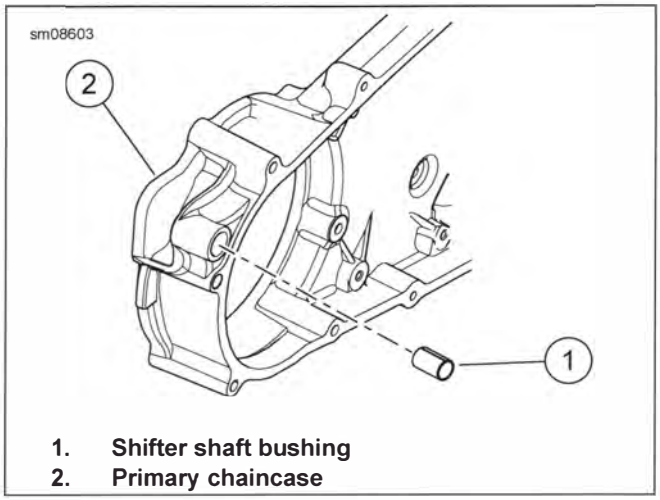


1. **Bearing inner race**
2. **Extension shaft**
3. **Wrench flat**
4. **Installer sleeve**
5. **Washer (2)**
6. **Nut**

Figure 5-35. Installing Bearing Race

SHIFTER SHAFT BUSHING

1. See Figure 5-36. Press out bushing (1).
2. Inspect bushing bore to verify that it is clean and smooth.
3. Press in **new** bushing to specification, below edge of bore.
   Length/Dimension/Distance: 0.030 in (0.76 mm)



1. **Shifter shaft bushing**
2. **Primary chaincase**

Figure 5-36. Shifter Shaft Bushings

VENT HOSE

Remove

1. See Figure 5-38. Cut at vent hose crown (3) and discard.

Install

1. *NOTE*

Lubricate hose with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.

Avoid cutting hose during installation.

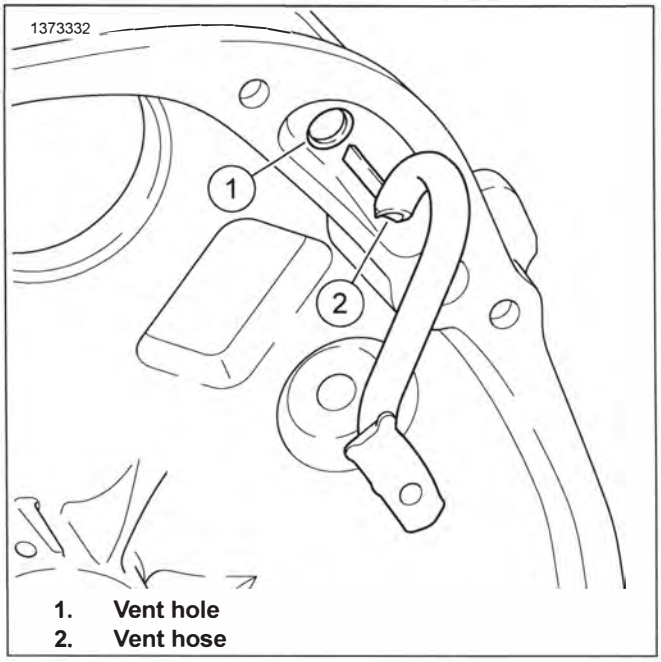
   See Figure 5-37. Install vent hose.

   a. Route vent hose (2) through vent hole (1).

   b. See Figure 5-38. Align base of vent hose (4) in case pocket.

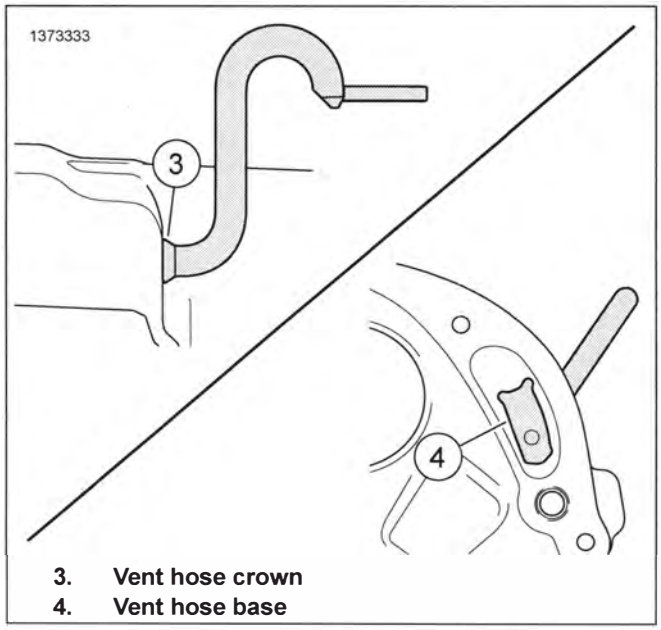
   c. Pull vent hose crown (3) through primary case.

2. Clean off any residual fluid from vent hose installation.



1. Vent hole
2. Vent hose

Figure 5-37. Install Vent Hose



3. Vent hose crown
4. Vent hose base

Figure 5-38. Vent Hose Installed

COMPLETE

1. Install primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).

2. Install starter. See ELECTRICAL > STARTER (Page 8-9).

3. Fill primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

4. Fill primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

5. Install foot shifter levers and front shifter rod lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).

6. Install rider left footboard and bracket, if removed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

7. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove left footboard and bracket. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Remove foot shifter levers and front shifter rod lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
4. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
6. Remove starter. See ELECTRICAL > STARTER (Page 8-9).
7. Remove primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
8. Remove primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
9. Loosen drive belt. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).

REMOVE

PART NUMBER	TOOL NAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT

NOTE

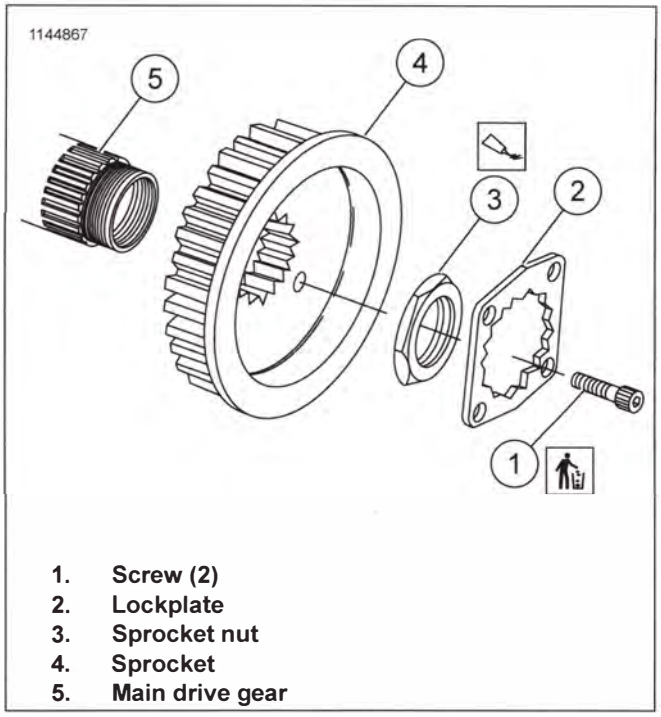
- *Loosen sprocket nut only while transmission is installed in frame. Damage to transmission or transmission stand may result.*
- *Sprocket nut has **right-hand** threads.*

1. See Figure 5-39. Remove sprocket nut.
   a. Remove and discard screws (1).
   b. Remove lockplate (2).
   c. See Figure 5-40. Attach sprocket locking tool (2) with arm of tool against bottom of rear fork pivot (1).

      Special Tool: FINAL DRIVE SPROCKET LOCKING TOOL (HD-46282A)
   d. Install pilot on mainshaft.

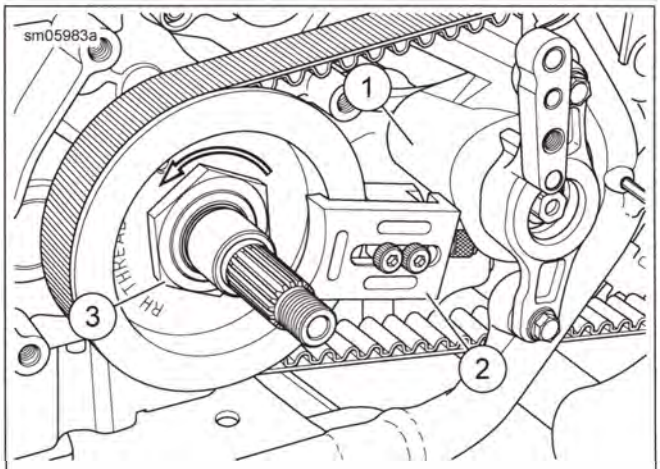
      Special Tool: PILOT (HD-94660-2)
   e. Remove sprocket nut (3) using locknut wrench.

      Special Tool: MAINSHAFT LOCKNUT WRENCH (HD-47910)
2. See Figure 5-39. Remove sprocket (4), allowing belt to slip from sprocket as sprocket is removed.



1. **Screw (2)**
2. **Lockplate**
3. **Sprocket nut**
4. **Sprocket**
5. **Main drive gear**

Figure 5-39. Transmission Sprocket



1. **Rear fork pivot**
2. **Final drive sprocket locking tool**
3. **Sprocket nut**

Figure 5-40. Sprocket Nut Removal

CLEAN AND INSPECT

1. Using a non-volatile cleaning solvent, clean sprocket of all grease and dirt.
2. Inspect belt and sprocket. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).

3. Inspect main drive gear and mainshaft seals. Replace if damaged.

INSTALL

PART NUMBER	TOOL NAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT
TA360	TORQUE ANGLE GAUGE

FASTENER	TORQUE VALUE	
Transmission sprocket lock-plate screws	100–120 **in-lbs**	11.3–13.6 N·m
Transmission sprocket nut step 1	100 ft-lbs	135.6 N·m
Transmission sprocket nut step 2. Loosen one turn		360°
Transmission sprocket nut step 3	35 ft-lbs	47.5 N·m
Transmission sprocket nut step 4. Additional		35–45°

CONSUMABLE	PART NUMBER
LOCTITE 271 HIGH STRENGTH THREADLOCKER AND SEALANT (RED)	Loctite 271

NOTE

- *Tighten sprocket nut only while transmission is installed in frame. Damage to transmission or transmission stand may result.*

1. Place transmission sprocket in position. Install belt as sprocket is installed.

2. Install sprocket nut.

NOTE

*Transmission sprocket nut has **right-hand** threads.*

a. See Figure 5-39. Apply a film of clean engine oil to mating surfaces of sprocket nut (3) and sprocket (4).

NOTE

Never get oil on sprocket nut threads.

b. If reusing sprocket nut, apply threadlocker to threads of sprocket nut.

LOCTITE 271 HIGH STRENGTH THREADLOCKER AND SEALANT (RED) (Loctite 271)

c. Install sprocket nut finger-tight.

d. See Figure 5-41. Install sprocket locking tool (2) against rear fork pivot (3).

Special Tool: FINAL DRIVE SPROCKET LOCKING TOOL (HD-46282A)

e. Install pilot on mainshaft.

Special Tool: PILOT (HD-94660-2)

f. Tighten sprocket nut (3) Using locking wrench.

Torque: 100 ft-lbs (135.6 N·m) *Transmission sprocket nut step 1*
Special Tool: MAINSHAFT LOCKNUT WRENCH (HD-47910)

3. Loosen sprocket nut one full revolution (360 degrees).

Torque: (360°) *Transmission sprocket nut step 2. Loosen one turn*

4. Tighten sprocket nut.

Torque: 35 ft-lbs (47.5 N·m) *Transmission sprocket nut step 3*

5. See Figure 5-42. Scribe lines (3) or use torque angle gauge for final torque.

Special Tool: TORQUE ANGLE GAUGE (TA360)

6. Tighten sprocket nut an additional.

Torque: (35–45°) *Transmission sprocket nut step 4. Additional*

NOTE

- *Lockplate can be installed either side out.*
- *Never LOOSEN nut to align screw holes.*
- *If necessary, tighten nut slightly to align lockplate.*
- *Do not exceed final torque of 45 degrees.*

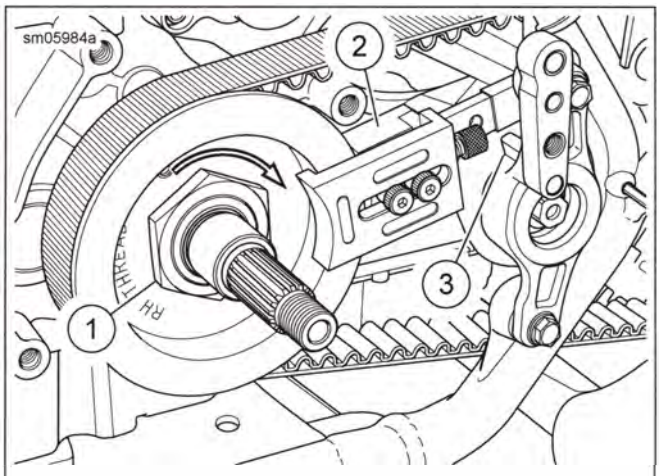
7. Install lockplate.

a. See Figure 5-39. Align lockplate (2) holes with tapped holes in sprocket (4).

b. Install **new** screws (1).

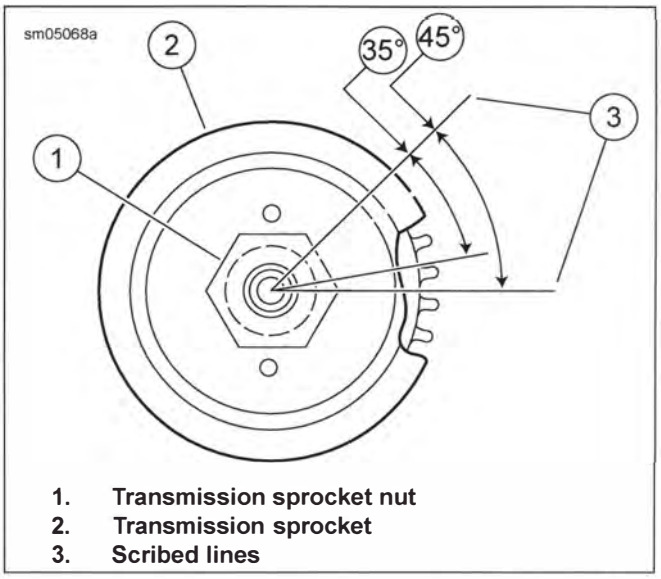
c. Tighten.

Torque: 100–120 **in-lbs** (11.3–13.6 N·m) *Transmission sprocket lockplate screws*



1. **Sprocket nut**
2. **Final drive sprocket locking tool**
3. **Rear fork pivot**

Figure 5-41. Sprocket Nut Installation



1. **Transmission sprocket nut**
2. **Transmission sprocket**
3. **Scribed lines**

Figure 5-42. Transmission Sprocket Nut Final Tightening

COMPLETE

1. Install primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
2. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
3. Install starter. See ELECTRICAL > STARTER (Page 8-9).
4. Install primary chaincase cover and **new** gasket. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
5. Fill primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
6. Install foot shifter levers and front shifter rod lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
7. Install rider left footboard and bracket. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
8. Adjust drive belt deflection. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
9. Verify rear fork pivot shaft torque. See CHASSIS > REAR FORK (Page 3-72).
10. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Drain transmission oil. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).
3. Drain engine oil. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
4. Remove exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
5. Remove gear position cover and sensor. See ELECTRICAL > GEAR POSITION SENSOR (Page 8-70).
6. Remove clutch release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).
7. Remove clutch release push rod. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).
8. Remove rider footboard and bracket, if needed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
9. Remove heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
10. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
11. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
12. Remove starter. See ELECTRICAL > STARTER (Page 8-9).
13. Remove primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
14. Remove primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
15. Loosen drive belt. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
16. Remove transmission mainshaft bearing inner race. See PRIMARY CHAINCASE HOUSING > MAINSHAFT BEARING INNER RACE (Page 5-28).

REMOVE

NOTE

Do not remove transmission case unless case requires replacement. See DRIVE AND TRANSMISSION > TRANSMISSION CASE (Page 5-49).

1. Remove breather cover from transmission. See ENGINE > BREATHER (Page 4-20).
2. See Figure 5-43. Set a rag (2) over transmission case.
3. Set shifter cam pawl (1) on rag.
4. Cover mainshaft clutch hub splines with tape to prevent damaging main drive gear bearings and oil seal.

NOTE

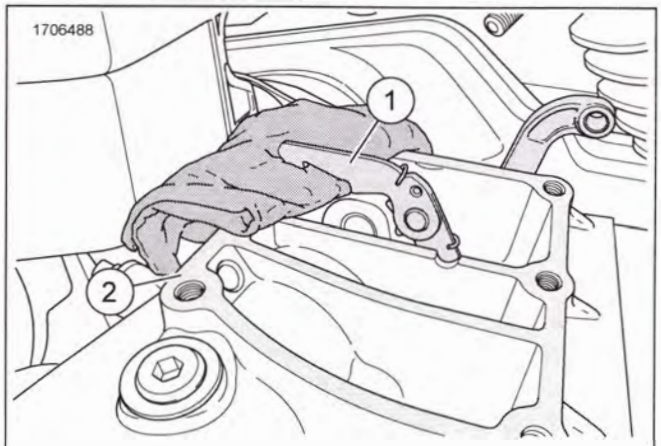
See Figure 5-44. Always pry bearing housing loose. Never tap on shafts to remove transmission assembly. The bearing housing bearings will be damaged.

5. See Figure 5-45. Remove transmission and bearing housing assembly.
   a. Remove transmission bearing housing screws (1).
   b. See Figure 5-44. Pry bearing housing loose.
   c. Remove bearing housing (2) and transmission components from transmission case as an assembly.

INSTALL

FASTENER	TORQUE VALUE	
Transmission bearing housing screw	22–25 ft-lbs	29.8–33.9 N·m

1. Cover mainshaft clutch hub splines with tape to prevent damaging main drive gear bearings and oil seal.
2. See Figure 5-45. Remove transmission dipstick (3).
3. Install a **new** gasket (4) on transmission assembly dowels (5).
4. Apply clean transmission lubricant to main drive gear bearings.
5. Install bearing housing and transmission assembly.
   a. Install screws (1).
   b. See Figure 5-46. Tighten in sequence.
      Torque: 22–25 ft-lbs (29.8–33.9 N·m) *Transmission bearing housing screw*
6. Set shifter cam pawl on shift cam.
7. Install breather cover. See ENGINE > BREATHER (Page 4-20).



1. Shifter pawl
2. Rag

Figure 5-43. Transmission Shifter Pawl

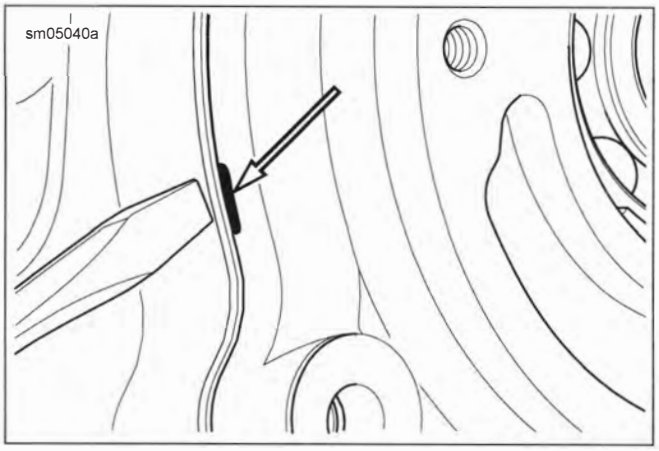
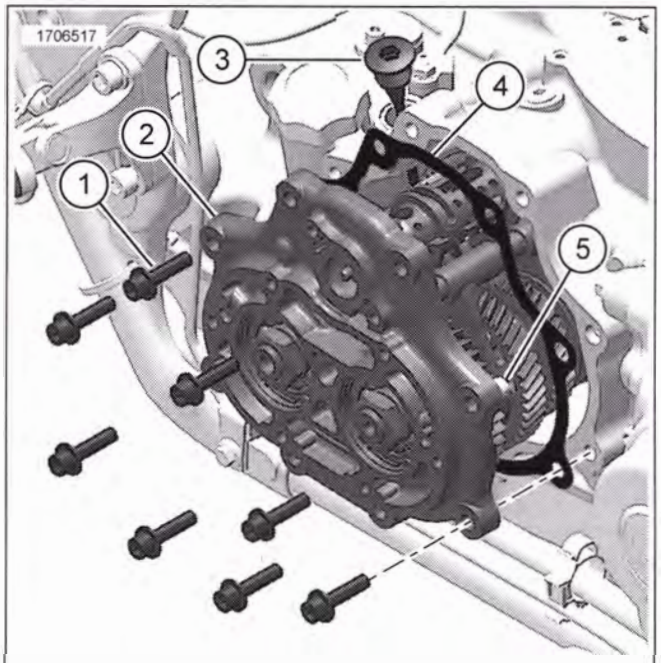


Figure 5-44. Bearing Housing Pry Point



1. Screw (8)
2. Bearing housing
3. Transmission dipstick
4. Gasket
5. Assembly dowel (2)

Figure 5-45. Bearing Housing

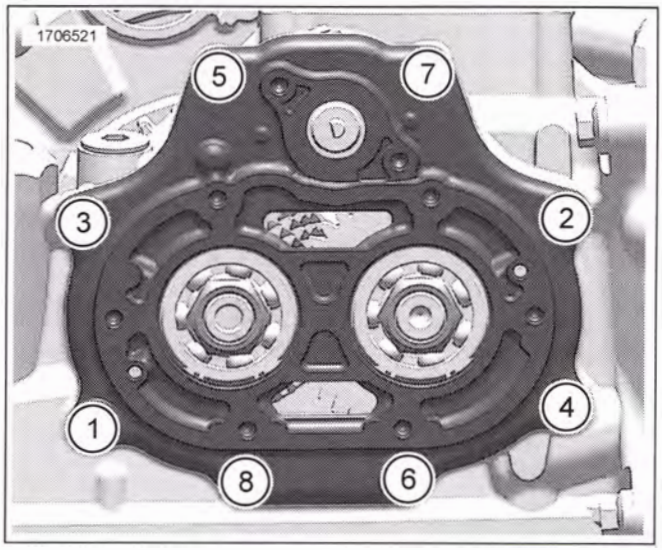


Figure 5-46. Transmission Bearing Housing Tightening Sequence

DISASSEMBLE

Remove Shift Cam and Shifter Forks

1. See Figure 5-47. Remove shift fork shafts.
   a. Set bearing housing on bench with shafts pointing up.

NOTE

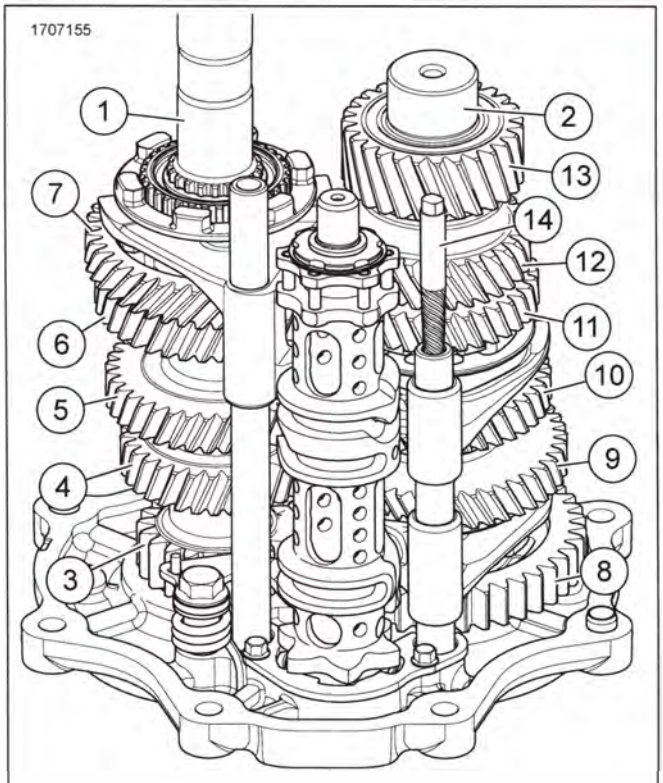
Shafts have slight interference fit.

   b. Remove shift fork shafts using spiral-flute screw extractor (14) or vise grips.
   c. Mark end of shaft to aid assembly.
2. Remove shift forks from dog rings.
3. See Figure 5-48. Remove lock plate (2). Discard screws (3).
4. Hold detent arm back and remove shift cam (4).
5. See Figure 5-49. If needed, remove detent assembly.
   a. Remove detent screw (1), detent arm (2), sleeve (3) and detent spring (4).
   b. Discard detent screw.

NOTE

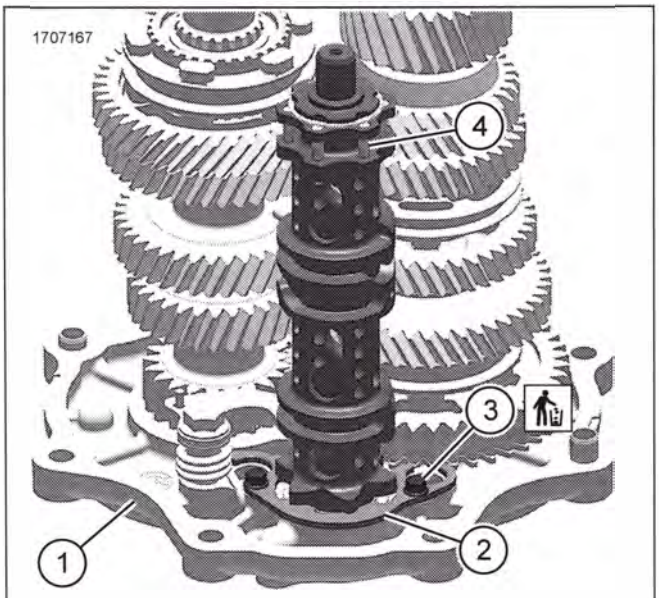
Mark parts so they can be installed in same direction as removed.

6. See Figure 5-50. Remove mainshaft and countershaft locknuts.
   a. Lock two gears in place using dog rings.
   b. Temporarily put transmission assembly into transmission case.
   c. Remove locknuts.
   d. Remove transmission assembly from transmission case.



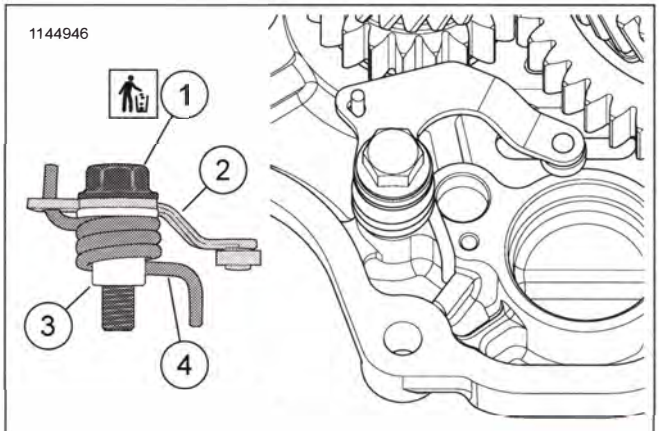
1. Mainshaft
2. Countershaft
3. Mainshaft first gear
4. Mainshaft second gear
5. Mainshaft third gear
6. Mainshaft fourth gear
7. Mainshaft fifth gear
8. Countershaft first gear
9. Countershaft second gear
10. Countershaft third gear
11. Countershaft fourth gear
12. Countershaft fifth gear
13. Countershaft sixth gear
14. Screw extractor

Figure 5-47. Gear Set



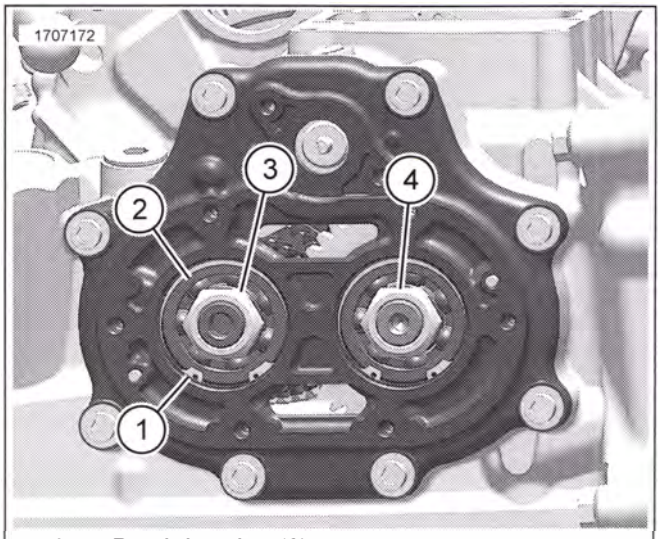
1. Bearing housing
2. Lock plate
3. Lock plate screw (2)
4. Shift cam

Figure 5-48. Shift Drum



1. Detent screw
2. Detent arm
3. Sleeve
4. Detent spring

Figure 5-49. Detent Assembly



1. **Retaining ring (2)**
2. **Bearing (2)**
3. **Mainshaft locknut**
4. **Countershaft locknut**

Figure 5-50. Bearing Housing Locknuts

Remove Mainshaft

NOTE

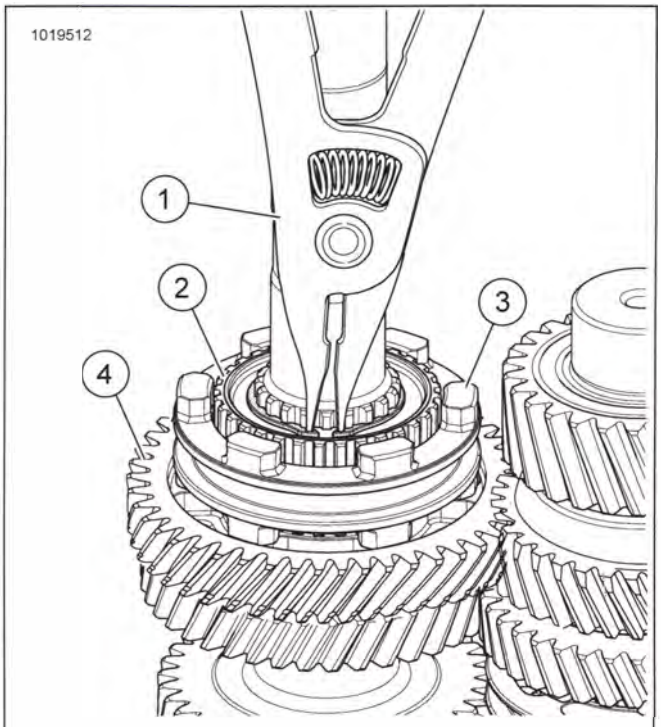
- *Mainshaft fourth gear, third gear, second gear and first gear are integral parts of the shaft. Damage to any gear requires mainshaft replacement.*
- *Always replace bearing housing bearings.*

1. See Figure 5-51. Remove retaining ring.
2. Remove dog ring (3), guiding hub (2), mainshaft fifth gear (4) and bearing.

NOTE

Do not press directly on end of mainshaft. Use a spacer between end of mainshaft and press ram.

3. Press mainshaft out of bearing housing.
4. Replace bearing housing bearing. See procedure later in this section.



1. **Retaining ring pliers**
2. **Guiding hub**
3. **Dog ring**
4. **Mainshaft fifth gear**

Figure 5-51. Mainshaft Fifth Gear

Remove Countershaft

NOTE

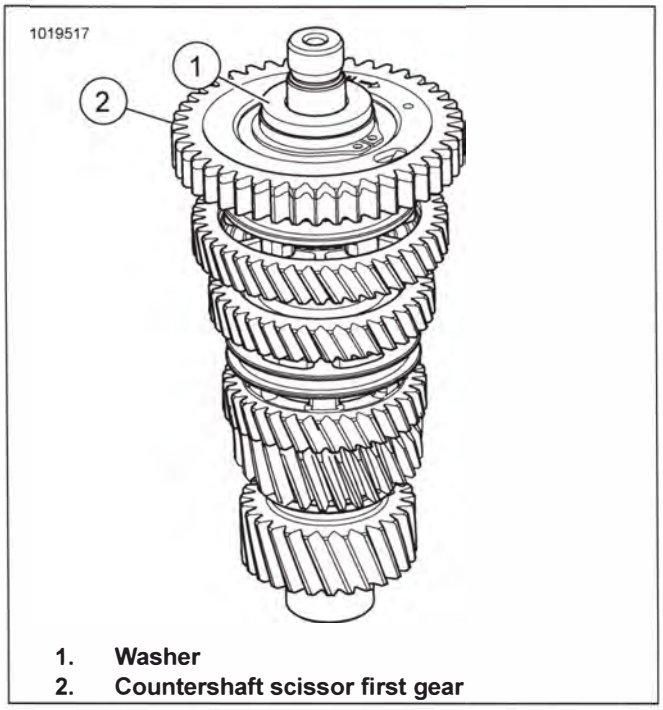
Do not press directly on end of countershaft. Place a spacer between end of countershaft and press ram.

1. If mainshaft is not removed, hold countershaft third and fourth gear shift dog up while removing countershaft.
2. Press countershaft out of bearing housing bearing.
3. See Figure 5-52. Remove washer (1), countershaft first gear (2) and bearing.
4. Remove countershaft second, third and forth gears.
   a. See Figure 5-53. Remove dog ring (5).
   b. Remove lock ring (1).
   c. Remove securing segments (2).
   d. Remove guiding hub (3), countershaft second gear (4) and bearing.
   e. See Figure 5-54 and Figure 5-55. Repeat steps with third and fourth gears.

NOTE

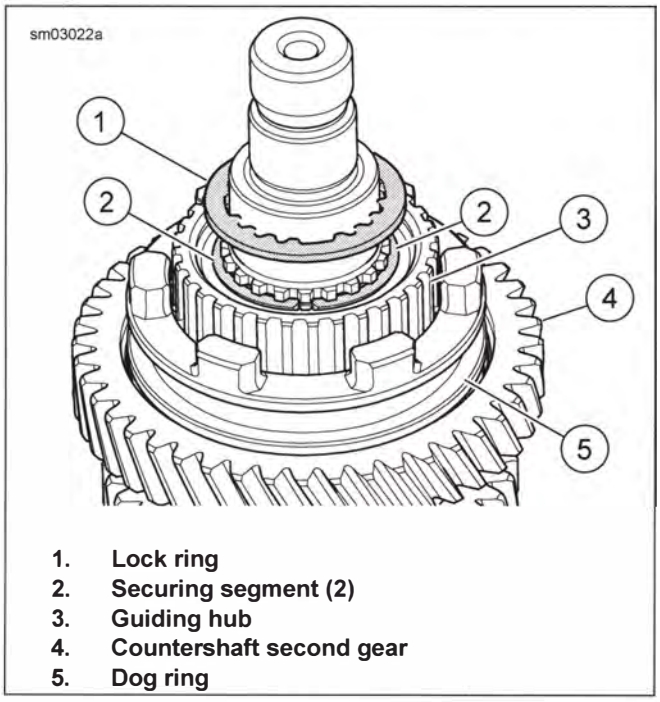
The countershaft fifth gear and sixth gear are integral parts of the shaft. Damage to either gear requires countershaft replacement.

5. Replace bearing housing bearing. See procedure later in this section.



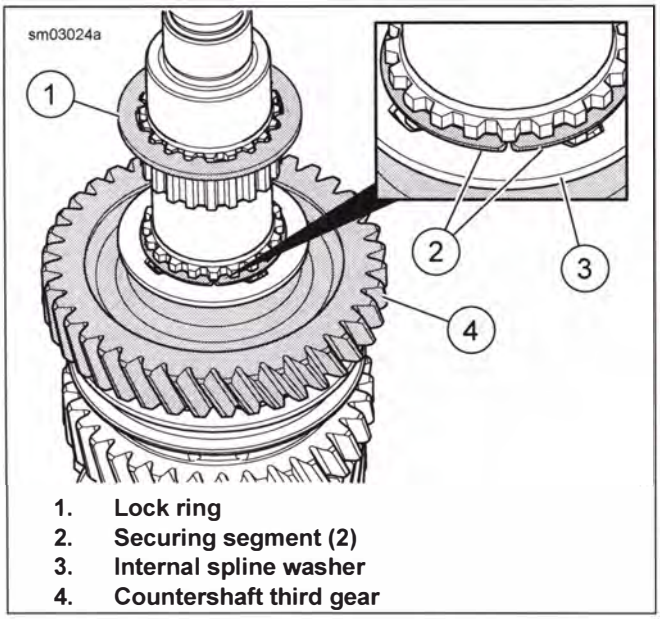
1. Washer
2. Countershaft scissor first gear

Figure 5-52. Countershaft First Gear



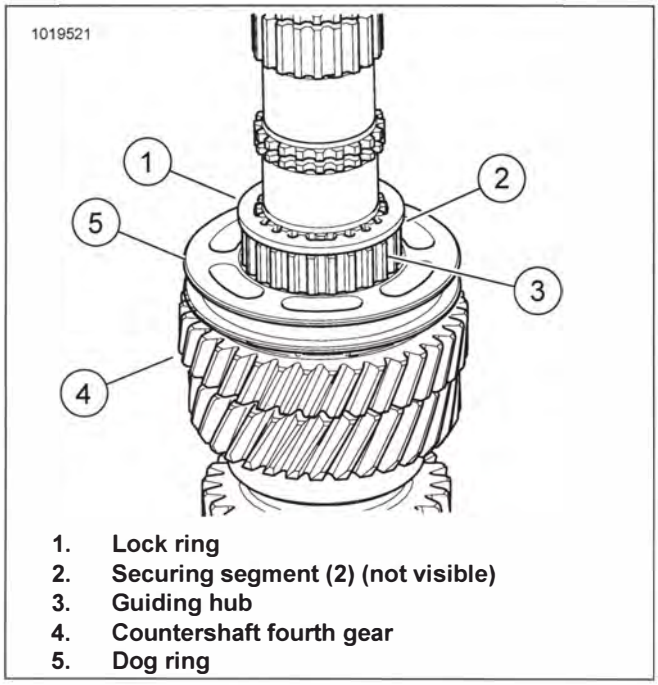
1. Lock ring
2. Securing segment (2)
3. Guiding hub
4. Countershaft second gear
5. Dog ring

Figure 5-53. Countershaft Second Gear



1. Lock ring
2. Securing segment (2)
3. Internal spline washer
4. Countershaft third gear

Figure 5-54. Countershaft Third Gear



1. Lock ring
2. Securing segment (2) (not visible)
3. Guiding hub
4. Countershaft fourth gear
5. Dog ring

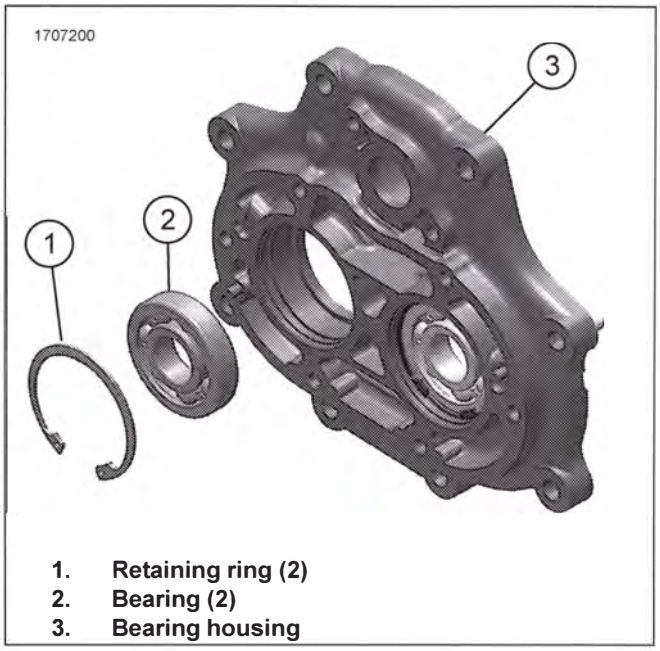
Figure 5-55. Countershaft Fourth Gear

Remove Bearing Housing Bearings

NOTE

Always replace bearing housing bearing if shaft is pressed out.

1. See Figure 5-56. Remove and discard retaining rings (1).
2. Press bearings (2) out of bearing housing (3).



1. **Retaining ring (2)**
2. **Bearing (2)**
3. **Bearing housing**

Figure 5-56. Bearing Housing Bearings

CLEAN AND INSPECT

⚠ 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 parts in a non-volatile cleaning solution. Dry parts with low-pressure, compressed air.
2. Replace worn or damaged gears.
3. Replace dog rings if dogs and/or pockets are rounded, battered or chipped.
4. Replace guiding hubs if splines are rounded, battered or chipped.
5. Replace bent or damaged shift fork shafts.
6. Replace shift fork if it is excessively worn or shows signs of overheating.
7. See Figure 5-57. Using a small square, verify that the shift forks are square. Replace shift fork if not square.
8. Replace shift drum assembly if drum or bearing are damaged.
9. Clean shift cam lock plate mounting holes in transmission bearing housing.

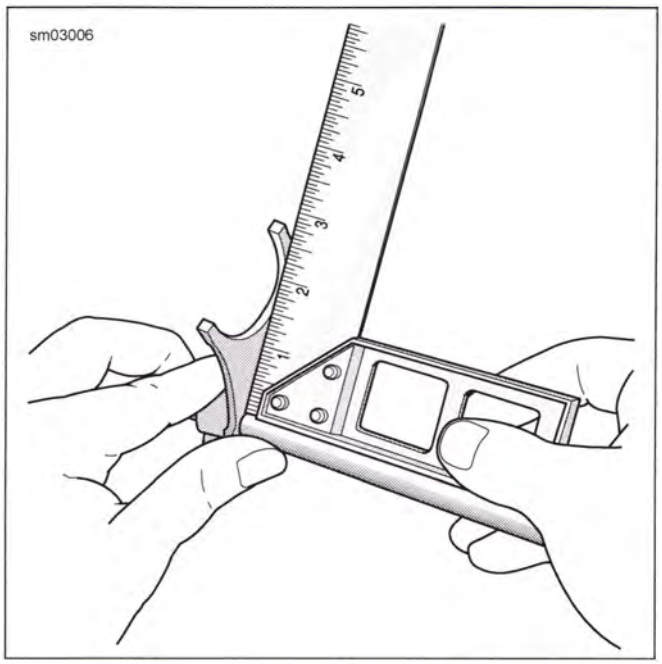


Figure 5-57. Checking Fork

ASSEMBLE

FASTENER	TORQUE VALUE	
Shift drum detent screw	120–150 **in-lbs**	13.6–17 N·m
Shift drum lock plate screws	50–70 **in-lbs**	5.6–7.9 N·m
Transmission mainshaft/countershaft locknuts	85–95 ft-lbs	115.3–128.8 N·m

Install Bearing Housing Bearings

NOTE

- *Always replace bearing housing bearing if shaft was removed.*
- *Always support bearing housing with a plate when pressing bearings.*
- *Press on bearing outer race.*

1. Install bearings.
   a. Support bearing housing at bearing bores with a flat plate.
   b. Position **new** bearing over bore with number side up.
   c. Press bearing until seated in bore.

⚠ WARNING

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

2. See Figure 5-56. Install **new** beveled retaining ring (1) with flat side against bearing (2).

Install Countershaft

1. Install fourth, third and second gears on countershaft.
   a. See Figure 5-55 . Install countershaft fourth gear (4).
   b. Lubricate needle bearings and races using SCREAMIN' EAGLE ASSEMBLY LUBE.
   c. Install **new** needle bearing.
   d. Install guiding hub (3).
   e. Install dog ring (5).
   f. Install securing segments (2) with rounded edge facing up. Verify that segments fully engage grooves in countershaft.
   g. Install lock ring (1) with waved, stepped face toward securing segments.
   h. See Figure 5-54 . Install countershaft third gear (4).

NOTE

Install second gear guiding hub with deeper counterbore facing countershaft second gear.

   i. See Figure 5-53 . Install countershaft second gear (4).

2. See Figure 5-58. Preload scissor first gear.
   a. While holding thick gear, rotate thin gear until holes align.
   b. Install HD-52235 (SCISSOR FIRST GEAR TOOL).

3. See Figure 5-52 . Install **new** needle bearing, countershaft first gear (2) and washer (1).

NOTE

- *If installing countershaft with mainshaft installed, raise and hold countershaft third and fourth gear shift dog up while pressing bearing housing bearing on to countershaft.*
- *Failure to press on bearing inner race damages bearing.*

4. See Figure 5-60. If mainshaft is not removed, raise and hold countershaft third and fourth gear shift dog while installing countershaft.
5. See Figure 5-59. Install countershaft to bearing housing.
   a. Support countershaft sixth gear in press.
   b. Using a suitable sleeve, press on bearing inner race until bearing contacts countershaft first gear washer.

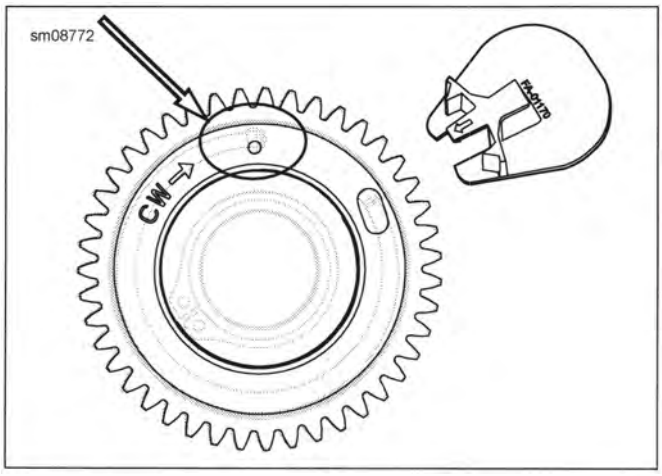


Figure 5-58. Preload Scissor First Gear

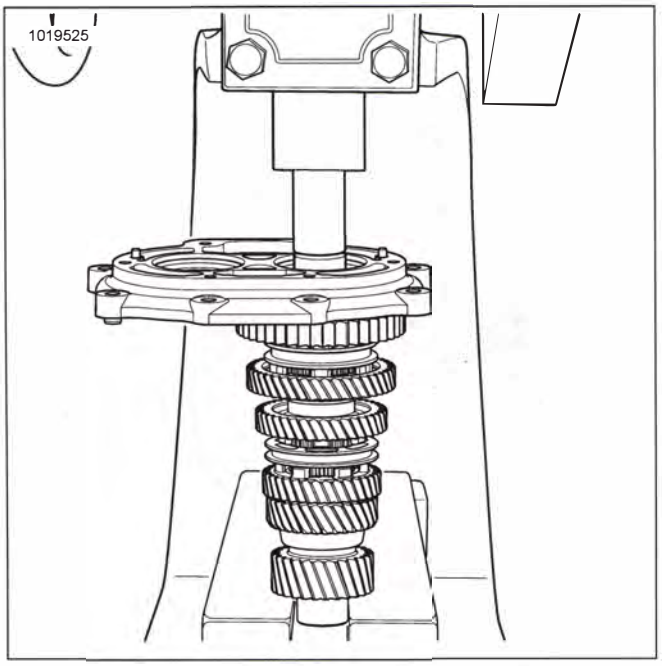


Figure 5-59. Installing Countershaft

Install Mainshaft

NOTE

Failure to press on bearing inner race damages bearing.

1. Support mainshaft fourth gear in press.
2. See Figure 5-60. Raise and hold dog ring engaged with countershaft third gear during press procedure.
3. Using a suitable sleeve, press on bearing inner race until bearing contacts mainshaft first gear.
4. See Figure 5-51 . With bearing housing on end (shafts pointing up), install **new** bearing and mainshaft fifth gear (4).
5. With guiding hub counterbore facing mainshaft fifth gear, install guiding hub (2) and dog ring (3).
6. Install **new** retaining ring (1).
7. Remove holding tool from scissor first gear.
8. Install **new** mainshaft and countershaft locknuts.
   a. Using dog rings, lock two gears in place.
   b. Temporarily install transmission assembly in transmission case.
   c. Install locknuts. Tighten.
      Torque: 85–95 ft-lbs (115.3–128.8 N·m) *Transmission mainshaft/countershaft locknuts*
   d. Remove transmission assembly from transmission case.

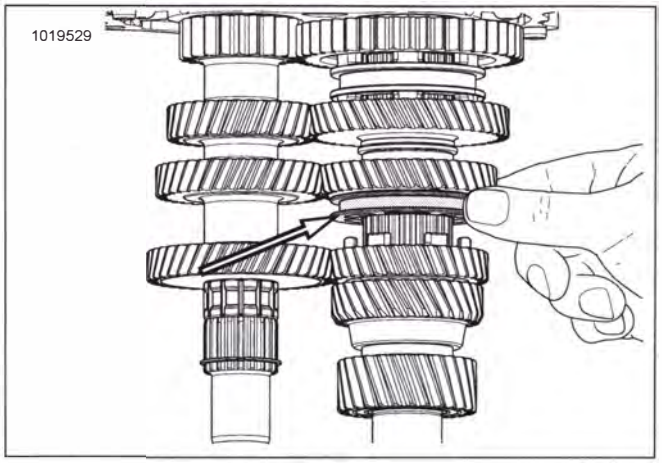


Figure 5-60. Raise and Hold Dog Ring

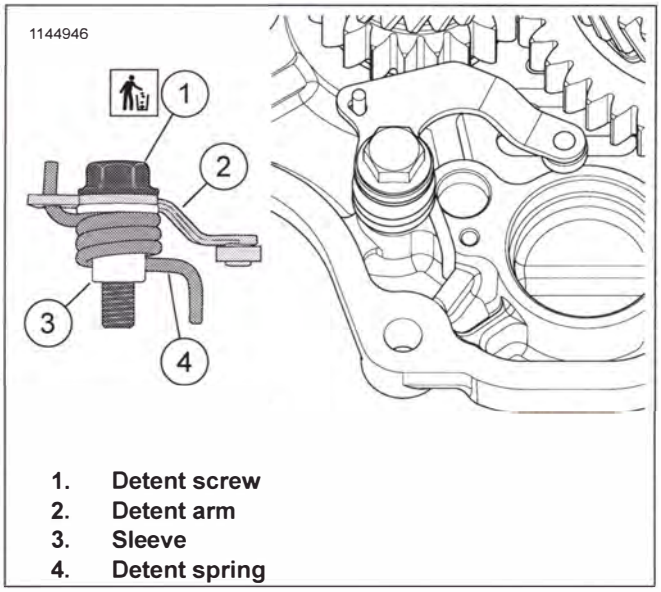
Install Shifter Cam/Shifter Forks

1. Set bearing housing on bench with shafts pointing up.
2. Install detent arm assembly, if removed.
   a. See Figure 5-61. Clean detent screw mounting hole in transmission bearing housing.
   b. Assemble **new** detent screw (1), detent arm (2), sleeve (3) and detent spring (4).
   c. Align spring and detent arm as shown.
   d. Install detent assembly in bearing housing with screw (1).
   e. Tighten.
      Torque: 120–150 **in-lbs** (13.6–17 N·m) *Shift drum detent screw*
3. See Figure 5-62. Hold detent arm back and install shift cam assembly (4).
4. Install lock plate (2) and **new** lock plate screws (3). Tighten.
   Torque: 50–70 **in-lbs** (5.6–7.9 N·m) *Shift drum lock plate screws*
5. Remove any burrs created on shift shafts (1, 3) during removal.

NOTE

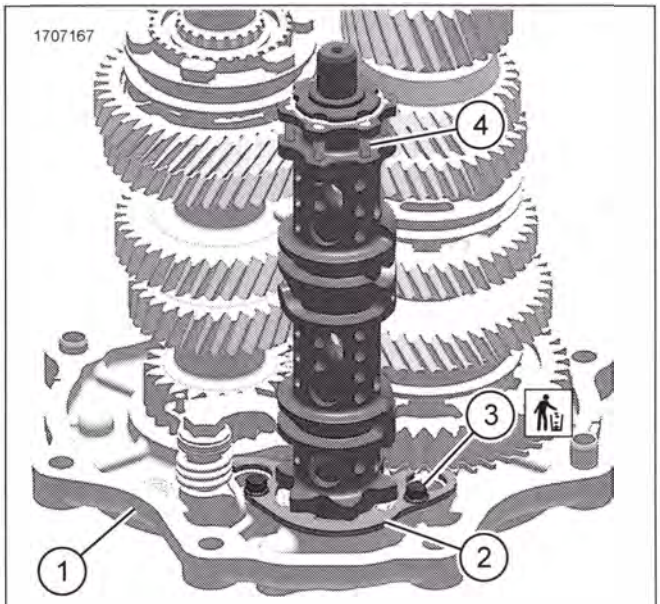
See Figure 5-63. Shifter forks are unique and identified as shown.

6. See Figure 5-64. Install long shift shaft (1).
   a. Insert shifter fork (2) into dog ring between mainshaft fifth and sixth gear.
   b. Slide shift shaft through shifter fork.
   c. Install shaft in bearing housing.
7. Install short shift shaft (4).
   a. Insert shifter fork (6) into dog ring between countershaft third and fourth gear.
   b. Insert shifter fork (9) into dog ring between countershaft first and second gear.
   c. Slide shift shaft through shifter forks.
   d. Install shaft in bearing housing.



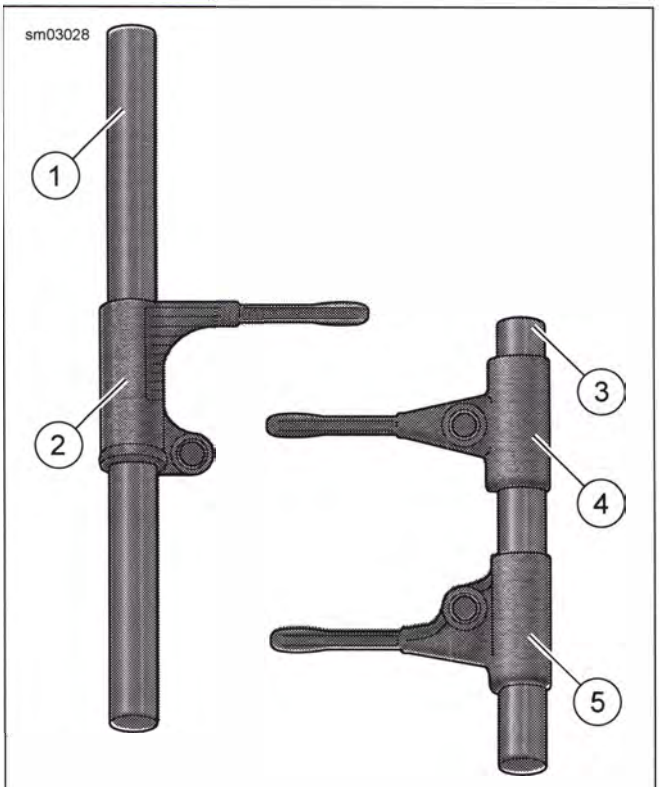
1. **Detent screw**
2. **Detent arm**
3. **Sleeve**
4. **Detent spring**

Figure 5-61. Detent Assembly



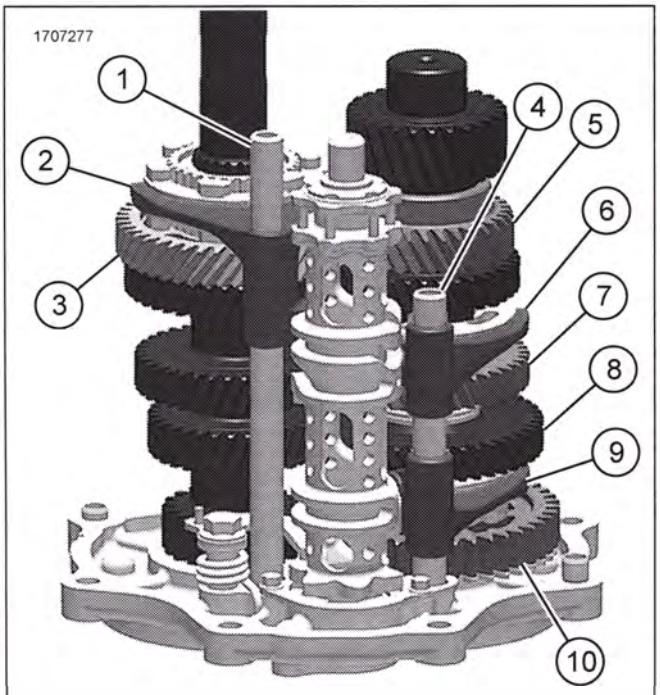
1. **Bearing housing**
2. **Lock plate**
3. **Lock plate screw (2)**
4. **Shift cam**

Figure 5-62. Shift Drum



1. Long shift shaft
2. Fifth and sixth gear shifter fork
3. Short shift shaft
4. Third and fourth gear shifter fork
5. First and second gear shifter fork

Figure 5-63. Shifter Forks and Shafts



1. Long shift shaft
2. Fifth and sixth gear shifter fork
3. Mainshaft fifth gear
4. Short shift shaft
5. Countershaft fifth gear
6. Third and fourth gear shifter fork
7. Third gear
8. Second gear
9. First and second gear shifter fork
10. First gear

Figure 5-64. Transmission Gears and Shifter Forks

COMPLETE

1. Install transmission mainshaft bearing inner race. See PRIMARY CHAINCASE HOUSING > MAINSHAFT BEARING INNER RACE (Page 5-28).

2. Install clutch release push rod. See DRIVE AND TRANSMISSION > CLUTCH RELEASE PUSH ROD COMPONENTS (Page 5-13).

3. Install clutch release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).

4. Install gear position sensor and cover. See ELECTRICAL > GEAR POSITION SENSOR (Page 8-70).

5. Fill transmission oil. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).

6. Fill engine oil. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).

7. Install exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

8. Install primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).

9. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).

10. Install starter. See ELECTRICAL > STARTER (Page 8-9).

11. Install primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).

12. Fill primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

13. Install heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).

14. Install rider left footboard and bracket, if removed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).

15. Adjust drive belt deflection. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).

16. Verify rear fork pivot shaft torque. See CHASSIS > REAR FORK (Page 3-72).

17. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove rider footboard and bracket, if needed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Remove heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
4. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
6. Remove starter. See ELECTRICAL > STARTER (Page 8-9).
7. Remove primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
8. Remove primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
9. Remove bearing inner race from transmission mainshaft. See PRIMARY CHAINCASE HOUSING > MAINSHAFT BEARING INNER RACE (Page 5-28).
10. Remove transmission sprocket. See DRIVE AND TRANSMISSION > TRANSMISSION SPROCKET (Page 5-31).
11. Remove transmission bearing housing and gear assembly. See DRIVE AND TRANSMISSION > TRANSMISSION (Page 5-34).

REMOVE

PART NUMBER	TOOL NAME
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET

NOTICE

Failure to use Main Drive Gear Remover and Installer can cause premature failure of bearing and related parts. (00540b)

NOTE

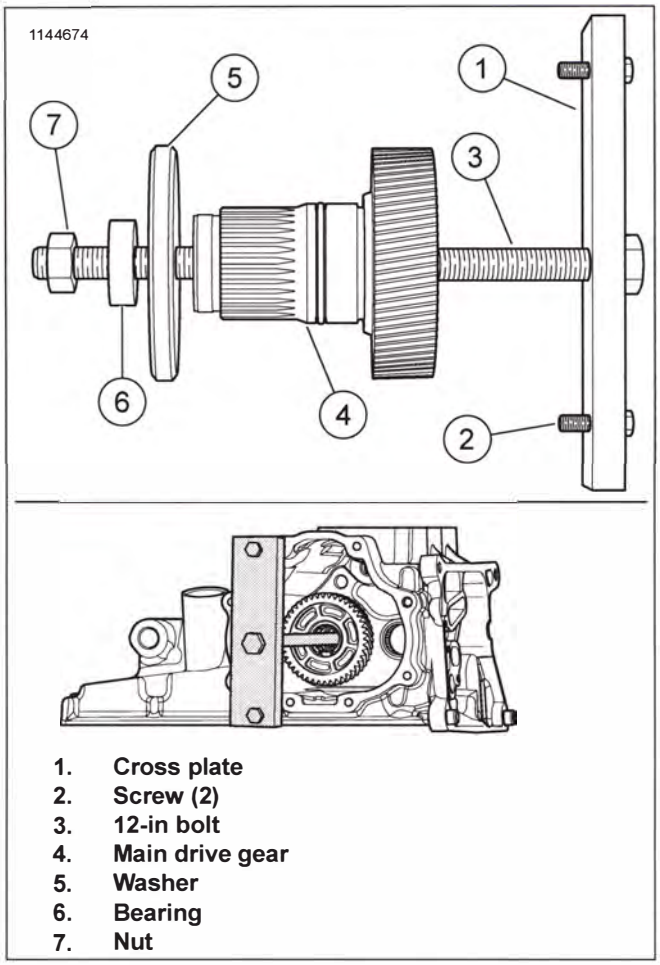
Main drive gear and bearing can be removed with transmission case in frame after removing bearing housing.

1. See Figure 5-65. Remove main drive gear.

   Special Tool: MAIN DRIVE GEAR REMOVER AND INSTALLER SET (HD-35316-D)

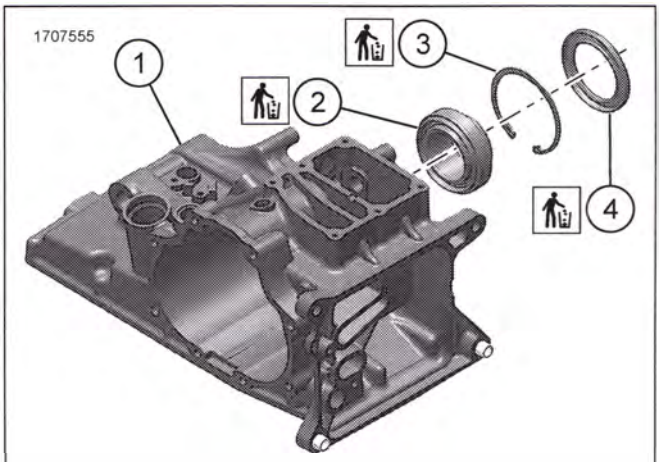
2. See Figure 5-66. Remove and discard main drive gear seal (4).
3. Remove and discard retaining ring (3).
4. Remove and discard main drive gear bearing (2).

   Special Tool: MAIN DRIVE GEAR REMOVER AND INSTALLER SET (HD-35316-D)



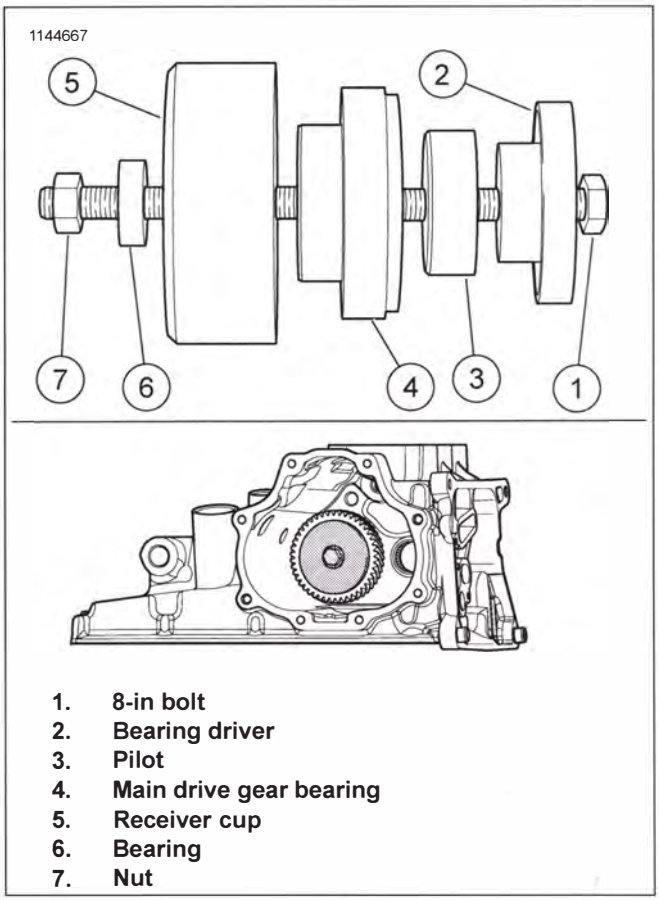
1. **Cross plate**
2. **Screw (2)**
3. **12-in bolt**
4. **Main drive gear**
5. **Washer**
6. **Bearing**
7. **Nut**

Figure 5-65. Removing Main Drive Gear



1. **Transmission case**
2. **Main drive bearing**
3. **Retaining ring**
4. **Main drive gear seal**

Figure 5-66. Main Drive Bearing



1. **8-in bolt**
2. **Bearing driver**
3. **Pilot**
4. **Main drive gear bearing**
5. **Receiver cup**
6. **Bearing**
7. **Nut**

Figure 5-67. Removing Main Drive Gear Bearing

CLEAN AND INSPECT

NOTE

Never wash transmission case and needle bearings with solvent unless replacing needle bearings. Normal cleaning methods wash dirt or other contaminants into bearing case (behind the needles) and leads to bearing failure.

1. Clean all parts in solvent except transmission case and needle bearings. Dry parts with low-pressure, compressed air.
2. See Figure 5-72. Inspect main drive gear (3) for pitting and wear.
3. Inspect needle bearings (2) inside main drive gear.
4. Inspect mainshaft race. Replace needle bearings if mainshaft race is damaged.

INSTALL

PART NUMBER	TOOL NAME
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET
HD-47856	MAIN DRIVE GEAR SEAL INSTALLER KIT

NOTICE

Improper tightening of sprocket nut can cause drive component damage. (00541b)

1. See Figure 5-66 and Figure 5-68. Install main drive gear bearing.

   Special Tool: MAIN DRIVE GEAR REMOVER AND INSTALLER SET (HD-35316-D)

2. See Figure 5-69. Install **new** O-ring (4) onto main drive gear (3). Lubricate O-ring with clean engine oil.

3. Install main drive gear.

   Special Tool: MAIN DRIVE GEAR REMOVER AND INSTALLER SET (HD-35316-D)

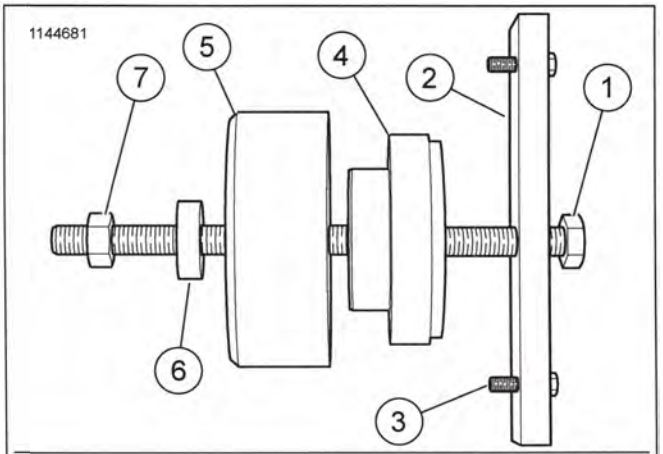
4. Install **new** retaining ring.

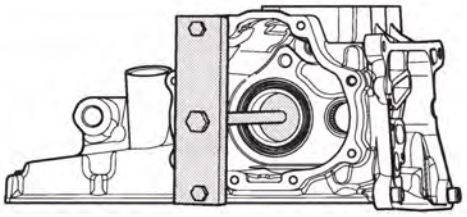
   NOTE

   See Figure 5-70. Install retaining ring with flat side facing bearing and opening within range shown.

5. See Figure 5-71. Install **new** main drive gear large seal.

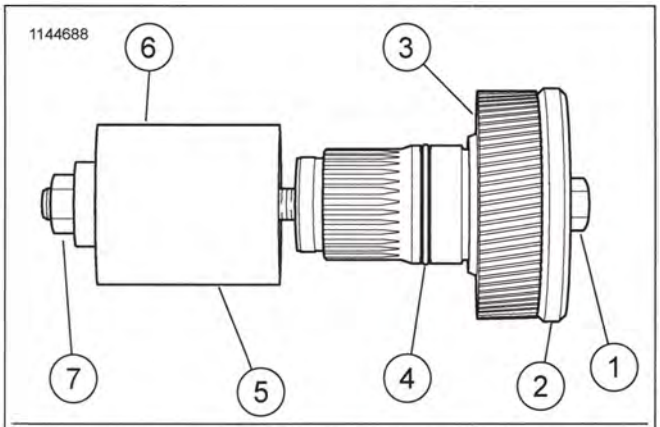
   Special Tool: MAIN DRIVE GEAR SEAL INSTALLER KIT (HD-47856)

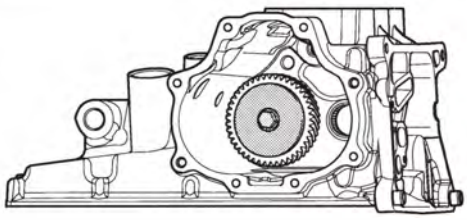




1. 12-in bolt
2. Cross plate
3. Screw (2)
4. Main drive gear bearing
5. Bearing driver
6. Bearing
7. Nut

Figure 5-68. Installing Main Drive Gear Bearing (Typical)





1. 8-in bolt
2. Washer
3. Main drive gear
4. O-ring
5. Installer cup
6. Bearing
7. Nut

Figure 5-69. Installing Main Drive Gear (Typical)

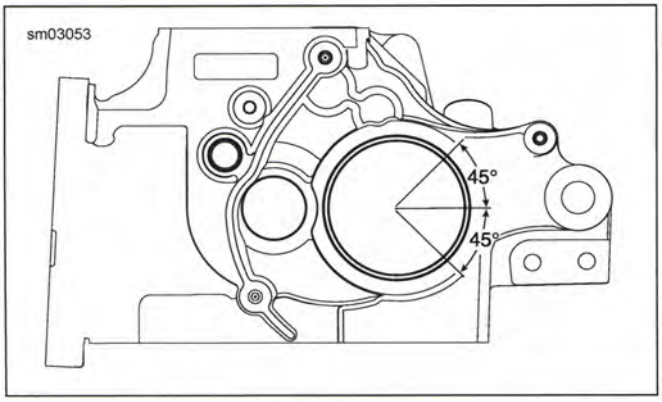
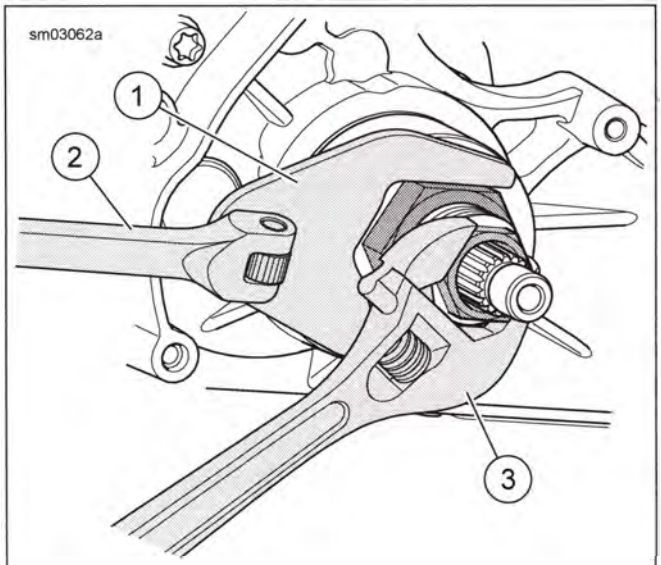


Figure 5-70. Retaining Ring Opening



1. Crow's foot wrench
2. Breaker bar
3. Adjustable wrench

Figure 5-71. Press Seal into Crankcase

REPLACE NEEDLE BEARINGS

PART NUMBER	TOOL NAME
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL

Remove

1. See Figure 5-72. Remove and discard mainshaft seal (6).
2. Remove and discard retaining rings (1).
3. Remove needle bearings (2).
4. Remove spacer (5) from main drive gear (3).
5. Remove and discard O-ring (4).

Install

1. See Figure 5-73. Press in outer needle bearing near spline end of main drive gear until tool contacts spline.

   Special Tool: MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (HD-47932)

2. See Figure 5-74. Install mainshaft seal with garter spring side down.

NOTE

Mainshaft seal can also be installed after main drive gear is installed. See MAIN DRIVE GEAR AND BEARING > REPLACE MAINSHAFT SEAL (Page 5-47).

   a. Use the 0.090-in step of main drive gear bearing and seal tool.

      Special Tool: MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (HD-47932)

   b. Press until tool contacts gear.

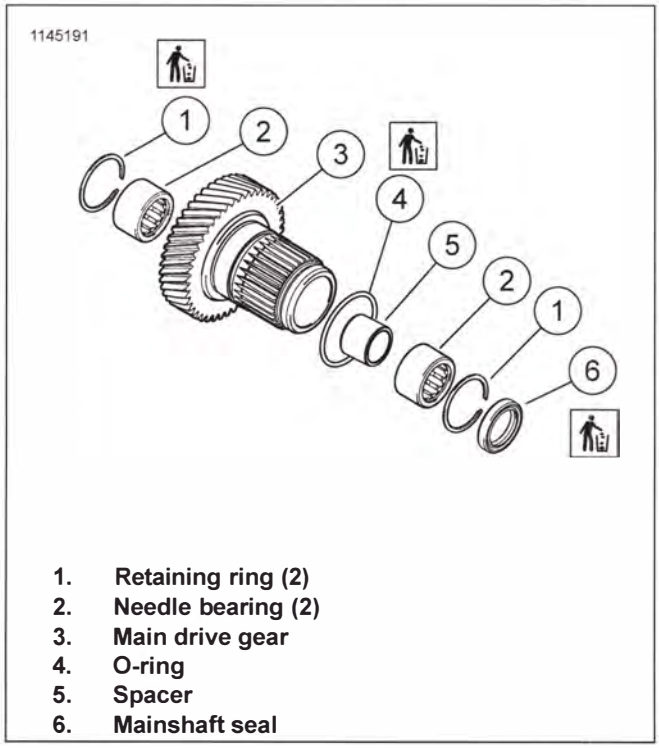
3. See Figure 5-72. Turn over main drive gear. Install spacer (5).

4. See Figure 5-75. Press inner needle bearing from gear end until tool contacts gear.

   Special Tool: MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (HD-47932)

5. See Figure 5-72. Install **new** retaining rings (1).

6. Install **new** O-ring (4).



1. **Retaining ring (2)**
2. **Needle bearing (2)**
3. **Main drive gear**
4. **O-ring**
5. **Spacer**
6. **Mainshaft seal**

Figure 5-72. Main Drive Gear Assembly

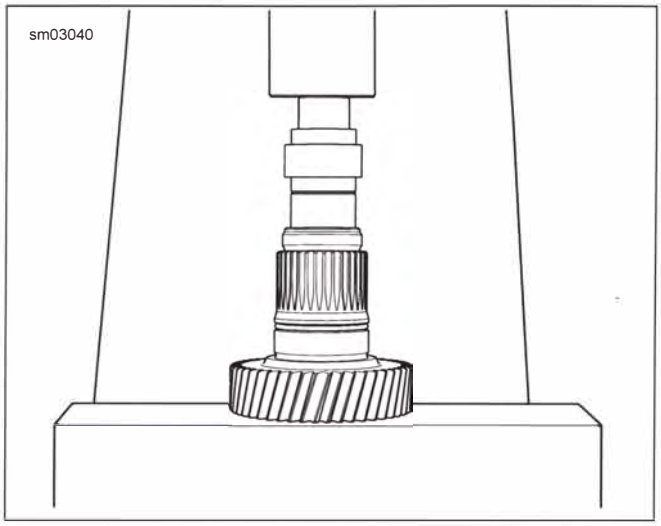


Figure 5-73. Installing Outer Needle Bearing in Main Drive Gear

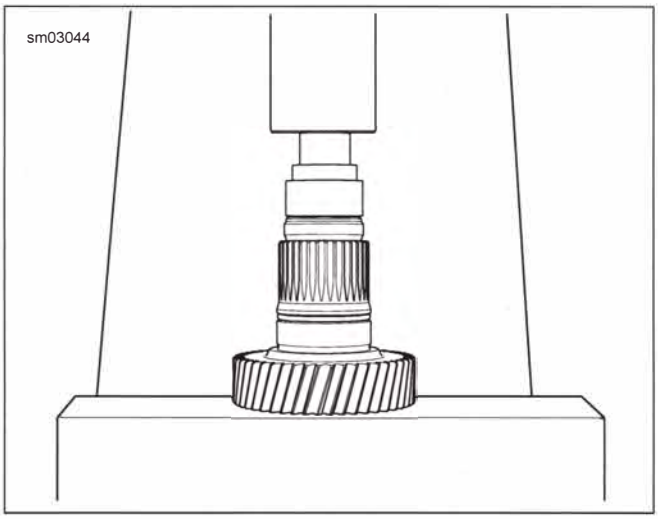


Figure 5-74. Pressing in Seal

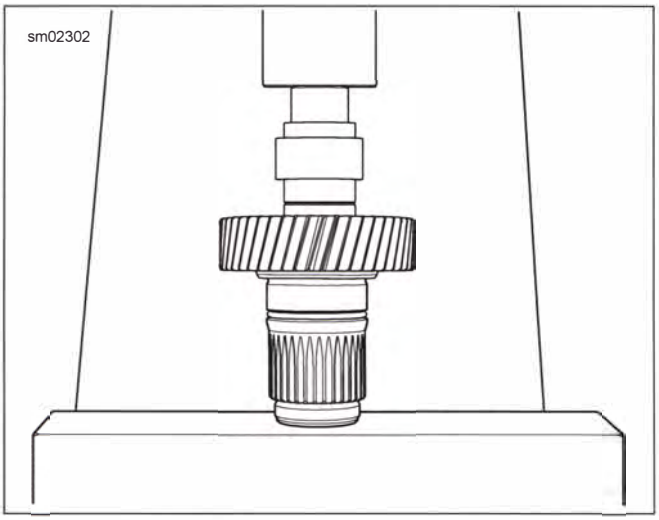


Figure 5-75. Installing Inner Needle Bearing in Main Drive Gear

REPLACE MAINSHAFT SEAL

PART NUMBER	TOOL NAME
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER

Remove

See Figure 5-66. Replace mainshaft seal while main drive gear is installed.

1. Remove mainshaft seal (4).

2. Verify that bore is clean and smooth.

Install

1. See Figure 5-77 Place seal protector sleeve (1) from gear seal installer over end of mainshaft.

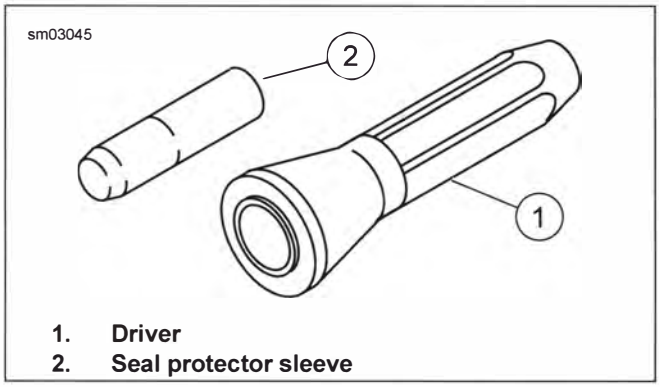
   Special Tool: MAIN DRIVE GEAR SEAL INSTALLER (HD-47933)

2. Lightly lubricate protector sleeve and seal ID with clean transmission oil.

3. Slide seal (2) on seal protector sleeve with garter spring facing bearing.

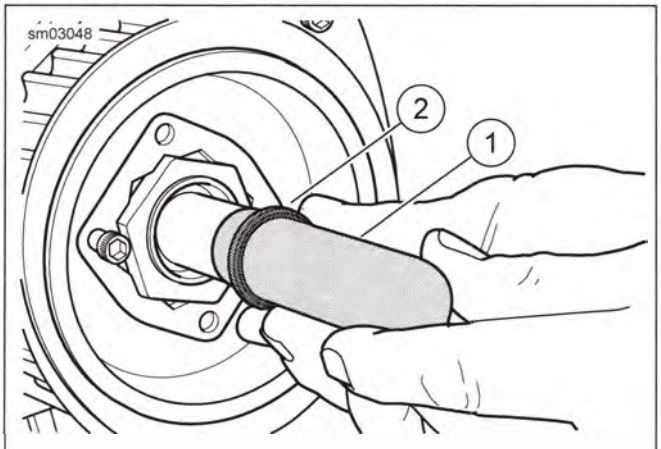
4. See Figure 5-78. Hand press seal onto place until seal driver contacts end of main drive gear. Lightly tap with a rubber mallet if necessary.

   Special Tool: MAIN DRIVE GEAR SEAL INSTALLER (HD-47933)



1. **Driver**
2. **Seal protector sleeve**

Figure 5-76. Main Drive Gear Seal Installer



1. **Seal protector sleeve**
2. **Seal**

Figure 5-77. Seal Protector Sleeve

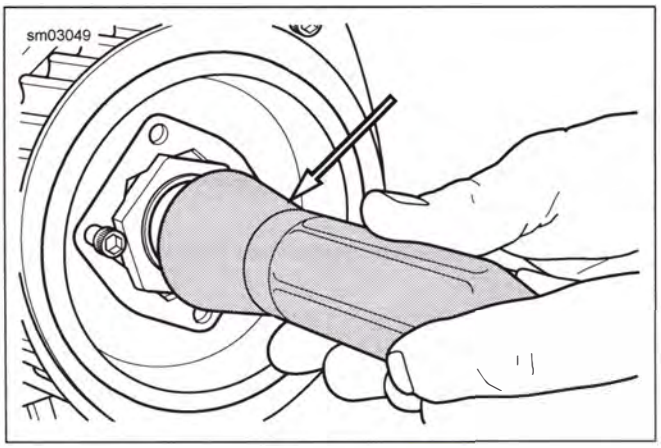


Figure 5-78. Seal Driver

COMPLETE

1. Install bearing housing and gear assembly. See DRIVE AND TRANSMISSION > TRANSMISSION (Page 5-34).
2. Install transmission sprocket. See DRIVE AND TRANSMISSION > TRANSMISSION SPROCKET (Page 5-31).
3. Install bearing inner race to transmission mainshaft. See PRIMARY CHAINCASE HOUSING > MAINSHAFT BEARING INNER RACE (Page 5-28).
4. Install primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
5. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
6. Install starter. See ELECTRICAL > STARTER (Page 8-9).
7. Install primary chaincase cover and **new** gasket. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
8. Fill primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
9. Install heel shift lever. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
10. Install rider left footboard and bracket, if removed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
11. Adjust drive belt deflection. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
12. Verify rear fork pivot shaft torque. See CHASSIS > REAR FORK (Page 3-72).
13. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

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

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Drain engine oil. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).
3. Drain transmission oil. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).
4. Drain primary chaincase oil. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Disconnect breather hose. See ENGINE > BREATHER (Page 4-20).
6. Remove exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).
7. Remove gear position cover and sensor. See ELECTRICAL > GEAR POSITION SENSOR (Page 8-70).
8. Remove clutch release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).
9. Remove rider footboard and bracket, if needed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
10. Remove passenger footrest. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
11. Remove shift levers and shift lever shaft. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
12. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
13. Remove starter. See ELECTRICAL > STARTER (Page 8-9).
14. Remove primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
15. Remove primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
16. Loosen drive belt. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).
17. Remove transmission assembly. See DRIVE AND TRANSMISSION > TRANSMISSION (Page 5-34).
18. Remove oil pan. See ENGINE > OIL PAN (Page 4-70).
19. Remove coolant hose guide. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).

NOTICE

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

20. Position jack across lower frame to support rear of motorcycle. Slide wooden blocks beneath crankcase to support weight of engine and transmission assembly.
21. Remove rear fork. See CHASSIS > REAR FORK (Page 3-72).

REMOVE

1. See Figure 5-80. Remove battery negative cable.
   a. Remove nut (1).
   b. Remove cable (2).
2. Move aside harness that terminates at O2 sensor and starter solenoid.
3. See Figure 5-81. In a cross-wise pattern, remove bolts (1,5) securing transmission to engine.

NOTE

See Figure 5-79. Do not use a hammer to remove transmission. If transmission sticks or binds on ring dowels, gently pry away from crankcase using pry point.

4. Move transmission rearward until two ring dowels in lower flange are free of crankcase.
5. Remove transmission case from left side of motorcycle.

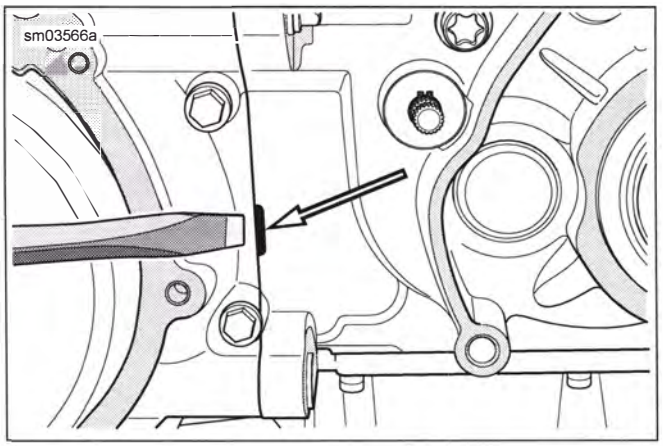


Figure 5-79. Transmission Case Pry Point

INSTALL

FASTENER	TORQUE VALUE	
Battery ground cable to transmission, nut	72–96 **in-lbs**	8.1–10.8 N·m
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 N·m
Transmission mounting bolts, final torque	34–39 ft-lbs	46.1–52.9 N·m

NOTE

*A **new** transmission case has shifter shaft sleeve and seal, centering screw, countershaft needle bearing and main drive gear bearing and seal installed.*

1. Wipe all engine oil from pockets in crankcase flange.

2. See Figure 5-81. Install **new** engine-to-transmission gasket (3).

3. Verify that alignment dowels (4) are seated. Place transmission case (2) into position.

4. Secure transmission.

   a. Install shorter bolts (1) on top, longer bolts (5) on bottom. Hand-tighten bolts.

   b. See Figure 5-82. Tighten bolts in sequence.

      Torque: 15 ft-lbs (20.3 N·m) *Transmission mounting bolts, 1st torque*

   c. Tighten to final torque in same sequence.

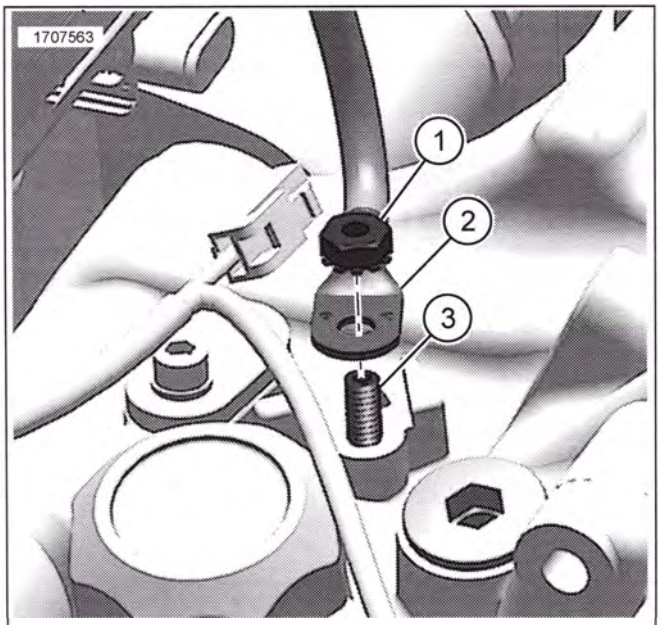
      Torque: 34–39 ft-lbs (46.1–52.9 N·m) *Transmission mounting bolts, final torque*

5. See Figure 5-80. Install negative battery cable.

   a. Install negative cable (2) on ground post (3).

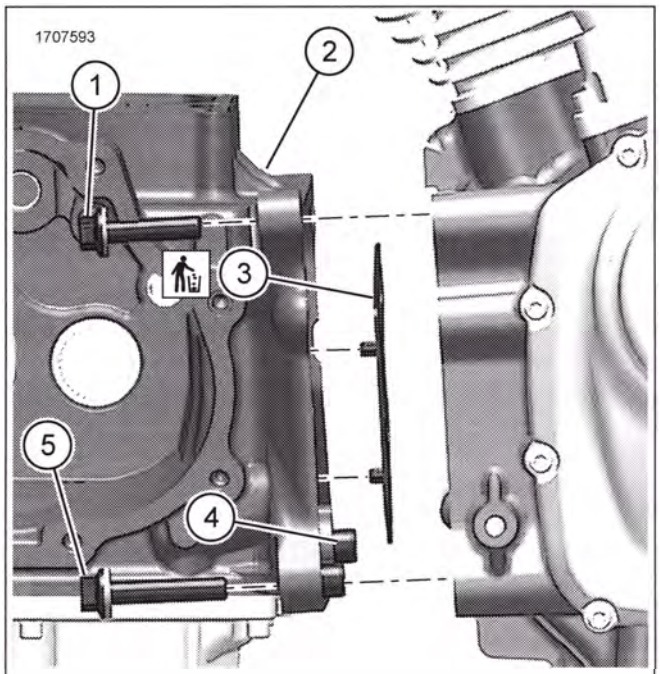
   b. Install nut (1). Tighten

      Torque: 72–96 **in-lbs** (8.1–10.8 N·m) *Battery ground cable to transmission, nut*



1. **Nut**
2. **Negative cable**
3. **Ground post**

Figure 5-80. Negative Cable to Transmission Ground Post



1. **Short bolts (2)**
2. **Transmission**
3. **Gasket**
4. **Alignment dowels (2)**
5. **Long bolts (2)**

Figure 5-81. Engine to Transmission Bolts

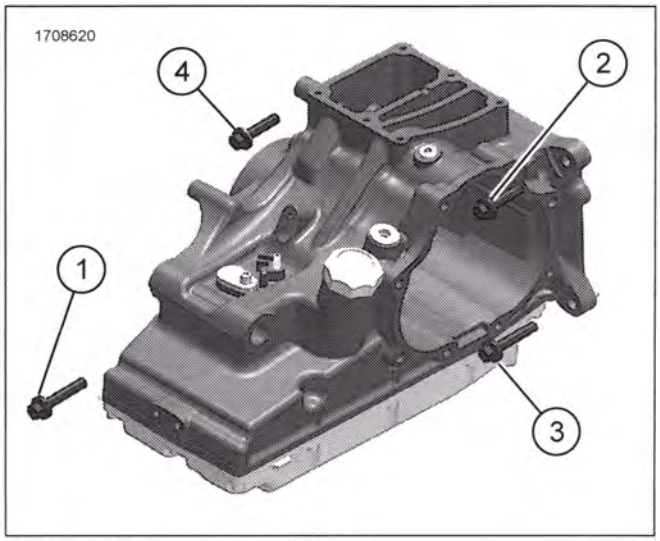


Figure 5-82. Transmission Housing to Crankcase Tightening Sequence

DISASSEMBLE

Remove Shifter Pawl Lever

1. See Figure 5-84 . Remove shifter rod lever.
   a. Mark splines on shifter pawl lever assembly (1) and shift rod lever (9) to help with assembly.
   b. Remove screw (8).
   c. Remove shifter rod lever from shifter pawl lever assembly.
2. Remove shifter pawl assembly.
   a. Remove retaining ring (7), washer (6) and seal (5).
   b. Discard retaining ring and seal.
   c. Remove shifter pawl lever assembly (1).
3. Inspect sleeve (3) in transmission case.

Remove Transmission Plug

1. See Figure 5-83. Remove transmission plug.
   a. Remove screw (1).
   b. Remove plug (2).

Remove Counter Shaft Bearing

1. Remove counter shaft bearing.
   a. Remove bearing (3).
   b. Dispose of bearing.

CLEAN AND INSPECT

⚠ 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

Never wash transmission case and needle bearings with solvent. Normal cleaning methods wash dirt or other contaminants into bearing case (behind the needles) leading to bearing failure.

1. Clean all parts in solvent except case and main drive gear needle bearings. Dry parts with low-pressure, compressed air.
2. See Figure 5-84. Inspect shifter pawl lever assembly (1) for wear. Replace assembly if pawl ends are damaged. Replace centering spring (2) if elongated.
3. Inspect shifter shaft lever spring (4). Replace if spring fails to hold pawl on cam pins.
4. Thoroughly clean oil pan.
5. Inspect breather cover vent hose for damage. Verify that hose and fitting are unobstructed.

ASSEMBLE

PART NUMBER	TOOL NAME
HD-51337	SHIFTER SHAFT SEAL INSTALLATION TOOL

FASTENER	TORQUE VALUE	
Shifter pawl centering screw	18–23 ft-lbs	24.4–31.2 N·m
Shifter rod lever pinch screw	18–22 ft-lbs	24.4–29.8 N·m
Transmission, top plug, screw	100–120 **in-lbs**	11.3–13.6 N·m

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

Install Transmission plug

1. See Figure 5-83. Install transmission plug.
   a. Install transmission plug.
   b. Install screw (1). Tighten.
      Torque: 100–120 **in-lbs** (11.3–13.6 N·m) *Transmission, top plug, screw*

Install Countershaft Needle Bearing

1. See Figure 5-83. Install **new** bearing.
   a. From outside of transmission case, place Counter shaft needle bearing (3) on bearing bore.
   b. Install bearing flush or to a maximum depth of 0.030 in (0.76 mm) with outside surface of case.

2. Lubricate bearing.

   Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

Install Shifter Pawl Lever

1. See Figure 5-84. Verify that sleeve (3) is in transmission case bore.

2. Install screw (10) into side of transmission case. Tighten.

   Torque: 18–23 ft-lbs (24.4–31.2 N·m) *Shifter pawl centering screw*

3. See Figure 5-85. Assemble shifter arm.

   a. Slide centering spring (3) over shaft of shifter pawl lever (2).

   b. Align opening on spring with tab on lever.

   c. Place lever spring (4) on shifter pawl lever. Flex spring only enough to assemble.

4. See Figure 5-86. Insert shifter arm assembly into transmission case.

5. See Figure 5-87. Verify that pin of screw sits inside lever spring.

6. Install **new** seal with garter spring facing transmission. Drive seal until tool bottoms on transmission case.

   Special Tool: SHIFTER SHAFT SEAL INSTALLATION TOOL (HD-51337)

7. See Figure 5-86. Install washer (1) and **new** retaining ring (2).

NOTE

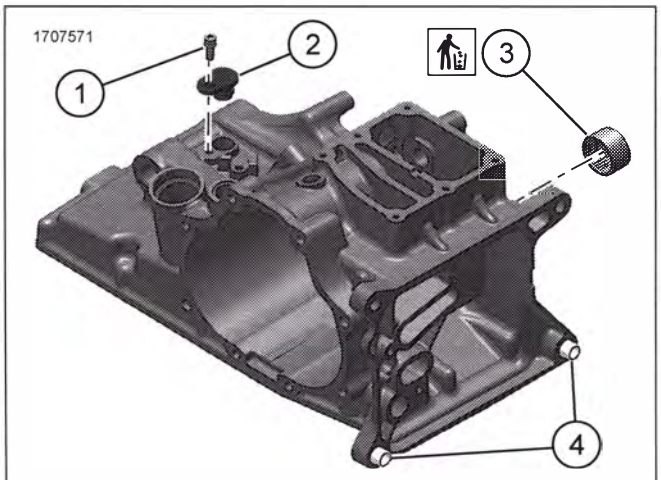
Install shifter rod lever one spline from vertical toward front of vehicle.

8. See Figure 5-84 . Install shifter rod lever (9).

   a. Install pinch screw (8).

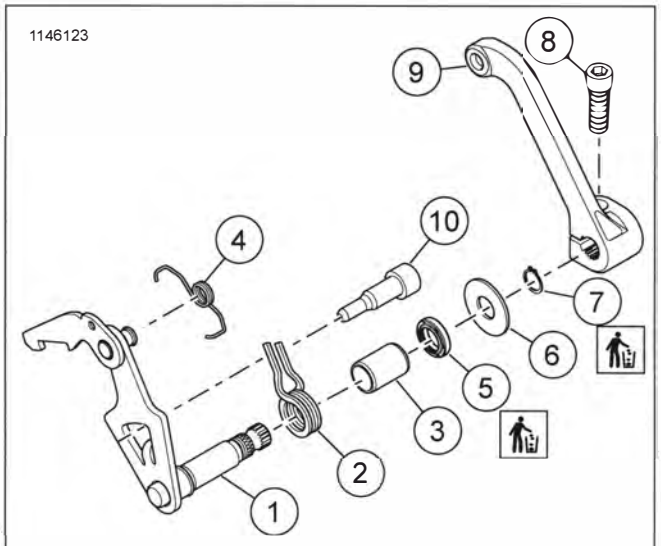
   b. Tighten.

      Torque: 18–22 ft-lbs (24.4–29.8 N·m) *Shifter rod lever pinch screw*



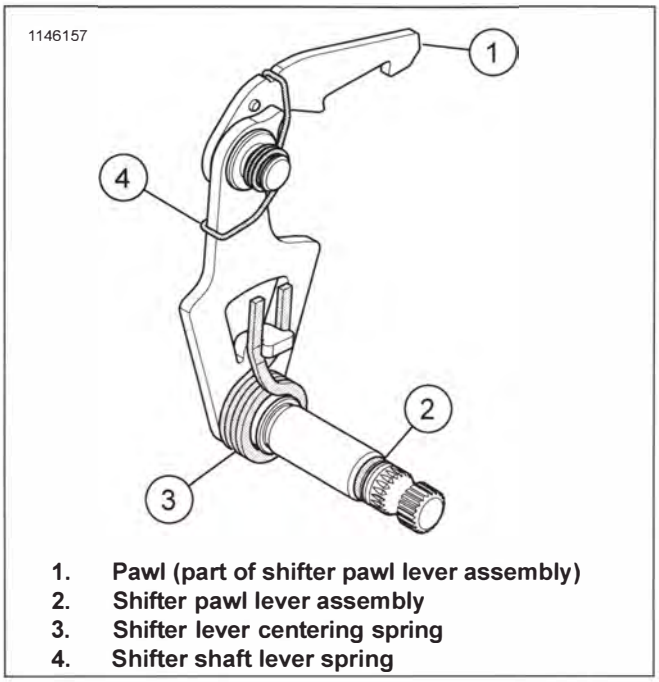
1. **Screw**
2. **Plug**
3. **Needle bearing**
4. **Dowel (2)**

Figure 5-83. Countershaft Needle Bearing



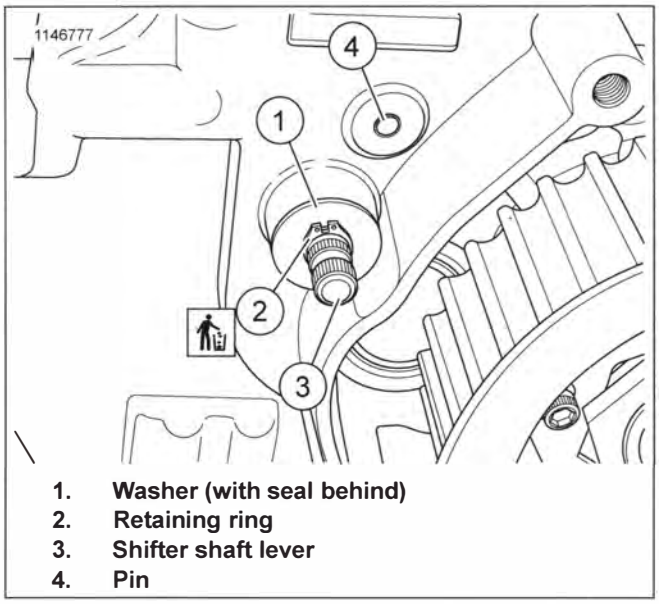
1. **Shifter pawl lever assembly**
2. **Shift lever centering spring**
3. **Sleeve (inside transmission case)**
4. **Shifter shaft lever spring**
5. **Seal**
6. **Washer**
7. **Retaining ring**
8. **Pinch screw**
9. **Shifter rod lever**
10. **Screw**

Figure 5-84. Shifter Arm and Pawl Assembly (Typical)



1. Pawl (part of shifter pawl lever assembly)
2. Shifter pawl lever assembly
3. Shifter lever centering spring
4. Shifter shaft lever spring

Figure 5-85. Shifter Pawl Lever Assembly



1. Washer (with seal behind)
2. Retaining ring
3. Shifter shaft lever
4. Pin

Figure 5-86. Shifter Shaft Lever, Exterior View

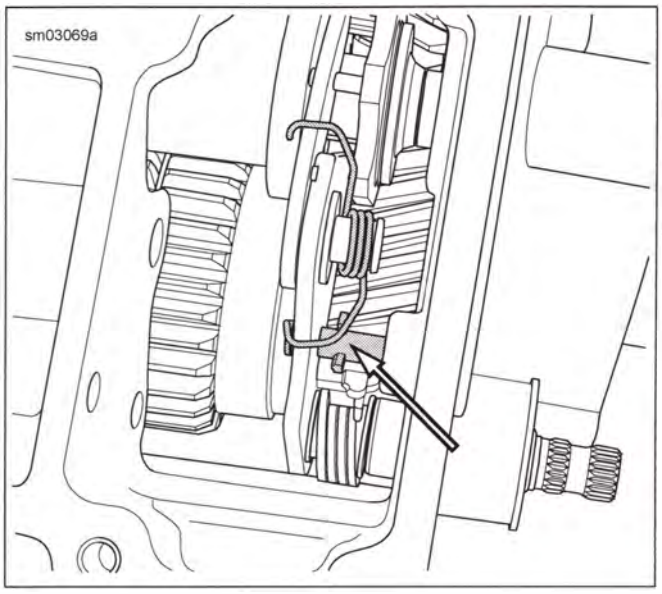


Figure 5-87. Shifter Shaft Lever Spring

COMPLETE

1. Install rear fork. See CHASSIS > REAR FORK (Page 3-72).
2. Install oil pan. See ENGINE > OIL PAN (Page 4-70).
3. Install coolant hose guide. See COOLING SYSTEM > COOLANT HOSES (Page 7-17).
4. Install transmission assembly. See DRIVE AND TRANSMISSION > TRANSMISSION (Page 5-34).
5. Install primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
6. Install primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
7. Install starter. See ELECTRICAL > STARTER (Page 8-9).
8. Install breather hose. See ENGINE > BREATHER (Page 4-20).
9. Install primary chaincase cover and **new** gasket. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
10. Install foot shift levers. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).
11. Install passenger footrest. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
12. Install rider footboard and bracket, if removed. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
13. Install transmission shift linkage. See DRIVE AND TRANSMISSION > SHIFTER LINKAGE (Page 5-7).

14. Install clutch release cover. See DRIVE AND TRANSMISSION > CLUTCH RELEASE COVER (Page 5-10).

15. Install gear position sensor and cover. See ELECTRICAL > GEAR POSITION SENSOR (Page 8-70).

16. Install exhaust system. See FUEL AND EXHAUST > EXHAUST SYSTEM (Page 6-27).

17. Fill primary chaincase. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

18. Fill transmission. See MAINTENANCE > REPLACE TRANSMISSION LUBRICANT (Page 2-11).

19. Fill engine oil. See MAINTENANCE > REPLACE ENGINE OIL AND FILTER (Page 2-7).

20. Adjust drive belt deflection. See MAINTENANCE > INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-37).

21. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Air cleaner backplate, snorkel screws	22–27 **in-lbs**	2.5–3 N·m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Install
Air cleaner backplate to cylinder head screws	19–21 ft-lbs	25.4–28.1 N·m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Install
Air cleaner backplate to induction module screws	50–60 **in-lbs**	5.6–6.8 N·m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Install
Charcoal canister screw	15–20 **in-lbs**	1.7–2.3 N·m	6.21 CHARCOAL CANISTER: EVAPORATIVE EMISSIONS, Install
Console, front screw	20–29 **in-lbs**	2.3–3.3 N·m	6.4 CONSOLE, Install
Console, rear screw	35–62 **in-lbs**	4–7 N·m	6.4 CONSOLE, Install
Exhaust, crossover pipe, support bracket screws	11–13 ft-lbs	15–18 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, crossover pipe clamp	38–43 ft-lbs	51–58 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, crossover pipe support clamp screw	14–18 ft-lbs	19–24 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, front, 1st torque	9–18 **in-lbs**	1–2 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, front, final torque	100–120 **in-lbs**	11.3–13.6 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, rear, 1st torque	9–18 **in-lbs**	1–2 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, rear, final torque	100–120 **in-lbs**	11.3–13.6 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, shield clamps	20–40 **in-lbs**	2.3–4.5 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust side bracket flange locknut	15–20 ft-lbs	20–27 N·m	6.19 EXHAUST SYSTEM, Install
Fuel inlet screws	25–28 **in-lbs**	2.8–3.2 N·m	6.8 FUEL INLET, Install
Fuel line screw	22–40 **in-lbs**	2.5–4.5 N·m	6.7 FUEL LINE, Install
Fuel pump, quick connector	22–26 ft-lbs	30–35 N·m	6.10 FUEL PUMP, Assemble
Fuel pump assembly screws	40–45 **in-lbs**	4.5–5.1 N·m	6.10 FUEL PUMP, Install
Fuel rail screws	31–49 **in-lbs**	3.5–5.5 N·m	6.14 FUEL INJECTORS, Install
Fuel tank, front screws	15–20 ft-lbs	20–27 N·m	6.9 FUEL TANK, Install
Fuel tank, rear screws	15–20 ft-lbs	20–27 N·m	6.9 FUEL TANK, Install
Induction module screw torque step 1	16–20 **in-lbs**	1.8–2.26 N·m	6.15 INDUCTION MODULE, Install
Induction module screw torque step 2	8–13 ft-lbs	10.84–17.63 N·m	6.15 INDUCTION MODULE, Install
Muffler to clamp	38–43 ft-lbs	51.5–58.3 N·m	6.18 MUFFLERS, Install
Muffler to saddlebag support screws	14–18 ft-lbs	19–24.4 N·m	6.18 MUFFLERS, Install
Oxygen sensor, heated	12–14 ft-lbs	16–19 N·m	6.17 HEATED OXYGEN SENSORS (HO2S), Install
Oxygen sensor, heated	12–14 ft-lbs	16–19 N·m	6.17 HEATED OXYGEN SENSORS (HO2S), Install
Oxygen sensor, heated	12–14 ft-lbs	16–19 N·m	6.17 HEATED OXYGEN SENSORS (HO2S), Install
Temperature manifold absolute pressure (TMAP) screw	22–40 **in-lbs**	2.5–4.5 N·m	6.12 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Install
Throttle body to manifold screws	35–53 **in-lbs**	4–6 N·m	6.15 INDUCTION MODULE, Assemble
Throttle grip sensor screws	4 **in-lbs**	0.4 N·m	6.13 TWIST GRIP SENSOR (TGS), Install

SPECIFICATIONS

Table 6-1. Fuel System Specifications

FUEL SYSTEM	TYPE
Recommended fuel	91 Octane

Table 6-2. Fuel Capacity

FUEL TANK CAPACITY	GALLONS	LITERS
Total	6.0	22.7
Reserve (warning light on)	1.0	3.79

Table 6-3. Fuel Pump Pressure Specifications

RANGE	VALUE
Normal	55–62 psi (376–425 kPa)

REMOVE

1. Remove air cleaner cover and filter element. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).

2. See Figure 6-1. Remove backplate assembly.

   a. Remove screws (2).

   b. Remove screws (3).

   c. Tilt backplate assembly (4) to disconnect breather hose (1).

   d. Remove backplate assembly.

3. See Figure 6-2. Remove snorkel.

   a. Remove screws (6).

   b. Remove snorkel (1).

4. Remove seal ring (4) if worn or damaged.

INSTALL

FASTENER	TORQUE VALUE	
Air cleaner backplate to cylinder head screws	19–21 ft-lbs	25.4–28.1 N·m
Air cleaner backplate to induction module screws	50–60 **in-lbs**	5.6–6.8 N·m
Air cleaner backplate, snorkel screws	22–27 **in-lbs**	2.5–3 N·m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

1. See Figure 6-2. Install snorkel.

   a. Install snorkel (1).

   b. Install screws (6). Tighten.

   Torque: 22–27 **in-lbs** (2.5–3 N·m) *Air cleaner backplate, snorkel screws*

2. Install backplate seal ring.

   a. Clean backplate assembly (5) from all residual oil and debris.

   b. Align tab on **new** seal ring (4) with tab opening (2) on backplate assembly. Install seal ring.

3. Install backplate.

   a. Install breather hose to breather connector (3).

NOTE

Failure to connect breather hose allows crankcase vapors to be vented into the atmosphere and is in violation of legal emissions standards.

   b. See Figure 6-1. Position backplate assembly on induction module.

   c. Apply threadlocker to screws (2). Install and Tighten.

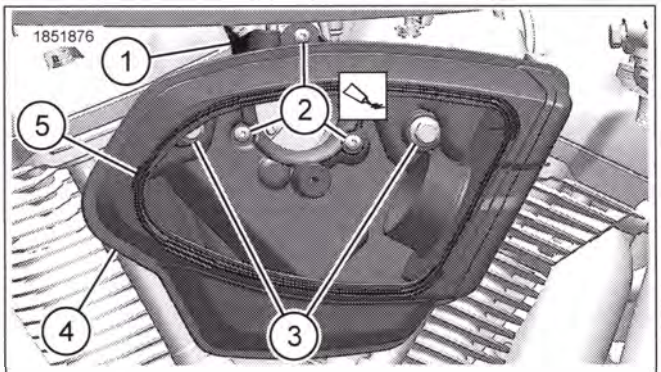
   Torque: 50–60 **in-lbs** (5.6–6.8 N·m) *Air cleaner backplate to induction module screws*

   LOCTITE 565 THREAD SEALANT (99818-97)

   d. Install screws (3). Tighten.

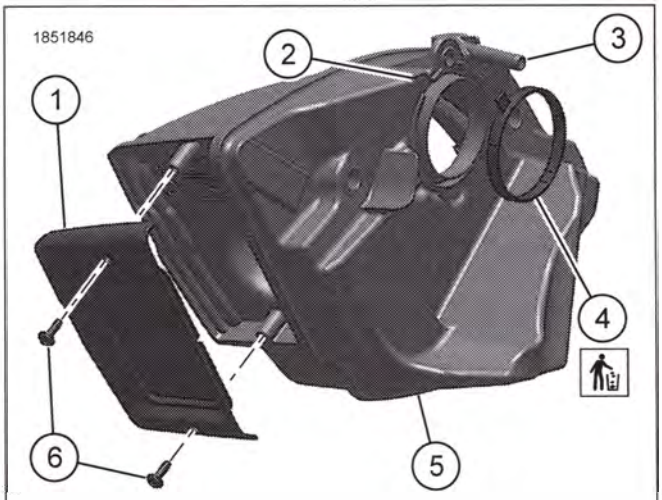
   Torque: 19–21 ft-lbs (25.4–28.1 N·m) *Air cleaner backplate to cylinder head screws*

4. Install filter element and air cleaner cover. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).



1. **Breather hose**
2. **Backplate to induction module screw (3)**
3. **Backplate to head screw (2)**
4. **Backplate assembly**
5. **Seal**

Figure 6-1. Breather Hose to Backplate Assembly



1. **Snorkel**
2. **Tab opening**
3. **Breather connector**
4. **Seal ring**
5. **Backplate assembly**
6. **Screw (2)**

Figure 6-2. Backplate Assembly

PREPARE

1. Remove seat. See CHASSIS > SEAT (Page 3-139).
2. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

1. See Figure 6-3. Remove console.
   a. Remove screws (1 and 4).
   b. Slightly rotate while removing console (3).
2. Inspect gaskets (2 and 5) for deterioration or damage. Replace if necessary.

INSTALL

FASTENER	TORQUE VALUE	
Console, front screw	20–29 **in-lbs**	2.3–3.3 N·m
Console, rear screw	35–62 **in-lbs**	4–7 N·m

1. See Figure 6-3. Install **new** gaskets (2 and 5) if damaged.
2. Install console.
   a. Position console on fuel tank.

NOTE

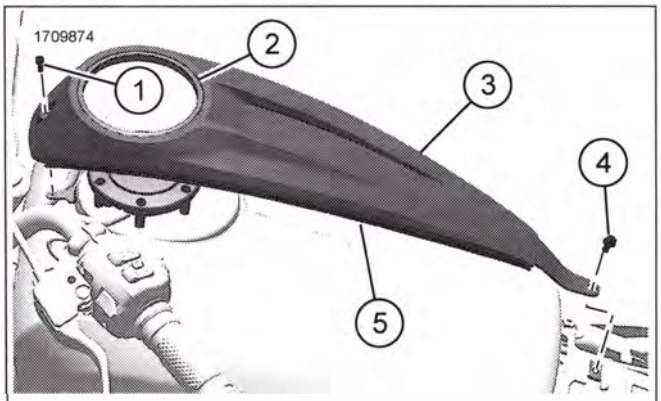
Verify drain tube and EVAP line are not pinched.

   b. Install screw (1). Tighten.

      Torque: 20–29 **in-lbs** (2.3–3.3 N·m) *Console, front screw*

   c. Install screw (4). Tighten.

      Torque: 35–62 **in-lbs** (4–7 N·m) *Console, rear screw*



1. **Screw**
2. **Console filler gasket**
3. **Console**
4. **Screw**
5. **Console gasket (2)**

Figure 6-3. Console

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

⚠ WARNING

Gasoline is extremely flammable and highly explosive. Keep gasoline away from ignition sources which could result in death or serious injury. See the Safety chapter. (00635c)

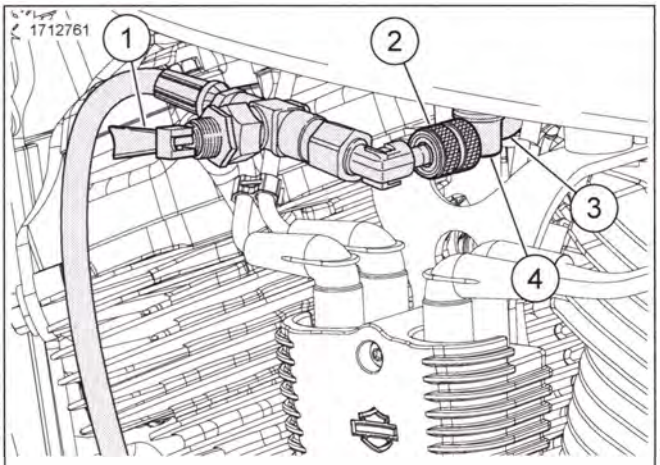
⚠ WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge fuel line. Do not remove fuel supply line fitting, just remove cap. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).

TEST

1. See Figure 6-4. Attach valve union (2) on to schrader valve (4) on fuel line (3).
2. Close fuel valve (1).
3. Insert clear tube of fuel pressure gauge into a suitable container.
4. Start engine.
5. Open fuel valve.
6. Open clear tube bleeder valve to remove air from fuel pressure tester.
7. Close clear tube bleeder valve.
8. Operate engine at various speeds. Note pressure gauge reading. Compare readings to specifications. SPECIFICATIONS > SPECIFICATIONS (Page 6-2)
9. Turn off engine.
10. Open clear tube bleeder to remove pressure from fuel pressure gauge.
11. Remove fuel pressure tester.
12. Install schrader valve cap.



1. **Fuel valve (closed position)**
2. **Valve union**
3. **Fuel line**
4. **Schrader valve**

Figure 6-4. Fuel Pressure Test

PURGE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

⚠ WARNING

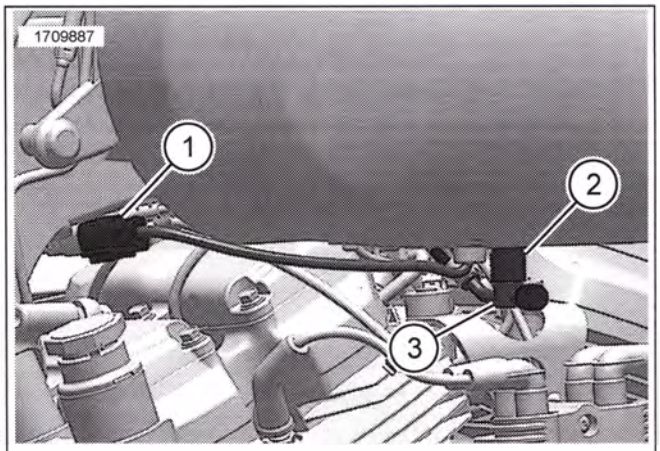
To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

NOTE

Gasoline in the fuel supply line is under high pressure: 58 psi (400 kPa). To avoid an uncontrolled discharge or spray of gasoline, always purge the line before disconnecting.

Preferred method to disable the fuel pump is to use a special tool. The fuel pump can optionally be disconnected instead.DIGITAL TECHNICIAN II (PART NUMBER: HD-48650)

1. See Figure 6-5. Disconnect fuel pump connector (1).
2. Remove fuel from fuel supply line.
   a. Run engine until it stalls.
   b. Operate starter an additional 3 seconds.
3. Remove main fuse.
4. Connect fuel pump connector (1).
5. Pull up on sleeve of quick-connect fitting (2) while Pulling down on fuel supply line fitting (3).



1. Fuel pump connector
2. Quick connect fitting
3. Fuel supply line fitting

Figure 6-5. Purge Fuel Line

PREPARE

⚠ WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

1. See Figure 6-6. Remove fuel line from induction module.
   a. Remove screw (1).
   b. Remove fuel line (2) from induction module.
   c. See Figure 6-7. Discard O-ring (2).

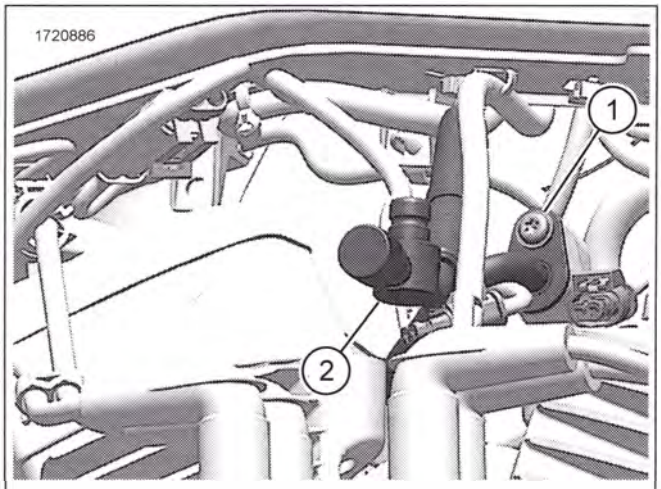
INSTALL

FASTENER	TORQUE VALUE	
Fuel line screw	22–40 **in-lbs**	2.5–4.5 N·m

⚠ WARNING

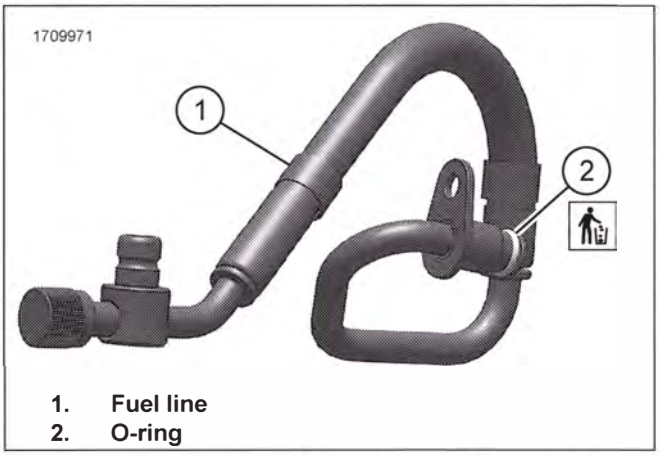
To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

1. Install fuel line to induction module.
   a. See Figure 6-7. Install new O-ring (2).
   b. See Figure 6-6. Position fuel line (2) on induction module.
   c. Install screw (1). Tighten
      Torque: 22–40 **in-lbs** (2.5–4.5 N·m) *Fuel line screw*



1. Screw
2. Fuel line

Figure 6-6. Fuel Line



1. Fuel line
2. O-ring

Figure 6-7. Fuel Line O-Ring

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove console. See FUEL AND EXHAUST > CONSOLE (Page 6-4).

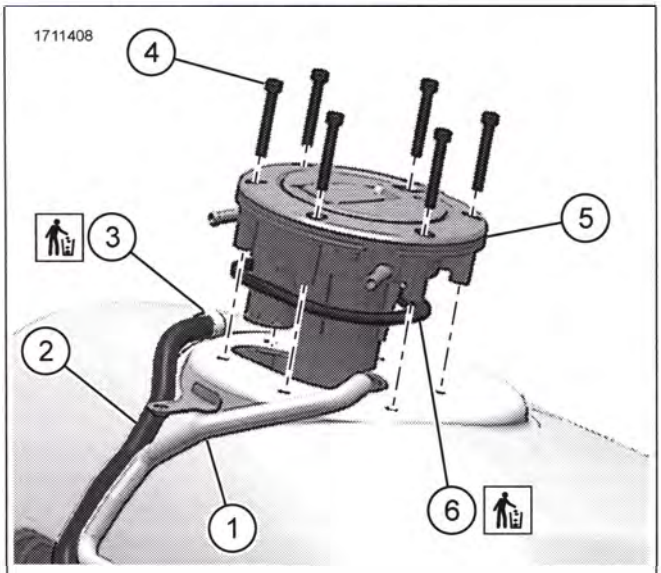
REMOVE

1. See Figure 6-8. Remove drain line (1).
2. Remove clamp (3) and fuel inlet-to-charcoal canister line (2).
3. Remove fuel inlet assembly.
   a. Remove screws (4).
   b. Remove fuel inlet assembly (5).
   c. Discard gasket (6).

INSTALL

FASTENER	TORQUE VALUE	
Fuel inlet screws	25–28 **in-lbs**	2.8–3.2 N·m

1. Install fuel inlet assembly.
   a. Clean any debris from fuel inlet gasket seat.
   b. See Figure 6-8. Install Gasket (6).
   c. Install fuel inlet (5).
   d. Install screws (4).
      Torque: 25–28 **in-lbs** (2.8–3.2 N·m) *Fuel inlet screws*
2. Install drain line (1).
3. Install fuel inlet-to-charcoal canister line (2).
4. Install clamp (3).



1. **Drain line**
2. **Fuel inlet-to-charcoal canister line**
3. **Clamp**
4. **Screw (6)**
5. **Fuel inlet**
6. **Gasket**

Figure 6-8. Fuel Inlet Assembly

COMPLETE

1. Install console. See FUEL AND EXHAUST > CONSOLE (Page 6-4).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ 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 seat. See CHASSIS > SEAT (Page 3-139).
2. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove console if necessary. See FUEL AND EXHAUST > CONSOLE (Page 6-4).

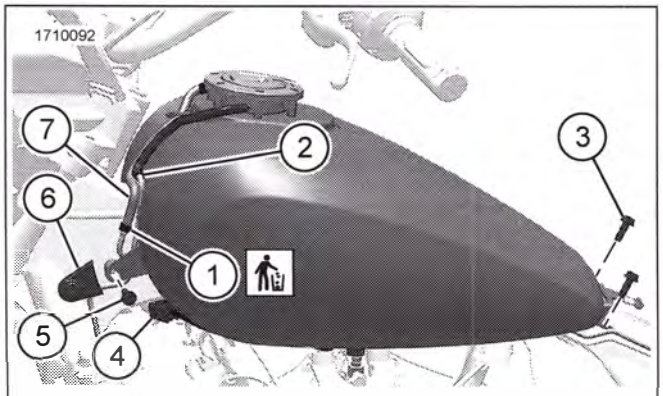
REMOVE

1. See Figure 6-11. Disconnect fuel supply line.
   a. Pull up on sleeve of quick-connect fitting (2) while pulling down on fuel supply line fitting (3).
2. Disconnect fuel pump connector (1).
3. See Figure 6-9. Remove fuel tank.
   a. Remove caps (6).
   b. Remove front screws (5).
   c. Remove rear screws (3).
   d. Slide fuel tank rearward.
4. See Figure 6-10. If leaving console on.
   a. Remove clamp (1).
   b. Disconnect fuel inlet-to-charcoal canister line (2) at connection.
   c. Remove drain line (3) at connection.
5. See Figure 6-9. If removing console.
   a. Remove clamp (1).
   b. Disconnect fuel inlet-to-charcoal canister line (7).
   c. Disconnect drain line (2).
6. Remove fuel tank.
7. See Figure 6-12. Vent screw in fuel tank are for manufacturing purposes and not intended to be removed.

INSTALL

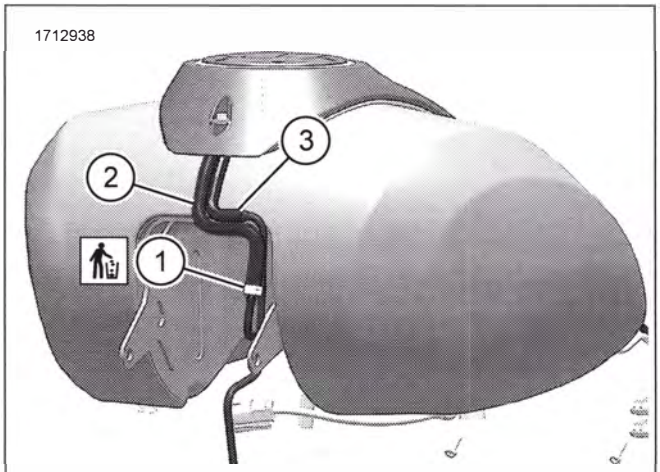
FASTENER	TORQUE VALUE	
Fuel tank, front screws	15–20 ft-lbs	20–27 N·m
Fuel tank, rear screws	15–20 ft-lbs	20–27 N·m

1. See Figure 6-9. Place fuel tank on frame backbone.
1. If console was removed.
   a. Connect fuel inlet-to-charcoal canister line (7).
   b. Install clamp (1).
   c. Connect drain line (2).
2. See Figure 6-10. If console was not removed.
   a. Connect fuel inlet-to-charcoal canister (2) at connection.
   b. Install clamp (1).
   c. Connect drain line (3) at connection.
3. See Figure 6-9. Secure fuel tank.
   a. Install front screws (5). Tighten.
      Torque: 15–20 ft-lbs (20–27 N·m) *Fuel tank, front screws*
   b. Install caps (6).
   c. Install rear screws (3). Tighten.
      Torque: 15–20 ft-lbs (20–27 N·m) *Fuel tank, rear screws*
4. See Figure 6-11. Connect fuel pump connector (1).
5. Connect fuel line to fuel tank.
   a. Pull up on sleeve of quick-connect fitting (2) while pushing up on fuel supply line fitting (3).
   b. While pushing on fuel supply line fitting, pull down on sleeve until it clicks into locked position.
   c. Pull on fuel line to verify it is secure.



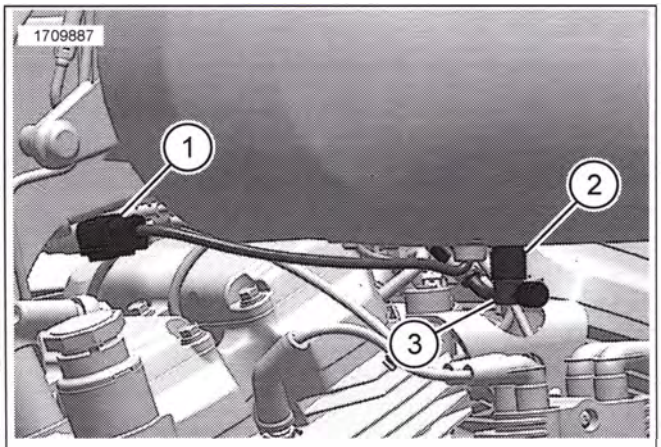
1. Clamp
2. Drain line
3. Screw (2)
4. Fuel pump connector
5. Screw (2)
6. Cap (2)
7. Fuel inlet-to-charcoal canister line

Figure 6-9. Fuel Tank



1. Clamp
2. Fuel inlet-to-charcoal canister line
3. Drain line

Figure 6-10. Fuel Tank with Console Attached



1. Fuel pump connector
2. Quick connect fitting
3. Fuel supply line fitting

Figure 6-11. Fuel Line to Fuel Tank

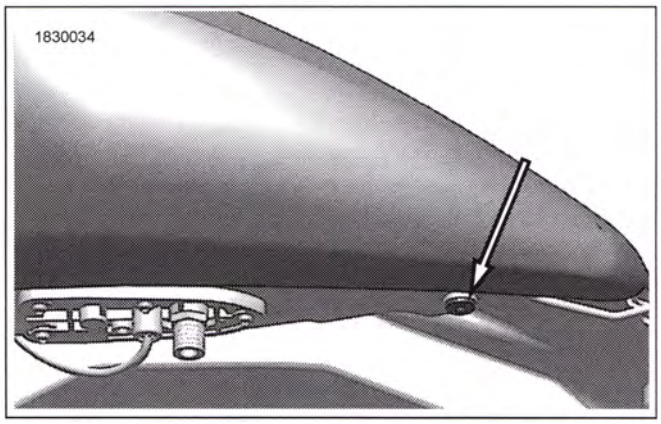


Figure 6-12. Vent Screw (DO NOT REMOVE)

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install fuel line. See FUEL AND EXHAUST > FUEL LINE (Page 6-7).
4. Install console if removed. See FUEL AND EXHAUST > CONSOLE (Page 6-4).

PREPARE

⚠ WARNING

Gasoline is extremely flammable and highly explosive. Keep gasoline away from ignition sources which could result in death or serious injury. See the Safety chapter. (00635c)

⚠ 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 seat. See CHASSIS > SEAT (Page 3-139).
2. Purge fuel system. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove and drain fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

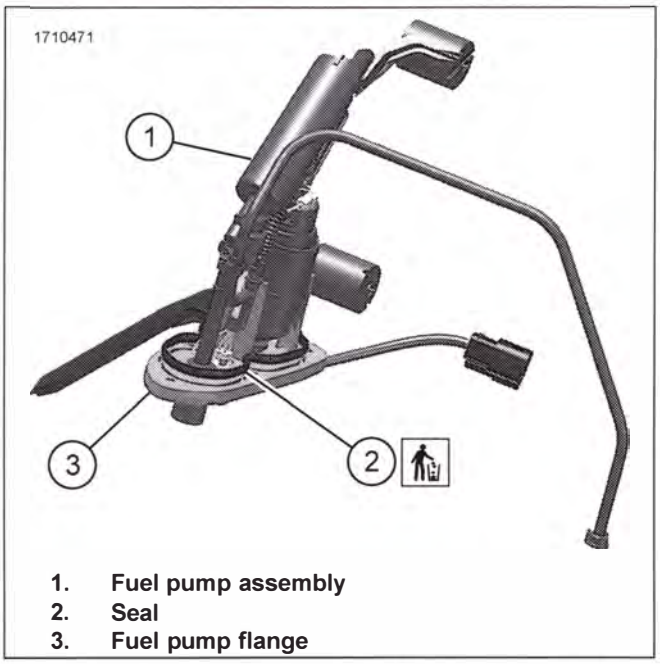
1. See Figure 6-14. Remove fuel pump assembly.
   a. Remove screws (2).
   b. Using a wooden tool, pull inlet strainer (1) from fuel tank (6).
   c. Remove fuel pump assembly (5).

CLEAN AND INSPECT

⚠ WARNING

Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (00621b)

1. See Figure 6-13. Clean and inspect fuel pump assembly.
   a. Clean fuel pump assembly (1).
   b. Remove seal (2). Discard.
   c. Clean groove in fuel pump flange (3).
2. Replace any worn or damaged parts.



1. **Fuel pump assembly**
2. **Seal**
3. **Fuel pump flange**

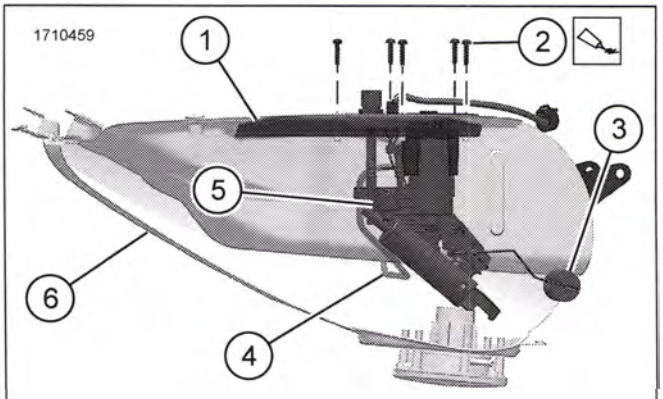
Figure 6-13. Fuel Pump Assembly

INSTALL

FASTENER	TORQUE VALUE	
Fuel pump assembly screws	40–45 **in-lbs**	4.5–5.1 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

1. See Figure 6-13. Install new seal (2).
2. See Figure 6-14. Install fuel pump assembly.
   a. Insert siphon tube (4) facing forward into fuel tank (6) on opposite side.
   b. Insert fuel level sender float (3) into fuel tank.
   c. Insert fuel pump assembly (5) half way into fuel tank.
   d. Insert inlet strainer (1) into fuel tank.
   e. Install fuel pump assembly.
   f. Apply threadlock to screws (2).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   g. See Figure 6-15. Install screws and tighten in sequence shown.
      Torque: 40–45 **in-lbs** (4.5–5.1 N·m) *Fuel pump assembly screws*



1. **Inlet strainer**
2. **Screw (5)**
3. **Float**
4. **Siphon tube**
5. **Fuel pump assembly**
6. **Fuel tank**

Figure 6-14. Fuel Pump Assembly Installed

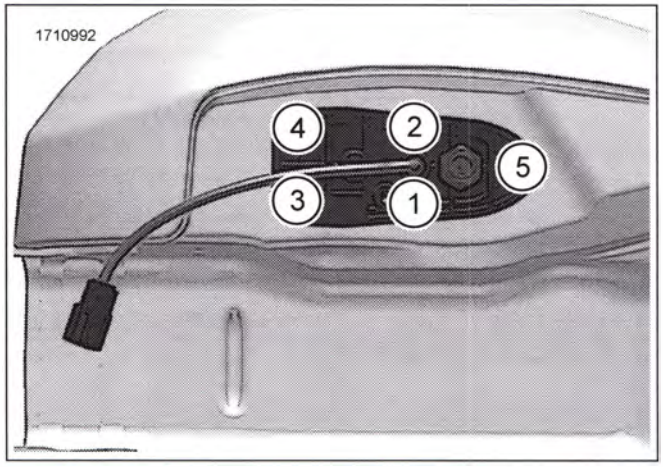


Figure 6-15. Tightening Sequence

DISASSEMBLE

Quick Connector

1. See Figure 6-19. Remove quick connector.
   a. Remove quick connector (3).
   b. Remove and discard O-ring (2).

Level sender

1. See Figure 6-16. Remove level sender.
   a. Mark wires for orientation and disconnect electrical connectors (1).
   b. Pull tab (3) and push level sender assembly (2) down.
   c. Remove level sender assembly.

Pressure Regulator

1. See Figure 6-17. Remove pressure regulator.
   a. Remove retainer (1).
   b. Remove pressure regulator (4).
   c. Remove and discard O-ring (3).

Filters

1. See Figure 6-18. Remove pump filter.
   a. Remove filter housing cap (1).
   b. Discard O-ring (2).
   c. Remove and discard pump filter (3).
2. Remove and discard pick up filter (5).

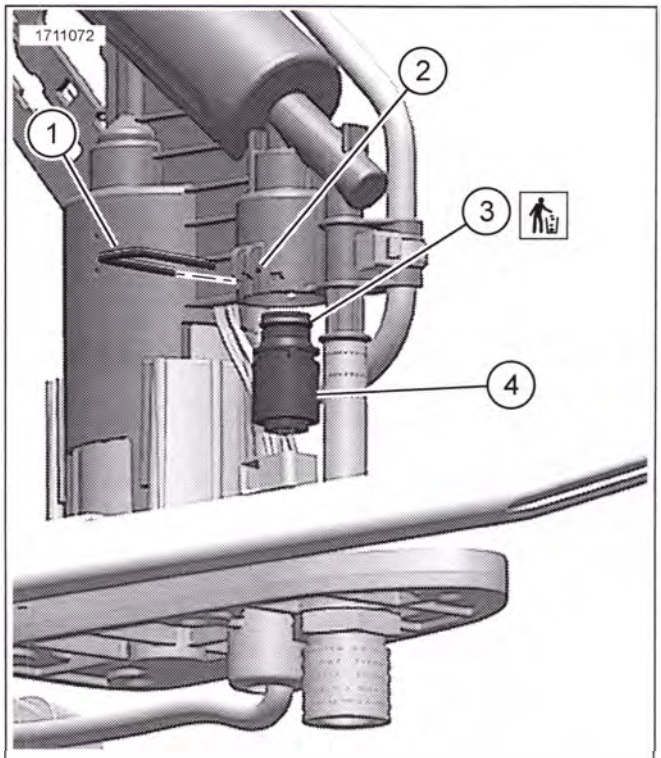
ASSEMBLE

FASTENER	TORQUE VALUE	
Fuel pump, quick connector	22–26 ft-lbs	30–35 N·m



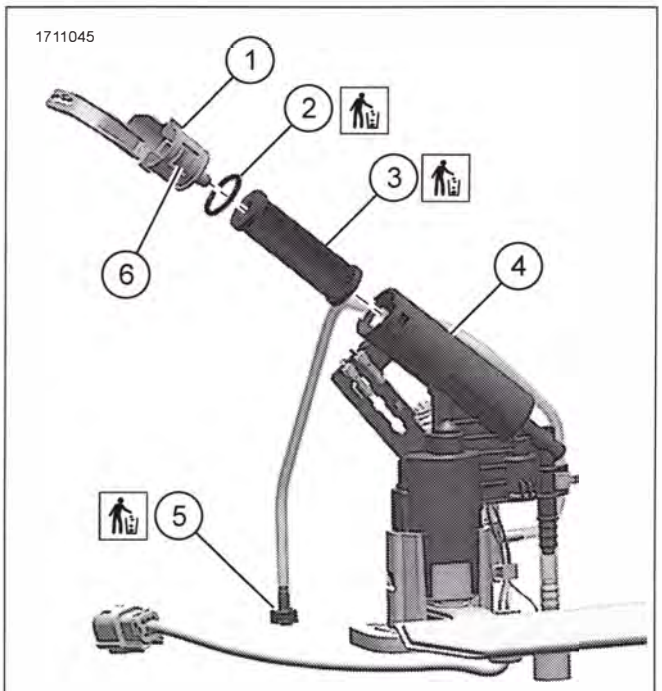
1. **Connector (2)**
2. **Lever sender assembly**
3. **Tab**

Figure 6-16. Fuel Level Sender



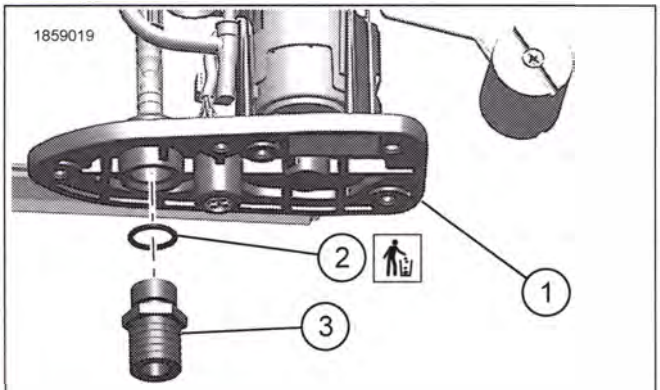
1. Retainer
2. Tab
3. O-ring
4. Pressure regulator

Figure 6-17. Pressure Regulator



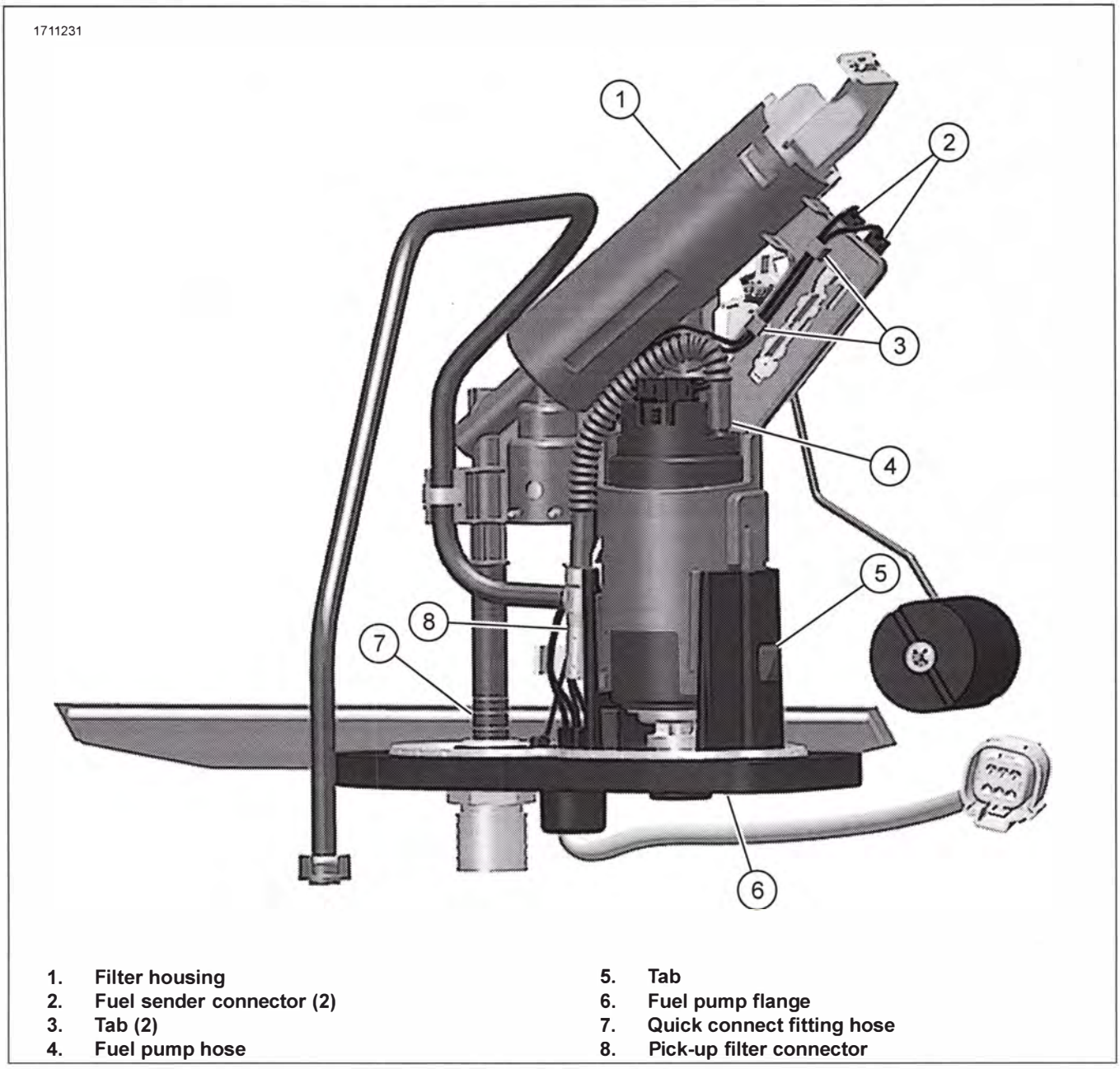
1. Filter housing cap
2. O-ring
3. Pump filter
4. Filter housing
5. Pick-up filter
6. Tab

Figure 6-18. Fuel Filters



1. Fuel pump flange
2. O-ring
3. Quick-connect fitting

Figure 6-19. Quick-Connect Fitting



1. **Filter housing**
2. **Fuel sender connector (2)**
3. **Tab (2)**
4. **Fuel pump hose**
5. **Tab**
6. **Fuel pump flange**
7. **Quick connect fitting hose**
8. **Pick-up filter connector**

Figure 6-20. Fuel Pump

Filter

1. See Figure 6-18. Install pump filter.
   a. Install pump filter (3).
   b. Install **new** O-ring on filter housing cap (1).
   c. Align tab (6) with opening on filter housing (4) and install.
2. Install pick-up filter (5) on hose.

Pressure Regulator

1. See Figure 6-17. Install pressure regulator.
   a. Install **new** O-ring (3).
   b. Install pressure regulator (4) in filter housing.
   c. Install retainer (1).
   d. Verify retainer is seated properly in tab (2).

Level Sender

1. See Figure 6-16. Install level sender assembly.
   a. Install level sender assembly (2) in filter housing.
   b. Slide level sender assembly up to engage tab (3).
   c. Connect connectors (1) as marked when removed.

Quick Connector

1. See Figure 6-19. Install quick connector
   a. Install new O-ring (2).

b. Install quick connector (3). Tighten.

Torque: 22–26 ft-lbs (30–35 N·m) *Fuel pump, quick connector*

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

NOTE

Add at least 3.8 L (1 gal) of fuel to fuel tank before operating fuel pump.

4. Set OFF/RUN switch to RUN and check for leaks.

PREPARE

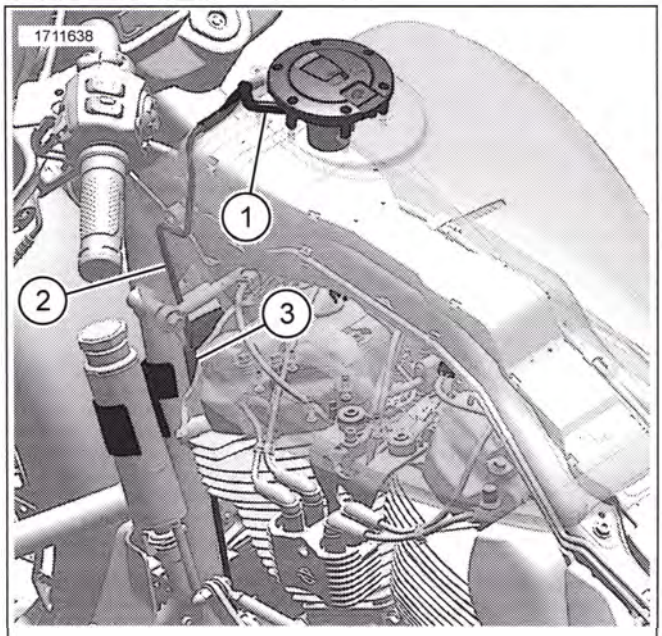
1. Remove seat. See CHASSIS > SEAT (Page 3-139).
2. Remove console if removing entire line. See FUEL AND EXHAUST > CONSOLE (Page 6-4).

REMOVE

1. See Figure 6-21. Make note of location of drain line (2) routing.
2. Removing drain line.
   a. If removing entire drain line slide fuel tank back and remove hose from inlet. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
   b. If removing lower drain line, remove at connection.
3. Remove drain line from bracket (3).
4. Remove hose from drain line.

INSTALL

1. See Figure 6-21. If fully removed, install drain line into hose.
2. Install drain line.
   a. If fully removed, install drain line assembly on fuel inlet fitting.
   b. If not fully removed, install at connection.
3. Install drain line in bracket (3).
4. Install fuel tank if slide back. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).



1. **Hose**
2. **Drain line**
3. **Bracket**

Figure 6-21. Drain Line

COMPLETE

1. Install console if removed. See FUEL AND EXHAUST > CONSOLE (Page 6-4).
2. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

⚠ WARNING

Gasoline is extremely flammable and highly explosive. Keep gasoline away from ignition sources which could result in death or serious injury. See the Safety chapter. (00635c)

⚠ 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 main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
3. Remove knock sensors and support ignition coil and ignition coil bracket out of the way. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).

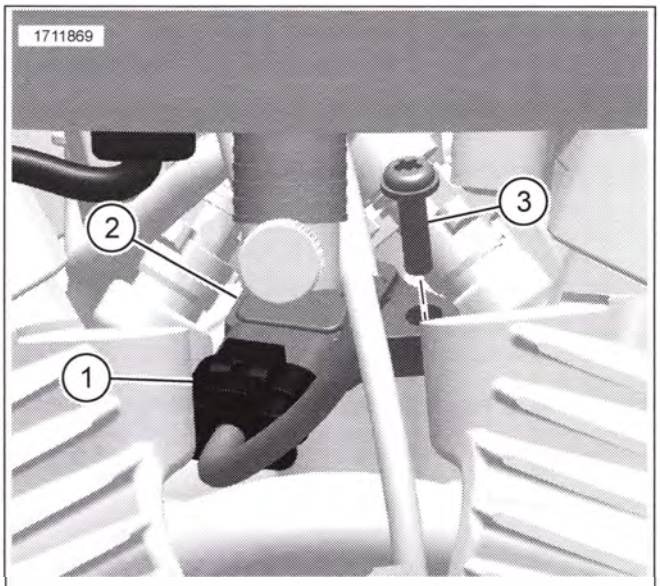
REMOVE

1. See Figure 6-22. Remove TMAP sensor.
   a. Remove screw (3).
   b. Remove sensor (2).
2. Disconnect TMAP connector (1).

INSTALL

FASTENER	TORQUE VALUE	
Temperature manifold absolute pressure (TMAP) screw	22–40 **in-lbs**	2.5–4.5 N·m

1. See Figure 6-22. Connect TMAP connector (1).
2. Install TMAP sensor.
   a. Install TMAP sensor (2).
   b. Install screw (3). Tighten.
      Torque: 22–40 **in-lbs** (2.5–4.5 N·m) *Temperature manifold absolute pressure (TMAP) screw*



1. TMAP connector
2. TMAP sensor
3. Screw

Figure 6-22. TMAP Sensor

COMPLETE

1. Install ignition coil bracket, ignition coil and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
2. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove right hand grip. See CHASSIS > HAND GRIPS (Page 3-118).
3. Remove RHCM. See ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23).

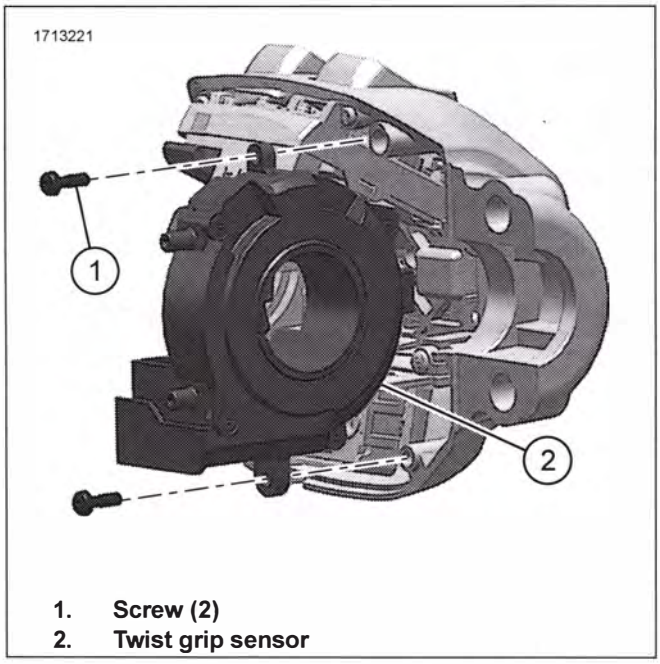
REMOVE

1. See Figure 6-23. Remove TGS.
   a. Remove screws (1).
   b. Remove TGS (2).

INSTALL

FASTENER	TORQUE VALUE	
Throttle grip sensor screws	**4 in-lbs**	0.4 N·m

1. See Figure 6-23. Install TGS.
   a. Install TGS (2).
   b. Install screws (1). Tighten.
      Torque: **4 in-lbs** (0.4 N·m) *Throttle grip sensor screws*



1. Screw (2)
2. Twist grip sensor

Figure 6-23. Twist Grip Sensor

COMPLETE

1. Install RHCM. See ELECTRICAL > RIGHT HAND CONTROL MODULE (RHCM) (Page 8-23).
2. Install right hand grip. See CHASSIS > HAND GRIPS (Page 3-118).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

Gasoline is extremely flammable and highly explosive. Keep gasoline away from ignition sources which could result in death or serious injury. See the Safety chapter. (00635c)

⚠ 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 seat. See CHASSIS > SEAT (Page 3-139).
2. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

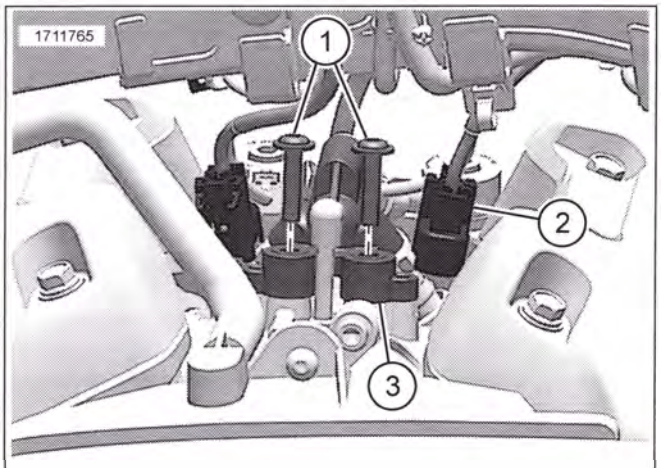
REMOVE

1. See Figure 6-24. Disconnect fuel injector connectors (2).
2. Remove fuel rail and fuel injectors.
   a. Remove screws (1).
   b. Remove fuel rail (3).
   c. See Figure 6-25. Remove fuel injectors (2).
3. Discard all O-rings (1,3).

INSTALL

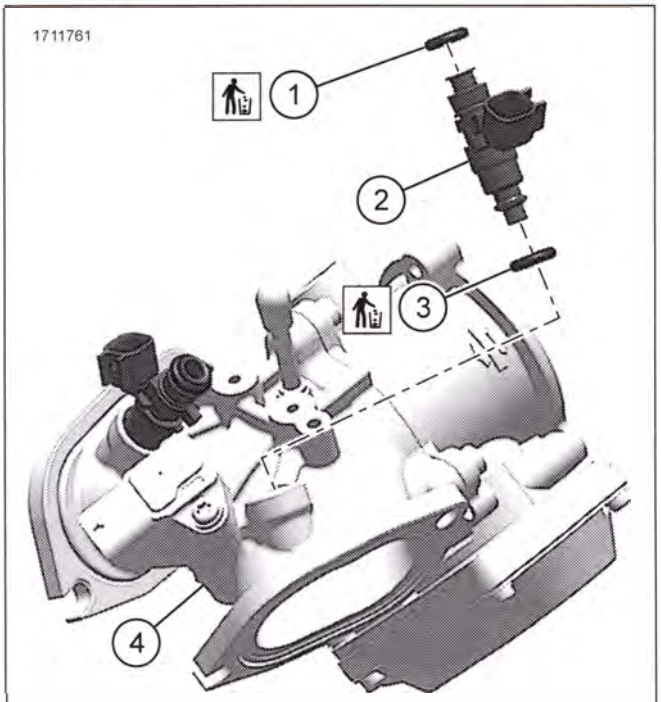
FASTENER	TORQUE VALUE	
Fuel rail screws	31–49 **in-lbs**	3.5–5.5 N·m

1. See Figure 6-25. Install fuel injectors.
   a. Install **new** O-rings (1, 3) on fuel injector (2).
   b. Install fuel injectors.
2. See Figure 6-24. Install fuel rail.
   a. Install fuel rail (3).
   b. Install screws (1). Tighten.
      Torque: 31–49 **in-lbs** (3.5–5.5 N·m) *Fuel rail screws*
   c. Connect fuel injector connectors (2).



1. **Screw (2)**
2. **Injector connector (2)**
3. **Fuel rail**

Figure 6-24. Fuel Rail and Injector Connectors



1. **Injector to fuel rail O-ring (2)**
2. **Fuel Injector (2)**
3. **Injector to induction module O-ring (2)**
4. **Induction module**

Figure 6-25. Fuel Injectors

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

⚠ WARNING

Gasoline is extremely flammable and highly explosive. Keep gasoline away from ignition sources which could result in death or serious injury. See the Safety chapter. (00635c)

⚠ WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge fuel line. See FUEL AND EXHAUST > FUEL LINE (Page 6-7).
2. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Remove seat. See CHASSIS > SEAT (Page 3-139).
4. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Remove air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
6. Remove knock sensors, support ignition coil bracket out of the way. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
7. Remove TMAP sensor. See FUEL AND EXHAUST > TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (Page 6-17).

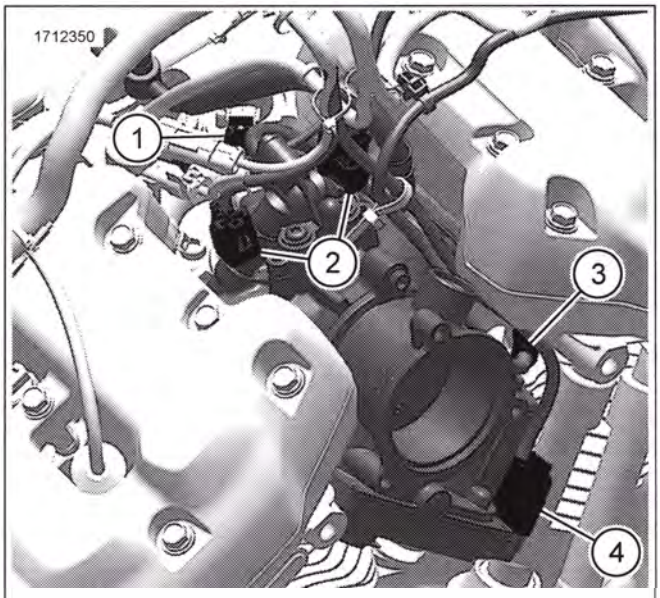
REMOVE

1. See Figure 6-26. Disconnect connectors:
   a. TMAP sensor connector (1).
   b. Fuel injector connectors (2).
   c. Throttle motor connector (4).
2. See Figure 6-27. Remove induction module.
   a. Loosen left side screws (3).
   b. Remove right side screws (2).
   c. Remove induction module (1).

INSTALL

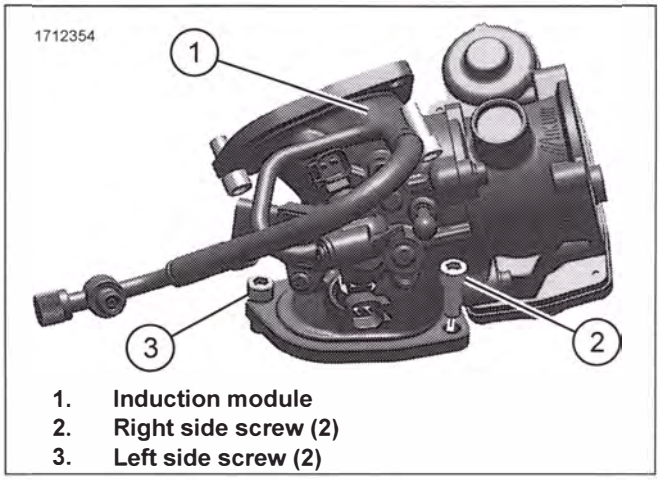
FASTENER	TORQUE VALUE	
Induction module screw torque step 1	16–20 **in-lbs**	1.8–2.26 N·m
Induction module screw torque step 2	8–13 ft-lbs	10.84–17.63 N·m

1. See Figure 6-27. Install induction module.
   a. Slide induction module into position until slots engage left side screws (3).
   b. Install screws (2).
   c. See Figure 6-28. Tighten screws to initial torque sequence (1,4).
      Torque: 16–20 **in-lbs** (1.8–2.26 N·m) *Induction module screw torque step 1*
   d. Tighten screws to final torque sequence (5,8).
      Torque: 8–13 ft-lbs (10.84–17.63 N·m) *Induction module screw torque step 2*
2. Figure 6-26 Install connectors:
   a. Connect sensor connector (1).
   b. Connect fuel injector connectors (2).
   c. Connect throttle motor connector (4).



1. **TMAP sensor connector**
2. **Fuel injector connector (2)**
3. **Engine temperature sensor**
4. **Throttle motor connector**

Figure 6-26. Induction Module Connectors



1. **Induction module**
2. **Right side screw (2)**
3. **Left side screw (2)**

Figure 6-27. Induction Module

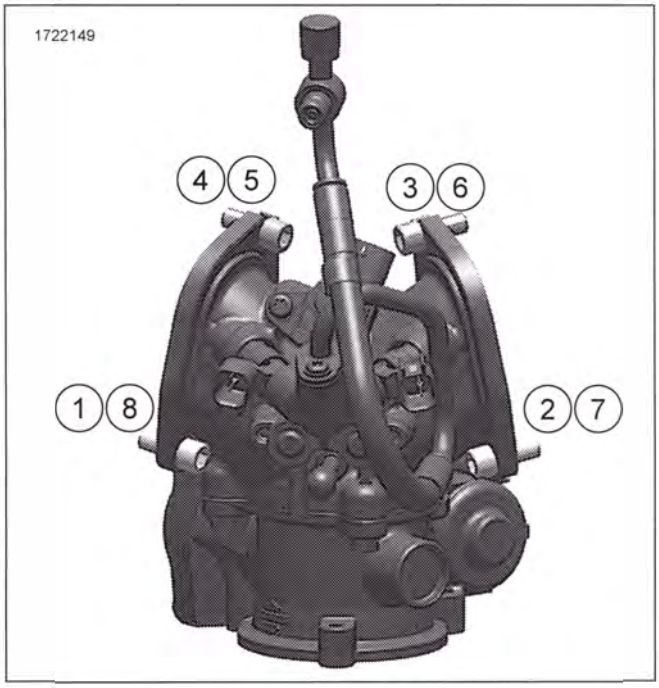


Figure 6-28. Induction Module Torque Sequence

DISASSEMBLE

Throttle Body

NOTE

Throttle body can be removed without removing entire induction module.

1. **Intake manifold (6) still installed:** Disconnect TCM connector.
2. See Figure 6-29. Remove throttle body.
   a. Remove screws (5).
   b. Remove throttle body (4).
   c. Discard O-ring (3).

Flange Adapters

1. Remove flange adapters.
   a. Remove flange adapters (2).
   b. Discard seals (1).
   c. Clean intake manifold (6) seal lip.

Intake Manifold

1. Remove TMAP sensor. See FUEL AND EXHAUST > TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (Page 6-17).
2. Remove fuel rail and fuel injectors. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).

ASSEMBLE

FASTENER	TORQUE VALUE	
Throttle body to manifold screws	35–53 **in-lbs**	4–6 N·m

Intake Manifold

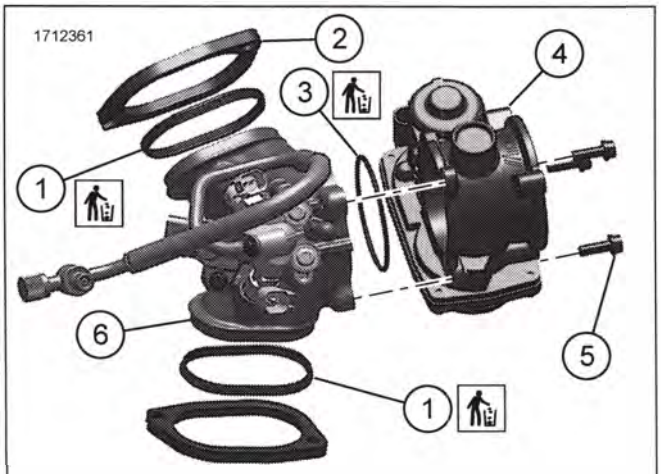
1. Install TMAP sensor. See FUEL AND EXHAUST > TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (Page 6-17).
2. Install fuel injectors and fuel rail. See FUEL AND EXHAUST > FUEL INJECTORS (Page 6-19).

Throttle Body

1. See Figure 6-29. Install throttle body.
   a. Install **new** gasket (3).
   b. Install throttle body (4).
   c. Install screws (5). Tighten.
      Torque: 35–53 **in-lbs** (4–6 N·m) *Throttle body to manifold screws*
2. **Intake manifold still installed:** Connect TCM connector.

Flange Adapters

1. Install flange adapters.
   a. Install seal (1).
   b. Install flange adapters (2) with screw opening facing away from throttle body.



1. **Seal (2)**
2. **Flange adapter (2)**
3. **O-ring**
4. **Throttle body**
5. **Throttle body screw (3)**
6. **Intake manifold**

Figure 6-29. Induction Module Assembly

COMPLETE

1. Install TMAP sensor. See FUEL AND EXHAUST > TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (Page 6-17).
2. Install ignition coil bracket and knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
3. Install air cleaner assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
4. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
5. Install seat. See CHASSIS > SEAT (Page 3-139).
6. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
7. Connect fuel line. See FUEL AND EXHAUST > FUEL LINE (Page 6-7).

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

⚠ 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)

Parts List

- Small propane cylinder.
- PROPANE ENRICHMENT KIT (PART NUMBER: HD-41417).

Tester Assembly

1. See Figure 6-30 . Make sure valve knob (6) is closed (fully clockwise).
2. Install valve assembly (5) onto propane bottle (1).

Tester Adjustment

1. See Figure 6-30 . Press and hold trigger button (8).
2. Slowly open valve knob (6) until pellet in flow gauge (7) rises 5-10 SCFH on gauge.
3. Release trigger button.

PROCEDURE

NOTE

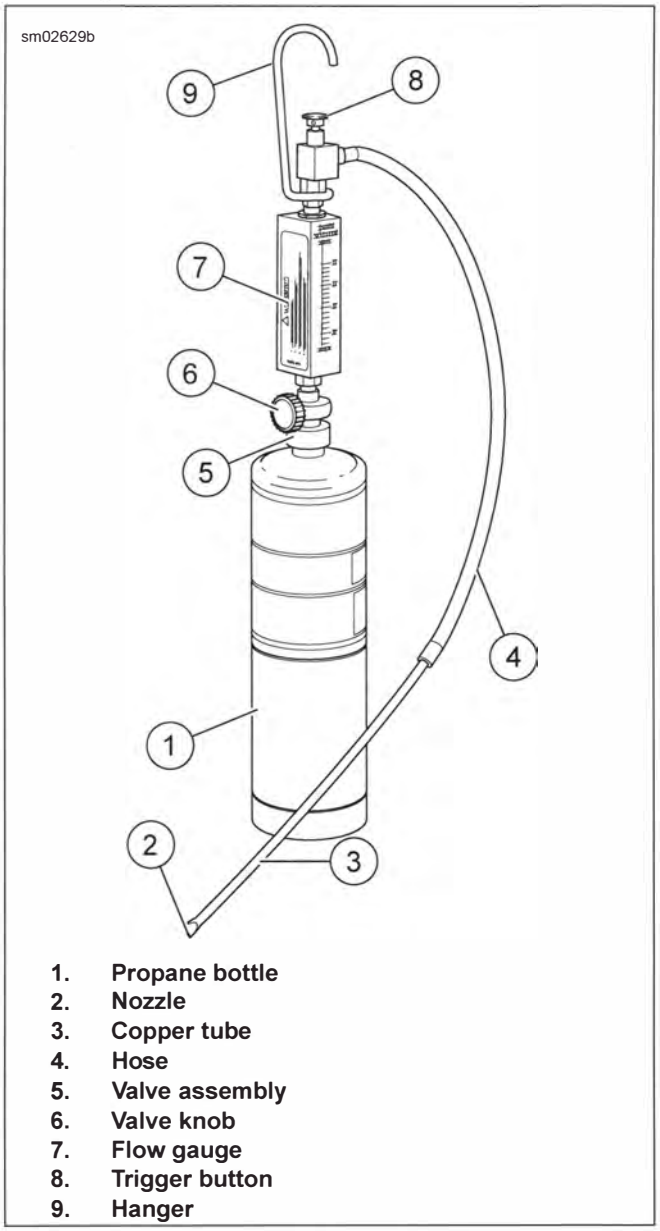
Propane injected into air cleaner causes false readings. Keep air cleaner cover installed.

1. Run motorcycle until engine is at normal operating temperature.
2. Aim nozzle toward possible sources of leak.

NOTE

The tone of the engine changes when propane enters source of leak.

3. Press and release trigger button to dispense propane.
4. Repeat as necessary to detect leak.
5. When test is finished, close valve.



1. **Propane bottle**
2. **Nozzle**
3. **Copper tube**
4. **Hose**
5. **Valve assembly**
6. **Valve knob**
7. **Flow gauge**
8. **Trigger button**
9. **Hanger**

Figure 6-30. Leak Tester

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

Front HO2 Sensor

1. See Figure 6-31. Remove front HO2S.
   a. Disconnect front HO2S connector (3).
   b. Remove cable straps (5) and discard.
   c. Remove cable from clips (9) and Clamp (10).
   d. Remove anchored cable strap (12) from anchored mount strap (11).
   e. Remove front HO2S (1).

Rear HO2 Sensor

1. See Figure 6-31. Remove rear HO2S.
   a. Disconnect rear HO2S connector (4).
   b. Remove cable straps (5) and discard.
   c. Remove rear HO2S (2).

Crossover HO2 Sensor (if equipped)

1. See Figure 6-31. Remove crossover HO2S.
   a. Disconnect crossover HO2S connector (8).
   b. Remove cable strap (7) and discard.
   c. Remove crossover HO2S (6).

INSTALL

PART NUMBER	TOOL NAME
HD-52977	17MM OXYGEN SENSOR SOCKET

FASTENER	TORQUE VALUE	
Oxygen sensor, heated	12–14 ft-lbs	16–19 N·m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

NOTE

- *Do not install sensors that have dropped or have been impacted by other components. Damage to the sensing element can occur.*
- *Replacement sensor assemblies have threads coated with ANTI-SEIZE LUBRICANT (98960-97) and **new** gaskets.*
- *If reusing HO2S, replace gasket. Use a high-quality professional grade side cutter for gasket removal. Make sure larger side of **new** gasket faces exhaust.*
- *If reusing HO2S, apply a thin coat of ANTI-SEIZE LUBRICANT (98960-97) to each oxygen sensor.*

Front HO2 Sensor

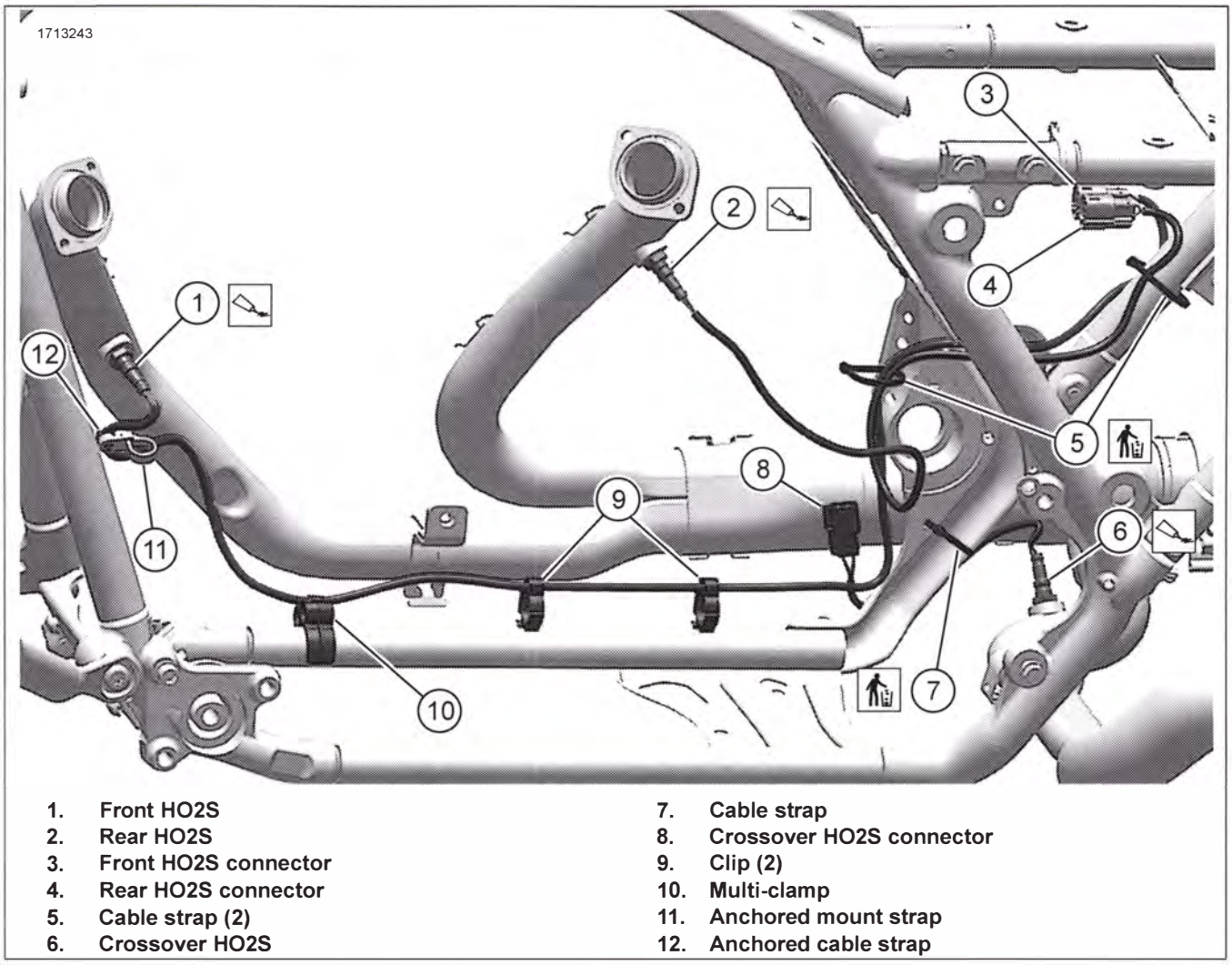
1. See Figure 6-31. Install front HO2S.
   a. Install front HO2S (1) using special tool. Tighten.
      Torque: 12–14 ft-lbs (16–19 N·m) *Oxygen sensor, heated*
      Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)
   b. Route wire harness along lower frame and above rear engine mount.
   c. Connect front HO2S connector (3).
   d. Install harness in clips (9) and multi-clamp (10).
   e. Install **new** cable straps (5).
   f. Install anchored cable strap (12) to anchored mount strap (11).

Rear HO2 Sensor

1. See Figure 6-31. Install rear HO2S.
   a. Install rear HO2S (2) using special tool. Tighten.
      Torque: 12–14 ft-lbs (16–19 N·m) *Oxygen sensor, heated*
      Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)
   b. Route harness along top of transmission to neutral switch area.
   c. Connect rear HO2S connector (4).
   d. Install **new** cable straps (5).

Crossover HO2 Sensor (if equipped)

1. See Figure 6-31. Install crossover HO2S.
   a. Install crossover HO2S (6) using special tool. Tighten.
      Torque: 12–14 ft-lbs (16–19 N·m) *Oxygen sensor, heated*
      Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)
   b. Route wire harness.
   c. Connect crossover HO2S connector (8).
   d. Install **new** cable strap (7).



1. **Front HO2S**
2. **Rear HO2S**
3. **Front HO2S connector**
4. **Rear HO2S connector**
5. **Cable strap (2)**
6. **Crossover HO2S**
7. **Cable strap**
8. **Crossover HO2S connector**
9. **Clip (2)**
10. **Multi-clamp**
11. **Anchored mount strap**
12. **Anchored cable strap**

Figure 6-31. Oxygen Sensors

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE

1. See Figure 6-32. Remove muffler.
   a. Remove screws (1) and lock washers (2).
   b. Loosen clamp (7).
   c. Remove muffler (5).
   d. Discard clamp.
   e. Discard gasket (6), if equipped.
2. Inspect rubber mount (3). Replace if required.

INSTALL

FASTENER	TORQUE VALUE	
Muffler to clamp	38–43 ft-lbs	51.5–58.3 N·m
Muffler to saddlebag support screws	14–18 ft-lbs	19–24.4 N·m

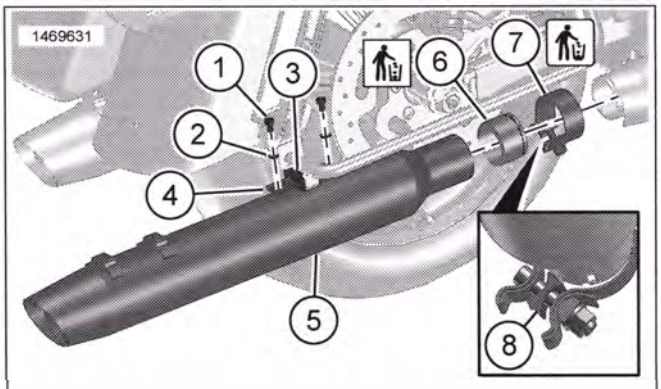
1. See Figure 6-32. Install muffler.

NOTE

Use a pipe expander (such as Snap-on Part No. PH300) on mufflers (5) to aid installation of gaskets (6), if necessary.

Flange on gasket should not be inside muffler inlet.

   a. Install **new** gasket (6) in muffler (5), if equipped.
   b. Slide **new** clamp (7) onto muffler.
   c. Install muffler to bracket (4) with screws (1) and lock washers (2). Tighten. 14–18 ft-lbs (19–24.4 N·m)
   d. Position clamp block (8) away from slot as shown. Tighten. 38–43 ft-lbs (51.5–58.3 N·m)



1. **Screw (2)**
2. **Lock washer (2)**
3. **Rubber mount**
4. **Bracket**
5. **Muffler**
6. **Gasket (if equipped)**
7. **Clamp**
8. **Clamp block**

Figure 6-32. Muffler

COMPLETE

1. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).
5. Remove seat. See CHASSIS > SEAT (Page 3-139).
6. Remove right side rider footboard and brackets from frame. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
7. Disconnect H02 sensor connectors. See FUEL AND EXHAUST > HEATED OXYGEN SENSORS (HO2S) (Page 6-24).

REMOVE

1. See Figure 6-36. Remove exhaust shields.
   a. Remove clamps (16).
   b. Remove shields (7, 14, 17, 18).
2. See Figure 6-35. Remove crossover pipe.
   a. Remove clamp (8) and discard.
   b. Remove screw (2).
   c. Remove cross-over pipe (1).
   d. Remove gasket (7), if equipped and discard.
3. See Figure 6-33. Remove exhaust header pipe.
   a. Remove flange locknut (1).
   b. Remove bracket (2).
   c. Remove flange nuts (3).
   d. See Figure 6-34. Remove flange nuts (2).
   e. Remove exhaust header pipe.
   f. See Figure 6-36. Discard gaskets (9) if equipped.
4. Inspect retaining rings (8) and exhaust flanges (10). Replace if necessary.

INSTALL

FASTENER	TORQUE VALUE	
Exhaust side bracket flange locknut	15–20 ft-lbs	20–27 N·m
Exhaust, crossover pipe clamp	38–43 ft-lbs	51–58 N·m
Exhaust, crossover pipe support clamp screw	14–18 ft-lbs	19–24 N·m
Exhaust, crossover pipe, support bracket screws	11–13 ft-lbs	15–18 N·m
Exhaust, flange nut, front, 1st torque	9–18 **in-lbs**	1–2 N·m
Exhaust, flange nut, front, final torque	100–120 **in-lbs**	11.3–13.6 N·m
Exhaust, flange nut, rear, 1st torque	9–18 **in-lbs**	1–2 N·m
Exhaust, flange nut, rear, final torque	100–120 **in-lbs**	11.3–13.6 N·m
Exhaust, shield clamps	20–40 **in-lbs**	2.3–4.5 N·m

1. See Figure 6-36. If removed, install crossover pipe support bracket.
   a. Install transmission exhaust bracket (5).
   b. Install screws. Tighten
      Torque: 11–13 ft-lbs (15–18 N·m) *Exhaust, crossover pipe, support bracket screws*
2. See Figure 6-36. Install exhaust header pipe.
   a. Slide Flanges (10) on exhaust header pipe.
   b. Install retaining rings (8).
   c. Install **new** gaskets (9) with tapered side out.
   d. Install exhaust header pipes (12,20).
   e. Install flange nuts (11, 19), loosely.
   f. Install bracket (13).
   g. Install flange locknut (15). Do not tighten.
3. See Figure 6-35. Install cross-over pipe.
   a. Slide **new** clamp (8) over cross pipe (1).
   b. Install **new** gasket (7) with ring (6) facing exhaust pipe (5), if equipped.
   c. Install cross-over pipe. Do not tighten clamp.
4. Install cross-over pipe support clamp.
   a. Install crossover pipe support clamp (3).
   b. Install flange bolt (2). Do not tighten.

5. Install mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).

6. Verify exhaust components have proper clearance to reduce noise and vibration.

7. See Figure 6-33 or Figure 6-34. Tighten exhaust flange nuts.

   a. Tighten front flange nuts (4) to first torque.

      Torque: 9–18 **in-lbs** (1–2 N·m) *Exhaust, flange nut, front, 1st torque*

   b. Tighten rear flange nuts (2) to first torque.

      Torque: 9–18 **in-lbs** (1–2 N·m) *Exhaust, flange nut, rear, 1st torque*

   c. Tighten front flange nuts (4) to final torque.

      Torque: 100–120 **in-lbs** (11.3–13.6 N·m) *Exhaust, flange nut, front, final torque*

   d. Tighten rear flange nuts (2) to final torque.

      Torque: 100–120 **in-lbs** (11.3–13.6 N·m) *Exhaust, flange nut, rear, final torque*

8. See Figure 6-36. Tighten remaining exhaust system fasteners.

   a. Flange locknut (15). Tighten.

      Torque: 15–20 ft-lbs (20–27 N·m) *Exhaust side bracket flange locknut*

   b. See Figure 6-35. Cross-over pipe clamp (8). Tighten.

      Torque: 38–43 ft-lbs (51–58 N·m) *Exhaust, crossover pipe clamp*

9. Screw (2). Tighten.

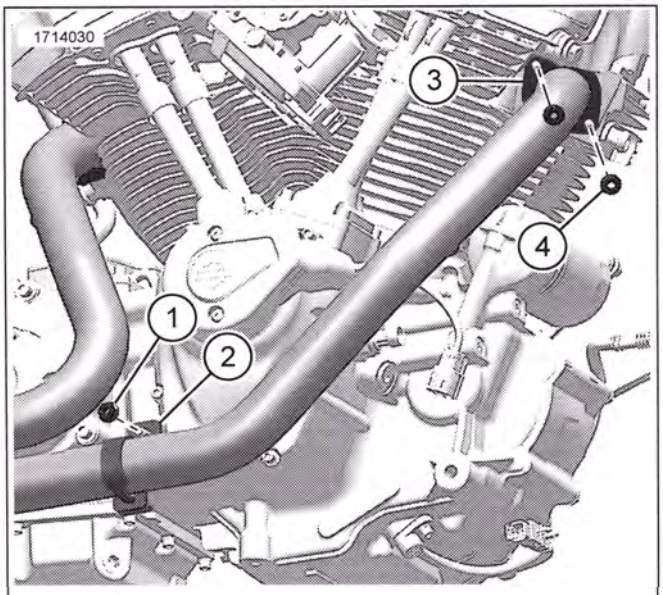
   Torque: 14–18 ft-lbs (19–24 N·m) *Exhaust, crossover pipe support clamp screw*

10. *NOTE*

- *Verify exhaust shields are clear of motorcycle frame or mounted components.*
- *Install cross-over pipe exhaust shield with the longer straight portion toward the muffler.*
- *Position each clamp so screw is positioned on outboard side and is accessible.*

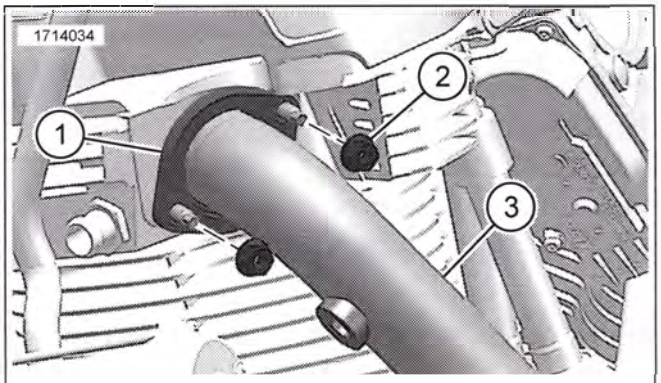
Install exhaust shields (7, 14, 17, 18). Tighten.

Torque: 20–40 **in-lbs** (2.3–4.5 N·m) *Exhaust, shield clamps*



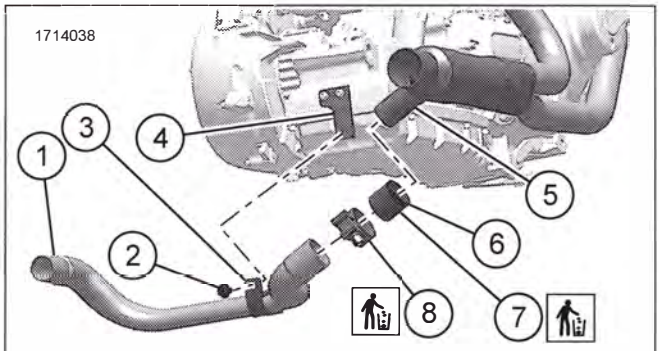
1. **Flange locknut**
2. **Exhaust side bracket**
3. **Front exhaust flange**
4. **Flange nut (2)**

Figure 6-33. Front Exhaust Pipe



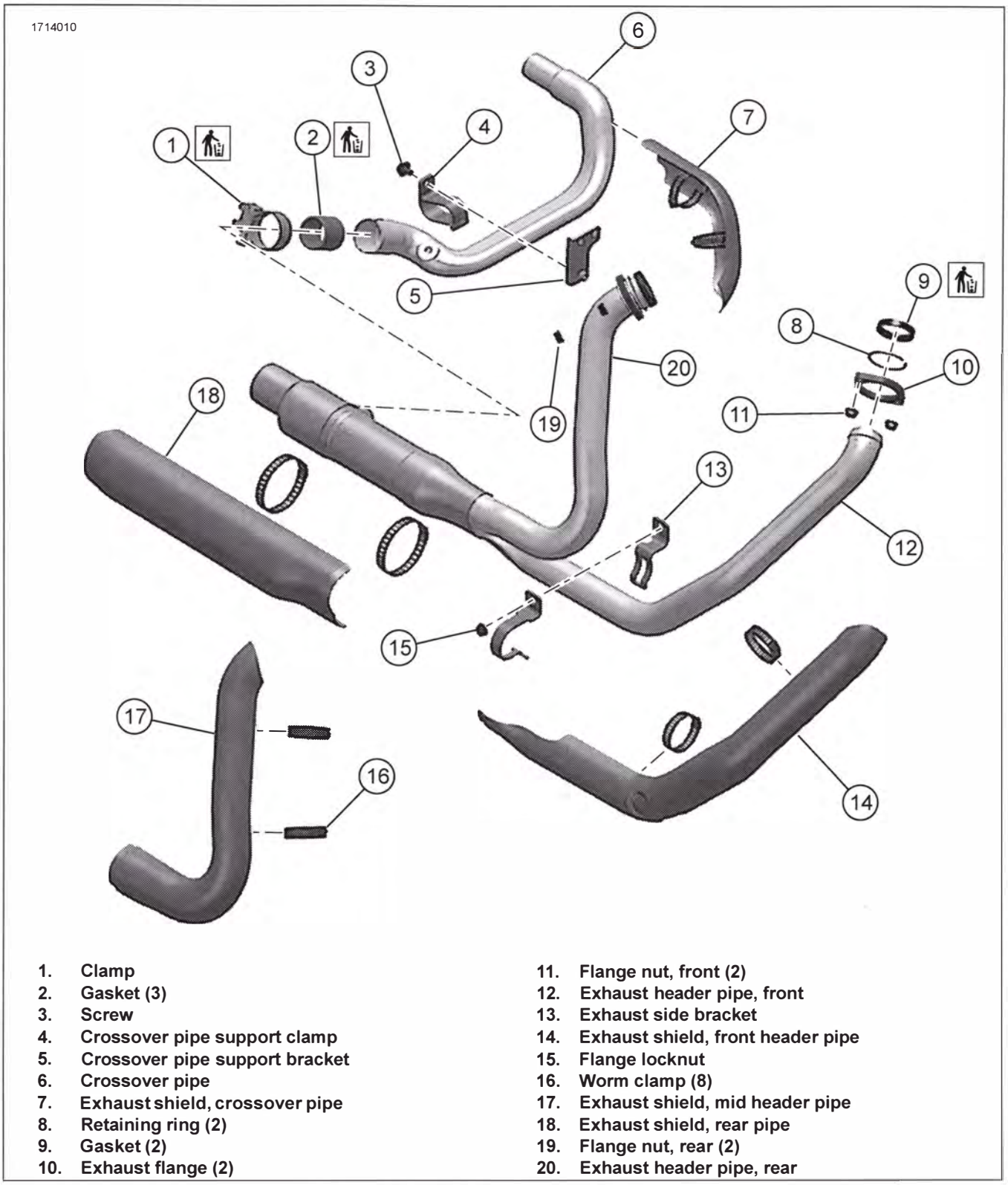
1. **Rear exhaust flange**
2. **Flange nut (2)**
3. **Rear exhaust pipe**

Figure 6-34. Rear Exhaust Pipe



1. **Crossover pipe**
2. **Screw**
3. **Crossover pipe support clamp**
4. **Crossover pipe support bracket**
5. **Exhaust pipe**
6. **Gasket ring (attached to gasket)**
7. **Gasket (if equipped)**
8. **Clamp**

Figure 6-35. Exhaust Pipe, Crossover



1. **Clamp**
2. **Gasket (3)**
3. **Screw**
4. **Crossover pipe support clamp**
5. **Crossover pipe support bracket**
6. **Crossover pipe**
7. **Exhaust shield, crossover pipe**
8. **Retaining ring (2)**
9. **Gasket (2)**
10. **Exhaust flange (2)**
11. **Flange nut, front (2)**
12. **Exhaust header pipe, front**
13. **Exhaust side bracket**
14. **Exhaust shield, front header pipe**
15. **Flange locknut**
16. **Worm clamp (8)**
17. **Exhaust shield, mid header pipe**
18. **Exhaust shield, rear pipe**
19. **Flange nut, rear (2)**
20. **Exhaust header pipe, rear**

Figure 6-36. Exhaust System

COMPLETE

1. Connect HO2 sensor connectors. See FUEL AND EXHAUST > HEATED OXYGEN SENSORS (HO2S) (Page 6-24).
2. Install right side rider foot board and brackets. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Install seat. See CHASSIS > SEAT (Page 3-139).
4. Install mufflers. See FUEL AND EXHAUST > MUFFLERS (Page 6-26).
5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
7. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Reposition and secure left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).

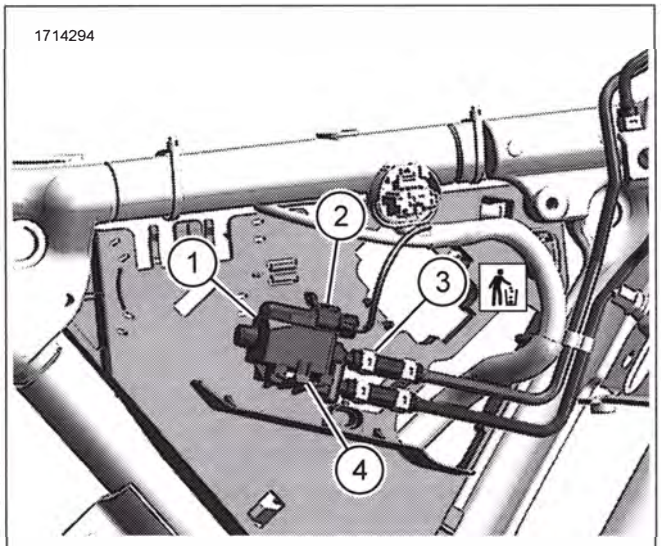
REMOVE

1. See Figure 6-37. Disconnect the purge solenoid connector (2).
2. Remove Evaporative Emissions Control System (EVAP) hoses.
   a. Remove clamps (3) and discard.
   b. Remove hoses.
3. Remove purge solenoid.
   a. Press down on purge solenoid retaining lock (4).
   b. Remove purge solenoid (1).

INSTALL

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

1. Install purge solenoid.
   a. Install purge solenoid (1).
   b. Verify that purge solenoid is secure in purge solenoid retaining lock (4).
2. Install EVAP hoses.
   a. Install hoses.
   b. Install **new** hose clamps (3).
      Special Tool: HOSE CLAMP PLIERS (HD-41137)
3. Connect purge solenoid connector (2).
4. Verify all wiring and evaporative lines are properly retained and not near belt.



1. Purge solenoid
2. Purge solenoid connector
3. Hose clamp (2)
4. Purge solenoid retaining lock

Figure 6-37. Purge Solenoid (behind left side caddy)

COMPLETE

1. Install left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
5. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
4. Remove battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).

REMOVE

1. See Figure 6-38. Remove EVAP hoses.
   a. Remove clamps (1) and discard.
   b. Remove EVAP hoses.
2. See Figure 6-39. Remove charcoal canister.

NOTE

Note location of ground wires.

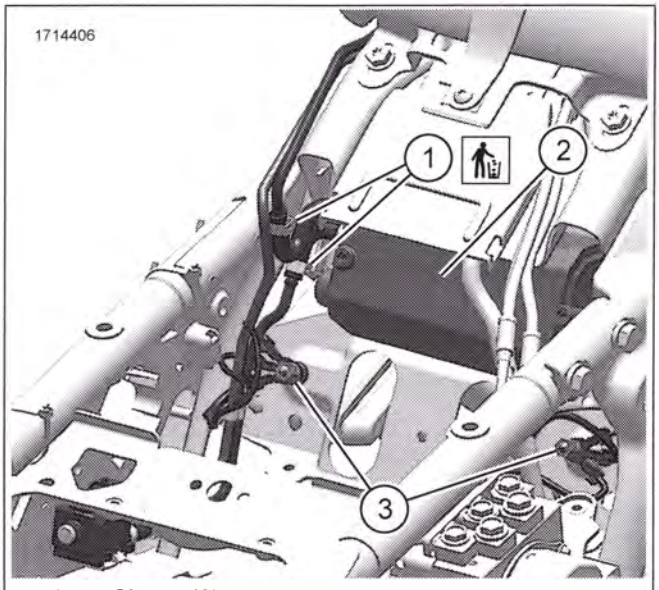
   a. Remove screws (1).
   b. Remove charcoal canister (2).
3. Remove ground studs (3) and ground wires if needed.

INSTALL

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

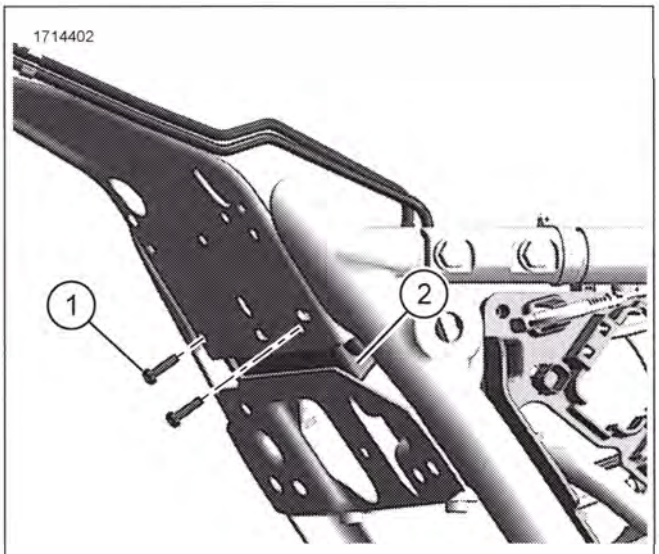
FASTENER	TORQUE VALUE	
Charcoal canister screw	15–20 **in-lbs**	1.7–2.3 N·m

1. See Figure 6-39. Install charcoal canister.
   a. Install charcoal canister (2).
   b. Install screws (1). Tighten.
      Torque: 15–20 **in-lbs** (1.7–2.3 N·m) *Charcoal canister screw*
2. See Figure 6-38. Install EVAP hoses.
   a. Install EVAP hoses.
   b. Install **new** clamps.
      Special Tool: HOSE CLAMP PLIERS (HD-41137)
3. Install ground wires and studs (3) in noted position if removed.



1. **Clamp (2)**
2. **Charcoal canister**
3. **Ground stud (2)**

Figure 6-38. Charcoal Canister EVAP Hoses



1. **Screw (2)**
2. **Charcoal canister**

Figure 6-39. Charcoal Canister

COMPLETE

1. Install battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
2. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
3. Install seat. See CHASSIS > SEAT (Page 3-139).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
4. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
5. Remove battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).

REMOVE

1. See Figure 6-41. Remove fuel inlet-to-charcoal canister line.
   a. Remove clamp (5) and discard.
   b. Remove line (4) from hose.
   c. See Figure 6-40. Remove line from clip (6) and clips (3,4).
   d. Remove line.
   e. Remove clamp (2) and discard.
   f. Remove hose (1).
2. See Figure 6-40. Remove induction module-to-purge solenoid line.
   a. Remove clamp (8) and discard.
   b. Remove line (7) from hose (9).
   c. Remove line from clip (6).
   d. See Figure 6-41. Remove clamp (2) and discard.
   e. Remove line (3) from hose.
   f. Remove line from clip (7).
   g. Remove line.
3. See Figure 6-41. Remove purge solenoid-to-charcoal canister line.
   a. Remove clamps (6,9) and discard.
   b. Remove line (8) from clip (7).
   c. Remove line from hoses.
   d. Remove line.

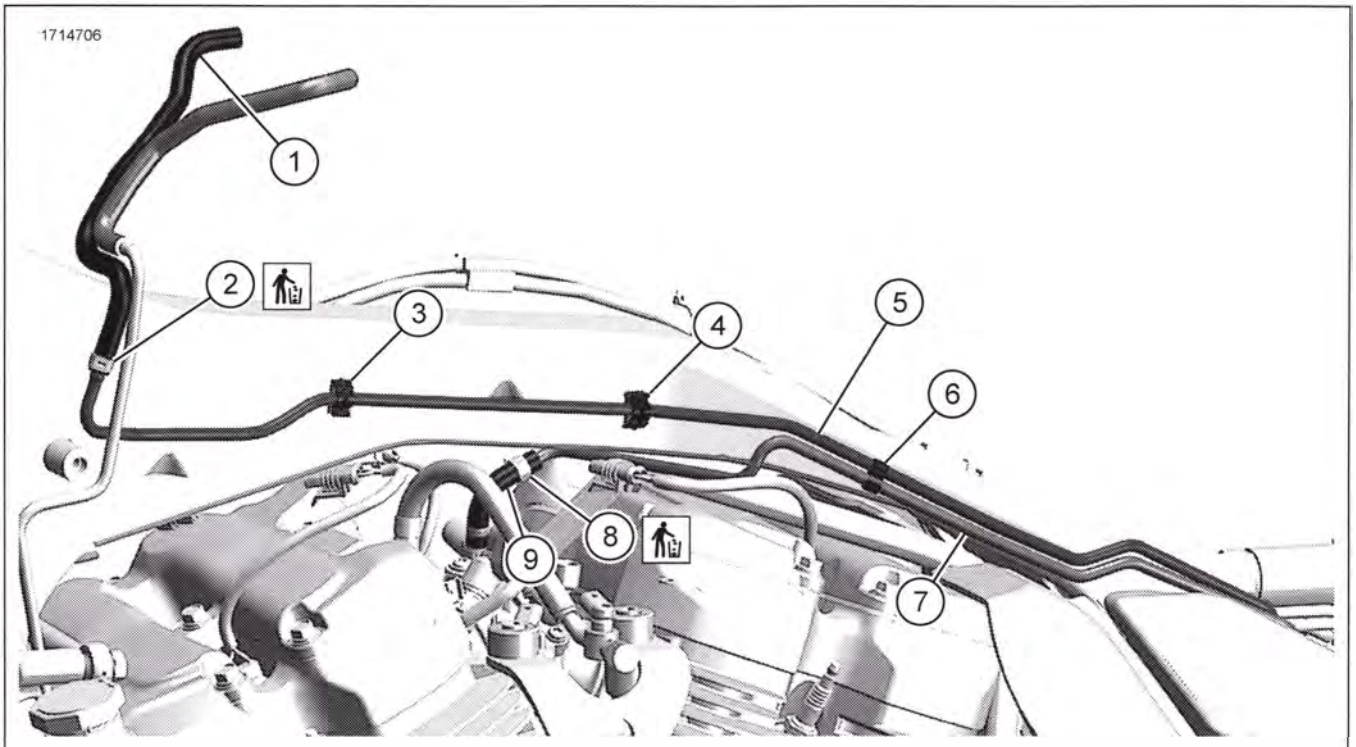
INSTALL

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

NOTE

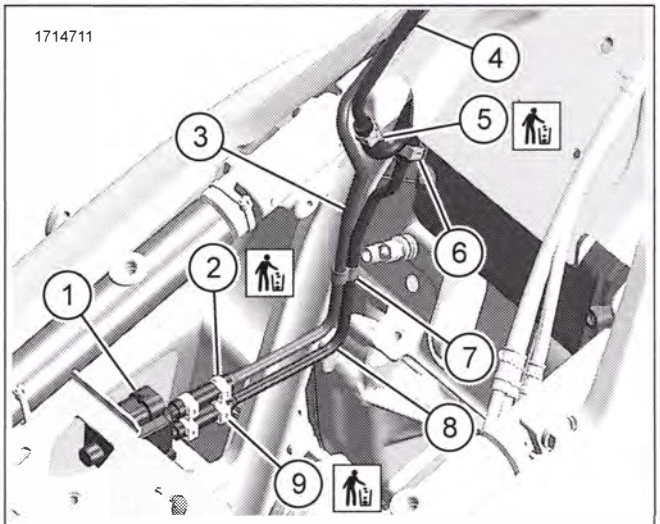
Inspect all lines and hoses for wear or damage and replace as necessary.

1. See Figure 6-41. Install purge solenoid-to-charcoal canister line.
   a. Install line (8) to hoses.
   b. Install **new** clamps (6,9).
      Special Tool: HOSE CLAMP PLIERS (HD-41137)
   c. Install line to clip (7).
2. See Figure 6-40. Install induction module-to-purge solenoid line.
   a. Install line (7) to hose (9).
   b. Install **new** clamp (8).
      Special Tool: HOSE CLAMP PLIERS (HD-41137)
   c. Install line to clip (6).
   d. See Figure 6-41. Install line (3) to hose.
   e. Install **new** clamp (2).
   f. Install line to clip (7).
3. See Figure 6-40. Install fuel inlet-to-charcoal canister line.
   a. Position clip (3) with opening facing down.
   b. Position clip (4) with opening facing up.
   c. Install line (5) in clips.
   d. Install hose (1) on line.
   e. Install **new** clamp (2), do not tighten. Tighten after fuel tank is installed to get proper orientation of hose.
   f. See Figure 6-41. Install line (4) to hose.
   g. Install **new** clamp (5).



1. Hose
2. Clamp
3. Clip
4. Clip
5. Fuel inlet-to-charcoal canister line
6. Fixed spacer clip
7. Induction module-to-purge solenoid line
8. Clamp
9. Hose

Figure 6-40. Evaporative Emissions Control System (EVAP) Line Routing



1. Purge solenoid
2. Clamp
3. Induction module-to-purge solenoid line
4. Fuel inlet-to-charcoal canister line
5. Clamp
6. Clamp
7. Fixed spacer clip
8. Purge solenoid-to-charcoal canister line
9. Clamp

Figure 6-41. Purge Tube Connections and Routing

COMPLETE

1. Install battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
2. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
3. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
4. Install seat. See CHASSIS > SEAT (Page 3-139).
5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

NOTES

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7.2 SPECIFICATIONS....7-2
7.3 COOLANT FLOW....7-3
7.4 DIAGNOSE AND TEST....7-5
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7.10 RADIATOR....7-22

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Coolant pump bracket, screw	80–97 **in-lbs**	9–11 N·m	7.6 COOLANT PUMP, Install
Coolant pump bracket, screws	33–39 **in-lbs**	3.7–4.4 N·m	7.6 COOLANT PUMP, Install
Coolant temperature sensor	212–230 **in-lbs**	24–26 N·m	7.9 ENGINE COOLANT TEMPERATURE (ECT) SENSOR, Install

GENERAL

Table 7-1. Capacities

ITEM	QUARTS	LITERS
Coolant capacity	0.82	0.78

Table 7-2. Coolant Pressure

ITEM	PSI	KPA
Cap lower limit	18	124
Rated cap pressure	20	138
Cap upper limit	22	152

Table 7-3. Coolant Temperatures

ITEM	°F	°C
Engine temperature lamp	428	220
Antifreeze protection	-34	-36.7

Table 7-4. Fan Operation *

STATUS	Coolant Temperature	
	°F	°C
On (below 40 mph)	194	90
Off (below 40 mph)	181	83
On (above 40 mph)	230	110
Off (above 40 mph)	216	102
Fan and pump will run after vehicle shutdown until 188 °F (87 °C) is reached or three minutes, whichever occurs first.		

OPERATION

Engine Below Operating Temperature

See Figure 7-1. During cold start operation, coolant pump (6) is off. Coolant will not circulate until the temp sensor reaches a value of 147.1 °F (64 °C) or engine is running for 150 seconds, whichever occurs first.

Coolant Flow with Engine at Operating Temperature

With engine at operating temperature the coolant pump turns on. The coolant follows a single loop starting from the pump. From the pump (6), coolant flows through the rear head (1), front head (2), radiator (4), and back to the pump.

Coolant Reservoir

The coolant reservoir (5) is unique on this powertrain. It integrates both a pressurized coolant fill location and overflow reservoir in one assembly.

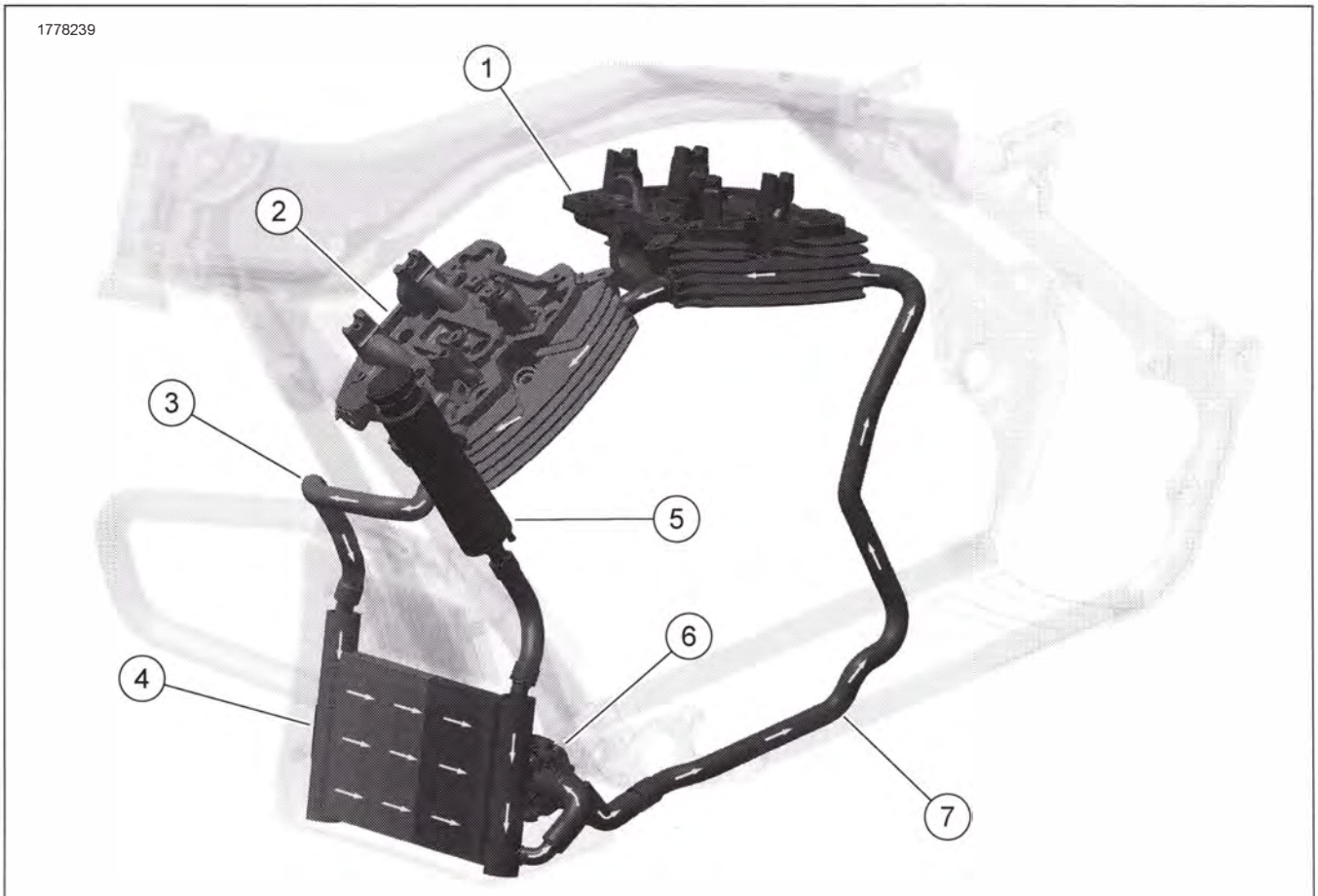
See Figure 7-2. Both the pressurized coolant in the system fill tube (3) and non-pressurized coolant contained outside the fill tube, can exist during vehicle operation.

1. Coolant reservoir operation.

   a. When pressure cap primary valve opens during system fluid expansion, coolant flows through passage (1) and into overflow reservoir through internal suction tube (2).

   b. When pressure cap secondary valve opens during system fluid cool down, coolant is pulled into the system from the overflow reservoir through internal suction tube (2).

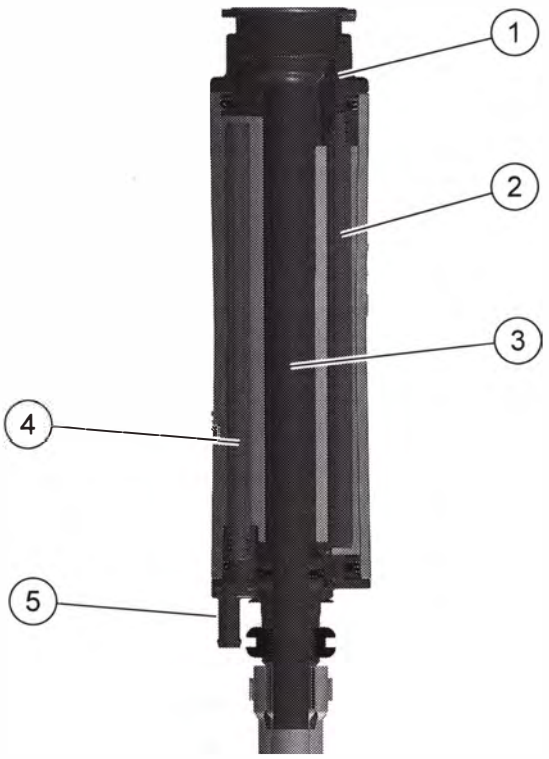
   c. If an overheat situation occurs where excess coolant is pushed into the overflow reservoir, internal vent tube (4) is designed to channel the excess to the external vent port (5) and to the ground.



1. **Rear cylinder head**
2. **Front cylinder head**
3. **Inlet hose**
4. **Radiator**
5. **Coolant reservoir**
6. **Coolant pump**
7. **Rear head coolant hose**

Figure 7-1. Coolant Flow

1781224



1. Passage
2. Internal suction tube
3. System fill tube
4. Internal vent tube
5. External vent port

Figure 7-2. Coolant Reservoir Flow

TROUBLESHOOTING

TROUBLESHOOTING

⚠ 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)

High Engine Temperature

- Blocked hoses, pipes or passages
- Restricted air flow through radiator
- Defective cooling fan
- Faulty coolant pump
- Low coolant level
- Air in system
- Defective pressure cap
- Defective engine coolant sensor

Coolant Leaks

- Pressure cap not properly installed
- Damaged pressure cap gasket
- Deteriorated O-rings on coolant pump or manifolds
- Leaking hose or hose connection

PRESSURE CAP TEST

PART NUMBER	TOOL NAME
HD-45335	COOLANT SYSTEM PRESSURE TESTER

PRESSURE CAP TEST

Test pressure cap for the correct operating range every time the coolant is changed or any cooling system maintenance performed.

⚠ WARNING

Do not loosen or remove pressure cap when cooling system is hot. The cooling system is under pressure and hot coolant and steam can escape from pressure cap, which could cause severe burns. Allow motorcycle to cool before servicing the cooling system. (00091c)

1. Remove pressure cap.
2. Inspect cap for gasket deterioration and inoperative springs.
3. **New cap:** Wet the upper sealing gasket before turning onto adapter.
4. See Figure 7-3. Connect tester to pressure cap.

   Special Tool: COOLANT SYSTEM PRESSURE TESTER (HD-45335)
5. Pump handle to pressurize cap. Stop pumping when pressure limiting valve in cap opens.
6. Replace pressure cap if:
   a. Opens below low limit, 18 psi (124 kPa).
   b. Opens above high limit, 22 psi (152 kPa).
   c. Pressure falls rapidly when pressurized within range.
7. Remove adapter and cap.
8. See Figure 7-4. Check vacuum valve at the center of the radiator cap for proper operation.
   a. Verify vacuum valve (1) can be easily opened with a finger nail and with little effort.
   b. Open the vacuum valve to verify it is not frozen and snaps back closed when released.

NOTE

- *An indication that the vacuum valve is not opening is when the system cools the radiator hoses will collapse.*
- *Normal function of the vacuum valve will allow it to open as the system cools to ambient temperature and coolant will be drawn back into the main system from the overflow bottle.*

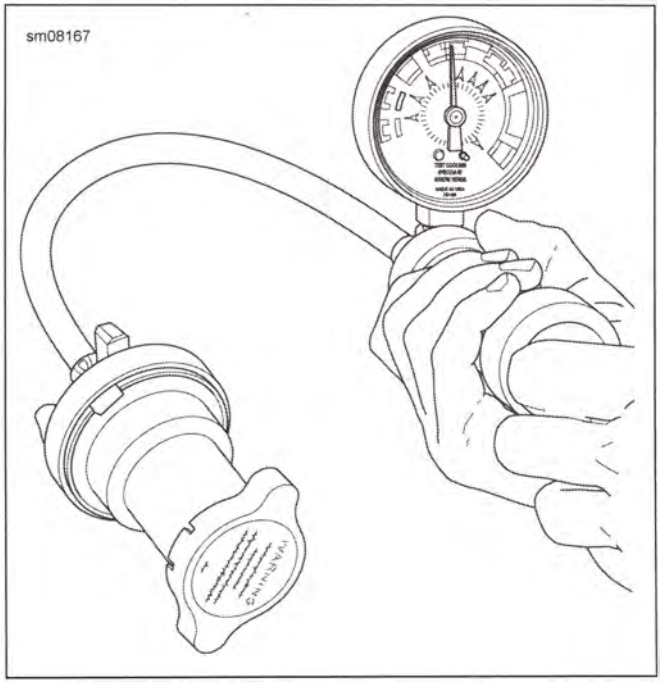
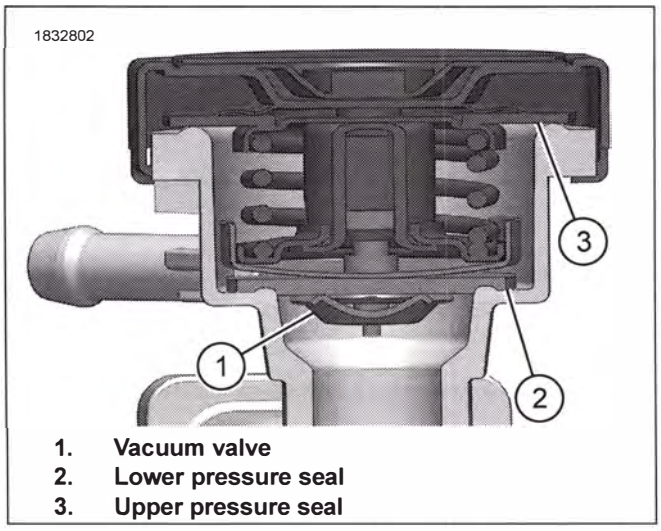


Figure 7-3. Pressure Cap Test



1. **Vacuum valve**
2. **Lower pressure seal**
3. **Upper pressure seal**

Figure 7-4. Radiator Pressure Cap

SYSTEM PRESSURE TEST

PART NUMBER	TOOL NAME
HD-45335	COOLANT SYSTEM PRESSURE TESTER

SYSTEM PRESSURE TEST

1. See Figure 7-5. Before troubleshooting cooling system, make sure that engine coolant level is at or slightly above COLD full mark on reservoir (2).

⚠ WARNING

Do not loosen or remove pressure cap when cooling system is hot. The cooling system is under pressure and hot coolant and steam can escape from pressure cap, which could cause severe burns. Allow motorcycle to cool before servicing the cooling system. (00091c)

2. Remove coolant pressure cap.

NOTE

Damaged reservoir neck cams, reservoir stops and sealing surfaces can cause cap to leak or affect pressure limiting valve. Replace reservoir if damaged. Damaged cap stop can also cause a coolant leak. Replace cap if damaged.

3. Clean and inspect reservoir (2) cap connection surface.

NOTE

Wet upper sealing surfaces before turning adapter onto tester head.

4. Connect tester to reservoir.

   Special Tool: COOLANT SYSTEM PRESSURE TESTER (HD-45335)

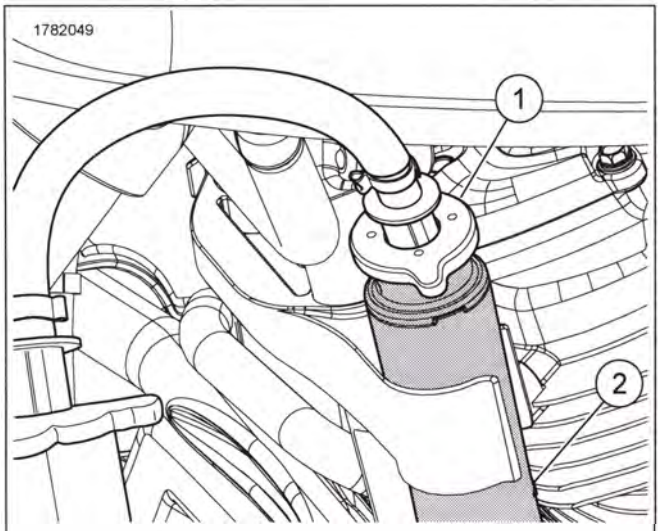
NOTE

When performing the coolant system pressure test, never exceed the upper limit rating of the pressure cap. Excessive pressure can rupture cooling pipes and radiator.

5. Pump tester until pressure reaches 20 psi (138 kPa).
6. Observe pressure gauge and proceed as indicated in Table 7-5.
7. Release system pressure. Remove tester from reservoir.

Table 7-5. System Pressure Test

NEEDLE MOVEMENT	LEAK	ACTION
Holds steady for 2 minutes	None	None
Drops slowly	Small	Perform dye test
Drops quickly	Major	Perform visual inspection



1. **Test adapter**
2. **Reservoir**

Figure 7-5. System Pressure Test

FREEZE POINT TEST

PART NUMBER	TOOL NAME
HD-23688	COOLANT TESTER (F)
HD-26568	COOLANT TESTER (C)

CONSUMABLE	PART NUMBER
GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT	99822-02A

FREEZE POINT TEST

1. Allow engine to cool.
2. Remove pressure cap.
3. Place a few drops of coolant from filler neck onto prism of either one of the following testers.

   Special Tool: COOLANT TESTER (F) (HD-23688)
   Special Tool: COOLANT TESTER (C) (HD-26568)

4. Hold prism up to a light.
5. Coolant freeze point is the mark where the dark area begins on the ETHYLENE GLYCOL temperature scale.

6. Compare freeze point of coolant to anticipated operating or storage temperatures. Replace as required. See COOLING SYSTEM > COOLANT (Page 7-9).

   a. If indicated freeze point is less than specified on the container, replace with antifreeze.

      GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT (99822-02A)

   b. If anticipated cold temperatures exceed that of Harley-Davidson premixed antifreeze, replace with a mixture of de-ionized water and ethylene glycol antifreeze. Follow directions on the container to create a mixture with a freeze point that will exceed the expected cold temperature.

7. Install pressure cap.

LEAK DETECTION DYE TEST

PART NUMBER	TOOL NAME
HD-29545-6A	COOLANT FLUORESCENT LEAK DETECTION DYE
HD-35457	BLACK LIGHT LEAK DETECTOR

LEAK DETECTION DYE TEST

1. Before troubleshooting cooling system, make sure that engine coolant level is at COLD FULL mark on reservoir.

NOTE

If reservoir is empty when engine is cold, check system fill tube. If system fill tube is empty air has been drawn into coolant system. Fill/Bleed system See COOLANT > DRAIN AND FILL COOLING SYSTEM (Page 7-10).

⚠ WARNING

Do not loosen or remove pressure cap when cooling system is hot. The cooling system is under pressure and hot coolant and steam can escape from pressure cap, which could cause severe burns. Allow motorcycle to cool before servicing the cooling system. (00091c)

2. Remove filler cap.

3. If system fill tube is full of coolant, remove an amount of coolant equal to amount of dye.

4. See Figure 7-6. Pour dye into system fill tube.

   Special Tool: COOLANT FLUORESCENT LEAK DETECTION DYE (HD-29545-6A)

5. Install pressure cap. Run engine for 10 minutes.

6. Use detector to illuminate entire cooling system. A yellow fluorescence indicates a leak.

NOTE

Locally source an LED UV light, 365 NM, 10 Watts or greater or use BLACK LIGHT LEAK DETECTOR (PART NUMBER: HD-35457).

7. Inspect engine oil for yellow dye.

NOTE

Dye in oil may indicate a damaged engine head gasket. Draining and replacing coolant contaminated oil is necessary as part of engine service.

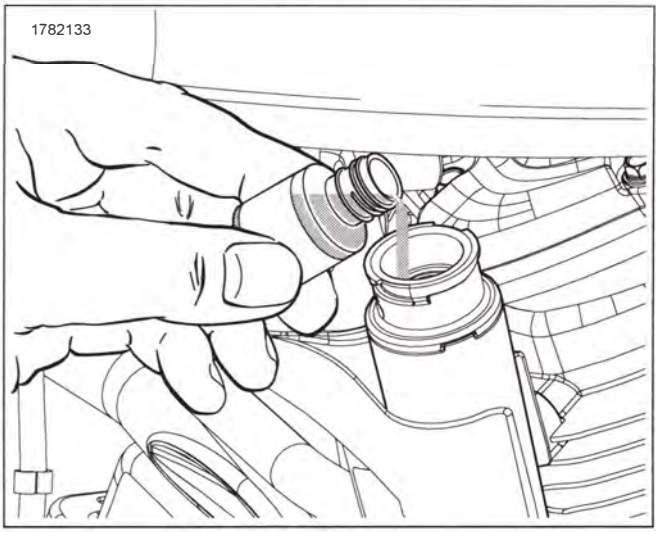


Figure 7-6. Leak Detection Dye Test

GASKET LEAK TEST

PART NUMBER	TOOL NAME
HD-45335	COOLANT SYSTEM PRESSURE TESTER

GASKET LEAK TEST

Perform the following tests if a leak exists but no external evidence of a leak is found.

1. Start and run cold engine.

   a. White smoke from exhaust system indicates a leaking gasket.

2. Run engine. Turn off engine.

   a. Remove oil level dipstick. Light-colored foam on dipstick indicates a leaking gasket.

   b. Open oil drain plug. Drain a small amount of oil. Water or coolant drains out first if gasket is leaking.

NOTE

- *Do not allow pressure to build up past maximum for system. If pressure rises past maximum, 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 NUMBER: HD-45335) installed. There is no safety valve with the pressure cap removed and the COOLANT SYSTEM PRESSURE TESTER (PART NUMBER: HD-45335) installed.*

3. Install tester.

   Special Tool: COOLANT SYSTEM PRESSURE TESTER (HD-45335)

⚠ WARNING

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

4. Start cold engine and idle engine to normal operating temperature.

   a. If gauge indicates fast pressure buildup, a gasket is leaking.

   b. If pressure does not build up immediately, pump the tester to 20 psi (138 kPa).

   c. A vibrating needle indicates a leaking cylinder head gasket.

   d. Turn off engine. Disable one spark plug at the coil. Start engine. Repeat for other cylinder. The needle stops vibrating when spark is removed from leaking cylinder.

NOTE

Always replace engine oil after replacing cylinder head gasket.

CHECK COOLANT LEVEL

CONSUMABLE	PART NUMBER
GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT	99822-02A

⚠ CAUTION

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

⚠ WARNING

Do not loosen or remove pressure cap when cooling system is hot. The cooling system is under pressure and hot coolant and steam can escape from pressure cap, which could cause severe burns. Allow motorcycle to cool before servicing the cooling system. (00091c)

NOTE

If reservoir is empty when engine is cold, inspect system for leaks. Repair as needed. Bleed coolant system.

1. Allow engine to cool.
2. See Figure 7-7. Check coolant level.
   a. Check that coolant level is between cold level mark (3) and maximum cold level mark (1).
   b. Remove reservoir from clip.
   c. Remove reservoir pressure cap (2).
   d. Holding reservoir vertical.
   e. See Figure 7-8. Verify coolant (2) and full to top of center tube.
3. Add coolant to system fill tube.

   Consumable: GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT (99822-02A)

   NOTE

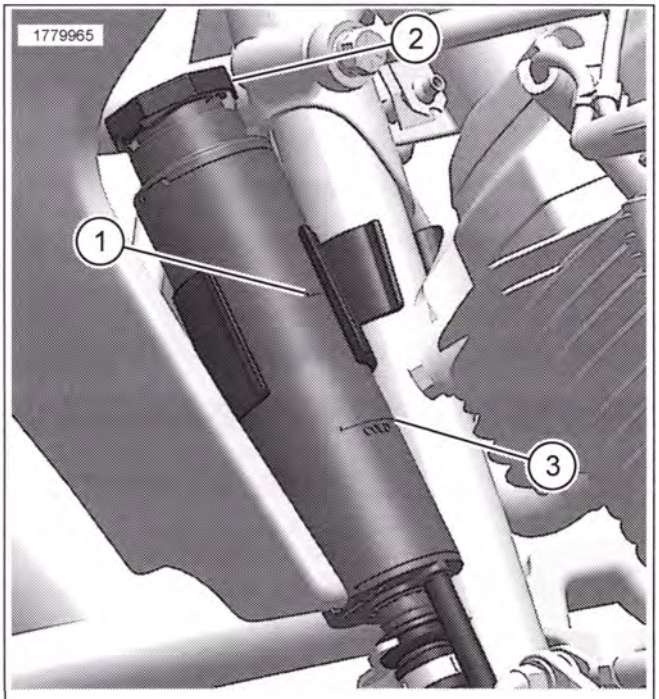
   Do not over fill.

   a. Hold reservoir vertical.
   b. Add coolant (2) to system fill tube just below reservoir coolant passage (1).
4. Add coolant to outer reservoir.

   NOTE

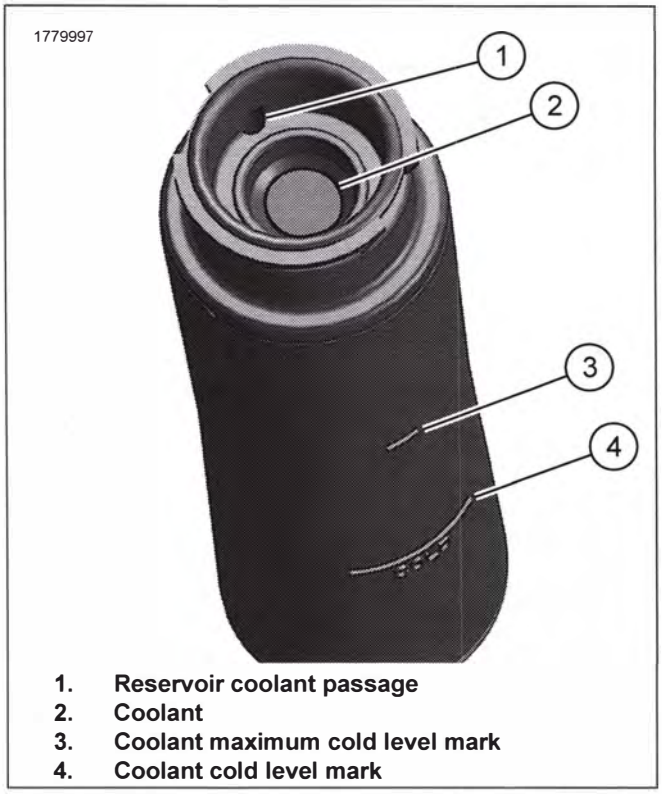
   Do not over fill. Coolant level should fall between upper and lower coolant level marks when cold.

   a. Hold reservoir vertical.
   b. Slightly tip reservoir towards reservoir coolant passage (1) to allow coolant to enter outer reservoir.
   c. Tip reservoir backup.
   d. Check coolant cold level mark (4).
   e. Repeat process until coolant level is slightly above coolant cold level mark.
5. See Figure 7-7. Install reservoir pressure cap (2).
6. Install reservoir in clip.



1. **Coolant maximum cold level mark**
2. **Reservoir pressure cap**
3. **Coolant cold level mark**

Figure 7-7. Coolant Level



1. **Reservoir coolant passage**
2. **Coolant**
3. **Coolant maximum cold level mark**
4. **Coolant cold level mark**

Figure 7-8. Reservoir Coolant Level

DRAIN AND FILL COOLING SYSTEM

PART NUMBER	TOOL NAME
MCR102A	MATCO COOLING SYSTEM FILLER
MPT10128	COOLING SYSTEM ADAPTER
SVT262-28A	SNAP-ON COOLING SYSTEM ADAPTER
SVTSRAD272A	SNAP-ON VACUUM COOLING SYSTEM FILLER

⚠ CAUTION

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

⚠ WARNING

Do not loosen or remove pressure cap when cooling system is hot. The cooling system is under pressure and hot coolant and steam can escape from pressure cap, which could cause severe burns. Allow motorcycle to cool before servicing the cooling system. (00091c)

Drain

1. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
2. Allow engine to cool.
3. See Figure 7-10. Disconnect Coolant pump and radiator outlet hoses.
   a. Remove and dispose of clamp (6).
   b. Disconnect radiator outlet hose (5).
   c. Remove clamp (3).
   d. Disconnect Coolant pump outlet hose (4).
   e. Remove reservoir pressure cap.
   f. Lower hoses to drain.
4. Remove reservoir from clip.
5. Pour any remaining coolant from reservoir.
6. Discard used coolant.

Fill/Bleed Coolant System

NOTICE

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

NOTE

- *Coolant system cannot be filled without bleeding.*
- *Coolant must be drained before attaching vacuum refiller.*
- *Engine must be cool.*
- ***A vacuum bleeder must be used to fill the coolant system. Using a conventional method will not purge major air pockets in cooling system and will cause engine damage.***
- *Harley-Davidson recommends using MATCO COOLING SYSTEM FILLER (PART NUMBER: MCR102A) along with COOLING SYSTEM ADAPTER (PART NUMBER: MPT10128) OR SNAP-ON VACUUM COOLING SYSTEM FILLER (PART NUMBER: SVTSRAD272A) along with SNAP-ON COOLING SYSTEM ADAPTER (PART NUMBER: SVT262-28A) or equivalent. This allows for a vacuum test of the complete system and effective filling with coolant.*
- *Follow manufacturer's instructions supplied with tool. A general overview follows.*

1. Create a vacuum on cooling system.
   a. Drain coolant system. See previous procedure.
   b. See Figure 7-11. Remove pressure cap (2).
   c. See Figure 7-9. Attach vacuum filler tool.
   d. Connect to low-pressure, compressed air.
   e. Immerse coolant pick-up hose into **new** coolant mixture. Fill hose and tool with coolant to purge air.
   f. Turn on air valve and observe vacuum gauge. When gauge has stabilized, turn off air valve.
   g. Observe vacuum gauge to verify that it remains steady.

NOTE

Loss of vacuum indicates a leak in system. Investigate leak before continuing.

h. Purge air in pick-up hose by opening coolant valve just enough to allow system to fill coolant pick-up hose. Turn off coolant valve.

i. Turn on air valve and observe vacuum gauge. When gauge has stabilized, turn off air valve.

j. Open coolant valve to allow system to fill.

k. Remove vacuum filler tool.

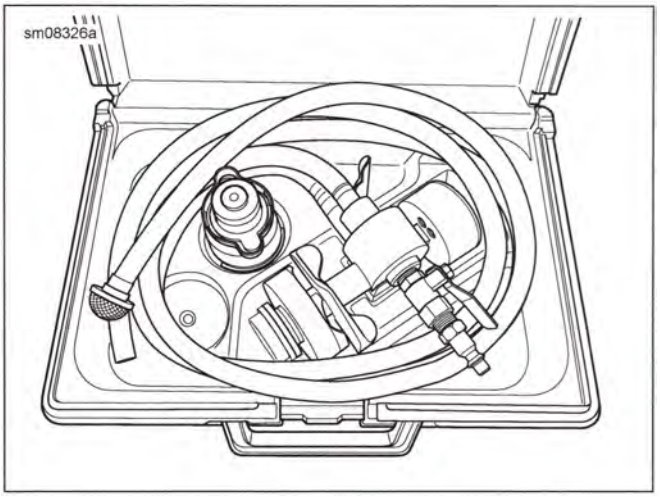


Figure 7-9. Matco Vacuum Venturi Cooling System Refiller

2. See Figure 7-12. Verify coolant (2) is at correct level in system fill tube if not add coolant.

3. Turn on coolant fan and pump.

   a. Hold throttle wide-open.

   b. Press engine OFF/RUN/START switch to run. Hold throttle until coolant fan and pump activates.

4. As the pump runs, continue to add coolant until filler neck remains topped off.

5. Remove trapped air in hoses.

   a. Squeeze/massage coolant hoses to get out trapped air.

   b. Verify that no bubbles appear in system fill tube if they do continue removing trapped air.

6. Fill reservoir.

NOTE

See Figure 7-13. Verify pressure cap is tightened. Pressure cap stop (2) must contact reservoir stop (1) for proper system operation.

   a. Fill system fill tube.

   b. Tip reservoir to allow coolant to enter outer reservoir.

   c. Check coolant cold level mark.

   d. Continue filling outer reservoir until at or above coolant cold level mark.

7. Install coolant pressure cap.

8. Install reservoir in clip.

9. Turn coolant fan and pump off by turning off ignition switch.

10. Activate cooling fan.

    a. Run bike to operating temperature.

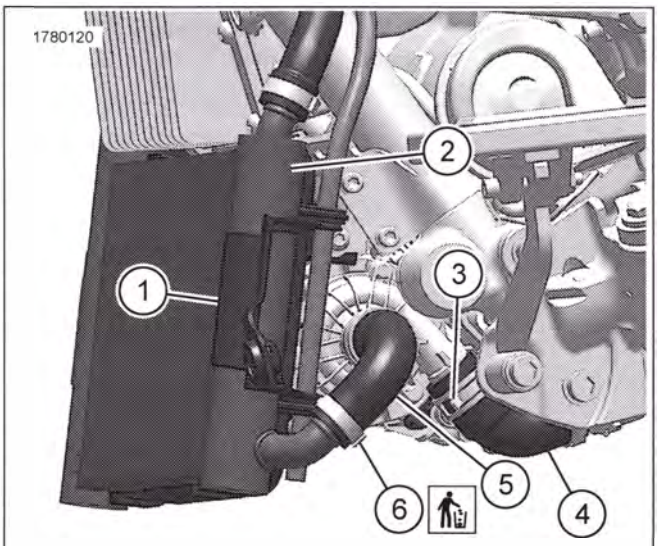
    b. Run until coolant temperature activates cooling fan.

    c. When fan cycles off, turn off ignition.

11. Let bike cool.

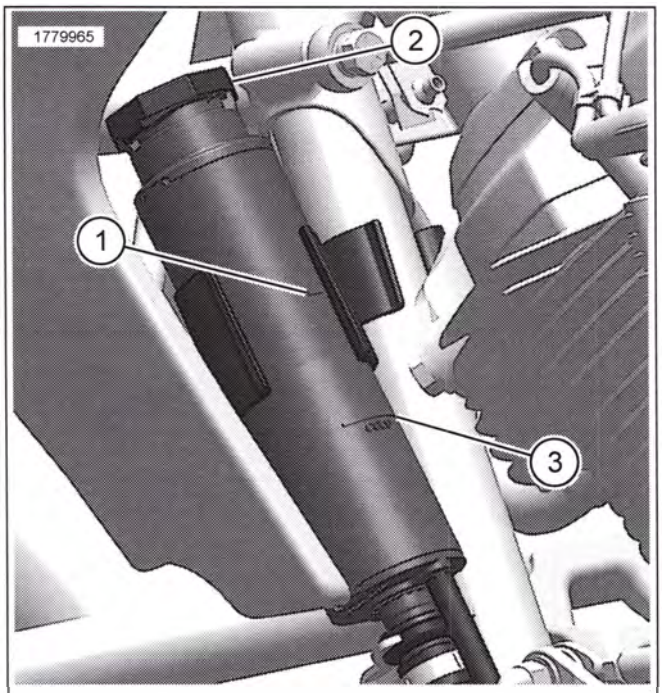
12. Remove pressure cap.

13. Verify coolant levels in system fill tube and outer reservoir coolant cold level are at correct level.



1. **Clip**
2. **Radiator**
3. **Clamp**
4. **Coolant pump outlet hose**
5. **Radiator outlet hose**
6. **Clamp**

Figure 7-10. Drain Coolant



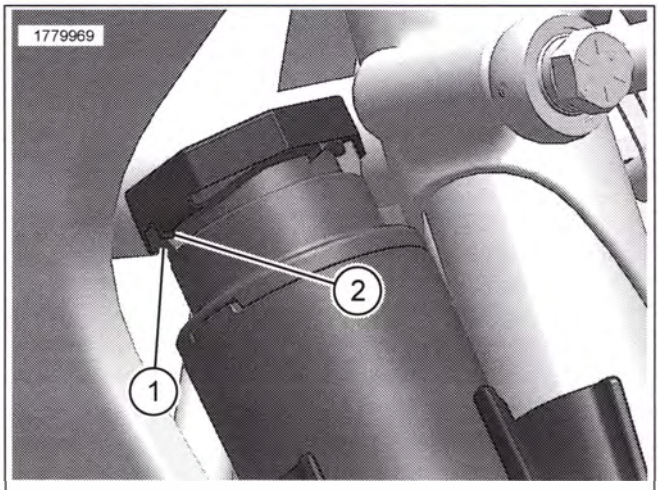
1. Coolant maximum cold level mark
2. Reservoir pressure cap
3. Coolant cold level mark

Figure 7-11. Coolant Level



1. Reservoir coolant passage
2. Coolant
3. Coolant maximum cold level mark
4. Coolant cold level mark

Figure 7-12. Reservoir Coolant Level



1. Reservoir stop
2. Pressure cap stop

Figure 7-13. Radiator Pressure Cap Installation

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
5. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).

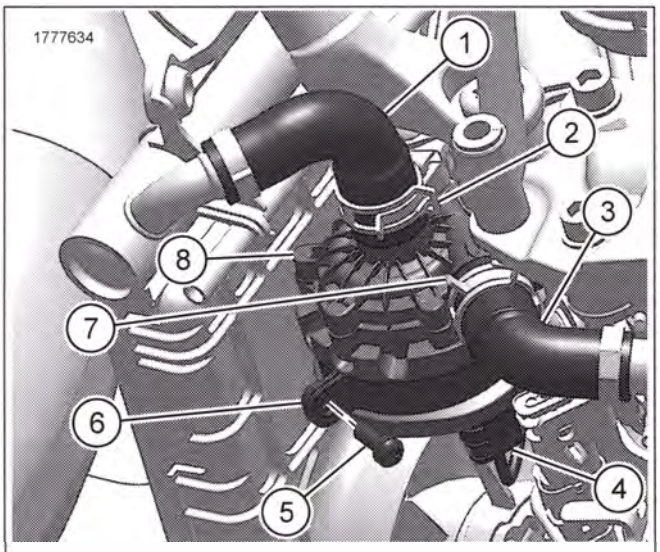
REMOVE

1. See Figure 7-14. Disconnect pump connector (4).
2. Disconnect coolant pump hoses.
   a. Remove Clamp (2).
   b. Disconnect inlet hose (1).
   c. Remove clamp (7).
   d. Disconnect outlet hose (3).
3. Remove coolant pump.
   a. Remove screw (5).
   b. Open coolant pump bracket (6).
   c. Remove coolant pump (8).
4. Remove coolant system bracket. See ELECTRICAL > COOLING FAN (Page 8-59).
5. See Figure 7-15. Remove coolant pump bracket.
   a. Remove screws (1).
   b. Remove coolant pump bracket (2).

INSTALL

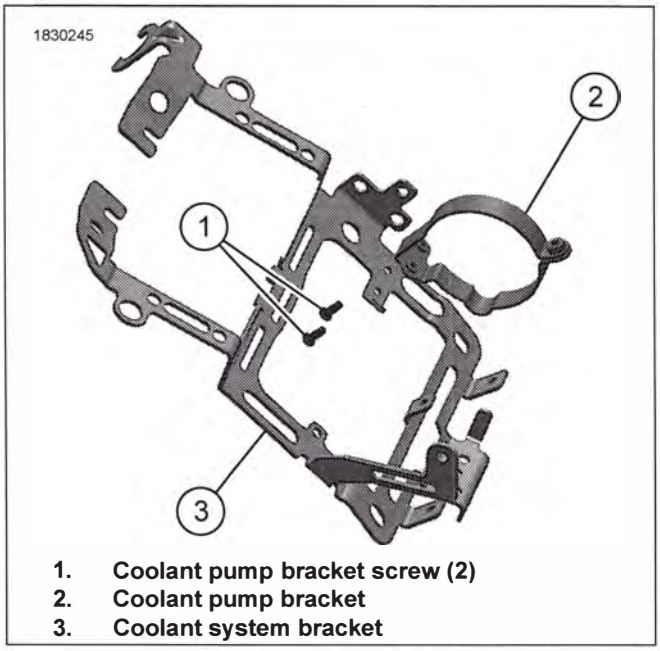
FASTENER	TORQUE VALUE	
Coolant pump bracket, screw	80–97 **in-lbs**	9–11 N·m
Coolant pump bracket, screws	33–39 **in-lbs**	3.7–4.4 N·m

1. See Figure 7-15. Assemble coolant pump bracket.
   a. Align holes on coolant pump bracket (2) with holes in coolant system bracket (3).
   b. Install screw (1). Tighten.
      Torque: 33–39 **in-lbs** (3.7–4.4 N·m) *Coolant pump bracket, screws*
2. Install coolant system bracket. See ELECTRICAL > COOLING FAN (Page 8-59).
3. See Figure 7-14. Install coolant pump.
   a. Install coolant pump (8).
   b. Install screw (5). Tighten.
      Torque: 80–97 **in-lbs** (9–11 N·m) *Coolant pump bracket, screw*
4. Connect coolant pump hoses.
   a. Connect outlet hose (3).
   b. Install clamp (7).
   c. Connect inlet hose (1).
   d. Install clamp (2).
5. Connect pump connector (4).



1. **Inlet hose**
2. **Clamp**
3. **Outlet hose**
4. **Pump connector**
5. **Screw**
6. **Bracket**
7. **Clamp**
8. **Coolant pump**

Figure 7-14. Coolant Pump



1. **Coolant pump bracket screw (2)**
2. **Coolant pump bracket**
3. **Coolant system bracket**

Figure 7-15. Coolant Pump Bracket

COMPLETE

1. Fill/Bleed cooling system. See COOLING SYSTEM > COOLANT (Page 7-9).
2. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
5. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).

REMOVE

NOTE

Reservoir cap should be on to reduce coolant from being released.

1. See Figure 7-16. Remove coolant reservoir (1) from clip (2).
2. Disconnect coolant reservoir hose.
   a. See Figure 7-17. Disconnect overflow hose (1).
   b. Remove and dispose of clamp (4).
   c. Disconnect reservoir hose (5).
   d. Remove coolant reservoir (2).

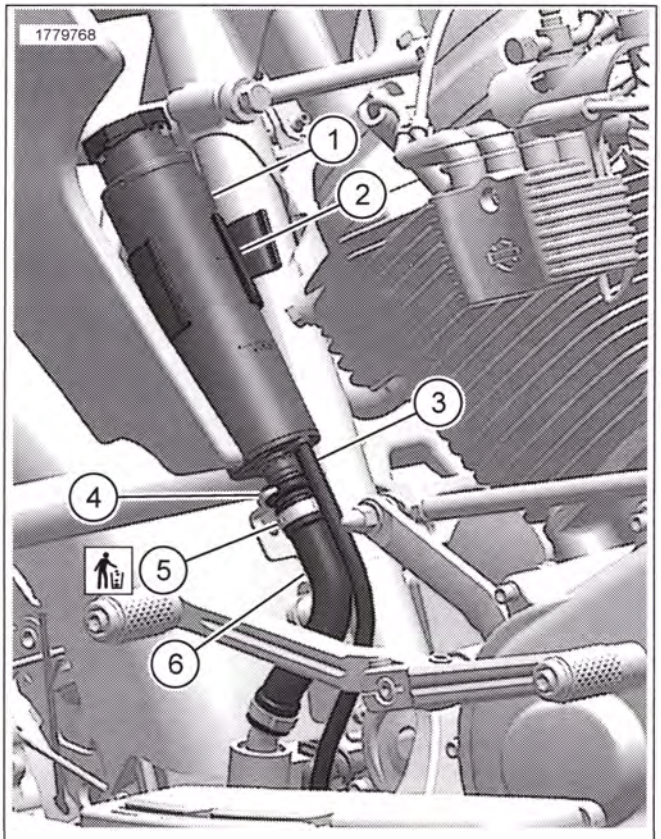
INSTALL

1. See Figure 7-17. Connect coolant reservoir hose.

NOTE

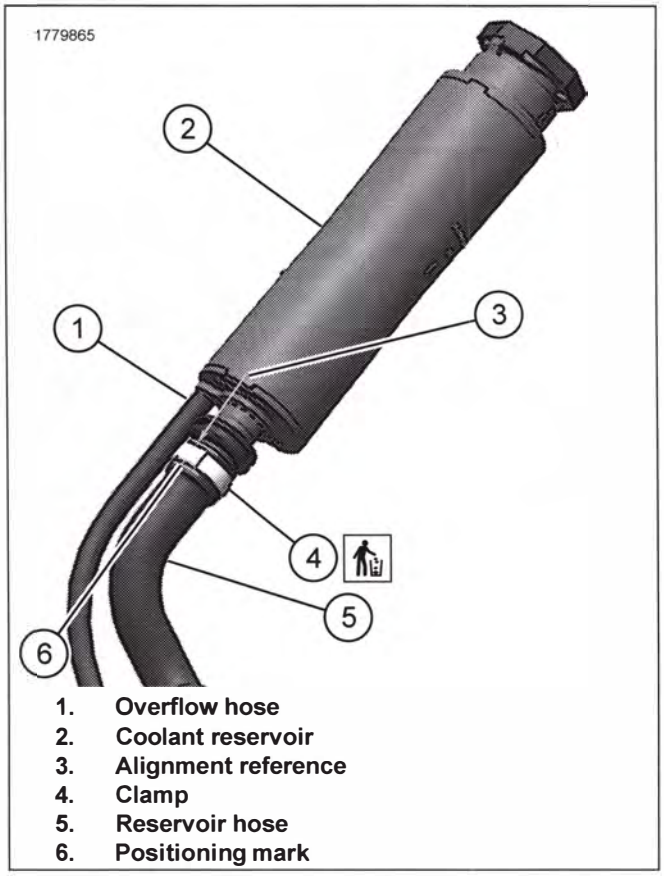
Proper alignment of reservoir hose and clamp is necessary for proper reservoir installation.

   a. Connect coolant reservoir hose (5).
   b. Align positioning mark (6) with alignment reference (3).
   c. Install **new** clamp (4).
   d. Connect overflow hose (1).
2. See Figure 7-16. Install coolant reservoir.
   a. Align grommet with bracket (4).
   b. Install coolant reservoir (1) onto clip (2).



1. **Coolant reservoir**
2. **Clip**
3. **Overflow hose**
4. **Bracket**
5. **Clamp**
6. **Reservoir hose**

Figure 7-16. Coolant Reservoir



1. **Overflow hose**
2. **Coolant reservoir**
3. **Alignment reference**
4. **Clamp**
5. **Reservoir hose**
6. **Positioning mark**

Figure 7-17. Reservoir Hose and Clamp Placement

COMPLETE

1. Fill/Bleed cooling system. See COOLING SYSTEM > COOLANT (Page 7-9).
2. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
5. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).
6. If removing cylinder head to head coolant connector hose.
   a. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
   b. Remove ignition coil and mount. See ELECTRICAL > IGNITION COIL (Page 8-17).
   c. Remove air cleaner backplate assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
   d. Remove induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).

REMOVE

1. See Figure 7-19. Remove inlet hose.
   a. Remove clamps (1).
   b. Remove inlet hose (2).
2. See Figure 7-20. Remove reservoir hose.
   a. Remove clamps (1,3).
   b. Remove reservoir hose (2).
3. Remove radiator outlet hose.
   a. Remove clamps (4,6).
   b. Remove radiator outlet hose (5).
4. See Figure 7-21. Remove coolant pump outlet hose.
   a. Remove clamps (6,7).
   b. Remove coolant pump outlet hose (1).
5. Remove rear head coolant hose.
   a. Remove clamp (5).
   b. Remove rear head coolant hose (3) from hose connector (2).
   c. Lubricate rear head coolant hose with equal mix of isopropyl alcohol and water.
   d. See Figure 7-22. Remove clamp (2).
   e. Remove rear head coolant hose (1) from hose connector.
   f. See Figure 7-23. Pull rear head coolant hose (1) out through rear head coolant hose shield (2).
   g. Remove rear head coolant hose.
6. See Figure 7-24. Remove cylinder head to head coolant connector hose.
   a. Remove clamps (2).
   b. Remove cylinder head coolant connector hose (1).

INSTALL

NOTE

See Figure 7-18. Use proper positioning of coolant clamps for installation of coolant hoses.

- *Clamps (1,2) to be located parallel between positioning marks (2).*
- *Clamp (1) crimp to be located on horizontal line of positioning mark (2).*

1. See Figure 7-24. Install cylinder head to head coolant connector hose.
   a. Install cylinder head coolant connector hose (1).
   b. Install **new** clamps (2).
2. See Figure 7-23. Install rear head coolant hose.
   a. Lubricate rear head coolant hose (1) with equal mix of isopropyl alcohol and water.
   b. Route rear head coolant hose through Rear head coolant shield (2).
   c. See Figure 7-22. Connect Rear head coolant hose (1) to rear cylinder head coolant fitting.
   d. Install **new** clamp (2).
   e. See Figure 7-21. Route rear head coolant hose (3) through hose guide (4).
   f. Slide hose connector (2) into hose until lip of hose connector contacts hose.
   g. Install clamp (5).

3. Install coolant pump outlet hose.

   a. Install coolant pump outlet hose (1) on coolant pump (8).

   b. Install clamp (7).

   c. Slide hose connector (2) into coolant pump outlet hose until lip of hose connector contacts hose.

   d. Install **new** clamp (6).

4. See Figure 7-20. Install radiator outlet hose.

   a. Install radiator outlet hose (5).

   b. Install clamp (4).

   c. Install **new** clamp (6).

5. Install reservoir hose.

   a. Install reservoir hose (2).

   b. Install **new** clamp (1).

   c. Install **new** clamp (3).

6. See Figure 7-19. Install Inlet hose.

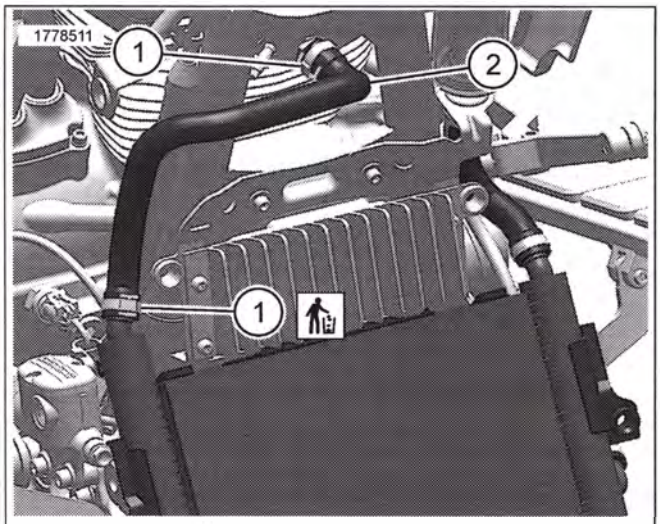
   a. Install Inlet hose (2).

   b. Install **new** clamps (1).



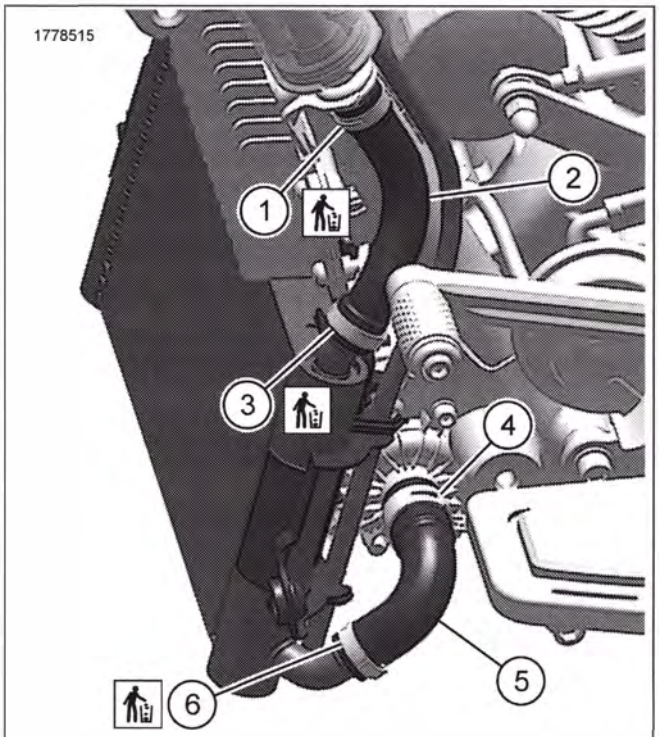
1. Hose clamp
2. Positioning mark
3. Hose clamp

Figure 7-18. Coolant Clamp Position (example)



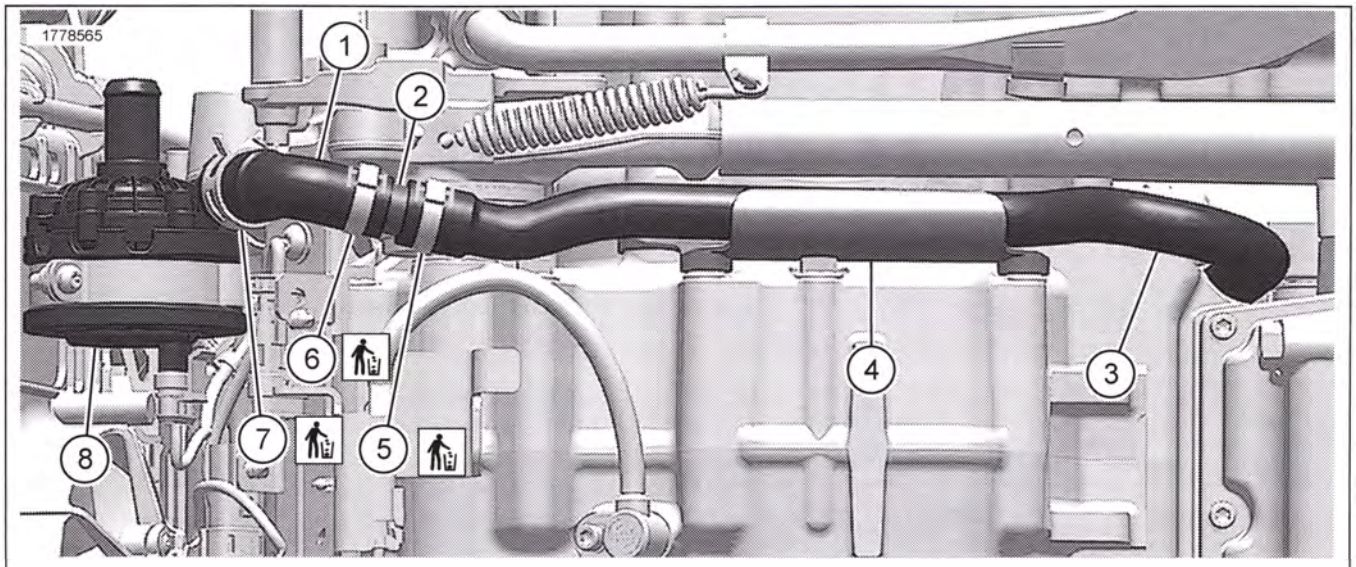
1. Clamp (2)
2. Inlet hose

Figure 7-19. Coolant Inlet Hose



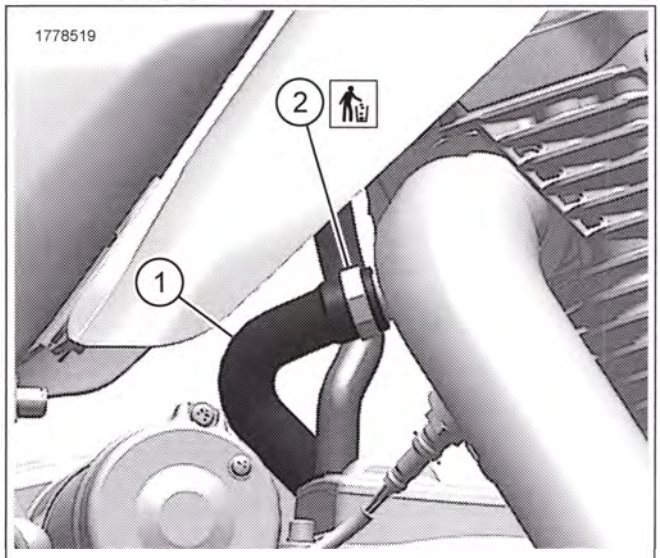
1. Clamp
2. Reservoir hose
3. Clamp
4. Clamp
5. Radiator outlet hose
6. Clamp

Figure 7-20. Coolant Hoses (left side)



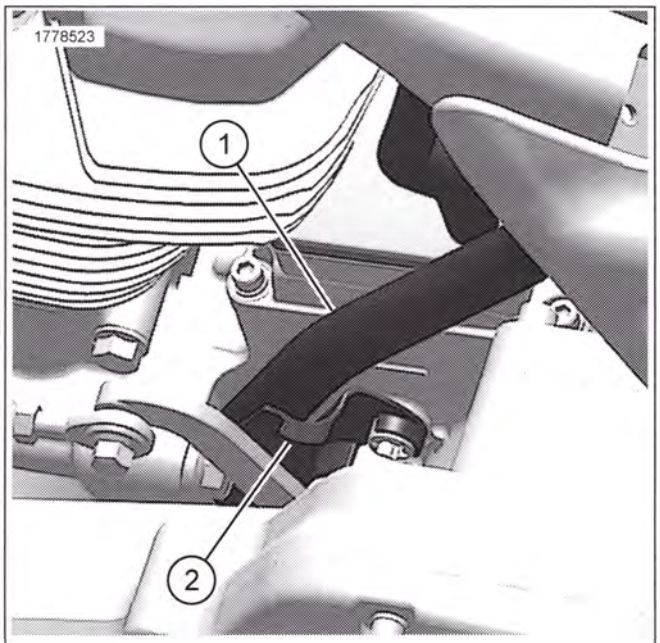
1. Coolant pump outlet hose
2. Hose connector
3. Rear head coolant hose
4. Hose guide
5. Clamp
6. Clamp
7. Clamp
8. Coolant pump

Figure 7-21. Rear Head Coolant Hose (view from bottom)



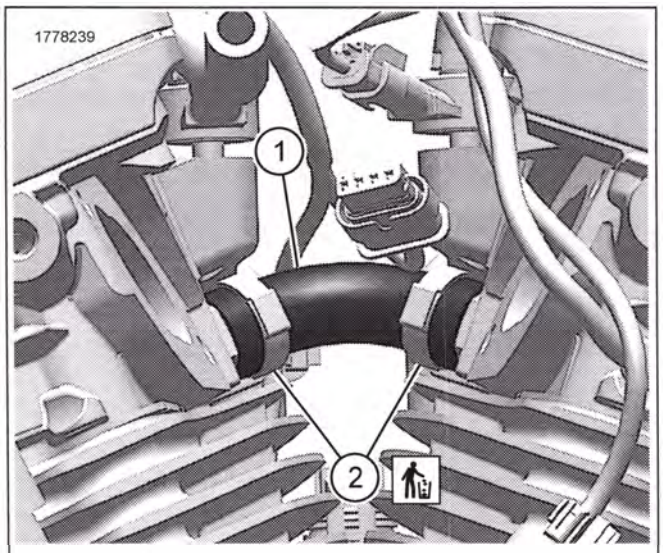
1. Rear head coolant hose
2. Clamp

Figure 7-22. Rear Head Coolant Hose Connection



1. Rear head coolant hose
2. Rear head coolant hose shield

Figure 7-23. Rear Head Coolant Hose Routing



1. **Cylinder head coolant connector hose**
2. **Clamp (2)**

Figure 7-24. Cylinder Head Coolant Connector Hose

COMPLETE

1. If cylinder head coolant connector hose was removed.

    a. Install induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).

    b. Install air cleaner backplate assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).

    c. Install ignition coil and mount. See ELECTRICAL > IGNITION COIL (Page 8-17).

    d. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

2. Fill/Bleed cooling system. See COOLING SYSTEM > COOLANT (Page 7-9).

3. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

6. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

REMOVE

1. See Figure 7-25. Remove ECT sensor.
   a. Disconnect connector (1).
   b. Remove ECT sensor (2).

INSTALL

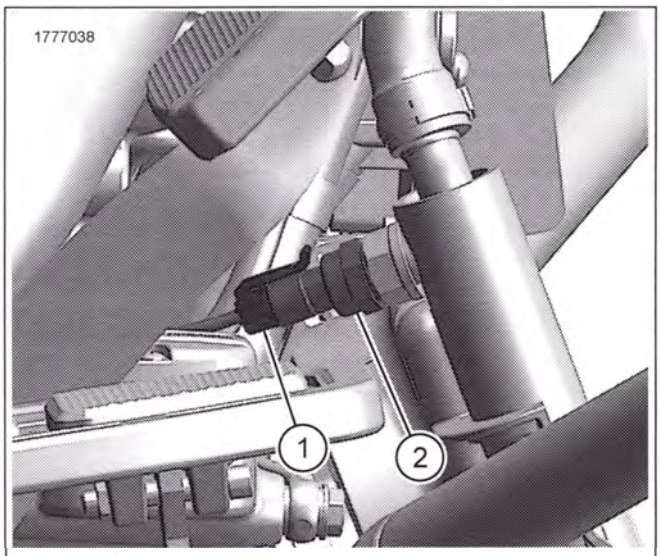
FASTENER	TORQUE VALUE	
Coolant temperature sensor	212–230 **in-lbs**	24–26 N·m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

NOTE

Avoid getting sealant on sensor probe.

1. See Figure 7-25. Apply sealant to ECT sensor (2).
   Consumable: LOCTITE 565 THREAD SEALANT (99818-97)
2. Install ECT sensor.
   a. Install sensor. Tighten.
   Torque: 212–230 **in-lbs** (24–26 N·m) *Coolant temperature sensor*
   b. Install connector.



1. ECT sensor connector
2. ECT sensor

Figure 7-25. ECT Sensor

COMPLETE

1. Install radiator shroud. See .
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
5. Drain coolant. See COOLING SYSTEM > COOLANT (Page 7-9).

REMOVE

1. See Figure 7-26. Disconnect coolant hoses.

NOTE

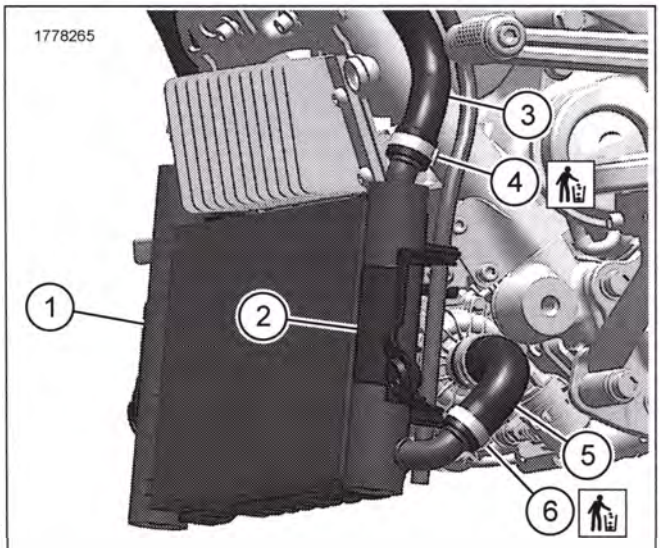
Clamp (6) and hose (5) will be disconnected when drained.

   a. Remove and dispose of clamp (4).
   b. Disconnect reservoir hose (3).
   c. See Figure 7-27. Remove and dispose of clamp (4).
   d. Disconnect inlet hose (3).

2. Disconnect ECT sensor connector (2).
3. Remove radiator.
   a. Unclip radiator (1) from fan shroud clip (5).
   b. Remove radiator from fan shroud ledge (7).

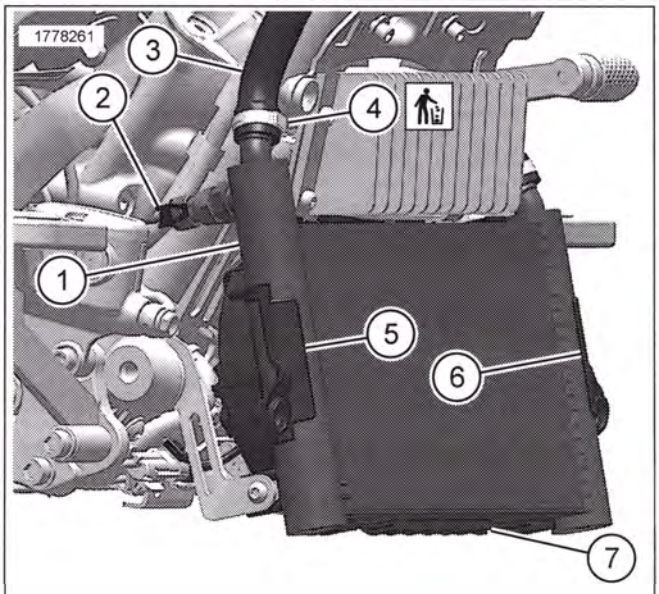
INSTALL

1. See Figure 7-27. Install radiator.
   a. Install radiator (1) on fan shroud ledge (7).
   b. Install radiator in fan shroud clips (5,6).
2. Connect ECT sensor connector (2).
3. Connect coolant hoses.
   a. Connect inlet hose (3).
   b. Install clamp (4).
   c. See Figure 7-26. Connect reservoir hose (3).
   d. Install clamp (4).
   e. Connect outlet hose (5).
   f. Install clamp (6).



1. **Radiator**
2. **Fan shroud clip (left side)**
3. **Reservoir hose**
4. **Clamp**
5. **Outlet hose**
6. **Clamp**

Figure 7-26. Radiator (left side)



1. **Radiator**
2. **ECT sensor connector**
3. **Inlet hose**
4. **Clamp**
5. **Fan shroud clip (right side)**
6. **Fan shroud clip (left side)**
7. **Fan shroud ledge**

Figure 7-27. Radiator (right side)

COMPLETE

1. Fill/Bleed cooling system. See COOLING SYSTEM > COOLANT (Page 7-9).

2. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
ABS module locknuts	53–89 **in-lbs**	6–10 N·m	8.47 RIGHT SIDE CADDY, Install
ABS module locknuts	53–89 **in-lbs**	6–10 N·m	8.49 BATTERY TRAY, Install
ACR	17–19 ft-lbs	23–26.4 N·m	8.38 AUTOMATIC COMPRESSION RELEASE (ACR), Install
Amplifier screws	49–60 **in-lbs**	5.5–6.8 N·m	8.22 AUDIO AMPLIFIER, Install
Antenna amplifier, screw	11–14 **in-lbs**	1.25–1.6 N·m	8.24 HIDDEN ANTENNA, Install
Battery tray screws	11–13 ft-lbs	15–18 N·m	8.47 RIGHT SIDE CADDY, Install
Battery tray screws	11–13 ft-lbs	15–18 N·m	8.49 BATTERY TRAY, Install
Battery tray to right side caddy screw	35–44 **in-lbs**	4–5 N·m	8.47 RIGHT SIDE CADDY, Install
Battery tray to right side caddy screw	35–44 **in-lbs**	4–5 N·m	8.49 BATTERY TRAY, Install
BCM caddy screw	27–35 **in-lbs**	3–4 N·m	8.27 BODY CONTROL MODULE (BCM), Install
Brake lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
Brake lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
Brake switch screw	4–6 **in-lbs**	0.5–0.7 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Front Brake Switch Replacement
Caddy, left side, screws	71–97 **in-lbs**	8–11 N·m	8.46 LEFT SIDE CADDY, Install
Camshaft cover screws	72–96 **in-lbs**	8.1–10.8 N·m	8.35 CAMSHAFT TIMING SENSOR, Install
Camshaft sensor cover screw	72–96 **in-lbs**	8.1–10.8 N·m	8.35 CAMSHAFT TIMING SENSOR, Install
Clutch lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
Clutch lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
Clutch switch cover screw	7–11 **in-lbs**	0.8–1.2 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Clutch Switch Replacement
Clutch switch screw	4–5 **in-lbs**	0.49–0.61 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Clutch Switch Replacement
Coolant system bracket, lower, screws	20–22 ft-lbs	27–30 N·m	8.32 COOLING FAN, Install
Cooling fan bracket screws	70–85 **in-lbs**	7.9–9.6 N·m	8.32 COOLING FAN, Install
Crankcase sensor screw	90–120 **in-lbs**	10.17–13.55 N·m	8.34 CRANKSHAFT POSITION SENSOR (CKP), Install
Engine guard, upper, screws	90–110 **in-lbs**	10.2–12.4 N·m	8.32 COOLING FAN, Install
Engine temperature (ET) sensor	10–15 ft-lbs	13.6–20.3 N·m	8.36 ENGINE TEMPERATURE (ET) SENSOR, Install
Fork lock screw, 1st torque	19.5 **in-lbs**	2.2 N·m	8.13 FORK LOCK, Install
Fork lock screw, final torque or until they snap off		540°	8.13 FORK LOCK, Install
Gear position sensor cover screws	72–96 **in-lbs**	8.13–10.8 N·m	8.39 GEAR POSITION SENSOR, Install
Ground studs, under seat	44–89 **in-lbs**	5–10 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
Ground studs, under seat	44–89 **in-lbs**	5–10 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
Handlebar clamp screws	16–18 ft-lbs	21.7–24.4 N·m	8.23 FRONT SPEAKERS, Remove and Install: Fork Mounted Fairing
HD-53290 Alternator rotor installer/remover	15 **in-lbs**	1.7 N·m	8.6 ALTERNATOR, Remove

FASTENER	TORQUE VALUE		NOTES
Headlamp, adjuster bracket screws, single headlamp	25–35 **in-lbs**	2.8–3.95 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp, ball end retainer screws, single headlamp	25–35 **in-lbs**	2.8–3.95 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp, horizontal, mounting screws, single headlamp	60–84 **in-lbs**	6.8–9.5 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp mounting screws, dual headlamp	96–119 **in-lbs**	10.8–13.5 N·m	8.16 HEADLAMP, Remove and Install: Dual Headlamp
Headlamp mounting screws, single headlamp	30–37 **in-lbs**	3.4–4.2 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp stabilizer bracket screws, single headlamp	30–37 **in-lbs**	3.4–4.2 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Horn bracket, screws	71–97 **in-lbs**	8–11 N·m	8.15 HORN, Install
Horn nut	80–100 **in-lbs**	9–11.3 N·m	8.15 HORN, Install
IFCU display mounting screws	9–11 ft-lbs	12.1–14.7 N·m	8.12 IFCU DISPLAY, Install
IFCU display trim screws	7.5–10.5 **in-lbs**	0.85–1.19 N·m	8.12 IFCU DISPLAY, Install
Ignition coil screw	11–14 ft-lbs	14.9–19 N·m	8.9 IGNITION COIL, Install
IMU screws	32–40 **in-lbs**	3.6–4.5 N·m	8.42 INERTIAL MEASUREMENT UNIT (IMU), Install
Jiffy stand sensor screw	97–124 **in-lbs**	11–14 N·m	8.43 JIFFY STAND SENSOR (JSS), Install
Knock sensor, screws	16–18 ft-lbs	22–24 N·m	8.37 KNOCK SENSOR (KS), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM cover screw	27–31 **in-lbs**	3–3.5 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
License plate bracket screws	60–80 **in-lbs**	6.8–9 N·m	8.21 LICENSE PLATE LAMP, Install
License plate lamp cover to license plate bracket screws	6.2–8.0 **in-lbs**	0.7–0.9 N·m	8.21 LICENSE PLATE LAMP, Install
License plate lamp screws	3.7–5.1 **in-lbs**	0.42–0.58 N·m	8.21 LICENSE PLATE LAMP, Install
Negative battery cable screw to battery	60–70 **in-lbs**	6.8–7.9 N·m	8.4 POWER DISCONNECT, Negative Battery Cable
Oil pressure switch	13–17 ft-lbs	17–23 N·m	8.14 OIL PRESSURE SWITCH, Install
Rear stop lamp switch	12 ft-lbs	16.3 N·m	8.20 REAR STOPLAMP SWITCH, Install
Relay housing, saddlebag lock, screws, right side	25–35 **in-lbs**	2.8–3.9 N·m	8.47 RIGHT SIDE CADDY, Install
Relay housing, saddlebag lock. screws, right side	25–35 **in-lbs**	2.8–3.9 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install

FASTENER	TORQUE VALUE		NOTES
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, throttle grip sensor screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM cover screws	27–31 **in-lbs**	3–3.5 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
Speaker, front, fork mounted fairing, grille screw	11–14 **in-lbs**	1.24–1.58 N·m	8.23 FRONT SPEAKERS, Remove and Install: Fork Mounted Fairing
Speaker, front, fork mounted fairing, screws	9–13 **in-lbs**	1–1.5 N·m	8.23 FRONT SPEAKERS, Remove and Install: Fork Mounted Fairing
Speaker, front, frame mounted fairing, screws	9–13 **in-lbs**	1–1.5 N·m	8.23 FRONT SPEAKERS, Remove and Install: Frame Mounted Fairing
Starter mounting screws	22–24 ft-lbs	29.8–32.5 N·m	8.5 STARTER, Install Apply a light coat of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
Starter solenoid nut	80–90 **in-lbs**	9–10.2 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
Starter solenoid stud nut	80–90 **in-lbs**	9–10.2 N·m	8.5 STARTER, Install
Stator mounting screws	55–75 **in-lbs**	6.2–8.5 N·m	8.6 ALTERNATOR, Install
Tail/Turn lamp assembly nuts	60–80 **in-lbs**	6.8–9 N·m	8.19 TAIL LAMP, Install
Tail/Turn lamp to bracket screws	10–11 ft-lbs	12.9–14.9 N·m	8.19 TAIL LAMP, Install
Tail/Turn light housing to bracket screws	23–26 **in-lbs**	2.6–2.94 N·m	8.19 TAIL LAMP, Install
Turn signal lamp, front, single headlamp, screws	30–37 **in-lbs**	3.4–4.2 N·m	8.17 FRONT TURN SIGNAL LAMPS, Install
Voltage regulator screws	96–119 **in-lbs**	10.8–13.5 N·m	8.7 VOLTAGE REGULATOR, Install
Wire guide bracket	20–30 ft-lbs	27–41 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Frame Mounted Fairing

SPECIFICATIONS

Table 8-1. Idle Speed Specifications

ADJUSTMENT	RPM
Normal idle speed (hot)	950 +/- 50 RPM

Table 8-2. Battery Specifications

BATTERY	SPECIFICATIONS
Size	12 V/ 28 Ah/405 CCA
Type	Sealed, Absorbed Glass Mat (AGM) battery

Table 8-3. Spark Plug Specifications

SPARK PLUG	SPECIFICATIONS
Size	10 mm
Torque	80–106 **in-lbs** (9–12 N·m)
Gap	0.031–0.035 in (0.8–0.9 mm)

Table 8-4. Spark Plug Cables

LOCATION	LENGTH	RESISTANCE
Left rear	7.36–7.60 in (187–193 mm)	1,356–5,066 Ω
Left front	7.36–7.60 in (187–193 mm)	1,356–5,066 Ω
Right rear	16.22–16.73 in (412–425 mm)	2,900–11,000 Ω
Right front	14.96–15.24 in (380–387 mm)	2,750–10,100 Ω

Table 8-5. Ignition Coil Specifications

WINDING	RESISTANCE
Primary resistance	0.2–0.5 Ω
Secondary resistance	5,500–8,000 Ω

Table 8-6. Starter Specifications

STARTER	SPECIFICATIONS
Cranking current	250 A maximum
Free current	90 A maximum

Table 8-7. Alternator Specifications

ALTERNATOR	VALUE
Three phase	58 A system
Alternating Current (AC) voltage output	13–15 VAC per 1,000 rpm
Stator coil resistance	0.1–0.3 Ω

Table 8-8. Regulator Specifications

REGULATOR	VALUE
Amperes @ 3,600 rpm	40–44 A
Voltage @ 3,600 rpm	14.1–14.5 V @ 75.2 °F (24 °C)

Table 8-9. VVT Cam Phaser Actuator Solenoid Specifications

SOLENOID	VALUE
Coil resistance	5.5–5.9 Ω

Table 8-10. Fuse Specifications

ITEM	RATING
Main	60 A
Battery	7.5 A
Rear Parts and Accessories (P&A)	30 A
Homelink/Infotainment Control Unit (IFCU)	10 A
Front P&A	30 A
Cooling	15 A
PAC / Tender	30 A

PREPARE

1. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove right side cover if removing power lock relays. See CHASSIS > RIGHT SIDE COVER (Page 3-61).

REMOVE

Main Fuse

1. Disable security system.
   a. Verify that fob is present.
   b. Turn OFF/RUN switch to RUN.
2. See Figure 8-1. Remove main fuse (2).
3. Turn OFF/RUN switch to OFF.

Fuses and Relays

1. Remove fuse block cover.
   a. Press in tabs on the left and right sides of fuse block cover.
   b. Remove fuse block cover.
2. See Figure 8-2. Remove fuse or relay, if needed.

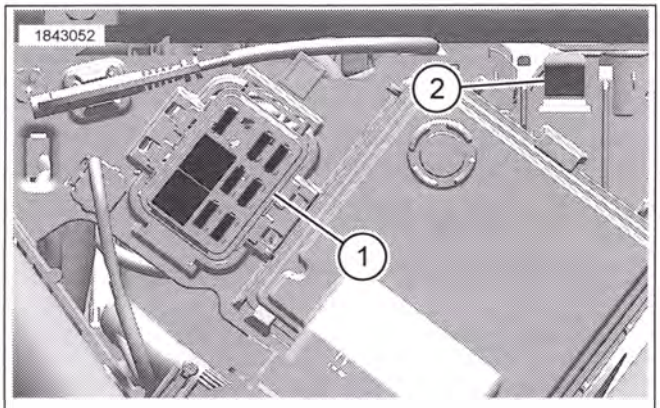
INSTALL

Fuses and Relays

1. See Figure 8-2. Install fuse or relay, if removed.
2. Install fuse block cover.
   a. Install tabs on left and right side of fuse block cover.

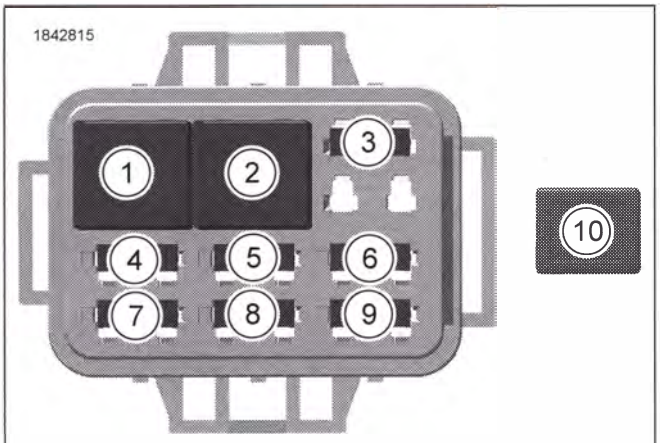
Main Fuse

1. See Figure 8-1. Install main fuse (2).



1. **Fuse block**
2. **Main fuse**

Figure 8-1. Fuses and Relays (under left side cover)



1. **Cooling relay**
2. **P&A relay**
3. **Battery tender (7.5 A)**
4. **Front P&A/Amp (30 A)**
5. **Cooling (15 A)**
6. **Parts Accessories and Customization (PAC) (30 A)**
7. **Battery (7.5 A)**
8. **Rear P&A (30 A)**
9. **IFCU (10 A)**
10. **Main fuse (60 A)**

Figure 8-2. Fuses and Relays Identification

COMPLETE

1. Install right side cover if removed. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

⚠ 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. Test affected circuit for proper operation.

MAIN FUSE

Remove main fuse when there is a possibility of injury caused by accidental vehicle start-up or electrical equipment damage.

Remove Main Fuse

1. Disable security system.
   a. Verify that fob is present.
   b. Turn OFF/RUN switch to RUN.
2. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

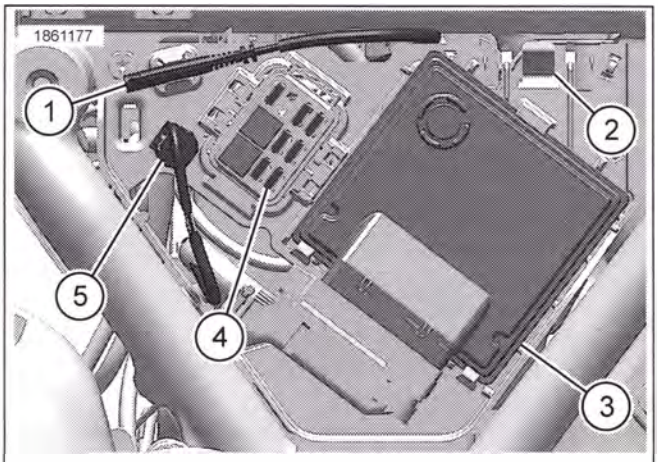
⚠ WARNING

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

4. See Figure 8-3. Remove main fuse (4).
5. Turn OFF/RUN switch to OFF.

Install Main Fuse

1. See Figure 8-3. Install main fuse (4).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).



1. **Battery tender**
2. **Main fuse**
3. **ECM**
4. **Fuse block**
5. **DLC**

Figure 8-3. Behind Left Side Cover

NEGATIVE BATTERY CABLE

FASTENER	TORQUE VALUE	
Negative battery cable screw to battery	60–70 **in-lbs**	6.8–7.9 N·m

Disconnect negative battery cable from battery when there is a possibility of injury caused by starter engagement (engine rotation).

Disconnect Negative Battery Cable

1. Disable security system.
   a. Verify that fob is present.
   b. Turn OFF/RUN switch to RUN.
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Move and secure Body Control Module (BCM) to the side. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).

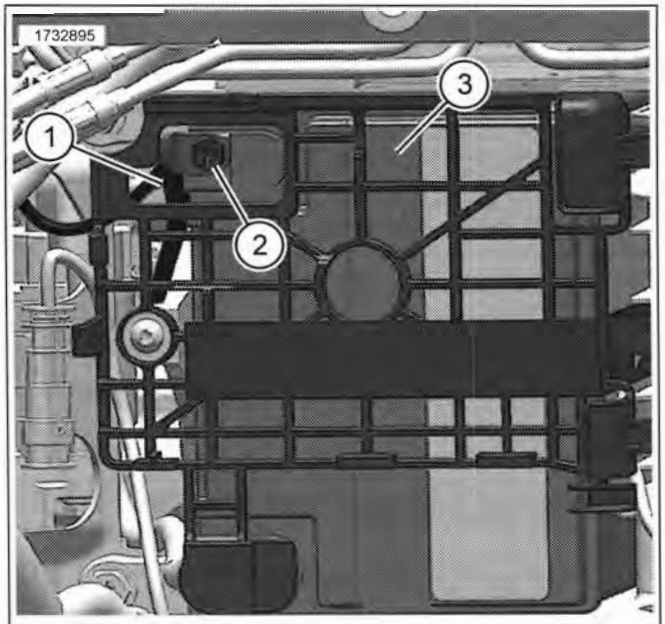
⚠ WARNING

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

4. See Figure 8-4. Remove battery cable screw (2).
5. Disconnect negative battery cable (1).
6. Turn OFF/RUN switch to OFF.

Connect Negative Battery Cable

1. See Figure 8-4. Position battery cable (1).
2. Install screw (2). Tighten
   Torque: 60–70 **in-lbs** (6.8–7.9 N·m) *Negative battery cable screw to battery*
3. Reposition Body Control Module (BCM). See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
4. Install seat. See CHASSIS > SEAT (Page 3-139).



1. Negative battery cable
2. Screw
3. Battery

Figure 8-4. Negative Battery Cable

PREPARE

⚠ WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect battery cables (negative (-) cable first) before proceeding. (00307a)

1. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

1. Remove engine oil filler cap/dipstick.
   a. Remove cap/dipstick.
   b. Cover fill spout with clean shop cloth to keep out dirt and debris.
2. See Figure 8-5. Remove starter.
   a. Remove starter solenoid nut (4).
   b. Remove battery positive cable from starter solenoid stud.
   c. Disconnect starter solenoid connector (1).
   d. Remove starter mounting screws (2).
   e. See Figure 8-6. Remove starter (4).

NOTE

Do not allow ring dowels (2) to drop when removing starter.

3. Discard O-ring (1).

INSTALL

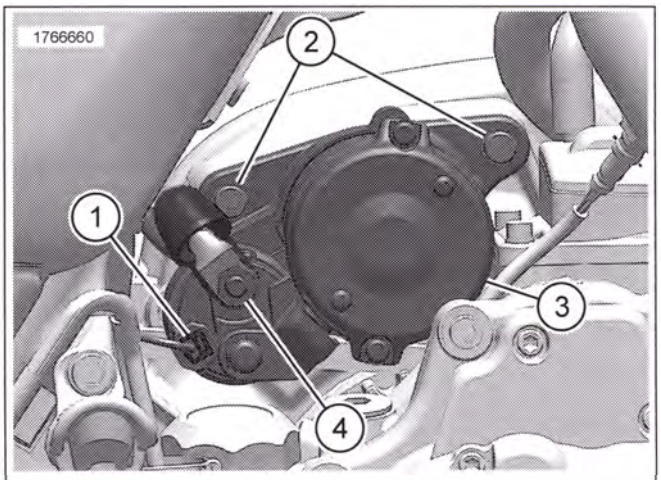
FASTENER	TORQUE VALUE	
Starter mounting screws	22–24 ft-lbs	29.8–32.5 N·m
Starter solenoid stud nut	80–90 **in-lbs**	9–10.2 N·m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97
SPECIAL PURPOSE GREASE	99857-97A

NOTE

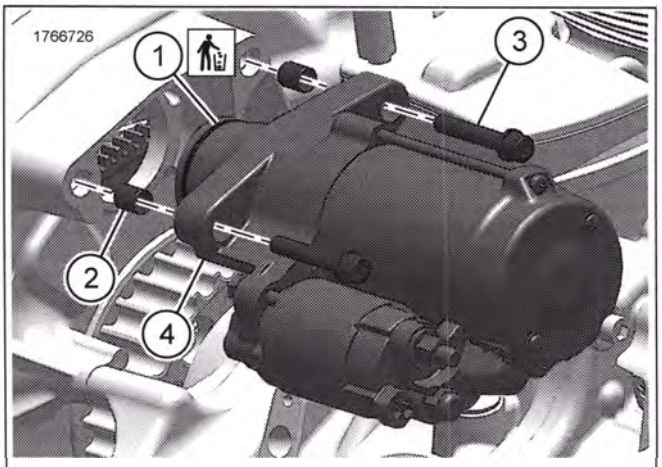
See Figure 8-6. Verify ring dowels (2) are installed.

1. Install starter.
   a. Apply a light coat of grease on **new** O-Ring (1).
      SPECIAL PURPOSE GREASE (99857-97A)
   b. Install **new** O-Ring.
   c. Apply a light coat of threadlocker to starter mounting screws (3).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   d. Install starter.
   e. See Figure 8-5. Install starter mounting screws. Tighten.
      Torque: 22–24 ft-lbs (29.8–32.5 N·m) *Starter mounting screws*
   f. Install battery positive cable on starter solenoid stud.
   g. Install starter solenoid nut (4). Tighten.
      Torque: 80–90 **in-lbs** (9–10.2 N·m) *Starter solenoid stud nut*
   h. Pull down rubber boot over terminal connection.
   i. Install starter solenoid connector (1).
2. Install engine oil filler cap/dipstick.



1. **Starter solenoid connector**
2. **Screw (2)**
3. **Starter**
4. **Starter solenoid nut**

Figure 8-5. Starter



1. O-ring
2. Ring dowel (2)
3. Starter mounting screw (2)
4. Starter

Figure 8-6. Starter Removed

COMPLETE

1. Connect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

PREPARE

1. Remove seat. See CHASSIS > SEAT (Page 3-139).
2. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Remove left passenger footboard and bracket as an assembly. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
4. Remove left rider footboard and brackets as an assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
5. Remove Horn. See ELECTRICAL > HORN (Page 8-31).
6. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
7. Reposition regulator, remove screws and secure. See ELECTRICAL > VOLTAGE REGULATOR (Page 8-14).
8. Remove starter. See ELECTRICAL > STARTER (Page 8-9).
9. Drain primary chaincase. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
10. Remove primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
11. Remove primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
12. Remove primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).

REMOVE

PART NUMBER	TOOL NAME
HD-53290	ALTERNATOR ROTOR INSTALLER/REMOVER

FASTENER	TORQUE VALUE	
HD-53290 Alternator rotor installer/remover	15 **in-lbs**	1.7 N·m

⚠ CAUTION

The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

1. See Figure 8-7. Disconnect connector (1) from voltage regulator.
2. Remove anchored cable strap (3).
3. Remove rotor.

   Special Tool: ALTERNATOR ROTOR INSTALLER/REMOVER (HD-53290)

   a. See Figure 8-8. Verify hooks (1) on tool.

   b. See Figure 8-9. Locate holes (3) farthest away from Crankshaft (2).

   c. Install hooks into holes on alternator rotor (1).

   d. See Figure 8-10. Hold stand offs (2) and move inward toward crankshaft so hooks can engage the rotor.

   e. Tighten nuts.

   Torque: 15 **in-lbs** (1.7 N·m) *HD-53290 Alternator rotor installer/remover*

   f. Turn screw (1) CW until rotor is removed.

   g. Leave tool attached to rotor unless replacing rotor.
4. See Figure 8-11. Remove and discard screws (6).
5. See Figure 8-12. Remove grommet (2).

NOTE

***Do not** pull stator wiring unless stator is being replaced.*

   a. Use end of an awl or small screwdriver to move grommet away from crankcase.

   b. Spray isopropyl alcohol or glass cleaner into opening.

   c. Repeat this step at one or two other locations around grommet.

   d. Push grommet from outside of crankcase while pulling through bore with needle nose pliers.
6. Remove stator (5).

INSTALL

PART NUMBER	TOOL NAME
HD-53290	ALTERNATOR ROTOR INSTALLER/REMOVER

FASTENER	TORQUE VALUE	
Stator mounting screws	55–75 **in-lbs**	6.2–8.5 N·m

CONSUMABLE	PART NUMBER
ELECTRICAL CONTACT LUBRICANT	11300004

1. Install grommet.

NOTE

***Do not** reuse stator mounting screws.*

a. Clean grommet (4) of dirt and oil residue.

b. Lubricate grommet with glass cleaner or isopropyl alcohol.

c. See Figure 8-12. Route Stator cable through hole from inside crankcase.

d. Push grommet (2) into crankcase bore while carefully pulling on outside cable.

NOTE

Verify grommet position (3) when installing.

e. Installation is complete when cable stop contacts casting and capped rib of grommet exits crankcase bore.

2. Install stator (5) using **new** screws (4). Tighten.

   Torque: 55–75 **in-lbs** (6.2–8.5 N·m) *Stator mounting screws*

3. See Figure 8-7. Connect connector.

   a. Apply dielectric grease to connector (1).

      ELECTRICAL CONTACT LUBRICANT (11300004)

   b. Install connector to voltage regulator.

   c. Engage locking latch.

   d. Align anchor cable strap with mark on sheathing (not shown).

   e. Install anchored cable strap (3) with loop facing out.

NOTE

Loop needs to face out to keep cable from rubbing on crankcase.

⚠ CAUTION

The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

4. *NOTE*

Install rotor slowly to prevent damaging rotor magnets. Damaged magnet fragments can damage the stator.

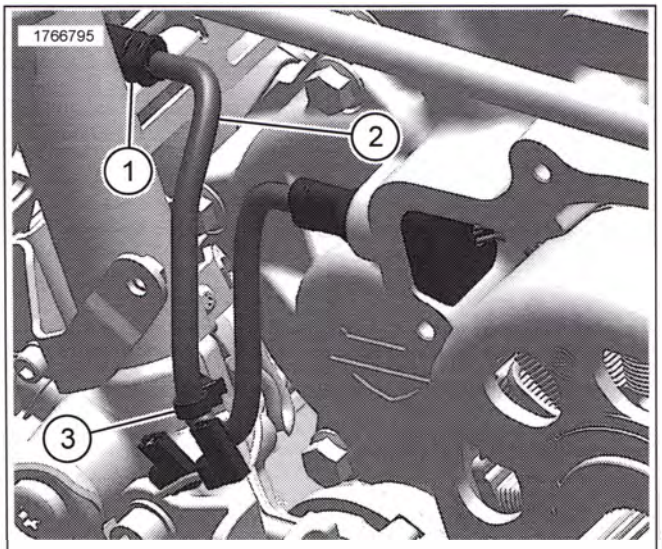
   Install rotor.

   Special Tool: ALTERNATOR ROTOR INSTALLER/REMOVER (HD-53290)

   a. See Figure 8-10. Install rotor and tool on crankshaft.

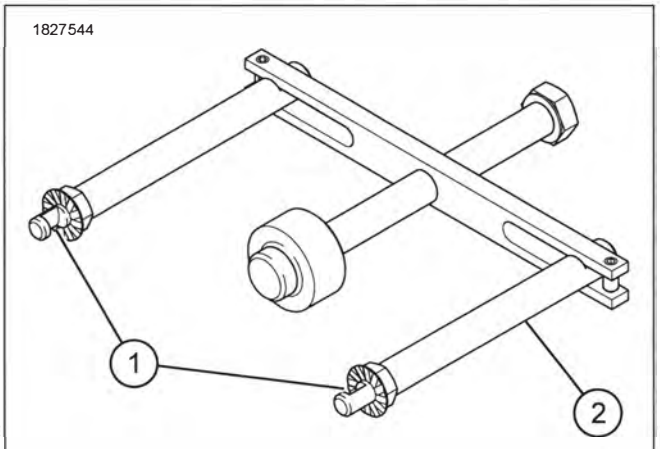
   b. Turn screw (1) CCW.

   c. Loosen nuts on tool and remove.



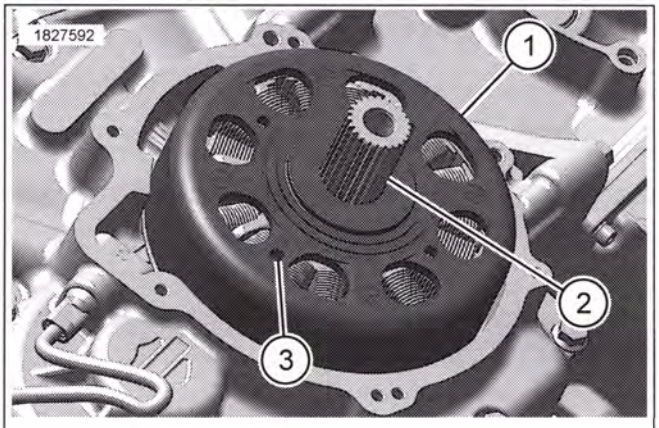
1. Connector
2. Stator cable
3. Anchored cable strap

Figure 8-7. Stator Cable Routing



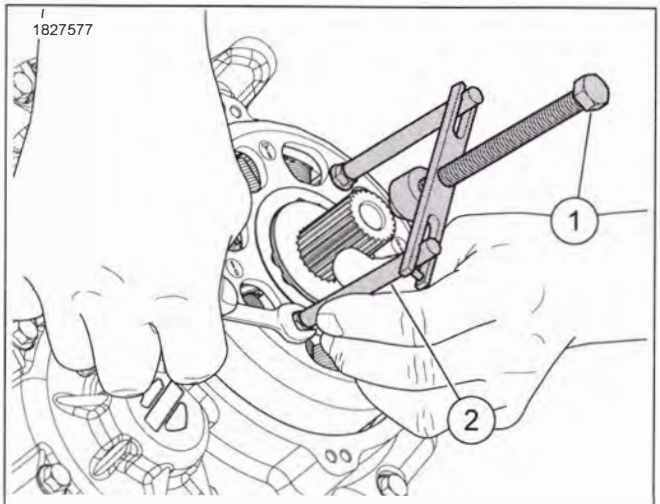
1. Hook (2)
2. Stand off (2)

Figure 8-8. Alternator Rotor Installer/Remover Tool



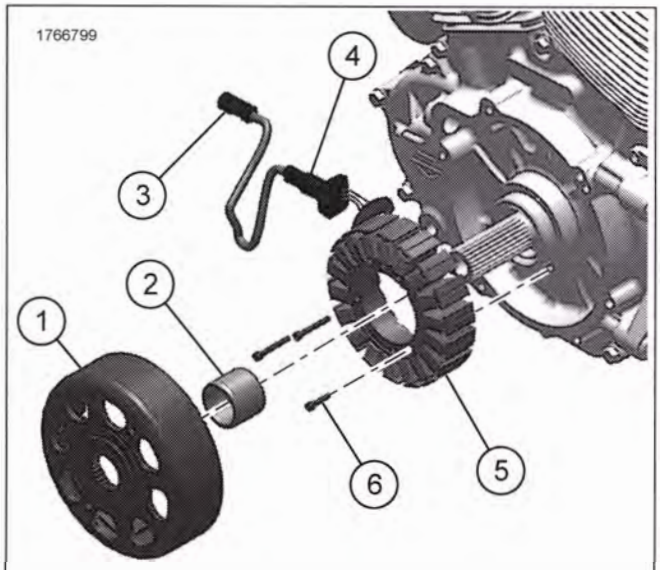
1. Alternator rotor
2. Crankshaft
. Hole (2)

Figure 8-9. Alternator Rotor



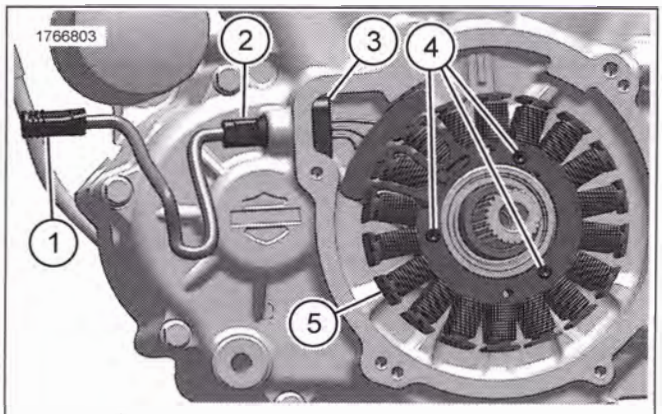
1. Screw
2. Standoff (2)

Figure 8-10. Alternator Rotor Installation/ Removal Tool Installed



1. Rotor
2. Spacer
3. Connector
4. Grommet
5. Stator
6. Screw (3)

Figure 8-11. Rotor and Stator



1. Connector
2. Grommet
3. Grommet position
4. Screw (3)
5. Stator

Figure 8-12. Stator Installed

COMPLETE

1. Install primary chaincase housing. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE HOUSING (Page 5-26).
2. Install primary chain, clutch and compensating sprocket. See DRIVE AND TRANSMISSION > DRIVE COMPONENTS (Page 5-17).
3. Install primary chaincase cover. See DRIVE AND TRANSMISSION > PRIMARY CHAINCASE COVER (Page 5-15).
4. Fill primary chaincase. See MAINTENANCE > REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Install starter. See ELECTRICAL > STARTER (Page 8-9).
6. Install Horn. See ELECTRICAL > HORN (Page 8-31).
7. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
8. Attach regulator. See ELECTRICAL > VOLTAGE REGULATOR (Page 8-14).
9. Install Remove left rider footboard and brackets as an assembly. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
10. Remove left passenger footboard and bracket as an assembly. See CHASSIS > PASSENGER FOOTRESTS (Page 3-134).
11. Disconnect negative battery cable. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
12. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

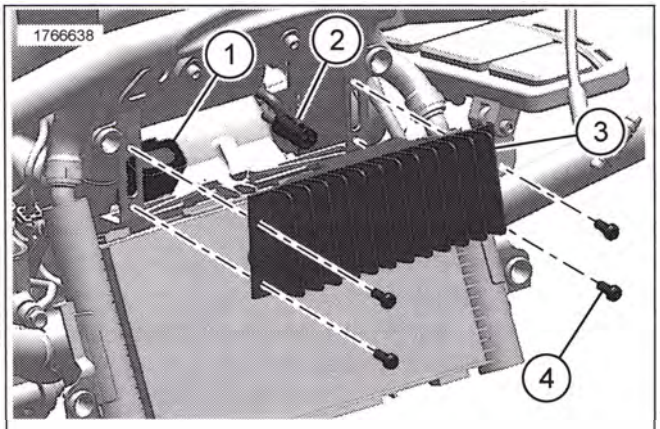
REMOVE

1. See Figure 8-13. Remove voltage regulator.
   a. Remove screws (4).
   b. Remove voltage regulator connector (1).
   c. Remove stator to voltage regulator connector (2).
   d. Remove voltage regulator (3).

INSTALL

FASTENER	TORQUE VALUE	
Voltage regulator screws	96–119 **in-lbs**	10.8–13.5 N·m

1. See Figure 8-13. Install voltage regulator.
   a. Connect voltage regulator connector (1).
   b. Connect stator to voltage regulator connector (2).
   c. Install voltage regulator (3) on bracket.
   d. Install screws (4). Tighten.
      Torque: 96–119 **in-lbs** (10.8–13.5 N·m) *Voltage regulator screws*



1. **Voltage regulator connector**
2. **Stator to voltage regulator connector**
3. **Voltage regulator**
4. **Screw (4)**

Figure 8-13. Voltage Regulator

COMPLETE

1. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove seat. See CHASSIS > SEAT (Page 3-139).
4. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

PART NUMBER	TOOL NAME
HD-52006	ADJUSTABLE SPARK PLUG WIRE PULLER

NOTE

- *Verify and note plug cable routing. Route new cables same way*
- *Do not remove spark plugs or wires while engine is hot.*

1. See Figure 8-14. Remove spark plug cable retainers.
   a. Remove cable retainers (3).
   b. Remove anchored cable strap (4).
   c. Remove cable from clip (2).
2. Remove spark plug cables.
   a. Remove coil boots (6,8).
   b. Remove spark plug boots (1,5).

      Special Tool: ADJUSTABLE SPARK PLUG WIRE PULLER (HD-52006)
   c. See Figure 8-15. Remove coil boots (3,4).
   d. Remove spark plug boots (1,2).

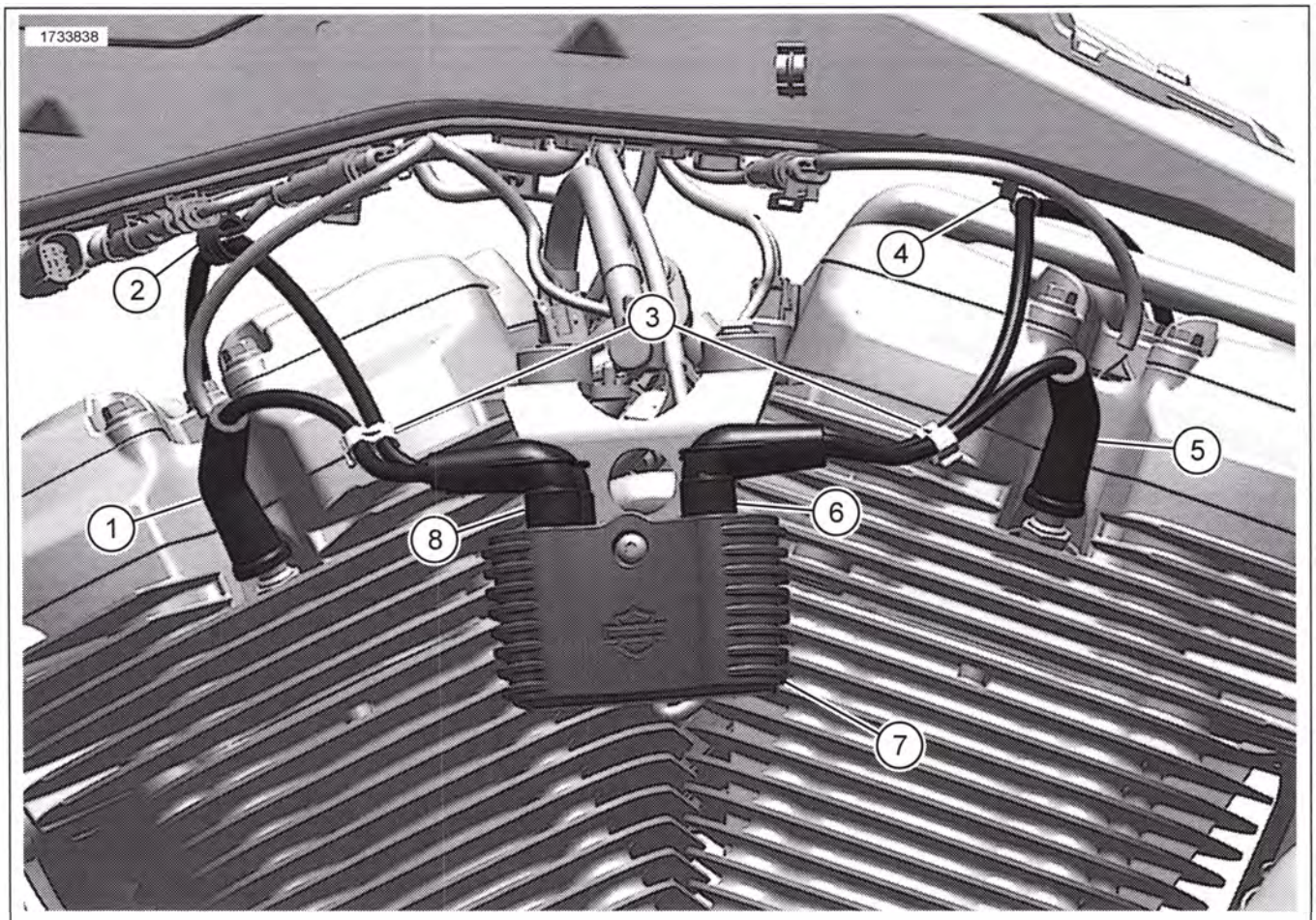
      Special Tool: ADJUSTABLE SPARK PLUG WIRE PULLER (HD-52006)
   e. Remove cables.

INSTALL

CONSUMABLE	PART NUMBER
ELECTRICAL CONTACT LUBRICANT	11300004

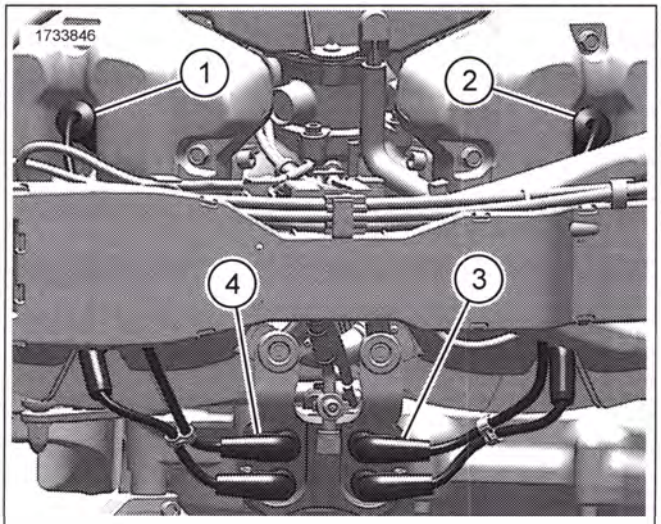
1. Install spark plug cables.
   a. Apply electrical contact lubricant to inside of terminal boots.

      ELECTRICAL CONTACT LUBRICANT (11300004)
   b. See Figure 8-14. Connect plug boots (1,5).
   c. Connect coil boots (6,8) to coil (7).
   d. Route right side cables into position.
   e. See Figure 8-15. Connect plug boots (1,2).
   f. Connect coil boots (3,4) to coil (7).
2. Secure cables.
   a. Install and attach right rear cable to anchor cable strap (4).
   b. Attach front cable to clip (2).
   c. Attach cable retainers (3).



1. Front left spark plug boot
2. Clip
3. Cable retainer (2)
4. Anchor cable strap
5. Rear left spark plug boot
6. Rear left coil boot
7. Ignition coil
8. Front left coil boot

Figure 8-14. Spark Plug Cables (left side)



1. Front right spark plug boot
2. Rear right spark plug boot
3. Rear right coil boot
4. Front right coil boot

Figure 8-15. Spark Plug Cables (right side)

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install seat. See CHASSIS > SEAT (Page 3-139).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
6. Remove spark plug cable coil boots. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).

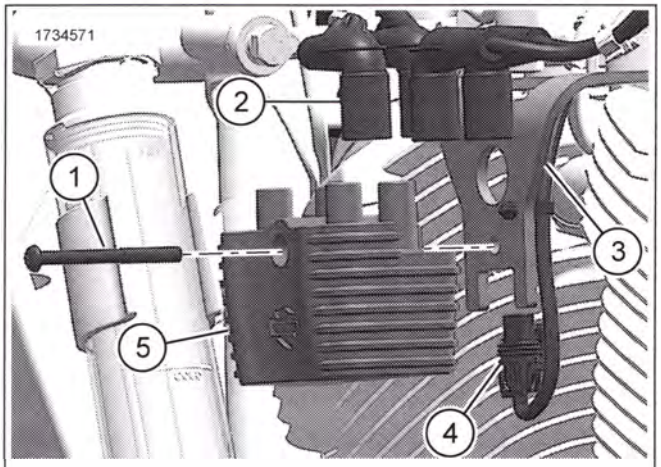
REMOVE

1. See Figure 8-16. Remove ignition coil.
   a. Remove screw (1).
   b. Remove connector (4).
   c. Remove ignition coil (5).
2. See Figure 8-17. Remove ignition coil bracket.
   a. Remove knock sensors (1). See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
   b. Remove anchor cable strap (3).
   c. Remove bracket (2).

INSTALL

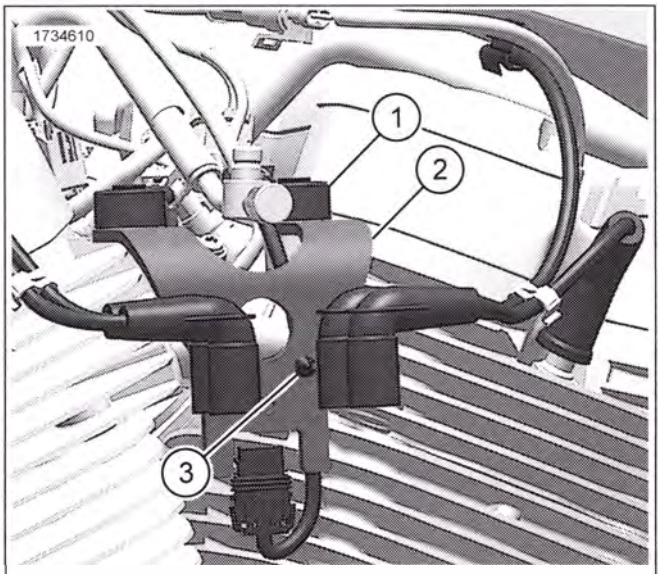
FASTENER	TORQUE VALUE	
Ignition coil screw	11–14 ft-lbs	14.9–19 N·m

1. See Figure 8-17. Install ignition coil bracket.
   a. Install anchor cable strap (3).
   b. Position bracket (2) on heads.
   c. Install knock sensors (1). See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
2. See Figure 8-16. Install ignition coil.
   a. Connect connector (4).
   b. Position coil (5) on bracket (3).
   c. Install screw (1). Tighten.
      Torque: 11–14 ft-lbs (14.9–19 N·m) *Ignition coil screw*



1. **Screw**
2. **Spark plug cable coil boot (4)**
3. **Bracket**
4. **Connector**
5. **Ignition coil**

Figure 8-16. Ignition Coil



1. **Knock sensor (2)**
2. **Ignition coil bracket**
3. **Anchor cable strap**

Figure 8-17. Ignition Coil Bracket

COMPLETE

1. Install spark plug cable coil boots. See ELECTRICAL > SPARK PLUG CABLES (Page 8-15).
2. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
3. Install seat, See CHASSIS > SEAT (Page 3-139).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

6. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove clutch handle assembly. See CHASSIS > CLUTCH CONTROL (Page 3-79).

REMOVE

Remove

1. See Figure 8-18. Remove clutch lever bracket.
   a. Slide rubber boot (5) back.
   b. Disconnect clutch switch connector (4).
   c. Remove screws (1).
   d. Remove washers (2).
   e. Remove clutch lever bracket (3).
   f. Secure bracket out of the way.

NOTE

Protect cosmetic surfaces.

2. See Figure 8-19. Remove LHCM cover.
   a. Remove screws (3).
   b. Remove cover (2).
3. See Figure 8-20. Disconnect LHCM connector (6).
4. Remove LHCM (2).

Disassemble

NOTE

Switch pack buttons are connected by ribbon cable. Be careful when removing switch pack.

1. See Figure 8-21. Remove cable guide.
   a. Remove screws (2).
   b. Remove cable guide (1).
2. See Figure 8-22. Remove LHCM switch pack.
   a. Remove long lower switch screws (7).
   b. Remove long headlamp switch screws (4).
   c. Remove short headlamp switch screw (3).
   d. Lift headlamp switch (5).
   e. Remove long upper switch screws (2).
   f. Lift upper switch (1) and headlamp switch (5).
   g. See Figure 8-23. Remove long navigation pad screws (2).
   h. Remove LHCM switch pack.

INSTALL

FASTENER	TORQUE VALUE	
Clutch lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m
Clutch lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m
LHCM cover screw	27–31 **in-lbs**	3–3.5 N·m
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m

Assemble

1. See Figure 8-23. Install LHCM switch pack.
   a. Install switch pack into housing.
   b. Install long navigation pad screws (2). Tighten.
      Torque: 3–5 **in-lbs** (0.3–0.59 N·m) *LHCM, switch pack, screws*
   c. See Figure 8-22. Install upper switch(1).
   d. Install long upper switch screws (2). Tighten.
      Torque: 3–5 **in-lbs** (0.3–0.59 N·m) *LHCM, switch pack, screws*
   e. Install headlamp switch (5).
   f. Install long headlamp switch screws (4). Tighten.
      Torque: 3–5 **in-lbs** (0.3–0.59 N·m) *LHCM, switch pack, screws*
   g. Install short headlamp switch screw (3). Tighten.
      Torque: 3–5 **in-lbs** (0.3–0.59 N·m) *LHCM, switch pack, screws*
   h. Install lower switch (6).
   i. Install long lower switch screws (7). Tighten.
      Torque: 3–5 **in-lbs** (0.3–0.59 N·m) *LHCM, switch pack, screws*
2. See Figure 8-21. Install cable guide.
   a. Install cable guide (1).

b. Install cable guide screws (2). Tighten.

Torque: 3–5 **in-lbs** (0.3–0.59 N·m) *LHCM, switch pack, screws*

Install

1. See Figure 8-20. Install LHCM (2) on handlebar.
2. Install hand grip lip (3) in groove (5) on LHCM.
3. Connect connector.
   a. Route LHCM cable (1) in groove on LHCM cable guide (7).
   b. Connect LHCM connector (7).
4. See Figure 8-19. Install cover.
   a. Guide clutch switch cable (1). through cover opening (5).
   b. Install cover (2).

NOTE

Do not remove alignment screw.

   c. Align alignment screw (4) with alignment hole in handlebar.
   d. Verify alignment screw is properly engaged into hole in handle bar.

NOTE

Failure to do this may result in damage to cover.

   e. Install screws (3). Tighten.

   Torque: 27–31 **in-lbs** (3–3.5 N·m) *LHCM cover screw*

   f. If alignment screw was removed install and snug alignment screw (4).
5. See Figure 8-18. Install clutch lever bracket.
   a. Place clutch lever bracket (3) on LHCM bracket.
   b. Install washers (2).
   c. Install screws (1) and align gap (6) with alignment Mark (7).

NOTE

Gap on LHCM must not be rotated past alignment mark.

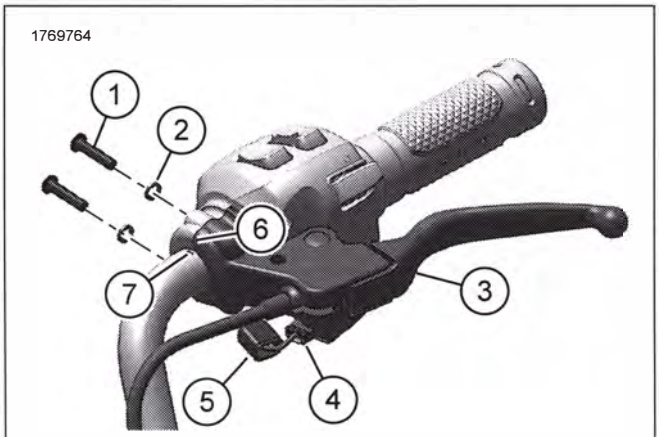
   d. Tighten top screw first.

   Torque: 89–97 **in-lbs** (10–11 N·m) *Clutch lever, top, bracket screw*

   e. Tighten bottom screw.

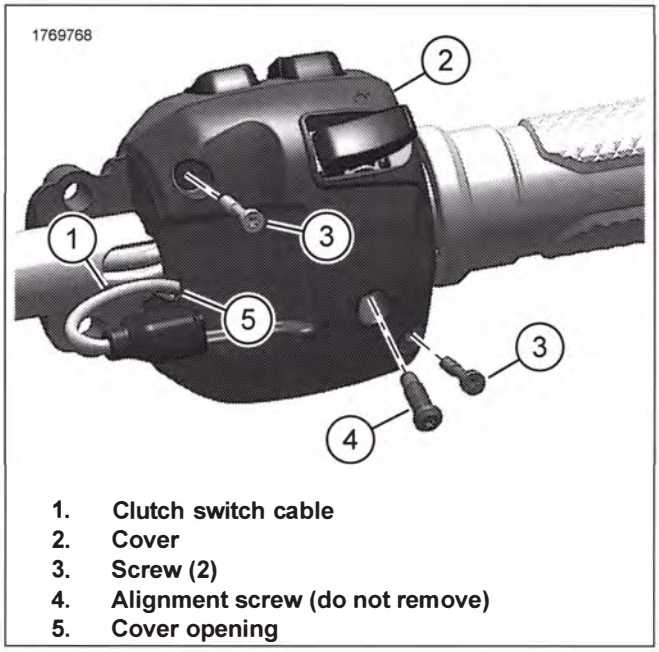
   Torque: 89–97 **in-lbs** (10–11 N·m) *Clutch lever, bottom, bracket screw*

   f. Connect clutch switch connector (4).
   g. Slide rubber boot (5) over connector.



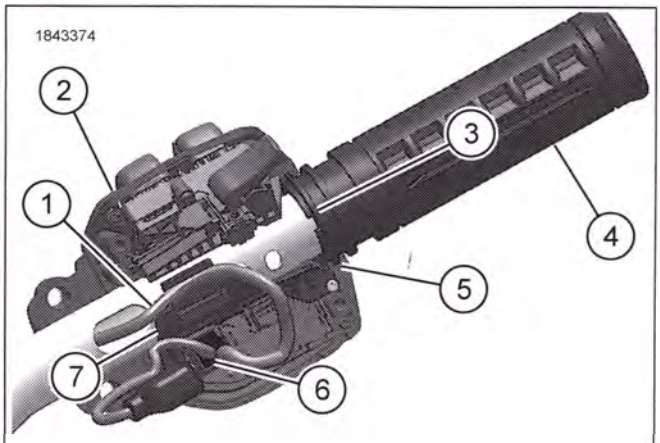
1. **Screw (2)**
2. **Washer (2)**
3. **Clutch lever bracket**
4. **Clutch switch connector**
5. **Rubber boot**
6. **Gap**
7. **Alignment mark**

Figure 8-18. Clutch Lever Bracket



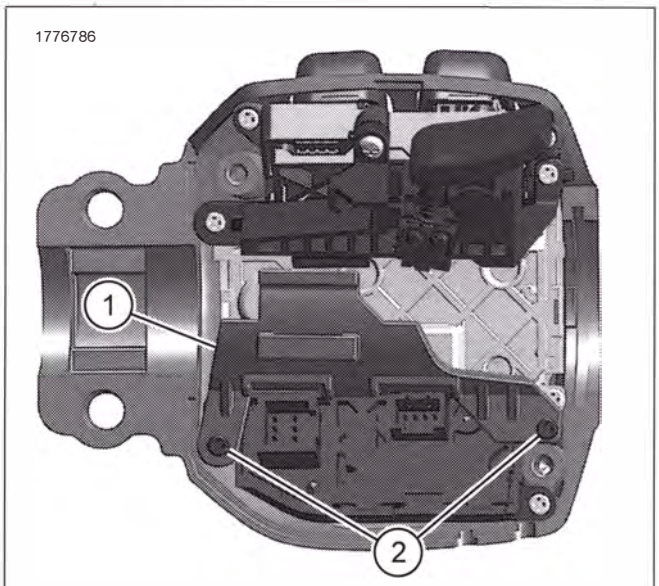
1. **Clutch switch cable**
2. **Cover**
3. **Screw (2)**
4. **Alignment screw (do not remove)**
5. **Cover opening**

Figure 8-19. LHCM Cover



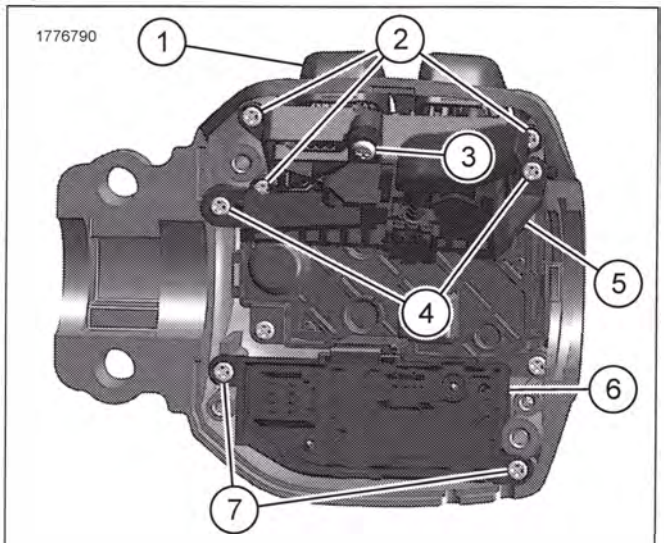
1. LHCM cable
2. LHCM
3. Hand grip lip
4. LH grip
5. Groove
6. LHCM connector
7. Cable guide

Figure 8-20. LHCM



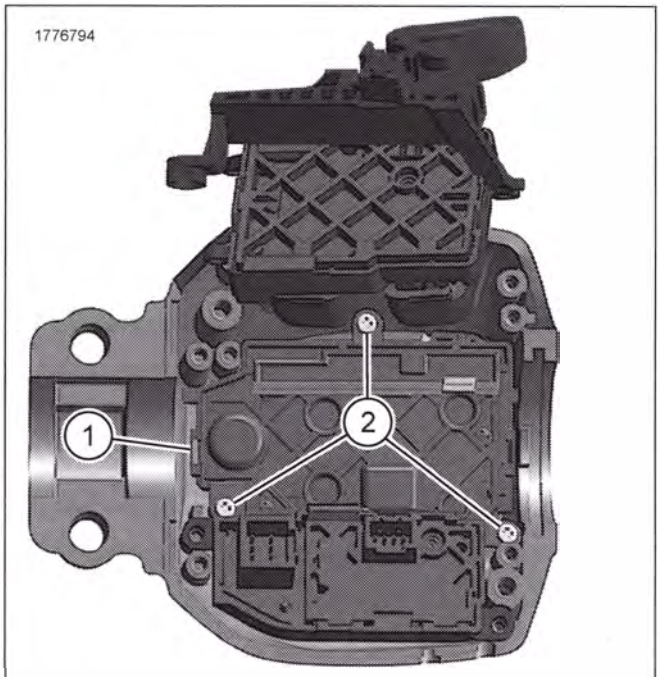
1. Cable guide
2. Screw (2)

Figure 8-21. LHCM Cable Guide



1. Upper switch
2. Upper switch screw (3) (long)
3. Headlamp switch screw (short)
4. Headlamp switch screw (2) (long)
5. Headlamp switch
6. Lower switch
7. Lower switch screw (2) (long)

Figure 8-22. LHCM Switch Pack



1. Navigation pad
2. Screw (3) (long)

Figure 8-23. Navigation Pad

CLUTCH SWITCH REPLACEMENT

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Clutch switch cover screw	7–11 **in-lbs**	0.8–1.2 N·m
Clutch switch screw	4–5 **in-lbs**	0.49–0.61 N·m

Remove

1. See Figure 8-24. Place clutch lever (9) against grip and secure in position.

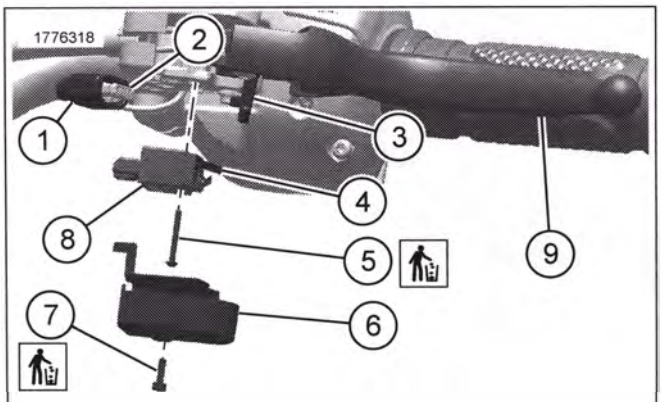
NOTE

Damage to switch contacts may occur if clutch lever is not positioned against grip.

2. Remove clutch switch cover.
   a. Remove and discard screw (7).
   b. Remove cover (6).
3. Disconnect clutch switch connector.
   a. Slide back rubber boot (1).
   b. Disconnect clutch switch connector (2).
4. Remove clutch switch.
   a. Remove and discard screw (5).
   b. Remove clutch switch (8).

Install

1. See Figure 8-24. Install clutch switch.
   a. Position Contacts (4) next to actuator switch (3).
   b. Install **new** screw (5). Tighten.
      Torque: 4–5 **in-lbs** (0.49–0.61 N·m) *Clutch switch screw*
2. Connect clutch connector (2) and install boot (1).
3. Install cover.
   a. Install cover (6).
   b. Install **new** screw (7). Tighten.
      Torque: 7–11 **in-lbs** (0.8–1.2 N·m) *Clutch switch cover screw*
4. Release clutch lever from secured position against grip.
5. Verify clutch switch function using digital technician.
   Special Tool: DIGITAL TECHNICIAN II (HD-48650)



1. **Rubber boot**
2. **Clutch switch connector**
3. **Actuator switch**
4. **Contact (2)**
5. **Screw**
6. **Cover**
7. **Screw**
8. **Clutch switch**
9. **Clutch lever**

Figure 8-24. Clutch Switch

COMPLETE

1. Install clutch handle assembly. See CHASSIS > CLUTCH CONTROL (Page 3-79).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

Remove

NOTE

Protect cosmetic surfaces.

Do not allow master cylinder to be positioned upside down.

1. See Figure 8-25. Remove brake lever bracket.
   a. Slide rubber boot (3) off connector.
   b. Disconnect brake switch connector (4).
   c. Remove screws (2).
   d. Remove washers (1).
   e. Remove brake lever bracket (5).
   f. Secure bracket out of the way.
2. See Figure 8-26. Remove RHCM cover.
   a. Remove screws (1).
   b. Remove cover (2).
3. See Figure 8-27. Disconnect connectors.
   a. Disconnect brake lever switch connector (1).
   b. Disconnect twist grip sensor connector (7).
4. See Figure 8-28. Remove hand grip.
   a. Open wire bridge (2).
   b. Remove hand grip (1).
5. Remove RHCM.

Disassemble

NOTE

Switch pack buttons are connected by ribbon cable. Be careful when removing switch pack.

1. See Figure 8-29. Remove throttle grip sensor.
   a. Remove screws (1).
   b. Remove throttle grip sensor (2).
2. See Figure 8-30. Remove RHCM switch pack.
   a. Remove long lower switch screw (6).
   b. Remove short Lower switch screw (9).
   c. Remove long upper switch screw (1).
   d. Remove short upper switch screws (3).
   e. Tilt upper switch to access short navigation screw (2).
   f. Remove short navigation pad screw (8).
   g. Remove RHCM switch pack.

INSTALL

FASTENER	TORQUE VALUE	
Brake lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m
Brake lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m
RHCM cover screws	27–31 **in-lbs**	3–3.5 N·m
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m
RHCM, throttle grip sensor screws	3–5 **in-lbs**	0.39–0.59 N·m

Assemble

1. See Figure 8-30. Install switch pack.
   a. Install switch pack into housing.
   b. Install short navigation pad screw (2). Tighten.
      Torque: 3–5 **in-lbs** (0.39–0.59 N·m) *RHCM, switch pack, screws*
   c. Install short upper switch screws (3). Tighten.
      Torque: 3–5 **in-lbs** (0.39–0.59 N·m) *RHCM, switch pack, screws*
   d. Install long upper switch screw (1). Tighten.
      Torque: 3–5 **in-lbs** (0.39–0.59 N·m) *RHCM, switch pack, screws*
   e. Install short navigation pad screw (8). Tighten.
      Torque: 3–5 **in-lbs** (0.39--0.59 N·m) *RHCM, switch pack, screws*
   f. Install long lower switch screw (6). Tighten.
      Torque: 3–5 **in-lbs** (0.39–0.59 N·m) *RHCM, switch pack, screws*

g. Install short lower switch screw (9). Tighten.

Torque: 3–5 **in-lbs** (0.39–0.59 N·m) *RHCM, switch pack, screws*

2. See Figure 8-29. Install throttle grip sensor.

a. Install throttle grip sensor (2).

b. Install throttle grip sensor screws (1). Tighten.

Torque: 3–5 **in-lbs** (0.39–0.59 N·m) *RHCM, throttle grip sensor screws*

Install

1. See Figure 8-28. Install RHCM on handlebar.

2. Install hand grip.

a. Install hand grip lip (5) in groove (6).

b. Line opening on hand grip with handlebar hole (4).

c. Close wire bridge (2).

d. Rotate hand grip and verify alignment pin is in handlebar hole.

3. See Figure 8-27. Connect connectors.

a. Connect twist grip sensor connector (7).

b. Connect brake lever switch connector (1).

4. Install cover.

a. See Figure 8-27. Verify cables are between cover supports (5).

b. See Figure 8-26. Guide cables through cover opening (3).

c. Install cover (2).

d. Install screws (1). Tighten.

Torque: 27–31 **in-lbs** (3–3.5 N·m) *RHCM cover screws*

5. See Figure 8-25. Install brake lever bracket.

a. Place brake lever bracket (5) on RHCM bracket.

b. Install washers (1) and screws (2). Tighten screws in the following order.

c. Tighten top screw first.

Torque: 89–97 **in-lbs** (10–11 N·m) *Brake lever, top, bracket screw*

d. Tighten bottom screw.

Torque: 89–97 **in-lbs** (10–11 N·m) *Brake lever, bottom, bracket screw*

e. Connect brake switch connector (4).

f. Slide rubber boot (3) over connector.

6. Verify throttle function.

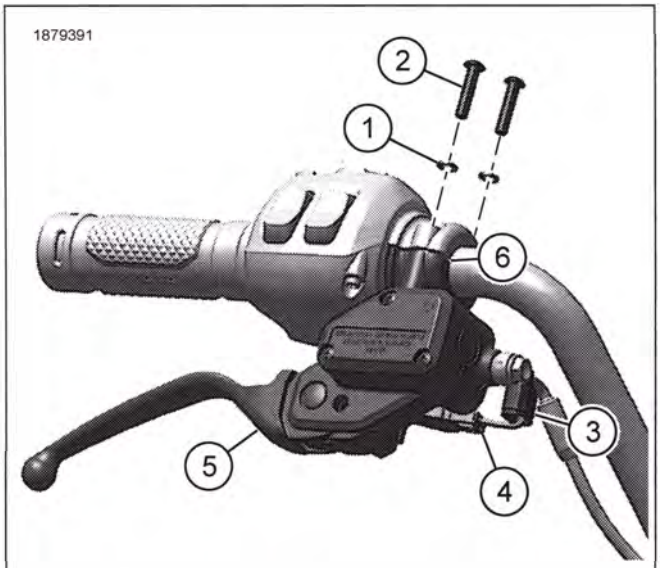
NOTE

Motorcycle must not be running for this step.

a. Rotate throttle wide open.

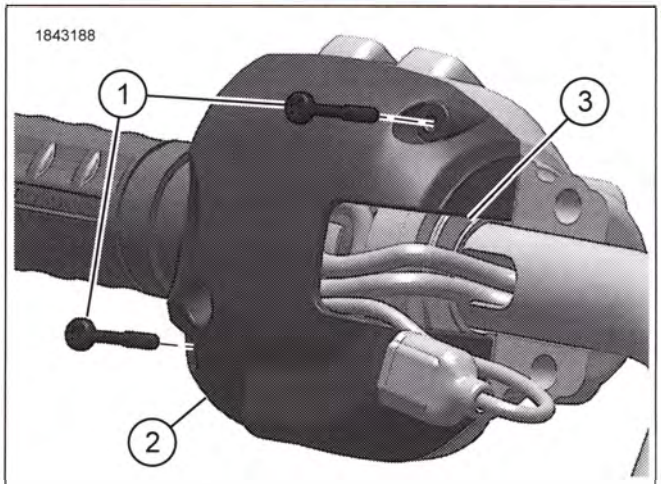
b. Release throttle.

c. Throttle should rotate freely with no binding/dragging/slowing.



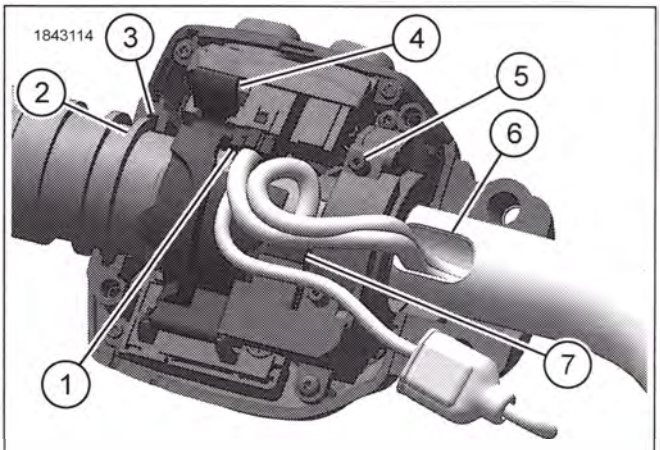
1. **Washer (2)**
2. **Screw (2)**
3. **Rubber boot**
4. **Brake switch connector**
5. **Brake lever bracket**
6. **Gap**

Figure 8-25. Brake Lever Bracket (typical)



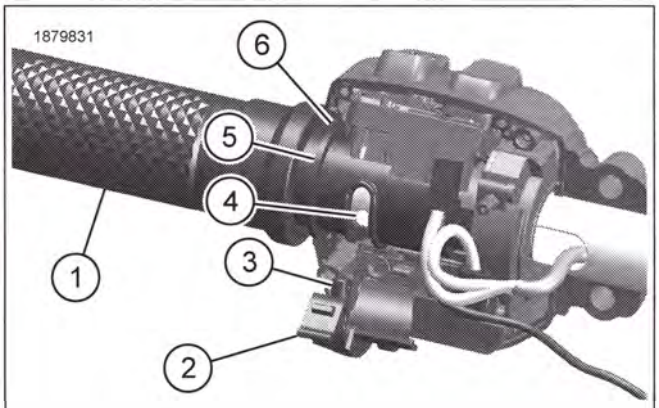
1. **Screw (2)**
2. **Cover**
3. **Cover opening**

Figure 8-26. RHCM cover



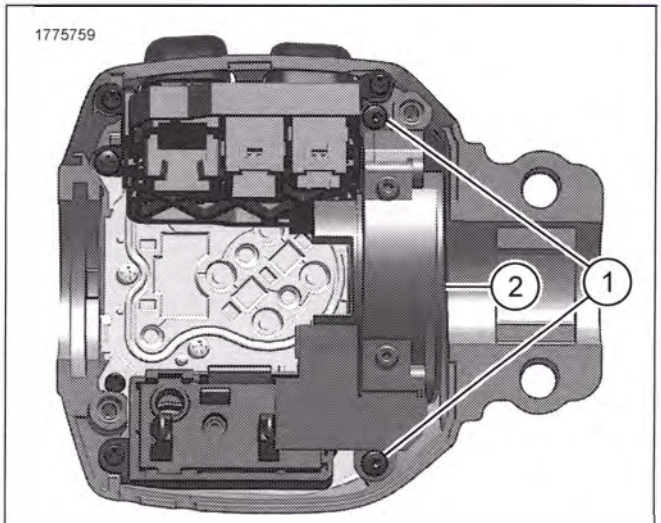
1. Brake lever switch connector
2. Hand grip lip
3. Groove
4. Wire bridge
5. Cover supports (2)
6. Cable opening
7. Twist grip sensor connector

Figure 8-27. RHCM Connections



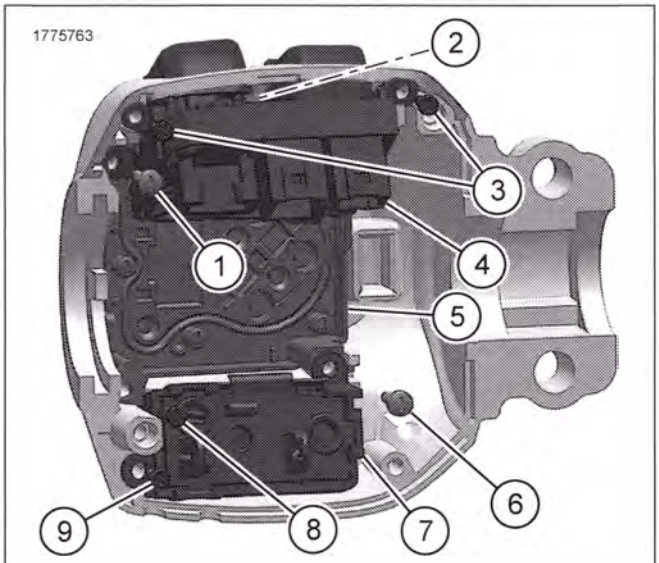
1. Hand grip
2. Wire bridge
3. Alignment pin
4. Handlebar hole
5. Hand grip lip
6. Groove

Figure 8-28. RH Grip



1. Throttle grip sensor screw (2)
2. Throttle grip sensor

Figure 8-29. RHCM Throttle Grip Sensor



1. Upper switch screw (long)
2. Navigation pad screw (short)
3. Upper switch screw (2) (short)
4. Upper switch
5. Navigation pad
6. Lower switch screw (long)
7. Lower switch
8. Navigation pad screw (short)
9. Lower switch screw (short)

Figure 8-30. RHCM Switch Pack

FRONT BRAKE SWITCH REPLACEMENT

FASTENER	TORQUE VALUE	
Brake switch screw	4–6 **in-lbs**	0.5–0.7 N·m

Remove

1. See Figure 8-31. Remove brake switch.
   a. Remove rubber boot (5).
   b. Disconnect brake switch connector (6).
   c. Remove screw (4), lock washer (3) and washer (2).

d. Squeeze brake lever (1) while removing brake switch (7).

Install

1. See Figure 8-31. Install brake switch.

   a. Squeeze brake lever (1) while installing brake switch (7).

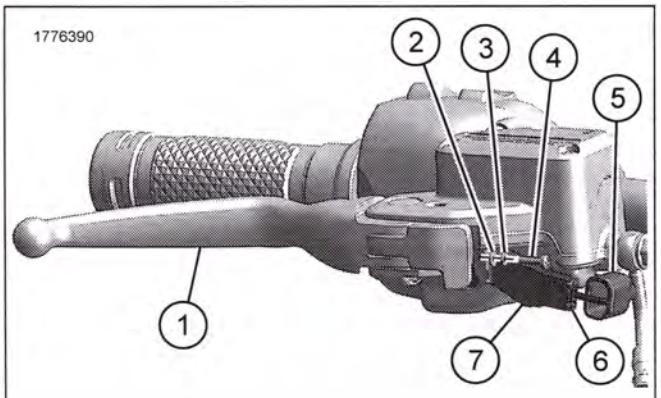
   b. Release brake lever.

   c. Install washer (2), lock washer (3) and screw (4). Tighten.

      Torque: 4–6 **in-lbs** (0.5–0.7 N·m) *Brake switch screw*

   d. Connect brake switch connector (6).

   e. Install rubber boot (5).



1. **Brake lever**
2. **Washer**
3. **lock washer**
4. **Screw**
5. **Rubber boot**
6. **Brake switch connector**
7. **Brake switch**

Figure 8-31. Brake Switch

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. **Fork-mounted fairing:** See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   a. Remove windshield.
   b. Remove upper vent.
   c. Remove outer fairing.
   d. Remove speaker grills.
   e. Remove inner fairing.
5. **Frame-mounted fairing:** See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
   a. Remove windshield.
   b. Remove upper vent.
   c. Remove outer fairing.
   d. Remove inner fairing.

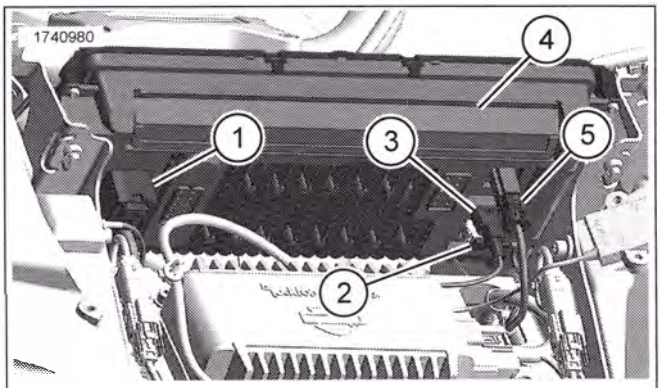
REMOVE

1. See Figure 8-32. Remove connectors.
   a. Remove main connector (1).
   b. Remove USB C connector (5).
   c. Remove radio antenna connector (3).
   d. Remove GPS antenna connector (2).
2. See Figure 8-33. Remove IFCU display assembly.
   a. Remove screws (1).
   b. Remove IFCU display assembly.
3. See Figure 8-34. Remove IFCU display trim.
   a. Remove screws (1).
   b. Lift tabs (2), pull away from display.
   c. Remove trim (3).

INSTALL

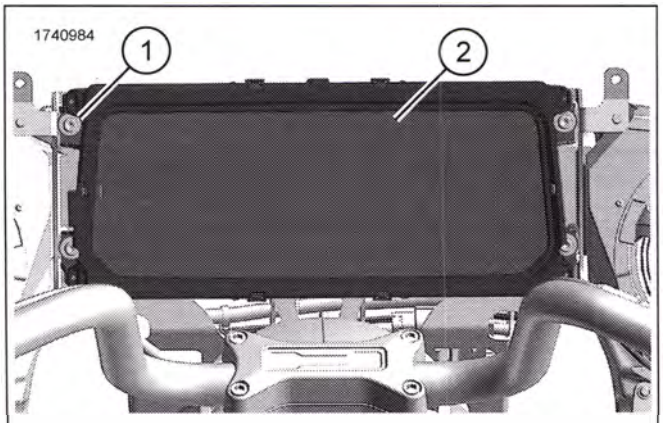
FASTENER	TORQUE VALUE	
IFCU display mounting screws	9–11 ft-lbs	12.1–14.7 N·m
IFCU display trim screws	7.5–10.5 **in-lbs**	0.85–1.19 N·m

1. See Figure 8-34. Install IFCU display trim.
   a. Latch bottom tabs (2) on display.
   b. Raise trim (3) and latch top tabs on display.
   c. Install screws (1). Tighten.
      Torque: 7.5–10.5 **in-lbs** (0.85–1.19 N·m) *IFCU display trim screws*
2. See Figure 8-33. Install IFCU display.
   a. Position display (2) on bracket.
   b. Install screws (1). Tighten.
      Torque: 9–11 ft-lbs (12.1–14.7 N·m) *IFCU display mounting screws*
3. See Figure 8-32. Connect connectors.
   a. Connect GPS antenna connector (2).
   b. Connect radio antenna connector (3).
   c. Connect USB C connector (5).
   d. Connect main connector (1).



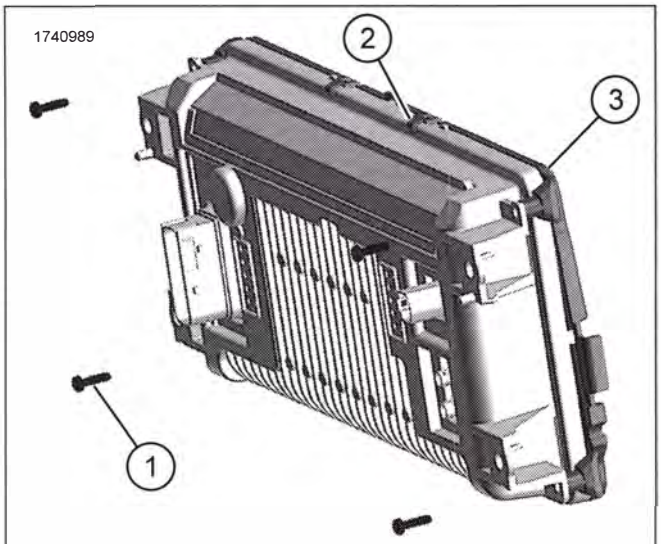
1. **Main connector**
2. **GPS antenna connector**
3. **Radio antenna connector**
4. **Display**
5. **USB C connector**

Figure 8-32. Connectors



1. **Screw (4)**
2. **Display assembly**

Figure 8-33. Display



1. **Screw (4)**
2. **Tab (4)**
3. **Trim**

Figure 8-34. Trim

COMPLETE

1. **Fork-mounted fairing:** See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   a. Install inner fairing.
   b. Install speaker grills.
   c. Install outer fairing.
   d. Install fairing vent.
   e. Install windshield.
2. **Frame-mounted fairing:** See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
   a. Install inner fairing.
   b. Install outer fairing.
   c. Install fairing vent.
   d. Install windshield.
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. **Frame mounted fairing:** Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
5. **Fork mounted fairing:** Remove dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

REMOVE

1. See Figure 8-35. Remove fork lock.
   a. Remove screws (2) and discard.

NOTE

Screws are breakaway screws.

   b. Remove washers (1).
   c. Remove fork lock (3).

INSTALL

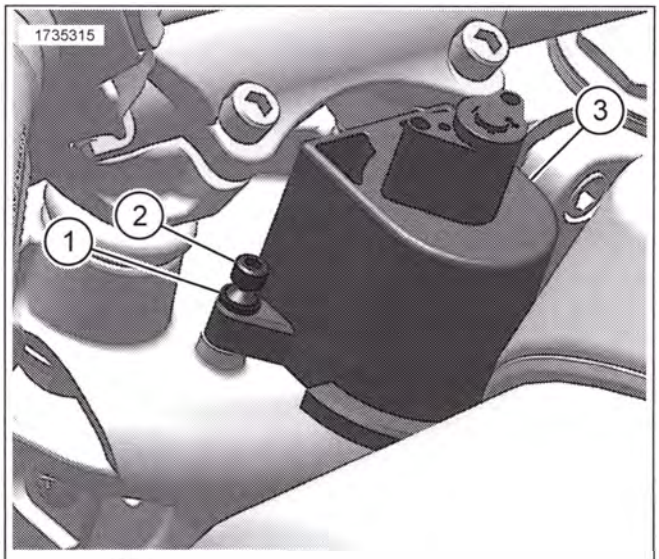
FASTENER	TORQUE VALUE	
Fork lock screw, 1st torque	19.5 **in-lbs**	2.2 N·m
Fork lock screw, final torque or until they snap off		540°

1. See Figure 8-35. Install fork lock.
   a. Verify fork lock (3) is in retracted position.
   b. Install fork lock.
   c. Install washers (1).
   d. Install Screws (2). Tighten to initial torque.

      Torque: 19.5 **in-lbs** (2.2 N·m) *Fork lock screw, 1st torque*

   e. Tighten Screws (2) until they snap off.

      Torque: (540°) *Fork lock screw, final torque or until they snap off*



1. **Washer (2)**
2. **Screw (2)**
3. **Fork lock**

Figure 8-35. Fork Lock

COMPLETE

1. **Frame mounted fairing:** Install nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
2. **Fork mounted fairing:** Install dash panel. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

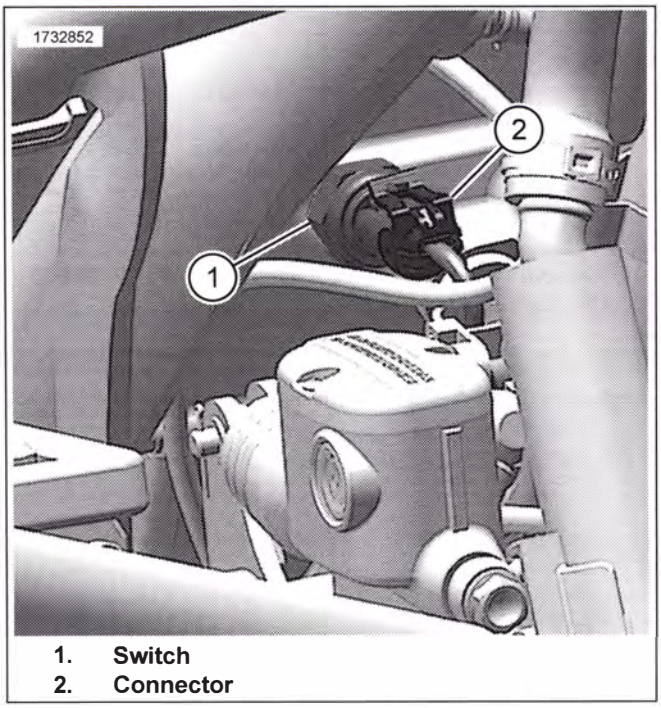
REMOVE

1. See Figure 8-36. Remove oil pressure switch.
   a. Disconnect connector (2).
   b. Remove switch (1).

INSTALL

FASTENER	TORQUE VALUE	
Oil pressure switch	13–17 ft-lbs	17–23 N·m

1. See Figure 8-36. Install oil pressure switch.
   a. Install switch (1). Tighten.
      Torque: 13–17 ft-lbs (17–23 N·m) *Oil pressure switch*
   b. Connect connector (2).



1. Switch
2. Connector

Figure 8-36. Oil Pressure Switch

COMPLETE

1. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
2. Install main fuse: See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144)

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

1. See Figure 8-37. Remove horn.
   a. Remove screws (3).
   b. Lift horn (1) away from engine and disconnect connectors (2).
   c. Remove horn assembly.
2. See Figure 8-38. Disassembly horn assembly.
   a. Remove nut (1).
   b. Remove bracket (3).

INSTALL

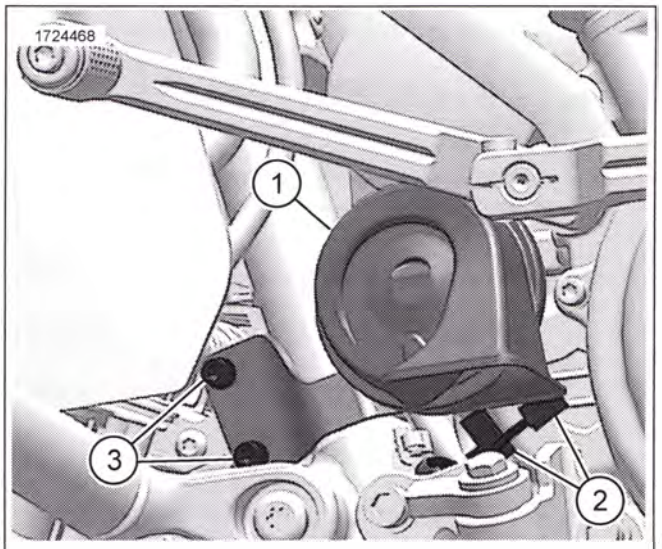
FASTENER	TORQUE VALUE	
Horn bracket, screws	71–97 **in-lbs**	8–11 N·m
Horn nut	80–100 **in-lbs**	9–11.3 N·m

1. See Figure 8-38. Assemble horn.
   a. Install bracket (3) and nut (1). Do not tighten.
   b. Adjust bracket to angle (4) shown.

NOTE

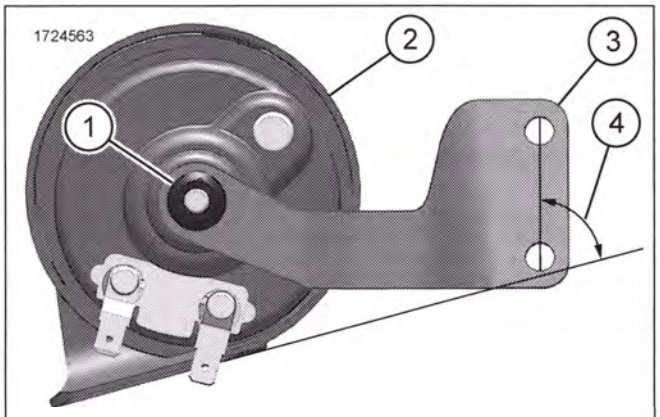
Terminals need to face front of motorcycle.

   c. Tighten nut.
   Torque: 80–100 **in-lbs** (9–11.3 N·m) *Horn nut*
2. See Figure 8-37. Install horn.
   a. Connect connectors (2).
   b. Place horn in position and install screws (3). Tighten.
   Torque: 71–97 **in-lbs** (8–11 N·m) *Horn bracket, screws*



1. **Horn assembly**
2. **Connector (2)**
3. **Screw (2)**

Figure 8-37. Horn Assembly



1. **Nut**
2. **Horn**
3. **Bracket**
4. **Bracket angle (75°)**

Figure 8-38. Horn Bracket

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove outer fairing.
   a. Fork-mounted fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. Frame-mounted fairing. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101)

REMOVE AND INSTALL: SINGLE HEADLAMP

FASTENER	TORQUE VALUE	
Headlamp mounting screws, single headlamp	30–37 **in-lbs**	3.4–4.2 N·m
Headlamp stabilizer bracket screws, single headlamp	30–37 **in-lbs**	3.4–4.2 N·m
Headlamp, adjuster bracket screws, single headlamp	25–35 **in-lbs**	2.8–3.95 N·m
Headlamp, ball end retainer screws, single headlamp	25–35 **in-lbs**	2.8–3.95 N·m
Headlamp, horizontal, mounting screws, single headlamp	60–84 **in-lbs**	6.8–9.5 N·m

Remove

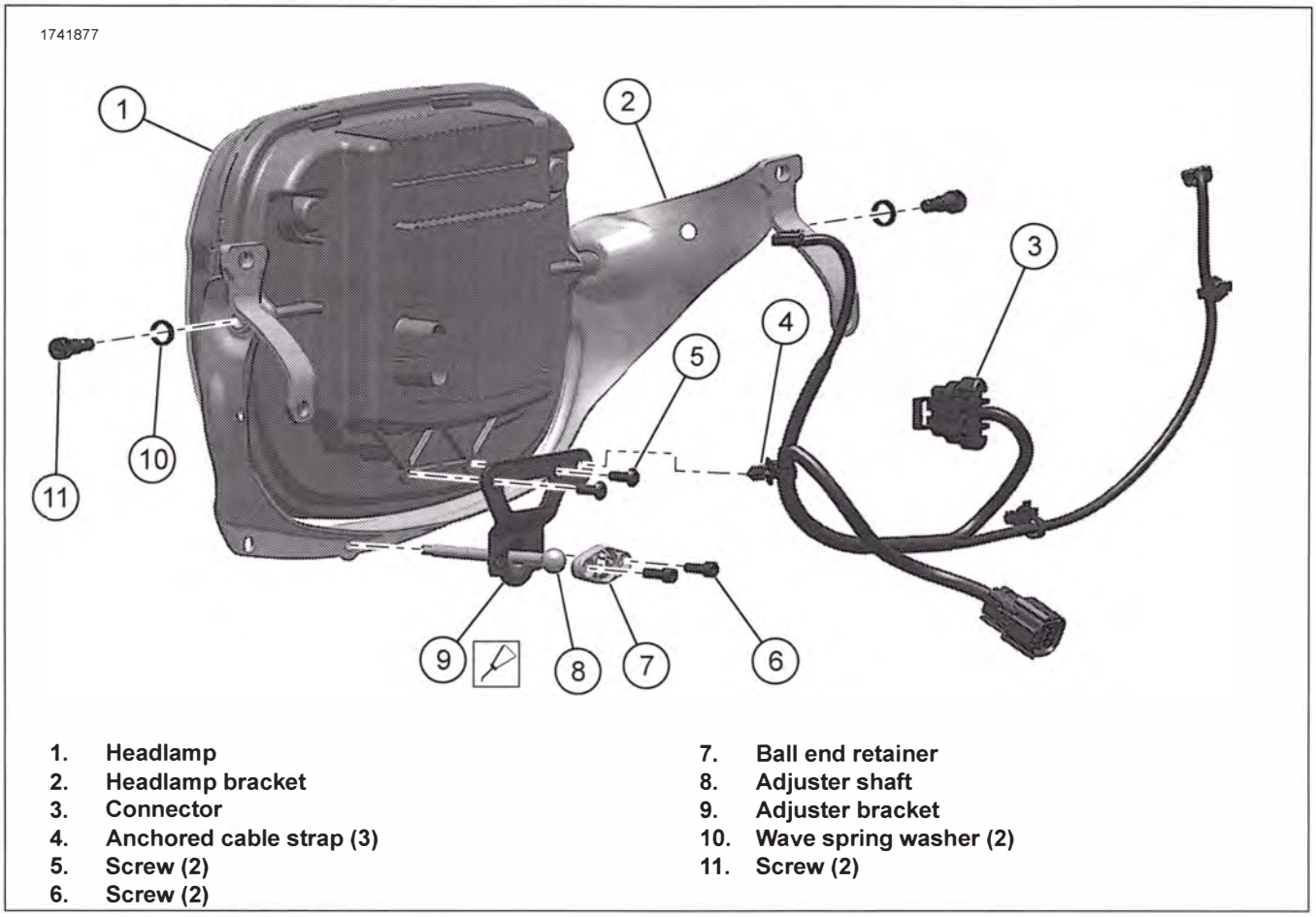
1. See Figure 8-41. Remove headlamp assembly.
   a. Remove connectors (2).
   b. Remove screws (4).
   c. Remove screws (1).
   d. Remove headlamp assembly (3).

Disassembly

1. See Figure 8-39. Remove headlamp harness.
   a. Disconnect connector (3).
   b. Remove anchor cable straps (4).
   c. Remove headlamp harness.
2. Remove adjuster bracket (serviced as an assembly).
   a. Removes screws (6).
   b. Remove ball end retainer (7).
   c. Remove adjuster shaft (8).
   d. Remove screws (5).
   e. Remove Adjuster bracket (9).
3. Remove headlamp bracket (serviced as an assembly).
   a. Remove screws (11) and wave spring washers (10).
   b. Remove headlamp bracket (2).
4. Remove headlamp assembly (1).

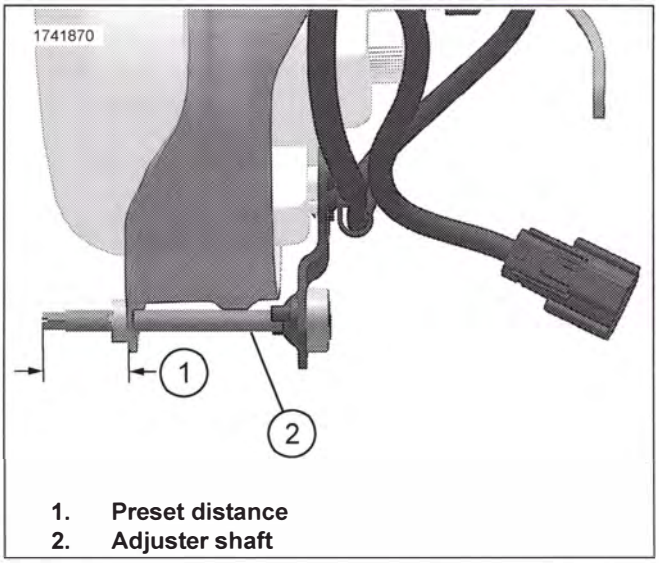
Assemble

1. See Figure 8-39. Install headlamp bracket if removed.
   a. Place headlamp (1) in headlamp bracket (2).
   b. Install wave spring washers (10) and screws (11). Do not tighten.
2. Install adjuster bracket if removed.
   a. Position adjuster bracket (9) on headlamp.
   b. Install screws (5). Tighten.
      Torque: 25–35 **in-lbs** (2.8–3.95 N·m) *Headlamp, adjuster bracket screws, single headlamp*
   c. Apply a small amount of lithium grease on adjuster bracket shaft pivot point.
   d. Install adjuster shaft (8).
   e. Install ball end retainer (7).
   f. Install Screws (6). Tighten.
      Torque: 25–35 **in-lbs** (2.8–3.95 N·m) *Headlamp, ball end retainer screws, single headlamp*
3. Tighten screws (11).
   Torque: 60–84 **in-lbs** (6.8–9.5 N·m) *Headlamp, horizontal, mounting screws, single headlamp*
4. Install headlamp harness.
   a. Connect connector (3).
   b. Install anchored cable straps (4).
5. See Figure 8-40. Set adjuster shaft (2) to preset length (1) if removed.
   .95–1.05 in (24.1–26.7 mm)



1. **Headlamp**
2. **Headlamp bracket**
3. **Connector**
4. **Anchored cable strap (3)**
5. **Screw (2)**
6. **Screw (2)**
7. **Ball end retainer**
8. **Adjuster shaft**
9. **Adjuster bracket**
10. **Wave spring washer (2)**
11. **Screw (2)**

Figure 8-39. Headlamp Assembly



1. **Preset distance**
2. **Adjuster shaft**

Figure 8-40. Headlamp Pre Adjustment

Install

1. See Figure 8-41. Install headlamp assembly.

   a. Place headlamp assembly (3) onto fairing.

   b. Install screws (4). Do not tighten.

   c. Install screws (1). Do not tighten.

   d. Using a screw from outer fairing partially install screws (6). Do Not tighten.

NOTE

Screws (6) are used to align bracket.

   e. Tighten screws (1).

   Torque: 30–37 **in-lbs** (3.4–4.2 N·m) *Headlamp stabilizer bracket screws, single headlamp*

   f. Tighten screws (4).

   Torque: 30–37 **in-lbs** (3.4–4.2 N·m) *Headlamp mounting screws, single headlamp*

   g. Remove screws (6).

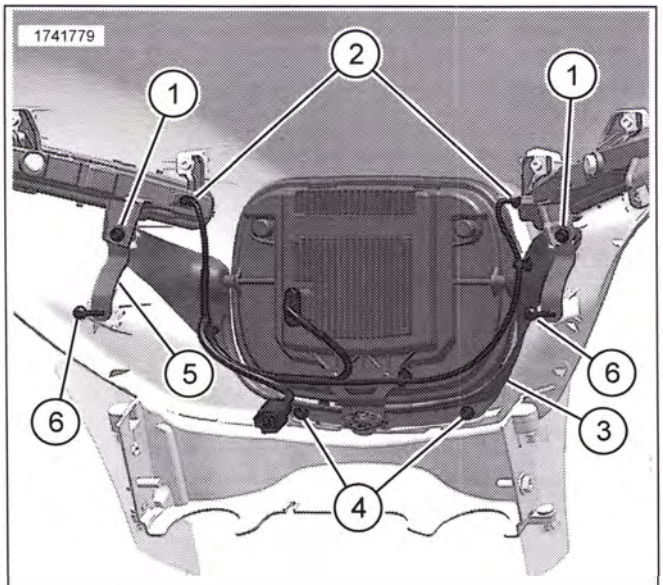
2. Connect connectors (2).

NOTE

Connector with yellow marker connects to right side turn signal lamp

3. Adjust headlamp. See adjust in this section.

4. Install outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).



1. **Screw (2)**
2. **Connector (2)**
3. **Headlamp assembly**
4. **Screw (2)**
5. **Stabilizer bracket (2)**
6. **Screw (2)**

Figure 8-41. Single Headlamp

REMOVE AND INSTALL: DUAL HEADLAMP

FASTENER	TORQUE VALUE	
Headlamp mounting screws, dual headlamp	96–119 **in-lbs**	10.8–13.5 N·m

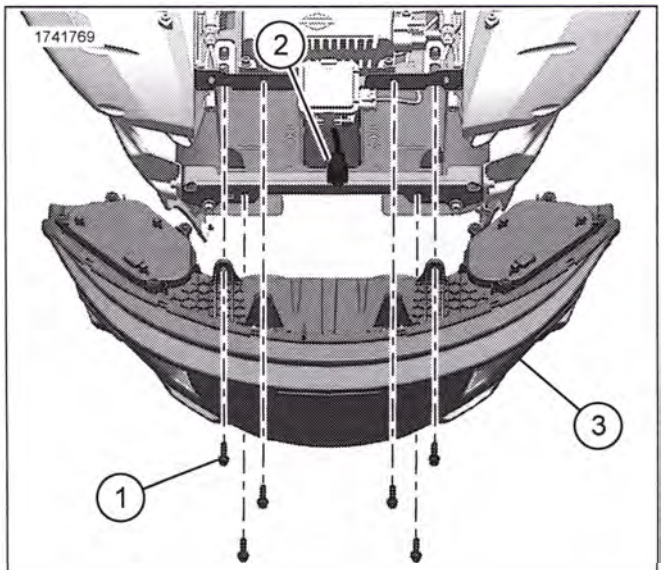
Remove

Turn signal lamps are incorporated with headlamp, and not serviceable. Replace entire headlamp assembly if failure occurs.

1. See Figure 8-42. Remove headlamp.
   a. Remove screws (1).
   b. Pull out headlamp (3) and disconnect connector (2).
   c. Remove headlamp.

Install

1. See Figure 8-42. Install headlamp.
   a. Connect connector (2).
   b. Slide headlamp (3) onto bracket.
   c. Install screws (1). Hand tighten.
   d. See Figure 8-43. Tighten to specification.
      Torque: 96–119 **in-lbs** (10.8–13.5 N·m) *Headlamp mounting screws, dual headlamp*
2. Install outer fairing. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).



1. **Screw (6)**
2. **Connector**
3. **Headlamp**

Figure 8-42. Dual Headlamp

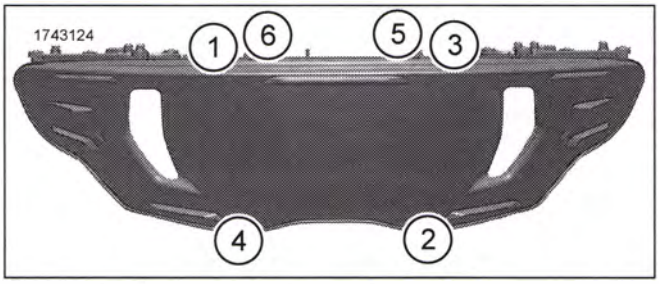


Figure 8-43. Headlamp Torque Sequence

ALIGN

1. Prepare motorcycle.
   a. Check tire pressure. See MAINTENANCE > INSPECT TIRES AND WHEELS (Page 2-13).
   b. Adjust rear shocks for rider and intended load. See MAINTENANCE > ADJUST SUSPENSION (Page 2-43).
   c. Fill fuel tank or add an equal amount of ballast.

NOTE

Choose a wall in minimum light.

2. See Figure 8-46. Park motorcycle on a line perpendicular to wall (1).
3. Position motorcycle so front of headlamp is 16.4 ft (5 m) from wall (3).

NOTE

See Figure 8-44. Upper lens is low beam (4) on LED headlamps.

Single headlamp shown, dual headlamp similar.

4. **Single headlamp:** Measure distance from floor to optical center of low beam (2) (dimple in lens).

5. See Figure 8-45.

   Dual headlamp:

   a. Measure from ground to center of headlamp opening (1).

   b. Subtract 1 in (25.4 mm).

   c. Measure from the ground to the sum that was arrived at above. This will be the optical center of low beam (2).

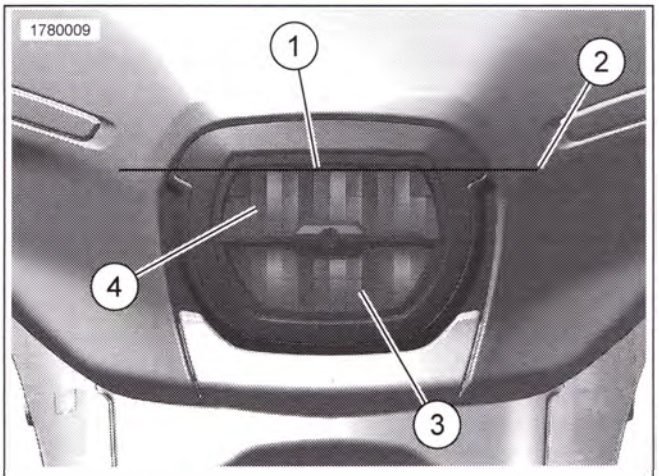
6. Draw a horizontal line (5) on the wall at the same height as the low beam center height was measured from the floor (2).

7. Draw another horizontal line (4) 1 in (2.5 cm) below horizontal line (5).

8. High beams and aux light need to be OFF during alignment procedure.

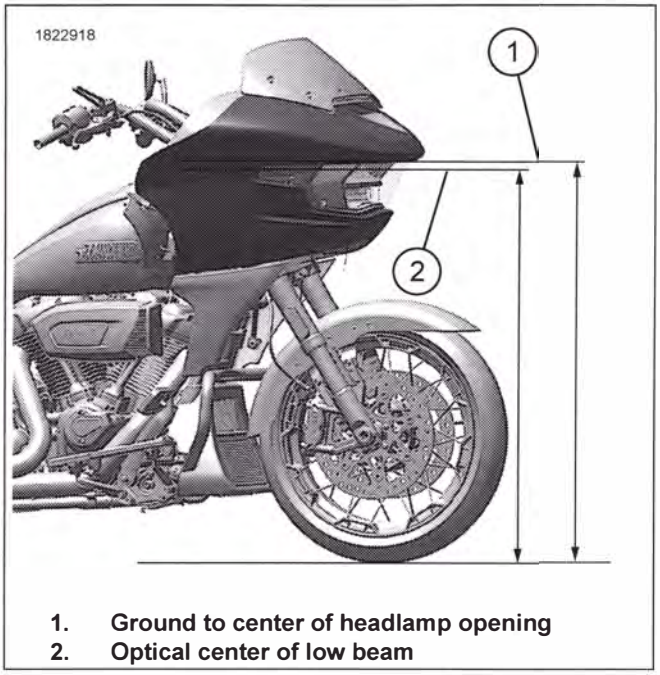
9. Verify headlamp alignment.

   a. See Figure 8-46. Headlamp is aligned when top of headlamp low beam (6) is aligned with alignment mark (4).



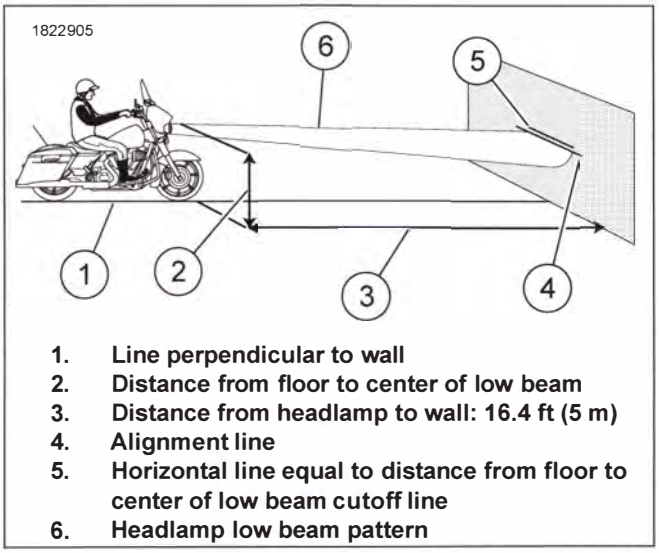
1. **Optical center of low beam (dimple in lens)**
2. **Low beam centerline**
3. **High beam**
4. **Low beam**

Figure 8-44. Headlamp Components (typical)



1. **Ground to center of headlamp opening**
2. **Optical center of low beam**

Figure 8-45. Headlamp Center of Low Beam



1. **Line perpendicular to wall**
2. **Distance from floor to center of low beam**
3. **Distance from headlamp to wall: 16.4 ft (5 m)**
4. **Alignment line**
5. **Horizontal line equal to distance from floor to center of low beam cutoff line**
6. **Headlamp low beam pattern**

Figure 8-46. Headlamp Alignment

ADJUST

Single Headlamp

1. Adjust headlamp.

   a. See Figure 8-47. Grasp adjuster cover (2) and pull forward to release it from posts (3).

   b. Insert flat blade screwdriver in vertical adjuster screw (1).

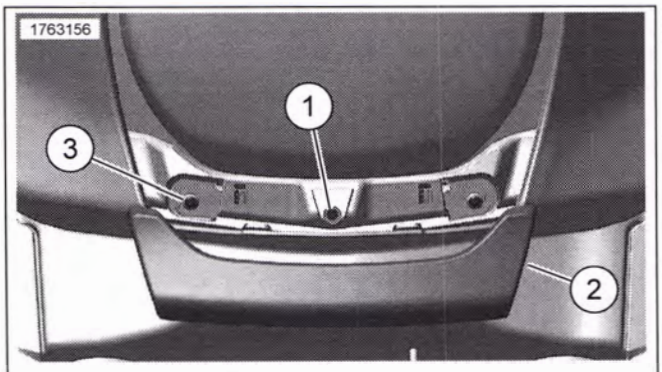
   c. See Figure 8-46. Turn adjuster screw CW or CCW to move headlamp beam (6) up or down until top of light beam meets horizontal line (5).

2. Remove screwdriver.

3. See Figure 8-47. Install adjuster cover.

   a. Align adjuster cover (2) with posts (3).

b. Press cover firmly onto posts.



1. **Vertical adjuster**
2. **Adjuster cover**
3. **Post (2)**

Figure 8-47. Headlamp Adjustment

Dual Headlamp

1. Adjust headlamp.

   a. See Figure 8-48 or Figure 8-49 Insert an appropriately sized Philips #2 screwdriver vertically, behind close-out panel.

   b. See Figure 8-46. Turn adjuster screw CW or CCW to move headlamp beam (4) up or down until top of light beam meets horizontal line (5).

   c. Remove screwdriver.

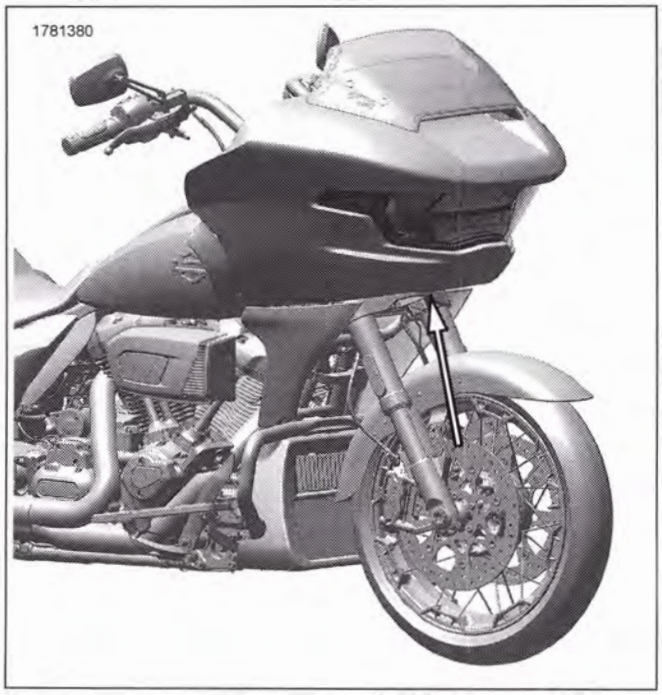
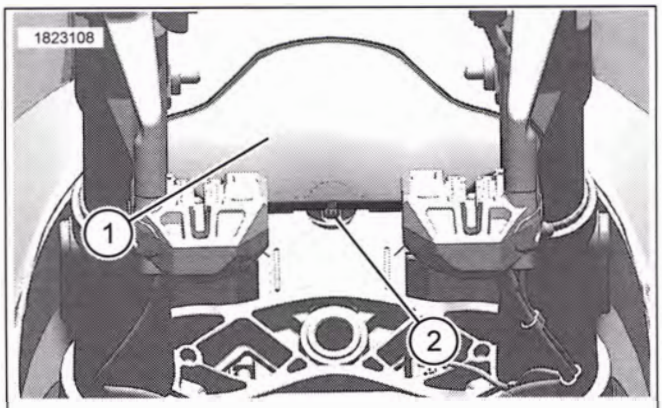
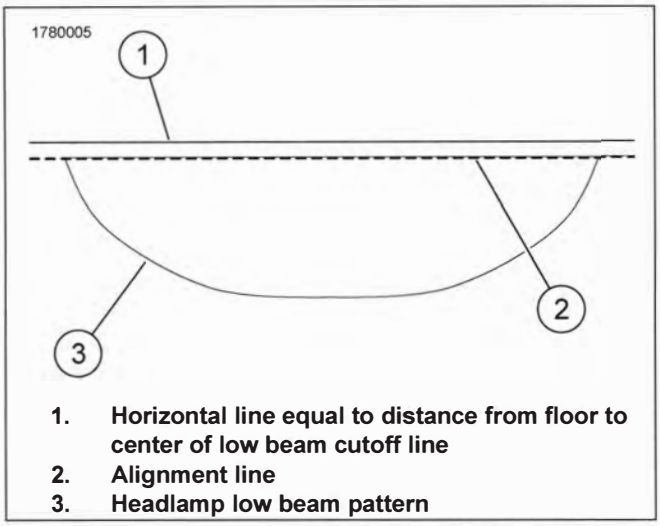


Figure 8-48. Headlamp Adjuster



1. **Fairing**
2. **Headlamp adjuster**

Figure 8-49. Headlamp Adjuster (view from under fairing)



1. **Horizontal line equal to distance from floor to center of low beam cutoff line**
2. **Alignment line**
3. **Headlamp low beam pattern**

Figure 8-50. Alignment of Headlamp Low Beam

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

Single Headlamp

Turn signal lamps are not serviceable. Replace entire assembly if failure occurs.

1. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

2. Remove outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87)

Dual Headlamp

Turn signal lamps are not serviceable. Replace entire headlamp if failure occurs. See HEADLAMP > REMOVE AND INSTALL: DUAL HEADLAMP (Page 8-34).

REMOVE

1. See Figure 8-51. Disconnect connectors.

2. See Figure 8-52. Remove turn signal lamps.

   a. Remove screws (2).

   b. Remove turn signal lamps (1,3).

INSTALL

FASTENER	TORQUE VALUE	
Turn signal lamp, front, single headlamp, screws	30–37 **in-lbs**	3.4–4.2 N·m

1. See Figure 8-52. Install front turn signal lamps.

   a. Install front turn signal lamp (1,3).

   b. Install screws (2) hand tight.

   c. Tighten screws.

      Torque: 30–37 **in-lbs** (3.4–4.2 N·m) *Turn signal lamp, front, single headlamp, screws*

2. See Figure 8-51. Connect connectors.

NOTE

Connector with yellow marker connects to right side turn signal lamp

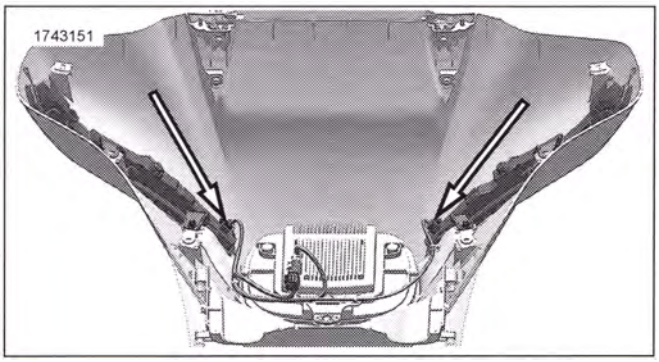
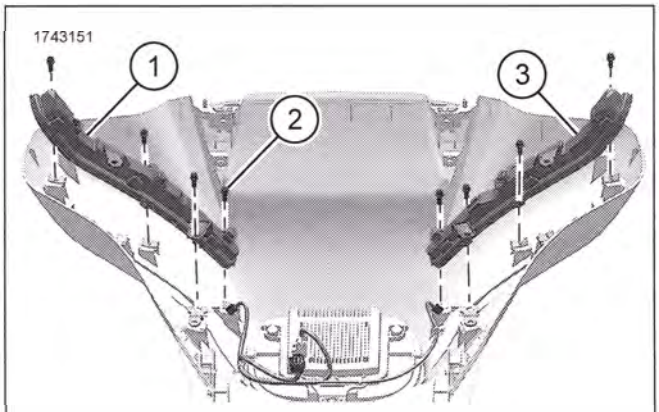


Figure 8-51. Front Turn Signal Connections



1. **Left turn signal lamp**
2. **Screw (8)**
3. **Right turn signal lamp**

Figure 8-52. Front Turn Signal Lamps

COMPLETE

Single Headlamp

1. Install outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

GENERAL

See ELECTRICAL > TAIL LAMP (Page 8-39). for rear turn signal procedures.

BULB REPLACEMENT

If replacing tail/turn lamp, the entire unit must be replaced as it is a sealed unit.

PREPARE

1. Remove saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

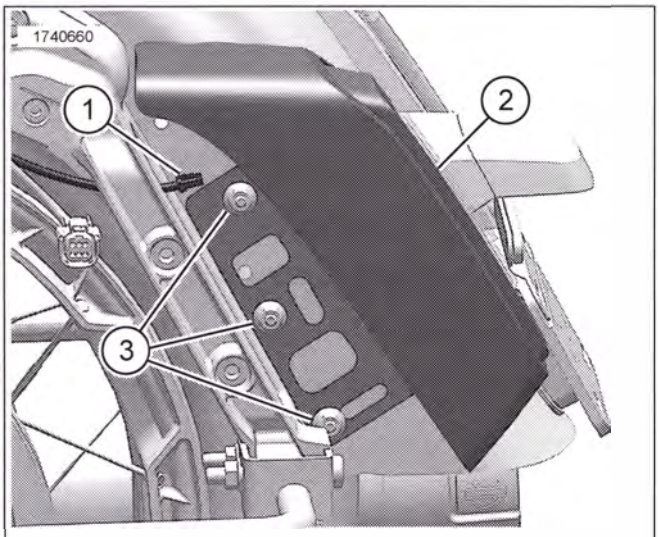
REMOVE

1. See Figure 8-53. Remove tail/turn lamp assembly.
   a. Disconnect connector (1).
   b. Remove nuts (3).
   c. Remove tail/turn lamp assembly (2).
2. See Figure 8-54. Remove lamp housing.
   a. Remove screws (1).
   b. Remove lamp housing (4).
3. Remove tail/turn lamp (serviced as an assembly).
   a. Remove screws (5).
   b. Remove tail/turn lamp (3).

INSTALL

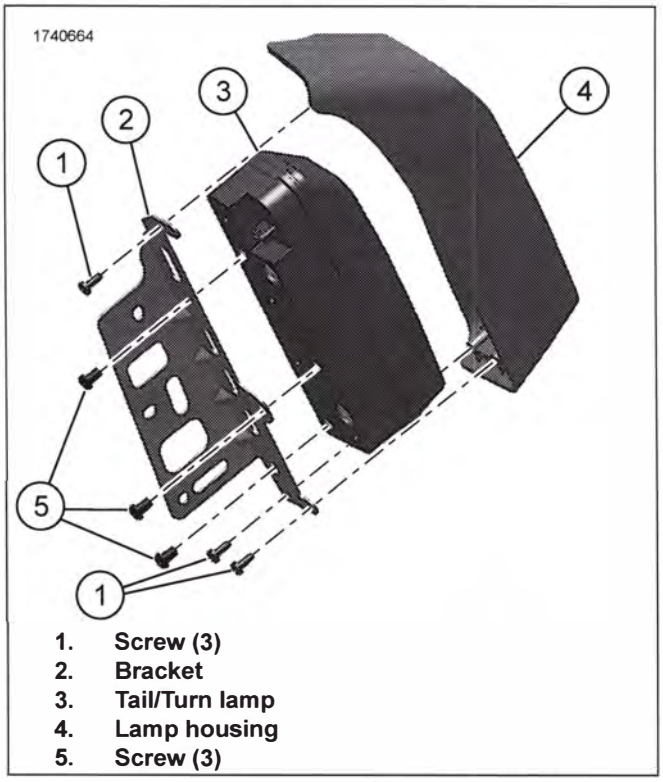
FASTENER	TORQUE VALUE	
Tail/Turn lamp assembly nuts	60–80 **in-lbs**	6.8–9 N·m
Tail/Turn lamp to bracket screws	10–11 ft-lbs	12.9–14.9 N·m
Tail/Turn light housing to bracket screws	23–26 **in-lbs**	2.6–2.94 N·m

1. See Figure 8-54. Install tail/turn lamp (serviced as an assembly).
   a. Position tail/turn lamp (3) on bracket (2).
   b. Install Screws (5). Tighten.
      Torque: 10–11 ft-lbs (12.9–14.9 N·m) *Tail/Turn lamp to bracket screws*
2. Install lamp housing.
   a. Position lamp housing (4) on bracket (2).
   b. Install screws (1). Tighten.
      Torque: 23–26 **in-lbs** (2.6–2.94 N·m) *Tail/Turn light housing to bracket screws*
3. See Figure 8-53. Install tail/turn lamp assembly.
   a. Position tail/turn lamp assembly (2) on mounting studs.
   b. Install nuts (3). Tighten.
      Torque: 60–80 **in-lbs** (6.8–9 N·m) *Tail/Turn lamp assembly nuts*
   c. Connect connector (1).



1. **Connector**
2. **Tail/Turn lamp assembly**
3. **Screw (3)**

Figure 8-53. Tail/Turn Lamp Assembly



1. **Screw (3)**
2. **Bracket**
3. **Tail/Turn lamp**
4. **Lamp housing**
5. **Screw (3)**

Figure 8-54. Tail/Turn Lamp

COMPLETE

1. Install Main Fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove right side rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
5. *NOTE*

Do not disconnect brake line.

Remove rear brake master cylinder from frame. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).

REMOVE

1. See Figure 8-55. Disconnect stop lamp switch connectors from terminals (1).
2. *NOTE*

Wrap switch fitting with pieces of lint-free shop towel to absorb any loss of brake fluid.

Hold brake line fitting (3) and remove rear stop lamp switch (2).

INSTALL

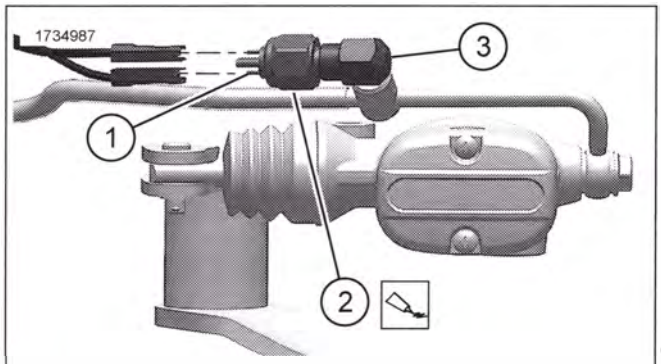
FASTENER	TORQUE VALUE	
Rear stop lamp switch	12 ft-lbs	16.3 N·m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

1. Apply thread sealant to rear stop lamp switch.

   Consumable: LOCTITE 565 THREAD SEALANT (99818-97)
2. See Figure 8-55. Install rear stop lamp switch (2) into rear brake line fitting (3).
3. Hold brake line fitting and tighten.

   Torque: 12 ft-lbs (16.3 N·m) *Rear stop lamp switch*
4. Install stop lamp switch connectors on terminals (1).



1. Wire terminals
2. Stop lamp switch
3. Brake line fitting

Figure 8-55. Rear Stop Lamp Switch

COMPLETE

1. *NOTE*

Do not disconnect brake line.

Install rear brake master cylinder. See CHASSIS > REAR BRAKE MASTER CYLINDER (Page 3-33).

   a. Confirm oil switch/sender wires are inboard of rubber mount.
2. Install right side rider footboard. See CHASSIS > RIDER FOOTRESTS (Page 3-133).
3. Bleed brake system. See CHASSIS > BLEED BRAKES (Page 3-58).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

⚠ WARNING

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

5. Verify tail lamp and stop lamp operation.
6. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
7. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

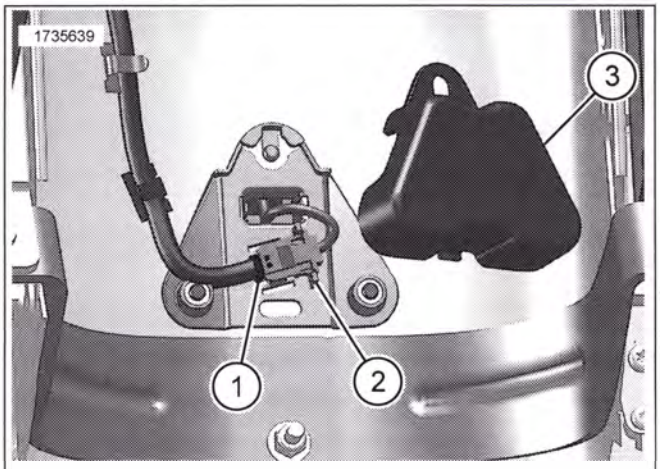
REMOVE

1. See Figure 8-56. Disconnect license plate lamp.
   a. Remove cover (3).
   b. Remove connector from clip (2).
   c. Disconnect connector (1).
2. See Figure 8-57. Remove reflector (4).
3. Remove license plate bracket assembly.
   a. Remove screws (3) and washers (2).
   b. Remove license plate bracket assembly (5).
   c. Remove gasket (1).
4. See Figure 8-58. Remove lamp cover.
   a. Remove screws (1).
   b. Remove cover (6).
5. Remove lamp.
   a. Remove screws (4).
   b. Remove lamp (5).

INSTALL

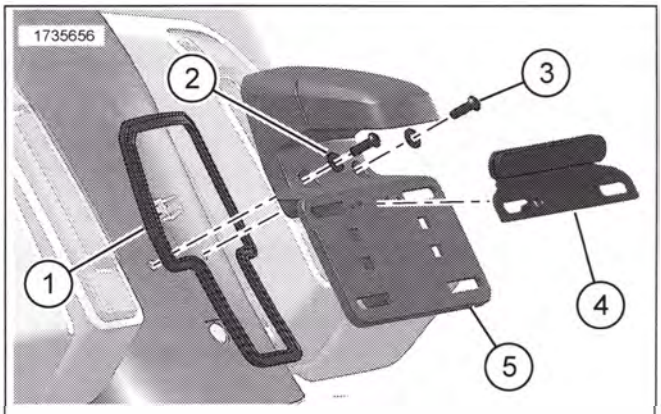
FASTENER	TORQUE VALUE	
License plate bracket screws	60–80 **in-lbs**	6.8–9 N·m
License plate lamp cover to license plate bracket screws	6.2–8.0 **in-lbs**	0.7–0.9 N·m
License plate lamp screws	3.7–5.1 **in-lbs**	0.42–0.58 N·m

1. See Figure 8-58. Install license plate lamp.
   a. Place lamp (5) on lamp cover (6).
   b. Install screws (4). Tighten
      Torque: 3.7–5.1 **in-lbs** (0.42–0.58 N·m) *License plate lamp screws*
2. Install lamp cover assembly.
   a. Insert connector (3) through opening on license plate bracket (2).
   b. Position lamp cover assembly on license plate bracket.
   c. Install screws (1). Tighten.
      Torque: 6.2–8.0 **in-lbs** (0.7–0.9 N·m) *License plate lamp cover to license plate bracket screws*
3. See Figure 8-57. Install license plate bracket assembly.
   a. Place gasket (1) on license plate bracket assembly (5).
   b. Insert connector through opening on fender.
   c. Install washers (2) and screws (3). Tighten.
      Torque: 60–80 **in-lbs** (6.8–9 N·m) *License plate bracket screws*
4. See Figure 8-56. Connect connector (1).
5. Install in clip (2).
6. Install cover.
   a. Slide cover under tabs on mounting bracket.
   b. Snap cover onto mounting bracket.



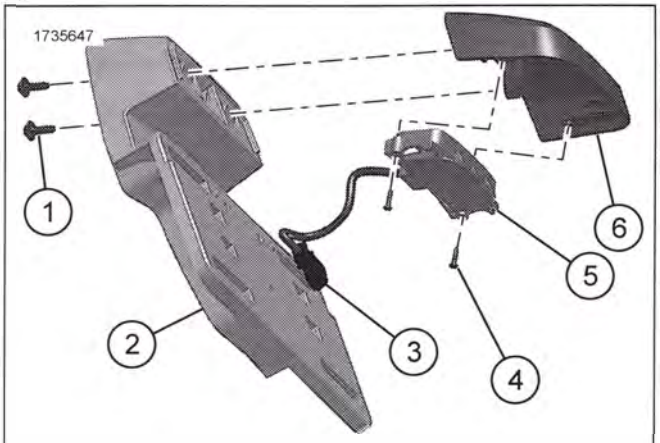
1. **Connector**
2. **Clip**
3. **Cover**

Figure 8-56. License Plate Lamp (view from behind fender)



1. Gasket
2. Washer (2)
3. Screw (2)
4. Reflector
5. License plate bracket assembly

Figure 8-57. License Plate Bracket Assembly



1. Screw (2)
2. Licence plate bracket
3. Connector
4. Screw (2)
5. Lamp
6. Lamp cover

Figure 8-58. License Plate Lamp

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Verify lamp operation.
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove outer fairing.
   a. **Fork-mounted fairing model:** See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. **Frame-mounted fairing model:** See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

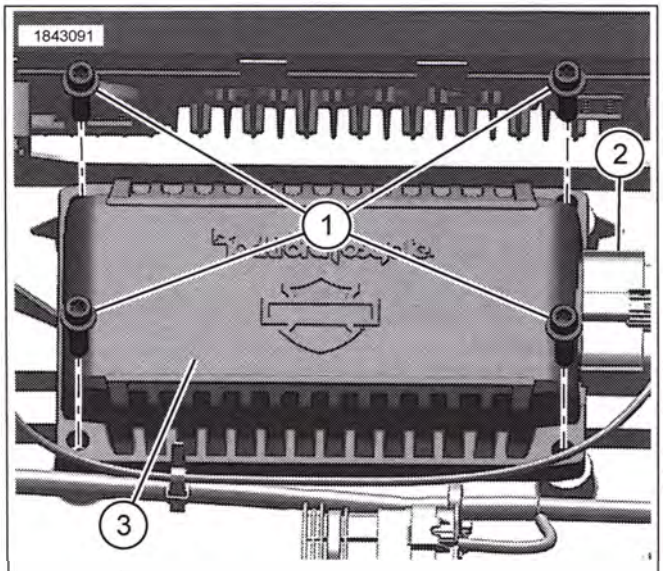
REMOVE

1. See Figure 8-59. Remove Amplifier.
   a. Remove screws (1).
   b. Remove Amplifier (3).
   c. Disconnect connector (2).

INSTALL

FASTENER	TORQUE VALUE	
Amplifier screws	49–60 **in-lbs**	5.5–6.8 N·m

1. See Figure 8-59. Install amplifier.
   a. Connect connector (2).
   b. Install amplifier (3) on mounts.
   c. Install screws (1). Tighten.
      Torque: 49–60 **in-lbs** (5.5–6.8 N·m) *Amplifier screws*



1. **Screw (4)**
2. **Connector**
3. **Amplifier**

Figure 8-59. Amplifier

COMPLETE

1. Install outer fairing.
   a. **Fork-mounted fairing model:** See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. **Frame-mounted fairing model:** See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. **Fork-mounted fairing:** Remove media compartment. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

REMOVE AND INSTALL: FORK MOUNTED FAIRING

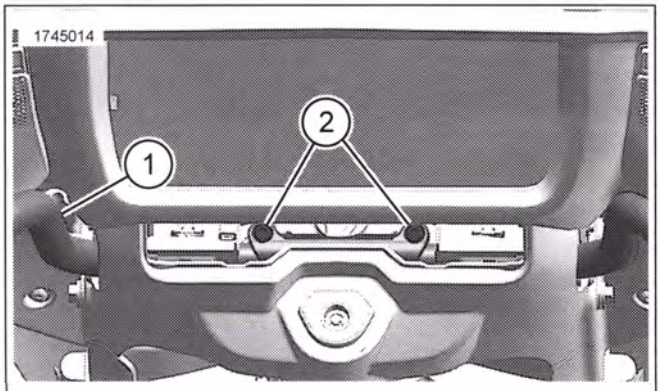
FASTENER	TORQUE VALUE	
Handlebar clamp screws	16–18 ft-lbs	21.7–24.4 N·m
Speaker, front, fork mounted fairing, grille screw	11–14 **in-lbs**	1.24–1.58 N·m
Speaker, front, fork mounted fairing, screws	9–13 **in-lbs**	1–1.5 N·m

Remove

1. See Figure 8-60. Lower handlebar.
   a. Make a line from handlebar (1) onto clamp to mark handlebar position.
   b. Loosen screws (2).
   c. Lower handlebar.
2. See Figure 8-61. Remove grille.
   a. Remove screw (5).
   b. Using a non-marring tool, pry clips (3) from clip openings (2).
   c. Remove grille (4).
   d. See Figure 8-62. Verify clips (1) and gasket (2) are in good shape, if not replace.
3. See Figure 8-61. Remove speaker.
   a. Remove screws (6).
   b. See Figure 8-63. Slide speaker (1) out of fairing.
   c. Disconnect connectors (4).
   d. Remove speaker.

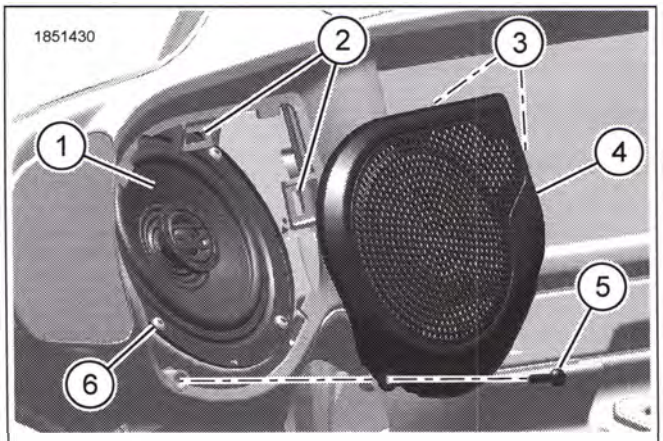
Install

1. See Figure 8-63. Install speaker.
   a. Connect connectors (4) on terminals (3).
   b. Align pin (5) with alignment hole (2).
   c. See Figure 8-61. Position speaker on speaker opening.
   d. Install screws (6). Tighten.
      Torque: 9–13 **in-lbs** (1–1.5 N·m) *Speaker, front, fork mounted fairing, screws*
2. Install grille.
   a. See Figure 8-62. Verify clips (1) and gasket (2) are in place on grille.
   b. See Figure 8-61. Press grille clips (3) into clip openings (2).
   c. Install screw (5). Tighten.
      Torque: 11–14 **in-lbs** (1.24–1.58 N·m) *Speaker, front, fork mounted fairing, grille screw*
3. See Figure 8-60. Secure handlebar.
   a. Raise handlebar (1) to marked position.
   b. Tighten screws (2).
      Torque: 16–18 ft-lbs (21.7–24.4 N·m) *Handlebar clamp screws*



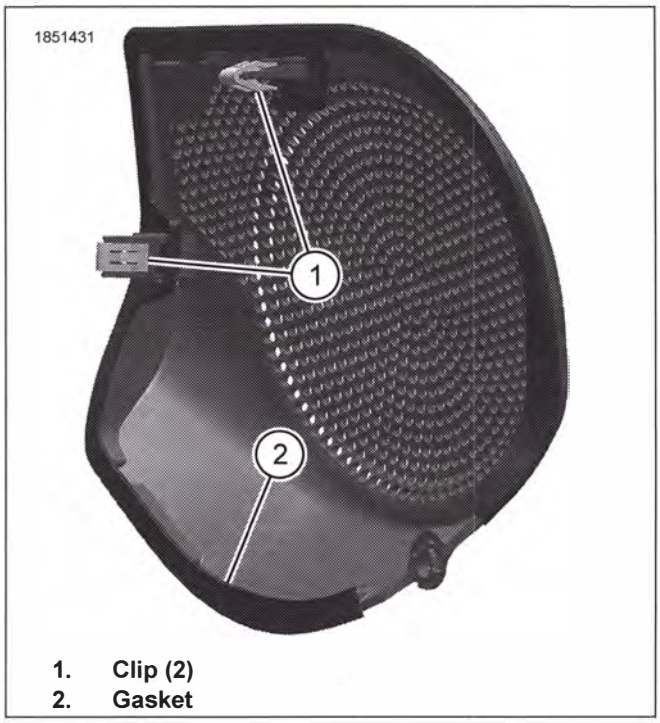
1. Handlebar
2. Screw (2)

Figure 8-60. Handlebar Screws



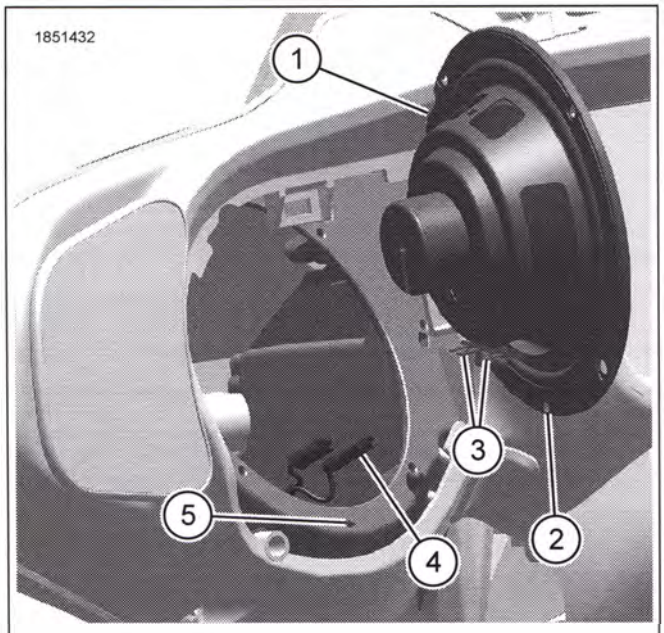
1. Speaker
2. Clip opening (2)
3. Clip (2)
4. Grille
5. Screw
6. Screw (4)

Figure 8-61. Fork Mounted Fairing Speaker Grille



1. Clip (2)
2. Gasket

Figure 8-62. Fork Mounted Fairing Grille Gasket



1. Speaker
2. Alignment hole
3. Terminal (2)
4. Connector (2)
5. Pin

Figure 8-63. Fork Mounted Fairing Speaker

REMOVE AND INSTALL: FRAME MOUNTED FAIRING

FASTENER	TORQUE VALUE	
Speaker, front, frame mounted fairing, screws	9–13 **in-lbs**	1–1.5 N·m

Remove

1. See Figure 8-64. Remove grille.

NOTE

Do not pry on bottom of speaker grille. Damage could occur to lower tabs.

   a. Using a non-marring tool, pry inner upper clip (6) out.

   b. Using a non-marring tool, pry outer upper clip (5) out.

   c. Rotate top of grille (8) out.

   d. Remove grille.

   e. See Figure 8-65. Verify clips (1) and gasket (2) are in good shape, if not replace.

2. Remove speaker.

   a. Remove screws (1).

   b. See Figure 8-66. Slide speaker (1) out of fairing.

   c. Disconnect connectors (4).

   d. Remove speaker.

Install

1. See Figure 8-66. Install speaker.

   a. Connect connectors (4) on terminals (3).

   b. Align pin (5) with alignment hole (2).

   c. Position speaker on speaker opening.

   d. See Figure 8-64. Install screws (1). Tighten

      Torque: 9–13 **in-lbs** (1–1.5 N·m) *Speaker, front, frame mounted fairing, screws*

2. Install grille.

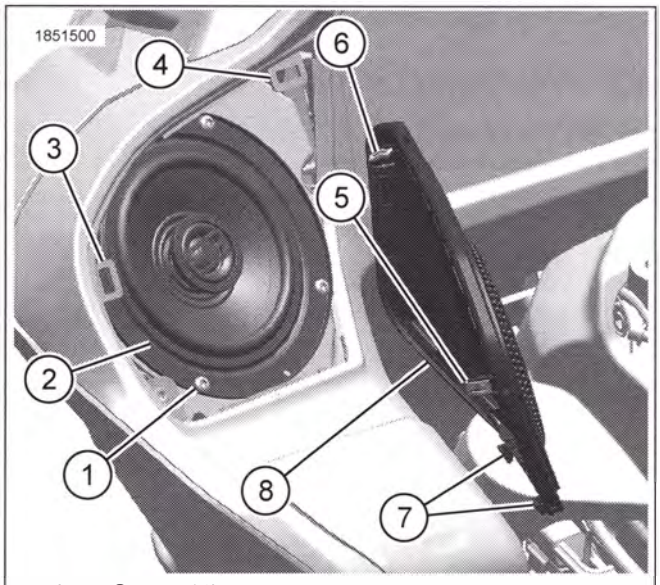
   a. See Figure 8-65. Verify clips (1) and gasket (2) are in place on grille.

   b. See Figure 8-64. Install lower tabs (7) onto fairing.

   c. Rotate grille (8) up.

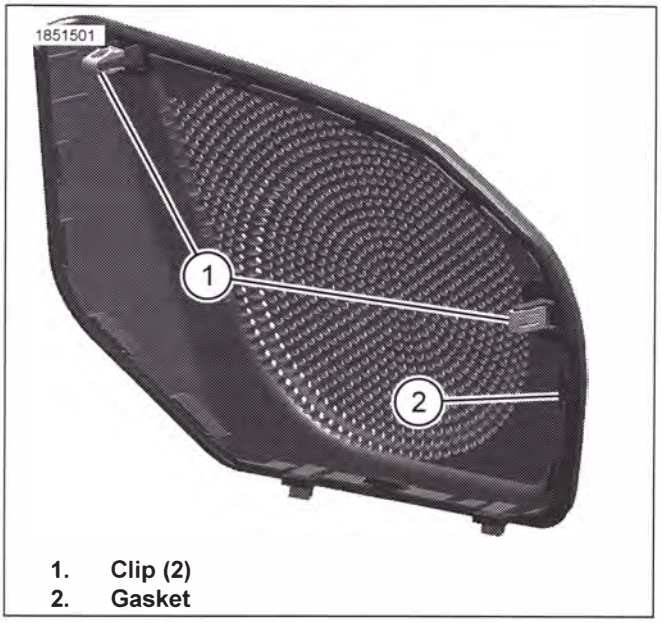
   d. Press grille outer upper clip (5) into outer clip opening (3).

   e. Press grille inner upper clip (6) into inner clip opening (4).



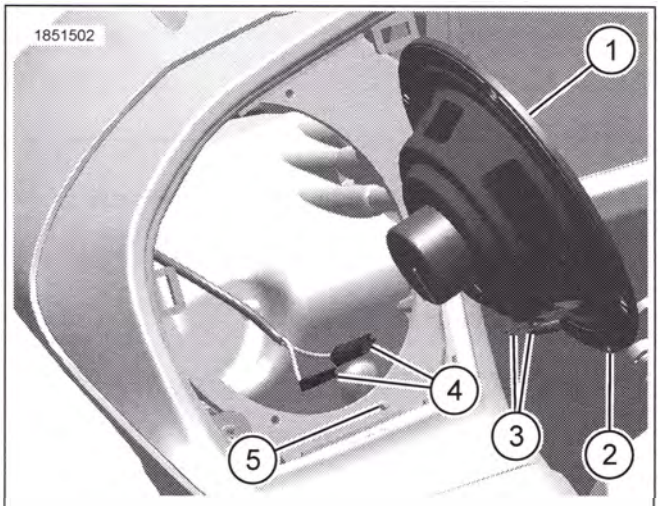
1. **Screw (4)**
2. **Speaker**
3. **Outer clip opening**
4. **Inner clip opening**
5. **Outer upper clip**
6. **Inner upper clip**
7. **Tab (2)**
8. **Grille**

Figure 8-64. Frame Mounted Fairing Speaker Grille



1. **Clip (2)**
2. **Gasket**

Figure 8-65. Frame Mounted Fairing Speaker Gasket



1. **Speaker**
2. **Alignment hole**
3. **Terminal (2)**
4. **Connector (2)**
5. **Pin**

Figure 8-66. Frame Mounted Fairing Speaker

COMPLETE

1. **Fork-mounted fairing:** Install media compartment. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove outer fairing. See
   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
5. **Frame-mounted fairing:** Remove headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

REMOVE

1. See Figure 8-67 or Figure 8-68.Remove antenna.
   a. Disconnect antenna connector (1).
   b. Remove screw (2).
   c. Remove AM/FM antenna foil (5).
   d. Remove antenna amplifier (6) and foil and discard.
2. Remove any residual adhesive. See CHASSIS > MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-153).

INSTALL

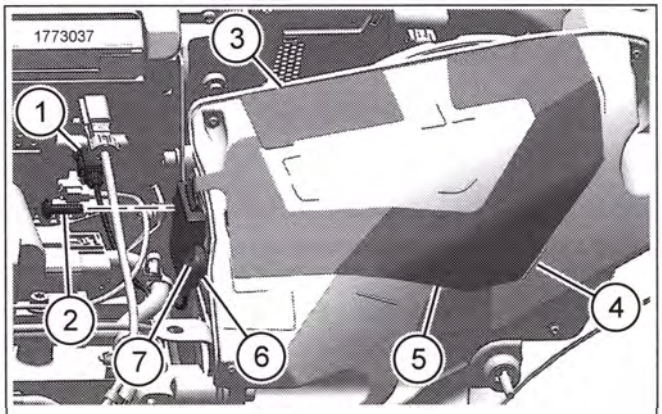
FASTENER	TORQUE VALUE	
Antenna amplifier, screw	11–14 **in-lbs**	1.25–1.6 N·m

1. See Figure 8-67 or Figure 8-68. Install **new** antenna amplifier.
   a. Place amplifier locating hole (7) on locating pin.
   b. Install screw (2).Tighten.
      Torque: 11–14 **in-lbs** (1.25–1.6 N·m) *Antenna amplifier, screw*
   c. Connect antenna connector (1).
2. Install AM/FM antenna foil.

NOTE

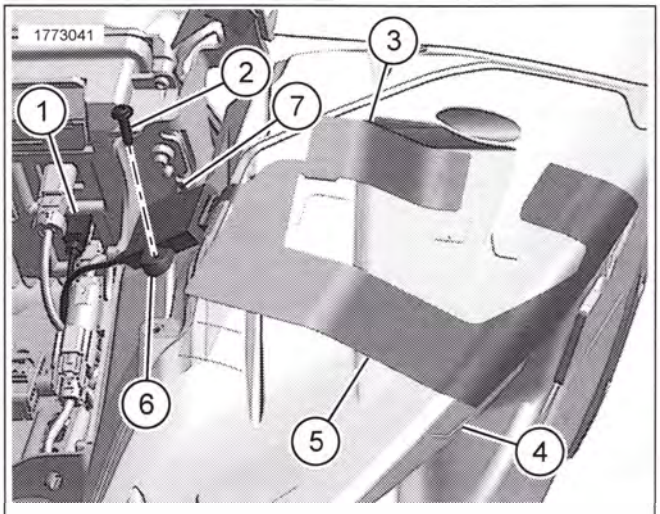
Antenna cannot be repositioned after initial installation. Do not remove protective film from adhesive until ready to apply.

   a. Lay out AM/FM antenna foil (5) within alignment ribs (4) as shown.
   b. Remove protective film from AM/FM antenna foil.
   c. Align AM/FM antenna foil parallel to alignment ribs.
   d. Attach to pod.
3. Install DAB antenna (if equipped).
   a. Align DAB (3) antenna (if equipped).
   b. Remove protective film from DAB antenna.
   c. Attach to pod.



1. **Antenna connector**
2. **Screw**
3. **DAB (if equipped)**
4. **Alignment rib**
5. **AM/FM antenna foil**
6. **Antenna amplifier**
7. **Locating hole**

Figure 8-67. Fork-Mounted Fairing



1. **Antenna connector**
2. **Screw**
3. **DAB (if equipped)**
4. **Alignment rib**
5. **AM/FM antenna foil**
6. **Antenna amplifier**
7. **Locating hole**

Figure 8-68. Frame-Mounted Fairing

COMPLETE

1. **Frame-mounted fairing:** Install headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

2. Install outer fairing. See

   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).

   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove outer fairing. See
   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
5. **Frame-mounted fairing:** Remove headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

REMOVE

1. Remove double loop cable strap(s) (3).
   a. **Fork-Mounted fairing:**See Figure 8-69.
   b. **Frame-Mounted fairing:**See Figure 8-70.
2. See Figure 8-69. or See Figure 8-70. Disconnect connector (2).
3. Gently pry GPS antenna (1) from upper support bracket.

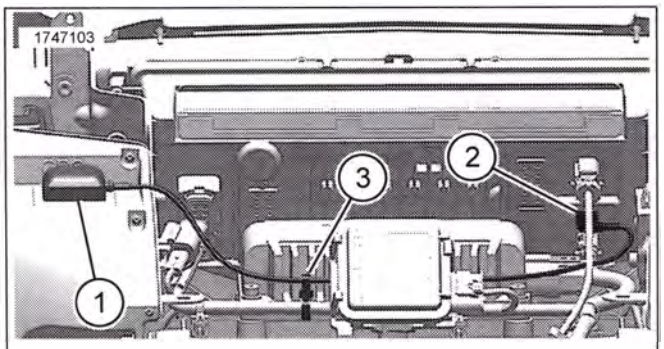
INSTALL

1. See Figure 8-69 or Figure 8-70 Install antenna (1).

NOTE

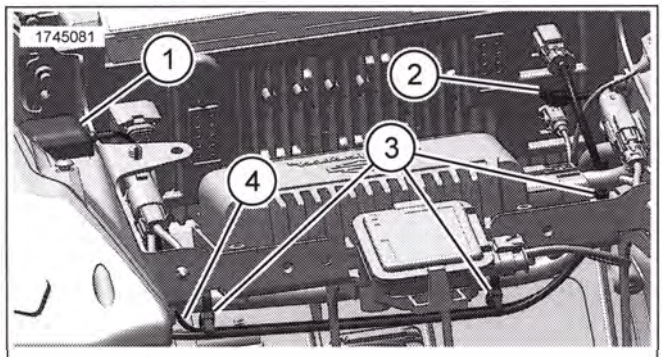
After installing antenna, avoid contact with or movement of the antenna for 20 minutes.

   a. Clean top of upper support bracket with isopropyl alcohol. Allow to dry completely.
   b. Remove adhesive backing from GPS antenna.
   c. With wire lead toward the right, press and hold antenna (1) for 60 seconds.
2. Secure GPS cable.
   a. **Fork-mounted fairing:**See Figure 8-69. Route and secure GPS cable with cable strap (3) as shown.
   b. **Frame-mounted fairing:**See Figure 8-70. Route and secure GPS cable (4) and USB cable with cable straps (3) as shown.
3. Connect connector (2).



1. **GPS antenna**
2. **GPS connector**
3. **Double loop cable strap**

Figure 8-69. Fork-Mounted Fairing GPS Antenna



1. **GPS antenna**
2. **GPS connector**
3. **Double loop cable strap (3)**
4. **GPS cable**

Figure 8-70. Frame-Mounted Fairing GPS Antenna

COMPLETE

1. **Frame-mounted fairing:** Install headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).
2. Install outer fairing. See
   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

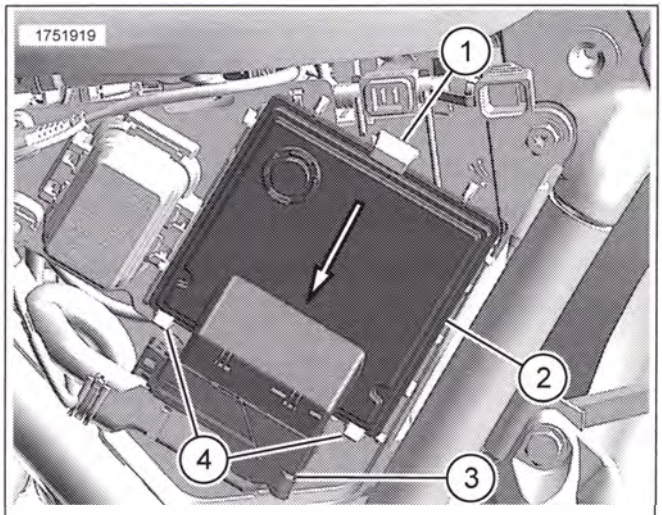
1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

1. See Figure 8-71. Remove ECM.
   a. Push ECM (2) towards cam lock connector and pullout.
   b. Remove cam lock connector (3).

INSTALL

1. See Figure 8-71. Install ECM.
   a. Install cam lock connector (3).
   b. Place ECM (2) on tabs (4).
   c. Press ECM down and in to secure on latch (1).



1. **Latch**
2. **ECM**
3. **Cam lock connector**
4. **Tab (2)**

Figure 8-71. ECM

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).

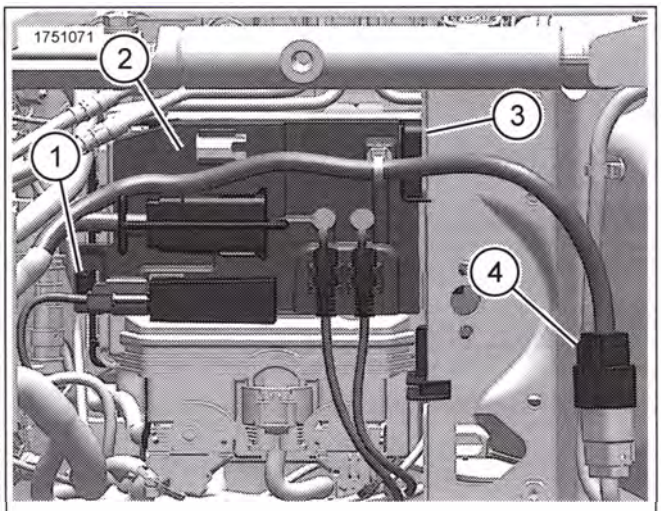
REMOVE

1. See Figure 8-72. Relocate top caddy.
   a. Disconnect rear harness connector (4).
   b. Push on tab (1).
   c. Lift caddy (2) from hold down clip (3).
   d. Secure out of the way.
2. See Figure 8-73. Remove BCM.
   a. Pull on tab (2).
   b. Lift BCM (1) from hold down clip (3).
   c. Disconnect connector (5).
   d. Disconnect cam lock connectors (4).
   e. Remove BCM.
3. See Figure 8-74. Remove BCM Caddy.
   a. Remove screw (1).
   b. Remove BCM caddy (3).

INSTALL

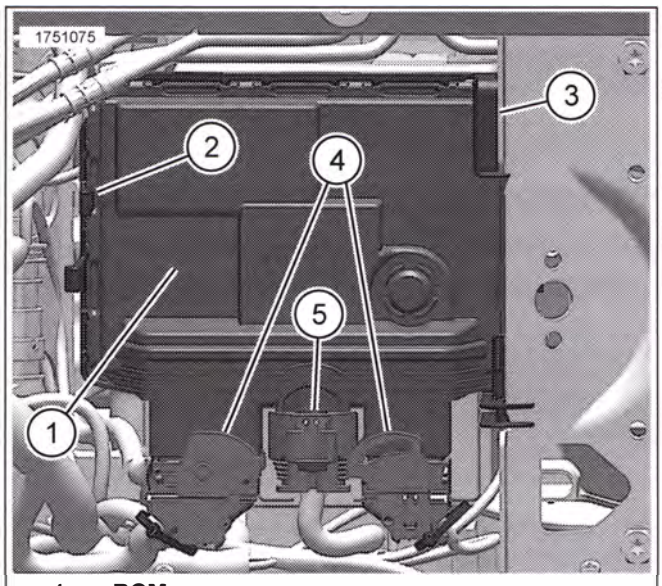
FASTENER	TORQUE VALUE	
BCM caddy screw	27–35 **in-lbs**	3–4 N·m

1. See Figure 8-74. Install BCM caddy.
   a. Install tab (2) on cross member.
   b. Install screw (1). Tighten.
      Torque: 27–35 **in-lbs** (3–4 N·m) *BCM caddy screw*
2. See Figure 8-73. Connect BCM.
   a. Connect cam lock connectors (4). Rotate lock to secure.
   b. Connect connector (5).
3. Install BCM.
   a. Install BCM in hold down clip (3).
   b. Press down to secure BCM to tab (2).
4. See Figure 8-72. Install top caddy.
   a. Install top caddy (2) in hold down clip (3).
   b. Press top caddy onto tab (1) to secure.
5. Connect rear harness connector (4).



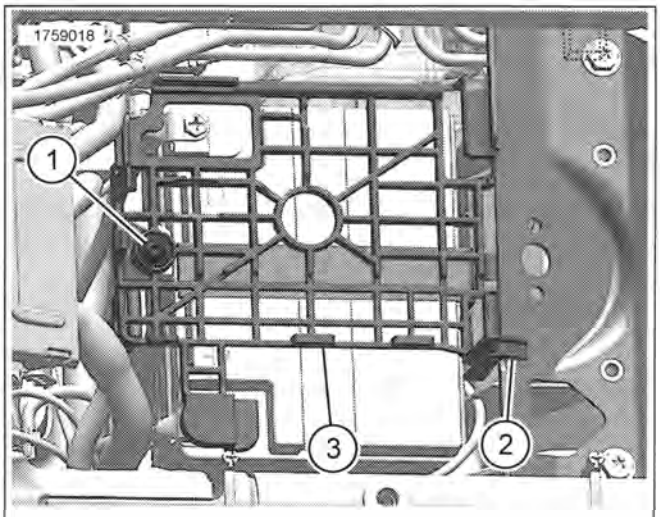
1. **Tab**
2. **Top caddy**
3. **Hold down clip**
4. **Rear harness connector**

Figure 8-72. Top Caddy



1. **BCM**
2. **Tab**
3. **Hold down clip**
4. **Cam lock connector (2)**
5. **Connector**

Figure 8-73. BCM



1. **Screw**
2. **Tab**
3. **BCM caddy**

Figure 8-74. BCM Caddy

COMPLETE

1. Install seat. See CHASSIS > SEAT (Page 3-139).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

ACTIVATION

Activation consists of assigning two fobs to the system and entering an initial PIN.

NOTE

If fob is lost or inoperable, the PIN allows owner to disarm the system. See ELECTRICAL > PERSONAL IDENTIFICATION NUMBER (PIN) (Page 8-55).

1. Configure security system by assigning both fobs to the vehicle.

2. Configure security system by entering a PIN picked by the owner.

Record PIN in the owner's manual. Instruct customer to carry a copy.

Once the system has been activated, it "arms" within 5 seconds of switching IGN switch to OFF and no motorcycle motion.

FOB ASSIGNMENT

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Use DIGITAL TECHNICIAN II (PART NUMBER: HD-48650) to assign both fobs to vehicle.

NOTE

- *Choose correct fob type. Choosing incorrectly at beginning of the process results in a failure to assign the fob. This can be mistakenly diagnosed as a bad fob or SCM.*
- *When assigning a fob, keep fob within 3 ft (1 m) of vehicle seat.*
- *Serial number of fob is found on inside of fob.*

Serial number of fob is found on inside of the fob. Follow menu prompts in the DIGITAL TECHNICIAN II (PART NUMBER: HD-48650)display and scan the fob serial number with bar code reader, or key-in the number from the keyboard. Use DIGITAL TECHNICIAN II (PART NUMBER: HD-48650) to assign fob and enter initial PIN.

NOTE

Each fob has a unique serial number. Attach fob label to a blank NOTES page in the owner's manual for reference.

CHANGING THE PIN

The Personal Identification Number (PIN) is a number that can be used to disarm the security system. Use the PIN in case the assigned fob is misplaced, fails or if the fob cannot communicate with the motorcycle because of electromagnetic interference.

NOTE

Record and memorize your PIN. If the fob is lost or the fob battery dies, the PIN is needed to operate the motorcycle. If the fob is lost, a new fob cannot be assigned without the PIN.

A PIN is a five-digit number (1-9).

Changing the PIN

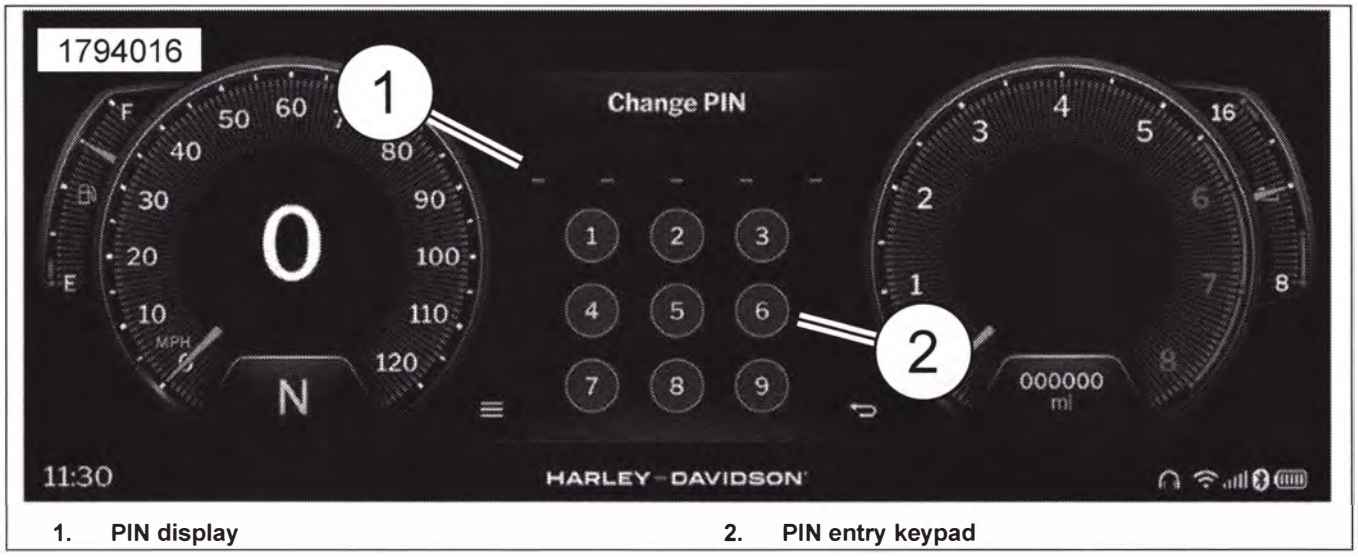
The rider can change the PIN at any time.

- Ignition must be ON.
- Fob must be present.
- Numbers between 1 and 9 can be selected (the digit 0 cannot be used in a PIN).

1. Select a 5-digit (1-9) PIN and record on the wallet card from the owners manual.
2. In the IFCU, navigate to **Settings > General Settings > System Info**. At the **System Info** screen, select **Change Security PIN**.
3. See Figure 8-75. The **Change PIN** screen is displayed.

Touch Screen Entry

1. Touch digit on the PIN entry keypad, digit will be shown on the PIN display.
2. Repeat step 1 until all five-digits are filled in with the desired PIN.
3. Cycle the ignition to save the PIN.



1. **PIN display**
2. **PIN entry keypad**

Figure 8-75. Change PIN Screen

SERVICE MODE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

With a fob present, the security system can be configured for service by disabling the security system with DIGITAL TECHNICIAN II (PART NUMBER: HD-48650).

Once disabled, the vehicle can be operated without an assigned fob present. To maintain the service mode, the assigned fobs must be kept out of range. If the fob appears in range, the service mode is cancelled.

TRANSPORT MODE

It is possible to arm the security system without enabling the motion detector for one ignition cycle. The motorcycle can be moved in an armed state. The motorcycle cannot be turned on or started while in transport mode until the fob is present.

To Enter Transport Mode

1. With security fob present, set the OFF/RUN/START switch to RUN.
2. Set the OFF/RUN/START switch to OFF.
3. Simultaneously press both the left turn signal and the flash-to-pass switches within five seconds of turning the OFF/RUN/START switch to OFF.
4. See Figure 8-76. Once activated, a transport mode icon will be displayed on the IFCU to indicate that the security system is in transport mode.

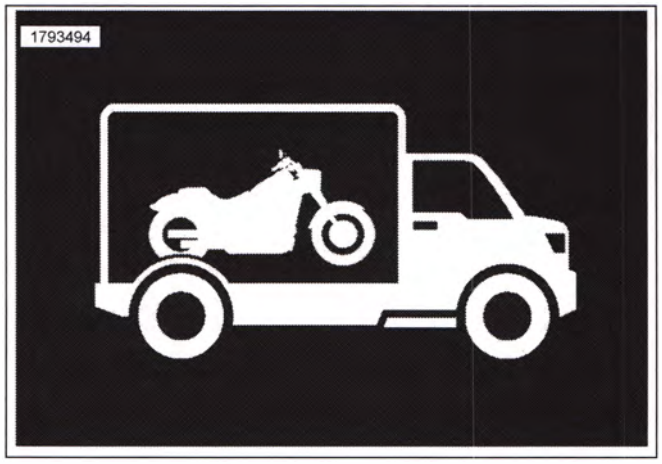


Figure 8-76. Transport Mode Display

To Exit Transport Mode

With the fob present, set the OFF/RUN/START switch to RUN to disarm the system and exit transport mode.

FOB BATTERY

Battery Replacement Schedule

⚠ WARNING



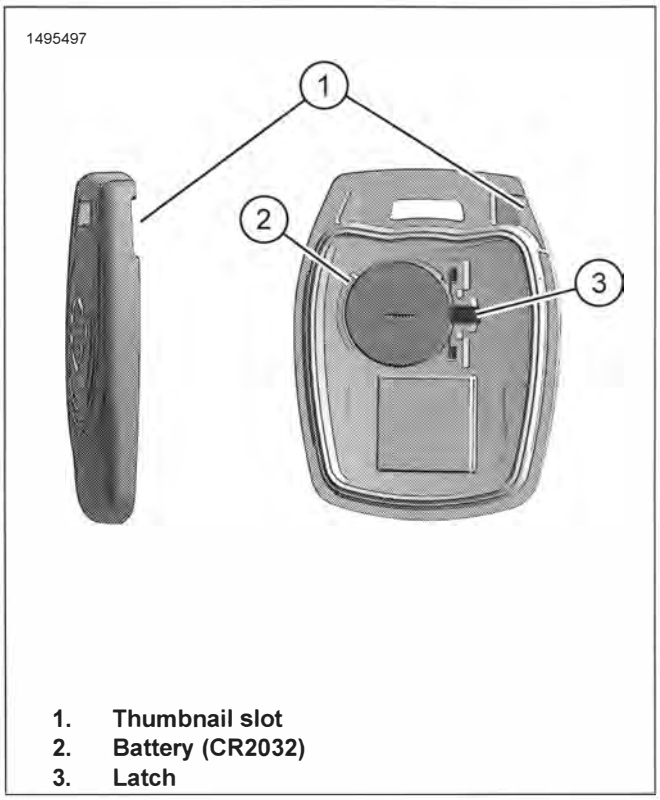
CONTAINS BUTTON OR COIN CELL BATTERY. KEEP OUT OF REACH OF CHILDREN.

Ingestion can result in death or serious injury. Choking, chemical burns and perforation of soft tissue may result. Severe burns can occur within 2 hours of ingestion or placement in any part of the body. Seek medical attention immediately. (13105b)

Replace fob battery every year.

Battery Replacement

1. See Figure 8-77. Open fob
   a. Place a thin blade in thumbnail slot (1).
   b. Twist blade to separate cases.
2. Remove battery (2) and discard in accordance with local regulations.
3. Install a new battery (Panasonic CR2032 or equivalent) with negative side up.
4. Align two halves of the fob. Snap halves together.



1. **Thumbnail slot**
2. **Battery (CR2032)**
3. **Latch**

Figure 8-77. Replace Fob Battery

PREPARE

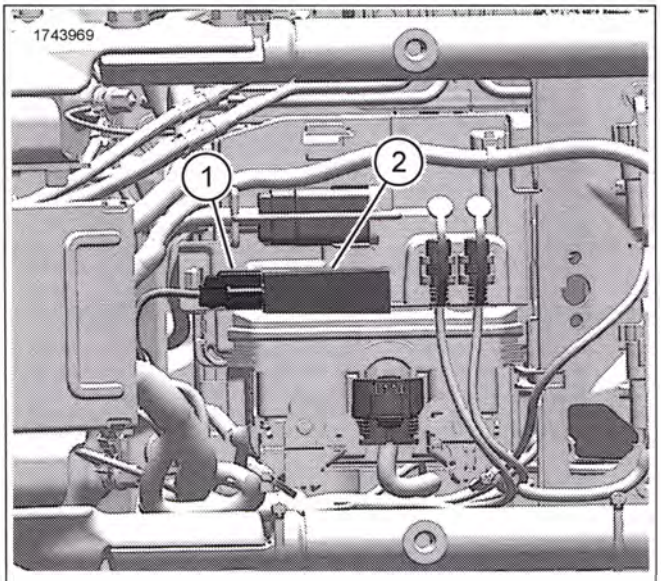
1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).

REMOVE

1. See Figure 8-78. Remove antenna.
   a. Remove antenna (2) from caddy.
   b. Disconnect connector (1).
   c. Remove antenna.

INSTALL

1. See Figure 8-78. Install antenna.
   a. Connect connector (1).
   b. Connect antenna (2) to caddy.



1. **Connector**
2. **Antenna**

Figure 8-78. Security Antenna

COMPLETE

1. Install seat. See CHASSIS > SEAT (Page 3-139).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
5. Remove voltage regulator. See ELECTRICAL > VOLTAGE REGULATOR (Page 8-14).
6. Remove radiator. See COOLING SYSTEM > RADIATOR (Page 7-22).
7. Removing cooling system bracket.
   a. Remove coolant pump. See COOLING SYSTEM > COOLANT PUMP (Page 7-13).
   b. Remove horn. See ELECTRICAL > HORN (Page 8-31).

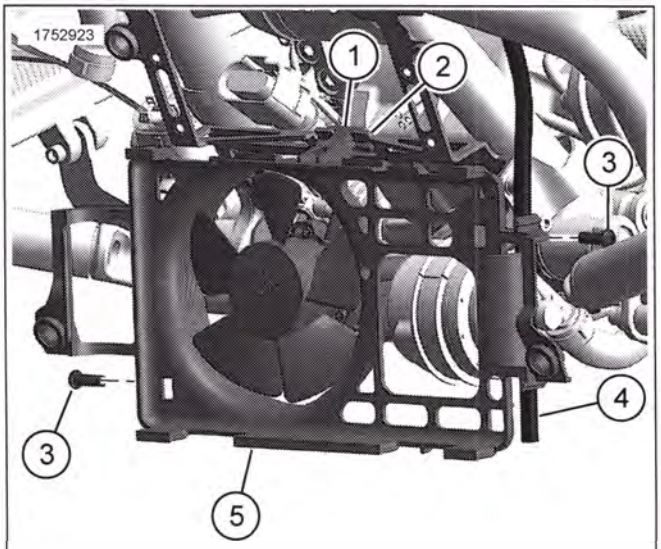
REMOVE

1. See Figure 8-79. Remove cooling fan bracket.
   a. Remove coolant vent hose (4) from bracket.
   b. Remove screws (3).
   c. Lift cooling fan bracket (5) from cooling system bracket (2).
   d. See Figure 8-80. Disconnect connector (4).
2. See Figure 8-81. Remove cooling system bracket.
   a. Pry out anchored cable straps (3).
   b. Remove jiffy stand sensor connector (4) from bracket and disconnect.
   c. Remove fog lamp connector (6) from bracket.
   d. Remove crank position sensor connector (7) from bracket.
   e. Remove fan motor connector (10) from bracket.
   f. Remove and discard cable strap (8).
   g. Remove screws (5).
   h. Remove screws (1).
   i. Remove cooling system bracket (2).

INSTALL

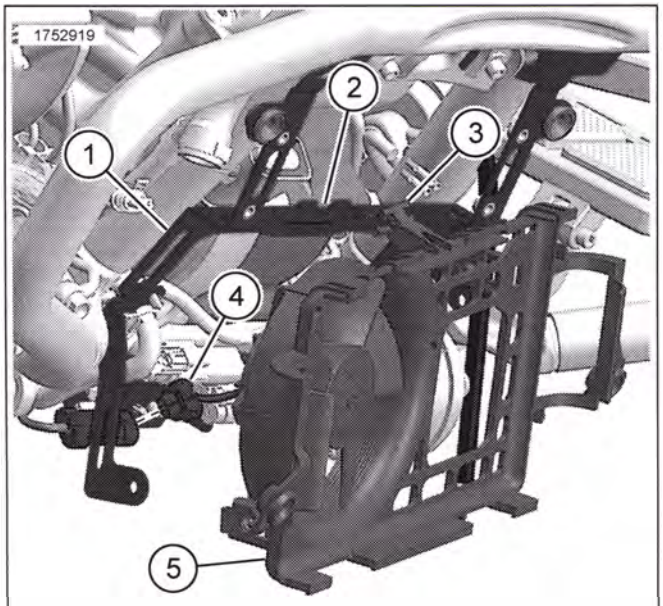
FASTENER	TORQUE VALUE	
Coolant system bracket, lower, screws	20–22 ft-lbs	27–30 N·m
Cooling fan bracket screws	70–85 **in-lbs**	7.9–9.6 N·m
Engine guard, upper, screws	90–110 **in-lbs**	10.2–12.4 N·m

1. See Figure 8-81. Install coolant system bracket.
   a. Position coolant system bracket (2) behind engine guard.
   b. Install screws (1), do not tighten.
   c. Install screws (5). Tighten.
      Torque: 20–22 ft-lbs (27–30 N·m) *Coolant system bracket, lower, screws*
   d. Tighten screws (1).
      Torque: 90–110 **in-lbs** (10.2–12.4 N·m) *Engine guard, upper, screws*
   e. Install crank position sensor connector (7).
   f. Install **new** cable strap (8) securing voltage regulator cable (9).
   g. Install fan motor connector (10).
   h. Install fog lamp connector (6).
   i. Connect and install jiffy stand sensor connector (4).
   j. Install anchored cable straps (3).
2. See Figure 8-80. Connect connector (4).
3. Install cooling fan bracket.
   a. Place tab (3) in Notch (2).
   b. See Figure 8-79. Install screws (3). Tighten.
      Torque: 70–85 **in-lbs** (7.9–9.6 N·m) *Cooling fan bracket screws*
   c. Install coolant vent hose (4).



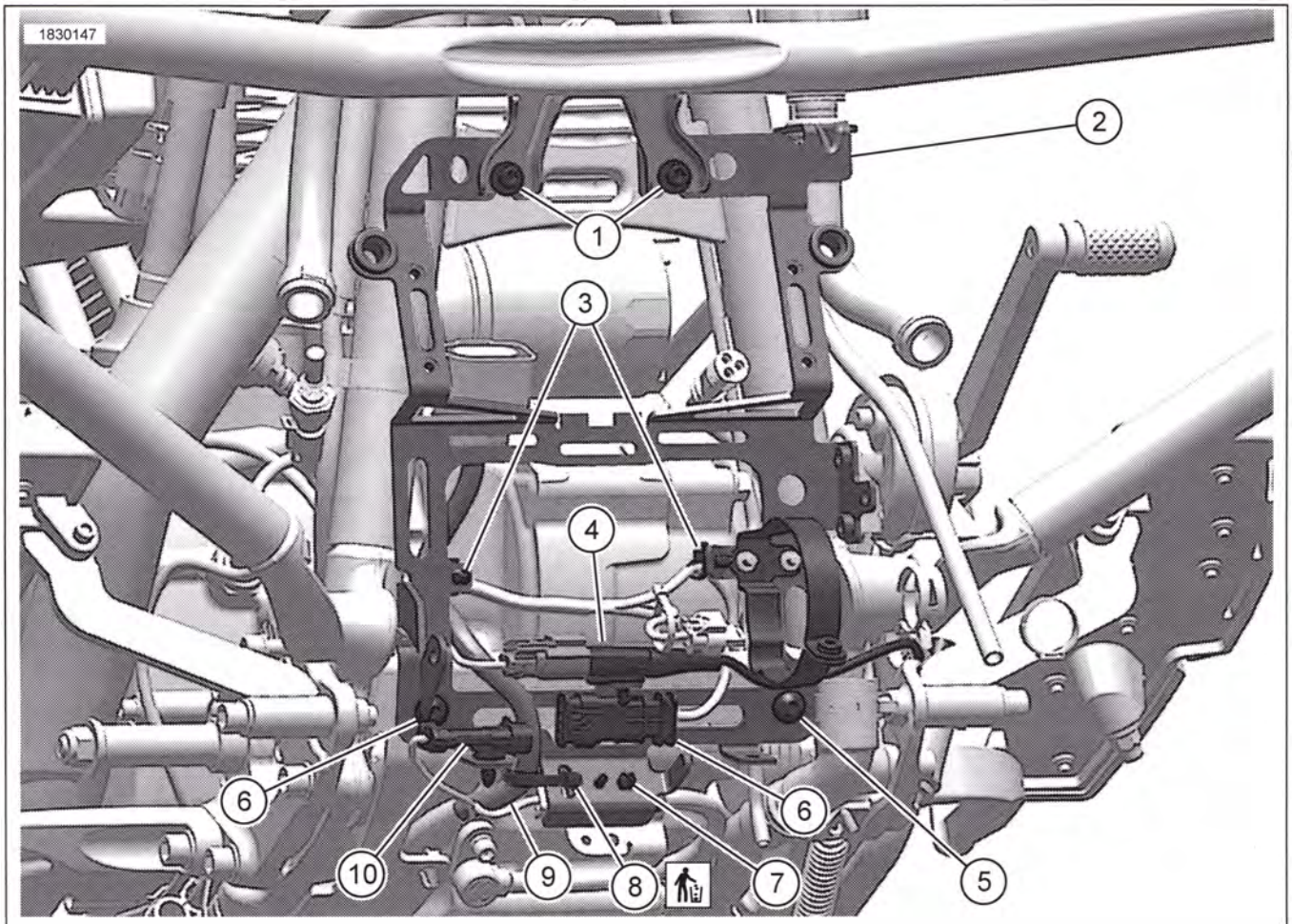
1. Tab
2. Mounting bracket
3. Screw (2)
4. Coolant vent hose
5. Cooling fan bracket

Figure 8-79. Cooling Fan



1. Cooling system bracket
2. Notch
3. Tab
4. Connector
5. Cooling fan bracket

Figure 8-80. Cooling Fan Connector



1. **Engine guard upper screw (2)**
2. **Coolant system bracket**
3. **Anchored cable strap (2)**
4. **Jiffy stand sensor connector**
5. **Lower mounting screw (2)**
6. **Fog lamp connector**
7. **Crank position sensor connector**
8. **Cable strap**
9. **Voltage regulator cable**
10. **Fan motor connector**

Figure 8-81. Coolant System Bracket

COMPLETE

1. Install cooling system bracket.

   a. Install coolant pump. See COOLING SYSTEM > COOLANT PUMP (Page 7-13).

   b. Install horn. See ELECTRICAL > HORN (Page 8-31).

2. Install radiator. See COOLING SYSTEM > RADIATOR (Page 7-22).

3. Fill/Bleed cooling system. See COOLING SYSTEM > COOLANT (Page 7-9).

4. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).

5. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

6. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).

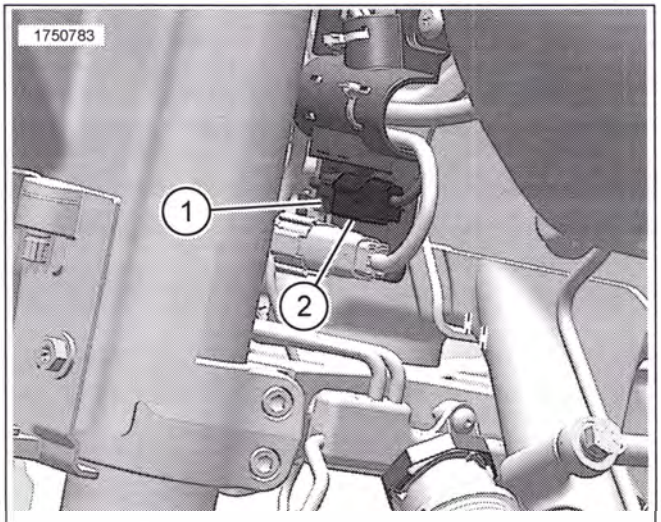
7. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

REMOVE

1. See Figure 8-82 or See Figure 8-83. Remove ambient air temperature sensor.
   a. Pull down on sensor (1).
   b. Disconnect connector (2).
   c. Remove sensor.

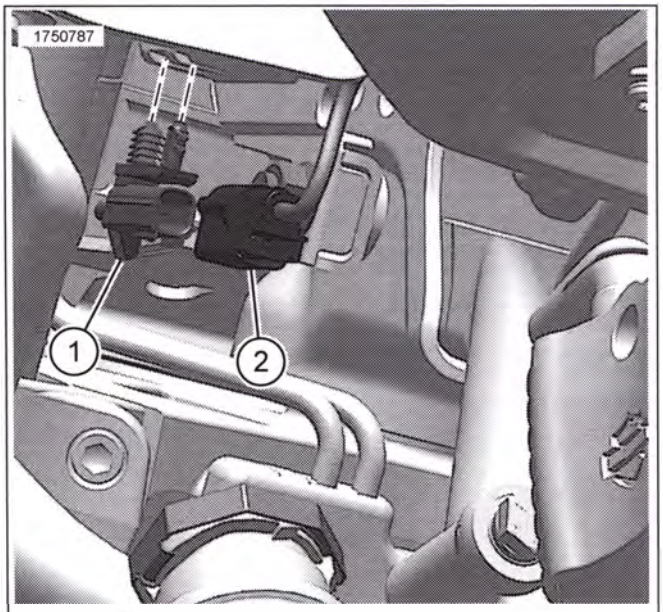
INSTALL

1. See Figure 8-82 or Figure 8-83. Install ambient air sensor.
   a. Connect connector (2) to sensor (1).
   b. Install sensor into retaining holes by pressing up to secure.



1. Sensor
2. Connector

Figure 8-82. Fork-Mounted Ambient Air Temperature Sensor



1. Sensor
2. Connector

Figure 8-83. Frame-Mounted Ambient Air Temperature Sensor

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

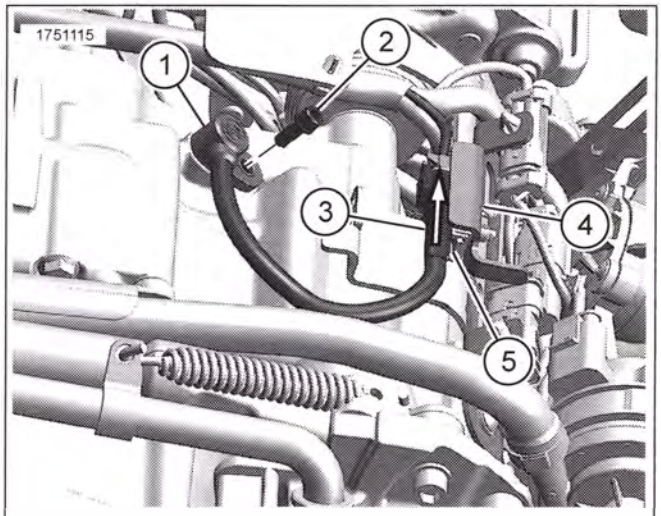
REMOVE

1. See Figure 8-84. Remove CKP sensor.
   a. Remove screw (2).
   b. Remove CKP sensor (1).
2. Disconnect CKP connector.
   a. Insert appropriate tool pressing tab (5) down while sliding connector (3) off regulator bracket (4).
   b. See Figure 8-85. Disconnect connector (3).
   c. Remove O-ring (1) and discard.

INSTALL

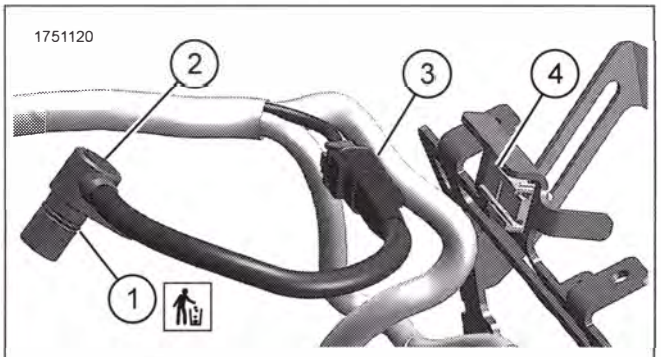
FASTENER	TORQUE VALUE	
Crankcase sensor screw	90–120 **in-lbs**	10.17–13.55 N·m

1. See Figure 8-85. Install CKP sensor.
   a. Install **new** O-ring (1).
   b. See Figure 8-84. Install CKP sensor (1) and screw (2). Tighten.
      Torque: 90–120 **in-lbs** (10.17–13.55 N·m) *Crankcase sensor screw*
2. Secure connector.
   a. Connect CKP connector (3) to wiring harness connector.
   b. Slide connector onto regulator bracket (4).Verify connector is secure.



1. **CKP sensor**
2. **Screw**
3. **Connector**
4. **Regulator bracket**
5. **Tab**

Figure 8-84. Crankshaft Position (CKP) Sensor (bottom of engine)



1. **O-ring**
2. **CKP sensor**
3. **Connector**
4. **Tab**

Figure 8-85. CKP Sensor Assembly

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

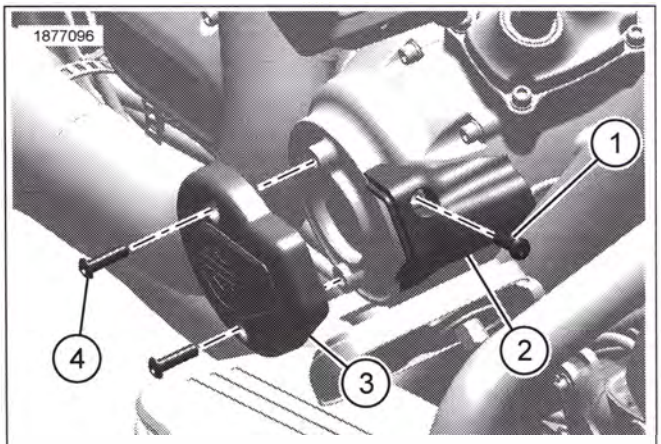
REMOVE

1. See Figure 8-86. Remove covers.
   a. Remove screws (4).
   b. Remove cover (3).
   c. Remove screw (1).
   d. Remove camshaft sensor cover (2).
2. See Figure 8-87. Remove camshaft sensor.
   a. Remove connector (2).
   b. Remove camshaft timing sensor (1).
3. See Figure 8-88. Remove and discard O-ring (1).

INSTALL

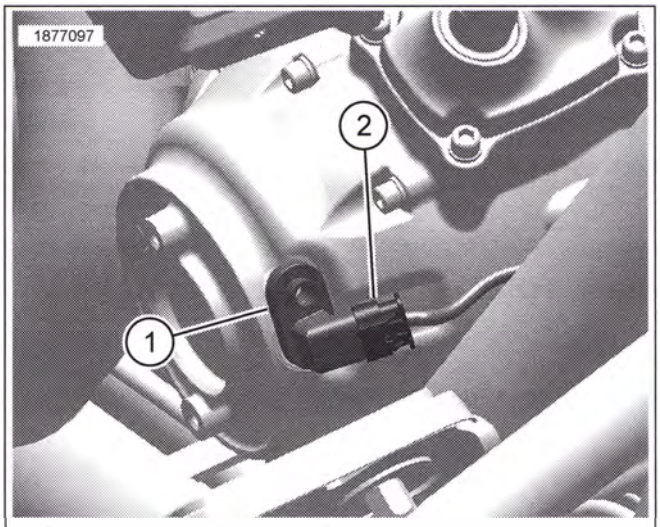
FASTENER	TORQUE VALUE	
Camshaft cover screws	72–96 **in-lbs**	8.1–10.8 N·m
Camshaft sensor cover screw	72–96 **in-lbs**	8.1–10.8 N·m

1. See Figure 8-88. Install **new** O-ring (1) to camshaft timing sensor (2).
2. Lubricate O-ring and camshaft timing sensor shaft with clean engine oil.
3. Install camshaft timing sensor.
   a. See Figure 8-87. Connect camshaft timing sensor connector (2).
   b. Install camshaft sensor (1).
4. Install covers.
   a. See Figure 8-86. Install cover (2).
   b. Install screw (1). Tighten.
      Torque: 72–96 **in-lbs** (8.1–10.8 N·m) *Camshaft sensor cover screw*
   c. Install cover (3).
   d. Install screws (4). Tighten.
      Torque: 72–96 **in-lbs** (8.1–10.8 N·m) *Camshaft cover screws*



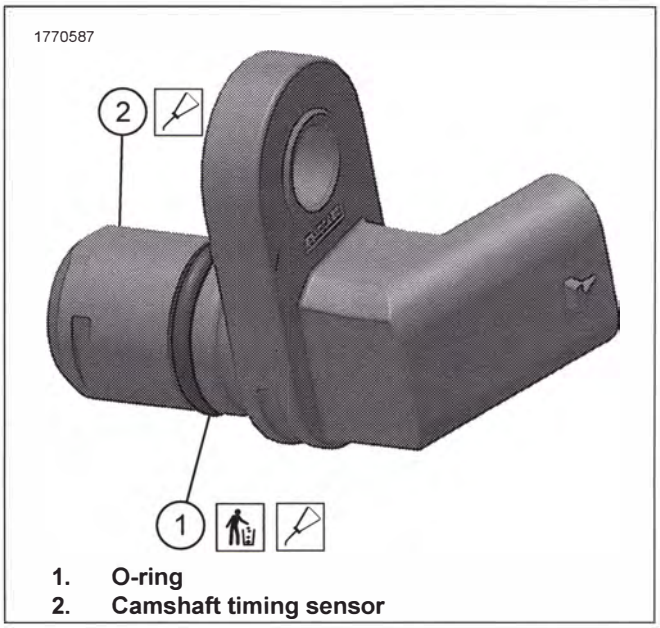
1. **Screw**
2. **Camshaft sensor cover**
3. **Camshaft cover**
4. **Screw (2)**

Figure 8-86. Camshaft Cover



1. **Camshaft timing sensor**
2. **Camshaft timing sensor connector**

Figure 8-87. Camshaft Timing Sensor



1. O-ring
2. Camshaft timing sensor

Figure 8-88. Camshaft Timing Sensor O-Ring

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Purge fuel system. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove seat. See CHASSIS > SEAT (Page 3-139).
3. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
4. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
7. Remove air cleaner backplate assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
8. Remove induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).

REMOVE

PART NUMBER	TOOL NAME
HD-48116-A	TEMPERATURE SENSOR SOCKET

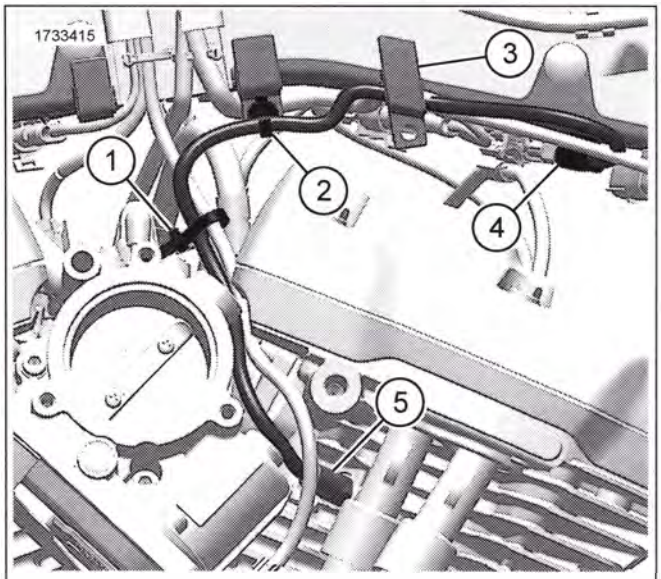
1. See Figure 8-89. Remove engine temperature sensor.
   a. Remove and discard cable tie (1).
   b. Remove anchored cable strap (2).
   c. Disconnect connector (4).
   d. Remove cable from lower backbone caddy hook (3).
   e. Remove engine temperature sensor (5).
      Special Tool: TEMPERATURE SENSOR SOCKET (HD-48116-A)

INSTALL

PART NUMBER	TOOL NAME
HD-48116-A	TEMPERATURE SENSOR SOCKET

FASTENER	TORQUE VALUE	
Engine temperature (ET) sensor	10–15 ft-lbs	13.6–20.3 N·m

1. See Figure 8-89. Install engine temperature sensor.
   a. Install engine temperature sensor (5). Tighten.
      Torque: 10–15 ft-lbs (13.6–20.3 N·m) *Engine temperature (ET) sensor*
      Special Tool: TEMPERATURE SENSOR SOCKET (HD-48116-A)
   b. Route cable through lower backbone caddy hook (3).
   c. Connect connector (4).
   d. Install anchored cable strap (2).
   e. Install **new** cable strap (1).



1. **Cable strap**
2. **Anchored cable strap**
3. **Lower backbone caddy hook**
4. **Connector**
5. **Engine temperature (ET) sensor (front head only)**

Figure 8-89. Engine Temperature Sensor

COMPLETE

1. Install induction module. See FUEL AND EXHAUST > INDUCTION MODULE (Page 6-20).
2. Install air cleaner backplate assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
3. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
6. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
7. Install seat. See CHASSIS > SEAT (Page 3-139).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

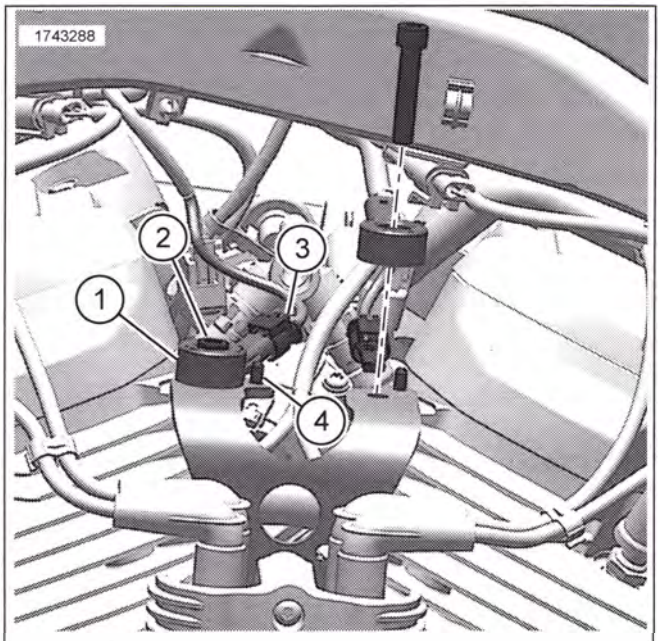
REMOVE

1. See Figure 8-90. Disconnect connectors (3).
2. Remove screws (2).
3. Remove knock sensors (1).

INSTALL

FASTENER	TORQUE VALUE	
Knock sensor, screws	16–18 ft-lbs	22–24 N·m

1. See Figure 8-90. Install knock sensors.
   a. Install knock sensors (1).
   b. Install screws (2). Hand Tighten.
   c. Press sensors against pins (4).
   d. Tighten screws (2).
      Torque: 16–18 ft-lbs (22–24 N·m) *Knock sensor, screws*
2. Connect connectors (3).



1. **Knock sensor (2)**
2. **Screw (2)**
3. **Connector (2)**
4. **Pin (2)**

Figure 8-90. Knock Sensors

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Remove seat. See CHASSIS > SEAT (Page 3-139).
6. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

PART NUMBER	TOOL NAME
HD-48498-B-1	ACR SOLENOID SOCKET

1. See Figure 8-91. Remove ACR (Automatic compression release) solenoid.
   a. Disconnect ACR connectors (1).
2. Using ACR socket, remove ACR (2).
   Special Tool: ACR SOLENOID SOCKET (HD-48498-B-1)

INSTALL

PART NUMBER	TOOL NAME
HD-48498-B-1	ACR SOLENOID SOCKET

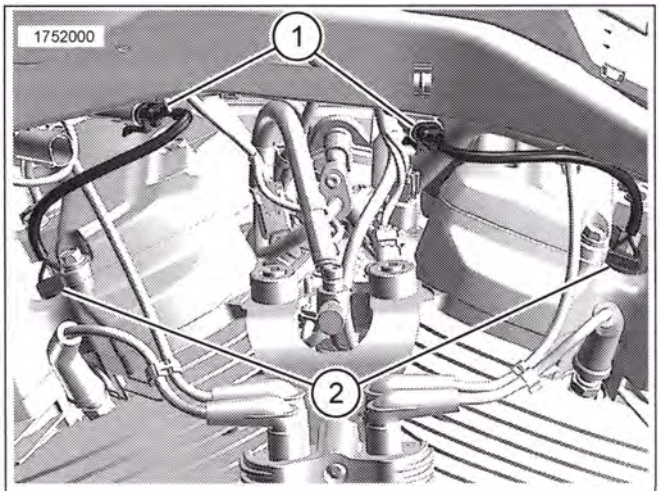
FASTENER	TORQUE VALUE	
ACR	17–19 ft-lbs	23–26.4 N·m

CONSUMABLE	PART NUMBER
LOCTITE 246 HIGH TEMPERATURE MEDIUM STRENGTH BLUE THREADLOCKER	Loctite 246

NOTE

*If installing **new** ACR, verify old copper seal washer does not remain in cylinder head.*

1. Verify copper seal washer is in place on ACR.
2. See Figure 8-92. Apply threadlocker.
   Consumable: LOCTITE 246 HIGH TEMPERATURE MEDIUM STRENGTH BLUE THREADLOCKER (Loctite 246)
   a. Identify a location around threads of ACR, one-third distance from end.
   b. See Figure 8-93. Apply three equally spaced dots of threadlocker on threads.
3. See Figure 8-91. Install ACR solenoid.
   a. Install ACR (2). Hand tighten.
   b. See Figure 8-94. Tighten ACR solenoid using an ACR socket.
      Torque: 17–19 ft-lbs (23–26.4 N·m) *ACR*
      Special Tool: ACR SOLENOID SOCKET (HD-48498-B-1)
4. Connect ACR connectors (1).



1. **Connector (2)**
2. **ACR (2)**

Figure 8-91. ACR

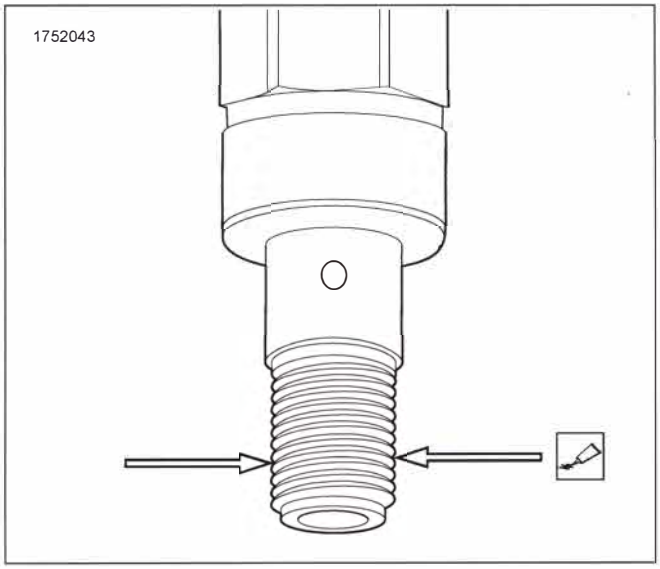


Figure 8-92. Bottom Third

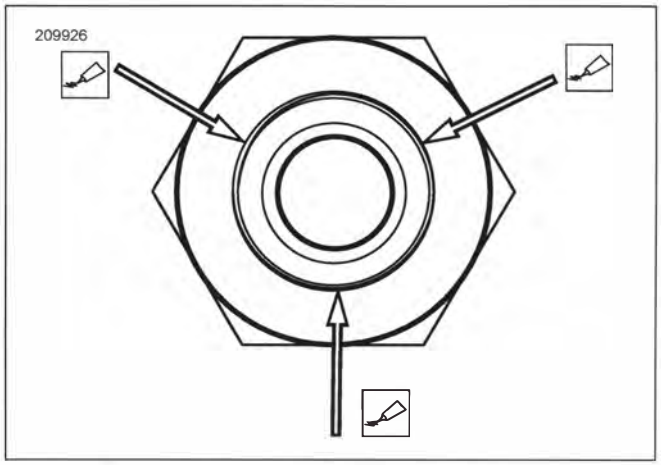


Figure 8-93. Three Dots of Threadlock

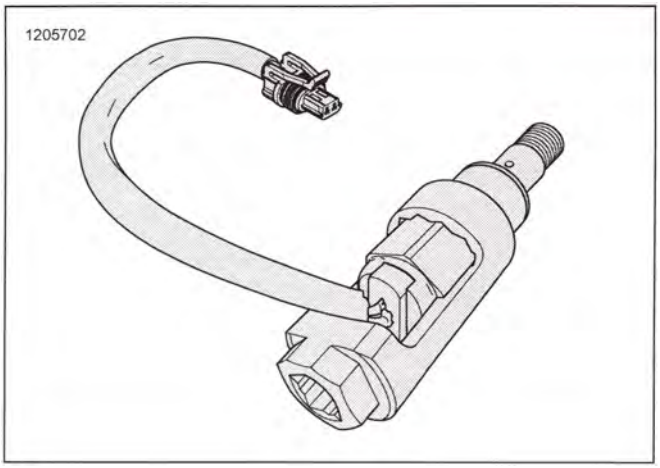


Figure 8-94. ACR Solenoid Socket and ACR

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

REMOVE

1. See Figure 8-95. Remove gear position sensor.
   a. Remove screws (5).
   b. Remove gear cover (1).
   c. Disconnect connector (2).
   d. Remove gear position sensor (4).
2. See Figure 8-96. Remove or replace seal (2) if necessary.

INSTALL

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Gear position sensor cover screws	72–96 **in-lbs**	8.13–10.8 N·m

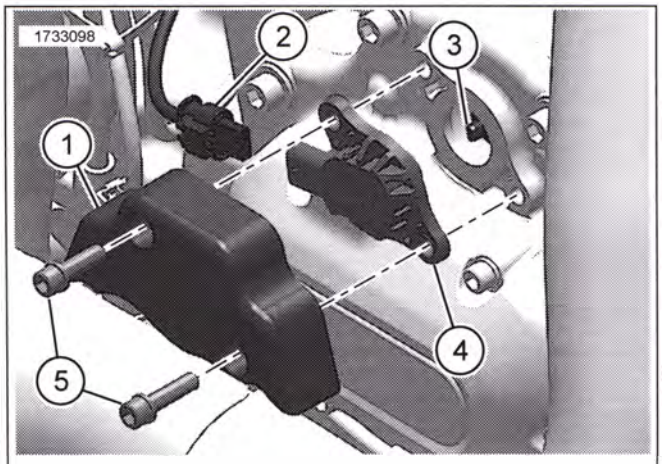
1. See Figure 8-96. Install seal if removed.
   a. Clean groove in gear position sensor (3) from all residual oil and debris.
   b. Press in seal (2).
2. See Figure 8-95. Install gear position sensor.

NOTE

Gear position sensor calibration is required using DIGITAL TECHNICIAN II (PART NUMBER: HD-48650)

   a. Connect connector (2).
   b. Align flat spot on gear position sensor with flat spot on shift drum (3).
   c. Slide gear position sensor on aligning holes with transmission holes.
   d. Install cover (1) and screws (5). Tighten.

      Torque: 72–96 **in-lbs** (8.13–10.8 N·m) *Gear position sensor cover screws*



1. **Cover**
2. **Connector**
3. **Shifter drum**
4. **Gear position sensor**
5. **Screw (2)**

Figure 8-95. Gear Position Sensor



1. **Flat spot**
2. **Seal**
3. **Gear position Sensor**

Figure 8-96. Gear Position Sensor Seal

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. **Fork-mounted fairing:** Remove outer fairing and fairing skirt. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
5. **Frame-mounted fairing:** Remove nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).

REMOVE

Fork mounted fairing

1. Retract front axle until WSS is free. See CHASSIS > FRONT WHEEL (Page 3-10).
2. See Figure 8-97. Remove WSS cable.

NOTE

Note WSS cable routing before removing.

   a. Remove clips (1).
   b. See Figure 8-98. Remove and discard cable straps (2).
   c. Remove harness connector (5).
   d. Tilt WSS connector (1) and push from mounting clip (4).

3. Remove WSS.

Frame mounted fairing

1. Retract front axle until WSS is free. See CHASSIS > FRONT WHEEL (Page 3-10).
2. See Figure 8-97. Remove WSS cable.

NOTE

Note WSS cable routing before removing.

   a. Remove clips (1).
   b. See Figure 8-99. Remove cable strap (1).
   c. Remove harness connector (2).

3. Remove WSS.

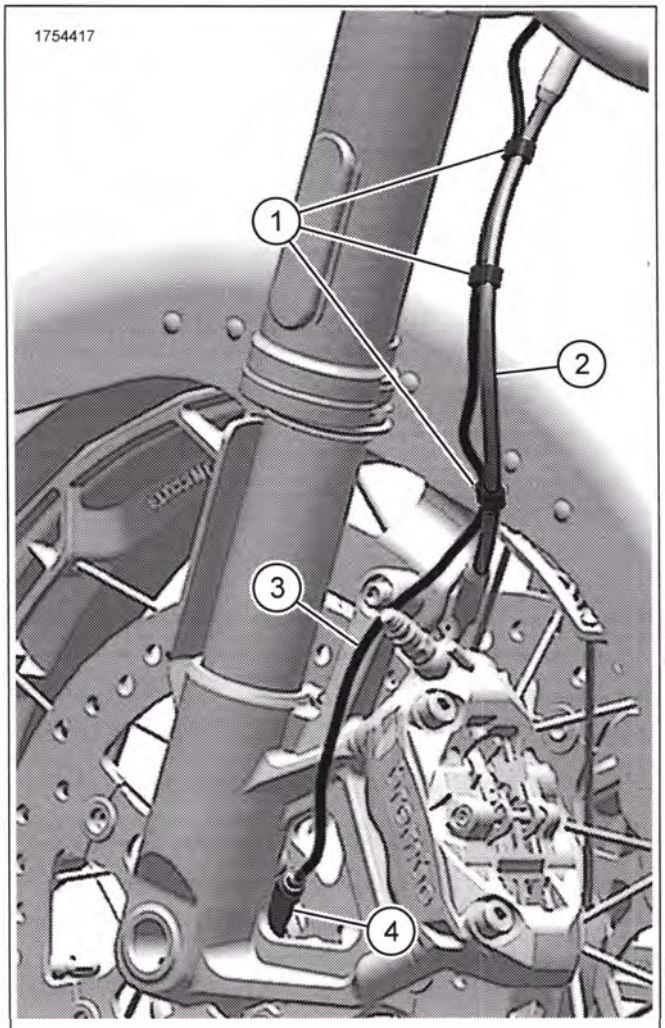
INSTALL

Fork mounted fairing

1. Install and secure axle through **new** front WSS (4) and left fork slider. See CHASSIS > FRONT WHEEL (Page 3-10).
2. See Figure 8-97. Route WSS cable (3) up to lower fork bracket following brake line (2).
3. See Figure 8-98. Connect WSS connector (1) and harness connector (5).
4. Secure connector.
   a. Align WSS connector (1) with front of mounting clip (4).
   b. Pull back on WSS connector to secure.
   c. Verify connector is secure.
5. Secure WSS cable.
   a. Install **new** cable straps (2) securing WSS cable (3) to brake line.
   b. See Figure 8-97. Install clips (1) securing WSS cable (3) to brake line (2).

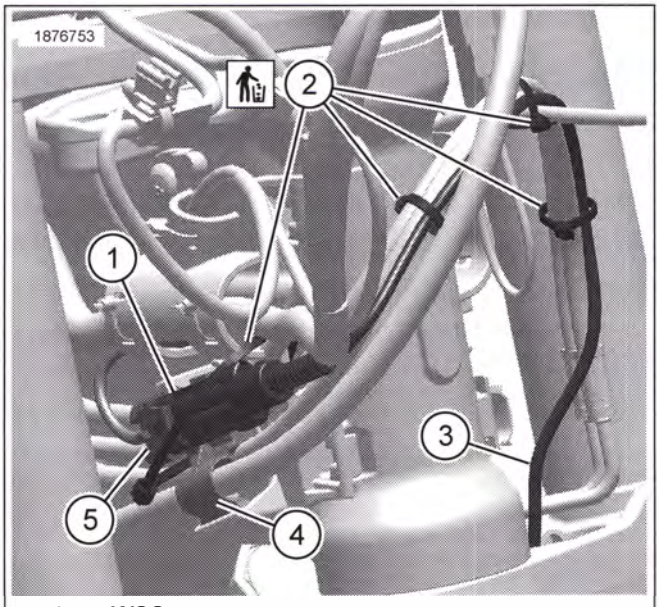
Frame mounted fairing

1. Install and secure axle through **new** front WSS and left fork slider. See. CHASSIS > FRONT WHEEL (Page 3-10).
2. See Figure 8-97. Route WSS cable (3) up to lower fork bracket following brake line (2).
3. See Figure 8-99. Route WSS cable through frame opening (5).
4. Connect WSS connector (3) and harness connector (2).
5. Install cable strap (1) through mounting clip (4) and secure connectors.
6. See Figure 8-97. Install clips (1) securing WSS cable (3) to brake line (2).



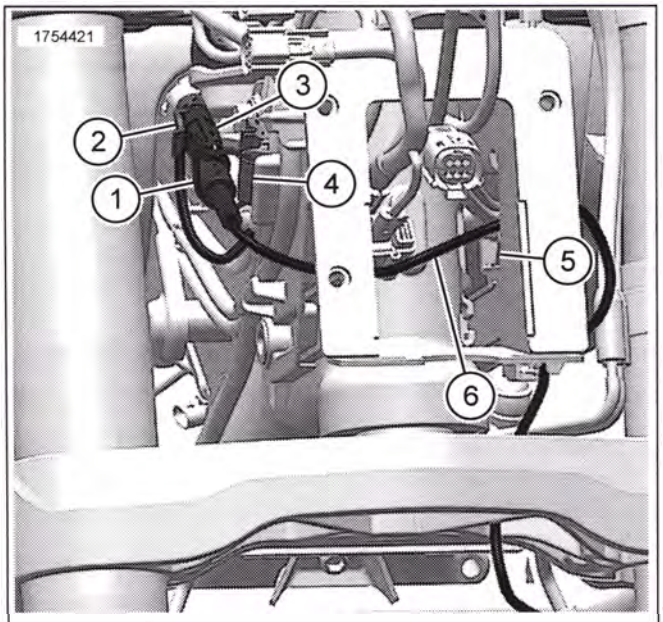
1. Clip (3)
2. Brake line
3. WSS cable
4. WSS

Figure 8-97. Front WSS Cable Clips



1. WSS connector
2. Cable strap (4)
3. WSS cable
4. Mounting clip
5. Harness connector

Figure 8-98. Fork-Mounted Fairing Front WSS Connector



1. Cable strap
2. Harness connector
3. WSS connector
4. Mounting clip
5. Frame opening
6. WSS cable

Figure 8-99. Frame-Mounted Fairing Front WSS Connector

COMPLETE

1. **Fork-mounted fairing:** Install outer fairing. See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87)
2. **Frame-mounted fairing:** Install nacelle. See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).

REMOVE

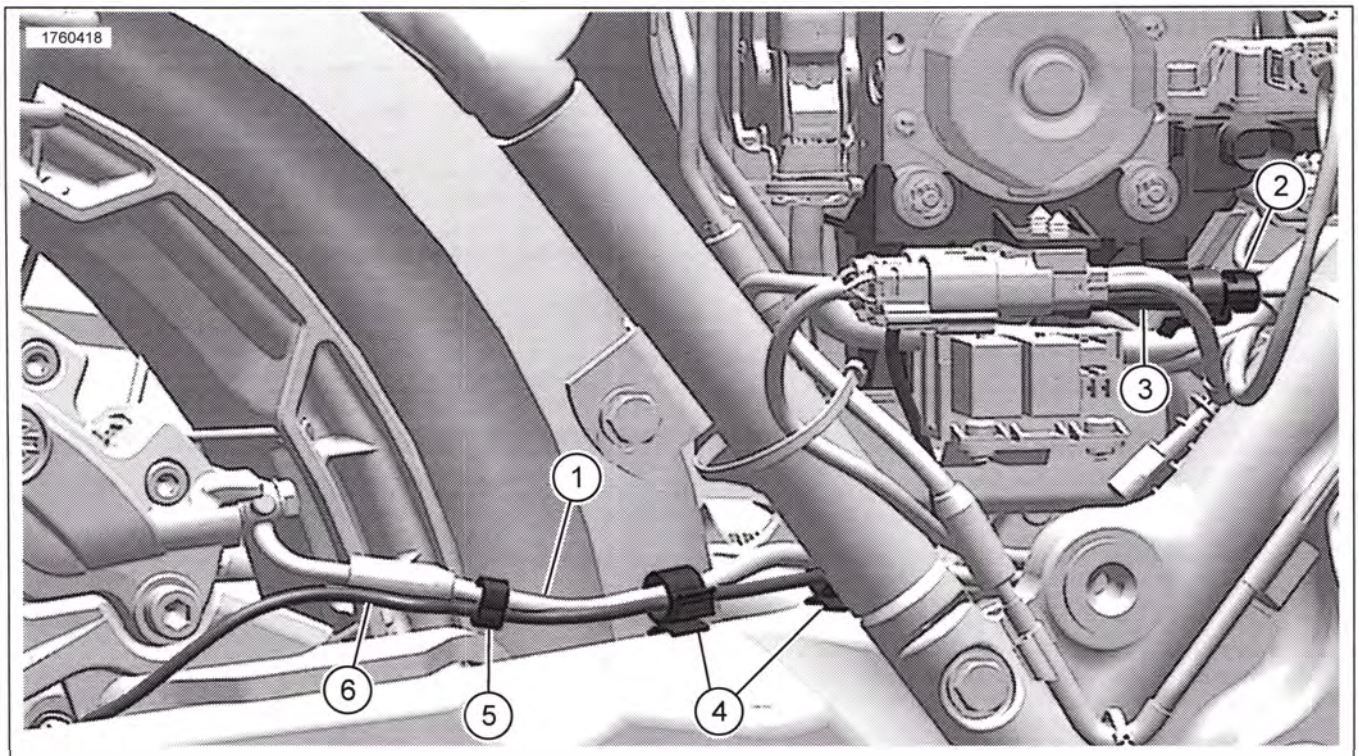
NOTE

- *Always keep wheel speed sensor (WSS) and ABS encoder bearing away from magnetic fields. Magnetic items will damage sensor*
- *Never pull WSS cable taut or use to retain wheel, axle or other components.*

1. See Figure 8-100. Detach WSS cable.
   a. Remove connector housing (3) from right side caddy.
   b. Disconnect connector (2).
   c. Remove clip (5).
   d. Remove cable (6) from brake line clamps (4).
2. See Figure 8-101. Remove WSS.
   a. Retract rear axle (2) until WSS (1) is free. See CHASSIS > REAR WHEEL (Page 3-12).
   b. Remove WSS.

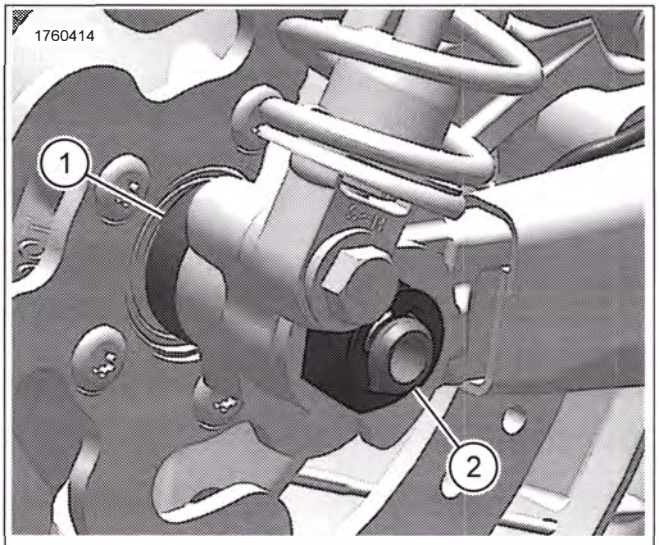
INSTALL

1. See Figure 8-102. Install WSS.
   a. Hold **new** rear WSS in place with index pin outboard toward rear fork.
   b. Push axle through sensor, caliper bracket and right side of rear fork.
   c. Rotate rear WSS until index pin contacts caliper bracket at point shown.
   d. Secure rear wheel. See CHASSIS > REAR WHEEL (Page 3-12).
2. See Figure 8-100. Install WSS cable.
   a. Install connector (2) to connector housing (3).
   b. Install connector housing to right side caddy.
   c. Install cable (6) to brake line clamps (4).
   d. Install clip (5).



1. Brake line
2. Connector
3. Connector housing
4. Brake line clamp (2)
5. Clip
6. Speed sensor cable

Figure 8-100. Rear Wheel Speed Sensor Routing



1. Wheel speed sensor
2. Axle shaft

Figure 8-101. Rear Wheel Speed Sensor (typical)

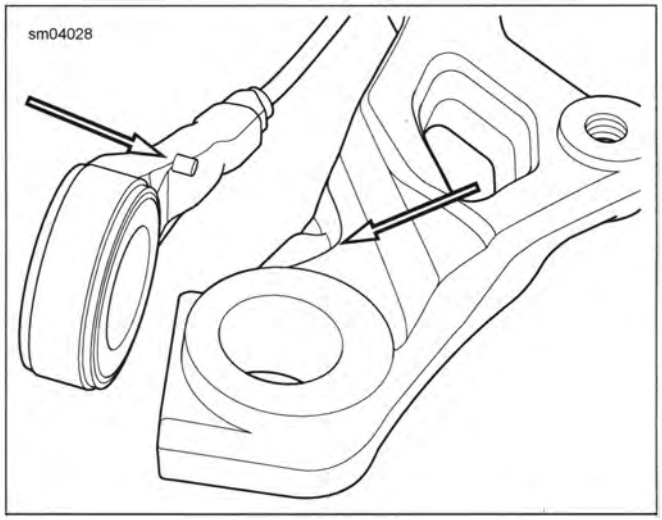


Figure 8-102. Rear Wheel Speed Sensor Index Pin

COMPLETE

1. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).

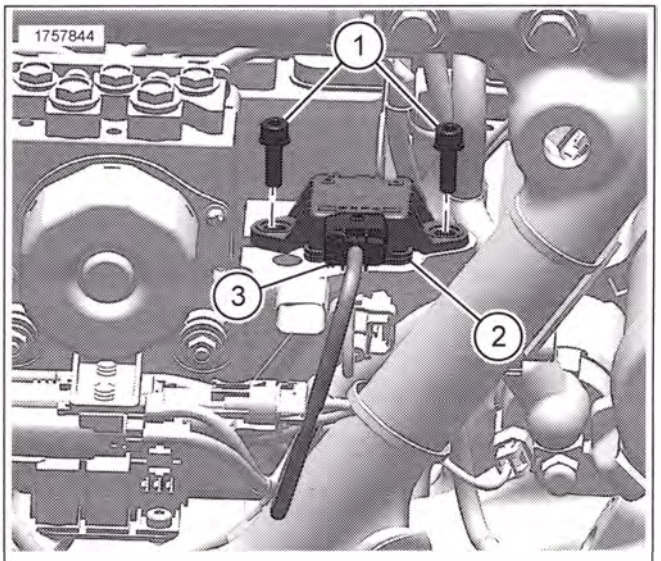
REMOVE

1. See Figure 8-103. Remove IMU sensor.
   a. Disconnect IMU connector (3).
   b. Remove screws (1).
   c. Remove IMU (2).

INSTALL

FASTENER	TORQUE VALUE	
IMU screws	32–40 **in-lbs**	3.6–4.5 N·m

1. See Figure 8-103. Install IMU sensor.
   a. Install IMU (2).
   b. Install screws (1). Tighten.
      Torque: 32--40 **in-lbs** (3.6–4.5 N·m) *IMU screws*
   c. Connect connector (3).



1. **Screw (2)**
2. **IMU**
3. **IMU connector**

Figure 8-103. IMU Mounting

COMPLETE

1. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).

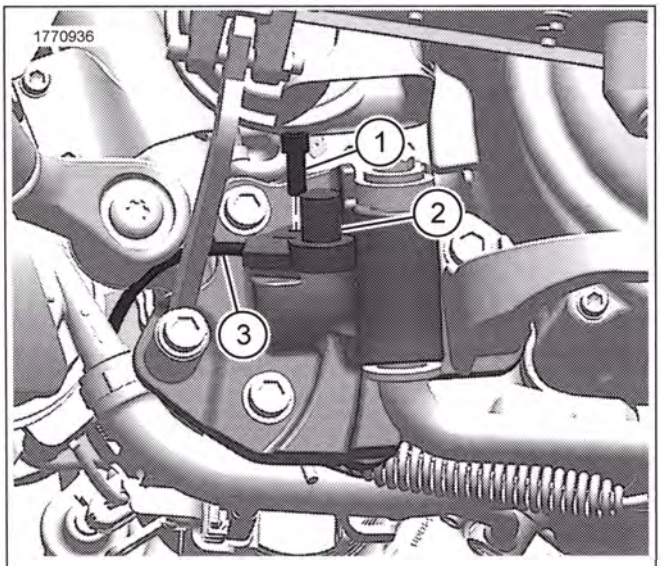
REMOVE

1. See Figure 8-104. Remove jiffy stand sensor.
   a. Remove screw (1).
   b. Remove jiffy stand sensor (2).
2. See Figure 8-105. Remove jiffy stand connector.
   a. Detach anchored cable strap (2).
   b. Disconnect jiffy stand connector (3).
3. Remove jiffy stand sensor.

INSTALL

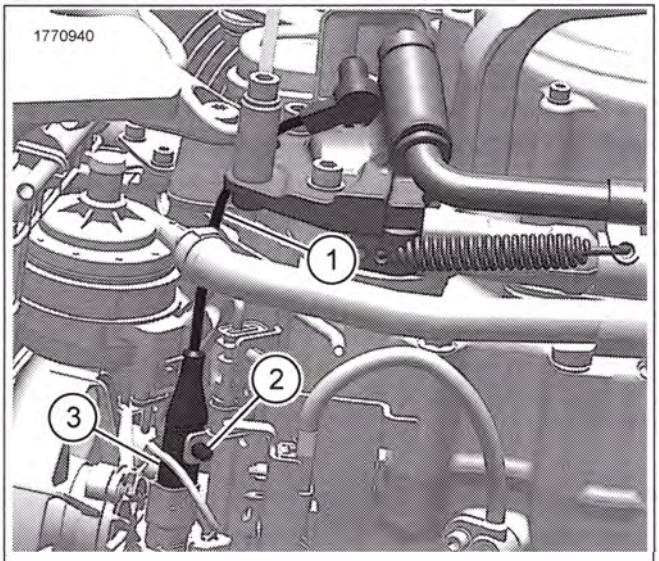
FASTENER	TORQUE VALUE	
Jiffy stand sensor screw	97–124 **in-lbs**	11–14 N·m

1. See Figure 8-105. Connect jiffy stand connector.
   a. Route jiffy stand cable (1) between water pump and engine as shown.
   b. Connect jiffy stand connector (3).
   c. Install anchored cable strap (2).
2. See Figure 8-104. Install jiffy stand sensor.
   a. Place jiffy stand sensor on jiffy stand bracket.
   b. Install screw (1). Tighten.
      Torque: 97–124 **in-lbs** (11–14 N·m) *Jiffy stand sensor screw*



1. **Screw**
2. **Jiffy stand sensor**
3. **Jiffy stand cable**

Figure 8-104. Jiffy Stand Sensor



1. **Jiffy stand cable**
2. **Anchored cable strap**
3. **Jiffy stand connector**

Figure 8-105. Jiffy Stand Connector

COMPLETE

1. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
2. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

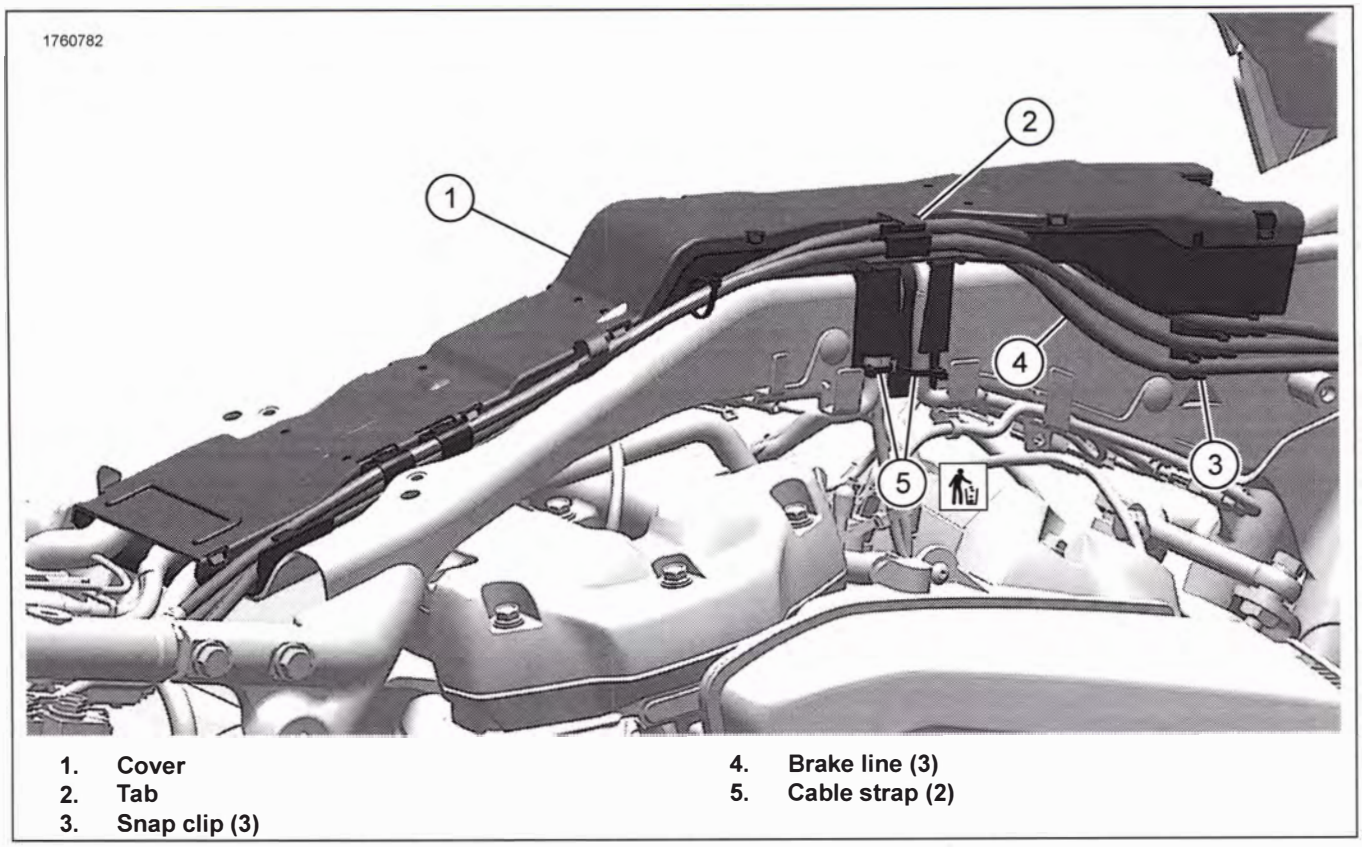
1. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Remove seat. See CHASSIS > SEAT (Page 3-139).
6. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
7. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).

REMOVE

1. See Figure 8-106. Remove trough cover.
   a. Lift cover (1) from nubs on trough.
   b. Lift tab (2), slide off cover.
2. Remove trough.
   a. Remove and discard cable straps (5).
   b. Unclip brake lines (4) from snap clips (3).
   c. See Figure 8-107. Remove cables (4) from trough.
   d. Remove brake line (7) from brake line holder (6).
   e. Remove brake line retention clips (5) from trough.
   f. Remove and discard cable straps (1,2).
   g. Lift cables.
   h. Pry anchor pins at rear of wire trough from holes in frame backbone.
   i. Remove trough from left side.

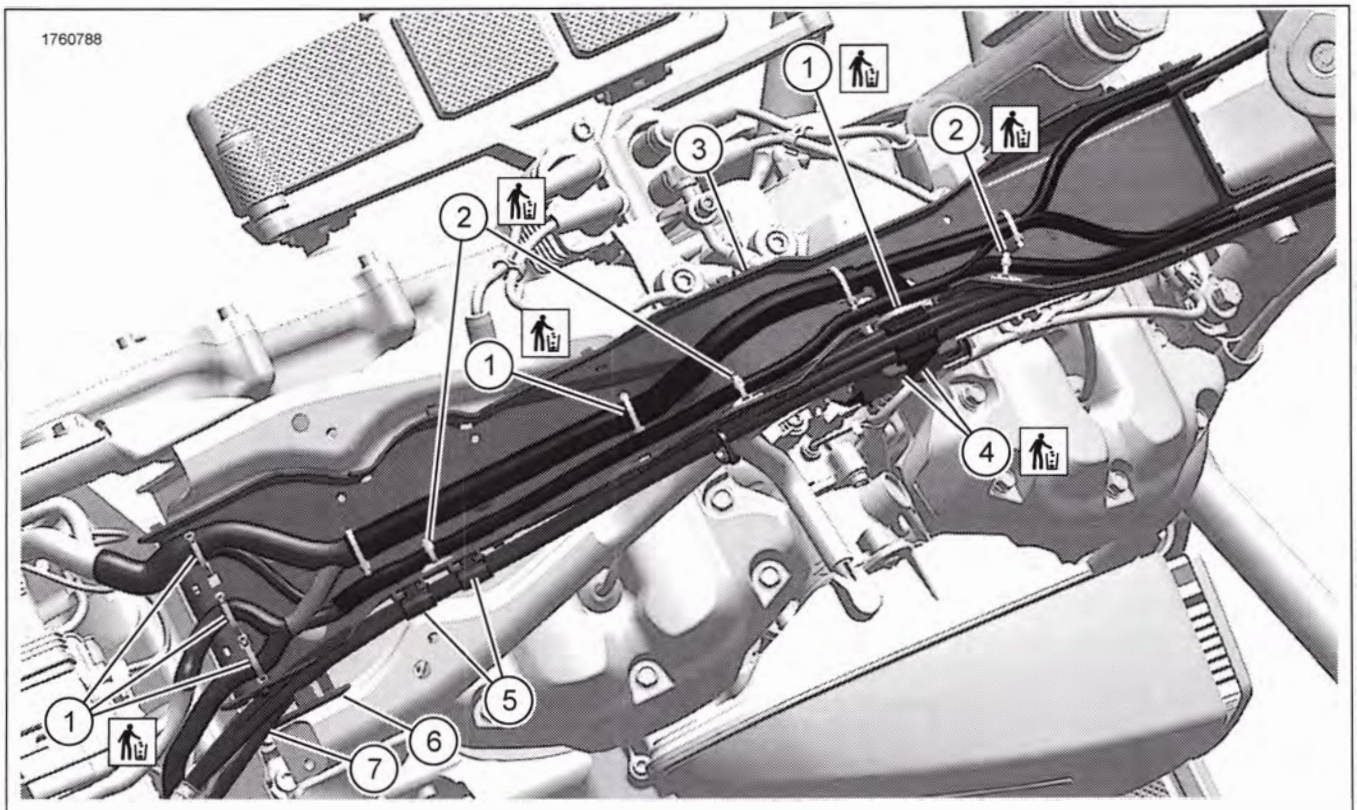
INSTALL

1. See Figure 8-107. Install trough.
   a. Thread **new** cable straps (1,2) through slots inside wire trough (3).
   b. Slide wire trough into position.
   c. Route forward cables through channels in trough.
   d. Press anchor pins at rear of wire trough into frame backbone.
   e. Install brake line retention clips (5) in holders.
   f. Install brake line (7) in brake line holder (6).
   g. Align cables in trough.
   h. Secure cables with cable straps (1).
   i. Secure cables on side of trough with cable straps (2).
   j. Press cables (4) into trough.
   k. See Figure 8-106. Install **new** cable straps (5).
2. Install cover.
   a. Install brake line bracket between trough and tab (2).
   b. Secure cover to wire trough starting at rear and working forward.
   c. Verify that all latches are fully engaged.



1. Cover
2. Tab
3. Snap clip (3)
4. Brake line (3)
5. Cable strap (2)

Figure 8-106. Wire Trough Cover



1. Cable strap (5)
2. Cable strap (3)
3. Wire trough
4. Cable (2)
5. Brake line retention clip (2)
6. Brake line holder
7. Brake line (3)

Figure 8-107. Wire Trough

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9)
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
4. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
6. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

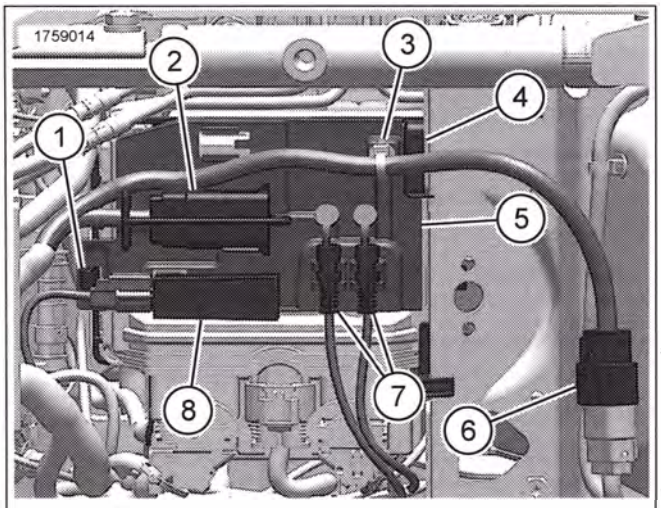
1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).

REMOVE

1. See Figure 8-108. Disconnect rear harness connector (6).
2. Remove anchored cable strap (3) from caddy (5).
3. Remove security system antenna (8) from caddy.
4. Remove connectors.
   a. Unclip heated gear connectors (7).
   b. Remove P&A connector (2) from caddy.
5. Press tab (1), remove caddy.

INSTALL

1. See Figure 8-108. Install caddy.
   a. Install top caddy (5) in hold down clip (4).
   b. Press top caddy onto tab (1) to secure.
2. Install connectors.
   a. Install P&A connector (2).
   b. Install heated gear connectors (7).
3. Install rear harness connector (6).
4. Install anchored cable strap (3).
5. Install security system antenna (8).



1. **Tab**
2. **P&A connector**
3. **Anchored cable strap**
4. **Hold down clip**
5. **Top caddy**
6. **Rear harness connector**
7. **Heated gear connector (2)**
8. **Security system antenna connector**

Figure 8-108. Top Caddy

COMPLETE

1. Install seat. See CHASSIS > SEAT (Page 3-139).
2. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
3. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove ECM. See ELECTRICAL > ELECTRONIC CONTROL MODULE (ECM) (Page 8-51).

REMOVE

1. See Figure 8-109. Remove cable straps (2) and discard.
2. Remove fuse block.
   a. Remove fuse block cover (7).
   b. See Figure 8-110. Insert a thin tool to release tabs (1).
   c. Push fuse block away from caddy.
3. See Figure 8-109. Remove screws (4).
4. Disconnect connectors.
   a. Unclip battery tender (1).
   b. Disconnect OBD connector (8).
   c. Disconnect Purge solenoid connector (5).
5. See Figure 8-111. Remove main fuse holder (1).
6. Remove AUX connector.
   a. Press on cable end of AUX connector (2).
   b. Push opposite direction of cable to remove.
7. Remove caddy.

INSTALL

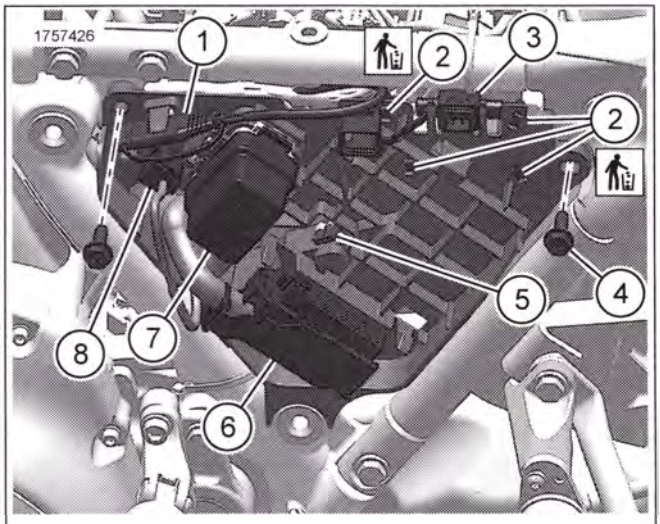
FASTENER	TORQUE VALUE	
Caddy, left side, screws	71–97 **in-lbs**	8–11 N·m

1. See Figure 8-111. Install AUX connector.
   a. Align AUX connector (2) with tabs on caddy.
   b. Slide connector rearward towards cable.
2. Install main fuse holder.
   a. Place main fuse holder (1) in caddy main fuse holder (3).

NOTE

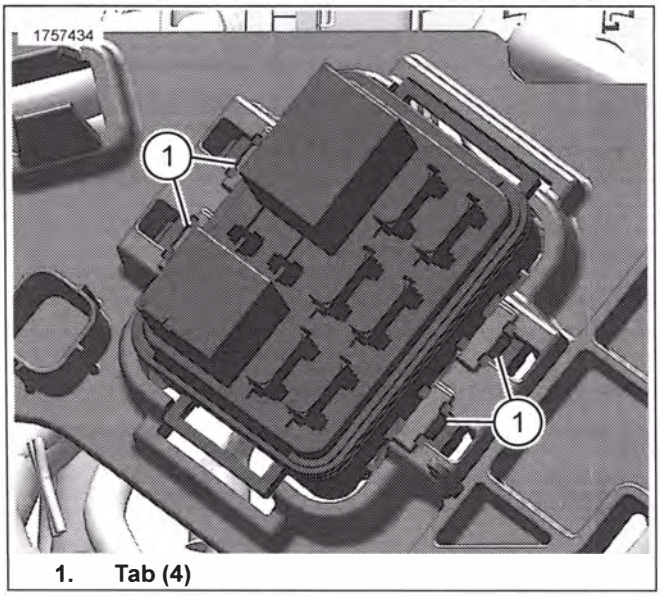
Tighten cable straps only enough to secure cable but still allow movement.

   b. Install **new** cable straps (4).
3. See Figure 8-109. Install purge solenoid connector (5).
4. See Figure 8-110. Install fuse block.
   a. Install fuse block onto caddy until tabs (1) click into place.
   b. Verify tabs are secure to caddy.
   c. See Figure 8-109. Install cover (7).
5. Route cam lock connector (6) and OBD connector (8) through opening in caddy.
6. Align caddy and install screws (4). Tighten.
   Torque: 71–97 **in-lbs** (8–11 N·m) *Caddy, left side, screws*
7. Install battery tender (1) in holder.
8. Connect OBD connector (8)



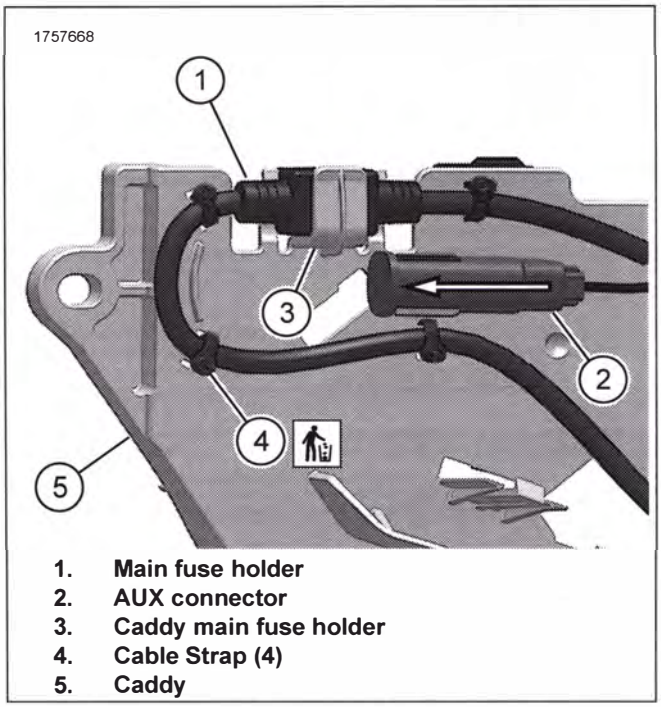
1. **Battery tender**
2. **Cable strap (4)**
3. **Main fuse holder**
4. **Screw (2)**
5. **Purge solenoid connector**
6. **Cam lock connector**
7. **Fuse block cover**
8. **OBD connector**

Figure 8-109. Left Side Caddy



1. Tab (4)

Figure 8-110. Fuse Block Tab Location (typical)



1. **Main fuse holder**
2. **AUX connector**
3. **Caddy main fuse holder**
4. **Cable Strap (4)**
5. **Caddy**

Figure 8-111. Behind Left Side Caddy

COMPLETE

1. Install ECM. See ELECTRICAL > ELECTRONIC CONTROL MODULE (ECM) (Page 8-51).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
6. Remove BCM and caddy. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
7. Remove battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
8. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).

REMOVE

1. See Figure 8-112. Detach connectors.
   a. Detach HO2S front connector (1).
   b. Detach HO2S rear connector (2).
   c. Detach Can Bus termination connector (3).
   d. Detach rear wheel speed sensor (4).
2. See Figure 8-113. Remove right side caddy from battery tray.
   a. Remove screw (3) and washer (2).
   b. Remove screws (1).
   c. See Figure 8-114. Detach brake line (6) from clip.
   d. Disengage latch (3) on bottom of caddy (1).
   e. Loosen nuts (5) securing ABS module to caddy.
   f. Pry between bottom of ABS module and right caddy to release stud on bottom of module from grommet (4).
   g. Remove ABS module from caddy.
   h. Release caddy from dovetail (2) while lowering battery tray into frame.
   i. Remove caddy.
3. See Figure 8-112. Remove relay housing (if equipped).
   a. Remove relay (8).
   b. Remove screws (5) and washers (6).
   c. Remove relay housing (7).

INSTALL

FASTENER	TORQUE VALUE	
ABS module locknuts	53–89 **in-lbs**	6–10 N·m
Battery tray screws	11–13 ft-lbs	15–18 N·m
Battery tray to right side caddy screw	35–44 **in-lbs**	4–5 N·m
Relay housing, saddlebag lock, screws, right side	25–35 **in-lbs**	2.8–3.9 N·m

NOTE

Lubricate grommets with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water to aid installation.

1. See Figure 8-114. Install ABS module.
   a. Align screw on bottom of ABS with grommet (4).
   b. Align grommets on ABS studs with right side caddy (1).
   c. Install ABS module to right side caddy.
   d. Install nuts (5). Tighten.
      Torque: 53–89 **in-lbs** (6–10 N·m) *ABS module locknuts*
2. See Figure 8-112. Install relay housing (if equipped).
   a. Install relay housing (7).
   b. Install washers (6) and screws (5). Tighten.
      Torque: 25–35 **in-lbs** (2.8–3.9 N·m) *Relay housing, saddlebag lock, screws, right side*
   c. Install relays (8).
3. See Figure 8-114. Install right side caddy to battery tray.
   a. Install right side caddy on dovetail (2).
   b. Lift battery tray into position.
   c. Verify latch (3) is engaged.
   d. Attach brake line (6) to clip.
   e. See Figure 8-113. Install washer (2) and screw (3). Tighten.
      Torque: 35–44 **in-lbs** (4–5 N·m) *Battery tray to right side caddy screw*
   f. Install screws (1) securing battery tray (4) to frame.
      Torque: 11–13 ft-lbs (15–18 N·m) *Battery tray screws*

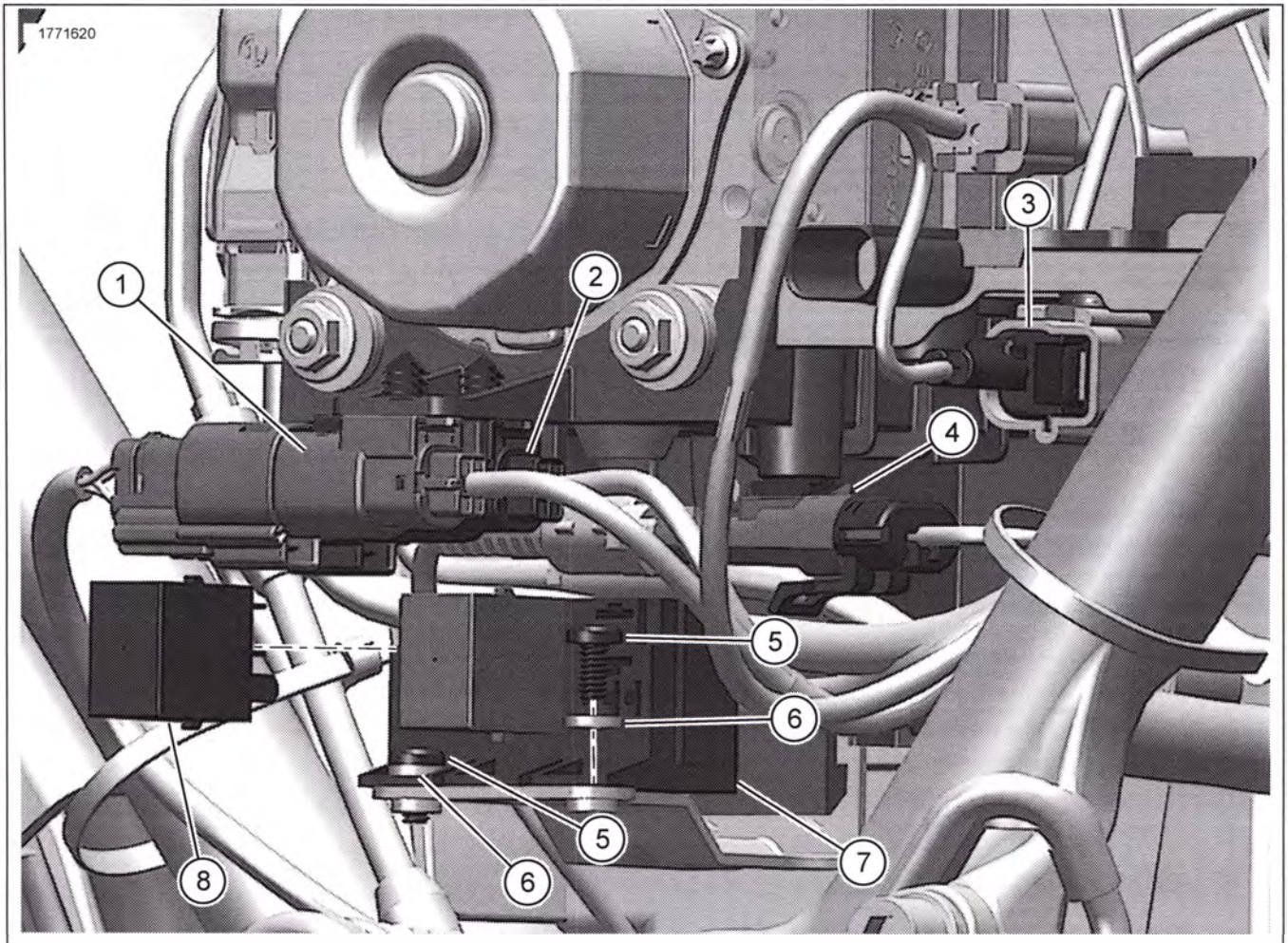
4. Attach connectors.

   a. Attach rear wheel speed sensor (4).

   b. Attach HO2S rear connector (2).

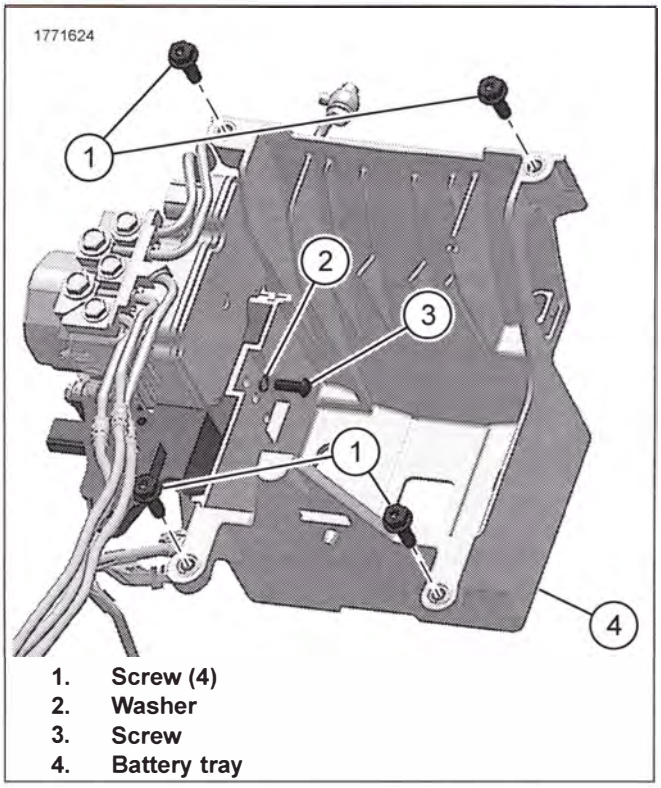
   c. Attach HO2S front connector (1).

   d. Attach Can Bus termination connector (3).



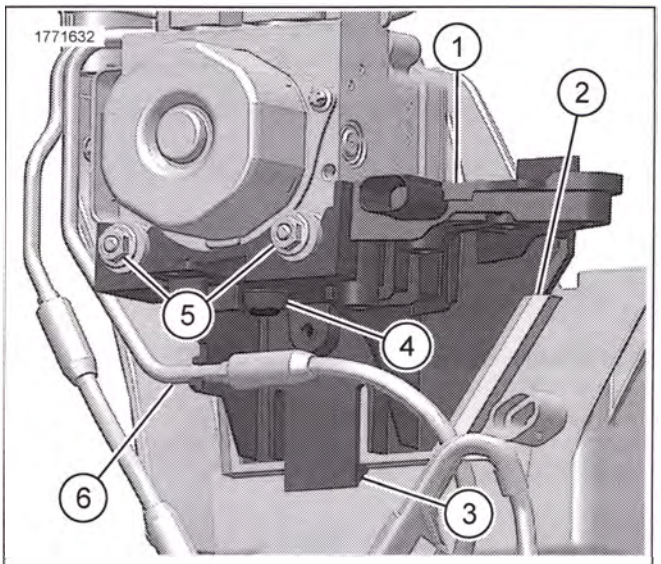
1.	**HO2S front connector**	**5.**	**Screw (2)**
2.	**HO2S rear connector**	**6.**	**Washer (2)**
3.	**Can Bus termination connector**	**7.**	**Relay housing**
4.	**Rear wheel speed sensor**	**8.**	**Relay (2)**

Figure 8-112. Right Side Caddy Connectors



1. Screw (4)
2. Washer
3. Screw
4. Battery tray

Figure 8-113. Battery Tray Screw



1. Right side caddy
2. Dovetail
3. Latch
4. Grommet
5. Nut (2)
6. Brake line

Figure 8-114. Right Side Caddy Assembly

COMPLETE

1. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
2. Install battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
3. Install BCM and caddy. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
4. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
5. Install seat. See CHASSIS > SEAT (Page 3-139)
6. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
7. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
8. Install both saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
2. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
3. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
4. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
5. Remove seat. See CHASSIS > SEAT (Page 3-139).
6. Remove fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).

REMOVE

1. See Figure 8-115. Remove connectors.

NOTE

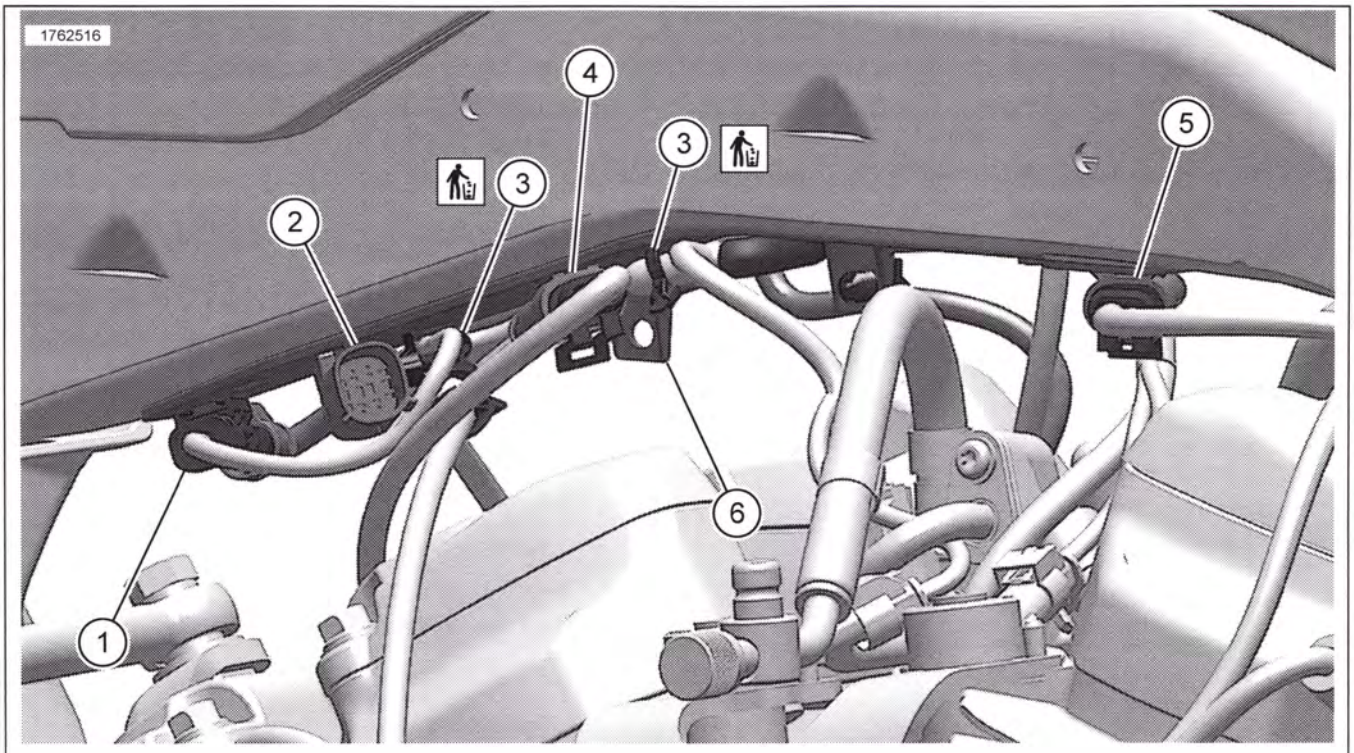
Only disconnect connecters if necessary.

   a. Remove engine temperature sensor connector (1).
   b. Remove fuel pump connector (2).
   c. Remove front ACR connector (4).
   d. Remove rear ACR connector (5).
   e. Remove and dispose of cable straps (3).

2. See Figure 8-116. Remove lower backbone caddy.
   a. Remove anchored cable strap (4).
   b. Remove plastic rivets (1).
   c. Slide lower backbone caddy (5) forward and down to remove.

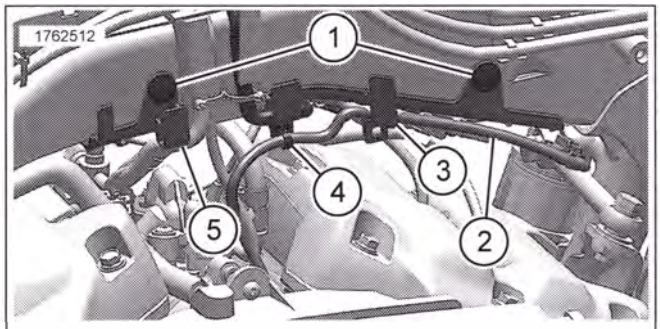
INSTALL

1. See Figure 8-117. Install lower caddy.
   a. Install **new** cable straps (2). Do not secure.
   b. Slide lower backbone caddy (3) up and rearward to engage tabs (1).
   c. See Figure 8-116. Install plastic rivets (1).
   d. Place engine temperature sensor cable (2) in hook (3).
   e. Install anchored cable strap (4).
2. See Figure 8-115. Install connectors.
   a. Install rear ACR connector (5).
   b. Install front ACR connector (4).
   c. Install fuel pump connector (2).
   d. Install engine temperature sensor connector (1).
   e. Secure Cable straps (3).



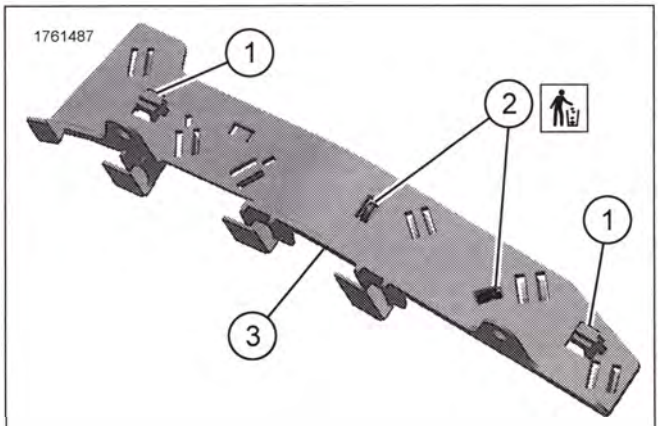
1. Engine temperature sensor connector
2. Fuel pump connector
3. Cable strap (2)
4. Front ACR connector
5. Rear ACR connector
6. Lower backbone caddy

Figure 8-115. Lower Backbone Caddy (left side)



1. Plastic rivet (2)
2. Engine temperature sensor cable
3. Hook
4. Anchored cable strap
5. Lower backbone caddy

Figure 8-116. Lower Backbone Caddy (right side)



1. Tab (2)
2. Cable strap (2)
3. Lower backbone caddy

Figure 8-117. Lower Backbone Caddy

COMPLETE

1. Install fuel tank. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
2. Install seat. See CHASSIS > SEAT (Page 3-139).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove seat. See CHASSIS > SEAT (Page 3-139).
5. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
6. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
7. Remove BCM and caddy. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
8. Remove left side caddy. (Remove left side caddy bolts and swing caddy out of the way of the battery tray. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).

REMOVE

1. See Figure 8-118. Disconnect cooling fan connector (1) from battery tray (2).
2. See Figure 8-119. Disconnect EHCU (1).
3. See Figure 8-120. Remove right side caddy from battery tray.
   a. Remove screw and washer (4).
   b. Remove screws (1).
   c. See Figure 8-121. Detach brake line (6) from clip.
   d. Disengage latch (3) on bottom of caddy (1).
   e. Loosen nuts (5) securing ABS module to caddy.
   f. Pry between bottom of ABS module and right caddy to release stud on bottom of module from grommet (4).
   g. Remove ABS module from caddy.
   h. Release caddy from dovetail (2) while lowering battery tray into frame.
4. See Figure 8-120. Remove battery tray.
   a. Pry relay bracket from battery tray while pushing on plastic fasteners (5).
   b. Roll front of battery tray (2) up and out of frame.
5. See Figure 8-122. Remove battery strap (2) if needed.

INSTALL

FASTENER	TORQUE VALUE	
ABS module locknuts	53–89 **in-lbs**	6–10 N·m
Battery tray screws	11–13 ft-lbs	15–18 N·m
Battery tray to right side caddy screw	35–44 **in-lbs**	4–5 N·m

1. See Figure 8-122. Install battery strap.
   a. Install battery strap (2) on tab (3).
   b. Route strap through battery tray opening.

NOTE

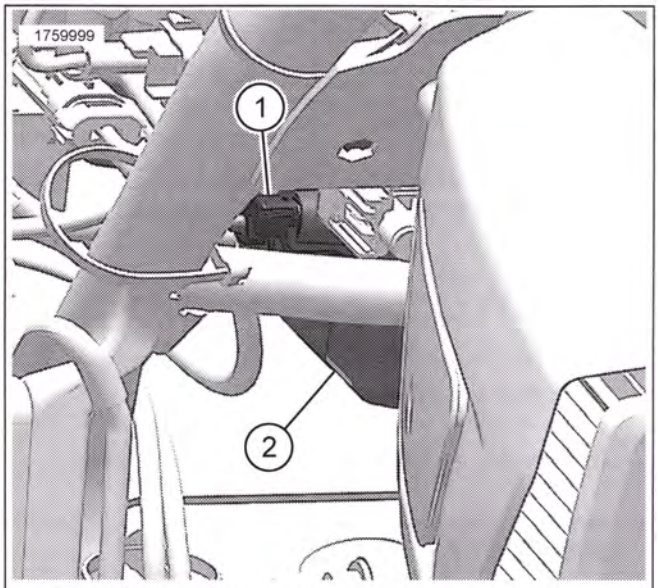
Leave strap lay on bottom of tray until installing battery.

2. See Figure 8-120. Install battery tray.
   a. Roll rear of battery tray (2) down into frame.
   b. Install relay bracket while aligning plastic fasteners (5) with holes in battery tray.
   c. See Figure 8-121. Slide right side caddy (1) into dovetail (2) on battery tray.

NOTE

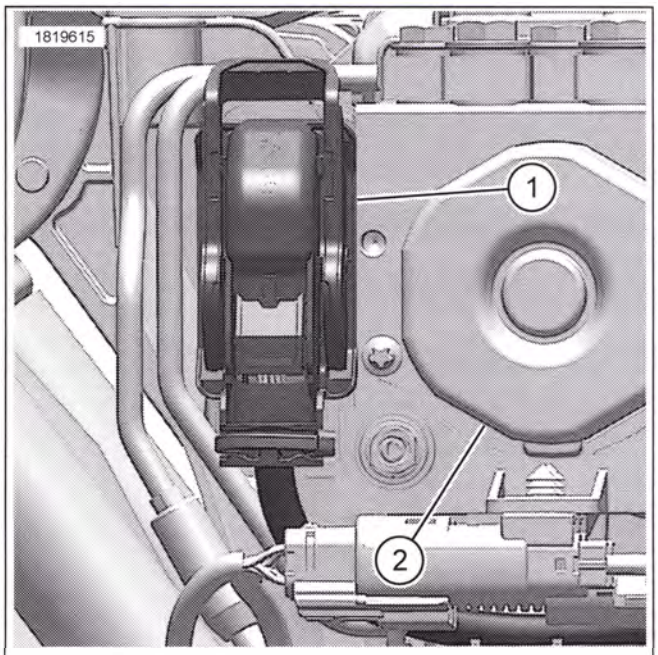
Lubricate grommets with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water to aid installation.

   d. Install ABS module to right side caddy.
   e. Tighten nuts (5).
      Torque: 53–89 **in-lbs** (6–10 N·m) *ABS module locknuts*
   f. Verify latch (3) is engaged.
   g. Attach brake line (6) to clip.
   h. See Figure 8-120. Install screw and washer (4). Tighten.
      Torque: 35–44 **in-lbs** (4–5 N·m) *Battery tray to right side caddy screw*
   i. Install screws (1). Tighten.
      Torque: 11–13 ft-lbs (15–18 N·m) *Battery tray screws*
3. See Figure 8-122. Connect cooling fan connector (1).
4. See Figure 8-119. Install EHCU connector.



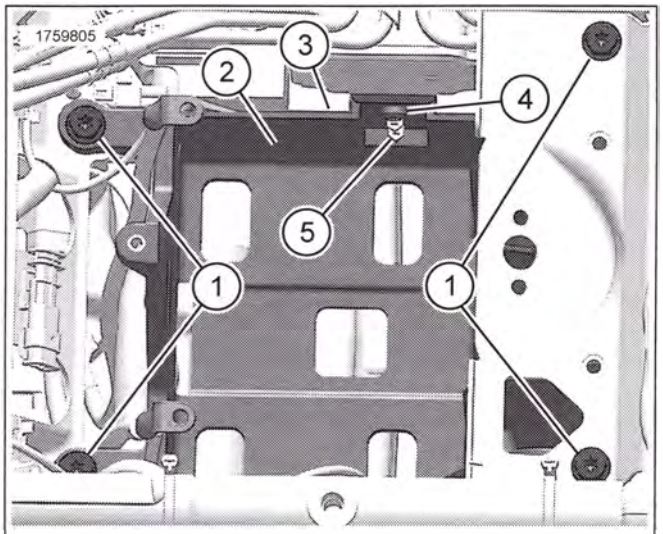
1. Cooling fan connector
2. Battery tray

Figure 8-118. Cooling Fan Connector



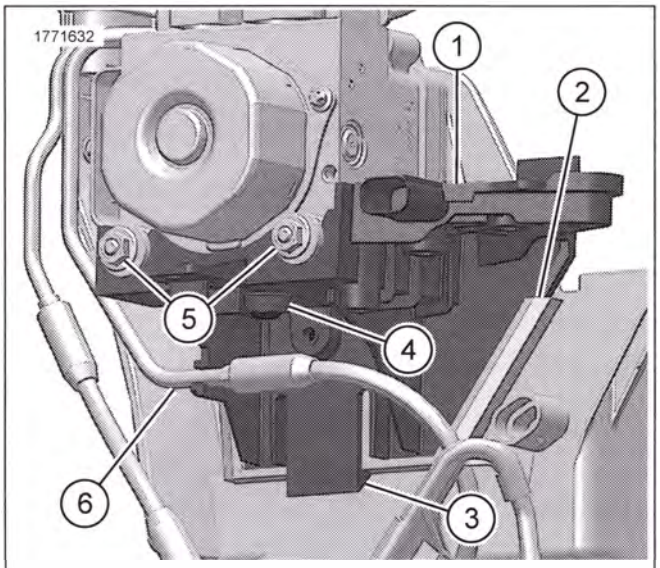
1. EHCU connector
2. ABS module

Figure 8-119. EHCU Connector



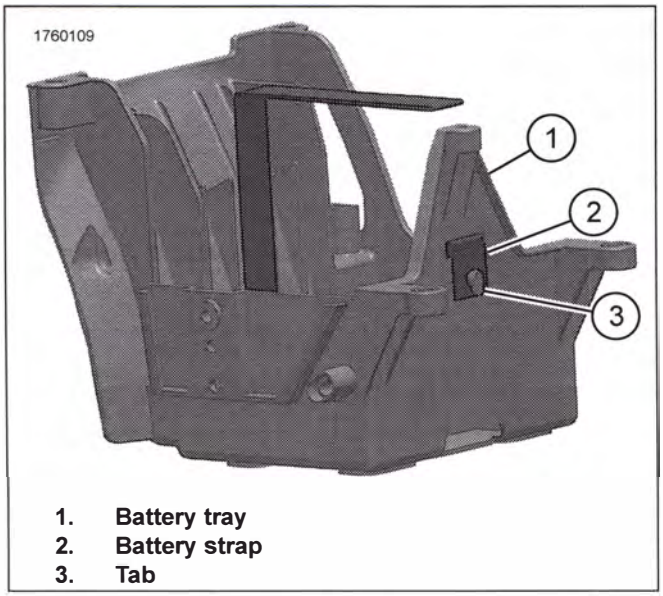
1. Screw (4)
2. Battery tray
3. Pry area
4. Screw and washer
5. Plastic fastener (2)

Figure 8-120. Battery Tray



1. Right side caddy
2. Dovetail
3. Latch
4. Grommet
5. Nut (2)
6. Brake line

Figure 8-121. Right Side Caddy Assembly



1. **Battery tray**
2. **Battery strap**
3. **Tab**

Figure 8-122. Battery Strap

COMPLETE

1. Install left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).
2. Install BCM and caddy. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
3. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
4. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
5. Install seat. See CHASSIS > SEAT (Page 3-139).
6. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
7. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
8. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).
2. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
3. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Remove outer fairing. See
   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
5. **Frame-mounted fairing:** Remove headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).

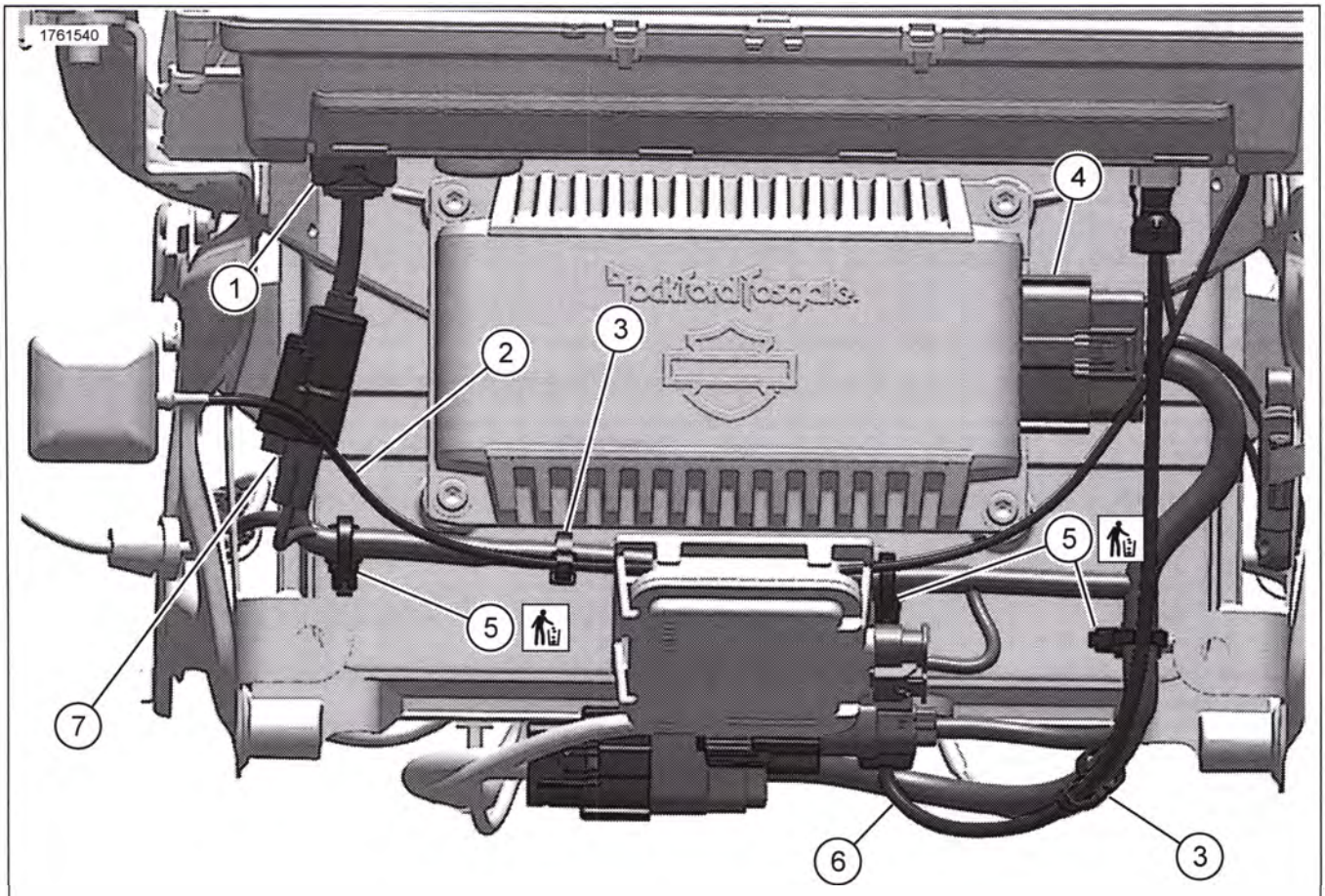
REMOVE AND INSTALL: FORK MOUNTED FAIRING

Remove

1. See Figure 8-123. Remove cable straps.
   a. Pry out anchored cable straps (5).
   b. Remove double loop cable straps (3) and discard.
2. See Figure 8-124. Disconnect connectors.
   a. Disconnect IFCU connector (1).
   b. Disconnect module connector (2).
   c. Disconnect amplifier connector (3).
   d. Disconnect front audio connector (4).
   e. Disconnect P&A connector (5).
   f. Disconnect speaker connectors (6).
3. Remove fairing wire harness.

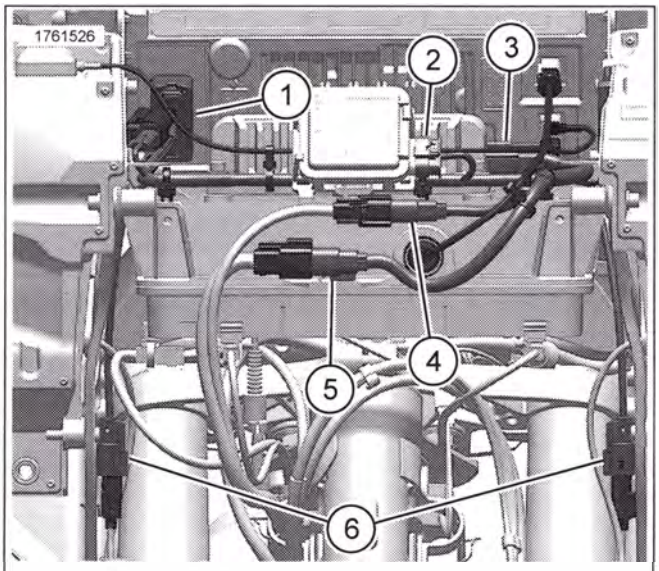
Install

1. Route fairing wire harness.
2. See Figure 8-124. Connect connectors.
   a. Connect speaker connectors (6).
   b. Connect P&A connector (5).
   c. Connect front audio connector (4).
   d. Connect amplifier connector (3).
   e. Connect module connector (2).
   f. Connect IFCU connector (1).
3. See Figure 8-123. Install cable straps.
   a. Install anchored cable straps (5).
   b. Install GPS cable (2) to harness with **new** double loop cable strap (3).
   c. Install USB cable (6) to harness with **new** double loop cable strap (3).



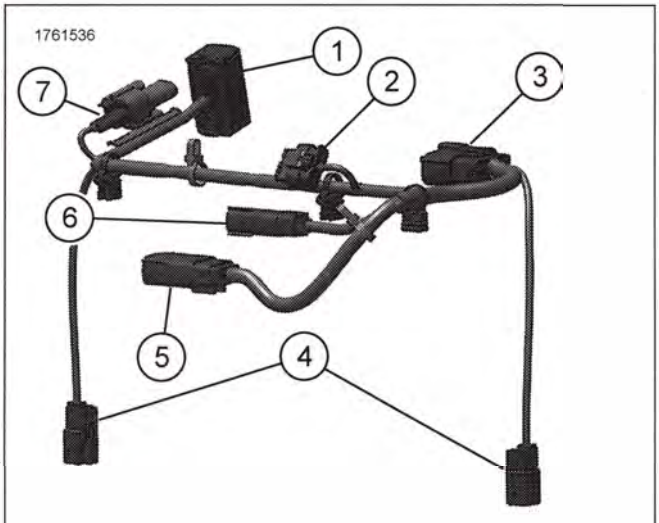
1. IFCU connector
2. GPS cable
3. Double loop cable strap (2)
4. Amplifier connector
5. Anchored cable strap (3)
6. USB cable
7. Terminating resistor

Figure 8-123. Fork-Mounted Fairing Harness Top View



1. IFCU connector
2. Module connector
3. Amplifier connector
4. Front audio connector
5. P&A connector
6. Speaker connector (2)

Figure 8-124. Fork-Mounted Fairing Harness Bottom View



1. IFCU connector
2. Module connector
3. Amplifier connector
4. Speaker connector (2)
5. P&A connector
6. Front audio connector
7. Terminating resistor

Figure 8-125. Fork-Mounted Fairing Harness

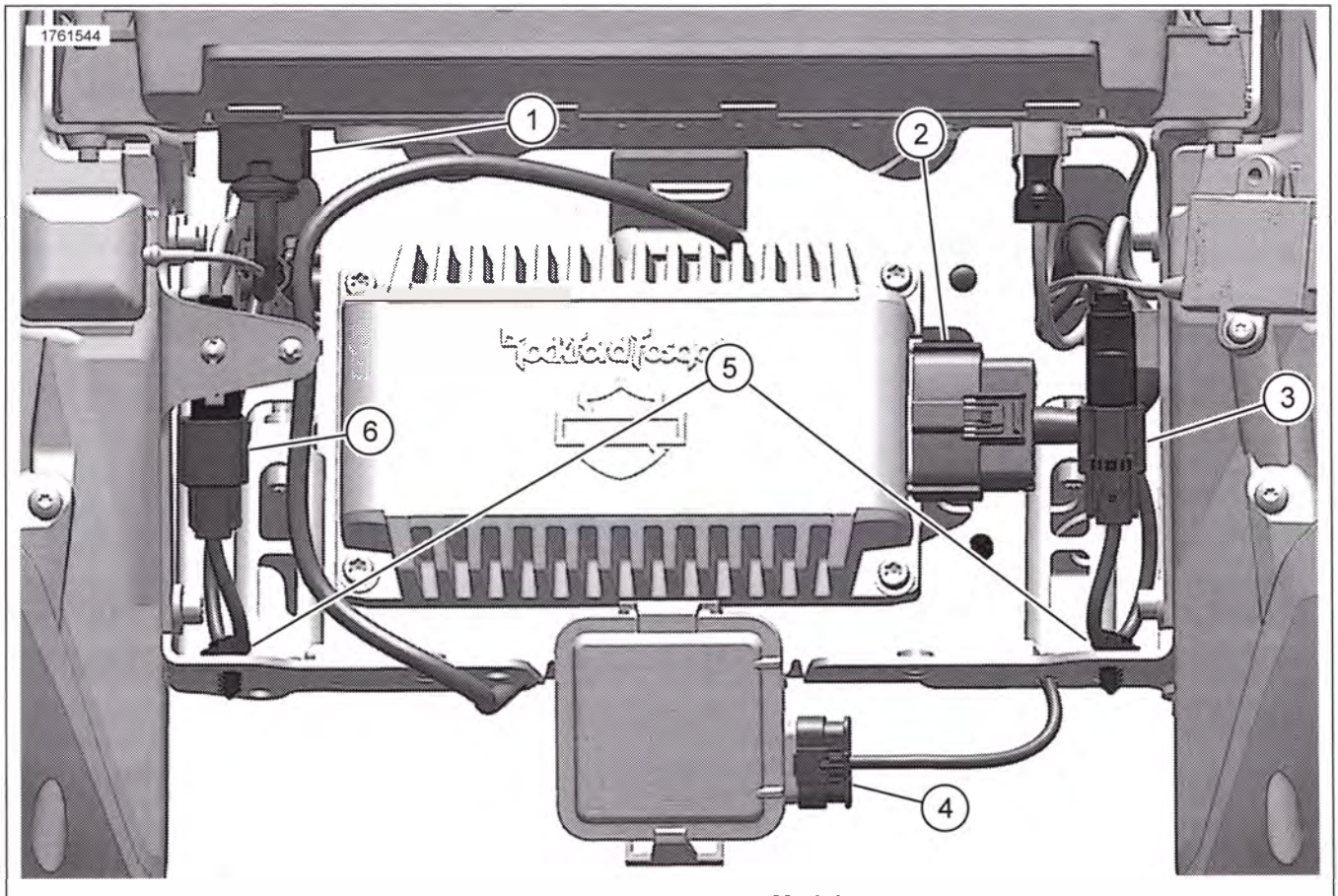
REMOVE AND INSTALL: FRAME MOUNTED FAIRING

Remove

1. See Figure 8-126. Remove cable straps.
   a. Pry out anchored cable straps (5).
   b. See Figure 8-127. Pry out anchored cable straps (1).
   c. Remove double loop cable straps (4) and discard.
2. Disconnect connectors.
   a. Disconnect P&A connector (6).
   b. Disconnect front audio connector (5).
   c. Disconnect module connector (2).
   d. See Figure 8-126. Disconnect IFCU connector (1).
   e. Disconnect RH speaker connector (6).
   f. Disconnect LH speaker connector (3).
   g. Disconnect amplifier connector (2).
3. Remove fairing wire harness.

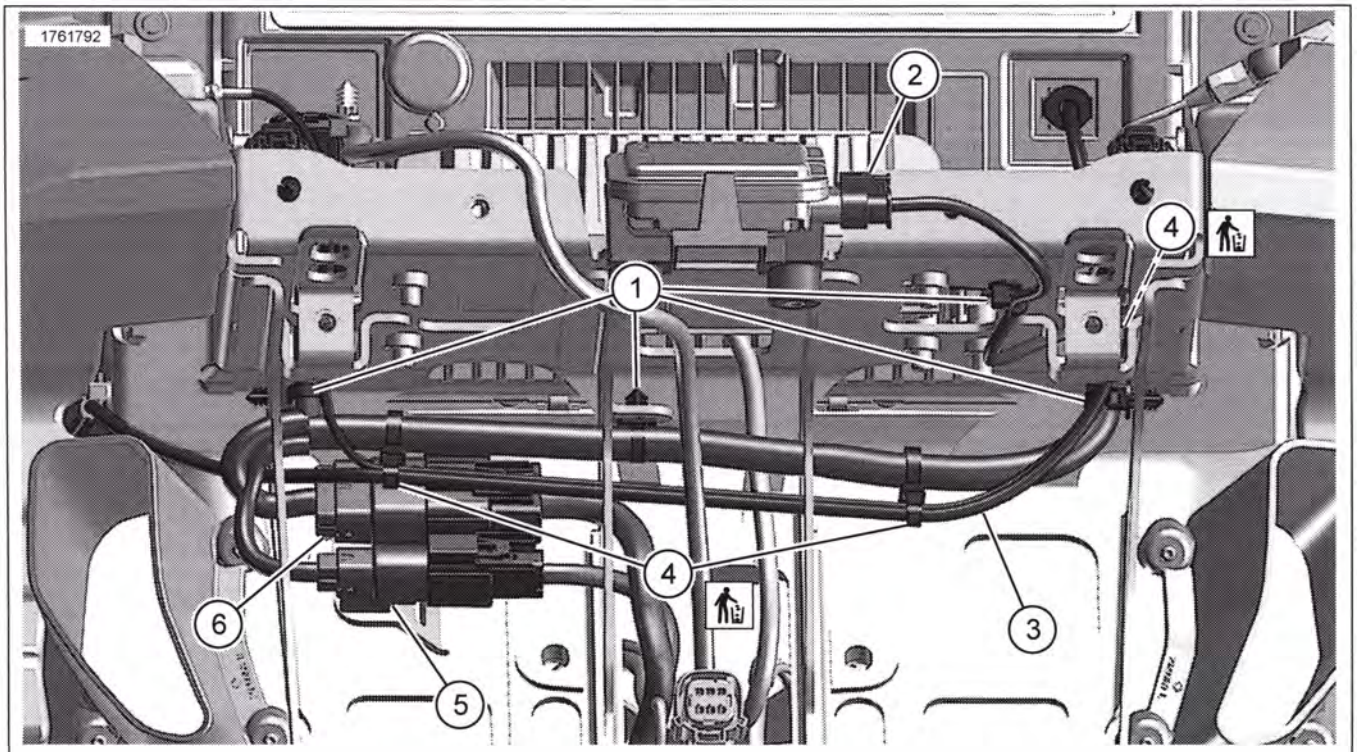
Install

1. Route fairing wire harness.
2. See Figure 8-126. Connect connectors.
   a. Connect RH speaker connector (6).
   b. Connect LH speaker connector (3).
   c. Connect IFCU connector (1).
   d. Connect amplifier connector (2).
   e. Connect module connector (4).
   f. See Figure 8-127. Connect P&A connector (6).
   g. Connect front audio connector (5).
3. Install cable straps.
   a. Install anchored cable straps (1).
   b. Install USB and GPS cables (3) to harness with **new** double loop cable strap (4).
   c. See Figure 8-126. Install anchored cable straps (5).



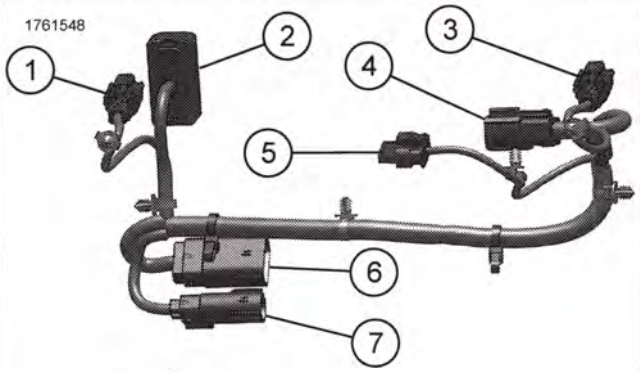
1. **IFCU connector**
2. **Amplifier connector**
3. **LH speaker Connector**
4. **Module connector**
5. **Anchored cable strap (2)**
6. **RH speaker Connector**

Figure 8-126. Frame-Mounted Fairing Wire Harness Top View



1. **Anchored cable strap (4)**
2. **Module connector**
3. **USB and GPS cable**
4. **Double loop cable strap (3)**
5. **Front audio connector**
6. **P&A connector**

Figure 8-127. Frame-Mounted Fairing Wire Harness Bottom View



1. **RH speaker connection**
2. **IFCU connector**
3. **LH speaker connection**
4. **Amplifier connector**
5. **Module connector**
6. **P&A connector**
7. **Front audio connector**

Figure 8-128. Frame-Mounted Fairing Wire Harness

COMPLETE

1. **Frame-mounted fairing:** Install headlamp. See ELECTRICAL > HEADLAMP (Page 8-32).
2. Install outer fairing. See
   a. CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   b. CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
3. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
4. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Install left saddlebag. See CHASSIS > SADDLEBAGS (Page 3-144).

PREPARE

1. Remove radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
2. Purge fuel line. See FUEL AND EXHAUST > PURGE FUEL LINE (Page 6-6).
3. Remove saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).
4. Remove left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
5. Remove main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
6. Remove seat. See CHASSIS > SEAT (Page 3-139).
7. Remove fuel tank and console. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
8. Remove top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
9. Remove Body Control Module (BCM) and BCM caddy. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
10. Remove battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
11. Remove battery tray. See ELECTRICAL > BATTERY TRAY (Page 8-88).
12. Remove Electronic Control Module (ECM). See ELECTRICAL > ELECTRONIC CONTROL MODULE (ECM) (Page 8-51).
13. Remove left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).

NOTE

If replacing harness a new left side and right side caddy will be attached.

14. Remove right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
15. Remove air cleaner cover and filter. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).
16. Remove air cleaner backplate assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
17. Disconnect knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
18. Remove ignition coil and secure out of the way. See ELECTRICAL > IGNITION COIL (Page 8-17).
19. Remove right side caddy screws. See ELECTRICAL > RIGHT SIDE CADDY (Page 8-83).
20. Release lower backbone caddy. See ELECTRICAL > LOWER BACKBONE CADDY (Page 8-86)
21. **Fork-mounted fairing model:** See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
    a. Remove outer fairing.
22. **Frame-mounted fairing model:** See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
    a. Remove outer fairing.
    b. Remove inner fairing.
    c. Remove instrument nacelle.
    d. Remove fairing mounting bracket.

REMOVE AND INSTALL: FORK MOUNTED FAIRING

Remove

NOTE

Note locations of and remove cable strap anchors, wire harness anchors, cable straps and remove from retaining devices as necessary.

1. See Figure 8-129. Disconnect electrical connectors in fairing.
    a. Disconnect RH control connector (2).
    b. Disconnect twist grip connector (3).
    c. Disconnect P&A connector (4).
    d. Disconnect front audio connector (5).
    e. Disconnect ground (6).
    f. Disconnect LH control connector (7).
2. See Figure 8-130. Remove LH steering head caddy.
    a. Disconnect Front headlight connector (3).
    b. Disconnect ambient air sensor connector (4).
    c. Remove plastic retainer (1).
    d. Slide steering head caddy (2) forward to remove.
    e. Pull main harnesses rearward and allow to hang.
3. See Figure 8-131. Remove RH steering head caddy.
    a. Remove and discard cable strap (6).

b. Disconnect wheel speed sensor connector (3).

c. Remove plastic retainer (2).

d. Lift tab (5) and open brake line retainer (4).

e. Remove brake line retainer.

f. Slide steering head caddy (1) forward to remove.

g. Pull main harnesses rearward and allow to hang.

4. To complete the remove procedure go to MAIN WIRE HARNESS > REMOVE AND INSTALL: COMMON COMPONENTS (Page 8-100).

Install

1. Route main harness forward along each side of steering head and into inner fairing area.

2. Install LH steering head caddy.

   a. See Figure 8-129. Route ground connector (6) and LHCM connector (7) through upper hole in LH steering head caddy (8).

   b. See Figure 8-130. Slide steering head caddy (2) rearward.

   c. Connect Front headlight connector (3).

   d. Connect ambient air sensor connector (4).

   e. Install plastic retainer (1).

3. See Figure 8-131. Install RH steering head caddy.

   a. Route right side cable through RH steering head caddy (1) as shown.

   b. Slide steering head caddy (1) rearward.

   c. Place brake lines and clutch cable in brake line retainer (4) as shown.

   d. Insert retainer into pocket in caddy.

   e. Rotate top of retainer in until latched.

   f. Install plastic retainer (2).

   g. Connect wheel speed sensor connector (3).

   h. Install **new** cable strap (6). Do not capture clutch cable.

4. See Figure 8-129. Connect connectors in fairing.

   a. Connect RHCM connector (2).

   b. Connect twist grip connector (3).

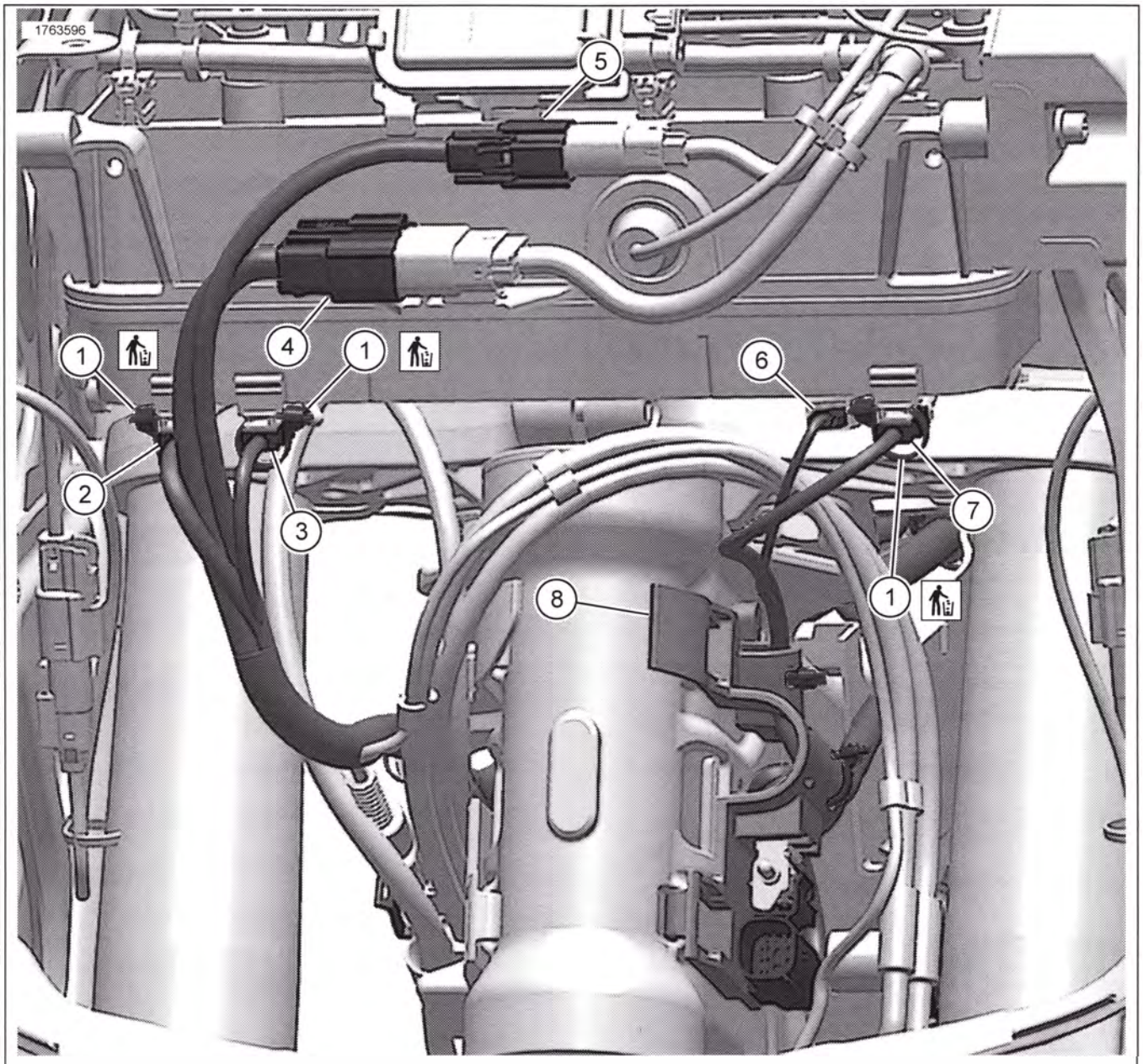
   c. Connect front audio connector (5).

   d. Connect P&A connector (4).

   e. Connect ground connector (6).

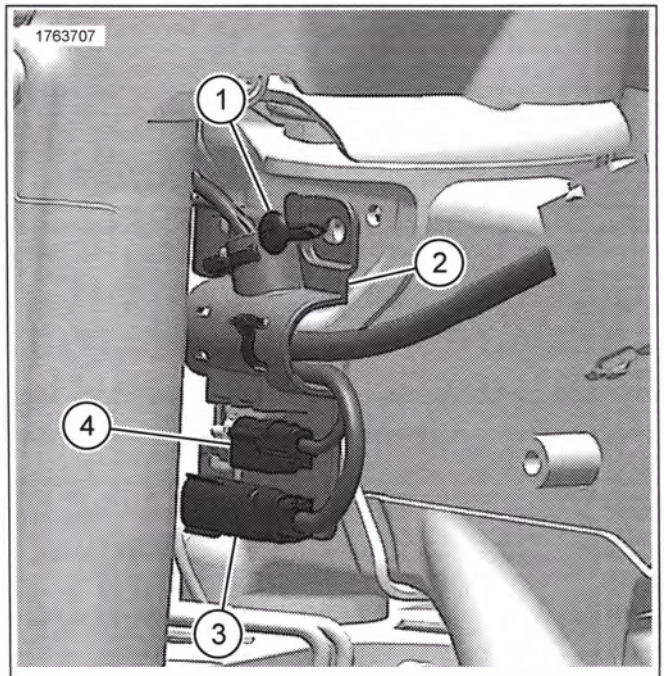
   f. Connect LHCM connector (7).

5. Install **new** cable straps (1).



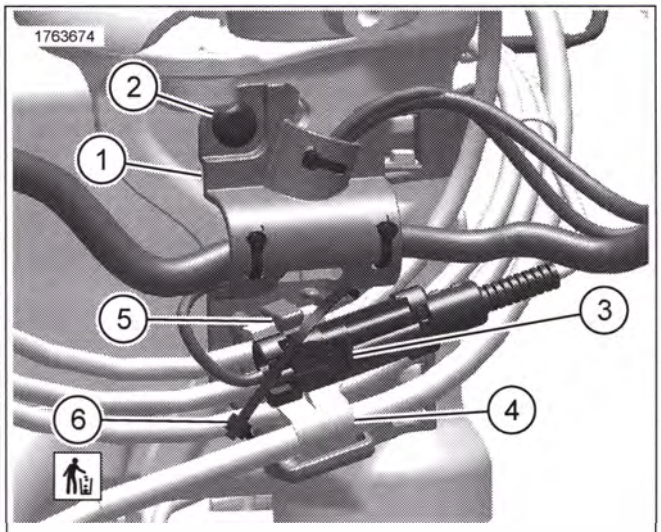
1. Cable strap (3)
2. RHCM connector
3. Twist grip connector
4. P&A connector
5. Front audio connector
6. Ground connector
7. LHCM connector
8. Steering head caddy

Figure 8-129. Fork-Mounted Main Harness Fairing Connectors



1. **Plastic retainer**
2. **Steering head caddy**
3. **Front headlight connector**
4. **Ambient air sensor connector**

Figure 8-130. LH Steering Head Caddy



1. **Steering head caddy**
2. **Plastic retainer**
3. **Wheel speed sensor connector**
4. **Brake line retainer**
5. **Tab**
6. **Cable strap**

Figure 8-131. RH Steering Head Caddy

REMOVE AND INSTALL: FRAME MOUNTED FAIRING

FASTENER	TORQUE VALUE	
Wire guide bracket	20–30 ft-lbs	27–41 N·m

Remove

NOTE

Note locations of cable strap anchors, wire harness anchors, cable straps and remove from retaining devices as necessary

1. See Figure 8-132. Disconnect electrical connectors in fairing.
   a. Disconnect anchored cable strap (1).
   b. Disconnect front audio connector (6).
   c. Disconnect P&A connector (2).
   d. Feed cables through fairing bracket opening (4).
   e. See Figure 8-133. Disconnect LHCM connector (1).
   f. Disconnect ground connector (2).
   g. Disconnect ambient air sensor connector (5).
2. Remove wire guide.
   a. Remove nut (4).
   b. Remove ambient air sensor connector (5) from wire guide (6).
3. See Figure 8-134. Pull left side main harness branch (3) rearward and allow to hang.
4. See Figure 8-135. Disconnect right side main harness branch.
   a. Remove anchored cables (4).
   b. Disconnect RHCM connector (2).
   c. Disconnect twist grip connector (3).
5. Pull right side main harness branch (1) rearward and allow to hang.

Install

1. Route main harness forward along each side of steering head and into inner fairing area.
2. See Figure 8-134. Route left side main harness branch (3) through left side frame opening (4).
3. Route headlamp cable (5) through fairing bracket.
4. Connect connectors.
   a. Connect LHCM connector (1).
   b. Connect ground connector (2).
   c. See Figure 8-133. Route ambient air sensor connector (5) through wire guide (6) opening.
   d. Connect ambient air sensor connector.
5. Install wire guide (6) and nut (4). Tighten.
   Torque: 20–30 ft-lbs (27–41 N·m) *Wire guide bracket*
6. See Figure 8-135. Route right side main harness branch (1) through right side frame opening (6).

7. Connect connectors.

   a. Connect twist grip connector (3).

   b. Connect RHCM connector (2).

   c. Install anchored cable straps (4).

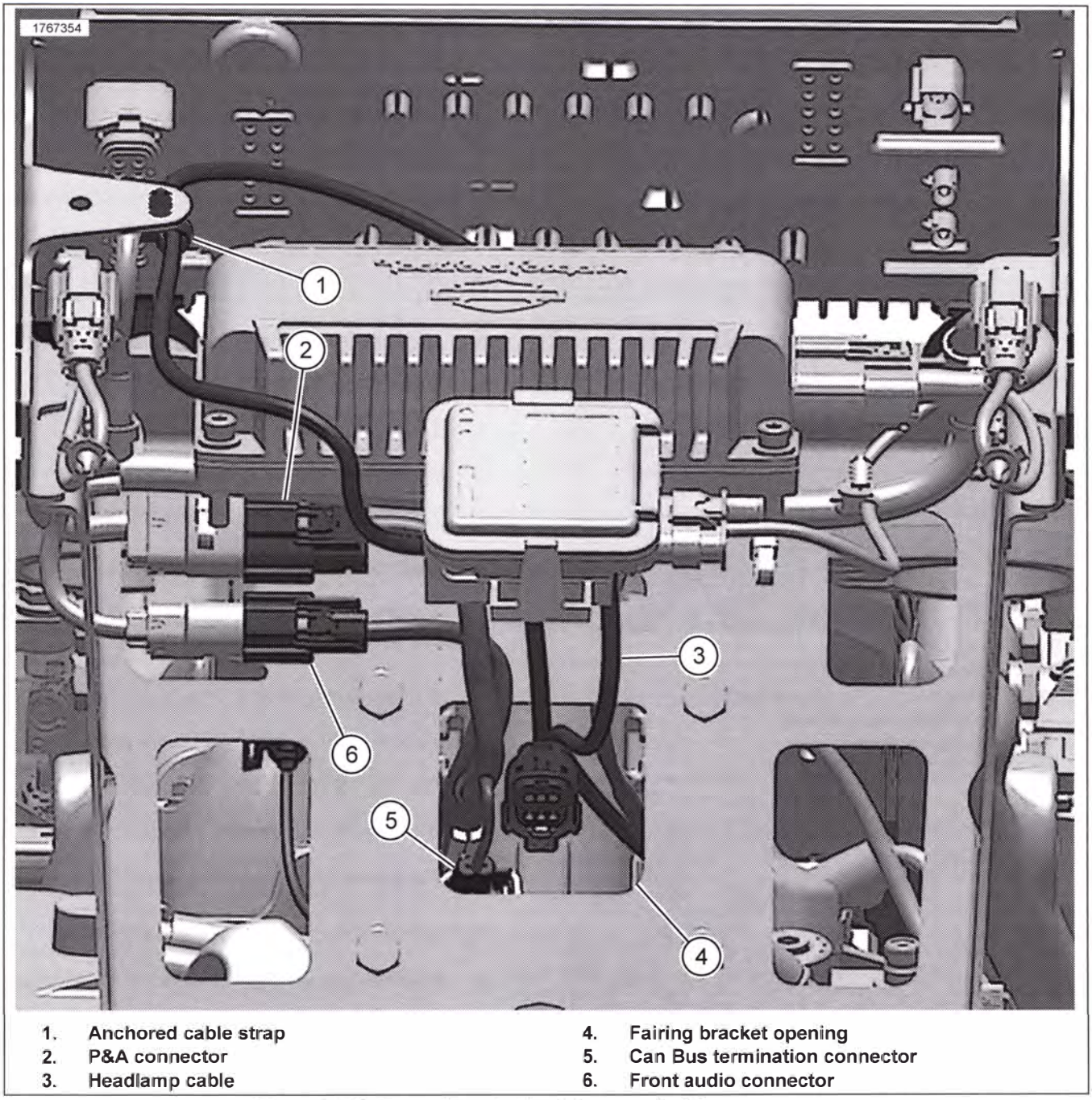
   d. See Figure 8-132. Connect P&A connector (2).

   e. Connect front audio connector (6).

   f. Route headlamp cable (3) through opening in fairing bracket opening (4).

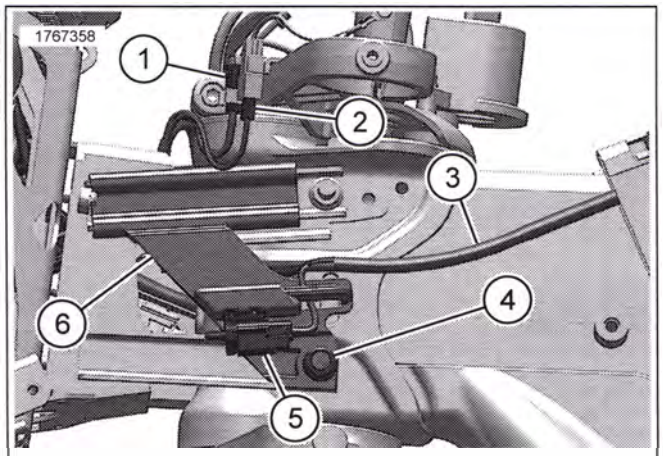
   g. Pull up headlamp cable behind amplifier.

   h. Install anchored cable strap (1)



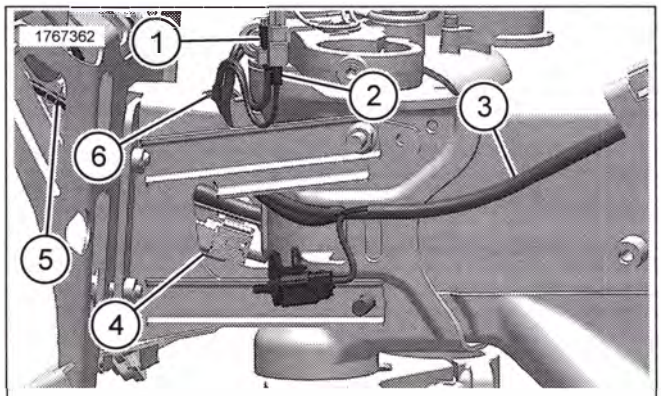
1. Anchored cable strap
2. P&A connector
3. Headlamp cable
4. Fairing bracket opening
5. Can Bus termination connector
6. Front audio connector

Figure 8-132. Frame-Mounted Main Harness Fairing Connectors



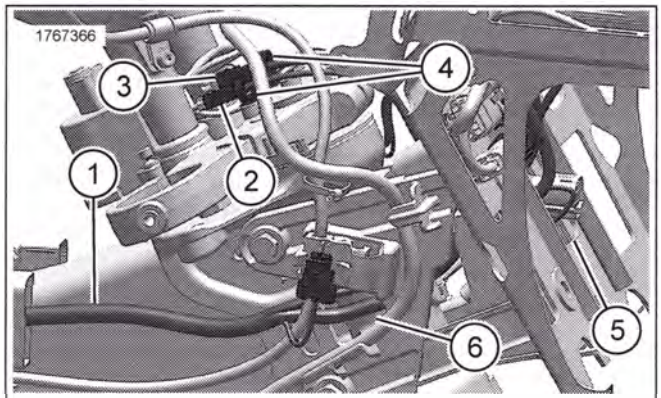
1. LHCM connector
2. Ground connector
3. Left side main harness branch
4. Nut
5. Ambient air sensor connector
6. Wire guide

Figure 8-133. Wire Guide



1. LHCM connector
2. Ground connector
3. Left side main harness branch
4. Left side frame opening
5. Headlamp cable
6. Top frame opening

Figure 8-134. Left Side Steering Head Wire Routing



1. Right side main branch
2. Right hand control connector
3. Twist grip connector
4. Anchored cable strap (2)
5. Fairing bracket opening
6. Right side frame opening

Figure 8-135. RH Steering Head Wire Routing

REMOVE AND INSTALL: COMMON COMPONENTS

FASTENER	TORQUE VALUE	
Ground studs, under seat	44–89 **in-lbs**	5–10 N·m
Relay housing, saddlebag lock. screws, right side	25–35 **in-lbs**	2.8–3.9 N·m
Starter solenoid nut	80–90 **in-lbs**	9–10.2 N·m

Remove

NOTE

Note locations of and remove cable strap anchors, wire harness anchors, cable straps and remove from retaining devices as necessary.

1. See Figure 8-136. Disconnect electrical connectors on left side around upper engine.
   a. Disconnect engine temperature sensor connector (1).
   b. Disconnect fuel pump connector (2).
   c. Disconnect front ACR connector (3).
   d. Disconnect rear ACR connector (5).
   e. Disconnect rear injector connector (6).
   f. Disconnect T-map connector (7).
   g. Disconnect front injector connector (8).
2. See Figure 8-137. Disconnect electrical connectors and retainers on right side around upper engine.
   a. Remove anchored cable strap (1).
   b. Remove brake line (2) from brake line holder.
   c. Remove Spark plug cable (3) from clip (4).
   d. Remove and discard cable strap (5).
   e. Disconnect throttle control connector (6).
3. See Figure 8-138. Remove retainers from trough.
   a. Remove brake line retention clips (3) from holders.
   b. Secure brake lines (2) away from main harness.
4. See Figure 8-139. Disconnect electrical connector and ring terminals under seat area.

NOTE

Record harness ground ring terminal orientation when removing.

   a. Remove left side ground stud (2).
   b. Remove right side ground stud (1).
   c. Disconnect shift sensor connector (3).

5. See Figure 8-140. Disconnect electrical connectors under right side cover.
    a. Disconnect IMU connector (4).
    b. Disconnect Can Bus termination connector (5).
    c. Disconnect Can Bus termination connector (9).
    d. Disconnect starter solenoid connector (8).
    e. Lift battery terminal cover.
    f. Remove starter solenoid nut (7) and remove cable.
    g. Remove and discard cable strap (6).
    h. Disconnect rear wheel speed sensor (10).
    i. Remove relays (14).
    j. Remove screws (11) and washers (12).
    k. Disconnect HO2S front connector (1).
    l. Disconnect HO2S rear connector (2) (not shown).
    m. Disconnect EHCU connector (3).
    n. Disconnect gear position sensor (13) (not shown).
6. Draw harness branch into battery tray.
7. See Figure 8-141. Disconnect electrical connectors around front of engine area.
    a. Disconnect water pump connector (3).
    b. Disconnect jiffy stand sensor connector (5).
    c. Disconnect cooling fan connector (6).
    d. Disconnect crank position sensor connector (7).
    e. Disconnect fog lamp connector (4).
    f. Disconnect anchored cable straps (2).
8. See Figure 8-142. Disconnect cable to horn.
    a. Disconnect connectors (1).
    b. Remove anchored cable strap (2).
9. See Figure 8-143. Remove lower frame rail retainers.
    a. Remove main harness from anchored conduit clips (2)
    b. Remove cable straps (1) and discard.
10. Draw front of harness branch to right side frame rail.
11. See Figure 8-145. Loosen rear frame.
    a. Support motorcycle upright. See MAINTENANCE > GENERAL (Page 2-2).
    b. Remove upper rear shock screws (1).
    c. Remove rear frame screws (3).
    d. Loosen front frame screws (2).
12. Remove main harness.
    a. Raise rear frame (4).
    b. Slide harness past frame and rear fork.
    c. Pull up harness branch through battery tray opening.
    d. Remove main harness.
13. Remove wire trough. See ELECTRICAL > WIRE TROUGH (Page 8-77).

Install

1. See Figure 8-145. Install main harness between frame and rear fork.
    a. Slide harness between frame and rear fork.
    b. Secure rear frame (4). See CHASSIS > REAR FRAME (Page 3-141).
    c. Install upper rear shock screws (1). See CHASSIS > REAR SHOCK ABSORBERS (Page 3-77).
    d. Motorcycle can be placed on jiffy stand.
2. Install wire trough. See ELECTRICAL > WIRE TROUGH (Page 8-77).
3. Install main harness front engine branch.
    a. Verify main harness front engine branch.
    b. See Figure 8-143. and See Figure 8-144. Route main wire harness inside of battery tray down along right frame rail.
    c. See Figure 8-141. Connect crank position sensor connector (7).
    d. Connect cooling fan connector (6).
    e. Connect jiffy stand sensor connector (5).
    f. Connect fog lamp connector (4).
    g. Connect water pump connector (3).
    h. Install anchored cable straps (2).
    i. Install **new** cable strap (1).
    j. See Figure 8-142. Install horn connectors (1).

k. Verify connectors are installed as shown.

l. Install anchored cable strap (2).

4. See Figure 8-140. Route right side cover area branch.

a. Verify EHCU connector (3).

b. Route EHCU connector through frame as shown.

c. Connect EHCU connector.

d. Connect HO2S rear connector (2).

e. Connect HO2S front connector (1).

f. Install washers (12) and screws (11). Tighten.

Torque: 25–35 **in-lbs** (2.8–3.9 N·m) *Relay housing, saddlebag lock. screws, right side*

g. Install relays (14).

h. Connect gear position sensor (13).

i. Connect rear wheel speed sensor (10).

j. Connect Can Bus termination connector (9).

k. Connect Can Bus termination connector (5).

l. Connect IMU connector (4).

m. Install **new** cable strap (6).

5. Install starter connections.

a. Connect starter solenoid connector (8).

b. Install positive battery cable to battery stud.

c. Install starter solenoid nut (7). Tighten.

Torque: 80–90 **in-lbs** (9–10.2 N·m) *Starter solenoid nut*

6. See Figure 8-138. Install wire harness trough.

7. Install brake line retention clips (3) in holders.

8. See Figure 8-136. Connect and secure electrical connectors in upper engine area.

a. Connect T-map connector (7).

b. Connect rear injector connector (6).

c. Connect front injector connector (8).

d. Connect rear ACR connector (5).

e. Connect front ACR connector (3).

f. Connect fuel pump connector (2).

g. Connect engine temperature sensor connector (1).

h. See Figure 8-137. Connect throttle control connector (6).

i. Install anchored cable strap (1).

j. Install spark plug cable (3) in clip (4).

k. Install **new** cable strap (5).

9. Secure brake lines (3) in clips.

10. See Figure 8-139. Connect connectors under seat area.

a. Connect shift sensor connector (3).

b. Install right side ground cables, install nut. Tighten.

Torque: 44–89 **in-lbs** (5–10 N·m) *Ground studs, under seat*

c. Install left side ground cables, install nut. Tighten.

Torque: 44–89 **in-lbs** (5–10 N·m) *Ground studs, under seat*

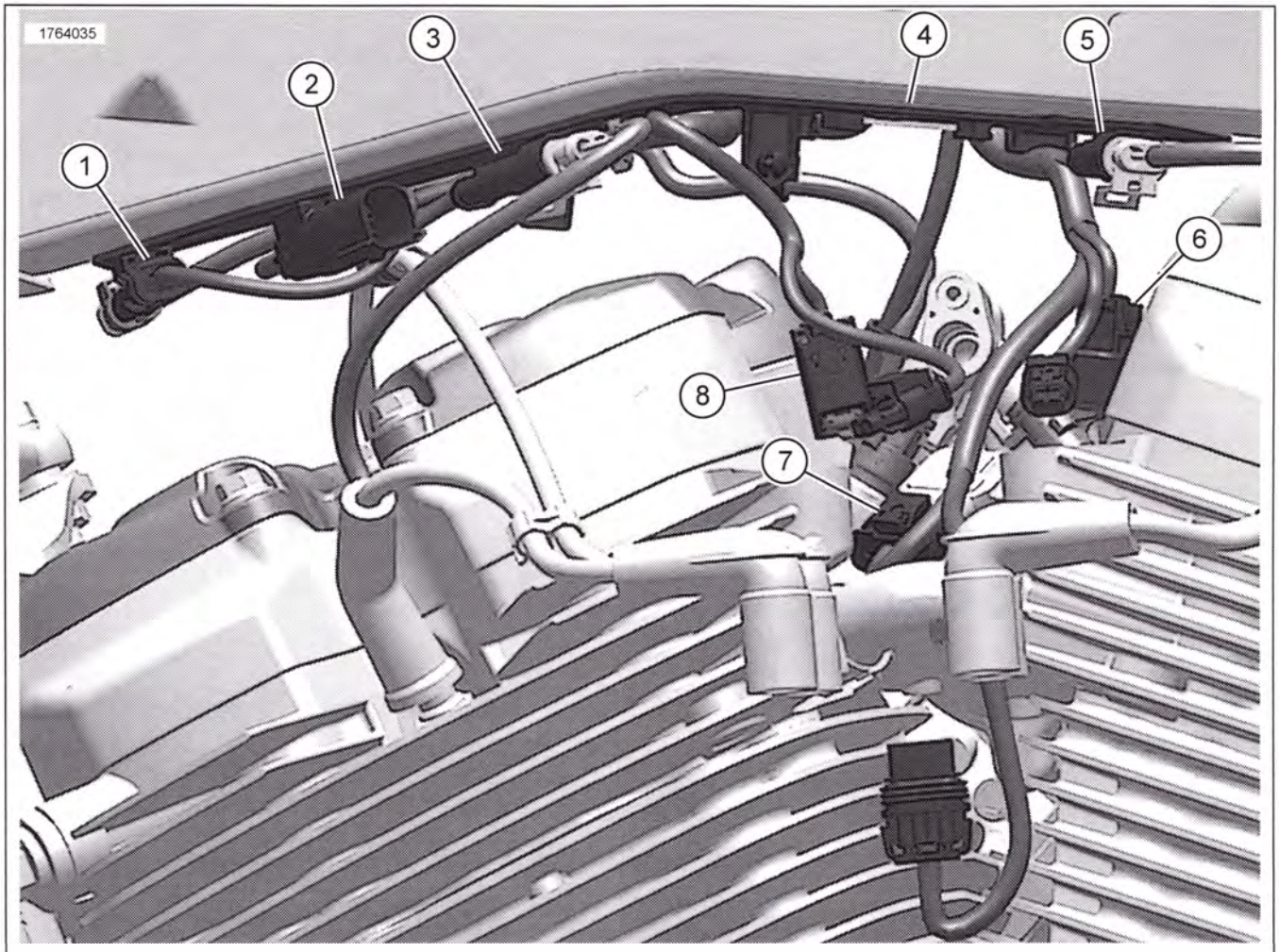
11. See Figure 8-144. Secure wire harness to lower frame rail.

a. Install main harness to anchored conduit clips (2).

b. Install **new** cable straps (1).

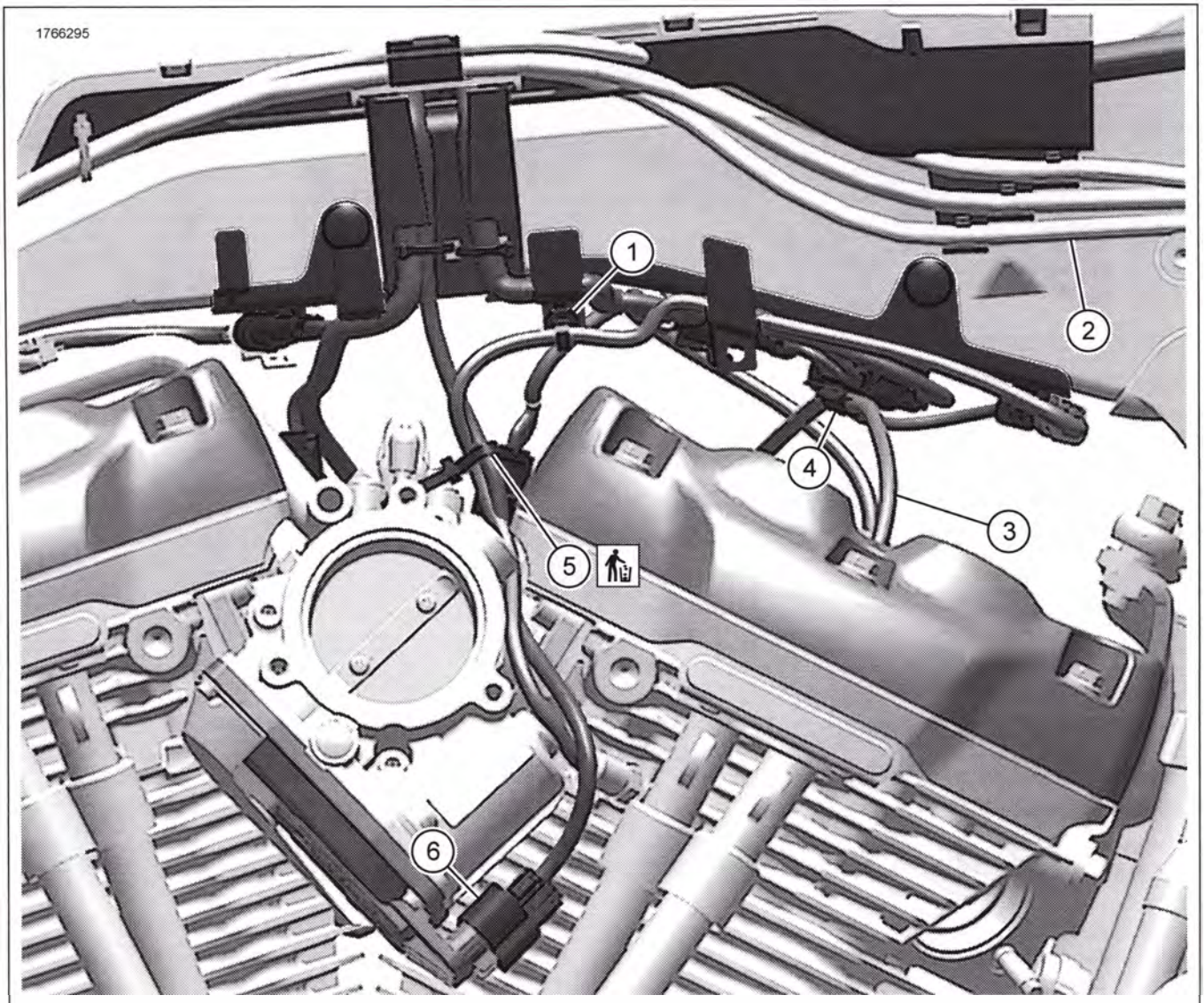
Depending upon model, continue with install procedure at:

- MAIN WIRE HARNESS > REMOVE AND INSTALL: FORK MOUNTED FAIRING (Page 8-95)
- MAIN WIRE HARNESS > REMOVE AND INSTALL: FRAME MOUNTED FAIRING (Page 8-98)



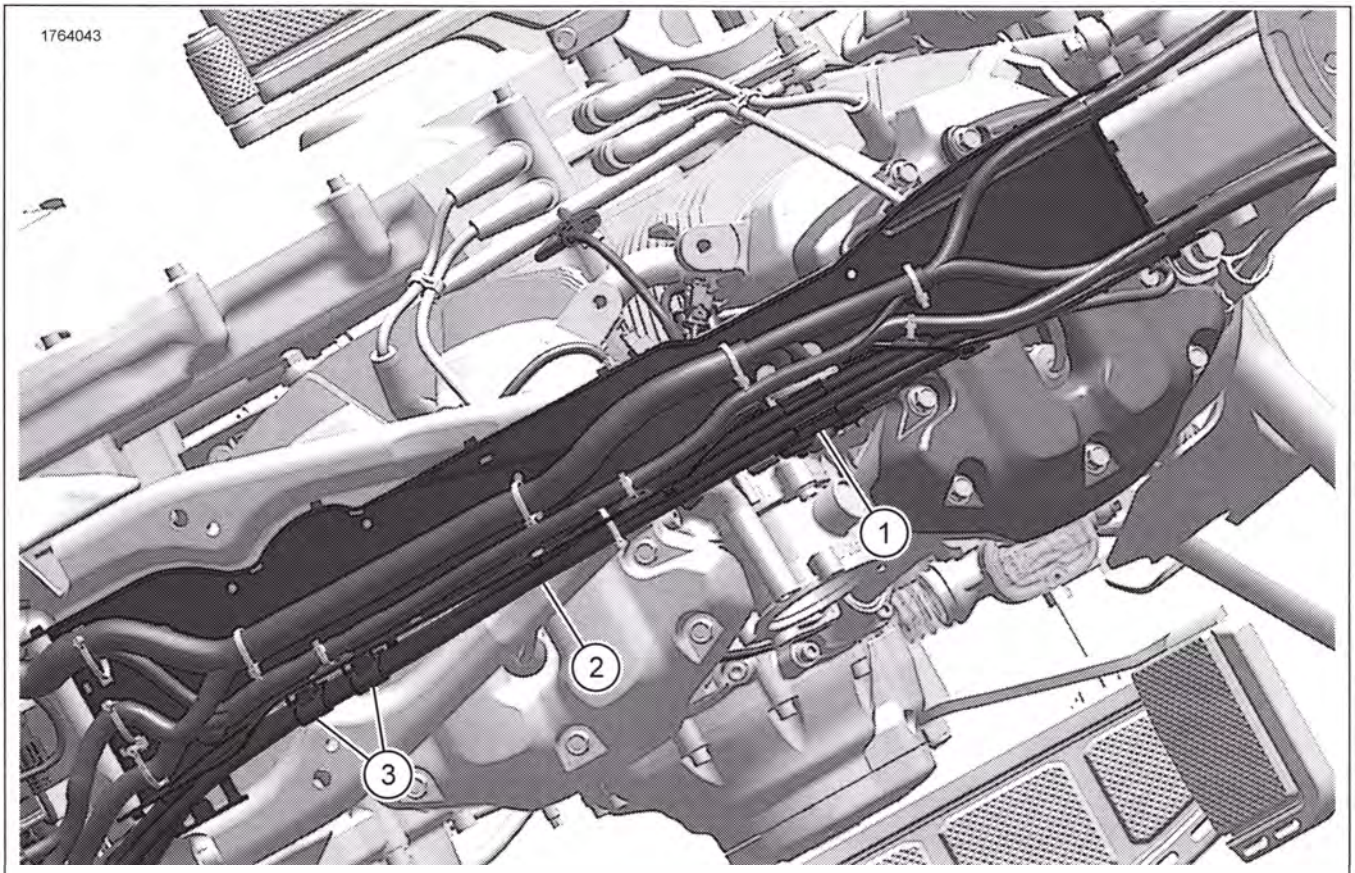
1. Engine temperature sensor connector
2. Fuel pump connector
3. Front ACR connector
4. Lower backbone caddy
5. Rear ACR connector
6. Rear injector connector
7. T-map connector
8. Front injector connector

Figure 8-136. Main Wire Harness Left Side Middle



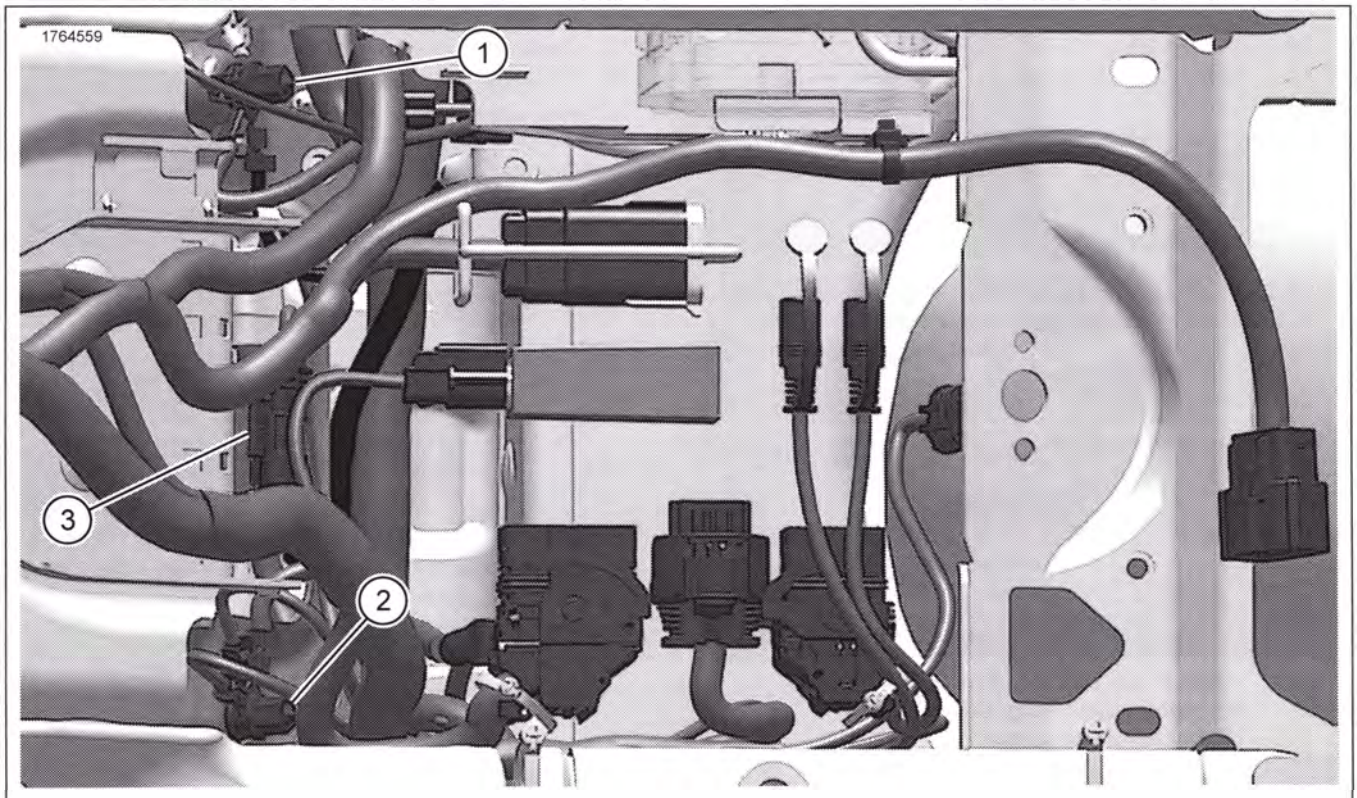
1. Anchored cable strap
2. Brake line (3)
3. Spark plug cable
4. Clip
5. Cable strap
6. Throttle control connector

Figure 8-137. Main Wire Harness Right Side Middle



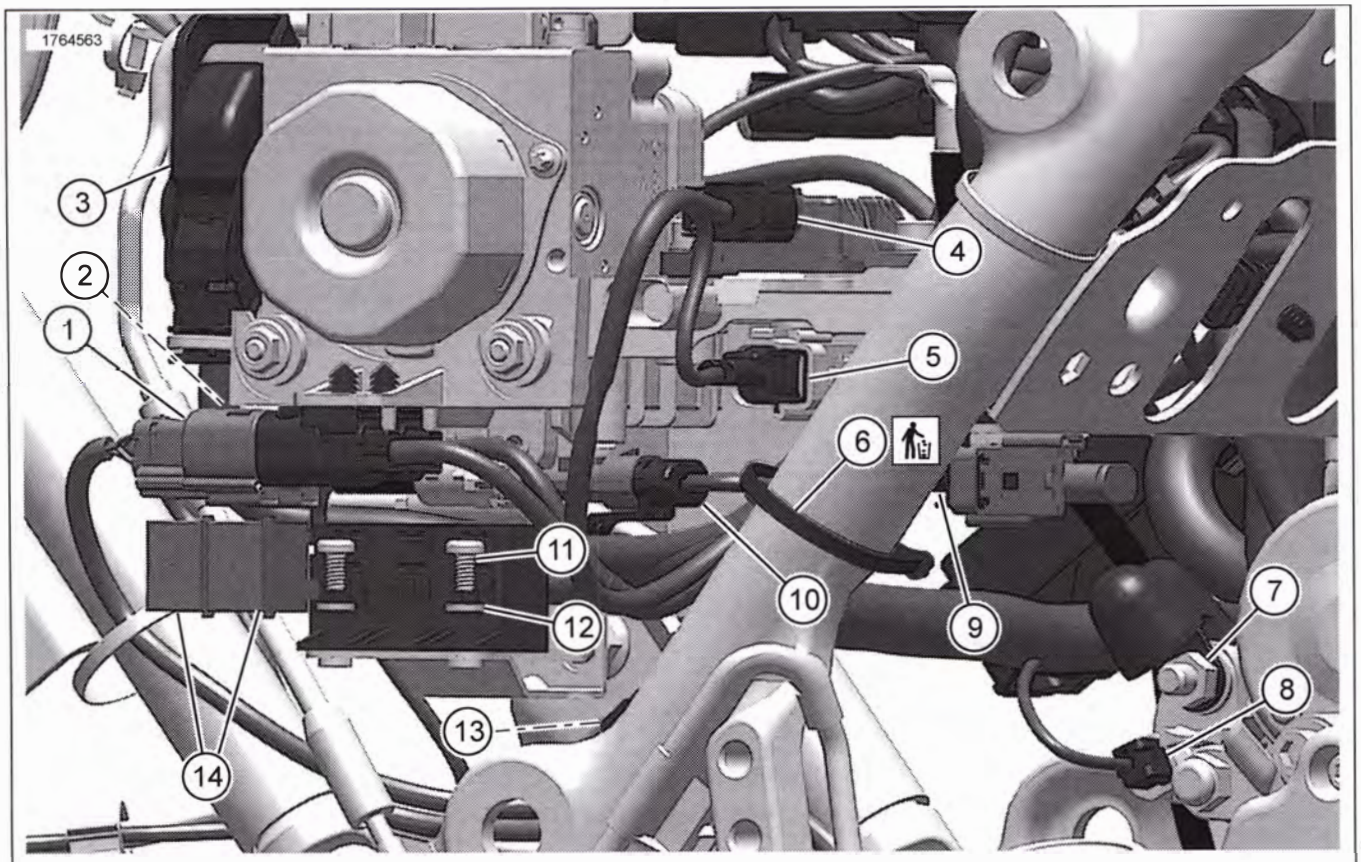
1. Brake triangle bracket
2. Brake line (3)
3. Brake line retention clip (2)

Figure 8-138. Main Wire Harness Wire Trough



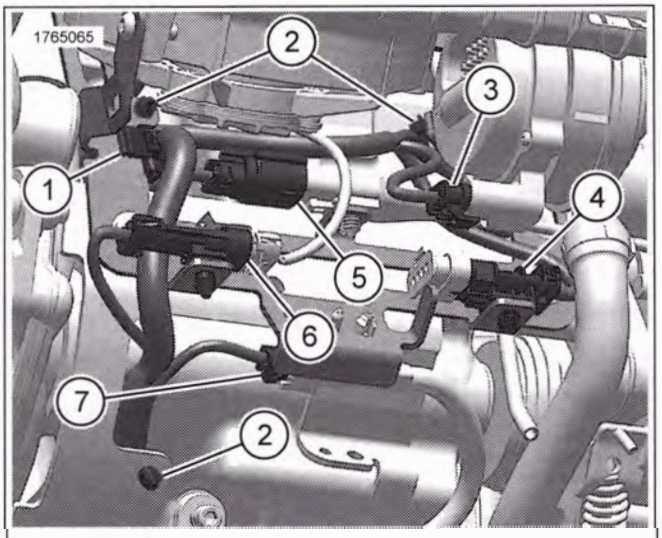
1. RH ground stud
2. LH ground stud
3. Shift sensor connector

Figure 8-139. Under Seat



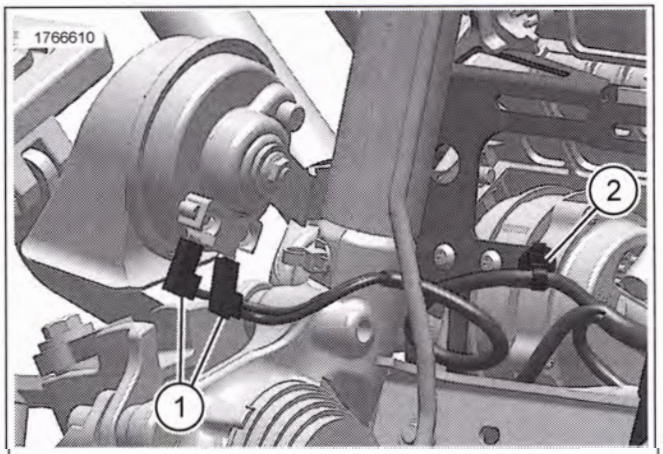
1. HO2S front connector
2. HO2S rear connector
3. EHCU connector
4. IMU connector
5. Can Bus termination connector
6. Cable strap
7. Starter solenoid nut
8. Starter solenoid connector
9. Can Bus termination connector
10. Rear wheel speed sensor
11. Screw (2)
12. Washer (2)
13. Gear position sensor (not shown)
14. Relay (2)

Figure 8-140. Right Side Cover Area



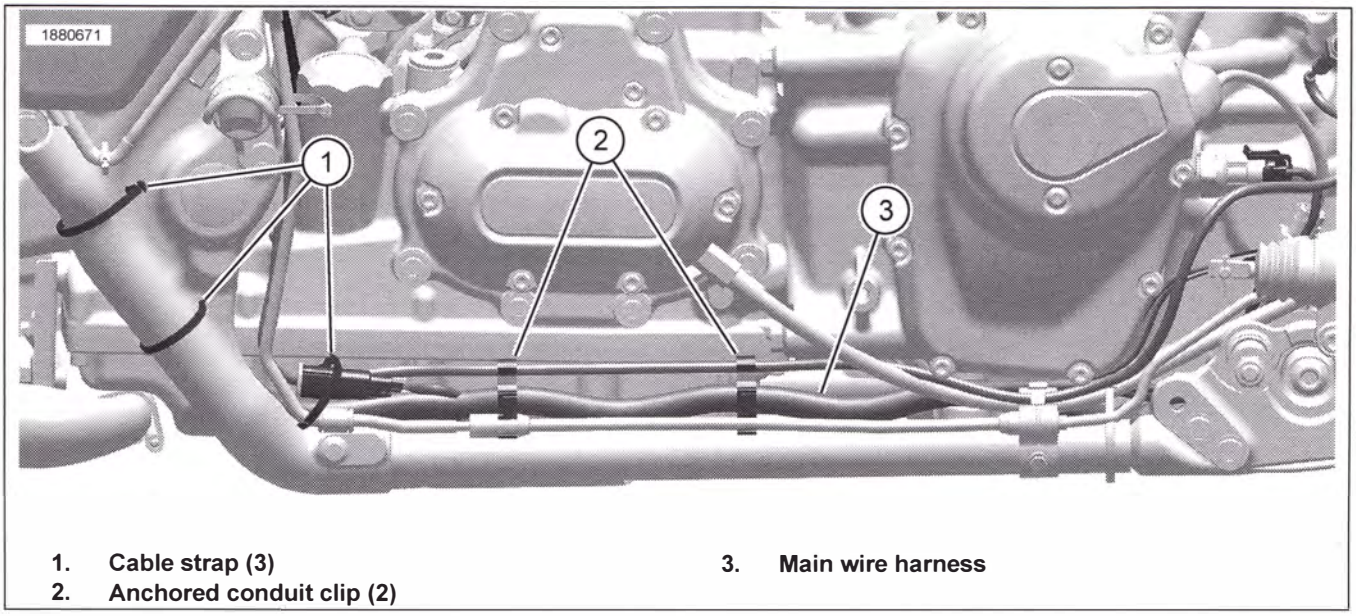
1. Cable strap, two piece
2. Anchored cable strap (3)
3. Water pump connector
4. Fog lamp connector
5. Jiffy stand sensor connector
6. Cooling fan connector
7. Crank position sensor connector

Figure 8-141. Front of Engine Area



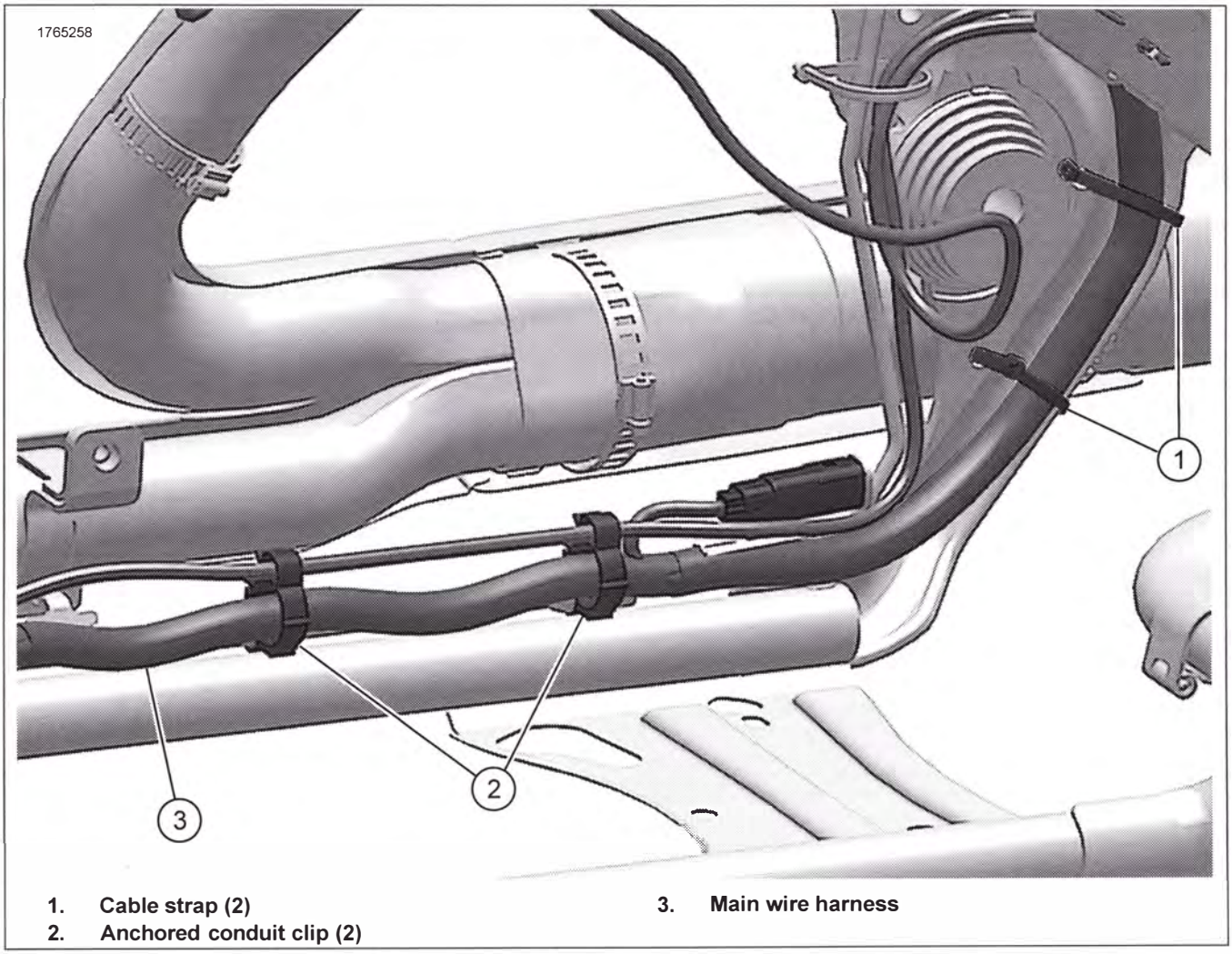
1. Connector (2)
2. Anchored cable strap

Figure 8-142. Horn Connection and Anchor



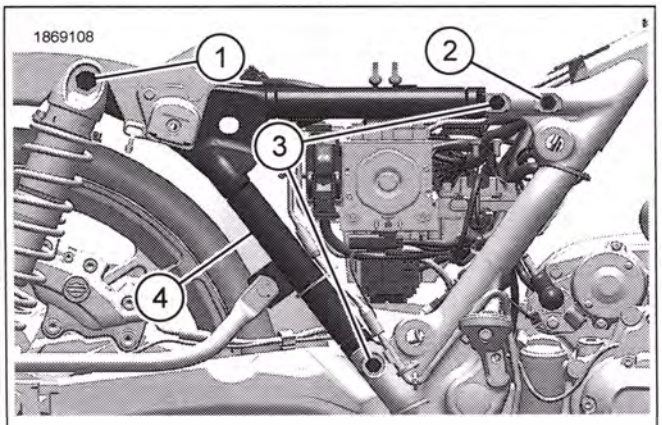
1. Cable strap (3)
2. Anchored conduit clip (2)
3. Main wire harness

Figure 8-143. Lower Frame Rail Retainers



1. Cable strap (2)
2. Anchored conduit clip (2)
3. Main wire harness

Figure 8-144. Frame Rail Retainers (inside side frame view)



1. **Upper rear shock screw (2)**
2. **Front frame screw (2)**
3. **Rear frame screw (4)**
4. **Rear frame**

Figure 8-145. Splitting the Frame (typical)

COMPLETE

1. **Frame-mounted fairing model:** See CHASSIS > FAIRING: FRAME MOUNTED (Page 3-101).
   a. Install outer fairing.
   b. Install inner fairing.
   c. Install instrument nacelle.
   d. Install fairing mounting bracket.
2. **Fork-mounted fairing model:** See CHASSIS > FAIRING: FORK MOUNTED (Page 3-87).
   a. Install outer fairing.
3. Install lower backbone caddy. See ELECTRICAL > LOWER BACKBONE CADDY (Page 8-86).
4. Install right side caddy screw. See ELECTRICAL > RIGHT SIDE CADDY (Page 8-83).
5. Install ignition coil bracket. See ELECTRICAL > IGNITION COIL (Page 8-17).
6. Install knock sensors. See ELECTRICAL > KNOCK SENSOR (KS) (Page 8-67).
7. Install radiator shroud. See CHASSIS > RADIATOR SHROUD (Page 3-114).
8. Install air cleaner backplate assembly. See FUEL AND EXHAUST > AIR CLEANER BACKPLATE ASSEMBLY (Page 6-3).
9. Install air cleaner cover and filter. See MAINTENANCE > INSPECT AIR FILTER (Page 2-46).
10. Install right side cover. See CHASSIS > RIGHT SIDE COVER (Page 3-61).
11. Install left side caddy. See ELECTRICAL > LEFT SIDE CADDY (Page 8-81).
12. Install ECM. See ELECTRICAL > ELECTRONIC CONTROL MODULE (ECM) (Page 8-51).
13. Install battery tray. See ELECTRICAL > BATTERY TRAY (Page 8-88).
14. Install battery. See MAINTENANCE > INSPECT BATTERY (Page 2-48).
15. Install BCM caddy and BCM. See ELECTRICAL > BODY CONTROL MODULE (BCM) (Page 8-52).
16. Install top caddy. See ELECTRICAL > TOP CADDY (Page 8-80).
17. Install fuel tank and console. See FUEL AND EXHAUST > FUEL TANK (Page 6-9).
18. Install seat. See CHASSIS > SEAT (Page 3-139).
19. Install main fuse. See ELECTRICAL > POWER DISCONNECT (Page 8-7).
20. Install left side cover. See CHASSIS > LEFT SIDE COVER (Page 3-60).
21. Install saddlebags. See CHASSIS > SADDLEBAGS (Page 3-144).

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NOTES

ACRONYMS AND ABBREVIATIONS

Refer to the table below for a list of common acronyms and abbreviations.

Table A-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
AAT	Ambient air temperature
ABS	Anti-lock braking system
AC	Alternating current
ACC	Accessory position on ignition switch
ACR	Automatic compression release
AGM	Absorbed glass mat (battery)
Ah	Ampere-hour
AIS	Active intake solenoid
ARH	Adaptive Ride Height
AWG	American wire gauge
B+	Battery voltage
bar	Bar
BAS	Bank angle sensor
BCM	Body control module
BMU	Battery Management Unit
BOB	Breakout box
BTDC	Before top dead center
°C	Celsius (Centigrade)
CA	California
CAL	Calibration
CAN	Controller area network
CB Tx	CB send transmission
CB Rx	CB receive transmission
cc	Cubic centimeters
CCA	Cold cranking amps
CCW	Counterclockwise
CKP	Crankshaft position
cm	Centimeters
cm^3	Cubic centimeters
CW	Clockwise
DC	Direct current
DLC	Data link connector
DOM	Domestic
DOT	Department of Transportation
DTC	Diagnostic trouble code
DVOM	Digital volt ohm meter
ECM	Electronic control module
ECT	Engine coolant temperature
ECU	Electronic control unit
EEPROM	Electrically erasable programmable read only memory
EFI	Electronic fuel injection
EHCU	Electro hydraulic control unit
EPTC	Electronic Powertrain Controller
ET	Engine temperature
ETC	Electronic throttle control
EVAP	Evaporative emissions control system
EVPT	Electric Vehicle Powertrain
°F	Fahrenheit
fl oz	Fluid ounce
FPS	Fuel pressure sensor
ft	Feet
ft-lbs	Foot pounds
FTP	Flash to pass
g	Gram

Table A-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
gal	Gallon
GAWR	Gross axle weight rating
GND	Ground (electrical)
GPS	Global positioning system
GVWR	Gross vehicle weight rating
HCU	Hydraulic control unit
HDI	Harley-Davidson International
HD-Link	Networking system
H-DSSS	Harley-Davidson smart security system
HFM	Hands-free mode
HFSM	Hands-free security module
Hg	Mercury
H02S	Heated oxygen sensor
hp	Horsepower
hr	Hour
IAC	Idle air control
IAT	Intake air temperature
IC	Instrument cluster
ID	Inside diameter
IGN	Ignition light/key switch position
IM	Instrument module
IMU	Inertial Measurement Unit
in	inch
in^3	Cubic inch
INJ PW	Injector pulse width
INTCM	Intercom
in-lbs	Inch pounds
JSS	Jiffy stand sensor
kg	Kilogram
km	Kilometer
km/h	Kilometers per hour
kPa	Kilopascal
kW	Kilowatt
KS	Knock sensor
L	Liter
lb	Pounds
LCD	Liquid crystal display
LED	Light emitting diode
LH	Left hand
LHCM	Left hand control module
LP	License plate
LT	Left
mA	Milliampere
MAP	Manifold absolute pressure
max	Maximum
MCM	Motor Control Module
mi	Mile
min	Minimum
mL	Milliliter
mm	Millimeter
mph	Miles per hour
ms	Millisecond
Nm	Newton-meter
NIM	Navigation interface module
NiMH	Nickel metal hydride
N/A	Not applicable
O2	Oxygen
OBC	Onboard Charger
OD	Outside diameter
OEM	Original equipment manufacturer
oz	Ounce
P&A	Parts and Accessories
Part No.	Part number

Table A-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
PIN	Personal identification number
PND	Personal navigation device
psi	Pounds per square inch
PWM signal	Pulse width modulated signal
qt	Quart
RAD	Radio
RCM	Reverse control module
RDS	Radio data system
RES	Reserve mark on fuel supply valve
RESS	Rechargeable Energy Storage System
RFF	Roller Finger Follower
RH	Right hand
RHCM	Right hand control module
rpm	Revolutions per minute
RT	Right
s	Seconds
SCFH	Cubic feet per hour at standard conditions
SDARS	Satellite digital audio radio service
SPDO	Speedometer
SPKR	Speaker
STT	Stop/tail/turn
TA	Traffic announcement
TCA	Throttle control actuator
TCU	Telemetry Control Unit
TDC	Top dead center
TGS	Twist grip sensor
TPMS	Tire pressure monitoring system
TPS	Throttle position sensor
TSM	Turn signal module
TSSM	Turn signal/security module
TT	Telltale
USB	Universal serial bus
V	Volt
VAC	Volts of alternating current
VDC	Volts of direct current
VIN	Vehicle identification number
VR	Voice recognition
VSC	Vehicle speed controller
VSS	Vehicle speed sensor
W	Watt
WA	Weather alert
WHIM	Wireless headset interface module
WSS	Wheel speed sensor

CONVERSION TABLE

Table A-2. 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

UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this manual are expressed in United States (U.S.) units-of-measure. See below:

- 1 pint (U.S.) = 16 fluid ounces (U.S.)
- 1 quart (U.S.) = 2 pints (U.S.) = 32 fl. oz. (U.S.)
- 1 gallon (U.S.) = 4 quarts (U.S.) = 128 fl. oz. (U.S.)

METRIC SYSTEM

Fluid volume measurements in this manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). To convert between U.S. units-of-measure and metric units-of-measure, refer to the following:

- fluid ounces (U.S.) x 29.574 = milliliters
- pints (U.S.) x 0.473 = liters
- quarts (U.S.) x 0.946 = liters
- gallons (U.S.) x 3.785 = liters
- milliliters x 0.0338 = fluid ounces (U.S.)
- liters x 2.114 = pints (U.S.)
- liters x 1.057 = quarts (U.S.)
- liters x 0.264 = gallons (U.S.)

BRITISH IMPERIAL SYSTEM

Fluid volume measurements in this manual do not include the British Imperial (Imp.) system equivalents. The following conversions exist in the British Imperial system:

- 1 pint (Imp.) = 20 fluid ounces (Imp.)
- 1 quart (Imp.) = 2 pints (Imp.)
- 1 gallon (Imp.) = 4 quarts (Imp.)

Although the same unit-of-measure terminology as the U.S. system is used in the British Imperial (Imp.) system, the actual volume of each British Imperial unit-of-measure differs from its U.S. counterpart. The U.S. fluid ounce is larger than the British Imperial fluid ounce. However, the U.S. pint, quart, and gallon are smaller than the British Imperial pint, quart, and gallon, respectively. To convert between U.S. units and British Imperial units, refer to the following:

- fluid ounces (U.S.) x 1.042 = fluid ounces (Imp.)
- pints (U.S.) x 0.833 = pints (Imp.)
- quarts (U.S.) x 0.833 = quarts (Imp.)
- gallons (U.S.) x 0.833 = gallons (Imp.)
- fluid ounces (Imp.) x 0.960 = fluid ounces (U.S.)
- pints (Imp.) x 1.201 = pints (U.S.)
- quarts (Imp.) x 1.201 = quarts (U.S.)
- gallons (Imp.) x 1.201 = gallons (U.S.)

UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this manual. To convert units, use the following equations:

- foot pounds (ft-lbs) X 12.00000 = inch pounds (**in-lbs**)
- inch pounds (**in-lbs**) X 0.08333 = foot pounds (ft-lbs)

METRIC SYSTEM

All metric torque specifications are written in Newton-meters (Nm). To convert metric to United States units and United States to metric, use the following equations:

- Newton meters (Nm) X 0.737563 = foot pounds (ft-lbs)
- Newton meters (Nm) X 8.85085 = inch pounds (**in-lbs**)
- foot pounds (ft-lbs) X 1.35582 = Newton meters (Nm)
- inch pounds (**in-lbs**) X 0.112985 = Newton meters (Nm)

TOOLS

Part Number	TOOL NAME	NOTES
93979-10	MAGNETIC LIFTER HOLDERS	4.18 CAM COMPARTMENT AND COMPONENTS, Remove
94086-09	PUSHROD TUBE CLIP REMOVER AND INSTALLER	4.14 PUSHRODS, LIFTERS AND COVERS, Remove 4.14 PUSHRODS, LIFTERS AND COVERS, Install
94686-00	OIL FILTER WRENCH	2.5 REPLACE ENGINE OIL AND FILTER, Change Oil and Oil Filter
94863-10	OIL FILTER WRENCH	2.5 REPLACE ENGINE OIL AND FILTER, Change Oil and Oil Filter
B-45525	VALVE GUIDE HONE	4.15 CYLINDER HEADS, Clean and Inspect
B-49312	CYLINDER HEAD HOLDING FIXTURE	4.15 CYLINDER HEADS, Disassemble 4.15 CYLINDER HEADS, Assemble
BB200A	BASIC VACUUM BRAKE BLEEDER	3.18 BLEED BRAKES, Drain 3.18 BLEED BRAKES, Fill and Bleed
HD-23688	COOLANT TESTER (F)	7.4 DIAGNOSE AND TEST, Freeze Point Test
HD-25070	ROBINAIR HEAT GUN	4.14 PUSHRODS, LIFTERS AND COVERS, Remove 4.21 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-26568	COOLANT TESTER (C)	7.4 DIAGNOSE AND TEST, Freeze Point Test
HD-29545-6A	COOLANT FLUORESCENT LEAK DETECTION DYE	7.4 DIAGNOSE AND TEST, Leak Detection Dye Test
HD-33223-1	CYLINDER COMPRESSION GAUGE	4.7 TROUBLESHOOTING, Compression Test
HD-34736-B	VALVE SPRING COMPRESSOR	4.15 CYLINDER HEADS, Disassemble 4.15 CYLINDER HEADS, Assemble
HD-34751	CLEANING BRUSH	4.15 CYLINDER HEADS, Clean and Inspect 4.15 CYLINDER HEADS, Assemble
HD-34902-B	BIG-TWIN MAINSHAFT PRIMARY BEARING RACE REMOVER AND INSTALLER	4.21 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-34902-C	BEARING RACE REMOVER AND INSTALLER KIT	5.11 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing Inner Race
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET	5.14 MAIN DRIVE GEAR AND BEARING, Remove 5.14 MAIN DRIVE GEAR AND BEARING, Install
HD-35381-A	BELT TENSION GAUGE	2.18 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Measure Drive Belt Deflection
HD-35457	BLACK LIGHT LEAK DETECTOR	7.4 DIAGNOSE AND TEST, Leak Detection Dye Test
HD-35667-A	CYLINDER LEAKDOWN TESTER	4.7 TROUBLESHOOTING, Cylinder Leakdown Test
HD-41137	HOSE CLAMP PLIERS	4.8 CRIMP CLAMPS, Install 6.20 PURGE SOLENOID: EVAPORATIVE EMISSIONS, Install 6.21 CHARCOAL CANISTER: EVAPORATIVE EMISSIONS, Install 6.22 PURGE LINES: EVAPORATIVE EMISSIONS, Install
HD-41177	FORK TUBE HOLDER	3.21 FRONT FORK, Disassemble 3.21 FRONT FORK, Assemble
HD-41417	PROPANE ENRICHMENT KIT	6.16 INTAKE LEAK TEST, Leak Tester
HD-42320-D	PISTON PIN EXTRACTOR	4.17 PISTONS, Remove
HD-42325-C	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER	4.18 CAM COMPARTMENT AND COMPONENTS, Camshaft Needle Bearings
HD-42326-B	CRANKSHAFT GUIDE	4.21 CRANKCASE, Assemble
HD-44060	WHEEL BEARING INSTALLER/REMOVER	3.8 SEALED WHEEL BEARINGS, Remove 3.8 SEALED WHEEL BEARINGS, Install
HD-44060-11A	COLLET	3.8 SEALED WHEEL BEARINGS, Remove
HD-44060-8	1 INCH INSTALLER	3.8 SEALED WHEEL BEARINGS, Install

TOOLS

Part Number	TOOL NAME	NOTES
HD-44358	FLYWHEEL SUPPORT FIXTURE	4.21 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-45322	VALVE GUIDE SEAL INSTALLER	4.15 CYLINDER HEADS, Assemble
HD-45327	REAR SWINGARM BEARING INSTALLER	3.23 REAR FORK, Assemble
HD-45335	COOLANT SYSTEM PRESSURE TESTER	7.4 DIAGNOSE AND TEST, Pressure Cap Test 7.4 DIAGNOSE AND TEST, System Pressure Test 7.4 DIAGNOSE AND TEST, Gasket Leak Test
HD-45968	FAT JACK	2.2 GENERAL, Secure the Motorcycle for Service 4.20 REPLACE ENGINE, Remove
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL	5.12 TRANSMISSION SPROCKET, Remove 5.12 TRANSMISSION SPROCKET, Install
HD-47856	MAIN DRIVE GEAR SEAL INSTALLER KIT	5.14 MAIN DRIVE GEAR AND BEARING, Install
HD-47910	MAINSHAFT LOCKNUT WRENCH	5.12 TRANSMISSION SPROCKET, Remove 5.12 TRANSMISSION SPROCKET, Install
HD-47925-A	AXLE NUT TORQUE ADAPTER	2.18 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt 3.5 REAR WHEEL, Remove
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL	5.14 MAIN DRIVE GEAR AND BEARING, Replace Needle Bearings
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER	5.14 MAIN DRIVE GEAR AND BEARING, Replace Mainshaft Seal
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL	4.18 CAM COMPARTMENT AND COMPONENTS, Remove 4.18 CAM COMPARTMENT AND COMPONENTS, Install
HD-48116-A	TEMPERATURE SENSOR SOCKET	8.36 ENGINE TEMPERATURE (ET) SENSOR, Remove 8.36 ENGINE TEMPERATURE (ET) SENSOR, Install
HD-48219	PRIMARY DRIVE LOCKING TOOL	5.9 DRIVE COMPONENTS, Remove 5.9 DRIVE COMPONENTS, Install
HD-48497-A	DOT 4 BRAKE FLUID MOISTURE TESTER	2.10 INSPECT BRAKES, Inspect 2.11 CHECK AND REPLACE BRAKE FLUID, Check Brake Fluid Level
HD-48498-B-1	ACR SOLENOID SOCKET	8.38 AUTOMATIC COMPRESSION RELEASE (ACR), Remove 8.38 AUTOMATIC COMPRESSION RELEASE (ACR), Install
HD-48650	DIGITAL TECHNICIAN II	3.9 TIRE PRESSURE MONITORING SYSTEM (TPMS), Complete 3.17 ABS MODULE, Install 3.18 BLEED BRAKES, Fill and Bleed 6.6 PURGE FUEL LINE, Purge 8.10 LEFT HAND CONTROL MODULE (LHCM), Clutch Switch Replacement 8.28 SECURITY SYSTEM ACTIVATION, Fob Assignment 8.30 SECURITY SYSTEM MAINTENANCE, Service Mode 8.39 GEAR POSITION SENSOR, Install
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER	3.7 REAR WHEEL COMPENSATOR, Disassemble 3.7 REAR WHEEL COMPENSATOR, Assemble
HD-50549	BORESCOPE	4.7 TROUBLESHOOTING, Compression Test 4.7 TROUBLESHOOTING, Cylinder Leakdown Test
HD-51069	PISTON PIN CLIP REMOVER/INSTALLER KIT	4.17 PISTONS, Remove
HD-51069-17	NOSE ADAPTER	4.17 PISTONS, Remove

TOOLS

Part Number	TOOL NAME	NOTES
		4.17 PISTONS, Install
HD-51069-2	PISTON PIN RETAINING RING INSTALLER	4.17 PISTONS, Install
HD-51337	SHIFTER SHAFT SEAL INSTALLATION TOOL	5.15 TRANSMISSION CASE, Assemble
HD-51727	STEERING HEAD BEARING INSTALLER	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
HD-51794	TPMS ACTIVATION TOOL	3.9 TIRE PRESSURE MONITORING SYSTEM (TPMS), Complete
HD-52006	ADJUSTABLE SPARK PLUG WIRE PULLER	2.25 CLEAN, INSPECT, REPLACE SPARK PLUGS, Remove 8.8 SPARK PLUG CABLES, Remove
HD-52020	CYLINDER HOLD-DOWN NUTS	4.16 CYLINDERS, Install
HD-52064	LEFT MAIN BEARING OIL SEAL INSTALLATION TOOL	4.21 CRANKCASE, Assemble
HD-52065	BALANCER SCISSOR GEAR ALIGNMENT TOOL	4.21 CRANKCASE, Disassemble 4.21 CRANKCASE, Assemble
HD-52071	MAIN BEARING REMOVER AND INSTALLER	4.21 CRANKCASE, Repair Right Crankcase Half 4.21 CRANKCASE, Repair Left Crankcase Half
HD-52185	PISTON SUPPORT PLATE	4.16 CYLINDERS, Install
HD-52252	CRANKSHAFT LOCKING TOOL	4.7 TROUBLESHOOTING, Cylinder Leakdown Test
HD-52977	17MM OXYGEN SENSOR SOCKET	6.17 HEATED OXYGEN SENSORS (HO2S), Install
HD-53290	ALTERNATOR ROTOR INSTALLER/REMOVER	8.6 ALTERNATOR, Remove 8.6 ALTERNATOR, Install
HD-59000B	FORK OIL LEVEL GAUGE	3.21 FRONT FORK, Assemble
HD-94660-2	PILOT	5.12 TRANSMISSION SPROCKET, Remove 5.12 TRANSMISSION SPROCKET, Install
HD-95637-46B	WEDGE ATTACHMENT	4.21 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-96333-51F	PISTON RING COMPRESSOR	4.16 CYLINDERS, Install
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT	4.6 OIL PRESSURE, Oil Pressure Check
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER	4.21 CRANKCASE, Assemble 4.21 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-99500-80	WHEEL TRUING STAND	3.6 CHECKING AND TRUING WHEELS, Checking Wheel Runout
MCR102A	MATCO COOLING SYSTEM FILLER	7.5 COOLANT, Drain and Fill Cooling System
MPT10128	COOLING SYSTEM ADAPTER	7.5 COOLANT, Drain and Fill Cooling System
SVT262-28A	SNAP-ON COOLING SYSTEM ADAPTER	7.5 COOLANT, Drain and Fill Cooling System
SVTSRAD272A	SNAP-ON VACUUM COOLING SYSTEM FILLER	7.5 COOLANT, Drain and Fill Cooling System
TA360	TORQUE ANGLE GAUGE	5.12 TRANSMISSION SPROCKET, Install

NOTES

Torque Values

FASTENER	TORQUE VALUE		NOTES
ABS module locknuts	53–89 **in-lbs**	6–10 N·m	3.17 ABS MODULE, Install
ABS module, caliper, banjo bolts, 10mm	17–19 ft-lbs	23–26 N·m	3.17 ABS MODULE, Install
ABS module, master cylinder, banjo bolts, 12mm	28–30 ft-lbs	38–41 N·m	3.17 ABS MODULE, Install
ACR	17–19 ft-lbs	23–26.4 N·m	8.38 AUTOMATIC COMPRESSION RELEASE (ACR), Install
Air cleaner backplate to cylinder head screws	19–21 ft-lbs	25.4–28.1 N·m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Install
Air cleaner backplate to induction module screws	50–60 **in-lbs**	5.6–6.8 N·m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Install
Air cleaner backplate, snorkel screws	22–27 **in-lbs**	2.5–3 N·m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Install
Air cleaner cover screw	92–102 **in-lbs**	10.4–11.5 N·m	2.22 INSPECT AIR FILTER, Install
Air deflector screw	13–15 ft-lbs	17.5–20 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Air Deflector Assembly
Air deflector screws frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.31 AIR DEFLECTORS, Frame Mounted Fairing
Amplifier screws	49–60 **in-lbs**	5.5–6.8 N·m	8.22 AUDIO AMPLIFIER, Install
Antenna amplifier, screw	11–14 **in-lbs**	1.25–1.6 N·m	8.24 HIDDEN ANTENNA, Install
Axle, front	70–75 ft-lbs	95–102 N·m	3.4 FRONT WHEEL, Install
Axle, front, pinch screw	18–22 ft-lbs	24–30 N·m	3.4 FRONT WHEEL, Install
BCM caddy screw	27–35 **in-lbs**	3–4 N·m	8.27 BODY CONTROL MODULE (BCM), Install
Balancer bearing screw	80–110 **in-lbs**	9–12.4 N·m	4.21 CRANKCASE, Repair Right Crankcase Half
Banjo bolt, master cylinder, front	18–19 ft-lbs	24–26 N·m	3.12 FRONT BRAKE MASTER CYLINDER, Install
Banjo bolt, master cylinder, rear	21–22 ft-lbs	28–30 N·m	3.14 REAR BRAKE MASTER CYLINDER, Install
Battery cable screws	60–70 **in-lbs**	6.8–7.9 N·m	2.24 INSPECT BATTERY, Install
Battery ground cable to transmission, nut	72–96 **in-lbs**	8.1–10.8 N·m	5.15 TRANSMISSION CASE, Install
Battery tray screws	11–13 ft-lbs	15–18 N·m	8.47 RIGHT SIDE CADDY, Install
Battery tray to right side caddy screw	35–44 **in-lbs**	4–5 N·m	8.47 RIGHT SIDE CADDY, Install
Brake bleeder screw, rear	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake caliper, front, bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m	3.13 FRONT BRAKE CALIPER, Install
Brake caliper, front, mounting screws	28–38 ft-lbs	38–52 N·m	3.13 FRONT BRAKE CALIPER, Install
Brake caliper, front, screws	28–38 ft-lbs	38–52 N·m	3.13 FRONT BRAKE CALIPER, Install
Brake caliper, rear, banjo bolt	18–19 ft-lbs	24–26 N·m	3.15 REAR BRAKE CALIPER, Install
Brake caliper, rear, mounting screws	43–48 ft-lbs	58–65 N·m	3.15 REAR BRAKE CALIPER, Install
Brake disc, front, screws	20–22 ft-lbs	27–30 N·m	3.4 FRONT WHEEL, Assemble
Brake disc, rear, screws	30–45 ft-lbs	41–61 N·m	3.5 REAR WHEEL, Assemble
Brake lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m	3.12 FRONT BRAKE MASTER CYLINDER, Install
Brake lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m	3.12 FRONT BRAKE MASTER CYLINDER, Install
Brake line, front caliper bracket, screws	45–50 **in-lbs**	5.1–5.7 N·m	3.16 BRAKE LINES, Brake Line: Front Caliper to ABS Module
Brake line, front caliper, bracket, center screw	12–18 **in-lbs**	1.4–2 N·m	3.16 BRAKE LINES, Brake Line: Front Caliper to ABS Module
Brake line, front, master cylinder P-clamp	62–80 **in-lbs**	7–9 N·m	3.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Brake line, master cylinder, rear, P-clamp screw	80–97 **in-lbs**	9–11 N·m	3.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake line, master cylinder, rear, multi-clamp screw	20–25 **in-lbs**	2.3–2.8 N·m	3.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module

Torque Values

FASTENER	TORQUE VALUE		NOTES
Brake master cylinder, front, reservoir cover screws	9–11 **in-lbs**	1–1.2 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake master cylinder, rear, reservoir cover screws	12–15 **in-lbs**	1.4–1.7 N·m	3.18 BLEED BRAKES, Fill and Bleed
Brake pad pin	75–102 **in-lbs**	8.5–11.5 N·m	2.10 INSPECT BRAKES, Replace Front Brake Pads
Brake pedal, nut	15–20 ft-lbs	20–27 N·m	3.14 REAR BRAKE MASTER CYLINDER, Install
Brake switch screw	4–6 **in-lbs**	0.5–0.7 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Front Brake Switch Replacement
Breather cover screws	11–13 ft-lbs	14.91–17.63 N·m	4.11 BREATHER, Install
Caddy, left side, screws	71–97 **in-lbs**	8–11 N·m	8.46 LEFT SIDE CADDY, Install
Cam chain tensioner fasteners	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Cam needle bearing installation maximum torque	25 ft-lbs	33.9 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Camshaft Needle Bearings
Cam support plate screws	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Camshaft cover screws	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Remove and Install: Camshaft Cover
Camshaft sensor cover screw	72–96 **in-lbs**	8.1–10.8 N·m	8.35 CAMSHAFT TIMING SENSOR, Install
Camshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install See procedure to verify alignment specification before tightening. Apply LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red).
Camshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install See procedure to verify alignment specification before tightening.
Camshaft sprocket screw, final torque	34 ft-lbs	46.1 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Charcoal canister screw	15–20 **in-lbs**	1.7–2.3 N·m	6.21 CHARCOAL CANISTER: EVAPORATIVE EMISSIONS, Install
Clutch cable fitting	90–120 **in-lbs**	10.2–13.6 N·m	5.6 CLUTCH RELEASE COVER, Install
Clutch cable, P-clamp screw	62–80 **in-lbs**	7–9 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Clutch cable, P-clamp, screw	62–80 **in-lbs**	7–9 N·m	3.26 CLUTCH CONTROL, Install
Clutch hub jamnut	74–120 **in-lbs**	8.4–13.6 N·m	2.12 CHECK AND ADJUST CLUTCH, Check and Adjust
Clutch hub mainshaft nut	70–80 ft-lbs	95–108.5 N·m	5.9 DRIVE COMPONENTS, Install
Clutch inspection cover screws	84–108 **in-lbs**	9.5–12.2 N·m	2.6 REPLACE PRIMARY CHAINCASE LUBRICANT, Change Primary Chaincase Lubricant Torque sequence
Clutch lever, bottom, bracket screw	89–97 **in-lbs**	10–11 N·m	3.26 CLUTCH CONTROL, Install
Clutch lever, top, bracket screw	89–97 **in-lbs**	10–11 N·m	3.26 CLUTCH CONTROL, Install
Clutch release cover screws	11–13 ft-lbs	14.9–17.6 N·m	5.6 CLUTCH RELEASE COVER, Install
Clutch switch cover screw	53 **in-lbs**	6 N·m	3.26 CLUTCH CONTROL, Install
Clutch switch screw	4–5 **in-lbs**	0.49–0.61 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Clutch Switch Replacement
Clutch, stopper plate bolts	71–106 **in-lbs**	8–12 N·m	5.10 CLUTCH, Disassemble and Assemble: Clutch Pack

Torque Values

FASTENER	TORQUE VALUE		NOTES
Compensating sprocket bolt, 1st torque	100 ft-lbs	135.6 N·m	5.9 DRIVE COMPONENTS, Install Loosen then final tighten
Compensating sprocket bolt, final torque	175 ft-lbs	237.3 N·m	5.9 DRIVE COMPONENTS, Install
Console, front screw	20–29 **in-lbs**	2.3–3.3 N·m	6.4 CONSOLE, Install
Console, rear screw	35–62 **in-lbs**	4–7 N·m	6.4 CONSOLE, Install
Coolant pump bracket, screw	80–97 **in-lbs**	9–11 N·m	7.6 COOLANT PUMP, Install
Coolant pump bracket, screws	33–39 **in-lbs**	3.7–4.4 N·m	7.6 COOLANT PUMP, Install
Coolant system bracket, lower, screws	20–22 ft-lbs	27–30 N·m	8.32 COOLING FAN, Install
Coolant temperature sensor	212–230 **in-lbs**	24–26 N·m	7.9 ENGINE COOLANT TEMPERATURE (ECT) SENSOR, Install
Cooling fan bracket screws	70–85 **in-lbs**	7.9–9.6 N·m	8.32 COOLING FAN, Install
Crankcase oil check valve or plug with O-ring	18–22 ft-lbs	24.4–29.8 N·m	4.21 CRANKCASE, Plugs and Oil Fittings
Crankcase screws, 1st torque	10 ft-lbs	13.6 N·m	4.21 CRANKCASE, Assemble
Crankcase screws, final torque	15–19 ft-lbs	20.3–25.8 N·m	4.21 CRANKCASE, Assemble
Crankcase sensor screw	90–120 **in-lbs**	10.17–13.55 N·m	8.34 CRANKSHAFT POSITION SENSOR (CKP), Install
Crankcase tapered plugs	10–12 ft-lbs	13.6–16.3 N·m	4.21 CRANKCASE, Plugs and Oil Fittings
Crankshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install Apply LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red)
Crankshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install See procedure to verify alignment specification before tightening.
Crankshaft sprocket screw, final torque	24 ft-lbs	32.5 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Cylinder head nut torque step 1.	20–30 ft-lbs	27.1–40.7 N·m	4.15 CYLINDER HEADS, Install Apply ENGINE OIL to cylinder head nut washers and threaded portion of new cylinder head nuts. See procedure for torque sequence.
Cylinder head nut torque step 2. Loosen one turn.	-360°	-360°	4.15 CYLINDER HEADS, Install
Cylinder head nut torque step 3.	9–11 ft-lbs	12.2–14.9 N·m	4.15 CYLINDER HEADS, Install
Cylinder head nut torque step 4.	18–20 ft-lbs	24.4–27.1 N·m	4.15 CYLINDER HEADS, Install
Cylinder head nut torque step 5. Tighten additional degree value.	90°	90°	4.15 CYLINDER HEADS, Install
Cylinder stud	10–20 ft-lbs	13.6–27.1 N·m	4.21 CRANKCASE, Cylinder Studs
Debris deflector, screws	62–89 **in-lbs**	7–10 N·m	3.24 BELT GUARDS, Install
Engine guard, lower, screws	15–20 ft-lbs	20–27 N·m	3.30 ENGINE GUARD, Install
Engine guard, upper, screws	90–110 **in-lbs**	10.2–12.4 N·m	3.30 ENGINE GUARD, Install
Engine mount, front bracket, screws	42–48 ft-lbs	57–65 N·m	3.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Engine mount, lower front, end cap screws	42–48 ft-lbs	57–65 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount, lower front, flange nut	50–55 ft-lbs	68–75 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount, upper front, stabilizer link screws	30–35 ft-lbs	41–47 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine oil drain plug	14–21 ft-lbs	19–28.5 N·m	2.5 REPLACE ENGINE OIL AND FILTER, Change Oil and Oil Filter
Engine stabilizer bracket screws	45–50 ft-lbs	61–68 N·m	4.9 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount

Torque Values

FASTENER	TORQUE VALUE		NOTES
Engine temperature (ET) sensor	10–15 ft-lbs	13.6–20.3 N·m	8.36 ENGINE TEMPERATURE (ET) SENSOR, Install
Exhaust side bracket flange locknut	15–20 ft-lbs	20–27 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, crossover pipe clamp	38–43 ft-lbs	51–58 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, crossover pipe support clamp screw	14–18 ft-lbs	19–24 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, crossover pipe, support bracket screws	11–13 ft-lbs	15–18 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, front, 1st torque	9–18 **in-lbs**	1–2 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, front, final torque	100–120 **in-lbs**	11.3–13.6 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, rear, 1st torque	9–18 **in-lbs**	1–2 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, flange nut, rear, final torque	100–120 **in-lbs**	11.3–13.6 N·m	6.19 EXHAUST SYSTEM, Install
Exhaust, shield clamps	20–40 **in-lbs**	2.3–4.5 N·m	6.19 EXHAUST SYSTEM, Install
Fairing bracket to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Disassemble and Assemble: Inner Fairing Assembly
Fairing mount to steering head locknuts: Frame-mounted fairing	20–30 ft-lbs	27–41 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Mounting Bracket
Fairing support to fairing: Frame-mounted fairing	48–60 **in-lbs**	5.4–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing support to fork: Frame-mounted fairing	22–28 ft-lbs	30–38 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing vent to inner fairing: fork mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Air Duct Cover Assembly
Footboard mounting screws	60–80 **in-lbs**	6.8–9 N·m	3.39 RIDER FOOTRESTS, Assemble
Footboard support bracket screws	36–42 ft-lbs	49–57 N·m	3.39 RIDER FOOTRESTS, Install
Footpeg lower shoulder screw, passenger	44–71 **in-lbs**	5–8 N·m	3.40 PASSENGER FOOTRESTS, Install
Footpeg pad screw	15–20 ft-lbs	20.3–27.1 N·m	3.40 PASSENGER FOOTRESTS, Assemble
Footpeg upper screw, passenger	36–42 ft-lbs	49–57 N·m	3.40 PASSENGER FOOTRESTS, Install
Fork bracket to fork pinch screw	15–18 ft-lbs	19.7–24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork bracket to steer stem pinch screw	15–18 ft-lbs	19.7–24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork bracket, lower, pinch screws	15–18 ft-lbs	19.7–24.4 N·m	3.21 FRONT FORK, Install
Fork bracket, upper pinch screw	15–18 ft-lbs	19.7–24.4 N·m	3.21 FRONT FORK, Install
Fork cover screws	24–48 **in-lbs**	2.7–5.4 N·m	3.21 FRONT FORK, Install
Fork lock screw, 1st torque	19.5 **in-lbs**	2.2 N·m	8.13 FORK LOCK, Install
Fork lock screw, final torque or until they snap off		540°	8.13 FORK LOCK, Install
Fork mounted dash panel screw (side)	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Dash Panel
Fork mounted dash panel screw (top)	10–20 **in-lbs**	1.1–2.3 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Dash Panel
Fork mounted headlamp screw	96–119 **in-lbs**	10.8–13.5 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Headlamp Assembly
Fork mounted inner fairing screws	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Inner Fairing Shell
Fork mounted inner fairing to upper fork screws	155–177 **in-lbs**	17.5–20 N·m	3.27 FAIRING: FORK MOUNTED, Detach Fairing For Service
Fork mounted outer fairing shell screw	25–30 **in-lbs**	2.8–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Outer Fairing Shell
Fork slider assembly screw	30–37 ft-lbs	40–50 N·m	3.21 FRONT FORK, Assemble
Fork stem screw, 1st torque	18 ft-lbs	24.4 N·m	3.22 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Fork, tube plug	22–59 ft-lbs	30–80 N·m	3.21 FRONT FORK, Assemble
Front brake caliper bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Drain
Front fender mounting screw	16–20 ft-lbs	21.7–27.1 N·m	3.35 FRONT FENDER, Install
Fuel inlet screws	25–28 **in-lbs**	2.8–3.2 N·m	6.8 FUEL INLET, Install
Fuel line screw	22–40 **in-lbs**	2.5–4.5 N·m	6.7 FUEL LINE, Install
Fuel pump assembly screws	40–45 **in-lbs**	4.5–5.1 N·m	6.10 FUEL PUMP, Install
Fuel pump, quick connector	22–26 ft-lbs	30–35 N·m	6.10 FUEL PUMP, Assemble
Fuel rail screws	31–49 **in-lbs**	3.5–5.5 N·m	6.14 FUEL INJECTORS, Install
Fuel tank, front screws	15–20 ft-lbs	20–27 N·m	6.9 FUEL TANK, Install
Fuel tank, rear screws	15–20 ft-lbs	20–27 N·m	6.9 FUEL TANK, Install
Gear position sensor cover screws	72–96 **in-lbs**	8.13–10.8 N·m	8.39 GEAR POSITION SENSOR, Install
Ground studs, under seat	44–89 **in-lbs**	5–10 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
HD-53290 Alternator rotor installer/remover	15 **in-lbs**	1.7 N·m	8.6 ALTERNATOR, Remove
Handlebar clamp screws	16–18 ft-lbs	21.7–24.4 N·m	8.23 FRONT SPEAKERS, Remove and Install: Fork Mounted Fairing
Handlebar riser screws	30–40 ft-lbs	40.7–54.2 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Handlebar, fork mounted fairing, clamp screws	16–20 ft-lbs	21.7–27.1 N·m	3.33 HANDLEBAR, Remove and Install: Fork Mounted Fairing
Handlebar, frame mounted fairing, clamp screws	16–18 ft-lbs	21.7–24.4 N·m	3.33 HANDLEBAR, Remove and Install: Frame Mounted Fairing
Handlebar, ground jump connector, screw	25–35 **in-lbs**	2.8–3.9 N·m	3.33 HANDLEBAR, Disassemble and Assemble
Headlamp mounting screws, dual headlamp	96–119 **in-lbs**	10.8–13.5 N·m	8.16 HEADLAMP, Remove and Install: Dual Headlamp
Headlamp mounting screws, single headlamp	30–37 **in-lbs**	3.4–4.2 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp stabilizer bracket screws, single headlamp	30–37 **in-lbs**	3.4–4.2 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp, adjuster bracket screws, single headlamp	25–35 **in-lbs**	2.8–3.95 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp, ball end retainer screws, single headlamp	25–35 **in-lbs**	2.8–3.95 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Headlamp, horizontal, mounting screws, single headlamp	60–84 **in-lbs**	6.8–9.5 N·m	8.16 HEADLAMP, Remove and Install: Single Headlamp
Horn bracket, screws	71–97 **in-lbs**	8–11 N·m	8.15 HORN, Install
Horn nut	80–100 **in-lbs**	9–11.3 N·m	8.15 HORN, Install
IFCU display mounting screws	9–11 ft-lbs	12.1–14.7 N·m	8.12 IFCU DISPLAY, Install
IFCU display trim screws	7.5–10.5 **in-lbs**	0.85–1.19 N·m	8.12 IFCU DISPLAY, Install
IMU screws	32–40 **in-lbs**	3.6–4.5 N·m	8.42 INERTIAL MEASUREMENT UNIT (IMU), Install
Ignition coil screw	11–14 ft-lbs	14.9–19 N·m	8.9 IGNITION COIL, Install
Induction module screw torque step 1	16–20 **in-lbs**	1.8–2.26 N·m	6.15 INDUCTION MODULE, Install
Induction module screw torque step 2	8–13 ft-lbs	10.84–17.63 N·m	6.15 INDUCTION MODULE, Install
Inner fairing screws (near speakers): frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Inner fairing support screws, frame-mounted fairing	48–60 **in-lbs**	5.4–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Assembly
Inner fairing-to-mount screws, frame-mounted fairing	97–142 **in-lbs**	11–16 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Assembly
Jiffy stand bracket screws	36–42 ft-lbs	49–57 N·m	3.41 JIFFY STAND, Install
Jiffy stand leg stop screw	15–20 ft-lbs	20.3–27.1 N·m	3.41 JIFFY STAND, Install
Jiffy stand sensor screw	97–124 **in-lbs**	11–14 N·m	3.41 JIFFY STAND, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Knock sensor, screws	16–18 ft-lbs	22–24 N·m	8.37 KNOCK SENSOR (KS), Install
LH inner speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
LH outer speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
LHCM cover screw	27–31 **in-lbs**	3–3.5 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
LHCM, switch pack, screws	3–5 **in-lbs**	0.3–0.59 N·m	8.10 LEFT HAND CONTROL MODULE (LHCM), Install
License plate bracket screws	60–80 **in-lbs**	6.8–9 N·m	8.21 LICENSE PLATE LAMP, Install
License plate lamp cover to license plate bracket screws	6.2–8.0 **in-lbs**	0.7–0.9 N·m	8.21 LICENSE PLATE LAMP, Install
License plate lamp screws	3.7–5.1 **in-lbs**	0.42–0.58 N·m	8.21 LICENSE PLATE LAMP, Install
License plate module mounting screw	60–80 **in-lbs**	6.8–9 N·m	3.38 REAR LICENSE PLATE BRACKET, Install
Lifter anti-rotation device screw	90–120 **in-lbs**	10.2–13.6 N·m	4.14 PUSHRODS, LIFTERS AND COVERS, Install
Lifter cover screws	11–13 ft-lbs	14.9–17.6 N·m	4.14 PUSHRODS, LIFTERS AND COVERS, Install
Lower air vent halves	9–13 **in-lbs**	1–1.5 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Lower Vents
Master cylinder, rear, mounting screws	10–13 ft-lbs	14–17 N·m	3.14 REAR BRAKE MASTER CYLINDER, Install
Mid frame air deflector screws	25–35 **in-lbs**	2.8–4 N·m	3.31 AIR DEFLECTORS, Remove and Install: Mid Frame Deflectors
Mirror flange nut	29–35 **in-lbs**	3.3–4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Mirrors
Mirror stem acorn nut	10–12 ft-lbs	14–16 N·m	3.34 MIRRORS, Install
Muffler screws	14–18 ft-lbs	19–24 N·m	3.45 SADDLEBAG SUPPORTS, Install
Muffler to clamp	38–43 ft-lbs	51.5–58.3 N·m	6.18 MUFFLERS, Install
Muffler to saddlebag support screws	14–18 ft-lbs	19–24.4 N·m	6.18 MUFFLERS, Install
Nacelle to ignition switch screws	10–20 **in-lbs**	1.1–2.3 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Nacelle
Negative battery cable screw to battery	60–70 **in-lbs**	6.8–7.9 N·m	8.4 POWER DISCONNECT, Negative Battery Cable
Oil pan screws	11–13 ft-lbs	14.9–17.6 N·m	4.23 OIL PAN, Install
Oil pan tapered plug	30–36 ft-lbs	40.7–48.8 N·m	4.23 OIL PAN, Install
Oil pressure switch	13–17 ft-lbs	17–23 N·m	8.14 OIL PRESSURE SWITCH, Install
Oil pump screws (1-4), final torque	90–120 **in-lbs**	10.2–13.6 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Oil pump screws, 1st torque	12–60 **in-lbs**	1.4–6.8 N·m	4.18 CAM COMPARTMENT AND COMPONENTS, Install
Outer fairing lower screws: frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Outer fairing upper front: frame mounted fairing	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Outer nacelle to fork bracket screws	53–80 **in-lbs**	6–9 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Nacelle
Oxygen sensor, heated	12–14 ft-lbs	16–19 N·m	6.17 HEATED OXYGEN SENSORS (HO2S), Install
Piston jet screws	25–35 **in-lbs**	2.8–3.9 N·m	4.21 CRANKCASE, Repair Right Crankcase Half
Primary chain tensioner fasteners	21–24 ft-lbs	28.5–33 N·m	5.9 DRIVE COMPONENTS, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Primary chaincase drain plug	14–21 ft-lbs	19–28.5 N·m	2.6 REPLACE PRIMARY CHAINCASE LUBRICANT, Change Primary Chaincase Lubricant
Primary chaincase sealing screws	26–28 ft-lbs	35.3–38 N·m	5.11 PRIMARY CHAINCASE HOUSING, Install
Primary cover screws	12–13 ft-lbs	16.3–17.6 N·m	5.8 PRIMARY CHAINCASE COVER, Install See sequence in the procedure
RH inner speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
RH outer speaker enclosure to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Speaker Enclosure
RHCM cover screws	27–31 **in-lbs**	3–3.5 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, switch pack, screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
RHCM, throttle grip sensor screws	3–5 **in-lbs**	0.39–0.59 N·m	8.11 RIGHT HAND CONTROL MODULE (RHCM), Install
Rear axle cone nut, 1st torque	15–20 ft-lbs	20–27 N·m	2.18 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt For belt adjustment only
Rear axle cone nut, final torque	135–145 ft-lbs	183–197 N·m	2.18 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt
Rear brake caliper bleeder screw	75–102 **in-lbs**	8.5–11.5 N·m	3.18 BLEED BRAKES, Drain
Rear fender mounting nut	16–20 ft-lbs	21.7–27.1 N·m	3.36 REAR FENDER, Assemble
Rear fender mounting screw	16–20 ft-lbs	21.7–27.1 N·m	3.36 REAR FENDER, Install
Rear fender, support bracket, nut	44–89 **in-lbs**	5–10 N·m	3.36 REAR FENDER, Assemble
Rear fork bracket screws	55–65 ft-lbs	75–88 N·m	3.23 REAR FORK, Install
Rear fork, bracket, pivot shaft screws	55–65 ft-lbs	75–88 N·m	3.23 REAR FORK, Install
Rear frame to main frame screws	40–45 ft-lbs	54–61 N·m	3.43 REAR FRAME, Install
Rear shock absorber mounting bolt	63–70 ft-lbs	85–95 N·m	3.25 REAR SHOCK ABSORBERS, Install
Rear shock mounting screws	63–70 ft-lbs	85–95 N·m	3.23 REAR FORK, Install
Rear shock, adjuster knob, screw	26–43 **in-lbs**	2.9–4.9 N·m	3.25 REAR SHOCK ABSORBERS, Assemble
Rear stop lamp switch	12 ft-lbs	16.3 N·m	8.20 REAR STOPLAMP SWITCH, Install
Relay housing, saddlebag lock, screws, right side	25–35 **in-lbs**	2.8–3.9 N·m	8.47 RIGHT SIDE CADDY, Install
Relay housing, saddlebag lock. screws, right side	25–35 **in-lbs**	2.8–3.9 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
Rocker cover, lower, screws	90–120 **in-lbs**	10.2–13.6 N·m	4.12 LOWER ROCKER COVERS, Install
Rocker cover, lower, stud	90–120 **in-lbs**	10.2–13.6 N·m	4.12 LOWER ROCKER COVERS, Install
Rocker cover, upper, screws	10–12 ft-lbs	13.6–15.8 N·m	4.10 UPPER ROCKER COVERS, Install
Rocker cover, upper, stud	90–120 **in-lbs**	10.2–13.6 N·m	4.10 UPPER ROCKER COVERS, Install
Rocker shaft screw, step 1	59–83 **in-lbs**	6.7–9.4 N·m	4.13 ROCKER ARMS, Install
Rocker shaft screw, step 2	23–27 ft-lbs	31.2–36.6 N·m	4.13 ROCKER ARMS, Install
Saddlebag hinge screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag support, insert, screws	18–22 ft-lbs	24–30 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, face plate, screws	12–15 **in-lbs**	1.41–1.75 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, latch assembly, screws	30–35 **in-lbs**	3.4–4 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lever, screw	50–60 **in-lbs**	5.65–6.78 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lock, nut	25–35 **in-lbs**	2.82–3.95 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lock, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, lower support to fender support, screw	15–20 ft-lbs	20–27 N·m	3.45 SADDLEBAG SUPPORTS, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Saddlebag, lower support to support casting, screw	30–37 ft-lbs	40.7–50.2 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, lower support, front, screw	32–36 ft-lbs	43–49 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, strike, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Saddlebag, support casting, captivated washer,screw	15–20 ft-lbs	20–27 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, support casting, flange screw	10–12 ft-lbs	14–16 N·m	3.45 SADDLEBAG SUPPORTS, Install
Saddlebag, tether, screws	20–30 **in-lbs**	2.26–3.39 N·m	3.44 SADDLEBAGS, Assemble
Seat, two-up one-piece, seat screw	44–71 **in-lbs**	5–8 N·m	3.42 SEAT, Install
Seat, two-up one-piece, strap screw	44–71 **in-lbs**	5–8 N·m	3.42 SEAT, Install
Shift drum detent screw	120–150 **in-lbs**	13.6–17 N·m	5.13 TRANSMISSION, Assemble
Shift drum lock plate screws	50–70 **in-lbs**	5.6–7.9 N·m	5.13 TRANSMISSION, Assemble
Shift lever pinch screw	9.0–12.0 ft-lbs	12.2–16.3 N·m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Shifter pawl centering screw	18–23 ft-lbs	24.4–31.2 N·m	5.15 TRANSMISSION CASE, Assemble
Shifter peg screw	96–144 **in-lbs**	10.9–16.3 N·m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Shifter rod ball stud	70–99 **in-lbs**	7.9–11.2 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Rear
Shifter rod jamnut	80–120 **in-lbs**	9–13.6 N·m	5.5 SHIFTER LINKAGE, Shifter Rod
Shifter rod lever pinch screw	18–22 ft-lbs	24.4–29.8 N·m	5.15 TRANSMISSION CASE, Assemble
Shifter rod lever pinch screw, front lever	132–156 **in-lbs**	14.9–17.6 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Shifter rod lever pinch screw, rear lever	13–16 ft-lbs	18–22 N·m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Rear
Shifter rod nut	8–12 ft-lbs	11–16 N·m	5.5 SHIFTER LINKAGE, Shifter Rod
Spark plug	80–106 **in-lbs**	9–12 N·m	2.25 CLEAN, INSPECT, REPLACE SPARK PLUGS, Install
Speaker enclosure screws	50–60 **in-lbs**	5.6–6.8 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Speaker Enclosure
Speaker, front, fork mounted fairing, grille screw	11–14 **in-lbs**	1.24–1.58 N·m	8.23 FRONT SPEAKERS, Remove and Install: Fork Mounted Fairing
Speaker, front, fork mounted fairing, screws	9–13 **in-lbs**	1–1.5 N·m	8.23 FRONT SPEAKERS, Remove and Install: Fork Mounted Fairing
Speaker, front, frame mounted fairing, screws	9–13 **in-lbs**	1–1.5 N·m	8.23 FRONT SPEAKERS, Remove and Install: Frame Mounted Fairing
Starter mounting screws	22–24 ft-lbs	29.8–32.5 N·m	8.5 STARTER, Install Apply a light coat of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
Starter solenoid nut	80–90 **in-lbs**	9–10.2 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Common Components
Starter solenoid stud nut	80–90 **in-lbs**	9–10.2 N·m	8.5 STARTER, Install
Stator mounting screws	55–75 **in-lbs**	6.2–8.5 N·m	8.6 ALTERNATOR, Install
Steering stem torque step 1	18 ft-lbs	24.4 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLHX models	4.4 ft-lbs	5.9 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLHXSE models	3.9 ft-lbs	5.3 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLTRX models	8.9 ft-lbs	12 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Steering stem, final torque: FLTRXSE, FLTRXSTSE models	8.3 ft-lbs	11.2 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Lubricate
Storage compartment cover to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Storage Compartment Doors and Hinges

Torque Values

FASTENER	TORQUE VALUE		NOTES
Storage compartment to fairing screws	49–60 **in-lbs**	5.5–6.8 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Storage Compartments
Tail/Turn lamp assembly nuts	60–80 **in-lbs**	6.8–9 N·m	8.19 TAIL LAMP, Install
Tail/Turn lamp to bracket screws	10–11 ft-lbs	12.9–14.9 N·m	8.19 TAIL LAMP, Install
Tail/Turn light housing to bracket screws	23–26 **in-lbs**	2.6–2.94 N·m	8.19 TAIL LAMP, Install
Temperature manifold absolute pressure (TMAP) screw	22–40 **in-lbs**	2.5–4.5 N·m	6.12 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Install
Throttle body to manifold screws	35–53 **in-lbs**	4–6 N·m	6.15 INDUCTION MODULE, Assemble
Throttle grip sensor screws	4 **in-lbs**	0.4 N·m	6.13 TWIST GRIP SENSOR (TGS), Install
Transmission bearing housing screw	22–25 ft-lbs	29.8–33.9 N·m	5.13 TRANSMISSION, Install
Transmission drain plug	14–21 ft-lbs	19–28.5 N·m	2.7 REPLACE TRANSMISSION LUBRICANT, Change Transmission Lubricant
Transmission filler plug/dipstick	25–75 **in-lbs**	2.8–8.5 N·m	2.7 REPLACE TRANSMISSION LUBRICANT, Check Transmission Lubricant
Transmission mainshaft/countershaft locknuts	85–95 ft-lbs	115.3–128.8 N·m	5.13 TRANSMISSION, Assemble
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 N·m	5.15 TRANSMISSION CASE, Install
Transmission mounting bolts, final torque	34–39 ft-lbs	46.1–52.9 N·m	5.15 TRANSMISSION CASE, Install
Transmission sprocket lockplate screws	100–120 **in-lbs**	11.3–13.6 N·m	5.12 TRANSMISSION SPROCKET, Install Lock patch, use 3-5 times
Transmission sprocket nut step 1	100 ft-lbs	135.6 N·m	5.12 TRANSMISSION SPROCKET, Install
Transmission sprocket nut step 2. Loosen one turn		360°	5.12 TRANSMISSION SPROCKET, Install
Transmission sprocket nut step 3	35 ft-lbs	47.5 N·m	5.12 TRANSMISSION SPROCKET, Install
Transmission sprocket nut step 4. Additional		35–45°	5.12 TRANSMISSION SPROCKET, Install Do not loosen to align lockplate screws.
Transmission, top plug, screw	100–120 **in-lbs**	11.3–13.6 N·m	5.15 TRANSMISSION CASE, Assemble
Triple clamp fork pinch screws	15–18 ft-lbs	19.7–24.4 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Turn signal lamp, front, single headlamp, screws	30–37 **in-lbs**	3.4–4.2 N·m	8.17 FRONT TURN SIGNAL LAMPS, Install
Upper air duct screws	23–30 **in-lbs**	2.6–3.4 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Upper Air Duct
Upper fork stem pinch screw	15–18 ft-lbs	19.7–24.4 N·m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Valve stem screw	23–27 **in-lbs**	2.6–3 N·m	3.9 TIRE PRESSURE MONITORING SYSTEM (TPMS), Install
Voltage regulator screws	96–119 **in-lbs**	10.8–13.5 N·m	8.7 VOLTAGE REGULATOR, Install
Windshield bracket screws	22–32 **in-lbs**	2.5–3.6 N·m	3.27 FAIRING: FORK MOUNTED, Disassemble and Assemble: Air Duct Cover Assembly
Windshield mount screws fairing: Frame mounted fairing	20–35 **in-lbs**	2.3–4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Air Duct Cover and Air Duct Bezel
Windshield screws: Fork-mounted fairing models	13–15 **in-lbs**	1.5–1.7 N·m	3.27 FAIRING: FORK MOUNTED, Remove and Install: Windshield
Windshield screws: Frame-mounted fairing models	25–30 **in-lbs**	2.8–3.4 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Windshield
Windshield, air duct vane, screws: Frame mounted fairing	8–11 **in-lbs**	0.9–1.2 N·m	3.28 FAIRING: FRAME MOUNTED, Remove and Install: Air Duct Vane Assembly
Wire guide bracket	20–30 ft-lbs	27–41 N·m	8.51 MAIN WIRE HARNESS, Remove and Install: Frame Mounted Fairing

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NOTES

SUBJECT PAGE NO.

WIRING DIAGRAMS B-1

NOTES

GENERAL

Wire Color Codes

Wire traces on wiring diagrams are labeled with alpha codes. Refer to Table A-1.

For Solid Color Wires: See Figure A-1. The alpha code identifies wire color.

For Striped Wires: The code is written with a slash (/) between the solid color code and the stripe code. For example, a trace labeled GN/Y is a green wire with a yellow stripe.

Wiring Diagram Symbols

See Figure A-1. On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets [ ]. The letter inside the brackets identifies whether the housing is a socket or pin housing.

A=Pin: The letter A and the pin symbol after a connector number identifies the pin side of the terminal connectors.

B=Socket: The letter B and the socket symbol after a connector number identifies the socket side of the terminal connectors. Other symbols found on the wiring diagrams include the following:

Diode: The diode allows current flow in one direction only in a circuit.

Wire break: The wire breaks are used to show option variances or page breaks.

No Connection: Two wires crossing over each other in a wiring diagram that are shown with no splice indicating they are not connected together.

Circuit to/from: This symbol indicates a more complete circuit diagram on another page. The symbol is also identifying the direction of current flow.

Splice: Splices are where two or more wires are connected together along a wiring diagram. The indication of a splice only indicates that wires are spliced to that circuit. It is not the true location of the splice in the wiring harness.

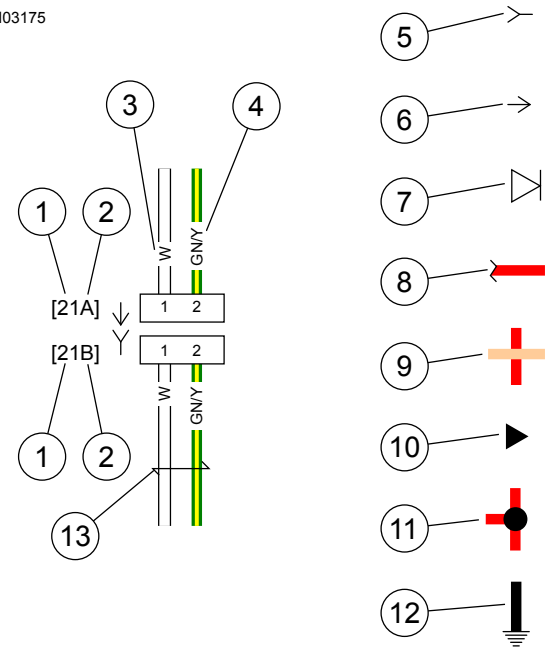
Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules.

NOTE

Clean grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit.

Dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

Twisted pair: This symbol indicates the two wires are twisted together in the harness. This minimizes the circuit's electromagnetic interference from external sources. If repairs are necessary to these wires they should remain as twisted wires.



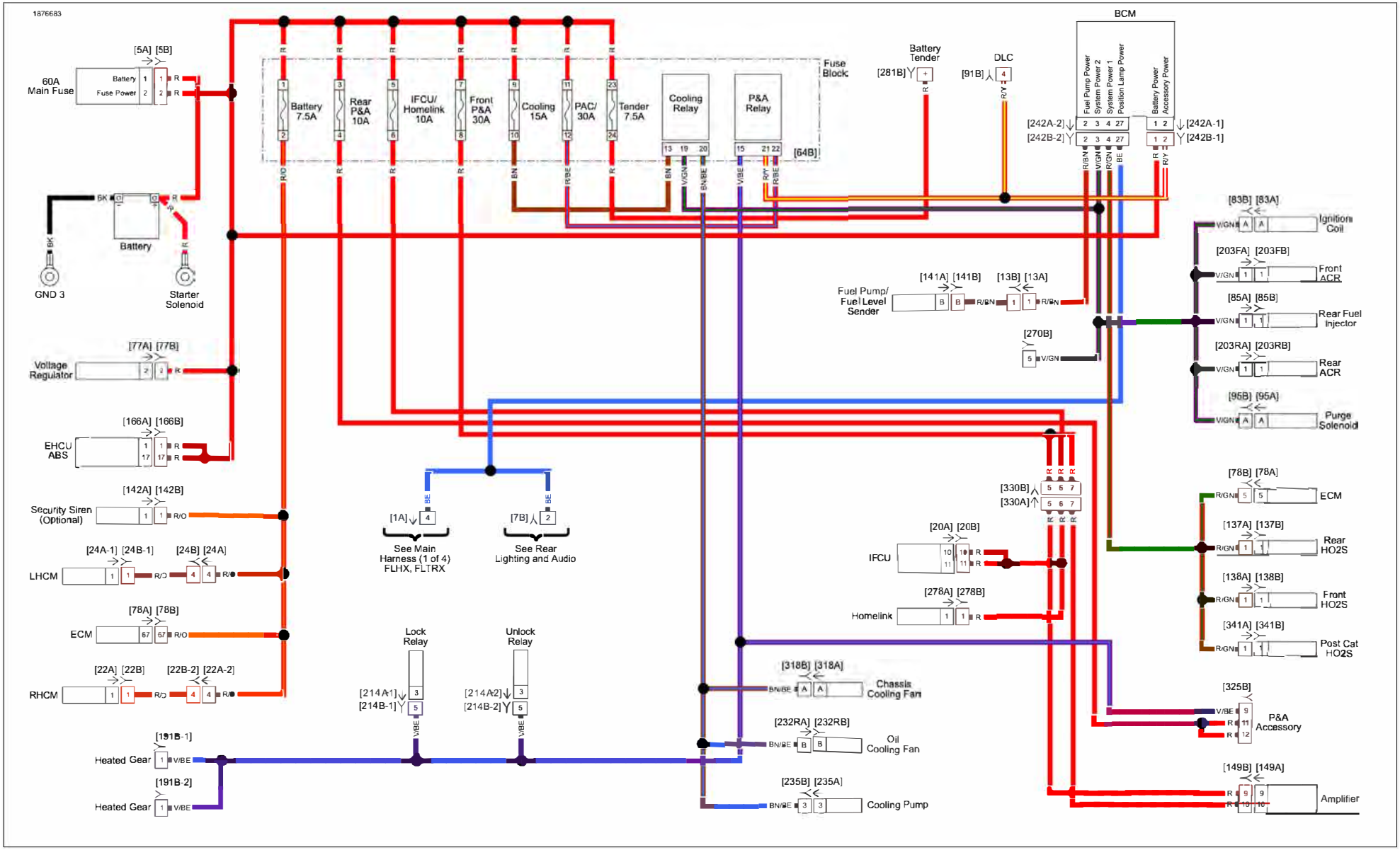
1. **Connector number**
2. **Terminal code (A=pin, B=socket)**
3. **Solid wire color**
4. **Striped wire color**
5. **Socket symbol**
6. **Pin symbol**
7. **Diode**
8. **Wire break**
9. **No connection**
10. **Circuit to/from**
11. **Splice**
12. **Ground**
13. **Twisted pair**

Figure A-1. Connector/Wiring Diagram Symbols

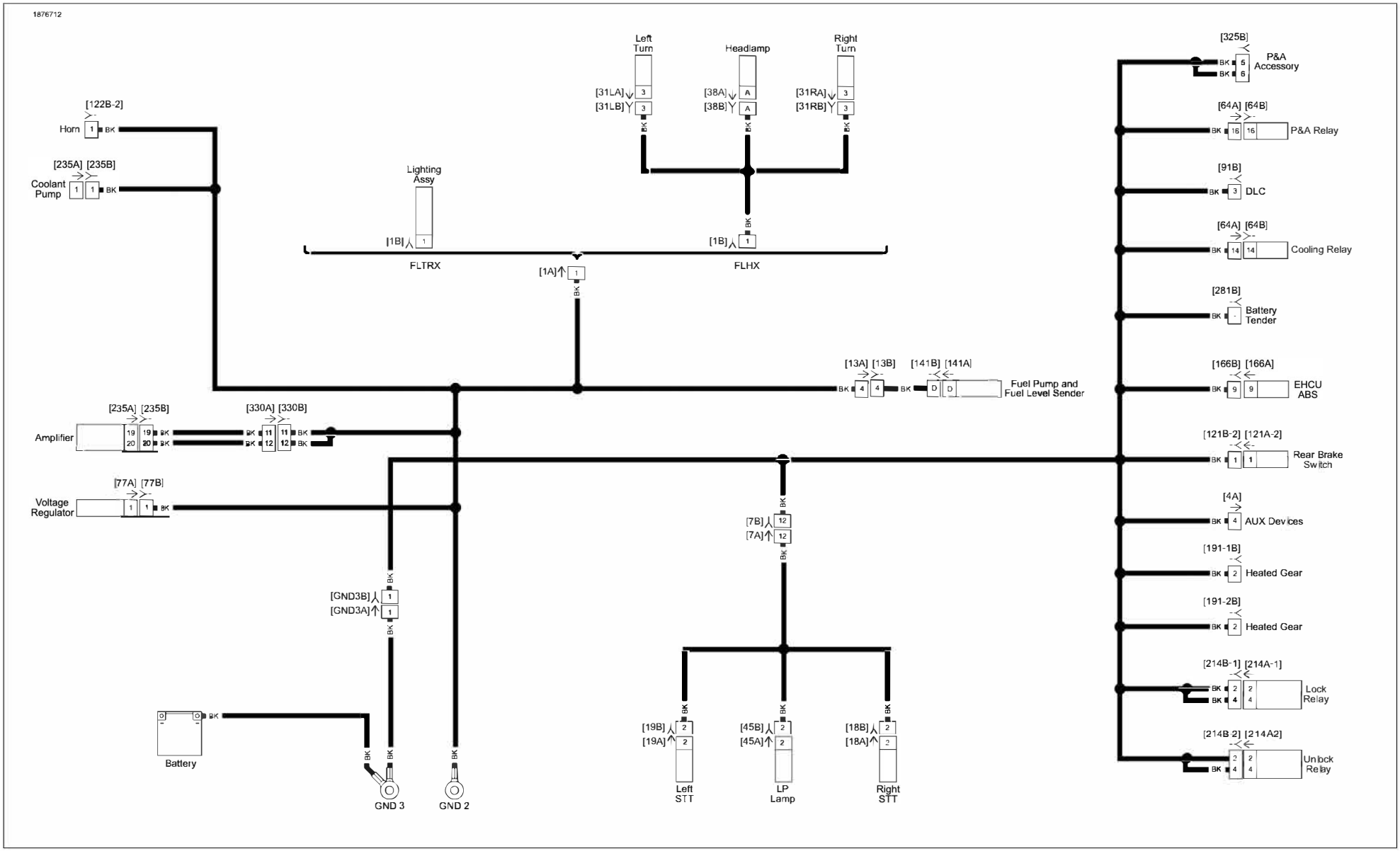
Figure A-2. Fuse Block [64B]

WIRING DIAGRAM LIST

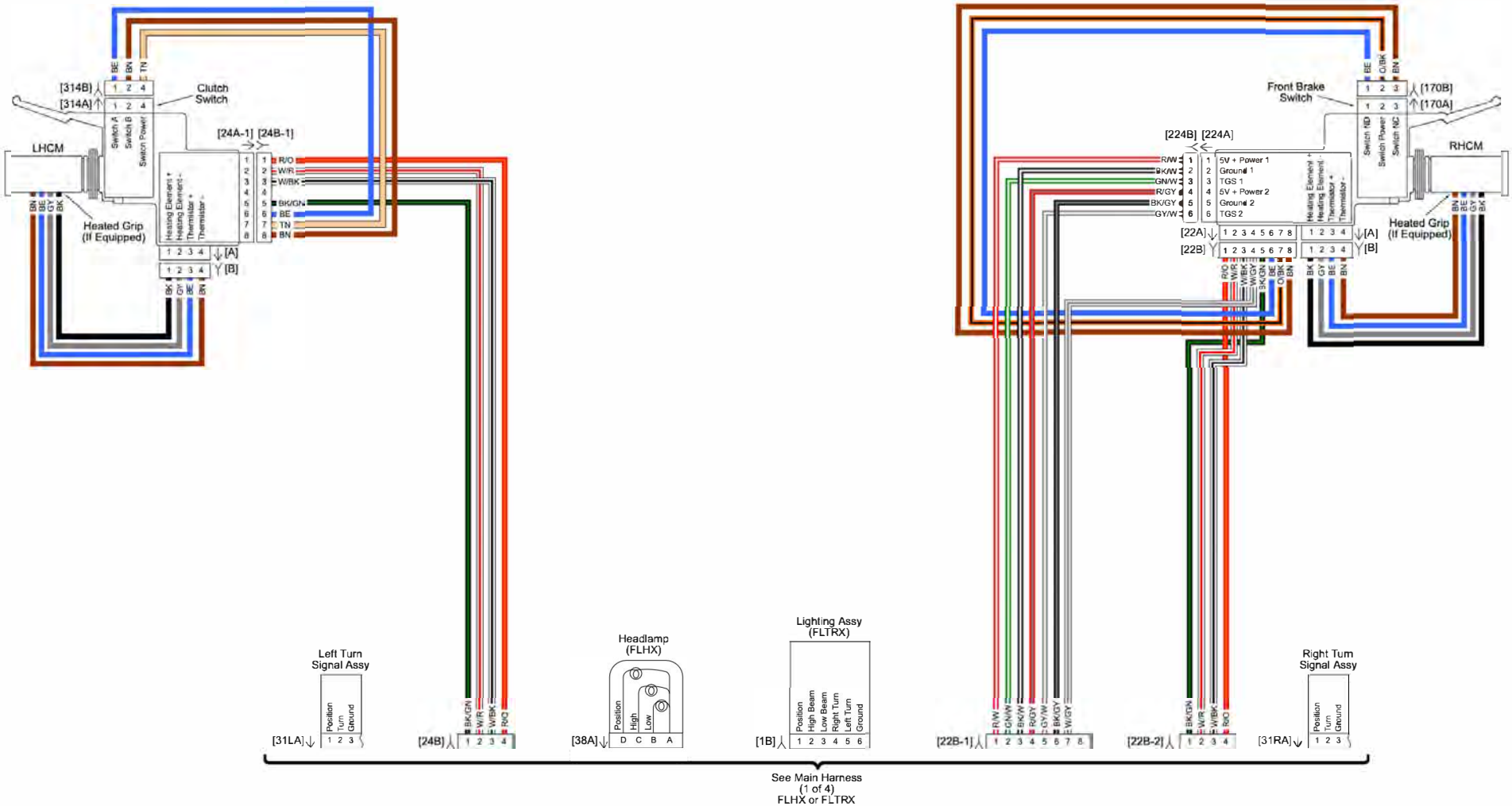
FIGURE	NUMBER
Power Distribution: FLHX, FLTRX	Figure A-3.
Ground Circuit: FLHX, FLTRX	Figure A-4.
Front Lighting and Hand Controls: FLHX, FLTRX	Figure A-5.
Fairing Harness: FLTRX	Figure A-6.
Fairing Harness: FLHX	Figure A-7.
Main Harness (1 of 4): FLTRX	Figure A-8.
Main Harness (2 of 4): FLTRX	Figure A-9.
Main Harness (3 of 4): FLTRX	Figure A-10.
Main Harness (4 of 4): FLTRX	Figure A-11.
Main Harness (1 of 4): FLHX	Figure A-12.
Main Harness (2 of 4): FLHX	Figure A-13.
Main Harness (3 of 4): FLHX	Figure A-14.
Main Harness (4 of 4): FLHX	Figure A-15.
Rear Lighting and Audio: FLHX, FLTRX	Figure A-16.



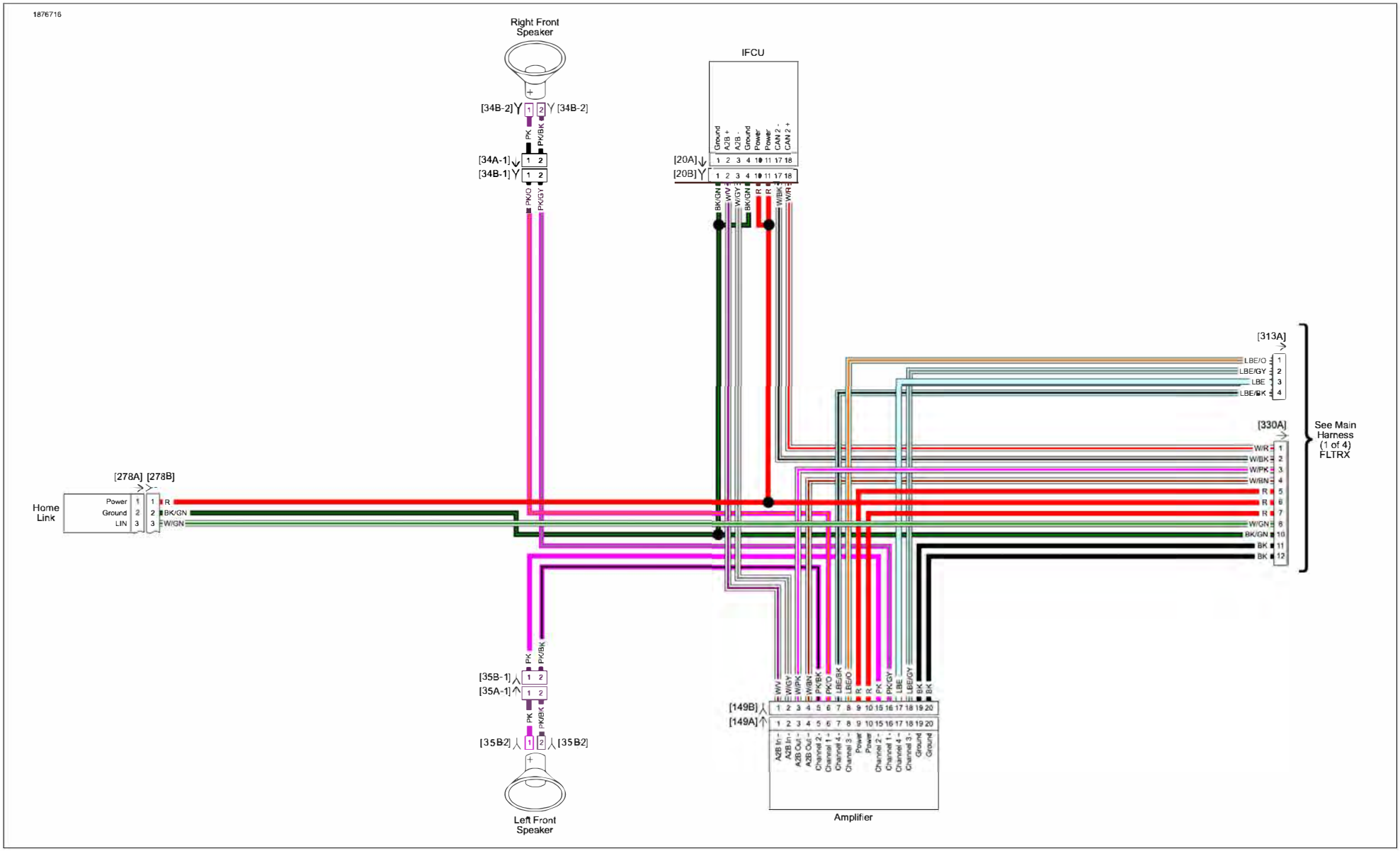
Power Distribution: FLHX, FLTRX



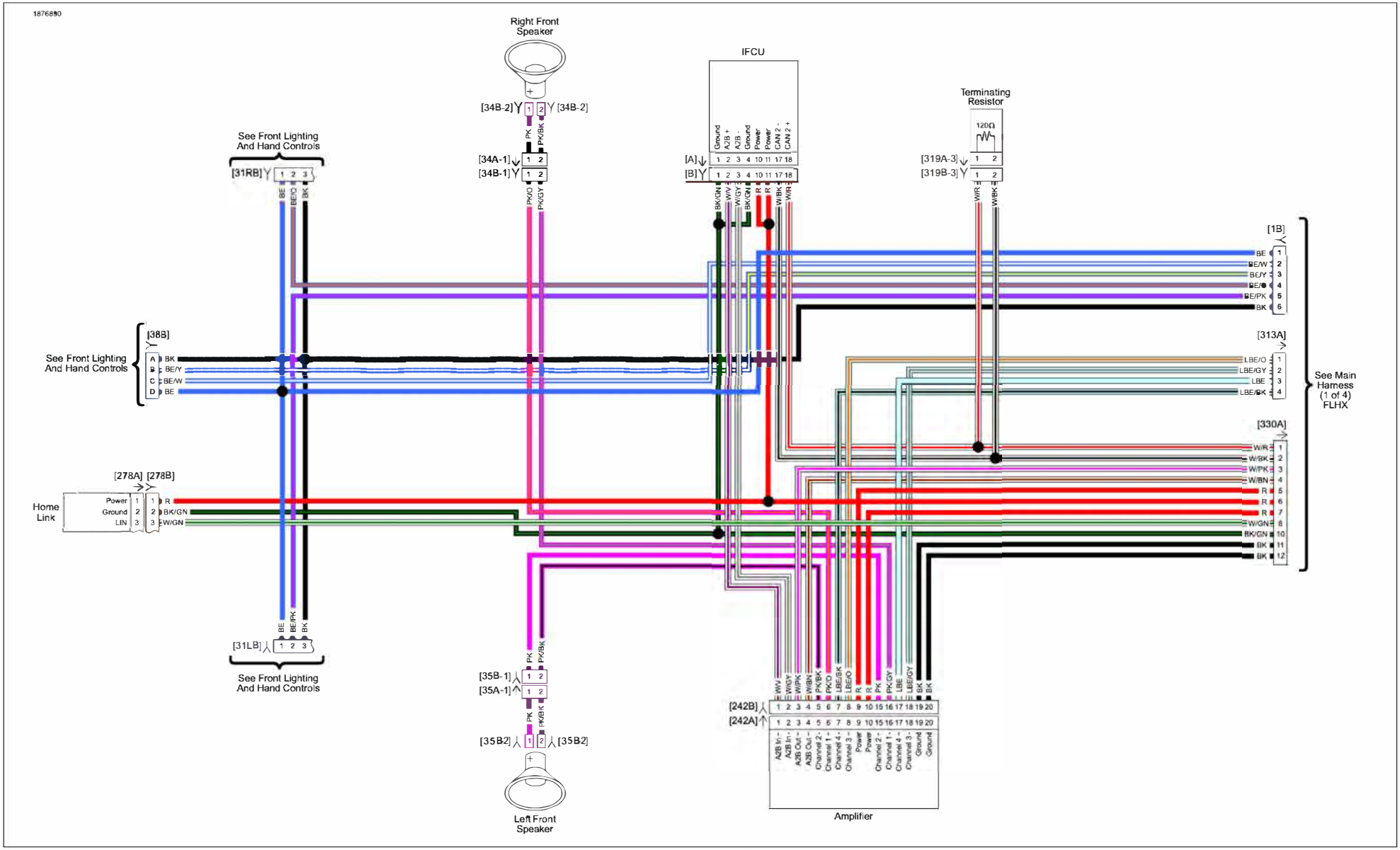
Ground Circuit: FLHX, FLTRX



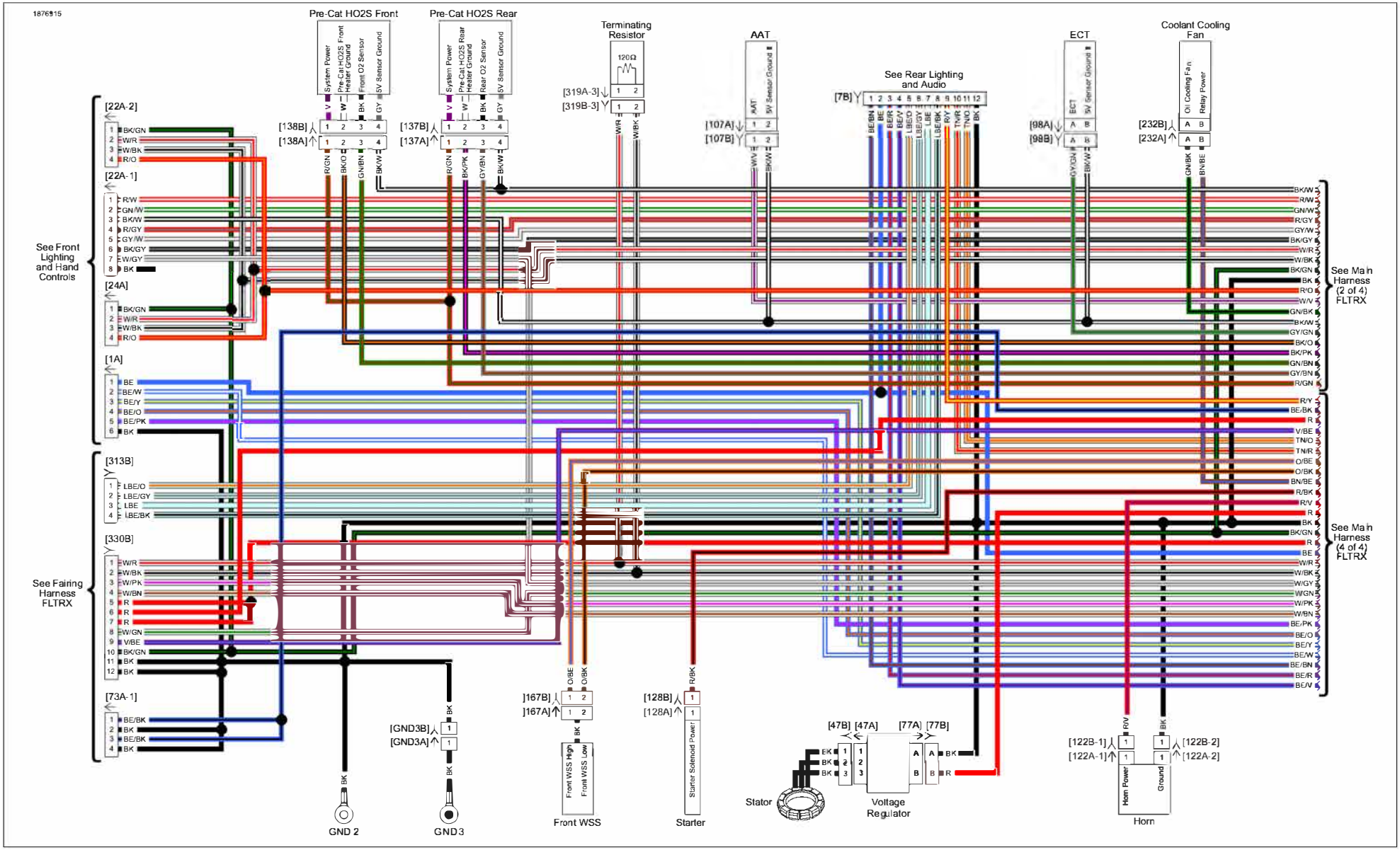
Front Lighting and Hand Controls: FLHX, FLTRX



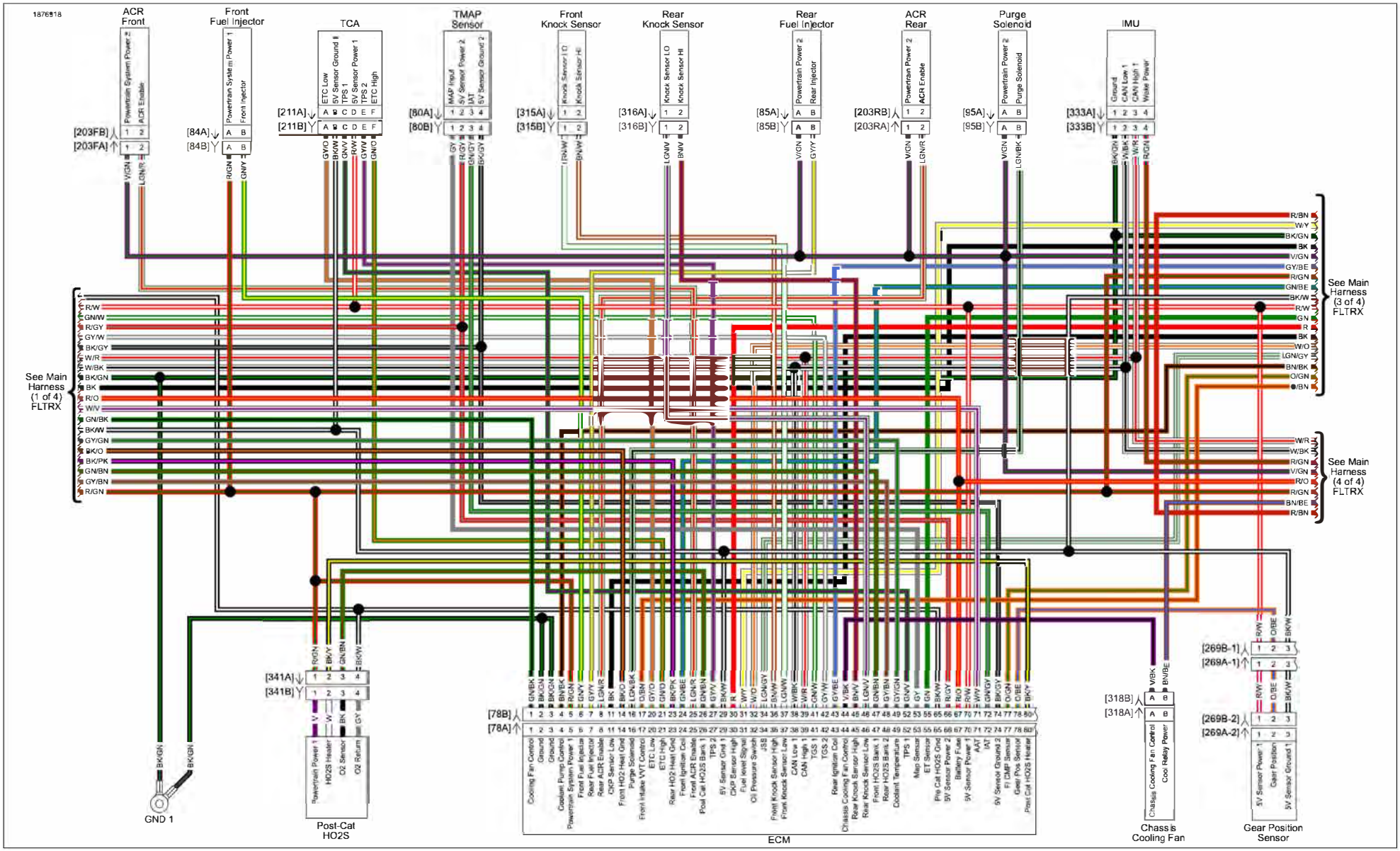
Fairing Harness: FLTRX



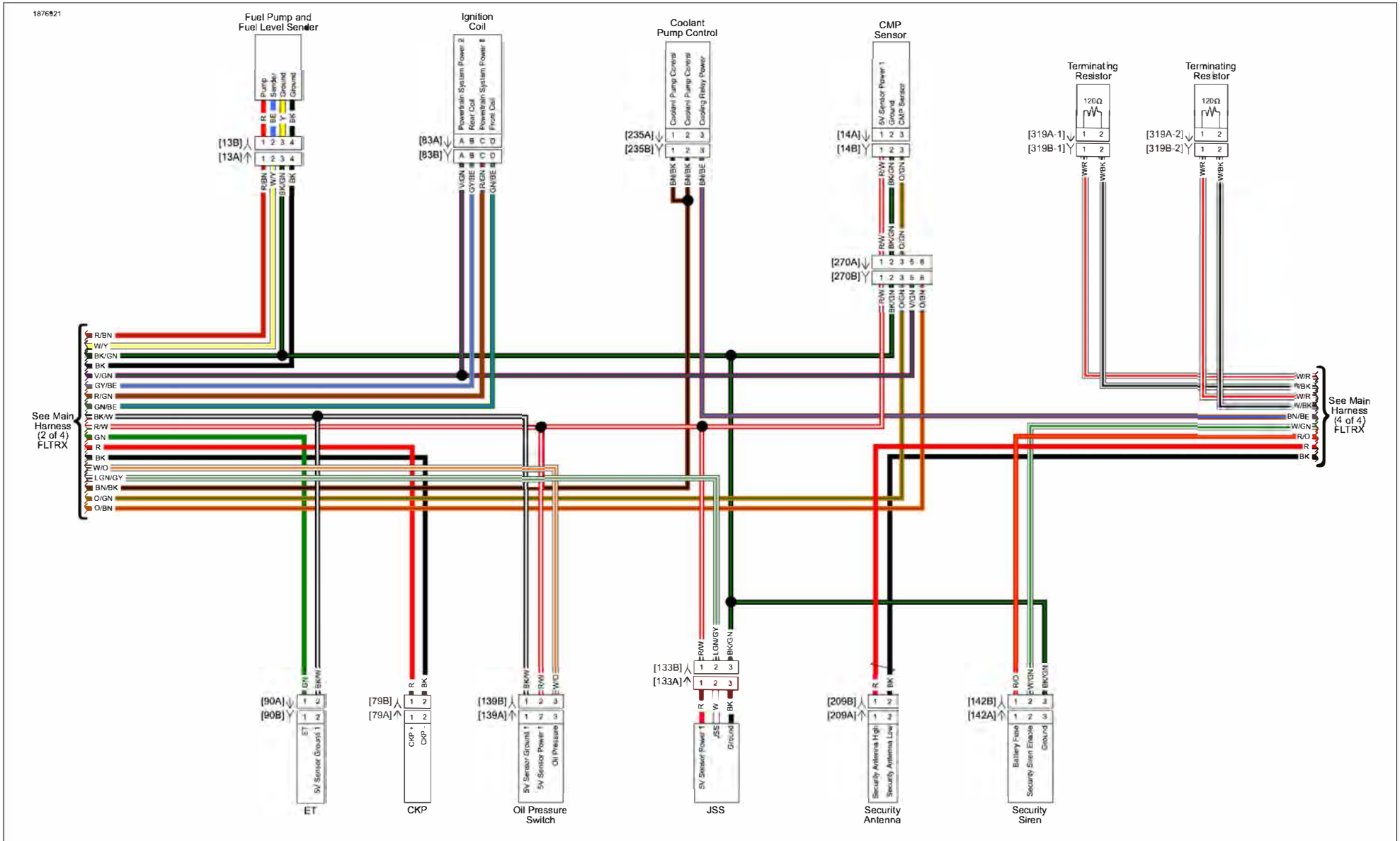
Fairing Harness: FLHX



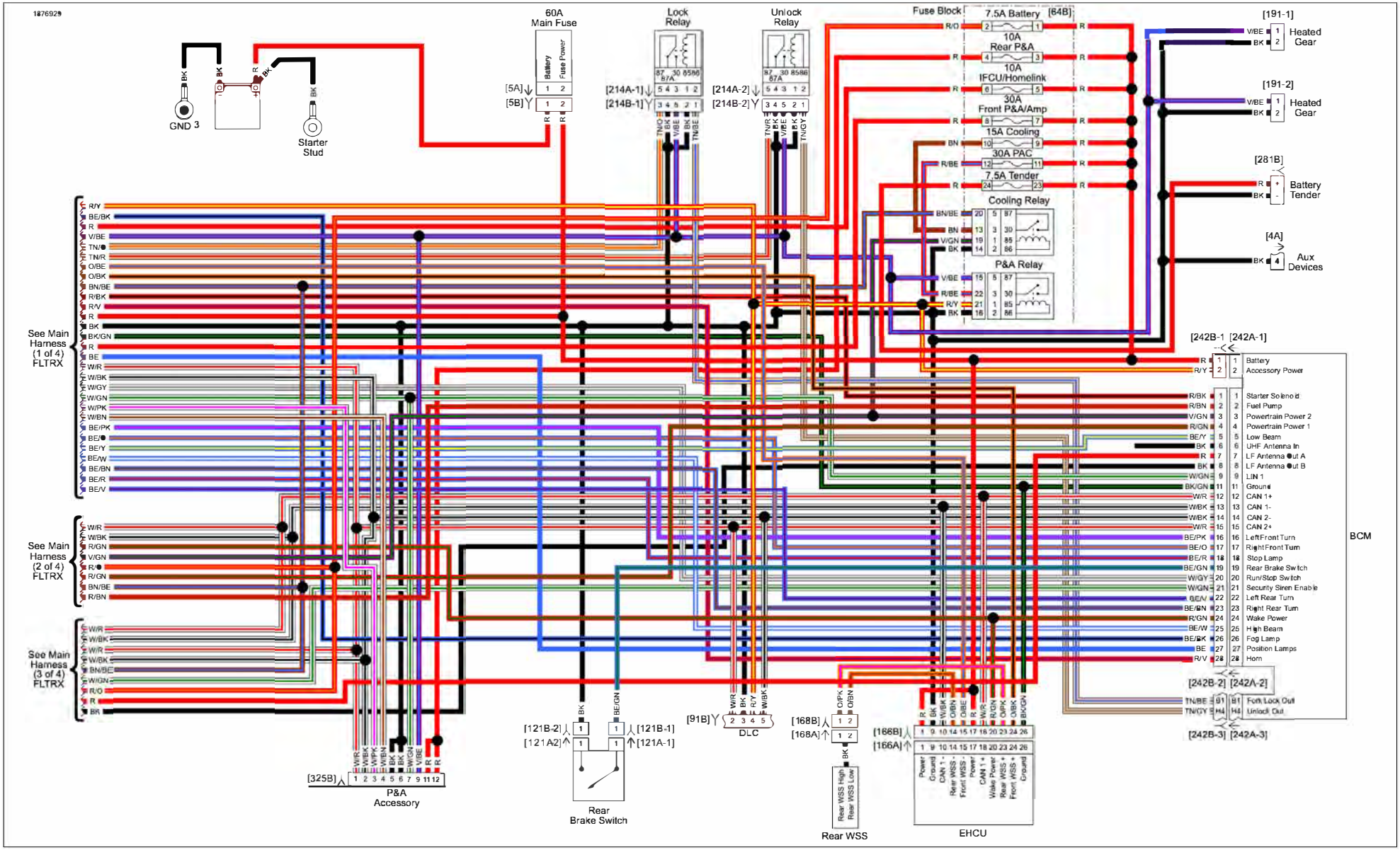
Main Harness (1 of 4): FLTRX



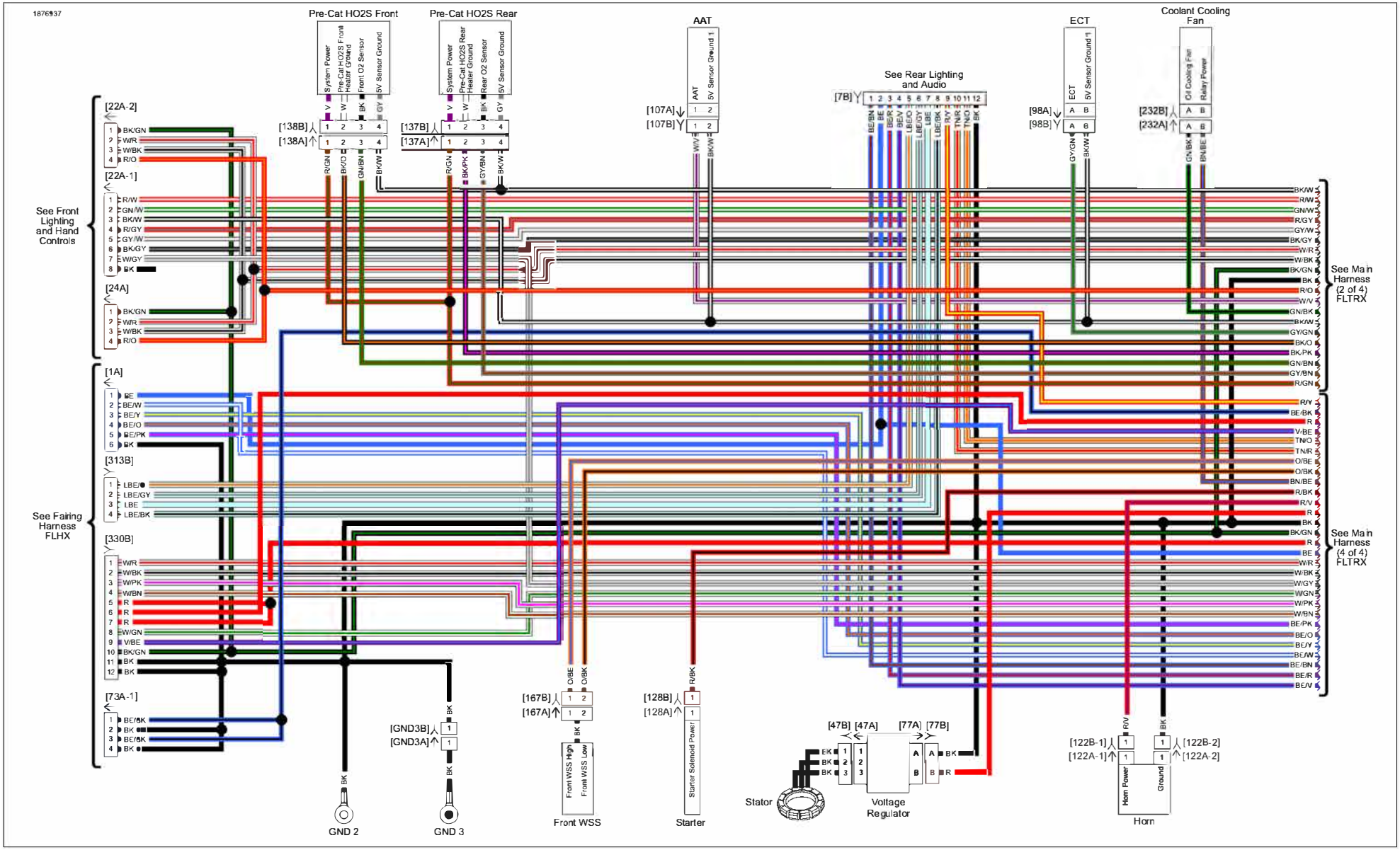
Main Harness (2 of 4): FLTRX



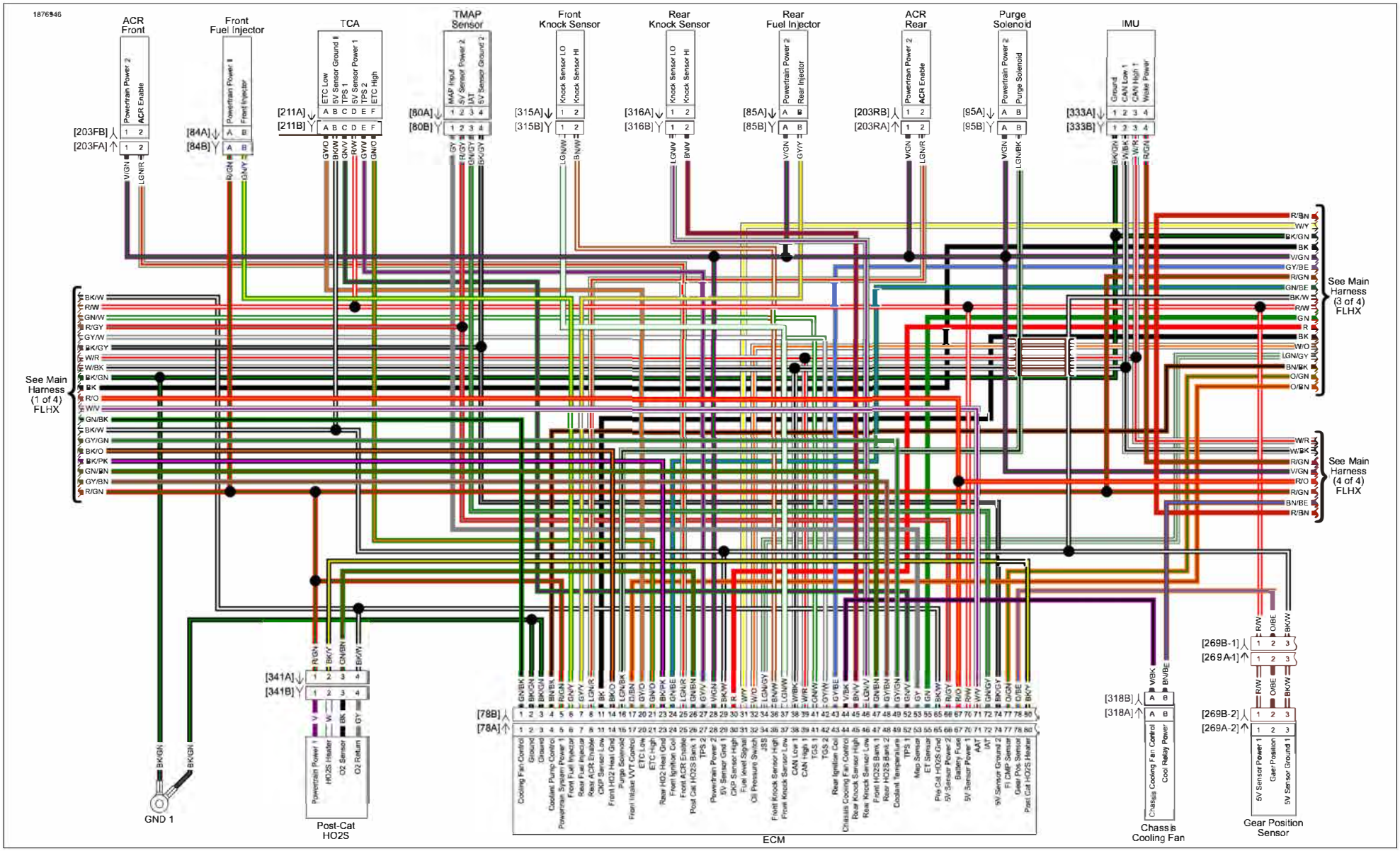
Main Harness (3 of 4): FLTRX



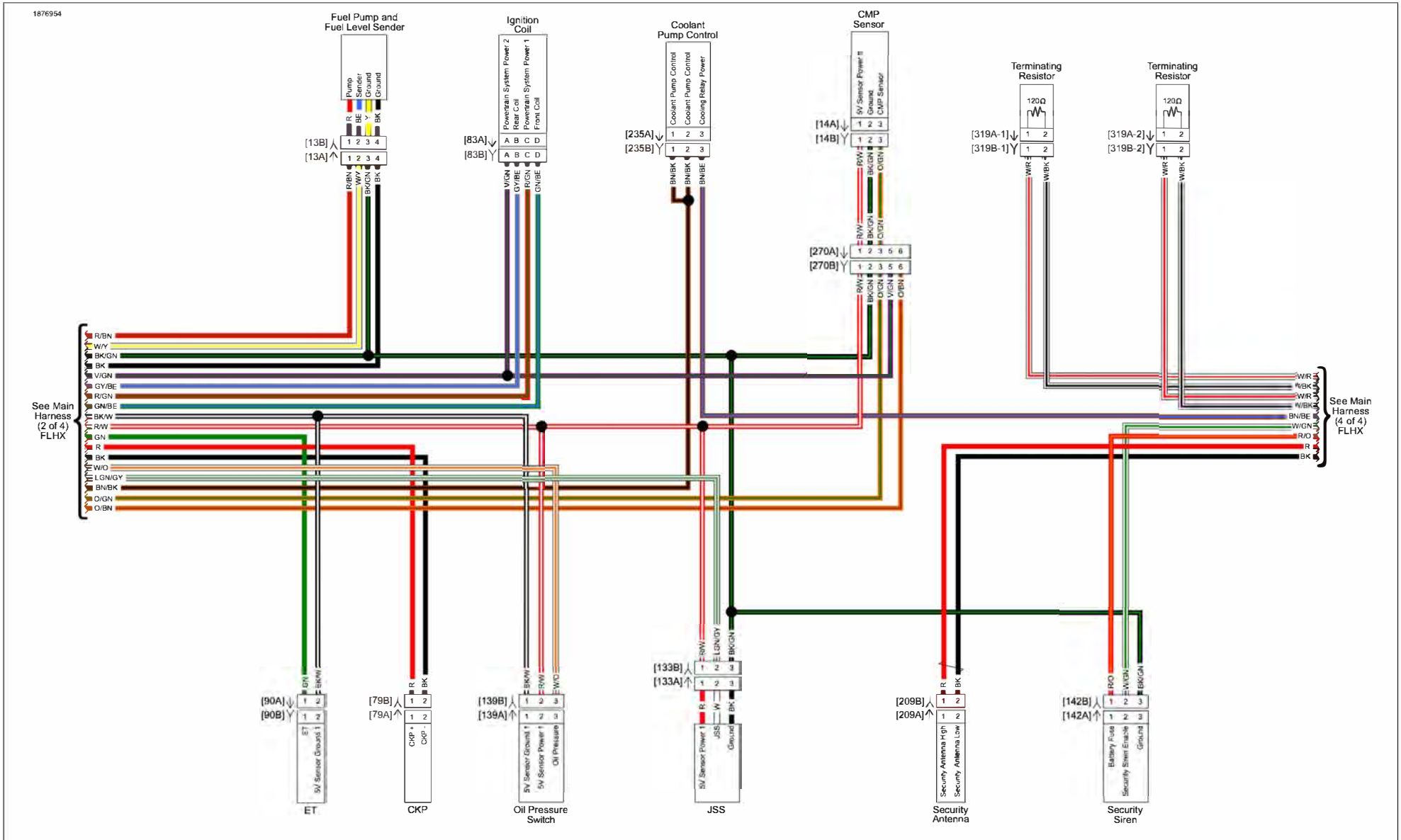
Main Harness (4 of 4): FLTRX



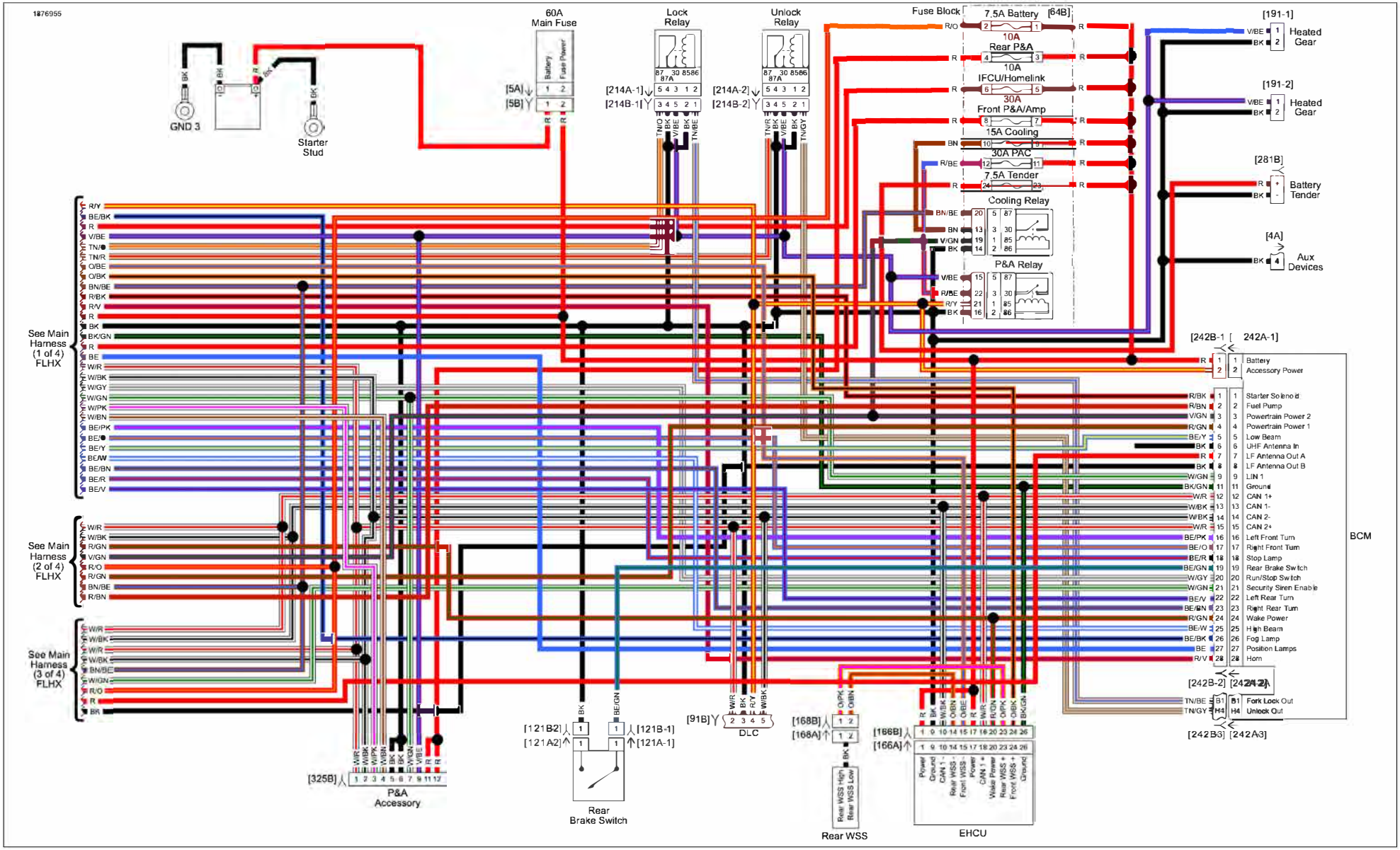
Main Harness (1 of 4): FLHX



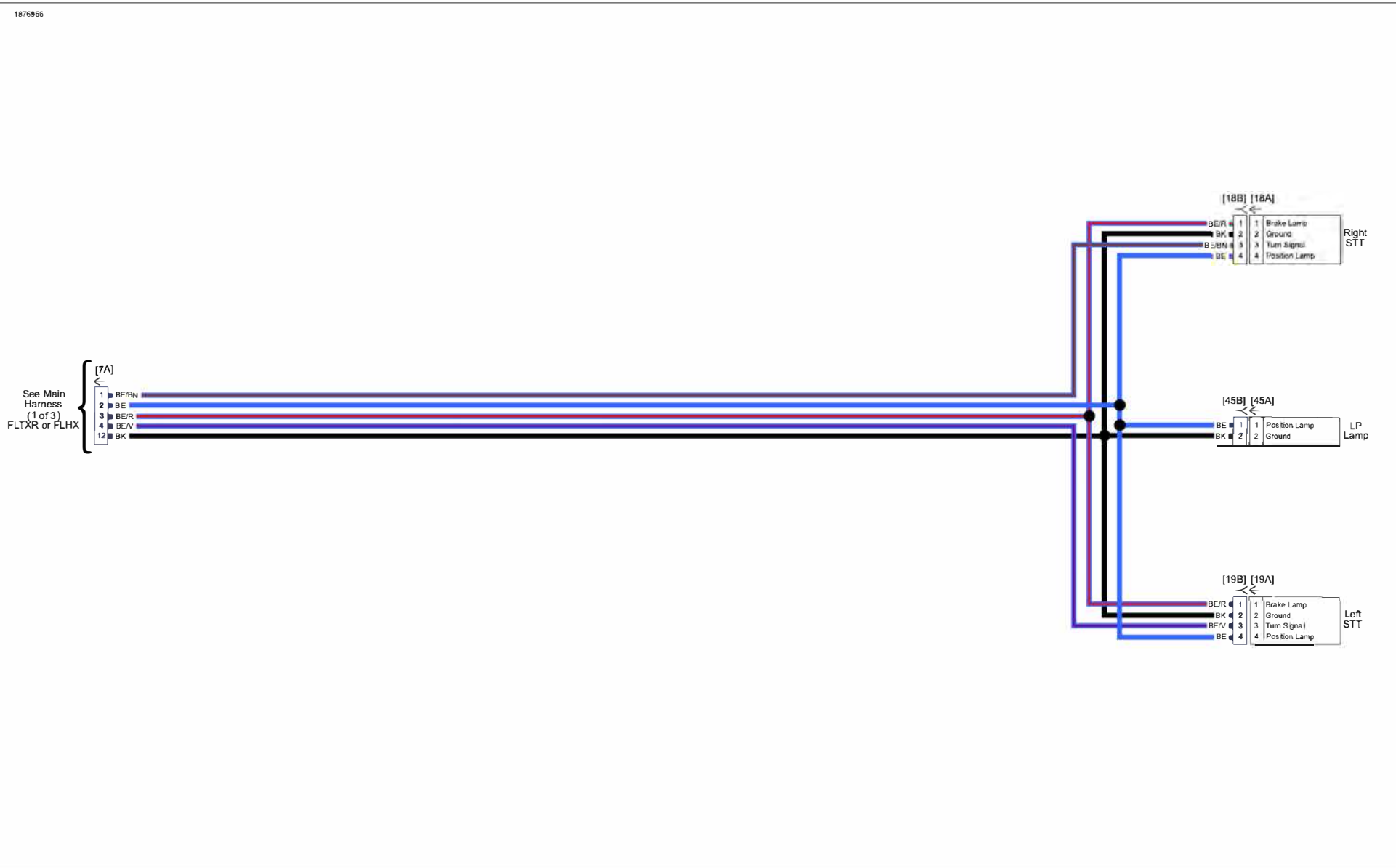
Main Harness (2 of 4): FLHX



Main Harness (3 of 4): FLHX



Main Harness (4 of 4): FLHX



Rear Lighting and Audio: FLHX, FLTRX