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SOFTAIL® MODELS

2022 HARLEY-DAVIDSON® SERVICE MANUAL

94000936

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

SOFTAIL® MODELS

2022 HARLEY-DAVIDSON® SERVICE MANUAL

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2022 HARLEY-DAVIDSON® SERVICE MANUAL - SOFTAIL® MODELS

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NOTES

FOREWORD

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 Acronyms and Abbreviations (Page B-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

A 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. (00001 b)

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 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 threadl ocker 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.

A 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

A 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	
0	• Content applies to model or feature listed
☐	• Content does not apply to model or feature listed

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NOTES

SAFETY

Customer 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.

A DANGER

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

A WARNING

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

A 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.

A 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

A 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.

A WARNING

Product Safety

A CAUTION

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

A 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

A 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

A WARNING

Read and follow warnings and directions on all products. Failure to follow warnings and directions can result in death or serious injury. (00470b) [1]

- 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.

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

A 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.

1 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.

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NOTES

FASTENER TORQUE VALUES

FASTENER TORQUE VALUES IN THIS CHAPTER.

FASTENER	TORQUE VALUE		NOTES
Air filter cover screw, cone	18-24 in-lbs	2-2.7 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Cone
Air filter cover screw, single screw cover	50-65 in-lbs	5.6-7.3 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Round Apply LOCTITE 243 (blue) to the threads of screw.
Air filter cover screws, five-screw cover	48-72 in-lbs	5.4-8.1 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Round Apply LOCTITE 243 (blue) to the threads of screw. Tighten in a star pattern.
Air filter cover screws, oval cover	50-60 in-lbs	5.7-6.8 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Oval
Air filter element screws, round cover	48-72 in-lbs	5.4-8.1 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Round
Air filter trim insert screws	27-32 in-lbs	3-3.6 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Oval
Axle nut, rear	95-105 ft-lbs	128.8-142.4 N-m	2.17 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt
Battery, positive cable, screw	60-70 in-lbs	6.78-7.91 N-m	2.21 INSPECT BATTERY, Install
Brake master cylinder, front, reservoir cover screws	9-18 in-lbs	1-2 N-m	2.11 CHECK AND REPLACE BRAKE FLUID, Check Brake Fluid Level
Brake master cylinder, rear, reservoir cover screws	9-18 in-lbs	1-2 N-m	2.11 CHECK AND REPLACE BRAKE FLUID, Check Brake Fluid Level
Clutch hub jamnut	72-120 in-lbs	8.1-13.6 N-m	2.12 CHECK AND ADJUST CLUTCH, Check and Adjust
Clutch inspection cover screws	25-35 in-lbs	2.8-3.9 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
Fork stem pinch bolt -	16-20 ft-lbs	21.7-27.1 N-m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Front brake pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	2.10 INSPECT BRAKES, Replace Front Brake Pads
Lower fork bracket pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Primary chaincase drain plug	14-21 ft-lbs	19-28.5 N-m	2.6 REPLACE PRIMARY CHAINCASE LUBRICANT, Change Primary Chaincase Lubricant
Spark plug	86-108 in-lbs	9.7-12.2 N-m	2.22 CLEAN, INSPECT, REPLACE SPARK PLUGS, Install
Spoke nipple	55 in-lbs	6.2 N-m	2.8 INSPECT TIRES AND WHEELS, Wheel Spokes
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	

SERVICING A MOTORCYCLE

A 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 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

A 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.

MAINTENANCE SCHEDULE

Table 2-1. Regular Service Intervals: Harley-Davidson Softail 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
DOT4 front brake fluid moisture content	Check	x	x	x	x	x	x	x	x	x	x	x	1. 2
Steering head bearings	Adjust	x		x		x		x		x		x	2
Steering head bearings	Lubricate							x					2
Windshield bushings (if applicable)	Inspect			x		x		x		x		x	
Upper and lower 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
Master cylinder 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
Air cleaner filter	Inspect		x	x	x	x	x	x	x	x	x	x	3
Engine oil and filter	Replace	x	x	x	x	x	x	x	x	x	x	x	1, 3
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, 2
Transmission lubricant	Replace	x				x				x			3,2
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
DOT4 rear brake fluid moisture content	Check	x	x	x	x	x	x	x	x	x	x	x	1,2

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.

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

COMPONENT	ACTION												NOTES
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
Clutch system	Adjust	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 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. .											
Front forks	Rebuild												2,3
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 exlreme 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.

2 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.

FUEL

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

A 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)

A 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)

- 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

A 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)

A 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.

REPLACE ENGINE OIL AND FILTER

CHECK ENGINE OIL LEVEL

A 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

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.

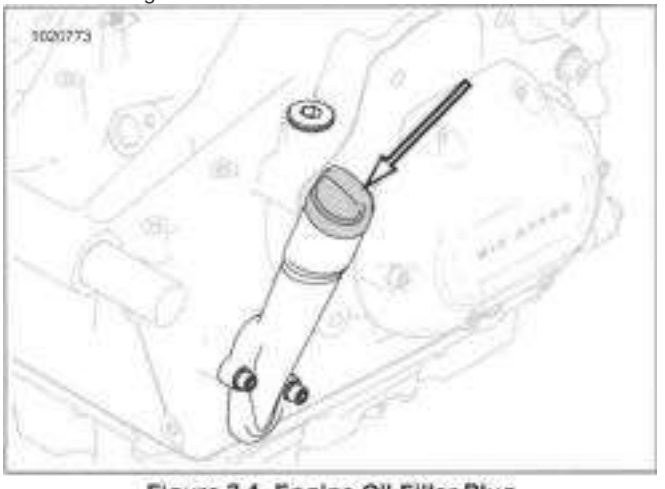


Figure 2-1. Engine Oil Filler Plug

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

A 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 the initial service, change oil at regular intervals in normal service at warm or moderate temperatures. Refer to General (Page 2-3).
- Change oil at more frequent intervals in cold weather or severe operating conditions. See FUEL AND OIL (Page 2-5).

1. Run motorcycle until engine is at normal operating temperature. Turn off engine.
2. Remove filler plug/dipstick.

NOTE

Replace drain plug O-ring.

3. See Figure 2-3. Remove the oil drain plug (2) and O-ring. Allow oil to drain completely.

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.

4. Remove the 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 the oil filter mount flange.
6. Clean any residual oil for crankcase and transmission housing.
7. See Figure 2-4. Install **new** 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 the proper grade of oil for the lowest temperature expected before the next oil change. Refer to Table 2-3 for recommended oil.

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 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.**

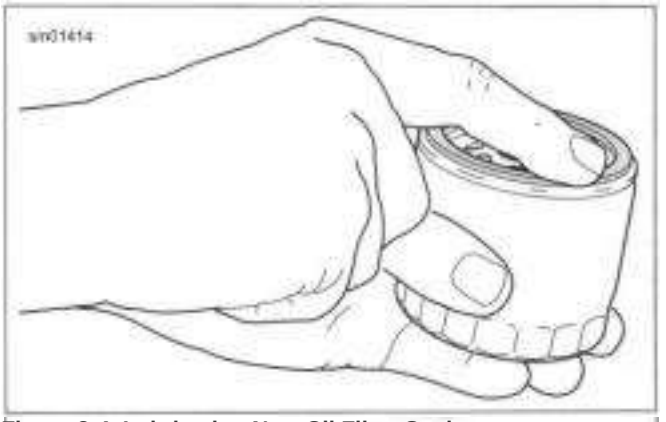


Figure 2-4. Lubricating New Oil Filter Gasket

Figure 2-3. Engine Oil Drain Plug

CHANGE PRIMARY CHAINCASE LUBRICANT

FASTENER	TORQUE VALUE	
Clutch inspection cover screws	25-35 in-lbs	2.8-3.9 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.

A 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***

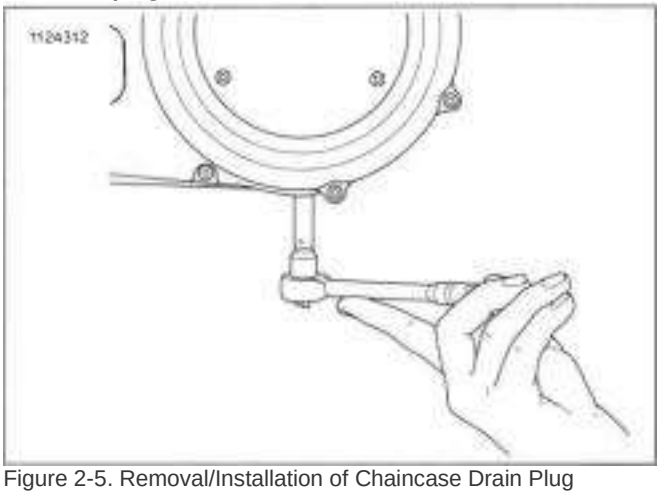


Figure 2-5. Removal/Installation of Chaincase Drain Plug

6. See Figure 2-7. Remove screws (3).

7. Remove clutch inspection cover (2).

8. Remove seal (1). Wipe oil from primary cover and O-ring groove.

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)

9. 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.

ITEM	DRY FILL[1,1]		WET FILL[1,1]	
	Oz	L	Oz	L
Amount[1]	40	1.18	36	1.06

(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.

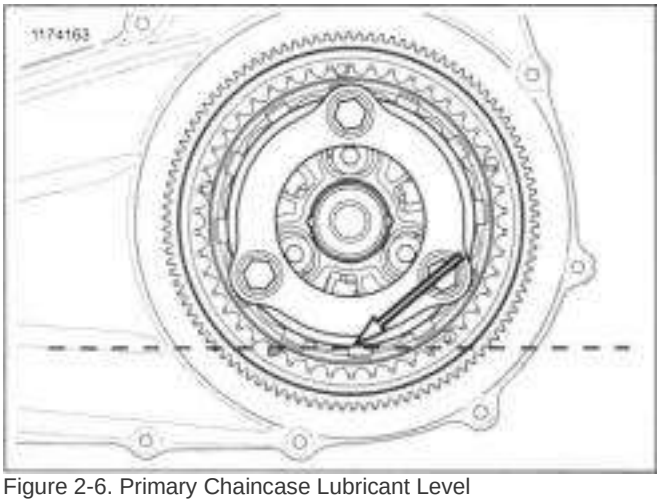


Figure 2-6. Primary Chaincase Lubricant Level

Table 2-5. Primary Chaincase Lubricant

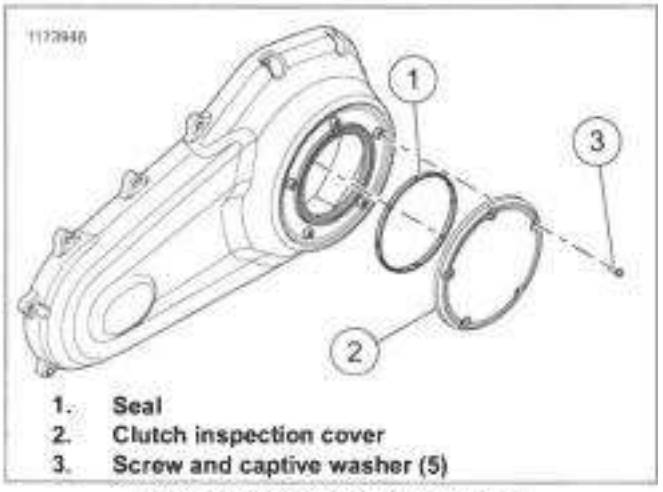
10. See Figure 2-7. Install new seal (1):

11. Install clutch inspection cover (2).

12. Install screws (3). Tighten finger tight.

13. See Figure 2-8. Tighten screws in sequence.

    Torque: 25-35 in-lbs (2.8-3.9 N-m) ***Clutch inspection cover screws***



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

Figure 2-7. Clutch Cover (Typical)

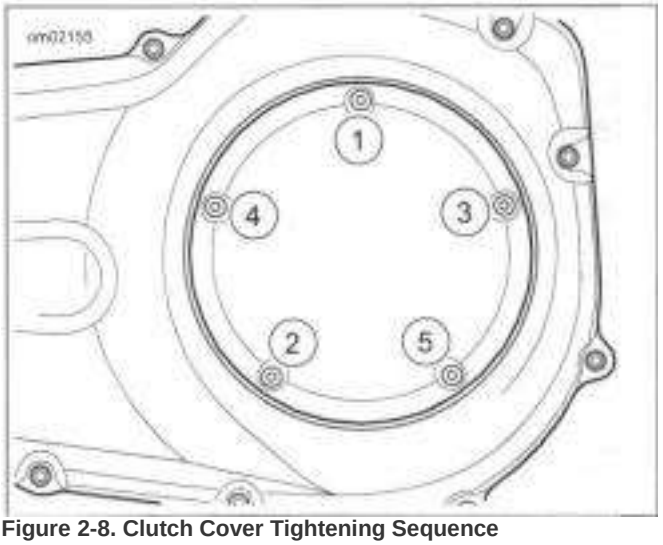


Figure 2-8. Clutch Cover Tightening Sequence

REPLACE TRANSMISSION LUBRICANT

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 0-ring. Replace if necessary.

1. Park motorcycle on a level surface on jiffy stand.
2. Remove right side cover. See Remove (Page 3-64).
3. See Figure 2-9. Remove transmission filler plug/dipstick. Wipe dipstick clean.
4. Install filler plug/dipstick until O-ring contacts the case. Do not tighten.
5. 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.

NOTICE

Mixing mineral-based lubricants with SYN-3 in the transmission can damage the transmission. (00452b)

6. 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.
7. Install filler plug/dipstick. Tighten.

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

8. Install right side cover. See Install (Page 3-64).

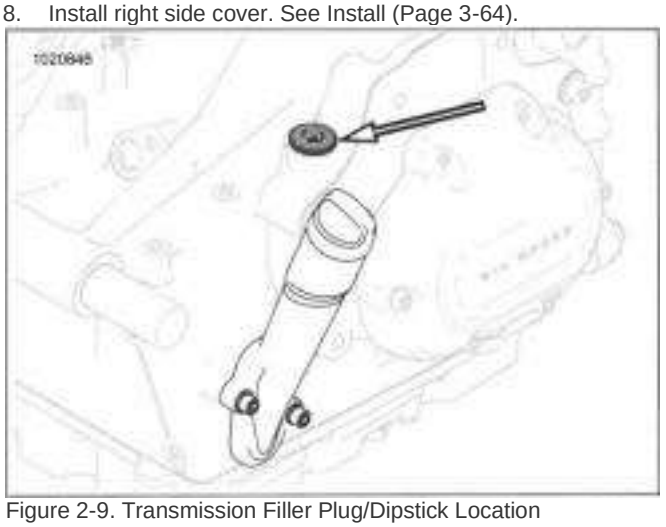


Figure 2-9. Transmission Filler Plug/Dipstick Location

CHANGE TRANSMISSION LUBRICANT

A 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)

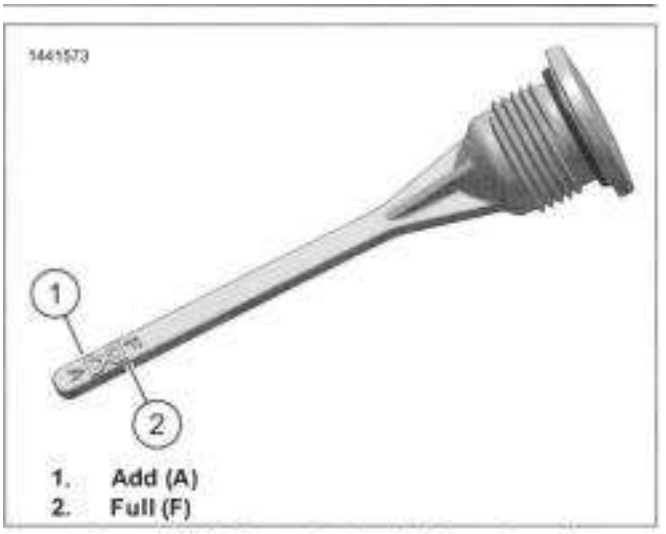


Figure 2-10. Transmission Lubricant Level

Table 2-6. Transmission Lubricant

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

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.
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 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.^^.5 N-m) ***Transmission filler plug/dipstick***

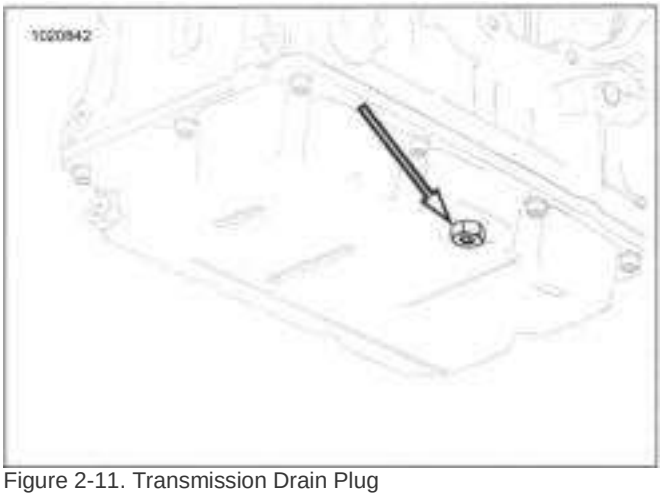


Figure 2-11. Transmission Drain Plug

GENERAL

A WARNING

reach the tread wear indicators.

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)

A 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.***
- ***Tire sizes are molded on the tire sidewall. Inner tube sizes are printed on the tube.***
- ***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

A 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)

Check tire pressure:

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

1. **Check tire pressures when tires are cold. Compare with specifications. Refer to Table 2-7.**

NOTE

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

Tread

A 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.**

1. **Inspect each tire for punctures, cuts and breaks.**
2. **See Figure 2-12, Figure 2-13 and Figure 2-14. Inspect each tire for wear. Replace tires before they**

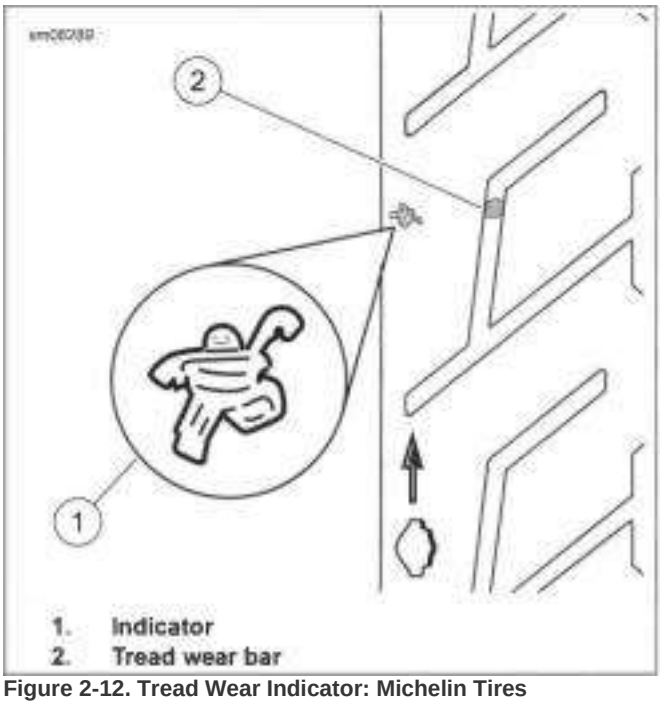


Figure 2-12. Tread Wear Indicator: Michelin Tires

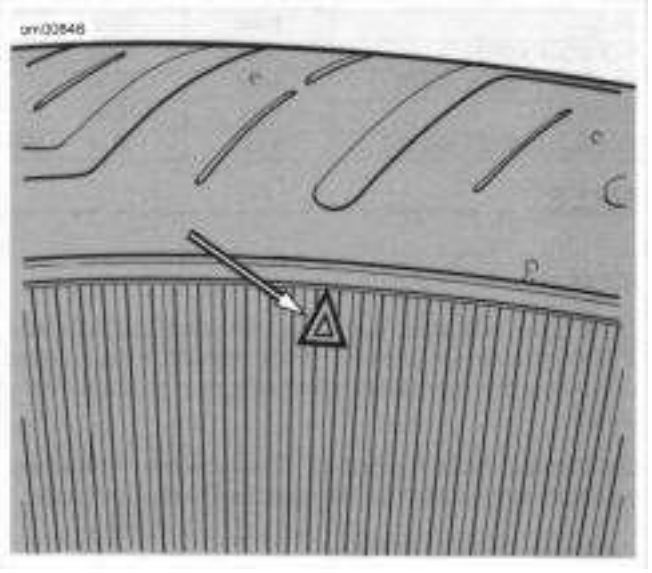


Figure 2-13. Dunlop Sidewall Tread Wear Indicator Bar Locator

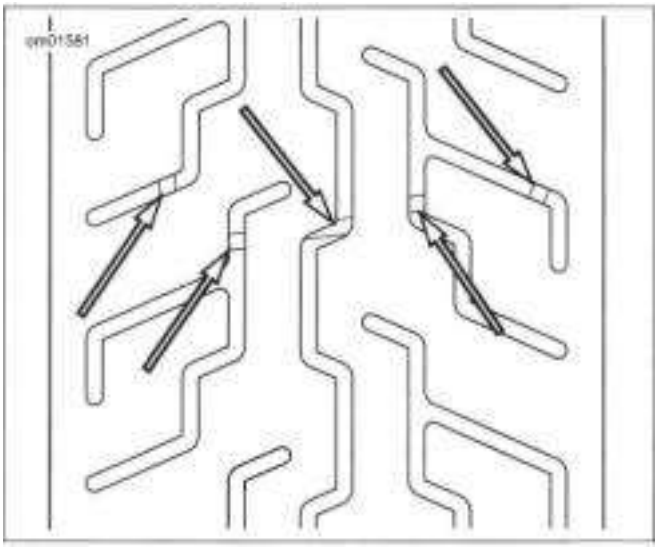


Figure 2-14. Dunlop Tread Wear Indicator Bar Appearance

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.

WHEEL SPOKES

Table 2-7. Specified Tires

MODEL	MOUNT	SIZE	SPECIFIED TIRE	PRESSURE(COLD 68.0 °F (20 °C))	
				psi	kPa
FLFBS	front	18 in	Michelin Scorcher 11 160/60R18 70V BW	36	248
FLHCS	front	16 in	Dunlop D401F 130/90B16 73H BW	36	248
FXBBS,FXST	front	19 in	Dunlop D401F 100/90B19 57H BW	36	248
FXBRS	front	21 in	Michelin Scorcher 11 130/60B21 63H BW	36	248
FXFBS	front	16 in	Dunlop D429F 150/80B16 71H BW	36	248
FXLRS,FXLRST	front	19 in	Michelin Scorcher 31 110/90B19 62H BW	32	221
FLSB	front	18 in	Michelin Scorcher 31 130/70B18 63H BW	36	248
FLFBS,FXBRS	rear	18 in	Michelin Scorcher 11 240/40R18 79V BW	42	290
FLHCS, FXBBS, FXST	rear	16 in	Dunlop D401 150/80B16 77H BW	40	276
FXFBS	rear	16 in	Dunlop 180/70B16 77H BW	40	276
FLSB,FXLRS,FXLRST	rear	16 in	Michelin Scorcher 31 180/70B16 77H BW	40	276

TIRES

Inspect

Tread wear indicators appear on tire tread surfaces when 0. 031 in (0.8 mm) or less of tire tread remains. Always replace tires before the tread wear indicators appear on the surface of the tire.

See Figure 2-12 or Figure 2-13 . The locations of tread wear indicators are identified by the marks on the tire sidewalls.

When to Replace Tires

New tires are needed if:

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

WHEEL BEARINGS

NOTE

Replace bearings in sets only. See SEALED WHEEL BEARINGS (Page 3-25).

PART NUMBER	TOOLNAME
HD-48985	SPOKE TORQUE WRENCH
HD-94681-80	SPOKE WRENCH

FASTENER	TORQUE VALUE	
Spoke nipple	55 in-lbs	6.2 N-m

A WARNING

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

A WARNING

Do not over-tighten spoke nipples. Protruding spoke nipples can damage rim seal, resulting in rapid tire deflation, which could cause death or serious injury. (00611c)

NOTICE

When llfting 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 perfonn major repair work. (00586d)

Identify Wheel Spoke Groups

NOTE

Spokes are grouped in sets of four.

1. Raise the wheel.
2. See Figure 2-15. Starting at the valve stem, identify the first group of four spokes (1-4).
3. Using a different color for each spoke in the group, draw an alignment mark across the spoke nipple and onto the rim.
4. Continue around the wheel marking the rest of the spokes the same as they were marked in the previous steps.

Adjust Wheel Spokes

NOTE

- ***Do not tighten spake mare than one-quarter turn past alignment mark. If more tension is needed, label spoke and check after completing rest of wheel.***
- ***Do not use the spoke torque wrench to loosen spokes. Use SPOKE WRENCH (PART NUMBER: HD-94681-80) to loosen spokes.***

1. See Figure 2-15. Starting with the first group of spokes, loosen spoke (1) one-quarter turn using SPOKE WRENCH (PART NUMBER: HD-94681-80).
2. Using SPOKE TORQUE WRENCH (PART NUMBER: HD-48985) tighten spoke (1) to the value listed in Table 2-8.
   a. While tightening, if the torque wrench clicks before the alignment marks align, continue to turn the spoke nipple until the marks align.
   b. If the marks align and torque specification has not been reached, tighten the spoke nipple until the correct torque is achieved. Do not turn spoke nipple more than one-quarter turn past alignment mark.
3. Repeat previous two steps for spoke (4) in the same group.
4. Continue around the wheel checking spokes 1 and 4 until all groups are done.
5. Repeat procedure for spokes (2, 3) in each group.

NOTE

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

6. Check spokes, if any, that were labeled as not reaching the proper torque value after tightening one-quarter turn past alignment mark.
   a. Loosen spoke one-quarter turn past original alignment mark using SPOKE WRENCH (PART NUMBER: HD-94681-80).
   b. While tightening, if the torque wrench clicks before the alignment marks align, continue to turn the spoke nipple until the marks align.
   c. If the marks align and torque specification has not been reached, tighten the spoke nipple until the correct torque is achieved. Do not turn spoke nipple more than one-quarter turn past alignment mark.
7. True the wheel. See CHECKING AND TRUING WHEELS (Page 3-21).

Table 2-8. Spoke Nipple Torque Specification

RIM TYPE	MINIMUM TORQUE
All	55 in-lbs (6.2 N-m)

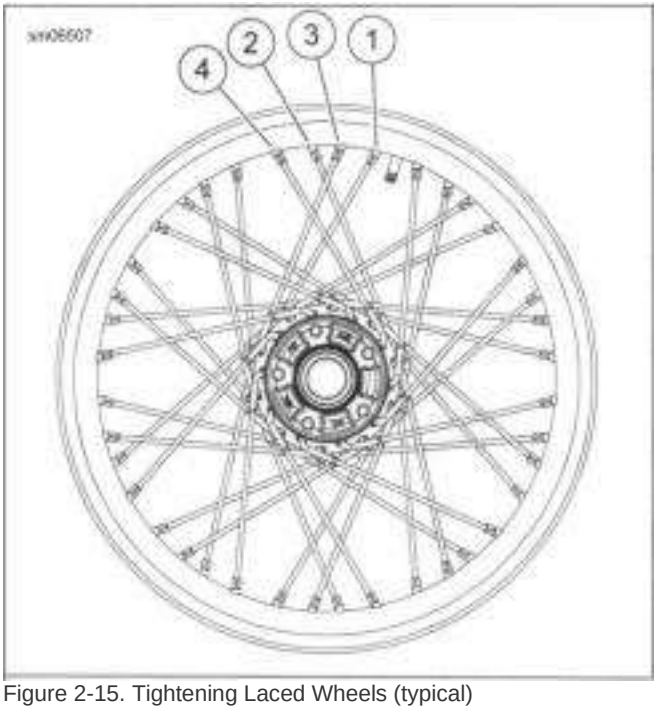


Figure 2-15. Tightening Laced Wheels (typical)

LUBRICATE CABLES AND CHASSIS

GENERAL

Inspect and lubricate the following items according to 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

See Figure 2-16 for general location of lubrication points.

1. **Front brake hand lever:** Use grease on front brake lever pivot pin hole and end of piston that contacts brake lever. See FRONT BRAKE MASTER CYLINDER (Page 3-35).

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

2. ***NOTE***

   HARLEYLUBE (94968-09) is formulated to be compatible with clutch cable lining. Use of other lubricants could damage clutch cable lining.

   Clutch cable. See CLUTCH CONTROL (Page 3-91).

   Consumable: HARLEY LUBE (94968-09)

3. **Clutch hand lever.** See CLUTCH CONTROL (Page 3-91).

   Consumable: HARLEY LUBE (94968-09)

4. **Jiffy stand:** Lubricate clevis pin and spring hook groove. See JIFFY STAND (Page 3-140).

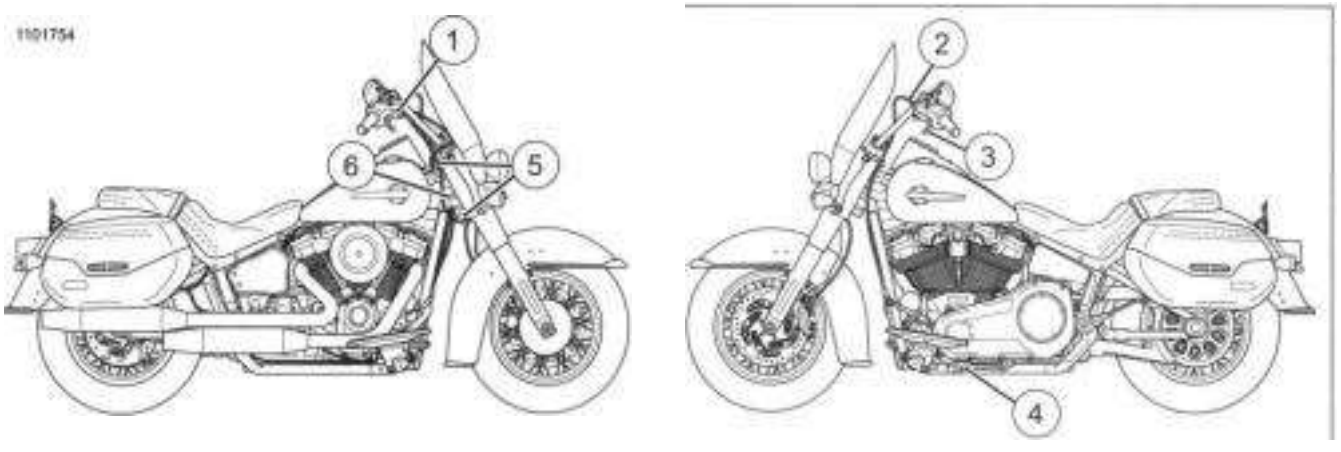
   Consumable: ANTI-SEIZE LUBRICANT (98960-97)

5. **Steering head bearings:** Lubricate steering head bearings. See ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-27).

   Consumable: SPECIAL PURPOSE GREASE (99857-97A)

6. **Fork lock:** Lubricate lock internal components.

   Consumable: HARLEY LUBE (94968-09)



1. **Front brake hand lever**
2. **Clutch cable**
3. **Clutch hand lever**
4. **Jiffy stand**
5. **Steering head bearings**
6. **Fork lock**

Figure 2-16. Lubrication Points

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

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.

Brake Pads

^ — — — — i s

A 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)

A WARNING

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 2-17. Measure brake pad thickness.

a. Replace brake pads (3) if friction material thickness equal to or less than dimension.

0. 016 in (0.4 mm)

b. See 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.

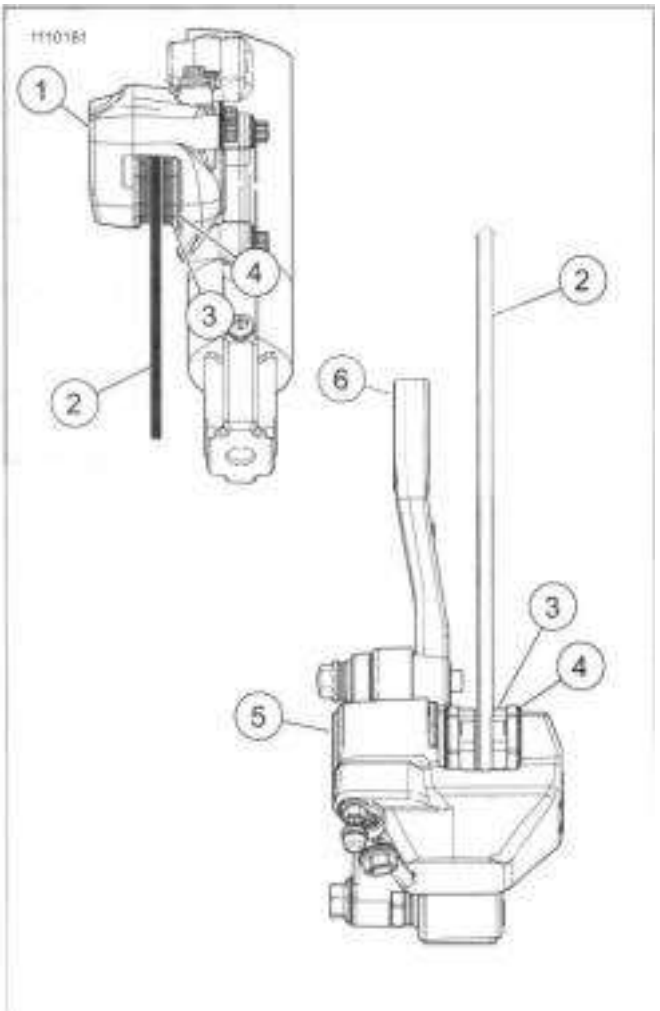
a. Measure runout near the outside diameter of the disc using a dial indicator.

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 FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).

Front brake caliper (viewed from below) Brake disc Brake



1. pads Backplate
2. Rear brake caliper (viewed from above) Rear brake
3. caliper mounting bracket
4. Figure 2-17. Brake Pad Inspection
5. **REPLACE FRONT BRAKE PADS**
6.

Remove

1. Remove front caliper. See FRONT BRAKE CALIPER (Page 3-38).

FASTENER	TORQUE VALUE	
Front brake pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m

2. See Figure 2-18. Remove brake pad hanger pins (3).

3. Remove brake pads.

NOTE

Loosening the reservoir cap allows air to escape and helps prevent contamination. It also helps prevent fluid from squirting out of reservoir.

4. Remove brake pad spring (4).

5. Loosen front master cylinder reservoir cap.

NOTE

,4s ***pistons are pushed back into caliper, verify that fluid does not overflow reservoir. Remove fluid if necessary.***

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

Install

A 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. Install new pads into caliper.

NOTE

See ***Figure 2-18. Brake pad spring (4) must be installed with the stamped arrow facing up.***

2. Loosely install new brake pad hanger pins (3) and new brake pad spring (4).

3. Install front caliper. See FRONT BRAKE CALIPER (Page 3-38).

4. Tighten brake pad hanger pins.

Torque: 11-14 ft-lbs (14.7-19.6 N-m) ***Front brake pad hanger pin***

5. Pump brakes to move pistons out until brake pads contact rotor. Verify piston location against pads. If the 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 CHECK AND REPLACE BRAKE FLUID (Page 2-21).

A WARNING

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

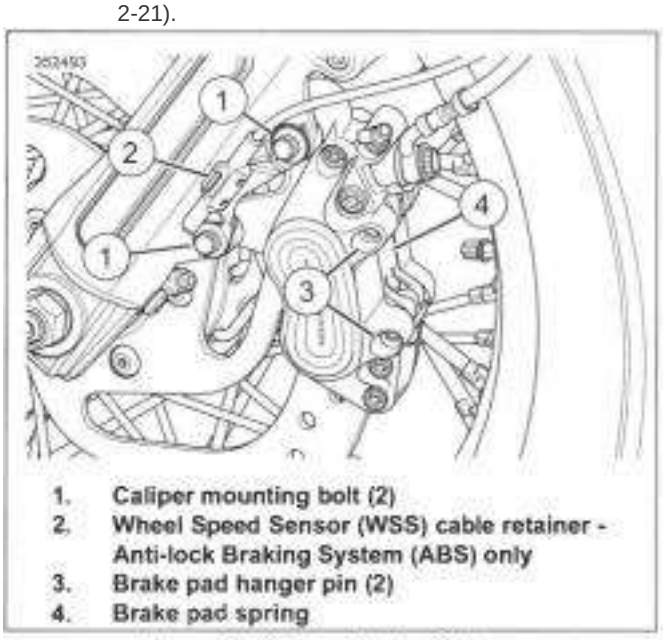
7. Test brakes.

NOTE

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

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

b. Test ride motorcycle. If brakes feel spongy, bleed brakes . See CHECK AND REPLACE BRAKE FLUID (Page 2-21).



1. Caliper mounting bolt (2)
2. Wheel Speed Sensor (WSS) cable retainer - Anti-lock Braking System (ABS) only
3. Brake pad hanger pin (2)
4. Brake pad spring

Figure 2-18. Front Brake Caliper

Remove

1. See Figure 2-19. Remove rear caliper (1). See REAR BRAKE CALIPER (Page 3-46).

2. Remove brake pad hanger pins (2).

   a. Inspect brake pad hanger pins for damage or wear, replace if needed.

3. Remove brake pads (4).

4. ***NOTE***

Loosening the reservoir cap allows air to escape and helps prevent contamination. It also helps prevent fluid from squirting out of reservoir.

   Loosen rear master cylinder reservoir cap.

5. ***NOTE***

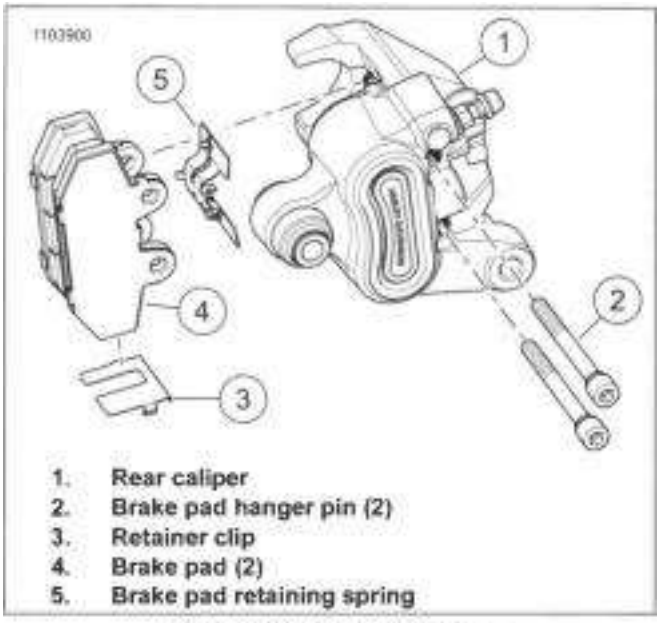
As pistons are pushed back into caliper, verify that fluid does not overflow reservoir. Remove fluid if necessary.

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

6. Inspect brake pad retainer spring (5). Replace if needed.

7. See Figure 2-19 and Figure 3-50. Remove retainer clip (3) from rear caliper mounting bracket.

REPLACE REAR BRAKE PADS



1. Rear caliper
2. Brake pad hanger pin (2)
3. Retainer clip
4. Brake pad (2)
5. Brake pad retaining spring

Figure 2-19. Rear Brake Pads

Install

1. See Figure 2-19. Install brake pad retaining spring (5).

A WARNING

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

2. Install **new** brake pads (4).

3. Install brake pad hanger pin (2). Hand tighten.

NOTE

Hanger pins are torqued after caliper is installed on vehicle.

4. See Figure 2-19 and Figure 3-50. Install **new** retainer clip (3) onto rear caliper mounting bracket.

5. Install rear caliper. See REAR BRAKE CALIPER (Page 3-46).

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

7. Check fluid level in rear brake master cylinder reservoir. See CHECK AND REPLACE BRAKE FLUID (Page 2-21).

A WARNING

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

8. ***NOTE***

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

Test brakes.

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

b. Test ride motorcycle. If brakes feel spongy, bleed brakes. See BLEED BRAKES (Page 3-61).

CHECK BRAKE FLUID LEVEL

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

FASTENER	TORQUE VALUE	
Brake master cylinder, front, reservoir cover screws	9-18 in-lbs	1-2 N-m
Brake master cylinder, rear, reservoir cover screws	9-18 in-lbs	1-2 N-m

CONSUMABLE	PART NUMBER
DOT 4 BRAKE FLUID	41800219

A 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)

A 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 DOT 4 BRAKE FLUID (41800219) 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.***

1. Front **brake:** Check fluid level.
   a. Set motorcycle upright and turn handlebar to level reservoir.
   b. See Figure 2-20. Check low-level mark on reservoir sight glass. See Figure 2-21. If necessary, add brake fluid to reservoir.

      DOT 4 BRAKE FLUID (41800219)
2. **Rear brake:** Check fluid level.
   a. Stand motorcycle upright (not leaning on jiffy stand) on a level surface.
   b. See Figure 2-20. Check low-level mark on reservoir sight glass. See Figure 2-22. If necessary, add brake fluid to reservoir.

      DOT 4 BRAKE FLUID (41800219)
3. If fluid level was below minimum mark:
   a. Check for brake system fluid leaks.
   b. Check that brake pads and rotors are properly installed and not worn beyond service wear limits. See INSPECT BRAKES (Page 2-17).
4. ***NOTE***

   Vent holes in front master cylinder cover face rear of motorcycle.

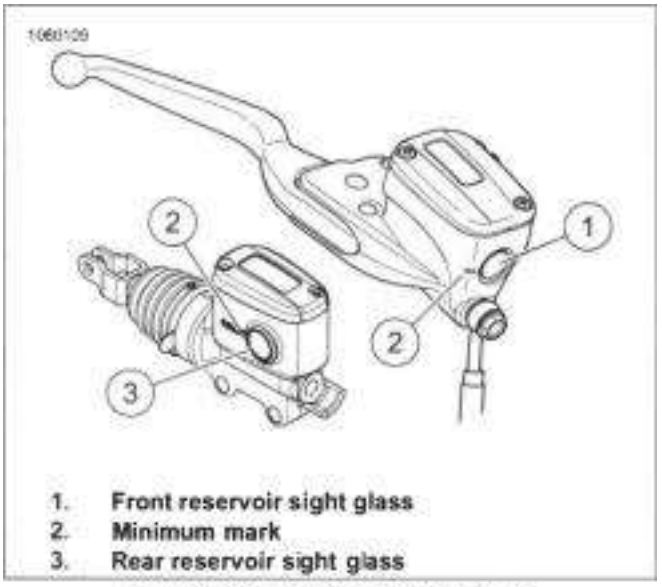
   If master cylinder reservoir cover was removed. Tighten.

   a. Front:

   Torque: 9-18 **in-lbs** (1-2 N-m) ***Brake master cylinder; front, reservoir cover screws***

   b. Rear:

   Torque: 9-18 **in-lbs** (1-2 N-m) ***Brake master cylinder; rear; reservoir cover screws***
5. Verify front brake hand lever and rear brake foot pedal have a firm feel when applied. If brakes are not firm, the brake system must be bled. See BLEED BRAKES (Page 3-61).



1. Front reservoir sight glass
2. Minimum mark
3. Rear reservoir sight glass

Figure 2-20. Brake Fluid Reservoirs

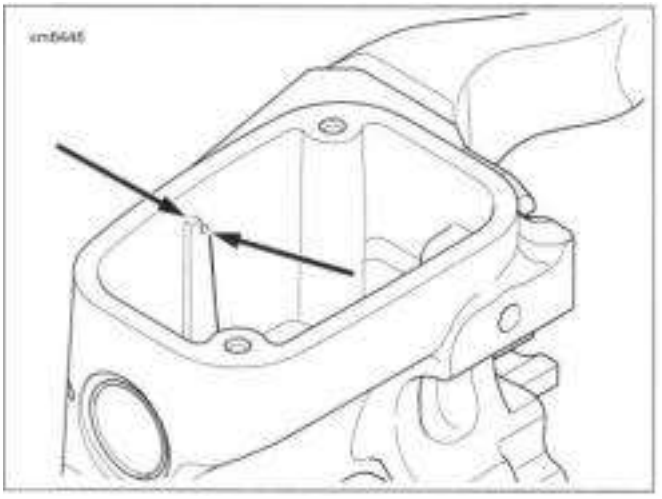


Figure 2-21. Front Master Cylinder Fill Level

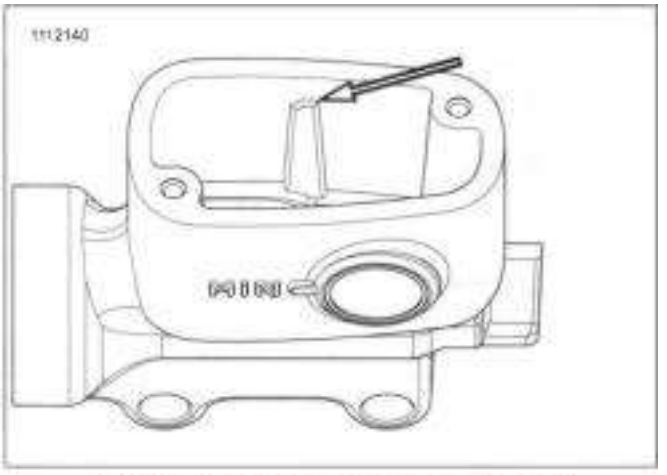


Figure 2-22. Rear Master Cylinder Fill Level

DRAIN AND REPLACE FLUID

For this scheduled maintenance procedure, see BLEED BRAKES (Page 3-61).

CHECK AND ADJUST CLUTCH

CHECK AND ADJUST

FASTENER	TORQUE VALUE	
Clutch hub jamnut	72-120 in-lbs	8.1-13.6 N-m

Adjust

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

2. See Figure 2-23. Access two piece clutch cable.

   a. Remove spring clip (1).

   b. Slide cover (2) up.

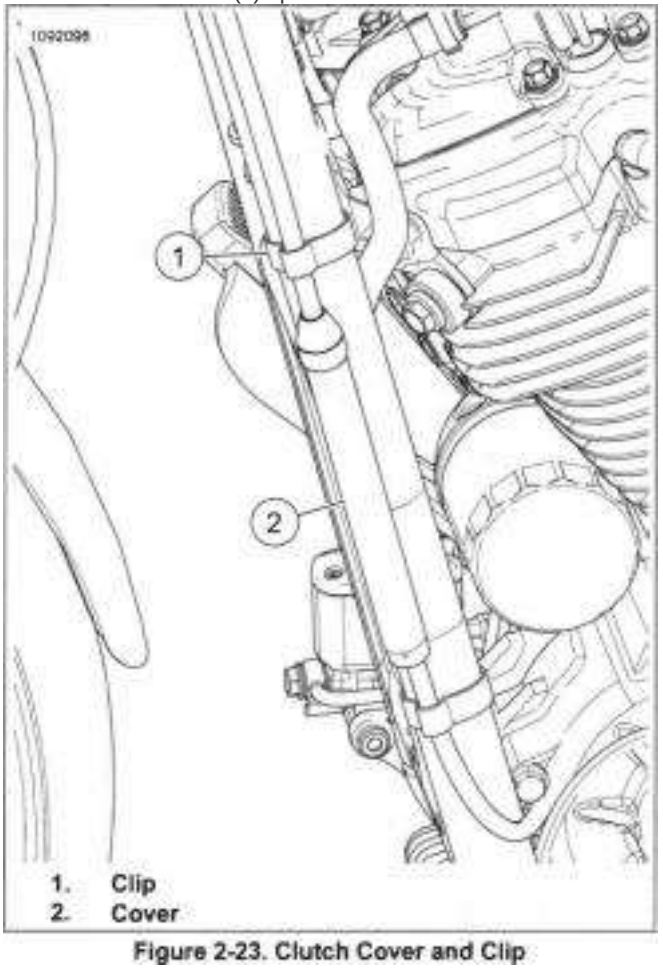


Figure 2-23. Clutch Cover and Clip

3. See Figure 2-24. Identify upper clutch cable (1) and red lock button (2).

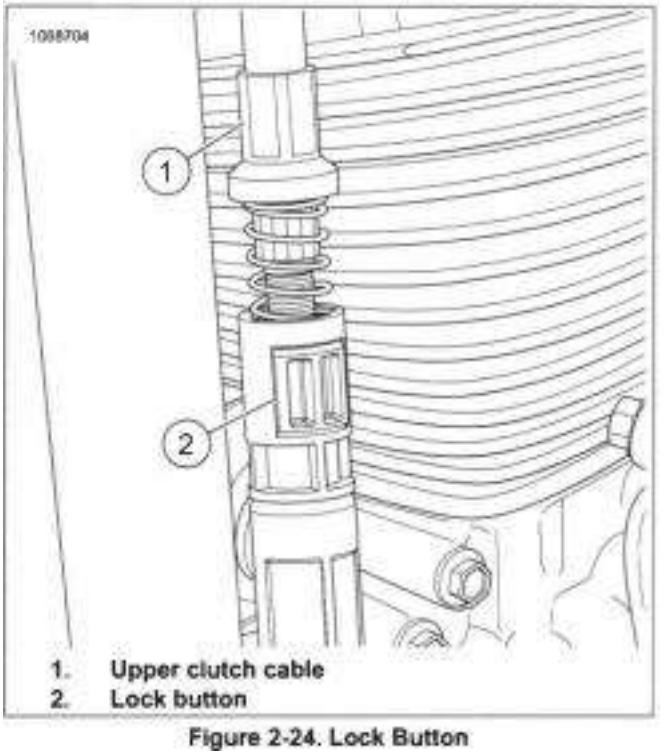


Figure 2-24. Lock Button

4. ***NOTE***

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

See Figure 2-25. Unlock upper clutch cable (1).

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

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

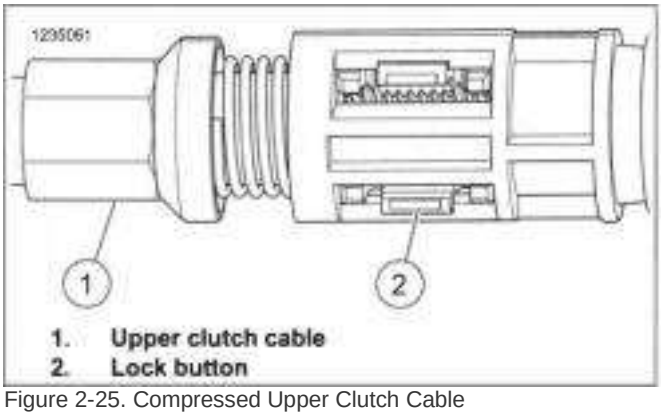


Figure 2-25. Compressed Upper Clutch Cable

6. ***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.

Adjust clearance at hub.

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

b. See Figure 2-26. 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: 72-120 **in-lbs** (8.1-13.6 N-m) ***Clutch hub jamnut***

e. Secure clutch inspection cover. Tighten in sequence. See REPLACE PRIMARY CHAINCASE LUBRICANT

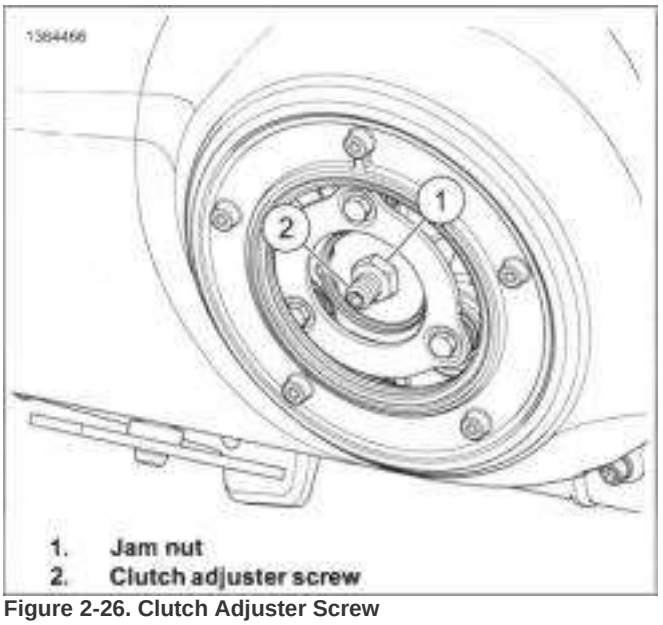


Figure 2-26. Clutch Adjuster Screw

(Page 2-9).

7. See Figure 2-27. Ensure clutch lever is in full open position and that ferrule (1) is correctly seated in housing.

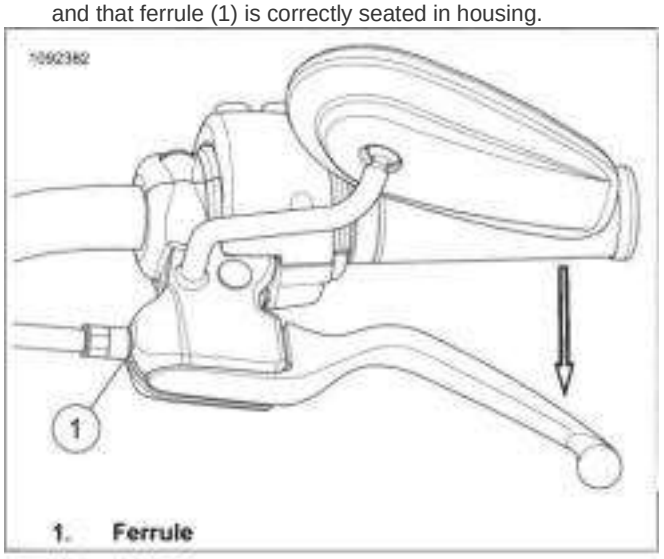


Figure 2-27. Clutch Lever

8. See Figure 2-25. Disengage lock button (2) allowing upper clutch cable spring (1) to set free-play at clutch lever.

9. ***NOTE***
Inspect lock button (2). Replace if damaged.
Push in lock button (2).

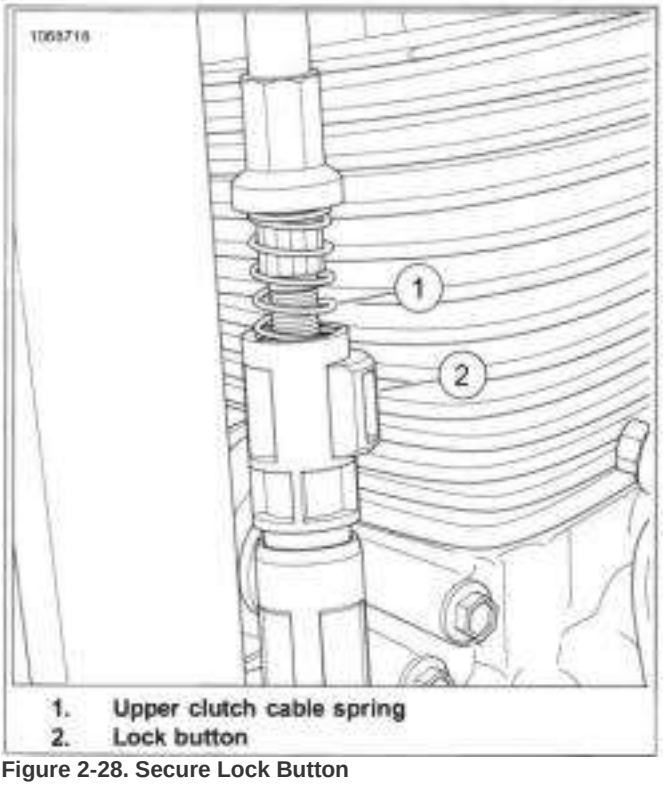


Figure 2-28. Secure Lock Button

10. See Figure 2-29. Spring force is sufficient to ensure correct system freeplay.

a. Check free-play (4) at clutch lever.

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

11. Check clutch operation.

12. See Figure 2-23. Slide cover down and reinstall spring clip **(1**).

Clutch Cable Only Check

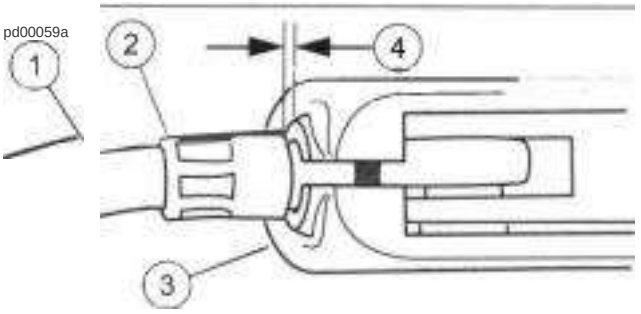
1. Rotate front wheel straight ahead.

2. See Figure 2-29. Check free play.

a. Pull clutch cable ferrule (2) away from clutch lever bracket (3).

b. Check free play (4) dimension. Refer to Table 2-9.

c. Adjust clutch. See Adjustment in this section.



1. **Clutch cable Cable**
2. **ferrule Clutch lever**
3. **bracket Free play**
4. **Figure 2-29. Clutch Cable Free Play**

Table 2-9. Clutch Cable Free Play

ITEM	DIMENSION
Free play dimension	1/16--% in (1.6--3.2 mm)

REBUILD FRONT FORK AND REPLACE OIL

REBUILD AND REPLACE FORK OIL

For this scheduled maintenance procedure, see FRONT FORK (Page 3-65).

PREPARE

1. Support motorcycle upright with front wheel suspended and vehicle level.

2. Remove all accessory weight from front of motorcycle. a.

   Remove windshield if equipped.

3. Move forks from stop to stop to check for smooth operation. Rough operation indicates damaged bearings. See STEERING HEAD (Page 3-78).

4. Grasping both forks near the front axle, pull forks to front then push to rear.

   a. If a clunk is felt, perform **Adjust in ADJUSTMENT CHECK.**

CHECK AND ADJUST

FASTENER	TORQUE VALUE	
Fork stem pinch bolt -	16-20 ft-lbs	21.7-27.1 N-m
Lower fork bracket pinch bolt	16-20 ft-lbs	21.7-27.1 N-m

Measure

1. Perform test.

   a. Move handlebars from left to right steering stops three times, ending at full left steering stop.

   b. Using a 0-25 lb pull force scale with a peak hold feature, pull from the inside diameter of the front axle until the front end is straight.

NOTE

See Figure 2-30. While pulling, keep scale parallel to front tire and perpendicular to fork leg.

Be sure to pull slowly without tugging the scale.

   c. Repeat steps a and b until the peak force value becomes consistent.

2. If peak force value is not within specification, adjust the fork stem bolt. Refer to Table 2-10.

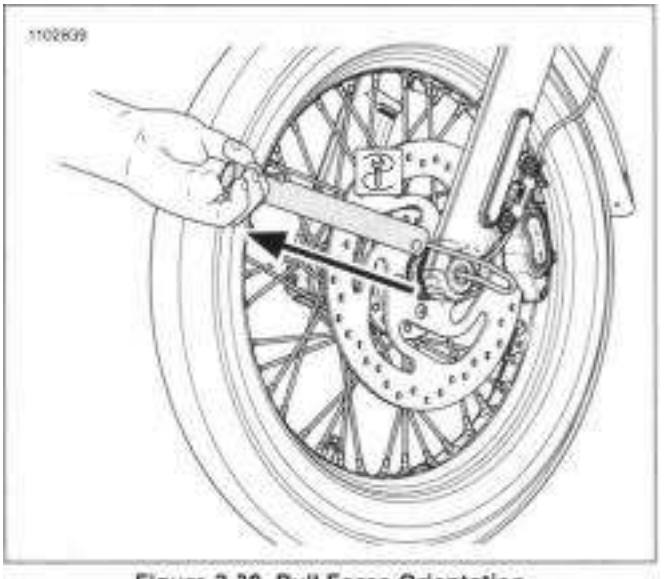


Figure 2-30. Pull Force Orientation

Table 2-10. Pull Force Specifications

MODEL	MINIMUM	MAXIMUM
FXFBS	3 lb	7 lb
FXBBS,FXST	4lb	8lb
FXLRS,FXLRST	6 lb	9lb
FLSB,FLFBS,FLHCS	7lb	11 lb
FXBRS	10 lb	14lb

Adjust

1. FLHCS: Remove rear headlight nacelle panels. See HEADLAMP NACELLE (Page 3-96)

2. **FXBBS, FXBRS, FXST:** Remove handlebars. See HANDLEBAR (Page 3-109)

3. See Figure 2-31. Loosen fork stem pinch bolt (2).

4. Loosen upper fork bracket pinch bolts (3).

5. Adjust fork stem bolt (1).
   a. If pull force dimension is more than the maximum, loosen the fork stem bolt.

   b. If pull force dimension is less than the minimum, tighten the fork stem bolt.

6. Tighten fork stem pinch bolt (2).

   Torque: 16-20 ft-lbs (21.7-27.1 N-m) ***Fork stem pinch bolt***

7. Tighten upper fork bracket pinch bolts (3).

   Torque: 16-20 ft-lbs (21.7-27.1 N-m) ***Lower fork bracket pinch bolt***

8. **FXBBS, FXBRS, FXST:** Install handlebars. See HANDLEBAR (Page 3-109)

9. FLHCS: Install rear headlight nacelle panels. See HEADLAMP NACELLE (Page 3-96)

10. Repeat measure and adjust as needed.

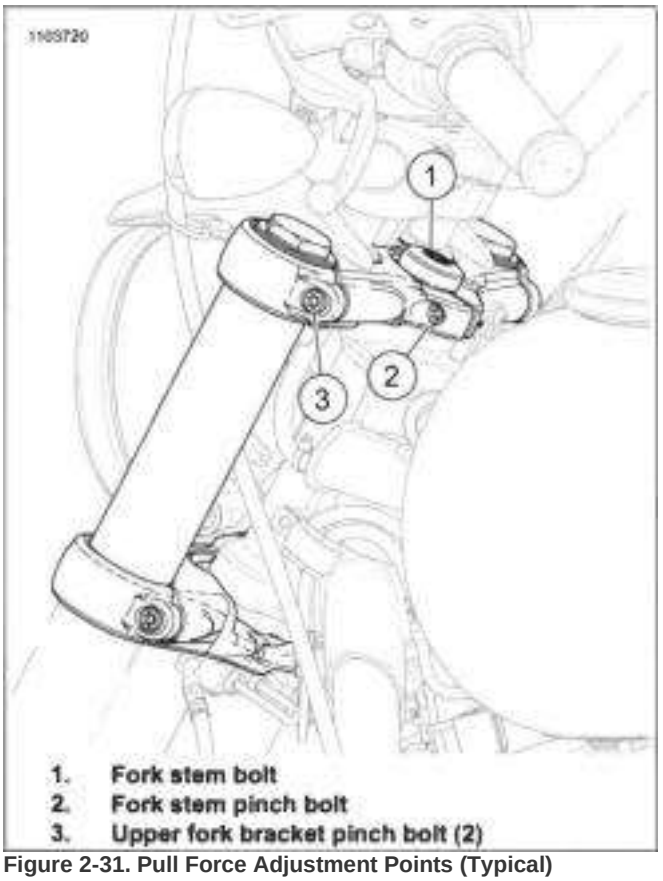


Figure 2-31. Pull Force Adjustment Points (Typical)

LUBRICATE

1. Disassemble the steering head assembly and lubricate the tapered roller bearings with SPECIAL PURPOSE GREASE. See STEERING HEAD (Page 3-78)

COMPLETE

1. Lower motorcycle.

2. Replace all items removed in prepare.

INSPECT FUEL LINES AND FITTINGS

2.15

INSPECT

For this scheduled maintenance procedure, see FUEL LINE (Page 6-13).

INSPECT AND LUBRICATE JIFFY STAND

2.16

INSPECT AND LUBRICATE

For this scheduled maintenance procedure, see JIFFY STAND (Page 3-140).

INSPECT

General

A 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 2-32. 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.

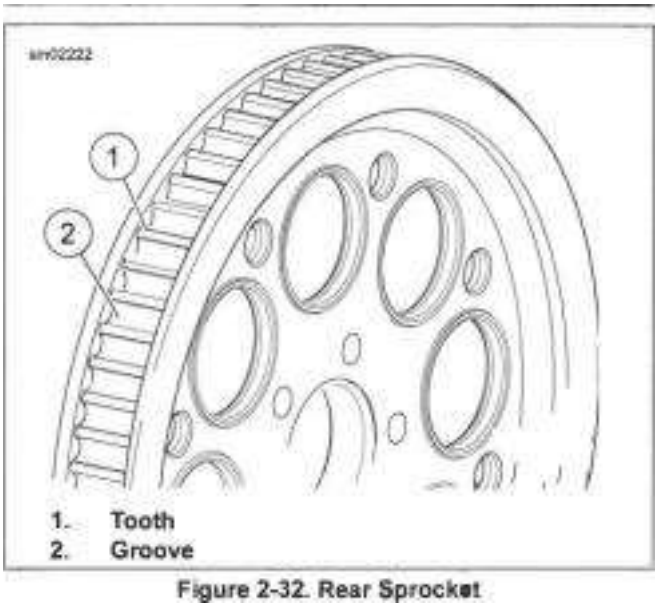


Figure 2-32. Rear Sprocket

Drive Belt

See Figure 2-33 and Refer to Table 2-11. 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 exist:.
- 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.

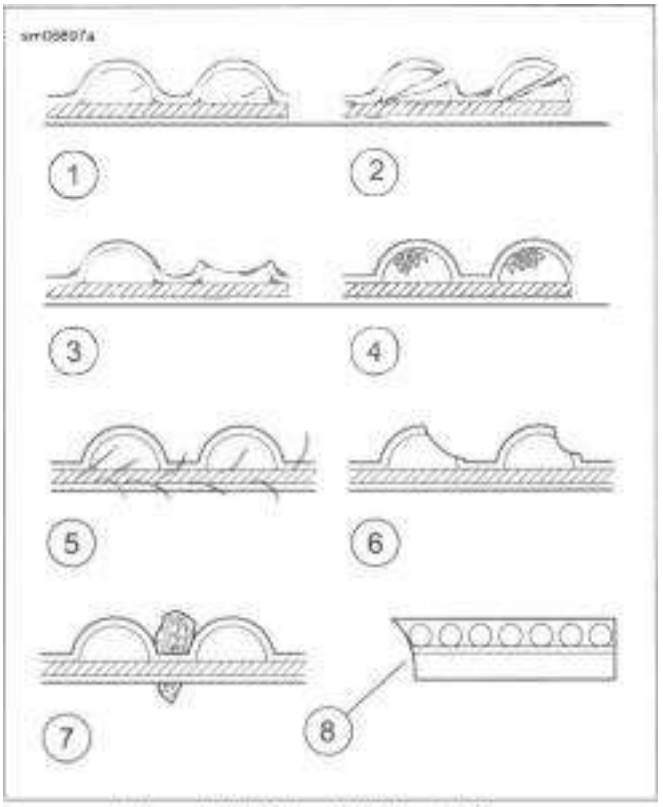


Figure 2-33. Drive Belt Wear Patterns

Table 2-11.

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"ljumping a tooth) which causes tensile cord crimping and breakage.

Check deflection:

- With transmission in neutral.
- With motorcycle at ambient temperature.
- With motorcycle upright or on jiffy stand with rear wheel on the ground.

A WARNING

- With the vehicle unladen: no rider, no luggage and empty saddlebags.

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 TOWER DISCONNECT (Page 7-7).
2. Shift transmission to neutral.

NOTE

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

3. See Figure 2-34. Measure belt deflection using BELT TENSI GAUGE (PART NUMBER: HD-35381-A):
   a. Slide O-ring (4) to zero mark (3).
   b. **Models equipped with belt deflection window:** Fit belt cradle (2) against bottom of drive belt in line with belt deflection window.
   c. **All other models:** Fit belt cradle (2) against bottom of drive belt hafvay between drive pulleys.
   d. Press upward on knob (6) until O-ring slides down to 10 lb (4.54 kg) mark (5) and hold steady.
4. Measure belt deflection:
   a. **Models equipped with belt deflection window:** See Figure 2-35. Measure belt deflection as viewed through belt deflection viewing window while holding gauge steady. Each deflection graduation is approxiately 1/16 in (1.6 mm).
   b. **All other models:** See Figure 2-36. Measure amount of deflection (4) while holding gauge steady.

NOTE

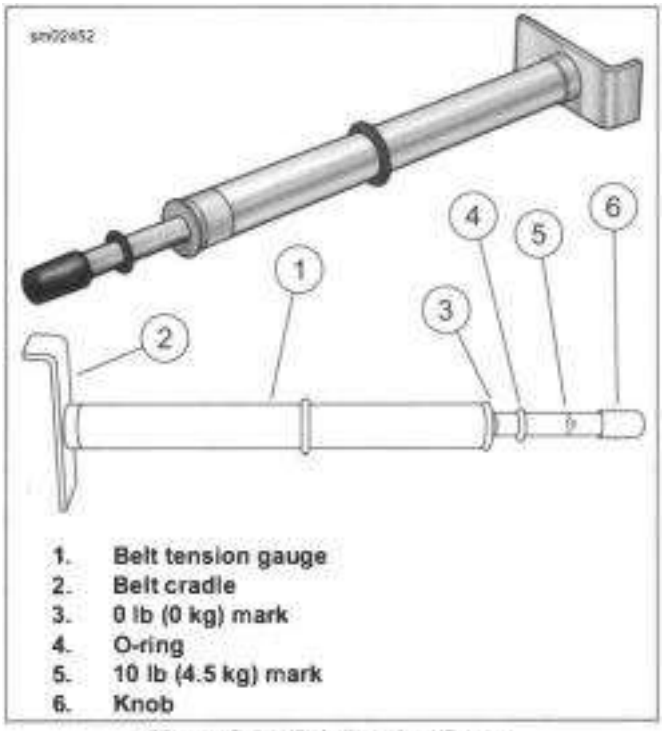
Service belt tension specification is for belts with more than 1000 mi (1,600 km). Set belt to new belt tension specification if the belt has less than 1000 mi (1,600 km).

5. Compare with specifications. Refer to Table 2-12. If not within specifications, see a Harley-Davidson dealer.
6. Install main fuse.

Table 2-12. Drive Belt Deflection

MODEL	DEFLECTION (1)	
	in	mm
Service belt tension	1/2-9/16	12.7-14.2
New belt tension	3/16-1/2	4.7-12.7

(1) Deflection measured at 10 lb (4.5 kg) tension.



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

Figure 2-34. Belt Tension Gauge

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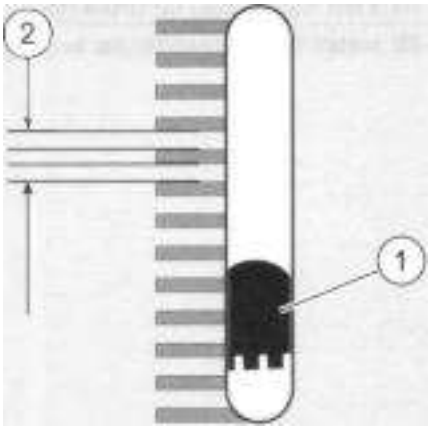
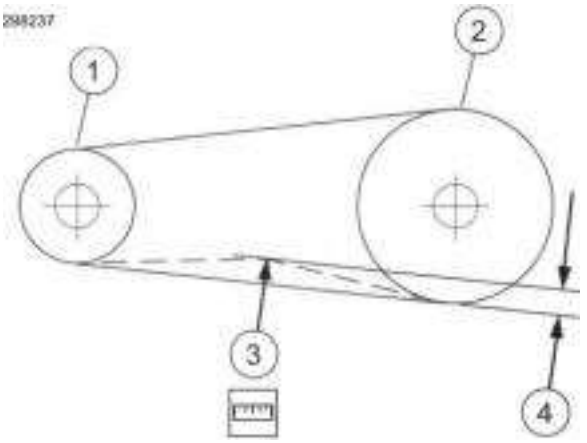


1. Drive belt
2. Deflection graduations (Approx: 1.5 mm (1/16-in)

Figure 2-35. Belt Deflection Window



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

Figure 2-36. Checking Belt Deflection

ADJUSTBELT

PART NUMBER	TOOL NAME
HD-47925	AXLE NUT TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Axle nut, rear	95-105 ft-lbs	128.8--142.4N-m

Screw Style:

1. See Figure 2-37. Loosen rear axle nut (2).

2. Adjust drive belt deflection.

   a. Screw style: Turn axle adjusters (3) an equal amount.

   b. Keep wheel aligned until specification is achieved.

3. ***NOTE***
See Figure 2-38. To tighten rear axle nut without removing exhaust, use AXLE NUT TORQUE ADAPTER (PART NUMBER: HD-47925).

   Tighten axle nut (2).

   Torque: 98--105 ft-lbs (128.8-142.4 N-m) ***Axle nut, rear***

4. Install E-clip (1).

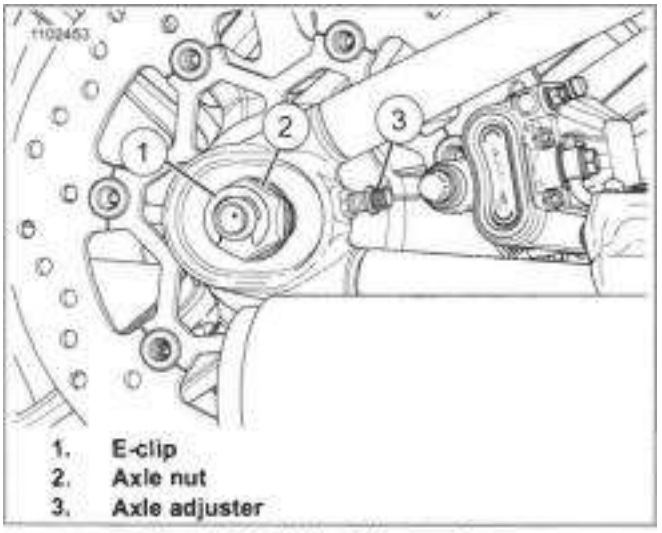
5. Verify rear wheel alignment. See WHEEL ALIGNMENT (Page 3-33).

6. Verify drive belt deflection.

A WARNING

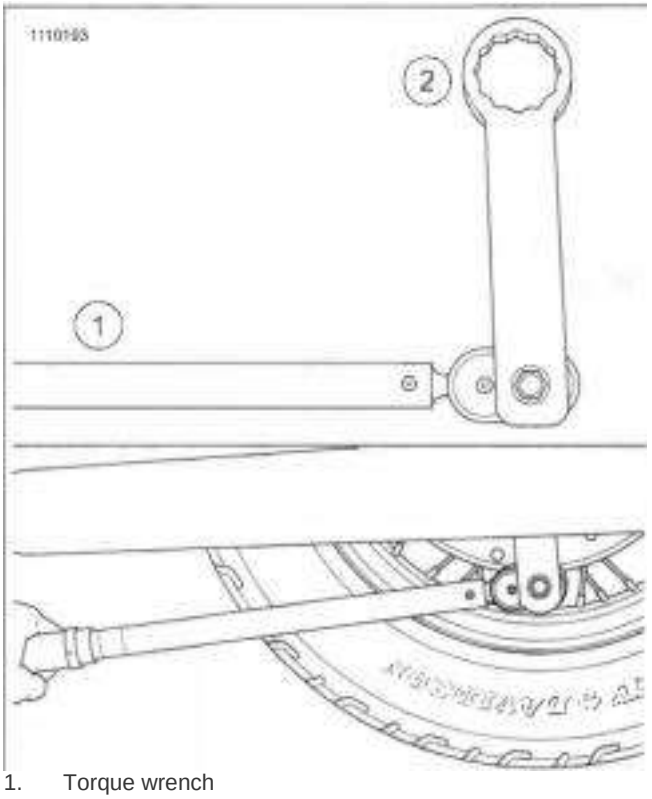
Check wheel bearing end play after tightening axle nut to specified torque. Excessive end play can adversely affect stability and handling and can cause loss of control, which could result in death or serious injury. (00285b)

7. Check wheel bearing end play. See SEALED WHEEL BEARINGS (Page 3-25).



1. E-clip
2. Axle nut
3. Axle adjuster

Figure 2-37. Axle Adjuster: Screw



1. Torque wrench
2. Axle nut torque adapter (HD-4792

Figure 2-38. Install ToolPerpend icularto Torque Wrench

ADJUST SHOCK ABSORBER

PART NUMBER	TOOL NAME
14900102	SPANNER WRENCH KIT

Calculate Preload Setting

A WARNING

Do not exceed the motorcycle's Gross Vehicle Weight Rating (G^WR) 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)

Adjust suspension to suit load conditions, riding style and personal comfort. Increase preload to accommodate the total load. Reduce the preload if carrying less weight. Do not exceed maximum GVWR or GAWR when loading.

NOTE

To determine the motorcycle configuration check the model character stamped on the VIN. See Vehicle Identification Number (VIN) (Page 3-10).

1. Add the weight of the rider to the total weight of the passenger and/or cargo to Identify the proper preload setting.

   a. Fat Boy 114 (FLFBS):

      Refer to Table 2-13.

   b. Heritage Classic (FLHCS):

      Refer to Table 2-14.

   c. Sport Glide (FLSB):

      Refer to Table 2-15.

   d. Street Bob 114 (FXBBS), Softail Standard (FXST)

      Refer to Table 2-16.

   e. Breakout 114 (FXBRS):

      Refer to Table 2-17.

   f. Fat Bob 114 (FXFBS):

      Refer to Table 2-18.

   g. Low Rider S (FXLRS):

      Refer to Table 2-19.

   h. Low Rider ST (FXLRST):

      Refer to Table 2-20.

Table 2-13. Suspension Preload Table: Fat Boy 114 (FLFBS)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		0	0.5	1	1.5	2	2 5	3	3.5	4	4
180	82		0.5	1	1.5	2	2.5	3	3	3.5	4	4,5
200	91		1	1.5	2	2	2.5	3	3.5	4	4.5	5
220	100		1	1,5	2	2.5	3	3.5	4	4.5	5	5
240	109		1.5	2	2.5	3	3.5	4	4	4.5	5	5
260	118		2	2.5	3	3	3.5	4	4.5	5	5	5
280	127		2	2,5	3	3.5	4	4 5	5	5	5	NA
300	136		2.5	3	3 5	4	4.5	5	NA	NA	NA	NA

Table 2-14. Suspension Preload Table: Heritage Classic (FLHCS)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	00°
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		0.5	1	1.5	2	2,5	3	3,5	4	4,5	5
180	82		1	1.5	2	2.5	3	3	3.5	4	4.5	5
200	91		1	1.5	2	2.5	3	3.5	4	4.5	5	5
220	100		1.5	2	2.5	3	3.5	4	4.5	5	5	5
240	109		2	2,5	3	3,5	4	4 5	4,5	5	5	5
260	118		2	2.5	3	3.5	4	4 5	5	5	5	NA
280	127		2.5	3	3.5	4	NA	NA	NA	NA	NA	NA
300	136		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-15. Suspension Preload Table: Sport Glide (FLSB)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload **Setting**									
160	73		1	1.5	2	2.5	3	3.5	4	4.5	5	5
180	82		1	1.5	2	2.5	3	3.5	4	4.5	5	5
200	91		1.5	2	2.5	3	3.5	4	4.5	5	5	5
220	100		2	2.5	3	3.5	4	4.5	5	5	5	5
240	109		2.5	3	3.5	4	4.5	5	5	5	5	5
260	118		2.5	3	3 5	4	4.5	5	5	5	5	5
280	127		3	3.5	4	4 5	5	5	5	5	5	5
300	136		3.5	4	4 5	5	5	5	5	5	5	NA

Table 2-16. Suspension Preload Table: Street Bob 114 (FXBBS), Softail Standard (FXST)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		1	1	2	3	4	5	6	7	7	7
180	82		1	2	3	4	5	6	6	7	7	7
200	91		2	3	4	4	5	6	7	7	7	7
220	100		2	3	4	5	6	7	7	7	7	7
240	109		3	4	5	6	7	7	7	7	7	7
260	118		4	5	5	6	7	7	7	7	7	7
280	127		4	5	6	7	7	7	7	7	7	7
300	136		5	6	7	7	7	7	7	7	7	7

Table 2-17. Suspension Preload Table: Breakout 114 (FXBRS)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		0	0	0.5	1	1.5	2	2.5	3	35	4
180	82		0	0.5	1	1.5	2	2.5	3	3	3.5	4
200	91		0.5	1	1	1.5	2	2.5	3	3.5	4	4.5
220	100		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
240	109		1	1.5	2	2.5	3	3 5	4	4.5	4.5	5
260	118		1.5	2	2.5	3	3	3.5	4	4.5	5	5
280	127		1.5	2	2.5	3	3.5	4	4.5	5	5	5
300	136		2	2.5	3	3.5	4	4.5	5	5	5	5

Table 2-18. Suspension Preload Table: Fat Bob 114 (FXFBS)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		0	0	0.5	1	1 5	2	2.5	3	3.5	4
180	82		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5
200	91		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5
220	100		0.5	1	1 5	2	2.5	3	3.5	4	4.5	NA
240	109		1	1 5	2	2.5	3	3.5	4	NA	NA	NA
260	118		1.5	2	2.5	3	NA	NA	NA	NA	NA	NA
280	127		1.5	2	NA	NA	NA	NA	NA	NA	NA	NA
300	136		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-19. Suspension Preload Table: Low Rider S (FXLRS)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		0	0	0.5	1	1.5	2	2.5	3	3.5	4
180	82		0	0.5	1	1.5	2	2	2.5	3	3.5	4
200	91		0	0.5	1	1.5	2	25	3	3.5	4	4.5
220	100		0.5		1.5	2	2 5	3	3.5	4	4.5	5
240	109		1	1.5	2	2.5	3	3.5	3.5	4	4.5	5
260	118		1	1.5	2	2.5	3	3.5	4	4.5	5	NA
280	127		1.5	2	2.5	3	NA	NA	NA	NA	NA	NA
300	136		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-20. Suspension Preload Table: Low Rider ST (FLXRST)

ADDITIONAL WEIGHT OF PASSENGER, CARGO AND ACCESSORIES												
		LB	0	20	40	60	80	100	120	140	160	180
		KG	0	9	18	27	36	45	54	64	73	82
RIDER WEIGHT												
LB	KG		Preload Setting									
160	73		0 5		1,5	2	2.5	3	3.5	4	4.5	5
180	82		1	1.5	2	2 5	3	3	3.5	4	4.5	5
200	91		1	1.5	2	2.5	3	3.5	4	4.5	5	5
220	100		1.5	2	2 5	3	3.5	4	4,5	5	5	5
240	109		2	2.5	3	3.5	4	45	4.5	5	5	5
260	118		2	2,5	3	3 5	4	4.5	5	5	5	NA
280	127		2.5	3	3,5	4	NA	NA	NA	NA	NA	NA
300	136		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Adjustment

NOTE

Adjust the shock with the motorcycle resting on the jiffy stand.

1. **Cam style:** See Figure 2-39.

   a. Remove seat.

NOTE

The provided spanner wrench is to be assembled before use.

   b. Insert the tang of the SPANNER WRENCH KIT (PART NUMBER: 14900102) in the slots in the rear shock, turn the cam until the indicator (1) points to the appropriate preload setting (2).

2. **Hydraulic external:** See Figure 2-40.

   a. Rotate the adjustment knob clockwise to increase preload setting, or counterclockwise to decrease preload setting until the indicator knob shows the appropriate preload setting on the scale.

3. **Hydraulic under seat:** See Figure 2-41.

   a. Remove seat.

NOTE

The provided spanner wrench is to be assembled before use.

   b. Using the socket end of the SPANNER WRENCH KIT (PART NUMBER: 14900102), rotate adjustment screw clockwise to increase preload setting, or counterclockwise to decrease preload setting until the indicator shows the appropriate preload setting.

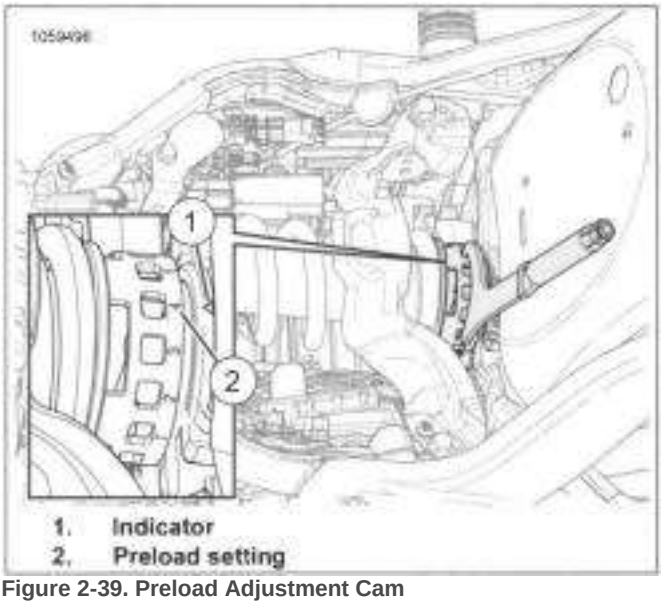


Figure 2-39. Preload Adjustment Cam

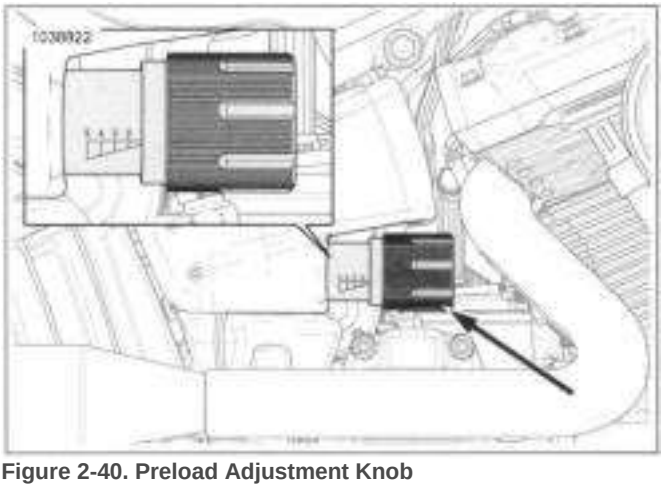


Figure 2-40. Preload Adjustment Knob

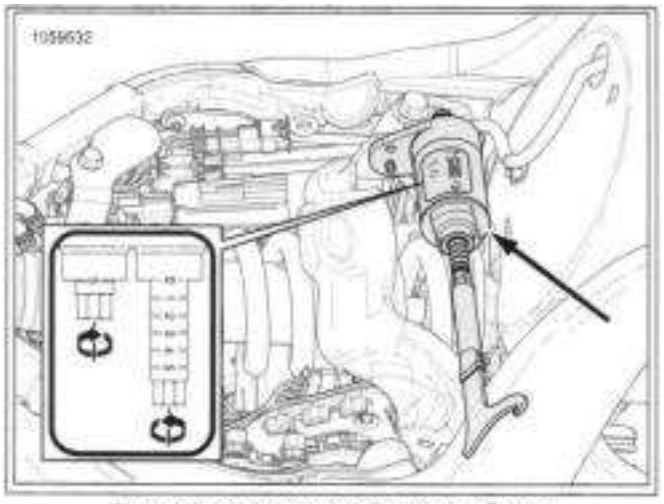


Figure 2-41. Preload Adjustment Screw

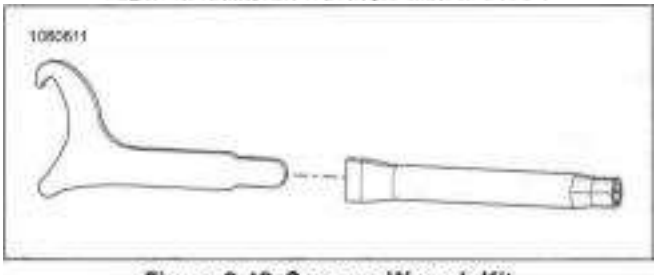


Figure 2-42. Spanner Wrench Kit

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 EXHAUST SYSTEM (Page 6-36). 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 AND INSTALL:. ROUND

FASTENER	TORQUE VALUE	
Air filter cover screw, single screw cover	50-65 in-lbs	5.6-7.3 N-m
Air filter cover screws, five-screw cover	48-72 in-lbs	5.4-8.1 N-m
Air filter element screws, round cover	48-72 in-lbs	5.4-8.1 N-m

REMOVE

1. See Figure 2-43 or Figure 2-44. Remove air filter cover.

a. Remove screws (1).

b. Remove cover (2).

2. Remove filter element.

a. Remove screws (3).

b. Remove filter element (4) while pulling breather tube (5) from element.

INSTALL

1. See Figure 2-43 or Figure 2-44. Install filter element.

a. Install breather tube (5) into filter element (4).

b. Install breather tube onto breather bolts.

c. Install filter element.

d. Install screws (3). Tighten.
Torque: 48-72 in-lbs (5.^^.1 ***Nm)Airfilter element screws, round cover***

2. Verify that rubber seal (6) is properly seated and not damaged.

3. Install air filter cover.

a. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of screw (1).

b. Install cover (2).

c. Single screw cover: Install screw (1). Tighten.
Torque: 50-65 in-lbs (5.6-7.3 N-m) ***Air filter cover screw, single screw cover***

d. Five-screw cover: Install screws (1). Tighten in a star pattern.
Torque: 48-72 in-lbs (5.4-8.1 N-m) ***Air filter cover screws, five-screw cover***

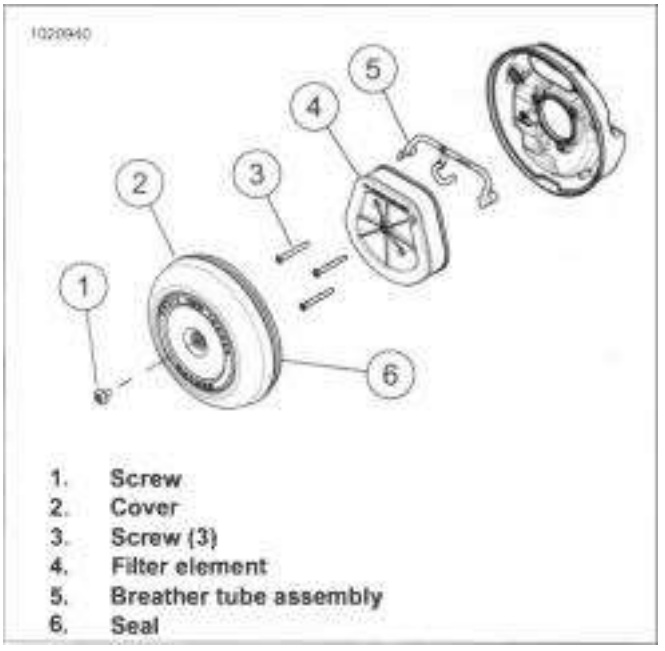
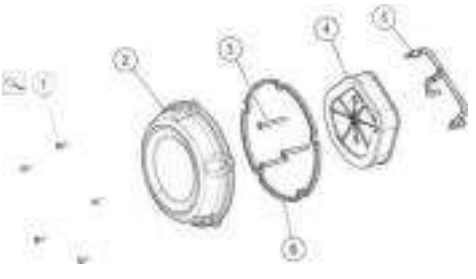


Figure 2-43. Replace Air Filter Element, Single Screw Cover



1. Screw (5)
2. Cover
3. Screw (3)
4. Filter element
5. Breather tube assembly
6. Seal

Figure 2-44. Replace Air Filter Element, Five-Screw Cover

REMOVE AND INSTALL: OVAL

REMOVE

1. Remove rain sock (6), if equipped.

2. Remove air filter trim insert.

a. Remove trim insert screws (1).

FASTENER	TORQUE VALUE	
Air filter cover screws, oval cover	50-60 in-lbs	5.7-6.8 N-m
Air filter trim insert screws	27-32 in-lbs	3-3.6 N-m

b. Remove trim insert (2).

3. Remove cover and filter element.

   a. Remove screws (3).

   b. Remove cover (4).

   c. Clean and inspect the filter element. Replace if necessary.

INSTALL

1. See Figure 2-45. Install cover and filter element.

   a. Install filter element (5).

   b. Install cover (4).

   c. Install screws (3). Tighten.

   Torque: 50-60 in-lbs (5.7-6.8 N-m) ***Air filter cover screws, oval cover***

2. Install air filter trim insert.

   a. Install trim insert (2).

   b. Install trim insert screws (1). Tighten.

   Torque: 27-32 in-lbs (3-3.6 N-m) ***Air filter trim insert screws***

3. Install rain sock (6), if equipped.

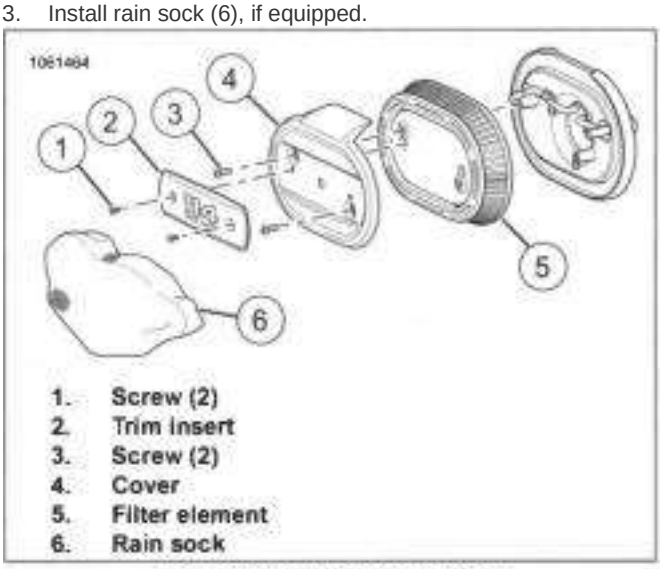


Figure 2-45. Air Cleaner: Oval

REMOVE AND INSTALL: CONE

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

Remove

1. Remove air filter.

   a. See Figure 2-46. Remove screws (1, 2).

   b. Remove cover (4).

   c. Remove air filter element (3).

Install

FASTENER	TORQUE VALUE	
Air filter cover screw, cone	18-24 in-lbs	2-2.7 N-m

1. Install air filter.

   a. See Figure 2-46. Apply threadlocker to screws (1, 2).

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

   b. Install air filter element (3) and cover (4).

   c. Install screws (1, 2). Tighten.

   Torque: 18-24 in-lbs (2-2.7 N-m) ***Air filter cover screw, cone***

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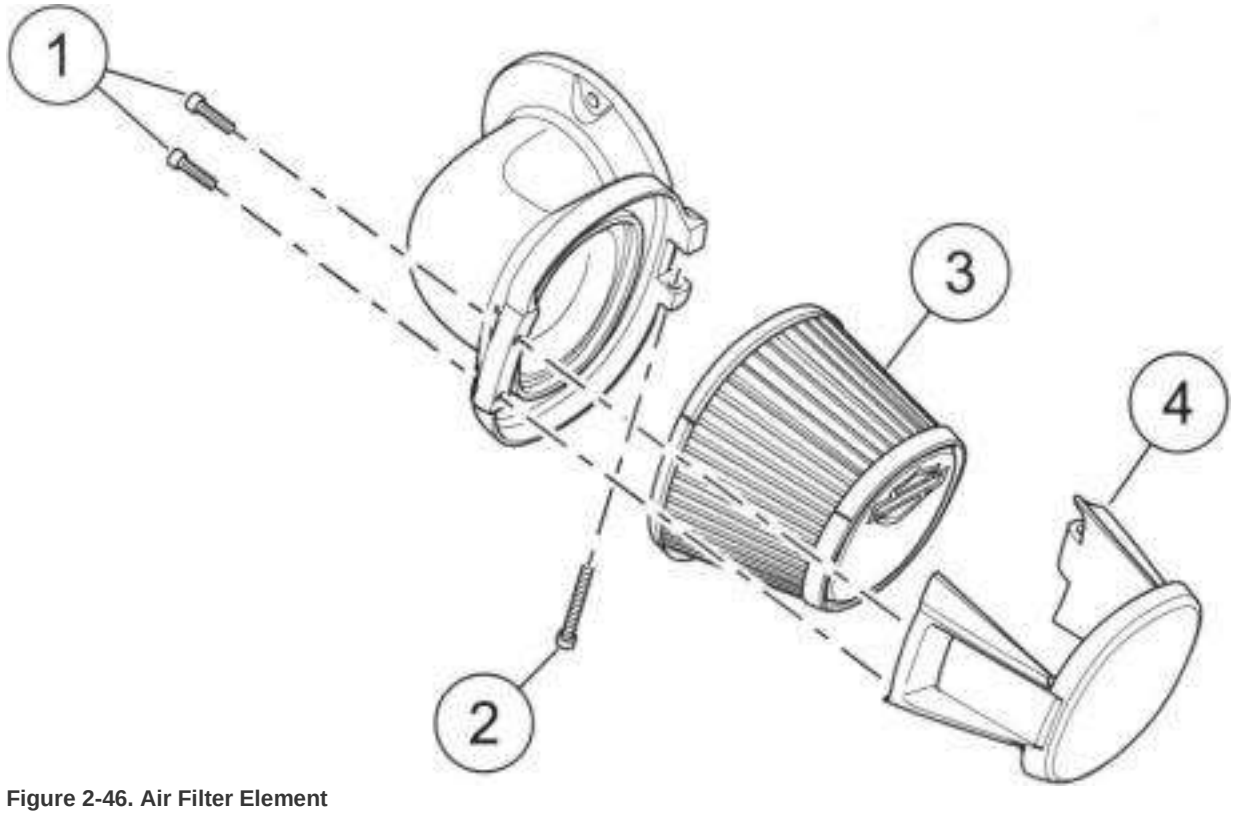


Figure 2-46. Air Filter Element

1. **Screw (2)**
2. **Long Screw**
3. **Air filter element (synthetic)**
4. **Cover**

CLEAN AND INSPECT

1. Remove breather tube from breather bolts.

2. Inspect the breather tube and fittings for damage.

NOTE

- ***Do not strike filter element on a hard surface to dislodge dirt.*** [3]

3. Clean filter element.

a. Wash the filter element and breather tubes in lukewarm water with a mild detergent.

b. **Synthetic element:** Rinse filter element with clean water. The filter element is sufficiently clean when water running from the filter element appears clear.

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

d. **Paper/wire mesh element:** Hold the filter element up to a strong light source. The element is sufficiently clean when light is uniformly visible through the media.

e. Replace the filter element if damaged or if filter media cannot be adequately cleaned.

3 ***Do not use air cleaner filter oil on the Harley-Davidson paper/wire mesh or synthetic air filter element.***

A 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)

PREPARE _ _

1. Remove seat. See SEAT (Page 3-142).

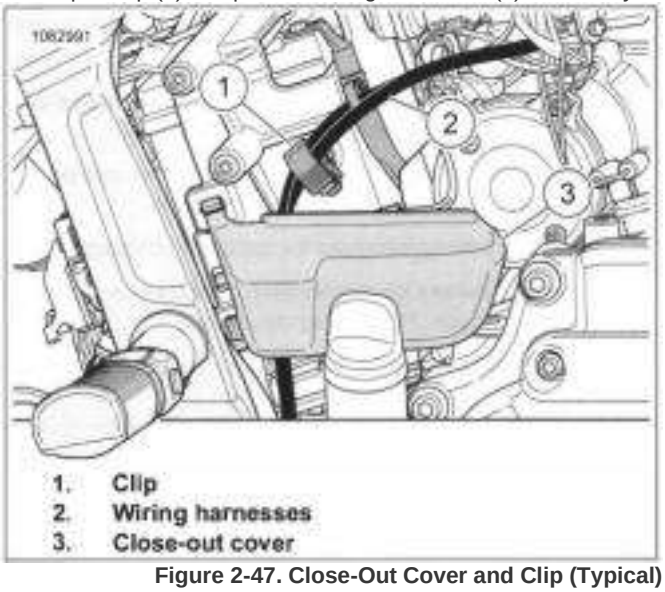
2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).

3. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).

REMOVE

1. See Figure 2-47. Remove close-out cover (3).

2. Open clip (1) and position wiring harnesses (2) out-of-way.



1. Clip
2. Wiring harnesses
3. Close-out cover

Figure 2-47. Close-Out Cover and Clip (Typical)

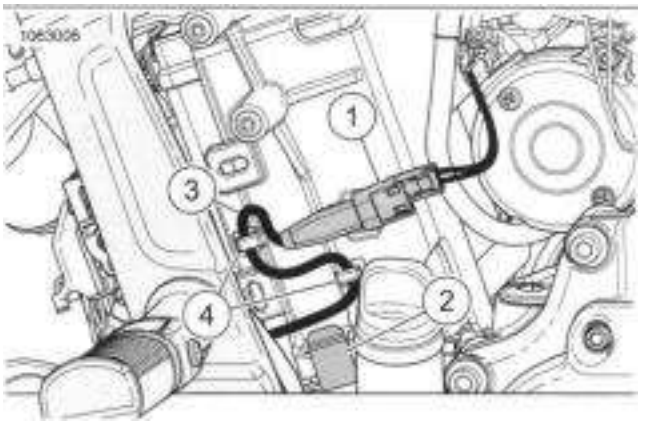
3. See Figure 2-48. Disconnect WSS connector (1).

4. Remove WSS wiring from battery strap.

   a. Remove WSS wiring (3) from battery strap fingers (4).

   b. Slide WSS connector forward and remove from battery strap.

5. Unlock retaining clip (2).



1. **WSS connector**
2. **Retaining clip**
3. **WSS wiring**
4. **Battery strap fingers**

Figure 2-48. WSS and Wiring

6. See See Figure 2-49.. Remove battery strap (3).

   a. Disconnect back tab (2) from battery strap to battery tray (4).

   b. Disconnect front left tab (1) from battery strap to battery tray.

   c. Remove battery strap.

7. Disconnect positive battery cable.

8. **If needed:** Remove engine oil dipstick.

NOTE

Ifdipstick is removed, cover fill hole with tape or clean rag.

9. Remove battery.

   a. Slide battery out and remove.

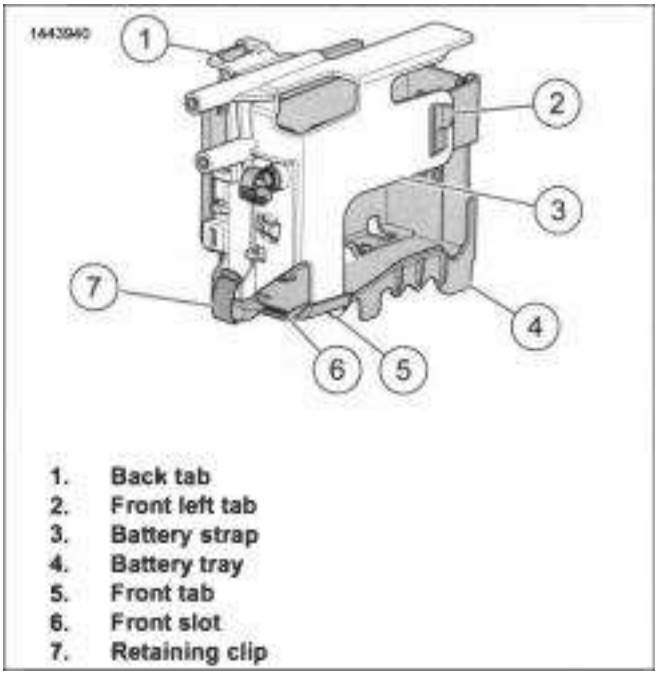


Figure 2-49. Battery Strap and Tray: (Removed for clarity)

INSTALL

FASTENER	TORQUE VALUE
Battery, positive cable, screw	60-70 in-lbs 16.78-7.91 N-m

1. See Figure 2-49. Install battery into battery.

NOTE

- ***Verify battery is under tab on Electronic Control Module (ECM) caddy, upper left corner on back side.***

2. If removed: Install engine oil dipstick.

3. Connect positive battery cable. Tighten.
   Torque 60-70 in-lbs (6.78-7.91 N-m) ***Battery positive cable, screw***

4. Install battery strap (3).

   a. Position battery strap.

   b. Connect front left tab (2) on battery strap to battery tray.

NOTE

Verify front tab (5) is align with battery tray when installing battery strap.

   c. Connect back tab (1) on battery strap to battery tray.

5. Lock retaining clip (9).

6. See Figure 2-48. Install WSS wiring (3) to battery strap.

   a. Side WSS connector (1) rearward into battery strap.
   b. Install WSS wiring into battery strap fingers (4).

7. Connect WSS connector (1).

8. See Figure 2-47. Position wiring harnesses (2) into place and close clip (1).

9. Install close-out cover (3).

NOTE

Verify all close-out tabs are fully set into battery strap.

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 2-21.

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 Vor above:

   a. Perform a battery diagnostic test. See the electrical diagnostic manual for the load test procedure.

Table 2-21. 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

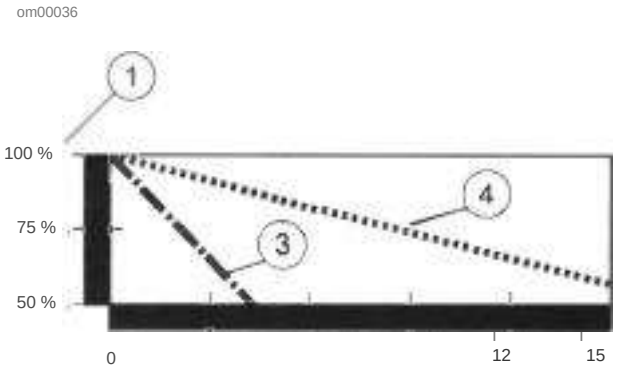
caused by things like diode leakage or maintaining computer memory with the vehicle turned off.

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 negative battery cable. See POWER DISCONNECT (Page 7-7).
2. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Install seat. See SEAT (Page 3-142).

PREPARE

A 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)

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).

A WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

4. Remove fuel tank. See FUEL TANK (Page 6-14).

REMOVE

A WARNING

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

1. See Figure 2-51 . Remove spark plug cables from spark plugs.
2. Thoroughly clean around spark plug base.
3. Remove spark plugs.

CLEAN AND INSPECT

Spark Plugs

NOTE

Discard plugs with eroded electrodes, heavy deposits or cracked insulators.

1. Inspect spark plugs. Compare plug deposits to Table 2-22.

Table 2-22. Spark Plug Deposit Analysis

DEPOSITS	POSSIBLE CAUSE
Wet, black and shiny	Worn pistons Worn piston rings Worn valves Worn valve guides Worn valve seals Weak battery Faulty ignition system
Dry, fluffy or sooty and black	Air-fuel mixture too rich

Table 2-22. Spark Plug Deposit Analysis

DEPOSITS	POSSIBLE CAUSE
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
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.	

Spark Plug Cables

1. Inspect spark plug cables. Replace as necessary.
   a. Check for cracks or loose terminals.
   b. Check for loose fit on ignition coil and spark plugs.
2. Check cable boots/caps for cracks or tears. Replace as necessary.

INSTALL

FASTENER	TORQUE VALUE	
Spark plug	86-108 in-lbs	9.7-12.2 N-m

NOTE

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

1. Verify proper gap before installing new or cleaned spark plugs.
   a. Use a wire-type feeler gauge within specification. Refer to Table 2-23.
   b. Pass the wire gauge between the center and the outer electrodes.
   c. Adjust gap to within specification.
2. Verify that spark plug threads are clean and dry.
3. Install spark plugs. Tighten.
   Torque: 86-108 in-lbs (9.7-12.2 N-m) ***Spark plug***
4. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).

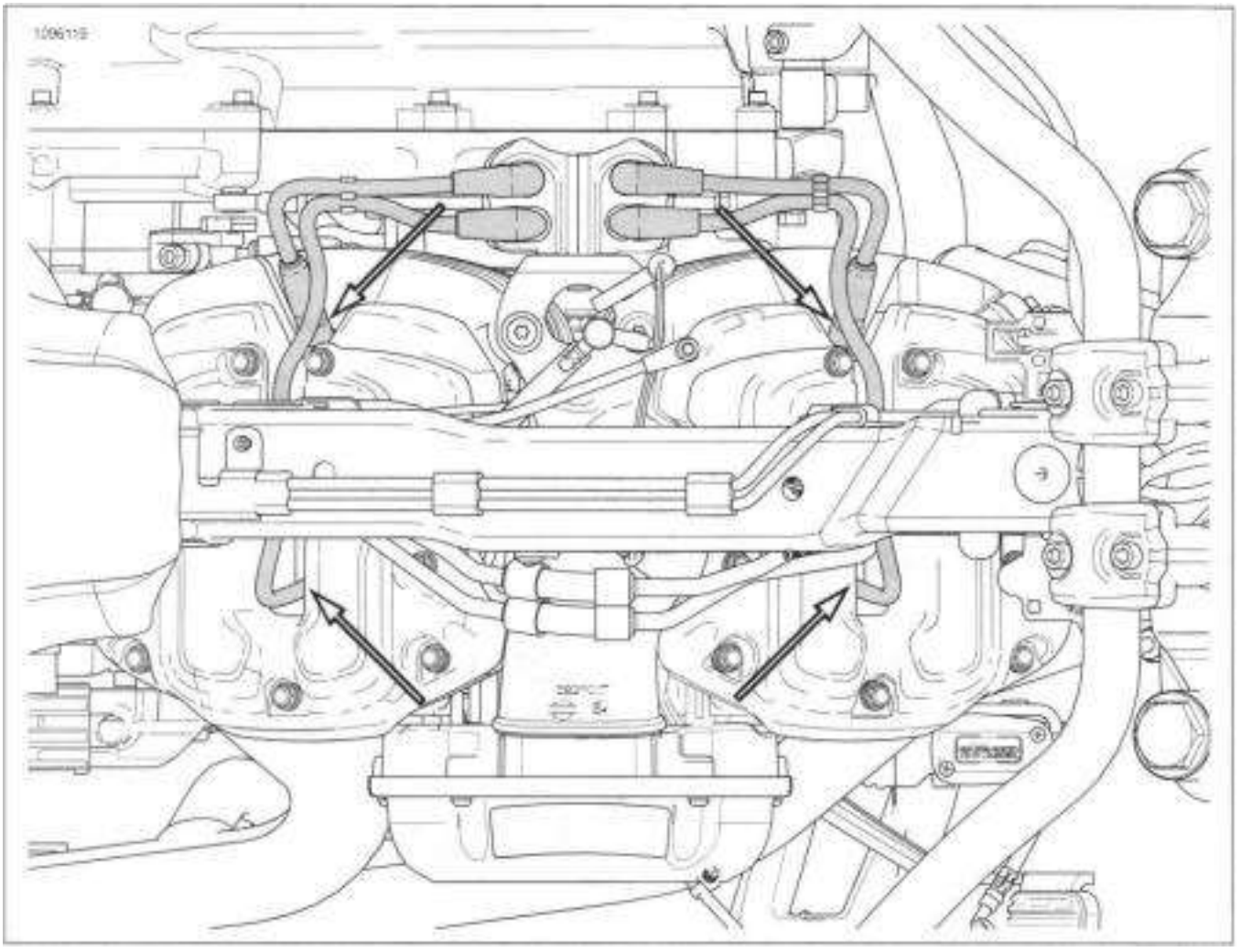


Figure 2-51. Spark Plug Location

Table 2-23. Spark Plug Gap

MODEL	MM	IN
All Models	0.8-0.9	0.031-0.035

COMPLETE

1. Install fuel tank. See FUEL TANK (Page 6-14).
2. Install seat. See SEAT (Page 3-142).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).

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.

PLACE IN STORAGE

A 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 REPLACE ENGINE OIL AND FILTER (Page 2-7).

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

A 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)

A 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 CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
   b. Inject a few squirts of engine oil into each cylinder.
   c. Crank engine for 5-6 revolutions.
   d. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
3. Inspect drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
4. Inspect drive belt and sprockets. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
5. Inspect air cleaner filter. See INSPECT AIR FILTER (Page 2-40).
6. Lubricate controls. See LUBRICATE CABLES AND CHASSIS (Page 2-16).
7. Check tire inflation and inspect tires for wear and/or damage. See 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.

A 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.

A 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)

A 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 INSPECT BATTERY (Page 2-43).
   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)

A 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_____ _____

A 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 INSPECT BATTERY (Page 2-43).
3. Inspect spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).

4. Fill fuel tank, if empty.

5. Start engine. Run until it reaches normal operating temperature.

6. Check engine oil level. See REPLACE ENGINE OIL AND FILTER (Page 2-7).

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

8. Perform all of the checks in the PRE-RIDING CHECKLIST in the owner's manual.

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

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

Engine Turns Over But Does Not Start

1. Less than 1 USgal (3.79 L) of fuel in fuel tank.
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. Follow any current DTC's in order of priority.
8. Ignition timing incorrect due to faulty ignition coil, ECM or sensors.
9. Bank Angle Sensor tripped and ignition not cycled OFF then back to RUN.
10. Manually check fuel pressure to verify it is in specification.
11. Manually check compression and leak down to verify they are in specification.
12. Fuel filter clogged.
13. Sticking or damaged valve(s) or wrong length pushrod(s).
14. 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. Follow any current DTC's in order of priority.
5. Faulty ignition coil, ECM or sensor.
6. Battery nearly discharged.
7. Damaged wire or loose wire connection at ignition coil, battery or ECM connector.
8. Intermittent short circuit due to damaged wire insulation.
9. Water or dirt in fuel system.
10. Fuel tank vent system plugged.
11. Air leak at intake manifold or air cleaner.
12. Loose or dirty ECM connector.
13. Follow any current DTC's in order of priority. Monitor typical scan values of sensors in the Digital Technician to verify performance is in normal parameters.
14. Faulty Sensor(s): Temperature Manifold Absolute Pressure (TMAP), Crank Position (CKP) or Oxygen (02).
15. Incorrect valve timing.
16. Weak or damaged valve springs.
17. Manually check compression and leak down to verify they are in specification.
18. Damaged intake or exhaust valve.
19. 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. Oil cooler dirty.
3. Insufficient air flow over engine.
4. Heavy carbon deposits.
5. Ignition timing retarded due to defective ECM or faulty sensor(s) (TMAP and/or CKP).
6. Leaking valve(s).

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 shoe worn.
8. Cam(s), cam gear(s) or cam bushing(s) worn.
9. Cam timing incorrect.
10. Valve seat loose in cylinder.
11. Cam bearing in crankcase or cam support plate clearance is 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)/pooriy tuned engine.
7. Internal engine problem.
8. Damaged frame.
9. Rear fork pivot shaft fasteners loose.
10. 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. Engine ground wire loose or damaged.
2. Faulty voltage regulator module.
3. Loose or damaged wires in charging circuit.
4. Faulty stator and/or rotor.

Alternator Charge Rate Is Below Normal

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

Speedometer Operates Erratically

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

TRANSMISSION

Shifts Hard

1. Primary chaincase overfilled.
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 damaged/worn.
3. Shifter engaging parts badly worn and rounded.
4. Bent shifter forks .
5. Damaged gears.

Clutch Slips

1. Reservoir overfull.
2. Clutch lever not returning completely.
3. Insufficient clutch spring tension.
4. Worn friction discs.

Clutch Drags Or Does Not Release

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

Clutch Chatters

Friction discs or steel discs worn or warped.

HANDLING

Irregularities

1. Improperly loaded motorcycle. Non-standard equipment on the front end such as heavy radio receivers, extra lighting equipment or luggage tends to cause unstable handling.
2. Damaged tire(s) or improper front-rear tire combination.
3. Irregular or peaked front tire tread wear.
4. Incorrect tire pressure. See SPECIFICATIONS (Page 3-8)
5. Shock absorber not functioning normally.
6. Loose wheel axle nuts. Tighten to recommended torque specification.
7. Rear wheel out of alignment with frame and front wheel.
8. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races.
9. Loose spokes (laced wheel vehicles only).
10. Tire and wheel unbalanced.
11. Rims and tires out-of-round or eccentric with hub.
12. Rims and tires out-of-true sideways.
13. Rear fork pivot-improper torque.
14. Incorrect, non-specified tire(s) mounted on front or rear wheel.

BRAKES

Brake Does Not Hold Normally

1. Brake fluid reservoir low, system leaking or pads worn.
2. Brake system contains air bubbles.
3. Master cylinder/caliper piston seals worn or parts damaged.
4. Brake pads contaminated with grease or oil.
5. Brake pads badly worn.
6. Brake disc badly worn or warped.
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.

NOTES

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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
ABS Module bracket screw	96-119 in-lbs	10.8-13.5 N-m	3.16 ABS MODULE, Install
ABS Module frame screw	96-119 in-lbs	10.8-13.5 N-m	3.16 ABS MODULE, Install
Banjo bolt	21-23 ft-lbs	29-31 N-m	3.17 BLEED BRAKES, Fill and Bleed
Banjo bolt to ABS module	17-19 ft-lbs	23.1-25.8 N-m	3.15 BRAKE LINES, Front ABS Lines
Banjo bolt to ABS module, rear	17-19 ft-lbs	23.1-25.8 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Banjo bolt to ABS module, rear	17-19 ft-lbs	23.1-25.8 N-m	3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
Banjo bolt to brake caliper, rear	21-23 ft-lbs	29-31 N-m	3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
Banjo bolt to master cylinder, rear	21-23 ft-lbs	29-31 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Belt guard, lower screw	70-80 in-lbs	7.9-9 N-m	3.24 BELT GUARDS, Remove and Install: Standard
Belt guard, upper screw	70-80 in-lbs	7.9-9 N-m	3.24 BELT GUARDS, Remove and Install: Standard
Belt guard, upper screw	70-80 in-lbs	7.9-9 N-m	3.24 BELT GUARDS, Remove and Install: Standard
Bleeder screw	35-61 in-lbs	3.9-6.9 N-m	3.17 BLEED BRAKES, Fill and Bleed
Brake caliper, front, bridge bolt	14-18 ft-lbs	19.6-24.5 N-m	3.12 FRONT BRAKE CALIPER, Assemble
Brake line, P-clamp, screw	36-48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Brake Line: Front Master Cylinder (ABS)
Brake line bracket, rear, screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake line bracket, rear, screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
Brake line to caliper, rear, P-clamp screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
Brake line to master cylinder, rear, P-clamp screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake line tube nuts, manifold	128-173 in-lbs	14.5-19.5 N-m	3.15 BRAKE LINES, Brake Line: Front Master Cylinder (ABS)
Brake master cylinder, rear, mounting screws	18-22 ft-lbs	24.4-29.9 N-m	3.13 REAR BRAKE MASTER CYLINDER, Install
Brake master cylinder, reservoir cover screw	9-18 in-lbs	1-2 N-m	3.17 BLEED BRAKES, Fill and Bleed
Brake pedal linkage, mid control, front, screw	15-18 ft-lbs	20.3-24.4 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Brake pedal linkage, mid control, rear, screw	15-18 ft-lbs	20.3-24.4 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Brake pedal pivot, footboard control, screw.	18-22 ft-lbs	24.5-30 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Footboards
Brake pedal pivot, forward control, screw	18-22 ft-lbs	24.4-29.8 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Forward Foot Controls
Brake pedal pivot, mid control, screw	10-14 ft-lbs	13.6-19 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Clutch cable lever screw	60-80 in-lbs	6.8-9 N-m	3.26 CLUTCH CONTROL, Install
ECM caddy small screw	55-60 in-lbs	6.2-6.8 N-m	3.45 FRAME CROSSMEMBER, Install
Fairing, frame mounted, air deflector screws	25-30 in-lbs	2.8-3.4 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Air Deflector

FASTENER	TORQUE VALUE		NOTES
Fairing, frame mounted, air deflector screws	25-30 in-lbs	2.8-3.4 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Fairing, frame mounted, air duct screws	4.5-5.5 in-lbs	0.51-0.62 N-m	3.29 FAIRING: FRAME MOUNTED, Disassemble and Assemble: Inner Fairing Shell
Fairing, frame mounted, bracket screws	48-60 in-lbs	5.4-6.8 N-m	3.29 FAIRING: FRAME MOUNTED, Disassemble and Assemble: Inner Fairing Shell
Fairing, frame mounted, fairing mount to steering head locknut	20-27 ft-lbs	27-37 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing, frame mounted, inner fairing screws	96-144 in-lbs	10.8-16.3 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Shell
Fairing, frame mounted, inner fairing screws	96-144 in-lbs	10.8-16.3 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing, frame mounted, lower mount screws	16-20 ft-lbs	21.7-27.1 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Shell
Fairing, frame mounted, lower mount screws	16-20 ft-lbs	21.7-27.1 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing, frame mounted, lower support screws	48-60 in-lbs	5.4-6.8 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Shell
Fairing, frame mounted, mount screws upper	71-84 in-lbs	8-9.5 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing, frame mounted, outer fairing screws	25-30 in-lbs	2.8-3.4 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Fairing, inner screw	32-40 in-lbs	3.6-4.5 N-m	3.28 FAIRING, Disassemble and Assemble
Fairing, screw-on, inner fairing screws	35-62 in-lbs	4-7 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing, screw-on, lower bracket screws	97-120 in-lbs	11-13.6 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing, screw-on, screws	20-30 in-lbs	2.3-3.4 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing, screw-on, upper bracket screws	35-62 in-lbs	4-7 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing windshield screw	32-40 in-lbs	3.6-4.5 N-m	3.28 FAIRING, Disassemble and Assemble
Footboard assembly, left side, mounting screw	40-45 ft-lbs	54-61 N-m	3.40 LEFT FOOT CONTROLS, Remove and Install: Footboards
Footboard assembly, right side, mounting screw	40-45 ft-lbs	54-61 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Footboards
Foot support bracket, forward control, left side, screw	40-45 ft-lbs	54-61 N-m	3.40 LEFT FOOT CONTROLS, Remove and Install: Forward Foot Controls
Foot support bracket, forward control, right side, screw	40-45 ft-lbs	54.2-61 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Forward Foot Controls
Foot support bracket, left side, screw	40-45 ft-lbs	54.2-61 N-m	3.40 LEFT FOOT CONTROLS, Install
Foot support bracket, mid control, left side, screw	40-45 ft-lbs	54-61 N-m	3.40 LEFT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Foot support bracket, mid control, right side, screw	40-45 ft-lbs	54.2-61 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Fork, left side, inverted, cartridge screw	13-17 ft-lbs	17.5-22.5 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
Fork, right side, inverted, inner fork nut	69-83 ft-lbs	93-113 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
Fork bracket, lower, pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	3.20 FRONT FORK, Install Models with two lower pinch bolts per side: Alternately tighten until specification is met.
Fork bracket, upper, pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	3.20 FRONT FORK, Install
Fork damper tube screw, front	30-37 ft-lbs	40-50 N-m	3.20 FRONT FORK, Disassemble and Assemble: Standard
Fork stem pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install

FASTENER	TORQUE VALUE		NOTES
Fork stem screw, 1st torque	160-168 in-lbs	18.1-19 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork stem screw, final torque - All except FXLRS,FXLRST	62-68 in-lbs	7-7.7 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork stem screw, final torque - FXLRS, FXLRST	110-122 in-lbs	12.4-13.8 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork tube plug, left side, inverted	22-28 ft-lbs	30-40 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
Fork tube plug, right side, inverted	22-30 ft-lbs	30-40 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
Fork tube plug, standard	22-59 ft-lbs	30-80 N-m	3.20 FRONT FORK, Disassemble and Assemble: Standard
Fork tube plug to damper nut, left side, inverted	13-16 ft-lbs	17.5-22.5 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
Fork tube plug to damper nut , right side, inverted	13-16 ft-lbs	17.5-22.5 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
Frame crossmember mounting screws	17-20 ft-lbs	23.1-27.1 N-m	3.45 FRAME CROSSMEMBER, Install
Front ABS brake line P-clamp screw	36-48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Front ABS Lines
Front ABS brake line to front brake line	128-173 in-lbs	14.5-19.5 N-m	3.15 BRAKE LINES, Front ABS Lines
Front brake caliper banjo bolt	14-18 ft-lbs	19-24.4 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper bleeder screw	35-61 in-lbs	3.9-6.9 N-m	3.12 FRONT BRAKE CALIPER, Assemble
Front brake caliper bridge bolt	14-18 ft-lbs	19.6-24.5 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper mounting bolts	28-38 ft-lbs	38-51.5 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper mounting bolts	28-38 ft-lbs	38-51.5 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper mounting bolts	28-38 ft-lbs	38-51.5 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake disc screw	16-24 ft-lbs	22-33 N-m	3.4 FRONT WHEEL, Assemble
Front brake line screw	36-48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Front Brake Line: Non-ABS
Front brake line screw	36-48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Brake Line: Front Caliper (ABS)
Front brake master cylinder banjo bolt - Dual disk front brake	24-25 ft-lbs	32-34 N-m	3.11 FRONT BRAKE MASTER CYLINDER, Install
Front brake master cylinder banjo bolt - Single disk front brake	21-23 ft-lbs	29-31 N-m	3.11 FRONT BRAKE MASTER CYLINDER, Install
Front fender mounting screw, FXBBS/FXST	16-21 ft-lbs	22-28 N-m	3.34 FRONT FENDER, Install
Front fender mounting screw, FXFBS	72-96 in-lbs	8.1-10.8 N-m	3.34 FRONT FENDER, Install
Front fender mounting screw, FXLRS/FXLRST	72-96 in-lbs	8.1-10.8 N-m	3.34 FRONT FENDER, Install
Front fender mounting screw (typical)	16-21 ft-lbs	22-28 N-m	3.34 FRONT FENDER, Install
Front fender side trim nut	10-15 in-lbs	1.1-1.7 N-m	3.34 FRONT FENDER, Assemble
Front fender to bracket screw, FXFBS	36-48 in-lbs	4.1-5.4 N-m	3.34 FRONT FENDER, Install
Front fork bottom mount pinch bolt	11-15 ft-lbs	15-20 N-m	3.4 FRONT WHEEL, Install
Front fork side mount pinch bolt	21-25 ft-lbs	28-34 N-m	3.4 FRONT WHEEL, Install
Front licence plate clamp bracket screws	1-1 ft-lbs	1.1-1.7 N-m	3.38 FRONT LICENSE PLATE BRACKET, Install
Front licence plate one hole bracket screw	25-30 ft-lbs	34-40.7 N-m	3.38 FRONT LICENSE PLATE BRACKET, Install
Front licence plate two hole bracket screws	16-20 ft-lbs	21.7-27 N-m	3.38 FRONT LICENSE PLATE BRACKET, Install
Front wheel axle	70-75 ft-lbs	94.9-101.6 N-m	3.4 FRONT WHEEL, Install

FASTENER	TORQUE VALUE		NOTES
Handlebar clamp gap limiting fasteners	12-16 ft-lbs	16.3-21.7 N-m	3.32 HANDLEBAR, Disassemble and Assemble: Standard
Handlebar clamp open gap fasteners	12-16 ft-lbs	16.3-21.7 N-m	3.32 HANDLEBAR, Disassemble and Assemble: Standard
Handlebar switch clamp screw	60-80 in-lbs	6.8-9 N-m	3.11 FRONT BRAKE MASTER CYLINDER, Install
Headlamp, nacelle mounted, bezel screw	25-32 in-lbs	2.8-3.6 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp, nacelle mounted, left side, cover screw	84-108 in-lbs	9.5--12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp, nacelle mounted, right side, cover screw	84-108 in-lbs	9.5--12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp nacelle, standard round, clamp screw	36-48 in-lbs	4.1-5.4 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp nacelle, standard round, trim strip screw	84-108 in-lbs	9.5--12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp nacelle, standard round, trim strip screw	84-108 in-lbs	9.5--12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp nacelle mounted, rear panel bracket screw	85--104 in-lbs	9.6-11.7 N-m	3.27 HEADLAMP NACELLE, Install
Hub cap screw	16-24 ft-lbs	22-33 N-m	3.4 FRONT WHEEL, Assemble
Jiffy stand screws	40-45 ft-lbs	54.2--61 N-m	3.43 JIFFY STAND, Install
License plate bracket inner mounting screws	18-21 in-lbs	2.03-2.37 N-m	3.39 REAR LICENSE PLATE BRACKET, Center Mount
License plate bracket outer mounting screws	63-77 in-lbs	7.11-8.69 N-m	3.39 REAR LICENSE PLATE BRACKET, Center Mount
License plate holder screw	63-77 in-lbs	7.11-8.69 N-m	3.39 REAR LICENSE PLATE BRACKET, Center Mount With Lighting
License plate standard assembly bolt	62-89 in-lbs	7-10 N-m	3.39 REAR LICENSE PLATE BRACKET, Standard
License plate standard mount screws	71-97 in-lbs	8-11 N-m	3.39 REAR LICENSE PLATE BRACKET, Standard
Lower shock screw	70-75 ft-lbs	94.9-101.7 N-m	3.25 REAR SHOCK ABSORBER, Install
Master brake cylinder yoke	11-14 ft-lbs	14.7-19.6 N-m	3.13 REAR BRAKE MASTER CYLINDER, Disassemble and Assemble: Master Cylinder
Master cylinder, rear, banjo bolt	14-18 ft-lbs	19-24.4 N-m	3.13 REAR BRAKE MASTER CYLINDER, Install
Master cylinder bracket to frame screw	30-40 ft-lbs	40.7-54.2 N-m	3.13 REAR BRAKE MASTER CYLINDER, Install
Mirror mounting nut	96-144 in-lbs	10.8-16.3 N-m	3.33 MIRRORS, Install
One piece seat grab strap screw	60-90 in-lbs	6.8-10.16 N-m	3.44 SEAT, Install
Passenger footpeg support screw	38-47 ft-lbs	51.5-63.7 N-m	3.42 PASSENGER FOOTRESTS, Install
Rear brake caliper banjo bolt	21-23 ft-lbs	29-31 N-m	3.14 REAR BRAKE CALIPER, Install
Rear brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	3.14 REAR BRAKE CALIPER, Install
Rear brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	3.14 REAR BRAKE CALIPER, Install
Rear brake disc screws	30-45 ft-lbs	40.7--61 N-m	3.5 REAR WHEEL, Assemble
Rear brake line bracket screws	24-36 in-lbs	2.7-4.1 N-m	3.15 BRAKE LINES, Rear Brake Line: Non-ABS
Rear brake line clamp screws	24-36 in-lbs	2.7-4.1 N-m	3.15 BRAKE LINES, Rear Brake Line: Non-ABS
Rear caliper sleeve screw	15—18 ft-lbs	20.3-24.4 N-m	3.14 REAR BRAKE CALIPER, Install
Rear caliper slider bolt	15—18 ft-lbs	20.3-24.4 N-m	3.14 REAR BRAKE CALIPER, Install
Rear fender inner mount screw	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting
Rear fender mounting screw	42-46 ft-lbs	57--62.5 N-m	3.35 REAR FENDER, Remove and Install: Standard
Rear fender support screw	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting

FASTENER	TORQUE VALUE		NOTES
Rear fender support screw	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting
Rear fender support screw	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender With License Plate Bracket Lighting
Rear fender support screws	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting
Rear fender support screws	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Full Fender
Rear fork pivot shaft nut, final torque	154-170 ft-lbs	209-230 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft nut, first torque	25-30 ft-lbs	34--41 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft nut, second torque	1-48 in-lbs	0.1-5.4 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft nut, third torque	154-170 ft-lbs	209-230 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft pinch bolt	18-20 ft-lbs	24-27 N-m	3.23 REAR FORK, Remove and Install
Rear shock adjuster knob screw	26.6--44.3 in-lbs	3-5 N-m	3.25 REAR SHOCK ABSORBER, Disassemble and Assemble: Rear Shock Adjuster
Rear sprocket screws, final torque	77-83 ft-lbs	104.4-112.5 N-m	3.5 REAR WHEEL, Assemble
Rear sprocket screws, first torque	60 ft-lbs	81.3 N-m	3.5 REAR WHEEL, Assemble
Riser flange nuts	30--40 ft-lbs	40.7-54.3 N-m	3.32 HANDLEBAR, Remove and Install: Standard
Riser flange nuts	30--40 ft-lbs	40.7-54.3 N-m	3.32 HANDLEBAR, Disassemble and Assemble: Standard
Saddle bag, docking bracket screw	38--47 ft-lbs	52-64 N-m	3.24 BELT GUARDS, Remove and Install: Standard
Saddlebag, left side, mounting bracket grommet screw	96-120 in-lbs	10.9-13.6 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag, left side, mounting bracket screw	38--47 ft-lbs	52-64 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag, left side, mounting bracket screw	38--47 ft-lbs	52-64 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect
Saddlebag, mounting bolt	21-27 ft-lbs	29-37 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect
Saddlebag, mounting screw	21-27 ft-lbs	29-37 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag, right side, mounting bracket grommet screw	97-124 in-lbs	11-14 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect
Saddlebag docking rod	13-15 ft-lbs	17-21 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag hinge screw	18-25 in-lbs	2-2.8 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saddlebag hinge screw	20-30 in-lbs	2.3-3.4 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag hinge screw	20-30 in-lbs	2.3-3.4 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag indicator flag cover screw	24-36 in-lbs	2.7—4.1 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag latch assembly	10-15 in-lbs	1.1-1.7 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag latch lever screw	20-30 in-lbs	2.3-3.4 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag left side mounting bracket grommet screw	97-124 in-lbs	11-14 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect
Saddlebag locking knob cover screw	97-120 in-lbs	11-13.6 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect

FASTENER	TORQUE VALUE		NOTES
Saddlebag locking knob screw	97-120 in-lbs	11-13.6 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
saddlebag lock screw	15-20 in-lbs	1.7-2.3 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag lockset nut	45--55 in-lbs	5.1-6.2 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saddlebag right side mounting bracket grommet screw	96-120 in-lbs	10.9-13.6 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag strike screw	20-30 in-lbs	2.3-3.4 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag tether screw	45--55 in-lbs	5.1—6.2 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag tether stud	45--55 in-lbs	5.1-6.2 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag tether to lid screw	8-15 in-lbs	0.9-1.7 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saddlebag tether to lid screw	8-15 in-lbs	0.9-1.7 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saree lower guard lower screw	10-13 ft-lbs	14-18 N-m	3.37 SAREE GUARD, Install
Saree lower guard top screw	71-80 in-lbs	8-9 N-m	3.37 SAREE GUARD, Install
Saree upper guard screw	21-27 ft-lbs	28-37 N-m	3.37 SAREE GUARD, Install
Seat mounting nut	9-15 in-lbs	1-1.7 N-m	3.44 SEAT, Install
Seat thumbscrew	15--30 in-lbs	1.7-3.4 N-m	3.44 SEAT, Install
Seat thumbscrew	15--30 in-lbs	1.7-3.4 N-m	3.44 SEAT, Install
Seat thumbscrew	15-30 in-lbs	1.7-3.4 N-m	3.44 SEAT, Install
Shift lever bracket screws	120-144 in-lbs	13.6-16.3 N-m	3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footboard
Shock adjuster mounting screw	90-114 in-lbs	10.2-12.9 N-m	3.45 FRAME CROSSMEMBER, Install
Shock pinch bolt	12-15 ft-lbs	16.3-20.3 N-m	3.25 REAR SHOCK ABSORBER, Install
Side cover, left side, bracket to frame screw	8-10 in-lbs	0.9-1.1 N-m	3.18 LEFT SIDE COVER, Install
Side cover mounting stud	72-96 in-lbs	8.1-10.8 N-m	3.16 ABS MODULE, Install
Side cover screw, single screw	24-36 in-lbs	2.7-4.1 N-m	3.18 LEFT SIDE COVER, Install
Side cover screw, vertical screw	24-36 in-lbs	2.7-4.1 N-m	3.19 RIGHT SIDE COVER, Install
Side-mounted shock adjuster screw	90-114 in-lbs	10.2-12.9 N-m	3.25 REAR SHOCK ABSORBER, Install
Splash guard screw	35-45 in-lbs	3.9-5.1 N-m	3.23 REAR FORK, Remove and Install
Spoke nipple	55 in-lbs	6.2 N-m	3.7 CHECKING AND TRUING WHEELS, True Laced Wheels
Under seat frame cover, front screw	20-30 in-lbs	2.3-3.4 N-m	3.15 BRAKE LINES, Front ABS Lines
Under seat frame cover, rear screw	96-120 in-lbs	10.8-13.6 N-m	3.15 BRAKE LINES, Front ABS Lines
Upper shock screw	80-90 ft-lbs	108.5--122 N-m	3.25 REAR SHOCK ABSORBER, Install
Valve stem nut	12-15 in-lbs	1.4-1.7 N-m	3.9 TIRES, Install
Wear peg	30-42 in-lbs	3.4-4.7 N-m	3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footboard
Wear peg	30-42 in-lbs	3.4-4.7 N-m	3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footpeg
Wear peg	30-42 in-lbs	3.4-4.7 N-m	3.41 RIGHT FOOT CONTROLS, Disassemble and Assemble: Footboard
Wear peg	30-42 in-lbs	3.4-4.7 N-m	3.41 RIGHT FOOT CONTROLS, Disassemble and Assemble: Footpeg
Windshield, frame mounted fairing, screws	5-7 in-lbs	0.6-0.8 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Windshield

FASTENER	TORQUE VALUE		NOTES
Windshield acorn nuts	23-27 in-lbs	2.6-3 N-m	3.30 WINDSHIELD, Assemble

CHASSIS

Chassis Specifications

Table 3-1. Capacities

ITEM		U.S.	L
Fuel tank (total)	Sport Glide (FLSB), Fat Boy 114 (FLFBS), Heritage Classic (FLHCS), Low Rider S (FXLRS)	5.0 gal	18.9
	Breakout 114 (FXBRS), Street Bob 114 (FXBBS), Softail Standard (FXST), Fat Bob 114 (FXFBS)	3.5 gal	13.25
Low fuel warning light on'"		1.0 gal	3.8
Oil tank with filter'[2]'		5.0 qt	4.73
Transmission (approximate)'[31]		1.0 qt	0.95
Primary chaincase (approximate)'[21]	Heritage Classic (FLHCS), Sport Glide (FLSB), Street Bob 114 (FXBBS), Fat Bob 114 (FXFBS), Low Rider S (FXLRS), Softail Standard (FXST)	1.25 qt	1.18
	Fat Boy 114 (FLFBS), Breakout 114 (FXBRS)	1.43 qt	1.35

(1) When refilling from empty, add at least 3.8 L (1.0 gal).

(2) When refilling, initially add 3.78 L (4.0 qt) and add as needed to bring level within specification.

(3) When refilling, initially add 0.83 L (28 oz) and add as needed to bring level within specification.

(4) When refilling, initially add 1.06 L (36 oz) and add as needed to bring level within specification.

Table 3-2. Dimensions: FL Models

Item	Fat Boy® 114 (FLFBS)	Heritage Classic 114 (FLHCS)	Sport Glide™ (FLSB)
Length	93.3 in (2,370 mm)	95.1 in (2,415 mm)	91.5 in (2,325 mm)
Overall width	38.8 in (985 mm)	36.6 in (930 mm)	37.8 in (960 mm)
Overall height	43.1 in (1,095 mm)	53.9 in (1,370 mm)	44.1 in (1,120 mm)
Wheelbase	65.6 in (1,665 mm)	64.2 in (1,630 mm)	64.0 in (1,625 mm)
Road clearance	4.5 in (115 mm)	4.7 in (120 mm)	4.7 in (120 mm)
Seat height'[1]	25.9 in (658 mm)	26.3 in (668 mm)	25.7 in (653 mm)

(1) With 180 lb (81.6 kg) rider on seat

Table 3-3. Dimensions: FX Models

Item	Street Bob® 114 (FXBBS) Softail Standard®(FXST)	Breakout® 114 (FXBRS)	Fat Bob™ 114 (FXFBS)	Low Rider®S (FXLRS)	Low Rider®ST (FXLRST)
Length	91.3 in (2,320 mm)	93.3 in (2,370 mm)	92.1 in (2,340 mm)	93.1 in (2,365 mm)	93.1 in (2,365 mm)
Overall width	34.1 in (865 mm)	37.4 in (950 mm)	37.8 in (960 mm)	34.3 in (870 mm)	34.3 in (870 mm)
Overall height	45.7 in (1,160 mm)	41.9 in (1,065 mm)	43.7 in (1,110 mm)	47.0 in (1,195 mm)	51.2 in (1,300 mm)
Wheelbase	64.2 in (1,630 mm)	66.7 in (1,695 mm)	63.6 in (1,615 mm)	63.6 in (1,615 mm)	63.6 in (1,615 mm)
Road clearance	4.9 in (125 mm)	4.5 in (115 mm)	4.7 in (120 mm)	5.7 in (145 mm)	5.9 in (150 mm)
Seat height'[1]	25.8 in (655 mm)	25.6 in (650 mm)	27.7 in (704 mm)	27.0 in (686 mm)	27.0 in (686 mm)

(1) With 180 lb (81.6 kg) rider on seat

Table 3-4. Weights: FL Models

Item	Fat Boy® 114 (FLFBS)	Heritage Classic 114 (FLHCS)	Sport Glide ™ (FLSB)
Running weight'[1]	699 lb (317 kg)	728 lb (330 kg)	699 lb (317 kg)
Maximum added weight allowed'[21]	476 lb (216 kg)	432 lb (196 kg)	461 lb (209 kg)
GVWR	1,175 lb (533 kg)	1,160 lb (526 kg)	1,160 lb (526 kg)
GAWR front	450 lb (204 kg)	450 lb (204 kg)	450 lb (204 kg)
GAWR rear	760 lb (345 kg)	730 lb (331 kg)	730 lb (331 kg)

(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 3-5. Weights: FX Models

Item	Softail Standard®(FXST)	Breakout® 114 (FXBRS)	Street Bob® 114 (FXBBS)	Fat Bob™ 114 (FXFBS)	Low Rider®S (FXLRS)	Low Rider®ST (FXLRST)
Running weight™	655 lb (297 kg)	672 lb (305 kg)	655 lb (297 kg)	675 lb (306 kg)	679 lb (308 kg)	721 lb (327 kg)
Maximum added weight allowed®	505 lb (229 kg)	503 lb (228 kg)	505 lb (229 kg)	485 lb (220 kg)	481 lb (218 kg)	439 lb (199 kg)
GVWR	1,160 lb (526 kg)	1,175 lb (533 kg)	1,160 lb (526 kg)	1,160 lb (526 kg)	1,160 lb (526 kg)	1,160 lb (526 kg)
GAWR front	450 lb (204 kg)	450 lb (204 kg)	450 lb (204 kg)	450 lb (204 kg)	450 lb (204 kg)	450 lb (204 kg)
GAWR rear	730 lb (331 kg)	760 lb (345 kg)	730 lb (331 kg)	730 lb (331 kg)	730 lb (331 kg)	730 lb (331 kg)

(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.

A WARNING

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

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

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 INSPECT TIRES AND WHEELS (Page 2-13).

Tire Specifications

A 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)

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 3-1. 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.

See Figure 3-2. A unique 17-digit serial or Vehicle Identification Number (VIN) is assigned to each motorcycle. Refer to Table 3-6.

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.

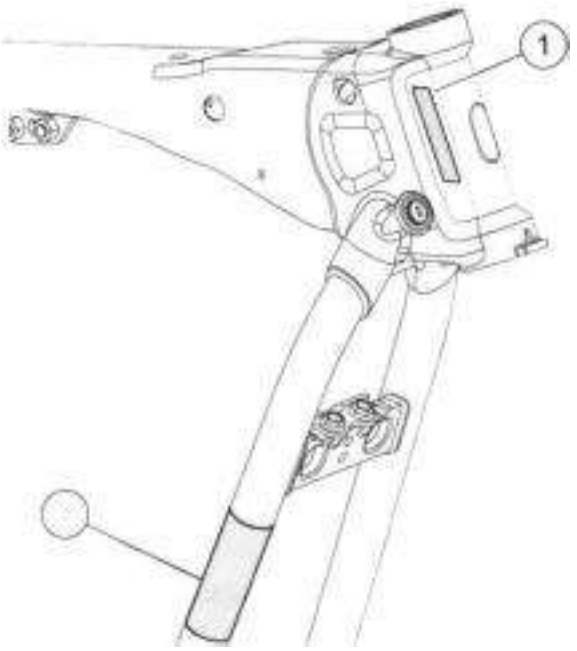
1606058

Location

1038766

1. Stamped Vehicle Identification Number (VIN)
2. VIN label

Figure 3-1. VIN Locations



1 HD 1 YC J 1 3 N B 111000

Figure 3-2. Typical Harley-Davidson VIN: 2022 Softail Models

Table 3-6. Harley-Davidson VIN Breakdown: 2022 Softail 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 or larger)
3	Model	See VIN model table
4	Engine type	J=Milwaukee Eight 107 (1753 cm) air-cooled, fuel-injected, balanced K=Milwaukee Eight™ 114 (1868 cm^3) air-cooled, fuel-injected, balanced Z=Milwaukee Eight 117 (1923 cm) air-cooled, fuel-injected, balanced

Table 3-6. Harley-Davidson VIN Breakdown: 2022 Softail Models

POSITION	DESCRIPTION	POSSIBLE VALUES
5	Calibration/configuration, introduction	1=Domestic (DOM) 2=California (CAL) 3=Canada (CAN) 4=ENG, EN2, HDI, HD2, HD4 S=Japan (JPN) 6=Australia (AUS) 7=Brazil (BRZ) 8=Asia Pacific (APC) 9=India (IND/IN2) 0=ASEAN (AZN) A=China (CHN) G=HD3
6	VIN check digit	Can be 0-9 or X
7	Model year	N=2022
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

Table 3-7. VIN Model Codes: Softail Models

CODE	MODEL	CODE	MODEL
BV	FXST Softail Standard	YM	FLSB Sport Glide®
YB	FLHCS Heritage Classic 114	yy	FXBBS Street Bob® 114
YG	FLFBS Fat Boy® 114	YW	FXLRS Low Rider® S
YH	FXBRS Breakout® 114	YX	FXLRST Low Rider® ST
YL	FXFBS Fat Bob® 114		

PREPARE

1. Raise front wheel. See Secure the Motorcycle for Service (Page 2-2).

2. Check wheel bearing end play. See SEALED WHEEL BEARINGS (Page 3-25).

3. Remove front brake caliper(s). See FRONT BRAKE CALIPER (Page 3-38).

NOTE

Do not operate front brake lever with the front brake caliper removed. Without the rotor, brake pressure forces the pistons out of the piston bores. Seating pistons requires caliper disassembly

REMOVE 1. See Figure 3-3. Remove front wheel.

NOTE

- ***ABS models: Never pull wheel speed sensor cable taut or use to retain wheel, axle or other components.***
- ***Keep wheel speed sensor and ABS encoder bearing away from magnetic fields.***

a. Loosen pinch bolt (2 or 3) depending on model.

b. See Figure 3-5 Remove front axle (1), left bearing spacer (10) or wheel speed sensor (7) and right bearing spacer (2).

c. Remove front wheel (5).

NOTE

If equipped with a hub cap, the hub cap will come off with the wheel.

INSTALI

FASTENER	TORQUE VALUE	
Front fork bottom mount pinch bolt	11-15 ft-lbs	15-20 N-m
Front fork side mount pinch bolt	21-25 ft-lbs	28-34 N-m
Front wheel axle	70-75 ft-lbs	94.9-101.6 N-m

CONSUMABLE	PART NUMBER
LOCTITE SILVER GRADE ANTI-SEIZE	11100001

1. See Figure 3-5 . Install front wheel.

a. Apply a light coat of ANTI-SEIZE LUBRICANT to front axle (1), wheel bearing bores and bore of the inner wheel bearing spacer (4).

LOCTITE SILVER GRADE ANTI-SEIZE (11100001)

b. Position front wheel (5) between front forks.

c. See Figure 3-5. Install front axle through right fork, right bearing spacer (2), front wheel, left bearing spacer (10) or wheel speed sensor (7).

NOTE

See Figure 3-4. Position wheel speed sensor (1) with index pin (2) contacting fork.

NOTE

Models with a hub cap assembly (11) will not have a right bearing spacer (2), use hub cap assembly in place of right bearing spacer.

d. Thread the front axle into the left fork. lighten.

Torque: 70-75 ft-lbs (94.9-101.6 N-m) ***Front wheel axle***

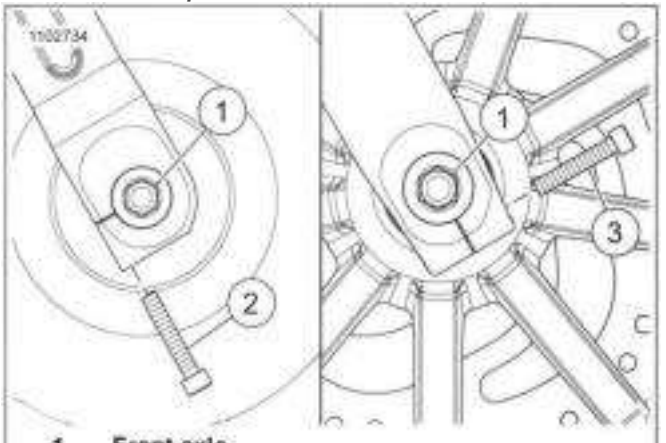
2. See Figure 3-3. Tighten pinch bolt.

a. **Bottom mount pinch bolt:**

Torque: 11-15 ft-lbs (15--20 N-m) ***Front fort< bottom mount pinch bolt***

b. Side mount pinch bolt:

Torque: 21-25 ft-lbs (28-34 N-m) ***Front fork side mount pinch bolt***



1. Front axle
2. Front axle pinch bolt, bottom mount
3. Front axle pinch bolt, side mount

Figure 3-3. Front Axle Pinch Bolt (Typical)

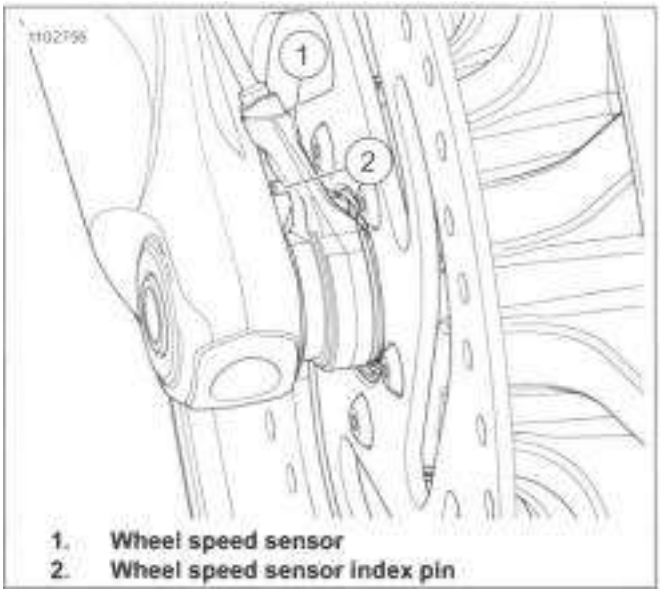


Figure 3-4. Front Wheel Speed Sensor Index Pin (ABS equipped)

DISASSEMBLE

1. See Figure 3-6. Disassemble hub cap assembly if equipped.

a. Remove and discard retaining ring from hub cap assembly (11).

b. Remove hub spacer from hub cap.

2. See Figure 3-5 or Figure 3-6. Remove front brake disc(s).

a. Remove and discard screws (9).
b. Remove front brake disc(s) (8).

3. Remove front tire. See TIRES (Page 3-28).

4. Remove valve stem. See TIRES (Page 3-28).

5. Remove and discard sealed wheel bearings. See SEALED WHEEL BEARINGS (Page 3-25).

6. See Figure 3-5 or Figure 3-6. Remove wheel bearing inner spacer (4).

7. See Figure 3-6. Remove screws (13) and hub cap (12) if equipped.

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 CHECKING AND TRUING WHEELS (Page 3-21).

ASSEMBLE

FASTENER	TORQUE VALUE	
Front brake disc screw	16-24 ft-lbs	22-33 N-m
Hub cap screw	16-24 ft-lbs	22-33 N-m

1. Install **new** valve stem. See TIRES (Page 3-28).

2. Install tire. See TIRES (Page 3-28).

3. See Figure 3-5 or Figure 3-6. Install wheel bearing inner spacer (4).

4. Install **new** wheel bearings. See SEALED WHEEL BEARINGS (Page 3-25).

5. See Figure 3-6. Install hub cap if equipped.

a. Align holes on hubcap (12) with holes on the right side of front wheel.

b. Install screws (13). Tighten.

Torque: 16-24 ft-lbs (22-33 N-m) ***Hub cap screw***

NOTICE

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

6. See Figure 3-5 or Figure 3-6. Install front brake disc(s).

a. Align front brake disc(s) (8) with mounting holes in front wheel (5).

b. Install **new** screws (9). Tighten.

Torque: 16-24 ft-lbs (22-33 N-m) ***Front brake disc screw***

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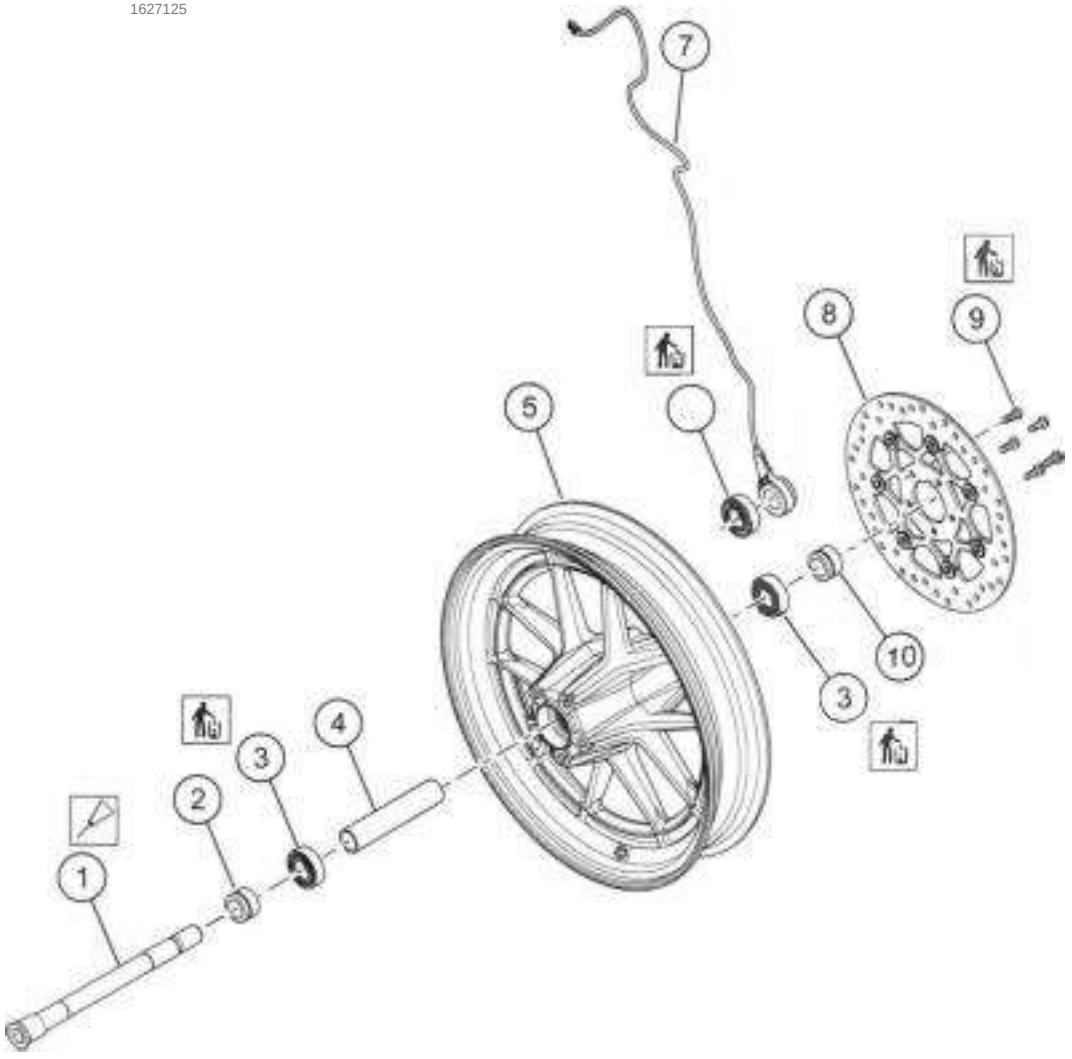
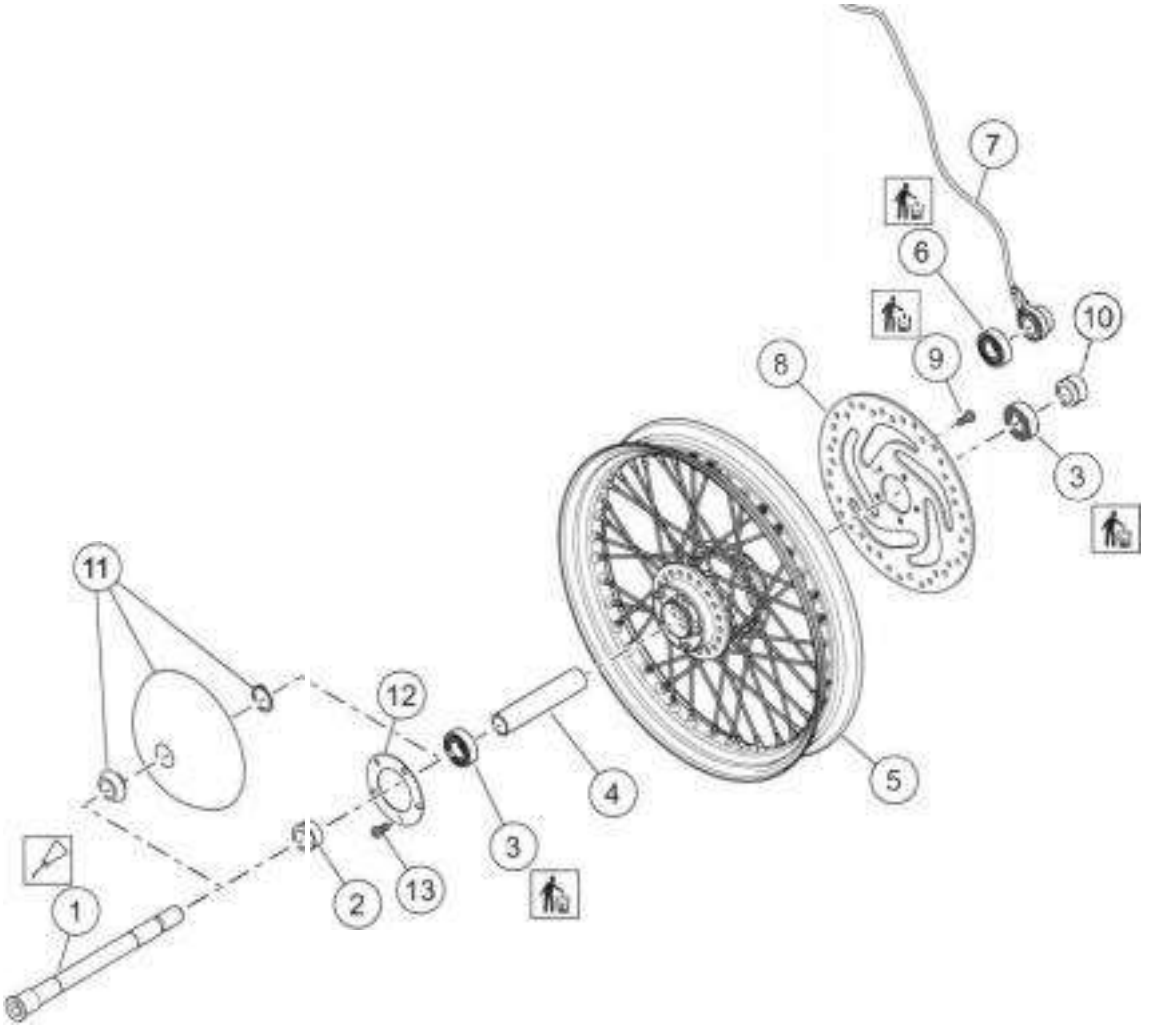


1. Front axle
2. Right bearin g spacer
3. Wheel bearing (2)
4. Inner wheel bearing spacer
5. Wheel
6- Wheel bearing (ABS encoder)
7. Wheel speed sensor (ABS)
8. Brake disc
9. Brake disc screw (5)
10. Left bearingspacer

Figure 3-5. Cast Front Wheel (Typical)



1. **Front axle**
2. **Right bearing spacer**
3. **Wheel bearing (2)**
4. **Inner wheel bearing spacer**
5. **Wheel**
6. **Wheel bearing (ABS encoder)**
7. **Wheel speed sensor (ABS)**
8. **Brake disc**
9. **Brake disc screw (5)**
10. **Left bearing spacer**
11. **Hub spacer, hub cap and retaining ring**
12. **Hub cap (if equipped)**
13. **Screw (5)**

Figure 3-6. Laced Front Wheel

COMPLETE

(Page 2-2).

1. Install caliper(s). See FRONT BRAKE CALIPER (Page 3-38)

_____ 2. Lower front wheel. See Secure the Motorcycle for Service

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove saddlebags, if equipped. See SADDLEBAGS (Page 3-145).
3. Measure wheel alignment. See WHEEL ALIGNMENT (Page 3-33).
4. Remove belt guards, if necessary. See BELT GUARDS (Page 3-85).
5. Remove muffler, if necessary. See MUFFLERS (Page 6-34).
6. Raise rear wheel. See Secure the Motorcycle for Service (Page 2-2).
7. Check wheel bearing end play. See SEALED WHEEL BEARINGS (Page 3-25).
8. ***NOTE***

Do not operate rear brake pedal with the rear brake caliper removed. Without the rotor, brake pressure forces the pistons out of the piston bores. Seating pistons requires caliper disassembly

Remove rear brake caliper. See REAR BRAKE CALIPER (Page 3-46).

REMOVE

PART NUMBER	TOOL NAME
HD-47925	AXLE NUT TORQUE ADAPTER

1. See Figure 3-7. Remove rear wheel.
   a. Remove E-clip (13).
   b. Loosen axle nut (12) using axle nut torque adapter.
      Special Tool: AXLE NUT TORQUE ADAPTER (HD-47925)
   c. Loosen axle adjuster screws (10) and slide rear wheel forward.
   d. Remove axle nut and washer (11).
   e. Support brake caliper bracket (2).
   f. Remove rear axle (9), right outer spacer (1), right inner spacer (3) or WSS (4) and left spacer (6).
   g. Remove drive belt from rear sprocket (8).
   h. Remove rear wheel assembly.

CONSUMABLE	PART NUMBER
LOCTITE SILVER GRADE ANTI-SEIZE	11100001

1. See Figure 3-7. Install rear wheel.

INSTALL

   a. Apply a light coat of anti-seize lubricant to rear axle (9), wheel bearing bores, and bore of wheel bearing spacer (16).
      LOCTITE SILVER GRADE ANTI-SEIZE (11100001)
   b. Position rear wheel between rear fork.
   c. Install rear axle through left spacer (6), left leg of rear fork, and rear sprocket (8).
   d. Install rear axle through rear wheel.
   e. Install rear axle through right inner spacer (3) or WSS (4), caliper bracket (2), right outer spacer (1) and right leg of rear fork.
   f. Install washer (11).
   g. Install axle nut (12). Hand-tighten.
   h. Slide rear axle forward. Install drive belt on front and rear sprockets.
2. See Figure 3-8. Rotate WSS to position shown, if equipped. Verify wire harness is routed correctly.
3. Align rear wheel. See WHEEL ALIGNMENT (Page 3-33).
4. Adjust drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
5. Verify drive belt tracking properly.

1644977

1. Right outer spacer
2. Brake caliper bracket
3. Right inner spacer, non ABS
4. WSS
5. Brake disk (typical)
6. Left spacer
7. Sprocket screw (5)
8. Rear sprocket
9. Rear axle
10. Adjuster screw (2)
11. Washer
12. Axle nut
13. E-clip
14. Wheel bearing (2)
15. Brake disk screw (5)
16. Wheel bearing spacer

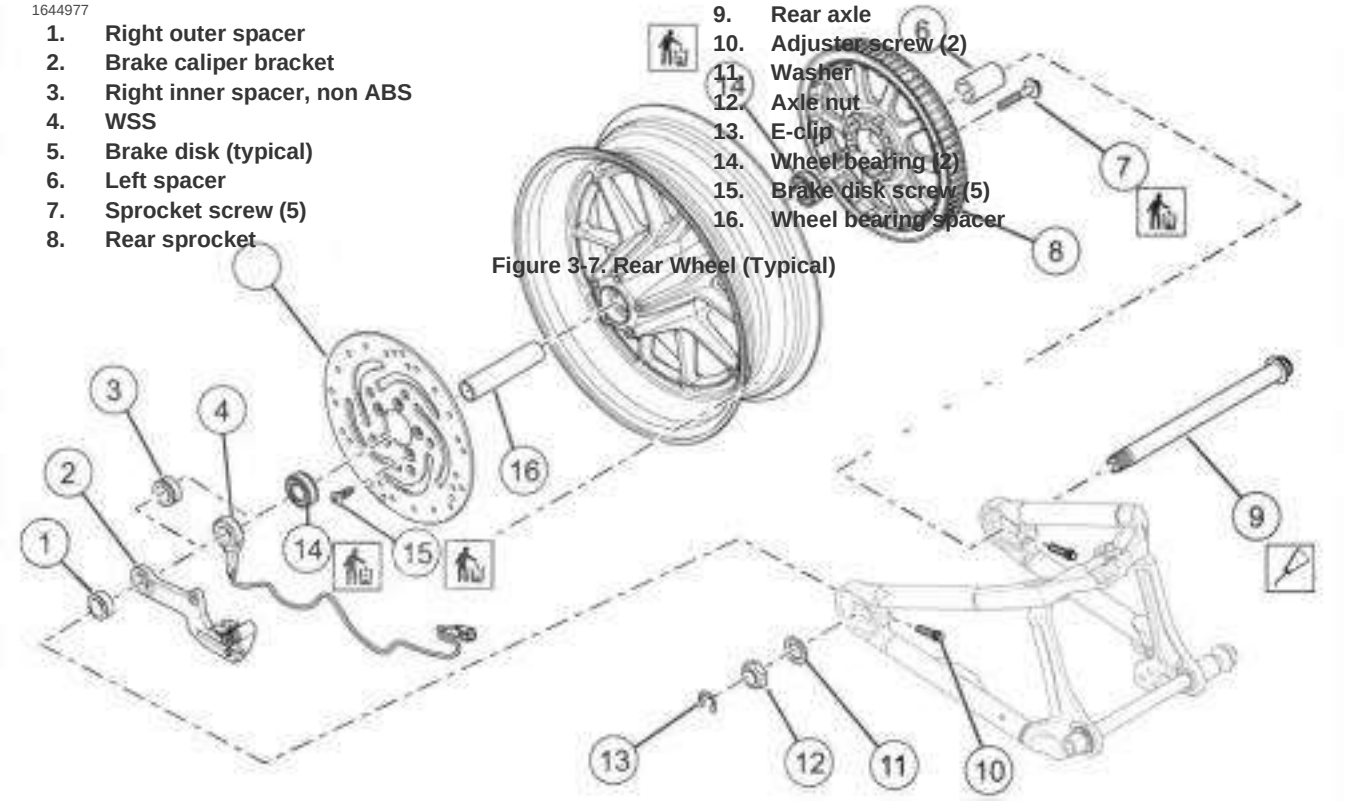


Figure 3-7. Rear Wheel (Typical)

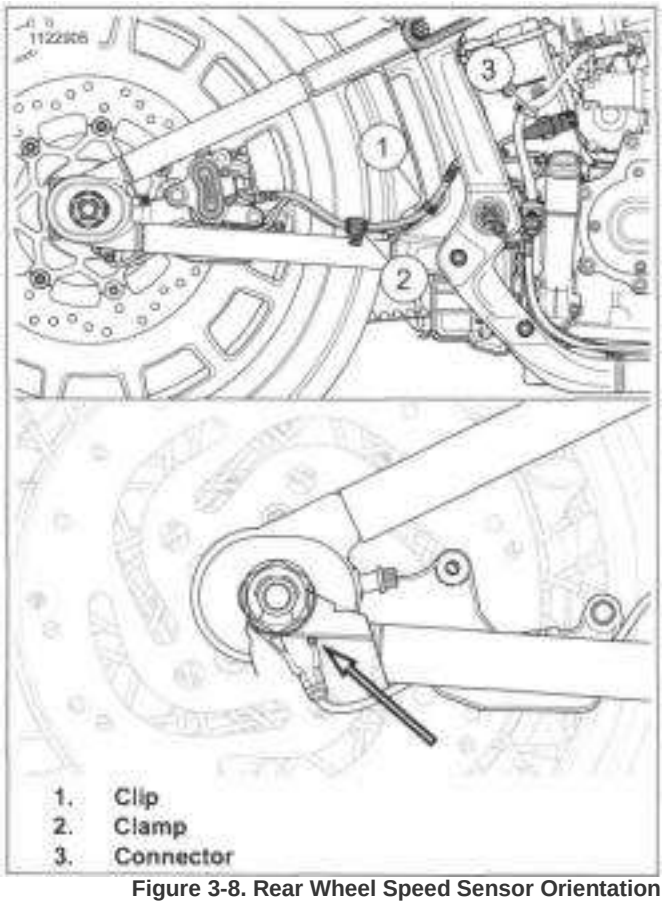


Figure 3-8. Rear Wheel Speed Sensor Orientation

DISASSEMBLE

1. See Figure 3-7. Remove rear brake disc.
   a. Discard brake disk screws (15).
   b. Remove rear brake disc (5).
2. Remove rear sprocket.
   a. Discard rear sprocket screws (7)
   b. Remove rear sprocket (8).
3. Remove rear tire. See TIRES (Page 3-28).
4. Remove valve stem. See TIRES (Page 3-28).
5. If necessary, remove and discard sealed wheel bearings. See SEALED WHEEL BEARINGS (Page 3-25).

CLEAN AND INSPECT

1. Clean all parts thoroughly.
2. Inspect rear wheel for damage. Replace or repair as necessary.
3. Check wheel runout. See CHECKING AND TRUING WHEELS (Page 3-21).

ASSEMBLE

FASTENER	TORQUE VALUE	
Rear brake disc screws	30-45 fl-lbs	40.7-81 N-m
Rear sprocket screws, final torque	77-83 ft-lbs	104.4-112.5 N-m
Rear sprocket screws, first torque	60 ft-lbs	81.3 N-m

1. Install **new** valve stem. See TIRES (Page 3-28).
2. Install tire. See TIRES (Page 3-28).
3. Install wheel bearing spacer (16), if removed.
4. See Figure 3-7. Install **new** sealed wheel bearings (14), if removed. See SEALED WHEEL BEARINGS (Page 3-25).

NOTICE

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

5. Install rear sprocket.
   a. Align rear sprocket (8) with mounting holes in rear wheel.
   b. Install **new** sprocket screws (7). Tighten using the following sequence.
   c. Tighten screws to initial torque.

      Torque: 60 ft-lbs (81.3 N-m) ***Rear sprocket screws, first torque***
   d. Back off screws one-half turn (180 degrees).
   e. Tighten screws to final torque.

      Torque: 77-83 ft-lbs (104.4-112.5 N-m) ***Rear sprocket screws, final torque***

NOTICE

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

6. Install rear brake disc.
   a. Align rear brake disc (5) with mounting holes in rear wheel.
   b. Install **new** brake disk screws (15). Tighten

      Torque: 30-45 ft-lbs (40.7-61 N-m) ***Rear brake disc screws***

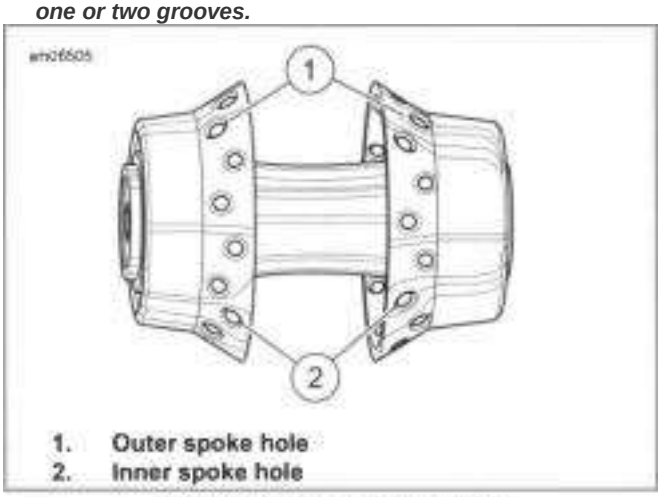
COMPLETE

1. Lower rear wheel. See Secure the Motorcycle for Service (Page 2-2).
2. Install muffler, if removed. See MUFFLERS (Page 6-34).
3. Install belt guards, if removed. See BELT GUARDS (Page 3-85).
4. Install saddlebags, if removed. See SADDLEBAGS (Page 3-145).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).

WHEEL LACING: ANGLE FLANGE HUB

NOTE

- ***See Figure 3-9. The following procedure is valid for wheels that use an angle flange hub regardless of rim style or diameter.***
- ***Disc mounting surface for primary brake side of hub has one or two grooves.***



1. Outer spoke hole
2. Inner spoke hole

Figure 3-9. Angle Flange Hub

1. Place hub on workbench:
   a. **Front:** primary brake side up.
   b. **Rear:** brake side down.
2. Install all spokes in the lower flange.
3. See Figure 3-10. Flip hub over. Gather all outer spokes and hold upright with a rubber band. Repeat with the inner spokes using a second rubber band.
4. Install spokes in remaining flange.
5. Rotate the lower flange spokes as far as they go:
   a. Outer spokes clockwise.
   b. Inner spokes counterclockwise.
6. Center the rim over the hub and spokes assembly and support on wooden blocks approximately 1.5 in (38.1 mm) thick.
   a. If valve is not located in the center of the rim, place valve hole facing up.
   b. If the valve is located in the center of the rim, it can be placed either side up.

NOTE

Install nipples until approximately % in (32 mm) of spoke thread shows.

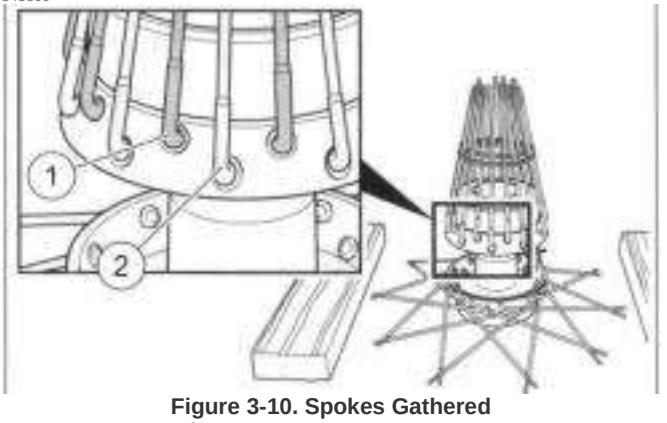


Figure 3-10. Spokes Gathered

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

7. Install lower flange outer spokes and loosely install spoke nipples:
   a. **Rim with side valve hole:** See Figure 3-11. Start at the valve stem hole (1).
   b. **Rim with center valve hole:** See Figure 3-12. Start at the first hole counterclockwise (1) from valve stem hole.
8. Install remaining outer spokes in every fourth hole.
9. Install lower flange inner spokes and loosely install spoke nipples:
   a. Starting at the second hole counterclockwise (2) from first spoke installed, install inner spoke.
   b. Install remaining inner spokes in every fourth hole.
10. Carefully release upper flange inner spokes and fan out around rim, rotating them clockwise.
11. Starting at the first hole counterclockwise (3) from first spoke installed, install inner spoke. Install remaining inner spokes in every fourth hole.
12. Carefully release upper flange outer spokes and fan out around rim, rotating them counterclockwise.
13. Install outer spokes in remaining holes (4).
14. Verify that spoke heads are seated. See CHECKING AND TRUING WHEELS (Page 3-21).
    a. Evenly hand-tighten spoke nipples until snug.
    b. Only tighten until slack is removed.
    c. Proper torque is applied when the wheel is trued.
    d. Adjust offset and true the wheel.

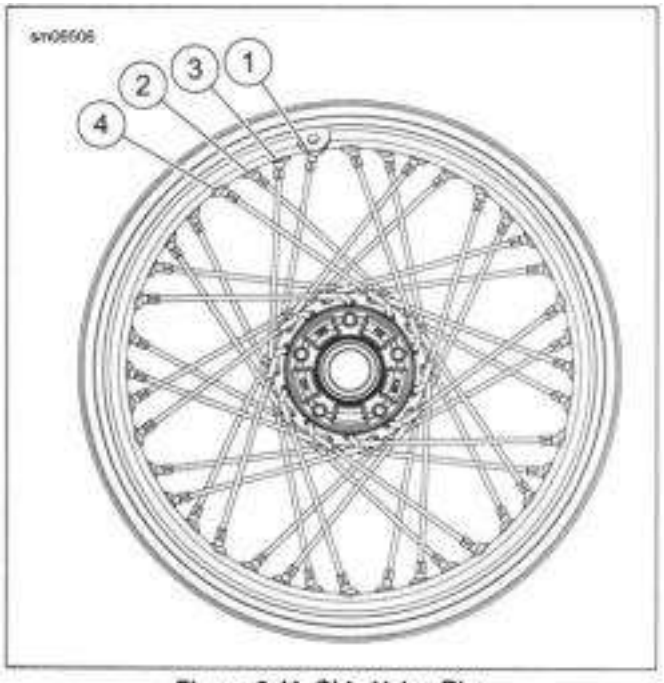


Figure 3-11. Side Valve Rim

Figure 3-12. Center Valve Rim

GENERAL

Check wheels for lateral and radial runout before installing a **new** tire, tube or rim seal. Checking cast or laced wheels is performed using the same procedure.

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

Always check condition of the wheel bearings before checking or adjusting wheel runout. See SEALED WHEEL BEARINGS (Page 3-25).

CHECKING WHEEL RUNOUT _ _ _

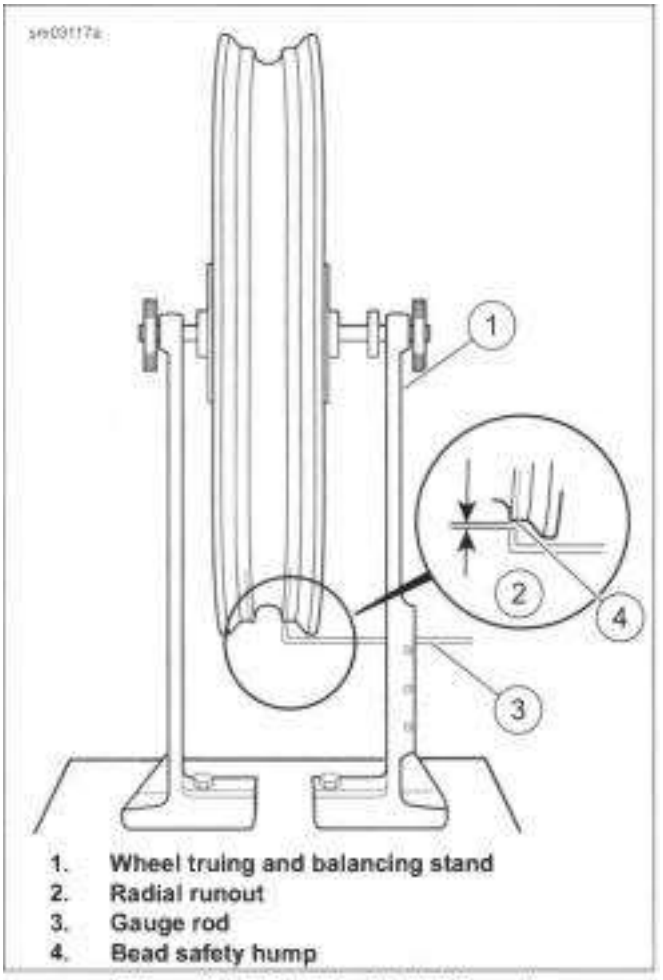
PART NUMBER	TOOL NAME
HD-99500-80	WHEEL TRUING STAND

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

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

Checking Radial Runout

1. See Figure 3-13. Mount wheel in WHEEL TRUING STAND (PART NUMBER: 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 specification.
   - **Cast Wheels:** 0.030 in (0.76 mm)
   - **Laced Wheels:** 0.050 in (1.27 mm)



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

Figure 3-13. Checking Radial Runout

Checking Lateral Runout

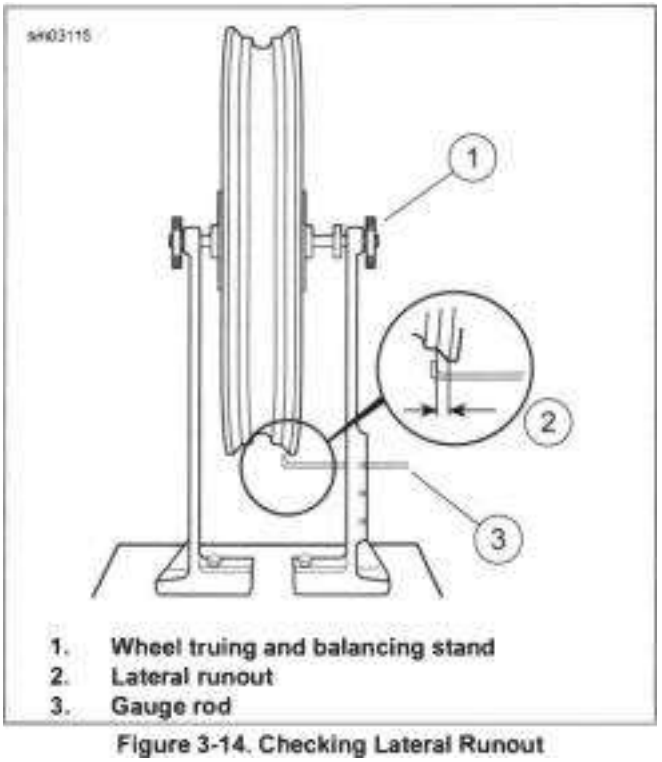
1. See Figure 3-14. Mount wheel in WHEEL TRUING STAND (PART NUMBER: HD-99500-80).

NOTE

Dial indicators are more accurate than gauge rods.

2. Place a gauge rod near, or dial indicator on the rim bead flange.
3. Measure distance at several locations. Lateral runout must not exceed specification.

- **Cast Wheels:** 0.030 in (0.76 mm)
- **Laced Wheels:** 0.050 in (1.27 mm)



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

Figure 3-14. Checking Lateral Runout

LACED WHEEL RIM OFFSET

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

1. See Figure 3-15. Prepare rim.
   a. Place a piece of tape to mark the center of each group of four spokes as shown.
   b. Mark groups directly opposite one another and approximately 90 degrees apart.
   c. Use different colors of tape or number each group.

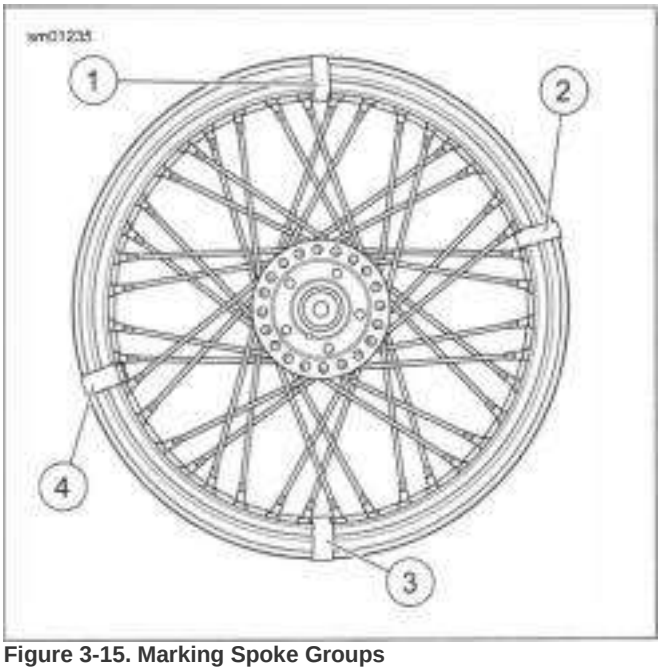


Figure 3-15. Marking Spoke Groups

2. See Figure 3-16. Mount wheel in WHEEL TRUING STAND (PART NUMBER: HD-99500-80) so hub turns freely on its bearings.

NOTE

Disc mounting surface for primary brake side of hub has one or two grooves.

3. Measure offset.
   a. Lay a straightedge across the primary brake disc mounting surface and one of the marked spoke groups.
   b. See Figure 3-17. Measure the distance from the straightedge to the location shown to determine distance A. '
   c. Compare to dimensions in Table 3-8.

NOTE

- ***Always loosen the appropriate spokes before tightening the other two. Reversing this procedure causes the rim to become out-of-round. For example: If the right side is less than specification, loosen the two spokes on the hub right side. Then tighten the two spokes attached to the hub left side.***
- ***Tighten or loosen spokes one flat at a time and recheck measurement.***
- ***Always work on groups that are opposite each other to maintain radial runout.***

4. If the dimension is not correct, adjust the four spokes using SPOKE WRENCH (PART NUMBER: HD-94681-80). Turn all four spokes an equal number of turns until offset is at specification.
5. Repeat the previous step for all groups on the wheel.
6. Check wheel runout. See True Laced Wheels (Page 3-23).

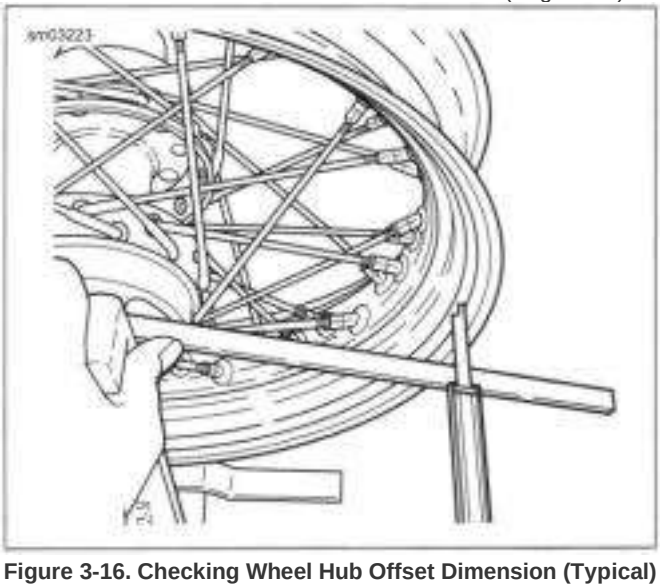


Figure 3-16. Checking Wheel Hub Offset Dimension (Typical)

Table 3-8. Laced Wheel Offset Dimensions

MODEL	SIZE	WHEEL	IN	MM
FLHCS	16 X 3	Front	1.267-1.297	32.18-32.94
FXBBS, FXST	19 X 2.5	Front	1.258-1.288	31.95-32.72
FXBBS,FXST,FLHCS	16 X 3	Rear	1.387-1.417	35.23-35.99

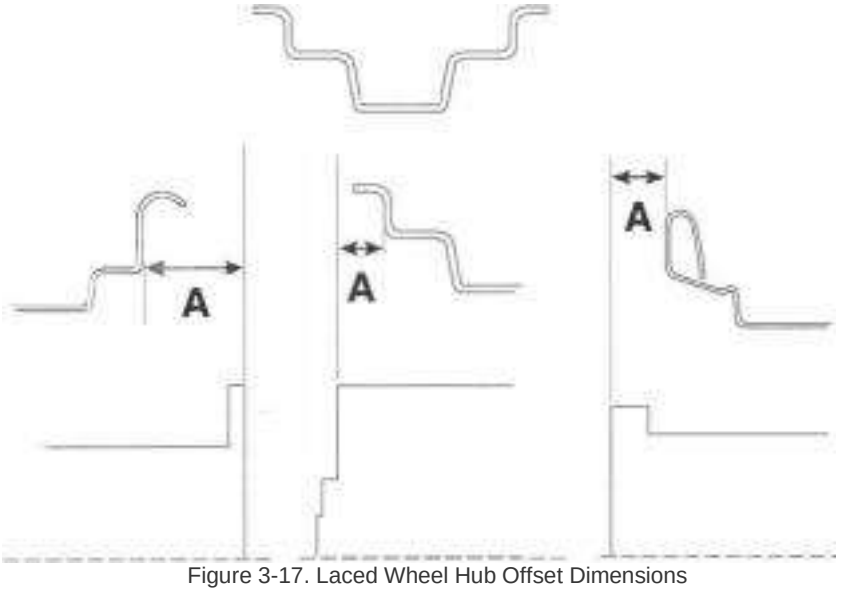


Figure 3-17. Laced Wheel Hub Offset Dimensions

TRUE LACED WHEELS

FASTENER	TORQUE VALUE	
Spoke nipple	55 in-lbs	6.2 N-m

HD-48985	SPOKE TORQUE WRENCH
HD-94681-80	SPOKE WRENCH
HD-99500-80	WHEEL TRUING STAND

NOTE

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

Adjust Radial Runout

1. See Figure 3-18. Mount wheel in WHEEL TRUING STAND (PART NUMBER: HD-99500-80).
2. Adjust the gauge rod (3) near to the tire bead safety hump (4). If using a dial indicator, place the tip on the safety bead hump.
3. Straight flange hub: Seat each spoke head in the hub flange using a flat nose punch and mallet.

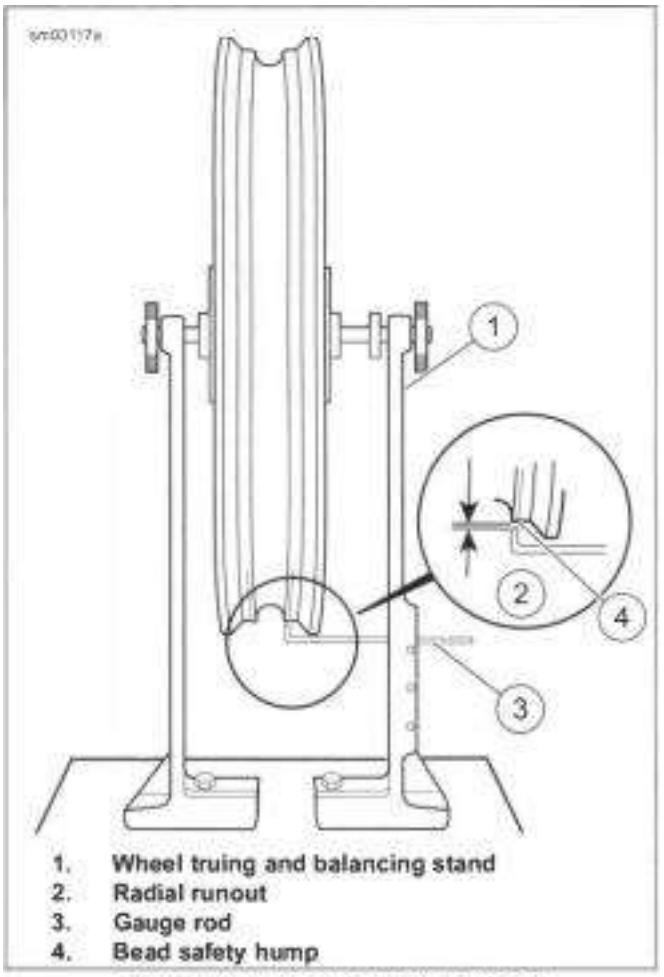
NOTE

- ***Always loosen the appropriate spokes before tightening the other two. Reversing this procedure causes the rim to become out of round.***
- ***Tighten or loosen spoke. Then recheck measurement. Small changes in the spokes can make large changes in the runout.***
- ***Always work on groups that are opposite each other to maintain radial runout.***

4. Spin the rim slowly. Check radial runout (2). The rim must be true within 0.030 in (0.76 mm).
   a. Use SPOKE WRENCH (PART NUMBER: HD-94681-80).
   b. If the rim contacts the gauge on or near a marked group of spokes, loosen the spokes in the group on the opposite side of the rim. Then tighten the spokes in the group where the rim makes contact an equal number of turns.
   c. If the rim contacts the gauge between two marked groups, loosen the spokes in both groups on the opposite side of the rim. Then tighten the spoke groups on the side of the rim that makes contact an equal number of turns.
5. When the wheel is true, start at the valve stem hole and tighten any loose spoke nipples one turn at a time until they are snug.
6. Working alternately across the wheel, use SPOKE TORQUE WRENCH (PART NUMBER: HD-48985) evenly tighten all spokes to specification listed in Table 3-9.
7. Straight flange hub: Verify that each spoke head is seated in the hub flange using a flat nose punch and mallet.
8. Verify that radial runout is still within specification.
9. Proceed to lateral runout.

A WARNING

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



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

Figure 3-18. Checking Radial Runout

Table 3-9. Spoke Nipple Torque Specification

RIM TYPE	MINIMUM TORQUE
All	55 in-lbs (6.2 N-m)

Adjust Lateral Runout

NOTE

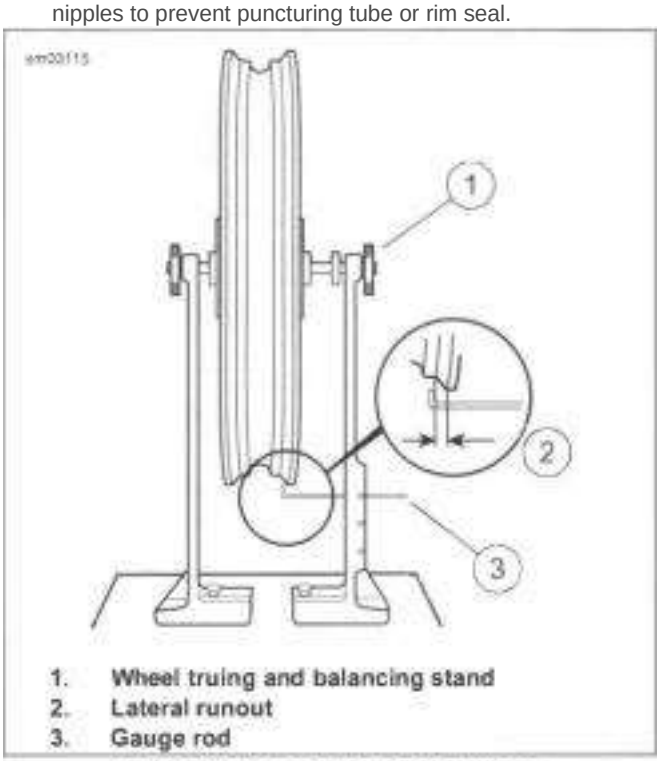
Dial indicators are more accurate than gauge rods.

1. See Figure 3-19. Adjust the gauge rod (3) near to the rim bead flange. If using a dial indicator, place the tip against the bead flange.
2. Rotate the rim slowly to check lateral runout (2). If runout exceeds 0.030 in (0.76 mm), adjust spokes:

NOTE

- ***Always loosen the appropriate spokes before tightening the other two. Reversing this procedure causes the rim to become out of round.***
- ***Tighten or loosen spoke. Then recheck measurement. Small changes in the spokes can make large changes in the runout.***
- ***Always work on groups that are opposite each other to maintain radial runout.***

3. Working in groups of four, loosen two spokes on the tight side and tighten the two spokes on the loose side.
4. Repeat with each group until wheel is within specification.
5. Verify that all spoke nipples are tightened to the specification. Refer to Table 3-9.
6. File or grind off ends of spokes that protrude through the nipples to prevent puncturing tube or rim seal.



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

Figure 3-19. Checking Lateral Runout

PREPARE

1. Raise front or rear wheel. See Secure the Motorcycle for Service (Page 2-2).

INSPECT

1. Turn the wheel through several rotations.

NOTE

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

2. Check end play:
   a. See Figure 3-20. Mount a magnetic base dial indicator to the brake disc. Set the indicator contact point on the end of the axle.
   b. Firmly push the wheel to one side. Zero the dial indicator gauge.
   c. Firmly pull the wheel back. Note the reading of the dial indicator.
   d. Repeat the procedure to verify the reading.
   e. Replace the bearings if end play exceeds Dimension: 0. 002 in (0.051 mm) or if there is drag, rough rotation or abnormal noise.

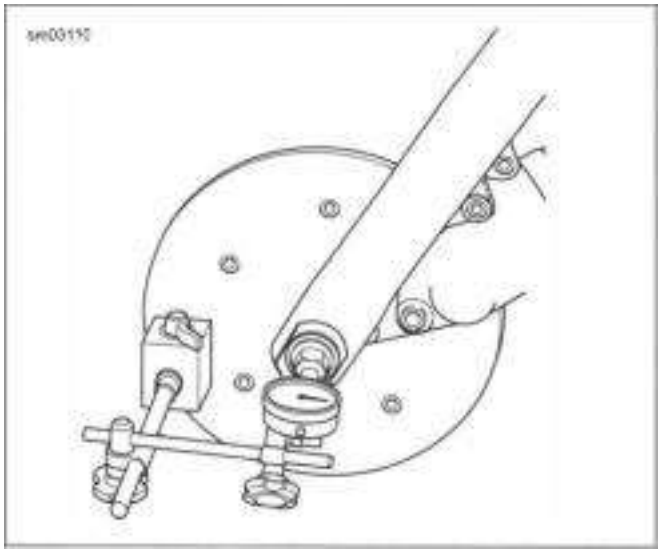


Figure 3-20. Measuring Lateral End Play (Front Wheel) (Typical)

REMOVE

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

1. Remove wheel. See FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).

NOTE

OE disc removal is not necessary. Place the scrap disc directly over the OE disc mounting screws.

2. See Figure 3-21. Assemble WHEEL BEARING INSTALLER/REMOVER (PART NUMBER: HD-44060D).
   a. Lubricate draw down bolt or a suitable threaded rod with two locking nuts.
   b. Install nut (2), washer (3) and bearing (4) on screw.
   c. Insert assembly through hole in bridge (6).
   d. Install ball bearing inside collet (5). Fasten collet and ball bearing to forcing screw (1).

3. Remove bearings.
   a. See Figure 3-21. Hold end of forcing screw (1) and turn collet (5) to expand edges of collet.
   b. See Figure 3-22. Hold end of forcing screw (1) and turn nut (2) to remove bearing from wheel.
   c. Remove spacer from inside wheel hub.
   d. Repeat on opposite side.

4. Discard all bearings.

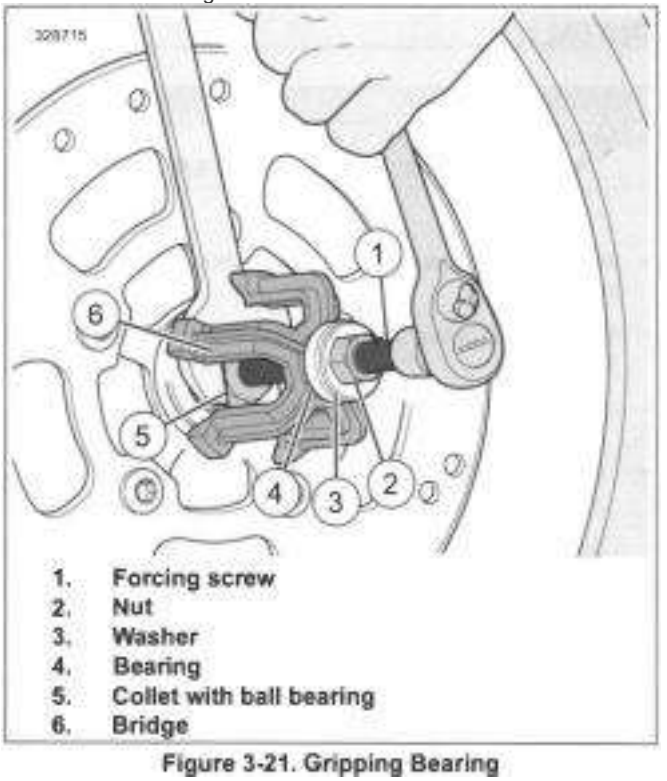
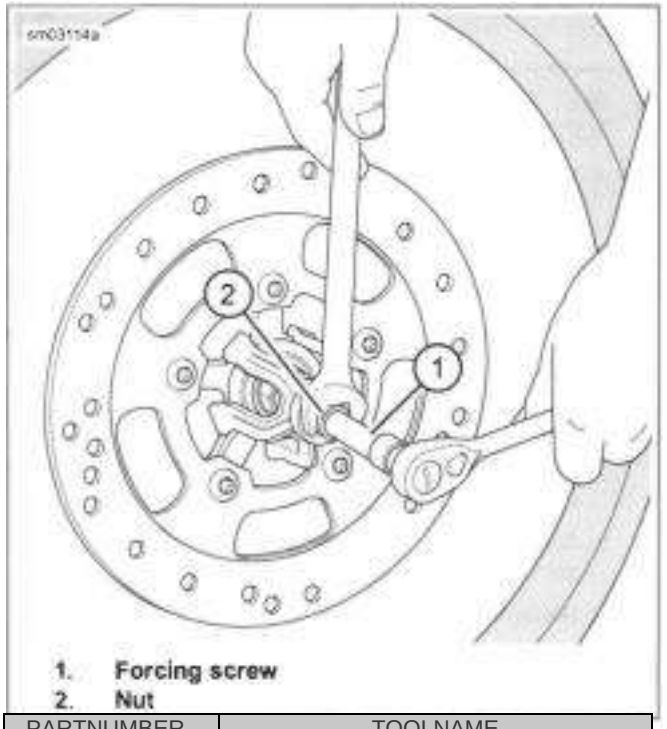


Figure 3-21. Gripping Bearing



1. Forcing screw
2. Nut

PARTNUMBER	TOOLNAME
HD-44060D	WHEEL BEARING INSTALLER/REMOVER

NOTE

- ***Front wheel: Install bearing on the brake disc or left side first.***
- ***Rear wheel: Install bearing on the brake disc or right side first.***
- ***Install ABS bearing on the brake disc side of the wheel.***

1. See Figure 3-23. Assemble wheel bearing installer/remover.

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

   a. Lubricate draw down bolt or a suitable threaded rod with two locking nuts.

   b. Insert threaded rod (1) through support plate (2).

   c. Insert assembly through wheel.

   d. Place new bearing on threaded rod (1).

NOTE

- ***Bearing orientation is important.***
- ***Standard bearing: Lettered side against pilot (6).***
- ***ABS bearing: Red side against wheel.***

   e. Install pilot (6), bearing (5), washer (4) and nut (3) over rod.

NOTICE

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

2. Install bearings.

   a. Hold hex end of threaded rod (1) and turn nut (3).

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

   c. Remove tool.

   d. Install spacer sleeve inside wheel hub.

   e. Reverse tool.

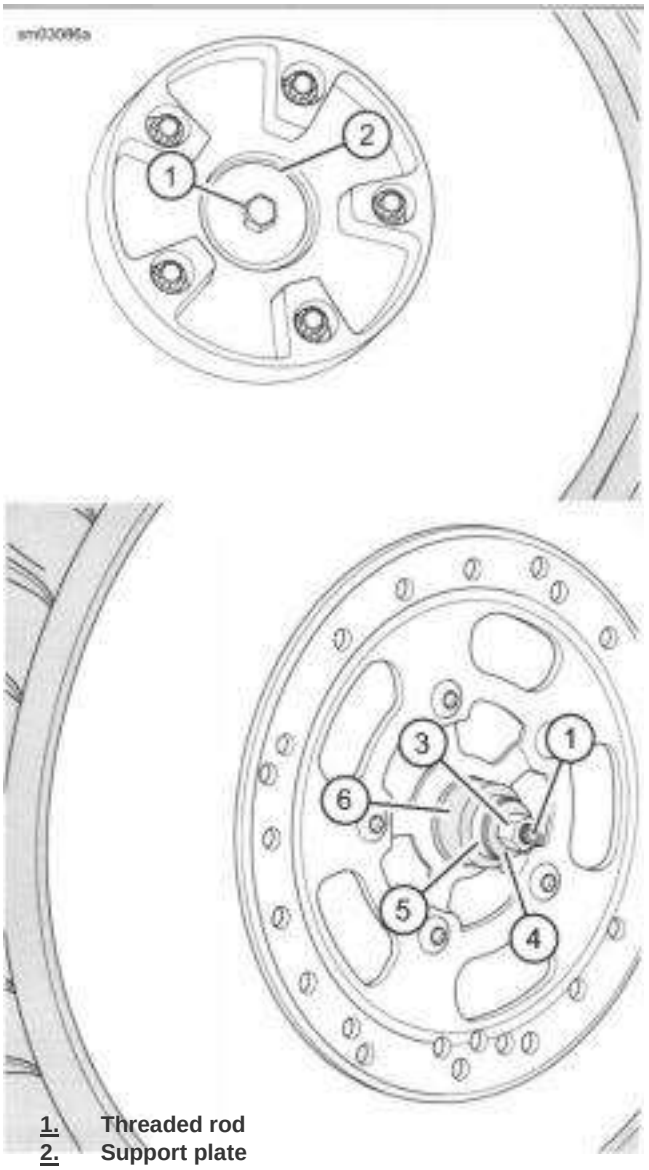
   f. Install opposite side bearing.

3. Install wheel. See FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).

INSTALL

COMPLETE

1. Lower wheel.



1. Threaded rod
2. Support plate
3. Nut
4. Washer
5. Bearing
6. Pilot

Figure 3-23. Installing Wheel Bearing

TIRES

GENERAL

A 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 INSPECT TIRES AND WHEELS (Page 2-13). Do not load tires beyond GAWR. Refer to tables in SPECIFICATIONS (Page 3-8). Underinflated, over-inflated or overloaded tires can fail.

NOTE

- ***Check runout on wheel before installing a new tire. See CHECKING AND TRUING WHEELS (Page 3-21).***
- ***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 3-24. The tread wear indicators appear when % 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 INSPECT TIRES AND WHEELS (Page 2-13) for recommended tires.

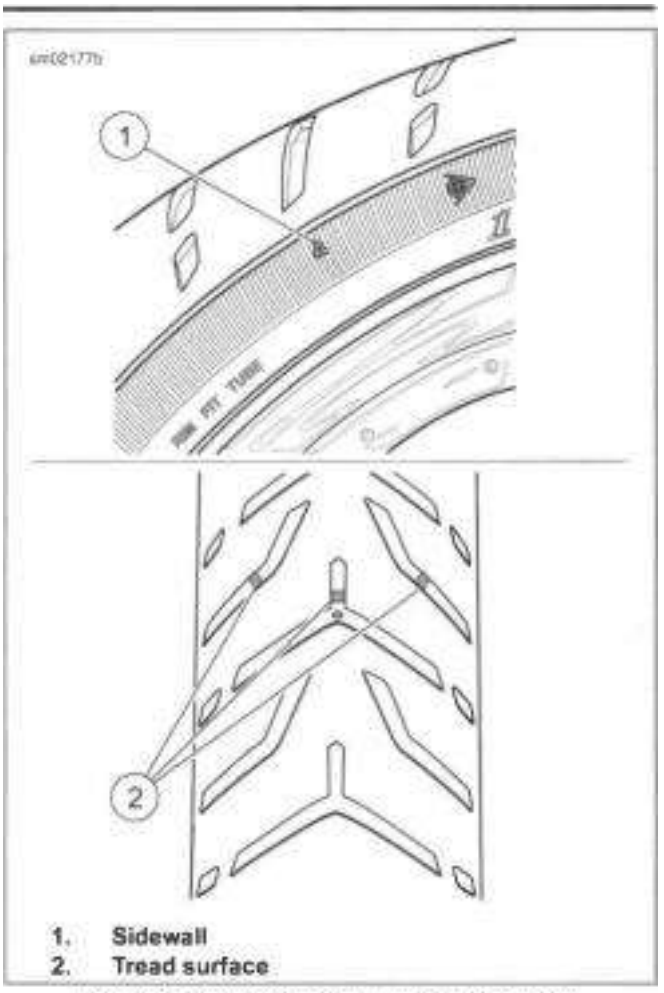


Figure 3-24. Tread Wear Indicators (Typical)

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 FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).
2. Check wheels for lateral and radial runout. See Checking Wheel Runout (Page 3-21).

REMOVE

NOTE

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

1. Deflate tire.

2. Loosen both tire beads from rim flange.
3. Remove tire.

CLEAN. INSPECT AND REPAIR

1. Clean.
   a. Clean the inside of tire and outer surface of tube.
   b. Clean rim bead area with a stiff wire brush.
2. Inspect.
   a. Verify that wheel is true. See CHECKING AND TRUING WHEELS (Page 3-21).
   b. Check tire tread depth.
   c. Inspect tire for punctures or tears. Small punctures can be repaired.

A 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)

3. Repair.
   a. Patch inner tubes only as an emergency measure. Replace a damaged or patched tube as soon as possible.
   b. Repair tread on tubeless tires if puncture is % in (6.4 mm) or smaller.
   c. Make repairs from inside the tire.
   d. Always combine a patch and plug when repairing tire.

INSTALL

Harley-Davidson recommends the use of its specified tires.

FASTENER	TORQUE VALUE	
Valve stem nut	12-15 in-lbs	1.4—1.7 N-m

A WARNING

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)

A 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)

A 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 INSPECT TIRES AND WHEELS (Page 2-13).

NOTE

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

Tube-Type Tires

A 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)

NOTE

- ***For correct tire and tube types, see SPECIFICATIONS (Page 3-8).***
- ***When replacing a tube-type tire, replace the inner tube and rim strip.***
- ***Always use a rim strip on tube-type laced wheels.***

1. See Figure 3-25. Tube-type laced wheels:
   a. Verify that no spokes protrude through nipples.
   b. Install a new rim strip.
   c. Align the valve stem hole in rim strip with valve stem hole in rim.
   d. Install new tube and tire.
2. Balance wheel. See Balance (Page 3-31).
3. Check tire lateral and radial runout. See Checking Wheel Runout (Page 3-21).
4. Install wheel. See FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).

sm02466a

Figure 3-25. Installed Rim Strip

Tubeless Tires: Cast Wheels

A WARNING

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

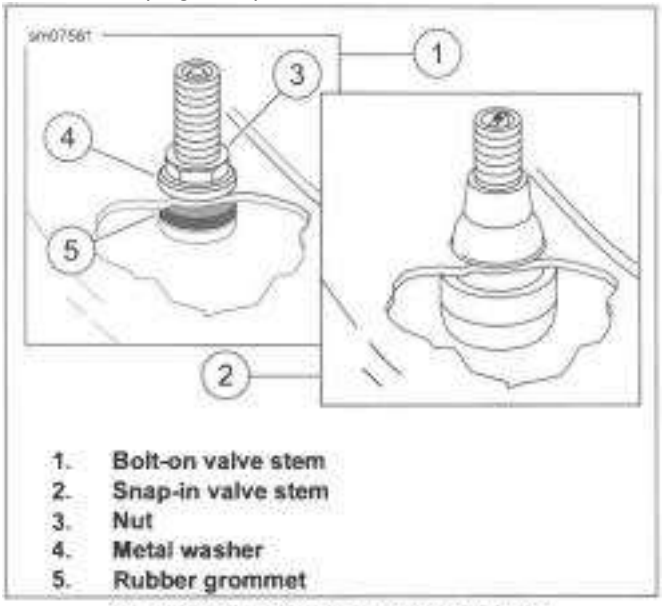
Replace damaged or leaking valve stems.

1. See Figure 3-26. Metal valve stem.
   a. Install rubber grommet (5) on valve stem.
   b. Insert valve stem into rim hole.
   c. Install metal washer (4) and nut (3). Tighten. Torque: 12-15 **in-lbs** (1.4—1.7 N-m) ***Valve stem nut***
2. See Figure 3-26. or Figure 3-27 Rubber valve stem.
   a. Cut old valve stem to remove.

NOTE

Install new 90 degree valve stem perpendicular to wheel.

   b. Install **new** valve stem.
   c. Verify that valve stem is securely seated.
3. Install tire.
4. Balance wheel. See Balance (Page 3-31).
5. Check tire lateral and radial runout. See Checking Wheel Runout (Page 3-21).
6. Install wheel. See FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).



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

Figure 3-26. Tubeless Tire Valve Stems

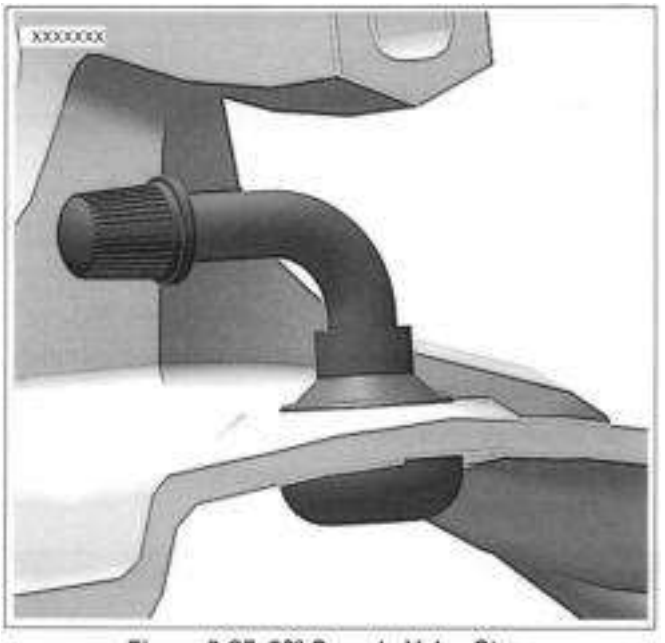


Figure 3-27. 90° Snap-in Valve Stem

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 3-28. Spin the wheel and measure lateral runout from a fixed point to a smooth area on the tire sidewall.
3. If lateral runout exceeds 0.090 in (2.29 mm), remove tire from rim and check rim lateral runout. See CHECKING AND TRUING WHEELS (Page 3-21).
   a. If rim runout is within specification, replace faulty tire.
   b. If rim runout is not within specification, adjust spokes on laced wheel or replace cast wheel. See CHECKING AND TRUING WHEELS (Page 3-21).

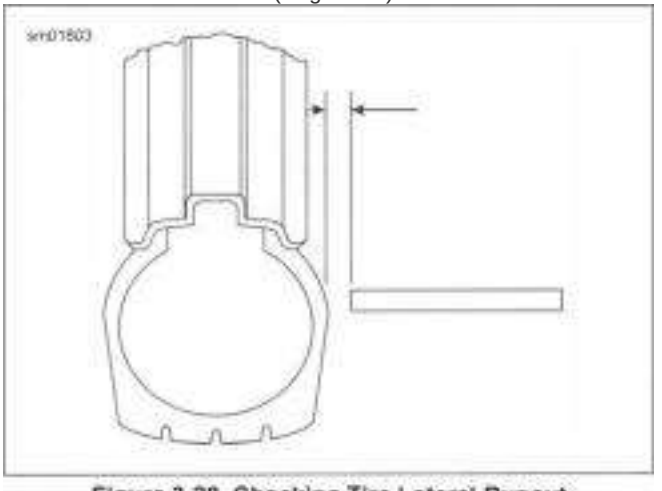


Figure 3-28. Checking Tire Lateral Runout

Radial Runout

1. Check tire pressure.
2. See Figure 3-29. Spin the wheel on the axle and measure radial runout at the tread centerline.

3. Iftire runout exceeds 0.090 in (2.29 mm), remove tire from rim and check rim radial runout. See CHECKING AND TRUING WHEELS (Page 3-21).

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

   b. If rim runout is not within specification, adjust spokes on laced wheel or replace cast wheel. See CHECKING AND TRUING WHEELS (Page 3-21).

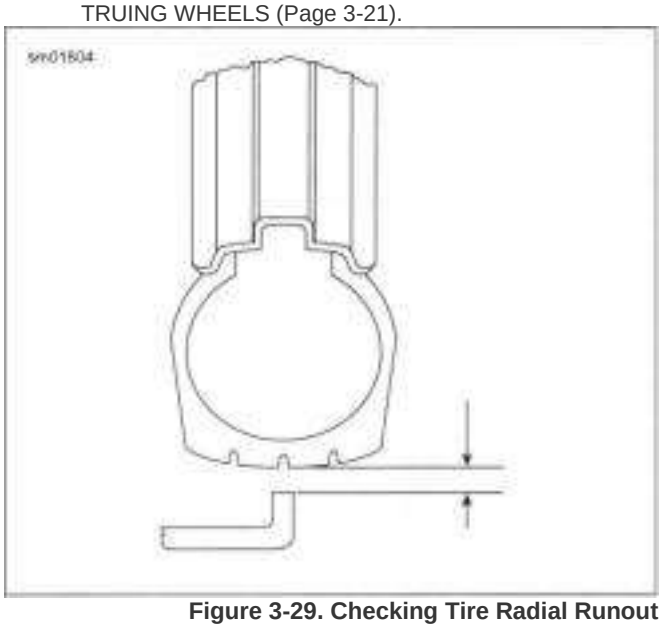


Figure 3-29. Checking Tire Radial Runout

BALANCE

Static vs Dynamic

Wheel balancing is recommended to improve handling. Balanced wheels reduce vibration especially at high speeds.

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

Weights

NOTE

- ***If more than 3.5 oz (99.2 g) of weight is required to balance wheel, 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.***
- ***If adding more than 1.5 oz (43 g) of weight at one location, divide the amount to apply half to each side of rim.***
- ***On cast wheels without a flat area near the bead, place the weights cross-wise through the opening.***

1. See Figure 3-31. Place weights on a smooth surface of the wheel rim such that centrifugal force keeps them in place. Make sure that the area of application is clean, dry and free of oil and grease.

NOTE

See Figure 3-30. When installing wheel weights, consider cosmetics. Snaking (1) is not to exceed 0.040 in (1.02 mm) (2) of straight. The angle alignment of individual segments is not to exceed three degrees (3).

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

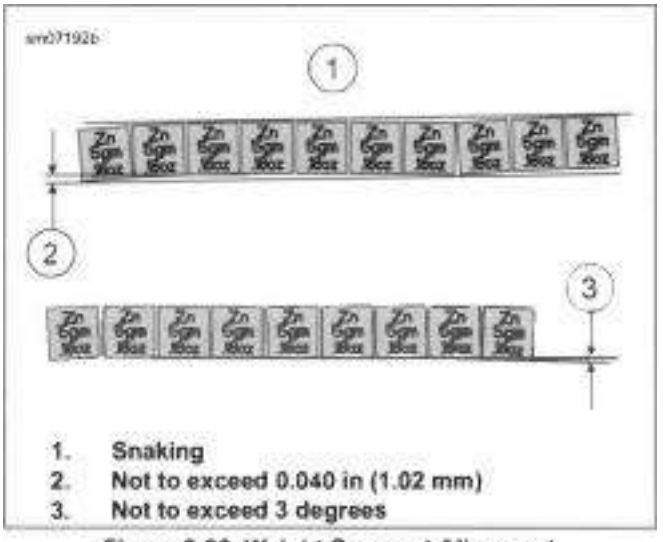


Figure 3-30. Weight Segment Alignment

Figure 3-31. Wheel Weight Placement

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

COMPLETE

1. Install wheel. See FRONT WHEEL (Page 3-12) or REAR WHEEL (Page 3-16).

PREPARE

1. Remove mufflers as necessary. See MUFFLERS (Page 6-34).

INSPECT _____ _____ _

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

A WARNING

Only a Harley-Davidson dealer should perform vehicle alignment. Improper alignment can adversely affect stability and handling, which could result in death or serious injury. (00060a)

A WARNING

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

1. Install rear axle alignment components to rear axle.

   Special Tool: AXLE ALIGNMENT PLUGS (HD-48856-B)

   a. See Figure 3-33. Insert alignment plug (2) into left end of rear axle. Turn handle until plug is firmly held in axle.

   b. See Figure 3-34. Install rear axle alignment tool (4) onto right end of rear axle over the e-clip.

Measure: Rear Fork Flat

NOTE

This method should be used prior to disassembly if alignment and belt tension are good.

1. See Figure 3-32. Fabricate an alignment tool.

   a. Cut a piece of 0.13 in (3.175 mm) diameter aluminum welding rod approximately 6 in (153 mm) long.

   b. Bend rod at a 90 degree angle, 3 in (76 mm) (3) from the flat end.

   c. Place a snug-fitting rubber grommet (2) on rod.

2. Measure left side: Measure distance between rear fork flat and rear axle alignment plug center.

   a. See Figure 3-33. Place end of alignment tool (1) against rear fork flat (4).

   b. Slide rubber grommet (3) along tool shaft until it aligns with hole in center of rear axle alignment plug (2).

   c. Without moving grommet, position alignment tool on other side of rear fork.

   d. Record measurement.

3. Measure Right side: Measure distance between rear fork flat and rear axle alignment tool center.

   a. See Figure 3-34. Place end of alignment tool (1) against rear fork flat (2).

   b. If necessary, slide rubber grommet (3) along tool shaft until it aligns with hole in center of rear axle alignment tool (4).

   c. Record measurement

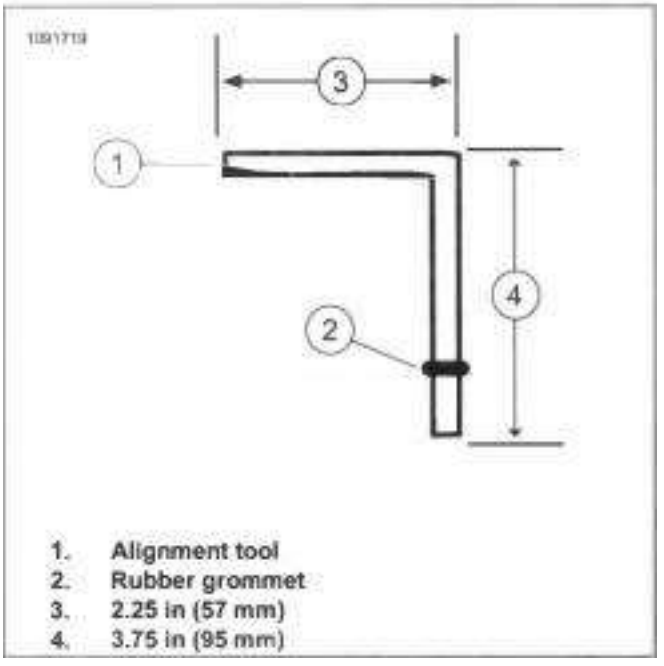


Figure 3-32. Wheel Alignment Tool

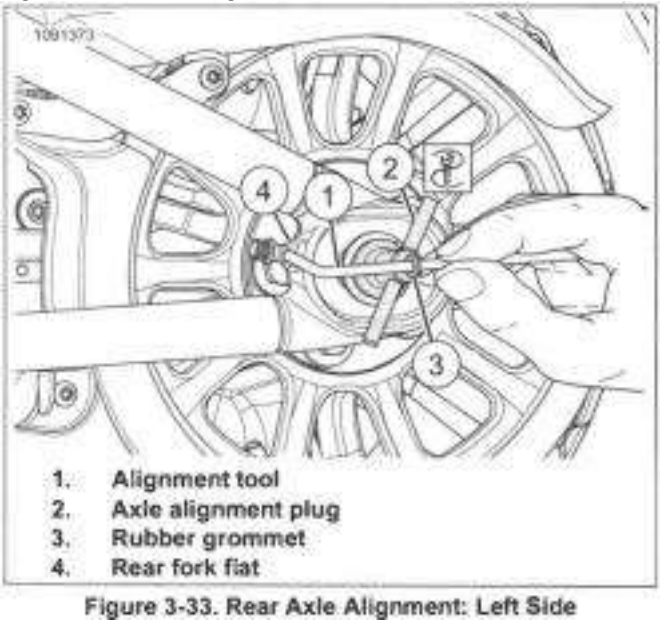


Figure 3-33. Rear Axle Alignment: Left Side

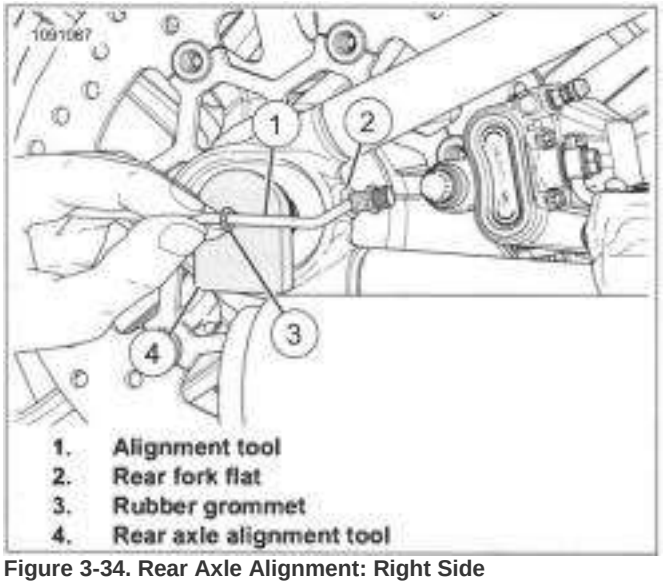


Figure 3-34. Rear Axle Alignment: Right Side

Measure: Rear Fork Pivot Shaft

NOTE

This method should be used if measurement not taken prior to disassembly.

1. See Figure 3-35. Place a steel rod through rear fork pivot shaft.

   5/16 in (8 mm)

2. Measure the distance between the center of the steel rod and the axle alignment tools.

   a. Using this method, the left and right side measurements should be equal.

3. Adjust if necessary.

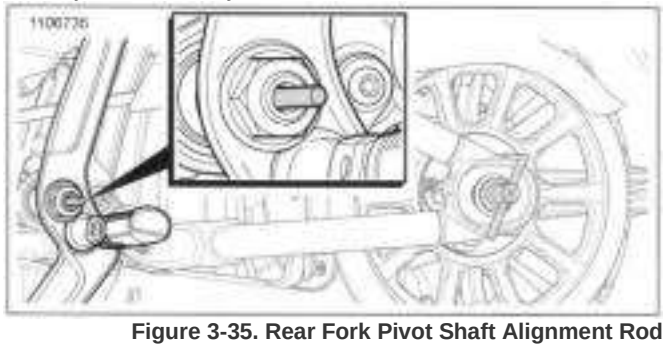


Figure 3-35. Rear Fork Pivot Shaft Alignment Rod

ADJUST

NOTE
Do not remove E-clip when loosening rear axle nut.

1. Loosen rear axle nut. See REAR WHEEL (Page 3-16).
2. See Figure 3-36. Adjust rear axle.
   a. Turn axle adjuster screw counterclockwise to shorten distance on the side with the longer distance.
   b. **If measured from rear fork flats:** Adjust axle until left and right side alignment measurements match any difference from left or right side previously recorded.
   c. **If measured from rear fork pivot shaft:** Adjust axle until measurements on left and right side are equal.

NOTE

- ***Keep axle adjuster mechanisms firmly seated (under tension) on each side of rear fork during wheel alignment.***
- ***Do not tighten rear axle nut until after checking drive belt tracking and tension.***

3. Verify drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
4. Verify drive belt tracking properly.

A WARNING

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

5. Tighten rear axle nut. See Adjust Belt (Page 2-33).
6. Verify alignment. See Inspect (Page 3-33).

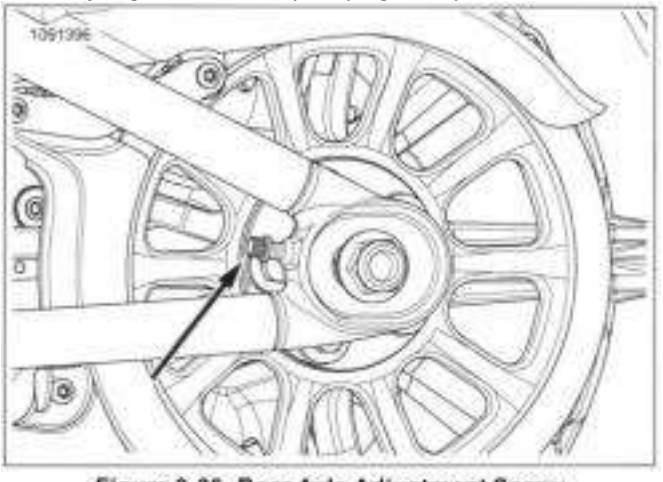


Figure 3-36. Rear Axle Adjustment Screw

COMPLETE

1. If removed, install muffler. See MUFFLERS (Page 6-34).

PREPARE

1. Remove right mirror. See MIRRORS (Page 3-112).

2. Drain brake fluid from front brake system. See BLEED BRAKES (Page 3-61).

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)

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

1. Remove brake line.
   a. Remove banjo bolt and two gasket washers.
   b. Discard gasket washers.
   c. Remove brake line.

   See Figure 3-37. Remove screws (17), washers (16), handlebar clamp (15) and master cylinder.

3. Remove master cylinder.

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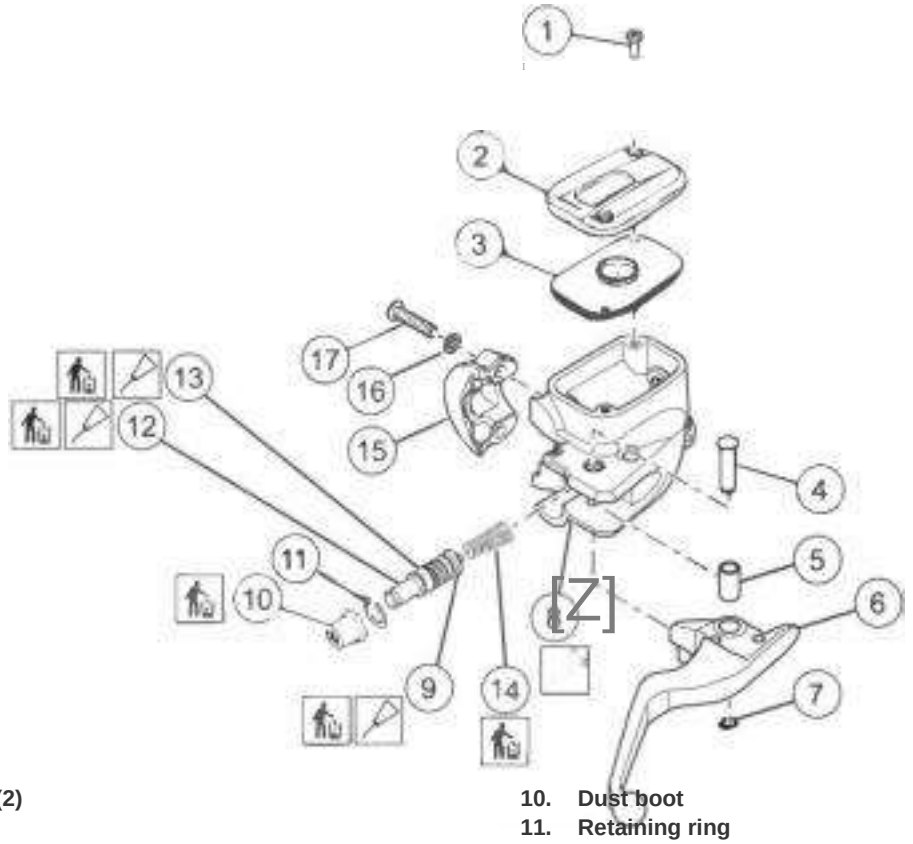


1. **Screws (2)**
2. **Cover**
3. **Gasket**
4. **Pivot pin**
5. **Bushing**
6. **Brake hand lever**
7. **Retaining ring**
8. **Master cylinder reservoir**
9. **Primary cup**
10. **Dust boot**
11. **Retaining ring**
12. **Piston**
13. **Secondary cup**
14. **Spring**
15. **Handlebar clamp**
16. **Washer (2)**
17. **Screw (2)**

Figure 3-37. Front Brake master Cylinder

INSTALL

FASTENER	TORQUE VALUE	
Front brake master cylinder banjo bolt - Dual disk front brake	24-25 ft-lbs	32-34 N-m
Front brake master cylinder banjo bolt - Single disk front brake	21-23 ft-lbs	29-31 N-m
Handlebar switch clamp screw	60-80 in-lbs	6.8-9 N-m

1. See Figure 3-38. Position the brake lever/master cylinder assembly inboard of the switch housing assembly, engaging the tab (2) on the lower switch housing (1) in the groove (3) at the top of the brake lever bracket (4).

2. Secure the handlebar clamp to master cylinder with two screws (with flat washers). Position hand lever and controls for rider comfort. Beginning with the top screw, tighten.

   Torque: 60-80 in-lbs (6.8-9 N-m) ***Handlebar switch clamp screw***

NOTE

See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20) For proper positioning of hand lever.

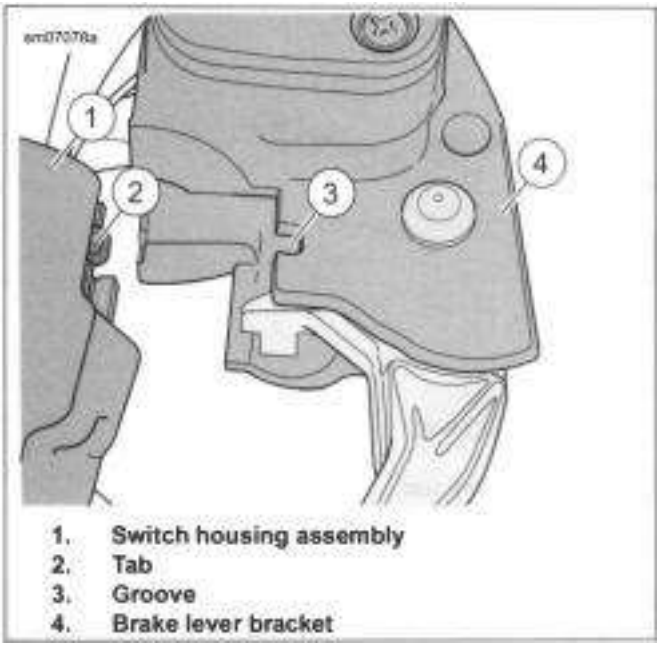
Avoid leakage. Be sure gaskets, banjo bolt(s), brake line and

NOTICE

caliper bore are clean and undamaged before assembly. (00321a)

3. Attach brake line to master cylinder with banjo bolt and new gasket washers. Tighten.

   Torque: 21-23 ft-lbs (29-31 N-m) ***Front brake master cylinder banjo bolt*** - ***Single disk front brake*** Torque: 24-25 ft-lbs (32-34 N-m) ***Front brake master cylinder banjo bolt*** - ***Dual disk front brake***



1. Switch housing assembly
2. Tab
3. Groove
4. Brake lever bracket

Figure 3-38. Attach Master Cylinder to Right Handlebar Switches

1. See Figure 3-37. Remove retaining ring (7) from pivot pin groove at bottom of master cylinder bracket.

2. Remove pivot pin (4) and brake hand lever (6).

DISASSEMBLE

3. Remove dust boot (10) and discard.

4. Remove retaining ring (11).

5. Remove and discard piston assembly (9, 12-14).

6. Remove screws (1), cover (2) and gasket (3).

CLEAN ANDJNSPECT

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

CONSUMABLE	PART NUMBER
DOT 4 BRAKE FLUID	41800219

A WARNING

could result in death or serious injury. (00291a)

A WARNING

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

1. Clean all parts with denatured alcohol or brake fluid.

   Consumable: DOT 4 BRAKE FLUID (41800219)

   a. Wipe parts dry with a clean, lint-free cloth.

   b. Clear drilled passages and bore with clean compressed air.

2. ***NOTE***

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

   Inspect parts for wear or damage. Replace parts if necessary.

3. Inspect the piston bore in the master cylinder housing for scoring, pitting or corrosion. Replace as necessary.

4. Carefully inspect the outlet port that mates with the brake line fitting. As a critical sealing surface, replace the master cylinder assembly if any damage is noted.

5. Carefully inspect the cover gasket for damage. Replace as necessary.

ASSEMBLE

CONSUMABLE	PART NUMBER
CCI #20 BRAKE GREASE	42830-05

1. ***NOTE***

- ***Always reassemble the master cylinder using new parts from the correct repair kit.***
- ***Use CCI #20 BRAKE GREASE (42830-05), included in kit, to lubricate cylinder bore, cups and seals before assembly.***

   See Figure 3-37. Coat piston bore of master cylinder reservoir (8), piston (12), primary cup (9) and secondary cup (13) with grease (supplied in kit).

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

2. Install piston assembly into piston bore of master cylinder reservoir.

   a. Press small end of spring (14) onto piston (12).

   b. Install piston/spring assembly into master cylinder reservoir (8) bore.

3. Press in on piston (12). Install **new** retaining ring (11).

4. Install **new** dust boot (10). Press large end against retaining ring. Small end should fit into groove on shaft.

5. Install gasket (3), cover (2) and screws (1). Leave fasteners loose.

6. Coat front brake lever pin pivot hole and on the end of piston that contacts brake lever with grease (supplied in kit).

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

7. Assemble brake hand lever (6) with pivot pin (4) to master cylinder reservoir (8).

A WARNING

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

8. Install **new** retaining ring (7).

COMPLETE

1. Fill and bleed front brake system. See BLEED BRAKES (Page 3-61).

2. Install right mirror. See MIRRORS (Page 3-112).

FRONT BRAKE CALIPER

PREPARE

1. Caliper service only: Drain brake fluid from front brake system. See BLEED BRAKES (Page 3-61).

REMOVE

A 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. (00321 a)

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)

Remove Caliper to Remove Front Wheel

1. See Figure 3-39. Remove mounting bolts (2). Slide caliper rearward, and position out-of-way.

Remove Caliper to Remove Front Brake Pads

1. See Figure 3-39. Loosen brake pad hanger pins (6).

2. Remove mounting bolts (2). Slide caliper rearward, and position out-of-way.

Remove Caliper for Service

1. See Figure 3-39. Loosen brake pad hanger pins (6).

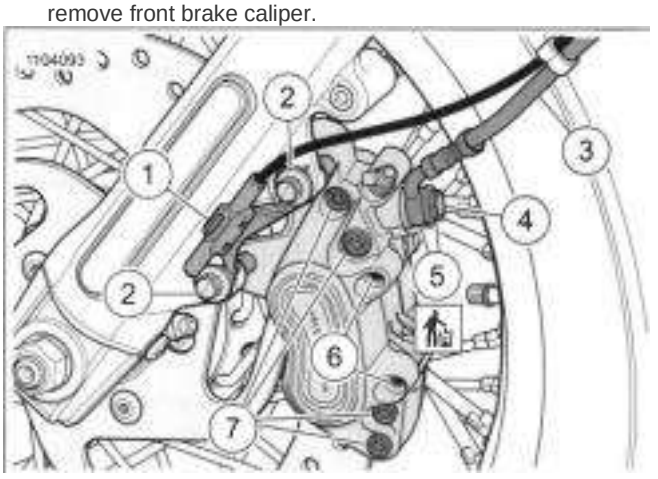
2. Remove banjo bolt (4).

   a. Remove banjo bolt.

   b. Remove and discard gasket washers (5).

3. Loosen bridge bolts (7).

4. Remove mounting bolts (2). Slide caliper rearward, and remove front brake caliper.



1. WSS harness retainer - ABS only
2. Caliper mounting bolt (2)
3. Front brake line
4. Banjo bolt
5. Gasket washer (2)
6. Brake pad hanger pin (2)
7. Bridge bolt (4)

Figure 3-39. Front Brake Caliper: (Typical)

INSTALL

Install Caliper After Service

FASTENER	TORQUE VALUE	
Front brake caliper banjo bolt	14-18 ft-lbs	19-24.4 N-m
Front brake caliper bridge bolt	14-18 ft-lbs	19.6-24.5 N-m
Front brake caliper mounting bolts	28-38 ft-lbs	38-51.5 N-m
Front brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m

CONSUMABLE	PART NUMBER
DOT 4 BRAKE FLUID	41800219

1. ***NOTE***

ABS Models: Install WSS harness retainer (1) when installing caliper to front fork.

See Figure 3-39. Install caliper.

   a. Slide caliper forward, guiding the brake pads around brake rotor.

   b. Align the caliper with the mounting bolt holes.

2. Install mounting bolts (2). Tighten.
   Torque: 28-38 ft-lbs (38-51.5 N-m) ***Front brake caliper mounting bolts***

3. Install banjo bolt (4).

   a. Lubricate new gasket washers (3) with brake fluid.

      DOT 4 BRAKE FLUID (41800219)

NOTICE

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

   b. Install banjo bolt, **new** gasket washers (1) and front brake line (3). Tighten.

      Torque: 14-18 ft-lbs (19-24.4 N-m) ***Front brake caliper banjo bolt***

4. Tighten bridge bolts (7).

   Torque: 14-18 ft-lbs (19.6-24.5 N-m) ***Front brake caliper bridge bolt***

5. Tighten brake pad hanger pin (6).

   Torque: 11-14 ft-lbs (14.7-19.6 N-m) ***Front brake caliper pad hanger pin***

Install Caliper After Installing Front Brake Pads

1. ***NOTE***

ABS Models: Install WSS ***harness retainer (1) when installing caliper to front fork.***

   See Figure 3-39. Install caliper.

   a. Slide caliper forward, guiding the brake pads around brake rotor.

   b. Align the caliper with the mounting bolt holes.

2. Install mounting bolts (2). Tighten.

   Torque: 28-38 ft-lbs (38-51.5 N-m) ***Front brake caliper mounting bolts***

3. Tighten brake pad hanger pin (6).

   Torque: 11-14 ft-lbs (14.7-19.6 N-m) ***Front brake caliper pad hanger pin***

Install Caliper After Installing Front Wheel

1. ***NOTE***

ABS Models: Install WSS ***harness retainer (1) when installing caliper to front fork.***

   See Figure 3-39. Install caliper.

   a. Slide caliper forward, guiding the brake pads around brake rotor.

   b. Align the caliper with the mounting bolt holes.

2. Install mounting bolts (2). Tighten.

   Torque: 28-38 ft-lbs (38-51.5 N-m) ***Front brake caliper mounting bolts***

3. **ABS models:** Verify WSS wire harness clips are in place.

NOTE

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

DISASSEMBLE

1. Remove one brake pad. See INSPECT BRAKES (Page 2-17).

2. Verify that remaining brake pad is installed with brake pad pins.

3. Verify that bleeder screw is installed.

NOTE

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

A 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)

A CAUTION

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

4. Gently apply low pressure compressed air to banjo bolt hole to force pistons from caliper bores.

5. Remove brake pad pins and brake pad.

6. See Figure 3-40. Remove bridge bolts (11, 12) and separate caliper housings.

7. Remove pistons from each housing by hand. If necessary, wiggle pistons gently to remove.

NOTE

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

8. Using a wooden toothpick, remove dust seals (5, 9) and piston seals (4,10) from each caliper bore. Discard seals.

9. If necessary, remove bleeder screw (1).

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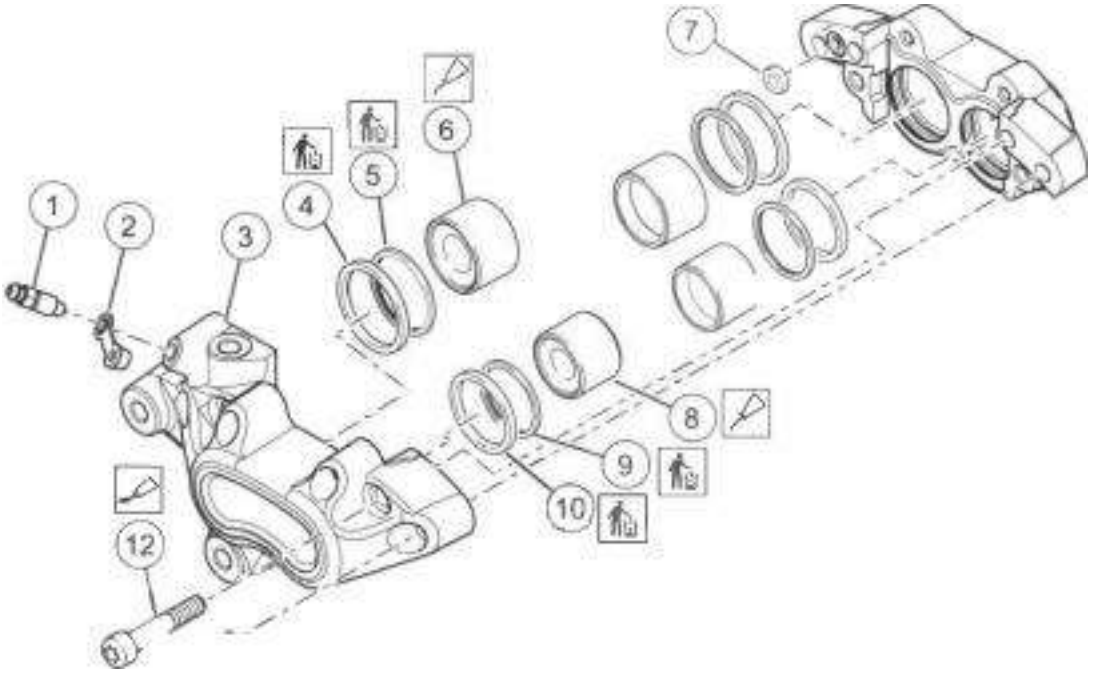


1. Bleeder screw Bleeder
2. screw cap Outer caliper
3. housing 34 mm seal (2)
4. 34 mm dust seal (2) 34
5. mm piston (2)
6.
7. Cross-over seal
8. 32 mm piston (2)
9. 32 mm dust seal (2)
10. 32 mm seal (2)
11. Short bridge bolt (2)
12. Long bridge bolt (2)

Figure 3^0. Front Caliper

CLEAN AND INSPECT

CONSUMABLE	PART NUMBER
DOT4 BRAKE FLUID	41800219

A WARNING

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

1. **Clean all rubber parts with brake fluid. Do not contaminate with mineral oil or other solvents. Clean all metal parts with denatured alcohol. Wipe parts dry with a clean, lint-free cloth.**

   Consumable: DOT 4 BRAKE FLUID (41800219)

A WARNING

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

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

3. **Carefully inspect all components. Replace as necessary.**

   a. **Check pistons for pitting, scratches or corrosion on outside surfaces.**

   b. **Inspect piston bores. Do not hone bores. Replace as necessary.**

NOTE

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

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

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

   e. **Always replace all seals after disassembly.**

A WARNING

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

4. **Inspect brake pads and brake disc. Replace if necessary.**

   a. **Specifications: content: See INSPECT BRAKES (Page**

See Figure 3-40. Install a new piston seal (4, 10) and a new dust seal (5, 9) into each piston bore.

2-17).

b. Brake Disc: See FRONT WHEEL (Page 3-12).

ASSEMBLE

FASTENER	TORQUE VALUE	
Brake caliper, front, bridge bolt	14-18 ft-lbs	19.6-24.5 N-m
Front brake caliper bleeder screw	35-61 in-lbs	3.9-6.9 N-m

CONSUMABLE	PART NUMBER
G40M BRAKE GREASE	42820-04
LOCTITE 569 BROWN THREAD SEALANT	Loctite 569

1. Lubricate the following parts using a light coat of grease.

   All other surfaces must be dry.

   Consumable: G40M BRAKE GREASE (42820-04)

   a. Nose radius of pistons.

   NOTE

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

   b. All surfaces of piston seals and dust seals.

2.

3. Carefully insert pistons (6, 8) by hand, nose radius first, into caliper bores. If installation shows resistance, remove pistons. Check that seals are properly installed and fully seated in grooves. Press pistons completely into bores.

4. Install new cross-over seal (7).

5. Install bridge bolts (11, 12).

   a. Apply a drop of threadlocker to the threads of the bridge bolts.

   LOCTITE 569 BROWN THREAD SEALANT (Loctite 569)

   b. Assemble caliper housings.

   c. Install bridge bolts. Tighten.

   Torque: 14-18 ft-lbs (19.6-24.5 N-m) ***Brake caliper, front, bridge bolt***

6. Install bleeder screw on caliper housing if removed. Tighten.

   Torque: 35-61 in-lbs (3.9-6.9 N-m) ***Front brake caliper bleeder screw***

COMPLETE

1. If drained: Fill and bleed front brake system. See BLEED BRAKES (Page 3-61).

REAR BRAKE MASTER CYLINDER

PREPARE

1. Drain brake fluid from rear brake system. See BLEED BRAKES (Page 3-61).

2. **If needed:** Remove right footboard/footpeg bracket. See RIGHT FOOT CONTROLS (Page 3-133).

REMOVE

2. Remove clevis pin.

1. See Figure 3-41. Remove cotter circle (1).

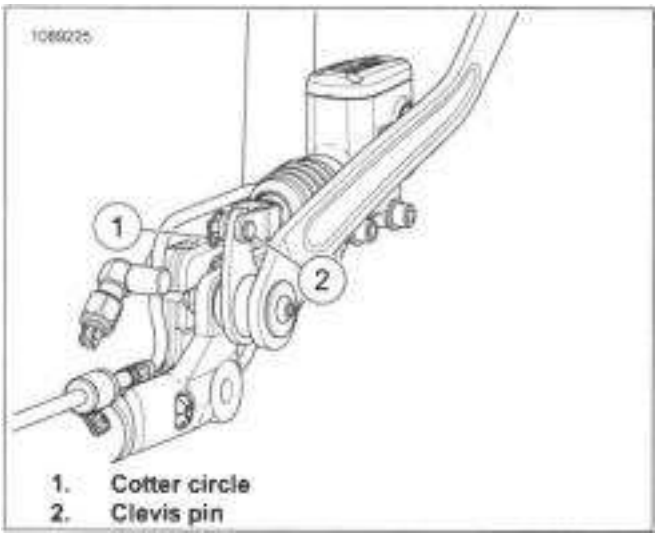


Figure 3-41. Rear Master Cylinder - Rear View: (exhaust remove for clarity)

3. See Figure 3-42. Remove banjo bolt (2) and two gasket washers (1) to disconnect fitting of hydraulic brake line from master cylinder. Discard washers.

4. Remove screws (4).

See Figure 3-40. Install a new piston seal (4, 10) and a new dust seal (5, 9) into each piston bore.

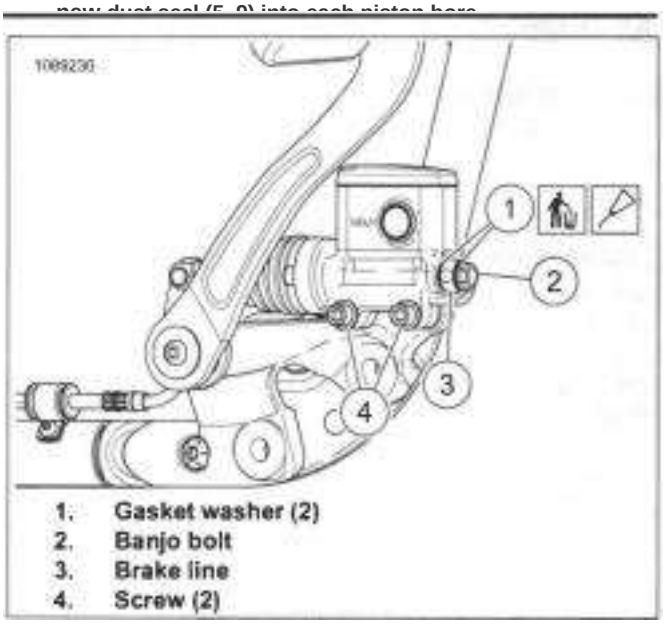


Figure 3-42. Rear Master Cylinder - Front View: (exhaust remove for clarity)

5. Remove rear master cylinder bracket.

   a. See Figure 3-43. Remove screw (3).

b. Remove rear master cylinder bracket.

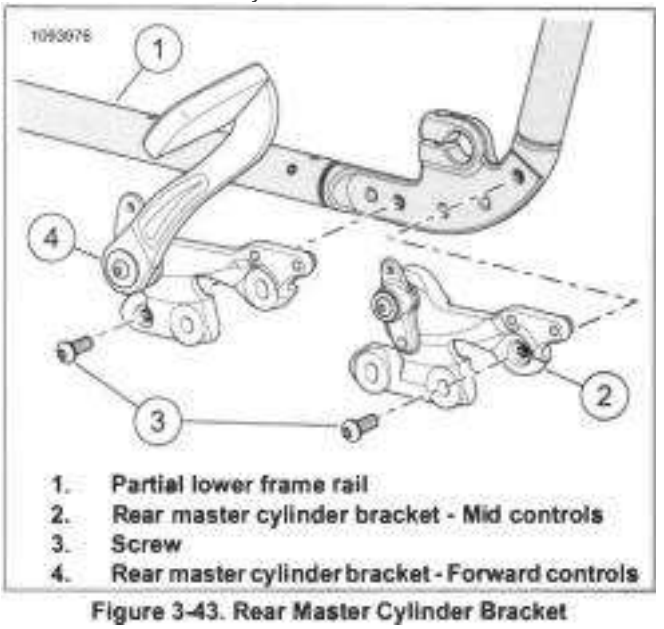


Figure 3-43. Rear Master Cylinder Bracket

INSTALL

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, mounting screws	18-22 ft-lbs	24.4-29.9 N-m
Master cylinder bracket to frame screw	30-40 ft-lbs	40.7-54.2 N-m
Master cylinder, rear, banjo bolt	14-18 ft-lbs	19-24.4 N-m

1. ***NOTE***
Verify that the brake pedal link is between the master cylinder yoke when placing the master cylinder into place.

Install rear master cylinder onto rear master cylinder bracket. Hand tighten.

2. See Figure 3-41. Install clevis pin.

3. Install cotter circle.

4. Position rear master assembly into place on frame.

5. See Figure 3-43. Install screw. Tighten.

   Torque: 30-40 ft-lbs (40.7-54.2 N-m) ***Master cylinder bracket to frame screw***

6. See Figure 3-42. Install screws (4). Tighten.

   Torque: 18-22 ft-lbs (24.4-29.9 N-m) ***Brake master cylinder, rear, mounting screws***

NOTICE

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

7. Attach brake line (3) to master cylinder with banjo bolt (2) and new gasket washers (1). Tighten.

   Torque: 14-18 ft-lbs (19-24.4 N-m) ***Master cylinder, rear, banjo bolt***

DISASSEMBLE AND ASSEMBLE: MASTER CYLINDER

FASTENER	TORQUE VALUE	
Master brake cylinder yoke	11-14 ft-lbs	14.7-19.6 N-m

CONSUMABLE	PART NUMBER
G40M BRAKE GREASE	42820-04
CCI #20 BRAKE GREASE	42830-05

1. ***NOTE***
Install a new rebuild kit when unit is reassembled.

   See Figure 3-44. Remove cover.

   a. Remove cover screws (3).

   b. Remove cover (5).

   c. Remove reservoir gasket (2).

2. Remove piston set (1).

   a. Hold nut (18). Remove yoke (20).

   b. Remove return spring boot (19).

A 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)

   c. Remove nut (18), spring retainer (17) and return spring (16).

   d. Remove boot (15).

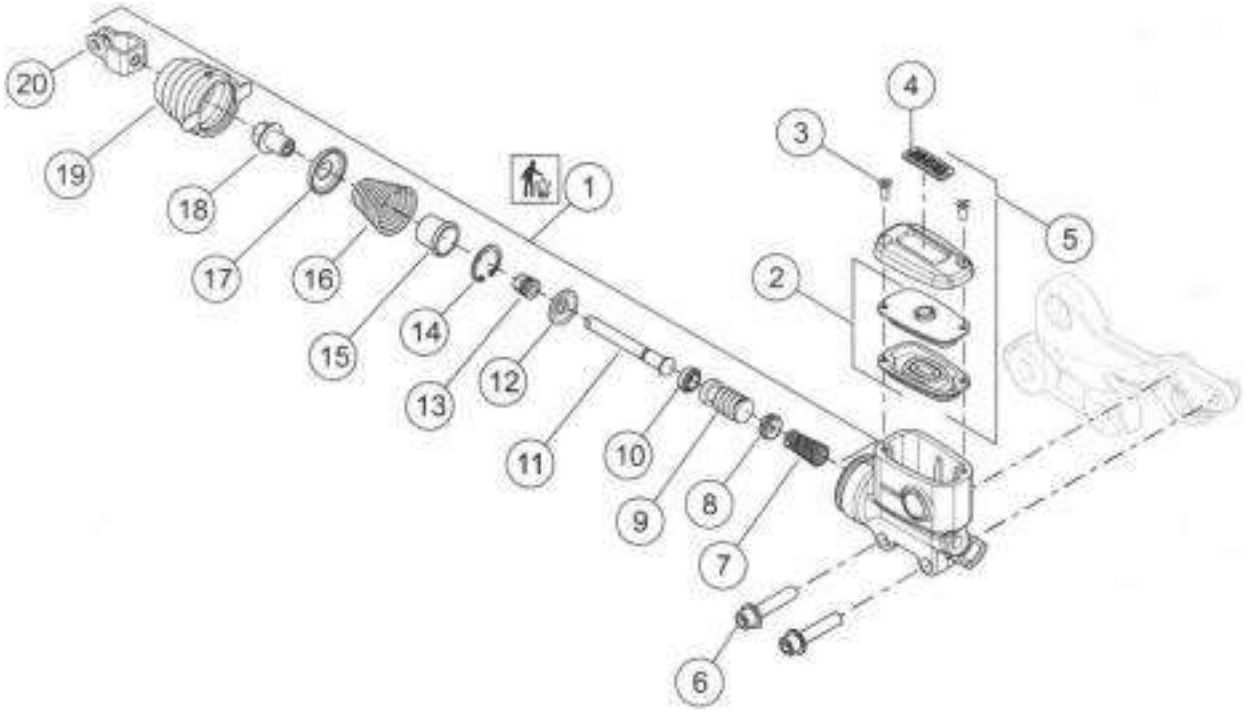
Disassemble

   e. Remove retaining ring (14) and pushrod assembly (13, 12 and 11).

   f. Remove piston assembly (9 and 10).

   g. Remove spring (7) and primary cup (8).

3. Discard piston set.



1.	Piston set	11.	Push rod
2.	Reservoir gasket	12.	Stop plate
3.	Cover screw (2)	13.	Boot collar
4.	Decal	14.	Retaining ring
5.	Cover	15.	Boot
6.	Screw (2)	16.	External return spring
7.	Spring	17.	Spring retainer
8.	Primary cup	18.	Nut
9.	Piston	19.	Return spring boot
10.	Secondary cup	20.	Yoke

Figure 3-44. Rear Master Cylinder Assembly

Clean and Inspect

A WARNING

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

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

   Clean all metal parts, except the cartridge body assembly, and blow dry with compressed air. Clean all rubber parts using denatured alcohol.

2. Inspect the cylinder bore for scratches. Replace the master cylinder assembly if scratches are present.

3. Inspect O-ring grooves on the cartridge body for dirt. Carefully clean O-ring grooves using a soft cotton cloth moistened with alcohol and allow to dry. Inspect O-ring grooves for scratches. Replace cartridge body if grooves are scratched.

4. Inspect the reservoir cover gasket for cuts, tears or general deterioration.

Assemble

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

   See Figure 3-44. Install new piston set (1).

   a. Apply grease to cylinder bore, piston (9) and cups (8 and 10).

      CCI #20 BRAKE GREASE (42830-05)

   b. Install primary cup (8) on small end of spring (7).

   c. Insert large end of spring first. Install spring and cup into cylinder bore.

   d. Insert flat end of piston first. Install piston and cup into cylinder bore.

   e. Lightly apply grease to ball end of the pushrod assembly.

G40M BRAKE GREASE (42820-04)

f. Install ball end of pushrod into cupped end of piston.

g. Compress piston with pushrod.

A 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)

h. Install retaining ring (14). Verify that retaining ring is completely seated in groove.

i. Install boot (15) over pushrod and into end of master cylinder bore. Press lip of inner boot down around groove in boot collar (13).

j. Install external return spring (16).

k. Compress return spring and Install spring retainer (17) and nut (18).

l. See Figure 3-45. Tighten nut to 1.9 in (48.8 mm) from face of master cylinder to end of hex nut.

m. See Figure 3-44. Install return spring boot (19). Position boot taps at 3 o'clock and 9 o'clock position when master cylinder body is held upright.

n. Hold nut and install yoke (20). Tighten.

Torque: 11-14 ft-lbs (14.7-19.6 N-m) ***Master brake cylinder yoke***

sm07934

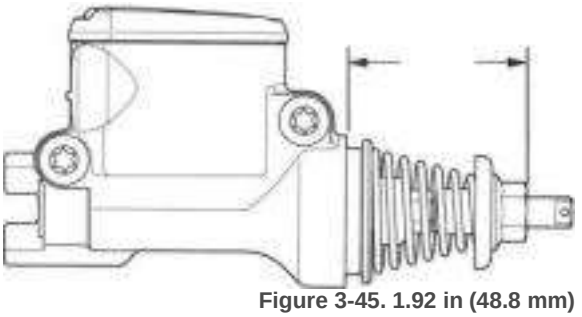


Figure 3-45. 1.92 in (48.8 mm)

COMPLETE

1. **If removed:** Install right footboard/footpeg bracket. See RIGHT FOOT CONTROLS (Page 3-133).

2. Fill and bleed rear brake system. See BLEED BRAKES (Page 3-61).

REAR BRAKE CALIPER

PREPARE

1. If necessary: Remove muffler. See EXHAUST SYSTEM (Page 6-36).

2. Caliper service only: Drain brake fluid from rear brake system. See BLEED BRAKES (Page 3-61).

REMOVE

A 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)

NOTE

IfDOT4 brake fluid contacts painted surfaces, /MMEDIATELY flush area with clear water.

1. See Figure 3-46. Remove slider bolt (5) and sleeve screw (6).

   a. Clean threads of sleeve screw.

Removing Caliper to Remove Rear Wheel

1. Remove caliper.

   a. Slide caliper forward to clear rear brake rotor, and position out-of-way.

Removing Caliper to Removing Rear Brake Pads

1. Loosen the brake pad hanger pins (7).

   a. Slide caliper forward to clear rear brake rotor, and position to remove rear brake pads.

Removing Caliper for Service

1. Loosen the brake pad hanger pins (7).

2. Remove banjo bolt (2).

   a. Remove banjo bolt.
   b. Remove and discard gasket washers (1).

3. Remove caliper.

   a. Slide caliper forward to clear rear brake rotor, and remove rear brake caliper.

1. Gasket washer (2)
2. Banjo bolt
3. Rear brake line
4. WSS harness - ABS only
5. Slider bolt
6. Sleeve screw
7. Brake pad hanger pin (2)

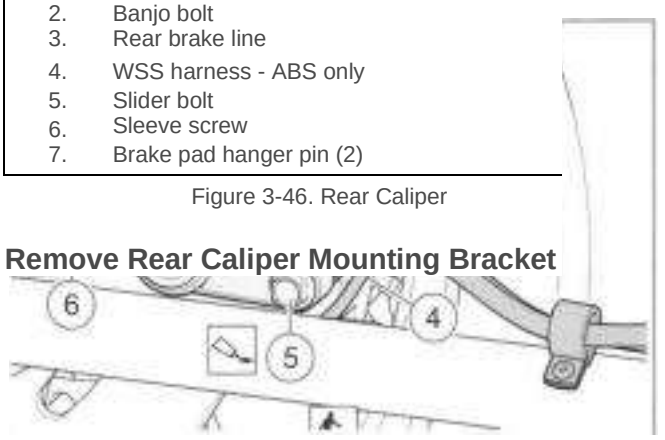


Figure 3-46. Rear Caliper

Remove Rear Caliper Mounting Bracket

1. Remove rear wheel. See REAR WHEEL (Page 3-16).

2. Remove rear caliper mounting bracket. a.

   Inspect for damage or worn parts.

INSTALL

PART NUMBER	TOOL NAME
HD-52351	12MM TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Rear brake caliper banjo bolt	21-23 ft-lbs	29-31 N-m
Rear brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6Nm
Rear caliper sleeve screw	15-18 ft-lbs	20.5-24.4 Nm

FASTENER	TORQUE VALUE	
Rear caliper slider bolt	15-18 ft-lbs	20.3-24.4 N-m

CONSUMABLE	PART NUMBER
LOCTITE 242 MEDIUM STRENGTH THREADLOCKER ADHESIVE (BLUE)	Loctite 242

Install Rear Caliper Mounting Bracket

1. Position rear caliper mounting bracket on rear wheel.
2. Install rear wheel. See REAR WHEEL (Page 3-16).

Installing Caliper from Service

1. See Figure 3-46. Install caliper
   a. Position caliper on mounting bracket in front of brake rotor.
   b. Slide caliper rearward, guiding the brake pads around brake rotor.

NOTE

Verify the WSS ***harness (4) is routed under the caliper mounting bracket.***

   c. Align the caliper with the slider bolt hole and sleeve screw hole.
   d. Apply threadlocker to sleeve screw. Install slider bolt (5) and sleeve screw (6). Hand tighten.

      LOCTITE 242 MEDIUM STRENGTH THREADLOCKER ADHESIVE (BLUE) (Loctite 242)

2. Install banjo bolt (2).
   a. Install banjo bolt, **new** gasket washers (1) and rear brake line (3). Tighten.

      Torque: 21-23 ft-lbs (29-31 N-m) ***Rear brake caliper banjo bolt***

3. Tighten brake pad hanger pins (7).

   Torque: 11-14 ft-lbs (14.7-19.6 N-m) ***Rear brake caliper pad hanger pin***

Installing Caliper from Removing Rear Brake Pads

1. See Figure 3-46. Install caliper
   a. Position caliper on mounting bracket in front of brake rotor.
   b. Slide caliper rearward, guiding the brake pads around brake rotor.

NOTE

Verify the WSS ***harness (4) is routed under the caliper mounting bracket.***

   c. Align the caliper with the slider bolt hole and sleeve screw hole.
   d. Install slider bolt (5) and sleeve screw (6). Hand tighten.

2. Tighten brake pad hanger pins (7).

   Torque: 11-14 ft-lbs (14.7-19.6 N-m) ***Rear brake caliper pad hanger pin***

Installing Caliper from Remove Rear Wheel

1. See Figure 3-46. Install caliper
   a. Position caliper on mounting bracket in front of brake rotor.
   b. Slide caliper rearward, guiding the brake pads around brake rotor.

NOTE

Verify the WSS ***harness (4) is routed under the caliper mounting bracket.***

   c. Align the caliper with the slider bolt hole and sleeve screw hole.
   d. Install slider bolt (5) and sleeve screw (6). Hand tighten.

Install All

1. See Figure 3-47. Using torque adapter.

   Special Tool: 12MM TORQUE ADAPTER (HD-52351)

   a. Tighten sleeve screw (4).

      Torque: 15-18 ft-lbs (20.3-24.4 N-m) ***Rear caliper sleeve screw***

   b. Tighten slider bolt (3).

      Torque: 15-18 ft-lbs (20.3-24.4 N-m) ***Rear caliper slider bolt***

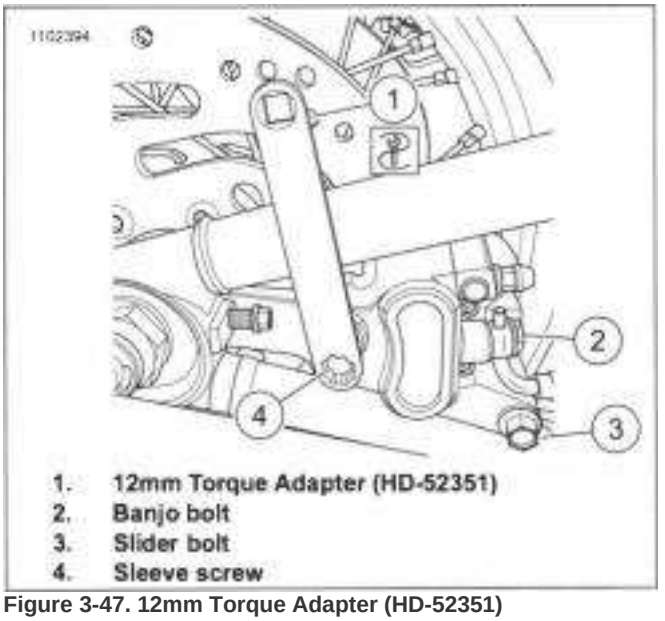


Figure 3-47. 12mm Torque Adapter (HD-52351)

PART NUMBER	TOOLNAME
HD-48648	REAR BRAKE PISTION REMOVAL TOOL

DISASSEMBLE

Caliper

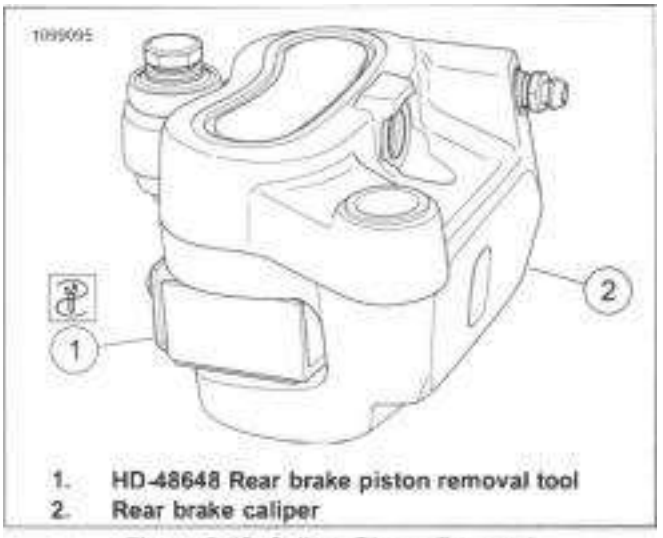
1. Remove rear brake pads. See INSPECT BRAKES (Page 2-17).

A 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. See Figure 3-49. Removal pistons (1).
   a. Place caliper on working bench.
   b. Remove brake pad retaining spring (10).
   c. See Figure 3-48. Using low pressure compressed air and removal tool, remove pistons and discard.

      Special Tool: REAR BRAKE PISTION REMOVAL TOOL (HD-48648)



1. HD-48648 Rear brake piston removal tool
2. Rear brake caliper

Figure 3-48. Caliper Piston Removal

3. See Figure 3-49. Remove seals and discard.
   a. Remove dust seal (2).
   b. Remove piston seal (3).
4. Remove brake caliper sleeve (8).
5. Remove brake caliper sleeve boot (9).
6. Remove bleeder screw cap (5).
7. Remove bleeder screw (4).
8. Remove medallion (7).

1. **Piston (2)**
2. **Dust seal (2)**
3. **Piston seal (2)**
4. **Bleeder screw**
5. **Bleeder screw cap**
6. **Brake caliper body**
7. **Medallion**
8. **Brake caliper sleeve**
9. **Brake caliper sleeve boot**
10. **Brake pad retaining spring**

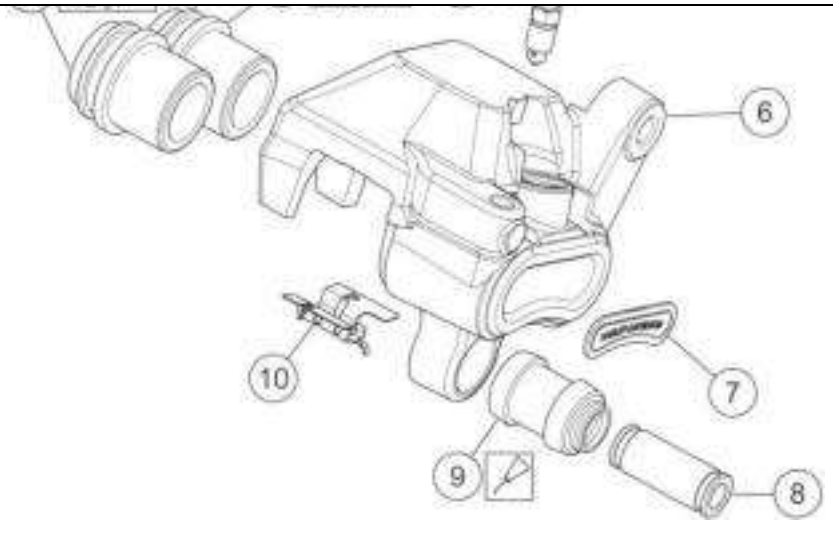


Figure 3-49. Rear Brake Caliper Assembly

Rear Caliper Mounting Bracket

3. Install bleeder screw cap (5).

1. See Figure 3-50. Remove slider pin (5).

2. Remove slider pin dust cover (4).
3. Remove caliper damper (3).

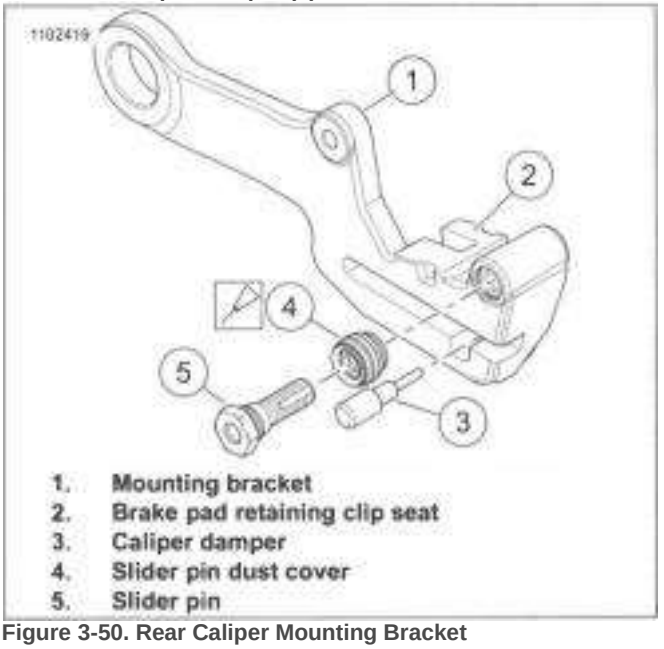


Figure 3-50. Rear Caliper Mounting Bracket

CLEAN AND INSPECT

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

CONSUMABLE	PART NUMBER
DOT 4 BRAKE FLUID	41800219

A WARNING

assembly. Deterioration of these components can cause brake failure, which could result in death or serious injury. (00291a)

1. Clean all rubber parts with brake fluid. Do not contaminate with mineral oil or other solvents. Clean all metal parts with denatured alcohol. Wipe parts dry with a clean, lint-free cloth.

   Consumable: DOT 4 BRAKE FLUID (41800219)

A WARNING

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

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

3. Carefully inspect all components. Replace as necessary.
   e. Install brake pad retaining spring (10).

   a. Check pistons for pitting, scratches or corrosion on outside surfaces.

   b. Inspect piston bores. Do not hone bores. Replace as necessary.

NOTE

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

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

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

   e. Always replace all seals after disassembly.

A WARNING

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

4. Inspect brake pads and brake disc. Replace if necessary.

   a. Specifications: content: See INSPECT BRAKES (Page 2-17).

CONSUMABLE	PART NUMBER
DOT 4 BRAKE FLUID	41800219
G40M BRAKE GREASE	42820-04
CCI #20 BRAKE GREASE	42830-05

   b. Brake Disc: See REAR WHEEL (Page 3-16).

ASSEMBLE

Rear Caliper Mounting Bracket

1. See Figure 3-50. Install caliper damper (3).

2. Apply grease to the inside of slider pin dust cover (4).

   Consumable: G40M BRAKE GREASE (42820-04)

3. Install slider pin dust cover.

4. Install slider pin (5).

Caliper

1. See Figure 3-49. Install new medallion (7). See
2. Install bleeder screw (4). Hand tighten.

MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).

3. Install bleeder screw cap (5).

4. Lightly apply silicone grease to brake caliper sleeve boot (9).

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

5. Install brake caliper sleeve (8).

NOTICE

Avoid leakage. Prevent damage to piston or piston bore. Use non-metallic tools when servicing components. (00529d)

6. Install piston (1).

   a. Apply a light coating of brake fluid over the pistons, dust seal (2) and piston seal (3).

      DOT 4 BRAKE FLUID (41800219)

   b. See Figure 3-51. Install the piston seals (3) into the brake caliper piston bore.

   c. Install the dust seals (2) into the brake caliper piston bore.

   d. Insert pistons, by hand, into bores of caliper housing. Press pistons squarely into place until they bottom in the bores. If installation shows resistance, remove piston. Check that seals are properly installed.

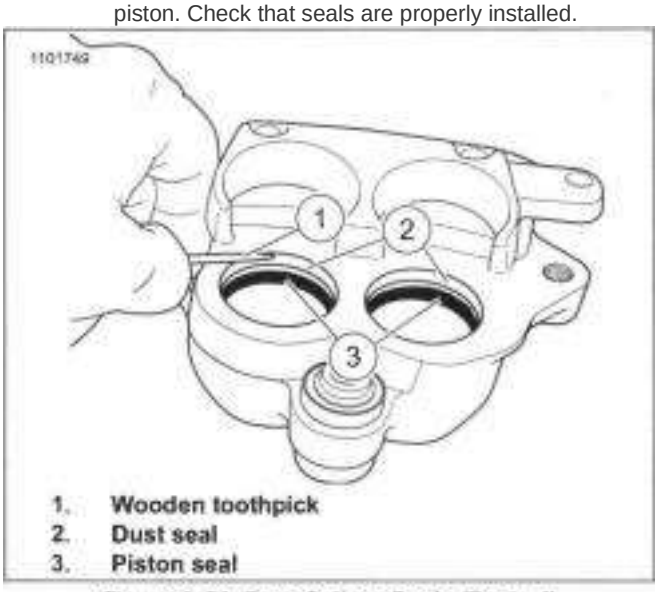


Figure 3-51. Rear Caliper Seals (Typical)

COMPLETE

1. **If drained:** Fill and bleed rear brake system. See BLEED BRAKES (Page 3-61).

2. **If removed:** Install muffler. See EXHAUST SYSTEM (Page 6-36).

e. Install brake pad retaining spring (10).

FRONT BRAKE LINE: NON-ABS

FASTENER	TORQUE VALUE	
Front brake line screw	36-48 in-lbs	4.1-5.4 N-m

Prepare

1. Drain front brake line. See BLEED BRAKES (Page 3-61).

Remove

1. Remove brake line (1) from front brake master cylinder. See FRONT BRAKE MASTER CYLINDER (Page 3-35).

NOTE

If equipped with dual front calipers, remove brake lines from both calipers.

2. Remove brake line from front brake caliper. See FRONT BRAKE CALIPER (Page 3-38).
3. See Figure 3-52. Remove brake line.
   a. Remove brake line from wireform (2).
   b. Remove cable strap, if equipped.
   c. Remove screw (4).
   d. Remove brake line.
   e. Single caliper: Remove clamp (3) from front brake line.

Install

1. Install brake line (1) to front brake master cylinder. See FRONT BRAKE MASTER CYLINDER (Page 3-35).
2. See Figure 3-52. Install brake line.
   a. Route brake line as shown.
   b. Single caliper: Install clamp (3) onto front brake line.
   c. Dual caliper: Position front brake line manifold (5)
   d. Install screw (4). Tighten.
      Torque: 3^-48 in-lbs (4.1-5.4 N-m) ***Front brake line screw***
3. Install brake line to front brake caliper. See FRONT BRAKE CALIPER (Page 3-38).

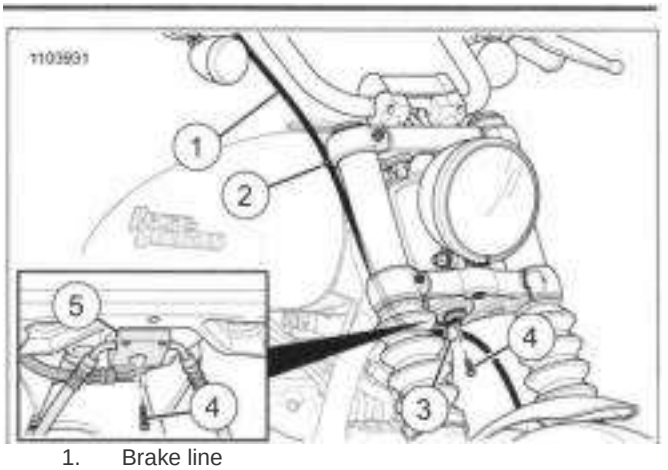
NOTE

If equipped with dual front calipers, install brake lines to both calipers.

4. Install brake line into wireform (2).
5. Install cable strap, if removed.

Complete

1. Bleed brake system. See BLEED BRAKES (Page 3-61).



1. Brake line
2. Wire form
3. Clamp
4. Screw
5. Front brake line manifold

Figure 3-52. Front Brake Line: Single and Dual Front Caliper (Non ABS)

FASTENER	TORQUE VALUE	
Rear brake line bracket screws	24-36 in-lbs	2.7-4.1 N-m
Rear brake line clamp screws	24-36 in-lbs	2.7-4.1 N-m

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

REAR BRAKE LINE: NON-ABS

Prepare

1. Remove seat. See SEAT (Page 3-142).
2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Remove negative battery cable. See POWER DISCONNECT (Page 7-7).
4. Remove battery strap. See INSPECT BATTERY (Page 2-43).
5. Remove battery. See INSPECT BATTERY (Page 2-43).
6. Remove battery tray. See BATTERY TRAY (Page 7-97).
7. Drain rear brake line. See BLEED BRAKES (Page 3-61).
8. Remove rear stoplamp switch. See REAR STOPLAMP SWITCH (Page 7-63).

Remove

1. Remove brake line from rear brake master cylinder. See REAR BRAKE MASTER CYLINDER (Page 3-42).
2. Remove brake line from rear brake caliper. See REAR

3. Install bleeder screw cap (5).

BRAKE CALIPER (Page 3-46).

e. Install brake pad retaining spring (10).

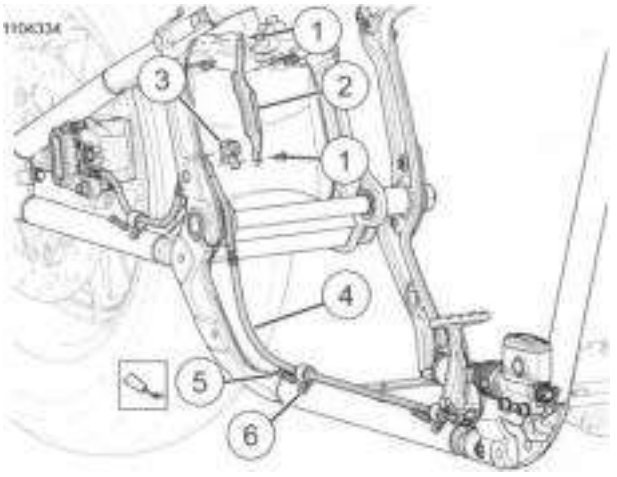
3. See Figure 3-53. Remove rear brake line retaining bracket.
   a. Remove screws (1).
   b. Remove rear brake line bracket (2).
4. Remove brake line.
   a. Remove screws (5).
   b. Remove brake line (4).
   c. Remove clamps (6) from brake line.
   d. Remove grommet (3) from brake line.

Install

1. See Figure 3-53. Install grommet (3) onto brake line (4).
2. Route brake line as shown.
3. Install brake line at rear brake master cylinder. See REAR BRAKE MASTER CYLINDER (Page 3-42).
4. Install brake line at rear brake caliper. See REAR BRAKE CALIPER (Page 3-46).
5. Install rear brake line retaining bracket.
   a. Install rear brake line bracket (2).
   b. Install screws (1). Tighten.
      Torque: 24-36 in-lbs (2.7-4.1 N-m) ***Rear brake line bracket screws***
6. Install brake line.
   a. Install clamps (6).
   b. Apply threadlocker to screws (5).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screws. Tighten.
      Torque: 24-36 in-lbs (2.7-4.1 N-m) ***Rear brake line clamp screws***

Complete

1. Install rear stoplamp switch. See REAR STOPLAMP SWITCH (Page 7-63).
2. Install battery tray. See BATTERY TRAY (Page 7-97).
3. Install battery. See INSPECT BATTERY (Page 2-43).
4. Install negative battery cable. See POWER DISCONNECT (Page 7-7).
5. Install battery strap. See INSPECT BATTERY (Page 2-43).
6. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
7. Install seat. See SEAT (Page 3-142).
8. Bleed brake system. See BLEED BRAKES (Page 3-61).



1. Screw (2)
2. Rear brake line bracket
3. Grommet
4. Brake line
5. Screw (3)
6. Clamp (3)

Figure 3-53. Rear Brake Line: (Non ABS)

BRAKE LINE: FRONT MASTER CYLINDER (ABS)

FASTENER	TORQUE VALUE	
Brake line tube nuts, manifold	128-173 in-lbs	14.5-19.5 N-m
Brake line, P-clamp, screw	36-48 in-lbs	4.1-5.4 N-m

PART NUMBER	TOOL NAME
HD-48650	1 DIGITAL TECHNICIAN II

Prepare

1. Drain front brake lines. See BLEED BRAKES (Page 3-61).

Remove

1. See Figure 3-54. Remove brake line (5) from front brake master cylinder. See FRONT BRAKE MASTER CYLINDER (Page 3-35).
2. Remove tube nut (3) from manifold (4).
3. Remove brake line from wireform, if equipped.
4. Remove clamp, if equipped.
   a. Remove screw (1).
   b. Remove clamp (2).

Install

1. See Figure 3-54. Install brake line (5) at front master cylinder. See FRONT BRAKE MASTER CYLINDER (Page 3-35).

2. Install tube nut (3) to manifold (4). Do not tighten.

3. See Figure 3-55 or Figure 3-56. Position brake line (1) in orientation shown and snug tube nut (2).

4. Move handlebars to full left lock and full right lock, adjust brake line as needed.

5. Tighten tube nut.

   Torque: 128-173 in-lbs (14.5-19.5 N-m) ***Brake line tube nuts, manifold***

6. Move handlebars to full left lock and full right lock to verify brake line routing and there is no binding of brake lines or manifold.

NOTE

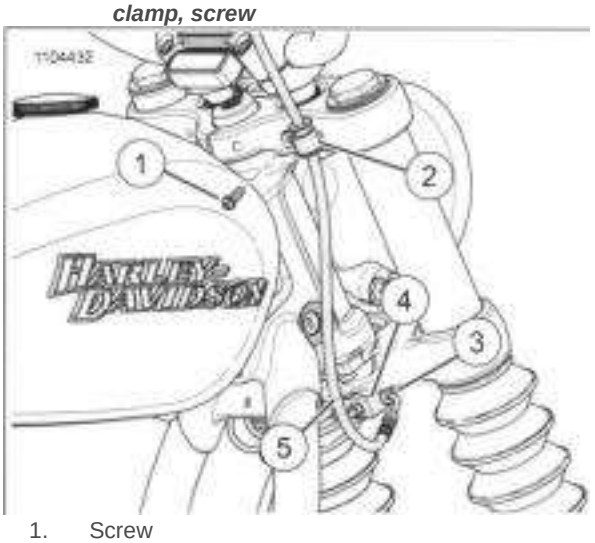
Manifold assembly should face forward, primarily stationary but free to rotate.

7. Install brake line into wireform, if equipped.

8. Install clamp, if equipped.

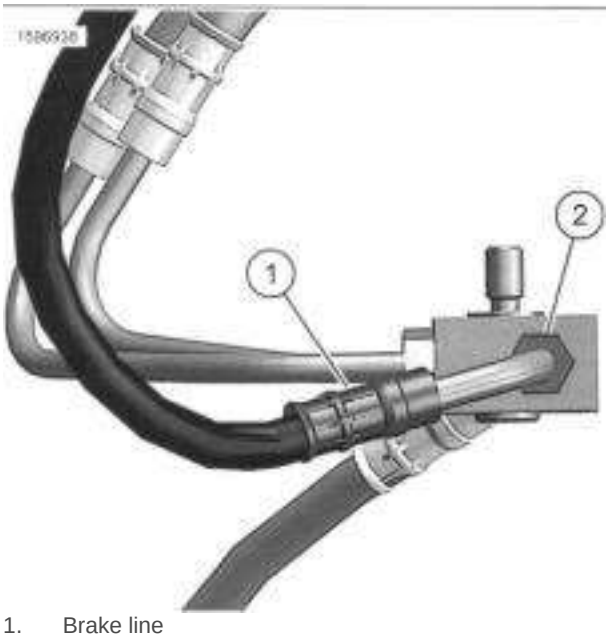
   a. Install clamp (2).
   b. Install screw (1). Tighten

      Torque: 3^48 in-lbs (4.1-5.4 N-m) ***Brake line, P-clamp, screw***



1. Screw
2. Clamp
3. Tube nut
4. Front brake line manifold
5. Brake line

Figure 3-54. Brake Line: Front Master Cylinder (ABS)



1. Brake line
2. Tube nut

Figure 3-55. Single Disc Brake Line Orientation

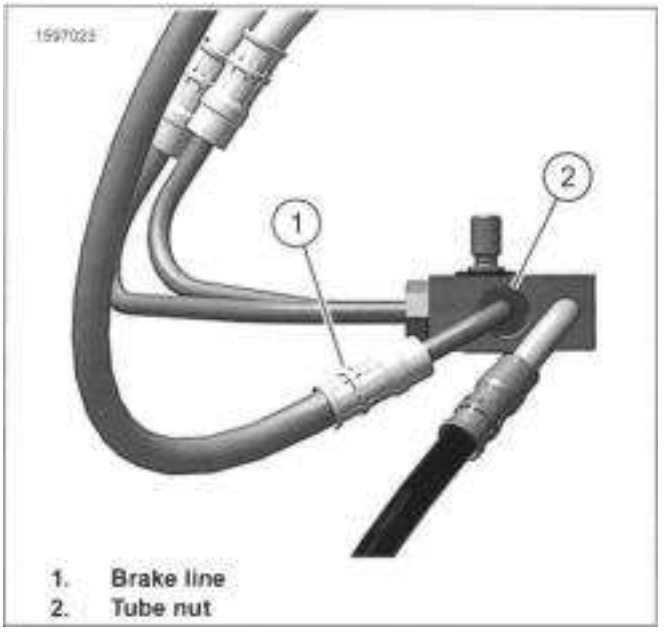


Figure 3-56. Dual Disc Brake Line Orientation **Complete**

NOTE

DIGITAL TECHNICIAN II (PART NUMBER: HD-48650) is required to properly bleed brake system.

1. Bleed brake system. See BLEED BRAKES (Page 3-61).

BRAKE LINE: FRONT CALIPER (ABS) _____

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Front brake line screw	36-48 in-lbs	4.1-5.4 N-m

Prepare

1. Drain front brake lines. See BLEED BRAKES (Page 3-61).

Remove

NOTE

If equipped with dual front calipers, remove brake lines from both calipers.

1. Remove brake line from front brake caliper. See FRONT BRAKE CALIPER (Page 3-38).
2. See Figure 3-57. Disconnect ABS lines (4) from manifold (2). See Front ABS Lines (Page 3-54).
3. Disconnect front master cylinder brake line (1) from manifold. See Brake Line: Front Master Cylinder (ABS) (Page 3-52).
4. Remove brake line.
   a. Remove wire harness retainers (6).
   b. Remove Screw (5).
   c. Remove brake line (3).

Install

1. See Figure 3-57. Install brake line.
   a. Install brake line (3).
   b. Install screw (5). Tighten.
      Torque: 36-48 in-lbs (4.1-5.4 N-m) ***Front brake line screw***
   c. Install wire harness retainers (6).
2. Install front master cylinder brake line (1) at manifold (2). See Brake Line: Front Master Cylinder (ABS) (Page 3-52).
3. Install ABS lines (4) at manifold. See Front ABS Lines (Page 3-54).
4. ***NOTE***

If equipped with dual front calipers, Install brake lines to both calipers.

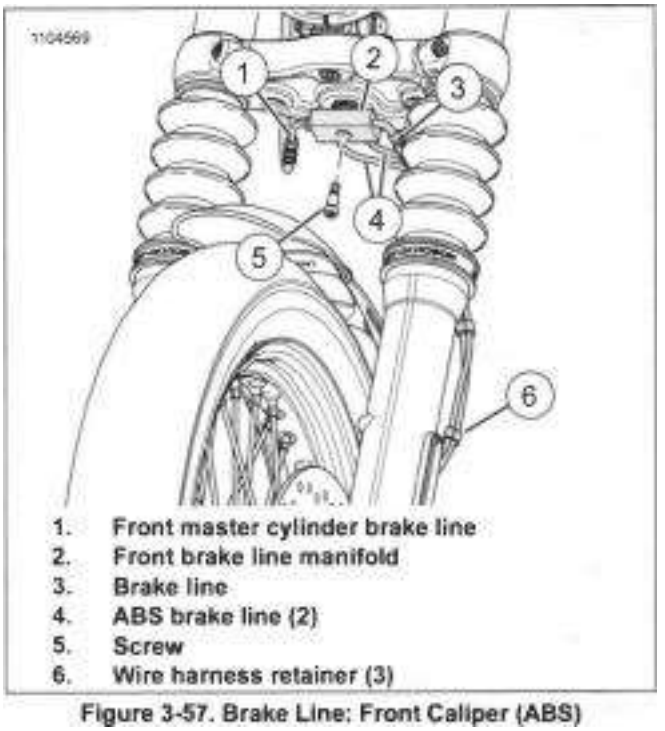
   Install brake line (3) at front caliper. See FRONT BRAKE CALIPER (Page 3-38).

Complete

NOTE

DIGITAL TECHNICIAN II (PART NUMBER: HD-48650) is required to properly bleed brake system.

1. Bleed brake system. See BLEED BRAKES (Page 3-61).



1. Front master cylinder brake line
2. Front brake line manifold
3. Brake line
4. ABS brake line (2)
5. Screw
6. Wire harness retainer (3)

Figure 3-57. Brake Line: Front Caliper (ABS)

FRONT ABS LINES

PART NUMBER	TOOL NAME
HD-52351	12MM TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Banjo bolt to ABS module	17-19 ft-lbs	23.1-25.8 N-m
Front ABS brake line P-clamp screw	36-48 in-lbs	4.1-5.4 N-m
Front ABS brake line to front brake line	128-173 in-lbs	14.fr-19.5 N-m
Under seat frame cover, front screw	20-30 in-lbs	2.3-3.4 N-m
Under seat frame cover, rear screw	96-120 in-lbs	10.8—13.6 N-m

Prepare

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove seat. See SEAT (Page 3-142).
3. Remove fuel tank. See FUEL TANK (Page 6-14).
4. Drain front brake line. See BLEED BRAKES (Page 3-61).
5. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
6. Remove rear lighting caddy. See REAR LIGHTING CADDY (Page 7-96). ~

Remove

1. See Figure 3-59. Disconnect ABS lines (2, 4) from front brake line (1).
2. Remove P-clamp screws (3).

3. See Figure 3-60. Remove under seat frame cover (5).

   a. Remove front screw (4).

   b. Remove rear screws (6).

4. See Figure 3-61. Remove banjo bolts (1) from ABS module (5).

5. Remove brake lines from vehicle.

6. See Figure 3-59 and Figure 3-60. Remove P-clamps and grommets from brake lines.

Install

1. ***NOTE***
Under seat frame cover requires two grommets.

   See Figure 3-59 and Figure 3-60. Install grommets and P-clamps.

2. See Figure 3-61. Install brake lines to ABS module. Special Tool: 12MM TORQUE ADAPTER (HD-52351)

   a. Install banjo bolt (1), new gaskets (4) and brake line (3).

   b. Install banjo bolt (1), new gaskets (4) and brake line (2).

   c. See Figure 3-58. Tighten banjo bolts.

      Torque: 17-19 ft-lbs (23.1-25.8 N-m) ***Banjo bolt to ABS module***

      NOTE

The torque wrench should be 90 degrees to special tool.

3. See Figure 3-60. Install under seat frame cover (5).

   a. Install rear screws (6). Tighten.

      Torque: 96-120 in-lbs (10.8-13.6 N-m) ***Under seat frame cover, rear screw***

   b. Install front screw (4). Tighten.

      Torque: 20-30 in-lbs (2.3-3.4 N-m) ***Under seat frame cover, front screw***

4. See Figure 3-59. Connect ABS lines (2, 4) to front brake line (1). Tighten.

   Torque: 128-173 in-lbs (14.5-19.5 N-m) ***Front ABS brake line to front brake line***

5. Install P-clamp screws (3). Tighten.

   Torque: 36-48 in-lbs (4.1-5.4 N-m) ***Front ABS brake line P-clamp screw***

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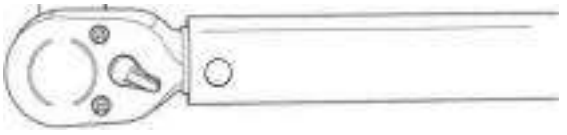
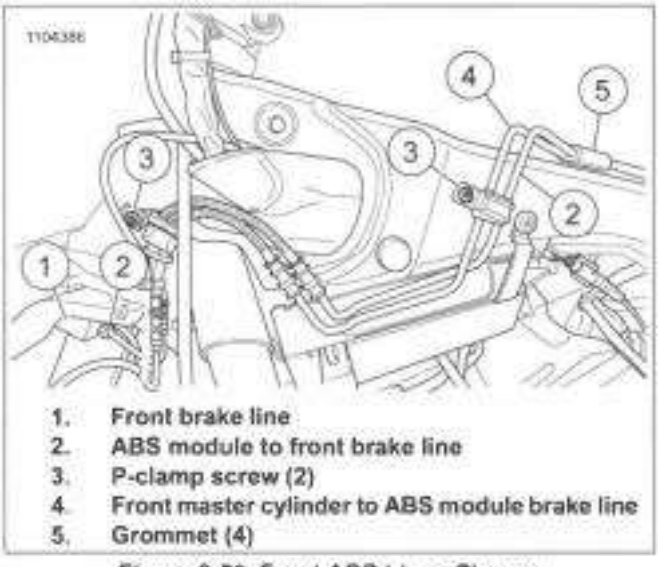
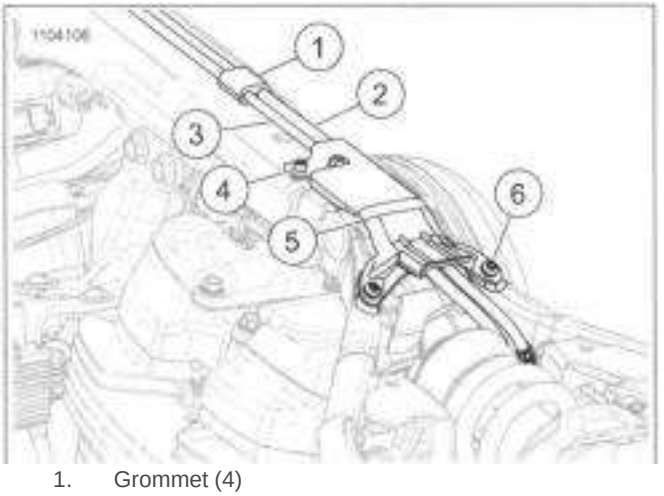


Figure 3-58. HD-52351 In Use



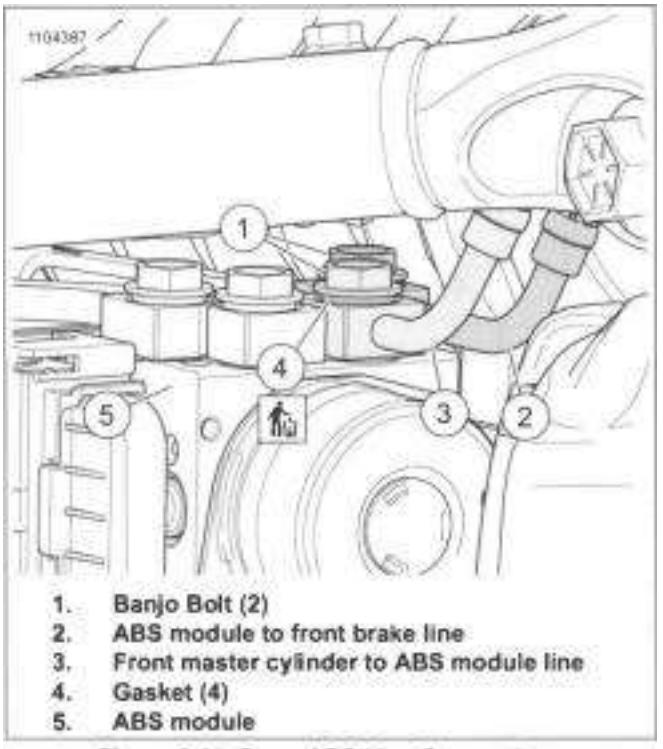
1. Front brake line
2. ABS module to front brake line
3. P-clamp screw (2)
4. Front master cylinder to ABS module brake line
5. Grommet (4)

Figure 3-59. Front ABS Lines Clamps



1. Grommet (4)
2. Front master cylinder to ABS module brake line
3. ABS Module to front brake line
4. Front screw
5. Under seat frame cover
6. Rear screw (2)

Figure 3-60. Rear Frame Cover For Front ABS Lines



1. Banjo Bolt (2)
2. ABS module to front brake line
3. Front master cylinder to ABS module line
4. Gasket (4)
5. ABS module

Figure 3-61. Front ABS Line Connections

Complete

1. Install rear lighting caddy. See REAR LIGHTING CADDY (Page 7-96).

2. Bleed brake system. See BLEED BRAKES (Page 3-61).

3. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

4. Install seat. See SEAT (Page 3-142).

5. Install fuel tank. See FUEL TANK (Page 6-14).

6. Install main fuse. See POWER DISCONNECT (Page 7-7).

7. Install left side cover. See LEFT SIDE COVER (Page 3-63).

BRAKE LINE: REAR MASTER CYLINDER TO ABS MODULE

Prepare

1. Drain fluid from rear brake. See BLEED BRAKES (Page 3-61).

FASTENER	TORQUE VALUE	
Banjo bolt to ABS module, rear	17-19 ft-lbs	23.1-25.8 N-m
Banjo bolt to master cylinder, rear	21-23 ft-lbs	29-31 N-m
Brake line bracket, rear, screw	24-35 in-lbs	2.7-4 N-m
Brake line to master cylinder, rear, P-clamp screw	24-35 in-lbs	2.7-4 N-m

2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).

3. Remove seat. See SEAT (Page 3-142).

4. Remove rear lighting caddy. See REAR LIGHTING CADDY (Page 7-96).

5. Remove battery and battery tray. See INSPECT BATTERY (Page 2-43). "

6. Remove rear stoplamp switch. See REAR STOPLAMP SWITCH (Page 7-63).

Remove

1. See Figure 3-62. Remove clamps.

   a. Remove screw (1).

   b. Remove clamp (2).

2. See Figure 3-63. Remove screws (4).

3. Remove bracket (5).

4. Remove banjo bolt (1) and gaskets (2) from master cylinder.

5. Remove banjo bolt (1) and gaskets (2) from ABS module.

6. Discard gaskets (2)

7. Remove brake line from clip (6).

8. Remove brake line (7).

Install

1. See Figure 3-63. Route brake line (7).

2. ***NOTE***

The torque wrench should be at a 90 degree angle or perpendicular to the special tool so the setting on the torque wrench will be applied.

   Install banjo bolt (1), new gaskets (2) and brake line (7) to ABS module. Tighten.

   Torque: 17-19 ft-lbs (23.1-25.8 N-m) ***Banjo bolt to ABS module, rear***

3. Install banjo bolt (1), new gaskets (2) and brake line (7) to master cylinder. Tighten.

   Torque: 21-23 ft-lbs (29-31 N-m) ***Banjo bolt to master cylinder, rear***

4. Install bracket (5).

5. Install screws (4). Tighten.

   Torque: 24-35 in-lbs (2.7-4 N-m) ***Brake line bracket, rear, screw***

6. Attach brake line to clip (6).

7. See Figure 3-62. Install clamp.

   a. Install clamp (2).

   b. Install screw (1). Tighten.

      Torque: 24-35 **in-lbs** (2.7-4 N-m) ***Brake line to master cylinder, rear, P-clamp screw***

Complete

1. Install rear stoplamp switch. See REAR STOPLAMP SWITCH (Page 7-63).

2. Bleed brake system. See BLEED BRAKES (Page 3-61).

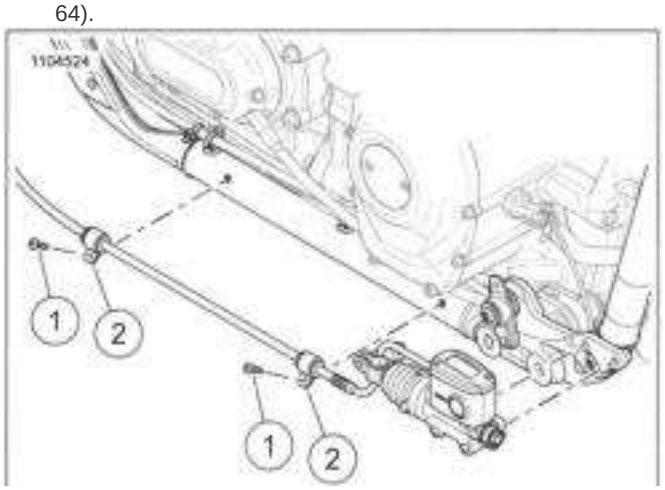
3. Install battery tray and battery. See INSPECT BATTERY (Page 2-43).

4. Install rear lighting caddy. See REAR LIGHTING CADDY (Page 7-96).

5. Install seat. See SEAT (Page 3-142).

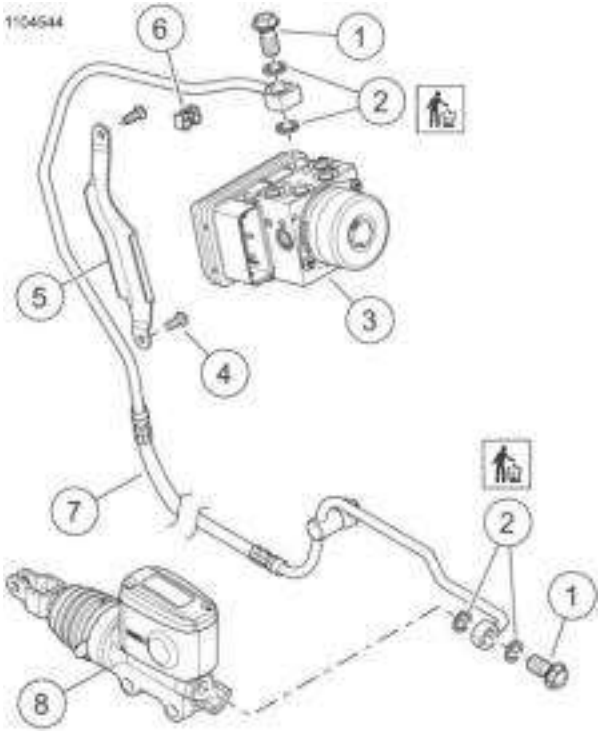
6. After installing seat, pull up on the seat to verify it is secure.

7. Install right side cover. See RIGHT SIDE COVER (Page 3-64).



1. Screw (2)
2. Clamp (2)

Figure 3-62. Brake Line Clamp



1. Banjo bolt (2)
2. Gasket (4)
3. ABS Module
4. Screw (2)
5. Bracket
6. Clip
7. Brake Line
8. Master cylinder

Figure 3-63. Master Cylinder Brake Line

BRAKE LINE: REAR CALIPER TO ABS MODULE

PART NUMBER	TOOL NAME
HD-52351	12MM TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Banjo bolt to ABS module, rear	17-19 ft-lbs	23.1-25.8 N-m
Banjo bolt to brake caliper, rear	21-23 ft-lbs	29—31 N-m
Brake line bracket, rear, screw	24-35 **in-lbs**	2.7-4 N-m
Brake line to caliper, rear, P-clamp screw	24-35 in-lbs	2.7-4 N-m

Prepare

1. Remove right saddlebag, if equipped. See SADDLEBAGS (Page 3-145).

2. Drain fluid from rear brake. See BLEED BRAKES (Page 3-61).

3. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).

4. Remove seat. See SEAT (Page 3-142).

5. Remove rear lighting caddy. See REAR LIGHTING CADDY (Page 7-96).

6. Remove battery and battery tray. See INSPECT BATTERY (Page 2-43).

Remove

1. See Figure 3-64. Remove brake line from clip (1).

2. Remove clamp (2).

   a. Remove screw from clamp.
   b. Remove WSS wire from clamp.

3. See Figure 3-65. Remove screws (5).

4. Remove bracket (6).

5. Remove banjo bolt (3) and gaskets (2) from brake caliper.

6. Remove banjo bolt (3) and gaskets (2) from ABS module.

7. Discard gaskets (2)

8. Remove brake line (7).

Install

1. See Figure 3-65. Route brake line (7).

2. ***NOTE***

The torque wrench should be at a 90 degree angle or perpendicular to the special tool so the setting on the torque wrench will be applied.

   Install banjo bolt (3), **new** gaskets (2) and brake line (7) to ABS module. Tighten.

   Torque: 17-19 ft-lbs (23.1-25.8 N-m) ***Banjo bolt to ABS module, rear***
   Special Tool: 12MM TORQUE ADAPTER (HD-52351)

3. Install banjo bolt (3), **new** gaskets (2) and brake line (7) to brake caliper. Tighten.

   Torque: 21-23 ft-lbs (29-31 N-m) ***Banjo bolt to brake caliper, rear***

4. Install bracket (6).

5. Install screws (5). Tighten.

   Torque: 24-35 **in-lbs** (2.7-4 N-m) ***Brake line bracket, rear, screw***

6. See Figure 3-64. Install clamp (2).

   a. Install WSS wire into clamp.

   b. Install screw. Tighten.

      Torque: 24-35 **in-lbs** (2.7-4 N-m) ***Brake line to caliper, rear, P-c/amp screw***

7. Attach brake line to clip (1).

Complete

1. Bleed brake system. See BLEED BRAKES (Page 3-61).

2. Install battery tray and battery. See INSPECT BATTERY (Page 2-43).

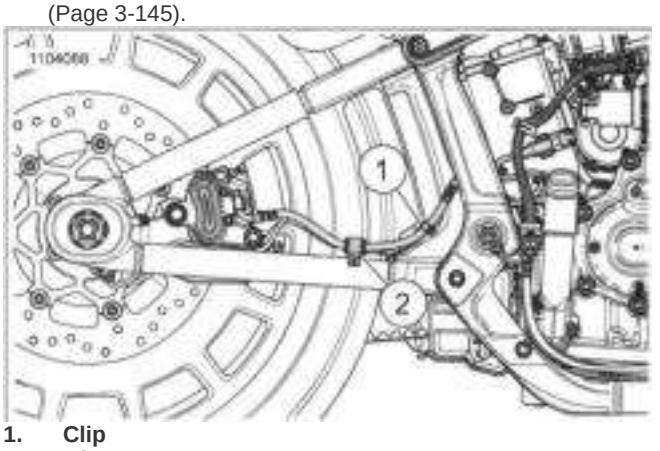
3. Install rear lighting caddy. See REAR LIGHTING CADDY (Page 7-96).

4. Install seat. See SEAT (Page 3-142).

5. After installing seat, pull up on the seat to verify it is secure.

6. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

7. Install right saddlebag, if equipped. See SADDLEBAGS (Page 3-145).



1. Clip
2. Clamp

Figure 3-64. Rear Brake Line

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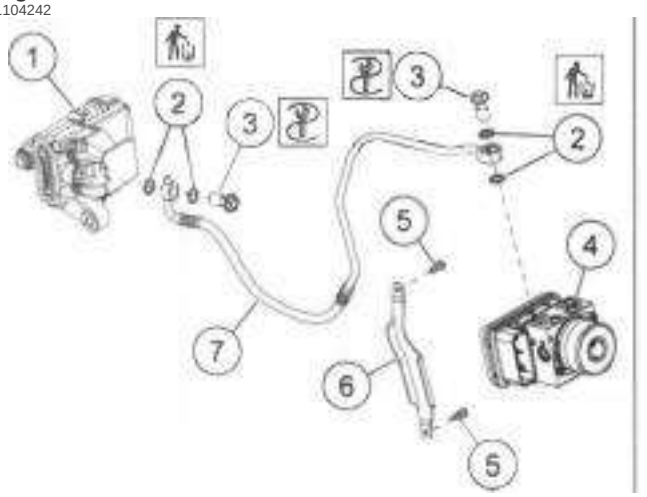


1. Rear caliper
2. Gasket (4)
3. Banjo bolt (2)
4. ABS Module
5. Screw (2)
6. Bracket
7. Brake line

Figure 3-65. Brake Line Routing

GENERAL

NOTE

The ABS module consists of the Hydraulic Control Unit (HCU) and the Electronic Control Unit (ECU). The two are not serviced separately.

PREPARE

1. Remove seat. See SEAT (Page 3-142).
2. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
4. Drain fluid from system. See BLEED BRAKES (Page 3-61).
5. Disconnect brake lines from ABS module. See BRAKE LINES (Page 3-51).

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)

1. Remove ABS module.
   a. See Figure 3-66. Disconnect ABS connector (4).
   b. Remove cable straps (3).
   c. Remove side cover mounting stud (2).
   d. Remove screw (1).
   e. See Figure 3-67. Remove ABS module (3) with bracket.
   f. Remove screws (2).
   g. Remove bracket (1).

INSTALL

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
ABS Module bracket screw	96-119 in-lbs	10.8—13.5 N-m
ABS Module frame screw	96-119 in-lbs	10.8—13.5 N-m
Side cover mounting stud	72-96 in-lbs	8.1-10.8 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. Install ABS module.
   a. See Figure 3-67. Install bracket (1).
   b. Install screws (2). Tighten.
      Torque: 96-119 in-lbs (10.8-13.5 N-m) ***ABS Module bracket screw***
   c. Install ABS module (3) with bracket.
   d. See Figure 3-66. Install screw (1). Tighten.
      Torque: 9^—119 in-lbs (10.S-13.5 N-m)ABS ***Module frame screw***
   e. Install side cover mounting stud (2).
      Torque: 72-96 in-lbs (8.1-10.8 N-m) ***Side cover mounting stud***
   f. Install cable straps (3).
   g. Connect ABS connector (4).
2. If installing a new ABS module, use DTII for set-up procedure:
   Special Tool: DIGITAL TECHNICIAN II (HD-48650)
   a. Choose the REFLASH icon.
   b. Follow the on-screen prompts.

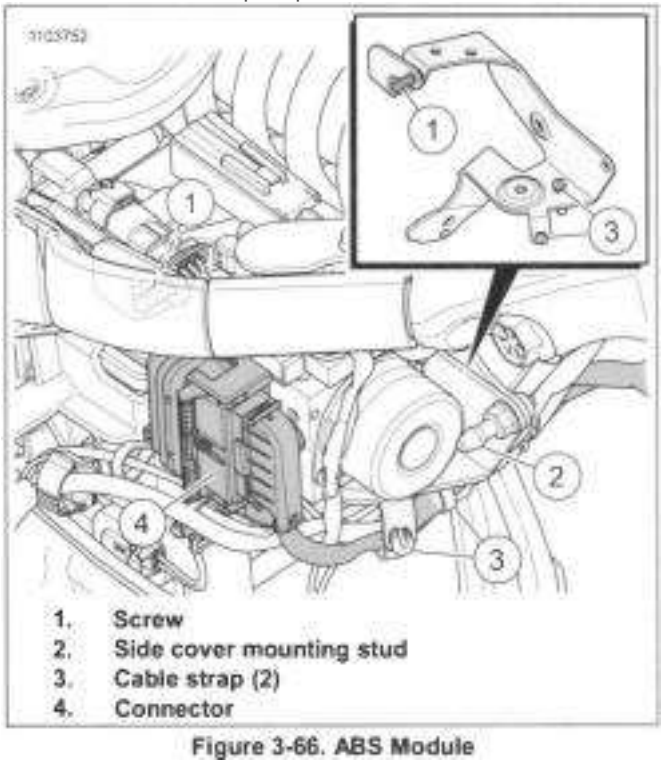
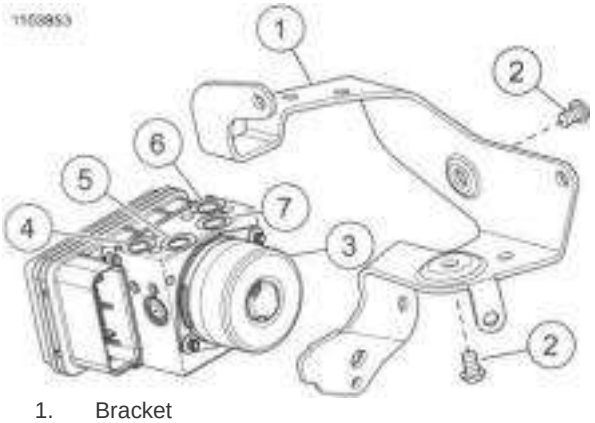


Figure 3-66. ABS Module



1. Bracket
2. Screw (2)
3. ABS Module
4. ABS module to rear brake line
5. Rear master cylinder to ABS module line
6. ABS module to front brake line
7. Front master cylinder to ABS module line

Figure 3-67. ABS Module Bracket

COMPLETE _____ .

1. Connect brake lines from ABS module. See BRAKE LINES (Page 3-51).
2. Bleed brake system. See BLEED BRAKES (Page 3-61).
3. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).
4. Install seat. See SEAT (Page 3-142).
5. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

A 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. Operate motorcycle at low speeds to verify that braking systems operate properly.

A 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)

DRAIN

PART NUMBER	TOOL NAME
BB200A	BASIC VACUUM BRAKE BLEEDER

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.***
- ***For best results, use BASIC VACUUM BRAKE BLEEDER (PART NUMBER: BB200A) to drain the 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 3-68. 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 end of a length of 0.31 in (7.9 mm) of the Inside Diameter (ID) 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. Refer to Table 3-10.
6. Wipe out any remaining fluid inside master cylinder reservoir with a clean, lint-free cloth.

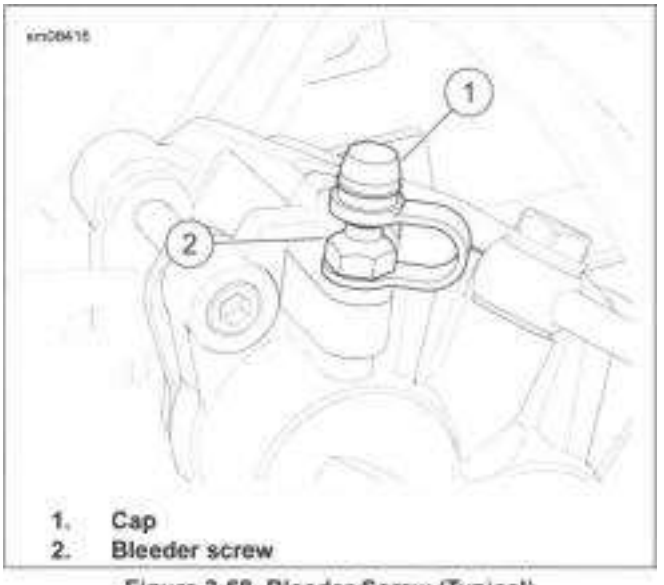


Figure 3-68. Bleeder Screw (Typical)

FILL AND BLEED

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

FASTENER	TORQUE VALUE	
Banjo bolt	21-23 ft-lbs	29-31 N-m
Bleeder screw	35-61 in-lbs	3.9-6.9 N-m
Brake master cylinder, reservoir cover screw	9-18 in-lbs	1-2 N-m

A 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)

A 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. (00291 a)

A 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)

■ 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)

Verify front brake hand lever and rear brake foot pedal have a firm feel when applied. If not, bleed system as described.

1. Check for moisture content in brake fluid. See CHECK AND REPLACE BRAKE FLUID (Page 2-21).

NOTE

- ***For best results, use BASIC VACUUM BRAKE BLEEDER (PART NUMBER: BB200A), particularly if the brake system was drained completely. If a vacuum brake bleeder is not available, use the following procedure.***
- ***ABS Models: Use DIGITAL TECHNICIAN II (PART NUMBER: HD-48650) to verify that system is bled.***

2. Remove bleeder screw cap. Install end of clear plastic tubing over bleeder screw and place free end in a clean container.

3. Position vehicle or handlebar so master cylinder reservoir is level.

4. Remove cover from master cylinder reservoir.

A WARNING

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

5. Top off the reservoir. Verify proper operation of the master cylinder relief port by actuating the brake pedal or lever. A slight spurt of fluid breaks the fluid surface in the reservoir with internal components are working properly. See CHECK AND REPLACE BRAKE FLUID (Page 2-21).

NOTE

Pay careful attention to fluid level in the master cylinder reservoir. Add fluid before it empties to avoid drawing air into the brake lines.

6. Operate the brake lever or pedal to build hydraulic pressure.

7. While holding pressure with the brake lever or pedal:

   a. Open bleeder screw about three-quarter turn.

   b. Close bleeder screw as soon as the lever or pedal has moved full range of travel.

   c. Allow brake lever or pedal to return slowly to its released position.

8. Repeat steps until all air bubbles are purged and a solid column of fluid is observed in the bleeder tube.

9. Install bleeder screw cap. Tighten. Refer to Table 3-10.

10. Check and fill reservoir to specified level. See CHECK AND REPLACE BRAKE FLUID (Page 2-21).

11. ABS Models: Connect Digital Technician II (DT 11) and perform "ABS Service" procedure.

12. Check operation of rear lamps.

A WARNING

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

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

Table 3-10. Torque Specifications

COMPONENT"^	TORQUE
Bleeder screws	35-61 in-lbs (3.9-6.9 N-m)
Banjo bolts	21-23 ft-lbs (29-31 N-m)
Reservoir cover screws	9-18 in-lbs (1-2 N-m)
(1) Applies to both front and rear brake systems.	

LEFT SIDE COVER

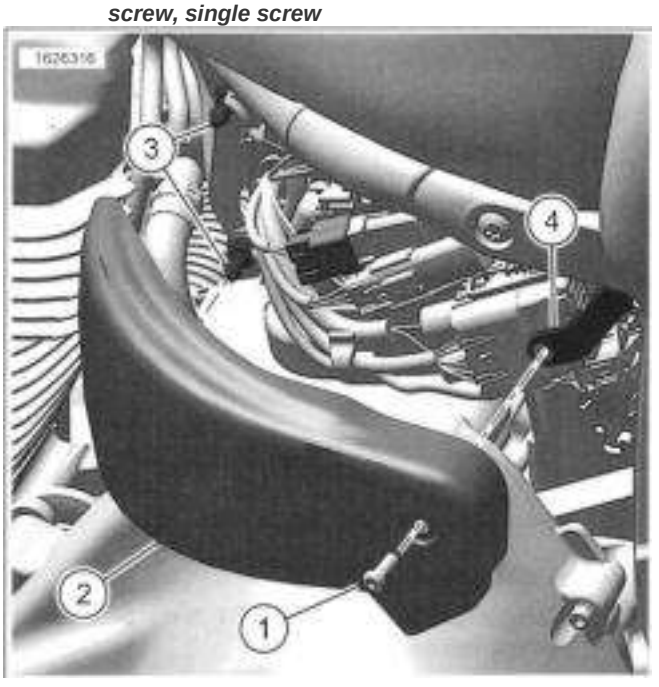
REMOVE

1. See See Figure 3-69.. Remove side cover.
   a. Remove screw (1).
   b. Pull side cover (2) away to release grommet from mounting stud (3).
2. Remove bracket (4) if needed.

INSTALI

FASTENER	TORQUE VALUE	
Side cover screw, single screw	24-36 in-lbs	2.7-4.1 N-m
Side cover, left side, bracket to frame screw	8-10 in-lbs	0.9-1.1 N-m

1. See Figure 3-69. Install bracket, if removed.
   a. Install bracket (4).
   b. Install screw securing bracket to frame. Tighten.
      Torque: 8-10 in-lbs (0.9-1.1 N-m) ***Side cover, left side, bracket to frame screw***
2. Install side cover.
   a. Align side cover (2) with mounting studs (3).
   b. Press side cover until fully seated.
   c. Install screw (1). Tighten.
      Torque: 24-36 in-lbs (2.7—4.1 N-m) ***Side cover screw, single screw***



1. Screw
2. Left side cover
3. Mounting stud (2)
4. Bracket

Figure 3-69. Left Side Cover

RIGHT SIDE COVER

REMOVE

1. See Figure 3-70. Remove side cover.

   a. Remove screws (1).

   b. Pull side cover (2) away to release grommet from mounting stud (3).

INSTALL

FASTENER	TORQUE VALUE	
Side cover screw, vertical screw	24-36 in-lbs	2.7—-4.1 N-m

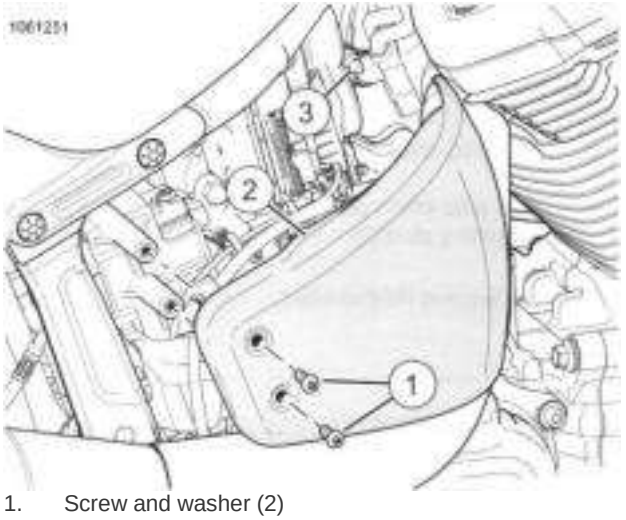
1. See Figure 3-70. Install side cover.

   a. Align side cover (2) with mounting stud (3).

   b. Press side cover until fully seated.

   c. Install screws (3). Tighten.

      Torque: 24-36 in-lbs (2.7--4.1 N-m) ***Side cover screw, vertical screw***



1. Screw and washer (2)
2. Right side cover
3. Mounting stud

Figure 3-70. Right Side Cover

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 3-71. 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.

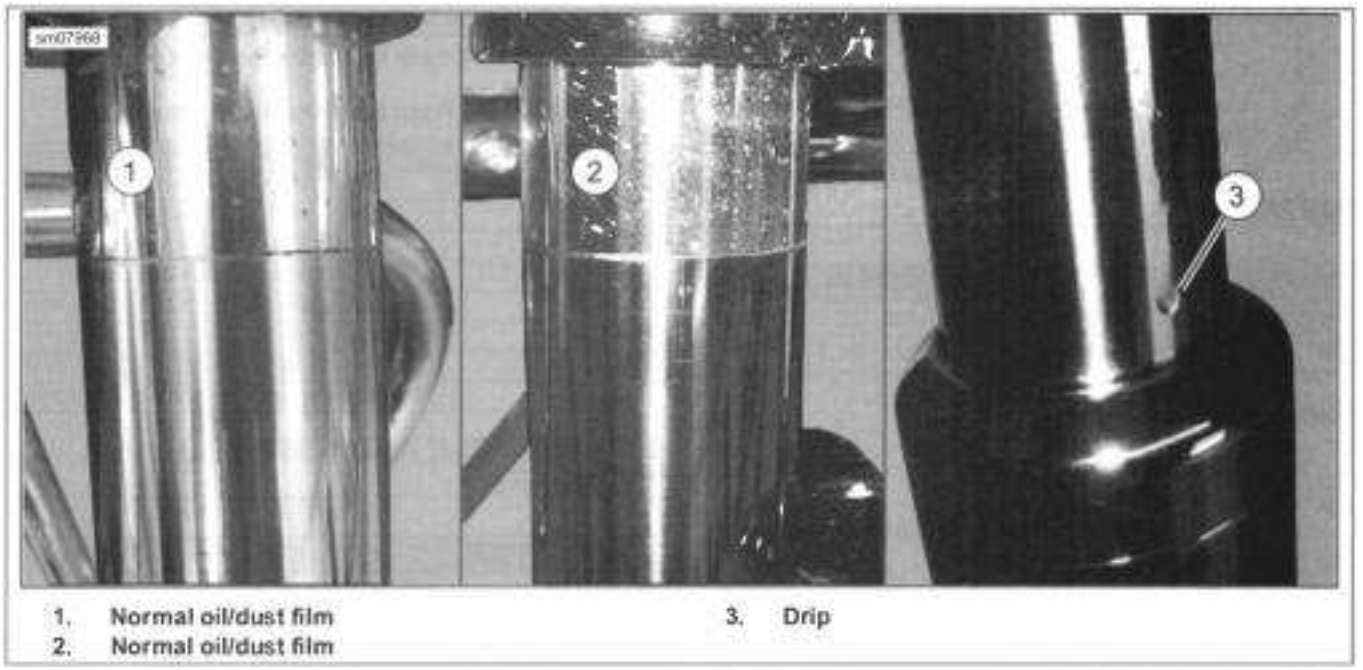


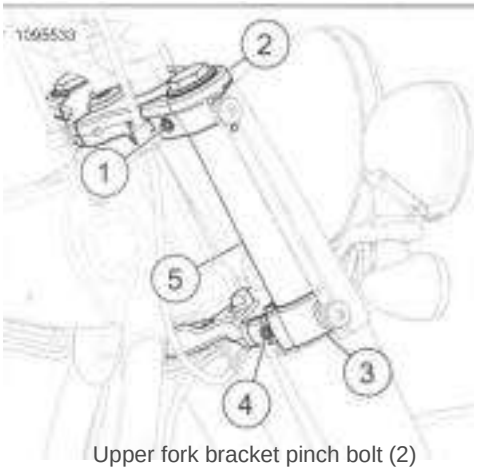
Figure 3-71. Front Forks

PREPARE

1. Remove front wheel. See FRONT WHEEL (Page 3-12).
2. Remove front fender. See FRONT FENDER (Page 3-113).
3. Remove windshield, if equipped (except FXLRST). See WINDSHIELD (Page 3-106).
4. Remove front brake caliper(s). See FRONT BRAKE CALIPER (Page 3-38).
5. FLFBS, FLHC, FLHCS Remove rear headlamp nacelle panels. See HEADLAMP NACELLE (Page 3-96).

REMOVE
Remove

1. See Figure 3-72 or Figure 3-73. Remove front fork tube assemblies.
   a. Loosen the upper fork bracket pinch screws (1).
   b. Loosen the lower fork bracket pinch screws (4).
   c. Remove fork tube assemblies (5) from fork brackets (2, 3).



Upper fork bracket pinch bolt (2)
Upper fork bracket
Lower fork bracket
Lower fork bracket pinch bolt (2)
Fork tube assembly (2)

Figure 3-72. Four Pinch Bolt Fork Brackets

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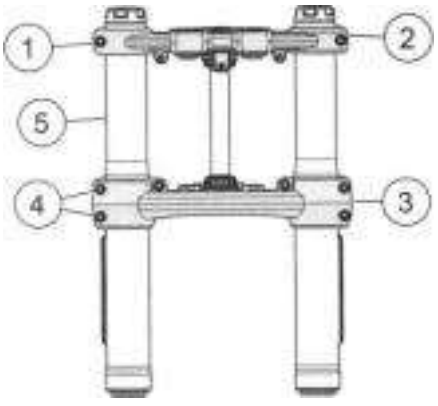

1. **Upper fork bracket pinch bolt (2)**
2. **Upper fork bracket**
3. **Lower fork bracket**
4. **Lower fork bracket pinch bolt (4)**
5. **Fork tube assembly (2)**

Figure 3-73. Six Pinch Bolt Fork Brackets

INSTALL

FASTENER	TORQUE VALUE	
Fork bracket, lower, pinch bolt	16-20 ft-lbs	21.7-27.1 N-m
Fork bracket, upper, pinch bolt	16-20 ft-lbs	21.7-27.1 N-m

Install

1. Install front fork tube assemblies.

a. See Figure 3-74. Install fork tube assemblies through lower and upper fork brackets.

b. Set installed height (1) at dimension given and match left and right sides. Refer to Table 3-11.

c. See Figure 3-72 or Figure 3-73. Tighten lower fork bracket pinch bolt (4).

Torque: 16-20 ft-lbs (21.7-27.1 N-m) ***Fork bracket, lower, pinch bolt NOTE***

For models equipped with two lower pinch bolts per side: Tighten alternately until torque specification is maintained.

d. Tighten upper fork bracket pinch bolt (1).

Torque: 16-20 ft-lbs (21.7-27.1 N-m) ***Fork bracket, upper, pinch bolt***

e. **FXBBS, FXST**: See See Figure 3-76.. Slide upper end of protector (5) up until it contacts underside of lower fork bracket.

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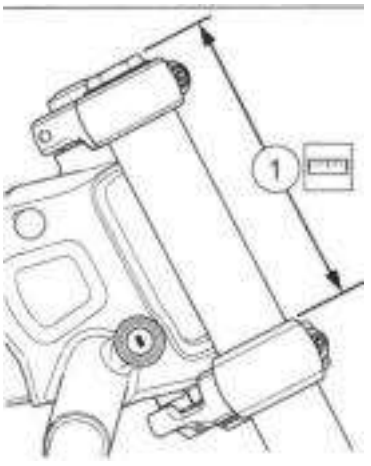

1. Fork tube installed height Figure 3-74. Fork Height Dimension Location

Table 3-11. Front Fork Assembly Dimension

MODEL	DIMENSION
FLHCS	8.82-8.94 in (224.0-227.1 mm)
FLFBS	8.94-9.06 in (227.1-230.1 mm)
FLSB	7.73-7.85 in (196.3-199.4 mm)
FXBBS,FXST	7.90-8.02 in (200.7-203.7 mm)
FXBRS	Distance: 7.84-7.96 in (199.1-202.2 mm)
FXFBS	Distance: 9.15-9.27 in (232.4-235.5 mm)
FXLRS	Distance: 8.88-9 in (225.6-228.6 mm)
FXLRST	Distance: 8.51-8.63 in (216.2-219.2 mm)

PART NUMBER	TOOL NAME
HD-41177	FORK TUBE HOLDER
HD-45305	FORK SEAL DRIVER
HD-59000B	FORK OIL LEVEL GAUGE

FASTENER	TORQUE VALUE	
Fork damper tube screw, front	30-37 ft-lbs	40-50 N-m
Fork tube plug, standard	22-59 ft-lbs	30-80 N-m

A WARNING

DISASSEMBLE AND ASSEMBLE: STANDARD

Wear safety glasses or goggles when servicing fork assembly. Do not remove slider tube caps without relieving spring preload or caps and springs can fly out, which could result in death or serious injury. (00297a)

Disassemble Initial

Disassembly

1. See Figure 3-75. Clamp fork tube in fork tube holder. Mount in vise with fork vertical.

   Special Tool: FORK TUBE HOLDER (HD-41177)

2. See Figure 3-76. Remove fork tube plug (1) and O-ring (21).

3. ***NOTE***
Have a suitable container ready to place spring assembly into after removal from tube.

Pull spring collar (20), washer (19), and spring (18) out of fork tube (2).

4. **Remove fork assembly from tool.**

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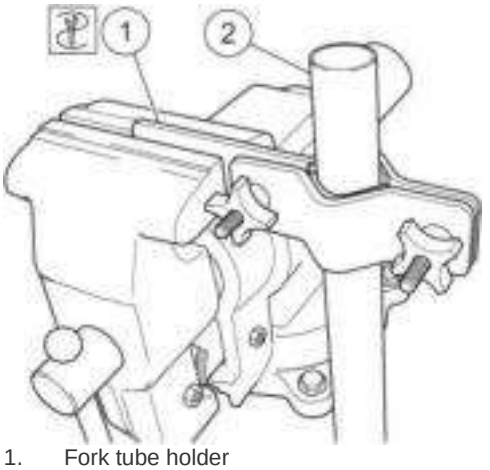

1. Fork tube holder
2. Fork tube

Figure 3-75. Fork Tube Holder

1. Fork tube plug
2. Fork tube
3. Lower slider bushing
4. Case cover (FXBRS)
5. Protector (FXBBS, FXST)
6. Dust seal
7. Retaining ring
8. Slider oil seal
9. Seal spacer
10. Upper slider bushing
11. Lower stop
12. Slider
13. Washer
14. Screw
15. Damper tube spring
16. Damper tube
17. Damper tube ring
18. Spring
19. Washer
20. Spring collar
21. O-ring

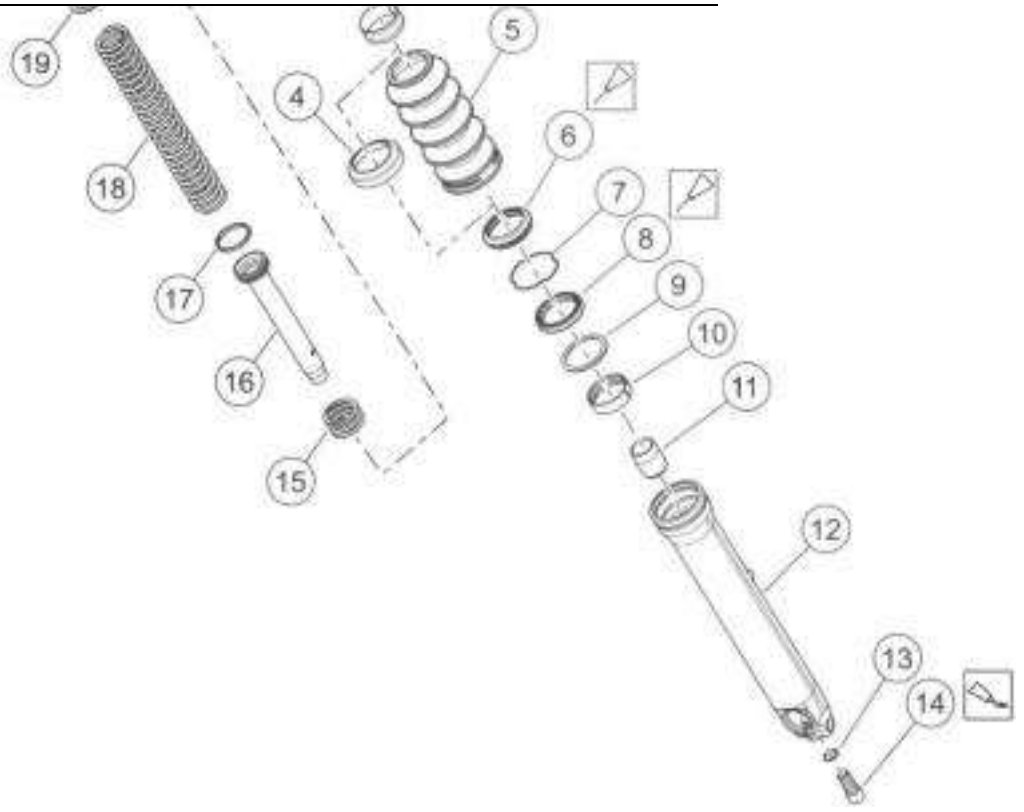

Figure 3-76. Standard Fork Components

Fork Drain

1. ***NOTE***

Drain fork oil into a suitable container.

Turn fork assembly upside down to drain fork oil.

a. If only performing a fork oil change, see FORK FILL later in this procedure. If overhauling the fork assembly, continue with procedure.

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Complete Disassembly

1. Separate slider from fork tube.

NOTE

Since there is little resistance to rotation when removing socket screw (14), the job is done more easily with an air impact wrench.

   a. Remove screw (14) with washer (13) from the bottom end of slider (12).

   b. **FXBRS:** Remove case cover (4).

   c. **FXBBS, FXST:** Remove protector (5).

   d. Remove dust seal (6).

   e. Compress retaining ring (7) and remove from slider (12).

2. ***NOTE***

The upper slider bushing (10) is a slight interference fit in slider (12). The upper bushing, seal spacer (9) and slider oil seal (8) are removed together.

   Use the fork tube and lower slider bushing (3) as a slide hammer. Pull the fork tube in a quick continuous stroke. Continue this slide hammer action until the components are freed.

3. Push damper tube (16) and damper tube spring (15) free of fork tube (2) by inserting a small diameter rod through the opening in the bottom of tube.

4. Remove lower stop (11) from the lower end of damper tube (16).

5. Damper tube ring (17) can now be removed from the grooves at the top end of damper tube (16). Do not remove lower slider bushing (3) unless it requires replacement.

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 3-77. Check runout with a dial indicator.

   a. Set fork tube on V-blocks.

   b. Replace fork if runout exceeds dimension. 0.008 in (0.2 mm)

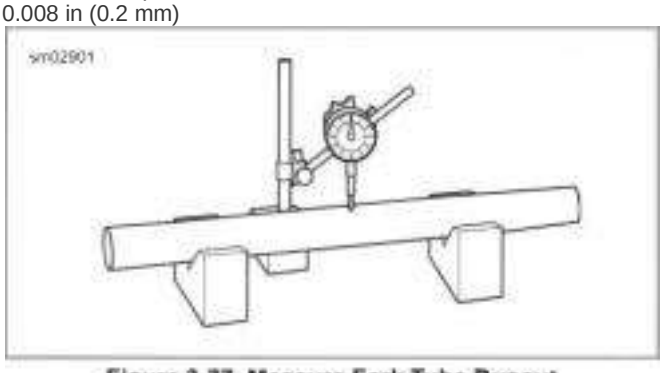

Figure 3-77. Measure Fork Tube Runout

Assemble

Initial Assembly

NOTE

Lubricate all seal lips, quad rings and O-rings with HARLEY DAVIDSON SEAL GREASE during assembly.

1. Install damper tube ring (17). Place damper tube spring (15) on damper tube (16). Insert damper tube into fork tube (2).

2. Insert spring (18) into fork tube (2), tapered side toward damper tube (15), and push bottom of damper tube through the opening at the bottom end of the fork tube. Place lower stop (11) over end of damper tube (16).

3. Apply LOCTITE 565 THREAD SEALANT to screw (14).

4. Position fork tube (2) and damper tube (16) in slider (12). Hold the assembly in place by exerting pressure on the spring. Install socket screw (14) with washer (13).

5. Tighten screw (14).

   Torque: 30-37 ft-lbs (40-50 N-m) ***Fork damper tube screw, front***

   a. Remove spring (18).

6. Place upper slider bushing (10), seal spacer (9) and a **new** slider oil seal (8) (in that order) over fork slider (2). Verify that the lettered side of the seal is facing upward.

7. Place fork oil seal installer over fork slider (2). Seat upper slider bushing (10), seal spacer (9), and slider oil seal (8) into the slider bore by lightly tapping the components into place with the installation tool.

   Special Tool: FORK SEAL DRIVER (HD-45305)

8. Install retaining ring (7).

9. Install dust seal (6).

a. FXBBS, FXST: Install protector (5).

b. FXBRS: Install case cover (4).

Fork Fill

A WARNING

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

1. Fill fork tube.

   a. Fully compress fork.

   b. See Figure 3-78. Fill with TYPE "E" HYDRAULIC FORK OIL until oil level matches specification from top of fork tube with spring removed. Adjust oil level to specification using fork oil level gauge. Refer to Table 3-12.

      Special Tool: FORK OIL LEVEL GAUGE (HD-59000B)

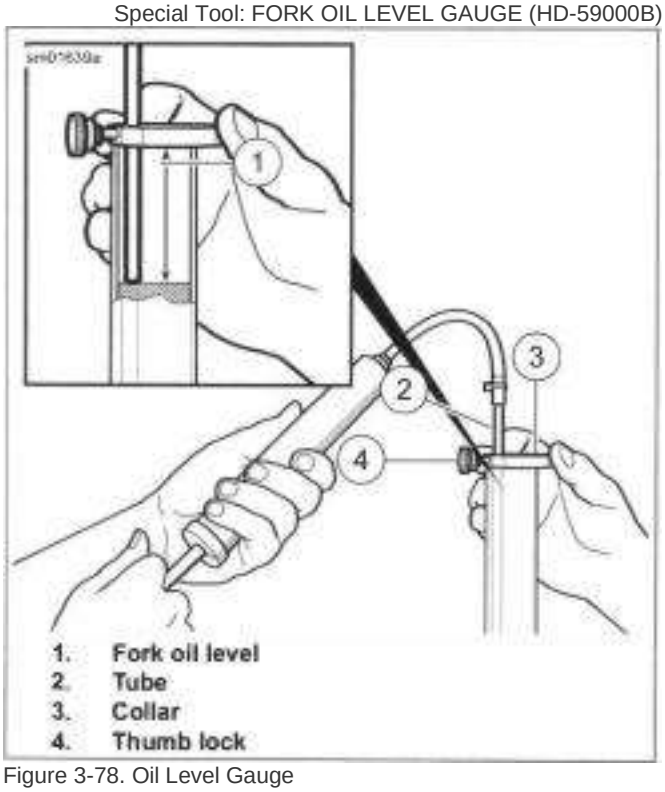

Figure 3-78. Oil Level Gauge

Complete Assembly

1. See Figure 3-76. Install fork spring.

   a. Fully extend fork. Install spring (18) with tightly wound end at bottom.

b. Install washer (19) and spring collar (20).

2. Install fork tube plug.

   a. Install new O-ring (2).

   b. Install fork tube plug (1). Tighten.

      Torque: 22-59 ft-lbs (30-80 N-m) ***Fork tube plug, standard***

DISASSEMBLE AND ASSEMBLE: INVERTED. LEFT SIDE

PART NUMBER	TOOL NAME
B-42571	FORK SEAL DRIVER AND DUST BOOT INSTALLER (43MM)
HD-41177	FORK TUBE HOLDER
HD-45966	FRONT FORK COMPRESSOR
HD-59000B	FORK OIL LEVEL GAUGE

FASTENER	TORQUE VALUE	
Fork tube plug to damper nut, left side, inverted	13-16 ft-lbs	17.5-22.5 N-m
Fork tube plug, left side, inverted	22-28 ft-lbs	30-40 N-m
Fork, left side, inverted, cartridge screw	13-17 ft-lbs	17.5--22.5 N-m

Disassemble

Initial Disassembly

NOTICE

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

1. See Figure 3-75.Clamp fork tube in fork tube holder. Mount in vise with fork vertical.

   Special Tool: FORK TUBE HOLDER (HD-41177)

2. See Figure 3-79 .

   a. Remove fork tube plug (1).

   b. Compress fork assembly to expose cartridge damper (15) rod.

   c. Hold nut (10). Remove fork tube plug (1) from end of damper rod.

   d. Discard O-ring (2).

3. ***NOTE***

Have a suitable container ready to place spring into after removal from assembly.

   Remove spring from fork tube.

   a. Clamp front fork compressor vertically in vise with length adjuster screw topside.

      Special Tool: FRONT FORK COMPRESSOR (HD-45966)

b. Compress fork spring.

c. See Figure 3-80. Remove nut (1).

d. Release fork spring.

e. See Figure 3-79. Remove spring seat stopper (11), spring collar (12) and spring joint (13).

f. Remove fork assembly from tool. Remove spring (14).

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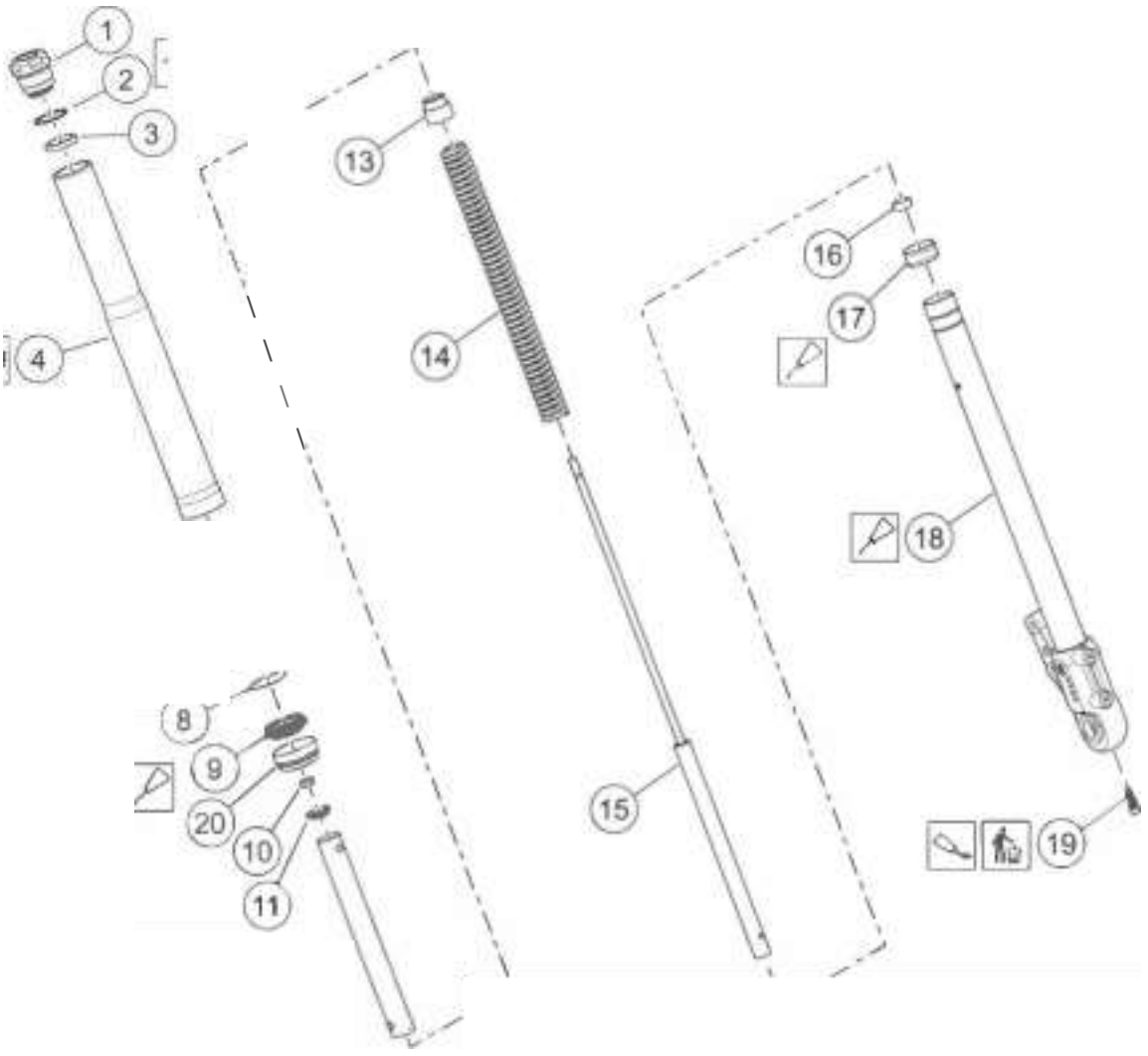

1. Fork tube plug
2. O-ring
3. Rubber stopper
4. Fork tube
5. Fork tube bushing
6. Seal Spacer
7. Oil seal
8. Retaining ring
9. Dust seal
10. Nut
11. Spring seat stopper
12. Spring collar
13. Spring joint
14. Spring
15. Cartridge damper
16. Centering plate
17. Slider bushing
18. Fork slider
19. Screw
20. Dust cover(FLSB)

Figure 3-79. Cartridge Fork (Left Side)

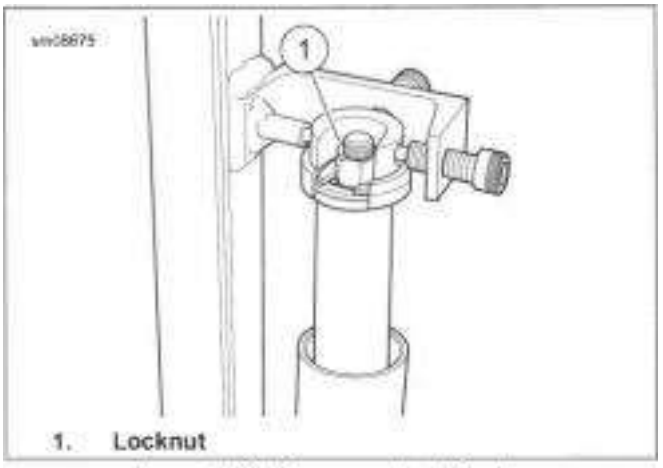

Figure 3-80. Compress Fork Spring

Fork Drain

1. ***NOTE***

Drain fork oil into a suitable container.

Drain fork oil.

a. Thread rod extension tool (part of front fork compressor) onto end of damper rod.

Special Tool: FRONT FORK COMPRESSOR (HD-45966)

b. Turn fork assembly upside down over drain pan and slowly pump damper rod at least 20 times until rod moves freely.

c. If only performing a fork oil change, see FORK FILL later in this procedure. If overhauling the fork assembly, continue with procedure.

d. Remove extension tool from damper rod.

Complete Disassembly

1. See Figure 3-79. Remove cartridge damper (15).

a. Place fork spring into fork tube.

b. Place fork assembly upside down on a clean shop rag on the floor.

c. While compressing spring (14) to prevent rotation of damper, remove screw (19). Use an air impact wrench for best results.

d. Discard screw.

e. Remove spring (14) and cartridge damper (15) from fork tube.

2. ***NOTE***

Do not bend or stretch oil seal retaining ring during removal.

Remove fork tube.

a. If equipped, separate dust cover (20) from fork tube (4).

b. Separate dust seal (9) from fork tube.

c. Remove retaining ring (8).

d. Expand fork slider (18) and tube (4) against each other repeatedly (in a slide-hammer effect) to remove fork tube.

e. Gently pry at split line to remove slider bushing (17).

f. Remove fork tube bushing (5), seal spacer (6), oil seal (7), retaining ring (8), and dust seal (9). Discard oil seal.

g. If equipped, remove dust cover (20).

3. Remove centering plate (16).

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 3-77. Check runout with a dial indicator.

a. Set fork tube on V-blocks.

b. Replace fork if runout exceeds dimension.

0. 008 in (0.2 mm)

Assemble

Initial Assembly

NOTICE

4 5

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

NOTE

- ***Lubricate all seal lips, quad rings and O-rings with HARLEY-DAVIDSON SEAL GREASE during assembly.***

5 Use FORK TUBE HOLDER (PART NUMBER: HD-41177) as necessary.

- ***Place dust seal with larger diameter end toward top of fork assembly.***
- ***Place oil seal with lettering toward top of fork assembly.***

1. See Figure 3-79. Assemble fork slider.
   a. If equipped, install dust cover (20) onto fork slider (18).
   b. Install dust seal (9), retaining ring (8), oil seal (7), seal spacer (6) and fork tube bushing (5) onto fork slider.
   c. Lightly coat fork slider (18) and slider bushing (17) with fork oil.
   d. Install slider bushing (17). Expand bushing only enough to fit onto fork slider (18).
   e. Install centering plate (16).
   f. Install fork slider (18) into fork tube (4).
   g. Slide cartridge damper (15) into fork slider (18).
   h. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to new screw (19).
   i. Install screw (19). Tighten.
      Torque: 13-17 ft-lbs (17.5-22.5 N-m) ***Fork, left side, inverted, cartridge screw***
2. Clamp fork slider horizontally in fork tube holder.
   Special Tool: FORK TUBE HOLDER (HD-41177)
3. Install fork oil seal.
   a. Install fork tube bushing (5) and seal spacer (6).
   b. Assemble fork seal driver and dust boot installer (43mm) in front of oil seal (7). Long end of tool faces oil seal.
      Special Tool: FORK SEAL DRIVER AND DUST BOOT INSTALLER (43MM) (B-42571)
   c. Drive oil seal into fork tube until seated.
   d. Install retaining ring (8).
   e. Tap dust seal (9) into place.
   f. If equipped rotate dust cover (20) to match any removal burrs in slider. Tap dust cover into place.

Fork Fill

A WARNING

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

1. Fill fork tube.
   a. Install damper rod extension tool.
   b. Fill with TYPE "E" HYDRAULIC FORK OIL until it is approximately 2.0 in (50.8 mm) from top of fork tube.
   c. Pump fork slider ten times to remove air from system.
   d. See Figure 3-78. Fully compress fork. Measure oil level from top of fork tube with spring removed. Adjust oil level to specification using fork oil level gauge. Refer to Table 3-13.
      Special Tool: FORK OIL LEVEL GAUGE (HD-59000B)

Table 3-13. Oil Level, Left Fork

MODEL	FLUID FILL DIMENSION
FLSB	5.20 in (132 mm)
FXFBS,FXLRS	5.39 in (137 mm)
FXLRST	4.49 in (114 mm)

Complete Assembly

1. Clamp fork slider vertically in fork tube holder.
   Special Tool: FORK TUBE HOLDER (HD-41177)
2. See Figure 3-79. Install fork spring.
   a. Fully extendfork. Install spring (14) with tightly wound end at bottom.
   b. Install spring joint (13) and spring collar (12).
   c. Compress fork using front fork compressor.
      Special Tool: FRONT FORK COMPRESSOR (HD-45966)
   d. Install spring seat stopper (11).
   e. Install nut (10) so that there is/ in (14 mm) between top of nut and top of damper shaft.
3. Install fork tube plug.
   a. Install new O-ring (2).
   b. Install rubber stopper (3).
   c. Install fork tube plug (1) onto damper (15). Tighten.
      Torque: 13-16 ft-lbs (17.5-22.5 N-m) ***Fork tube plug to damper nut, left side, inverted***
   d. Install fork tube plug onto fork tube (4). Tighten.
      Torque: 22-28 ft-lbs (30-40 N-m) ***Fork tube plug, left side, inverted***

DISASSEMBLE AND ASSEMBLE: INVERTED. RIGHT SIDE

PART NUMBER	TOOL NAME
B-42571	FORK SEAL DRIVER AND DUST BOOT INSTALLER (43MM)
HD-41177	FORK TUBE HOLDER
HD-47852	INNER FORK NUT REMOVER/INSTALLER
HD-59000B	FORK OIL LEVEL GAUGE

FASTENER	TORQUE VALUE	
Fork tube plug to damper nut , right side, inverted	13-16 ft-lbs	17.5-22.5 N-m
Fork tube plug, right side, inverted	22-30 ft-lbs	30-40 N-m
Fork, right side, inverted, inner fork nut	69-83 ft-lbs	93-113 N-m

Disassemble

Initial Disassembly

NOTICE

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

1. See Figure 3-75. Clamp fork tube in fork tube holder. Mount in vise with fork vertical.

   Special Tool: FORK TUBE HOLDER (HD-41177)

2. See Figure 3-81.

   a. Remove fork tube plug (1).

   b. Compress fork assembly to expose joint rod (7).

   c. Hold nut (5). Remove fork tube plug (1) from end of joint rod.

   d. Discard O-ring (2).

3. ***NOTE***

   Have a suitable container ready to place spring assembly into after removal from tube.

   Remove spring assembly from fork tube.

   a. Using inner fork nut remover/installer remove inner fork nut (6).

      Special Tool: INNER FORK NUT REMOVER/INSTALLER (HD-47852)

   b. Remove nut (5) and joint rod (7).

   c. Remove spring collar (8), washer (9) and spring (10).

   d. Remove fork assembly from tool.

1. Fork tube plug
2. O-ring
3. Rubber stopper
4. Fork tube
5. Nut
6. Inner fork nut
7. Joint rod
8. Spring collar
9. Washer
10. Spring
11. Slider bushing
12. Fork tube bushing
13. Seal spacer
14. Oil seal
15. Retaining ring
16. Dust seal
17. Dust cover(FLSB)
18. Fork slider
19. Screw

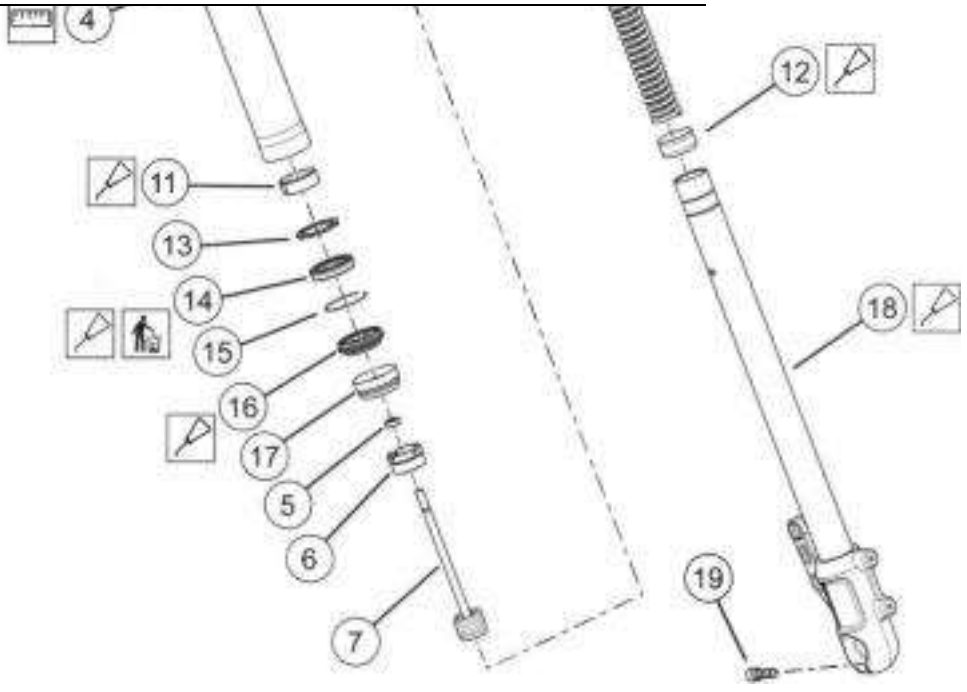

Figure 3-81. Front Fork (Right Side)

Fork Drain

1. ***NOTE***

Drain fork oil into a suitable container.

Turn fork assembly upside down to drain fork oil.

a. If only performing a fork oil change, see FORK FILL later in this procedure. If overhauling the fork assembly, continue with procedure.

Complete Disassembly

1. See Figure 3-75. Clamp fork tube in fork tube holder. Mount in vise with fork vertical.

Special Tool: FORK TUBE HOLDER (HD-41177)

2. Remove fork tube.

NOTE

Do not bend or stretch oil seal retaining ring during removal.

a. If equipped, separate dust cover (17) from fork tube (4) .

b. Separate dust seal (16) from fork tube.

c. Remove retaining ring (15).

d. Expand fork slider (18) and fork tube (4) against each other repeatedly (in a slide-hammer effect) to remove fork tube.

e. Gently pry at split line to remove fork tube bushing (12).

f. Remove slider bushing (11), seal spacer (13), oil seal (14), retaining ring (15), and dust seal (16) from fork slider. Discard oil seal.

g. If equipped, remove dust cover (17).

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 3-77. Check run-out with a dial indicator.
   a. Set fork tube on V-blocks.

   b. Replace fork if runout exceeds dimension.

      0. 008 in (0.2 mm)

Assemble

Initial Assembly

NOTICE

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

NOTE

- Lubricate all seal lips, quad rings and O-rings with HARLEY-DAVIDSON SEAL GREASE during assembly.

- ***Use FORK TUBE HOLDER (PART NUMBER: HD-41177)*** as ***necessary.***
- ***Place dust seal with larger diameter end toward top of fork assembly.***
- ***Place oil seal with lettering toward top of fork assembly.***

1. See Figure 3-81. Assemble fork slider.

   a. If equipped, place dust cover (17) onto fork slider (18).

   b. Place dust seal (16), retaining ring (15), oil seal (14), seal spacer (13) and slider bushing (11) onto fork slider.

   c. Install fork tube bushing (12). Expand bushing only enough to fit onto fork slider (18).

   d. Lightly coat fork slider (18) and fork tube bushing (12) with fork oil.

   e. Install fork slider (18) into fork tube (4).

2. Clamp fork slider horizontally in fork tube holder.

   Special Tool: FORK TUBE HOLDER (HD-41177)

3. Install fork oil seal.
   a. Install slider bushing (11) and seal spacer (13).

   b. Assemble fork seal driver and dust boot installer (43mm) in front of oil seal (14). Long end oftool faces oil seal.

      Special Tool: FORK SEAL DRIVER AND DUST BOOT INSTALLER (43MM) (B-42571)

   c. Drive oil seal into fork tube until seated.

   d. Install retaining ring (15).

   e. Install dust seal (16).

   f. Tap dust seal into place.

   g. If equipped, install dust cover (17).
   h. Rotate dust cover to match any removal burrs in slider. Tap dust cover into place.

Fork Fill

A WARNING

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

1. Fill fork tube.

   a. Fully compress fork.

   b. See Figure 3-78. Fill with TYPE "E" HYDRAULIC FORK OIL until oil level matches specification from top of fork tube with spring removed. Adjust oil level to specification using fork oil level gauge. Refer to Table 3-14.

Table 3-14. Oil Level, Right Fork

MODEL	FLUID FILL DIMENSION
FLSB	5.5 in (140 mm)
FXFBS,FXLRS	5.6 in (141 mm)
FXLRST	4.8 in (123 mm)

Special Tool: FORK OIL LEVEL GAUGE (HD-59000B)

Complete Assembly

A WARNING

Wear safety glasses or goggles when servicing fork assembly. Do not remove slider tube caps without relieving spring preload or caps and springs can fly out, which could result in death or serious injury. (00297a)

1. See Figure 3-81. Install fork spring.

   a. Fully extend fork. Install spring (10) with tightly wound end at bottom.

   b. Install washer (9) and spring collar (8).

   c. Install nut (5) and joint rod (7).

   d. Using inner fork nut remover/installer install inner fork nut (6).

      Special Tool: INNER FORK NUT REMOVER/INSTALLER (HD-47852)

   e. Tighten inner fork nut.

      Torque: 69-83 ft-lbs (93-113 N-m) ***Fork, right side, inverted, inner fork nut***

   a. Install new O-ring (2).

2. Install fork tube plug.

   b. Install rubber stopper (3).

   c. Install fork tube plug (1) onto joint rod (7). Tighten.

      Torque: 13-16 ft-lbs (17.5-22.5 N-m) ***Fork tube plug to damper nut*** , ***right side, inverted***

   d. Install fork tube plug onto fork tube (4). Tighten.

      Torque: 22-30 ft-lbs (30-40 N-m) ***Fork tube plug, right side, inverted***

COMPLETE

1. **FLFBS, FLHC, FLHCS:** Install rear headlamp nacelle panels. See HEADLAMP NACELLE (Page 3-96).

2. Install front brake caliper(s). See FRONT BRAKE CALIPER (Page 3-38).

3. Install windshield, if equipped. See WINDSHIELD (Page 3-106)

4. Install front fender. See FRONT FENDER (Page 3-113).

5. Install front wheel. See FRONT WHEEL (Page 3-12).

PREPARE

1. All but FXLRST:. Remove front light bar, if equipped. See FRONT LIGHT BAR (Page 7-43)
2. All but FXLRST:. Remove headlamp. See HEADLAMP (Page 7-31)
3. Remove handlebar. See HANDLEBAR (Page 3-109).
4. Support front of motorcycle enough to take weight off of front tire without lifting. See Secure the Motorcycle for Service (Page 2-2).

REMOVE

Upper Fork Bracket

NOTE

If only removing upper fork bracket, use following procedure.

1. See Figure 3-82. Remove upper fork bracket assembly.
   a. Loosen fork stem pinch bolt (4).
   b. Remove fork stem screw (1) and washer (2).
   c. Remove upper fork bracket (3).

Lower Fork Bracket

1. Remove front fork. See FRONT FORK (Page 3-65).
2. Remove front brake line manifold screw from lower fork bracket. See BRAKE LINES (Page 3-51).
3. Remove upper fork bracket.
4. Secure lower fork bracket to frame.
5. Remove fork stem and lower fork bracket assembly (10) from steering head.

CLEAN AND INSPECT

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

1. Clean all parts.
2. Inspect fork stem and upper and lower brackets. Replace as necessary.

NOTICE

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

FASTENER	TORQUE VALUE	
Fork stem pinch bolt	16-20 ft-lbs	21.7-27.1 N-m
Fork stem screw, 1st torque	160-168in-lbs	18.1-19 N-m
Fork stem screw, final torque - All except FXLRS, FXLRST	62-68 in-lbs	7-7.7 N-m
Fork stem screw, final torque - FXLRS, FXLRST	110-122 in-lbs	12.4-13.8 N-m

CONSUMABLE	PART NUMBER
SPECIAL PURPOSE GREASE	99857-97A

A WARNING

3. Inspect bearings for the following conditions:

- Pitting
- Wear
- Scoring

Replace as necessary.

4. Inspect bearing cups. Replace as necessary

   a. Remove bearing cups from steering head using STEERING HEAD BEARING RACE REMOVER (PART NUMBER: HD-39301-A) and UNIVERSAL DRIVER HANDLE (PART NUMBER: HD-33416).

   b. Install new steering head bearing cups.

INSTALL

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)

A WARNING

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

Lower Fork Bracket

1. See Figure 3-82. Install front fork stem and lower fork bracket assembly.
   a. Install new dust seal (6) over fork stem and lower fork bracket assembly (10).
   b. Apply SPECIAL PURPOSE GREASE (99857-97A) to lower steering head bearing (7).
   c. Install lower steering head bearing.
   d. Install fork stem through steering head.
   e. Apply SPECIAL PURPOSE GREASE (99857-97A) to upper steering head bearing.
   f. Install upper steering head bearing and new dust seal (6).
   g. Install front brake line manifold screw to lower fork bracket. See BRAKE LINES (Page 3-51).
2. Install upper fork bracket (3).

Upper Fork Bracket

1. See Figure 3-82. Install upper fork bracket (3) assembly.
   a. Place front fork tube assemblies in fork bracket assemblies (3,10).
   b. Install washer (2) and fork stem screw (1). Tighten.
      Torque: 160-168 in-lbs (18.1-19 N-m) ***Fork stem screw, 1st torque***
   c. Loosen fork stem screw.
      Angle: 45°
   d. Final tighten fork stem screw. Tighten.
      Torque: 62-68 in-lbs (7-7.7 N-m) ***Fork stem screw, final torque*** - ***All except FXLRS, FxLRST*** Torque: 110-122 in-lbs (12.4-13.8 N-m) ***Fork stem screw, final torque*** - ***FXLRS, FXLRST***
   e. Tighten fork stem pinch bolt (4). Tighten.
      Torque: 16-20 ft-lbs (21.7-27.1 N-m) ***Fork stem pinch bolt***
3. Install headlamp if removed (except FXLRST). See

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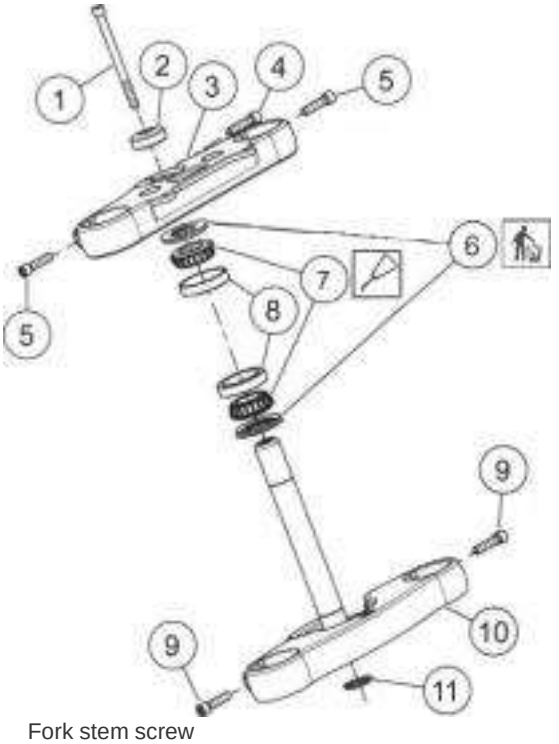


1. Fork stem screw
2. Washer
3. Upper fork bracket
4. Fork Stem Pinch Bolt
5. Upper fork clamp pinch bolt (2)
6. Dust seal (2)
7. Steering head bearing (2)
8. Bearing cup (2)
9. Lower fork bracket pinch bolt (2) (if equipped)
10. Fork stem and lower fork bracket assembly
11. Fork stem retaining ring

Figure 3-82. Fork Clamp Components (Typical)

COMPLETE _____

1. Adjust and tighten front fork. See FRONT FORK (Page 3-65).
2. Install handlebar. See HANDLEBAR (Page 3-109).
3. HEADLAMP (Page 7-31)
4. Install front light bar, if equipped (except FXLRST). See FRONT LIGHT BAR (Page 7-43)
5. Adjust steering head bearings. See ADJUST AND LUBRICATE STEERING HEAD BEARINGS (Page 2-27).

FORK LOCK

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove frame plug and front electrical caddy. See FRONT ELECTRICAL CADDY (Page 7-87).

REMOVE

1. Turn forks to full right position.
2. ***NOTE***

Fork lock mounting screw has left handed threads.

   Remove fork lock mounting screw through hole in lower fork clamp.

3. See Figure 3-83. Remove fork lock (1) and gasket (2).

INSTALL

1. Turn handlebars to full right position, aligning hole in lower fork clamp with mounting hole for fork lock fastener.
2. ***NOTE***

Fork lock needs to be in the retracted/unlocked position for installation.

   See Figure 3-83. Place fork lock and gasket in position.

3. Install fork lock mounting screw. Tighten.
   Torque: 54-79 **in-lbs** (6.1-8.9 N-m)

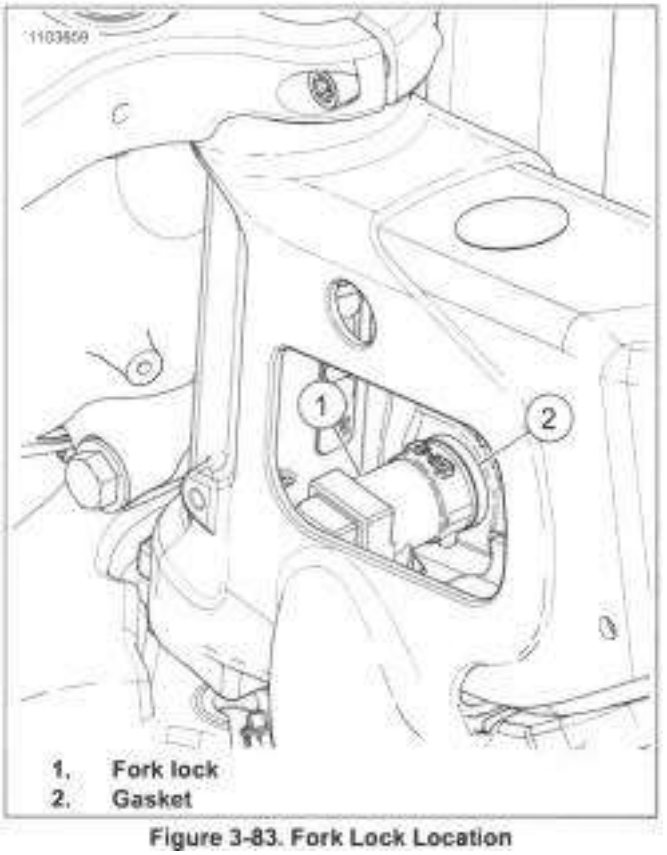


Figure 3-83. Fork Lock Location

COMPLETE

1. Verify proper operation of fork lock.
2. Install electrical caddy and frame plug. See FRONT ELECTRICAL CADDY (Page 7-87).
3. Install fuel tank. See FUEL TANK (Page 6-14).
4. Install seat. See SEAT (Page 3-142).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).
6. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove negative battery cable. See POWER DISCONNECT (Page 7-7).
2. Remove saddlebags, if equipped. See SADDLEBAGS (Page 3-145).
3. Remove mufflers and exhaust bracket. See EXHAUST SYSTEM (Page 6-36).
4. Remove brake line P-clip from rear fork. See BRAKE LINES (Page 3-51).
5. Remove belt guards. See BELT GUARDS (Page 3-85).
6. Remove rear wheel. See REAR WHEEL (Page 3-16).
7. Remove drive belt. See DRIVE BELT (Page 5-7).
8. Remove lower shock screw. See REAR SHOCK ABSORBER (Page 3-87).

REMOVE AND INSTALL

FASTENER	TORQUE VALUE	
Rear fork pivot shaft nut, final torque	154-170 ft-lbs	209-230 N-m
Rear fork pivot shaft nut, first torque	25-30 ft-lbs	34-41 N-m
Rear fork pivot shaft nut, second torque	1-48 in-lbs	0.1-5.4 N-m
Rear fork pivot shaft nut, third torque	154-170 ft-lbs	209-230 N-m
Rear fork pivot shaft pinch bolt	18-20 ft-lbs	24-27 N-m
Splash guard screw	35-45 in-lbs	3.9-5.1 N-m

Remove

1. See Figure 3-84. Remove splash guard.
   a. Remove screw (1).
   b. Pull bottom of splash guard (2) out and down to remove.
2. Remove rear fork.
   a. Support rear of transmission and frame.
   b. Support rear fork (3).
   c. Remove nut (7).
   d. Loosen pinch bolt (8).
   e. Remove pivot shaft (9) and spacer (6).
   f. Remove rear fork.

Install

1. See Figure 3-84. Install splash guard.
   a. Place the bottom tabs on splash guard (2) into the slots on rear fork (3).
   b. Slightly bend the splash guard top mounting tabs and push the top onto the stubs (13) protruding from the fork.
   c. Install screw (1). Tighten.
      Torque: 3^45 in-lbs (3.9-5.1 N-m) ***Splash guard screw***
2. Install rear fork.
   a. Align rear fork (3) with frame.
   b. Lift top of drive belt (9). Install pivot shaft through right side of frame, rear fork (3), transmission fork mount, drive belt, spacer (6) and left side of frame.
   c. Install pivot shaft nut (7). Tighten.
      Torque: 25-30 ft-lbs (34-41 N-m) ***Rear fork pivot shaft nut, first torque***
   d. Back off pivot shaft nut.
      Angle: 90°
   e. Tighten pivot shaft nut.
      Torque: 1-48 in-lbs (0.1-5.4 N-m) ***Rear fork pivot shaft nut, second torque***
   f. Install lower shock bolt. See REAR SHOCK ABSORBER (Page 3-87).

NOTE

Verify spacer (6) does not have lateral play.

   g. Install belt slot spacer. See DRIVE BELT (Page 5-7).
   h. Install rear wheel. See REAR WHEEL (Page 3-16).

NOTE

Adjust the belt tension after the drive belt slot spacer screws have been torqued to final specifications and before the pivot shaft nut has been torqued to final specifications.

   i. Tighten pivot shaft nut (7).
      Torque: 154-170 ft-lbs (209-230 N-m) ***Rear fork pivot shaft nut, third torque***
   j. Back off pivot shaft nut.
      Angle: 90°
   k. Tighten pivot shaft nut.
      Torque: 154-170 ft-lbs (209-230 N-m) ***Rear fork pivot shaft nut, final torque***

NOTE

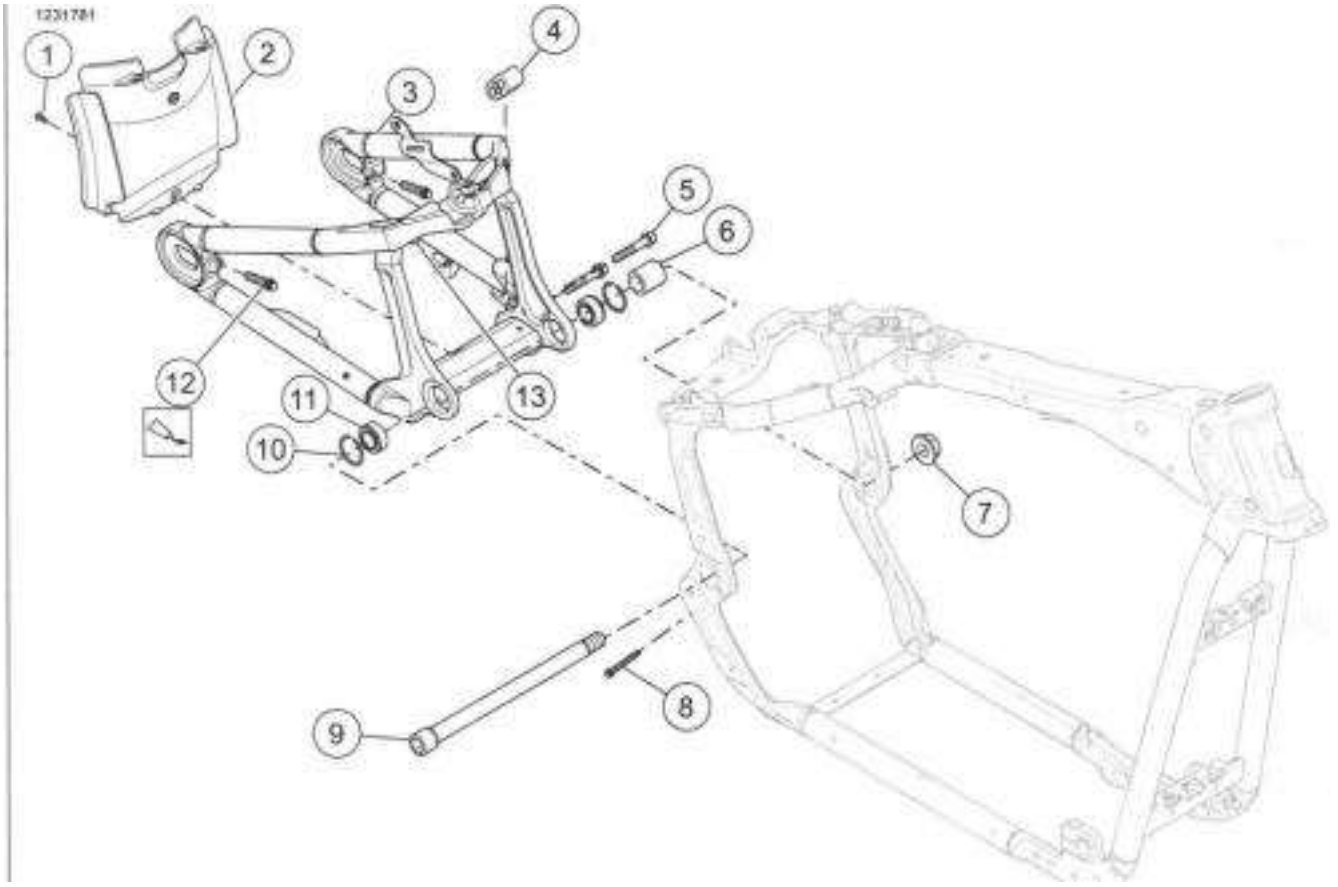
After final torque of pivot shaft nut there will still be a slight gap between the right side bearing and rear fork.

I. Tighten pivot shaft pinch bolt (8).

Torque: 18-20 ft-lbs (24-27 N-m) ***Rear fork pivot shaft pinch bolt***

NOTE

Verify spacer (6) does not have lateral play.



1. Splash guard screw
2. Splash guard
3. Rear fork
4. Belt slot spacer
5. Belt slot spacer screw (2)
6. Spacer
7. Pivot shaft nut
8. Pivot shaft pinch bolt
9. Pivot shaft
10. Retaining ring (2)
11. Bearing (2)
12. Adjusting screw (2)
13. Splash guard stubs (2)

Figure 3-84. Rear Fork Assembly

DISASSEMBLE AND ASSEMBLE: STANDARD

PART NUMBER	TOOL NAME
HD-46281	BEARING REMOVER/INSTALLER TOOL

Disassemble

1. See Figure 3-85. Remove bearings from rear fork using.

   Special Tool: BEARING REMOVER/INSTALLER TOOL (HD-46281)

NOTE

Remove bearings only if replacement is required.

2. See Figure 3-86. Remove adjusting screws (1).

Clean and Inspect

1. See Figure 3-86. Clean all components in solvent.
2. Dry parts with low-pressure, compressed air.
3. Carefully inspect bearings (2) for wear and/or corrosion. Replace or repair as necessary.
4. Verify that the bearing retaining rings (3) are not bent or damaged. Replace or repair as necessary.
5. If the bearings were removed, clean the bearing bores (4) with a clean shop towel, removing any dirt or grit adhering to the bearing surface.
6. Rough check rear fork (5) for correct alignment or damage. Replace if bent or damaged.

7. Clean threads on adjustment screws (1) and adjusting screw holes.

Assemble

1. See Figure 3-86. Install adjusting screw.

   a. Inspect condition of adjusting screws (1) and replace if necessary.

   b. Install adjusting screws.

2. Install bearings.

   a. Install **new** retaining rings (3) onto grooves on **new** bearings (2) if removed.

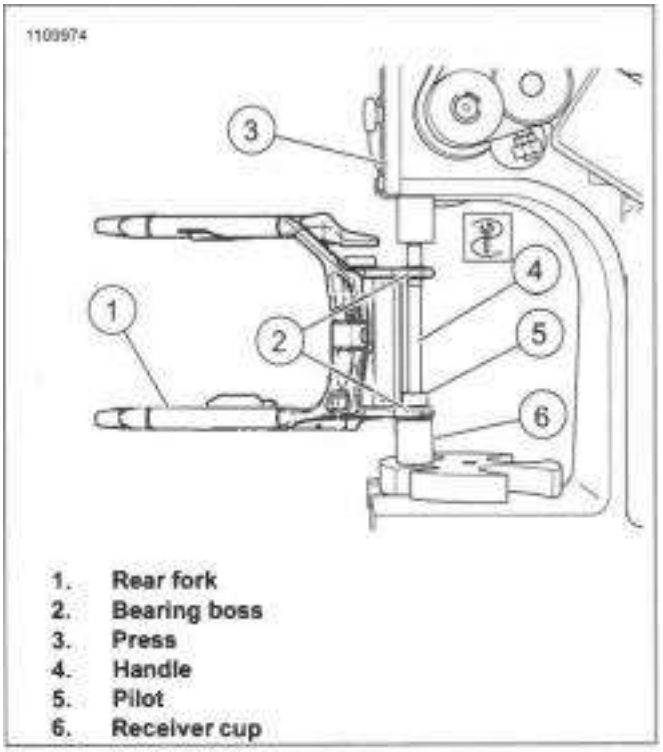
   b. See Figure 3-87. Position left bearing squarely on left bearing bore.

   c. Press left bearing into fork bearing bore until retaining ring bottoms out.

   d. Position right bearing on right bearing bore.

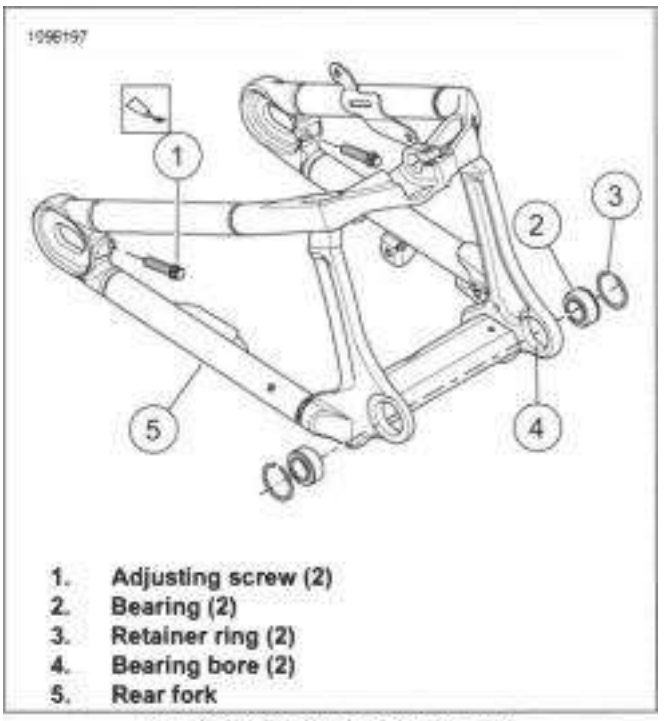
   e. See Figure 3-88. Press right bearing into fork bearing bore leaving a gap.

      0.06-0.13 in (1.47-3.2 mm)



1. Rear fork
2. Bearing boss
3. Press
4. Handle
5. Pilot
6. Receiver cup

Figure 3-85. Removing Rear Fork Bearings



1. Adjusting screw (2)
2. Bearing (2)
3. Retainer ring (2)
4. Bearing bore (2)
5. Rear fork

Figure 3-86. Rear Fork Bearings

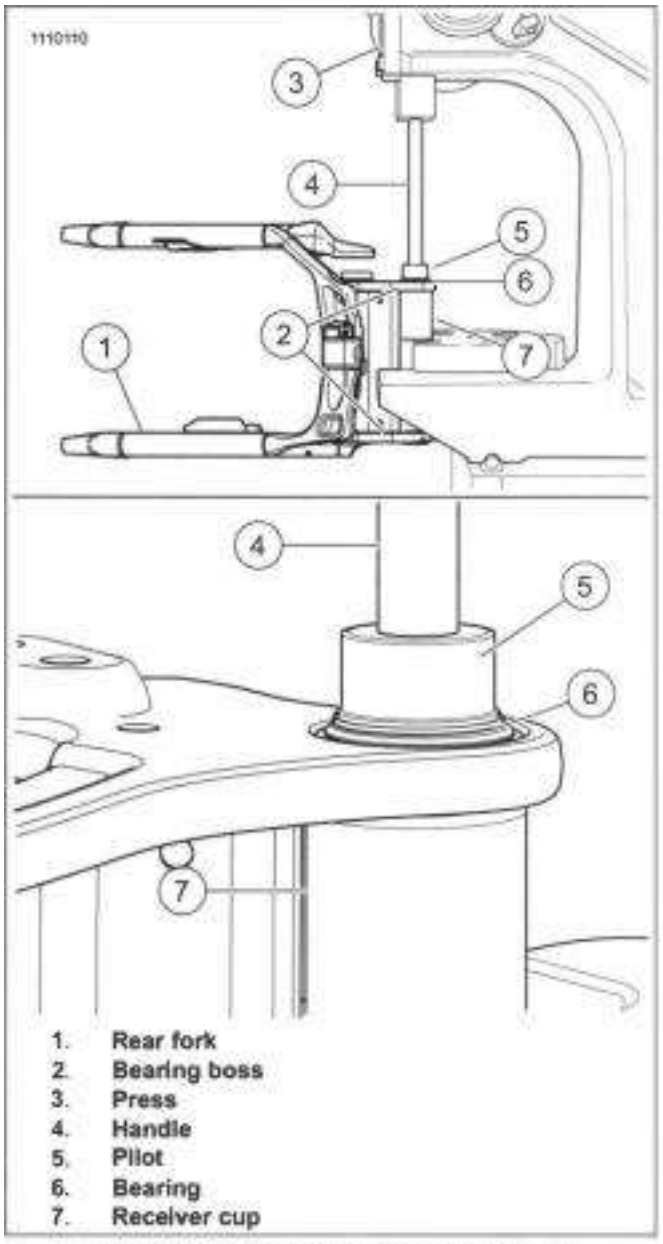


Figure 3-87. Installing Rear Fork Bearings

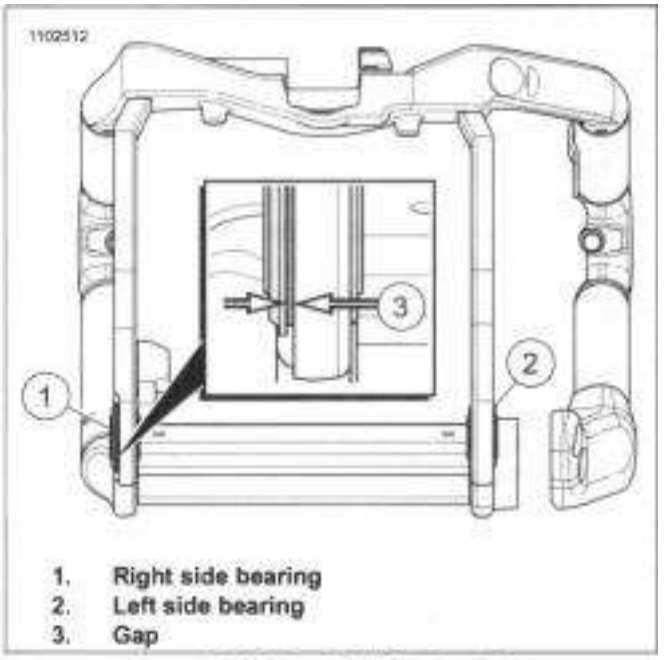


Figure 3-88. Rear Fork Bearing Gap

145)

8. Install negative battery cable. See POWER DISCONNECT (Page 7-7)

COMPLETE

1. Install lower shock screw. See REAR SHOCK ABSORBER (Page 3-87)
2. Install drive belt. See DRIVE BELT (Page 5-7)
3. Install rear wheel. See REAR WHEEL (Page 3-16)
4. Install belt guards. See BELT GUARDS (Page 3-85)
5. Install brake line P-clip into rear fork. See BRAKE LINES (Page 3-51)
6. Install mufflers and exhaust bracket. See EXHAUST SYSTEM (Page 6-36)
7. Install saddlebags, if equipped. See SADDLEBAGS (Page 3-

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove saddlebag, if equipped. See SADDLEBAGS (Page 3-145).

REMOVE AND INSTALL: STANDARD

FASTENER	TORQUE VALUE	
Belt guard, lower screw	70-80 in-lbs	7.9-9 N-m
Belt guard, upper screw	70-80 in-lbs	7.9-9 N-m
Saddle bag, docking bracket screw	38-47 ft-lbs	52-64 N-m

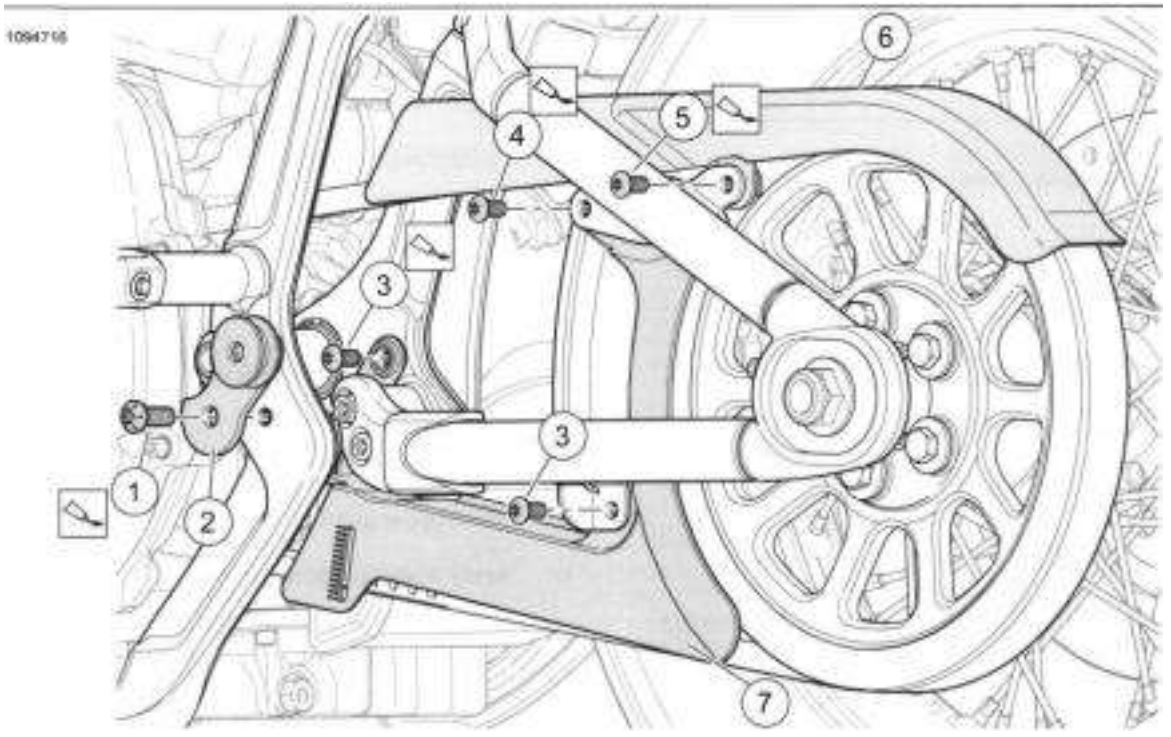
CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

REMOVE

1. See Figure 3-89. Remove upper guard.
   a. Remove screw (5) andnut.
   b. Remove screw (4).
   c. Remove upper guard (6).
2. Remove lower guard.
   a. Remove screw (1) and docking bracket (2) if equipped.
   b. Remove screws (3).
   c. Remove lower belt guard (7) through opening in rear fork.

INSTALL

1. See Figure 3-89. Install lower belt guard. a. Guide lower guard (7) through rear fork.
   b. Place lower guard in position.
   c. Apply threadlock to screw (3).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   d. Install screws. Tighten.
      Torque: 70-80 in-lbs (7.9--9 N-m) ***Belt guard, lower screw***
2. Install upper guard.
   a. Place upper guard (6) in position.
   b. Apply threadlock to screw (4).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screw. Tighten.
      Torque: 70-80 in-lbs (7.9-9 N-m) ***Belt guard, upper screw***
   d. Apply threadlock to screw (5).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   e. Install screw and nut. Tighten.
      Torque: 70-80 in-lbs (7.9-9 N-m) ***Belt guard, upper screw***
3. Install docking bracket, if equipped.
   a. Apply threadlock to screw (1).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Position docking bracket (2) on frame and install screw. Tighten.
      Torque: 38-47 ft-lbs (52-84 N-m) ***Saddle bag, docking bracket screw***



1.	**Screw**	**5.**	**Screw**
2.	**Docking bracket**	**6.**	**Upper guard**
3.	**Screw (2)**	**7.**	**Lower guard**
4.	**Screw**		

Figure 3-89. Belt Guards

COMPLETE

1. Install saddlebag, if equipped. See SADDLEBAGS (Page 3-145).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

1. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
2. Remove seat. See SEAT (Page 3-142).
3. Remove fender, if necessary. See REAR FENDER (Page 3-116).
4. Remove frame crossmember. See FRAME CROSSMEMBER (Page 3-144).
5. Models with side mounted shock adjuster.
   a. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
   b. Remove battery strap. See INSPECT BATTERY (Page 2-43).
6. Using a suitable lift, support frame and raise slightly to relieve pressure on the shock.

REMOVE _ _____ _____

1. Models with top-mounted shock adjuster: See Figure 3-90. Remove cable strap (2).
2. Models with side-mounted shock adjuster: See Figure 3-91. Remove shock adjuster from bracket.
   a. Remove clip from ABS bracket (4).
   b. Remove screw (2) and washer (1).
   c. Set side mounted shock adjuster (3) to the side, being careful not to damage oil line.
3. Remove rear shock.
   a. See See Figure 3-92.. Remove pinch bolt (1).
   b. See See Figure 3-93.. Remove screw (6).
   c. Remove screw (5).
   d. Remove rear shock (1, 2 or 3).

INSTALL

FASTENER	TORQUE VALUE	
Lower shock screw	70-75 ft-lbs	94.9-101.7 N-m
Shock pinch bolt	12-15 ft-lbs	16.3-20.3 N-m
Side-mounted shock adjuster screw	90-114 in-lbs	10.2-12.9 N-m
Upper shock screw	80-90 ft-lbs	108.5-122 N-m

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

NOTE

• Lower shock mount bushing and bearing are not serviceable.

1. See Figure 3-93. Install rear shock.
   a. Place rear shock (1, 2 or 3) in position.
   b. Install screw (5). Tighten.
      Torque: 70-75 ft-lbs (94.9-101.7 N-m) *Lower shock screw*
   c. Apply threadlocker to screw (6).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   d. Raise or lower rear fork to align upper shock mount.
   e. Install screw (6). Tighten.
      Torque: 80-90 ft-lbs (108.5-122 N-m) *Upper shock screw*
   f. See Figure 3-92. Apply thread locker to pinch screws.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   g. See Figure 3-92. Install pinch bolt (1). Tighten.
      Torque: 12-15 ft-lbs (16.3-20.3 N-m) *Shock pinch bolt*
2. Models with side-mounted shock adjuster: See Figure 3-91. Install shock adjuster on bracket.
   a. Route side mounted shock adjuster (3) in front of the battery tray.
   b. Position side mounted shock adjuster on mounting bracket.
   c. Install washer (1) and screw (2). Tighten.
      Torque: 90-114 in-lbs (10.2-12.9 N-m) *Side-mounted shock adjuster screw*
   d. Insert shock adjuster hose clip onto ABS bracket (4).
3. Models with top-mounted shock adjuster See Figure 3-

90. Install cable strap (2).

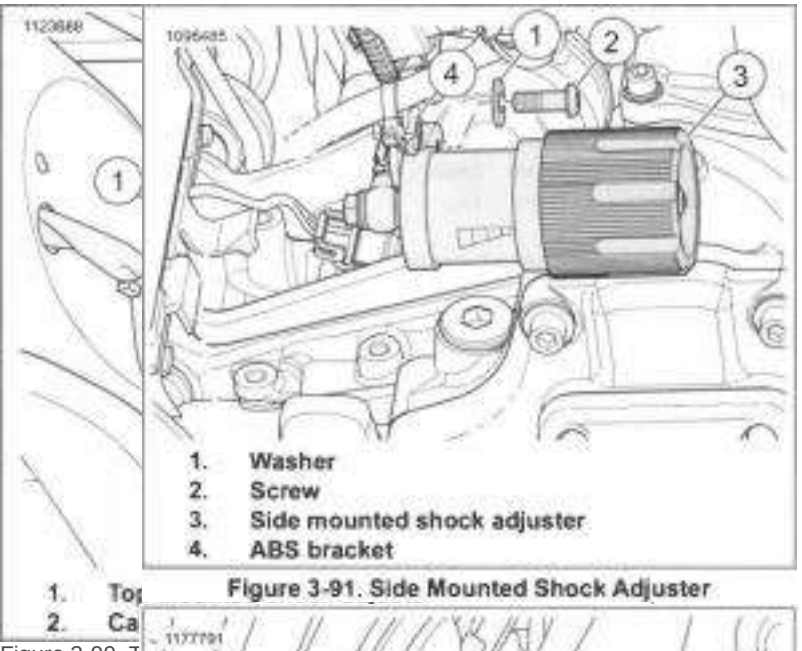
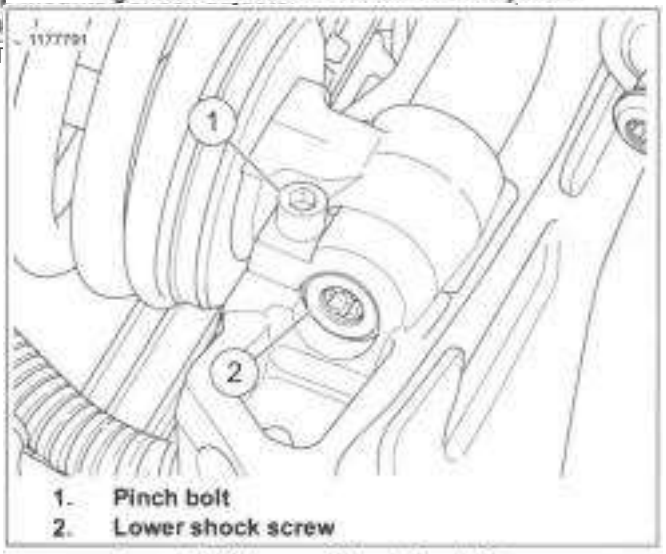


Figure 3-90. T

1. Washer
2. Screw
3. Side mounted shock adjuster
4. ABS bracket

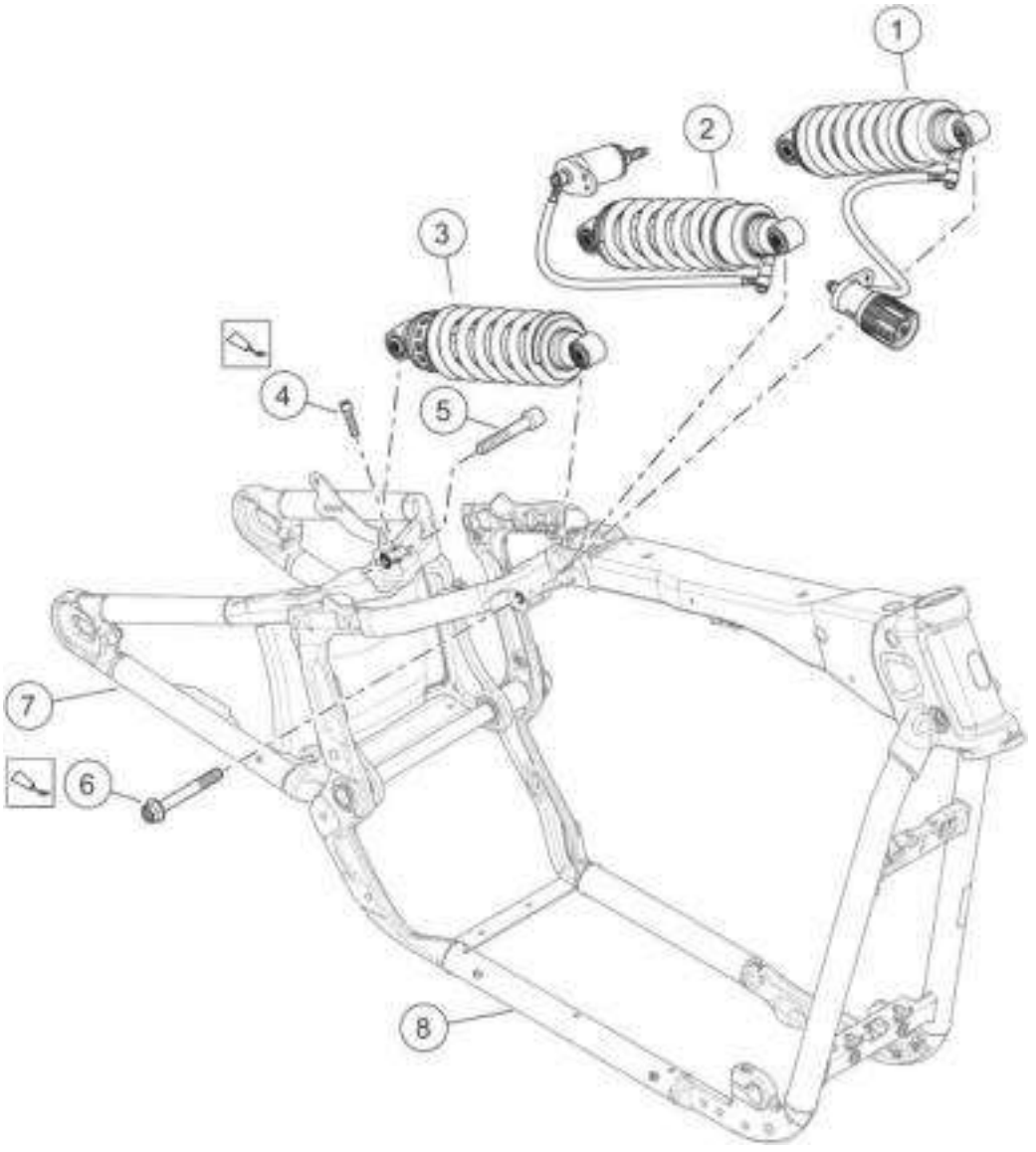
Figure 3-91. Side Mounted Shock Adjuster



1. Pinch bolt
2. Lower shock screw

Figure 3-92. Lower Shock Pinch Screw

1096314



1.	Shock, side mounted adjuster	5.	Lower shock screw
2.	Shock, top mounted adjuster	6.	Upper shock screw
3.	Shock, cam adjustable	7.	Rear fork
4.	Pinch bolt	8.	Frame

Figure 3-93. Rear Shocks

DISASSEMBLE AND ASSEMBLE: REAR SHOCK ADJUSTER

FASTENER	TORQUE VALUE	
Rear shock adjuster knob screw	26.^6--44.3 in-lbs	3--5 N-m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

The rear shock absorbers contain no serviceable parts except an adjustment knob and hardware kit.

Remove shock adjuster knob.

1. See Figure 3-94. Remove shock adjuster knob (1).

   a. Remove screw (3) and washer (2).

   b. Hold a rag wrapped around the adjuster housing and knob to prevent loss of the detent ball (4) and spring (5) . Carefully remove the knob.

   c. Remove detent ball and spring.

Install shock adjuster knob.

1. Lubricate adjuster shaft.

   a. Apply a light coat of ANTI-SEIZE LUBRICANT to the knob adjuster shaft.

      ANTI-SEIZE LUBRICANT (98960-97)

b. Rotate adjuster shaft, using a wrench, completely in both directions to distribute lubricant.

2. See Figure 3-94. Install shock adjuster knob.

   a. Apply threadlocker to screw (3).

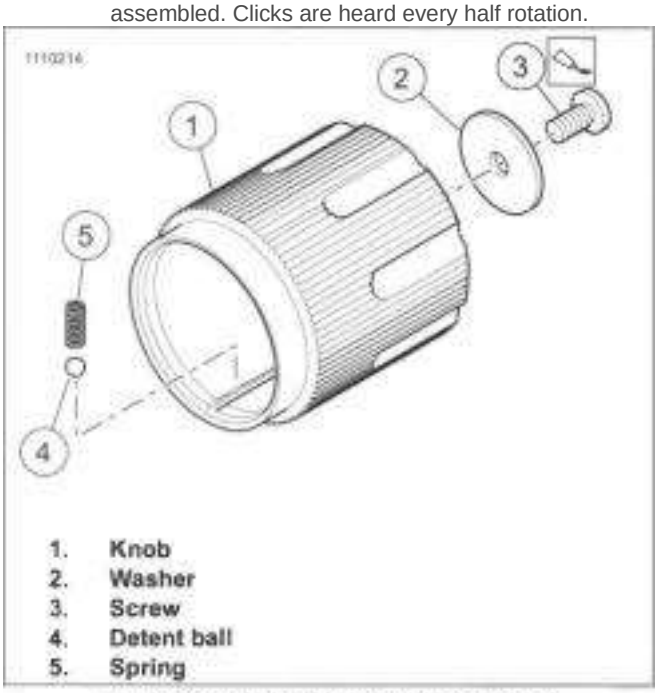
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

   b. Install spring (5) and detent ball (4).

   c. Install adjuster knob (1).

   d. Install washer (2) and screw (3). Tighten.
      Torque: 26.6-44.3 **in-lbs** (3-5 N-m) ***Rear shock adjuster knob screw***

   e. Rotate knob to verify that the detent is properly assembled. Clicks are heard every half rotation.



1. Knob
2. Washer
3. Screw
4. Detent ball
5. Spring

Figure 3-94. Rear Shock Adjuster Knob

1. Adjust shock absorber. See ADJUST SUSPENSION (Page 2-35).

2. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

3. **Models with side-mounted shock adjuster.**

   a. Install battery strap. See INSPECT BATTERY (Page 2-43).

   b. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

4. Install frame crossmember. See FRAME CROSSMEMBER (Page 3-144).

5. Install fender, if removed. See REAR FENDER (Page 3-116).

6. Install seat. See SEAT (Page 3-142).

PREPARE

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

REMOVE

Clutch Cable Disconnect

NOTE

The two cable halves should only be taken apart if replacing the upper clutch cable or housing. Otherwise disconnect at clutch lever and leave two halves assembled.

1. See Figure 3-95. Access two piece clutch cable.

   a. Remove spring clips (1).

   b. Slide cover (2) up.

2. See Figure 3-96. Identify upper clutch cable (1) and red lock button (2).

3. ***NOTE***

Inspect lock button (2). Replace if damaged.

   See Figure 3-97. 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 3-98. Lift locking tab (1) from swaged ball end (2).

6. See Figure 3-99. Push swaged ball end (2) out from coupler from opposite side and slightly pull clutch lever in until locking tab is at top of window. Remove swaged ball end from coupler (1).

7. See Figure 3-100. Pry flex fingers (3) open and slide lower clutch cable (2) from housing (1).

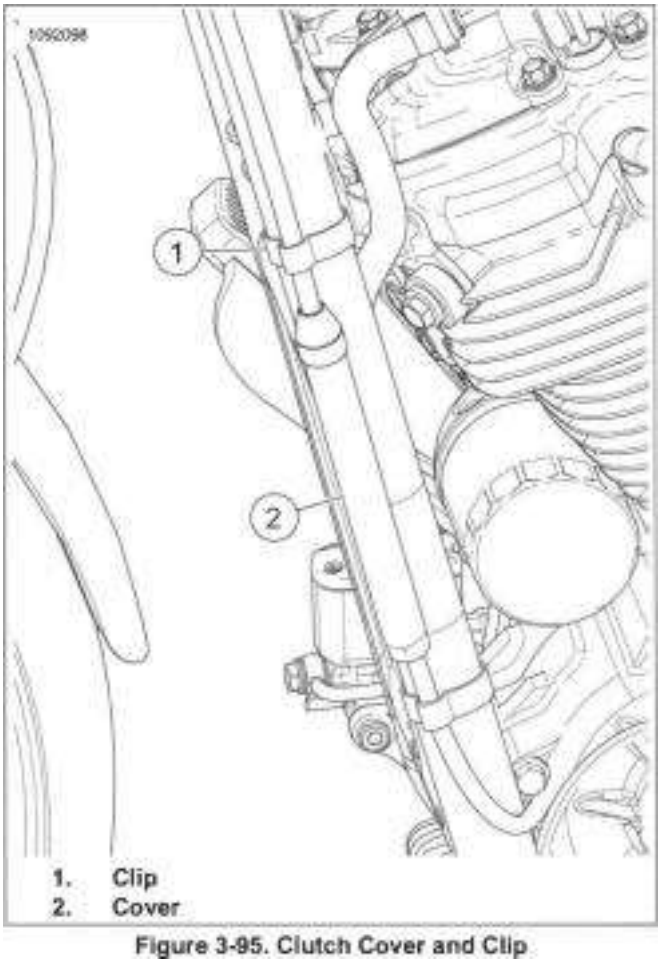


Figure 3-95. Clutch Cover and Clip

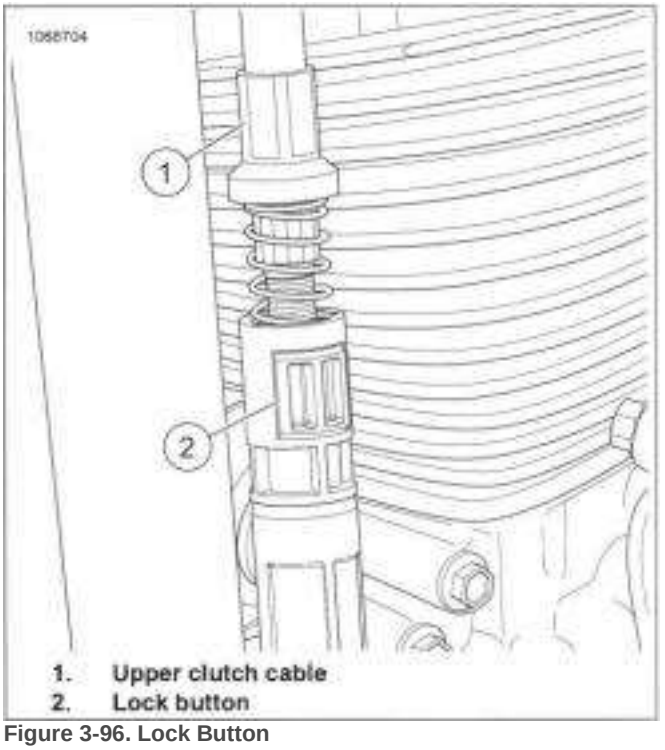
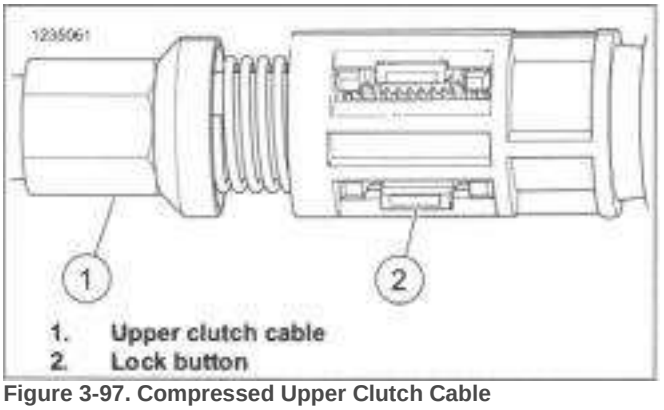
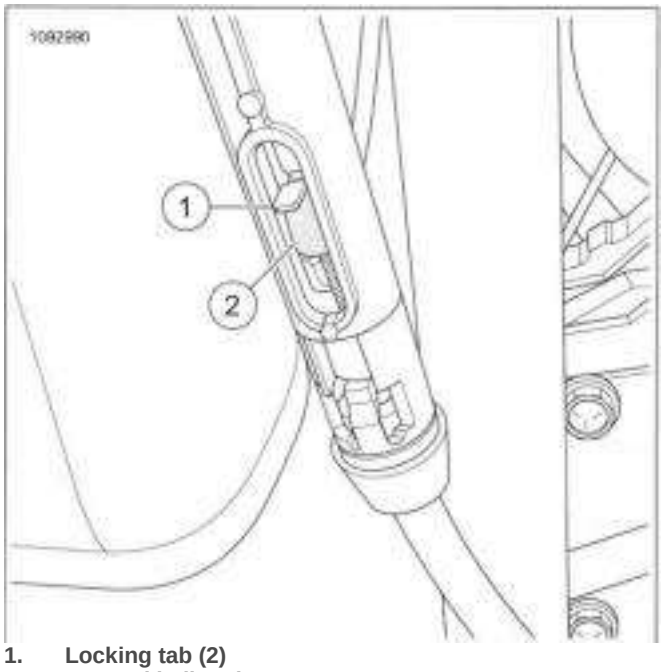


Figure 3-96. Lock Button



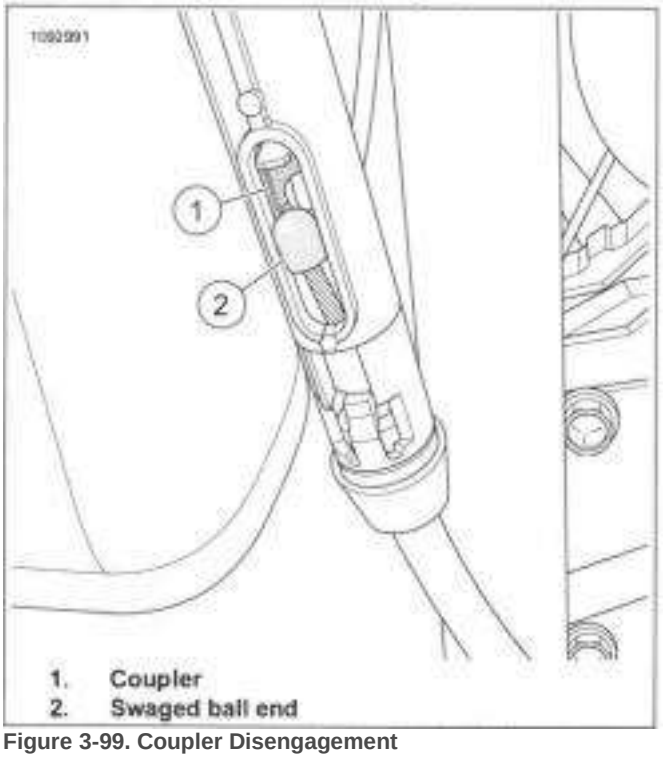
1. Upper clutch cable
2. Lock button

Figure 3-97. Compressed Upper Clutch Cable



1. Locking tab (2)
2. Swaged ball end

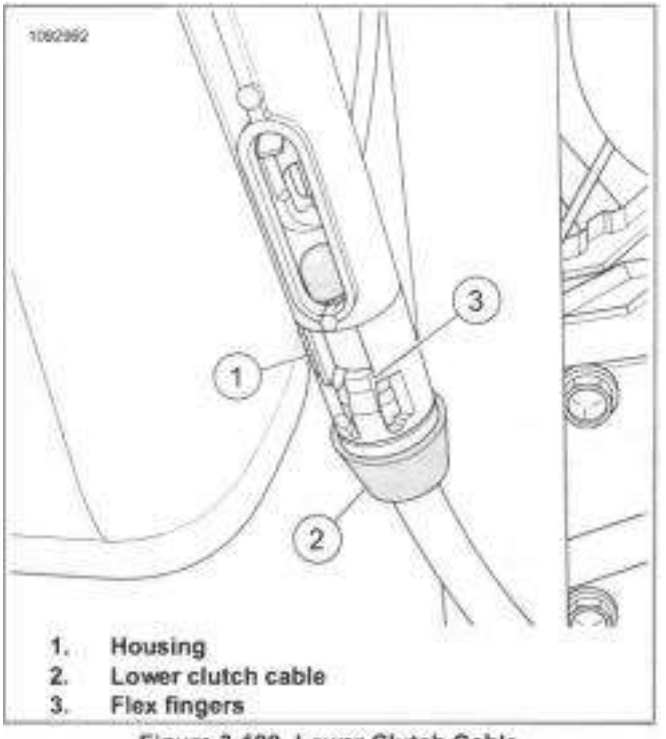
Figure 3-98. Retaining Clips



1. Coupler
2. Swaged ball end

Figure 3-99. Coupler Disengagement

Clutch Cable: Lower End



1. Housing
2. Lower clutch cable
3. Flex fingers

Figure 3-100. Lower Clutch Cable

1. Remove clutch cable.

   a. Disconnect clutch cable at release cover. See CLUTCH RELEASE COVER (Page 5-12).

   b. Disconnect clutch cable. See Clutch Cable Disconnect in this section.

Clutch Cable: Upper End

1. See Figure 3-101. Remove clutch cable.

   a. Remove retaining ring (7).

   b. Remove pivot pin (3).

   c. Remove clutch hand lever (6).

   d. Remove pin (5).

   e. Remove clutch cable (8).

   f. Disconnect clutch cable. See Clutch Cable Disconnect in this section.

Clutch Hand Control

1. See Figure 3-101. Remove clutch hand control assembly.

   a. Remove screws (1) and washers (2).

   b. Remove lever bracket clamp (9).

   c. Remove hand lever bracket (4).

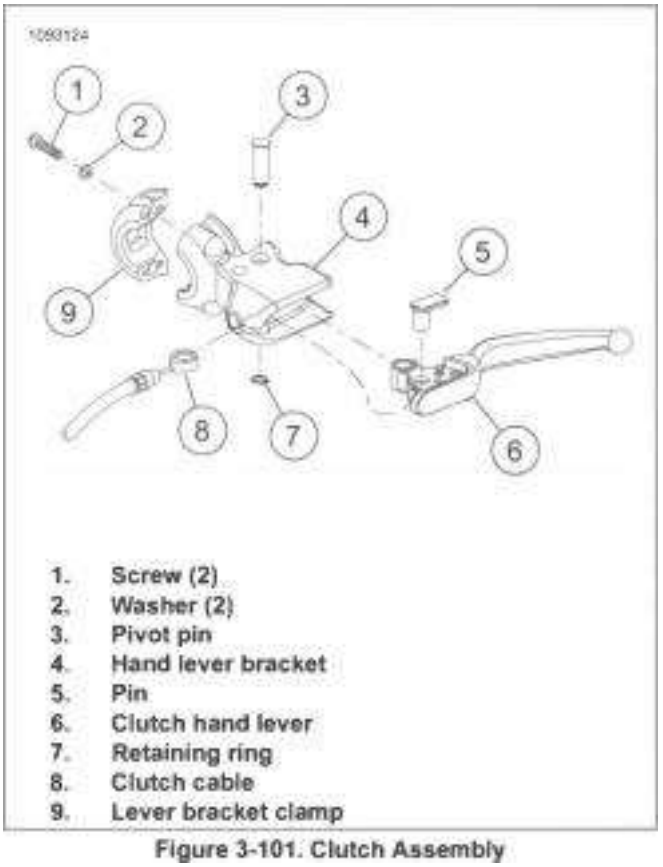


Figure 3-101. Clutch Assembly

CLEAN AND INSPECT

1. Inspect clutch lever and cable for wear or damage. Replace or repair as necessary.

2. Inspect clutch cable. Replace as necessary.

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)

3. Lubricate clutch cable and hand lever pivot pin hole with HARLEY LUBE.

INSTALL

FASTENER	TORQUE VALUE	
Clutch cable lever screw	60-80 in-lbs	6.8-9 N-m

Clutch Cable: Lower End

1. Install clutch cable.

   a. Connect clutch cable at release cover. See CLUTCH RELEASE COVER (Page 5-12).

   b. Connect clutch cable. See Clutch Cable Disconnect in this section.

Clutch Cable: Upper End

1. See Figure 3-101. Install clutch cable.

   a. Install clutch cable (8).

   b. Install pin (5).

   c. Install clutch hand lever (6).

   d. Install pivot pin (3)

   e. Install retaining ring (7).

   f. Connect clutch cable. See Clutch Cable Disconnect in this section.

Clutch Cable Connect

1. See Figure 3-100. Install lower clutch cable (2) into housing (1).

2. See Figure 3-99. Pull clutch cable swaged ball end (2) out slightly from window and then manipulate clutch lever to align coupler (1) with swagged ball end and then release.

3. See Figure 3-98. Secure locking tab (1) swaged ball end (2).

NOTE

Replace upper clutch cable if locking tab is damaged or missing.

4. See Figure 3-101. Ensure clutch lever (6) is in full open position and that ferrule is correctly seated in housing.

5. ***NOTE***

Inspect lock button (2). Replace if damaged.

See Figure 3-97. Disengage lock button (2) allowing upper clutch cable spring to set free-play at clutch lever.

6. See Figure 3-96. Push in lock button (2).

7. Check clutch operation.

8. See Figure 3-95. Slide cover (2) down and install spring clips (1).

Clutch Hand Control

1. See Figure 3-101. Install clutch hand control assembly.

   a. Install hand lever bracket (4).

   b. Install lever bracket clamp (9).

   c. Install washers (2) and screws (1). Tighten.
   Torque: 60-80 in-lbs (6.8-9 N-m) ***Clutch cable lever screw***

DISASSEMBLE

Lock Button

1. See Figure 3-102. Access two piece clutch cable.

   a. Remove spring clips (1).

   b. Slide cover (2) up.

2. ***NOTE***

Upper clutch cable (1) spring must be uncompressed.

   See Figure 3-103. 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 the this section.

2. See Figure 3-103. Remove housing (4) from upper housing (3).

ASSEMBLE

Lock Button

1. ***NOTE***

Upper clutch cable (1) spring must be uncompressed.

   See Figure 3-103. Install lock button (2).

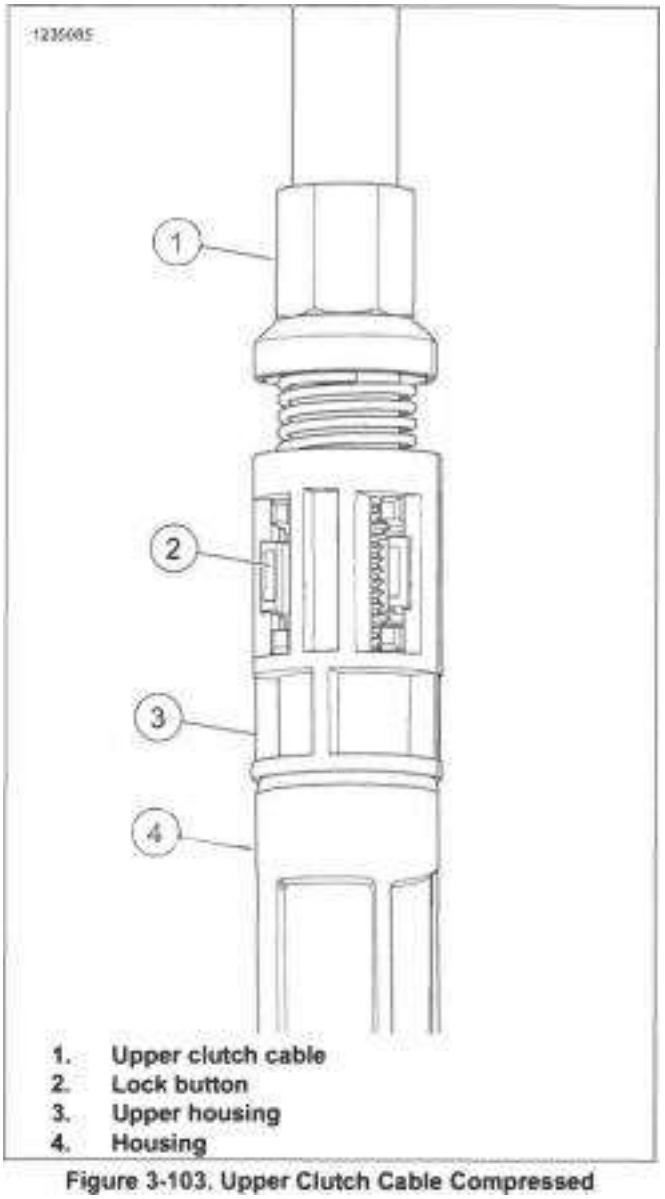
2. See Figure 3-102. Slide cover (2) down and install spring clips (1).

Housing

1. See Figure 3-104. Align coupler guide (2) with the guide in housing.

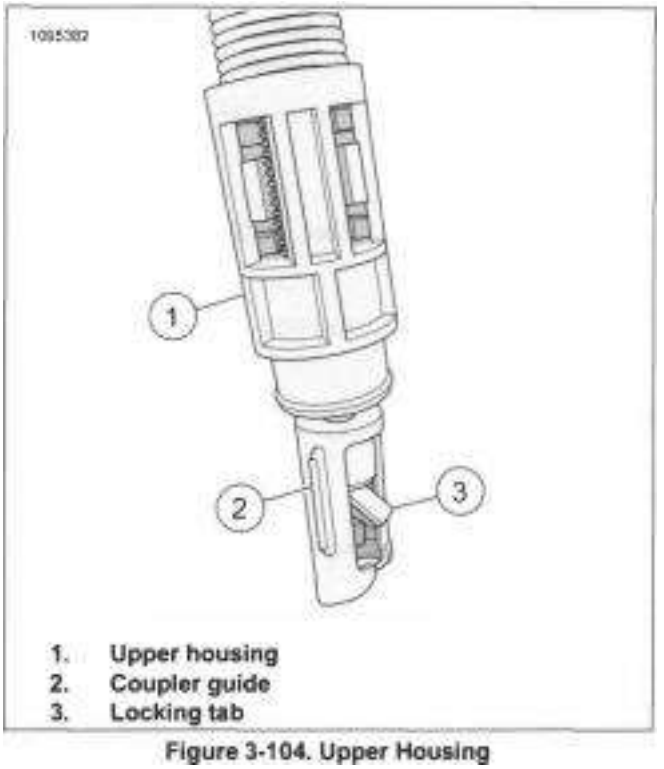
2. See Figure 3-103. Install housing (4) to upper housing (3).

3. Connect clutch cable. See Clutch Cable Connect in this section.



1. Upper clutch cable
2. Lock button
3. Upper housing
4. Housing

Figure 3-103. Upper Clutch Cable Compressed



1. Upper housing
2. Coupler guide
3. Locking tab

Figure 3-104. Upper Housing

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).

HEADLAMP NACELLE

PREPARE

PREPARE

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

2. FLHC/S: Remove headlamp. See HEADLAMP (Page 7-31).

REMOVE

HORIZONTAL

1. See HEADLAMP (Page 7-31).

STANDARD ROUND

1. See Figure 3-105 and Figure 3-106. Remove screws (1) and clamps (2).

2. See Figure 3-105. Remove screws (3).

3. Remove trim cover (4).

4. Remove left and right cover (5 and 6).

5. Remove nacelle (7).

NACELLE MOUNTED

1. See Figure 3-107. Remove screw (6).

2. ***NOTE***

Bezel is under pressure from isolators (7), disassemble slowly.

Remove bezel (5).

3. Remove screws (8) and washers (9).

4. Remove screws (3).

5. Remove left and right cover (2 and 1).

6. Remove nacelle (4).

INSTALL

FASTENER	TORQUE VALUE	
Headlamp nacelle mounted, rear panel bracket screw	85-104 in-lbs	9.6-11.7 N-m
Headlamp nacelle, standard round, clamp screw	36-48 in-lbs	4.1-5.4 N-m
Headlamp nacelle, standard round, trim strip screw	84-108 in-lbs	9.5-12.2 N-m
Headlamp, nacelle mounted, bezel screw	25-32 in-lbs	2.8-3.6 N-m
Headlamp, nacelle mounted, left side, cover screw	84-108 in-lbs	9.5-12.2 N-m
Headlamp, nacelle mounted, right side, cover screw	84-108 in-lbs	9.5-12.2 N-m

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

HORIZONTAL

1. See HEADLAMP (Page 7-31).

STANDARD ROUND

1. Inspect upper and lower pads. Replace as needed.

2. See Figure 3-105. Install nacelle (7), right cover (6) and trim strip (2).

3. Apply threadlocker and install screws (3). Tighten.

   Torque: 84-108 in-lbs (9.5-12.2 N-m) ***Headlamp nacelle, standard round, trim strip screw*** Consumable: LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

4. Install left cover (5) and trim strip (4).

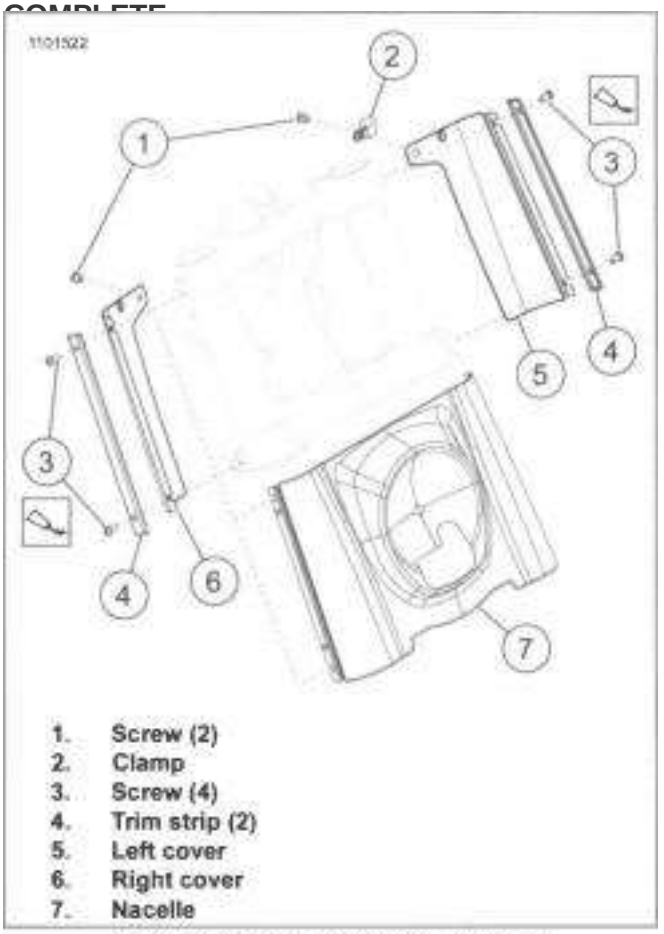
5. Install screws (3). Tighten.

   Torque: 84-108 in-lbs (9.5-12.2 N-m) ***Headlamp nacelle, standard round, trim strip screw***

6. See Figure 3-105 and Figure 3-106. Install clamps (2) and screws (1). Tighten.

   Torque: 36-48 in-lbs (4.1-5.4 N-m) ***Headlamp nacelle, standard round, clamp screw***

COMPLETE



1. Screw (2)
2. Clamp
3. Screw (4)
4. Trim strip (2)
5. Left cover
6. Right cover
7. Nacelle

Figure 3-105. Standard Round Nacelle

1. Screw
2. Clamp

Figure 3-106. Standard Round Rear View

NACELLE MOUNTED

1. See Figure 3-107. Inspect trim strip (10). Replace if necessary. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).

2. Install nacelle (4) and right cover (1).

3. Apply threadlocker and install screws (3). Tighten.

   Torque: 84-108 in-lbs (9.5-12.2 N-m) ***Headlamp, nacelle mounted, right side, cover screw*** Consumable: LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

4. Install left cover (2).

5. Install screws (3). Tighten.

   Torque: 84-108 in-lbs (9.5-12.2 N-m) ***Headlamp, nacelle mounted, left side, cover screw***

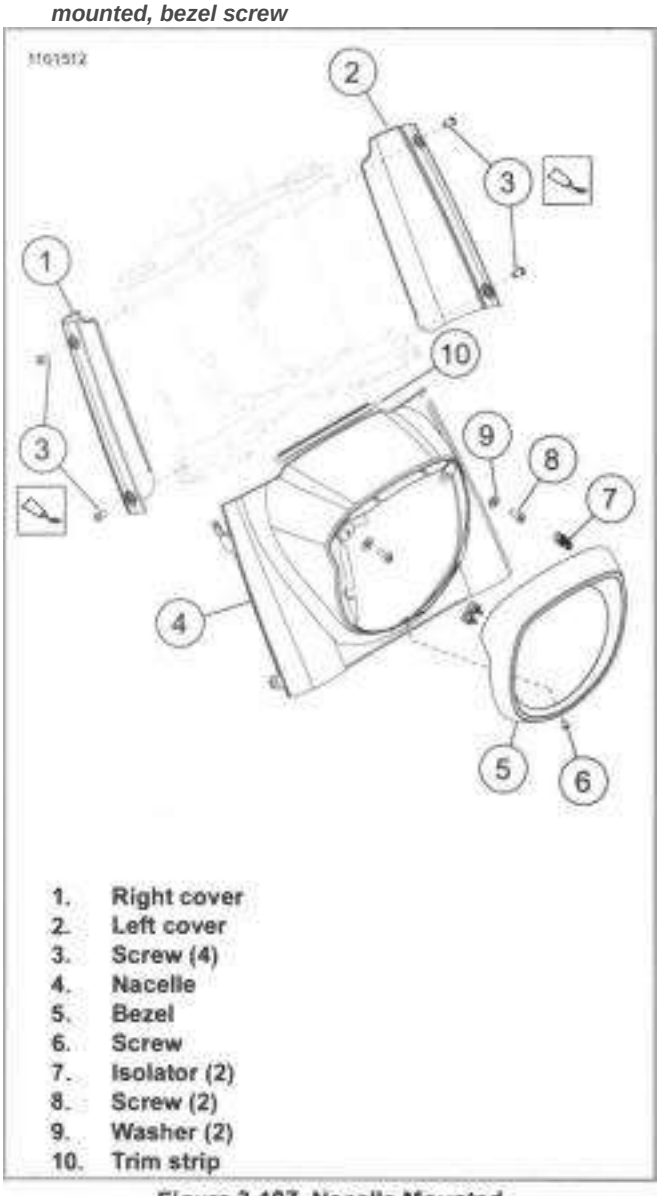
6. Install washers (9) and screws (8). Tighten.

   Torque: 85--104 in-lbs (9.6-11.7 N-m) ***Headlamp nacelle mounted, rear panel bracket screw***

7. Install bezel (5). Insert gasket behind lip of bezel.

8. Install screw (6). Tighten.

   Torque: 25-32 in-lbs (2.8-3.6 N-m) ***Headlamp, nacelle mounted, bezel screw***



1. Right cover
2. Left cover
3. Screw (4)
4. Nacelle
5. Bezel
6. Screw
7. Isolator (2)
8. Screw (2)
9. Washer (2)
10. Trim strip

Figure 3-107. Nacelle Mounted

COMPLETE

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

REMOVE AND INSTALL: SCREW-ON

APPLICABILITY		
^ • 2022 LOW RIDERS (FXLRS)		
FASTENER	TORQUE VALUE	
Fairing, screw-on, innerfairing screws	35-62 in-lbs	4-7 N-m
Fairing, screw-on, lower bracket screws	97-120 in-lbs	11-13.6 N-m
Fairing, screw-on, screws	20-30 in-lbs	2.3-3.4 N-m
Fairing, screw-on, upper bracket screws	35-62 in-lbs	4-7 N-m

Fairing

Remove

1. See Figure 3-108. Remove fairing.
   a. Remove screws and washers (8).
   b. Pull fairing (3) away from upper bracket (7).
   c. Pull speed screen away from lower bracket (5) to remove posts from grommets.

Install

1. Install fairing.
   a. Align studs on fairing (3) to grommets in lower bracket (5).
   b. Press fairing firmly until seated.
   c. Align fairing (3) with inner fairing (2).
   d. Install screws and washers (8). Tighten.
      Torque: 20-30 in-lbs (2.3-3.4 N-m) ***Fairing, screw-on, screws***

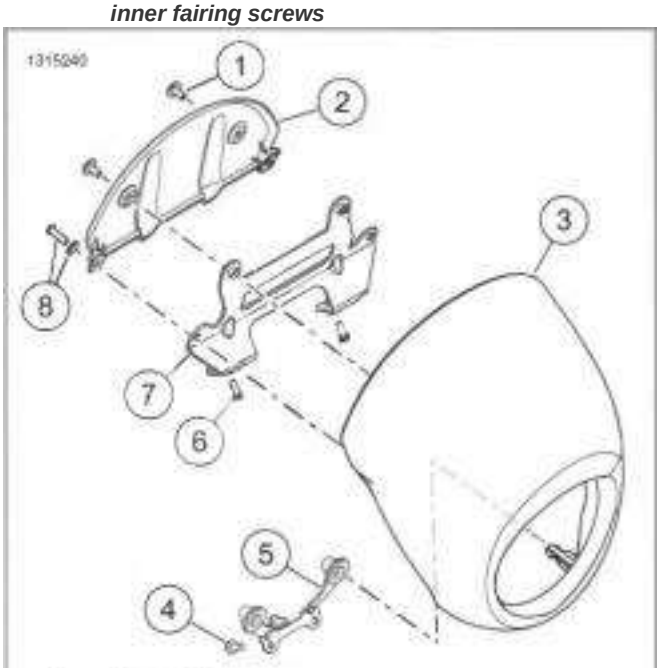
Brackets

Remove

1. See Figure 3-108. Remove inner fairing.
   a. Remove screws (1).
   b. Remove inner fairing (2).
2. Remove upper bracket.
   a. Remove screws (6).
   b. Remove upper bracket (7).
3. Remove lower bracket.
   b. Remove lower bracket (5).

Install

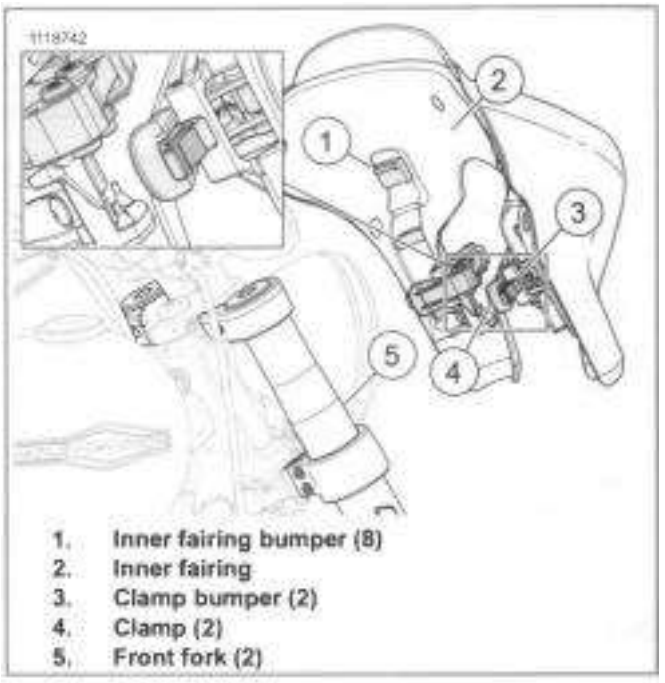
1. Install lower bracket.
   a. Install lower bracket (5).
   b. Install screws (4). Tighten.
      Torque: 97-120 in-lbs (11-13.6 N-m) ***Fairing, screw-on, lower bracket screws***
2. Install upper bracket.
   a. Install upper bracket (7).
   b. Install screws (6). Tighten.
      Torque: 35-62 in-lbs (4-7 N-m) ***Fairing, screw-on, upper bracket screws***
3. Install inner fairing.
   a. Install inner fairing (2).
   b. Install screws (1). Tighten.
      Torque: 35-62 in-lbs (4-7 N-m) ***Fairing, screw-on, inner fairing screws***



1. Screw (2)
2. Inner fairing
3. Fairing
4. Screw (2)
5. Lower bracket
6. Screw with washer (2) (short)
7. Upper bracket
8. Screw and washer (2) (long)

Figure 3-108. FXLRS Fairing

a. Remove screws (4).



1. Inner fairing bumper (8)
2. Inner fairing
3. Clamp bumper (2)
4. Clamp (2)
5. Front fork (2)

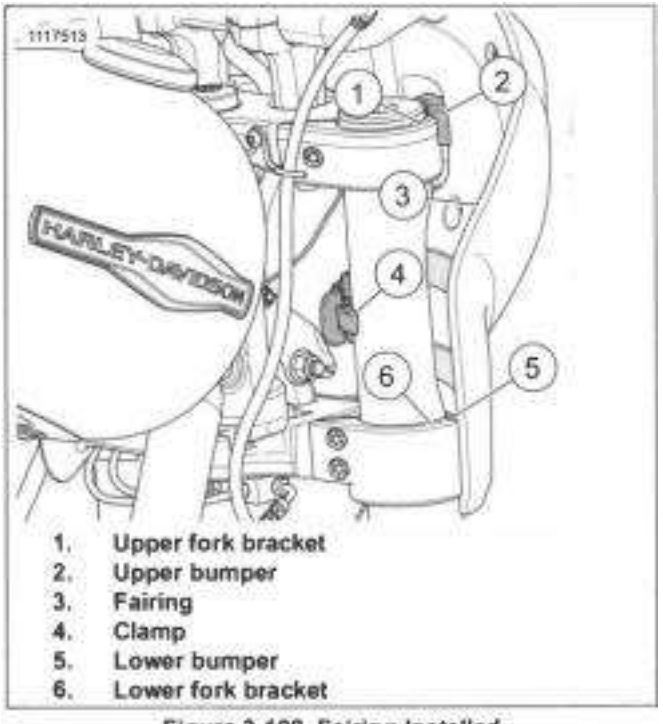
Figure 3-110. Fairing Clamps

fork bracket (1).

e. Verify lower bumper (5) is seated on lower fork bracket (6).

f. Lock clamps.

g. Verify the upper bumpers and lower bumpers are properly seated and fairing is secure.



1. Upper fork bracket
2. Upper bumper
3. Fairing
4. Clamp
5. Lower bumper
6. Lower fork bracket

Figure 3-109. Fairing Installed

APPLICABILITY	
0	• 2022 SPORT GLIDE (FLSB)

FASTENER	TORQUE VALUE	
Fairing windshield screw	32-40 in-lbs	3.6-4.5 N-m
Fairing, inner screw	32-40 in-lbs	3.6-4.5 N-m

a. Remove fairing.

b. Remove screws (7).

c. Separate inner fairing (1) from outer fairing (3).

d. Remove clips (2) if needed.

2. Remove clamps.

a. Remove pins (4).

b. Remove clamps (6).

3. See Figure 3-111. Remove windshield.

a. Loosen screws (3).

NOTE

Do not remove screws.

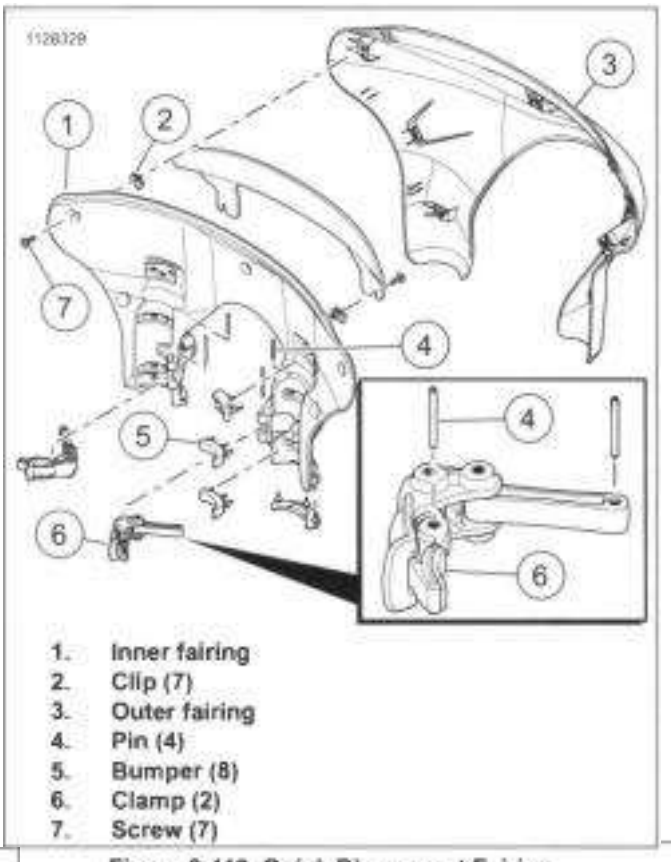
b. Lift windshield (2) from inner fairing (1).

Disassemble

1. See Figure 3-112. Remove inner fairing.

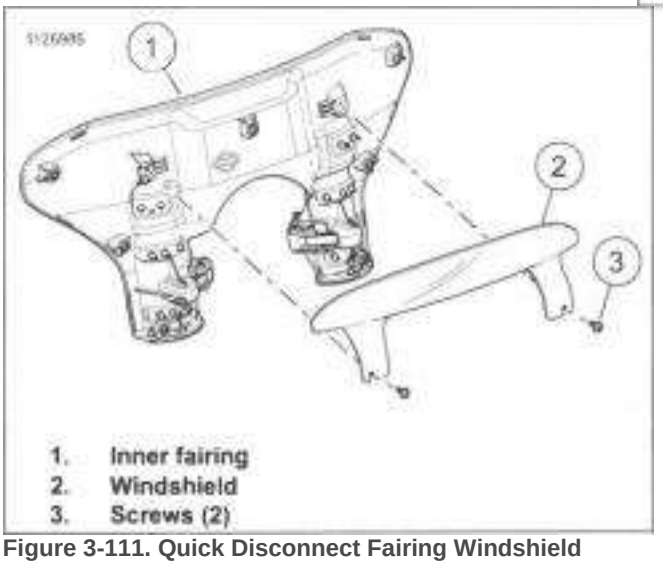
Assemble

1. See Figure 3-111. Install windshield.
   a. Slide windshield (2) onto screws (3).
   b. Verify the windshield is properly seated. Tighten.
      Torque: 32-40 **in-lbs** (3.6-4.5 N-m) ***Fairing windshield screw***
2. See Figure 3-112. Install clamps.
   a. Place clamps (6) in position on inner fairing (1).
   b. Install pins (4) through holes on inner fairing and through clamps until flush.
   c. Verify operation of clamps.
3. Install inner fairing.
   a. Place inner fairing (1) and outer fairing (3) together.
   b. Install screws (7).
   c. See Figure 3-113. Tighten screws in sequence shown.
      Torque: 32-40 **in-lbs** (3.6-4.5 N-m) ***Fairing, inner screw***



1. Inner fairing
2. Clip (7)
3. Outer fairing
4. Pin (4)
5. Bumper (8)
6. Clamp (2)
7. Screw (7)

Figure 3-112. Quick Disconnect Fairing



1. Inner fairing
2. Windshield
3. Screws (2)

Figure 3-111. Quick Disconnect Fairing Windshield

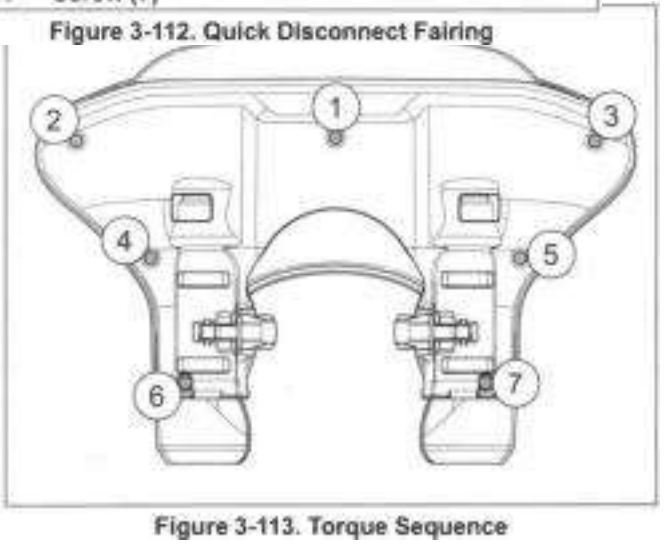


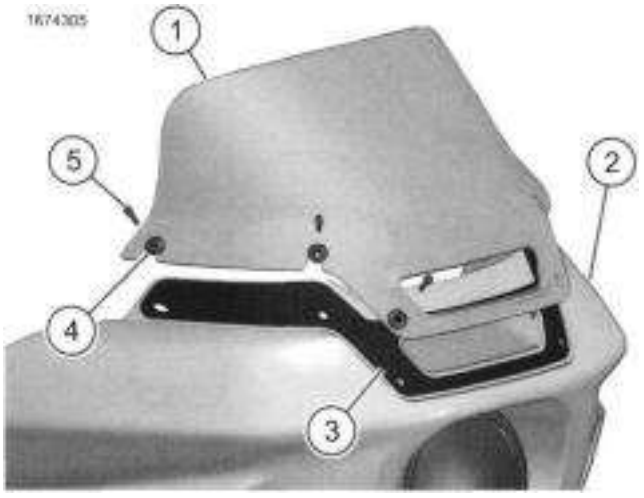
Figure 3-113. Torque Sequence

REMOVE AND INSTALL: WINDSHIELD

FASTENER	TORQUE VALUE	
Windshield, frame mounted fairing, screws	5-7 in-lbs	0.6-0.8 N-m

Remove

1. See Figure 3-114. Remove screws (5).
2. Remove windshield (1).



Install

1. See Figure 3-114. Verify windshield seal (3) is in place on fairing (2) and not damaged. Replace if damaged.
2. Verify bushings (4) are not damaged. Replace if damaged.
3. Install bushings in windshield (1).

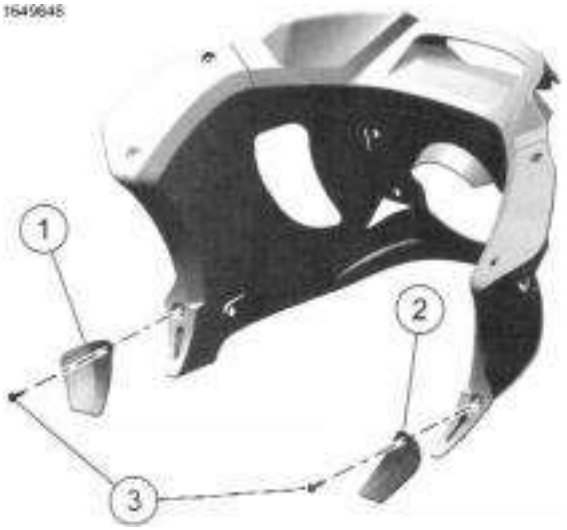
FASTENER	TORQUE VALUE	
Fairing, frame mounted, air deflector screws	25-30 in-lbs	2.8-3.4 N-m

4. Position windshield on fairing.
5. Install screws (5). Tighten.
   Torque: 5-7 in-lbs (0.6-0.8 N-m) ***Windshield, frame mounted fairing, screws***

1. Windshield
2. Fairing
3. Windshield seal
4. Bushing (6)
5. Screw (6)

Figure 3-114. Windshield

REMOVE AND INSTALL: AIR DEFLECTOR



Remove

1. See Figure 3-115. Remove screws (3).
2. Remove deflectors (1,2).

1. Left air deflector
2. Right air deflector
3. Screw (2)

Figure 3-115. Air Deflector

REMOVE AND INSTALL: OUTER FAIRING SHELL

FASTENER	TORQUE VALUE	
Fairing, frame mounted, air deflector screws	25-30 in-lbs	2.8-3.4 N-m
Fairing, frame mounted, outer fairing screws	25-30 in-lbs	2.8-3.4 N-m

Install

1. See Figure 3-115. Position air deflectors (1, 2) at side of inner fairing.

2. Install screws (3). Tighten.

   Torque: 25-30 in-lbs (2.8-3.4 N-m) ***Fairing, frame mounted, air deflector screws***

Prepare

1. Remove windshield. See Remove and Install: Windshield (Page 3-102).

2. Remove air deflectors. See Remove and Install: Air Deflector (Page 3-102).

Remove

1. See Figure 3-116. Remove outer fairing.

   a. Support outer fairing (3) from front.

   b. Remove screws (2).

   c. Disconnect head lamp connector.

   d. Remove outer fairing.

Install

1. Install outer fairing.

    a. Connect headlamp connector.

    b. See Figure 3-116. Position outer fairing (3) on inner fairing (1).

    c. Install screws (2). Do not tighten.

    d. Install air deflectors and screws (3). Do not tighten. See Remove and Install: Air Deflector (Page 3-102).

    e. See Figure 3-116. Tighten outer fairing screws (2).

    Torque: 25-30 in-lbs (2.8-3.4 N-m) ***Fairing, frame mounted, outer fairing screws***

    f. See Remove and Install: Air Deflector (Page 3-102). Tighten air deflector screws.

    Torque: 25-30 in-lbs (2.8-3.4 N-m) ***Fairing, frame mounted, air deflector screws***

Complete

1. Install windshield. See Refer to Remove and Install: Windshield (Page 3-102).

2. Verify headlamp operation.

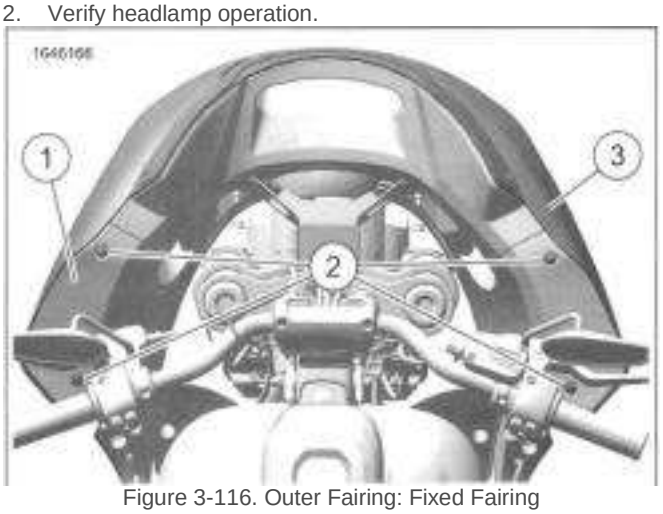


Figure 3-116. Outer Fairing: Fixed Fairing

REMOVE AND INSTALL: INNER FAIRING SHELL

1. Inner fairing
2. Screws (4)
3. Outer fairing

FASTENER	TORQUE VALUE	
Fairing, frame mounted, inner fairing screws	96-144 in-lbs	10.8-16.3 N-m
Fairing, frame mounted, lower mount screws	16-20 ft-lbs	21.7-27.1 N-m
Fairing, frame mounted, lower support screws	48-60 in-lbs	5.4-6.8 N-m

Prepare

1. Remove outer fairing. Remove and Install: Outer Fairing Shell (Page 3-102).

Remove

1. See Figure 3-117. Release connector retainer (3).

2. Disconnect fairing harness connector (1).

3. Disconnect turn signal connectors (4).

4. Remove screws (7) and washers (6).

5. Remove screws (2).

6. Remove inner fairing (8).

Install

1. See Figure 3-117. Loosen lower fairing mounting bracket screws (5).

NOTE

Loosening these screws ***will aid in lining up and starting other screws.***

2. Position inner fairing (8), install screws (2). Tighten.

    Torque: 96-144 in-lbs (10.8-16.3 N-m) ***Fairing, frame mounted, inner fairing*** screws

3. Install screws (7) and washers (6). Tighten.

    Torque: 48-60 in-lbs (5.4-6.8 N-m) ***Fairing, frame mounted, lower support screws***

4. Connect fairing harness connector (1) to main harness.

5. Install retainer (3).

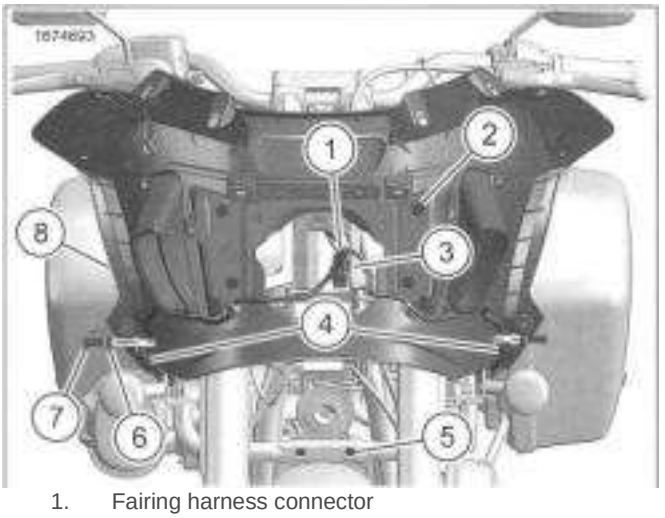
6. Connect turn signals (4).

7. Tighten lower fairing mounting bracket screws (5).

    Torque: 16-20 ft-lbs (21.7-27.1 N-m) ***Fairing, frame mounted, lower mount screws***

Complete

1. Install outer fairing. See Refer to Remove and Install: Outer Fairing Shell (Page 3-102)..



1. Fairing harness connector
2. Screw (4)
3. Retainer
4. Turn signal connector (2)
5. Screw (2)
6. Washer (2)
7. Screw (2)
8. Inner fairing

Figure 3-117. Inner Fairing

FASTENER	TORQUE VALUE	
Fairing, frame mounted, air duct screws	4.5-5.5 in-lbs	0.51-0.62 N-m
Fairing, frame mounted, bracket screws	48-60 in-lbs	5.4-6.8 N-m

DISASSEMBLE AND ASSEMBLE: INNER FAIRING SHELL

Disassemble

1. Remove upper air deflector.
   a. See Figure 3-118. Release two outer clips (9).
   b. Pull air deflector (1) straight back to release inner clips.
   c. Remove upper air deflector.
2. Release harness retainers (7) from inner fairing (8). Remove harness.
3. Remove screws (3) and air ducts (4).
4. Remove screws (6) and fairing bracket (10).

Assemble

1. Position fairing bracket (10), Install screws (6). Tighten.
   Torque: 48-60 in-lbs (5.4-6.8 N-m) ***Fairing, frame mounted, bracket screws***
2. See Figure 3-118. Inspect and verify fairing clips (2) are installed on inner fairing (8). Replace as needed.
3. Position air ducts (4), install screws (3). Tighten.
   Torque: 4.5-5.5 in-lbs (0.51-0.62 N-m) ***Fairing, frame mounted, air duct screws***
4. Position fairing harness (5). Install harness retainers (7).
5. Verify upper air deflector clips (9) are installed on upper fairing tabs. Replace as needed.
6. Install upper air deflector. Verify clips are fully seated.

1. Air deflector upper
2. Clips (6)
3. Screws (6)
4. Air duct (2)
5. Fairing harness
6. Screws (4)
7. Harness retainers (6)
8. Inner fairing
9. Clips (4)
10. Fairing bracket

Figure 3-118. Air Ducts

REMOVE AND INSTALL: FAIRING SUPPORTS

Prepare

FASTENER	TORQUE VALUE	
Fairing, frame mounted, inner fairing screws	96-144 in-lbs	10.8-16.3 N-m
Fairing, frame mounted, fairing mount to steering head locknut	20-27 ft-lbs	27-37 N-m
Fairing, frame mounted, lower mount screws	16-20 ft-lbs	21.7-27.1 N-m
Fairing, frame mounted, mount screws upper	71-84 in-lbs	8-9.5 N-m

1. Remove outer fairing. See Remove and Install: Outer Fairing Shell (Page 3-102)
2. If removing upper mounting bracket, remove inner fairing assembly. See Remove and Install: Inner Fairing Shell (Page 3-103).

Remove

1. Remove fairing mounting bracket, upper.
   a. See Figure 3-119. Remove locknut (2) and screw (1).
   b. Remove screws (4).

c. Remove fairing mounting bracket (3).

2. Remove fairing mounting bracket, lower.

a. See Figure 3-120. Disconnect front turn signal connectors (3).

b. Remove screws (1) and washers (2).

c. Remove screws (4).

d. Remove fairing mounting bracket (5).

Install

1. Install fairing mounting bracket, lower.

a. See Figure 3-120. Position fairing mounting bracket (5).

b. Install screws (1) and washers (2). Do not tighten.

c. Connect front turn signal connectors (3).

d. Install screws (4). Tighten.

Torque: 16-20 ft-lbs (21.7-27.1 N-m) *Fairing, frame mounted, lower mount screws*

e. Tighten screws (1).

Torque: 96-144 **in-lbs** (10.8-16.3 N-m) *Fairing, frame mounted, inner fairing screws*

2. See Figure 3-119. Install fairing mounting bracket, upper.

a. Install fairing mounting bracket (3).

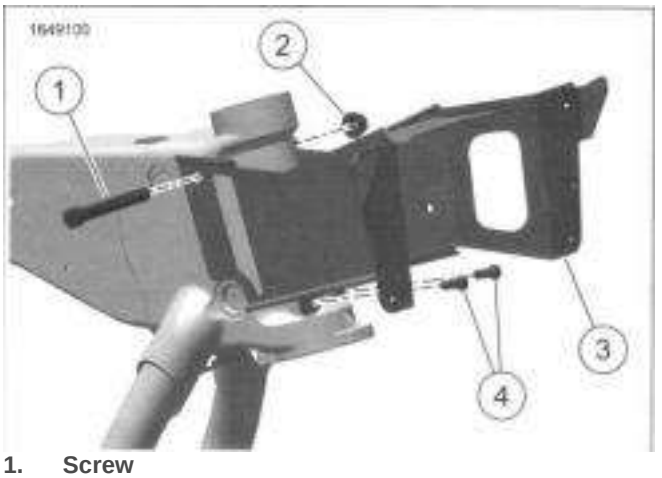
b. Install screw (1) and locknut (2). Do not tighten.

c. Install screws (4). Tighten.

Torque: 71-84 **in-lbs** (8-9.5 N-m) *Fairing, frame mounted, mount screws upper*

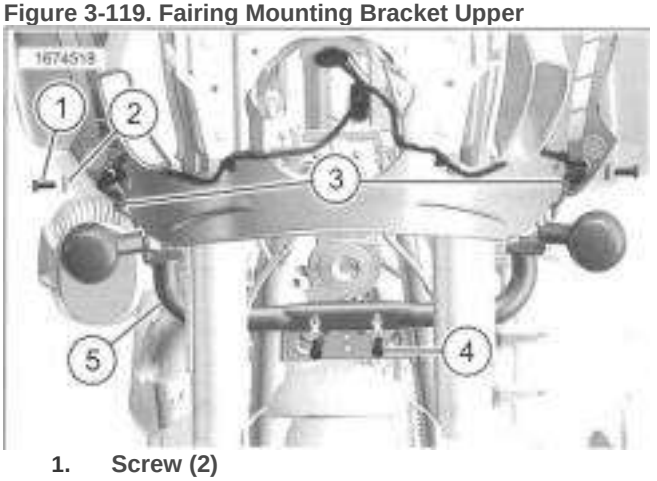
d. Tighten screw (1).

Torque: 20-27 ft-lbs (27-37 N-m) *Fairing, frame mounted, fairing mount to steering head locknut*



1. **Screw**
2. **Flange locknut**
3. **Fairing mounting bracket**
4. **Screw (2)**

Figure 3-119. Fairing Mounting Bracket Upper



1. **Screw (2)**
2. **Washer (2)**
3. **Turn signal connector (2)**
4. **Screw (2)**
5. **Fairing mounting bracket lower**

Figure 3-120. Fairing Mounting Bracket Lower

Complete

1. Install inner fairing assembly. See Remove and Install: Inner Fairing Shell (Page 3-103).

• 2022 HERITAGE CLASSIC 114 (FLHCS)

REMOVE.

1. See Figure 3-121. Remove windshield.

NOTE
For fairing mounted windshield, see FAIRING: FRAME MOUNTED (Page 3-102).

a. Grab windshield at either side of horizontal bracket (2).

b. Pull windshield so that upper notches (1) separate from grommets.

c. Raise windshield until lower notches (5) separate from grommets.

d. Remove windshield.

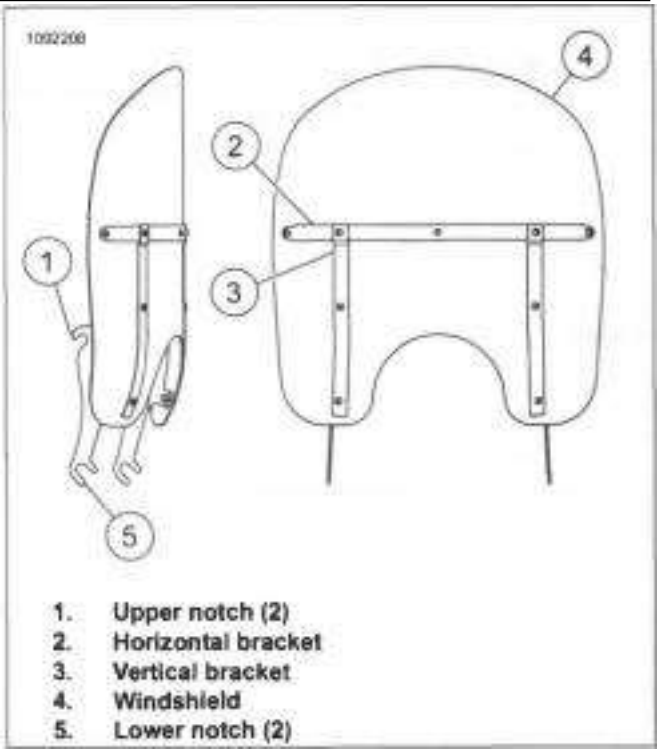
INSTALL

1. See Figure 3-121. Install windshield.

NOTE
For fairing mounted windshield, see FAIRING: FRAME MOUNTED (Page 3-102)

a. Place upper and lower notches (1,5) on upper and lower grommets.

b. Push evenly on horizontal bracket (2) until notches are fully seated on grommets.



1. Upper notch (2)
2. Horizontal bracket
3. Vertical bracket
4. Windshield
5. Lower notch (2)

Figure 3-121. Windshield

DISASSEMBLE

1. See Figure 3-122. Disassemble windshield brackets.

a. Place windshield on a clean padded surface.

b. Remove acorn nuts (2) and discard screws (6, 7) from each vertical bracket (8).

c. Remove and discard remaining screws from horizontal bracket (5).

ASSEMBLE

FASTENER	TORQUE VALUE	
Windshield acorn nuts	23-27 In-lbs	2.6-3 N-m

1. See Figure 3-122. Install horizontal bracket.

a. Position inner horizontal bracket (3) and outer horizontal bracket (5) on windshield (4).

b. Loosely install three new short screws (6) and acorn nuts (2).

2. Install vertical bracket.

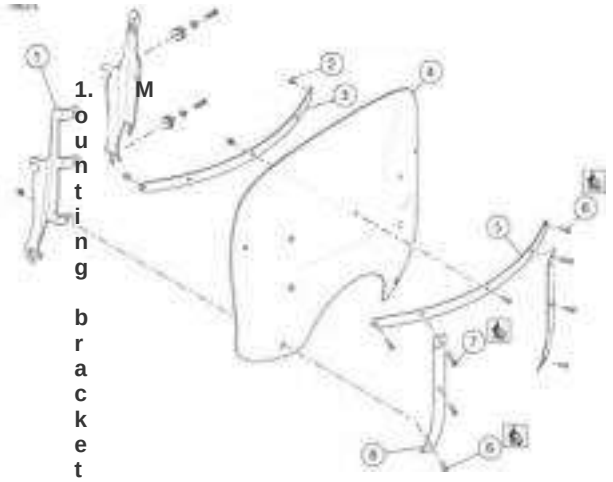
a. Position mounting brackets (1) and vertical brackets (8) on windshield.

b. Loosely install new long screws (7) and new short screws (6) through vertical brackets, windshield and mounting brackets.

c. loosely install acorn nuts.

d. Tighten all nuts.

Torque: 23-27 in-lbs (2.6-3 N-m) *Windshield acorn nuts*



1. Mounting bracket (2)
2. Acorn nut (9)
3. Inner horizontal bracket
4. Windshield
5. Outer horizontal bracket
6. Short Screw (7)
7. Long screw (2)
8. Vertical bracket

Figure 3-122. Windshield Assembly

REMOVE

Left

1. Remove LHCM. See LEFT HAND CONTROL MODULE (LHCM) (Page 7-16).
2. Remove left hand grip.
   a. Cut hand grip open with a sharp knife.
   b. Peel hand grip open.
   c. Remove from handlebar.

Right

1. Remove RHCM. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).
2. Remove right hand grip.

INSTALL

CONSUMABLE	PART NUMBER
HARLEY-DAVIDSON ADHESIVE (GRIPLOCK)	99839-95
LOCTITE 770 PRISM PRIMER	Loctite 770

Left

1. Install left hand grip.

NOTE

Adhesive sets in 4 minutes and cures in 24 hours.

   a. Prepare the left grip end of the handlebar with emery cloth.
   b. Clean the left grip end of the handlebar with acetone.
   c. Apply primer to the inside of the new hand grip.

      LOCTITE 770 PRISM PRIMER (Loctite 770)

   d. Remove excess primer. Wait 2 minutes for the primer to set.
   e. Apply adhesive to the inside of the new hand grip.

      HARLEY-DAVIDSON ADHESIVE (GRIPLOCK) (99839-95)

   f. Install the new hand grip with a twisting motion, ending with cosmetic features properly positioned.

2. Install LHCM. See LEFT HAND CONTROL MODULE (LHCM) (Page 7-16).

Right

1. Install hand grip with cosmetic features properly positioned.
   a. Rotate to verify that internal splines are engaged with the twist grip sensor.
2. Install RHCM. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20)

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. All but FXLRST: Remove windshield, if equipped. See WINDSHIELD (Page 3-106).
3. All but FXLRST: Remove fairing, if equipped. See FAIRING (Page 3-99).
4. Remove front brake master cylinder. See FRONT BRAKE MASTER CYLINDER (Page 3-35).
5. Disconnect RHCM, TGS, and LHCM from front electrical caddy. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).
6. Remove clutch hand control from handlebar. See CLUTCH CONTROL (Page 3-91).

REMOVE AND INSTALL: STANDARD

FASTENER	TORQUE VALUE	
Riser flange nuts	30-40 ft-lbs	40.7-54.3 N-m

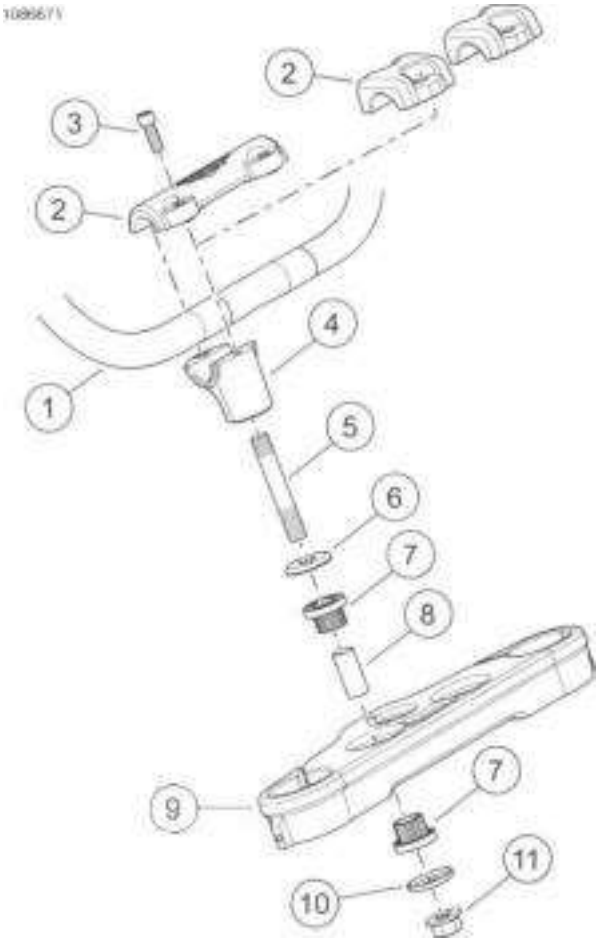
Remove

1. See Figure 3-123 or Figure 3-124. Remove handlebar assembly.
   a. Remove flange nuts (11) and lower cup washers (10).
   b. FXBBS, FXST, FXBRS, FXLRS, FXLRST Disconnect IM. See INSTRUMENT MODULE (IM) (Page 7-24).
   c. Remove handlebar (1) and attached components as an assembly.

Install

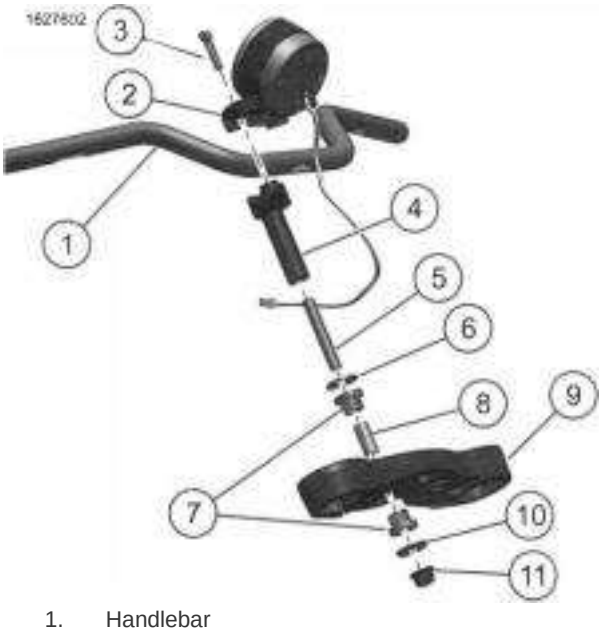
1. See Figure 3-123 or Figure 3-124. Install handlebar assembly.
   a. Place upper cup washers (6) on top of bushings (7).
   b. Install studs (5) through upper cup washers (6), bushings (7), spacers (8), and upper fork bracket (9).
   c. Install lower cup washers (10) and flange nuts (11). Tighten flange nuts.

      Torque: 30-40 ft-lbs (40.7-54.3 N-m) ***Riser flange nuts***
   d. FXBBS, FXST, FXBRS, FXLRS, FXLRST Connect IM. See INSTRUMENT MODULE (IM) (Page 7-24).



1. Handlebar
2. Handlebar clamp
3. Handlebar clamp fastener (4)
4. Riser (2)
5. Stud (2)
6. Upper cup washer (2)
7. Bushing (4)
8. Spacer (2)
9. Upper fork bracket (typical)
10. Lower cup washer (2)
11. Flange nut (2)

Figure 3-123. Handlebar Mounting (Typical)



1. Handlebar
2. Handlebar clamp
3. Handlebar clamp fastener (4)
4. Riser (2)
5. Stud (2)
6. Upper cup washer (2)
7. Bushing (4)
8. Spacer (2)
9. Upper fork bracket
10. Lower cup washer (2)
11. Flange nut (2)

Figure 3-124. Handlebar, Speedometer Mount

DISASSEMBLE AND ASSEMBLE: STANDARD

FASTENER	TORQUE VALUE	
Handlebar clamp gap limiting fasteners	12-16 ft-lbs	16.3-21.7 N-m
Handlebar clamp open gap fasteners	12-16 ft-lbs	16.3-21.7 N-m
Riser flange nuts	30-40 ft-lbs	40.7-54.3 N-m

Disassemble

1. Remove RHCM. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).

2. Remove TGS. See TWIST GRIP SENSOR (TGS) (Page 6-24).

3. Remove LHCM. See LEFT HAND CONTROL MODULE (LHCM) (Page 7-16).

4. Remove left hand grip, if necessary.

5. FXBRS, FXFBS, FLFBS, FLSB, FXLRS, FXLRST Remove weight inside left handlebar, if necessary.

6. See Figure 3-123 or Figure 3-124. Disassemble handlebar assembly.

   a. Remove handlebar clamp fasteners (3) to separate handlebar (1), handlebar clamp (2), and risers (4).

   b. Remove studs (5) from riser, if necessary.

   c. Remove spacers (8) and bushings (7), if necessary.

Assemble

1. See Figure 3-123 or Figure 3-124. Assemble handlebar assembly.

   a. Install bushings (7) and spacers (8), if removed.

   b. Thread short end of studs (5) into risers (4) until bottomed, if removed.

   c. Install upper cup washer (6) on top of left and right bushings (7).

   d. Insert studs in bushings and install lower cup washer (10) and flange nut (11) loosely.

   e. Center handlebar (1) in risers.

   f. Place handlebars in normal riding position and hold.

   g. Attach handlebar clamp (2) with handlebar clamp fasteners (4).

NOTE

Tighten handlebar clamp fasteners just enough to maintain handlebar position.

   h. Tighten gap limiting fasteners.

   Torque: 12-16 ft-lbs (16.3-21.7 N-m) ***Handlebar clamp gap limiting fasteners NOTE***

Handlebar clamps are manufactured with pads on one half of top clamp that should be touching the riser when assembled. Fasteners (gap limiting fasteners) closest to the pads need to be tightened first.

   i. Tighten open gap fasteners. Verify that there is a gap between upper and lower clamps at opposite gap limiting fasteners.

   Torque: 12-16 ft-lbs (16.3-21.7 N-m) ***Handlebar clamp open gap fasteners***

   j. Tighten flange nuts (11).

   Torque: 30-40 ft-lbs (40.7-54.3 N-m) ***Riser flange nuts***

2. FXBBS, FXST, FXBRS, FXLRS, FXLRST Connect IM. See INSTRUMENT MODULE (IM) (Page 7-24).

3. FXBRS, FXFBS, FLFBS, FLSB, FXLRS, FXLRST Install weight inside left handlebar, if necessary.

4. Install left hand grip, if necessary. See HAND GRIPS (Page 3-108).

5. Install LHCM. See LEFT HAND CONTROL MODULE (LHCM) (Page 7-16).

6. Install clutch control. See CLUTCH CONTROL (Page 3-91).

7. Install TGS. See TWIST GRIP SENSOR (TGS) (Page 6-24).

8. Install RHCM. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).

COMPLETE

1. Connect clutch hand control to handlebar. See CLUTCH CONTROL (Page 3-91).

2. Connect RHCM, TGS, and LHCM tofront electrical caddy. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).
3. Install front brake master cylinder. See FRONT BRAKE MASTER CYLINDER (Page 3-35).

4. **All but FXLRST:** Install fairing, if equipped. See FAIRING (Page 3-99).

5. **All but FXLRST:** Install windshield, if equipped. See WINDSHIELD (Page 3-106).

6. Install main fuse. See POWER DISCONNECT (Page 7-7).

Remove

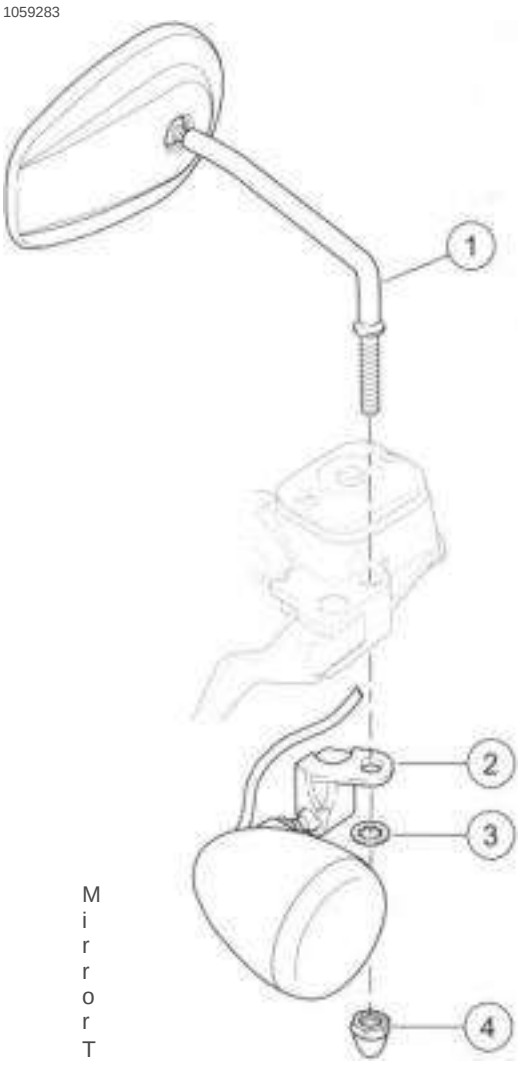
1. See Figure 3-125. Support turn signal assembly (2), if equipped.
2. Remove nut (4) and washer (3).
3. Remove mirror (1).

INSTALL

FASTENER	TORQUE VALUE	
Mirror mounting nut	96-144 in-lbs	10.8-16.3 N-m

REMOVE
Install

1. See Figure 3-125. Insert threaded stem of mirror into hole in clutch or brake lever bracket.
2. Install turn signal (2), if equipped.
3. Install washer (3) and nut (4).
4. Adjust mirror as necessary and tighten nut.



Torque: 96-144 in-lbs (10.8-16.3 N-m) ***Mirror mounting nut***

Mirror
Turn signal assembly, if equipped
Lock washer
Nut

Figure 3-125. Mirror Mount (Typical)

REMOVE

1. See Figure 3-126. Remove front fender.

   a. Remove screws (3,5,7, 12) and nuts (8), depending on model.

   b. Remove fender (2,4,6,11), depending on model.

   c. Inverted fork: Fender (2) assembly, remove screws (1) and nuts (9). Separate from bracket (10).

FASTENER	TORQUE VALUE	
Front fender mounting screw (typical)	16-21 ft-lbs	22-28 N-m
Front fender mounting screw, FXBBS/FXST	16-21 ft-lbs	22-28 N-m
Front fender mounting screw, FXFBS	72-96 in-lbs	8.1-10.8 N-m
Front fender mounting screw, FXLRS/FXLRST	72-96 in-lbs	8.1-10.8 N-m
Front fender to bracket screw, FXFBS	36--48 in-lbs	4.1-5.4 N-m

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

INSTALL

Inverted Fork

1. See Figure 3-126. Install front fender.

   a. Align fender (2) with bracket (10).

   b. Apply threadlock to screws (1).

   LOCTITE 243 MEDIUM STRENGTH

   THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install screws and nuts (9), if equipped. Tighten.

   Torque: 36-48 in-lbs (4.1-5.4 N-m) ***Front fender to bracket*** screw, ***FXFBS***

   d. Align fender assembly with mounting holes on front fork.

   e. Apply threadlock to screws (3).

   LOCTITE 243 MEDIUM STRENGTH

   THREADLOCKER AND SEALANT (BLUE) (99642-97)

   f. Install screws. Tighten.

   Torque: 72-96 in-lbs (8.1-10.8 N-m) ***Front fender mounting*** screw; ***FXFBS***

FXBBS, FXST

1. See Figure 3-126. Install front fender.

NOTE

Verify that the mounting brackets are resting against the machined bosses ***of the forks before tightening.***

   a. Align fender (6) mounting brackets to the machined bosses on the front forks.

   b. Apply threadlock to screws (7).

   LOCTITE 243 MEDIUM STRENGTH

   THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install Screws and nuts (8). Tighten.

   Torque: 16-21 ft-lbs (22-28 N-m) ***Front fender mounting*** screw; ***FXBBS/FXST***

FXLRS,FXLRST

1. See Figure 3-126. Install front fender.

NOTE

Verify that the mounting brackets are resting against the machined bosses ***of the forks before tightening.***

   a. Align fender (11) mounting brackets to the machined bosses on the front forks.

   b. Apply threadlock to screws (12).

   LOCTITE 243 MEDIUM STRENGTH

   THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install screws. Tighten.

   Torque: 72-96 in-lbs (8.1-10.8 N-m) ***Front fender mounting*** screw; ***FXLRS/FXLRST***

Standard Fork (Typical)

1. See Figure 3-126. Install front fender.

   a. Align fender (4) to the mounting holes on fork.

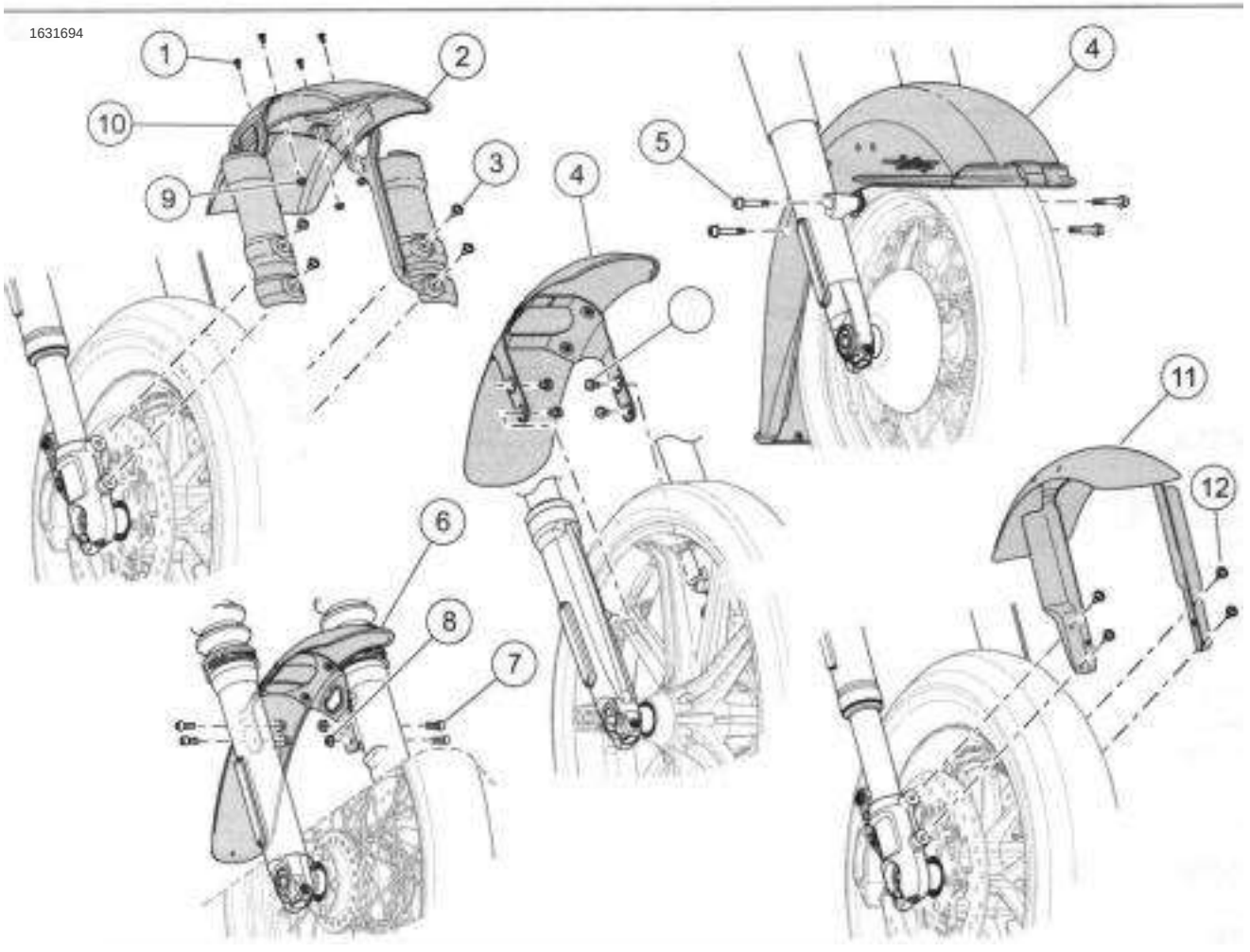
   b. Apply threadlock to screws (5).

   LOCTITE 243 MEDIUM STRENGTH

   THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install Screws. Tighten.

   Torque: 16-21 ft-lbs (22-28 N-m) ***Front fender mounting*** screw ***(typical)***



1. Screw (4)
2. Fender, FXFBS
3. Screw (4)
4. Fender (typical)
5. Screw (4)
6. Fender, FXBBS, FXST
7. Screw (4)
8. Nut (4)
9. Nut (4)
10. Bracket
11. Fender, FXLRS, FXLRST
12. Screw (4)

Figure 3-126. Front Fenders

DISASSEMBLE _____ _____ b, Remove trim (1),

Full Fender

1. See Figure 3-127. Remove side trim.
   a. Remove nuts (5).
   b. Remove trim (6).
   c. Remove tee bolts (7) from trim.
2. Remove fender tip.
   a. Remove nuts (4).
   b. Remove tip (3).
3. Remove medallions (9). See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).
4. See Figure 3-127. Remove skirt trim.

ASSEMBLE

FASTENER	TORQUE VALUE	
Front fender side trim nut	10-15 in-lbs	1.1-1.7 N-m

1. See Figure 3-127. Install skirt trim.
   a. Position skirt trim (1) on fender (2).
   b. Install nuts (8).

2. Install medallions.
   a. Clean mounting surface. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).
   b. Remove adhesive backing from medallion (9).
   c. Install medallion pressing firmly to make sure there is good adhesion.

a. Remove nuts (8).

3. Install fender tip.
   a. Position fender tip (3) on fender (2).

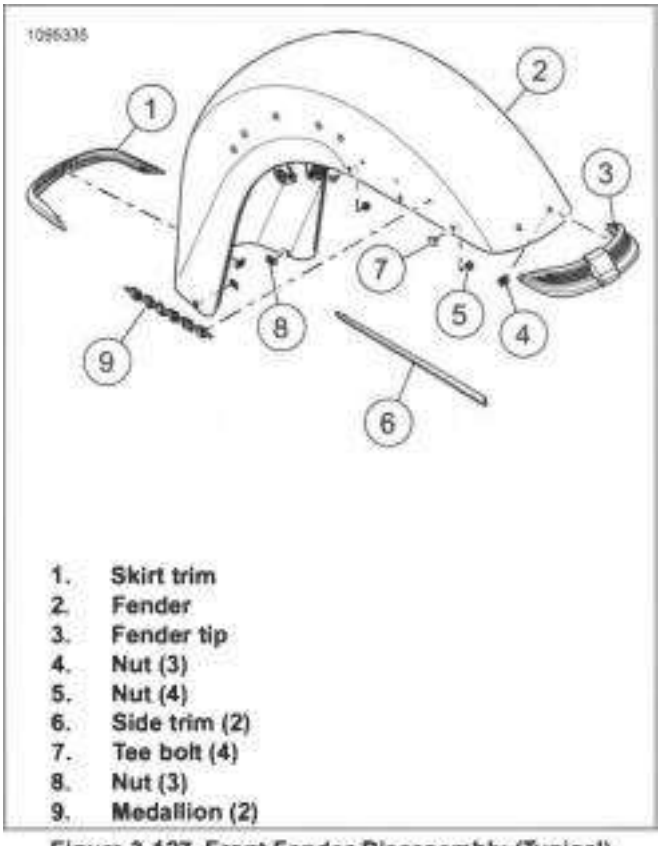
   b. Install nuts (4).

   Install side trim.

4.
   a. Loosely install tee bolt (7) and nut (5) on fender.
   b. Slide side trim (6) on tee bolts.

   c. Hold side trim tight to fender tip (3) and tighten nuts.

      Torque: 10-15 in-lbs (1.1-1.7 N-m) ***Front fender side trim nut***



1. Skirt trim
2. Fender
3. Fender tip
4. Nut (3)
5. Nut (4)
6. Side trim (2)
7. Tee bolt (4)
8. Nut (3)
9. Medallion (2)

Figure 3-127. Front Fender Disassembly (Typical)

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove saddle bags, if equipped. See SADDLEBAGS (Page 3-145).
3. Remove seat. See SEAT (Page 3-142).

REMOVE AND INSTALL: STANDARD

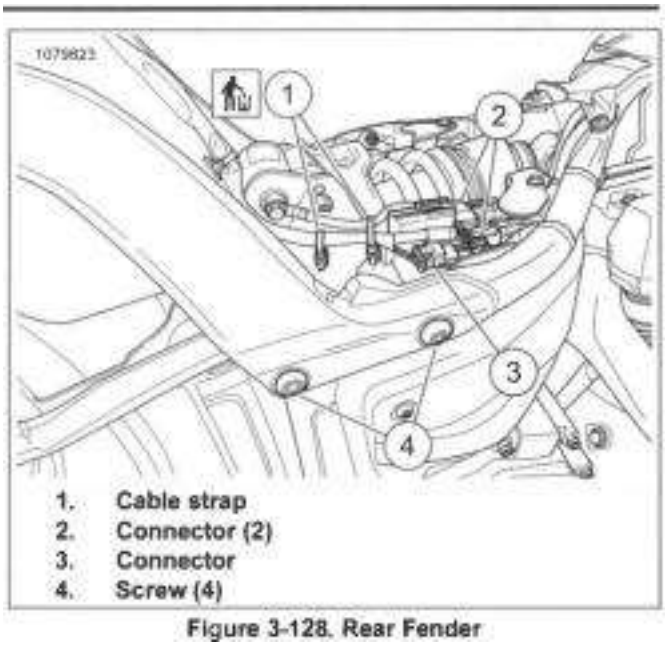
FASTENER	TORQUE VALUE
Rear fender mounting screw	42-46 ft-lbs ! 57-62.5 N-m

Remove

1. See Figure 3-128. Disconnect connectors (2, 3).
2. Discard cable strap(s) (1).
3. Remove fender.
   a. Support rear fender.
   b. Remove fender screws (4) and washers from both sides.
   c. Remove fender.

Install

1. See Figure 3-128. Install rear fender.
   a. Place fender into position.
   b. Install screws (4) and washers. Tighten.
      Torque: 42-46 ft-lbs (57-62.5 N-m) ***Rear fender mounting screw***
2. Connect connectors (2, 3).
3. Install new cable strap(s) (1) into hole(s) on frame and attach cable.



1. Cable strap
2. Connector (2)
3. Connector
4. Screw (4)

Figure 3-128. Rear Fender

DISASSEMBLE AND ASSEMBLE: FULL FENDER

FASTENER	TORQUE VALUE	
Rear fender support screws	21-27 ft-lbs	28.4-37 N-m

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

Disassemble

1. Remove rear fender lighting. See REAR TURN SIGNAL LAMPS (Page 7-52) and TAIL LAMP (Page 7-57).
2. ***NOTE***

Rear fender wire conduit is not reusable.

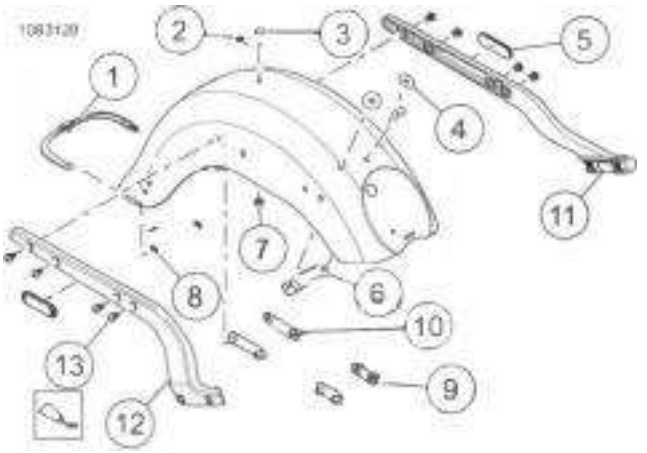
   Remove rear fender wire conduit, if necessary. See REAR FENDER WIRE CONDUIT (Page 3-122).

3. Remove license plate bracket mount. See REAR LICENSE PLATE BRACKET (Page 3-126).
4. See Figure 3-129. Remove fender support.
   a. Remove screws (13).
   b. Remove fender mounts (9,10).
   c. Remove fender supports (11,12).
5. Remove fender tip.
   a. Remove nuts (8).
   b. Remove fender tip (1).

6. Remove seat retention nut.
    a. Hold nut (7).
    b. Remove clip (2).
    c. Remove nut.
    d. If equipped, remove plugs (3).
7. Remove stud plate.
    a. Remove washers (4).
    b. Remove stud plate (6).

Assemble

1. See Figure 3-129. Install stud plate.
    a. Position stud plate (6) on fender.
    b. Install washers (4).
2. Install seat retention nut.
    a. Position nut (7) through fender.
    b. Install clip (2).
    c. If equipped, install plugs (3).
3. Install fender tip.
    a. Position fender tip (1) on fender.
    b. Install nuts (8).
4. Install fender supports.
    a. Align holes on fender supports (11,12) with holes in fender.
    b. Place fender mounts (10) in the holes near rear of fender.
    c. Place fender mounts (9) in the holes near front of fender.
    d. Apply threadlock and Install screws (13). Tighten.
    Torque: 21-27 ft-lbs (28.4-37 N-m) *Rear fender support screws*
    LOCTITE 243 MEDIUM STRENGTH
    THREADLOCKER AND SEALANT (BLUE) (99642-97)
5. Install license plate bracket mount. See REAR LICENSE PLATE BRACKET (Page 3-126).
6. Install rear fender wire conduit. See REAR FENDER WIRE CONDUIT (Page 3-122).
7. Install fender lighting. See REAR TURN SIGNAL LAMPS (Page 7-52) and TAIL LAMP (Page 7-57).



1. Fender tip
2. Clip
3. Plug (2)
4. Washer (2)
5. Reflector (2)
6. Stud plate
7. Nut
8. Nut (3)
9. Fender mount rear (2)
10. Fender mount front (2)
11. Left fender support
12. Right fender support
13. Fender support screw (8)

Figure 3-129. Full Fender

DISASSEMBLE AND ASSEMBLE: CHOPPED FENDER WITHOUT LICENSE PLATE BRACKET LIGHTING

Disassemble

1. Remove taillight, if equipped. See TAIL LAMP (Page 7-57).

FASTENER	TORQUE VALUE	
Rear fender inner mount screw	21-27 ft-lbs	28.4-37 N-m
Rear fender support screw	21-27 ft-lbs	28.4-37 N-m
Rear fender support screws	21-27 ft-lbs	28.4-37 N-m

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

2. Remove license plate bracket. See REAR LICENSE PLATE BRACKET (Page 3-126).
3. See Figure 3-130, Figure 3-131 , Figure 3-132 or Figure 3-133. Remove rear fender support.
    a. Models equipped with inner fender mount screws: Remove screws (13).
    b. Models without saddlebags: Remove screws (11).

c. **Models with saddlebags:** Remove screws (18), bracket (17) and spacer (16).

d. Remove fender mounts (9).

e. Remove fender supports (7,10).

f. Remove license plate support bracket (12), if equipped.

4. Remove turn signals. See REAR TURN SIGNAL LAMPS (Page 7-52).

5. Remove reflector bracket (2) and reflectors (1, 6), if equipped.

a. Saw behind reflectors with mono-filament fishing line or waxed dental floss.

6. *NOTE*

Some fenders will have two seat retention nuts.

Remove seat retention nut.

a. Hold nut (3).

b. Remove clip (4).

7. See Figure 3-132. Remove stud plate, if equipped.

a. Remove washers (15).
b. Remove stud plate (14).

Assemble

1. See Figure 3-132. Install stud plate, if equipped.

a. Position stud plate (14) on fender.

b. Install washers (15).

2. See Figure 3-130, Figure 3-131, Figure 3-132 or Figure 3-133. Install seat retention nut.

a. Position nut (3).

b. Install clip (4).

3. Install reflector bracket (2) and reflectors (1, 6) if equipped.

a. Clean mounting surface. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).

b. Test fit reflector (1, 6).

c. Remove adhesive backing.

d. Install and press firmly to adhere.

4. Install turn signals. See REAR TURN SIGNAL LAMPS (Page 7-52).

5. See Figure 3-130. **Models without license plate support brackets:** Install rear fender supports.

NOTE

Before installing fender supports, route and secure turn signal wire harnesses through fender supports. See REAR TURN SIGNAL LAMPS (Page 7-52)

a. Align holes on fender supports (7, 10) with holes in fender.

b. Place fender mounts (9) in holes on fender.

c. **Models without saddlebags:** Apply threadlock and install screws (11). Tighten.

Torque: 21-27 ft-lbs (28.4-37 N-m) *Rear fender support screws*

LOCTITE 243 MEDIUM STRENGTH

THREADLOCKER AND SEALANT (BLUE) (99642-97)

d. **Models with saddlebags:** Apply threadlock to screws (18), Install spacers (16), brackets (17). Tighten.

Torque: 21-27 ft-lbs (28.4-37 N-m) *Rear fender support screw*

LOCTITE 243 MEDIUM STRENGTH

THREADLOCKER AND SEALANT (BLUE) (99642-97)

6. See Figure 3-131, Figure 3-132 or Figure 3-133. **Models with license plate support brackets:** Install rear fender supports.

a. Align holes on bracket (12) with holes on fender and insert fender mounts (9).

b. Align fender supports (7,10).

c. **Models equipped with license plate bracket and inner fender screws:** Apply threadlock and install screw (13) through license plate bracket. Tighten.

Torque: 21-27 ft-lbs (28.4-37 N-m) *Rear fender inner mount screw*

LOCTITE 243 MEDIUM STRENGTH

THREADLOCKER AND SEALANT (BLUE) (99642-97)

d. Apply threadlock and install screws (11). Tighten.

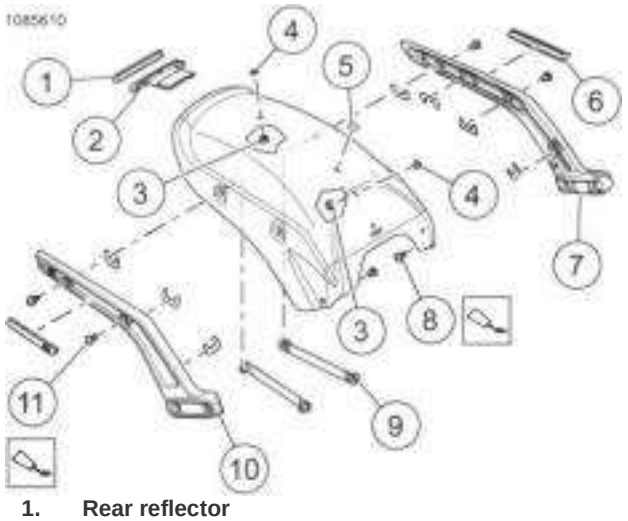
Torque: 21-27 ft-lbs (28.4-37 N-m) *Rear fender support screw*

LOCTITE 243 MEDIUM STRENGTH

THREADLOCKER AND SEALANT (BLUE) (99642-97)

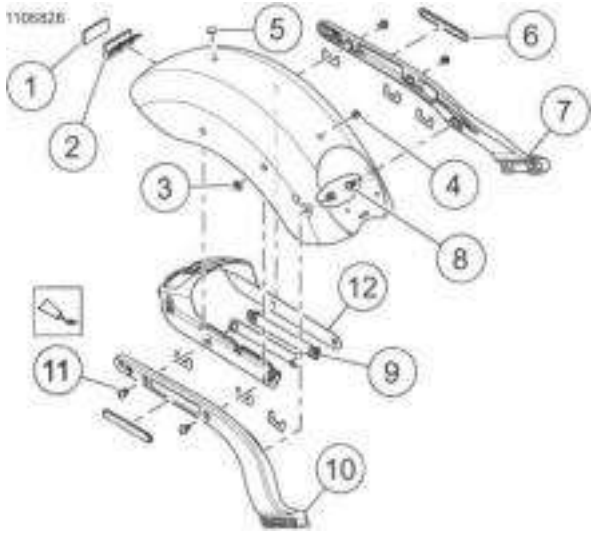
7. Install license plate bracket. See REAR LICENSE PLATE BRACKET (Page 3-126).

8. Install taillight if equipped. See TAIL LAMP (Page 7-57).



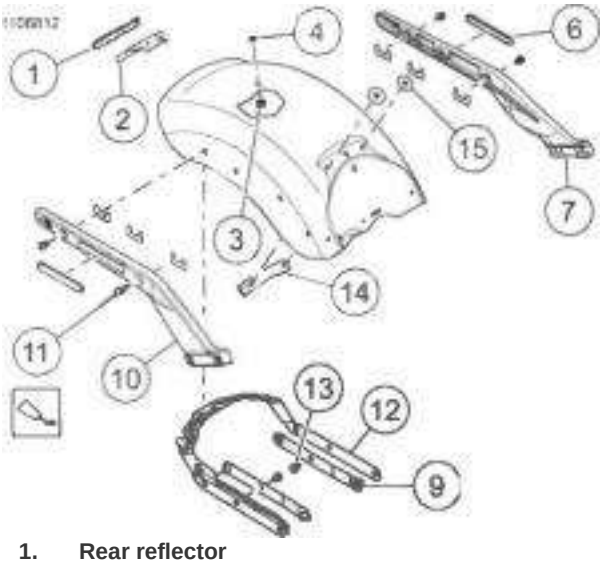
1. Rear reflector
2. Reflector bracket
3. Seat retention nut (2)
4. Clip (2)
5. Plug
6. Side reflector (2)
7. Left fender support
8. Inner fender screw (2)
9. Fender mount (2)
10. Right fender support
11. Fender support screw (4)

Figure 3-130. Chopped Fender: W/O License Plate Bracket



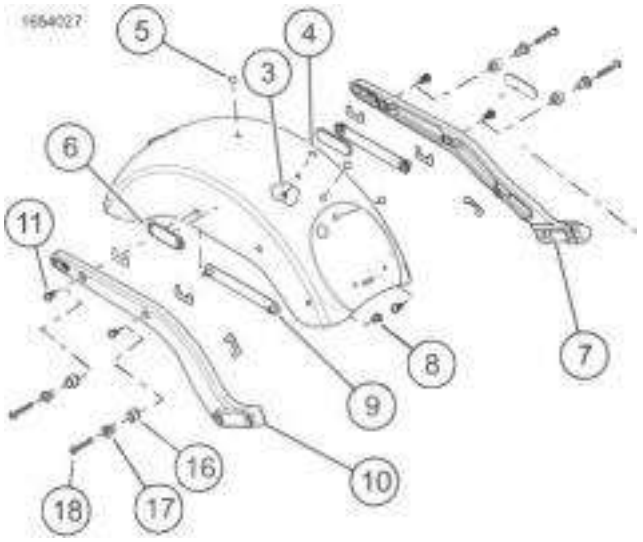
1. Rear reflector
2. Reflector bracket
3. Seat retention nut
4. Clip
5. Plug
6. Side reflector (2)
7. Left fender support
8. Inner fender screw (2)
9. Fender mount (2)
10. Right fender support
11. Fender support screw (4)
12. License plate support bracket

Figure 3-131. Chopped Fender: With Licence Plate Bracket, W/O Inner Fender Mounting Screws



1. Rear reflector
2. Reflector bracket
3. Seat retention nut
4. Clip
6. Side reflector (2)
7. Left fender support
9. Fender mount (2)
10. Right fender support
11. Fender support screw (4)
12. License plate support bracket
13. Inner fender mount screw (2)
14. Stud plate
15. Washer (2)

Figure 3-132. Chopped Fender: With license Plate Bracket and Inner Fender Mount Screws



3. **Seat retention nut**
4. **Clip**
5. **Plug (3)**
6. **Side reflectors (2)**
7. **Left fender support**
8. **Inner fender screw (2)**
9. **Fender mount (2)**
10. **Right fender support**
11. **Fender support screw (4)**
16. **Saddlebag mounting spacer (4)**
17. **Saddlebag mounting bracket (4)**
18. **Screw (4)**

Figure 3-133. Chopped Fender: License Plate Bracket With Tail Lamp Mounted Below

DISASSEMBLE AND ASSEMBLE: CHOPPED FENDER WITH LICENSE PLATE BRACKET LIGHTING

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

Disassemble

1. See Figure 3-134. Remove rear fender support.
   a. Remove screws (10).
   b. Remove saddlebag mounting bracket (9) and spacer (**8**).
   c. Remove fender mount bracket (6).
   d. Remove fender supports (4, 7).
   e. Remove inner bracket assembly (13).
2. Discard cable strap (12).
3. Remove seat retention nuts.
   a. Hold nut (2).
   b. Remove clip (1).
4. Disassemble inner bracket assembly (13).
   a. Remove turn signals. See REAR TURN SIGNAL LAMPS (Page 7-52).
   b. Remove taillight. See TAIL LAMP (Page 7-57).
   c. Disassemble license plate bracket. See REAR LICENSE PLATE BRACKET (Page 3-126).
5. Remove reflectors (11).
   a. Saw behind reflectors with mono-filament fishing line or waxed dental floss.

Assemble

1. See Figure 3-134. Install reflectors (11).
   a. Clean mounting surface. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).
   b. Test fit reflector.
   c. Remove adhesive backing.
   d. Install and press firmly to adhere.
2. Assemble inner bracket assembly (13).
   a. Assemble license plate bracket. See REAR LICENSE PLATE BRACKET (Page 3-126).
   b. Install taillight. See TAIL LAMP (Page 7-57).
   c. Install turn signals. See REAR TURN SIGNAL LAMPS (Page 7-52).
3. Install seat retention nuts.
   a. Position nut (2).
   b. Install clip (1).
4. Insert **new** cable strap (12) into fender.
5. Install rear fender support.
   a. Route harnesses through access hole in right side of fender.
   b. Install inner bracket assembly (13).
   c. Route and secure harnesses with cable strap (12).
   d. Install fender mount brackets (6).
   e. Install fender supports (4, 7).

NOTE

Route harnesses under right fender support (7).

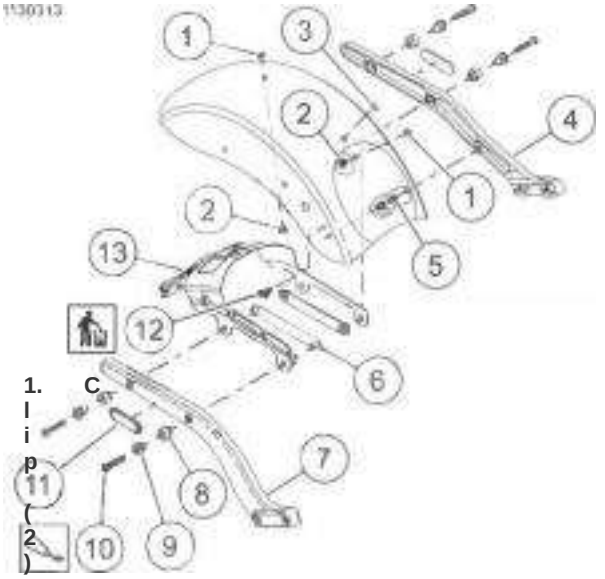
f. Install saddlebag mounting spacers (8) and brackets (9) .

g. Apply threadlocker and install screws (10). Tighten.

Torque: 21-27 ft-lbs (28.4-37 N-m) ***Rear fender support screw***

LOCTITE 243 MEDIUM STRENGTH

THREADLOCKER AND SEALANT (BLUE) (99642-97)



1. Clip (2)
2. Seat retention nut (2)
3. Plug
4. Left fender support
5. Fender seat nut screw (2)
6. Fender mount bracket (2)
7. Right fender support
8. Saddlebag mounting spacer (4)
9. Saddlebag mounting bracket (4)
10. Screw (4)
11. Reflector (2)
12. Anchored cable strap
13. Inner bracket assembly

Figure 3-134. Chopped Fender: License Plate Bracket With Lights

COMPLETE

COMPLETE

1. Install seat. See SEAT (Page 3-142).

2. Install saddle bags if removed. See SADDLEBAGS (Page 3-145).

3. Install main fuse. See FUSES (Page 7-6).

PREPARE

1. Remove rear fender. See REAR FENDER (Page 3-116).
2. Remove rear fender wire harness. See the electrical diagnostic manual.
   a. Remove wire terminals from harness connectors.
   b. Remove wire harness from conduit.

REMOVE

1. Remove conduit.
   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.

INSTALL

1. See Figure 3-135, Figure 3-136, Figure 3-137. Install wiring conduit.
   a. Clean mounting surface. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).
   b. With the adhesive backing still in place, test fit the conduit.
   c. See Figure 3-136 and Figure 3-137. Remove the adhesive backing (2).
   d. Lightly position the conduit (1) in place.
   e. Using Iii wallpaper roller (4), roll along conduit (3) to purge the air from between adhesive and fender.

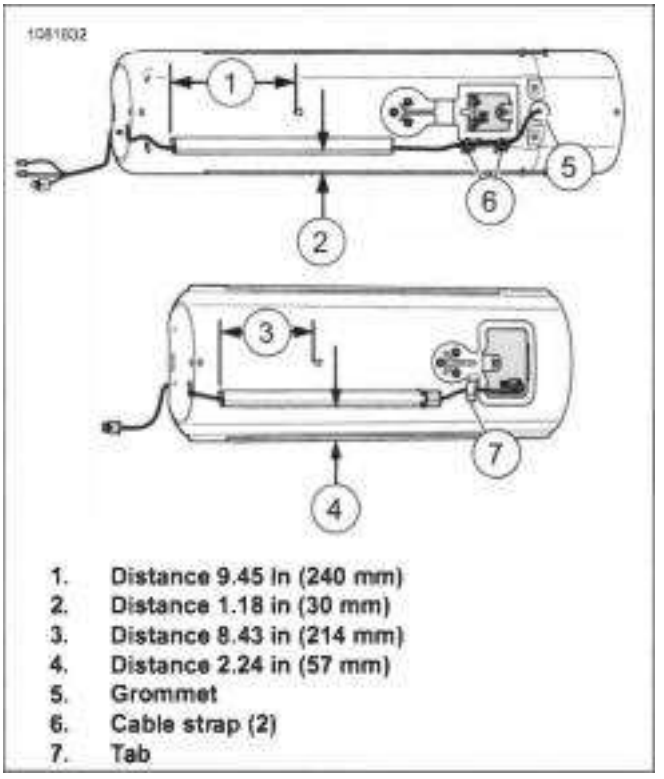


Figure 3-135. Fender Conduit Placement

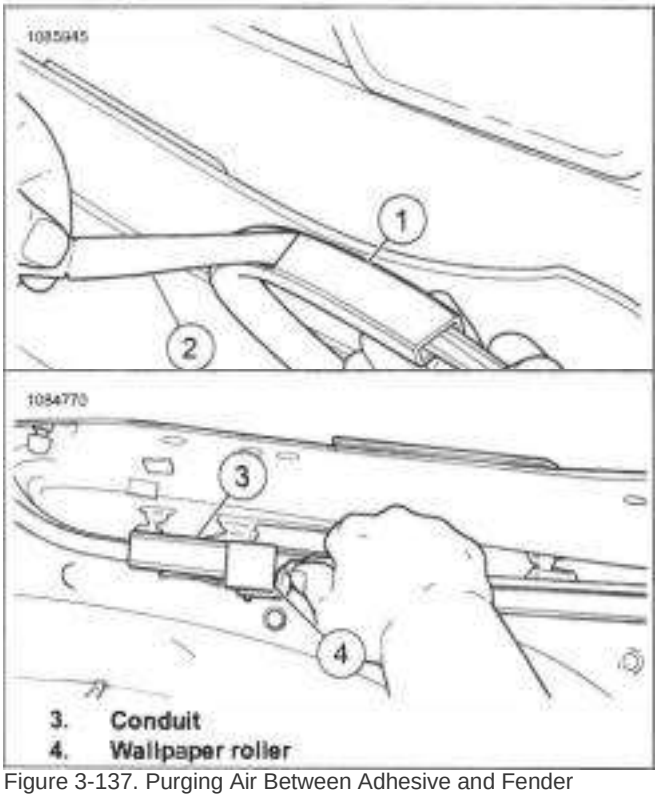


Figure 3-137. Purging Air Between Adhesive and Fender

COMPLETE

1. Install wiring harness.

    a. Slide wiring harness through new conduit.

    b. Install wire terminals into connector housings. See the electrical diagnostic manual.

Install connectors to proper component and install rear fender. See REAR FENDER (Page 3-116).

REMOVE

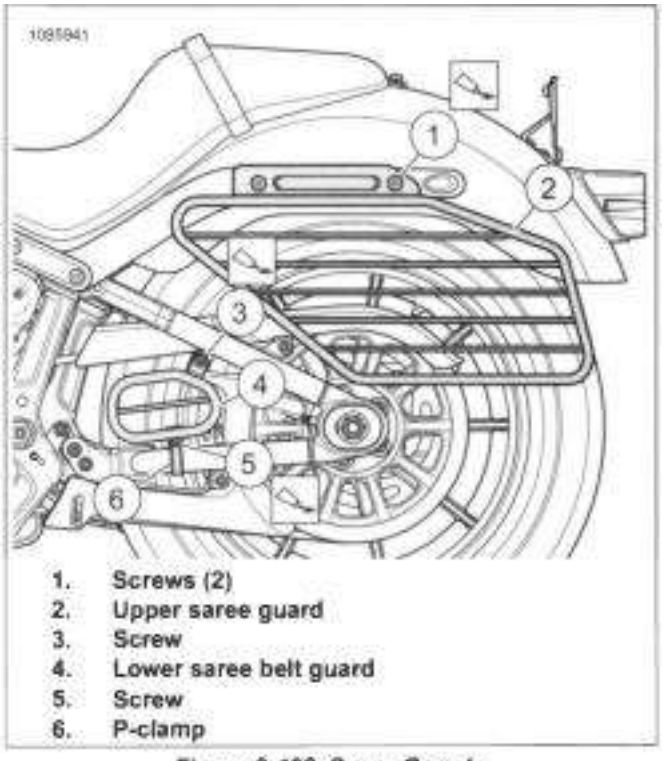
1. See Figure 3-138 Remove upper saree guard.
   a. Remove screws (1) and washers.
   b. Remove guard (2).
2. Remove lower saree belt guard.
   a. Remove screws (3, 5).
   b. Remove guard (4).

INSTALL

FASTENER	TORQUE VALUE	
Saree lower guard top screw	71-80 in-lbs	8-9 N-m
Saree lower guard lower screw	10-13 ft-lbs	14-18 N-m
Saree upper guard screw	21-27 ft-lbs	28-37 N-m

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

1. See Figure 3-138. Install upper saree guard.
   a. Place upper saree guard (2) in position.
   b. Install threadlocker to screws (1).
      LOCTITE 243 MEDIUM STRENGTH
      THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screws and washers. Tighten.
      Torque: 21-27 ft-lbs (28-37 N-m) ***Saree upper guard screw***
2. Install lower saree belt guard.
   a. Place lower saree belt guard (4) in position with the lower tab behind P-clamp (6).
   b. Install threadlocker to screws (3,5).
      LOCTITE 243 MEDIUM STRENGTH
      THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screws.
   d. Tighten screw (3).
      Torque: 71-80 in-lbs (8-9 N-m) ***Saree lower guard top screw***
   e. Tighten screw (5).
      Torque: 10-13 ft-lbs (14-18 N-m) ***Saree lower guard lower screw***



1. Screws (2)
2. Upper saree guard
3. Screw
4. Lower saree belt guard
5. Screw
6. P-clamp

Figure 3-138. Saree Guards

REMOVE

1. See Figure 3-139. Remove front license plate bracket.

   a. If equipped with two hole bracket (1) remove headlamp, screws and bracket. See HEADLAMP (Page 7-31).

   b. If equipped with one hole bracket (2) or clamp bracket (3), remove nuts (6), screws (4 or 8), washers (5), spacer (7), depending on the bracket.

   c. Remove license plate bracket (2 or 3).

FASTENER	TORQUE VALUE	
Front licence plate clamp bracket screws	1-1 ft-lbs	1.1—1.7 N-m
Front licence plate one hole bracket screw	25-30 ft-lbs	34-40.7 N-m
Front licence plate two hole bracket screws	16-20 ft-lbs	21.7-27 N-m

INSTALL

Two hole bracket

1. Install license plate bracket (1).

a. See Figure 3-139. Position bracket (1) on upper triple clamp.

b. Install headlamp. See HEADLAMP (Page 7-31).

c. Install screws (4). Tighten.

Torque: 16-20 ft-lbs (21.7-27 N-m) ***Front licence plate two hole bracket screws***

One hole bracket

1. Install license plate bracket (2).

a. See Figure 3-139. Position spacer (7) between lower triple clamp and bracket (2).

b. Install washer (5) and screw (8). Tighten.

Torque: 25-30 ft-lbs (34-40.7 N-m) ***Front licence plate one hole bracket screw***

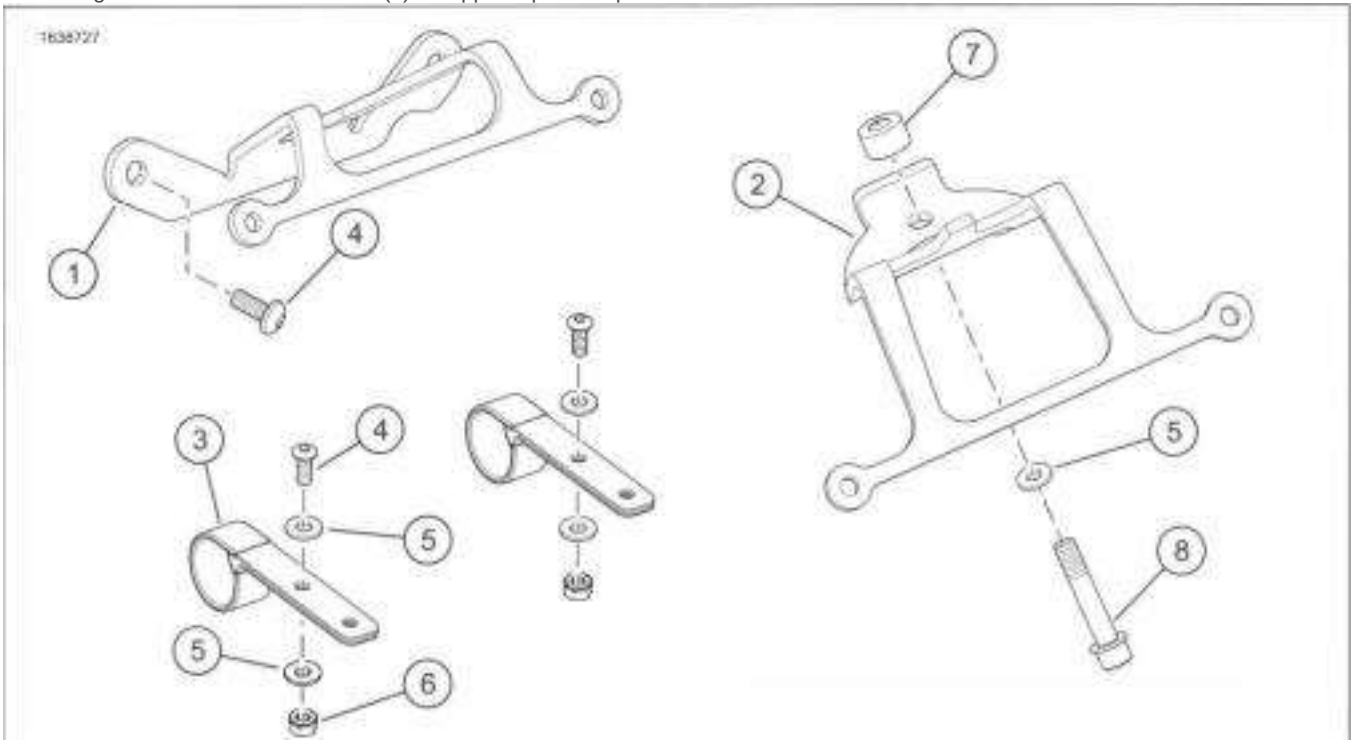
Clamp brackets

1. Install license plate brackets (3).

a. See Figure 3-139. Position brackets (3) on either side of risers on handle bar with tab facing front of bike.

b. Install screws (4), washers (5) and nuts (6). Tighten.

Torque: 1-1 ft-lbs (1.1-1.7 N-m) ***Front licence plate clamp bracket screws***



1. **Two hole bracket**
2. **One hole bracket**
3. **Clamp bracket**
4. **Button head screw (2)**
5.
6.
7.
8.

Washer(s)
Nut (2)
Spacer
Screw

Figure 3-139. License Plate Bracket

GENERAL

Remove side mounted bracket: See REAR TURN SIGNAL LAMPS (Page ***7-52)***

Remove rear mounted bracket: See LICENSE PLATE LAMP (Page 7-64)

STANDARD

FASTENER	TORQUE VALUE	
License plate standard assembly bolt	62-89 in-lbs	7-10 N-m
License plate standard mount screws	71-97 in-lbs	8-11 N-m

Remove

1. See Figure 3-140. Remove license plate bracket.

   a. Reach up under the rear fender and remove nuts (9).

   b. Remove license plate bracket assembly.

Install

1. Install license plate bracket on fender.

   a. Position license plate assembly on fender.

   b. Install screws (8) and nuts (9). Tighten.

      Torque: 71-97 in-lbs (8-11 N-m) ***License plate standard mount screws***

Disassemble

1. Disassemble license plate bracket.

   a. Remove nut (6), washer (5) and bolt (2).

   b. Separate the bracket (3), clamp (4) and support (7).

2. Remove reflector if needed. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156)

Assemble

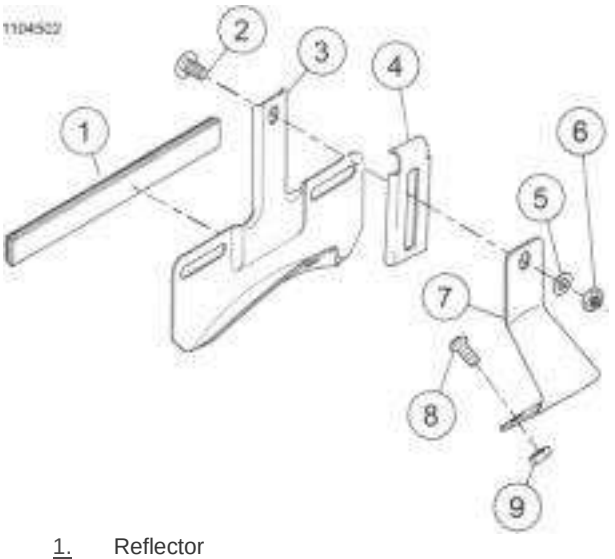
1. Assemble the license plate bracket.

   a. Position clamp (4) between the bracket (3) and the support (7).

   b. Install bolt (2), washer (5) and nut (6). Tighten.

      Torque: 62-89 in-lbs (7-10 N-m) ***License plate standard assembly bolt***

   c. Install reflector (1) if removed. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156)



1. Reflector
2. Bolt
3. Bracket
4. Clamp
5. Washer
6. Nut
7. Support
8. Screw (3)
9. Nut (3)

Figure 3-140. Standard License Plate Bracket

CENTER MOUNT

FASTENER	TORQUE VALUE	
License plate bracket inner mounting screws	18-21 in-lbs	2.03-2.37 N-m
License plate bracket outer mounting screws	63-77 in-lbs	7.11-8.69 N-m

Disassemble

1. See Figure 3-141. Remove center mounted license plate bracket.

   a. Remove license plate lamp housing. See LICENSE PLATE LAMP (Page 7-64).

   b. Remove screws (3,5) from rear fender support (4).

   c. Separate license plate bracket (2) from rear fender support.

Assemble

1. Install center mounted license plate bracket.

   a. Align holes on center mounted licence plate bracket (2) with rear fender support (4).

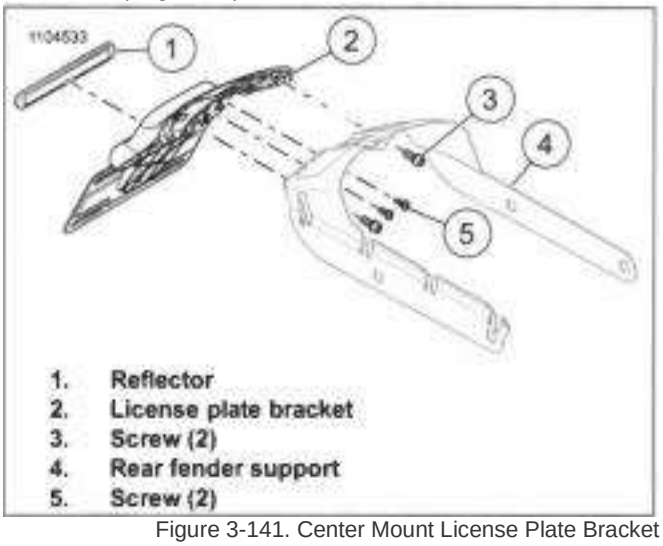
   b. Install screws (5). Tighten.

      Torque: 18-21 in-lbs (2.03-2.37 N-m) ***License plate bracket inner mounting screws***

c. Install screws (3). Tighten.

Torque: 63-77 in-lbs (7.11-8.69 N-m) ***License plate bracket outer mounting screws***

2. Install center mount lamp housing. See LICENSE PLATE LAMP (Page 7-64)



1. Reflector
2. License plate bracket
3. Screw (2)
4. Rear fender support
5. Screw (2)

Figure 3-141. Center Mount License Plate Bracket

CENTER MOUNT WITH LIGHTING

FASTENER	TORQUE VALUE	
License plate holder screw	63-77 in-lbs	7.11-8.69 N-m

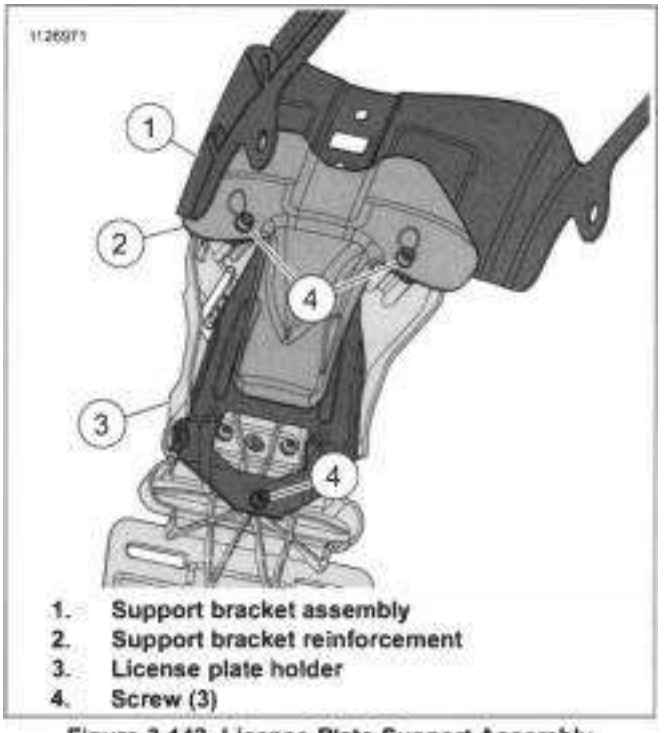
Disassemble

1. Remove license plate lamp. See LICENSE PLATE LAMP (Page 7-64).

2. Remove turn signal lamps. See REAR TURN SIGNAL LAMPS (Page 7-52).

3. See Figure 3-142. Remove center mount licence plate holder.

   a. Remove screws (4).
   b. Disassemble license plate holder (3), support bracket assembly (1) and support bracket reinforcement (2).



1. Support bracket assembly
2. Support bracket reinforcement
3. License plate holder
4. Screw (3)

Figure 3-142. License Plate Support Assembly

Assemble

1. See Figure 3-142. Install center mount licence plate holder.

   a. Assemble license plate holder (3), support bracket assembly (1) and support bracket reinforcement (2).

   b. Install screws (4). Tighten.

   Torque: 63-77 in-lbs (7.11-8.69 N-m) ***License plate holder screw***

2. Install license plate lamp. See LICENSE PLATE LAMP (Page 7-64).

3. Install turn signal lamps. See REAR TURN SIGNAL LAMPS (Page 7-52).

LEFT FOOT CONTROLS

PREPARE

1. Set motorcycle upright. See Secure the Motorcycle for Service (Page 2-2).

2. Remove shifter linkage. See SHIFTER LINKAGE (Page 5-9).

REMOVE

1. See Figure 3-143. Remove foot support bracket.

   a. Remove screws (2).

   b. Remove foot support bracket (1).

INSTALL

FASTENER	TORQUE VALUE	
Foot support bracket, left side, screw	40-45 ft-lbs	54.2-61 N-m

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

1. See Figure 3-143. Install foot support bracket.

   a. Apply threadlocker to screws (2).

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

   b. Install foot support bracket (1).

   c. Install screws. Tighten.

      Torque: 40-45 ft-lbs (54.2-61 N-m) *Foot support bracket, left side, screw*

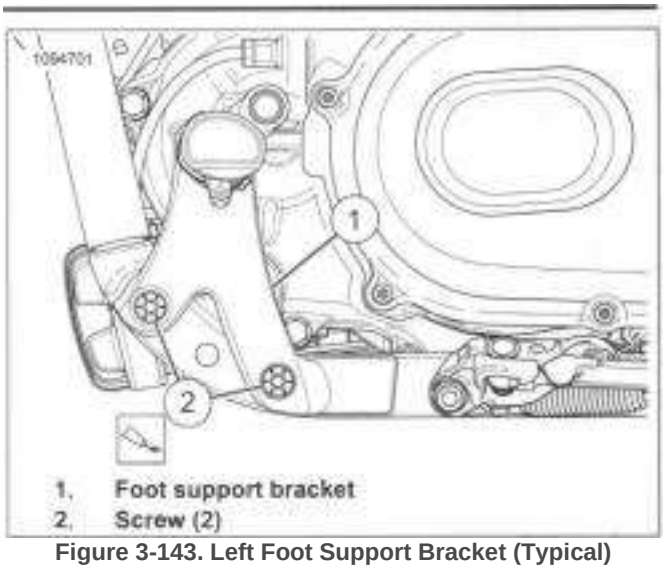


Figure 3-143. Left Foot Support Bracket (Typical)

REMOVE AND INSTALL: FORWARD FOOT CONTROLS

FASTENER	TORQUE VALUE	
Foot support bracket, forward control, left side, screw	40-45 ft-lbs	54-61 N-m

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

Prepare

1. Set motorcycle upright. See GENERAL (Page 2-2).

2. Remove shifter linkage. See SHIFTER LINKAGE (Page 5-9).

Remove

1. See Figure 3-144. Remove screws (2).

2. Remove foot support bracket (1).

Install

1. See Figure 3-144. Install foot support bracket (1).

2. Apply threadlocker to screws (2).

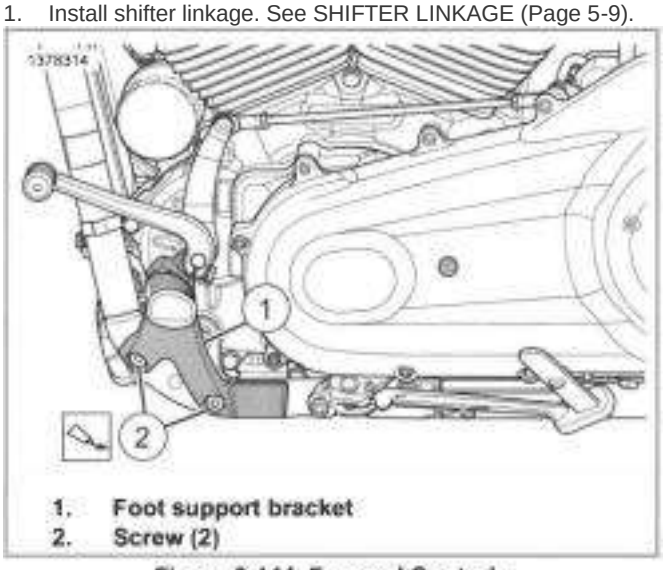
   Consumable: LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

3. Install screws (2). Tighten.

   Torque: 40-45 ft-lbs (54-61 N-m) *Foot support bracket, forward control, left side, screw*

Complete

1. Install shifter linkage. See SHIFTER LINKAGE (Page 5-9).



1. Foot support bracket
2. Screw (2)

Figure 3-144. Forward Controls

REMOVE AND INSTALL: MID FOOT CONTROLS

FASTENER	TORQUE VALUE	
Foot support bracket, mid control, left side, screw	40-45 ft-lbs	54-61 N-m

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

Prepare

1. Set motorcycle upright. See GENERAL (Page 2-2).

Remove

1. See Figure 3-145. Remove screws (2).
2. Remove foot support bracket (1).

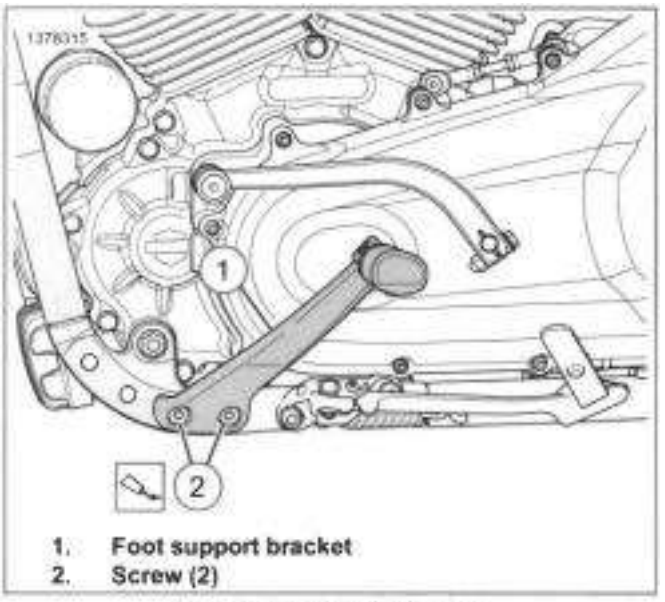
Install

1. See Figure 3-145. Install foot support bracket (1).
2. Apply threadlocker to screws (2).

   Consumable: LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

3. Install screws (2). Tighten.

   Torque: 4^45 ft-lbs (54-61 N-m) *Foot support bracket, mid control, left side, screw*



1. Foot support bracket
2. Screw (2)

Figure 3-145. Mid Controls

REMOVE AND INSTALL: FOOTBOARDS

FASTENER	TORQUE VALUE

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

Prepare

1. Set motorcycle upright. See GENERAL (Page 2-2).
2. Remove shifter linkage. See SHIFTER LINKAGE (Page 5-9).

Remove

1. See Figure 3-146. Remove screws (1).
2. Remove footboard assembly (2).

Install

1. Apply threadlocker to screws (1).

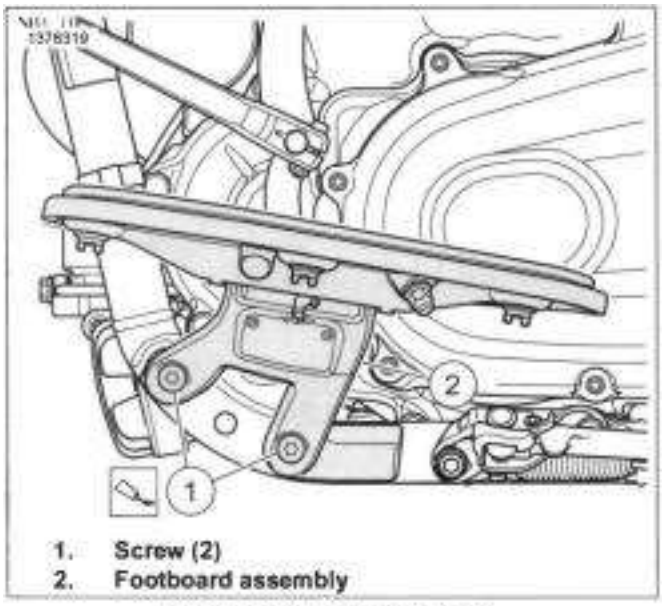
   Consumable: LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

2. See Figure 3-146. Install footboard assembly (2).
3. Install screws (1). Tighten.

   Torque: 40-45 ft-lbs (54-61 N-m) *Footboard assembly, left side, mounting screw*

Complete

1. Install shifter linkage. See SHIFTER LINKAGE (Page 5-9).



1. Screw (2)
2. Footboard assembly

Figure 3-146. Left Footboard

DISASSEMBLE AND ASSEMBLE: FOOTBOARD

PART NUMBER	TOOL NAME
HD-52369	E-CLIP TOOL

FASTENER	TORQUE VALUE	
Shift lever bracket screws	120-144 in-lbs	13.6-16.3 N-m
Wear peg	30-42 in-lbs	3.4-4.7 N-m

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

Disassemble

1. See Figure 3-147. Remove shift lever bracket.
   a. Remove screws (3).
   b. Remove shift lever bracket (2).
   c. Inspect O-rings (1) for damage, replace if necessary.
2. See Figure 3-148. Remove wear peg (6), if equipped.
3. Remove footboard.

NOTE

Be careful when removing E-c/ip, use E-c/ip tool to help prevent damage to painted surfaces.

   a. Remove E-clip (5).
      Special Tool: E-CLIP TOOL (HD-52369)
   b. Remove clevis pin (2).
   c. Remove torsion spring (4).
   d. Remove footboard (3).

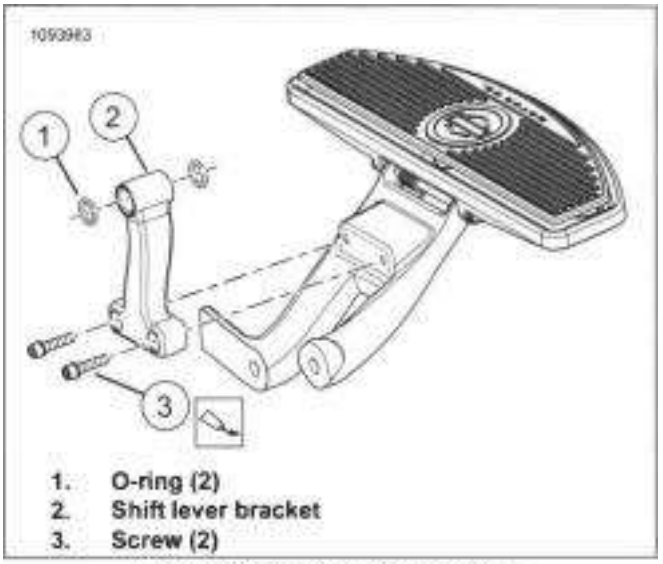
Assemble

1. See Figure 3-148. Install footboard.
   a. Insert short leg of torsion spring (4) in hole in footboard (3).
   b. Position footboard and torsion spring on foot support bracket (1).
   c. Install clevis pin (2).

NOTE

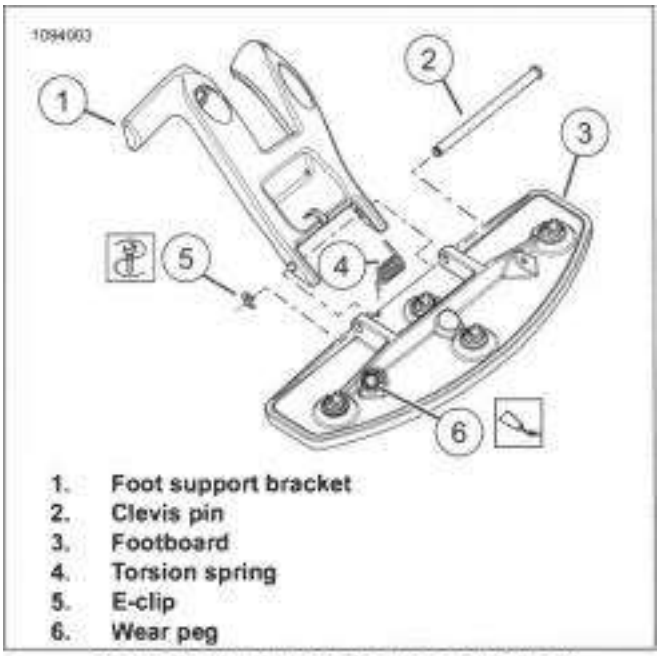
Be careful when installing E-c/ip, use E-c/ip tool to help prevent damage to painted surfaces.

   d. Install E-clip (5).
      Special Tool: E-CLIP TOOL (HD-52369)
   e. Push the long leg of the torsion spring into the slot in the foot support bracket.
2. Install wear peg, if equipped.
   a. Apply threadlocker to wear peg.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install wear peg (6). Tighten.
      Torque: 30-42 in-lbs (3.4-4.7 N-m) *Wear peg*
3. See Figure 3-147. Install shift lever bracket.
   a. Install shift lever bracket (2).
   b. Apply threadlocker to screws.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screws (3). Tighten.
      Torque: 120-144 in-lbs (13.6-16.3 N-m) *Shift/ever bracket screws*
   d. If removed, install O-rings (1).



1. O-ring (2)
2. Shift lever bracket
3. Screw (2)

Figure 3-147. Shift Lever Bracket



1. Foot support bracket
2. Clevis pin
3. Footboard
4. Torsion spring
5. E-clip
6. Wear peg

Figure 3-148. Left Side Footboard (Typical)

DISASSEMBLE AND ASSEMBLE: FOOTPEG

PART NUMBER	TOOL NAME
HD-52369	E-CLIP TOOL

FASTENER	TORQUE VALUE	
Wear peg	30-42 in-lbs	3.4-4.7 N-m

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

Disassemble

1. See Figure 3-149. Remove wear peg (7), if equipped.

2. Remove footpeg.

NOTE

When removing E-clip, use E-clip tool to prevent damage to painted surfaces.

   a. Remove E-clip (2).
      Special Tool: E-CLIP TOOL (HD-52369)
   b. Remove clevis pin (5).
   c. Remove footpeg (3).
   d. Remove torsion spring (4).

3. Inspect O-rings (1) for damage, replace if necessary.

Assemble

1. See Figure 3-149. Install footpeg (3).

   a. Insert short leg of torsion spring (4) into hole in footpeg.
   b. Insert long leg of torsion spring into hole in foot support (6).
   c. Rotate footpeg into position and install clevis pin (5).

NOTE

When installing E-clip, use E-clip tool to prevent damage to painted surfaces.

   d. Install E-clip (2).
      Special Tool: E-CLIP TOOL (HD-52369)

2. If removed, install O-rings (1).

3. Install wear peg, if equipped.

   a. Apply threadlocker to wear peg.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install wear peg (7). Tighten.
      Torque: 30-42 in-lbs (3.4-4.7 N-m) ***Wear peg***

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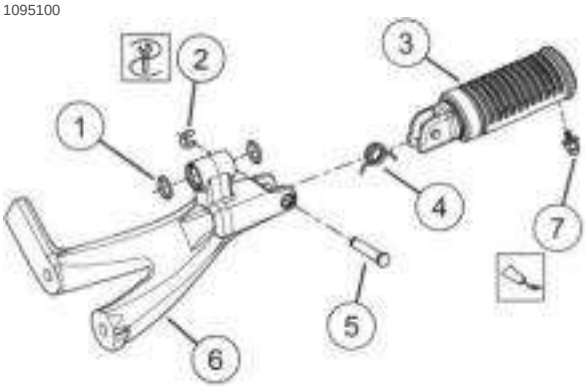


COMPLETE

1. Install shifter linkage. See SHIFTER LINKAGE (Page 5-9).

2. Remove vehicle from upright. See Secure the Motorcycle for Service (Page 2-2).

1. **O-ring (2)**
2. **E-clip**
3. **Footpeg**
4. **Torsion spring**
5. **Clevis pin**
6. **Foot support bracket**
7. **Wear peg**

Figure 3-149. Left Side Footpeg (Typical)

REMOVE AND INSTALL: FORWARD FOOT CONTROLS

FASTENER	TORQUE VALUE	
Brake pedal pivot, forward control, screw	18-22 ft-lbs	24.4-29.8 N-m
Foot support bracket, forward control, right side, screw	40-45 ft-lbs	54.2-61 N-m

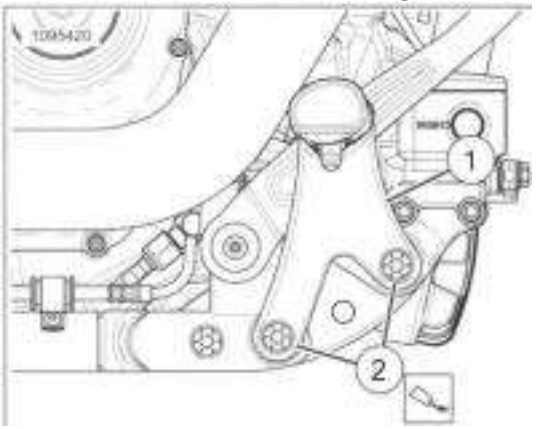
CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

Remove

1. See Figure 3-150. Remove foot support bracket
   a. Remove screws (2).
   b. Remove foot support bracket (1).
2. See Figure 3-151. Remove brake pedal.
   a. Remove rear master cylinder bracket (5). See REAR BRAKE MASTER CYLINDER (Page 3-42).
   b. Remove rear brake master cylinder clevis pin (8). See REAR BRAKE MASTER CYLINDER (Page 3-42).
   c. Remove flange nut (7) and washer (6).
   d. Remove screw (1) and large washer (2).
   e. Remove brake pedal (3).
   f. Inspect O-rings (4) for damage, replace if necessary

Install

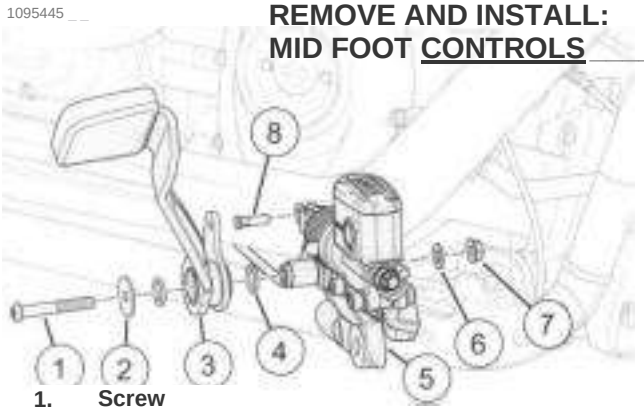
1. See Figure 3-151. Install brake pedal.
   a. If removed, install O-rings (4).
   b. Install brake pedal (3).
   c. Install screw (1) and large washer (2).
   d. Install washer (6) and flange nut (7). Tighten.
      Torque: 18-22 ft-lbs (24.4-29.8 N-m) ***Brake pedal pivot, forward control, screw***
   e. Install rear brake master cylinder clevis pin (8). See REAR BRAKE MASTER CYLINDER (Page 3-42).
   f. Install rear master cylinder bracket (5). See REAR BRAKE MASTER CYLINDER (Page 3-42).
2. See Figure 3-150. Install foot support bracket.
   a. Apply threadlocker to screws (2).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install foot support bracket (1).
   c. Install screws. Tighten.
      Torque: 40-45 ft-lbs (54.2-61 N-m) ***Foot support bracket, forward control, right side, screw***



1. Foot support bracket
2. Screw (2)
Figure 3-150. Right Foot Support Bracket (Typical)

Figure 3-151. Brake Pedal

REMOVE AND INSTALL: MID FOOT CONTROLS



1. Screw
2. Large washer
3. Brake pedal
4. O-ring (2)
5. Bracket
6. Washer
7. Flange nut
8. Clevis pin

FASTENER	TORQUE VALUE	
Brake pedal linkage, mid control, front, screw	15-18 ft-lbs	20.3-24.4 N-m
Brake pedal linkage, mid control, rear, screw	15-18 ft-lbs	20.3-24.4 N-m

FASTENER	TORQUE VALUE	
Brake pedal pivot, mid control, screw	10-14 ft-lbs	13.6-19 N-m
Foot support bracket, mid control, right side, screw	40-45 ft-lbs	54.2-61 N-m

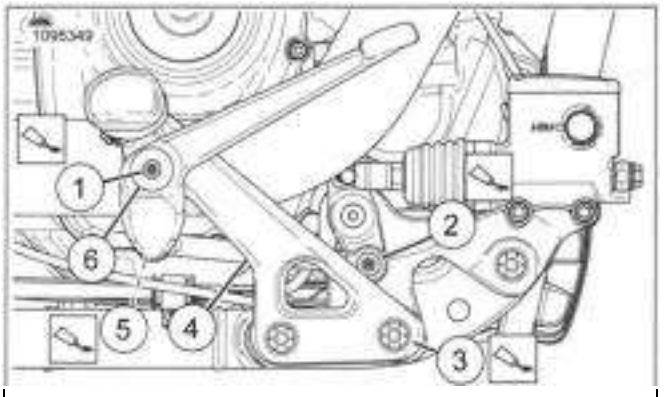
CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)	99642-97

Remove

1. See Figure 3-152. Remove brake pedal.
   a. Remove front brake pedal linkage screw (2).
   b. Remove pivot screw (1) and washer (6).
   c. Remove brake pedal.
   d. Remove rear brake pedal linkage screw (5).
2. Remove foot support bracket
   a. Remove screws (3).
   b. Remove foot support bracket (4).

Install

1. See Figure 3-152. Install foot support bracket.
   a. Apply threadlocker to screws (3).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install foot support bracket (4).
   c. Install screws (3). Tighten.
      Torque: 40-45 ft-lbs (54.2-61 N-m) ***Foot support bracket, mid control, right side, screw***
2. Install brake pedal.
   a. Apply threadlocker to rear brake pedal linkage screw (5).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install rear brake pedal linkage screw. Tighten.
      Torque: 15--18 ft-lbs (20.3-24.4 N-m) ***Brake pedal linkage, mid control, rear, screw***
   c. Install brake pedal.
   d. Apply threadlocker to pivot screw (1).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   e. Install pivot screw and washer (6). Tighten.
      Torque: 10-14 ft-lbs (13.6-19 N-m) ***Brake pedal pivot, mid control, screw***
   f. Apply threadlocker to front brake pedal linkage screw (2) .
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   g. Install front brake pedal linkage screw. Tighten.
      Torque: 15-18 ft-lbs (20.3-24.4 N-m) ***Brake pedal linkage, mid control, front, screw***



1. **Pivot screw**
2. **Front linkage screw**
3. **Screw (2)**
4. **Foot support bracket**
5. **Rear linkage screw**
6. **Washer**

Figure 3-152. Right Side Mid Controls

REMOVE AND INSTALL: FOOTBOARDS

FASTENER	TORQUE VALUE	
Brake pedal pivot, footboard control, screw.	18-22 ft-lbs	24.5-30 N-m
Footboard assembly, right side, mounting screw	40-45 ft-lbs	54-61 N-m

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

Prepare

1. Set motorcycle upright. See GENERAL (Page 2-2).

Remove

1. See Figure 3-153. Remove footboard assembly.
   a. Remove screws (1).

b. Remove footboard assembly (2).

2. See Figure 3-151. Remove brake pedal.

   a. Remove rear master cylinder bracket (5). See REAR BRAKE MASTER CYLINDER (Page 3-42).

   b. Remove rear brake master cylinder clevis pin (8). See REAR BRAKE MASTER CYLINDER (Page 3-42).

   c. Remove flange nut (7) and washer (6).

   d. Remove screw (1) and large washer (2).

   e. Remove brake pedal (3).

   f. Inspect O-rings (4) for damage, replace if necessary.

Install

1. See Figure 3-151. Install brake pedal.

   a. If removed, install O-rings (4).

   b. Install brake pedal (3).

   c. Install screw (1) and large washer (2).

   d. Install washer (6) and flange nut (7). Tighten.

   Torque: 18-22 ft-lbs (24.5-30 N-m) ***Brake pedal pivot, footboard control, screw.***

   e. Install rear brake master cylinder clevis pin (8). See REAR BRAKE MASTER CYLINDER (Page 3-42).

   f. Install rear master cylinder bracket (5). See REAR BRAKE MASTER CYLINDER (Page 3-42).

2. See Figure 3-153. Install footboard assembly.

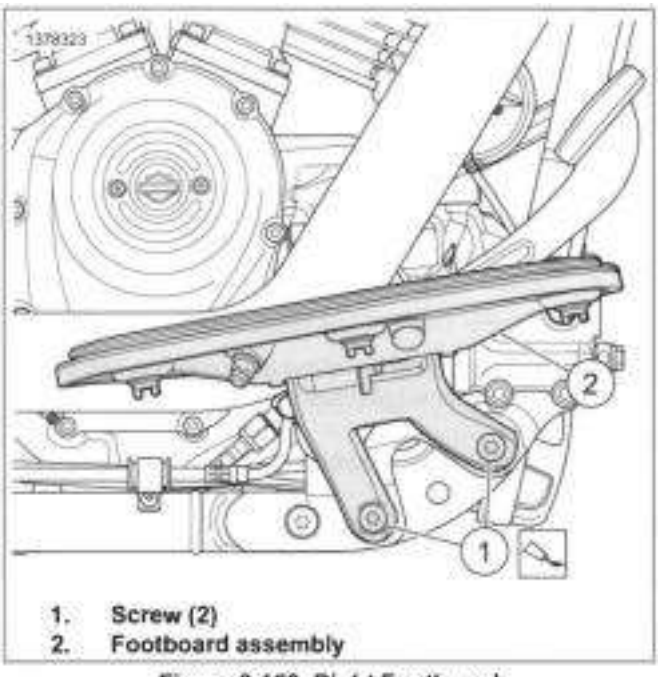
   a. Apply threadlocker to screws (1).

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

   b. Install footboard assembly (2).

   c. Install screws (1). Tighten.

   Torque: 40-45 ft-lbs (5^^1 N-m) ***Footboard assembly, right side, mounting screw***



1. Screw (2)
2. Footboard assembly

Figure 3-153. Right Footboard

DISASSEMBLE AND ASSEMBLE: FOOTBOARD

PART NUMBER	TOOLNAME
HD-52369	E-CLIP TOOL

FASTENER	TORQUE VALUE	
Wear peg	30-42 **in-lbs**	3.4-4.7 N-m

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

Disassemble

1. See Figure 3-154. Remove wear peg (5), if equipped.

2. Remove footboard.

NOTE

When removing E-clip, use E-c/ip tool to help prevent damage to painted surfaces.

   a. Remove E-clip (3).

   Special Tool: E-CLIP TOOL (HD-52369)

   b. Remove clevis pin (6).

   c. Remove torsion spring (2).

   d. Remove footboard (4).

Assemble

1. See Figure 3-154. Install footboard.

   a. Insert short leg of torsion spring (2) in hole in footboard (4).

b. Position footboard and torsion spring on foot support bracket (1).

c. Install clevis pin (6).

NOTE

When installing E-clip, use E-clip tool to help prevent damage to painted surfaces.

d. Install E-clip (3).

Special Tool: E-CLIP TOOL (HD-52369)

e. Push the long leg of the torsion spring into the slot in the foot support bracket.

2. Install wear peg, if equipped.

a. Apply threadlocker to wear peg.

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

b. Install wear peg (5). Tighten.

Torque: 30-42 in-lbs (3.4-4.7 N-m) *Wear peg*

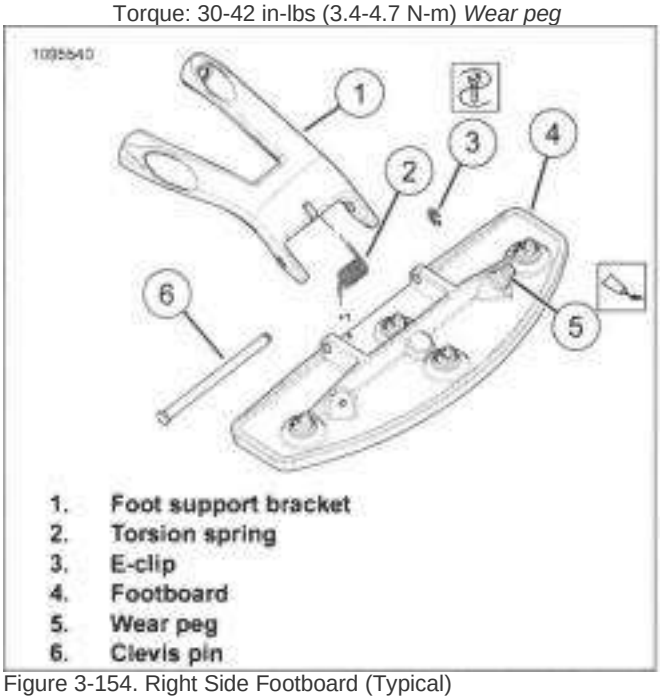


Figure 3-154. Right Side Footboard (Typical)

DISASSEMBLE AND ASSEMBLE: FOOTPEG

PART NUMBER	TOOL NAME
HD-52369	E-CLIP TOOL

FASTENER	TORQUE VALUE	
Wear peg	30-42 in-lbs	3.4-4.7 N-m

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

Disassemble

1. See Figure 3-155. Remove wear peg (4), if equipped.

2. Remove footpeg.

NOTE

When removing E-clip, use E-clip tool to help prevent damage to painted surfaces.

a. Remove E-clip (5).

Special Tool: E-CLIP TOOL (HD-52369)

b. Remove clevis pin (1).

c. Remove footpeg (3).

d. Remove torsion spring (2).

Assemble

1. See Figure 3-155. Install footpeg.

a. Insert short leg of torsion spring (2) into hole in footpeg (3).

b. Insert long leg of torsion spring into hole in foot support bracket (6).

c. Rotate footpeg into position and install clevis pin (1).

NOTE

When installing E-c/ip, use E-clip tool to help prevent damage to painted surfaces.

d. Install E-clip (5).

Special Tool: E-CLIP TOOL (HD-52369)

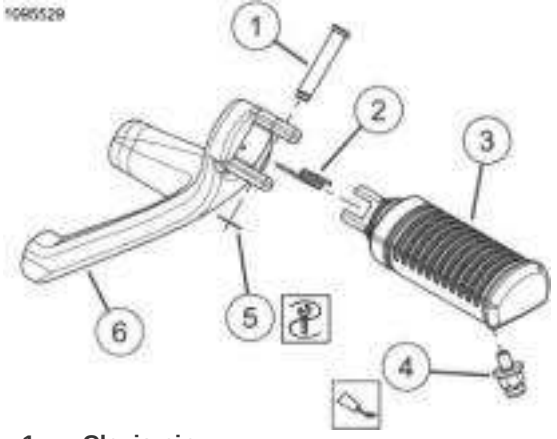
2. Install wear peg, if equipped.

a. Apply threadlocker to wear peg.

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

b. Install wear peg (4). Tighten.

Torque: 30-42 in-lbs (3.4-4.7 N-m) *Wear peg*



1. Clevis pin
2. Torsion spring
3. Footpeg
4. Wear peg
5. E-clip
6. Foot support bracket

Figure 3-155. Right Side Footpeg (Typical)

PASSENGER FOOTRESTS

REMOVE

PART NUMBER	TOOL NAME
HD-52369	E-CLIP TOOL

1. See Figure 3-156. Remove footpeg.

NOTE

When removing e-clip, use e-clip tool to help prevent damage to painted surfaces.

a. Remove e-clip (8).

Special Tool: E-CLIP TOOL (HD-52369)

b. Remove clevis pin (3).

NOTE

Remove footpeg and detent plate as an assembly to keep detent ball and detent spring in place.

c. Remove footpeg (5) with detent plate (4).

2. *NOTE*

Detent ball is under spring pressure, place finger over detent ball when removing detent plate to keep detent ball from falling out.

Remove detent plate from footpeg.

3. Remove detent ball (7) and detent spring (6) from footpeg.

4. Remove footpeg support (1).

a. Remove screw (2).

b. Remove footpeg support.

INSTALL

PART NUMBER	TOOL NAME
HD-52369	E-CLIP TOOL

FASTENER	TORQUE VALUE	
Passenger footpeg support screw	38-47 ft-lbs	51.5--63.7 N-m

Install footpeg.

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

1. See Figure 3-156. Install footpeg support (1).

a. Right side: Align notch in footpeg support with alignment tab on exhaust bracket.

NOTE

FLHC and FLHCS do not have alignment tabs for the passenger footpeg supports. Align footpeg supports at a 5-15 ° rearward angle.

b. Left side: Align notch in footpeg support with rear fork pivot shaft.

c. Apply threadlocker to screw (2).

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

d. Install screw. Tighten.

Torque: 3^47 ft-lbs (51.5-63.7 N-m) *Passenger footpeg support screw*

2. Install detent spring (6) and detent ball (7) into footpeg (5).

3. Install detent plate (4) onto footpeg.

NOTE

- *Hold detent ball in place while installing detent plate to prevent detent ball from falling out.*
- *Detent plate should be oriented with the detent holes on the bottom.*
- *Make sure detent ball is aligned with the innermost hole in the detent plate when installed.*

4. *NOTE*

Install footpeg and detent plate as an assembly.

a. Install footpeg into footpeg support.

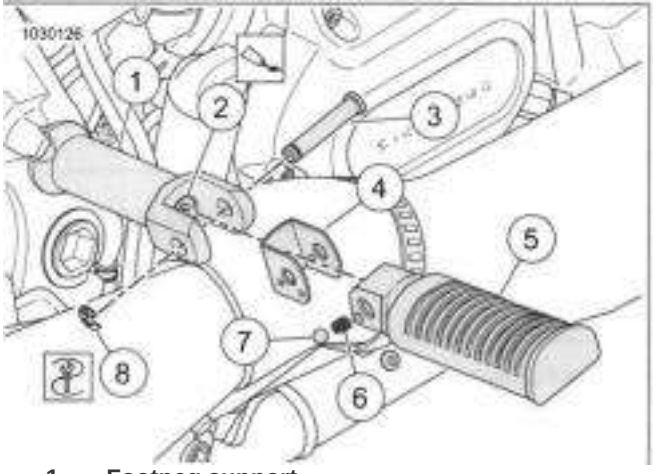
b. Install clevis pin (3).

NOTE

When Installing e-clip, use e-clip tool to help prevent damage to painted surfaces.

c. Install e-clip (8).

Special Tool: E-CLIP TOOL (HD-52369)



1. Footpeg support
2. Screw
3. Clevis pin
4. Detent plate
5. Footpeg
6. Detent spring
7. Detent ball
8. E-clip

Figure 3-156. Passenger Footpeg

PREPARE

1. Set motorcycle upright. See Secure the Motorcycle for Service (Page 2-2).

REMOVE

1. See Figure 3-157. Lower jiffy stand (1).
2. Remove screws (2).
3. Remove jiffy stand.

INSTALL

FASTENER	TORQUE VALUE	
Jiffy stand screws	40-45 ft-lbs	54.2-61 N-m

1. See Figure 3-157. Install Jiffy stand (1).
2. Install screws (2). Tighten.

   Torque: 40--45 ft-lbs (54.2-61 N-m) ***Jiffy stand screws***

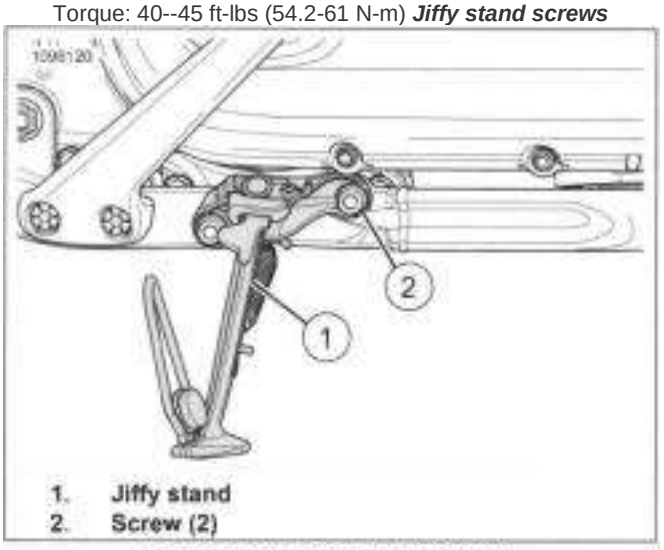


Figure 3-157. Jiffy Stand Screws

8. Remove jiffy stand bumper (7).

DISASSEMBLE

1. See Figure 3-158. Remove Jiffy Stand Sensor (JSS) (1), if equipped. See JIFFY STAND SENSOR (JSS) (Page 7-86).
2. Remove spring (3).
3. Remove screw (4).
4. Remove pivot pin (8).
5. Remove jiffy stand (6).
6. Remove bushings (5).
7. Inspect bushings for wear or damage, replace if necessary.

ASSEMBLE

2. Install bushings (5).

CONSUMABLE	PART NUMBER
LOCTITE SILVER GRADE ANTI-SEIZE	11100001

1. See Figure 3-158. Install jiffy stand bumper (7).
3. Install jiffy stand (6).
4. Apply anti-sieze lubricant to pivot pin (8).

   Consumable: LOCTITE SILVER GRADE ANTI-SEIZE (11100001)
5. Install pivot pin (8).
6. Install screw (4). Tighten.

   Torque: 20-25 in-lbs (2.3-2.8 N-m)
7. Apply anti-sieze lubricant to spring hook groove on jiffy stand bracket (2).

   Consumable: LOCTITE SILVER GRADE ANTI-SEIZE (11100001)

NOTE

Spring hooks must point towards rear when jiffy stand is down.

8. Install spring (3).
9. Install JSS (1), if equipped. See JIFFY STAND SENSOR (JSS) (Page 7-86).

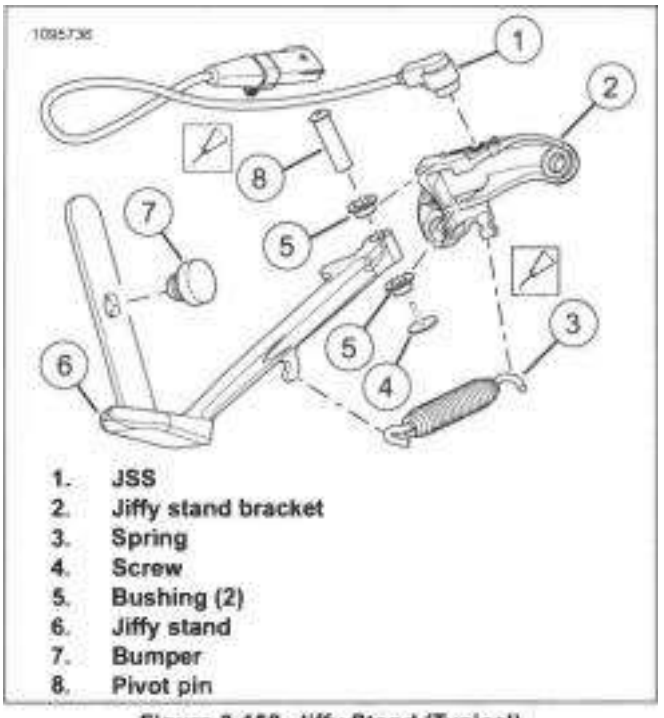


Figure 3-158. Jiffy Stand (Typical)

COMPLETE

1. Remove vehicle from upright. See Secure the Motorcycle for Service (Page 2-2).

REMOVE

Two-Up One-Piece Seat

1. See Figure 3-163. Remove seat.
   a. Remove thumbscrew (1).
   b. Slide seat tongue out of the frame.
   c. Slide seat forward to remove from grab strap (4).
   d. Remove Screw (10), washer (9) and grab strap (4), if necessary.

Two-Up Two-Piece Seat

1. See Figure 3-163 or Figure 3-161. Remove seat.
   a. Remove the thumbscrew (1) or screw (1).
   b. Remove the passenger pillion (3).
   c. Remove mounting nuts (2) or screw with washers (1-3).
   d. Remove seat and grab strap (4), if necessary.

Solo Seat

1. Figure 3-163
   a. Remove thumbscrew (1) or mounting nuts (2).
   b. Remove seat.

INSTALL

FASTENER	TORQUE VALUE	
One piece seat grab strap screw	60-90 in-lbs	6.8-10.16 Nm
Seat mounting nut	9-15 in-lbs	1-1.7Nm
Seat thumbscrew	15-30 in-lbs	1.7-3.4 Nm

Two-up One-piece Seat

1. See Figure 3-163. Install Seat.

NOTE

See for FXBRS, FLFBS, FXFBS grab strap installation.

   a. Install washer (9), screw (10) and grab strap (4) if removed. Tighten.

      Torque: 60-90 in-lbs (6.8-10.16 Nm) ***One piece seat grab strap screw***

   b. Install seat (5) rearward through the grab strap.
   c. See Figure 3-159. Engage seat tongue in frame bracket.
   d. See Figure 3-163. Install thumbscrew (1). Tighten.

      Torque: 15-30 in-lbs (1.7-3.4 Nm) ***Seat thumbscrew***

2. After installing seat, pull up on the seat to verify it is secure.

Two-up Two-piece Seat

1. See Figure 3-163 or Figure 3-161. Install Seat.
   a. Install grab strap (4) if removed.
   b. See Figure 3-159. Engage seat tongue in frame bracket.
   c. See Figure 3-163 or Figure 3-161. Install mounting nuts (2) or screw with washers (1-3).
   d. Install passenger pillion (3).
   e. Install thumbscrew (1) or screw with washer (1, 2). Tighten.

      Torque: 15-30 in-lbs (1.7-3.4 Nm) ***Seat thumbscrew***

2. After installing seat, pull up on the seat to verify it is secure.

Solo Seat

1. See Figure 3-163. Install Seat.
   a. See Figure 3-159 and . Engage seat tongue in frame bracket.
   b. See Figure 3-163. Install thumbscrew (1), if equipped. Tighten.

      Torque: 15-30 in-lbs (1.7-3.4 Nm) ***Seat thumbscrew***

   c. Install mounting nuts (2), if equipped. Tighten. Torque: 9-15 in-lbs (1-1.7 N m) ***Seat mounting nut***

2. After installing seat, pull up on the seat to verify it is secure.

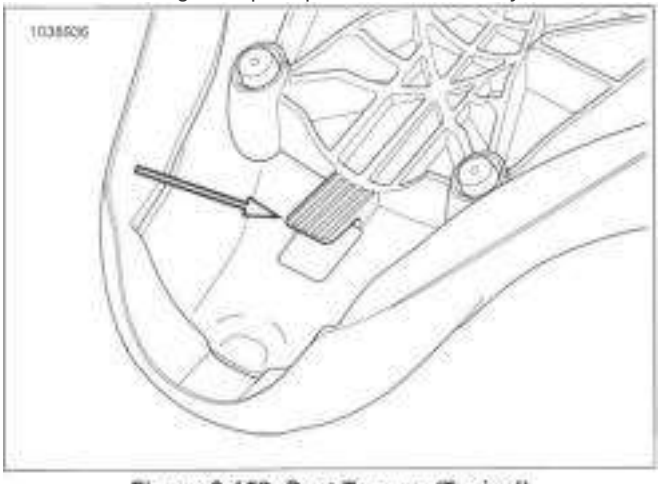


Figure 3-159. Seat Tongue (Typical)

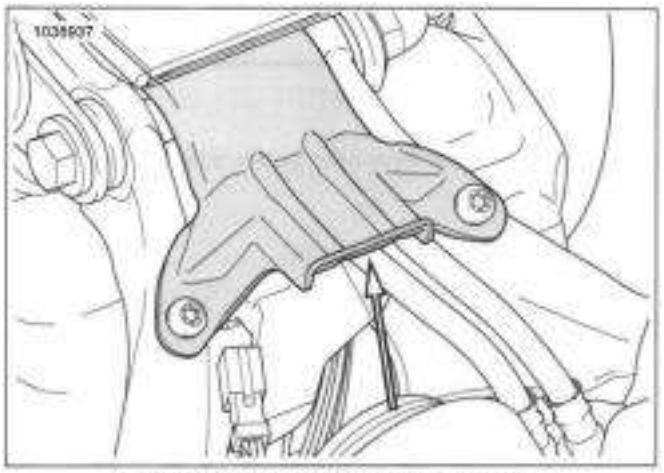
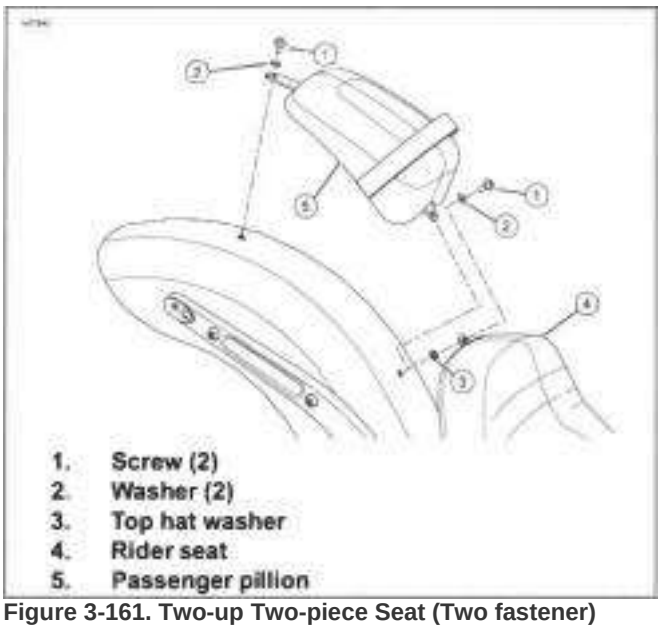
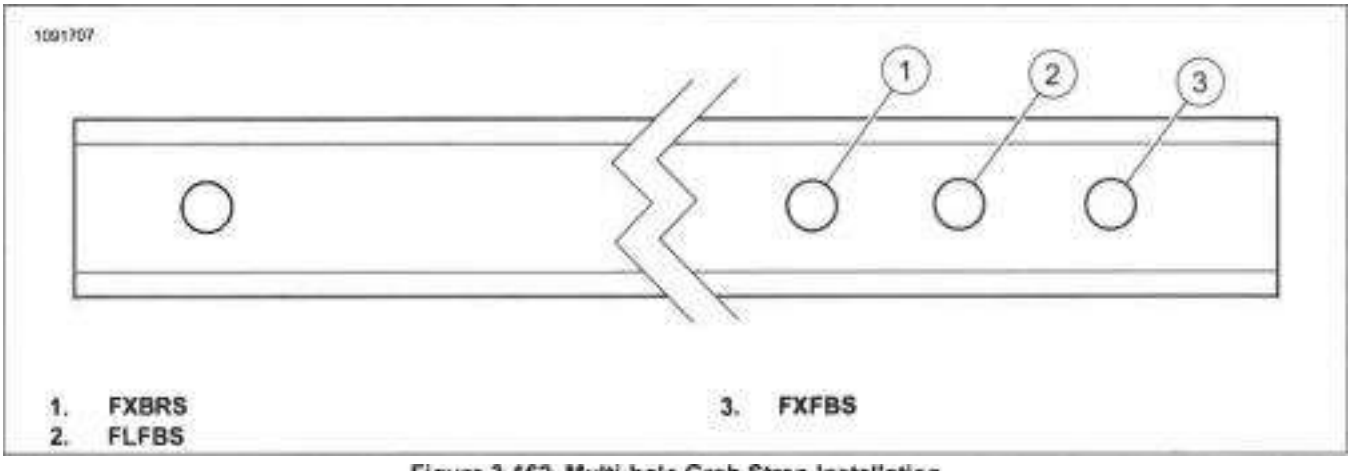


Figure 3-160. Seat Mounting Bracket



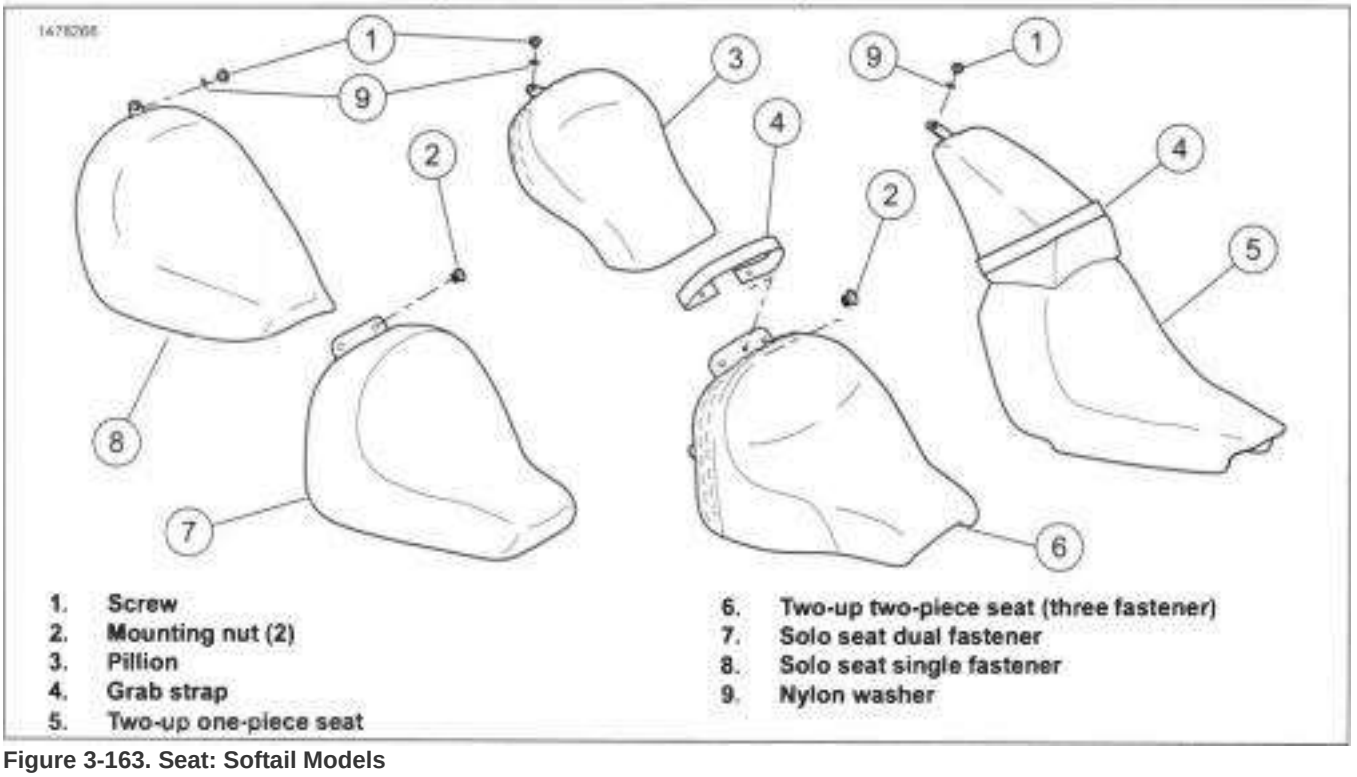
1. Screw (2)
2. Washer (2)
3. Top hat washer
4. Rider seat
5. Passenger pillion

Figure 3-161. Two-up Two-piece Seat (Two fastener)



1. FXBRS
2. FLFBS
3. FXFBS

Figure 3-162. Multi-hole Grab Strap Installation



1. Screw
2. Mounting nut (2)
3. Pillion
4. Grab strap
5. Two-up one-piece seat
6. Two-up two-piece seat (three fastener)
7. Solo seat dual fastener
8. Solo seat single fastener
9. Nylon washer

Figure 3-163. Seat: Softail Models

FRAME CROSSMEMBER

PREPARE

1. Remove seat. See SEAT (Page 3-142).

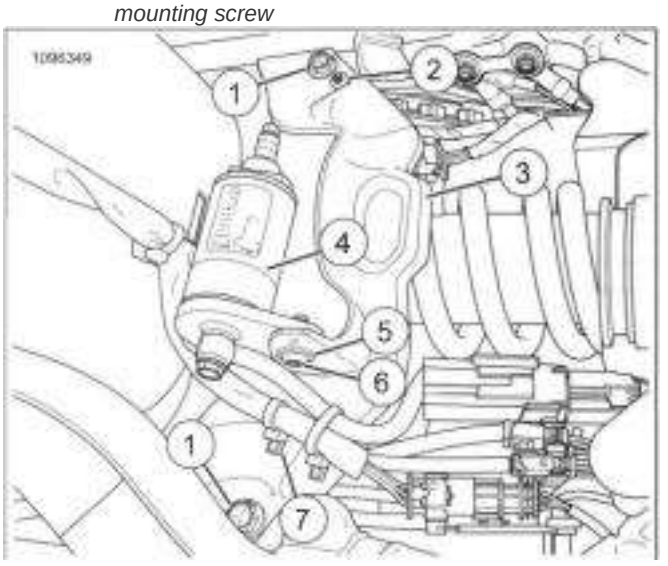
REMOVE

1. See Figure 3-164. Ifequipped with hydraulic under seat adjust shock:
   a. Remove screw (6) and washer (5).
   b. Move preload adjuster (4) forward.
2. Remove wire harness anchor (7).
3. Remove small screw (2).
4. Remove mounting screws (1).
5. Remove frame crossmember (3).

INSTALL

FASTENER	TORQUE VALUE	
ECM caddy small screw	55-60 in-lbs	6.2-6.8 N-m
Frame crossmember mounting screws	17-20 ft-lbs	23.1-27.1 N-m
Shock adjuster mounting screw	90-114 in-lbs	10.2-12.9 N-m

1. See Figure 3-164. Install frame crossmember (3).
2. Install small screw (2) hand tight.
3. Install mounting screws (1). Tighten.
   Torque: 17-20 ft-lbs (23.1-27.1 N-m) *Frame crossmember mounting screws*
4. Tighten small screw.
   Torque: 55-60 in-lbs (6.2-6.8 N-m) *ECM caddy small screw*
5. Install wire harness anchor (7).
6. If equipped with hydraulic under seat adjust shock absorber:
   a. Install preload adjuster (4).
   b. Install screw (6) and washer (5). Tighten.
   Torque: 90-114 in-lbs (10.2-12.9 N-m) *Shock adjuster mounting screw*



1. Mounting screw (2)
2. Small screw
3. Frame crossmember
4. Preload adjuster
5. Washer
6. Screw
7. Wire harness anchor

Figure 3-164. Frame Crossmember

COMPLETE COMPLETE

1. Install seat. See SEAT (Page 3-142).

REMOVE AND INSTALL: STANDARD

APPLICABILITY		
^ • 2022 HERITAGE CLASSIC 114 (FLHCS)		
FASTENER	TORQUE VALUE	
Saddlebag right side mounting bracket grommet screw	96-120 in-lbs	10.9-13.6 N-m
Saddlebag, left side, mounting bracket grommet screw	96-120 in-lbs	10.9-13.6 N-m
Saddlebag, left side, mounting bracket screw	38-47 ft-lbs	52-64 N-m
Saddlebag, mounting screw	21-27 ft-lbs	29-37 N-m

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

Remove

1. See Figure 3-166. Remove saddlebag.
   a. Open saddlebag lid.
   b. Remove screws (6).
   c. Pull saddlebag (7) out and remove.
   d. Remove spacers (5) and O-rings (4), if necessary.
2. See Figure 3-165. Remove right side mounting bracket grommet.
   a. Remove screw (2).
   b. Remove mounting bracket grommet (1).
3. See Figure 3-166. Remove left side mounting bracket grommet.
   a. Remove screw (2).
   b. Remove mounting bracket grommet (1).
   c. Remove screw (8).
   d. Remove mounting bracket (9).

Install

NOTICE

Check that saddlebag frame(s) are fully seated and tightly secured with mounting hardware. Failure to do so could result in the saddlebags becoming detached and/or damaged. (00171b)

1. See Figure 3-165. Install right side mounting bracket grommet.
   a. Seat the mounting bracket grommet (1) nubs with the holes on frame.
   b. Apply threadlock to screw (2).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screw. Tighten.

      Torque: 96-120 in-lbs (10.9-13.6 N-m) *Saddlebag right side mounting bracket grommet screw*
2. See Figure 3-166. Install left side mounting bracket grommet.
   a. Position mounting bracket (9) on frame.
   b. Apply threadlock to screw (8).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screw. lighten.

      Torque: 38-47 ft-lbs (52-64 N-m) *Saddlebag, left side, mounting bracket screw*
   d. Seat the mounting bracket grommet (1) nubs with the holes on mounting bracket.
   e. Apply threadlock to screw (2).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   f. Install screw. lighten.

      Torque: 96-120 in-lbs (10.9-13.6 N-m) *Saddlebag, left side, mounting bracket grommet screw*
3. Install saddlebag.
   a. Position docking rod (3) on mounting bracket grommet (1).
   b. Slide screws (6) through holes in saddlebag. Install spacers (5) and O-rings (4), if removed.
   c. Apply threadlock to screws (6).

      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   d. Align screws on saddlebag with holes on fender support. Tighten.

      Torque: 21-27 ft-lbs (29-37 N-m) *Saddlebag, mounting screw*

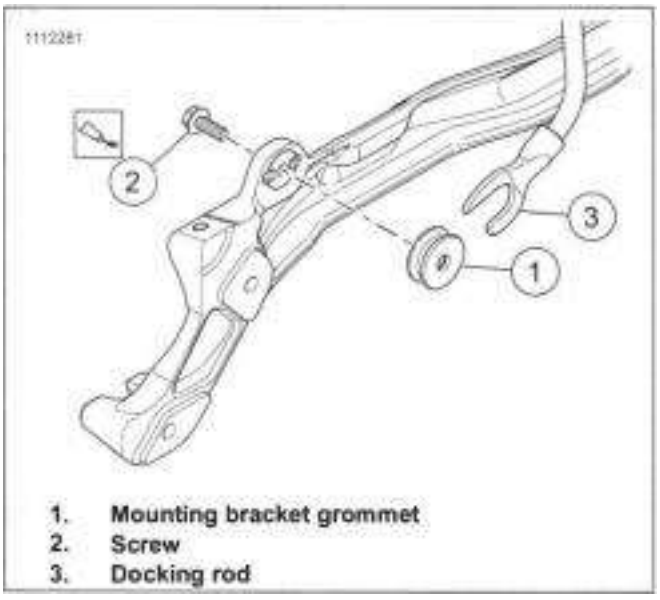


Figure 3-165. Right Side Saddlebag Docking Rod

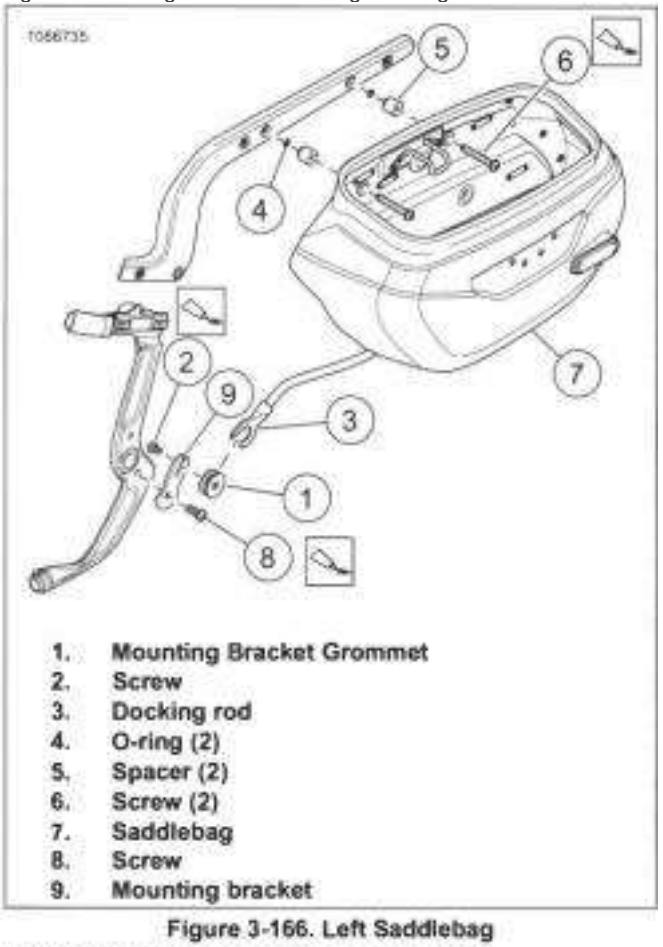


Figure 3-166. Left Saddlebag

REMOVE AND INSTALL: QUICK

DISCONNECT

APPLICABILITY	
0	• 2022 SPORT GLIDE (FLSB) • 2022 LOW RIDER ST (FXLRST)

FASTENER	TORQUE VALUE	
Saddlebag left side mounting bracket grommet screw	97-124 in-lbs	11-14 N-m
Saddlebag, left side, mounting bracket screw	38--47 ft-lbs	52--64 N-m
Saddlebag, mounting bolt	21-27 ft-lbs	29-37 N-m
Saddlebag, right side, mounting bracket grommet screw	97-124 in-lbs	11-14 N-m

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

Remove

1. See Figure 3-167. Remove saddlebag.
   a. Open saddlebag outer clamshell (3).
   b. Pull out and turn lock knob (4) to the unlocked position (5).
   c. Close saddlebag outer clamshell and lower latch lever (2).
   d. See Figure 3-168. Slide saddlebag rearward to disengage the saddlebag docking rod (4) from the mounting bracket grommet (5).
   e. Lift saddlebag away from motorcycle.
2. See Figure 3-169 and Figure 3-170. Remove docking mount.
   a. Remove mounting bolt (5), docking mount (4) and spacer (3).
3. See Figure 3-169. Remove right side mounting bracket grommet.
   a. Remove screw (9).
   b. Remove mounting bracket grommet (7).
4. See Figure 3-170. Remove left side mounting bracket grommet.
   a. Remove screw (9).
   b. Remove mounting bracket grommet (7).
   c. Remove screw (11).
   d. Remove mounting bracket (10).

Install

NOTICE

Check that saddlebag frame(s) are fully seated and tightly secured with mounting hardware. Failure to do so could result in the saddlebags becoming detached and/or damaged. (00171b)

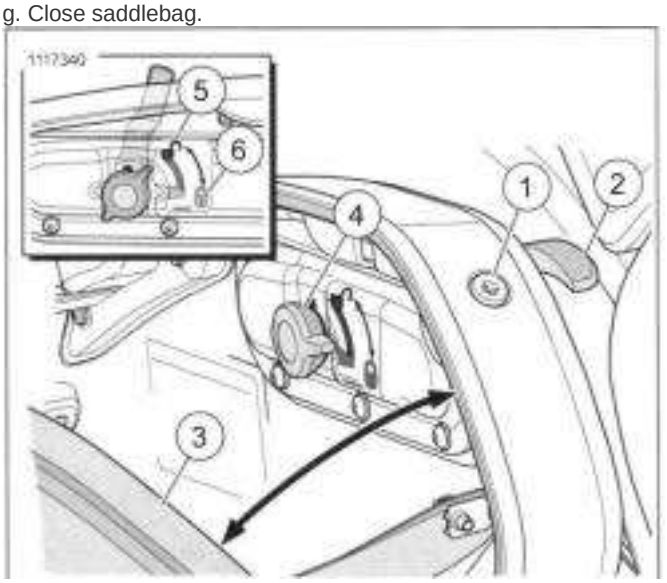
1. See Figure 3-169 and Figure 3-170. Install docking mount.
   a. Slide docking mount (4) on mounting bolt (5).
   b. Slide spacer (3) on mounting bolt.
   c. Apply threadlock to mounting bolt.
      LOCTITE 243 MEDIUM STRENGTH
      THREADLOCKER AND SEALANT (BLUE) (99642-97)
   d. Install mounting bolt through fender supports into fender mount. Tighten.
      Torque: 21-27 ft-lbs (29--37 N-m) *Saddlebag, mounting bolt*
2. See Figure 3-169. Install right side mounting bracket grommet.
   a. Seat the mounting bracket grommet (7) nubs with the holes on bracket (8).
   b. Apply threadlock to screw (9).
      LOCTITE 243 MEDIUM STRENGTH
      THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screw. Tighten.
      Torque: 97-124 in-lbs (11-14 N-m) *Saddlebag, right side, mounting bracket grommet screw*
3. See Figure 3-170. Install left side mounting bracket grommet.
   a. Position mounting bracket (10) on frame (8).
   b. Apply threadlock to screw (11).
      LOCTITE 243 MEDIUM STRENGTH
      THREADLOCKER AND SEALANT (BLUE) (99642-97)
   c. Install screw. Tighten.
      Torque: 38-47 ft-lbs (52-64 N-m) *Saddlebag, left side, mounting bracket screw*
   d. Seat the mounting bracket grommet (7) nubs with the holes on mounting bracket.
   e. Apply threadlock to screw (9).
      LOCTITE 243 MEDIUM STRENGTH
      THREADLOCKER AND SEALANT (BLUE) (99642-97)
   f. Install screw. Tighten.
      Torque: 97-124 in-lbs (11-14 N-m) *Saddlebag left side mounting bracket grommet screw*
4. See Figure 3-167. Install saddlebag.
   a. Open saddlebag outer clamshell (3).
   b. Pull out and turn lock knob (4) to the unlocked position (5).
   c. See Figure 3-168. Place saddlebag mounting bracket (2) on mounting studs (3) while aligning the saddlebag docking rod (4) with the mounting bracket grommet (5). Slide saddlebag completely forward.
   d. See Figure 3-167. Rotate lock knob to the locked position (6) until a click is heard. Without pulling out on the knob, verify that knob cannot rotate back to the unlocked position.

NOTE

Indicator flag (1) is for showing when lock knob is unlocked only. Do not use indicator flag to lock or unlock saddlebag from motorcycle.

   e. See Figure 3-168. Verify the indicator flag is not showing and saddlebag is securely fastened.
   f. Pull saddlebag rearward to verify it is secure.

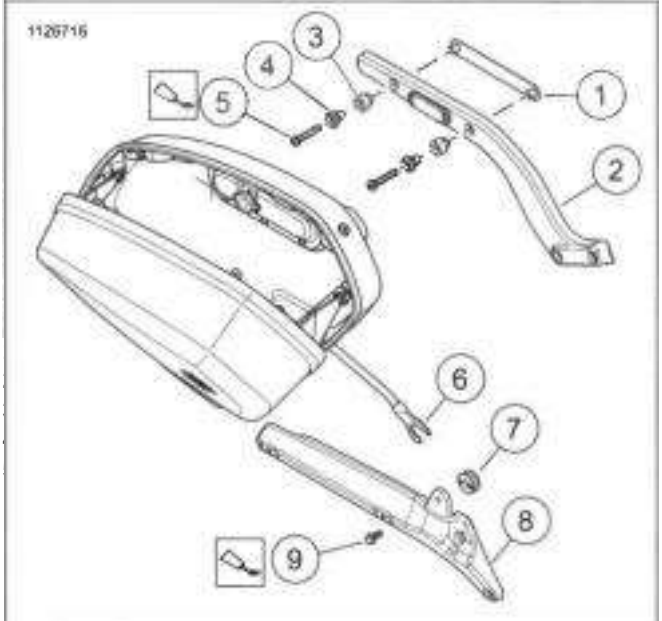
g. Close saddlebag.



1. Lock
2. Latch lever
3. Outer clamshell
4. Lock knob
5. Unlocked position
6. Locked position

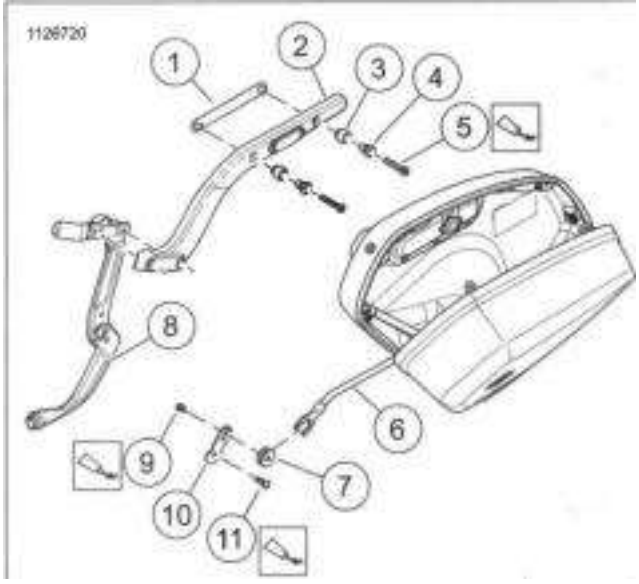
Figure 3-167. Saddlebag Lock Knob

Figure 3-168. Saddlebag Mounting Bracket



1. Fender mount
2. Fender support
3. Spacer
4. Docking mount
5. Mounting bolt
6. Docking rod
7. Mounting bracket grommet
8. Bracket
9. Screw

Figure 3-169. Right Side Quick Disconnect Saddlebag



1. ender mount
2. ender support
3. pacer
4. ocking mount
5. ounting bolt
6. ocking rod
7. ounting bracket grommet
8. rame
9. crew
10. ounting bracket
11. crew

Figure 3-170. Left Side Quick Disconnect Saddlebag

DISASSEMBLE AND ASSEMBLE: STANDARD

APPLICABILITY	
0	• 2022 HERITAGE CLASSIC 114 (FLHCS)

FASTENER	TORQUE VALUE
Saddlebag hinge screw	18-25 in-lbs 2-2.8 N-m
Saddlebag lockset nut	45-55 in-lbs 5.1-6.2 N-m
Saddlebag tether to lid	8-15 in-lbs 0.9-1.7 N-m

Disassemble

1. See Figure 3-171. Remove saddlebag lid.
   a. Open saddlebag lid (4).
   b. Remove screws (7) and tether bracket (14).
   c. Remove screws (8) and medallion (15).
   d. Remove saddlebag lid.
2. Remove reflector.
   a. Remove retainer clips (11).

b. Remove reflector bracket (9) and reflector (10).

3. **Remove lock assembly.**

   a. **Remove nut (6) and lockwasher (5).**

b. Remove lock (1), gasket (2) and bezel (3).

4. See Figure 3-173. Remove lockset.

   a. Place key in lock.
   b. Turn key half way between locked and open so the tumbler (3) shows in the access hole (2).
   c. Place a pin in the access hole. Press down the tumbler and slide out the lockset (4).

5. See Figure 3-171. Remove saddlebag gasket.

   a. Open saddlebag lid (4).
   b. Remove screws (7) from the tether bracket (14) and saddlebag lid.
   c. Completely remove gasket (13).

NOTE

Do not remove stitching.

Assemble

1. See Figure 3-172. Install saddlebag gasket.

   a. Align the new gasket (1) with the center of the tether (2) on the saddlebag lip.
   b. Press the gasket firmly onto saddlebag lip.
   c. Continue pressing gasket around saddlebag lip until gasket ends meet.
   d. Trim gasket to length and press onto lip.
   e. See Figure 3-171. Place tether bracket (14) beneath tether (12) and install screws (7) into bracket on the lid (4). Tighten.

      Torque: 8-15 in-lbs (0.9-1.7 N-m) ***Saddlebag tether to lid screw***

2. See Figure 3-174. Install lockset.

   a. Place key in lockset (2).
   b. Align notches (1) on lockset as shown. Pull key out.
   c. Align cam (6) and housing notches (5) in the open position as shown.
   d. Verify the cam is in the open position by pressing down on the spring loaded lockset housing.

NOTE

If you can not press ***down on the spring loaded lockset housing the cam*** is ***in the locked position.***

   e. Align the lockset notches with the housing notches and slide together.
   f. Verify the operation of the lock.

NOTE

In the locked position the lockset should not be able to be pressed in.

3. See Figure 3-171. Install lock assembly.

   a. Place bezel (3) through opening on saddlebag lid (4).
   b. Place gasket (2) on lock (1).
   c. Place lock through bezel.
   d. Place lockwasher (5) on bottom of bezel and install nut (6).
   e. Tighten nut.

      Torque: 45-55 in-lbs (5.1-6.2 N-m) ***Saddlebag lockset nut***

4. Install reflector.

   a. Place reflector (10) and bracket (9) on saddlebag as shown.
   b. Install retainer clips (11).

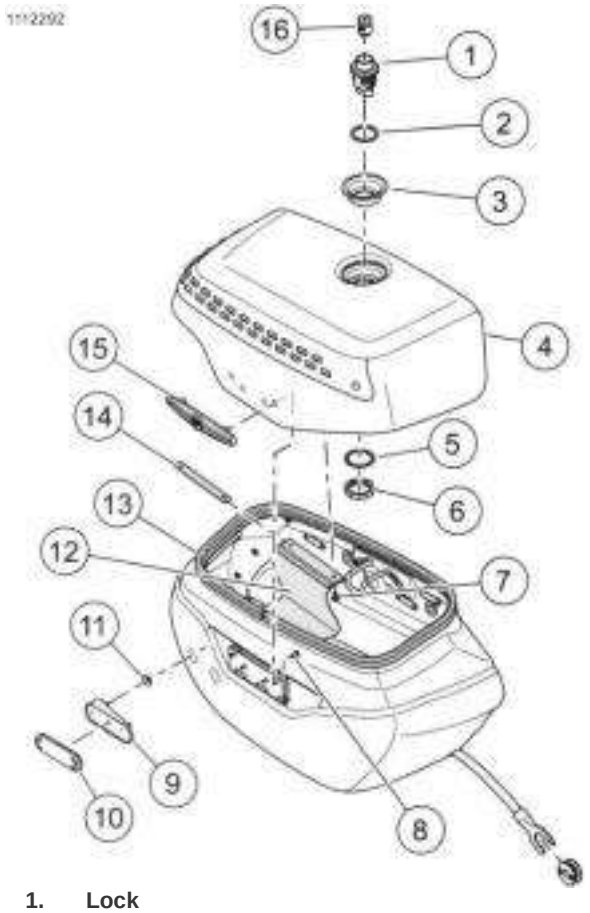
5. Install saddlebag lid.

   a. Place medallion (15) on saddlebag lid (4).
   b. Align the holes on hinge with holes on lid.
   c. Install screws (8) through hinge and into medallion. Tighten.

      Torque: 18-25 in-lbs (2-2.8 N-m) ***Saddlebag hinge screw***

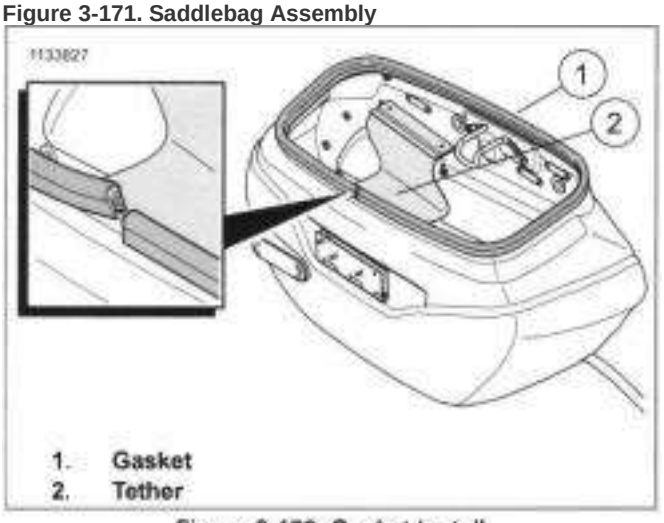
   d. Place tether bracket (14) beneath tether (12) and install screws (7) into bracket on the lid. Tighten.

      Torque: 8-15 in-lbs (0.9-1.7 N-m) ***Saddlebag tether to lid screw***



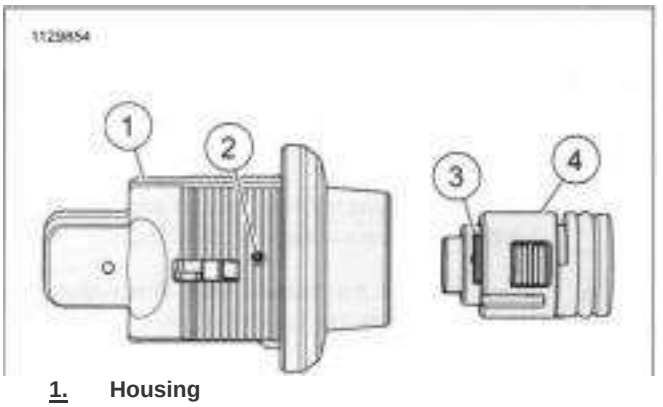
1. Lock
2. Gasket
3. Bezel
4. Saddlebag lid
5. Lockwasher
6. Nut
7. Screw (2)
8. Screw (4)
9. Reflector bracket
10. Reflector
11. Retainer clip (2)
12. Tether
13. Gasket
14. Tether bracket
15. Medallion
16. Lockset

Figure 3-171. Saddlebag Assembly



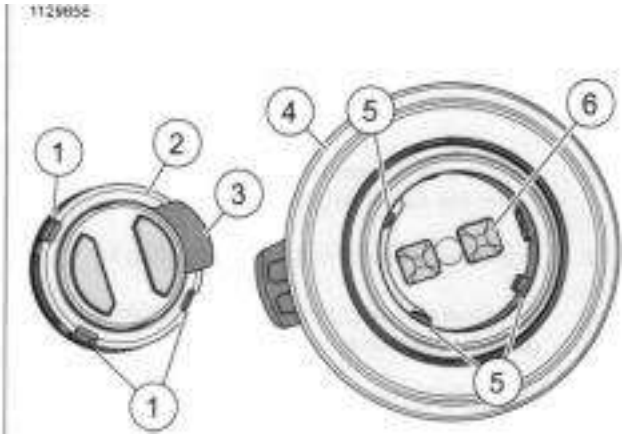
1. Gasket
2. Tether

Figure 3-172. Gasket Install



1. Housing
2. Access hole
3. Tumbler
4. Lockset

Figure 3-173. Lockset Removal



1. Lockset notch (3)
2. Lockset
3. Tumbler
4. Housing
5. Housing notch (3)
6. Cam

Figure 3-174. Lockset in Unlocked Position

DISASSEMBLE AND ASSEMBLE: QUICK DISCONNECT

APPLICABILITY		
ryf ■ 2022 SPORT GLIDE (FLSB) ^ ■ 2022 LOW RIDER ST (FXLRST)		
FASTENER	**TORQUE VALUE**	
Saddlebag docking rod	13-15 ft-lbs	17-21 N-m
Saddlebag hinge screw	20-30 in-lbs	2.3-3.4 N-m
Saddlebag indicator flag cover screw	24-36 in-lbs	2.7-4.1 N-m
Saddlebag latch assembly	10-15 in-lbs	1.1-1.7 N-m
Saddlebag latch lever screw	20-30 in-lbs	2.3-3.4 N-m
Saddlebag locking knob cover screw	97-120 in-lbs	11-13.6 N-m
Saddlebag locking knob screw	97-120 in-lbs	11-13.6 N-m

FASTENER	TORQUE VALUE	
Saddlebag strike screw	20-30 in-lbs	2.3-3.4 N-m
Saddlebag tether screw	45-55 in-lbs	5.1-6.2 N-m
Saddlebag tether stud	45-55 in-lbs	5.1-6.2 N-m
saddlebag lock screw	15-20 in-lbs	1.7-2.3 N-m

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

Disassemble

1. See Figure 3-175. Remove outer clamshell.
   a. Open saddlebag.
   b. Pry out slightly on damper clip (9) on lower damper (1) while pulling damper from stud (7).

NOTE

Do not remove clip from damper.

   c. Remove two screws (4) attached to the outer clamshell (6).
   d. See Figure 3-176. If necessary remove gasket (2) from outer clamshell (1).
   e. Remove hinge screws (4) from outer clamshell.
   f. Remove outer clamshell.
2. See Figure 3-175. Remove damper.
   a. Pry out slightly on damper clip (9) on upper damper (1) while pulling damper from stud (7).

NOTE

Do not remove clip from damper.

   b. Remove damper (1).
3. Remove tether.
   a. Remove remaining screw (4) from inner clamshell (3) .
   b. Remove studs (7).
   c. Remove tether (5).
4. See Figure 3-176. Remove strikes.
   a. Remove screws (9).
   b. Remove strikes (8).
5. Remove medallions. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).
6. See Figure 3-177. Remove hinges.
   a. Remove screws (6).
   b. Remove hinges (7).
7. Remove docking rod.
   a. Remove docking rod screws (8).
   b. Remove docking rod (5).
8. Remove latch assembly.
   a. Remove screw (11).
   b. Remove latch lever (4) and O-ring (3) from inner clamshell (2).
   c. Remove screws (12) on front of latch.
   d. Remove latch assembly (1).
9. Remove lock.
   a. Place lock (10) in the unlocked position.
   b. Remove screws (9).
   c. Remove lock.
10. See Figure 3-178. Remove lock knob assembly.
   a. Remove screws (8) and indicator flag cover (9).
   b. Remove cap (17).
   c. Remove nut (16) and screw (7).
   d. Remove lock knob (15).
   e. Remove screws (1) and cover (13).
   f. Remove latching arm cover (10), spacer (4) and spring (5).
   g. Remove indicator flag (12) and latching arm (11) from latching arm cover.
   h. Remove grommets (6).
   i. Remove seals (14).
11. Remove Retaining clip.
   a. Pry center of clip (2) out.
   b. Remove clip.

Assemble

1. See Figure 3-176. Install strikes.
   a. Place strikes (8) on outer clamshell (1).
   b. Apply threadlocker to screws (9).

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

c. Install screws. Tighten.

Torque: 20-30 in-lbs (2.3-3.4 N-m) *Saddlebag strike screw*

2. Install medallions and reflectors.

a. Clean mounting surface. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156)

b. With the adhesive backing still in place, test fit the medallions (10) and reflectors.

c. Remove the adhesive backing.

d. Install medallions and reflectors.

e. Press firmly to make sure that there is good adhesion.

3. Install hinges.

a. Position hinges (6) on outer clamshell (1).

b. Apply threadlocker to screws (4).

c. Install screws. Tighten.
Torque: 20-30 in-lbs (2.0-3.4 N-m) *Saddlebag hinge screw*

4. Install gasket.

a. Clean gasket surface (3). See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).

b. Trim gasket (2) to length.

NOTE

Do not stretch gasket. Gasket split (5) should be located on the bottom of clamshell.

c. Install gasket at midpoint (7) of hinge area. Press gasket firmly in place.

5. See Figure 3-178. Install lock knob assembly.

a. Install bushings (6) to latching arm cover (10).

NOTE

Grommet tabs must be fully seated.

b. Replace seals (14) on locking knob cover (13).

c. Place indicator flag (12) on latching arm (11) and slide through opening on latching arm cover.

d. Place spring (5) and spacer (4) on latching arm.

e. Place locking knob cover on inner clamshell (3) aligning the holes.

f. Place locking knob cover (13) on inner clamshell.

g. Install screws (1). Tighten.

Torque: 97-120 in-lbs (11-13.6 N-m) *Saddlebag locking knob cover screw*

h. Place pins on locking knob (15) into holes on latching arm.

i. Install screw (7) through assembly and install new lock nut (16). Tighten.

Torque: 97-120 in-lbs (11-13.6 N-m) *Saddlebag locking knob screw*

j. Install cap (17).

k. Place indicator flag cover (9) on latching arm cover.

l. Apply threadlocker to screws (8).

m. Install screws. Tighten.
Torque: 24-36 in-lbs (2.7--4.1 N-m) *Saddlebag indicator flag cover screw*

n. Verify operation.

6. Install retaining clips.

a. Place new clips (2) in position and press in place.

7. See Figure 3-177. Install lock.

a. Place lock (10) in the unlocked position.
b. Place lock onto latch assembly (1).

NOTE

Lock pin should be toward inner clamshell.

c. Install screws (9). Tighten.

Torque: 10-20 in-lbs (1.7-2.3 N-m) *saddlebag lock screw*

d. Verify lock installation.

8. Install latch assembly.

a. Place latch (1) in position on inner clamshell (2).
b. Install screws (12). Tighten.

Torque: 10-15 in-lbs (1.1-1.7 N-m) *Saddlebag latch assembly*

c. Place O-ring (3) on latch lever (4) and position on inner clamshell.

d. Install screw (11). Tighten.

Torque: 20-30 in-lbs (2.3-3.4 N-m) *Saddlebag latch lever screw*

9. Install docking rod.

a. Place docking rod (5) on inner clamshell (2).

b. Apply threadlocker to screws (8).

c. Install screws. Tighten.

Torque: 13-15ft-lbs (17-21 N-m) ***Saddlebag docking rod***

10. Install outer clamshell.

a. Align outer clamshell with inner clamshell.

b. Position outer clamshell hinges (7) in inner clamshell hinge slot.

c. Apply threadlocker to screws (6).

d. Install screws. Tighten.

Torque: 20-30 **in-lbs** (2.3-3.4 N-m) ***Saddlebag hinge screw***

e. See Figure 3-175. Place tether (5) in position.

f. Apply threadlocker to screws (4).

g. Install screws.

Torque: 45-55 **in-lbs** (5.1-6.2 N-m) ***Saddlebag tether screw***

h. Install studs (7).

Torque: 45-55 **in-lbs** (5.1-6.2 N-m) ***Saddlebag tether stud***

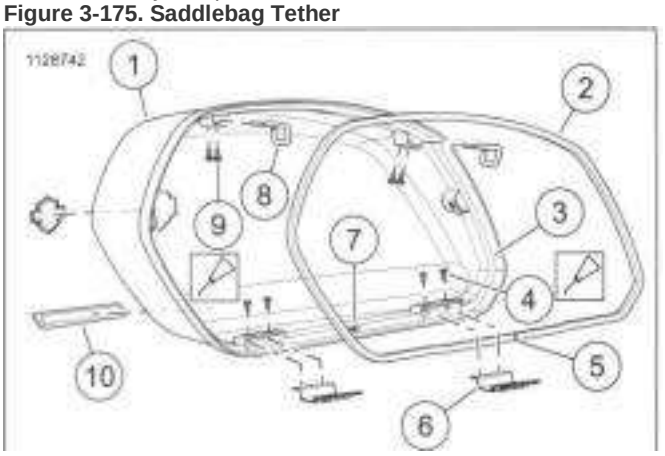
i. Slide damper (1) through tether loop (2).

NOTE
Rod end of damper oriented toward outer clamshell.

j. Press damper on studs to secure.

k. Verify damper is secure.

Figure 3-175. Saddlebag Tether



1. **Outer clamshell**
2. **Gasket**
3. **Gasket surface**
4. **Hinge screw (4)**
5. **Gasket split**
6. **Hinge (2)**
7. **Gasket gap location**
8. **Strike (2)**
9. **Screw (4)**
10. **Medallions and reflectors (2)**

Figure 3-176. Outer Clamshell Assembly

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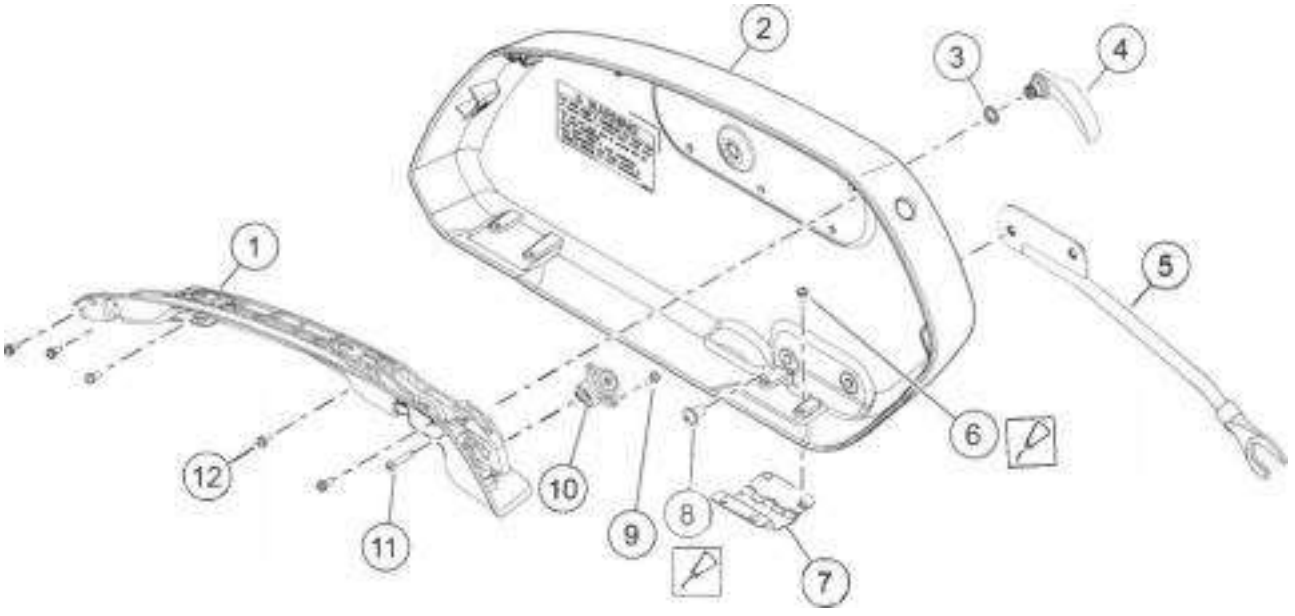
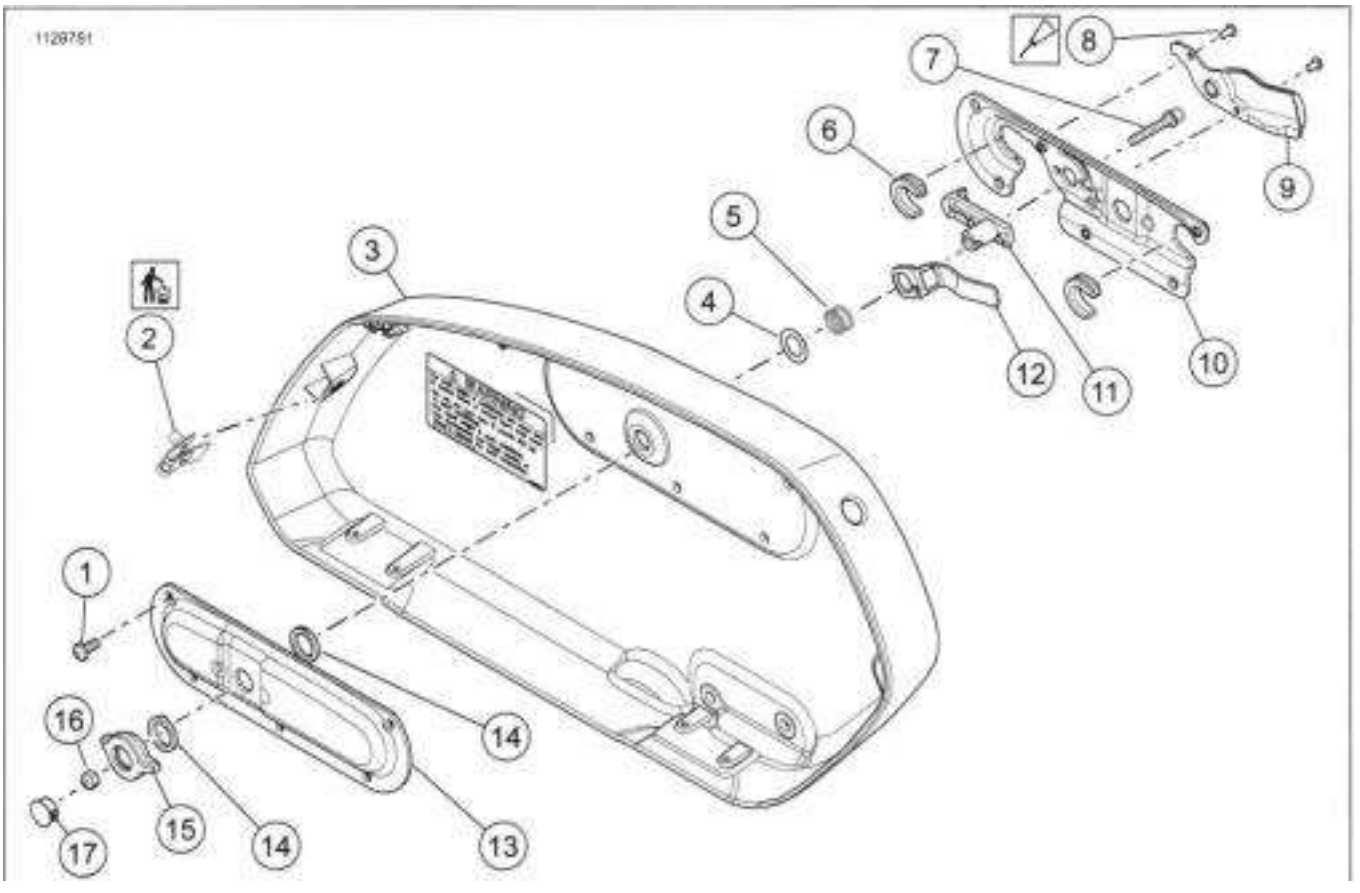


	Latch assembly	7.	Hinge (2)
	Inner clamshell	8.	Screw (2)
	O-ring	9.	Screw (2)
	Latch lever	10.	Lock
	Docking rod	11.	Screw (1)
	Hinge screw (4)	12.	Screw (5)

1.
2.
3.
4.
5.
6.

Figure 3-177. Latch Assembly



1. Screw (5)
2. Clip (5)
3. Inner clamshell
4. Spacer
5. Spring
6. Bushing (2)
7. Screw
8. Screw (2)
9. Indicator flag cover
10. Latching arm cover
11. Latching arm
12. Indicator flag
13. Locking knob cover
14. Seal (2)
15. Locking knob
16. Lock nut
17. Cap

Figure 3-178. Inner lock knob Assembly

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 REMOVERQ

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

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.

°C).

SUBJECT PAGE NO.

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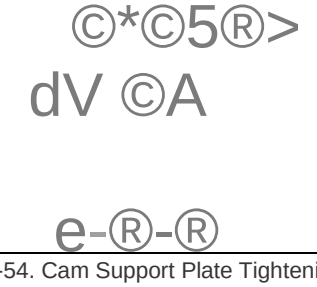
NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Balancer bearing screw	80-110 in-lbs	9-12.4 N-m	4.25 CRANKCASE, Repair Right Crankcase Half
Balancer bearing screw	80-110 in-lbs	9-12.4 N-m	4.25 CRANKCASE, Repair Left Crankcase Half H
Breather screw	90-120 in-lbs	10.2-13.6 N-m	4.15 BREATHERS, Install
Cam chain tensioner fasteners	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Cam needle bearing installation maximum torque	25 ft-lbs	33.9 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Camshaft Needle Bearings
Camshaft cover screws	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Remove and Install: Camshaft Cover
Camshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N-m	4.22 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	4.22 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	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Camshaft timer cover screws	25-35 in-lbs	2.8-4 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Remove and Install: Camshaft Cover
Cam support plate screws	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Crankcase oil check valve or plug with O-ring	18-22 ft-lbs	24.4-29.8 N-m	4.10 OIL CHECK VALVE, Install
Crankcase oil check valve or plug with O-ring	18-22 ft-lbs	24.4-29.8 N-m	4.25 CRANKCASE, Plugs and Oil Fittings
Crankcase screws, first torque	120 in-lbs	13.6 N-m	4.25 CRANKCASE, Assemble
Crankcase screws, last torque	15-19 ft-lbs	20.3-25.8 N-m	4.25 CRANKCASE, Assemble
Crankcase tapered plugs	120-144 in-lbs	13.6-16.3 N-m	4.25 CRANKCASE, Plugs and Oil Fittings
Crankshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install Apply LOCTITE 262 HIGH STRENGTH THREAD-LOCKER AND SEALANT (red)
Crankshaft sprocket screw, alignment check torque	15.0 ft-lbs	20.3 N-m	4.22 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	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Cylinder head nut torque step 1.	20-30 ft-lbs	27.1--40.7 N-m	4.19 CYLINDER HEADS, Install Apply ENGINE OIL to new cylinder head bolt washers and threaded portion of the cylinder head bolts. See procedure for torque sequence.
Cylinder head nut torque step 2. Loosen one turn.	-360°	-360°	4.19 CYLINDER HEADS, Install
Cylinder head nut torque step 3.	9-11 ft-lbs	12.2-14.9 N-m	4.19 CYLINDER HEADS, Install
Cylinder head nut torque step 4.	25-27 ft-lbs	33.9-36.6 N-m	4.19 CYLINDER HEADS, Install

FASTENER	TORQUE VALUE		NOTES
Cylinder head nut torque step 5. Tighten additional degree value.	90°	90°	4.19 CYLINDER HEADS, Install
Cylinder stud	120-240 in-lbs	13.6-27.1 N-m	4.25 CRANKCASE, Cylinder Studs
Cylinder temperature sensor	120-180 in-lbs	13.6-20.3 N-m	4.19 CYLINDER HEADS, Assemble
Engine mount bolt, front, lower	50-55 ft-lbs	67.8-74.5 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount pinch bolt, front, lower	8-9 ft-lbs	10.2-12.2 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount screw, front, upper engine bracket	45-50 ft-lbs	61-67.8 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine mount screw, front, upper frame bracket	45-50 ft-lbs	61-67.8 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine mount screw, front, upper frame bracket-to-engine bracket	45-50 ft-lbs	61-67.8 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine mount screw, left side, bracket- to-frame	45-50 ft-lbs	61-67.8 N-m	4.13 LEFT SIDE ENGINE MOUNT, Install
Engine mount screw, left side, bracket- to-head	28-33 ft-lbs	38-44.7 N-m	4.13 LEFT SIDE ENGINE MOUNT, Install
Engine oil drain plug	14-21 ft-lbs	19-28.5 N-m	4.27 OIL PAN, Install
Knock sensor screw	13-17 ft-lbs	17.6-23 N-m	4.19 CYLINDER HEADS, Assemble
Lifter anti-rotation device screw	90-120 in-lbs	10.2-13.6 N-m	4.18 PUSHRODS, LIFTERS AND COVERS, Install
Lifter cover screws	132-156 in-lbs	14.9-17.6 N-m	4.18 PUSHRODS, LIFTERS AND COVERS, Install
Lower rocker cover screws	90-120 in-lbs	10.2-13.6 N-m	4.16 LOWER ROCKER COVERS, Install
Lower rocker cover stud	90-120 in-lbs	10.2-13.6 N-m	4.14 UPPER ROCKER COVERS, Install Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to screws.
Oil cooler cover screw	32-42 in-lbs	3.6-4.7 N-m	4.9 OIL COOLER, Install
Oil cooler screw	84-102 in-lbs	9.5-11.5 N-m	4.9 OIL COOLER, Install
Oil line manifold screws	90-120 in-lbs	10.2-13.6 N-m	4.11 OIL COOLANT LINES, Install Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)
Oil pan fasteners	132-156 in-lbs	14.9-17.6 N-m	4.27 OIL PAN, Install Torque sequence; LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) with used fasteners
Oil pump screws, 1st torque	12-60 in-lbs	1.4-6.8 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Oil pump screws, final torque	90-120 in-lbs	10.2-13.6 N-m	sm0854B (5J  Figure 4-54. Cam Support Plate Tightening Sequence
Piston jet screws	25-35 in-lbs	2.8-3.9 N-m	4.25 CRANKCASE, Repair Right Crankcase Half
Rocker shaft screw	23-27 ft-lbs	31.2-36.6 N-m	4.17 ROCKER ARMS, Install

FASTENER	TORQUE VALUE		NOTES
Spark plug	86-108 in-lbs	9.7-12.2 N-m	4.7 TROUBLESHOOTING, Compression Test
Transmission drain plug	14-21 ft-lbs	19-28.5 N-m	4.27 OIL PAN, Install
Upper rocker cover screws	120-140 in-lbs	13.6-15.8 N-m	4.14 UPPER ROCKER COVERS, Install Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to screws.

ENGINE

Table 4-1. Engine: Milwaukee-Eight™ 107 Engine

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-Type, oil-cooled Single camshaft Dual balance shafts	
Compression ratio	10.0:1	
Bore	3.937 in	100 mm
Stroke	4.375 in	111.1 mm
Displacement	107 in^3	1753 cm^3
Fuel requirement	Premium unleaded	
Lubrication system	Pressurized, dry sump with oil cooler	

Table 4-2. Engine: Milwaukee-Eight™ 114 Engine

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-Type, oil-cooled Single camshaft Dual balance shafts	
Compression ratio	10.5:1	
Bore	4.016 in	102 mm
Stroke	4.500 in	114.3 mm
Displacement	114 in^3	1868 cm^3
Fuel requirement	Premium unleaded	
Lubrication system	Pressurized, dry sump with oil cooler	

Table 4-3. Engine: Air-Cooled Milwaukee-Eight 117 ™

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-type Single camshaft Single balance shaft	
Compression ratio	10.2:1	
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	Oil-cooled cylinder heads with oil cooler	

Table 4-4. Engine Idle Characteristics

CONDITION	DOM*	ALL OTHERS *
Cold start	1450 rpm	1700 rpm
Hot idle	850 rpm	850 rpm
Hot idle; EITMS engaged	950 rpm	950 rpm
Low voltage	200 rpm increase from normal	
* All values are approximate		

Table 4-5. Oiling System

ITEM	SPECIFICATION
Capacity with filter	Air-Cooled (new system): 5 qt (4.7 L)
	Service oil change (initial fill): 4 qt (3.8 L)

Table 4-5. Oiling System

ITEM	SPECIFICATION
Recommended oil	Genuine Harley-Davidson H-D 360 or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50 Motorcycle Oil
Pump	Twin gerotor, dual scavenge, crank mounted and driven, internal oil pump, dry sump
Pressure	35-45 psi (242-310 kPa) at 2000 RPM and normal operating temperature of 230 °F (110 °C)
Filtration	5 micron media, filtered between pump and engine
Cooling	Oil cooler

Table 4-6. Oiling System: Air-Cooled Milwaukee-Eight 117 ™

ITEM	SPECIFICATION
Oil capacity with filter (service oil change)	Air-Cooled (new system): 5.2 qt (4.9 L)
	Service oil change: 4.5 qt (4.3 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

Table 4-7. 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 4-8. Rocker Arm Shaft Specifications

ROCKER ARM SHAFTS	IN	MM
Diameter	0.5538-0.5543	14.067-14.079 |

Table 4-9. Hydraulic Lifter Specifications

HYDRAULIC LIFTERS	IN	MM
Fit in crankcase (loose)	0.0009-0.0026	0.023-0.066

Table 4-10. Cylinder Head Specifications

CYLINDER HEAD	IN	MM
Head gasket surface (flatness)	0-0.003	0-0.08

Table 4-11. 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

Table 4-11. Valve Specifications

VALVES	IN	MM
Valve lash *	0.000-0.003	0.00-0.08
* Variation between valve pairs operated by a common rocker arm.		

Table 4-12. Valve Spring Specifications

VALVE SPRINGS	IN	MM
Closed	63 lbs @ 1.535 in.	280 N @ 39.0 mm
Open	165 lbs @ 1.154 in.	735 N @ 29.3 mm
Free length	1.838 in.	46.69 mm

Table 4-13. Piston

PISTON		IN	MM
Fit in cylinder		0.0025-0.0036	0.064-0.091
Piston pin fit (loose)		0.0002-0.0005	0.005-0.013
Ring end gap	Top compression	0.010-0.016	0.25-0.40
	2nd compression	0.016-0.024	0.40-0.60
	Oil control ring	0.008-0.028	0.20-0.70
Ring side clearance	Top compression	0.0012-0.0027	0.030-0.068
	2nd compression	0.0012-0.0027	0.030-0.068
	Oil control rails	0.001-0.007	0.025-0.178

Table 4-14. 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 4-15. 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 4-16. 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 4-17. 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 4-18. 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 4-19. 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 4-20. 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 4-21. 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 4-22. 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 4-23. Valve Springs

VALVE SPRINGS	IN	MM
Closed	56.8-66.1 lbs @ 1.154 in	253-294 **N** @ 29.3 mm
Open	150.0-172.7 lbs @ 1.091 in	667-768 **N** @ 27.70 mm
Free length	1.838 in	46.70 mm

Table 4-24. Cylinder

CYLINDER	REPLACE IF WEAR EXCEEDS	
	IN	MM
Warpage of gasket sur face: top	0.006	0.152
Warpage of gasket surface: base	0.004	0.102

Table 4-25. Piston

PISTON	REPLACE IF WEAR EXCEEDS	
	IN	MM
Fit in cylinder (loose)	0.0041	0.104
Piston pin fit (loose)	0.0008	0.020

Table 4-25. Piston

PISTON		REPLACE IF WEAR EXCEEDS	
		IN	MM
Ring end gap	Top compression	0.020	0.508
	Second compression	0.030	0.762
	Oil control rails	0.050	1.27
Ring side clearance	Top compression	0.004	0.102
	Second compression	0.004	0.102
	Oil control rails	0.010	0.254

Table 4-26. Connecting Rod

CONNECTING ROD	REPLACE IF WEAR EXCEEDS	
	IN	MM
Piston pin fit (loose)	0.002	0.051

Table 4-27. 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 4-28. 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

ENGINE OIL FLOW

OPERATION

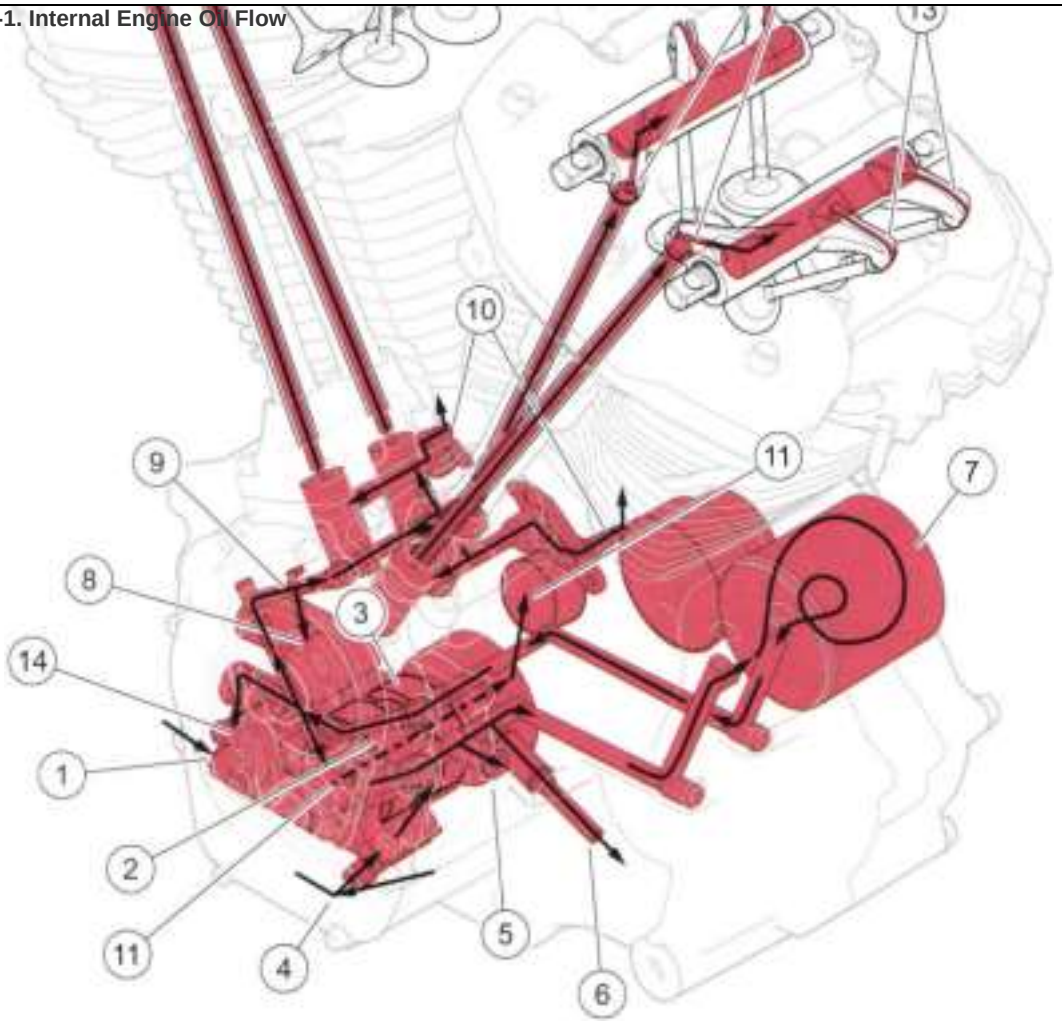
____ _____ oil cooler and circulate oil between the exhaust ports for additional heat control.

Milwaukee-Eight engines are dry sump engines meaning that they have external oil reservoirs. Air cooled engines have an

sm08728

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 out to oil cooler (oil cooled only)**
7. **Oil filter**
8. **Cam plain bearing**
9. **Oil to camshaft, lifters and piston jets**
10. **Piston jets**
11. **Oil through crankshaft to crankpin and rod bearings**
12. **Oil through pushrods to rocker arms**
13. **Oil spillover to lubricate valve stems**
14. **Hydraulic chain tensioner**

Figure 4-1. Internal Engine Oil Flow



Internal Oil Distribution: All

1. See Figure 4-1.

    a. Oil from the oil pan (1) is pulled through ports in the oil pan (not shown), the transmission housing and crankcase

    b. Oil enters the oil pump feed gerotors.

    c. Oil exits the pump and passes oil pressure switch (5) and oil cooler port (6) headed to oil filter (7). Oil cooler port is plugged on Twin-Cooled engines.

    d. Oil exits filter and is directed back into cam support plate where its split between crankshaft, hydraulic chain tensioner (14), and lifters (9).

    e. Crankshaft oil travels through crankshaft to the crankpin and rod bearings (11).

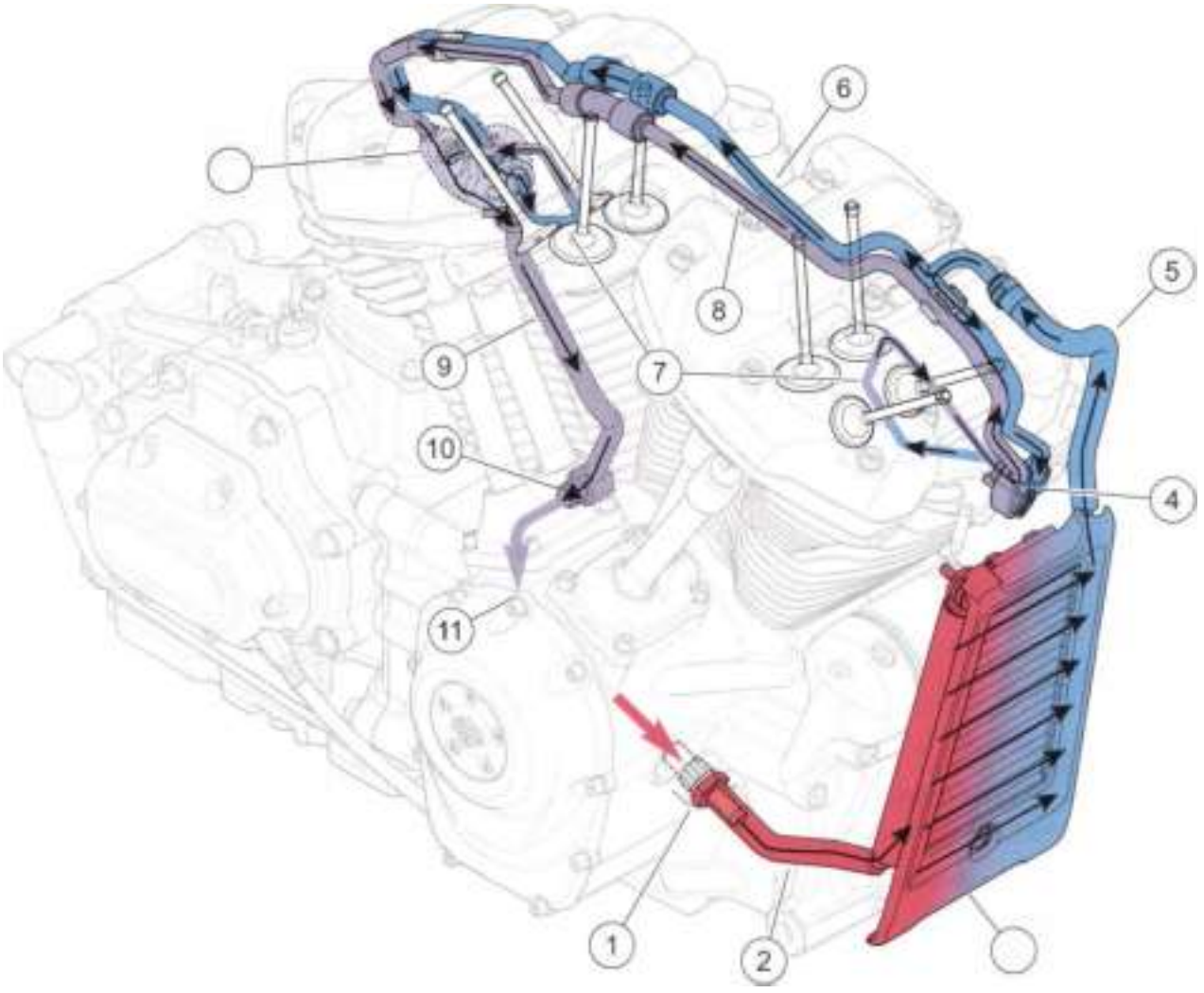
    f. Flow toward lifters splits to cam plain bearing (8), lifters and on to piston jets (10).

    g. Oil flows from lifters up through pushrods to rocker arms (12).

    h. Oil exits rocker arms to lubricate valve stems via spillover (13).

    i. Oil drains through passages in the heads and cylinders back to the camchest cavity. Residual oil in the camchest cavity and the crankcase cavity is picked up by the scavenge port (4) in the pump. Return oil is fed through the scavenge gerotors and case passages back to the oil pan.

    j. Main bearings, balancer bearing and left cam bearing are lubricated by oil splash.



1. Oil out check valve
2. Hose, engine to oil cooler
3. Oil cooler
4. Manifold
5. Hose, oil cooler to supply line
6. Supply oil line
7. Passages around exhaust ports
8. Return oil line
9. Oil return line to transmission
10. Connection to engine oil passage in transmission
11. Return oil to oil pan

Figure 4-2. External Engine Oil Flow: Air Cooled

External Oil Distribution: Air Cooled Only

1. See Figure 4-2.

a. Pressurized oil exits crankcase and flows through check valve (1), hose (2) to oil cooler (3).

b. Oil flows through oil cooler, hose (5) to oil supply line (6) .

c. Oil flow splits at oil supply line (6) and flows to manifolds (4).

d. Oil flows through passages between the exhaust ports (7) in cylinder heads and back to manifolds.

e. Oil flows through return line (8) to return oil line to transmission (9).

f. Return fitting (10) connects to a passage in transmission where it returns to the oil pan (11).

GENERAL

See Figure 4-3. 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.

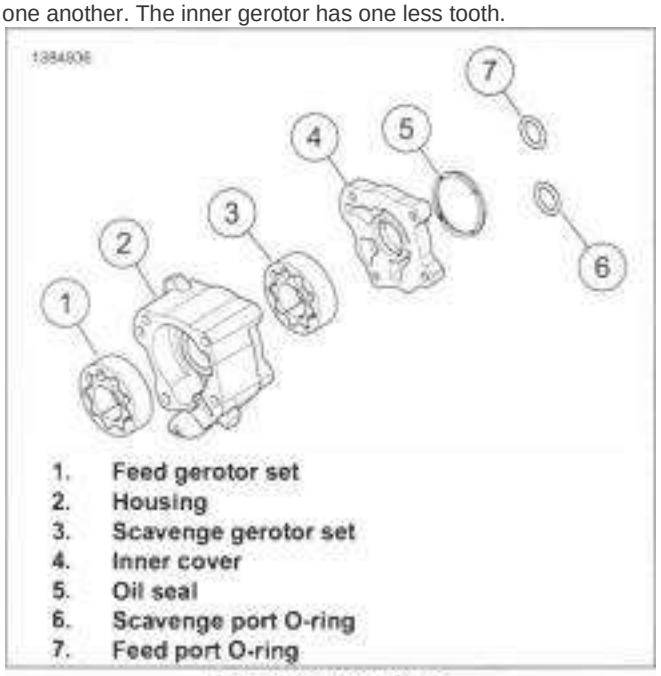


Figure 4-3. Oil Pump

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 4-4. 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 4-5. 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.

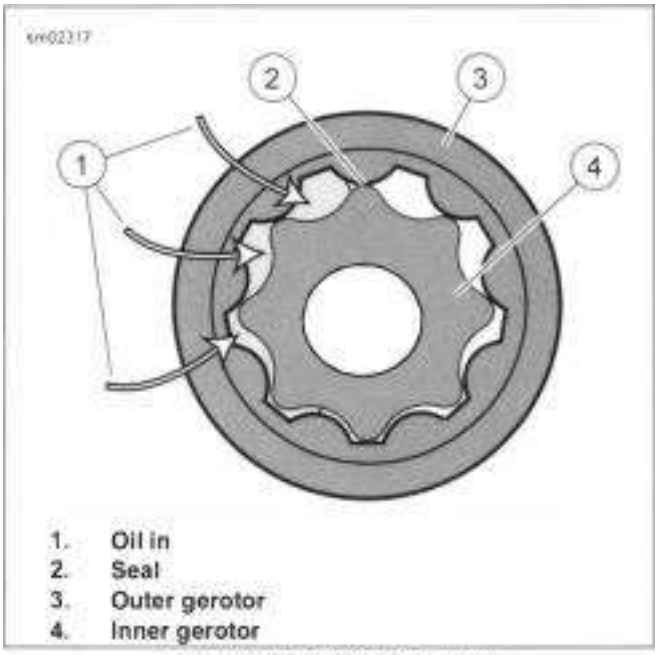


Figure 4-4. Inlet Side Oil Flow

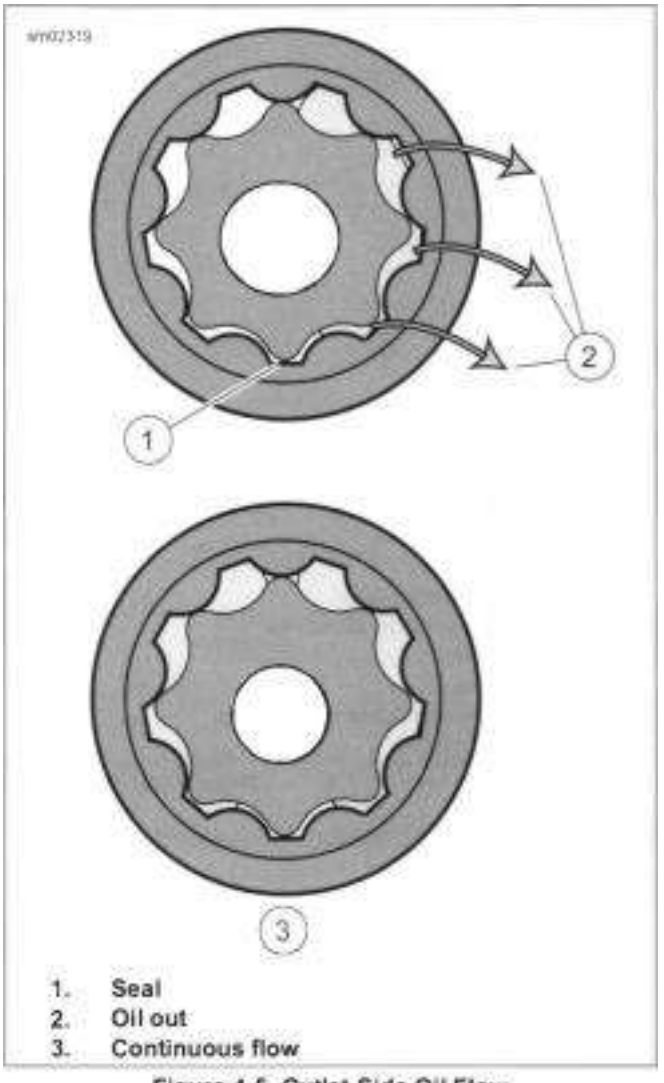


Figure 4-5. Outlet Side Oil Flow

GENERAL

A breather assembly is mounted to each cylinder head to prevent a buildup of pressure caused by the downward force of the pistons. Burning crankcase vapor eliminates the pollutants normally discharged from the crankcase.

See Figure 4-6. As pistons push downward, displaced air in the crankcase is vented through the crankshaft roller bearing into the cam compartment. The air flows up the pushrod covers (1) into the rocker housing. 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 (3).

In the breather assembly, the flow of air passes downward through a labyrinth where most of the oil is separated from the air. It then moves upward through the breather element (4) where the remaining oil is removed. Two small holes in the bottom of the breather housing allow the separated oil to drain back into the crankcase.

Passing through the breather element, the vapor passes through the umbrella valve (2). Vapor passes down into the cylinder head passageway and through the breather bolt (5). It passes through a breather tube (6) into the air filter element where it combines with the intake air stream and is burned during normal combustion.

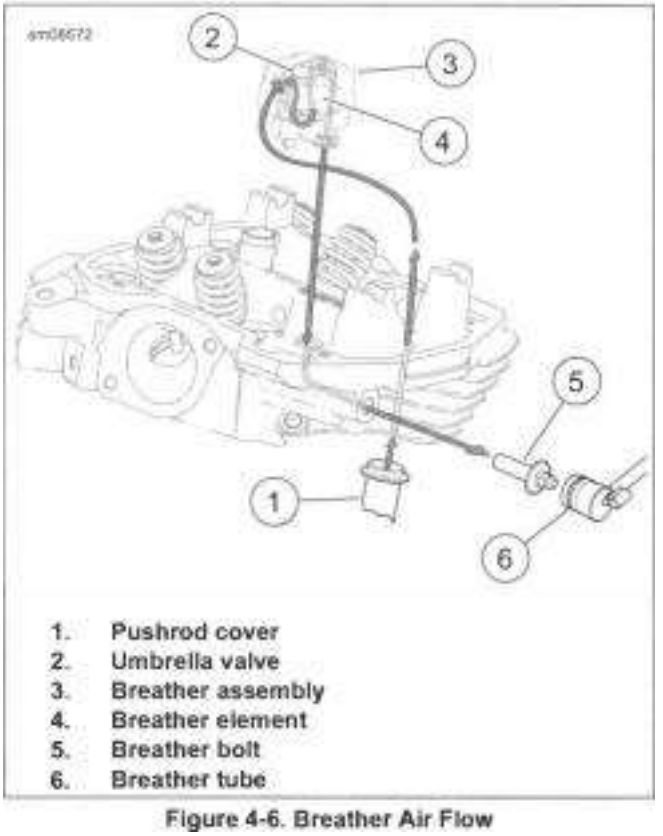


Figure 4-6. Breather Air Flow

OPERATION

See Figure 4-7. The red OIL PRESSURE indicator lamp illuminates to indicate improper pressure of the engine oil. The lamp illuminates when the ignition is initially turned on (before the engine is started), but should extinguish once the engine is running.

NOTICE

If the oil pressure indicator lamp remains lit, always check the oil supply first. If the oil supply is normal and the lamp is still lit, stop the engine at once and do not ride further until the trouble is located and the necessary repairs are made. Failure to do so may result in engine damage. (00157a)

If the indicator lamp does not extinguish, it may be caused by low oil level or diluted oil supply. In freezing weather, the oil feed and return lines can clog with ice or sludge. Other conditions that may cause the lamp to remain lit are:

- Faulty lamp wiring
- Faulty oil pressure sending unit
- Damaged oil pump
- Plugged oil filter element
- Incorrect oil viscosity for the operating temperature
- Fractured or weak spring in the oil pressure relief valve
- Incorrectly installed O-rings in the engine

To troubleshoot the problem, always check the engine oil level first. If the oil level is OK, determine if oil returns to the oil pan. If oil does not return, shut off the engine until the problem is located and corrected.

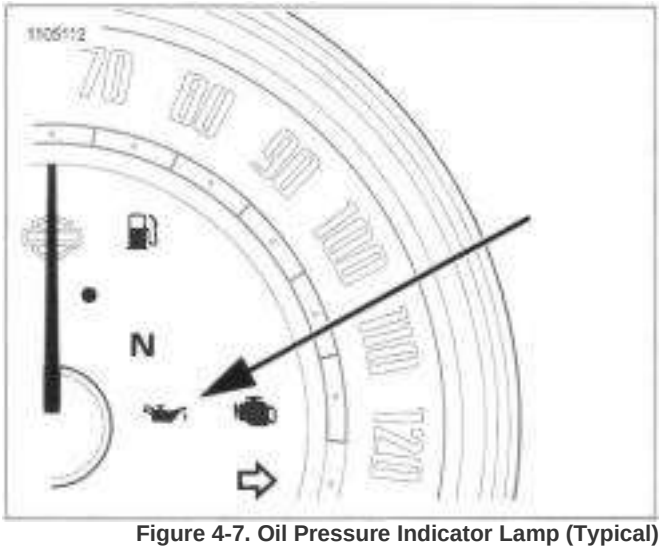


Figure 4-7. Oil Pressure Indicator Lamp (Typical)

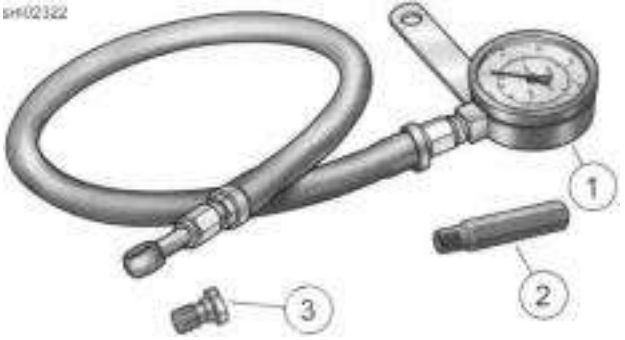
OIL PRESSURE CHECK

PART NUMBER	TOOL NAME
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT

1. Verify that engine oil is at the proper level. See 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 OIL PRESSURE SWITCH (Page 7-28).
5. See Figure 4-8. 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 4-29.
8. Remove oil pressure gauge assembly.
9. Install oil pressure switch. See OIL PRESSURE SWITCH (Page 7-28).

Table 4-29. 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**

Washer *(2)* _____ _____

Figure 4-8. 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 the 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 the symptoms indicate that any one of the above components is worn, service all related parts.

COMPRESSION TEST

Check for cylinder leakage with a compression test. Use

PART NUMBER	TOOL NAME
HD-33223-1	CYLINDER COMPRESSION GAUGE
HD-50549	BORESCOPE

FASTENER	TORQUE VALUE
Spark plug	9.7-12.2 N-m

CYLINDER COMPRESSION GAUGE (PART NUMBER: HD-33223-1) with a screw-in type adapter.

1. Remove all spark plug cables.

2. Remove one spark plug from each cylinder.

NOTE
Never use a ***metal object to hold the throttle plate open.***

3. Open throttle plate.

   a. Remove air cleaner cover and filter. See INSPECT AIR FILTER (Page 2-40).

   b. Disconnect TCA connector [211] from the induction module.

   c. Insert a 0.75 in (19 mm) diameter by 12 in (30.5 cm) long wooden or nylon dowel to hold the throttle valve open.

4. Test compression.

   a. Connect compression tester to front cylinder following manufacturer's instructions.

   b. Crank engine continuously through 5-7 full compression strokes.

   c. Note gauge readings at the end of the first and last compression strokes. Record test results.

   d. Disconnect ACR and repeat test.

   e. Connect ACR.

   f. Repeat steps (a-e) on rear cylinder.

5. Compare with specifications. Refer to Table 4-30

   a. If compression is within specifications and the variance between cylinders is less than 10%, compression is normal.

   b. If readings do not meet specifications, inject 0.5 fl oz (15 ml) engine oil into each cylinder and repeat the compression tests on both cylinders. Readings that are considerably higher during the second test indicate worn piston rings.

   c. Refer to Table 4-31 for possible causes of low compression.

   d. Inspect cylinder using borescope. Refer to Clean and Inspect (Page 4-45) for more detail.

      Special Tool: BORESCOPE (HD-50549)

6. Remove dowel from induction module.

7. Connect TCA connector.

8. Assemble the air cleaner. See INSPECT AIR FILTER (Page 2-40).

9. Install the spark plugs. Connect spark plug wires.
   Torque: 86-108 **in-lbs** (9.7-12.2 N-m) ***Spark plug***

Table 4-30. Compression Specifications

ACR STATUS	PSI	kPa
ACR connected	90 (min)	621 (min)
ACR disconnected	175 (min)	1207 (min)

Table 4-31. 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 the leakdown tester is free from leakage.

   Special Tool: CYLINDER LEAKDOWN TESTER (HD-35667-A)

   a. Apply a soap/water solution around all tester fittings.

   b. Connect cylinder leakdown tester to compressed air source.

   c. Bubbles indicate leakage.

2. ***NOTE***

Perform the test with the ignition switch turned OFF

   Remove one spark plug per cylinder.

3. Set piston in the cylinder being tested at top dead center (TDC) of compression stroke (both valves closed).

4. ***NOTE***

Never use CRANKSHAFT LOCKING TOOL (PART NUMBER: HD-52252) for procedures such as servicing the compensator, servicing the clutch or servicing the camshaft. Crankcase damage will result.

   Lock the crankshaft.

   a. Remove CKP. See CRANKSHAFT POSITION SENSOR (CKP) (Page 7-78).

   b. Install crankshaft locking tool.

      Special Tool: CRANKSHAFT LOCKING TOOL (HD-52252)

5. Follow the manufacturer's instructions to perform the leakdown test.

   a. Record the percent of leakage.

   b. Listen for air leaks at throttle body, exhaust pipe, oil fill spout and head gasket.

6. Verify that the piston is still at TDC. Repeat the test if it moved.

7. Results:

   a. Leakage greater than 25 percent indicates that further diagnosis is warranted.

   b. Air escaping through the throttle body indicates leaking past intake valves.

   c. Air escaping through the exhaust pipe indicates leaking past exhaust valves.

   d. Air sound from the oil fill spout indicates leaking past piston rings.

   e. Inspect cylinder using borescope. Refer to Clean and Inspect (Page 4-45) for more detail.

      Special Tool: BORESCOPE (HD-50549)

8. Remove crankshaft locking tool.

MEASURECRANKSHAFT RUNOUT

Crankshaft Installed

NOTE

- ***Perform the following checks during engine disassembly as a method to determine condition of crankshaft and whether crankshaft is suitable for reuse. The checks can be done with the engine either installed in the frame or removed.***
- ***Dial indicators must be set up and zeroed perpendicular to the shaft in both directions. The indicator 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 or the bolt holes.***
- ***Never secure the dial indicator base to the vehicle frame. Movement within the engine mounts will result in a false reading.***
- ***While rotating the crankshaft, the indicator needle may move to both the minus and plus sides of zero. The total indicator reading is the value to record.***

1. **Right Side**

   a. Remove spark plugs.

   b. Remove the cam support plate. See CAM COMPARTMENT AND COMPONENTS (Page 4-53).

   c. Secure a dial indicator base to a stable location (crankcase, engine stand, etc.).

NOTE

To obtain an accurate measurement, the dial indicator must be set up perpendicular in both directions to the shaft being measured.

   d. Attach a dial indicator and set it up to measure runout at the cam plate bearing contact area of the crankshaft. Adjust the indicator to zero.

   e. Slowly rotate the crankshaft one complete revolution and record the total needle movement.

   f. Compare results of measurements. If the total indicator reading exceeds service wear limit, the crankshaft/flywheel assembly should be removed and checked on a truing stand. Refer to Table 4-32.

2. Left Side
   a. Remove spark plugs.
   b. Remove the primary cover and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
   c. Secure a dial indicator base to a stable location (crankcase, engine stand, etc.).

NOTE

To obtain an accurate measurement, the dial indicator must be set up perpendicular in both directions to the shaft being measured.

   d. Attach a dial indicator set up to measure runout near the end of the splined area of the crankshaft. Adjust the indicator to zero on the "high" part of one spline.
   e. Mark the crankshaft and crankcase to use as reference for the amount of rotation.

NOTE

Pay attention to only the values from the "high"part of the splines.

   f. Slowly rotate the crankshaft one complete revolution and record the total needle movement.
   g. Compare results to Table 4-32. If the total indicator reading exceeds service wear limit, remove the crankshaft/flywheel assembly and check on a truing stand.

Crankshaft Removed

NOTE

- ***The following procedure should be performed if the crankshaft/flywheel assembly is suspected of being out-of-true.***
- ***The crankshaft must be supported by the bearing races during inspection. Never use centers as the holes may not be perfectly centered.***
- ***Verify that the bearing races are in good condition and suitable for performing this inspection.***

1. See Figure 4-9. Mount crankshaft in truing stand so it is supported on the bearing races (1) by the roller supports (2).
2. Secure a dial indicator mount near each end of the crankshaft.

NOTE

Dial indicators must be perpendicular to the shaft in both directions.

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 the crankshaft assembly while observing the total indicator reading.

NOTE

Twin Cam crankshaft/flywheel assemblies are not serviceable. Replace parts not within specifications.

6. Compare results of measurements. If the total indicator reading exceeds service wear limit, replace the crankshaft/flywheel assembly. Refer to Table 4-32.

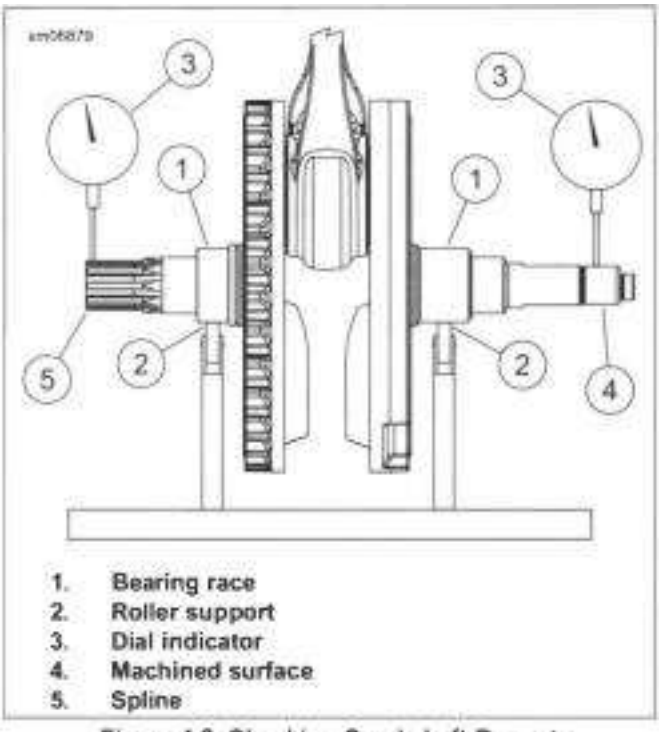


Figure 4-9. Checking Crankshaft Runout

Table 4-32. 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 Check (Page 4-12).
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 Inspect Lifters (Page 4-35).
   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 Valve and Seat Repair (Page 4-41).

DIAGNOSE SMOKING ENGINE OR HIGH OIL CONSUMPTION

Perform both a compression test and a cylinder leakage test. See Compression Test (Page 4-14) and Cylinder Leakdown Test (Page 4-15). If further testing is needed, inspect for the following:

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 the above checks do not reveal the cause:
    a. Remove the cylinder.
    b. Verify that the piston ring gaps are properly staggered.
    c. Inspect for excess piston ring wear.

CRIMP CLAMPS

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 4-10. Push the tip of a 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.

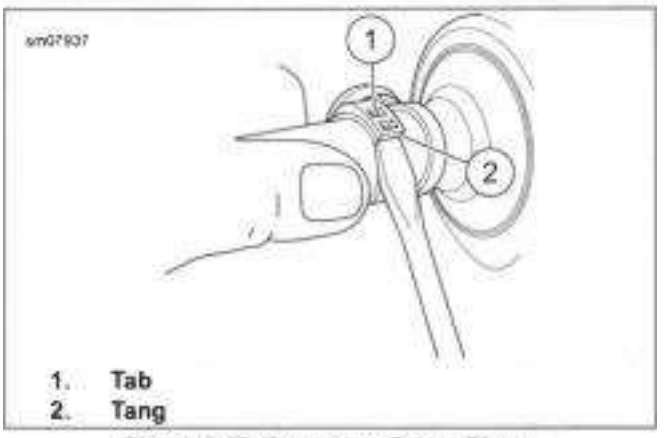


Figure 4-10. Removing Crimp Clamp

INSTALL

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

Installation

1. Install new clamp.

2. Tighten clamp using:

Special Tool: HOSE CLAMP PLIERS (HD-41137)

PREPARE_____

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

REMOVE _____ _____

Oil Cooler Cover

1. See Figure 4-11. Remove oil cooler cover.
   a. Remove screw (6).
   b. Remove oil cooler cover (5).

Oil Cooler

1. See Figure 4-11. Disconnect hoses (9, 10) from the oil cooler (1).
   a. Remove clamps (2, 8). See CRIMP CLAMPS (Page 4-18).
   b. Remove hoses.

NOTE

If any damage is caused to the hoses during removal of the crimp clamps, replace the hoses.

2. Remove screw (4) and washer (3).
3. Slide oil cooler assembly up to disengage from isolators (7) . Remove oil cooler assembly.

INSTALL_____ _____

FASTENER	TORQUE VALUE	
Oil cooler cover screw	32-42 in-lbs	3.6-4.7 N-m
Oil cooler screw	84-102 in-lbs	9.5-11.5 N-m

CONSUMABLE	PART NUMBER
LOCTITE 243 MEDIUM STRENGTH THREADLOCKER	99642-97

Oil Cooler

NOTE

- ***See Figure 4-11. If removed, install hose (9) with paint stripe facing out and at check valve end.***

1. See Figure 4-11. Inspect condition of isolators (7).
2. Install oil cooler assembly.

   Consumable: LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)

   a. Engage pins on bottom of oil cooler into isolators (7).

NOTE

Lubricate pins with 50/50 mix of isopropyl alcohol and water.

CONSUMABLE	PART NUMBER
AND SEALANT (BLUE)	

   b. Install washer (3) and screw (4). Apply thread locker and tighten.

      Torque: 84-102 in-lbs (9.5-11.5 N-m) ***Oil cooler screw***

3. Install new clamps (2, 8) onto hose (9, 10) ends.
4. ***NOTE***

Clamps should be tightened close to the end of the hose, NOT right behind the barb bead.

   Connect hoses (9, 10) to the oil cooler (1).

   a. Tighten clamps (2, 8). See CRIMP CLAMPS (Page 4-18).

Oil Cooler Cover

1. See Figure 4-11. Install oil cooler cover.
   a. Install oil cooler cover (5).
   b. Install screw (6). Tighten.

      Torque: 32-42 in-lbs (3.^4.7 N-m) ***Oil cooler cover screw***

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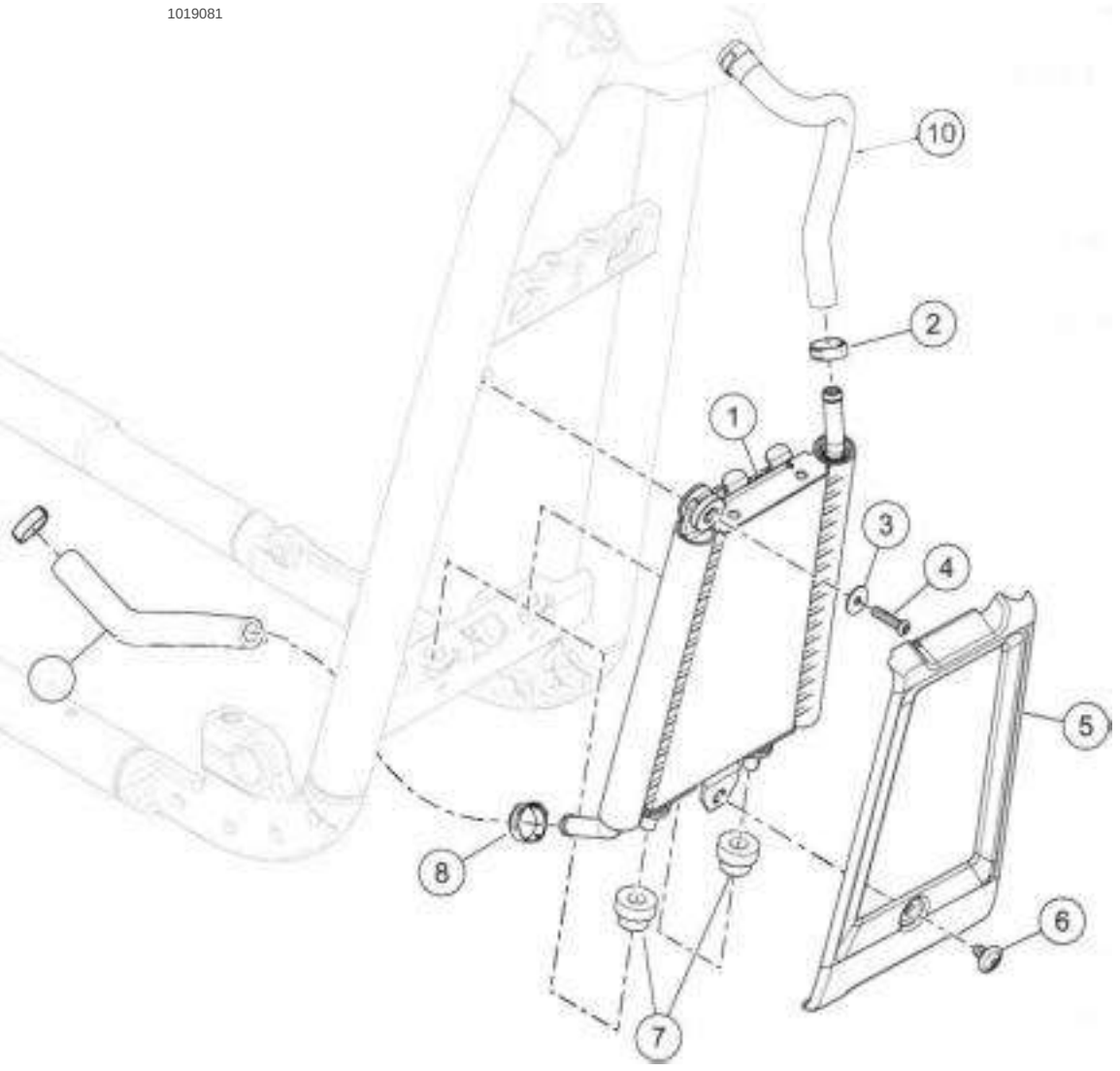


1. **Oil cooler**
2. **Hose clamp (upper hose)**
3. **Washer**
4. **Screw**
5. **Oil cooler cover**
6. **Screw**
7. **Isolator (2)**
8. **Hose clamp (lower hose)**
9. **Lower hose**
10. **Upper hose**

Figure 4-11.

COMPLETE

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

1. Check engine oil level. See REPLACE ENGINE OIL AND FILTER (Page 2-7).

PREPARE

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

REMOVE

1. See Figure 4-12. Disconnect hose from oil check valve (2). See CRIMP CLAMPS (Page 4-18).
2. Remove oil check valve.
3. Discard O-ring (3).

INSTALL

FASTENER	TORQUE VALUE	
Crankcase oil check valve or plug with O-ring	18-22 ft-lbs	24.4-29.8 N-m

1. See Figure 4-12. Lubricate new O-ring (3) with fresh oil.
2. Install oil check valve (2) with O-ring. Tighten.

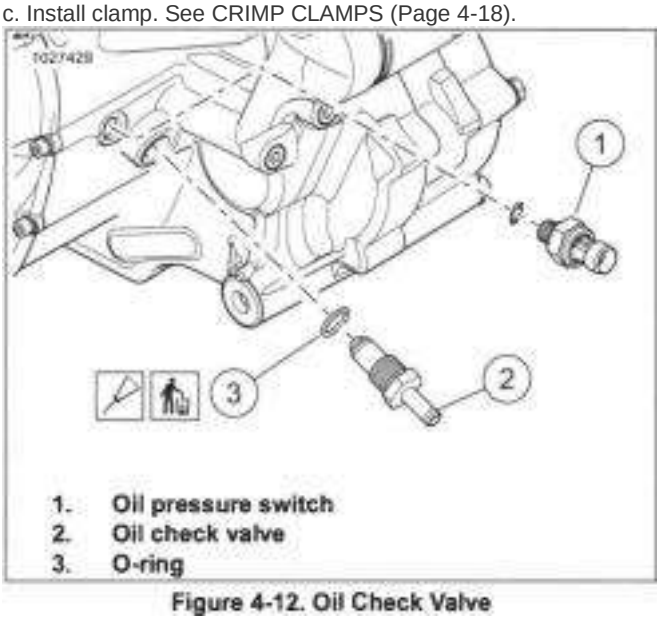
   Torque: 18-22 ft-lbs (24.4-29.8 N-m) ***Crankcase oil check valve or plug with O-ring***

3. Install lower hose.

   a. Place new clamp on lower hose.

   b. Connect hose to check valve (2).

   c. Install clamp. See CRIMP CLAMPS (Page 4-18).



1. Oil pressure switch
2. Oil check valve
3. O-ring

Figure 4-12. Oil Check Valve

COMPLETE

1. Check engine oil level. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

1. Remove left and right side covers. See LEFT SIDE COVER (Page 3-63) and RIGHT SIDE COVER (Page 3-64).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove upper engine mount. See FRONT ENGINE MOUNT (Page 4-24).
6. Remove oil cooler cover and upper screw. See OIL COOLER (Page 4-19).

REMOVE

1. Disconnect right side spark plug cables.
2. See Figure 4-13. Disconnect upper hose (3) from oil cooler.
3. Use low-pressure compressed air to clear residual oil out of line assembly.
   a. Remove engine oil filler cap.
   b. Blow into the hose (3) where disconnected from oil cooler.
4. Disconnect hose (2) from transmission fitting.
   a. Remove hose clamp from hose.
5. Remove screws (1) from each manifold (4).
6. Remove line assembly from the right side.
7. If necessary, remove rear oil hose (2) from line assembly.

INSTALL

NOTE

FASTENER	TORQUE VALUE	
Oil line manifold screws	90-120 in-lbs	10.2-13.6 N-m

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

Verify that all components and mating surfaces are free of all debris before assembling.

1. Clean components.
   a. Remove all residual thread locking material from screws and manifolds.
   b. Clean all debris from mating surfaces and threaded holes.
   c. Clean all debris from coolant ports in heads and manifolds.
   d. Thoroughly clean interior of all lines, especially if an engine failure occurred.
2. See Figure 4-13. If removed, install hose (2) to line assembly. Secure clamp. See CRIMP CLAMPS (Page 4-18).
3. ***NOTE***
   Make sure o-rings are not rolled after assembly.

   Install new O-rings (5) on the ports of each manifold (4).
4. Install line assembly with screws (1).
   a. Apply threadlocker to threads of screws.
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Tighten to 90-120 in-lbs (10.2-13.6 N-m).
5. Install hose (2) to transmission fitting with spring clamp.
6. Connect right spark plug cables.

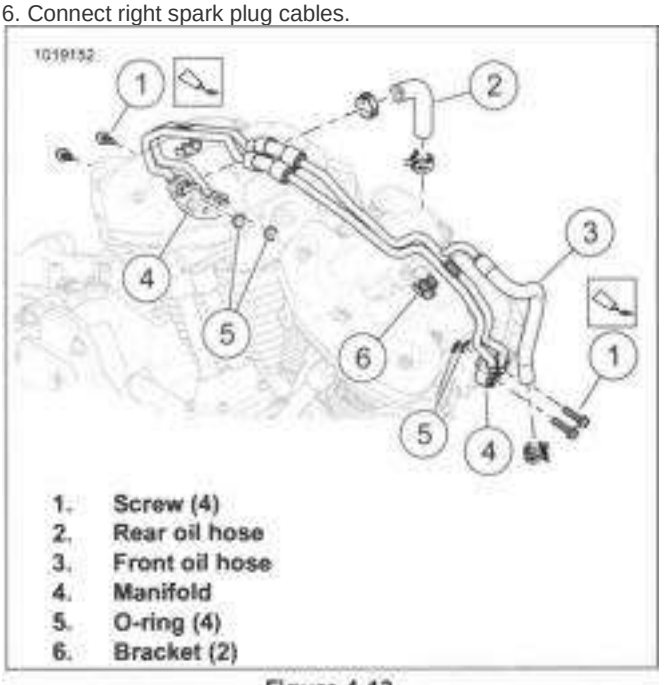


Figure 4-13.

COMPLETE

1. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
2. Install oil cooler upper screw and cover. See OIL COOLER (Page 4-19).

3. Install fuel tank. See FUEL TANK (Page 6-14).

4. Install seat. See SEAT (Page 3-142).

5. Install main fuse. See POWER DISCONNECT (Page 7-7).
6. Install side covers. See LEFT SIDE COVER (Page 3-63) and RIGHT SIDE COVER (Page 3-64).

7. Check engine oil level. See REPLACE ENGINE OIL AND FILTER (Page 2-7).

PREPARE

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

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

2. **Lower Front Engine Mount:**

   a. Support engine using the following jack or equivalent.

   Special Tool: FAT JACK (HD-45968)

   b. Detach right foot control bracket. See RIGHT FOOT CONTROLS (Page 3-133).

   c. Detach rear brake master cylinder bracket. See REAR BRAKE MASTER CYLINDER (Page 3-42).

REMOVE AND INSTALL: LOWER FRONT ENGINE MOUNT

Remove

FASTENER	TORQUE VALUE	
Engine mount bolt, front, lower	50-55 ft-lbs	67.8-74.5 N-m
Engine mount pinch bolt, front, lower	8-9 ft-lbs	10.2-12.2 N-m

1. See Figure 4-14. Loosen pinch bolt (3).

2. Remove and discard locknut (4).

3. Remove mounting bolt (1).

4. Remove spacer (2).

Install

1. See Figure 4-14. Install mounting bolt (1) through spacer (2).

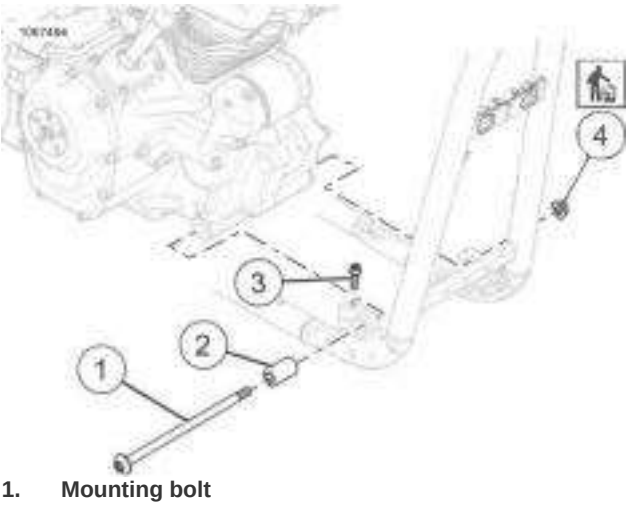
2. Install **new** locknut (4). Tighten.

   Torque: 50-55 ft-lbs (67.8-74.5 N-m) ***Engine mount bolt, front, lower***

3. See Figure 4-15.Verify spacer is installed properly.

4. See Figure 4-14.Tighten pinch bolt (3).

   Torque: 8-9 ft-lbs (10.2-12.2 N-m) ***Engine mount pinch bolt, front, lower***



1. **Mounting bolt**
2. **Spacer**
3. **Pinch bolt**
4. **Locknut**

Figure 4-14. Lower Front engine Mount

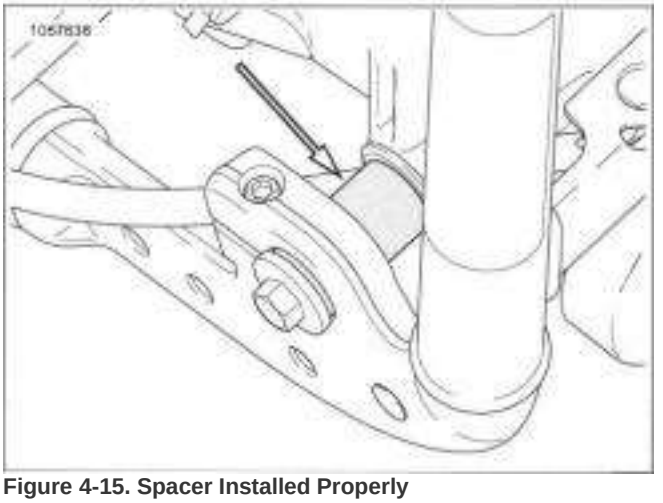


Figure 4-15. Spacer Installed Properly

REMOVE AND INSTALL: UPPER FRONT ENGINE MOUNT

FASTENER	TORQUE VALUE	
Engine mount screw, front, upper engine bracket	45-50 ft-lbs	61-67.8 N-m
Engine mount screw, front, upper frame bracket	45-50 ft-lbs	61-67.8 N-m
Engine mount screw, front, upper frame bracket-to-engine bracket	45-50 ft-lbs	61-67.8 N-m

1. See Figure 4-16. Remove frame-to-engine bracket screws (4).

2. Remove frame bracket (2).

   a. Remove frame bracket screws (3).

   b. Remove frame bracket (2).

Remove

3. Remove engine bracket (1).

   a. Loosen engme bracket screws (5).

   b. Remove engine bracket (1) by lifting left side up then pulling to the left.

Install

1. See Figure 4-16. Install engine bracket.

   a. Install engine bracket (1).

   b. Hand tighten engme bracket screws (5).

2. Install frame bracket.

   a. Install frame bracket (2).
   b. Install frame bracket screws (3). Hand tighten.

3. Install frame bracket-to-engine bracket screws (4). Hand tighten.

4. Tighten fasteners in the following order.

   a. Tighten engine bracket screws (5).

      Torque: 45-50 ft-lbs (61-67.8 N-m) ***Engine mount screw, front, upper engine bracket***

   b. If left side engine mount removed: Tighten bracket-to-head screws. See LEFT SIDE ENGINE MOUNT (Page 4-26).

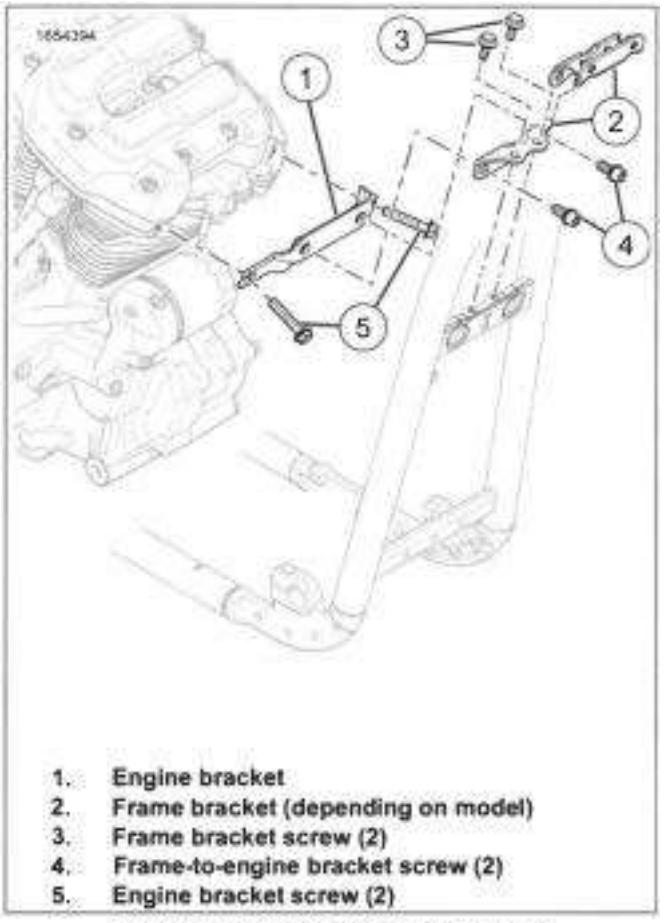
   c. Tighten frame bracket screws (3).

      Torque: 45-50 ft-lbs (61-67.8 N-m) ***Engine mount screw, front, upper frame bracket***

   d. If left side engine mount removed: Tighten bracket-to-frame screws. See LEFT SIDE ENGINE MOUNT (Page 4-26).

   e. Tighten frame bracket-to-engine bracket screws (4).

      Torque: 45-50 ft-lbs (61-67.8 N-m) ***Engine mount screw, front, upper frame bracket-to-engine bracket***



1. Engine bracket
2. Frame bracket (depending on model)
3. Frame bracket screw (2)
4. Frame-to-engine bracket screw (2)
5. Engine bracket screw (2)

Figure 4-16. Upper Front Engine Mount

COMPLETE

1. Lower Front Engine Mount:

   a. Attach rear brake master cylinder bracket. See REAR BRAKE MASTER CYLINDER (Page 3-42).

   b. Attach right foot control bracket. See RIGHT FOOT CONTROLS (Page 3-133).

   c. Remove jack.

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

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove ignition coil. See IGNITION COIL (Page 7-14).
3. Lift rear of fuel tank. See Lift Rear Of Fuel Tank (Page 6-12).

REMOVE

1. See Figure 4-17. Remove bracket (1).
   a. Remove screws (3).
   b. Remove screws and washers (2).
   c. Remove bracket (1).

INSTALL

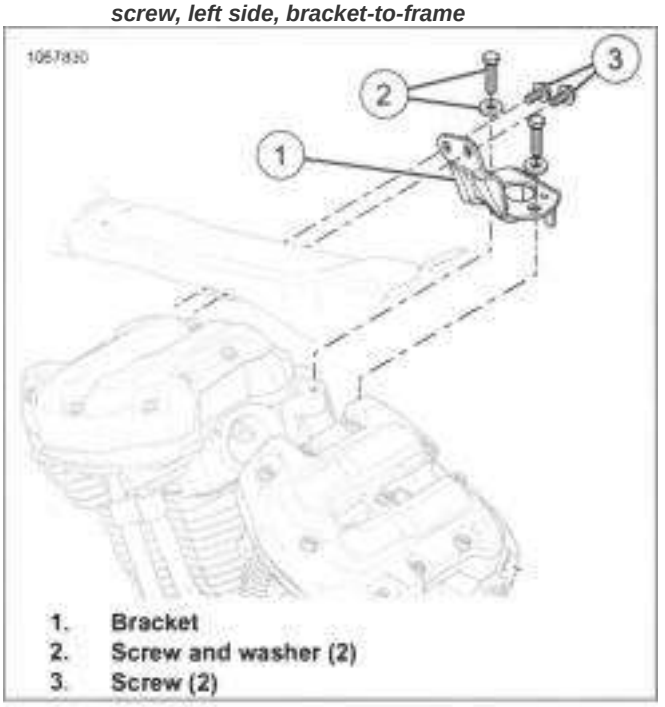
a. Install bracket (1).

FASTENER	TORQUE VALUE	
Engine mount screw, left side, bracket-to-frame	45-50 ft-lbs	61-67.8 N-m
Engine mount screw, left side, bracket-to-head	28-33 ft-lbs	38-44.7 N-m

1. See Figure 4-17. Install bracket (1).
   b. Install screws and washers (2). Hand tighten.
   c. Install screws (3). Hand tighten.
2. ***NOTE***
If upper front engine mount was also removed, see the combined tightening sequence in Remove and Install: Upper Front Engine Mount (Page 4-24).

Tighten fasteners in the following order.

a. Tighten screws and washers (2).
   Torque: 28-33 ft-lbs (38-44.7 N-m) ***Engine mount screw, left side, bracket-to-head***
b. Tighten screws (3).
   Torque: 45-50 ft-lbs (61-67.8 N-m) ***Engine mount screw, left side, bracket-to-frame***



1. Bracket
2. Screw and washer (2)
3. Screw (2)

Figure 4-17. Left Side Engine Mount

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).
2. Install ignition coil. See IGNITION COIL (Page 7-14).
3. Secure fuel tank. See Secure Fuel Tank (Page 6-12).

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
7. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
8. See Figure 7-163. Reposition engine harness caddy.
   a. Disconnect rear knock sensor (8).
   b. Separate rear knock sensor connector from electrical caddy.
   c. Disconnect rear ACR (9).
   d. Disconnect front ACR (10).
   e. Remove push/lock pin securing electrical caddy to right side of backbone.
   f. Gently bend tabs outward at rear of electrical caddy to separate from backbone.
   g. Move rear electrical caddy and engine wire harness to gain access as needed.

REMOVE

1. See Figure 4-18. Remove the rocker cover screws.
   a. Hold hex on stud (4).
   b. Remove center screw (3).
   c. Remove remaining screws.
2. Remove the rocker cover (2) and gasket (1) from right side of vehicle. Discard gasket.
3. Clean threadlocker from all screws and threaded holes. See Cleaning Threads and Threaded Holes in Cleaning (Page II).
   a. Cover exposed internal engine area to prevent contamination from loosened threadlocker.
   b. Verify that no foreign material in the threaded hole.

INSTALL

FASTENER	TORQUE VALUE	
Lower rocker cover stud	90-120 in-lbs	10.2-13.6 N-m
Upper rocker cover screws	120-140 in-lbs	13.6-15.8 N-m

1. Verify that all threaded holes are free from oil and threadlocking residue.
2. Install rocker cover and new gasket.
   a. Verify torque of stud (4).
      Torque: 90-120 in-lbs (10.2-13.6 N-m) ***Lower rocker cover stud***
   b. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to 5-7 screw threads.
   c. Start all screws.
   d. Hold hex on stud (4) when tightening center screw (3) .
   e. See Figure 4-19. Tighten in sequence shown.
      Torque: 120-140 in-lbs (13.0-15.8 N-m) ***Upper rocker cover screws***

COMPLETE

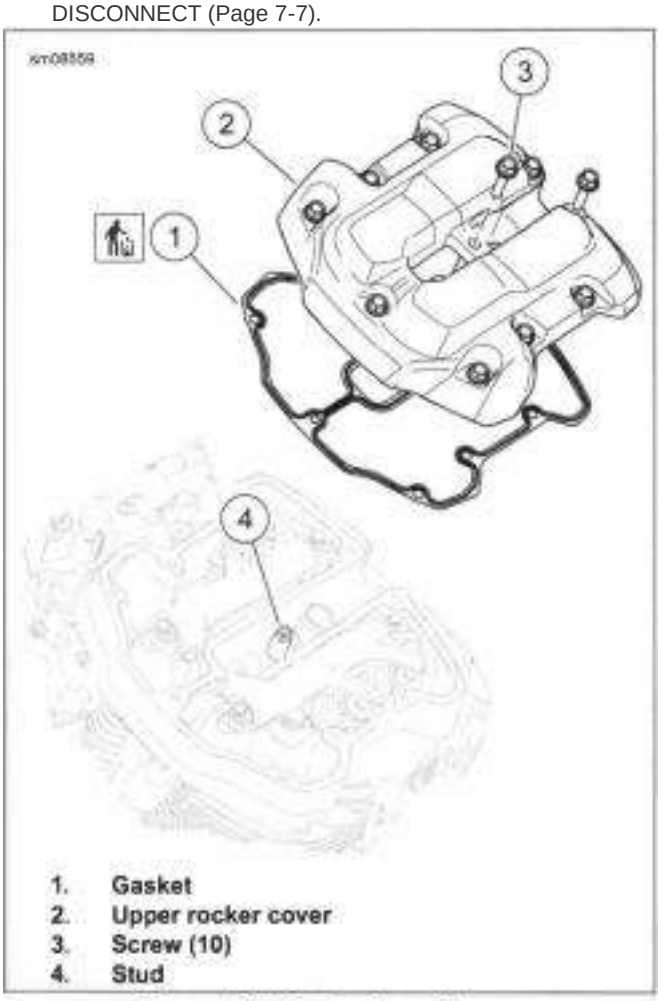
1. See Figure 7-163. Attach engine harness and caddy.
   a. Gently bend tabs outward at rear of electrical caddy to allow rear mounting pins to engage holes in backbone.
   b. Install push/lock pin through electrical caddy mounting hole on right side of backbone.
   c. Connect front ACR (10).
   d. Connect rear ACR (9).
   e. Attach rear knock sensor (8) to electrical caddy.
   f. Connect rear knock sensor.
2. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).
3. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

4. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).

5. Install fuel tank. See FUEL TANK (Page 6-14).

6. Install seat. See SEAT (Page 3-142).

7. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).



1. Gasket
2. Upper rocker cover
3. Screw (10)
4. Stud

Figure 4-18. Rocker Cover Screws

Figure 4-

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
7. Remove oil cooler upper screw. See OIL COOLER (Page 4-19).
8. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
9. Disconnect electrical connectors.
   a. Rear cylinder: Knock sensor and ACR.
   b. Front cylinder: ACR.
10. Remove left side spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
11. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

REMOVE

1. See Figure 4-20 . Remove screw (1).
2. Remove breather assembly (2).

NOTE

Breather assembly contains no service parts. Replace as an assembly

INSTALL

FASTENER	TORQUE VALUE	
Breather screw	90-120 in-lbs	10.2-13.6 N-m

1. See Figure 4-20. Lubricate O-ring (3).
2. Install breather with screw (1). Tighten to 90-120 in-lbs (10.2-13.6 N-m).

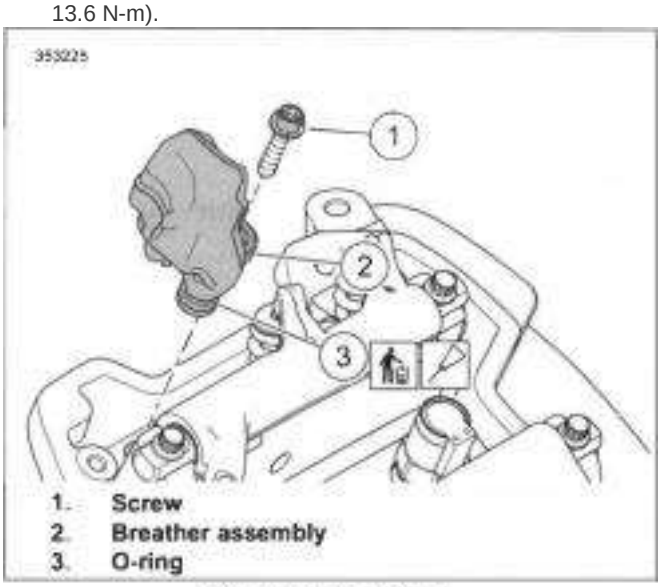


Figure 4-20. Breather

COMPLETE

1. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
2. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
3. Connect electrical connectors.
   a. Rear cylinder: Knock sensor and ACR.
   b. Front cylinder: ACR.
4. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).
5. Install oil cooler upper screw. See OIL COOLER (Page 4-19).
6. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
7. Install spark plug cables. SPARK PLUG CABLES (Page 7-13).
8. Install fuel tank. See FUEL TANK (Page 6-14).
9. Install seat. See SEAT (Page 3-142).
10. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
7. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
8. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
9. Remove oil cooler upper screw. See OIL COOLER (Page 4-19).
10. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
11. Disconnect electrical connectors.
    a. Rear cylinder: Knock sensor and ACR.
    b. Front cylinder: ACR.
12. Remove spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
13. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
14. Remove breathers. See BREATHERS (Page 4-29).

REMOVE

1. See Figure 4-21 . Remove lower rocker cover.
    a. Remove five screws.
    b. Lift off from cylinder head.
    c. Engine in chassis: Remove from left side.
2. Discard gasket.
3. Clean threadlocker from all screws and threaded holes. See Cleaning Fastener Threads in Cleaning (Page II).
    a. Cover exposed internal engine area to prevent contamination from loosened threadlocker.

INSTALL

FASTENER	TORQUE VALUE	
Lower rocker cover screws	90-120 in-lbs	10.2-13.6 N-m

1. Install new gasket.
2. See Figure 4-21. Install lower rocker cover.
    a. Engine in chassis: Install from left side.
    b. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to 5-7 screw threads.
    c. Start four screws and the stud.
    d. lighten in sequence shown to 90-120 in-lbs (10.2-13.6 N-m).

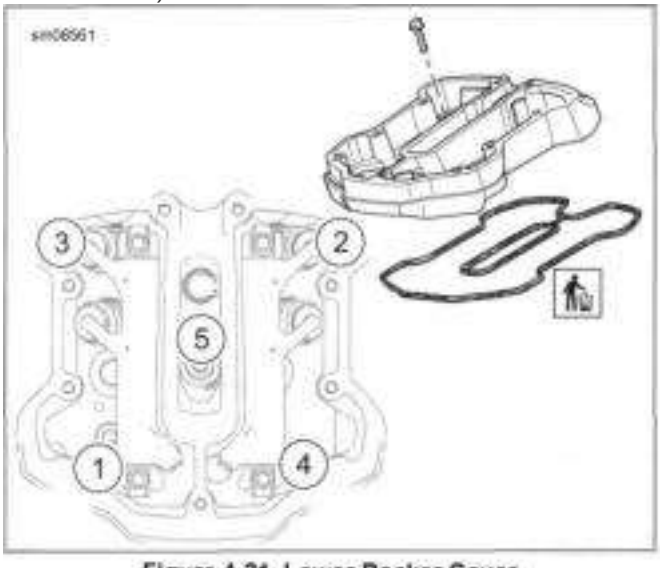


Figure 4-21. Lower Rocker Cover

COMPLETE

1. Install breathers. See BREATHERS (Page 4-29).
2. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
3. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
4. Connect electrical connectors.
    a. Rear cylinder: Knock sensor and ACR.
    b. Front cylinder: ACR.

5. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).

6. Install oil cooler upper screw. See OIL COOLER (Page 4-19).

7. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

8. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
9. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).

10. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).

11. Install fuel tank. See FUEL TANK (Page 6-14).

12. Install seat. See SEAT (Page 3-142).

13. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
7. Remove oil cooler upper screw. See OIL COOLER (Page 4-19).
8. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
9. Disconnect electrical connectors.
    a. **Rear cylinder:** Knock sensor and ACR.
    b. **Front cylinder:** ACR.
10. Remove left side spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
11. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

REMOVE

1 . Remove rocker arms.

a. Set piston at TDC on the compression stroke.

b. See Figure 4-22. Alternately loosen screws (3) until screws can be turned by hand.

c. Remove screws.

d. Remove rocker shaft (1) and rocker arm (4).

e. Repeat with remaining rocker arm.

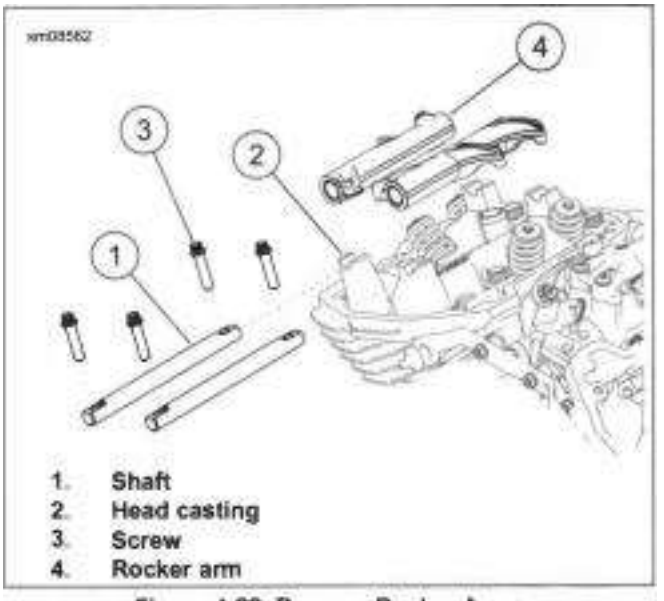


Figure 4-22. Remove Rocker Arms

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.

FASTENER	TORQUE VALUE	
Rocker shaft screw	23-27 ft-lbs	31.2-36.6 N-m

1. Set piston at approximate BDC on the power stroke.

INSTALL

2. Install rocker arms.

a. Verify that lifters are on the base circle of the camshaft lobe.

b. See Figure 4-22 . Install rocker arm (4) and rocker shaft (1).

c. Verify that rocker shaft is seated in both towers.

d. Install screws (3).

e. Alternately tighten screws to pull rocker shaft down evenly.

f. Tighten to 23-27 ft-lbs (31.2-36.6 N-m).

g. Repeat with remaining rocker arms.

3. Allow lifters to bleed down. When lifters have bled down,

pushrods can be rotated by hand.

NOTE

Do not rotate crankshaft until lifters have bled down. Rotating crankshaft sooner could result in valve-to-piston contact resulting in damage.

4. Check valve lash after lifters have bled down.

    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. The maximum allowable lash on a common rocker arm is 0.008 in (0.2 mm). A measurement in excess requires disassembly and repair of cylinder head assembly.

COMPLETE

1. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

2. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
3. Connect electrical connectors.

    a. **Rear cylinder:** Knock sensor and ACR.

    b. **Front cylinder:** ACR.

4. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).

5. Install oil cooler upper screw. See OIL COOLER (Page 4-19).

6. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

7. Install spark plug cables. SPARK PLUG CABLES (Page 7-13).

8. Install fuel tank. See FUEL TANK (Page 6-14).

9. Install seat. See SEAT (Page 3-142).

10. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
7. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
8. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
9. Remove oil cooler cover and upper screw. See OIL COOLER (Page 4-19).
10. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
11. Disconnect electrical connectors.
    a. Rear cylinder: Knock sensor and ACR.
    b. Front cylinder: ACR
12. Remove spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
13. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
14. Remove rocker arms. See ROCKER ARMS (Page 4-32).

REMOVE

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN

NOTE

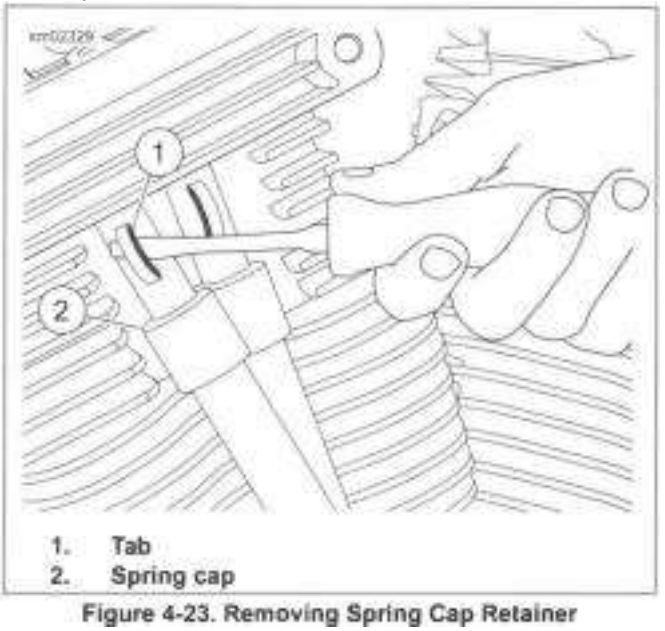
Mark parts for location and orientation during removal. 1. Remove pushrods.

2. Remove pushrod covers using 94086-09 (PUSHROD COVER RETAINER INSTALLATION AND REMOVAL TOOL).
    a. See Figure 4-23. Alternately, insert the blade of a screwdriver in tab (1) of spring cap retainer.
    b. While pushing down on spring cap (2), rotate bottom of retainer outboard.
3. Remove pushrod covers.
    a. Collapse upper and lower pushrod covers.
4. Disassemble pushrod cover assemblies.
    a. Discard three O-rings.
5. See Figure 4-24. Remove lifter covers.
    a. Remove four screws (1).
    b. Remove the lifter cover (2) and gasket (3). Discard gasket.

NOTE

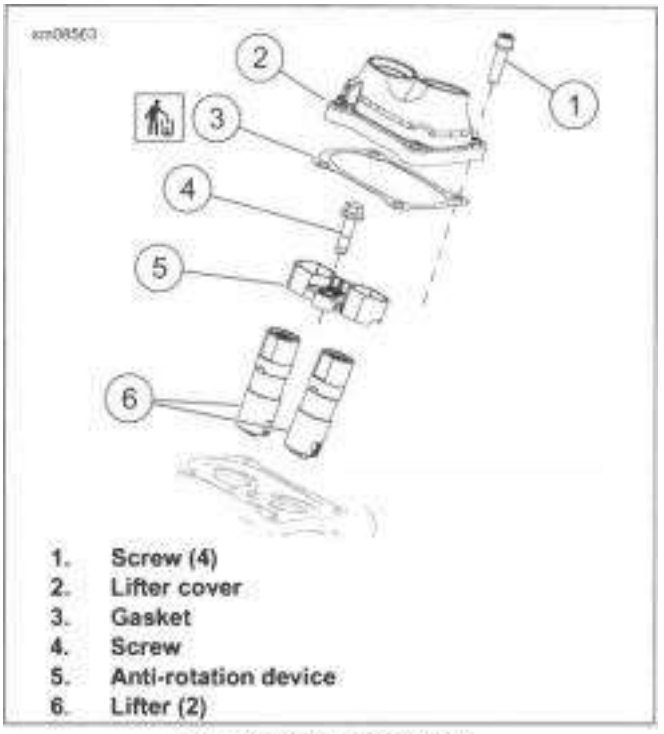
Heat lifter anti-rotation device screw (4) to soften the thread sealant with ROB/NAIR HEAT GUN (PART NUMBER: HD-25070). Do not use an open flame.

6. Remove lifters.
    a. Remove screw (4) securing anti-rotation device (5).
    b. Remove anti-rotation device.
    c. Remove the lifters (6) and place in clean plastic bags to prevent contamination.



1. Tab
2. Spring cap

Figure 4-23. Removing Spring Cap Retainer



1. Screw (4)
2. Lifter cover
3. Gasket
4. Screw
5. Anti-rotation device
6. Lifter (2)

Figure 4-24. Lifter Cover

CLEAN AND INSPECT

1. Except for the hydraulic lifters, clean all parts in a non-volatile cleaning solution or solvent.

A 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 the O-ring seats and contact surfaces of the pushrod covers are completely clean.
4. Verify that all oil holes are clean and open.
5. Examine the pushrods. Replace any pushrods that are bent, dented, damaged, discolored or if the ball ends show signs of excessive wear or damage.
6. Cover all parts to protect them from dust and dirt.

INSPECT LIFTERS

1. Measure the lifter outer diameter. Record the measurement.
2. Measure lifter bore. Subtract this measurement from the lifter measurement to determine clearance.

   a. Clearance when **new** is 0.0009-0.0026 in (0.023-0.066 mm)

3. Check lifter roller end clearance.

   b. Install new lifters and/or replace crankcases if clearance exceeds service wear limit of 0.006 in (0.152 mm)

   a. Allowable end clearance is within. 0.008-0.022 in (0.203-0.559 mm)

   b. Replace lifters if end clearance exceeds service wear limit of. 0.022 in (0.559 mm)

4. Soak lifters in clean engine oil. Keep covered until assembly.
5. Examine lifter rollers. If damaged, examine the associated cam lobe.

   a. Verify that the hydraulic lifter rollers turn freely.

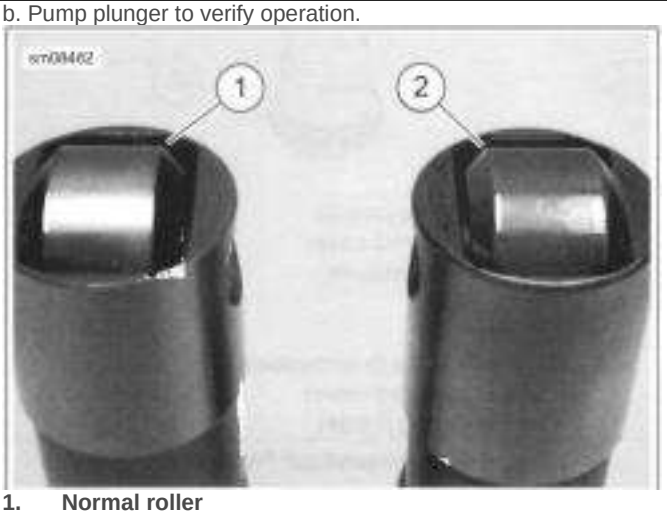
   b. Check for flat spots, scuff marks and pitting.

   c. See Figure 4-25. A dull lifter roller surface is called frosting (2). Frosting is a cosmetic condition and does not affect function.

6. Inspect the lifter for signs of wear.

   a. Verify that the plunger is fully extended against the C-clip.

   b. Pump plunger to verify operation.



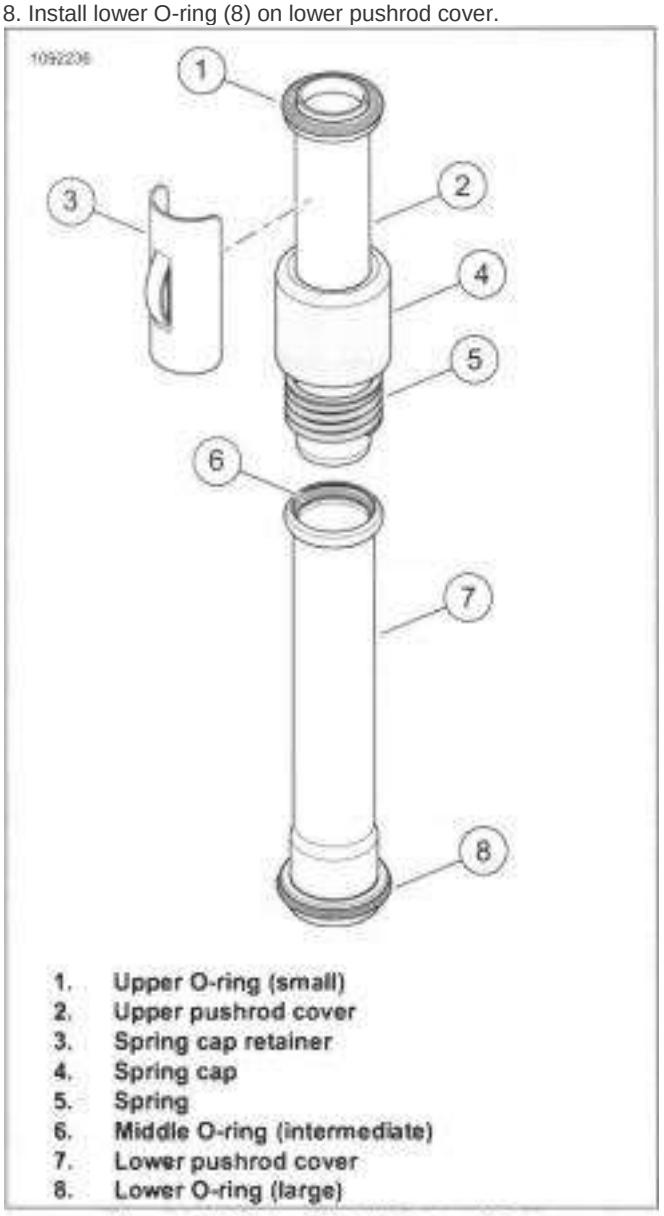
1. **Normal roller**
2. **Frosted roller**

Figure 4-25. Roller Inspection

ASSEMBLEPUSHROD COVER

1. See Figure 4-26. Apply a film of clean engine oil to **new** O-rings (1,6 and 8).
2. Install upper O-ring (1) on the upper pushrod cover (2).
3. Slide the spring cap (4) and spring (5) onto the body of the 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 a light film of clean engine oil on the upper pushrod cover.
6. Slide the straight end of the upper pushrod cover into the end of the 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 4-26. Assembled Pushrod Cover

INSTALL

FASTENER	TORQUE VALUE	
Lifter anti-rotation device screw	90-120 in-lbs	10.2—13.6 N-m
Lifter cover screws	132-156in-lbs	1-4.9—17.6 N-m

NOTE

Anti-rotation devices are marked "F" (front) and "R" (rear).

1. Install lifters.

   a. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to outer surface of each lifter. Pour a small amount onto each cam lobe.

   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 4-24 . 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: 132-156 in-lbs (14.9-17.6 N-m) ***Lifter cover screws***

3. Install pushrod covers.

   a. Assemble pushrod covers with new O-rings.

   b. Install new O-rings on each end of the pushrod cover.

   c. Compress pushrod cover assembly and fit into lifter cover bore.

   d. Extend assembly into cylinder head bore.

   e. Verify that the ends of the pushrod cover fit snugly into cylinder head and lifter cover bores.

4. Install spring cap retainers using 94086-09 (PUSHROD COVER RETAINER INSTALLATION AND REMOVAL TOOL).

   a. Insert upper edge of spring cap retainer into cylinder head bore.

   b. See Figure 4-27. Alternately, insert blade of small screwdriver between bottom edge of spring cap retainer and top of spring cap.

   c. Press spring cap down and slide bottom edge of retainer toward tip of screwdriver.

   d. Verify that spring cap retainer seats tightly against upper pushrod cover.

5. Apply a small amount of SCREAMIN' EAGLE ASSEMBLY LUBE to ends of each pushrod.

6. ***NOTE***

If installing original parts, install them in their 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.

Figure 4-27. Install Spring Cap Retainers

COMPLETE

1. Install rocker arms. See ROCKER ARMS (Page 4-32).
2. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
3. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
4. Connect electrical connectors.
    a. Rear cylinder: Knock sensor and ACR.
    b. Front cylinder: ACR
5. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).
6. Install oil cooler upper screw and cover. See OIL COOLER (Page 4-19).
7. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
8. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
9. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
10. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).
11. Install fuel tank. See FUEL TANK (Page 6-14).
12. Install seat. See SEAT (Page 3-142).
13. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove coil. See IGNITION COIL (Page 7-14).
7. Remove left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).
8. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
9. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
10. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
11. Remove oil cooler cover and upper screw. See OIL COOLER (Page 4-19).
12. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
13. Remove induction module. See INDUCTION MODULE (Page 6-27).
14. Disconnect electrical connectors.
    a. **Rear cylinder:** Engine temperature sensor, knock sensor, and ACR.
    b. **Front cylinder:** Knock sensor and ACR.
15. Remove spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
16. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
17. Remove breathers. See BREATHERS (Page 4-29).
18. Remove lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).
19. Remove rocker arms. See ROCKER ARMS (Page 4-32).
20. Remove pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).

REMOVE

1. Disconnect knock sensor connector.
2. See Figure 4-28. Discard cylinder head bolts.
    a. Loosen each cylinder head bolt in sequence shown.
    b. Discard head bolts.
3. Remove cylinder head.
    a. Lift cylinder head from dowel pins.
    b. Discard gasket.

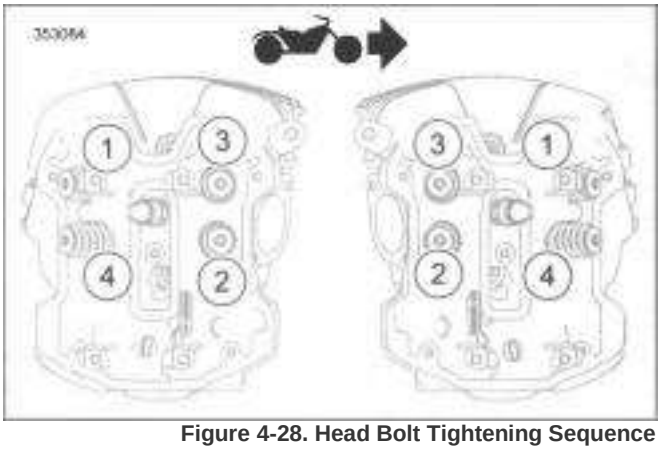


Figure 4-28. Head Bolt Tightening Sequence

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. This would adversely affect 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 material.

3. To soften stubborn deposits, soak the cylinder head in a chemical solution, such as GUNK HYDRO-SEAL or other carbon and gum dissolving agent. Repeat previous step as necessary.

NOTE

Keep all parts grouped by location so ***they can be installed in the original location.***

4. Thoroughly clean the cylinder head, spring retainers, tapered keepers, valves and valve springs in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water.

5. Thoroughly flush all coolant and oil passages to remove loose debris.

A WARNING

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

6. Dry parts with low-pressure, compressed air.

7. Clean threadlocker from all screws and threaded holes. See **Cleaning Fastener Threads** in Cleaning (Page 11).

   a. Cover exposed internal engine area to prevent contamination from loosened threadlocker.

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.	25-27 ft-lbs	33.9-36.6 N-m
Cylinder head nut torque step 5. Tighten additional degree value.	go°	go°

1. Clean all gasket surfaces.
2. Thoroughly flush all coolant and oil passages to remove loose debris.

3. See Figure 4-29. Install cylinder head.

   a. Install **new** gasket with the part number facing up.

   b. Install cylinder head on dowel pins.

4. Install **new** cylinder head flange nuts.

   a. Apply **new** engine oil to flanges of cylinder head nuts.

   b. Install cylinder head nuts.

5. See Figure 4-28 .Tighten **new** 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.***

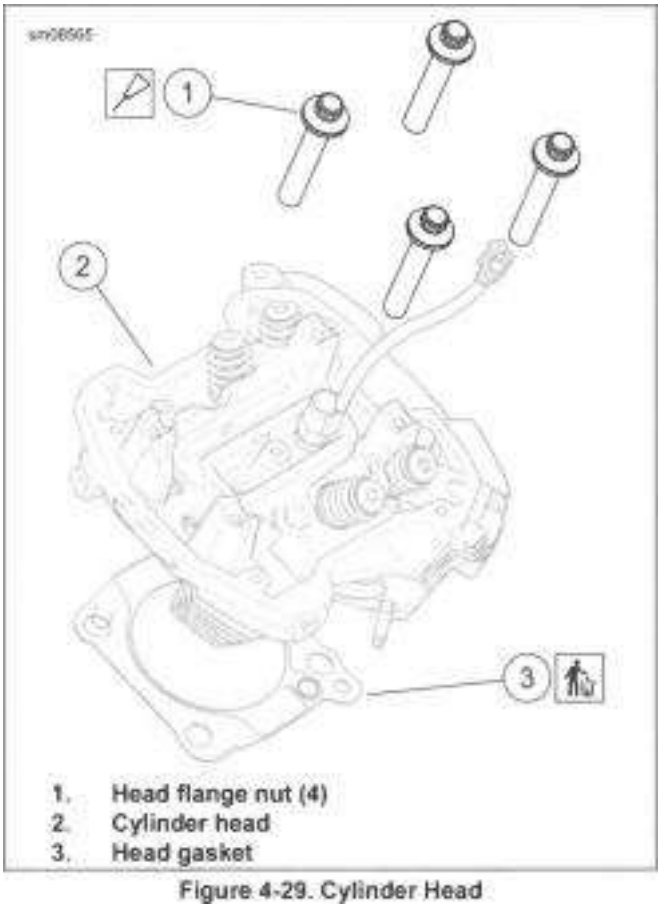
   d. Tighten.

      Torque: 25-27 ft-lbs (33.9-36.6 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.***

6. Connect knock sensor, engine temperature sensor, and ACR.



1. Head flange nut (4)
2. Cylinder head
3. Head gasket

Figure 4-29. Cylinder Head

DISASSEMBLE

PART NUMBER	TOOLNAME
B-49312	CYLINDER HEAD HOLDING FIXTURE
HD-34736-B	VALVE SPRING COMPRESSOR

1. Secure cylinder head for service.
   a. Remove spark plugs.
   b. Turn 12 mm end of CYLINDER HEAD HOLDING FIXTURE (PART NUMBER: B-49312) (1) into cylinder head (2) spark plug hole.
   c. Clamp tool in vise at a comfortable working position.
2. Remove ACR. See AUTOMATIC COMPRESSION RELEASE (ACR) (Page 7-81).
3. See Figure 4-30. Remove screw (2) and knock sensor (1).
4. Remove cylinder head temperature sensor (3).
5. See Figure 4-32. Remove valves.
   a. See Figure 4-31. Use VALVE SPRING COMPRESSOR (PART NUMBER: HD-34736-B) to compress valve spring.
   b. Remove tapered keepers (1).
   c. Slowly release valve spring compression.
   d. Remove the spring retainer (2) and valve spring (3).
   e. Remove the valve (11).
6. Remove and discard valve stem seal assembly (4).
7. Identify components.
   a. Mark the valve head for identification.
   b. Place tapered keepers, valve spring and spring retainer in a plastic bag with identification.
8. Remove the remaining valves and components.

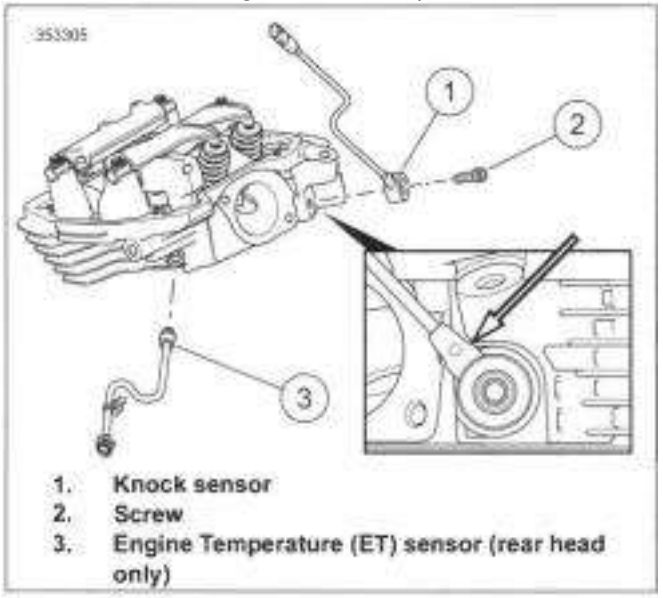


Figure 4-30. Cylinder Head Sensors

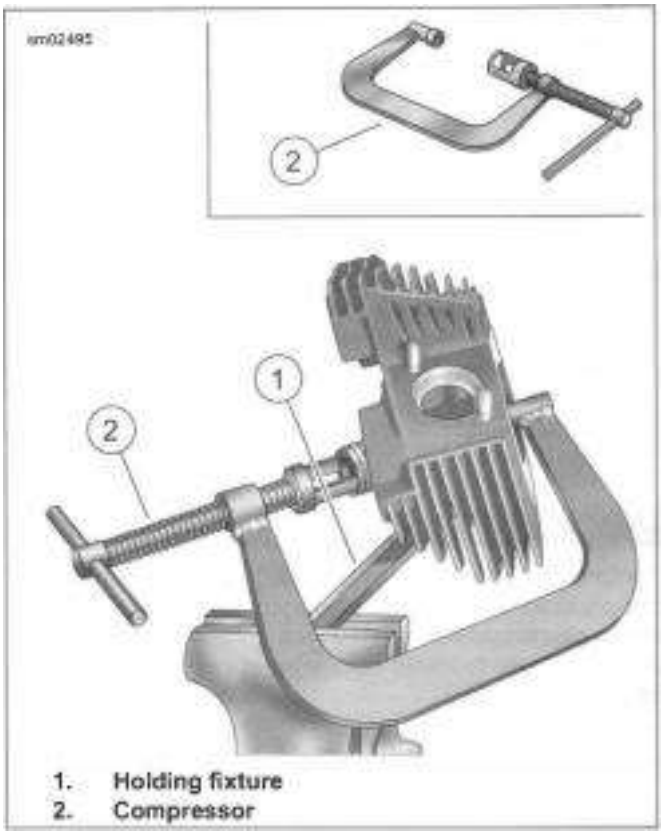


Figure 4-31. Valve Spring Compressor

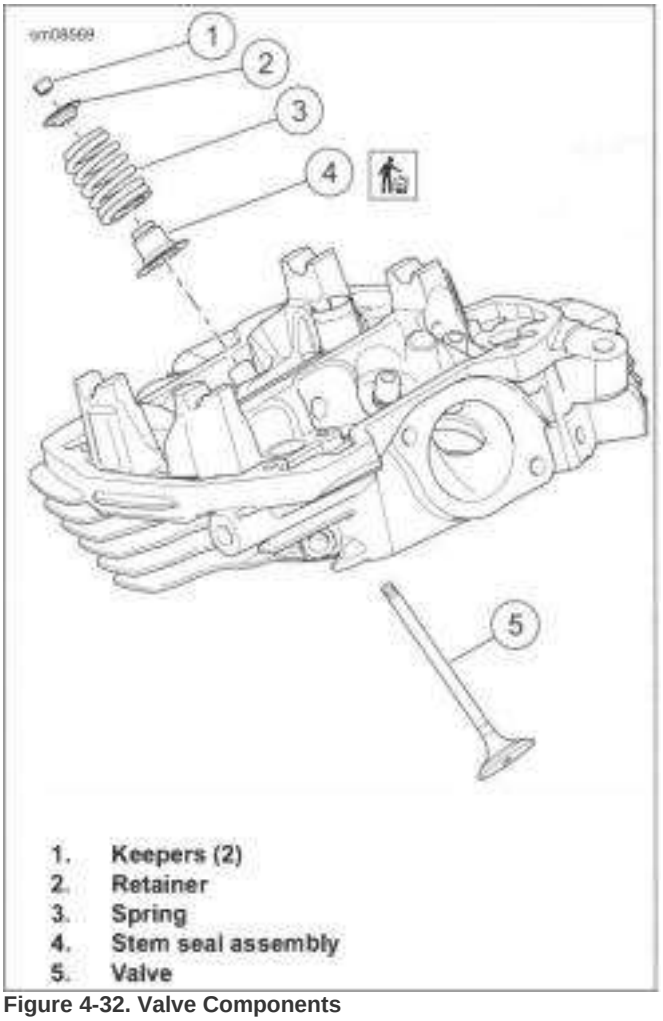


Figure 4-32. Valve Components

CLEAN AND INSPECT

PART NUMBER	TOOLNAME
B-45525	VALVE GUIDE HONE
HD-34751	CLEANING BRUSH

See SPECIFICATIONS (Page 4-4) for specifications not shown here.

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 the head if warpage is beyond specification.
      Length/Dimension/Distance: 0.006 in (0.152 mm)
3. Verify that all oil holes 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.
   a. Measure the **inside** diameter of the valve guide.
   b. Measure the **outside** diameter of the valve stem.
   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 the sealing surface of the valve face and valve seat.
   a. The sealing surfaces must be smooth and even around entire contact area.
   b. If the sealing contact area is uneven or shows evidence of pitting, carbon tracking, or other indications of combustion gas leakage, recondition the valve and seat, or replace cylinder head assembly. See Valve and Seat Repair (Page 4-41)
2. Inspect the valve for burning, cracking, carbon tracking, or other indications of combustion gas leakage.
3. Inspect the end of the valve stem for pitting or uneven wear.
4. Remove burrs around the valve stem keeper groove with a fine tooth file.
5. To determine if the 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.
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 Valve and Seat Repair (Page 4-41).
3. Replace cylinder head if seats are damaged or worn excessively.

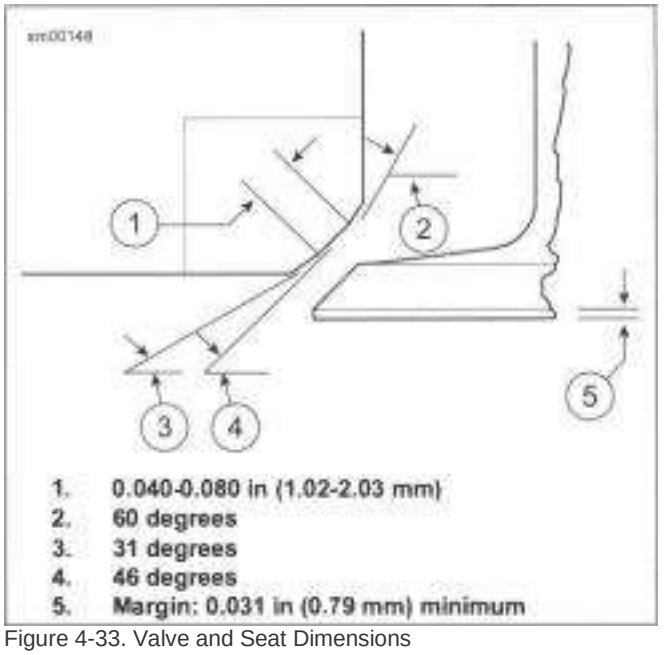
VALVE AND SEAT REPAIR [6] [7]

NOTE

- ***Verify correct valve stem to valve guide clearance before refacing. Refer to Table 4-33.***
- ***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 4-33. Replace the valve if margin (5) is less than 0. 0313 in (0.795mm).***

7 ***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 Install (Page 4-32).***

- ***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 4-33. Valve and Seat Dimensions

Table 4-33. 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

PART NUMBER	TOOLNAME
B-49312	CYLINDER HEAD HOLDING FIXTURE
HD-34736-B	VALVE SPRING COMPRESSOR
HD-34751	CLEANING BRUSH
HD-45322	VALVE GUIDE SEAL INSTALLER

FASTENER	TORQUE VALUE	
Cylinder temperature sensor	120-180 in-lbs	13.6-20.3 N-m
Knock sensor screw	13-17 ft-lbs	17.6-23 N-m

1. Secure cylinder head for service.

ASSEMBLE

a. Turn 10 mm end of special tool into spark plug hole.

Special Tool: CYLINDER HEAD HOLDING FIXTURE (B-49312)

b. Clamp tool in vise at a comfortable working position.

NOTE

Install all parts in their original location and position.

2. Install valve.

a. Clean valve guide with special too.

Special Tool: CLEANING BRUSH (HD-34751)

b. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to valve stem.

c. Install the valve into the cylinder head.

d. Spin the valve as it is installed to distribute the lubricant evenly.

3. Install valve seal.

a. Remove the valve and apply a second coat of SCREAMIN' EAGLE ASSEMBLY LUBE to the valve stem. Install the valve.

a. Slide special tool over valve stem tip.

Special Tool: VALVE GUIDE SEAL INSTALLER (HD-45322)

b. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to installer.

c. See Figure 4-34. Slide new valve stem seal assembly over installer and down valve stem until seated against cylinder head casting.

d. Remove installer from valve stem tip.

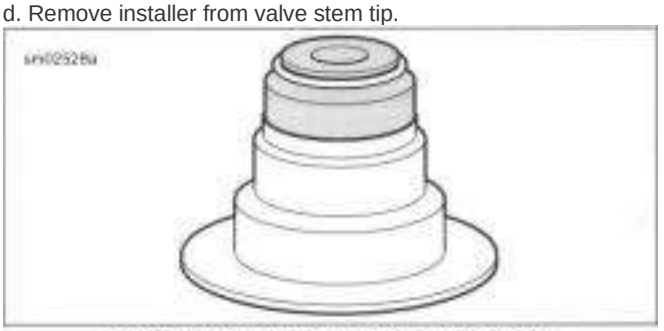


Figure 4-34. Valve Stem Seal Assembly

4. See Figure 4-32. Install valve spring.

a. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to valve stem tip and keeper groove.

b. Install the valve spring (3) with the smaller diameter coils topside.

c. Place the spring retainer (2) on top of the valve spring.

5. Install new keepers.

a. Compress valve spring with special tool.

Special Tool: VALVE SPRING COMPRESSOR (HD-34736-B)

b. Install the keepers.

c. Slowly release valve spring compression.

d. Tap the end of the valve stem once or twice with a soft mallet to make sure that tapered keepers are tightly seated.

6. Install remaining valves.

7. Install ACR. See AUTOMATIC COMPRESSION RELEASE (ACR) (Page 7-81).

8. See Figure 4-30. Install knock sensor with screw (2).

   a. Rotate sensor housing up against head casting.

b. Tighten.

Torque: 13-17 ft-lbs (17.6-23 N-m) ***Knock sensor screw***

9. Install temperature sensor (3). Tighten.

Torque: 120-180 in-lbs (13.6-20.3 N-m) ***Cylinder temperature sensor***

COMPLETE

1. Install pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).
2. Install rocker arms. See ROCKER ARMS (Page 4-32).
3. Install lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).
4. Install breathers. See BREATHERS (Page 4-29).
5. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
6. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
7. Connect electrical connectors.
   a. Rear cylinder: Engine temperature sensor, knock sensor and ACR.
   b. Front cylinder: Knock sensor and ACR.
8. Install induction module. See INDUCTION MODULE (Page 6-27).
9. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).
10. Install oil cooler upper screw and cover. See OIL COOLER (Page 4-19).
11. ***NOTE***
See Remove and Install: Upper Front Engine Mount (Page 4-24) for proper tightening sequence.

    Install left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).
12. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
13. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
14. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
15. Install coil. See IGNITION COIL (Page 7-14).
16. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).
17. Install fuel tank. See FUEL TANK (Page 6-14).
18. Install seat. See SEAT (Page 3-142).
19. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

NOTE

Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

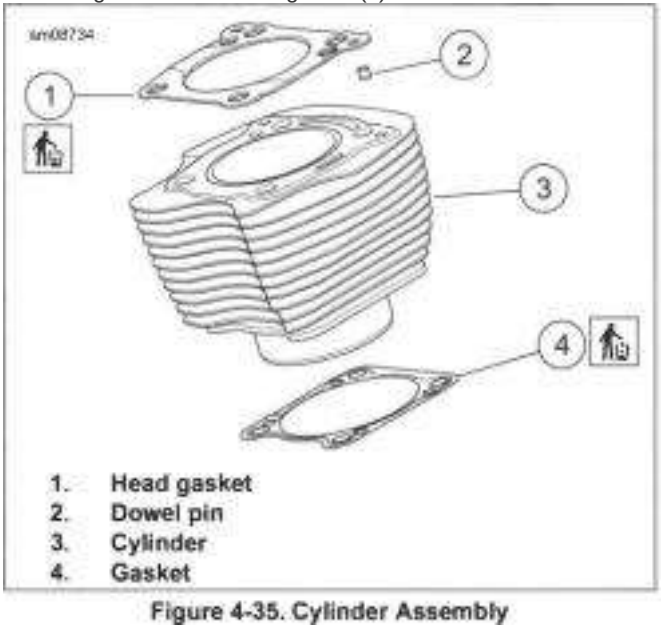
1. Use low-pressure compressed air to clean exterior surfaces of engine.
2. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove coil. See IGNITION COIL (Page 7-14).
7. Remove left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).
8. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
9. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
10. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
11. Remove oil cooler cover and upper screw. See OIL COOLER (Page 4-19).
12. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
13. Remove induction module. See INDUCTION MODULE (Page 6-27).
14. Disconnect electrical connectors.
    a. Rear cylinder: Engine temperature sensor, knock sensor and ACR.
    b. Front cylinder: Knock sensor and ACR.
15. Remove spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
16. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
17. Remove breathers. See BREATHERS (Page 4-29).
18. Remove lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).
19. Remove rocker arms. See ROCKER ARMS (Page 4-32).
20. Remove pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).
21. Remove cylinder heads. See CYLINDER HEADS (Page 4-38).

REMOVE _____ _____

NOTE

Do not bend the cylinder studs.

1. Remove the cylinder.
    a. Raise the cylinder and place clean shop towels under the piston.
    b. Hold the piston to prevent touching the studs as it exits the cylinder.
    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 4-35. Discard gasket (4).



1. Head gasket
2. Dowel pin
3. Cylinder
4. Gasket

Figure 4-35. Cylinder Assembly

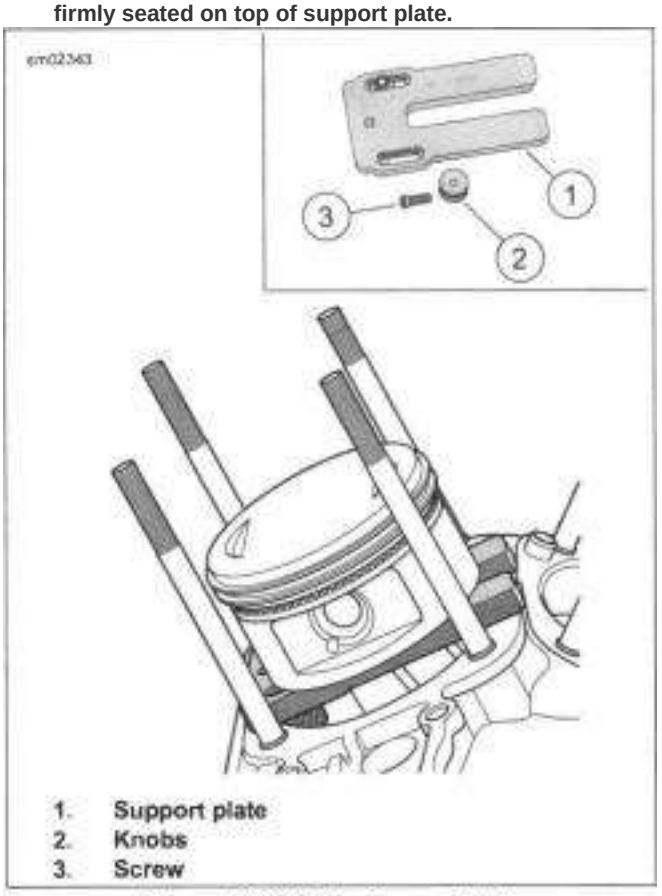
INSTALL

PART NUMBER	TOOL NAME
HD-96333-51F	PISTON RING COMPRESSOR

NOTE

Front and rear cylinders are unique. Install them in the correct locations.

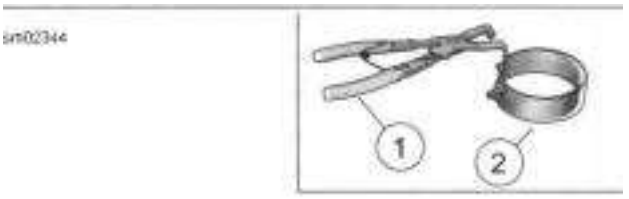
1. Prepare for cylinder installation.
   a. Install new base gasket to the crankcase.
   b. See Figure 4-48 . Verify piston ring alignment.
   c. Apply clean engine oil to piston, piston rings and cylinder bore.
   d. Rotate crankshaft until piston is at top dead center.
2. Remove protective covers from cylinder studs.
3. See Figure 4-36. Install the HD-52185 (PISTON SUPPORT PLATE) under piston.
4. Rotate crankshaft until piston skirt is centered and firmly seated on top of support plate.

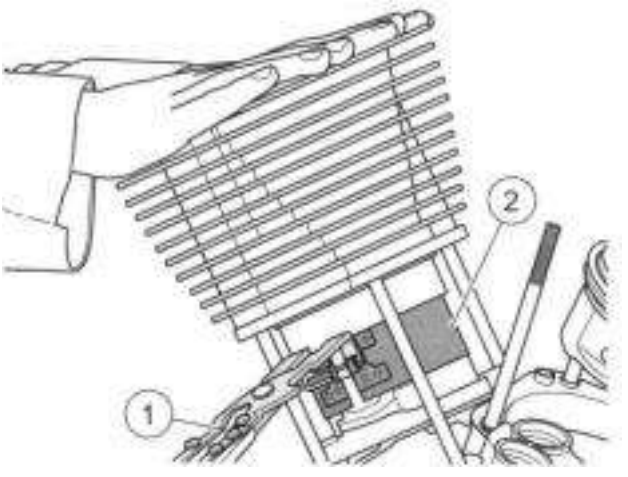


1. Support plate
2. Knobs
3. Screw

Figure 4-36. Piston Support Plate

5. See Figure 4-37. Install cylinder using PISTON RING COMPRESSOR (PART NUMBER: HD-96333-51F).
   a. Align tool with the top of the band positioned between the top compression ring and the piston crown.
   b. Compress piston rings.
   c. Align the indent in the cooling fins to the right side of the engine. Slide cylinder over the cylinder studs and piston until it rests on the top of the ring compressor.
   d. Push down on the cylinder with a sharp, quick motion using the palms of both hands.
   e. Remove pliers and piston support plate.
   f. Remove shop towels from around the crankcase bore.
   g. Push down on the cylinder until it is fully seated in the crankcase bore.
   h. See Figure 4-38. Install HD-52020 (CYLINDER HOLD-DOWN NUTS) onto cylinder studs.





1. Pliers
2. Compressor band

Figure 4-37. Piston Ring Compressor

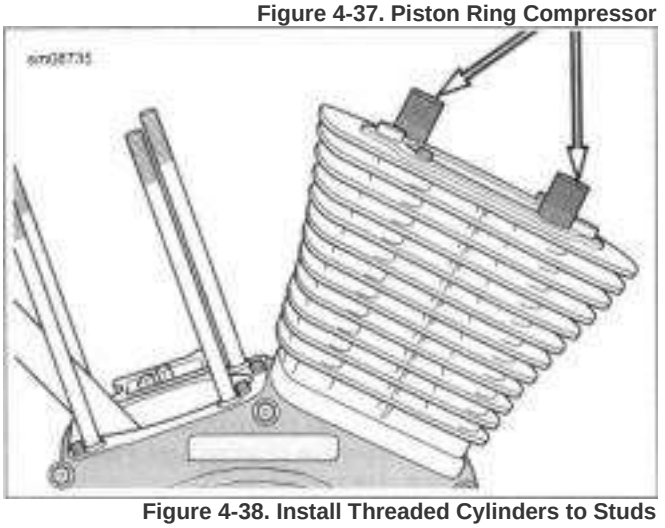


Figure 4-38. Install Threaded Cylinders to Studs

CLEAN AND INSPECT

1. **Clean all gasket material from the cylinder.**
2. **Clean parts in a non-volatile cleaning solution. Dry parts with low-pressure, compressed air.**
3. **Inspect the cylinder bore for defects or damage in the ring travel area.**
   a. **Light scratches that are not the length of the piston travel are considered normal. Hone pattern should travel through the scratches. This cylinder is fit for operation.**
   b. **Run a fingernail across the scratches. If a scratch catches a fingernail, the cylinder must be replaced.**
   c. **Scoring or broad bands that are the length of piston travel, or evidence that material transferred between the piston and cylinder, replace the cylinder.**
4. **Deglaze cylinders. See Deglaze Cylinder (Page 4-46).**

5. Verify that all oil holes are clean and open.
6. Carefully remove any nicks or burrs from the machined gasket surfaces.
7. Check the gasket surfaces for flatness. Measure with a straightedge and feeler gauge.
   a. Check head gasket surface of the cylinder. Record measurements.
   b. Check lower gasket surface of the cylinder. Record measurements.
   c. Discard cylinder if either gasket surface flatness is not within wear limits. See SPECIFICATIONS (Page 4-4)

DEGLAZE CYLINDER

1. Lightly swab the 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 the 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 the 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 the inside of the cylinder.
   c. Repeat wiping process until a new towel remains white.

COMPLETE

1. Install cylinder heads. See CYLINDER HEADS (Page 4-38).
2. Install pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).
3. Install rocker arms. See ROCKER ARMS (Page 4-32).
4. Install lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).
5. Install breathers. See BREATHERS (Page 4-29).
6. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
7. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
8. Connect electrical connectors.
   a. Rear cylinder: Engine temperature sensor, knock sensor and ACR.
   b. Front cylinder: Knock sensor and ACR
9. Install induction module. See INDUCTION MODULE (Page 6-27).
10. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).
11. Install oil cooler upper screw and cover. See OIL COOLER (Page 4-19).
12. ***NOTE***

See Remove and Install: Upper Front Engine Mount (Page 4-24) for proper tightening sequence.

    Install left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).
13. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
14. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
15. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
16. Install coil. See IGNITION COIL (Page 7-14).
17. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).
18. Install fuel tank. See FUEL TANK (Page 6-14).
19. Install seat. See SEAT (Page 3-142).
20. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove spark plug cables. See SPARK PLUG CABLES (Page 7-13).
6. Remove coil. See IGNITION COIL (Page 7-14).
7. Remove left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).
8. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
9. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
10. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
11. Remove oil cooler cover and upper screw. See OIL COOLER (Page 4-19).
12. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).
13. Remove induction module. See INDUCTION MODULE (Page 6-27).
14. Disconnect electrical connectors.
    a. **Rear cylinder:** Engine temperature sensor, knock sensor and ACR.
    b. **Front cylinder:** Knock sensor and ACR.
15. Remove spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).
16. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
17. Remove breathers. See BREATHERS (Page 4-29).
18. Remove lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).
19. Remove rocker arms. See ROCKER ARMS (Page 4-32).
20. Remove pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).
21. Remove cylinder heads. See CYLINDER HEADS (Page 4-38).
22. Remove cylinders. See CYLINDERS (Page 4-44).

REMOVE

NOTE

It is not necessary to remove both piston pin retaining rings for piston removal.

1. Place clean shop towels over crankcase bore to prevent the piston pin retaining ring from falling into the crankcase.
2. See Figure 4-39. Using HD-51069-2 (PISTON PIN RETAINING RING INSTALLER) with HD-51069-17 (NOSE ADAPTER), remove and discard one piston pin retaining ring.
    a. Insert tool (1) into piston pin bore with claw on tool in slot of piston (2) (directly under retaining ring).
    b. Squeeze handles of tool together.
    c. Pull retaining ring from bore. Discard retaining ring.

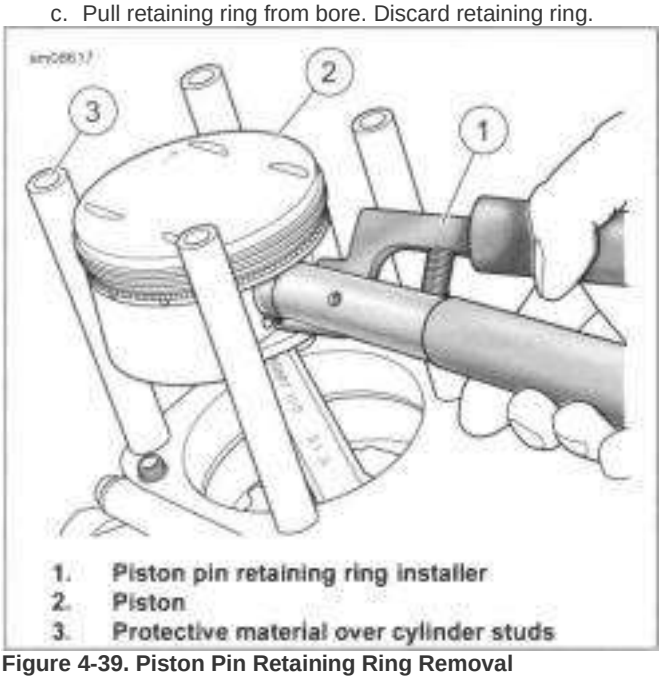


Figure 4-39. Piston Pin Retaining Ring Removal

3. See Figure 4-40. Remove piston.
    a. Remove the piston pin using HD-42320-8 (PISTON PIN EXTRACTOR) with HD-42320-D (PISTON PIN REMOVER).
    b. Hold the connecting rod to prevent it from striking the crankcase. Remove the piston.
    c. Place a piece of foam-type water pipe insulation around connecting rod to prevent damage.

4. Identify piston location by marking piston pin boss underneath.

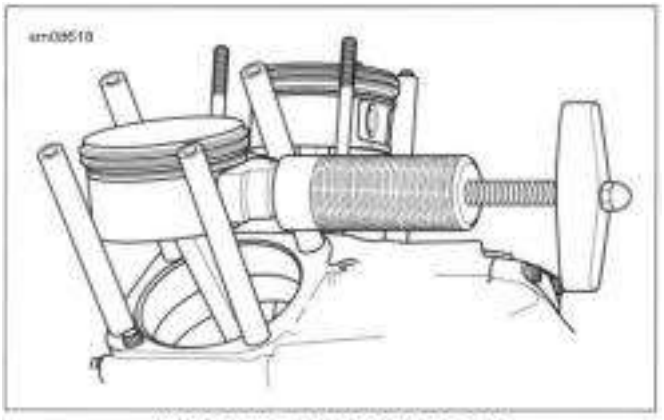


Figure 4-40. Remove Piston Pin

INSTALL

PART NUMBER	TOOL NAME
HD-51069-17	NOSE ADAPTER
HD-51069-2	PISTON PIN RETAINING RING INSTALLER

A 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)**

NOTE

Do not reuse piston pin retaining rings.

1. Install one **new** piston pin retaining ring using PISTON PIN RETAINING RING INSTALLER (PART NUMBER: HD-51069-2) with NOSE ADAPTER (PART NUMBER: HD-51069-17).
   a. See Figure 4-41. Slide retaining ring down nose of tool until it contacts claw.
   b. Center retaining ring at top of tool. Lightly squeeze handles of tool to capture retaining ring in claw.
   c. Tilt the retaining ring forward until the end gap contacts nose of tool.
   d. See Figure 4-43. Insert the tool (2) into the piston pin bore until claw is aligned with slot (3) in piston.
   e. Firmly push the tool into the piston pin bore until it bottoms.
   f. Release handles, Remove tool.
   g. See Figure 4-42. Verify that retaining ring end gap (3) is opposite from opening (2).
   h. Inspect the retaining ring to verify that it is fully seated in the groove.
2. Install piston.
   a. Verify that one retaining ring is installed in piston pin bore.
   b. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to piston pin, piston pin bores and upper connecting rod bore.
   c. Remove water pipe insulation from connecting rod shank.
   d. See Figure 4-43. Place piston over rod end with the arrow (1) pointing toward the front of the engine.
   e. Insert piston pin through pin bore and upper connecting rod until it contacts retaining ring installed in opposite pin boss.
   f. Place clean shop towels over the cylinder and lifter bores.
3. See Figure 4-41. Install **new** retaining ring using PISTON PIN RETAINING RING INSTALLER (PART NUMBER: HD-51069-2) with NOSE ADAPTER (PART NUMBER: HD-51069-17).
   a. See Figure 4-42. Verify that retaining ring end gap (3) is opposite from opening (2).
   b. Inspect the retaining ring to verify that it is fully seated in the groove.

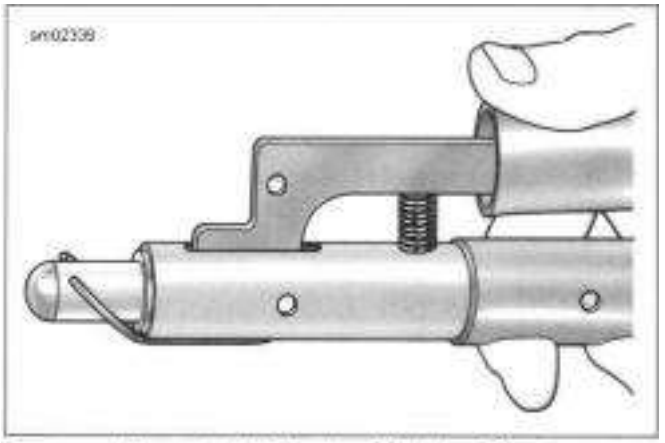
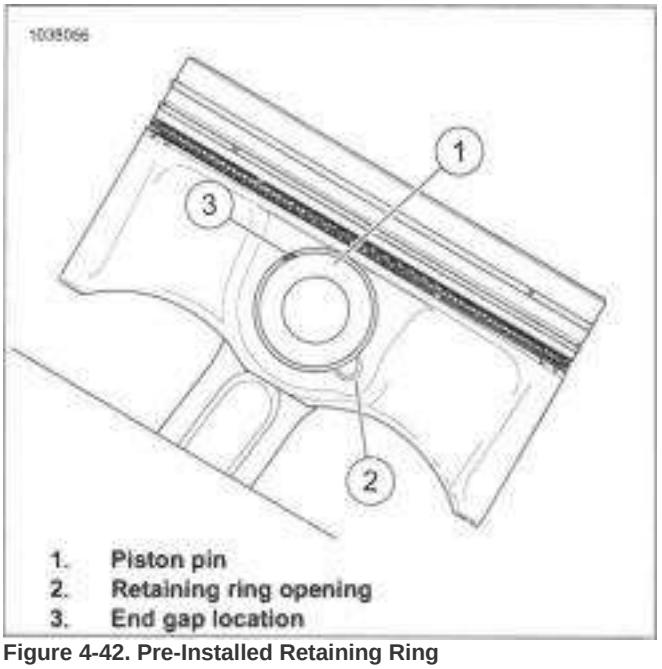
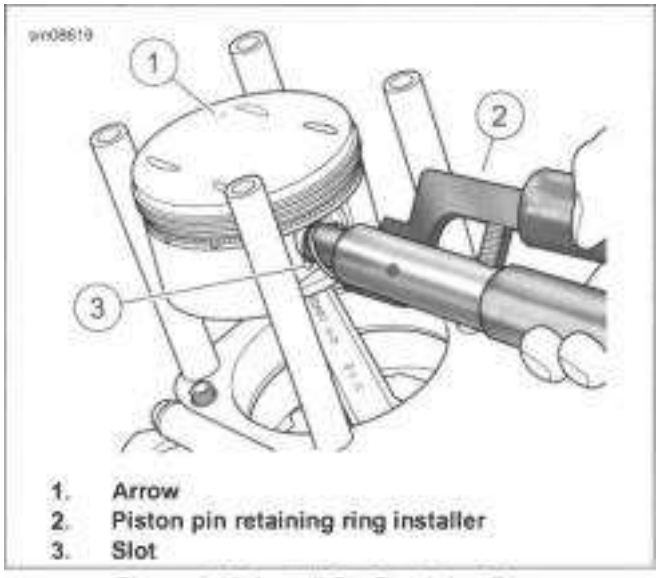


Figure 4-41. Aligning Retaining Ring



1. Piston pin
2. Retaining ring opening
3. End gap location

Figure 4-42. Pre-Installed Retaining Ring



1. Arrow
2. Piston pin retaining ring installer
3. Slot

Figure 4-43. Install Pin Retaining Ring

DISASSEMBLE

1. Remove piston rings.

CLEAN_AND INSPECT

Clean

A 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 4-44. 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)

5. ***NOTE***

- ***Check piston clearance in the cylinder in which that piston will run. Cylinder must be deglazed. See Deglaze Cylinder in CYLINDERS (Page 4-44).***

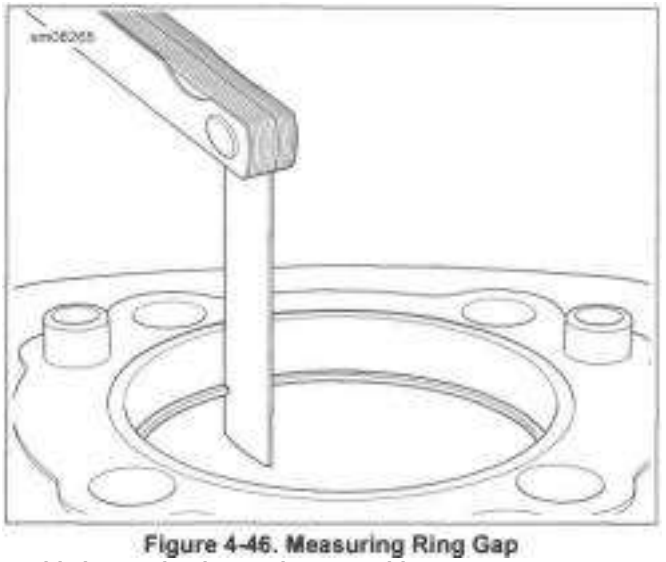


Figure 4-46. Measuring Ring Gap

- *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 4-45. The coating has an oval-shaped opening (1) on each side of the piston for proper micrometer placement.*
- *See lower frame of Figure 4-45. Use a blade or ball anvil style micrometer to measure piston.*

See Figure 4-45. 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

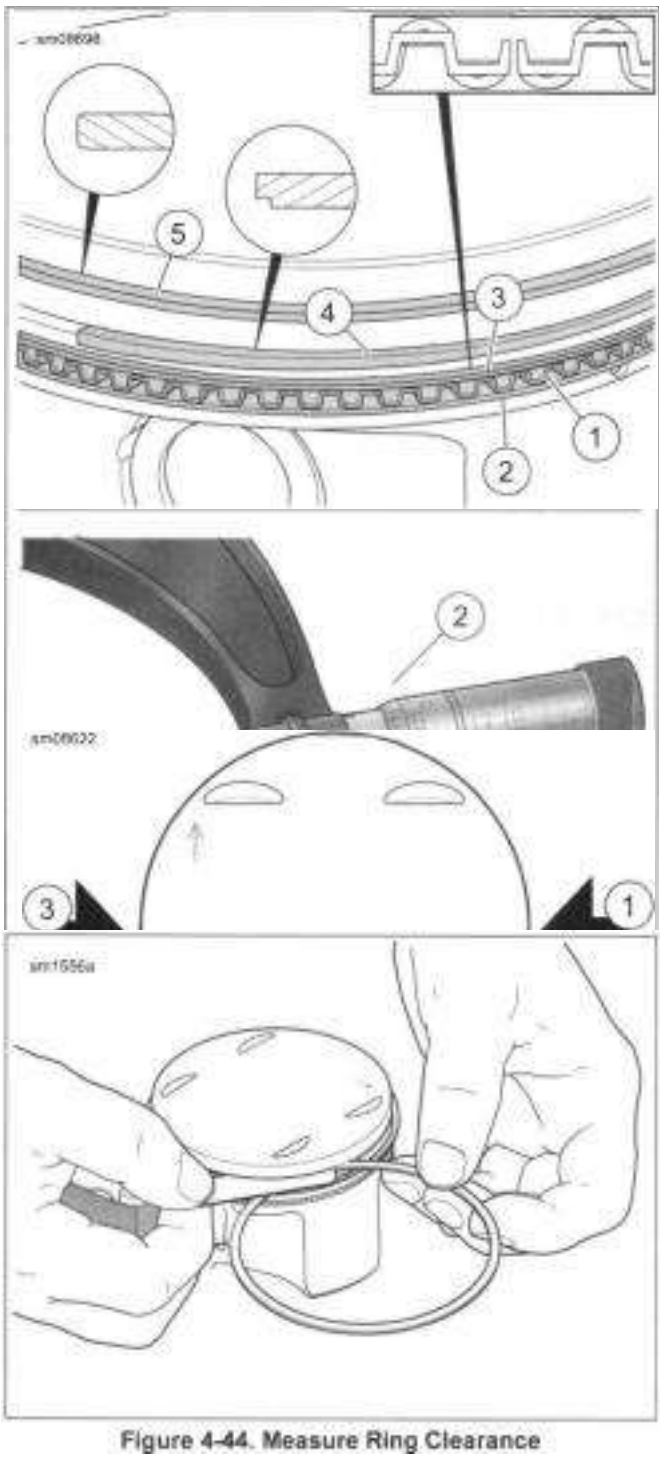


Figure 4-44. Measure Ring Clearance

ASSEMBLE [8]

8 The top ring has chamfered corners on the ring face. The second ring has a sharp upper corner and a groove cut around the lower edge.

2. Install second compression ring (4).
3. Install top compression ring (5).
4. Verify that all piston rings rotate freely.
5. See Figure 4-48. Arrange gaps as shown.

1. **Expander ring**
2. **Bottom oil rail**
3. **Top oil rail**
4. **Second compression ring**
5. **Top compression ring**

Figure 4-47. Piston Rings

1. **Expander ring**
2. **Bottom oil rail**
3. **Top oil rail**
4. **Second compression ring**
5. **Top compression ring**

Figure 4-48. Piston Ring Order of Assembly and Gap Alignment

COMPLETE _____

1. Install cylinders. See CYLINDERS (Page 4-44).
2. Install cylinder heads. See CYLINDER HEADS (Page 4-38).
3. Install pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).
4. Install rocker arms. See ROCKER ARMS (Page 4-32).
5. Install lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).

6. Install breathers. See BREATHERS (Page 4-29).

7. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

8. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).

9. Connect electrical connectors.

    a. **Rear cylinder:** Engine temperature sensor, knock sensor and ACR.

    b. **Front cylinder:** Knock sensor and ACR.

10. Install induction module. See INDUCTION MODULE (Page 6-27).

11. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).

12. Install oil cooler upper screw and cover. See OIL COOLER (Page 4-19).
13. ***NOTE***

See Remove and Install: Upper Front Engine Mount (Page 4-24) for proper tightening sequence.

    Install left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).

14. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

15. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

16. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).

17. Install coil. See IGNITION COIL (Page 7-14).

18. Install spark plug cables. See SPARK PLUG CABLES (Page 7-13).

19. Install fuel tank. See FUEL TANK (Page 6-14).

20. Install seat. See SEAT (Page 3-142).

21. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

CAM COMPARTMENT AND COMPONENTS

PREPARE

FASTENER	TORQUE VALUE	
Camshaft cover screws	90-120 in-lbs	10.2-13.6 N-m
Camshaft timer cover screws	25-35 in-lbs	2.8-4 N-m

REMOVE AND INSTALL: CAMSHAFT 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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).

3. ***NOTE***

Detach rider foot control bracket only if needed to remove exhaust system.

   Detach right side rider foot control bracket. See RIGHT FOOT CONTROLS (Page 3-133).

4. Remove exhaust system. See EXHAUST SYSTEM (Page 6-36).

5. Remove seat. See SEAT (Page 3-142).

6. Remove fuel tank. See FUEL TANK (Page 6-14).

7. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).

8. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

9. Remove spark plug cables. SPARK PLUG CABLES (Page 7-13).

10. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

11. Remove oil cooler cover upper screw. See OIL COOLER (Page 4-19).

12. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).

13. Disconnect electrical connectors.

    a. **Rear cylinder:** Engine temperature sensor, knock sensor and ACR.

    b. **Front cylinder:** Knock sensor and ACR

14. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

15. Loosen rocker arm screws to relieve tension on pushrods. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).

Remove

1. **See Figure 4-49. Remove camshaft cover.**

    a. **Remove screws (3).**

    b. **Remove camshaft cover (4).**

    c. **Discard gasket (5).**

Install

1. **See Figure 4-49. Install camshaft cover.**

    a. **Install new gasket (5).**

    b. **Install camshaft cover (4).**

    c. **Install screws (3). Hand tighten.**

    d. **See Figure 4-50. Tighten screws in the sequence shown.**

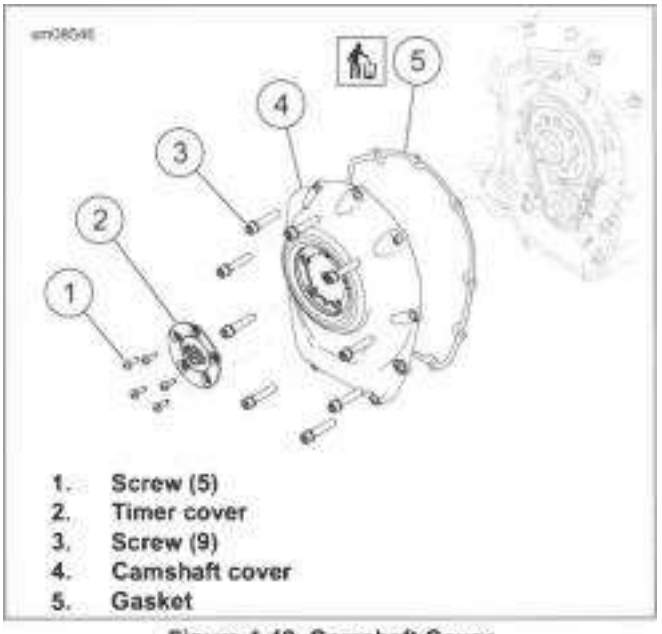
    Torque: 90-120 in-lbs (10.2-13.6 N-m) ***Camshaft cover screws***

2. **See Figure 4-49. Install timer cover, if removed.**

    a. **Install timer cover (2).**

    b. **Install screws (1). Tighten.**

    Torque: 25-35 in-lbs (2.8-4 N-m) ***Camshaft timer cover screws***



1. Screw (5)
2. Timer cover
3. Screw (9)
4. Camshaft cover
5. Gasket

Figure 4-49. Camshaft Cover

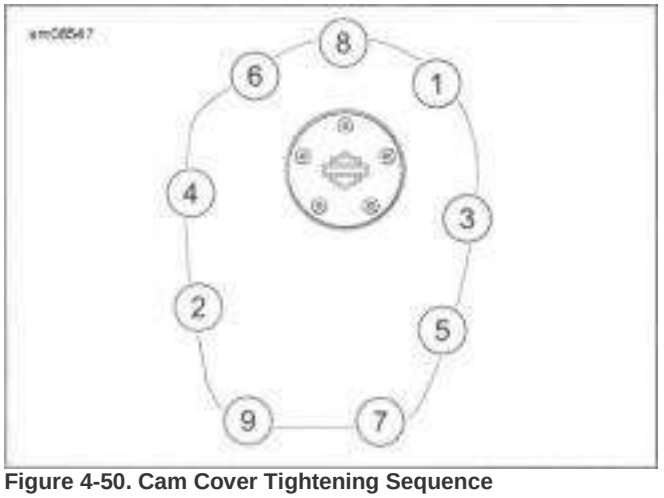


Figure 4-50. Cam Cover Tightening Sequence

REMOVE

PART NUMBER	TOOLNAME
93979-10	MAGNETIC LIFTER HOLDERS
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

1. See Figure 4-51. Remove chain and sprockets.
   a. Mark one of the chain links with a colored marker.
   b. Remove cam chain tensioner fasteners (2). Remove cam chain tensioner (1).
   c. Install CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (PART NUMBER: HD-47941) between cam sprocket (9) and crank sprocket (8).
   d. Remove cam sprocket screw (4) and washer (3).
   e. Remove crank sprocket screw (5) and washer (6).
   f. Remove sprocket locking tool.
   g. Remove both sprockets and chain.
   h. Remove spacer (10).

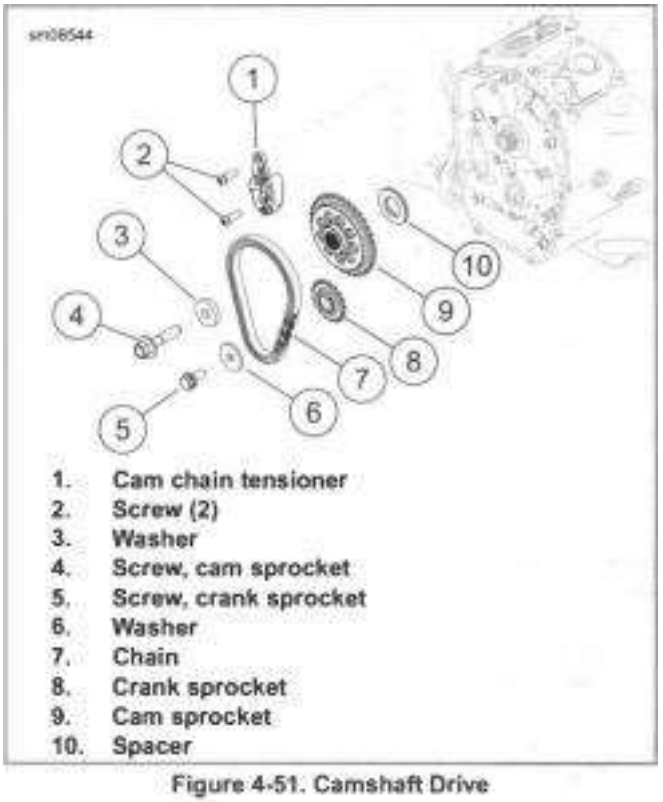


Figure 4-51. Camshaft Drive

2. Remove camshaft.
   a. See Figure 4-52. Support lifters using MAGNETIC LIFTER HOLDERS (PART NUMBER: 93979-10).
   b. See Figure 4-53. Remove four screws (5).
   c. Remove screws (1).
   d. Remove cam support plate (2).
   e. Remove camshaft (3).
   f. Remove O-ring (4).

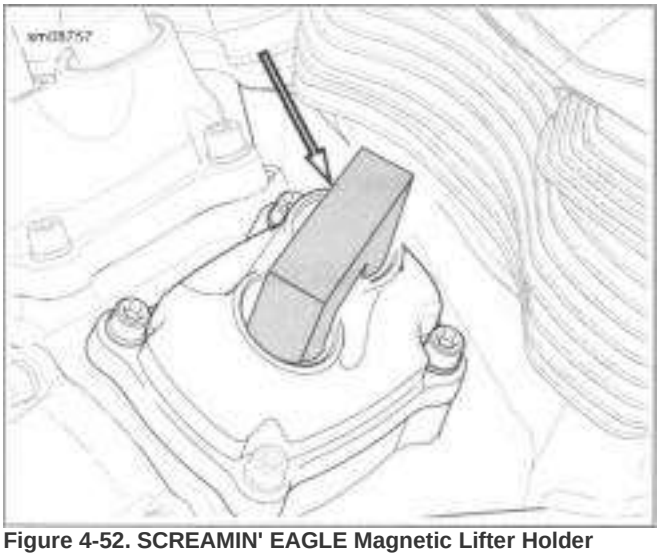
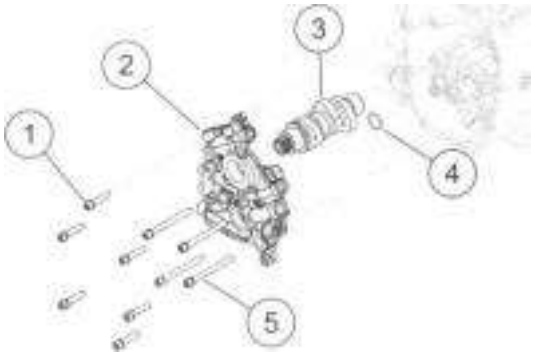


Figure 4-52. SCREAMIN' EAGLE Magnetic Lifter Holder

sm08545



1. Support plate screw (6)
2. Cam support plate
3. Camshaft
4. O-ring
5. Oil pump screws (4)

Figure 4-53. Cam Support Plate

INSPECT CAM_COMPONENT _____

NOTE

See SPECIFICATIONS (Page 4-4) 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 so they can be installed in the same location and orientation as original.
   b. Remove lifters through camshaft cavity.
   c. Measure lifters.

Cam Support Plate

1. Measure the diameters of the camshaft and crankshaft bores.
2. Measure flatness of support plate.
3. Inspect gerotor area for excessive wear or deep grooves.
4. Verify that all oil passages are clean and open.

Cam Drive Components

1. Inspect sprockets and chain 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, 1st torque	12-60 in-lbs	1.4-6.8 N-m
Oil pump screws, final torque	90-120 in-lbs	10.2-13.6 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 4-53. 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 4-54. Tighten screws in sequence.
   a. Tighten screws (1,2).

      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 (3-8) in sequence shown.

      Torque: 90-120 in-lbs (10.2-13.6 N-m) ***Cam support plate screws***

   d. Final tighten four oil pump screws (1-2,9-10) in same sequence.

      Torque: 90-120 in-lbs (10.2-13.6 N-m) ***Oil pump screws, final torque***

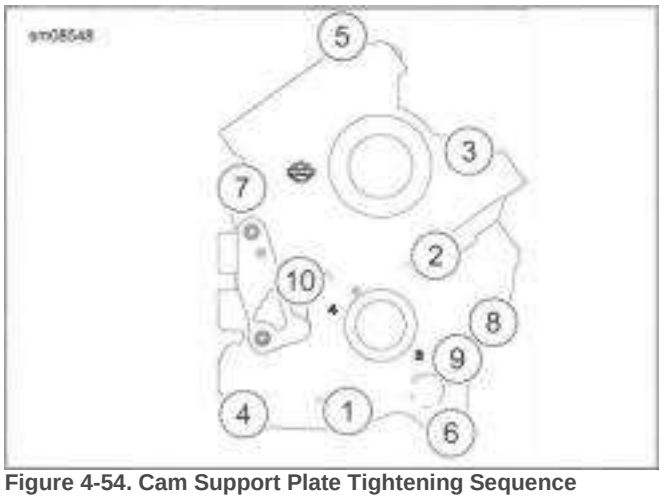


Figure 4-54. Cam Support Plate Tightening Sequence

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 4-51. Install original cam sprocket spacer (10) . ‘

b. Install cam sprocket without chain using screw (4) and washer (3).

c. Install crankshaft sprocket without chain using screw (5) 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 (10) using Table 4-34 as a guide.

l. Check alignment with **new** spacer installed.

m. Remove both sprockets.

Table 4-34. 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 (10).

c. See Figure 4-55. 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 threadlockerfrom 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.

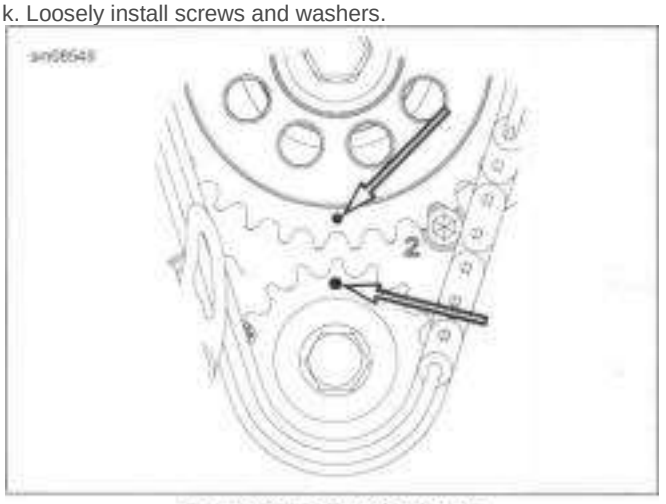


Figure 4-55. Timing Marks

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. Install rocker arms. See ROCKER ARMS (Page 4-32).
2. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).
3. Connect electrical connectors.

a. **Rear cylinder:** Engine temperature sensor, knock sensor and ACR.

b. **Front cylinder:** Knock sensor and ACR.

4. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).
5. Install oil cooler cover and upper screw. See OIL COOLER (Page 4-19).
6. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).
7. Install spark plug cables. SPARK PLUG CABLES (Page 7-13).
8. Install fuel tank. See FUEL TANK (Page 6-14).
9. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
10. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
11. Install seat. See SEAT (Page 3-142).
12. Install exhaust system. See EXHAUST SYSTEM (Page 6-36).
13. Attach right side foot control bracket, if removed. See RIGHT FOOT CONTROLS (Page 3-133).
14. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

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 4-56. Remove camshaft bearing using components of CAMSHAFT NEEDLE BEARI VER/INSTALLER (PART NUMBER: HD-42325-C).
2. Hold the flat on the HD-42325-12A (COLLET). Turn hex at end to expand collet.

3. Turn hex nut to remove bearing.

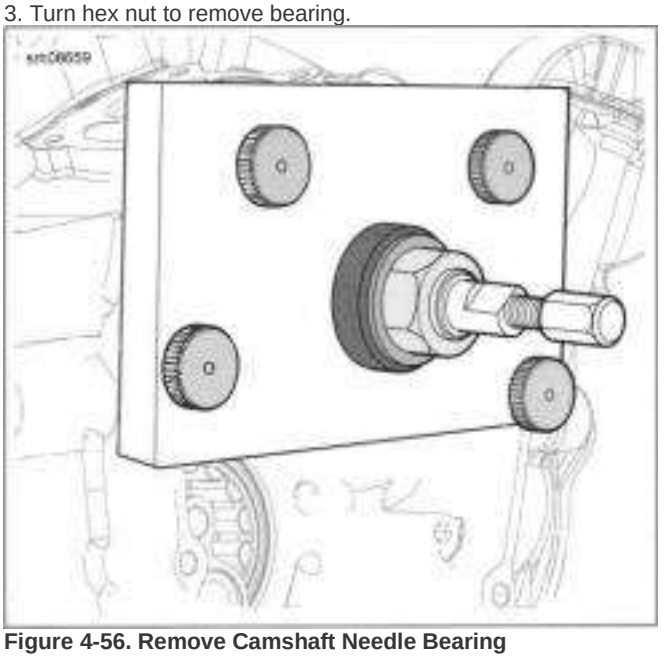


Figure 4-56. Remove Camshaft Needle Bearing

Install

1. Calculate bearing installed depth.

a. Measure thickness of HD-42325-4 (SUPPORT PI^R).

b. Add support plate thickness to 3.737 in (94.92 mm). Record this value.

2. See Figure 4-56. Install bearing using HD-42325-7A (CAMSAFT NEEDLE BEARING INSTALLER).

a. Place **new** needle bearing on installer with letters facing installer (visible from cam chest when installed).

b. Install support plate.

3. See Figure 4-57. 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***

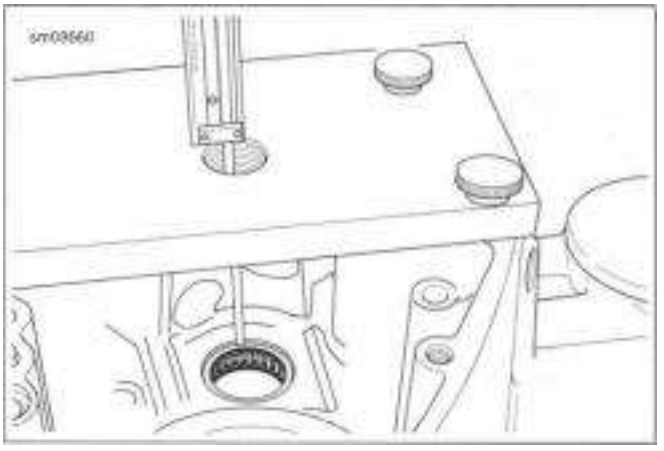


Figure 4-57. Measure from Top of Support Plate to Edge of Needle Bearing

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. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).

3. ***NOTE***

Detach rider foot control bracket only if needed to remove exhaust system.

Detach right side rider foot control bracket. See RIGHT FOOT CONTROLS (Page 3-133).

4. Remove exhaust system. See EXHAUST SYSTEM (Page 6-36).

5. Remove seat. See SEAT (Page 3-142).

6. Remove fuel tank. See FUEL TANK (Page 6-14).

7. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).

8. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

9. Remove spark plug cables. SPARK PLUG CABLES (Page 7-13).

10. Remove upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

11. Remove oil cooler cover and upper screw. See OIL COOLER (Page 4-19).

12. Remove upper cooling lines. See OIL COOLANT LINES (Page 4-22).

13. Disconnect electrical connectors.

    a. Rear cylinder: Engine temperature sensor, knock sensor and ACR.

    b. Front cylinder: Knock sensor and ACR.

14. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

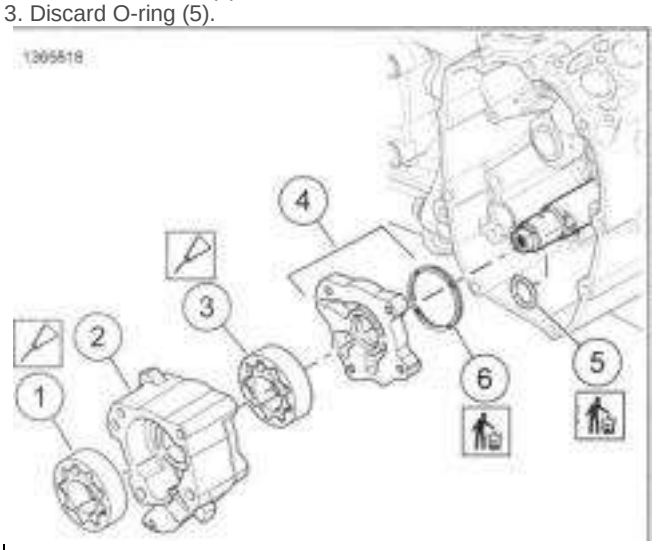
15. Loosen rocker arm screws to relieve tension on pushrods. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).

16. Remove camshaft cover and cam support plate. See CAM COMPARTMENT AND COMPONENTS (Page 4-53).

REMOVE

1. See Figure 4-58. 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 4-58. Oil Pump

DISASSEMBLE AND INSPECT

1. See Figure 4-58 . Remove gerotors (1, 3).

2. See Figure 4-59. 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 4-58 . Inspect for grooves or scratches on cam support plate and back housing (4).

6. See Figure 4-60. 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 4-35. 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 4-35. Compare measurements to maximum specification.

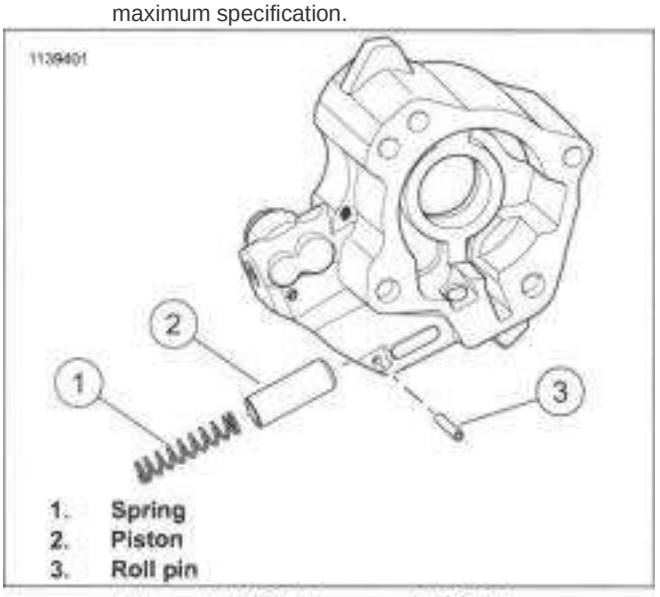


Figure 4-59. Oil Pressure Relief Valve

ASSEMBLE

a. See Figure 4-59 . 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

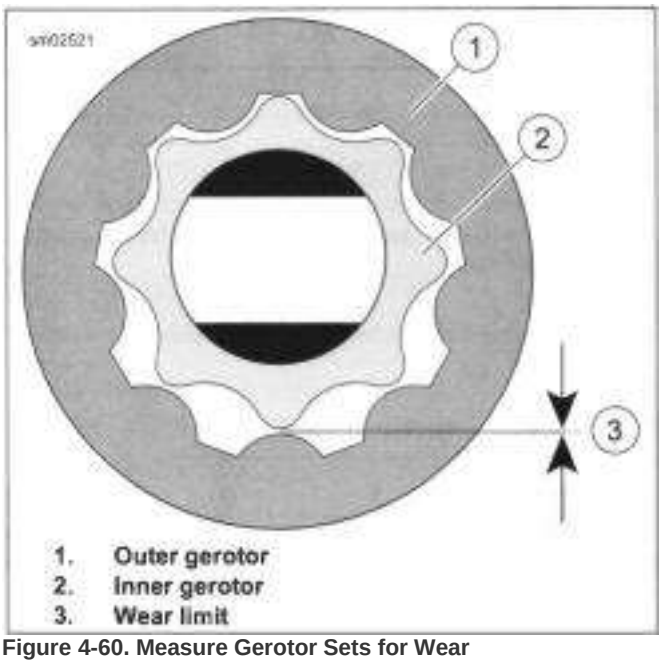


Figure 4-60. Measure Gerotor Sets for Wear

Table 4-35. Oil Pump Feed and Scavenge Gerotor Tolerances

MAXIMUM LOBE CLEARANCE	MAXIMUMTHICKNESS DIFFERENCE
0.004 in (0.1 mm)	0.001 in (0.025 mm)

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002

1. Install pressure relief valve.

CONSUMABLE	PART NUMBER
SCREAM IN' EAGLE ASSEMBLY LUBE	11300002

1. Lubricate all parts with assembly lube during assembly.

Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

2. See Figure 4-58 . Install **new** oil seal (6) on back housing (4) .

3. Install back housing (4) and scavenge gerotor set (3) onto crankshaft.

4. Install **new** O-ring (5) in crankcase scavenge port.

5. Apply assembly lube to scavenge port spigot.

   Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

6. Slide oil pump housing (4) onto crankshaft while fitting scavenge port into O-ring.

   a. Firmly push on oil pump housing to fully seat.

7. Install feed gerotor set (1).

COMPLETE

1. Install cam support plate and camshaft cover. See CAM COMPARTMENT AND COMPONENTS (Page 4-53).

2. Install rocker arms. See ROCKER ARMS (Page 4-32).

3. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

4. Connect electrical connectors.

   a. **Rear cylinder:** Engine temperature sender, knock sensor and ACR.

   b. **Front cylinder:** Knock sensor and ACR.

5. Install upper cooling lines. See OIL COOLANT LINES (Page 4-22).

6. Install oil cooler upper screw and cover. See OIL COOLER (Page 4-19).

7. Install upper front engine mount. See FRONT ENGINE MOUNT (Page 4-24).

8. Install spark plug cables. SPARK PLUG CABLES (Page 7-13).

9. Install fuel tank. See FUEL TANK (Page 6-14).

10. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

11. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).

12. Install seat. See SEAT (Page 3-142).

13. Install exhaust system. See EXHAUST SYSTEM (Page 6-36).

14. Attach right side foot control bracket, if removed. See RIGHT FOOT CONTROLS (Page 3-133).

15. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

Prepare

1. Secure motorcycle on lift. See GENERAL (Page 2-2).
2. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove saddlebags, if equipped. See SADDLEBAGS (Page 3-145).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).
6. Remove battery. See INSPECT BATTERY (Page 2-43).
7. Remove battery tray. See BATTERY TRAY (Page 7-97)
8. Remove exhaust system. See EXHAUST SYSTEM (Page 6-36).
9. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
10. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
11. Disconnect front oil hose from oil cooler. See OIL COOLANT LINES (Page 4-22).
12. Drain engine oil and discard filter. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
13. Remove voltage regulator. See VOLTAGE REGULATOR (Page 7-12).
    a. Release stator harness anchor.
14. Disconnect CKP sensor. See CRANKSHAFT POSITION SENSOR (CKP) (Page 7-78).
15. Disconnect jiffy stand sensor, if equipped. See JIFFY STAND SENSOR (JSS) (Page 7-86).
16. Disconnect oil pressure sender. See OIL PRESSURE SWITCH (Page 7-28).
17. Disconnect clutch cable. See CLUTCH CONTROL (Page 3-91).
18. Remove starter. See STARTER (Page 7-9).
19. Remove primary chaincase. See PRIMARY CHAINCASE HOUSING (Page 5-27).
20. Remove drive belt from transmission pulley. See DRIVE BELT (Page 5-7).
21. Remove rear splash guard. See REAR FORK (Page 3-81).
22. Disconnect line from oil check valve. See OIL COOLER (Page 4-19).
23. Release main harness and brake line from lower frame rail.
    a. Allow to hang below frame.
24. Remove right foot support bracket. See RIGHT FOOT CONTROLS (Page 3-133).
25. Remove brake pedal master cylinder assembly. See REAR BRAKE MASTER CYLINDER (Page 3-42).
    a. Place on work surface. Wrap rear master cylinder with protective padding.
26. Disconnect VSS. See VEHICLE SPEED SENSOR (VSS) (Page 7-83).
27. Disconnect ACRs. See AUTOMATIC COMPRESSION RELEASE (ACR) (Page 7-81).
28. Disconnect ground cable from transmission case. Do this only if removing as one assembly or transmission case separately.
29. Disconnect knock sensors. See KNOCK SENSOR (KS) (Page 7-80).
30. Disconnect cylinder temperature sensor. See ENGINE TEMPERATURE (ET) SENSOR (Page 7-79).
31. Remove USB caddy. See USB CADDY (Page 7-90).
32. Disconnect spark plug cables. See SPARK PLUG CABLES (Page 7-13).
33. Remove ignition coil. See IGNITION COIL (Page 7-14).
34. Remove left side engine mount (coil bracket). See LEFT SIDE ENGINE MOUNT (Page 4-26).

REMOVE

Remove

1. Wrap rocker covers and frame rails with protective padding or tape.
2. Support powertrain.
    a. Support engine using FAT JACK (PART NUMBER: HD-45968) or similar.
    b. Place support under crankcase.

c. Support transmission using FAT JACK (PART NUMBER: HD-45968) or similar.

d. Place support under frame.

3. Remove pivot shaft. See REAR FORK (Page 3-81)

4. Remove front engine mount. See FRONT ENGINE MOUNT (Page 4-24)

5. Remove lower front engine mount bolt. See FRONT ENGINE MOUNT (Page 4-24)

6. Remove powertrain from chassis.

a. Slide transmission case as far back as possible.

b. Remove engine from right side.

7. Remove induction module assembly. See INDUCTION MODULE (Page 6-27)

INSTALL

Install

1. Make sure motorcycle is secure on lift.

2. Install induction module assembly. See INDUCTION MODULE (Page 6-27)

3. Install powertrain into chassis.

a. Install engine from right side.

b. Position in chassis.

4. Install lower front engine mount. See FRONT ENGINE MOUNT (Page 4-24)

5. Install front stabilizer link and bracket. See FRONT ENGINE MOUNT (Page 4-24)

6. Install pivot shaft. See REAR FORK (Page 3-81)

7. Remove powertrain supports.

8. Remove protective padding/tape from rear master cylinder, rocker covers and frame rails.

COMPLETE

Complete

1. Install left side engine mount (coil bracket). See LEFT SIDE ENGINE MOUNT (Page 4-26).

2. Install ignition coil. See IGNITION COIL (Page 7-14).

3. Connect spark plug cables. See SPARK PLUG CABLES (Page 7-13).

4. Install USB caddy. See USB CADDY (Page 7-90).

5. Connect cylinder temperature sensor. See ENGINE TEMPERATURE (ET) SENSOR (Page 7-79).

6. Connect knock sensors. See KNOCK SENSOR (KS) (Page 7-80).

7. Connect ground cable to transmission case.

8. Connect ACRs. See AUTOMATIC COMPRESSION RELEASE (ACR) (Page 7-81).

9. Connect VSS. See VEHICLE SPEED SENSOR (VSS) (Page 7-83).

10. Install brake pedal master cylinder assembly. See REAR BRAKE MASTER CYLINDER (Page 3-42).

11. Install right foot support bracket. See RIGHT FOOT CONTROLS (Page 3-133).

a. Secure main harness and brake line to lower frame rail.

12. Connect line to oil check valve. See OIL COOLER (Page 4-19)

13. Install rear splash guard. See REAR FORK (Page 3-81)

14. Install drive belt. See DRIVE BELT (Page 5-7).

15. Install primary chaincase. See PRIMARY CHAINCASE HOUSING (Page 5-27).

16. Install starter. See STARTER (Page 7-9).

17. Install and adjust clutch cable. See CLUTCH CONTROL (Page 3-91).

18. Connect oil pressure sender. See OIL PRESSURE SWITCH (Page 7-28).

19. Connect jiffy stand sensor, if equipped. See JIFFY STAND SENSOR (JSS) (Page 7-86).

20. Connect CKP sensor. See CRANKSHAFT POSITION SENSOR (CKP) (Page 7-78).

21. Install voltage regulator. See VOLTAGE REGULATOR (Page 7-12).

22. Fill engine oil and install new filter. See REPLACE ENGINE OIL AND FILTER (Page 2-7).

23. Connect upper cooling lines. See OIL COOLANT LINES (Page 4-22).

24. Install air cleaner backplate assembly. AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

25. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).

26. Install exhaust system. See EXHAUST SYSTEM (Page 6-36).

27. Install battery tray. See BATTERY TRAY (Page 7-97).

28. Install battery. See INSPECT BATTERY (Page 2-43).

29. Install fuel tank. See FUEL TANK (Page 6-14).

30. Install seat. See SEAT (Page 3-142).
31. Install saddlebags, if equipped. See SADDLEBAGS (Page 3-145).
32. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

33. 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 REPLACE ENGINE (Page 4-62).

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 spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).

4. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

5. Remove breathers. See BREATHERS (Page 4-29).

6. Remove lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).

7. Remove rocker arms. See ROCKER ARMS (Page 4-32).

8. Remove pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).

9. Remove cylinder heads. See CYLINDER HEADS (Page 4-38).

10. Remove cylinders. See CYLINDERS (Page 4-44).

11. Remove pistons. See PISTONS (Page 4-47).

12. Remove cam cover and cam compartment components. See CAM COMPARTMENT AND COMPONENTS (Page 4-53).

13. Remove oil pump. See OIL PUMP (Page 4-59).

DISASSEMBLE

1. Remove oil pump from crankshaft.

A 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)

2. Position crankcase with cam compartment facing down.

NOTE
Never move or lift the crankcase by grasping the cylinder studs.

3. ***NOTE***
Use care to not allow the balancer gears to raise when lifting off left crankcase. The balancer gears can disengage the crankshaft gear, allowing the balancer scissor gear to unload. Rotating the scissor gear back into position is difficult.

   Separate crankcase halves.

   a. See Figure 4-61. Remove 14 crankcase screws in the sequence shown.

   b. Separate case halves.

   c. See Figure 4-62. Lift left crankcase half (2) off end of crankshaft.

4. Remove two dowel pins in split line face of right case half.

NOTE
HD-52065 (Balancer Gear Alignment Tool) must be installed before removing balancer.

5. Remove balancers (4).

   a. Rotate gear teeth slightly with a screwdriver to allow tool installation.

   b. Install HD-52065 (Balancer Gear Alignment Tool).

   c. Lift balancer from crankcase.

6. Remove flywheel assembly (3).

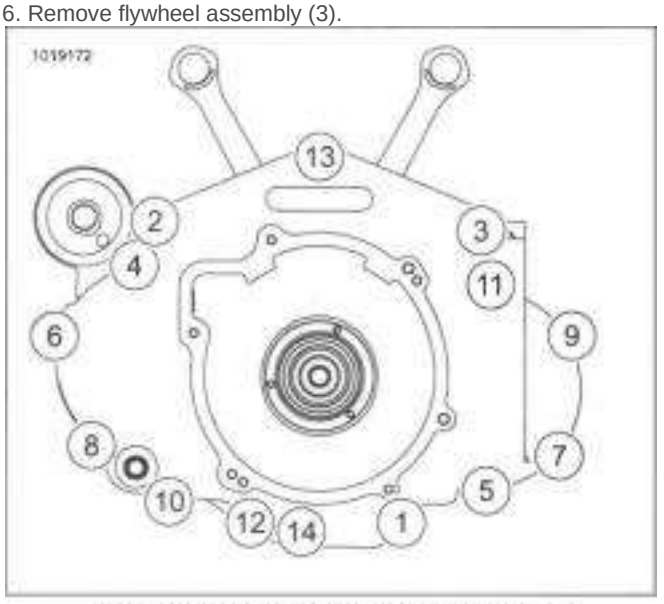


Figure 4-61. Crankcase Torque Sequence

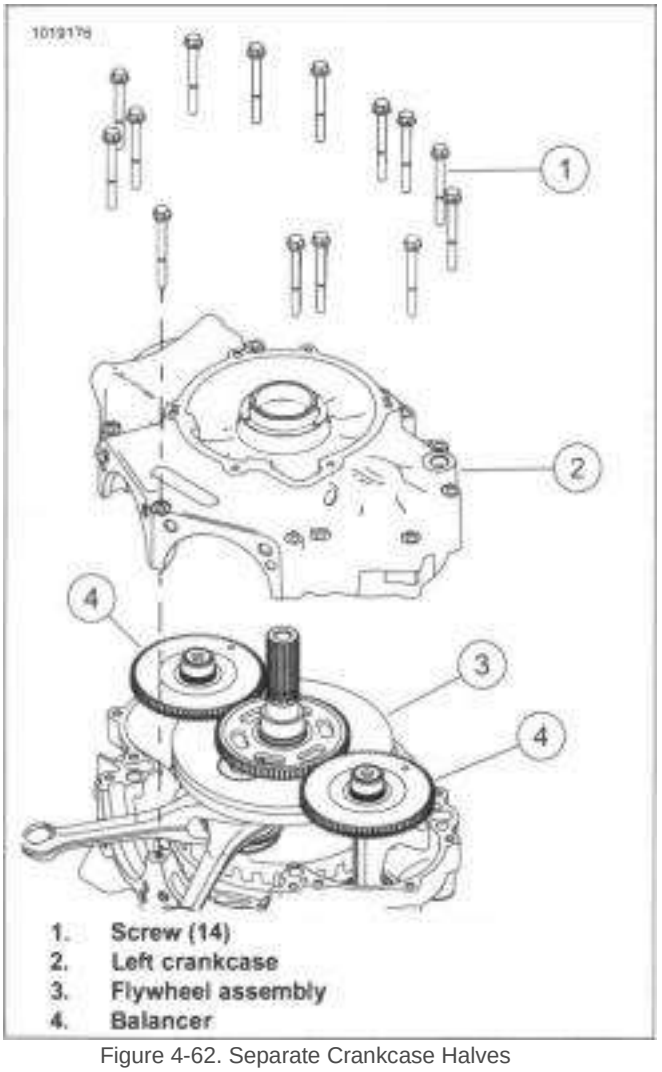


Figure 4-62. Separate Crankcase Halves

CLEAN AND INSPECT

1. Remove all gasket material from the crankcase flanges.

2. Clean all parts in a non-volatile cleaning solution or solvent.

A WARNING

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

3. Dry parts with moisture-free compressed air.

4. Verify that all oil holes are clean and open.

5. Check ring dowels for looseness, wear or damage. Replace if necessary.

6. Use a file to carefully remove any nicks or burrs from machined surfaces.

7. Clean out tapped holes and clean up damaged threads.

8. Check the top of the crankcase for flatness with a straightedge and feeler gauge. Replace if warped.

9. Spray all machined surfaces with clean engine oil.

10. Inspect crankshaft/flywheel assembly. See FLYWHEEL AND CONNECTING RODS (Page 4-75).

ASSEMBLE

PART NUMBER	TOOL NAME
HD-42326-B	CRANKSHAFT GUIDE
HD-52064	LEFT MAIN BEARING OIL SEAL INSTALLATION TOOL
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

FASTENER	TORQUE VALUE	
Crankcase screws, first torque	120 in-lbs	13.6 N-m
Crankcase screws, last torque	15-19 ft-lbs	20.3-25.8 N-m

CONSUMABLE	PART NUMBER
SCREAMIN' EAGLE ASSEMBLY LUBE	11300002
HARLEY-DAVIDSON HIGH PERFORMANCE	99650-02

1. Position right crankcase with cam compartment facing down.

2. Install flywheel assembly.

   a. Work a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE into both main bearings and balancer bearings.

   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 4-63. When aligning timing marks match dash to dash and circle to circle.***
- ***Timing marks may not align exactly. Align to the closest tooth.***

See Figure 4-63, Install balancers.

   a. Rotate flywheel so crankpin is at BDC.

   b. Install balancer while aligning timing marks (2).

   c. Repeat with remaining balancer.

4. Remove alignment tool.

a, Rotate gear teeth slightly with a screwdriver to unload pressure on tool.

b. Remove tool.

5. ***NOTE***

The balancer shafts may splay away from the 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 4-64. Apply a bead of sealant to specification to the split line face of right crankcase half.

Length/Dimension/Distance: 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 4-61. Install 14 crankcase screws.

a. Finger-tighten each screw.

b. Tighten screws in sequence shown

Torque: 120 in-lbs (13.6 N-m) ***Crankcase screws, first torque***

c. Loosen, then following the same sequence, final tighten.

Torque: 15-19 ft-lbs (20.3-25.8 N-m) ***Crankcase screws, last 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 (and the chamfer inboard). If using original part without markings, position to preserve existing wear pattern.

9. See Figure 4-65. Install new sprocket shaft oil seal using components from the following tools.

Special Tool: SPROCKET SHAFT BEARING INSTALLER (HD-97225-55C)

b. Install sprocket shaft spacer.

c. Install oil seal with rounded feature of metal casing facing in and sharp edge facing out.

Special Tool: LEFT MAIN BEARING OIL SEAL INSTALLATION TOOL (HD-52064)

a. Verify that lip garter spring is in place on both sides of oil seal.

10. Rotate crankcase so that cam compartment is facing up.

11. Apply a liberal amount of lube to main bearing. Rotate flywheel assembly to distribute lube.

Consumable: SCREAMIN' EAGLE ASSEMBLY LUBE (11300002)

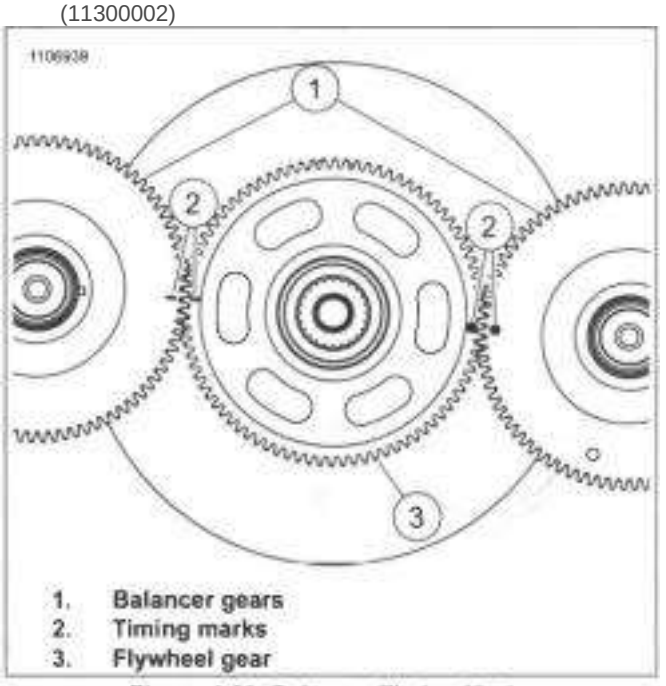


Figure 4-63. Balancer Timing Marks

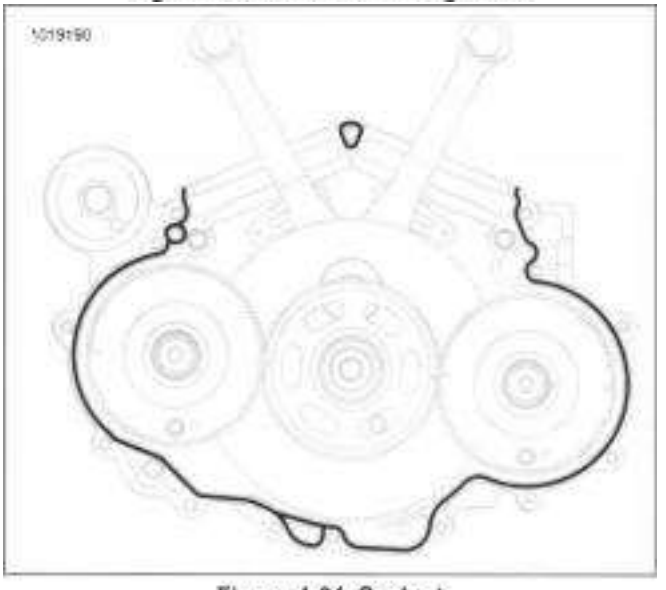


Figure 4-64. Sealant

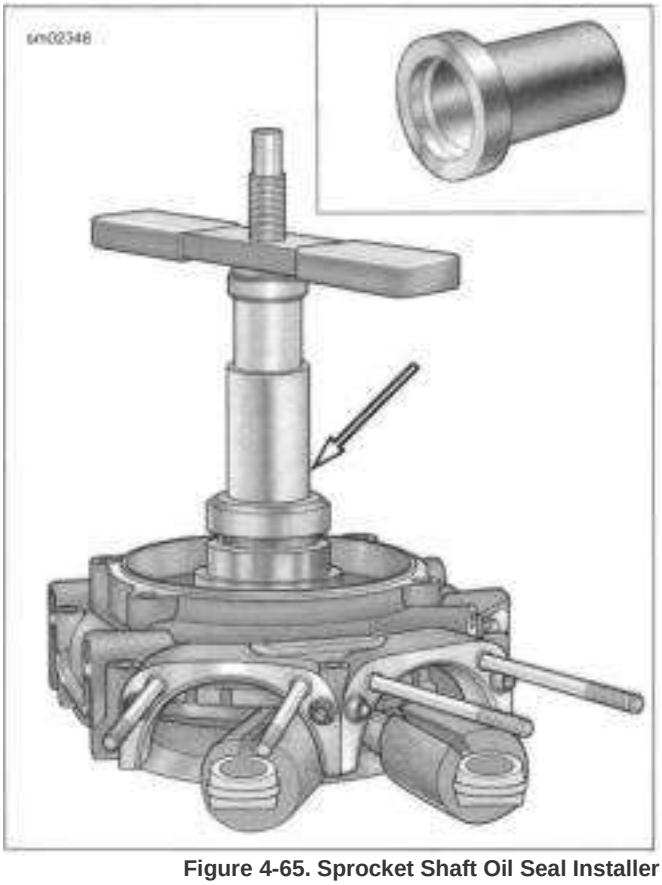


Figure 4-65. Sprocket Shaft Oil Seal Installer

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***

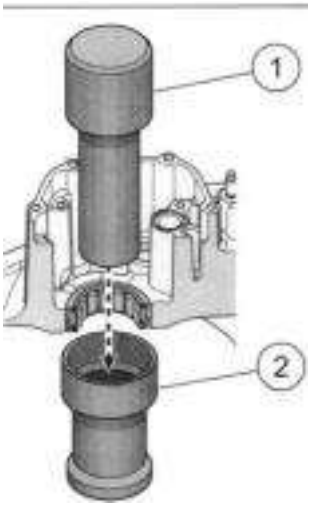
Never move or lift crankcase by grasping cylinder studs.

See Figure 4-66. 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 4-66. Remove Right Main Bearing

Install Main Bearing

1. See Figure 4-67. Install bearing.

Special Tool: MAIN BEARING REMOVER AND INSTALLER (HD-52071)

a. Place crankcase with flywheel side facing up on main bearing support (3).

b. Spread clean engine oil on OD of new bearing (5).

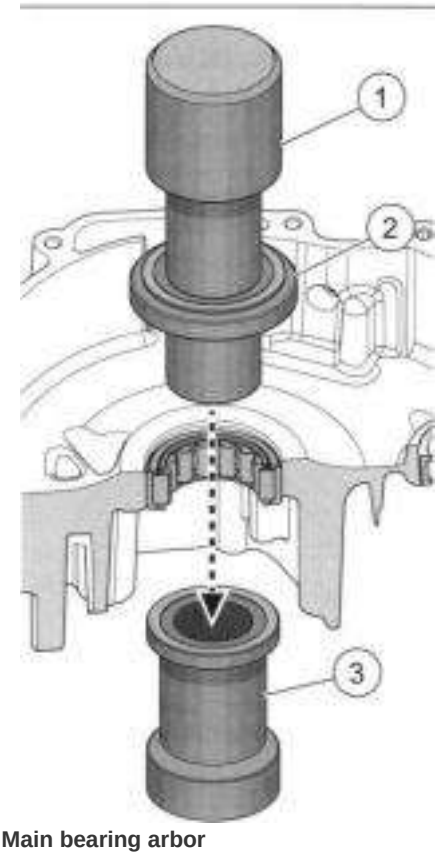
c. Place bearing on bearing bore with lettering facing up.

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 4-36.



1. **Main bearing arbor**
2. **Main bearing installer**
3. **Bearing support**
4. **Press ram**
5. **Main bearing**

Figure 4-67. Right Main Bearing Installation

Table 4-36. 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 4-68. 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.

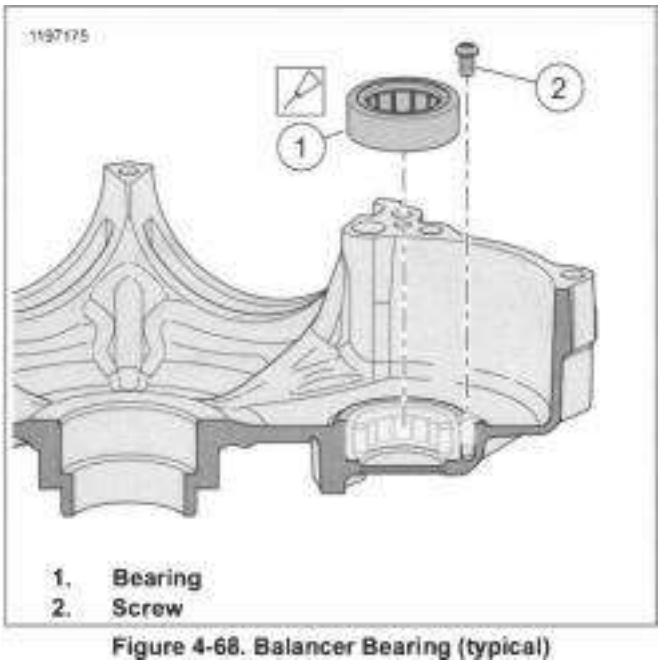


Figure 4-68. Balancer Bearing (typical)

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.

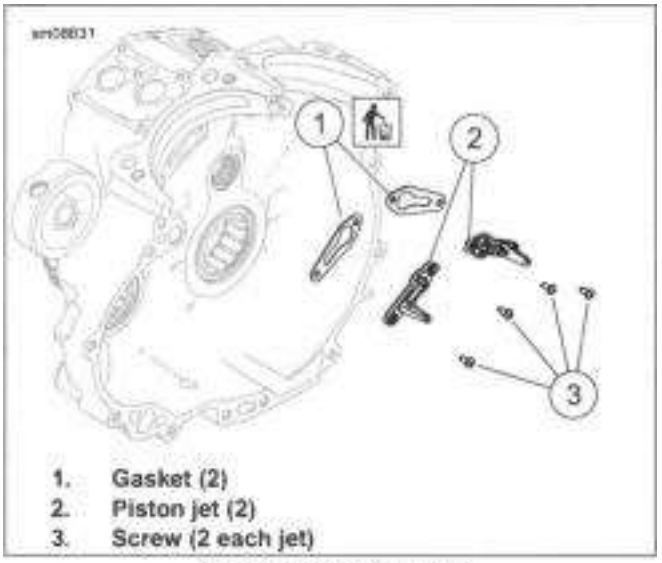
3. Install retaining screw. Tighten.

   Torque: 80-110 **in-lbs** (9-12.4 N-m) ***Balancer bearing screw***

Remove Piston Jets

1. See Figure 4-69. 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 4-69. 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 4-69. 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	TOOLNAME
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

A 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 Sprocket Shaft Bearing Inner Race (Page 4-71).***

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 4-70. Remove bearing retaining ring.

b. See Figure 4-71. Press bearing from stator side into flywheel side of crankcase.

4. Discard bearing.

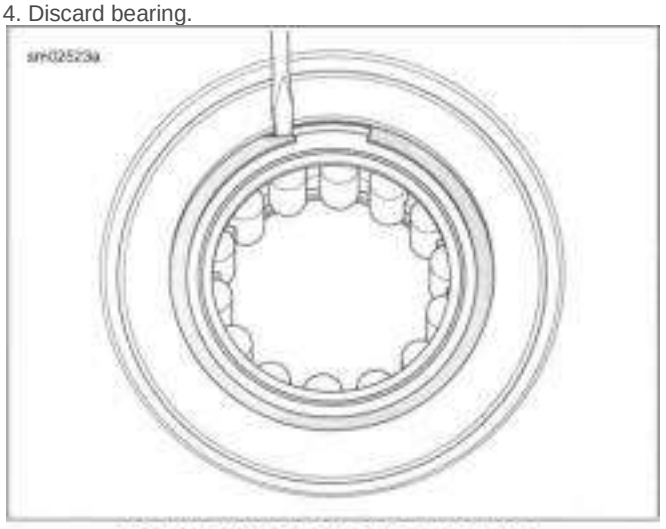
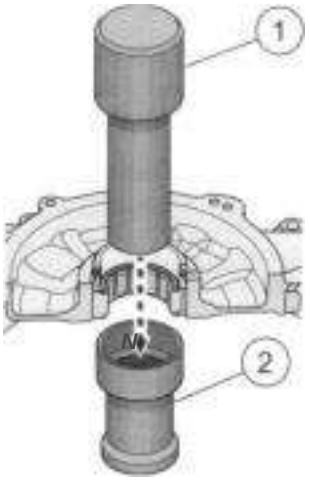


Figure 4-70. Remove Retaining Ring

1. Main bearing arbor
2. Bearing support

Figure 4-71. Remove Left Main Bearing



Install Main Bearing

1. ***OTE***

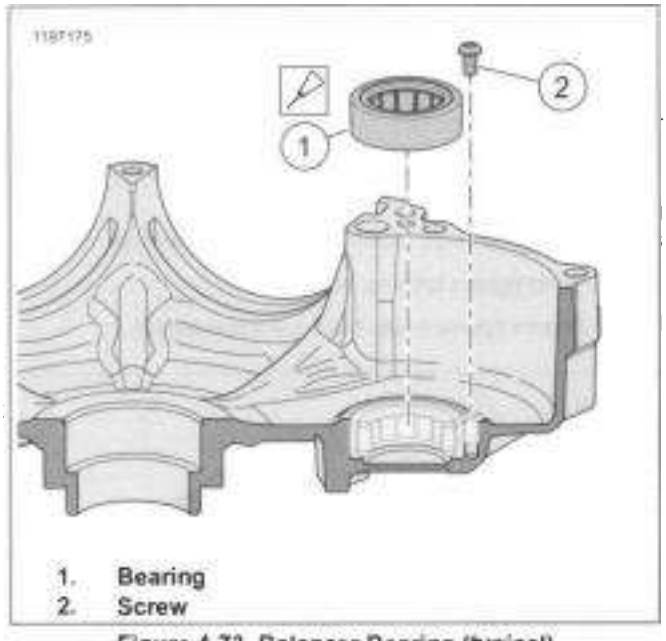
Alternator stator may be left installed when main bearing press adapter is used.

See Figure 4-72. 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.



1. Bearing
2. Screw

Figure 4-73. Balancer Bearing (typical)

1. Main bearing arbor
2. Main bearing installer
3. Main bearing press adapter
4. Bearing support

Figure 4-72. Install Left Main Bearing

Remove Balancer Bearing

1. See Figure 4-73. 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.

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

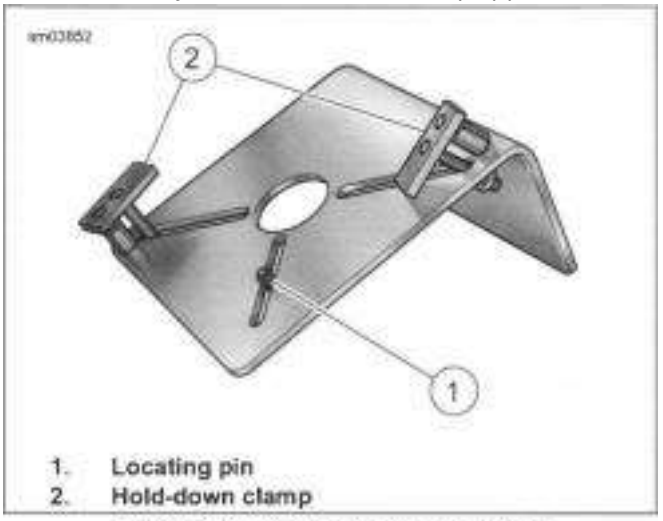
Remove

PART NUMBER	TOOLNAME
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

NOTE

For proper clamping force, hold-down clamp must not be tilted. Rotate hex on outboard stud until clamp is level.

1. See Figure 4-74. Secure flywheel assembly in FLYWHEEL SUPPORT FIXTURE (PART NUMBER: HD-44358).
   a. Secure fixture in soft-jawed vise with the round hole topside.
   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 4-74. 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 4-75. Install pulling tool.
   a. Position WEDGE ATTACHMENT (PART NUMBER: HD-95637-46B) (5) on inboard side of thrust washer.
   b. Draw wedge halves together evenly.
   c. Secure the bridge and forcing screw from BIG-TWIN MAINSHAFT PRIMARY BEARING RACE REMOVER AND INSTALLER (PART NUMBER: HD-34902-B) to the wedge attachment with flat washers and two 3/8-16 x 7-1/2 in bolts.
   d. Place hardened washer between end of sprocket shaft and the end of the forcing screw.
3. Uniformly heat the bearing inner race for about 30 seconds using the ROBINAIR HEAT GUN (PART NUMBER: HD-25070).

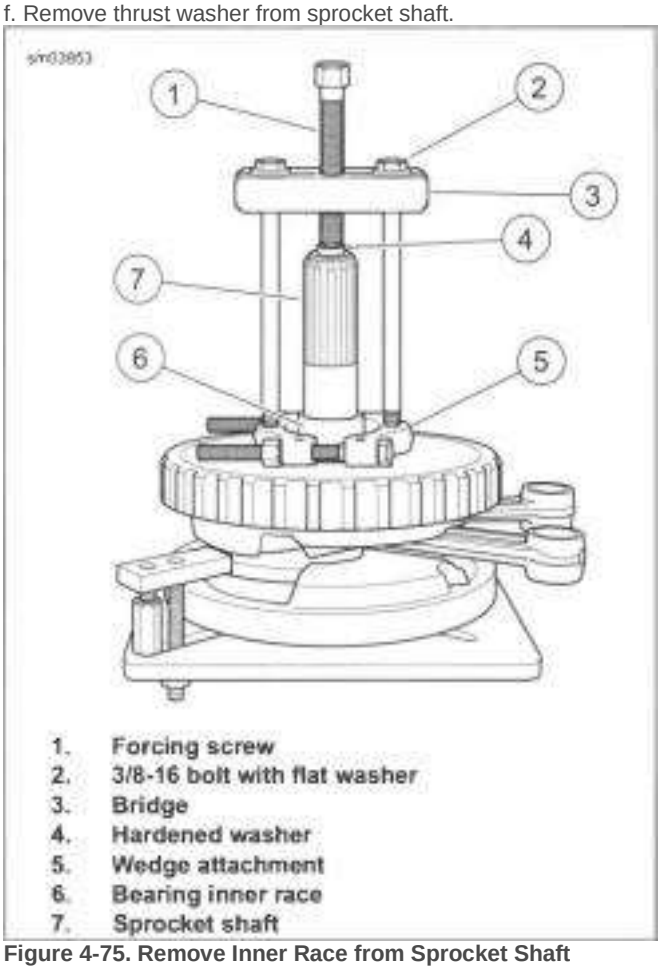
NOTE

To assist removal without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

A WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

4. See Figure 4-75. Remove bearing race.
   a. Turn forcing screw until thrust washer and bearing inner race move approximately 0.125 in (3.2 mm).
   b. Reposition WEDGE ATTACHMENT (PART NUMBER: HD-95637-46B) to pull on bearing inner race only.
   c. Verify that the tool assembly is square.
   d. Heat the bearing inner race for about 30 seconds.
   e. Turn forcing screw until bearing inner race is free of sprocket shaft.
   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 4-75. Remove Inner Race from Sprocket Shaft

Install

1. Place **new** thrust washer over sprocket shaft.
2. Uniformly heat **new** bearing for about 60 seconds using the ROBINAIR HEAT GUN (PART NUMBER: HD-25070).
3. Drop heated bearing inner race over sprocket shaft.

NOTE

To assist installation without heat, apply a light penetrating oil to shaft and leading edge ofbearing inner race.

A WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious Injury. (00375a)

4. See Figure 4-76. Seat the bearing race using SPROCKET SHAFT BEARING INSTALLER (PART NUMBER: HD-97225-55C). Follow instructions supplied with tool.
5. Verify that thrust washer cannot be rotated by hand.

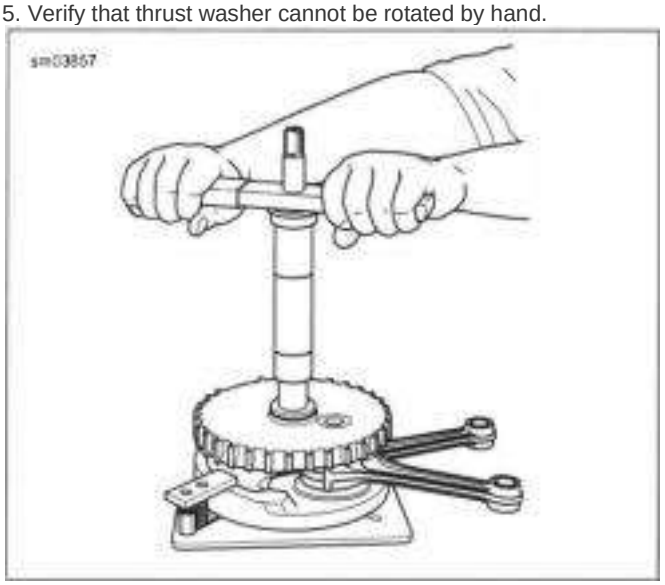


Figure 4-76. Press Inner Race onto Sprocket Shaft: Operation

CYLINDER STUDS

Remove

1. Tighten two nuts together on threads of stud.

FASTENER	TORQUE VALUE	
Cylinder stud	120-240in-lbs	13.6-27.1 N-m

2. Place wrench on lower nut. Turn to remove stud.

Install

1. Place a steel ball inside a cylinder head screw.
2. Put the head screw on the long end of the cylinder stud.
3. Install stud using air gun until collar reaches crankcase.
4. Tighten to 120-240 in-lbs (13.6-27.1 N-m).

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	120-144 in-lbs	13.6-16.3 N-m

Remove

See Figure 4-77. Turn pipe plug or oil check valve counterclockwise to remove.

Install

1. See Figure 4-77. Install tapered plug (1).
   a. Apply LOCTITE 565 THREAD SEALANT to threads.
   Torque: 120-144 in-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. Tighten.
   Torque: 18-22 ft-lbs (24.4-29.8 N-m) ***Crankcase oil check valve or plug with O-ring***

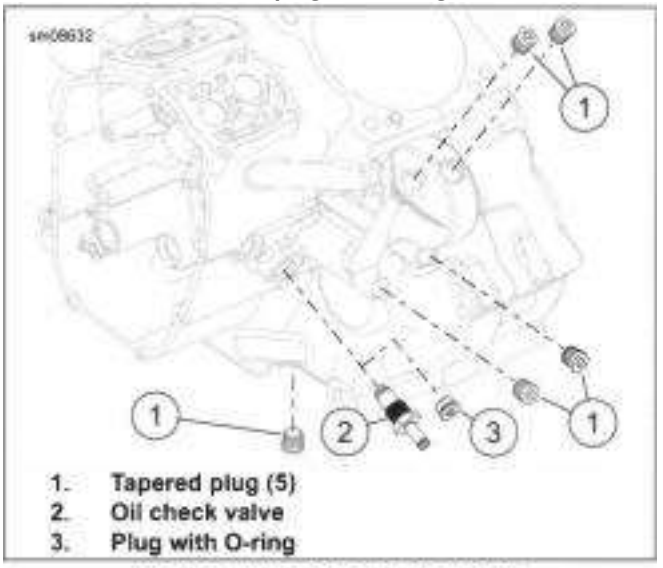


Figure 4-77. Crankcase Pipe Plugs

COMPLETE

1. Install oil pump. See OIL PUMP (Page 4-59).
2. Install cam compartment components and cam cover. See CAM COMPARTMENT AND COMPONENTS (Page 4-53).
3. Install pistons. See PISTONS (Page 4-47).
4. Install cylinders. See CYLINDERS (Page 4-44).
5. Install cylinder heads. See CYLINDER HEADS (Page 4-38).
6. Install pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).
7. Install rocker arms. See ROCKER ARMS (Page 4-32).
8. Install lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).
9. Install breathers. See BREATHERS (Page 4-29).

11. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 446).

12. Insta

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

When the crankshaft shifts more than 0.015 in (0.381 mm), it can break the oil pump gerotors. This causes a loss of oil pressure.

If a low or no oil pressure condition is confirmed, inspect the oil pump and cam support plate. If the oil pump gerotors are bound or damaged, the cause is likely from a contaminant running through the pump or a shifted crankshaft. If this type of damage is found, always replace the oil lines and clean all debris from the entire lubrication system. See TROUBLESHOOTING (Page 2-50) for general diagnostics of low oil pressure.

Vibration

Generally, left crankshaft runout must exceed 0.020 in (0.508 mm) to be noticeable to the rider. It is much more likely that vibration issues are resolved by following the checklist in TROUBLESHOOTING (Page 2-50).

If correct chassis set-up has been verified and other items in TROUBLESHOOTING (Page 2-50) have been eliminated, checking left crankshaft runout is appropriate.

PREPARE

1. Remove engine. See REPLACE ENGINE (Page 4-62).

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 spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).

4. Remove upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

5. Remove breathers. See BREATHERS (Page 4-29).

6. Remove lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).

7. Remove rocker arms. See ROCKER ARMS (Page 4-32).

8. Remove pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).

9. Remove cylinder heads. See CYLINDER HEADS (Page 4-38).

10. Remove cylinders. See CYLINDERS (Page 4-44).

11. Remove pistons. See PISTONS (Page 4-47).

12. Remove cam cover and cam compartment components, See CAM COMPARTMENT AND COMPONENTS (Page 4-53).

13. Remove oil pump. See OIL PUMP (Page 4-59).

14. Separate crankcase and remove flywheel and connecting rods. See CRANKCASE (Page 4-65).

NOTE

For measure crankshaft runout procedure, see TROUBLESHOOTING (Page 4-14).

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

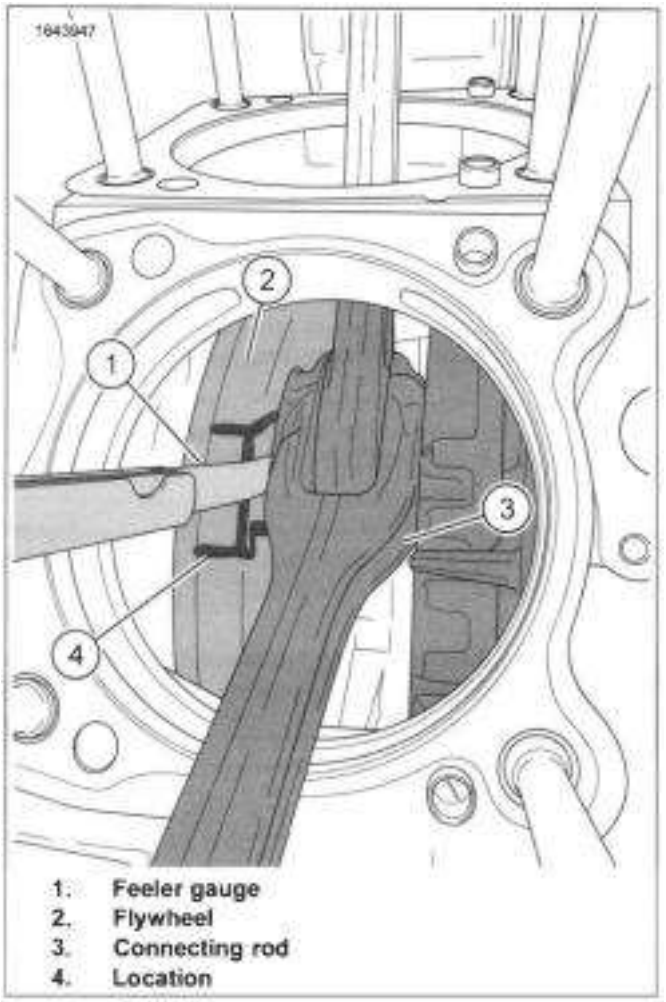
2. Measure crankshaft runout if crankshaft is suspected of being out-of-true. See TROUBLESHOOTING (Page 4-14).

3. Measure connecting rod side play.

a. See Figure 4-78. 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 4-78. Connecting Rod Side Play

COMPLETE _____ ___

1. Install flywheel and connecting rods and assemble crankcase. See CRANKCASE (Page 4-65).

2. Install oil pump. See OIL PUMP (Page 4-59).

3. Install cam compartment components and cam cover. See CAM COMPARTMENT AND COMPONENTS (Page 4-53).

4. Install pistons. See PISTONS (Page 4-47).

5. Install cylinders. See CYLINDERS (Page 4-44).

6. Install cylinder heads. See CYLINDER HEADS (Page 4-38).

7. Install pushrods, lifters and covers. See PUSHRODS, LIFTERS AND COVERS (Page 4-34).

8. Install rocker arms. See ROCKER ARMS (Page 4-32).

9. Install lower rocker covers. See LOWER ROCKER COVERS (Page 4-30).

10. Install breathers. See BREATHERS (Page 4-29).

11. Install upper rocker covers. See UPPER ROCKER COVERS (Page 4-27).

12. Install spark plugs. See CLEAN, INSPECT, REPLACE SPARK PLUGS (Page 2-46).

13. Install engine. See REPLACE ENGINE (Page 4-62).

PREPARE

1. Position motorcycle on a lift.
2. Drain engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
3. Drain transmission lubricant. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).

REMOVE

1. Remove the engine oil fill plug/dipstick.
2. See Figure 4-79. Remove oil pan.
   a. Remove 10 screws (3).
   b. Remove oil pan (2).
   c. Discard oil pan gasket (1).

NOTE

Debris that remains in the pan can cause a repeat failure. Install a new oil pan if necessary.

3. Thoroughly inspect and clean the oil pan.

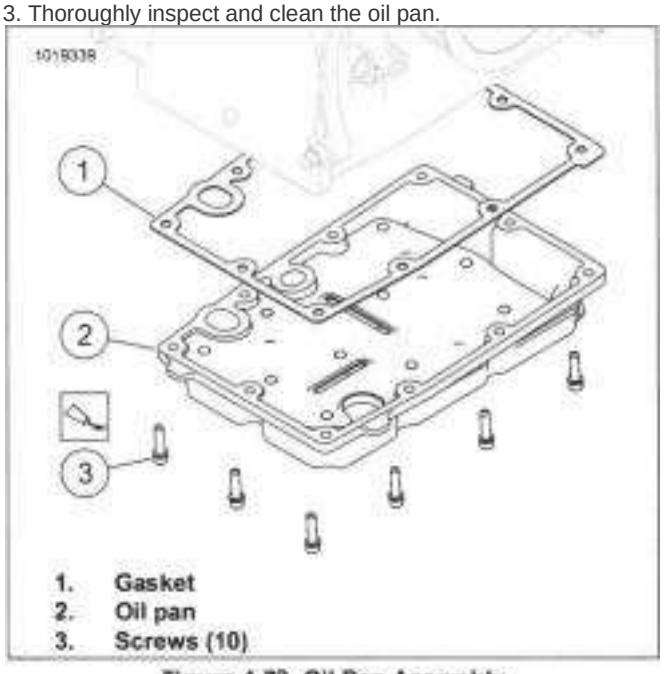


Figure 4-79. Oil Pan Assembly

INSTALL

FASTENER	TORQUE VALUE	
Engine oil drain plug	14-21 ft-lbs	19-28.5 N-m
Oil pan fasteners	132-156 in-lbs	14.9-17.6 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

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. Install oil pan.
   a. Apply a thin coat of HYLOMAR GASKET AND THREAD SEALANT to oil pan flange.
   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 sealer to dry until tacky.
   d. Position oil pan with gasket on bottom of transmission.
   e. Loosely install fasteners (3).
   f. Verify that the gasket is properly positioned. Tighten following sequence shown.
      Torque: 132-156 in-lbs (14.9-17.6 N-m) ***Oil pan fasteners***

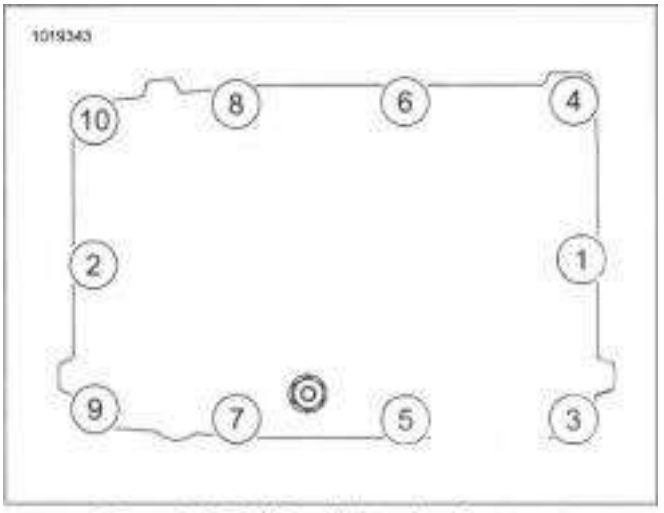


Figure 4-80. Oil Pan Tightening Sequence

COMPLETE

1. Add fluids.
   a. Add transmission lubricant. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).
   b. Install new engine oil filter.

c. Fill engine oil. See REPLACE ENGINE Olt AND FILTER (Page 2-7).

SUBJECT PAGE NO.

5.1 FASTENER TORQUE VALUES 5-1
5.2 SPECIFICATIONS 5-3
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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Battery ground cable to transmission	66-114 in-lbs	7.5--12.9 N-m	5.16 TRANSMISSION CASE, Install
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	94.9-108.5 N-m	5.9 DRIVE COMPONENTS, Install
Clutch release cover screws	132-156 in-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
Drive belt slot spacer screw, 1st torque	50-55 ft-lbs	68-75 N-m	5.4 DRIVE BELT, Install
Drive belt slot spacer screw, final torque	65-70 ft-lbs	88-95 N-m	5.4 DRIVE BELT, Install
Engine oil fill spout screw.	100-120 in-lbs	11.3-13.6 N-m	5.12 ENGINE OIL FILL SPOUT, Install
Forward Foot Control shifter rod to front shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Forward Foot Control shifter rod to rear shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Forward Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Forward Foot Control shift lever pinch screw	9-12 ft-lbs	12.2-16.3 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Forward foot control with footboards shift lever pinch screw	108-144 in-lbs	12.2-16.3 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Forward foot control with footpegs shift lever pinch screw	18-22 ft-lbs	24.4-29.8 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Forward or Mid Foot Control shifter peg screw	96-144 in-lbs	10.9-16.3 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Forward or Mid Foot Control shifter rod jamnut	84-132 in-lbs	9.5-14.9 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Forward or Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Mid Foot Control shifter rod lever pinch screw	18-22 ft-lbs	24.4-29.8 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Mid foot control shift lever pinch screw	24-28 ft-lbs	32.5-38 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Oil return tube screw	100-120 in-lbs	11.3-13.6 N-m	5.16 TRANSMISSION CASE, Assemble
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	28.5-32.6 N-m	5.9 DRIVE COMPONENTS, Install
Primary cover screws	144-156 in-lbs	16.3-17.6 N-m	5.8 PRIMARY CHAINCASE COVER, Install See sequence in the procedure
Rear fork pivot shaft nut, 1st torque	25-30 ft-lbs	34-41 N-m	5.4 DRIVE BELT, Install
Rear fork pivot shaft nut, 2nd torque	1-48 in-lbs	0.1-5.4 N-m	5.4 DRIVE BELT, Install
Rear fork pivot shaft nut, 3rd torque	154-170 ft-lbs	209-230 N-m	5.4 DRIVE BELT, Install
Rear fork pivot shaft nut, final torque	154-170 ft-lbs	209-230 N-m	5.4 DRIVE BELT, Install
Rear fork pivot shaft pinch bolt	18-20 ft-lbs	24-27 N-m	5.4 DRIVE BELT, Install
Shift drum detent screw	120-150 in-lbs	13.6-17 N-m	5.14 TRANSMISSION, Assemble

FASTENER	TORQUE VALUE		NOTES
Shift drum detent screw	120-150 in-lbs	13.6-17 N-m	5.14 TRANSMISSION, Assemble
Shift drum lock plate screws	57-63 in-lbs	6.4-7.1 N-m	5.14 TRANSMISSION, Assemble
Shift drum lock plate screws	57-63 in-lbs	6.4-7.1 N-m	5.14 TRANSMISSION, Assemble
Shifter pawl centering screw	18-23 ft-lbs	24.4-31.2 N-m	5.16 TRANSMISSION CASE, Assemble
Shifter rod lever pinch screw, transmission lever	18-22 ft-lbs	24.4-29.8 N-m	5.16 TRANSMISSION CASE, Assemble
Transmission bearing housing screws	22-25 ft-lbs	29.8-33.9 N-m	5.14 TRANSMISSION, Install
Transmission mainshaft/countershaft locknuts	85-95 ft-lbs	115.3—128.8 N-m	5.14 TRANSMISSION, Assemble
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 N-m	5.16 TRANSMISSION CASE, Install
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 N-m	5.16 TRANSMISSION CASE, Install
Transmission sprocket lockplate screws	90-120 in-lbs	10.2-13.6 N-m	5.13 TRANSMISSION SPROCKET, Install Lock patch, use 3-5 times
Transmission sprocket nut, 1st torque	100 ft-lbs	135.6 N-m	5.13 TRANSMISSION SPROCKET, Install Apply LOCTITE 271 HIGH STRENGTH THREAD-LOCKER (red) to last few threads. Loosen one full turn after first torque.
Transmission sprocket nut, 2nd torque	35 ft-lbs	47.5 N-m	5.13 TRANSMISSION SPROCKET, Install
Transmission sprocket nut, final torque	35-40°	35-40°	5.13 TRANSMISSION SPROCKET, Install Do not loosen to align lockplate screws.
Transmission top cover	132-156 in-lbs	14.9-17.6 N-m	5.14 TRANSMISSION, Install

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

AMOUNT*	DRY FILL**		WET FILL***
DRIVE	ITEM		NUMBER OF TEETH
Primary	Engine		34
	Clutch		46
Final	Transmission		32
	Rear wheel		66

Table 5-3. Overall Drive Ratios

GEAR	RATIO
First	9.311
Second	6.454
Third	4.793
Fourth	3.882
Fifth	3.307
Sixth	2.790

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)	28 fl oz (0.83 L)
* Add additional fluid as necessary to bring level within specification.	

Table 5-5. Transmission Gear Ratios

GEAR	GEAR RATIO
First (low)	
Second	
Third	
Fourth	
Fifth	
Sixth (high)	

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

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
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

Table 5-11. Shifter Fork Specifications

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).

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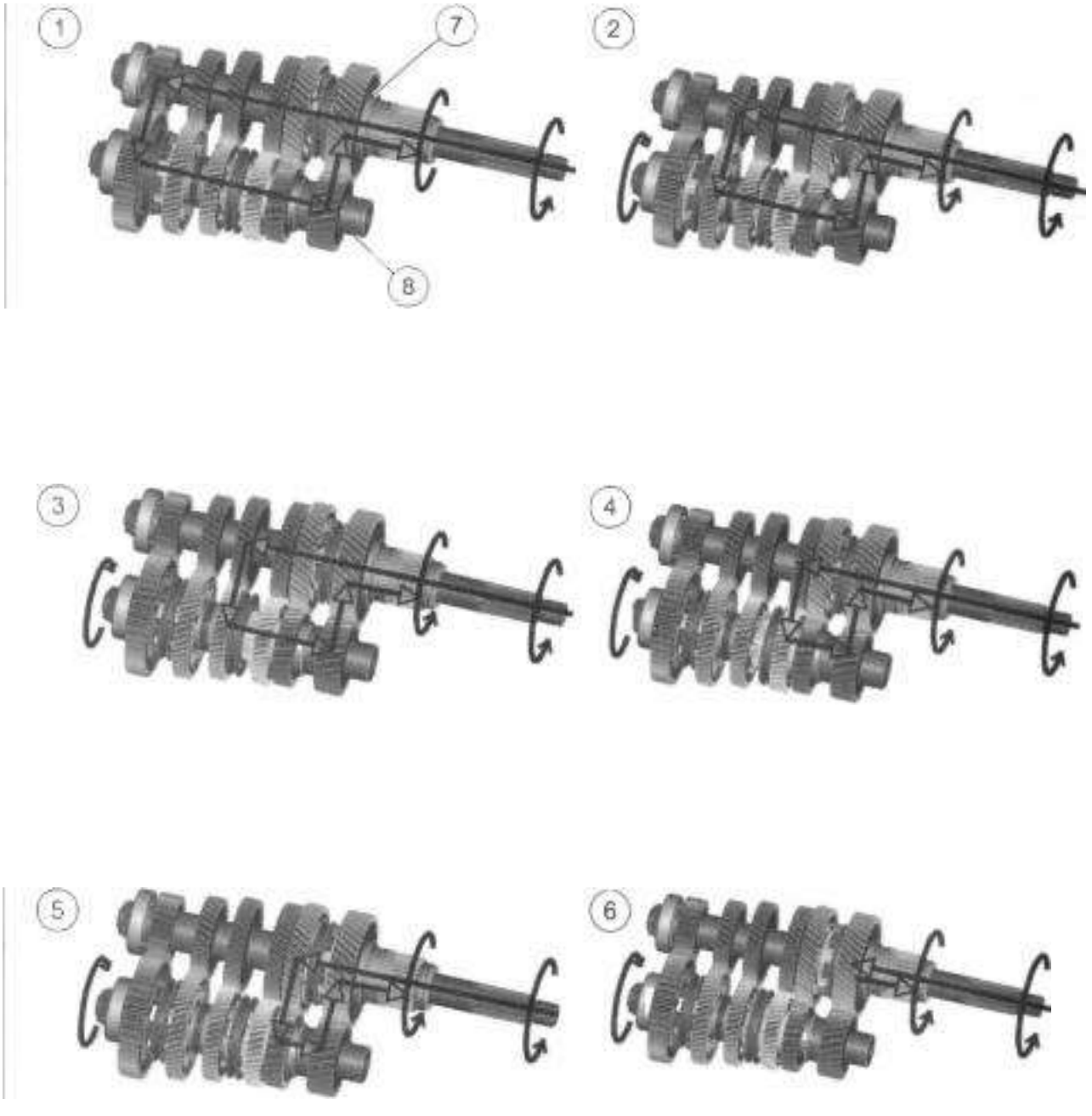


1. First gear
2. Second gear
3. Third gear
4. Fourth gear
5. Fifth gear
6. Sixth gear
7. Mainshaft
8. Countershaft

Figure 5-1. Transmission Power Flow

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove saddlebags if equipped. See SADDLEBAGS (Page 3-145)
3. Remove mufflers and exhaust bracket. See EXHAUST SYSTEM (Page 6-36)
4. Remove rear wheel. See REAR WHEEL (Page 3-16).
5. Remove rider footboard and bracket, if needed. See LEFT FOOT CONTROLS (Page 3-128).
6. Mid-mount controls: Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
7. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
8. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
9. Remove starter. See STARTER (Page 7-9).
10. Remove primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
11. Remove primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).

REMOVE

1. See Figure 5-2. Loosen pivot shaft.
   a. Remove nut (1).

NOTE

Hold pivot shaft while loosening nut.

   b. See See Figure 3-84.. Loosen pivot shaft pinch bolt.
   c. See Figure 5-2. Slide pivot shaft out enough to remove round spacer (2).
2. Remove slot spacer.
   a. Remove screws (5).
   b. Remove slot spacer (4).
3. Remove belt (3).

INSTALL

FASTENER	TORQUE VALUE	
Drive belt slot spacer screw, 1st torque	50-55 ft-lbs	68-75 N-m
Drive belt slot spacer screw, final torque	65-70 ft-lbs	88-95 N-m
Rear fork pivot shaft nut, 1st torque	25-30 ft-lbs	34-41 N-m
Rear fork pivot shaft nut, 2nd torque	1-48 in-lbs	0.1-5.4 N-m
Rear fork pivot shaft nut, 3rd torque	154-170 ft-lbs	209-230 N-m
Rear fork pivot shaft nut, final torque	154-170 ft-lbs	209-230 N-m
Rear fork pivot shaft pinch bolt	18-20 ft-lbs	24-27 N-m

A 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 drive belt (3) on final drive sprocket.
2. Install pivot shaft.
   a. Position round spacer (2) between drive belt (3), frame and rear fork.
   b. Slide pivot shaft through round spacer and left side of frame.
   c. Install pivot shaft nut (1). Tighten.

      Torque: 25-30 ft-lbs (34-41 N-m) ***Rear fork pivot shaft nut, 1st torque***

   d. Back off pivot shaft nut.

      Angle: 90°

   e. Tighten pivot shaft nut.

      Torque: 1-48 in-lbs (0.1-5.4 N-m) ***Rear fork pivot shaft nut, 2nd torque***

3. ***NOTE***

Verify round spacer (2) does not have lateral play.

   Install slot spacer.
   a. Place slot spacer (4) in the center of the drive belt and between frame and rear fork.
   b. Install slot spacer screws (5). Tighten.

      Torque: 50-55 ft-lbs (68-75 N-m) ***Drive belt slot spacer screw, 1st torque***

   c. Loosen slot spacer screws.

      Angle: 90°

   d. Tighten slot spacer screws.

      Torque: 65-70 ft-lbs (88-95 N-m) ***Drive belt slot spacer screw, final torque***

4. Place drive belt on sprocket and install rear wheel. See REAR WHEEL (Page 3-16).

NOTE

Adjust the belt tension after the drive belt slot spacer screws have been torqued to final specifications and before the pivot shaft nut has been torqued to final specifications.

5. Tighten pivot shaft nut (1).

   a. Tighten pivot shaft nut.

      Torque: 154-170 ft-lbs (209-230 N-m) ***Rear fork pivot shaft nut, 3rd torque***

   b. Loosen pivot shaft nut.

      Angle: 90°

   c. Tighten pivot shaft nut.

      Torque: 154-170 ft-lbs (209-230 N-m) ***Rear fork pivot shaft nut, final torque NOTE***

After final torque of pivot shaft nut there will be a slight gap between the right side bearing and rear fork.

6. ***NOTE***

Verify round spacer (2) does not have lateral play.

   See See Figure 3-84.. Tighten pivot shaft pinch bolt.

   Torque: 18-20 ft-lbs (24-27 N-m) ***Rear fork pivot shaft pinch bolt***

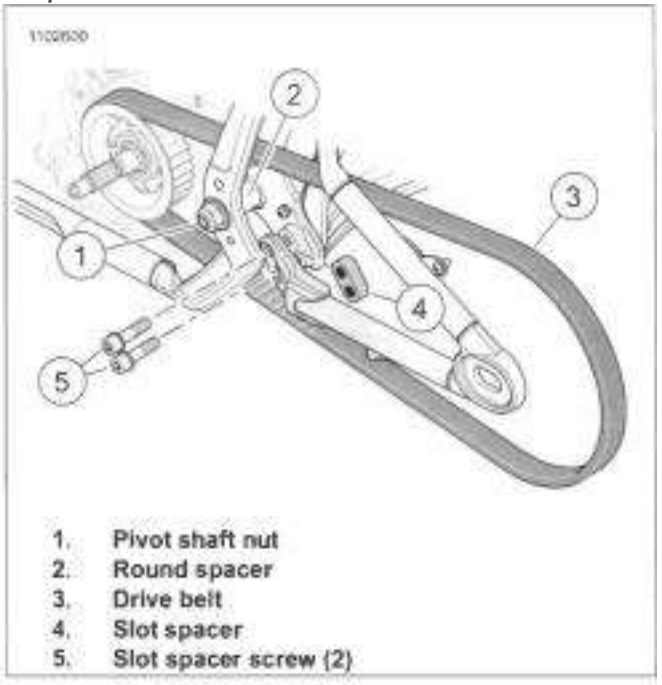


Figure 5-2. Drive Belt

COMPLETE

1. Install primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
2. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE COMPONENTS (Page 5-18).
3. Install starter. See STARTER (Page 7-9).
4. Install primary chaincase cover and new gasket. See PRIMARY CHAINCASE COVER (Page 5-17).
5. Fill primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
6. Mid-mount controls: Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
7. Install rider left footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
8. Install mufflers and exhaust bracket. See EXHAUST SYSTEM (Page 6-36).
9. Install saddlebags if equipped. See SADDLEBAGS (Page 3-145).
10. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

SHIFTER ROD

FASTENER	TORQUE VALUE	
Forward Foot Control shifter rod to front shifter rod lever	120-168in-lbs	13.6-19 N-m
Forward Foot Control shifter rod to rear shifter rod lever	120-168in-lbs	13.6-19 N-m
Forward or Mid Foot Control shifter rod jamnut	84-132 in-lbs	9.5-14.9 N-m
Forward or Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.0-19 N-m
Mid Foot Control shifter rod to shifter rod lever	120-168in-lbs	13.6-19 N-m

Replace

Forward Foot Control Models

1. See Figure 5-3. Discard nut (2) and remove screw (6) from front shifter rod lever (1).
2. Remove screw (5) from rear shifter rod lever (4).
3. Remove shifter rod (3)
4. Install shifter rod.
   a. Install shifter rod to each shifter rod lever.
   b. Install screw (5). Tighten.
      Torque: 120-168 in-lbs (13.0-19 N-m) ***Forward Foot Control shifter rod to rear shifter rod lever***
   c. Install screw (6) and new nut. Tighten.
      Torque: 120-168 in-lbs (13.6-19 N-m) ***Forward Foot Control shifter rod to front shifter rod lever***

Mid Foot Control Models

1. See Figure 5-4. Remove screws (4).
2. Remove shifter rod (3).
3. Install shifter rod.
   a. Install shifter rod to each shifter rod lever.
   b. Install screws. Tighten.
      Torque: 120-168 in-lbs (13.6-19 N-m) ***Mid Foot Control shifter rod to shifter rod lever***

Adjust

NOTE

- ***The shifter rod should not require adjustment under normal circumstances. However, if full gear engagement or full lever travel is not achieved, adjust the shifter rod.***
- ***Do not allow shift lever to contact footboard or support bracket when shifting. This prevents proper gear engagement. Contact may also damage the transmission.***

1. See Figure 5-3 or Figure 5-4. Disconnect forward end of shifter rod from forward shifter rod lever.
2. Loosen jamnuts. Adjust rod (3) as necessary.
3. Secure shifter rod to front shifter rod lever. Tighten.
   Torque: 120-168 in-lbs (13.6-19 N-m) ***Forward or Mid Foot Control shifter rod to shifter rod lever***
4. Tighten jamnuts.
   Torque: 84-132 in-lbs (9.5-14.9 N-m) ***Forward or Mid Foot Control shifter rod jamnut***

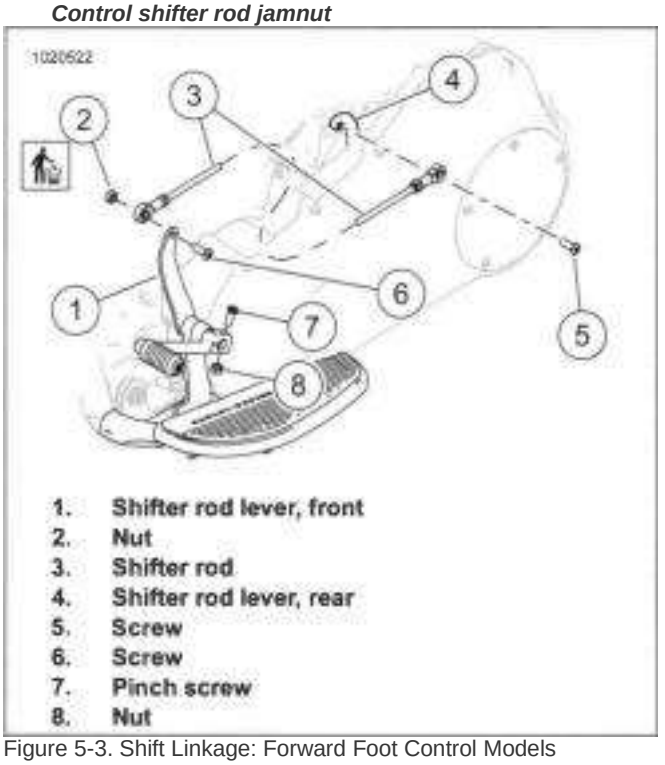
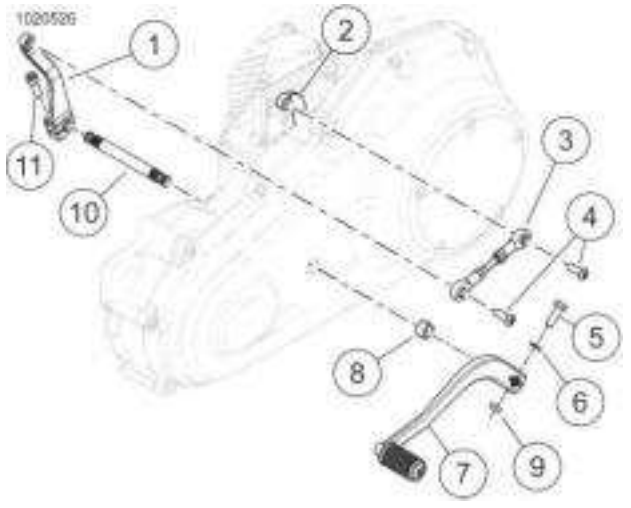


Figure 5-3. Shift Linkage: Forward Foot Control Models



1. Shifter rod lever, front
2. Shifter rod lever, rear
3. Shifter rod
4. Screw (2)
5. Pinch screw
6. Washer
7. Foot shift lever
8. Spacer
9. Nut
10. Shaft
11. Pinch screw

Figure 5-4. Shift Linkage: Mid Foot Control Models

FOOT SHIFT LEVER

FASTENER	TORQUE VALUE	
Forward foot control with footboards shift lever pinch screw	10^144 in-lbs	12.2-16.3 N-m
Forward foot control with footpegs shift lever pinch screw	18-22 ft-lbs	24.4-29.8 N-m
Forward or Mid Foot Control shifter peg screw	96-144 in-lbs	10.9-16.3 N-m
Mid foot control shift lever pinch screw	24-28 ft-lbs	32.5-38 N-m

Removal

1. See Figure 5-3 or Figure 5-4. Mark position of lever in relation to shaft.
2. Mid Foot Control Models: Remove nut (9). Forward Foot Control Models: Remove nut (8).
3. Remove pinch screw securing foot shift lever.
4. Remove lever from shaft.
5. Mid Foot Control Models: Remove spacer (8).

Repair

1. Remove screw securing rubber peg to lever. Separate screw from peg.
2. Assemble peg to lever with screw. Tighten.

   Torque: 96-144 in-lbs (10.9-16.3 N-m) ***Forward or Mid Foot Control shifter peg screw***

Installation

1. Mid Foot Control Models: Install spacer (8).

NOTE

Foot 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, the peg must not contact the footboard or supports when shifting.

2. Install foot shift lever.
   a. Align to marks made during removal.
   b. Press foot shift lever onto shaft.
   c. Install pinch screw and nut.
   d. Tighten.
      Torque: 24-28 ft-lbs (32.5-38 N-m) ***Mid foot control shift lever pinch screw***
      Torque: 108-144 in-lbs (12.2-16.3 N-m) ***Forward foot control with footboards shift lever pinch screw***
      Torque: 18-22 ft-lbs (24.4-29.8 N-m) ***Forward foot control with footpegs shift lever pinch screw***
3. Verify shift lever operation.

SHIFTER ROD _LEVER,. FRONT _____

FASTENER	TORQUE VALUE	
Forward Foot Control shift lever pinch screw	9-12 ft-lbs	12.2-16.3 N-m
Forward Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m
Mid Foot Control shifter rod lever pinch screw	18-22 ft-lbs	24.4-29.8 N-m
Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m

Removal

1. See Figure 5-3 or Figure 5-4. Remove screw to free linkage from front shifter rod lever (1).
2. Mark position of foot shift lever in relation to shaft.
3. Forward Foot Control Models:
   a. See Figure 5-3. Remove pinch screw (7) and nut (8).
   b. Remove foot shift lever assembly.
   c. Remove shifter rod lever and shaft.
4. Mid Foot Control Models:
   a. See Figure 5-4. Remove pinch screw from front shifter rod lever (1).
   b. Pull foot shifter rod lever (1) and shaft outward until shifter rod lever is free.
   c. Remove shifter rod lever (7).

Installation

1. Forward Foot Control Models:

   a. See Figure 5-3. Install shifter rod lever (1) and shaft.

   b. Install foot shift lever, aligning to marks made during removal.

   c. Install pinch screw (7). Tighten.

      Torque: 9-12 ft-lbs (12.2-16.3 N-m) ***Forward Foot Control shift lever pinch screw***

   d. Connect shifter rod. Tighten.

      Torque: 120-168 in-lbs (13.6-19 N-m) ***Forward Foot Control shifter rod to shifter rod lever***

2. Mid Foot Control Models:

   a. See Figure 5-4. Hold shifter rod lever (1) in place.

   b. Push foot shift lever and rod into shifter rod lever aligning splines as they mate.

   c. Install pinch screw. Tighten.

      Torque: 18-22 ft-lbs (24.4-29.8 N-m) ***Mid Foot Control shifter rod lever pinch screw***

3. Secure linkage to shifter rod lever (1). Tighten.

   Torque: 128-168 in-lbs (13.8-19 N-m) ***Mid Foot Control shifter rod to shifter rod lever***

4. Verify shifter rod operation.

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7)
2. Remove exhaust system if needed. See EXHAUST SYSTEM (Page 6-36).
3. Drain transmission. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).

REMOVE

1. *NOTE*

Actuating the clutch hand lever after removing the six *screws will help break the cover free.*

See Figure 5-5. Remove screws.

2. Remove clutch release cover.

3. Discard gasket.

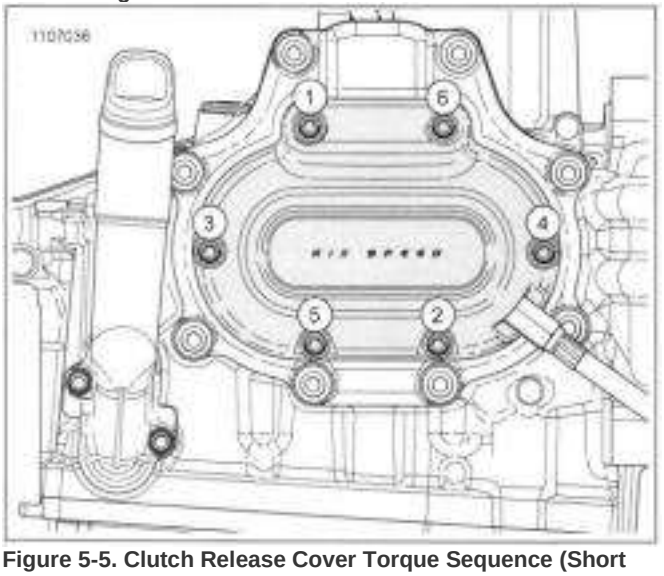


Figure 5-5. Clutch Release Cover Torque Sequence (Short Screws at Locations 1 and 6)

INSTALL

1. Verify that two dowel pins are in place on transmission bearing housing flange.

FASTENER	TORQUE VALUE	
Clutch cable fitting	90-120 in-lbs	10.2-13.6 N-m
Clutch release cover screws	132-156in-lbs	14.9-17.6 N-m

2. Install new gasket.

3. Install clutch release cover.

4. *NOTE*

See Figure 5-5 . Clutch release cover screws *in positions (1) and (6) are shorter than the others.*

Install screws. Tighten in sequence shown.

Torque: 132-156 in-lbs (14.9-17.6 N-m) *Clutch release cover screws*

5. Tighten clutch cable fitting, if removed.

Torque: 90-120 in-lbs (10.2-13.6 N-m) *Clutch cable fitting*

DISASSEMBLE

1. *NOTE*

Do not separate clutch cable halves.

Add free play to clutch cable. See CHECK AND ADJUST CLUTCH (Page 2-23).

A 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 5-6. 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 the ramp coupling (3).
3. Remove coupling (3) from inner ramp.
4. See Figure 5-7. Remove balls (4) and outer ramp (2).
5. Remove clutch cable fitting from clutch release cover.

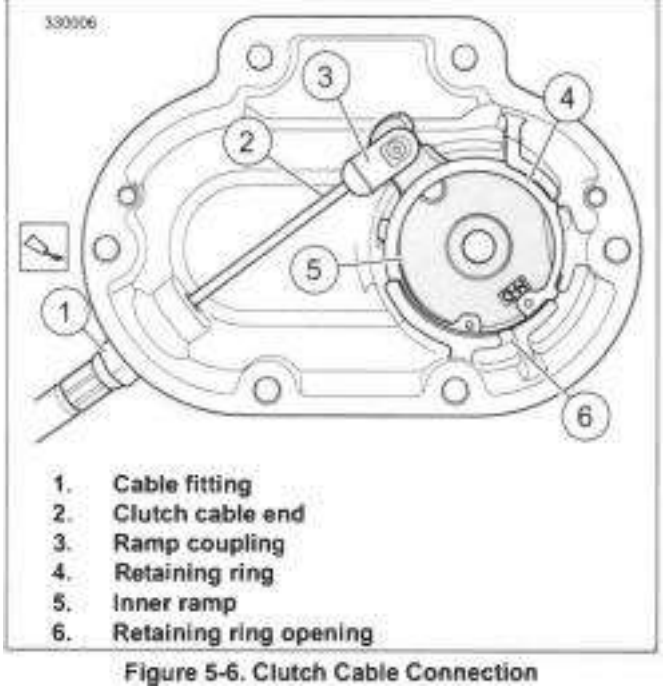


Figure 5-6. Clutch Cable Connection

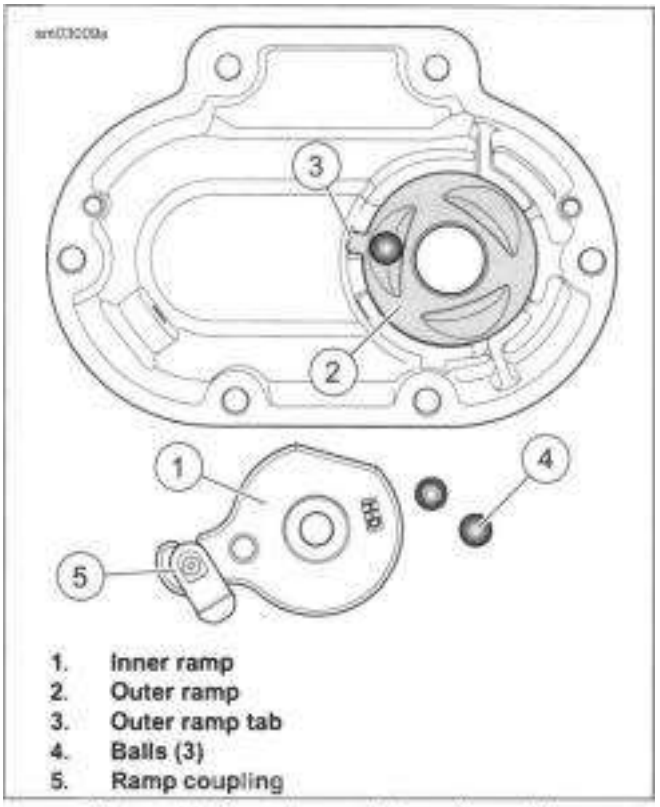


Figure 5-7. Coupling and Ramp Assembly

CLEAN AND INSPECT

1. See Figure 5-8. Wash the ball and ramp mechanism components in cleaning solvent.
2. Inspect the three balls (2) and ball socket surfaces on ramps (1,3) for wear, pitting, surface breakdown and other damage. Replace as necessary.
3. Check fit of the ramp coupling (4) on inner ramp (1). Replace both parts if there is excessive wear.
4. Inspect the retaining ring (6) for damage or distortion.
5. Check clutch cable end for frayed or worn ends. Replace cable if damaged or worn. Check cable fitting 0-ring for damage.
6. Check the bore in the clutch release cover (5) where the ramps (1, 3) are retained. There should be no wear that would cause the ramps to tilt, causing improper clutch adjustment.

Adjust clutch. See CHECK AND ADJUST CLUTCH

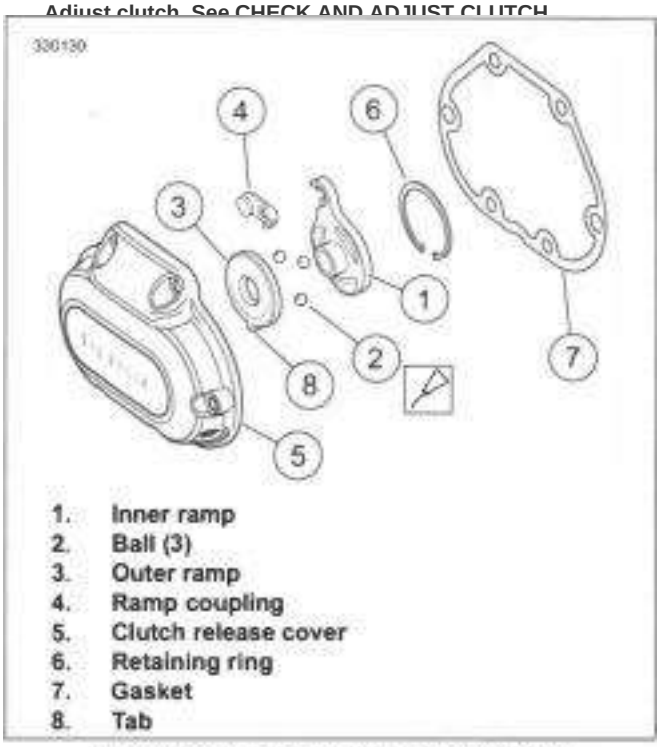


Figure 5-8. Release Mechanism Assembly

ASSEMBLE

NOTE

Replace cable fitting O-ring if damaged.

1. See Figure 5-6 . Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the clutch cable fitting (1).
2. Install clutch cable fitting in clutch release cover. Leave fasteners loose.
3. See Figure 5-8 . Place outer ramp (3) with ball socket side up in clutch release cover. Confirm tab (8) is in clutch release cover slot.
4. Apply a multi-purpose grease to the balls and outer ramp sockets. Place a ball in each of the outer ramp sockets.
5. See Figure 5-6 . Connect clutch cable.
   a. Connect cable end to ramp coupling (3).
   b. Install coupling on inner ramp (5).
   c. Place inner ramp and coupling in position in clutch release cover.

A WARNING

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

6. Install retaining ring.
   a. Center opening of retaining ring above break in ribbing at bottom of clutch release cover.

b. Install retaining ring (4).

COMPLETE

1. Fill transmission. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).

2.

3. Install exhaust system. See EXHAUST SYSTEM (Page 6-36).

4. Install main fuse. See POWER DISCONNECT (Page 7-7)

CLUTCH RELEASE PUSH ROD COMPONENTS

PREPARE

1. Remove clutch inspection cover. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

2. If necessary:

a. Drain transmission lubricant. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).

b. Remove mufflers. See MUFFLERS (Page 6-34).

c. Remove exhaust system if needed. See EXHAUST SYSTEM (Page 6-36).

d. Remove clutch release cover. See CLUTCH RELEASE COVER (Page 5-12).

REMOVE

Right Side

1. See Figure 5-10. 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 5-9. 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

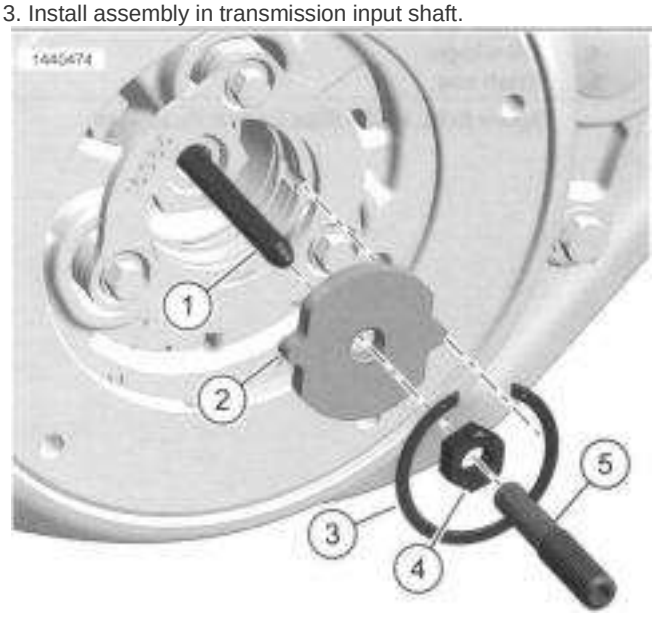
Left Side

1. See Figure 5-9. 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).

Adjust clutch. See CHECK AND ADJUST CLUTCH (Page 2-23).

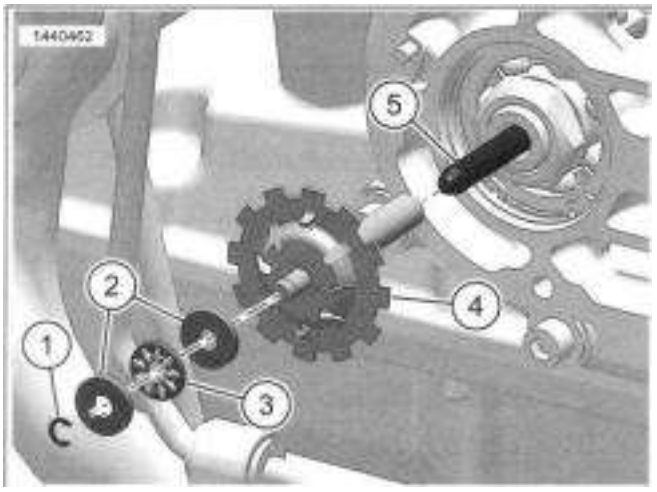
Right Side

1. See Figure 5-10. 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 5-9. Left Side Clutch Push Rod



1. **Retaining ring**
2. **Thrust washer (2)**
3. **Throw out bearing**
4. **Oil slinger**
5. **Push rod**

Figure 5-10. Right Side Clutch Push Rod

COMPLETE

1. **If necessary:**
   a. Install clutch release cover. See CLUTCH RELEASE COVER (Page 5-12).
   b. Fill transmission. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).
   c. Install exhaust system if removed. See EXHAUST SYSTEM (Page 6-36).
   d. Install mufflers. See MUFFLERS (Page 6-34).
2. Adjust clutch. See CHECK AND ADJUST CLUTCH (Page 2-23).
3. Install clutch inspection cover. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove rider left footboard and bracket, if necessary. See LEFT FOOT CONTROLS (Page 3-128).
3. Mid-mount controls: Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

REMOVE

1. See Figure 5-11. Remove primary chaincase cover.

   a. Remove cover screws (4, 5).

   b. Remove cover.

INSTALL

FASTENER	TORQUE VALUE	
Primary cover screws	144-156 in-lbs	16.3-17.6 N-m

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

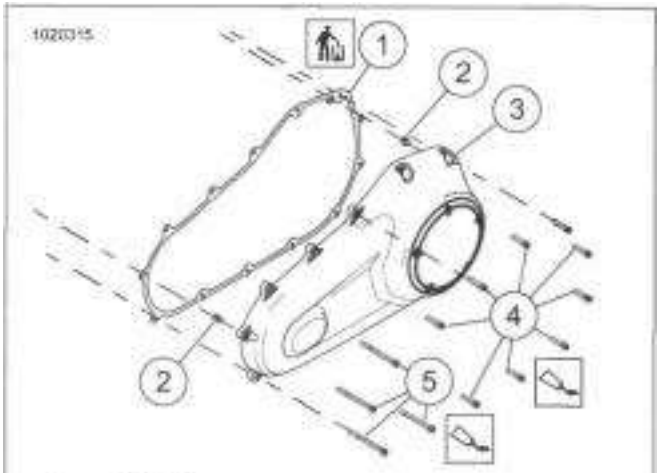
1. See Figure 5-11. Verify that all debris is washed from the inside ribs of the cover.
2. Verify hollow dowels (2) are installed properly.
3. Install new cover gasket (1).
4. Install cover.
   a. Apply a drop of threadlocker to the threads of each screw.

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

   b. Install cover with screws (4, 5) in positions shown.

   c. See Figure 5-12. Tighten in sequence shown.

      Torque: 144-156 in-lbs (16.3-17.6 N-m) ***Primary cover screws***



1. Gasket
2. Hollow dowel
3. Cover
4. Screws, short (9)
5. Screws, long (4)

Figure 5-11. Primary Chaincase Cover

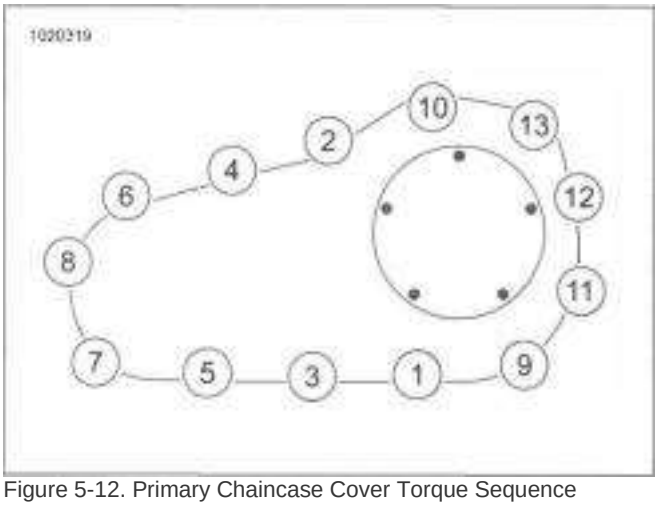


Figure 5-12. Primary Chaincase Cover Torque Sequence

COMPLETE

1. Fill primary chaincase with oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
2. Mid-mount controls: Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
3. Install rider footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
4. Install negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove rider left footboard and bracket, if necessary. See LEFT FOOT CONTROLS (Page 3-128).
3. Mid-mount controls: Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).

REMOVE

PART NUMBER	TOOL NAME
HD-47977	PRIMARY DRIVE LOCKING TOOL

1. See Figure 5-13. 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 5-14. Remove chain tensioner fasteners (2).
   c. Remove chain tensioner (1).

NOTE

Clutch hub does not need to be removed when removing compensating sprocket.

2. Mark one of the links of the primary chain for reference during installation.
3. Remove retaining ring and release plate from center of clutch assembly.

NOTE

The mainshaft nut has left-hand threads.

4. See Figure 5-15. Remove mainshaft nut.
   a. Place special tool between the sprockets as shown.PRIMARY DRIVE LOCKING TOOL (PART NUMBER: HD-47977)
   b. Wide frame only: See Figure 5-17. Discard oil spinner (10).
   c. Figure 5-15. Rotate clutch hub mainshaft nut (4) clockwise to remove.
5. See Figure 5-16. Remove compensating sprocket bolt.
   a. Place the primary drive locking tool between the sprockets as shown.
   b. Rotate compensating sprocket bolt (1) counterclockwise to loosen.
   c. See Figure 5-17. Remove bolt (9), retainer (8) and thrust washer (7).
6. Inspect thrust washers (7) for damage.
7. Clean sprocket retainer (8). Verify that oil holes are clear.

INSTALL

PART NUMBER	TOOL NAME
HD-47977	PRIMARY DRIVE LOCKING TOOL

FASTENER	TORQUE VALUE	
Clutch hub mainshaft nut	70-80 ft-lbs	94.9--108.5N-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	28.5-32.6 N-m

NOTE

The O-ring inside the shaft extension is for manufacturing assembly only and has no replacement part number.

1. See Figure 5-17 and Figure 5-18. Install spring washers.
   a. Apply a thin layer of primary chaincase oil to the inner diameter of the compensating sprocket (6) and the splines of shaft extension (1).
   b. Install shaft extension.
   c. Install large spring washers (2) and medium spring washers (3). Outer diameter of spring washers must contact each other.
   d. Install small spring washer (4) so outer diameter contacts sliding cam (5).
2. Install primary chain, compensating sprocket and clutch.
3. Lightly lubricate thrust washer (7). Install components (7, 8) and new bolt (9). Hand tighten.

NOTE

Clutch hub mainshaft nut has left-hand threads.

4. See Figure 5-19. Install mainshaft nut.
   a. Clean and prime threads of clutch hub mainshaft nut (2).
   b. Apply two drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to the threads.

c. Install nut onto mainshaft. Hand-tighten.

5. See Figure 5-20. Tighten compensating sprocket bolt.

   a. Place special tool between the sprockets as shown.

      Special Tool: PRIMARY DRIVE LOCKING TOOL (HD-47977)

   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***

6. **Wide frame only:** See Figure 5-17. Install **new** oil spinner (10).

7. See Figure 5-19. Tighten clutch hub mainshaft nut.

   a. Place special tool between the sprockets as shown.

      Special Tool: PRIMARY DRIVE LOCKING TOOL (HD-47977)

   b. Tighten clutch hub mainshaft nut (2).

      Torque: 70--80 ft-lbs (94.9-108.5 N-m) ***Clutch hub mainshaft nut***

8. Install release plate and retaining ring into center of clutch assembly.

9. 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 5-21. Locate end of spring rod (2) on roll pin (3).

   b. See Figure 5-22. Slide wedge (2) of primary chain tensioner in direction of arrow until all travel is removed.

   c. See Figure 5-13. Push shoe (1) down until it contacts wedge. Keep tension on shoe so wedge stays in place.

   d. Insert 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.

   a. Install primary chain tensioner (1) with fasteners (2). Tighten.

      Torque: 21-24 ft-lbs (28.5-32.6 N-m) ***Primary chain tensioner fasteners***

   b. Remove cable strap.

10. See Figure 5-14. Install primary chain tensioner.
11. 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)

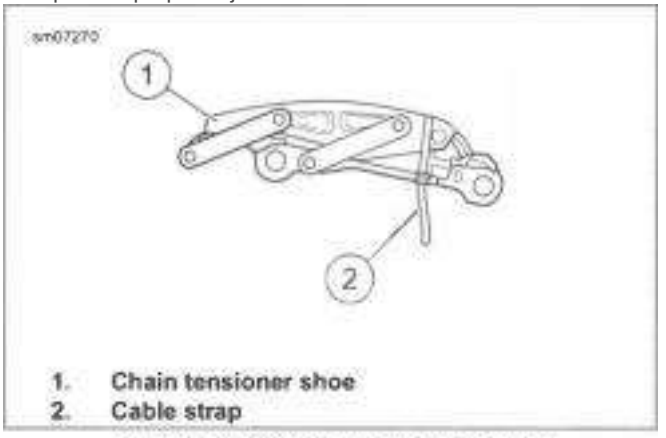
   b. If chain is loose, move chain adjuster one notch. Check tension.

   c. Repeat steps until tension is within specification.

NOTE

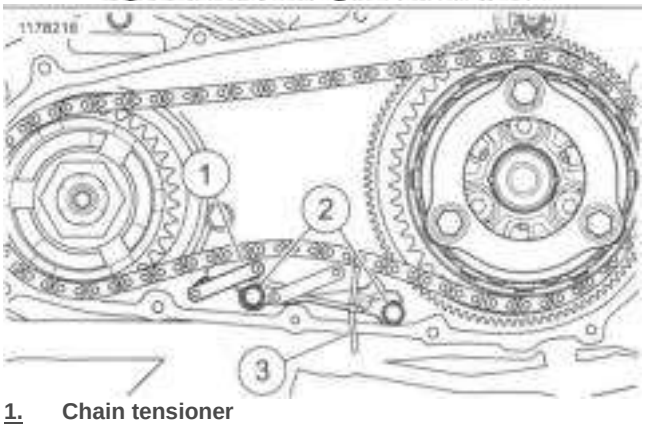
Primary chain tensioner will not complete chain adjustment until vehicle is ridden.

12. Test ride vehicle after tensioner removal/installation to provide proper adjustment.



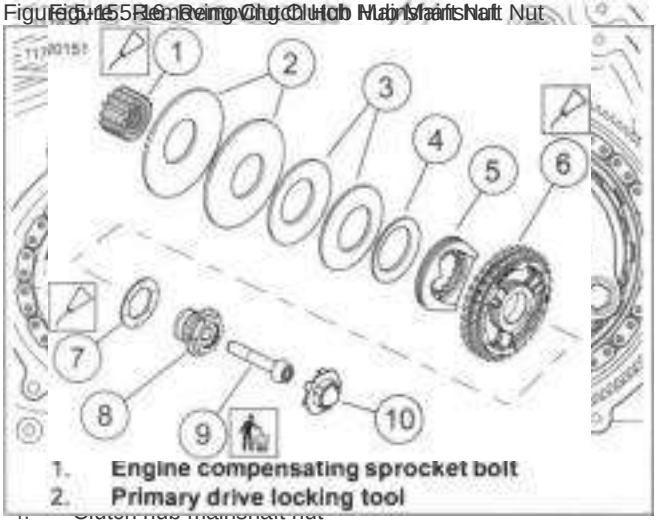
1. Chain tensioner shoe
2. Cable strap

Figure 5-13. Securing Chain Tensioner



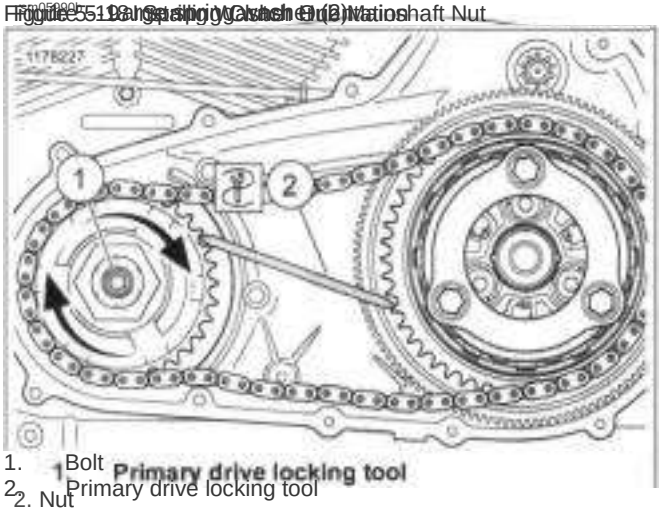
1. Chain tensioner
2. Chain tensioner fasteners
3. Cable strap

Figure 5-14. Chain Tensioner



1. Engine compensating sprocket bolt
2. Primary drive locking tool

Figure 5-19. Removing Clutch Mainshaft Nut

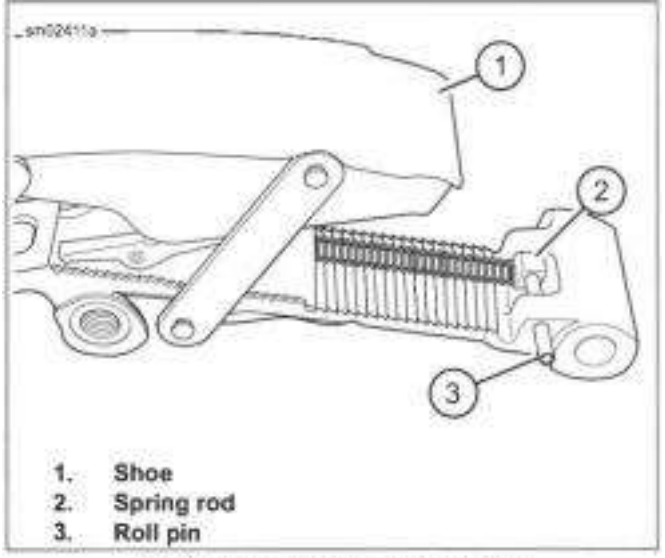


1. Bolt
2. Primary drive locking tool

Figure 5-20. Installing Engine Compensating Sprocket Bolt

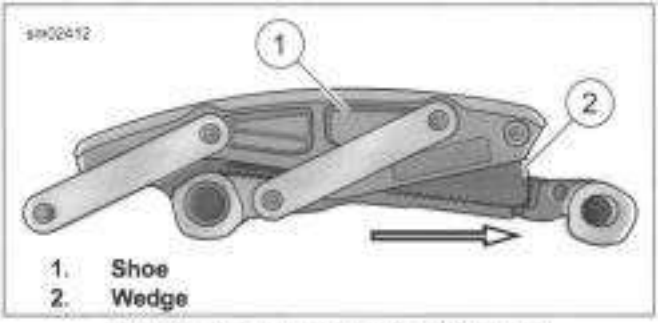
1. Shaft extension
2. Large spring washer (2)
3. Medium spring washer (2)
4. Small spring washer
5. Sliding cam
6. Compensating sprocket
7. Thrust washer
8. Sprocket retainer
9. Bolt
10. Oil spinner (wide frame only)

Figure 5-17. Engine Compensating Sprocket Assembly



1. Shoe
2. Spring rod
3. Roll pin

Figure 5-21. Spring Rod Location



1. Shoe
2. Wedge

Figure 5-22. Primary Chain Tensioner

COMPLETE

1. Install primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
2. Fill primary chaincase with oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
3. **Mid-mount controls:** Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Install rider footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
5. Install negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove rider left footboard and bracket, if necessary. See LEFT FOOT CONTROLS (Page 3-128).
3. **Mid-mount controls:** Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).

DISASSEMBLE AND ASSEMBLE: CLUTCH PACK

To replace the entire clutch assembly, see DRIVE COMPONENTS (Page 5-18).

Disassemble

1. See Figure 5-23. Remove pressure plate (6).
   a. Remove bolts (1).
   b. Remove spring stopper plate (2).
   c. Remove springs (4).
   d. Remove spring seats (5).
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

A 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 the 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.
      Length/Dimension/Distance: 0.006 in (0.15 mm)
4. Check clutch hub bearing for smooth operation. Replace if necessary. See Disassemble and Assemble: Hub (Page 5-25).
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 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 5-23. 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 (9).

d. Install narrow friction plate (7), narrow steel plate (8) and remaining friction plate (7).

4. Install pressure plate (6).

a. Install spring seats (5).

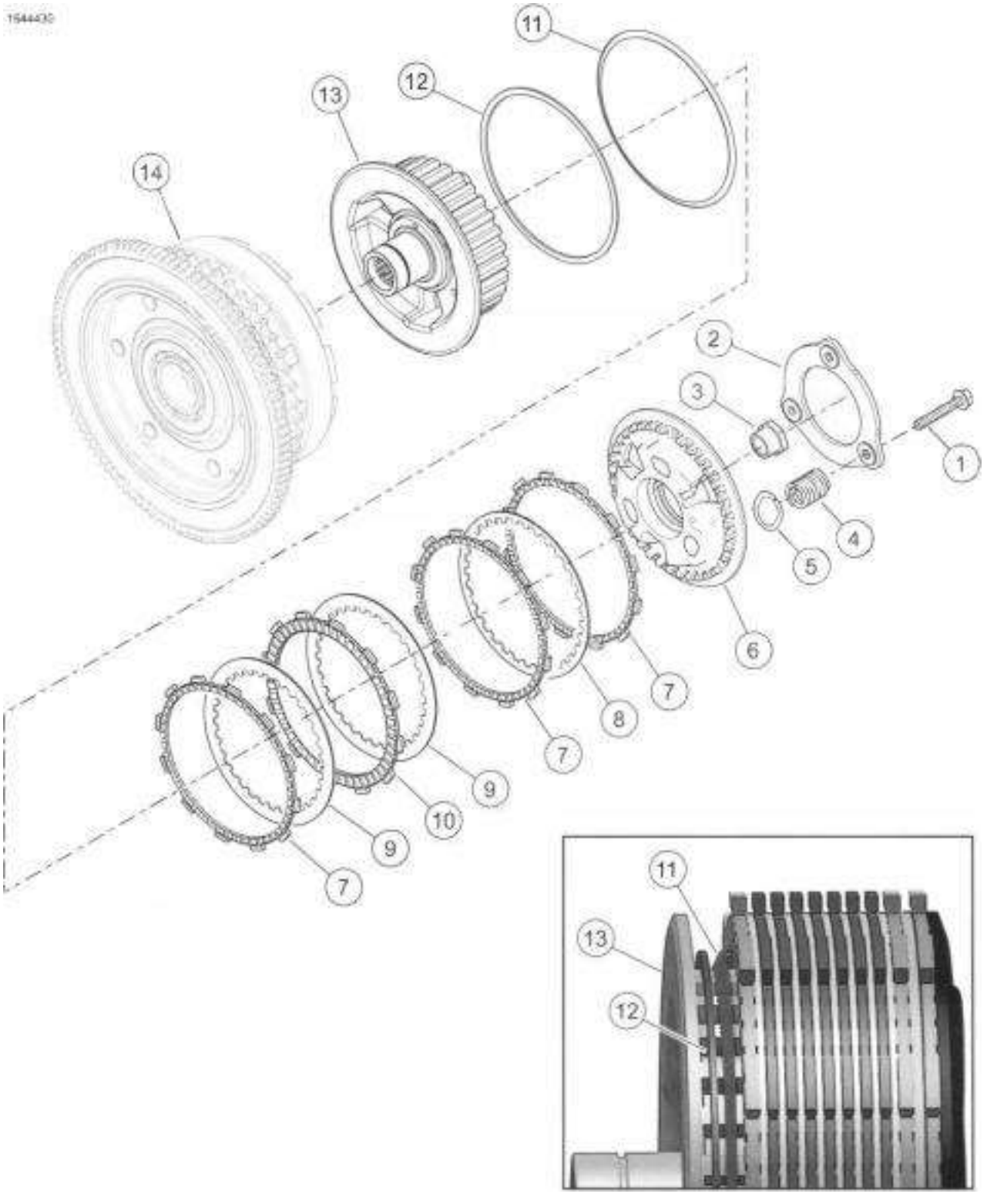
b. Align and install pressure plate (6) onto clutch hub (13).

c. Install springs (4).

d. Install spring stopper plate (2).

e. Install bolts (1).

Torque: 71-106 **in-lbs** (8-12 N-m)



1. Bolt (3)
2. Stopper plate
3. Mainshaft nut
4. Coil spring (3)
5. Seat (3)
6. Pressure plate
7. Narrow fri cti on plate (3)
8. Narrow steel plate (1)
9. Wide steel plate (8)
10. Wide fri cti on plate (7)
11. Damper spring
12. Damper spring seat
13. Clutch hub
14. Clutch shell

Figure 5-23. Clutch Shell Assembly

DISASSEMBLE AND ASSEMBLE: HUB

Disassemble

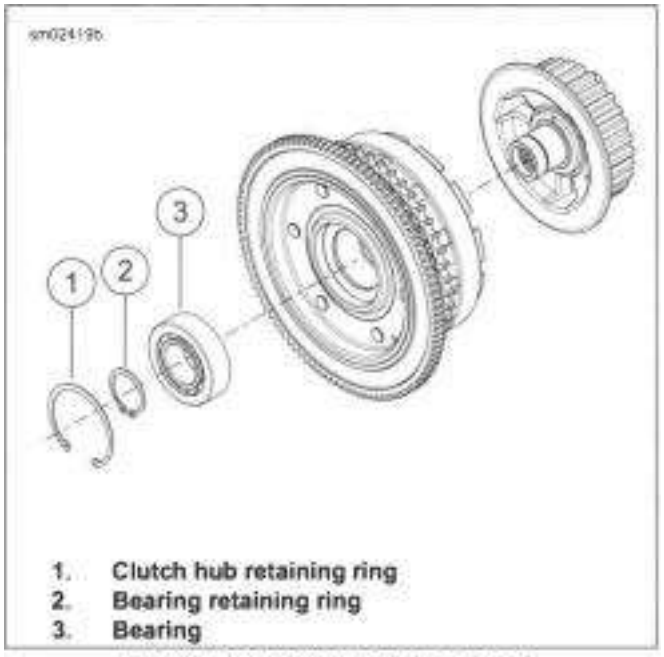
A WARNING

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 the clutch shell and hub assembly unless the bearing, hub or shell require replacement. Replace the bearing if disassembled.

1. Press out clutch hub.
   a. See Figure 5-24. Remove clutch hub retaining ring (2).
   b. See Figure 5-25. Support clutch shell in press with ring gear side up.
   c. Press hub from bearing in clutch shell.
2. Remove bearing.
   a. See Figure 5-24. Remove bearing retaining ring (1) from groove in clutch shell bore.
   b. See Figure 5-25. 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 Disassemble and Assemble: Clutch Pack (Page 5-22).



1. Clutch hub retaining ring
2. Bearing retaining ring
3. Bearing

Figure 5-24. Clutch Retaining Rings

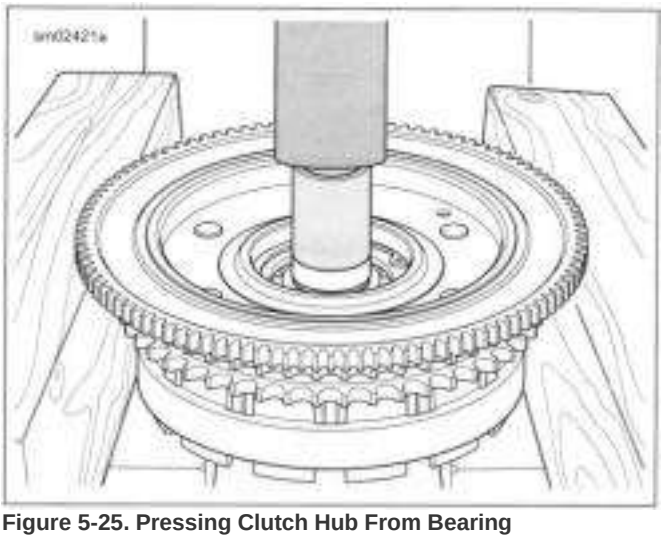


Figure 5-25. Pressing Clutch Hub From Bearing

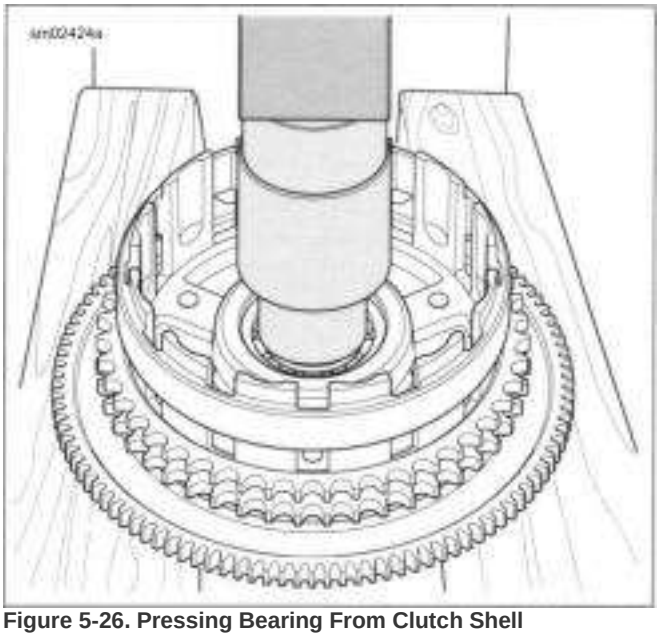


Figure 5-26. Pressing Bearing From Clutch Shell Assemble

1. 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.

A 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 5-24. Install 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 the 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. See Figure 5-24. Install clutch hub retaining ring (2) in groove of clutch hub.

COMPLETE

1. Install primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
2. Fill primary chaincase with oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
3. Mid-mount controls: Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Install rider footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
5. Install negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove rider footboard and bracket, if needed. See LEFT FOOT CONTROLS (Page 3-128).
3. Mid-mount controls: Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
6. Remove starter. See STARTER (Page 7-9).
7. Remove primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).

REMOVE

1. See Figure 5-27. Remove five sealing screws (5).
2. Remove primary chaincase housing (6).
3. Discard the crankcase gasket (7) and sealing screws.

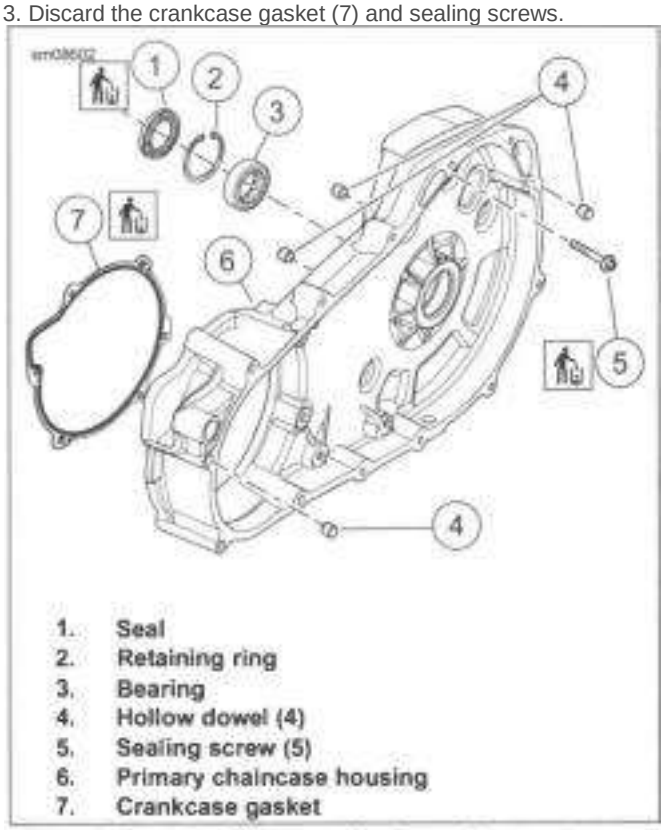


Figure 5-27. Primary Chaincase Housing

INSPECT

1. Inspect primary chaincase for cracks or damaged gasket surface.
2. Check the mainshaft bearing. Replace if bearing does not rotate freely. See Mainshaft Bearing and Seal (Page 5-28).
3. Replace the oil seal. See Mainshaft Bearing and Seal (Page 5-28).
4. Inspect shifter shaft bushing. Replace if necessary. See 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 the splines from damaging the primary housing inner oil seal.

1. See Figure 5-29. Install gasket on surface (2). Verify dowels in gasket engage dowel holes (3).
2. Spread a film of oil on mainshaft oil seal lip and rubber portion of crankcase gasket.
3. Install primary chaincase housing.
   a. See Figure 5-30. Install new sealing screws.
   b. See Figure 5-31. Tighten in sequence shown.
      Torque: 26-28 ft-lbs (35.3-38 N-m) ***Primary chaincase sealing screws***

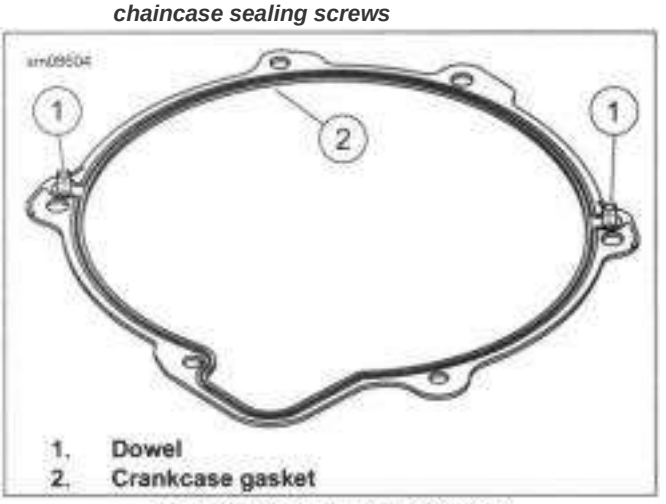
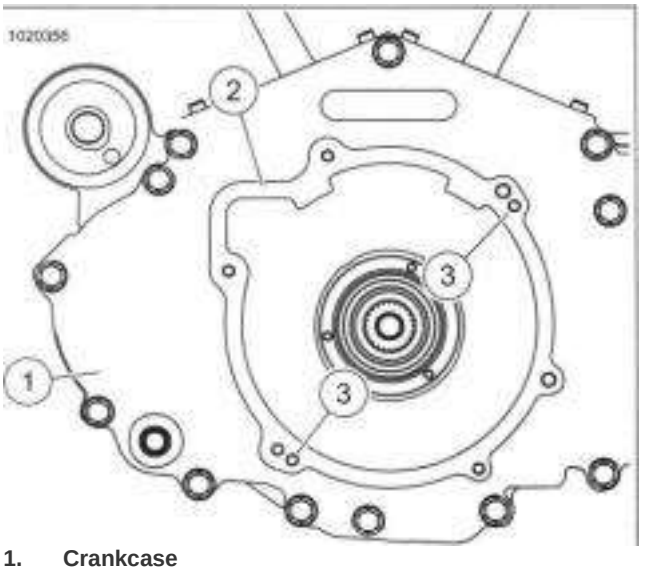


Figure 5-28. Crankcase Gasket



1. Crankcase
2. Gasket surface
3. Dowel holes
Figure 5-29. Crankcase

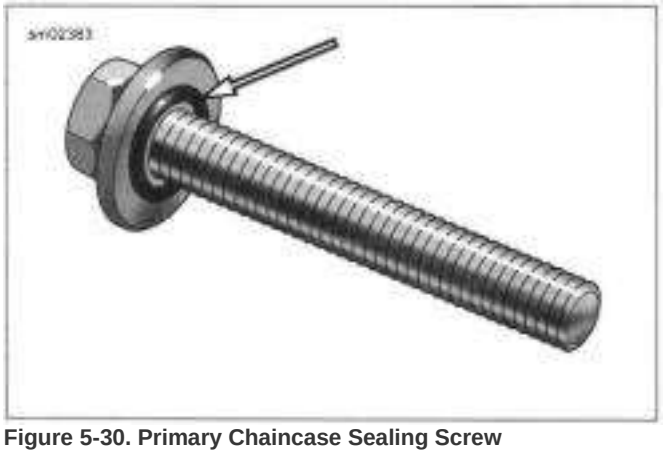


Figure 5-30. Primary Chaincase Sealing Screw

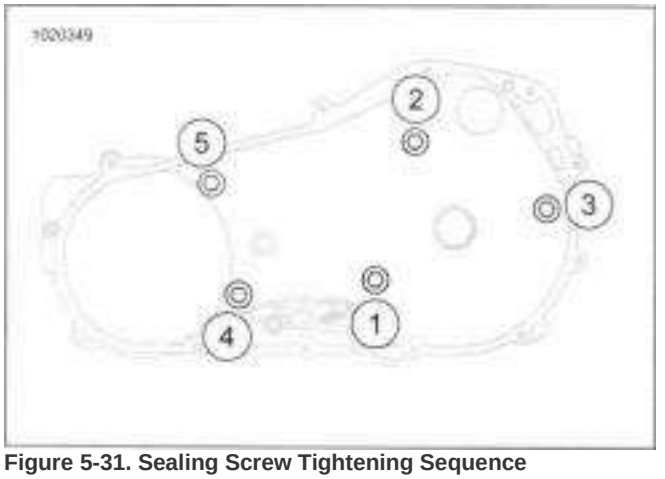


Figure 5-31. Sealing Screw Tightening Sequence

1. Remove seal with a seal remover or rolling head pry bar for best results.

A 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 5-32. Remove retaining ring (1).

NOTE

Support the bearing support area on the transmission side of the 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 the bearing bore is clean and smooth.

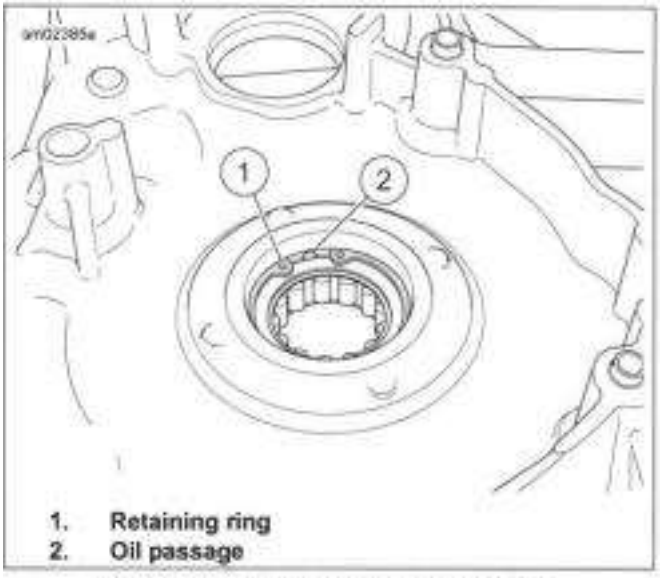
NOTE

Support the bearing support area on the clutch side of the primary chaincase while pressing bearing.

2. Place primary chaincase in a press with the 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 the bearing support area.
4. See Figure 5-32. Install retaining ring.
   a. Retaining ring (1) must not block oil passage (2).
   b. Verify that the ring is fully seated in the groove.
5. Install mainshaft oil seal.
   a. Lubricate the OD of the **new** seal with SCREAMIN' EAGLE ASSEMBLY LUBE.
   b. Place over bore with the lip garter spring side (stamped "OIL SIDE") facing toward the bearing.
   c. Press against the outer rim of oil seal the seal until seal is flush with machined surface of inner primary housing.
6. Lubricate the bearing and seal lip with multi-purpose grease or SCREAMIN' EAGLE ASSEMBLY LUBE.

MAINSHAFT_BEARING_AND SEAL

Remove



1. Retaining ring
2. Oil passage

Figure 5-32. Retaining Ring Orientation

MAINSHAFT BEARING INNER RACE

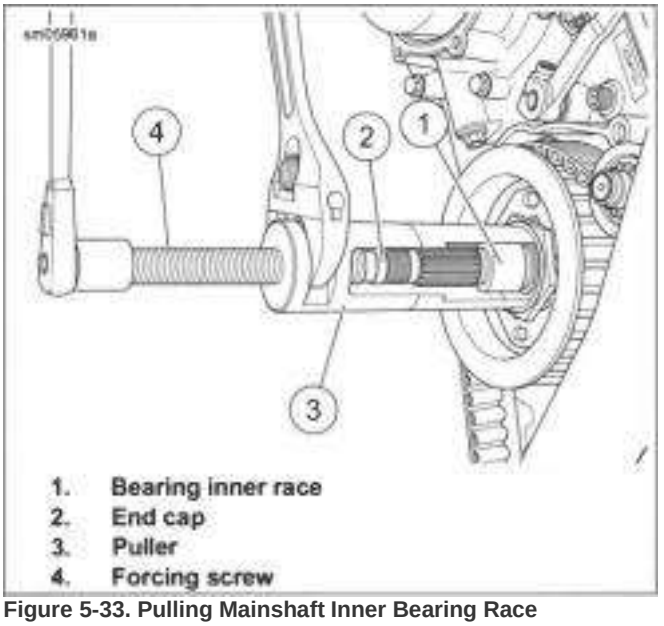
PART NUMBER	TOOL NAME
HD-34902-C	BEARING RACE REMOVER AND INSTALLER KIT

Remove

NOTE

Use only BEARING RACE REMOVER AND INSTALLER KIT (PART NUMBER: HD-34902-C).

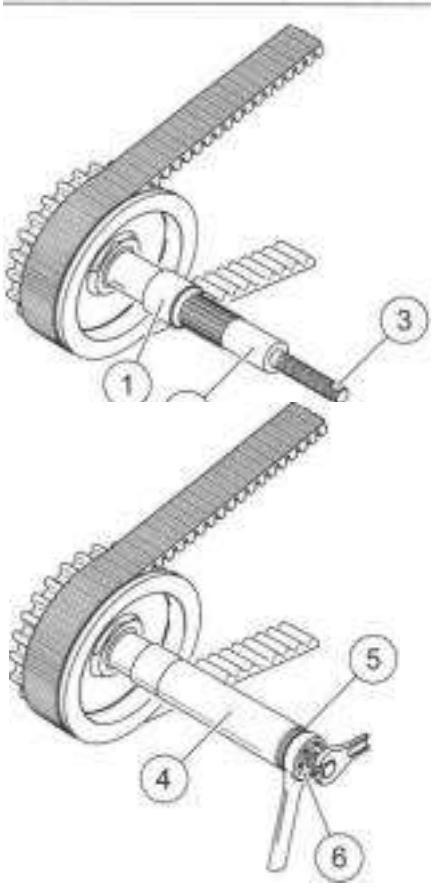
1. See Figure 5-33. Remove bearing inner race using BEARING RACE REMOVER AND INSTALLER KIT (PART NUMBER: HD-34902-C).



1. Bearing inner race
2. End cap
3. Puller
4. Forcing screw

Figure 5-33. Pulling Mainshaft Inner Bearing Race

sm03455



1. **Bearing inner race**
2. **Extension shaft**
3. **Wrench flat**
4. **Installer sleeve**
5. **Washer (2)**
6. **Nut**

Figure 5-34. Installing Bearing Race

SHIFTER SHAFT BUSHING

1. See Figure 5-35. Press out old bushing (1) from front to back.
2. Inspect the bushing bore to verify that it is clean and smooth.
3. Press **new** bushing from back of chaincase until it is flush to 0.020 in (0.51 mm) below edge of bore.

Install

1. See Figure 5-34. Install bearing inner race (1) onto mainshaft until edge of race contacts step on shaft using BEARING RACE REMOVER AND INSTALLER KIT (PART NUMBER: HD-34902-C).
2. Lubricate race with SCREAMIN' EAGLE ASSEMBLY LUBE.

COMPLETE

1. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE COMPONENTS (Page 5-18).
2. Install starter. See STARTER (Page 7-9).
3. Install primary chaincase cover and **new** gasket. See PRIMARY CHAINCASE COVER (Page 5-17).
4. Fill primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. **Mid-mount controls:** Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
6. Install rider left footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
7. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

ENGINE OIL FILL SPOUT

PREPARE

1. Drain engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).

REMOVE

1. See Figure 5-36. Remove screws (4).
2. Remove fill spout (3).
3. Discard O-ring (1).

INSTALL

FASTENER	TORQUE VALUE	
Engine oil fill spout screw.	100---120in-lbs	11.3-13.6 N-m

1. See Figure 5-36. Install new O-ring (1).
2. Install fill spout.
   a. Install fill spout (3).
   b. Install screws (4). Tighten.
      Torque: 100---120 in-lbs (11.3-13.6 N-m) ***Engine oil fill spout screw.***

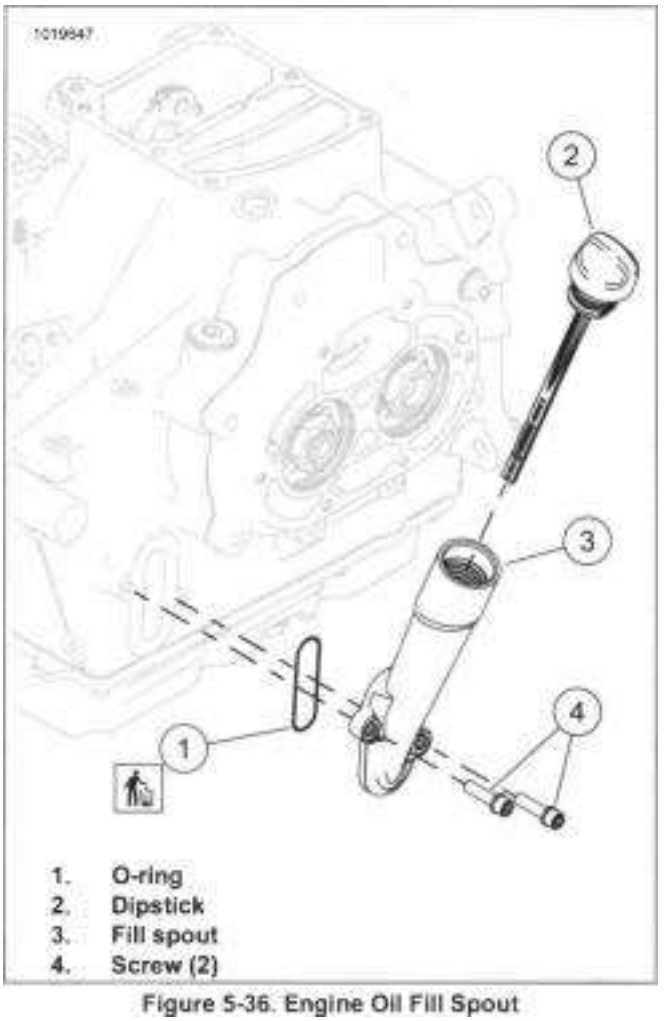


Figure 5-36. Engine Oil Fill Spout

COMPLETE

1. Fill engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove rider footboard and bracket, if needed. See LEFT FOOT CONTROLS (Page 3-128).
3. **Mid-mount controls:** Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
6. Remove starter. See STARTER (Page 7-9).
7. Remove primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
8. Remove primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
9. Loosen drive belt. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).

REMOVE

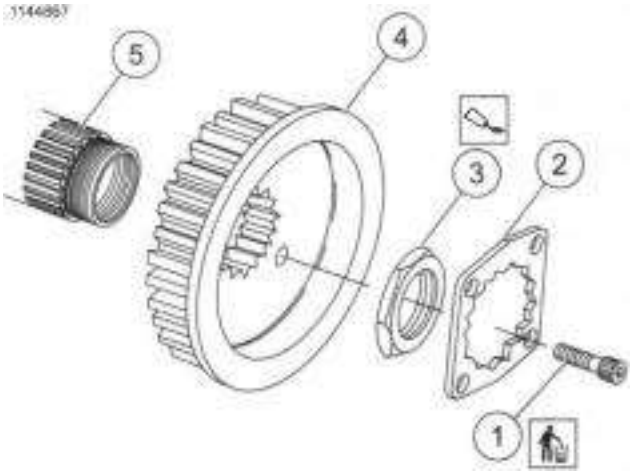
PART NUMBER	TOOLNAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT

NOTE

- ***Loosen sprocket nut only while transmission is installed in frame. Otherwise damage to transmission or transmission stand results.***
- ***Sprocket nut has a right-hand thread.***

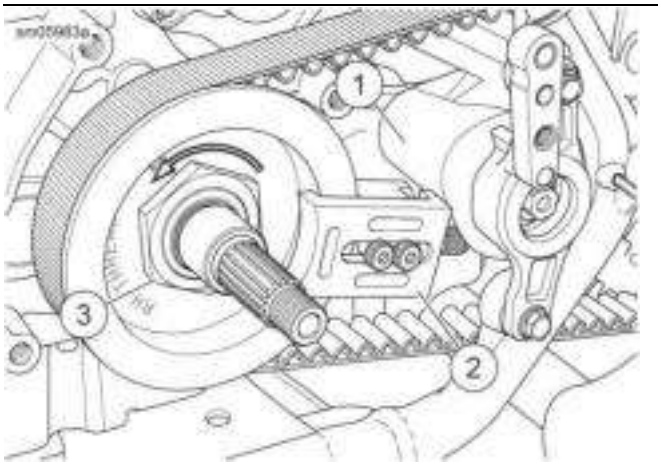
1. See Figure 5-37. Remove sprocket nut.
   a. Remove two screws (1) and lockplate (2).
   b. See Figure 5-38. Install FINAL DRIVE SPROCKET LOCKING TOOL (PART NUMBER: HD-46282A) (2) with arm of tool against bottom of rear fork pivot (1).
   c. Install PILOT (PART NUMBER: HD-94660-2) on mainshaft.
   d. Remove the sprocket nut (3) using MAINSHAFT LOCKNUT WRENCH (PART NUMBER: HD-47910) (1).

2. Remove sprocket, allowing belt to slip from sprocket as sprocket is removed.



1. **Screw (2)**
2. **Lockplate**
3. **Sprocket nut**
4. **Sprocket**
5. **Main drive gear**

Figure 5-37. Transmission Sprocket



1. **Rear fork pivot**
2. **Final drive sprocket locking tool**
3. **Sprocket nut**

Figure 5-38. Sprocket Nut Removal

CLEAN AND INSPECT

1. Using a non-volatile cleaning solvent, clean sprocket of all grease and dirt.
2. Inspect belt and sprocket. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
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

PART NUMBER	TOOL NAME
TA360	TORQUE ANGLE GAUGE

FASTENER	TORQUE VALUE	
Transmission sprocket lock-plate screws	90-120 in-lbs	10.2-13.6 N-m
Transmission sprocket nut, 1st torque	100 ft-lbs	135.6 N-m
Transmission sprocket nut, 2nd torque	35 ft-lbs	47.5 N-m
Transmission sprocket nut, final torque	35-40°	35-40°

CONSUMABLE	PART NUMBER
LOCTITE 271 HIGH STRENGTH THREADLOCKER AND SEALANT (RED)	Loctite 271

NOTE

- ***Tighten sprocket nut only while transmission is installed in frame. Otherwise damage to transmission or transmission stand results.***
- ***Never get oil on the threads of the sprocket nut.***
- ***The transmission sprocket nut has right-hand threads.***

1. Place transmission sprocket in position. Install the belt as the sprocket is installed.

2. Install sprocket nut.

   a. See Figure 5-37 . Apply a film of clean engine oil to the mating surfaces of the sprocket nut (3) and the sprocket (4).

   b. Apply threadlocker to the threads of the sprocket nut.

      LOCTITE 271 HIGH STRENGTH THREADLOCKER AND SEALANT (RED) (Loctite 271)

   c. Install the sprocket nut finger-tight.

   d. See Figure 5-39. Install special tool (2) resting against the rear fork pivot (3).

      Special Tool: FINAL DRIVE SPROCKET LOCKING TOOL (HD-46282A)

   e. Install special tool on mainshaft.

      Special Tool: PILOT (HD-94660-2)

   f. Using special tool, tighten sprocket nut to initial torque.

      Torque: 100 ft-lbs (135.6 N-m) ***Transmission sprocket nut, 1st torque***
      Special Tool: MAINSHAFT LOCKNUT WRENCH (HD-47910)

3. Loosen sprocket nut one full turn.

4. Tighten to second torque.

   Torque: 35 ft-lbs (47.5 N-m) ***Transmission sprocket nut, 2nd torque***

NOTE

5. See Figure 5-40. Scribe lines (3) or use special tool for final torque.

   Special Tool: TORQUE ANGLE GAUGE (TA360)

6. Turn sprocket nut to specification.

   Torque: 35-40° (35-40°) ***Transmission sprocket nut, final torque***

NOTE

- ***The lockplate can be installed either side out.***
- ***Never LOOSEN nut to align screw holes.***
- ***If necessary, tighten the nut slightly to align lockplate.***
- ***Do not exceed a final torque of 45 degrees.***

7. Install lockplate.

   a. Align lockplate holes with tapped holes in sprocket.

   b. See Figure 5-37 . Install two new screws (1). Tighten.

      Torque: 90--120 in-lbs (10.2-13.6 N-m) ***Transmission sprocket lockplate screws***

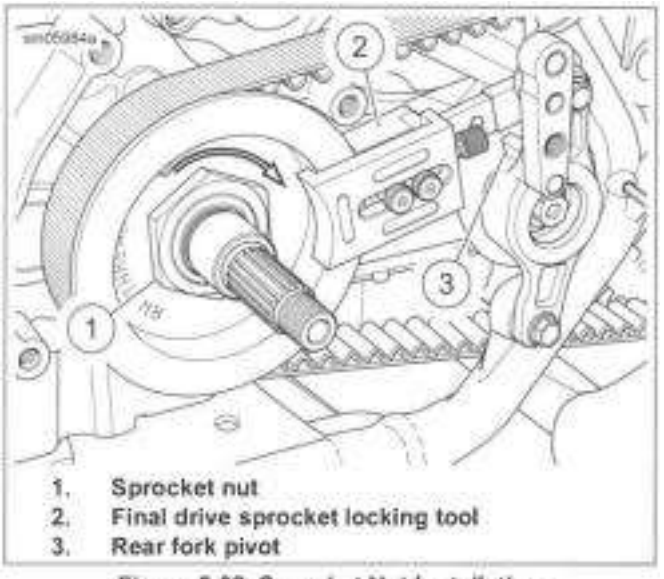


Figure 5-39. Sprocket Nut Installation

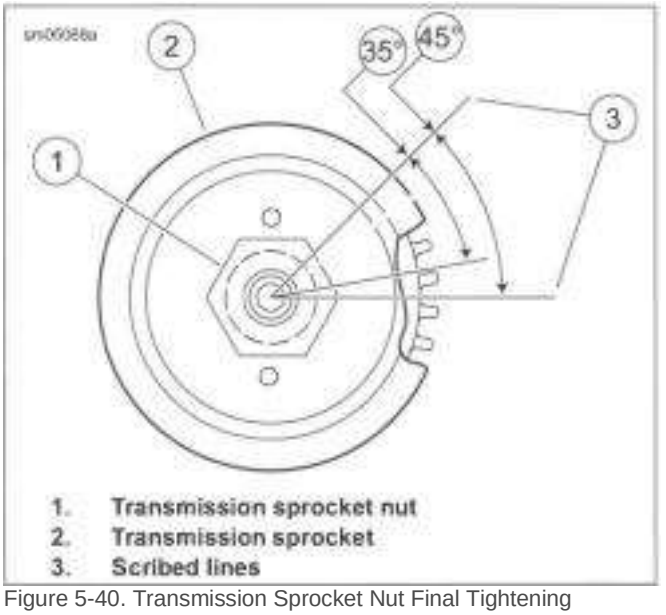


Figure 5-40. Transmission Sprocket Nut Final Tightening

COMPLETE

1. Install primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
2. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE COMPONENTS (Page 5-18).
3. Install starter. See STARTER (Page 7-9).
4. Install primary chaincase cover and **new** gasket. See PRIMARY CHAINCASE COVER (Page 5-17).
5. Fill primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
6. **Mid-mount controls:** Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
7. Install rider left footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
8. Adjust drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
9. Verify rear fork pivot shaft torque. See REAR FORK (Page 3-81).
10. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Drain transmission oil. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).
3. Drain engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
4. Remove exhaust system. See EXHAUST SYSTEM (Page 6-36).
5. Remove engine oil fill spout. See ENGINE OIL FILL SPOUT (Page 5-31).
6. Remove clutch release cover. See CLUTCH RELEASE COVER (Page 5-12).
7. Remove rider footboard and bracket, if needed. See LEFT FOOT CONTROLS (Page 3-128).
8. Mid-mount controls: Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
9. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
10. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
11. Remove starter. See STARTER (Page 7-9).
12. Remove primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
13. Remove primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
14. Loosen drive belt. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
15. Remove transmission mainshaft bearing inner race. See Mainshaft Bearing Inner Race (Page 5-29).

REMOVE

NOTE

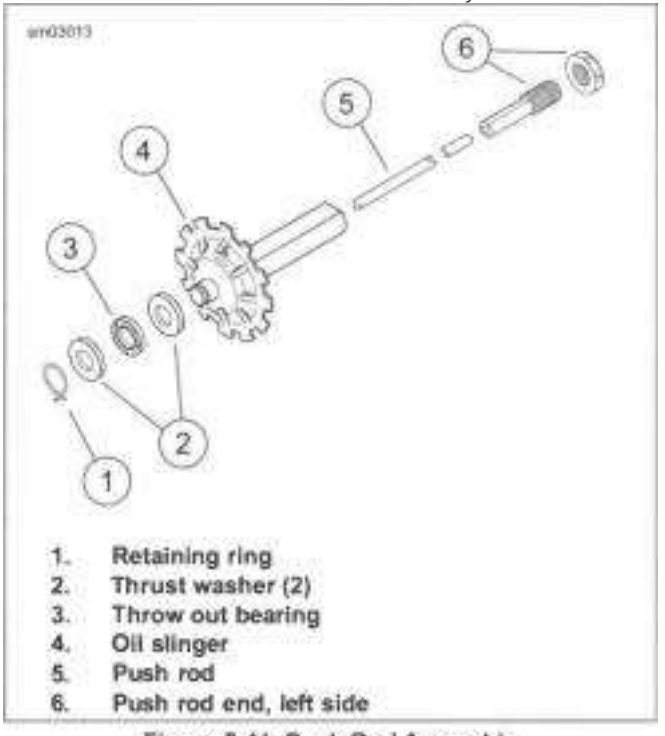
Do not remove the transmission case unless the case requires replacement. See TRANSMISSION CASE (Page 5-50).

1. See Figure 5-41. Remove oil slinger assembly and pushrod from main shaft.
2. Remove transmission top cover.
3. See Figure 5-42. Set a rag over the transmission case.
4. Set shifter cam pawl on rag.
5. Cover mainshaft clutch hub splines with tape to prevent damaging the main drive gear bearings and oil seal.

NOTE

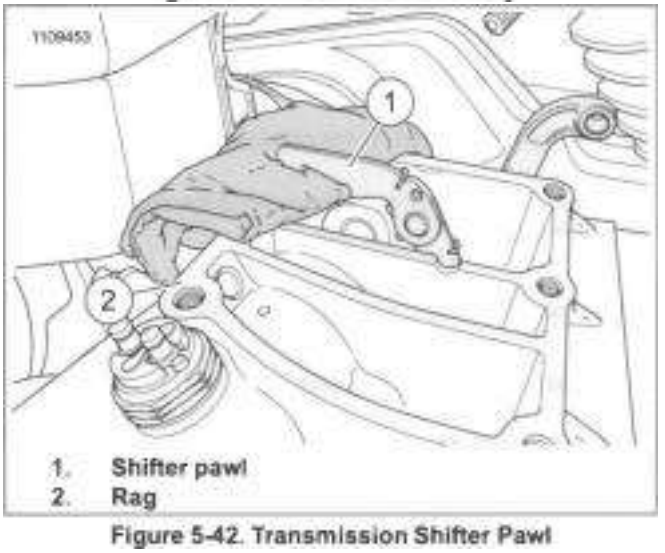
See Figure 5-43. Always pry bearing housing loose. Never tap on shafts to remove transmission assembly The bearing housing bearings will be damaged.

6. See Figure 5-44. Remove the transmission and bearing housing assembly:
   a. Remove the transmission bearing housing screws (1).
   b. See Figure 5-43. Pry the bearing housing loose.
   c. Remove bearing housing and transmission components from transmission case as an assembly.



1. Retaining ring
2. Thrust washer (2)
3. Throw out bearing
4. Oil slinger
5. Push rod
6. Push rod end, left side

Figure 5-41. Push Rod Assembly



1. Shifter pawl
2. Rag

Figure 5-42. Transmission Shifter Pawl

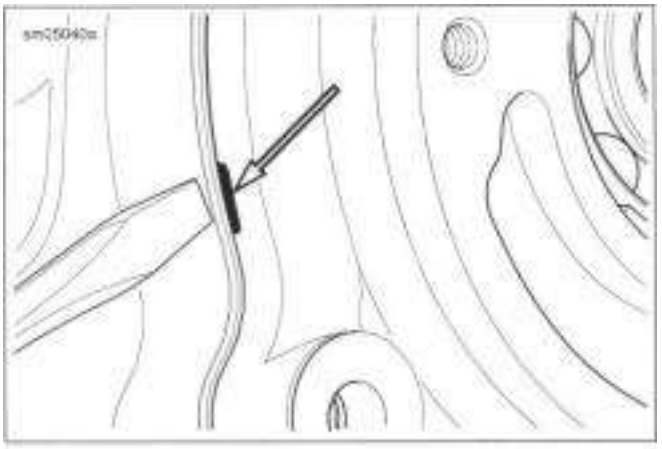


Figure 5-43. Bearing Housing Pry Point

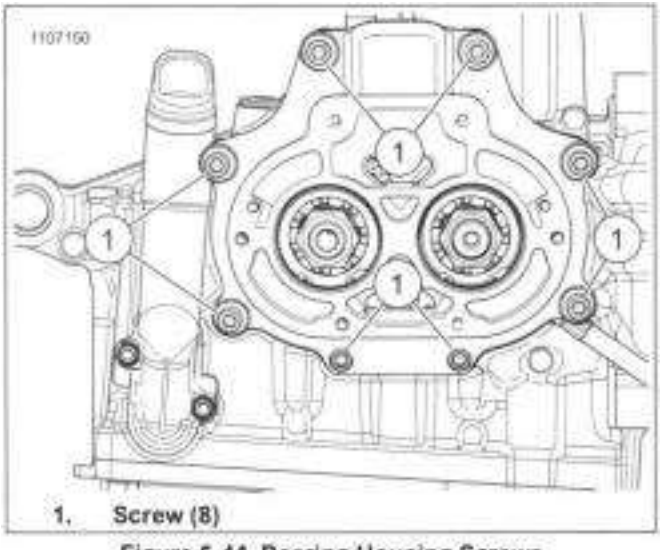


Figure 5-44. Bearing Housing Screws

INSTALL

FASTENER	TORQUE VALUE	
Transmission bearing housing screws	22-25 ft-lbs	29.8-33.9 N-m
Transmission top cover	132-156 in-lbs	14.9-17.6 N-m

1. Cover mainshaft clutch hub splines with tape to prevent damaging the main drive gear bearings and oil seal.

2. Install a new gasket on the ring dowels.

3. Apply clean transmission lubricant to the main drive gear bearings.

NOTE

Verify that transmission filler plug/dipstick is removed.

4. Install the transmission assembly in the transmission case.

5. See Figure 5-44 . Install transmission bearing housing.

   a. Install screws (1).

   b. See Figure 5-45. Tighten in sequence to 22-25 ft-lbs (29.8-33.9 N-m). '

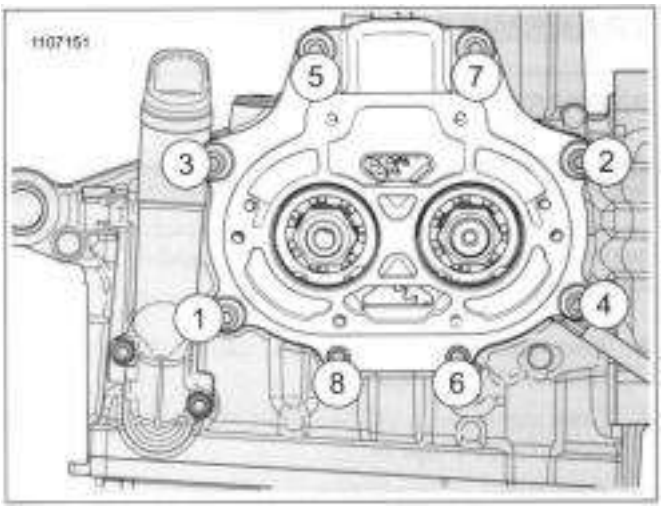


Figure 5-45. Transmission Bearing Housing Tightening Sequence

6. Install top cover.

   a. Set shifter cam pawl on shift cam.

   b. Inspect transmission top cover gasket. Replace as necessary.

   c. Install transmission top cover and screws. Tighten.

      Torque: 132-156 in-lbs (14.9-17.6 N-m)
      Transmission top cover

7. Install vent hose to top cover fitting, if removed.

8. See Figure 5-41. Install pushrod assembly (2-5) in mainshaft hole.

   a. Install new retaining ring (1) if removed.

DISASSEMBLE

Remove Shift Cam and Shifter Forks

1. See Figure 5-46. 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 5-47. Remove lock plate (2). Discard screws (3).
4. Hold detent arm back and remove shift cam (4).
5. See Figure 5-48. If needed, remove detent assembly.

   a. Remove detent screw (1), detent arm (2), sleeve (3) and detent spring (4).

   b. Discard detent screw.

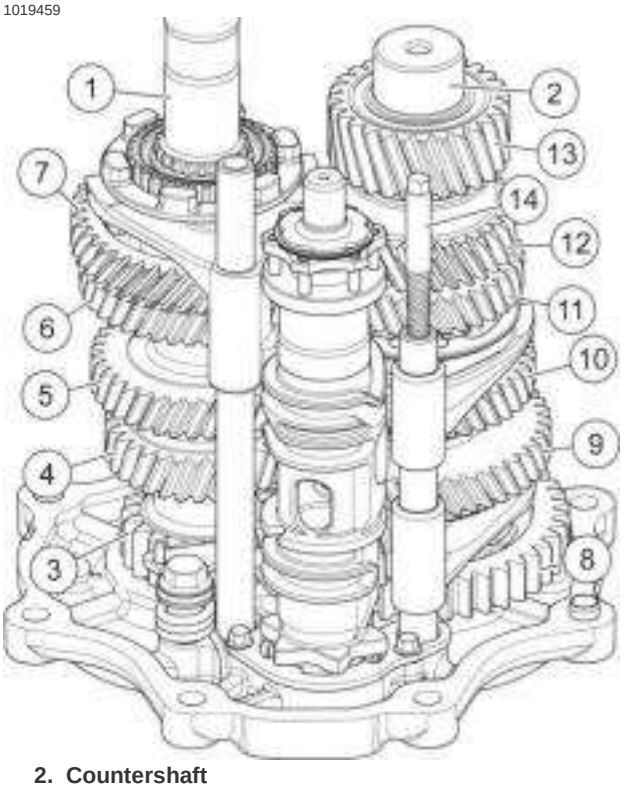
NOTE

Mark parts so they can be installed in same direction as removed.

6. See Figure 5-49. 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

1019459

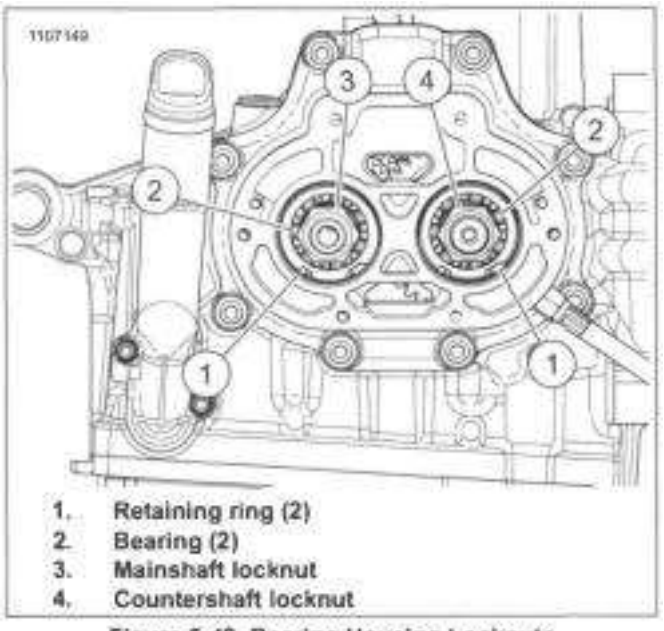


2. Countershaft
3. Mainshaft first gear
4. Mainshaft second gear
5. Mainshaft third gear
6. Mainshaft fourth gear
7. Mainshaft fifth gear
8. Countershaft first gear
9. Countershaft second gear
10. Countershaft third gear
11. Countershaft fourth gear
12. Countershaft fifth gear
13. Countershaft sixth gear
14. Screw extractor

Figure 5-46. Gear Set

1. B
2. L
3. L
4. S

Figure 5-4



1. Retaining ring (2)
2. Bearing (2)
3. Mainshaft locknut
4. Countershaft locknut

Figure 5-49. Bearing Housing Locknuts

Remove Mainshaft

NOTE

■ ***The mainshaft fourth gear, third gear, second gear and first gear are integral parts of the shaft. Damage to any gear requires mainshaft replacement.***

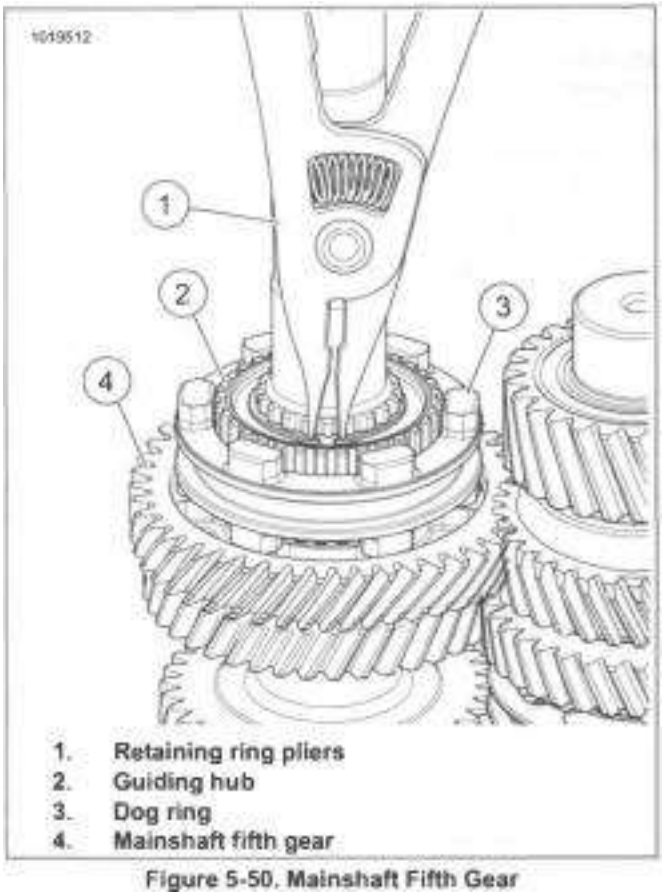
• ***Always replace bearing housing bearings.***

1. See Figure 5-50. Using 714 (OTC HORSESHOE LOCK RING PLIERS,), remove retaining ring.
2. Remove dog ring (3), guiding hub (2), mainshaft fifth gear (4) and bearing.

NOTE

Do not press directly on the end of the mainshaft. Use a spacer between the end of the mainshaft and the press ram.

3. Press mainshaft out of bearing housing bearing.
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 5-50. Mainshaft Fifth Gear

Remove Countershaft

NOTE

Do not press directly on the end of the countershaft. Place a spacer between the end of the countershaft and the 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 5-51. Remove washer (1), countershaft first gear (2) and bearing.
4. Remove countershaft second, third and forth gears.
   a. See Figure 5-52. 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 5-53 and Figure 5-54. Repeat steps with third and fourth gears.

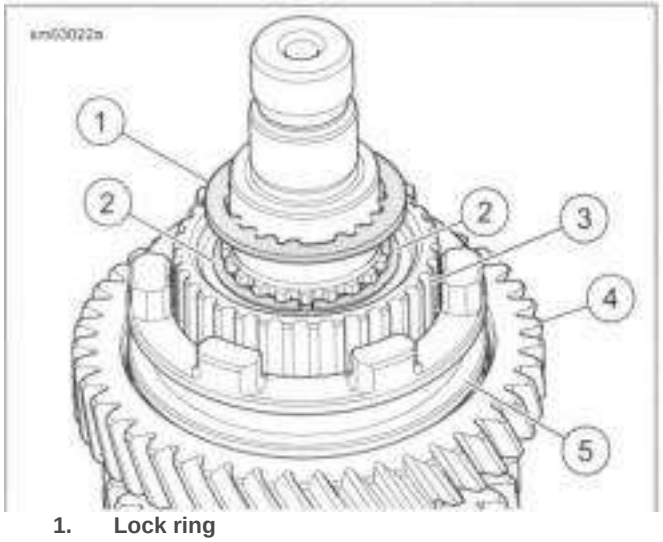
NOTE

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.

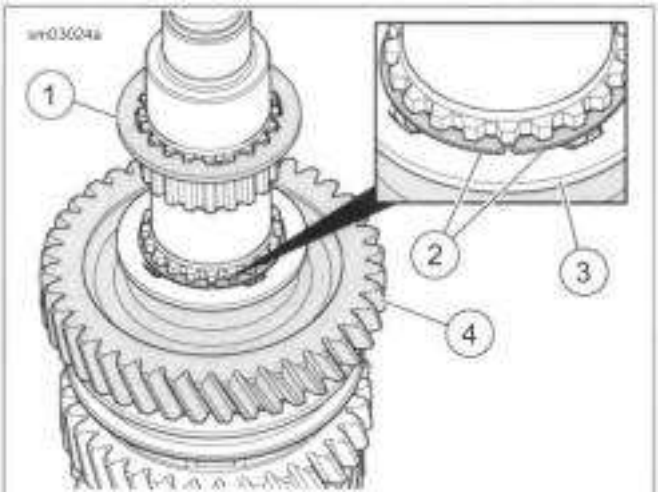
1. Washer
2. Countershaft scissor first gear

Figure 5-51. Countershaft First Gear



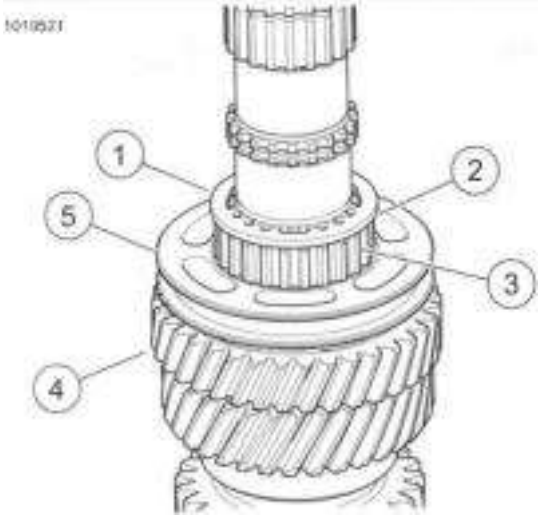
1. Lock ring
2. Securing segment (2)
3. Guiding hub
4. Countershaft second gear
5. Dog ring

Figure 5-52. Countershaft Second Gear



1. Lock ring
2. Securing segment (2)
3. Internal spline washer
4. Countershaft third gear

Figure 5-53. Countershaft Third Gear



1. Lock ring
2. Securing segment (2) (not visible)
3. Guiding hub
4. Countershaft fourth gear
5. Dog ring

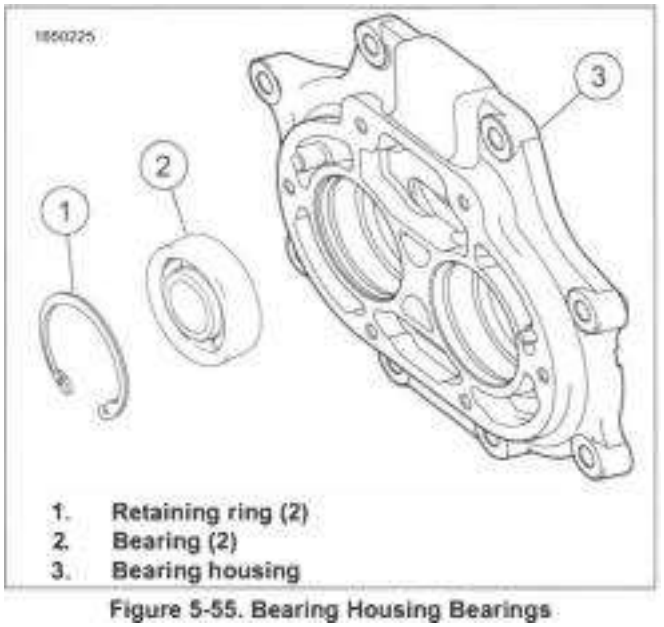
Figure 5-54. Countershaft Fourth Gear

Remove Bearing Housing Bearings

NOTE

Always replace bearing housing bearing if the shaft is pressed out.

1. See Figure 5-55. Remove the retaining rings (2). Discard retaining rings.
2. Press the bearings out of the bearing housing.



1. Retaining ring (2)
2. Bearing (2)
3. Bearing housing

Figure 5-55. Bearing Housing Bearings

CLEAN AND INSPECT

A 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 gears that are worn or damaged.
3. Replace the 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 shift fork shafts if bent or damaged.
6. Replace a shift fork if it is excessively worn or shows signs of overheating.
7. See Figure 5-56. 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.

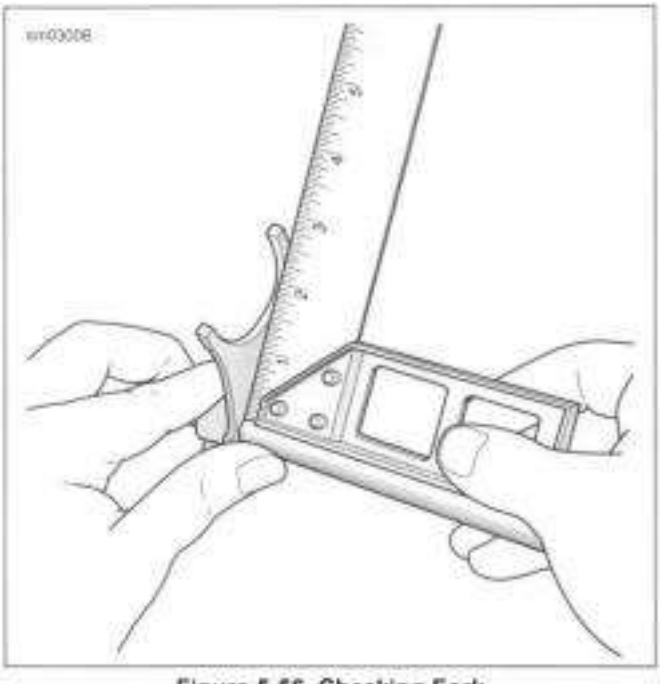


Figure 5-56. Checking Fork

ASSEMBLE

FASTENER	TORQUE VALUE	
Shift drum detent screw	120-150 in-lbs	13.6-17 N-m
Shift drum lock plate screws	57-63 in-lbs	6.4-7.1 N-m
Transmission mainshaft/countershaft locknuts	85-95 ft-lbs	115.3-128.8Nm

Install Bearing Housing Bearings

NOTE

- ***Always replace bearing housing bearing if the shaft*** was ***removed.***
- ***Always support the bearing housing with a plate when pressing bearings.***
- ***Press on the bearing outer race.***

1. Install bearings.
   a. Support the bearing housing at the bearing bores with a flat plate.
   b. Position new bearing over bore with number side up.
   c. Press the bearing until seated in the bore.

A 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 5-55 . Install new beveled retaining ring (1) with the flat side against the bearing.

Install Countershaft

1. Install fourth, third and second gears on countershaft.
   a. See Figure 5-54 . Install countershaft fourth gear (4).
   b. Lubricate needle bearings and races with 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 the rounded edge facing up. Verify that segments fully engage grooves in countershaft.
   g. Install lock ring (1) with waved, stepped face toward the securing segments.
   h. See Figure 5-53 . Install countershaft third gear (4).

NOTE

Install the second gear guiding hub with the deeper counterbore facing countershaft second gear.

   i. See Figure 5-52 . Install countershaft second gear (4).

2. See Figure 5-57. 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 5-51 . 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 the bearing.***

4. See Figure 5-59. If mainshaft is not removed, raise and hold countershaft third and fourth gear shift dog while installing countershaft.
5. See Figure 5-58. 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.

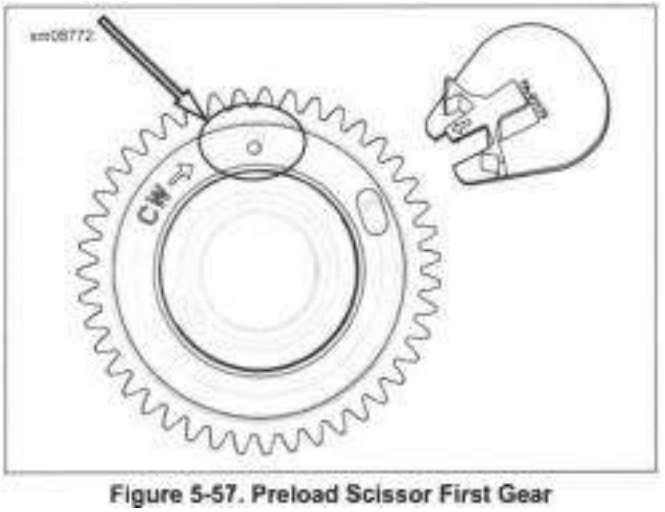


Figure 5-57. Preload Scissor First Gear

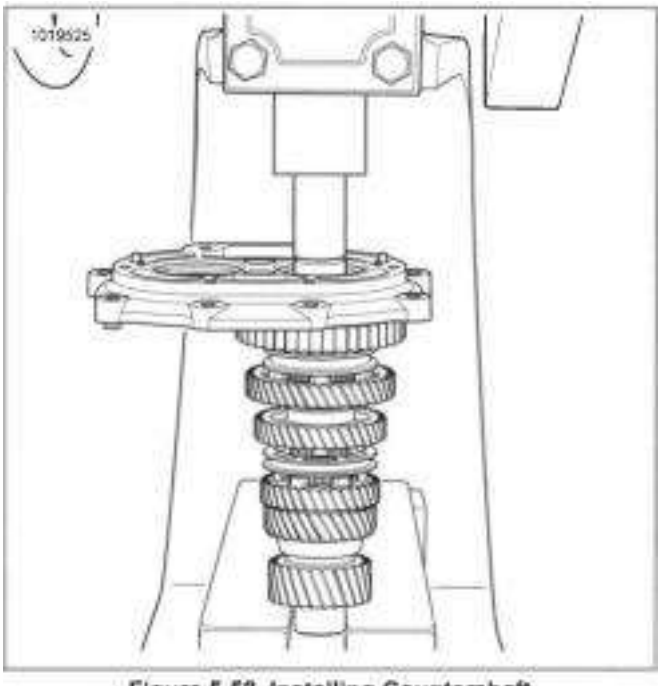


Figure 5-58. Installing Countershaft

Install Mainshaft

NOTE

Failure to press on bearing inner race damages the bearing.

1. Support mainshaft fourth gear in press.
2. See Figure 5-59. Raise and hold dog ring engaged with countershaft third gear during the press procedure.
3. Using a suitable sleeve, press on bearing inner race until bearing contacts mainshaft first gear.
4. See Figure 5-50 . 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 using 714 (OTC HORSESHOE LOCK RING PLIERS,) (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. lighten to 85-95 ft-lbs (115.3-128.8 N-m).
   d. Remove transmission assembly from transmission case.

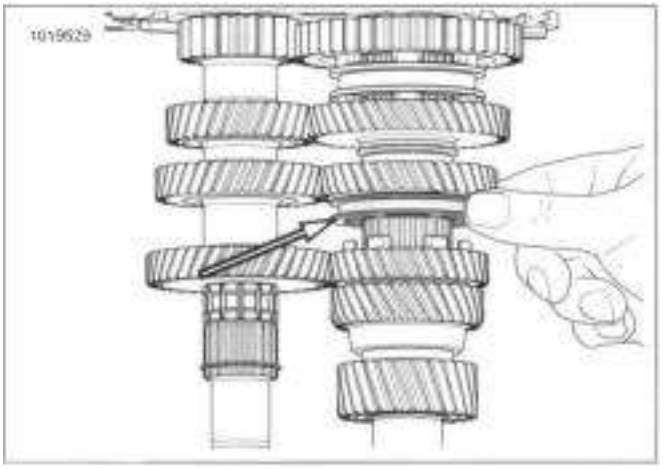


Figure 5-59. Raise and Hold Dog Ring

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 5-60. 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***
      Torque: 120-150 **in-lbs** (13.6-17 N-m) ***Shift drum detent screw***

3. See Figure 5-61. Hold detent arm back and install shift cam assembly (4).

4. Install lock plate (2) and **new** lock plate screws (3). Tighten..

   Torque: 57-63 **in-lbs** (6.4-7.1 N-m) ***Shift drum lock plate screws***
   Torque: 57-63 **in-lbs** (6.4-7.1 N-m) ***Shift drum lock plate screws***

5. Remove any burrs created on shift shafts (1, 3) during removal.

NOTE

See Figure 5-62. The shifter forks are unique and identified as shown.

6. See Figure 5-63. Install long shift shaft (1):

   a. Insert shifter fork (2) into the dog ring between mainshaft fifth and sixth gear.

   b. Slide shift shaft through shifter fork.

   c. Install shaft in hole in bearing housing.

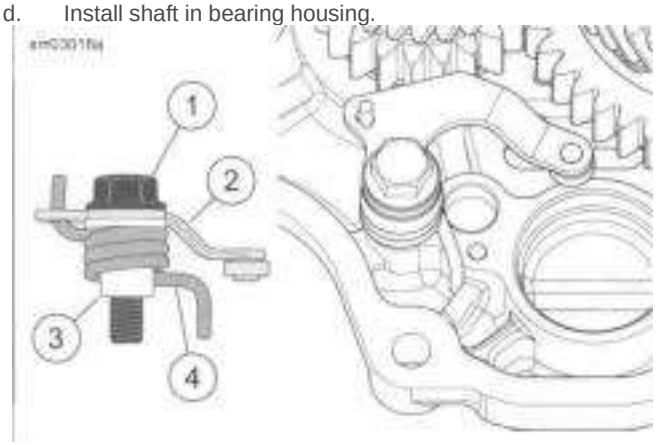
7. Install short shift shaft (4):

   a. Insert shifter fork (6) into the dog ring between countershaft third and fourth gear.

   b. Insert shifter fork (9) into the 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 5-60. Detent Assembly

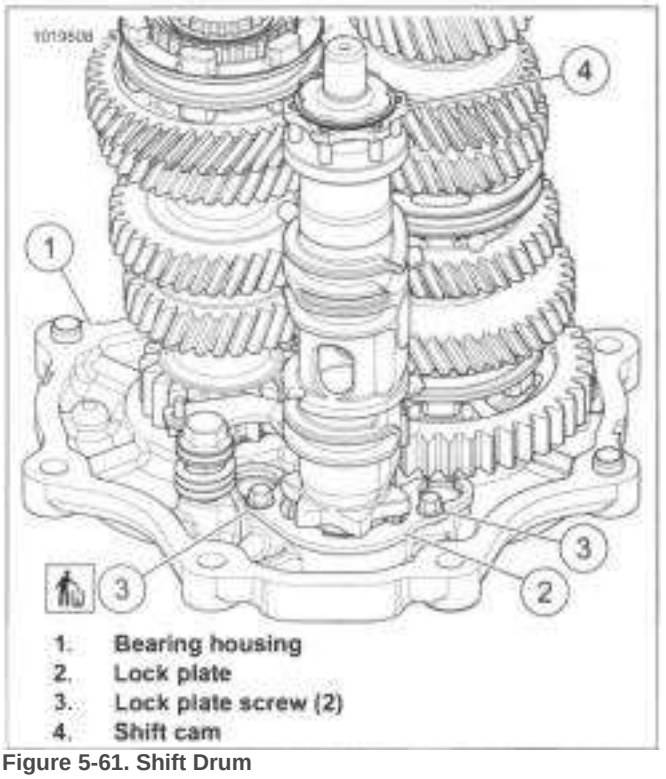
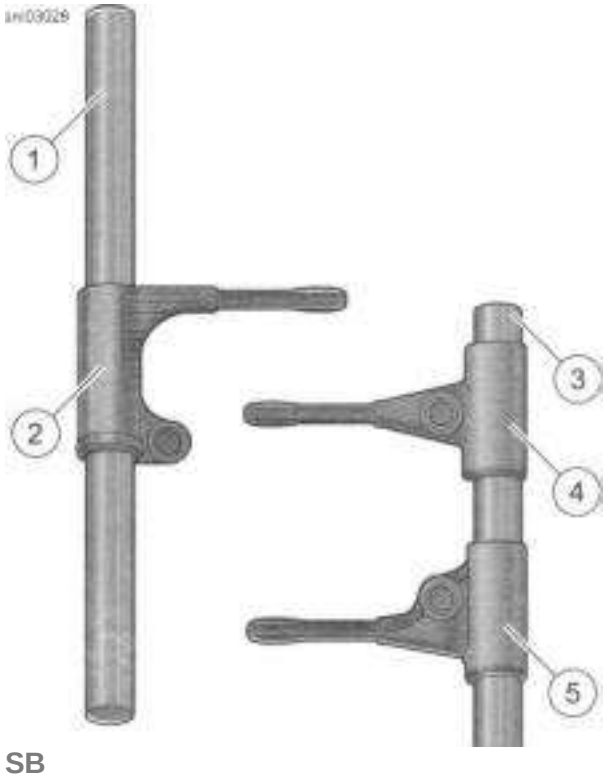


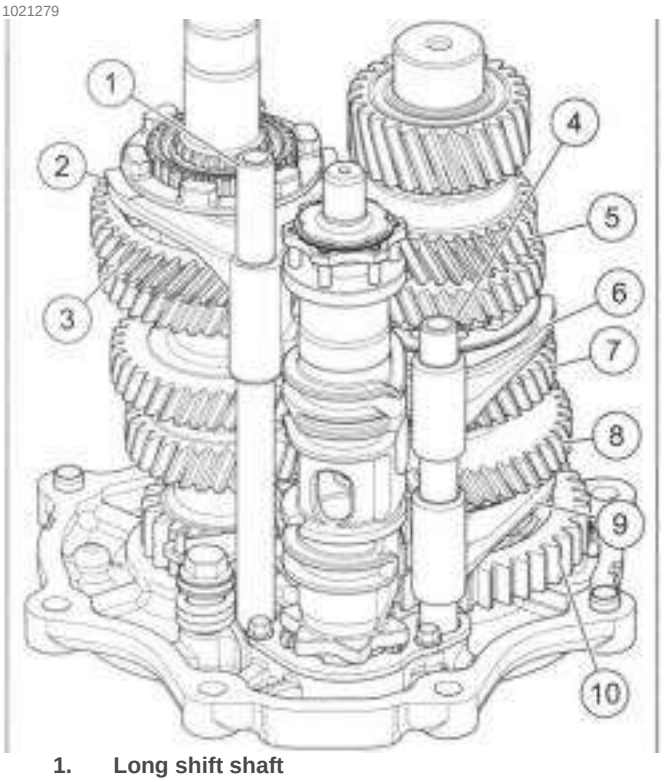
Figure 5-61. Shift Drum



SB

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 5-62. 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 5-63. Transmission Gears and Shifter Forks

COMPLETE

1. Install transmission mainshaft bearing inner race. See Mainshaft Bearing Inner Race (Page 5-29).
2. Install clutch release cover. See CLUTCH RELEASE COVER (Page 5-12).
3. Fill transmission oil. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).
4. Install engine oil fill spout. See ENGINE OIL FILL SPOUT (Page 5-31).
5. Fill engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
6. Install exhaust system. See EXHAUST SYSTEM (Page 6-36).
7. Install primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
8. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE COMPONENTS (Page 5-18).
9. Install starter. See STARTER (Page 7-9).
10. Install primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
11. Fill primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).

12. **Mid-mount controls:** Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
13. Install rider left footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
14. Adjust drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
15. Verify rear fork pivot shaft torque. See REAR FORK (Page 3-81).
16. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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 POWER DISCONNECT (Page 7-7).
2. Remove rider footboard and bracket, if needed. See LEFT FOOT CONTROLS (Page 3-128).
3. Mid-mount controls: Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
4. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
6. Remove starter. See STARTER (Page 7-9).
7. Remove primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
8. Remove primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
9. Remove bearing inner race from transmission mainshaft. See Mainshaft Bearing Inner Race (Page 5-29).
10. Remove transmission sprocket. See TRANSMISSION SPROCKET (Page 5-32).
11. Remove transmission bearing housing and gear assembly. See TRANSMISSION (Page 5-35).

REMOVE

PART NUMBER	TOOLNAME
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET

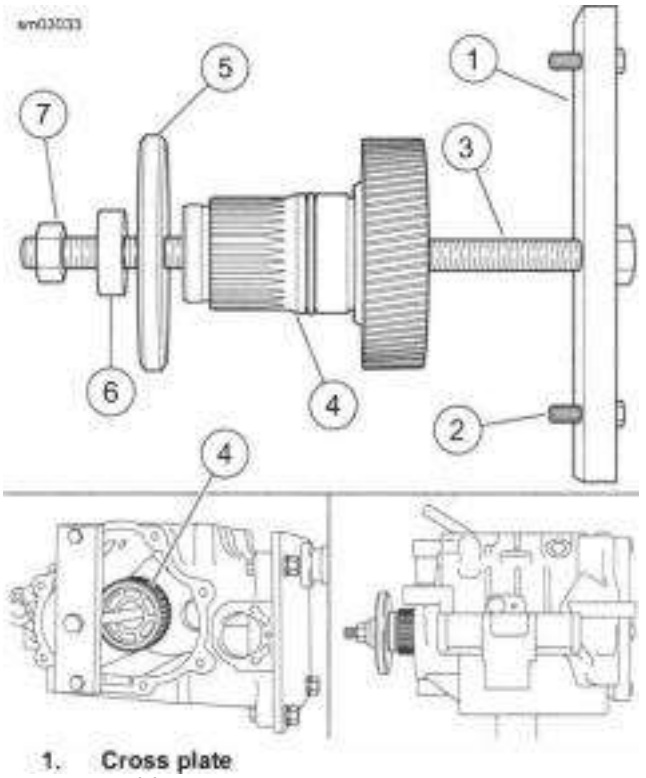
NOTICE

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 the transmission case in the frame after removing bearing housing.

1. See Figure 5-64. Remove gear using MAIN DRIVE GEAR REMOVER AND INSTALLER SET (PART NUMBER: HD-35316-D).
2. Remove tool.
3. Remove large main drive gear oil seal.
4. Remove retaining ring from bearing bore.
5. See Figure 5-65. Remove main drive gear bearing from transmission case using MAIN DRIVE GEAR REMOVER AND INSTALLER SET (PART NUMBER: HD-35316-D).
6. Discard main drive gear bearing.



1. Cross plate
2. Screw (2)
3. 12-in bolt
4. Main drive gear
5. Washer
6. Bearing
7. Nut

Figure 5-64. Removing Main Drive Gear

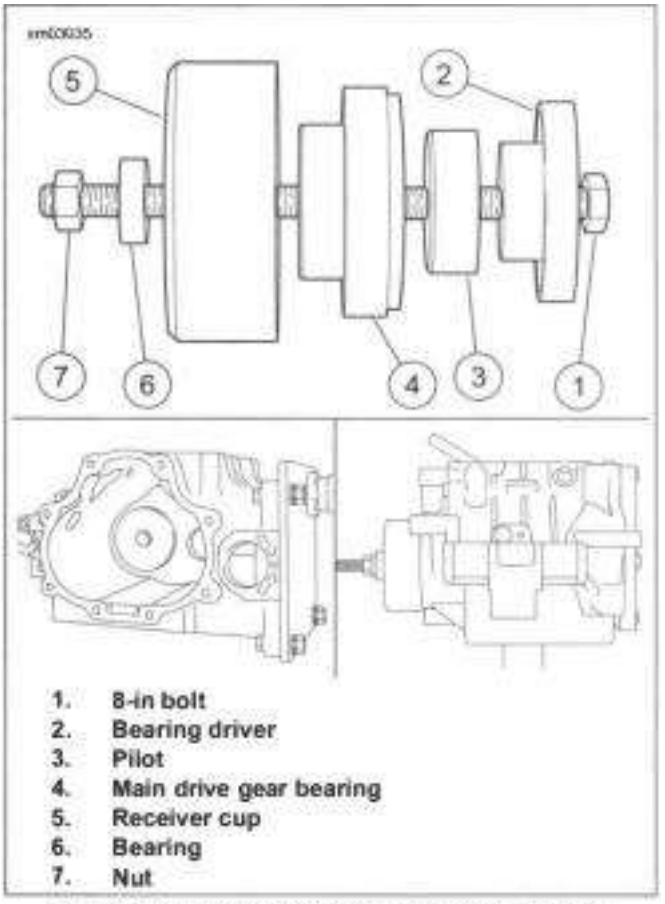


Figure 5-65. Removing Main Drive Gear Bearing

CLEAN AND INSPECT

NOTE

Never wash the transmission case and needle bearings with solvent unless replacing the needle bearings. Normal cleaning methods wash dirt or other contaminants into the bearing case (behind the needles) and leads to bearing failure.

1. Clean all parts in solvent except the transmission case and needle bearings. Dry parts with low-pressure, compressed air.
2. Inspect the main drive gear for pitting and wear.
3. Inspect the needle bearings inside the main drive gear.
4. Inspect mainshaft race. Replace the needle bearings if the mainshaft race is damaged.

INSTALL

PART NUMBER	TOOLNAME
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. Install main drive gear bearing using MAIN DRIVE GEAR REMOVER AND INSTALLER SET (PART NUMBER: HD-35316-D).

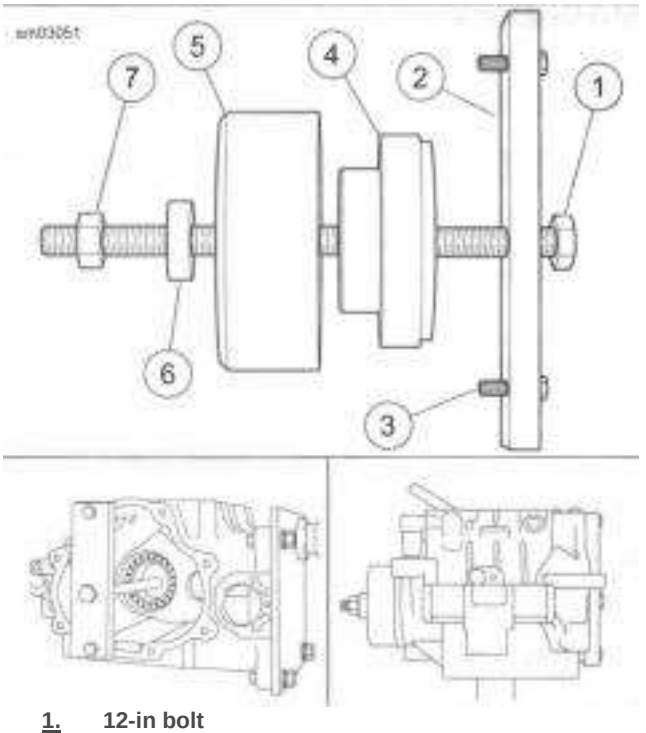


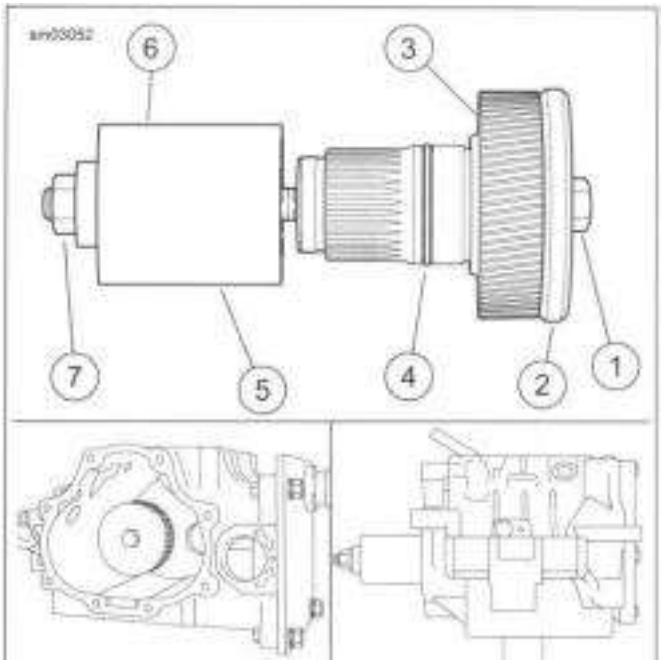
Figure 5-66. Installing Main Drive Gear Bearing (Typical)

2. See Figure 5-67. Install **new** O-ring (4) onto main drive gear (3). Lubricate O-ring with clean engine oil.
3. Install main drive gear using MAIN DRIVE GEAR REMOVER AND INSTALLER SET (PART NUMBER: HD-35316-D).

NOTE

See Figure 5-68. Install retaining ring with the flat side facing the bearing and the opening within the range shown.

4. Install **new** retaining ring.



1. 8-in bolt
2. Washer
3. Main drive gear
4. O-ring
5. Installer cup
6. Bearing
7. Nut

Figure 5-67. Installing Main Drive Gear (Typical)

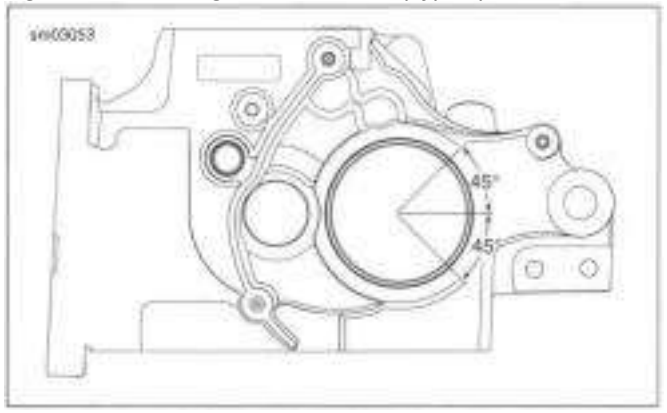


Figure 5-68. Retaining Ring Opening

5. See Figure 5-69. Install new main drive gear large seal using MAIN DRIVE GEAR SEAL INSTALLER KIT (PART NUMBER: HD-47856).

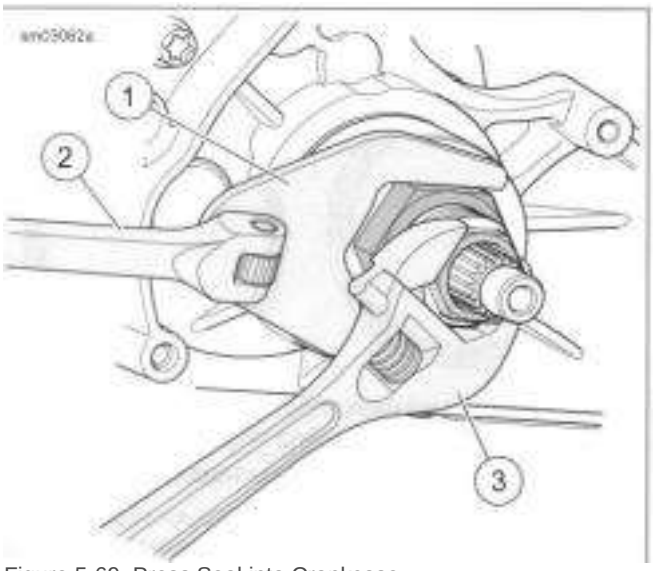


Figure 5-69. Press Seal into Crankcase

1. Crow's foot wrench
2. Breaker bar
3. Adjustable wrench

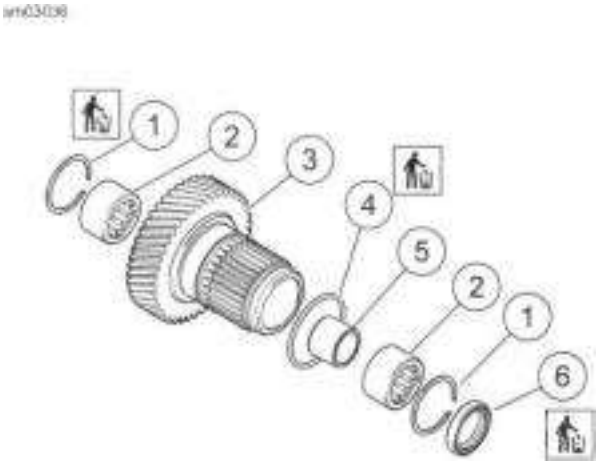
REPLACE NEEDLE BEARINGS

PART NUMBER	TOOL NAME
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL

NOTE

See Figure 5-71. When replacing needle bearings, replace retaining rings (1) with new retaining rings (2).

1. See Figure 5-70. Remove mainshaft seal (7).
2. Remove retaining rings (1), needle bearings (2, 6) and spacer (5) from main drive gear (3). Discard retaining rings.
3. Discard O-ring (4).



1. Retaining ring (2)
2. Inner needle bearing
3. Main drive gear
4. O-ring
5. Spacer
6. Outer needle bearing
7. Mainshaft seal

Figure 5-70. Main Drive Gear Assembly

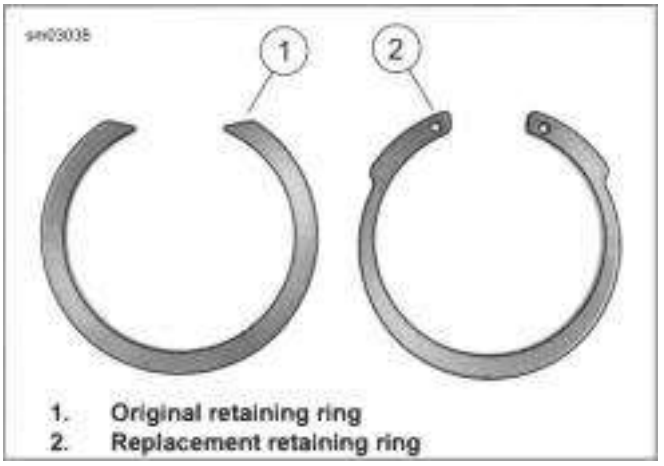


Figure 5-71. Main Drive Gear Retaining Rings

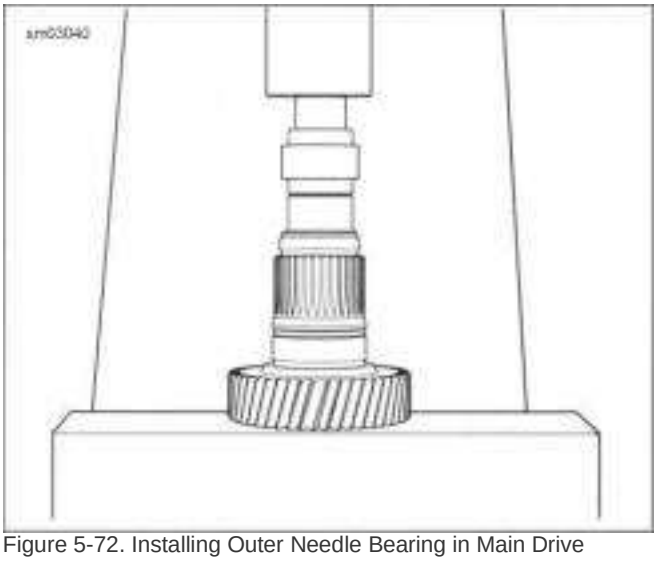


Figure 5-72. Installing Outer Needle Bearing in Main Drive Gear

NOTE

4. See Figure 5-72. Use MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (PART NUMBER: HD-47932) to install outer needle bearing. Press until tool contacts gear.

The mainshaft seal can also be installed after the main drive gear is installed. See Replace Mainshaft Seal (Page 5-48).

5. See Figure 5-73. Install mainshaft seal with garter spring side down.
   a. Use the 0.090-in step of MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (PART NUMBER: HD-47932).
   b. Press until tool contacts gear.
6. See Figure 5-70. Turn over the main drive gear. Install spacer (5).
7. See Figure 5-74. Use MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (PART NUMBER: HD-47932) to press inner needle bearing until tool contacts gear.
8. See Figure 5-70. Install new retaining rings (1).
9. Install new O-ring (4).

Figure 5-73. Pressing in Seal

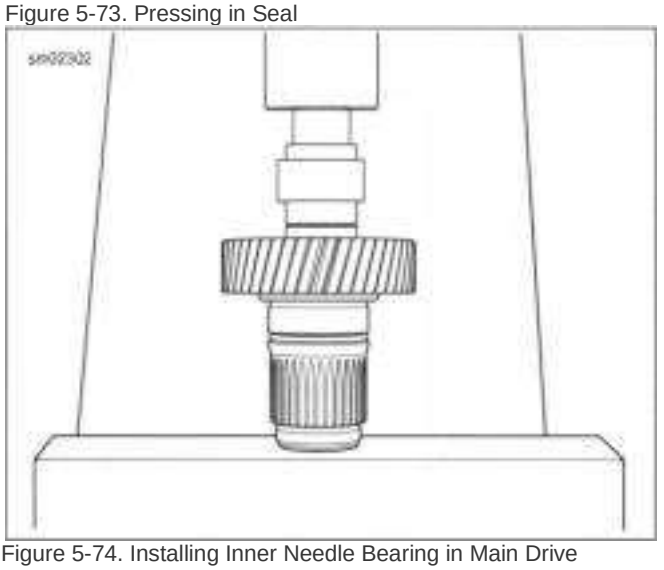


Figure 5-74. Installing Inner Needle Bearing in Main Drive Gear

REPLACE MAINSHAFT SEAL

PART NUMBER	TOOL NAME
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER

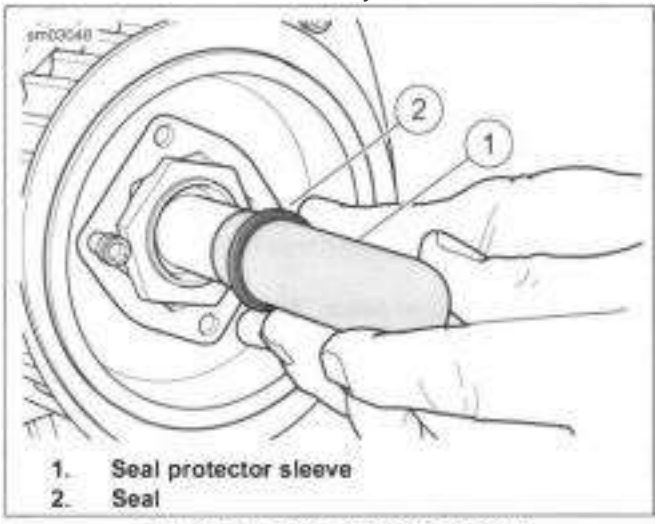
See Figure 5-75. Use the MAIN DRIVE GEAR SEAL INSTALLER (PART NUMBER: HD-47933) to replace the mainshaft seal while the main drive gear is installed.

Figure 5-75. Main Drive Gear Seal Installer

1. Remove the seal using a seal remover or rolling head pry bar.

2. Verify that bore is clean and smooth.

3. See Figure 5-76. Place the seal protector sleeve (1) of MAIN DRIVE GEAR SEAL INSTALLER (PART NUMBER: HD-47933) over the end of the mainshaft.
4. Lightly lubricate the protector sleeve and seal ID with clean transmission oil.
5. Slide the seal (2) on the seal protector sleeve with the garter spring facing the bearing.
6. See Figure 5-77. Hand press seal onto place until seal driver contacts end of main drive gear using MAIN DRIVE GEAR SEAL INSTALLER (PART NUMBER: HD-47933). Lightly tap with a rubber mallet if necessary.



1. Seal protector sleeve
2. Seal

Figure 5-76. Seal Protector Sleeve

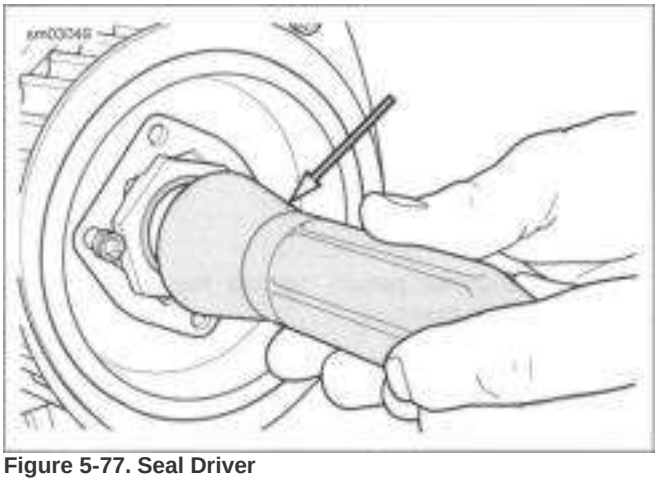


Figure 5-77. Seal Driver

COMPLETE

1. Install bearing housing and gear assembly. See TRANSMISSION (Page 5-35).
2. Install transmission sprocket. See TRANSMISSION SPROCKET (Page 5-32).
3. Install bearing inner race to transmission malnshaft. See Mainshaft Bearing Inner Race (Page 5-29).
4. Install primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
5. Install the primary chain, clutch, compensating sprocket and chain tensioner. See DRIVE COMPONENTS (Page 5-18).
6. Install starter. See STARTER (Page 7-9).
7. Install primary chaincase cover and **new** gasket. See PRIMARY CHAINCASE COVER (Page 5-17).
8. Fill primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
9. **Mid-mount controls:** Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
10. Install rider left footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
11. Adjust drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
12. Verify rear fork pivot shaft torque. See REAR FORK (Page 3-81).
13. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

PREPARE

A WARNING

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

1. Remove battery. See INSPECT BATTERY (Page 2-43).
2. Remove battery tray. See BATTERY TRAY (Page 7-97).
3. Drain engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
4. Drain transmission oil. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).
5. Drain primary chaincase oil. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
6. See Figure 5-78. Disconnect oil return line (1).
7. Remove exhaust system. See EXHAUST SYSTEM (Page 6-36).
8. Remove clutch release cover. See CLUTCH RELEASE COVER (Page 5-12).
9. Remove screw securing jiffy stand sensor, if equipped. See JIFFY STAND SENSOR (JSS) (Page 7-86).
10. Remove rider footboard and bracket, if needed. See LEFT FOOT CONTROLS (Page 3-128).
11. **Mid-mount controls:** Remove foot shift lever. See SHIFTER LINKAGE (Page 5-9).
12. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER (Page 5-17).
13. Remove starter. See STARTER (Page 7-9).
14. Remove primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
15. Remove primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
16. Loosen drive belt. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
17. Remove transmission assembly. See TRANSMISSION (Page 5-35).
18. Remove oil pan. See OIL PAN (Page 4-77).

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)

19. Position jack across lower frame to support rear of motorcycle. Slide wooden blocks beneath the crankcase to support the weight of the engine and transmission assembly.
20. Remove rear fork. See REAR FORK (Page 3-81).
21. Disconnect vehicle speed sensor (VSS). See VEHICLE SPEED SENSOR (VSS) (Page 7-83).
22. Disconnect neutral switch. See NEUTRAL INDICATOR SWITCH (Page 7-29).

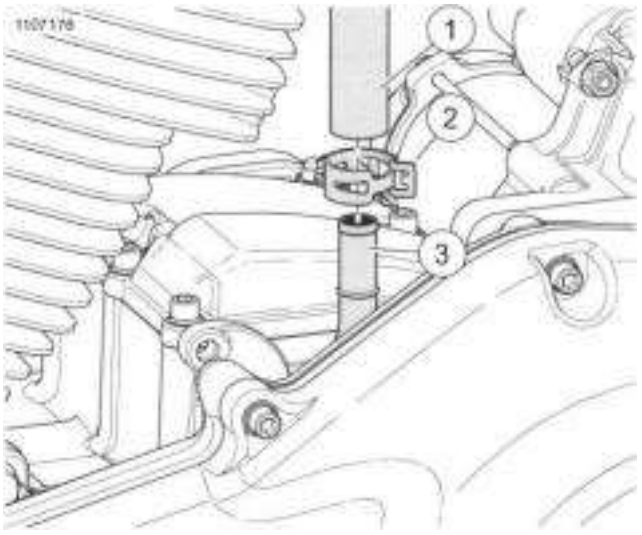
REMOVE

1. Remove battery negative cable from ground post at top of transmission case.
2. Move aside the harness that terminates at the 02 sensor, starter solenoid, neutral switch and VSS.
3. Remove transmission shift lever.
   a. Mark splines on transmission shift lever and shift shaft to help with assembly.
   b. Remove pinch screw.
   c. Pull lever from shaft.
4. In a cross-wise pattern, remove four bolts securing transmission to engine.

NOTE

See Figure 5-79. Do not use a hammer to remove transmission. If the transmission sticks or binds on the ring dowels, gently pry away from crankcase using the pry point.

5. Move transmission rearward until two ring dowels in lower flange are free of crankcase.
6. Remove transmission case from rear of the motorcycle.



1. Oil return line
2. Clamp
3. Oil return tube

Figure 5-78. Oil Return Line

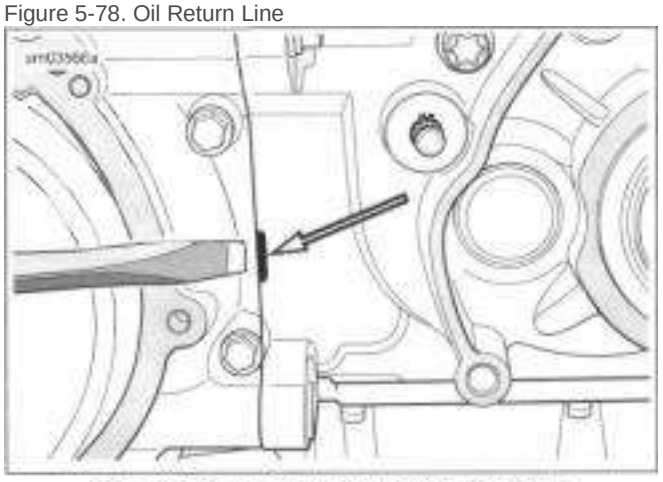


Figure 5-79. Transmission Case Pry Point

FASTENER	TORQUE VALUE	
Battery ground cable to transmission	66-114 in-lbs	7.5-12.9 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

1. Install new ground post at top of transmission case. Tighten ground post until snug.

NOTE

A new transmission case has the shifter shaft sleeve and seal, centering screw, countershaft needle bearing and main drive gear bearing and seal installed.

2. Wipe all engine oil from pockets in crankcase flange.

3. Install new engine-to-transmission gasket.

4. Verify that transmission dowels are seated. Place transmission case into position.

5. Secure transmission.

   a. Install shorter bolts at the top, longer bolts at the bottom. Hand-tighten bolts.

   b. See Figure 5-80. Tighten bolts in the sequence shown to.

      Torque: 15 ft-lbs (20.3 N-m) ***Transmission mounting bolts, 1st torque***

   c. Tighten to the final torque in the same sequence.

      Torque: 34-39 ft-lbs (46.1-52.9 N-m) ***Transmission mounting bolts, final torque***

6. Secure battery ground cable to ground post at top of transmission case. Tighten to.

   Torque: 66-114 in-lbs (7.5-12.9 N-m) ***Battery ground cable to transmission***

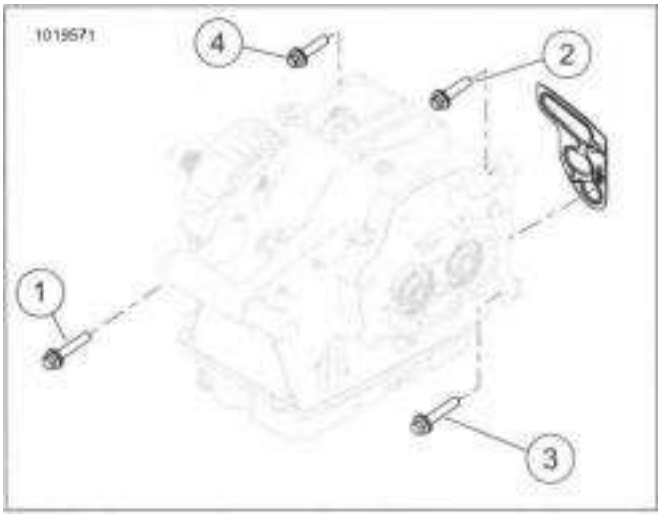


Figure 5-80. Transmission Housing to Crankcase Tightening Sequence

DISASSEMBLE

INSTALL

Remove Shifter Pawl Lever

1. See Figure 5-82 . Remove shifter rod lever.
   a. Remove pinch screw (8).
   b. Remove shifter rod lever (9) from the shifter pawl lever assembly (1).

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.

3. Inspect sleeve (2) in transmission case.

Remove Oil Return Tube

1. If transmission case is installed in vehicle:
   a. Disconnect battery.
   b. See Figure 5-78. Disconnect oil return hose (1) from return tube (3).

2. See Figure 5-81.. Remove screws (2, 4).

3. Remove oil return tube (1).

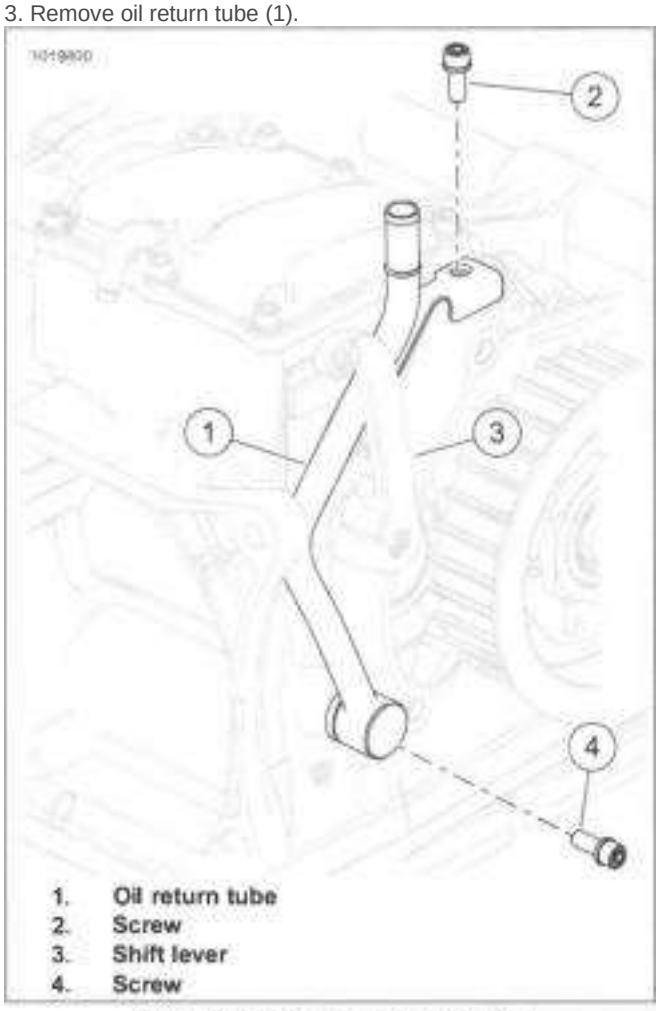


Figure 5-81. Oil Return Tube/Cover

CLEAN AND INSPECT

A 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. (00061 a)

NOTE

Never wash the transmission case and needle bearings with solvent. Normal cleaning methods wash dirt or other contaminants into the bearing case (behind the needles) leading to bearing failure.

1. Clean all parts in solvent except the case and main drive gear needle bearings. Dry parts with low-pressure, compressed air.
2. See Figure 5-82. Inspect the shifter pawl lever assembly (1) for wear. Replace assembly if pawl ends are damaged. Replace centering spring (3) if elongated.
3. Inspect the shifter shaft lever spring (4). Replace if the spring fails to hold the pawl on the cam pins.
4. Thoroughly clean the oil pan.
5. Inspect transmission top cover vent hose for damage. Verify that hose and fitting are unobstructed.

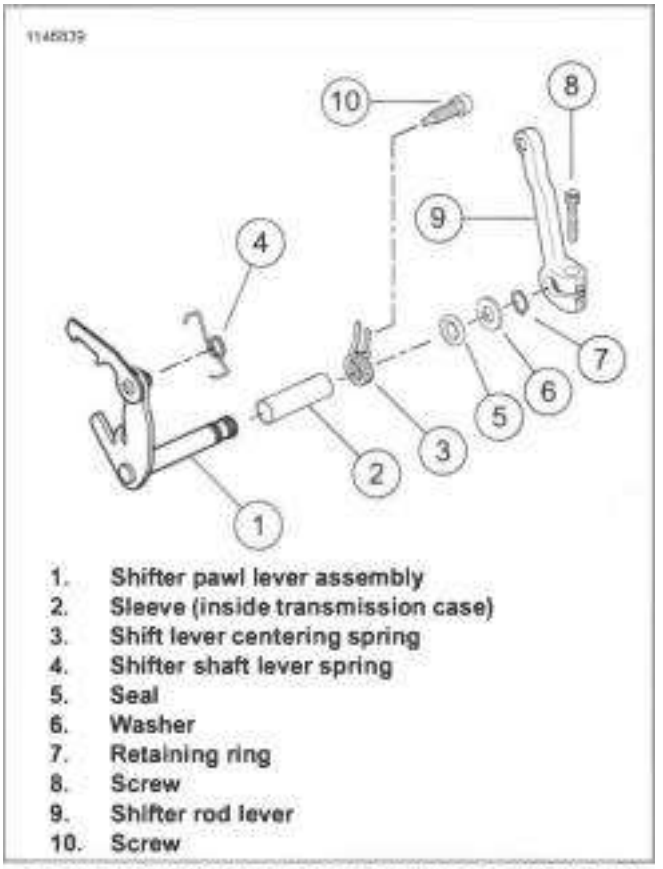


Figure 5-82. Shifter Arm and Pawl Assembly (Typical)

ASSEMBLE

PART NUMBER	TOOLNAME
HD-51337	SHIFTER SHAFT SEAL INSTALLATION TOOL

FASTENER	TORQUE VALUE	
Oil return tube screw	100-120 in-lbs	11.3-13.6 N-m
Shifter pawl centering screw	18-23 ft-lbs	24.4-31.2 N-m
Shifter rod lever pinch screw, transmission lever	18-22 ft-lbs	24.4-29.8 N-m

Install Oil Return Tube

1. See Figure 5-81. Install new O-ring on lower oil tube adapter.
2. Install oil return tube (1).
   a. Locate oil return tube between shift lever (3) and transmission housing.
3. Install screws (2, 4). a. Tighten.
   Torque: 100-120 in-lbs (11.3-13.6 N-m) ***Oil return tube screw***
4. If transmission case is installed in vehicle:
   a. See Figure 5-78. Connect oil return hose (1) to return tube (3). Secure with clamp (2).
   b. Connect battery.

5. Check engine oil level after running engine.

sm03067a

Replace Countershaft Needle Bearing

1. Press or drive out bearing using a bearing driver 1.25 in (31.75 mm) in diameter.
2. Install **new** bearing.
   a. From the outside of the transmission case, place the bearing on the bearing bore.
   b. Install the bearing flush or to a maximum depth of 0.030 in (0.76 mm) with the outside surface of the case.
3. Lubricate the bearing with SCREAMIN' EAGLE ASSEMBLY LUBE.

Install Shifter Pawl Lever

1. See Figure 5-82 . Verify that sleeve (2) 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 5-83. Assemble shifter arm.
   a. Slide shifter lever centering spring (2) over shaft of shifter pawl lever assembly (3).
   b. Align opening on spring with tab on lever.
   c. Place shifter shaft lever spring (4) on shifter pawl lever assembly. Flex spring only enough to assemble.
4. See Figure 5-84. Insert the shifter arm assembly into the transmission case.
5. See Figure 5-85. Verify that pin of screw sits inside shifter shaft lever spring.
6. Install **new** seal with garter spring facing the transmission.
   a. Drive the seal until the tool bottoms on the transmission case.
   Special Tool: SHIFTER SHAFT SEAL INSTALLATION TOOL (HD-51337)
7. See Figure 5-84. Install washer (1) and **new** retaining ring (2).

NOTE

Install shifter rod lever one spline from vertical toward front of vehicle.

8. See Figure 5-82 . Install shifter rod lever (9).
   a. Install pinch screw (8).
   b. Tighten to 18-22 ft-lbs (24.4-29.8 N-m).

Figure 5-

COMPLETE

1. Install neutral switch. See NEUTRAL INDICATOR SWITCH (Page 7-29).
2. Install VSS. See VEHICLE SPEED SENSOR (VSS) (Page 7-83).
3. Install rear fork. See REAR FORK (Page 3-81).
4. Install oil pan. See OIL PAN (Page 4-77).
5. Install transmission. See TRANSMISSION (Page 5-35).
6. Install primary chaincase housing. See PRIMARY CHAINCASE HOUSING (Page 5-27).
7. Install primary chain, clutch and compensating sprocket. See DRIVE COMPONENTS (Page 5-18).
8. See Figure 5-78. Connect oil return line (1).
9. Install starter. See STARTER (Page 7-9).
10. Install primary chaincase cover and **new** gasket. See PRIMARY CHAINCASE COVER (Page 5-17).
11. **Mid-mount controls:** Install foot shift lever. See SHIFTER LINKAGE (Page 5-9).
12. Install rider footboard and bracket, if removed. See LEFT FOOT CONTROLS (Page 3-128).
13. Install transmission shift linkage. See SHIFTER LINKAGE (Page 5-9).
14. Install jiffy stand sensor, if removed. See JIFFY STAND SENSOR (JSS) (Page 7-86).
15. Install clutch release cover. See CLUTCH RELEASE COVER (Page 5-12).
16. Install exhaust system. See EXHAUST SYSTEM (Page 6-36).
17. Fill primary chaincase. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
18. Fill transmission. See REPLACE TRANSMISSION LUBRICANT (Page 2-11).
19. Fill engine oil. See REPLACE ENGINE OIL AND FILTER (Page 2-7).
20. Adjust drive belt deflection. See INSPECT AND ADJUST DRIVE BELT AND SPROCKETS (Page 2-31).
21. Install battery tray. See BATTERY TRAY (Page 7-97).
22. Install battery. See INSPECT BATTERY (Page 2-43).

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NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
Air filter element screws, round	48-72 in-lbs	5.4--8.1 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Round
Backplate breather screw, cone	22-24 ft-lbs	30-32.5 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Backplate cover screw, cone	43-53 in-lbs	4.9--6 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Backplate screws, oval	50-60 in-lbs	5.6--6.8 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Oval
Backplate to throttle body screw, cone	55--60 in-lbs	6.2-6.8 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Breather bolts, oval	22-24 ft-lbs	29.8-32.5 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Oval metric
Breather bolts, round	22-24 ft-lbs	29.8-32.5 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Round
Charcoal canister bracket to engine case screws	72-96 in-lbs	8.1-10.8 N-m	6.21 CHARCOAL CANISTER: EVAPORATIVE EMISSIONS, Install
Charcoal canister to bracket screws	30-36 in-lbs	3.4-4.1 N-m	6.21 CHARCOAL CANISTER: EVAPORATIVE EMISSIONS, Install
Console screw, , rear, no instrument	25-30 in-lbs	2.8-3.4 N-m	6.4 CONSOLE, Remove and Install: No Instrument
Console screw, front, no instrument	30-50 in-lbs	3.4-5.6 N-m	6.4 CONSOLE, Remove and Install: No Instrument
Console screw (Front)	30-50 in-lbs	3.4-5.6 N-m	6.4 CONSOLE, Remove and Install: Single Instrument with Panel
Console screw (Rear)	25--30 in-lbs	2.8-3.4 N-m	6.4 CONSOLE, Remove and Install: Single Instrument with Panel
Console screws	40-50 in-lbs	4.5--5.6 N-m	6.4 CONSOLE, Remove and Install: Single Instrument without Panel
Exhaust bracket screws	40-50 ft-lbs	54.2-67.8 N-m	6.19 EXHAUST SYSTEM, Install
Exhaust shield clamps	20-40 in-lbs	2.3-4.5 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Standard
Exhaust shield clamps	20-40 in-lbs	2.3-4.5 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Upswept
Exhaust shield clamps	20-40 in-lbs	2.3-4.5 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Two Into One
Exhaust shield screws	108-132 in-lbs	12.2-14.9 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Upswept
Exhaust support clamp screw	40-50 ft-lbs	54.2--67.8 N-m	6.19 EXHAUST SYSTEM, Install
Exhaust to engine flange nuts	100-120 in-lbs	11.3-13.6 N-m	6.19 EXHAUST SYSTEM, Install
Fuel line to fuel rail screw	22-40 in-lbs	2.5-4.5 N-m	6.7 FUEL LINE, Install
Fuel line to fuel rail screw	22-40 in-lbs	2.5-4.5 N-m	6.15 INDUCTION MODULE, Install
Fuel pump assembly screws	40-45 in-lbs	4.5-5 N-m	6.9 FUEL PUMP, Install
Fuel rail screws	31-49 in-lbs	3.5-5.5 N-m	6.14 FUEL INJECTORS, Install
Fuel tank, vent screws	11-13 ft-lbs	15-18 N-m	6.8 FUEL TANK, Install
Fuel tank mounting screw	28-32 ft-lbs	38-43.4 N-m	6.6 PURGE FUEL LINE, Secure Fuel Tank
Fuel tank mounting screw	28-32 ft-lbs	38-43.4 N-m	6.6 PURGE FUEL LINE, Secure Fuel Tank
HO2S (Heated oxygen sensor)	12-14 ft-lbs	16.3-19 N-m	6.17 HEATED OXYGEN SENSORS (HO2S), Install
HO2S (Heated oxygen sensor)	12-14 ft-lbs	16.3-19 N-m	6.17 HEATED OXYGEN SENSORS (HO2S), Install

FASTENER	TORQUE VALUE		NOTES
Induction module bracket	66-84 in-lbs	7.5-9.5 N-m	6.15 INDUCTION MODULE, Assemble
Induction module flange adapter screws	96-156 in-lbs	10.9-17.6 N-m	6.15 INDUCTION MODULE, Install metric
Induction module flange adapter screws	96-156 in-lbs	10.9-17.6 N-m	6.15 INDUCTION MODULE, Install metric
Intake tube screw, cone	66-72 in-lbs	7.5-8.1 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Muffler clamp	38-43 ft-lbs	51.5-58.3 N-m	6.18 MUFFLERS, Install
Muffler end cap screws	96-120 in-lbs	10.8-13.6 N-m	6.18 MUFFLERS, Install
Muffler intermediate exhaust shield screw	108-132 in-lbs	12.2-14.9 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Two Into One
Muffler screws	120-144 in-lbs	13.6-16.3 N-m	6.18 MUFFLERS, Install
Muffler screws	120-144 in-lbs	13.6-16.3 N-m	6.19 EXHAUST SYSTEM, Install
Muffler shield clamps	20-40 in-lbs	2.3-4.5 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Standard
Temperature manifold absolute pressure sensor (TMAP) screw	23-39 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

SPECIFICATIONS

Table 6-1. Capacities

ITEM		U.S.	L
Fuel tank (total)	Sport Glide (FLSB), Fat Boy 114 (FLFBS), Heritage Classic (FLHCS), Low Rider S (FXLRS), Low Rider ST (FXLRST)	5.0 gal	18.9
	Breakout 114 (FXBRS), Street Bob 114 (FXBBS), Softail Standard (FXST), Fat Bob 114 (FXFBS)	3.5 gal	13.25
Low fuel warning light on™		1.0 gal	3.8
Oil tank with filter™		5.0 qt	4.73
Transmission (approximate)™		1.0 qt	0.95
Primary chaincase (approximate)™	Heritage Classic (FLHCS), Sport Glide (FLSB), Street Bob 114 (FXBBS), Fat Bob 114 (FXFBS), Low Rider S (FXLRS), Low Rider ST (FXLRST), Softail Standard (FXST)	1.25 qt	1.18
	Fat Boy 114 (FLFBS), Breakout 114 (FXBRS)	1.43 qt	1.35

(1) When refilling from empty, add at least 3.8 L (1.0 gal).

(2) When refilling, initially add 3.78 L (4.0 qt) and add as needed to bring level within specification.

(3) When refilling, initially add 0.83 L (28 oz) and add as needed to bring level within specification.

(4) When refilling, initially add 1.06 L (36 oz) and add as needed to bring level within specification.

Table 6-2. Fuel Pump Specifications

MEASUREMENT	VALUE
Pressure	54-62 psi (375-425 kPa)
Current draw	7.5A or less

AIR CLEANER BACKPLATE ASSEMBLY

PREPARE

1. Remove air cleaner cover and filter. See INSPECT AIR FILTER (Page 2-40).

REMOVE AND INSTALL: ROUND

FASTENER	TORQUE VALUE	
Air filter element screws, round	48-72 in-lbs	5.4-8.1 N-m
Breather bolts, round	22-24 ft-lbs	29.8-32.5 N-m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

Remove

1. See Figure 6-1. Remove breather tube assembly (5) from breather bolts (6).
2. Remove breather bolts.
3. Remove backplate (7).
4. Discard seal ring (8).
5. Verify that passages in breather bolts (6) are clear.

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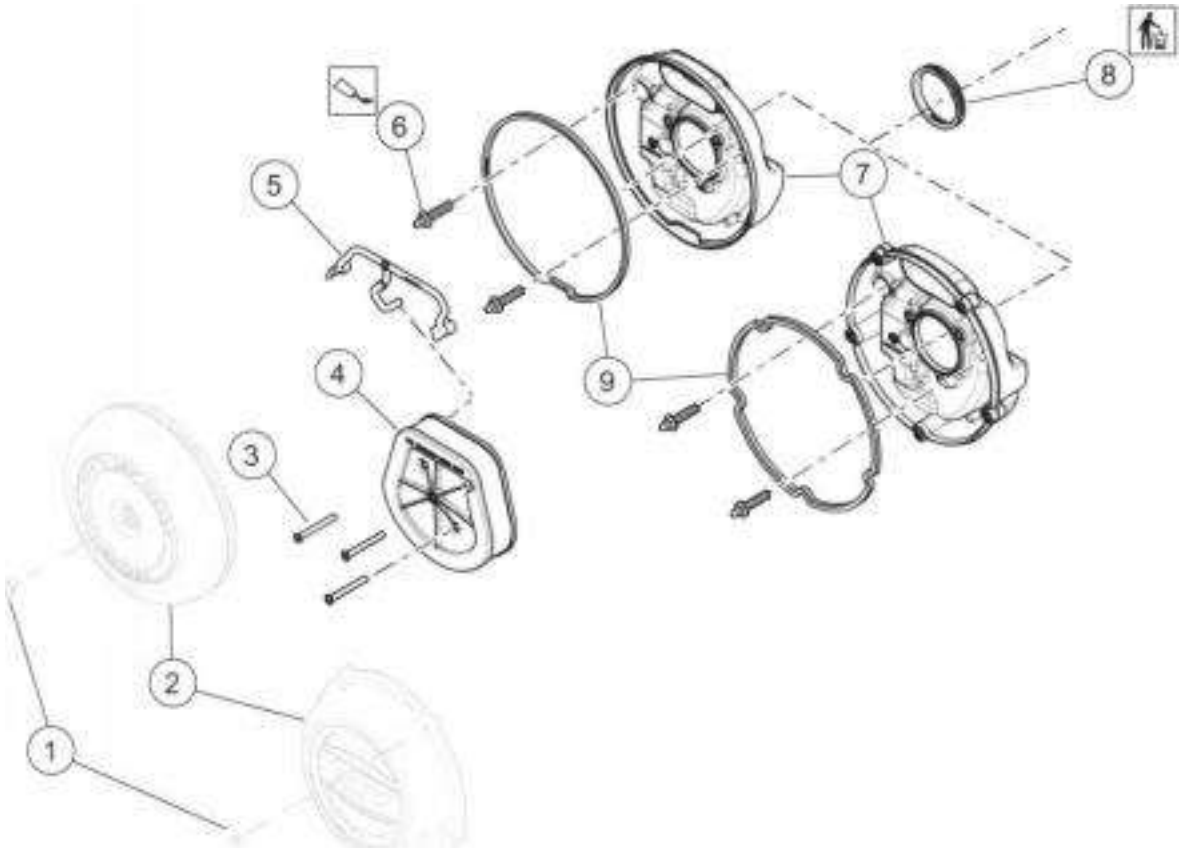


1. **Cover screw (1 or 5)**
2. **Air cleaner cover**
3. **Filter screw (3)**
4. **Filter element**
5. **Breather tube assembly**
6. **Breather bolt (2)**
7. **Backplate**
8. **Seal ring**
9. **Rubber seal**

Figure 6-1. Air Cleaner Assembly

Install

1. See Figure 6-1. Install **new** seal ring (8) on backplate (7).
2. Apply thread sealant to threads of breather bolts (6).

   Consumable: LOCTITE 565 THREAD SEALANT (99818-97)
3. Install backplate.
4. Install breather bolts. Hand tighten.
5. Install breather tube assembly (5) to filter element (4).
6. Install filter element.
7. Install filter element screws (3). Tighten.

   Torque: 48-72 **in-lbs** (5.4-8.1 N-m) ***Air filter element screws, round***
8. Tighten breather bolts.

   Torque: 22-24 ft-lbs (29.8-32.5 N-m) ***Breather bolts, round***

9. Attach breather tube assembly (5) to breather bolts.

NOTE

Failure to connect the breather tubes allows crankcase vapors to be vented into the atmosphere in violation of legal emissions standards.

REMOVE AND INSTALL: OVAL

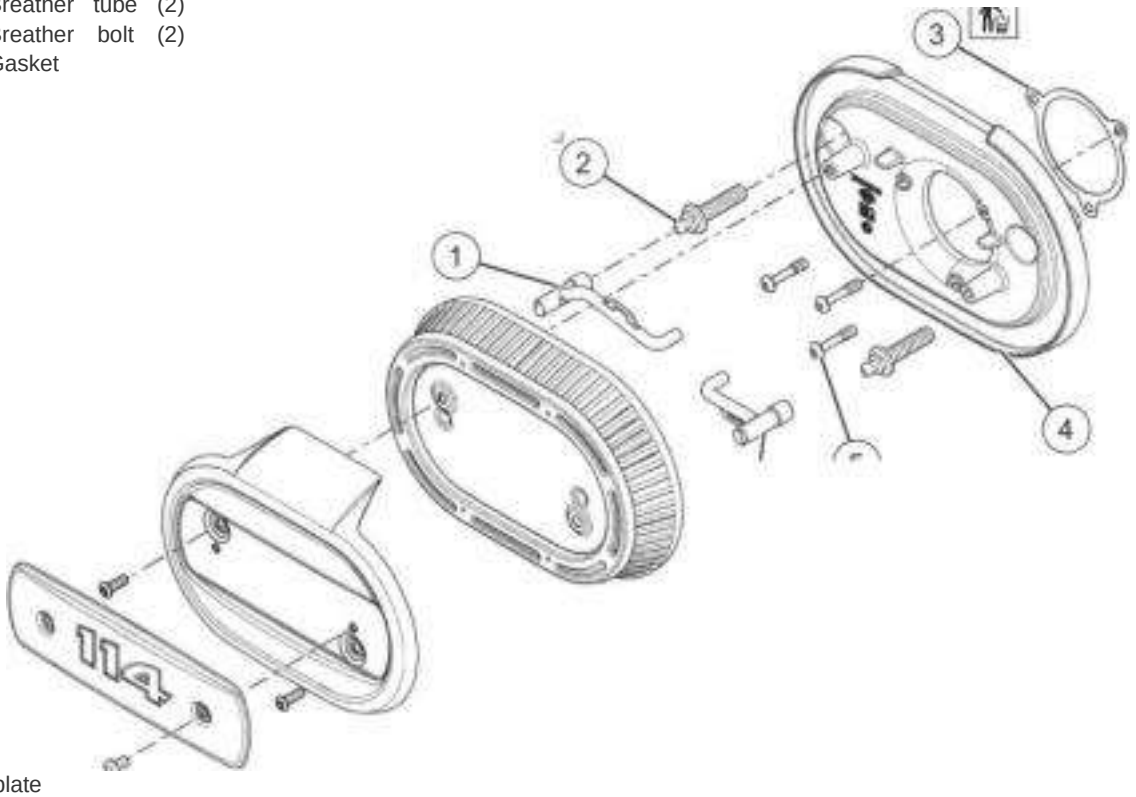
FASTENER	TORQUE VALUE	
Backplate screws, oval	50-60 in-lbs	5.6-6.8 N-m
Breather bolts, oval	22-24 ft-lbs	29.8-32.5 N-m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

Remove

1. See Figure 6-2. Remove breather tubes (1) from breather bolts (2).
2. Remove breather bolts.
3. Remove backplate screws (5).
4. Remove backplate (4).
5. Discard gasket (3).
6. Verify that passages in breather bolts are clear.

1050318 Breather tube (2)
Breather bolt (2)
Gasket



4. Backplate
5. Backplate screw (3)

Figure 6-2. Air Cleaner Assembly

Install

1. See Figure 6-2. Install new gasket (3) on backplate (4).
2. Apply thread sealant to threads of breather bolts (2).

   Consumable: LOCTITE 565 THREAD SEALANT (99818-97)
3. Install backplate.
4. Install breather bolts. Hand tighten.
5. Install backplate screws (5). Tighten.

   Torque: 50-60 in-lbs (5.6-6.8 N-m) ***Backplate screws, oval***
6. Tighten breather bolts.

   Torque: 22-24 ft-lbs (29.8-32.5 N-m) ***Breather bolts, oval***
7. Install breather tubes (1) onto breather bolts.

NOTE

Failure to connect the breather tubes allows crankcase vapors to be vented into the atmosphere in violation of legal emissions standards.

REMOVE AND INSTALL: CONE

FASTENER	TORQUE VALUE	
Backplate breather screw, cone	22-24 ft-lbs	30-32.5 N-m
Backplate cover screw, cone	43-53 in-lbs	4.9-6 N-m
Backplate to throttle body screw, cone	55--60 in-lbs	6.2-6.8 N-m
Intake tube screw, cone	66-72 in-lbs	7.6-8.1 N-m

Remove

1. Remove intake tube.
   a. See Figure 6-3. Remove screws (3).
   b. Remove intake tube (2) and gasket (1). Discard gasket.
2. Remove backplate.
   a. See Figure 6-4. Remove breather screws (2) and O-rings (3). Discard O-rings.
   b. Remove screws (1), backplate (4) and gasket (8).
   c. Remove square ring adhesive (5) from backplate and discard.
   d. Remove short screws (7).
   e. Remove cover (6).

Install

1. Install backplate.
   a. See Figure 6-4. Position cover (6) on backplate (4).
   b. Install short screws (7). Tighten.
      Torque: 43-53 in-lbs (4.9-6 N-m) ***Backplate cover screw, cone***

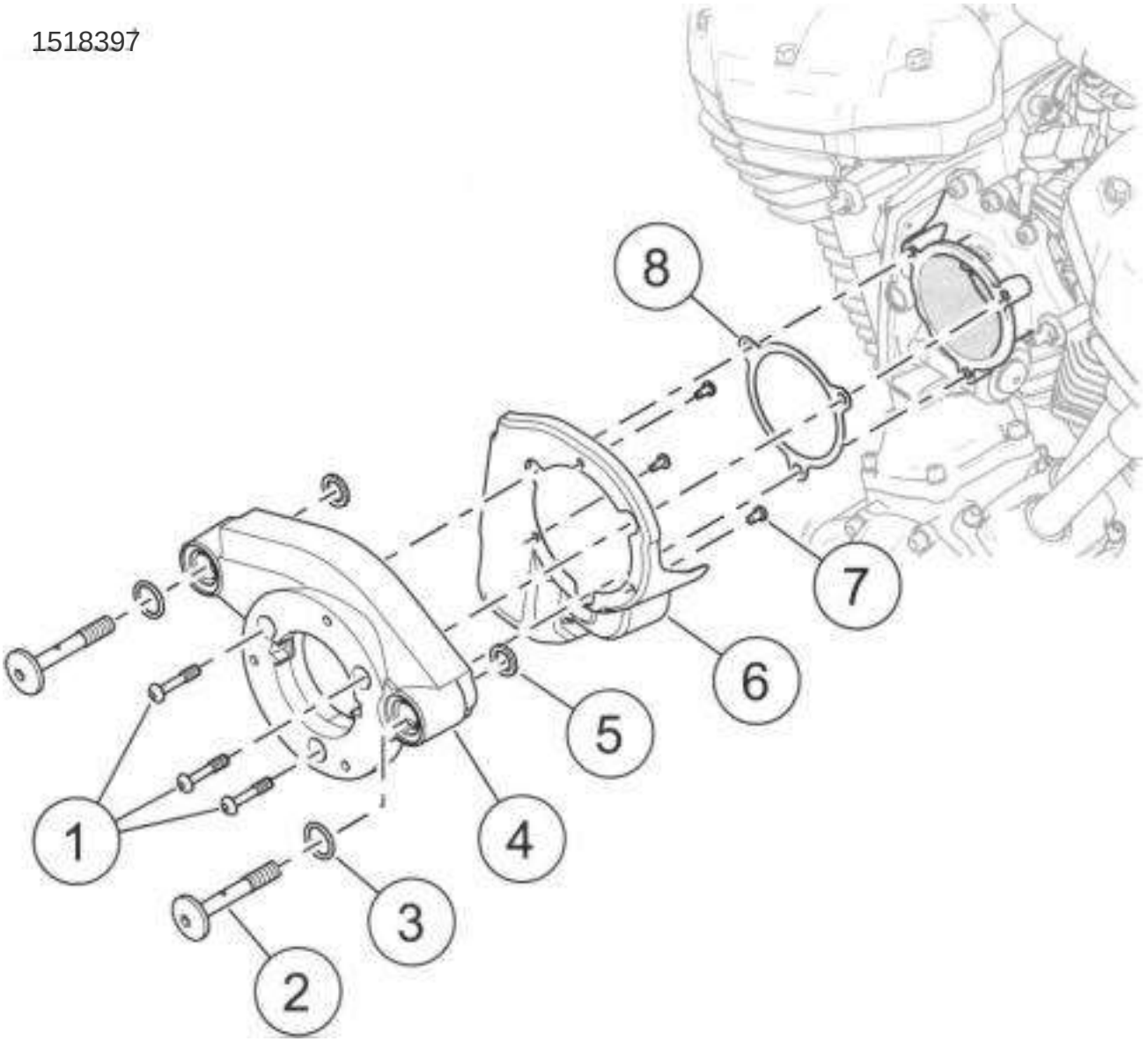
NOTE

Peel adhesive off square ring.

   c. Install square ring adhesive (5) to backplate (4).
   d. Install gasket (8) and backplate (4) to throttle body.
   e. Install screws (1). Tighten.
      Torque: 56-60 in-lbs (6.2-6.8 N-m) ***Backplate to throttle body screw, cone***
   f. Install new O-rings (3).
   g. Apply threadlocker to breather screws (2). Install and tighten.
      Torque: 22-24 ft-lbs (30-32.5 N-m) ***Backplate breather screw, cone***
2. Install intake tube.
   a. See Figure 6-3. Install new gasket (1) and intake tube (2).
   b. Install screws (3). Tighten.
      Torque: 66-72 in-lbs (7.5-8.1 N-m) ***Intake tube screw, cone***

Figure 6-3. Intake Tube

1. Gasket
2. Intake tube
3. Screw (3)



1.	Screw (3)	5.	Square ring adhesive (2)
2.	Breather screw (2)	6.	Cover
3.	O-ring (2)	7.	Short screw (3)
4.	Backplate	8.	Gasket

Figure 6-4. Air Cleaner Backplate

COMPLETE

1. Install filter and air cleaner cover. See INSPECT AIR FILTER (Page 2-40)

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. All but FXFBS: Remove seat. See SEAT (Page 3-142).

REMOVE AND INSTALL: NO INSTRUMENT

FASTENER	TORQUE VALUE	
Console screw, , rear, no instrument	25-30 in-lbs	2.8-3.4 N-m
Console screw, front, no instrument	30-50 in-lbs	3.4-5.6 N-m

Remove

1. Remove console.
   a. See Figure 6-5. Remove front screw (2).
   b. Remove rear screw (4)
   c. Remove console (3).
2. Remove medallion.
   a. If removing medallion (1) use holes (6) to aid in removal. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).

Install

1. Install medallion if removed. See MEDALLIONS, BADGES, TANK EMBLEMS AND ADHESIVE STRIPS (Page 3-156).
2. Install console.
   a. See Figure 6-5. Align console (3) with bracket (5).
   b. Install front screw (2).
   c. Install rear screw (4).
   d. Tighten front screw.
      Torque: 30-50 in-lbs (3.4-5.6 N-m) ***Console screw, front, no instrument***
   e. Tighten rear screw.
      Torque: 25-30 in-lbs (2.8-3.4 N-m) ***Console screw, , rear, no instrument***

1. Medallion
2. Front screw
3. Console
4. Rear screw
5. Bracket
6. Hole (2)

Figure 6-5. Console

REMOVE AND INSTALL: SINGLE INSTRUMENT WITH PANEL

FASTENER	TORQUE VALUE	
Console screw (Front)	30-50 in-lbs	3.4-5.6 N-m
Console screw (Rear)	25-30 in-lbs	2.8-3.4 N-m

Remove

1. See Figure 6-6. Detach console.
   a. Remove front screw (1).
   b. Remove rear screw (4)
   c. Move console (2) rearward.
2. See Figure 6-7. Disconnect connector.
   a. Remove grommet (4) from backbone (1).
   b. Pull harness (2) from backbone.

NOTE

See the electrical diagnostic manual for the appropriate disassembly procedure for the connector,

   c. Disconnect connector (3).
3. Remove console.

Install

1. See Figure 6-7. Connect connector.
   a. Connect connector (3).
   b. Feed harness (2) into backbone (1).
   c. Position grommet (4) into backbone.

2. See Figure 6-6. Install console.

   a. Align console (2) with bracket (3).

   b. Install front screw (1).

   c. Install rear screw (4).

   d. Tighten front screw.
   Torque: 30-50 in-lbs (3.4-5.6 N-m) ***Console screw (Front)***

   e. Tighten rear screw.
   Torque: 25-30 in-lbs (2.8-3.4 N-m) ***Console screw (Rear)***

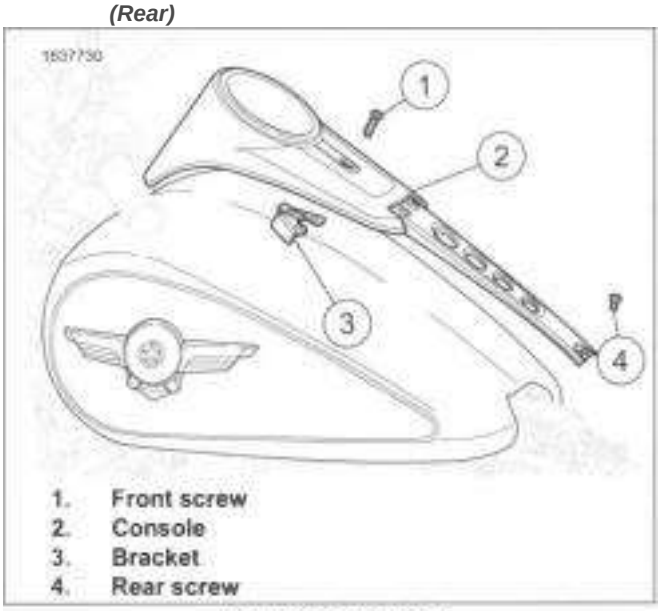


Figure 6-6. Console

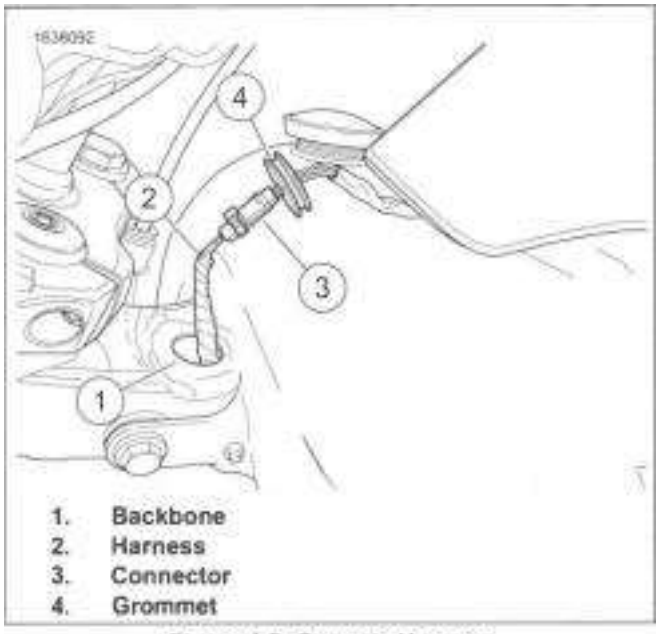


Figure 6-7. Console Harness

REMOVE AND INSTALL: SINGLE INSTRUMENT WITHOUT PANEL

FASTENER	TORQUE VALUE	
Console screws	40-50 in-lbs	4.5-5.6 N-m

Remove

1. See Figure 6-8. Detach console.

   a. Remove screws (1).

   b. Move console (2) rearward.

2. See Figure 6-9. Disconnect connector.

   a. Remove grommet (4) from backbone (1).

   b. Pull harness (2) from backbone.

NOTE

See the electrical diagnostic manual for the appropriate disassembly procedure for the connector.

   c. Disconnect connector (3).

Install

1. See Figure 6-9. Connect connector.

   a. Connect connector (3).

   b. Feed harness (2) into backbone (1).

   c. Seat grommet (4) into backbone.

2. See Figure 6-8. Install console.

   a. Align console (2) with bracket (3).

   b. Install screws (1). Tighten.
   Torque: 40-50 in-lbs (4.5-5.6 N-m) ***Console screws***

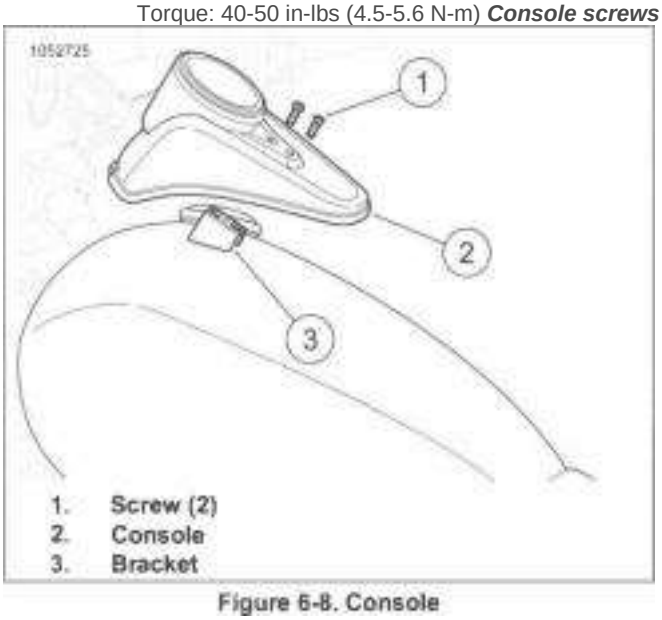


Figure 6-8. Console

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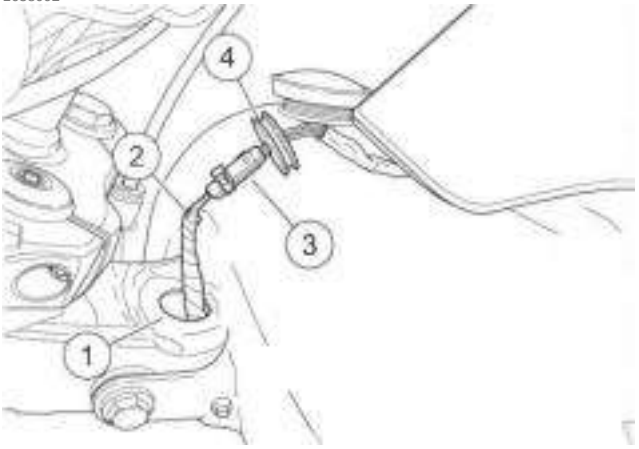


1. Backbone
2. Harness
3. Connector
4. Grommet

Figure 6-9. Console Harness

1. All but FXFBS Install Seat. See SEAT (Page 3-142).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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)

1. Remove seat. See SEAT (Page 3-142).

A WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).

TEST

PART NUMBER	TOOL NAME
HD-41182	FUEL PRESSURE GAUGE

1. See Figure 6-10. Attach valve union (2) on FUEL PRESSURE GAUGE (PART NUMBER: HD-41182) 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. Refer to Table 6-2..
9. Turn off engine.
10. Open clear tube bleeder to remove pressure from fuel pressure gauge.
11. Remove fuel pressure tester.

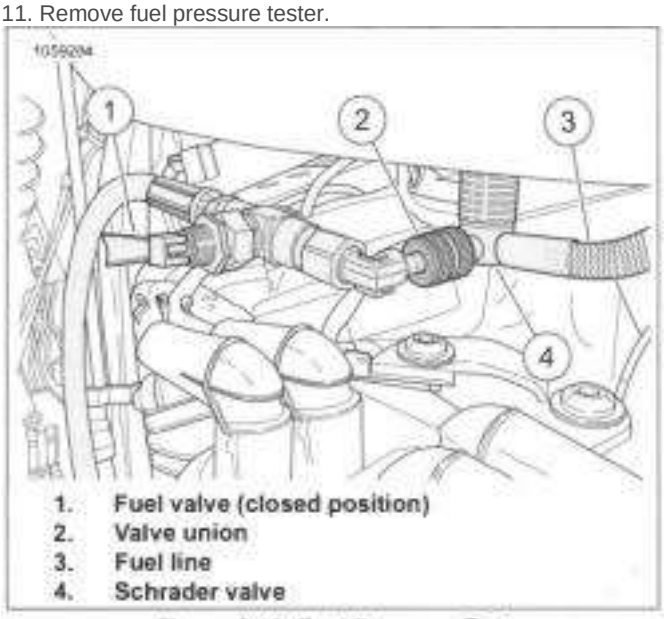


Figure 6-10. Fuel Pressure Test

COMPLETE

1. Secure fuel tank. See PURGE FUEL LINE (Page 6-12).
2. Install seat. See SEAT (Page 3-142).

PREPARE

1. Remove seat. See SEAT (Page 3-142).

LIFT REAR OF FUEL TANK

1. See Figure 6-11. Lift rear of fuel tank.
   a. Loosen front fuel tank mounting screw (5).
   b. Remove rear fuel tank mounting screw (1), washers (2), and acorn nut (3).

NOTE

Verify fuel tank or fuel tank console do not contact any components when lifting.

   c. Lift rear of fuel tank.

PURGE

1. See Figure 6-12. Disconnect fuel pump connector.
   a. Disconnect fuel pump connector.
2. Purge fuel line.
   a. Start engine.
   b. Allow vehicle to stall.
   c. Operate starter for 3 seconds to remove any remaining fuel.

A 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)

A 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)

SECURE FUEL TANK

FASTENER	TORQUE VALUE	
Fuel tank mounting screw	28-32 ft-lbs	38-43.4 N-m

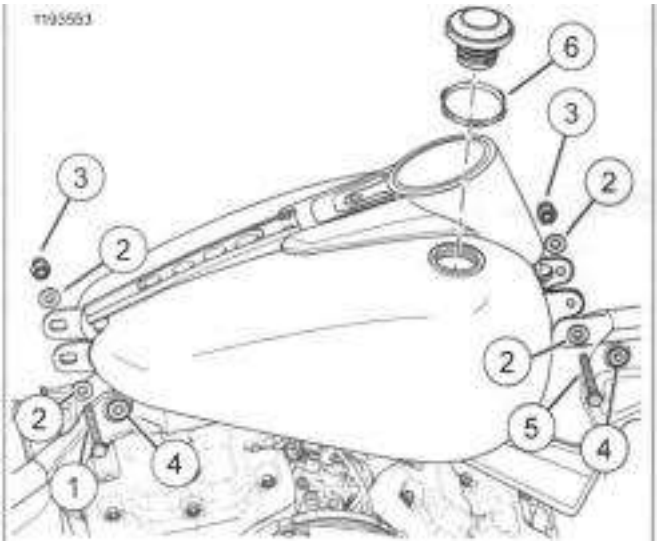
1. See Figure 6-12. Connect fuel pump connector.

2. See Figure 6-11. Install rear fuel tank mounting screw (1) , washers (2), and acorn nut (3). Tighten.

   Torque: 28-32 ft-lbs (38--43.4 N-m) ***Fuel tank mounting screw***

3. Tighten front fuel tank mounting screw (5) and acorn nut.

   Torque: 28-32 ft-lbs (38-43.4 N-m) ***Fuel tank mounting screw***



1. Rear fuel tank mounting screw
2. Washer (4)
3. Acorn nut (2)
4. Bushing and grommet (4)
5. Front fuel tank mounting screw
6. Filler neck ring

Figure 6-11. Fuel Tank

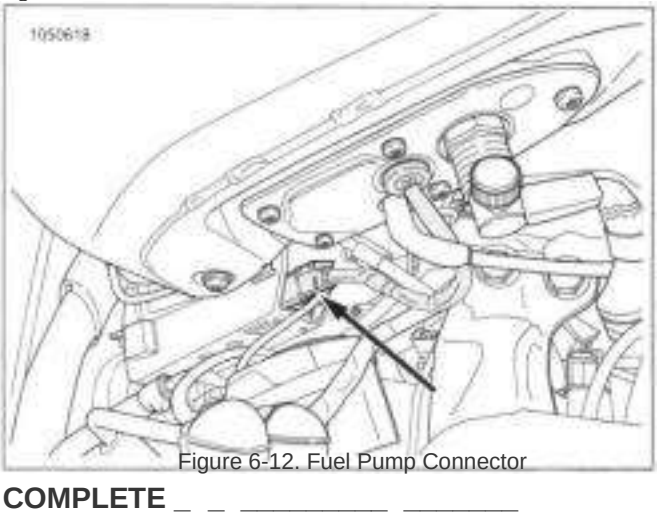


Figure 6-12. Fuel Pump Connector

COMPLETE

1. Install seat. See SEAT (Page 3-142).

PREPARE

A WARNING

fuel line.

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)

1. Remove seat. See SEAT (Page 3-142).

A WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
5. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

REMOVE

Remove

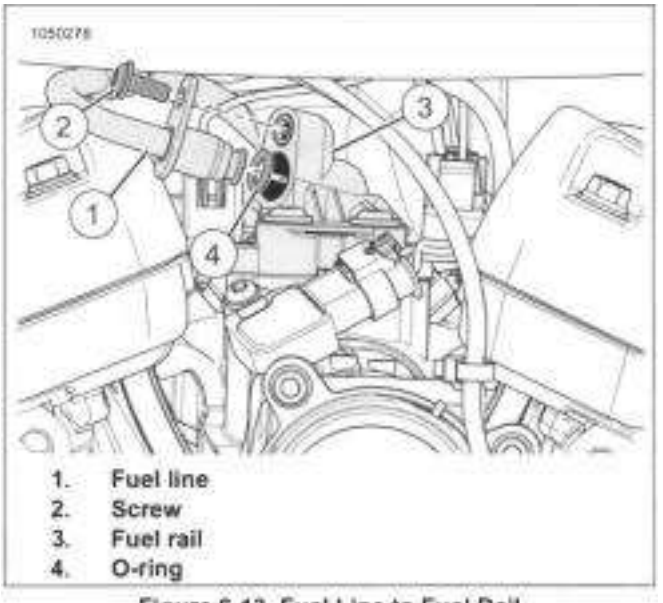
1. See Figure 6-14 Disconnect fuel line from fuel tank.
   a. Push up on sleeve of quick disconnect fitting (1).
   b. Remove fuel line (2) from quick disconnect fitting.
2. See Figure 6-13 Disconnect fuel line from fuel rail.
   a. Remove screw (2).
   b. Pull fuel line (1) away from fuel rail (3).
   c. Inspect O-ring (4) for damage. replace as necessary.

FASTENER	TORQUE VALUE	
Fuel line to fuel rail screw	22-40 in-lbs	2.5-4.5 N-m

1. See Figure 6-13. Install fuel line to fuel rail.

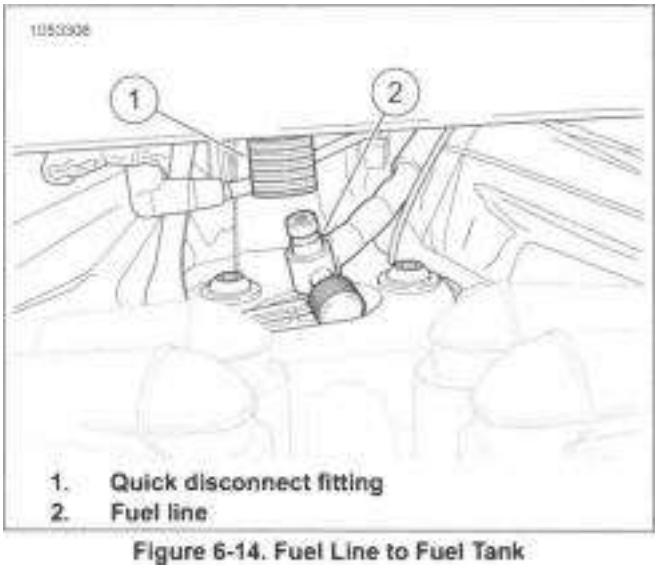
INSTALL

   a. Install new O-ring (4) to fuel line (1), if removed.
   b. Connect fuel line (2) to quick disconnect fitting.
   c. Release sleeve of quick disconnect fitting to secure



1. Fuel line
2. Screw
3. Fuel rail
4. O-ring

Figure 6-13. Fuel Line to Fuel Rail



1. Quick disconnect fitting
2. Fuel line

Figure 6-14. Fuel Line to Fuel Tank

COMPLETE

1. Secure fuel tank. See PURGE FUEL LINE (Page 6-12).
2. Install seat. See SEAT (Page 3-142).
3. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
4. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).
6. Set OFF/RUN switch to RUN and check for leaks.

PREPARE

A 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)

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).

A WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

4. Disconnect fuel line at quick disconnect fitting. See FUEL LINE (Page 6-13).
5. Disconnect vent line. See VENT TUBE (Page 6-20).
6. Drain fuel tank.
7. If equipped with fuel tank console:
   a. disconnect fuel tank console connector. See CONSOLE (Page 6-8).
   b. If necessary remove console. See CONSOLE (Page 6-8).

REMOVE

1. Remove fuel tank.
   a. See Figure 6-15. Remove front fuel tank mounting screw (5), washers (2), and acorn nut (3).
   b. Remove fuel tank.
   c. Remove bushings and grommets (4) if necessary.
2. See Figure 6-16. Vent screws in fuel tank are for manufacturing purposes and not intended to be removed.

INSTALL

a. Install bushings and grommets (4) if removed.

b. Place fuel tank onto frame backbone.

FASTENER	TORQUE VALUE	
Fuel tank, vent screws	11-13 ft-lbs	15-18 N-m

1. See Figure 6-15. Install fuel tank.
   c. Loosely install front fuel tank mounting screw (5), washers (2), and acorn nut (3).

2. ***NOTE***
Vent screws on bottom of tank are not meant to be removed. If removed for any reason, replace with new screws.

See Figure 6-16. Install new screws. Tighten.

Torque: 11-13 ft-lbs (15-18 N-m) ***Fuel tank, vent screws***

Figure 6-15. Fuel Tank

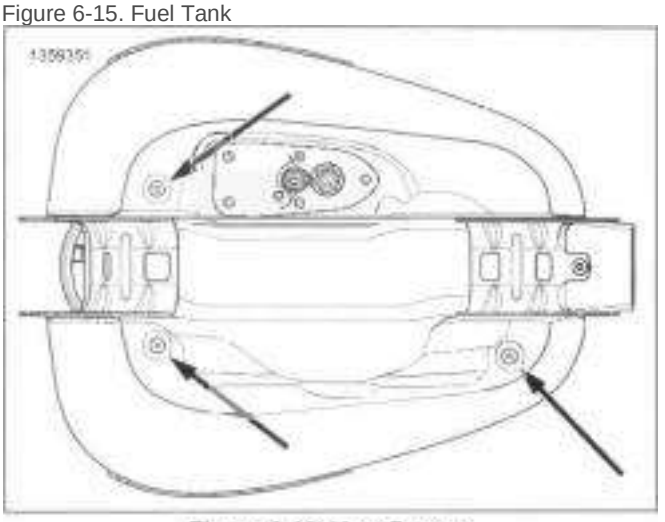
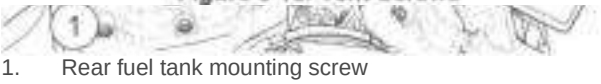


Figure 6-16. Vent Screws



1. Rear fuel tank mounting screw
2. Washer (4)
3. Acorn nut (2)
4. Bushing and grommet (4)
5. Front fuel tank mounting screw

COMPLETE

1. Secure fuel tank. See PURGE FUEL LINE (Page 6-12).
2. If equipped with fuel tank console:
   a. If necessary install console. See CONSOLE (Page 6-8).
   b. Connect console connector. See CONSOLE (Page 6-8).
3. Connect vent line. See VENT TUBE (Page 6-20).

4. Connect fuel line at quick disconnect fitting. See FUEL LINE (Page 6-13).
5. Install seat. See SEAT (Page 3-142).
6. Install main fuse. See POWER DISCONNECT (Page 7-7).
7. Set OFF/RUN switch to RUN and check for leaks.

PREPARE

A 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)

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).

A WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

4. Remove fuel tank. See FUEL TANK (Page 6-14).

REMOVE

NOTE

Fuel pumps used in 5 gallon fuel tanks are equipped with a flexible siphon tube (6).

1. See Figure 6-18. Remove fuel pump assembly.
   a. Remove screws (1).
   b. Using a wooden tool, pull inlet strainer (3) from fuel tank.
   c. Remove fuel pump assembly (5).
2. Discard seal (4).

CLEAN AND INSPECT

A 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. (00621 b)

1. See Figure 6-18. Clean and inspect fuel pump assembly.
   a. Inspect fuel pickup screen (3) for damage. Replace if necessary.
   b. Clean fuel pump assembly (5).
2. ***NOTE***

Placing o-ring in wrong groove will hinder fuel system venting.

3.5 gal tank pump: See Figure 6-17. Inspect o-ring (2) on vent tube (1) and verify proper location.

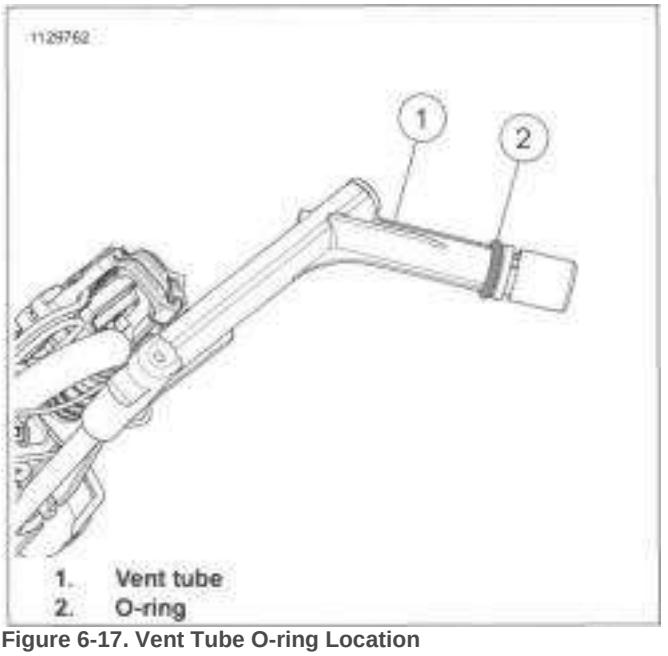
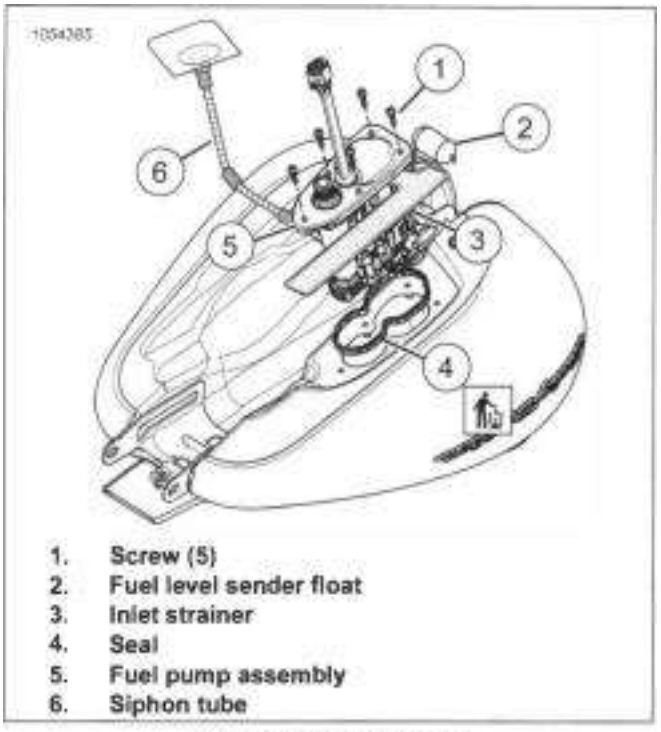


Figure 6-17. Vent Tube O-ring Location

INSTALL

FASTENER	TORQUE VALUE
Fuel pump assembly screws	40-45 **in-lbs** 1 4.5-5 N-m



1. Screw (5)
2. Fuel level sender float
3. Inlet strainer
4. Seal
5. Fuel pump assembly
6. Siphon tube

Figure 6-18. Fuel Pump

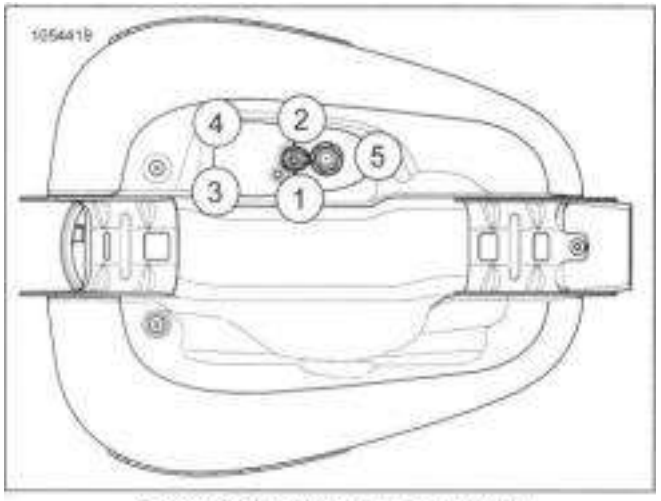


Figure 6-19. Tightening Sequence

DISASSEMBLE

Level Sender

1. See Figure 6-20. Remove level sender.
   a. Disconnect electrical connector (4).
   b. Press tab (1) to release level sender bracket (2).
   c. Remove level sender (3).

Pressure Regulator

1. See Figure 6-21. Remove regulator cover.
   a. Remove regulator cover retaining clip (4).
   b. Remove regulator cover (1).
2. Discard pressure regulator (2) and adapter with O-ring (3).

NOTE

Plastic portion of pressure regulator may separate from assembly during removal, if this occurs plastic portion must be removed before installing new pressure regulator.

Filter

1. Remove regulator cover.
2. See Figure 6-22. Remove filter housing.
   a. Remove retaining clip (3).
   b. Remove filter housing (2) from filter base (5).
3. Remove and discard fuel filter (4).
4. Remove and discard O-ring (6).

Pump

1. Remove level sender.
2. See Figure 6-23. Remove pump retainer.
   a. Press tabs (3) to release pump retainer (2).
   b. Remove pump retainer.
3. Disconnect electrical connectors (1).
4. See Figure 6-24. Remove pump (4).
5. Remove lower isolator (1).
6. If necessary remove and discard inlet strainer (5).
7. Inspect parts for damage. Replace if necessary.
   - pump
   - spacer(3)
   - O-ring (2)

Inlet Strainer

1. See Figure 6-24. Remove pump (4).
2. Remove and discard inlet strainer (5).

ASSEMBLE

Level Sender

1. See Figure 6-20 Install level sender.
   a. Align level sender bracket (2) with tab (1).
   b. Install level sender (3).
   c. Connect electrical connector (4).

Pressure Regulator

1. See Figure 6-21 Install **new** pressure regulator (2) and adapter with O-ring (3).
2. Install regulator cover.
   a. Install regulator cover (1).
   b. Install regulator cover retaining clip (4).

Filter

1. See Figure 6-22 Install **new** filter (4).
2. Install **new** O-ring (6).
3. Install filter housing.
   a. Install filter housing (2) onto filter base (5) and bracket (1).
   b. Install filter housing retaining clip (3).

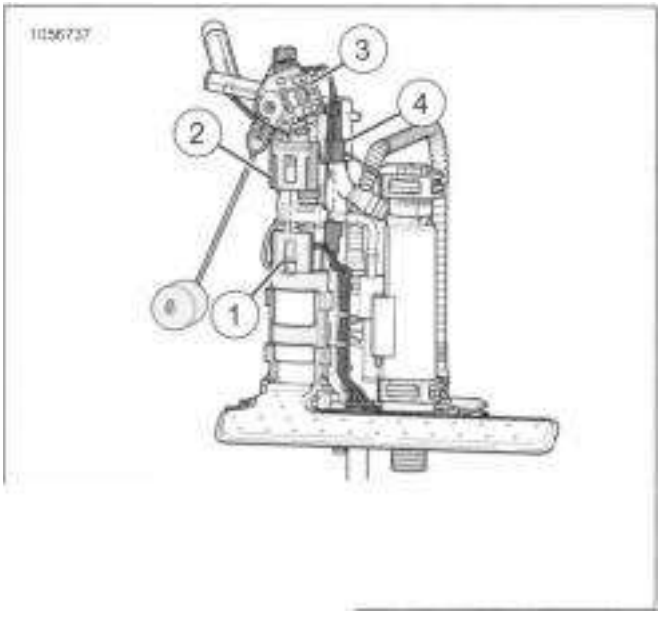
4. Install regulator cover.

Pump

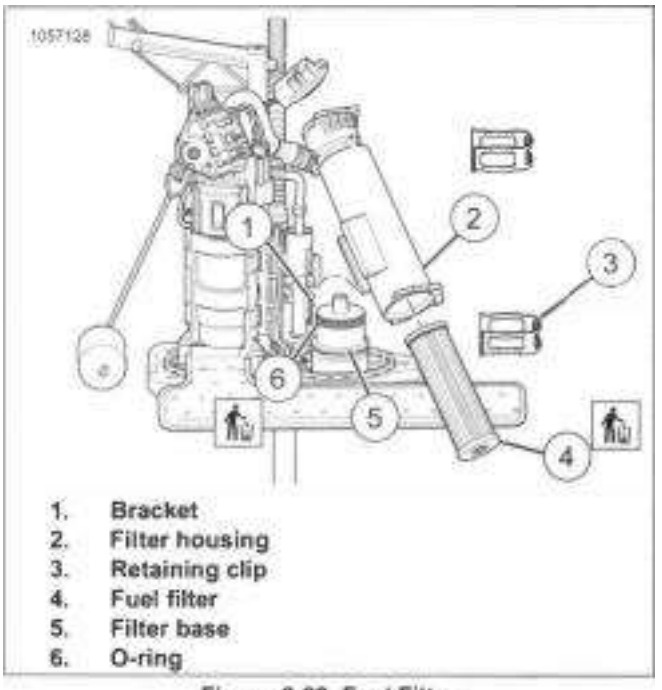
1. See Figure 6-24 If necessary install **new** inlet strainer (5).
2. Install fuel pump spacer (3) and, O-ring (2).
3. Install lower isolator (1).
4. Install pump (4).
5. See Figure 6-23 Connect electrical connectors (1).
6. Install pump retainer (2).
7. Install level sender.

Inlet Strainer

1. See Figure 6-24 Install **new** inlet strainer (5) in proper orientation.
2. Install pump (4).

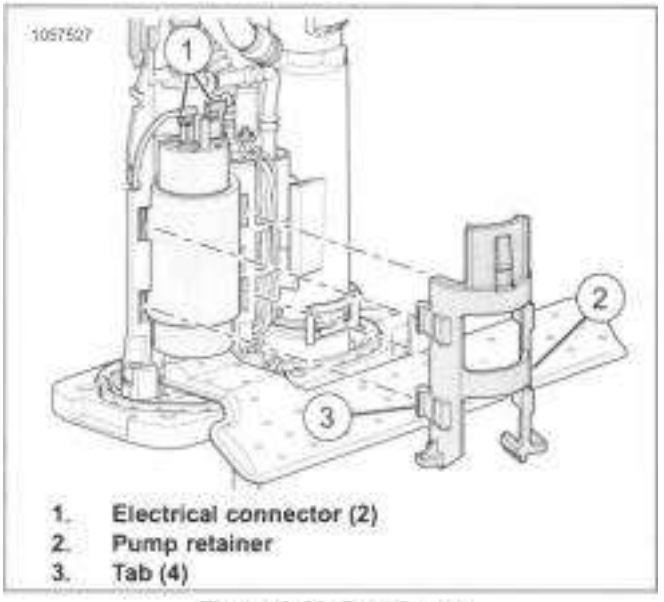


Tab
Level sender bracket
Level sender
Electrical connector



1. **Bracket**
2. **Filter housing**
3. **Retaining clip**
4. **Fuel filter**
5. **Filter base**
6. **O-ring**

Figure 6-22. Fuel Filter



1. **Electrical connector (2)**
2. **Pump retainer**
3. **Tab (4)**

Figure 6-23. Fuel Pump

COMPLETE

Figure 6-20. Level Sender

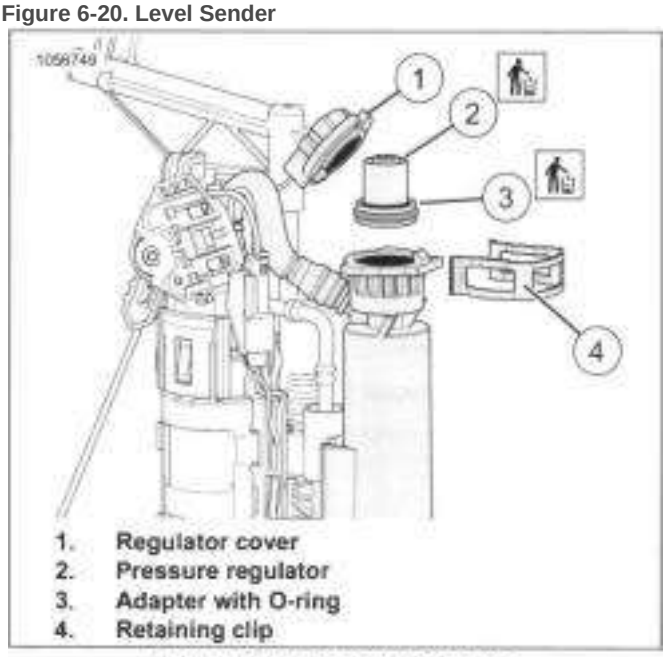


Figure 6-21. Pressure Regulator

1. Install fuel tank. See FUEL TANK (Page 6-14).
2. Install seat. See SEAT (Page 3-142).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).

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.

1. **Lower isolator**
2. **O-ring**
3. **Spacer**
4. **Pump**
5. **Inlet strainer**

Figure 6-24. Fuel Pump and Inlet Strainer

VENT TUBE

PREPARE

1. Remove seat. See SEAT (Page 3-142).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).

NOTE

Right side cover, battery and tray removal are only necessary if replacing lower vent line.

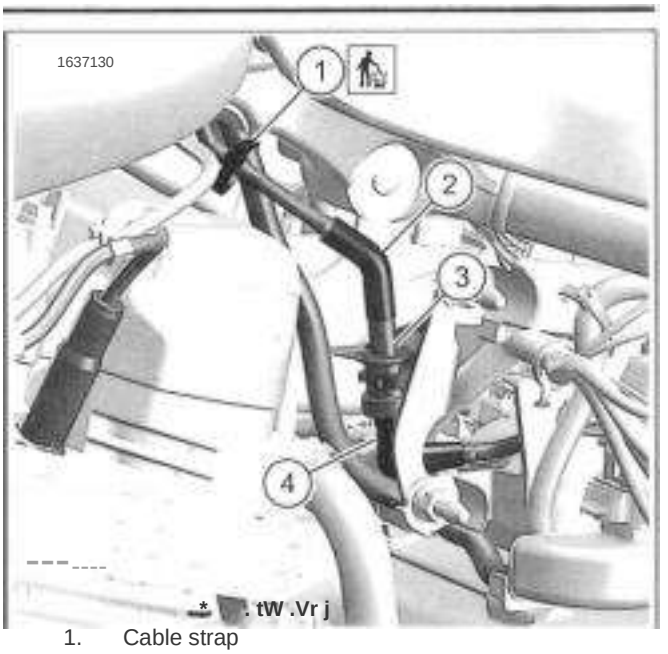
4. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
5. Remove battery. See INSPECT BATTERY (Page 2-43).
6. Remove battery tray. See BATTERY TRAY (Page 7-97).

REMOVE

1. Remove upper vent line.
   a. See Figure 6-25. Remove and discard cable strap (1).
   b. Disconnect upper vent line (2) from vapor valve (3).
   c. See Figure 6-26. Disconnect upper vent line (1) from fuel tank (2).
   d. Remove upper vent line (3).
2. Remove lower vent line.
   a. See Figure 6-25. Disconnect lower vent line (4) from vapor valve (3).
   b. See Figure 6-27. Remove lower vent line from clips (3).
   c. Remove lower vent line.

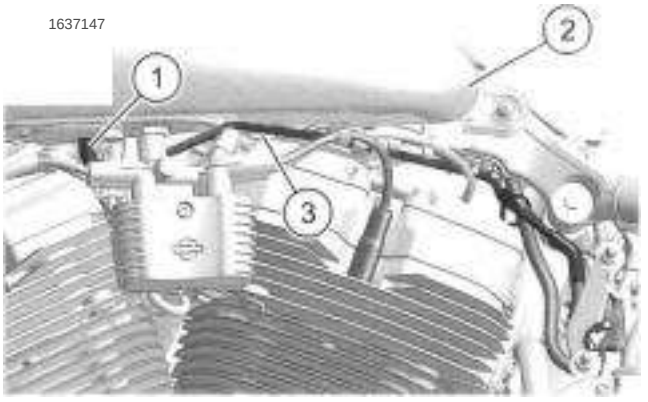
INSTALL

1. Install upper vent line.
   a. See Figure 6-26. Route upper vent line (3) as shown.
   b. Connect hose (1) to fuel tank (2).
   c. See Figure 6-25. Connect upper vent line to vapor valve (3).
   d. Install new cable strap (1).
2. Install lower vent line.
   a. See Figure 6-27. Route lower vent line (2) as shown.
   b. Connect lower vent line to vapor valve (1).
   c. Install vent lines in clips (3).



1. Cable strap
2. Upper vent line
3. Vapor valve
4. Lower vent line

Figure 6-25. Fuel Tank Vent Line



1. Hose
2. Fuel tank
3. Upper vent line

Figure 6-26. Upper Vent Line Routing

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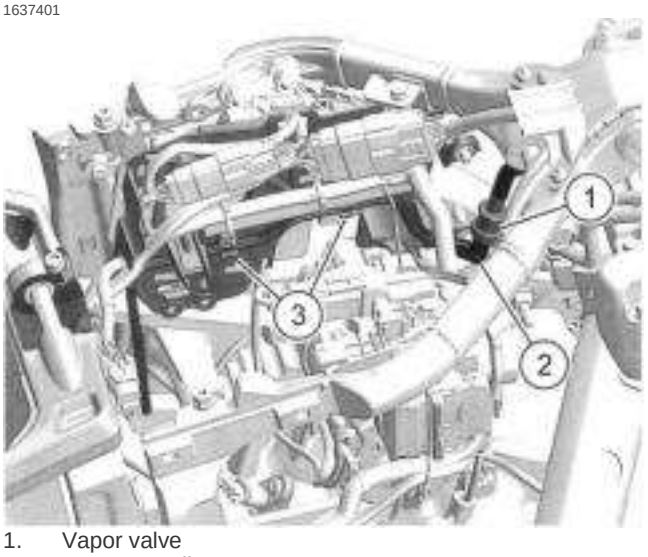


1. Vapor valve
2. Lower vent line

1. Install battery tray, if removed. See BATTERY TRAY (Page 7-97).
2. Install battery, if removed. See INSPECT BATTERY (Page 2-43).
3. Install right side cover, if removed. See RIGHT SIDE COVER (Page 3-64).
4. Install seat. See SEAT (Page 3-142).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).
6. Install left side cover. See LEFT SIDE COVER (Page 3-63).

3. Clips (2) _____

Figure 6-27. Lower Vent Line Routing (some parts removed for clarity)

VAPOR VALVE

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).

REMOVE

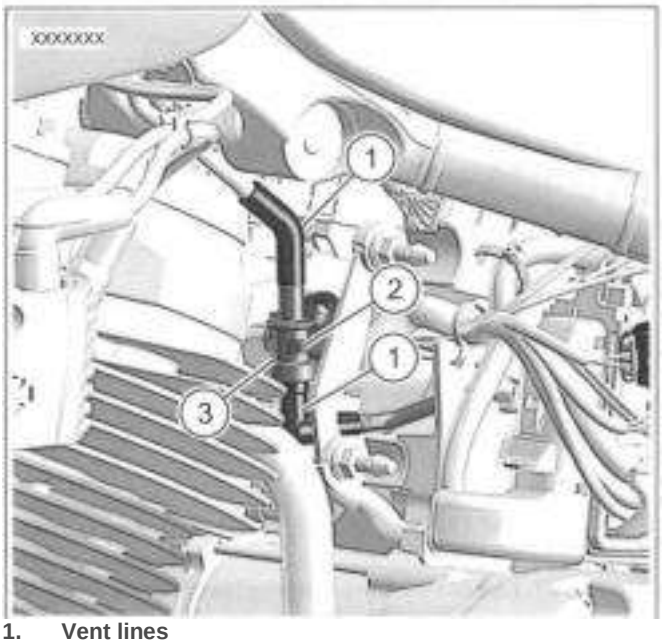
1. See Figure 6-28 . Remove vapor valve.
   a. Remove vent lines (1) from vapor valve (3).
   b. Pull vapor valve from clip (2).

INSTALL

A WARNING

Excessive pressure can build in the fuel tank if vapor valve is not mounted vertically with long fitting to top. Leaks due to excessive pressure can cause a fire or explosion, which could result in death or serious injury. (00265a)

1. See Figure 6-28. Install vapor valve.
   a. Press vapor valve (3) into clip (2).
   b. Install vent lines (1).



1. **Vent lines**
2. **Clip**
3. **Vapor valve**

Figure 6-28. Vapor Valve

COMPLETE

1. Install left side cover. See LEFT SIDE COVER 3-63). (Page

TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR

PREPARE

A 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)

A 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 SEAT (Page 3-142).
2. Remove fuel tank. See FUEL TANK (Page 6-14).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).

REMOVE

1. Disconnect TMAP sensor connector.
2. See Figure 6-29 . Remove TMAP sensor.

FASTENER	TORQUE VALUE	
Temperature manifold absolute pressure sensor (TMAP) screw	23-39 in-lbs	2.5--4.5 N-m

1. See Figure 6-29. Install TMAP sensor.
   b. Install screw (2). Tighten to 23-39 in-lbs (2.5--4.5 N-m).
2. Connect TMAP sensor connector.

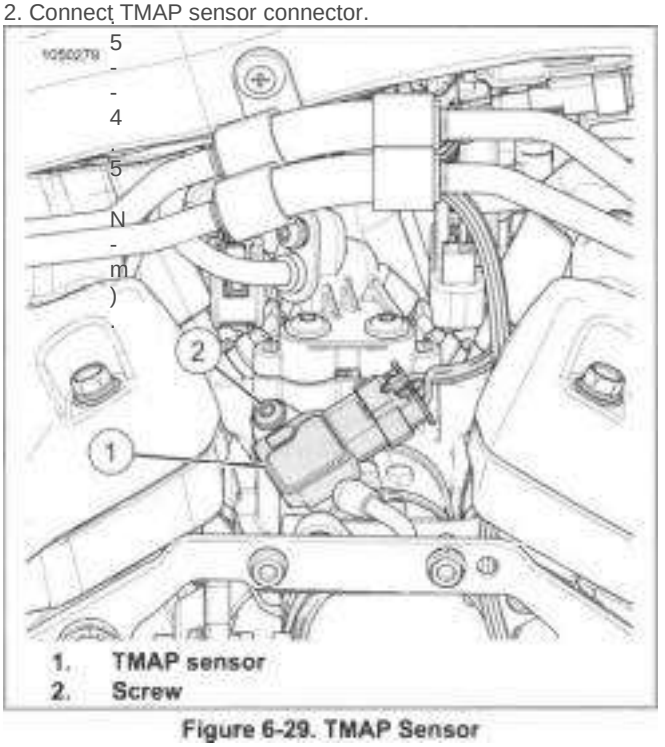


Figure 6-29. TMAP Sensor

COMPLETE

a. Remove screw (2).
b. Remove TMAP sensor (1).

INSTALL

1. Install fuel tank. See FUEL TANK (Page 6-14).
2. Install seat. See SEAT (Page 3-142).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).

a. Install TMAP sensor (1).

PREPARE

A 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)

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove frame plug and slide front electrical caddy away from backbone. See FRONT ELECTRICAL CADDY (Page 7-87).
6. Remove right handlebar switch housing from handlebar. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20)
7. Remove right hand grip.

REMOVE

1. See Figure 6-30. Disconnect Twist Grip Sensor (TGS) connector (2)
2. Remove cable straps and note location for installation.
3. Remove TGS.
   a. Attach a chaser wire to the TGS connector
   b. Remove TGS.
   c. Pull TGS harness out of handlebar.

INSTALL

1. ***NOTE***

Never use any kind of lubricant or spray cleaner on the twist grip, handlebar or TGS. All parts are designed to operate dry.

See Figure 6-31 The seal cap protects the TGS terminals from dirt and moisture. It also serves as a retention device for the throttle grip.

Install seal cap at end of TGS.

a. Check condition of O-ring on seal cap, replace if necessary.

b. See Figure 6-31 Install seal cap engaging legs in slots at end of TGS.

2. Install TGS.

   a. Attach chaser wire used during removal to newTGS connector.

   b. Draw harness into handlebar while guiding TGS into end into end of handlebar.

   c. See Figure 6-32 Verify TGS is engaged into alignment slots in handlebar.

3. See Figure 6-30 Connect TGS connector (2).

4. Install new cable straps.

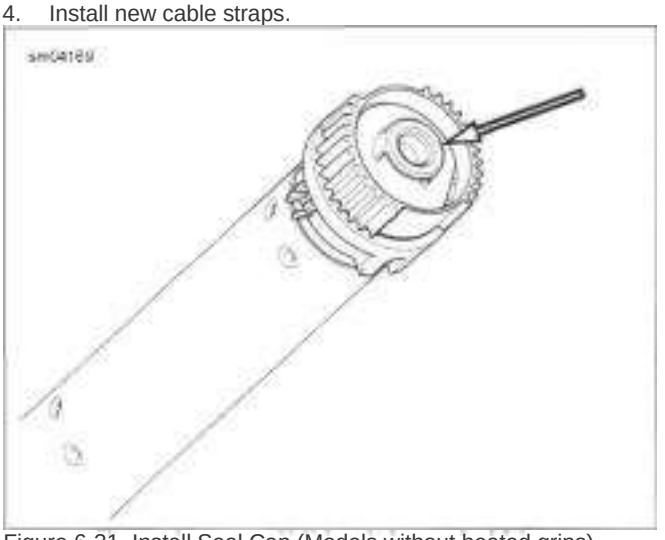


Figure 6-31. Install Seal Cap (Models without heated grips)

1. Frame plug
2. TGS connector
3. Heated hand grip connector

Figure 6-30. TGS Connector

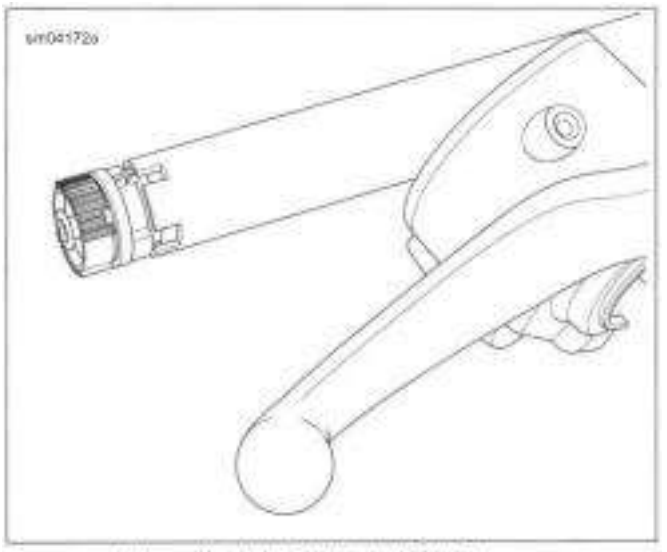


Figure 6-32. Install Twist Grip Sensor

1. Install right handgrip.
2. Install right handlebar switch housing. See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).
3. Install front electrical caddy and frame plug. See FRONT ELECTRICAL CADDY (Page 7-87).
4. Install fuel tank. See FUEL TANK (Page 6-14).
5. Install seat. See SEAT (Page 3-142).
6. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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)

A 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 SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
6. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

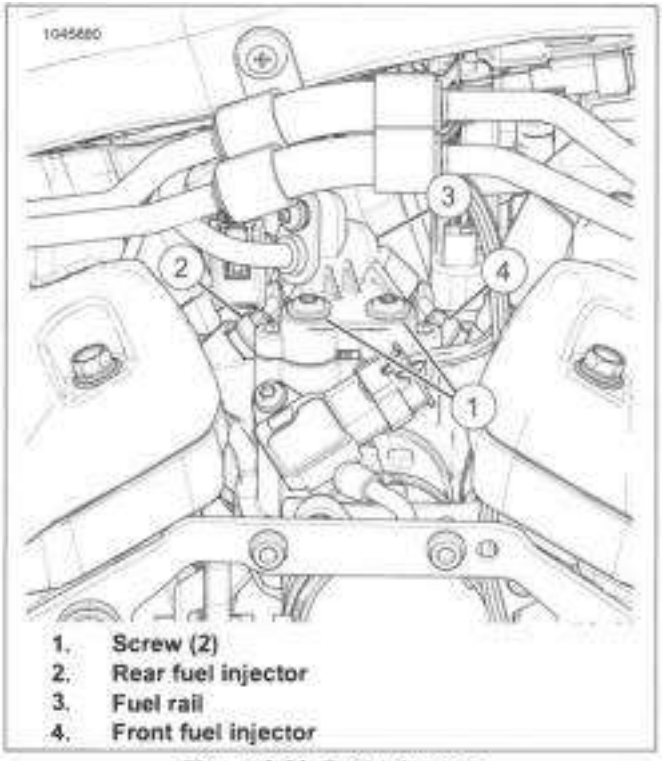
REMOVE

1. Disconnect fuel injector connectors.
2. See Figure 6-33 . Remove fuel rail and fuel injectors.
   a. Remove screws (1).
   b. Remove fuel rail (3).
   c. Remove fuel injectors (2, 4).
3. Discard O-rings from intake manifold.

INSTALL

FASTENER	TORQUE VALUE	
Fuel rail screws	31-49 in-lbs	3.5-5.5 N-m

1. See Figure 6-33. Install fuel injectors to intake manifold.
   a. Install new O-rings into intake manifold.
   b. Install fuel injectors (2,4) to intake manifold.
2. 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***
3. Connect fuel injector connectors.
   a. Grey connector to front injector.
   b. Black connector to rear injector.



1. Screw (2)
2. Rear fuel injector
3. Fuel rail
4. Front fuel injector

Figure 6-33. Fuel Injectors

COMPLETE

1. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
2. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
3. Install fuel tank. See FUEL TANK (Page 6-14).
4. Install seat. See SEAT (Page 3-142).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

A 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)

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
6. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

REMOVE _____ _____

1. California models: See Figure 6-34. Pull purge tube from fitting (13).

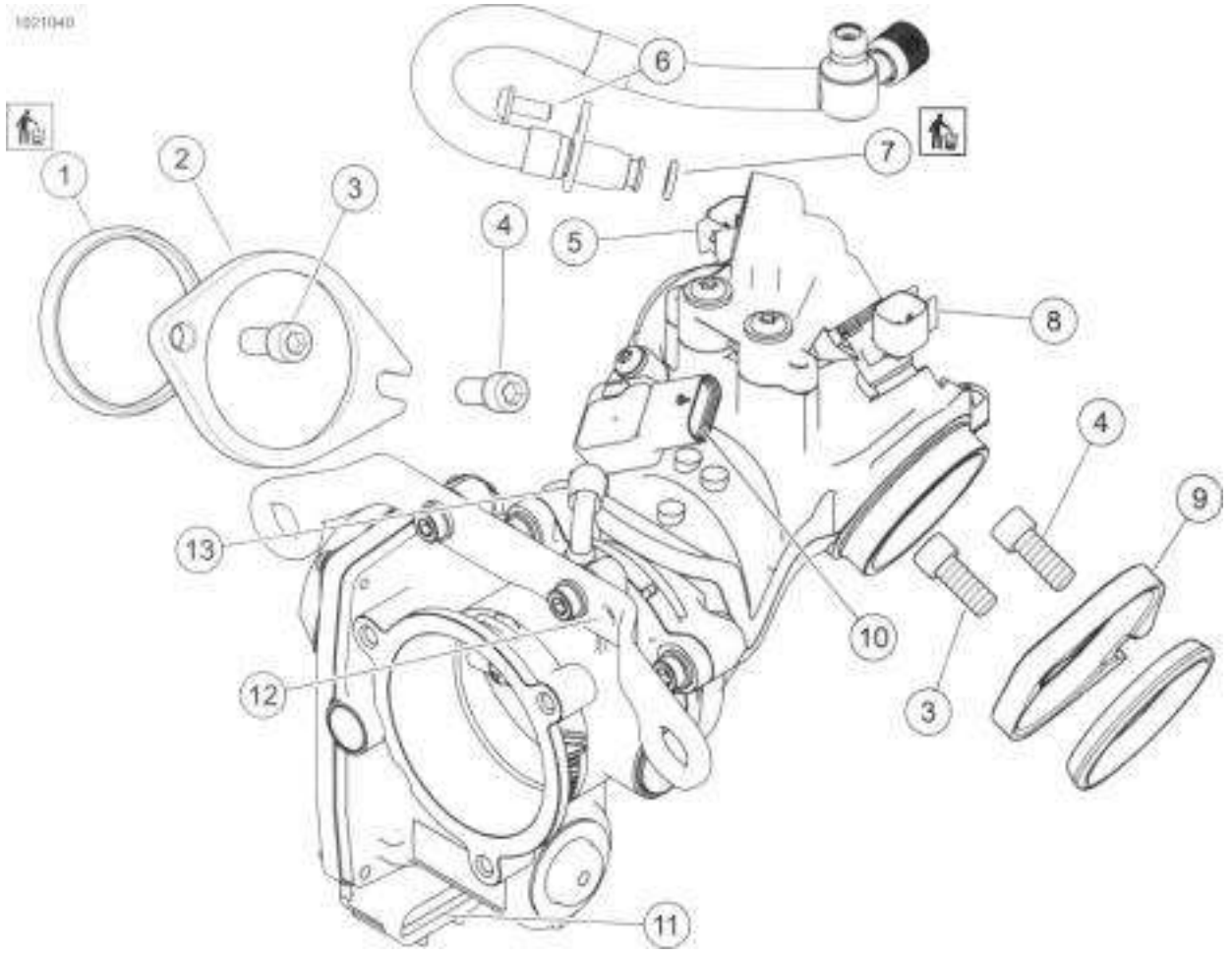
PART NUMBER	TOOL NAME
HD-47250	INTAKE MANIFOLD WRENCH

2. Disconnect connectors:
   a. Remove TMAP sensor connector (10).
   b. Remove front fuel injector connector (8).
   c. Remove rear fuel injector connector (5).
   d. Remove TCA connector (11).
   e. Release harness from anchor point (12).

NOTE

See Figure 6-35. For best results, use the INTAKE MANIFOLD WRENCH (PART NUMBER: HD-47250).

3. See Figure 6-34. Remove right side screws (3).
4. Loosen left side screws (4).
5. Remove induction module from right side.
6. Discard seals (1).
7. Remove flange adapters (2, 9).
8. Disconnect fuel line from induction module.
   a. Remove screw (6).
   b. Pull fuel line from fuel rail inlet.
   c. Discard O-ring (7).



1. Seal (2)
2. Rear flange adapter
3. Right side screw (2)
4. Left side screw (2)
5. Rear fuel injector connector
6. Screw
7. O-ring
8. Front fuel injector connector
9. Front flange adapter
10. TMAP sensor connector
11. TCA connector
12. TCA harness anchor point
13. Purge tube fitting/cap

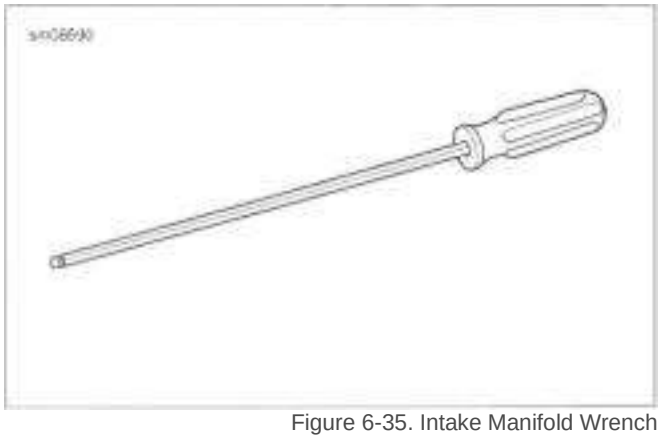


Figure 6-35. Intake Manifold Wrench

INSTALL

PART NUMBER	TOOL NAME
HD-47250	INTAKE MANIFOLD WRENCH

FASTENER	TORQUE VALUE	
Fuel line to fuel rail screw	22-40 in-lbs	2.5-4.5 N-m

FASTENER	TORQUE VALUE	
Induction module flange adapter screws	96-156 ln-lbs	10.9-17.6 N-m

1. Connect fuel line to induction module.

Figure 6-34. Induction Module Assembly

   a. See Figure 6-34. Install new O-ring (7).

   b. Push fuel line firmly onto fuel rail inlet.

   c. Install screw (6). Tighten.
   Torque: 22-40 in-lbs (2.5-4.5 N-m) ***Fuel line to fuel rail screw***

2. With the counterbore facing outward, install flange adapters (2, 9) onto the induction module.

3. Place new seal (1) in each flange adapter with the beveled side against the counterbore.

NOTE

For best results, use the INTAKE MANIFOLD WRENCH (PART NUMBER: HD-47250).

4. Install induction module.

   a. Slide induction module into position until slots engage left side screws (4).

   b. Start right side screws (3).

   c. Temporarily fasten mounting bracket to cylinder heads with breather bolts.

5. Tighten right side screws (3) until snug.

6. Tighten left side screws (4).

   Torque: 96-156 **in-lbs** (10.9-17.6 N-m) ***Induction module flange adapter screws***

7. Tighten right side screws (3).

   Torque: 96-156 **in-lbs** (10.9-17.6 N-m) ***Induction module flange adapter screws***

8. Install connectors:

   a. Install rear fuel injector connector (5) (black).

   b. Install front fuel injector connector (8) (grey).

   c. Install TMAP sensor connector (10).

   d. Install TCA connector (11).

9. Capture TCA harness to anchor point (12) with **new** anchored cable strap.

10. **California models:** Connect purge tube to fitting (13).

11. **Non-California models:** Inspect rubber cap for damage. Replace as necessary.

DISASSEMBLE _____ ___ _____

Throttle Body

NOTE

The throttle body can be removed without removing the entire induction module.

1. **Induction module still installed:** Disconnect TCM connector.
2. See Figure 6-36 Remove bracket (1).
   a. Remove screws (2).
   b. Remove bracket.
3. Remove throttle body (4).
   a. Remove screws (3).
   b. Remove throttle body.
   c. **California models:** Disconnect vent hose.
   d. Discard gasket (6).

Induction Manifold

1. See Figure 6-36 . Remove TMAP sensor (7). See TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (Page 6-23).
2. Remove fuel rail (9) and fuel injectors (8, 10). See FUEL INJECTORS (Page 6-26).

ASSEMBLE _____

FASTENER	TORQUE VALUE	
Induction module bracket	66-84 in-lbs	7.5--9.5 N-m
Throttle body to manifold screws	35-53 in-lbs	4-6 N-m

Induction Manifold

1. See Figure 6-36. Install TMAP sensor (7). See TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (Page 6-23).
2. Install fuel injectors (8, 10) and fuel rail (9). See FUEL INJECTORS (Page 6-26).

Throttle Body

1. See Figure 6-36. Install throttle body (4).
   a. Install **new** gasket (6).
   b. Installthrottle body.
   c. Install screws (3).
      Torque: 35--53 **in-lbs** (4-6 N-m) ***Throttle body to manifold screws***
   d. If removed, install **new** rubber cap (5) or connect vent hose.
2. Install bracket (1) with screws (2).
   Torque: 66-84 **in-lbs** (7.5-9.5 N-m) ***Induction module bracket***
3. **Induction module still installed:** Connect TCM connector.

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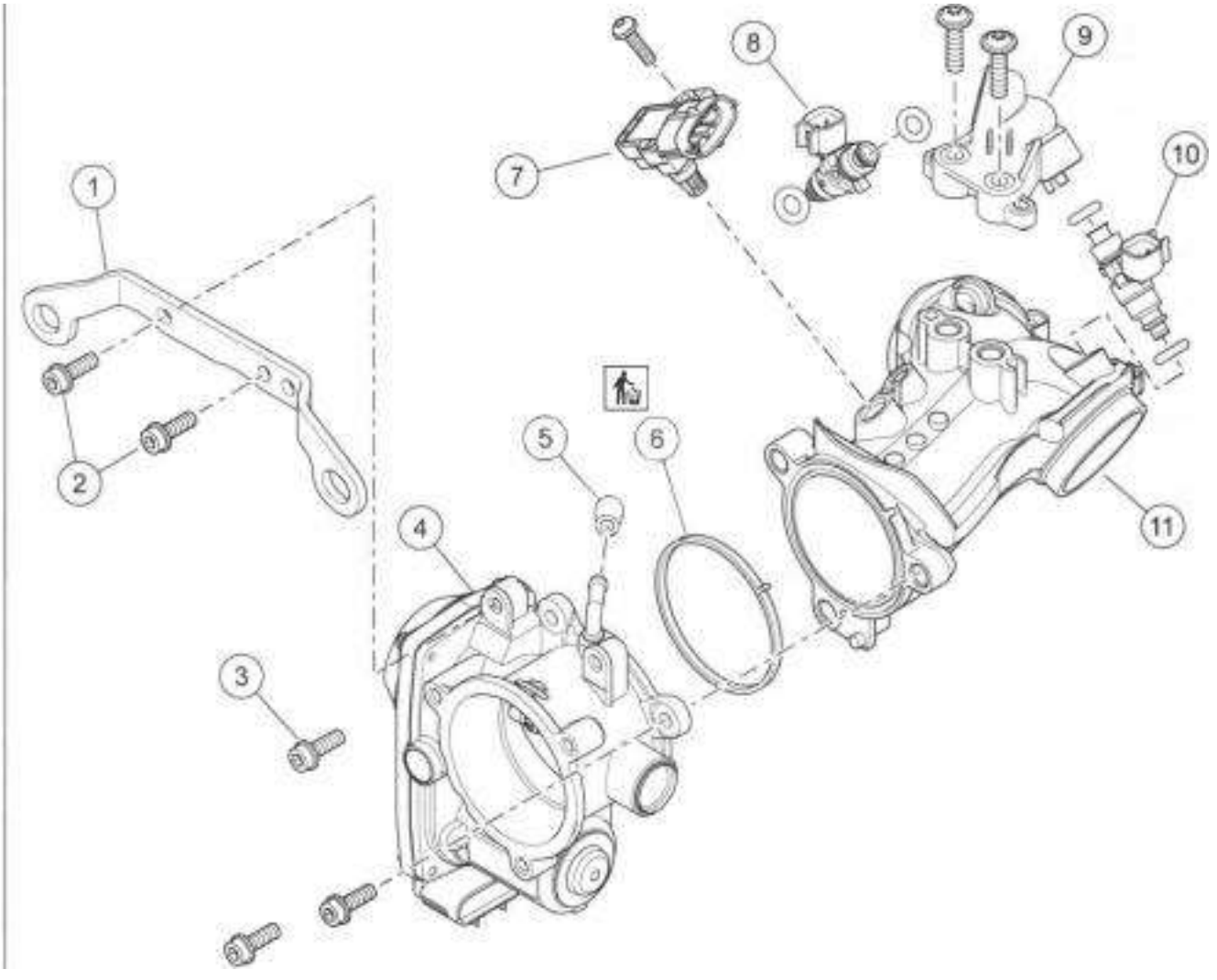


1. Bracket Screw
2. (2) Screw (3)
3. Throttle body
4. Rubber cap
5. Gasket
6.
7. TMAP sensor
8. Rear fuel injector
9. Fuel rail
10. Front fuel injector
11. Intake manifold

Figure 6-36. Induction Module Assembly

COMPLETE

1. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
2. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
3. Install fuel tank. See FUEL TANK (Page 6-14).
4. Install seat. See SEAT (Page 3-142).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

A WARNING

Do not allow open flame or sparks near propane. Propane is extremely flammable, which could cause death or serious injury. (00521 b)

A WARNING

Read and follow warnings and directions on propane bottle. Failure to follow warnings and directions can result in death or serious injury. (00471 b)

Parts List

- Small propane cylinder.
- PROPANE ENRICHMENT KIT (PART NUMBER: HD-41417).

Tester Assembly

1. See Figure 6-37 . Make sure valve knob (6) is closed (fully clockwise).
2. Install valve assembly (5) onto propane bottle (1).

Tester Adjustment

1. See Figure 6-37 . 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

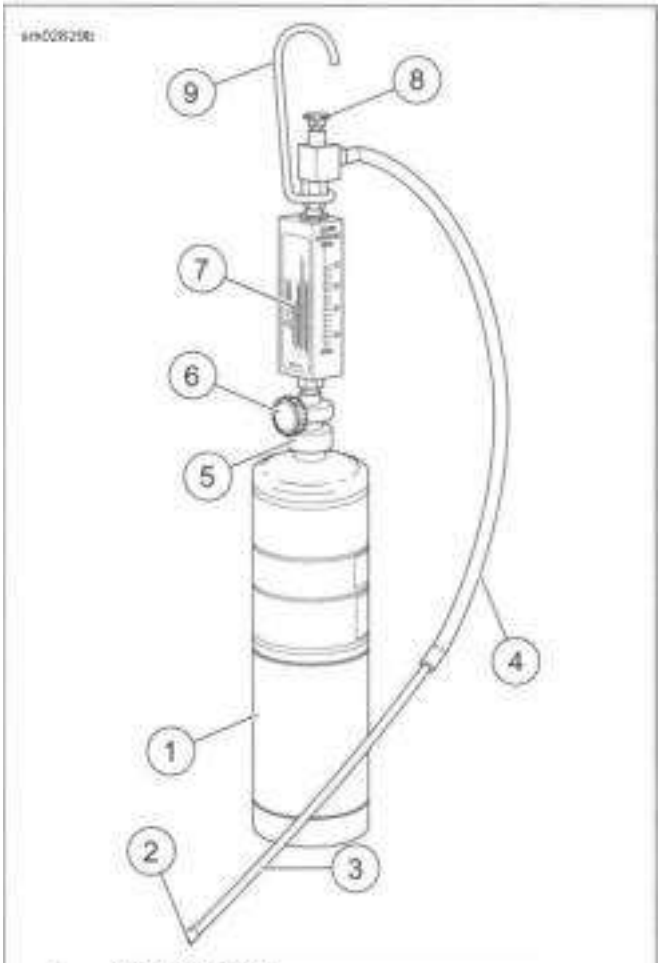
Propane injected into air cleaner causes false readings. Keep air cleaner cover installed.

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 6-37. Leak Tester

PREPARE

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

NOTE

Right side cover removal only necessary if replacing rear Heated Oxygen Sensor (HO2S).

2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).

REMOVE

PART NUMBER	TOOL NAME
HD-52977	17MM OXYGEN SENSOR SOCKET

1. See Figure 6-38 or Figure 6-39. Disconnect HO2S connector (1).
2. Remove HO2S (2) with oxygen sensor wrench.

   Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)
3. See Figure 6-40. Remove third HO2S (if equipped) with oxygen sensor socket.

   Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)

INSTALL

PART NUMBER	TOOL NAME
HD-52977	17MM OXYGEN SENSOR SOCKET

FASTENER	TORQUE VALUE
HO2S (Heated oxygen sensor)	12-14 ft-lbs 116.3-19 N-m [9] [10]

NOTE

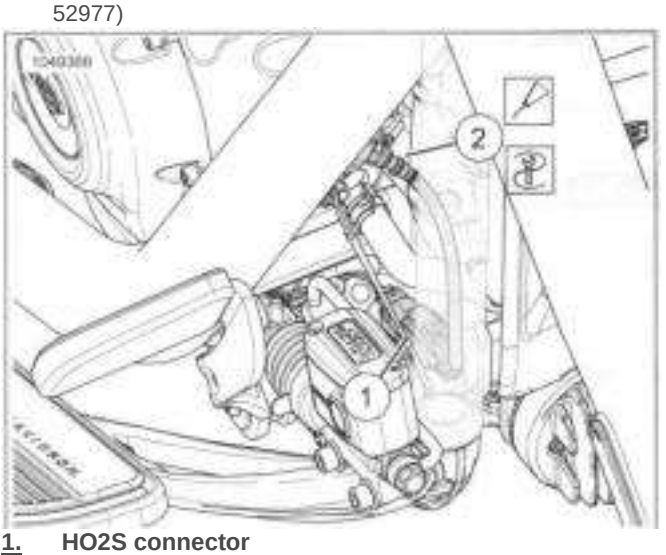
- ***Do not install sensors that have dropped or have been impacted by other components. Damage to the sensing element can occur.***
- ***Replacement sensor assemblies have threads coated with ANTI-SEIZE LUBRICANT and new gaskets.***

10 ***If reusing HO2S. replace the 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 to each oxygen sensor.***

3. See Figure 6-40. Install third HO2S (if equipped). Tighten.

   Torque: 12-14 ft-lbs (16.3-19 N-m) ***HO2S (Heated oxygen sensor)***
   Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)



1. HO2S connector
2. HO2S

Figure 6-38. Front HO2S (Heated Oxygen Sensor)

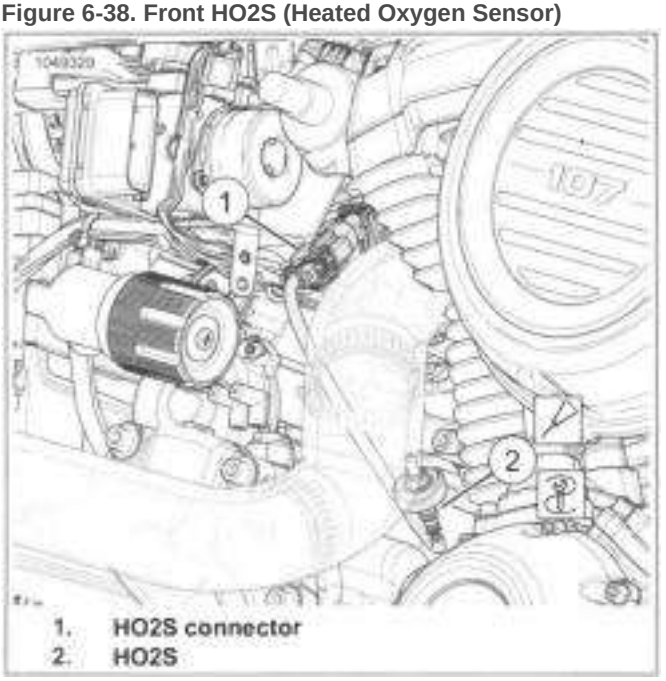


Figure 6-39. Rear HO2S (Heated Oxygen Sensor)

COMPLETE

1. See Figure 6-38 or Figure 6-39. Install HO2S (2). Tighten using special tool.

   Torque: 12-14 ft-lbs (16.3-19 N-m) ***HO2S (Heated oxygen sensor)***
   Special Tool: 17MM OXYGEN SENSOR SOCKET (HD-52977)

2. Connect HO2S connector (1).

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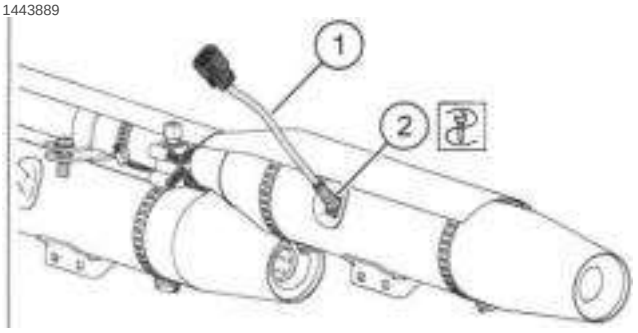


1. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

1. HO2S connector
2. HO2S

Figure 6-40. Third HO2S (Heated Oxygen Sensor) typical (If equipped)

MUFFLERS

PREPARE

1. Remove exhaust shields as necessary. See EXHAUST SYSTEM (Page 6-36).
2. Remove rear HO2S connector. See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

REMOVE

Muffler

1. See Figure 6-41, Figure 6-42. Remove muffler.
   a. Discard clamp (4).
   b. Remove screws (1).
   c. Remove muffler (2).
   d. Discard muffler gasket (3), if equipped.

End Cap

1. See Figure 6-43. Remove end cap.
   a. Remove screws (1).
   b. Remove end cap (2).
   c. Remove end cap gasket (3), if equipped.

INSTALL

FASTENER	TORQUE VALUE	
Muffler clamp	38-43 ft-lbs	51.5-58.3 N-m
Muffler end cap screws	96-120 in-lbs	10.8--13.6 N-m
Muffler screws	120---144 in-lbs	13.6-16.3 N-m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

Muffler

1. ***NOTE***
Use a pipe expander (such as ***Snap-on Part No. PH300) on mufflers (2) to aid installation of gaskets (3), if necessary.***

Flange on gasket should not be inside muffler inlet.

See Figure 6-41 or Figure 6-42. Install new gasket into muffler.if equipped.

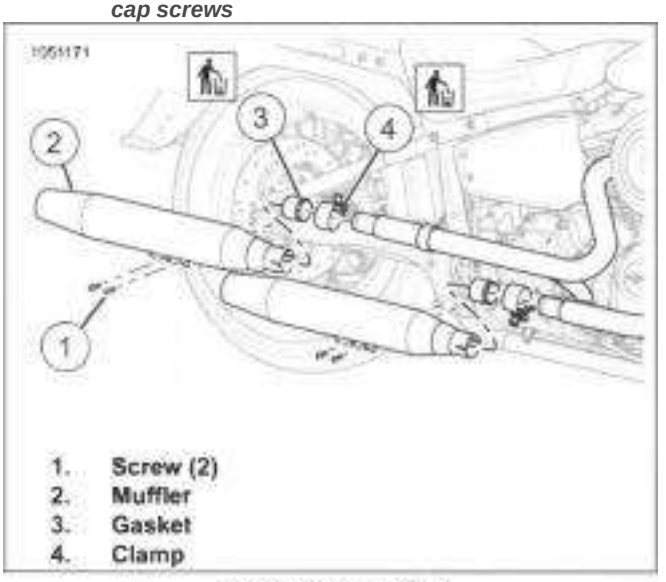
2. See Figure 6-41 or Figure 6-42 Install muffler.
   a. Loosely install new clamp (4).
   b. All others: Align muffler with bracket. Slide muffler on.
   c. Install screws (1). Hand-tighten.

COMPLETE

   d. Tighten screws.
   Torque: 120-144 in-lbs (13.6-16.3 N-m) ***Muffler screws***
   e. Tighten clamp.
   Torque: 38-43 ft-lbs (51.5-58.3 N-m) ***Muffler clamp***

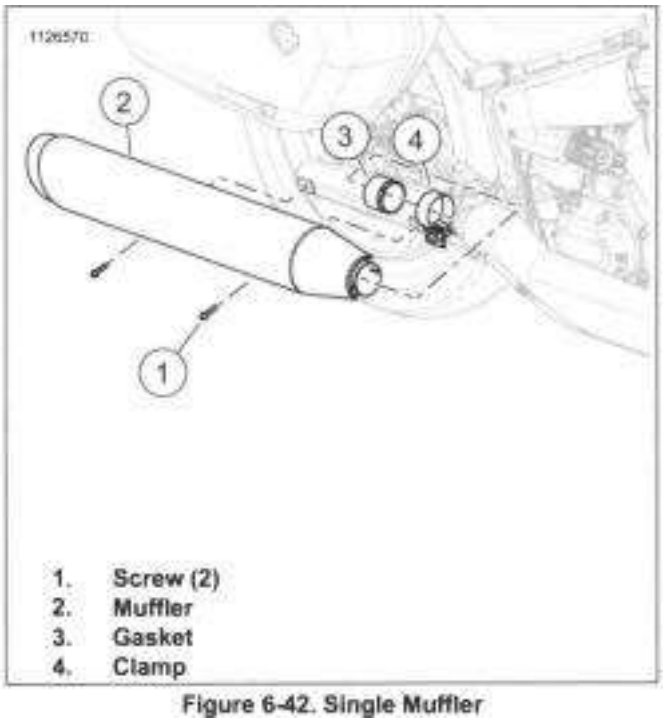
End Cap

1. See Figure 6-43. Install end cap.
   a. Apply anti-seize lubricant to screws (1).
   ANTI-SEIZE LUBRICANT (98960-97)
   b. Install end cap (2).
   c. Install screws. Tighten.
   Torque: 96-120 in-lbs (10.8-13.6 N-m) ***Muffler end cap screws***



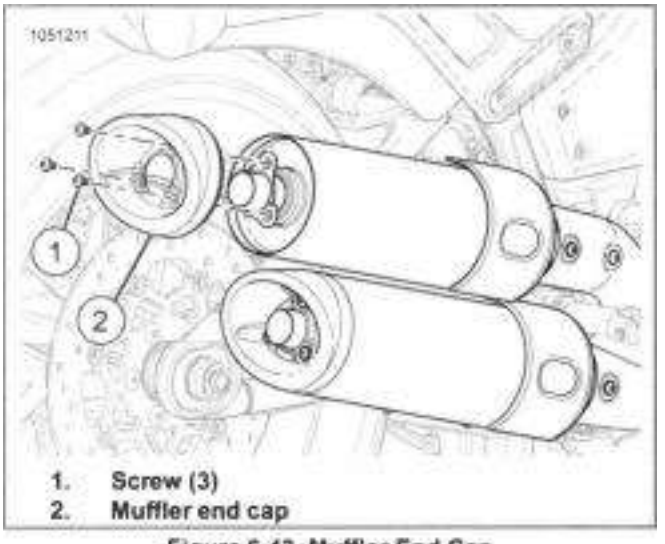
1. Screw (2)
2. Muffler
3. Gasket
4. Clamp

Figure 6-41. Muffler



1. Screw (2)
2. Muffler
3. Gasket
4. Clamp

Figure 6-42. Single Muffler



1. Screw (3)
2. Muffler end cap

Figure 6-43. Muffler End Cap

COMPLETE.

1. Install exhaust shields as necessary. See EXHAUST SYSTEM (Page 6-36).
2. Install HO2S connector. See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

EXHAUST SYSTEM

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PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. If necessary remove right foot support bracket. See RIGHT FOOT CONTROLS (Page 3-133).
3. Disconnect front and rear HO2S connectors. See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

REMOVE

1. See Figure 6-44 or Figure 6-45. Remove exhaust system.
   a. Remove flange nuts (5).
   b. Remove support clamp screw (4), if equipped.
   c. Remove muffler screws (1).
   d. Remove exhaust system.
2. Remove and discard gaskets (6).
3. If necessary remove exhaust bracket.
   a. Remove exhaust bracket screws (3).
   b. Remove exhaust bracket (2).

INSTALL

FASTENER	TORQUE VALUE	
Exhaust bracket screws	40-50 ft-lbs	54.2--67.8 N-m
Exhaust support clamp screw	40-50 ft-lbs	54.2--67.8 N-m
Exhaust to engine flange nuts	100-120 in-lbs	11.3-13.6 N-m
Muffler screws	120--144 in-lbs	13.6-16.3 N-m

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

1. See Figure 6-44 or Figure 6-45. If removed install exhaust bracket.
   a. Install exhaust bracket (2).
   b. Apply thread-locker to exhaust bracket screws (3).

      LOCTITE 243 MEDIUM STRENGTH

      THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install exhaust bracket screws (3). Tighten.

      Torque: 40-50 ft-lbs (54.2--67.8 N-m) ***Exhaust bracket screws***
2. Install new gaskets (6).
3. Install exhaust system.
   a. Align and install exhaust system.
   b. Apply thread-locker to muffler screws (1).

      LOCTITE 243 MEDIUM STRENGTH

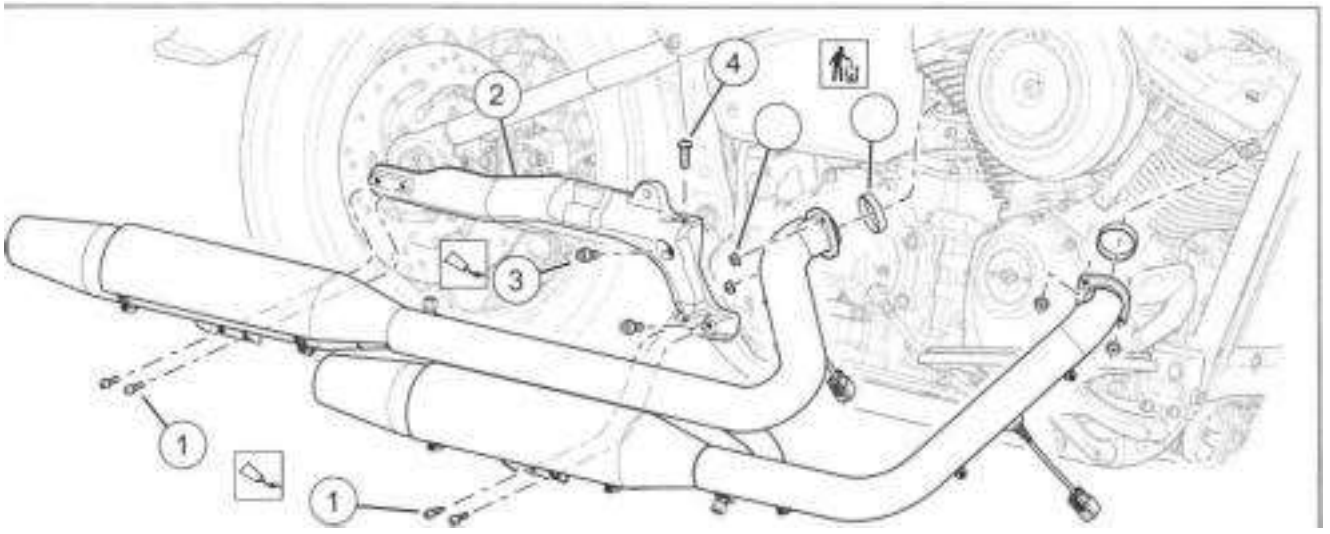
      THREADLOCKER AND SEALANT (BLUE) (99642-97)

   c. Install muffler screws. Hand tighten.
   d. Install support clamp screw (4), if equipped. Hand tighten.
   e. Install flange nuts (5). Hand tighten.
   f. Tighten flange nuts.

      Torque: 100-120 in-lbs (11.3-13.6 N-m) ***Exhaust to engine flange nuts***
   g. Tighten muffler screws.

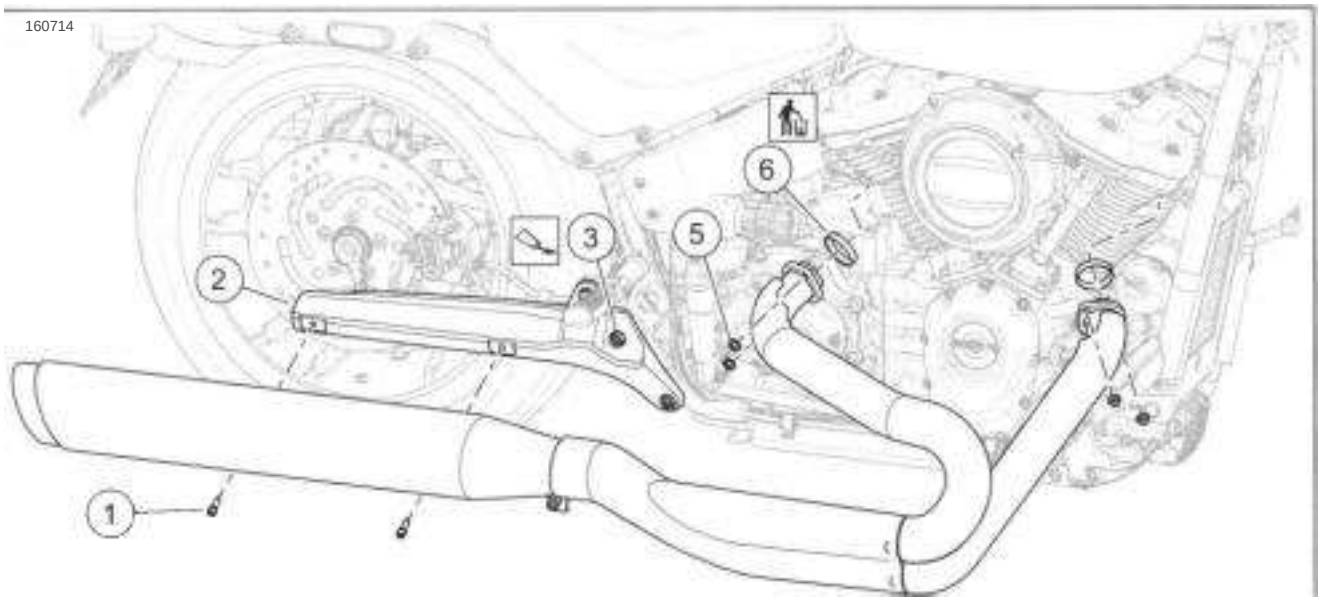
      Torque: 120-144 in-lbs (13.6-16.3 N-m) ***Muffler screws***
   h. Tighten support clamp screw, if equipped.

      Torque: 40-50 ft-lbs (54.2-67.8 N-m) ***Exhaust support clamp screw***



1. Muffler screw (4)
2. Exhaust bracket
3. Exhaust bracket screw (2)
4. Support clamp screw
5. Flange nut (4)
6. Gasket (2)

Figure 6-44. Exhaust System (Typical)



1. Muffler screw (2)
2. Exhaust bracket
3. Exhaust bracket screw (2)
5. Flange nut (4)
6. Gasket (2)

Figure 6-45. Exhaust System (Two Into One)

DISASSEMBLE AND ASSEMBLE: STANDARD_

FASTENER	TORQUE VALUE	
Exhaust shield clamps	20--40 in-lbs	2.3--4.5 N-m
Muffler shield clamps	20--40 in-lbs	2.3--4.5 N-m

Disassemble

1. See Figure 6-46. Remove HO2S (6). See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).
2. Remove exhaust and muffler shields.
   a. Remove exhaust and muffler shield clamps (1, 8).
   b. Remove exhaust and muffler shields (3, 7, 9, 10).
3. Remove muffler (2). See MUFFLERS (Page 6-34).
4. Remove exhaust flange.
   a. Remove retaining ring (4).
   b. Remove exhaust flange (5).

Assemble

1. ***NOTE***
Recess in exhaust flange should face engine.

   See Figure 6-46. Install exhaust flange.
   a. Install exhaust flange (5).
   b. Install Retaining ring (4).
2. Install muffler (2). See MUFFLERS (Page 6-34).

3. Install exhaust and muffler shields.

a. Install and position exhaust and muffler shields (3, 7,9,10).

b. Install exhaust shield clamps (8). Tighten.

Torque: 20-40 in-lbs (2.3-4.5 N-m) ***Exhaust shield clamps***

c. Install muffler shield clamps (1). Tighten.

Torque: 20-40 in-lbs (2.3-4.5 N-m) ***Muffler shield clamps***

4. Install HO2S (6). See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

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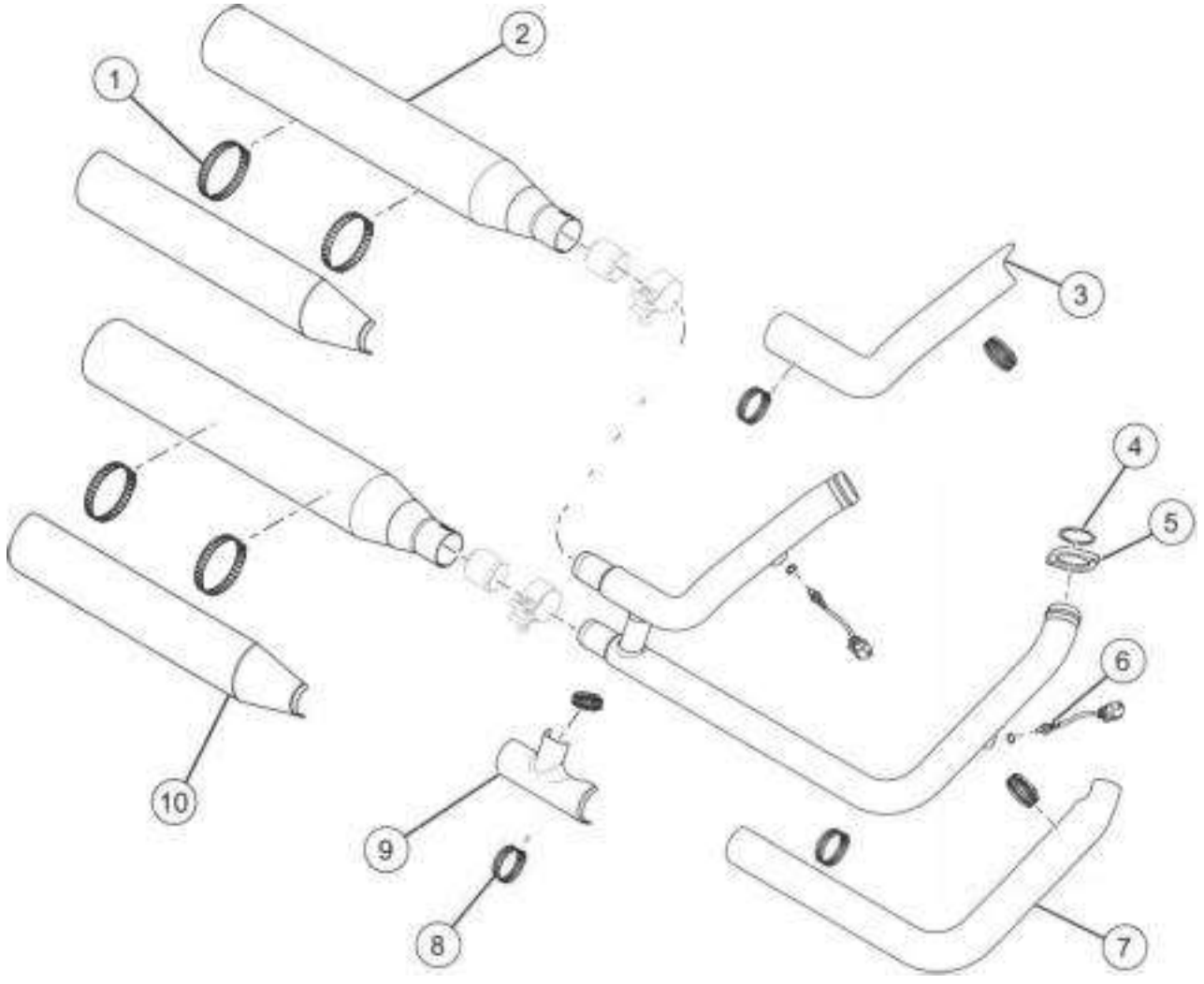

1. Muffler shield clamp (4)
2. Muffler (2)
3. Rear exhaust shield
4. Retaining ring (2)
5. Exhaust flange (2)
6. HO2S (Heated oxygen sensor) (2)
7. Front exhaust shield
8. Exhaust shield clamp (6)
9. Intermediate exhaust shield (FXBBS, FXST)
10. Muffler shield (2)

Figure 6-46. Exhaust System (Typical)

DISASSEMBLE AND ASSEMBLE: UPSWEPT Disassemble

FASTENER	TORQUE VALUE	
Exhaust shield clamps	20-40 in-lbs	2.3-4.5 N-m
Exhaust shield screws	108-132 in-lbs	12.2-14.9 N-m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

1. See Figure 6-47. Remove HO2S (4). See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

2. Remove intermediate exhaust shield.

a. Remove screws (7).

b. Remove intermediate exhaust shield (8).

Remove front exhaust shield, rear exhaust shield, and muffler shields.

a. Remove exhaust and muffler shield clamps (6, 11).

b. Remove exhaust shields (5, 9, 10).

4. Remove muffler (1). See MUFFLERS (Page 6-34).
5. Remove exhaust flange.
   a. Remove retaining ring (2).
   b. Remove exhaust flange (3).

Assemble

1. See Figure 6-47. Install exhaust flange.

NOTE
Recess in exhaust flange should face engine.

   a. Install exhaust flange (3).

   b. Install Retaining ring (2).

2. Install muffler (1). See MUFFLERS (Page 6-34).
3. Install front exhaust shield, rear exhaust shield, and muffler shields.

   a. Install and position muffler and exhaust shields (5, 9, 10).
4. Install intermediate exhaust shield.
   a. Apply anti-seize lubricant to screws (7). ANTI-SEIZE LUBRICANT (98960-97)
   b. Install intermediate exhaust shield (8).
   c. Install screws (7). Tighten.

      Torque: 108-132 in-lbs (12.2-14.9 N-m) ***Exhaust shield screws***
5. Tighten muffler and exhaust shield clamps.

   Torque: 20-40 in-lbs (2.3-4.5 N-m) ***Exhaust shield clamps***
6. Install HO2S (4). See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

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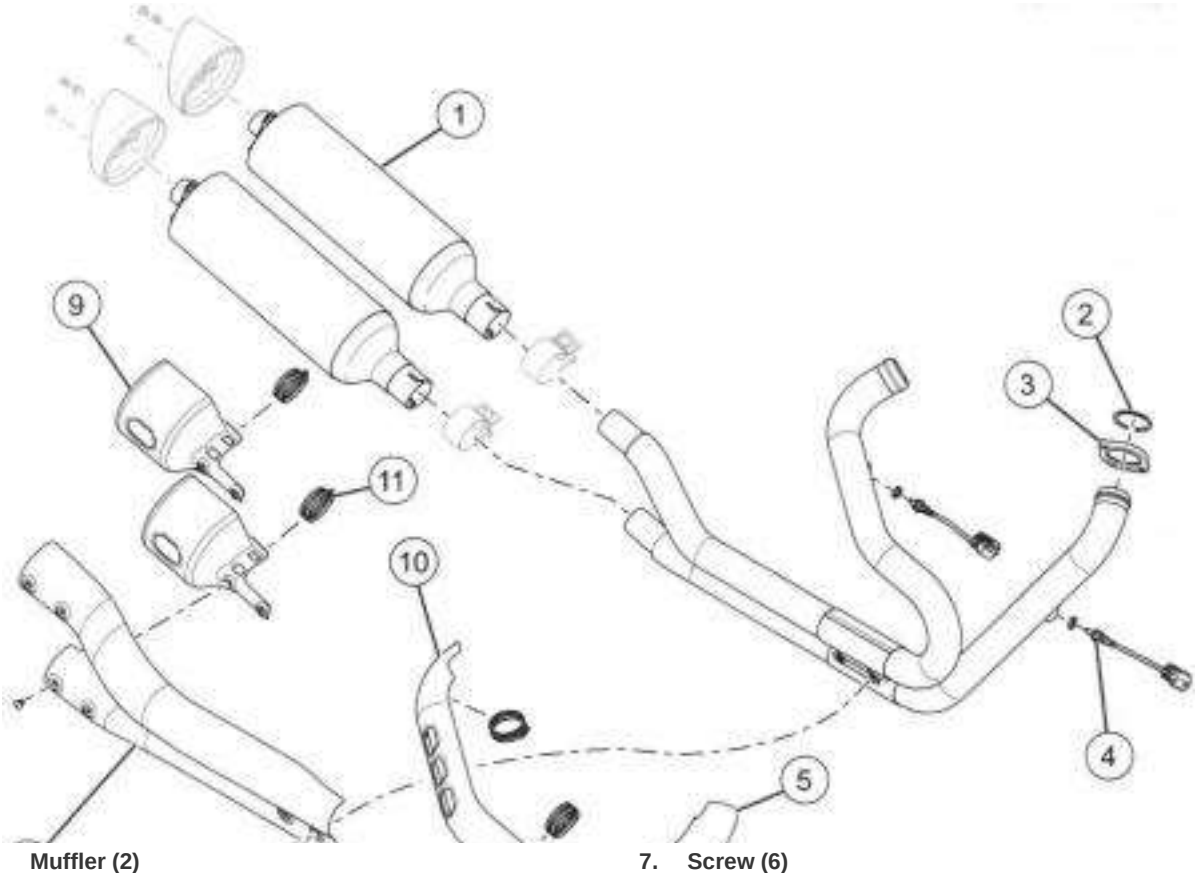


1. Muffler (2)
2. Retaining ring (2)
3. Exhaust flange (2)
4. H02S (Heated oxygen sensor) (2)
5. Front exhaust shield
6. Exhaust shield clamp (4)
7. Screw (6)
8. Intermediate exhaust shield
9. Muffler shield (2)
10. Rear exhaust shield
11. Muffler shield clamp (2)

Figure 6-47. Exhaust System: FXFBS

FASTENER	TORQUE VALUE	
Exhaust shield clamps	20--40 in-lbs	2.3-4.5 N-m
Muffler intermediate exhaust shield screw	108--132 in-lbs	12.2-14.9 N-m

CONSUMABLE	PART NUMBER
ANTI-SEIZE LUBRICANT	98960-97

Disassemble

1. See Figure 6-48. Remove HO2S (Heated oxygen sensor) (6) . See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).

2. Remove intermediate exhaust shield.

DISASSEMBLE AND ASSEMBLE: TWO INTO

ONE

b. Remove front clamps (10) or clamp (16).

c. Remove intermediate exhaust shield (9 or 17).

3. Remove front exhaust shield and rear exhaust shield.

a. Remove clamps (3).

b. Remove shields (2, 8).

4. Remove muffler shield, if equipped.

a. Remove clamps (12).

b. Remove muffler shield (13).

5. Remove muffler (1). See MUFFLERS (Page 6-34)

6. Remove exhaust flanges.

a. Remove rear clamp (11) or screws (15).

a. Remove retaining rings (5).

b. Remove exhaust flanges (4).

Assemble

1. ***NOTE***
Recess in exhaust flange should face engine.

   See Figure 6-48. Install exhaust flanges.

   a. Install exhaust flanges (4).

   b. Install Retaining rings (5).

2. Install muffler (1). See MUFFLERS (Page 6-34).

3. Install muffler shield, if equipped.

   a. Place muffler shield in position.
   b. Install clamps (12). Hand tighten.

4. Install front exhaust shield, rear exhaust shield.

   a. Place muffler and exhaust shields (2, 8) in position.

   b. Install clamps (3). Hand tighten.

5. Install intermediate exhaust shield.

   a. Apply anti-seize lubricant to screws (14). ANTI-SEIZE LUBRICANT (98960-97)
   b. Place intermediate exhaust shield (9 or 17) in position.
   c. Install exhaust shield rear clamp (11) or screws (14). Hand tighten clamp or tighten screws.

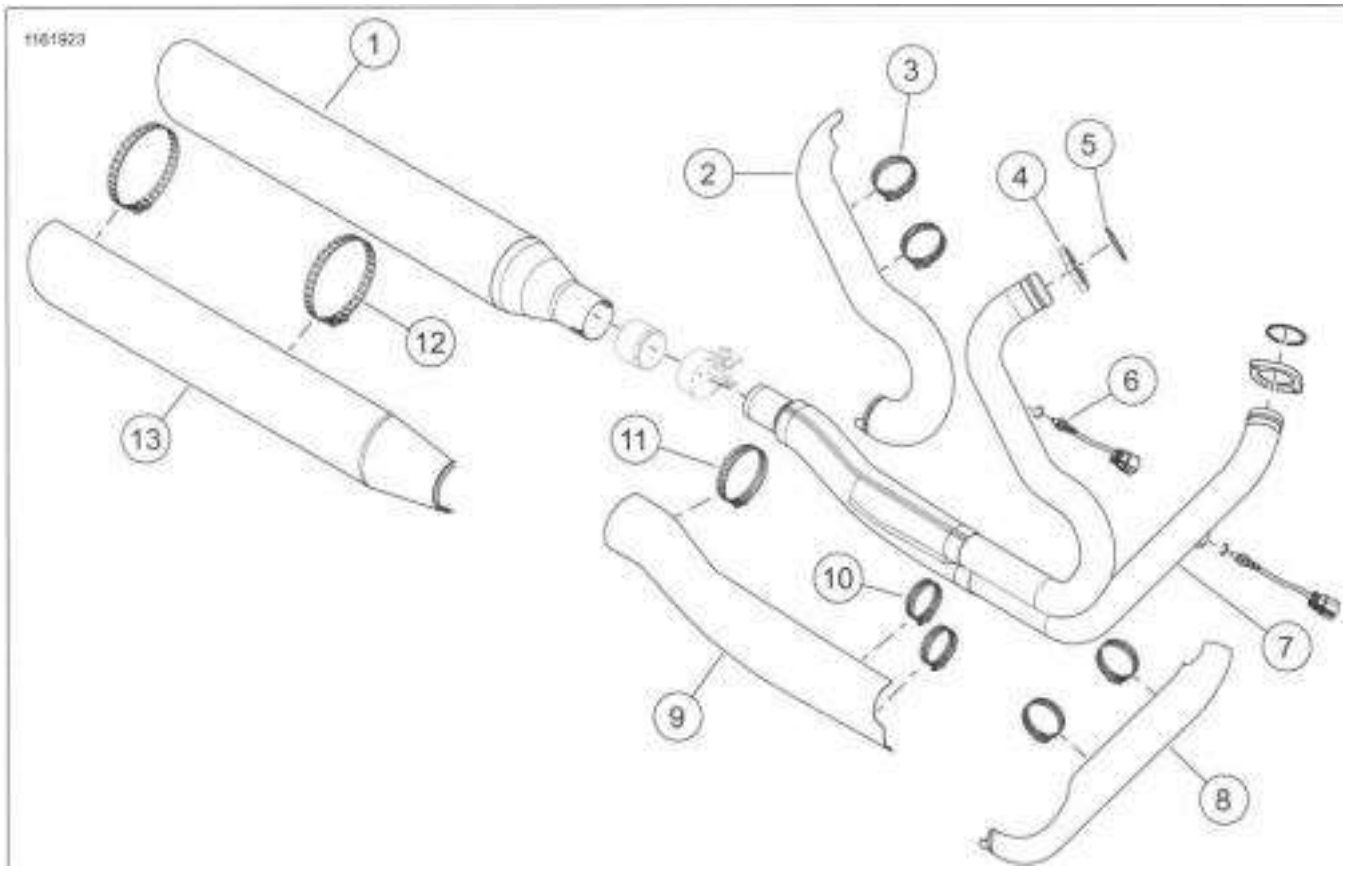
      Torque: 108-132 **in-lbs** (12.2-14.9 N-m) ***Muffler intermediate exhaust shield screw***

   d. Install exhaust shield front clamps (10) or clamps (16).

6. Tighten muffler and exhaust shield clamps.

   Torque: 20-40 **in-lbs** (2.3-4.5 N-m) ***Exhaust shield clamps***

7. Install HO2S (6). See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).



1. **FLSB: Muffler**
2. **Rear exhaust Shield**
3. **Exhaust shield clamp (4)**
4. **Exhaust flange (2)**
5. **Retaining ring (2)**
6. **H02S (Heated oxygen sensor) (2)**
7. **Header assembly**
8. **Front exhaust shield**
9. **FLSB: Intermediate exhaust shield**
10. **Intermediate exhaust shield front clamp (2)**
11. **Intermediate exhaust shield rear clamp**
12. **Muffler shield clamp (2)**
13. **Muffler shield**

Figure 6-48. Exhaust System (Two Into One)

COMPLETE

1. Connect front and rear HO2S connectors. See HEATED OXYGEN SENSORS (HO2S) (Page 6-32).
2. If removed install right foot support bracket. See RIGHT FOOT CONTROLS (Page 3-133).

3. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

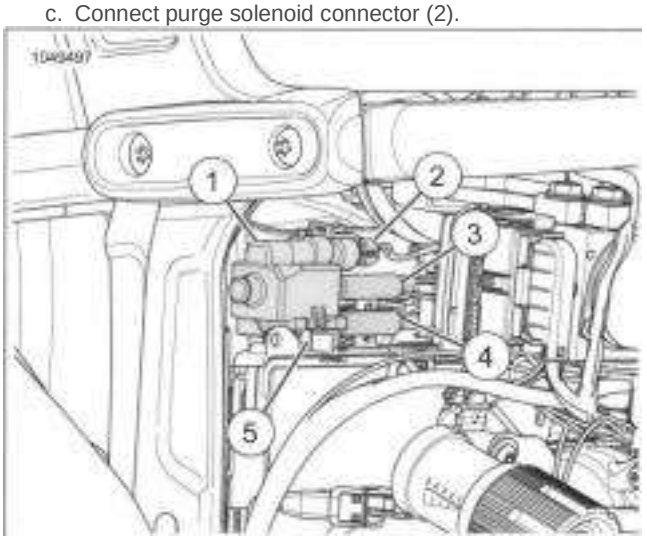
1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Remove battery. See INSPECT BATTERY (Page 2-43).
4. Remove battery tray. See BATTERY TRAY (Page 7-97).

REMOVE

1. See Figure 6-49 . Remove purge solenoid.
   a. Disconnect purge solenoid connector (2).
   b. Remove solenoid-to-induction module and canister-to-solenoid lines (3, 4) from purge solenoid (1).
   c. Remove purge solenoid.

INSTALL

1. See Figure 6-49. Install purge solenoid.
   a. Install purge solenoid (1).
   b. Install solenoid-to-induction module and canister-to-solenoid lines (3, 4).
   c. Connect purge solenoid connector (2).



1. Purge solenoid
2. Purge solenoid connector
3. Solenoid-to-induction module line
4. Canister-to-solenoid line
5. BCM caddy

Figure 6-49. Purge Solenoid

COMPLETE

1. Install battery tray. See BATTERY TRAY (Page 7-97).
2. Install battery. See INSPECT BATTERY (Page 2-43).
3. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
4. Install main fuse. See POWER DISCONNECT (Page 7-7).

REMOVE

1. See Figure 6-50. Remove charcoal canister and bracket assembly.
   a. Remove lines (4, 5) from charcoal canister.
   b. Remove screws (3).
   c. Remove charcoal canister (1) and bracket (2).

NOTE

If charcoal canister is removed from bracket, a new charcoal canister and screws ***are required for installation.***

2. If necessary, remove charcoal canister from bracket.
   a. Remove and discard screws (6).
   b. Discard charcoal canister.

INSTALL

FASTENER	TORQUE VALUE	
Charcoal canister bracket to engine case screws	72-96 in-lbs	8.1-10.8 N-m

a. Install charcoal canister and bracket assembly

FASTENER	TORQUE VALUE	
Charcoal canister to bracket screws	30-36 in-lbs	3.4-4.1 N-m

1. See Figure 6-50. If removed, install charcoal canister to bracket.
   a. Install new charcoal canister (1) onto bracket (2).
   b. Install new screws (6). Tighten.
      Torque: 30-36 in-lbs (3.4-4.1 N-m) ***Charcoal canister to bracket screws***

2. Install charcoal canister and bracket assembly.
   b. Install screws (3). Tighten.
      Torque: 72-96 in-lbs (8.1-10.8 N-m) ***Charcoal canister bracket to engine case screws***
   c. Install lines (4,5).

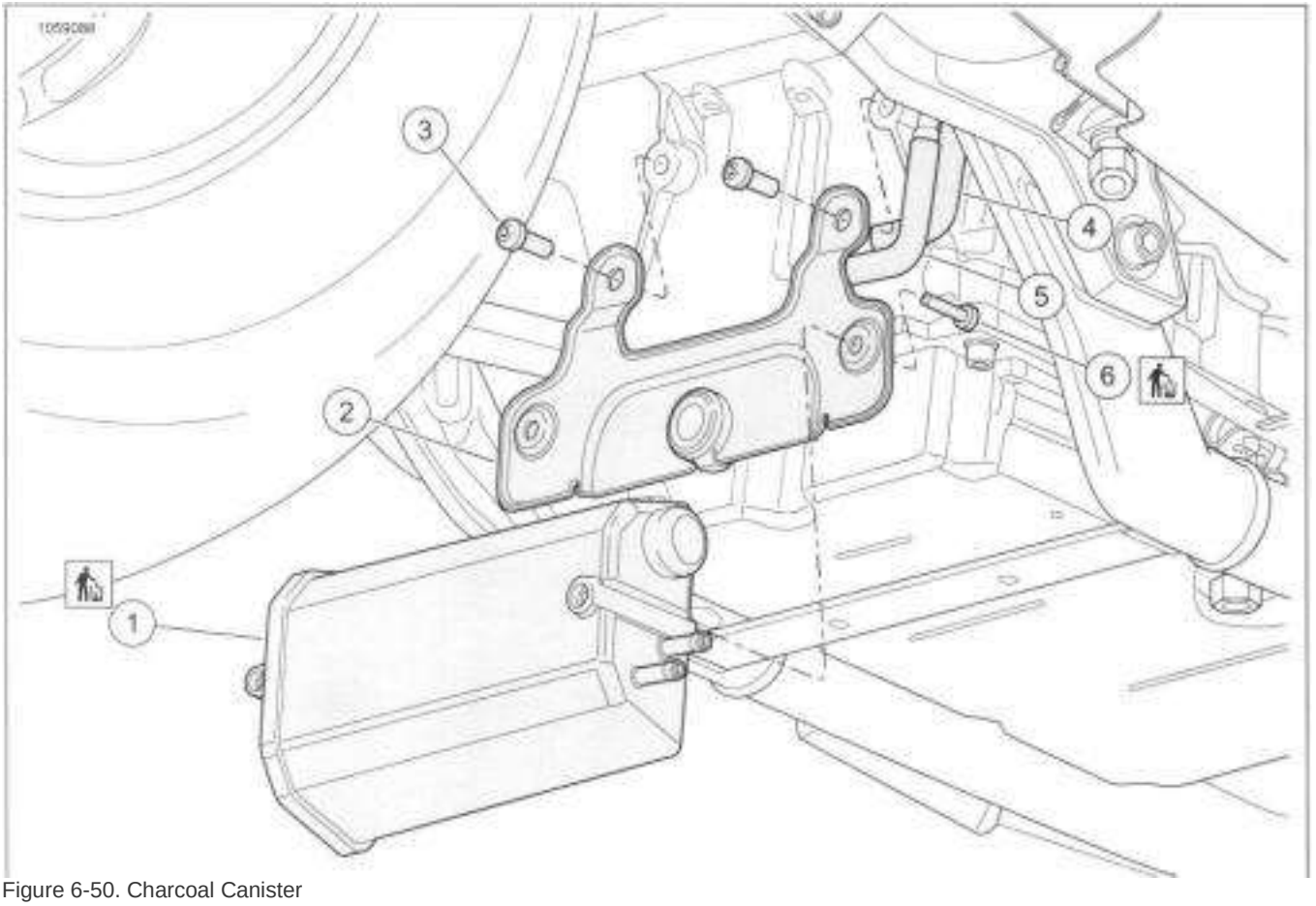


Figure 6-50. Charcoal Canister

1. Charcoal canister
2. Bracket
3. Screw (2)
4. Canister-to-solenoid line
5. Vapor valve-to-canister line
6. screw (2)

PREPARE

1. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove battery. See INSPECT BATTERY (Page 2-43).
4. Remove battery tray. See BATTERY TRAY (Page 7-97).

NOTE

Air cleaner removal and lifting rear of fuel tank is only necessary for replacing purge solenoid to induction module line.

5. Remove air cleaner. See INSPECT AIR FILTER (Page 2-40).
6. Remove air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
7. Lift rearof fuel tank. See PURGE FUEL LINE (Page 6-12).

REMOVE

1. Remove vapor valve-to-canister line.
   a. See Figure 6-52. Disconnect vapor valve-to-canister line (4) from vapor valve (5).
   b. See Figure 6-51. Disconnect vapor valve-to-canister line (2) from charcoal canister (3).
   c. Remove vapor valve-to-canister line.
2. Remove canister-to-solenoid line.
   a. Disconnect canister-to-solenoid line (1) from charcoal canister (3).
   b. See Figure 6-52. Disconnect canister-to-solenoid line (1) from purge solenoid (2).
3. Remove solenoid-to-induction module line.
   a. Remove solenoid-to-induction module line (3) from purge solenoid (2).
   b. Remove solenoid-to-induction module line from induction module.

INSTALL

1. Install vapor valve-to-canister line.
   a. See Figure 6-51. Install vapor valve-to-canister line (4) to charcoal canister (3).
   b. See Figure 6-52. Install valve-to-canister line to vapor valve (5).
2. Install canister to solenoid line.
   a. See Figure 6-51. Install canister-to-solenoid line (1) to charcoal canister (3).
   b. See Figure 6-52. Install canister-to-solenoid line to purge solenoid (2).
3. Install solenoid-to-induction module line.
   a. Install solenoid-to-induction module line (3) to induction module.
   b. Install solenoid-to-induction module line to purge solenoid (2).

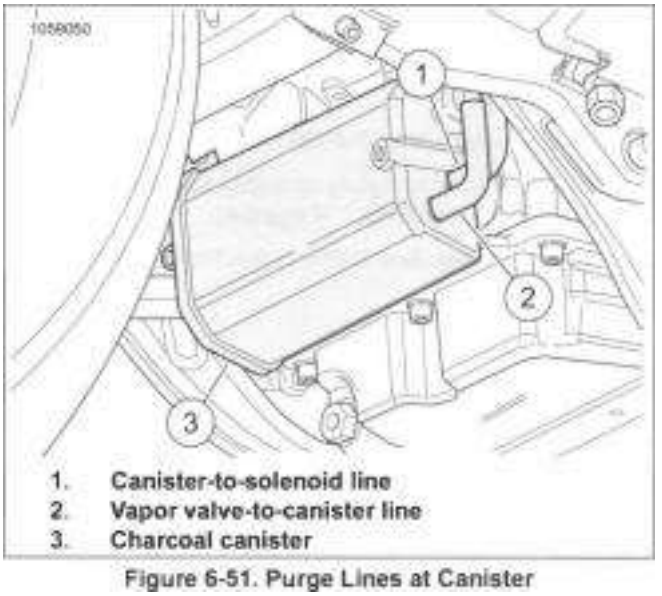
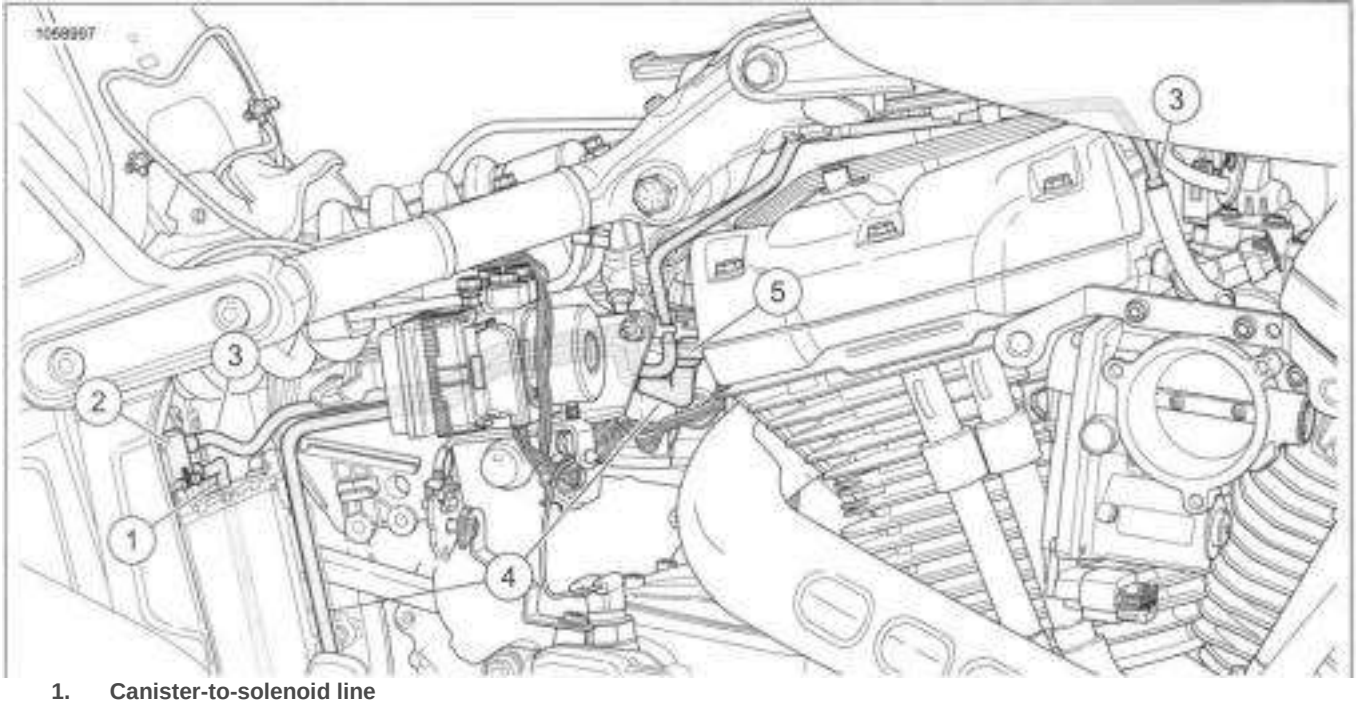


Figure 6-51. Purge Lines at Canister



1. **Canister-to-solenoid line**
2. **Purge solenoid**
3. **Solenoid-to-induction module line**

COMPLETE

1. Secure fuel tank. See PURGE FUEL LINE (Page 6-12).
2. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
3. Install air cleaner. See INSPECT AIR FILTER (Page 2-40).
4. Install battery tray. See BATTERY TRAY (Page 7-97).
5. Install battery. See INSPECT BATTERY (Page 2-43).
6. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
7. Install main fuse. See POWER DISCONNECT (Page 7-7).

SUBJECT		PAGE NO.
7.1	FASTENER TORQUE VALUES	7-1
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FASTENER TORQUE VALUES IN THIS CHAPTER

FASTENER	TORQUE VALUE		NOTES
ACR	17-19 ft-lbs	23-26.4 N-m	7.37 AUTOMATIC COMPRESSION RELEASE (ACR), Install
Auxiliary lamp bezel nut	9-12 in-lbs	1.07-1.36 N-m	7.20 AUXILIARY LAMPS, Bulb Replacement
Auxiliary lamp nut	19-23 ft-lbs	25.76-31.18 N-m	7.20 AUXILIARY LAMPS, Remove and Install: Standard Lighting
Auxiliary lamp nut	19-23 ft-lbs	25.7-31.1 N-m	7.20 AUXILIARY LAMPS, Adjust
Battery, negative cable, screw	60-70 in-lbs	6.8-7.9 N-m	7.4 POWER DISCONNECT, Negative Battery Cable
Battery tray screw	6-9 ft-lbs	8.1-12.2 N-m	7.47 BATTERY TRAY, Install
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Install
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m	7.12 RIGHT HAND CONTROL MODULE (RHCM), Install
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m	7.42 FRONT ELECTRICAL CADDY, Install
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m	7.50 BACKBONE WIRE HARNESS, Install
ECM caddy large screw	36-60 in-lbs	4.1-6.8 N-m	7.44 ECM CADDY, Install
ECM caddy small screw	5^5-60 in-lbs	6.2-6.8 N-m	7.44 ECM CADDY, Install
ET sensor	11-15 ft-lbs	14.9-21 N-m	7.35 ENGINE TEMPERATURE (ET) SENSOR, Install
Fender Support, Screw	42-46 ft-lbs	57-62 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Fender Support, Screw	42-46 ft-lbs	57-62.3 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: Side Mount
Fender Support, Screw	21-27 ft-lbs	28-37 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: Side Mount
Frame ground stud nut	50-90 in-lbs	5.7-10.2 N-m	7.44 ECM CADDY, Install
Frame ground stud nut	50-90 in-lbs	5.6-10.2 N-m	7.48 ENGINE GROUND CABLE, Install
Frame ground stud nut	50-90 in-lbs	5.6-10.2 N-m	7.52 MAIN WIRE HARNESS, Install
Front light bar, bracket screw	16-20 ft-lbs	21.7-27.1 N-m	7.19 FRONT LIGHT BAR, Remove and Install: Standard Lighting
Front light bar, clamp screw	6-10 in-lbs	0.67-1.1 N-m	7.19 FRONT LIGHT BAR, Remove and Install: Standard Lighting
Front light bar mounting screw	20-25 ft-lbs	27.1-33.9 N-m	7.19 FRONT LIGHT BAR, Remove and Install: Standard Lighting
Handlebar-mounted turn signal, ball stud clamp	96-144 in-lbs	10.8-16.3 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar-mounted turn signal, ball stud jam nut	50-70 in-lbs	5.6-7.9 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar-mounted turn signal, ball stud locknut	50-70 in-lbs	5.6-7.9 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar-mounted turn signal, ball stud set screw	3-5 ft-lbs	4-6.7 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Install
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Clutch Switch Replacement
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m	7.12 RIGHT HAND CONTROL MODULE (RHCM), Install

FASTENER	TORQUE VALUE		NOTES
Handlebar switch assembly retainer screws	8-10 in-lbs	0.59-1.1 N-m	7.12 RIGHT HAND CONTROL MODULE (RHCM), Front Brake Switch Replacement
Handlebar switch housing screws	35--4 in-lbs	4-5.1 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Install
Handlebar switch housing screws	35-45 in-lbs	4-5.1 N-m	7.12 RIGHT HAND CONTROL MODULE (RHCM), Install
Headlamp, fixed fairing, Bracket-to-lamp screws	in-lbs	9.459-12.2 N-m	7.18 HEADLAMP, Remove and Install: Fixed Fairing
Headlamp, fixed fairing, retainer screws	22-32 in-lbs	2.59-3.6 N-m	7.18 HEADLAMP[1], Remove and Install: Fixed Fairing
Headlamp, nacelle mounted, bezel screw	25-32 in-lbs	2.8-3.6 N-m	7.18 HEADLAMP Bulb Replacement: Nacelle Mounted
Headlamp, nacelle mounted, retainer screw	17-25 in-lbs	1.9-2.8 N-m	7.18 HEADLAMP Bulb Replacement: Nacelle Mounted
Headlamp, oblong, bracket-to-fork clamp screws	1(^20 ft-lbs	21.6-27.1 N-m	7.18 HEADLAMP Remove and Install: Oblong
Headlamp, oblong, isolator screws	33-4 in-lbs	3.7--49 N-m	7.18 HEADLAMP Remove and Install: Oblong
Headlamp, oblong, mounting screw	10-13ft-lbs	13.6-17.6 N-m	7.18 HEADLAMP Remove and Install: Oblong
Headlamp, round, locknut	27-32 ft-lbs	36.6-4.3 N-m	7.18 HEADLAMP Remove and Install: Standard Round
Headlamp, upper triple clamp mounted, screw	11-1***4*** ft-lbs	15-19 N-m	7.18 HEADLAMP Remove and Install: Horizontal
Headlamp (Oblong) mounting screw	1<0-13ft-lbs	13.5-17.6 N-m	7.18 HEADLAMP Bulb Replacement: Oblong
Headlamp bezel screw	9-14 in-lbs	1-1.6N-m	7.18 HEADLAMP Bulb Replacement: Standard Round
Headlamp bracket to headlamp mounting bracket bolt	***27-32*** ft-lbs	36.6-43 N-m	7.1 (3 HEADLAMP Remove and Install: LED Round
Headlamp FXBBS, FXST, FXLRS, FLSB vertical adjustment screw	27-32 ft-lbs	36.6-4.3 N-m	7.18 HEADLAMP, Adjust
Headlamp FXBBS, FXST horizontal ad-justment screw	20-25 ft-lbs	27.1-33.9 N-m	7.18 HEADLAMP Adjust
Headlamp FXBRS, vertical adjustment screw	1<0-13ft-lbs	13.5-17.6 N-m	7.18 HEADLAMP Adjust
Headlamp FXFBS vertical adjustment screw	11-14 ft-lbs	14.9-19 N-m	7 .18 HEADLAMP Adjust
Headlamp isolator bracket screw	6.5-8.0 ft-lbs	8.8-10.8 N-m	7.18 HEADLAMP Bulb Replacement: Standard Round
Headlamp mounting bracket to lower fork bracket	2(0-25 ft-lbs	27.1-33.9 N-m	7.18 HEADLAMP Remove and Install: LED Round
Headlamp mounting ring screw	16-20ft-lbs	21.6-27.1 N-m	7.18 HEADLAMP Remove and Install: Nacelle Mounted
Headlamp nacelle, screw	16-20 ft-lbs	21.6-27.1 N-m	7.18 HEADLAMP Remove and Install: Horizontal
Headlamp retainer screw	18-22 in-lbs	2-2.5 N-m	7.18 HEADLAMP Bulb Replacement: Standard Round
Headlamp to headlamp bracket screw	96-120 in-lbs	10.8-13.6 N-m	7.18 HEADLAMP Bulb Replacement: LED Round
Horn, Bracket Screw	62-71 in-lbs	7-8 N-m	7.1***7*** HORN, Assemble
Horn, Narrow Mounting Screw	27-33 in-lbs	59-3.7 N-m	7.17 HORN, Install
Horn, Wide Mounting Screw	in-lbs	9.5-12.2 N-m	7.17 HORN, Install
Housing to IM screw	2(0-25 in-lbs	2.3-2.8 N-m	7.13INSTRUMENT MODULE (IM), Remove and Install: Console Without Panel
Ignition coil, screw	11-14ft-lbs	159-19 N-m	7.59 IGNITION COIL, Install
IM, rectangular, handlebar clamp screws	12-17 in-lbs	1.4-1.9 N-m	7.13 INSTRUMENT MODULE (IM), Remove and Install: Handlebar Mount

FASTENER	TORQUE VALUE		NOTES
IM, round.cover screws	12-17 in-lbs	1.4-1.9 N-m	7.13 INSTRUMENT MODULE (IM), Remove and Install: Handlebar Mount
Indicator lamp, screw	20-30 in-lbs	2.26-3.39 N-m	7.14 INDICATOR LAMPS, Install
JSS screw	20-25 in-lbs	2.3-2.8 N-m	7.41 JIFFY STAND SENSOR (JSS), Install
Knock sensor screw	13-17 ft-lbs	17.6-23 N-m	7.36 KNOCK SENSOR (KS), Install
License plate, center mount, lamp housing screw	10-20 in-lbs	1.1-2.25 N-m	7.25 LICENSE PLATE LAMP, Bulb Replacement
License plate, center mount, lamp housing screw	10-20 in-lbs	1.1-2.25 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: Center Mount
License plate, center mount, tail lamp screw	10-20 in-lbs	1.1-2.25 N-m	7.23 TAIL LAMP, Remove and Install: Center Mount
License plate, LED housing, screw	10-20 in-lbs	1.1-2.3 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: License Plate Bracket Mount
License plate, tail lamp, screw	10-20 in-lbs	1.1-2.3 N-m	7.23 TAIL LAMP, Remove and Install: License Plate Bracket Mount
License plate holder, screw	60-80 in-lbs	6.8-9 N-m	7.23 TAIL LAMP, Remove and Install: License Plate Bracket Mount
License plate holder, screw	60-80 in-lbs	6.8-9 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: License Plate Bracket Mount
License Plate Lamp Cover, Screw	8-16 in-lbs	0.9-1.8 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: Side Mount
Lower fairing bracket screw	96-120 in-lbs	10.8-13.6 N-m	7.18 HEADLAMP, Remove and Install: LED Round
Rear fork clamp screw	24-36 in-lbs	2.7-4.1 N-m	7.40 REAR WHEEL SPEED SENSOR (WSS), Remove and Install: Standard Fork
Rear stoplamp switch	12-15 ft-lbs	16.3-20.3 N-m	7.24 REAR STOPLAMP SWITCH, Install
Rear Turn Signal, Center Mount, Screw	15-18 ft-lbs	20-24 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Center Mount
Rear Turn Signal, Fender Mount, Screw	15-18 ft-lbs	20-24 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Rear Turn Signal, Fender Mount, Screw	15-18 ft-lbs	20-24 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Rear Turn Signal, Fender Mount, Screw	15-18 ft-lbs	20-24 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: Side Mount
Rear Turn Signal, Fender Support, Screw	21-27 ft-lbs	28-37 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Rear Turn Signal, Light Bar Mount, Screw	16-20 ft-lbs	22-27 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Light Bar Mount
Rear turn signal, rear lighting assembly, screw	10-13 ft-lbs	14.12-17.74 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Rear Lighting Assembly
Sensor, CKP, screw	90-120 in-lbs	10.2-13.6 N-m	7.34 CRANKSHAFT POSITION SENSOR (CKP), Install
Sensor, vehicle speed, screw	100-120 in-lbs	11.3-13.6 N-m	7.38 VEHICLE SPEED SENSOR (VSS), Install
Solenoid nut	80-90 in-lbs	9-10.2 N-m	7.5 STARTER, Install
Starter, mounting screw	22-24 ft-lbs	29.8-32.5 N-m	7.5 STARTER, Install
Stator mounting screws	55-75 in-lbs	6.2-8.5 N-m	7.6 ALTERNATOR, Install Always use new screws
Sub caddy screw	36-60 in-lbs	4.1-6.8 N-m	7.27 ELECTRONIC CONTROL MODULE (ECM), Install
Switch, Neutral Indicator	120-180 in-lbs	13.6-20.3 N-m	7.16 NEUTRAL INDICATOR SWITCH, Install
Switch, Oil Pressure	13-17 ft-lbs	17-23 N-m	7.15 OIL PRESSURE SWITCH, Install
Tail lamp, circuit board screw	40-48 in-lbs	4.5-5.4 N-m	7.23 TAIL LAMP, Remove and Install: Standard
Tail lamp bracket, screw	40-48 in-lbs	4.5-5.4 N-m	7.23 TAIL LAMP, Remove and Install: Rear Lighting Assembly

FASTENER	TORQUE VALUE		NOTES
Tail lamp lens screw	20-24 in-lbs	2.3-2.7 N-m	7.23 TAIL LAMP, Remove and Install: Standard
Tail Lamp Lens Screw	20-24 in-lbs	2.3-2.7 N-m	7.23 TAIL LAMP, Bulb Replacement
Transmission ground stud nut	72-96 in-lbs	8.1-10.9 N-m	7.48 ENGINE GROUND CABLE, Install
Turn signal, frame mounted fairing, screw	15-18 ft-lbs	20.34-24.4 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Fixed Fairing Mount
Under seat frame, rear screws	96-120 in-lbs	10.9-13.6 N-m	7.50 BACKBONE WIRE HARNESS, Install
Under seat frame cover, front screw	20-30 in-lbs	2.3-3.4 N-m	7.50 BACKBONE WIRE HARNESS, Install
USB caddy screw	14-17 in-lbs	1.6—1.9 N-m	7.43 USB CADDY, Assemble
Voltage regulator, screw	106-124 in-lbs	12-14 N-m	7.7 VOLTAGE REGULATOR, Install
Voltage regulator bracket, screw	100-120 in-lbs	11.3-13.6 N-m	7.7 VOLTAGE REGULATOR, Install
Wide mounting screw	84-108 in-lbs	9.5-12.2 N-m	7.43 USB CADDY, Install
Wireform screw, headlamp, oblong,	10-12 ft-lbs	13.5-16.2 N-m	7.18 HEADLAMP, Remove and Install: Oblong

SPECIFICATIONS

Table 7-1. Battery Specifications

BATTERY	SPECIFICATIONS
Size	12 V/17.5 Ah/315 CCA
Type	Sealed, Absorbed Glass Mat (AGM) battery

Table 7-2. Starter Specifications

STARTER	SPECIFICATIONS
Cranking current	250 A maximum
Free current	90A maximum

Table 7-3. Alternator Specifications

ALTERNATOR	VALUE
Three phase	42 A system
AC voltage output	16-28 VAC per 1,000 rpm
Stator coil resistance	0.1-0.3 0

Table 7-4. Spark Plug Cables

LOCATION	LENGTH	RESISTANCE
Left front and rear	7.36-7.64 in (187-194 mm)	1,840-5,085 0
Right front and rear	15.00-15.24 in (381-387 mm)	3,750-10,070 0

Table 7-5. Regulator Specifications

REGULATOR	VALUE
Amperes @ 3,600 rpm	40--44A
Voltage @ 3,600 rpm	14.1-14.5 V@ 75.2 °F (24 °C)

Table 7-6. Fuse Specifications

ITEM	RATING
Main	40A
Battery	5A
Battery tender	7.5A
System	7.5A

Table 7-7. Ignition Coil Specifications

WINDING	RESISTANCE
Primary resistance	0.2-0.5 0
Secondary resistance	5,500-8,000 0

Table 7-8. Spark Plug Cables

LOCATION	LENGTH	RESISTANCE
Left front and rear	7.36--7.64 In (187-194 mm)	1,840-5,085 0
Right front and rear	15.00-15.24 in (381-387 mm)	3,750-10,070 0

PREPARE

1. **Remove left side cover. See LEFT SIDE COVER (Page 3-63).**

REMOVE

Primary Fuses

1. **See Figure 7-1. Remove fuse block (3) from ECM sub caddy.**
2. **Remove fuse cover (1).**
3. **See Figure 7-2. Remove required fuse.**

INSTALL

See Figure 7-2 for proper amperage rating.

Primary Fuses

1. **See Figure 7-2. Install required fuse.**
2. **See Figure 7-1. Install primary fuse cover (1).**
3. **Install fuse block (3) onto ECM sub caddy.**

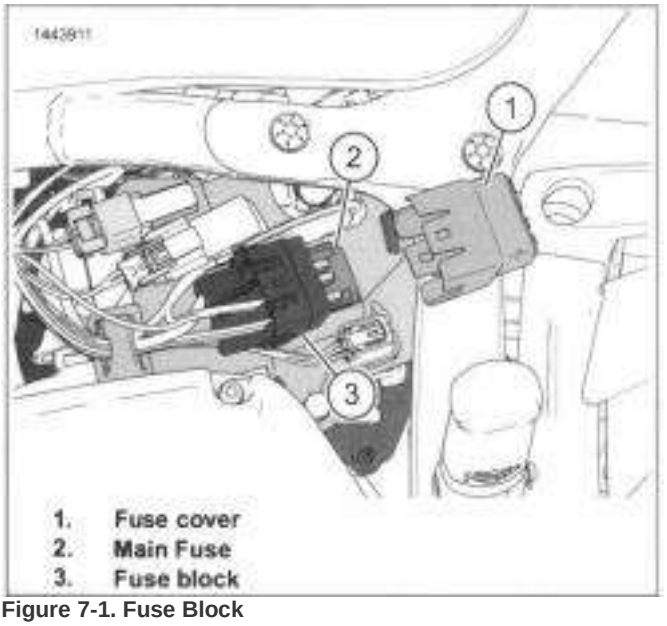


Figure 7-1. Fuse Block

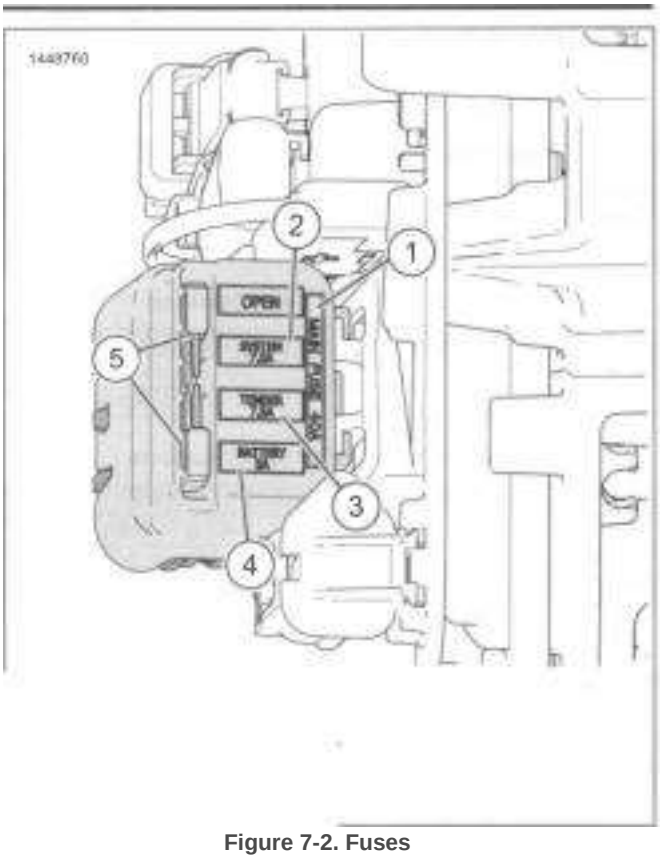


Figure 7-2. Fuses

COMPLETE

1. **Install left side cover. See LEFT SIDE COVER (Page 3-63).**

A 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)

2. **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. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Models with security:
   a. Verify that fob is present.
   b. Turn OFF/RUN switch to RUN.

A WARNING

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

3. See Figure 7-3. Remove fuse cover (1).
   a. Remove fuse block from ECM (Electronic control module) sub caddy.
   b. Remove fuse cover.
4. Remove main fuse (2).
5. Models with security: Turn ignition switch OFF.

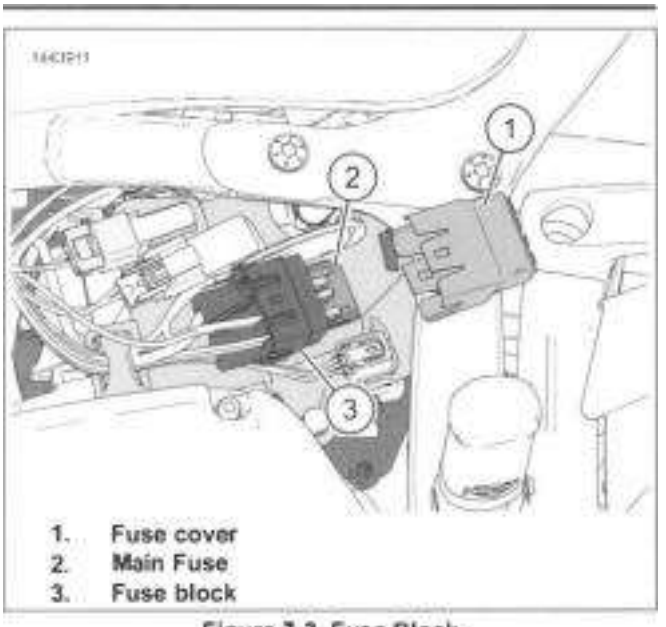
Install Main Fuse

1. See Figure 7-3. Install main fuse (2).
2. Install fuse cover (1).
3. Install fuse block onto ECM sub caddy.
4. Install left side cover. See LEFT SIDE COVER (Page 3-63).

A WARNING

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

5. Test affected circuits for proper operation.



1. Fuse cover
2. Main Fuse
3. Fuse block

Figure 7-3. Fuse Block

NEGATIVE BATTERY CABLE

FASTENER	TORQUE VALUE
Battery, negative cable, screw	60-70 in-lbs ! 6.8-7.9 N-m

A WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

Disconnect negative battery cable when there is a possibility of injury caused by starter engagement (engine rotation).

Disconnect Negative Battery Cable

1. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Models with security:
   a. Verify that fob is present.
   b. Turn OFF/RUN switch to RUN.
3. See Figure 7-4. Remove screw (1).
4. Disconnect negative battery cable (2).
5. Models with security: Turn ignition switch OFF.

Connect Negative Battery Cable

1. See Figure 7-4. Connect negative battery cable (2).

2. Install screw (1). Tighten

Torque: 60-70 in-lbs (6.8-7.9 N-m) ***Battery, negative cable, screw***

3. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

A 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 circuits for proper operation.

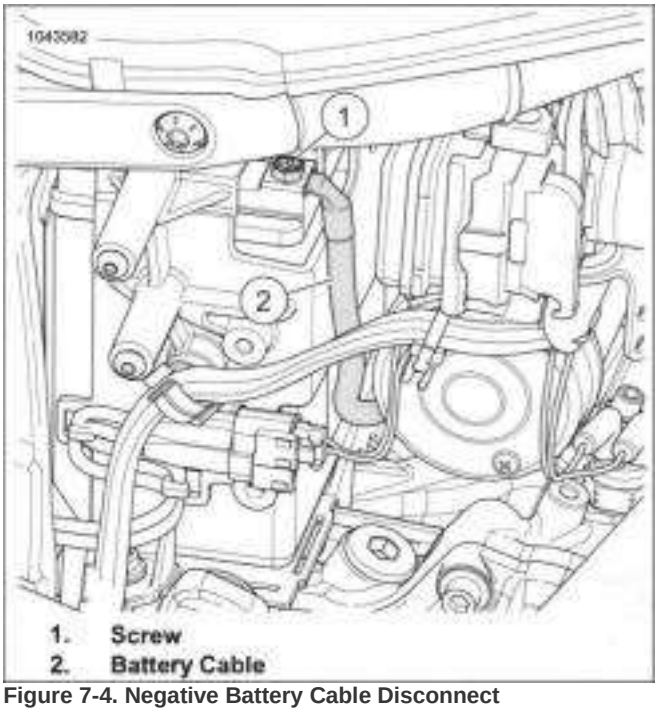


Figure 7-4. Negative Battery Cable Disconnect

PREPARE

A WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

1. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Remove battery. See INSPECT BATTERY (Page 2-43).
3. Models with side mounted shock adjuster: Remove screw securing shock adjustment knob to ABS bracket. See REAR SHOCK ABSORBER (Page 3-87).

REMOVE

1. See Figure 7-5. Remove positive cable (3).
2. Remove starter.
   a. Disconnect connector (2) from solenoid.
   b. Remove screws (1).
3. Discard O-ring (4).

INSTALL

FASTENER	TORQUE VALUE	
Solenoid nut	80-90 in-lbs	9-10.2 N-m
Starter, mounting screw	22-24 ft-lbs	29.8-32.5 N-m

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

1. See Figure 7-5. Install new O-ring (4).
   a. Lubricate new O-ring with clean engine oil.
   b. Install new O-ring (4).
2. Install starter.
   a. Apply thread-locker to screws (1).
      LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE) (99642-97)
   b. Install screws. Tighten.
      Torque: 22-24 ft-lbs (29.8-32.5 N-m) ***Starter, mounting screw***
   c. Connect connector (2) to solenoid.
   d. Install positive battery cable (3) to solenoid. Tighten.
      Torque: 80-90 in-lbs (9-10.2 N-m) ***Solenoid nut***

NOTE

Install battery cable at 3 o'clock position.

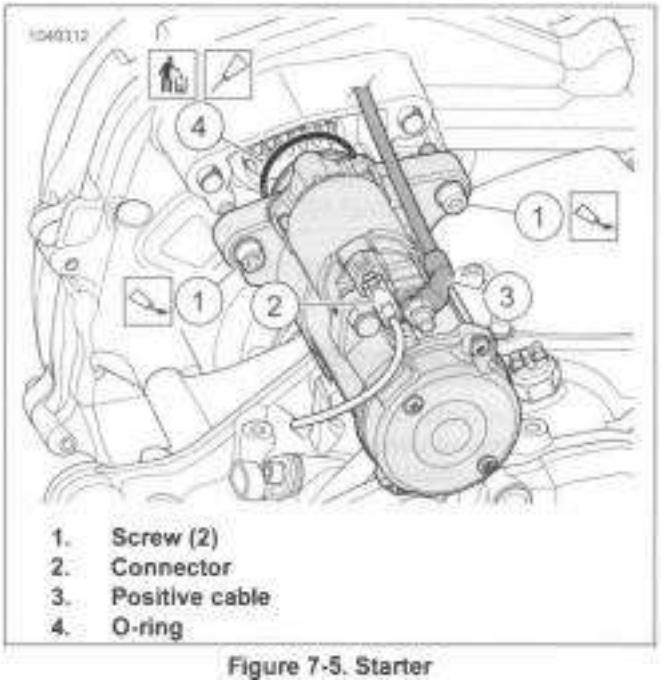


Figure 7-5. Starter

COMPLETE

1. Models with side mounted shock adjuster: Install screw securing shock adjustment knob to ABS bracket. See REAR SHOCK ABSORBER (Page 3-87).
2. Install battery. See INSPECT BATTERY (Page 2-43).
3. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove left side rider foot control assembly, if necessary. See LEFT FOOT CONTROLS (Page 3-128).
4. Drain primary chaincase. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
5. Remove primary cover. See PRIMARY CHAINCASE HOUSING (Page 5-27).
6. Remove compensator assembly. See DRIVE COMPONENTS (Page 5-18).

REMOVE

PART NUMBER	TOOL NAME
HD-52073	ALTERNATOR ROTOR REMOVER AND INSTALLER

1. See Figure 7-6. Disconnect connector (5) from voltage regulator.

A CAUTION

The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

2. Remove rotor (4).

   Special Tool: ALTERNATOR ROTOR REMOVER AND INSTALLER (HD-52073)

3. See Figure 7-7. Discard cable strap.

NOTE

The rubber molded stator connector (5) is not serviceable.

4. See Figure 7-6. Discard screws (2).
5. See Figure 7-8. Remove grommet (2).
   a. Use the end of an awl (1) or small screwdriver to move grommet (2) 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 the bore with needle nose pliers.

NOTE

Do not pull stator wiring unless the stator is being replaced.

6. Remove stator assembly.

INSTALL

PART NUMBER	TOOLNAME
HD-52073	ALTERNATOR ROTOR REMOVER AND INSTALLER

FASTENER	TORQUE VALUE	
Stator mounting screws	55-75 in-lbs	6.2-8.5 N-m

1. Install grommet.
   a. Lubricate parts with glass cleaner or isopropyl alcohol. Ribs of grommet must be clean and free of dirt and oily residue.
   b. Feed connector and harness through hole from inside crankcase.
   c. Push grommet into crankcase bore while carefully pulling on outside cable.
   d. Installation is complete when cable stop contacts casting and capped rib of grommet exits crankcase bore.

NOTE

Do not reuse stator mounting screws.

2. See Figure 7-6. Secure stator to crankcase using new screws (2). Tighten to:

   Torque: 55-75 in-lbs (6.2-8.5 N-m) ***Stator mounting screws***

3. See Figure 7-7. Secure stator wiring (2) to frame with new cable strap (1). Verify that stator wire does not contact the engine or frame.
4. Apply silicone based dielectric grease to connector.
5. Install connector to voltage regulator. Engage locking latch.

NOTE

Install rotor slowly to prevent damaging rotor magnets.

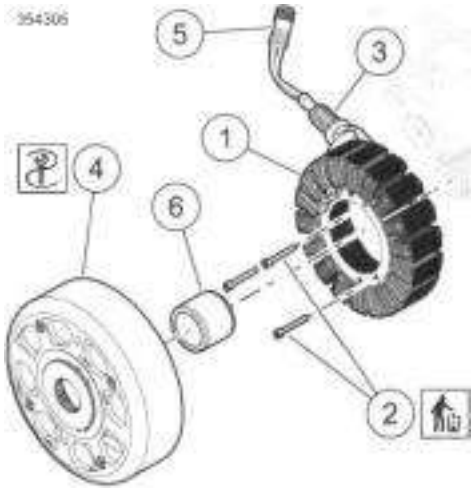
Damaged magnet fragments can damage the stator.

A CAUTION

The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

6. Install rotor.

   Special Tool: ALTERNATOR ROTOR REMOVER AND INSTALLER (HD-52073)



1. Stator
2. Screw (3)
3. Grommet
4. Rotor
5. Connector [47B]

Figure 7-6. Rotor and Stator

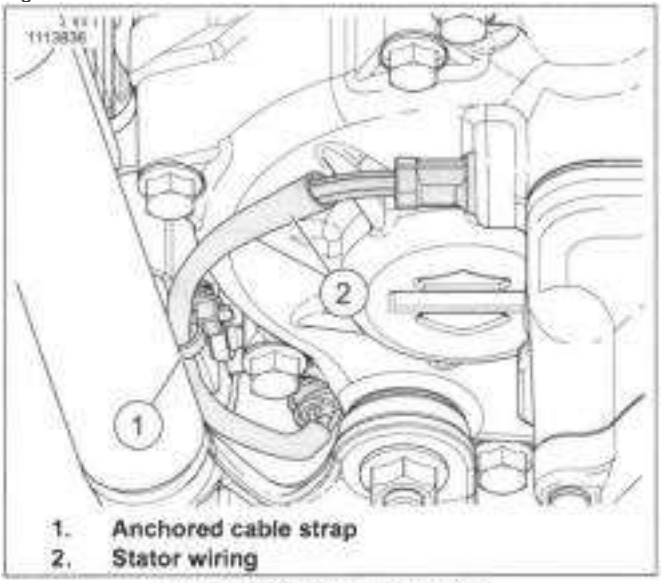


Figure 7-7. Harness Routing

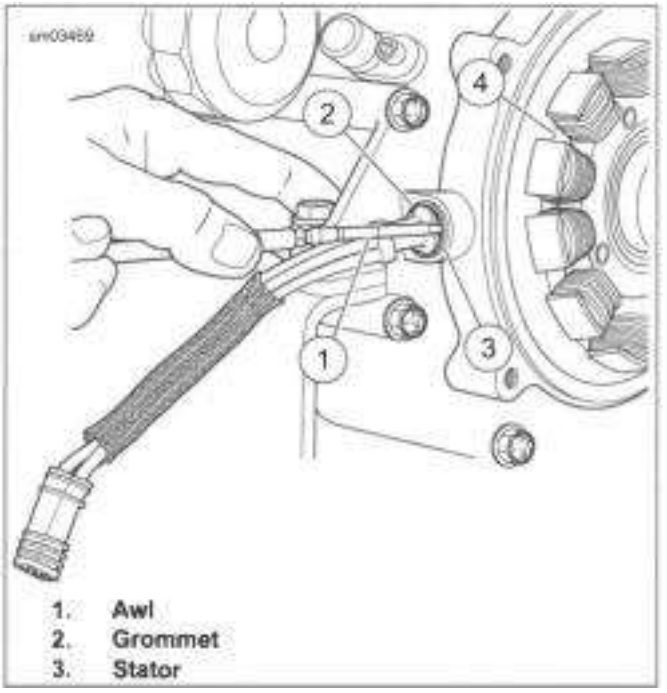


Figure 7-8. Remove Grommet From Crankcase (Typical)

COMPLETE

1. Install compensator assembly. See DRIVE COMPONENTS (Page 5-18).
2. Install primary cover. See PRIMARY CHAINCASE HOUSING (Page 5-27).
3. Fill primary chaincase. See REPLACE PRIMARY CHAINCASE LUBRICANT (Page 2-9).
4. Install left side rider foot control assembly. See LEFT FOOT CONTROLS (Page 3-128).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).
6. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove main fuse. See Refer to POWER DISCONNECT (Page 7-7)..

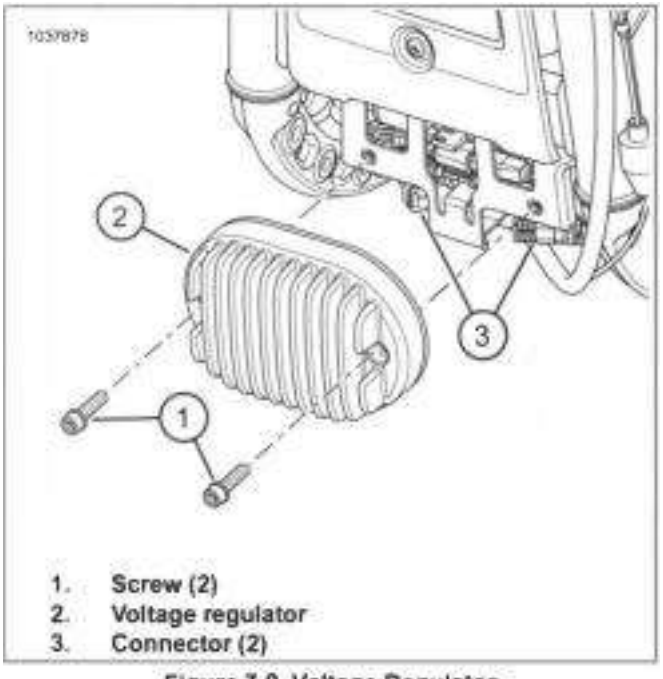
REMOVE

1. See Figure 7-9 Remove screws (1).
2. Remove voltage regulator (2).
3. Disconnect voltage regulator connectors (3).

INSTALL

FASTENER	TORQUE VALUE	
Voltage regulator bracket, screw	100-120 in-lbs	11.3-13.6 N-m
Voltage regulator, screw	106-124in-lbs	12-14 N-m

1. Install voltage regulator bracket, if removed.
   a. Install bracket.
   b. Install screws. Tighten.
      Torque: 100-120 in-lbs (11.3-13.6 N-m) ***Voltage regulator bracket, screw***
2. See Figure 7-9. Connect voltage regulator connectors (3).
3. Align voltage regulator (2) to mounting bracket.
4. Install screws (1). Tighten.
   Torque: 106-124 in-lbs (12-14 N-m) ***Voltage regulator. screw***



1. Screw (2)
2. Voltage regulator
3. Connector (2)

Figure 7-9. Voltage Regulator

COMPLETE

1. Install main fuse. See Refer to POWER DISCONNECT (Page 7-7)..
2. Install left side cover. See LEFT SIDE COVER (Page 3-63).

REMOVE

A WARNING

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

NOTE

- ***Remove cable end by pulling on rubber boot only. Do not pull on cable or damage can result.***
- ***Pull and twist simultaneously to remove rubber boot.***

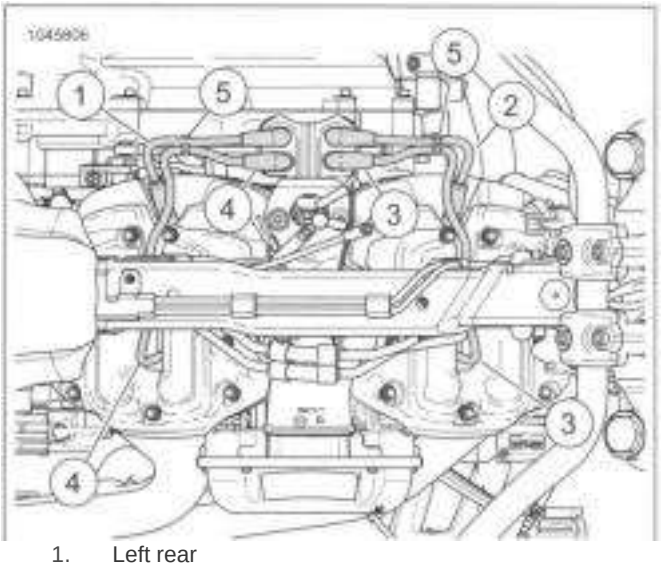
1. See Figure 7-10. Remove cables retainers (5).
2. Remove cables (1--4) from ignition coil.
3. Remove boot from spark plugs.
4. Remove cables.

INSTALL

1. See Figure 7-10. Route and connect long cables (3, 4) to right spark plugs.
2. Connect short cables (1, 2) to left spark plugs.
3. Connect cables to ignition coil.
4. ***NOTE***

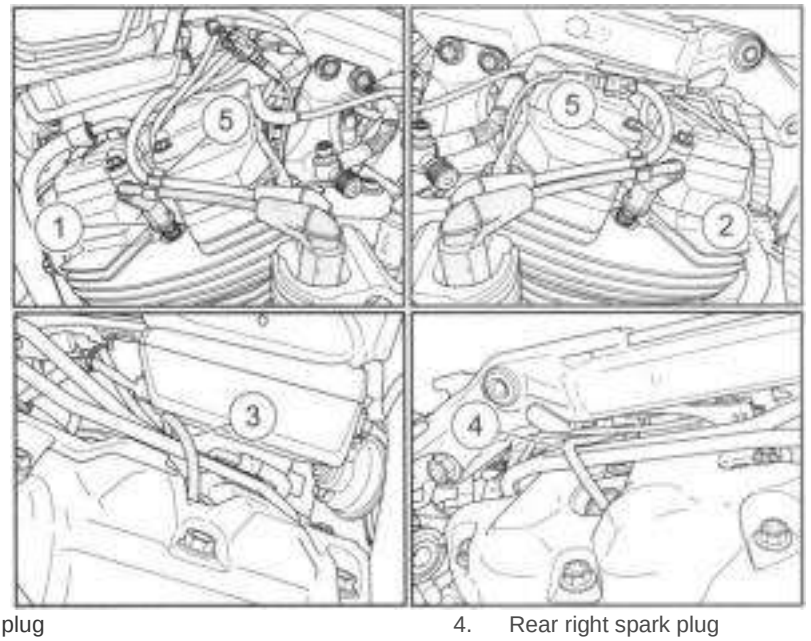
   Make sure spark plug cables do not make contact with rocker cover screw heads.

   See Figure 7-11. Install cables retainers (5).
5. Verify spark plug cable routing.



1. Left rear
2. Left front
3. Right front
4. Right rear
5. Cable retainer (2)

Figure 7-10. Spark Plug Cable



1. Front left spark plug
2. Rear left spark plug
3. Front right spark plug
4. Rear right spark plug
5. Cable retainer (2)

Figure 7-11. Spark Plug Cable Routing: (Fuel tank removed for clarity)

PREPARE

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

REMOVE

1. See Figure 7-12. Disconnect ignition coil connector (3).
2. See Figure 7-13. Disconnect spark plug cables (1)
3. Remove screw (2).
4. Remove ignition coil (3).

INSTALL

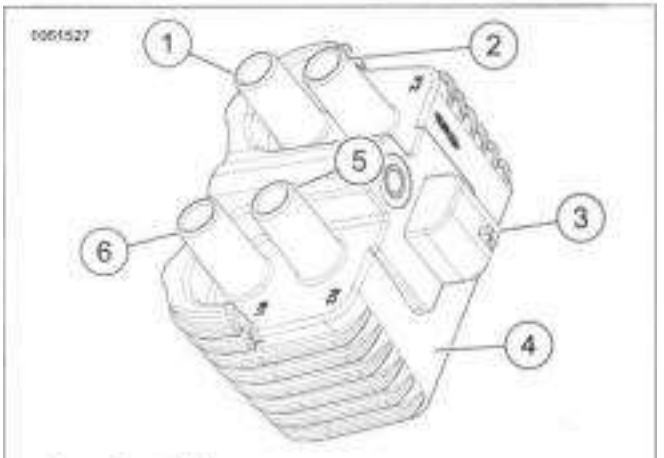
1. See Figure 7-13. Install ignition coil (3).

FASTENER	TORQUE VALUE	
Ignition coil, screw	11-14 ft-lbs	15--19 N-m

2. Install screw (2). Tighten.

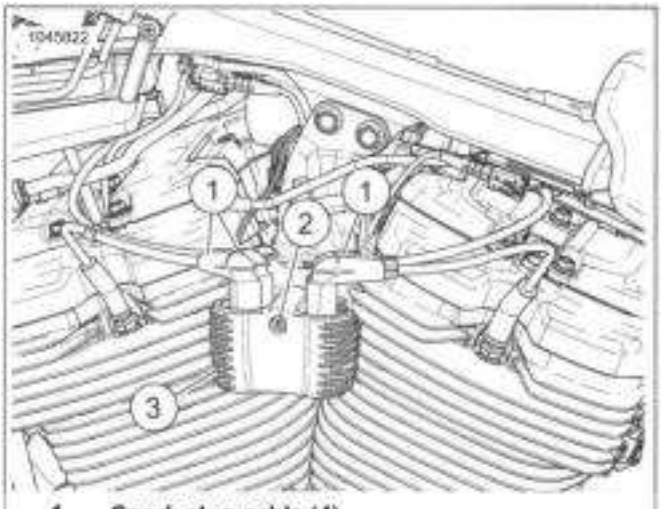
   Torque: 11-14 ft-lbs (15--19 N-m) ***Ignition coil, screw***

3. Connect spark plug cables (1). See SPARK PLUG CABLES (Page 7-13)
4. See Figure 7-12. Connect ignition coil connector.



1. Front left
2. Front right
3. Ignition coil connector
4. Ignition coil back
5. Rear right
6. Rear left

Figure 7-12. Ignition Coil Connector



1. Spark plug cable (4)
2. Screw
3. Ignition coil

Figure 7-13. Ignition Coil

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).

GENERAL

- The left and right hand control modules are non-repairable.
- The clutch switch and brake switch are hard-wired to the control modules.
- The clutch switch and brake switch are replaceable. This section details the proper method for soldering new switches. For removal and installation procedures, see Front Brake Switch Replacement (Page 7-22) or Clutch Switch Replacement (Page 7-19).

SOLDER PROCEDURE [11] [12]

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-39969	ULTRA TORCH UT-100
HD-41183	HEAT SHIELD ATTACHMENT

1. Push conduit back to better access wires and avoid damaging conduit with radiant heating device. Secure conduit with cable strap.
2. Strip 0.5 in (12.7 mm) of insulation off switch wires. Twist stripped ends of switch wires until all strands are tightly coiled.
3. Cut dual wall heat shrink tubing, supplied in repair kit into 1.0 in (25.4 mm) segments. Slide tubing over each wire of **new** switch assembly.
4. Splice existing and **new** switch wires, matching wire colors. Solder the spliced connections. For best results, splice one wire at a time.
5. Center the heat shrink tubing over the soldered splices.

A WARNING

Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)

12 Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.

■ Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.

- Always keep hands away from tool tip area and heat shrink attachment.

6. See Figure 7-14. Use ULTRA TORCH UT-100 (PART NUMBER: HD-39969) or ROBINAIR HEAT GUN (PART NUMBER: HD-25070) with HEAT SHIELD ATTACHMENT (PART NUMBER: HD-41183) or equivalent. Uniformly heat the heat shrink tubing to insulate and seal the soldered connections. Apply heat just until the meltable sealant exudes out both ends of tubing and assumes a smooth cylindrical appearance.
7. Inspect solder connection.
   a. Inspect the melted sealant for solder beads.
   b. Excess solder or heat can force out some solder with the melted sealant.
   c. Remove any solder found.
   d. Briefly heat the connection to reseal the tubing if solder beads were removed.
   e. Use less solder or reduce heating time or intensity when doing subsequent splices.

A 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)

Figure 7-14. Radiant Heating Devices

PREPARE

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Detach clutch control clamp from handlebar. See CLUTCH CONTROL (Page 3-91).

REMOVE

A WARNING

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

1. See Figure 7-15. Remove brake line clamp screws.
2. See Figure 7-16. Remove front electrical caddy from left side of frame.
3. Record locations of cable straps securing LHCM harness.
4. Discard cable straps securing LHCM harness.
5. Disconnect Left Hand Control Module (LHCM) connector (9).

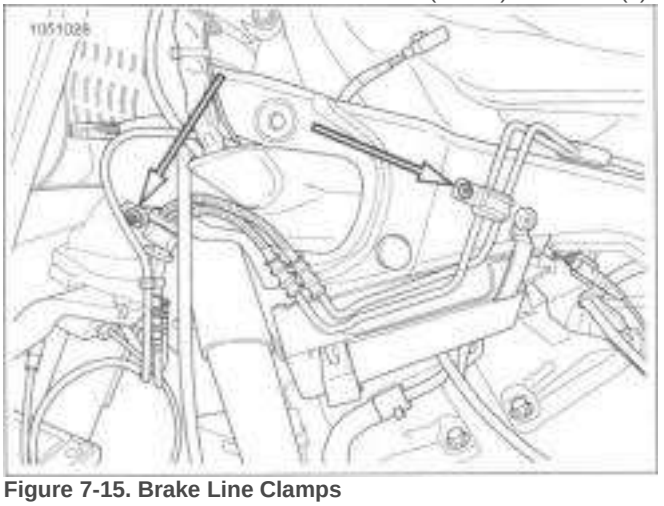
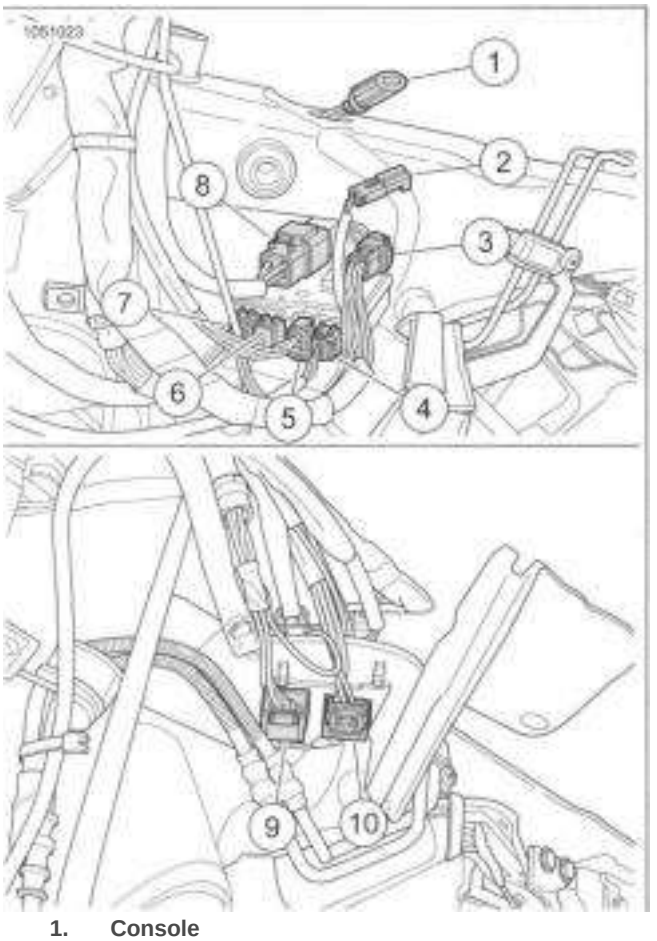


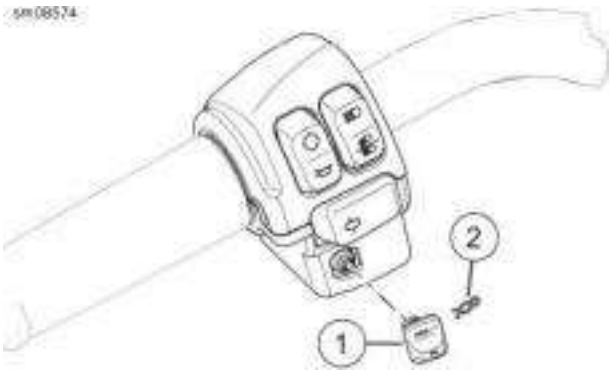
Figure 7-15. Brake Line Clamps



1. **Console**
2. **Heated hand grip**
3. **Twist grip**
4. **WSS**
5. **Right turn signal**
6. **Right Hand Control Module (RHCM) [22-2]**
7. **RHCM [22-1]**
8. **Headlamp**
9. **LHCM**
10. **Left turn signal**

Figure 7-16. Front Electrical Caddy Connectors

6. **Cruise Control Models:** See Figure 7-17. Remove clip (2) and switch (1).
7. Remove LHCM housing.
   a. Remove upper and lower switch housing screws.
   b. Remove upper switch housing.
   c. See Figure 7-18. Remove screws (3) and retainer (1).
   d. Remove clutch switch (2) and LHCM from lower switch housing.



1. Switch
2. Clip _____

Figure 7-17. Cruise Switch

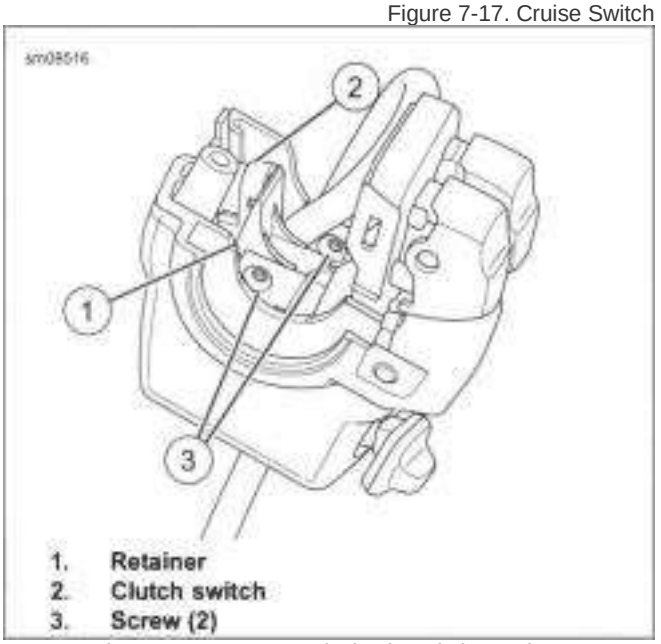


Figure 7-18. LHCM and Clutch Switch Retainer

8. ***NOTE***

Verify that there is enough wire to work at both ends of handlebar with scrap wire installed through handlebar.

Internally wired handlebars: Remove control module.

a. Attach scrap wire to control module connector.

b. Pull control module wiring through handlebar.

c. Disconnect scrap wire from old control module connector.

9. Externally wired handlebars: Remove control module.

a. Release module wiring from anchors.

INSTALL

FASTENER	TORQUE VALUE	
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m
Handlebar switch housing screws	35-45 in-lbs	4-5.1 N-m

1. Internally wired handlebars: Route LHCM wires through handlebar.

a. Attach scrap wire to new LHCM wiring.

b. Pull LHCM wiring through handlebar.

c. Remove scrap wire.

2. Externally wired handlebars: Attach using anchors.

3. See Figure 7-18. Place switch assembly into position on lower switch housing.

4. Install clutch switch (2).

5. ***NOTE***

- ***Handlebar-mounted turn singles: See Figure 7-19. Verify that turn signal wiring (1) is routed through opening (2).***
- ***Always tighten lower switch housing screw first, so that any gap between upper and lower housings is at front of switch.***

See Figure 7-18. Install retainer (1) with screws (3). Tighten.

Torque: 8-10 in-lbs (0.9-1.1 N-m) ***Handlebar switch assembly retainer screws***

6. See Figure 7-20. Install upper and lower switch housing. Align seam (2) with alignment mark (1).

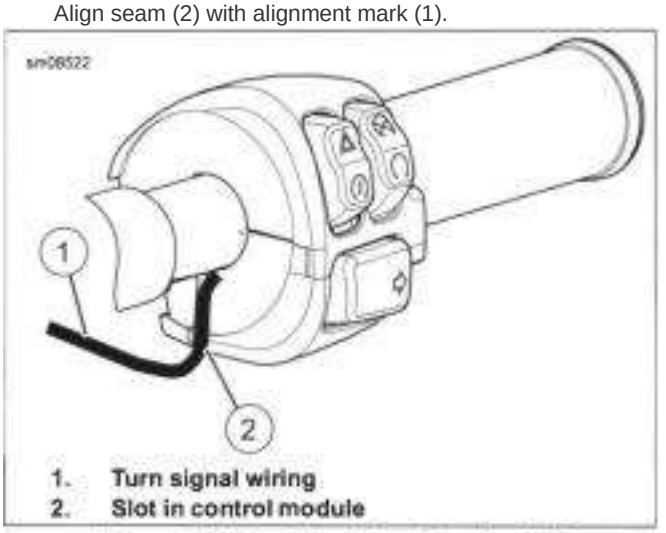


Figure 7-19. Turn Signal Routing (Typical)

sm08521

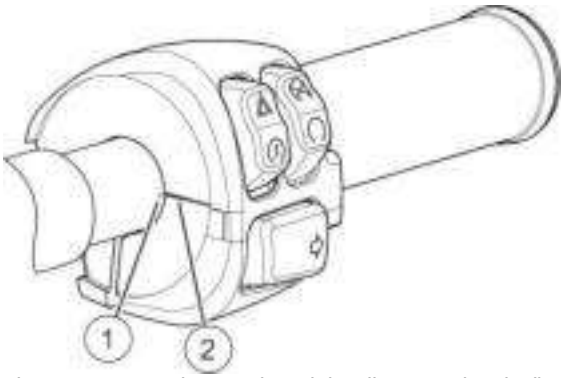


Figure 7-20. Hand Control Module Alignment (Typical)
1. Alignment mark
2. Control module seam

7. Install switch housing screws. Tighten.

   Torque: 35--45 in-lbs (4-5.1 N-m) ***Handlebar switch housing screws***

8. Cruise Control Models: See Figure 7-17. Install switch (1) and clip (2).

9. See Figure 7-16. Connect LHCM connector (9).

10. Place front electrical caddy into frame, and install frame plug.

11. See Figure 7-15. Install brake clamp screws. Tighten.

    Torque: 3^48 in-lbs (4.1-5.4 N-m) ***Brake line clamp screw***

12. Install new cable straps in locations recorded in Remove.

SWITCH CAPS

Rocker Switch Caps

1. Remove handlebar switch housing.

2. ***NOTE***
There are small pins and springs under some caps. Springs and pins could be lost during cap removal or installation.

   Remove switch cap.

   a. See Figure 7-21. Carefully pry switch cap up off pin (2) on side of switch.

   b. Pry switch cap up and away from pin (3) on opposite side.

3. Install switch cap.

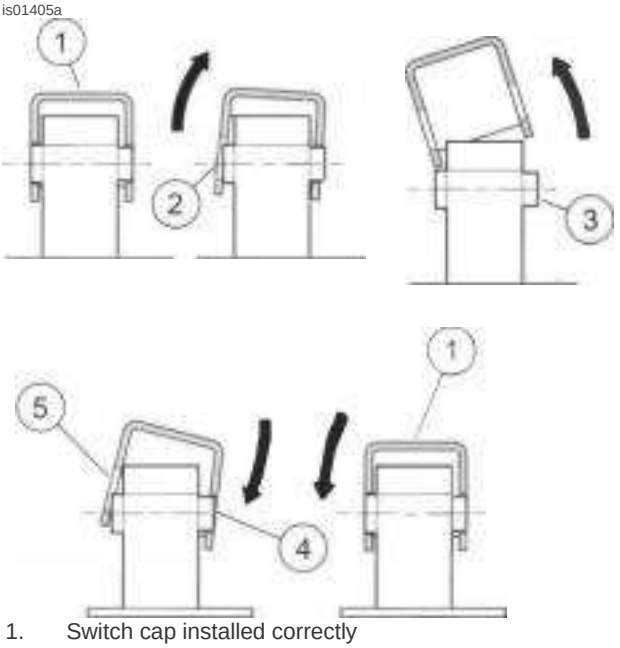
   a. Place cap onto switch, angling hole over pin (4).

   b. Carefully press switch cap down onto opposite pin (5) , rocking cap until snapping into place.

4. Verify proper operation.

5. Install switch housing.

is01405a



1. Switch cap installed correctly
2. Switch cap removal from shaft
3. Switch cap removal from pivot pin
4. Switch cap installation on to pivot pin
5. Switch cap installation onto shaft

Figure 7-21. Switch Cap Removal and Replacement

Cruise Switch Cap

1. See Figure 7-22. Remove cap.

   a. Remove clip (2).

   b. Remove cap (1).

2. Install cap.

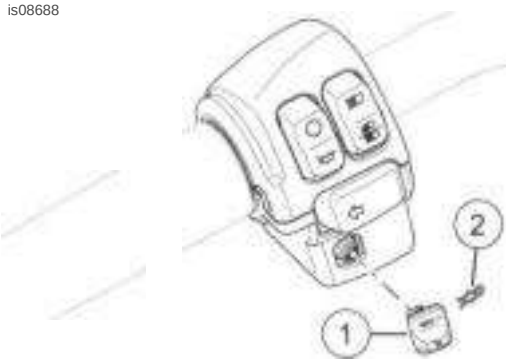
   a. Install cap.

   b. Install clip.

   c. Verify cap is secure.

Figure 7-22. Cruise Switch Cap

is08688



1. Cap
2. Clip

CLUTCH SWITCH REPLACEMENT

FASTENER	TORQUE VALUE	
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m

1. Remove upper switch housing cover. See Remove (Page 7-16).

2. See Figure 7-18. From inside the switch housing, remove screws (3) and retainer (1).

3. Remove clutch switch (2) from housing.

4. Cut wires flush at inoperative clutch switch.

5. If new clutch switch wires have terminals installed, cut wires at terminal end.

6. Remove 0.25-0.31 in (6.4-7.9 mm) of insulation from each wire end.

7. Cut two pieces of dual wall heat shrink tubing to 12.7 mm (0.5 in).

8. **Solder wires together and cover with heat shrink tubing.**

9. See Figure 7-18 . Install clutch switch (2) into housing. Install retainer (1) and screws (3). Tighten.

   Torque: 8-10 in-lbs (0.9-1.1 N-m) ***Handlebar switch assembly retainer screws***

10. Assemble left handlebar switch housing. See Install (Page 7-17).

COMPLETE

1. Install clutch controls on handlebar. See CLUTCH CONTROL (Page 3-91).

2. Install fuel tank. See FUEL TANK (Page 6-14).

3. Install main fuse. See POWER DISCONNECT (Page 7-7).

4. Install seat. See SEAT (Page 3-142).

PREPARE

1. Remove seat. See SEAT (Page 3-142).
2. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove fuel tank. See FUEL TANK (Page 6-14).
5. Detach front brake clamp from handlebar. See FRONT BRAKE MASTER CYLINDER (Page 3-35).

REMOVE

A WARNING

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

1. See Figure 7-23. Remove brake line clamp screws.
2. See Figure 7-24. Remove front electrical caddy.
3. Record locations of cable straps securing RHCM harness.
4. Discard cable straps securing RHCM harness.
5. Disconnect RHCM connectors (6 and 7).

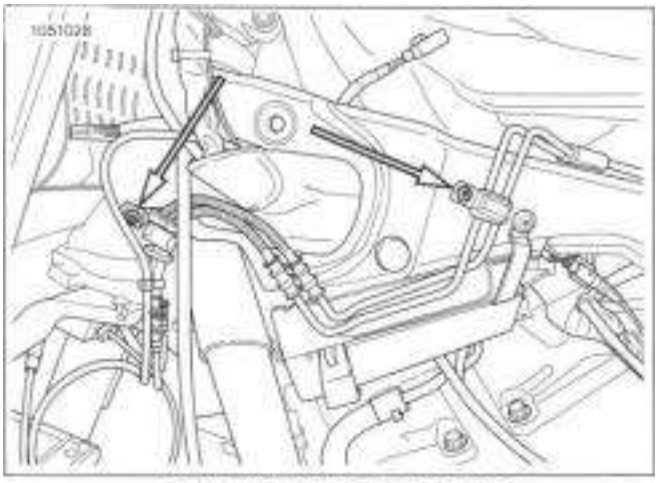


Figure 7-23. Brake Line Clamps

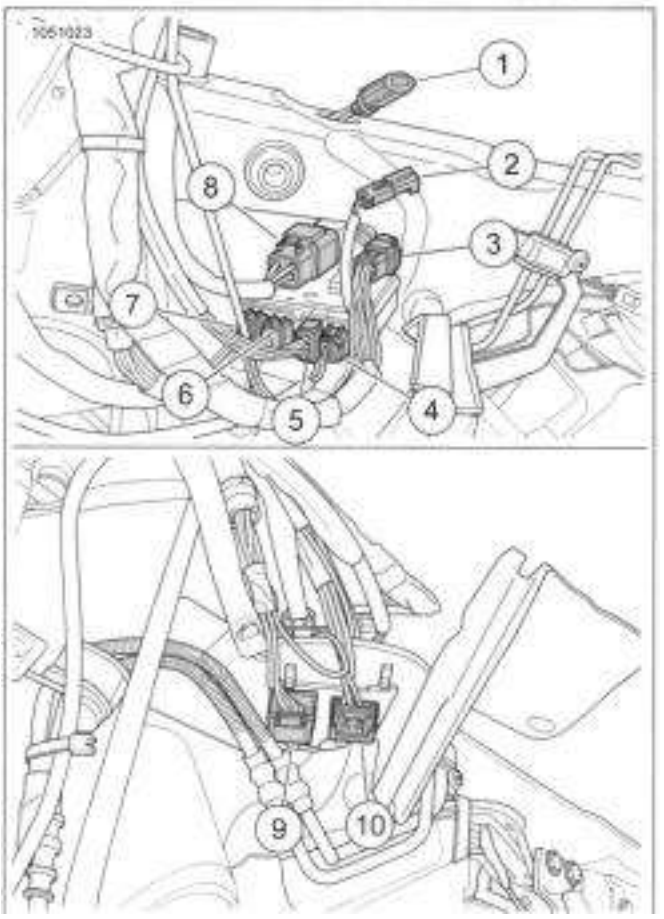


Figure 7-24. Front Electrical Caddy Connectors

1. Console
2. Heated hand grip
3. Twist grip
4. WSS
5. Right turn signal
6. RHCM [22-2]
7. RHCM [22-1]
8. Headlamp
9. LHCM
10. Left turn signal

6. Remove RHCM housing.
   a. Remove upper and lower switch housing screws.
   b. Remove upper switch housing.
   c. See Figure 7-25. Remove screws (3) and retainer (1).
   d. Remove brake switch (2) and RHCM from lower switch housing.

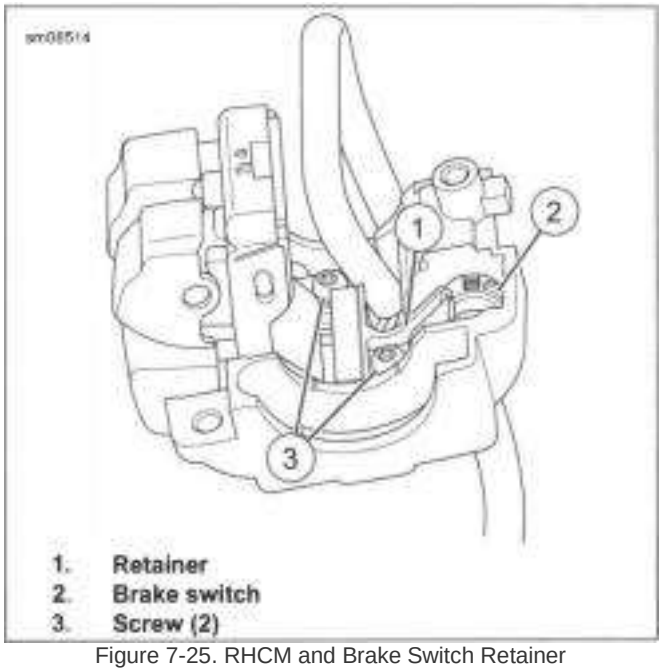


Figure 7-25. RHCM and Brake Switch Retainer

7. ***NOTE***

Verify that there is enough wire to work at both ends of handlebar with scrap wire installed through handlebar.

Internally wired handlebars: Remove control module.

a. Attach scrap wire to control module connector.

b. Pull control module wiring through handlebar.

c. Disconnect scrap wire from old control module connector.

8. Externally wired handlebars: Remove control module.

a. Release module wiring from anchors.

INSTALL

FASTENER	TORQUE VALUE	
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m
Handlebar switch housing screws	3^45 in-lbs	4-5.1 N-m

1. Internally wired handlebars: Route RHCM wires through handlebar.

a. Attach scrap wire to new RHCM wiring.

b. Pull RHCM wiring through handlebar.

c. Remove scrap wire.

2. Externally wired handlebars: Attach using anchors.

3. See Figure 7-25. Place switch assembly into position on lower switch housing. Install brake switch (2).

NOTE

Handlebar-mounted turn singles: See Figure 7-26. Verify that turn signal wiring (1) is routed through opening (2).

Always tighten lower switch housing screw first, so ***that any gap between upper and lower housings is at front of switch.***

See Figure 7-25. Install retainer (1) with screws (3). Tighten.

Torque: 8-10 in-lbs (0.9-1.1 N-m) ***Handlebar switch assembly retainer screws***

5. See Figure 7-27. Install upper and lower switch housing. Align seam (2) with alignment mark (1).

6. Install switch housing screws finger tight.

7. Set right hand grip end play.

a. Move RHCM assembly inboard to remove grip end play.

b. Move switch housing outboard to specification. 0.039-0.079 in (1-2 mm)

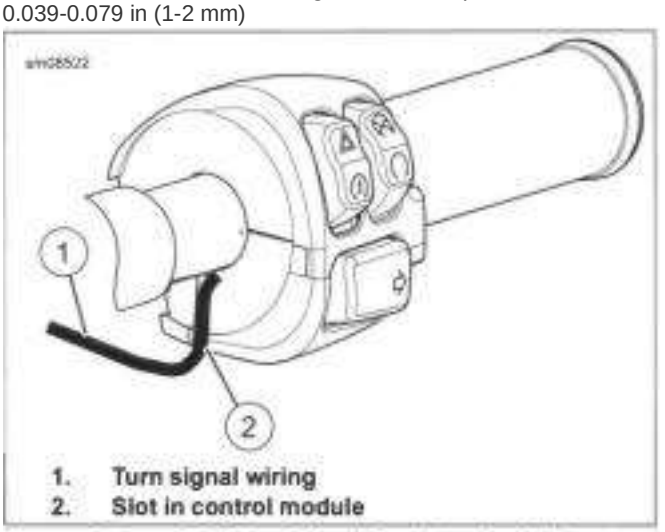


Figure 7-26. Turn Signal Routing (Typical)

sm08521

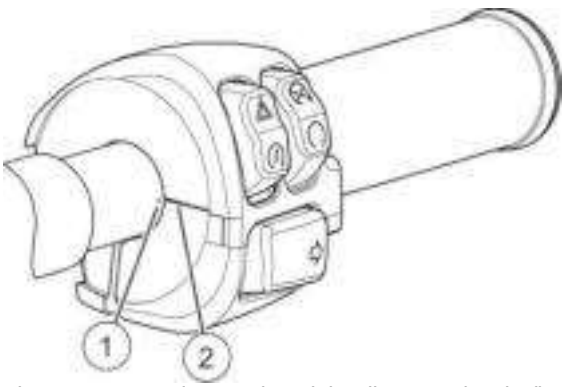


Figure 7-27. Hand Control Module Alignment (Typical)

1. Alignment mark
2. Control module seam

8. Install switch housing screws. Tighten.

   Torque: 3^45 **in-lbs** (4-5.1 N-m) ***Handlebar switch housing screws***

9. Verify right hand grip has slight inboard-outboard movement.

10. Verify right hand grip rotates and returns freely.

11. Place front electrical caddy into frame, and install frame plug.

12. See Figure 7-24. Connect RHCM connectors (6 and 7).

13. See Figure 7-23. Install brake line clamp screws. Tighten.

    Torque: 36--48 **in-lbs** (4.1-5.4 N-m) ***Brake line clamp screw***

14. Install **new** cable straps in locations recorded in REMOVE.

SWITCH CAPS

Rocker Switch Caps

1. Remove handlebar switch housing. See Remove (Page 7-16).

2. ***NOTE***

There are small pins and springs under some caps. Springs and pins could be lost during cap removal or installation.

   Remove switch cap.

   a. See Figure 7-28. Carefully pry switch cap up off pin (2) on side of switch.

   b. Pry switch cap up and away from pin (3) on opposite side.

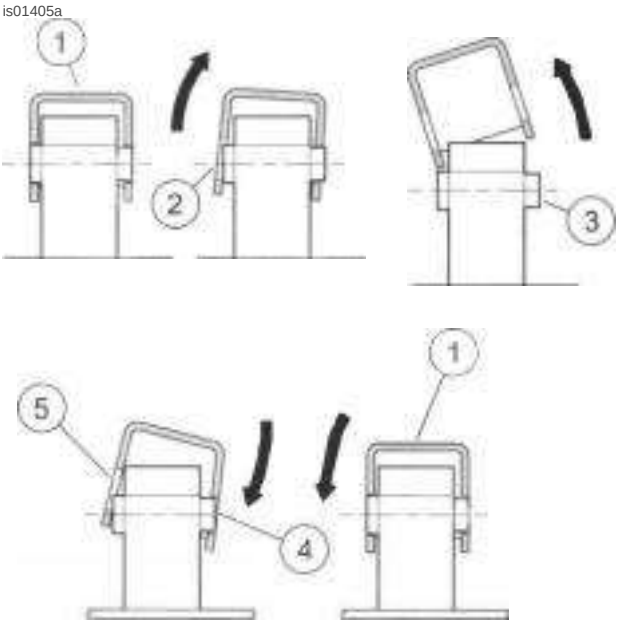
3. Install switch cap.

   a. Place cap onto switch, angling hole over pin (4).

   b. Carefully press switch cap down onto opposite pin (5), rocking cap until snapping into place.

4. Verify proper operation.

5. Install switch housing. See Install (Page 7-17).



1. Switch cap installed correctly
2. Switch cap removal from shaft
3. Switch cap removal from pivot pin
4. Switch cap installation on to pivot pin
5. Switch cap installation onto shaft

Figure 7-28. Switch Cap Removal and Replacement

FRONT BRAKE SWITCH REPLACEMENT

FASTENER	TORQUE VALUE	
Handlebar switch assembly retainer screws	8-**10in-lbs**	0.9—1.1 N-m

1. Remove upper switch housing cover. See Remove (Page 7-2o).

2. See Figure 7-25 . From inside the switch housing, remove screws (3) and retainer (1).

3. Remove brake switch (2) from housing.

4. Cut wires flush at inoperative brake switch.

5. If **new** brake switch wires have terminals installed, cut wires at terminal end.

6. Remove 6.4-7.9 mm (0.25-0.31 in) of insulation from each wire end.

7. Cut two pieces of dual wall heat shrink tubing to 12.7 mm (0.5 in).

8. Solder wires together and cover with heat shrink tubing. See HANDLEBAR CONTROL MODULES (Page 7-15).

9. See Figure 7-25. Install brake switch (2) into housing. Install retainer (1) and screws (3). Tighten.
   Torque: 8-10 **in-lbs** (0.9-1.1 N-m) ***Handlebar switch assembly retainer screws***

10. Assemble right handlebar switch housing. See Install (Page 7-21).

COMPLETE

1. Install front brake controls on handlebar. See FRONT BRAKE MASTER CYLINDER (Page 3-35).
2. Install fuel tank. Refer to FUEL TANK (Page 6-14).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).
4. Install seat. See SEAT (Page 3-142).

GENERAL

- Both the ECM and the Instrument Module (IM) retain the odometer value. If the IM is replaced, the new IM will display the odometer value stored in the ECM. The new IM will lock to the mileage stored in the ECM after 31 mi (50 km) have been accumulated. The trip B odometer will display the countdown mileage.
- If the IM is installed on another vehicle after it has locked to the ECM, the odometer will display "VIN ERR" on the new vehicle. If the IM is removed from the vehicle before the countdown reaches zero, it will reset the mileage countdown to 31 mi (50 km). This mileage countdown allows for a road test to verify that IM replacement was the proper repair.

PREPARE

1. FXLRS: Remove fairing. See FAIRING (Page 3-99).

2. Console mounted: Remove console. See CONSOLE (Page 6-8).

3. Handlebar mounted, rectangular: Remove upper clamp of handlebars. See HANDLEBAR (Page 3-109).

REMOVE AND INSTALL: HANDLEBAR MOUNT

Handlebar mounted, rectangular

FASTENER	TORQUE VALUE	
IM, rectangular, handlebar clamp screws	12-17 in-lbs	1.4-1.9 N-m
IM, round.cover screws	12-17 in-lbs	1.4-1.9 N-m

Remove

1. See Figure 7-29. Remove IM (2).
   a. Remove screws (3).
   b. Disconnect connector.
   c. Remove IM from upper clamp (1).

Install

1. ***NOTE***
Verify that gasket does not twist while installing IM

   See Figure 7-29. Install lM (2).
   a. Connect connector.
   b. Align IM in upper clamp (1).
   c. Install screws (3). Tighten.
   Torque: 12-17 in-lbs (1.4-1.9 N-m) ***IM, rectangular, handlebar clamp screws***

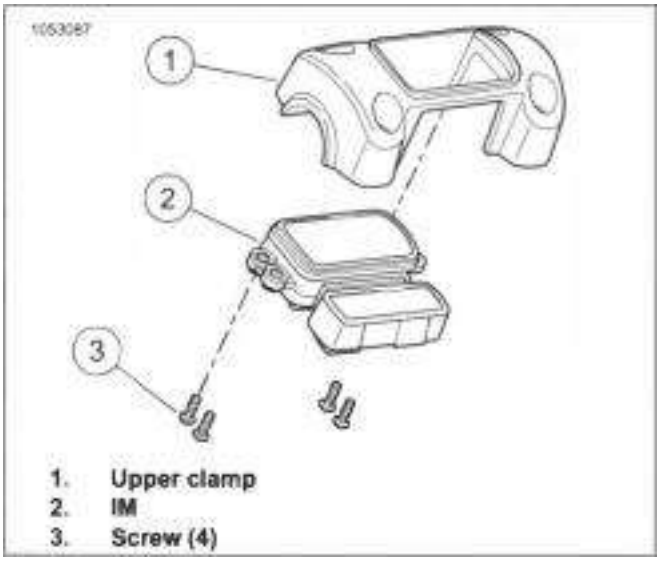


Figure 7-29. IM: Handlebar Mounted, Rectangular **Handlebar mounted, round**

Remove

1. See Figure 7-30. Remove IM (1).
   a. Remove screws (6).
   b. Remove cover (5).
   c. Disconnect connector (4).
   d. Remove IM (1) from handlebar clamp (3).
   e. Remove gasket (2).

Install

1. See Figure 7-30. Install lM (1).
   a. Install gasket (2).
   b. Install IM in handlebar clamp (3).
   c. Connect connector (4).
   d. Align cover (5) with IM.
   e. Install screws (6). Tighten.
   Torque: 12-17 in-lbs (1.4-1.9 N-m) ***IM, round.cover screws***

1. IM
2. Gasket
3. Handlebar bracket clamp
4. Connector
5. Cover
6. Screw (2)

Figure 7-30. IM: Handlebar Mounted, Round

REMOVE AND INSTALL: CONSOLE WITH PANEL

Remove

1. See Figure 7-31. Disconnect IM connector (2).

2. Remove back clamp from IM.

   a. Pry between the tabs (1) and back clamp (3).
   b. Raise and release back clamp from IM. Remove back clamp from IM.

3. Remove IM.

4. Remove gasket.

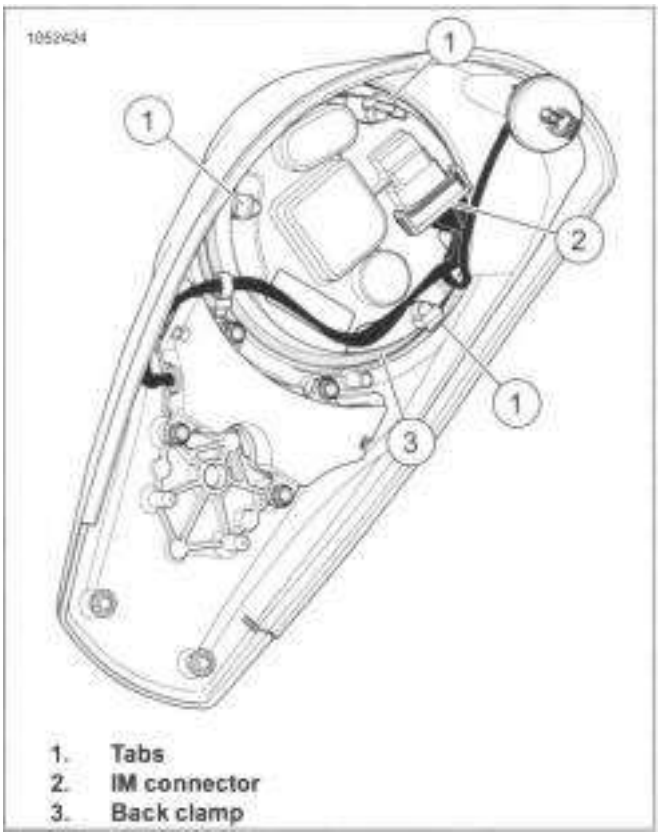


Figure 7-31. Console: FLHCS, FLFBS (Typical)

Install

1. Install gasket onto console.

2. Install IM.

NOTE
Verify that gasket does not twist while installing IM.

3. See Figure 7-31. Install back clamp.

   a. Press on back clamp (3) until three tabs (1) engage on back of IM.

4. Connect IM connector (2).

REMOVE AND INSTALL: CONSOLE WITHOUT PANEL

FASTENER	TORQUE VALUE	
Housing to IM screw	20-25 in-lbs	2.3-2.8 N-m

Remove

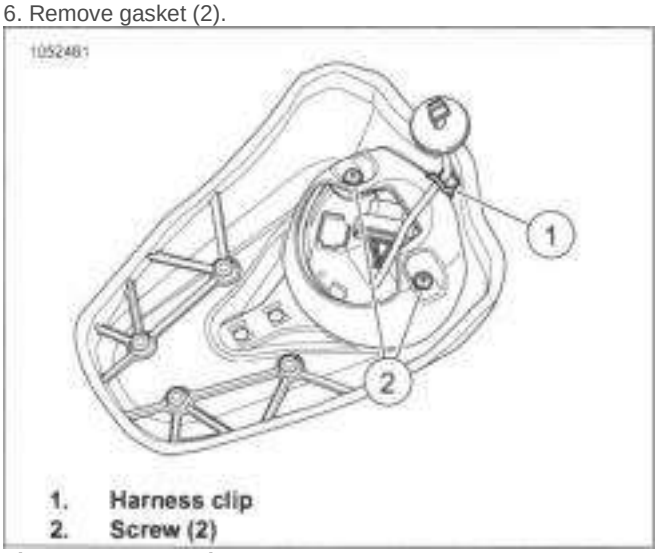
1. See Figure 7-32. Remove screws (2).

2. Remove harness from clip (1).

3. Remove IM assembly.

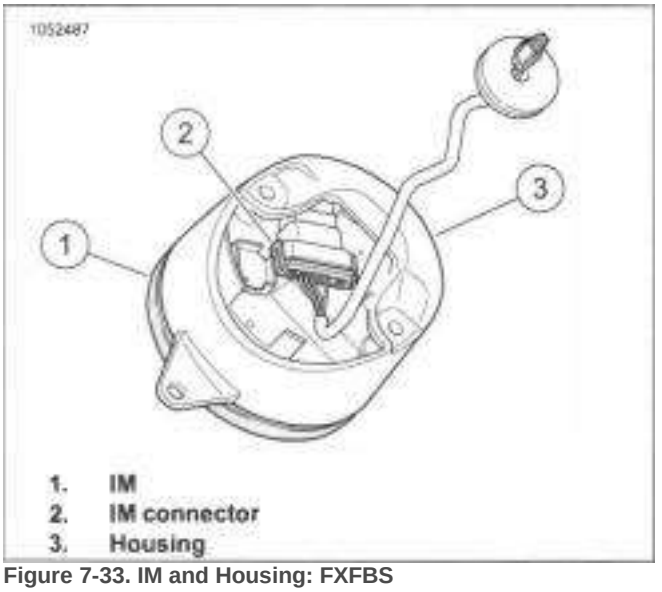
4. See Figure 7-33. Disconnect IM connector (2).
5. See Figure 7-34. Pushing from the bottom of the IM (1), separate the IM from the housing (3).

6. Remove gasket (2).



1. Harness clip
2. Screw (2)

Figure 7-32. Console: FXFBS



1. IM
2. IM connector
3. Housing

Figure 7-33. IM and Housing: FXFBS

1. ***NOTE***
Verify that gasket does not twist while installing IM.

   See Figure 7-34. Install gasket (2) onto IM (1).

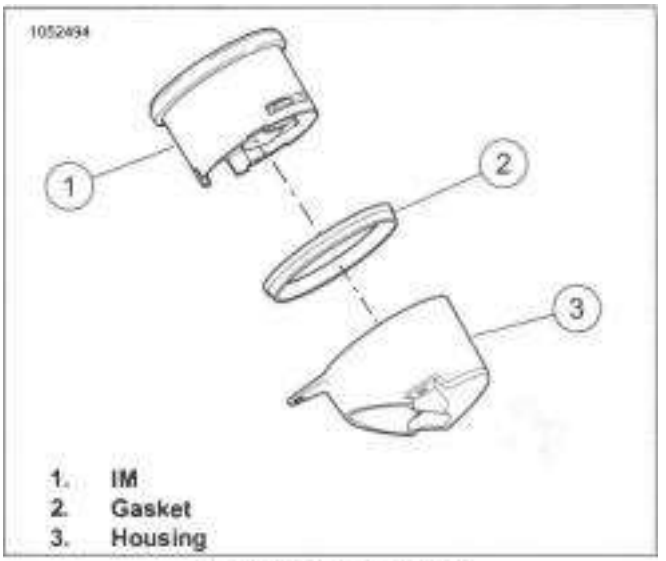
2. Install IM into housing (3).

3. See Figure 7-33. Connect IM connector (2).

4. Install IM assembly into console.

5. See Figure 7-32. Install screws (2). Tighten.
   Torque: 20-25 **in-lbs** (2.3-2.8 N-m) ***Housing to IM screw***

6. Install harness into clip (1).



1. IM
2. Gasket
3. Housing

Figure 7-34. IM: FXFBS

Install COMPLETE

1. **Handlebar mounted, rectangular:** Install upper clamp of handlebars. See HANDLEBAR (Page 3-109).

2. **Console mounted:** Install console. See CONSOLE (Page 6-8).

3. **FXLRS:** Install fairing. See Refer to FAIRING (Page 3-99)..

APPLICABILITY

2022 HERITAGE CLASSIC 114 (FLHCS)

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove seat. See SEAT (Page 3-142).
3. Remove console. See CONSOLE (Page 6-8).

REMOVE

1. See Figure 7-35. Disconnect connector (1).
2. Discard cable strap (2).
3. Remove screws (3).
4. Remove indicator lamp assembly (4).

INSTALL

FASTENER	TORQUE VALUE	
Indicator lamp, screw	20-30 in-lbs	2.26-3.39 N-m

1. Install indicator lamp assembly (4).

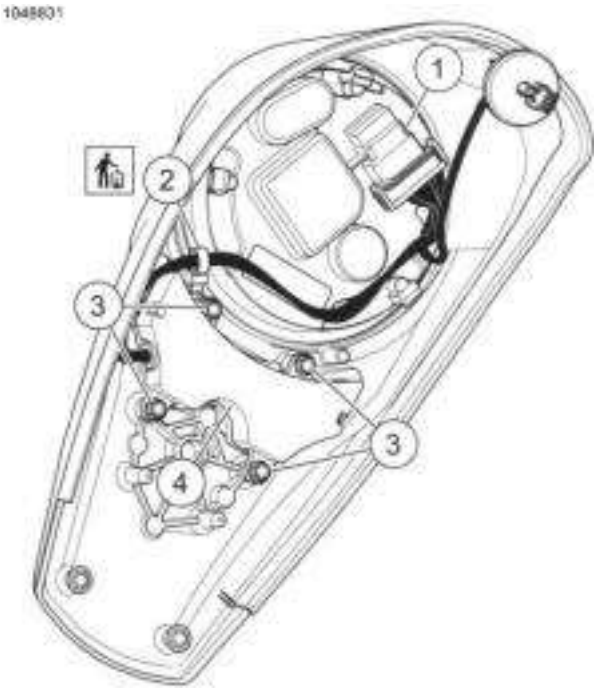


Figure 7-35. Indicator Lamps

1. **Connector**
2. **Cable strap**
3. **Screw (4)**
4. **Indicator lamp assembly**

COMPLETE

2. Install screws (3). Tighten.

   Torque: 20-30 **in-lbs** (2.26-3.39 N-m) ***Indicator lamp, screw***

3. Install **new** cable strap (2).
4. Connect connector (1).
1. Install console. See CONSOLE (Page 6-8).
2. Install seat. See SEAT (Page 3-142).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

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

REMOVE

1. See Figure 7-36. Disconnect connector (2).
2. Remove switch (1).

INSTALL

1. See Figure 7-36. Install switch (1). Tighten.

FASTENER	TORQUE VALUE	
Switch, Oil Pressure	13-17 ft-lbs	17-23 N-m

Torque: 13-17 ft-lbs (17-23 N-m) ***Switch, Oil Pressure***

2. Connect connector (2).

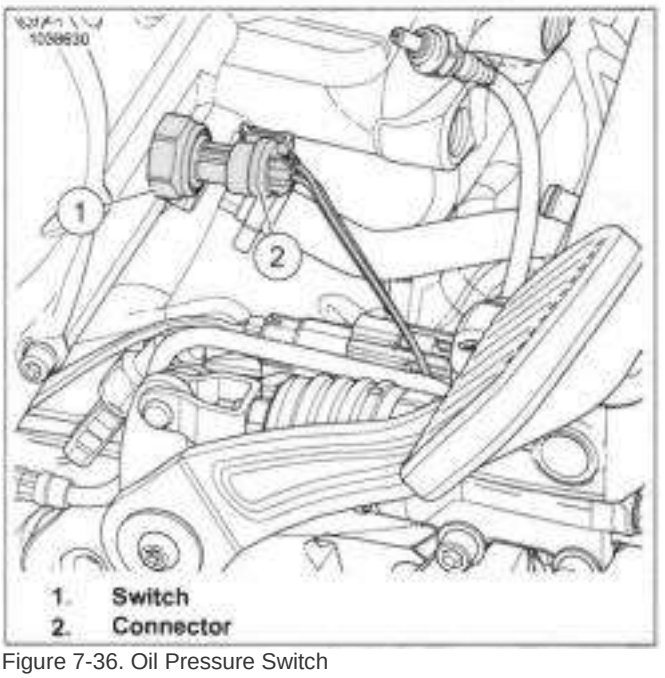


Figure 7-36. Oil Pressure Switch

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
4. Place transmission in NEUTRAL.

REMOVE

1. ***NOTE***
Wires are interchangeable.

See Figure 7-37. Disconnect wires (1) from switch (2).

2. Remove switch and O-ring.

INSTALL

FASTENER	TORQUE VALUE	
Switch, Neutral Indicator	126-180 in-lbs	13.6-20.3 N-m

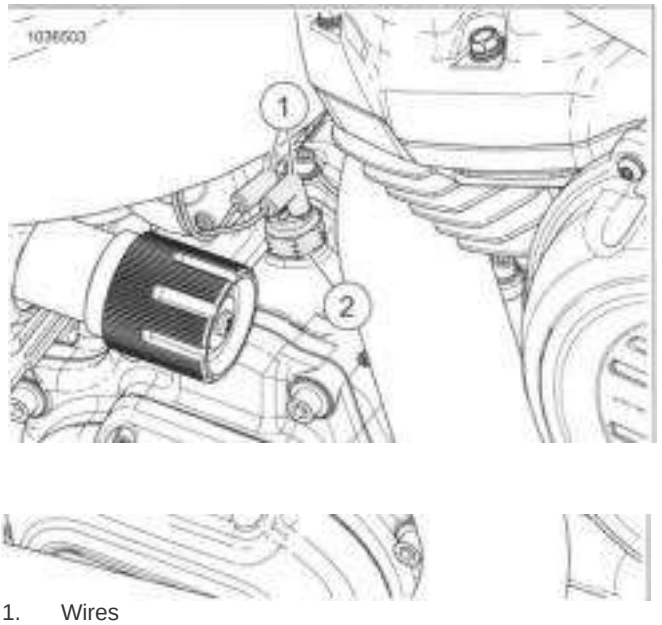
1. Verify transmission is in NEUTRAL.

2. See Figure 7-37. Install new switch (2) and O-ring. Tighten.

Torque: 126-180 in-lbs (13.6-20.3 N-m) ***Switch, Neutral Indicator***

3. ***NOTE Wires are interchangeable.***

Connect harness wires (1).



1. Wires
2. Switch

Figure 7-37. Neutral Indicator Switch

COMPLETE

1. Install right side cover. See Refer to RIGHT SIDE COVER (Page 3-64)..
2. Install main fuse. See POWER DISCONNECT (Page 7-7).
3. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

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

REMOVE

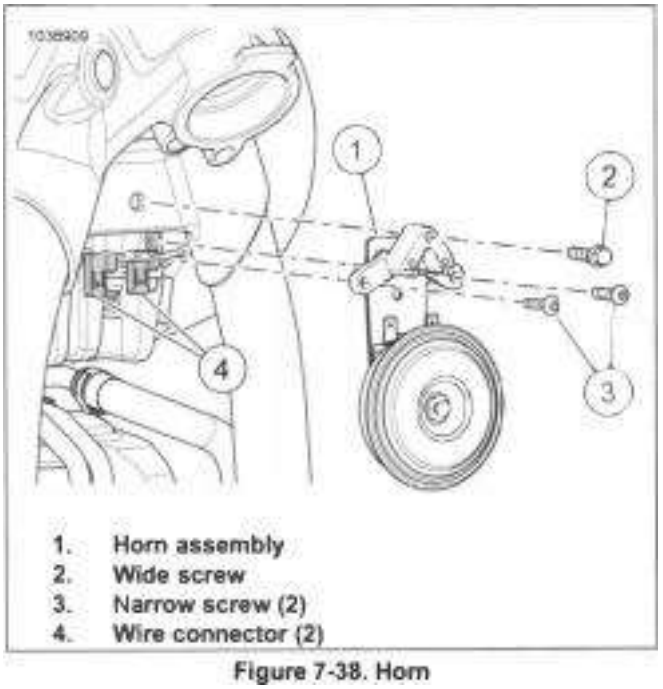
1. See Figure 7-38. Remove horn.
   a. Remove narrow screws (3).
   b. Remove wide screw (2).
   c. Remove horn assembly (1).
   d. Disconnect wire connectors (4).

INSTALL

   a. Connect wire connectors (4).

FASTENER	TORQUE VALUE	
Horn, Narrow Mounting Screw	27-33 in-lbs	3-3.7 N-m
Horn, Wide Mounting Screw	84-108 in-lbs	9.5-12.2 N-m

1. See Figure 7-38. Install horn.
   b. Position horn assembly (1).
   c. Install wide screw (2). Tighten.
      Torque: 84-108 in-lbs (9.5-12.2 N-m) ***Horn, Wide Mounting Screw***
   d. Install narrow screws (3). Tighten.
      Torque: 27-33 in-lbs (3-3.7 N-m) ***Horn, Narrow Mounting Screw***



1. Horn assembly
2. Wide screw
3. Narrow screw (2)
4. Wire connector (2)

Figure 7-38. Horn

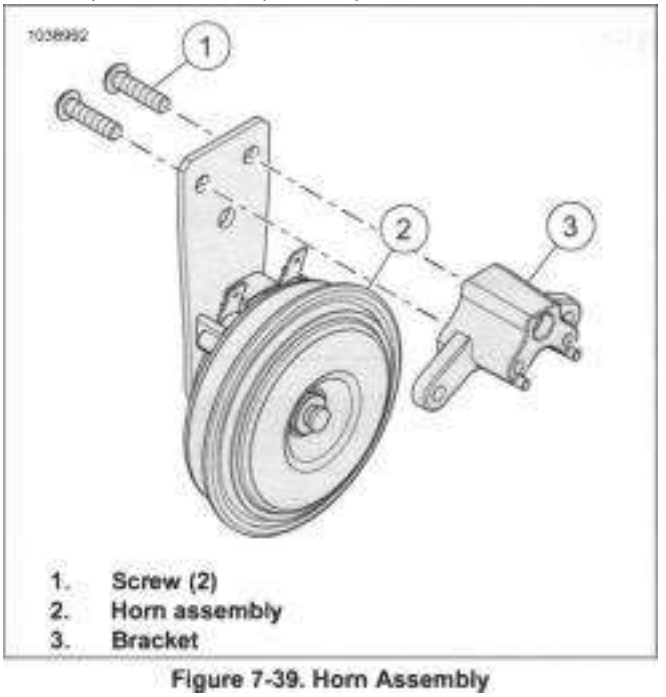
DISASSEMBLE

1. See Figure 7-39. Remove screws (1) and bracket (3).

ASSEMBLE

FASTENER	TORQUE VALUE	
Horn, Bracket Screw	62-71 in-lbs	7--8 N-m

1. See Figure 7-39. Install screws (1) and bracket (3). Tighten.
   Torque: 62-71 in-lbs (7--8 N-m) ***Horn, Bracket Screw***



1. Screw (2)
2. Horn assembly
3. Bracket

Figure 7-39. Horn Assembly

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).

BULB REPLACEMENT: STANDARD ROUND

FASTENER	TORQUE VALUE	
Headlamp bezel screw	9-14 in-lbs	1-1.6 N-m
Headlamp isolator bracket screw	6.5-8.0 ft-lbs	8.8-10.8 N-m
Headlamp retainer screw	18-22 in-lbs	2-2.5 N-m

Prepare

1. Remove headlamp housing. See Remove And Install: Standard Round in this section.

Remove

1. See Figure 7-40. Remove screw and nut (1).
2. Remove bezel (2).
3. 7-inch headlamp only: Remove screws (10) and retainer (9) .
4. 5-3/4 headlamp only: Remove spacer (8).
5. Remove headlamp (3) from housing (7).
6. Disconnect connector (6).
7. Remove screws (5).
8. Remove isolator bracket (4).

Install

1. See Figure 7-40. Position isolator bracket (4) on headlamp (3).
2. Install screws (5). Tighten.

   Torque: 6.5-8.0 ft-lbs (8.8-10.8 N-m) ***Headlamp isolator bracket screw***

3. ***NOTE Use alignment tabs on components.***

   5-3/4 inch headlamp only: Install spacer (8) on headlamp (3).
4. Connect connector (6).
5. ***NOTE Use alignment tabs on components.***

   Install headlamp (3) into housing (7).
6. 7-inch headlamp only: Install retainer (9) and screws (10) . Tighten.

   Torque: 18-22 in-lbs (2-2.5 N-m) ***Headlamp retainerscrew***
7. Install bezel (2).
8. Install screw and nut (1). Tighten.

   Torque: 9-14 in-lbs (1-1.6 N-m) ***Headlamp bezel screw***

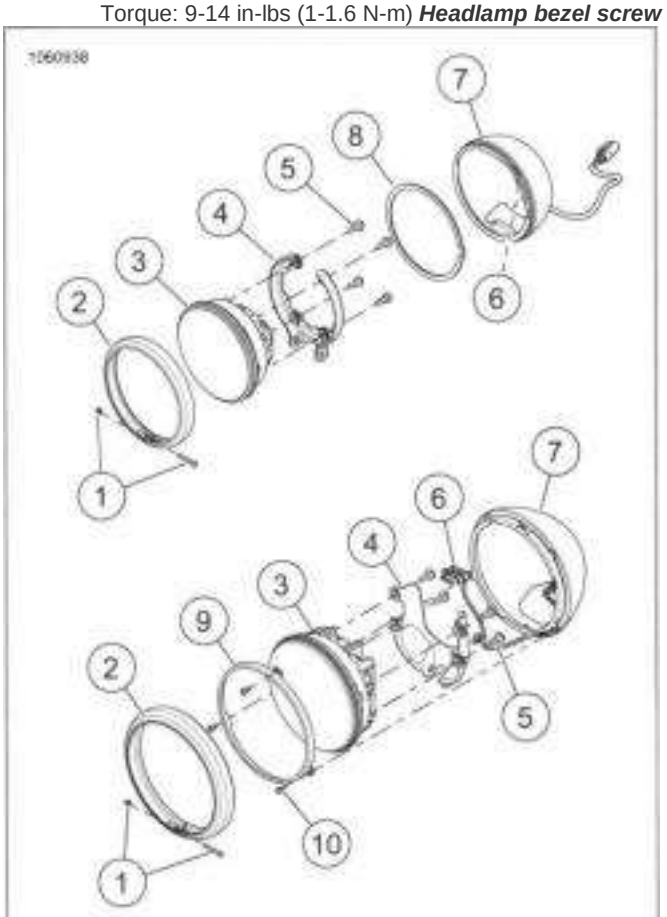


Figure 7-40. Round Headlamp

Complete

1. Install headlamp housing. See Remove And Install: Standard Round in this section.

BULB REPLACEMENT: LED ROUND

APPLICABILITY	
0	• 2022 LOW RIDERS (FXLRS)

FASTENER	TORQUE VALUE	
Headlamp to headlamp bracket screw	98-120 in-lbs	10.8-13.6 N-m

Remove

1. Remove fairing. See FAIRING (Page 3-99).
2. See Figure 7-41. Disconnect headlamp connector (1).
3. See Figure 7-42. Remove screws (2).
4. Remove headlamp (1).

Install

1. See Figure 7-42. Position headlamp (1).
2. Install screws (2). Tighten.

   Torque: 96-120 in-lbs (10.8-13.6 N-m) ***Headlamp to headlamp bracket screw***
3. See Figure 7-41. Connect headlamp connector (1).
4. Install fairing. See FAIRING (Page 3-99).

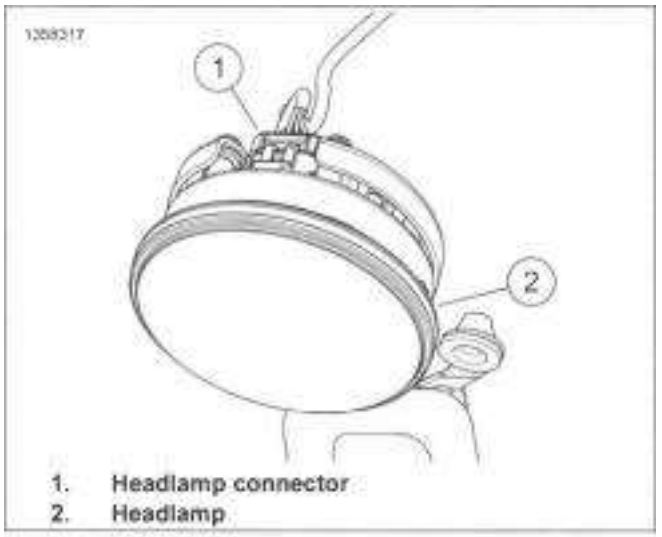


Figure 7-41. Headlamp Connector

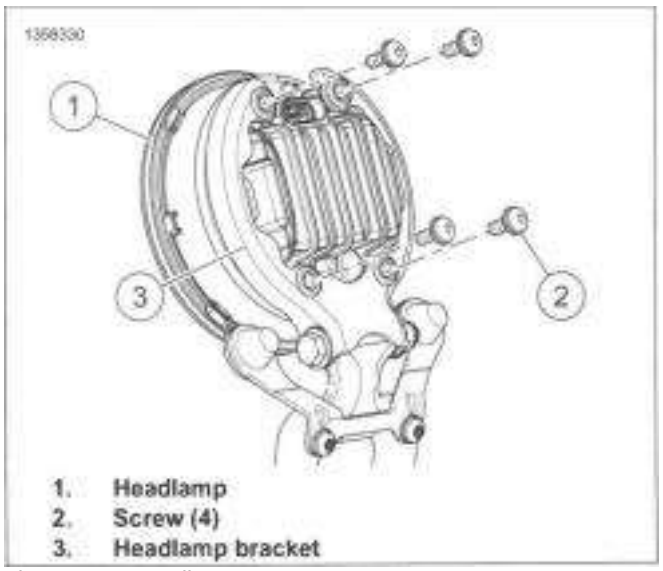


Figure 7-42. Headlamp Screws

BULB REPLACEMENT: NACELLE MOUNTED _____ _ _

FASTENER	TORQUE VALUE	
Headlamp, nacelle mounted, bezel screw	25-32 in-lbs	2.8-3.6 N-m
Headlamp, nacelle mounted, retainer screw	17-25 in-lbs	1.9-2.8 N'm

Remove

1. See Figure 7-43. Remove screw (1).
2. ***NOTE***

   Bezel is under pressure from isolators (3), disassemble slowly.

   Remove bezel (2).
3. Remove screws (5).
4. Remove retainer (6).
5. Remove headlamp (7).
6. Disconnect connector (10).

Install

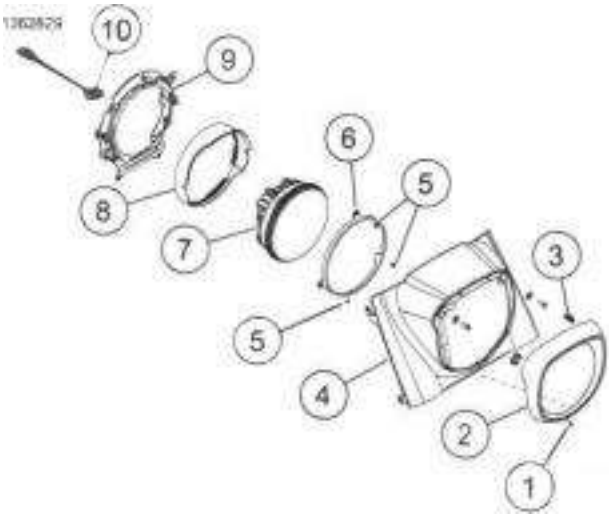
1. ***NOTE***

   Check gasket (8) is properly installed on retainer.

   See Figure 7-43. Install retainer (6) to headlamp (7).
2. Connect connector (10).
3. Install headlamp (7).
4. Install screws (5). Tighten.

   Torque: 17-25 in-lbs (1.9--2.8 N-m) ***Headlamp, nacelle mounted, retainer screw***
5. Install bezel (2). Insert gasket (8) behind lip of bezel.
6. Install screw (1). Tighten.

   Torque: 25-32 in-lbs (2.8-3.6 N-m) ***Headlamp, nacelle mounted, bezel screw***



1. Screw
2. Bezel
3. Isolator (2)
4. Nacelle
5. Screw (3)
6. Retainer
7. Headlamp
8. Gasket
9. Mounting ring
10. Connector

Figure 7-43. Nacelle Mounted Headlamp

BULB REPLACEMENT: OBLONG

FASTENER	TORQUE VALUE	
Headlamp (Oblong) mounting screw	10-13 ft-lbs	13.5--17.6 N-m

Remove

1. See Figure 7-44. Remove screw (3).
2. Remove headlamp (1).
3. Disconnect connector (2).

Install

1. See Figure 7-44. Connect connector (2).
2. Install headlamp (1).
3. Install screw (3). Tighten.
   Torque: 10-13 ft-lbs (13.5--17.6 N-m) ***Headlamp (Oblong) mounting screw***

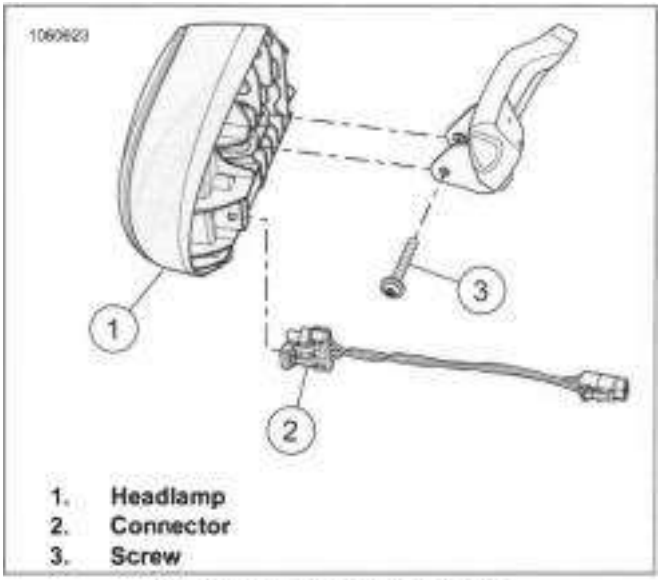


Figure 7-44. Oblong Headlamp

BULB REPLACEMENT: HORIZONTAL

See Remove and Install: Horizontal (Page 7-37) for bulb replacement.

BULB REPLACEMENT: FIXED FAIRING

See Remove and Install: Fixed Fairing (Page 7-38) for bulb replacement.

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove associated parts:

- Round headlamp: Remove fuel tank. See FUEL TANK (Page 6-14).
- Model with windshield: Remove windshield. See WINDSHIELD (Page 3-106).
- Model with nacelle: Remove nacelle. See HEADLAMP NACELLE (Page 3-96).
- Model with steered fairing: Remove fairing. See FAIRING (Page 3-99).

REMOVE AND INSTALL: STANDARD ROUND

FASTENER	TORQUE VALUE	
Headlamp, round, locknut	27-32 ft-lbs	36.6-43.3 N-m

Remove

1. Disconnect headlamp connector. See FRONT ELECTRICAL CADDY (Page 7-87).
2. See Figure 7-45. Remove locknut (6) and flat washer (5).
3. Remove screw (2) and flat washer (3).
4. Remove headlamp (1).

1. **5 *314* or 7-inch headlamp**
2. **Screw**
3. **Washer**
4. **Mounting bracket**
5. **Washer**
6. **Locknut**

Figure 7-45. Round Headlamp (Typical)

Install

1. See Figure 7-45. Install headlamp (1).
2. Install screw (2) and flat washer (3).
3. Install flat washer (5) and locknut (6). Tighten.

   Torque: 27-32 ft-lbs (36.6--43.3 N-m) ***Headlamp, round, locknut***
4. Connect headlamp connector. See FRONT ELECTRICAL CADDY (Page 7-87).

REMOVE AND INSTALL: LED ROUND

APPLICABILITY		
j^j • 2022 LOW RIDER S (FXLRS)		
FASTENER	**TORQUE VALUE**	
Headlamp bracket to headlamp mounting bracket bolt	27-32 ft-lbs	36.6--43 N-m
Headlamp mounting bracket to lower fork bracket	20-25 ft-lbs	27.1-33.9 N-m
Lower fairing bracket screw	96-120 **in-lbs**	10.8-13.6 N-m

1. See Figure 7-47. Position headlamp assembly (1).

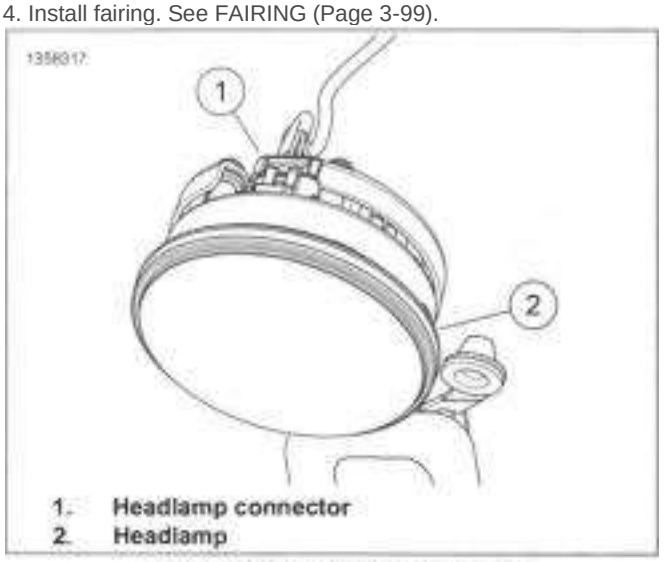
Remove

1. Remove fairing. See FAIRING (Page 3-99).
2. See Figure 7-46. Disconnect headlamp connector (1).
3. See Figure 7-47. Remove screws (2).
4. Remove headlamp assembly (1).

Install

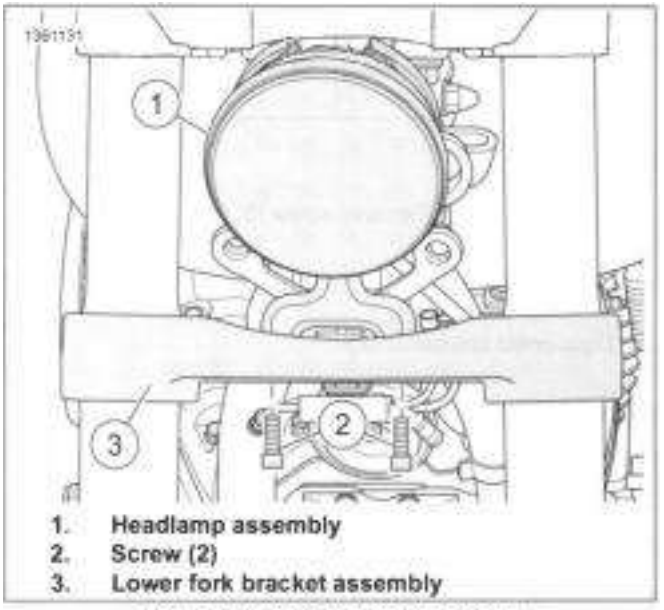
2. Install screws (2). Tighten.

   Torque: 20-25 ft-lbs (27.1-33.9 N-m) ***Headlamp mounting bracket to lower fork bracket***
3. Connect headlamp connector (1).
4. Install fairing. See FAIRING (Page 3-99).



1. **Headlamp connector**
2. **Headlamp**

Figure 7-46. Headlamp Connector



1. **Headlamp assembly**
2. **Screw (2)**
3. **Lower fork bracket assembly**

Figure 7-47. Headlamp Assembly

Disassemble

1. Remove headlamp. See Bulb Replacement: LED Round in this section.
2. See Figure 7-48. Remove lower fairing bracket.
   a. Remove screws (3).
   b. Remove lower fairing bracket.

3. See Figure 7-49. Remove headlamp bracket (1).

   a. Remove bolt (5), washers (2) and nut (3).

   b. Remove headlamp bracket.

4. See Figure 7-50. Remove stand-offs (1) and grommets (2) .

Assemble

1. See Figure 7-50. Install grommets (2) and stand-offs (1).

   a. Install grommets.

   b. Install stand-offs.

2. See Figure 7-49. Install headlamp bracket (1).

   a. Position headlamp bracket on headlamp mounting bracket (4).

   b. Install Bolt (5), washers (2), and nut (3). lighten.

      Torque: 27-32 ft-lbs (36.6-43 N-m) ***Headlamp bracket to headlamp mounting bracket bolt NOTE***

Verify a ***washer is on each side of the headlamp bracket.***

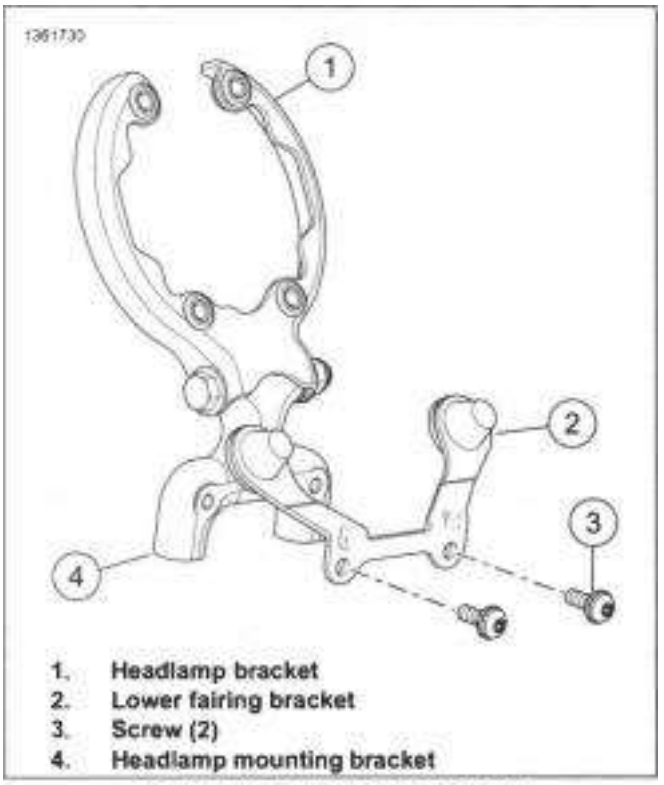
3. See Figure 7-48. Install lower fairing bracket (2).

   a. Position lower fairing bracket.

   b. Install screws (3). lighten.

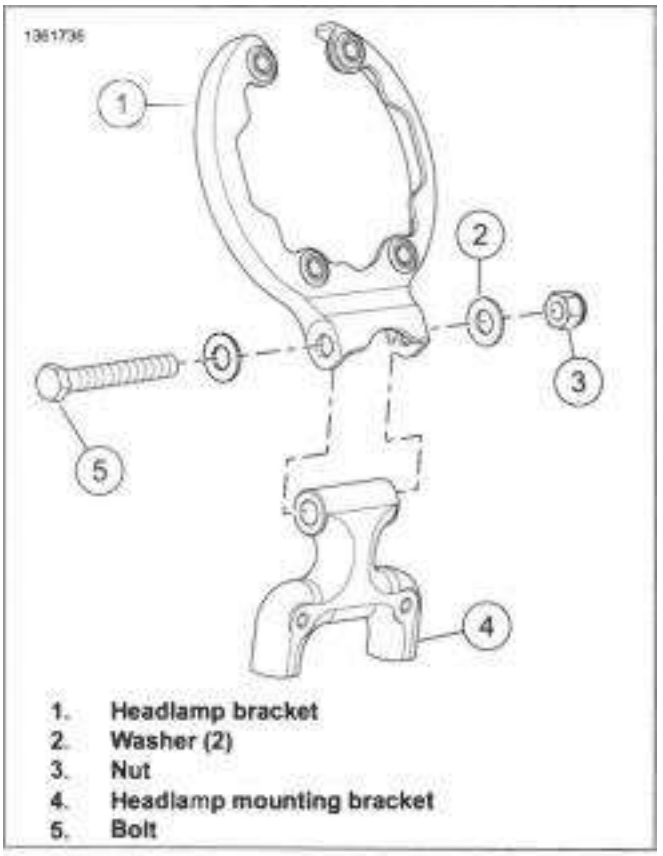
      Torque: 96-120 in-lbs (10.6-13.6 N-m) ***Lower fairing bracket screw***

4. Install headlamp. See Bulb Replacement: LED Round in this section.



1. Headlamp bracket
2. Lower fairing bracket
3. Screw (2)
4. Headlamp mounting bracket

Figure 7-48. Lower Fairing Bracket



1. Headlamp bracket
2. Washer (2)
3. Nut
4. Headlamp mounting bracket
5. Bolt

Figure 7-49. Headlamp Bracket Bolt, Washers, Nut

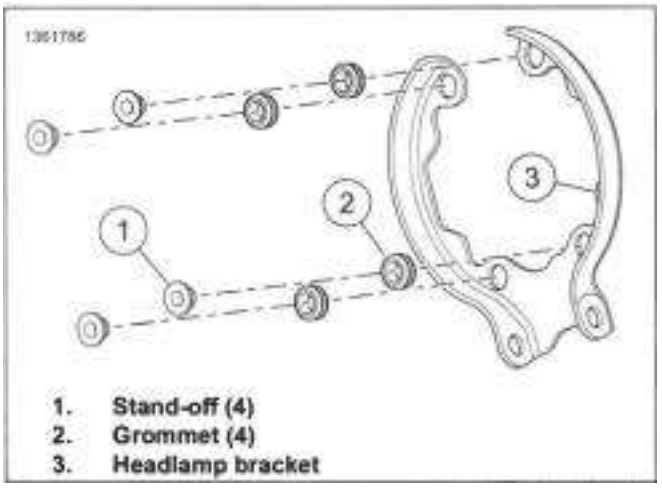


Figure 7-50. Headlamp Bracket Grommets, Stand-Offs

REMOVE AND INSTALL: NACELLE MOUNTED

FASTENER	TORQUE VALUE	
Headlamp mounting ring screw	16-20 ft-lbs	21.6-27.1 N-m

Remove

1. Remove nacelle. See HEADLAMP NACELLE (Page 3-96).

2. Remove headlamp. See Bulb Replacement in this section.

3. See Figure 7-51. Remove screw and washer (2).
4. Remove mounting ring (1).

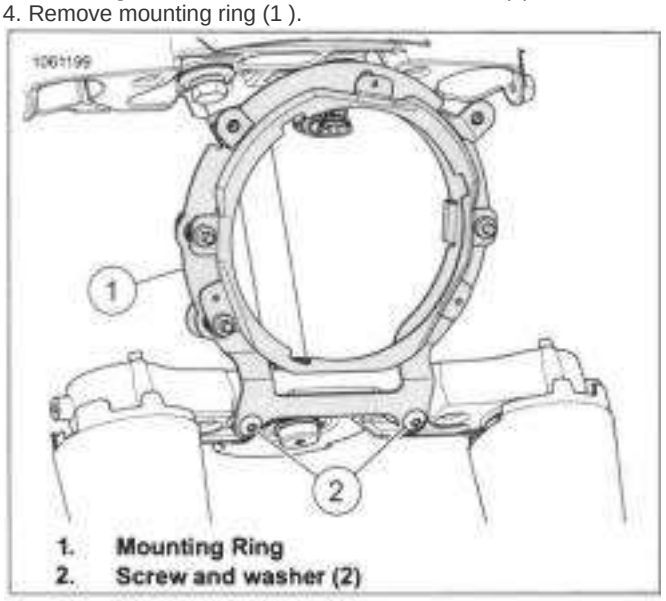


Figure 7-51. Headlamp Mounting Ring

Install

1. See Figure 7-51. Install mounting ring (1).

2. Install screw and washer (2). Tighten.

   Torque: 16-20 ft-lbs (21.6-27.1 N-m) ***Headlamp mounting ring screw***

3. Install headlamp. See Bulb Replacement in this section.

4. Install nacelle. See HEADLAMP NACELLE (Page 3-96).

REMOVE AND INSTALL: OBLONG

FASTENER	TORQUE VALUE	
Headlamp, oblong, bracket-to-fork clamp screws	16-20 ft-lbs	21.6-27.1 N-m
Headlamp, oblong, isolator screws	33-43 in-lbs	3.7-49 N-m
Headlamp, oblong, mounting screw	10-13 ft-lbs	13.6-17.6 N-m
Wireform screw, headlamp, oblong,	10-12 ft-lbs	13.5-16.2 N-m

Remove

1. FXBRS:See Figure 7-52. Remove clutch cable from wireform (5).

2. Disconnect connector (1).

3. FXBRS: Remove headlamp assembly.

   a. Remove screws (2).
   b. Remove headlamp assembly.

   c. Remove screw and wireform(5), if necessary.

4. Remove headlight.

   a. Remove screw (3).
   b. Remove headlamp (4).

5. See Figure 7-53. Disassemble mounting bracket.

   a. Remove screws (5) and spacers (4).
   b. Discard isolators (3).

Install

1. See Figure 7-53. Assemble mounting bracket.

   a. Assemble bracket (1), new isolators (3) and clevis (2).

   b. Install spacers (4) and screws (5). Tighten.

      Torque: 33-43 in-lbs (3.7-4.9 N-m) ***Headlamp, oblong, isolator screws***

2. See Figure 7-52. Install headlamp to bracket.

   a. Install headlamp (4).

   b. Install screw (3). Tighten.

      Torque: 10-13 ft-lbs (13.6-17.6 N-m) ***Headlamp, oblong, mounting screw***

3. FXBRS: Install headlamp assembly.

   a. Install wireform and screw (5), if removed. Tighten.

      Torque: 10-12 ft-lbs (13.6-16.2 N-m) ***Wireform screw, headlamp, oblong,***

   b. Install headlamp assembly.

   c. Install screws (2). Tighten.

      Torque: 16-20 ft-lbs (21.6-27.1 N-m) ***Headlamp, oblong, bracket-to-fork clamp screws***

4. Connect connector (1).
5. FXBRS: Install clutch cable into wireform (5).

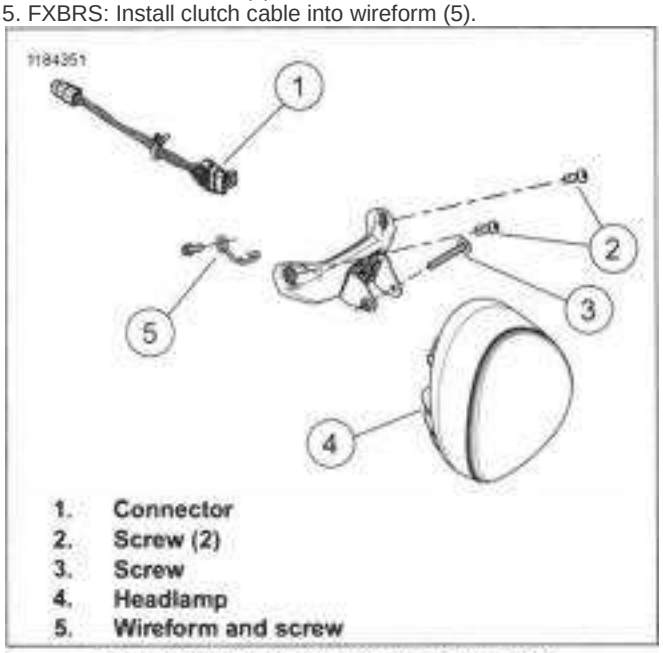


Figure 7-52. Headlamp: FXBRS (Typical)

REMOVE AND INSTALL: HORIZONTAL

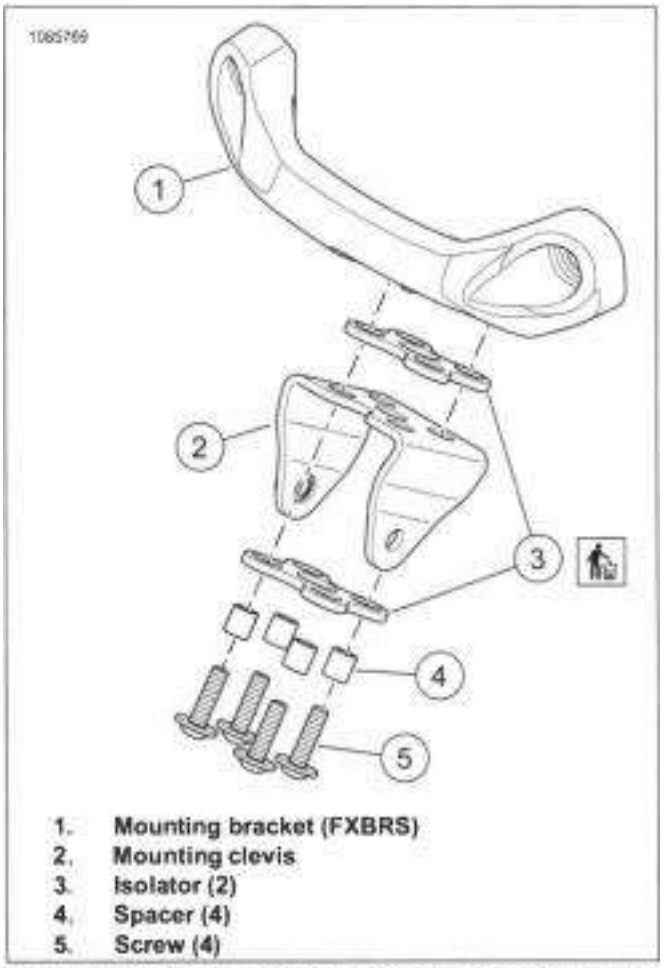
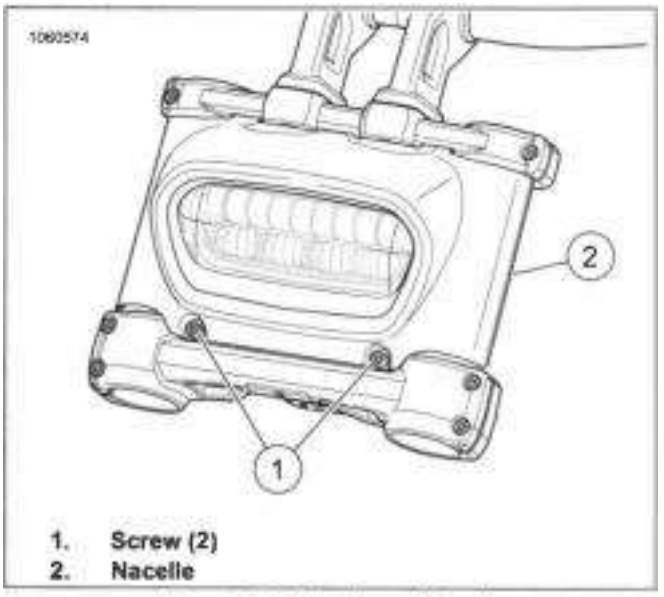


Figure 7-53. Oblong Headlamp Mounting Bracket (Typical)

FASTENER	TORQUE VALUE	
Headlamp nacelle, screw	16-20 ft-lbs	21.6-27.1 N-m
Headlamp, upper triple clamp mounted, screw	11-14 ft-lbs	16-19 N-m

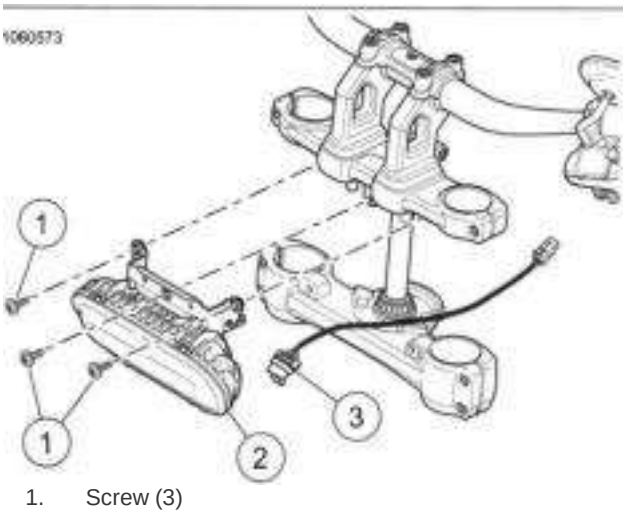
Remove

1. See Figure 7-54. Remove screws (1).
2. Remove nacelle (2).
3. See Figure 7-55. Remove screws (1).
4. Disconnect connector (3).
5. Remove headlamp (2).



1. Screw (2)
2. Nacelle

Figure 7-54. Headlamp Nacelle



1. Screw (3)
2. Headlamp
3. Connector

Figure 7-55. Headlamp

Install

1. See Figure 7-55. Install headlamp (2).
2. Connect connector (3).
3. Install screws (1). Tighten.

   Torque: 11-14 ft-lbs (15-19 N-m) ***Headlamp, upper triple clamp mounted, screw***
4. See Figure 7-54. Install nacelle (2).
5. Install screws (1). Tighten.

   Torque: 16-20 ft-lbs (21.6-27.1 N-m) ***Headlamp nacelle, screw***

REMOVE AND INSTALL: FIXED FAIRING

FASTENER	TORQUE VALUE	
Headlamp, fixed fairing, Bracket-to-lamp screws	[illegible]	9.49-12.2 N-m
Headlamp, fixed fairing, retainer screws	22-32 in-lbs	2.5-3.6 N-m

Remove

1. Remove bezel.
   a. See Figure 7-56. Rotate bezel (3) counterclockwise to disengage hooks.
   b. Remove bezel.
2. Remove headlamp assembly.
   a. Remove screws (1).
   b. Remove headlamp assembly (5).
3. Remove headlamp.
   a. See Figure 7-57. Disconnect connector (1).
   b. Remove screws (2).
   c. Remove Headlamp (3).
4. Disassembly headlamp bracket, if needed.
   a. See Figure 7-58. Remove screws (4) and washers (3) .
   b. Remove support ring (2), springs (5) and support plate (1).

Install

1. Assembly headlamp bracket.
   a. See Figure 7-58. Place support ring (2) and springs (5) on support plate (1).
   b. Install washers (3) and screws (4).
   c. Tighten screws evenly (4) to specification (6).

      Length/Dimension/Distance: 0.85 in (21.59 mm)
2. Install headlamp.
   a. See Figure 7-57. Position headlamp (3) in bracket (4) .
   b. Install screws (2). Tighten.

      Torque: 84-108 **in-lbs** (9.49-12.2 N-m) ***Headlamp, fixed fairing, Bracket-to-lamp screws***
   c. Connect connector (1).
   d. See Figure 7-56. Install headlamp assembly (5).
   e. Install screws (1). Tighten.

      Torque: 22-32 **in-lbs** (2.5-3.6 N-m) ***Headlamp, fixed fairing, retainer screws***

3. Install bezel.

a. Line bezel tabs (4) left of fairing tabs (2).

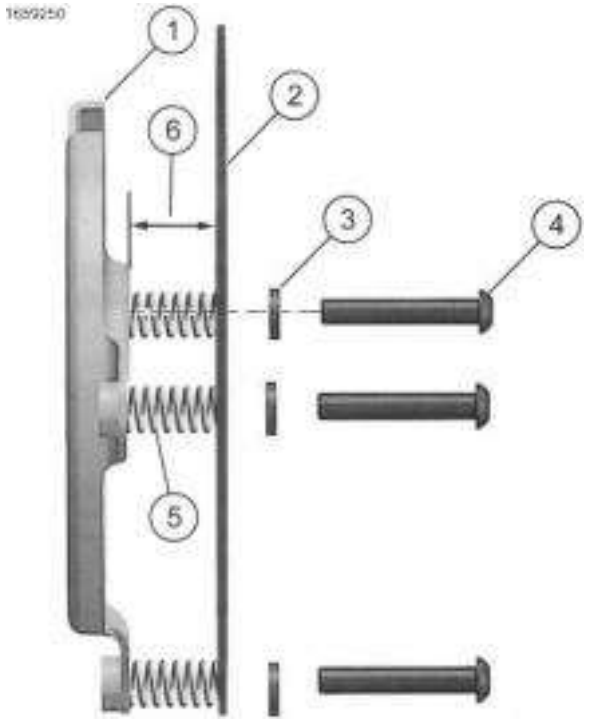
b. Press in bezel and turn clockwise.

1. Screw (3)
2. Fairing Tab (3)
3. Bezel
4. Bezel tab (3)
5. Headlamp assembly

Figure 7-56. Headlamp Bezel

1. Connector
2. Screw (4)
3. Headlamp
4. Bracket

Figure 7-57. Headlamp Assembly



1. Support plate
2. Support ring
3. Washers (3)
4. Screw (3)
5. Spring (3)
6. 21.59 mm (0.85 in)

Figure 7-58. Headlamp Support Ring

ALIGN

A WARNING

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

Prepare

1. Check tire pressure.

2. Adjust rear shock preload for rider and intended load.

3. Fill fuel tank or add an equal amount of ballast.

Check Alignment

1. See Figure 7-59. Park the motorcycle on a line (1) perpendicular to the wall.

2. Set vehicle distance from wall to front axle.

   25 ft (7.6 m)

3. Draw a vertical centerline (2) on the wall aligned with line (1).

4. ***NOTE***
The upper lens half of LED is the low beam.

With the motorcycle loaded, point the front wheel straight forward at wall.

a. All except FXFBS: Measure the distance (4) from the floor to the center of headlamp.

b. FXFBS: Measure the distance (4) from the floor to the center of low beam.

5. Draw a horizontal line (5) through vertical line (2) using the same height measurement as low beam bulb centerline (4).

6. Align the top of the hot spot to horizontal line (5) with headlamp set to low beam.

7. Adjust headlamp, if necessary.

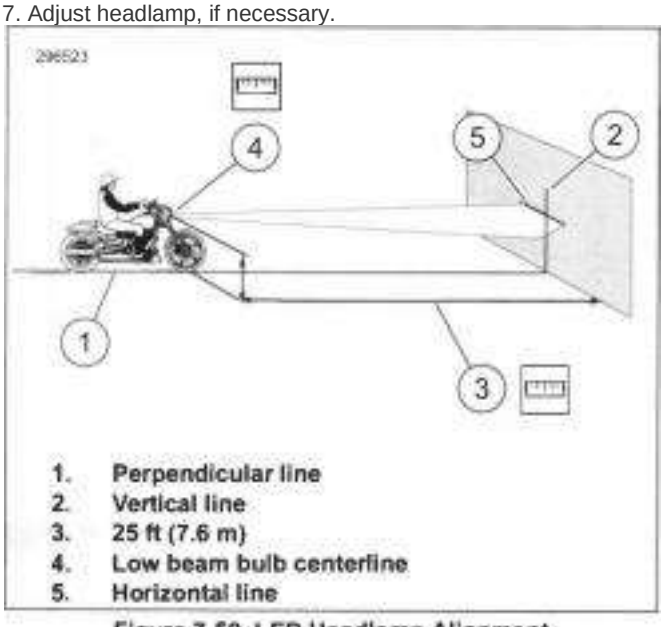


Figure 7-59. LED Headlamp Alignment

ADJUST

FASTENER	TORQUE VALUE	
Headlamp FXBBS, FXST horizontal adjustment screw	20-25 ft-lbs	27.1-33.9 N-m
Headlamp FXBBS, FXST, FXLRS, FLSB vertical adjustment screw	27-32 ft-lbs	36.6--43.3 N-m
Headlamp FXBRS, vertical adjustment screw	10-13 ft-lbs	13.5-17.6 N-m
Headlamp FXFBS vertical adjustment screw	11-14 ft-lbs	14.9-19 N-m

Round

1. All except FLSB, FXLRS and FXLRST: See Figure 7-60. Loosen horizontal adjustment screw (2). Adjust headlamp horizontally to direct light beam straight ahead.

NOTE

Not all headlamps have a horizontal adjustment.

2. Tighten horizontal adjustment screw:

a. FXBBS, FXST:

Torque: 20-25 ft-lbs (27.1-33.9 N-m) ***Headlamp FXBBS, FXST horizontal adjustment screw***

3. Loosen vertical adjustment screw (1). Adjust headlamp vertically until beam centers on horizontal line.

4. Tighten vertical adjustment screw (1):

Torque: 27-32 ft-lbs (36.6-43.3 N-m) ***Headlamp FXBBS, FXST, FXLRS, FLSB vertical adjustment screw***

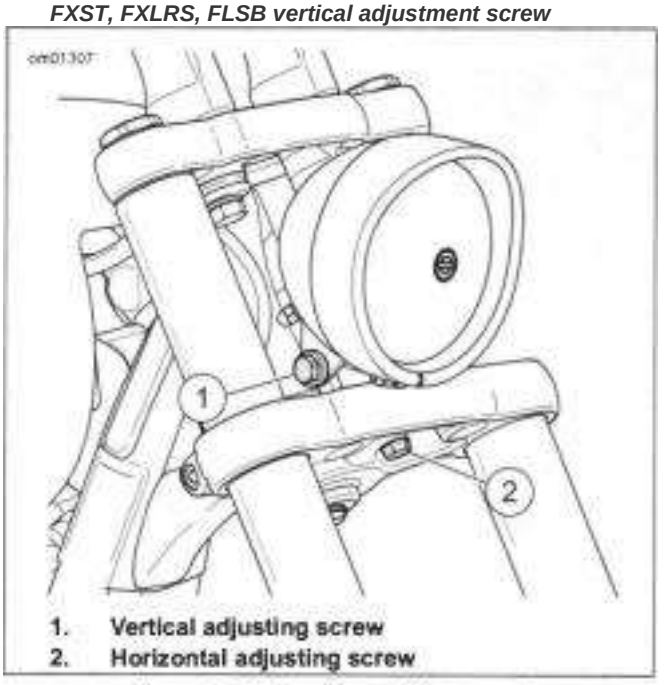


Figure 7-60. Headlamp Adjustment

FXBRS, FXFBS

1. See Figure 7-61 and Figure 7-62. Loosen vertical adjustment screw (3). Adjust headlamp vertically until beam centers on horizontal line.

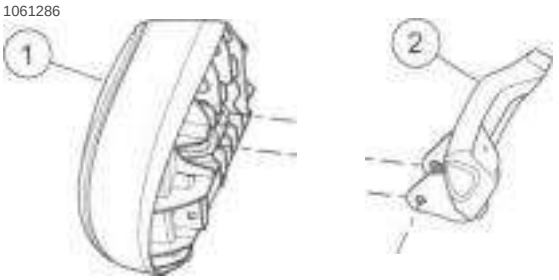
2. Tighten vertical adjustment screw (3):

a. FXBRSSee Figure 7-61.

Torque: 10-13 ft-lbs (13.5--17.6 N-m) ***Headlamp FXBRS, vertical adjustment screw***

b. FXFBSSee Figure 7-62.

Torque: 11-14 ft-lbs (14.9-19 N-m) ***Headlamp FXFBS vertical adjustment screw***



1. **Headlamp**
2. **Mounting bracket (typical)**
3. **Screw**

Figure 7-61. Headlamp Adjustment: FXBRS

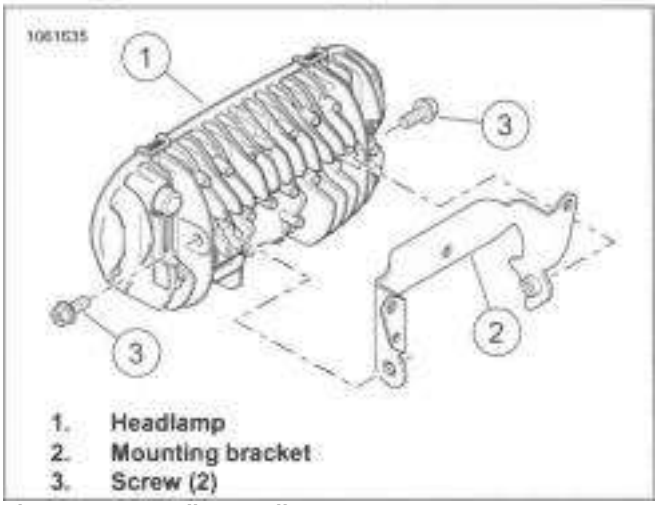


Figure 7-62. Headlamp Adjustment: FXFBS

FLFBS

1. See Figure 7-63. Rotate horizontal adjustment screw (1). Adjust headlamp horizontally to direct light beam straight ahead.

2. Rotate vertical adjustment screw (2). Adjust headlamp vertically until beam centers on horizontal line.

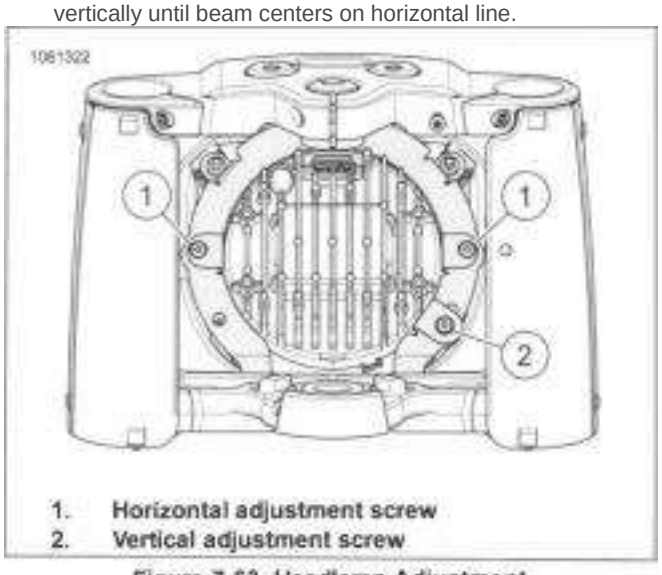


Figure 7-63. Headlamp Adjustment

FXLRST

1. See Figure 7-64. Rotate trim ring (3) counterclockwise to disengage hooks and remove.

2. Rotate horizontal adjustment screw (1). Adjust headlamp horizontally to direct light beam straight ahead.

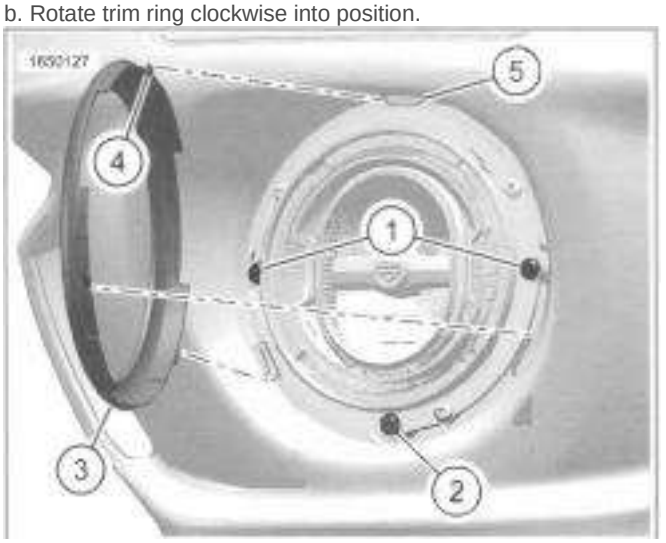
3. Rotate vertical adjustment screw (2). Adjust headlamp vertically until beam centers on horizontal line.

4. Install trim ring.

   a. Align trim ring hooks (4) with docking points (5).

   1. **Horizontal adjusters**
   2. **Vertical adjuster**
   3. **Trim ring**
   4. **Trim ring hooks (3)**

   b. Rotate trim ring clockwise into position.



5. **Docking points (3)**

Figure 7-64. Headlamp: FXLRST

COMPLETE

1. Install associated parts:

- **Round headlamp:** Install fuel tank. See FUEL TANK (Page 6-14).
- **Model with windshield:** Install windshield. See WINDSHIELD (Page 3-106).
- **Model with nacelle:** Install nacelle. See HEADLAMP NACELLE (Page 3-96).
- **Model with steered fairing:** Install fairing. See FAIRING (Page 3-99).

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

A WARNING

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

3. Test headlamp for proper operation.

4. Align headlamp. See Align in this section.

APPLICABILITY

0	• 2022 HERITAGE CLASSIC 114 (FLHCS)

PREPARE

Prepare

1. Remove main fuse. See TOWER DISCONNECT (Page 7-7).

2. Remove fuel tank. See FUEL TANK (Page 6-14).

REMOVE AND INSTALL: STANDARD LIGHTING

APPLICABILITY	
0	• 2022 HERITAGE CLASSIC 114 (FLHCS)

FASTENER	TORQUE VALUE	
Front light bar mounting screw	20-25 ft-lbs	27.1-33.9 N-m
Front light bar, bracket screw	16-20 ft-lbs	21.7-27.1 N-m
Front light bar, clamp screw	6-10 in-lbs	0.67-1.1 N-m

Remove

1. Disconnect right and left turn signal connectors. See FRONT ELECTRICAL CADDY (Page 7-87).

3. Remove light bar.
2. See Figure 7-65. Remove screws (1).

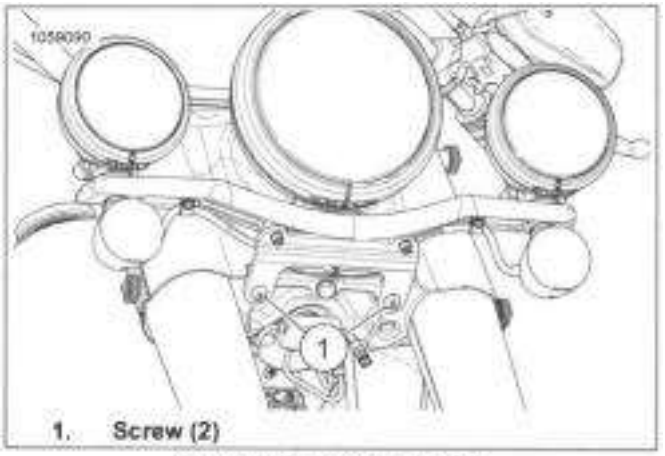


Figure 7-65. Front Light Bar

Disassemble

1. See Figure 7-66. Discard cable strap (3).

2. Remove screws (2) and bracket (1).

3. Remove auxiliary lamp housings. See AUXILIARY LAMPS (Page 7-45).

4. See Figure 7-67. Remove screws (1) and clamps (2).

5. Remove left and right turn signals (3, 4).

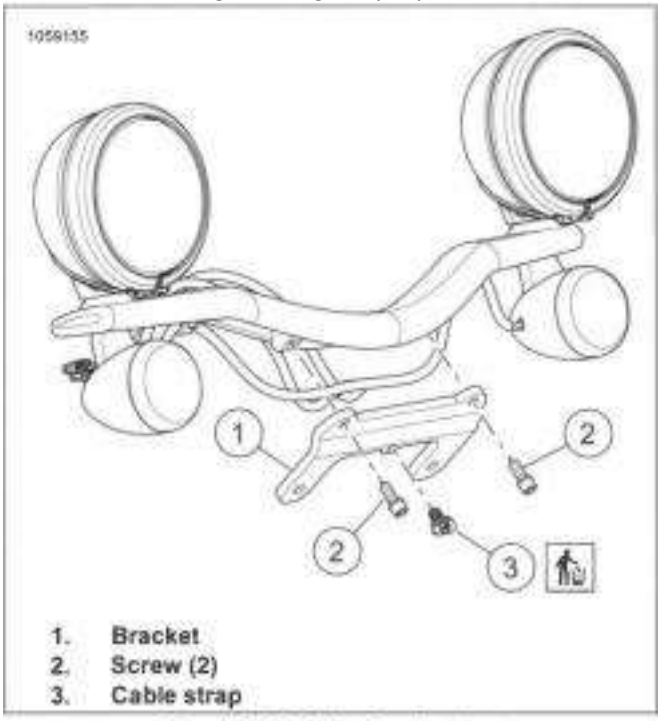


Figure 7-66. Light Bar Bracket

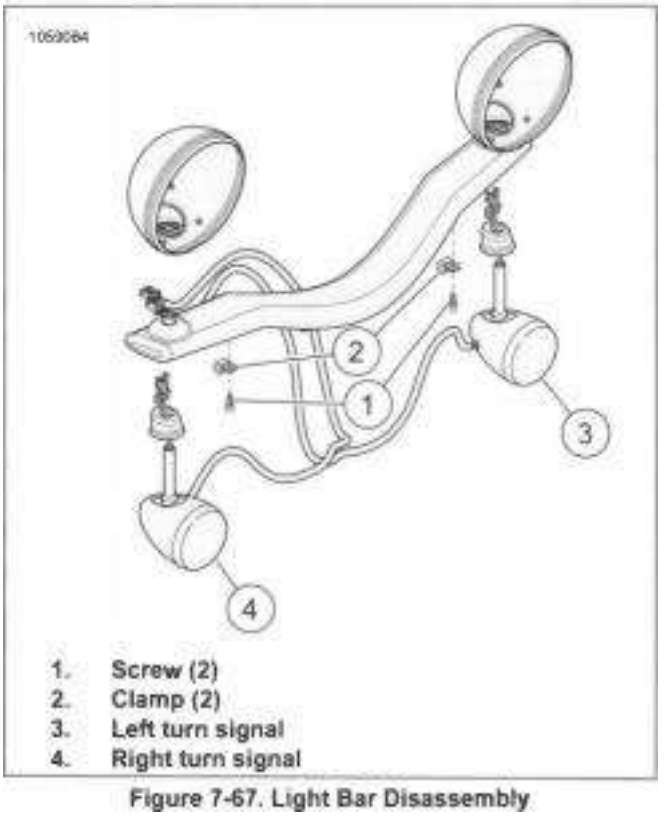


Figure 7-67. Light Bar Disassembly

Assemble

1. See Figure 7-67. Install left and right turn signals (3, 4).

2. Install screws (1) and clamps (2). Tighten.

   Torque: 6-10 **in-lbs** (0.67-1.1 N-m) *Front light bar, clamp screw*

3. Install auxiliary lamp housings. See AUXILIARY LAMPS (Page 7-45).

4. See Figure 7-66. Install screws (2) and bracket (1). Tighten.

   Torque: 16-20 ft-lbs (21.7-27.1 N-m) *Front light bar, bracket screw*

5. Install **new** cable strap (3).

Install

1. Install light bar.
2. See Figure 7-65. Install screws (1). Tighten.

   Torque: 20-25 ft-lbs (27.1-33.9 N-m) *Front light bar mounting screw*

3. Connect right and left turn signal connectors. See FRONT ELECTRICAL CADDY (Page 7-87).

COMPLETE

Complete

1. Install fuel tank. See FUEL TANK (Page 6-14).

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

APPLICABILITY

2022 HERITAGE CLASSIC 114 (FLHCS)

BULB REPLACEMENT

FASTENER	TORQUE VALUE	
Auxiliary lamp bezel nut	9-12 in-lbs	1.07-1.36 N-m

Bulb

Remove

1. See Figure 7-68. Remove screw (1) and nut (2).
2. Remove bezel (3).
3. Remove LED lamp (4).
4. Disconnect connector (5).

Install

1. See Figure 7-68. Connect connector (5).
2. Install LED lamp (4) in alignment ring (6).
3. Install bezel (3).
4. Install screw (1) and nut (2). Tighten.
   Torque: 9-12 in-lbs (1.07-1.36 N-m) ***Auxiliary lamp bezel nut***

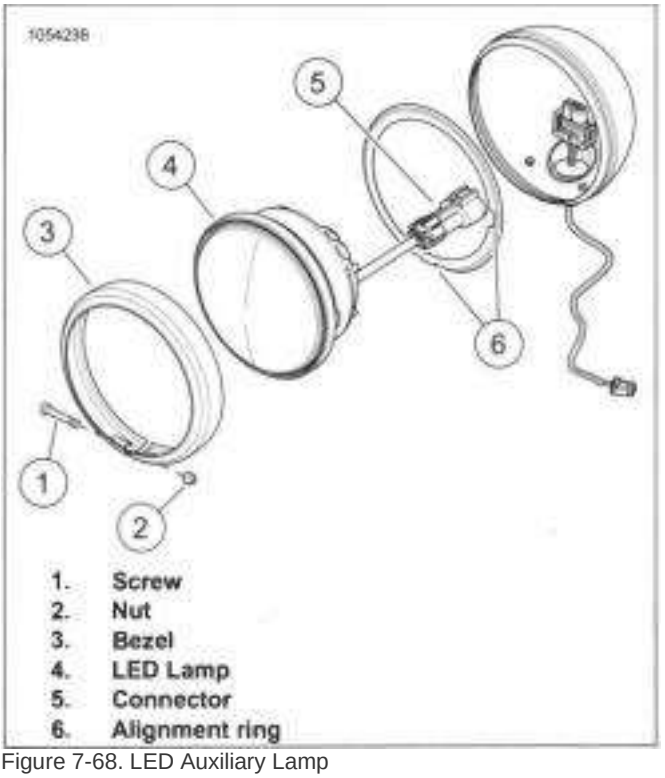


Figure 7-68. LED Auxiliary Lamp

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove bulb. See Bulb Replacement (Page 7-45).

REMOVE AND INSTALL: STANDARD LIGHTING

APPLICABILITY	
0	• 2022 HERITAGE CLASSIC 114 (FLHCS)

FASTENER	TORQUE VALUE
Auxiliary lamp nut	19-23 ft-lbs 25.76--31.18Nm

Remove

1. See Figure 7-69. Disconnect pins (4) from connector (2).
2. Remove nut (3).
3. Remove housing (1).

Figure 7-69. Auxiliary Lamp Housing with Incandescent Signal

Install

1. See Figure 7-69. Install housing (1).

2. Position housing. Install nut (3) and tighten.

   Torque: 19-23 ft-lbs (25.76-31.18 N-m) ***Auxiliary lamp nut***

3. Connect pins (4) to connector (2). See electrical diagnostic manual.

4. Align auxiliary lamps. See Align in this section.

ALIGN

Check Alignment

1. Place vehicle facing target wall as described in Align section of Headlamp. See HEADLAMP (Page 7-31).

2. Check headlamp alignment. Adjust if necessary.

FASTENER	TORQUEVALUE	
Auxiliary lamp nut	19-23 ft-lbs	25.7-31.1 N-m

ADJUST

Auxiliary Lamp Adjustment

NOTE

Have a person weighing roughly the same as the principal rider sit on the motorcycle.

1. With the vehicle upright and a rider seated on the motorcycle, measure the distance from the floor to the centerline of each auxiliary lamps.

2. See Figure 7-70. Mark the center of the headlamp high beam by making a vertical line through the horizontal line already drawn on the wall. Properly adjusted, the beam should project an equal area of light to the left and right of the vertical centerline (1).

3. Measure the horizontal distance from the headlamp vertical centerline to the vertical centerline of each auxiliary lamp.

4. Mark the auxiliary lamp horizontal and vertical centerline (2, 3) on the wall.

5. ***NOTE***

Minimize auxiliary lamp movement while tightening to maintain alignment.

   Adjust auxiliary lamps.

   a. Remove bulb. See Auxiliary Lamps in this section.

   b. See Figure 7-71. Loosen nut (3).

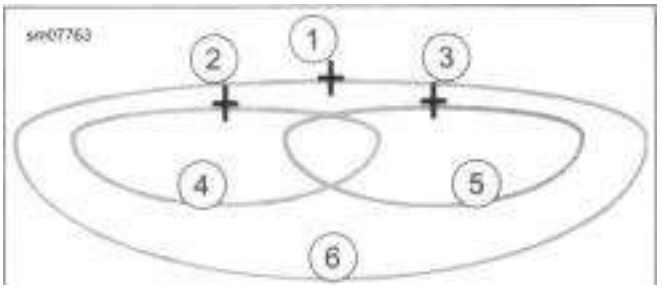
   c. Adjust housing (1).

   d. While holding auxiliary lamp housing (1) steady, tighten nut (3)

      Torque: 19-23 ft-lbs (25.7-31.1 N-m) ***Auxiliary lamp nut***

   e. Install bulb. See Auxiliary Lamps in this section.

6. Verify auxiliary lamp alignment.



1. **Headlamp centerline**
2. **Left auxiliary lamp centerline**
3. **Right auxiliary lamp centerline**
4. **Left auxiliary lamp beam area**
5. **Right auxiliary lamp beam area**
6. **Headlamp low beam area**

Figure 7-70. Headlamp Pattern: LED Type with Auxiliary Lamps

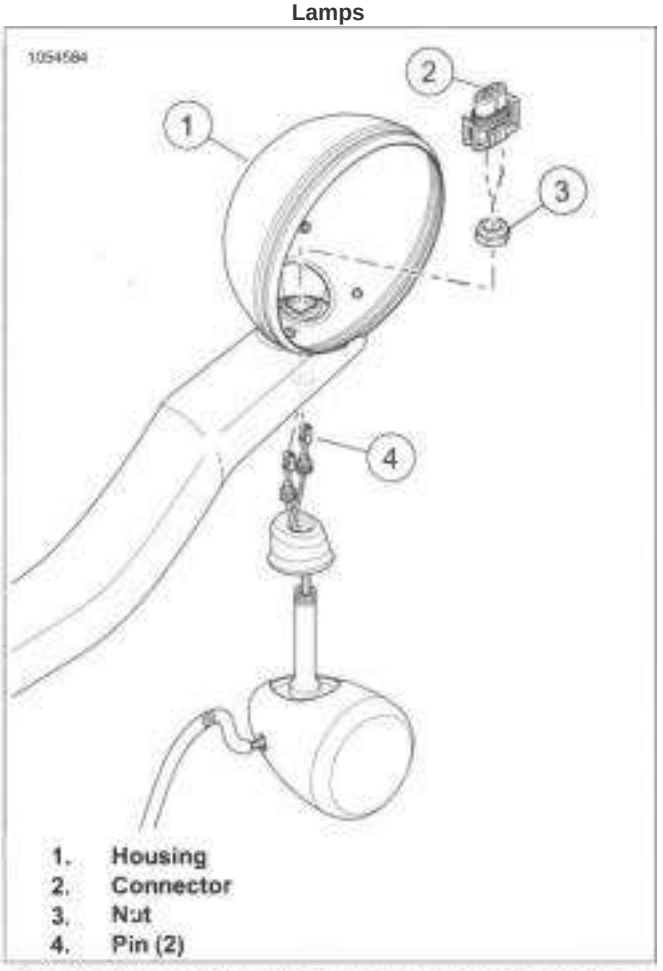


Figure 7-71. Auxiliary Lamp Housing with Incandescent Signal

COMPLETE

1. Install bulb. See Bulb Replacement (Page 7-45).

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

A WARNING

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

3. Check operation of all lamps.

BULB REPLACEMENT

Incandescent

1. See Figure 7-72. Replace bulb.
   a. Remove lens.
   b. Replace bulb.

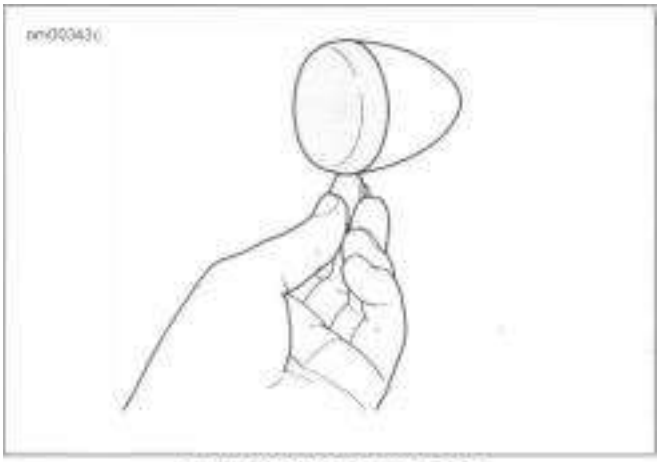


Figure 7-72. Remove Lens

   c. Install lens.

PREPARE

Prepare

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove fuel tank if needed. See FUEL TANK (Page 6-14).
3. Frame mounted fairing models: Remove outer fairing shell. See FAIRING: FRAME MOUNTED (Page 3-102).

REMOVE AND INSTALL: HANDLEBAR MOUNT

Remove

FASTENER	TORQUE VALUE	
Handlebar-mounted turn signal, ball stud clamp	96-144 in-lbs	10.8-16.3 N-m
Handlebar-mounted turn signal, ball stud jam nut	50-70 in-lbs	5.6-7.9 N-m
Handlebar-mounted turn signal, ball stud locknut	50-70 in-lbs	5.6-7.9 N-m
Handlebar-mounted turn signal, ball stud set screw	3-5 ft-lbs	4-6.7 N-m

All Except FXBBS, FXST

1. See Figure 7-73. Remove front turn signals.
   b. Loosen locknut (3) and remove ball stud (6) from turn signal.

FXBBS, FXST Only

1. See Figure 7-74. Remove front turn signals.
   a. Loosen ball stud clamp (6) completely.
   b. Loosen jam nut (8).
   c. Remove ball stud (7) from turn signal (9 or 10).

All

1. Remove hand control module from handlebar.
   a. Left hand control module: See LEFT HAND CONTROL MODULE (LHCM) (Page 7-16).
   b. Right hand control module: See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).
2. Disconnect left or right turn signal connector. See FRONT ELECTRICAL CADDY (Page 7-87).
3. ***NOTE***

Verify that there is enough scrap wire to work both ends of handlebar when wiring is routed through handlebar.

Route turn signal wires through handlebar.

   a. Attach scrap wire to turn signal connector.
   b. Pull turn signal wiring through handlebar.
   c. Disconnect scrap wire from old turn signal connector. Attach scrap wire to new turn signal wiring.

Install

All

1. ***NOTE***

Verify that there is enough scrap wire to work both ends of handlebar when wiring is routed through handlebar.

Route turn signal wires through handlebar.

   a. Disconnect scrap wire from old turn signal connector. Attach scrap wire to new turn signal wiring.
   b. Pull new turn signal wiring through handlebar.
   c. Remove scrap wire.
2. Install hand control module to handlebar.
   a. Left hand control module: See LEFT HAND CONTROL

MODULE (LHCM) (Page 7-16).

a. Loosen set screw (7).

b. Right hand control module: See RIGHT HAND CONTROL MODULE (RHCM) (Page 7-20).

3. Connect left or right turn signal connector. See FRONT ELECTRICAL CADDY (Page 7-87).

FXBBS, FXST Only

NOTE

When installing right side turn signal assembly, do not cover brake lever pivot pin.

1. See Figure 7-74. Install front turn signals.

   a. Install ball stud (7) to turn signal (9 or 10) and tighten jamnut (8).

      Torque: 50-70 **in-lbs** (5.6-7.9 N-m) ***Handlebar-mounted turn signal, ball stud jam nut***

   b. Tighetn ball stud clamp (6).

      Torque: 96-144 **in-lbs** (10.8-16.3 N-m) ***Handlebar-mounted turn signal, ball stud clamp***

   c. Verify turn signal is positioned properly.

All Except FXBBS, FXST

NOTE

When installing right side turn signal assembly, do not cover brake lever pivot pin.

1. See Figure 7-73. Install front turn signal.

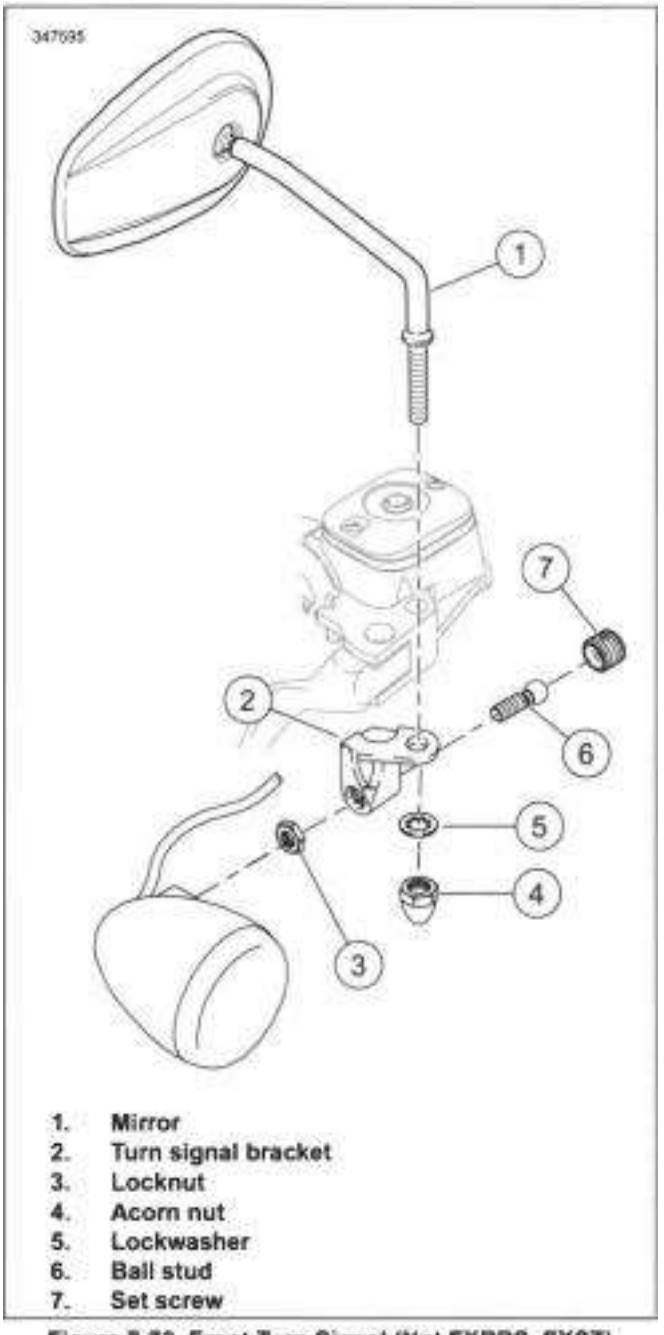
   a. Install ball stud (6) to turn signal and tighten locknut (3).

      Torque: 50-70 **in-lbs** (5.6-7.9 N-m) ***Handlebar-mounted turn signal, ball stud locknut***

   b. Tighten set screw (7).

      Torque: 3--5 ft-lbs (4-6.7 N-m) ***Handlebar-mounted turn signal, ball stud set screw***

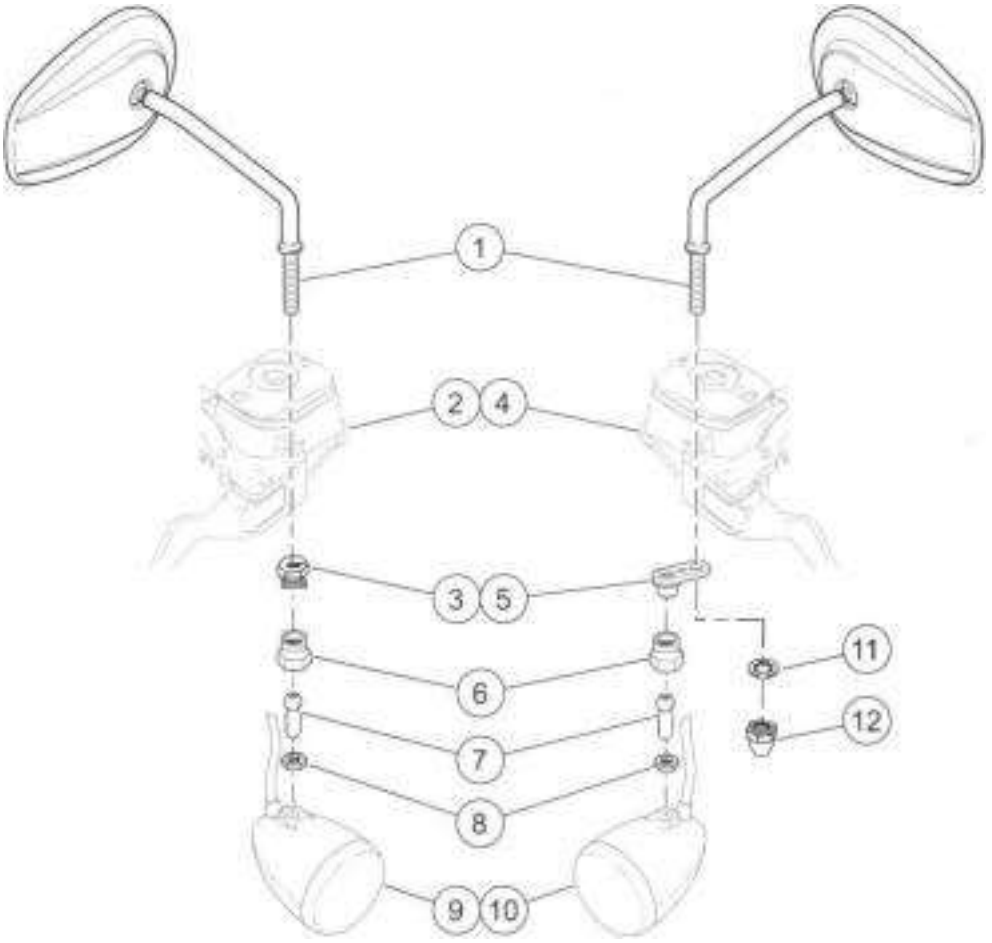
   c. Verify turn signal is positioned properly.



1. Mirror
2. Turn signal bracket
3. Locknut
4. Acorn nut
5. Lockwasher
6. Ball stud
7. Set screw

Figure 7-73. Front Turn Signal (Not FXBBS, FXST)

1372254



1. Mirror
2. Right brake lever
3. Ball receptacle nut
4. Left clutch lever
5. Ball receptacle plate
6. Ball stud clamp
7. Ball stud
8. Jam nut
9. Right turn signal
10. Left turn signal
11. Lockwasher
12. Acorn nut

Figure 7-74. Front Turn Signal (FXBBS, FXST)

REMOVE AND INSTALL: FIXED FAIRING InsfaM MOUNT InStaM

FASTENER	TORQUE VALUE	
Turn signal, frame mounted fairing, screw	15-18 ft-lbs	20.34-24.4 N-m

Remove

1. Remove turn signal lamp.

a. See Figure 7-75. Disconnect connector (1).

b. Remove screw (2).

c. Remove turn signal (3).

d. See Figure 7-76. Remove wiring cable from standoff (5) .

e. De-pin connector.

f. Remove standoff.

1. Install turn signal lamp.

a. See Figure 7-76. Install wiring cable through opening in standoff (5).

b. Re-pin connector.

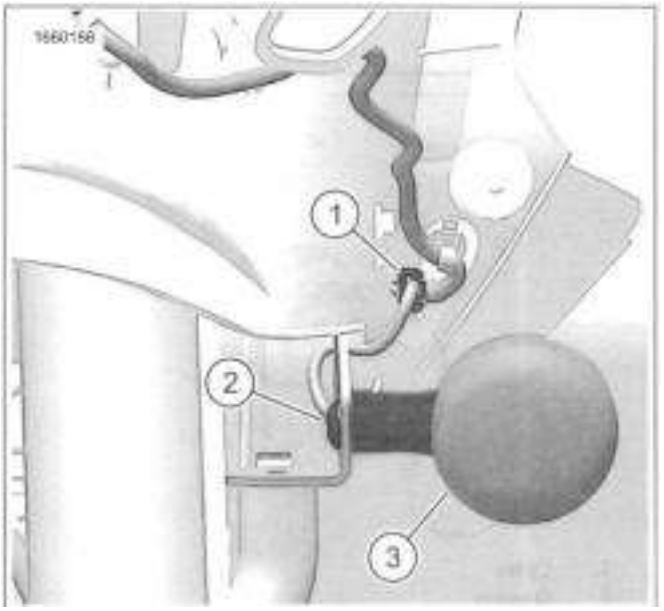
c. Route connector (3) through fairing bracket opening (2).

d. Position standoff (5) on turn signal (4).

e. See Figure 7-75. Install screw (2). Tighten.

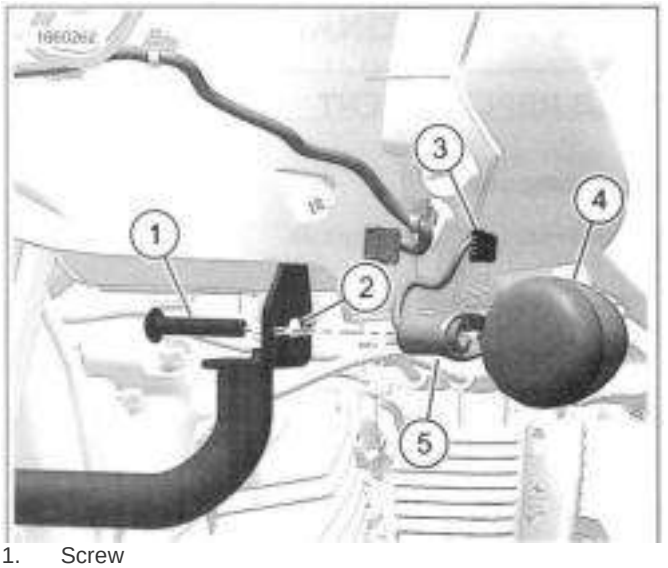
Torque: 15-18 ft-lbs (20.34-24.4 N-m) ***Turn signal, frame mounted fairing, screw***

f. Connect connector (1).



1. Connector
2. Screw
3. Turn signal

Figure 7-75. Front Turn Signal



1. Screw
2. Fairing bracket opening
3. Connector
4. Turn signal
5. Standoff

Figure 7-76. Front Turn Signal Assembly

COMPLETE

Complete

1. Frame mounted fairing models: Install outer fairing shell. See Remove and Install: Outer Fairing Shell (Page 3-102)

2. Install fuel tank if removed. See FUEL TANK (Page 6-14).

3. Install main fuse. See POWER DISCONNECT (Page 7-7).

A WARNING

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

4. Check operation of all lamps.

BULB REPLACEMENT

Incandescent

1. See Figure 7-77. Replace bulb.
   a. Remove lens.
   b. Replace bulb.
   c. Install lens.

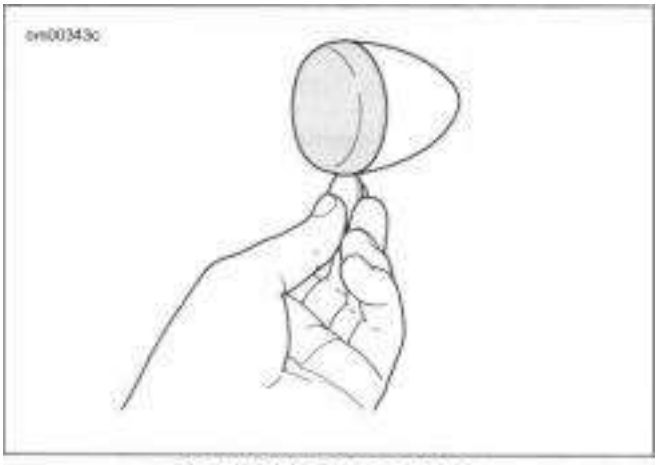


Figure 7-77. Remove Lens

LED Puck

Remove

1. See Figure 7-78. Remove lens (1).
2. Remove LED assembly (3).
3. Disconnect connector (4).

Install

1. Connector connector (4).
2. Align LED assembly (3) to housing. Press evenly until fully seated.
3. Inspect gasket (2) on lens (1). Replace if needed.
4. Install lens (1) with removal notch at the bottom.

A 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 all lamps.

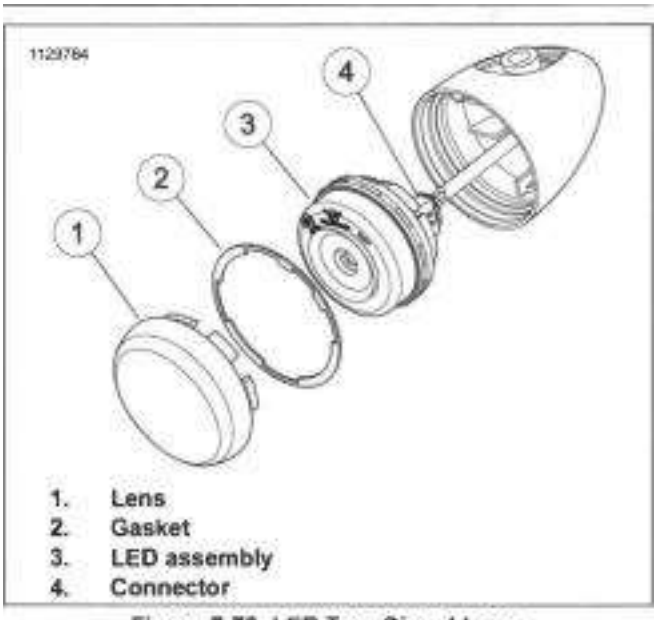


Figure 7-78. LED Turn Signal Lamp

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove seat if needed. See SEAT (Page 3-142).
3. If removing both turn signals, remove rear fender if needed. See REAR FENDER (Page 3-116).
4. Remove rear lighting assembly if model has rear lighting assembly. See Remove and Install: Rear Lighting Assembly (Page 7-57).

REMOVE AND INSTALL: FENDER MOUNT

FASTENER	TORQUE VALUE	
Fender Support, Screw	42-46 ft-lbs	57-62 N-m
Rear Turn Signal, Fender Mount, Screw	15-18 ft-lbs	20-24 N-m
Rear Turn Signal, Fender Support, Screw	21-27 ft-lbs	28-37 N-m

Remove

1. See Figure 7-79. Disconnect connector(s).
   a. Right Signal: Disconnect connector (1).
   b. Left Signal: Disconnect connectors (2, 3).
2. See Figure 7-80. Remove fender support.
   a. Remove screws (2).
   b. Remove screws (4) and washers (3).
   c. Remove fender support (1).

3. See Figure 7-81. Remove harness.

   a. Remove and discard wire retention pads (1).

   b. Remove harness (2).

4. See Figure 7-82. Disassemble turn signal.

NOTE

Not all left signal assemblies will have a license plate mounting support.

   a. Left Signal: Remove screw (1) and washer (2). Disassemble license plate mounting support (3), lamp mounting support (4) and turn signal (5).

   b. Right Signal: Remove screw (6) and washer (7). Disassemble lamp mounting support (8) and turn signal (9).

Install

1. See Figure 7-82. Assemble turn signal.

NOTE

Not all left signal assemblies will have a license plate mounting support.

   a. Left Signal: Assemble license plate mounting support (3), lamp mounting support (4) and turn signal (5). Install screw (1) and washer (2). Tighten.

      Torque: 15-18 ft-lbs (20-24 N-m) ***Rear Turn Signal, Fender Mount, Screw***

   b. Right Signal: Assemble lamp mounting support (8) and turn signal (9). Install screw (6) and washer (7). Tighten.

      Torque: 15-18 ft-lbs (20-24 N-m) ***Rear Turn Signal, Fender Mount, Screw***

2. See Figure 7-81. Install harness.

   a. Route harness (2) through fender support (3).

   b. Install new wire retention pads (1).

3. See Figure 7-80. Install fender support.

   a. Install fender support (1), washers (3) and screws (4). Tighten.

      Torque: 42-46 ft-lbs (57-62 N-m) ***Fender Support, Screw***

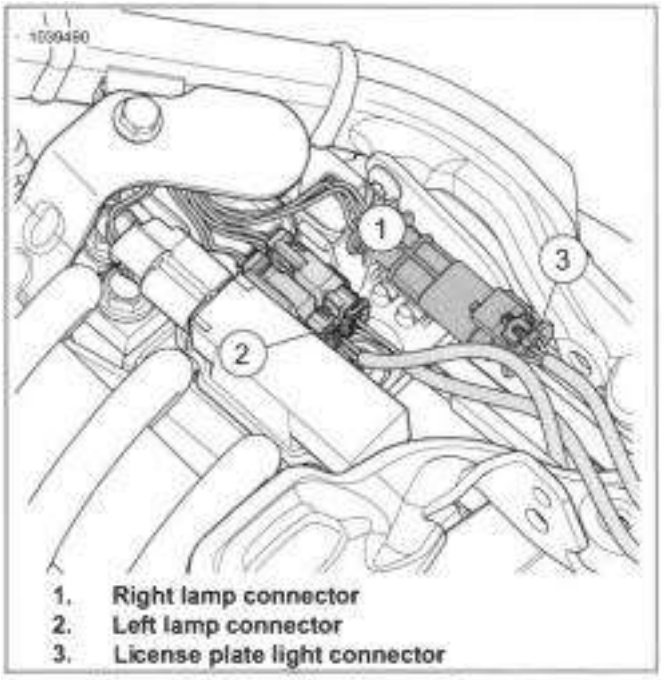
   b. Install screws (2). Tighten.

      Torque: 21-27 ft-lbs (25-37 N-m) ***Rear Turn Signal, Fender Support, Screw***

4. See Figure 7-79. Connect connector(s).

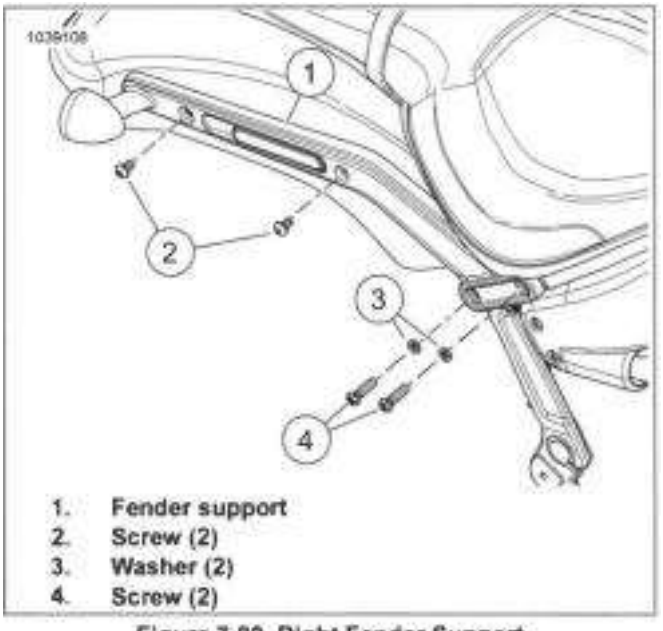
   a. Right Signal: Connect connector (1).

   b. Left Signal: Connect connectors (2, 3).



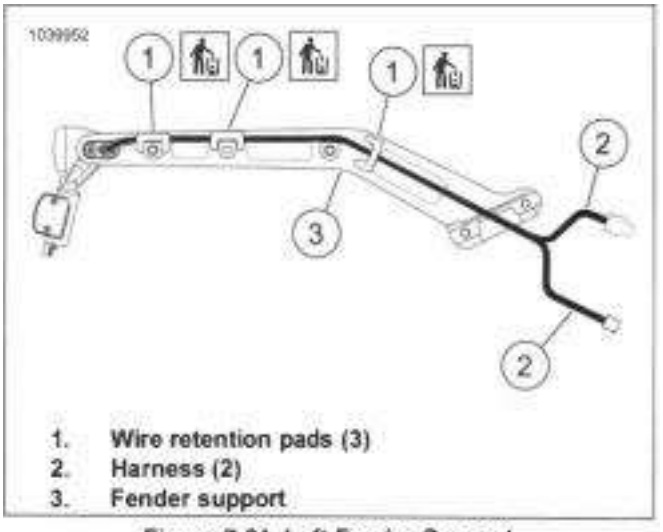
1. Right lamp connector
2. Left lamp connector
3. License plate light connector

Figure 7-79. Turn Signal Lamp Connectors



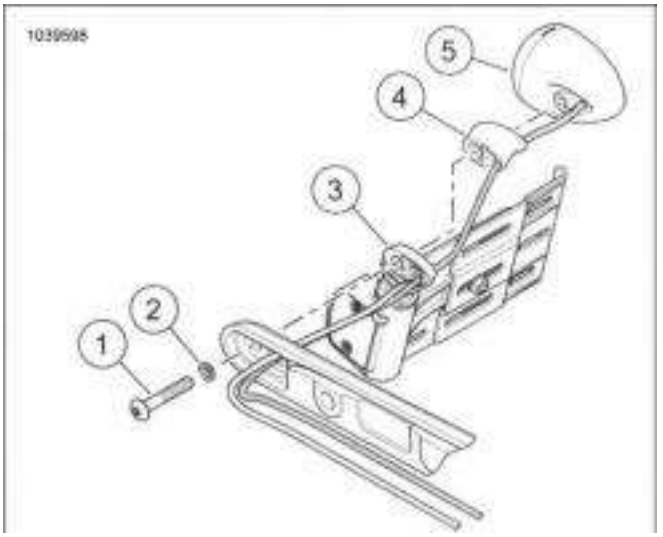
1. Fender support
2. Screw (2)
3. Washer (2)
4. Screw (2)

Figure 7-80. Right Fender Support



1. Wire retention pads (3)
2. Harness (2)
3. Fender support

Figure 7-81. Left Fender Support



1. Screw
2. Washer
3. License plate mounting support
4. Lamp mounting support
5. Left turn signal housing
6. Screw
7. Washer
8. Lamp mounting support
9. Right turn signal housing

Figure 7-82. Turn Signal Assembly

REMOVE AND INSTALL: REAR LIGHTING ASSEMBLY

FASTENER	TORQUE VALUE	
Rear turn signal, rear lighting assembly, screw	10-13ft-lbs	14.12-17.74Nm

CONSUMABLE	PART NUMBER
LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (RED)	94759-99

Remove

1. Remove rear tail lamp lighting assembly. See TAIL LAMP (Page 7-57).

2. Remove turn signal housing.

   a. See Figure 7-83. Remove cable straps (4) and discard.

   b. See Figure 7-84. Remove cable straps (2) and discard.

   c. Remove screws (1).

   d. Remove turn signal housing (6).

Install

1. Install turn signal housing.

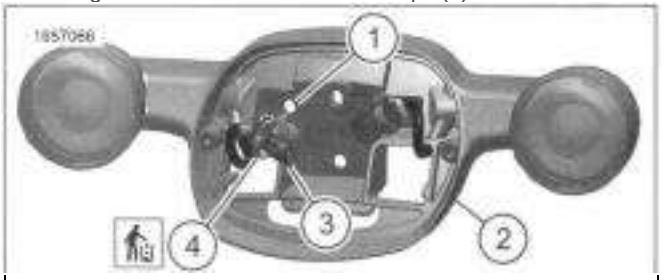
   a. See Figure 7-84. Apply threadlocker to screws (1). LOCTITE 262HIGH STRENGTH THREADLOCKER AND SEALANT (RED) (94759-99)

   b. Install screws (1). Tighten.
   Torque: 10-13 ft-lbs (14.12-17.74 N-m) ***Rear turn signal, rear lighting assembly, screw***

   c. Route cable (3) as shown through bracket opening.

   d. Install new cable straps (2).

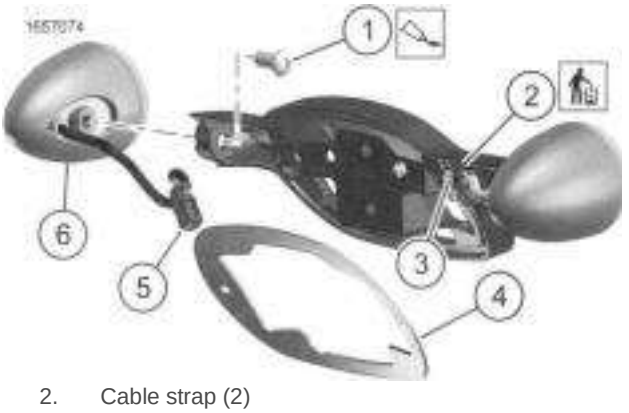
e. See Figure 7-83. Install new cable straps (4).



1. Hole
2. Tail lamp bracket
3. Turn signal connector (2)
4. Cable strap (2)

Figure 7-83. Turn Signal Lamp Connector

1. Screw (2)



2. Cable strap (2)
3. Cable (2)
4. Gasket
5. Connector (2)
6. Turn signal housing (2)

Figure 7-84. Turn Signal Assembly

REMOVE AND INSTALL: LIGHT BAR MOUNT

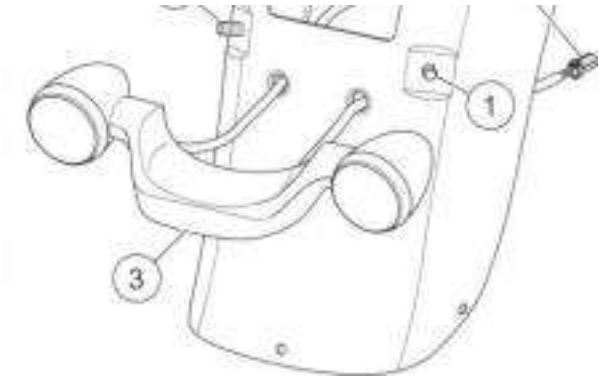
FASTENER	TORQUE VALUE	
Rear Turn Signal, Light Bar Mount, Screw	16-20 ft-lbs	22-27 N-m

Remove

1. See Figure 7-85. Remove screws (1).
2. Disconnect connector(s) (2).
3. Remove light bar (3).

Install

1. See Figure 7-85. Position light bar (3).
2. Connect connector(s) (2).
3. Install screws (1). Tighten.
   Torque: 16-20 ft-lbs (22-27 N-m) ***Rear Turn Signal, Light Bar Mount, Screw***



1. **Screw (2)**
2. **Connector (2)**
3. **Light Bar**

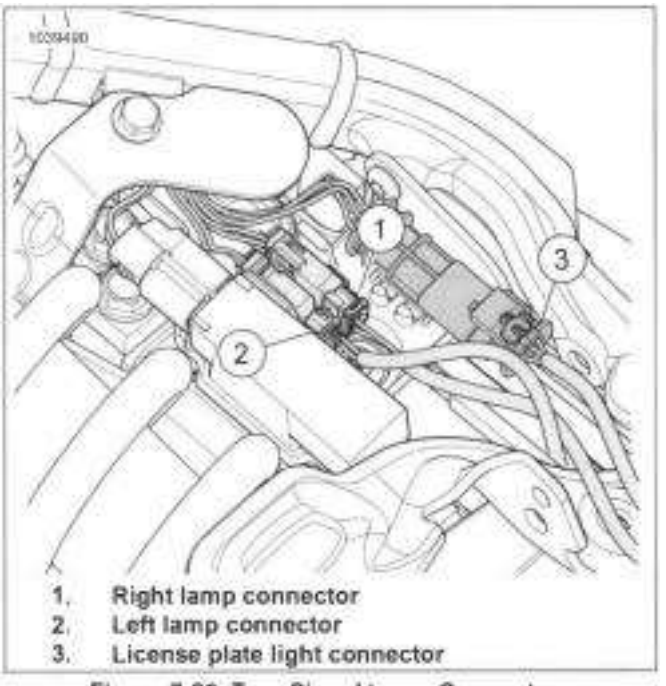
Figure 7-85. Incandescent Light Bar

REMOVE AND INSTALL: CENTER MOUNT

FASTENER	TORQUE VALUE	
Rear Turn Signal, Center Mount, Screw	15-18 ft-lbs	20-24 N-m

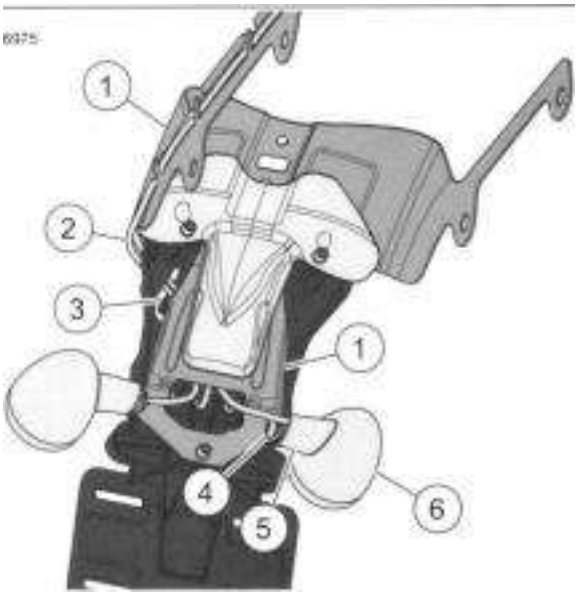
Remove

1. See Figure 7-86. Disconnect connectors (1-3).
2. Disconnect pins from 4-pin connector (1 or 2). See electrical diagnostic manual.
3. Remove and disassemble rear fender. See REAR FENDER (Page 3-116).
4. See Figure 7-87. Remove wire harness (2) from support bracket assembly (1) and license plate holder (3).
5. Disassemble left or right turn signal.
   a. Remove screw and washer (4).
   b. Disassemble signal mounting support (5) and turn signal housing (6).



1. **Right lamp connector**
2. **Left lamp connector**
3. **License plate light connector**

Figure 7-86. Turn Signal Lamp Connectors



1. **Support bracket assembly**
2. **Wire harness**
3. **License plate holder**
4. **Screw and washer**
5. **Signal mounting support**
6. **Turn signal housing**

Figure 7-87. Center Mount Turn Signal

Install

1. See Figure 7-87. Assemble left or right turn signal.
   a. Assemble signal mounting support (5) and turn signal housing (6).
   b. Install washer and screw **(4).** Tighten.
      Torque: 15--18 ft-lbs (20-24 N-m) ***Rear Turn Signal, Center Mount, Screw***
2. Route wire harness (2) through license plate holder (3) and support bracket assembly (1).

3. Assemble and install rear fender. See REAR FENDER (Page 3-116).

4. See Figure 7-86. Connect pins to 4-pin connector (1 or 2). See electrical diagnostic manual.

5. Connect connectors (1-3).

1. Install rear lighting assembly, if removed. See Remove and Install: Rear Lighting Assembly (Page 7-57).

COMPLETE

2. Install rear fender, if removed. See REAR FENDER (Page 3-116).

3. Install seat, if removed. See SEAT (Page 3-142).

4. Install main fuse. See POWER DISCONNECT (Page 7-7).

BULB REPLACEMENT

FASTENER	TORQUE VALUE
Tail Lamp Lens Screw	20-24 in-lbs 2.3-2.7 N-m

Bulb Replacement

- LED Tombstone: LED bulb is not replaceable. Replace housing.
- LED License plate mount: LED bulb is not replaceable. Replace housing.
- LED Center mount with lighting: LED bulb is not replaceable. Replace housing.

Standard

1. See Figure 7-88 and Figure 7-89. Replace tail lamp lighting.

    a. Remove screws (1).

    b. Remove lens (2).

    c. Disconnect connector (3).

    d. Incandescent: Remove bulb (4).

2. Install tail lamp lighting.

    a. Incandescent: Install bulb (4).
    b. Connect connector (3).

    c. Install lens (2).

    d. Install screws (1). Tighten.

    Torque: 20-24 in-lbs (2.3-2.7 N-m) ***Tail Lamp Lens Screw***

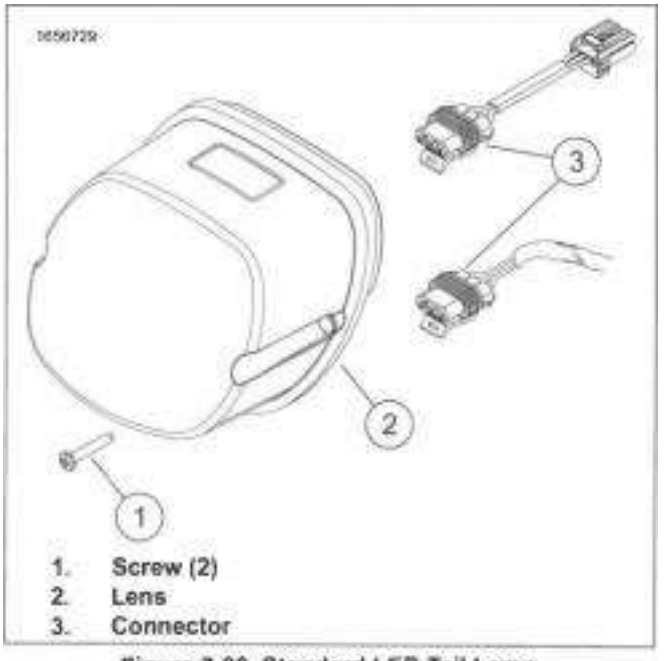


Figure 7-88. Standard LED Tail Lamp

1. Remove main fuse. See POWER DISCONNECT (Page 7-

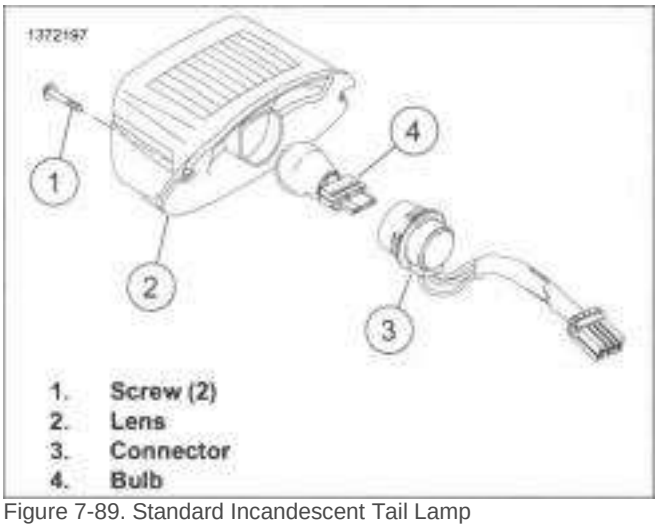


Figure 7-89. Standard Incandescent Tail Lamp

PREPARE

7).

2. Remove seat. See SEAT (Page 3-142).

REMOVE AND INSTALL: REAR LIGHTING ASSEMBLY

FASTENER	TORQUE VALUE	
Tail lamp bracket, screw	40-48 in-lbs	4.5-5.4 N-m

Remove

1. Remove tail lamp. See Bulb Replacement (Page 7-57).

2. Remove tail lamp assembly.

    a. See Figure 7-90. Remove tail lamp connector (4) from tail lamp bracket (1).

    b. Disconnect turn signal connectors (5).

    c. Remove screw (2).

    d. Remove tail lamp assembly.
    e. See Figure 7-91. Remove gasket (2). Inspect for damage and replace as necessary.

3. Remove wiring harness.

    a. See Figure 7-92. Remove cable straps (1).

    b. Remove cable strap (2).

    c. Disconnect Right and left turn connectors (3,4).

    d. Disconnect tail lamp connector (5).
    e. See Figure 7-93. Remove cable (1) from conduit (2) and clip (3).

f. Remove wiring harness.

Install

1. Install wiring harness.

   a. See Figure 7-93. Route wiring harness (1) through hole in fender.

   b. Install wiring harness in conduit (2) and behind clip (3).

   c. See Figure 7-92. Connect left turn signal connector (3).

   d. Connect right turn signal connector (4).

   e. Connect tail lamp connector (5).

   f. Install cable strap (2).

   g. Install cable straps (1).

2. See Figure 7-91. Install new cable strap anchor (3).

3. Install gasket (2).

4. Install tail lamp assembly (1).

   a. See Figure 7-90. Route tail lamp wiring harness through opening (3).

   b. Install screw (2). Tighten.

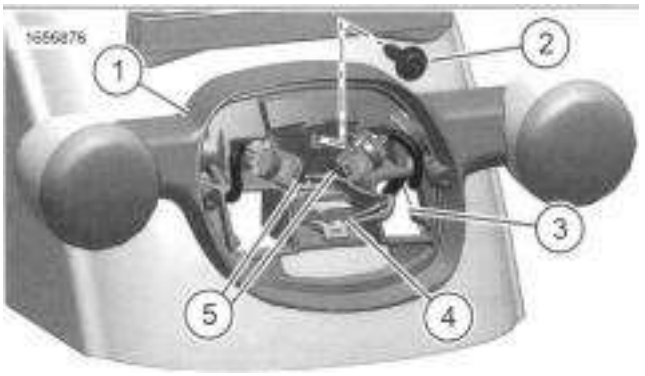
      Torque: 40-48 in-lbs (4.5-5.4 N-m) *Tail lamp bracket, screw*

   c. Connect turn signal connectors (5).

   d. Install tail lamp connector (4).

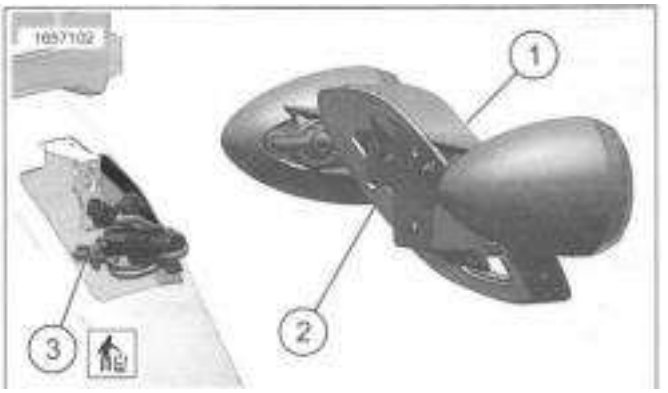
   e. Install tail lamp. See Bulb Replacement (Page 7-57).

   f. Test tail lamp and turn signals.



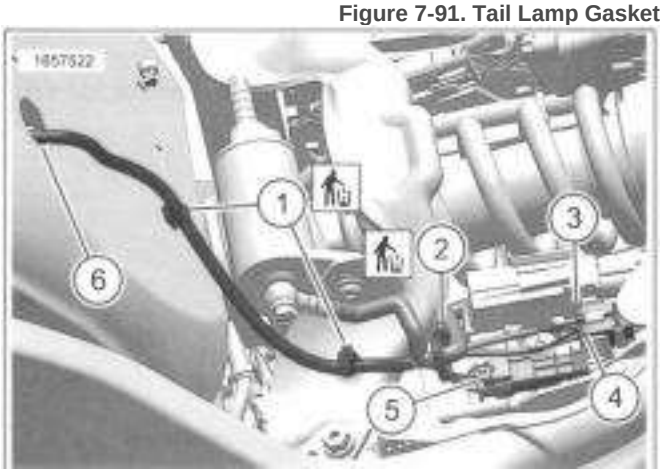
1. Tail lamp bracket
2. Screw
3. Opening
4. Tail lamp Connector
5. Turn signal connector (2)

Figure 7-90. Rear Tail Lamp Assembly



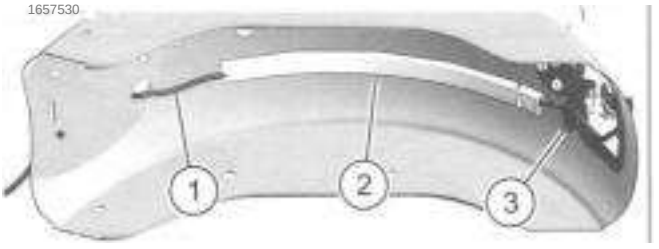
1. Tail lamp assembly
2. Gasket
3. Cable strap anchor

Figure 7-91. Tail Lamp Gasket



Cable Strap (2)
Cable Strap
Left turn signal connector
Right turn signal connector
Tail lamp connector Access hole

Figure 7-92. Rear Lighting Assembly Harness



1. Wiring harness
2. Conduit
3. Clip

Figure 7-93. Under Fender Harness Routing

REMOVE AND INSTALL:. STANDARD

FASTENER	TORQUE VALUE	
Tail lamp lens screw	20-24 in-lbs	2.3-2.7 N-m
Tail lamp, circuit board screw	40-48 in-lbs	4.5-5.4 N-m

Base Replacement

1. See Figure 7-94. Remove screw (1) and base assembly (2).

2. Disconnect 4-pin multilock connector (3).

3. See Figure 7-96. Disconnect two 2-pin connectors (2).

4. See Figure 7-98. Disconnect 6-pin connector (4).

5. See Figure 7-97. Remove screw, pin housing (1) and circuit board (2).

6. Remove base from fender.

7. Install new base to rear fender.

8. Install circuit board/pin housing to base with screw, nut and washer. Tighten.

   Torque: 40-48 in-lbs (4.5-5.4 N-m) ***Tail lamp, circuit board screw***

9. See Figure 7-98. Install connectors to circuit board.

10. Install lens to base with screws. Tighten.

    Torque: 20-24 in-lbs (2.3-2.7 N-m) ***Tail lamp lens screw***

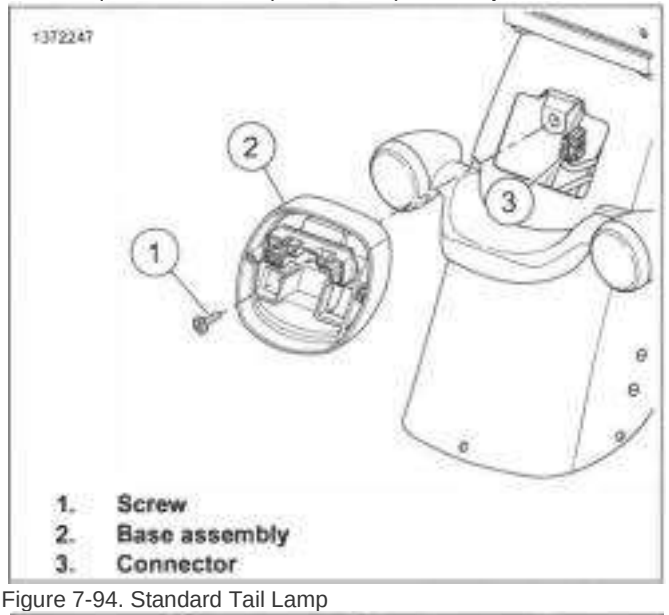


Figure 7-94. Standard Tail Lamp

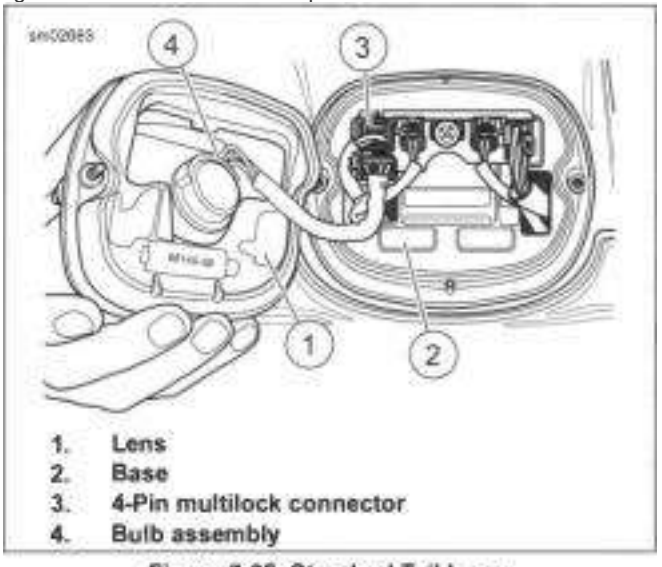


Figure 7-95. Standard Tail Lamp

Figure 7-

1.
2.
3.
4.

REMOVE AND INSTALL: LICENSE PLATE BRACKET MOUNT

FASTENER	TORQUE VALUE	
License plate holder, screw	60-----80 in-lbs	6.8-9 N-m
License plate, tail lamp, screw	10-20 in-lbs	1.1-2.3 N-m

Remove

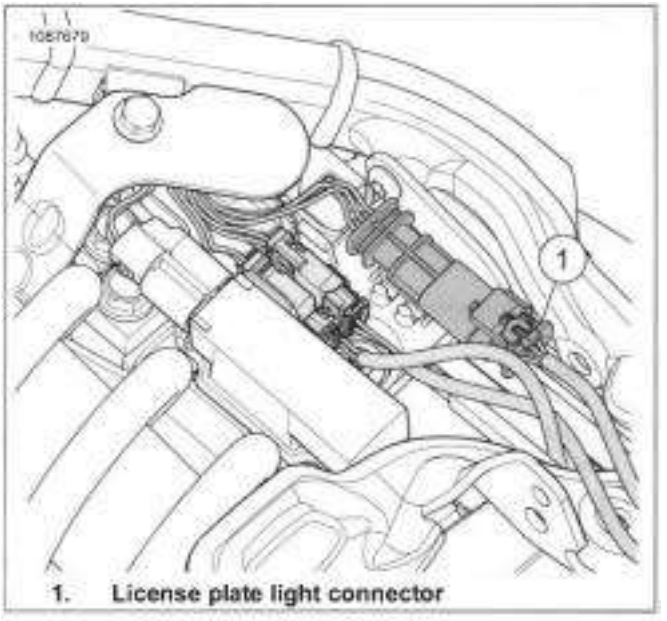
1. See Figure 7-99. Disconnect license plate connector (1).
2. Disconnect pins from connector (1). See electrical diagnostic manual.
3. See Figure 7-100. Discard cable straps (1).
4. Remove screws (2).
5. Remove license plate holder (3).
6. Remove wire bundle (4) from frame.
7. See Figure 7-101. Remove screws (1) and washers (2).
8. Remove tail lamp (3).

Install

1. See Figure 7-101. Install tail lamp (3).
2. Install screws (1) and washers (2). Tighten.

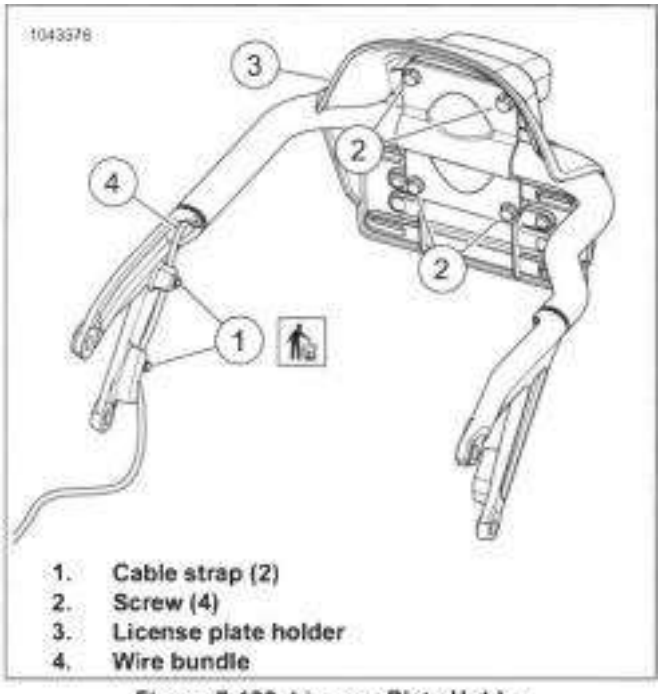
   Torque: 10-20 in-lbs (1.1-2.3 N-m) ***License plate, tail lamp, screw***
3. See Figure 7-100. Route wire bundle (4) through frame.
4. Install license plate holder (3).
5. Install screws (2). Tighten.

   Torque: 60-80 in-lbs (6.8-9 N-m) ***License plate holder, screw***
6. Route harness and install new cable straps (1).
7. Connect pins to connector (1). See electrical diagnostic manual.
8. See Figure 7-99. Connect license plate connector (1).



1. License plate light connector

Figure 7-99. License Plate Light Connector



1. Cable strap (2)
2. Screw (4)
3. License plate holder
4. Wire bundle

Figure 7-100. License Plate Holder

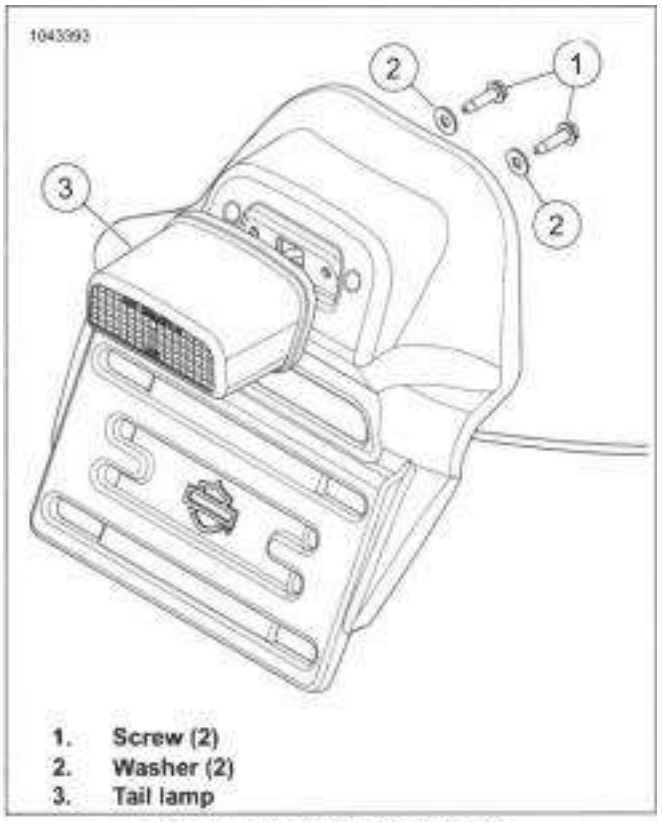


Figure 7-101. Tail Lamp (Typical)

REMOVE AND INSTALL: CENTER MOUNT

FASTENER	TORQUE VALUE	
License plate, center mount, tail lamp screw	10-20 in-lbs	1.1-2.25 N-m

Remove

1. See Figure 7-102. Disconnect connector (3).
2. Disconnect pins from connector (3). See electrical diagnostic manual.
3. Remove and disassemble rear fender. See REAR FENDER (Page 3-116).
4. See Figure 7-103. Remove harness (2) from support bracket assembly (1).
5. See Figure 7-104. Remove screws (1) and washers (2).
6. Remove tail lamp (3).

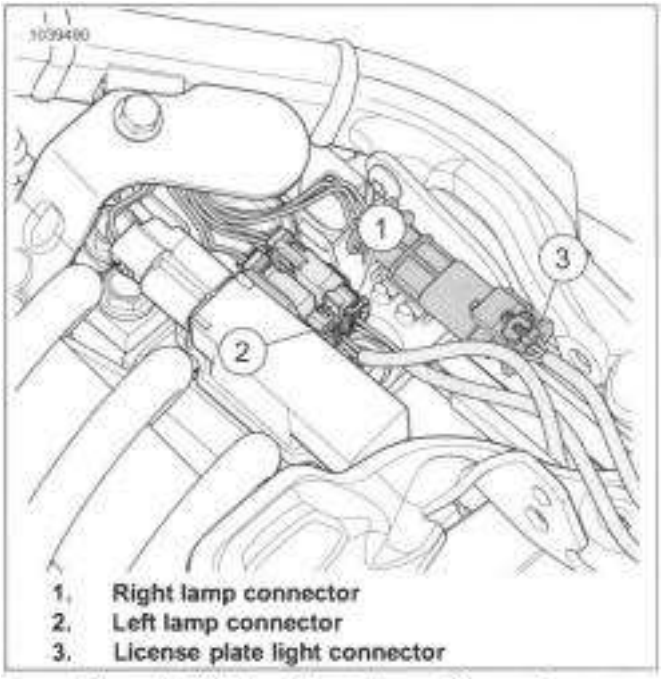


Figure 7-102. Turn Signal Lamp Connectors

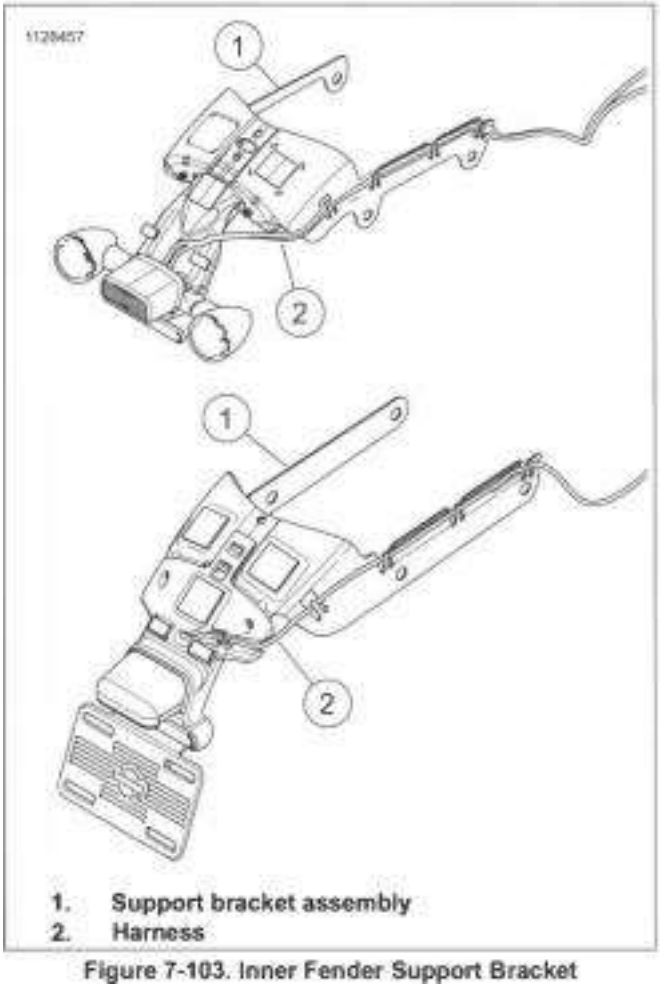


Figure 7-103. Inner Fender Support Bracket

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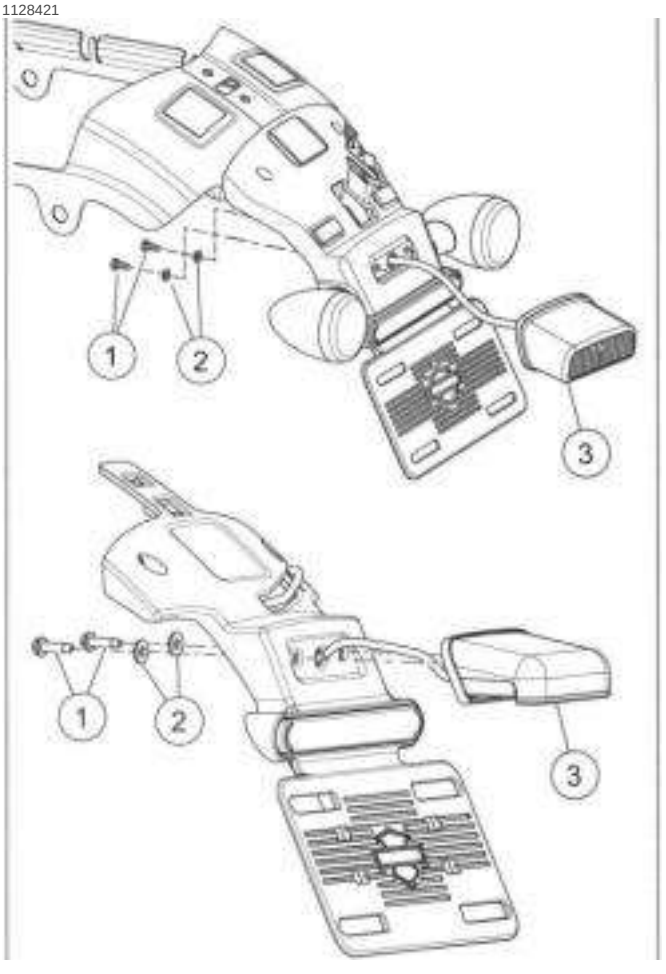


Install

1. See Figure 7-104. Install tail lamp (3).
2. Install screws (1) and washers (2). lighten.

   Torque: 10-20 in-lbs (1.1-2.25 N-m) ***License plate, center mount, tail lamp screw***
3. See Figure 7-103. Route harness (2) through support bracket assembly (1).
4. Assemble and install rear fender. See REAR FENDER (Page 3-116).
5. See Figure 7-104. Connect pins to connector (3). See electrical diagnostic manual.
6. Connect connector (3).

COMPLETE

1. Install seat. See SEAT (Page 3-142).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

1. Screw (2)
2. Washer (2)
3. Tail lamp

Figure 7-104. LED Center Mount

PREPARE

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

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)

1. See Figure 7-105. Remove connectors (1).
2. Remove switch (2).

INSTALL

FASTENER	TORQUE VALUE	
Rear stoplamp switch	12-15 ft-lbs	16.3-20.3 N-m

CONSUMABLE	PART NUMBER
LOCTITE 565 THREAD SEALANT	99818-97

1. Apply LOCTITE® 565 to threads of switch.

   Consumable: LOCTITE 565 THREAD SEALANT (99818-97)

2. See Figure 7-105. Install switch (2). Tighten.

   Torque: 12-15 ft-lbs (16.3--20.3 N-m) ***Rearstop/amp switch***

3. Install connectors (1).

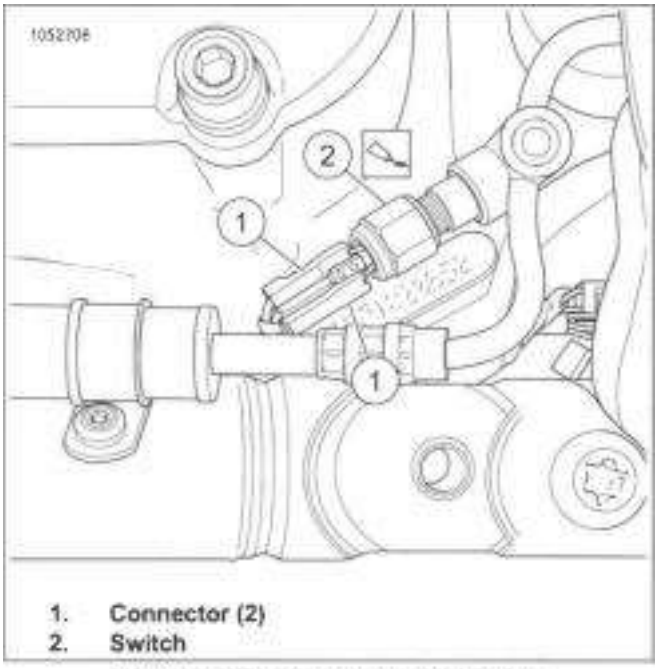


Figure 7-105. Rear Stop Lamp Switch

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).

A 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)

2. Bleed brake system. See BLEED BRAKES (Page 3-61).

LICENSE PLATE LAMP

BULB REPLACEMENT

FASTENER	TORQUE VALUE	
License plate, center mount, lamp housing screw	10-20 in-lbs	1.1-2.25 N-m

Bulb Replacement

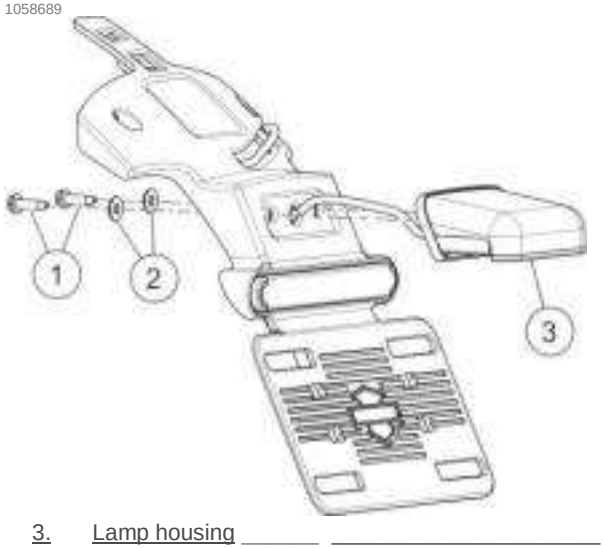
- Standard Tail Lamp: Replace tail lamp bulb. See TAIL LAMP (Page 7-57).
- LED Tombstone: LED bulb is not replaceable. Replace housing. See TAIL LAMP (Page 7-57).
- LED License Plate Mount: LED bulb is not replaceable. Replace housing. See TAIL LAMP (Page 7-57).
- LED Center Mount: LED bulb is not replaceable. Replace housing. See TAIL LAMP (Page 7-57).
- LED Rear Lighting Assembly: Replace rear tail lamp bulb. See Bulb Replacement, Rear Lighting Assembly in REAR TURN SIGNAL LAMPS (Page 7-52).

Incandescent Bulb Center Mount:

Remove

1. See Figure 7-106. Remove screws (1) and washers (2).
2. Rotate lamp housing (3) to face upward.
3. See Figure 7-107. Insert the tip of a small flat bladed screwdriver (3) into each slot (2). Gently disengage housing from cover.
4. See Figure 7-108. Gently pull bulb (2) straight out of socket.

1. Screw (2)
2. Washer (2)



3. Lamp housing _____ _____

Figure 7-106. Center Mount Lamp Housing (Typical)

Figure 7-107. Removing License Plate Lamp Housing Cover

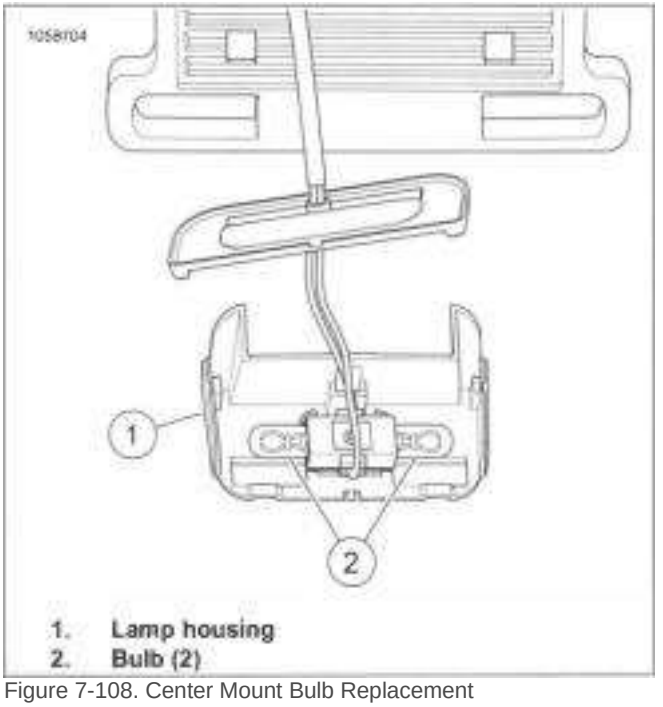


Figure 7-108. Center Mount Bulb Replacement

Install

1. See Figure 7-108. Push new light bulb (2) into socket.

2. See Figure 7-107. Install lamp housing to cover.

3. Position lamp housing (3).
4. See Figure 7-106. Install screws (1) and washers (2). Tighten.

   Torque: 10--20 in-lbs (1.1-2.25 N-m) ***License plate, center mount, lamp housing screw***

PREPARE

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

2. Remove seat. See SEAT (Page 3-142).

REMOVE AND INSTALL: CENTER MOUNT

FASTENER	TORQUE VALUE	
License plate, center mount, lamp housing screw	10-20 in-lbs	1.1-2.25 N-m

Remove

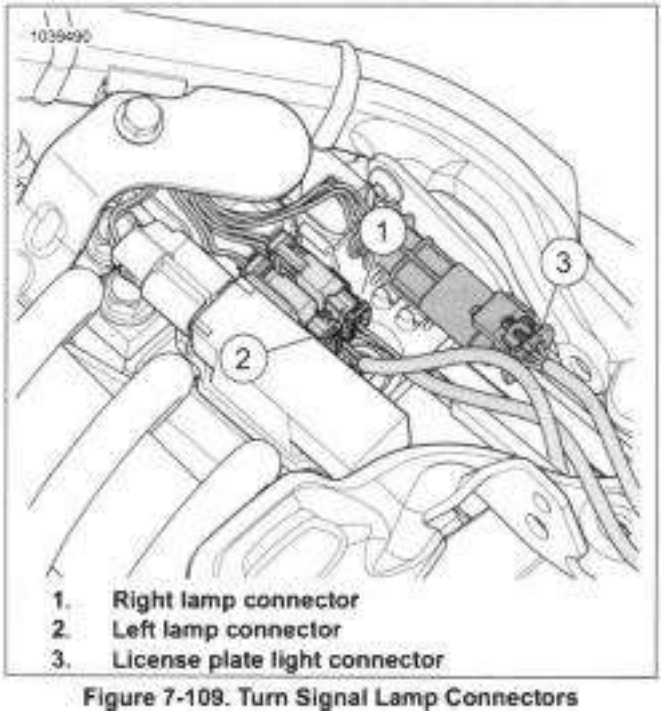
1. See Figure 7-109. Disconnect connector (3).

2. Disconnect pins from 3-pin connector (3). See electrical diagnostic manual.

3. Remove rear fender. See REAR FENDER (Page 3-116).

4. See Figure 7-110. Remove harness (2) from inner fender support assembly (1).

5. See Figure 7-111. Remove screws (1) and washers (2).
6. Remove lamp housing (3).



1. Right lamp connector
2. Left lamp connector
3. License plate light connector

Figure 7-109. Turn Signal Lamp Connectors

1. Inner fender support assembly
2. Harness

Figure 7-110. Inner Fender Support Assembly (Typical)

1. Screw (2)
2. Washer (2)
3. Lamp housing

Figure 7-111. Center Mount Lamp Housing (Typical)

Install

1. See Figure 7-111. Install lamp housing (3).

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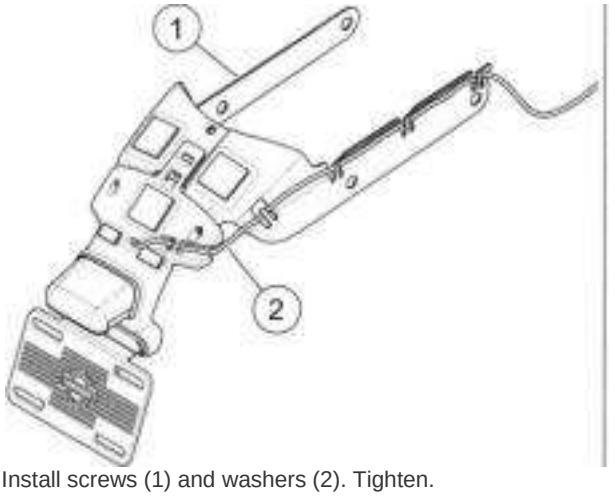

2. Install screws (1) and washers (2). Tighten.
   Torque: 10-20 in-lbs (1.1-2.25 N-m) ***License plate, center mount, lamp housing screw***

3. See Figure 7-110. Route harness (2) through inner fender support assembly (1).

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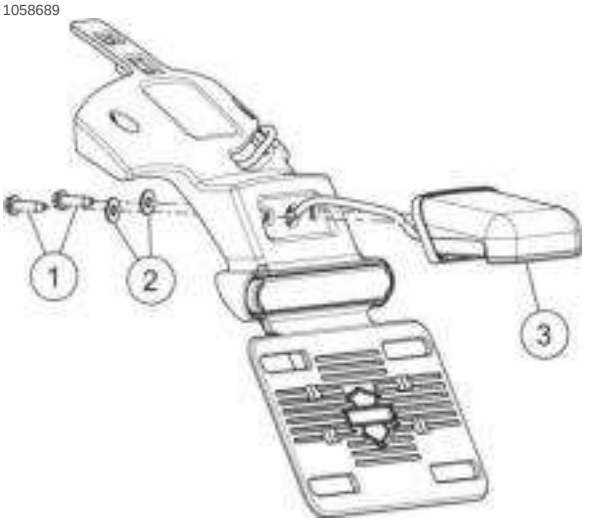


4. Install rear fender. See REAR FENDER (Page 3-116).

5. See Figure 7-109. Connect pins to 3-pin connector (3). See electrical diagnostic manual.

6. Connect connector (3).

REMOVE AND INSTALL: LICENSE PLATE BRACKET MOUNT

FASTENER	TORQUE VALUE	
License plate holder, screw	60-80 in-lbs	6.8-9 N-m
License plate, LED housing, screw	10-20 in-lbs	1.1-2.3 N-m

Remove

1. See Figure 7-112. Disconnect license plate connector (1).
2. Disconnect pins from connector (1). See electrical diagnostic manual.
3. See Figure 7-113. Discard cable straps (1).
4. Remove screws (2).
5. Remove license plate holder (3).
6. Remove wire bundle (4) from frame.
7. See Figure 7-114. Remove screws (1) and washers (2).
8. Remove LED housing (3).

Install

1. See Figure 7-114. Install LED housing (3).
2. Install screws (1) and washers (2). Tighten.

   Torque: 10-20 in-lbs (1.1-2.3 N-m) ***License plate, LED housing, screw***
3. See Figure 7-113. Route wire bundle (4) through frame.
4. Install license plate holder (3).
5. Install screws (2). Tighten.

   Torque: 60-80 in-lbs (6.8-9 N-m) ***License plate holder, screw***
6. Route harness and install new cable straps (1).
7. Connect pins to connector (1). See electrical diagnostic manual.
8. See Figure 7-112. Connect license plate connector (1).

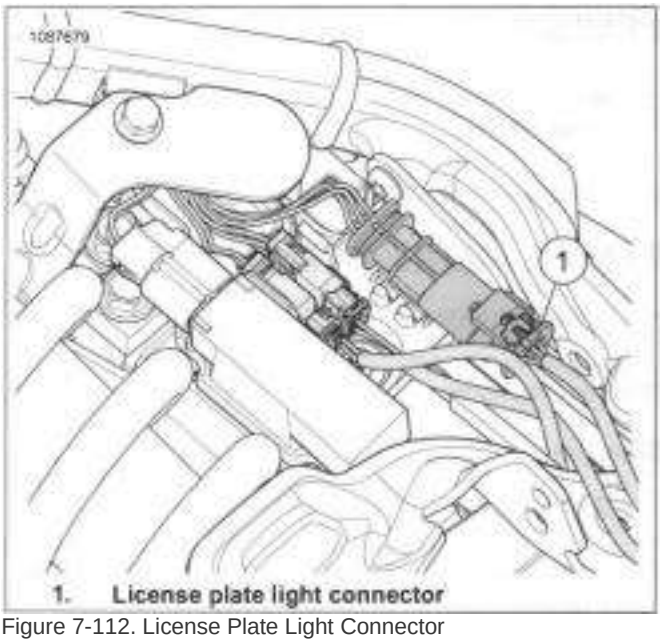


Figure 7-112. License Plate Light Connector

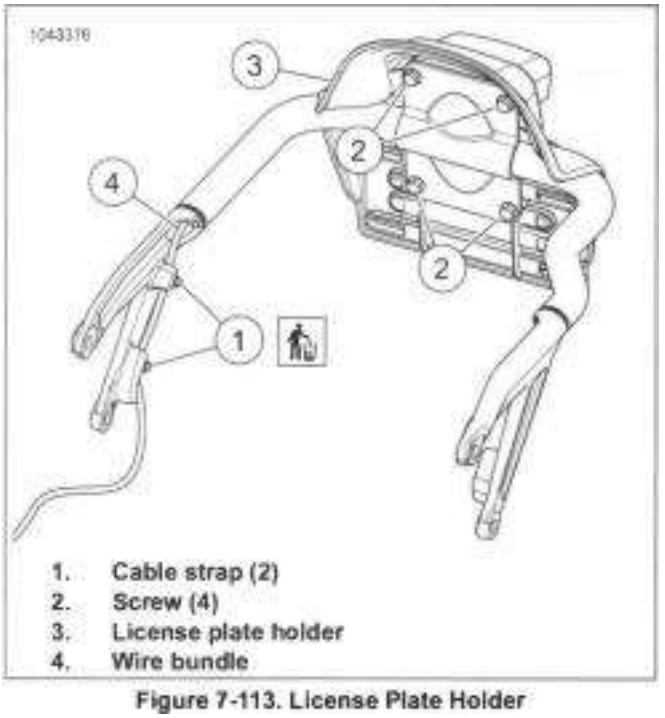


Figure 7-113. License Plate Holder

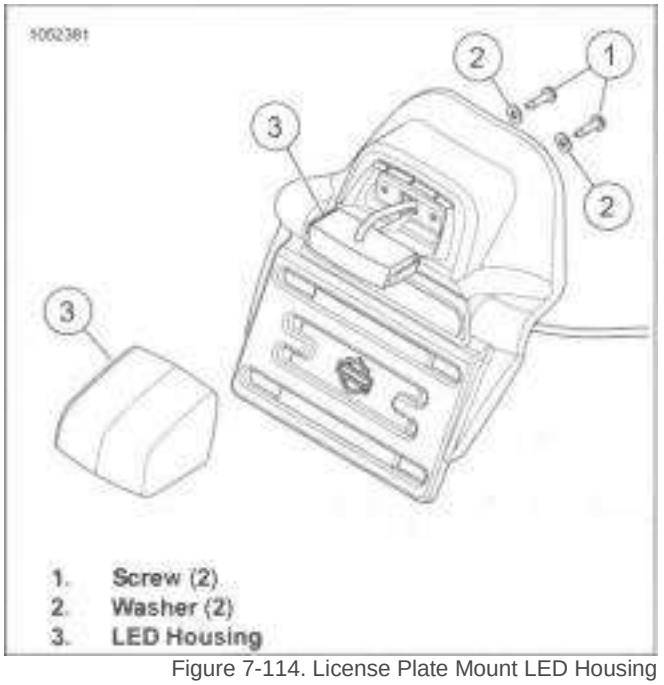


Figure 7-114. License Plate Mount LED Housing

REMOVE AND INSTALL: SIDE MOUNT

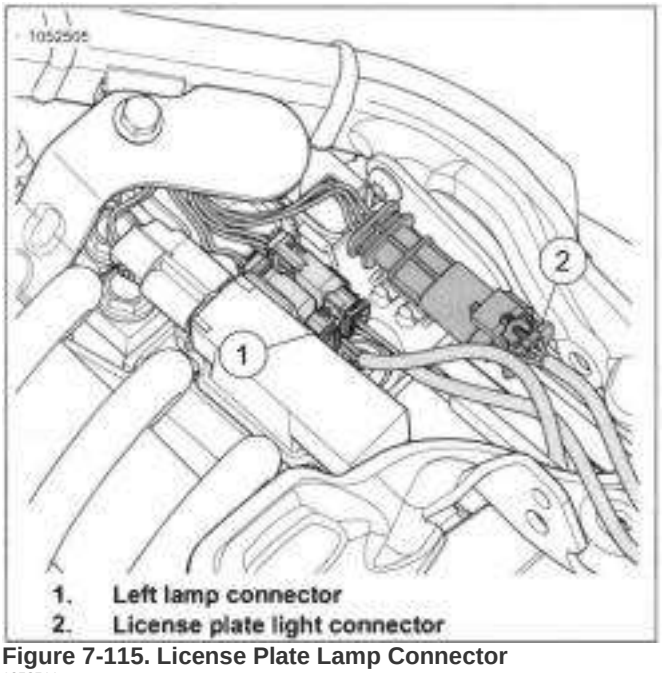
FASTENER	TORQUE VALUE	
Fender Support, Screw	42-46 ft-lbs	57-62.3 N-m
License Plate Lamp Cover, Screw	8-16 in-lbs	0.9-1.8 N-m
Rear Turn Signal, Fender Mount, Screw	15-18 ft-lbs	20-24 N-m

Remove

1. See Figure 7-115. Disconnect connectors.
   a. License Plate: Disconnect connector (2).
   b. Left Signal: Disconnect connectors (1).
2. See Figure 7-116. Remove left fender support.
   a. Remove screws (2).
   b. Remove screws (4) and washers (3).
   c. Remove fender support (1).
3. See Figure 7-117. Remove harness.
   a. Discard wire retention pads (1).
   b. Remove harness (2).
4. See Figure 7-115. Disconnect pins from connector (2). See electrical diagnostic manual.
5. See Figure 7-118. Disassemble turn signal.
   a. Remove screw (1) and washer (2).
   b. Disassemble license plate mounting support and turn signal.
   c. Remove screws (4) and cover (5).
   d. Remove lamp (3) with harness.

Install

1. See Figure 7-118. Assemble turn signal.
   a. Install lamp (3).
   b. Install cover (5) and screws (4). Tighten.
      Torque: 8-16 in-lbs (0.9-1.8 N-m) ***License Plate Lamp Cover, Screw***
   c. Route harness, assemble license plate mounting support and turn signal. See REAR TURN SIGNAL LAMPS (Page 7-52).
   d. Install screw (1) and washer (2).
      Torque: 15-18 ft-lbs (20-24 N-m) ***Rear Turn Signal, Fender Mount, Screw***
2. See Figure 7-115. Connect pins to connector (2). See electrical diagnostic manual.
3. See Figure 7-117. Install harness.
   a. Route harness (2) through fender support (4).
   b. Install new wire retention pads (1).
4. See Figure 7-116. Install fender support.
   a. Install fender support (1), washers (3) and screws (4). Tighten.
      Torque: 42-46 ft-lbs (57-62.3 N-m) ***Fender Support, Screw***
   b. Install screws (2). Tighten.
      Torque: 21-27 ft-lbs (28-37 N-m) ***Fender Support, Screw***
5. See Figure 7-115. Connect connectors.
   a. License Plate: Disconnect connector (2).
   b. Left Signal: Disconnect connectors (1).



1. Left lamp connector
2. License plate light connector

Figure 7-115. License Plate Lamp Connector

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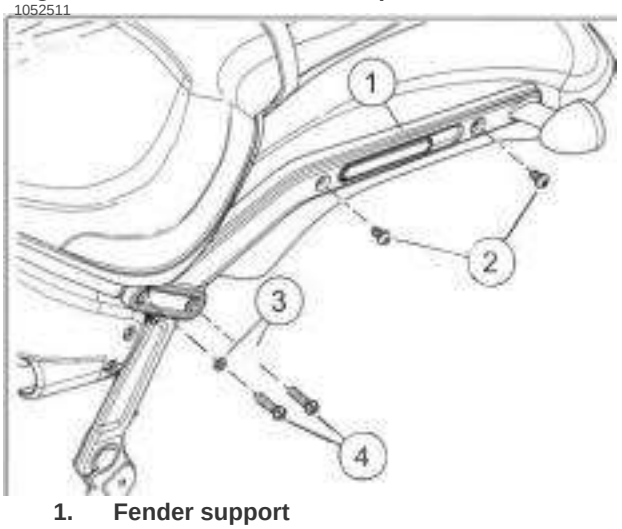
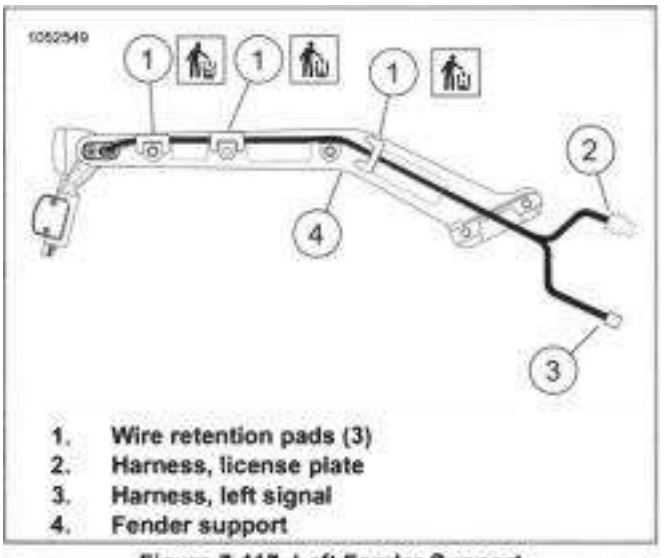


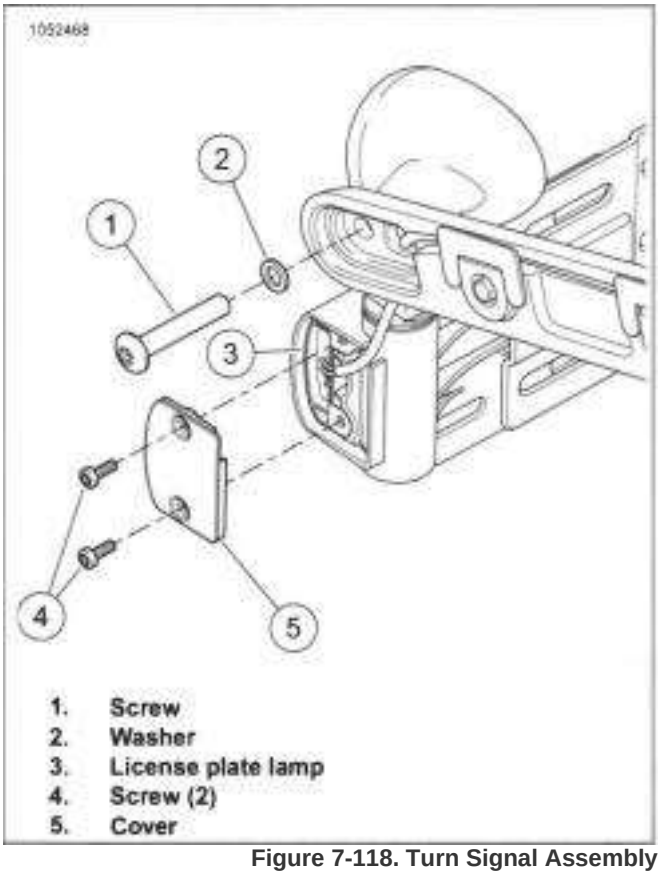
1. Fender support
2. Screw, long or short (2)
3. Washer (2)
4. Screw (2)

Figure 7-116. Right Fender Support



1. Wire retention pads (3)
2. Harness, license plate
3. Harness, left signal
4. Fender support

Figure 7-117. Left Fender Support



1. Screw
2. Washer
3. License plate lamp
4. Screw (2)
5. Cover

Figure 7-118. Turn Signal Assembly

COMPLETE

1. Install seat. See SEAT (Page 3-142).

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

TERMINATING RESISTOR

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).

2. Remove main fuse. See POWER DISCONNECT (Page 7-7).

REMOVE

1. See Figure 7-119. Remove terminating resistor.

INSTALL

1. See Figure 7-119. Install terminating resistor.

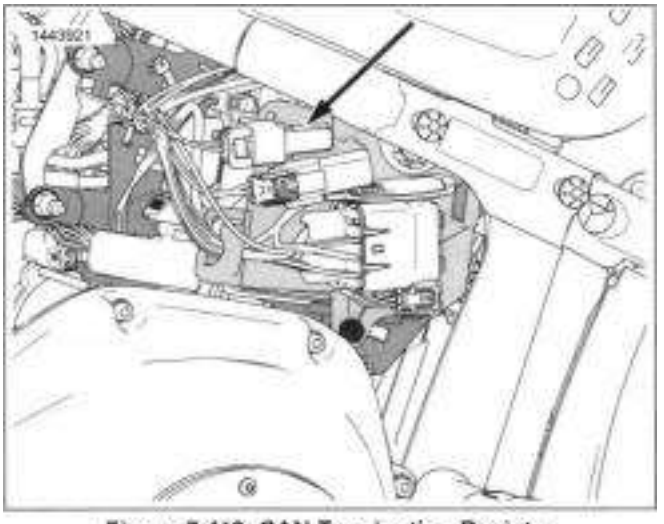


Figure 7-119. CAN Terminating Resistor

COMPLETE

1. Install main fuse. See POWER DISCONNECT (Page 7-7).

2. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

NOTE

Always calibrate replaced ECM with DIGITAL TECHNICIAN II (PART NUMBER: HD-48650).

1. Remove seat. See SEAT (Page 3-142).

2. Remove main fuse. See POWER DISCONNECT (Page 7-7).

REMOVE

1. Release and move sub caddy (1).

   a. See Figure 7-120. Remove screw (3).

   b. Release sub caddy lock (2).

   c. Route sub caddy out-of-way.

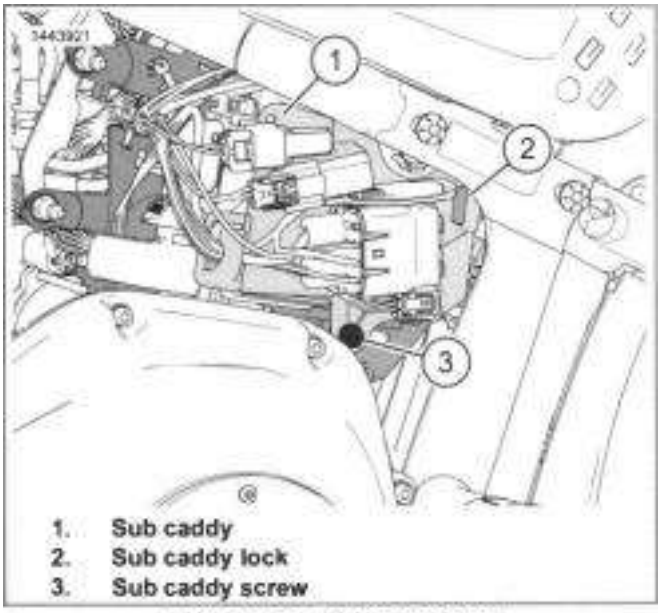
2. Remove ECM.

   a. See Figure 7-121. Slide ECM forward.

   b. Pull ECM from caddy to gain clearance to remove connector.

   c. Disconnect ECM connector.

   d. Remove ECM.



1. Sub caddy
2. Sub caddy lock
3. Sub caddy screw

Figure 7-120. ECM Sub Caddy

INSTALL

FASTENER	TORQUE VALUE	
Sub caddy screw	36-60 in-lbs	4.1-6.8 N-m

1. Install ECM.

   a. See Figure 7-121. Connect ECM connector. Verify connector lock is engaged.

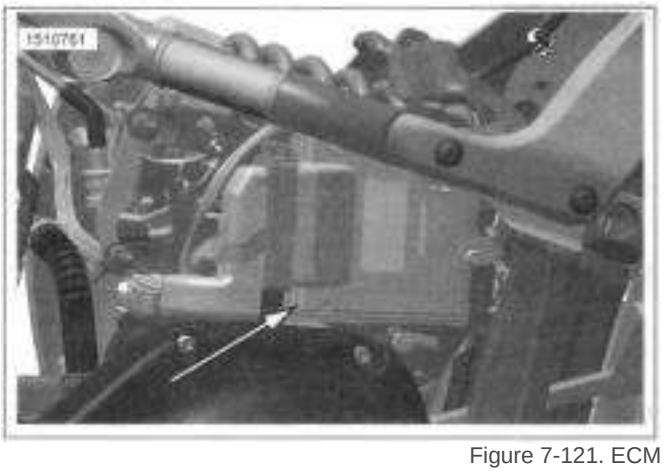


Figure 7-121. ECM

   b. Install ECM into caddy.

2. Install sub caddy mounting bracket.

   a. See Figure 7-120. Route sub caddy into position.

   b. Push and lock into position the rear sub caddy lock (2).

   c. Install screw (3). Tighten

      Torque: 36--60 in-lbs (4.1--6.8 N-m) ***Sub caddy screw***

COMPLETE

1. Install seat. See SEAT (Page 3-142).

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

PREPARE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

NOTE

Always calibrate replaced Body Control Module (BCM) with DIGITAL TECHNICIAN II (PART NUMBER: HD-48650).

1. Remove seat. See SEAT (Page 3-142).

2. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).

3. Remove battery tray. See BATTERY TRAY (Page 7-97).

REMOVE

1. Remove BCM.

   a. See Figure 7-122. Disconnect BCM [242] (1).

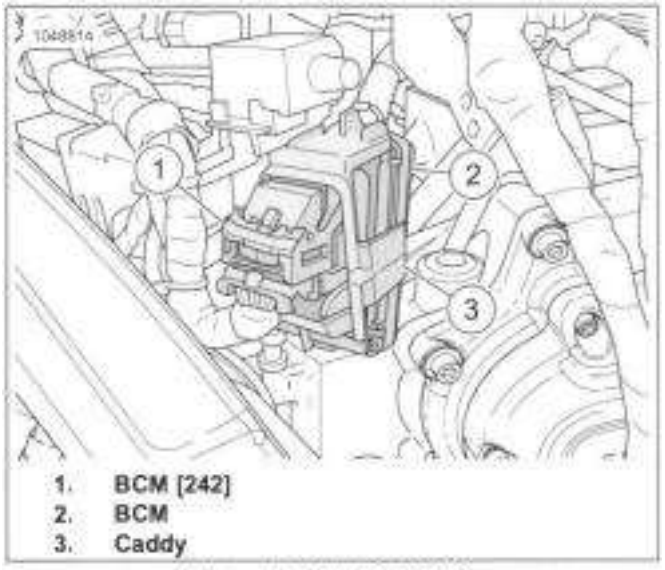
   b. See Figure 7-123. Move BCM out of caddy.

NOTE

If rotating the BCM to access components behind BCM, do not disconnect BCM battery power or remove BCM.

   c. Disconnect BCM battery power [259] (1).

d. Remove BCM (2).



1. BCM [242]
2. BCM
3. Caddy

Figure 7-122. BCM [242]

INSTALL

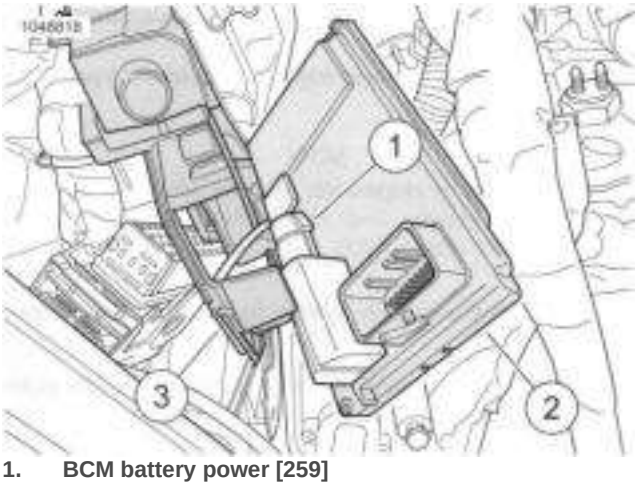
1. ***NOTE***

When installing battery power connector verify seal does not roll.

Install BCM.

   a. See Figure 7-123. Connect BCM battery power [259] (1).

   b. See Figure 7-122. Install BCM (2) into caddy (3).



1. **BCM battery power [259]**
2. **BCM**
3. **Caddy**

Figure 7-123. BCM [259]

   c. Connect BCM [242] (1).

COMPLETE

1. Install battery tray. See BATTERY TRAY (Page 7-97).

2. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

3. Install seat. See SEAT (Page 3-142).

ACTIVATION

Activation consists of assigning two fobs to the system and entering an initial PIN.

NOTE

If the fob is lost or inoperable, the PIN allows the owner to disarm the system. See PERSONAL IDENTIFICATION NUMBER (PIN) (Page 7-73).

1. Configure the security system by assigning both fobs to the vehicle.
2. Configure the security system by entering a PIN picked by the owner.

Record the PIN in the owner's manual. Instruct the customer to carry a copy (use the wallet card found in the owner's manual). See PERSONAL IDENTIFICATION NUMBER (PIN) (Page 7-73).

Once the system has been activated, it "arms" within 5 seconds of switching the IGN switch to OFF and no motorcycle motion.

FOB ASSIGNMENT [13] [14]

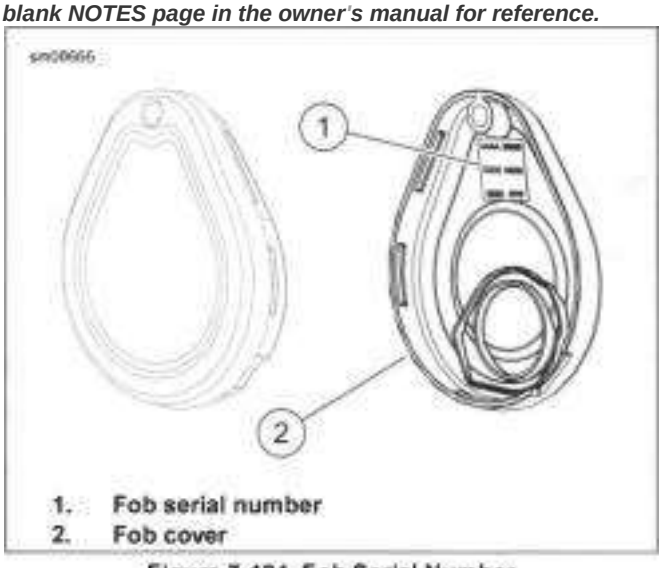
PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

• When assigning a fob, keep the fob within 3 ft (1 m) of the vehicle seat.

See Figure 7-124. Follow the menu prompts to scan the fob serial number with the bar code reader. Alternatively, enter the number using 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.



1. Fob serial number
2. Fob cover

Figure 7-124. Fob Serial Number

Use DIGITAL TECHNICIAN II (PART NUMBER: HD-48650) to assign both fobs to the vehicle.

NOTE

14 Choose the correct fob type. Choosing incorrectly at the beginning of the process will result in a failure to assign the fob. This can be mistakenly diagnosed as a bad fob or SCM.

GENERAL

The PIN consists of five digits. Each digit can be any number from 1 through 9. There can be no zeros (0) in the PIN. Use the PIN to disarm the security system in case the fob becomes unavailable.

CHANGING THE PIN

The rider can change the PIN at any time. Refer to Table 7-9.

Modifying an Existing PIN

If a PIN was previously entered, the odometer will display the equivalent digit. Each additional press of the left turn switch will increment the digit.

Examples:

- To advance from 5 to 6, press and release the left turn switch 1 time.
- To advance from 8 to 2, press and release the left turn switch 3 times (9-1-2).

Table 7-9. Changing the PIN

STEP NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Select a 5-digit (1 thru 9) PIN and record on the wallet card from owner's manual.		
2	With an assigned fob present, turn the OFF/RUN switch to **OFF.**		
3	Turn the OFF/RUN switch to **RUN.**		
4	Cycle the OFF/RUN switch twice: **RUN -OFF-RUN-OFF-RUN.**		
5	Press **left** turn signal switch **two times.**	ENTER PIN will scroll through the odometer window.	
6	Press **right** turn signal switch **one time** and release.	Turn signals will flash three times. Current PIN will appear in odometer. The first digit will be flashing.	
7	Enter first digit of new PIN by pressing and releasing the **left** turn signal switch until the selected digit appears.		
8	Press **right** turn signal switch **one time** and release.	The new digit will replace the current in odometer window.	
9	Enter second digit of selected PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
10	Press **right** turn signal switch **one time** and release.	The new digit will replace the current in odometer window.	
11	Enter third digit of the selected PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
12	Press **right** turn switch **one time** and release.	The new digit will replace the current in odometer window.	
13	Enter fourth digit of new PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
14	Press **right** turn switch **one time** and release.	The new digit will replace the current in odometer window.	
15	Enter fifth digit of the new PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
16	Press **right** turn switch **one time** and release.	The new digit will replace the current in odometer window.	
17	Turn the OFF/RUN switch **OFF,** then turn the ignition switch to **OFF.**		Pushing the OFF/RUN switch to **OFF** stores the new PIN in the module.

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 switch to RUN.
2. Set the OFF/RUN switch to OFF.
3. Simultaneously press both the left and the right turn signal switches within five seconds of turning the OFF/RUN switch to OFF.
4. Following a single flash, the turn signals flash three times to indicate that the system is armed in transport mode.

To Exit Transport Mode

With the fob present, set the OFF/RUN switch to RUN to disarm the system and exit transport mode.

FOB BATTERY

Battery Replacement Schedule

Replace the fob battery every year.

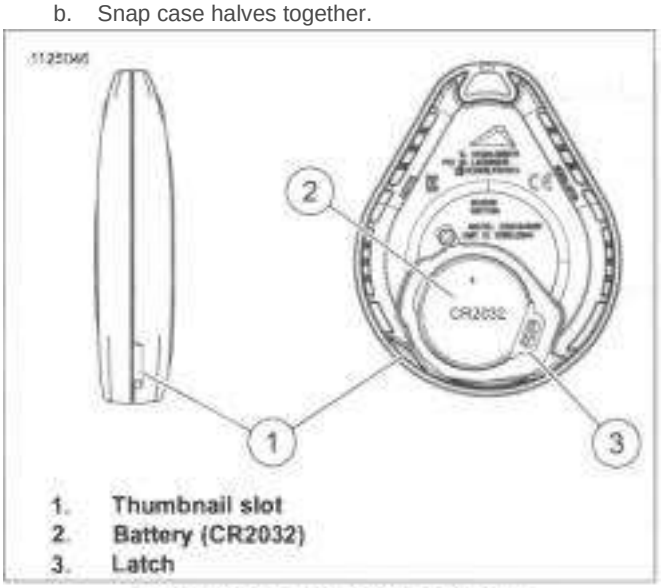
Battery Replacement

1. Open the fob case.
   a. See Figure 7-125. Place a thin blade in the thumbnail slot (1).
   b. Twist the blade to separate cases.

NOTE

Use a CR2032 or equivalent battery.

2. Install a new battery with the positive side up.
   a. Push the latch (3) away from the battery.
   b. Lift the battery from the side opposite the latch.
   c. Verify that the metal tabs will firmly contact battery. Bend up slightly if necessary.
   d. Install the battery against the latch with the positive side up. Drop into place.
3. Close the case.
   a. Align case halves.
   b. Snap case halves together.



1. Thumbnail slot
2. Battery (CR2032)
3. Latch

Figure 7-125. Replace Fob Battery

SECURITY SIREN BATTERY

Battery Replacement Schedule

The siren internal 9 V battery is rechargeable and does not require regular replacement. Battery life under normal conditions is approximately 3-6 years.

NOTE

If the motorcycle battery is less than 12.5 V, the internal siren battery may not charge.

Battery Replacement

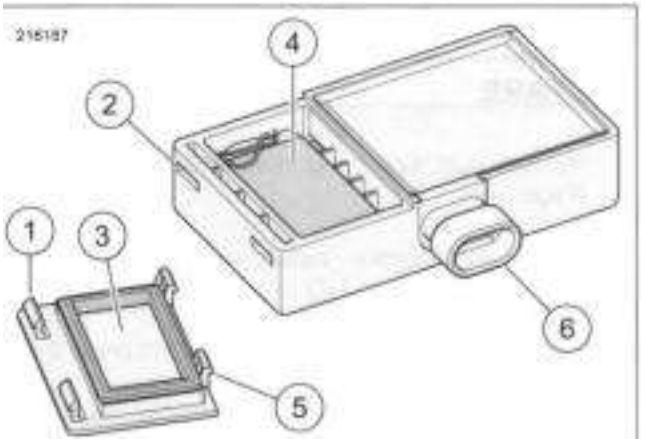
1. Disarm system. Remove siren.
2. See Figure 7-126. With a small screwdriver, push the catches (1) in through the two slots (2) in the end of the siren. Release the battery cover (3).

NOTE

- ***For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on new battery***
- ***Use only a 9 V nickel metal hydride battery in the siren.***

3. Replace 9 volt battery (4) by removing old battery from polarized battery clip.
4. Recharge and install or install a **new** 9 volt nickel metal hydride battery.
5. Install cover (3).
   a. Carefully replace the rubber seal (5) on the cover.
   b. Align battery cover with case placing round corners on cover away from connector [142A] (6).
   c. Snap cover into place.

6. Install siren and check operation. Two chirps after an arming command indicate a working siren.



1. **Catch (2)**
2. **Slot (2)**
3. **Cover**
4. **9V battery**
5. **Rubber seal**
6. **Connector [142A]**

Figure 7-126. Battery Compartment

PREPARE

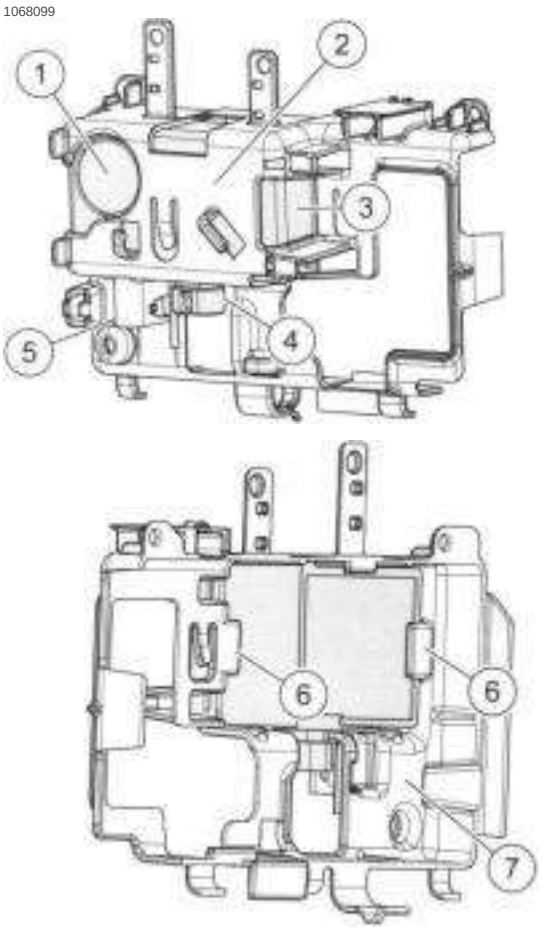
1. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
3. Remove battery. See INSPECT BATTERY (Page 2-43).
4. Remove battery tray. See BATTERY TRAY (Page 7-97).
5. Rotate BCM out-of-way. See BODY CONTROL MODULE (BCM) (Page 7-71).

REMOVE

1. See Figure 7-127. Remove security siren (3).
2. Disconnect connector (4).

INSTALL

1. **First-time security siren is being installed:** Disconnect security siren connector (5) from back side of BCM caddy (2).
2. See Figure 7-127. Connect connector (4).
3. Install security siren into front side of BCM caddy (7).
   a. Verify that sounder disc (1) is facing to the rear of the vehicle.
   b. Place security siren into BCM caddy and press into place locking retainer tabs (6).



1. **Sounder disc**
2. **Back side, BCM caddy**
3. **Security siren**
4. **Siren connector**
5. **Siren connector storage port**
6. **Retainer tab**
7. **Front side, BCM caddy**

Figure 7-127. Security Siren and BCM Caddy: (Removed for clarity)

COMPLETE

1. Install BCM. See BODY CONTROL MODULE (BCM) (Page 7-71).
2. Install battery tray. See BATTERY TRAY (Page 7-97).
3. Install battery. See INSPECT BATTERY (Page 2-43).
4. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).
5. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

PREPARE

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

2. Remove seat. See SEAT (Page 3-142).

REMOVE

1. See Figure 7-128. Remove antenna (1).

   a. Remove antenna from caddy.

   b. Disconnect connector (2).

   c. Remove antenna.

INSTALL

1. See Figure 7-128. Install antenna (1).

   a. Connect connector (2).

   b. Connect antenna to caddy.

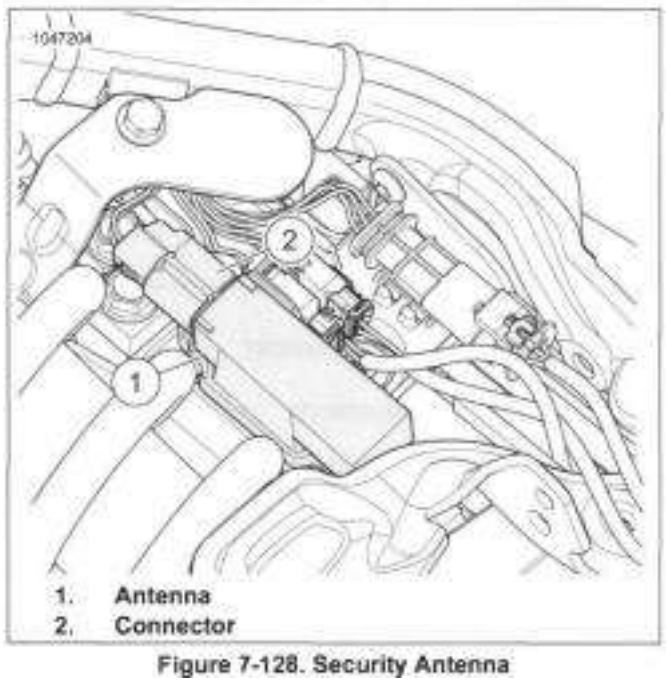


Figure 7-128. Security Antenna

COMPLETE

1. Install seat. See SEAT (Page 3-142).

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

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove voltage regulator. See VOLTAGE REGULATOR (Page 7-12).

REMOVE

1. Figure 7-129 Disconnect connector.
   a. Disconnect connector (1).
   b. Detach connector (1) from voltage regulator bracket.
2. Remove sensor.
   a. Remove screw (2).
   b. Remove sensor (3).
3. Figure 7-130 Discard O-ring.

INSTALL

FASTENER	TORQUE VALUE	
Sensor, CKP, screw	90-120 in-lbs	10.2-13.6 N-m

1. See Figure 7-130. Install new O-ring.
   a. Lubricate new O-ring with clean engine oil.
   b. Install new O-ring.
2. See Figure 7-129. Install sensor.
   a. Install sensor (3).
   b. Install screw (2). Tighten.
      Torque: 90-120 in-lbs (10.2-13.6 N-m) ***Sensor. CKP, screw***
3. Connect connector.
   a. Attach connector (1) to voltage regulator bracket.
   b. Connect connector (1).

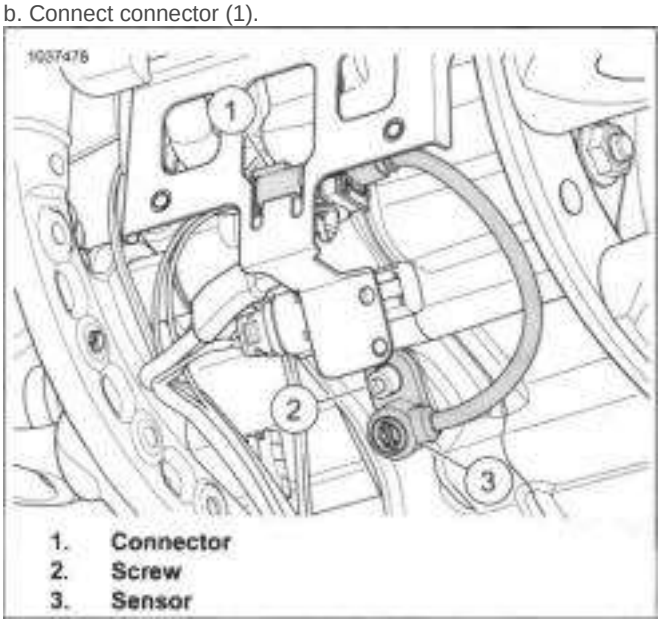


Figure 7-129. Crankshaft Position (CKP) Sensor

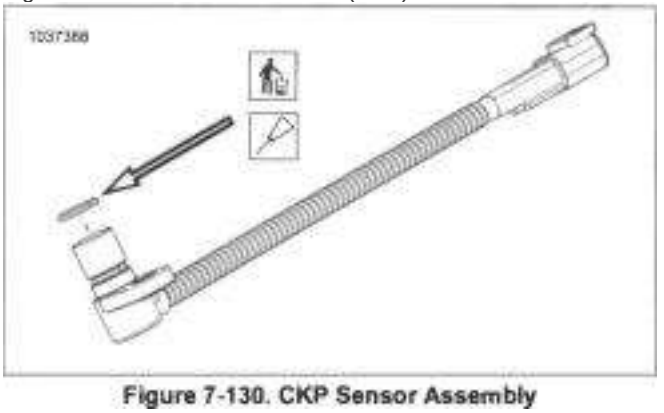


Figure 7-130. CKP Sensor Assembly

COMPLETE

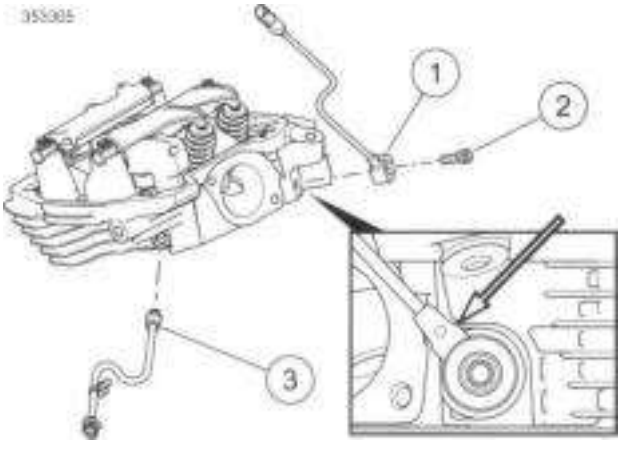
1. Install voltage regulator. See VOLTAGE REGULATOR (Page 7-12).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).
6. Remove air cleaner assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
7. Remove throttle body from induction module. See disassemble in INDUCTION MODULE (Page 6-27).

REMOVE

1. See Figure 7-131. Disconnect ET connector. See USB CADDY (Page 7-90).
2. Remove sensor (3) from rear cylinder head.



1. Knock sensor
2. Screw
3. ET sensor (rear head only)

Figure 7-131. Cylinder Head Sensors

INSTALL

FASTENER	TORQUE VALUE	
ET sensor	11-15 ft-lbs	14.9-21 N-m

1. Install ET sensor. Tighten.

   Torque: 11-15 ft-lbs (14.9-21 N-m) ***ET sensor***
2. Connect ET connector. See USB CADDY (Page 7-90).

COMPLETE

1. Install throttle body to induction module. See assemble in INDUCTION MODULE (Page 6-27).
2. Install air cleaner assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
3. Install fuel tank. See FUEL TANK (Page 6-14).
4. Install seat. See SEAT (Page 3-142).
5. Install main fuse. See POWER DISCONNECT (Page 7-7).
6. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).

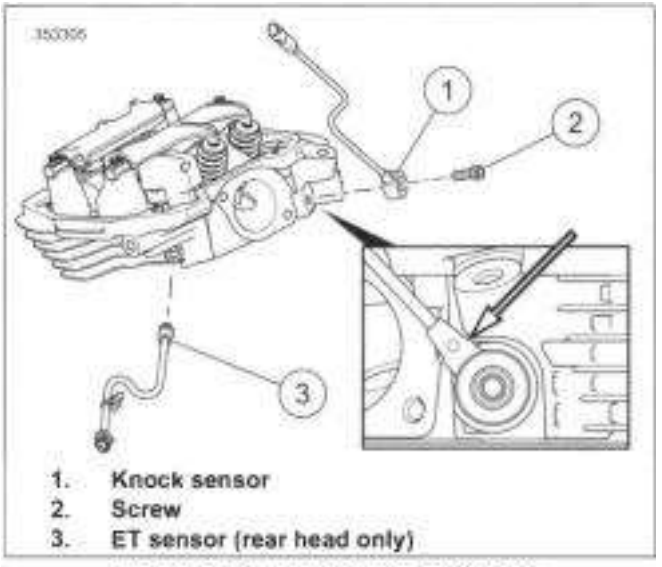
REMOVE

1. See Figure 7-132 . Remove screw (2).
2. Disconnect connector.
3. Remove sensor (1).

INSTALL

FASTENER	TORQUE VALUE	
Knock sensor screw	13-17 ft-lbs	17.6-23 N-m

1. See Figure 7-132. Install sensor (1).
   a. Install sensor against head casting as shown.
   b. Install screw. Tighten.
      Torque: 13-17 ft-lbs (17.6-23 N-m) ***Knock sensor screw***
2. Connect connector.



1. Knock sensor
2. Screw
3. ET sensor (rear head only)

Figure 7-132. Cylinder Head Sensors

COMPLETE

1. Install fuel tank. See FUEL TANK (Page 6-14).
2. Install seat. See SEAT (Page 3-142).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).
4. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).
6. Front ACR: Remove oil lines. See OIL COOLANT LINES (Page 4-22).

REMOVE

1. Disconnect Automatic Compression Release (ACR) connector.

PART NUMBER	TOOL NAME
HD-48498-B-1	ACR SOLENOID SOCKET

2. See Figure 7-136. Remove ACR.

Special Tool: ACR SOLENOID SOCKET (HD-48498-B-1)

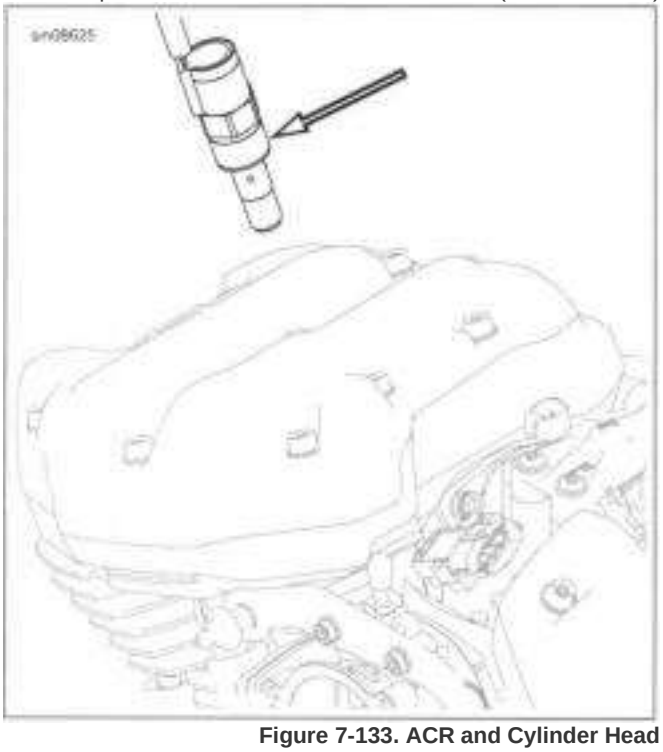


Figure 7-133. ACR and Cylinder Head

INSTALL

PART NUMBER	TOOL NAME
HD-48498-B-1	ACR SOLENOID SOCKET

FASTENER	TORQUEVALUE	
ACR	17-19 ft-lbs	23-26.4 N-m

CONSUMABLE	PART NUMBER
LOCTITE 246 HIGH TEMPERATURE MEDIUM STRENGTH BLUE THREADLOCKER	Loctite 246

1. ***NOTE***

Ifinstalling new ACR, verify old copper seal washer does not remain in cylinder head.

Verify copper seal washer is in place on ACR.

2. See Figure 7-134. Apply threadlocker.

Consumable: LOCTITE 246 HIGH TEMPERATURE MEDIUM STRENGTH BLUE THREADLOCKER (Loctite 246)

a. Identify a location around the threads of the ACR approximately one-third distance from end.

b. See Figure 7-135. Apply three equally spaced dots of threadlocker on threads.

3. Install by hand until finger-tight.
4. See Figure 7-136. Use socket to tighten.

Torque: 17-19 ft-lbs (23-26.4 N-m) ***ACR***
Special Tool: ACR SOLENOID SOCKET (HD-48498-B-1)

5. Connect ACR connector.

1205500

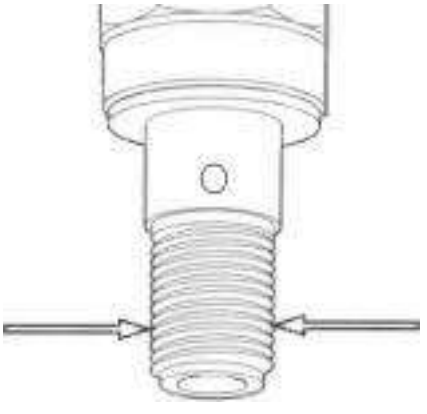


Figure 7-134. Bottom Third

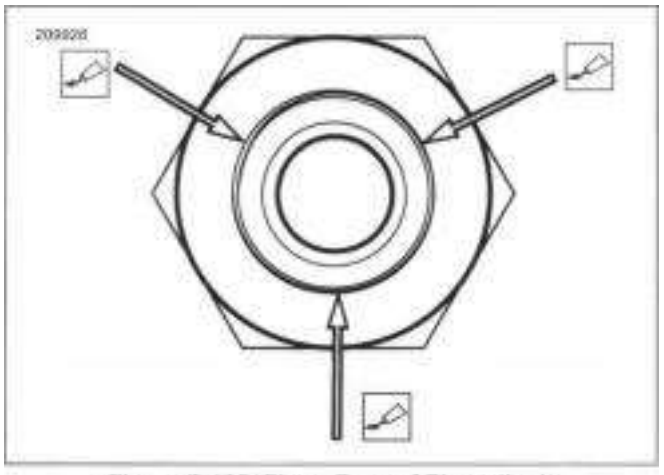


Figure 7-135. Three Dots of Threadlock

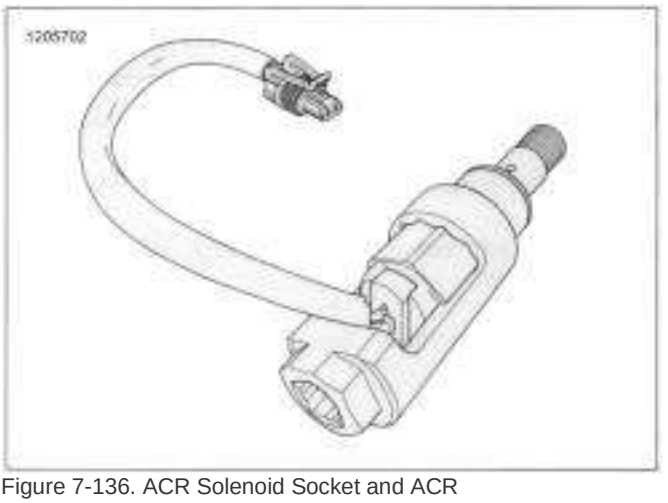


Figure 7-136. ACR Solenoid Socket and ACR

COMPLETE

1. Front ACR: Install oil lines. See OIL COOLANT LINES (Page 4-22).
2. Install fuel tank. See FUEL TANK (Page 6-14).
3. Install seat. See SEAT (Page 3-142).
4. Install main fuse. See POWER DISCONNECT (Page 7-7).
5. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove seat. See SEAT (Page 3-142).
4. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
5. Remove battery. See INSPECT BATTERY (Page 2-43).

REMOVE

1. See Figure 7-137. Disconnect connector (1).
2. Remove VSS.
   a. Remove screw (2).
   b. Remove VSS (3).

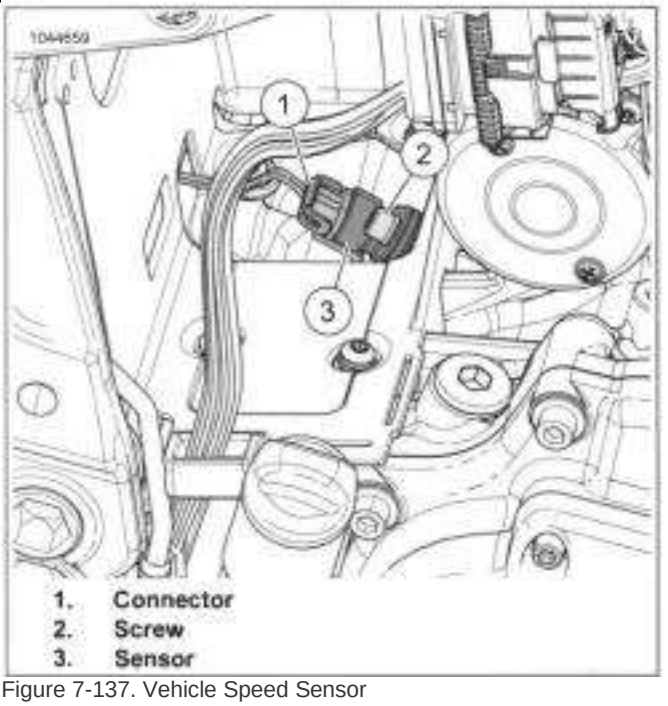


Figure 7-137. Vehicle Speed Sensor

INSTALL _____

FASTENER	TORQUE VALUE
Sensor, vehicle speed, screw	100--120in-lbs 111.3--13.6 N-m

1. See Figure 7-137. Install VSS.
   a. Install VSS (3).
   b. Install screw (2). Tighten.
      Torque: 100-120 in-lbs (11.3-13.6 N-m) ***Sensor, vehicle speed, screw***
2. Connect connector (1).

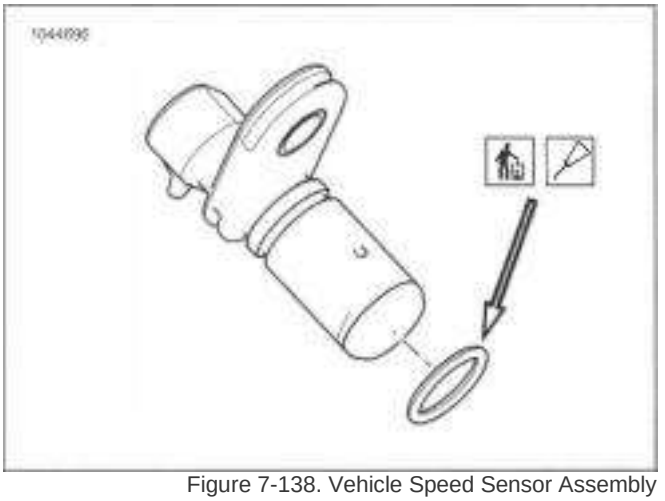


Figure 7-138. Vehicle Speed Sensor Assembly

COMPLETE _____ _____

1. Install battery. See INSPECT BATTERY (Page 2-43).
2. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Install seat. See SEAT (Page 3-142).
4. Install main fuse. See POWER DISCONNECT (Page 7-7).
5. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).
3. Remove fuel tank. See FUEL TANK (Page 6-14).

REMOVE

1. Note location of cable straps and discard as needed.
2. See Figure 7-139. Remove brake line clamp screws.
3. See Figure 7-140. Detach WSS wire from clips (1).
4. Remove frame plug (2).
5. See Figure 7-141. Disconnect connector (1).
6. Retract front axle until sensor is free. See FRONT WHEEL (Page 3-12).

INSTALL

1. Align sensor and insert front axle. See FRONT WHEEL (Page 3-12).
2. See Figure 7-141. Connect connector (1).
3. See Figure 7-140. Install frame plug (2).
4. Attach WSS wire to clips (1).
5. See Figure 7-139. Install brake line clamp screws.
6. Install **new** cable straps as needed.

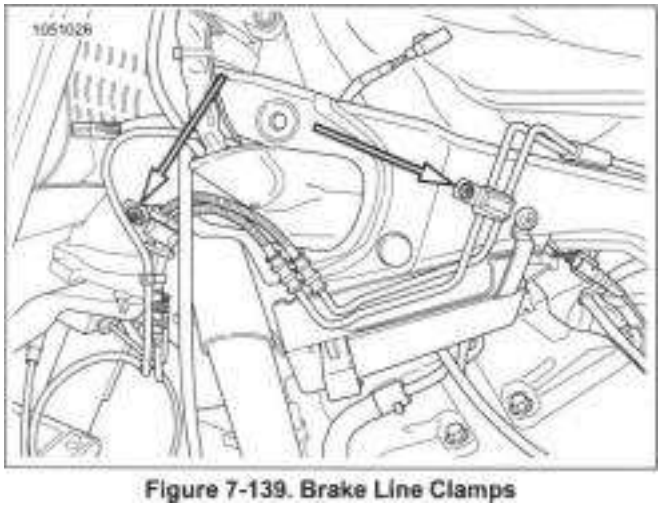
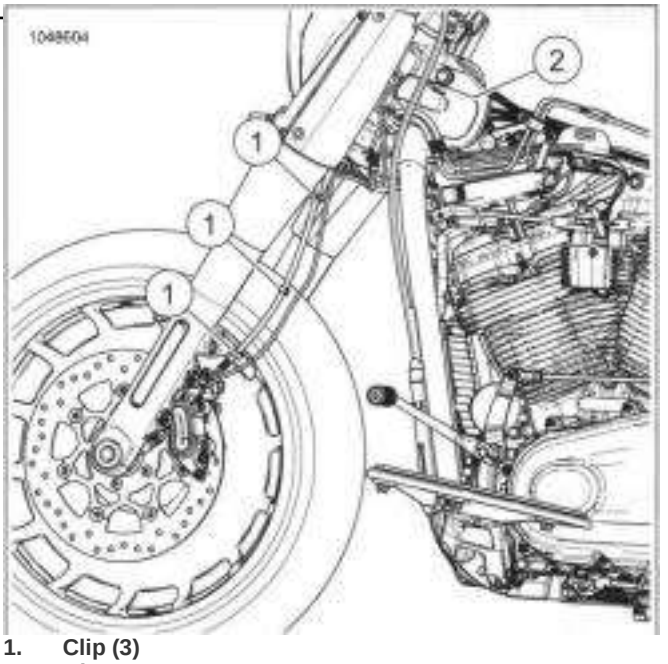


Figure 7-139. Brake Line Clamps



1. Clip (3)
2. Plug

Figure 7-140. Front Wheel Speed Sensor

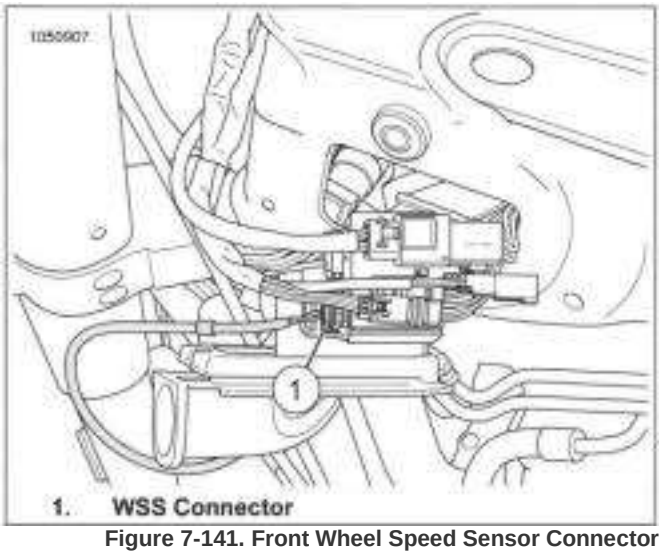


Figure 7-141. Front Wheel Speed Sensor Connector

COMPLETE

1. Install fuel tank. See FUEL TANK (Page 6-14).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).
3. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).

2. Remove main fuse. See POWER DISCONNECT (Page 7-7).

3. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).

REMOVE AND INSTALL: STANDARD FORK

Remove

FASTENER	TORQUE VALUE	
Rear fork clamp screw	24-36 in-lbs	2.7-4.1 N-m

1. Note location of cable straps. Remove as needed.

2. See Figure 7-142. Remove WSS wire from clips (1).

3. Remove clamp (2).

   a. Remove screw from clamp.
   b. Remove WSS wire from clamp.

4. Disconnect connector (3).

5. Retract rear axle until sensor is free. See REAR WHEEL (Page 3-16).

Install

1. Align sensor and rear axle. See REAR WHEEL (Page 3-16).

2. See Figure 7-142. Connect WSS sensor connector (3).

3. Install clamp (2).

   a. Install WSS sensor wire into clamp.

   b. Install screw. Tighten.

      Torque: 24-36 in-lbs (2.7-4.1 N-m) ***Rear fork clamp screw***

4. Attach WSS wire to clips (1).
5. Install cable straps as needed.

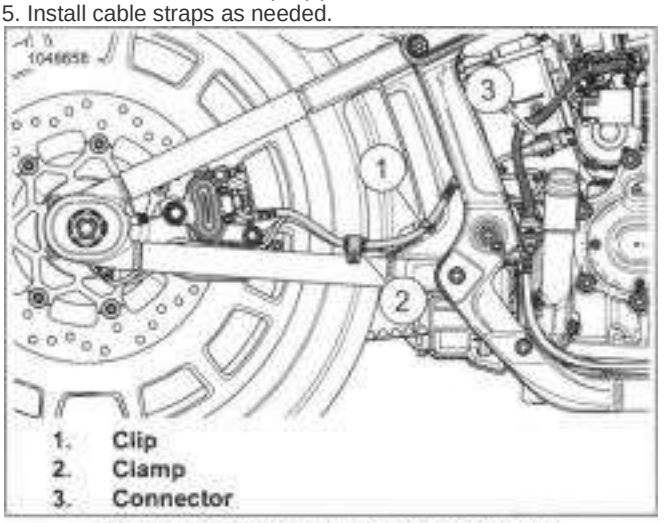


Figure 7-142. Rear Wheel Speed Sensor

COMPLETE

1. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

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

3. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove jiffy stand. See JIFFY STAND (Page 3-140).

REMOVE

1. See Figure 7-143. Disconnect connector (1).
2. ***NOTE***

Make note of cable routing and cable strap locations.

   Discard cable straps.

3. Remove screw (2).
4. Remove sensor (3).

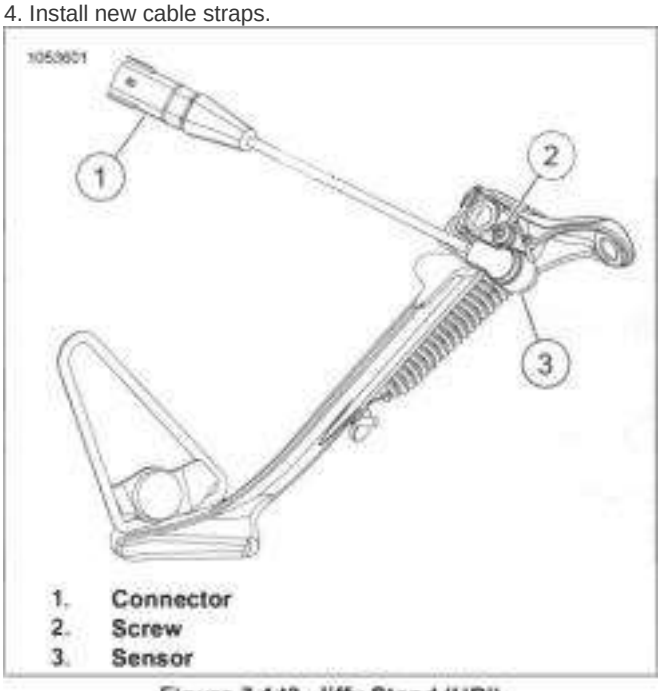
INSTALL

FASTENER	TORQUE VALUE	
JSS screw	20-25 in-lbs	2.3-2.8 N-m

1. See Figure 7-143. Install jiffy stand sensor (3).
2. Install screw (2). Tighten.

   Torque: 20-25 in-lbs (2.3-2.8 N-m) ***JSS screw***

3. Connect connector (1).
4. Install new cable straps.



1. Connector
2. Screw
3. Sensor

Figure 7-143. Jiffy Stand (HDI)

COMPLETE

1. Remove jiffy stand. See JIFFY STAND (Page 3-140).
2. Remove main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).

REMOVE

1. See Figure 7-144. Disconnect backbone harness interconnect [327].

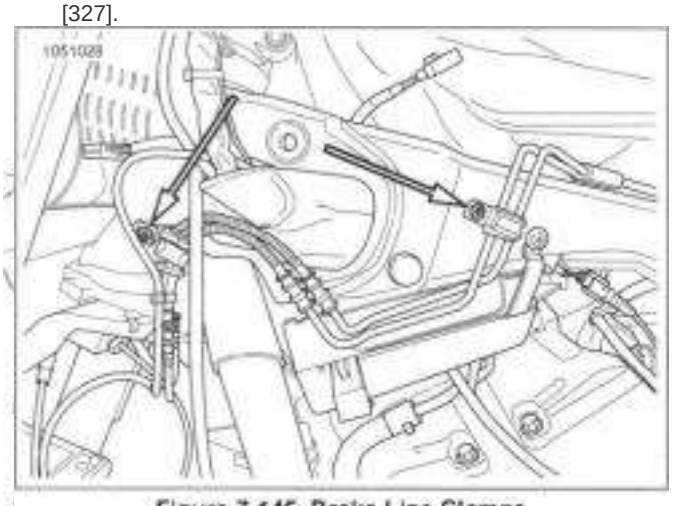
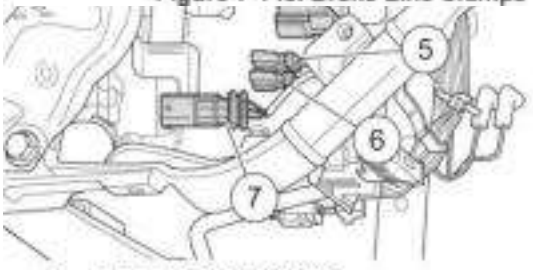


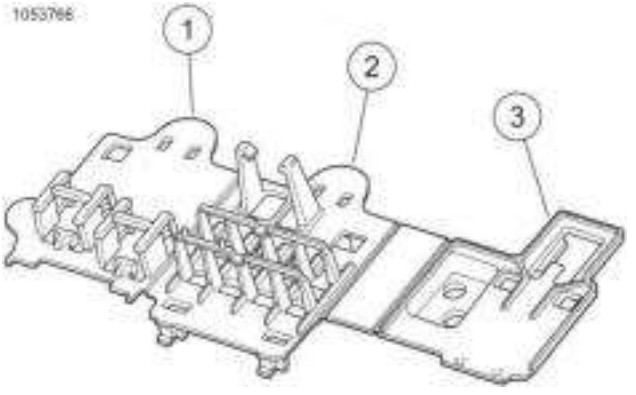
Figure 7-145. Brake Line Clamps



1. Engine harness [145]
2. Frame ground stud (2)
3. Backbone harness interconnect [327]
4. Security antenna [209]
5. Left rear Stop/Tail/Turn (STT) [19]
6. Right rear STT [18]
7. License Plate (LP) [40]

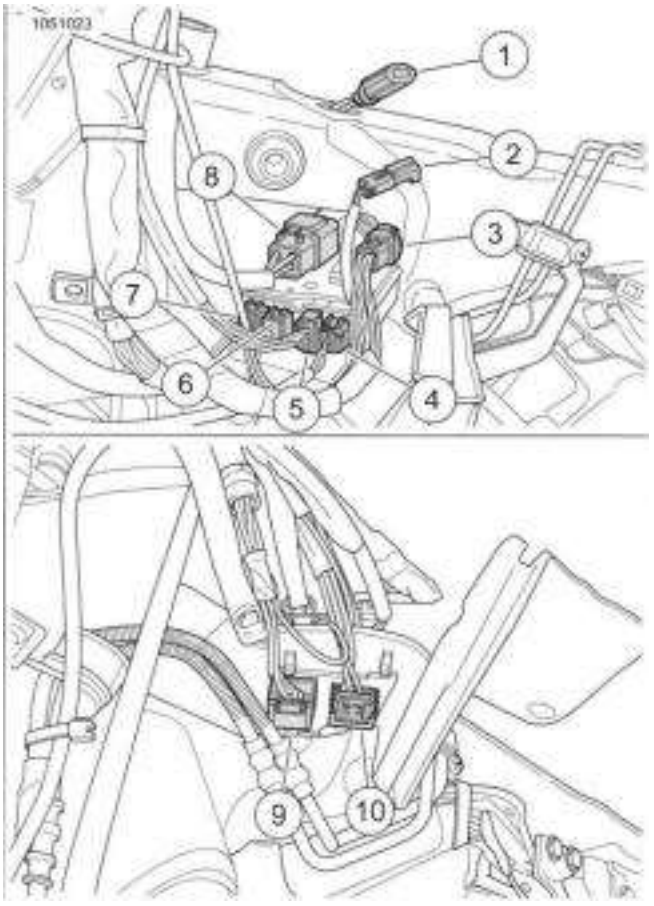
Figure 7-144. Main Harness Under Seat

2. See Figure 7-145. Remove brake line clamp screws.
3. See Figure 7-147. Remove frame plug and front electrical caddy.



1. Bottom fold
2. Center fold
3. Top fold

Figure 7-146. Front Electrical Caddy



1. **Console**
2. **Heated hand grip**
3. **Twist grip**
4. **WSS**
5. **Right turn signal**
6. **RHCM [22-2]**
7. **RHCM [22-1]**
8. **Headlamp**
9. **LHCM**
10. **Left turn signal**

Figure 7-147. Front Electrical Caddy Connectors

4. See Figure 7-146. Open front electrical caddy.

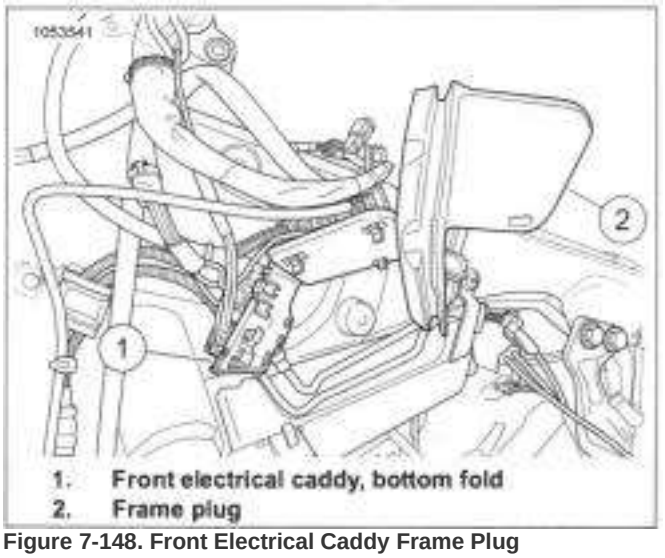
   a. See Figure 7-146 and Figure 7-148. Unlock and open bottom fold (1) that contains frame plug.

   b. Remove frame plug.

   c. See Figure 7-146 and Figure 7-149. On top fold (3) disconnect twist grip and headlamp connectors.

   d. Remove twist grip and headlamp connectors from top fold and position out-of-way.

   e. Open caddy.



1. **Front electrical caddy, bottom fold**
2. **Frame plug**

Figure 7-148. Front Electrical Caddy Frame Plug

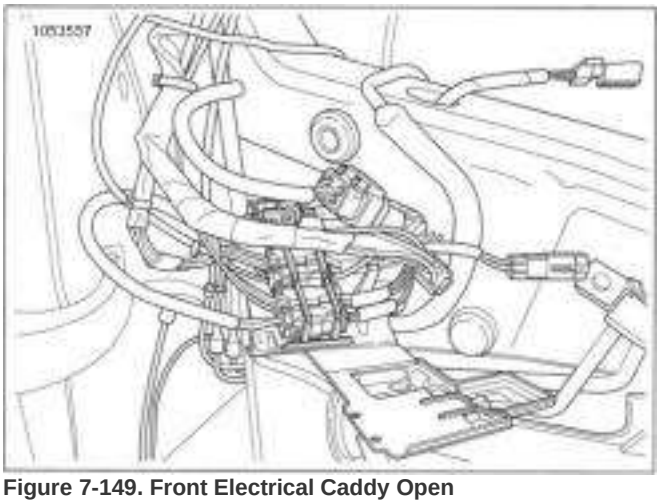


Figure 7-149. Front Electrical Caddy Open

5. ***NOTE***

If needed, label each half of the remaining connectors on caddy.

Figure 7-146 Remove center fold (2) connectors.

   a. See Figure 7-150. Disconnect connectors.

   b. See Figure 7-151. Using a small screwdriver (3), pry the connector locking tab (2) open.

   c. See Figure 7-152. Remove connector (2).

   d. Repeat for all connectors in center fold.

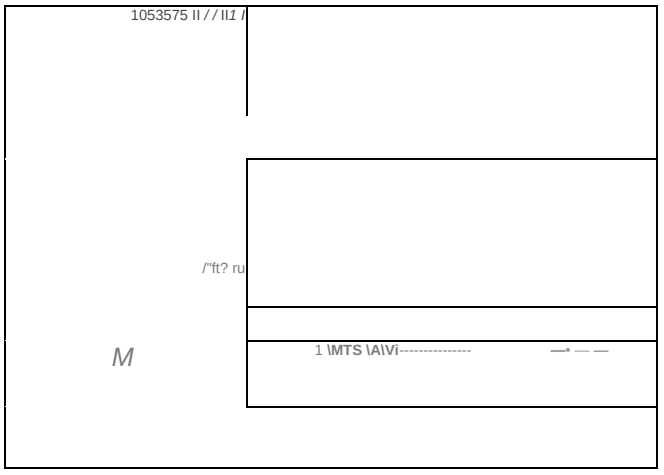


Figure 7-150. Center Fold Connectors

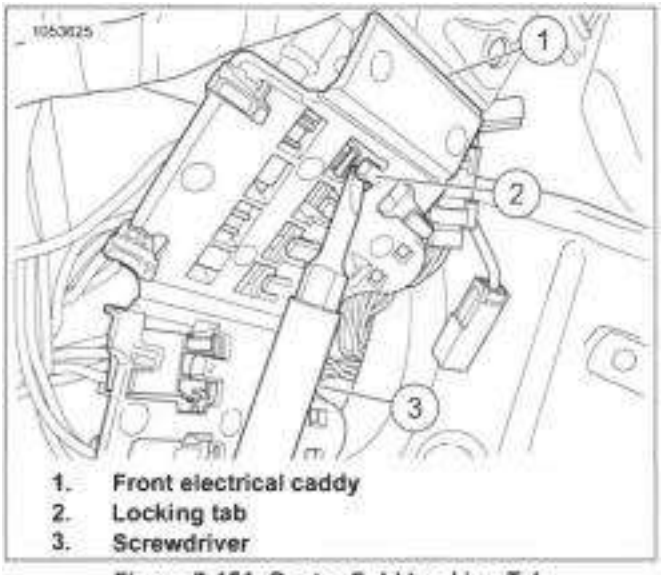


Figure 7-151. Center Fold Locking Tab

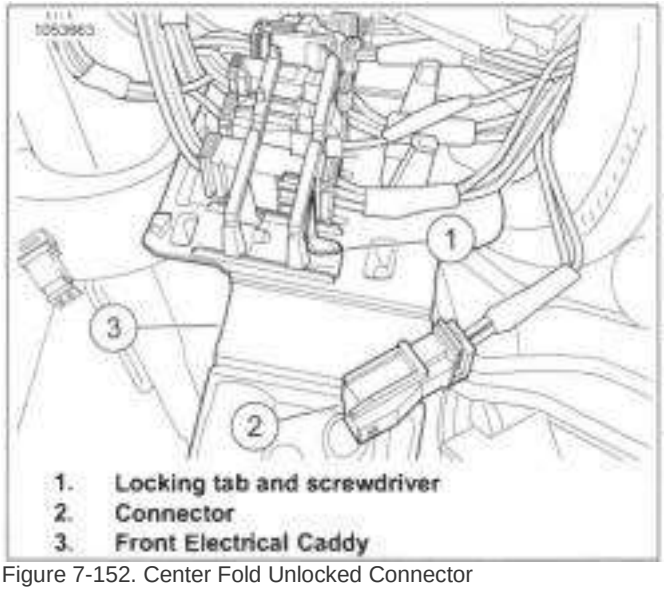


Figure 7-152. Center Fold Unlocked Connector

a. Install connector into caddy.

b. Connect the connectors.

6. Figure 7-146. Remove remaining connectors on bottom fold (1).

a. Disconnect connectors.

b. With a wiggling motion, pull connectors from caddy.

INSTALL

FASTENER	TORQUE VALUE	
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m

1. See Figure 7-146. Install connectors into bottom fold (1).

2. Install connectors into center fold (2).

   a. Install connectors into caddy.
   b. Connect the connectors.

3. See Figure 7-148. Install frame plug (2) onto caddy. Close bottom fold (1).

4. See Figure 7-147. Close top fold and install headlamp (8) and twist grip connectors (3).

5. Install front electrical caddy and frame plug into frame.

6. See Figure 7-145. Install brake line clamp screws. Tighten.

   Torque: 36-48 in-lbs (4.1-5.4 N-m) ***Brake line clamp screw***

7. See Figure 7-144. Connect backbone harness interconnect [327].

COMPLETE

1. Install fuel tank. See FUEL TANK (Page 6-14).

2. Install seat. See SEAT (Page 3-142).

3. Install main fuse. See POWER DISCONNECT (Page 7-7).

4. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).

1. See Figure 7-153. Remove wide screw (1).

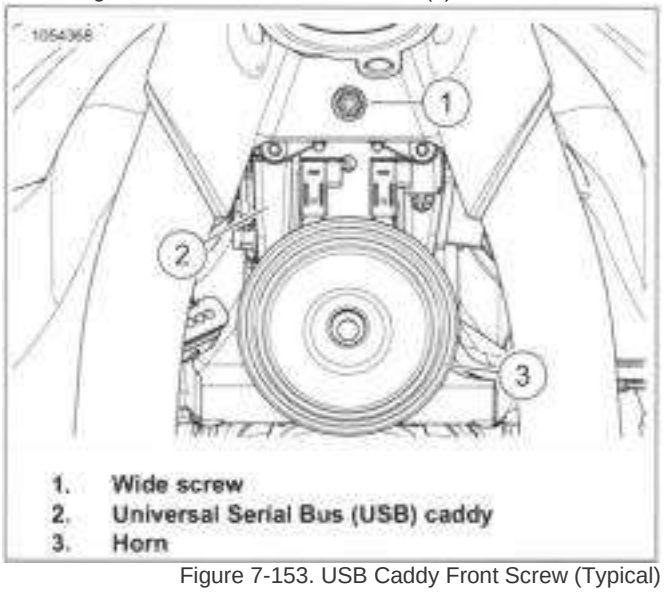


Figure 7-153. USB Caddy Front Screw (Typical)

2. See Figure 7-154. Disconnect ET connector (4).
3. Remove retainer pin (1).

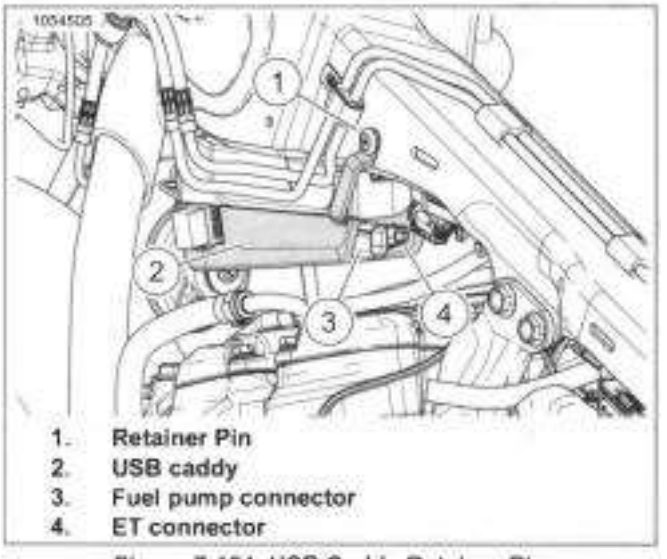


Figure 7-154. USB Caddy Retainer Pin

REMOVE

4. See Figure 7-155. Slide USB caddy (2) forward and disconnect USB caddy interconnect (1).
5. Remove USB caddy.

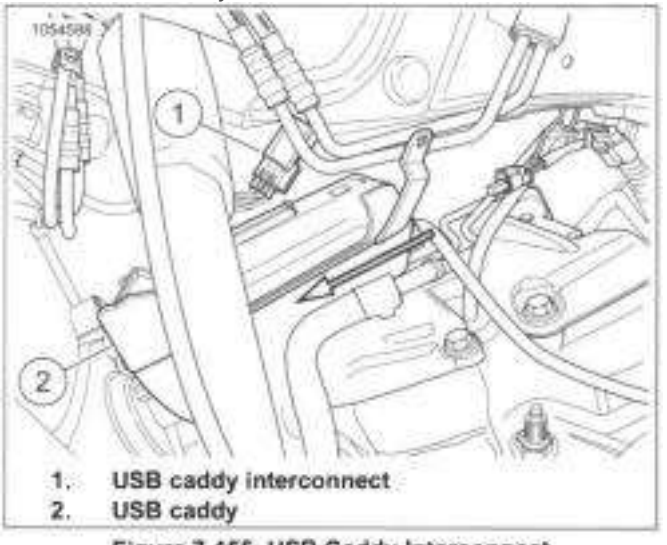


Figure 7-155. USB Caddy Interconnect

INSTALL

FASTENER	TORQUE VALUE	
Wide mounting screw	84-108 in-lbs	9.5-12.2 N-m

1. See Figure 7-155. Slide USB caddy (2) from front of engine and connect USB caddy interconnect (1).

   a. See Figure 7-156. Verify main harness tab is installed into main harness slot (5) on USB caddy.

2. See Figure 7-154. Install retainer pin (1).
3. Connect ET connector (4).

4. See Figure 7-153. Install wide screw (1). Tighten.
   Torque: 84-108 in-lbs (9.5-12.2 N-m) ***Wide mounting screw***

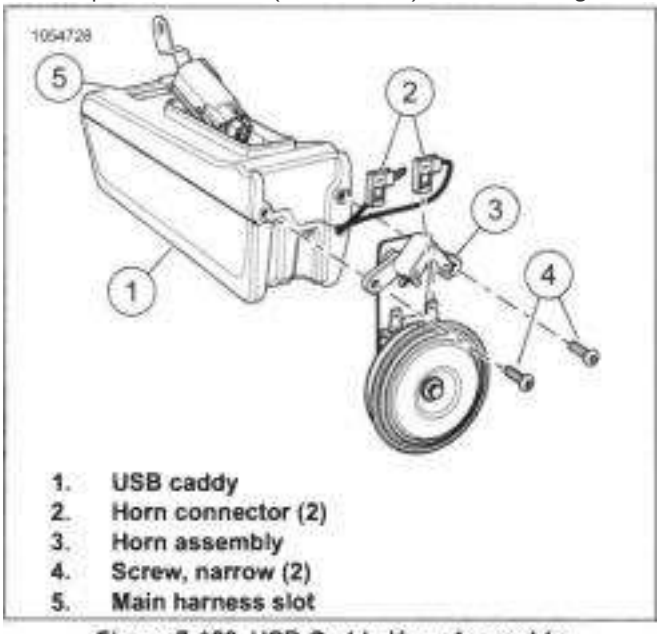


Figure 7-156. USB Caddy Horn Assembly

DISASSEMBLE

1. Remove horn assembly. See HORN (Page 7-30).

2. See Figure 7-157 Separate USB caddy.

   a. Remove screws (4).
   b. Separate USB caddy.

   c. Remove harness (2).

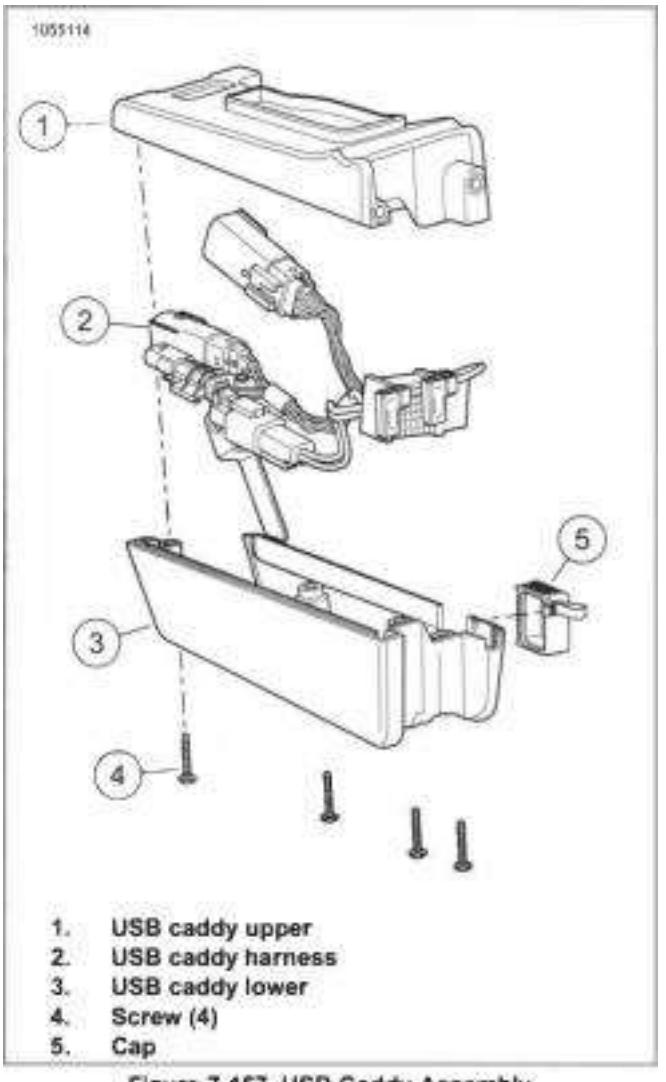


Figure 7-157. USB Caddy Assembly

A

FASTENER	TORQUE VALUE	
USB caddy screw	14-17 in-lbs	1.6—1.9 N-m

1. Figure 7-157. Assemble USB lower (3) and upper (1) caddy.

   a. Install harness (2) into lower USB caddy.

   b. Align USB caddy upper and lower.

   c. Install screws (4). Tighten.
   Torque: 14-17 in-lbs (1.6-1.9 N-m) ***USB caddy*** screw

2. Install horn assembly. See HORN (Page 7-30).

COMPLETE

1. Install fuel tank. See FUEL TANK (Page 6-14).

2. Install seat. See SEAT (Page 3-142).

3. Install main fuse. See POWER DISCONNECT (Page 7-7).

4. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Remove seat. See SEAT (Page 3-142).
4. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
5. Remove battery. See INSPECT BATTERY (Page 2-43).
6. Remove ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70).

REMOVE

1. See Figure 7-158. Remove ECM caddy (1).
2. Remove frame ground stud nuts (2)
3. Remove anti-rotation bracket (3).
4. Remove ground wires.
5. Disconnect engine harness connector (4).
6. Remove engine harness connector anchor from ECM caddy.
7. Remove small screw (5).
8. Remove large screws (6).
9. From inside of battery tray, remove push pin retainers (7).
10. Detach evaporative emissions purge lines from ECM caddy, if equipped.
11. Remove ECM caddy.

INSTALL

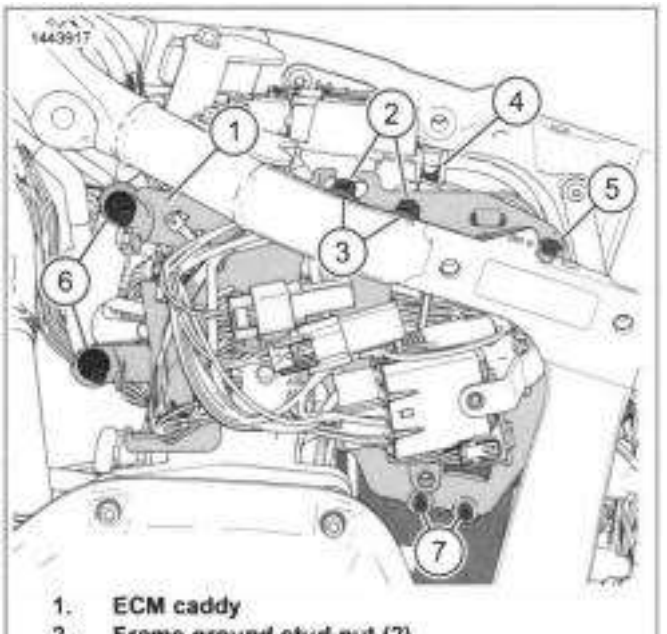
1. Attach evaporative emissions purge lines to ecm caddy, If equipped.
2. Install and align ECM caddy.
3. See See Figure 7-158.. Install large screws (6). Hand tighten.
4. Align holes in battery tray and ECM caddy. Install push pin retainers (7) from battery tray side.
5. Install small screw (5). Tighten.

   Torque: 55--60 in-lbs (6.2--6.8 N-m) ***ECM caddy small screw***
6. Tighten large screws.

   Torque: 36--60 in-lbs (4.1--6.8 N-m) ***ECM caddy large screw***
7. Install engine harness connector anchor to ECM caddy.
8. Connect engine harness connector (4).
9. Install frame ground wires.
10. Install anti-rotation bracket (3).
11. Install frame ground stud nuts (2). Tighten.

    Torque: 50-90 in-lbs (5.7-10.2 N-m) ***Frame ground stud nut***

FASTENER	TORQUE VALUE	
ECM caddy large screw	36-60 in-lbs	4.1--6.8 N-m
ECM caddy small screw	55-60 in-lbs	6.2--6.8 N-m
Frame ground stud nut	50-90 in-lbs	5.7-10.2 N-m



1. ECM caddy
2. Frame ground stud nut (2)
3. Anti-Rotation bracket
4. Engine harness connector
5. Small screw
6. Screw (2)
7. Push pin retainer (2)

Figure 7-158. ECM Caddy

COMPLETE

1. Install ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70).
2. Install battery. See INSPECT BATTERY (Page 2-43).
3. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).

4. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

5. Install left side cover. See LEFT SIDE COVER (Page 3-63).

6. Install seat. See SEAT (Page 3-142).

PREPARE

1. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Remove seat. See SEAT (Page 3-142).
3. Disconnect negative battery cable. See POWER DISCONNECT (Page 7-7).
4. Remove battery. See INSPECT BATTERY (Page 2-43).
5. Remove battery tray. See BATTERY TRAY (Page 7-97).
6. Remove BCM. See BODY CONTROL MODULE (BCM) (Page 7-71).
7. Models with purge solenoid: Remove purge solenoid. See Fuel and Exhaust (Page 6-1).
8. Security system with siren: Remove security siren. See SECURITY SIREN (Page 7-76).

REMOVE

1. Models without purge solenoid: Disconnect purge solenoid connector from top side of BCM caddy.
2. Security system without siren: Disconnect security siren connector.
   a. Move BCM caddy forward,
   b. Disconnect security siren connector on back side of BCM caddy.
3. Remove BCM caddy.

INSTALL

1. Install BCM caddy.
2. Security system without siren: Connect security siren.
   a. Move BCM caddy forward.
   b. Connect security siren connector to back side of BCM caddy.
3. Models without purge solenoid: Connect purge solenoid connector to BCM caddy.

COMPLETE

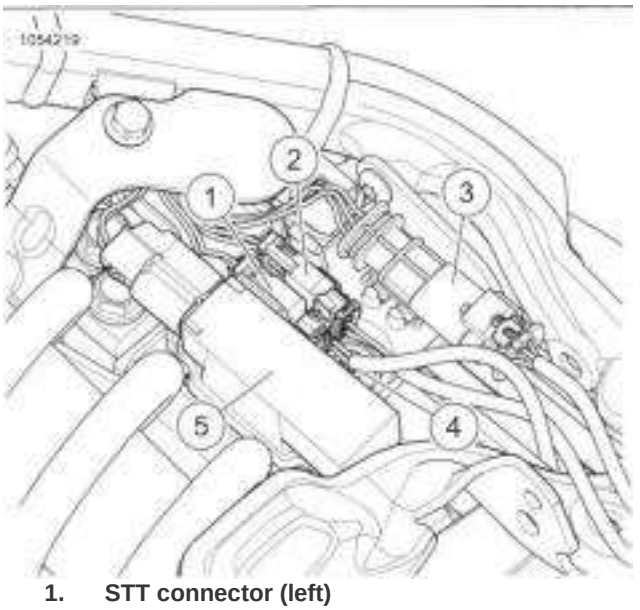
1. Install BCM. See BODY CONTROL MODULE (BCM) (Page 7-71).
2. Security system with siren: Install security siren. See SECURITY SIREN (Page 7-76).
3. Models with purge solenoid: Install purge solenoid. See PURGE SOLENOID: EVAPORATIVE EMISSIONS (Page 6-43).
4. Install battery tray. See BATTERY TRAY (Page 7-97).
5. Install battery. See INSPECT BATTERY (Page 2-43).
6. Connect negative battery cable. See POWER DISCONNECT (Page 7-7).
7. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
8. Install seat. See SEAT (Page 3-142).

PREPARE

1. Remove main fuse. See POWER DISCONNECT (Page 7-7).
2. Remove seat. See SEAT (Page 3-142).

REMOVE

1. See Figure 7-159. Remove security antenna (5).
2. Remove both STT connectors (1 and 2).
3. Remove LP connector.
4. Remove rear lighting caddy.
   a. Remove push pin retainer (4).
   b. Remove caddy.



1. STT connector (left)
2. STT connector (right)
3. LP connector
4. Push pin retainer
5. Security antenna

Figure 7-159. Rear Lighting Caddy

INSTALL

1. Install rear lighting caddy.
   a. Position rear lighting caddy into place.
   b. See Figure 7-159. Install push pin retainer (4).
2. Install LP connector (3).
3. Install both STT connectors (1 and 2).
4. Install security antenna (5).

COMPLETE

1. Install seat. See SEAT (Page 3-142).
2. Install main fuse. See POWER DISCONNECT (Page 7-7).

PREPARE

1. Remove main fuse. See Main Fuse (Page ***7-7).***
2. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Remove battery. See INSPECT BATTERY (Page 2-43).

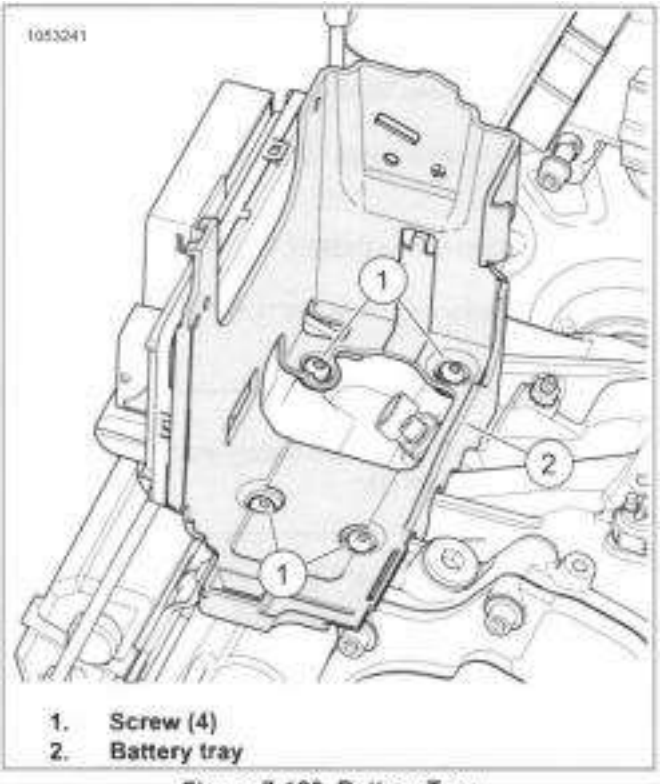
REMOVE

1. Remove plastic fasteners securing ECM caddy to battery tray.
2. Remove plastic fasteners securing BCM caddy to battery tray.
3. See Figure 7-160. Remove battery tray.
   a. Remove screws (1).
   b. Remove battery tray (2).

INSTALL

FASTENER	TORQUE VALUE	
Battery tray screw	6-9 ft-lbs	8.1-12.2 N-m

1. See Figure 7-160. Install battery tray.
   a. Install battery tray (2).
   b. Install screws (1). Tighten.
      Torque: 6-9 ft-lbs (8.1-12.2 N-m) ***Battery tray screw***
2. Install plastic fasteners securing BCM caddy to battery tray.
3. Install plastic fasteners securing ECM caddy to battery tray.



1. Screw (4)
2. Battery tray

Figure 7-160. Battery Tray

COMPLETE

1. Install battery. See INSPECT BATTERY (Page 2-43).
2. Install right side cover. See RIGHT SIDE COVER (Page 3-64).
3. Install main fuse. See Main Fuse (Page 7-7).

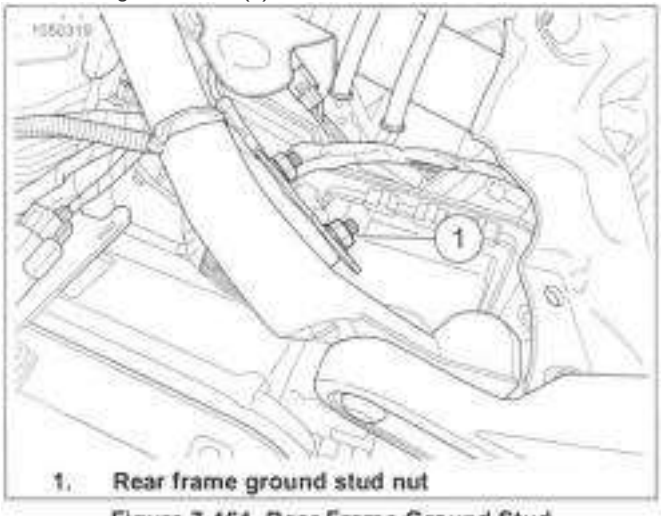
ENGINE GROUND CABLE

PREPARE

1. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
2. Remove seat. See SEAT (Page 3-142).
3. Remove negative cable. See POWER DISCONNECT (Page 7-7).
4. Remove battery. See INSPECT BATTERY (Page 2-43).
5. Remove battery tray. See BATTERY TRAY (Page 7-97)

REMOVE

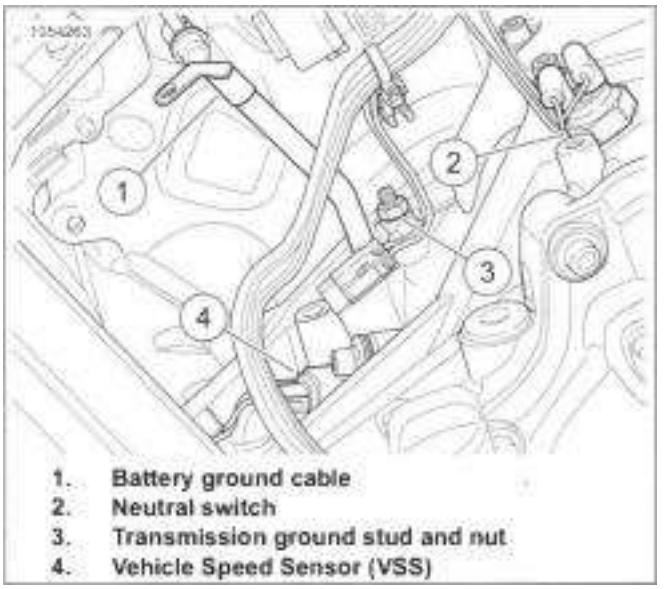
1. See Figure 7-161. Remove battery ground cable on rear frame ground stud (1).



1. Rear frame ground stud nut

Figure 7-161. Rear Frame Ground Stud

2. See Figure 7-162. Remove battery ground cable (1) on transmission ground stud (3).



1. Battery ground cable
2. Neutral switch
3. Transmission ground stud and nut
4. Vehicle Speed Sensor (VSS)

Figure 7-162. Battery Ground Cable: (Starter removed for clarity)

INSTALL

1. See Figure 7-162. Install battery ground cable on transmission ground stud (3).

FASTENER	TORQUE VALUE	
Frame ground stud nut	50-90 in-lbs	5.6-10.2 N-m
Transmission ground stud nut	72-96 in-lbs	8.1-10.9 N-m

2. Install nut hand tight on transmission ground stud.
3. See Figure 7-161. Route battery ground cable to rear frame ground stud. Install nut. Tighten.

   Torque: 50-90 in-lbs (5.6-10.2 N-m) ***Frame ground stud nut***
4. Tighten transmission ground stud nut.

   Torque: 72-96 in-lbs (8.1-10.9 N-m) ***Transmission ground stud nut***

COMPLETE

1. Install battery tray. See BATTERY TRAY (Page 7-97)
2. Install battery. See INSPECT BATTERY (Page 2-43).
3. Install negative cables. See POWER DISCONNECT (Page 7-7).
4. Install seat. See SEAT (Page 3-142).
5. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove right side cover. See RIGHT SIDE COVER (Page 3-64).
4. Remove main fuse. See POWER DISCONNECT (Page 7-7).
5. Remove seat. See SEAT (Page 3-142).
6. Remove fuel tank. See FUEL TANK (Page 6-14).
7. Remove battery. See INSPECT BATTERY (Page 2-43).
8. Remove battery tray. See BATTERY TRAY (Page 7-97).
9. Remove air filter. See INSPECT AIR FILTER (Page 2-40).
10. Remove air cleaner backplate. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).
11. Remove ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70).
12. Remove coil. See IGNITION COIL (Page 7-14).
13. Remove left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).

REMOVE

1. ***NOTE***
Remove cable strap anchors, wire harness anchors and cable straps as necessary.

   See Figure 7-163. Disconnect electrical connectors around throttle body area.

   a. Disconnect Electronic Throttle Control (ETC) (15).

   b. Disconnect Temperature, Intake Air I Manifold Absolute Pressure (TMAP) (12).

   c. Disconnect front injector (10).

   d. Disconnect rear injector (9).

   e. Disconnect front knock sensor (8).

   f. Disconnect front ACR (7).

2. Disconnect electrical connectors around rear cylinder/ECM area.

   a. Disconnect engine harness (2).

   b. Disconnect engine harness interconnect (4).

   c. Disconnect rear knock sensor (5).

   d. Disconnect rear ACR (6).

3. Disconnect electrical connectors around starter/BCM area.

   a. Disconnect purge solenoid (1).

   b. Disconnect rear HO2S (13).

   c. Disconnect VSS (14).

4. Disconnect electrical connectors around voltage regulator/oil pressure sensor area.

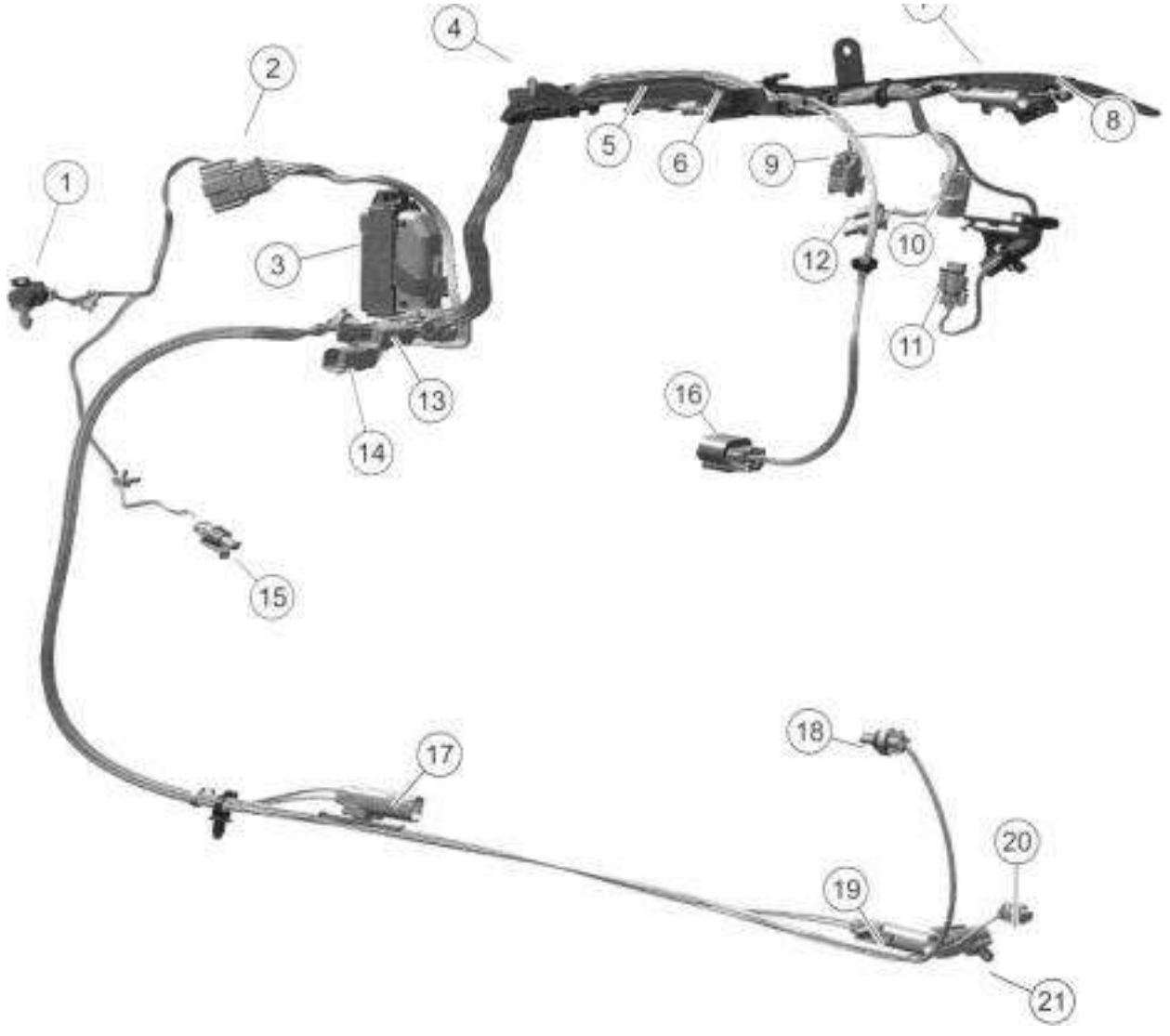
   a. Disconnect oil pressure sensor (16).

   b. Disconnect front HO2S (17).

   c. Disconnect JSS (18).

   d. Disconnect Crankshaft Position (CKP) (19).

5. Remove engine wire harness.



1. **Purge solenoid**
2. **Engine harness**
3. **ECM**
4. **Engine harness interconnect**
5. **Rear knock sensor**
6. **Rear ACR**
7. **Front ACR**
8. **Front knock sensor**
9. **Rear injector**
10. **Front injector**
11. **Coil**
12. **TMAP**
13. **Rear HO2S**
14. **Rear HO2S (depends on configuration)**
15. **VSS**
16. **ETC**
17. **Front HO2S (depends on configuration)**
18. **Oil pressure sensor**
19. **Front HO2S**
20. **JSS**
21. **CKP sensor**

Figure 7-163. Engine Wire Harness

INSTALL

1. Install engine wire harness.

2. See See Figure 7-163.. Connect electrical connectors around voltage regulator/oil pressure sensor area.

   a. Connect CKP (19).

   b. Connect JSS (18).

   c. Connect front HO2S (17).

   d. Connect oil pressure sensor (16).

_____ 3. Connect electrical connectors around starter/BCM area.

   a. Connect VSS (14).

   b. Connect rear HO2S (13).

   c. Connect purge solenoid (1).

4. Connect electrical connectors around rear cylinder/ECM area.

   a. Connect rear ACR (6).

   b. Connect rear knock sensor (5).

c. Connect engine harness interconnect (4).

d. Connect engine harness (2).

5. Connect electrical connectors around throttle body area.

a. Connect front ACR (7).
b. Connect front knock sensor (8).

c. Connect rear injector (9).

d. Connect front injector (10).

e. Disconnect TMAP (12).

f. Connect ETC (15).

COMPLETE

1. Install left side engine mount. See LEFT SIDE ENGINE MOUNT (Page 4-26).

2. Install coil. See IGNITION COIL (Page 7-14).
3. Install ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70).

4. Install air cleaner backplate assembly. See AIR CLEANER BACKPLATE ASSEMBLY (Page 6-4).

5. Install air filter. See INSPECT AIR FILTER (Page 2-40).

6. Install battery tray. See BATTERY TRAY (Page 7-97).

7. Install battery. See INSPECT BATTERY (Page 2-43).

8. Install fuel tank. See FUEL TANK (Page 6-14).

9. Install seat. See SEAT (Page 3-142).
10. Install main fuse. See POWER DISCONNECT (Page 7-7).

11. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

12. Install left side cover. See LEFT SIDE COVER (Page 3-63).

PREPARE

1. Purge fuel system. See PURGE FUEL LINE (Page 6-12).
2. Remove left side cover. See LEFT SIDE COVER (Page 3-63).
3. Remove main fuse. See POWER DISCONNECT (Page 7-7).
4. Remove seat. See SEAT (Page 3-142).
5. Remove fuel tank. See FUEL TANK (Page 6-14).

REMOVE

1. See Figure 7-164. Disconnect main harness connector (6).
2. Remove under seat frame cover.
   a. Remove screws (1,3).
   b. Remove under seat frame cover (2).
3. Disconnect engine harness connector (4).
4. Remove cable strap (7).
5. See Figure 7-165 Remove brake line clamp screws (2).
6. Disconnect fairing connector (3), if equipped.
7. Remove frame plug (1) and front electrical caddy. See FRONT ELECTRICAL CADDY (Page 7-87).
8. Remove backbone wire harness.
   a. See Figure 7-164. Attach scrap wire to backbone harness (5) main harness connector (6).
   b. Pull backbone wire harness through backbone.
   c. Disconnect scrap wire from old backbone harness.

INSTALL

FASTENER	TORQUE VALUE	
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m
Under seat frame cover, front screw	20-30 in-lbs	2.3-3.4 N-m
Under seat frame, rear screws	96-120 in-lbs	10.9-13.6 N-m

1. Route backbone wire harness through backbone.
   a. See Figure 7-164. Attach scrap wire to backbone harness (5) main harness connector (6).
   b. Pull backbone wire harness through backbone.
   c. Remove scrap wire.
2. Connect engine harness connector (4).
3. Connect main harness connector (6).
4. Install cable strap (7).
5. Install under seat frame cover (2).
   a. Align under seat frame cover to frame.
   b. Install screws (3). Hand tight.
   c. Install screw (1). Tighten
      Torque: 20-30 in-lbs (2.3-3.4 N-m) ***Under seat frame cover, front screw***
   d. Tighten screws (3).
      Torque: 96-120 in-lbs (10.9-13.6 N-m) ***Under seat frame, rear screws***
6. Install front electrical caddy and frame plug. See FRONT ELECTRICAL CADDY (Page 7-87).
7. See Figure 7-165. Connect fairing connector (3), if equipped.
8. Install brake clamp screws (2). Tighten.
   Torque: 36-48 in-lbs (4.1-5.4 N-m) ***Brake line clamp screw***

1. Screw
2. Under seat frame cover
3. Screw (2)
4. Engine harness connector
5. Backbone harness
6. Main harness connector
7. Cable strap

Figure 7-164. Backbone Harness to Main Harness

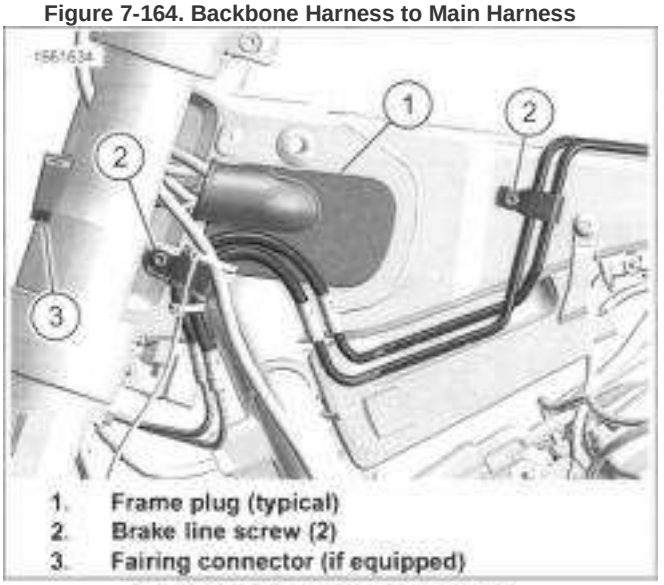


Figure 7-165. Brake Line Clamps

COMPLETE

1. Install fuel tank. See FUEL TANK (Page 6-14).
2. Install seat. See SEAT (Page 3-142).
3. Install main fuse. See POWER DISCONNECT (Page 7-7).
4. Install left side cover. See LEFT SIDE COVER (Page 3-63).

REMOVE AND INSTALL: FRAME MOUNTED FAIRING

Prepare

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

2. Remove outer fairing shell. See FAIRING: FRAME MOUNTED (Page 3-102).

Remove

1. Remove fairing harness.

   a. See Figure 7-166. Remove connector anchor (6) from fairing.

   b. Disconnect backbone harness connector (2).

   c. Disconnect left and right turn signal connectors (4,5).

   d. Remove cable strap anchors (3).

   e. Remove fairing harness.

Install

1. Install fairing harness.

   a. See Figure 7-166. Install cable strap anchors (3).

   b. Install new cable straps if they were removed from the wiring harness.

   c. Connect left turn signal connector (4).

   d. Connect right turn signal connector (5).

   e. Connect backbone harness connector (2).

   f. Install connector anchor (6) to fairing.

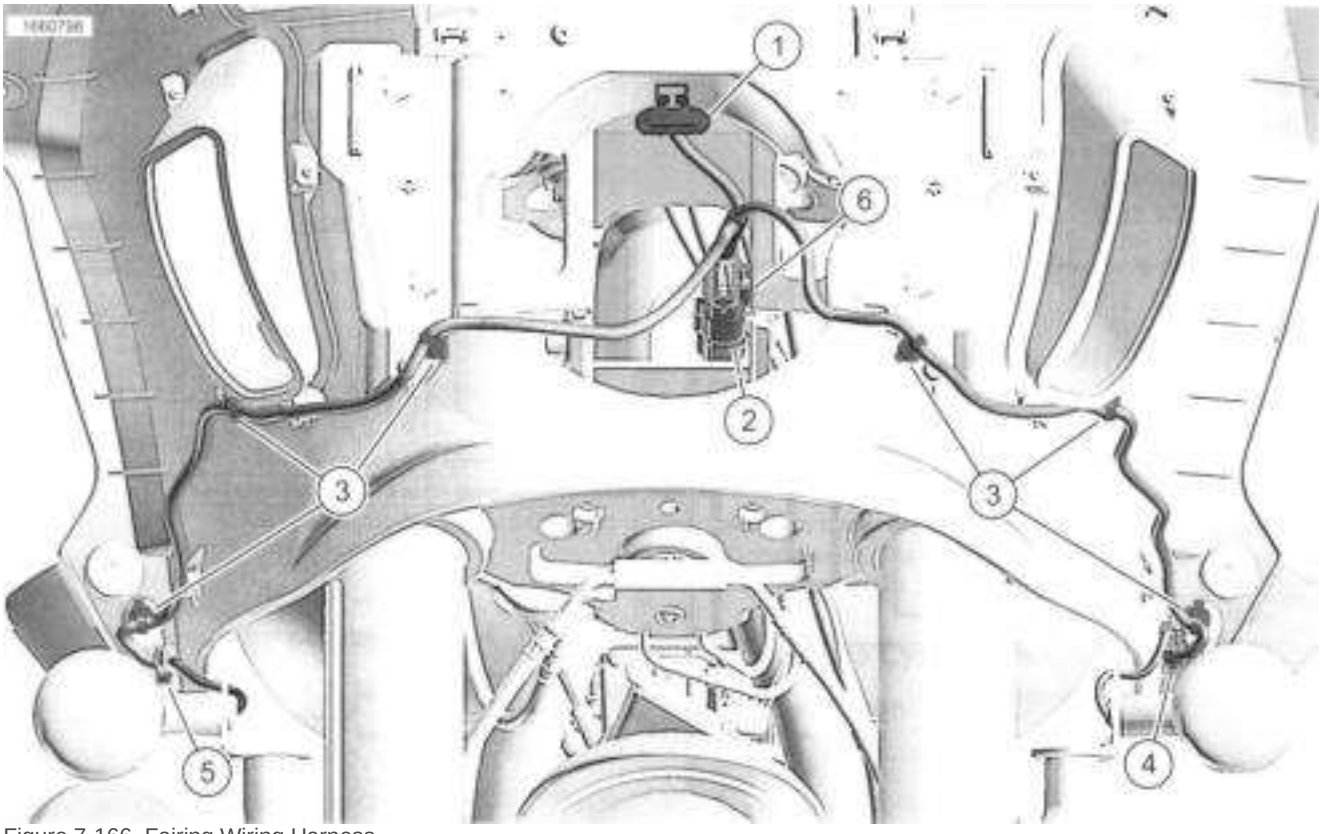


Figure 7-166. Fairing Wiring Harness

1. Headlamp connector
2. Backbone harness connector
3. Cable strap anchors (6)
4. Left turn signal connector
5. Right turn signal connector
6. Connector anchor

Complete

1. Install outer fairing shell. See FAIRING: FRAME MOUNTED (Page 3-102).

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

PREPARE

1. **Remove left side cover. See LEFT SIDE COVER (Page 3-63).**
2. **Remove right side cover. See RIGHT SIDE COVER (Page 3-64).**
3. **Remove seat. See SEAT (Page 3-142).**
4. **Remove battery. See INSPECT BATTERY (Page 2-43).**
5. **Remove battery tray. See BATTERY TRAY (Page 7-97).**
6. **Remove ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70).**
7. **Remove ECM caddy. See ECM CADDY (Page 7-93).**

REMOVE _____ __ _

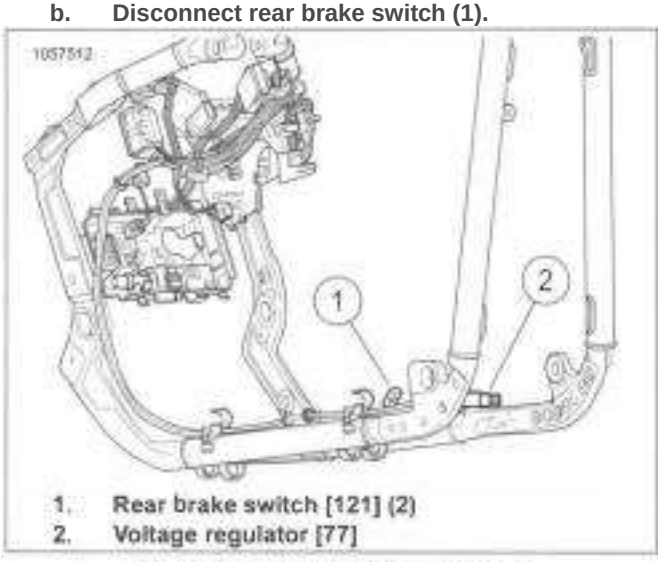
1. ***NOTE***

Note locations of and remove cable strap anchors, wire harness anchors and cable straps as necessary.

See Figure 7-167. Disconnect electrical connectors around voltage regulator.

a. **Disconnect voltage regulator (2).**

b. **Disconnect rear brake switch (1).**



1. Rear brake switch [121] (2)
2. Voltage regulator [77]

Figure 7-167. Main Harness Front

1. Starter solenoid power [128]
2. ABS module [166]

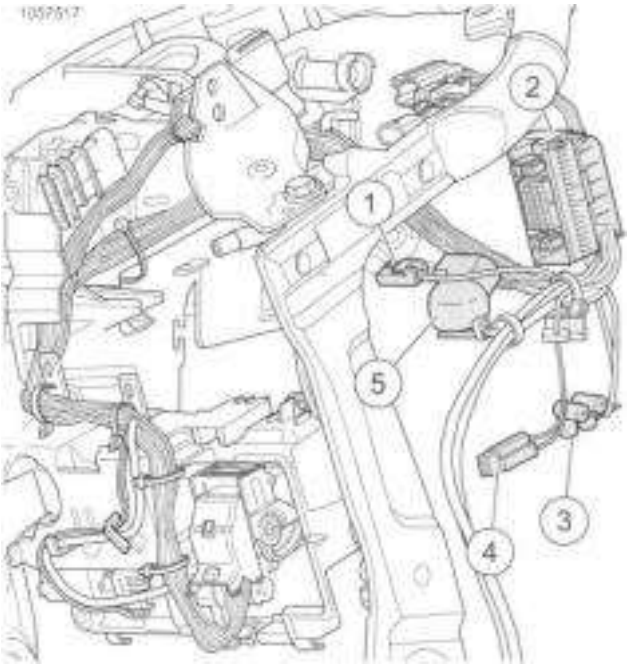
2. **See Figure 7-168. Disconnect electrical connectors from right side.**

a. If equipped: **Disconnect ABS module (2).**

b. **Disconnect neutral switch (3).**

c. **Disconnect battery power on starter stud (5).**

d. **Disconnect starter solenoid power (1).**



3. Neutral switch [131] (2)
4. Rear WSS [168]
5. Battery power starter stud

Figure 7-168. Main Harness Right Side

3. **See Figure 7-169. Disconnect electrical connectors under seat.**

a. **Disconnect right rear STT lighting (6) and remove from rear lighting caddy.**

b. **Disconnect left rear STT lighting (5) and remove from rear lighting caddy.**

c. **Disconnect LP lighting (7) and remove from rear lighting caddy.**

d. **Disconnect security antenna (4) and remove from rear lighting caddy.**

e. **Remove both frame ground studs nuts (2). Remove shunt and all ring terminals.**

f. **Disconnect engine harness (1).**

g. **Disconnect backbone harness interconnect (3).**

Figure 7-169. Main Harness Under Seat

4. Detach ECM caddy. See ECM CADDY (Page 7-93).
5. Remove BCM. See BODY CONTROL MODULE (BCM) (Page 7-71).

6. Remove main wire harness.

INSTALL

2. Install BCM. See BODY CONTROL MODULE (BCM) (Page

FASTENER	TORQUE VALUE	
Frame ground stud nut	50-90 **in-lbs**	5.6-10.2 N-m

1. Route main wire harness into place.
7-71).

3. Install ECM caddy. See ECM CADDY (Page 7-93).

4. Install ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70).

5. See Figure 7-169. Connect electrical connectors under seat.

a. Connect backbone harness interconnect (3).

b. Connect engine harness (1).

c. Install shunt and all ring terminals. Install both frame ground studs nuts (2). Tighten.

Torque: 50-90 **in-lbs** (5.6-10.2 N-m) ***Frame ground stud nut***

d. Connect security antenna (4) and install onto rear lighting caddy.

e. Connect LP lighting (7) and install onto rear lighting caddy.

f. Connect left rear STT lighting (5) and install onto rear lighting caddy.

g. Connect right rear STT lighting (6) and install onto rear lighting caddy.

6. See Figure 7-168. Connect electrical connectors from right side.

a. Connect starter solenoid power (1).

b. Connect battery power on starter stud (5).

c. Connect neutral switch (3).

d. **If equipped:** Connect ABS module (2).

7. See Figure 7-167. Connect electrical connectors around voltage regulator.

a. Connect rear brake switch (1).

b. Connect voltage regulator (2).

COMPLETE _____

1. Install ECM caddy. See ECM CADDY (Page 7-93).

2. Install battery tray. See BATTERY TRAY (Page 7-97).

3. Install battery. See INSPECT BATTERY (Page 2-43).
4. Install ECM. See ELECTRONIC CONTROL MODULE (ECM) (Page 7-70)

5. Install negative battery cable. See POWER DISCONNECT (Page 7-7).

6. Install right side cover. See RIGHT SIDE COVER (Page 3-64).

7. Install left side cover. See LEFT SIDE COVER (Page 3-63).

8. Install seat. See SEAT (Page 3-142).

SUBJECT PAGE NO.
A.1 WIRING DIAGRAMS A-1
A.2 WIRE HARNESS CONNECTORS A-29

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-2. 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.

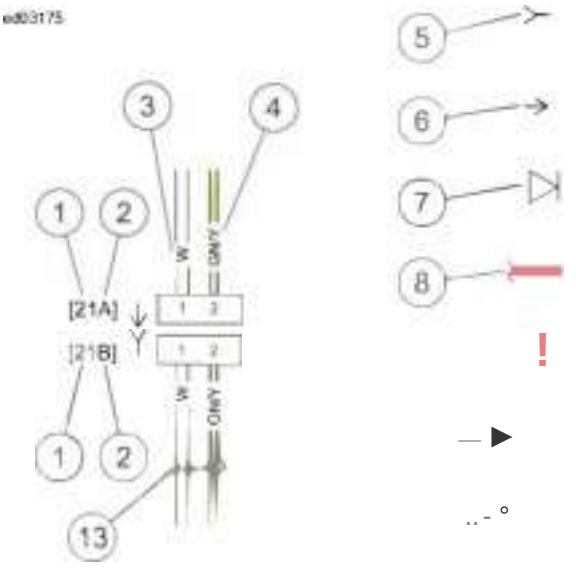
Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules.

NOTE

Clean grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit.

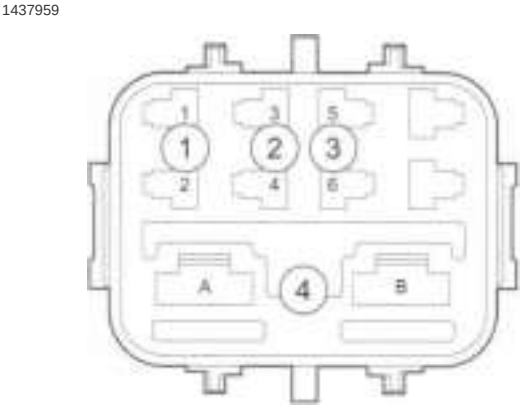
Dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

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



1. **Battery**
2. **Battery tender**
3. **System power**
4. **Main**

Figure A-2. Fuse Blocks and Socket Terminals

Table A-1. Wire Color Codes

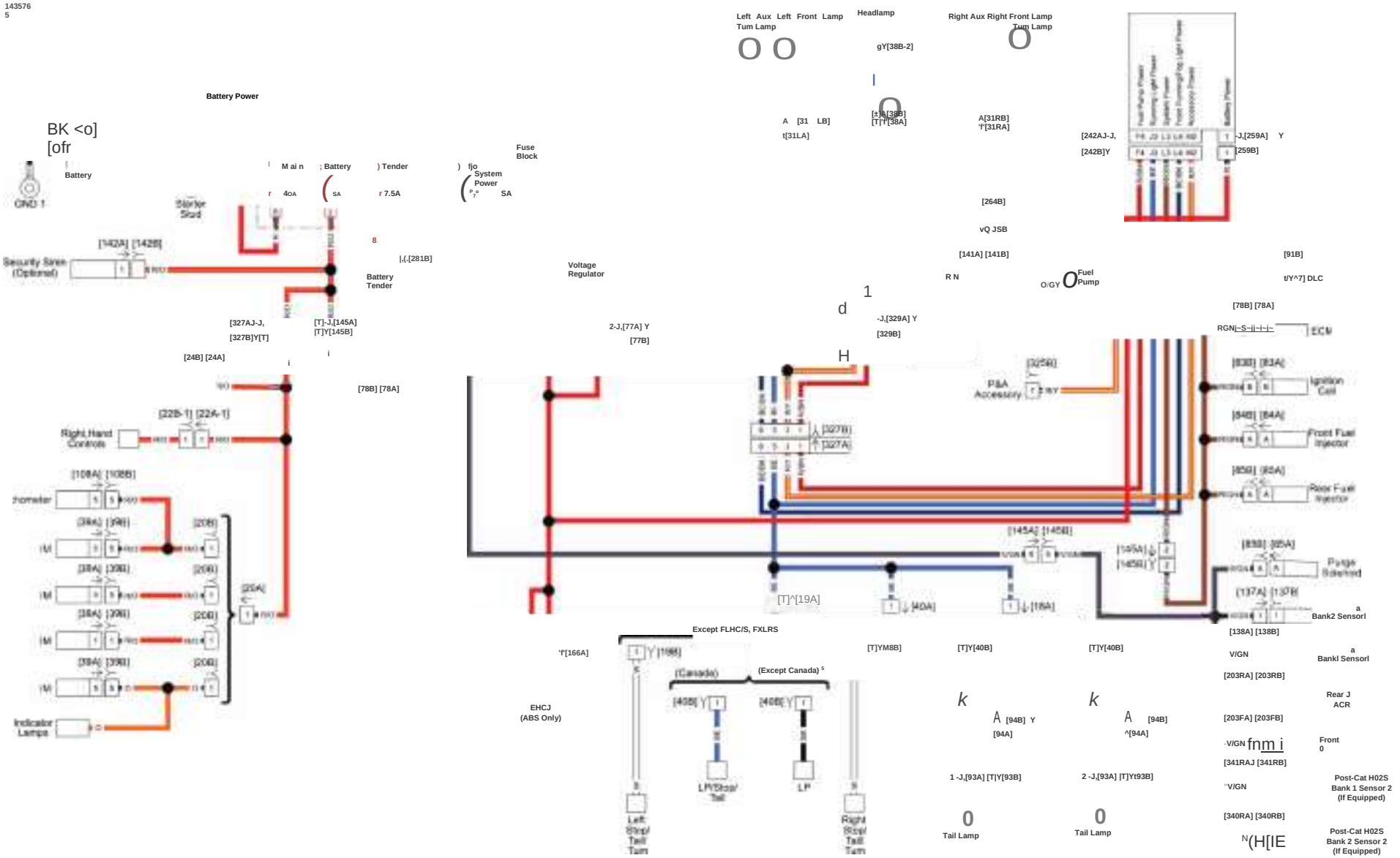
ALPHA CODE	WIRE COLOR
BE	Blue
BK	Black
BN	Brown
GN	Green
GY	Gray
LBE	Light Blue
LGN	Light Green
0	Orange
PK	Pink
R	Red
TN	Tan
V	Violet
W	White
Y	Yellow

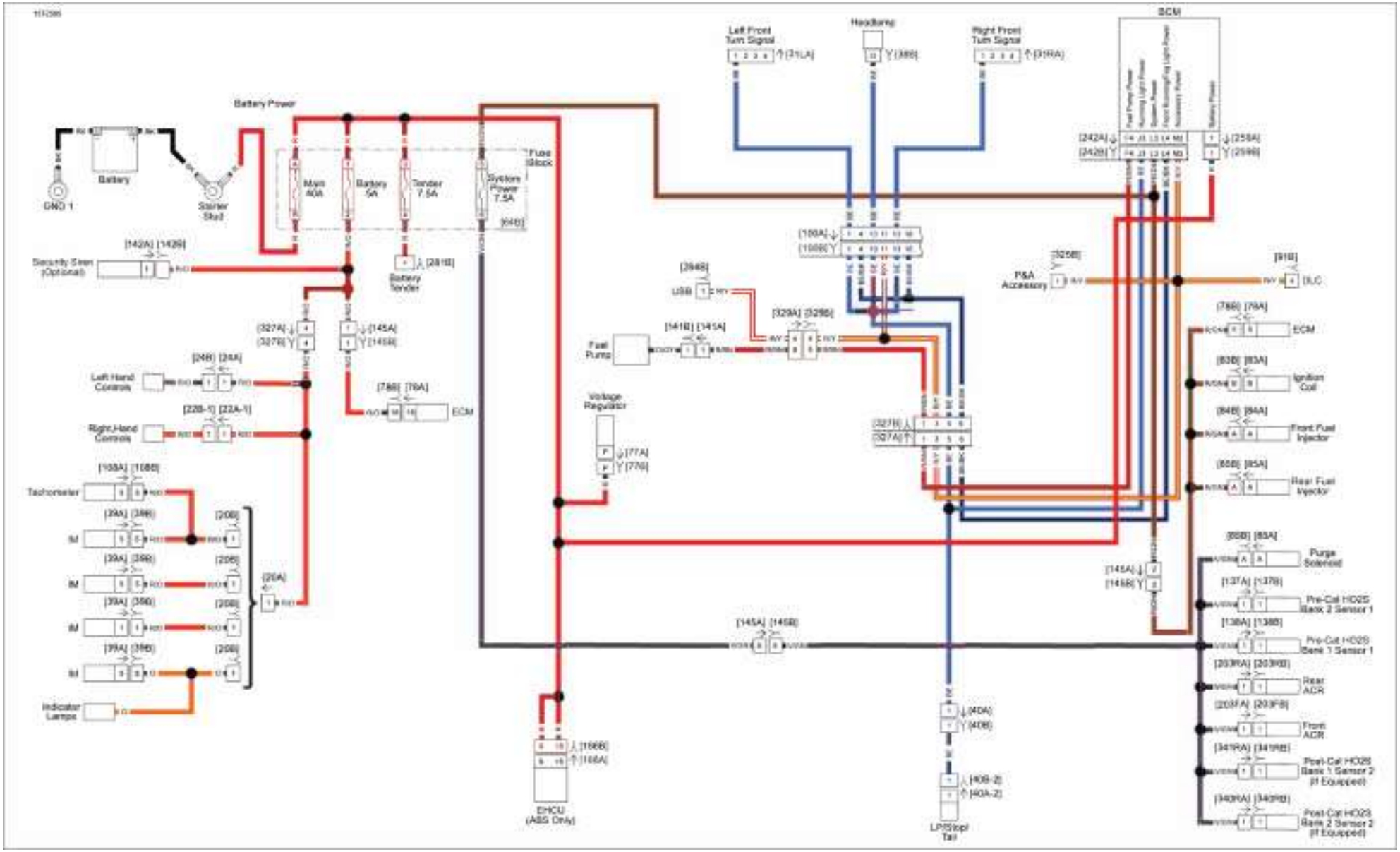
WIRING DIAGRAMS

Refer to the table below for wiring diagram information.

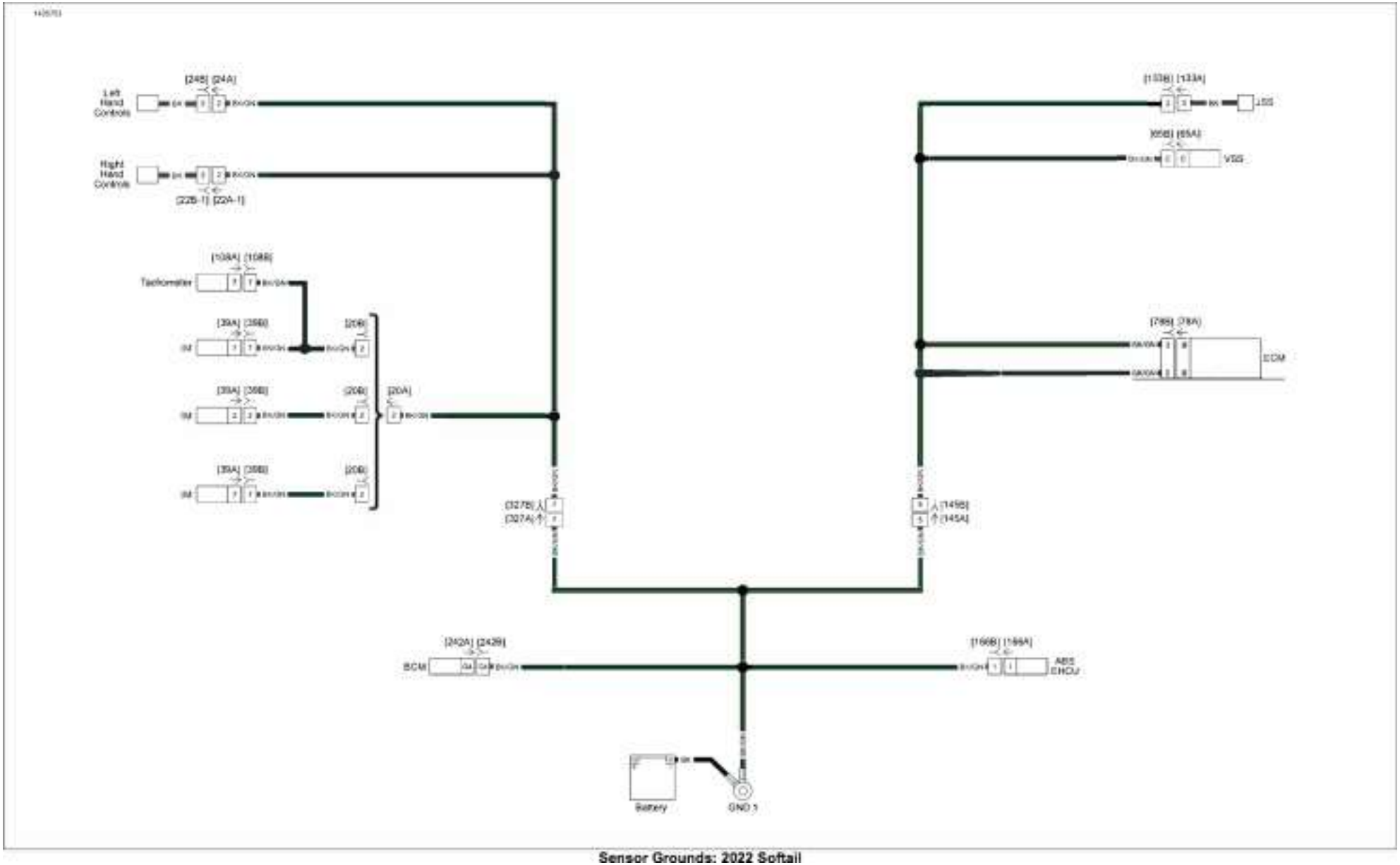
WIRING DIAGRAM LIST

FIGURE	NUMBER
Power Distribution (Except FXLRST): 2022 Softail	Figure A-3.
Power Distribution (FXLRST): 2022 Softail	Figure **A-4.**
Sensor Grounds: 2022 Softail	Figure A-5.
Front Lighting and Hand Controls: 2021 Softail	Figure A-6.
Ground Circuit (Except FXLRST): 2022 Softail	Figure A-7.
Ground Circuit (FXLRST): 2022 Softail	Figure A-8.
Front Lighting and Hand Controls: 2022 Softail	Figure A-9.
Fairing Harness (FXLRST): 2022 Softail	Figure A-10.
Backbone Harness (Except FXLRST) 1 of 3: 2022 Softail	Figure A-11.
Backbone Harness (FXLRST) 1 of 3: 2022 Softail	Figure A-12.
Engine Harness 2 of 3: 2022 Softail	Figure A-13.
Main Harness 3 of 3: 2022 Softail	Figure A-14.
Rear Lighting: 2022 Softail	Figure A-15.

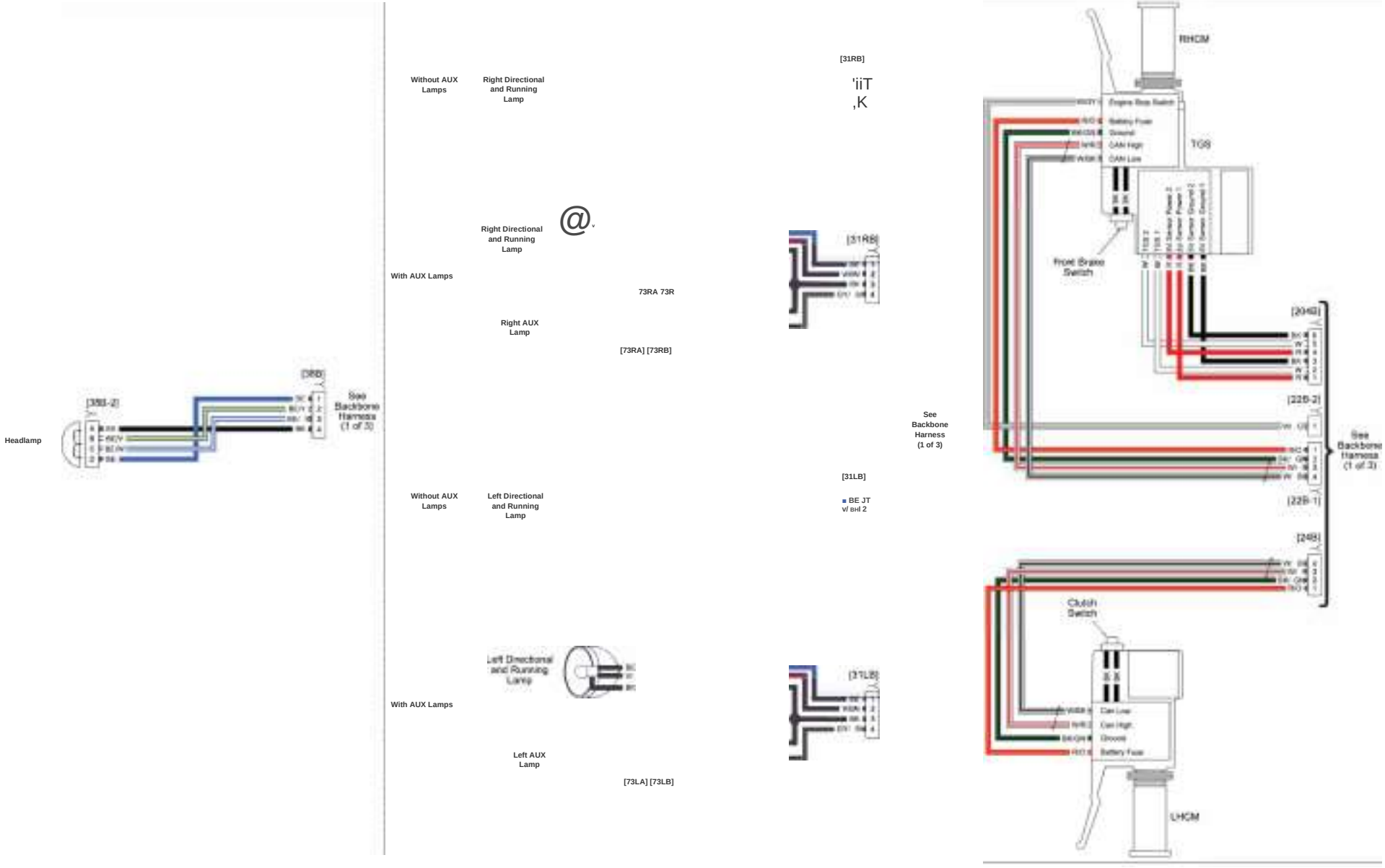

Battery Power
Battery
GND 1
Starter Stud
Security Siren (Optional)
Battery Tender
Fuse Block
System Power
Voltage Regulator
Right Hand Controls
Indicator Lamps
Except FLHC/S, FXLRS
(Canada)
(Except Canada) 5
EHCJ (ABS Only)
Left Aux Left Front Lamp Tum Lamp
Headlamp
Right Aux Right Front Lamp Tum Lamp
Tail Lamp
Fuel Pump
ECM
Ignition Coil
Front Fuel Injector
Rear Fuel Injector
Purge Solenoid
Bank2 Sensorl
Bankl Sensorl
Rear J ACR
Front 0
Post-Cat H02S Bank 1 Sensor 2 (If Equipped)
Post-Cat H02S Bank 2 Sensor 2 (If Equipped)



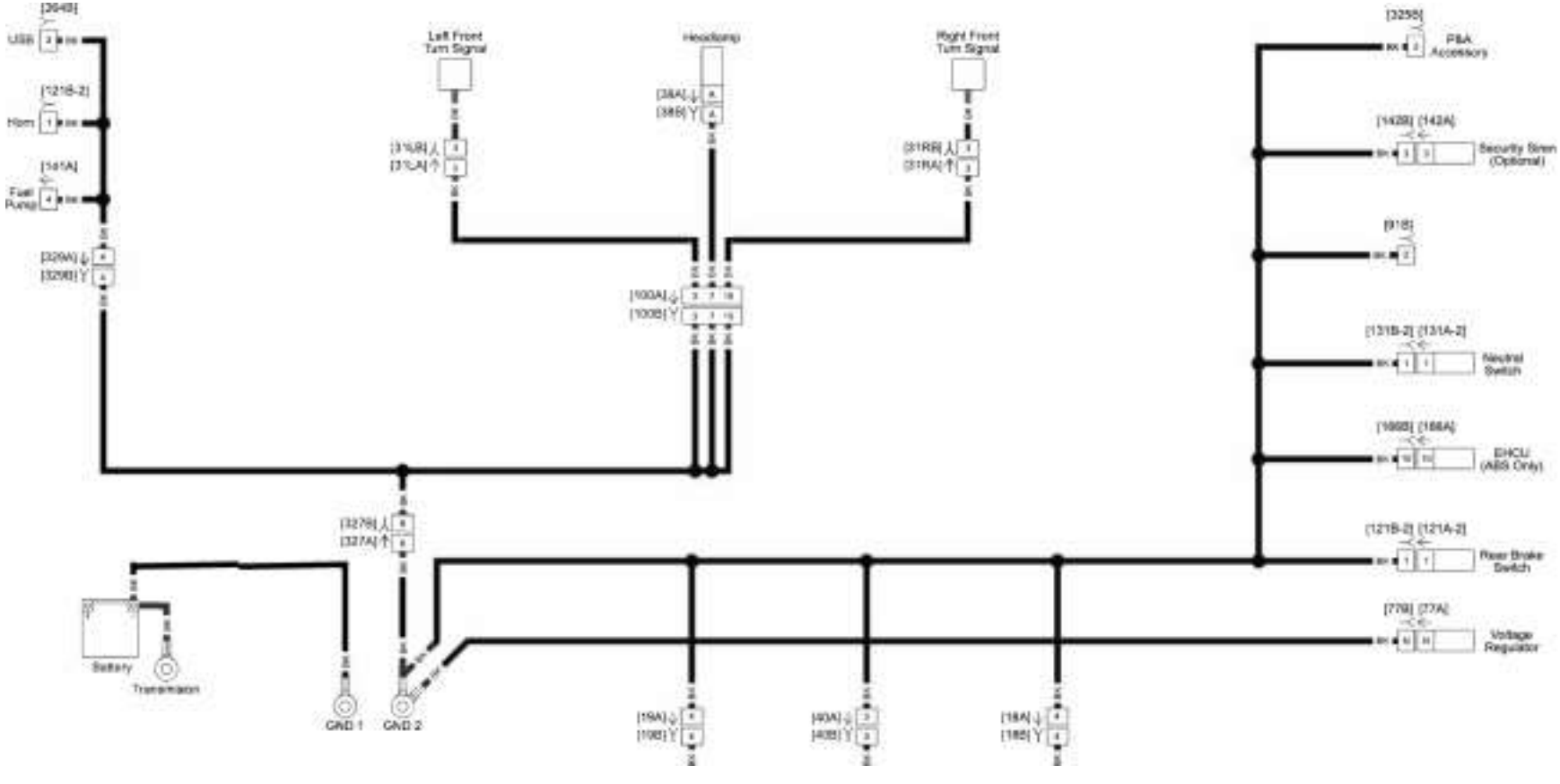
Power Distribution (FXLRST): 2022 Softail
2022 HARLEY-DAVIDSON® SERVICE MANUAL : SOFTAIL® MODELS (94000936)

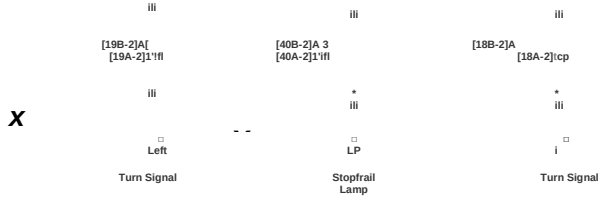


Sensor Grounds: 2022 Softail


Without AUX Lamps
Right Directional and Running Lamp
[31RB]
Right Directional and Running Lamp
With AUX Lamps
73RA 73R
Right AUX Lamp
[73RA] [73RB]
[31RB]
[3RB]
See Backbone Harness (1 of 3)
[35B-2]
Headlamp
See Backbone Harness (1 of 3)
[31LB]
Without AUX Lamps
Left Directional and Running Lamp
Left Directional and Running Lamp
With AUX Lamps
Left AUX Lamp
[73LA] [73LB]
[31LB]
RHCM
TGS
Front Brake Switch
[204B]
[225-2]
[225-1]
[24B]
See Backbone Harness (1 of 3)
Clutch Switch
LHCM

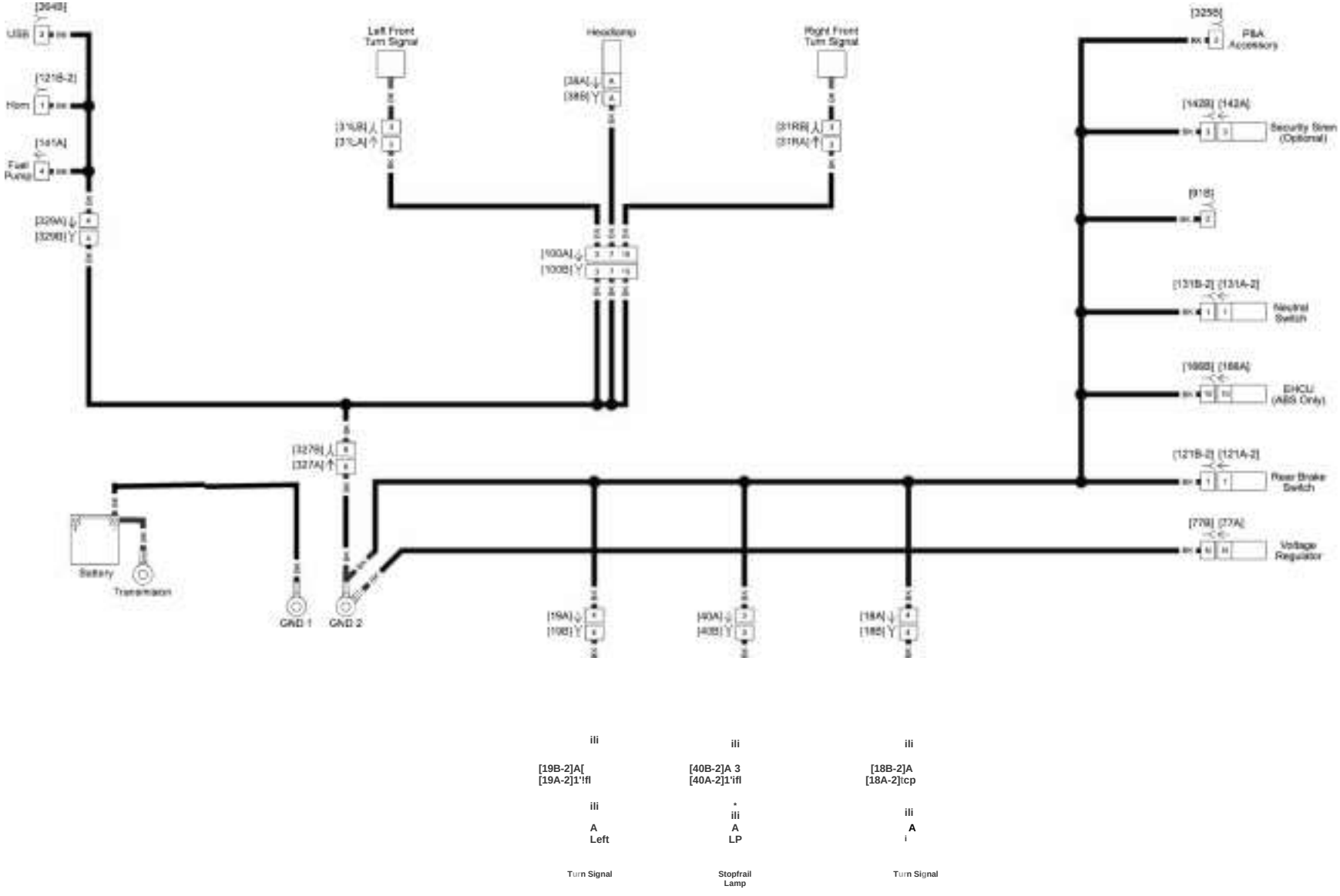
1572593





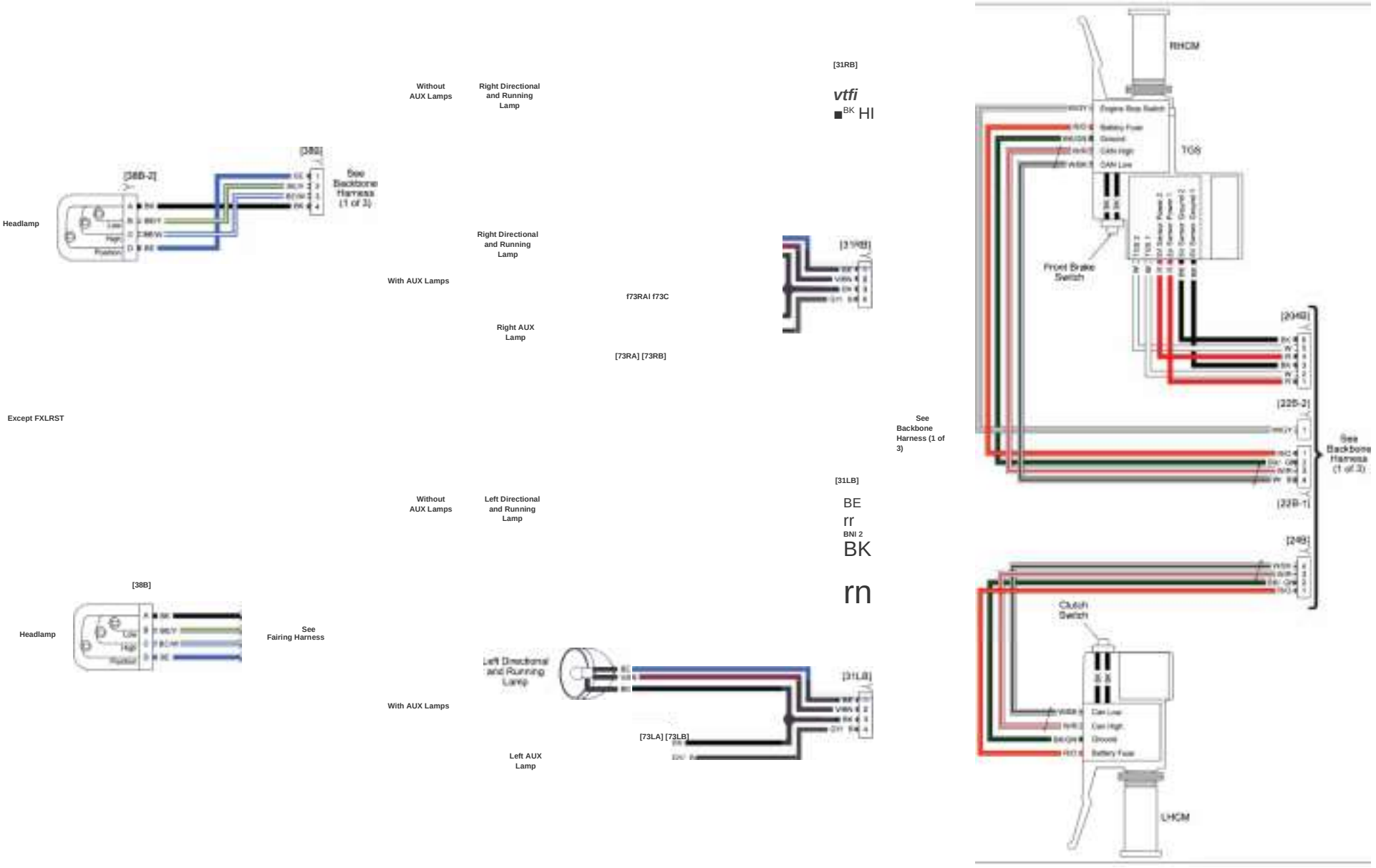
Ground Circuit (Except FXLRST): 2022 Softail

1572593

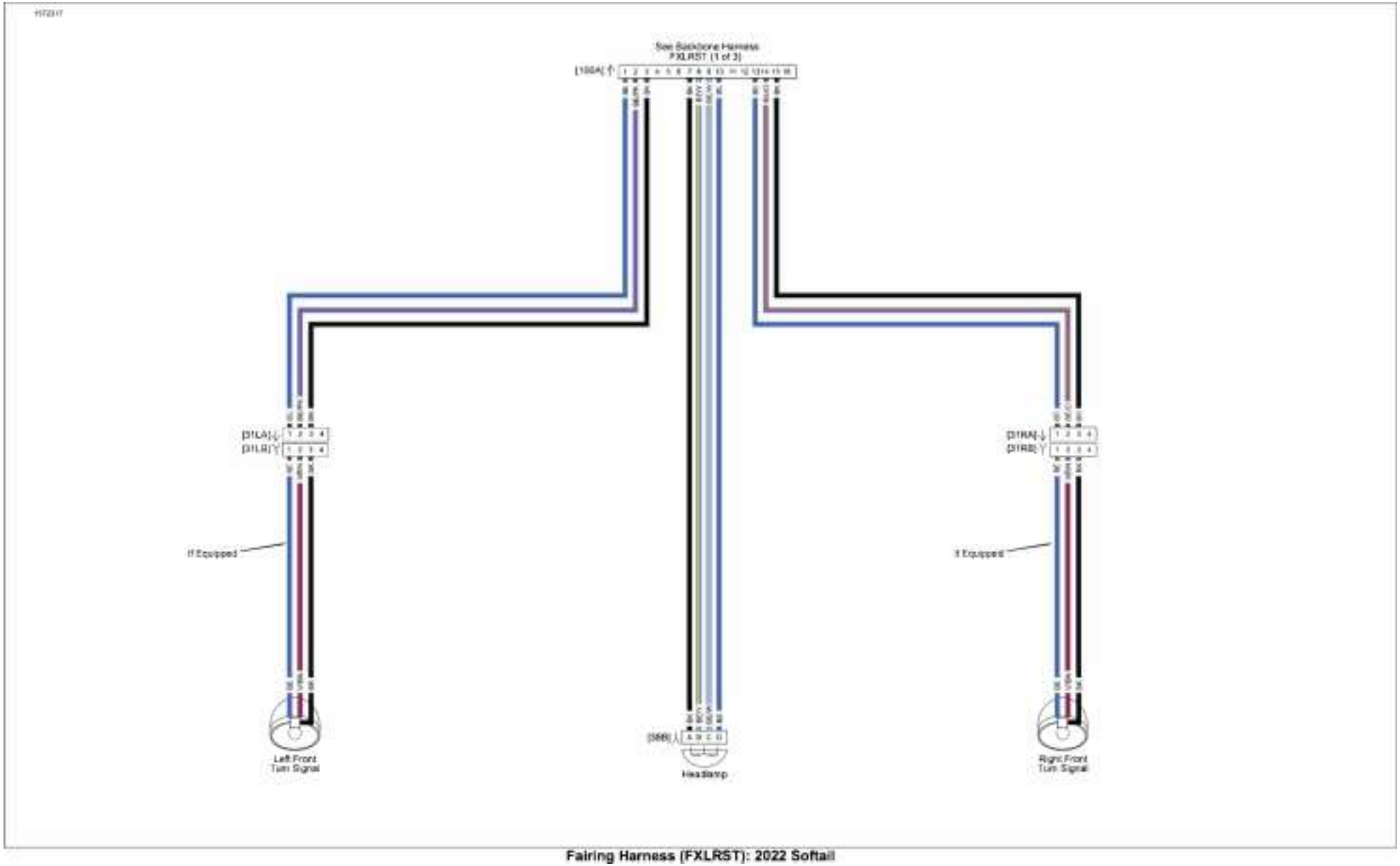


ili	ili	ili
[19B-2]A[[19A-2]1'!fl	[40B-2]A 3 [40A-2]1'ifl	[18B-2]A [18A-2]tcp
ili A Left	* ili A LP	ili A i
Turn Signal	Stopfrail Lamp	Turn Signal

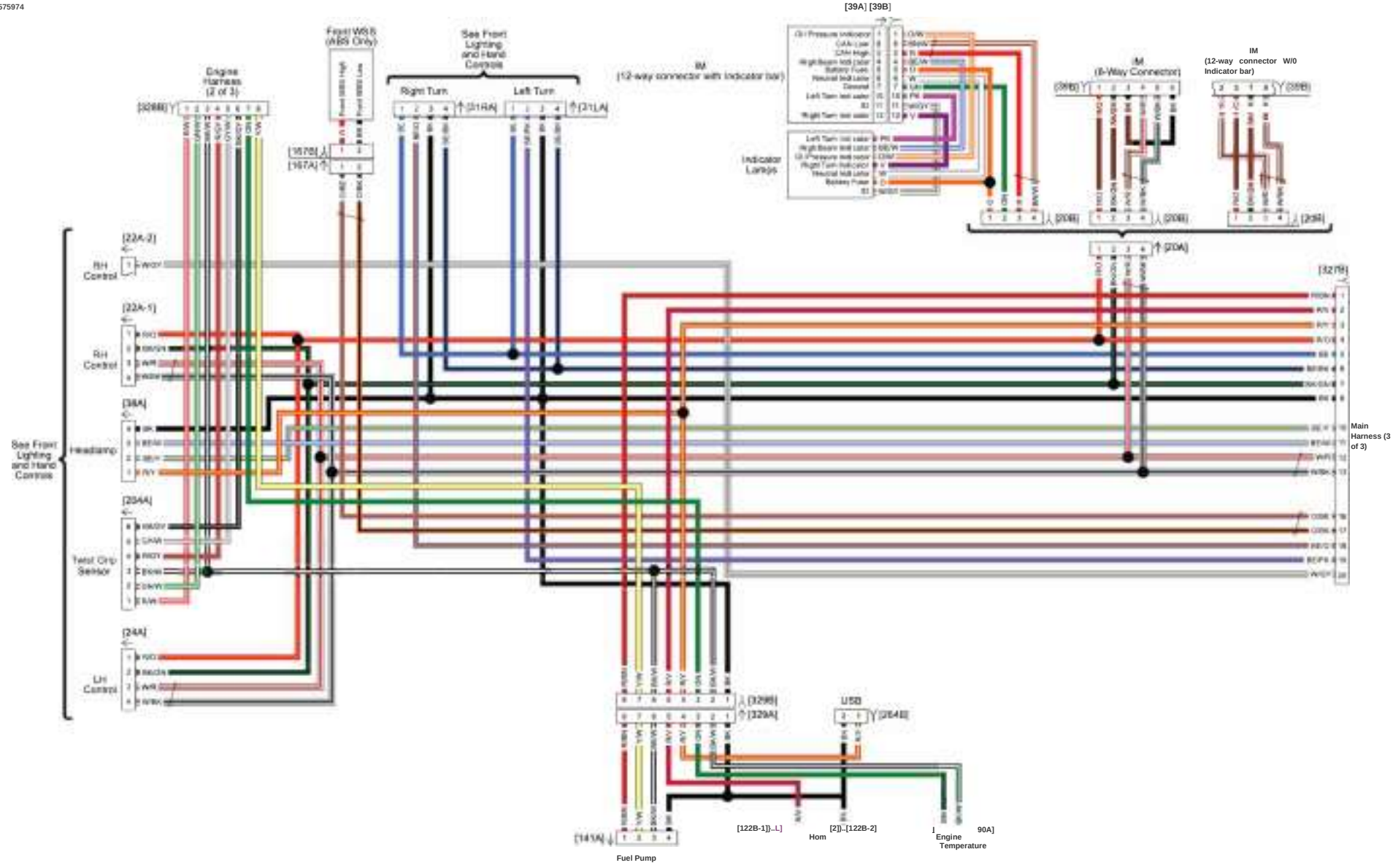
Ground Circuit (FXLRST): 2022 Softail



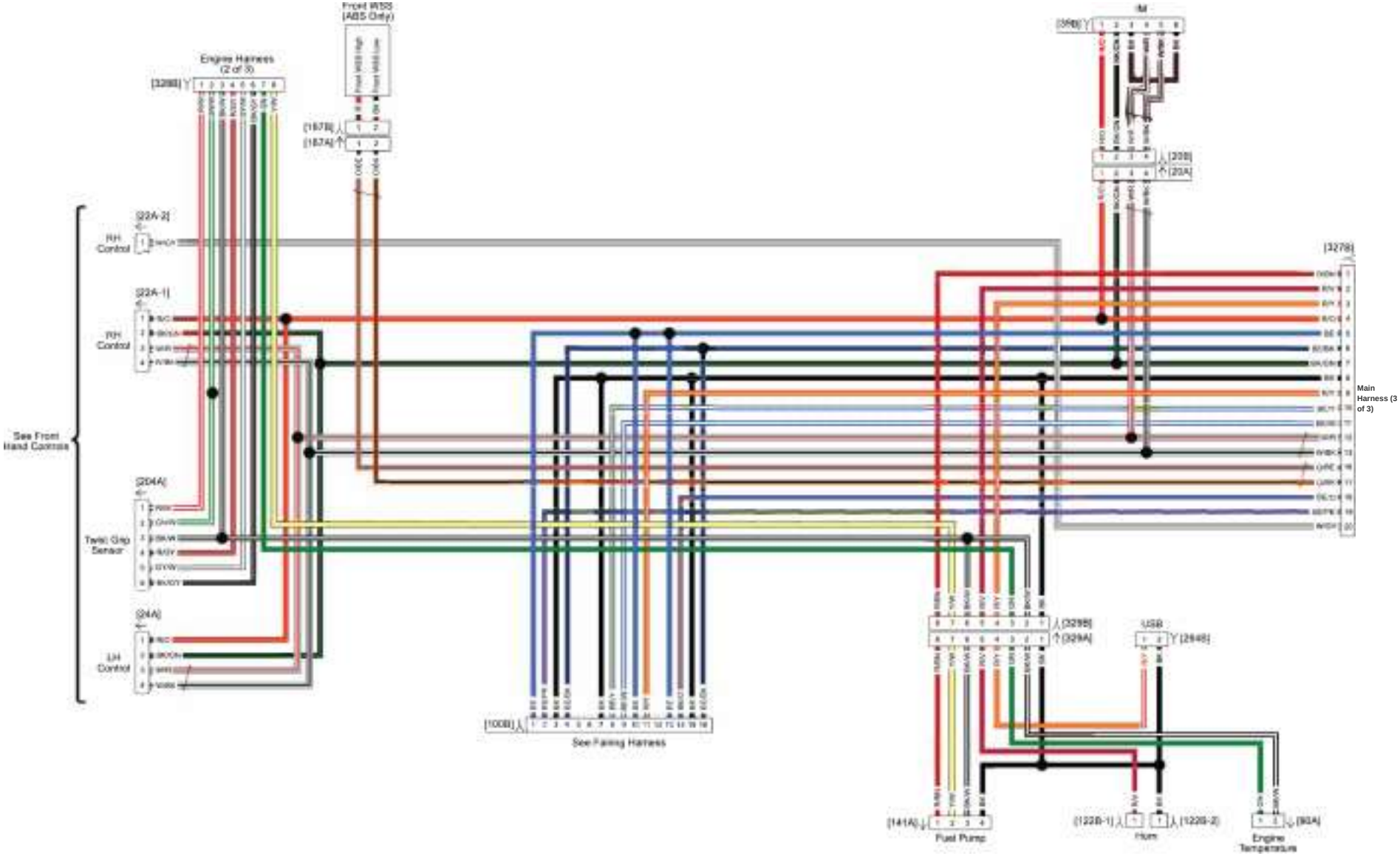
Headlamp
[38B-2]
[38B]
See Backbone Harness (1 of 3)
Without AUX Lamps
Right Directional and Running Lamp
With AUX Lamps
Right Directional and Running Lamp
Right AUX Lamp
[31RB]
vtfi
BK HI
[31RB]
f73RAI f73C
[73RA] [73RB]
Except FXLRST
See Backbone Harness (1 of 3)
[31LB]
BE
rr
BNI 2
BK
rn
Without AUX Lamps
Left Directional and Running Lamp
[38B]
Headlamp
See Fairing Harness
Left Directional and Running Lamp
With AUX Lamps
[31LB]
[73LA] [73LB]
Left AUX Lamp
RHCM
TGS
Front Brake Switch
[204B]
[22B-2]
[22B-1]
[24B]
See Backbone Harness (1 of 3)
Clutch Switch
LHCM



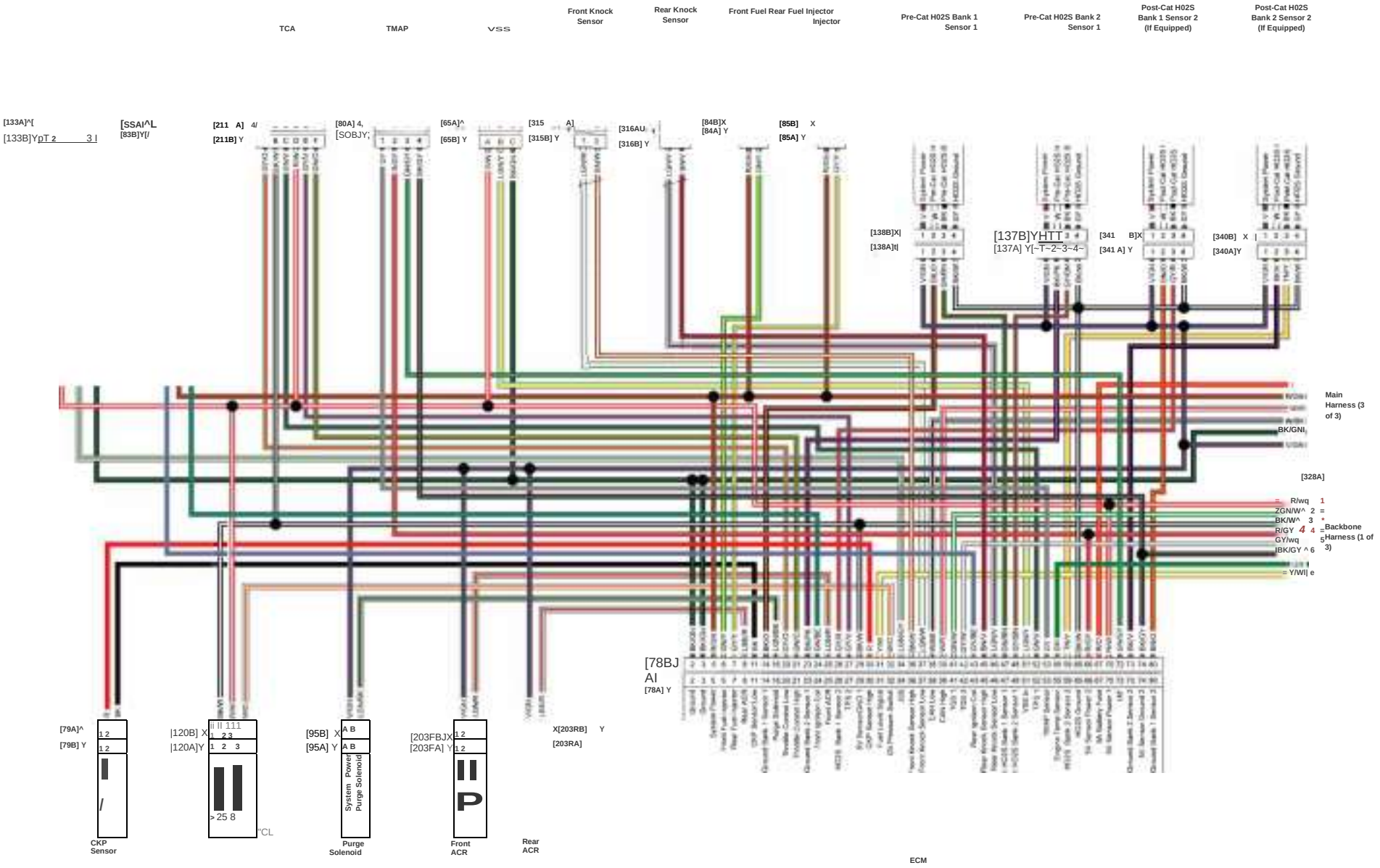
Fairing Harness (FXLRST): 2022 Softail

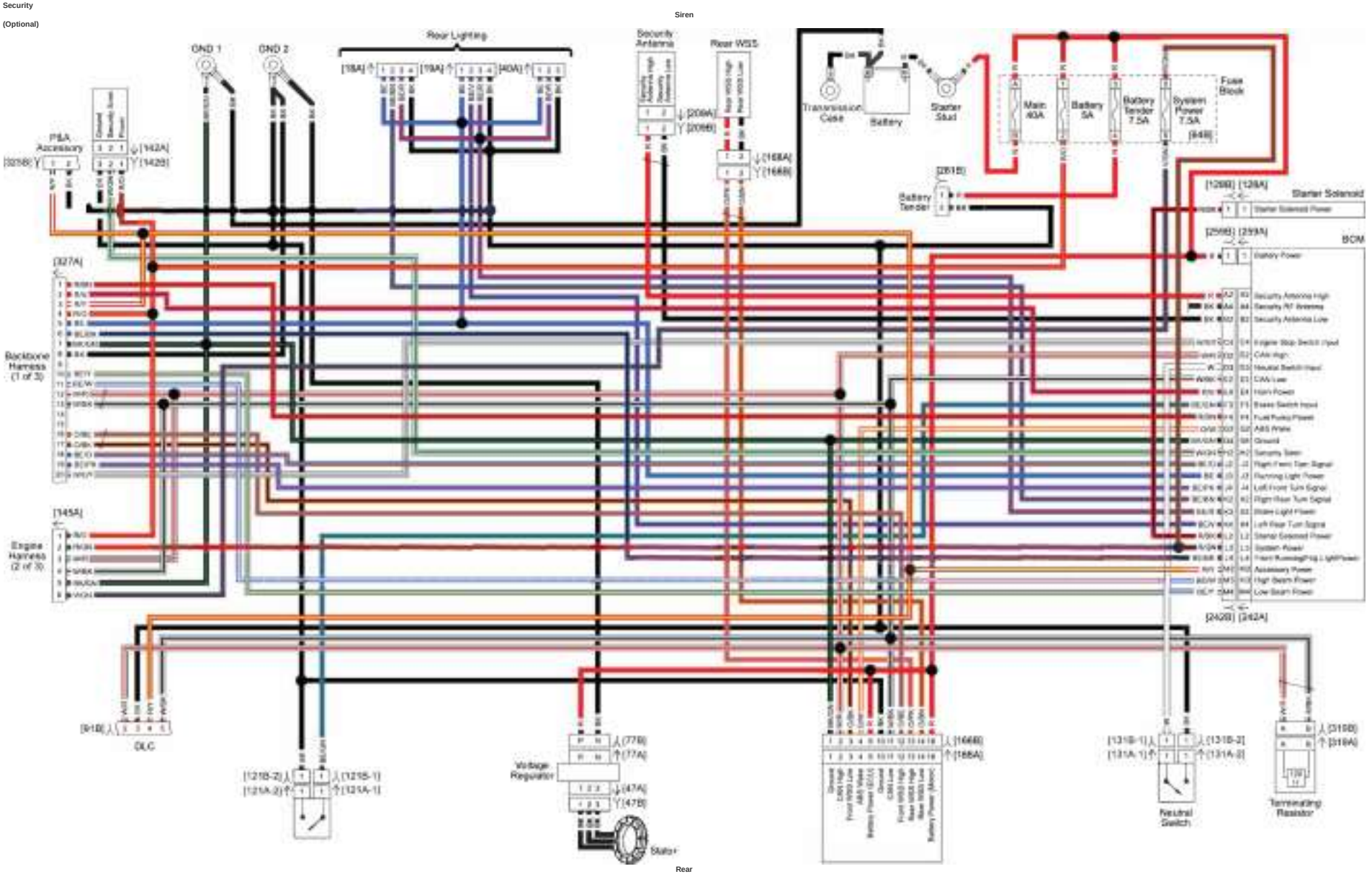


Backbone Harness (Except FXLRST) 1 of 3: 2022 Softail
2022 HARLEY-DAVIDSON® SERVICE MANUAL: SOFTAIL® MODELS (94000936)



Backbone Harness (FXLRST) 1 of 3: 2022 Softail
2022 HARLEY-DAVIDSON® SERVICE MANUAL: SOFTAIL® MODELS (94000936)


TCA
TMAP
VSS
Front Knock Sensor
Rear Knock Sensor
Front Fuel Injector
Rear Fuel Injector
Pre-Cat H02S Bank 1 Sensor 1
Pre-Cat H02S Bank 2 Sensor 1
Post-Cat H02S Bank 1 Sensor 2 (If Equipped)
Post-Cat H02S Bank 2 Sensor 2 (If Equipped)
[133A]^[
[133B]YpT 2 3 I
[SSAI^L
[83B]Y[/
[211 A] 4/
[211B] Y
[80A] 4,
[SOBJY;
[65A]^
[65B] Y
[315 A]
[315B] Y
[316AU
[316B] Y
[84B]X
[84A] Y
[85B] X
[85A] Y
[138B]X|
[138A]t|
[137B]YHTT
[137A] Y[~T~2~3~4~
[341 B]X
[341 A] Y
[340B] X
[340A]Y
Main Harness (3 of 3)
BK/GNI
[328A]
R/wq 1
ZGN/W^ 2
BK/W^ 3
R/GY 4
GY/wq 5
BK/GY ^ 6
Y/WI| e
Backbone Harness (1 of 3)
[78BJ
AI
[78A] Y
[79A]^
[79B] Y
CKP Sensor
|120B] X
|120A]Y
> 25 8
*CL
[95B] X
[95A] Y
System Power
Purge Solenoid
Purge Solenoid
[203FBJX
[203FA] Y
Front ACR
X[203RB] Y
[203RA]
Rear ACR
ECM



Mam Harness 3 of 3: 2022 Softail
2022 HARLEY-DAVIDSON® SERVICE MANUAL: SOFTAIL® MODELS (94000936)

Rear Lighting

[18B] & [19B] >-

See Main Harness (3 of 3)

HDI Only

Left & Right RearSTT

Except FLDE, FLHC/S, FXLRST

[40B)
>-
See Main Harness (3 of 3)

Except FLDE FLHC/S, FXLRST

[40B]

See Main Harness (3 of 3)

Brake Light

7J).J94B]

[94A]

[19A]

[19A]

FXLR

[93A]

FXLRS

[93B]

[93B]

[93B-2]

Ground Brake Running

LED Tail Lamp

Tail HDI Only

Tail DOM Only

Tail Lamp

[18B] & [19B]
>-

SeeMain Harness (3of3)

Right Rear Directional Lamp

See Main Harness (3 of 3)

[18B]

[40B]

[19B]

[18B-2]

[19B-2]

[94B]

[94A]

[18A-2]

[19A-2]

[45A]

[93A]

[93B]

Brake Light

Tail HDI Only

Tail DOM Only

Tail Lamp

Left Rear Directional Lamp

[18B]
>-

[40B)
>-

T]» BE H
BE/R ■
7f BK*

[19B]
>-

B BEN

*

BK "=

[18B-2] --<

KillU

Right Rear Directional Lamp

[40B-2]
-C

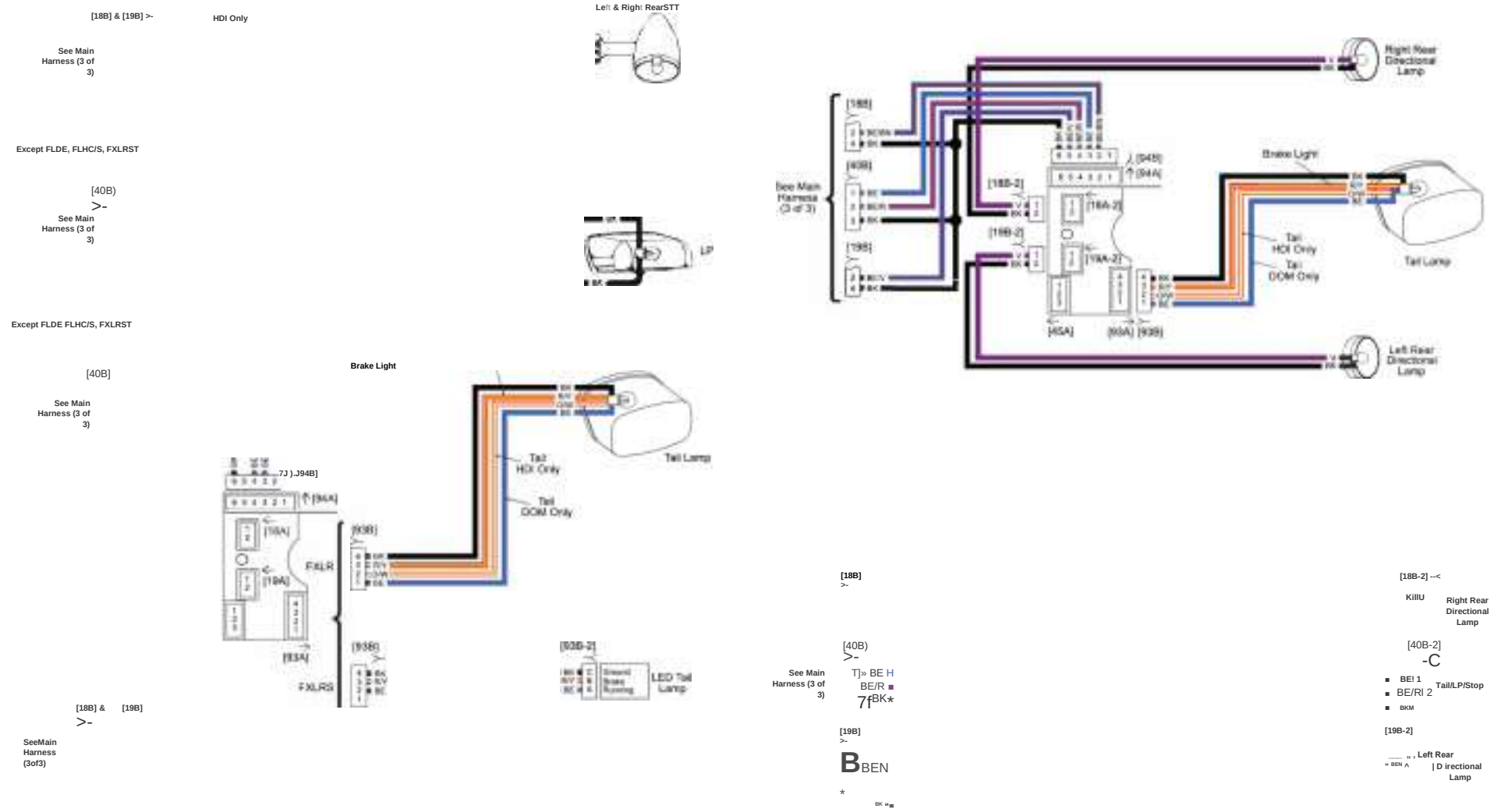
BE! 1
BE/RI 2
BKM

Tail/LP/Stop

[19B-2]

" BEN ^

, Left Rear
| D irectional Lamp



Rear Lighting: 2022 Softail
2022 HARLEY-DAVIDSON® SERVICE MANUAL: SOFTAIL® MODELS (94000936)

NOTES

GENERAL

Function/Location

All vehicle connectors are identified by their function and location. Refer to Table A-2.

Place and Color

The place (number of wire cavities of a connector housing) and color of the connector can also aid identification.

Connector Number

On wiring diagrams and in service instructions, connectors are identified by a number in brackets.

Repair Instructions

The repair instructions in Appendix B of the electrical diagnostic manual (EDM) are by connector type. Refer to Table A-2.

Table A-2. Softail Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[18]	Right rear stop, tail and turn assembly	4-place JAE MX19 Sealed (BK)	Yellow	Under seat
[18-2]	Right rear turn	4-place JAE MX19 Sealed (BK)	Yellow	Inside stop lamp (FLHC/S)
[19]	Left rear stop, tail and turn assembly	4-place JAE MX19 Sealed (BK)	Yellow	Under seat
[19-2]	Left rear turn	4-place JAE MX19 Sealed (BK)	Yellow	Inside stop lamp (FLHC/S)
[20]	Console harness	4-way JST JWPF Sealed (BK)	Yellow	Inside frame behind grommet
[22-1]	Right hand controls	4-place JAE MX19 Sealed (BK)	Yellow	Caddy inside left frame behind grommet
[22-2]	Right hand controls	2-place JAEMX19 Sealed (BK)	Yellow	Under frame in front of front cylinder
[24]	Left hand controls	4-place JAE MX19 Sealed (BK)	Yellow	Under frame in front of front cylinder
[31L]	Left front turn signal/auxiliary lamp	4-way JAE MX19 Sealed (GY)	Yellow	Caddy inside left frame behind grommet
[31R]	Right front turn signal/auxiliary lamp	4-way JAE MX19 Sealed (GY)	Yellow	Under frame in front of front cylinder
[38]	Headlamp	4-place Deutsch DTM Sealed (BK) (FXBR/S, FXFR/S)	Brown	Caddy inside left frame behind grommet
[38-2]	Headlamp	4-way Delphi 150 Metri-Pack (BK)	Gray	Inside headlamp nacelle
[39]	IM	12-place Delphi Micro 64 Sealed (GY) (except FXBR/S, FXBBS) 6-place JST JWPF Sealed (BK) (FXBR/S, FXBBS)	BOB Yellow	**IM**
[40]	Center rear lighting	3-place Tyco MCON 1.2 Sealed (BK)	Gray	Under seat
[40-2]	Tail lamp	4-place JAEMX19 Sealed (BK)	Yellow	Inside light bar
[47]	Voltage regulator to stator	3-place Dekko (BK)	Green	Back of voltage regulator
[64]	Fuse block	6-way	Purple/Red	Behind left side cover
[65]	VSS	3-place Delphi GT 150 3.5 Sealed (BK)	Gray	Top of transmission under battery
[73L]	Left auxiliary lamps	2-way Delphi 280 Metri-Pack	Purple	Inside auxiliary/fog lamps sealed (BK)
[73R]	Right auxiliary lamps	2-way Delphi 280 Metri-Pack	Purple	Inside auxiliary/fog lamps sealed (BK)
[77]	Voltage regulator	2-place Dekko (BK)	Green	Back of voltage regulator
[78]	ECM	81-way Delphi (BK)	BOB	Behind left side cover under fuse block caddy
[79]	CKP sensor	2-place Deutsch DTM Sealed (BK)	Brown	Back of voltage regulator bracket
[80]	TMAP	4-place Tyco MCON 1.2 Sealed (BK)	Gray	Top of induction module
[83]	Ignition coil	3-place Delphi GT 150 Sealed (BK)	Gray	Rear of coil
[84]	Front fuel injector	2-place Delphi GT 150 3.5 Sealed (GY)	Gray	Beneath fuel tank

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[85]	Rear fuel injector	2-place Delphi GT 150 3.5 Sealed (GY)	Gray	Beneath fuel tank
[90]	ET sensor	2-place Tyco **MCON** 1.2 Sealed (GY)	Gray	Under frame below fuel tank
[91]	DLC	6-place Deutsch DT Sealed (GY)	Black	Behind left side cover
[93]	Tail lamp	4-way Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly (FLHC)
[95]	Purge solenoid	2-place Delphi 150 Metri-pack Sealed (BK)	Gray	Under seat in front of rear fender
[100]	Fairing interconnect	16-way Molex MX150	Gray	Inside fairing
[108]	Tachometer	12-place Delphi Micro 64 Sealed (GY)	BOB	Behind tachometer
[120]	Oil pressure switch	3-place Delphi GT 150 3.5 (BK)	Gray	Front right crankcase
[121-1]	Rear brake switch	Push-on molded terminals (BK)	Red	Right side of engine behind voltage regulator
[121-2]	Rear brake switch	Push-on molded terminals (BK)	Red	Right side of engine behind voltage regulator
[122]	Horn	Flag terminals (BK)	Red	USB caddy under frame in front of front cylinder
[128]	Starter solenoid	Tyco Insulated Spade terminal (W)	Red	Top of starter
[131-1]	Neutral switch	Right Angle Push On Molded (BK)		Top of transmission
[131-2]	Neutral switch	Right Angle Push On Molded (BK)		Top of transmission
[133]	JSS	3-place Molex MX 150 Sealed (BK)	Gray	Back of voltage regulator bracket
[137]	HO2S rear	4-place Molex MX 150 Sealed (BK)	Gray	Under seat in front of battery
[138]	HO2S front	4-place Molex MX 150 Sealed (BK)	Gray	Behind voltage regulator
[141]	Fuel pump and sender	4-place Molex MX150 Sealed (BK)	Gray	USB caddy under frame in front of front cylinder
[142]	Security siren (optional)	3-place Delphi GT 150 3.5 Sealed (BK)	Gray	Electrical panel behind fender extension
[145]	Engine harness	6-way Molex MX 150 Sealed (BK)	Gray	Under seat
[166]	ABS EHCU	18-place Tyco MCON 1.2 Sealed (BK)	BOB	Behind right side cover
[167]	Front WSS	2-place JAEMX19 Sealed (GY)	Yellow	Under frame in front of front cylinder
[168]	Rear WSS	2-place Deutsch DTM Sealed (BK)	Brown	Behind right side cover
[203FA]	ACR (front)	2-place Tyco Superseal 1.5 Sealed	Gray	Under frame below fuel tank
[203RA]	ACR (rear)	2-place Tyco Superseal 1.5 Sealed	Gray	Under frame below fuel tank
[204]	TGS	6-place JST JWPF Sealed	Yellow	Caddy inside left frame behind grommet
[209]	Security antenna	2-place Molex MX 64 Unsealed (BK)	Light Blue	Under seat
[211]	TCA	6-way Delphi GT 150 Sealed (BK)	Gray	Right side of engine (induction module)
[242]	BCM	48-place Molex CMC Sealed (BK)	BOB	Front of rear wheel behind splash guard
[259]	BCM battery power	1-place Delphi 800 Metri-pack Sealed (BK)	Red	Front of rear wheel behind splash guard
[264]	USB	2-way Deutsch DT (GY)	Black	USB caddy under frame in front of front cylinder
[281]	Battery tender	2-way over mold (BK)		Behind left side cover

Table A-2. Softail Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[315]	Front knock sensor	2-way Kostal MLK 1.2	Light blue	Under fuel tank
[316]	Rear knock sensor	2-way Kostal MLK 1.2	Light blue	Under fuel tank
[319]	Terminating resistor	2-way Delphi GT 150 (BK)	Gray	Behind left side cover
(325]	P&A accessory	3-way Molex MX150 (BK)	Gray	Behind left side cover
[327]	Backbone harness interconnect	20-way Molex MX150 (BK)	Gray	Under seat
[328]	Engine harness interconnect	8-way JST JWPF Sealed (BK)	Yellow	Under fuel tank behind rear cylinder
[329]	USB caddy interconnect	8-way Molex MX150	Gray	USB caddy under frame in front of front cylinder
[340]	Post HO2S Bank 2	4-place Molex MX 150 Sealed	Gray	Right side of engine
[341]	Post HO2S Bank 1	4-place Molex MX 150 Sealed	Gray	Right side of engine
[GND1] [GND2] [GND2A]	Rear ground stud Front ground stud (Regulator) Front ground stud	Ring terminals		Under seat

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CONNECTOR END VIEWS

Table A-3. Right Rear Turn Signal [18]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	BE/BN	Right rear turn signal
3	-	N/C
4	BK	Ground

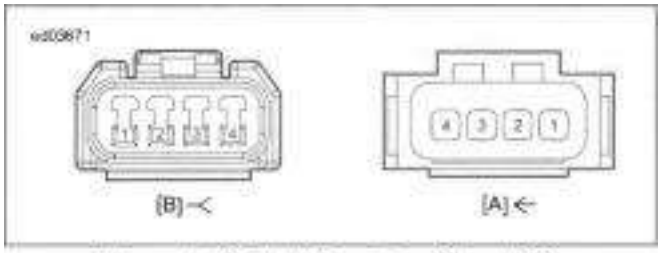

Figure A-16. Right Rear Turn Signal [18]

Table A-4. Right Rear Turn Signal [18-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	BE/BN	Right rear turn signal
3	BK	Ground
4	-	N/C

Figure A-17. Right Rear Turn Signal [18-2]

Table A-5. Left Rear Turn Signal [19]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	BE/BN	Left rear turn signal
3	-	N/C
4	BK	Ground

Figure A-18. Left Rear Turn Signal [19]

Table A-6. Left Rear Turn Signal [19-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	BEN	Left rear turn signal
3	BK	Ground
4	-	N/C

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Figure A-19. Left Rear Turn Signal [19-2]

Table A-7. Console Harness [20]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/O	Battery fuse
2	BK/GN	Ground
3	W/R	CAN high
4	W/BK	CAN low

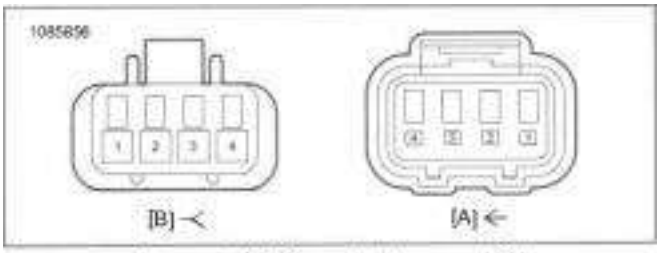

Figure A-20. Console Harness [20]

Table A-8. RHCM [22-1]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/O	Battery fuse
2	BK	Ground
3	W/R	CAN high
4	W/BK	CAN low

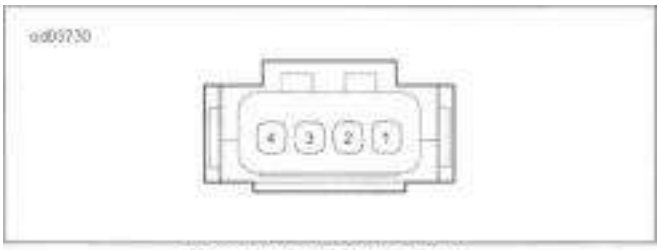

Figure A-21. RHCM [22-1]

Table A-9. RHCM [22-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	W/GY	Engine stop switch
2	-	N/C

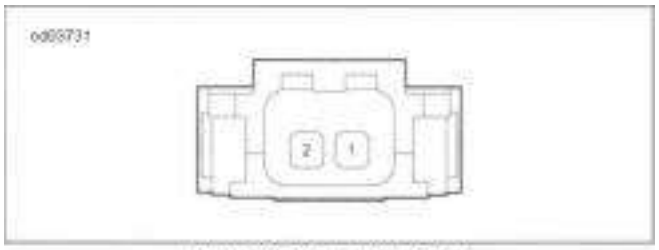

Figure A-22. RHCM [22-2]

Table A-10. LHCM [24]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/O	Battery fuse
2	BK	Ground
3	W/R	CAN high
4	W/BK	CAN low

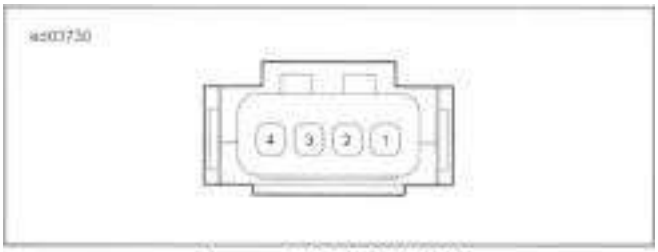

Figure A-23. LHCM [24]

Table A-11. Front Left Turn Signal [31L]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Position
2	BE/PK	Left front turn signal
3	BK	Ground
4	BE/BK	AUX/fog

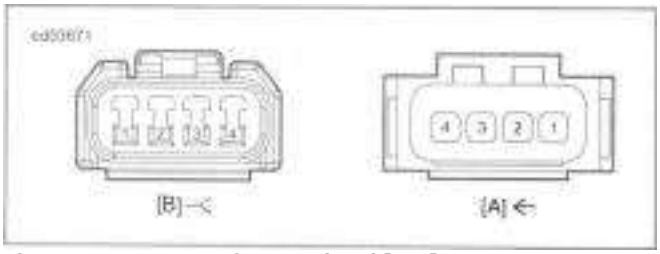

Figure A-24. Front Left Turn Signal [31L]

Table A-12. Front Left Turn [31L-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Position
2	BE/PK	Left front turn signal
3	BK	Ground
4	-	N/C

Figure A-25. Front Left Turn [31L-2]

Table A-13. Front Right Turn Signal [31R]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Position
2	BE/O	Right front turn signal
3	BK	Ground
4	BE/BK	AUX/fog

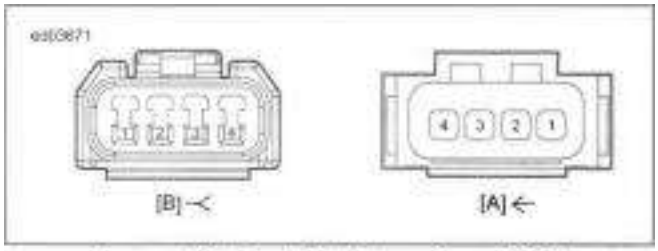

Figure A-26. Front Right Turn Signal [31R]

Table A-14. Front Right Turn Signal [31R-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Position
2	BE/O	Right front turn signal
3	BK	Ground
4	-	N/C

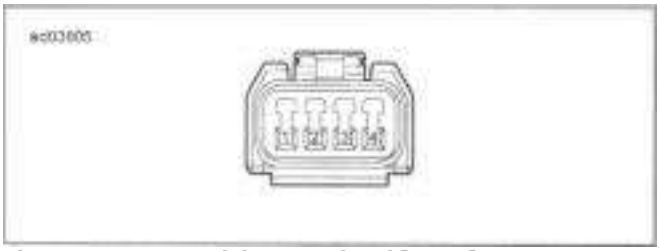

Figure A-27. Front Right Turn Signal [31R-2]

Table A-15. Headlamp [38]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Running/position lamp
2	BE/Y	Low beam
3	BE/W	High beam
4	BK	Ground

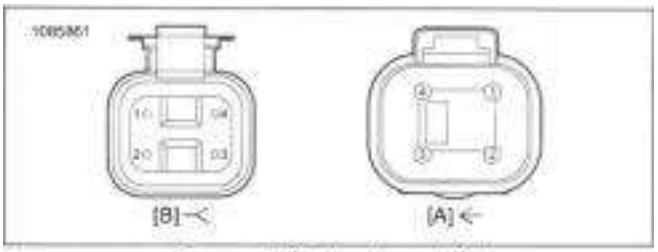

Figure A-28. Headlamp [38]

Table A-16. Headlamp [38-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A	BK	Ground
B	BE/Y	Low beam
C	BE/W	High beam
D	BE	Running/position lamp

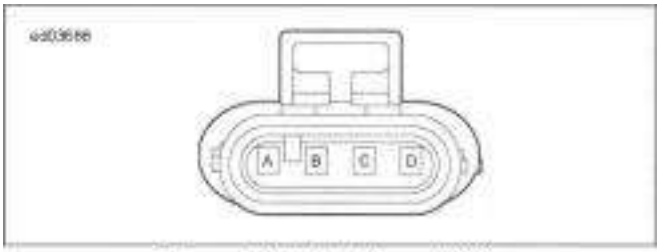

Figure A-29. Headlamp [38-2]

Table A-17. IM [39] (12 place connector)

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	W/O	Oil pressure indicator
2	W/R	CAN high
3	-	N/C
4	BE/W	High beam indicator
5	R/O	Battery fuse
6	W	Neutral indicator
7	BK/GN	Ground
8	W/BK	CAN low
9	-	N/C
10	BE/PK	Left turn indicator
11	W	Indicator type ID
12	BE/O	Right turn indicator

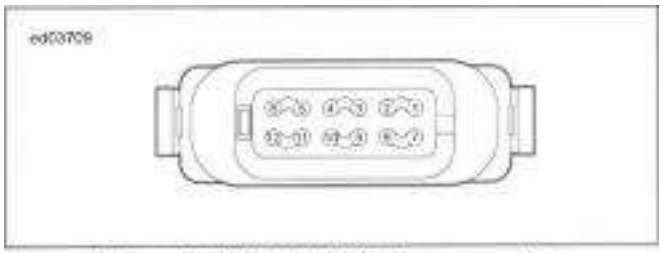

Figure A-30. IM [39] (12 place connector)

Table A-18. IM [39] (6 place connector)

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/O	Battery fuse
2	BK/GN	Ground
3	BK	Spare „
4	W/R	CAN +
5	W/BK	CAN low
6	BK	H-D link

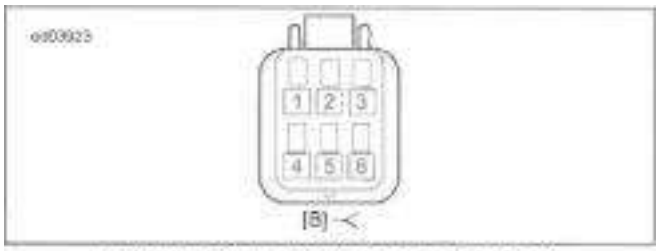

Figure A-31. IM [39] (6 place connector)

Table A-19. Center Lighting [40A]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Running/position lamps
2	BE/R	Brake lamp power
3	BK	Ground

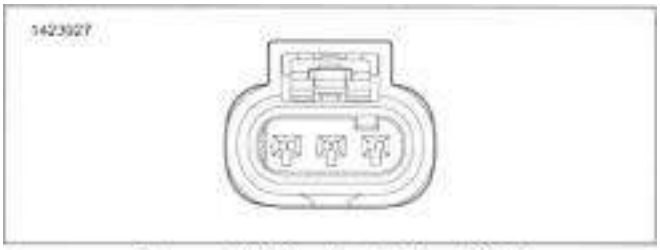

Figure A-32. Center Lighting [40A]

Table A-20. Center Lighting [40B]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Running/position lamps
2	BE/R	Brake lamp power
3	BK	Ground

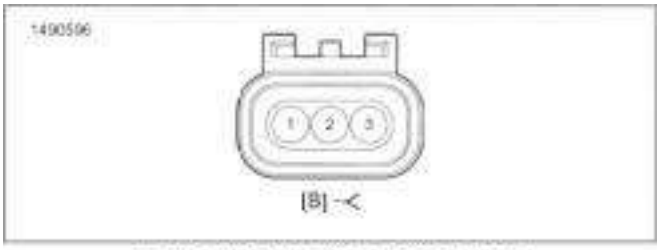

Figure A-33. Center Lighting [40B]

Table A-21. Stop Tail Lamp [40-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Position
2	BE/R	Brake lamp power
3	BK	Ground
4	-	N/C

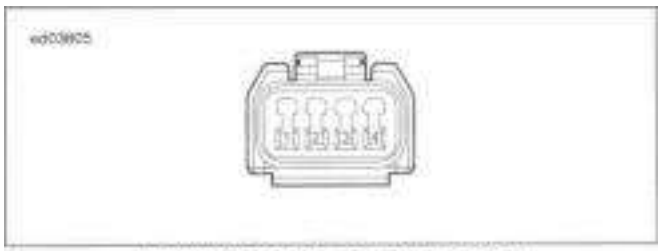

Figure A-34. Stop Tail Lamp [40-2]

Table A-22. Stator [47]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BK	Stator
2	BK	Stator
3	BK	Stator

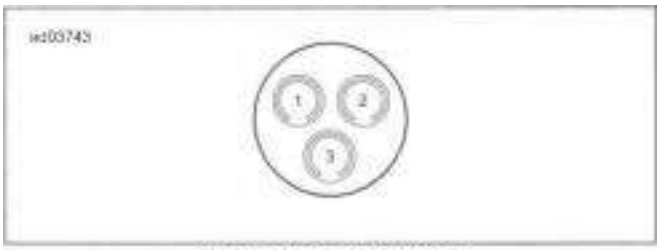

Figure A-35. Stator [47]

Table A-23. Fuse Block [64]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	R	Battery
2	R/O	Battery fuse
3	R	Battery
4	R	Tender fuse
5	R/GR	System power
6	V/G	System power
A	R	Battery/main fuse
B	R	Battery/main fuse

1437959

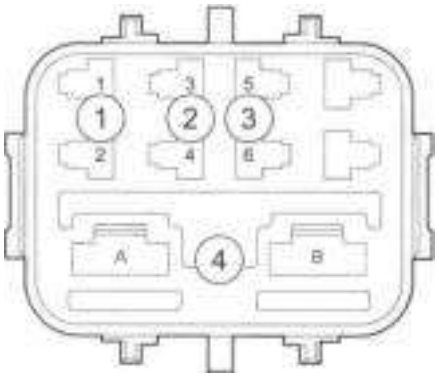

Figure A-36. Fuse Block [64]

Table A-24. VSS [65]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A	R/W	5 Volt sensor power
B	LGN/Y	VSS input
C	BK/GN	Sensor ground

Figure A-37. VSS [65]

Table A-25. Auxiliary/Fog Lamps [73L]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
A	BK	Ground
B	GY/BK	Front running/fog light power

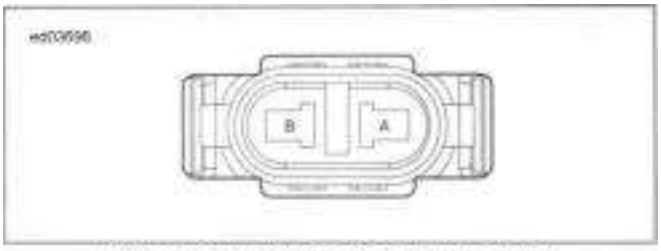

Figure A-38. Auxiliary/Fog Lamps [73L]

Table A-26. Left Auxiliary/Fog Lamps [73L-2]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	BK	Ground
2	BE/BK	Front running/fog light power

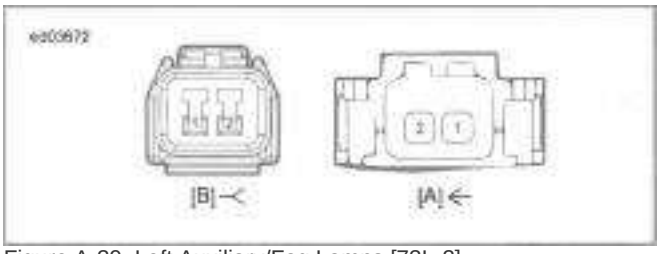

Figure A-39. Left Auxiliary/Fog Lamps [73L-2]

Table A-27. Auxiliary/Fog Lamps [73R]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
A	BK	Ground
B	GY/BK	Front running/fog light power

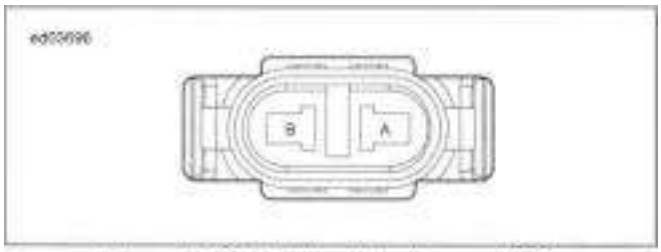

Figure A-40. Auxiliary/Fog Lamps [73R]

Table A-28. Right Auxiliary/Fog Lamp [73R-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BK	Ground
2	BE/BK	Front running/fog light power

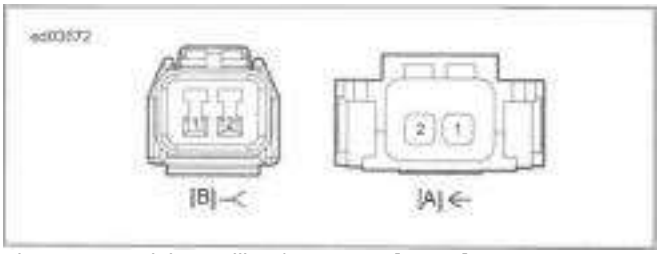

Figure A-41. Right Auxiliary/Fog Lamp [73R-2]

Table A-29. Voltage Regulator [77]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
P	R	Battery
N	BK	Ground

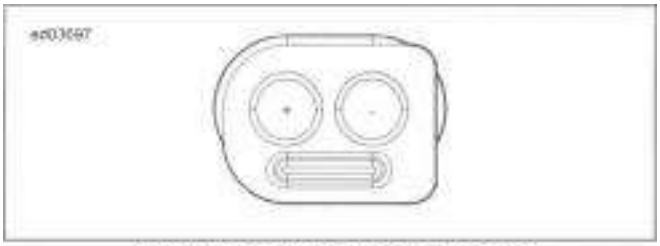

Figure A-42. Voltage Regulator [77]

Table A-30. ECM [78]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	BK/GN	Ground
3	BK/GN	Ground
4	-	N/C
5	R/GN	System power
6	GN/Y	Front fuel injector
7	GY/Y	Rear fuel injector
8	LBE/R	Rear ACR
9	-	N/C
10	-	N/C
11	BK	Crank position sensor
12	-	N/C
13	-	N/C
14	BK/O	Pre-cat heater ground bank 1 sensor1
15	-	N/C
16	LGN/BK	Purge solenoid
17	-	N/C
18	-	N/C
19	-	N/C
20	GY/O	Throttle motor lo
21	GN/O	Throttle motor hi
22	-	N/C
23	BK/PK	Pre-cat heater ground bank 2 sensor1
24	GN/BE	Front coil out
25	LGN/R	Front ACR
26	GY/R	Post-cat 02 sensor bank 1 sensor 2
27	***GYN***	Throttle position sensor 2
28	***-***	N/C
29	BK/W	5V sensor ground 1
30	R	Crank position sensor +
31	Y/W	Fuel level
32	W/O	Oil pressure
33	-	N/C
34	LGN/GY	Jiffy stand
35	-	N/C
36	BN/W	Front knock sensor HI
37	LGN/W	Front knock sensor LO
38	W/BK	CAN low
39	W/R	CAN high
40	-	N/C
41	GN/W	Twist grip sensor 1
42	GY/W	Twist grip sensor 2
43	GY/BE	Rear coil out
44	-	N/C
45	BNN	Rear knock sensor HI
46	LGNN	Rear knock sensor LO
47	GN/BN	Pre-cat HO2S bank 1 sensor 1
48	GY/BN	Pre-cat HO2S bank 2 sensor 1
49	GY/GN	Coolant sensor
50	-	N/C
51	LGN/Y	Vehicle speed
52	GNN	Throttle position sensor 1
53	GY	TMAP pressure in
54	-	N/C
55	GN	Engine temp sensor
56	-	N/C
57	-	N/C
58	-	N/C

Table A-30. ECM [78]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
59	TN/Y	Post-cat HO2S bank 2 sensor 2
60	-	N/C
61	-	N/C
62	-	N/C
(53	-	N/C
(54	-	N/C
65	BK/W	HO2S sensor ground
656	R/GY	5V sensor power 2
87	R/O	5A battery fuse
658	-	N/C
69	-	N/C
70	R/W	5V sensor power 1
71	-	N/C
72	GN/GY	Intake air temperature
73	BKN	Post-cat 02 heater bank 2 sensor2
74	BK/GY	5V sensor ground 2
75	-	N/C
76	-	N/C
77	-	N/C
78	-	N/C
79	-	N/C
80	BN/O	Post-cat 02 heater bank 1 sensor 2
81	-	N/C

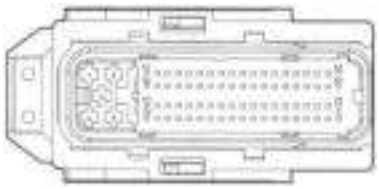

Figure A-43. ECM [78] Table A-31. CKP Sensor [79]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R	CKP sensor high
2	BK	CKP sensor low

Figure A-44. CKP Sensor [79]

Table A-32. TMAP [80]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	GY	MAP input
2	R/GY	5V sensor power 2
3	GN/GY	IAT
4	BK/GY	5V sensor ground 2

ed04042

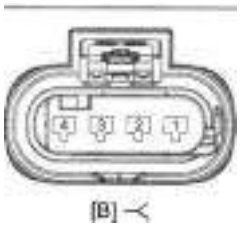

Figure A-45. TMAP [80]

Table A-33. Ignition Coil [83]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
A	GY/BE	Rear ignition coil
B	R/GN	System power
C	GN/BE	Front ignition coil

ed03695

Figure A-46. Ignition Coil [83]

Table A-34. Front Fuel Injector [84]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A	R/GN	System power
B	GN/Y	Rear fuel injector

ed03574

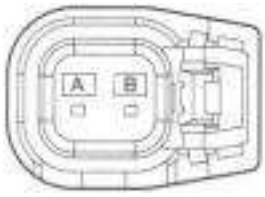

Figure A-47. Front Fuel Injector [84]

Table A-35. Rear Fuel Injector [85]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A	R/GN	System power
B	GY/Y	Front fuel injector

ed03574

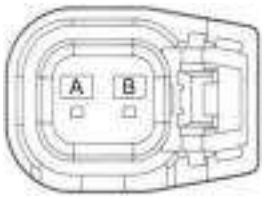

Figure A-48. Rear Fuel Injector [85]

Table A-36. ET Sensor [90]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	GN	ET sensor
2	BK/W	5V sensor ground

ed04040

Figure A-49. ET Sensor [90]

Table A-37. OBD [91C]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	W/R	CAN high
3	BK	Ground
4	R/Y	Accessory power
5	W/BK	CAN low
6	-	N/C

Figure A-50. OBD [91B]

Table A-38. [93]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Running light power
2	O/W	Accessory power
3	R/Y	Brake lamp power
4	BK	Ground

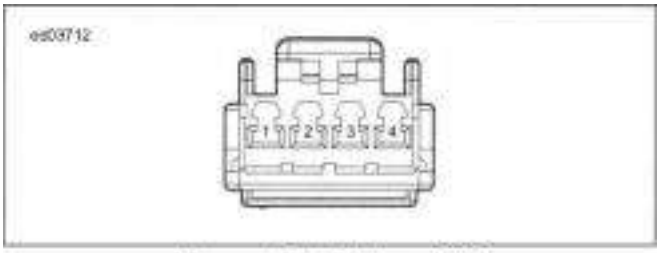

Figure A-51. Tail Lamp [93]

Table A-39. Stop Tail Lamp [94]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	BE/BN	Right rear turn signal
3	BE	Running lights power
4	BE/R	Brake lamp power
5	BEN	Left rear turn signal
6	BK	Ground

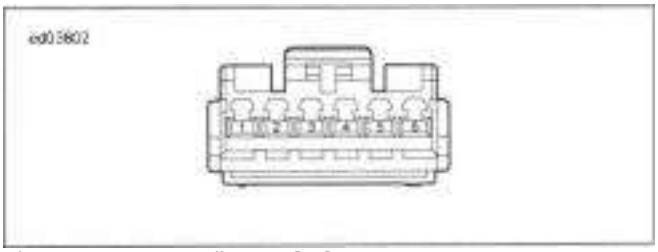

Figure A-52. Stop Tail Lamp [94]

Table A-40. Purge Solenoid [95]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A	V/GR	System power
B	LGN/BK	Purge solenoid

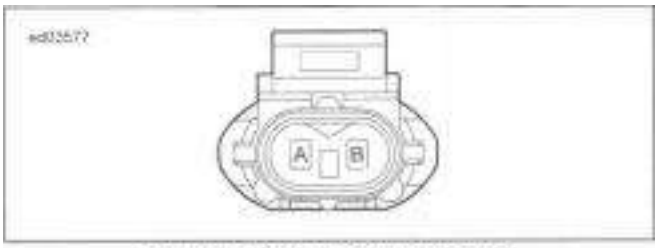

Figure A-53. Purge Solenoid [95]

Table A-41. Fairing Interconnect [100]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE	Position lamp
2	BE/PK	Front left turn signal
3	BK	Ground
4	BE/BK	N/C
5	-	N/C
6	-	N/C
7	BK	Ground
8	BE/Y	Low beam headlamp
9	BE/W	High beam headlamp
10	BE	Position lamp
11	R/Y	N/C
12	-	N/C
13	BE	Position lamp
14	BE/O	Front right turn signal
15	BK	Ground
16	BE/PK	N/C

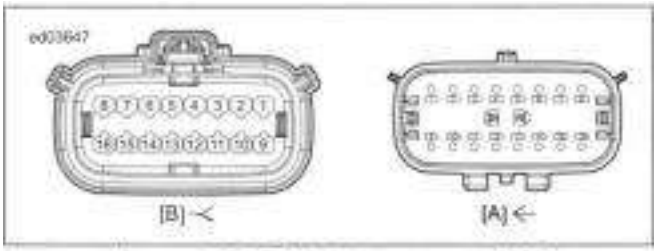

Figure A-54. Fairing Interconnect [100]

Table A-42. Tachometer [108]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	-	N/C
2	W/R	CAN +
3	-	N/C
4	-	N/C
5	R/O	Battery power
6	-	N/C
7	BK/GN	Ground
8	W/BK	CAN -
9	-	N/C
10	-	N/C
11	-	N/C
12	-	N/C

Figure A-55. Tachometer [108]

Table A-43. Oil Pressure Switch [120]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BK/W	5V sensor ground
2	R/W	5V sensor power
3	W/O	Oil pressure

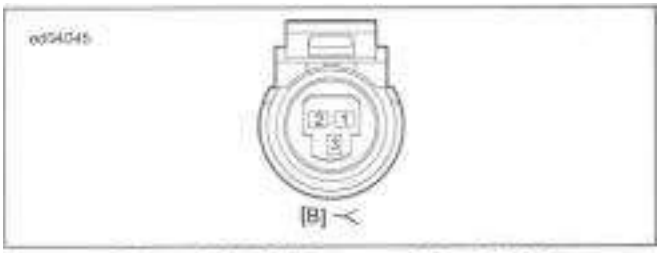

Figure A-56. Oil Pressure Switch [120]

Table A-44. Rear Brake Switch [121-1] [121-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BE/GN	Rear brake switch
1	BK	Ground

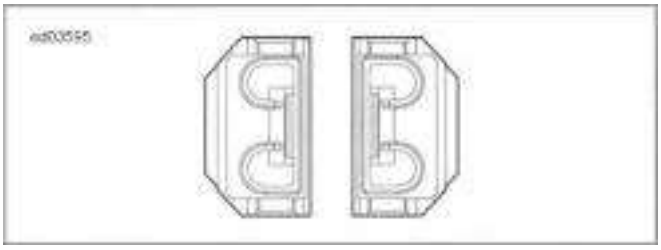

Figure A-57. Rear Brake Switch [121-1] [121-2] Table A-45. Horn [122-1] [122-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	RN	Horn power
1	BK	Ground

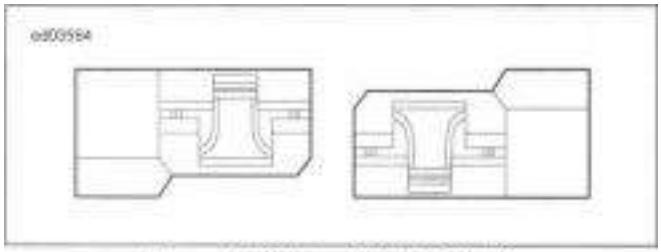

Figure A-58. Horn [122-1] [122-2]

Table A-46. Starter Solenoid [128]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/BK	Starter solenoid power

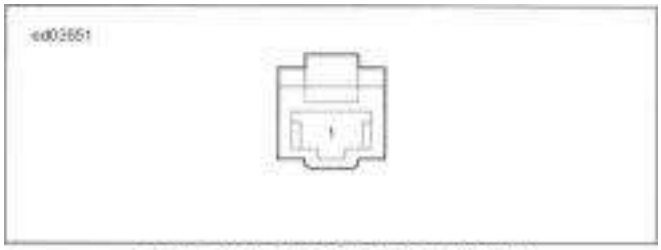

Figure A-59. Starter Solenoid [128]

Table A-47. Neutral Switch [131-1] [131-2]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	W	Neutral switch input
1	BK	Ground

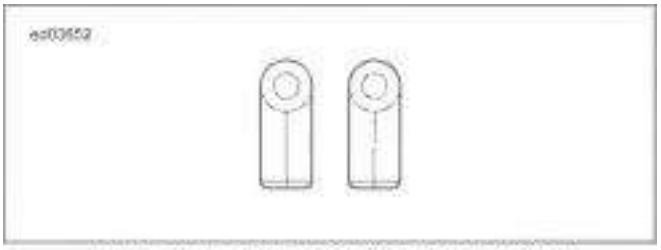

Figure A-60. Neutral Switch [131-1] [131-2]

Table A-48. Jiffy Stand [133]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/W	5 Volt sensor power
2	LGN/GY	JSS signal
3	BK/GN	Sensor ground

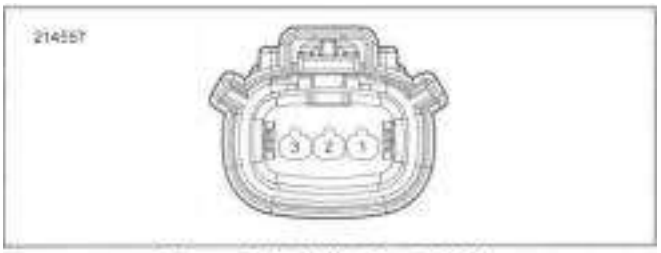

Figure A-61. Jiffy Stand [133]

Table A-49. HO2S Rear [137]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	V/GN	Fuse system power
2	BK/PK	Rear HO2S heater ground
3	GY/BN	Rear HO2S
4	BK/W	5 Volt sensor ground

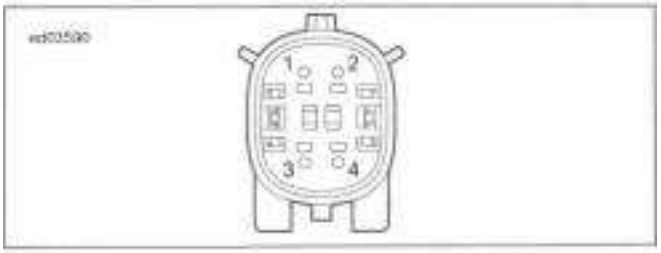

Figure A-62. HO2S Rear [137]

Table A-50. HO2S Front [138]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	V/GN	Fuse system power
2	BK/O	Front HO2S heater ground
3	GN/BN	Front HO2S
4	BK/W	5 Volt sensor ground

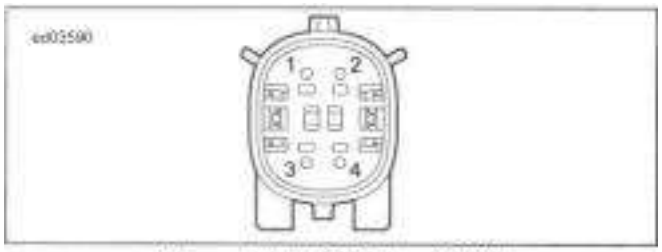

Figure A-63. HO2S Front [138]

Table A-51. Fuel Pump [141]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/BN	Fuel pump power
2	W/Y	Fuel level sender
3	BK/W	5V sensor ground
4	BK	Ground

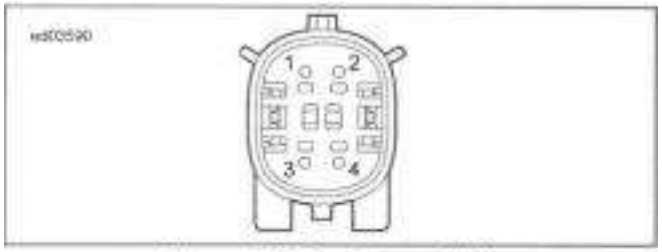

Figure A-64. Fuel Pump [141]

Table A-52. Security Siren (Optional) [142]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/O	Power
2	W/GN	Security siren
3	BK	Ground

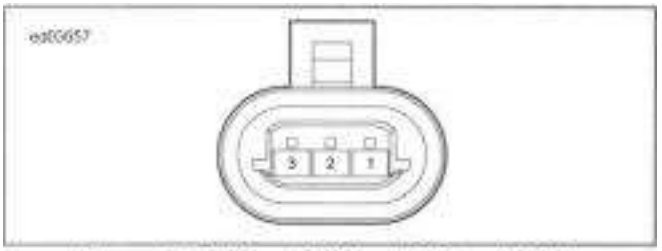

Figure A-65. Security Siren (Optional) [142]

Table A-53. Engine Harness [145]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/O	Battery power
2	R/GN	System power
3	W/R	CAN +
4	W/BK	CAN-
5	BK/GN	Ground
6	V/GN	System power

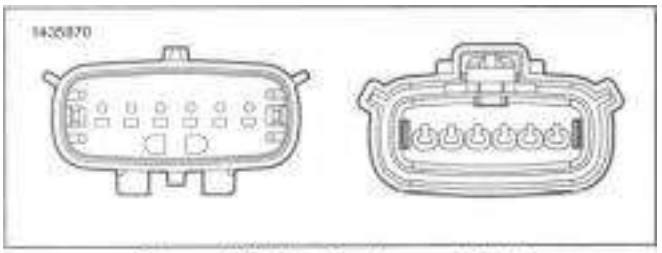

Figure A-66. Engine Harness [145]

Table A-54. ABS [166]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	BK/GN	Ground
2	W/R	CAN high
3	O/BK	Front WSS low
4	BE/BK	Switched aux lamp PWR
5	-	N/C
6	-	N/C
7	-	N/C
8	-	N/C
9	R	Battery power
10	BK	Ground
11	W/BK	CAN low
12	O/BE	Front WSS high
13	O/PK	Rear WSS high
14	O/BN	Rear WSS low
15	-	N/C
16	-	N/C
17	-	N/C
18	R	Battery power

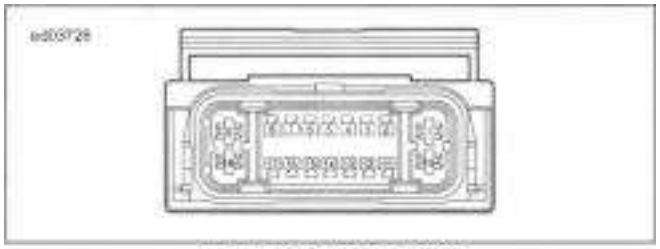

Figure A-67. ABS [166]

Table A-55. Front WSS [167]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	O/BE	Front WSS high
2	O/BK	Front WSS low

ed03731

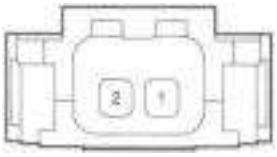

Figure A-68. Front WSS [167] Table A-56. Rear WSS [168]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	O/PK	Rear WSS high
2	O/BN	Rear WSS low

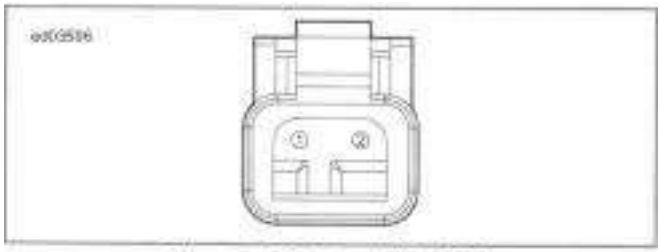

Figure A-69. Rear WSS [168]

Table A-57. ACR [203]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/GN	System power
2	LGN/R	ACR enable

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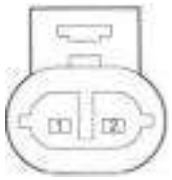

Figure A-70. Front ACR [203F]

Table A-58. Rear ACR [203R]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/GN	System power
2	LBE/R	ACR enable

ed03669

Figure A-71. Rear ACR [203R]

Table A-59. TGS [204A]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	R/W	5V sensor power 1
2	GN/W	TGS 1
3	BK/W	5V sensor ground 1
4	R/GY	5V sensor power 2
5	GY/W	TGS2
6	BK/GY	5V sensor ground 2

Figure A-72. TGS [204]

Table A-60. TGS [204B]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R	5V sensor power 1
2	W	TGS 1
3	BK	5V sensor ground 1
4	R	5V sensor power 2
5	W	TGS2
6	BK	5V sensor ground 2

Figure A-73. TGS [204B]

Table A-61. Security Antenna [209]

TERMINAL	WIRECOLOR	r CIRCUIT DESCRIPTION
1	R	Security antenna high
2	BK	Security antenna low

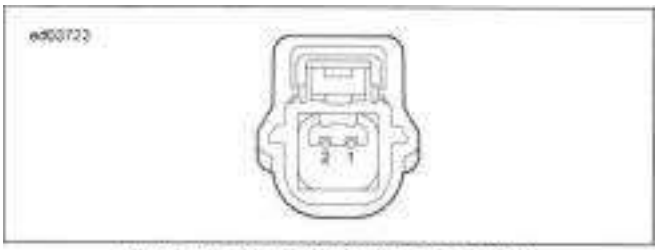

Figure A-74. Security Antenna [209]

Table A-62. TCA [211]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A	GY/O	ETC low
B	BK/W	5V sensor ground 1
C	GNN	TPS 1
D	R/W	5V sensor power 1
E	***GYN***	TPS 2
F	GN/O	ETC high

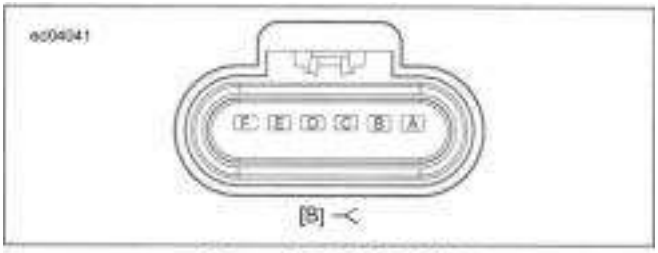

Figure A-75. TCA [211]

Table A-63. BCM [242]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
A1	-	N/C
A2	R	Security antenna high
A3	-	N/C
A4	BK	Security RF antenna
B1	-	N/C
B2	BK	Security antenna low
B3	-	N/C
B4	-	N/C
C1	-	N/C
C2	-	N/C
C3	-	N/C
C4	W/GY	Engine stop switch input
D1	-	N/C
D2	W/R	CAN high
D3	W	Neutral switch input
D4	-	N/C
E1	-	N/C
E2	W/BK	CAN low
E3	W/O	Oil pressure switch input
E4	RN	Horn power
F1	-	N/C
F2	-	N/C
F3	BE/GN	Brake switch input
F4	R/BN	Fuel pump power
G1	-	N/C
G2	O/W	ABS wake
G3	-	N/C
G4	BK/GN	Sensor ground
H1	-	N/C

Table A-63. BCM [242]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
H2	W/GN	Security siren
H3	-	N/C
H4	-	N/C
J1	-	N/C
J2	BE/O	Right front turn signal
J3	BE	Running lights
J4	BE/PK	Left front turn signal
K1	-	N/C
K2	BE/BN	Right rear turn signal
K3	BE/R	Brake lamp power
K4	BEN	Left rear turn signal
L1	-	N/C
L2	R/BK	Starter solenoid power
L3	R/GN	System power
L4	BE/BK	Front running/Fog light power
M1	-	N/C
M2	R/Y	Accessory power
M3	BE/W	High beam power
M4	BE/Y	Low beam power

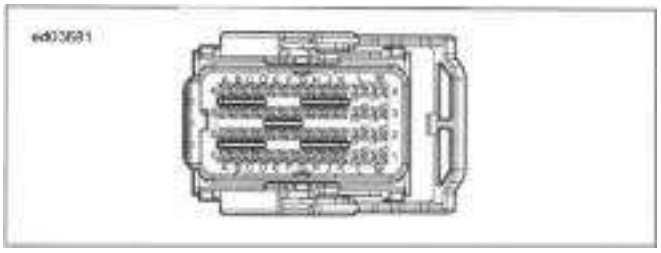

Figure A-76. BCM [242] Table A-64. BCM Power [259]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R	Battery power

Figure A-77. BCM Power [259]

Table A-65. USB Interconnect [264]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/Y	Accessory power
2	BK	Ground

1085865

Figure A-78. USB Interconnect [264]

Table A-66. Battery Tender [281]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R	Battery power
2	BK	Ground

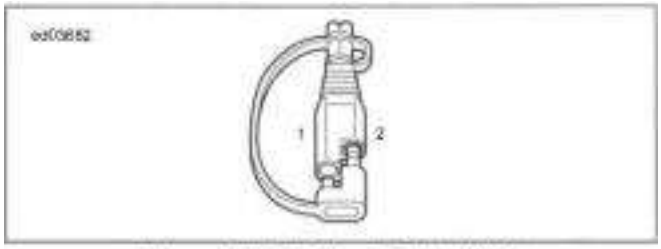

Figure A-79. Battery Tender [281]

Table A-67. Front Knock Sensor [315]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	LGNN	Front knock sensor LO
2	BN/W	Front knock sensor HI

ed04043

[B]-<

Figure A-J^<0. Knock Sensor

Table A-^iB. Rear Knock Sensor [316]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	LGNN	Rear knock sensor LO
2	BNN	Rear knock sensor HI

ed04043

[B] -<

Figure A-81. Knock Sensor

Table A-69. Termination Resistor [319]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
A	W/R	CAN High
B	W/BK	CAN Low

ed04046

[B]--<

Figure A-82. Termination Resistor [319]

Table A-70. P&A Accessory [325]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	R/Y	Accessory power
2	BK	Ground
3	-	N/C

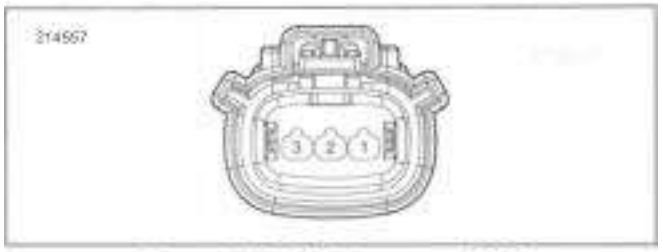

Figure A-83. P&A Accessory [325]

Table A-71. Backbone Harness Interconnect [327A]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/BN	Fuel pump power
2	RN	Horn power
3	R/Y	Accessory power
4	R/O	Battery fuse
5	BE	Position lamp
6	BE/BK	AUX/fog lamps
7	BK/GN	Ground
8	BK	Ground
9	-	N/C
10	BE/Y	Low beam
11	BE/W	High beam
12	W/R	CAN +
13	W/BK	CAN-
14	-	N/C
15	-	N/C
16	O/BE	Front WSS +
17	O/BK	Front WSS -
18	BE/O	Front right turn
19	BE/PK	Front left turn
20	W/GY	Run/stop switch

Figure A-84. Backbone Harness Interconnect [327A]

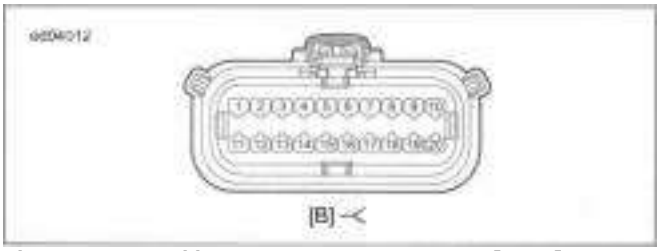

Figure A-85. Backbone Harness Interconnect [327B]

Table A-72. Engine Harness Interconnect [328]

TERMINAL	WIRE COLOR	CIRCUIT DESCRIPTION
1	R/W	5V sensor power 1
2	GN/W	TGS 1
3	BK/W	5V sensor ground 1
4	R/GY	5V sensor power 2
5	GY/W	TGS2
6	BK/GY	5V sensor ground 2
7	GN	Engine temperature
8	Y/W	Fuel level

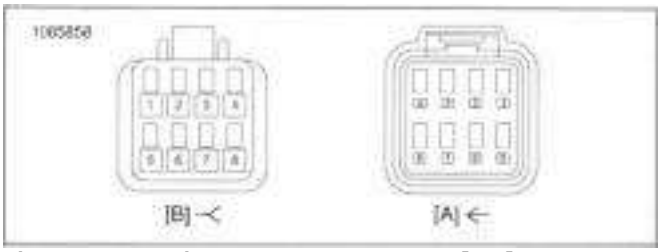

Figure A-86. Engine Harness Interconnect [328]

Table A-73. USB Caddy Interconnect [329]

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	BK	Ground
2	BK/W	5V sensor ground 1
3	GN	Engine temperature
4	R/Y	Accessory power
5	RN	Horn power
6	BK/W	5V sensor ground 1
7	Y/W	Fuel level
8	R/BN	Fuel pump power

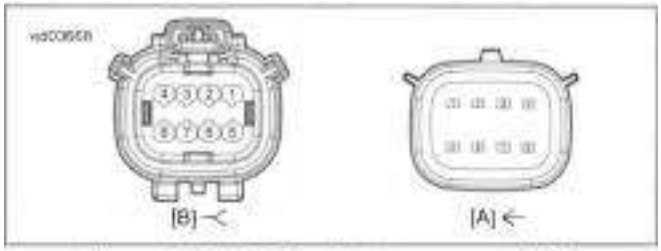

Figure A-87. USB Caddy Interconnect [329]

Table A-74. Light Bar Interconnect [331] (4 place connector)

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	BE/BN	Right rear turn signal
2	BK	Ground

Table A-74. Light Bar Interconnect [331] (4 place connector)

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
3	BEN	Left rear turn signal
4	BK	Ground

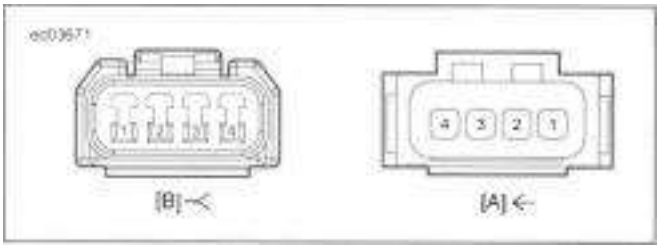

Figure A-88. Light Bar Interconnect [331] (4 place connector)

Table A-75. Light Bar Interconnect [331] (6 place connector)

TERMINAL	WIRECOLOR	CIRCUIT DESCRIPTION
1	BK	Ground
2	BE/BN	Right rear turn signal
3	BEN	Left rear turn signal
4	BE/R	Brake light power
5	BE	Running light power

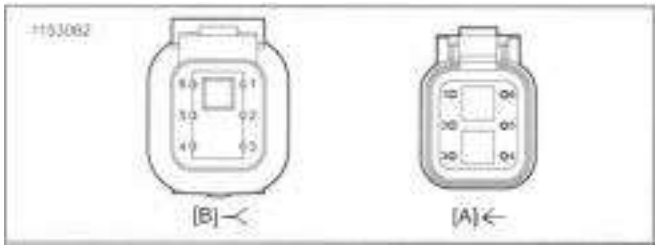

Figure A-89. Light Bar Interconnect [331] (6 place connector)

NOTES

SUBJECT PAGE NO.

B.1 GLOSSARY B-1
B.2 METRIC CONVERSION B-4
B.3 FLUID CONVERSION B-5

NOTES

ACRONYMS AND ABBREVIATIONS

Refer to the table below for a list of common acronyms and abbreviations.

Table B-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 B-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 lighUkey 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
02	Oxygen
OBC	Onboard Charger
OD	Outside diameter
OEM	Original equipment manufacturer
oz	Ounce
P&A	Parts and Accessories
Part No.	Part number

Table B-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
SOARS	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 Security Advisory Controller
VSS	Vehicle speed sensor
W	Watt
WA	Weather alert
WHIM	Wireless headset interface module
WSS	Wheel speed sensor

Table B-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	7144	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.)

NOTES

TOOLS

Part Number	TOOLNAME	NOTES
14900102	SPANNER WRENCH KIT	2.18 ADJUST SUSPENSION, Adjust Shock Absorber
93979-10	MAGNETIC LIFTER HOLDERS	4.22 CAM COMPARTMENT AND COMPONENTS, Remove
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-42571	FORK SEAL DRIVER AND DUST BOOT INSTALLER (43MM)	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side 3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
B-45525	VALVE GUIDE HONE	4.19 CYLINDER HEADS, Clean and Inspect
B-49312	CYLINDER HEAD HOLDING FIXTURE	4.19 CYLINDER HEADS, Disassemble 4.19 CYLINDER HEADS, Assemble
BB200A	BASIC VACUUM BRAKE BLEEDER	3.17 BLEED BRAKES, Drain 3.17 BLEED BRAKES, Fill and Bleed
HD-25070	ROBINAIR HEAT GUN	4.18 PUSHRODS, LIFTERS AND COVERS, Remove 4.25 CRANKCASE, Sprocket Shaft Bearing Inner Race 7.10 HANDLEBAR CONTROL MODULES, Solder Procedure
HD-33223-1	CYLINDER COMPRESSION GAUGE	4.7 TROUBLESHOOTING, Compression Test
HD-33416	UNIVERSAL DRIVER HANDLE	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Clean and Inspect
HD-34736-B	VALVE SPRING COMPRESSOR	4.19 CYLINDER HEADS, Disassemble 4.19 CYLINDER HEADS, Assemble
HD-34751	CLEANING BRUSH	4.19 CYLINDER HEADS, Clean and Inspect 4.19 CYLINDER HEADS, Assemble
HD-34902-B	BIG-TWIN MAINSHAFT PRIMARY BEARING RACE REMOVER AND INSTALLER	4.25 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	5.15 MAIN DRIVE GEAR AND BEARING, Remove 5.15 MAIN DRIVE GEAR AND BEARING, Install
HD-35381-A	BELT TENSION GAUGE	2.17 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Measure Drive Belt Deflection
HD-35667-A	CYLINDER LEAKDOWN TESTER	4.7 TROUBLESHOOTING, Cylinder Leakdown Test
HD-39301-A	STEERING HEAD BEARING RACE REMOVER	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Clean and Inspect
HD-39969	ULTRA TORCH UT-100	7.10 HANDLEBAR CONTROL MODULES, Solder Procedure
HD-41137	HOSE CLAMP PLIERS	4.8 CRIMP CLAMPS, Install
HD-41177	FORK TUBE HOLDER	3.20 FRONT FORK, Disassemble and Assemble: Standard 3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side 3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
HD-41182	FUEL PRESSURE GAUGE	6.5 FUEL PRESSURE TEST, Test
HD-41183	HEAT SHIELD ATTACHMENT	7.10 HANDLEBAR CONTROL MODULES, Solder Procedure
HD-41417	PROPANE ENRICHMENT KIT	6.16 INTAKE LEAK TEST, Leak Tester
HD-42325-C	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER	4.22 CAM COMPARTMENT AND COMPONENTS, Camshaft Needle Bearings
HD-42326-B	CRANKSHAFT GUIDE	4.25 CRANKCASE, Assemble

TOOLS

Part Number	TOOLNAME	NOTES
HD-44060D	WHEEL BEARING INSTALLER/REMOVER	3.8 SEALED WHEEL BEARINGS, Remove 3.8 SEALED WHEEL BEARINGS, Install
HD-44358	FLYWHEEL SUPPORT FIXTURE	4.25 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-45305	FORK SEAL DRIVER	3.20 FRONT FORK, Disassemble and Assemble: Standard
HD-45322	VALVE GUIDE SEAL INSTALLER	4.19 CYLINDER HEADS, Assemble
HD-45966	FRONT FORK COMPRESSOR	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
HD-45968	FAT JACK	2.2 GENERAL, Secure the Motorcycle for Service 4.12 FRONT ENGINE MOUNT, Prepare
HD-46281	BEARING REMOVER/INSTALLER TOOL	3.23 REAR FORK, Disassemble and Assemble: Standard
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL	5.13 TRANSMISSION SPROCKET, Remove 5.13 TRANSMISSION SPROCKET, Install
HD-47250	INTAKE MANIFOLD WRENCH	6.15 INDUCTION MODULE, Remove 6.15 INDUCTION MODULE, Install
HD-47852	INNER FORK NUT REMOVER/INSTALLER	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
HD-47856	MAIN DRIVE GEAR SEAL INSTALLER KIT	5.15 MAIN DRIVE GEAR AND BEARING, Install
HD-47910	MAINSHAFT LOCKNUT WRENCH	5.13 TRANSMISSION SPROCKET, Remove 5.13 TRANSMISSION SPROCKET, Install
HD-47925	AXLE NUT TORQUE ADAPTER	2.17 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt 3.5 REAR WHEEL, Remove
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL	5.15 MAIN DRIVE GEAR AND BEARING, Replace Needle Bearings
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER	5.15 MAIN DRIVE GEAR AND BEARING, Replace Mainshaft Seal
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL	4.22 CAM COMPARTMENT AND COMPONENTS, Remove 4.22 CAM COMPARTMENT AND COMPONENTS, Install
HD-47977	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	7.37 AUTOMATIC COMPRESSION RELEASE (ACR), Remove 7.37 AUTOMATIC COMPRESSION RELEASE (ACR), Install
HD-48648	REAR BRAKE PISTION REMOVAL TOOL	3.14 REAR BRAKE CALIPER, Disassemble
HD-48650	DIGITAL TECHNICIAN II	3.15 BRAKE LINES, Brake Line: Front Master Cylinder (ABS) 3.15 BRAKE LINES, Brake Line: Front Caliper (ABS) 3.16 ABS MODULE, Install 3.17 BLEED BRAKES, Fill and Bleed 7.27 ELECTRONIC CONTROL MODULE (ECM), Prepare 7.28 BODY CONTROL MODULE (BCM), Prepare 7.29 SECURITY SYSTEM ACTIVATION, Fob Assignment 7.31 SECURITY SYSTEM MAINTENANCE, Service Mode
HD-48856-B	AXLE ALIGNMENT PLUGS	3.10 WHEEL ALIGNMENT, Inspect

TOOLS

Part Number	TOOL NAME	NOTES
HD-48985	SPOKE TORQUE WRENCH	2.8 INSPECT TIRES AND WHEELS, Wheel Spokes 3.7 CHECKING AND TRUING WHEELS, True Laced Wheels
HD-50549	BORESCOPE	4.7 TROUBLESHOOTING, Compression Test 4.7 TROUBLESHOOTING, Cylinder Leakdown Test
HD-51069-17	NOSE ADAPTER	4.21 PISTONS, Install
HD-51069-2	PISTON PIN RETAINING RING INSTALLER	4.21 PISTONS, Install
HD-51337	SHIFTER SHAFT SEAL INSTALLATION TOOL	5.16 TRANSMISSION CASE, Assemble
HD-52064	LEFT MAIN BEARING OIL SEAL INSTALLATION TOOL	4.25 CRANKCASE, Assemble
HD-52071	MAIN BEARING REMOVER AND INSTALLER	4.25 CRANKCASE, Repair Right Crankcase Half 4.25 CRANKCASE, Repair Left Crankcase Half
HD-52073	ALTERNATOR ROTOR REMOVER AND INSTALLER	7.6 ALTERNATOR, Remove 7.6 ALTERNATOR, Install
HD-52252	CRANKSHAFT LOCKING TOOL	4.7 TROUBLESHOOTING, Cylinder Leakdown Test
HD-52351	12MM TORQUE ADAPTER	3.14 REAR BRAKE CALIPER, Install 3.15 BRAKE LINES, Front ABS Lines 3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
HD-52369	E-CLIP TOOL	3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footboard 3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footpeg 3.41 RIGHT FOOT CONTROLS, Disassemble and Assemble: Footboard 3.41 RIGHT FOOT CONTROLS, Disassemble and Assemble: Footpeg 3.42 PASSENGER FOOTRESTS, Remove 3.42 PASSENGER FOOTRESTS, Install
HD-52977	17MM OXYGEN SENSOR SOCKET	6.17 HEATED OXYGEN SENSORS (HO2S), Remove 6.17 HEATED OXYGEN SENSORS (HO2S), Install
HD-59000B	FORK OIL LEVEL GAUGE	3.20 FRONT FORK, Disassemble and Assemble: Standard 3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side 3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
HD-94660-2	PILOT	5.13 TRANSMISSION SPROCKET, Remove 5.13 TRANSMISSION SPROCKET, Install
HD-94681-80	SPOKE WRENCH	2.8 INSPECT TIRES AND WHEELS, Wheel Spokes 3.7 CHECKING AND TRUING WHEELS, Laced Wheel Rim Offset 3.7 CHECKING AND TRUING WHEELS, True Laced Wheels
HD-95637-46B	WEDGE ATTACHMENT	4.25 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-96333-51F	PISTON RING COMPRESSOR	4.20 CYLINDERS, Install
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT	4.6 OIL PRESSURE, Oil Pressure Check
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER	4.25 CRANKCASE, Assemble 4.25 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-99500-80	WHEEL TRUING STAND	3.7 CHECKING AND TRUING WHEELS, Checking Wheel Runout

TOOLS

Part Number	TOOL NAME	NOTES
		3.7 CHECKING AND TRUING WHEELS, Laced Wheel Rim Offset 3.7 CHECKING AND TRUING WHEELS, True Laced Wheels
TA360	TORQUE ANGLE GAUGE	5.13 TRANSMISSION SPROCKET, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Fairing, frame mounted, inner fairing screws	96-144 in-lbs	10.8-16.3 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
ABS Module bracket screw	96-119 in-lbs	10.8-13.5 N-m	3.16 ABS MODULE, Install
ABS Module frame screw	96-119 in-lbs	10.8-13.5 N-m	3.16 ABS MODULE, Install
ACR	17-19 ft-lbs	23-26.4 N-m	7.37 AUTOMATIC COMPRESSION RELEASE (ACR), Install
Air filter cover screw, cone	18-24 in-lbs	2-2.7 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Cone
Air filter cover screw, single screw cover	50-65 in-lbs	5.6-7.3 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Round Apply LOCTITE 243 (blue) to the threads of screw.
Air filter cover screws, five-screw cover	48-72 in-lbs	5.4-8.1 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Round Apply LOCTITE 243 (blue) to the threads of screw. Tighten in a star pattern.
Air filter cover screws, oval cover	50-60 in-lbs	5.7-6.8 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Oval
Air filter element screws, round	48-72 in-lbs	5.4-8.1 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Round
Air filter element screws, round cover	48-72 in-lbs	5.4-8.1 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Round
Air filter trim insert screws	27-32 in-lbs	3-3.6 N-m	2.20 INSPECT AIR FILTER, Remove and Install: Oval
Auxiliary lamp bezel nut	9-12 in-lbs	1.07-1.36 N-m	7.20 AUXILIARY LAMPS, Bulb Replacement
Auxiliary lamp nut	19-23 ft-lbs	25.76-31.18 N-m	7.20 AUXILIARY LAMPS, Remove and Install: Standard Lighting
Axle nut, rear	95-105 ft-lbs	128.8-142.4 N-m	2.17 INSPECT AND ADJUST DRIVE BELT AND SPROCKETS, Adjust Belt
Backplate breather screw, cone	22-24 ft-lbs	30-32.5 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Backplate cover screw, cone	43-53 in-lbs	4.9-6 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Backplate screws, oval	50-60 in-lbs	5.6-6.8 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Oval
Backplate to throttle body screw, cone	55-60 in-lbs	6.2-6.8 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Cone
Balancer bearing screw	80-110 in-lbs	9-12.4 N-m	4.25 CRANKCASE, Repair Right Crankcase Half
Banjo bolt	21-23 ft-lbs	29-31 N-m	3.17 BLEED BRAKES, Fill and Bleed
Banjo bolt to ABS module	17-19 ft-lbs	23.1-25.8 N-m	3.15 BRAKE LINES, Front ABS Lines
Banjo bolt to ABS module, rear	17-19 ft-lbs	23.1-25.8 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Banjo bolt to brake caliper, rear	21-23 ft-lbs	29-31 N-m	3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
Banjo bolt to master cylinder, rear	21-23 ft-lbs	29-31 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Battery ground cable to transmission	66-114 in-lbs	7.5-12.9 N-m	5.16 TRANSMISSION CASE, Install
Battery tray screw	6-9 ft-lbs	8.1-12.2 N-m	7.47 BATTERY TRAY, Install
Battery, negative cable, screw	60-70 in-lbs	6.8-7.9 N-m	7.4 POWER DISCONNECT, Negative Battery Cable
Battery, positive cable, screw	60-70 in-lbs	6.78-7.91 N-m	2.21 INSPECT BATTERY, Install
Belt guard, lower screw	70-80 in-lbs	7.9-9 N-m	3.24 BELT GUARDS, Remove and Install: Standard
Belt guard, upper screw	70-80 in-lbs	7.9-9 N-m	3.24 BELT GUARDS, Remove and Install: Standard

Torque Values

FASTENER	TORQUE VALUE		NOTES
Bleeder screw	35-61 in-lbs	3.9-6.9 N-m	3.17 BLEED BRAKES, Fill and Bleed
Brake caliper, front, bridge bolt	14-18 ft-lbs	19.6-24.5 N-m	3.12 FRONT BRAKE CALIPER, Assemble
Brake line bracket, rear, screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake line clamp screw	36-48 in-lbs	4.1-5.4 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Install
Brake line to caliper, rear, P-clamp screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Caliper to ABS Module
Brake line to master cylinder, rear, P- clamp screw	24-35 in-lbs	2.7-4 N-m	3.15 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake line tube nuts, manifold	128-173 in-lbs	14.5-19.5 N-m	3.15 BRAKE LINES, Brake Line: Front Master Cylinder (ABS)
Brake line, P-clamp, screw	36-48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Brake Line: Front Master Cylinder (ABS)
Brake master cylinder, front, reservoir cover screws	9-18 in-lbs	1-2 N-m	2.11 CHECK AND REPLACE BRAKE FLUID, Check Brake Fluid Level
Brake master cylinder, rear, mounting screws	18-22 ft-lbs	24.4-29.9 N-m	3.13 REAR BRAKE MASTER CYLINDER, Install
Brake master cylinder, rear, reservoir cover screws	9-18 in-lbs	1-2 N-m	2.11 CHECK AND REPLACE BRAKE FLUID, Check Brake Fluid Level
Brake master cylinder, reservoir cover screw	9-18 in-lbs	1-2 N-m	3.17 BLEED BRAKES, Fill and Bleed
Brake pedal linkage, mid control, front, screw	15-18 ft-lbs	20.3-24.4 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Brake pedal linkage, mid control, rear, screw	15-18 ft-lbs	20.3-24.4 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Brake pedal pivot, footboard control, screw.	18-22 ft-lbs	24.5-30 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Footboards
Brake pedal pivot, forward control, screw	18-22 ft-lbs	24.4-29.8 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Forward Foot Controls
Brake pedal pivot, mid control, screw	10-14 ft-lbs	13.6-19 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Breather bolts, oval	22-24 ft-lbs	29.8-32.5 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Oval metric
Breather bolts, round	22-24 ft-lbs	29.8-32.5 N-m	6.3 AIR CLEANER BACKPLATE ASSEMBLY, Remove and Install: Round
Breather screw	90-120 in-lbs	10.2-13.6 N-m	4.15 BREATHERS, Install
Cam chain tensioner fasteners	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Cam needle bearing installation maximum torque	25 ft-lbs	33.9 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Camshaft Needle Bearings
Cam support plate screws	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Camshaft cover screws	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Remove and Install: Camshaft Cover
Camshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N-m	4.22 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	4.22 CAM COMPARTMENT AND COMPONENTS, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
			See procedure to verify alignment specification before tightening.
Camshaft sprocket screw, final torque	34 ft-lbs	46.1 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Camshaft timer cover screws	25--35 in-lbs	2.8--4 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Remove and Install: Camshaft Cover
Charcoal canister bracket to engine case screws	72-96 in-lbs	8.1-10.8 N-m	6.21 CHARCOAL CANISTER: EVAPORATIVE EMISSIONS, Install
Charcoal canister to bracket screws	30-36 in-lbs	3.4--4.1 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 lever screw	60-80 in-lbs	6.8-9 N-m	3.26 CLUTCH CONTROL, Install
Clutch hub jamnut	72-120 in-lbs	8.1-13.6 N-m	2.12 CHECK AND ADJUST CLUTCH, Check and Adjust
Clutch hub mainshaft nut	70-80 ft-lbs	94.9-108.5 N-m	5.9 DRIVE COMPONENTS, Install
Clutch inspection cover screws	25-35 in-lbs	2.8-3.9 N-m	2.6 REPLACE PRIMARY CHAINCASE LUBRICANT, Change Primary Chaincase Lubricant Torque sequence
Clutch release cover screws	132-156 in-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
Console screw (Front)	30-50 in-lbs	3.4-5.6 N-m	6.4 CONSOLE, Remove and Install: Single Instrument with Panel
Console screw (Rear)	25-30 in-lbs	2.8-3.4 N-m	6.4 CONSOLE, Remove and Install: Single Instrument with Panel
Console screw, , rear, no instrument	25-30 in-lbs	2.8-3.4 N-m	6.4 CONSOLE, Remove and Install: No Instrument
Console screw, front, no instrument	30-50 in-lbs	3.4-5.6 N-m	6.4 CONSOLE, Remove and Install: No Instrument
Console screws	40-50 in-lbs	4.5--5.6 N-m	6.4 CONSOLE, Remove and Install: Single Instrument without Panel
Crankcase oil check valve or plug with 0-ring	18-22 ft-lbs	24.4-29.8 N-m	4.10 OIL CHECK VALVE, Install
Crankcase screws, first torque	120 in-lbs	13.6 N-m	4.25 CRANKCASE, Assemble
Crankcase screws, last torque	15—19 ft-lbs	20.3-25.8 N-m	4.25 CRANKCASE, Assemble
Crankcase tapered plugs	120-144 in-lbs	13.6-16.3 N-m	4.25 CRANKCASE, Plugs and Oil Fittings
Crankshaft sprocket screw, 1st torque	15.0 ft-lbs	20.3 N-m	4.22 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	4.22 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	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Cylinder head nut torque step 1.	20-30 ft-lbs	27.1--40.7 N-m	4.19 CYLINDER HEADS, Install Apply ENGINE OIL to new cylinder head bolt washers and threaded portion of the cylinder head bolts. See procedure for torque sequence.
Cylinder head nut torque step 2. Loosen one turn.	-360°	-360°	4.19 CYLINDER HEADS, Install
Cylinder head nut torque step 3.	9-11 ft-lbs	12.2-14.9 N-m	4.19 CYLINDER HEADS, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Cylinder head nut torque step 4.	25-27 ft-lbs	33.9-36.6 N-m	4.19 CYLINDER HEADS, Install
Cylinder head nut torque step 5. Tighten additional degree value.	go°	go°	4.19 CYLINDER HEADS, Install
Cylinder stud	120-240 in-lbs	13.6-27.1 N-m	4.25 CRANKCASE, Cylinder Studs
Cylinder temperature sensor	120-180 in-lbs	13.6-20.3 N-m	4.19 CYLINDER HEADS, Assemble
Drive belt slot spacer screw, 1st torque	50-55 ft-lbs	68-75 N-m	5.4 DRIVE BELT, Install
Drive belt slot spacer screw, final torque	65-70 ft-lbs	88-95 N-m	5.4 DRIVE BELT, Install
ECM caddy large screw	36-60 in-lbs	4.1-6.8 N-m	7.44 ECM CADDY, Install
ECM caddy small screw	5^^0 in-lbs	6.2-6.8 N-m	3.45 FRAME CROSSMEMBER, Install
ET sensor	11-15 ft-lbs	14.9-21 N-m	7.35 ENGINE TEMPERATURE (ET) SENSOR, Install
Engine mount bolt, front, lower	50-55 ft-lbs	67.8-74.5 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount pinch bolt, front, lower	8-9 ft-lbs	10.2-12.2 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Lower Front Engine Mount
Engine mount screw, front, upper engine bracket	45-50 ft-lbs	61-67.8 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine mount screw, front, upper frame bracket	45-50 ft-lbs	61-67.8 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine mount screw, front, upper frame bracket-to-engine bracket	45-50 ft-lbs	61-67.8 N-m	4.12 FRONT ENGINE MOUNT, Remove and Install: Upper Front Engine Mount
Engine mount screw, left side, bracket-to-frame	45-50 ft-lbs	61-67.8 N-m	4.13 LEFT SIDE ENGINE MOUNT, Install
Engine mount screw, left side, bracket-to-head	28-33 ft-lbs	38-44.7 N-m	4.13 LEFT SIDE ENGINE MOUNT, Install
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 oil fill spout screw.	100-120 in-lbs	11.3-13.6 N-m	5.12 ENGINE OIL FILL SPOUT, Install
Exhaust bracket screws	40-50 ft-lbs	54.2-67.8 N-m	6.19 EXHAUST SYSTEM, Install
Exhaust shield clamps	20--40 in-lbs	2.3-4.5 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Standard
Exhaust shield screws	108-132 in-lbs	12.2-14.9 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Upswept
Exhaust support clamp screw	40-50 ft-lbs	54.2-67.8 N-m	6.19 EXHAUST SYSTEM, Install
Exhaust to engine flange nuts	100-120 in-lbs	11.3-13.6 N-m	6.19 EXHAUST SYSTEM, Install
Fairing windshield screw	32--40 in-lbs	3.6--4.5 N-m	3.28 FAIRING, Disassemble and Assemble
Fairing, frame mounted, air deflector screws	25-30 in-lbs	2.8-3.4 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Air Deflector
Fairing, frame mounted, air deflector screws	25-30 in-lbs	2.8-3.4 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Fairing, frame mounted, air duct screws	4.5-5.5 in-lbs	0.51-0.62 N-m	3.29 FAIRING: FRAME MOUNTED, Disassemble and Assemble: Inner Fairing Shell
Fairing, frame mounted, bracket screws	48-60 in-lbs	5.4-6.8 N-m	3.29 FAIRING: FRAME MOUNTED, Disassemble and Assemble: Inner Fairing Shell
Fairing, frame mounted, fairing mount to steering head locknut	20-27 ft-lbs	27-37 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports
Fairing, frame mounted, inner fairing screws	96-144 in-lbs	10.8-16.3 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Shell
Fairing, frame mounted, lower mount screws	16-20 ft-lbs	21.7-27.1 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Shell
Fairing, frame mounted, lower support screws	48-60 in-lbs	5.4-6.8 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Inner Fairing Shell
Fairing, frame mounted, mount screws upper	71-84 in-lbs	8-9.5 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Fairing Supports

Torque Values

FASTENER	TORQUE VALUE		NOTES
Fairing, frame mounted, outer fairing screws	25-30 in-lbs	2.8-3.4 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Outer Fairing Shell
Fairing, inner screw	32--40 in-lbs	3.6--4.5 N-m	3.28 FAIRING, Disassemble and Assemble
Fairing, screw-on, inner fairing screws	35-62 in-lbs	4-7 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing, screw-on, lower bracket screws	97-120 in-lbs	11-13.6 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing, screw-on, screws	20-30 in-lbs	2.3-3.4 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fairing, screw-on, upper bracket screws	35-62 in-lbs	4-7 N-m	3.28 FAIRING, Remove and Install: Screw-On
Fender Support, Screw	42-46 ft-lbs	57-62 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Foot support bracket, forward control, left side, screw	40--45 ft-lbs	54-61 N-m	3.40 LEFT FOOT CONTROLS, Remove and Install: Forward Foot Controls
Foot support bracket, forward control, right side, screw	400--45 ft-lbs	54.2-61 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Forward Foot Controls
Foot support bracket, left side, screw	40--45 ft-lbs	54.2-61 N-m	3.40 LEFT FOOT CONTROLS, Install
Foot support bracket, mid control, left side, screw	40--45 ft-lbs	54-61 N-m	3.40 LEFT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Foot support bracket, mid control, right side, screw	40--45 ft-lbs	54.2-61 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Mid Foot Controls
Footboard assembly, left side, mounting screw	40--45 ft-lbs	54-61 N-m	3.40 LEFT FOOT CONTROLS, Remove and Install: Footboards
Footboard assembly, right side, mounting screw	40--45 ft-lbs	54-61 N-m	3.41 RIGHT FOOT CONTROLS, Remove and Install: Footboards
Fork bracket, lower, pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	3.20 FRONT FORK, Install Models with two lower pinch bolts per side: Alternately tighten until specification is met.
Fork bracket, upper, pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	3.20 FRONT FORK, Install
Fork damper tube screw, front	30-37 ft-lbs	40-50 N-m	3.20 FRONT FORK, Disassemble and Assemble: Standard
Fork stem pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork stem pinch bolt -	16-20 ft-lbs	21.7-27.1 N-m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Fork stem screw, 1st torque	160-168 in-lbs	18.1-19 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork stem screw, final torque - All except FXLRS,FXLRST	62--68 in-lbs	7-7.7 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork stem screw, final torque - FXLRS, FXLRST	110-122 in-lbs	12.4-13.8 N-m	3.21 STEERING HEAD/FORK STEM AND BRACKET ASSEMBLY, Install
Fork tube plug to damper nut , right side, inverted	13-16 ft-lbs	17.5-22.5 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
Fork tube plug to damper nut, left side, inverted	13-16 ft-lbs	17.5-22.5 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
Fork tube plug, left side, inverted	22-28 ft-lbs	30-40 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
Fork tube plug, right side, inverted	22-30 ft-lbs	30--40 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side
Fork tube plug, standard	22-59 ft-lbs	30-80 N-m	3.20 FRONT FORK, Disassemble and Assemble: Standard
Fork, left side, inverted, cartridge screw	13-17 ft-lbs	17.5-22.5 N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Left Side
Fork, right side, inverted, inner fork nut	69-83 ft-lbs	93-113N-m	3.20 FRONT FORK, Disassemble and Assemble: Inverted, Right Side

Torque Values

FASTENER	TORQUE VALUE		NOTES
Forward Foot Control shift lever pinch screw	9-12 ft-lbs	12.2-16.3 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Forward Foot Control shifter rod to front shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Forward Foot Control shifter rod to rear shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Forward Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Forward foot control with footboards shift lever pinch screw	108-144 in-lbs	12.2-16.3 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Forward foot control with footpegs shift lever pinch screw	18-22 ft-lbs	24.4-29.8 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Forward or Mid Foot Control shifter peg screw	96-144 in-lbs	10.9-16.3 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Forward or Mid Foot Control shifter rod jamnut	84-132 in-lbs	9.5---14.9 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Forward or Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Frame crossmember mounting screws	17-20 ft-lbs	23.1-27.1 N-m	3.45 FRAME CROSSMEMBER, Install
Frame ground stud nut	50-90 in-lbs	5.7-10.2 N-m	7.44 ECM CADDY, Install
Front ABS brake line P-clamp screw	36-48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Front ABS Lines
Front ABS brake line to front brake line	128-173 in-lbs	14.5-19.5 N-m	3.15 BRAKE LINES, Front ABS Lines
Front brake caliper banjo bolt	14-18 ft-lbs	19-24.4 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper bleeder screw	35-61 in-lbs	3.9--6.9 N-m	3.12 FRONT BRAKE CALIPER, Assemble
Front brake caliper bridge bolt	14-18 ft-lbs	19.6-24.5 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper mounting bolts	28-38 ft-lbs	38-51.5 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	3.12 FRONT BRAKE CALIPER, Install
Front brake disc screw	16-24 ft-lbs	22-33 N-m	3.4 FRONT WHEEL, Assemble
Front brake line screw	36--48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Brake Line: Front Caliper (ABS)
Front brake line screw	36--48 in-lbs	4.1-5.4 N-m	3.15 BRAKE LINES, Front Brake Line: Non-ABS
Front brake master cylinder banjo bolt - Dual disk front brake	24-25 ft-lbs	32-34 N-m	3.11 FRONT BRAKE MASTER CYLINDER, Install
Front brake master cylinder banjo bolt - Single disk front brake	21-23 ft-lbs	29-31 N-m	3.11 FRONT BRAKE MASTER CYLINDER, Install
Front brake pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	2.10 INSPECT BRAKES, Replace Front Brake Pads
Front fender mounting screw (typical)	16-21 ft-lbs	22-28 N-m	3.34 FRONT FENDER, Install
Front fender mounting screw, FXBBS/FXST	16-21 ft-lbs	22-28 N-m	3.34 FRONT FENDER, Install
Front fender mounting screw, FXFBS	72-96 in-lbs	8.1-10.8 N-m	3.34 FRONT FENDER, Install
Front fender mounting screw, FXLRS/FXLRST	72-96 in-lbs	8.1-10.8 N-m	3.34 FRONT FENDER, Install
Front fender side trim nut	10-15 in-lbs	1.1-1.7 N-m	3.34 FRONT FENDER, Assemble
Front fender to bracket screw, FXFBS	36-48 in-lbs	4.1-5.4 N-m	3.34 FRONT FENDER, Install
Front fork bottom mount pinch bolt	11-15 ft-lbs	15-20 N-m	3.4 FRONT WHEEL, Install
Front fork side mount pinch bolt	21-25 ft-lbs	28-34 N-m	3.4 FRONT WHEEL, Install
Front licence plate clamp bracket screws	1-1 ft-lbs	1.1-1.7 N-m	3.38 FRONT LICENSE PLATE BRACKET, Install
Front licence plate one hole bracket screw	25-30 ft-lbs	34-40.7 N-m	3.38 FRONT LICENSE PLATE BRACKET, Install
Front licence plate two hole bracket screws	16-20 ft-lbs	21.7-27 N-m	3.38 FRONT LICENSE PLATE BRACKET, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Front light bar mounting screw	20-25 ft-lbs	27.1-33.9 N-m	7.19 FRONT LIGHT BAR, Remove and Install: Standard Lighting
Front light bar, bracket screw	16-20 ft-lbs	21.7-27.1 N-m	7.19 FRONT LIGHT BAR, Remove and Install: Standard Lighting
Front light bar, clamp screw	6-10 in-lbs	0.67-1.1 N-m	7.19 FRONT LIGHT BAR, Remove and Install: Standard Lighting
Front wheel axle	70-75 ft-lbs	94.9-101.6 N-m	3.4 FRONT WHEEL, Install
Fuel line to fuel rail 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 N-m	6.9 FUEL PUMP, Install
Fuel rail screws	31-49 in-lbs	3.5-5.5 N-m	6.14 FUEL INJECTORS, Install
Fuel tank mounting screw	28-32 ft-lbs	38-43.4 N-m	6.6 PURGE FUEL LINE, Secure Fuel Tank
Fuel tank, vent screws	11-13 ft-lbs	15-18 N-m	6.8 FUEL TANK, Install
HO2S (Heated oxygen sensor)	12-14 ft-lbs	16.3-19 N-m	6.17 HEATED OXYGEN SENSORS (HO2S), Install
Handlebar clamp gap limiting fasteners	12-16 ft-lbs	16.3-21.7 N-m	3.32 HANDLEBAR, Disassemble and Assemble: Standard
Handlebar clamp open gap fasteners	12-16 ft-lbs	16.3-21.7 N-m	3.32 HANDLEBAR, Disassemble and Assemble: Standard
Handlebar switch assembly retainer screws	8-10 in-lbs	0.9-1.1 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Install
Handlebar switch clamp screw	60-80 in-lbs	6.8-9 N-m	3.11 FRONT BRAKE MASTER CYLINDER, Install
Handlebar switch housing screws	35-45 in-lbs	4-5.1 N-m	7.11 LEFT HAND CONTROL MODULE (LHCM), Install
Handlebar-mounted turn signal, ball stud clamp	96-144 in-lbs	10.8-16.3 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar-mounted turn signal, ball stud jam nut	50-70 in-lbs	5.6-7.9 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar-mounted turn signal, ball stud locknut	50-70 in-lbs	5.6-7.9 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Handlebar-mounted turn signal, ball stud set screw	3-5 ft-lbs	4-6.7 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Handlebar Mount
Headlamp (Oblong) mounting screw	10-13 ft-lbs	13.5-17.6 N-m	7.18 HEADLAMP, Bulb Replacement: Oblong
Headlamp FXBBS, FXST horizontal adjustment screw	20-25 ft-lbs	27.1-33.9 N-m	7.18 HEADLAMP, Adjust
Headlamp FXBBS, FXST, FXLRS, FLSB vertical adjustment screw	27-32 ft-lbs	36.6-43.3 N-m	7.18 HEADLAMP, Adjust
Headlamp FXBRS, vertical adjustment screw	10-13 ft-lbs	13.5-17.6 N-m	7.18 HEADLAMP, Adjust
Headlamp FXFBS vertical adjustment screw	11-14 ft-lbs	14.9-19 N-m	7.18 HEADLAMP, Adjust
Headlamp bezel screw	9-14 in-lbs	1-1.6 N-m	7.18 HEADLAMP, Bulb Replacement: Standard Round
Headlamp bracket to headlamp mounting bracket bolt	27-32 ft-lbs	36.6-43 N-m	7.18 HEADLAMP, Remove and Install: LED Round
Headlamp isolator bracket screw	6.5-8.0 ft-lbs	8.8-10.8 N-m	7.18 HEADLAMP, Bulb Replacement: Standard Round
Headlamp mounting bracket to lower fork bracket	20-25 ft-lbs	27.1-33.9 N-m	7.18 HEADLAMP, Remove and Install: LED Round
Headlamp mounting ring screw	16-20 ft-lbs	21.6-27.1 N-m	7.18 HEADLAMP, Remove and Install: Nacelle Mounted
Headlamp nacelle mounted, rear panel bracket screw	85-104 in-lbs	9.6-11.7 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp nacelle, screw	16-20 ft-lbs	21.6-27.1 N-m	7.18 HEADLAMP, Remove and Install: Horizontal

Torque Values

FASTENER	TORQUE VALUE		NOTES
Headlamp nacelle, standard round, clamp screw	36--48 in-lbs	4.1-5.4 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp nacelle, standard round, trim strip screw	84-108 in-lbs	9.5-12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp retainer screw	18-22 in-lbs	2-2.5 N-m	7.18 HEADLAMP, Bulb Replacement: Standard Round
Headlamp to headlamp bracket screw	96-120 in-lbs	10.8-13.6 N-m	7.18 HEADLAMP, Bulb Replacement: LED Round
Headlamp, fixed fairing, Bracket-to-lamp screws	84-108 in-lbs	9.49-12.2 N-m	7.18 HEADLAMP, Remove and Install: Fixed Fairing
Headlamp, fixed fairing, retainer screws	22-32 in-lbs	2.5-3.6 N-m	7.18 HEADLAMP, Remove and Install: Fixed Fairing
Headlamp, nacelle mounted, bezel screw	25-32 in-lbs	2.8-3.6 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp, nacelle mounted, left side, cover screw	84-108 in-lbs	9.5-12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp, nacelle mounted, retainer screw	17-25 in-lbs	1.9-2.8 N-m	7.18 HEADLAMP, Bulb Replacement: Nacelle Mounted
Headlamp, nacelle mounted, right side, cover screw	84-108 in-lbs	9.5-12.2 N-m	3.27 HEADLAMP NACELLE, Install
Headlamp, oblong, bracket-to-fork clamp screws	16-20 ft-lbs	21.6-27.1 N-m	7.18 HEADLAMP Remove and Install: Oblong
Headlamp, oblong, isolator screws	33-43 in-lbs	3.7--4.9 N-m	7.18 HEADLAMP Remove and Install: Oblong
Headlamp, oblong, mounting screw	10-13 ft-lbs	13.6-17.6 N-m	7.18 HEADLAMP, Remove and Install: Oblong
Headlamp, round, locknut	27-32 ft-lbs	36.6-43.3 N-m	7.18 HEADLAMP Remove and Install: Standard Round
Headlamp, upper triple clamp mounted, screw	11-14 ft-lbs	15-19 N-m	7.18 HEADLAMP Remove and Install: Horizontal
Horn, Bracket Screw	62-71 in-lbs	7-8 N-m	7.17 HORN, Assemble
Horn, Narrow Mounting Screw	27-33 in-lbs	3-3.7 N-m	7.17 HORN, Install
Horn, Wide Mounting Screw	84-108 in-lbs	9.5-12.2 N-m	7.17 HORN, Install
Housing to IM screw	20-25 in-lbs	2.3-2.8 N-m	7.13 INSTRUMENT MODULE (IM), Remove and Install: Console Without Panel
Hub cap screw	16-24 ft-lbs	22-33 N-m	3.4 FRONT WHEEL, Assemble
IM, rectangular, handlebar clamp screws	12-17 in-lbs	1.4—1.9 N-m	7.13 INSTRUMENT MODULE (IM), Remove and Install: Handlebar Mount
IM, round,cover screws	12-17 in-lbs	1.4—1.9 N-m	7.13 INSTRUMENT MODULE (IM), Remove and Install: Handlebar Mount
Ignition coil, screw	11-14 ft-lbs	15-19 N-m	7.9 IGNITION COIL, Install
Indicator lamp, screw	20-30 in-lbs	2.26-3.39 N-m	7.14 INDICATOR LAMPS, Install
Induction module bracket	66-84 in-lbs	7.5-9.5 N-m	6.15 INDUCTION MODULE, Assemble
Induction module flange adapter screws	96-156 in-lbs	10.9-17.6 N-m	6.15 INDUCTION MODULE, Install metric
Intake tube screw, cone	66-72 in-lbs	7.5-8.1 N-m	6.3 AIR CLEANER BACKPLATE AS-SEMBLY, Remove and Install: Cone
JSS screw	20-25 in-lbs	2.3-2.8 N-m	7.41 JIFFY STAND SENSOR (JSS), Install
Jiffy stand screws	40--45 ft-lbs	54.2-61 N-m	3.43 JIFFY STAND, Install
Knock sensor screw	13-17 ft-lbs	17.6-23 N-m	4.19 CYLINDER HEADS, Assemble
License Plate Lamp Cover, Screw	8-16 in-lbs	0.9-1.8 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: Side Mount
License plate bracket inner mounting screws	18-21 in-lbs	2.03-2.37 N-m	3.39 REAR LICENSE PLATE BRACKET, Center Mount
License plate bracket outer mounting screws	63-77 in-lbs	7.11-8.69 N-m	3.39 REAR LICENSE PLATE BRACKET, Center Mount

Torque Values

FASTENER	TORQUE VALUE		NOTES
License plate holder screw	63-77 in-lbs	7.11-8.69 N-m	3.39 REAR LICENSE PLATE BRACKET, Center Mount With Lighting
License plate holder, screw	60-80 in-lbs	6.8-9 N-m	7.23 TAIL LAMP, Remove and Install: License Plate Bracket Mount
License plate standard assembly bolt	62-89 in-lbs	7-10 N-m	3.39 REAR LICENSE PLATE BRACKET, Standard
License plate standard mount screws	71-97 in-lbs	8-11 N-m	3.39 REAR LICENSE PLATE BRACKET, Standard
License plate, LED housing, screw	10-20 in-lbs	1.1-2.3 N-m	7.25 LICENSE PLATE LAMP, Remove and Install: License Plate Bracket Mount
License plate, center mount, lamp housing screw	10-20 in-lbs	1.1-2.25 N-m	7.25 LICENSE PLATE LAMP, Bulb Replacement
License plate, center mount, tail lamp screw	10-20 in-lbs	1.1-2.25 N-m	7.23 TAIL LAMP, Remove and Install: Center Mount
License plate, tail lamp, screw	10-20 in-lbs	1.1-2.3 N-m	7.23 TAIL LAMP, Remove and Install: License Plate Bracket Mount
Lifter anti-rotation device screw	90-120 in-lbs	10.2-13.6 N-m	4.18 PUSHRODS, LIFTERS AND COVERS, Install
Lifter cover screws	132-156 in-lbs	14.9-17.6 N-m	4.18 PUSHRODS, LIFTERS AND COVERS, Install
Lower fairing bracket screw	96-120 in-lbs	10.8-13.6 N-m	7.18 HEADLAMP, Remove and Install: LED Round
Lower fork bracket pinch bolt	16-20 ft-lbs	21.7-27.1 N-m	2.14 ADJUST AND LUBRICATE STEERING HEAD BEARINGS, Check and Adjust
Lower rocker cover screws	90-120 in-lbs	10.2-13.6 N-m	4.16 LOWER ROCKER COVERS, Install
Lower rocker cover stud	90-120 in-lbs	10.2-13.6 N-m	4.14 UPPER ROCKER COVERS, Install Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to screws.
Lower shock screw	70-75 ft-lbs	94.9-101.7 N-m	3.25 REAR SHOCK ABSORBER, Install
Master brake cylinder yoke	11-14 ft-lbs	14.7-19.6 N-m	3.13 REAR BRAKE MASTER CYLINDER, Disassemble and Assemble: Master Cylinder
Master cylinder bracket to frame screw	30-40 ft-lbs	40.7-54.2 N-m	3.13 REAR BRAKE MASTER CYLINDER, Install
Master cylinder, rear, banjo bolt	14-18 ft-lbs	19-24.4 N-m	3.13 REAR BRAKE MASTER CYLINDER, Install
Mid Foot Control shifter rod lever pinch screw	18-22 ft-lbs	24.4-29.8 N-m	5.5 SHIFTER LINKAGE, Shifter Rod Lever, Front
Mid Foot Control shifter rod to shifter rod lever	120-168 in-lbs	13.6-19 N-m	5.5 SHIFTER LINKAGE, Shifter Rod
Mid foot control shift lever pinch screw	24-28 ft-lbs	32.5-38 N-m	5.5 SHIFTER LINKAGE, Foot Shift Lever
Mirror mounting nut	96-144 in-lbs	10.8-16.3 N-m	3.33 MIRRORS, Install
Muffler clamp	38-43 ft-lbs	51.5-58.3 N-m	6.18 MUFFLERS, Install
Muffler end cap screws	96-120 in-lbs	10.8-13.6 N-m	6.18 MUFFLERS, Install
Muffler intermediate exhaust shield screw	108-132 in-lbs	12.2-14.9 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Two Into One
Muffler screws	120-144 in-lbs	13.6-16.3 N-m	6.18 MUFFLERS, Install
Muffler shield clamps	20-40 in-lbs	2.3-4.5 N-m	6.19 EXHAUST SYSTEM, Disassemble and Assemble: Standard
Oil cooler cover screw	32-42 in-lbs	3.6-47 N-m	4.9 OIL COOLER, Install
Oil cooler screw	84-102 in-lbs	9.5-11.5 N-m	4.9 OIL COOLER, Install
Oil line manifold screws	90-120 in-lbs	10.2-13.6 N-m	4.11 OIL COOLANT LINES, Install Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (BLUE)
Oil pan fasteners	132-156 in-lbs	14.9-17.6 N-m	4.27 OIL PAN, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
			Torque sequence; LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) with used fasteners
Oil pump screws, 1st torque	12-60 in-lbs	1.4-6.8 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Oil pump screws, final torque	90-120 in-lbs	10.2-13.6 N-m	4.22 CAM COMPARTMENT AND COMPONENTS, Install
Oil return tube screw	100-120 in-lbs	11.3-13.6 N-m	5.16 TRANSMISSION CASE, Assemble
One piece seat grab strap screw	60-90 in-lbs	6.8-10.16 N-m	3.44 SEAT, Install
Passenger footpeg support screw	38-47 ft-lbs	51.5----63.7 N-m	3.42 PASSENGER FOOTRESTS, Install
Piston jet screws	25--35 in-lbs	2.8-3.9 N-m	4.25 CRANKCASE, Repair Right Crankcase Half
Primary chain tensioner fasteners	21-24 ft-lbs	28.5-32.6 N-m	5.9 DRIVE COMPONENTS, Install
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	144-156 in-lbs	16.3-17.6 N-m	5.8 PRIMARY CHAINCASE COVER, Install See sequence in the procedure
Rear Turn Signal, Center Mount, Screw	15—18 ft-lbs	20-24 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Center Mount
Rear Turn Signal, Fender Mount, Screw	15—18 ft-lbs	20-24 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Rear Turn Signal, Fender Support, Screw	21-27 ft-lbs	28-37 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Fender Mount
Rear Turn Signal, Light Bar Mount, Screw	16-20 ft-lbs	22-27 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Light Bar Mount
Rear brake caliper banjo bolt	21-23 ft-lbs	29-31 N-m	3.14 REAR BRAKE CALIPER, Install
Rear brake caliper pad hanger pin	11-14 ft-lbs	14.7-19.6 N-m	3.14 REAR BRAKE CALIPER, Install
Rear brake disc screws	30-45 ft-lbs	40.7-61 N-m	3.5 REAR WHEEL, Assemble
Rear brake line bracket screws	24-36 in-lbs	2.7-4.1 N-m	3.15 BRAKE LINES, Rear Brake Line: Non-ABS
Rear brake line clamp screws	24-36 in-lbs	2.7-4.1 N-m	3.15 BRAKE LINES, Rear Brake Line: Non-ABS
Rear caliper sleeve screw	15—18 ft-lbs	20.3-24.4 N-m	3.14 REAR BRAKE CALIPER, Install
Rear caliper slider bolt	15—18 ft-lbs	20.3-24.4 N-m	3.14 REAR BRAKE CALIPER, Install
Rear fender inner mount screw	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting
Rear fender mounting screw	42-46 ft-lbs	57-62.5 N-m	3.35 REAR FENDER, Remove and Install: Standard
Rear fender support screw	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting
Rear fender support screws	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Chopped Fender Without License Plate Bracket Lighting
Rear fender support screws	21-27 ft-lbs	28.4-37 N-m	3.35 REAR FENDER, Disassemble and Assemble: Full Fender
Rear fork clamp screw	24-36 in-lbs	2.7-4.1 N-m	7.40 REAR WHEEL SPEED SENSOR (WSS), Remove and Install: Standard Fork
Rear fork pivot shaft nut, 1st torque	25-30 ft-lbs	34-41 N-m	5.4 DRIVE BELT, Install
Rear fork pivot shaft nut, 2nd torque	1-48 in-lbs	0.1-5.4 N-m	5.4 DRIVE BELT, Install

Torque Values

FASTENER	TORQUE VALUE		NOTES
Rear fork pivot shaft nut, 3rd torque	154-170 ft-lbs	209-230 N-m	5.4 DRIVE BELT, Install
Rear fork pivot shaft nut, final torque	154-170 ft-lbs	209-230 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft nut, first torque	25-30 ft-lbs	34-41 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft nut, second torque	1-48 in-lbs	0.1-5.4 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft nut, third torque	154-170 ft-lbs	209-230 N-m	3.23 REAR FORK, Remove and Install
Rear fork pivot shaft pinch bolt	18-20 ft-lbs	24-27 N-m	3.23 REAR FORK, Remove and Install
Rear shock adjuster knob screw	26.6-44.3 in-lbs	3-5 N-m	3.25 REAR SHOCK ABSORBER, Disassemble and Assemble: Rear Shock Adjuster
Rear sprocket screws, final torque	77-83 ft-lbs	104.4-112.5 N-m	3.5 REAR WHEEL, Assemble
Rear sprocket screws, first torque	60 ft-lbs	81.3 N-m	3.5 REAR WHEEL, Assemble
Rear stoplamp switch	12-15 ft-lbs	16.3-20.3 N-m	7.24 REAR STOPLAMP SWITCH, Install
Rear turn signal, rear lighting assembly, screw	10-13 ft-lbs	14.12-17.74 N-m	7.22 REAR TURN SIGNAL LAMPS, Remove and Install: Rear Lighting Assembly
Riser flange nuts	30-40 ft-lbs	40.7-54.3 N-m	3.32 HANDLEBAR, Remove and Install: Standard
Rocker shaft screw	23-27 ft-lbs	31.2-36.6 N-m	4.17 ROCKER ARMS, Install
Saddle bag, docking bracket screw	38-47 ft-lbs	52-64 N-m	3.24 BELT GUARDS, Remove and Install: Standard
Saddlebag docking rod	13-15 ft-lbs	17-21 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag hinge screw	18-25 in-lbs	2-2.8 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saddlebag indicator flag cover screw	24-36 in-lbs	2.7-4.1 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag latch assembly	10-15 in-lbs	1.1-1.7 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag latch lever screw	20-30 in-lbs	2.3-3.4 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag left side mounting bracket grommet screw	97-124 in-lbs	11-14 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect
Saddlebag locking knob cover screw	97-120 in-lbs	11-13.6 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag locking knob screw	97-120 in-lbs	11-13.6 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag lockset nut	45--55 in-lbs	5.1—6.2 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saddlebag right side mounting bracket grommet screw	96-120 in-lbs	10.9-13.6 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag strike screw	20-30 in-lbs	2.3-3.4 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag tether screw	45-55 in-lbs	5.1-6.2 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag tether stud	45--55 in-lbs	5.1—6.2 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect
Saddlebag tether to lid screw	8-15 in-lbs	0.9-1.7 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Standard
Saddlebag, left side, mounting bracket grommet screw	96-120 in-lbs	10.9-13.6 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag, left side, mounting bracket screw	38-47 ft-lbs	52-64 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag, mounting screw	21-27 ft-lbs	29-37 N-m	3.46 SADDLEBAGS, Remove and Install: Standard
Saddlebag, mounting bolt	21-27 ft-lbs	29-37 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect

Torque Values

FASTENER	TORQUE VALUE		NOTES
Saddlebag, right side, mounting bracket grommet screw	97-124 in-lbs	11-14 N-m	3.46 SADDLEBAGS, Remove and Install: Quick Disconnect
Saree lower guard top screw	71-80 in-lbs	8-9 N-m	3.37 SAREE GUARD, Install
Saree lower guard lower screw	10-13 fl-lbs	14-18 N-m	3.37 SAREE GUARD, Install
Saree upper guard screw	21-27 fl-lbs	28-37 N-m	3.37 SAREE GUARD, Install
Seat mounting nut	9-15 in-lbs	1-1.7 N-m	3.44 SEAT, Install
Seat thumbscrew	15-30 in-lbs	1.7-3.4 N-m	3.44 SEAT, Install
Sensor, CKP, screw	90-120 in-lbs	10.2-13.6 N-m	7.34 CRANKSHAFT POSITION SENSOR (CKP), Install
Sensor, vehicle speed, screw	100-120 in-lbs	11.3-13.6 N-m	7.38 VEHICLE SPEED SENSOR (VSS), Install
Shift drum detent screw	120-150 in-lbs	13.6-17 N-m	5.14 TRANSMISSION, Assemble
Shift drum lock plate screws	57-63 in-lbs	6.4-7.1 N-m	5.14 TRANSMISSION, Assemble
Shift lever bracket screws	120-144 in-lbs	13.6-16.3 N-m	3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footboard
Shifter pawl centering screw	18-23 ft-lbs	24.4-31.2 N-m	5.16 TRANSMISSION CASE, Assemble
Shifter rod lever pinch screw, transmission lever	18-22 fl-lbs	24.4-29.8 N-m	5.16 TRANSMISSION CASE, Assemble
Shock adjuster mounting screw	90-114 in-lbs	10.2-12.9 N-m	3.45 FRAME CROSSMEMBER, Install
Shock pinch bolt	12-15 fl-lbs	16.3-20.3 N-m	3.25 REAR SHOCK ABSORBER, Install
Side cover screw, vertical screw	24-36 in-lbs	2.7—4.1 N-m	3.19 RIGHT SIDE COVER, Install
Side cover mounting stud	72-96 in-lbs	8.1-10.8 N-m	3.16 ABS MODULE, Install
Side cover screw, single screw	24-36 in-lbs	2.7—4.1 N-m	3.18 LEFT SIDE COVER, Install
Side cover, left side, bracket to frame screw	8-10 in-lbs	0.9-1.1 N-m	3.18 LEFT SIDE COVER, Install
Side-mounted shock adjuster screw	90-114 in-lbs	10.2-12.9 N-m	3.25 REAR SHOCK ABSORBER, Install
Solenoid nut	80-90 in-lbs	9-10.2 N-m	7.5 STARTER, Install
Spark plug	86-108 in-lbs	9.7-12.2 N-m	2.22 CLEAN, INSPECT, REPLACE SPARK PLUGS, Install
Splash guard screw	35-45 in-lbs	3.9-5.1 N-m	3.23 REAR FORK, Remove and Install
Spoke nipple	55 in-lbs	6.2 N-m	2.8 INSPECT TIRES AND WHEELS, Wheel Spokes
Starter, mounting screw	22-24 ft-lbs	29.8-32.5 N-m	7.5 STARTER, Install
Stator mounting screws	55-75 in-lbs	6.2-8.5 N-m	7.6 ALTERNATOR, Install Always use new screws
Sub caddy screw	36-60 in-lbs	4.1-6.8 N-m	7.27 ELECTRONIC CONTROL MODULE (ECM), Install
Switch, Neutral Indicator	120-180 in-lbs	13.6-20.3 N-m	7.16 NEUTRAL INDICATOR SWITCH, Install
Switch, Oil Pressure	13-17 ft-lbs	17-23 N-m	7.15 OIL PRESSURE SWITCH, Install
Tail Lamp Lens Screw	20-24 in-lbs	2.3-2.7 N-m	7.23 TAIL LAMP, Bulb Replacement
Tail lamp bracket, screw	40-48 in-lbs	4.5-5.4 N-m	7.23 TAIL LAMP, Remove and Install: Rear Lighting Assembly
Tail lamp lens screw	20-24 in-lbs	2.3-2.7 N-m	7.23 TAIL LAMP, Remove and Install: Standard
Tail lamp, circuit board screw	40-48 in-lbs	4.5-5.4 N-m	7.23 TAIL LAMP, Remove and Install: Standard
Temperature manifold absolute pressure sensor (TMAP) screw	23-39 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
Transmission bearing housing screws	22-25 ft-lbs	29.8-33.9 N-m	5.14 TRANSMISSION, Install
Transmission drain plug	14-21 ft-lbs	19-28.5 N-m	2.7 REPLACE TRANSMISSION LUBRICANT, Change Transmission Lubricant

Torque Values

FASTENER	TORQUE VALUE		NOTES
Transmission filler plug/dipstick	25-75 in-lbs	2.8-8.5 N-m	2.7 REPLACE TRANSMISSION LUBRICANT, Check Transmission Lubricant
Transmission ground stud nut	72-96 in-lbs	8.1-10.9 N-m	7.48 ENGINE GROUND CABLE, Install
Transmission mainshaft/countershaft locknuts	85--95 ft-lbs	115.3—128.8 N-m	5.14 TRANSMISSION, Assemble
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 N-m	5.16 TRANSMISSION CASE, Install
Transmission mounting bolts, final	34-39 ft-lbs	46.1-52.9 N-m	5.16 TRANSMISSION CASE, Install
Transmission sprocket lockplate screws	90-120 in-lbs	10.2-13.6 N-m	5.13 TRANSMISSION SPROCKET, Install Lock patch, use 3-5 times
Transmission sprocket nut, 1st torque	100 ft-lbs	135.6 N-m	5.13 TRANSMISSION SPROCKET, Install Apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to last few threads. Loosen one full turn after first torque.
Transmission sprocket nut, 2nd torque	35 ft-lbs	47.5 N-m	5.13 TRANSMISSION SPROCKET, Install
Transmission sprocket nut, final torque	35-40°	35-40°	5.13 TRANSMISSION SPROCKET, Install Do not loosen to align lockplate screws.
Transmission top cover	132-156 in-lbs	14.9-17.6 N-m	5.14 TRANSMISSION, Install
Turn signal, frame mounted fairing, screw	15—18 ft-lbs	20.34-24.4 N-m	7.21 FRONT TURN SIGNAL LAMPS, Remove and Install: Fixed Fairing Mount
USB caddy screw	14-17 in-lbs	1.6—1.9 N-m	7.43 USB CADDY, Assemble
Under seat frame cover, front screw	20-30 in-lbs	2.3-3.4 N-m	3.15 BRAKE LINES, Front ABS Lines
Under seat frame cover, rear screw	96-120 in-lbs	10.8-13.6 N-m	3.15 BRAKE LINES, Front ABS Lines
Under seat frame, rear screws	96-120 in-lbs	10.9-13.6 N-m	7.50 BACKBONE WIRE HARNESS, Install
Upper rocker cover screws	120-140 in-lbs	13.6-15.8 N-m	4.14 UPPER ROCKER COVERS, Install Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to screws.
Upper shock screw	80-90 ft-lbs	108.5--122 N-m	3.25 REAR SHOCK ABSORBER, Install
Valve stem nut	12-15 in-lbs	1.4—1.7 N-m	3.9 TIRES, Install
Voltage regulator bracket, screw	100-120 in-lbs	11.3-13.6 N-m	7.7 VOLTAGE REGULATOR, Install
Voltage regulator, screw	106-124 in-lbs	12-14 N-m	7.7 VOLTAGE REGULATOR, Install
Wear peg	30-42 in-lbs	3.4-4.7 N-m	3.40 LEFT FOOT CONTROLS, Disassemble and Assemble: Footboard
Wide mounting screw	84-108 in-lbs	9.5--12.2 N-m	7.43 USB CADDY, Install
Windshield acorn nuts	23-27 in-lbs	2.6-3 N-m	3.30 WINDSHIELD, Assemble
Windshield, frame mounted fairing, screws	5-7 in-lbs	0.6-0.8 N-m	3.29 FAIRING: FRAME MOUNTED, Remove and Install: Windshield
Wireform screw, headlamp, oblong,	10-12 ft-lbs	13.5-16.2 N-m	7.18 HEADLAMP, Remove and Install: Oblong
saddlebag lock screw	15-20 in-lbs	1.7-2.3 N-m	3.46 SADDLEBAGS, Disassemble and Assemble: Quick Disconnect

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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.

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***

1. See Figure 4-46. Check ring end gap of each ring before installing on piston.

a. Insert piston upside down into cylinder. Apply even downward force to align piston ring.

b. Measure the ring end gap with a feeler gauge. Refer to Table 4-13 .

NOTE

Piston ring position is identical for both pistons.

1. See Figure 4-47. 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).

NOTE

- ***Position the "N" marking on the compression rings to the top of the piston.***

1. See Figure 6-18. Install **new** seal (4).

2. ***NOTE***

- ***Fuel pumps used in 5 gallon fuel tanks are equipped with a flexible siphon tube (6), siphon tube must be routed to opposite side of fuel tank during fuel pump installation.***
- ***Do not bend float rod of fuel level sender. A bent float rod results in incorrect gauge readings.***

Install fuel pump assembly.

a. Insert siphon tube into fuel tank, if equipped.

b. Insert fuel level sender float (2) into fuel tank.

c. Insert fuel pump assembly (5) half way into fuel tank.

d. Insert inlet strainer (3) into fuel tank.

e. Install fuel pump assembly.

f. Install screws (1).

3. See Figure 6-19. Tighten in sequence shown.

   Torque: 40-45 **in-lbs** (4.5-5 N-m) ***Fuel pump assembly screws***