2014 Harley-Davidson Touring Models Service Manual

99483-14

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2014 Harley-Davidson Touring Models Service Manual (99483-14)

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

NOTES

ABOUT THIS MANUAL

GENERAL

⚠WARNING

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

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

- To acquaint the user with the construction of the Harley-Davidson product and assist in the performance of basic maintenance and repair.
- To introduce the professional Harley-Davidson technician to the latest field-tested and factory-approved major repair methods.

We sincerely believe that this service manual will make your association with Harley-Davidson products more pleasant and profitable.

HOW TO USE YOUR MANUAL

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

NO.	CHAPTER
1	Maintenance
2	Chassis
3	Engine
4	Fuel System
5	Drive
6	Transmission
7	Electrical
A	Appendix A Connector Repair
B	Appendix B Wiring
C	Appendix C Cooling System
D	Appendix D Reference

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

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

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

A number of acronyms and abbreviations are used in this document. See the D.4 GLOSSARY for a list of acronyms, abbreviations and definitions.

PREPARATION FOR SERVICE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

⚠WARNING

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

Good preparation is very important for efficient service work. Start each job with a clean work area. This will allow the repair to proceed as smoothly as possible. It will also reduce the incidence of misplaced tools and parts.

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

NOTES

- *To avoid unnecessary disassembly, carefully read all related service information before repair work begins.*
- *In figure legends, the number which follows the name of a part indicates the quantity necessary for one complete assembly.*
- *When servicing a vehicle equipped with the Harley-Davidson Smart Security System (H-DSSS), first disarm the system. Keep the fob close to the vehicle or use DIGITAL TECHNICIAN II (Part No. HD-48650) to disable the system. Activate the system after service is completed.*

SERVICE BULLETINS

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

USE GENUINE REPLACEMENT PARTS

⚠WARNING

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

To achieve satisfactory and lasting repairs, carefully follow the service manual instructions and use only genuine Harley-Davidson replacement parts. Behind the emblem bearing the words GENUINE HARLEY-DAVIDSON stand more than 100 years of design, research, manufacturing, testing and inspecting experience. This is your assurance that the parts you are using will fit right, operate properly and last longer.

WARNINGS AND CAUTIONS

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

⚠WARNING

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

⚠CAUTION

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

NOTICE

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

NOTE

Refers to important information, and is placed in italic type. It is recommended that you take special notice of these items.

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

⚠WARNING

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

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

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

PRODUCT REFERENCES

⚠WARNING

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

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

Special Tools

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

LOCTITE Sealing and THREADLOCKING Products

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

PRODUCT REGISTERED MARKS

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

H-D U.S.A., LLC TRADEMARK INFORMATION

Bar & Shield, Boom!, Cross Bones, Cruise Drive, CVO, Digital Tech, Digital Technician, Digital Technician II, Dyna, Electra Glide, Evolution, Fat Bob, Fat Boy, Forty-Eight, Glaze, Gloss, H-D, H-Dnet.com, Harley, Harley-Davidson, HD, Heritage Softail, Iron 883, Low Rider, Night Rod, Nightster, Night Train, Profile, Reflex, Revolution, Road Glide, Road King, Road Tech, Rocker, Screamin' Eagle, Seventy-Two, Softail, Sportster, Street Glide, Street Rod, Sun Ray, Sunwash, Super Glide, SuperLow, Switchback, SYN3, TechLink, TechLink II, Tour-Pak, Tri Glide, Twin Cam 88, Twin Cam 88B, Twin Cam 96, Twin Cam 96B, Twin Cam 103, Twin Cam 103B, Twin Cam 110, Twin Cam 110B, Twin-Cooled, Ultra Classic, V-Rod, VRSC and Harley-Davidson Genuine Motor Parts and Genuine Motor Accessories are among the trademarks of H-D U.S.A., LLC.

CONTENTS

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.

MAINTENANCE

1.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....1-1

1.2 GENERAL

Servicing a New Motorcycle....1-3
Safe Operating Maintenance....1-3
Disposal and Recycling....1-3
Shop Practices....1-3
- Repair Notes....1-3
- Safety....1-3
- Removing Parts....1-3
- Cleaning....1-3
- Disassembly and Assembly....1-4
- Checking Torques on Fasteners....1-4
- Magnetic Parts Trays....1-4

Repair and Replacement Procedures....1-4
- Hardware and Threaded Parts....1-4
- Threadlocking Agents....1-4
- Wiring, Hoses and Lines....1-4
- Instruments and Gauges....1-4
- Bearings....1-4
- Bushings....1-4
- Gaskets....1-4
- Lip-Type Seals....1-4
- O-Rings....1-5
- Gears....1-5
- Shafts....1-5
- Part Replacement....1-5

Cleaning....1-5
- Protecting Rubber Parts....1-5
- Cleaning Process....1-5
- Rust or Corrosion Removal....1-5
- Bearings....1-5

Tool Safety....1-5
- Air Tools....1-5
- Wrenches....1-5
- Pliers/Cutters/Pry Bars....1-5
- Hammers....1-6
- Punches/Chisels....1-6
- Screwdrivers....1-6
- Ratchets and Handles....1-6
- Sockets....1-6
- Storage Units....1-6

1.3 FUEL AND OIL

Fuel....1-7
Gasoline Blends....1-7
Engine Lubrication....1-7
Winter Lubrication....1-8

1.4 BULB REQUIREMENTS

General....1-9

1.5 MAINTENANCE SCHEDULE

General....1-10

1.6 ENGINE OIL AND FILTER

Engine Oil Level....1-15
- Oil Level Cold Check....1-15
- Oil Level Hot Check....1-15

Changing Oil and Oil Filter....1-16

1.7 AIR CLEANER AND EXHAUST SYSTEM

Air Filter....1-18
- Removal....1-18
- Installation....1-18

Exhaust System Leak Check....1-18
- Exhaust System Leakage....1-19

1.8 COOLANT

Cooling System....1-20
- Checking Coolant Level....1-20
- Clean Radiators....1-20

Drain and Fill Cooling System....1-21
- Drain System....1-21
- Fill System....1-21

1.9 TIRES AND WHEELS

General....1-23
Tires....1-23
Tire Replacement....1-24
- Inspection....1-24
- When To Replace Tires....1-24

Wheel Bearings....1-24
Wheel Spokes....1-25
- Identify Wheel Spoke Groups....1-25
- Wheel Spoke Adjustment....1-25

1.10 PRIMARY CHAINCASE LUBRICANT

General....1-27
Changing Primary Chaincase Lubricant....1-27

1.11 TRANSMISSION LUBRICANT

Checking Transmission Lubricant....1-29
Changing Transmission Lubricant....1-29

1.12 CLUTCH CABLE: ROAD KING

Adjustment....1-31

1.13 HYDRAULIC CLUTCH FLUID

General....1-32
Fluid Inspection....1-32

1.14 DRIVE BELT AND SPROCKETS

General....1-33
Cleaning....1-33
Inspection....1-33
- Sprockets....1-33
- Drive Belt....1-33

Checking Drive Belt Deflection....1-34
Setting Belt Deflection....1-36
- Adjustment....1-36
- Assembly....1-37

1.15 REAR SPROCKET ISOLATOR

Inspection....1-38

1.16 CABLE AND CHASSIS LUBRICATION

Chassis Lubrication....1-39

1.17 BRAKES

Fluid Inspection....1-40
Brake Fluid Replacement....1-40
Brake Lines Inspection....1-41

TABLE OF CONTENTS

1.18 BRAKE PADS AND DISCS

Inspection....1-42
Brake Pads....1-42
Brake Disc Thickness....1-42
Brake Disc Lateral Runout....1-42
Brake Pad Replacement....1-42
Rear Brake Caliper....1-42
Front Brake Calipers....1-44

1.19 SPARK PLUGS

Removal....1-46
Inspection....1-46
Cleaning....1-46
Installation....1-46
Spark Plug Cable Inspection....1-47

1.20 STEERING HEAD BEARINGS

Checking Swing-Back....1-48
Measure Swing-Back....1-48
Adjusting Swing-Back....1-49
Inspection and Lubrication....1-50

1.21 REAR SUSPENSION ADJUSTMENTS

Air Suspension....1-51
Manual Suspension Preload....1-52

1.22 BATTERY MAINTENANCE

General....1-54
Cleaning and Inspection....1-55
Battery....1-55
Disconnection and Removal....1-55
Installation and Connection....1-55
Voltmeter Test....1-56
Voltmeter Test....1-56
Battery Tender Connector....1-56
Charging Battery....1-57
Safety Precautions....1-57
Using a Battery Charger....1-57
Storage....1-58

1.23 HEADLAMP ALIGNMENT

Checking Headlamp Alignment....1-59
Headlamp Adjustment....1-59
Auxiliary/Fog Lamp Alignment....1-60

1.24 ENGINE MOUNTS

Inspection....1-62
General....1-62
Front Engine Mount....1-62

1.25 STORAGE

General....1-63
Placing in Storage....1-63
Removal from Storage....1-63

1.26 TROUBLESHOOTING

General....1-65
Engine....1-65
Starter Motor Does Not Operate or Does Not Turn Engine Over....1-65
Engine Turns Over But Does Not Start....1-65
Starts Hard....1-65
Starts But Runs Irregularly or Misses....1-65
A Spark Plug Fouls Repeatedly....1-66
Pre-Ignition or Detonation (Knocks or Pings)....1-66
Overheating....1-66
Valve Train Noise....1-66
Excessive Vibration....1-66
Check Engine Light Illuminates During Operation....1-66
Lubrication System....1-66
Oil Does Not Return To Oil Reservoir....1-66
Engine Uses Too Much Oil Or Smokes Excessively....1-66
Engine Leaks Oil From Cases, Pushrods, Hoses, Etc....1-67
Low Oil Pressure....1-67
High Oil Pressure....1-67
Electrical System....1-67
Alternator Does Not Charge....1-67
Alternator Charge Rate Is Below Normal....1-67
Speedometer Operates Erratically....1-67
Transmission....1-67
Shifts Hard....1-67
Jumps Out Of Gear....1-67
Clutch Slips....1-67
Clutch Drags Or Does Not Release....1-67
Clutch Chatters....1-67
Handling....1-67
Irregularities....1-67
Brakes....1-68
Brake Does Not Hold Normally....1-68

CHASSIS

2.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....2-1

2.2 SPECIFICATIONS

Specifications....2-8
Chassis Specifications....2-8
Tire Specifications....2-9

2.3 VEHICLE IDENTIFICATION NUMBER (VIN)

Vehicle Identification Number (VIN)....2-11
General....2-11
Location....2-11
Abbreviated VIN....2-11

2.4 FRONT WHEEL

Removal....2-13
Cleaning and Inspection....2-13
Installation....2-14

2.5 REAR WHEEL

Removal....2-15
Cleaning and Inspection....2-16
Installation....2-16

2.6 REAR WHEEL COMPENSATOR

Isolator Replacement....2-19
Removal....2-19

Installation....2-19
Sprocket Bearing Replacement....2-19
Removal....2-19
Installation....2-19

2.7 WHEEL LACING: FRONT RIM

Wheel Lacing: Angle Flange Hub....2-21

2.8 WHEEL LACING: 16 INCH REAR RIM

Wheel Lacing: 16 In. Rear Wheel....2-23

2.9 CHECKING AND TRUING WHEELS

General....2-26
Checking Wheel Runout....2-26
Checking Radial Runout....2-26
Checking Lateral Runout....2-26
Laced Wheel Rim Offset....2-27
Truing Laced Wheels....2-28
Radial Runout....2-28
Lateral Runout....2-29

2.10 SEALED WHEEL BEARINGS

Inspection....2-30
Removal....2-30
Installation....2-31

2.11 TIRES

General....2-33
Removal....2-33
Cleaning, Inspection and Repair....2-33
Installation....2-34
Tube Type Tires....2-34
Tubeless Tires: Cast Wheels....2-34
Checking Tire Runout....2-35
Lateral Runout....2-35
Radial Runout....2-35
Wheel Balancing....2-35
Static vs Dynamic....2-35
Weights....2-35

2.12 FRONT BRAKE MASTER CYLINDER

General....2-37
Removal and Disassembly....2-37
Removal....2-37
Disassembly....2-37
Cleaning and Inspection....2-38
Assembly and Installation....2-39
Assembly....2-39
Installation....2-39

2.13 FRONT BRAKE CALIPER

Removal....2-40
Installation....2-40

2.14 REAR BRAKE MASTER CYLINDER

General....2-41
Removal and Disassembly....2-41
Removal....2-41
Disassembly....2-41
Cleaning and Inspection....2-42
Assembly and Installation....2-43
Assembly....2-43
Installation....2-43

2.15 REAR BRAKE CALIPER

Removal....2-44
Installation....2-44

2.16 BRAKE LINES

Front Brake Line: Non-ABS Equipped....2-45
Removal....2-45
Installation....2-46
Rear Brake Line: Non-ABS Equipped....2-46
Removal....2-46
Installation....2-47
Brake Line: Front Master Cylinder to ABS Module....2-49
Removal....2-49
Front Line Routing....2-50
Installation....2-50
Brake Line: ABS Module to Front Caliper....2-51
Removal....2-51
Installation....2-52
Brake Line: Rear Master Cylinder to ABS Module....2-52
Removal....2-52
Installation....2-53
Brake Line: ABS Module to Rear Caliper....2-55
Removal....2-55
Installation....2-55

2.17 ABS MODULE

Reflex™ Linked Brakes with ABS Operation....2-56
ABS Module....2-56
Removal....2-56
Installation....2-57

2.18 BLEEDING BRAKES

General....2-58
Procedure....2-58

2.19 FRONT FORK

Fork Oil Leak Check....2-60
Fork Oil Seals....2-60
Oil Leak Check....2-60
Removal....2-60
Disassembly....2-61
Cleaning and Inspection....2-62
Assembly....2-63
Filling and Final Assembly....2-63
Installation....2-64

2.20 STEERING HEAD BEARINGS

Steering Stem Removal....2-66
Removal....2-66
Disassembly....2-66
Steering Stem Installation....2-66
Assembly....2-66
Installation....2-67
Upper Fork Bracket....2-67
Removal....2-67
Installation....2-68

TABLE OF CONTENTS

2.21 REAR SUSPENSION

Shock Absorber Removal....2-70
Cleaning and Inspection....2-70
Shock Absorber Installation....2-70
Air Shock Repair....2-71
Air Lines....2-71
- Check for Leaks....2-71
- Fittings....2-71
- Air Valve Assembly....2-71
- Air Tubes....2-71

Manual Adjust Shock Repair....2-72

2.22 REAR FORK

Removal....2-73
Disassembly and Assembly....2-73
- Bearing Removal....2-73
- Bearing Installation....2-74
- Pivot Shaft/Mount Disassembly....2-74

Installation....2-75

2.23 CLUTCH CABLE

Removal....2-76
Installation....2-76

2.24 CLUTCH MASTER CYLINDER AND RESERVOIR

Removal....2-78
Disassembly....2-79
Cleaning and Inspection....2-79
Assembly....2-80
Installation....2-80

2.25 HYDRAULIC CLUTCH HAND LEVER

Removal....2-82
Installation....2-82

2.26 CLUTCH FLUID LINE

Replacement....2-83
- Removal....2-83
- Installation....2-83

2.27 BLEEDING CLUTCH CONTROL SYSTEM

Drain and Fill....2-85
- Drain....2-85
- Fill....2-85

Bleed Fluid Line and Secondary Clutch Actuator....2-86

2.28 HANDLEBARS

Adjustment....2-87
Removal....2-87
Installation....2-89
Left Hand Grip....2-90
- Removal....2-90
- Installation....2-90

Right Hand Grip....2-90
- Removal....2-90
- Installation....2-90

Rubber Mounts....2-91
Heated Hand Grips....2-91
- Remove Left Hand Grip....2-91
- Install Left Hand Grip....2-92
- Remove Right Hand Grip....2-92
- Install Right Hand Grip....2-92

2.29 MIRRORS

All Models Except FLHX/S....2-93
- Removal....2-93
- Installation....2-93

FLHX/S....2-93
- Removal....2-93
- Installation....2-93

2.30 SEAT

Seat....2-94
- Removal....2-94
- Installation....2-94

Seat Retention Nut Replacement....2-94
Seat Bumper....2-95

2.31 SADDLEBAGS

Removal....2-96
Installation....2-96

2.32 SADDLEBAG SERVICE

Saddlebag Repair....2-97
- Lock....2-97
- Strikes....2-97
- Cover....2-97
- Cover Seal....2-98
- Hinge....2-98
- Latch Assembly....2-98

Saddlebag Support....2-99
- Removal....2-99
- Installation....2-99

2.33 TOUR-PAK

Removal and Installation....2-101
- Removal....2-101
- Installation....2-101

Tour-Pak Support....2-101
- Removal....2-101
- Installation....2-102
- Disassembly/Assembly....2-102

2.34 TOUR-PAK SERVICE

Tour-Pak Liner....2-103
- Removal....2-103
- Installation....2-103

Tour-Pak Seal....2-103
- Inspection....2-103
- Replacement....2-103

Tour-Pak Lock....2-103
- Removal....2-103
- Installation....2-103

Hinges....2-104
- Removal....2-104
- Installation....2-104

Latch Handle and Catch....2-104
- Removal....2-104
- Installation....2-104

Tether....2-104
Removal....2-104
Installation....2-104
Luggage Rack....2-105
Ground Plate....2-105
Removal....2-105
Installation....2-105

2.35 TOUR-PAK BACKREST

Passenger Backrest....2-107
Removal....2-107
Installation....2-107
Rubber Isolators....2-107
Removal....2-107
Installation....2-107
Passenger Backrest Flap....2-107
Removal....2-107
Installation....2-107

2.36 FAIRING LOWERS AND ENGINE GUARD

Fairing Lower: Air Cooled....2-108
Removal....2-108
Installation....2-108
Disassembly....2-108
Assembly....2-110
Fairing Lower: Twin-Cooled....2-110
Removal....2-110
Installation....2-111
Repair....2-111
Engine Guard....2-111
Removal....2-111
Installation....2-112

2.37 UPPER FAIRING AND WINDSHIELD

Outer Fairing and Windshield....2-113
Removal....2-113
Installation....2-113
Fairing Seal....2-113
Fairing Vent Bezel....2-113

2.38 DASH PANEL

Dash Panel....2-115
Removal....2-115
Installation....2-115

2.39 INNER FAIRING

Rotate Inner Fairing....2-116
Inner Fairing Assembly Removal and Installation....2-116
Removal....2-116
Installation....2-117
Inner Fairing Shell Replacement....2-118
Removal....2-118
Installation....2-118
Fairing Vent....2-119
Cleaning....2-119
Removal....2-119
Installation....2-119
Vent Repair....2-120
Upper Support Bracket....2-120
Removal....2-120
Installation....2-120
Media Compartment....2-121
Removal....2-121
Installation....2-121
Cable Replacement....2-121
Cover Replacement....2-121
Latch Replacement....2-121

2.40 AIR DEFLECTORS

Fairing Air Deflectors....2-123
Removal....2-123
Installation....2-123
Mid-Frame Air Deflectors....2-123
Removal....2-123
Installation....2-123

2.41 WINDSHIELD: ROAD KING MODELS

Windshield....2-124
Removal....2-124
Installation....2-124
Windshield Window....2-124
Removal....2-124
Installation....2-125

2.42 HEADLAMP NACELLE: ROAD KING MODELS

Removal....2-127
Installation....2-127

2.43 FRONT FENDER

Removal....2-129
Repair....2-130
Installation....2-130

2.44 REAR FENDER

Removal....2-132
Fender Repair....2-133
Mounting Hardware....2-133
Stud Plate....2-133
Lights and Harnesses....2-133
Installation....2-133

2.45 REAR FASCIA

Removal....2-135
Installation....2-135
Stud Plate....2-135
Removal....2-135
Installation....2-135
Rear Fascia Lamp....2-135

2.46 REAR FRAME

Rear Frame....2-136
Removal....2-136
Installation....2-137
Thread Repair....2-137

2.47 FOOTBOARDS AND FOOTRESTS

Rider Footboards....2-138
Removal....2-138
Installation....2-138
Disassembly....2-138

Assembly....2-139
Passenger Footboard....2-139
Removal....2-139
Disassembly....2-139
Assembly....2-139
Installation....2-139
Passenger Footrest: FLHX/S....2-139
Removal....2-139
Disassembly....2-140
Assembly....2-140
Installation....2-140

2.48 JIFFY STAND

General....2-141
Leg Removal....2-141
Leg Installation....2-141
Jiffy Stand Bracket....2-142
Removal....2-142
Installation....2-142
Jiffy Stand Interlock Sensor....2-142
Removal....2-142
Installation....2-143

2.49 FRONT ENGINE MOUNT

Removal....2-144
Installation....2-144

2.50 MEDALLIONS, SERIALIZED BADGES AND TANK EMBLEMS

Removal....2-146
Installation....2-146

ENGINE

3.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....3-1

3.2 SPECIFICATIONS

Specifications....3-3

3.3 SERVICE WEAR LIMITS

General....3-5

3.4 ENGINE OIL FLOW

Oil Feed....3-7
Top End....3-7
Bottom End....3-9
Oil Return....3-11
Oil Cooler Operation....3-11

3.5 OIL PUMP OPERATION

General....3-12
Operation....3-12

3.6 BREATHER OPERATION

General....3-14

3.7 OIL PRESSURE

Oil Pressure Indicator Lamp....3-15
Checking Oil Pressure....3-15

3.8 TROUBLESHOOTING

Diagnosing Valve Train Noise....3-17
Compression Test....3-17
Cylinder Leakdown Test....3-18
Diagnosing Smoking Engine or High Oil Consumption....3-18
Check Prior to Cylinder Head Removal....3-18
Check After Cylinder Head Removal....3-18

3.9 OIL COOLER

Removal....3-19
Installation....3-19

3.10 OIL COOLER ADAPTER

Removal....3-20
Disassembly....3-20
Assembly....3-20
Installation....3-20

3.11 HOW TO USE THIS SECTION

Top End Repair....3-21
Bottom End Repair....3-21
Typical Symptoms....3-21

3.12 TOP END SERVICE

Engine in Chassis....3-22
Engine Removed from Chassis....3-23

3.13 CAM COMPARTMENT SERVICE

Engine in Chassis....3-24
Engine Removed From Chassis....3-25

3.14 STRIPPING MOTORCYCLE FOR SERVICE

Procedure....3-26
Cam Compartment Service Only....3-26
Top End Service....3-26

3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE

Procedure....3-27
After Top End Service....3-27
After Cam Compartment Service....3-27

3.16 REMOVING ENGINE FROM CHASSIS

Procedure....3-28

3.17 INSTALLING ENGINE IN CHASSIS

Procedure....3-29

3.18 TOP END OVERHAUL: DISASSEMBLY

General....3-30
Rocker Covers....3-30
Rocker Arm Support Plate....3-30
Pushrods, Lifters and Covers....3-32
Cylinder Head....3-32
Cylinder....3-33
Piston....3-34

3.19 BREATHER ASSEMBLY

Disassembly....3-36
Cleaning and Inspection....3-36
Assembly....3-36

3.20 ROCKER ARM SUPPORT PLATE

Disassembly....3-37
Cleaning and Inspection....3-37
Inspection....3-37
Rocker Shaft Fit....3-37
Rocker Arm Shaft to Bushing....3-38
Replace Rocker Arm Bushings....3-38
Assembly....3-39

3.21 PUSHRODS, LIFTERS AND COVERS

Disassembly....3-40
Cleaning and General Inspection....3-40
Lifter Inspection....3-40
Assembly....3-41

3.22 CYLINDER HEAD

Disassembly....3-42
Cleaning....3-43
Inspection....3-43
Cylinder Head....3-43
Valve Guides....3-44
Valves....3-44
Valve Springs....3-44
Tapered Keepers....3-44
Valve Seats....3-44
Valve Guide Replacement....3-44
Removal....3-44
Installation....3-45
Valve and Seat Refacing....3-48
Assembly....3-50

3.23 CYLINDER

Cleaning....3-52
Inspection....3-52
Deglazing Cylinder....3-54
Boring and Honing Cylinder....3-54

3.24 PISTON

Disassembly....3-56
Piston Rings....3-56
Cleaning....3-56
Inspection....3-56
Assembly....3-58
Checking Piston Ring Gap....3-58
Installing Piston Rings....3-58

3.25 TOP END OVERHAUL: ASSEMBLY

General....3-60
Piston....3-60
Cylinder....3-61
Cylinder Head....3-63
Pushrods, Lifters and Covers....3-67
Rocker Arm Support Plate....3-68
Breather and Rocker Cover....3-69
Twin-Cooled Engine....3-69

3.26 CAM COMPARTMENT AND COMPONENTS

Cam Support Plate and Cover Removal....3-70
Prepare Engine....3-70
Cam Chain and Sprockets Removal....3-70
Cam Support Plate Removal....3-71
Cam Support Plate Cleaning and Inspection....3-72
Oil Pressure Valve....3-72
Cam Support Plate....3-72
Camshafts....3-72
Removal....3-72
Installation....3-73
Oil Pressure Relief Valve....3-74
Removal....3-74
Inspection....3-74
Installation....3-75
Cam Needle Bearings....3-75
Removal....3-75
Installation....3-76
Cam Support Plate and Cover Installation....3-78

3.27 OIL PUMP

Removal....3-82
Cleaning and Inspection....3-82
Installation....3-83

3.28 CRANKCASE DISASSEMBLY AND REPAIR

Crankcase Disassembly....3-84
Cleaning and Inspection....3-84
Right Crankcase Half....3-85
Main Bearing Removal....3-85
Main Bearing Installation....3-85
Piston Jets Removal....3-86
Piston Jets Installation....3-86
Left Crankcase Half....3-86
Main Bearing Removal....3-86
Main Bearing Installation....3-87
Sprocket Shaft Bearing Inner Race....3-88
Removal....3-88
Installation....3-89
Cylinder Studs....3-91
Removal....3-91
Installation....3-91
Pipe Plug and Oil Fittings....3-91
Removal....3-91
Installation....3-91

3.29 FLYWHEEL AND CONNECTING RODS

General....3-92
Symptoms....3-92
No Oil Pressure....3-92
Vibration....3-92
Inspection....3-92
Measuring Crankshaft Runout....3-92
Crankshaft Installed....3-92
Crankshaft Removed....3-93

3.30 CRANKCASE ASSEMBLY

Crankcase Assembly....3-94

TABLE OF CONTENTS

3.31 OIL PAN

Removal....3-96
Installation....3-96

FUEL SYSTEM

4.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....4-1

4.2 SPECIFICATIONS: FUEL SYSTEM

Specifications....4-2

4.3 FUEL PRESSURE TEST

General....4-3
Testing....4-3

4.4 INTAKE LEAK TEST

General....4-5
Leak Tester....4-5
- Parts List....4-5
- Tester Assembly....4-5
- Tester Adjustment....4-5

Procedure....4-5

4.5 AIR CLEANER ASSEMBLY

Removal....4-7
Installation....4-8
Air Cleaner Repair....4-8
- Insert: With Screw Access....4-8
- Insert: Without Screw Access....4-8
- Snorkel....4-8

4.6 FUEL TANK

Console....4-9
- Removal....4-9
- Installation....4-9

Fuel Door....4-9
- Door Replacement....4-9
- Lock Replacement....4-9

Removal....4-9
- Purge and Disconnect Fuel Line....4-9
- Remove Tank....4-9

Installation....4-10
Vent Tube: Models Without EVAP System....4-10
- Removal....4-10
- Installation....4-11

Fuel Supply Check Valve/Tube....4-11
- Removal....4-11
- Installation....4-11

4.7 FUEL TANK TOP PLATE

Removal....4-13
Installation....4-14

4.8 FUEL FILTER

Removal....4-15
Installation....4-15

4.9 FUEL PRESSURE REGULATOR

Removal....4-16
Installation....4-16

4.10 FUEL LEVEL SENDER

Removal....4-17
Installation....4-17

4.11 TWIST GRIP SENSOR (TGS)

Removal....4-18
Installation....4-19
Twist Grip Sensor Jumper Harness....4-20
- Removal....4-20
- Installation....4-20

4.12 THROTTLE CONTROL ACTUATOR (TCA)

General....4-21

4.13 INDUCTION MODULE

Removal....4-22
Installation....4-23

4.14 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP)

Removal....4-24
Installation....4-24

4.15 HEATED OXYGEN SENSORS (HO2)

Removal....4-25
Installation....4-26

4.16 FUEL INJECTORS

General....4-27
Removal....4-27
Installation....4-27

4.17 FUEL PUMP

General....4-29
Removal....4-29
Installation....4-29
Fuel Pump and Fuel Level Sender Wire Harness....4-30
- Removal....4-30
- Installation....4-30

4.18 EXHAUST SYSTEM

Mufflers....4-31
- Removal....4-31
- Installation....4-31

System Removal....4-31
System Installation....4-33

4.19 ACTIVE EXHAUST: HDI

Exhaust Valve Actuator....4-34
- Removal....4-34
- Installation....4-34

Exhaust Valve Actuator Cable....4-34
- Removal....4-34
- Installation....4-34

Active Exhaust Valve....4-35
- General....4-35

4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM

General....4-36
Vapor Valve....4-36
Fuel Vapor Vent Tube....4-37
Removal....4-37
Installation....4-37
Canister-to-Solenoid Tube....4-37
Removal....4-37
Installation....4-37
Solenoid-to-Induction Module Tube....4-37
Removal....4-37
Installation....4-37
Purge Solenoid....4-37
Removal....4-37
Installation....4-38
Charcoal Canister....4-38
Removal....4-38
Installation....4-38

DRIVE

5.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....5-1

5.2 SPECIFICATIONS: DRIVE

Specifications....5-2

5.3 PRIMARY CHAINCASE COVER

Removal....5-3
Installation....5-3

5.4 DRIVE COMPONENTS

Removal....5-5
Installation....5-7

5.5 PRIMARY CHAINCASE HOUSING

Removal....5-10
Inspection....5-10
Mainshaft Bearing and Seal....5-10
Removal....5-10
Installation....5-10
Mainshaft Bearing Inner Race....5-11
Removal....5-11
Installation....5-11
Shifter Shaft Bushings....5-12
Installation....5-12

5.6 CLUTCH

Removal and Installation....5-14
Clutch Pack Only....5-14
Partial Disassembly....5-14
Cleaning And Inspection....5-14
Assembly....5-15
Clutch Pack and Bearing....5-16
Complete Disassembly....5-16
Assembly....5-17

5.7 HYDRAULIC CLUTCH RELEASE BEARING AND PUSHROD

Removal....5-19
Installation....5-19
Measure Release Plate Movement....5-19
Install Clutch Inspection Cover....5-19

5.8 TRANSMISSION SPROCKET

Removal....5-21
Cleaning and Inspection....5-21
Installation....5-21

5.9 DRIVE BELT

Removal and Adjustment....5-23
Adjustment....5-23
Removal....5-23
Installation....5-23

TRANSMISSION

6.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....6-1

6.2 SPECIFICATIONS: TRANSMISSION

Specifications....6-2
Service Wear Limits....6-2

6.3 TRANSMISSION

Power Flow....6-3
Neutral....6-3
First Gear....6-3
Second Gear....6-3
Third Gear....6-3
Fourth Gear....6-3
Fifth Gear....6-3
Sixth Gear....6-3

6.4 SHIFTER LINKAGE

Shifter Rod Adjustment....6-5
Heel-Toe Shift Levers....6-5
Removal....6-5
Repair....6-5
Installation....6-5
Shifter Rod Lever, Front....6-5
Removal....6-5
Installation....6-5

6.5 CLUTCH RELEASE COVER: CABLE CLUTCH

Removal and Disassembly....6-7
Cleaning and Inspection....6-7
Assembly and Installation....6-8

6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH

Removal....6-9
Installation....6-9

TABLE OF CONTENTS

6.7 SECONDARY CLUTCH ACTUATOR

Replacement....6-10

6.8 TRANSMISSION ASSEMBLY

Removal....6-11
Disassembly....6-12
- Shifter Cam/Shifter Forks....6-12
- Mainshaft....6-14
- Countershaft....6-16
- Removing Bearing Housing Bearings....6-17

Cleaning and Inspection....6-18
Assembly....6-18
- Installing Bearing Housing Bearings....6-18
- Countershaft....6-18
- Mainshaft....6-19
- Shifter Cam/Shifter Forks....6-19

Installation....6-21

6.9 MAIN DRIVE GEAR AND BEARING

Removal....6-23
Cleaning and Inspection....6-24
- Needle Bearing Replacement....6-25

Mainshaft Seal Replacement....6-26
Installation....6-27
- Installing Main Drive Gear Bearing....6-27
- Installing Main Drive Gear....6-27
- Installing Main Drive Gear Large Seal....6-28

6.10 TRANSMISSION CASE

Removal....6-30
Installation....6-30
Disassembly....6-31
- Shifter Arm Assembly....6-31

Cleaning and Inspection....6-31
Assembly....6-32
- Countershaft Needle Bearing Replacement....6-32
- Shifter Pawl Lever Assembly....6-32

ELECTRICAL

7.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....7-1

7.2 SPECIFICATIONS: ELECTRICAL

Specifications....7-5

7.3 SYSTEM FUSES AND RELAYS

Main Fuse....7-6
- Removal....7-6
- Installation....7-6

System Fuses and Relays....7-6
- Removal....7-6
- Installation....7-6

Fuse Blocks....7-6
- Main Fuse Holder....7-6
- System Fuse Block....7-6

7.4 ELECTRONIC CONTROL MODULE (ECM)

ECM....7-7
- Removal....7-7
- Installation....7-7

7.5 BODY CONTROL MODULE (BCM)

Removal....7-8
Installation....7-8

7.6 ELECTRICAL CADDIES

Top Caddy....7-9
- Removal....7-9
- Installation....7-9

Left Side Caddy....7-9
- Removal....7-9
- Installation....7-10

Right Side Caddy....7-10
- Removal....7-10
- Installation....7-10

Battery Tray....7-11
- Removal....7-11
- Installation....7-11

7.7 IGNITION COIL

Removal....7-12
Installation....7-12

7.8 STARTER

General....7-13
Removal....7-13
Drive Assembly....7-13
- Disassembly....7-13
- Inspection....7-13
- Assembly....7-14

Solenoid....7-14
- Cover and Plunger Removal....7-14
- Short Post Contact: Starter....7-14
- Long Post Contact: Battery Positive....7-15
- Plunger and Cover Installation....7-15

Installation....7-15

7.9 HEADLAMP

Headlamp....7-17
- Removal....7-17
- Installation....7-17
- Bulb Replacement: Halogen Type....7-17
- Bulb Replacement: LED Type....7-17

7.10 AUXILIARY/FOG LAMPS AND BRACKETS

Auxiliary/Fog Lamp Bulb Replacement....7-18
- Removal....7-18
- Installation....7-18

Auxiliary/Fog Lamp Housing....7-18
- Removal....7-18
- Installation....7-19

Turn Signal/Auxiliary/Fog Lamp Bracket....7-19
- Removal....7-19
- Installation....7-20

Adjustment....7-20

7.11 REAR LIGHTING

Tail Lamp Bulb Replacement....7-21
- Removal....7-21

Installation....7-21
Circuit Board/Chrome Base....7-21
Removal....7-21
Installation....7-22
Rear Fender Lights Harness: all except FLHX/S....7-22
Removal....7-22
Installation....7-23
Rear Fascia Lamp....7-24
Removal....7-24
Installation....7-24
Rear Fender Lights Harness: FLHX/S....7-24
Removal....7-24
Installation....7-24

7.12 FENDER TIP LAMPS

Front Fender Tip Lamp....7-26
Removal....7-26
Installation....7-26
Rear Fender Tip Lamp....7-27
Removal....7-27
Installation....7-27

7.13 TOUR-PAK LIGHTS

Tour-Pak Side Lamps/Trim Strips....7-28
Removal....7-28
Installation....7-28
Tour-Pak Lights Harness....7-28
Removal....7-28
Installation....7-28
Wrap-Around Lamp (if equipped)....7-30
Removal....7-30
Repair....7-30
Installation....7-30

7.14 TURN SIGNAL LAMPS

Turn Signal Bulb Replacement: Bullet Style....7-31
Turn Signal Bulb Replacement: Flat Lens Style....7-31
Front Turn Signal Lamp....7-31
Removal: Flat Lens Style....7-31
Installation: Flat Lens Style....7-32
Removal: Bullet Style, Fork Mounted....7-32
Installation: Bullet Style, Fork Mounted....7-33
Rear Turn Signal Lamp....7-34
Removal: All but FLHX/S....7-34
Installation: All but FLHX/S....7-34
Removal: FLHX/S....7-35
Installation: FLHX/S....7-35
Lamp Repair....7-36
Rear Turn Signal Lamps Bracket....7-36
Removal: All but FLHX/S....7-36
Installation: All but FLHX/S....7-36
Removal: FLHX/S....7-37
Installation: FLHX/S....7-38

7.15 IGNITION SWITCH AND FORK LOCK

Fairing Models....7-39
Removal....7-39
Installation....7-40
Road King Models....7-40
Ignition/Light Key Switch: Removal....7-40
Ignition/Light Key Switch: Installation....7-40
Fork Lock: Removal....7-41
Fork Lock: Installation....7-41

7.16 DASH PANEL SWITCHES

Removal....7-42
Installation....7-42

7.17 CRANKSHAFT POSITION SENSOR (CKP)

General....7-43
Removal....7-43
Installation....7-43

7.18 ENGINE TEMPERATURE SENSOR (ET)

Removal....7-44
Installation....7-44

7.19 AUTOMATIC COMPRESSION RELEASE (ACR)

General....7-45
Removal....7-45
Installation....7-46

7.20 VOLTAGE REGULATOR

Removal....7-47
Installation....7-47

7.21 ALTERNATOR

Removal....7-49
Cleaning and Inspection....7-49
Installation....7-50

7.22 VEHICLE SPEED SENSOR (VSS)

VSS....7-51
Removal....7-51
Installation....7-51

7.23 WHEEL SPEED SENSORS

Front Wheel Speed Sensor (WSS)....7-52
Removal....7-52
Installation....7-52
Rear Wheel Speed Sensor....7-53
Removal....7-53
Installation....7-53

7.24 NEUTRAL SWITCH

Removal....7-54
Installation....7-54

7.25 OIL PRESSURE SWITCH OR SENDER

Removal....7-55
Installation....7-55

7.26 STOP LAMP SWITCHES

Front Stop Lamp Switch....7-56
Removal/Installation....7-56
Rear Stop Lamp Switch....7-56
Removal....7-56
Installation....7-56

TABLE OF CONTENTS

7.27 HORN

Inspection....7-57
Removal....7-57
Installation....7-57

7.28 FAIRING POWER OUTLET

Troubleshooting....7-59
Removal....7-59
Installation....7-59

7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS

2-Inch Diameter Gauges....7-60
- Removal....7-60
- Installation....7-60

Speedometer/Tachometer Instrument Cluster....7-60
- Removal....7-60
- Installation....7-60

7.30 GAUGES AND INSTRUMENTS: ROAD KING MODELS

Fuel Gauge....7-61
- Removal....7-61
- Installation....7-61

Speedometer....7-61
- Removal....7-61
- Installation....7-62

7.31 INDICATOR LAMPS: ROAD KING MODELS

Indicator Lamps....7-63
- Removal....7-63
- Installation....7-63

7.32 BOOM! BOX INFOTAINMENT SYSTEM

Radio Face Protective Film....7-64
- Replacement....7-64

Radio....7-64
- Removal....7-64
- Installation....7-64

CB Module....7-66
- Removal....7-66
- Installation....7-66
- CB Module Bracket....7-66

Front Fairing Speakers....7-66
- Removal....7-66
- Installation....7-67
- Speaker Grille....7-67

Rear Speaker Enclosures....7-67
- Removal....7-67
- Installation....7-68
- Disassembly....7-68
- Assembly....7-68

Passenger Audio Controls....7-69
Front Headset Connector....7-69
- Removal....7-69
- Installation....7-69

7.33 ANTENNA CABLES

Removal....7-70
- Main Cable....7-70
- Cable Extension: Models with Tour-Pak....7-70
- Cable Extension: FLHX/S....7-70

Installation....7-70
- Main Cable....7-70
- Cable Extension: Models with Tour-Pak....7-71
- Cable Extension: FLHX/S....7-71

7.34 WIRE TROUGH

Removal....7-73
Installation....7-74

7.35 MAIN WIRING HARNESS

Removal: All Models (Part 1)....7-75
Removal: Road King Models (Part 2)....7-75
Removal: Fairing Models (Part 2)....7-75
Removal: All Models (Part 3)....7-77
Installation: All Models (Part 1)....7-78
Installation: Road King Models (Part 2)....7-80
Installation: Fairing Models (Part 2)....7-80
Installation: All Models (Part 3)....7-81

7.36 FAIRING HARNESS

Harness Service....7-82
- Removal....7-82
- Repair....7-82
- Installation....7-83

7.37 HANDLEBAR SWITCH PACKS

Removal....7-84
- Handlebar Controls....7-84

Installation....7-85
- Right Handlebar Controls....7-85
- Left Handlebar Controls....7-86

Switch Pack Harness....7-87
- Removal....7-87
- Installation....7-87

Handlebar Switch Caps....7-88

7.38 HFSM MAINTENANCE

General....7-89
Fob Battery....7-89
- Battery Replacement Schedule....7-89
- Battery Replacement....7-89

Smart Siren (If Installed)....7-89
- Battery Replacement Schedule....7-89
- Battery Replacement....7-89

HFSM Antenna....7-89
- Removal....7-89
- Installation....7-90

7.39 PERSONAL IDENTIFICATION NUMBER (PIN)

General....7-91
Changing The PIN....7-91
- Modifying an Existing PIN....7-91

7.40 H-DSSS ACTUATION

Sidecar Configuration....7-92
Actuation....7-92
Fob Assignment....7-92

7.41 SECURITY SIREN

Removal....7-93
Installation....7-93

APPENDIX A CONNECTOR REPAIR

A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTORS

Autofuse Unsealed Connector Repair....A-1
General....A-1
Disassembly....A-1
Assembly....A-1

A.2 BOSCH COMPACT 1.1M CONNECTOR

Bosch Compact 1.1M Connector....A-2
General....A-2
Housings....A-2
Removing Socket Terminal....A-2
Installing Socket Terminal....A-2

A.3 BOSCH BTC SEALED CONNECTOR

Bosch BTC Sealed Connector Repair....A-3
Plugging and Unplugging Connector....A-3
Removing and Installing Connector Cover....A-3
Removing and Installing Wire Terminals....A-4
Crimping Terminals to Leads....A-5

A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR

Delphi 100W Micro-Pack Sealed Connector Repair....A-6
General....A-6
Separating Socket Housing From ECM....A-6
Mating Socket Housing To ECM....A-6
Removing Socket Terminal....A-6
Installing Socket Terminal....A-6
Crimping Terminals....A-7

A.5 DELPHI 150 METRI-PACK SEALED CONNECTORS

Delphi 150 Metri-Pack Sealed Connector Repair....A-8
General....A-8
Separating Pin and Socket Housings....A-8
Mating Pin and Socket Housings....A-8
Removing Socket Terminal....A-8
Inserting Socket Terminal....A-8

A.6 DELPHI 280 METRI-PACK UNSEALED CONNECTORS

Fuse Block Repair....A-10
Removing Socket Terminals....A-10
Installing Socket Terminals....A-10
Crimping Terminals....A-10

A.7 DELPHI 480 METRI-PACK UNSEALED CONNECTORS

Delphi 480 Metri-Pack Unsealed Connector Repair....A-11
General....A-11
Separating Pin and Socket Housings....A-11
Mating Pin and Socket Housings....A-11
Removing Socket Terminals....A-11
Installing Socket Terminals....A-11

A.8 DELPHI 630 METRI-PACK UNSEALED CONNECTORS

Delphi 630 Metri-Pack Unsealed Connector Repair....A-12
Separating Pin and Socket Housings....A-12
Mating Pin and Socket Housings....A-12
Removing Socket Terminal....A-12
Installing Socket Terminal....A-12

A.9 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING

Delphi 800 Metri-Pack Sealed Main Fuse Housing Repair....A-13
Removing Socket Terminals....A-13
Installing Socket Terminals....A-13

A.10 DELPHI METRI-PACK TERMINAL REPAIR

Metri-Pack Terminal Crimps....A-14
Matching Terminal To Crimper....A-14
Preparing Wire Lead....A-14
Crimping Wire Core....A-14
Crimping Insulation/Seal....A-15
Inspecting Crimps....A-15

A.11 DELPHI MICRO 64 SEALED CONNECTORS

Delphi Micro 64 Sealed Connector Repair....A-16
General....A-16
Separating Pin and Socket Housings....A-16
Mating Pin and Socket Housings....A-16
Removing Terminal....A-16
Installing Terminal....A-17
Preparing Wire Leads for Crimping....A-17
Crimping Terminals....A-17
Inspecting Crimps....A-17

A.12 DELPHI GT 150 SEALED CONNECTORS

Delphi GT 150 Sealed Connector Repair....A-19
General....A-19
Separating Pin and Socket Housings....A-19
Mating Pin and Socket Housings....A-19
Removing Socket Terminals....A-19
Installing Socket Terminals....A-19

A.13 DEUTSCH DT SEALED CONNECTORS

Deutsch DT Sealed Connector Repair....A-21
General....A-21
Separating Pin and Socket Housings....A-21
Mating Pin and Socket Housings....A-21
Removing Socket Terminals....A-21
Installing Socket Terminals....A-21
Removing Pin Terminals....A-22
Installing Pin Terminals....A-23
Crimping Terminals....A-23

TABLE OF CONTENTS

A.14 DEUTSCH DT SEALED TERMINAL REPAIR

Deutsch DT Sealed Terminal Crimps....A-25
- Preparing Wire Leads for Crimping....A-25
- Crimping Terminal to Lead....A-25
- Inspecting Crimps....A-25

A.15 DEUTSCH DTM SEALED MINI TERMINAL REPAIR

Deutsch DTM Sealed Mini Terminal Crimps....A-26
- Preparing Wire Leads for Crimping....A-26
- Crimping a Mini Terminal to Wire Lead....A-26
- Inspecting Crimps....A-26

A.16 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR

Deutsch DTM Sealed Solid Barrel Terminal Crimps....A-27
- Preparing Wire Leads For Crimping....A-27
- Adjusting Crimper Tool....A-27
- Crimping a Barrel Contact To Wire Lead....A-27
- Inspecting Crimps....A-27

A.17 JAE MX19 SEALED CONNECTORS

JAE MX19 Sealed Connectors....A-29
- Connector Housings....A-29
- Removing Terminals....A-29
- Installing Terminals....A-29

Crimping Terminals....A-29

A.18 MOLEX CMC SEALED CONNECTORS

Molex CMC Sealed Connectors....A-30
- Separating the Connector....A-30
- Removing Terminals....A-30
- Installing Terminals....A-30

Crimping Terminals....A-31

A.19 MOLEX MX 150 SEALED CONNECTORS

Molex MX 150 Sealed Connector Repair....A-32
- Separating Pin and Socket Housings....A-32
- Mating Pin and Socket Housings....A-32
- Removing Terminals....A-32
- Installing Terminals....A-32

Crimp Terminal to Lead....A-33
- Prepare Lead....A-33
- Prepare Tool....A-33
- Position Terminal in the Punch/Die....A-34
- Insert Stripped Lead....A-34
- Crimp Terminal to Lead....A-34
- Inspect Crimp....A-35

A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR

Tyco 040 Multilock Unsealed Connector Repair....A-36
- General....A-36
- Separating Pin and Socket Housings....A-36
- Mating Pin and Socket Housings....A-36
- Removing Terminals from Housing....A-36
- Inserting Terminals into Housing....A-37
- Crimping Terminals to Leads....A-37
- Inspecting Crimped Terminals....A-37

A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR

Tyco 070 Multilock Unsealed Connector Repair....A-38
- General....A-38
- Separating Pin and Socket Housings....A-38
- Mating Pin and Socket Housings....A-38
- Removing Terminals from Housing....A-38
- Inserting Terminals into Housing....A-39
- Crimping Terminals to Leads....A-40
- Inspecting Crimped Terminals....A-40

A.22 TYCO GET 64 SEALED CONNECTOR

Tyco GET 64 Sealed Connector Repair....A-41
- General....A-41
- Housings....A-41
- Removing Socket Terminals....A-41
- Installing Socket Terminals....A-42

Crimping Terminals....A-42

A.23 TYCO MCP SEALED CONNECTOR

Tyco MCP Sealed Connector....A-43
- General....A-43
- Housing....A-43
- Removing the Large Terminals....A-43
- Removing the Small Terminals....A-43
- Installing Terminals....A-44

Crimping Terminals....A-44

A.24 SEALED SPLICE CONNECTORS

Sealed Splice Connector Repair....A-45
- General....A-45
- Preparing Wire Leads....A-45
- Splicing Wire Leads....A-45
- Inspecting Seals....A-45

APPENDIX B WIRING

B.1 CONNECTORS

Connector Locations....B-1
- Function/Location....B-1
- Place and Color....B-1
- Connector Number....B-1
- Repair Instructions....B-1

B.2 WIRING DIAGRAMS

Wiring Diagram Information....B-6
- Wire Color Codes....B-6
- Wiring Diagram Symbols....B-6

2014 Touring Wiring Diagrams....B-8

APPENDIX C COOLING SYSTEM

C.1 FASTENER TORQUE VALUES

Fastener Torque Values in this Chapter....C-1

C.2 SPECIFICATIONS: COOLING SYSTEM

General....C-2

C.3 COOLING SYSTEM OPERATION

Operation....C-3

C.4 TESTING AND DIAGNOSTICS

Troubleshooting....C-4
Low Engine Temperature....C-4
High Engine Temperature....C-4
Coolant Leaks....C-4
Pressure Cap Test....C-4
System Pressure Test....C-4
Leak Detection Dye Test....C-5

C.5 COOLING SYSTEM REPAIR

Crimp Clamps....C-6
Removal....C-6
Installation....C-6
Upper Coolant Line Removal....C-6
Hose and Manifold Removal....C-6
Cylinder Head Coolant Lines and Adapters....C-6
Upper Coolant Line Installation....C-7
Cylinder Head Coolant Lines and Adapters....C-7
Hose and Manifold Installation....C-7
Coolant Down Tubes....C-8
Removal....C-8
Installation....C-8
Horizontal Coolant Tube....C-8
Removal....C-8
Installation....C-8
Radiator....C-9
Removal....C-9
Installation....C-9
Coolant Distribution Components....C-9
Coolant Pump/Thermostat Removal....C-9
Coolant Pump/Thermostat Installation....C-10
Coolant Temperature Sensor....C-11
Cooling Fan....C-12
Removal....C-12
Installation....C-12

APPENDIX D REFERENCE

D.1 METRIC CONVERSION

Conversion Table....D-1

D.2 FLUID CONVERSION

United States System....D-2
Metric System....D-2
British Imperial System....D-2

D.3 TORQUE CONVERSION

United States System....D-3
Metric System....D-3

D.4 GLOSSARY

Acronyms and Abbreviations....D-4

REFERENCE MATERIAL

TOOLS....I
TORQUE VALUES....IX
INDEX....XXV

NOTES

SUBJECT	PAGE NO.
1.1 FASTENER TORQUE VALUES	1-1
1.2 GENERAL	1-3
1.3 FUEL AND OIL	1-7
1.4 BULB REQUIREMENTS	1-9
1.5 MAINTENANCE SCHEDULE	1-10
1.6 ENGINE OIL AND FILTER	1-15
1.7 AIR CLEANER AND EXHAUST SYSTEM	1-18
1.8 COOLANT	1-20
1.9 TIRES AND WHEELS	1-23
1.10 PRIMARY CHAINCASE LUBRICANT	1-27
1.11 TRANSMISSION LUBRICANT	1-29
1.12 CLUTCH CABLE: ROAD KING	1-31
1.13 HYDRAULIC CLUTCH FLUID	1-32
1.14 DRIVE BELT AND SPROCKETS	1-33
1.15 REAR SPROCKET ISOLATOR	1-38
1.16 CABLE AND CHASSIS LUBRICATION	1-39
1.17 BRAKES	1-40
1.18 BRAKE PADS AND DISCS	1-42
1.19 SPARK PLUGS	1-46
1.20 STEERING HEAD BEARINGS	1-48
1.21 REAR SUSPENSION ADJUSTMENTS	1-51
1.22 BATTERY MAINTENANCE	1-54
1.23 HEADLAMP ALIGNMENT	1-59
1.24 ENGINE MOUNTS	1-62
1.25 STORAGE	1-63
1.26 TROUBLESHOOTING	1-65

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Filter
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Filter/Apply LOCTITE 243 (blue) to the threads of screw.
Auxiliary/fog lamp flange nut: Models with bullet style turn signal lamps	20-24 ft-lbs	27.1-32.5 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Auxiliary/fog lamp flange nut: Models with flat lens turn signal lamps	15-18 ft-lbs	20.3-24.4 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.22 BATTERY MAINTENANCE, Battery
Battery terminal fastener	60-72 **in-lbs**	6.8-8.1 Nm	1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Brake bleeder valve, front	72-108 **in-lbs**	8.1-12.2 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake bleeder valve, rear	75-102 **in-lbs**	8.5-11.5 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake caliper, front, mounting screws	28-38 ft-lbs	37.9-51.5 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper, front, pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new part
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper, rear, pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new part
Brake master cylinder, front, reservoir cover screws	12-15.0 **in-lbs**	1.3-1.7 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake master cylinder, front, reservoir cover screws	11.5-15.0 **in-lbs**	1.3-1.7 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement
Clutch adjuster screw jamnut	72-120 **in-lbs**	8.1-13.6 Nm	1.12 CLUTCH CABLE: ROAD KING, Adjustment
Clutch cable adjustment jamnut	120 **in-lbs**	13.6 Nm	1.12 CLUTCH CABLE: ROAD KING, Adjustment
Clutch inspection cover screw	84-108 **in-lbs**	9.5-12.2 Nm	1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant/Torque sequence
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm	1.12 CLUTCH CABLE: ROAD KING, Adjustment
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.13 HYDRAULIC CLUTCH FLUID, Fluid Inspection
Engine mount bracket to engine screws	36-40 ft-lbs	48.8-54.2 Nm	1.24 ENGINE MOUNTS, Inspection
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	1.24 ENGINE MOUNTS, Inspection
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection

FASTENER	TORQUE VALUE		NOTES
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Rear axle cone nut, 1st torque	15-20 ft-lbs	20-27 Nm	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection/For belt adjustment only
Rear axle cone nut, final torque	95-105 ft-lbs	128.8-142.4 Nm	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.19 SPARK PLUGS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	1.9 TIRES AND WHEELS, Wheel Spokes
Top caddy screws	72-96 **in-lbs**	8.1-10.9 Nm	1.22 BATTERY MAINTENANCE, Battery
Transmission dipstick	25-75 **in-lbs**	2.8-8.5 Nm	1.11 TRANSMISSION LUBRICANT, Checking Transmission Lubricant
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.11 TRANSMISSION LUBRICANT, Changing Transmission Lubricant
Transmission filler plug/dipstick	25-75 **in-lbs**	2.8-8.5 Nm	1.11 TRANSMISSION LUBRICANT, Changing Transmission Lubricant
Turn signal lamp to mounting bracket screw: Models with bullet style turn signal lamps	96-120 **in-lbs**	10.9-13.5 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Turn signal lamp to mounting bracket screws: Models with flat lens turn signal lamps	36-60 **in-lbs**	4.1-6.8 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Upper steering stem, 1st torque	35 ft-lbs	47.5 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, final torque: Fairing models	60-65 **in-lbs**	6.8-7.3 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, final torque: Road King models	110-115 **in-lbs**	12.4-13.0 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, final torque: Trike models	110-115 **in-lbs**	12.4-13.0 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem pinch screw	22-26 ft-lbs	29.8-35.2 Nm	1.20 STEERING HEAD BEARINGS, Checking Swing-Back

SERVICING A NEW MOTORCYCLE

⚠WARNING

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

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

The performance of new motorcycle initial service is required to keep warranty in force and to verify proper emissions systems operation. See 1.5 MAINTENANCE SCHEDULE.

SAFE OPERATING MAINTENANCE

NOTES

- *Do not attempt to tighten engine headbolts or engine damage may result.*
- *During the initial break-in period, use only GENUINE HARLEY-DAVIDSON H-D 360 MOTORCYCLE OIL 20W50. Failure to use the recommended oil will result in improper break-in of the engine cylinders and piston rings.*

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

Check:

1. Tires for correct pressure, excessive wear or any signs of tire damage.
2. Drive belt tension and condition.
3. Brakes, steering and throttle for responsiveness.
4. Brake fluid level and condition. Hydraulic lines and fittings for leaks. Also, check brake pads and discs for wear.
5. Cables for fraying, crimping and free operation.
6. Engine oil and transmission fluid levels.
7. Headlamp, auxiliary/fog lamp, tail lamp, stop lamp, horn and turn signal operation.

DISPOSAL AND RECYCLING

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

SHOP PRACTICES

Repair Notes

General maintenance practices are given in this section.

NOTES

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

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

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

Safety

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

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

Don't just do the job, do the job safely.

Removing Parts

Always consider the weight of a part when lifting. Use a hoist whenever necessary. Do not lift heavy parts by hand. If a hoist and adjustable lifting beam or sling are needed to remove some parts, verify that:

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

⚠WARNING

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

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

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

Cleaning

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

Thoroughly clean all parts to be reused before assembly. Clean parts promote better component operation and longer life. Seals, filters and covers used in this vehicle keep out

extraneous dirt and dust. Keep these items in good condition to guarantee satisfactory operation.

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

- Clean all threadlocking material from fastener threads and threaded holes.
- Use a wire brush to clean fastener threads.
- Use a thread chaser or other suitable tool to clean threaded holes.
- Use PJ1 cleaner or equivalent to remove all traces of oil and contaminants from threads.
- Clear all threaded holes with low pressure compressed air.

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

Disassembly and Assembly

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

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

Checking Torques on Fasteners

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

If it has a threadlocking agent, clean all material from the threaded hole. Replace the fastener with a **new** one or clean the original fastener threads and apply the appropriate threadlocking product. Install and tighten the fastener to specification.

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

Magnetic Parts Trays

Magnetic parts trays are common in the service facility because they are convenient and can keep parts from becoming lost during a repair procedure. However, hardened steel parts can become magnetized when held in magnetic parts trays.

Metal fragments from normal wear are usually trapped in the oil filter or by the magnetic drain plug. Magnetized parts in the engine can retain these fragments, potentially causing accelerated engine wear and damage.

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

REPAIR AND REPLACEMENT PROCEDURES

Hardware and Threaded Parts

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

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

Replace all damaged or missing lubrication fittings.

Use LOCTITE 565 THREAD SEALANT on pipe fitting threads.

Threadlocking Agents

Always follow specific service manual procedures when working with fasteners containing preapplied threadlocking agents when fastener replacement is recommended. When re-using fasteners containing threadlocking agents, thoroughly clean all fasteners and threaded holes. Always use the recommended threadlocking agent for the specific procedure.

Wiring, Hoses and Lines

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

Instruments and Gauges

Replace damaged or defective instruments and gauges.

Bearings

Always use the proper tools and fixtures when servicing bearings.

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

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

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

Bushings

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

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

Verify that all oil holes are properly aligned during installation.

Gaskets

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

Lip-Type Seals

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

Do not remove seals unless necessary. Only remove seals to gain access to other parts or if seal damage or wear dictates replacement.

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

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

O-Rings

Always discard O-rings after removal. Many O-rings are similar in size and appearance. Always use **new** O-rings keeping them packaged until use to avoid confusion. To prevent leaks, lubricate the O-rings before installation with the same type of lubricant as that being sealed. Be sure that all gasket, O-ring and seal mating surfaces are thoroughly clean before installation.

Gears

Always check gears for damaged or worn teeth.

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

Lubricate mating surfaces before pressing gears on shafts.

Shafts

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

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

Clean all rust from the machined surfaces of **new** parts.

Part Replacement

⚠WARNING

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

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

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

CLEANING

Protecting Rubber Parts

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

Cleaning Process

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

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

Rust or Corrosion Removal

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

Bearings

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

⚠WARNING

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

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

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

TOOL SAFETY

Air Tools

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

Wrenches

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

Pliers/Cutters/Pry Bars

- Plastic- or vinyl-covered pliers handles are not intended to act as insulation. Do not use them on live electrical circuits.
- Do not use pliers or cutters for cutting hardened wire unless they were designed for that purpose.
- Always cut at right angles.
- Do not use any pry bar as a chisel, punch or hammer.

Hammers

- Never strike a hammer against a hardened object, such as another hammer.
- Always grasp a hammer handle firmly, close to the end.
- Strike the object with the full face of the hammer.
- Never work with a hammer which has a loose head or cracked handle.
- Discard hammer if face is chipped or mushroomed.
- Wear approved eye protection when using striking tools.
- Protect bystanders with approved eye protection.

Punches/Chisels

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

Screwdrivers

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

Ratchets and Handles

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

Sockets

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

Storage Units

- Do not open more than one loaded drawer at a time. Close each drawer before opening another to prevent the cabinet from unexpectedly tipping over.
- Close lids and lock drawers and doors before moving storage units.
- Do not pull on a tool cabinet. Always push tool cabinets in front of you.
- Set the brakes on the locking casters after the cabinet has been rolled into position.

FUEL

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

⚠WARNING

Avoid spills. Slowly remove filler cap. Do not fill above bottom of filler neck insert, leaving air space for fuel expansion. Secure filler cap after refueling. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00028a)

⚠WARNING

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

Modern service station pumps dispense a high flow of gasoline into a motorcycle fuel tank. This can cause air entrapment and pressurization.

Table 1-1. Octane Ratings

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

GASOLINE BLENDS

Your motorcycle was designed to get the best performance and efficiency using unleaded gasoline. Most gasoline is blended with alcohol and/or ether to create oxygenated blends. The type and amount of alcohol or ether added to the fuel is important.

NOTICE

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

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

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

ENGINE LUBRICATION

⚠CAUTION

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

⚠CAUTION

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

NOTICE

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

Engine oil is a major factor in the performance and service life of the engine. Always use the proper grade of oil for the lowest temperature expected before the next scheduled oil change. Refer to Table 1-2.

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

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

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

Table 1-2. Recommended Engine Oils

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

WINTER LUBRICATION

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

NOTE

The further below freezing the temperature drops, the shorter the oil change interval should be.

Water vapor is a normal by-product of combustion in any engine. During cold weather operation, some water vapor condenses to liquid form on the cool metal surfaces inside the engine. In freezing weather this water will become slush or ice. Over time, accumulated slush or ice may block the oil lines and cause engine damage.

If the engine is run frequently and allowed to thoroughly warm up, most of this water will become vapor again and will be blown out through the crankcase breather.

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

GENERAL

Use the table to identify the bulb location and part number. Refer to Table 1-3.

Table 1-3. Bulb Chart

LAMP	DESCRIPTION (ALL LAMPS 12 VOLT)	BULBS REQUIRED	HARLEY-DAVIDSON PART NUMBER
Headlamp	FLHTCU, FLHXS, FLHTK *	LED	67700066
	FLHX, FLHR, FLHRC	High beam	67717-01
		Low beam	68881-01
	Position lamp (international)	1	53436-97
	Auxiliary lamps: FLHR, FLHRC	2	68453-05
	Auxiliary lamps: FLHTCU, FLHTK *	LED	68000020
Tail and stop lamp	Tail/stop lamp (all, FLHX/S Canadian)	1	68167-04
	Tail/stop/turn lamp: FLHTCU, FLHTK (Tour-Pak wrap-around lamp)	LED	See parts catalog
Turn signal lamp	Front (all domestic)	2	68168-89A
	Front (international except FLHRC)	2	68163-84
	Front, FLHRC (international)	2	68572-64B
	Rear, FLHR, FLHRC (all)	2	68572-64B
	Rear, FLHX (domestic)	2	68168-89A
	Rear, FLHX (international) *	LED	67800132
	Rear, FLHX (Canadian)	2	68572-64B
Additional lighting	Tour-Pak side lamps * FLHTCU, FLHTK	LED	53788-06 (right side) 53789-06 (left side)
	Fender tip lamp, front *	LED	See parts catalog
	Fender tip lamp, rear *	LED	See parts catalog
	License plate lamp (international) * FLHTCU, FLHTK, FLHRC	1	69378-09
	License plate lamp (Canadian) FLHX/S	2	52441-95
	License plate lamp (international) FLHX	LED	73254-10
Instruments (FLHR/C)	Speedometer *	Illuminated with LEDs. Replace assembly upon failure.	
	Fuel gauge *		
	Indicator panel on fuel tank *		
Instruments (other models)	Instrument cluster *	Illuminated with LEDs. Replace assembly upon failure.	
	Voltmeter *		
	Fuel gauge *		
Items with *	Illuminated with LEDs. Replace assembly upon failure.		

GENERAL

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

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

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

Table 1-4. Regular Service Intervals: 2014 Touring Models

ITEM SERVICED	PROCEDURE	1000 MI 1600 KM	5000 MI 8000 KM	10000 MI 16000 KM	15000 MI 24000 KM	20000 MI 32000 KM	25000 MI 40000 KM	30000 MI 48000 KM	35000 MI 56000 KM	40000 MI 64000 KM	45000 MI 72000 KM	50000 MI 80000 KM	NOTES
Electrical equipment and switches	Check operation	X	X	X	X	X	X	X	X	X	X	X	
Front tire	Check pressure, inspect tread	X	X	X	X	X	X	X	X	X	X	X	1
Front wheel spokes (if equipped)	Check tightness	X	X			X			X			X	2, 3, 4
Front brake fluid	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	5, 6
Clutch fluid (hydraulic operated)	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	5, 7
Reservoir cover screw: front brake and hydraulic clutch	Check torque	X		X		X		X		X		X	1, 2, 8
Hand control fasteners	Check switch housing screw torque	X		X		X		X		X		X	1, 2, 8
	Check clutch lever handlebar clamp screw torque	X		X		X		X		X		X	1, 2, 8
	Check master cylinder handlebar clamp screw torque	X		X		X		X		X		X	1, 2, 8
Steering head bearings	Inspect, lubricate and adjust						X					X	2, 9
Windshield bushings (if equipped)	Inspect			X		X		X		X		X	2
Air cleaner	Inspect, service as required		X	X	X	X	X	X	X	X	X	X	4
Engine oil and filter	Replace	X	X	X	X	X	X	X	X	X	X	X	1, 4
Engine coolant	Check freeze point, inspect for leaks	X	X	X	X	X	X	X	X	X	X	X	
	Replace coolant	Replace every 30,000 mi (48,000 km)											2
	Clean radiators	X	X	X	X	X	X	X	X	X	X	X	
Primary chaincase lubricant	Replace	X		X		X		X		X		X	4
Transmission lubricant	Replace	X				X				X			4
Right front engine mount end cap screws	Check torque	X		X		X		X		X		X	1, 2, 10
Engine mount to front crankcase screws	Check torque	X		X		X		X		X		X	1, 2, 8
Oil lines and brake system	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 2
Fuel lines and fittings	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 2
Rear brake fluid	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	5, 6
Rear brake reservoir cover screws	Check torque	X		X		X		X		X		X	1, 2, 8
Brake pads and discs	Inspect for wear	X	X	X	X	X	X	X	X	X	X	X	

Table 1-4. Regular Service Intervals: 2014 Touring Models

ITEM SERVICED	PROCEDURE	1000 MI 1600 KM	5000 MI 8000 KM	10000 MI 16000 KM	15000 MI 24000 KM	20000 MI 32000 KM	25000 MI 40000 KM	30000 MI 48000 KM	35000 MI 56000 KM	40000 MI 64000 KM	45000 MI 72000 KM	50000 MI 80000 KM	NOTES
Front axle nut	Check torque	X		X		X		X		X		X	1, 2, 8
Jiffy stand	Inspect and lubricate	X	X	X	X	X	X	X	X	X	X	X	2, 4
Clutch cable FLHR/C, FLHP	Check adjustment	X	X	X	X	X	X	X	X	X	X	X	2, 4
Brake and clutch controls	Check, adjust and lubricate with HARLEY LUBE	X	X	X	X	X	X	X	X	X	X	X	
Rear wheel spokes (if equipped)	Check tightness	X	X			X			X			X	2, 3, 4
Rear tire	Check pressure, inspect tread	X	X	X	X	X	X	X	X	X	X	X	1
Drive belt and sprockets	Inspect, adjust belt	X	X	X	X	X	X	X	X	X	X	X	2
Rear axle nut	Check torque	X		X		X		X		X		X	1, 2, 8
Air suspension (If equipped)	Check pressure, operation and leakage	X	X	X	X	X	X	X	X	X	X	X	1, 2, 4
Exhaust system	Inspect for leaks, cracks and loose, or missing fasteners or exhaust shields	X	X	X	X	X	X	X	X	X	X	X	4
Battery	Check battery, terminal torque, and clean connections. Lubricate terminals with ELECTRICAL CONTACT LUBRICANT.	Perform annually.											1
Spark plugs		Replace every two years or every 30,000 mi (48,000 km), whichever comes first.											
Fuel door	Lubricate hinge and latch with HARLEY LUBE	X	X	X	X	X	X	X	X	X	X	X	
Front forks	Rebuild											X	2, 11
Fuel filter element		Replace every 100,000 mi (160,000 km).											2
Rear sprocket isolators		Inspect for wear at each rear tire change.											
Road test	Verify component and system functions	X	X	X	X	X	X	X	X	X	X	X	

NOTES:

1. Perform annually or at specified intervals, whichever comes first.
2. Should be performed by an authorized Harley-Davidson dealer, unless you have the proper tools, service data and are mechanically qualified.
3. Perform spoke tension check at 1000 mi (1600 km), 5000 mi (8000 km), 20,000 mi (32,000 km) services and every 15,000 mi (24,000 km) interval thereafter. Not all vehicles are equipped with spoke wheels. Consult appropriate topic in service manual.
4. Perform maintenance more frequently in severe riding conditions such as extreme temperatures, dusty environments, mountainous or rough roads, long storage conditions, short runs, heavy stop/go traffic or poor fuel quality.
5. Replace DOT 4 hydraulic fluid and flush system every two years.
6. Brake fluid level will drop as brake pads wear.
7. Clutch fluid level will rise as clutch wears.
8. Attempt to turn the fastener using a torque wrench set to the minimum torque specification for that fastener. If the fastener does not rotate, the fastener torque has been maintained. No further attention is necessary. If fastener moves, tighten to specification.
9. Disassemble, lubricate, inspect and adjust every 25,000 mi (40,000 km).
10. Attempt to turn the fastener using a torque wrench set to the minimum torque specification for that fastener. If the fastener does not rotate, the fastener torque has been maintained. No further attention is necessary. If the fastener moves, clean all locking material from the threaded hole. Replace the fastener with a new one or clean the original fastener threads and apply the appropriate locking agent (see appropriate procedure). Install fastener. Tighten to specification.
11. Disassemble, inspect, rebuild forks and replace fork oil every 50,000 mi (80,000 km).

Table 1-5. Quick Reference Maintenance and Torque Chart: Touring

ITEM SERVICED	SPECIFICATION	DATA
Air cleaner	Air cleaner cover bracket screw torque	108-132 **in-lbs** (12.2-14.9 Nm)
	Air cleaner cover screw torque	36-60 **in-lbs** (4.1-6.8 Nm)
	Air cleaner cover screw threadlocker	LOCTITE 243 MEDIUM STRENGTH THREAD-LOCKER AND SEALANT (blue)
Axle nuts	Front	60-65 ft-lbs (81.3-88.1 Nm)
	Rear	95-105 ft-lbs (129.0-142.0 Nm)
Battery	Terminal bolt torque	60-70 **in-lbs** (6.8-7.9 Nm)
	Top caddy screw torque	72-96 **in-lbs** (8.1-10.9 Nm)
Brake fluid level (Check sight glass. If fluid is low, remove reservoir cover and re-check.)	Type	DOT 4 BRAKE FLUID
	Fluid level (from top of master cylinder reservoir)	Front: 0.20 in (5.0 mm) Rear: 0.26 in (6.5 mm)
	Master cylinder reservoir cover screw torque	Front: 11.5-15.0 **in-lbs** (1.3-1.7 Nm) Rear: 12-15 **in-lbs** (1.4-1.7 Nm)
Brake pads and discs	Minimum brake pad thickness	0.016 in (0.4 mm)
	Minimum brake disc thickness	Front: 0.18 in (4.5 mm) Rear: 0.25 in (6.3 mm)
	Maximum brake disc lateral runout (warpage)	0.008 in (0.20 mm)
Clutch cable adjustment (cable operated)	Adjuster screw free play	1/2-1 turn
	Adjuster screw locknut torque	72-120 **in-lbs** (8.1-13.6 Nm)
	Free play at hand lever	1/16-1/8 in (1.6-3.2 mm)
	Clutch inspection cover torque	84-108 **in-lbs** (9.5-12.2 Nm)
	Clutch cable lubricant	HARLEY LUBE
Clutch fluid level (hydraulic operated) (Check sight glass. If fluid is low, remove reservoir cover and re-check.)	Type	DOT 4 BRAKE FLUID
	Fluid level (with new clutch) ***	FILL LEVEL
	Clutch reservoir cover screw torque	12-15 **in-lbs** (1.4-1.7 Nm)
Drive belt deflection	Upward force applied at midpoint of bottom belt strand	10 lbs (4.5 kg)
	FLHR/C, FLHTC/U, FLHTK	3/8-7/16 in (9.5-11.1 mm)
	FLHX/S	1/4-5/16 in (6.4-7.9 mm)
Engine coolant	Coolant type	GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE AND COOLANT
	Coolant capacity	1.1 qt. (1.0 L)
Engine oil and filter	Drain plug torque	14-21 ft-lbs (19.0-28.5 Nm)
	Oil capacity *	4 qt. (3.8 L)
	Filter	Hand tighten 1/2-3/4 turn after gasket contact
Engine mounts	Engine mount, front, bolts	See 1.24 ENGINE MOUNTS.
Front fork oil	Amount	See 2.19 FRONT FORK.
	Type	TYPE 'E' HYDRAULIC FORK OIL
Hand controls	Switch housing screws	35-45 **in-lbs** (4.0-5.1 Nm)
	Clutch lever bracket handlebar clamp screws	72-108 **in-lbs** (8.1-12.2 Nm)
	Master cylinder reservoir handlebar clamp screws	72-108 **in-lbs** (8.1-12.2 Nm)

Table 1-5. Quick Reference Maintenance and Torque Chart: Touring

ITEM SERVICED	SPECIFICATION	DATA
Primary chain lubricant	Lubricant type and capacity	FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50 Wet: 38 oz. (1124 ml) Dry: 45 oz. (1331 ml)
	Primary chaincase drain plug torque	14-21 ft-lbs (19.0-28.5 Nm)
Spark plugs	Type	HD-6R12
	Gap	0.038-0.043 in (0.97-1.09 mm)
	Torque	12-18 ft-lbs (16.3-24.4 Nm)
Tire pressure and wear	Pressure: solo rider or with passenger	Front: 36 psi (248 kPA) Rear: 40 psi (276 kPA)
	Wear	Replace if less than 1/32 in (0.8 mm) of tread pattern
Transmission lubricant	Lubricant level	Dipstick between ADD and FULL marks with motorcycle on jiffy stand and filler plug threaded in until O-ring touches the case.
	Lubricant type and capacity **	FORMULA+ TRANSMISSION AND PRIMARY CHAIN LUBRICATION or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50 32 oz (0.95 L)
	Transmission drain plug torque	14-21 ft-lbs (19.0-28.5 Nm)
	Transmission dipstick torque	25-75 **in-lbs** (2.8-8.5 Nm)
Wheel spokes	Spoke nipple torque	55 **in-lbs** (6.2 Nm) minimum

* Capacity is approximate. When changing oil, initially add 3.0 qt (2.8 L). Run engine until warm. Check and fill as necessary.
** Capacity is approximate. When changing lubricant, initially add 28 oz (0.83 L). Check and fill as necessary.
*** Clutch fluid level will rise as clutch wears.

Table 1-6. Lubricants, Greases, Sealants

ITEM	PART NUMBER	PACKAGE
3M 847 Adhesive	021200-19718 *	5 oz tube
3M General Purpose Adhesive Remover		15 oz aerosol
Anti-Seize Lubricant	98960-97	1 oz squeeze tube
CCI #20 Brake Grease	42830-05	squeeze packet (included in master cylinder rebuild kit)
DOT 4 Brake Fluid	99953-99A	12 oz bottle
Dow Corning Moly 44 Grease	94674-99	2 cc packet
Electrical Contact Lubricant	11300004	1 oz squeeze tube
Formula+ Transmission and Primary Chaincase Lubricant	99851-05	1 qt bottle
G40M Brake Grease	42820-04	squeeze packet
Genuine Harley-Davidson Extended Life Antifreeze and Coolant	99822-02	1 gal container
Genuine Harley-Davidson H-D 360 20W50 Motorcycle Oil	99816-2050/00QT	1 qt bottle
Harley-Davidson Adhesive (Griplock)	99839-95	10 g tube

Table 1-6. Lubricants, Greases, Sealants

ITEM	PART NUMBER	PACKAGE
Harley-Davidson High Performance Sealant - Gray	99650-02	1.9 oz squeeze tube
Harley-Davidson Leather Dressing	98261-91V	6 oz can
Harley-Davidson Seal Grease	11300005	1 oz tube
Harley Lube	94968-09	1/4 oz needle dispenser
Hylomar Gasket and Thread Sealant	99653-85	3.5 oz tube
Loctite 222 Low Strength Threadlocker and Sealant (purple)	99811-97	6 mL tube
Loctite 243 Medium Strength Threadlocker and Sealant (blue)	99642-97	6 mL tube
	11100005	50 mL bottle
Loctite 246 Medium Strength/High Temperature Threadlocker (blue)		
Loctite 262 High Strength Threadlocker and Sealant (red)	94759-99	6 mL tube
Loctite 271 High Strength Threadlocker and Sealant (red)		6 mL tube
	11100006	50 mL bottle
Loctite 411 Prism Instant Adhesive		
Loctite 420 Super Bonder Adhesive		
Loctite 565 Thread Sealant	99818-97	6 mL tube
Loctite 770 Prism Primer		
Loctite 7649 Cleaner/Primer	98968-99	1.75 oz bottle
RTV Silicone Sealer	99650-02	1.9 oz tube
Screamin' Eagle Assembly Lube	94971-09	4 oz bottle
Screamin' Eagle SYN3 Full Synthetic Motorcycle Lubricant 20W50	99824-03/00QT	1 qt bottle
Special Purpose Grease	99857-97A	14 oz cartridge
Type "E" Hydraulic Fork Oil	62600026	16 oz bottle
Wheel Bearing Grease	99855-89	1 lb can
	99856-92	14 oz cartridge
* Not a Harley-Davidson part number		

ENGINE OIL LEVEL

⚠CAUTION

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

NOTICE

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

NOTE

The oil level marks for checking with motorcycle upright or on jiffy stand are on the same side of the dipstick. Carefully read dipstick when checking oil level.

Check engine oil level at each complete fuel refill.

Oil Level Cold Check

1. For pre-ride inspection, place vehicle on level ground resting on its jiffy stand.
2. See Figure 1-1. Remove filler plug/dipstick and wipe off the dipstick. Insert the dipstick and tighten into the fill spout.

NOTE

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

3. See Figure 1-2. Remove the dipstick and verify oil level. Remove filler plug/dipstick and check oil level. The correct oil level is midway (2) between the ADD QT and FULL HOT marks on the dipstick.

NOTE

If oil level is at or below the ADD QT mark, add only enough oil to bring the level midway (2) between the ADD QT and FULL HOT marks. Never bring the level to the FULL HOT mark on a cold engine.

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 at normal operating temperature.

1. Run motorcycle until engine is at normal operating temperature.
2. Place vehicle on level ground resting on its jiffy stand. Allow engine to idle for 1-2 minutes. Turn off engine.
3. See Figure 1-1. Remove filler plug/dipstick and wipe off the dipstick. Insert the dipstick and tighten into the fill spout.
4. See Figure 1-2. Remove filler plug/dipstick and check oil level. Oil level must register between the ADD QT and FULL HOT marks. 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.

NOTE

Use only recommended oil specified in 1.3 FUEL AND OIL, Engine Lubrication.

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

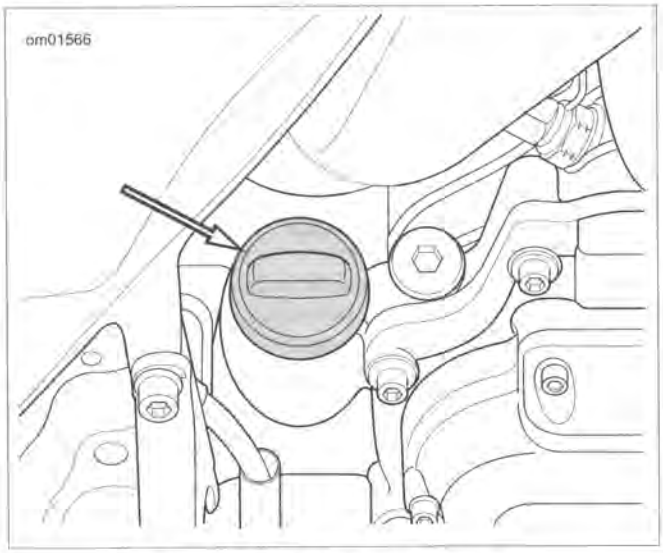
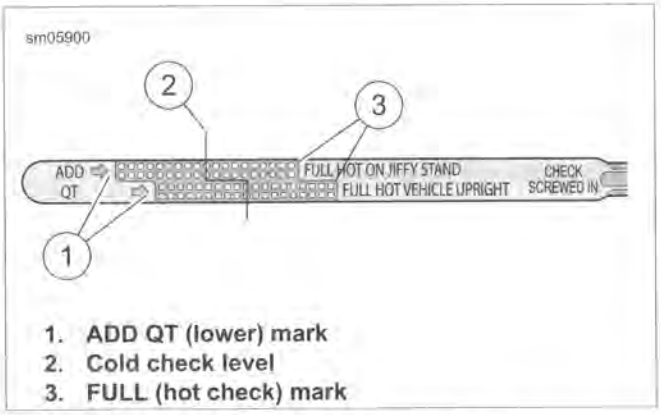


Figure 1-1. Engine Oil Filler Cap



1. **ADD QT (lower) mark**
2. **Cold check level**
3. **FULL (hot check) mark**

Figure 1-2. Engine Oil Dipstick

CHANGING OIL AND OIL FILTER

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

FASTENER	TORQUE VALUE	
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm

Refer to Table 1-4. Change engine oil at the first 1000 miles (1600 kilometers) for a **new** engine and at regular intervals in normal service at warm or moderate temperatures.

Change oil change at more frequent intervals in cold weather or severe operating conditions. See 1.3 FUEL AND OIL, Winter Lubrication.

Twin Cam equipped vehicles require the premium oil filter, available in chrome (Part No. 63798-99A) or black Part No. 63731-99A).

NOTICE

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

⚠WARNING

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

1. Run motorcycle until engine is at normal operating temperature. Turn off engine.
2. Remove filler plug/dipstick.
3. See Figure 1-3. Remove the oil drain plug (2). Do not remove hex plug (3) or transmission drain plug (1). Allow oil to drain completely.
4. Replace drain plug O-ring if damaged.

NOTICE

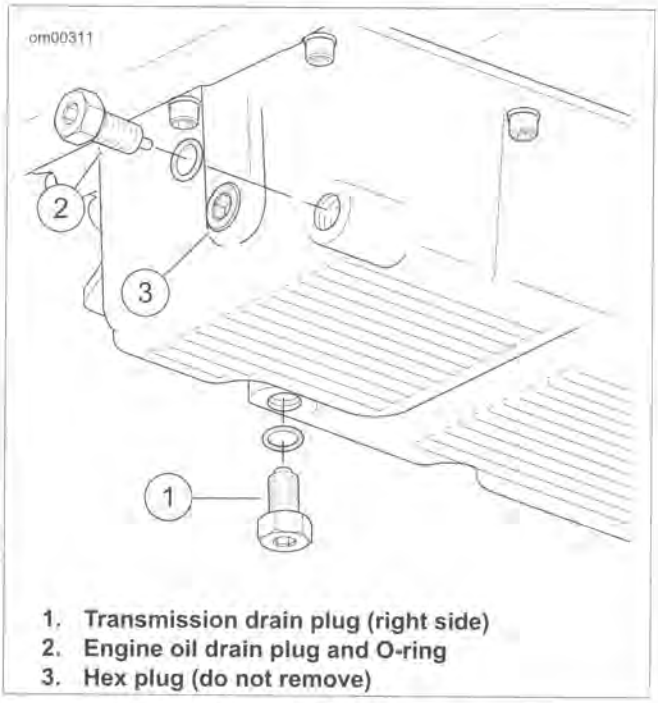
Use Harley-Davidson oil filter wrench for filter removal. This tool can prevent damage to crankshaft position sensor and/or sensor cable. (00192b)

5. Remove the oil filter using OIL FILTER WRENCH (Part No. HD-42311) or OIL FILTER WRENCH (Part No. HD-44067A) and hand tools. Do not use with air tools.
6. Clean the oil filter mount flange of any old gasket material.
7. See Figure 1-4. Lubricate gasket with clean engine oil. Install **new** oil filter on filter mount. 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. Tighten to 14-21 ft-lbs (19.0-28.5 Nm).

NOTE

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

9. Initially add 3.0 quarts (2.8 liters) of engine oil.
10. Verify proper oil level. See 1.6 ENGINE OIL AND FILTER, Engine Oil Level.
    a. Perform engine oil level **cold check**.
    b. Start engine and carefully check for oil leaks around drain plug and oil filter.
    c. Perform engine oil level **hot check**.



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

Figure 1-3. Oil Pan

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

Figure 1-4. Applying Thin Oil Film

AIR FILTER

FASTENER	TORQUE VALUE	
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. **Models without screw access:** See Figure 1-5. Pull on front edge of insert (8) to remove.

NOTE

When removing insert, only pull on the front edge without pushing in the middle. Otherwise the trim could be damaged.

2. Remove screw (1) and air cleaner cover with rubber seal (3).
3. Remove three screws (5) to release cover bracket (4) from filter element.
4. Remove filter element (6) pulling breather tube from hole on inboard side.
5. Remove breather tube (7) from breather bolts.
6. Inspect the breather tube and fittings for cuts, tears, holes or signs of deterioration.

⚠WARNING

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

⚠WARNING

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

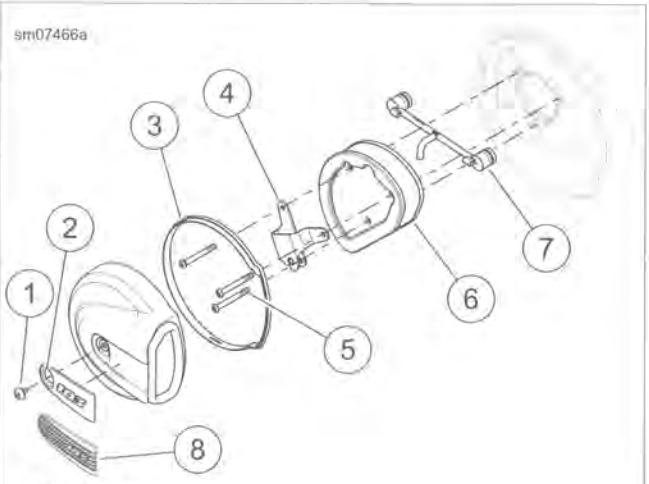
7. Clean filter element.
   a. Wash the paper/wire mesh filter element (and breather tubes) in lukewarm water with a mild detergent. Do not strike filter element on a hard surface to dislodge dirt.
   b. Allow filter element to air dry or use low pressure compressed air blowing from the inside. Do NOT use air cleaner filter oil on the Harley-Davidson paper/wire mesh air filter element.
   c. Hold the filter element up to a strong light source. The element is sufficiently clean when light is uniformly visible through the media.
   d. Replace the filter element if damaged or if filter media cannot be adequately cleaned.

Installation

NOTE

Air cleaner mounting without installation of the breather tubes will allow crankcase vapors to be vented into the atmosphere. This violates emissions regulations.

1. See Figure 1-5. Install breather tube (7) onto breather bolts.
2. Insert breather tube into hole on inboard side of filter element.
3. Place filter element onto backplate with the flat side at the 4 o'clock position.
4. Install cover bracket. Tighten screws (5) to 108-132 **in-lbs** (12.2-14.9 Nm).
5. Verify that rubber seal (3) is not damaged and is properly seated around perimeter of air cleaner cover.
6. Place air cleaner cover onto backplate. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of screw (1). Install screw. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
7. **Models without screw access:** Secure insert (8).



1. **Cover screw**
2. **Insert with screw access**
3. **Rubber seal**
4. **Cover bracket**
5. **Cover bracket screw (3)**
6. **Filter element**
7. **Breather tube**
8. **Insert without screw access**

Figure 1-5. Air Cleaner Assembly

EXHAUST SYSTEM LEAK CHECK

Check exhaust system for leaks at every scheduled service interval.

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

2. Check for loose or fractured exhaust shields. Replace or repair as necessary.
3. Start engine, cover muffler ends with clean, dry shop towels and listen for audible signs of exhaust leakage.
4. Correct any leaks detected.

Exhaust System Leakage

If an exhaust system leak is evident at a muffler or header pipe connection, disassemble and clean all mating surfaces. See 4.18 EXHAUST SYSTEM.

- Replace any damaged components and assemble.
- If leak continues, disassemble and apply Permatex Ultra Copper or LOCTITE 5920 FLANGE SEALANT. Unless available, use an equivalent oxygen sensor/catalyst-safe alternative.
- Assemble components. Wipe off any excess sealant.
- Follow sealant product instructions. Allow adequate curing time before operating vehicle.

COOLING SYSTEM

⚠CAUTION

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

⚠WARNING

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

NOTICE

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

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

NOTICE

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

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

Checking Coolant Level

NOTE

Check coolant level with engine cold and motorcycle on level ground.

1. Remove access panel from lower right fairing. Pry the center top and pull out to release retainers.

NOTE

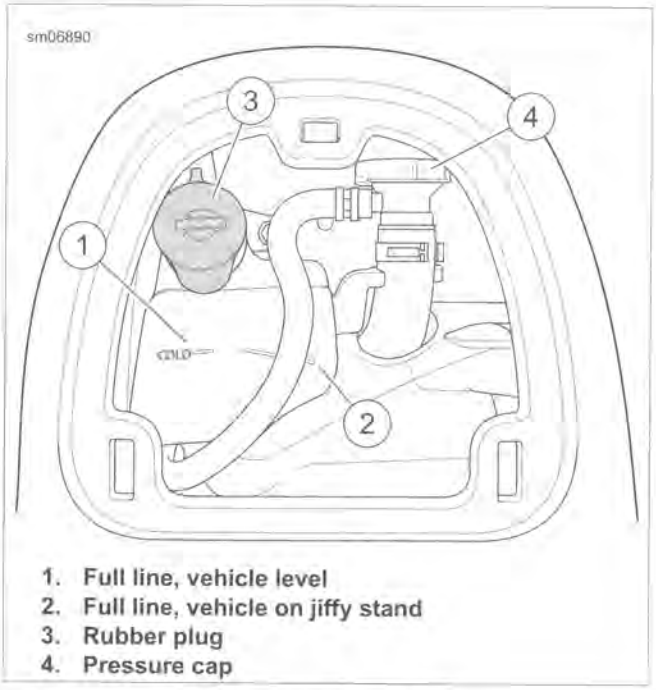
See Figure 1-6. The coolant bottle has two lines. Use the angled line (2) when the motorcycle is leaning on the jiffy stand.

2. See Figure 1-6. Check that coolant level in coolant bottle is at or slightly above the "COLD" line (1).

NOTES

- *Do not remove the pressure cap (4). Fill the coolant bottle by removing the rubber plug (3).*
- *If the coolant bottle is empty when the engine is cold, inspect the system for leaks. Repair as needed. Fill system with coolant and purge any trapped air.*

3. If level is below "COLD" line on tank, remove rubber plug (3). Add GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE AND COOLANT until fluid level reaches, or is slightly above the "COLD" line.
4. Install rubber plug.
5. Install access panel.



1. **Full line, vehicle level**
2. **Full line, vehicle on jiffy stand**
3. **Rubber plug**
4. **Pressure cap**

Figure 1-6. Coolant Level

Clean Radiators

NOTICE

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

1. See Figure 1-7. Remove outer grille from lower fairing.
   a. Carefully pry on curved edge of panel to release latches.
   b. Remove from fascia.
2. Clean debris from radiator fins.
3. Install outer grille.

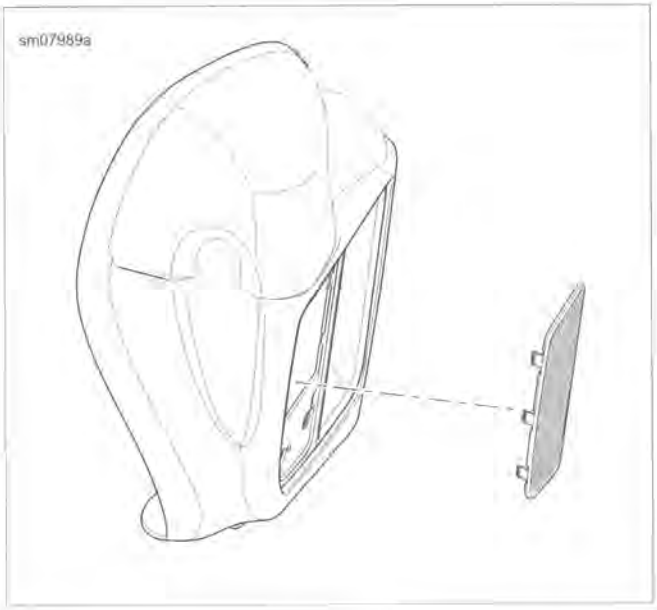


Figure 1-7. Lower Fairing Grille Panel

DRAIN AND FILL COOLING SYSTEM

⚠WARNING

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

Drain System

1. Remove main fuse.
2. Remove access panel from right lower fairing.

NOTE

Leave pressure cap installed at this time.

3. See Figure 1-6. Remove rubber plug (3).
4. Remove pump/thermostat cover.

NOTE

Hose barb on the pump is fragile. Use caution when removing coolant hose.

5. See Figure 1-8. Disconnect hose (5) from pump.
6. Drain and discard used coolant.

Fill System

NOTICE

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

NOTE

Verify that the hose clamp is installed between the raised barb and pump body. Do not install the clamp directly over the raised area.

1. See Figure 1-8. Connect hose (5) to pump with clamp.
2. Install pump/thermostat cover.
3. Pull filler neck from retainer on coolant bottle. Remove pressure cap.

NOTE

Using a squeeze bottle similar to a dishwashing liquid bottle simplifies the procedure. Capacity is approximately 1.1 qt (1.0 L).

4. Fill system through filler neck until coolant is visible. Allow coolant to bleed down for a few seconds and repeat.
5. Install main fuse.
6. Bleed cooling system.
   a. Turn ignition switch ON. Turn run switch ON. Do not start engine.
   b. Turn throttle to greater than 50% and hold for at least three seconds. Coolant pump and fans will start. Release throttle.
   c. As the pump runs, continue to add coolant until filler neck remains topped off.

NOTE

Unlike operational mode, the pump and fans will run indefinitely in bleed mode until ignition is turned OFF.

   d. Turn ignition switch OFF. Pump and fans will stop.

NOTE

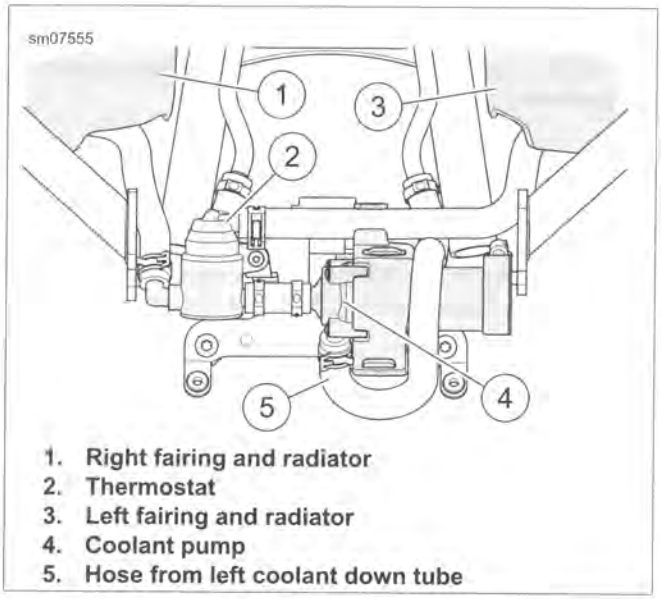
See Figure 1-9. Verify pressure cap is completely tightened. Tab (2) must contact stop (1) for proper system operation.

7. Install pressure cap. Secure filler neck to retainer on coolant bottle.
8. Fill coolant bottle to the cold fill line. Install rubber plug.
9. Start engine and check for leaks when hot.

NOTE

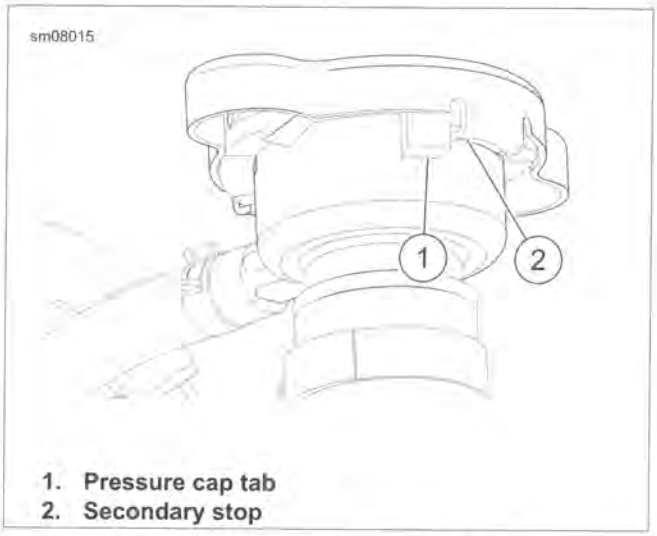
Coolant level in the coolant bottle typically rises when the engine is at operating temperature. The level will return to the "COLD" line when the system has cooled down.

10. Verify level in coolant bottle after system has cooled.
11. Install access panel.



1. Right fairing and radiator
2. Thermostat
3. Left fairing and radiator
4. Coolant pump
5. Hose from left coolant down tube

Figure 1-8. Drain Cooling System



1. Pressure cap tab
2. Secondary stop

Figure 1-9. Pressure Cap Installation

GENERAL

⚠WARNING

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

⚠WARNING

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)

⚠WARNING

Do not use liquid tire balancers or sealants in aluminum wheels. Using liquid tire balancers or sealants can cause rapid corrosion of the rim surface, which could cause tire deflation. Tire deflation can cause loss of vehicle control, which could result in death or serious injury. (00631b)

Always maintain proper tire pressure as specified in Table 1-7. Do not load tires beyond GAWR specified in Table 2-4 and Table 2-5. Underinflated, over-inflated or overloaded tires can fail.

Use only tires listed in Table 1-7.

NOTE

ABS equipped motorcycles must always use properly inflated tires and wheels that are the same as the original equipment. The ABS system 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 inflation pressure other than those specified in Table 1-7 can reduce ABS performance.

TIRES

NOTE

ABS equipped motorcycles must always use properly inflated tires and wheels that are the same as the original equipment. The ABS system 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 inflation pressure other than those specified in Table 1-7 can reduce ABS performance.

⚠WARNING

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

NOTES

- *Tubeless tires are used on all Harley-Davidson cast and disc wheels.*
- *Tire sizes are molded on the tire sidewall. Inner tube sizes are printed on the tube.*
- ***New** tires should be stored on a horizontal tire rack. Avoid stacking **new** tires in a vertical stack. The weight of the stack compresses the tires and closes down the beads.*

Check tire pressure and tread:

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

1. Inspect each tire for punctures, cuts and breaks.
2. Inspect each tire for wear. Replace tires before they reach the tread wear indicator bars.

⚠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)

NOTE

Missing indicator wear bars represent less than 1/32 in (0.8 mm) tread pattern depth remaining.

3. Check tire pressures when tires are cold. Compare results to Table 1-7.

NOTE

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

Table 1-7. Specified Tires

MODEL	MOUNT	SIZE	SPECIFIED TIRE	PRESSURE (COLD)	
				PSI	kPa
FLHTCU, FLHTK, FLHR	front	17 in	Dunlop D408F 130/80B17 65H *	36	248
FLHRC, FLHR (laced)	front	16 in	Dunlop D402F MT90B16 M/C 72H **	36	248
FLHX, FLHXS	front	19 in	Dunlop D408F 130/60B19 61H *	36	248
All with cast wheels	rear	16 in	Dunlop D407T 180/65B16 81H *	40	276
FLHRC, FLHR (laced)	rear	16 in	Dunlop D407 180/65B16 81H **	40	276

* Black wall
** Wide white wall

TIRE REPLACEMENT

Inspection

⚠WARNING

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

⚠WARNING

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

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

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

Arrows on tire sidewalls pinpoint location of wear bar indicators.

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

When To Replace Tires

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

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

When installing tires on rims, do not rely on tread design to determine direction of rotation. Always make sure the rotational arrows molded into the sidewalls point in the direction of forward rotation.

Refer to Table 1-7 for approved tires.

WHEEL BEARINGS

Service wheel bearings:

1. Check wheel bearings as outlined in 2.10 SEALED WHEEL BEARINGS. Replace wheel bearings if end play exceeds 0.002 in. (0.051 mm).
2. If wheel is already removed, check wheel bearings as follows:
   a. See Figure 1-10. Insert finger into wheel bearing and rotate the inner race in both directions. Repeat step on opposite side of wheel.
   b. Replace the wheel bearings if there is drag, rough rotation, abnormal noise or anything unusual.
3. Check axle spacers for wear and corrosion. Replace as necessary.

Figure 1-10. Inspect Wheel Bearings

WHEEL SPOKES

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

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

⚠WARNING

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

⚠WARNING

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

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on 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)

Identify Wheel Spoke Groups

NOTE

Spokes are grouped in sets of four.

1. Raise wheel with a suitable lifting device.
2. See Figure 1-11. Starting at the valve stem, identify the first group of four spokes (1-4).
3. Using a different color for each spoke in the group, draw an alignment mark across the spoke nipple and onto the rim.
4. Continue around the wheel marking the rest of the spokes the same as they were marked in the previous way.

Wheel Spoke Adjustment

NOTES

- *Do not tighten spoke more than 1/4 turn past alignment mark. If more tension is needed, label spoke and check after completing rest of wheel.*
- *Do not use the spoke torque wrench to loosen spokes. Use SPOKE NIPPLE WRENCH (Part No. HD-94681-80) to loosen spokes.*

1. See Figure 1-11. Starting with the first group of spokes, loosen spoke (1) 1/4 turn using SPOKE NIPPLE WRENCH (Part No. HD-94681-80).
2. Using SPOKE TORQUE WRENCH (Part No. HD-48985) tighten spoke (1) to the value listed in Table 1-8.
   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 alignment marks align and the torque specification has not been reached, continue to tighten the spoke nipple until the correct torque is achieved, but do not turn spoke nipple more than 1/4 turn past alignment mark.
3. Repeat previous two steps for spoke (4) in the same group.
4. Continue around the wheel checking spokes 1 and 4 until all groups are done.
5. Repeat procedure for spokes (2, 3) in each group.

NOTE

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

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

7. True the wheel. See 2.9 CHECKING AND TRUING WHEELS.

Table 1-8. Spoke Nipple Torque Specification

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

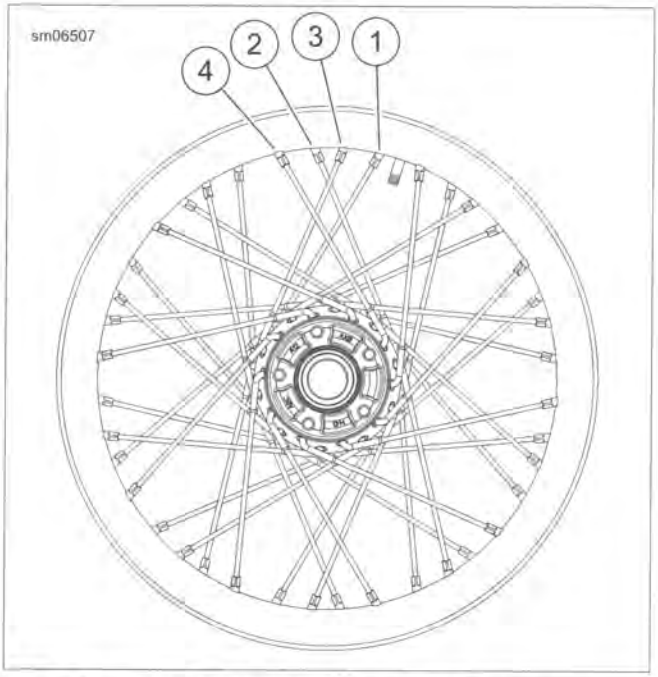


Figure 1-11. Tightening Laced Wheels (typical)

GENERAL

All models have an automatic chain tensioner. For primary chain service procedures, see 5.4 DRIVE COMPONENTS.

CHANGING PRIMARY CHAINCASE LUBRICANT

FASTENER	TORQUE VALUE	
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm
Clutch inspection cover screw	84-108 **in-lbs**	9.5-12.2 Nm
Battery terminal fastener	60-72 **in-lbs**	6.8-8.1 Nm

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

NOTICE

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

⚠WARNING

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

2. See Figure 1-12. Drain lubricant into suitable container.
3. Clean drain plug. If plug has accumulated a lot of debris, inspect the condition of chaincase components.
4. Install **new** O-ring on drain plug.
5. Install drain plug into primary chaincase cover. Tighten to 14-21 ft-lbs (19.0-28.5 Nm).

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

6. Disconnect negative battery cable.
7. See Figure 1-13. Remove screws with captive washers (3) and clutch inspection cover (2).
8. Remove seal (1). Wipe oil from groove in chaincase cover and mounting surface.

NOTICE

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

9. Place motorcycle in an upright position to fill primary chaincase.
10. Pour specified amount of FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT through clutch inspection cover opening. Refer to Table 1-9.

Table 1-9. Primary Chaincase Lubricant Refill Capacity

ITEM	CAPACITY
Primary chaincase lubricant	38 oz (1.12 L) wet
	45 oz (1.33 L) dry

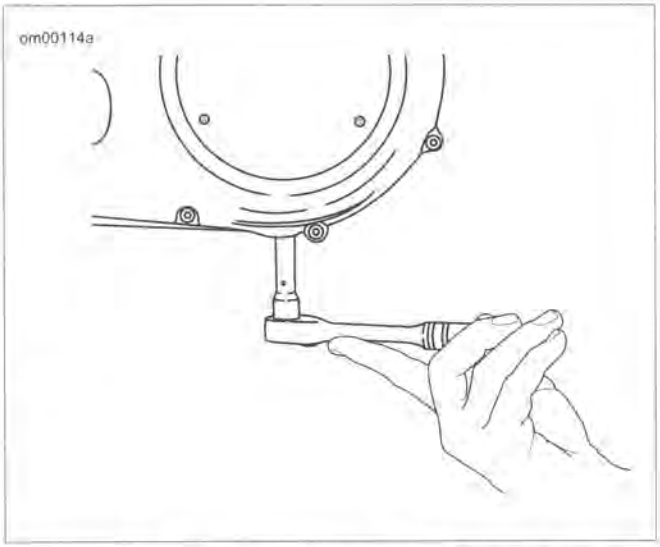
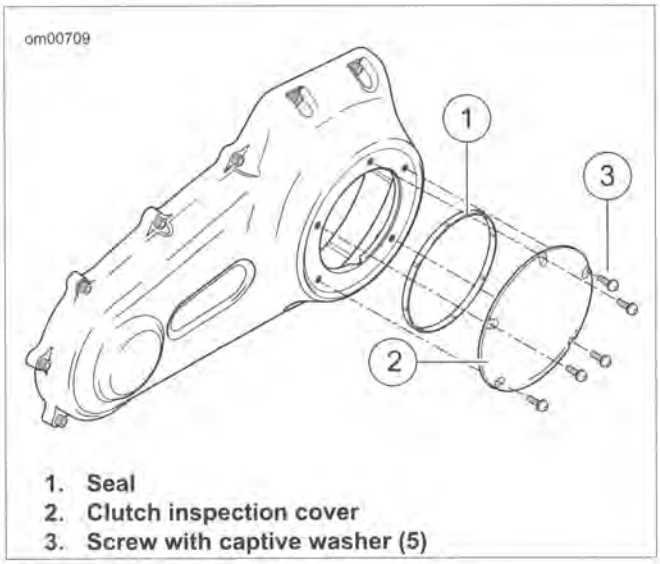


Figure 1-12. Removal/Installation of Chaincase Drain Plug



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

Figure 1-13. Clutch Cover

11. Install clutch inspection cover and **new** seal:
    a. Thoroughly wipe all lubricant from cover mounting surface and groove in chaincase cover.
    b. See Figure 1-13. Position **new** seal (1) in groove in clutch inspection cover. Press each of the nubs on seal into the groove.
    c. Secure inspection cover with screws with captive washers (3).
    d. See Figure 1-14. Tighten in sequence shown to 84-108 **in-lbs** (9.5-12.2 Nm).
12. Connect battery negative cable. Tighten to 60-72 **in-lbs** (6.8-8.1 Nm).

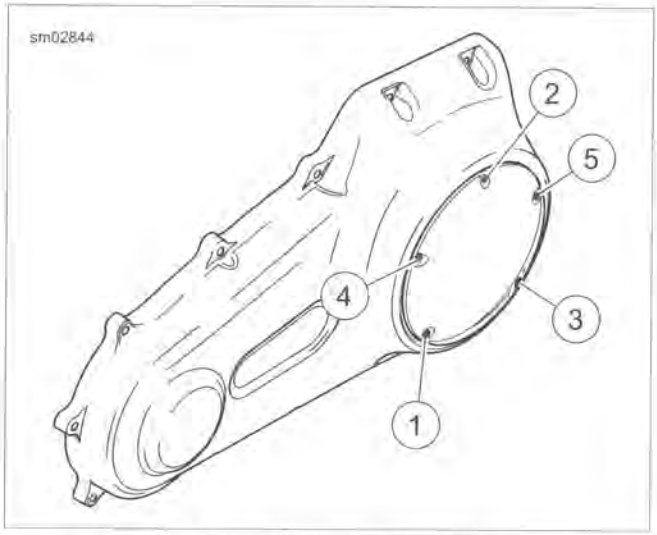


Figure 1-14. Clutch Cover Torque Sequence

CHECKING TRANSMISSION LUBRICANT

FASTENER	TORQUE VALUE	
Transmission dipstick	25-75 **in-lbs**	2.8-8.5 Nm

NOTE

Check transmission fluid with the motorcycle at room temperature.

1. Park on level ground on the jiffy stand.
2. See Figure 1-15. Remove transmission lubricant dipstick. Wipe dipstick clean.
3. Insert dipstick into transmission. Thread dipstick in until O-ring makes contact with case. Do not tighten.
4. See Figure 1-16. Remove dipstick. Check lubricant level on dipstick.

NOTICE

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

5. The level should be between the A and F marks. Add only enough lubricant to bring level to between the A mark and the F mark. Refer to Table 1-10.
6. Install dipstick. Tighten to 25-75 **in-lbs** (2.8-8.5 Nm).

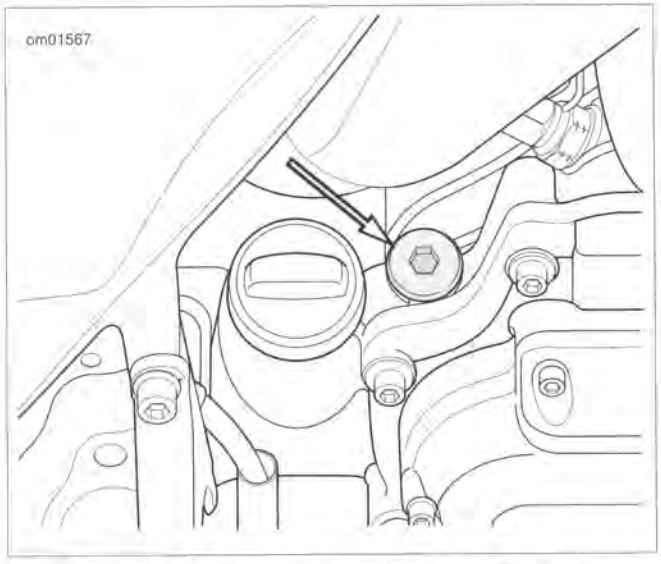
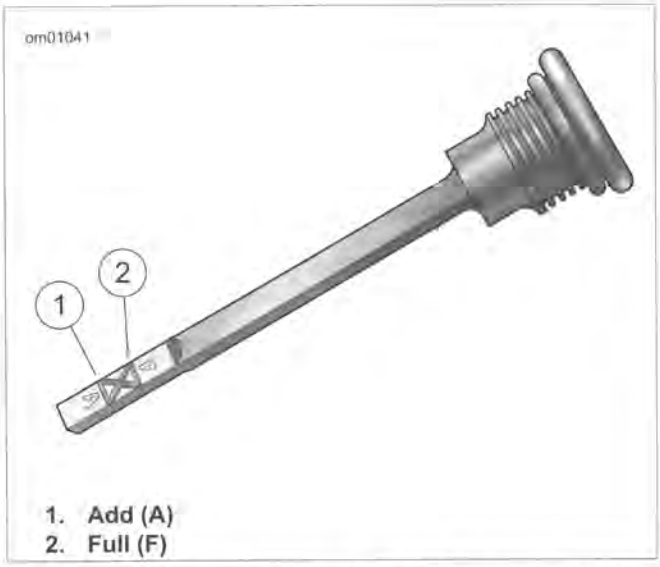


Figure 1-15. Transmission Dipstick Location



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

Figure 1-16. Transmission Dipstick Lubricant Level

Table 1-10. Recommended Lubricant

LUBRICANT	REFILL QUANTITY *
FORMULA+ TRANSMISSION AND PRIMARY CHAIN LUBRICANT or SCREAMIN' EAGLE SYN3 FULL SYNTHETIC MOTORCYCLE LUBRICANT 20W50	28 oz (0.83 L)
*Approximate. Check and add as needed to bring level within specification.	

CHANGING TRANSMISSION LUBRICANT

FASTENER	TORQUE VALUE	
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm
Transmission filler plug/dipstick	25-75 **in-lbs**	2.8-8.5 Nm

1. See Figure 1-15. Remove transmission filler plug/dipstick.

NOTICE

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

⚠WARNING

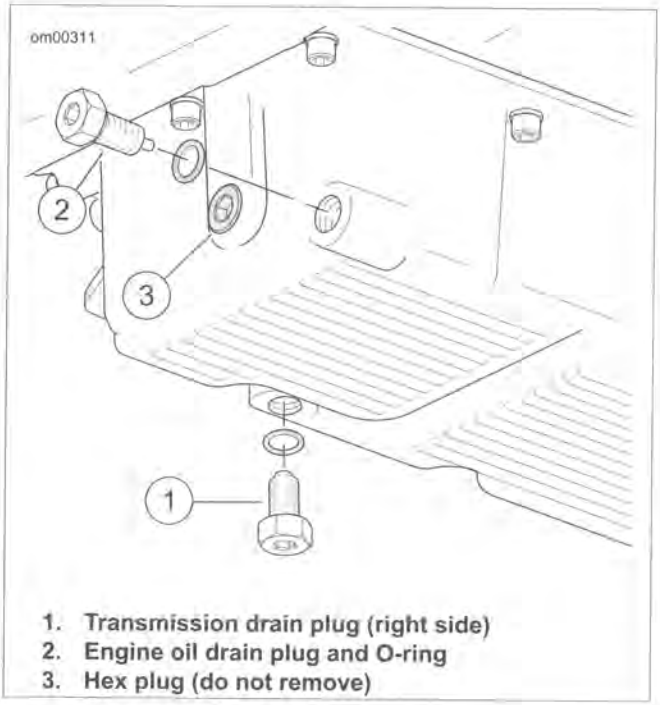
Be sure that no lubricants or fluids get on tires, wheels or brakes when changing fluid. Traction can be adversely affected, which could result in loss of control of the motorcycle and death or serious injury. (00047d)

2. See Figure 1-17. Remove transmission drain plug. Drain lubricant into a suitable container.
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 O-ring. Tighten to 14-21 ft-lbs (19.0-28.5 Nm). Do not over-tighten.
5. Fill the transmission with 28 oz (0.83 L) of recommended Harley-Davidson lubricant. Refer to Table 1-10.
6. Check lubricant level and add enough lubricant to bring the level between the ADD (A) and FULL (F) marks. See 1.11 TRANSMISSION LUBRICANT, Checking Transmission Lubricant.
7. Install filler plug/dipstick. Tighten to 25-75 **in-lbs** (2.8-8.5 Nm).



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

Figure 1-17. Oil Pan

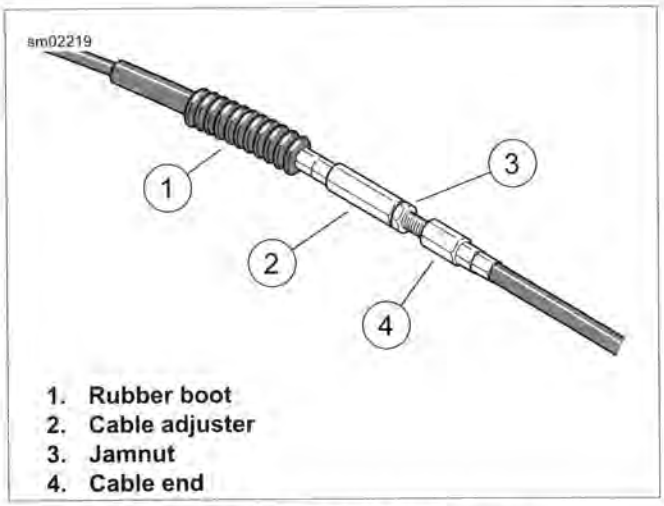
ADJUSTMENT

FASTENER	TORQUE VALUE	
Clutch adjuster screw jamnut	72-120 **in-lbs**	8.1-13.6 Nm
Clutch cable adjustment jamnut	120 **in-lbs**	13.6 Nm
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm

NOTE

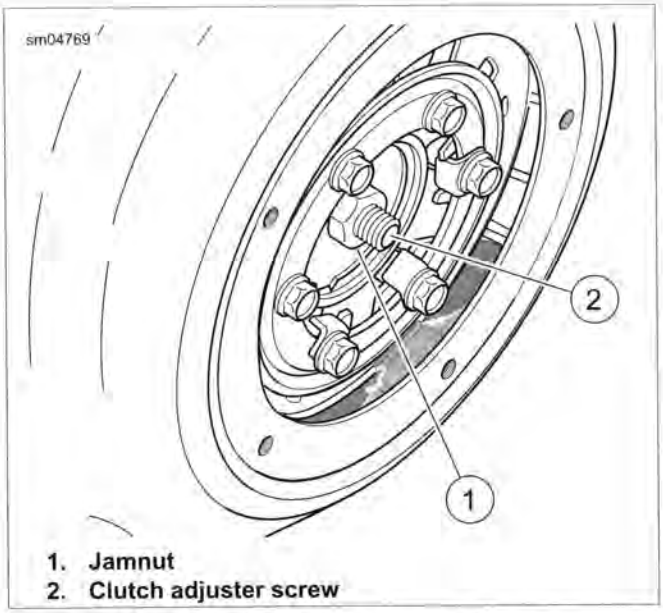
Perform the clutch adjustment with the motorcycle at room temperature. Clearance at the adjuster screw will increase as the powertrain temperature increases. If adjustment is made with powertrain hot, clearance at pushrod bearing could be insufficient with powertrain cold. Clutch slippage could occur.

1. Stand motorcycle upright and level.
2. Remove clutch inspection cover from primary chaincase cover.
3. Remove seal ring from clutch inspection cover and discard.
4. See Figure 1-18. Add freeplay to cable.
   a. Slide rubber boot (1) off cable adjuster.
   b. Loosen jamnut (3) and back away from cable adjuster.
   c. Move adjuster (2) toward jamnut to introduce a large amount of free play at hand lever.
5. See Figure 1-19. Loosen jamnut (1) on clutch adjuster screw. Turn adjuster screw (2) inward (clockwise) until lightly seated.
6. Back out adjuster screw 1/2 to 1 full turn. While holding adjuster screw, tighten jamnut to 72-120 **in-lbs** (8.1-13.6 Nm).
7. Squeeze clutch lever to maximum limit three times to set ball and ramp release mechanism.
8. See Figure 1-18. Check freeplay.
   a. Turn cable adjuster (2) until slack is eliminated at hand lever.
   b. See Figure 1-20. Pull clutch cable ferrule (2) away from clutch lever bracket to check free play. Turn cable adjuster as necessary to obtain 1/16 in. (1.6 mm) free play (4).
9. Hold adjuster and tighten jamnut to 120 **in-lbs** (13.6 Nm). Cover cable adjuster mechanism with rubber boot.
10. Swab all lubricant from seal ring groove in clutch inspection cover. Install **new** seal ring in groove with nubs contacting ring groove walls.
11. See Figure 1-14. Secure clutch inspection cover. Tighten screws in sequence to 84-108 **in-lbs** (9.5-12.2 Nm).



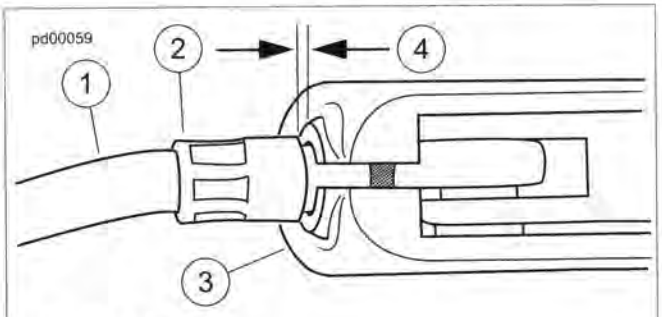
1. **Rubber boot**
2. **Cable adjuster**
3. **Jamnut**
4. **Cable end**

Figure 1-18. Clutch Cable Adjuster



1. **Jamnut**
2. **Clutch adjuster screw**

Figure 1-19. Clutch Adjuster Screw



1. **Clutch cable**
2. **Cable ferrule**
3. **Clutch lever bracket**
4. **Free play: 1/16 in (1.6 mm)**

Figure 1-20. Clutch Cable Free Play

GENERAL

The clutch is hydraulically actuated. The master cylinder creates pressure in the clutch fluid line. This pressure activates the secondary clutch actuator. The secondary clutch actuator piston extends and contacts a pushrod to disengage the clutch.

NOTICE

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

NOTICE

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

NOTE

Do not wipe any spilled brake fluid off of finished surfaces. Always flush the affected components with clean water.

⚠CAUTION

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

FLUID INSPECTION

FASTENER	TORQUE VALUE	
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm

NOTICE

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

1. Turn handlebar so master cylinder is level.
2. See Figure 1-21. Verify fluid presence in reservoir sight glass (3). Sight glass appears dark if fluid is present.

NOTES

- *Fluid should never need to be added or removed from the system during normal wear. Clutch fluid volume increases with clutch wear.*
- *If fluid level is substantially above the FILL LEVEL, a worn clutch may be the cause.*
- *Do NOT overfill clutch reservoir. Over-filling can damage seals or cause premature clutch wear.*
- *Check that clutch hand lever returns completely. If lever does not return completely, problems similar to over-filling can result.*

3. If sight glass is not dark:
   a. Check for fluid leaks in hydraulic clutch system.
   b. Check fluid level in clutch reservoir.
   c. If fluid level is below FILL LEVEL on ledge in reservoir, add DOT 4 BRAKE FLUID as necessary. Do not exceed FILL LEVEL.
   d. Attach cover with screws. Tighten to 12-15 **in-lbs** (1.4-1.7 Nm).

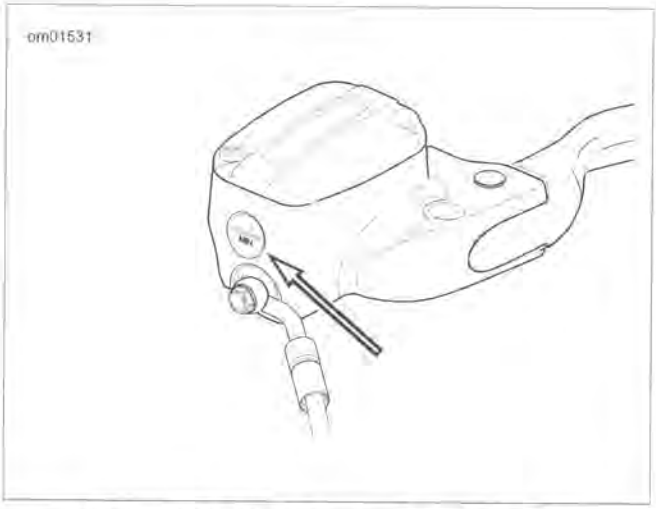


Figure 1-21. Clutch Reservoir Sight Glass

GENERAL

⚠WARNING

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

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

CLEANING

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

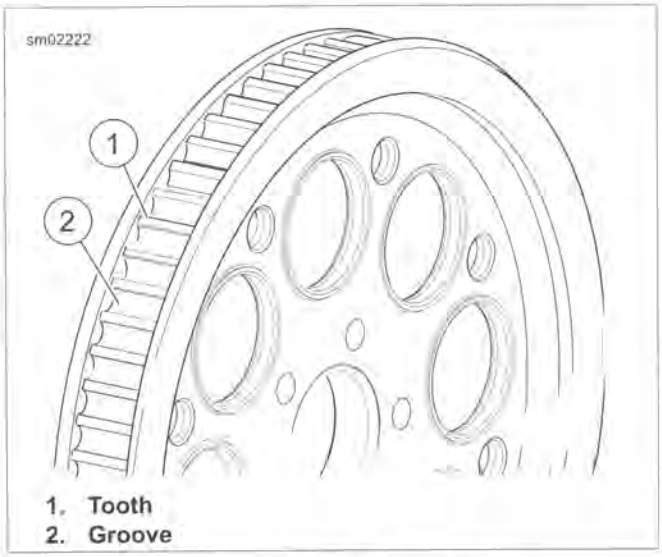
INSPECTION

Sprockets

NOTE

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

1. See Figure 1-22. Inspect each tooth (1) of rear sprocket for:
   - major tooth damage
   - large chrome chips with sharp edges
   - gouges caused by hard objects
   - excessive loss of chrome plating (see next step)
2. To check if chrome plating has worn off, drag a scribe or sharp knife point across the bottom of a groove (2) (between two teeth) with medium pressure.
   a. If scribe or knife point slides across groove without digging in or leaving a visible mark, chrome plating is still good.
   b. If scribe or knife points digs in and leaves a visible mark, it is cutting the bare aluminum. A knife point will not penetrate the chrome plating.
3. Replace rear sprocket if major tooth damage or loss of chrome exists.



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

Figure 1-22. Rear Sprocket

Drive Belt

See Figure 1-23. Inspect drive belt for:

- Cuts or unusual wear patterns.
- Outside edge beveling (8). Some beveling is common, but it indicates that sprockets are misaligned.
- Outside ribbed surface for signs of stone puncture (7). If cracks or other damage exists near edge of belt, replace belt immediately. Damage to center of belt will require belt replacement eventually. 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). This condition will result in belt failure and indicates worn transmission sprocket teeth. Replace belt and transmission sprocket.
- Signs of puncture or cracking at the base of the belt teeth. Replace belt if either condition exists.
- 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.

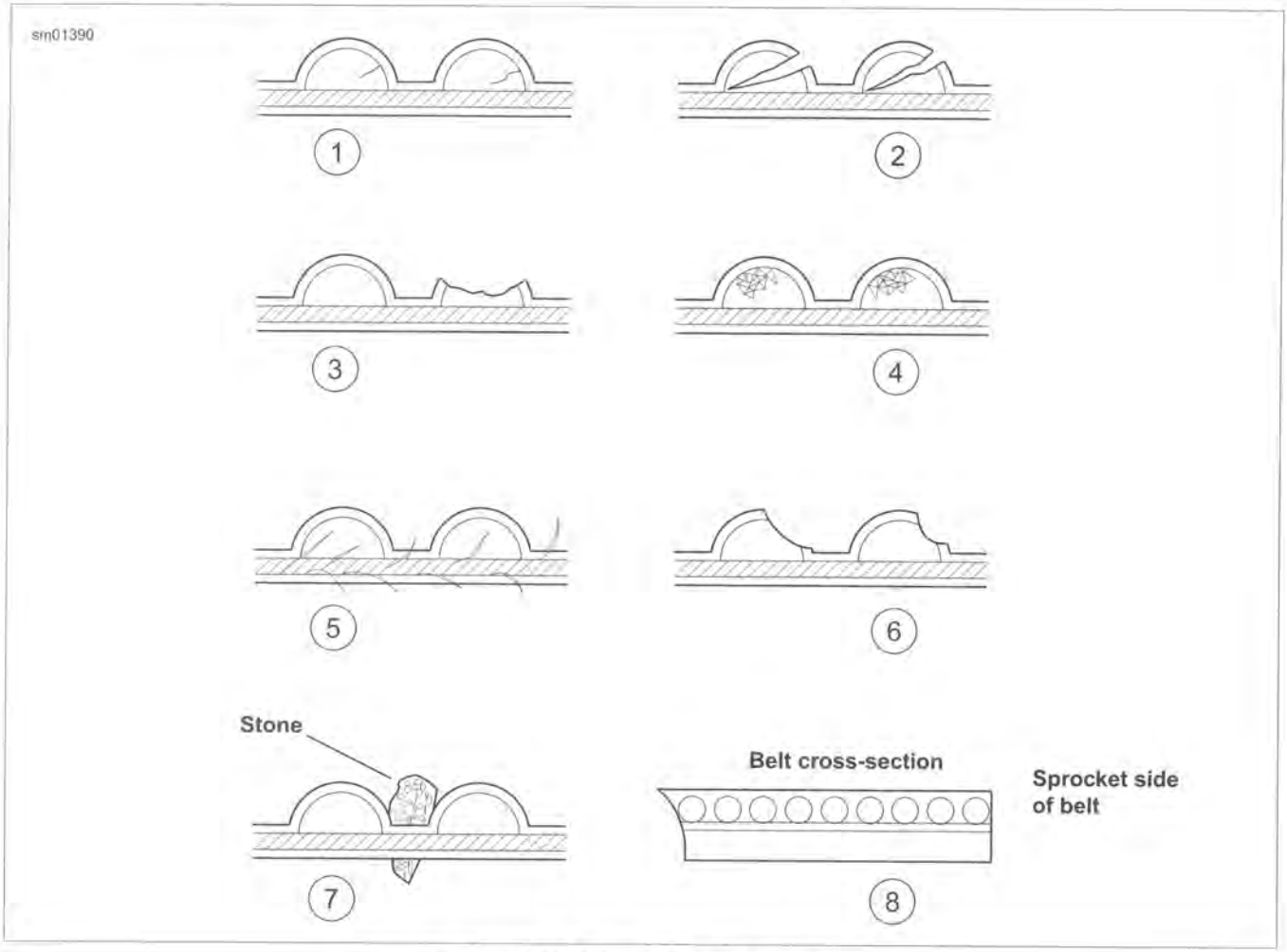


Figure 1-23. Drive Belt Wear Patterns

Table 1-11. Drive Belt Wear Analysis

PATTERN	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.

CHECKING DRIVE BELT DEFLECTION

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

NOTE

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

Check deflection:

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

⚠WARNING

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

1. Disarm security system and remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS, Main Fuse.
2. See Figure 1-24. Obtain H-D BELT TENSION GAUGE (Part No. HD-35381-A).

NOTE

Customers may purchase gauge from an authorized Harley-Davidson dealer.

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

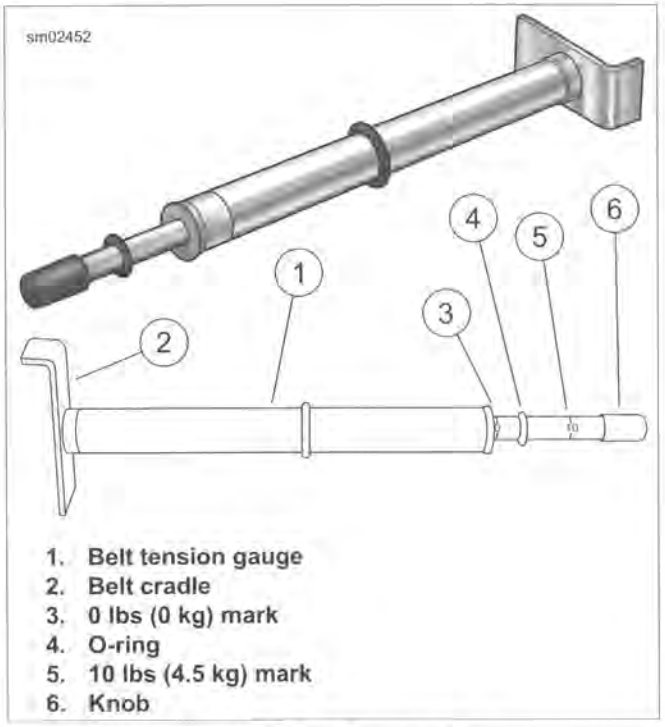
NOTE

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

4. Measure belt deflection:
   a. **Models equipped with belt deflection window:** See Figure 1-25. Measure belt deflection as viewed through belt deflection viewing window while holding gauge steady. Each deflection graduation is approximately 1/16th in (1.59 mm).
   b. **All other models:** See Figure 1-26. Measure belt deflection (4) while holding gauge steady.
5. Compare with specifications listed in Table 1-12. Adjust as necessary.
6. Install main fuse.

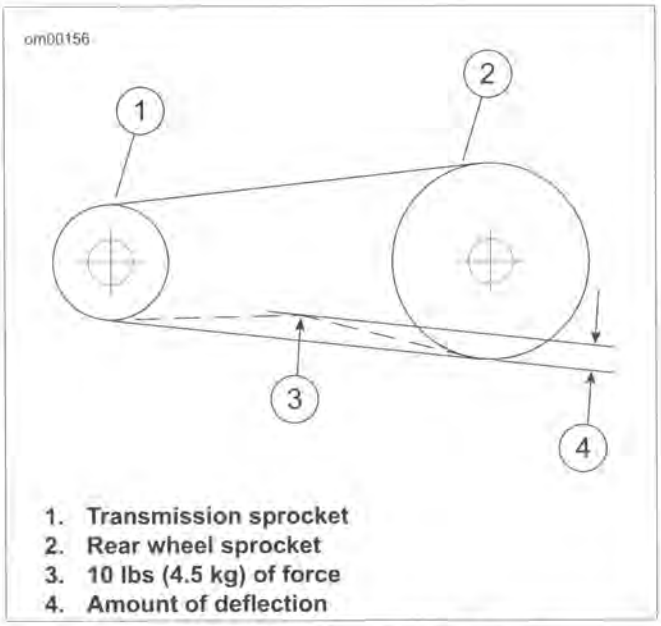
Table 1-12. Belt Deflection

MODEL	IN	MM
FLHX/S	1/4-7/16	6.4-11.1
All except FLHX/S	3/8-9/16	9.5-14.3



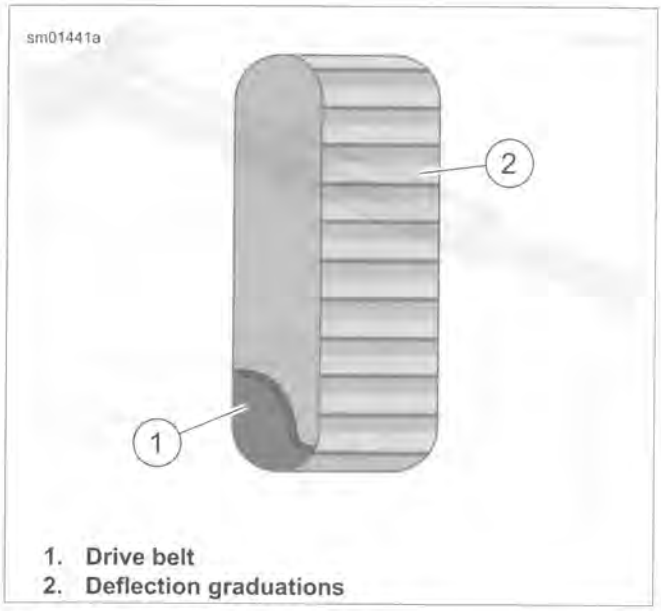
1. **Belt tension gauge**
2. **Belt cradle**
3. **0 lbs (0 kg) mark**
4. **O-ring**
5. **10 lbs (4.5 kg) mark**
6. **Knob**

Figure 1-24. Belt Tension Gauge



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

Figure 1-25. Checking Belt Deflection



1. **Drive belt**
2. **Deflection graduations**

Figure 1-26. Belt Deflection Window

SETTING BELT DEFLECTION

PART NUMBER	TOOL NAME
HD-35381A	BELT TENSION GAUGE
HD-47925	AXLE NUT TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Rear axle cone nut, 1st torque	15-20 ft-lbs	20-27 Nm
Rear axle cone nut, final torque	95-105 ft-lbs	128.8-142.4 Nm
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm

Adjustment

1. Remove both saddlebags.
2. Remove and discard E-clip from groove at end of axle.

NOTE

The AXLE NUT TORQUE ADAPTER simplifies the belt adjustment procedure by allowing the cone nut to be loosened and tightened without removing the right side muffler. The tool also can be used to rotate the weld nut on the left side.

3. See Figure 1-27. Install AXLE NUT TORQUE ADAPTER (Part No. HD-47925) perpendicular to breaker bar. For best clearance with muffler, install torque adapter on the outboard side.

NOTE

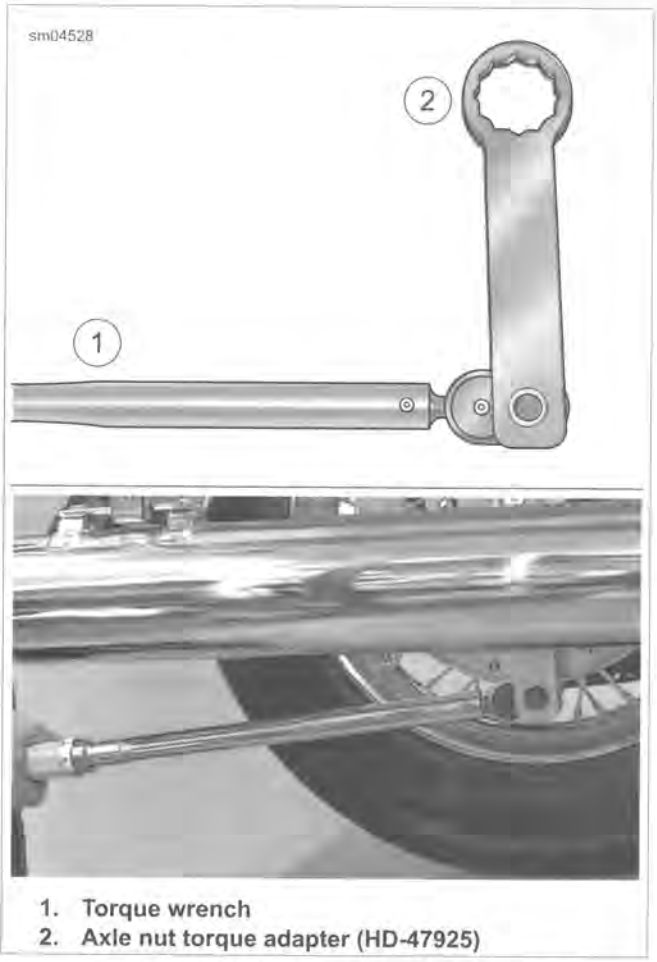
To install tools on the cone nut and weld nut, it may be beneficial to remove bolts fastening each muffler to the saddlebag frame to allow movement of the mufflers.

4. Insert tool up between rear wheel and muffler and onto cone nut. Loosen cone nut.

NOTE

Since any added length can act as a torque multiplier, the torque wrench must be perpendicular to the torque adapter.

5. Install AXLE NUT TORQUE ADAPTER (Part No. HD-47925) on torque wrench, perpendicular to torque wrench.
6. Insert tool up between rear wheel and muffler to capture cone nut.
7. See Figure 1-28. Push wheel forward and verify that cam (5) contacts boss (4) on both sides of rear fork.
8. For purposes of adjustment only, snug the cone nut (6) to 15-20 ft-lbs (20-27 Nm).
9. Use BELT TENSION GAUGE (Part No. HD-35381A) to check belt deflection as adjustment is made. See 1.14 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection.



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

Figure 1-27. Install Tool Perpendicular to Torque Wrench

NOTE

It may be beneficial to use a second AXLE NUT TORQUE ADAPTER (Part No. HD-47925) to rotate and hold the weld nut. The position of the breaker bar or ratchet in relation to the tool is not important. Mate the tools in any position that will make use easy.

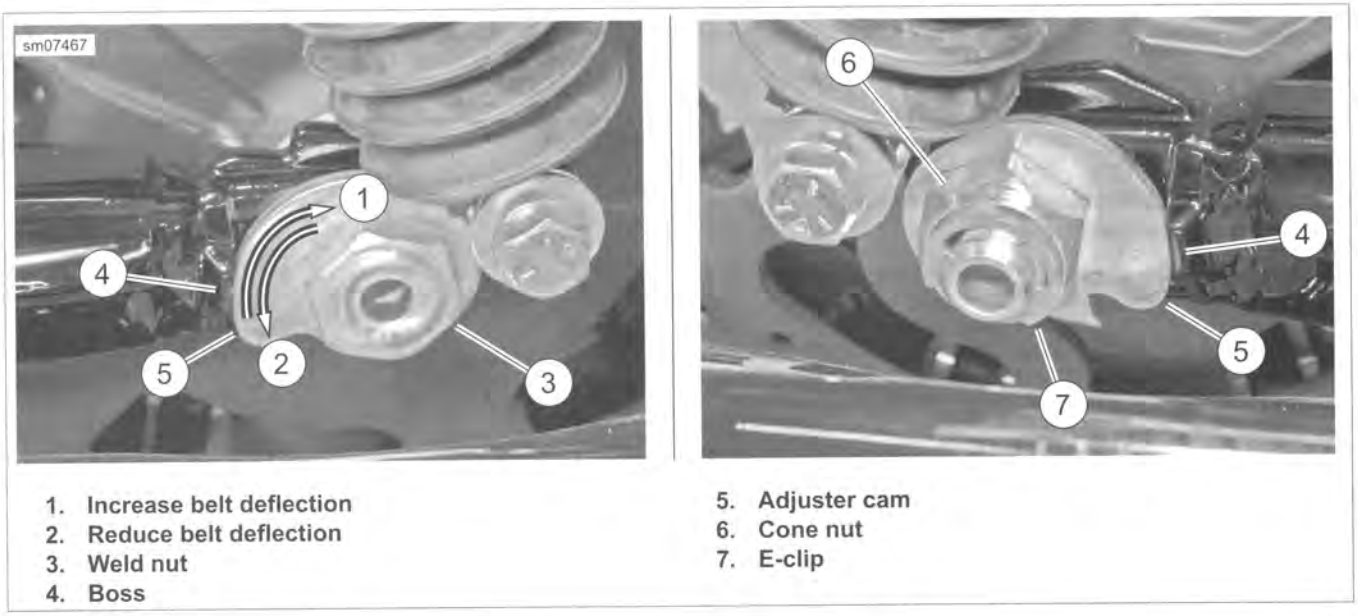
10. See Figure 1-28. Rotate weld nut (3) on left side of axle to adjust belt tension; clockwise to tighten or counterclockwise to loosen. If loosening the belt tension, push the wheel forward. Verify both cams (5) touch the bosses (4) on both sides after the weld nut is rotated.
11. When correct tension is obtained, verify the cams touch the bosses on both sides of the rear fork.

Assembly

NOTE

It is important that the weld nut does not rotate once belt tension is correct. If the axle moves during tightening of the cone nut, the belt deflection procedure must be restarted.

1. Hold weld nut and tighten cone nut to 95-105 ft-lbs (128.8-142.4 Nm).
2. Again, verify the cams touch the bosses on both sides of the rear fork. Check belt deflection to verify that it is still within specification.
3. With the flat side out, install **new** E-clip in groove on right side of axle.
4. If removed, install fasteners that attach mufflers to the saddlebag frames and tighten to 96-144 **in-lbs** (10.8-16.3 Nm).
5. Install saddlebags.



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

Figure 1-28. Rear Wheel Adjuster Cams

INSPECTION

1. Support the vehicle in an upright position in neutral and in a fashion that will not allow the rear wheel to rotate. Do not lift the wheels off the ground.
2. Remove left saddlebag.
3. See Figure 1-29. Hang a weighted string (1) on the left axle spacer as close as possible to, but not touching, the rear sprocket.
4. Place a piece of masking tape on the face of the sprocket where the marks will be drawn.

NOTE

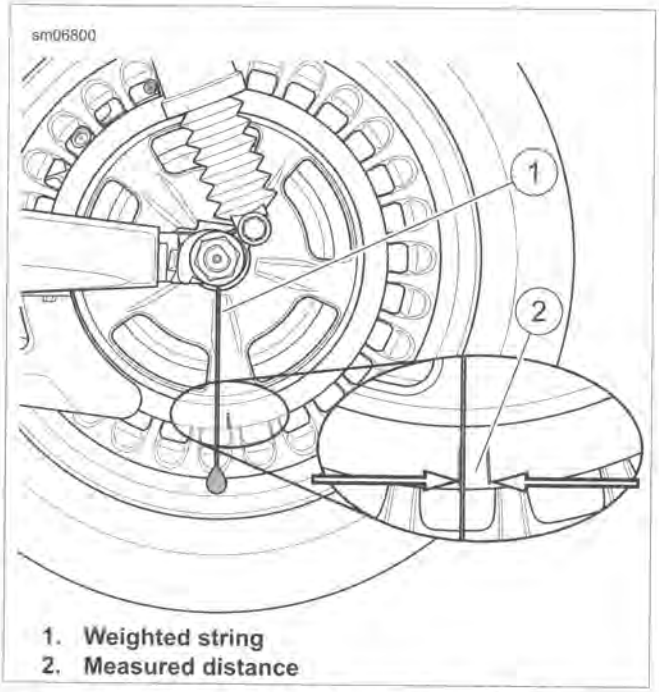
Do not allow the rear wheel to rotate when rotating the sprocket. A false measurement will occur.

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

NOTE

Visually inspect components when disassembled. See 2.6 REAR WHEEL COMPENSATOR to repair the rear wheel compensator.

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



1. **Weighted string**
2. **Measured distance**

Figure 1-29. Check Compensator Wear

CHASSIS LUBRICATION

Refer to Table 1-4. Inspect and lubricate the following components according to the maintenance schedule. Use HARLEY LUBE for components unless otherwise specified. See the service manual for additional lubrication instructions.

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

- Front brake lever
- Clutch control hand lever
- Foot shift lever pivot
- Rear brake lever pivot
- Hinges and latches (such as fuel door and footrests)
- Locks, as required
- Jiffy stand (use ANTI-SEIZE LUBRICANT)

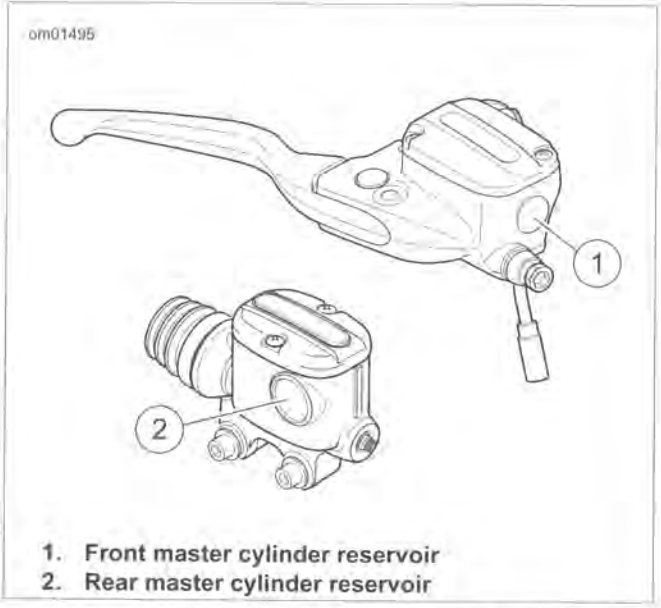
FLUID INSPECTION

1. Position vehicle for inspection.
   a. **Front brake:** Position vehicle on a flat level surface. Turn handlebar so front brake master cylinder is approximately level.
   b. **Rear brake:** Have an assistant hold vehicle upright on a level surface.
2. See Figure 1-30. View reservoir sight glass and verify fluid presence.

NOTES

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

3. If fluid is not visible through sight glass, check brake system for fluid leaks. Check that brake pads and rotors are properly installed and not worn beyond service wear limits. Perform any necessary repairs. See 1.18 BRAKE PADS AND DISCS.
4. If the above checks do no reveal the cause, remove cover and verify fluid level. If necessary, add DOT 4 BRAKE FLUID to reservoir. Replace cover. See 2.18 BLEEDING BRAKES.
5. Front brake hand lever and rear brake foot pedal must have a firm feel when applied. If not, bleed system using only DOT 4 BRAKE FLUID. See 2.18 BLEEDING BRAKES.



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

Figure 1-30. Brake Fluid Sight Glass (typical)

BRAKE FLUID REPLACEMENT

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Brake bleeder valve, front	72-108 **in-lbs**	8.1-12.2 Nm
Brake bleeder valve, rear	75-102 **in-lbs**	8.5-11.5 Nm
Brake master cylinder, front, reservoir cover screws	12-15.0 **in-lbs**	1.3-1.7 Nm
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm

NOTES

- *BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool is required.*
- *This procedure is meant to replace fluid without introducing air. If any air enters lines during this procedure, revert to 2.18 BLEEDING BRAKES.*

1. Remove bleeder screw cap. Install vacuum brake bleeder to bleeder screw.
2. Position vehicle or handlebar so master cylinder reservoir is level.

NOTES

- *Wrap a clean shop towel around the outside of the master cylinder reservoir to protect paint from brake fluid spills.*
- *Clean master cylinder reservoir cover before removal.*

3. Remove cover from master cylinder reservoir.

⚠WARNING

A plugged or covered relief port can cause brake drag or lock-up, which could lead to loss of control, resulting in death or serious injury. (00288a)

NOTE

A spurt may not be seen on models having remote reservoirs.

4. Add brake fluid as necessary. Verify proper operation of the master cylinder relief port by actuating the brake pedal or lever. A slight spurt of fluid will break the fluid surface in the reservoir if internal components are working properly. Refer to Table 1-13.

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.

5. Operate vacuum bleeder while maintaining fluid level in master cylinder reservoir.
   a. Following the sequence in Table 1-15, open bleeder screw about 3/4 turn.
   b. Continue until specified volume has been replaced. Refer to Table 1-15.
   c. Tighten bleeder screw to specification. Refer to Table 1-14. Install bleeder screw cap.
6. Repeat with each caliper following the sequence in Table 1-15 until all brake lines have been serviced.
7. Fill reservoir to specified level.
8. Refer to Table 1-14. Clean gasket and sealing surfaces of debris. Install master cylinder reservoir cover:
   a. **Front master cylinder reservoir:** Orient the cover with the vent holes facing the rear. Install cover screws. Tighten to specification.
   b. **Rear master cylinder reservoir:** Install cover screws. Tighten to specification.
9. Apply brakes to check proper lamp operation.

⚠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)

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

Table 1-13. Fluid Level

ITEM	SPECIFICATION
Front reservoir	Boss or ridge
Rear reservoir	Ledge or range window

Table 1-14. Torque Specifications

COMPONENT	TORQUE
Bleeder valve, front	72-108 **in-lbs** (8.1-12.2 Nm)
Bleeder valve, rear	75-102 **in-lbs** (8.5-11.5 Nm)
Front cover	12-15.0 **in-lbs** (1.3-1.7 Nm)
Rear cover	12-15 **in-lbs** (1.4-1.7 Nm)

Table 1-15. Bleeding Sequence

SYSTEM TYPE	CIRCUIT	VOLUME
Non-ABS	Front left	3 oz (89 cc)
	Front right	3 oz (89 cc)
	Rear	3 oz (89 cc)
ABS	Front left	6 oz (178 cc)
	Front right	3 oz (89 cc)
	Rear	3 oz (89 cc)

BRAKE LINES INSPECTION

Inspect brake lines for leaks, contact or abrasion. Refer to Table 1-16.

Table 1-16. Brake Line Inspection

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

* If there is line contact, reposition the line. If base material is visible, prevent corrosion with touch-up paint.

INSPECTION

Check brake pads and discs:

- At every scheduled service interval.
- Whenever the components are removed during service procedures.

Brake Pads

⚠CAUTION

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

NOTICE

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

⚠WARNING

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

Replace both rear brake pads if the friction material of either pad is worn to 0.016 in (0.4 mm) or less above the backing plate.

Replace all front brake pads (inner and outer pads of both the left and right side calipers) if the friction material of any single pad is worn to 0.016 in (0.4 mm) or less above the backing plate.

NOTES

- *See Figure 1-32. Wear indicator grooves provide visual indication of pad wear.*
- *Front left pads may wear more rapidly depending on how the vehicle is ridden.*

Always install a **new** pad pin (provided in brake pad service kit) whenever the brake pads are replaced.

Inspect brake lines and hoses for damage or wear.

Brake Disc Thickness

Minimum acceptable thickness is stamped on side of disc.

- **Front:** 0.180 in (4.5 mm)
- **Rear:** 0.180 in (4.5 mm)

Replace disc if warped, badly scored or worn beyond service limit.

Brake Disc Lateral Runout

Measure brake disc runout using a dial indicator mounted to a stationary surface. Maximum brake disc lateral runout is 0.008 in (0.2 mm) when measured near the outside diameter of the disc.

BRAKE PAD REPLACEMENT

FASTENER	TORQUE VALUE	
Brake caliper, rear, pad pin	75-102 **in-lbs**	8.5-11.5 Nm
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm
Brake caliper, front, pad pin	75-102 **in-lbs**	8.5-11.5 Nm
Brake caliper, front, mounting screws	28-38 ft-lbs	37.9-51.5 Nm
Brake master cylinder, front, reservoir cover screws	11.5-15.0 **in-lbs**	1.3-1.7 Nm

Rear Brake Caliper

1. Remove right side saddlebag. See 2.31 SADDLEBAGS, Removal.
2. **ABS equipped:** Release rear wheel speed sensor cable from retainer clip on brake hose.
3. Remove two screws to release brake caliper from caliper bracket.
4. Remove brake caliper from brake disc.

NOTE

Do not operate the brake pedal with the rear brake caliper removed or the caliper pistons may be forced out. The caliper contains no serviceable components and would require replacement.

5. Stand motorcycle upright with rear master cylinder reservoir level. Wrap a clean shop cloth around the outside of the reservoir to protect paint from brake fluid spills.
6. Remove master cylinder reservoir cover.

NOTE

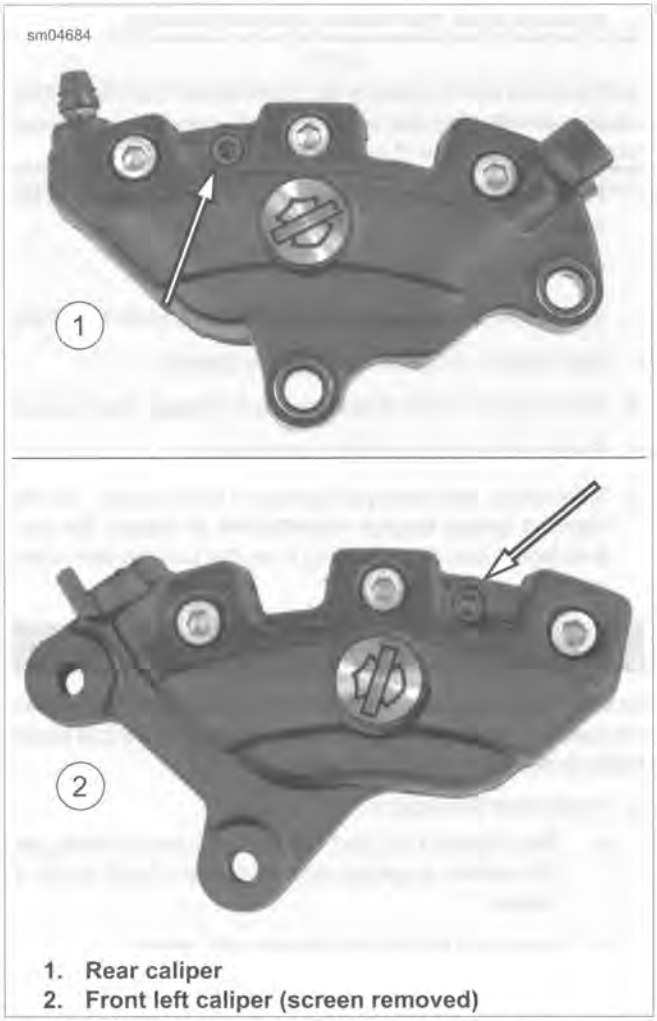
Fluid level will rise as pistons are pushed into the caliper, possibly overflowing the master cylinder reservoir. Remove fluid from the reservoir if necessary.

7. Push each pad back until pistons are fully seated in the bores.
8. See Figure 1-34. Pull retaining clip (3) from groove in pad pin.
9. See Figure 1-31. Remove pad pin (metric).
10. Pull on pad pin side of brake pads to release from caliper.
11. See Figure 1-34. Remove pad spring (1) if damaged or worn.
12. If removed, seat **new** pad spring on flat in caliper so clips on spring engage indentations in caliper. Be sure that

forked end of pad spring is on the pad pin side of the caliper.

⚠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. **Rear caliper**
2. **Front left caliper (screen removed)**

Figure 1-31. Brake Caliper Pad Pin

13. Install **new** brake pads:
    a. See Figure 1-32 and Figure 1-33. Insert brake pad into caliper engaging square corner of pad in slot of caliper.
    b. Push pad pin tab into caliper until seated.
    c. Verify that brake pad friction material faces brake disc gap in caliper.
    d. Repeat step to install remaining brake pad.
14. Verify that pad pin tabs are centered under forks of pad spring. Adjust pads if necessary.
15. Install **new** pad pin. Tighten to 75-102 **in-lbs** (8.5-11.5 Nm).
16. See Figure 1-34. Install retaining clip in groove of pad pin, so that lip overhangs caliper housing.
17. Install brake caliper onto brake disc and install two screws. Tighten to 43-48 ft-lbs (58.3-65.1 Nm).
18. **ABS equipped:** Secure sensor cable with clip on brake hose.

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

19. Operate brake pedal several times to set brake pads to proper operating position.
20. See Figure 1-35. Check brake fluid level in master cylinder reservoir. If necessary, add DOT 4 BRAKE FLUID until level is flush with ledge cast at front of reservoir.
21. Install master cylinder reservoir cover with screws. Tighten to 12-15 **in-lbs** (1.4-1.7 Nm).
22. Install right side saddlebag. See 2.31 SADDLEBAGS, Installation.

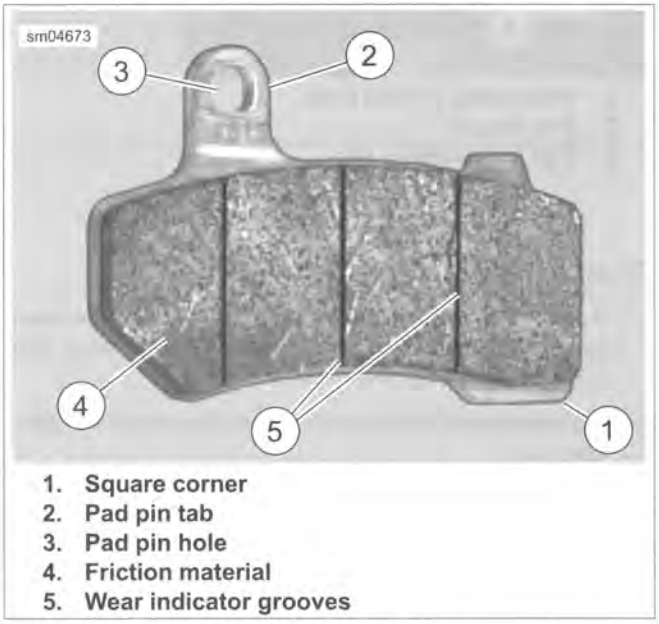
⚠WARNING

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)

23. Test brake system.
    a. Turn ignition switch ON. Press brake pedal to verify operation of stop lamp.
    b. Test ride motorcycle. Bleed the system if brakes feel spongy. See 2.18 BLEEDING BRAKES.

NOTE

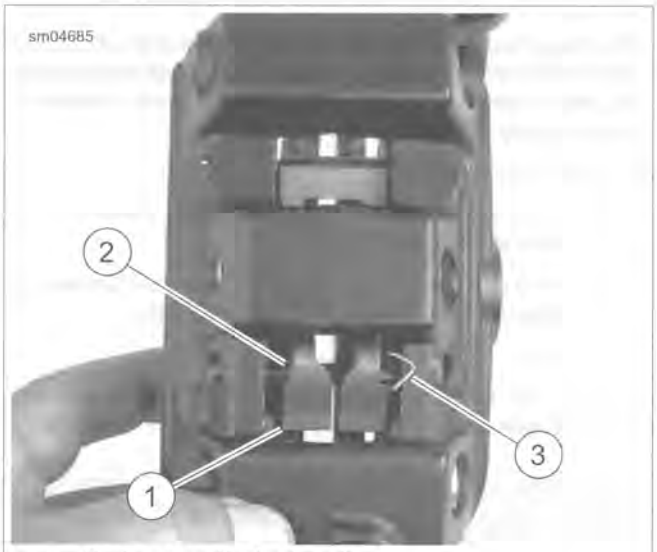
*Avoid making hard stops for the first 100 miles (160 km). This allows the **new** pads to become conditioned to the brake discs.*



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

Figure 1-32. Brake Pad

Figure 1-33. Brake Caliper (Bottom View)



1. **Pad spring (forked end)**
2. **Pad pin tab**
3. **Pad pin retaining clip**

Figure 1-34. Brake Caliper (Top View)

Front Brake Calipers

1. If present, carefully cut cable straps to release front wheel speed sensor cable and front fender tip lamp wires from brake hose to left brake caliper.
2. **ABS equipped:** Release front wheel speed sensor cable from clip:
   a. Push on lip at rear of clip to disengage from bracket.
   b. Rotate tab (stamped ABS) rearward until clip is perpendicular to bracket and remove cable.
3. Remove two brake caliper mounting screws. Slide brake caliper straight down off from brake disc. Temporarily secure caliper to engine guard.

NOTE

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

4. Turn front wheel to left until front master cylinder reservoir is level. Wrap a clean shop cloth around the outside of the reservoir to protect paint from brake fluid spills.
5. Remove cover from master cylinder reservoir.

NOTE

Fluid level will rise as pistons are pushed back into the caliper, possibly overflowing the master cylinder reservoir. Remove fluid from the reservoir if necessary.

6. Push each pad back until pistons are fully seated in the bores.
7. Remove screen from caliper.
8. See Figure 1-34. Pull retaining clip from groove in pad pin.
9. See Figure 1-31. Remove pad pin (metric).
10. Pull on pad pin end of brake pads to release from caliper.
11. Remove pad spring if damaged or worn.
12. If removed, seat **new** pad spring on flat in caliper, so that clips on spring engage indentations in caliper. Be sure that forked end of pad spring is on the pad pin side of the caliper.

⚠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)

13. Install **new** brake pads:
    a. See Figure 1-32 and Figure 1-33. Insert brake pad into caliper engaging square corner of pad in slot of caliper.
    b. Push pad pin tab into caliper until seated.
    c. Verify that brake pad friction material faces brake disc gap in caliper.
    d. Repeat step to install remaining brake pad.
14. Verify that pad pin tabs are centered under forks of pad spring. Adjust pads if necessary.
15. Install **new** pad pin. Tighten to 75-102 **in-lbs** (8.5-11.5 Nm).
16. See Figure 1-34. Install retaining clip in groove of pad pin, so that lip overhangs caliper housing.
17. Engage two prongs on screen beneath forked end of pad spring and push on single prong side of screen until engaged.
18. Install brake caliper:
    a. Install caliper with bleeder at top (and cable clip/bracket if ABS equipped). Secure with two screws.

NOTE

Confirm that tab (stamped ABS) on clip is installed in slot of bracket from inboard side. Clip cannot be installed once mounting screws are started.

b. Tighten mounting screws to 28-38 ft-lbs (37.9-51.5 Nm).

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

19. Install **new** cable straps to secure brake hose and wheel speed sensor if equipped.
20. **ABS equipped:** Install front wheel speed sensor cable in clip. See 2.17 ABS MODULE.

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

21. Operate brake lever several times to set brake pads to proper operating position.
22. See Figure 1-35. Check brake fluid level in master cylinder reservoir. If necessary, add DOT 4 BRAKE FLUID until level is flush with step (marked MAX) cast at rear of reservoir.

NOTE

Orient the cover with the vent holes facing the rear.

23. Verify gasket and sealing surfaces are free of debris. Install master cylinder reservoir cover. Tighten to 11.5-15.0 **in-lbs** (1.3-1.7 Nm).

⚠WARNING

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

24. Test brake system.
    a. Turn ignition switch ON. Squeeze brake lever to verify operation of stop lamp.
    b. Test ride motorcycle. Bleed system if brakes feel spongy. See 2.18 BLEEDING BRAKES.

NOTE

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

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

Figure 1-35. Brake Fluid Level

REMOVAL

⚠WARNING

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

NOTE

Allow the engine to cool before servicing.

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

INSPECTION

NOTE

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

See Figure 1-36. Compare plug deposits to Table 1-17.

Figure 1-36. Spark Plug Deposits

Table 1-17. Spark Plug Deposit Analysis

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

* See Figure 1-36.
** The glassy deposit on a spark plug may cause high-speed misfiring.

CLEANING

⚠WARNING

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

If the plugs require cleaning between tune-ups:

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

NOTE

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

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

INSTALLATION

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

1. Verify proper gap before installing **new** or cleaned spark plugs.
   a. Select a wire-type feeler gauge within specification. Refer to Table 1-18.

NOTE

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

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

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

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

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

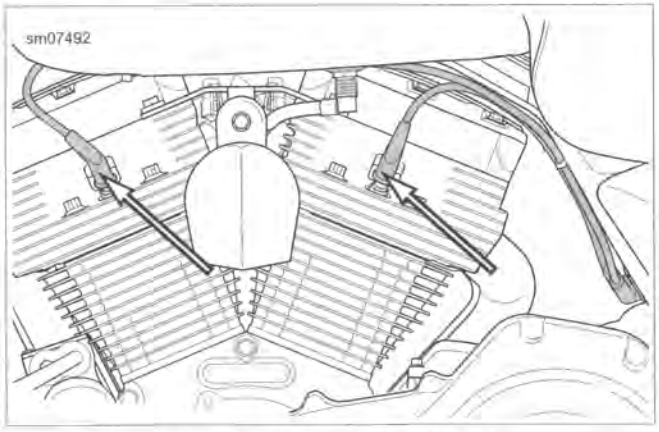


Figure 1-37. Spark Plug Wires

Table 1-18. Spark Plug Gap

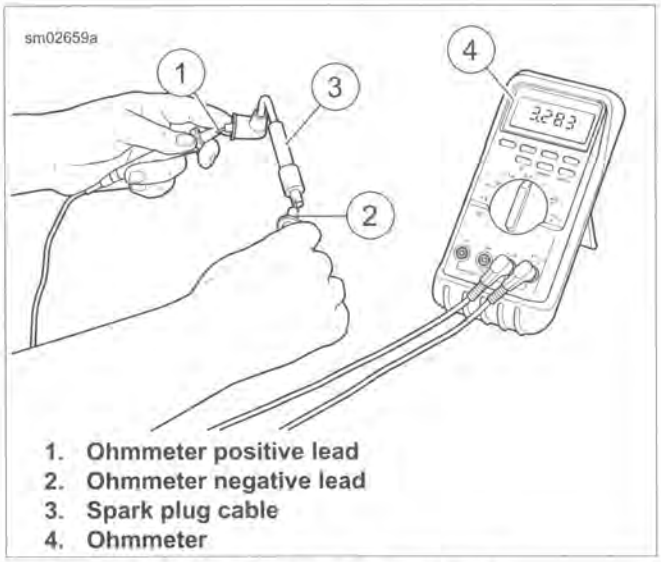
MODEL	TYPE	in	mm
All Models	HD-6R12	0.038-0.043	0.97-1.09

SPARK PLUG CABLE INSPECTION

1. Inspect spark plug cables. Replace if necessary.
   a. Check for cracks or loose terminals.
   b. Check for loose fit on ignition coil and spark plugs.
2. Check cable boots/caps for cracks or tears. Replace boots/caps that are worn or damaged.
3. See Figure 1-38. Check spark plug cable resistance with an ohmmeter. Replace cables not meeting resistance specifications. Refer to Table 1-19.

Table 1-19. Spark Plug Cable Resistance Values

DESCRIPTION	LENGTH		RESISTANCE VALUE (OHMS)
	In.	mm	
Front cable	34.75	883	8688-23,178
Rear cable	16.75	425	4188-11,172



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

Figure 1-38. Testing Resistance

CHECKING SWING-BACK

FASTENER	TORQUE VALUE	
Upper steering stem pinch screw	22-26 ft-lbs	29.8-35.2 Nm

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on 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)

⚠WARNING

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

NOTES

- *A steering head that is too tight can interfere with the vehicle's ability to absorb a weave. A steering head that is too loose can interfere with the vehicle's ability to absorb a wobble.*
- *This procedure is for 2-wheel vehicles only. Trike does not require this check due to the use of a steering damper.*

Measure Swing-Back

1. Vehicle must be in original equipment configuration. Remove all accessory weight, such as a windshield bag and contents or handlebar mounted navigation unit, that could influence the way the front fork swings.
2. **Models with cable clutch:** Disconnect clutch cable from hand control. Secure out of the way.
3. **Models with hydraulic clutch:** Leave fully assembled.

NOTE

Lower frame rails MUST be level for a valid check.

4. Lift entire vehicle until tires are off the ground. Using a level, verify that the lower frame rails are level front to rear and left to right.
5. Swing the front end from stop-to-stop to check for smooth movement.
6. Verify that there is no clunk:
   a. Grasp both forks near the front axle.
   b. Shake front to rear checking for a clunk. A clunk indicates loose fork stem. Disassemble and inspect before performing swing-back check. See 1.20 STEERING HEAD BEARINGS, Inspection and Lubrication.
7. Tape a lightweight piece of cardboard 8-10 in (20-25 cm) wide across the tip of the front fender. Install centered and even with fender tip.
8. Place a pointer on the floor with the tip near the cardboard. With the front wheel straight forward, center the pointer on the cardboard.

NOTE

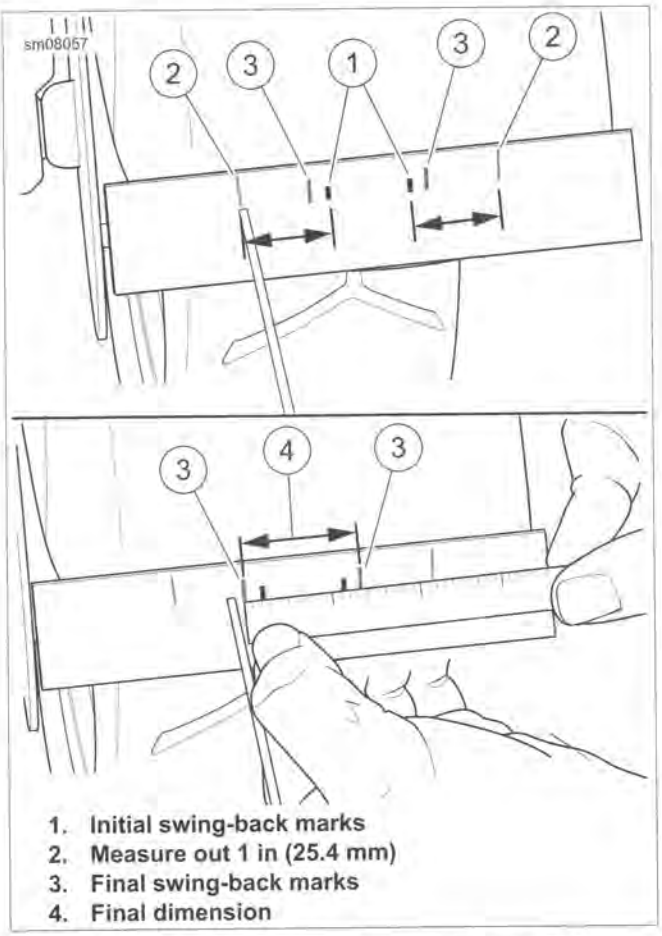
To avoid confusion, use three different colors to make the following marks.

9. See Figure 1-39. Lightly tap the front tire to the left until it just begins to swing back toward center. Mark the point (1) where it began to swing back.
10. Repeat by lightly tapping the front tire to the right. Mark the point (1) where it began to swing back.
11. Repeat two more times in each direction to validate marks.
12. Measure outboard 1 in (25.4 mm) from each mark (1). Mark these points (2).
13. Turn the front end until the pointer is at the left mark (2) and release. Mark where the swing stops (3).
14. Turn the front end until the pointer is at the right mark (2) and release. Mark where the swing stops (3).

NOTE

Marks (3) must fall between marks (1) and (2). If marks (3) are between marks (1), steering is too loose. Proceed to Adjusting Swing-Back later in this section.

15. Repeat two more times to validate final swing-back marks in each direction.
16. Measure the distance (4) between final swing-back marks (3). The readings must be within the values specified in Table 1-20.
17. A measurement greater than specification indicates that the steering stem is too tight. A measurement less than specification indicates that the steering stem is too loose. To adjust, see Adjusting Swing-Back below.



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

Figure 1-39. Marking and Measuring Swing Points

Table 1-20. Steering Swing-Back

MODEL	SPECIFICATION
Fairing models	1.7-2.6 in (4.3-6.6 cm)
Road King	3.4-4.8 in (8.6-12.2 cm)
Trike	N/A (N/A)

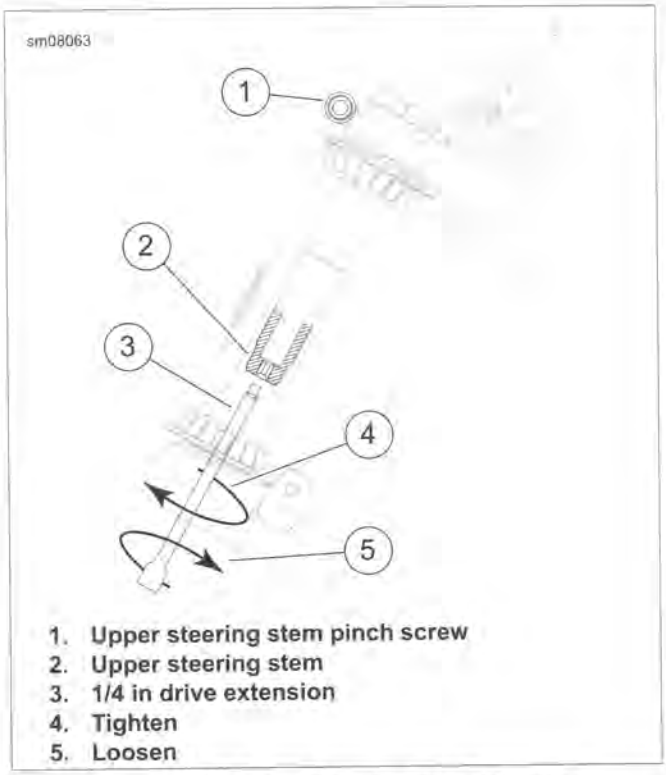
Adjusting Swing-Back

1. Disassemble motorcycle:
   a. **Road King models:** Remove headlamp. See 7.9 HEADLAMP.
   b. **Fairing models:** Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD, Outer Fairing and Windshield.
2. See Figure 1-40. Loosen upper steering stem pinch screw (1).

NOTE

Protect front fender from damage.

3. Adjust steering stem:
   a. Engage a 1/4 inch drive extension (3) six inches long into the bottom of upper steering stem (2).
   b. Based on swing-back dimension, tighten (4) (to increase dimension) or loosen (5) (to decrease dimension) the upper steering stem a few degrees.
   c. Tighten steering stem pinch screw to 22-26 ft-lbs (29.8-35.2 Nm).
4. Install headlamp, outer fairing and auxiliary/fog lamps. Do not tighten fasteners.
5. Check swing-back. Repeat until swing-back is within specification.
6. Assemble motorcycle:
   a. **Road King models:** Install headlamp. See 7.9 HEADLAMP.
   b. **Fairing models:** Install outer fairing and auxiliary/fog lamps. See 2.37 UPPER FAIRING AND WINDSHIELD, Outer Fairing and Windshield.
7. Install any accessories removed earlier.



1. **Upper steering stem pinch screw**
2. **Upper steering stem**
3. **1/4 in drive extension**
4. **Tighten**
5. **Loosen**

Figure 1-40. Adjust Steering Stem Bearings

FASTENER	TORQUE VALUE	
Upper steering stem, 1st torque	35 ft-lbs	47.5 Nm
Upper steering stem, final torque: Fairing models	60-65 **in-lbs**	6.8-7.3 Nm
Upper steering stem, final torque: Road King models	110-115 **in-lbs**	12.4-13.0 Nm
Upper steering stem, final torque: Trike models	110-115 **in-lbs**	12.4-13.0 Nm

1. Disassemble motorcycle:
   a. **Road King models:** Remove headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fairing models:** Remove inner fairing. See 2.39 INNER FAIRING, Inner Fairing Assembly Removal and Installation.
2. Remove upper fork bracket and handlebar as an assembly. Support out of the way. See 2.20 STEERING HEAD BEARINGS, Upper Fork Bracket.
3. Raise front end until tire is just touching surface.

NOTE

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

4. Remove upper steering stem. See 2.20 STEERING HEAD BEARINGS.
5. Raise motorcycle until lower stem bearing has exited far enough to clean grease from bearing cup and cone.

NOTE

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

6. Wipe grease from upper and lower bearing cups and cones. Inspect parts for wear or damage.
7. Pack bearings with SPECIAL PURPOSE GREASE.
8. Lower motorcycle until lower bearing just is seated. Do not place entire weight of vehicle on bearing.
9. Apply SPECIAL PURPOSE GREASE to the threads of the upper and lower steering stems.
10. Install upper steering stem (3). Tighten to 35 ft-lbs (47.5 Nm).
11. Lower vehicle until forks begin to compress.
12. Loosen upper steering stem 90-100 degrees. Tighten to specification. Refer to Table 1-21.
13. Install upper fork bracket and handlebar. Assemble motorcycle. See 2.20 STEERING HEAD BEARINGS.
14. Check swing-back. Adjust if necessary. See 1.20 STEERING HEAD BEARINGS, Checking Swing-Back.

Table 1-21. Steering Stem Torque

MODEL	TORQUE
Fairing models	60-65 **in-lbs** (6.8-7.3 Nm)
Road King	110-115 **in-lbs** (12.4-13.0 Nm)
Trike	110-115 **in-lbs** (12.4-13.0 Nm)

AIR SUSPENSION

PART NUMBER	TOOL NAME
HD-34633A	AIR SUSPENSION PUMP AND GAUGE

See Figure 1-41. Adjust the rear air suspension by adding or removing air from the air valve located near the left upper shock absorber mount. Always adjust pressures with the motorcycle on the jiffy stand.

⚠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)

Air pressure may be varied to suit load conditions, riding style and personal comfort.

- Less initial pressure does not necessarily result in a softer ride. Refer to Table 1-22 or Table 1-23 as a starting point for rear air suspension pressures.
- Do not exceed maximum GVWR when loading vehicle.
- Do not pressurize system in excess of 50 psi (345 kPa).

NOTICE

Do not exceed maximum air pressure for suspension. Air components fill rapidly. Therefore, use low air line pressure. Failure to do so can result in possible damage to components. (00165b)

NOTES

- *Use AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633A) to adjust suspension air pressure.*
- *Use a no-loss air gauge to check air pressure. Check suspension pressure weekly if used daily or before each trip if used occasionally.*
- *Improper inflation can result in a reduction of available suspension travel. This reduces rider comfort and may cause damage to shock absorbers.*

⚠WARNING

Use caution when bleeding air from the suspension. Moisture combined with lubricant may leak onto the rear wheel, tire and/or brake components and adversely affect traction, which could result in death or serious injury. (00084a)

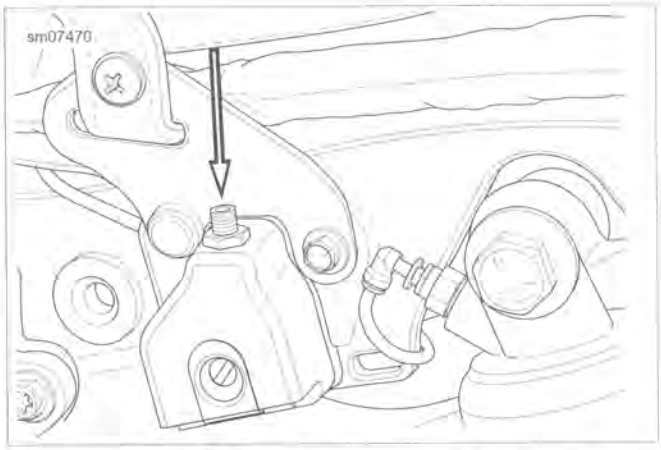


Figure 1-41. Rear Air Suspension Air Valve

Table 1-22. Recommended Suspension Air Pressure: Models With Tour-Pak

SHOCK LOAD	TOTAL WEIGHT	PRESSURE	
		PSI	kPa
Solo rider	up to 150 lb (68 kg)	5-10	34-69
	150-200 lb (68-91 kg)	10-20	69-138
	200-250 lb (91-113 kg)	20-30	138-206
	250-300 lb (113-136 kg)	30-40	206-276
	300 lb (136 kg) to maximum added weight allowed*	40-50	276-345
Solo rider with capacity luggage of 70 lbs (32 kg)	up to 150 lb (68 kg)	25-30	172-206
	150-200 lb (68-91 kg)	30-40	206-276
	200-250 lb (91-113 kg)	40-50	276-345
	250 lb (113 kg) to maximum added weight allowed*	50	345
Rider plus passenger	Any weight up to maximum added weight allowed*	50	345
Maximum loaded vehicle	Maximum added weight allowed*	50	345
Do **not** exceed 50 psi (345 kPa) suspension pressure. *Refer to Table 2-4 for maximum added weight allowed on the motorcycle.			

Table 1-23. Recommended Suspension Air Pressure: Models Without Tour-Pak

SHOCK LOAD	TOTAL WEIGHT	PRESSURE	
		PSI	kPa
Solo rider	up to 150 lb (68 kg)	0	0
	150-200 lb (68-91 kg)	0-10	0-69
	200-250 lb (91-113 kg)	10-20	69-138
	250-300 lb (113-136 kg)	20-30	138-206
	300 lb (136 kg) to maximum added weight allowed*	30-50	206-345
Solo rider with capacity luggage of 40 lbs (18 kg)	up to 150 lb (68 kg)	10-20	69-138
	150-200 lb (68-91 kg)	20-30	138-206
	200-250 lb (91-113 kg)	30-40	206-276
	250-300 lb (113-136 kg)	40-50	276-345
	300 lb (136 kg) to maximum added weight allowed*	50	345
Rider plus passenger	Any weight up to maximum added weight allowed*	40-50	276-345
Maximum loaded vehicle	Maximum added weight allowed*	50	345
If an optional Tour-Pak is installed, add 5-10 psi (34-69 kPa) to shock pressure. Do **not** exceed 50 psi (345 kPa) suspension pressure. *Refer to Table 2-5 for maximum added weight allowed on the motorcycle.			

MANUAL SUSPENSION PRELOAD

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

- Increase preload to accommodate the total load on the motorcycle.
- Reduce the preload if carrying less weight.

1. Remove the left saddlebag.
2. See Figure 1-42. Rotate the preload adjustment knob counterclockwise until it stops. This is the minimum preload position.
3. Refer to Table 1-24. Increase preload by rotating knob clockwise. Match preload setting to the total weight of the rider, passenger and cargo. The knob will click after each half rotation.
4. Install the left saddlebag.

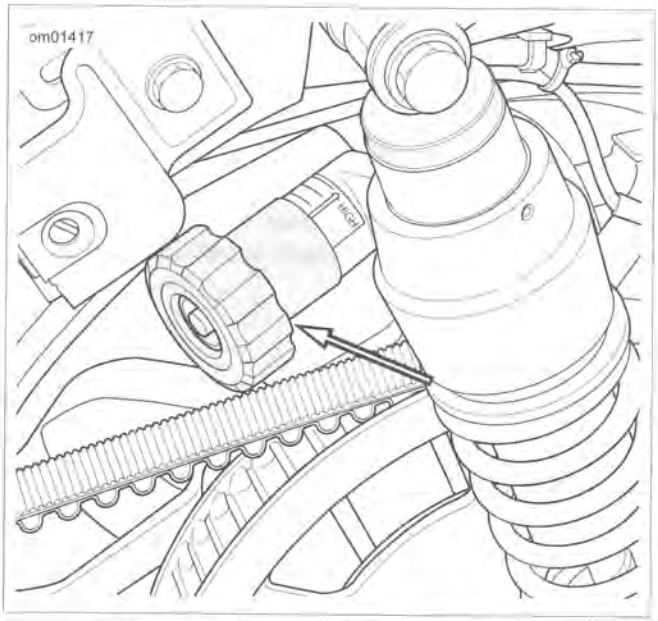


Figure 1-42. Preload Adjustment Knob

Table 1-24. Recommended Preload Settings

PRELOAD TURNS FROM MINIMUM	LOAD	PRELOAD TURNS FROM MINIMUM	LOAD
0	Less than 220 lb (100 kg)	10	310 lb (141 kg)
1	220 lb (100 kg)	11	320 lb (145 kg)
2	230 lb (104 kg)	12	330 lb (150 kg)
3	240 lb (109 kg)	13	340 lb (154 kg)
4	250 lb (113 kg)	14	350 lb (159 kg)
5	260 lb (118 kg)	15	360 lb (163 kg)
6	270 lb (122 kg)	16	370 lb (168 kg)

Table 1-24. Recommended Preload Settings

PRELOAD TURNS FROM MINIMUM	LOAD	PRELOAD TURNS FROM MINIMUM	LOAD
7	280 lb (127 kg)	17	380 lb (172 kg)
8	290 lb (132 kg)	18	390 lb (177 kg)
9	300 lb (136 kg)	19	400 lb (181 kg) to maximum added weight allowed (refer to Table 2-4)
Load includes the total weight of the rider, passenger, riding gear, accessories and cargo.			

GENERAL

⚠WARNING

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

⚠WARNING

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

⚠WARNING

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

NOTICE

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

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

NOTE

For charging information, see 1.22 BATTERY MAINTENANCE, Charging Battery. For testing information, see the electrical diagnostic manual.

Figure 1-43. AGM Battery with Warning Label

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

Figure 1-44. Battery Warning Label

Table 1-25. Antidotes for Battery Acid

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

CLEANING AND INSPECTION

NOTE

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

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

BATTERY

FASTENER	TORQUE VALUE	
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm
Top caddy screws	72-96 **in-lbs**	8.1-10.9 Nm

Disconnection and Removal

1. Remove seat.
2. See Figure 1-45. Release ECM (1) from top caddy. Move out of the way.
3. If present, move purge solenoid (2) forward to release from top caddy. Release HFSM antenna (3) from top caddy and move out of the way.
4. Release connectors (7) from anchors on top caddy.
5. Remove fasteners (5).
6. Cut cable straps (4). Move harnesses to allow more clearance for the top caddy.
7. Push top caddy forward to disengage front of caddy from front hold-down bracket. Lift and remove top caddy.
8. Disarm security system.

⚠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)

9. See Figure 1-46. Disconnect both battery cables, negative battery cable first.
10. Pull up lifting strap to raise battery. When battery is extracted far enough to get a good grip, grasp battery and remove the rest of the way.

Installation and Connection

1. Run lifting strap rearward across the bottom of the battery tray, then up and across the frame crossmember.
2. See Figure 1-46. Place the battery into the battery tray, terminal side forward.

NOTICE

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

⚠WARNING

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

NOTICE

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

3. Connect both battery cables, positive battery cable first. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).

NOTICE

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

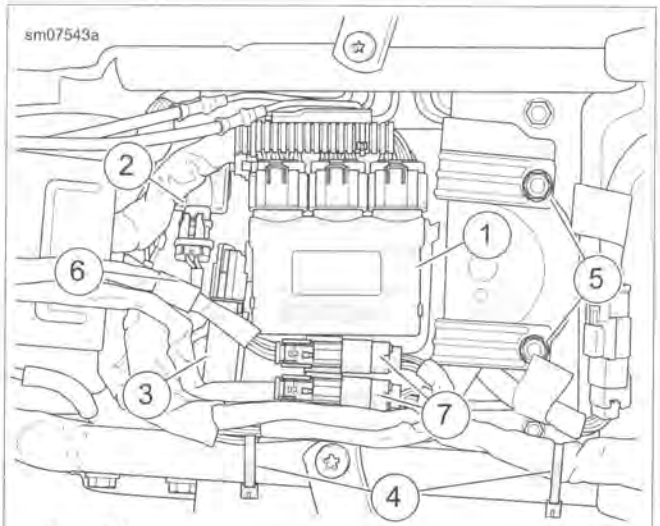
4. Apply a light coat of petroleum jelly or ELECTRICAL CONTACT LUBRICANT to both battery terminals.
5. Fold lifting strap forward over top of battery.
6. See Figure 1-45. Place top caddy into position and engage latch on hold-down bracket.
7. Fasten top caddy to frame crossmember with screws (5). Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
8. If equipped, engage HFSM antenna (3) and purge solenoid (2) on top caddy. Verify that all other connectors and harnesses are routed below the purge solenoid mounting tongue.
9. Secure connectors (7) to anchors on top caddy.
10. Latch ECM (1) into place on top caddy.

11. Secure harnesses to frame with cable straps (4).

⚠WARNING

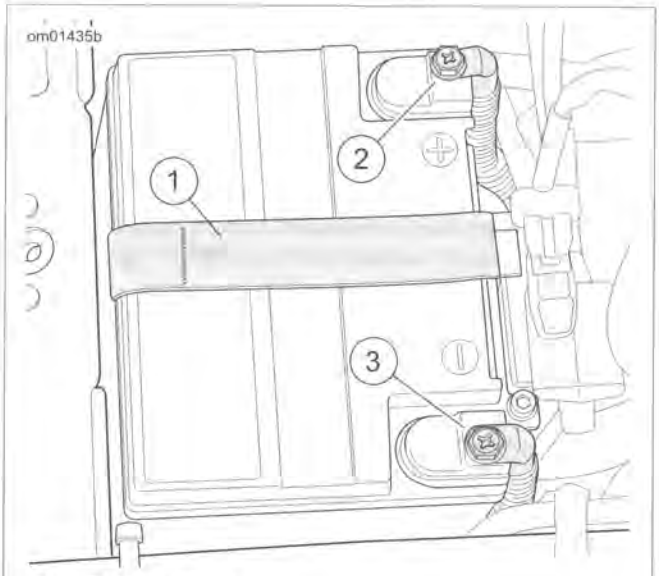
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

12. Install seat.



1. **ECM**
2. **Purge solenoid**
3. **HFSM antenna**
4. **Cable straps**
5. **Fastener**
6. **Hold-down (not visible)**
7. **Connectors**

Figure 1-45. Top Caddy



1. **Battery strap**
2. **Positive (+) terminal**
3. **Negative (-) terminal**

Figure 1-46. Battery Compartment

VOLTMETER TEST

⚠WARNING

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

⚠WARNING

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

Voltmeter Test

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

1. If the open circuit (disconnected) voltage reading is below 12.6 V:
   a. Charge the battery.
   b. Check the voltage after the battery has set for at least one hour.
2. If the voltage reading is 12.7 V or above:
   a. Perform a battery diagnostic test. See the electrical diagnostic manual for the load test procedure.
   b. Refer to Table 1-26.

Table 1-26. Voltmeter Test For Battery Charge Conditions

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

BATTERY TENDER CONNECTOR

All Touring models are conveniently equipped with a battery tender connector located under the left side cover. This connector is designed to be used with any battery tender available from the Harley-Davidson Genuine Motor Parts & Accessories catalog.

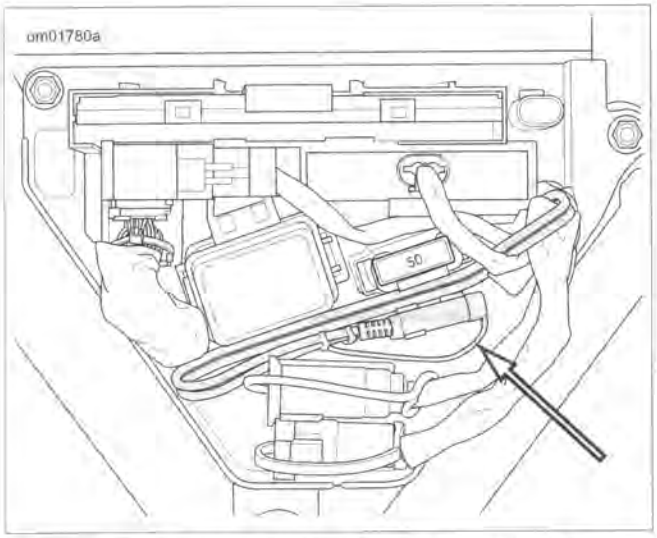


Figure 1-47. Battery Tender Connector (under left side cover)

CHARGING BATTERY

Safety Precautions

An automatic, constant monitoring battery charger/tender with a charging rate of 5 amps or less at less than 14.6 volts is recommended. The use of constant current chargers (including trickle chargers) to charge sealed AGM batteries is not recommended.

Any overcharge will cause dry-out and premature battery failure. Always review charger instructions before charging a battery. In addition to the manufacturer's instructions, follow these general safety precautions:

- Always wear eye, face and hand protection.
- Always charge batteries in a well-ventilated area.
- Turn the charger off before connecting or disconnecting the leads to the battery to avoid dangerous sparks.
- Never try to charge a visibly damaged or frozen battery.
- Connect the charger leads to the battery. Red positive lead to the positive terminal. Black negative lead to the negative terminal. If the battery is still in the vehicle, connect the negative lead to the chassis ground. Verify that the ignition and all electrical accessories are turned off.
- Verify that charger leads to battery are not separated, frayed or loose.
- If the battery temperature exceeds 110 °F (43 °C) during charging, discontinue charger and allow the battery to cool.

Using a Battery Charger

Charge the battery if:

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

⚠WARNING

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

NOTICE

If battery releases an excessive amount of gas during charging, decrease the charging rate. Overheating can result in plate distortion, internal shorting, drying out or damage. (00413b)

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

NOTES

- *Most constant monitoring battery chargers are completely automatic. They can be left connected to both AC power and to the battery that is being charged. When leaving this type of charger connected for extended periods of time, periodically check the battery to see if it is unusually warm. This is an indication that the battery may have a weak cell or internal short. Read the manufacturer's instructions for the charger.*
- *Do not use battery chargers that produce excessively high voltage designed for flooded batteries or excessively high current designed for much larger batteries. Charging should be limited to 5 amps maximum at no more than 14.6 volts.*

⚠WARNING

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

NOTICE

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

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

NOTE

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

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

⚠WARNING

Unplug or turn OFF battery charger before disconnecting charger cables from battery. Disconnecting clamps with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00067a)

4. After the battery is fully charged, turn the charger OFF. Disconnect the black battery charger lead from the negative terminal of the battery.
5. Disconnect the red battery charger lead from the positive terminal of the battery.
6. Mark the charging date on the battery.
7. Perform a battery diagnostic test to determine the condition of the battery. See the electrical diagnostic manual.
8. If charging a battery because voltmeter test reading was below 12.6 V, perform voltmeter test. See the electrical diagnostic manual.

STORAGE

PART NUMBER	TOOL NAME
99863-01A	GLOBAL BATTERY CHARGER

⚠WARNING

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

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

If the motorcycle is stored with the battery installed, without a GLOBAL BATTERY CHARGER, and with the security system **not** armed, remove main fuse.

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

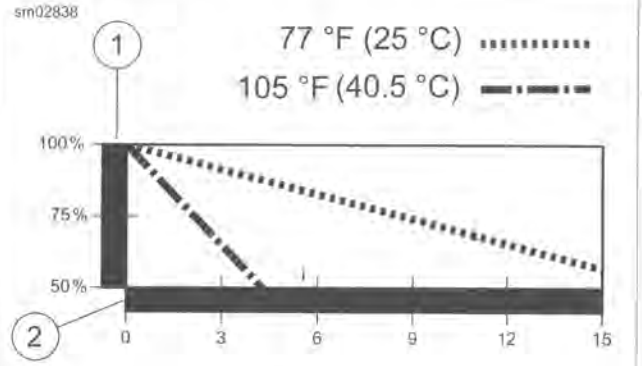
See Figure 1-48. A battery that is removed from the vehicle is affected by self-discharge. A battery that is stored in the vehicle is affected by self-discharge and, more significantly, by parasitic loads. A parasitic load is caused by things like diode leakage or maintaining computer memory with the vehicle turned off.

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

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

NOTE

Use the GLOBAL BATTERY CHARGER (Part No. 99863-01A) to maintain battery charge for extended periods of time without risk of overcharging or boiling.



1. Capacity
2. Months of non-use

Figure 1-48. Battery Self-Discharge Rate

CHECKING HEADLAMP ALIGNMENT

⚠WARNING

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

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

NOTE

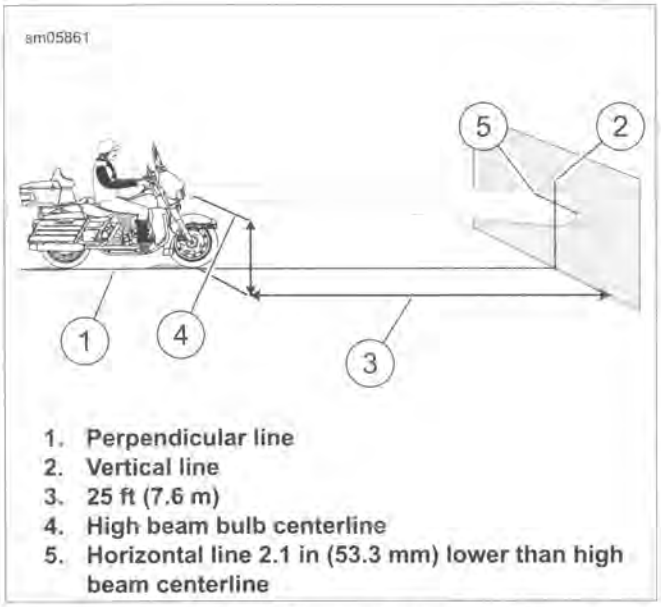
Choose a wall in minimum light.

4. See Figure 1-49. Park the motorcycle on a line (1) perpendicular to the wall.
5. Position motorcycle with the front axle 25 ft (7.6 m) from wall.
6. Draw a vertical centerline (2) on the wall.

NOTE

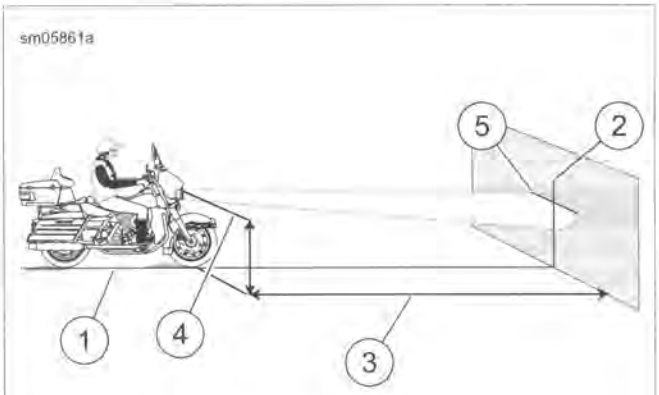
The upper lens is low beam on LED headlamps.

7. With the motorcycle loaded, point the front wheel straight forward at wall. Measure the distance (4) from the floor to the bulb centerline:
   a. **Quartz Halogen:** Center of **high** beam bulb.
   b. **LED:** Center of **low** beam bulb.
8. Draw a horizontal line (5) through the vertical line:
   a. **Quartz Halogen:** See Figure 1-49. 2.1 in (53.3 mm) lower than **high beam** bulb centerline.
   b. **LED:** See Figure 1-50. At **low beam** centerline.
9. The headlamp is aligned when the light beam hot spot is located as shown.
   a. **Quartz Halogen:** See Figure 1-52. Hot spot centered on mark with headlamp set to **high beam**.
   b. **LED:** See Figure 1-53. Top of hot spot at mark with headlamp set to **low beam**.



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

Figure 1-49. Headlamp Alignment: Quartz Halogen Type



1. **Perpendicular line**
2. **Vertical line**
3. **25 ft (7.6 m)**
4. **Low beam bulb centerline**
5. **Horizontal line at low beam centerline**

Figure 1-50. Headlamp Alignment: LED Type

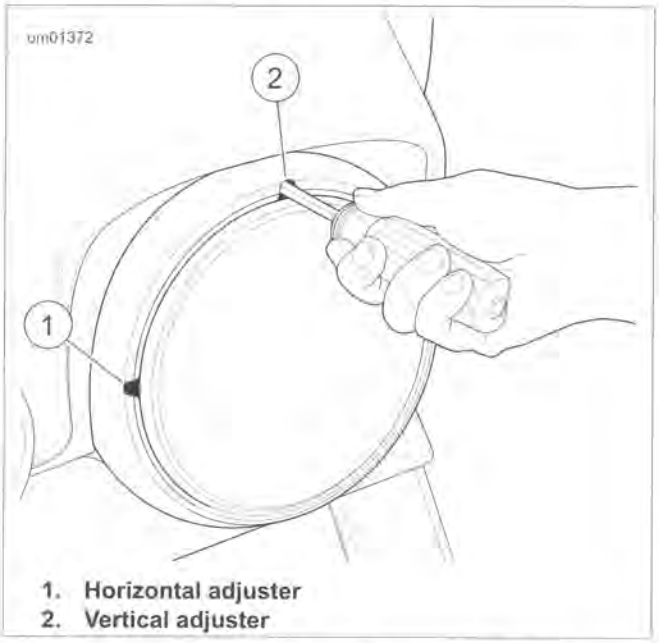
HEADLAMP ADJUSTMENT

NOTE

Do not remove trim ring for headlamp adjustment.

1. Set headlamp beam:
   a. **Quartz Halogen:** Set headlamp to high beam.
   b. **LED:** Set headlamp to low beam.
2. See Figure 1-51. Insert a 5/32 inch ball end hex wrench through adjuster slots in trim ring.
   a. **Horizontal:** Turn the horizontal adjusting screw (1) to adjust light beam left and right.
   b. **Vertical:** Turn the vertical adjusting screw (2) to adjust light beam up and down.

3. See Figure 1-52 or Figure 1-53. Adjust headlamp until light beam is centered as shown.



1. **Horizontal adjuster**
2. **Vertical adjuster**

Figure 1-51. Headlamp Adjusters (typical)

AUXILIARY/FOG LAMP ALIGNMENT

PART NUMBER	TOOL NAME
SNAP-ON® FRX181	FLARE NUT SOCKET

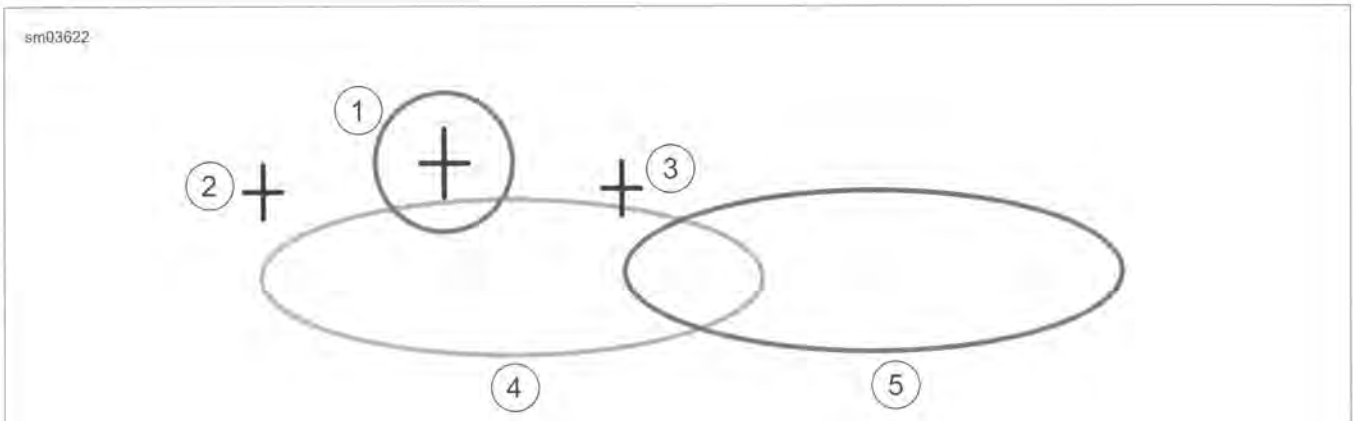
FASTENER	TORQUE VALUE	
Auxiliary/fog lamp flange nut: Models with flat lens turn signal lamps	15-18 ft-lbs	20.3-24.4 Nm
Auxiliary/fog lamp flange nut: Models with bullet style turn signal lamps	20-24 ft-lbs	27.1-32.5 Nm
Turn signal lamp to mounting bracket screws: Models with flat lens turn signal lamps	36-60 **in-lbs**	4.1-6.8 Nm
Turn signal lamp to mounting bracket screw: Models with bullet style turn signal lamps	96-120 **in-lbs**	10.9-13.5 Nm

1. Place the vehicle facing a target wall as described in 1.23 HEADLAMP ALIGNMENT, Checking Headlamp Alignment.

NOTE

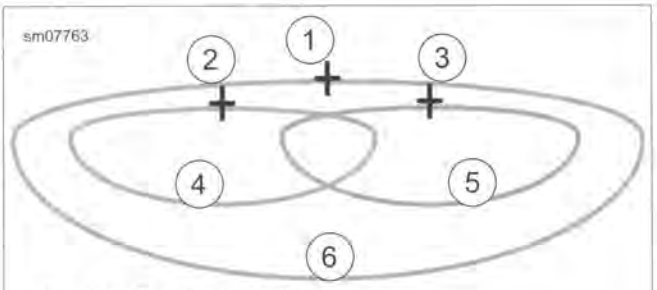
The weight of the rider will compress the suspension slightly. Have a person weighing roughly the same as that of the principal rider sit on the motorcycle.

2. With the vehicle upright and a rider seated on the motorcycle, measure the distance from the floor to the centerline of each auxiliary/fog lamp.
3. Measure the horizontal distance from the headlamp vertical centerline to the vertical centerline of each auxiliary/fog lamp.
4. See Figure 1-52. Mark the auxiliary/fog lamp horizontal and vertical centerlines (2, 3) on the wall.
5. Remove the turn signal lamp from the mounting bracket.
6. Using FLARE NUT SOCKET (Part No Snap-on® FRX181), loosen the auxiliary/fog lamp flange nut only enough to allow movement of the lamp.
7. Turn on the headlamp low beam and cover both the headlamp and the right auxiliary/fog lamp.
   a. **Quartz Halogen:** Adjust the left auxiliary/fog lamp so the entire high intensity zone (4) is below and to the right of the left auxiliary/fog lamp centerlines as shown in Figure 1-52.
   b. **LED:** Adjust the left auxiliary/fog lamp so the entire high intensity zone (4) is below the centerline as shown in Figure 1-53.
8. Repeat procedure with right lamp.
9. Tighten auxiliary/fog lamp nut:
   a. **Models with flat lens turn signal lamps:** 15-18 ft-lbs (20.3-24.4 Nm).
   b. **Models with bullet style turn signal lamps:** 20-24 ft-lbs (27.1-32.5 Nm)
10. Install turn signal:
    a. **Models with flat lens turn signal lamps:** Start two screws to secure turn signal lamp to mounting bracket. Verify that conduit fits in slot at back of bracket and is not pinched. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
    b. **Models with bullet style turn signal lamps:** Secure turn signal lamp to mounting bracket. Tighten to 96-120 **in-lbs** (10.9-13.5 Nm).



1. Headlamp high beam area
2. Left auxiliary/fog lamp centerlines
3. Right auxiliary/fog lamp centerlines
4. Left auxiliary/fog high intensity beam area
5. Right auxiliary/fog high intensity beam area

Figure 1-52. Properly Aim Lamps: Quartz Halogen Type



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 beam area

Figure 1-53. Properly Aim Lamps: LED Type

INSPECTION

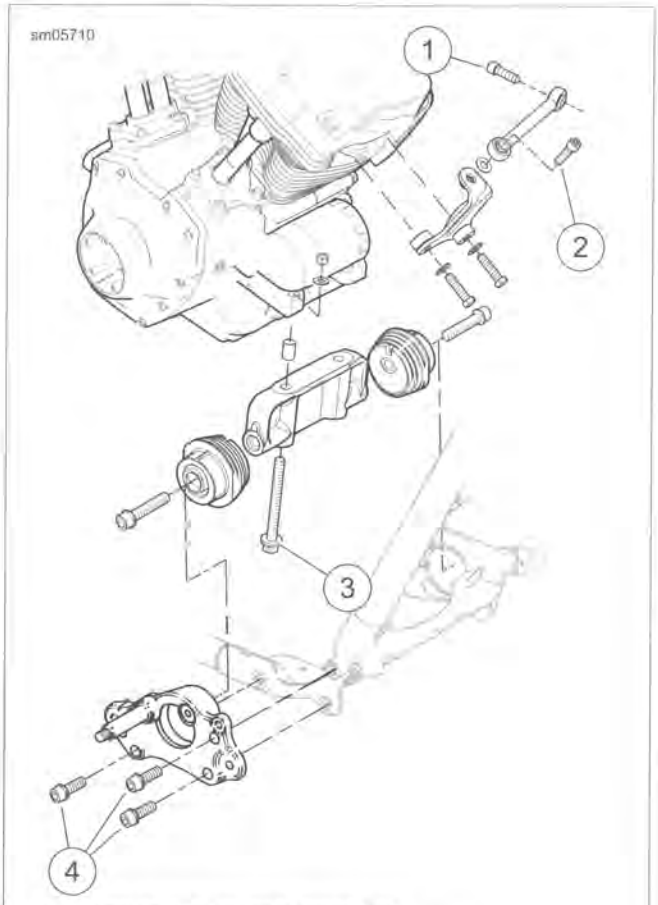
FASTENER	TORQUE VALUE	
Engine mount bracket to engine screws	36-40 ft-lbs	48.8-54.2 Nm
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm

General

Inspect the condition and tightness of the engine mounts. Replace fasteners if damaged. To properly check fastener torque, see 1.5 MAINTENANCE SCHEDULE.

Front Engine Mount

1. See Figure 1-54. Check two engine to front engine mounting bracket screws (3). The screws must not rotate with torque wrench set to 36-40 ft-lbs (48.8-54.2 Nm).
2. Check right front engine mount end cap screws (4). The screws must not rotate with torque wrench set to 42-48 ft-lbs (56.9-65.0 Nm).



1. Link-to-frame weldment bolt
2. Link-to-engine mounting bracket bolt
3. Engine mount screws (2)
4. Engine mount end cap screws

Figure 1-54. Front Mount and Stabilizer

GENERAL

Always prepare motorcycle for extended storage following service manual procedures. This will help protect parts against corrosion, preserve the battery and prevent buildup of gum and varnish in the fuel system.

PLACING IN STORAGE

⚠WARNING

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

⚠WARNING

Avoid spills. Slowly remove filler cap. Do not fill above bottom of filler neck insert, leaving air space for fuel expansion. Secure filler cap after refueling. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00028a)

⚠WARNING

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

1. Fill the fuel tank and add a gasoline stabilizer. Use a commercially available gasoline stabilizer following the manufacturer's instructions.
2. Run motorcycle until engine is at normal operating temperature. Stop the engine and change the engine oil and filter.
3. Remove the spark plugs, inject a few squirts of engine oil into each cylinder and crank the engine 5-6 revolutions. Install spark plugs.
4. Inspect drive belt deflection. See 1.14 DRIVE BELT AND SPROCKETS.
5. Inspect drive belt and sprockets.
6. Inspect air cleaner filter. See 1.7 AIR CLEANER AND EXHAUST SYSTEM.
7. Lubricate controls. See 1.16 CABLE AND CHASSIS LUBRICATION.
8. **Twin-Cooled:** Check freeze point of engine coolant prior to placing in storage. Verify freeze point is below the lowest expected temperature during storage.
9. Inspect operation of all electrical equipment and switches.
10. Check tire inflation and inspect tires for wear and/or damage. 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. See 1.9 TIRES AND WHEELS.
11. Wash painted and chrome-plated surfaces. Apply a light film of oil to exposed unpainted surfaces.

⚠WARNING

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

⚠WARNING

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

12. The battery can be maintained removed or installed:
    a. **Removed:** Remove the battery from the vehicle. Charge the battery until the correct voltage is obtained. Charge the battery every other month if it is stored at temperatures below 60 °F (16 °C). Charge battery once a month if it is stored at temperatures above 60 °F (16 °C). See 1.22 BATTERY MAINTENANCE.
    b. **Installed:** Connect a Harley-Davdison battery tender.

⚠WARNING

Unplug or turn OFF battery charger before disconnecting charger cables from battery. Disconnecting clamps with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00067a)

13. If the motorcycle will be covered, use a material that will breathe, such as a Harley-Davidson storage cover or light canvas. Plastic materials that do not breathe promote the formation of condensation which leads to corrosion.

REMOVAL FROM STORAGE

⚠WARNING

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

1. Charge and install the battery.
2. Remove and inspect the spark plugs. Replace if necessary.
3. Clean the air cleaner element.
4. If fuel tank was drained, fill fuel tank with fresh gasoline.
5. Verify engine coolant is at the proper level.
6. Start the engine and run until it reaches normal operating temperature.

7. Check engine oil level. Check the transmission lubricant level. Fill to proper levels with correct fluids, if required.
8. Perform all of the checks in the PRE-RIDING CHECKLIST in the owner's manual.

GENERAL

⚠WARNING

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

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

NOTES

- *See the electrical diagnostic manual for additional information.*
- *See C.4 TESTING AND DIAGNOSTICS, Troubleshooting for additional cooling system troubleshooting.*

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

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

Engine Turns Over But Does Not Start

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

NOTE

For cold weather starts, always disengage clutch.

5. Spark plug cables in bad condition and shorting, cable connections loose or cables connected to incorrect cylinders.
6. Damaged wire or loose wire connection at ignition coil, battery, or ECM connector.
7. Ignition timing incorrect due to faulty ignition coil, ECM or sensors.
8. Bank Angle Sensor tripped and ignition switch not cycled OFF then back to IGNITION.
9. Fuel filter clogged.
10. Sticking or damaged valve(s) or wrong length pushrod(s).
11. Plugged fuel injectors.

Starts Hard

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

NOTE

For cold weather starts, always disengage clutch.

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

Starts But Runs Irregularly or Misses

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

16. Partially plugged fuel injector(s).

A Spark Plug Fouls Repeatedly

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

Pre-Ignition or Detonation (Knocks or Pings)

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

Overheating

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

* Twin-Cooled only

Valve Train Noise

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

Excessive Vibration

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

Check Engine Light Illuminates During Operation

Fault detected. See the electrical diagnostic manual for more information.

LUBRICATION SYSTEM

Oil Does Not Return To Oil Reservoir

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

Engine Uses Too Much Oil Or Smokes Excessively

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

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

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

Low Oil Pressure

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

High Oil Pressure

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

ELECTRICAL SYSTEM

NOTE

For diagnostic information see the electrical diagnostic manual.

Alternator Does Not Charge

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

Alternator Charge Rate Is Below Normal

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

Speedometer Operates Erratically

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

TRANSMISSION

Shifts Hard

1. Primary chaincase overfilled with lubricant.
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 (inside transmission) sprung.
7. Corners worn off shifter clutch dog rings (inside transmission).

Jumps Out Of Gear

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

Clutch Slips

1. Reservoir overfull (hydraulic operated) or cable misadjusted (cable operated).
2. Clutch lever not returning completely.
3. Damaged or binding secondary clutch actuator.
4. Insufficient clutch spring tension.
5. Worn friction discs.

Clutch Drags Or Does Not Release

1. Lubricant level too high in primary chaincase.
2. Air in hydraulic clutch system.
3. Misadjusted cable.
4. Primary chain badly misaligned or too tight.
5. Insufficient clutch spring tension.
6. Clutch discs warped.

Clutch Chatters

Friction discs or steel discs worn or warped.

HANDLING

Irregularities

1. Improperly loaded motorcycle. Non-standard equipment such as heavy radio receivers, extra lighting equipment excess or unsecured luggage may cause unstable handling.
2. Damaged tire(s) or improper front-rear tire combination.
3. Irregular or peaked front tire tread wear.
4. Incorrect tire pressure.

5. Shock absorber not functioning normally.
6. Incorrect suspension adjustment.
7. Loose wheel axle nuts. Tighten to recommended torque specification.
8. Excessive wheel hub bearing play.
9. Rear wheel out of alignment with frame and front wheel.
10. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races.
11. Loose spokes (laced wheel vehicles only).
12. Tire and wheel unbalanced.
13. Rims and tires out-of-round or eccentric with hub.
14. Rims and tires out-of-true sideways.
15. Rear fork pivot assembly: improperly tightened or assembled, or loose/pitted or damaged pivot bearings.
16. Engine mounts and/or stabilizer links loose, worn or damaged.

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.

SUBJECT	PAGE NO.
2.1 FASTENER TORQUE VALUES	2-1
2.2 SPECIFICATIONS	2-8
2.3 VEHICLE IDENTIFICATION NUMBER (VIN)	2-11
2.4 FRONT WHEEL	2-13
2.5 REAR WHEEL	2-15
2.6 REAR WHEEL COMPENSATOR	2-19
2.7 WHEEL LACING: FRONT RIM	2-21
2.8 WHEEL LACING: 16 INCH REAR RIM	2-23
2.9 CHECKING AND TRUING WHEELS	2-26
2.10 SEALED WHEEL BEARINGS	2-30
2.11 TIRES	2-33
2.12 FRONT BRAKE MASTER CYLINDER	2-37
2.13 FRONT BRAKE CALIPER	2-40
2.14 REAR BRAKE MASTER CYLINDER	2-41
2.15 REAR BRAKE CALIPER	2-44
2.16 BRAKE LINES	2-45
2.17 ABS MODULE	2-56
2.18 BLEEDING BRAKES	2-58
2.19 FRONT FORK	2-60
2.20 STEERING HEAD BEARINGS	2-66
2.21 REAR SUSPENSION	2-70
2.22 REAR FORK	2-73
2.23 CLUTCH CABLE	2-76
2.24 CLUTCH MASTER CYLINDER AND RESERVOIR	2-78
2.25 HYDRAULIC CLUTCH HAND LEVER	2-82
2.26 CLUTCH FLUID LINE	2-83
2.27 BLEEDING CLUTCH CONTROL SYSTEM	2-85
2.28 HANDLEBARS	2-87
2.29 MIRRORS	2-93
2.30 SEAT	2-94
2.31 SADDLEBAGS	2-96
2.32 SADDLEBAG SERVICE	2-97
2.33 TOUR-PAK	2-101
2.34 TOUR-PAK SERVICE	2-103
2.35 TOUR-PAK BACKREST	2-107
2.36 FAIRING LOWERS AND ENGINE GUARD	2-108
2.37 UPPER FAIRING AND WINDSHIELD	2-113
2.38 DASH PANEL	2-115
2.39 INNER FAIRING	2-116
2.40 AIR DEFLECTORS	2-123
2.41 WINDSHIELD: ROAD KING MODELS	2-124
2.42 HEADLAMP NACELLE: ROAD KING MODELS	2-127
2.43 FRONT FENDER	2-129
2.44 REAR FENDER	2-132
2.45 REAR FASCIA	2-135
2.46 REAR FRAME	2-136
2.47 FOOTBOARDS AND FOOTRESTS	2-138
2.48 JIFFY STAND	2-141
2.49 FRONT ENGINE MOUNT	2-144
2.50 MEDALLIONS, SERIALIZED BADGES AND TANK EMBLEMS	2-146

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
ABS module locknuts	53-88 **in-lbs**	6-10 Nm	2.17 ABS MODULE, ABS Module
Auxiliary/fog lamp bracket acorn nuts: Road King models	72-108 **in-lbs**	8.1-12.2 Nm	2.23 CLUTCH CABLE, Installation
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.13 FRONT BRAKE CALIPER, Installation
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Front Brake Line: Non-ABS Equipped
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Front Caliper
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Front Caliper
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Rear Caliper
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm	2.17 ABS MODULE, ABS Module
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm	2.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm	2.17 ABS MODULE, ABS Module
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Front Brake Line: Non-ABS Equipped
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.15 REAR BRAKE CALIPER, Installation
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Rear Caliper
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	2.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Front Caliper
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm	2.17 ABS MODULE, ABS Module
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm	2.46 REAR FRAME, Rear Frame
Brake bleeder valve, front	72-108 **in-lbs**	8.1-12.2 Nm	2.18 BLEEDING BRAKES, Procedure
Brake bleeder valve, rear	75-102 **in-lbs**	8.5-11.5 Nm	2.18 BLEEDING BRAKES, Procedure
Brake caliper, front, mounting screws	28-38 ft-lbs	37.9-51.5 Nm	2.13 FRONT BRAKE CALIPER, Installation/metric

FASTENER	TORQUE VALUE		NOTES
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.5 REAR WHEEL, Installation/metric
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.15 REAR BRAKE CALIPER, Installation/metric
Brake disc, front, screws (metric)	16-24 ft-lbs	21.7-32.5 Nm	2.4 FRONT WHEEL, Installation/Always use new screws
Brake disc, rear, screws	30-45 ft-lbs	41-61 Nm	2.5 REAR WHEEL, Installation/Always use new part
Brake line, rear, P-clamp screw	80-100 **in-lbs**	9.0-11.3 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Brake line, rear, P-clamp screw	80-100 **in-lbs**	9.0-11.3 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake master cylinder, front, reservoir cover screws	12-15.0 **in-lbs**	1.3-1.7 Nm	2.18 BLEEDING BRAKES, Procedure
Brake master cylinder, rear, mounting screws	126-150 **in-lbs**	14.2-17.0 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.18 BLEEDING BRAKES, Procedure
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Clutch fluid line flare nut	96-144 **in-lbs**	10.9-16.3 Nm	2.26 CLUTCH FLUID LINE, Replacement
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.24 CLUTCH MASTER CYLINDER AND RESERVOIR, Installation
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.26 CLUTCH FLUID LINE, Replacement
Clutch master cylinder clamp fastener	72-108 **in-lbs**	8.1-12.2 Nm	2.24 CLUTCH MASTER CYLINDER AND RESERVOIR, Installation
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.24 CLUTCH MASTER CYLINDER AND RESERVOIR, Installation
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator
Dash panel screws	25-30 **in-lbs**	2.8-3.4 Nm	2.38 DASH PANEL, Dash Panel
Debris deflector screw	65-85 **in-lbs**	7.3-9.6 Nm	2.22 REAR FORK, Installation
Engine guard lower screws	15-20 ft-lbs	20.3-27.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Engine Guard
Engine guard upper screw	22-28 ft-lbs	29.8-37.9 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Engine Guard
Engine mount bracket to engine screws	36-40 ft-lbs	48.8-54.2 Nm	2.49 FRONT ENGINE MOUNT, Installation
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	2.49 FRONT ENGINE MOUNT, Installation
Engine rubber mount screws, front	40-50 ft-lbs	54.2-67.8 Nm	2.49 FRONT ENGINE MOUNT, Installation
Fairing air deflector screws	15-25 **in-lbs**	1.7-2.8 Nm	2.40 AIR DEFLECTORS, Fairing Air Deflectors
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm	2.39 INNER FAIRING, Rotate Inner Fairing
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm	2.39 INNER FAIRING, Inner Fairing Assembly Removal and Installation
Fairing speaker enclosure to fairing screws	48-60 **in-lbs**	5.4-6.8 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Fairing speaker grill screws	9-13 **in-lbs**	1.0-1.5 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Fairing vent	20-30 **in-lbs**	2.3-3.4 Nm	2.39 INNER FAIRING, Fairing Vent

FASTENER	TORQUE VALUE		NOTES
Fairing vent	20-30 **in-lbs**	2.3-3.4 Nm	2.39 INNER FAIRING, Fairing Vent
Fender, front, attachment screws	16-20 ft-lbs	21.7-27.1 Nm	2.43 FRONT FENDER, Installation
Fender, front, fender tip lamp nuts	20-25 **in-lbs**	2.3-2.8 Nm	2.43 FRONT FENDER, Removal
Fender, front, fender tip screws	20-25 **in-lbs**	2.3-2.8 Nm	2.43 FRONT FENDER, Removal
Fender, front, mounting screws	16-20 ft-lbs	21.7-27.1 Nm	2.43 FRONT FENDER, Removal
Fender, front, trim skirt screws/nuts	10-15 **in-lbs**	1.1-1.7 Nm	2.43 FRONT FENDER, Removal
Fender, front, trim strip T-bolt nut	10-15 **in-lbs**	1.1-1.7 Nm	2.43 FRONT FENDER, Removal
Fender, rear, mounting boss	15-20 ft-lbs	20.3-27.1 Nm	2.44 REAR FENDER, Fender Repair
Fender, rear, mounting screws	15-20 ft-lbs	20.3-27.1 Nm	2.44 REAR FENDER, Installation
Fender, rear, stud plate	60-96 **in-lbs**	6.8-10.8 Nm	2.44 REAR FENDER, Fender Repair
Fender, rear, support to fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.45 REAR FASCIA, Installation
Fender, rear, support to fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.45 REAR FASCIA, Stud Plate
Footboard/footrest lower fastener, passenger	48-72 **in lbs**	5.4-8.1 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Footboard/footrest upper fastener, passenger	36-42 ft-lbs	48.8-56.9 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Footboard bracket screws, rider	36-42 ft-lbs	48.8-56.9 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Footboard pivot bolt nut, rider	60-80 **in-lbs**	6.8-9.0 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Footrest mounting fastener	36-42 ft-lbs	48.8-56.9 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX/S
Footrest pad screw (FLHX/S)	15-20 ft-lbs	20.3-27.1 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX/S/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Fork bracket, lower, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.19 FRONT FORK, Installation/Alternately tighten each screw twice.
Fork bracket, lower, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.19 FRONT FORK, Installation/Alternately tighten each screw twice.
Fork bracket, upper, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.19 FRONT FORK, Installation
Fork bracket, upper, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.20 STEERING HEAD BEARINGS, Upper Fork Bracket
Fork damper tube screw (metric)	30-37 ft-lbs	40-50 Nm	2.19 FRONT FORK, Assembly
Fork slider cover screws	24-48 **in-lbs**	2.7-5.4 Nm	2.19 FRONT FORK, Installation/Apply LOCTITE 246 MEDIUM STRENGTH THREADLOCKER (blue) to the threads of screws
Fork tube plug	22-59 ft-lbs	30-80 Nm	2.19 FRONT FORK, Assembly
Front axle nut	70-75 ft-lbs	94.9-101.7 Nm	2.4 FRONT WHEEL, Installation/metric
Front axle pinch screw	18-22 ft-lbs	24.4-29.8 Nm	2.4 FRONT WHEEL, Installation/metric
Gauges, 2 inch diameter gauge screws	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Gauges, instrument cluster screws	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm	2.23 CLUTCH CABLE, Installation
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm	2.28 HANDLEBARS, Installation
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation

FASTENER	TORQUE VALUE		NOTES
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	2.28 HANDLEBARS, Installation
Handlebar lower clamp bolt	30-40 ft-lbs	40.7-54.2 Nm	2.28 HANDLEBARS, Rubber Mounts
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm	2.28 HANDLEBARS, Adjustment
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm	2.28 HANDLEBARS, Installation
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm	2.28 HANDLEBARS, Installation
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle acorn nuts	72-108 **in-lbs**	8.1-12.2 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle chrome strip flange nut	15-20 **in-lbs**	1.7-2.3 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Ignition switch housing nut	13-15 ft-lbs	17.5-20.9 Nm	2.38 DASH PANEL, Dash Panel
Jiffy stand bracket fasteners	36-42 ft-lbs	48.8-57.0 Nm	2.48 JIFFY STAND, Jiffy Stand Bracket
Jiffy stand interlock sensor fastener	96-120 **in-lbs**	10.8-13.6 Nm	2.48 JIFFY STAND, Jiffy Stand Interlock Sensor/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) if reusing screw
Jiffy stand leg stop hex screw	15-20 ft-lbs	20.3-27.1 Nm	2.48 JIFFY STAND, Leg Installation
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	2.46 REAR FRAME, Rear Frame
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Twin-Cooled
Lower fairing, upper nuts	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing, upper nuts	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Twin-Cooled
Lower fairing cap flange nut	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing cap flange nut	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Twin-Cooled
Lower fairing glove box screws	12.0-16.8 **in-lbs**	1.4-1.9 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing glove box tray screws	12-18 **in-lbs**	1.4-2.0 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing vent knob screw	12-18 **in-lbs**	1.4-2.0 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Media compartment screw, lower	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Media compartment screw, lower	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Media Compartment
Media compartment screw, upper	25-35 **in-lbs**	2.8-4.0 Nm	2.39 INNER FAIRING, Upper Support Bracket
Mid-frame air deflector screws	25-35 **in-lbs**	2.8-4.0 Nm	2.40 AIR DEFLECTORS, Mid-Frame Air Deflectors
Mirror flange nut: FLHX/S	20-30 **in-lbs**	2.3-3.4 Nm	2.29 MIRRORS, FLHX/S/metric
Mirror stem acorn nut	60-96 **in-lbs**	6.8-10.8 Nm	2.29 MIRRORS, All Models Except FLHX/S/metric
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support

FASTENER	TORQUE VALUE		NOTES
Nacelle stud	72-108 **in-lbs**	8.1-12.2 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of stud.
Outer fairing screws	20-30 **in-lbs**	2.3-3.4 Nm	2.37 UPPER FAIRING AND WINDSHIELD, Outer Fairing and Windshield
Outer transmission cover screws	100-120 **in-lbs**	11.2-13.6 Nm	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator
Power outlet, front	13-17 **in-lbs**	1.5-1.9 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Rear axle cone nut, 1st torque	15-20 ft-lbs	20-27 Nm	2.5 REAR WHEEL, Installation/metric
Rear fascia flange nuts	30-45 **in-lbs**	3.4-5.1 Nm	2.45 REAR FASCIA, Installation/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	2.45 REAR FASCIA, Installation
Rear fork bracket screws	55-65 ft-lbs	74.6-88.1 Nm	2.22 REAR FORK, Installation/Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREAD-LOCKER AND SEALANT (blue) to threads
Rear fork pivot shaft fasteners	55-65 ft-lbs	74.6-88.1 Nm	2.22 REAR FORK, Installation/Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREAD-LOCKER AND SEALANT (blue) to threads
Rear frame to main frame fastener	40-45 ft-lbs	54.2-61.0 Nm	2.46 REAR FRAME, Rear Frame
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag guard to frame screw, lower	32-36 ft-lbs	43.4-48.8 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag guard to frame screw, upper	32-36 ft-lbs	43.4-48.8 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag hinge to latch assembly screw	30-35 **in-lbs**	3.4-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag hinge to saddlebag screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag latch assembly screws	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag latch handle screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock screw	20-30 **in-lbs**	2.3-3.4 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag strike screw	15-20 **in-lbs**	1.7-2.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag support casting to frame screw	15-20 ft-lbs	20.3-27.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag support to lower fender support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.45 REAR FASCIA, Stud Plate
Saddlebag support tube screw	70-100 **in-lbs**	7.9-11.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag support tube to support casting fastener, large	23-30 ft-lbs	31.2-40.7 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag support tube to support casting fastener, small	15-20 ft-lbs	20.3-27.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag tether screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag tether screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Seat bumper fastener	32-36 ft-lbs	43.4-48.8 Nm	2.30 SEAT, Seat Bumper
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.30 SEAT, Seat

FASTENER	TORQUE VALUE		NOTES
Seat strap bracket screw	120-144 **in-lbs**	13.6-16.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm	2.30 SEAT, Seat
Secondary clutch actuator bleeder screw	31-41 **in-lbs**	3.5-4.6 Nm	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator
Shock absorber air tube fitting	12-17 ft-lbs	16.3-23.0 Nm	2.21 REAR SUSPENSION, Air Shock Repair
Shock absorber air tube fitting	12-17 ft-lbs	16.3-23.0 Nm	2.21 REAR SUSPENSION, Air Lines
Shock absorber mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.21 REAR SUSPENSION, Shock Absorber Installation/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Shock absorber mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.22 REAR FORK, Installation/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Speedometer bracket: FLHP	72-108 **in-lbs**	8.1-12.2 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Steering head clamp screw	30-40 **in-lbs**	3.4-4.5 Nm	2.26 CLUTCH FLUID LINE, Replacement
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped/Use LOCTITE 565 THREAD SEALANT
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module/Use LOCTITE 565 THREAD SEALANT
Suspension air valve nut	40-50 **in-lbs**	4.5-5.6 Nm	2.21 REAR SUSPENSION, Air Lines
Suspension air valve nut	40-50 **in-lbs**	4.5-5.6 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Top caddy screws	72-96 **in-lbs**	8.1-10.8 Nm	2.46 REAR FRAME, Rear Frame
Tour-Pak adapter mounting screws (APC models)	60-72 **in-lbs**	6.8-8.1 Nm	2.33 TOUR-PAK, Removal and Installation
Tour-Pak catch screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Latch Handle and Catch
Tour-Pak hinge screw	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Hinges
Tour-Pak latch handle	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Latch Handle and Catch
Tour-Pak lockset screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tour-Pak Lock
Tour-Pak luggage rack fastener	40-48 **in-lbs**	4.5-5.4 Nm	2.34 TOUR-PAK SERVICE, Luggage Rack
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm	2.33 TOUR-PAK, Removal and Installation
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm	2.33 TOUR-PAK, Removal and Installation
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm	2.34 TOUR-PAK SERVICE, Ground Plate
Tour-Pak passenger backrest flange nuts	108-132 **in-lbs**	12.2-14.9 Nm	2.35 TOUR-PAK BACKREST, Passenger Backrest
Tour-Pak passenger backrest flap screws	21-24 **in-lbs**	2.4-2.7 Nm	2.35 TOUR-PAK BACKREST, Passenger Backrest Flap
Tour-Pak side marker lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	2.34 TOUR-PAK SERVICE, Ground Plate
Tour-Pak support cover screws	8-18 **in-lbs**	0.9-2.0 Nm	2.33 TOUR-PAK, Tour-Pak Support
Tour-Pak support screws	15-20 ft lbs	20.3-27.1 Nm	2.33 TOUR-PAK, Tour-Pak Support
Tour-Pak tether anchor screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tour-Pak Liner
Tour-Pak tether anchor screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tether
Tour-Pak tether reel screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tether
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	2.23 CLUTCH CABLE, Installation

FASTENER	TORQUE VALUE		NOTES
Upper steering stem, 1st torque	35 ft-lbs	47.5 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem, final torque: Fairing models	60-65 **in-lbs**	6.8-7.3 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem, final torque: Road King models	110-115 **in-lbs**	12.4-13.0 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem, final torque: Trike models	110-115 **in-lbs**	12.4-13.0 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem pinch screw	22-26 ft-lbs	29.8-35.2 Nm	2.20 STEERING HEAD BEARINGS, Upper Fork Bracket
Upper support bracket to inner fairing screws	10-20 **in-lbs**	1.1-2.2 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Upper support bracket to inner fairing screws	10-20 **in-lbs**	1.1-2.2 Nm	2.39 INNER FAIRING, Upper Support Bracket
Upper support bracket to radio (storage box) screws	25-35 **in-lbs**	2.8-4.0 Nm	2.39 INNER FAIRING, Upper Support Bracket
Upper support bracket to speaker enclosure screws	48-60 **in-lbs**	5.4-6.8 Nm	2.39 INNER FAIRING, Upper Support Bracket
Valve stem nut	12-15 **in-lbs**	1.4-1.7 Nm	2.11 TIRES, Installation
Windshield screws: Fairing models	25-30 **in-lbs**	2.8-3.4 Nm	2.37 UPPER FAIRING AND WINDSHIELD, Outer Fairing and Windshield
Windshield window screws: Road King models	20-25 **in-lbs**	2.3-2.8 Nm	2.41 WINDSHIELD: ROAD KING MODELS, Windshield Window

SPECIFICATIONS

Chassis Specifications

Table 2-1. Dimensions: FLHTCU, FLHTCU TC, FLHTK

ITEM	FLHTCU		FLHTCU TC		FLHTK	
	IN	MM	IN	MM	IN	MM
Length	102.4	2600	102.4	2600	102.4	2600
Overall Width	37.8	960	37.8	960	37.8	965
Overall Height	56.7	1440	56.7	1440	56.7	1440
Wheel base	64.0	1625	64.0	1625	64.0	1625
Road clearance	5.3	135	5.3	135	5.3	135
Saddle height*	27.3	693	27.3	693	27.3	693
*With 180 lb. (81.7 kg) rider on seat						

Table 2-2. Dimensions: FLHR, FLHRC, FLHX, FLHXS

ITEM	FLHR		FLHRC		FLHX		FLHXS	
	IN	MM	IN	MM	IN	MM	IN	MM
Length	96.5	2450	96.5	2450	96.5	2450	96.5	2450
Overall Width	37.8	960	37.8	960	37.8	960	37.8	960
Overall Height	56.3	1430	56.3	1430	53.2	1350	53.2	1350
Wheel base	64.0	1625	64.0	1625	64.0	1625	64.0	1625
Road clearance	5.3	135	5.3	135	5.3	135	5.3	135
Saddle height*	26.7	678	26.7	678	26.1	663	26.1	663
*With 180 lb. (81.7 kg) rider on seat								

Table 2-3. Capacities

ITEM	U.S.	L
Fuel tank (total)	6.0 gal	22.7
Low fuel warning light on (approximate)	1.0 gal	3.8
Engine oil with filter * (approximate)	4.0 qt	3.8
Transmission ** (approximate)	1.00 qt	0.95
Primary chaincase (approximate)	1.4 qt	1.3
Coolant, Twin-Cooled models (approximate)	1.1 qt	1.0
* When refilling, initially add 3.0 qt (2.84 L) and add as needed to bring level within specification. ** When refilling, initially add 28 oz (0.83 L) and add as needed to bring level within specification.		

Table 2-4. Weights: FLHTCU, FLHTCU TC, FLHTK

ITEM	FLHTCU		FLHTCU TC		FLHTK	
	LB.	KG	LB.	KG	LB.	KG
Running weight*	879	399	906	410	896	406
Maximum added weight allowed**	481	218	454	206	464	210
GVWR	1360	617	1360	617	1360	617
GAWR front	500	227	500	227	500	227
GAWR rear	927	420	927	420	927	420

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

Table 2-5. Weights: FLHR, FLHRC, FLHX, FLHXS

ITEM	FLHR		FLHRC		FLHX		FLHXS	
	LB	KG	LB	KG	LB	KG	LB	KG
Running weight*	814	369	814	369	810	367	810	367
Maximum added weight allowed**	546	248	546	248	550	249	550	249
GVWR	1360	617	1360	617	1360	617	1360	617
GAWR front	500	227	500	227	500	227	500	227
GAWR rear	927	420	927	420	927	420	927	420

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

⚠WARNING

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

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

NOTES

- *The maximum additional weight allowed on the motorcycle equals the Gross Vehicle Weight Rating (GVWR) minus the running weight. For example, a motorcycle with GVWR of 1200 lbs (544 kg) having a running weight of 800 lbs (363 kg), would allow a maximum of an additional 400 lbs (181 kg) combined weight of the rider, passenger, riding gear, cargo and installed accessories.*
- *For important information regarding tire data and tire inflation, see 1.9 TIRES AND WHEELS.*

Tire Specifications

⚠WARNING

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

NOTE

ABS equipped motorcycles must always use properly inflated tires and wheels that are the same as the original equipment. The ABS system 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 effect its ability to detect and prevent lockups.*

Operating with inflation pressure other than those specified in Table 2-8 can reduce ABS performance.

Tire model and size is molded on the sidewall. Refer to the tire fitment tables below. Rim size and contour are cast or stamped into the exterior surface of the rim.

Example: T19 x 2.15 MT DOT

- "T" indicates that the rim conforms to Tire and Rim Association standards.
- The "19" is the diameter of the rim in inches, measured at the bead seat diameter.
- The "2.15" is the width of the bead seat measured in inches. "MT" designates the rim contour.
- "DOT" means that the rim meets U.S. Department of Transportation Federal Motor Vehicle Safety Standards.

Table 2-6. Tire Fitment - Tubeless Cast Wheels

WHEEL SIZE AND POSITION	RIM SIZE AND CONTOUR	RIM VALVE HOLE DIA.	APPROVED TIRE
19 in. - Front	T19 x 3.50 MT	0.45 in. (11.4 mm)	**Dunlop D408F** 130/60B19 61H
17 in. - Front	T17 x 3.00 MT	0.45 in. (11.4 mm)	**Dunlop D408F** 130/80B17 65H
16 in. - Rear	T16 x 5.00 MT	0.45 in. (11.4 mm)	**Dunlop D407T** 180/65B16 81H

Table 2-7. Tire Fitment - Tube Type Steel Laced Wheels

WHEEL SIZE & POSITION	RIM SIZE & CONTOUR	TUBE SIZE	APPROVED TIRE
16 in - Front	T16 x 3.00D	MT90-16/MU85-16 130/90-150/80-16	**Dunlop D402F** MT90-B16 M/C 72H
16 in - Rear	T16 x 5.00 MT	180/65-16	**Dunlop D407** 180/65-16 81H

Table 2-8. Specified Tires

MODEL	MOUNT	SIZE	SPECIFIED TIRE	PRESSURE (COLD)	
				PSI	kPa
FLHTCU, FLHTK, FLHR	front	17 in	Dunlop D408F 130/80B17 65H *	36	248
FLHRC, FLHR (laced)	front	16 in	Dunlop D402F MT90B16 M/C 72H **	36	248
FLHX, FLHXS	front	19 in	Dunlop D408F 130/60B19 61H *	36	248
All with cast wheels	rear	16 in	Dunlop D407T 180/65B16 81H *	40	276
FLHRC, FLHR (laced)	rear	16 in	Dunlop D407 180/65B16 81H **	40	276

* Black wall
** Wide white wall

VEHICLE IDENTIFICATION NUMBER (VIN)

General

See Figure 2-2. A unique 17-digit serial or Vehicle Identification Number (VIN) is assigned to each motorcycle. Refer to Table 2-9.

Location

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

Abbreviated VIN

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

NOTE

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

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

Figure 2-1. VIN Locations

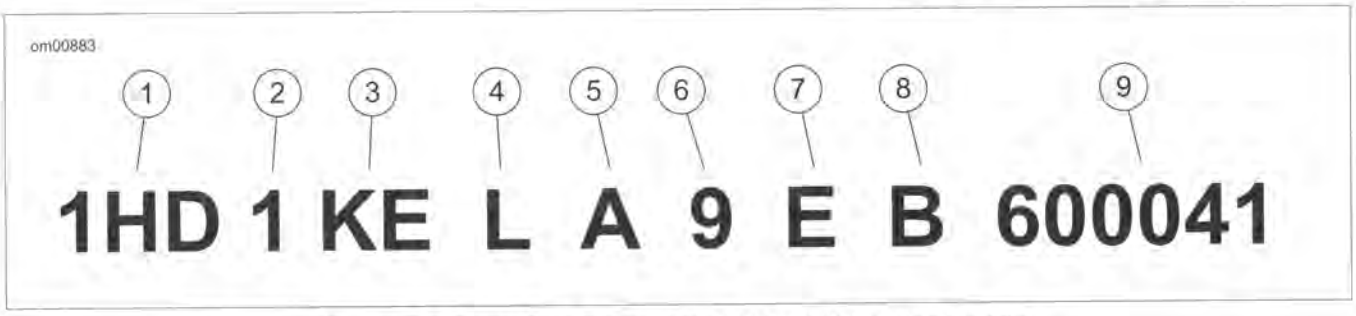


Figure 2-2. Typical Harley-Davidson VIN: 2014 Touring Models

Table 2-9. Harley-Davidson VIN Breakdown: 2014 Touring Models

POSITION	DESCRIPTION	POSSIBLE VALUES
1	World manufacturer identifier	1HD=Originally manufactured for sale **within** the United States 5HD=Originally manufactured for sale **outside** of the United States 932=Originally manufactured in and for sale only in Brazil market MEG=Originally manufactured in and for sale only in India market
2	Motorcycle type	1=Heavyweight motorcycle (901 cm^3 or larger)
3	Model	See VIN model code table
4	Engine type	M=Air-Cooled 1690 cm^3 High Output Twin Cam 103™, fuel-injected L=Twin-Cooled™ 1690 cm^3 High Output Twin Cam 103™, fuel-injected

Table 2-9. Harley-Davidson VIN Breakdown: 2014 Touring Models

POSITION	DESCRIPTION	POSSIBLE VALUES	
5	Calibration/configuration, introduction	**Normal Introduction** 1=Domestic (DOM) 3=California (CAL) A=Canada (CAN) C=HDI E=Japan (JPN) G=Australia (AUS) J=Brazil (BRZ) L=Asia Pacific (APC) N=India (IND)	**Mid-year or Special Introduction** 2, 4=Domestic (DOM) 5, 6=California (CAL) B=Canada (CAN) D=HDI F=Japan (JPN) H=Australia (AUS) K=Brazil (BRZ) M=Asia Pacific (APC) P=India (IND)
6	VIN check digit	Can be 0-9 or X	
7	Model year	E=2014	
8	Assembly plant	B=York, PA U.S.A. D=H-D Brazil-Manaus, Brazil (CKD) N=Haryana India (Bawal District Rewari)	
9	Sequential number	Varies	

Table 2-10. VIN Model Codes: 2014 Touring Models

CODE	MODEL	CODE	MODEL
FB	FLHR Road King®	KE	FLHTK Ultra Limited
FR	FLHRC Road King® Classic	KN	FLHTK Ultra Limited Shrine
KB	FLHX Street Glide®	FC	FLHTCU Electra Glide® Ultra Classic®
KP	FLHX Street Glide® Shrine	KS	FLHTCU TC Electra Glide® Ultra Classic® Twin-Cooled™
KR	FLHXS Street Glide® Special		

REMOVAL

NOTICE

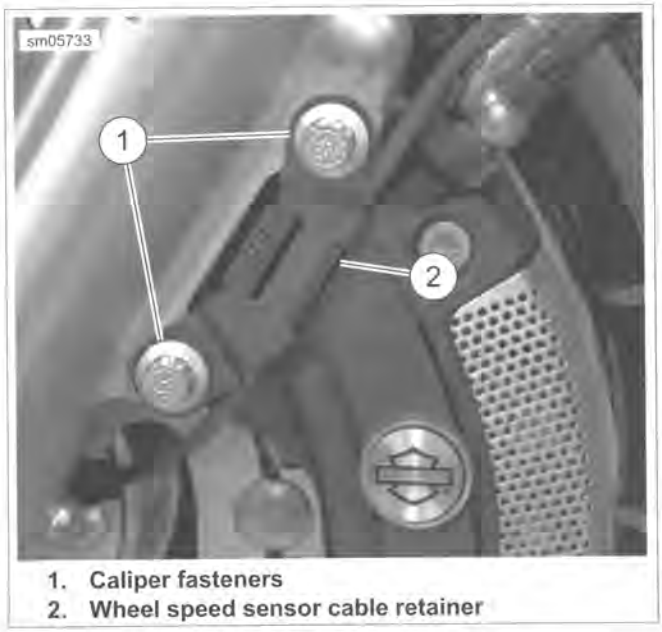
When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform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

1. Raise the wheel with a suitable lifting device.
2. Check wheel bearing wear. See 2.10 SEALED WHEEL BEARINGS.
3. If a warped brake disc is suspect, measure lateral runout prior to wheel removal. See 1.18 BRAKE PADS AND DISCS.
4. If equipped, cut cable straps to release front wheel speed sensor (WSS) cable and front fender tip lamp wires from left caliper brake hose.
5. See Figure 2-3. Remove both brake calipers. Temporarily secure calipers to engine guard.

NOTE

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

6. See Figure 2-4. Remove the axle nut (6) and flat washer (5).
7. Loosen axle pinch screw at bottom of right side fork slider.



1. **Caliper fasteners**
2. **Wheel speed sensor cable retainer**

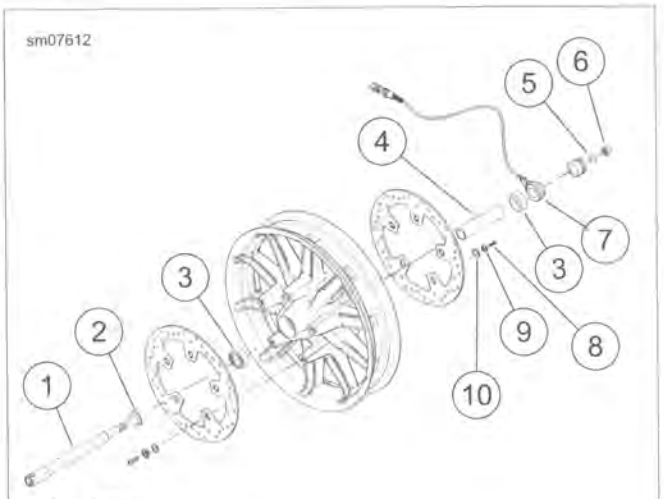
Figure 2-3. Remove Front Caliper

8. Remove the axle (1) from right side of motorcycle. Catch external spacer(s) (2) and front wheel speed sensor (WSS) (7) (if ABS equipped) as the axle is removed.

NOTE

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

9. If necessary, remove screws (8) (metric) to release brake discs from hub. Cast wheels also use bushings (9) and spring washers (10).



1. **Axle**
2. **Outer spacer**
3. **Bearing (2)**
4. **Inner spacer**
5. **Flat washer**
6. **Nut**
7. **WSS**
8. **Screw, brake disc**
9. **Bushing (cast wheels)**
10. **Spring washer (cast wheels)**

Figure 2-4. Front Wheel (typical)

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent (wheel speed sensor and bearings excepted). Inspect for damage or excessive wear.
2. Replace brake discs if warped or badly scored. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.

INSTALLATION

FASTENER	TORQUE VALUE	
Brake disc, front, screws (metric)	16-24 ft-lbs	21.7-32.5 Nm
Front axle nut	70-75 ft-lbs	94.9-101.7 Nm
Front axle pinch screw	18-22 ft-lbs	24.4-29.8 Nm

NOTE

When installing front brake discs, align the rivets with the rivets on the opposite disc.

NOTICE

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

1. See Figure 2-4. If removed, install brake discs using **new** screws (8) (metric), bushings and spring washers (9, 10) (cast wheels only). Tighten in a crosswise pattern to 16-24 ft-lbs (21.7-32.5 Nm).
2. Place wheel into position with the valve stem on the right side of motorcycle.
3. Apply a light coat of ANTI-SEIZE LUBRICANT to axle, bearing bores and bore of spacer sleeve.

NOTE

Be sure that grooves on external spacer(s), or index pin on front WSS (if ABS equipped), are on the outboard side. If motorcycle is not ABS equipped, external spacers on left and right side of wheel hub are interchangeable.

4. Slide axle through right fork and external spacer into wheel hub.
5. Push axle through front WSS (if ABS equipped) or second external spacer, and left fork.
6. Install flat washer and axle nut.
7. **ABS models:** Rotate WSS until it makes contact with rear of fork slider. Back off just enough to maintain clearance between the WSS wire stem and fork slider.
8. Hold axle stationary and tighten axle nut to 70-75 ft-lbs (94.9-101.7 Nm).
9. Push and hold right fork slider inboard until it contacts external spacer. Tighten axle pinch screw to 18-22 ft-lbs (24.4-29.8 Nm).

NOTE

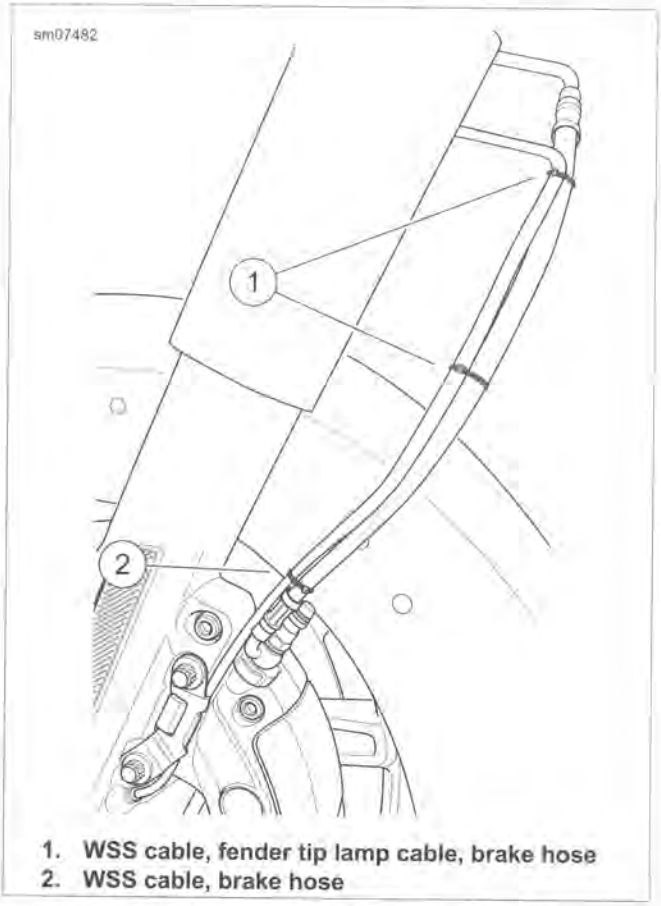
ABS equipped: See Figure 2-4. Verify that WSS cable is installed in bracket and that clip is secure. Clip cannot be installed once mounting screws are started.

10. Install brake calipers and sensor cable retainer (if equipped). See 2.13 FRONT BRAKE CALIPER.

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

11. Operate front brake hand lever several times to set brake pads to proper operating position.
12. See Figure 2-5. If ABS equipped, install **new** cable straps (1, 2) to secure WSS and fender tip lamp cables.



1. **WSS cable, fender tip lamp cable, brake hose**
2. **WSS cable, brake hose**

Figure 2-5. Secure Cables and Brake Hose

REMOVAL

PART NUMBER	TOOL NAME
HD-47925	AXLE NUT TORQUE ADAPTER

1. Remove saddlebags. See 2.31 SADDLEBAGS.

NOTICE

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

2. Raise the wheel with a suitable lifting device.
3. Inspect wheel bearings. See 2.10 SEALED WHEEL BEARINGS.
4. If a warped brake disc is suspected, measure lateral runout prior to wheel removal. See 1.18 BRAKE PADS AND DISCS.
5. If worn sprocket isolator is suspected, measure wear. See 1.15 REAR SPROCKET ISOLATOR.
6. Remove left muffler. See 4.18 EXHAUST SYSTEM.
7. On models equipped with manual adjust shock absorbers, remove left side lower saddlebag support rail. See 2.32 SADDLEBAG SERVICE, Saddlebag Support.
8. **ABS equipped:** Release rear wheel speed sensor (WSS) cable from rear brake hose.
9. Remove rear brake caliper but do not disconnect the brake hose. Set brake caliper on passenger footboard. See 2.15 REAR BRAKE CALIPER.

NOTE

Do not operate the rear brake pedal with the caliper removed or the caliper pistons may be forced out. The caliper contains no serviceable components and would require replacement.

10. See Figure 2-6. Remove E-clip (1) from the groove at the end of the axle.
11. See Figure 2-7. Hold weld nut on left side and loosen cone nut using AXLE NUT TORQUE ADAPTER (Part No. HD-47925).
12. Remove cone nut and adjuster cam from axle.
13. Rotate weld nut on opposite side of axle counterclockwise until wheel is loose.

NOTES

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

14. Remove the axle from the left side of the motorcycle. Catch external spacer(s), caliper bracket, and rear WSS (if ABS equipped) as the axle is removed.
15. Remove caliper bracket from anchor weldment on rear fork.

NOTE

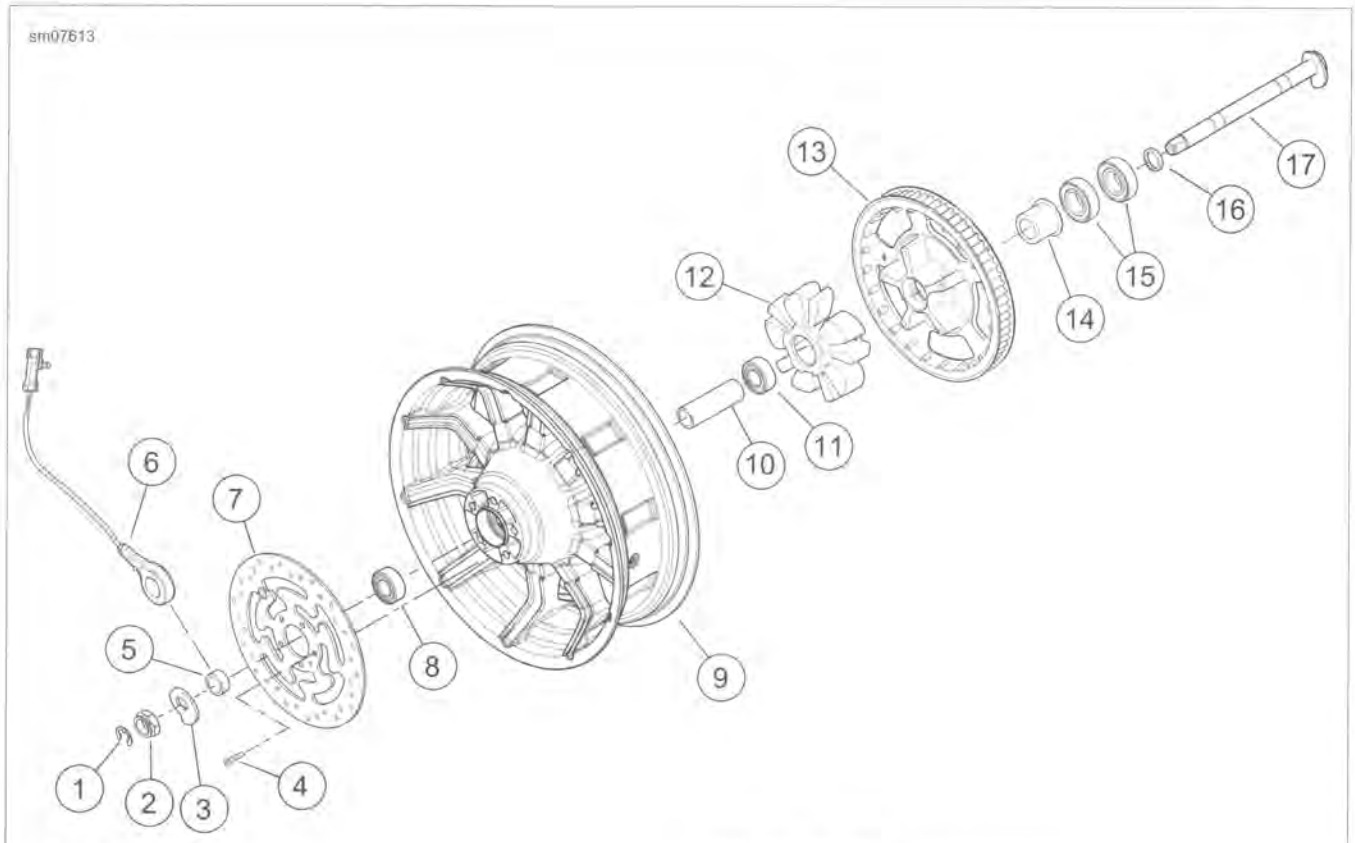
To protect belt on vehicles with a hot exhaust, place a shop towel over exhaust crossover.

16. Move wheel forward and slip belt off compensator sprocket.

NOTE

Hold sprocket while removing rear wheel. Sprocket may drop from wheel if isolators are excessively worn.

17. If necessary, remove brake disc from hub. If wheel is to be assembled with the same disc, mark both the wheel and disc, so that it can be installed in its original position.



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

Figure 2-6. Rear Wheel (typical)

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent (wheel speed sensor and bearings excepted) and inspect for damage or excessive wear.
2. Replace brake disc if warped or badly scored. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.
3. Check the compensator sprocket for wear, tooth damage, cracks or pitting. Check isolator for crumbling, flaking, excessive wear or general deterioration. Replace parts as necessary.

INSTALLATION

PART NUMBER	TOOL NAME
HD-35381A	BELT TENSION GAUGE

FASTENER	TORQUE VALUE	
Brake disc, rear, screws	30-45 ft-lbs	41-61 Nm
Rear axle cone nut, 1st torque	15-20 ft-lbs	20-27 Nm
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm

NOTICE

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

NOTE

Always install brake disc in its original position.

1. If removed, install brake disc in its original position using **new** screws. Tighten screws in a crosswise pattern to 30-45 ft-lbs (41-61 Nm).
2. Verify that sprocket is square and fully seated in bowl area of wheel.
3. Place wheel in rear fork. Install belt over sprocket and slide the wheel back.

⚠WARNING

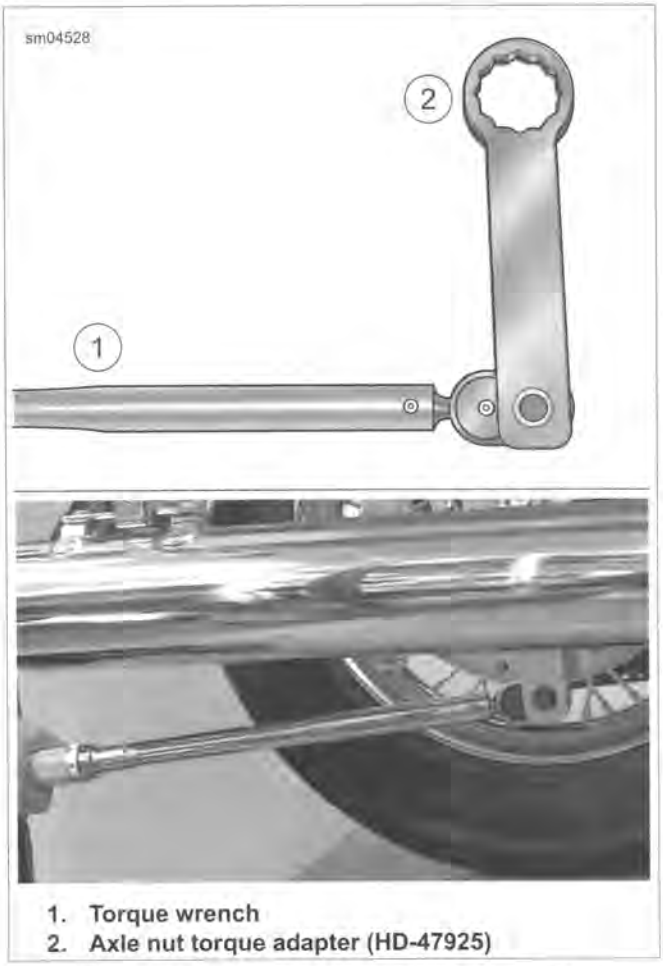
Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

4. Seat the caliper bracket on the anchor weldment of the rear fork.
5. Apply a light coat of ANTI-SEIZE LUBRICANT to axle, bearing bores and bore of spacer sleeve.
6. Slide axle through left side of rear fork, external spacer (thin), sprocket and into wheel hub.

NOTE

Grooves on external spacer, or index pin on rear WSS (if ABS equipped), must be on the outboard side.

7. Push axle through rear WSS (if ABS equipped) or external spacer (thick), caliper bracket and right side of rear fork.
8. Rotate axle so the flat on the threaded end is topside. With the cam forward, install adjuster cam on the end of the axle.
9. Apply a light coat of ANTI-SEIZE LUBRICANT to the inboard face of the cone nut avoiding contact with threads. Install cone nut on axle. Finger tighten only.



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

Figure 2-7. Install Tool Perpendicular to Torque Wrench

10. **ABS equipped:** Route sensor cable forward and outboard of caliper bracket. Continue forward following the top of the rear fork. Rotate rear WSS counterclockwise until index pin makes contact with caliper bracket at point shown in Figure 2-8.
11. Tighten the cone nut to a preliminary torque of 15-20 ft-lbs (20-27 Nm). The final torque will be done during the belt adjustment procedure.
12. Install the brake caliper and tighten screws to 43-48 ft-lbs (58.3-65.1 Nm).
13. Secure rear WSS cable to the brake hose with the conduit clip located approximately 1.25 in. (31.8 mm) in front of the brake hose crimp.
14. Adjust drive belt using BELT TENSION GAUGE (Part No. HD-35381A). See 1.14 DRIVE BELT AND SPROCKETS.
15. Install a **new** E-clip on right side of axle with the flat side out.
16. Install the left side lower saddlebag support rail if removed. See 2.32 SADDLEBAG SERVICE, Saddlebag Support.

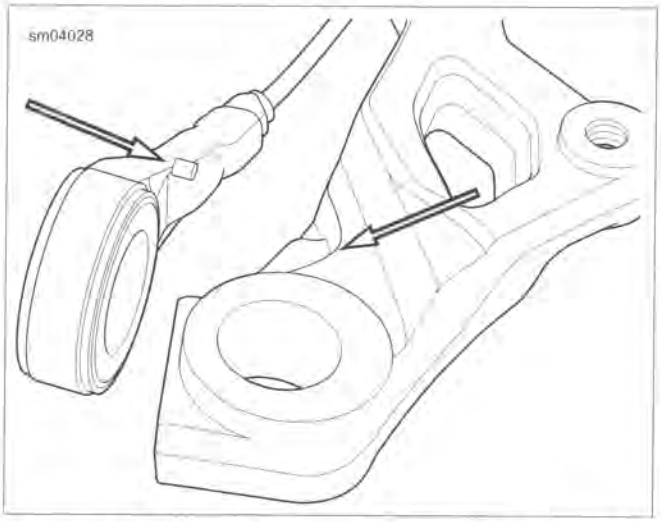


Figure 2-8. Rear Wheel Speed Sensor Index Pin (ABS Equipped)

17. Install the left muffler. See 4.18 EXHAUST SYSTEM.

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

18. Operate the rear brake pedal several times to set brake pads to the proper operating position.
19. Install saddlebags. See 2.31 SADDLEBAGS.

ISOLATOR REPLACEMENT

Removal

1. Remove rear wheel. See 2.5 REAR WHEEL.
2. Pull sprocket from wheel.
3. Remove isolator from wheel.

Installation

1. See Figure 2-9. Lubricate each segment (2) of **new** isolator with 50/50 mix of isopropyl alcohol and water. Do not use a petroleum based lubricant.
2. Push isolator into wheel. Verify that each isolator segment bottoms in bowl and are flush against side walls of ribs (1).
3. Lubricate sides of each isolator segment gap (3) with isopropyl alcohol/water mix.
4. Push sprocket onto wheel.
5. Install rear wheel. See 2.5 REAR WHEEL.

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

Figure 2-9. Install Isolator in Wheel

SPROCKET BEARING REPLACEMENT

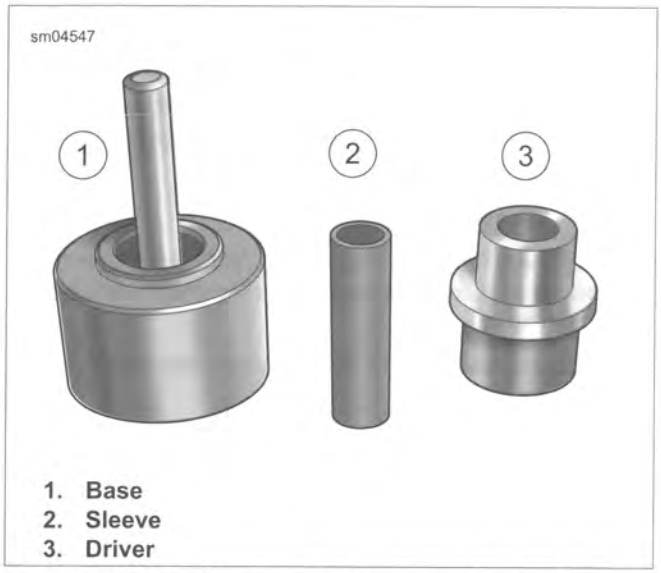
PART NUMBER	TOOL NAME
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER

Removal

1. Remove the rear wheel. See 2.5 REAR WHEEL.
2. Pull sprocket from wheel.
3. See Figure 2-10 and upper frame of Figure 2-11. Support the base (1) of REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921) on a press with the large OD topside and the long pin (3) down.
4. Slide sleeve (2) over the short pin.
5. See lower frame of Figure 2-11. With the inboard side facing up, slide the sprocket over the sleeve until it rests on the base.
6. Slide the small OD of driver (6) over the sleeve until it contacts spacer (5).
7. Apply pressure to the driver until bearings drop into base. Disassemble the tool and discard the bearings.

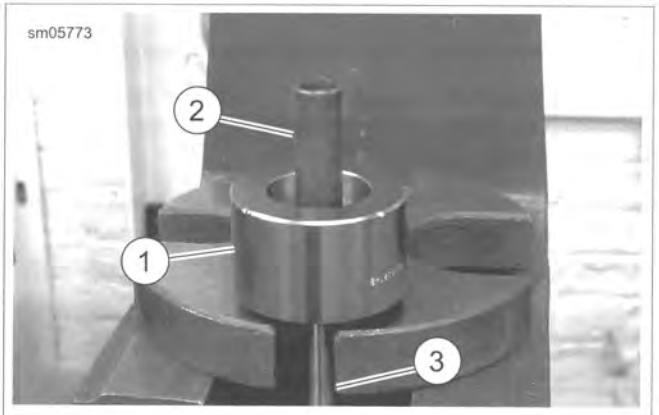
Installation

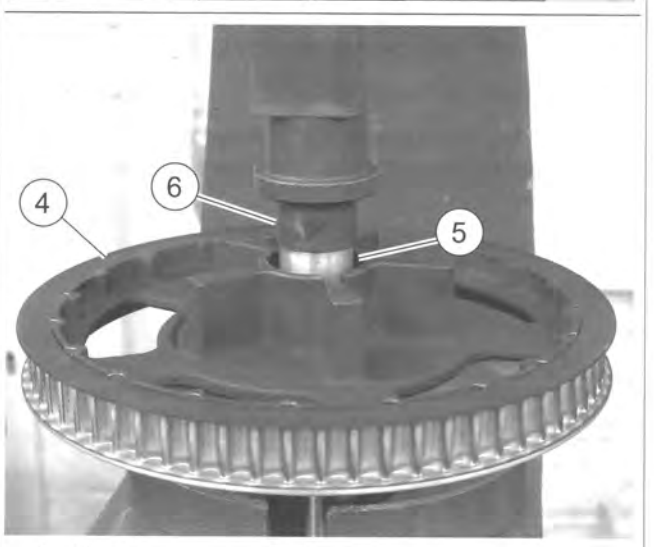
1. See upper frame of Figure 2-11. Support the base (1) of REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921) on a press with the large OD topside and the long pin (3) down.
2. Slide sleeve (2) over the short pin.
3. Verify that the sprocket bearing bore is clean and dry.
4. See upper frame of Figure 2-12. With the outboard side facing up, slide the sprocket over the sleeve until it rests on the base.
5. Place spacer (1) in the sprocket with the small diameter facing down.
6. Set bearing in place.
7. See lower frame of Figure 2-12. Center the large OD of driver (3) on the bearing. Verify the driver contacts the outer bearing race (4) all the way around.
8. Apply pressure to the driver until the bearing makes firm contact with the counterbore in the sprocket.
9. Repeat with the second bearing.
10. Lubricate each segment of **new** isolator with 50/50 mix of isopropyl alcohol and water. Do not use a petroleum based lubricant.
11. Push sprocket onto wheel.
12. Install rear wheel. See 2.5 REAR WHEEL.



1. Base
2. Sleeve
3. Driver

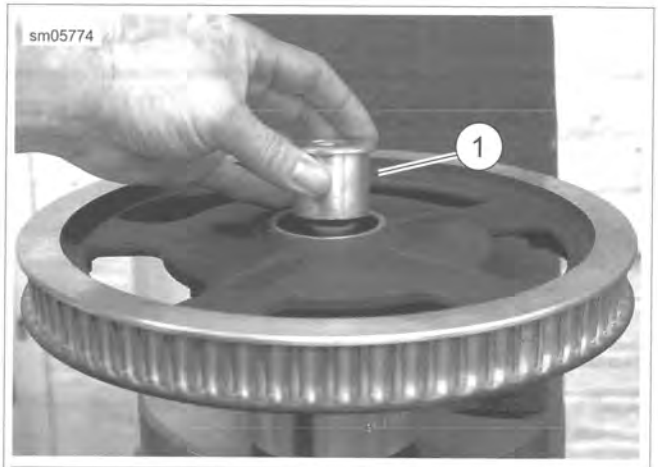
Figure 2-10. Rear Wheel Compensator Bearing Remover/Installer (HD-48921)

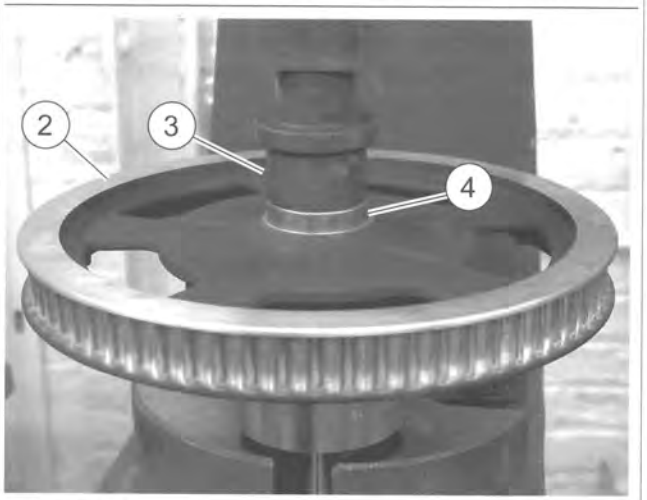




1. Base
2. Sleeve
3. Long pin
4. Sprocket (inboard side up)
5. Spacer
6. Driver

Figure 2-11. Remove Compensator Sprocket Bearing





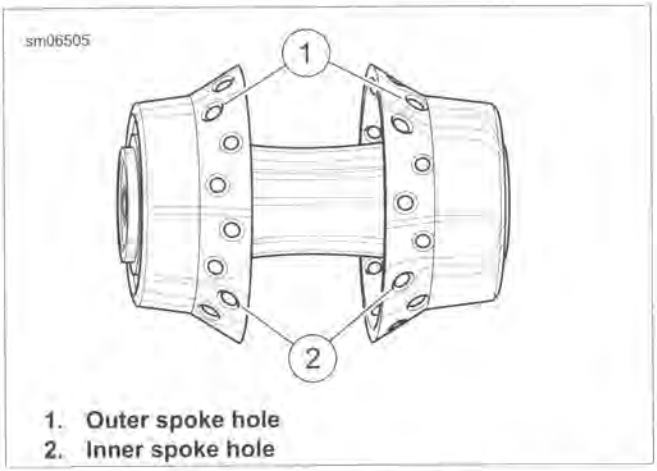
1. Spacer
2. Sprocket (outboard side up)
3. Driver
4. Bearing outer race

Figure 2-12. Install Compensator Sprocket Bearing

WHEEL LACING: ANGLE FLANGE HUB

NOTES

- *See Figure 2-13. The following procedure is valid for wheels that use an angle flange hub regardless of rim style or diameter.*
- *The primary brake side of the hub has one or two grooves cut into the disc mounting surface.*



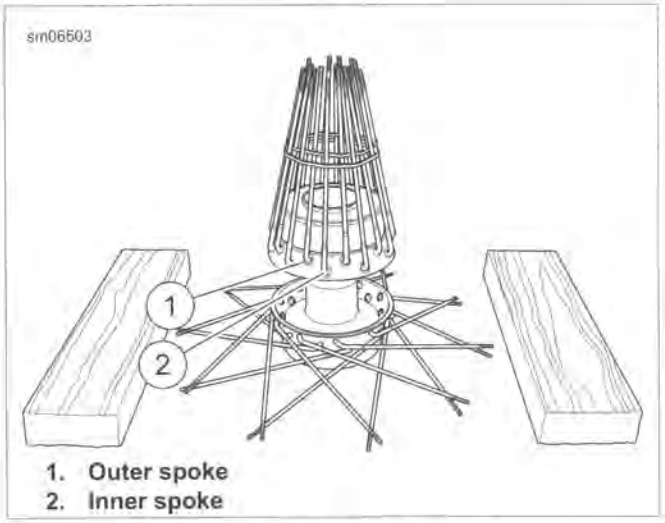
1. **Outer spoke hole**
2. **Inner spoke hole**

Figure 2-13. Angle Flange Hub

1. Place hub on workbench with primary brake side up.
2. Install all spokes in the lower flange.
3. See Figure 2-14. Flip hub over. Gather all outer spokes and hold upright with a rubber band. Repeat with the inner spokes using a second rubber band.
4. Install spokes in remaining flange.
5. Rotate the lower flange spokes as far as they will go:
   a. Outer spokes clockwise.
   b. Inner spokes counterclockwise.
6. Center the rim over the hub and spokes assembly and support on wooden blocks approximately 1.5 in (38.1 mm) thick.

NOTE

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



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

Figure 2-14. Spokes Gathered

7. See Figure 2-15. Install lower flange outer spokes and loosely install spoke nipples. Start at the first hole counterclockwise (1) from valve stem hole.
8. Install remaining outer spokes in every 4th hole.
9. Install lower flange inner spokes and loosely install spoke nipples:
   a. Starting at the 2nd hole counterclockwise (2) from first spoke installed, install inner spoke.
   b. Install remaining inner spokes in every 4th hole.
10. Carefully release upper flange inner spokes and fan out around rim, rotating them clockwise.
11. Starting at the first hole counterclockwise (3) from first spoke installed, install inner spoke. Install all remaining inner spokes in every 4th hole.
12. Carefully release upper flange outer spokes and fan out around rim, rotating them counterclockwise.
13. Install outer spokes in remaining holes (4).
14. Verify spoke heads are seated. See 2.9 CHECKING AND TRUING WHEELS.
    a. Evenly hand-tighten spoke nipples until snug.
    b. Only tighten until slack is removed.
    c. Proper torque will be applied when the wheel is trued.
    d. Adjust offset and true the wheel.

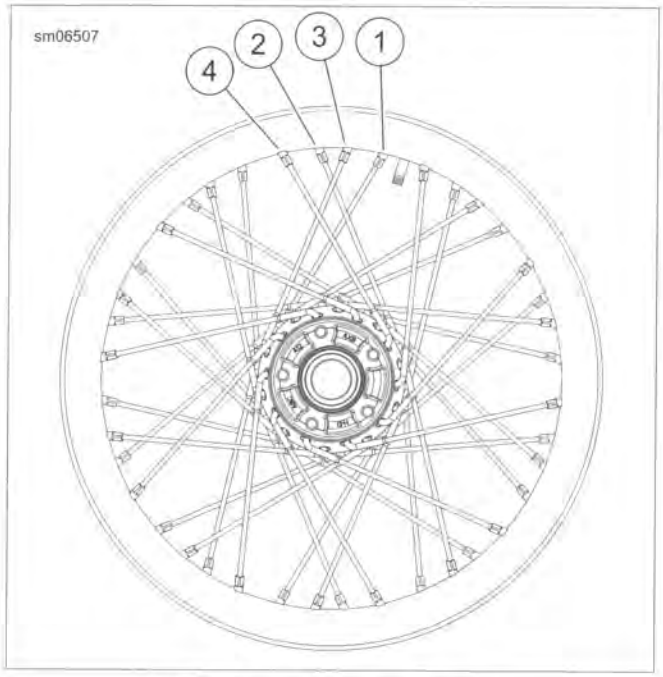


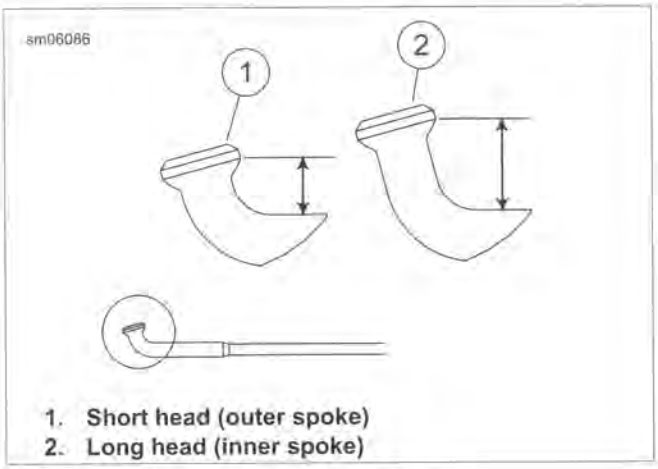
Figure 2-15. Center Valve Rim

WHEEL LACING: 16 IN. REAR WHEEL

1. See Figure 2-16. Divide spokes into two groups.
   a. Outer spokes (short heads) (1).
   b. Inner spokes (long heads) (2).

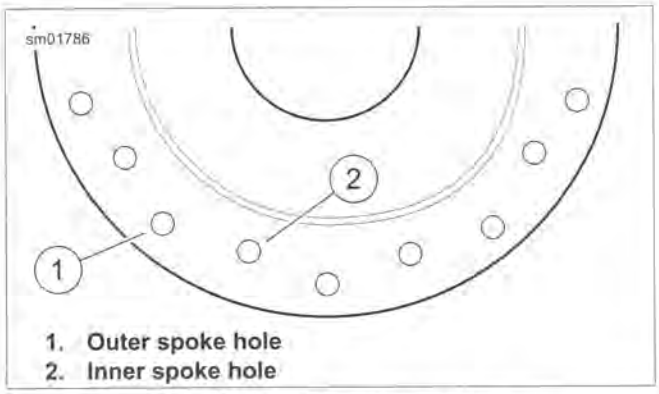
NOTE

See Figure 2-17. The spoke holes in the wheel hub are staggered, alternating between inner holes (2) (nearer hub center) and outer holes (1) (nearer hub edge).



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

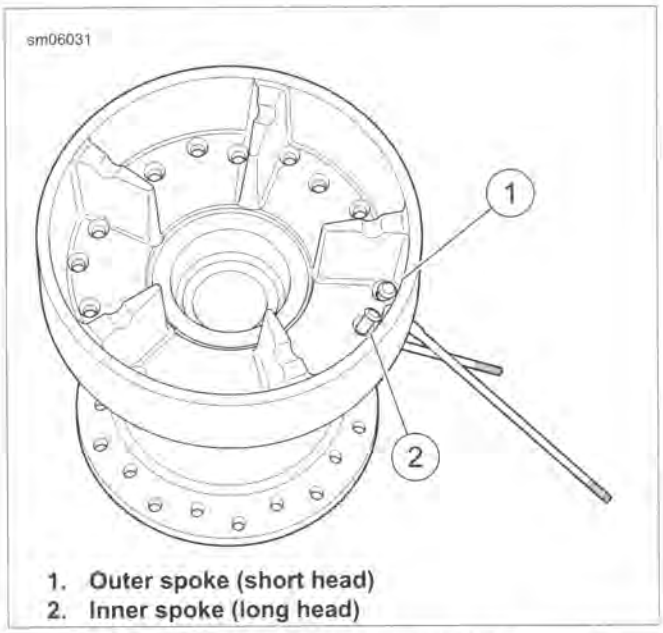
Figure 2-16. Spoke Heads



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

Figure 2-17. Spoke Hole Pattern

2. Lubricate all spoke threads and nipple shoulders with tire mounting lubricant.
3. See Figure 2-18. Place hub on workbench with the brake disc side down. Insert outer spokes (1) (short-head) into the outer holes and inner spokes (2) (long-head) in the inner holes.
4. See Figure 2-19. After spokes are installed, flip wheel hub over. Swing outer spokes counterclockwise and inner spokes clockwise as shown. Each inner spoke should cross four outer spokes, and each outer spoke should cross four inner spokes.
5. Install all outer spokes, then all inner spokes on brake-side flange. Swing inner spokes counterclockwise and outer spokes clockwise on brake-side flange, each crossing four of the opposite type.



1. **Outer spoke (short head)**
2. **Inner spoke (long head)**

Figure 2-18. Lacing Wheel Hub

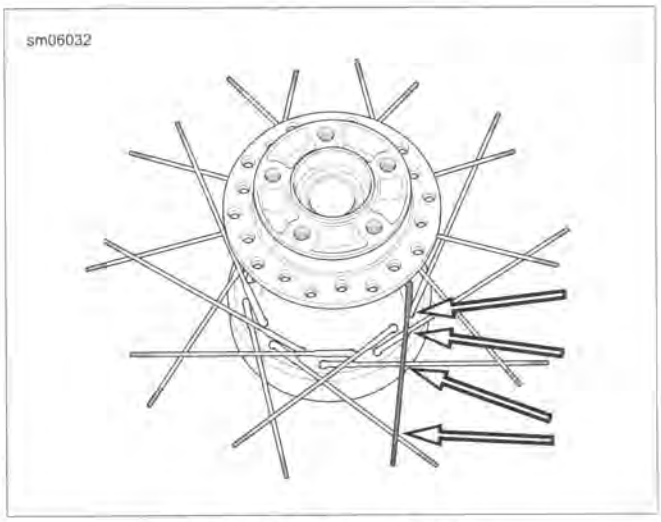
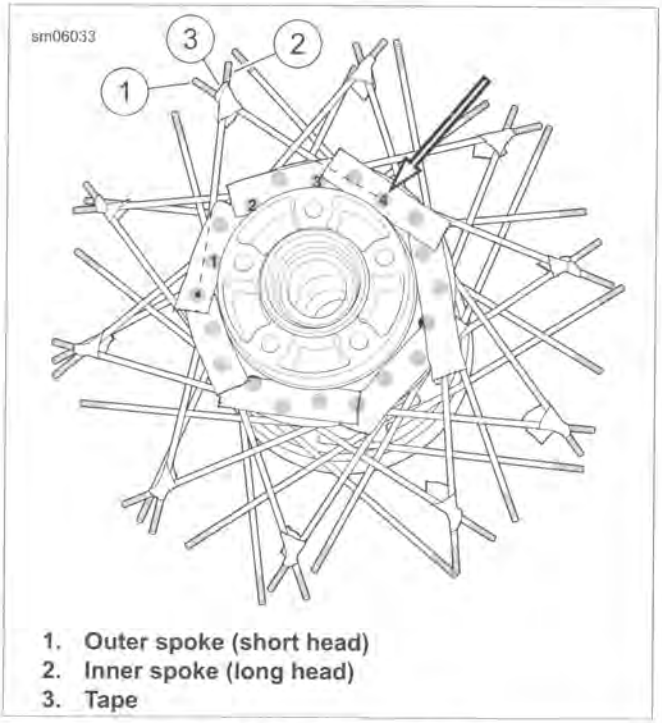


Figure 2-19. Arrange Spokes

NOTE

See Figure 2-20. Tape placed across brake disc flange and spoke heads will hold spokes up away from lower row of spokes, making it easier to gather upper spokes.

6. See Figure 2-20. Group upper spokes (brake-side) into bundles of two as shown. Join an outer spoke (1) with the inner spoke (2) that is located four places clockwise and secure with tape (3) approximately 1 in. (25 mm) from threaded end.



1. **Outer spoke (short head)**
2. **Inner spoke (long head)**
3. **Tape**

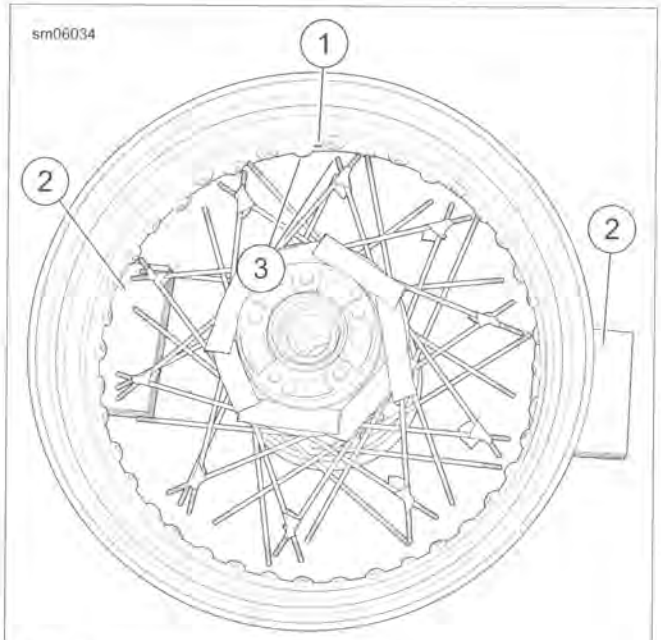
Figure 2-20. Bundling Spokes

7. Make sure all spokes on compensator-side flange are still arranged properly and pointing in the correct direction:
   a. All outer spokes (short-head) point counterclockwise, crossing four inner spokes.
   b. All inner spokes (long-head) point clockwise, crossing four outer spokes (short-head).
   c. Angle all spokes as far as they will go without overlapping the next LIKE spoke.

NOTES

- *Verify all inner spokes lay inboard and outer spokes lay outboard.*
- *See Figure 2-21. The valve stem hole location (1) is centered on the rim so rim orientation is not important.*

8. See Figure 2-21. Center the rim over the hub/spoke assembly and support on wooden blocks (2) approximately 1.5 in (38.1 mm) thick. Rotate so valve stem hole (1) is near a pair of taped spokes.



1. **Valve stem location**
2. **Wooden blocks**
3. **Beginning spoke location**

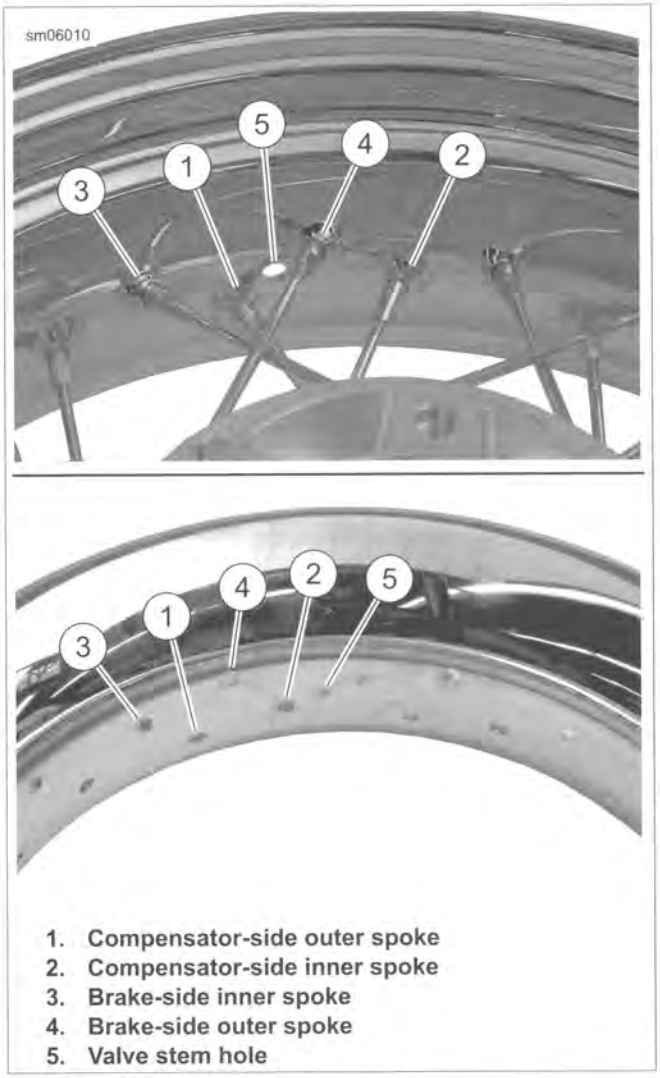
Figure 2-21. Place Rim

NOTE

See Figure 2-22. It is recommended that the first spoke be installed near the valve stem hole (5). Place spoke nipples through several rim holes to determine the hole direction. Only one spoke will fit into the spoke nipple correctly. When connecting the spoke to the spoke nipple, finger tighten two to three threads.

9. See Figure 2-22. Begin with the outer spokes (short-head) of the lower (compensator) flange. Using the spoke alignment method discussed previously, locate a spoke hole (1) just left of the valve stem hole (5) that points toward an outer spoke.
   a. Secure spoke to nipple. Skip three rim holes and repeat with the next outer spoke. Follow pattern to complete lower (compensator) flange outer spokes (short-head).
   b. Once completed, check for three empty holes between each spoke.

10. Install the lower (compensator) flange inner spokes (long-head) next. Choose a beginning spoke (2) near the valve stem hole (5).
    a. Each inner spoke (long-head) points clockwise and crosses four outer spokes (short-head).
    b. Secure spoke to nipple. Complete installing lower flange inner spokes (long-head).



1. **Compensator-side outer spoke**
2. **Compensator-side inner spoke**
3. **Brake-side inner spoke**
4. **Brake-side outer spoke**
5. **Valve stem hole**

Figure 2-22. Begin Lacing

NOTE

Do not move outer spokes (short-head) under inner spokes (long-head) when removing the tape or they will become trapped underneath the inner row of spokes.

11. See Figure 2-21. Remove tape from each upper bundle and fan the spokes out toward the rim.

NOTE

All upper flange inner spokes (long-head) should point counter-clockwise and outer spokes (long-head) clockwise.

12. See Figure 2-22. Choose a beginning spoke near the valve stem hole (5). Start with a top flange inner spoke (3) (long-head) first.
    a. Secure spoke to nipple. Follow pattern to complete upper (brake-side) flange inner spokes (long-head).
    b. Once completed, check for one empty hole after every third spoke.
13. Install upper flange outer spoke (4) (short-head).
14. Secure spoke to nipple. Complete upper flange outer spokes (short-head).

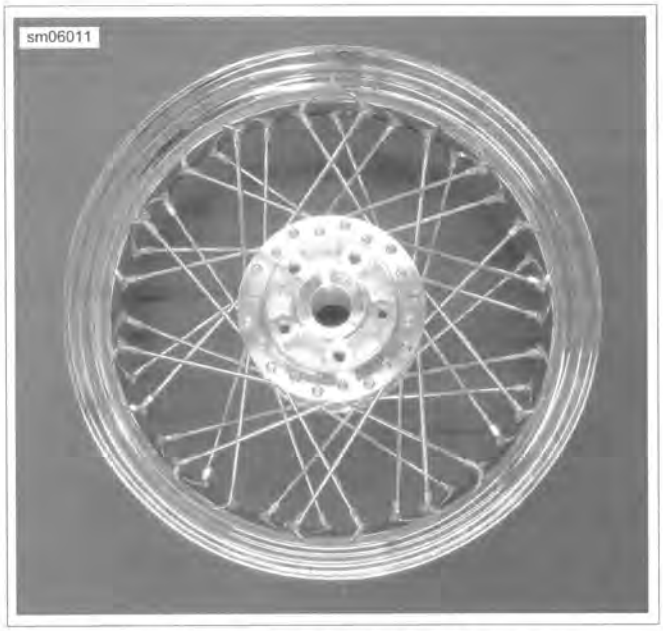


Figure 2-23. Completed 16 Inch Rear Wheel

15. Verify that completed wheel resembles Figure 2-23.
16. Verify spoke heads are seated. Evenly hand-tighten spoke nipples until snug. Only tighten until slack is removed. Proper torque will be applied when the wheel is trued.
17. Adjust offset and true the wheel. See 2.9 CHECKING AND TRUING WHEELS.

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 1.9 TIRES AND WHEELS, Wheel Bearings.

CHECKING WHEEL RUNOUT

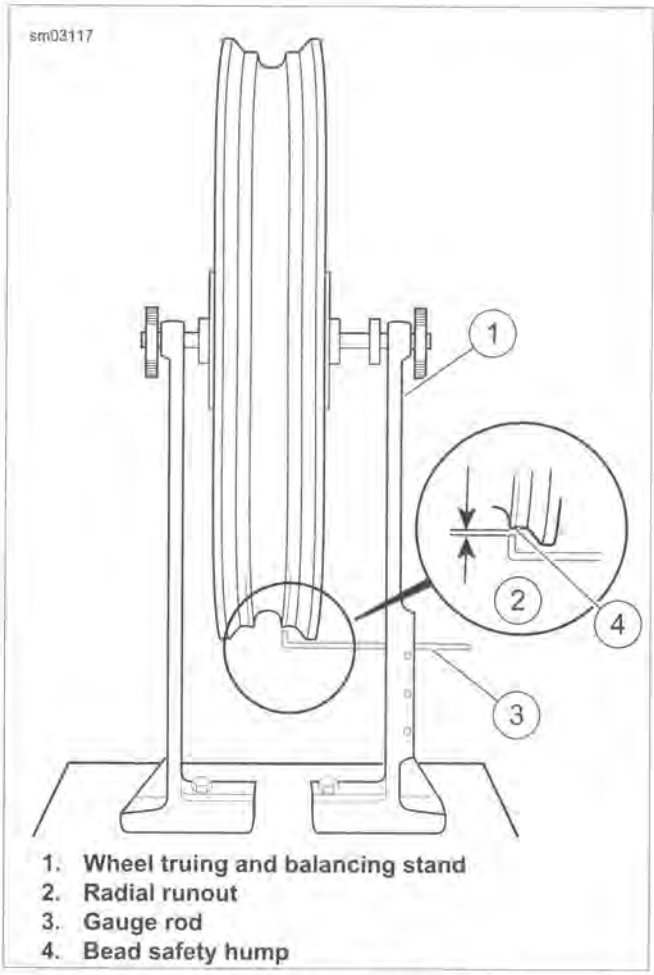
PART NUMBER	TOOL NAME
HD-99500-80	WHEEL TRUING AND BALANCING STAND

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 2-24. Mount wheel in WHEEL TRUING AND BALANCING STAND (Part No. 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 0.030 in (0.76 mm).



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

Figure 2-24. Checking Radial Runout

Checking Lateral Runout

1. See Figure 2-25. Mount wheel in WHEEL TRUING AND BALANCING STAND (Part No. 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 0.030 in (0.76 mm).

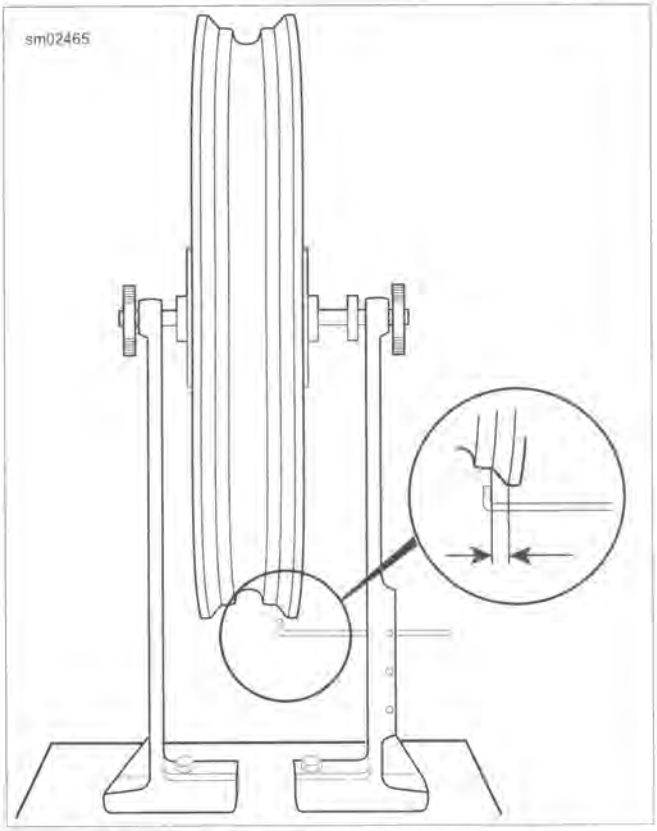


Figure 2-25. Checking Lateral Runout

LACED WHEEL RIM OFFSET

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

1. See Figure 2-26. Place a piece of tape to mark the center of each group of four spokes as shown. The groups should be directly opposite one another and approximately 90 degrees apart. Using different colors of tape or numbering each group is helpful.

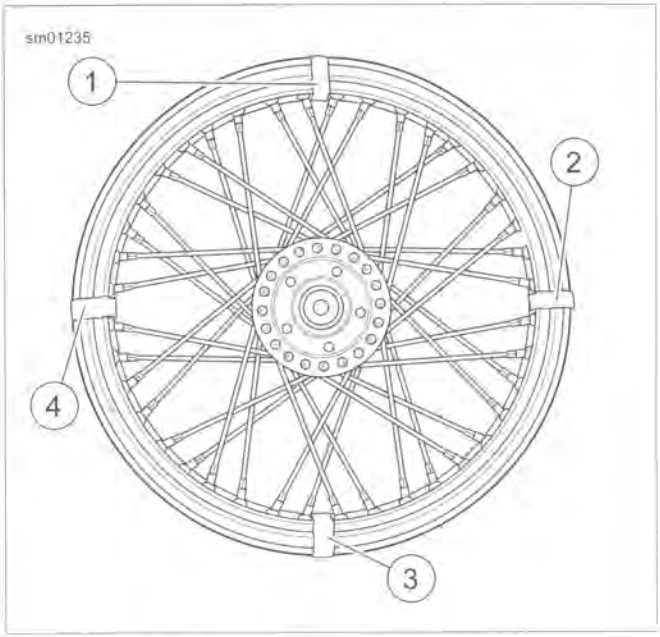


Figure 2-26. Marking Spoke Groups

2. See Figure 2-27. Mount wheel in WHEEL TRUING STAND (Part No. HD-99500-80) using truing arbor. Tighten arbor nuts so hub will turn on its bearings.

NOTE

The primary brake disc side of the hub has one or two grooves cut into the disc mounting surface.

3. Lay a straightedge across the primary brake disc mounting surface of hub and one of the marked spoke groups.
4. See Figure 2-28. Measure the distance from the straightedge to the location shown, based on rim design, to determine distance A. Refer to Table 2-11.

NOTES

- *Always loosen the appropriate spokes before tightening the other two. Reversing this procedure will cause the rim to become out-of-round.*
- *Tighten or loosen spokes one flat at a time and recheck measurement.*
- *Always work on groups that are opposite each other to maintain radial runout.*

5. If the dimension is not correct, adjust the four spokes using SPOKE NIPPLE WRENCH (Part No. HD-94681-80). For example: if the **right** side is **less** than specification, **loosen** the two spokes on the hub **right** side. Then **tighten** the two spokes attached to the hub **left** side. Turn all four spokes an equal number of turns until offset is to specification.
6. Repeat the previous step for all groups on the wheel. Verify the offset.
7. True the wheel. See 2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels.

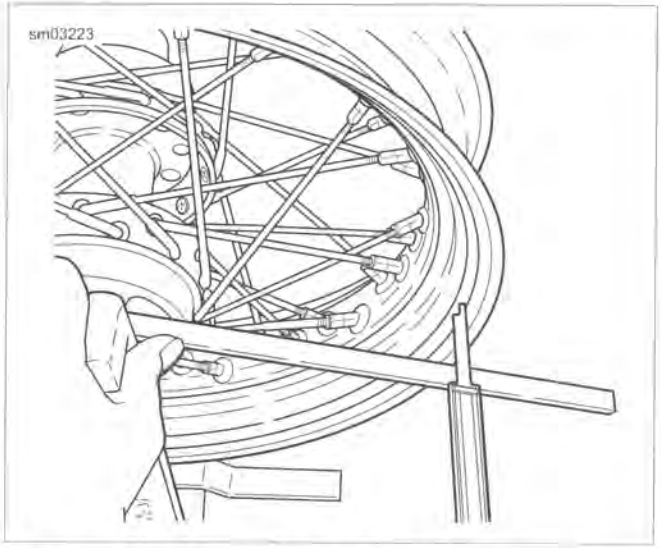


Figure 2-27. Checking Wheel Hub Offset Dimension (typical)

Table 2-11. Laced Wheel Offset Dimensions

RIM TYPE	RIM LOCATION	RIM SIZE	OFFSET (A)	
			IN	MM
Steel Laced	Front (1)	16 x 3	1.551-1.571	39.4-39.9
	Rear (2)	16 x 5	1.098-1.118	27.9-28.4

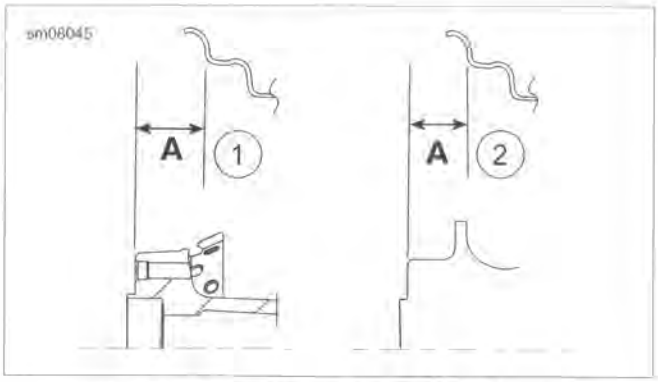


Figure 2-28. Laced Wheel Hub Offset Dimension

TRUING LACED WHEELS

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

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

NOTES

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

Radial Runout

1. See Figure 2-29. With the wheel mounted in WHEEL TRUING STAND (Part No. HD-99500-80), adjust the truing stand gauge (3) near to the rim's tire bead safety hump (4). If using a dial indicator, place the tip on the safety bead hump.
2. If working with a straight flange hub, seat each spoke head in the hub flange using a flat nose punch and mallet.

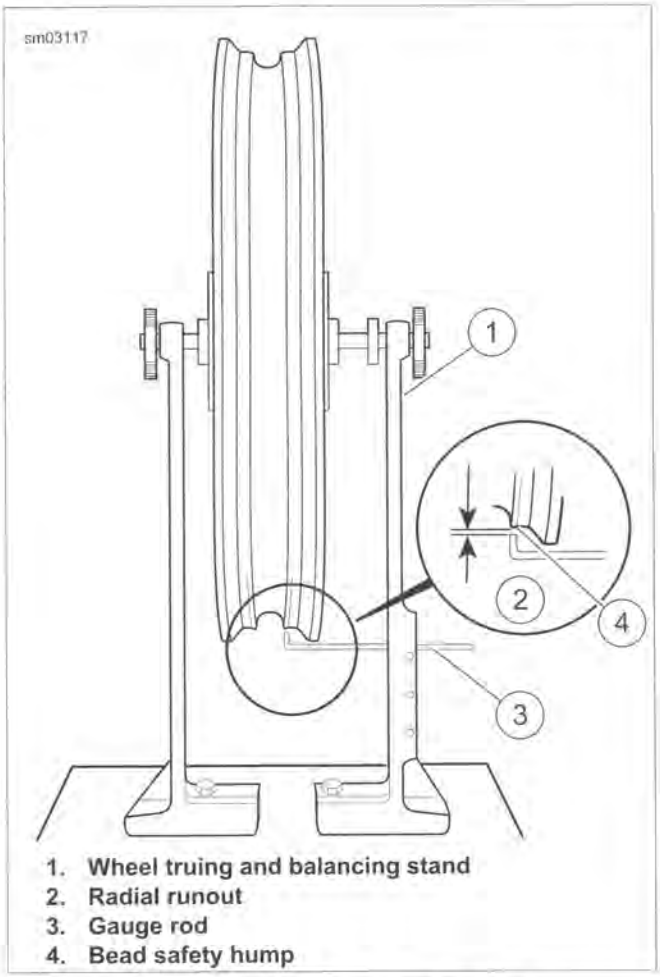
NOTES

- *Always loosen the appropriate spokes, using SPOKE NIPPLE WRENCH (Part No. HD-94681-80), before tightening the other two. Reversing this procedure will cause the rim to become out of round.*
- *Tighten or loosen spoke, one flat at a time, and recheck measurement. Small changes in the spokes can make large changes in the runout.*
- *Always work on groups that are opposite each other to maintain radial runout.*

3. Spin the rim slowly and check distance (2). The rim should be true within 0.030 in (0.76 mm).
   a. If the rim contacts the gauge on or near a marked group of spokes, loosen the spokes in the group on the opposite side of the rim. Then tighten the spokes in the group where the rim makes contact an equal number of turns.
   b. If the rim contacts the gauge between two marked groups, loosen the spokes in both groups on the opposite side of the rim. Then tighten the spoke groups on the side of the rim that makes contact an equal number of turns.
4. When the wheel is centered and trued, start at the valve stem hole and tighten any loose spoke nipples one turn at a time until they are snug.
5. Working alternately across the wheel, use SPOKE TORQUE WRENCH (Part No. HD-48985) evenly tighten all spokes to specification listed in Table 2-12.
6. If working with a straight flange hub, verify each spoke head is seated in the hub flange using a flat nose punch and mallet.
7. Verify radial runout is still within specification.
8. After you have verified that radial runout is still within specification, proceed to lateral runout.

⚠WARNING

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



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

Figure 2-29. Checking Radial Runout

Table 2-12. Spoke Nipple Torque Specification

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

Lateral Runout

NOTE

Dial indicators are more accurate than gauge rods.

1. See Figure 2-30. With the wheel mounted in WHEEL TRUING STAND (Part No. HD-99500-80), adjust the gauge rod (3) near the rim bead flange.
2. Rotate the rim slowly and check lateral runout (2). If runout exceeds 0.030 in (0.76 mm), adjust spokes as follows.

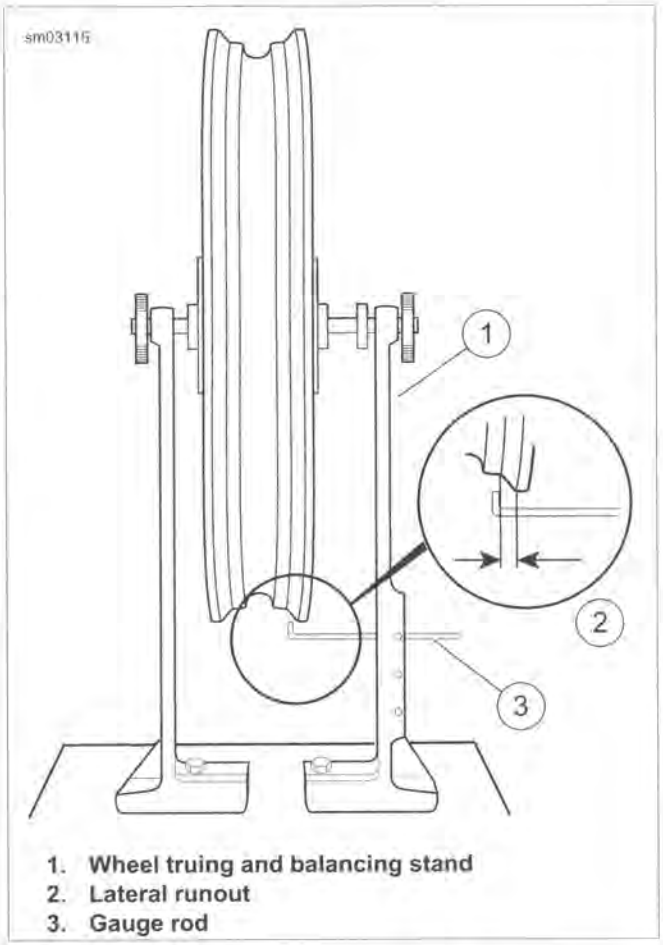
NOTES

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

3. Again working in groups of four, loosen two spokes on the tight side and tighten the two spokes on the loose side.
4. Repeat with each group until wheel is within specification.
5. Verify all spoke nipples are tightened to the specification. Refer to Table 2-12.
6. If the tire is removed from the rim, file or grind off ends of spokes that protrude through the nipples to prevent puncturing tube or rim seal when tire is mounted.

NOTE

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



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

Figure 2-30. Checking Lateral Runout

INSPECTION

NOTICE

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

1. Raise the wheel with a suitable lifting device.
2. Turn the wheel through several rotations.

NOTE

If ABS equipped: *keep magnetic base dial indicator as far away from wheel speed sensor and ABS encoder bearing as possible, or damage will occur.*

3. Check end play as follows:
   a. See Figure 2-31. 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 and zero the dial indicator gauge.
   c. Firmly pull the wheel back as far as it will go and note the reading of the dial indicator.
   d. Repeat the procedure to verify the reading.
   e. Replace the bearings if end play exceeds 0.002 in. (0.051 mm), or if there is drag, rough rotation, abnormal noise or anything unusual.

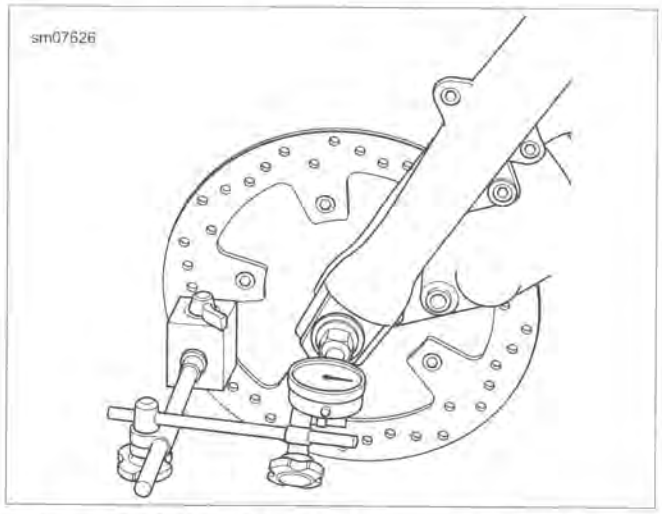
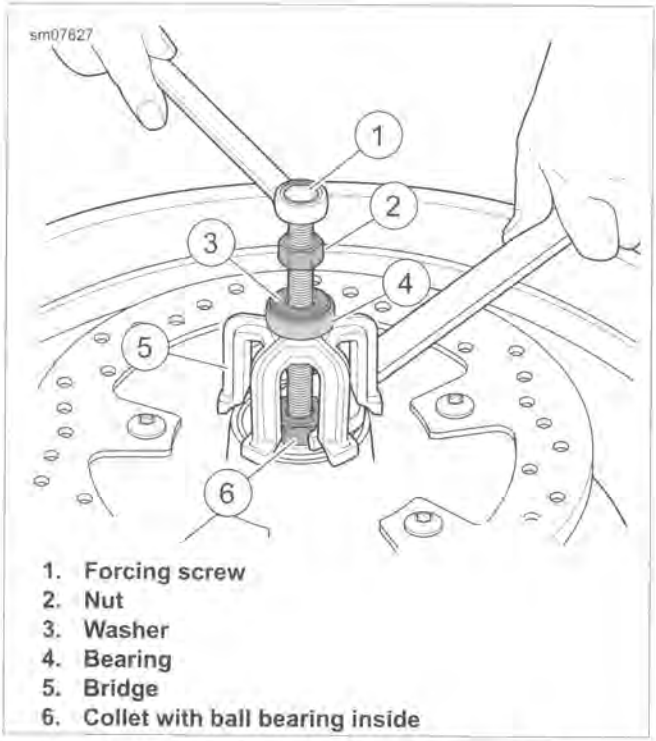


Figure 2-31. Wheel Bearing Inspection (Front Wheel Shown)

REMOVAL

PART NUMBER	TOOL NAME
HD-44060-10A	COLLET
HD-44060-11A	COLLET
HD-44060C	WHEEL BEARING REMOVER/INSTALLER

1. Remove wheel. See 2.4 FRONT WHEEL or 2.5 REAR WHEEL.



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

Figure 2-32. Wheel Bearing Removal Tool

2. If servicing rear wheel, remove the sprocket.

NOTES

- *On front wheel, remove the primary brake disc side (left) bearing first.*
- *ABS equipped motorcycles use both a special encoder bearing (greenish tan in color) on the primary brake disc side and a standard bearing (black) on the opposite side.*

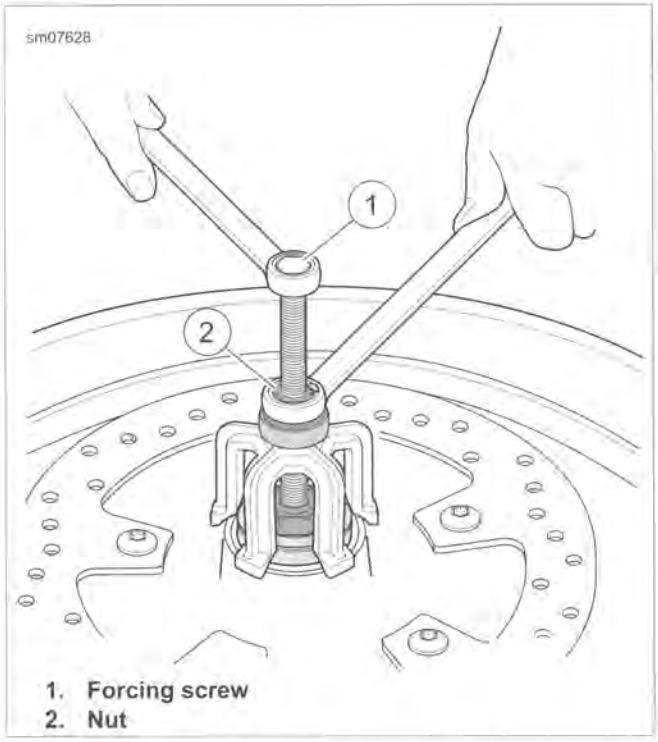
3. See Figure 2-32. Sparingly apply graphite lubricant to threads of forcing screw (1) of WHEEL BEARING REMOVER/INSTALLER (Part No. HD-44060C).
4. Install nut (2), washer (3) and bearing (4) on forcing screw. Insert assembly through hole in bridge (5).

NOTE

Standard and ABS bearings require different collets. Choose the appropriate one to remove the bearing.

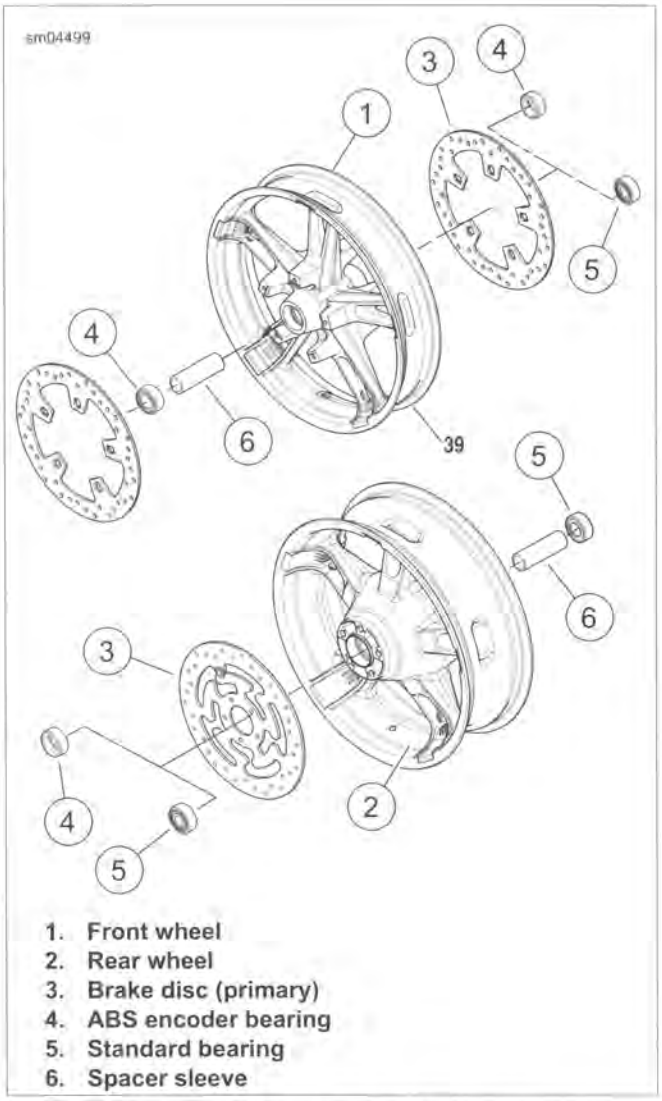
- ***Non-ABS models:*** *Use COLLET (Part No. HD-44060-10A).*
- ***ABS models:*** *Use COLLET (Part No. HD-44060-11A).*

5. Place steel ball inside collet and install collet at end of forcing screw.
6. Insert collet into bearing. Hold forcing screw (1) and turn hex on collet (6) until lip makes firm contact with inside edge of bearing.
7. See Figure 2-33. Turn hex nut (2) until bearing is free. Discard bearing.
8. See Figure 2-34. Remove spacer sleeve (6) from hub.
9. Repeat steps to remove remaining bearing from opposite side of wheel.



1. Forcing screw
2. Nut

Figure 2-33. Removing Bearing



1. Front wheel
2. Rear wheel
3. Brake disc (primary)
4. ABS encoder bearing
5. Standard bearing
6. Spacer sleeve

Figure 2-34. Wheel Bearing Assemblies

INSTALLATION

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

NOTES

- *Keep ABS encoder bearings away from magnetic fields (such as magnetic parts trays, magnetic base dial indicators, alternator rotors, etc.) or damage will occur.*
- *Always replace both bearings as a complete set.*

1. See Figure 2-35. Sparingly apply graphite lubricant to threads of threaded rod (1) of WHEEL BEARING REMOVER/INSTALLER (Part No. HD-44060C).

NOTE

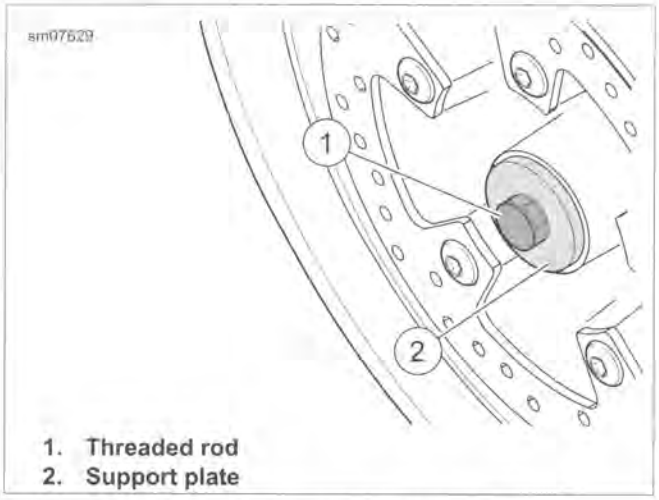
Install the primary (front: left; rear: right) brake disc side bearing first. ABS equipped motorcycles use a special encoder bearing (greenish tan in color) on the primary brake disc side and a standard bearing (black) on the opposite side.

2. Install support plate (2) onto rod (1) and slide rod through hub from the side opposite the primary brake side.

NOTE

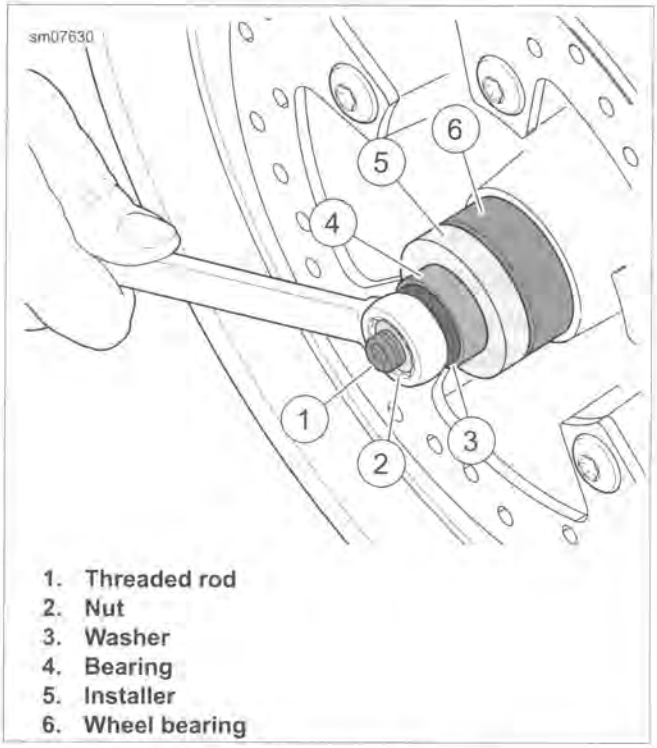
Bearing orientation is important.

3. See Figure 2-36. Place the bearing on the rod.
   a. Standard bearing with the lettered side against installer (5).
   b. ABS bearing with red side inward and tan side against installer (5).
4. Place 1 inch installer (Part No. HD-44060-8) (5), bearing (4), flat washer (3) and nut (2) onto rod.
5. Turn nut (2) until bearing is fully seated.
6. Install spacer sleeve in hub.
7. Reverse tool and install opposite side bearing until bearing contacts spacer sleeve.
8. Install wheel. See 2.4 FRONT WHEEL or 2.5 REAR WHEEL.



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

Figure 2-35. Assembling Installation Tool



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

Figure 2-36. Installing Bearing

GENERAL

⚠WARNING

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

⚠WARNING

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

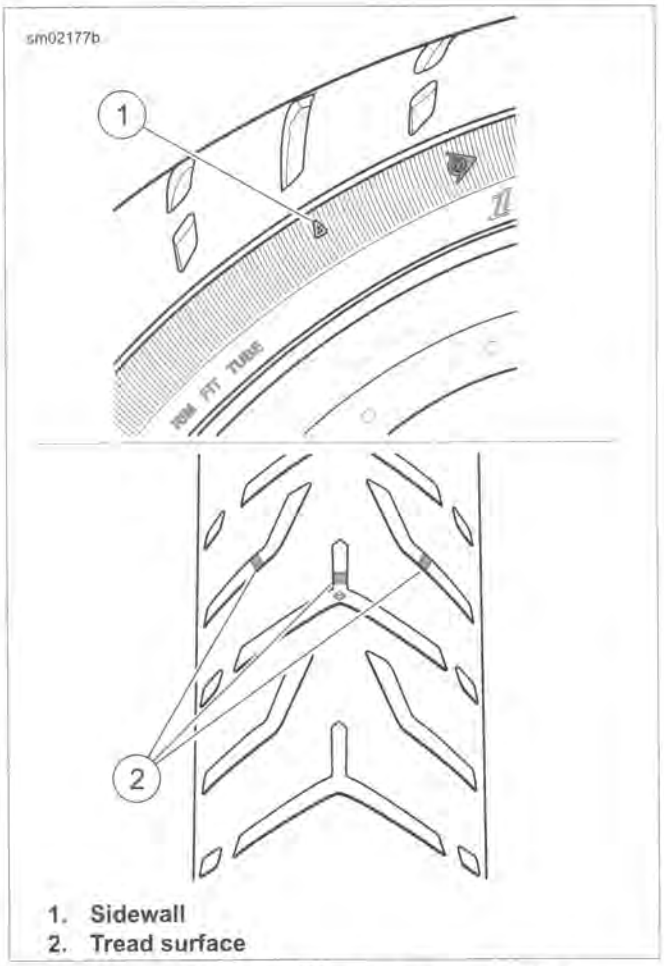
Always maintain proper tire pressure as specified in Table 2-8. Do not load tires beyond GAWR specified in Table 2-4 or Table 2-5. Underinflated, over-inflated or overloaded tires can fail.

NOTES

- *Check runout on all cast or spoke wheels before installing a **new** tire. See 2.9 CHECKING AND TRUING WHEELS.*
- *Store **new** tires on a horizontal tire rack. Avoid stacking **new** tires in a vertical stack. The weight of the stack compresses the tires and closes down the beads.*
- *Inspect tires for punctures, cuts, breaks and wear at least weekly.*
- *See Figure 2-37. The tread wear indicator bars will appear on tire tread surfaces when 1/32 in (0.8 mm) or less of tread remains. Always replace tires before they reach the tread wear indicator bars.*

***New** tires are needed if any of the following conditions exist. See 1.9 TIRES AND WHEELS.*

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



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

Figure 2-37. Tread Wear Indicators (Typical)

REMOVAL

NOTE

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

1. Remove wheel. See 2.4 FRONT WHEEL, Removal or 2.5 REAR WHEEL, Removal.
2. Deflate tire.

NOTE

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

3. Loosen both tire beads from rim flange. Use a bead breaker machine if available.
4. Remove tire.

CLEANING, INSPECTION AND REPAIR

1. Clean the inside of tire and outer surface of tube.
2. If rim is dirty or rusty, clean with a stiff wire brush.
3. Check wheels for lateral and radial runout before installing a tire. See 2.9 CHECKING AND TRUING WHEELS.

4. Inspect the tire for wear and damage.
5. Inspect tread depth. Replace worn tires.

⚠WARNING

Replace punctured or damaged tires. In some cases, small punctures in the tread area may be repaired from within the removed tire by a Harley-Davidson dealer. Speed should NOT exceed 50 mph (80 km/h) for the first 24 hours after repair, and the repaired tire should NEVER be used over 80 mph (130 km/h). Failure to follow this warning could lead to tire failure and result in death or serious injury. (00015b)

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

INSTALLATION

FASTENER	TORQUE VALUE	
Valve stem nut	12-15 **in-lbs**	1.4-1.7 Nm

⚠WARNING

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

⚠WARNING

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

⚠WARNING

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

For tire pressures, see 1.9 TIRES AND WHEELS, Tires.

Some tires have arrows molded into the tire sidewall. Mount these tires with the arrow pointing in the direction of forward rotation. The colored dot on the sidewall is a balance mark. Align it with the valve stem.

Tube Type Tires

⚠WARNING

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

NOTES

- *For correct tire and tube types, see 2.2 SPECIFICATIONS.*
- *When replacing a tube type tire, replace the tube. Inner tubes should be patched only as an emergency measure. Replace a damaged or patched tube as soon as possible. Always use a rim strip on all tube-type laced wheels.*

1. See Figure 2-38. On tube type laced wheels, verify that no spokes protrude through nipples. Install a rim strip into the rim well. Check to align the valve stem hole in rim strip with valve stem hole in rim.
2. Install tube and tire.

Figure 2-38. Installing Rim Strip

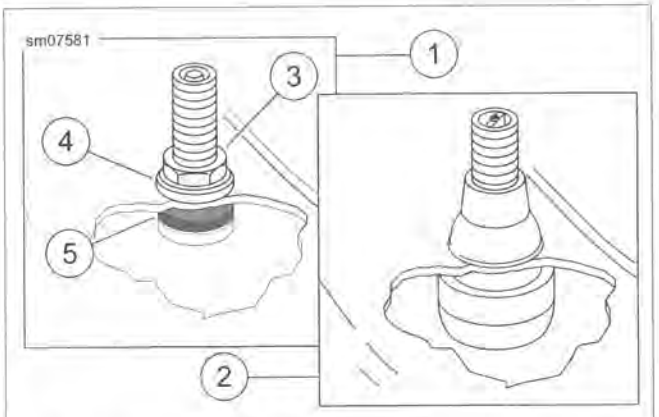
Tubeless Tires: Cast Wheels

⚠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)

On tubeless cast wheels, replace damaged or leaking valve stems.

1. See Figure 2-39. Install rubber grommet (5) on valve stem.
2. Insert valve stem into rim hole.
3. Install metal washer (4) and nut (3).
4. Tighten to 12-15 **in-lbs** (1.4-1.7 Nm).
5. Install tire.



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

Figure 2-39. Tubeless Tire Valve Stems

CHECKING TIRE RUNOUT

Lateral Runout

1. Check tire pressure.
2. See Figure 2-40. Turn the wheel on the axle and measure tire lateral runout from a fixed point to a smooth area on the tire sidewall. Avoid measuring on raised letters or vents.
3. Tire lateral runout should not exceed 0.090 in (2.29 mm). If tire runout exceeds specification, remove tire from rim and check rim lateral runout. See 2.9 CHECKING AND TRUING WHEELS.
   a. If rim lateral runout is within specification, the tire is at fault and must be replaced.
   b. If rim lateral runout is not within specification, correct by adjusting selected spokes on laced wheels or replace cast wheels. See 2.9 CHECKING AND TRUING WHEELS.
4. Install the tire. Check tire lateral runout of replacement tire.

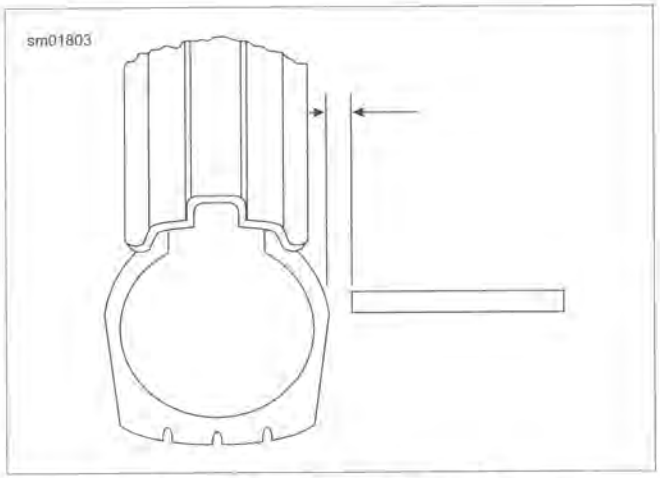


Figure 2-40. Checking Tire Lateral Runout

Radial Runout

1. Check tire pressure.
2. See Figure 2-41. Turn the wheel on the axle and measure tire radial runout at the tread centerline.
3. Tire radial runout should not exceed 0.090 in (2.29 mm). If tire runout exceeds this specification, remove tire from rim and check rim radial runout.See 2.9 CHECKING AND TRUING WHEELS.
   a. If rim radial runout is within specification, the tire is at fault and must be replaced.
   b. If rim radial runout is not within specification, correct by adjusting selected spokes on laced wheels or replace cast wheels. See 2.9 CHECKING AND TRUING WHEELS.
4. Install the tire. Check tire radial runout of replacement tire.

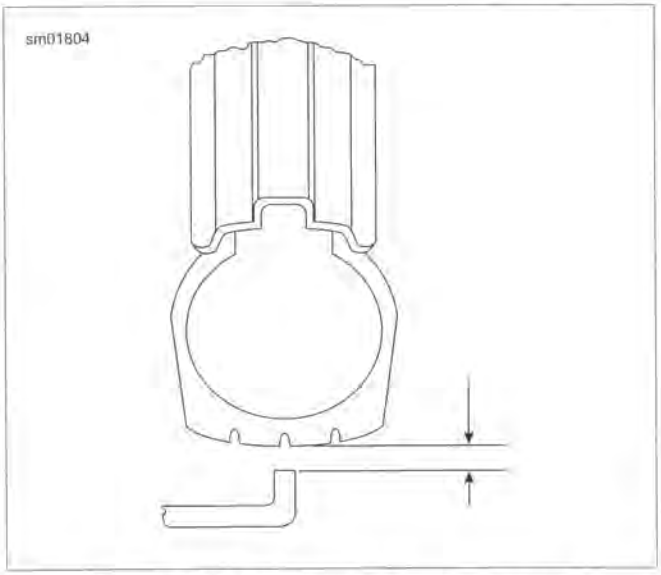


Figure 2-41. Checking Tire Radial Runout

WHEEL BALANCING

NOTE

Install tire after balancing. See 2.4 FRONT WHEEL, Installation or 2.5 REAR WHEEL, Installation.

Static vs Dynamic

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

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

Weights

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

All wheel weights currently supplied by Harley-Davidson are made from zinc which is lighter than lead. The weight of each

zinc segment is 0.18 oz (5 g) as compared to 0.25 oz (7 g) for lead. Weights are stamped for easy identification.

NOTES

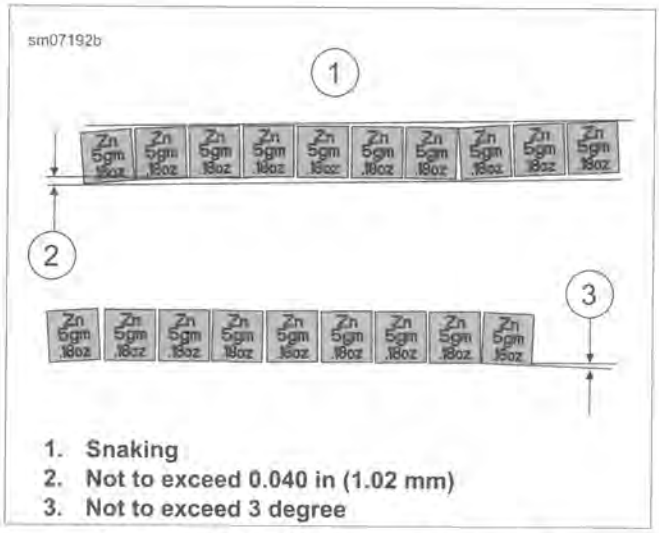
- *If adding more than 1.5 oz (43 g) of weight at one location, divide the amount so that half is applied to each side of rim.*
- *On cast wheels without a flat area near the bead, place the weights crosswise through the opening.*

1. See Figure 2-43. Place weights on a smooth surface of the wheel rim such that centrifugal force will help keep them in place. Make sure the area of application is completely clean, dry, and free of oil and grease.

NOTE

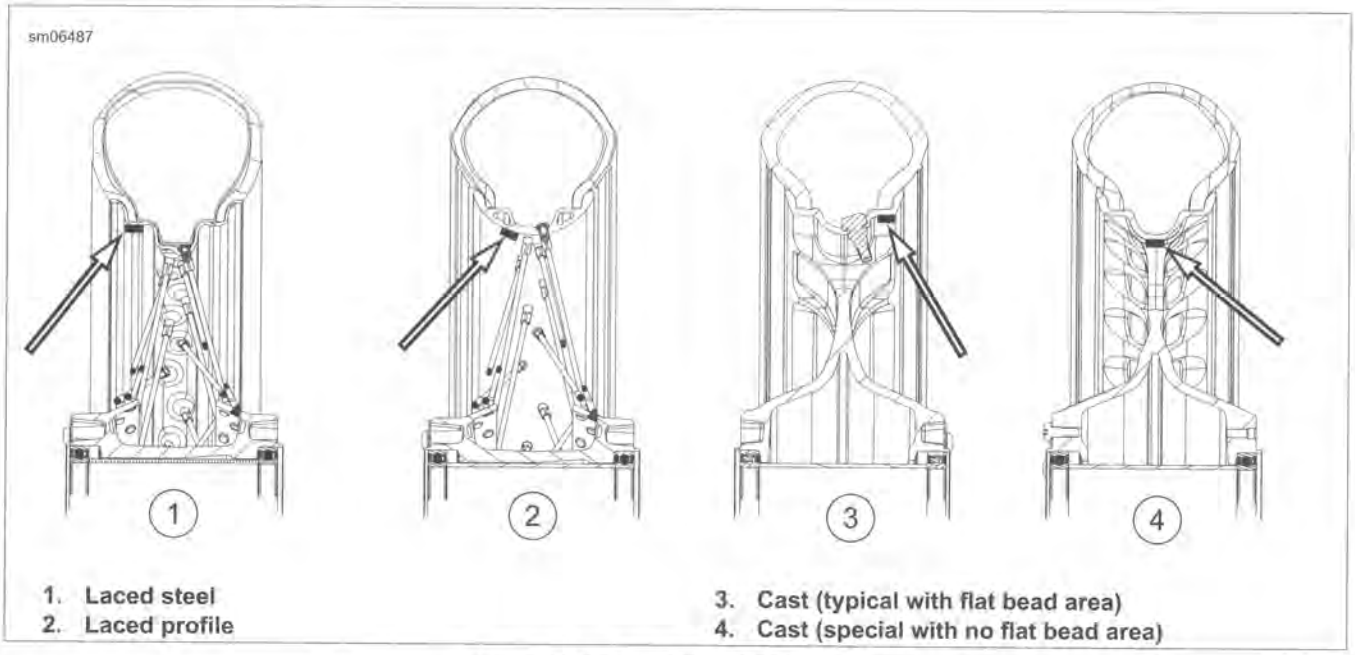
See Figure 2-42. When installing wheel weights, consider cosmetics. Keep snaking (1) within 0.040 in (1.02 mm) (2) of straight. Also keep the angle alignment of individual segments (3) within 3 degrees.

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



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

Figure 2-42. Weight Segment Alignment



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

Figure 2-43. Wheel Weight Placement

GENERAL

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)

⚠CAUTION

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

NOTICE

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

NOTE

Immediately wipe up any brake fluid spillage with a clean, dry, soft cloth. Follow up by thoroughly wiping affected area with a clean, damp, soft cloth (small spills) or washing with a large quantity of soapy water (large spills).

REMOVAL AND DISASSEMBLY

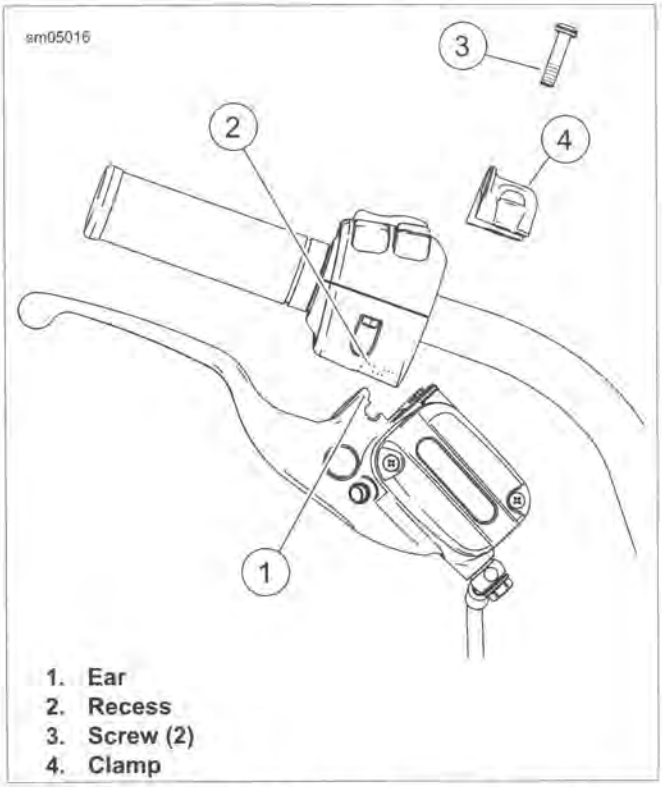
Removal

1. Turn handlebars until the master cylinder reservoir is level.
2. Clean master cylinder reservoir cover before removal.
3. Remove cover from master cylinder reservoir.

NOTE

Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

4. Remove banjo bolt. Hold suitable container under banjo bolt bore and allow reservoir to drain. Discard sealing washers.
5. Wipe out any remaining fluid inside master cylinder reservoir with a clean, lint-free cloth.
6. Remove clamp and master cylinder reservoir/brake lever assembly from handlebar.
7. Remove and discard retaining ring securing pivot pin.
8. Remove pivot pin and brake lever from brake lever bracket.



1. **Ear**
2. **Recess**
3. **Screw (2)**
4. **Clamp**

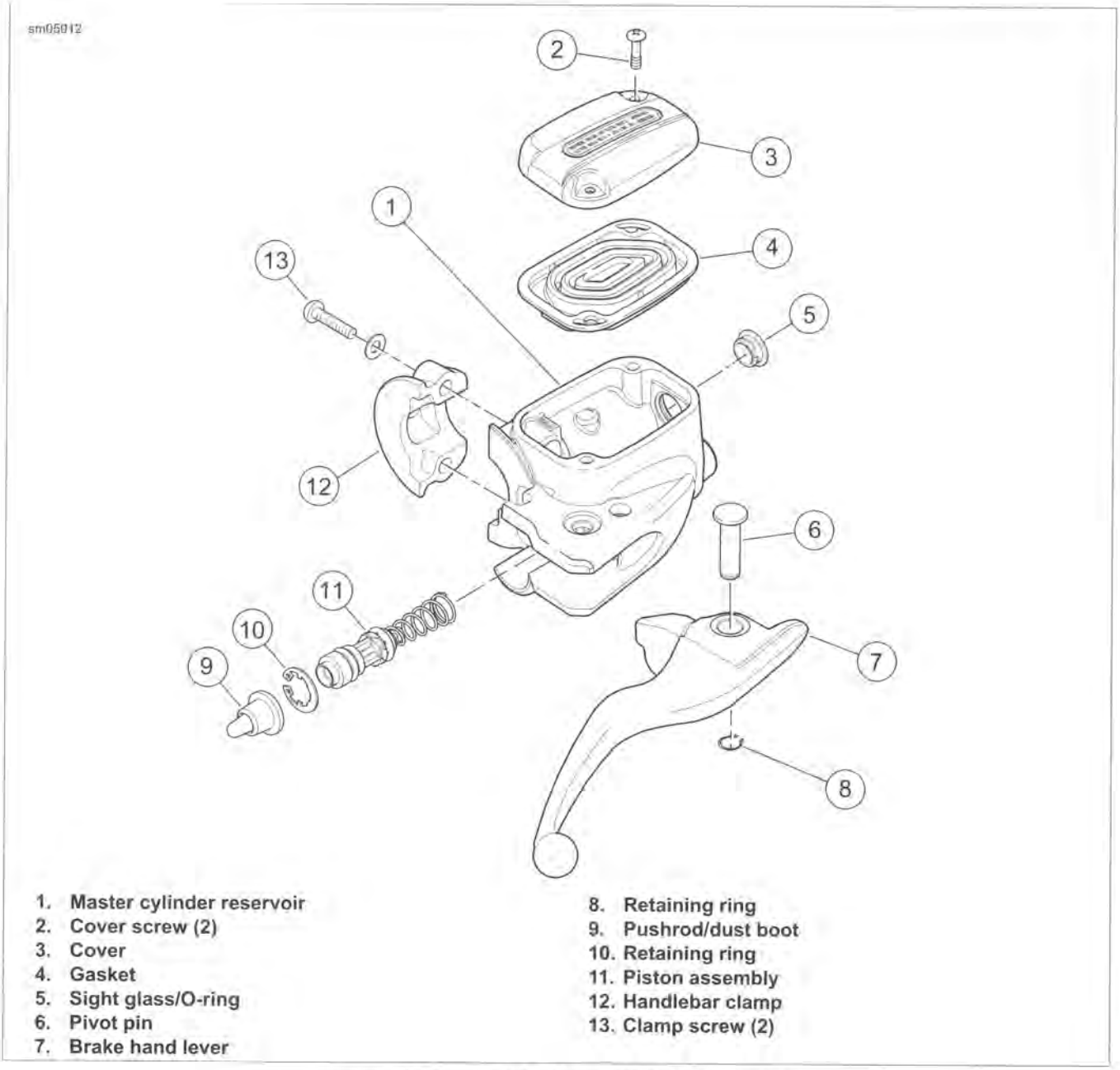
Figure 2-44. Hand Control Assembly (typical)

Disassembly

NOTE

Do not scratch or nick banjo sealing surface during handling. Damage to the sealing surface requires replacement of the master cylinder assembly.

1. See Figure 2-45. Remove dust boot and pushrod assembly (9).
2. While holding pressure against piston assembly (11), remove retaining ring (10).
3. Remove and discard piston assembly and spring.



1. Master cylinder reservoir
2. Cover screw (2)
3. Cover
4. Gasket
5. Sight glass/O-ring
6. Pivot pin
7. Brake hand lever
8. Retaining ring
9. Pushrod/dust boot
10. Retaining ring
11. Piston assembly
12. Handlebar clamp
13. Clamp screw (2)

Figure 2-45. Front Brake Master Cylinder Assembly

CLEANING AND INSPECTION

⚠WARNING

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

⚠WARNING

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

1. Clean all parts with denatured alcohol. Wipe dry with a clean, lint free cloth.
2. Inspect banjo seating surface for scratches or nicks.
3. Verify that reservoir is completely free of dust, dirt or residue.
4. Using a clean air supply, blow out piston bore and other drilled passages. Do not use a wire or similar instrument.
5. Inspect piston bore for scratches, nicks, scoring, pitting, corrosion or other damage.
6. Inspect retaining ring groove for damage.
7. Inspect piston seals, dust boot and reservoir cover gasket for cuts, tears or general deterioration.

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm

Assembly

NOTE

*Never install a used piston assembly or spring because unexpected failure can occur. Always install **new** parts.*

1. See Figure 2-45. Lightly lubricate piston bore and OD of piston seals with the included piston lube.
2. Insert **new** piston assembly (11) into piston bore.
3. Push and hold piston assembly into bore. Install **new** retaining ring (10) with the flat side in. Verify that retaining ring is completely seated in groove.
4. Install pushrod/dust boot (9) assembly into piston socket and engage dust boot into piston bore. Verify that collar on OD of dust boot is secure in lip of piston bore.

Installation

1. Install brake hand lever. Secure with pivot pin.
2. Install **new** retaining ring in pivot pin groove. Verify that retaining ring is completely seated in groove.
3. See Figure 2-44. Position brake lever/master cylinder reservoir assembly, engaging ear (1) in recess (2) at top of brake lever bracket.
4. Install two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten screws to 72-108 **in-lbs** (8.1-12.2 Nm).
5. Attach brake line to master cylinder reservoir with banjo bolt and **new** sealing washers. Tighten to 17-19 ft-lbs (23.1-25.8 Nm).
6. Verify that the line does not touch the handlebar or fairing when handlebar is turned. Adjust as needed.

⚠WARNING

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

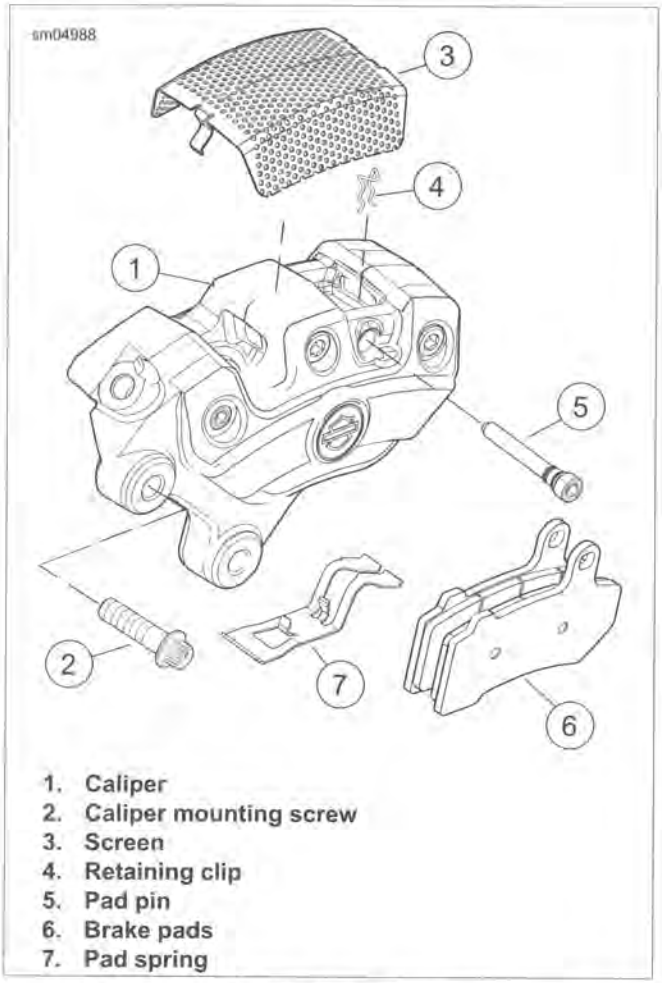
7. Fill and bleed brake system. See 2.18 BLEEDING BRAKES.

REMOVAL

NOTES

- *If only replacing brake pads, see 1.18 BRAKE PADS AND DISCS.*
- *Wrap banjo fitting with a shop towel to absorb any loss of brake fluid.*

1. Remove banjo bleeder bolt. Discard sealing washers.
2. See Figure 2-46. Remove two caliper mounting screws (2) and remove caliper from brake disc.



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

Figure 2-46. Front Brake Caliper Assembly

INSTALLATION

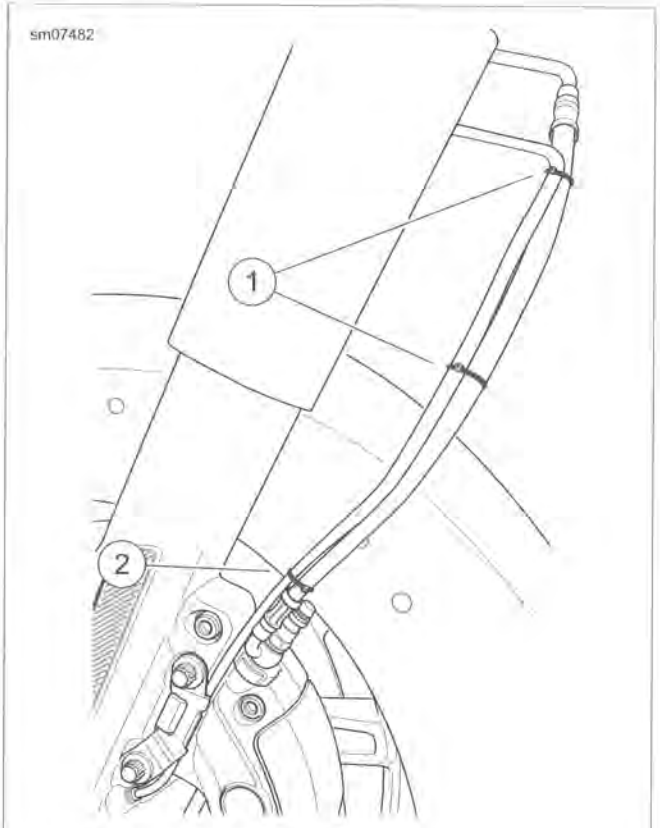
FASTENER	TORQUE VALUE	
Brake caliper, front, mounting screws	28-38 ft-lbs	37.9-51.5 Nm
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm

1. If necessary, assemble caliper installing pad spring, brake pads, pad pin, retaining clip and screen. See 1.18 BRAKE PADS AND DISCS.
2. Install caliper, and cable clip/bracket on left side if ABS equipped, with two screws. Tighten to 28-38 ft-lbs (37.9-51.5 Nm).
3. **ABS equipped:**
   a. Verify WSS cable is secure in clip.
   b. See Figure 2-47. Install **new** cable straps (1, 2) to secure WSS and fender tip lamp cables.
4. Secure brake line to caliper with banjo bleeder bolt and **new** sealing washers. Tighten to 17-19 ft-lbs (23.1-25.8 Nm).

NOTE

When servicing a bleeder valve or banjo bleeder bolt, check for the presence of an O-ring used during manufacturing. Remove the O-ring from the bleeder valve groove or bore and discard. If the O-ring is not removed, it may become lodged in the bleeder bore during valve installation. This will prevent proper torquing or sealing.

5. Fill and bleed brake system. See 2.18 BLEEDING BRAKES.



1. **WSS cable, fender tip lamp cable, brake hose**
2. **WSS cable, brake hose**

Figure 2-47. Secure Cables and Brake Hose

GENERAL

⚠CAUTION

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

NOTICE

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

NOTICE

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

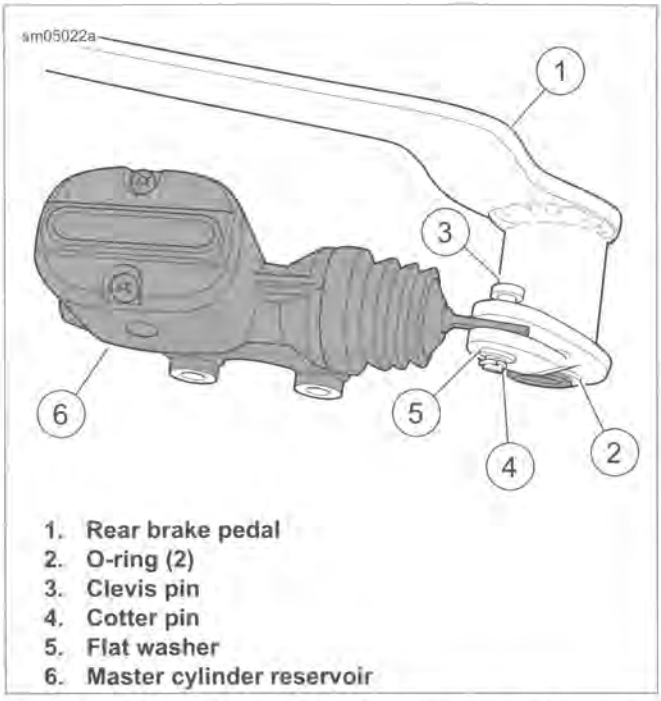
NOTE

Immediately wipe up any brake fluid spillage with a clean, dry, soft cloth. Follow up by thoroughly wiping affected area with a clean, damp, soft cloth (small spills) or washing with a large quantity of soapy water (large spills).

REMOVAL AND DISASSEMBLY

Removal

1. Remove right side rider footboard. See 2.47 FOOTBOARDS AND FOOTRESTS.
2. Stand motorcycle upright, so that rear master cylinder reservoir is level.
3. Thoroughly clean the cover before removal.
4. Remove cover from master cylinder reservoir.



1. **Rear brake pedal**
2. **O-ring (2)**
3. **Clevis pin**
4. **Cotter pin**
5. **Flat washer**
6. **Master cylinder reservoir**

Figure 2-48. Rear Master Cylinder/Brake Pedal Assembly

NOTE

Wrap banjo fitting with piece of shop towel to absorb any loss of brake fluid.

5. Remove brake line from master cylinder reservoir. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard sealing washers.
6. Wipe out any remaining fluid in the master cylinder reservoir using a clean lint free cloth.
7. Remove screws securing master cylinder.
8. Remove locknut with flat washer securing brake pedal. Pull brake pedal/master cylinder assembly from pedal shaft. Remove and discard O-ring on each side of brake pedal shaft bore.
9. See Figure 2-48. Remove cotter pin (4) and flat washer (5) from clevis pin. Remove clevis pin (3) to separate master cylinder assembly from brake pedal.

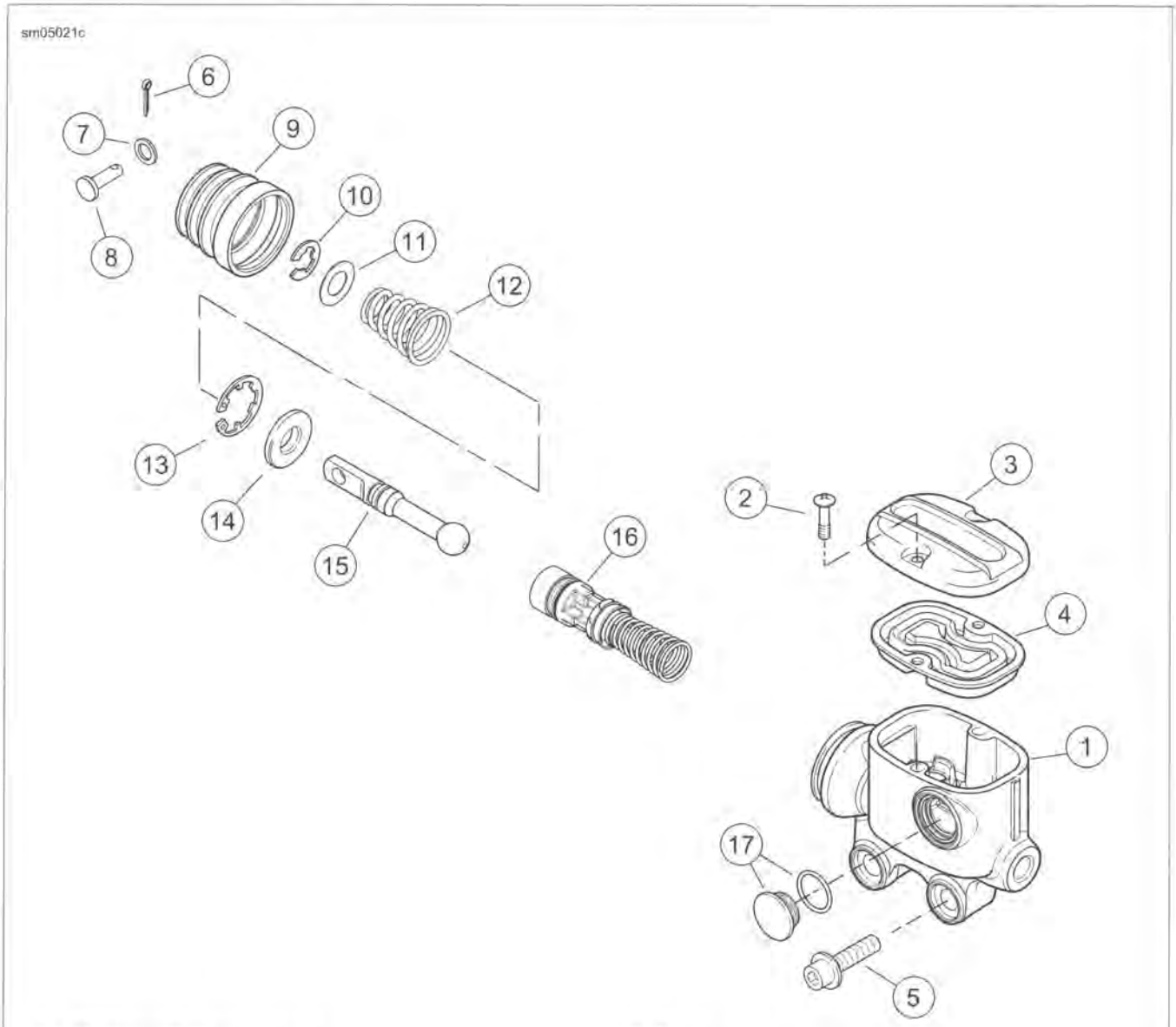
Disassembly

NOTE

Do not scratch or nick banjo sealing surface during handling. Damage to the sealing surface requires replacement of the master cylinder reservoir.

1. See Figure 2-49. Remove dust boot (9) from reservoir pulling and pushrod.
2. Push on flat washer (11) to compress pedal return spring (12). Remove E-clip (10) from groove in pushrod, and carefully release spring tension.
3. Remove flat washer (11) and pedal return spring (12).
4. Push on end of piston and remove retaining ring (13).

5. Remove pushrod (15) and special washer (14).
6. Pull piston assembly from piston bore.



1. Master cylinder reservoir
2. Cover screw (2)
3. Cover
4. Gasket
5. Screw (2)
6. Cotter pin
7. Flat washer
8. Clevis pin
9. Dust boot
10. E-clip
11. Flat washer
12. Pedal return spring
13. Retaining ring
14. Special washer
15. Pushrod
16. Piston assembly
17. Sight glass/O-ring

Figure 2-49. Rear Brake Master Cylinder Assembly

CLEANING AND INSPECTION

⚠WARNING

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

⚠WARNING

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

1. Clean all parts with denatured alcohol. Wipe dry with a clean, lint free cloth.

2. Inspect banjo seating surface for scratches or nicks.
3. Verify that reservoir is completely free of dust, dirt or residue.
4. Using a clean air supply, blow out piston bore and other drilled passages. Do not use a wire or similar instrument.
5. Inspect piston bore for scratches, nicks, scoring, pitting, corrosion or other damage.
6. Inspect E-clip for wear or distortion. Inspect retaining ring and E-clip grooves for damage.
7. Inspect springs for stretching, distortion, kinks, cracks or fractured coils.
8. Inspect piston seals, dust boot and reservoir cover gasket for cuts, tears or general deterioration.

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, mounting screws	126-150 **in-lbs**	14.2-17.0 Nm
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm

Assembly

1. Lightly lubricate piston bore and OD of piston seals with DOT 4 BRAKE FLUID.
2. Insert piston assembly into piston bore.
3. Slide special washer and retaining ring over pushrod with collar on special washer facing outer end of pushrod.
4. Push piston assembly in and install **new** retaining ring with flat side in. Verify that retaining ring is completely seated in groove.
5. Seat pedal return spring on retaining ring.
6. Slide flat washer over pushrod.
7. Compress pedal return spring and install E-clip in inboard groove of pushrod.
8. Install dust boot.

Installation

1. Install master cylinder assembly onto brake pedal flange. Install clevis pin from the outboard side. Install flat washer and cotter pin on clevis pin.
2. Apply a light coat of WHEEL BEARING GREASE to the brake pedal shaft and bore. Install **new** O-ring on each side of bore.
3. Install brake pedal/master cylinder assembly on the pedal shaft. Install flat washer and **new** locknut.
4. Secure master cylinder. Tighten to 126-150 **in-lbs** (14.2-17.0 Nm).
5. Tighten brake pedal shaft locknut to 15-20 ft-lbs (20.3-27.1 Nm).
6. Secure brake line to master cylinder with banjo bolt and **new** sealing washers. Tighten to 17-19 ft-lbs (23.1-25.8 Nm).

⚠WARNING

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

7. Fill and bleed brake system. See 2.18 BLEEDING BRAKES.
8. Install right side rider footboard. See 2.47 FOOTBOARDS AND FOOTRESTS.

REMOVAL

NOTE

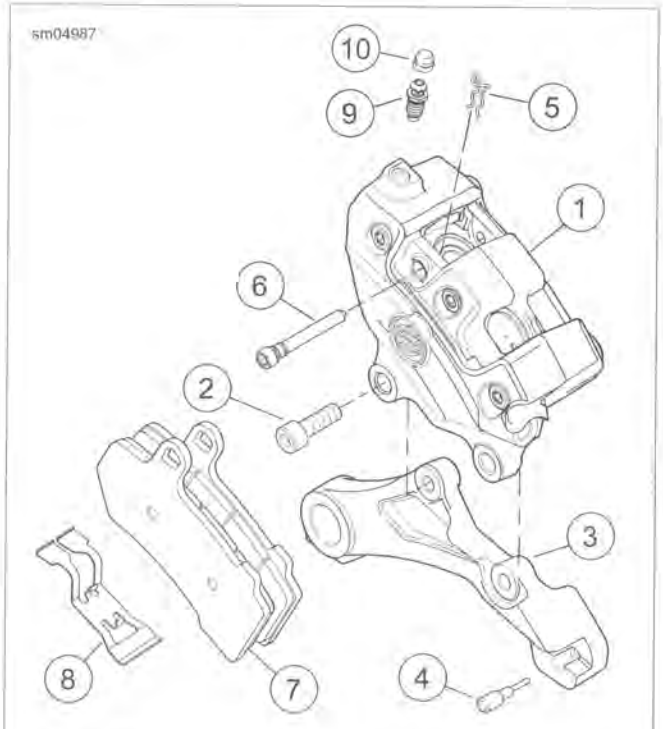
If only replacing brake pads, see 1.18 BRAKE PADS AND DISCS.

1. Remove right side saddlebag. See 2.31 SADDLEBAGS.

NOTE

Wrap banjo fitting with piece of shop towel to absorb any loss of brake fluid.

2. Remove banjo bolt to release brake line from caliper. Discard sealing washers.
3. See Figure 2-50. Remove two screws (2) to release caliper from caliper bracket.
4. Remove caliper from brake disc.
5. If necessary, retract rear axle to remove caliper bracket (3). See 2.5 REAR WHEEL.



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

Figure 2-50. Rear Brake Caliper Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm

1. Install caliper bracket, if removed:
   a. Replace rubber bumper if damaged, worn or missing. Lubricate anchor of **new** bumper with isopropyl alcohol or glass cleaner and pull rubber bead through hole to the inboard side of the caliper bracket.
   b. Seat caliper bracket on anchor weldment of rear fork.
   c. Complete installation of rear wheel. See 2.5 REAR WHEEL.
2. If necessary, assemble caliper by installing pad spring, brake pads, pad pin and retaining clip. See 1.18 BRAKE PADS AND DISCS.

NOTE

When servicing a bleeder valve or banjo bleeder bolt, check for the presence of an O-ring used during manufacturing. Remove the O-ring from the bleeder valve groove or bore and discard. If the O-ring is not removed, it may become lodged in the bleeder bore during valve installation. This will prevent proper torquing or sealing.

3. Install caliper and secure with two screws. Tighten to 43-48 ft-lbs (58.3-65.1 Nm).
4. Secure brake line to caliper with **new** sealing washers. Tighten banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
5. Fill and bleed brake system. See 2.18 BLEEDING BRAKES.
6. Install right side saddlebag. See 2.31 SADDLEBAGS.

FRONT BRAKE LINE: NON-ABS EQUIPPED

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm

Removal

1. **Road King models:**
   a. Remove right side headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. See Figure 2-51. Cut cable strap from right handlebar riser.
2. **Fairing models:**
   a. Rotate the upper fairing. See 2.39 INNER FAIRING.
   b. See Figure 2-52. Cut cable straps (1, 2).
3. See Figure 2-53. Cut cable straps from left brake hose.
4. Remove front brake line from retainer on lower fork bracket.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool to drain the brake systems.

5. Drain front brake lines:
   a. Attach vacuum brake bleeder to either front caliper bleeder screw. Loosen screw 3/4 turn.
   b. Operate vacuum bleeder to evacuate all fluid from line. Loosen master cylinder cover screws after a few seconds to prevent distortion of the bellows.
   c. Repeat with remaining caliper.

NOTE

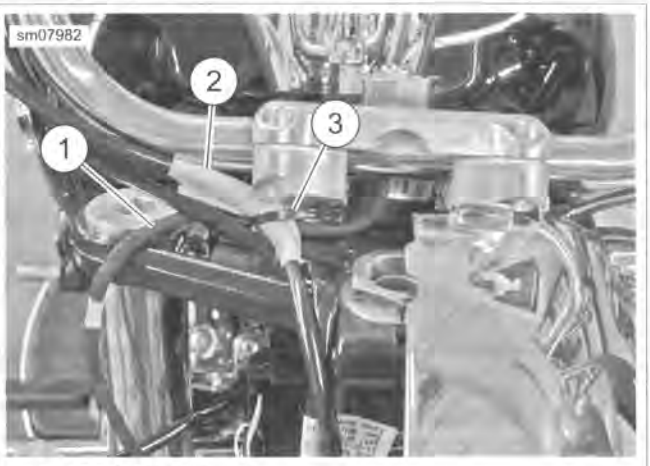
Clean master cylinder reservoir cover before removal.

6. Remove cover from master cylinder reservoir.

NOTE

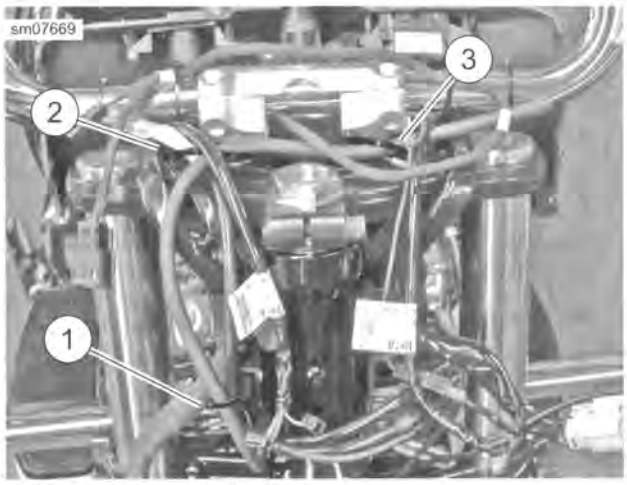
Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

7. Remove banjo bolt from master cylinder. Hold suitable container under banjo bolt bore and allow reservoir to drain. Discard sealing washers.
8. Wipe out any remaining fluid inside master cylinder reservoir with a clean, lint-free cloth.
9. Remove banjo bolts from both front brake calipers. Discard sealing washers.
10. Remove front brake line.



1. **TGS harness**
2. **Brake line**
3. **Cable strap**

Figure 2-51. Capture Brake Line and TGS harness (FLHR/C)



1. **Clutch line to brake line**
2. **Clutch line and brake line to right riser**
3. **Clutch line to left riser**

Figure 2-52. Capture Clutch and Brake Fluid Lines (Fairing Models) (Fairing removed for photo clarity)

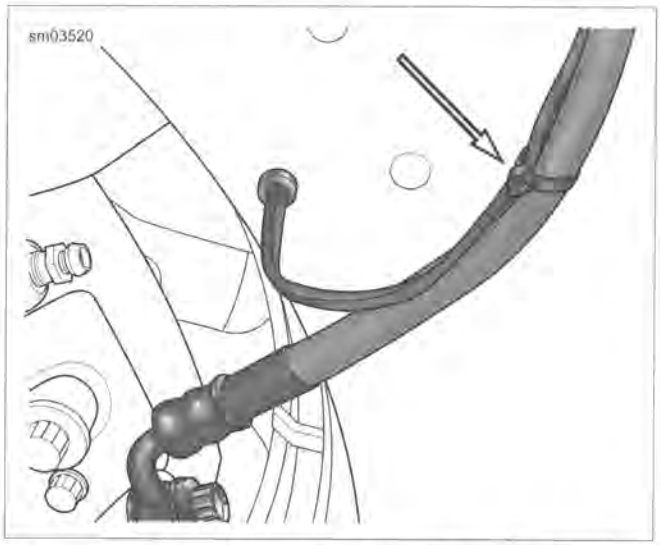


Figure 2-53. Capture Brake Hose and Front Fender Tip Lamp Wires

Installation

1. Position the front brake line. Secure in lower fork bracket retainer.
2. Attach brake line to master cylinder reservoir with banjo bolt and **new** sealing washers. Tighten banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
3. Attach brake line to caliper with banjo bolt and **new** sealing washers. Tighten banjo/bleeder bolts to 17-19 ft-lbs (23.1-25.8 Nm).
4. See Figure 2-53. Secure fender tip lamp and WSS wires to left brake hose with **new** cable straps.
5. **Road King models:**
   a. See Figure 2-51. Secure TGS harness and brake hose to right handlebar clamp with **new** cable strap.
   b. Install right side headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
6. **Fairing models:**
   a. See Figure 2-52. Secure brake line and clutch line to right riser with **new** cable strap (2).
   b. Secure brake line to clutch line with **new** cable strap (1).
   c. Install upper fairing. See 2.39 INNER FAIRING.
   d. Verify that the brake line does not touch the handlebar or fairing when handlebar is turned. Adjust as needed.
7. Bleed brake system. See 2.18 BLEEDING BRAKES.

REAR BRAKE LINE: NON-ABS EQUIPPED

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm
Brake line, rear, P-clamp screw	80-100 **in-lbs**	9.0-11.3 Nm
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm

Removal

NOTICE

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

NOTE

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

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.
3. Remove right side passenger footboard/footpeg. See 2.47 FOOTBOARDS AND FOOTRESTS.
4. Stand motorcycle upright (not leaning on jiffy stand) on a level surface.

NOTE

Clean master cylinder reservoir cover before removal.

5. Remove cover from master cylinder reservoir.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool to drain the brake systems.

6. Drain rear brake line:
   a. Attach vacuum brake bleeder to rear caliper bleeder screw. Loosen screw 3/4 turn.
   b. Operate vacuum bleeder to evacuate all fluid from line.

NOTE

Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

7. See Figure 2-54. Place container under master cylinder. Remove banjo bolt (13) from master cylinder reservoir. Discard sealing washers.
8. Remove banjo bolt (2) from rear brake caliper. Discard sealing washers (1).

9. Free rear brake line from electrical harness conduit clips (6).
10. Remove terminals from rear stop lamp switch (11).
11. Remove fastener (5) securing P-clamp (4).
12. Release line from retainers (14) securing line to frame.
13. Free rear brake line hose from cable clips (3) on rear fork.
14. Remove cable straps. Record locations for assembly.
15. Use a clean shop cloth to wipe out any remaining fluid in the master cylinder reservoir.
16. Remove right footboard/rear brake master cylinder:
    a. Support front of engine.
    b. Remove three screws securing front right engine mount end cap.
    c. Pull off engine end cap mount with footboard, master cylinder and brake pedal attached.
17. Remove rear brake line.

Installation

1. If installing **new** rear stop lamp switch, apply LOCTITE 565 THREAD SEALANT. Install switch into rear brake line. Tighten to 12-15 ft-lbs (16.3-20.3 Nm).
2. Place rear brake line into approximate position along top of lower right frame tube and top of rear fork.
3. See Figure 2-54. Attach brake line to caliper with banjo bolt and **new** sealing washers.
4. Tighten banjo bolt to brake caliper to 17-19 ft-lbs (23.1-25.8 Nm).
5. Capture rear brake line hose in two cable clips (3) on rear fork.
6. Secure P-clamp (4) with screw (5). Tighten to 80-100 **in-lbs** (9.0-11.3 Nm). Secure retainers (14).
7. **HDI:** Secure active exhaust cable to the brake line at rear retainer (14).
8. Capture rear brake line to electrical harness conduit clips (6).
9. Install right side front engine mount cap with rider footboard and master cylinder attached:
    a. Connect terminals onto rear stop lamp switch (11).

    NOTE

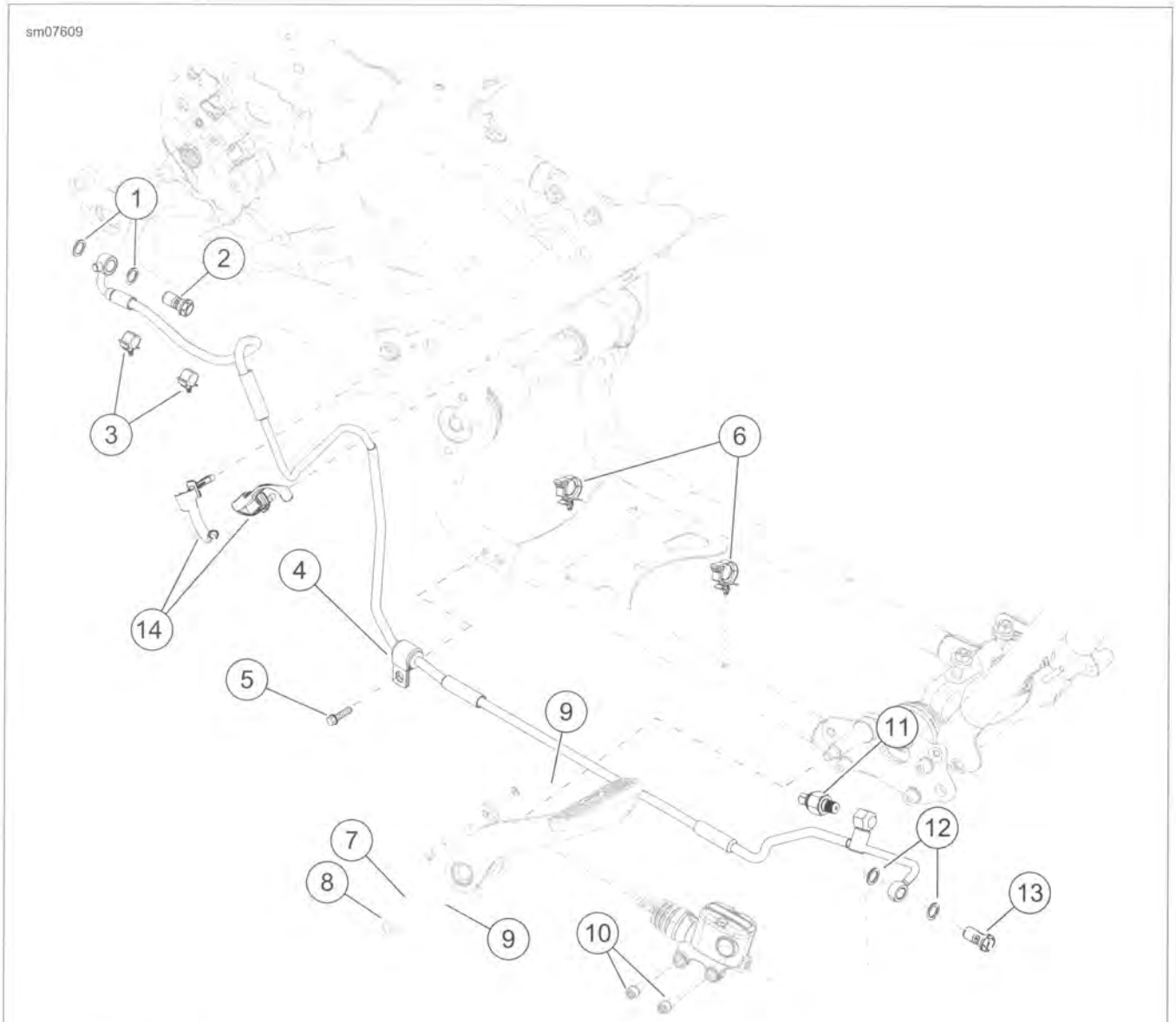
    Confirm oil switch/sender wires are inboard of rubber mount.

    b. Install engine mount end cap. Tighten to 42-48 ft-lbs (56.9-65.0 Nm).
    c. Remove support under front of engine.
10. Secure brake line to master cylinder reservoir using **new** sealing washers. Tighten banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
11. Install cable straps removed during removal.

⚠WARNING

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

12. Bleed brake system. See 2.18 BLEEDING BRAKES.
13. Install right passenger footboard/footpeg. See 2.47 FOOTBOARDS AND FOOTRESTS.
14. Install right side cover.
15. Install right saddlebag. See 2.31 SADDLEBAGS.



1. Sealing washers
2. Banjo bolt
3. Cable clips
4. P-clamp
5. Fastener
6. Electrical harness/brake line clips
7. Flat washer
8. Locknut
9. O-ring
10. Fastener
11. Rear stop lamp switch
12. Sealing washers
13. Banjo bolt
14. Brake line retainers

Figure 2-54. Rear Brake Line Assembly

BRAKE LINE: FRONT MASTER CYLINDER TO ABS MODULE

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm

Removal

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.
3. Remove fuel tank. See 4.6 FUEL TANK.
4. Remove top caddy. See 7.6 ELECTRICAL CADDIES.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool to drain the brake systems.

5. Drain brake line:
   a. Attach vacuum brake bleeder to either front caliper bleeder screw. Loosen screw 3/4 turn.
   b. Operate vacuum bleeder to evacuate all fluid from line. Loosen master cylinder cover screws after a few seconds to prevent distortion of the bellows.
6. **Fairing models:** Remove outer fairing and dash panel. See 2.37 UPPER FAIRING AND WINDSHIELD and 2.38 DASH PANEL, respectively.
7. **Road King models:** Remove right side headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
8. Cut cable straps to release brake line.
9. See Figure 2-55. Release brake line retainer block from right steering head caddy. Remove line from retainer block.
   a. Release upper latch.
   b. Rotate top of retainer out and lift from pocket in caddy.
10. Release brake lines from wire trough.
11. See Figure 2-56. Remove alignment clip (7) from lines at ABS module.

NOTE

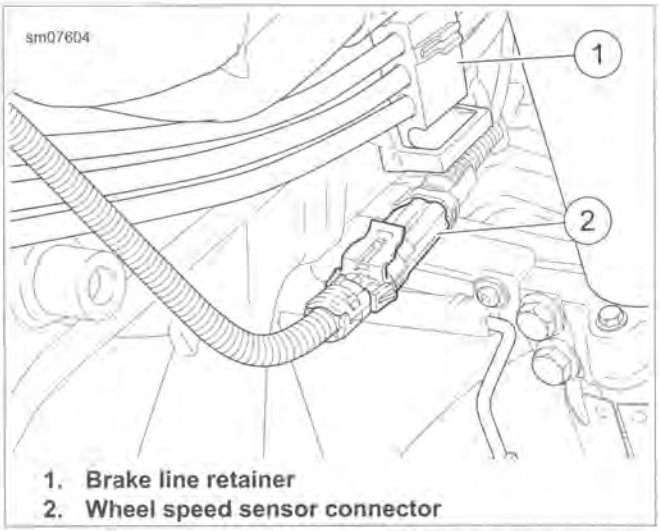
Loosen and tighten banjo bolts while ABS module is secured.

12. Loosen banjo bolt (5).
13. Remove two rear battery tray screws to allow battery tray to lower.

NOTE

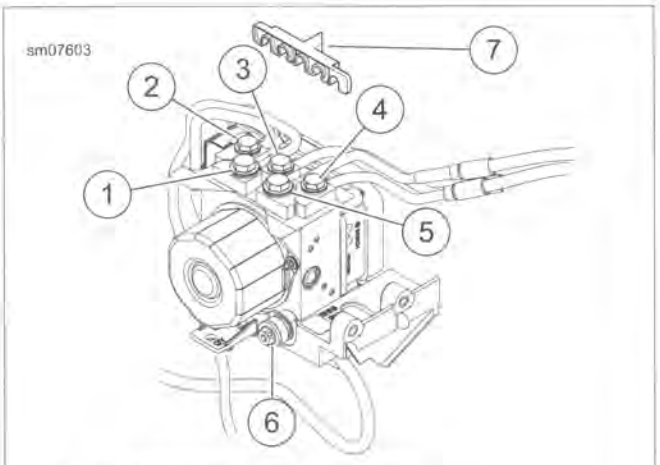
Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

14. Remove banjo bolt (5). Discard sealing washers. Allow to drain.
15. Remove cover from master cylinder reservoir.
16. Remove banjo bolt from master cylinder. Discard sealing washers.
17. Remove brake line.



1. **Brake line retainer**
2. **Wheel speed sensor connector**

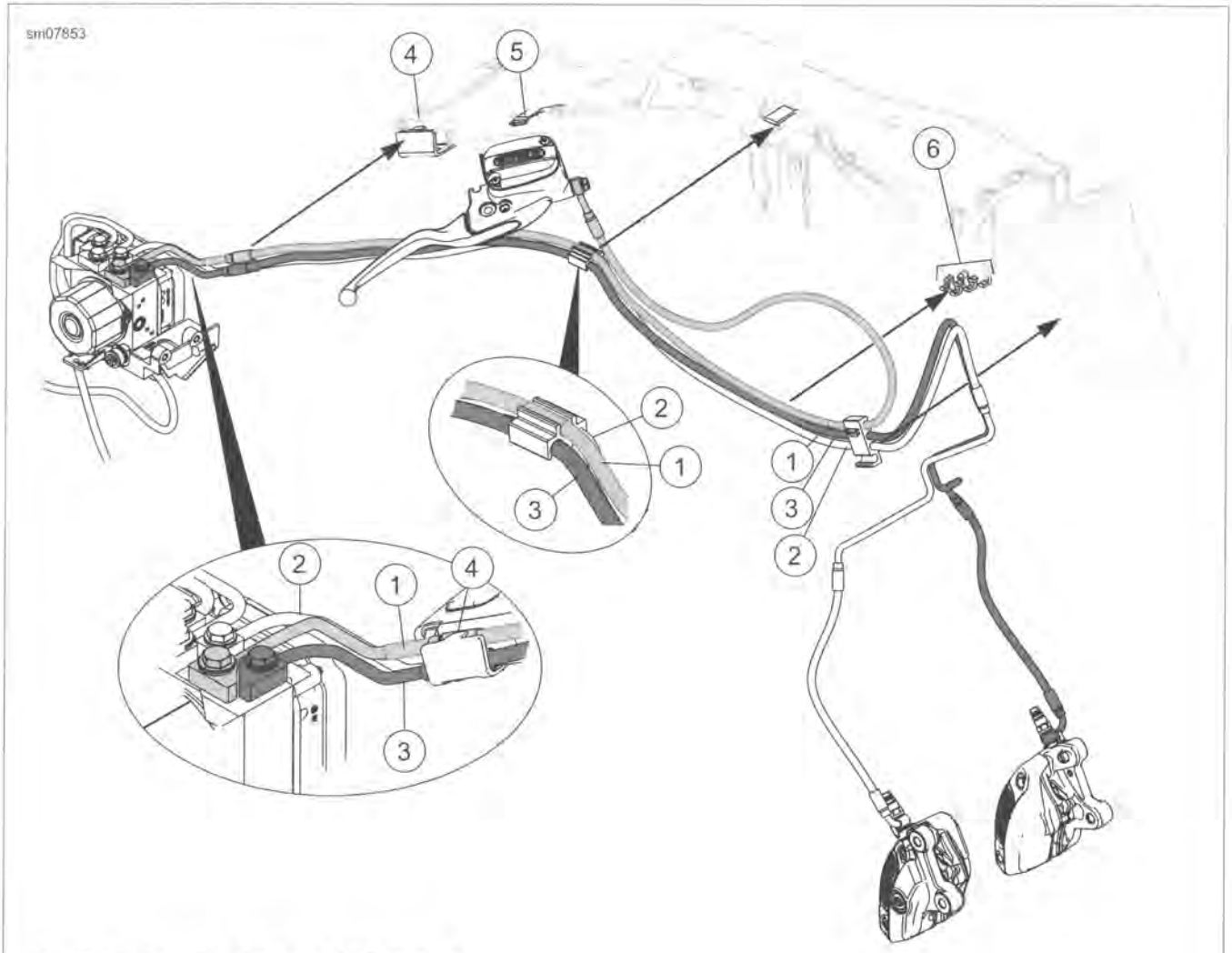
Figure 2-55. Steering Head Caddy (right side shown)



1. **Rear master cylinder, 12 mm**
2. **ABS module to rear caliper, 10 mm**
3. **ABS module to front-right caliper, 10 mm**
4. **ABS module to front-left caliper, 10 mm**
5. **Front master cylinder, 12 mm**
6. **Mount locknut**
7. **Alignment clip**

Figure 2-56. ABS Module Connections

Front Line Routing



1. **Front master cylinder to ABS module**
2. **ABS module to front right caliper**
3. **ABS module to front left caliper**
4. **Retainer with tab**
5. **Retainer tab**
6. **Retaining features**

Figure 2-57. Front ABS Brake Line Routing

Installation

1. Route brake line along right side of wire trough with rear banjo fitting near ABS module.
2. Route front of brake line forward along right side of steering head and up to master cylinder.
3. Start banjo bolt with **new** sealing washers to secure brake line to master cylinder.
4. Start banjo bolt with **new** sealing washers to secure brake line to ABS module port marked MF.
5. See Figure 2-56. Install alignment clip (7) onto lines at ABS module.
6. Secure brake line:
   a. **Road King models:** Loosely install **new** cable strap to secure TGS harness and brake hose to right handlebar riser.
   b. **Fairing models:** See Figure 2-58. Secure brake line and clutch line to right riser with **new** cable strap (2). Secure brake line to clutch line with **new** cable strap (1).
7. See Figure 2-55. Secure brake line in anchor block (1). Secure anchor block to right side steering head caddy.
   a. Insert retainer into pocket in caddy.
   b. Rotate top of retainer in until latched.

NOTES

See Figure 2-57. The order in which lines are arranged is important. Arrange as the insets show.

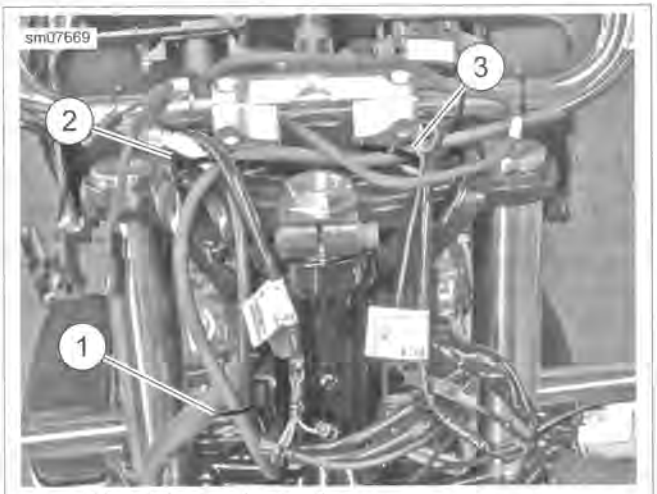
- *Secure lines at rear within retainer (4) and under the tab.*
- *Route lines under retainer tab (5)*
- *Secure lines in retaining features (6) at front of wire trough.*

8. Secure brake lines to wire trough including central anchor block.
9. Tighten master cylinder banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
10. Install rear battery tray screws. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
11. Tighten ABS module banjo bolt to 28-30 ft-lbs (38.0-40.6 Nm).

⚠WARNING

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

12. Bleed brake system. See 2.18 BLEEDING BRAKES.
13. **Road King models:** Install right side headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
14. **Fairing models:** Install outer fairing and dash panel. See 2.37 UPPER FAIRING AND WINDSHIELD and 2.38 DASH PANEL, respectively.
15. Install top caddy. See 7.6 ELECTRICAL CADDIES.
16. Install fuel tank. See 4.6 FUEL TANK.
17. Install right side cover.
18. Install right saddlebag. See 2.31 SADDLEBAGS.



1. **Clutch line to brake line**
2. **Clutch line and brake line to right riser**
3. **Clutch line to left riser**

Figure 2-58. Capture Clutch and Brake Fluid Lines (Fairing Models) (Fairing removed for photo clarity)

BRAKE LINE: ABS MODULE TO FRONT CALIPER

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm

This system has separate brake lines to each front caliper. Replacement is similar for both.

Removal

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.
3. Remove fuel tank. See 4.6 FUEL TANK.
4. Remove top caddy. See 7.6 ELECTRICAL CADDIES.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool to drain the brake systems.

5. Drain front brake lines:
   a. Attach vacuum bleeder to appropriate front caliper bleeder screw. Loosen screw 3/4 turn.
   b. Operate vacuum bleeder to evacuate all fluid from line. Loosen master cylinder cover screws after a few seconds to prevent distortion of the bellows.
6. **Road King models:** Remove headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
7. **Fairing models:** Remove outer fairing and dash panel. See 2.37 UPPER FAIRING AND WINDSHIELD and 2.38 DASH PANEL, respectively.
8. **Left caliper:** Cut three cable straps securing front wheel speed sensor cable and front fender tip lamp wires (if equipped) to left caliper brake hose.
9. See Figure 2-55. Release brake line retainer block (1) from right steering head caddy. Remove line from retainer block.
   a. Release upper latch.
   b. Rotate top of retainer out and lift from pocket in caddy.
10. Release brake line from wire trough.
11. Release brake line from retainer on lower fork bracket.
12. Release brake line from three conduit clips near front of steering head.

NOTE

Loosen and tighten banjo bolts while ABS module is secured.

13. See Figure 2-56. Loosen banjo bolt (3 or 4).
14. Remove alignment clip (7) from lines at ABS module.

15. Remove two rear battery tray screws to allow battery tray to lower.

NOTE

Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

16. Remove banjo bolt securing brake line to ABS module. Discard sealing washers.
17. Remove banjo bleeder bolt securing brake line to caliper. Allow line to drain. Discard sealing washers.
18. Remove brake line.

Installation

1. Route brake line rearward along right side of steering head and wire trough.
2. Start banjo bleeder bolt with **new** sealing washers to secure brake line to caliper.
3. Start banjo bolt with **new** sealing washers to secure brake line to ABS module.
4. See Figure 2-56. Install alignment clip (7) onto lines at ABS module.
5. See Figure 2-55. Secure brake line in retainer and secure retainer to right side steering head caddy.
   a. Insert retainer into pocket in caddy.
   b. Rotate top of retainer in until latched.

NOTES

See Figure 2-57. The order in which lines are arranged is important. Arrange as the insets show.

- *Secure lines at rear within retainer (4) and under the tab.*
- *Route lines under retainer tab (5)*
- *Secure lines in retaining features (6) at front of wire trough.*

6. Secure brake lines to wire trough including central anchor block.
7. Install rear battery tray screws. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
8. Tighten ABS module banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
9. Tighten caliper banjo bleeder bolt to 17-19 ft-lbs (23.1-25.8 Nm).
10. Secure the sensor cable and fender tip lamp wires using three **new** cable straps:
    a. On the brake hose lower crimp capturing cable and brake hose.
    b. Midway between the upper and lower brake hose crimps capturing cable, brake hose and front fender tip lamp wires, if equipped.
    c. On upper crimp capturing sensor cable, brake hose and front fender tip lamp wires, if equipped.
11. Secure line to three conduit clips near front of steering head.

⚠WARNING

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

12. Bleed brake system. See 2.18 BLEEDING BRAKES.
13. **Road King models:** Install headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
14. **Fairing models:** Install outer fairing and dash panel. See 2.37 UPPER FAIRING AND WINDSHIELD and 2.38 DASH PANEL, respectively.
15. Install top caddy. See 7.6 ELECTRICAL CADDIES.
16. Install fuel tank. See 4.6 FUEL TANK.
17. Install right side cover.
18. Install right saddlebag. See 2.31 SADDLEBAGS.

BRAKE LINE: REAR MASTER CYLINDER TO ABS MODULE

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm
Brake line, rear, P-clamp screw	80-100 **in-lbs**	9.0-11.3 Nm
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm

Removal

NOTICE

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

NOTE

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

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.
3. Remove right passenger footboard/footpeg. See 2.47 FOOTBOARDS AND FOOTRESTS.

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

NOTE

Clean master cylinder reservoir cover before removal.

5. Remove cover from master cylinder reservoir.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool to drain the brake systems.

6. Drain rear brake line:
   a. Attach vacuum brake bleeder to rear caliper bleeder screw. Loosen screw 3/4 turn.
   b. Operate vacuum bleeder to evacuate all fluid from line.

NOTE

Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

7. See Figure 2-59. Place container under master cylinder. Remove banjo bolt (13) from master cylinder reservoir. Discard sealing washers.
8. See Figure 2-56. Remove banjo bolt (1) securing brake line to ABS module. Discard sealing washers.
9. Remove alignment clip (7) from lines at ABS module.
10. See Figure 2-59. Free brake line from electrical harness conduit clips (6).
11. Remove terminals from rear stop lamp switch (11).
12. Remove fastener (5) securing P-clamp (4).
13. Release line from retainers (14) securing line to frame.
14. Cut cable straps as needed. Record their locations for assembly.
15. Use a clean shop cloth to wipe out any remaining fluid in the master cylinder reservoir.
16. Remove right footboard/rear brake master cylinder:
    a. Support front of engine.
    b. Remove three screws securing front right engine mount end cap.
    c. Pull off end cap mount with footboard, master cylinder and brake pedal attached.
17. Remove brake line.

Installation

1. If installing **new** rear stop lamp switch, apply LOCTITE 565 THREAD SEALANT. Install switch into rear brake line. Tighten to 12-15 ft-lbs (16.3-20.3 Nm).
2. Place rear brake line into approximate position. Route over passenger footboard boss and upward to ABS module.
3. See Figure 2-56. Install alignment clip (7) onto lines at ABS module.
4. Secure line to ABS module with banjo bolt (1) and **new** sealing washers. Tighten to 28-30 ft-lbs (38.0-40.6 Nm).
5. See Figure 2-59. Secure P-clamp (4) with screw (5). Tighten to 80-100 **in-lbs** (9.0-11.3 Nm). Secure retaining clips (14).
6. Capture rear brake line to electrical harness conduit clips (6).
7. Install right footboard/rear brake master cylinder:
   a. Connect terminals onto rear stop lamp switch (11).

   NOTE

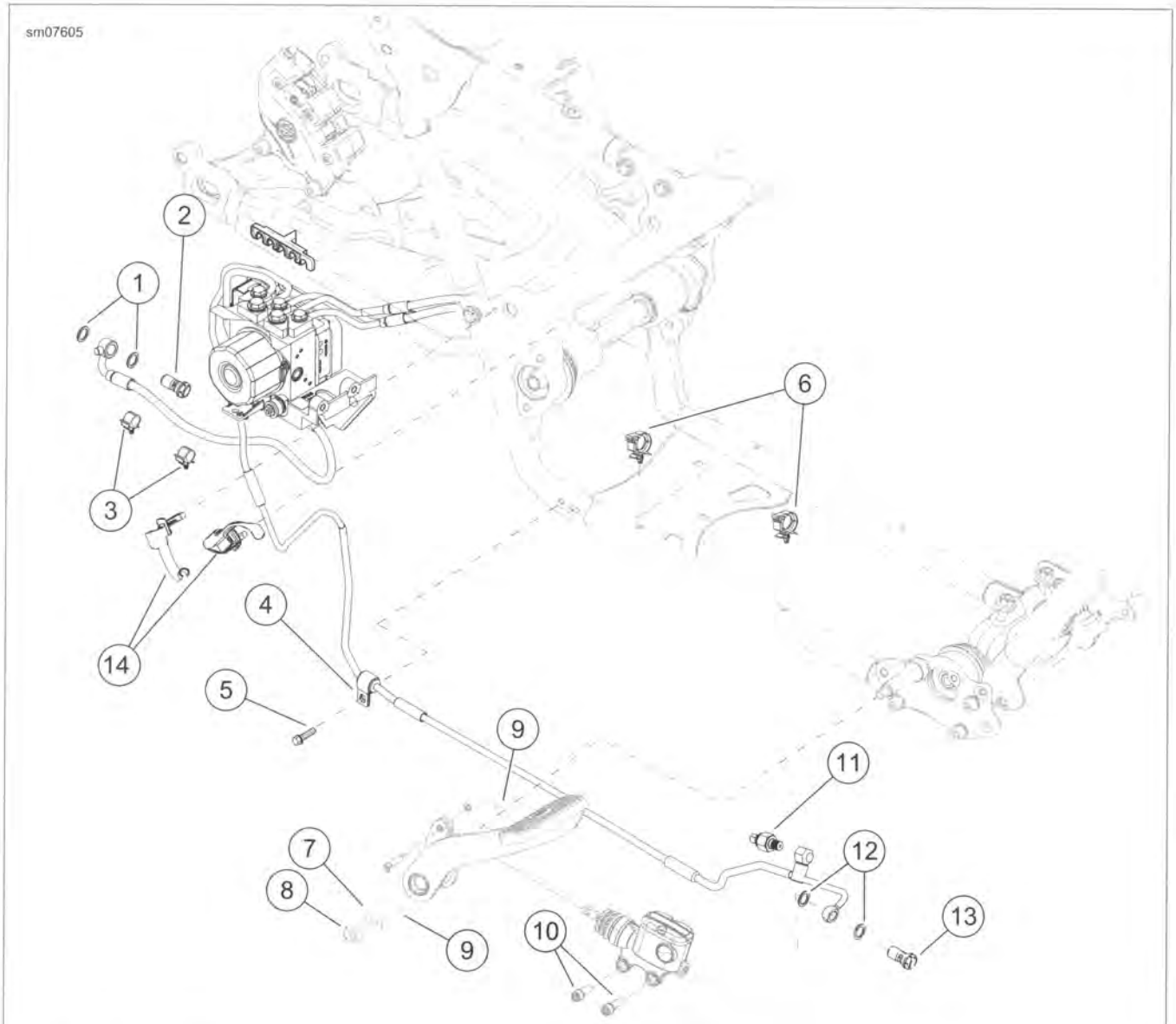
   Confirm oil switch/sender wires are inboard of rubber mount.

   b. Install engine mount end cap. Tighten to 42-48 ft-lbs (56.9-65.0 Nm).
   c. Remove support under front of engine.
8. Secure brake line to master cylinder reservoir using **new** sealing washers. Tighten banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
9. Install cable straps removed during removal.

⚠WARNING

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

10. Bleed brake system. See 2.18 BLEEDING BRAKES.
11. Install right passenger footboard/footpeg. See 2.47 FOOTBOARDS AND FOOTRESTS.
12. Install right side cover.
13. Install right saddlebag. See 2.31 SADDLEBAGS.



1. Sealing washers
2. Banjo bolt
3. Cable clips
4. P-clamp
5. Fastener
6. Electrical harness/brake line clips
7. Flat washer
8. Locknut
9. O-ring
10. Fastener
11. Rear stop lamp switch
12. Sealing washers
13. Banjo bolt
14. Brake line retainers

Figure 2-59. Rear ABS Brake Line Assembly

BRAKE LINE: ABS MODULE TO REAR CALIPER

PART NUMBER	TOOL NAME
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm

Removal

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.
3. See Figure 2-59. Free rear brake hose from retainer clips (3) on rear fork.
4. Remove conduit clip securing rear wheel speed sensor cable to brake hose.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool to drain the brake systems.

5. Drain rear brake line:
   a. Attach vacuum brake bleeder to rear caliper bleeder screw. Loosen screw 3/4 turn.
   b. Operate vacuum bleeder to evacuate all fluid from line.

NOTE

Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

6. See Figure 2-56. Remove banjo bolt (2) to release brake line from ABS module. Discard sealing washers.
7. Remove alignment clip (7) from lines at ABS module.
8. See Figure 2-59. Remove banjo bolt (2) from rear brake caliper. Discard sealing washers (1).
9. Release brake line from retainer on right caddy.
10. Remove brake line.

Installation

1. Place brake line in approximate position. Secure to retainer on right caddy.
2. See Figure 2-56. Install alignment clip (7) onto lines at ABS module.
3. Secure line to ABS module with banjo bolt (2) and **new** sealing washers. Tighten to 17-19 ft-lbs (23.1-25.8 Nm).
4. See Figure 2-59. Capture brake hose and wheel speed sensor cable in two retainer clips (3) on rear fork.
5. Secure line to rear caliper with banjo bolt (2) and **new** sealing washers. Tighten to 17-19 ft-lbs (23.1-25.8 Nm).
6. Install **new** conduit clip 1.25 in (31.8 mm) in front of the rear brake hose crimp capturing rear wheel speed sensor cable to brake hose.

⚠WARNING

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

7. Bleed brake system. See 2.18 BLEEDING BRAKES.
8. Install right side cover.
9. Install right side saddlebag. See 2.31 SADDLEBAGS.

REFLEX™ LINKED BRAKES WITH ABS OPERATION

This ABS braking system is an electronically linked brake system. Front and rear brakes are dynamically linked through the electronic ABS module. "Linked" means that both front and rear brakes are applied at the same time. Electronic linking provides maximum braking for all riders while allowing the more experienced rider flexibility. Braking is more responsive and allows more balanced braking under a wider range of conditions.

- Reflex™ Linked Brakes is designed and tuned to provide a seamless and predictable braking response.
- Linking is electronically controlled to achieve an optimized brake balance based on the amount of brake applied and vehicle speed. The amount of linking is dynamically adjusted to provide maximum benefit in heavier braking and is reduced or eliminated for light braking and low speed.
- Linking can occur in any braking situation above 20-25 mph (32-40 kph) whether only the front brake, rear brake, or both brakes are applied.
- The amount of linking is programmed to provide a good balance of stopping and rider feel.
- Front and rear brake systems are still hydraulically independent.
- If an ABS event occurs, the ABS unit will pulse the brakes to help prevent wheel lockup.

ABS MODULE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
ABS module locknuts	53-88 **in-lbs**	6-10 Nm
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm

NOTE

The ABS module consists of the hydraulic control unit (HCU) and the electronic control unit (ECU). The two are not serviced separately.

Removal

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-On BB200A) or equivalent tool to drain the brake systems.

3. Drain fluid from system.
4. Disconnect ABS module electrical connector.

NOTE

Loosen and tighten banjo bolts while ABS module is secured.

5. Loosen five banjo bolts (metric). Do not remove.
6. See Figure 2-60. Remove alignment clip (7) from lines at ABS module.
7. Remove two rear battery tray screws to allow battery tray to lower.

NOTE

Wrap banjo fittings with shop towel to absorb residual brake fluid.

8. Remove five banjo bolts to release brake lines from ABS module. Discard sealing washers.

NOTICE

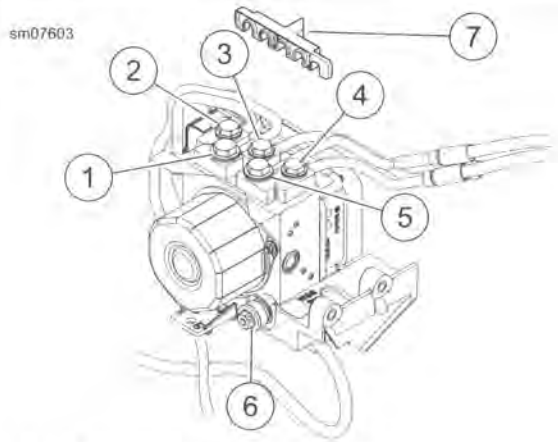
This device is sensitive to electrostatic discharge (ESD). To prevent damage to the device, always touch the motorcycle frame or a grounded surface before handling. (00588c)

9. Loosen two locknuts (6) at rubber mounts.

NOTE

Pry between the bottom of the ABS module and the right caddy to release stud on bottom of module from grommet.

10. Separate ABS module from caddy.
11. Inspect rubber mounts and grommet for damage or deterioration. Replace if necessary.



1. **Rear master cylinder, 12 mm**
2. **ABS module to rear caliper, 10 mm**
3. **ABS module to front-right caliper, 10 mm**
4. **ABS module to front-left caliper, 10 mm**
5. **Front master cylinder, 12 mm**
6. **Mount locknut**
7. **Alignment clip**

Figure 2-60. ABS Module Connections

Installation

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 on right caddy. Apply glass cleaner to ease installation of stud into grommet.
2. See Figure 2-60. Tighten locknuts (6) to 53-88 **in-lbs** (6-10 Nm).

NOTE

The order in which lines are arranged is important. Arrange as the insets show in Figure 2-57.

3. Install banjo fittings to their respective ports with banjo bolts and **new** sealing washers. Rear caliper line must be routed under rear master cylinder line. Do not tighten.
4. Install alignment clip (7) onto lines at ABS module.
5. Install rear battery tray screws. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
6. Tighten banjo bolts:
   a. 10 mm to 17-19 ft-lbs (23.1-25.8 Nm)
   b. 12 mm to 28-30 ft-lbs (38.0-40.6 Nm)
7. Connect ABS module electrical connector.
8. If installing a **new** ABS module, it must be set up using DIGITAL TECHNICIAN II (Part No. HD-48650):
   a. Choose the REFLASH icon.
   b. Follow the on-screen prompts.

⚠WARNING

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

9. Fill and bleed brake systems. See 2.18 BLEEDING BRAKES.
10. Install right side cover.
11. Install right saddlebag. See 2.31 SADDLEBAGS.

⚠WARNING

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

12. Operate motorcycle at low speeds to verify braking systems operate properly.

GENERAL

⚠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)

⚠WARNING

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

⚠CAUTION

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

NOTICE

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

NOTICE

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

Front brake lever and rear brake pedal must have a firm feel when brakes are applied. If not, bleed system as described.

PROCEDURE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Brake bleeder valve, front	72-108 **in-lbs**	8.1-12.2 Nm
Brake bleeder valve, rear	75-102 **in-lbs**	8.5-11.5 Nm
Brake master cylinder, front, reservoir cover screws	12-15.0 **in-lbs**	1.3-1.7 Nm
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm

NOTES

- *For best results, use of BASIC VACUUM BRAKE BLEEDER (Part No. Snap-on BB200A) or equivalent tool is recommended, particularly if the brake system was completely drained. If a vacuum brake bleeder is not available, use the following procedure.*
- ***ABS models:** To confirm that the brake systems are properly connected and air is completely purged, install master cylinder reservoir covers, connect motorcycle to DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure.*

1. Remove bleeder valve cap. Install end of clear plastic tubing over bleeder valve and place free end in a clean container.
2. Position vehicle or handlebar so master cylinder reservoir is level.

NOTES

- *Wrap a clean shop towel around the outside of the master cylinder reservoir to protect paint from brake fluid spills.*
- *Always clean master cylinder cover before removing.*

3. Remove cover from master cylinder reservoir.

⚠WARNING

A plugged or covered relief port can cause brake drag or lock-up, which could lead to loss of control, resulting in death or serious injury. (00288a)

4. 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 will break the fluid surface in the reservoir if internal components are working properly. Refer to Table 2-13.
5. Operate the brake lever or pedal to build hydraulic pressure.

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. While holding pressure with the brake lever or pedal:
   a. Open bleeder valve about 3/4 turn.
   b. Close bleeder valve as soon as the lever or pedal has moved full range of travel.
   c. Allow brake lever or pedal to return slowly to its released position.
7. Repeat steps until all air bubbles are purged and a solid column of fluid is observed in the bleeder tube.
8. Tighten bleeder valve to specification. Refer to Table 2-14. Install bleeder valve cap.

NOTE

Dual caliper brake system: *Repeat steps to bleed the second brake line and caliper.*

9. Check and fill reservoir to specified level.
10. Refer to Table 2-14. Verify gasket and sealing surfaces are free of debris. Install master cylinder reservoir cover as follows:
    a. **Front master cylinder reservoir:** Orient the cover with the vent holes facing the rear. Install cover screws. Tighten to specification.
    b. **Rear master cylinder reservoir:** Install cover screws. Tighten to specification.
11. **ABS equipped models:** Connect DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure.
12. Verify stop lamp operation.

⚠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 2-13. Fluid Level

ITEM	SPECIFICATION
Front reservoir	Boss or ridge
Rear reservoir	Ledge or range window

Table 2-14. Torque Specifications

COMPONENT	TORQUE
Bleeder valve, front	72-108 **in-lbs** (8.1-12.2 Nm)
Bleeder valve, rear	75-102 **in-lbs** (8.5-11.5 Nm)
Front cover	12-15.0 **in-lbs** (1.3-1.7 Nm)
Rear cover	12-15 **in-lbs** (1.4-1.7 Nm)

FORK OIL LEAK CHECK

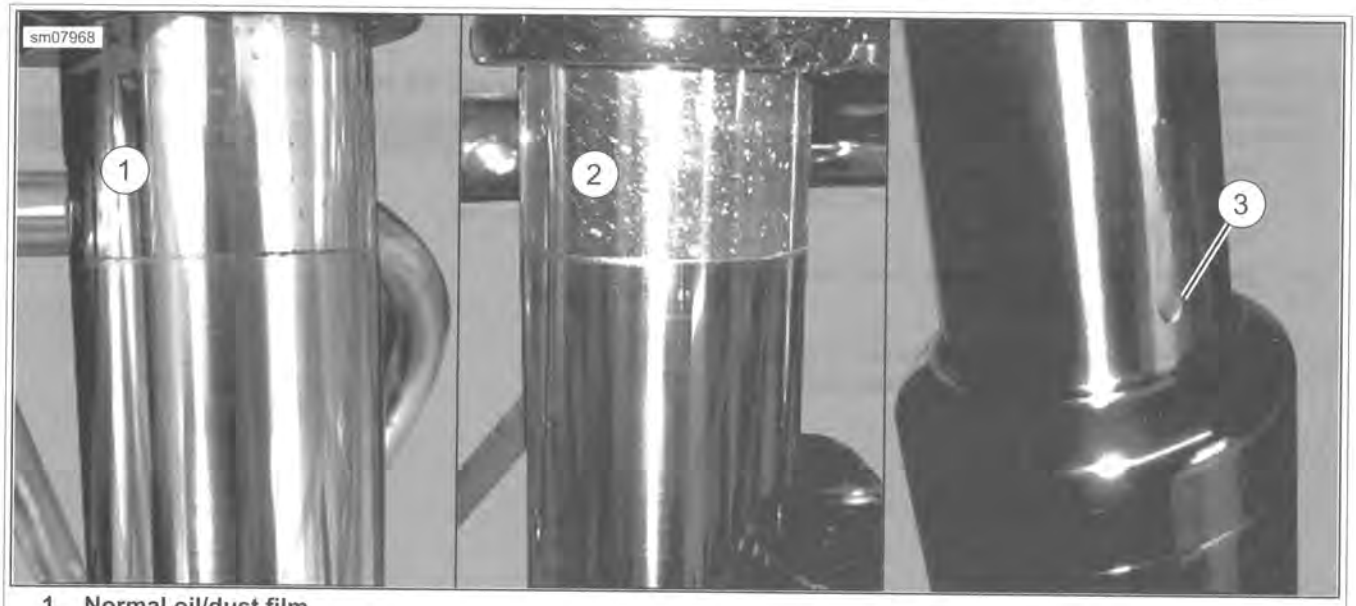
Fork Oil Seals

The fork oil seal is designed to allow a fine film of oil to lubricate the fork sliding surface.

- The oil film is more visible after continuous high-speed compression and rebound movement.
- Due to greater lubrication needs, larger forks have a greater amount of oil film than smaller forks.

Oil Leak Check

1. Rider observes oil-ring.
2. Wipe fork clean.
3. Ride motorcycle over bumpy road or complete 5-6 braking events.
4. See Figure 2-61. Check fork slider tube for oil.
   a. If a normal oil/dust film (1, 2) is present, there is no leak.
   b. If an oil run or drip (3) is present, perform procedure two or three more times to confirm oil leak.



1. **Normal oil/dust film**
2. **Normal oil/dust film**
3. **Drip**

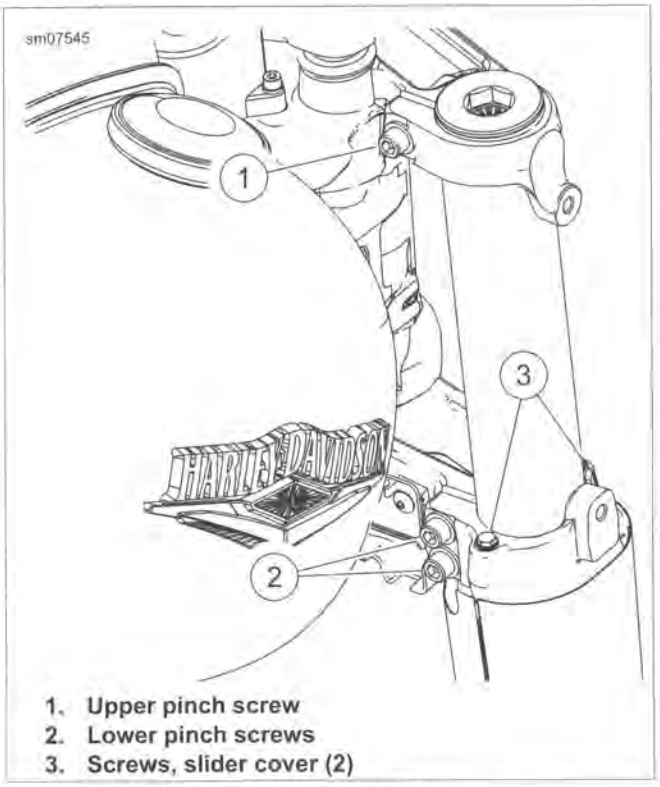
Figure 2-61. Front Forks

REMOVAL

NOTICE

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

1. Raise the front wheel with a suitable lifting device.
2. Remove the front wheel and fender. See 2.43 FRONT FENDER and 2.4 FRONT WHEEL.
3. **Road King models:** Remove headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
4. **Fairing models:** Remove dash panel. See 2.38 DASH PANEL.
5. See Figure 2-62. Loosen upper pinch screw (1) but do not remove.



1. **Upper pinch screw**
2. **Lower pinch screws**
3. **Screws, slider cover (2)**

Figure 2-62. Front Fork Attachment

6. Holding fork slider to prevent fork from dropping, loosen lower pinch screws (2). Slide fork tube down to remove.
7. If necessary, remove screws (3). Remove slider covers.

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-41177	FORK HOLDING TOOL

⚠WARNING

Wear safety glasses or goggles when servicing fork assembly. Do not remove slider tube caps without relieving spring preload or caps and springs can fly out, which could result in death or serious injury. (00297a)

NOTE

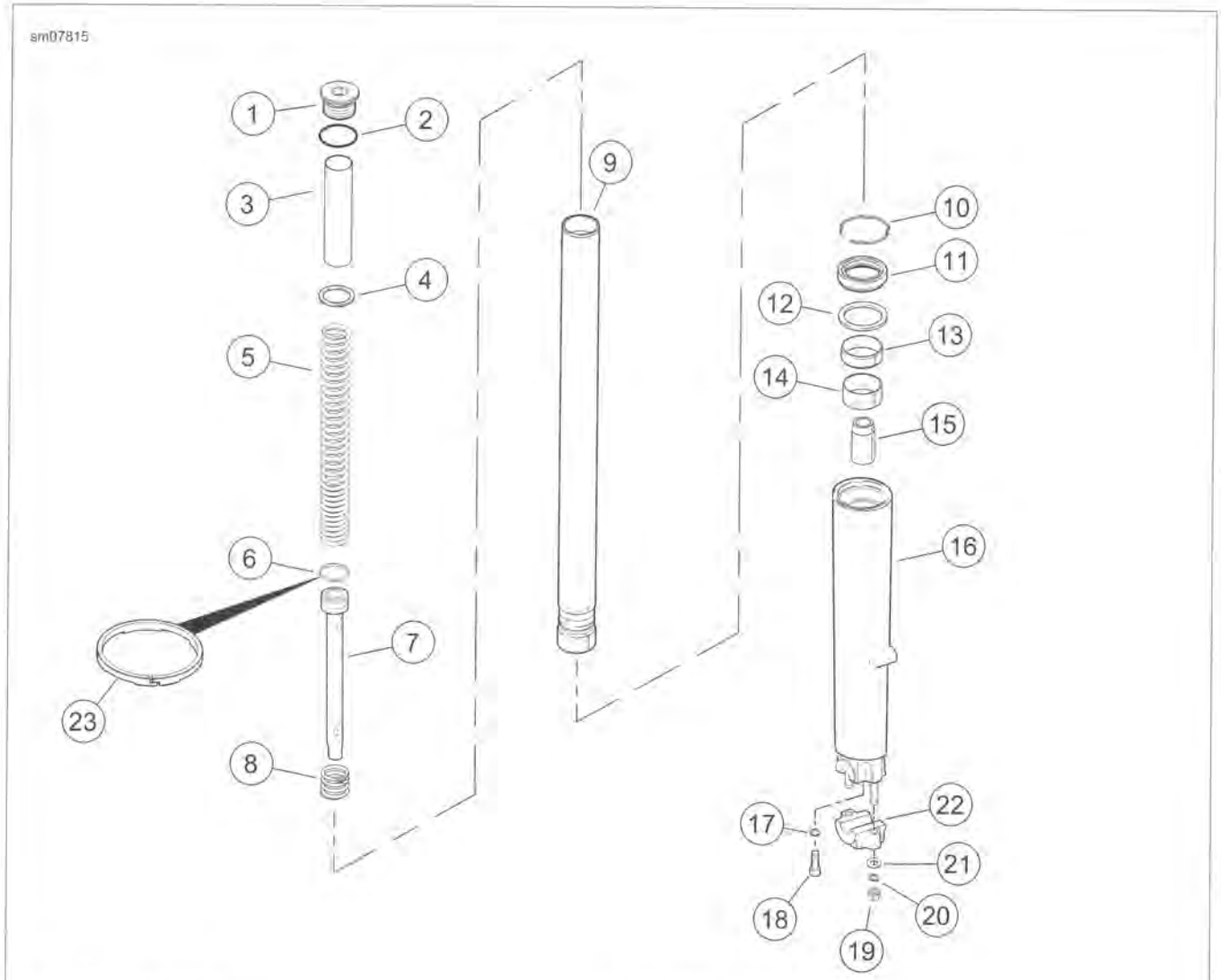
Always use soft jaws when placing any fork components into vise.

1. See Figure 2-63. If performing complete disassembly, clamp lower end of fork slider in a soft-jawed vise. Loosen lower screw (18). Do not remove at this time.
2. Install fork tube in FORK HOLDING TOOL (Part No. HD-41177) with fork approximately vertical.
3. Remove fork tube plug (1). Fork tube plug is under spring pressure. Have a firm grasp on plug as it is removed. Remove and discard O-ring (2).
4. Remove sleeve (3), spacer (4) and spring (5) from fork assembly.
5. Drain fork oil into a suitable container. Slowly pump fork tube and slider at least ten times. Allow approximately 10-15 minutes for fork to thoroughly drain.

NOTE

If only performing a fork oil change, go to ASSEMBLY, Filling and Final Assembly.

6. Reorient FORK HOLDING TOOL (Part No. HD-41177) so fork is approximately horizontal.
7. Temporarily install spring, spacer and sleeve.
8. Apply pressure to spring to prevent damper from rotating and remove screw (18) and copper washer (17) from bottom of fork assembly. Remove sleeve, spacer and spring.
9. Remove retaining clip (10).
10. Expand fork slider and tube against each other repeatedly (in a slide-hammer effect) to remove fork tube including seal (11), slider spacer (12), fork tube bushing (13) and slider bushing (14).
11. Remove lower stop (15) from end of fork tube.
12. Tip fork tube upside down to remove damper tube (7) with rebound spring (8).
13. Remove slider bushing (14), fork tube bushing (13), spacer (12), seal (11) and retaining clip (10) from fork tube.
14. Remove rebound spring and wear ring from damper tube.



1. Fork tube plug
2. O-ring
3. Sleeve
4. Spacer
5. Spring
6. Wear ring, damper tube
7. Damper tube
8. Rebound spring
9. Fork tube
10. Retaining clip
11. Lip seal
12. Slider spacer
13. Slider bushing
14. Fork tube bushing
15. Lower stop
16. Fork slider
17. Copper washer
18. Screw (metric)
19. Nut (2)
20. Lockwasher (2)
21. Flat washer (2)
22. Axle holder
23. Reliefs in wear ring

Figure 2-63. Fork Assembly

CLEANING AND INSPECTION

1. Clean all parts.
2. Inspect parts for wear or damage. Replace any parts that are damaged.
3. Replace retaining clip if bent or distorted.
4. Inspect OD of slider bushing and ID of fork tube bushing:
   a. If coating is worn through (metallic substrate showing), replace bushing.
   b. Inspect for distortion.
   c. If deep scratches or scoring are found, replace bushing. Also inspect mating components for similar wear. Replace or repair as necessary.
5. Check fork tube and slider for scoring, scratches and abnormal wear.

6. Inspect fork tube for nicks from stones and road debris, especially in area where seal contacts it. Replace or repair as necessary.
7. See Figure 2-64. Check runout with a dial indicator.
   a. Set fork tube on V-blocks.
   b. Replace fork if runout exceeds 0.008 in (0.2 mm).

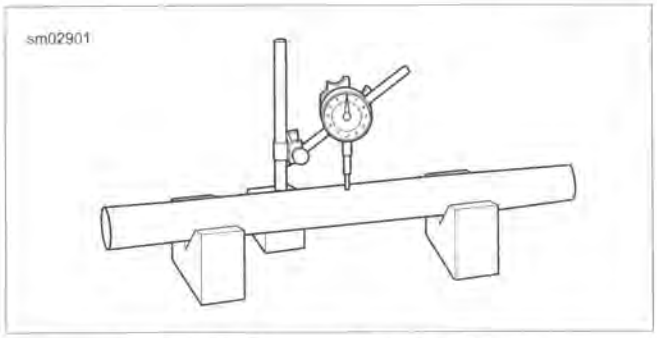


Figure 2-64. Measure Fork Tube Runout

ASSEMBLY

PART NUMBER	TOOL NAME
HD-41177	FORK HOLDING TOOL
HD-45305	FORK OIL SEAL INSTALLER
HD-59000B	FORK OIL LEVEL GAUGE

FASTENER	TORQUE VALUE	
Fork damper tube screw (metric)	30-37 ft-lbs	40-50 Nm
Fork tube plug	22-59 ft-lbs	30-80 Nm

NOTE

Lubricate all seal lips, quad rings and O-rings with HARLEY-DAVIDSON SEAL GREASE during assembly.

1. See Figure 2-63. Coat OD of slider bushing (14) with clean fork oil. Install on lower end of fork tube. Expand bushing only enough to slip over end and into groove of fork tube.
2. Coat ID of bushing (13) with clean fork oil. Install fork tube bushing and slider spacer (12) onto fork tube. Slide down until they contact bushing (14).

NOTE

Place masking tape over edge of fork tube to avoid damaging lip of fork oil seal during installation.

3. With the garter spring side toward the fork slider, slide **new** fork oil seal (11) down fork tube until it contacts slider spacer (12). Remove masking tape from edge of fork tube.
4. Install fork tube in FORK HOLDING TOOL (Part No. HD-41177) with fork approximately horizontal.
5. Install **new** wear ring (6) in groove of damper tube (7). Install with reliefs (23) down.
6. Install rebound spring (8) on opposite end.
7. With the small end down, slide damper tube into fork tube. Tube end will drop through hole at bottom of fork tube. Install lower stop (15) at end of damper tube.
8. Install fork spring (5) with the tightly wound coils toward the bottom. Install spacer (4) and sleeve (3).
9. Slide fork slider onto fork tube.

NOTE

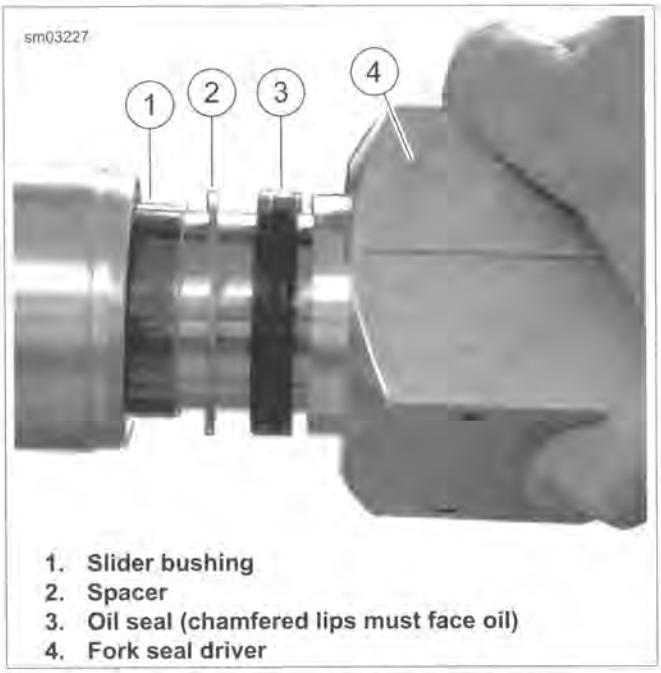
Screw (18) can be reused unless damaged.

10. Apply LOCTITE 565 THREAD SEALANT to screw (18). Loosely install screw and **new** copper washer (17) to prevent damper tube from unexpectedly falling out. Apply pressure to spring to prevent damper tube from rotating.
11. Remove from fork holder. Clamp lower end of fork slider in a soft-jawed vise.
12. See Figure 2-65. Using FORK OIL SEAL INSTALLER (Part No. HD-45305) like a slide hammer, drive fork oil seal down until installer contacts fork slider. Remove tool.

NOTE

Do not bend or stretch retaining clip (10) when installing.

13. See Figure 2-63. Install retaining clip (10) in the fork slider groove.
14. While compressing spring, tighten screw (18) to 30-37 ft-lbs (40-50 Nm).
15. Loosely install axle holder with flat washers, lockwashers and nuts on right fork slider.
16. Fill and install fork.



1. **Slider bushing**
2. **Spacer**
3. **Oil seal (chamfered lips must face oil)**
4. **Fork seal driver**

Figure 2-65. Assembled Fork Seal Driver

Filling and Final Assembly

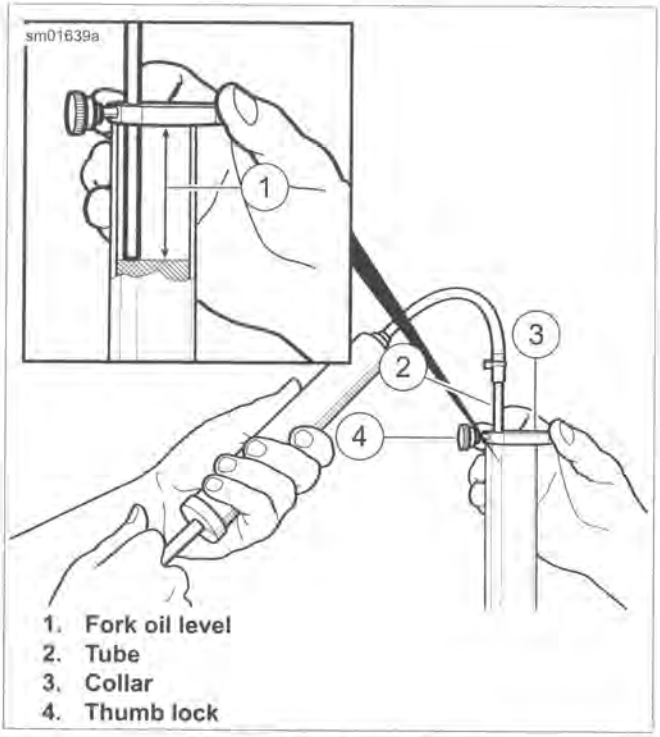
1. Clamp fork slider in FORK HOLDING TOOL (Part No. HD-41177) oriented vertically.
2. See Figure 2-63. Remove fork sleeve (3), spacer (4) and spring (5) from fork tube.
3. Pour slightly more than 24 oz (710 cc) TYPE 'E' HYDRAULIC FORK OIL directly into the fork tube.

4. Slowly pump fork tube until some resistance is felt. Then pump a few more times.

⚠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)

5. Adjust metal ring of FORK OIL LEVEL GAUGE (Part No. HD-59000B) to 3.74 in (95 mm).
6. See Figure 2-66. With the fork tube bottomed in the fork slider, insert tube of gauge until metal ring rests flat on top of fork tube.
7. Draw oil from fork with plunger. If no oil is drawn out, add a small amount to the fork tube and repeat.
8. Extend the fork. Install fork spring, spacer and sleeve into fork tube with the tighter wound coils at the bottom.
9. Remove fork slider from fork holding tool. Clamp fork tube into fork tube holder.
10. See Figure 2-63. Install **new** O-ring (2) onto fork tube plug (1). Install fork tube plug. Tighten to 22-59 ft-lbs (30-80 Nm).
11. Install fork and assemble motorcycle.



1. **Fork oil level**
2. **Tube**
3. **Collar**
4. **Thumb lock**

Figure 2-66. Oil Level Gauge

INSTALLATION

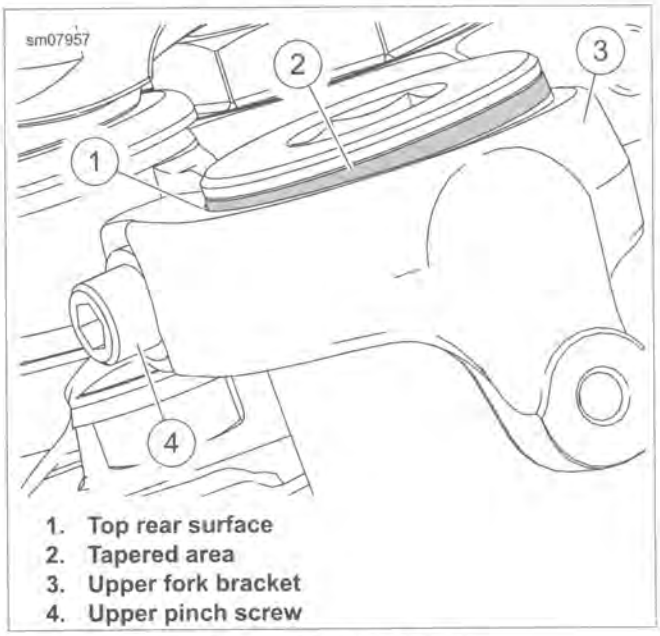
FASTENER	TORQUE VALUE	
Fork slider cover screws	24-48 **in-lbs**	2.7-5.4 Nm
Fork bracket, lower, pinch screws	14-18 ft-lbs	19.0-24.4 Nm
Fork bracket, lower, pinch screws	14-18 ft-lbs	19.0-24.4 Nm
Fork bracket, upper, pinch screws	14-18 ft-lbs	19.0-24.4 Nm

1. See Figure 2-62. If removed, install slider covers. Apply LOCTITE 246 MEDIUM STRENGTH THREADLOCKER (blue) to the threads of screws (3). Tighten to 24-48 **in-lbs** (2.7-5.4 Nm).
2. Slide fork tube into place.
3. Set fork height:
   a. Visual method: See Figure 2-67. Set fork height so top rear surface (1) of upper fork bracket is midway of the tapered area (2) at top of fork.
   b. Measurement method: See Figure 2-68. Set top of fork to a measurement (A) of 8.695 +/- 0.060 in (220.85 +/- 1.52 mm) from the top rear of the lower fork bracket.
4. See Figure 2-62. Tighten lower fork bracket pinch screws (2) in sequence:
   a. Tighten upper screw to 14-18 ft-lbs (19.0-24.4 Nm).
   b. Tighten lower screw to 14-18 ft-lbs (19.0-24.4 Nm).
   c. Repeat previous steps one time.

NOTE

Verify that upper fork bracket is seated against the upper dust shield.

5. Verify that upper fork bracket is evenly positioned on both fork tubes. Tighten upper pinch screw (1) to 14-18 ft-lbs (19.0-24.4 Nm).
6. Install the front fender and wheel. See 2.43 FRONT FENDER and 2.4 FRONT WHEEL.
7. **Road King models:** Install headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
8. **Fairing models:** Install dash panel. See 2.38 DASH PANEL.



1. Top rear surface
2. Tapered area
3. Upper fork bracket
4. Upper pinch screw

Figure 2-67. Fork Height

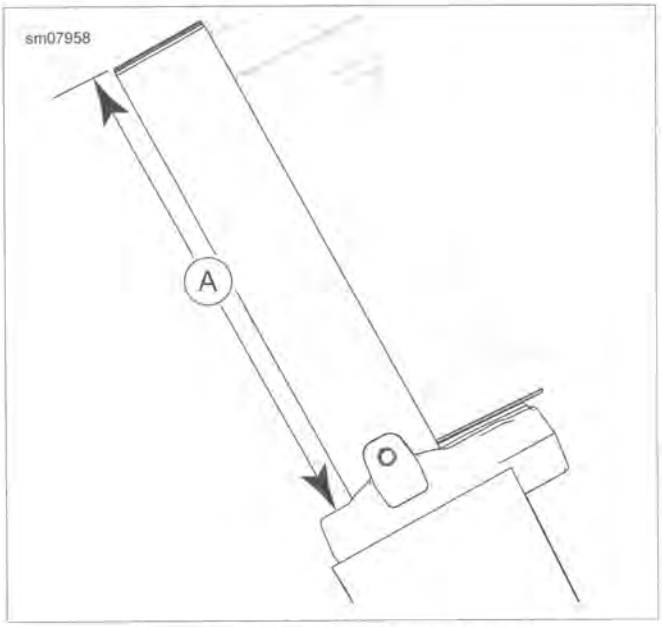


Figure 2-68. Measured Fork Height

STEERING STEM REMOVAL

Removal

1. Disassemble motorcycle:
   a. **Road King Models:** Remove headlamp nacelle, See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fairing Models:** Remove the inner fairing assembly. See 2.39 INNER FAIRING.
2. Remove front forks. See 2.19 FRONT FORK.
3. Release brake lines from lower fork bracket.

NOTE

Leave hand controls and switches assembled to handlebar.

4. Remove upper fork bracket with handlebar attached. Secure assembly with elastic cords on a well-padded fuel tank. See 2.20 STEERING HEAD BEARINGS, Upper Fork Bracket.
5. See Figure 2-69. Remove upper steering stem (1).
6. Remove lower steering stem/fork bracket (8).

Disassembly

NOTE

*Removal of the bearings will destroy them. Always install **new** bearings upon assembly.*

1. Remove bearing cones (3, 6) from upper stem and lower stem.

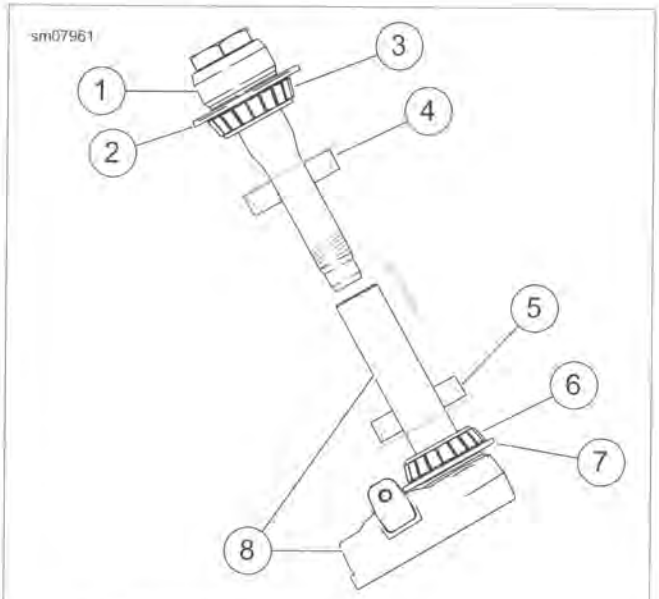
NOTE

Internal reliefs in steering head allow punch access to the bearing cups.

2. Drive both bearing cups (4, 5) out of steering head.

NOTE

Always replace both bearings if either requires replacement.



1. **Upper steering stem**
2. **Dust shield, upper**
3. **Upper bearing cone**
4. **Upper cup**
5. **Lower cup**
6. **Lower bearing cone**
7. **Dust shield, lower**
8. **Lower steering stem/fork bracket**

Figure 2-69. Steering Stem Bearings

STEERING STEM INSTALLATION

PART NUMBER	TOOL NAME
B-50119	WHEEL BEARING INSTALLER

FASTENER	TORQUE VALUE	
Upper steering stem, 1st torque	35 ft-lbs	47.5 Nm
Upper steering stem, final torque: Fairing models	60-65 **in-lbs**	6.8-7.3 Nm
Upper steering stem, final torque: Road King models	110-115 **in-lbs**	12.4-13.0 Nm
Upper steering stem, final torque: Trike models	110-115 **in-lbs**	12.4-13.0 Nm

Assembly

⚠WARNING

Properly seat bearing cups in steering head bore. Improper seating can loosen fork stem bearings adversely affecting stability and handling, which could result in death or serious injury. (00302a)

NOTES

- *Always install **new** bearings. Replace both bearings anytime either requires replacement.*
- *Install both bearing cups at the same time.*

1. Inspect the bores in the steering head. Remove any paint, rust or burrs.
2. See Figure 2-70. Install **new** bearing cups using components from WHEEL BEARING INSTALLER (Part No. B-50119):
   a. Use installer B-50119-3 on the upper cup, installer B-50119-4 on the lower cup, screw, washer, bearing and nut.
   b. Install until both cups are seated in bore.

NOTE

Upper dust shield has a larger OD than the lower dust shield.

3. See Figure 2-69. Install upper (2) and lower (7) dust shields. Press bearing cones onto upper and lower stems.

Installation

4. Lubricate upper steering stem threads with SPECIAL PURPOSE GREASE. Apply a coat of SPECIAL PURPOSE GREASE on bearing rollers and cups.
5. Install lower stem/fork bracket into steering head.
6. Hold lower stem/fork bracket (8) up against lower bearing cup (5). Install upper stem (1) hand-tight.

NOTE

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

7. Tighten upper steering stem (1) to 35 ft-lbs (47.5 Nm).
8. Loosen upper steering stem 90-100 degrees. Tighten to specification. Refer to Table 2-15.

Table 2-15. Steering Stem Torque

MODEL	TORQUE
Fairing models	60-65 **in-lbs** (6.8-7.3 Nm)
Road King	110-115 **in-lbs** (12.4-13.0 Nm)
Trike	110-115 **in-lbs** (12.4-13.0 Nm)

Figure 2-70. Install Steering Head Bearing Cups

9. Install front forks in lower fork bracket. Use the measurement method to adjust height. See 2.19 FRONT FORK.
10. Install upper fork bracket and handlebar. Do not tighten fork stem pinch screw. See 2.20 STEERING HEAD BEARINGS, Upper Fork Bracket.
11. Install inner fairing or headlamp nacelle.
12. Adjust swing-back. See 1.20 STEERING HEAD BEARINGS.

UPPER FORK BRACKET

FASTENER	TORQUE VALUE	
Upper steering stem pinch screw	22-26 ft-lbs	29.8-35.2 Nm
Fork bracket, upper, pinch screws	14-18 ft-lbs	19.0-24.4 Nm

Removal

1. Disassemble motorcycle:
   a. **Road King models:** Remove headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fairing models:** Remove inner fairing. See 2.39 INNER FAIRING.
2. Disconnect left and right handlebar switch connectors, ignition switch, TGS connector, upper fork bracket ground connector and heated hand grip connectors if equipped.
3. See Figure 2-71. Loosen pinch screw (1).
4. Loosen pinch screws (2). Do not loosen pinch screws (4).
5. Cut cable straps securing lines and wiring to the handlebar risers.
6. Lift off upper fork bracket and handlebar as an assembly. Carefully lay on protected fuel tank.

Installation

1. Check front fork height. Use the measurement method. See 2.19 FRONT FORK.
2. If wheel is installed, raise vehicle to remove weight from front wheel.
3. See Figure 2-71. Place upper fork bracket with handlebar over ends of forks and onto upper steering stem.

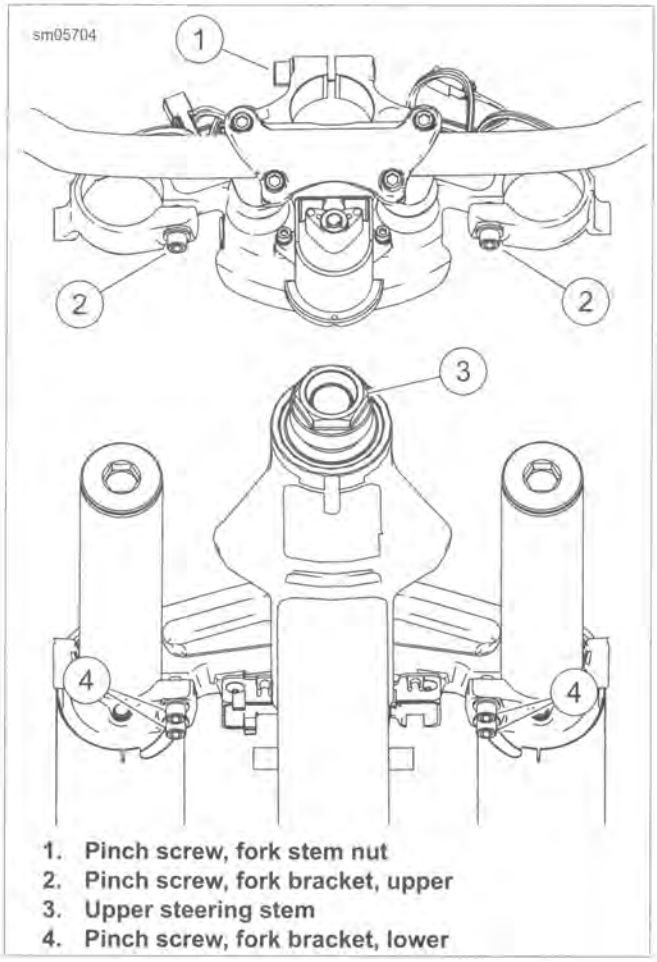
NOTE

If necessary, use a plastic deadblow hammer to tap the fork bracket onto the upper steering stem.

NOTE

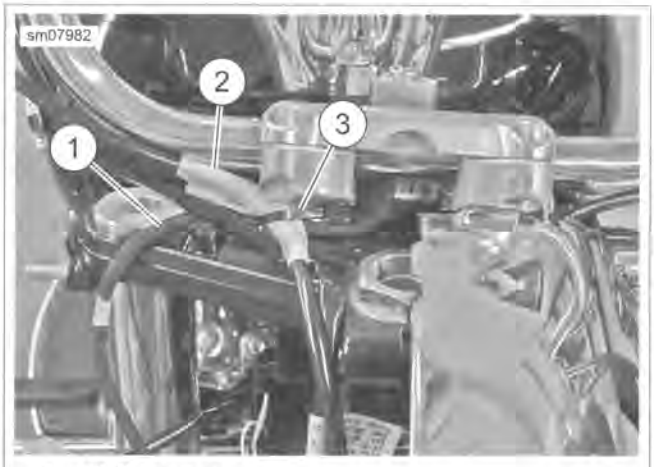
Verify that fork bracket is tightly mated down onto upper dust shield and evenly positioned on both forks.

4. Hold upper fork bracket down tight against upper dust shield. Tighten pinch screw (1) to 22-26 ft-lbs (29.8-35.2 Nm).
5. Verify that upper fork bracket is evenly positioned on both forks. Tighten upper fork pinch screws (2) to 14-18 ft-lbs (19.0-24.4 Nm).
6. Connect left and right handlebar switch connectors, ignition switch, TGS connector, upper fork bracket ground connector and heated hand grip connectors if equipped.
7. See Figure 2-72 and Figure 2-73. Secure lines and wiring to handlebar risers with **new** cable straps.
8. Secure brake lines to retainer on lower fork bracket.
9. Assemble motorcycle:
   a. **Road King Models:** Install headlamp nacelle. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fairing Models:** Install Inner and outer fairings. See 2.39 INNER FAIRING.



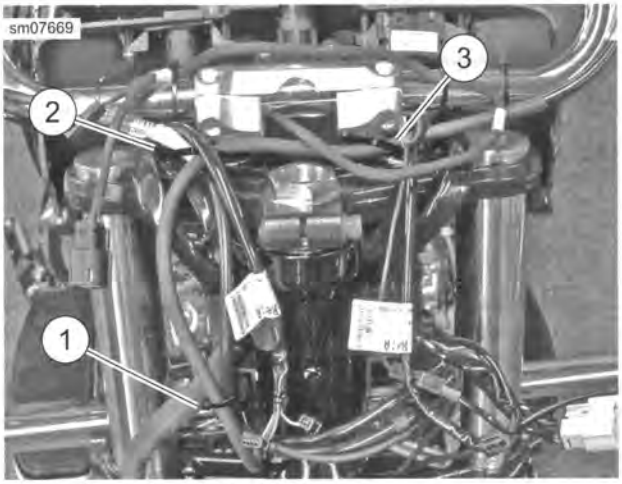
1. **Pinch screw, fork stem nut**
2. **Pinch screw, fork bracket, upper**
3. **Upper steering stem**
4. **Pinch screw, fork bracket, lower**

Figure 2-71. Fork Stem and Brackets



1. **TGS harness**
2. **Brake line**
3. **Cable strap**

Figure 2-72. Capture Brake Line and TGS harness (FLHR/C)



1. Clutch line to brake line
2. Clutch line and brake line to right riser
3. Clutch line to left riser

Figure 2-73. Capture Clutch and Brake Fluid Lines (Fairing Models) (Fairing removed for photo clarity)

SHOCK ABSORBER REMOVAL

PART NUMBER	TOOL NAME
HD-34633	AIR SUSPENSION PUMP AND GAUGE

NOTE

Remove and install one shock absorber at a time.

NOTICE

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

1. Raise the rear wheel with a suitable lifting device until the rear tire is just touching.
2. Remove saddlebags. See 2.31 SADDLEBAGS.

⚠WARNING

Use caution when bleeding air from the suspension. Moisture combined with lubricant may leak onto the rear wheel, tire and/or brake components and adversely affect traction, which could result in death or serious injury. (00084a)

3. **Air adjust shock absorbers:** Bleed air from the system. Remove the air tube from the fitting. To purge lines of any oil, add 3-5 psi (20.7-34.5 kPa) using the no-loss AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633) before releasing air.
4. Remove the shock absorber mounting bolts, lockwashers and flat washers.

NOTE

Never lay the shock absorber down. Always keep the shock absorber upright to prevent oil from draining out through the compression fitting. Any loss of oil requires shock absorber replacement.

CLEANING AND INSPECTION

1. Examine the rubber mounting bushings for cracks or wear.
2. Examine the shock absorber for leaks. The unit should not leak and should compress slightly easier than it extends.
3. Compare the action of the shock absorber with a **new** one to judge if it is worn. Replace the shock if necessary.
4. Clean and examine the mounting hardware. Replace parts that are worn or damaged.

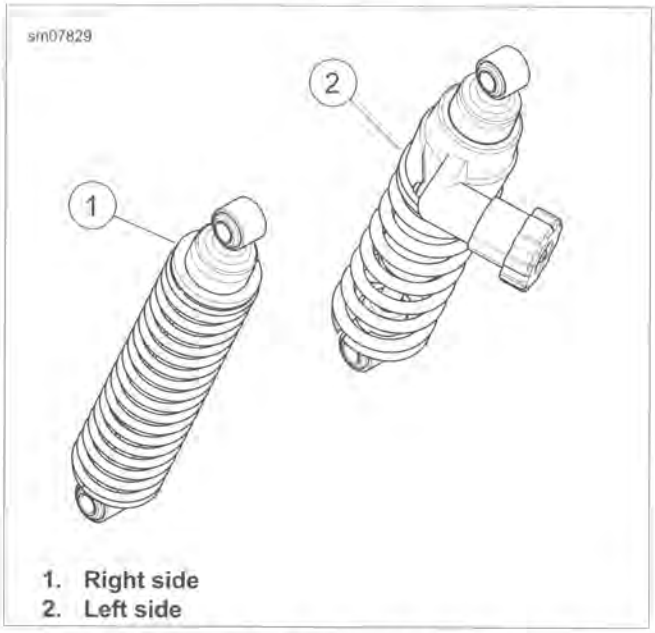
SHOCK ABSORBER INSTALLATION

FASTENER	TORQUE VALUE	
Shock absorber mounting bolt	35-40 ft-lbs	47.5-54.2 Nm

NOTES

- ***Air adjust shock absorbers:*** *Never lay the shock absorber down. Always keep the shock absorber upright to prevent oil from draining out through the compression fitting. Any loss of oil requires shock absorber replacement.*
- ***Manual adjust shock absorbers:*** *Install both with the rod end down. Install the adjustable one on the left with the knob facing forward.*

1. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of each mounting bolt.
2. Install shock absorber with mounting bolts, lockwashers and flat washers. Tighten to 35-40 ft-lbs (47.5-54.2 Nm).
3. Insert air tube into fitting until it bottoms. Gently tug on tube to verify that it is locked in place.
4. Pressurize rear air suspension system or adjust left knob as equipped. Check for leaks. See 1.21 REAR SUSPENSION ADJUSTMENTS and 2.21 REAR SUSPENSION.
5. Install saddlebags. See 2.31 SADDLEBAGS, Removal.



1. **Right side**
2. **Left side**

Figure 2-74. Manual Adjust Shock Absorber

AIR SHOCK REPAIR

FASTENER	TORQUE VALUE	
Shock absorber air tube fitting	12-17 ft-lbs	16.3-23.0 Nm

NOTE

Other than air tube fittings, air shocks are not repairable. Replace the shocks if damaged, worn or evidence of leakage is observed.

1. Remove the air tube fitting from the shock absorber.
2. Apply LOCTITE 565 THREAD SEALANT to the threads of a **new** air tube fitting and install. Tighten to 12-17 ft-lbs (16.3-23.0 Nm).

AIR LINES

PART NUMBER	TOOL NAME
HD-34633A	AIR SUSPENSION PUMP AND GAUGE

FASTENER	TORQUE VALUE	
Shock absorber air tube fitting	12-17 ft-lbs	16.3-23.0 Nm
Suspension air valve nut	40-50 **in-lbs**	4.5-5.6 Nm

Check for Leaks

⚠WARNING

Use caution when bleeding air from the suspension. Moisture combined with lubricant may leak onto the rear wheel, tire and/or brake components and adversely affect traction, which could result in death or serious injury. (00084a)

NOTES

- *Remove and replace components as necessary to access air suspension system components.*
- *Always release air pressure from system before removing any component from the suspension system. To purge tubes of any oil, add 3-5 psi (20.7-34.5 kPa) before releasing air.*

1. Verify that valve core is properly tightened and not leaking.
2. Adjust air pressure using AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633A). See 1.21 REAR SUSPENSION ADJUSTMENTS.
3. Apply a film of soapy water on all fittings and around the air valve including the core area. Pressurize system.
   a. If leakage is evident, repair or replace damaged components as necessary.
   b. If no leaks were evident at the fittings, inspect the air tubes for damage that may result in air leaks. Apply soapy water to the suspect area and look for leakage.
   c. If the tubes show no evidence of leakage, a damaged shock absorber is likely the fault. Allow the motorcycle to set overnight. If a loss of 5-10 psi (34.5-68.9 kPa) is noted, replace the shock absorbers, one at a time, and retest.
4. Pressurize system and check for leaks when repairs are completed.
5. Install protective cap on air valve.

Fittings

NOTE

Push and hold tube retaining ring to release grip of compression fitting.

1. See Figure 2-75. Remove elbow fitting (4) from compression fitting (5).
2. If necessary, remove elbow fitting (4) from air tube.
3. Remove compression fitting (5) from shock absorber.
4. Apply LOCTITE 565 THREAD SEALANT to the threads of a **new** compression fitting and install. Tighten to 12-17 ft-lbs (16.3-23.0 Nm).
5. Install elbow fitting if removed.
6. Insert the elbow fitting and gently tug to verify that it is secure in fitting.

Air Valve Assembly

1. Remove left saddlebag support casting. See 2.32 SADDLEBAG SERVICE, Saddlebag Support.
2. See Figure 2-75. Remove hex nut (1).
3. Remove air inlet manifold and valve assembly (2).
4. Separate air lines from manifold.
5. Install the manifold and valve assembly. Secure with nex nut (1). Tighten to 40-50 **in-lbs** (4.5-5.6 Nm).
6. Install left saddlebag support casting. See 2.32 SADDLEBAG SERVICE, Saddlebag Support.

Air Tubes

1. Remove the seat. See 2.30 SEAT.

NOTE

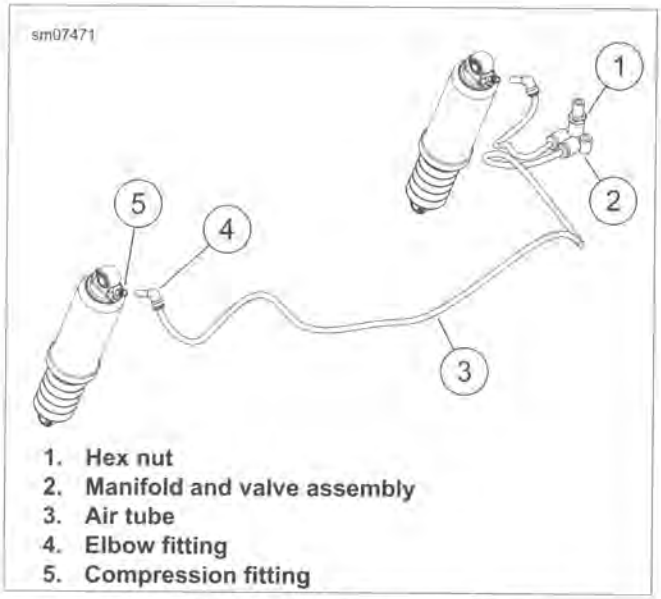
Note air tube routing.

2. Remove tubes from air valve assembly and elbow fittings.
3. Cut bulk tubing to proper length.
4. Install **new** tubes into fittings following the original routing. Gently tug on tube to verify that it is secure in fitting.

⚠WARNING

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

5. Install the seat. See 2.30 SEAT.



1. **Hex nut**
2. **Manifold and valve assembly**
3. **Air tube**
4. **Elbow fitting**
5. **Compression fitting**

Figure 2-75. Rear Air Suspension System

MANUAL ADJUST SHOCK REPAIR

Other than air lines, removal and installation is identical to the air suspension shock absorbers. See 2.21 REAR SUSPENSION.

See Figure 2-76. The rear shock absorbers contain no servicable parts except the adjustment knob, screw, washer, detent ball and spring in kit form.

1. Remove the screw and flat washer securing the knob.

NOTE

A detent spring and ball are located in a bore located under the collar of the knob. Use care not to allow them to release unexpectedly and become lost.

2. Carefully remove the knob while holding a rag wrapped around the adjuster housing and knob to prevent loss of the detent ball and spring.
3. If necessary, remove detent ball and spring.
4. If removed, place spring in bore.
5. Press ball onto end of spring and install knob on adjuster housing.
6. Install and tighten screw securely.
7. Rotate knob to verify the detent is properly assembled (clicks should be heard).

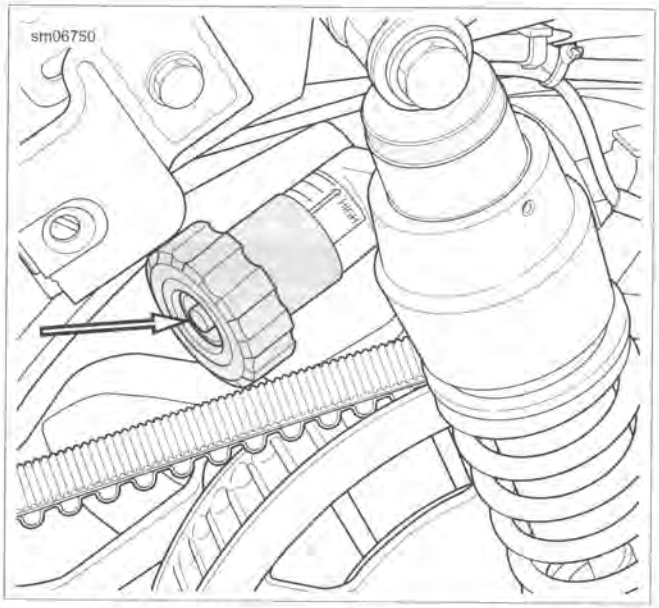


Figure 2-76. Rear Shock Absorber Preload Adjuster Knob

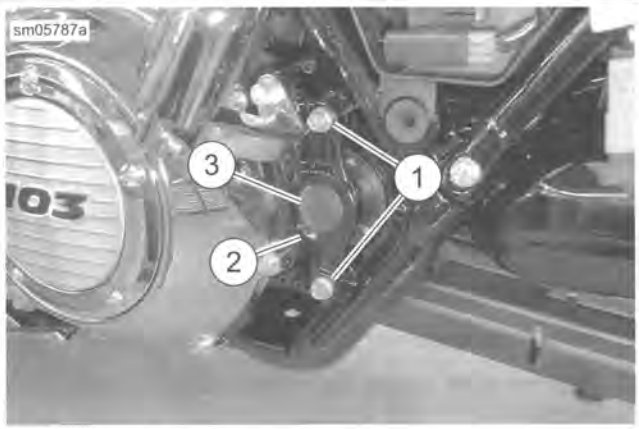
REMOVAL

1. Remove rear wheel. See 2.5 REAR WHEEL.
2. Remove caliper and bracket from anchor weldment on rear fork.
3. Remove debris deflector from bottom of left side fork.
4. Loosen both lower shock absorber mounting bolts but do not remove at this time.
5. See Figure 2-77. Remove two screws (1) to free left rear fork bracket (2) with foot rest.
6. Release rear brake line hose and rear wheel speed sensor (if ABS equipped) from cable clips on right side of rear fork.
7. Remove plug from right side.

NOTES

- *For best results, use an air impact wrench to remove the right-side nut. Applying heat to the right-side nut may also improve removal. If the left-side nut loosens first, remove left-side mount and use double 1/2-20 nuts to hold pivot shaft while removing right-side nut.*
- *A 6-point socket is recommended for removal of the pivot shaft locknuts.*

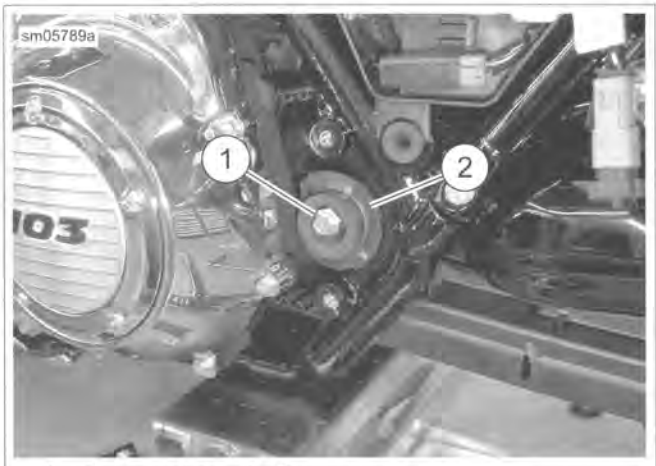
8. See Figure 2-78. Hold left side hex spacer and remove right side screw from pivot shaft. Remove outer spacer.
9. Using a suitable drift, tap pivot shaft toward left side of motorcycle.
10. See Figure 2-79. Pull pivot shaft assembly with screw, outer spacer, rubber mount and middle spacer out of transmission mount and left side fork.
11. Remove lower shock absorber bolts. Work rear fork free of transmission mount and rear fork brackets.
12. Remove middle spacer from right side fork tube.
13. Remove rubber mount from right side.



1. **Screws**
2. **Fork bracket**
3. **Plug**

Figure 2-77. Rear Fork Mount Bracket

Figure 2-78. Right Side Mount



1. **Screw, pivot shaft**
2. **Left mount**

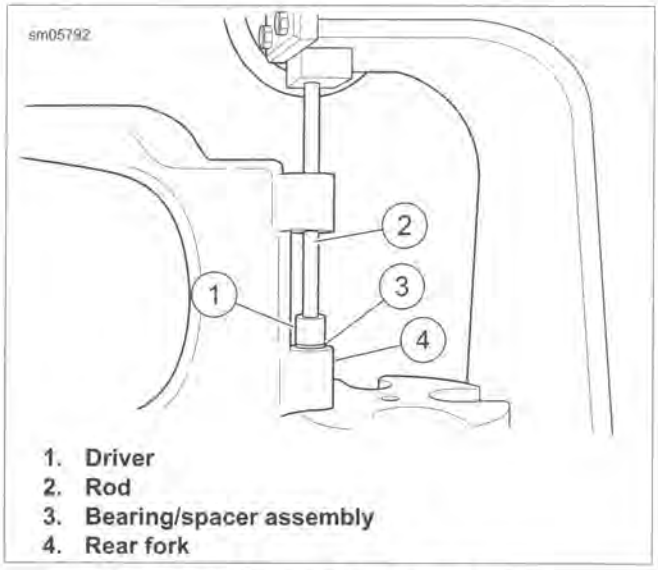
Figure 2-79. Left Side Mount and Pivot Shaft Assembly

DISASSEMBLY AND ASSEMBLY

PART NUMBER	TOOL NAME
HD-45327	REAR FORK BEARING INSTALLER

Bearing Removal

1. See Figure 2-80. Select a driver (1) slightly smaller than the bearing spacer and a rod (2) long enough to allow pressing through upper bearing.
2. Support the fork (4) in a press with brake anchor weldment on top. Slide rod through the brake side bearing against driver. Verify that assembly is square and the bearing bore is completely vertical.



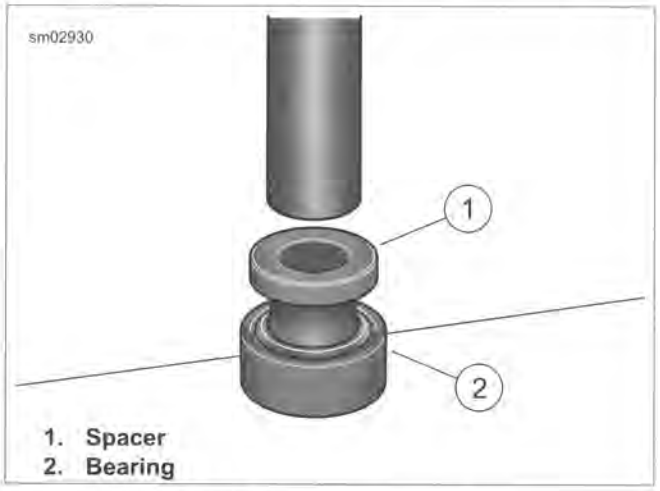
1. Driver
2. Rod
3. Bearing/spacer assembly
4. Rear fork

Figure 2-80. Remove Rear Fork Bearing

3. Press bearing/spacer assembly (3) from rear fork.
4. Turn fork over and press out brake side bearing in same manner.
5. If bearings are to be replaced with **new**, press spacers out and retain for later use.

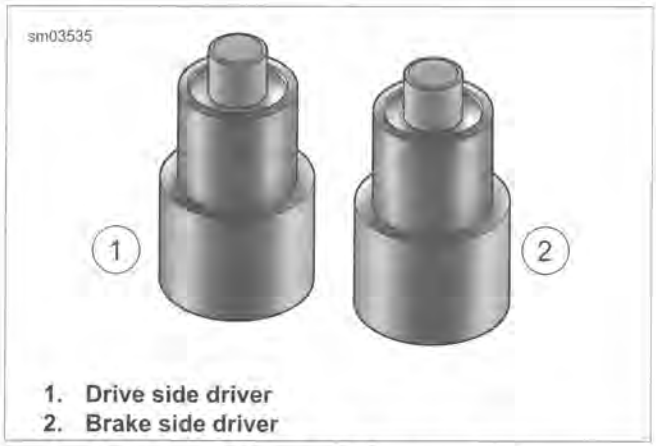
Bearing Installation

1. Assemble **new** rear fork bearings and spacers:
   a. Place bearing flat on suitable press plate.
   b. See Figure 2-81. With the collar topside, start spacer into bearing.
   c. Press spacer until it bottoms against press plate.



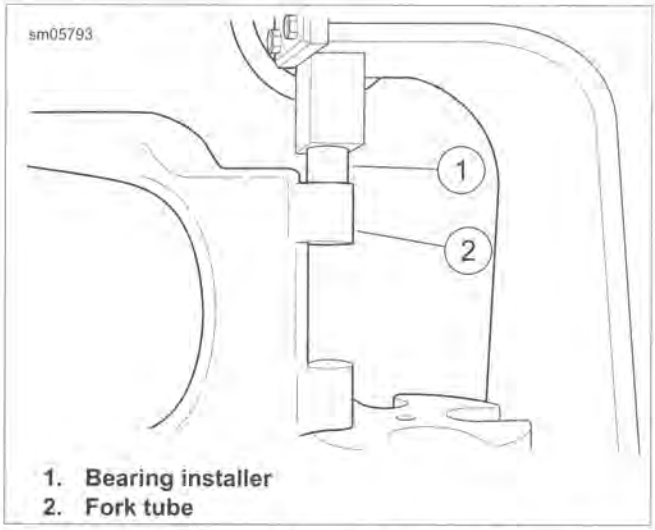
1. Spacer
2. Bearing

Figure 2-81. Press Spacer into Bearing



1. Drive side driver
2. Brake side driver

Figure 2-82. Rear Fork Bearing Installer



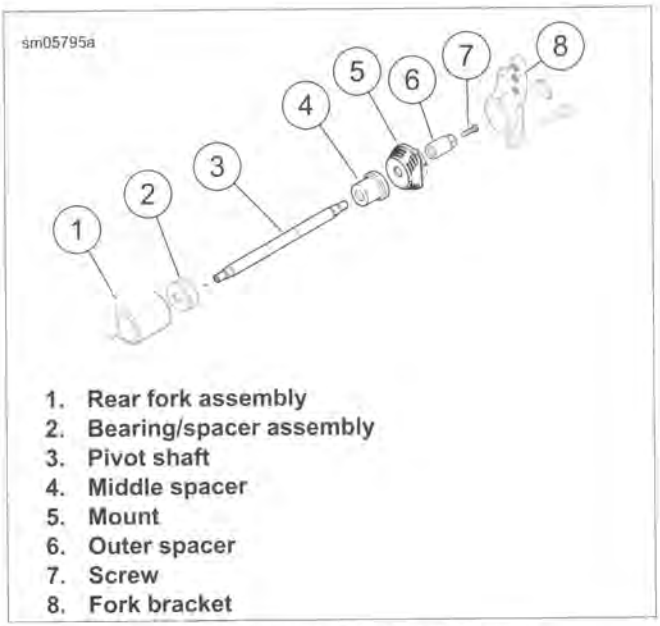
1. Bearing installer
2. Fork tube

Figure 2-83. Install Rear Fork Bearing (typical)

2. Coat the bearing bores in the rear fork with a light coat of SPECIAL PURPOSE GREASE.
3. See Figure 2-83. Support fork squarely on press bed with the brake anchor weldment on top.
4. Insert bearing into fork assembly with spacer down.
5. Using REAR FORK BEARING INSTALLER (Part No. HD-45327) (1) stamped "Brake Side", press on bearing until shoulder on tool makes contact with fork tube (2).
6. Turn rear fork over. Repeat process with remaining bearing using tool stamped "Drive Side". Press bearing until it bottoms. Shoulder on tool will **not** make contact with fork tube.

Pivot Shaft/Mount Disassembly

1. See Figure 2-84. Remove screw (7).
2. Remove outer spacer (6), rubber mount (5) and middle spacer (4).



1. **Rear fork assembly**
2. **Bearing/spacer assembly**
3. **Pivot shaft**
4. **Middle spacer**
5. **Mount**
6. **Outer spacer**
7. **Screw**
8. **Fork bracket**

Figure 2-84. Pivot Shaft Components

INSTALLATION

FASTENER	TORQUE VALUE	
Rear fork bracket screws	55-65 ft-lbs	74.6-88.1 Nm
Rear fork pivot shaft fasteners	55-65 ft-lbs	74.6-88.1 Nm
Shock absorber mounting bolt	35-40 ft-lbs	47.5-54.2 Nm
Debris deflector screw	65-85 **in-lbs**	7.3-9.6 Nm

1. See Figure 2-85. With the slot on the outboard side between the twelve and one o'clock positions, install rubber mount on inner-right side of frame. Be sure that index tab in mount cavity fully engages slot in rubber mount.
2. Hold middle spacer in right side fork tube and move the fork into approximate position. Loosely install lower shock absorber screws.
3. Work the rear fork into position between the transmission mount and the right-rear fork mount.
4. Coat pivot shaft with ANTI-SEIZE LUBRICANT. Avoid getting anti-seize on threads of pivot shaft.
5. See Figure 2-79. Slide pivot shaft from left side of motorcycle through left side fork and transmission mount. Guide end of pivot shaft through hole in right rubber mount.
6. See Figure 2-84. Slide middle spacer (4) onto left end of pivot shaft (3) until seated against shoulder.
7. Install left rubber mount (5) with the flat side inboard.
8. Install outer spacer (6).
9. See Figure 2-77. Rotate the left rubber mount so the slot is between the eleven and twelve o'clock positions. Install left side fork bracket (2) fitting index tab into slot of rubber mount.
10. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of fork bracket screws (1). Secure left side fork bracket. Tighten to 55-65 ft-lbs (74.6-88.1 Nm). Remove plug (3) from left side.
11. See Figure 2-78. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of both pivot shaft screws and install. Tighten to 55-65 ft-lbs (74.6-88.1 Nm).
12. Verify that rear fork assembly moves freely.
13. Install plugs.
14. Remove lower shock mounting bolts. Apply two or three drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads. Install bolts and tighten to 35-40 ft-lbs (47.5-54.2 Nm).
15. Install debris deflector. Tighten to 65-85 **in-lbs** (7.3-9.6 Nm).
16. Seat caliper bracket on anchor weldment of rear fork.
17. Capture rear brake line hose in two cable clips at top of right side fork. Rear cable clip also captures rear wheel speed sensor cable on ABS equipped motorcycles.
18. Install rear wheel. See 2.5 REAR WHEEL.

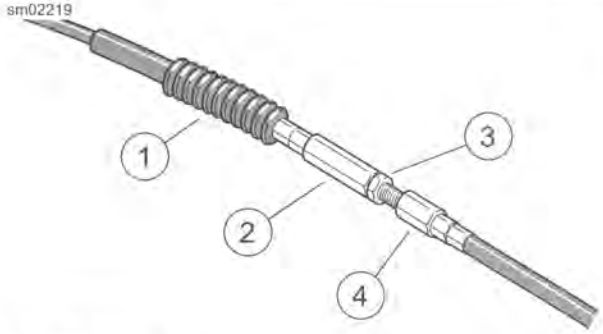
Figure 2-85. Right-Side Mount

REMOVAL

⚠WARNING

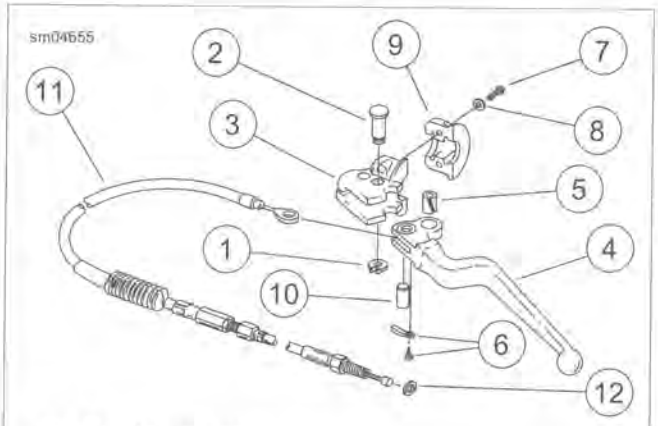
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove the main fuse.
2. Remove right side exhaust system. See 4.18 EXHAUST SYSTEM.
3. Remove retaining clips to free clutch cable from right frame downtube.
4. See Figure 2-86. Slide rubber boot off clutch cable adjuster. Adjust cable to introduce free play.
5. See Figure 2-87. Remove retaining ring from pivot pin. Remove pivot pin.
6. Remove clutch hand lever from bracket. If necessary, remove handlebar clamp from clutch lever bracket.
7. Remove anchor pin and cable eyelet from clutch hand lever.
8. Drain transmission lubricant into a suitable container. See 1.11 TRANSMISSION LUBRICANT.
9. Remove and disassemble clutch release cover. Discard gasket. See 6.5 CLUTCH RELEASE COVER: CABLE CLUTCH.



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

Figure 2-86. Clutch Cable Adjuster



1. **Retaining ring**
2. **Pivot pin**
3. **Clutch lever bracket**
4. **Hand lever**
5. **Bushing**
6. **Anti-rattle spring and screw**
7. **Screw**
8. **Flat washer**
9. **Handlebar clamp**
10. **Anchor pin**
11. **Clutch cable**
12. **O-ring**

Figure 2-87. Clutch Hand Lever Assembly

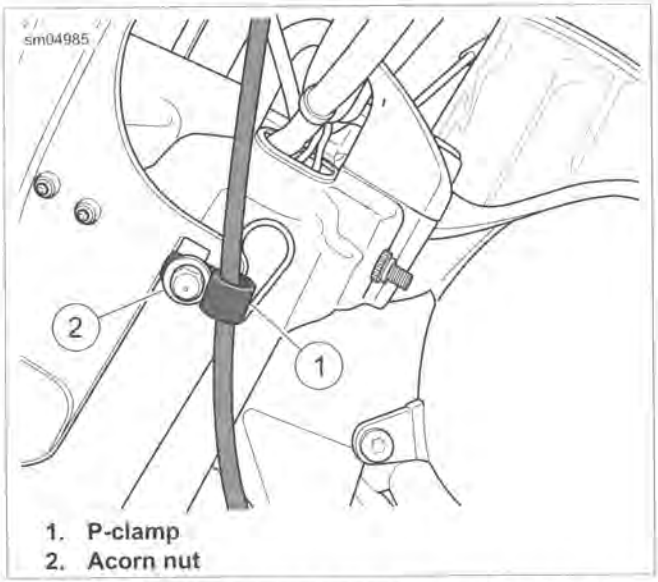
10. See Figure 2-88. Remove acorn nut to release P-clamp from stud in upper fork bracket. Remove clutch cable from P-clamp.
11. Remove clutch cable.

INSTALLATION

FASTENER	TORQUE VALUE	
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm
Auxiliary/fog lamp bracket acorn nuts: Road King models	72-108 **in-lbs**	8.1-12.2 Nm
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm

1. See Figure 2-87. Insert cable eyelet into groove of clutch hand lever. Insert anchor pin.
2. Insert lever into groove of clutch lever bracket fitting cable sleeve into bore on bracket.
3. Secure hand lever to bracket with pivot pin. Install retaining ring.
4. If removed, secure handlebar clamp to clutch lever bracket. Starting with the top screw, tighten screws to 72-108 **in-lbs** (8.1-12.0 Nm).
5. See Figure 2-88. Capture clutch cable in P-clamp (1) and secure to upper fork bracket with acorn nut (2). Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
6. Route cable downward between engine guard and front of left frame downtube.

7. Secure cable to left downtube using a cable strap through the hole in the cross brace.



1. P-clamp
2. Acorn nut

Figure 2-88. FLHR/C Clutch Cable Routing (Left Side View)

8. Route cable down between voltage regulator and front engine mount. Pass across under engine and up between engine and frame to clutch area.
9. Assemble and install clutch release cover with **new** gasket. See 6.5 CLUTCH RELEASE COVER: CABLE CLUTCH.
10. Check O-ring on the transmission drain plug for damage. Replace as necessary.
11. Install transmission drain plug. Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
12. Fill transmission. See 1.11 TRANSMISSION LUBRICANT.
13. Adjust the clutch cable. See 1.12 CLUTCH CABLE: ROAD KING.
14. Secure cable to downtube with two spring clamps, one on either end of bellows.
15. Install right side exhaust system. See 4.18 EXHAUST SYSTEM.
16. Install the main fuse.

REMOVAL

NOTICE

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

1. See Figure 2-89. Loosen cover screws (13) to relieve pressure in master cylinder/reservoir.

⚠CAUTION

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

⚠WARNING

Be sure no clutch fluid gets on tires, wheels or brakes when draining fluid. Traction can be adversely affected, which could result in loss of control and death or serious injury. (00295a)

NOTICE

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

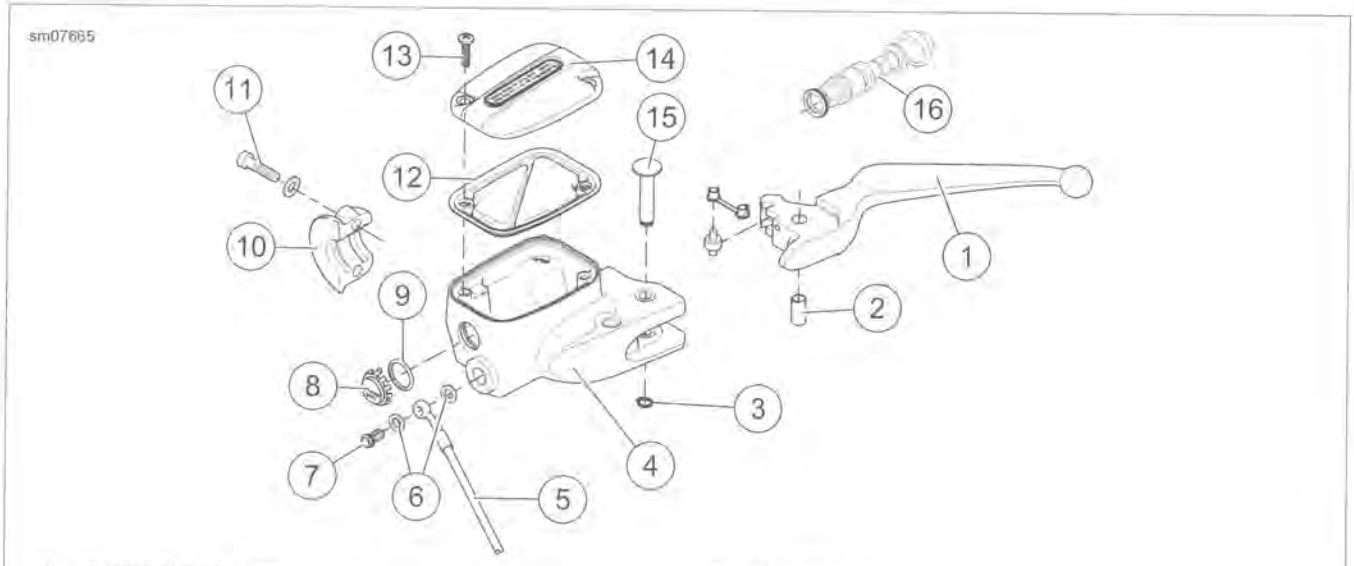
If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

2. Slowly loosen banjo bolt (7). Allow clutch fluid from reservoir to drain into container.
3. Remove banjo bolt. Discard two sealing washers (6).

NOTE

To prevent clutch fluid from draining from the clutch line and secondary clutch actuator, support the banjo fitting and clutch fluid line upright.

4. Remove master cylinder clamp screws (11). Remove clutch master cylinder/reservoir assembly.



1. Clutch hand lever
2. Bushing
3. Retaining ring
4. Master cylinder
5. Clutch fluid line
6. Steel/rubber washers
7. Banjo bolt
8. Sight glass
9. O-ring
10. Clamp
11. Clamp screw
12. Gasket
13. Cover screw
14. Cover
15. Pivot pin
16. Rebuild kit

Figure 2-89. Clutch Master Cylinder Assembly

DISASSEMBLY

NOTE

Thoroughly clean cover before removal. This prevents system contamination.

1. Remove cover and gasket. Turn housing upside down to remove remaining clutch fluid from reservoir.

⚠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. Remove clutch hand lever. See 2.25 HYDRAULIC CLUTCH HAND LEVER.
3. See Figure 2-90. Using a toothpick or small screwdriver, gently pry outer edge of piston boot (1) out of piston bore.
4. Remove piston (2) and spring (4).

⚠CAUTION

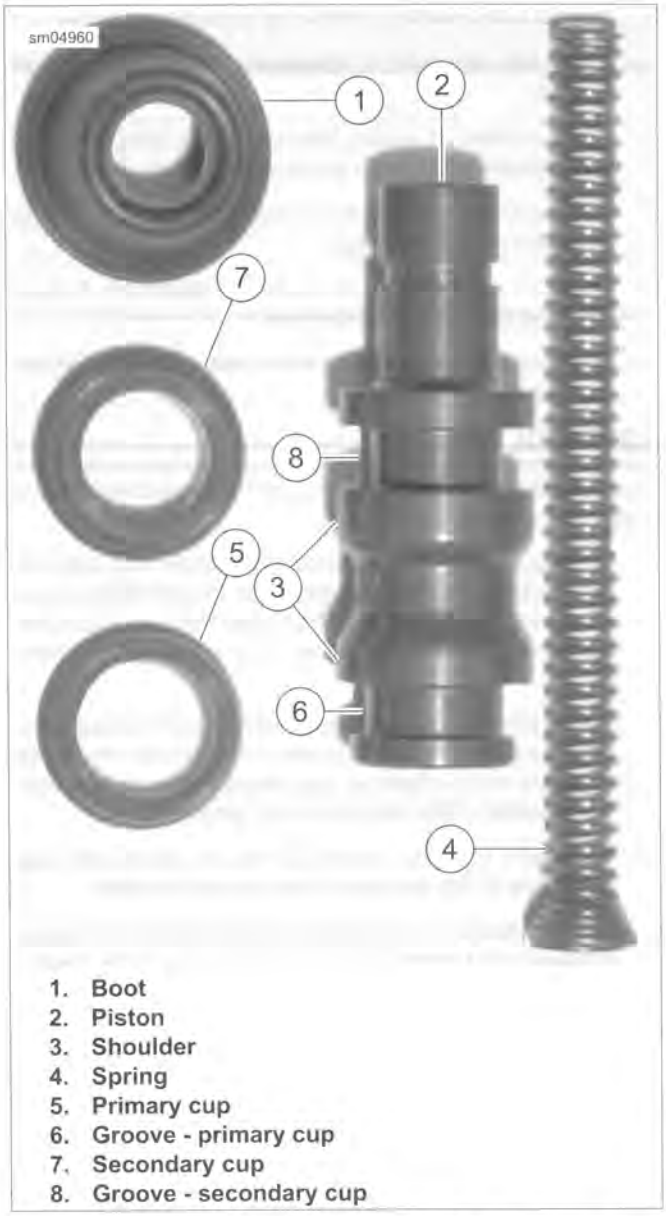
Direct contact of D.O.T. 4 brake fluid with eyes can cause irritation. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 4 brake fluid can cause digestive discomfort. If swallowed, obtain medical attention. Use in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

NOTICE

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

NOTICE

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



1. Boot
2. Piston
3. Shoulder
4. Spring
5. Primary cup
6. Groove - primary cup
7. Secondary cup
8. Groove - secondary cup

Figure 2-90. Clutch Master Cylinder Components

CLEANING AND INSPECTION

⚠WARNING

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

⚠WARNING

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

1. Clean all parts with denatured alcohol. Wipe dry with a clean, lint free cloth.

2. Inspect banjo seating surface for scratches or nicks.
3. Verify that reservoir is completely free of dust, dirt or residue.
4. Using a clean air supply, blow out piston bore and other drilled passages. Do not use a wire or similar instrument.
5. Inspect piston bore for scratches, nicks, scoring, pitting, corrosion or other damage.
6. Inspect retaining ring for wear or distortion. Inspect retaining ring groove for damage.
7. Inspect piston seals, dust boot and reservoir cover gasket for damage.

ASSEMBLY

To rebuild clutch master cylinder, use the components found in the service parts kit.

1. See Figure 2-90. Using lubricant in the service parts kit, lightly lubricate inside of primary cup (5) and fit over lip on spring end of piston (2) so the closed end (small ID) contacts evenly with the shoulder (3) in primary cup groove (6).
2. Lightly lubricate inside of secondary cup (7) (steep taper from center to outside diameter) and fit over the lip on outboard end of piston so that flared end is open toward the shoulder of the secondary cup groove (8).
3. Install boot (1), large sealing ID first, on piston until seal on smaller ID fits snugly into thin groove in piston.
4. Using lubricant in service parts kit, thoroughly coat outside diameters of primary and secondary cups. Coat master cylinder piston bore.
5. See Figure 2-91. With tapered end out, install spring into opening on inboard side of piston assembly.
6. Align and install piston assembly into bore. Firmly press on flat end of piston, compressing spring, until the entire assembly slides into cylinder bore.

NOTE

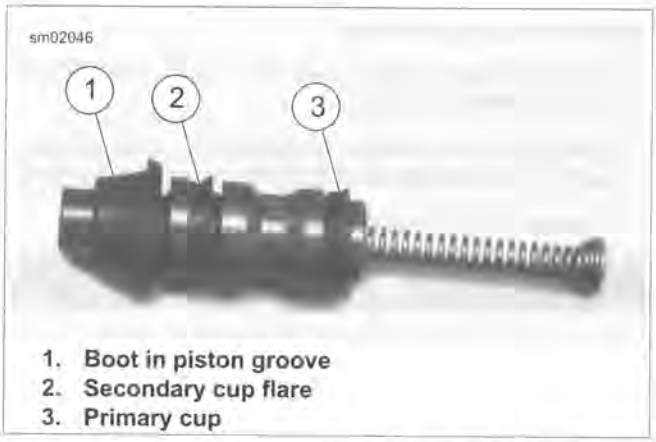
Do not damage piston sealing boot during installation.

7. Compress piston until it is even with the end of bore. Using a small dull bladed screwdriver or similar tool, gently work around sealing edges of boot until entire circumference of boot is seated in cylinder bore groove.
8. Replace cover gasket if necessary.
   a. Pull rubber gasket from cover.
   b. Fit nipple of **new** gasket into hole of cover aligning gasket and cover thru holes.
9. Replace sight glass gasket if necessary.
   a. From inboard side, push sight glass toward the outside of the reservoir until free.
   b. Pull rubber gasket from sight glass.
   c. Fit sight glass into **new** gasket.
   d. Push flat end of sight glass through reservoir until top of glass is flush with top of gasket. Verify that glass is square in bore. If lubrication is necessary, use clean DOT 4 BRAKE FLUID.
10. Install cover with gasket on master cylinder reservoir. Install two screws to fasten the cover to reservoir, but do not tighten.

⚠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)

11. Install clutch hand lever. See 2.25 HYDRAULIC CLUTCH HAND LEVER.



1. **Boot in piston groove**
2. **Secondary cup flare**
3. **Primary cup**

Figure 2-91. Assembled Cups and Piston

INSTALLATION

FASTENER	TORQUE VALUE	
Clutch master cylinder clamp fastener	72-108 **in-lbs**	8.1-12.2 Nm
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs	16.9-19.7 Nm
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm

1. See Figure 2-92. Position clutch lever/master cylinder reservoir assembly, engaging ear (1) in recess (2) at top of brake lever bracket.
2. Install two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten screws to 72-108 **in-lbs** (8.1-12.2 Nm).

NOTICE

Avoid leakage. Be sure gaskets, banjo bolt(s) and clutch line are clean and undamaged before assembly. (00329a)

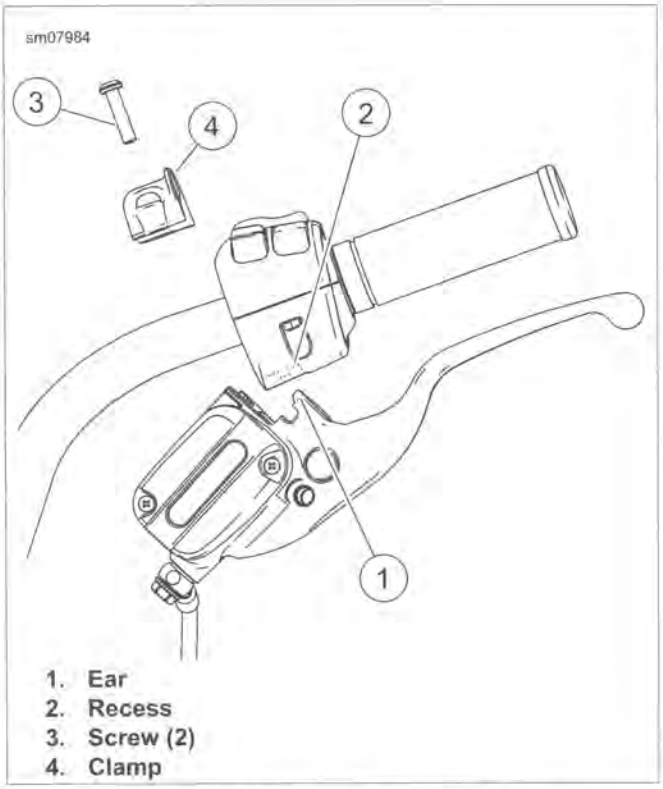
3. Attach banjo fitting to master cylinder using **new** sealing washers. Tighten banjo bolt. Refer to Table 2-16.

4. Verify that the line does not touch the handlebar or fairing when handlebar is turned.

Table 2-16. Torque Specification

ITEM	TORQUE
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs (16.9-19.7 Nm)

5. Fill and bleed clutch system. See 2.27 BLEEDING CLUTCH CONTROL SYSTEM.
6. Test clutch lever for pressure and operation.
7. Tighten reservoir cover screws to 12-15 **in-lbs** (1.4-1.7 Nm).



1. Ear
2. Recess
3. Screw (2)
4. Clamp

Figure 2-92. Hand Control Assembly (typical)

REMOVAL

⚠WARNING

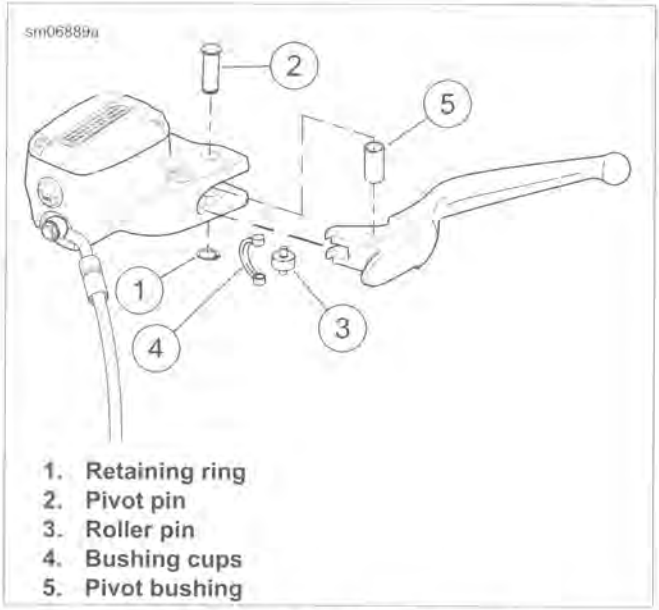
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove the main fuse.

⚠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 2-93. Remove the retaining ring (1) from the pivot pin (2).
3. Remove pivot pin and lever.
4. Remove pivot bushing (5).



1. **Retaining ring**
2. **Pivot pin**
3. **Roller pin**
4. **Bushing cups**
5. **Pivot bushing**

Figure 2-93. Clutch Hand Lever

INSTALLATION

NOTE

Never install a clutch lever from a different model year. Although they are similar and will physically install, certain features are different and will cause the clutch to operate improperly.

1. See Figure 2-93. Lightly grease pivot bushing (5) and install into clutch hand lever pivot hole. Position bushing flush with both sides of lever.

NOTE

It may be necessary to apply force to the hydraulic piston to allow the pivot pin to be inserted.

2. Orient clutch lever in master cylinder housing assembly. Insert pivot pin (2) from top.

⚠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)

3. Install **new** retaining ring (1).
4. Install main fuse.

⚠WARNING

The left hand control switch pack controls the clutch interlock. A motorcycle with the wrong switch pack installed can start in gear causing loss of control, which could result in death or serious injury. Verify clutch interlock function whenever switch pack is replaced. (00632b)

5. Verify clutch interlock operation. Perform the following steps in order. Do not skip any steps. If any test fails, stop and diagnose the condition before proceeding.
   a. Remove spark plug cables from spark plugs.
   b. Straddle vehicle. Press and hold the rear brake pedal.
   c. Turn the ignition switch ON. Turn the run/stop switch to RUN.
   d. Shift into neutral and release the clutch lever. Briefly push the start switch. The starter should operate.
   e. Shift into the highest gear. Pull in the clutch lever and briefly press the start switch. The starter should operate.
   f. With the clutch lever released and transmission in gear, briefly press the start switch. The starter should not operate.
   g. Turn off the ignition and run/stop switches.
   h. Install spark plug cables.

REPLACEMENT

FASTENER	TORQUE VALUE	
Steering head clamp screw	30-40 **in-lbs**	3.4-4.5 Nm
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs	16.9-19.7 Nm
Clutch fluid line flare nut	96-144 **in-lbs**	10.9-16.3 Nm

Removal

⚠WARNING

Be sure no clutch fluid gets on tires, wheels or brakes when adding fluid. Traction can be adversely affected, which could result in loss of control and death or serious injury. (00294a)

NOTICE

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

- **Do not wipe any spilled brake fluid off of finished surfaces. Always flush the affected components with plenty of clear water without soap.**

1. Rotate upper fairing. See 2.39 INNER FAIRING.

NOTES

- *Record routing of clutch fluid line and locations of all cable straps.*
- *Figure 2-94 shows the handlebar clamp area with surrounding items removed for clarity.*

2. See Figure 2-94. Cut cable straps securing clutch fluid line to the brake line and handlebar clamp.
3. Disconnect and drain clutch fluid line. See 2.27 BLEEDING CLUTCH CONTROL SYSTEM.

NOTE

Clutch fluid line O-ring may stick to inside of secondary clutch actuator. Use a non-metallic pick to remove.

4. See Figure 2-95. Remove and discard fluid line O-ring.
5. Disconnect banjo fitting from clutch reservoir and master cylinder. Discard washers.
6. Pull banjo bolt end of clutch fluid line out through inner fairing.
7. Remove plastic clamp on right side of steering head.
8. Remove two clamps along right frame down tube.
9. See Figure 2-96. Cut cable straps securing clutch fluid line to the rear brake line along lower frame.
10. Remove clutch fluid line.

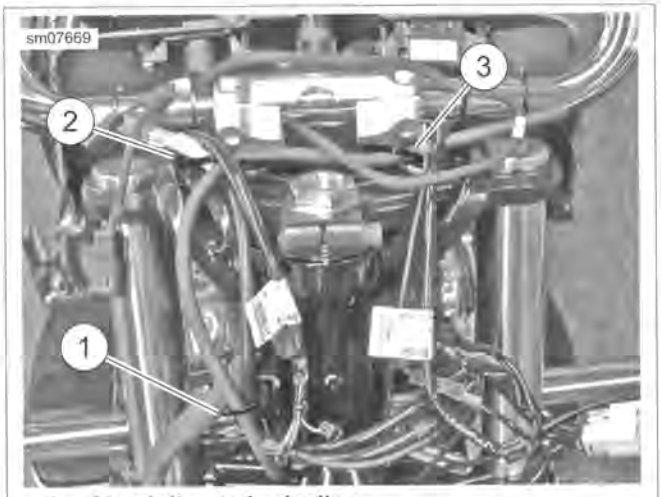
Installation

1. See Figure 2-94. Route clutch fluid line to master cylinder retracing original path. Secure line to each handlebar clamps and the brake line with three **new** cable straps.
2. Loosely secure line to clutch master cylinder using banjo bolt and **new** washers.
3. See Figure 2-97. Route clutch fluid line down right side frame tube, behind rear master cylinder and above footboard mounting bracket, to secondary clutch actuator. Loosely install clamps.
4. Install **new** O-ring on end of clutch fluid line. Loosely install flare nut to secondary clutch actuator.

NOTE

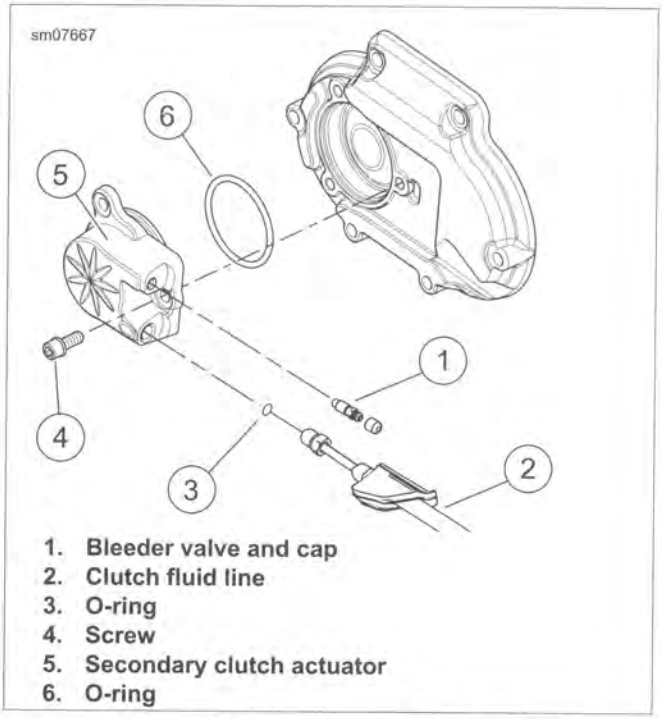
See Figure 2-96. It is important to secure the lines and harness as shown.

5. See Figure 2-96. Secure clutch fluid line with **new** cable straps. Verify there is no contact with the exhaust system or any other items that might result in damage.
6. Secure line under clamp on right side of steering head. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
7. See Figure 2-97. Secure line to down tube with two clamps.
   a. Locate the upper clamp just below the upper weld joint.
   b. Align the lower clamp with the bottom of the bow tie bracket.
8. Tighten banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm).
9. Tighten flare nut to 96-144 **in-lbs** (10.9-16.3 Nm).
10. Rotate and secure outer fairing. See 2.39 INNER FAIRING.
11. Fill and bleed clutch fluid system. See 2.27 BLEEDING CLUTCH CONTROL SYSTEM.



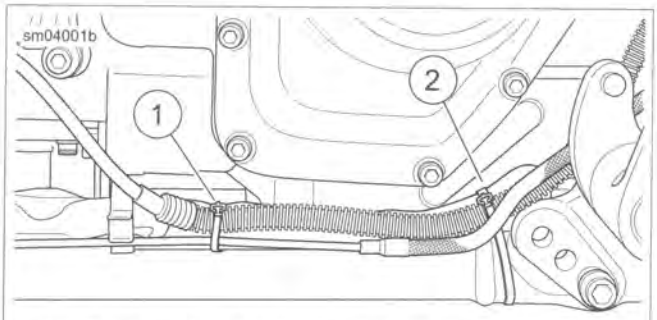
1. **Clutch line to brake line**
2. **Clutch line and brake line to right riser**
3. **Clutch line to left riser**

Figure 2-94. Capture Clutch and Brake Fluid Lines (Fairing Models) (Fairing removed for photo clarity)



1. Bleeder valve and cap
2. Clutch fluid line
3. O-ring
4. Screw
5. Secondary clutch actuator
6. O-ring

Figure 2-95. Secondary Clutch Actuator



1. Capture the clutch line to the brake line only
2. Capture only the clutch line and harness to the frame

Figure 2-96. Clutch Fluid Line Cable Strap Location

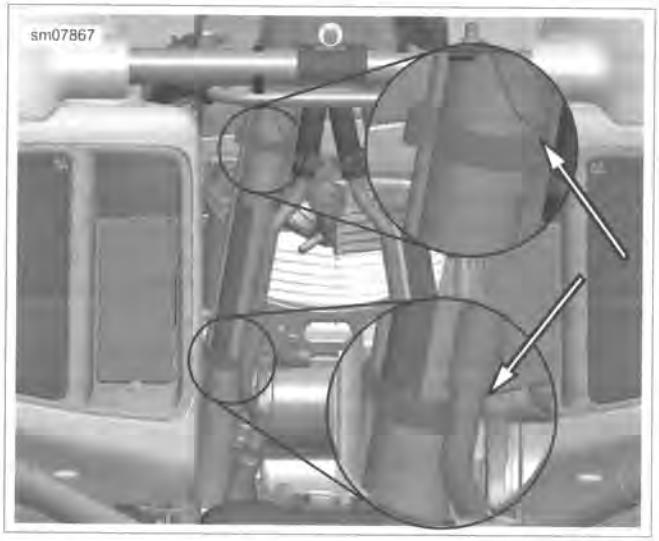


Figure 2-97. Clamp Locations on Frame Down Tube (typical)

DRAIN AND FILL

PART NUMBER	TOOL NAME
BB200A	SNAP-ON BASIC VACUUM BRAKE BLEEDER

⚠WARNING

Be sure no clutch fluid gets on tires, wheels or brakes when adding fluid. Traction can be adversely affected, which could result in loss of control and death or serious injury. (00294a)

⚠CAUTION

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

NOTICE

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

- **Never wipe spilled brake fluid off of finished surfaces. Always flush the affected components with clean 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)

Drain

1. See Figure 2-98. Remove outer transmission side cover (7).
2. Place a pan under the secondary clutch actuator (6) to catch excess clutch fluid.
3. Remove plastic cap (9) and loosen bleeder valve (8).
4. Run hose from bleeder valve to pan.
5. Loosen the clutch master cylinder/reservoir cover (1).
6. Allow clutch fluid to drain into pan.
7. Hand-tighten bleeder valve and replace cap.

Fill

NOTE

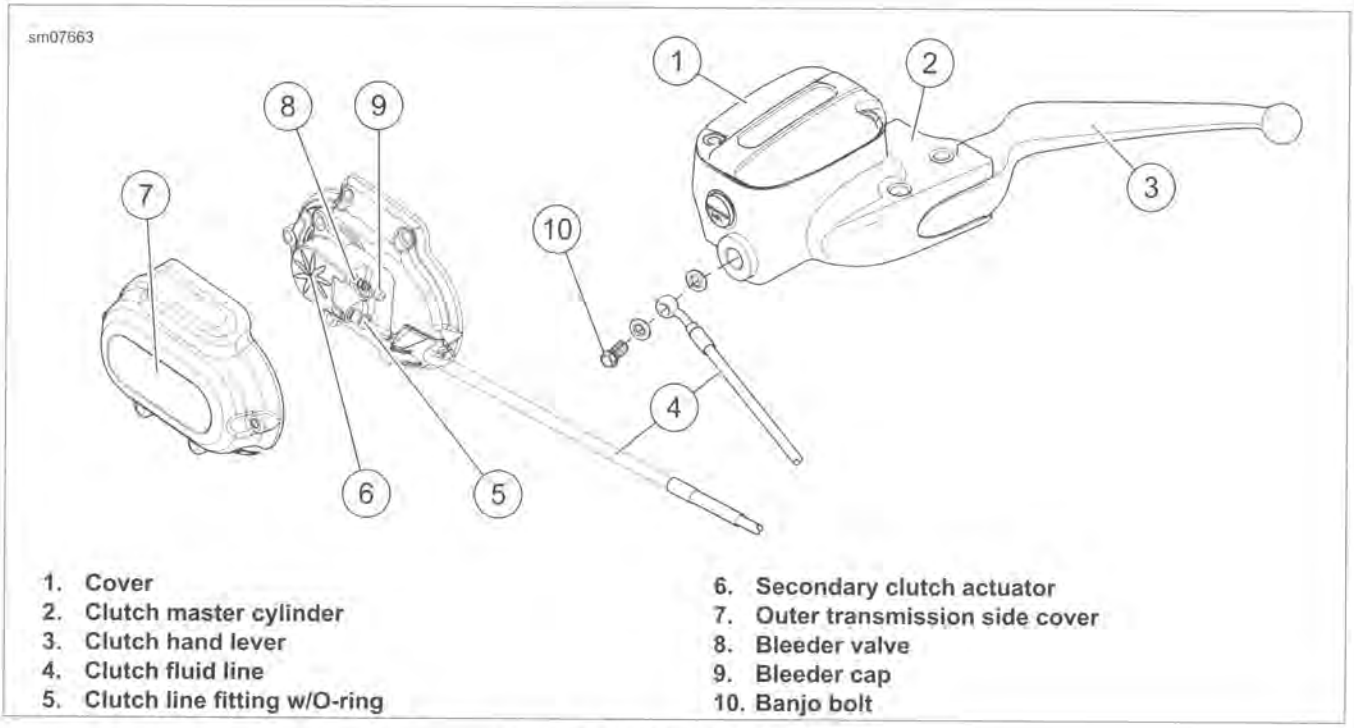
When filling an empty clutch fluid line, a SNAP-ON BASIC VACUUM BRAKE BLEEDER (Part No. BB200A) connected to the bleeder valve can be used for initial bleeding.

1. Fill clutch master cylinder/reservoir with DOT 4 BRAKE FLUID. Initial fluid level should not exceed FILL LEVEL with reservoir in a level position.

NOTE

The shelf life of an unopened bottle of DOT 4 BRAKE FLUID is one year. Discard any opened bottle after one week.

2. Bleed clutch fluid line and secondary clutch actuator. See 2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator.



1. **Cover**
2. **Clutch master cylinder**
3. **Clutch hand lever**
4. **Clutch fluid line**
5. **Clutch line fitting w/O-ring**
6. **Secondary clutch actuator**
7. **Outer transmission side cover**
8. **Bleeder valve**
9. **Bleeder cap**
10. **Banjo bolt**

Figure 2-98. Clutch Hydraulics

BLEED FLUID LINE AND SECONDARY CLUTCH ACTUATOR

FASTENER	TORQUE VALUE	
Secondary clutch actuator bleeder screw	31-41 **in-lbs**	3.5-4.6 Nm
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm
Outer transmission cover screws	100-120 **in-lbs**	11.2-13.6 Nm

1. Stand motorcycle upright (not leaning on jiffy stand) on a level surface. Turn handlebar to level reservoir.
2. See Figure 2-98. Add DOT 4 BRAKE FLUID to clutch master cylinder/reservoir (2). Do not exceed FILL LEVEL.
3. Remove bleeder cap (9) and run clear hose from bleeder screw (8) to suitable container.
4. While holding reservoir cover (1) in place:
   a. Pump clutch hand lever (3) five times.
   b. Hold clutch hand lever against handlebar.
   c. Loosen bleeder screw.
   d. Watch hose for air bubbles.
   e. Tighten bleeder screw.
   f. Release clutch hand lever.

NOTE

Clutch fluid volume increases with clutch wear. Do NOT overfill clutch reservoir.

5. Fill reservoir with DOT 4 brake fluid.
6. Repeat bleed procedure three times or more until only a steady flow of clutch fluid escapes bleeder valve.
7. Tighten bleeder screw to 31-41 **in-lbs** (3.5-4.6 Nm).
8. Verify that reservoir is at FILL LEVEL with reservoir level. Fill as necessary.
9. Tighten reservoir cover screws to 12-15 **in-lbs** (1.4-1.7 Nm).
10. Measure release plate movement. See 5.7 HYDRAULIC CLUTCH RELEASE BEARING AND PUSHROD.
11. Install outer transmission side cover. Tighten to 100-120 **in-lbs** (11.2-13.6 Nm).
12. Test ride motorcycle. Incorrect pressure or fluid level can cause a dragging clutch or hard shifting.

ADJUSTMENT

FASTENER	TORQUE VALUE	
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm

⚠WARNING

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

1. Remove the main fuse.
2. Gain access to upper handlebar clamp:
   a. **Road King models:** See Figure 2-99 and Figure 2-100. Remove decorative plate from handlebar clamp shroud.
   b. **Fairing models:** Remove dash panel. See 2.38 DASH PANEL.
3. Loosen rear screws on the upper handlebar clamp.
4. Position handlebars for rider posture and comfort.
5. Verify that the knurled area on each side handlebar clamp is equal.
6. Snug upper handlebar clamp screws.
7. Slowly turn handlebars to the full right and full left fork stops to verify there is no contact with the fuel tank. Adjust as necessary.
8. Tighten the upper handlebar clamp screws to 22-26 ft-lbs (29.8-35.2 Nm).
9. Assemble:
   a. **Road King models:** See Figure 2-99. Install decorative plate onto handlebar clamp shroud.
   b. **Fairing models:** Install dash panel. See 2.38 DASH PANEL.
10. If necessary, reposition the controls for rider comfort.
11. Install the main fuse.

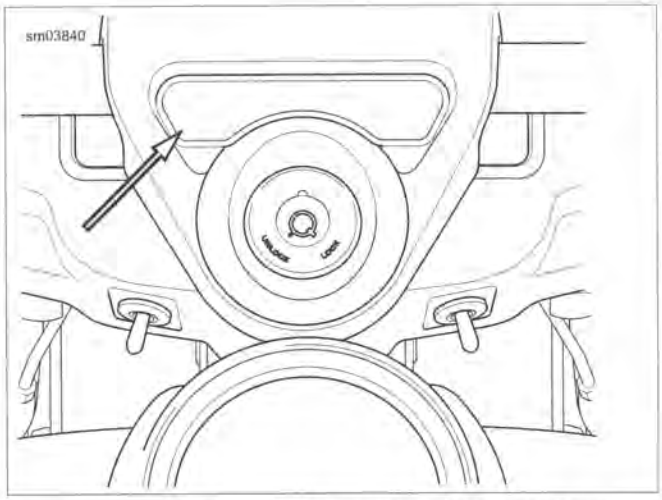


Figure 2-99. Remove Decorative Plate (FLHR/C)

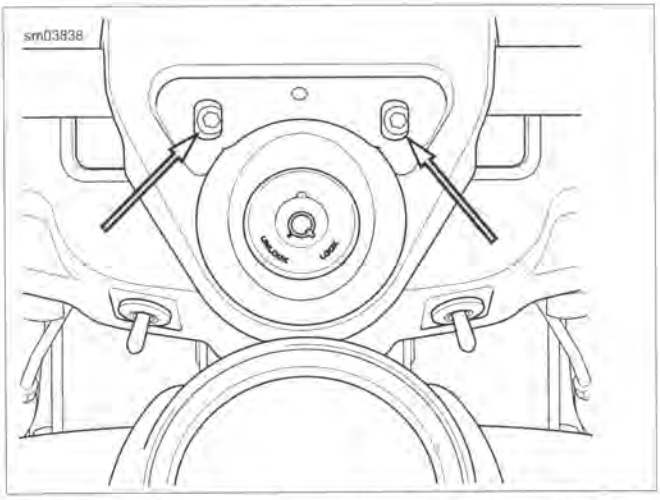


Figure 2-100. Loosen Upper Handlebar Clamp Screws (FLHR/C)

REMOVAL

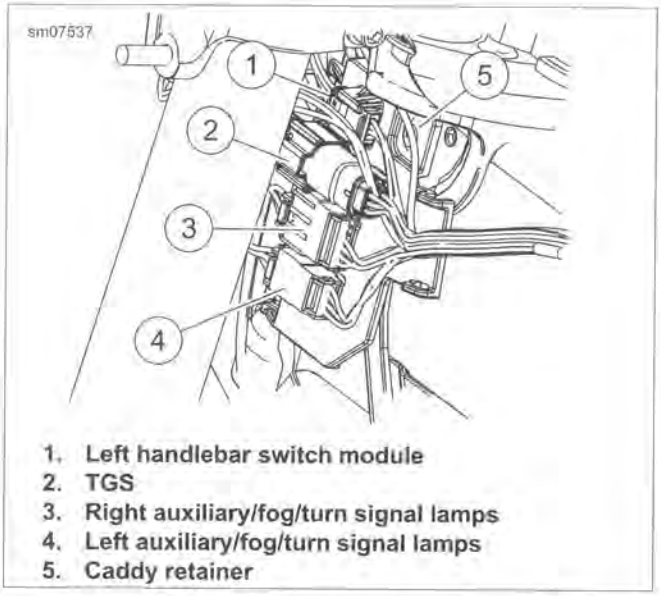
1. Remove main fuse.

NOTE

Cover painted surfaces to prevent scratches or other damage.

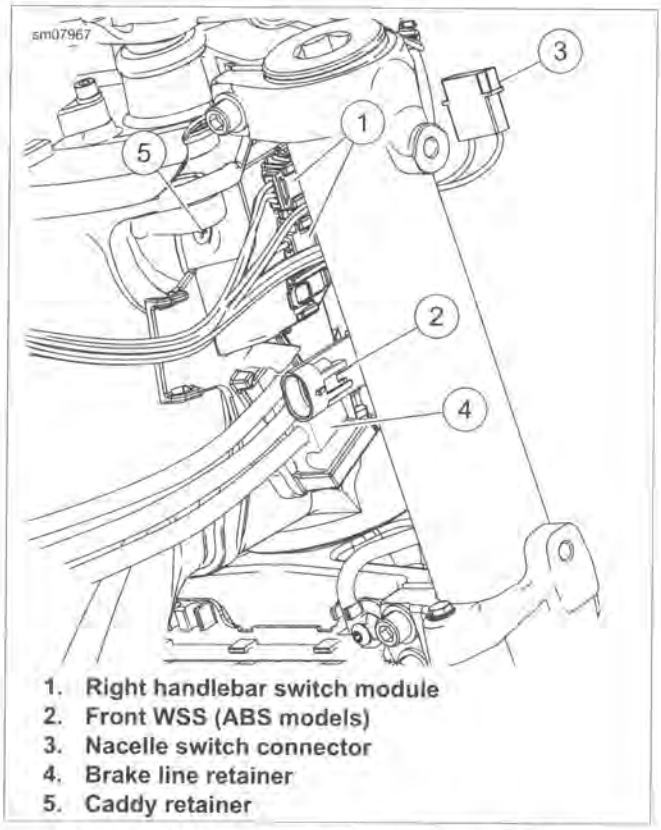
2. **Road King Models:**
   a. See Figure 2-101. Separate left handlebar switch (1) and TGS (2) connectors.
   b. See Figure 2-102. Separate right handlebar switch connectors (1).

3. **Fairing Models:**
   a. Remove outer fairing to gain access to harness connectors.
   b. See Figure 2-103. Separate TGS connector (14).
   c. Disconnect heated hand grip power connector (10) if equipped. The hand grip interconnect harness does not require disconnection.
   d. Disconnect handlebar switch connectors (6, 11, 12).



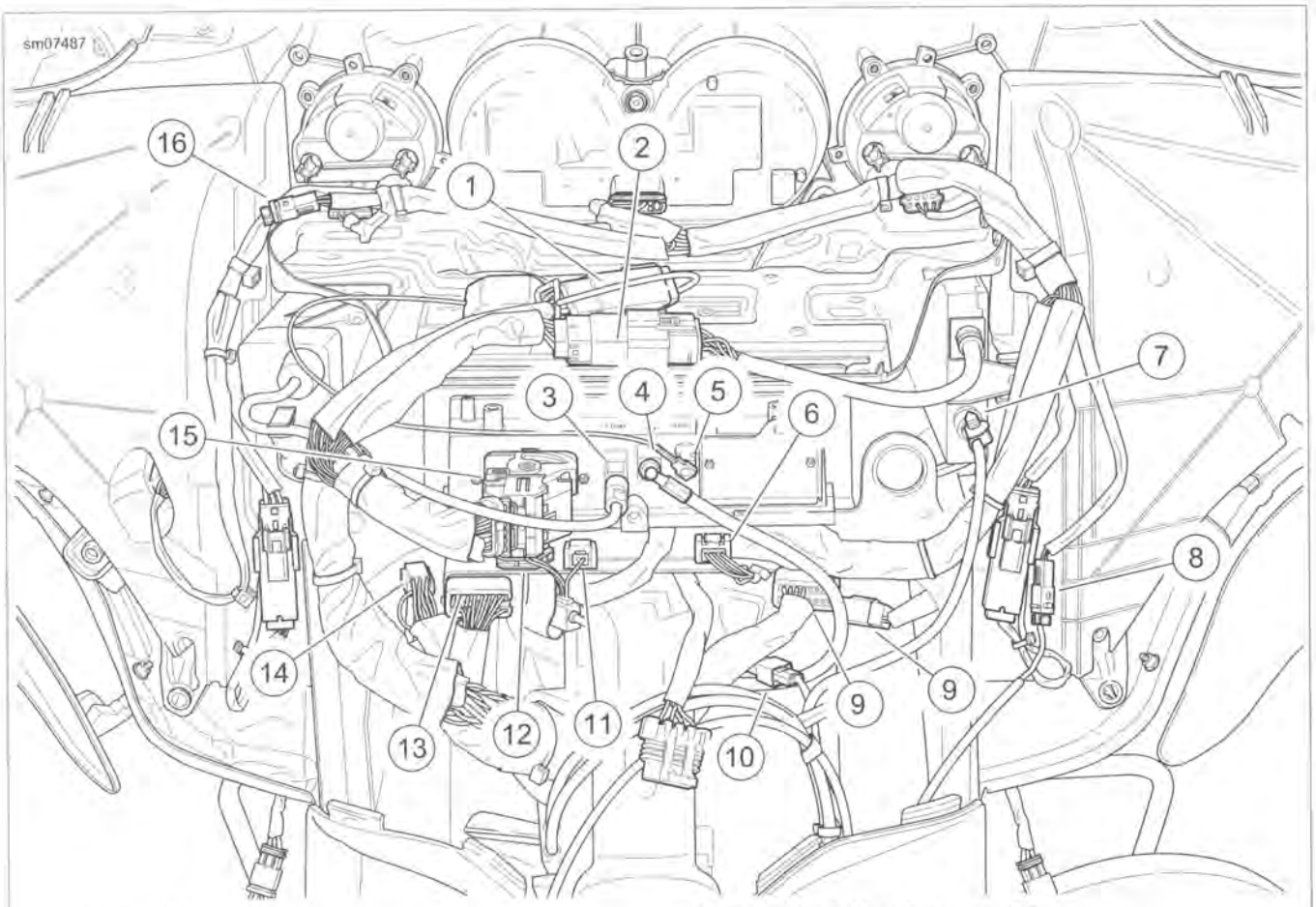
1. Left handlebar switch module
2. TGS
3. Right auxiliary/fog/turn signal lamps
4. Left auxiliary/fog/turn signal lamps
5. Caddy retainer

Figure 2-101. Left Side Connectors: Road King



1. Right handlebar switch module
2. Front WSS (ABS models)
3. Nacelle switch connector
4. Brake line retainer
5. Caddy retainer

Figure 2-102. Right Side Connectors: Road King



1. CB module
2. P&A audio
3. USB cable
4. AM/FM radio antenna
5. GPS antenna
6. Left handlebar switch harness
7. CB antenna
8. Front fender tip lamp
9. Main-to-fairing harness, left
10. Heated hand grip power, if equipped
11. Run/stop switch
12. Right handlebar switch harness
13. Main-to-fairing harness, right
14. TGS
15. Radio
16. Accessory power

Figure 2-103. Inner Fairing Harness Connectors

NOTICE

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

4. Remove master cylinder/brake lever assembly from handlebar.
5. Remove clutch hand lever assembly from handlebar.
6. Access upper handlebar clamp:
   a. **Road King models:** Remove handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fairing models:** Rotate inner fairing. See 2.39 INNER FAIRING.
7. Remove cable straps.
8. Remove upper handlebar clamp screws. Remove upper handlebar clamp and handlebar.

INSTALLATION

FASTENER	TORQUE VALUE	
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm

1. Install handlebars and upper handlebar clamp. Center the handlebars. Snug clamp screws.
2. Carefully turn handlebars to the full right and full left fork stops to verify that there is no contact with the fuel tank. Adjust as necessary.

3. Tighten forward clamp screws until upper and lower handlebar clamps make contact.
4. Tighten rear screws to 22-26 ft-lbs (29.8-35.2 Nm).
5. Tighten forward screws to 22-26 ft-lbs (29.8-35.2 Nm).

NOTE

A slight gap will exist between the upper and lower clamps at the rear of the handlebars after tightening.

6. Secure harnesses as necessary with **new** cable straps.
7. Assemble:
   a. **Road King models:** Install handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fairing models:** Rotate and secure inner fairing. See 2.39 INNER FAIRING.
8. Install hand brake control and clamp:
   a. Engage ear in recess. Rotate into position.
   b. Install clamp and screws.
   c. Beginning with the upper screw, tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
9. Install clutch lever bracket and clamp:
   a. Engage ear in recess. Rotate into position.
   b. Install clamp and screws.
   c. Beginning with the upper screw, tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
10. **Fairing models:**
    a. See Figure 2-103. Mate TGS harness (14). Connect handlebar switch harness connectors (6, 11, 12).
    b. Connect heated hand grip power connector (10), if equipped.
    c. Install outer fairing.
11. **Road King Models:** See Figure 2-101 and Figure 2-102. Mate left handlebar switch (1) and TGS (2) connectors. Mate right handlebar switch connectors (1).
12. Install main fuse.

⚠WARNING

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

13. Test all switches and lights for proper operation.
14. Operate front brake hand lever to verify stop lamp operation.
15. Operate clutch hand lever to verify start interlock operation. See 2.25 HYDRAULIC CLUTCH HAND LEVER.

LEFT HAND GRIP

Removal

NOTE

The following procedure is for unheated left hand grip. See 2.28 HANDLEBARS, Heated Hand Grips to service heated hand grips.

1. Remove left handlebar switch housings and clutch control. See 7.37 HANDLEBAR SWITCH PACKS.
2. Use a sharp blade to cut rubber grip. Peel grip off handlebar.
3. Thoroughly clean handlebar to remove all residual adhesive.

Installation

1. Apply a coat of HARLEY-DAVIDSON ADHESIVE (Grip-lock) to the inside surface of the **new** grip to a depth of approximately 1.0 in. (25.4 mm) from the open end. Apply a coat to the end of the handlebar.

NOTE

Align the cosmetic features with those on the right grip (with the throttle fully closed).

2. Immediately push grip completely onto end of handlebar using a twisting motion. Do not hesitate when installing grip or adhesive may set before installation is complete.
3. Install left handlebar switch housings and clutch control. See 7.37 HANDLEBAR SWITCH PACKS.
4. Allow adhesive to cure for 6-8 hours at 70 °F (21 °C).

RIGHT HAND GRIP

Removal

NOTE

The following procedure is for unheated right hand grip. See 2.28 HANDLEBARS, Heated Hand Grips to service heated hand grips.

1. Remove right handlebar switch housings and front brake control. See 7.37 HANDLEBAR SWITCH PACKS.

NOTE

To remove the hand grip, a slight tug may be necessary.

2. Pull hand grip off TGS.

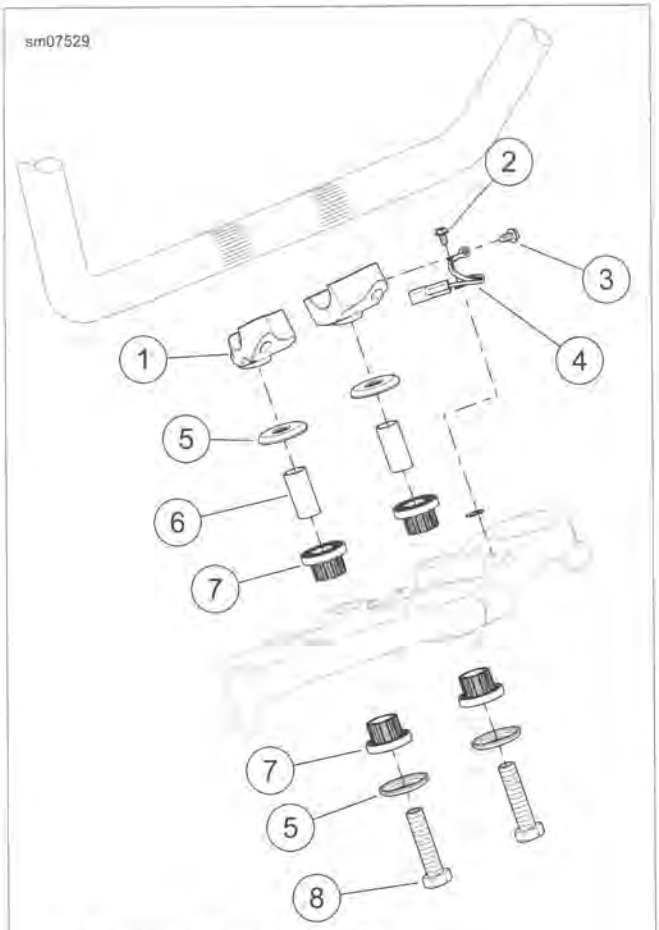
Installation

1. Confirm TGS is completely engaged into the slots in the handlebar.
2. Position hand grip so cosmetic features are aligned with left grip. Install the hand grip and rotate to verify that internal splines are engaged with the twist grip sensor.
3. Install right handlebar switch housings and brake control. See 7.37 HANDLEBAR SWITCH PACKS.

RUBBER MOUNTS

FASTENER	TORQUE VALUE	
Handlebar lower clamp bolt	30-40 ft-lbs	40.7-54.2 Nm

See Figure 2-104. When assembling handlebar mounts, apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of bolts (8). Tighten bolts to 30-40 ft-lbs (40.7-54.2 Nm).



1. **Handlebar lower clamp (2)**
2. **Fork bracket ground screw**
3. **Lower clamp ground screw**
4. **Ground jumper wire assembly**
5. **Cup washer (4)**
6. **Spacer (2)**
7. **Rubber bushing (4)**
8. **Bolt (2)**

Figure 2-104. Handlebar Mounts

HEATED HAND GRIPS

Remove Left Hand Grip

1. Remove main fuse.
2. Remove outer fairing.
3. Rotate inner fairing. See 2.39 INNER FAIRING.
4. See Figure 2-105. Disconnect and remove terminals from heated hand grip power connector (4).
5. See Figure 2-106. Disconnect and remove terminals from heated hand grip interconnect connector (2).

NOTE

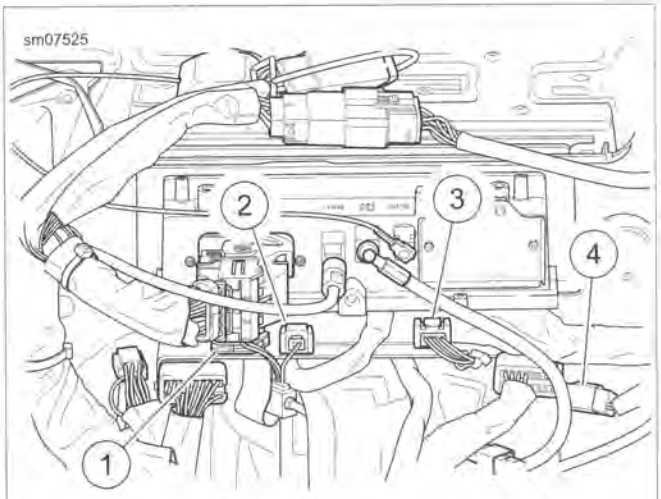
For connector service, see A.13 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair.

6. Fabricate a chaser wire approximately 3 ft (91.4 cm) long. Secure to terminals and wire leads of harness. Wrap with electrical tape.
7. Bend last few inches of free end of chaser wire into an "L" shape to prevent pulling it too far into the handlebar.
8. Remove left handlebar switch housing and clutch lever. Allow to hang. See 7.37 HANDLEBAR SWITCH PACKS.
9. Lubricate wire harness conduits with glass cleaner.

NOTE

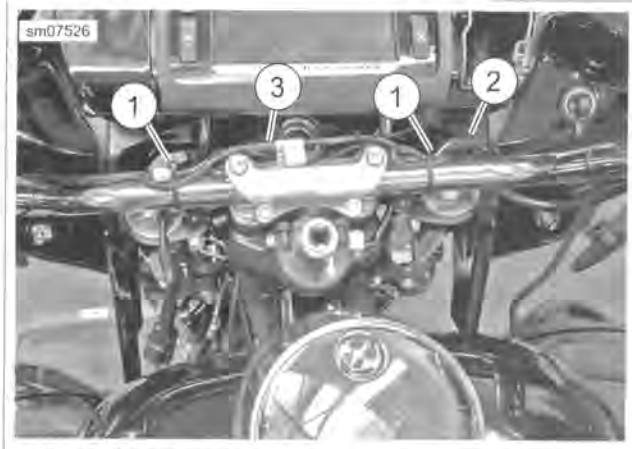
When pulling, feed opposite end of harnesses and mechanic's wire into handlebar.

10. Slide hand grip off end of handlebar. Grasp harnesses and pull from handlebar. Detach from chaser wire.



1. **Right handlebar switch harness**
2. **Run/stop switch**
3. **Left handlebar switch harness**
4. **Heated hand grip power**

Figure 2-105. Handlebar Harness Connectors



1. **Cable straps**
2. **Heated hand grip interconnect harness**
3. **TGS jumper harness**

Figure 2-106. Secure Harness to Handlebar

Install Left Hand Grip

1. Attach chaser wire to harnesses. Wrap with electrical tape.
2. Lubricate wire harness conduits with glass cleaner.
3. Carefully feed harnesses into handlebar with one hand as they are pulled with the other.
4. Slide hand grip onto end of handlebar. Pull slack from wiring harnesses. Remove chaser wire.
5. Install terminals into connector housing cavities. Refer to Table 2-17.

NOTE

For connector service, see A.13 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair.

6. Mate connectors. Secure harnesses with **new** cable straps.
7. Install left handlebar switch housing and clutch lever. See 7.37 HANDLEBAR SWITCH PACKS. Make sure rim of hand grip fits into grooves in switch housings.
8. Rotate inner fairing into position and secure. See 2.39 INNER FAIRING.
9. Install outer fairing. Install main fuse.

Table 2-17. Left Heated Grip Connectors

CONNECTOR	CAVITY	COLOR
Power	1	Red
	2	Black
Interconnect	1	Black/white
	2	Black/white

Remove Right Hand Grip

NOTE

This procedure covers only removal and installation of the hand grip. For service of the TGS, see 4.11 TWIST GRIP SENSOR (TGS).

1. Remove main fuse.

NOTICE

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

2. Remove right switch housing and brake control. See 7.37 HANDLEBAR SWITCH PACKS. Suspend out of the way.
3. Pry end cap from hand grip. Pull connector out through end of hand grip.

NOTE

To remove the throttle hand grip, a slight tug may be necessary.

4. Pull hand grip off end of handlebar.

Install Right Hand Grip

1. Verify twist grip sensor is properly installed in end of handlebar.
2. Seat hand grip onto twist grip sensor.
3. Using needle nose pliers, insert prongs of connector into connector holes located in end of twist grip sensor.
4. Pull hand grip off until it disengages TGS. Rotate hand grip to allow wires to wrap around connector. Orient hand grip to match left side and engage hand grip on TGS. Rotate hand grip to verify proper engagement. Install end cap.
5. Install right switch control housing and front brake master cylinder. See 7.37 HANDLEBAR SWITCH PACKS.
6. Install main fuse.

ALL MODELS EXCEPT FLHX/S

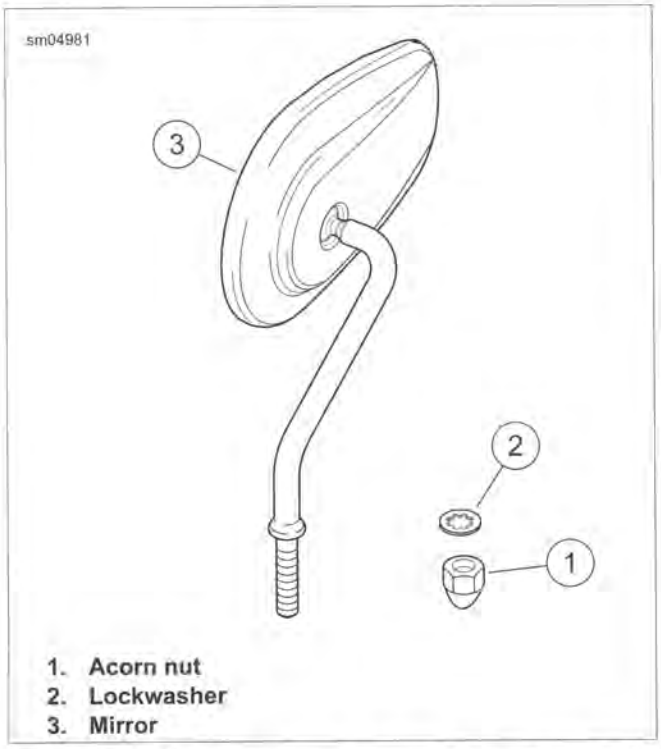
FASTENER	TORQUE VALUE	
Mirror stem acorn nut	60-96 **in-lbs**	6.8-10.8 Nm

Removal

1. See Figure 2-107. Remove acorn nut (1) and lockwasher (2).
2. Remove mirror (3).

Installation

1. Insert threaded stem of mirror into hole in clutch or brake lever bracket.
2. Install lockwasher (2) and acorn nut (1).
3. Adjust mirror as necessary and tighten acorn nut to 60-96 **in-lbs** (6.8-10.8 Nm).



1. **Acorn nut**
2. **Lockwasher**
3. **Mirror**

Figure 2-107. Mirror Assembly (All Models Except FLHX)

FLHX/S

FASTENER	TORQUE VALUE	
Mirror flange nut: FLHX/S	20-30 **in-lbs**	2.3-3.4 Nm

Removal

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. See Figure 2-109. Remove flange nut and backing plate. Remove mirror.

Installation

NOTE

See Figure 2-108 and Figure 2-109. The letters "L" or "R" are stamped on the backing plate and inner fairing to identify location.

1. See Figure 2-109. With the bar and shield logo on mirror right-side-up, insert threaded stud and align index pin (2) with hole in inner fairing.
2. Install the backing plate (3) engaging the hole with index pin (2).
3. Install flange nut (4). Tighten to 20-30 **in-lbs** (2.3-3.4 Nm).
4. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

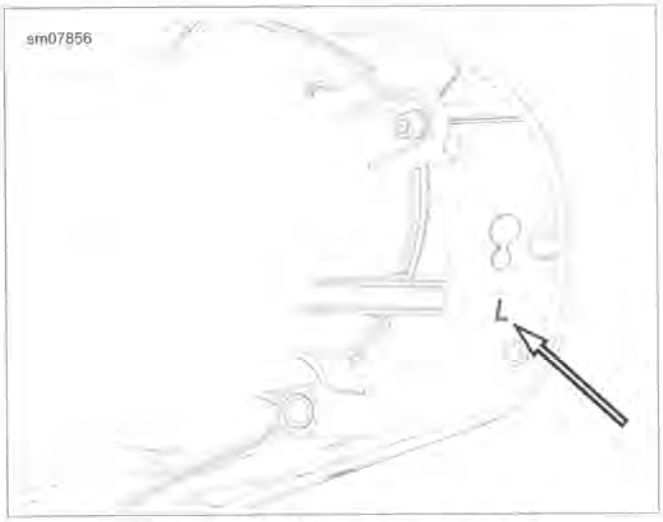
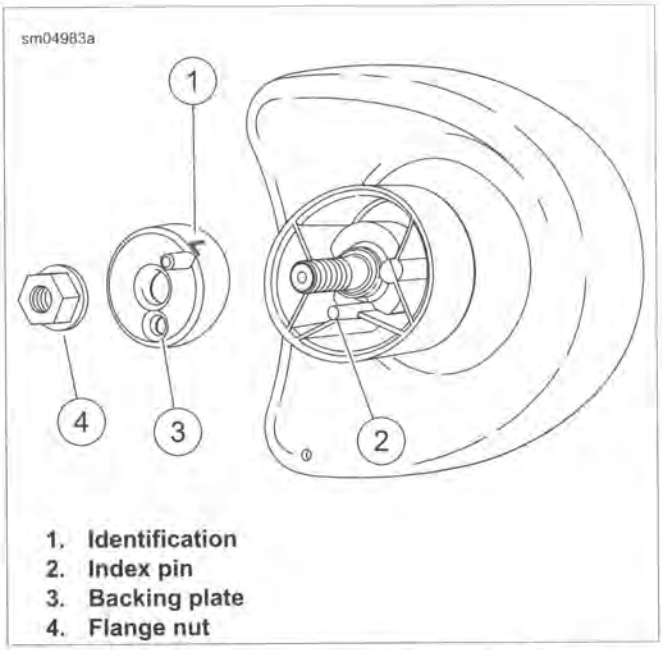


Figure 2-108. Mirror Location Mark



1. **Identification**
2. **Index pin**
3. **Backing plate**
4. **Flange nut**

Figure 2-109. Mirror Assembly, typical (FLHX/S)

SEAT

FASTENER	TORQUE VALUE	
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm

Removal

1. Open either saddlebag.
2. See Figure 2-110. Remove screw to release passenger seat strap from seat strap bracket.
3. Open Tour-Pak if equipped.

NOTES

- *Access to seat screw requires compression of the rear of the seat cushion. Use care to not damage the fabric during removal or installation.*
- *If the Tour-Pak is located in its forward-most position, the seat screw is difficult to access. Loosen the Tour-Pak and slide fully rearward.*

4. Remove screw to release seat from top of rear fender.
5. See Figure 2-111. Raise rear of seat. Push seat rearward to free slot from tongue on rear fuel tank bracket.
6. Remove seat.

Installation

1. See Figure 2-111. Place seat in position.

NOTE

To protect finish of Tour-Pak if equipped, cover rear seat mounting bracket with palm of hand.

2. Hold rear of seat approximately 3 in. (76.2 mm) above fender and use the other hand to push front of seat downward and forward until slot (1) engages tongue (2).

NOTES

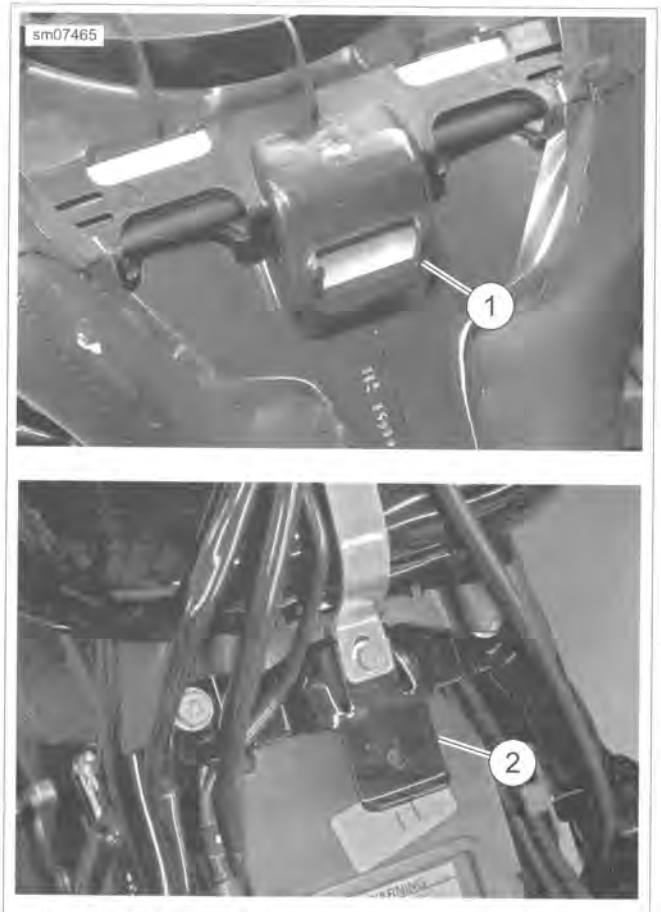
- *Access to seat screw requires compression of the rear of the seat cushion. Use care to not damage the fabric during removal or installation.*
- *If the Tour-Pak was relocated to access the screw, secure it in the original position.*

3. Secure seat to fender with screw. Tighten to 48-72 **in-lbs** (5.4-8.1 Nm).
4. See Figure 2-110. Tuck end of seat strap into slot. Install screw and washer. Tighten to 48-72 **in-lbs** (5.4-8.1 Nm).
5. Close saddlebag.

⚠WARNING

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

Figure 2-110. Seat Strap Screw



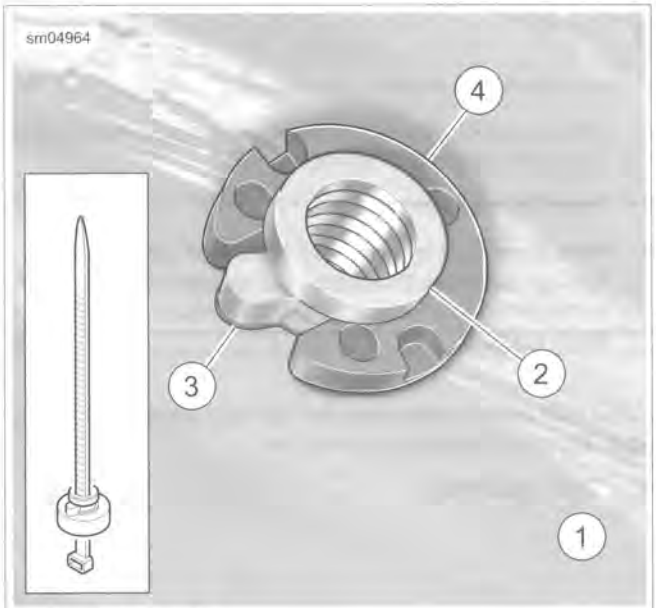
1. **Seat bottom slot**
2. **Fuel tank rear bracket tongue**

Figure 2-111. Seat Mounting

SEAT RETENTION NUT REPLACEMENT

1. See Figure 2-112. Remove retention washer (4) and remove retention nut from fender.
2. See inset of Figure 2-112. Slide **new** retention nut onto a cable strap as shown. Insert into fender hole and hold with cable strap.

3. Align tab (3) on retention nut and hold nut snug against underside of rear fender. Orient the retention washer (4) and install as shown. Remove cable strap.



1. Rear fender
2. Retention nut
3. Tab
4. Retention washer

Figure 2-112. Install Seat Retention Nut

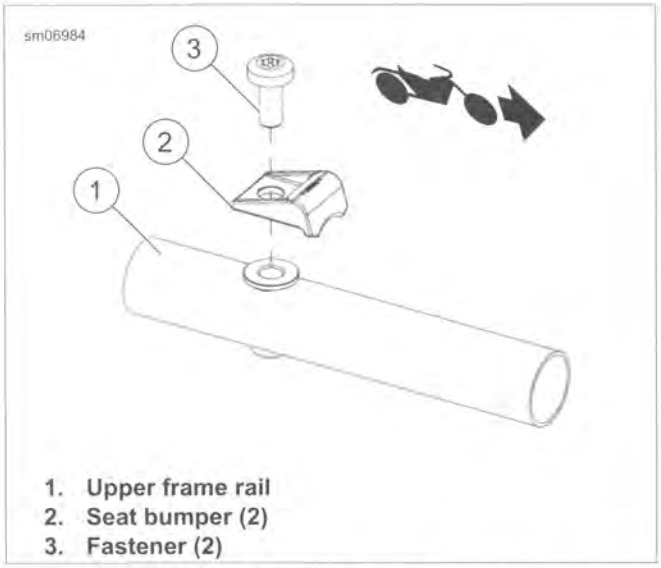
SEAT BUMPER

FASTENER	TORQUE VALUE	
Seat bumper fastener	32-36 ft-lbs	43.4-48.8 Nm

NOTE

FLHX/S models utilize a seat bumper to minimize seat movement.

1. See Figure 2-113. Install a seat bumper to each upper frame rail (1), in the orientation shown (arrows forward).
2. Secure with fastener (3). Tighten to 32-36 ft-lbs (43.4-48.8 Nm).



1. Upper frame rail
2. Seat bumper (2)
3. Fastener (2)

Figure 2-113. Seat Bumper Installation

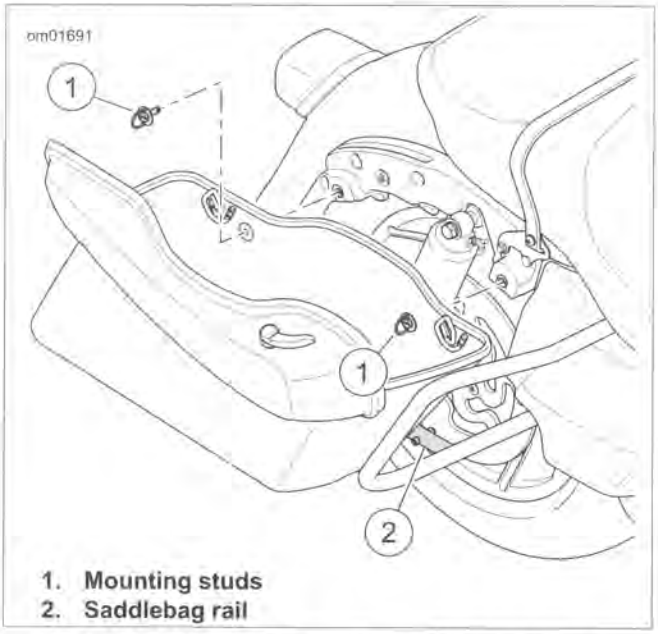
REMOVAL

1. Open saddlebag.
2. See Figure 2-114. Rotate each stud (1) 1/4 turn counterclockwise. Remove studs and flat washers from grommets.

NOTE

Some HDI motorcycles have the bail wire removed from the stud. Turn the stud with a screwdriver.

3. Remove saddlebag.



1. **Mounting studs**
2. **Saddlebag rail**

Figure 2-114. Saddlebag Removal/Installation

INSTALLATION

NOTE

Replace grommets if torn or deteriorated.

1. Position saddlebag on motorcycle aligning holes in grommets with attachment holes.
2. Place flat washers on studs.
3. Hold groove at end of stud horizontal and insert stud through grommet. When groove engages wire form spring in mounting bracket, turn stud clockwise 1/4 turn until it locks in place.

NOTE

Some HDI motorcycles have the bail wire removed from the stud. Turn the stud with a screwdriver.

4. Close saddlebag.

SADDLEBAG REPAIR

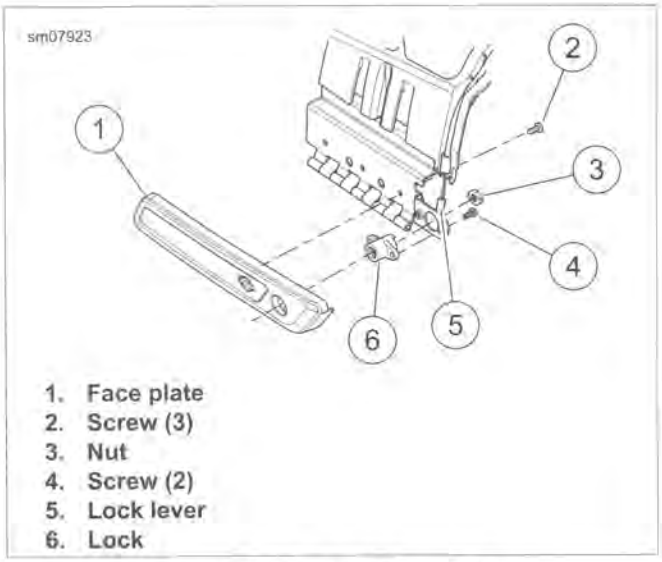
FASTENER	TORQUE VALUE	
Saddlebag lock screw	20-30 **in-lbs**	2.3-3.4 Nm
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag strike screw	15-20 **in-lbs**	1.7-2.3 Nm
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag latch assembly screws	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag latch handle screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag hinge to latch assembly screw	30-35 **in-lbs**	3.4-3.9 Nm
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag hinge to saddlebag screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag tether screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm
Saddlebag tether screw	40-45 **in-lbs**	4.5-5.1 Nm
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm

NOTES

- *The saddlebag can remain secured to the vehicle when servicing most of the following components.*
- *If tether is removed completely, install with top of logo facing saddlebag.*

Lock

1. See Figure 2-115. Hold face plate (1) while removing screws (2). Remove face plate.
2. Remove nut (3). Remove lock lever (5).
3. Remove two screws (4).
4. Remove lock assembly.
5. Install lock assembly with tab nearest to cover.
6. Secure with two screws (4). Tighten to 20-30 **in-lbs** (2.3-3.4 Nm).
7. Install lock lever and secure with nut (3). Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).
8. Secure face plate with screws (2). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).



1. **Face plate**
2. **Screw (3)**
3. **Nut**
4. **Screw (2)**
5. **Lock lever**
6. **Lock**

Figure 2-115. Saddlebag Lock

Strikes

1. See Figure 2-116. Remove four screws (5).
2. Remove strike (6).
3. Install strike and secure with screws (5). Tighten to 15-20 **in-lbs** (1.7-2.3 Nm).

Cover

1. If removed from vehicle, place saddlebag on protected surface with cover open.
2. Carefully peel seal away from hinge area.
3. See Figure 2-117. Remove screw (6) and latch handle (3). Do not lose grommet (2).
4. **Optional:** To ease access to screws (8), remove screws securing tether to latch assembly.

NOTE

Latch assembly will remain secured to hinge.

5. Hold face plate (9) while removing three hinge screws (7).
6. Remove four screws (5). Remove cover from latch assembly.
7. If installing a **new** cover, install **new** seal included. See procedure later in this section.
8. Inspect condition of foam seal (4).
9. While holding cover in place, loosely install four screws (5).
10. Hold face plate (9) in place and install screws (7). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
11. Tighten screws (5) to 40-45 **in-lbs** (4.5-5.1 Nm).
12. Install seal onto hinge. If adhesive does not hold, use automotive weatherstrip adhesive following manufacturers directions.
13. Inspect condition of grommet (2) on handle shaft.

14. Install latch handle. Secure with screw (6). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).

Cover Seal

1. Remove old seal.
2. Remove all residual adhesive using 3M GENERAL PURPOSE ADHESIVE REMOVER.
3. Thoroughly clean seal mounting area with isopropyl alcohol. Allow to dry.

NOTE

Do not touch the cleaned area with fingers after cleaning.

4. Peel back a few inches of backing and place end of seal at midpoint of hinge area. Work only a few inches at a time.
5. Install seal without stretching.
6. Cut squarely to length so no gap exists.
7. After the entire seal is installed, go back around the entire seal and press firmly in place to make sure that it is securely adhered.

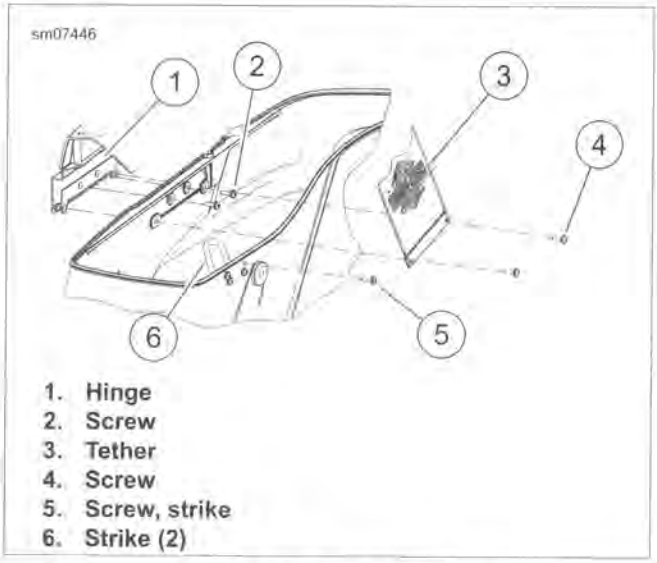
Hinge

1. Remove the saddlebag. Place on a protected surface with cover open.
2. See Figure 2-116. Remove screws (4) securing tether to saddlebag.
3. Remove two remaining screws (2). Separate cover with latch assembly from saddlebag.
4. Remove nut and lever from lock.
5. Carefully peel seal away from hinge area.
6. See Figure 2-117. Remove three screws (7).
7. Remove two screws (8). Remove hinge.
8. Align hinge and secure with screws (8). Tighten to 30-35 **in-lbs** (3.4-3.9 Nm).
9. Hold face plate (9) in place and install screws (7). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
10. Install seal onto hinge. If adhesive does not hold, use automotive weatherstrip adhesive following manufacturers directions.

NOTE

See Figure 2-116. Screws (2, 4) are easily cross-threaded. Use extreme care when installing.

11. Align hinge with saddlebag and loosely install screws (4) without the tether to maintain alignment.
12. Install screws (2). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
13. Remove screws (4), install tether and secure. Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
14. Install lock lever and secure with nut. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).



1. **Hinge**
2. **Screw**
3. **Tether**
4. **Screw**
5. **Screw, strike**
6. **Strike (2)**

Figure 2-116. Saddlebag Hinge

Latch Assembly

NOTE

The latch assembly has no serviceable parts. Any failure requires replacement of the entire assembly.

1. Remove screws securing tether to latch assembly.
2. Remove nut and lever from lock.
3. Remove cover. See procedure elsewhere in this section.

NOTE

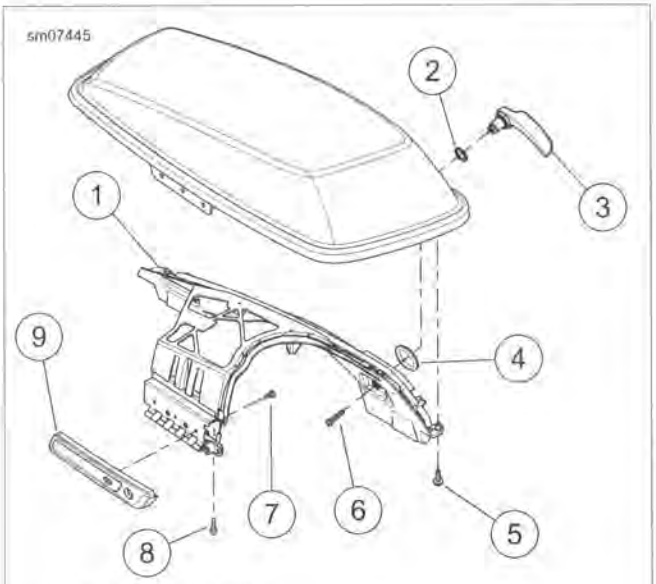
Hinge can remain secured to saddlebag.

4. See Figure 2-117. Remove two screws (7) securing hinge to latch assembly. Remove latch assembly.

NOTE

Verify foam gasket (4) is in place on latch assembly.

5. Secure hinge to latch assembly with two screws (7).
6. Install cover and latch handle. See procedure elsewhere in this section.
7. Secure tether to latch assembly. Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
8. Install lock lever and secure with nut. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).



1. **Latch assembly**
2. **Grommet**
3. **Lever**
4. **Foam seal**
5. **Screw, latch-to-cover (4)**
6. **Screw**
7. **Screw, face plate-to-cover (3)**
8. **Screw, hinge-to-latch assembly (2)**
9. **Face plate**

Figure 2-117. Saddlebag Latch Assembly

SADDLEBAG SUPPORT

FASTENER	TORQUE VALUE	
Suspension air valve nut	40-50 **in-lbs**	4.5-5.6 Nm
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm
Saddlebag support casting to frame screw	15-20 ft-lbs	20.3-27.1 Nm
Saddlebag support tube to support casting fastener, large	23-30 ft-lbs	31.2-40.7 Nm
Saddlebag support tube to support casting fastener, small	15-20 ft-lbs	20.3-27.1 Nm
Saddlebag guard to frame screw, upper	32-36 ft-lbs	43.4-48.8 Nm
Saddlebag guard to frame screw, lower	32-36 ft-lbs	43.4-48.8 Nm
Saddlebag support tube screw	70-100 **in-lbs**	7.9-11.3 Nm
Seat strap bracket screw	120-144 **in-lbs**	13.6-16.3 Nm

Removal

1. Remove saddlebag.
2. Remove seat.
3. Remove fasteners securing muffler to saddlebag support.
4. See Figure 2-118. Remove screw (4) and flange nut.
5. Remove screws (5, 6).
6. Remove screws (1, 8) to release support casting (9). **Left side:** Remove nut securing air valve to support casting.
7. Remove saddlebag support assembly with support casting.
8. Disassemble as needed.

Installation

NOTES

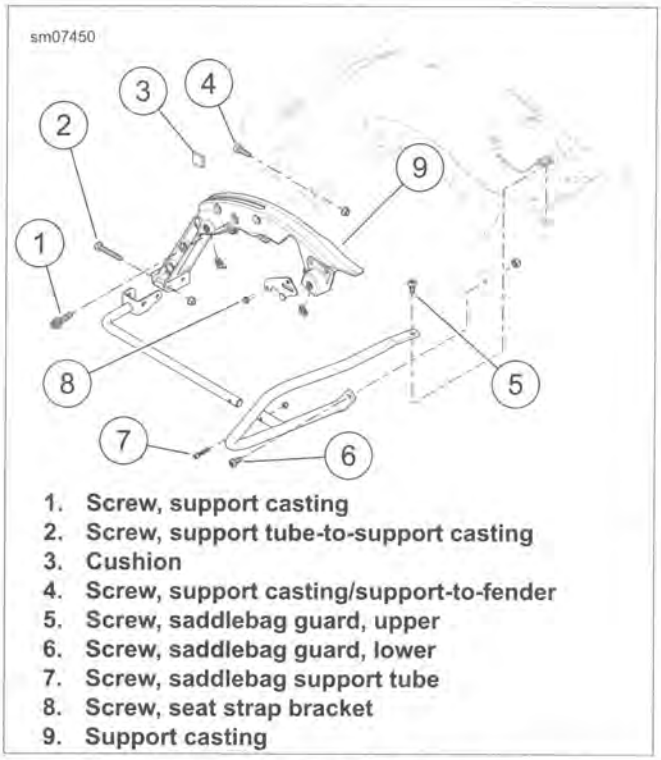
- *Refer to Table 2-18 for fastener torque specifications.*
- *See Figure 2-118. Support tube screw (2) is installed from rear to front on all models except FLHX/S.*

1. Assemble saddlebag support along with support casting. Refer to Table 2-18 for tightening specifications.
2. See Figure 2-119. Verify rubber cushion is in place and not damaged.
3. Install saddlebag support assembly with support casting. **Left side:** Install nut securing air valve to support casting. Tighten to 40-50 **in-lbs** (4.5-5.6 Nm).
4. Secure muffler to lower rail with screws. Tighten to 96-144 **in-lbs** (10.8-16.3 Nm).
5. Install saddlebag. See 2.31 SADDLEBAGS.

⚠WARNING

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

6. Install seat.



1. Screw, support casting
2. Screw, support tube-to-support casting
3. Cushion
4. Screw, support casting/support-to-fender
5. Screw, saddlebag guard, upper
6. Screw, saddlebag guard, lower
7. Screw, saddlebag support tube
8. Screw, seat strap bracket
9. Support casting

Figure 2-118. Saddlebag Supports

Table 2-18. Saddlebag Support Fastener Torque Specifications

ITEM	TORQUE
1	15-20 ft-lbs (20.3-27.1 Nm)
2	23-30 ft-lbs (31.2-40.7 Nm)
4	15-20 ft-lbs (20.3-27.1 Nm)
5	32-36 ft-lbs (43.4-48.8 Nm)
6	32-36 ft-lbs (43.4-48.8 Nm)
7	70-100 **in-lbs** (7.9-11.3 Nm)
8	120-144 **in-lbs** (13.6-16.3 Nm)

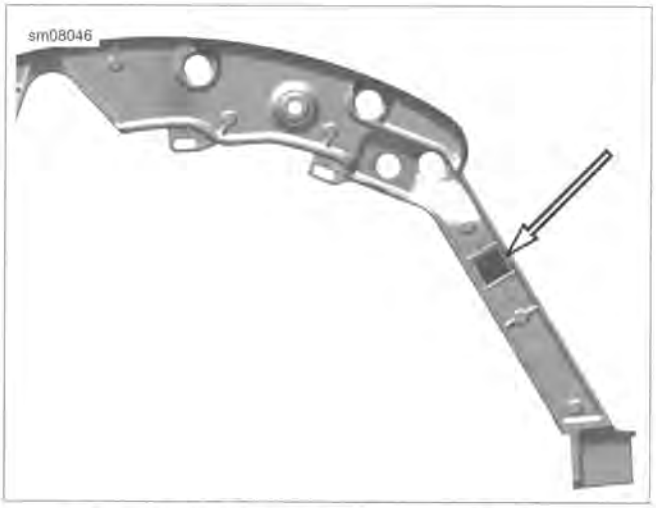


Figure 2-119. Saddlebag Supports Cushion

REMOVAL AND INSTALLATION

FASTENER	TORQUE VALUE	
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm
Tour-Pak adapter mounting screws (APC models)	60-72 **in-lbs**	6.8-8.1 Nm

Removal

NOTES

- *Slots in Tour-Pak support allow position adjustment. Record position before removal.*
- *APC models offer no adjustment. The adapter plate locates Tour-Pak to meet market regulations.*

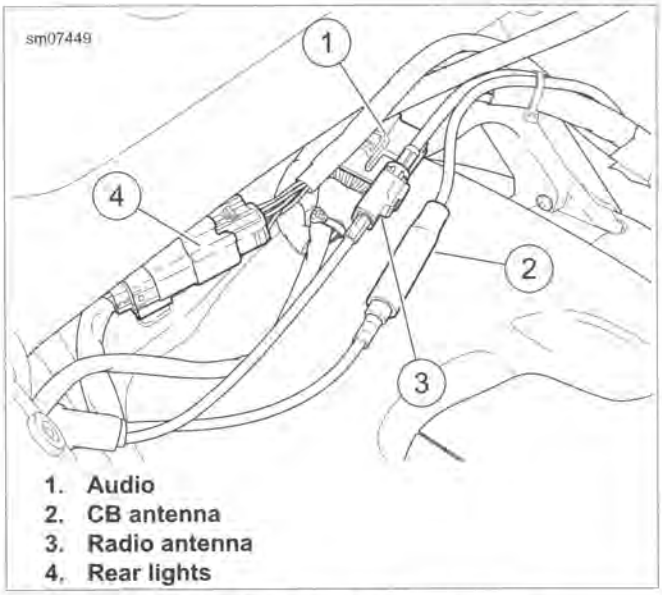
1. See Figure 2-120. Separate Tour-Pak electrical connectors.
2. Remove four flange nuts securing Tour-Pak to support.
3. **APC models:** See Figure 2-121. Remove four screws and flat washers to release adapter from support.
4. Remove Tour-Pak assembly.
5. **APC models:** Remove four flange nuts to release adapter from Tour-Pak.

Installation

NOTE

Make sure that connectors do not get trapped between Tour-Pak and mount.

1. **APC models:** Attach adapter to Tour-Pak with four flange nuts. Tighten to 60-72 **in-lbs** (6.8-8.1 Nm).
2. Set Tour-Pak in place.
3. Install four nuts. Tighten to 60-72 **in-lbs** (6.8-8.1 Nm).
4. **APC models:** See Figure 2-121. Secure adapter and Tour-Pak to support with four screws and flat washers. Tighten to 60-72 **in-lbs** (6.8-8.1 Nm).
5. See Figure 2-120. Mate Tour-Pak electrical connectors and secure to anchors.



1. **Audio**
2. **CB antenna**
3. **Radio antenna**
4. **Rear lights**

Figure 2-120. Tour-Pak Connectors

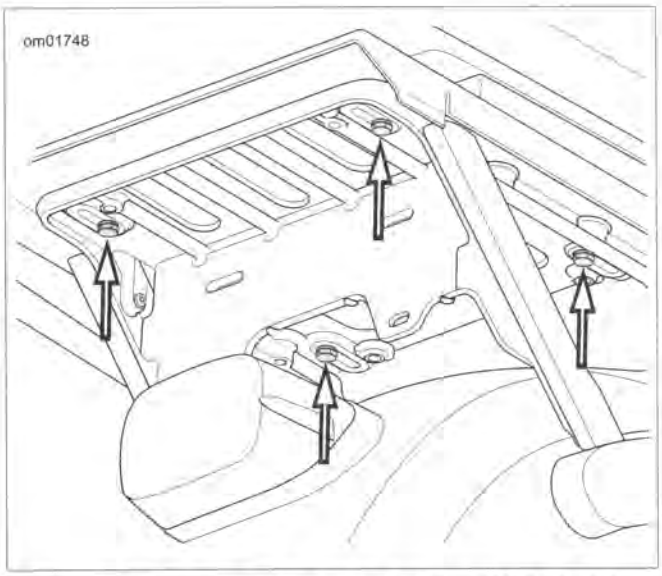


Figure 2-121. Tour-Pak Bracket Screws (APC Models)

TOUR-PAK SUPPORT

FASTENER	TORQUE VALUE	
Tour-Pak support screws	15-20 ft lbs	20.3-27.1 Nm
Tour-Pak support cover screws	8-18 **in-lbs**	0.9-2.0 Nm

Removal

NOTE

Models without Tour-Pak have spacers in place where the Tour-Pak support mounts. Removal and installation is similar.

1. See Figure 2-122. Remove harness connectors from anchors on support.

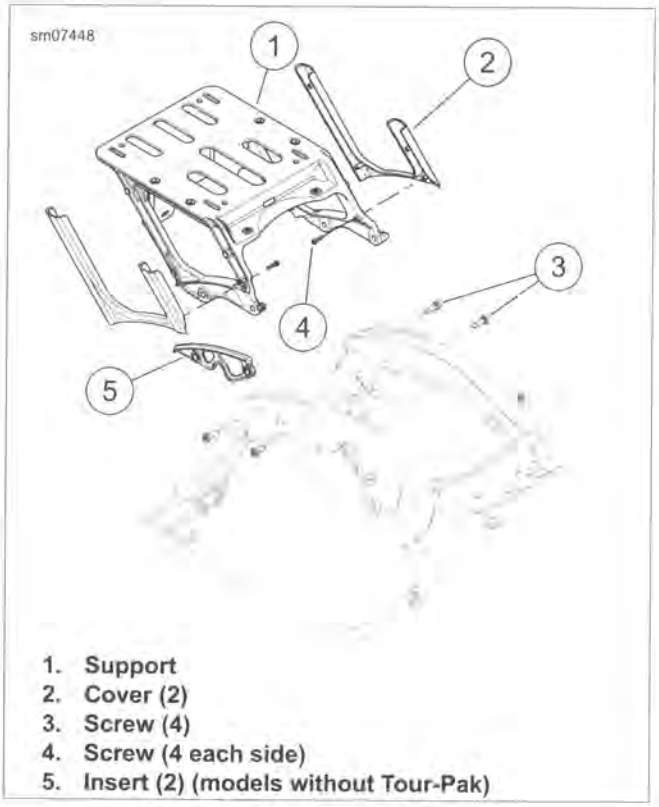
2. Remove two fasteners (3) from each side. Remove Tour-Pak support.

Installation

1. See Figure 2-122. Install Tour-Pak support.
2. Install fasteners (3). Tighten to 15-20 ft lbs (20.3-27.1 Nm).
3. Secure harness connectors to anchors on support.
4. Install Tour-Pak if removed.

Disassembly/Assembly

1. See Figure 2-122. Remove four screws (4).
2. Remove cover (2).
3. Install cover. Secure with screws (4).
4. Tighten to 8-18 **in-lbs** (0.9-2.0 Nm).



1. **Support**
2. **Cover (2)**
3. **Screw (4)**
4. **Screw (4 each side)**
5. **Insert (2) (models without Tour-Pak)**

Figure 2-122. Tour-Pak Support

TOUR-PAK LINER

FASTENER	TORQUE VALUE	
Tour-Pak tether anchor screws	25-35 **in-lbs**	2.8-3.9 Nm

NOTE

For service of wrap-around lamp, marker lamps/trim strips and harness, see 7.13 TOUR-PAK LIGHTS.

Removal

1. Support lid partly open.
2. Remove screws securing tether anchor.
3. Remove liner.
4. Loosely install tether anchor.

Installation

1. Remove tether anchor.
2. Install liner.
3. Secure tether anchor with screws. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

TOUR-PAK SEAL

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN

Inspection

1. Inspect for accumulation of dirt, grime or debris. Clean with warm soapy water, if necessary.
2. Inspect for damage or excessive wear. Replace if brittle, cracked, torn or shredded.
3. Verify seal is adhered securely. Replace if seal is not securely adhered at any point.

Replacement

NOTE

The use of ROBINAIR HEAT GUN (Part No. HD-25070) may improve seal removal.

1. Remove old seal and all residual adhesive using 3M GENERAL PURPOSE ADHESIVE REMOVER or equivalent.

NOTE

Do not touch the cleaned area with fingers after cleaning.

2. Thoroughly clean the seal mounting surface around the cover using a clean cloth and isopropyl alcohol.
3. Peel back a few inches of backing material. Beginning at the front middle, adhere the end of the seal. Work only a few inches at a time.

NOTE

To prevent the possibility of water intrusion, be careful the seal does not bunch or kink at the corners.

4. Continue around the opening until the seal returns to the point of beginning. Use care at the corners to prevent bunching or kinking of the seal.

NOTE

Do not cut seal long. Doing so may cause seal to bunch allowing a path of water intrusion.

5. Cut the seal squarely so the ends mate tightly together. A gap of up to 0.062 in (1.6 mm) is allowed.
6. After the entire seal is installed, go back around the entire seal and press firmly in place to be sure it is securely adhered.

TOUR-PAK LOCK

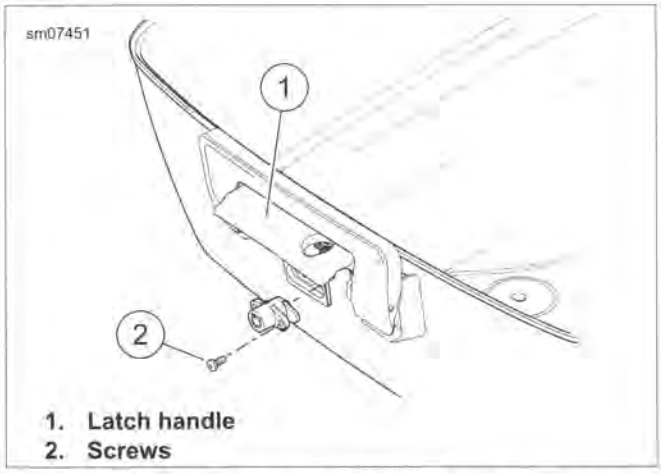
FASTENER	TORQUE VALUE	
Tour-Pak lockset screws	25-35 **in-lbs**	2.8-3.9 Nm

Removal

1. See Figure 2-123. Open latch handle (1) completely.
2. Remove two screws (2).
3. Remove lock.

NOTE

Lock contains no service parts. Do not disassemble.



1. Latch handle
2. Screws

Figure 2-123. Latch Handle and Lockset Assembly

Installation

1. See Figure 2-123. Orient lock with key notches toward the top. Secure with two screws (2).
2. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

HINGES

FASTENER	TORQUE VALUE	
Tour-Pak hinge screw	25-35 **in-lbs**	2.8-3.9 Nm

Removal

NOTE

Carefully compress seal when removing and installing screws nearest the edge of the lid.

1. Remove eight screws securing hinge to Tour-Pak and lid.
2. Remove hinge.

Installation

NOTES

- *The hinges are identified by having the letter "F"ront or "R"ear cast into them.*
- *The two screws nearest the edge of the lid are washerless and shorter than the remaining six. Install the shorter screws first.*

1. Hold hinge in place.
2. Install screws securing hinge to Tour-Pak and lid. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

LATCH HANDLE AND CATCH

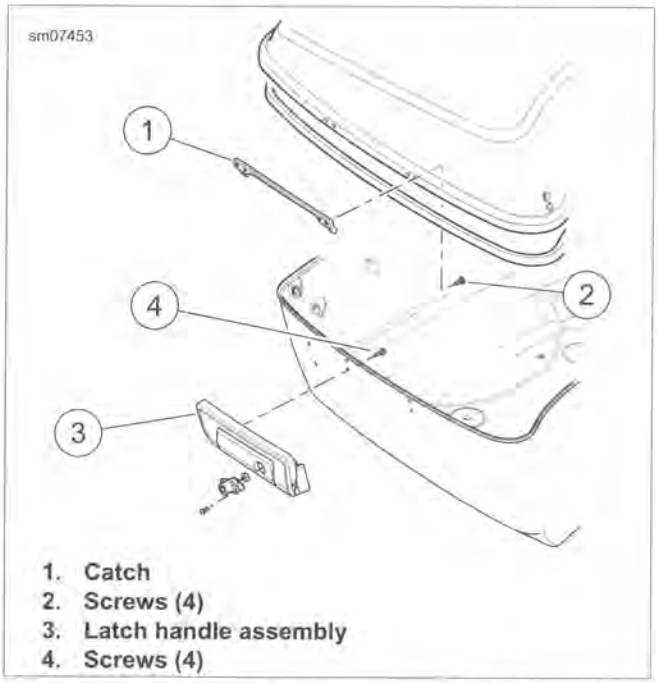
FASTENER	TORQUE VALUE	
Tour-Pak catch screws	25-35 **in-lbs**	2.8-3.9 Nm
Tour-Pak latch handle	25-35 **in-lbs**	2.8-3.9 Nm

Removal

1. Remove lockset. See 2.34 TOUR-PAK SERVICE, Tour-Pak Lock.
2. See Figure 2-124. Remove screws (4).
3. Remove latch handle and lock assembly (3).
4. Remove screws (2) securing catch (1) to lid. Remove catch.

Installation

1. See Figure 2-124. Secure catch to lid with screws (2). Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).
2. Hold latch handle in place and secure with screws (4). Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).



1. **Catch**
2. **Screws (4)**
3. **Latch handle assembly**
4. **Screws (4)**

Figure 2-124. Latch Handle and Catch

TETHER

FASTENER	TORQUE VALUE	
Tour-Pak tether reel screws	25-35 **in-lbs**	2.8-3.9 Nm
Tour-Pak tether anchor screws	25-35 **in-lbs**	2.8-3.9 Nm

Removal

NOTE

Support the Tour-Pak lid to keep it from opening beyond the normal travel.

1. Remove passenger backrest. See 2.35 TOUR-PAK BACKREST.
2. See Figure 2-125. Remove screws (2).
3. Remove screws (1) securing tether reel.

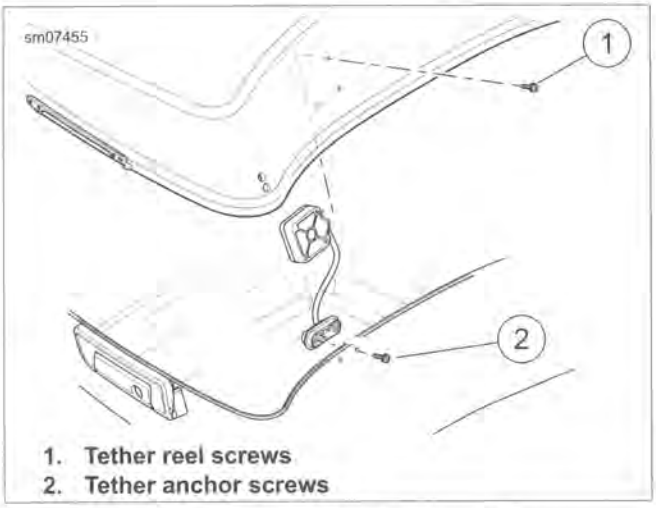
Installation

1. See Figure 2-125. Secure tether reel with screws (1).
2. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

NOTE

Do not allow tether ribbon to twist during installation.

3. Secure tether anchor with screws (2). Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).
4. Install passenger backrest. See 2.35 TOUR-PAK BACKREST.



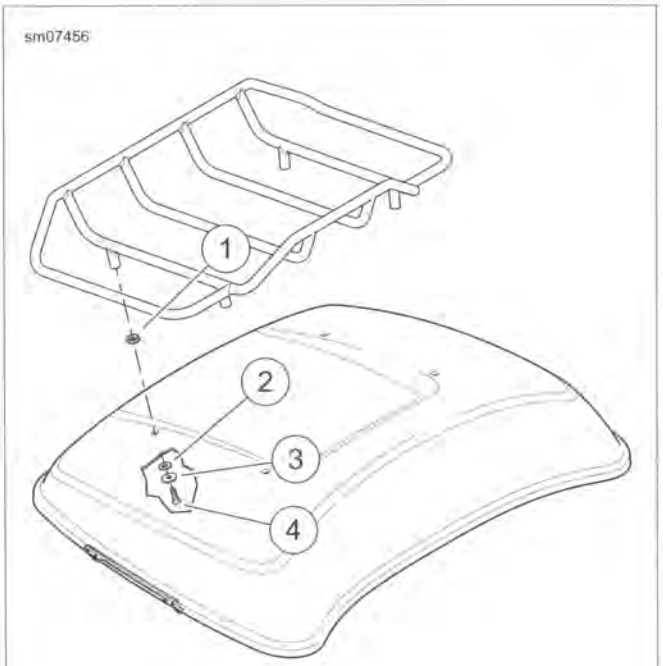
1. **Tether reel screws**
2. **Tether anchor screws**

Figure 2-125. Tether Mechanism Screws

LUGGAGE RACK

FASTENER	TORQUE VALUE	
Tour-Pak luggage rack fastener	40-48 **in-lbs**	4.5-5.4 Nm

1. See Figure 2-126. Hold the luggage rack while removing screws (4) and washers (2, 3).
2. Remove luggage rack.
3. Hold the luggage rack in place with mounting pads (1) between luggage rack and lid.
4. Secure with one nylon washer, one flat washer and screw on each stud.
5. Tighten in a crosswise pattern to 40-48 **in-lbs** (4.5-5.4 Nm).



1. **Mounting pad (4)**
2. **Nylon washer (4)**
3. **Flat washer (4)**
4. **Screw (4)**

Figure 2-126. Luggage Rack

GROUND PLATE

FASTENER	TORQUE VALUE	
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm
Tour-Pak side marker lamp screws	20-25 **in-lbs**	2.3-2.8 Nm

Removal

1. Remove Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.
2. Disconnect ground wire connectors.

NOTE

See Figure 2-127. Screws (2) secure both the ground plate and marker lamps/trim strips.

3. Remove screws (2).

NOTE

Slots in Tour-Pak support allow position adjustment. Record position before removal.

4. Hold Tour-Pak from tipping and remove four flange nuts (3). Remove ground plate.
5. Install a temporary screw and nut to prevent Tour-Pak from tipping until assembly.

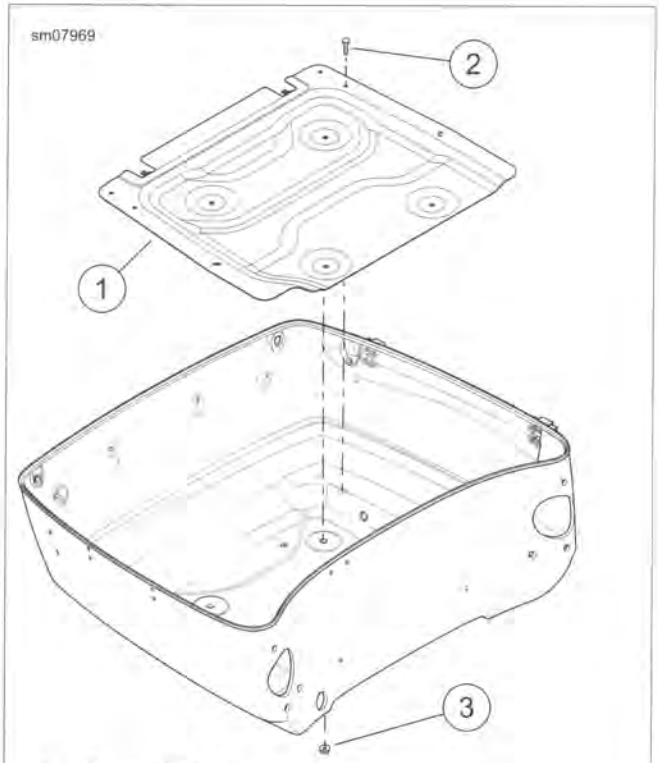
Installation

1. Hold Tour-Pak from tipping while removing temporary screw and nut.
2. See Figure 2-127. Install ground plate (1). Install four flange nuts (3). Tighten to 60-72 **in-lbs** (6.8-8.1 Nm).

NOTE

Screws (2) secure both the ground plate and marker lamps/trim strips.

3. Install screws (2). While holding lamps in position, tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
4. Mate two ground connectors to ground plate.
5. Install Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.



1. **Ground plate**
2. **Screws (4)**
3. **Flange nut**

Figure 2-127. Ground Plate

PASSENGER BACKREST

FASTENER	TORQUE VALUE	
Tour-Pak passenger backrest flange nuts	108-132 **in-lbs**	12.2-14.9 Nm

Removal

1. Remove three flange nuts and flat washers.
2. Remove backrest from Tour-Pak lid.

Installation

1. Hold backrest on Tour-Pak lid.
2. Secure with flange nuts and flat washers.
3. Tighten to 108-132 **in-lbs** (12.2-14.9 Nm).

RUBBER ISOLATORS

Removal

1. Remove passenger backrest. See 2.35 TOUR-PAK BACKREST, Passenger Backrest.
2. See Figure 2-128. Remove hair pin (1).
3. Remove pin (4) and washers (2).
4. Remove mount with isolators.
5. Remove isolators (3) from mount.

Installation

NOTE

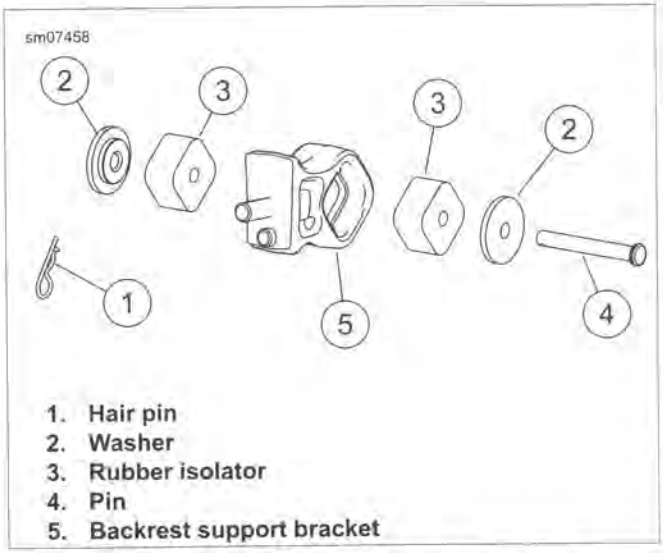
The left and right mounts are identified with "L" and "R" respectively. The center mount has no identification.

1. See Figure 2-128. Place the rubber isolators in the mount bracket.
2. Locate the mount assembly in the backrest. Install washers and pin.

NOTE

Washers (2) have a shoulder that fits into the bores of the backrest mounting area.

3. Secure assembly with hair pin.
4. Install passenger backrest. See 2.35 TOUR-PAK BACKREST, Passenger Backrest.



1. **Hair pin**
2. **Washer**
3. **Rubber isolator**
4. **Pin**
5. **Backrest support bracket**

Figure 2-128. Mount and Isolator (typical)

PASSENGER BACKREST FLAP

FASTENER	TORQUE VALUE	
Tour-Pak passenger backrest flap screws	21-24 **in-lbs**	2.4-2.7 Nm

Removal

1. Remove molded liner from Tour-Pak. See 2.34 TOUR-PAK SERVICE.
2. Remove two acorn nuts and screws with flat washers.
3. Remove backrest flap.

Installation

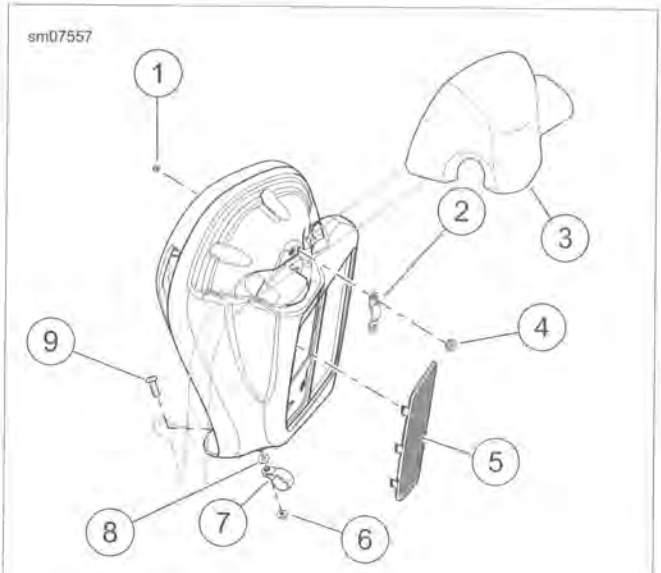
1. Secure backrest flap with two screws (with flat washers) and acorn nuts. Tighten to 21-24 **in-lbs** (2.4-2.7 Nm).
2. Tuck flap between seat and Tour-Pak to hide wires.
3. Install molded liner in Tour-Pak. See 2.34 TOUR-PAK SERVICE.

FAIRING LOWER: AIR COOLED

FASTENER	TORQUE VALUE	
Lower fairing, upper nuts	40-45 **in-lbs**	4.5-5.1 Nm
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm
Lower fairing cap flange nut	40-45 **in-lbs**	4.5-5.1 Nm
Lower fairing vent knob screw	12-18 **in-lbs**	1.4-2.0 Nm
Lower fairing glove box tray screws	12-18 **in-lbs**	1.4-2.0 Nm
Lower fairing glove box screws	12.0-16.8 **in-lbs**	1.4-1.9 Nm

Removal

1. Open glove box door.
2. See Figure 2-129. Remove flange nut (1) securing lower fairing cap (3). Remove fairing cap.
3. Remove lower fairing clamp screw (9) and nut (6). Discard rubber washer (8).
4. Remove flange nuts (4) securing upper clamp (2). Remove lower fairing assembly.



1. **Nut, fairing cap**
2. **Upper clamp**
3. **Lower fairing cap**
4. **Nuts, upper clamp (2)**
5. **Plate**
6. **Nut, lower clamp**
7. **Lower clamp**
8. **Rubber washer**
9. **Screw, lower clamp**

Figure 2-129. Lower Fairing: Air Cooled

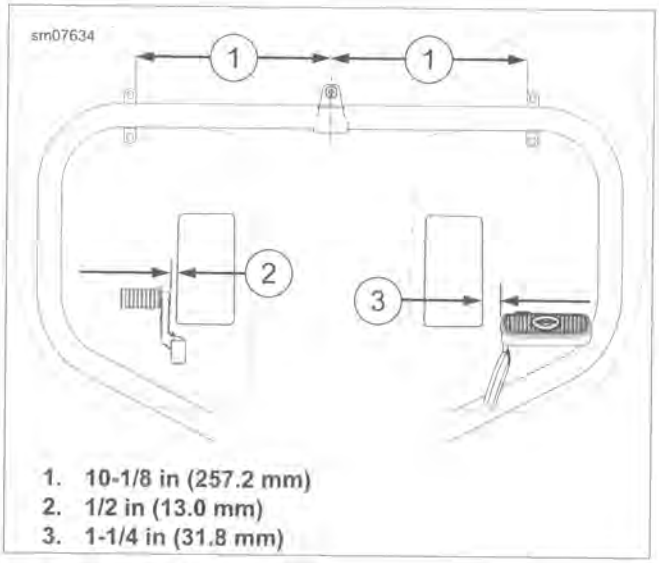
Installation

1. Place fairing lower into position.
2. See Figure 2-129. Install upper clamp (2) and two flange nuts (4). Leave fasteners loose.
3. Install **new** rubber washer (8), clamp (7), screw (9) and nut (6). Leave fasteners loose.
4. See Figure 2-130. Align upper clamp to dimension (1).
5. See Figure 2-129. Tighten flange nuts (4) to 40-45 **in-lbs** (4.5-5.1 Nm).

NOTE

See Figure 2-130. Verify shift lever and brake pedal do not contact fairing lower vent. Clearance from the vent openings to the shift lever (2) and brake pedal (3) should approximately match the distance shown.

6. See Figure 2-129. Verify that fairing lower is aligned. Tighten lower screw (9) to 90-100 **in-lbs** (10.2-11.3 Nm).
7. Install fairing lower cap (3) with flange nut (1). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
8. Close glove box door.



1. **10-1/8 in (257.2 mm)**
2. **1/2 in (13.0 mm)**
3. **1-1/4 in (31.8 mm)**

Figure 2-130. Lower Fairing Mounting Dimensions

Disassembly

1. Grille panel:
   a. See Figure 2-129. Carefully pry on curved edge of grille plate (5) to release retainers.
   b. Remove from fascia.
2. See Figure 2-131. Remove two screws (9) securing inner panel.
3. Remove three screws securing glove box frame to fairing lower.
4. Pull glove box frame away and pull vent link (4) down to disconnect from vent door lever.
5. See Figure 2-132. Remove three screws (7) to release glove box tray (8).
6. Remove screw (5) to disassemble knob from link.

7. Squeeze tabs to release latch (2).
8. Glove box door:
   a. Disengage spring (12).
   b. Remove push nuts (14) from pins (11).
   c. Remove pins. Remove door.
   d. If necessary, remove damper (13).
9. Vent door:
   a. See Figure 2-131. Rotate lever (5) to position shown.
   b. Lift lever assembly to remove. Remove door (6).
   c. Push up on lower pivot pin (7) to remove.

NOTE

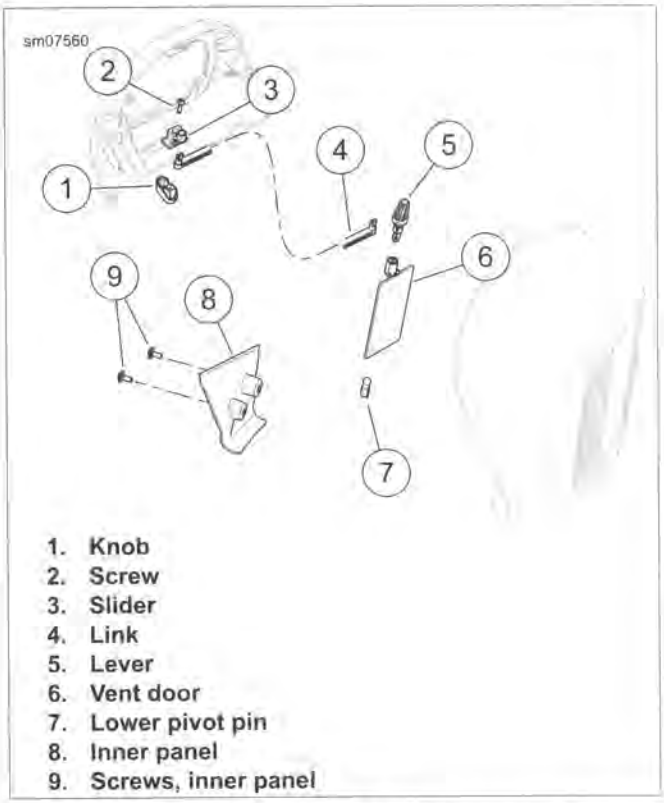
The fascia can be removed and installed without removing the lower fairing.

10. Fascia:
    a. See Figure 2-133. The fascia is retained by double-faced adhesive at the locations shown.

NOTE

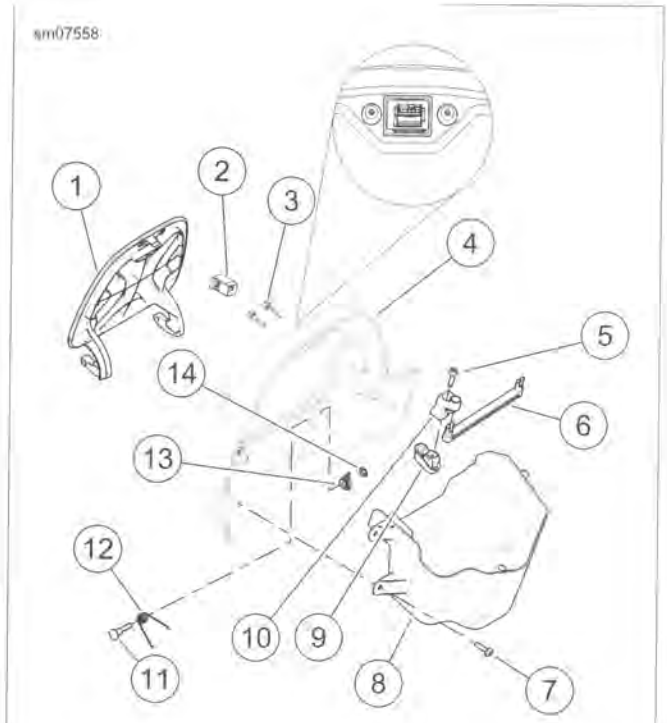
Do not damage the painted area next to the fascia.

    b. Starting with the area around the opening, push the fascia outward to loosen the medium (2) and small (1) tape strips.
    c. Using a 3/4 in (19 mm) flexible putty knife, push between the fascia and fairing housing to cut the large tape strips (3). A small amount of dish soap or liquid lubricant on the knife blade eases this process.
    d. Separate fascia from fairing lower housing. Remove all remaining adhesive. Wash thoroughly with isopropyl alcohol. Allow to dry completely.



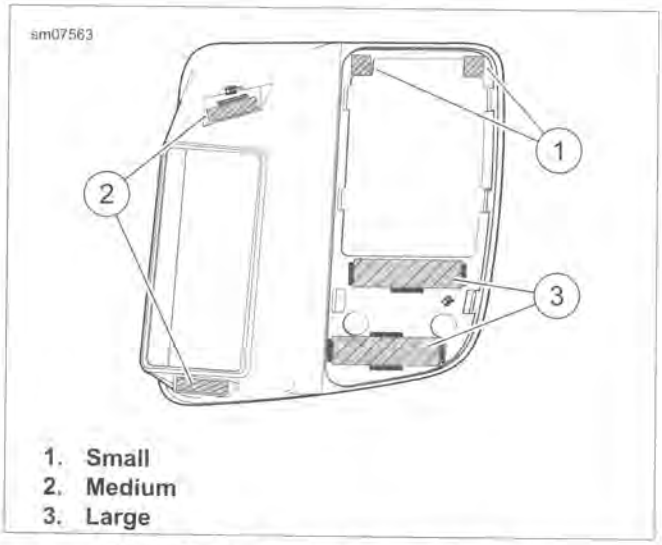
1. **Knob**
2. **Screw**
3. **Slider**
4. **Link**
5. **Lever**
6. **Vent door**
7. **Lower pivot pin**
8. **Inner panel**
9. **Screws, inner panel**

Figure 2-131. Lower Fairing Components



1. Door
2. Latch
3. Bumpers
4. Frame, glove box
5. Screw, link to knob
6. Link
7. Screw, glove box
8. Glove box tray
9. Knob, vent
10. Slider
11. Hinge pin
12. Spring
13. Damper
14. Push nut

Figure 2-132. Glove Box



1. Small
2. Medium
3. Large

Figure 2-133. Fascia Adhesive Locations

Assembly

1. Fascia:
   a. See Figure 2-133. Verify that tape locations are clean and dry.

   NOTE

   Replacement fascia has adhesive strips installed.

   b. If installing original fascia, place **new** adhesive strips on fascia in locations shown.
   c. Align fascia and press into place. Apply pressure at each tape location for 10-15 seconds.
2. Vent door:
   a. See Figure 2-131. Install lower pivot pin (7) in fairing housing.
   b. Rotate lever (5) to position shown.
   c. Place door on lower pivot pin (7). Hold door (6) at approximate 45 degree angle as shown and install lever (5). Rotate door to verify operation.
3. Glove box door:
   a. See Figure 2-132. If removed, install damper (13).
   b. Fit spring (12) on pin opposite damper. Install pins to secure door.
   c. Install **new** push nuts (14).
   d. Engage spring.
4. Install the latch oriented as shown in inset. Note that latch and latch opening are not symmetrical.
5. Apply a film of ELECTRICAL CONTACT LUBRICANT to the upper area along the slot where the slider runs.
6. Install screw (5) to secure knob to slider. Tighten to 12-18 **in-lbs** (1.4-2.0 Nm).
7. Install three screws (7) to secure glove box tray to glove box. Tighten to 12-18 **in-lbs** (1.4-2.0 Nm).
8. Engage linkage to vent door arm.
9. Secure glove box assembly to fairing lower with three screws. Tighten to 12.0-16.8 **in-lbs** (1.4-1.9 Nm).
10. Install grille plate.

FAIRING LOWER: TWIN-COOLED

FASTENER	TORQUE VALUE	
Lower fairing, upper nuts	40-45 **in-lbs**	4.5-5.1 Nm
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm
Lower fairing cap flange nut	40-45 **in-lbs**	4.5-5.1 Nm

Removal

1. Remove main fuse.
2. Remove fairing lower access panel. Pry the center top and near each lower corner to release retainers.

NOTE

The fairing lower shell can be replaced without opening the cooling system. Remove the fan and allow the radiator to hang

by the hoses. See C.5 COOLING SYSTEM REPAIR, Cooling Fan.

3. Drain coolant system. See 1.8 COOLANT.
4. See Figure 2-134. Disconnect upper (2) and lower (6) radiator hoses from the upper cross tube and thermostat respectively.
5. Disconnect fan power connector (7) located near pump.
6. Remove flange nut (1) securing fairing lower cap (4). Remove fairing cap.
7. Remove fairing lower clamp screw (11) and nut (8). Discard rubber washer (10).
8. Remove flange nuts (5) securing upper clamp (3). Remove fairing lower assembly.

1. **Nut, fairing cap**
2. **Upper radiator hose**
3. **Upper clamp**
4. **Lower fairing cap**
5. **Nuts, upper clamp (2)**
6. **Lower radiator hose**
7. **Connector**
8. **Nut, lower clamp**
9. **Lower clamp**
10. **Rubber washer**
11. **Screw, lower clamp**

Figure 2-134. Lower Fairing: Twin-Cooled

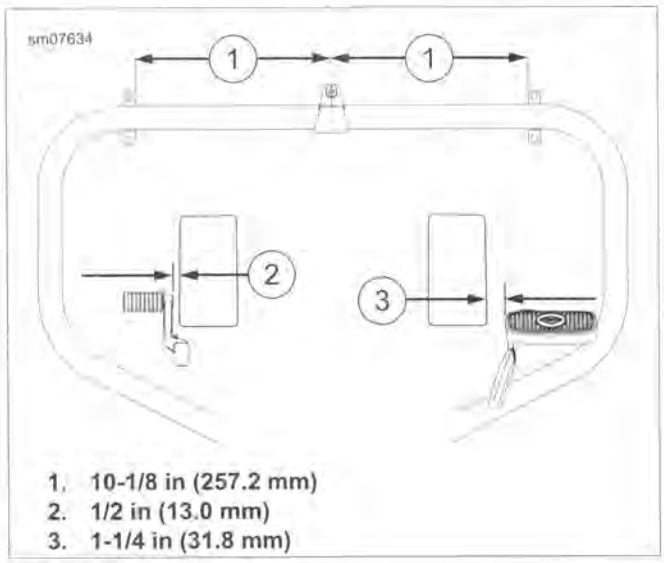
Installation

1. Place fairing lower into position.
2. See Figure 2-134. Install upper clamp (3) and two flange nuts (5). Leave fasteners loose.
3. Install **new** rubber washer (10), clamp (9), screw (11) and nut (8). Leave fasteners loose.
4. See Figure 2-135. Align upper clamp to dimension (1).
5. See Figure 2-134. Tighten flange nuts (5) to 40-45 **in-lbs** (4.5-5.1 Nm).

NOTE

See Figure 2-135. Verify shift lever and brake pedal do not contact fairing lower vent. Clearance from the vent openings to the shift lever (2) and brake pedal (3) should approximately match the distance shown.

6. See Figure 2-134. Verify that fairing lower is aligned. Tighten lower screw (11) to 90-100 **in-lbs** (10.2-11.3 Nm).
7. Install fairing lower cap (4) with flange nut (1). Tighten to 40-45 **in-lbs** (4.5-5.1 Nm).
8. Verify shift lever and brake pedal do not contact fairing lower vent.
9. Connect fan power connector (7) located near pump.
10. Connect upper (2) and lower (6) radiator hoses to the upper cross tube and thermostat respectively.
11. Install main fuse.
12. Fill coolant system. See 1.8 COOLANT.
13. Install fairing lower access panel.
14. Install coolant pump cover.



1. **10-1/8 in (257.2 mm)**
2. **1/2 in (13.0 mm)**
3. **1-1/4 in (31.8 mm)**

Figure 2-135. Lower Fairing Mounting Dimensions

Repair

For fairing disassembly and assembly, see 2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled.

For removal and installation of cooling system components, see C.5 COOLING SYSTEM REPAIR.

ENGINE GUARD

FASTENER	TORQUE VALUE	
Engine guard lower screws	15-20 ft-lbs	20.3-27.1 Nm
Engine guard upper screw	22-28 ft-lbs	29.8-37.9 Nm

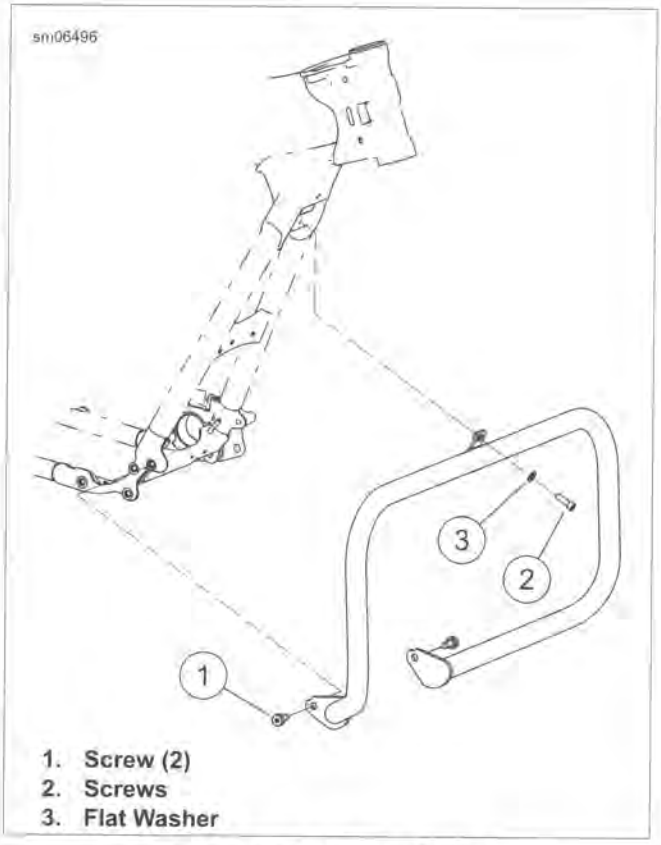
Removal

1. Remove lower fairings, if present. See 2.36 FAIRING LOWERS AND ENGINE GUARD. Remove lower fairing clamps from engine guard.

2. See Figure 2-136. Remove two screws (1) to release ends of engine guard from frame weldments.
3. Remove screw (2) and flat washer (3) and remove engine guard.

Installation

1. See Figure 2-136. Insert tab at top of engine guard into slot at base of steering head. Start screw (2) with flat washer (3).
2. Secure lower ends of engine guard to frame weldments with screws (1).
3. Tighten lower screws (1) to 15-20 ft-lbs (20.3-27.1 Nm).
4. Tighten upper screw (2) to 22-28 ft-lbs (29.8-37.9 Nm).
5. Install lower fairing clamps on each side of engine guard. Install lower fairings, if present. See 2.36 FAIRING LOWERS AND ENGINE GUARD.



1. **Screw (2)**
2. **Screws**
3. **Flat Washer**

Figure 2-136. Engine Guard

OUTER FAIRING AND WINDSHIELD

FASTENER	TORQUE VALUE	
Outer fairing screws	20-30 **in-lbs**	2.3-3.4 Nm
Windshield screws: Fairing models	25-30 **in-lbs**	2.8-3.4 Nm

Removal

1. Remove the main fuse.
2. Remove the left and right lamp brackets from front forks. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS or 7.14 TURN SIGNAL LAMPS.
3. See Figure 2-137. Loosen but do not remove three screws (1, 2) securing the windshield.
4. Raise and remove the windshield.
5. Remove two screws (3).
6. Remove two screws (4).
7. Remove the three screws (1, 2) with flat washers.
8. Pull the outer fairing forward and separate headlamp connector [38].
9. Remove outer fairing.

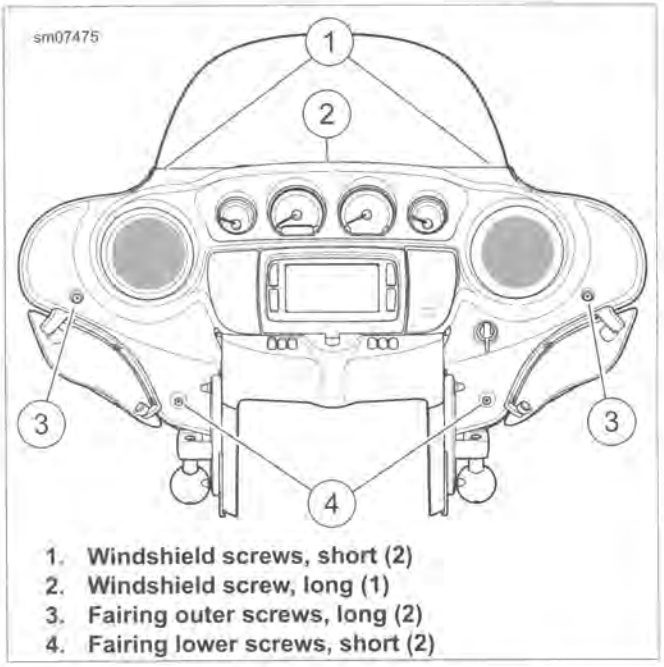
Installation

1. Verify seals between outer and inner fairing are in good shape and in place.
2. Mate headlamp connector [38]. Place the outer fairing on the motorcycle.

NOTES

- *Confirm the correct screws are installed in each location.*
- *See Figure 2-137. Screws (4) are similar to the center screw that secures the windshield. Use care to avoid mixing them during installation. Screws (4) have a smooth shank, captive washer and unthreaded tip.*

3. See Figure 2-137. Start three screws (1, 2). The center screw is the longest.
4. Start two long screws (3).
5. Start two short screws (4).
6. Tighten screws (3, 4) to 20-30 **in-lbs** (2.3-3.4 Nm).
7. Place the windshield into position between the inner and outer fairings.
8. Tighten screws (1, 2) to 25-30 **in-lbs** (2.8-3.4 Nm).
9. Install the left and right lamp brackets to front forks. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS or 7.14 TURN SIGNAL LAMPS.
10. Install the main fuse.



1. **Windshield screws, short (2)**
2. **Windshield screw, long (1)**
3. **Fairing outer screws, long (2)**
4. **Fairing lower screws, short (2)**

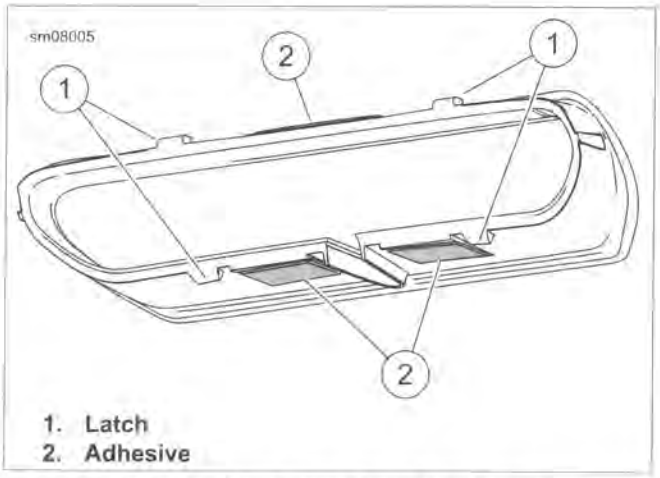
Figure 2-137. Outer Fairing Screws

Fairing Seal

1. Remove outer fairing.
2. Remove damaged seal.
3. Install **new** seal. Use masking tape at the ends to hold in place on inner fairing during assembly if needed.
4. Install outer fairing.

Fairing Vent Bezel

1. Remove outer fairing.
2. See Figure 2-138. From inside fairing, use a putty knife to release adhesive (2) in three places.
3. Release latches (1). Remove bezel.
4. Remove all old adhesive from fairing. Clean areas with rubbing alcohol. Allow to dry.
5. Install **new** bezel. Apply pressure to adhesive areas for 10 seconds.
6. Install outer fairing.



1. Latch
2. Adhesive

Figure 2-138. Outer Fairing Vent Bezel

DASH PANEL

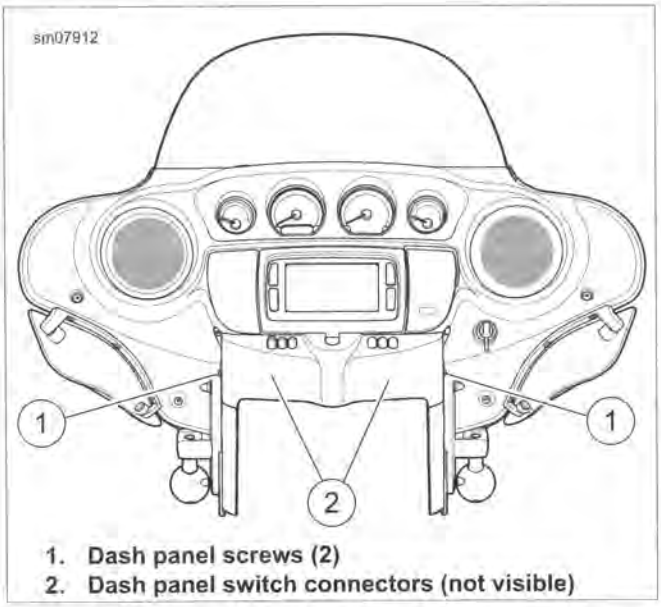
FASTENER	TORQUE VALUE	
Dash panel screws	25-30 **in-lbs**	2.8-3.4 Nm
Ignition switch housing nut	13-15 ft-lbs	17.5-20.9 Nm

Removal

1. Remove ignition switch knob and spring. Remove nut and collar from ignition switch. See 7.15 IGNITION SWITCH AND FORK LOCK.
2. See Figure 2-139. Remove two screws (1) (with flat washers) to release dash panel.
3. Lift the dash panel and disconnect dash panel switch connectors (2).
4. Remove dash panel.
5. See 7.16 DASH PANEL SWITCHES for switch service.

Installation

1. See Figure 2-139. Mate switch connectors (2).
2. Install dash panel over ignition switch housing.
3. Install two screws (1) (with flat washers) to secure dash panel. Tighten to 25-30 **in-lbs** (2.8-3.4 Nm).
4. Install collar and nut on ignition switch. Tighten to 13-15 ft-lbs (17.5-20.9 Nm).



1. **Dash panel screws (2)**
2. **Dash panel switch connectors (not visible)**

Figure 2-139. Dash Panel Screws

ROTATE INNER FAIRING

FASTENER	TORQUE VALUE	
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm

NOTE

Rotate the inner fairing to perform repairs such as ignition switch replacement, handlebar replacement or to access harnesses and lines that are attached to the handlebar. Rotate only as far as needed to make repair. Over-rotation can result in cosmetic damage.

1. Remove auxiliary/fog lamp brackets or turn signal brackets. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS.
2. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
3. Remove dash panel. See 2.38 DASH PANEL.

NOTE

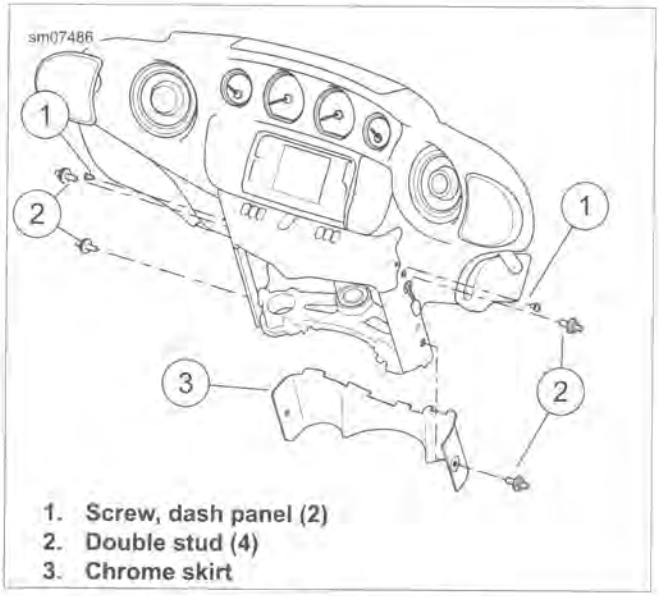
The area below radio opening may contact the ignition switch stem. Use care to avoid cosmetic damage. Place a rag or other protection between stem and inner fairing.

4. See Figure 2-140. Remove double studs (2).
5. Remove chrome skirt (3).

NOTES

- *Disconnection of any electrical components is not necessary.*
- *Over rotation of fairing can result in cosmetic damage. Rotate fairing only enough to access the components needing service.*

6. Lift inner fairing assembly slightly and rotate upper portion forward until it is approximately vertical.
7. Perform repairs as necessary.
8. Lift the inner fairing slightly and rotate back into position.
9. Install chrome skirt.
10. Install double studs. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
11. Install dash panel. See 2.38 DASH PANEL.
12. Install outer fairing and auxiliary/fog lamp brackets or turn signal brackets. See 2.37 UPPER FAIRING AND WINDSHIELD.



1. **Screw, dash panel (2)**
2. **Double stud (4)**
3. **Chrome skirt**

Figure 2-140. Rotate Inner Fairing

INNER FAIRING ASSEMBLY REMOVAL AND INSTALLATION

FASTENER	TORQUE VALUE	
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm

Removal

NOTE

Remove the inner fairing as an assembly to perform repairs such as handlebar replacement, fork bracket repair/replacement, steering head bearing adjustment/replacement, etc.

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

NOTE

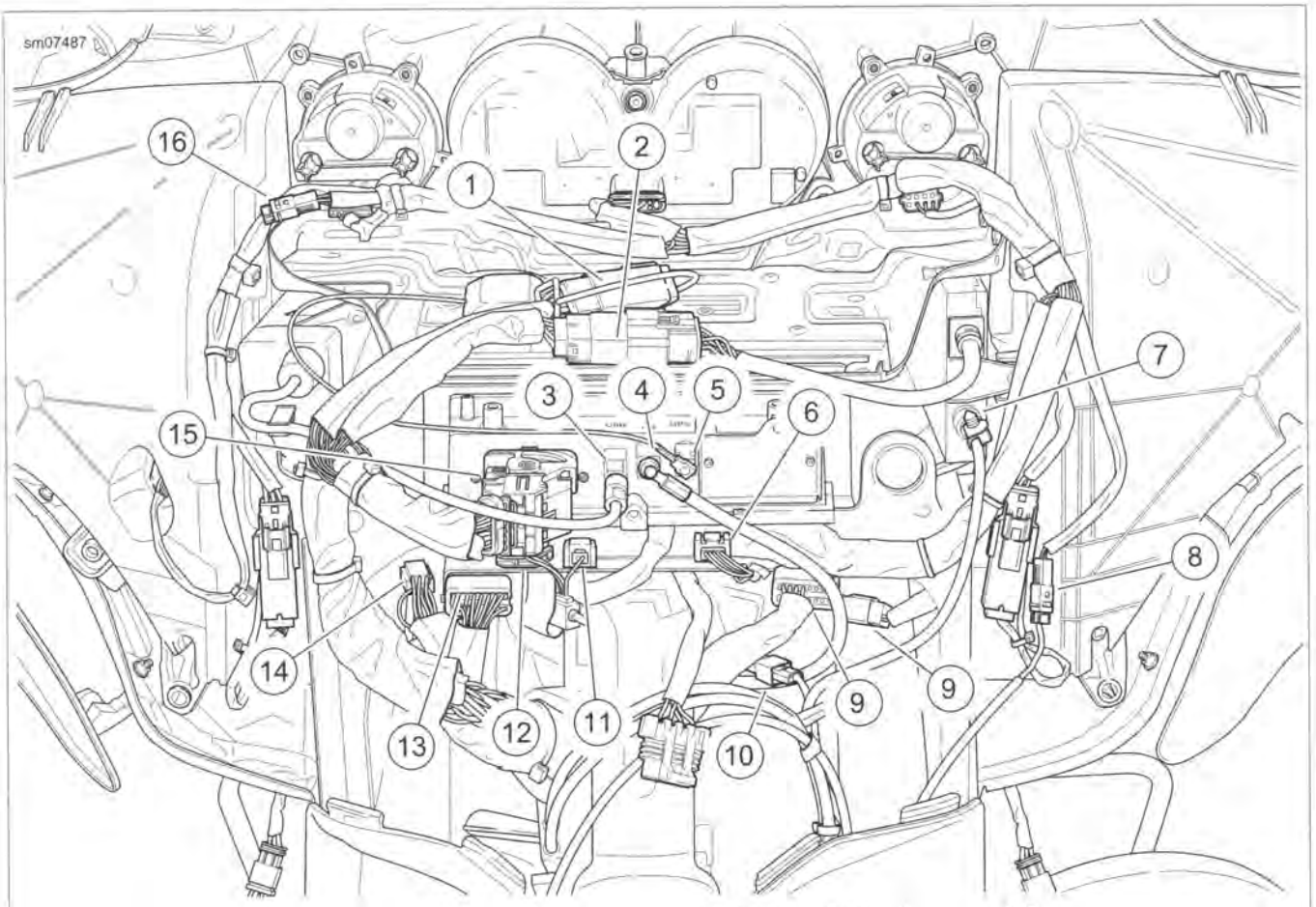
Vehicles equipped with hydraulic clutch do not require disconnection.

2. See Figure 2-141. Separate connectors (1-15).
3. Release connector anchors on connectors (1, 2, 8, 14).
4. Remove dash panel. See 2.38 DASH PANEL.

NOTE

The lower radio bezel may contact the ignition switch stem. Use care to avoid cosmetic damage. Place a rag or other protection between stem and radio bezel.

5. Roll top of fairing assembly forward while lifting to remove.



1. **CB module**
2. **P&A audio**
3. **USB cable**
4. **AM/FM radio antenna**
5. **GPS antenna**
6. **Left handlebar switch harness**
7. **CB antenna**
8. **Front fender tip lamp**
9. **Main-to-fairing harness, left**
10. **Heated hand grip power, if equipped**
11. **Run/stop switch**
12. **Right handlebar switch harness**
13. **Main-to-fairing harness, right**
14. **TGS**
15. **Radio**
16. **Accessory power**

Figure 2-141. Inner Fairing Harness Connectors

Installation

NOTE

Prior to installation, confirm dash panel switch harnesses are routed back between handlebar and upper fork bracket.

1. Slide the lower fairing support brackets over the bosses on the upper fork bracket. Roll top of fairing assembly rearward while lowering into position.
2. Install chrome skirt.
3. Install double studs. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
4. Install dash panel. See 2.38 DASH PANEL.
5. See Figure 2-141. Mate connectors (1-15).
6. Secure connector anchors on connectors (1, 2, 8, 14).
7. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

INNER FAIRING SHELL REPLACEMENT

FASTENER	TORQUE VALUE	
Power outlet, front	13-17 **in-lbs**	1.5-1.9 Nm
Media compartment screw, lower	8-12 **in-lbs**	1.0-1.3 Nm
Fairing speaker grill screws	9-13 **in-lbs**	1.0-1.5 Nm
Gauges, 2 inch diameter gauge screws	8-12 **in-lbs**	1.0-1.3 Nm
Gauges, instrument cluster screws	8-12 **in-lbs**	1.0-1.3 Nm
Upper support bracket to inner fairing screws	10-20 **in-lbs**	1.1-2.2 Nm
Fairing speaker enclosure to fairing screws	48-60 **in-lbs**	5.4-6.8 Nm

Removal

NOTES

- *To avoid scratches or other damage, place protective material over front fender, fuel tank and lower fairings.*
- *Never lift the fairing assembly by the radio face.*

1. Prepare a protective work surface large enough to lay the inner fairing assembly on.
2. Remove air deflectors. See 2.40 AIR DEFLECTORS.
3. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
4. Remove inner fairing assembly. See 2.39 INNER FAIRING, Inner Fairing Assembly Removal and Installation. Lay on protective surface with gauge faces down.
5. Remove fairing vent. See 2.39 INNER FAIRING, Fairing Vent.
6. Disconnect harness connectors from the gauges and instrument cluster. Pull harness anchors from the 2-inch gauges.
7. See Figure 2-142. Remove two upper support screws (2).
8. Remove four enclosure screws (1). Do not remove screws (3) at this time.
9. Disconnect connectors (4, 5).
10. See Figure 2-145. Flip fairing assembly with top near the edge of the protective surface. Lay with protrusions at top of fairing hanging off edge of surface.
11. Remove two lower enclosure screws (2).

NOTE

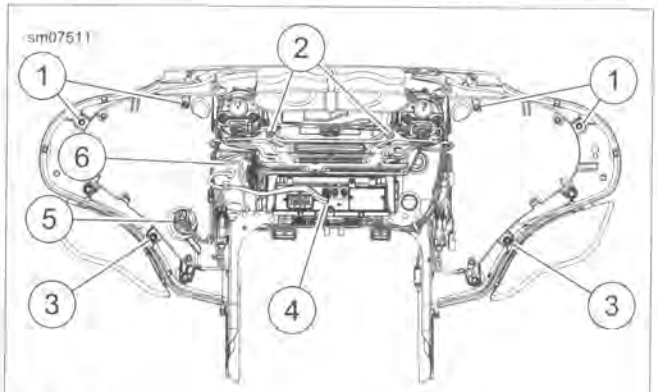
Use caution when lifting fairing from support structure assembly to prevent speaker damage.

12. Lift inner fairing shell off support structure assembly. Place face-down on protective surface to finalize disassembly.
13. See Figure 2-143. Remove screws to release 2-inch gauges (1) and instrument cluster (2).
14. Remove screws to release speaker grills (3).

NOTE

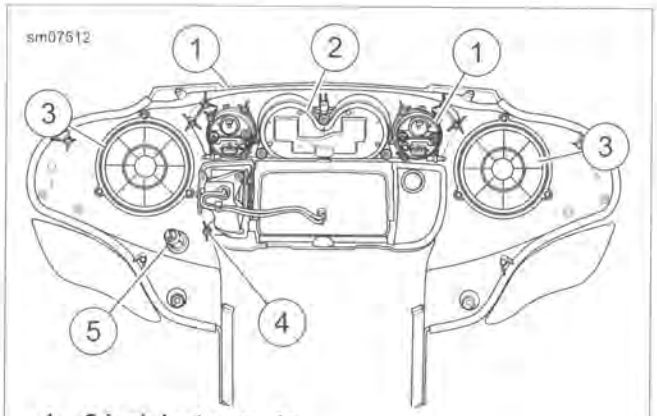
Media compartment door must be open to remove or install media compartment.

15. Remove screw (4) to release media compartment.
16. Remove power outlet (5).
17. Remove left and right edge seals.
18. Remove mirrors if equipped. See 2.29 MIRRORS, FLHX/S.



1. **Screw, speaker enclosure**
2. **Screw, upper support**
3. **Screw, enclosure, lower**
4. **Media cable connector**
5. **Power outlet connector**
6. **Screw, media compartment**

Figure 2-142. Inner Fairing



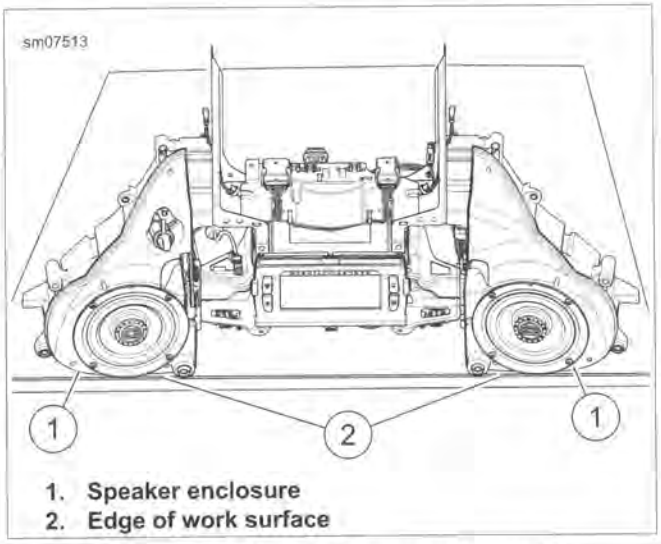
1. **2-Inch Instruments**
2. **Instrument cluster**
3. **Speaker grill**
4. **Screw, media compartment**
5. **Power outlet**

Figure 2-143. Support Structure Removed

Installation

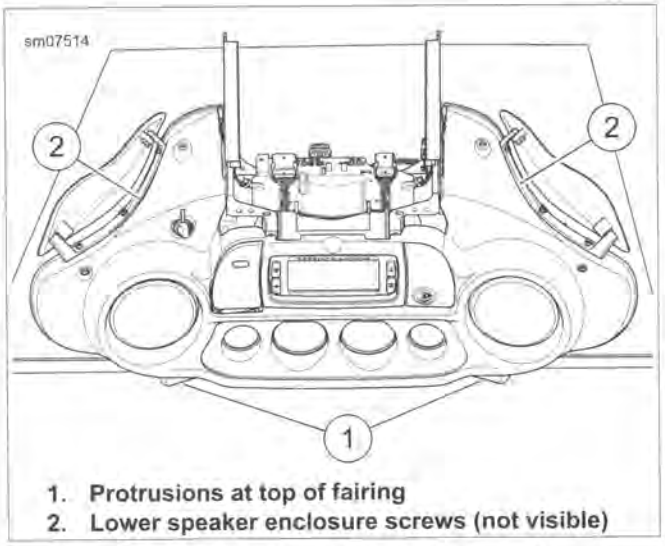
1. Place **new** inner fairing face-down on a protective surface.
2. Install mirrors if equipped. See 2.29 MIRRORS, FLHX/S.
3. See Figure 2-143. Install power outlet (5). Tighten to 13-17 **in-lbs** (1.5-1.9 Nm).
4. Verify media compartment door is open. Install media compartment. Tighten screw (4) to 8-12 **in-lbs** (1.0-1.3 Nm).

5. Install speaker grills (3) with arrows aligned with those on the inner fairing. Tighten to 9-13 **in-lbs** (1.0-1.5 Nm).
6. Install 2-inch gauges (1). Tighten to 8-12 **in-lbs** (1.0-1.3 Nm).
7. Install instrument cluster (2) using single screw at top. Tighten to 8-12 **in-lbs** (1.0-1.3 Nm).
8. See Figure 2-144. Place support structure assembly on the work surface with the tops of the speaker enclosures near the edge of the work surface.
9. See Figure 2-145. Place inner fairing onto structure assembly. Adjust position so the protrusions at the top of the fairing hang off the edge of the work surface. Start lower speaker enclosure screws (2).
10. Flip inner fairing assembly to lay face-down on a protective surface.
11. See Figure 2-142. Install two screws (2). Tighten to 10-20 **in-lbs** (1.1-2.2 Nm).
12. Install four screws (1). Tighten screws (1, 3) to 48-60 **in-lbs** (5.4-6.8 Nm).
13. Install connectors (4, 5).
14. Install harness connectors to the gauges and instrument cluster. Install harness anchors to the 2-inch gauges.
15. Install left and right edge seals.
16. Install fairing vent. See 2.39 INNER FAIRING, Fairing Vent.
17. Install inner fairing assembly. See 2.39 INNER FAIRING, Inner Fairing Assembly Removal and Installation.
18. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
19. Install air deflectors. See 2.40 AIR DEFLECTORS.



1. **Speaker enclosure**
2. **Edge of work surface**

Figure 2-144. Support Structure Assembly



1. **Protrusions at top of fairing**
2. **Lower speaker enclosure screws (not visible)**

Figure 2-145. Inner Fairing Assembly

FAIRING VENT

FASTENER	TORQUE VALUE	
Fairing vent	20-30 **in-lbs**	2.3-3.4 Nm
Fairing vent	20-30 **in-lbs**	2.3-3.4 Nm

Cleaning

Occasional cleaning of the air duct, vent door and button will provide trouble-free operation.

NOTE

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 form a white haze on non-painted plastic parts.

1. With button in the UP position (vent door closed), spray clean water into the area under the button.
2. Spray low-pressure air in the same direction.
3. Using mild soapy water and a soft brush, remove dirt and bugs from vent duct and vent door.
4. Operate vent and repeat cleaning as necessary.
5. If vent door does not operate freely, see Vent Repair below.

Removal

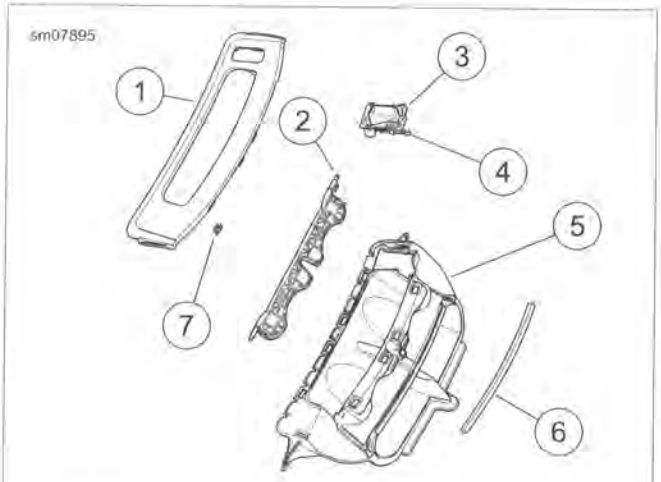
1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Remove screws from either end of vent.
3. Remove vent.

Installation

1. Install vent.
2. Install screws to each end of vent. Tighten to 20-30 **in-lbs** (2.3-3.4 Nm).
3. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

Vent Repair

1. Remove vent assembly from inner fairing.
2. See Figure 2-146. Using a thin flat tool, carefully pry between housing (5) and bezel (1) at each of the ten retainer clip locations. Remove bezel.
3. Replace any damaged or missing clips (7).
4. Disconnect link (4) from vent door. Remove vent door (2).
5. Press catches securing button assembly (3) and push out of vent housing.
6. Install button assembly.
7. Install vent door. Connect link.
8. Apply a small amount of ELECTRICAL CONTACT LUBRICANT to the vent door pivot journals.
9. Install bezel. Verify that all ten clips are engaged.
10. Install vent assembly to inner fairing. Tighten to 20-30 **in-lbs** (2.3-3.4 Nm).
11. Gasket replacement:
    a. Remove all gasket material and adhesive.
    b. Clean contact area with rubbing alcohol.
    c. Install new gasket along raised area of housing.



1. **Bezel**
2. **Vent door**
3. **Button assembly**
4. **Link**
5. **Vent housing**
6. **Foam gasket**
7. **Clip (10)**

Figure 2-146. Fairing Vent Assembly

UPPER SUPPORT BRACKET

FASTENER	TORQUE VALUE	
Upper support bracket to inner fairing screws	10-20 **in-lbs**	1.1-2.2 Nm
Upper support bracket to speaker enclosure screws	48-60 **in-lbs**	5.4-6.8 Nm
Upper support bracket to radio (storage box) screws	25-35 **in-lbs**	2.8-4.0 Nm
Media compartment screw, upper	25-35 **in-lbs**	2.8-4.0 Nm

Removal

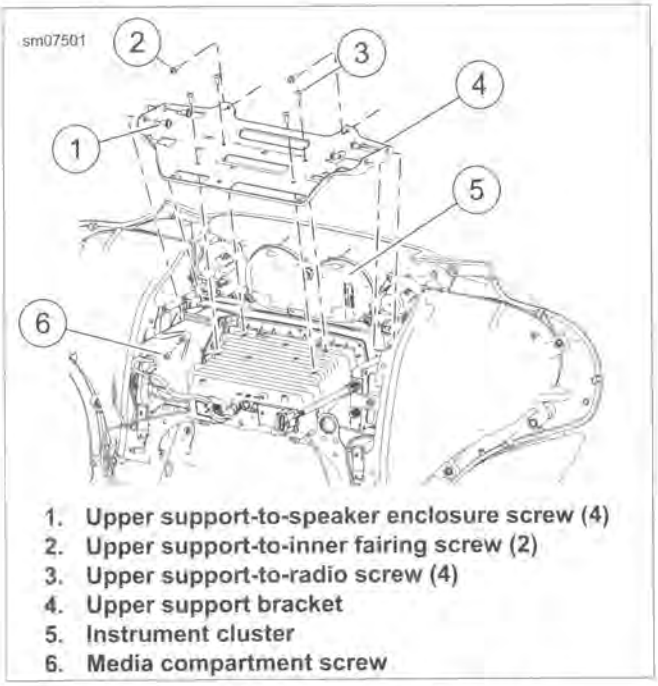
1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Remove fairing vent. See 2.39 INNER FAIRING, Fairing Vent.
3. Remove electrical connector anchors from support bracket.
4. If equipped, disconnect GPS antenna connector from radio.
5. See Figure 2-147. Remove four screws (1).
6. Remove two screws (2).
7. Remove four screws (3).
8. Remove screw (6) securing media compartment.
9. Remove upper support bracket (4).

NOTE

Never operate vehicle with the radio or upper support bracket removed. These components provide important structural support to the fairing. Temporarily install the Police glove box assembly if the vehicle must be operated while the radio is removed. Damage to the fairing assembly can result if operated without either of these components installed.

Installation

1. See Figure 2-147. Place upper support bracket (4) into position.
2. Loosely install screws (1-3).
3. Tighten screws in the following sequence for proper alignment:
    a. Tighten screws (2) to 10-20 **in-lbs** (1.1-2.2 Nm).
    b. Tighten screws (1) to 48-60 **in-lbs** (5.4-6.8 Nm).
    c. Install four screws (3). Tighten to 25-35 **in-lbs** (2.8-4.0 Nm).
4. Install screw (6). Tighten to 25-35 **in-lbs** (2.8-4.0 Nm).
5. Secure electrical connector anchors to upper support.
6. Mate GPS antenna connector if removed.
7. Install fairing vent. See 2.39 INNER FAIRING, Fairing Vent
8. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.



1. **Upper support-to-speaker enclosure screw (4)**
2. **Upper support-to-inner fairing screw (2)**
3. **Upper support-to-radio screw (4)**
4. **Upper support bracket**
5. **Instrument cluster**
6. **Media compartment screw**

Figure 2-147. Upper Support Bracket

MEDIA COMPARTMENT

FASTENER	TORQUE VALUE	
Media compartment screw, lower	8-12 **in-lbs**	1.0-1.3 Nm

Removal

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Remove fairing vent. See 2.39 INNER FAIRING, Fairing Vent
3. Remove upper support bracket. See 2.39 INNER FAIRING, Upper Support Bracket.

NOTE

Never operate vehicle with the radio or upper support bracket removed. These components provide important structural support to the fairing. Temporarily install the Police glove box assembly if the vehicle must be operated while the radio is removed. Damage to the fairing assembly can result if operated without either of these components installed.

4. Separate media cable connector from radio.
5. See Figure 2-148. Remove screw (4). Open compartment door. Remove media compartment.

Installation

1. See Figure 2-148. Place media compartment into position.
2. Install screw (4). Tighten to 8-12 **in-lbs** (1.0-1.3 Nm).
3. Mate media cable connector to radio.
4. Install upper support bracket. See 2.39 INNER FAIRING, Upper Support Bracket.
5. Install fairing vent. See 2.39 INNER FAIRING, Fairing Vent.
6. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

Cable Replacement

NOTE

This procedure can be performed with media compartment installed.

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Separate media cable connector from radio.
3. Remove cable from anchor feature (3).
4. Remove foam insert.
5. Push cable grommet (2) into media compartment to remove.

NOTE

Apply a small amount of window cleaner to aid installation.

6. Route cable through mounting hole from inside compartment.
7. Pull grommet into hole until seated.
8. Install foam insert.
9. Mate media cable connector to radio.
10. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

Cover Replacement

NOTE

This procedure can be performed with media compartment installed. Use care to avoid cosmetic damage.

1. Use a thin putty knife between the inner and outer (1) covers. Carefully pry outer cover off.
2. Align outer cover and apply to inner cover.

Latch Replacement

1. Remove media compartment.
2. See Figure 2-148. Release upper and lower catches on latch.
3. Push latch out of housing.
4. See inset. Install **new** latch. Verify that catches are securely hooked.
5. Close and open the door to verify operation.
6. Install media compartment.

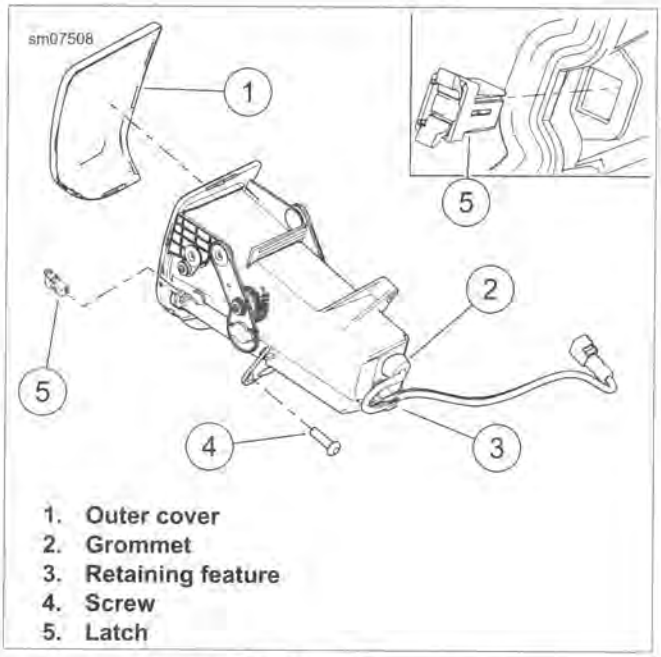


Figure 2-148. Media Compartment

FAIRING AIR DEFLECTORS

FASTENER	TORQUE VALUE	
Fairing air deflector screws	15-25 **in-lbs**	1.7-2.8 Nm

Removal

1. See Figure 2-149. Remove three screws to release air deflector at side of inner fairing.
2. Repeat step to remove air deflector on opposite side of motorcycle.

Installation

1. Install three screws to fasten air deflector at side of inner fairing. Alternately tighten screws to 15-25 **in-lbs** (1.7-2.8 Nm).
2. Repeat step to install air deflector on opposite side of motorcycle.

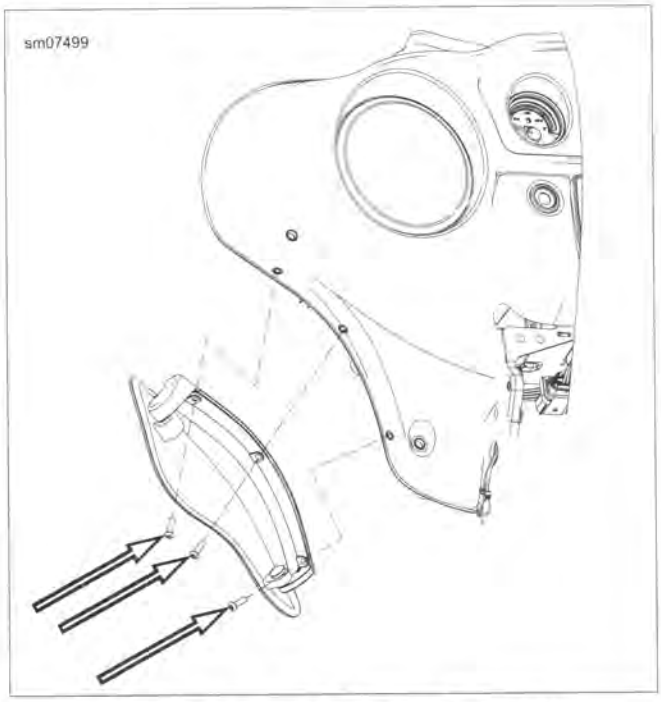


Figure 2-149. Air Deflector (Adjustable)

MID-FRAME AIR DEFLECTORS

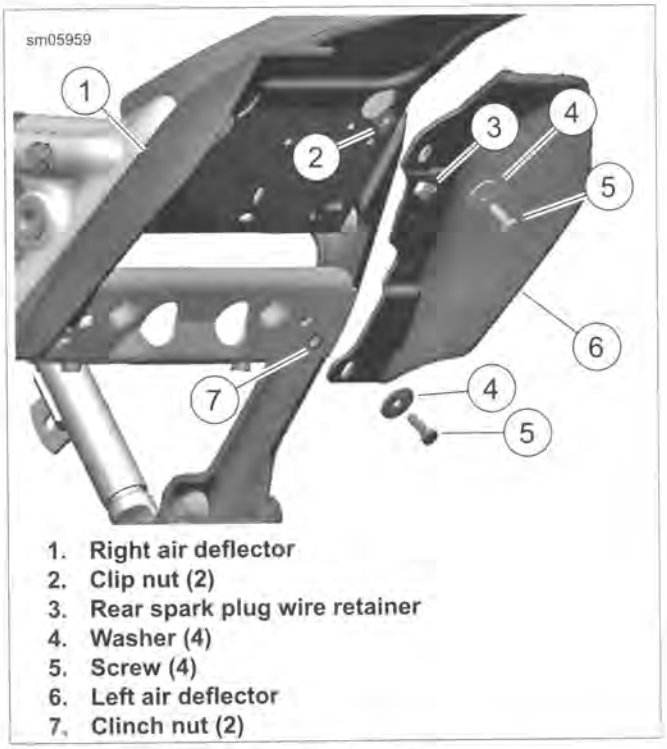
FASTENER	TORQUE VALUE	
Mid-frame air deflector screws	25-35 **in-lbs**	2.8-4.0 Nm

Removal

1. See Figure 2-150. Release spark plug wire from retainer (3) (left deflector only).
2. Remove screws (5) and washers (4).
3. Remove deflector (6) from frame.

Installation

1. See Figure 2-150. Verify clip nut (2) is installed in frame hole.
2. Install left air deflector (6) with washers (4) and screws (5). Tighten to 25-35 **in-lbs** (2.8-4.0 Nm).
3. Secure spark plug wire in retainer (3).



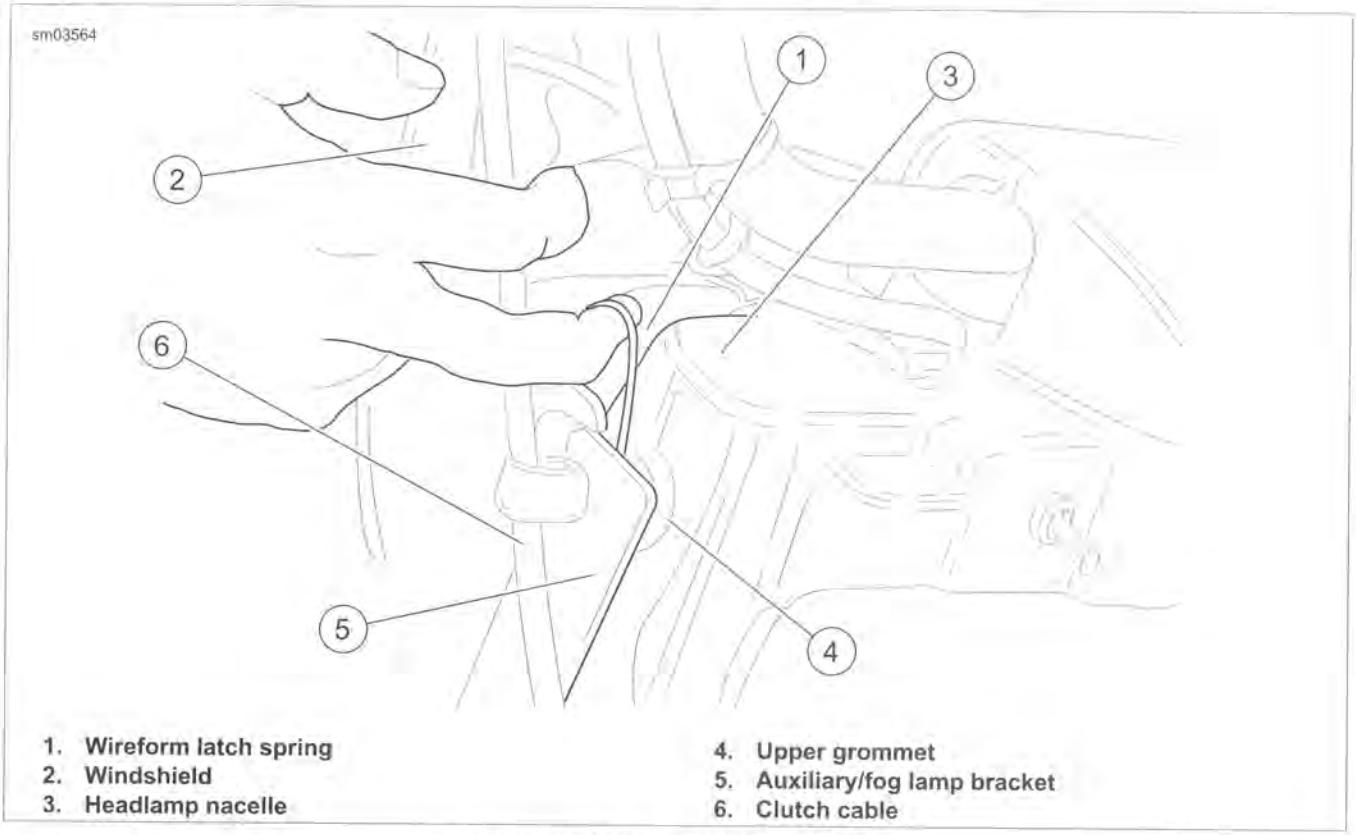
1. **Right air deflector**
2. **Clip nut (2)**
3. **Rear spark plug wire retainer**
4. **Washer (4)**
5. **Screw (4)**
6. **Left air deflector**
7. **Clinch nut (2)**

Figure 2-150. Air Deflectors

WINDSHIELD

Removal

1. See Figure 2-151. Raise the wireform latch springs on both sides of the windshield.
2. Pull on the top of the windshield until the upper notches on the windshield brackets are free of the upper grommets.
3. Raise the windshield until the lower notches are free of the lower grommets.
4. Remove windshield.



1. **Wireform latch spring**
2. **Windshield**
3. **Headlamp nacelle**
4. **Upper grommet**
5. **Auxiliary/fog lamp bracket**
6. **Clutch cable**

Figure 2-151. Windshield (FLHR/C)

Installation

NOTE

Verify that all four notches on the windshield brackets are firmly seated on rubber grommets.

1. Carefully insert the windshield brackets between the headlamp nacelle and the auxiliary/fog lamp bracket. Lower the windshield into position until the lower notches on the windshield brackets are seated on the lower grommets.
2. See Figure 2-151. Push the top of the windshield rearward until the upper notches fully engage the upper grommets.
3. Push down on the wireform latch springs so that they overhang the rubber grommets. If some adjustment is necessary, loosen the retaining screws and rotate the latch springs into the proper position.

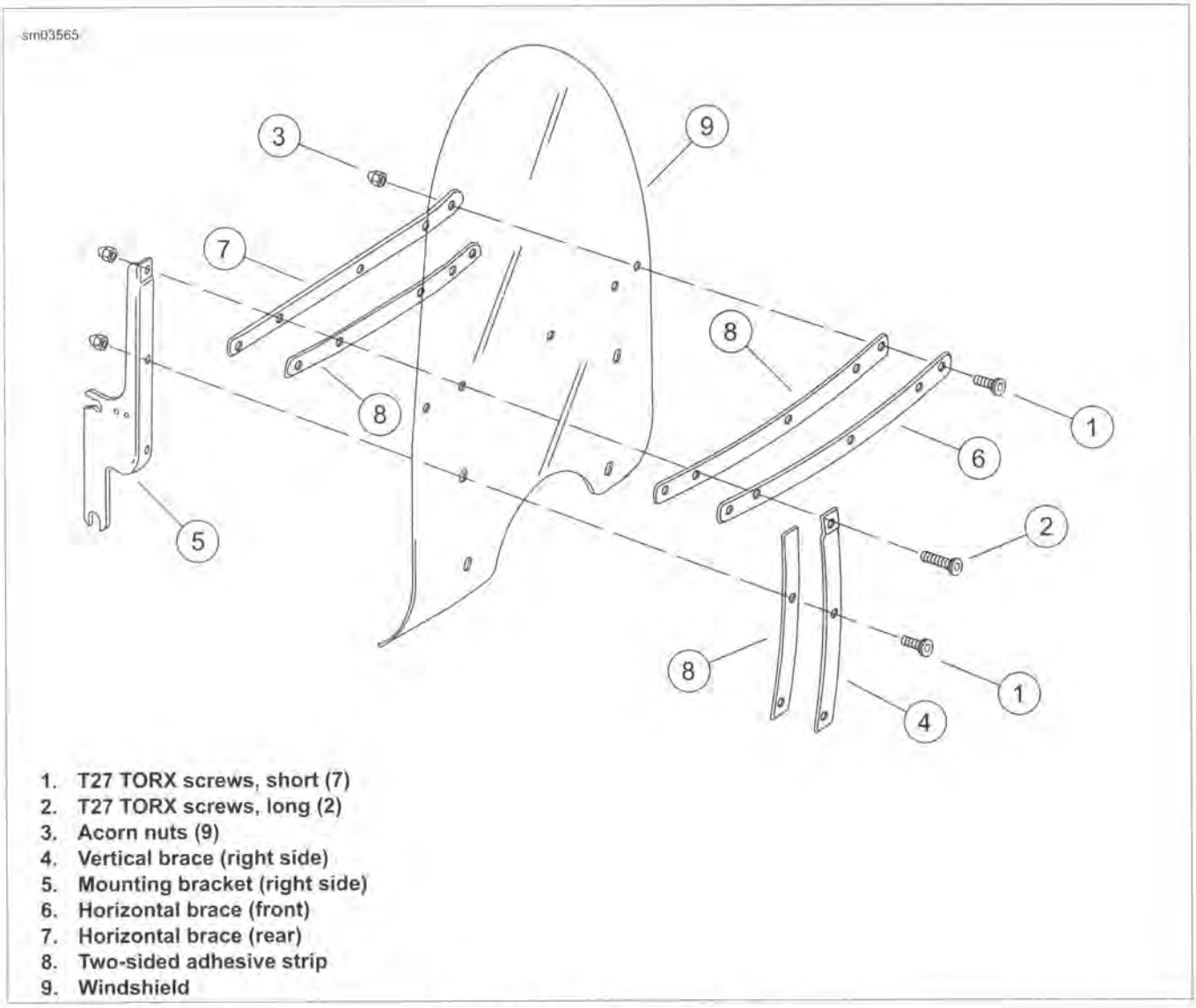
WINDSHIELD WINDOW

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN

FASTENER	TORQUE VALUE	
Windshield window screws: Road King models	20-25 **in-lbs**	2.3-2.8 Nm

Removal

1. Remove windshield. See 2.41 WINDSHIELD: ROAD KING MODELS.
2. Place windshield front side up on clean padded surface.
3. See Figure 2-152. Remove acorn nuts and screws from each vertical brace to release mounting bracket.
4. Remove three remaining screws from horizontal brace.



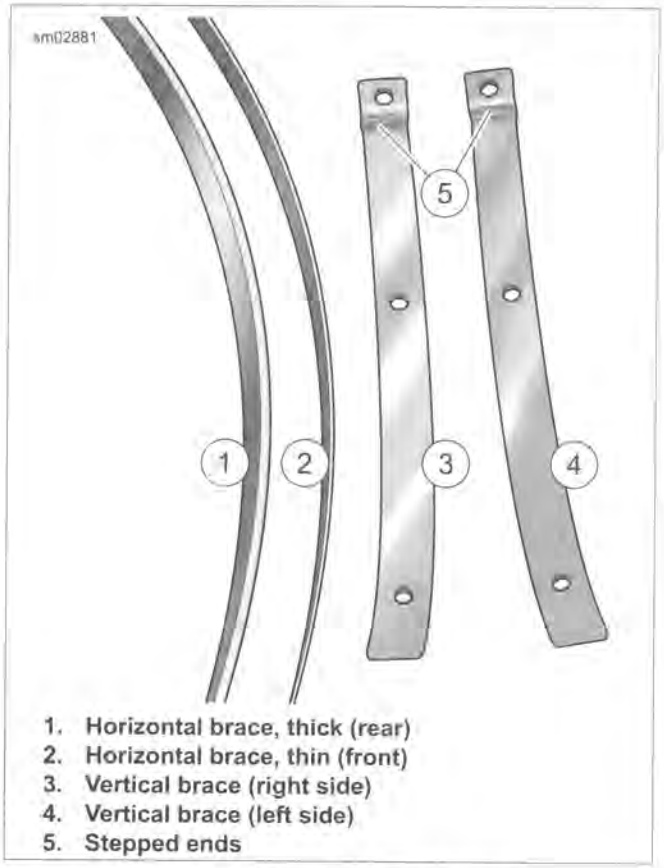
1. **T27 TORX screws, short (7)**
2. **T27 TORX screws, long (2)**
3. **Acorn nuts (9)**
4. **Vertical brace (right side)**
5. **Mounting bracket (right side)**
6. **Horizontal brace (front)**
7. **Horizontal brace (rear)**
8. **Two-sided adhesive strip**
9. **Windshield**

Figure 2-152. Windshield Assembly

5. Carefully pry braces from windshield. Discard windshield.
6. Remove adhesive strip from braces:
   a. Liberally apply 3M GENERAL PURPOSE ADHESIVE REMOVER. Allow to soak.
   b. Apply heat with ROBINAIR HEAT GUN (Part No. HD-25070).
   c. Peel adhesive strip from braces.
   d. Remove any remaining adhesive with 3M GENERAL PURPOSE ADHESIVE REMOVER.

Installation

1. Remove paper backing from one side of each adhesive strip and apply to windshield side of each brace.
2. Place **new** windshield with front side down on clean padded surface.
3. See Figure 2-153. Remove paper backing from adhesive strip on thicker horizontal brace. Align holes in brace with holes in windshield and press brace into position.
4. Turn windshield over (front side up).
5. Remove paper backing from adhesive strip on thinner horizontal brace. Align holes in brace with holes in windshield Edges of inner and outer braces must be even. Press into position.



1. **Horizontal brace, thick (rear)**
2. **Horizontal brace, thin (front)**
3. **Vertical brace (right side)**
4. **Vertical brace (left side)**
5. **Stepped ends**

Figure 2-153. Windshield Braces

6. Apply one drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to three short screws. Install screws through the middle and outer holes of the horizontal braces. Loosely install acorn nuts on rear side.
7. See Figure 2-153. Remove paper backing from adhesive strip on vertical brace. With the stepped end overlapping the horizontal brace and the end with the slight bend angled outward, align holes in brace with holes in windshield. Press into position.
8. Position mounting bracket on rear side of windshield with the wireform facing inboard.
9. Secure vertical brace:
   a. Apply one drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to two short screws and one long screw.
   b. Install the longer screw at the stepped end where the vertical brace overlaps the horizontal brace.
   c. Install short screws in the remaining holes.
   d. Loosely install acorn nuts.
10. Install second vertical brace and mounting bracket in a similar manner.
11. See Figure 2-154. Following the sequence shown, tighten all screws to 20-25 **in-lbs** (2.3-2.8 Nm).
12. Install windshield. See 2.41 WINDSHIELD: ROAD KING MODELS.

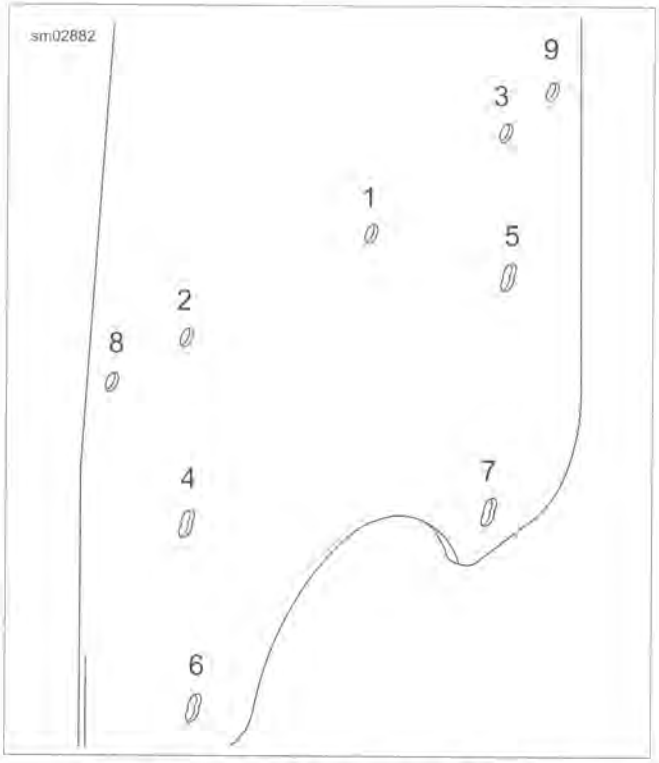
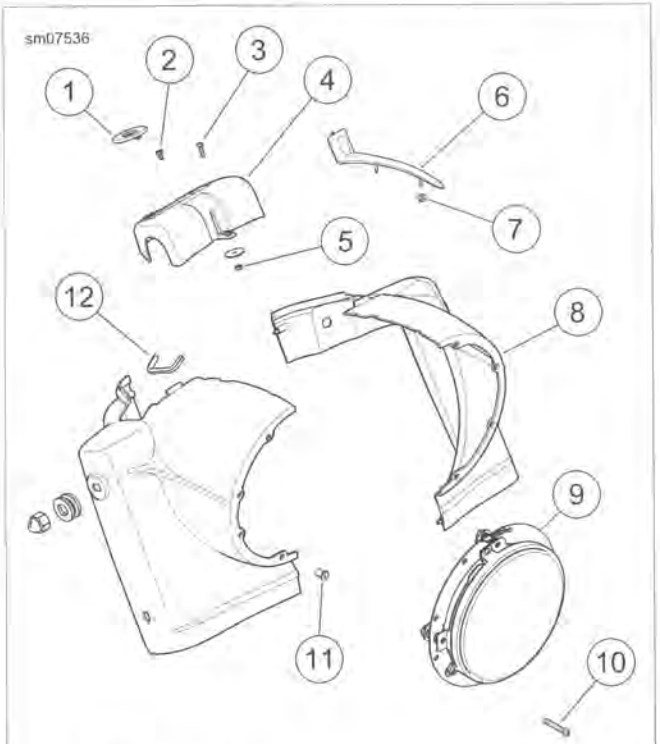


Figure 2-154. Windshield Torque Sequence

REMOVAL

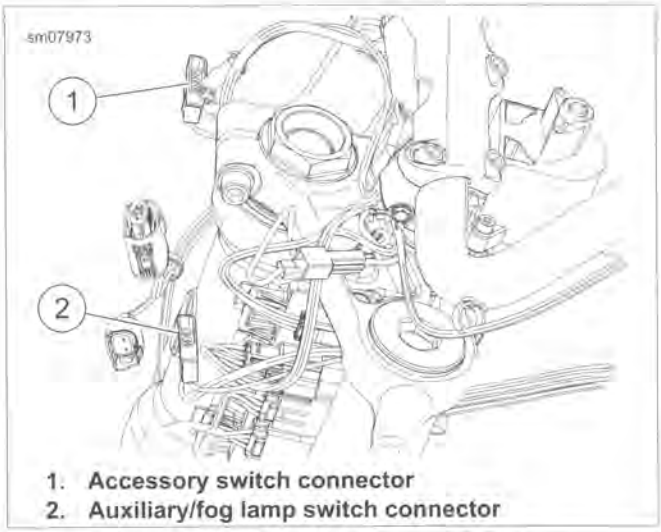
1. Remove windshield. See 2.41 WINDSHIELD: ROAD KING MODELS.
2. Loosen acorn nuts. Do not remove acorn nuts at this time. Remove the auxiliary/fog lamp bracket. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS.
3. **FLHP:**
   a. Remove acorn nuts securing speedometer bracket. Remove speedometer and hang over handlebar.
   b. Remove nut securing audio jack (left side).
4. Remove screw securing the headlamp door (chrome ring). Remove the headlamp door.
5. See Figure 2-155. Remove eight screws (10) to free the headlamp assembly from the headlamp nacelle.



1. **Fork lock plate**
2. **Screw (2)**
3. **Screw**
4. **Handlebar clamp shroud**
5. **Nut**
6. **Chrome strip**
7. **Flange nut**
8. **Nacelle**
9. **Headlamp assembly**
10. **Screw (8)**
11. **Well nut (8)**
12. **Trim strip**

Figure 2-155. Headlamp Nacelle Assembly

6. Disconnect headlamp connector(s). Remove the headlamp housing assembly.
7. Remove flange nut (7). Remove chrome strip (6).
8. Carefully pry off the fork lock plate (1). Remove two screws (2).
9. Loosen screw (3) until nut (5) and flat washer are near the end of screw.
10. Lift the handlebar clamp shroud (4). Pull rearward through the gap to remove shroud.
11. Remove acorn nuts, grommets and clutch cable P-clamp from the fork bracket studs.
12. See Figure 2-156. Disconnect accessory switch (1) and auxiliary/fog lamp switch (2) connectors.
13. Separate the halves of the headlamp nacelle and remove.



1. **Accessory switch connector**
2. **Auxiliary/fog lamp switch connector**

Figure 2-156. Nacelle Switch Connectors

INSTALLATION

FASTENER	TORQUE VALUE	
Nacelle stud	72-108 **in-lbs**	8.1-12.2 Nm
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm
Headlamp nacelle chrome strip flange nut	15-20 **in-lbs**	1.7-2.3 Nm
Headlamp nacelle acorn nuts	72-108 **in-lbs**	8.1-12.2 Nm
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm
Speedometer bracket: FLHP	72-108 **in-lbs**	8.1-12.2 Nm

NOTE

See Figure 2-155. Verify that trim strips (12) are installed to prevent chafing of the brake hose and/or handlebar switch wires.

1. Install headlamp nacelle housings on fork brackets. Install grommets and start acorn nuts. Also secure clutch cable P-clamp with upper-left stud.

If studs were removed:

a. Install acorn nut on the stud end without locking agent. Install until stud is bottomed in nut.

b. Install grommet on stud.

c. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of stud.

d. While holding nacelle housing in place, start stud/nut/grommet assembly in each hole.

e. Install auxiliary/fog lamp bracket.

f. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).L

2. Connect accessory switch and auxiliary/fog lamp switch connectors.

NOTE

See Figure 2-155. If disassembled, install screw, flat washer and nut on the handlebar clamp shroud.

3. See Figure 2-155. Install the handlebar clamp shroud (4):
   a. Slide the handlebar clamp shroud screw forward into the gap.
   b. Position the shroud over the flange at the top of the nacelle.
   c. Install screws (2).
4. Tighten screws (2, 3) to 10-20 **in-lbs** (1.1-2.3 Nm). Install fork lock plate (1).
5. Install chrome strip (6). Secure with flange nut (7). Tighten to 15-20 **in-lbs** (1.7-2.3 Nm).
6. Tighten acorn nuts to 72-108 **in-lbs** (8.1-12.2 Nm)
7. Connect headlamp.
8. Install headlamp assembly. Secure with eight screws (10). Tighten to 9-18 **in-lbs** (1.0-2.0 Nm).
9. Install headlamp door. Secure with screw. Tighten to 9-18 **in-lbs** (1.0-2.0 Nm).
10. **FLHP:**
    a. Install speedometer and bracket. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
    b. Install audio jack. Tighten securely.
11. Install the auxiliary/fog lamp bracket. Capture the clutch cable P-clamp on the upper left stud. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS.
12. Install windshield. See 2.41 WINDSHIELD: ROAD KING MODELS.

REMOVAL

FASTENER	TORQUE VALUE	
Fender, front, trim skirt screws/nuts	10-15 **in-lbs**	1.1-1.7 Nm
Fender, front, fender tip screws	20-25 **in-lbs**	2.3-2.8 Nm
Fender, front, mounting screws	16-20 ft-lbs	21.7-27.1 Nm
Fender, front, trim strip T-bolt nut	10-15 **in-lbs**	1.1-1.7 Nm
Fender, front, fender tip lamp nuts	20-25 **in-lbs**	2.3-2.8 Nm

1. See Figure 2-157. If equipped, remove outer fairing and disconnect fender tip lamp connector. See 7.12 FENDER TIP LAMPS.
2. Remove cable straps as necessary.
3. Draw connector housing down to fender area.
4. See Figure 2-158. Remove screws (1). Remove fender from motorcycle.

For fender repair, see Figure 2-159.

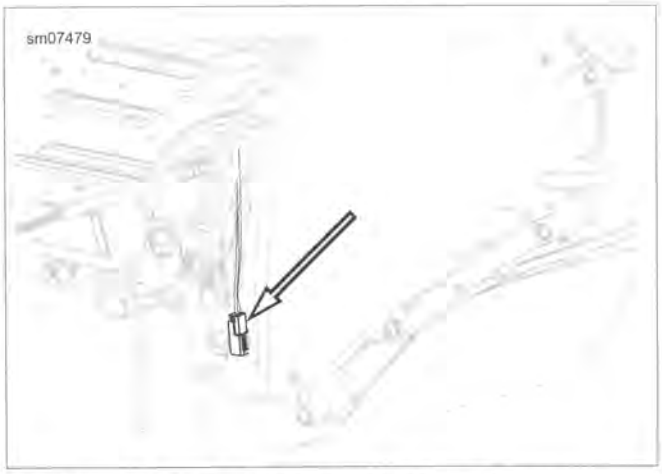
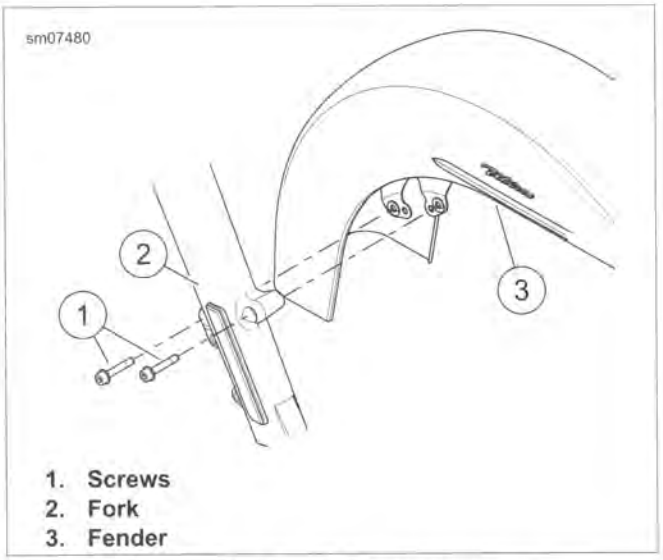


Figure 2-157. Front Fender Tip Lamp Connector



1. **Screws**
2. **Fork**
3. **Fender**

Figure 2-158. Front Fender Fasteners

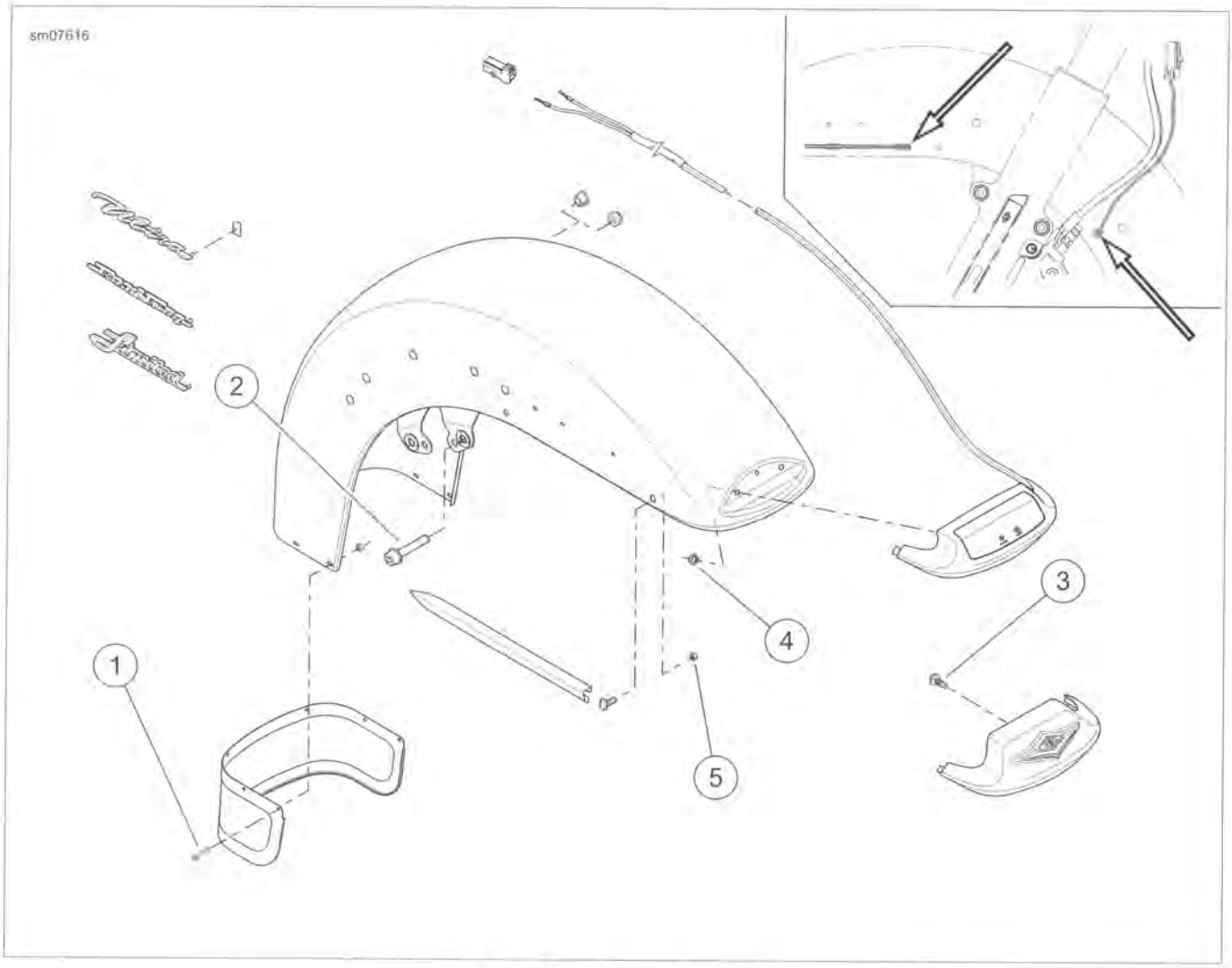


Figure 2-159. Front Fender

NOTE

Fender tip lamp wires route under the left trim strip, through rear oval hole into the fender cavity, then exit through grommet toward the rear of the fender. Tuck fender tip lamp wires between the fender mounting bracket and fender body. See 7.12 FENDER TIP LAMPS.

Table 2-19. Front Fender Faster Torque Values

ITEM	TORQUE	ITEM	TORQUE
1	10-15 **in-lbs** (1.1-1.7 Nm)	4	20-25 **in-lbs** (2.3-2.8 Nm)
2	16-20 ft-lbs (21.7-27.1 Nm)	5	10-15 **in-lbs** (1.1-1.7 Nm)
3	20-25 **in-lbs** (2.3-2.8 Nm)		

INSTALLATION

FASTENER	TORQUE VALUE	
Fender, front, attachment screws	16-20 ft-lbs	21.7-27.1 Nm

NOTES

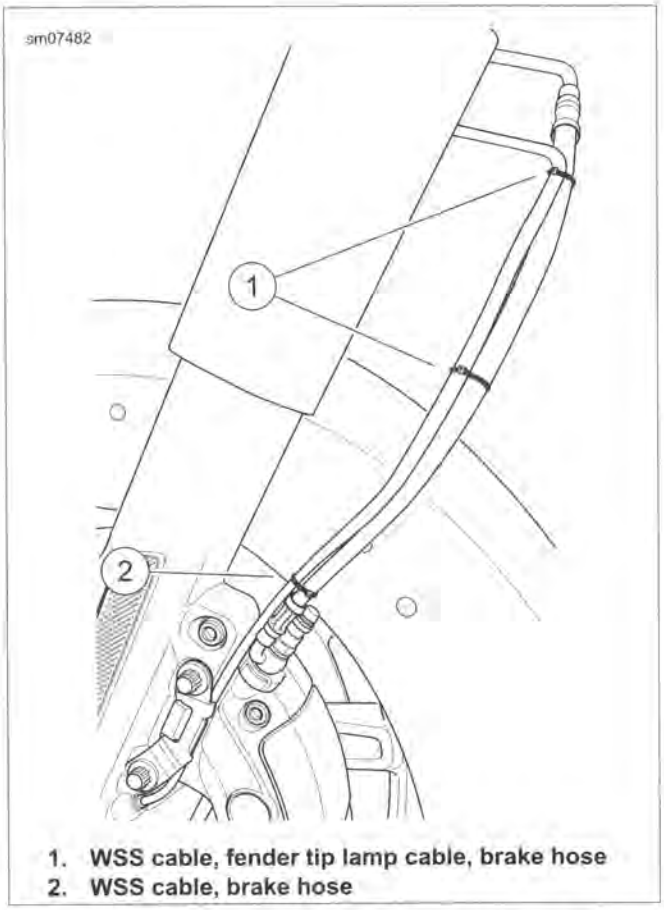
- *The contact area of the fork and fender mounting surfaces must be free from any paint or foreign substance. It must be metal-to-metal contact. Paint or debris in this area can result in loosening of fastener torque.*
- *If reusing the screws, apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to properly cleaned screws.*
- *If fender is being installed as part of a fork or wheel installation, tighten fender screws after all other components are installed.*

1. Install fender on fork sliders and start screws. Tighten to 16-20 ft-lbs (21.7-27.1 Nm).

NOTE

If fender appears twisted or misaligned, loosen screws and re-tighten.

2. See Figure 2-160. If equipped, connect fender tip lamp connector. Secure harness with two **new** cable straps (1). See 7.12 FENDER TIP LAMPS.
3. Install outer fairing.



1. **WSS cable, fender tip lamp cable, brake hose**
2. **WSS cable, brake hose**

Figure 2-160. Secure Cables and Brake Hose

REMOVAL

1. Remove seat. See 2.30 SEAT.
2. Remove saddlebags.
3. **All except FLHX/S:** See Figure 2-161. Disconnect rear lighting connector from front of fender. Release connector from fender.
4. **FLHX/S:** See Figure 2-162 and Figure 2-163. Remove shield and disconnect lights harness from rear fascia lamp. Release lights harness from retainers on left fascia and left saddlebag support casting.
5. If equipped, remove Tour-Pak and Tour-Pak support. See 2.33 TOUR-PAK.
6. Remove saddlebag supports and support castings. See 2.32 SADDLEBAG SERVICE.
7. See Figure 2-164. Remove fender mounting screws (7) from both sides. Fender will drop when screws are removed.
8. Carefully roll the fender back and out of the frame.

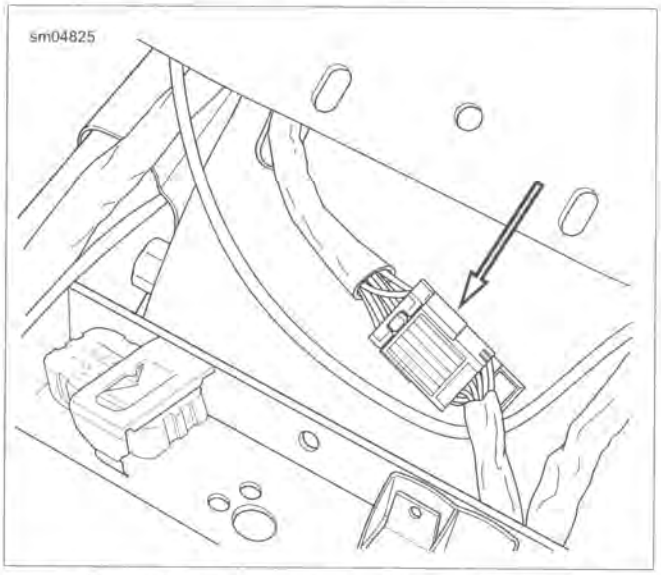


Figure 2-161. Rear Fender Lights Connector (models with under fender wiring)

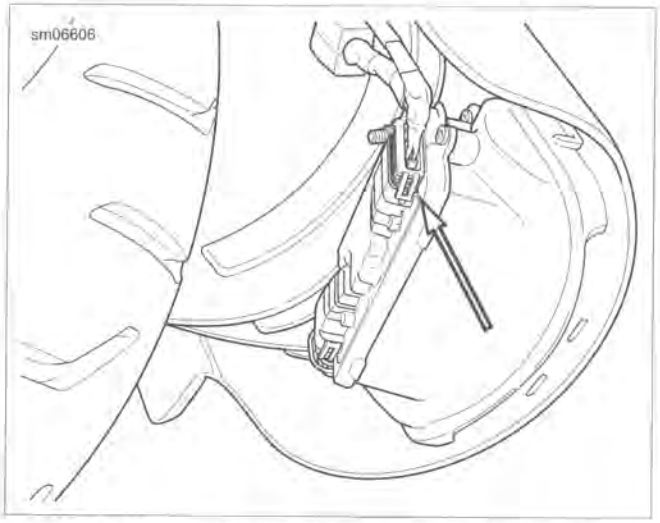
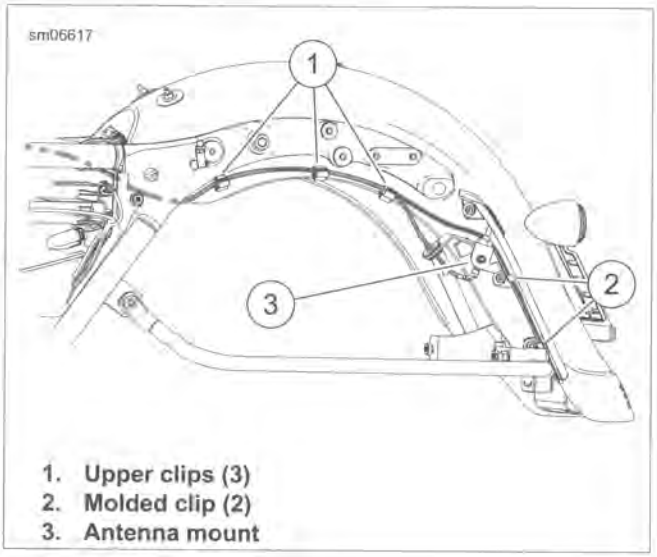
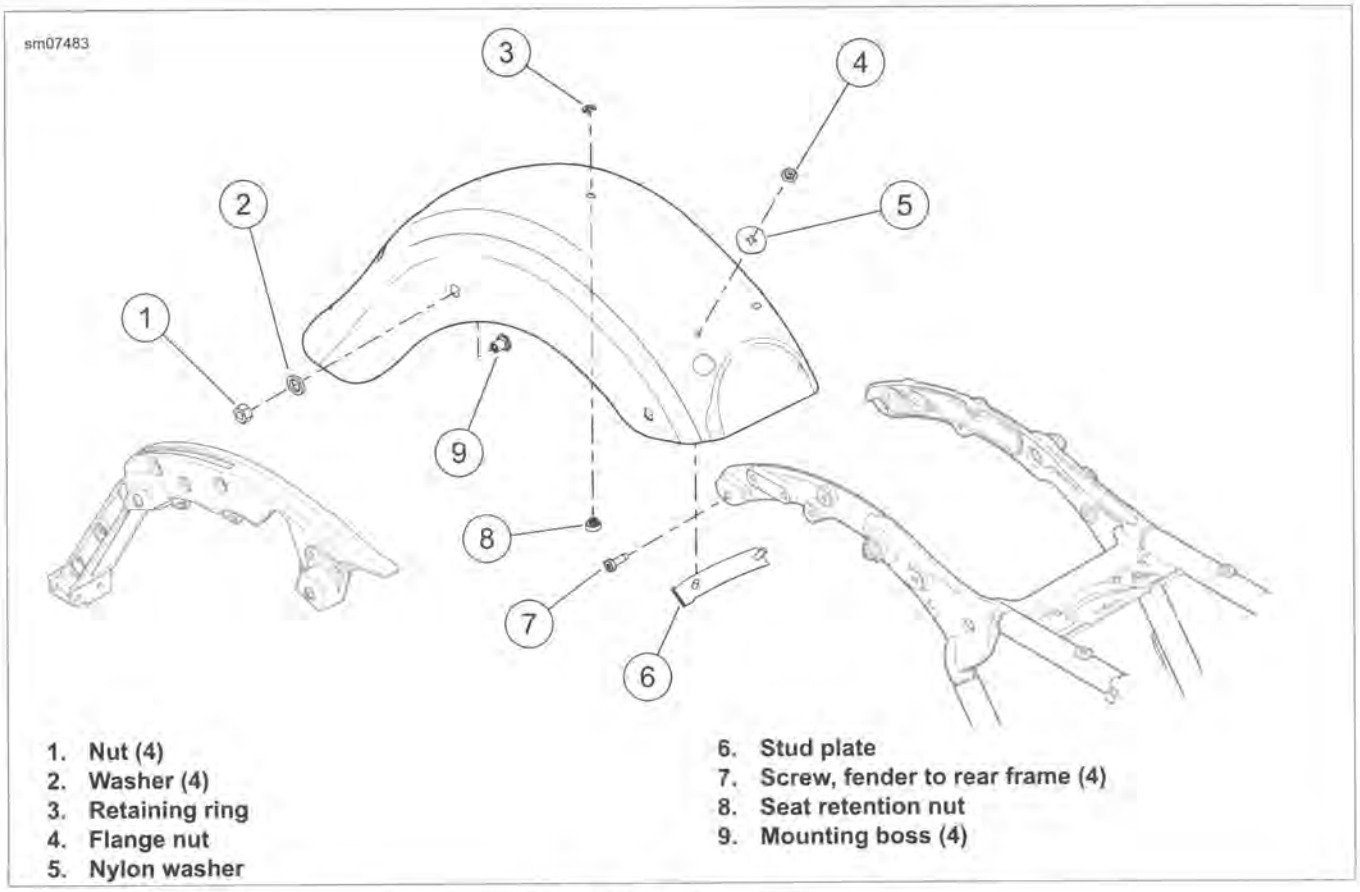


Figure 2-162. Rear Fender Lights Connector (FLHX/S)



1. **Upper clips (3)**
2. **Molded clip (2)**
3. **Antenna mount**

Figure 2-163. Rear Fender Lamps Harness and Antenna Cable: FLHX/S



1. **Nut (4)**
2. **Washer (4)**
3. **Retaining ring**
4. **Flange nut**
5. **Nylon washer**
6. **Stud plate**
7. **Screw, fender to rear frame (4)**
8. **Seat retention nut**
9. **Mounting boss (4)**

Figure 2-164. Rear Fender

FENDER REPAIR

FASTENER	TORQUE VALUE	
Fender, rear, mounting boss	15-20 ft-lbs	20.3-27.1 Nm
Fender, rear, stud plate	60-96 **in-lbs**	6.8-10.8 Nm

Mounting Hardware

1. See Figure 2-164. Remove nut (1), washer (2) and mounting boss (9).
2. Install **new** components as necessary. Tighten nut (1) to 15-20 ft-lbs (20.3-27.1 Nm)

Stud Plate

1. See Figure 2-164. Remove flange nuts (4).
2. Remove nylon washers (5) and stud plate (6).
3. Install **new** components as necessary. Tighten nuts (4) to 60-96 **in-lbs** (6.8-10.8 Nm).

Lights and Harnesses

All except FLHX/S: For service of the tail lights or harness, see 7.11 REAR LIGHTING.

FLHX/S: For service of the rear fascia or fascia lamp see 2.45 REAR FASCIA. For service of the tail lights or harness, see 7.11 REAR LIGHTING.

INSTALLATION

FASTENER	TORQUE VALUE	
Fender, rear, mounting screws	15-20 ft-lbs	20.3-27.1 Nm

1. Verify rubber cushion adhered to inside of each saddlebag support bracket is in place.
2. Carefully roll the fender into position.
3. **FLHX/S:** Verify the rear fender lights harness is routed below the front left fender screw location.
4. See Figure 2-164. Install four fasteners (7). Tighten to 15-20 ft-lbs (20.3-27.1 Nm).
5. Install saddlebag supports and support castings. See 2.32 SADDLEBAG SERVICE.
6. If equipped, install Tour-Pak support and Tour-Pak. See 2.33 TOUR-PAK.
7. **All except FLHX/S:** See Figure 2-161. Connect rear fender lights connector and secure anchor in rear fender hole.
8. **FLHX/S:** See Figure 2-162 and Figure 2-163. Secure harness in retainers on left fascia and left saddlebag support casting. Connect rear fender lights connector and install shield.

⚠WARNING

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

9. Install seat. See 2.30 SEAT.
10. Install saddlebags.

⚠WARNING

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

11. Verify rear lamp operation.

REMOVAL

1. Remove saddlebags.
2. See Figure 2-165. Remove six flange nuts (1).
3. Remove radio antenna mast.
4. Release rear lamps harness from molded clips on left side of fascia.
5. Remove shield (7). Disconnect rear lamps harness and tail lamp jumper from fascia lamp (8).
6. Loosen nut (5).
7. Spread top of fascia (2) and pull downward to release fascia from fender. Remove fascia lamp if necessary.

INSTALLATION

FASTENER	TORQUE VALUE	
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm
Fender, rear, support to fender nut	45-85 **in-lbs**	5.1-9.6 Nm
Rear fascia flange nuts	30-45 **in-lbs**	3.4-5.1 Nm

1. If removed, install fascia lamp. Tighten screws to 18-22 **in-lbs** (2.0-2.5 Nm).
2. See Figure 2-165. Insert flange at top of fascia between support (4) and fender. Tighten nut (5) to 45-85 **in-lbs** (5.1-9.6 Nm). Spread top of fascia to engage top studs.
3. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of each stud. Install flange nuts (1). Tighten to 30-45 **in-lbs** (3.4-5.1 Nm).
4. Secure rear lamps harness in molded clips of left fascia. Connect harness to fascia lamp. Connect tail lamp jumper to fascia lamp. Install shield (7).
5. Install radio antenna mast.
6. Install saddlebags.

STUD PLATE

FASTENER	TORQUE VALUE	
Fender, rear, support to fender nut	45-85 **in-lbs**	5.1-9.6 Nm
Saddlebag support to lower fender support fastener	15-20 ft-lbs	20.3-27.1 Nm

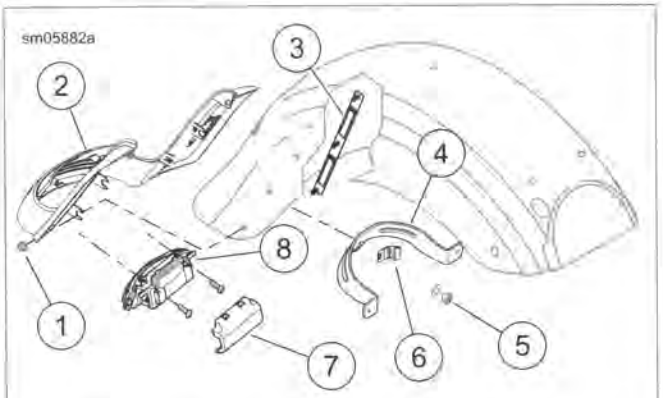
Removal

1. Remove rear wheel as necessary to gain access to fender well. See 2.5 REAR WHEEL.
2. See Figure 2-165. Remove rear fascia (2).
3. Remove screws and nuts securing fender support (4) to saddlebag support on both sides. Remove nut (5), flat washer and P-clamp (6). Remove support.

NOTE

Stud plates installed in production use adhesive strips as an assembly aid. Carefully work stud plate free using a small putty knife or gasket scraper.

4. Carefully pry stud plate (3) away from rear fender.



1. **Flange nut (6)**
2. **Fascia**
3. **Stud plate (2)**
4. **Fender support**
5. **Nut**
6. **P-clip**
7. **Shield**
8. **Fascia lamp**

Figure 2-165. Rear Fascia

Installation

1. See Figure 2-165. Install **new** stud plate (3).
2. Install fender support (4).
   a. Install P-clamp (6), washer and nut (5). Tighten to 45-85 **in-lbs** (5.1-9.6 Nm).
   b. Secure lower fender support to saddlebag support with screws and nuts. Tighten to 15-20 ft-lbs (20.3-27.1 Nm).
3. Install rear fascia. See 2.45 REAR FASCIA.
4. If removed, install rear wheel. See 2.5 REAR WHEEL.

REAR FASCIA LAMP

See 7.11 REAR LIGHTING for fascia lamp service.

REAR FRAME

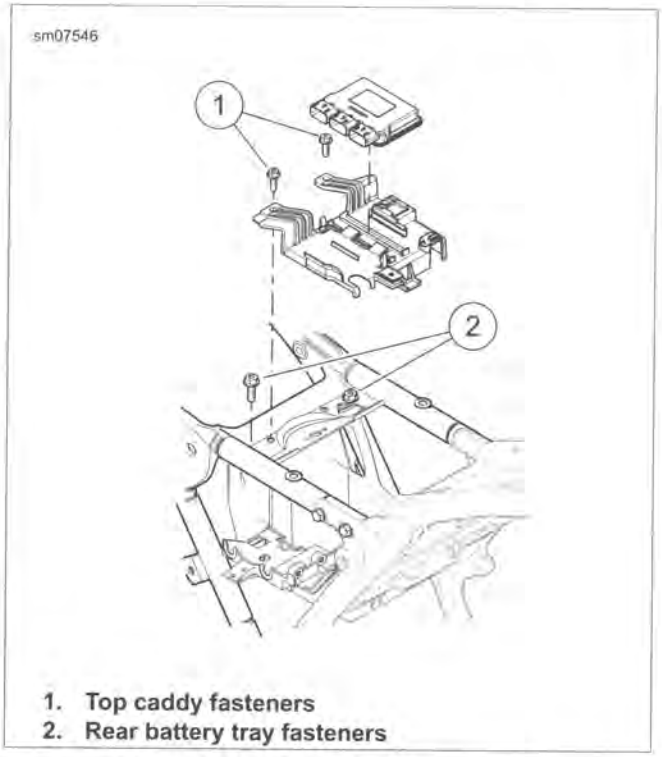
FASTENER	TORQUE VALUE	
Rear frame to main frame fastener	40-45 ft-lbs	54.2-61.0 Nm
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm
Top caddy screws	72-96 **in-lbs**	8.1-10.8 Nm

Removal

NOTICE

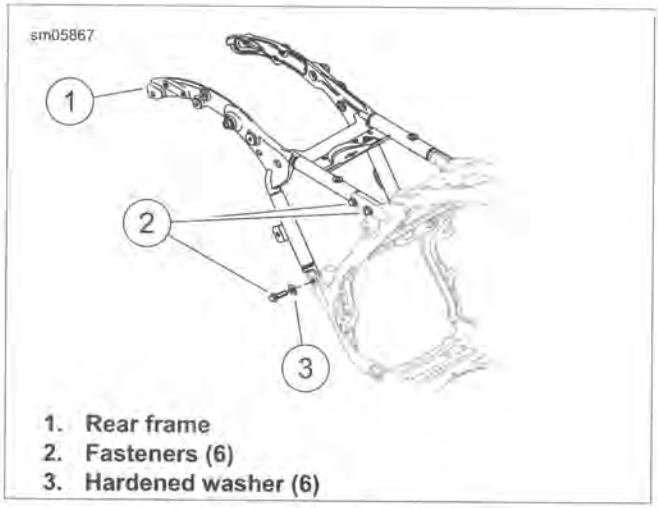
When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform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

1. Lift the motorcycle with suitable lifting device.
2. Remove the seat, top caddy and battery. See 1.22 BATTERY MAINTENANCE.
3. Cut cable straps securing harnesses to rear frame. Move harnesses aside. Record cable strap locations for assembly.
4. Remove Tour-Pak if equipped. See 2.33 TOUR-PAK.
5. Remove luggage rack, Tour-Pak support or spacers as equipped. See 2.33 TOUR-PAK, Tour-Pak Support.
6. Remove saddlebags, saddlebag supports and rear fender. See 2.44 REAR FENDER.
7. Remove shock absorbers. See 2.21 REAR SUSPENSION.
8. See Figure 2-166. Remove two rear battery tray fasteners (2).
9. Remove fastener securing left electrical caddy to rear frame.
10. See Figure 2-167. Remove six fasteners (2) and washers (3) securing the rear frame (1).
11. Remove rear frame.



1. **Top caddy fasteners**
2. **Rear battery tray fasteners**

Figure 2-166. Upper Caddy Fasteners



1. **Rear frame**
2. **Fasteners (6)**
3. **Hardened washer (6)**

Figure 2-167. Subframe

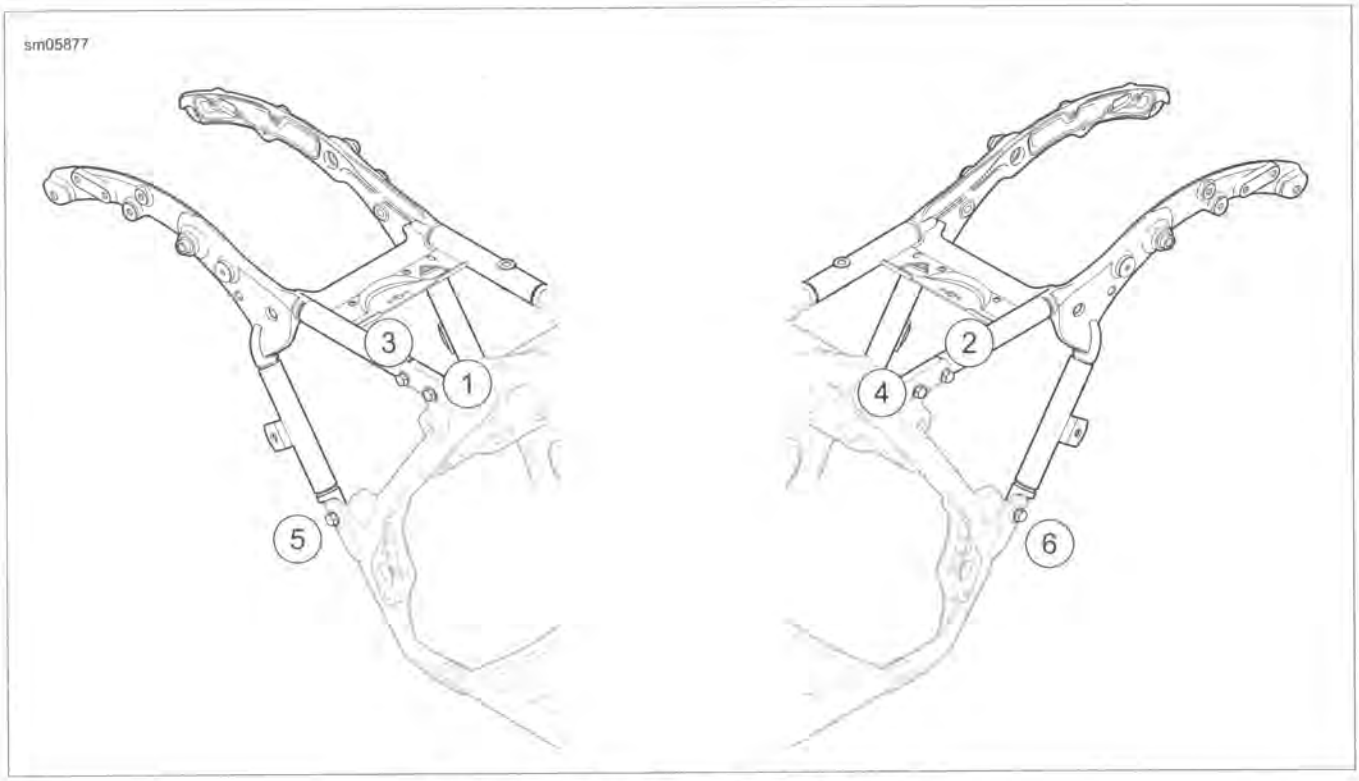


Figure 2-168. Rear Frame Torque Sequence

Installation

1. See Figure 2-167. Hold the rear frame in place and start two lower fasteners (2) and hardened washers (3). Install four remaining upper fasteners and hardened washers.
2. See Figure 2-168. Tighten rear frame fasteners in sequence shown to 40-45 ft-lbs (54.2-61.0 Nm).
3. Secure left electrical caddy to rear frame. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
4. See Figure 2-166. Secure upper battery tray to rear frame. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
5. Install shock absorbers. See 2.21 REAR SUSPENSION.
6. Install rear fender and saddlebag supports. See 2.44 REAR FENDER.
7. Install luggage rack, Tour-Pak support or spacers as equipped. See 2.33 TOUR-PAK, Tour-Pak Support.
8. Install Tour-Pak if equipped. See 2.33 TOUR-PAK.
9. Install battery. See 1.22 BATTERY MAINTENANCE.
10. See Figure 2-166. Install top caddy. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
11. Secure harnesses to rear frame with cable straps. Locate straps as noted during disassembly.

⚠WARNING

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

12. Install the seat.
13. Install the saddlebags.

Thread Repair

NOTES

- *Never re-tap the threaded holes in the rear frame to repair damaged threads. Always use the following procedure to provide repair.*
- *If more than one threaded hole is damaged on a given side, or if a thread repair has previously been done, the rear frame must be replaced. Never repair more than one hole per side.*

1. Remove the damaged fastener.
2. Drill out damaged threads. Install the appropriate size thread repair insert.
3. Install **new** fastener with hardened washer. Tighten to the specified torque.

RIDER FOOTBOARDS

FASTENER	TORQUE VALUE	
Footboard bracket screws, rider	36-42 ft-lbs	48.8-56.9 Nm
Footboard pivot bolt nut, rider	60-80 **in-lbs**	6.8-9.0 Nm

Removal

NOTICE

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

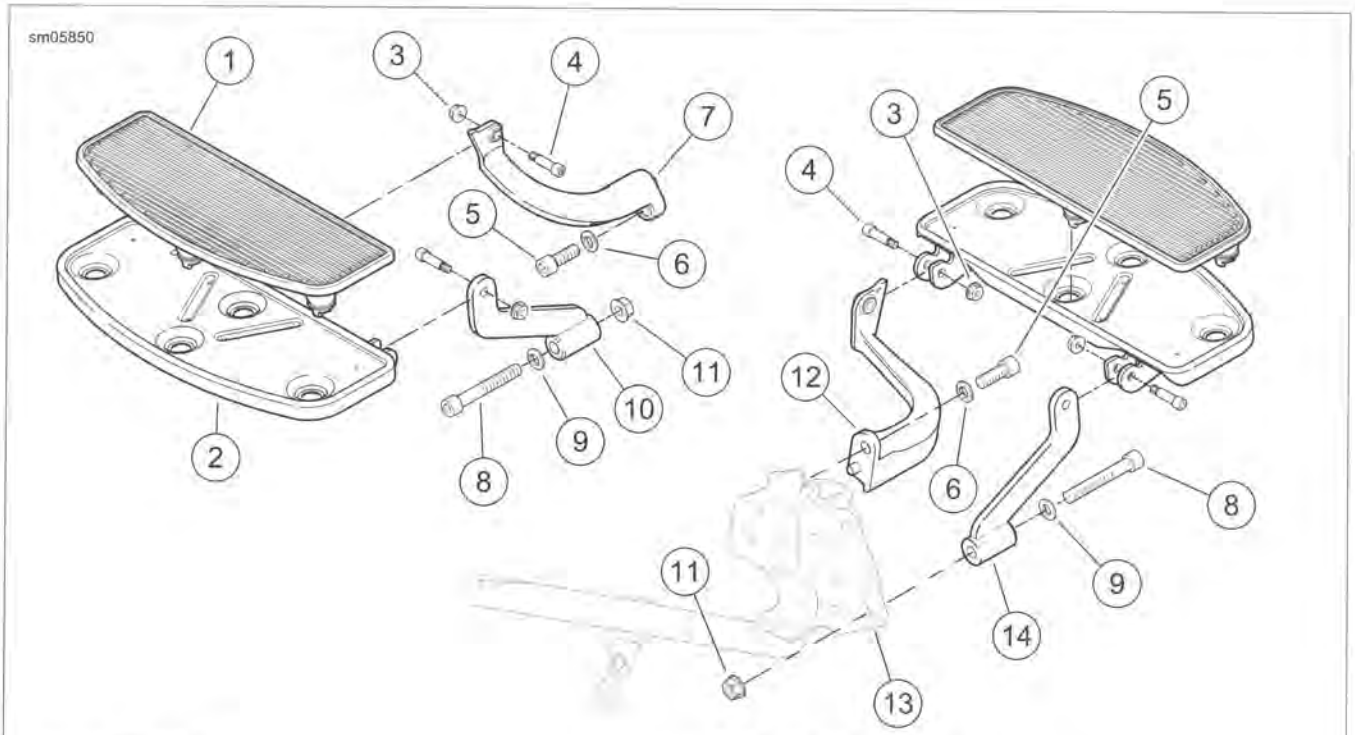
NOTE

Left side footboard fasteners also secure the jiffy stand bracket.

1. If removing left side footboard, support the motorcycle to remove weight from jiffy stand.
2. See Figure 2-169. Remove screw (5) and lockwasher (6).
3. Remove screw (8), lockwasher (9) and flange nut (11).
4. Remove footboard and bracket assembly from motorcycle.

Installation

1. See Figure 2-169. Install footboard and bracket assembly and secure with screws (5, 8), lockwashers (6, 9), and flange nut (11).
2. Tighten to 36-42 ft-lbs (48.8-56.9 Nm).



1. **Rubber pad**
2. **Footboard**
3. **Pivot screw nut (2)**
4. **Pivot screw (2)**
5. **Socket head screw, short**
6. **Lockwasher**
7. **Right rear bracket**
8. **Socket head screw, long**
9. **Lockwasher**
10. **Right forward bracket**
11. **Flange nut**
12. **Left rear bracket**
13. **Jiffy stand bracket**
14. **Left forward bracket**

Figure 2-169. Rider Footboards (Typical) (Quantities shown are for each footboard)

Disassembly

NOTE

If only replacing the rubber pad, refer to step 1 below and then see steps 3-4 under ASSEMBLY.

1. Tilt footboard upward. From bottom of footboard, use a large flat blade screwdriver to push four rubber anchors on pad up through holes in footboard.
2. See Figure 2-169. Remove nuts (3) and pivot screws (4) from underside of footboard.
3. Remove footboard from brackets.

Assembly

1. See Figure 2-169. Place footboard into position between brackets and install pivot screws (4) so that the nuts (3) will be on the inboard side.

NOTE

The bottom of FLHX footboards are stamped L(eft) or R(ight) to verify proper installation.

2. Install nuts (3) onto pivot screws. Tighten to 60-80 **in-lbs** (6.8-9.0 Nm).
3. Moisten four rubber anchors on bottom of **new** pad (1) with soapy water.
4. Place pad into position on footboard. From bottom of footboard, use pliers to pull rubber anchors through holes in footboard.

PASSENGER FOOTBOARD

FASTENER	TORQUE VALUE	
Footboard/footrest upper fastener, passenger	36-42 ft-lbs	48.8-56.9 Nm
Footboard/footrest lower fastener, passenger	48-72 **in lbs**	5.4-8.1 Nm

Removal

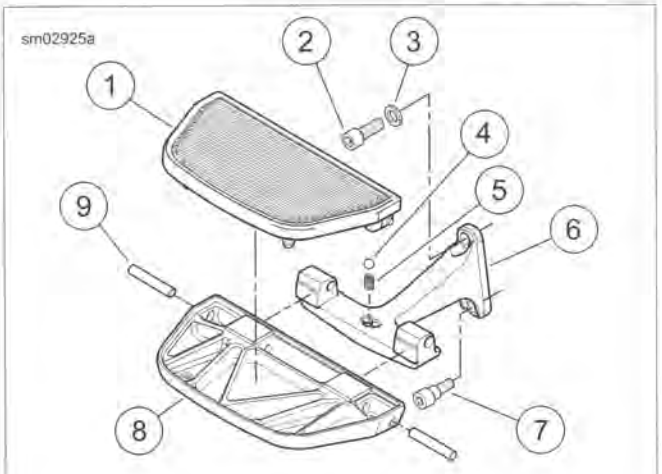
See Figure 2-170. Remove screw (2), lockwasher (3), screw (7) and footboard/bracket assembly from frame.

Disassembly

1. See Figure 2-170. Use a small flat blade screwdriver to push rubber beads on pad bottom through holes in footboard. Remove pad.
2. Using a brass drift and mallet, tap two pivot pins (9) toward center of footboard and remove.
3. Remove footboard from footboard bracket.
4. Remove steel ball (4) and spring (5).

Assembly

1. See Figure 2-170. Place spring (5) and ball (4) into hole in footboard bracket.
2. Place footboard into position on bracket and install pivot pins (9) from the outboard side. Using a brass drift and mallet, tap pins until centered in lugs of bracket.



1. **Rubber pad**
2. **Upper screw**
3. **Lockwasher**
4. **Steel ball**
5. **Spring**
6. **Footboard bracket**
7. **Lower screw**
8. **Footboard**
9. **Pivot pin (2)**

Figure 2-170. Passenger Footboard

3. Moisten rubber beads on pad with soapy water. Use needle nose pliers to pull rubber beads through holes in footboard.
4. Engage nubs on inboard corners of pad with holes in footboard.

Installation

NOTE

Passenger footboards can be installed to one of three positions. To install footboards in a new position, remove plastic plugs from holes in frame.

1. If reusing screws, apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of each screw.
2. See Figure 2-170. Secure bracket (6) with screw (2), lockwasher (3) and screw (7).
   a. Tighten upper screw (2) to 36-42 ft-lbs (48.8-56.9 Nm).
   b. Tighten lower screw (7) to 48-72 **in lbs** (5.4-8.1 Nm).

PASSENGER FOOTREST: FLHX/S

FASTENER	TORQUE VALUE	
Footrest pad screw (FLHX/S)	15-20 ft-lbs	20.3-27.1 Nm
Footrest mounting fastener	36-42 ft-lbs	48.8-56.9 Nm

Removal

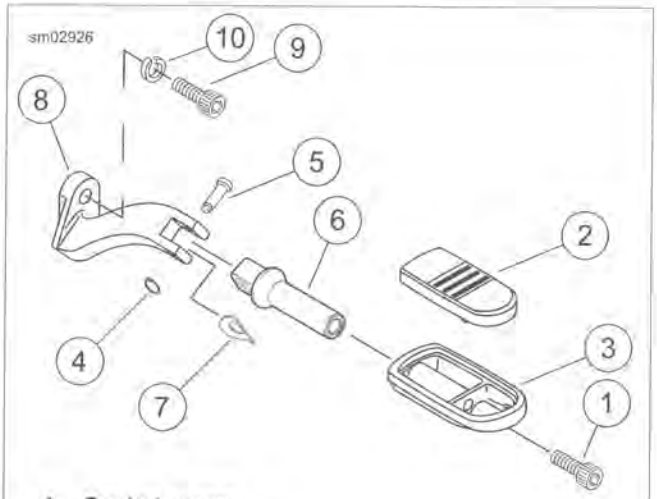
See Figure 2-171. Remove screw (9) and lockwasher (10) to remove footrest bracket from frame.

Disassembly

1. See Figure 2-171. Remove screw (1). Remove rubber pad (2) from footrest.
2. Remove footrest (3) from footrest mount.
3. Remove retaining ring (4) and pivot pin (5).
4. Remove footrest mount (6) and wave spring (7).

Assembly

1. See Figure 2-171. Holding wave spring (7) in place with concave side against bracket, install footrest with the rounded side of the pivot end up.
2. Install pivot pin and secure with **new** retaining ring.
3. Install footrest onto footrest mount and install rubber pad into footrest. Rotate footrest so that the rubber pad is topside.
4. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of screw (1) and install.
5. Tighten to 15-20 ft-lbs (20.3-27.1 Nm).



1. **Socket screw**
2. **Rubber pad**
3. **Footrest**
4. **Retaining ring**
5. **Pivot pin**
6. **Footrest mount**
7. **Wave spring**
8. **Footrest bracket**
9. **Socket screw**
10. **Lockwasher**

Figure 2-171. Passenger Footrest (FLHX/S)

Installation

1. Locate pin on footrest bracket into hole in frame.

NOTE

Passenger footrests can be installed to one of three positions. To install footboards in a new position, remove plastic plugs from holes in frame.

2. See Figure 2-171. Install screw (9) and lockwasher (10). Tighten screw to 36-42 ft-lbs (48.8-56.9 Nm).

GENERAL

⚠WARNING

The jiffy stand locks when placed in the full forward (down) position with vehicle weight on it. If the jiffy stand is not in the full forward (down) position with vehicle weight on it, the vehicle can fall over which could result in death or serious injury. (00006a)

⚠WARNING

Always park motorcycle on a level, firm surface. An unbalanced motorcycle can fall over, which could result in death or serious injury. (00039a)

LEG REMOVAL

⚠WARNING

Block or jack vehicle under frame in a way that the vehicle will not fall over. Failure to properly block and/or raise the vehicle could result in death or serious injury. (00462c)

NOTICE

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

1. Support the motorcycle to remove weight from the jiffy stand.
2. See Figure 2-174. Move jiffy stand to the full forward (down) position. Remove hex bolt (4), lockwasher (3), flat washer (2) and leg stop (5).
3. Swing leg forward beyond the normal down position and remove end of spring (9) from leg. Remove leg (8) from bracket. Remove other end of spring from frame weldment.
4. Inspect components for worn or damaged parts. Replace parts as necessary.

LEG INSTALLATION

FASTENER	TORQUE VALUE	
Jiffy stand leg stop hex screw	15-20 ft-lbs	20.3-27.1 Nm

1. Apply ANTI-SEIZE LUBRICANT to area of leg that rotates within the bracket.

NOTE

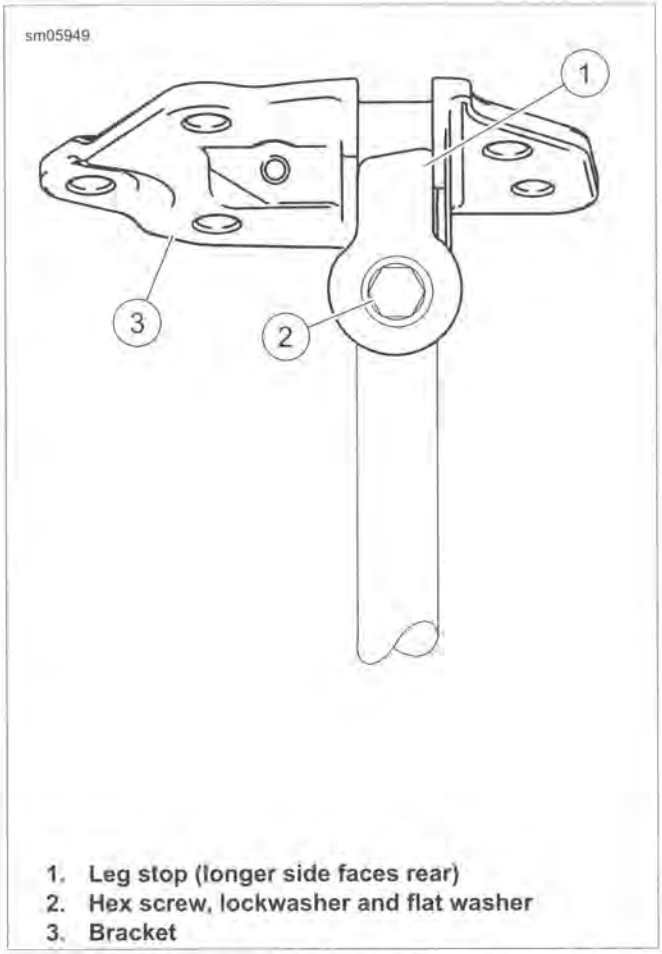
See Figure 2-173. Verify that end of spring enters hole from front of leg weldment. If end of spring enters hole from rear of weldment, spring coil will rub on leg when exercised.

2. Install end of spring into hole in frame weldment. Insert leg up through bracket. Swing leg forward beyond the normal down position and install other end of spring into hole in leg weldment.

⚠WARNING

If leg stop is incorrectly installed, excessive wear can allow vehicle to fall when rested on jiffy stand, which could result in death or serious injury. (00479b)

3. See Figure 2-172. Holding leg at the normal forward (down) position, install stop (1) with the stamped side down. Verify that the longer side of the stop faces the rear of the motorcycle.
4. Install flat washer, lockwasher and hex screw. Tighten to 15-20 ft-lbs (20.3-27.1 Nm).



1. **Leg stop (longer side faces rear)**
2. **Hex screw, lockwasher and flat washer**
3. **Bracket**

Figure 2-172. Leg Stop Orientation in Full Forward (Down) Position

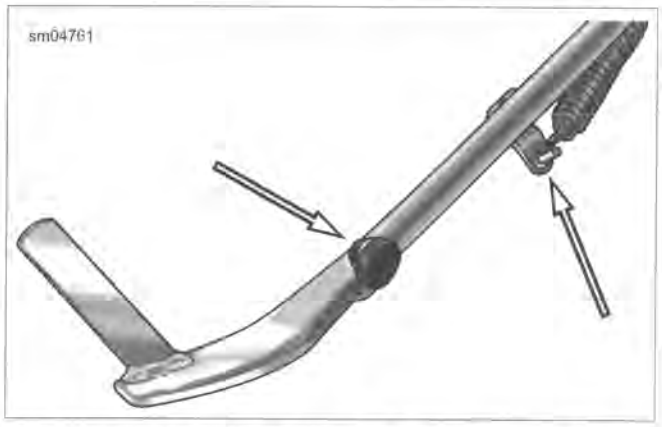


Figure 2-173. Rubber Stop and Spring Orientation

5. Extend and retract jiffy stand several times to verify proper operation. Jiffy stand should swing freely to the fully extended and fully retracted positions.
6. Remove support. Rest motorcycle on jiffy stand.

NOTE

See Figure 2-173. Verify that rubber stop is installed in hole of jiffy stand weldment to prevent damage to the painted finish.

JIFFY STAND BRACKET

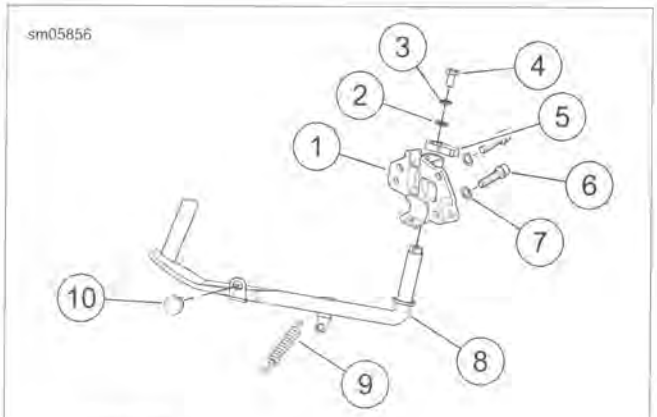
FASTENER	TORQUE VALUE	
Jiffy stand bracket fasteners	36-42 ft-lbs	48.8-57.0 Nm

Removal

NOTICE

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

1. Support motorcycle with suitable lifting device.
2. Remove left rider footboard and support brackets. See 2.47 FOOTBOARDS AND FOOTRESTS.
3. See Figure 2-174. Remove jiffy stand leg (8). See 2.48 JIFFY STAND, Leg Removal.
4. Remove two fasteners (6) and lockwashers (7) to release jiffy stand bracket from frame weldment.



1. **Bracket**
2. **Flat washer**
3. **Lockwasher**
4. **Bolt**
5. **Stop**
6. **Fastener (2)**
7. **Lockwasher (2)**
8. **Leg**
9. **Spring**
10. **Rubber stop**

Figure 2-174. Jiffy Stand Assembly

Installation

1. See Figure 2-174. Install two fasteners (6) and lockwashers (7) to secure front of bracket (1) to frame weldment.
2. Temporarily install footboard rear fastener to align rear of jiffy stand bracket but do not tighten.
3. Tighten front fasteners (6) to 36-42 ft-lbs (48.8-57.0 Nm).
4. Install footrest. See 2.47 FOOTBOARDS AND FOOTRESTS.
5. Install jiffy stand leg. See 2.48 JIFFY STAND, Leg Installation.

JIFFY STAND INTERLOCK SENSOR

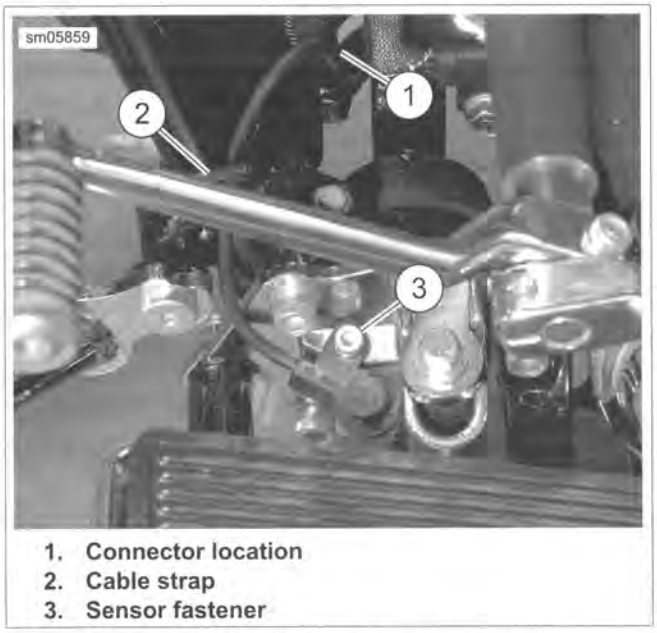
FASTENER	TORQUE VALUE	
Jiffy stand interlock sensor fastener	96-120 **in-lbs**	10.8-13.6 Nm

Removal

NOTE

See Figure 2-175. The sensor connector (1) is located below the voltage regulator.

1. Push anchor on sensor connector from hole in front frame cross member. Disconnect connector.
2. See Figure 2-175. Cut cable strap (2) to release cable.
3. Move jiffy stand to full forward (down) position.
4. Remove fastener (3). Pull sensor from jiffy stand bracket.



1. **Connector location**
2. **Cable strap**
3. **Sensor fastener**

Figure 2-175. Jiffy Stand Interlock Sensor

Installation

1. Move jiffy stand to full forward (down) position.
2. See Figure 2-175. Install sensor into bore of jiffy stand bracket.
3. If reusing fastener (3), apply a small dab of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads before installation. Install fastener. Tighten to 96-120 **in-lbs** (10.8-13.6 Nm).
4. Route connector and cable over top of frame weldment, staying rear of front frame down tube, and to area below voltage regulator.
5. Connect jiffy stand interlock sensor connector and push anchor into hole in front frame cross member.
6. Install **new** cable strap (2) to capture cable. Trim cable strap.

REMOVAL

1. Remove right lower fairing, if present. See 2.36 FAIRING LOWERS AND ENGINE GUARD.
2. Remove right side rider footboard. See 2.47 FOOTBOARDS AND FOOTRESTS.
3. Support the engine with a jack under the oil pan. Use a block of wood between the jack and the oil pan to distribute pressure.
4. Remove rear brake pedal from master cylinder and engine mount end cap. See 2.14 REAR BRAKE MASTER CYLINDER.
5. Remove rear master cylinder from engine mount end cap.
6. See Figure 2-176. Loosen, but do not remove, front engine mount fasteners (3).
7. Remove engine mounts.
   a. Remove nuts (7), washers (8) and engine mount bracket fasteners (6).
   b. Remove end cap fasteners (1) and end cap (2).
   c. Remove engine mount bracket (5) with attached engine mounts (4).
8. Remove front engine mount fasteners and engine mounts from engine mount bracket.

INSTALLATION

FASTENER	TORQUE VALUE	
Engine mount bracket to engine screws	36-40 ft-lbs	48.8-54.2 Nm
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm
Engine rubber mount screws, front	40-50 ft-lbs	54.2-67.8 Nm

NOTES

- *See Figure 2-176. Tapered end of engine mounts (4) face engine mounting bracket (5).*
- *Notches on engine mounts fit over tabs on engine mount bracket.*

1. Install engine mounts (4) to engine mount bracket (5). Verify the notches and tabs are aligned and install fasteners (3) finger-tight.
2. Fit left side engine mount into frame weldment on left side of motorcycle.
3. Install end cap (2) over right engine mount and secure with end cap fasteners (1) finger-tight.

NOTE

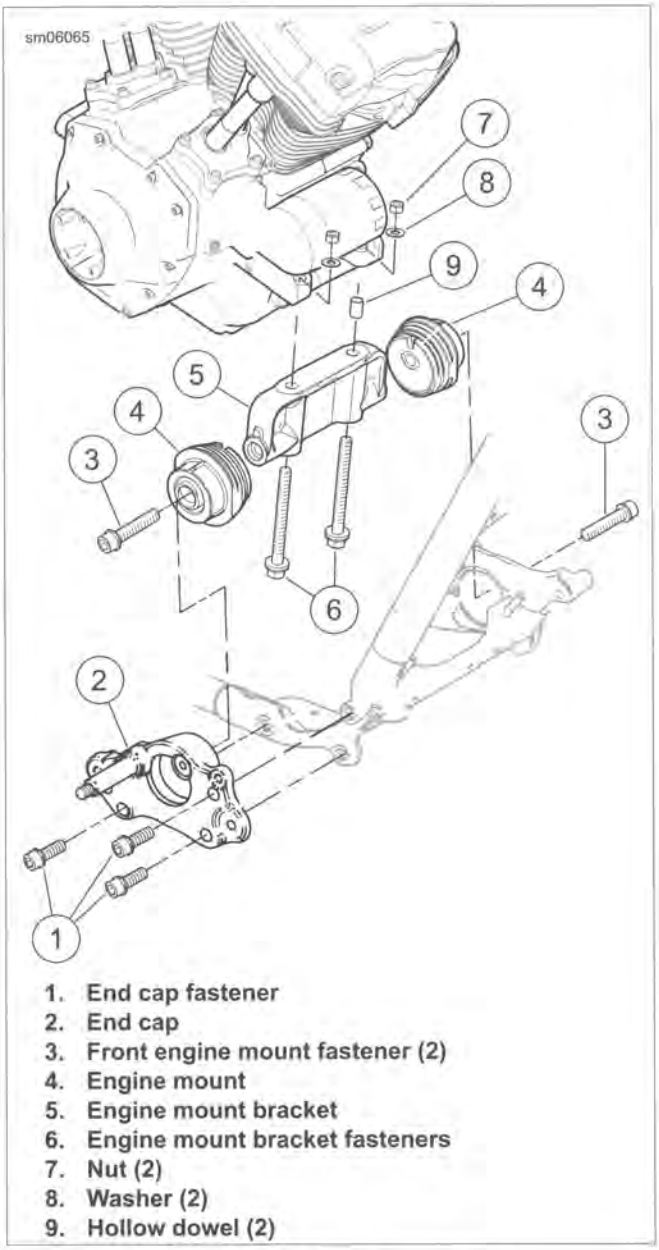
Verify hollow dowels (9) are engaged in the mount bracket (5) when installing fasteners (6).

4. Align engine mount bracket to engine and install fasteners (6).
5. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of nuts (7). Install washers (8) and nuts.

NOTE

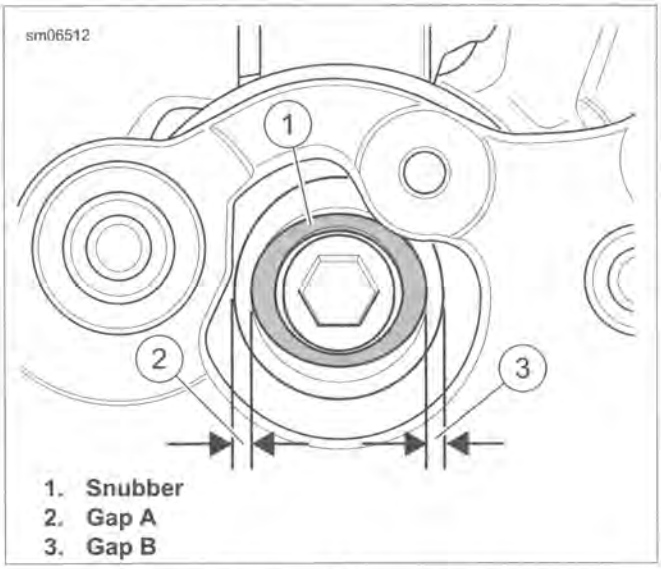
See Figure 2-177. Verify that the snubber (1) on each mount is centered fore and aft with gap A (2) and gap B (3) approximately equal. Vertical centering cannot be adjusted.

6. See Figure 2-176. Tighten engine mount bracket fasteners (6) to 36-40 ft-lbs (48.8-54.2 Nm). Verify engine mount snubbers are still centered and correct as necessary.
7. Tighten end cap fasteners (1) to 42-48 ft-lbs (56.9-65.0 Nm).
8. Tighten front engine mount fasteners (3) to 40-50 ft-lbs (54.2-67.8 Nm).
9. Install master cylinder and rear brake pedal. See 2.14 REAR BRAKE MASTER CYLINDER.
10. Install right side rider footboard. See 2.47 FOOTBOARDS AND FOOTRESTS.



1. End cap fastener
2. End cap
3. Front engine mount fastener (2)
4. Engine mount
5. Engine mount bracket
6. Engine mount bracket fasteners
7. Nut (2)
8. Washer (2)
9. Hollow dowel (2)

Figure 2-176. Front Engine Mount



1. Snubber
2. Gap A
3. Gap B

Figure 2-177. Front Mount Centering

MEDALLIONS, SERIALIZED BADGES AND TANK EMBLEMS 2.50

REMOVAL

1. Mark location of emblem with masking tape.

NOTE

Wear protective gloves.

2. Saw behind emblem with mono-filament fishing line or waxed dental floss to remove emblem.
3. Use 3M GENERAL PURPOSE ADHESIVE REMOVER to remove remaining foam backing tape and adhesive from mounting surface.

NOTE

For maximum bond, surface must be clean and dry.

4. Clean with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.

NOTE

Apply medallion within minutes of cleaning.

5. Allow to dry completely.

INSTALLATION

NOTES

- *Apply in ambient temperatures between 70-100 °F (21-38 °C).*
- *Do not remove protective film from adhesive until ready to apply.*
- *Do not bend emblem to fit contour of mounting surface.*

1. Test fit medallion in intended location.
   a. Check medallion against curve of mounting surface.
   b. Match left and right sides of fuel tank.

NOTES

- *Protect adhesive from grease, oil, dust, dirt and finger prints.*
- *Once applied, do not shift medallion.*
- *The adhesive bonds in 72 hours at room temperature.*

2. Remove protective film from back of medallion.
3. Apply even pressure across entire surface with palms and fingers of both hands. Hold in place for 15 seconds.
4. Wait 20 minutes before touching medallion.
5. Wait 24 hours before washing.

SUBJECT	PAGE NO.
3.1 FASTENER TORQUE VALUES	3-1
3.2 SPECIFICATIONS	3-3
3.3 SERVICE WEAR LIMITS	3-5
3.4 ENGINE OIL FLOW	3-7
3.5 OIL PUMP OPERATION	3-12
3.6 BREATHER OPERATION	3-14
3.7 OIL PRESSURE	3-15
3.8 TROUBLESHOOTING	3-17
3.9 OIL COOLER	3-19
3.10 OIL COOLER ADAPTER	3-20
3.11 HOW TO USE THIS SECTION	3-21
3.12 TOP END SERVICE	3-22
3.13 CAM COMPARTMENT SERVICE	3-24
3.14 STRIPPING MOTORCYCLE FOR SERVICE	3-26
3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE	3-27
3.16 REMOVING ENGINE FROM CHASSIS	3-28
3.17 INSTALLING ENGINE IN CHASSIS	3-29
3.18 TOP END OVERHAUL: DISASSEMBLY	3-30
3.19 BREATHER ASSEMBLY	3-36
3.20 ROCKER ARM SUPPORT PLATE	3-37
3.21 PUSHRODS, LIFTERS AND COVERS	3-40
3.22 CYLINDER HEAD	3-42
3.23 CYLINDER	3-52
3.24 PISTON	3-56
3.25 TOP END OVERHAUL: ASSEMBLY	3-60
3.26 CAM COMPARTMENT AND COMPONENTS	3-70
3.27 OIL PUMP	3-82
3.28 CRANKCASE DISASSEMBLY AND REPAIR	3-84
3.29 FLYWHEEL AND CONNECTING RODS	3-92
3.30 CRANKCASE ASSEMBLY	3-94
3.31 OIL PAN	3-96

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Breather assembly screws	120-156 **in-lbs**	13.6-17.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Cam chain tensioner fasteners	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam sprocket flange bolt, 1st torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam sprocket flange bolt, final torque	34 ft-lbs	46.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Crankcase pipe plugs	120-144 **in-lbs**	13.6-16.3 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Pipe Plug and Oil Fittings
Crankcase screws, 1st torque	120 **in-lbs**	13.6 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly/Loosen then final tighten
Crankcase screws, final torque	15-19 ft-lbs	20.3-25.8 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
Crankshaft sprocket bolt, 1st torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Crankshaft sprocket bolt, final torque	24 ft-lbs	32.5 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cylinder headbolts, 1st torque	120-144 **in-lbs**	13.6-16.3 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/ See procedure to tighten
Cylinder headbolts, 2nd torque	15-17 ft-lbs	20.3-23.0 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Cylinder headbolts, final torque	90 degrees	90 degrees	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Cylinder Studs
Cylinder torque plate bolts, 1st torque	120-144 **in-lbs**	13.6-16.3 Nm	3.23 CYLINDER, Inspection/ See procedure to tighten
Cylinder torque plate bolts, 2nd torque	15-17 ft-lbs	20.3-23.0 Nm	3.23 CYLINDER, Inspection
Cylinder torque plate bolts, final torque	90 degrees	90 degrees	3.23 CYLINDER, Inspection
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Engine stabilizer bracket to cylinder headbolts	30-35 ft-lbs	40.7-47.5 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	40.7-47.5 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Engine stabilizer link bolt	30-35 ft-lbs	40.7-47.5 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Engine stabilizer link bolt	30-35 ft-lbs	40.7-47.5 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Exhaust crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	3.31 OIL PAN, Installation

FASTENER	TORQUE VALUE		NOTES
Lifter cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Push-rods, Lifters and Covers
Main bearing, right, retaining screws	40-70 **in-lbs**	4.5-7.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Oil cooler mounting screws	20-22 ft-lbs	27.1-29.8 Nm	3.9 OIL COOLER, Installation
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm	3.10 OIL COOLER ADAPTER, Installation/Apply LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue)
Oil pan fasteners	132-156 **in-lbs**	14.9-17.6 Nm	3.31 OIL PAN, Installation/Torque sequence; LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) with used fasteners
Oil pan tapered plug	18-22 ft-lbs	24.4-29.8 Nm	3.31 OIL PAN, Installation/Apply LOCTITE 565 THREAD SEALANT
Oil pump screws, 1st torque	40-45 **in-lbs**	4.5-5.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Oil pump screws, final torque	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Piston jet screws	25-35 **in-lbs**	2.8-3.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Rocker arm support plate bolts	18-22 ft-lbs	24.4-29.8 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate
Rocker cover screws	15-18 ft-lbs	20.3-24.4 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Rocker housing bolts	120-168 **in-lbs**	13.6-19.0 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Secondary cam chain tensioner fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Camshafts
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	3.8 TROUBLESHOOTING, Compression Test
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure

SPECIFICATIONS

Table 3-1. Engine: Air-Cooled High Output Twin Cam 103

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-Type, air-cooled	
Compression ratio	9.6:1	
Bore	3.875 in	98.42 mm
Stroke	4.38 in	111.3 mm
Displacement	103.0 in^3	1690 cm^3
Lubrication system	Pressurized, dry sump with oil cooler	

Table 3-2. Engine: Twin-Cooled High Output Twin Cam 103

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-Type, Twin-Cooled™	
Compression ratio	10.0:1	
Bore	3.875 in	98.42 mm
Stroke	4.38 in	111.3 mm
Displacement	103.0 in^3	1690 cm^3
Lubrication system	Pressurized, dry sump	
Cooling system	Liquid-cooled cylinder heads with lower fairing-mounted radiators, electric pump and thermostat	

Table 3-3. Oiling System

OIL PUMP	DATA
Type	Twin gerotor, dual scavenge, crank mounted and driven, internal oil pump, dry sump
Pressure	30-38 PSI (207-262 kPa) at 2000 RPM and normal operating temperature of 230 °F (110 °C)
Filtration	5 micron media, filtered between pump and engine
Cooling: Twin Cam 103™	Thermostat controlled oil cooler (Air-cooled models only)

Table 3-4. Rocker Arms Specifications

ROCKER ARMS	IN	MM
Shaft fit in bushing (loose)	0.0005-0.0020	0.013-0.051
End clearance	0.003-0.013	0.08-0.33
Bushing fit in rocker arm (tight)	0.002-0.004	0.051-0.102

Table 3-5. Rocker Arm Shaft Specifications

ROCKER ARM SHAFTS	IN	MM
Shaft fit in rocker arm support plate (loose)	0.0007-0.0022	0.018-0.056

Table 3-6. Hydraulic Lifter Specifications

HYDRAULIC LIFTERS	IN	MM
Fit in crankcase (loose)	0.0009-0.0026	0.002-0.066

Table 3-7. Cylinder Head Specifications

CYLINDER HEAD	IN	MM
Valve guide in head (tight)	0.0022-0.0033	0.051-0.084
Valve seat in head (tight)	0.003-0.0045	0.076-0.114
Valve stem protrusion (min)	2.022	51.36
Head gasket surface (flatness)	0-0.006	0-0.152

Table 3-8. Valve Specifications

VALVES	IN	MM
Exhaust: fit in guide	0.001-0.003	0.0254-0.0762
Intake: fit in guide	0.001-0.003	0.0254-0.0762
Seat width	0.040-0.062	1.02-1.58
Stem protrusion from cylinder head boss	2.012-2.032	51.10-51.61

Table 3-9. Valve Springs Specifications

VALVE SPRINGS	IN	MM
Closed	135 lbs @ 1.850 in.	61.2 kg @ 47.0 mm
Open	312 lbs @ 1.300 in.	141.5 kg @ 33.0 mm
Free length	2.325 in.	59.1 mm

Table 3-10. Piston: Twin Cam 103

PISTON		IN	MM
Fit in cylinder (loose)		0.0014-0.0025	0.036-0.064
Piston pin fit (loose)		0.0002-0.0005	0.005-0.013
Ring end gap	Top compression	0.012-0.022	0.305-0.559
	2nd compression	0.015-0.025	0.381-0.635
	Oil control ring	0.010-0.050	0.254-1.270
Ring side clearance	Top compression	0.0012-0.0037	0.030-0.094
	2nd compression	0.0012-0.0037	0.030-0.094
	Oil control rails	0.0031-0.0091	0.079-0.231

Table 3-11. Connecting Rod Specifications

CONNECTING ROD	IN	MM
Piston pin fit (loose)	0.0007-0.0012	0.018-0.030
Side play between flywheels	greater than 0.005	greater than 0.13
Connecting rod to crankpin (loose)	0.0004-0.0017	0.0102-0.0432

Table 3-12. Flywheel Specifications

FLYWHEELS	IN	MM
Runout (shaft measured in case)	0.000-0.010	0.0-0.254
Runout (measured in truing stand)	0.000-0.004	0.0-0.102
End play	0.003-0.013	0.076-0.330

Table 3-13. Crankshaft/Sprocket Shaft Bearing Specifications

CRANKSHAFT/SPROCKET SHAFT BEARINGS	IN	MM
Roller bearing fit (loose)	0.0002-0.0015	0.005-0.038
Bearing fit in crankcase (tight)	0.0038-0.0054	0.097-0.137
Bearing inner race on crankshaft (tight)	0.0004-0.0014	0.010-0.036

GENERAL

Wear limits are given here as a guideline for measuring used engine components. Replace components when they exceed values listed here.

Table 3-14. Rocker Arm/Rocker Arm Shaft

ROCKER ARM/ROCKER ARM SHAFT	REPLACE IF WEAR EXCEEDS	
	IN	MM
Shaft fit in bushing (loose)	0.0035	0.089
End clearance	0.025	0.635
Shaft fit in rocker arm support (loose)	0.0035	0.089

Table 3-15. Hydraulic Lifter

HYDRAULIC LIFTER	REPLACE IF WEAR EXCEEDS	
	IN	MM
Fit in crankcase	0.006	0.152
Roller fit	0.0015	0.038
Roller end clearance	0.022	0.559

Table 3-16. Cam Support Plate

ITEM	REPLACE IF WEAR EXCEEDS	
	IN	MM
Cam chain tensioner shoe thickness	0.060 min.	1.52 min.
Crankshaft bore maximum ID	0.8545	21.704
Camshaft bore	1.1023	27.998
Flatness	0.010	0.25

Table 3-17. Oil Pump

OIL PUMP	REPLACE IF WEAR EXCEEDS	
	IN	MM
Rotor tip clearance	0.004	0.10
Rotor thickness variation	0.001	0.025
Rotor protrusion (pump assembled)	0.015-0.025	0.38-0.64

Table 3-18. Cylinder Head

CYLINDER HEAD	REPLACE IF	
	IN	MM
Valve guide press fit in head	Less than 0.002	Less than 0.05
Valve seat press fit in head	Less than 0.002	Less than 0.05
Valve seat width (max)	0.062	1.57
Valve margin (min)	0.031	0.80
Valve stem protrusion (max)	2.069	52.55
Head warpage (max)	0.006	0.15

Table 3-19. Cylinder

CYLINDER	REPLACE IF WEAR EXCEEDS	
	IN	MM
Taper	0.002	0.051
Out of round	0.002	0.051
Warpage of gasket surfaces: top	0.006	0.152
Warpage of gasket or O-ring surfaces: base	0.004	0.102

Table 3-20. Cylinder Bore (Twin Cam 103)

ITEM	REPLACE IF WEAR EXCEEDS	
	IN	MM
Standard	3.877	98.48
0.005 in oversize	3.882	98.60
0.010 in oversize	3.887	98.73

Table 3-21. Piston

PISTON		REPLACE IF WEAR EXCEEDS	
		IN	MM
Fit in cylinder (loose)		0.003	0.076
Piston pin fit (loose)		0.0008	0.020
Ring end gap	Top compression	0.030	0.762
	2nd compression	0.034	0.864
	Oil control rails	0.050	1.27
Ring side clearance	Top compression	0.0045	0.114
	2nd compression	0.0045	0.114
	Oil control rails	0.010	0.254

Table 3-22. Connecting Rod

CONNECTING ROD	REPLACE IF WEAR EXCEEDS	
	IN	MM
Piston pin fit (loose)	0.002	0.051
Fit on crankpin (loose)	0.002	0.051

Table 3-23. Breather Assembly

BREATHER ASSEMBLY	REPLACE IF WEAR EXCEEDS	
	IN	MM
Breather cover warpage	0.005	0.13
Breather baffle warpage	0.005	0.13

Table 3-24. 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 3-25. 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 3-26. 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

OIL FEED

NOTE

The oiling system is carefully designed for optimum efficiency. All oil holes and passageways are specially sized. Avoid enlarging oil holes during cleaning. Any modification of the oiling system will adversely affect oil pressure or cooling and lubrication efficiency.

Two illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Top end oil flow is shown in Figure 3-2.

Oil flows from the oil pan through an internal passageway at the front of the transmission housing, and enters the lower passageway (A1) cast into the rear right side of the crankcase.

Oil exits a hole in the crankcase flange (B2). It then enters a hole on the inboard side of the cam support plate. Passing through a channel in the cam support plate (A3), oil enters the feed side of the oil pump. See 3.5 OIL PUMP OPERATION. The feed gerotors of the pump direct the flow up a second channel in the cam support plate (A4).

A passage in this channel connects to a pressure relief valve mounted in the bypass port of the cam support plate (A5). When the oil pressure exceeds the setting of the relief valve spring 35 psi (241.3 kPa), the orifice opens to bypass excess oil back to the feed side of the pump (A3).

Oil not returned to the oil pump feed side exits a hole on the inboard side of the cam support plate. Oil then flows through a hole in the crankcase flange (B6). Oil flows through a passageway in the crankcase and exits the lower off-center hole in the oil filter mount (D8). The oil pressure sending unit (B7) is also connected to this passage.

After circulating through the oil filter, the flow is directed back into the crankcase through the center hole in the oil filter mount (D9). Exiting a passageway in the crankcase through a hole in the crankcase flange (B10), the flow of oil reenters the cam support plate.

Filtered oil is then routed to the top and bottom ends of the engine as described in 3.4 ENGINE OIL FLOW, Top End and 3.4 ENGINE OIL FLOW, Bottom End which follow.

TOP END

Two illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Top end oil flow is shown in Figure 3-2.

Oil passes through a channel in the cam support plate. It exits on the crankcase side through two holes near the top (A11, A12). Oil enters two holes in the crankcase flange (B13, B14). One passage leads to the front cylinder and the other to the rear cylinder. Oil then travels through passageways in the crankcase to the hydraulic lifter bores (D15).

Oil enters each lifter bore through oblong holes (E16), flows around the lifter and enters a hole at the side of the lifter body. As the chamber inside the lifter body is filled, the pushrod socket rises to eliminate lash of the valve train components.

Oil then exits a hole centered in the lifter socket and flows up the hollow pushrods.

NOTE

An additional round hole (E17) drilled into the lifter bores feed oil to the piston jets.

Exiting holes at the top of the pushrods, oil enters the rocker arms lubricating the rocker arm bushings. Oil flows along the rocker arm shafts and exits a pin hole in the outboard side of each rocker arm (F18). This oil lubricates the valve springs and the top of the valve stem.

Oil runs to the low side of the rocker housing and enters the exhaust valve spring pocket. A drain hole (G19) leads to a passageway in the cylinder head casting.

Oil exits the bottom of the cylinder head and passes through a dowel pin (H20) on the cylinder flange. Oil flows through a vertical passageway in the cylinder. It then passes through a second dowel pin on the cylinder deck (I21) and enters the left crankcase half.

Flowing through a horizontal passageway in the left crankcase half (J22), oil runs through a third dowel pin (K23) to the right crankcase half. Finally it travels through another passageway before emptying into the cam compartment (B23, B24).

Oil collecting in the cam compartment is picked up by one of two scavenge lobes on the oil pump (B25).

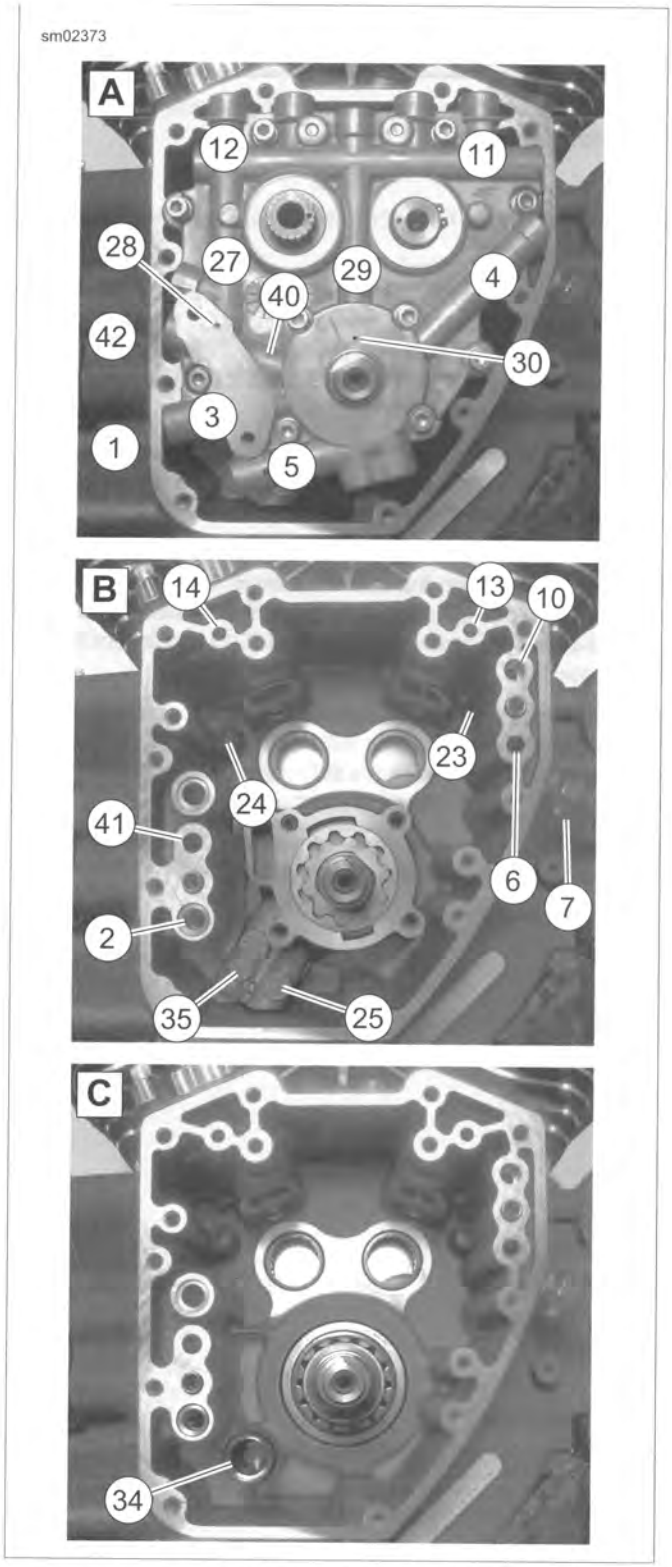


Figure 3-1. Engine Oil Flow: Cam Support Plate/Right Crankcase Half

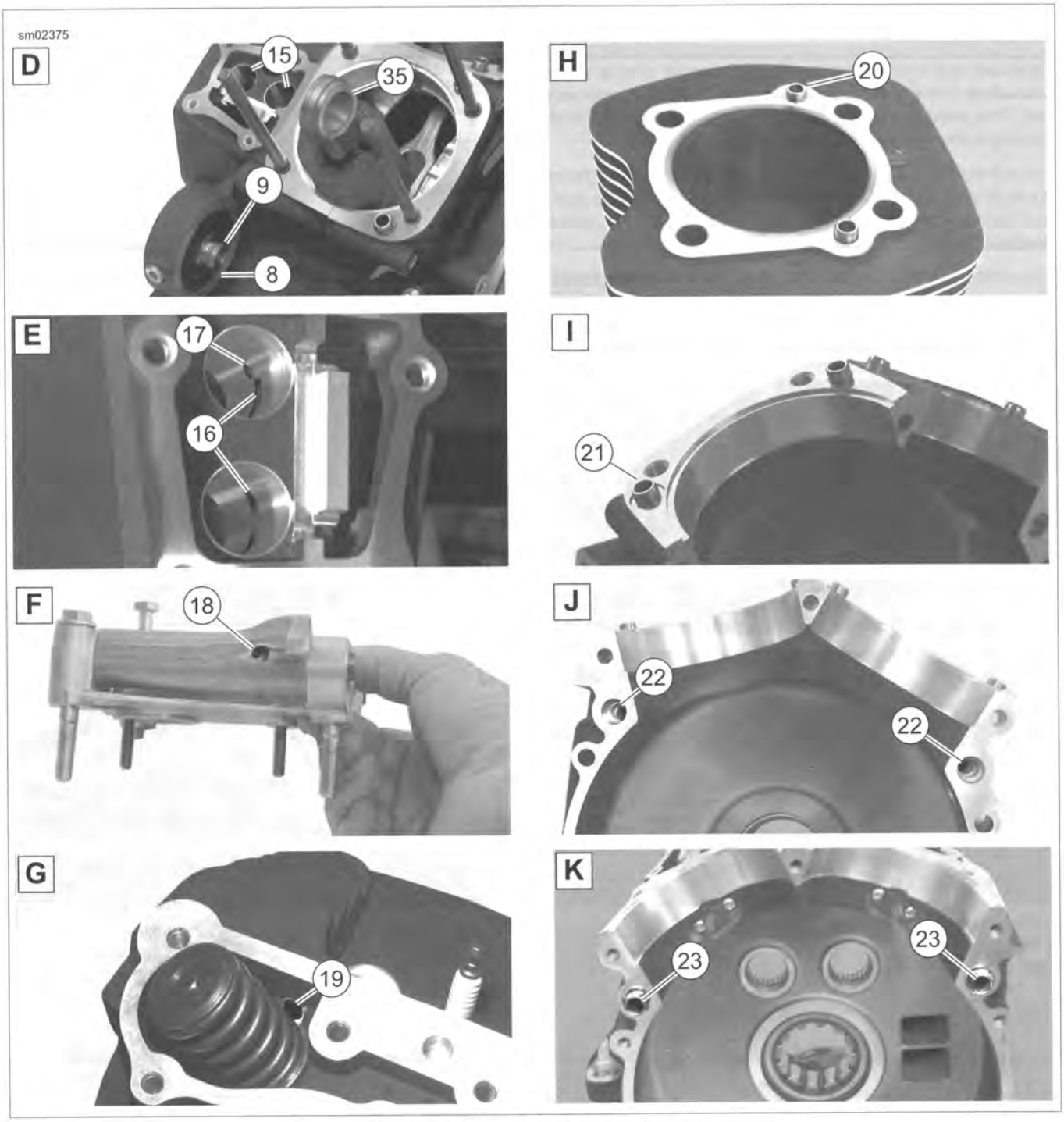


Figure 3-2. Engine Oil Flow: Top End

BOTTOM END

Three illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Top end oil flow is shown in Figure 3-2.
- Bottom end oil flow is shown in Figure 3-3.

Oil traveling through the horizontal passage (A11-A12) at the top of the cam support plate (en route to the cylinders) also passes through a hole at the top of each camshaft bore. This oil lubricates the journals of the plain bearing cams. Some oil flowing to the rear cylinder sprays through a pin hole to lubricate the secondary cam chain.

Oil to the rear cylinder also travels down the vertical passage (A27) at the rear of the cam support plate. This oil exits a hole on the outboard side to supply oil to the primary cam chain tensioner (A28).

The flow of oil in the vertical passage (A29) at the center of the cam support plate passes through a hole on the inboard side. This supplies oil to the secondary cam chain tensioner. Oil also sprays through a pin hole (A30) to lubricate the primary cam chain. Oil then flows through a hole in the crankshaft bushing where it enters a passage in the crankshaft (L31).

Oil flows through the center of the crankshaft and through a cross passage into the right side of the flywheel. Oil enters the

crank pin and exits through three holes to lubricate the lower rod bearing set.

Oil splash and mist created by flywheel rotation lubricates the crankshaft and the camshaft bearings in the right crankcase half. This same action serves to lubricate the sprocket shaft bearing in the left crankcase half (M32).

Since the oil mist also lubricates the cylinder walls, three holes on each side of the piston (in the area of the third ring land) evacuate excess oil scraped from the walls on the piston downstroke.

The piston jets (N33) receive oil from the intake lifter bores. They spray the underside of the piston for cooling of the piston crown and skirt area. A check valve in each jet opens only when the oil pressure reaches 12-18 psi (82.7-124.1 kPa), at which point the engine is operating above idle speed. Oil pressure at idle speeds will be 9-12 psi (62.1-82.7 kPa). At this pressure the valve remains closed to prevent over oiling and to provide proper system operating pressure.

Oil spray from each piston jet also enters a hole at the bottom of each pin boss (O34) to lubricate the piston pin. The spray also allows a portion of the oil to reach the upper rod bushing (D35).

Surplus oil falls back to the bottom of the flywheel compartment where it collects in the sump area (P36). Oil in the sump is drawn to the scavenge side of the oil pump (B35) through an internal channel (P37, C34).

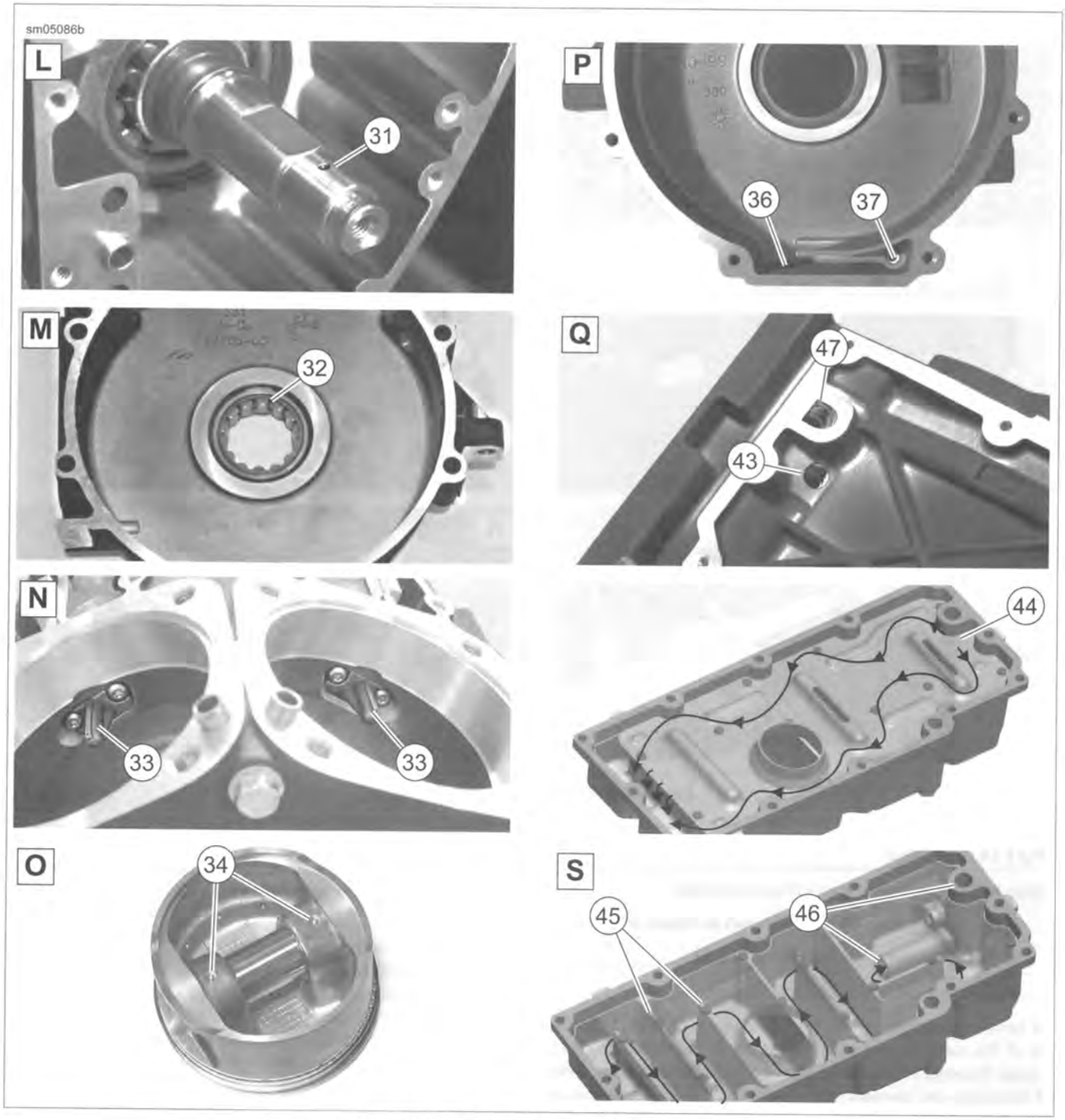


Figure 3-3. Engine Oil Flow: Bottom End

OIL RETURN

Two illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Bottom end oil flow is shown in Figure 3-3.

The "dual kidney" designation given to the oil pump refers to its two scavenging functions, whereby it simultaneously draws oil from both the cam and flywheel compartments.

Oil sucked up by the scavenge lobes passes through the scavenge gerotors of the oil pump and is directed through a return channel in the cam support plate (A40). See 3.5 OIL PUMP OPERATION.

Exiting a hole on the inboard side of the cam support plate, oil enters the upper hole in the crankcase flange (B41).

Oil flows through the upper passageway in the crankcase (A42), enters a passageway at the front of the transmission housing and empties into the oil pan (Q43) onto the front of the baffle plate (R44).

Oil flows to the rear of the oil pan along the top of the baffle plate. It then drops from the open end of the baffle plate into the oil pan where it is redirected forward. The baffles (S45) cast into the oil pan slow the circulation of the oil through the pan to enhance cooling.

Oil pickup occurs in the front compartment of the baffle where a passageway in the casting (S46) directs the flow upward. Passing through a second passageway in the transmission housing (Q47), the flow of oil enters the lower passageway in the crankcase (A1) to repeat the circuit.

OIL COOLER OPERATION

NOTE

Models equipped with Twin-Cooling do not use an oil cooler.

The flow of oil to the cooler is controlled by a thermostat in an adapter located between the oil filter and the filter mount.

Pressurized oil flows from the oil filter mount into a passage in the oil cooler adapter. The thermostat is located between the supply and return ports of the adapter. It consists of a temperature sensitive element compressed between a spring and a threaded plug.

When the engine oil temperature is below 200 °F (93 °C), the thermostat is open. This allows the largest percentage of oil to pass from the supply port to the return port. From the return port, oil flows to the oil filter. A smaller percentage flows through the oil cooler.

When oil temperature exceeds 200 °F (93 °C), the thermostat closes. This causes all the oil to flow to the oil cooler. Oil circulates through the finned tubes of the cooler to dissipate heat. Oil then returns to the cooler adapter through a return hose.

The oil is then filtered before returning to the crankcase.

NOTE

Regardless of whether the thermostat is closed or open, oil is ***always*** *pressurized in the oil cooler adapter, the oil cooler supply hose, the oil cooler and the oil return hose.*

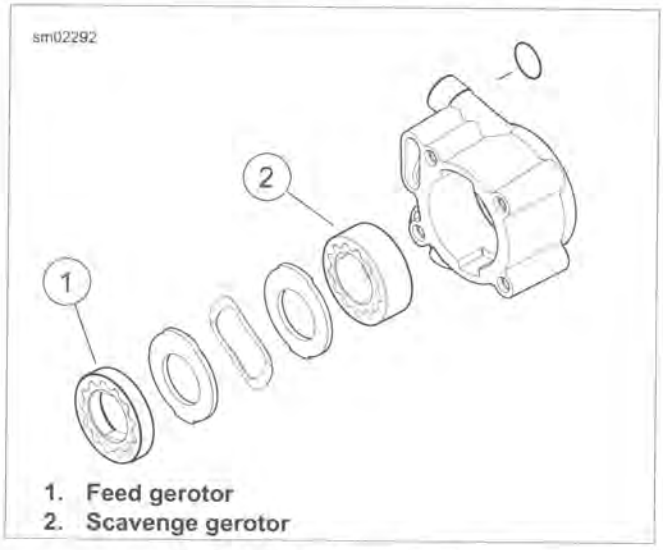
Check the oil cooler fins for dirt and debris at every service interval.

GENERAL

See Figure 3-4. The oil pump has two gerotor gear sets driven by the crankshaft.

- The feed gerotor set distributes oil to the engine.
- 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. Also, the inner gerotor has one less tooth.

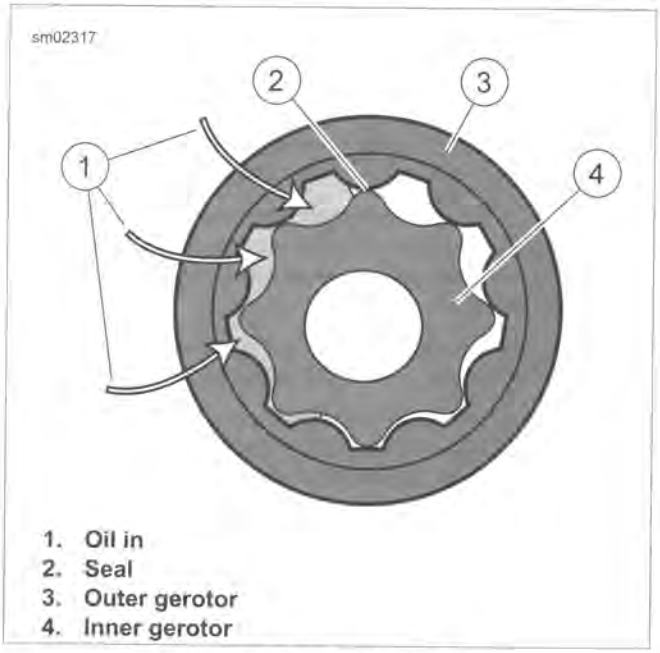


1. Feed gerotor
2. Scavenge gerotor

Figure 3-4. Oil Pump Gerotors

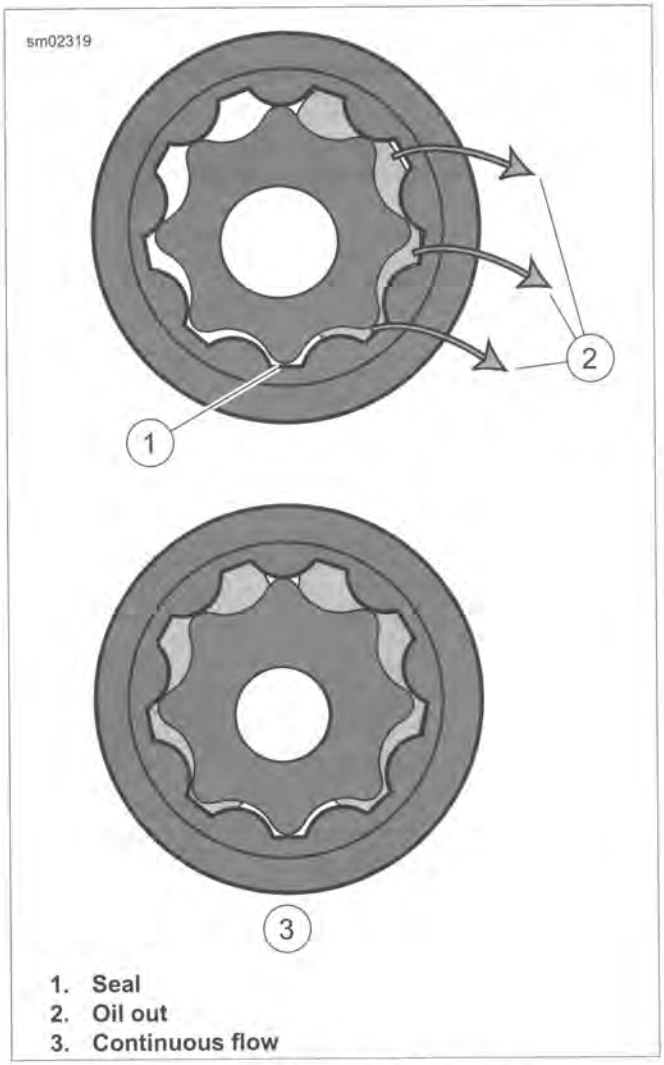
OPERATION

The oil pump is driven by the crankshaft. The inlet and outlet sides of the pump are sealed by the tips and lobes of the inner and outer gerotors. This prevents oil on the outlet side (high pressure) from being transferred to the inlet side.



1. Oil in
2. Seal
3. Outer gerotor
4. Inner gerotor

Figure 3-5. Inlet Side Oil Flow



1. Seal
2. Oil out
3. Continuous flow

Figure 3-6. Outlet Side Oil Flow

See Figure 3-5. As the gerotors rotate, the cavity volume increases between the inner and outer gerotors on the inlet side of the pump. This creates a vacuum causing oil to be drawn in. The cavity increases until the volume is equivalent to that of the missing tooth on the inner gerotor.

See Figure 3-6. As the oil moves to the outlet side of the pump, the cavity decreases in volume. This forces pressurized oil out the discharge port. In operation, the gerotors provide a continuous flow of oil.

GENERAL

The crankcase breather system relieves crankcase pressure produced by the downstroke of the pistons. Crankcase vapors are then directed into the intake air stream to be burned during normal combustion. Burning crankcase vapors eliminates the pollutants normally discharged from the crankcase.

See Figure 3-7. As pistons push downward, displaced air in the crankcase is vented through the crankshaft roller bearing into the cam compartment. The air then flows up the pushrod covers (1) into the rocker housing. The moving air absorbs a small amount if oil vapor as it travels through the engine.

The oil/air vapor rushes under the rocker arm support plate and passes through an opening at the bottom of the plate to enter the breather baffle compartment (2).

In the baffle compartment, the flow of air passes upward through the oil filter gauze, where the oil is removed from the air. Two pin holes in the rocker arm support plate allow the separated oil to drain back into the crankcase.

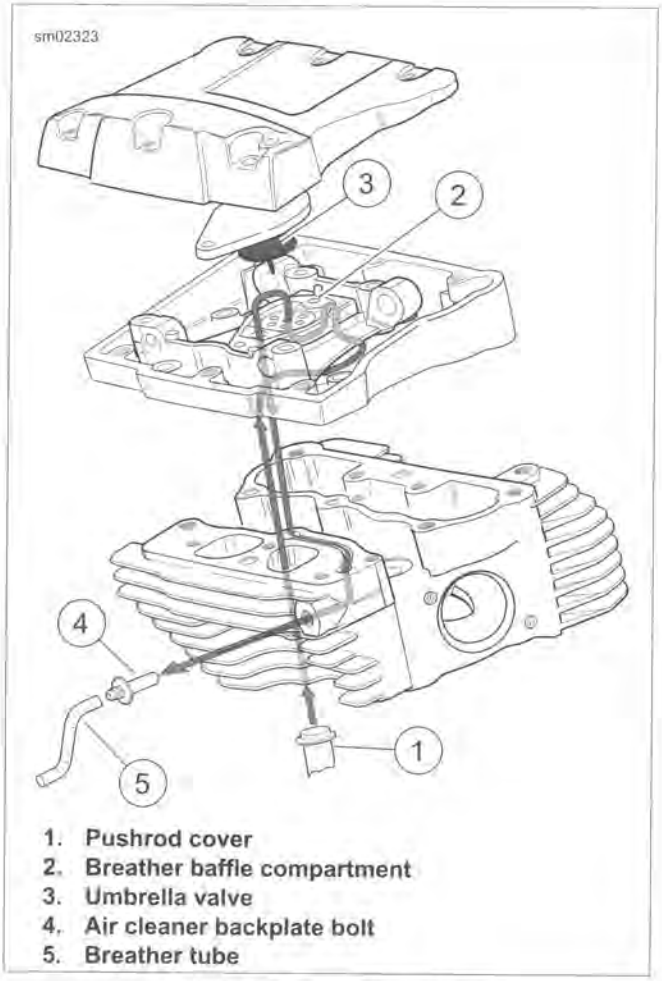
Passing through the oil filter gauze, the vapor passes through the umbrella valve (3) into the breather compartment. The umbrella valve only allows air to be vented one way.

In the breather compartment, air flows downward through holes aligned in the breather baffle, rocker arm support plate and rocker housing. Exiting the rocker housing, air enters a passageway cast into the top of the cylinder head. Proper orientation of the rocker housing gasket is critical for effective sealing of this passageway.

Air flows through the cylinder head passageway and through a passage in the air cleaner backplate bolt (4). It passes through a breather tube (5) into the air filter element. It then joins with the intake air stream and is burned during normal combustion.

NOTE

Always connect breather tubes. Loose or detached tubes vent crankcase gases into the atmosphere which violates emissions standards.



1. **Pushrod cover**
2. **Breather baffle compartment**
3. **Umbrella valve**
4. **Air cleaner backplate bolt**
5. **Breather tube**

Figure 3-7. Breather Air Flow

OIL PRESSURE INDICATOR LAMP

See Figure 3-8. The red OIL PRESSURE indicator lamp illuminates to indicate improper circulation of the engine oil. The lamp illuminates when the ignition is first 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.

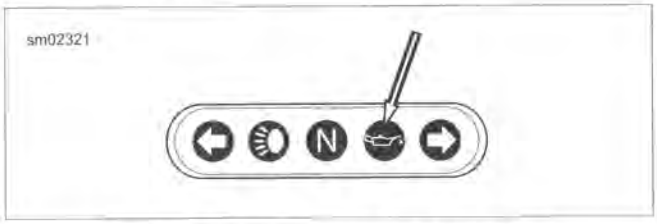


Figure 3-8. Oil Pressure Indicator Lamp

CHECKING OIL PRESSURE

PART NUMBER	TOOL NAME
HD-96921-52D	OIL PRESSURE GAUGE SET

Check operating oil pressure as follows:

1. Verify engine oil is at the proper level. See 1.6 ENGINE OIL AND FILTER.
2. See Figure 3-9. Remove oil pressure switch from crankcase. See 7.25 OIL PRESSURE SWITCH OR SENDER.
3. See Figure 3-10. Install OIL PRESSURE GAUGE SET (Part No. HD-96921-52D).
   a. Hand-tighten adapter (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.
4. Run motorcycle until engine is at normal operating temperature.

NOTE

Engine oil should be at normal operating temperature, 230 °F (110 °C), for an accurate reading.

5. Oil pressure should be within specifications. Refer to Table 3-27.
6. See 1.26 TROUBLESHOOTING if readings are not within specification.
7. Stop engine. Remove oil pressure gauge assembly.
8. Install oil pressure switch. See 7.25 OIL PRESSURE SWITCH OR SENDER.

Table 3-27. Oil Pressure

CHECK	SPECIFICATION *	
	SAE	METRIC
Oil pressure - min at idle	5 psi	34.5 kPa
Oil pressure - normal at 2000 rpm	30-38 psi	207-262 kPa
Oil pressure - max	50 psi	345 kPa
* With oil at normal operating temperature of 230 °F (110 °C)		

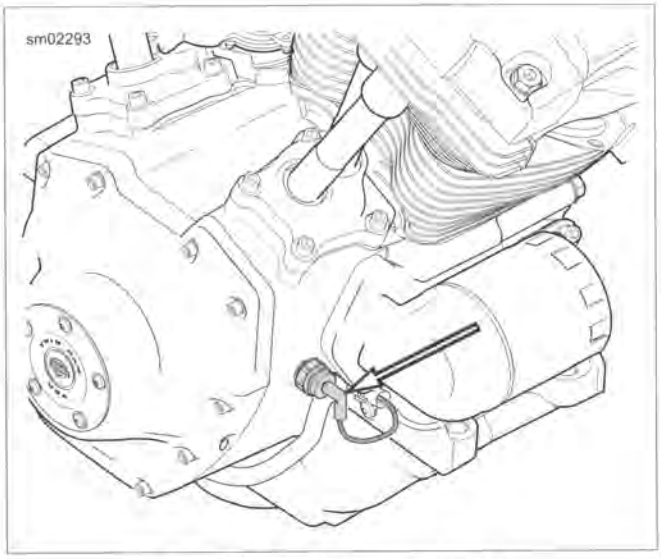
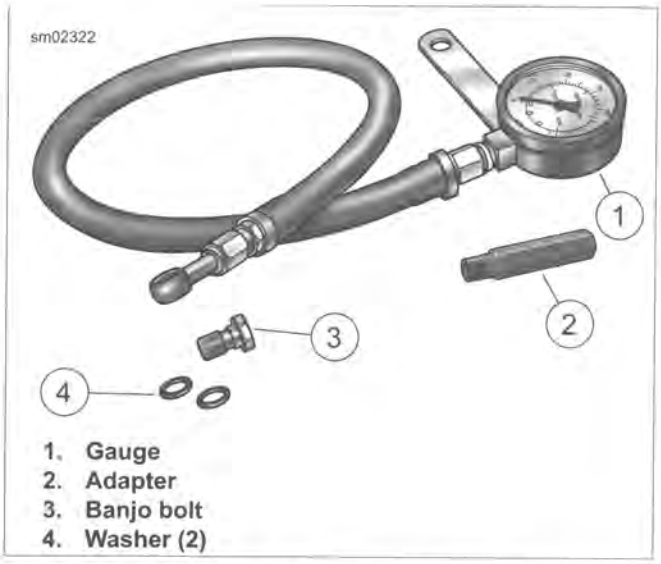


Figure 3-9. Oil Pressure Switch



1. Gauge
2. Adapter
3. Banjo bolt
4. Washer (2)

Figure 3-10. Oil Pressure Gauge Set

DIAGNOSING VALVE TRAIN NOISE

1. With engine and oil at normal operating temperature, check oil pressure at 2000 rpm. If oil pressure is above 50 psi (345 kPa) or below 5 psi (34 kPa), inspect the following for restrictions or blockage:
   a. Oil pump
   b. Crankcase passages
   c. Oil hoses
2. Repair or replace parts as necessary.
3. If oil is not reaching the hydraulic lifters, remove and inspect. See 3.21 PUSHRODS, LIFTERS AND COVERS, Lifter Inspection. Clean lifter bore of all foreign material. Replace hydraulic lifter if required.
4. Inspect pushrod, lifter and lifter block for proper fit and unusual wear. Replace parts as necessary.
5. Visually inspect camshaft lobes for abnormal wear.
6. Check cam chain tensioning shoe for wear.
7. Remove cylinder head and rocker box assemblies. Check rocker arm end play and check for binding. Inspect valve stems for scuffing and check stem to guide clearance. Check valve seats for signs of looseness or shifting.
8. Grind valves and valve seats. See 3.22 CYLINDER HEAD, Valve and Seat Refacing.

COMPRESSION TEST

PART NUMBER	TOOL NAME
HD-33223-1	CYLINDER COMPRESSION GAUGE

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

A compression test can help determine the source of cylinder leakage. Use CYLINDER COMPRESSION GAUGE (Part No. HD-33223-1) with a screw-in type adapter.

NOTE

All Twin Cam engines use a 12 mm adapter with the compression gauge.

1. Run motorcycle until engine is at normal operating temperature. Stop engine.
2. Disconnect spark plug wires. Clean around plug base and remove plugs.
3. Remove air cleaner. See 4.5 AIR CLEANER ASSEMBLY.
4. Disconnect TCA connector [211] from the induction module.

NOTE

Never use a metal object to hold the throttle plate open. Damage to the throttle plate or throat of the induction module may result.

5. Insert a 0.75 in (19 mm) diameter by approximately 12 in (305 mm) long wooden or nylon dowel to hold the throttle valve open.
6. Connect compression tester to front cylinder per manufacturer's instructions.
7. Make sure transmission is in neutral. Crank engine continuously through five to seven full compression strokes and note gauge readings at the end of the first and last compression strokes. Record test results.
8. Disconnect both ACRs and repeat test.
9. Connect ACRs.
10. Repeat tests on rear cylinder.
11. Hold throttle valve open and remove dowel. Connect TCA connector [211] when tests are complete.
12. Clear codes when test is complete.
13. Install the air cleaner. See 4.5 AIR CLEANER ASSEMBLY.
14. Refer to Table 3-28. If the final readings are within specifications and do not indicate more than a 10 percent variance between cylinders, compression is considered normal. If compression does not meet specifications, refer to Table 3-29 for possible causes.
15. If readings do not meet specifications, inject approximately 1/2 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.
16. Install the spark plugs and tighten to 12-18 ft-lbs (16.3-24.4 Nm). Connect spark plug wires.

Table 3-28. Compression Specifications

ACR STATUS	PSI	kPa
System relay installed	110 (min)	758 (min)
System relay removed	175 (min)	1207 (min)

Table 3-29. Compression Test Results

DIAGNOSIS	TEST RESULTS
Ring trouble	Compression low on first stroke, tends to build up on the following strokes, but does not reach normal. Improves considerably when oil is added to cylinder.
Valve trouble	Compression low on first stroke, does not build up much on following strokes. Does not improve considerably with the addition of oil. Check for correct pushrod length.
Head gasket leak	Same reaction as valve trouble.

CYLINDER LEAKDOWN TEST

PART NUMBER	TOOL NAME
HD-35667-A	CYLINDER LEAKDOWN TESTER

NOTE

On vehicles with automatic compression release (ACR), verify the ACRs are closed for this test. Perform the test with the ignition/light switch in the OFF position.

The cylinder leakdown test will help pinpoint leaking valves, worn, damaged or stuck piston rings and blown head gaskets. The cylinder leakage tester applies compressed air to the cylinder at a controlled pressure and volume. It then measures the percent of leakage from the cylinder.

Use the CYLINDER LEAKDOWN TESTER (Part No. HD-35667-A). Follow the specific instructions supplied with the tester.

The following are some general instructions that apply to Harley-Davidson V-twin engines:

1. Run motorcycle until engine is at normal operating temperature. Stop engine.
2. Disconnect spark plug wires. Clean around plug base and remove plugs.
3. Rotate crankshaft until piston in the cylinder being tested is at top dead center (TDC) of compression stroke (both valves closed) during the test.
4. Engage transmission in highest gear and lock the rear brake. This prevents the engine from turning over when air pressure is applied to the cylinder.

NOTE

Before performing the cylinder leakdown test, verify the tester itself is free from leakage. Apply a soap solution around all tester fittings. Connect cylinder leakdown tester to compressed air source. Look for any bubbles that indicate leakage from the tester.

5. Following the manufacturer's instructions, perform a cylinder leakdown test on the front cylinder. Make a note of the percent of leakage. Leakage greater than 10 percent indicates internal engine problems.
6. Listen for air leaks at throttle body, exhaust pipe and head gasket. Air escaping through the throttle body indicates a leaking intake valve. Air escaping through the exhaust pipe indicates a leaking exhaust valve.

NOTE

If air is escaping through valves, verify that piston is still at TDC or check for correct pushrod length.

7. Repeat procedure on rear cylinder.

DIAGNOSING SMOKING ENGINE OR HIGH OIL CONSUMPTION

Perform both a compression test and a cylinder leakage test. See 3.8 TROUBLESHOOTING, Compression Test and 3.8 TROUBLESHOOTING, Cylinder Leakdown Test. If further testing is needed, remove suspect head(s) and inspect for the following:

Check Prior to Cylinder Head Removal

1. Oil level too high.
2. Oil carryover.
3. Breather hose restricted.
4. Restricted oil filter.

Check After Cylinder Head Removal

1. Oil return passages for clogging.
2. Valve guide seals.
3. Valve guide to valve stem clearance.
4. Gasket surface of both head and cylinder.
5. Cylinder head casting 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, remove the cylinder to inspect for excess piston ring wear. Also verify the piston ring gaps are properly staggered.

REMOVAL

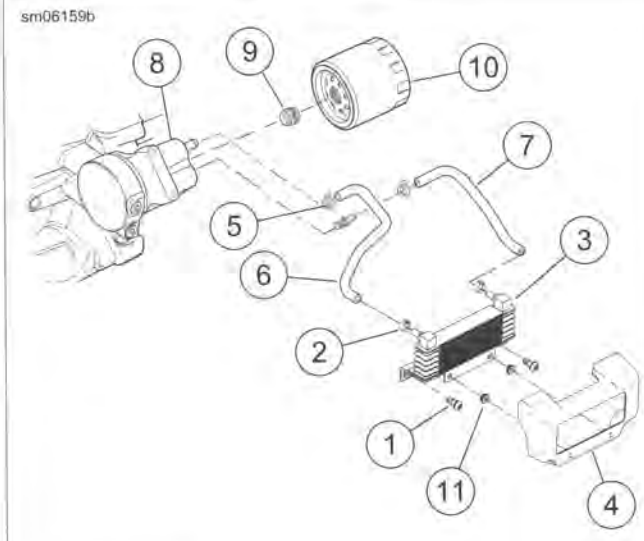
1. Cover the front fender to protect finish.
2. Place a container under the motorcycle to catch excess oil.
3. See Figure 3-11. Pull out on the bottom of the oil cooler cover (4) to disengage the lower retaining pins, then pull up and remove cover from oil cooler.
4. Remove screws (1) securing the oil cooler (3) to the frame.
5. Slide clamps (5) down the oil hoses (6, 7). Disconnect hoses from the oil cooler adapter (8).
6. Remove the oil cooler.
7. Inspect oil cooler for dirt, debris and damage.
8. To remove hoses from the oil cooler, cut clamps (2).

INSTALLATION

PART NUMBER	TOOL NAME
HD-97087-65B	HOSE CLAMP PLIERS

FASTENER	TORQUE VALUE	
Oil cooler mounting screws	20-22 ft-lbs	27.1-29.8 Nm

1. See Figure 3-11. If replacing the hoses, place **new** hose clamps (2) on the oil cooler end of the hoses.
2. Push the hoses onto the oil cooler fittings.
3. Align the hoses and tighten the hose clamps using HOSE CLAMP PLIERS (Part No. HD-97087-65B).
4. Secure cooler to frame with screws (1). Tighten to 20-22 ft-lbs (27.1-29.8 Nm).
5. Place clamps (5) on hoses. Install the hoses into the fittings of the oil cooler adapter. Secure clamps on hoses.
6. Check the condition of grommets (11) and replace as necessary. Install cover (4), upper latches first, then push down and back to engage lower pins into grommets.
7. Start engine and check for oil leaks.
8. When at operating temperature, perform an oil level HOT CHECK.



1. **Screw (2)**
2. **Clamp (2)**
3. **Oil cooler**
4. **Cover**
5. **Hose clamp (2)**
6. **Return oil hose**
7. **Supply oil hose**
8. **Oil cooler adapter**
9. **Oil filter adapter**
10. **Oil filter**
11. **Grommet (2)**

Figure 3-11. Oil Cooler

REMOVAL

PART NUMBER	TOOL NAME
HD-42311	OIL FILTER WRENCH

1. Place a drain pan under motorcycle.
2. Bend a cardboard funnel to route fluid away from regulator and oil cooler.
3. Use OIL FILTER WRENCH (Part No. HD-42311) to remove the oil filter.
4. Remove the clamps from the oil hoses at the adapter.
5. See Figure 3-12. Remove the oil filter adapter (5).
6. Remove the oil cooler adapter and O-ring (1).

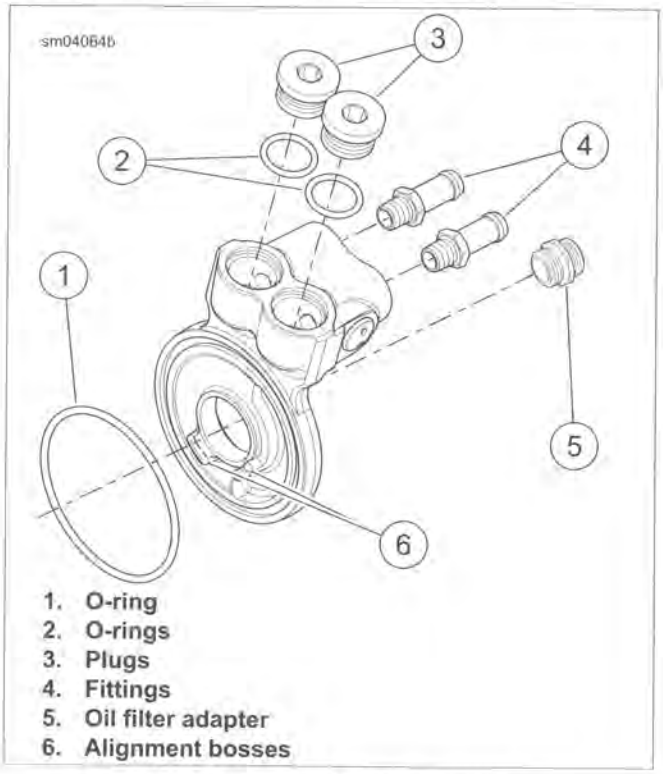
DISASSEMBLY

1. See Figure 3-12.Remove plugs (3) and O-rings (2).
2. Remove oil cooler line fittings (4).

NOTE

Replace the oil cooler adapter if the thermostat malfunctions.

3. Clean the oil filter mount surface.
4. Clean the oil passages in solvent.
5. Inspect the oil passages and the oil cooler mount.



1. **O-ring**
2. **O-rings**
3. **Plugs**
4. **Fittings**
5. **Oil filter adapter**
6. **Alignment bosses**

Figure 3-12. Oil Cooler Adapter

ASSEMBLY

1. See Figure 3-12. Install plugs (3) and **new** O-rings (2).
2. Apply LOCTITE 565 THREAD SEALANT fittings (4). Install fittings:
   a. Finger-tighten.
   b. Turn 2-3 more turns.

INSTALLATION

FASTENER	TORQUE VALUE	
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm

1. Clean all residual oil and threadlocking compound from the threaded hole in the crankcase and threads of the oil filter adapter.

NOTE

The oil cooler adapter will fit in only one orientation. Match the positioning bosses (6) on the oil cooler adapter to the oil filter mount.

2. See Figure 3-12. Apply LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue) to the threads of the oil filter adapter (5).
3. While holding oil cooler adapter in place, install the oil filter adapter (5) with the internal hex facing outward. Tighten to 18-22 ft-lbs (24.4-29.8 Nm).
4. Install the oil hoses and clamps.
5. Install new oil filter.

NOTICE

Do not operate the engine when the oil level is below the add mark on the dipstick at operating temperature. Engine damage will result. (00187b)

6. Start engine and check for oil leaks.
7. Perform engine oil level hot check.

TOP END REPAIR

NOTE

During top end disassembly, the engine may be left in the chassis for service.

If servicing only cylinder head components, pistons, cylinders and/or upper rod bushings, two options are available depending upon engine status.

- 3.12 TOP END SERVICE, Engine in Chassis.
- 3.12 TOP END SERVICE, Engine Removed from Chassis.

BOTTOM END REPAIR

NOTE

Servicing components in the cam compartment requires only partial disassembly. This can be done with the engine left in the chassis.

After disassembling as far as the cylinder heads you may find that bottom end repair is necessary. Bottom end service may require either partial or complete disassembly of the engine.

- To service the cam compartment, see 3.26 CAM COMPARTMENT AND COMPONENTS.
- To service components in the flywheel compartment, the engine must be removed and the crankcase halves split. See 3.13 CAM COMPARTMENT SERVICE, Engine Removed From Chassis.

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. But 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.

ENGINE IN CHASSIS

Table 3-30. Engine In Chassis

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURE
Remove parts to gain access to all components above cylinder deck. See 3.14 STRIPPING MOTORCYCLE FOR SERVICE.		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY	Inspect and repair. See 3.19 BREATHER ASSEMBLY*.
	ROCKER ARM SUPPORT	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE*.
	PUSHRODS, LIFTERS AND COVERS	Inspect and repair. See 3.21 PUSHRODS, LIFTERS AND COVERS*.
	CYLINDER HEAD	Inspect and repair. See 3.22 CYLINDER HEAD*.
	CYLINDER	Inspect and repair. See 3.23 CYLINDER*.
	PISTON	Inspect and repair. See 3.24 PISTON*.
Assemble top end. See 3.25 TOP END OVERHAUL: ASSEMBLY.		
Assemble motorcycle. See 3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE.		
Note: * If no other work is to be done, you may advance to 3.25 TOP END OVERHAUL: ASSEMBLY when this step is completed during top end service.		

ENGINE REMOVED FROM CHASSIS

Table 3-31. Engine Removed From Chassis

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURE
Remove engine from motorcycle. See 3.16 REMOVING ENGINE FROM CHASSIS.		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY	Inspect and repair. See 3.19 BREATHER ASSEMBLY*.
	ROCKER ARM SUPPORT	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE*.
	PUSHRODS, LIFTERS AND COVERS	Inspect and repair. See 3.21 PUSHRODS, LIFTERS AND COVERS*.
	CYLINDER HEAD	Inspect and repair. See 3.22 CYLINDER HEAD*.
	CYLINDER	Inspect and repair. See 3.23 CYLINDER*.
	PISTON	Inspect and repair. See 3.24 PISTON.
Assemble top end. See 3.25 TOP END OVERHAUL: ASSEMBLY.		
Install engine in motorcycle. See 3.17 INSTALLING ENGINE IN CHASSIS.		
Note: * If no other work is to be done, you may advance to 3.25 TOP END OVERHAUL: ASSEMBLY when this step is completed during top end service.		

ENGINE IN CHASSIS

Table 3-32. Engine In Chassis: Cam Compartment Service

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURES
Remove parts to gain access to all components above cylinder deck. See 3.14 STRIPPING MOTORCYCLE FOR SERVICE.		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY.	Inspect and repair. See 3.19 BREATHER ASSEMBLY.
	ROCKER ARM SUPPORT PLATE.	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE.
	PUSHRODS, LIFTERS AND COVERS.	Inspect and repair. See 3.21 PUSHRODS, LIFTERS AND COVERS.
Disassemble bottom end. See 3.26 CAM COMPARTMENT AND COMPONENTS.		
	COVER AND CAM SUPPORT PLATE	Inspect and repair. See 3.26 CAM COMPARTMENT AND COMPONENTS*.
	OIL PUMP	Inspect and repair. See 3.27 OIL PUMP.
Assemble bottom end. See 3.26 CAM COMPARTMENT AND COMPONENTS.		
Assemble motorcycle. See 3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE.		
Note: * If no other work is to be done, you may advance to 3.30 CRANKCASE ASSEMBLY when this step is completed during bottom end service.		

Table 3-33. Engine Removed: Flywheel Compartment Service or Complete Engine Overhaul

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURES
Remove engine from motorcycle. See 3.16 REMOVING ENGINE FROM CHASSIS.		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY	Inspect and repair. See 3.19 BREATHER ASSEMBLY.
	ROCKER ARM SUPPORT PLATE	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE.
	PUSHRODS, LIFTERS AND COVERS	Inspect and repair. See 3.21 PUSHRODS, LIFTERS AND COVERS.
	CYLINDER HEAD	Inspect and repair. See 3.22 CYLINDER HEAD.
	CYLINDER	Inspect and repair. See 3.23 CYLINDER.
	PISTON	Inspect and repair. See 3.24 PISTON.
Disassemble bottom end.		
	COVER AND CAM SUPPORT PLATE	Inspect and repair. See 3.26 CAM COMPARTMENT AND COMPONENTS.
	CRANKCASE	Inspect crankcase and repair. See 3.28 CRANKCASE DISASSEMBLY AND REPAIR.
		Inspect and repair flywheel/connecting rod assembly. See 3.29 FLYWHEEL AND CONNECTING RODS.
Assemble bottom end. See 3.30 CRANKCASE ASSEMBLY and 3.26 CAM COMPARTMENT AND COMPONENTS.		
Assemble top end. See 3.25 TOP END OVERHAUL: ASSEMBLY.		
Install engine in motorcycle. See 3.17 INSTALLING ENGINE IN CHASSIS.		

PROCEDURE

Cam Compartment Service Only

1. Remove exhaust system. See 4.18 EXHAUST SYSTEM.
2. Remove fuel tank. See 4.6 FUEL TANK.
3. Remove air cleaner and backplate. See 4.5 AIR CLEANER ASSEMBLY.
4. Remove spark plugs. See 1.19 SPARK PLUGS.
5. Remove purge solenoid hose, if equipped, from induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM.
6. **Twin-Cooled models:** See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Removal.
   a. Disconnect coolant manifolds from cylinder head lines.
   b. Remove clamp securing hoses to front cylinder head. Move hoses out of the way.

Top End Service

1. Complete all steps under Cam Compartment Service Only.
2. Remove induction module. See 4.13 INDUCTION MODULE.
3. Gather disconnected branches of main harness and tape to top of wire trough to keep out of the way.
4. Remove two screws to release top engine stabilizer bracket from front cylinder head. Remove screw to release stabilizer link from frame weldment.

PROCEDURE

FASTENER	TORQUE VALUE	
Engine stabilizer bracket to cylinder headbolts	30-35 ft-lbs	40.7-47.5 Nm
Engine stabilizer link bolt	30-35 ft-lbs	40.7-47.5 Nm

After Top End Service

1. Secure top engine stabilizer bracket to front cylinder head. Tighten to 30-35 ft-lbs (40.7-47.5 Nm).

NOTE

Check each end of the stabilizer link for excessive wear before installation. The spherical ball end may rotate freely, but should not have any lateral movement. Replace the link if lateral movement exists.

2. Secure stabilizer link to frame weldment. Tighten to 30-35 ft-lbs (40.7-47.5 Nm).
3. Secure horn bracket to front cylinder head.
4. Release disconnected branches of main harness from top of wire trough.
5. Install induction module. See 4.13 INDUCTION MODULE.
6. Continue with steps under After Cam Compartment Service.

After Cam Compartment Service

1. **Twin-Cooled models:** See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation.
   a. Connect coolant manifolds to cylinder head lines.
   b. Install clamp securing hoses to front rocker cover.
2. Install purge solenoid hose, if equipped, to induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM.
3. Install spark plugs and connect spark plug cables.
4. Install air cleaner assembly. See 4.5 AIR CLEANER ASSEMBLY.
5. Install fuel tank. See 4.6 FUEL TANK.
6. Install exhaust system. See 4.18 EXHAUST SYSTEM.

PROCEDURE

PART NUMBER	TOOL NAME
HD-42310	BENCH STAND
HD-42310-2	TWIN CAM 88 CRADLE
HD-43646A	ROLLING STAND

1. Remove exhaust system. See 4.18 EXHAUST SYSTEM.
2. Remove fuel tank. See 4.6 FUEL TANK.
3. Remove air cleaner and backplate. See 4.5 AIR CLEANER ASSEMBLY.
4. Remove spark plugs. See 1.19 SPARK PLUGS.
5. Remove induction module. See 4.13 INDUCTION MODULE.
6. Gather disconnected branches of main harness and tape to top of wire trough.
7. **Twin-Cooled models:** See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Removal.
   a. Disconnect coolant manifolds from cylinder head lines.
   b. Remove clamp securing hoses to front cylinder head. Move hoses out of the way.
8. Remove voltage regulator. See 7.20 VOLTAGE REGULATOR.
9. Remove CKP sensor. See 7.17 CRANKSHAFT POSITION SENSOR (CKP).
10. Remove oil filter. See 1.6 ENGINE OIL AND FILTER.
11. Remove oil pressure switch/sender. See 7.25 OIL PRESSURE SWITCH OR SENDER.
12. Coil main harness and allow to hang below lower frame tube at front of motorcycle.
13. Remove primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
14. Remove rotor and stator. See 7.21 ALTERNATOR.
15. Wrap rear master cylinder reservoir with foam padding or bubble pack.
16. Cover lower frame tubes (both left and right side) with foam padding or bubble pack to prevent damage to frame tubes, brake line and main harness. A split loom conduit or a half shell of PVC tubing will also produce good results.
17. Cover rocker covers with foam padding or bubble pack.
18. Place a jack under the oil pan and use a block of wood between the jack and oil pan to distribute pressure across the length of the casting. Raise the jack until firm contact is made with the bottom of the oil pan.
19. Remove top engine stabilizer bracket from front cylinder head. Remove stabilizer link from frame weldment.
20. Remove four bolts (with flat washers) in a crosswise pattern to free transmission from crankcase.
21. Remove front engine mount. See 2.49 FRONT ENGINE MOUNT.
22. Move engine forward far enough to clear two ring dowels at bottom of transmission flange. Raise engine and remove from right side of motorcycle. Exercise caution to avoid contact with rear brake line, rear brake master cylinder reservoir, and main harness.
23. See Figure 3-13. Using the TWIN CAM 88 CRADLE (Part No. HD-42310-2), install engine in BENCH STAND (Part No. HD-42310) or ROLLING STAND (Part No. HD-43646A).
24. Thoroughly wipe all engine oil from pockets in crankcase flange. Remove gasket and two index pins from transmission flange. Discard gasket.
25. Remove and clean the oil pan under any of the following conditions. See 3.31 OIL PAN.
   a. Metal debris is found in the engine or crankcase.
   b. Oil contamination is suspected.
   c. A complete engine overhaul is being performed as a result of a major engine failure.
   d. The engine is being replaced with a **new** one.

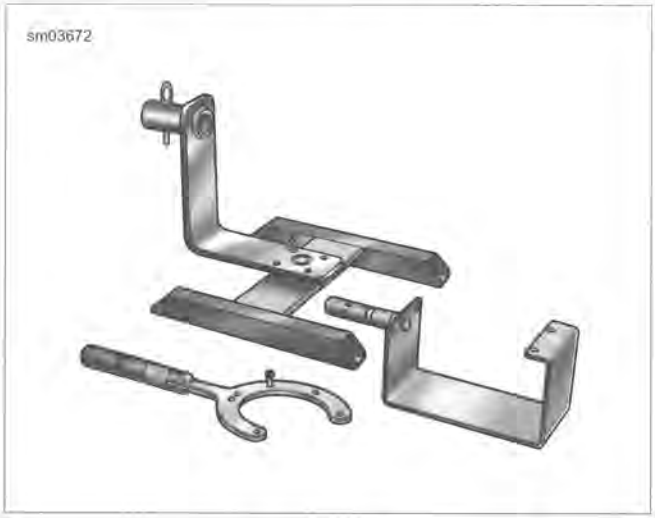


Figure 3-13. Engine/Transmission Bench Stand (HD-42310)

PROCEDURE

PART NUMBER	TOOL NAME
SNAP-ON FC018	OPEN END CROWFOOT

FASTENER	TORQUE VALUE	
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 Nm
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm
Engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	40.7-47.5 Nm
Engine stabilizer link bolt	30-35 ft-lbs	40.7-47.5 Nm

1. Install oil pan, if removed. See 3.31 OIL PAN.
2. Cover rocker covers of front and rear cylinders with foam padding or bubble pack.
3. Cover lower frame tubes (both left and right side) with foam padding or bubble pack to prevent damage to frame tubes, brake line and main harness. A split loom conduit or a half shell of PVC tubing will also produce good results.
4. Wrap rear master cylinder reservoir with foam padding or bubble pack.
5. Install engine in chassis from right side. Set front of crankcase onto front engine mount crossmember. Engine must be forward far enough to clear two ring dowels in lower flange of transmission.
6. Install **new** gasket and engage index pins in holes of transmission flange. Mate engine to transmission and fully engage two ring dowels at bottom of transmission flange.
7. Install front engine mount assembly. Install but do not fasten crankcase to front engine mount bracket at this time. See 2.49 FRONT ENGINE MOUNT.
8. Secure the engine:
   a. Hand-tighten four bolts (with flat washers) to secure transmission to crankcase. Install the shorter bolts at the top and the longer bolts at the bottom.
   b. Tighten the four transmission to crankcase bolts to 15 ft-lbs (20.3 Nm) in a crosswise pattern.

   NOTE

   For best results, use OPEN END CROWFOOT (Part No. Snap-On FC018) on upper transmission to crankcase bolts.

   c. Repeating the crosswise pattern, final tighten the four transmission to crankcase bolts to 34-39 ft-lbs (46.1-52.9 Nm).
   d. Secure engine to front engine mount. See 2.49 FRONT ENGINE MOUNT.

   NOTE

   Check each end of the stabilizer link for excessive wear prior to installation. The spherical ball end may rotate freely, but should not have any lateral movement. Replace the link if lateral movement exists.

   e. Secure front stabilizer link bracket to front cylinder head. Tighten to 30-35 ft-lbs (40.7-47.5 Nm).
   f. Secure stabilizer link to frame weldment. Tighten to 30-35 ft-lbs (40.7-47.5 Nm).
9. Remove jack and wooden block from under oil pan.
10. Install oil filter. See 1.6 ENGINE OIL AND FILTER.
11. Install stator and rotor. See 7.21 ALTERNATOR.
12. Install primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
13. Allow main harness to hang below lower frame tube at front of motorcycle.
14. Install oil pressure switch/sender. See 7.25 OIL PRESSURE SWITCH OR SENDER.
15. Install CKP sensor. See 7.17 CRANKSHAFT POSITION SENSOR (CKP).
16. Install voltage regulator. See 7.20 VOLTAGE REGULATOR.
17. **Twin-Cooled models:** See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation.
    a. Connect coolant manifolds to cylinder head lines.
    b. Install clamp securing hoses to front cylinder head.
18. Release disconnected branches of main harness from top of wire trough.
19. Install induction module. See 4.13 INDUCTION MODULE.
20. Install purge solenoid hose, if equipped, to induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM.
21. Install spark plugs. Install spark plug cables. See 1.19 SPARK PLUGS.
22. Install backplate and air cleaner. See 4.5 AIR CLEANER ASSEMBLY.
23. Install fuel tank. See 4.6 FUEL TANK.
24. Install exhaust system. See 4.18 EXHAUST SYSTEM.
25. Fill and check oil level. See 1.6 ENGINE OIL AND FILTER.

GENERAL

It is assumed that each step performed on one cylinder is automatically repeated on the other.

To perform a complete top end overhaul, follow all steps listed in this section including inspection and repair procedures.

Twin-Cooled engine: Drain coolant and remove upper coolant lines prior to disassembly. See C.5 COOLING SYSTEM REPAIR.

ROCKER COVERS

NOTE

Dirt caked on cooling fins and other areas can fall into crankcase bore. It can also stick to subassemblies as parts are removed. Abrasive particles can damage machined surfaces or plug oil passageways. Clean parts before disassembly to prevent component damage.

1. Use low pressure air to thoroughly clean exterior surfaces of engine prior to disassembly.
2. See Figure 3-14. Following the sequence shown, alternately loosen the six rocker cover bolts. Remove the rocker cover bolts and their captive washers.
3. Remove the rocker cover and gasket. Discard gasket.

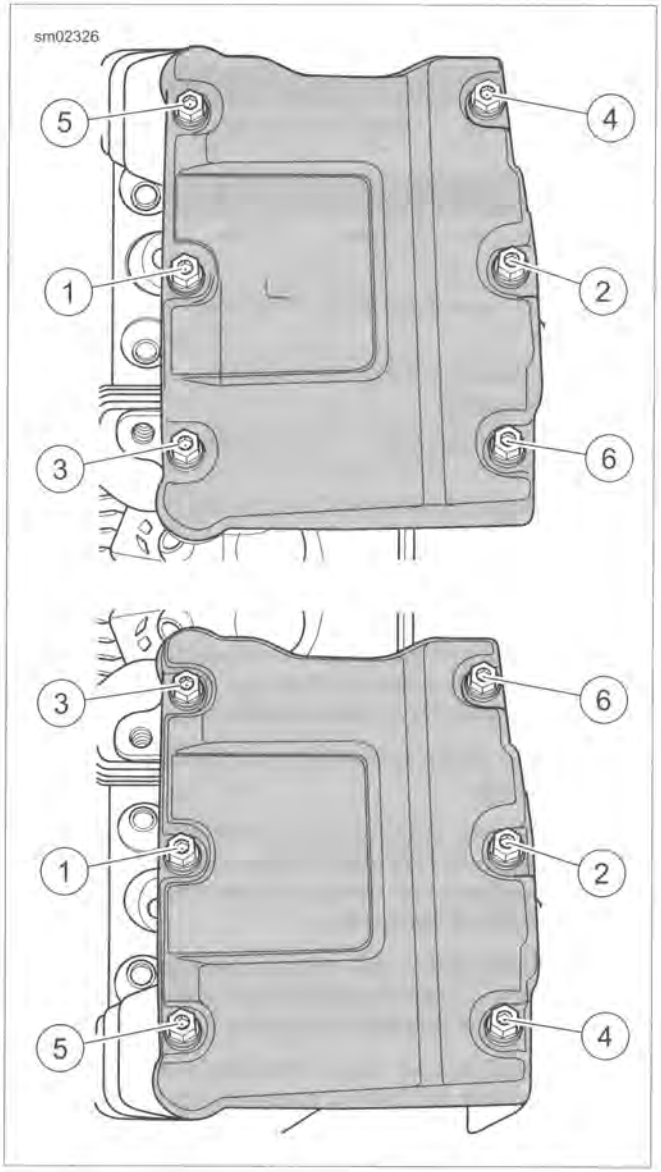
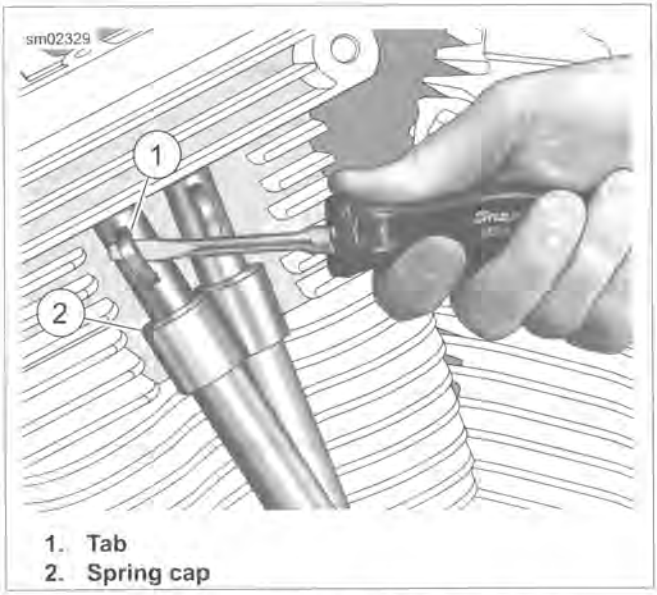


Figure 3-14. Rocker Cover Bolt Removal Sequence

ROCKER ARM SUPPORT PLATE

PART NUMBER	TOOL NAME
HD-48283	CRANKSHAFT ROTATING WRENCH

1. See Figure 3-15. Insert the blade of a small screwdriver into tab (1) of spring cap retainer. While pushing down on spring cap (2), rotate bottom of screwdriver toward outboard side to remove. Repeat step on second pushrod cover.



1. Tab
2. Spring cap

Figure 3-15. Removing Spring Cap Retainer

2. Collapse upper and lower pushrod covers.

NOTE

Do not attempt to rotate the crankshaft by placing a socket on the crankshaft or compensating sprocket bolt.

3. When removing the rocker arm support plate, both lifters must be on the base circle (lowest position) of the cam. Rotate the crankshaft using one of the methods presented below.
   a. **With primary cover installed:** Remove spark plugs. With the rear wheel raised, place the transmission in sixth gear and rotate rear wheel backward until the base circle is found.
   b. **With primary cover removed:** Remove spark plugs. Place the transmission in neutral. Using a large socket on the compensating sprocket retainer, rotate counterclockwise until the base circle is found.
   c. See Figure 3-16. **With engine mounted in engine stand:** Install CRANKSHAFT ROTATING WRENCH (Part No. HD-48283) on sprocket shaft and rotate counterclockwise until the base circle is found.

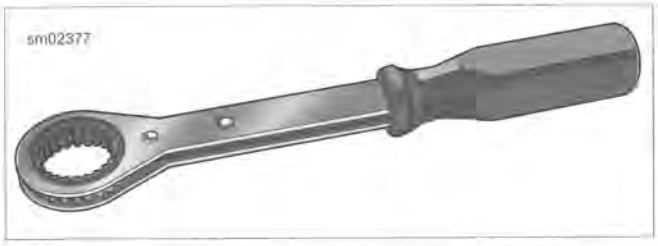


Figure 3-16. Crankshaft Rotating Wrench

4. Rotate engine until piston is at TDC of compression stroke.

NOTE

*Breather baffle assembly is manufactured with gaskets attached. Any time the breather is disassembled, the baffle assembly must be replaced with a **new** assembly.*

5. See Figure 3-17. Remove breather assembly (arrow) and filter element from the rocker arm support plate. For inspection and repair information, see 3.19 BREATHER ASSEMBLY.
6. Loosen the four rocker arm support plate bolts 1/4 turn at a time in the sequence shown. Remove the rocker arm support plate bolts with flat washers.
7. Remove the rocker arm support plate assembly. For inspection and repair information, see 3.20 ROCKER ARM SUPPORT PLATE.
8. See Figure 3-18. Remove and discard breather O-ring from rocker housing.

NOTE

If the other cylinder also requires service, find the cam base circle for that cylinder before disassembling.

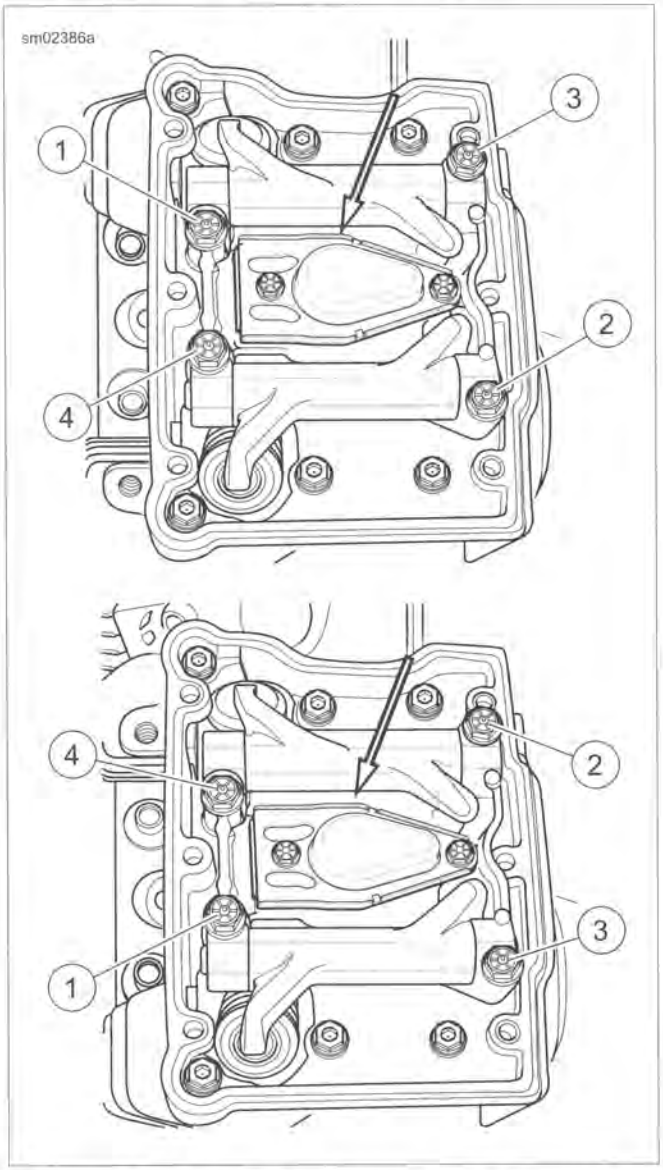


Figure 3-17. Rocker Arm Support Screw Sequence

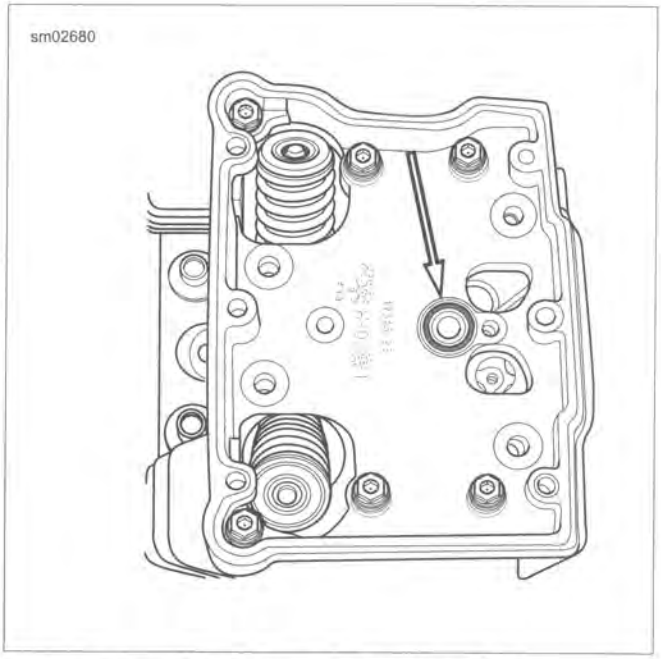


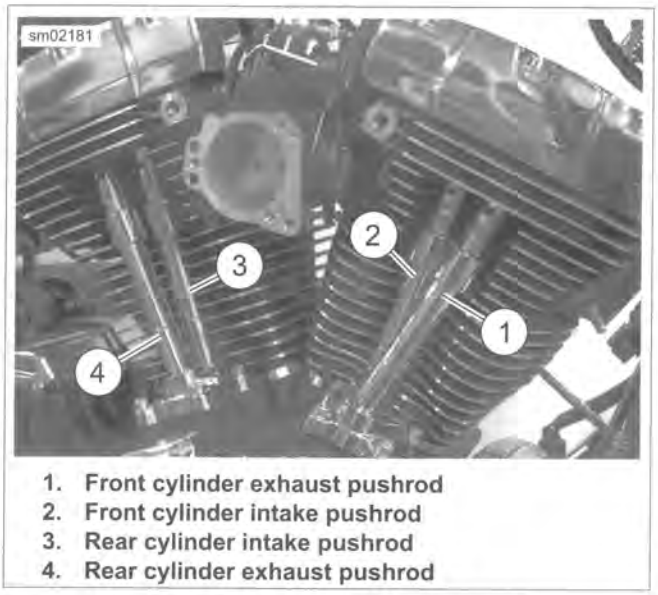
Figure 3-18. Breather Baffle Hole O-Ring

PUSHRODS, LIFTERS AND COVERS

NOTE

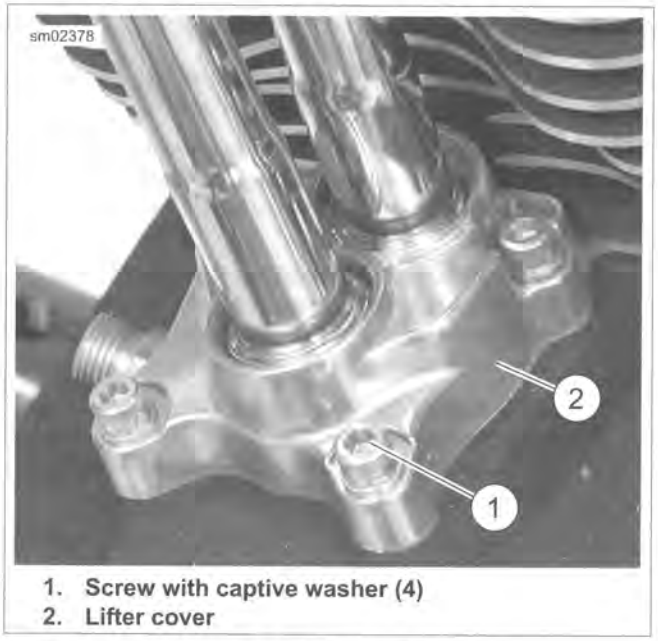
Mark parts for location and orientation upon removal.

1. See Figure 3-19. Remove the intake and exhaust pushrods and pushrod covers:
   a. Remove pushrods.
   b. Remove pushrod covers.
   c. Remove three O-rings from pushrod covers and discard. If O-ring is missing from upper pushrod cover, make sure to dislodge it from the cylinder head bore.
2. See Figure 3-20. Remove lifter covers:
   a. Using a crosswise pattern, remove four screws (1).
   b. Remove the lifter cover (2) and gasket. Discard gasket.
3. Remove lifters:
   a. Remove the anti-rotation pin to free the hydraulic lifters.
   b. Remove the lifters and place in clean plastic bags to prevent contamination.
4. For inspection and repair information, see 3.21 PUSHRODS, LIFTERS AND COVERS.



1. **Front cylinder exhaust pushrod**
2. **Front cylinder intake pushrod**
3. **Rear cylinder intake pushrod**
4. **Rear cylinder exhaust pushrod**

Figure 3-19. Pushrod Locations



1. **Screw with captive washer (4)**
2. **Lifter cover**

Figure 3-20. Lifter Cover

CYLINDER HEAD

PART NUMBER	TOOL NAME
HD-42324-A	CYLINDER TORQUE PLATES

1. See Figure 3-21. Following the sequence shown, loosen the six rocker housing bolts. Remove rocker housing bolts.
2. Remove rocker housing and gasket. Discard gasket.

NOTE

To prevent distortion of the cylinder head, cylinder and cylinder studs, gradually loosen the cylinder head bolts in the specified sequence.

3. See Figure 3-22. Remove cylinder head bolts:
   a. Alternately loosen cylinder head bolts 1/4 turn at a time the sequence shown.
   b. Remove the cylinder head bolts.
4. Remove cylinder head and head gasket.

NOTE

Save the cylinder head gasket (if salvageable) for use with the CYLINDER TORQUE PLATES (Part No. HD-42324-A) when measuring, boring or honing of the cylinder is required.

5. For inspection and repair information, see 3.22 CYLINDER HEAD.

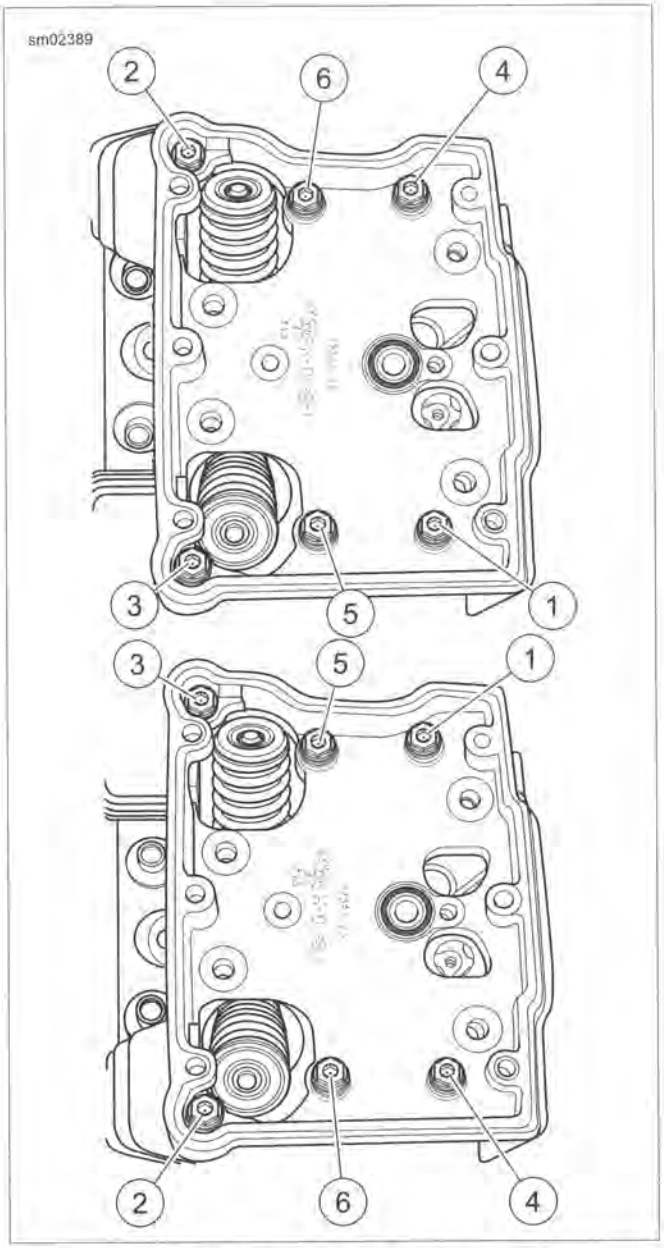


Figure 3-21. Rocker Housing Bolts Removal Sequence

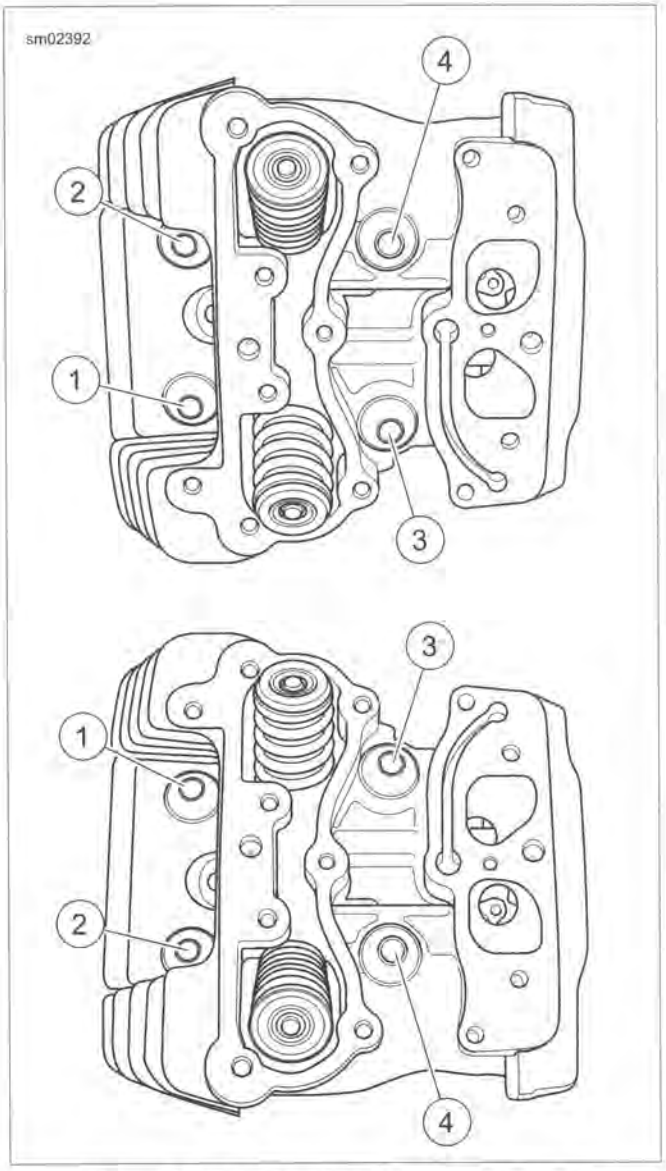


Figure 3-22. 1/4 Turn Head Bolts in Sequence

CYLINDER

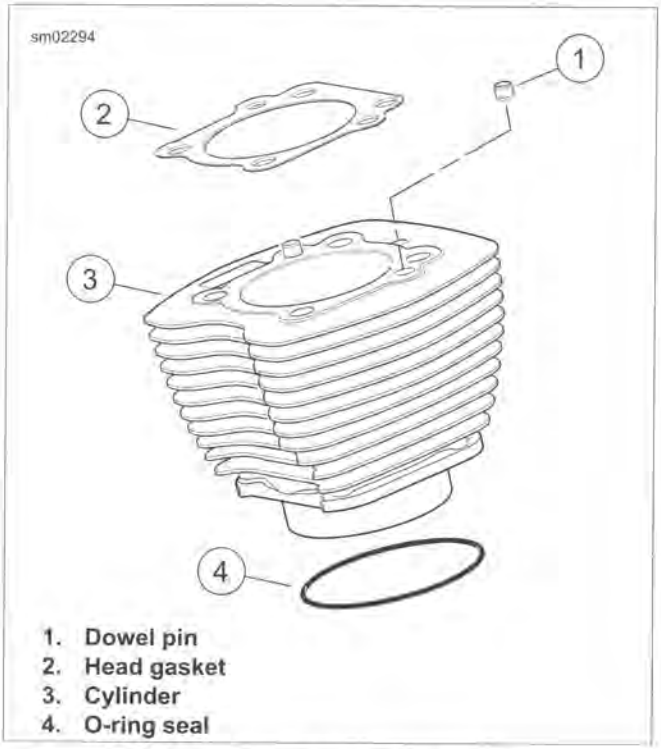
1. Raise the cylinder just enough to place clean shop towels under the piston. This will prevent any dirt or debris, such as broken ring pieces, from falling into the crankcase bore.

NOTE

Do not bend the cylinder studs. Even a slight bend or nick can cause a stress riser leading to stud failure.

2. Carefully remove the cylinder. Exercise caution to avoid bending the cylinder studs. As the piston becomes free of the cylinder, hold it upright to prevent it from striking the studs or dragging across the stud thread area.
3. Mark cylinder FRONT or REAR as appropriate.
4. Slide approximately 6.0 in (152 mm) of plastic tubing, rubber hose or conduit over each cylinder stud. Use material with ID of 0.5 in (12.7 mm) to protect cylinder studs and piston from damage.
5. See Figure 3-23. Remove O-ring seal (4) from the bottom of the cylinder liner. Discard O-ring seal.

6. See Figure 3-24. Remove O-ring from dowel pin (4) on base of cylinder deck. Discard O-ring.
7. For inspection and repair information, see 3.23 CYLINDER.



1. **Dowel pin**
2. **Head gasket**
3. **Cylinder**
4. **O-ring seal**

Figure 3-23. Cylinder Assembly

PISTON

PART NUMBER	TOOL NAME
HD-42317-A	PISTON PIN RETAINING RING INSTALLER
HD-42320-B	PISTON PIN REMOVER

1. Place clean shop towels over crankcase bore. This prevents the piston pin circlip from falling into the crankcase.

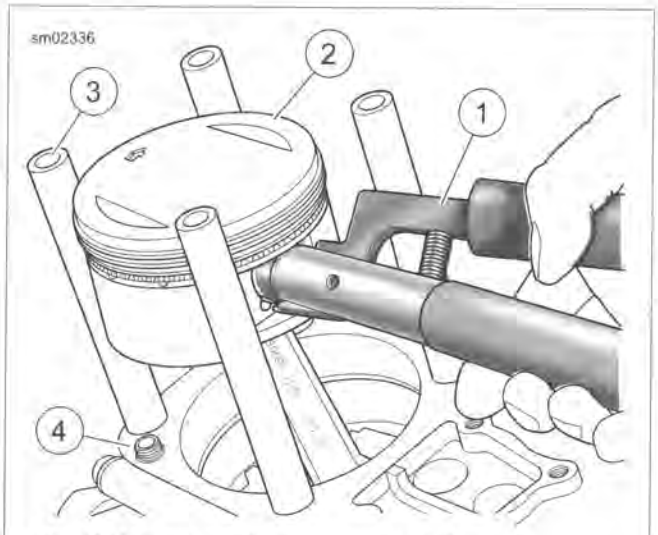
⚠WARNING

Wear safety glasses or goggles when removing or installing piston pin retaining rings. Piston pin retaining rings are compressed in the ring groove and can fly out when removed from the groove, which could result in serious eye injury. (00293a)

NOTE

It is not necessary to remove both piston pin circlips for piston removal.

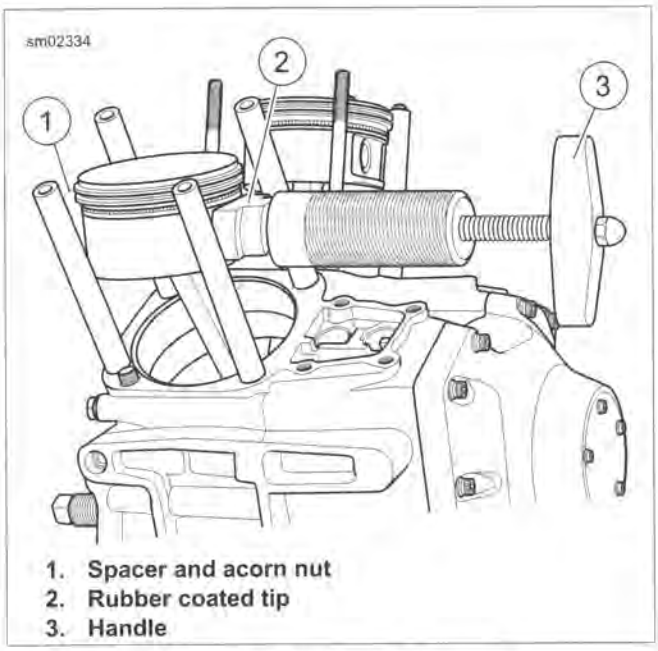
2. See Figure 3-24. Using PISTON PIN RETAINING RING INSTALLER (Part No. HD-42317-A), remove and discard one piston pin circlip.
   a. Insert tool (1) into piston pin bore. Position claw on tool in slot of piston (2) (directly under circlip).
   b. Squeeze handles of tool together. Pull circlip from bore. Discard circlip.



1. **Piston pin circlip remover/installer**
2. **Piston**
3. **Protective material over cylinder studs**
4. **Cylinder deck dowel (O-ring not shown)**

Figure 3-24. Piston Pin Circlip Removal

3. See Figure 3-25. Remove the piston pin. If piston pin is difficult to remove, use PISTON PIN REMOVER (Part No. HD-42320-B).
4. Remove the piston. Hold the connecting rod upright to prevent it from striking the crankcase.
5. Place a 3.0 in. (76.2 mm) long piece of foam-type water pipe insulation around connecting rod to prevent damage. Use material with an I.D. of 1.0 in. (25.4 mm).
6. Turn the piston over. Mark the pin boss with the letters F(ront) or R(ear) to identify location.
7. For inspection information, see 3.24 PISTON.
8. Complete engine repair:
   a. If performing a top end overhaul only, see 3.25 TOP END OVERHAUL: ASSEMBLY.
   b. If performing a complete engine overhaul, see 3.26 CAM COMPARTMENT AND COMPONENTS and 3.28 CRANKCASE DISASSEMBLY AND REPAIR.



1. Spacer and acorn nut
2. Rubber coated tip
3. Handle

Figure 3-25. Piston Pin Removal

DISASSEMBLY

NOTE

See Figure 3-26. Breather baffle assembly is manufactured with gaskets attached. Replacement part is supplied with the filter element (5) and umbrella valve (3). Any time the breather is disassembled, the baffle assembly must be replaced with a ***new*** *assembly.*

1. Remove rocker cover. See 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Covers.
2. Remove two fasteners (1) and remove breather cover (2).
3. Remove breather baffle (4). Discard breather baffle, filter element (5) and umbrella valve (3).

CLEANING AND INSPECTION

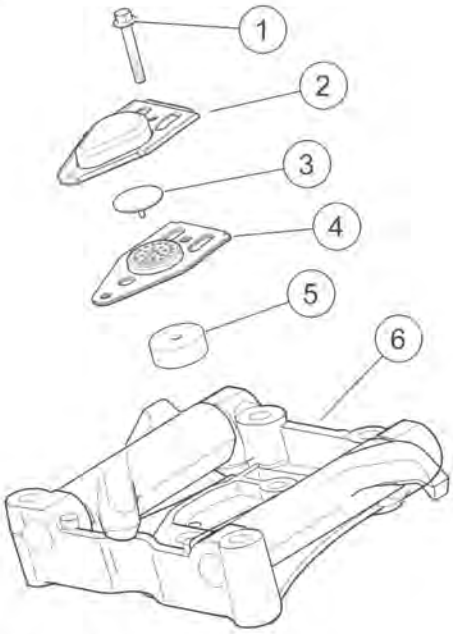
⚠WARNING

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

1. Clean cover and screws in a non-volatile cleaning solution or solvent. Dry parts with low pressure compressed air.
2. Set a straightedge diagonally across the length of the breather cover intersecting the opposite corners of the gasket surface.
3. Slide a feeler gauge beneath the straightedge to check the breather cover flatness.
4. Repeat the step checking the opposite diagonal.
5. Replace the breather cover if warpage exceeds 0.005 in. (0.13 mm).

ASSEMBLY

See Figure 3-26. Install breather assembly and rocker cover using **new** baffle assembly. See 3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover.



1. **Fasteners (2)**
2. **Breather cover**
3. **Umbrella valve**
4. **Breather baffle**
5. **Filter element**
6. **Rocker arm support plate**

Figure 3-26. Breather Assembly

DISASSEMBLY

1. See Figure 3-27. Remove four bolts and flat washers (1) from the rocker arm support plate (5).
2. Remove the rocker arm shafts (4) so that the notched ends exit the rocker arm support plate (5) first. Use a hammer and brass drift if necessary. Mark the shafts so that they are installed in their original locations at time of assembly.
3. Remove the rocker arms. Mark the rocker arms to indicate location.

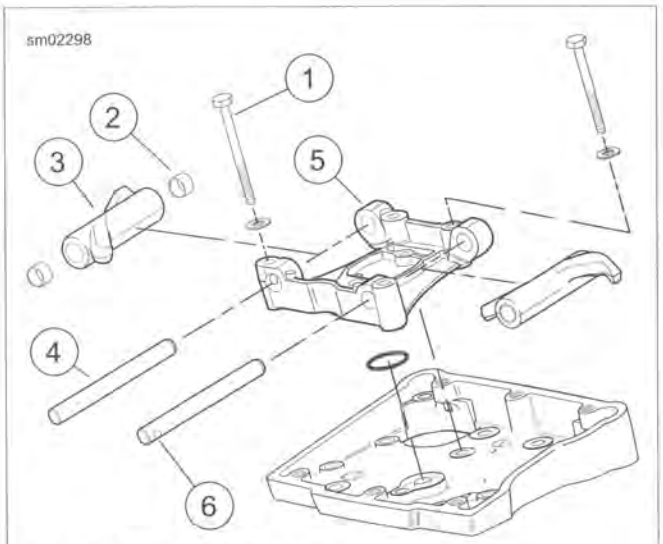
CLEANING AND INSPECTION

Inspection

⚠WARNING

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

1. Clean all parts in a non-volatile cleaning solution or solvent. Dry parts with low pressure compressed air.
2. See Figure 3-27. Check rocker arms (3) for uneven wear or pitting where contact is made with the valve stem tips. Check for concave wear where rocker arms contact the pushrod ends. Replace rocker arm if excessive wear is found.
3. Verify that oil holes in rocker arms and rocker arm support plate (5) are clean and open.
4. Inspect rocker arm shafts (4) for scratches, burrs, scoring or excessive wear. Replace as necessary.



1. **Bolt with flat washer**
2. **Rocker arm bushings**
3. **Rocker arm**
4. **Rocker arm shaft**
5. **Rocker arm support plate**
6. **Notch**

Figure 3-27. Rocker Arm Assembly

Rocker Shaft Fit

1. See Figure 3-28. Measure the inside diameter of the rocker arm support plate bore.
2. See Figure 3-29. Measure the outside diameter of the rocker arm shaft where it fits in the bore.
3. Repeat the measurement on opposite side of support plate and shaft. Replace shaft or support plate if clearance exceeds service wear limit of 0.0035 in (0.089 mm).

Figure 3-28. Checking Support Plate Bore

Figure 3-29. Checking Shaft to Support Plate Fit

Rocker Arm Shaft to Bushing

1. Check rocker arm shaft to bushing fit.
   a. See Figure 3-30. Measure the inside diameter of the rocker arm bushing.
   b. See Figure 3-31. Measure the outside diameter of the rocker arm shaft where it rides in the bushing.
2. Repeat measurement on opposite side of rocker arm and shaft. Replace shaft or bushings if clearance exceeds service wear limit of 0.0035 in (0.089 mm).

Figure 3-30. Checking Bushings

Figure 3-31. Checking Shaft to Bushing Fit

Replace Rocker Arm Bushings

NOTE

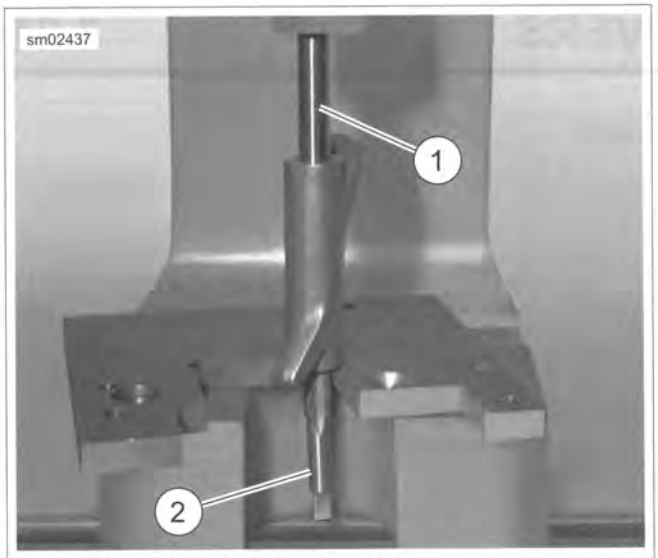
Bushing replacement and reaming must be done one at a time to achieve proper alignment. Follow all steps for one bushing and then repeat for the other bushing.

1. See Figure 3-32. Remove bushing from rocker arm:
   a. Turn a 9/16-18 tap (2) into bushing until tight.
   b. Place rocker arm under ram of arbor press with tap at bottom.
   c. Slide a discarded rocker arm shaft (1) through open end of rocker arm until contact is made with tap.
   d. Using shaft as driver (and untapped bushing as pilot), press against shaft until both tap and bushing are free.
2. See Figure 3-33. Using a suitable driver, press **new** bushing into side of rocker arm until flush with casting. Be sure to orient bushing so that split line faces top of rocker arm.

NOTE

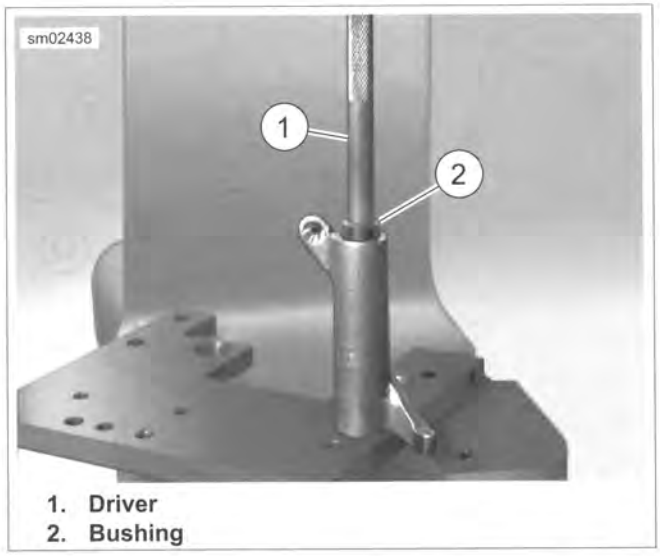
*Never back the reamer out of rocker arm or **new** bushing will be damaged.*

3. Ream bushing:
   a. See Figure 3-34. Lock rocker arm in a vise using brass jaw inserts or shop towels to prevent casting damage. Note that old bushing on drive side of reamer as pilot.
   b. Rotate reamer until the **new** bushing on the far side is reamed.
   c. Continuing in the same direction, draw drive side of reamer from **new** bushing.
4. Repeat steps to remove, install and ream second bushing.



1. Discarded shaft used as driver
2. Tap

Figure 3-32. Removing Bushing



1. Driver
2. Bushing

Figure 3-33. Installing Bushing

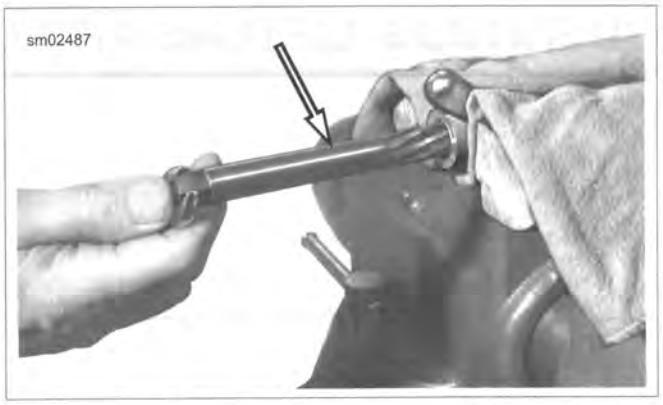


Figure 3-34. Ream Bushing

ASSEMBLY

1. Place the rocker arms into position on the rocker arm support plate.
2. Install rocker arm shafts:
   a. Push un-notched ends of rocker arm shafts into right side of support plate and then into rocker arms.
   b. As they approach their fully installed positions, rotate shafts until notches are aligned with bolt holes in support plate.
3. See Figure 3-35. Check for proper end play.
   a. Insert a feeler gauge between the rocker arm and support plate.
   b. Repeat measurement on other rocker arm.
   c. Replace the rocker arm, rocker arm support plate or both if end play exceeds 0.025 in. (0.635 mm).
4. Install the four bolts with flat washers in the rocker arm support plate. Remember that the two bolts on the pushrod side (right) must engage the notches in the rocker arm shafts for proper assembly.

Figure 3-35. Check End Play

DISASSEMBLY

1. See Figure 3-36. Separate upper (2) and lower (8) pushrod covers.
2. Remove and discard O-ring (9).
3. Remove O-ring (1). Slide O-ring (7), flat washer (6), spring (5) and spring cap (4) from upper pushrod cover (2). Discard O-rings.

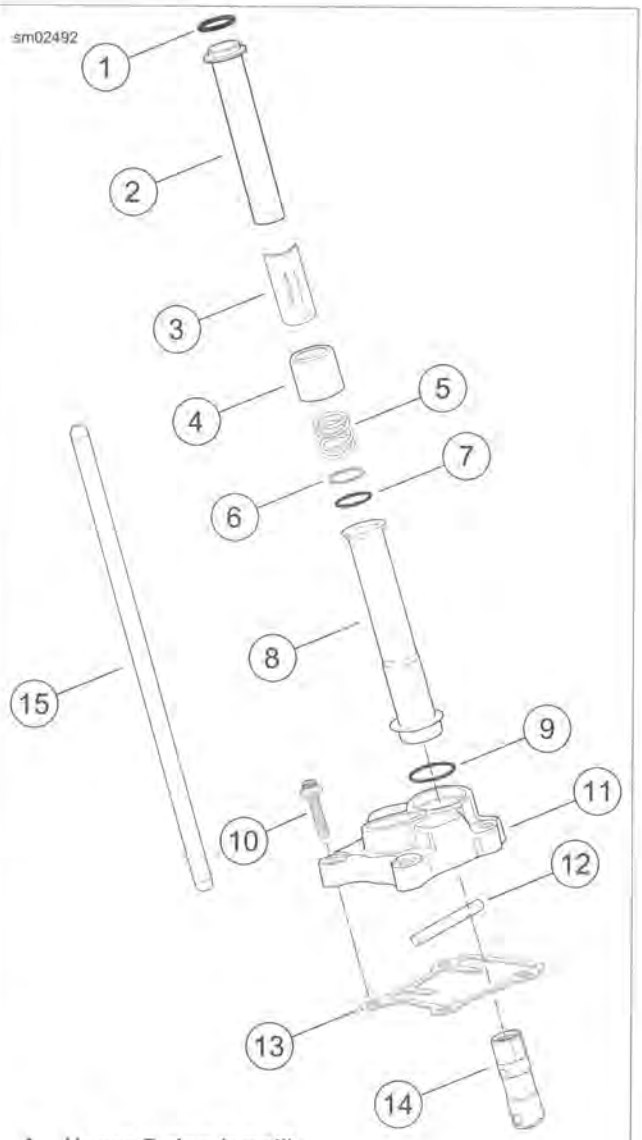
CLEANING AND GENERAL INSPECTION

1. See Figure 3-36. Clean old gasket material from the lifter cover (11).
2. With the exception of the hydraulic lifters (14), clean all parts in a non-volatile cleaning solution or solvent. Verify that the O-ring seats and contact surfaces of the pushrod covers (2, 8) are completely clean.

⚠WARNING

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

3. Dry parts with low pressure compressed air. Verify that all oil holes are clean and open.
4. Verify that the hydraulic lifter rollers turn freely and are free of flat spots, scuff marks and pitting. If flat spots exist, examine the cam lobe on which the lifter operates.
5. Inspect the lifter socket for signs of wear. Verify that the plunger of the hydraulic lifter is fully extended up against the C-clip. Use index finger to pump plunger to verify lifter operation.
6. Examine the pushrods (15). Replace any pushrods that are bent, dented, damaged, discolored or if the ball ends show signs of excessive wear or damage.
7. Cover all parts with a clean plastic sheet to protect them from dust and dirt.



1. **Upper O-ring (small)**
2. **Upper pushrod cover**
3. **Spring cap retainer**
4. **Spring cap**
5. **Spring**
6. **Flat washer**
7. **Middle O-ring (intermediate)**
8. **Lower pushrod cover**
9. **Lower O-ring (large)**
10. **Lifter cover screw**
11. **Lifter cover**
12. **Anti-rotation pin**
13. **Lifter cover gasket**
14. **Hydraulic lifter**
15. **Pushrod**

Figure 3-36. Pushrods, Lifters and Covers

LIFTER INSPECTION

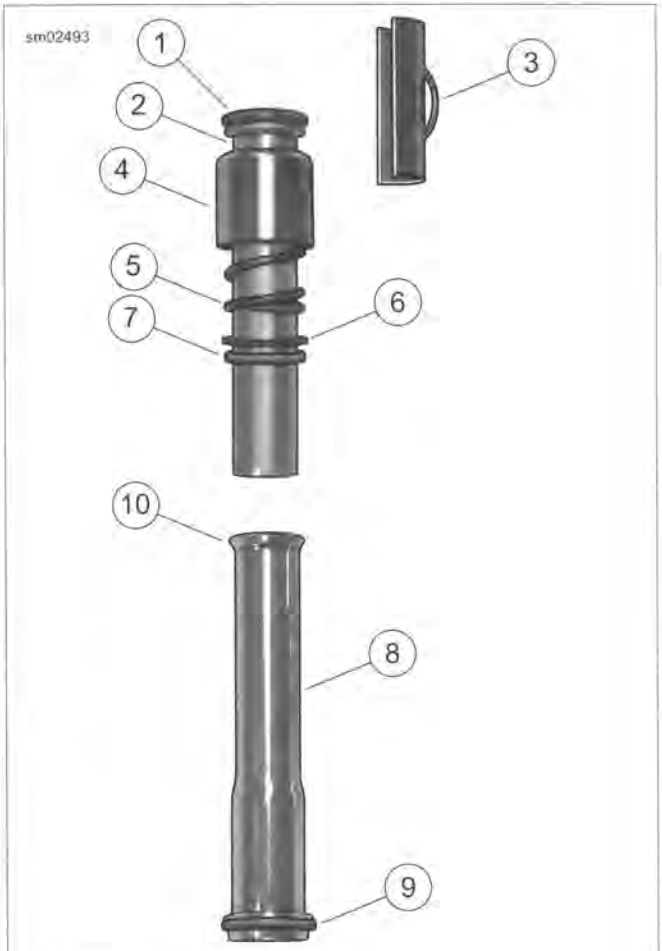
1. Inspect lifters for excessive clearance in bores. Accurately measure the lifter outer diameter and record the measurement.

2. Accurately measure lifter bore inner diameter with a snap gauge. Subtract this measurement from the lifter measurement to determine clearance.
   a. Clearance should be within 0.0008-0.0020 in (0.0203-0.0508 mm).
   b. Install **new** lifters and/or replace crankcases if clearance exceeds service wear limit of 0.007 in (0.076 mm).
3. Check lifter roller end clearance.
   a. End clearance should be 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.

ASSEMBLY

With the exception of the pushrod covers, all parts will be assembled during the installation procedure.

1. See Figure 3-37. Apply a very thin film of clean engine oil to **new** O-rings (1, 7 and 9) before installation.
2. Install small O-ring (1) on seat at the top of the upper pushrod cover (2).
3. Slide the spring cap (4), spring (5), flat washer (6) and intermediate size O-ring (7) onto the body of the upper pushrod cover. Move parts up body until spring cap contacts upper O-ring seat.
4. Fit the straight end of the upper pushrod cover into the flared end of the lower pushrod cover (8).
5. Install large O-ring (9) on seat at bottom of lower pushrod cover.



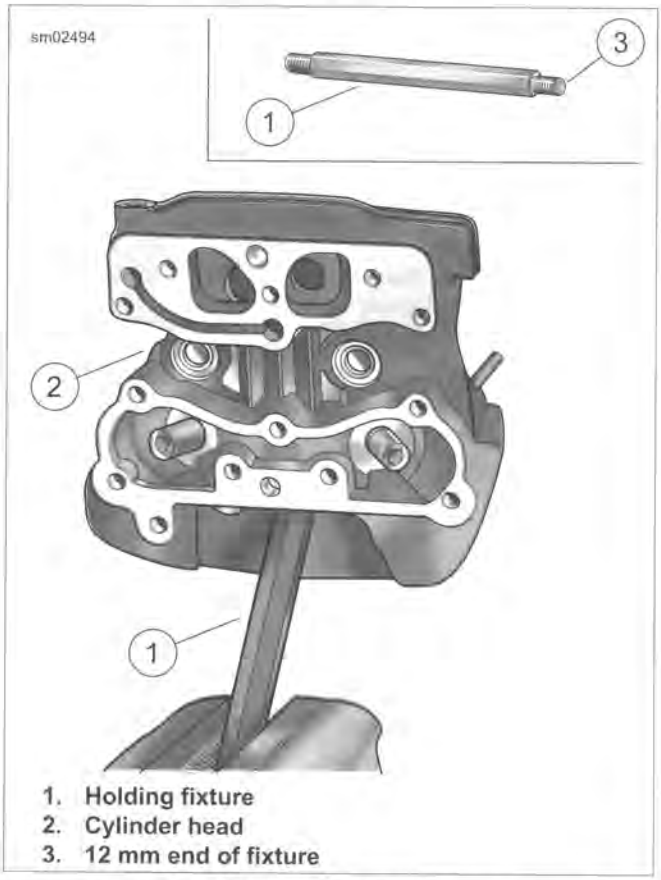
1. **Upper O-ring (small)**
2. **Upper pushrod cover**
3. **Spring cap retainer**
4. **Spring cap**
5. **Spring**
6. **Flat washer**
7. **Middle O-ring (intermediate)**
8. **Lower pushrod cover**
9. **Lower O-ring (large)**
10. **Flared end of lower pushrod cover**

Figure 3-37. Assembled Pushrod Cover

DISASSEMBLY

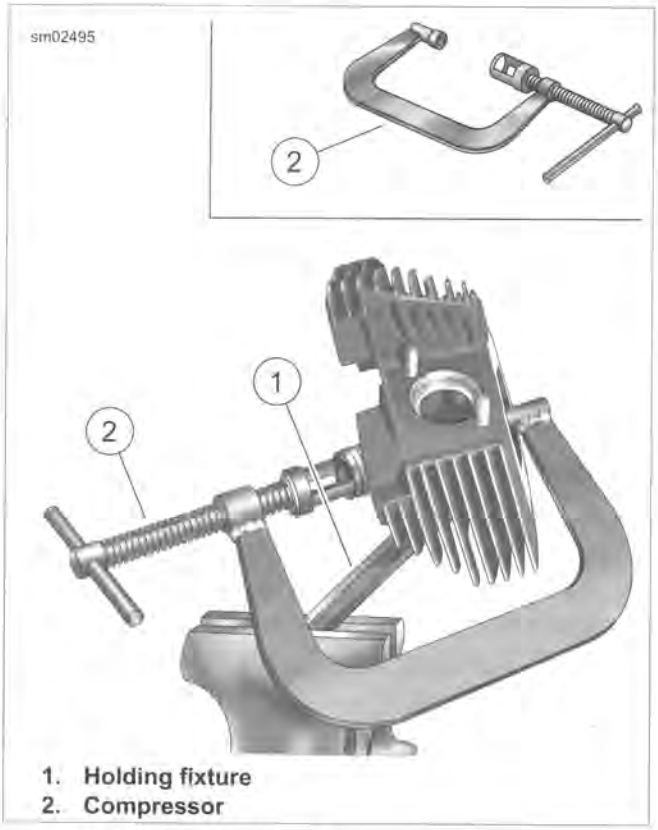
PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR
HD-39786	CYLINDER HEAD HOLDING FIXTURE

1. **Twin-Cooled models:** Remove lines and fittings from cylinder head. See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Removal.
2. Before proceeding with the disassembly procedure, determine if valve reconditioning is necessary. Use either of the following procedures:
   a. Raise valve ports of cylinder head to strong light source. If light is visible between valves and seats, the cylinder head and valves require reconditioning.
   b. Fill ports with solvent. Wait ten full seconds and check for leakage past valve seats. Recondition cylinder heads and valves that leak.
3. See Figure 3-38. Secure cylinder head for service.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) (1) into cylinder head (2) spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.



1. Holding fixture
2. Cylinder head
3. 12 mm end of fixture

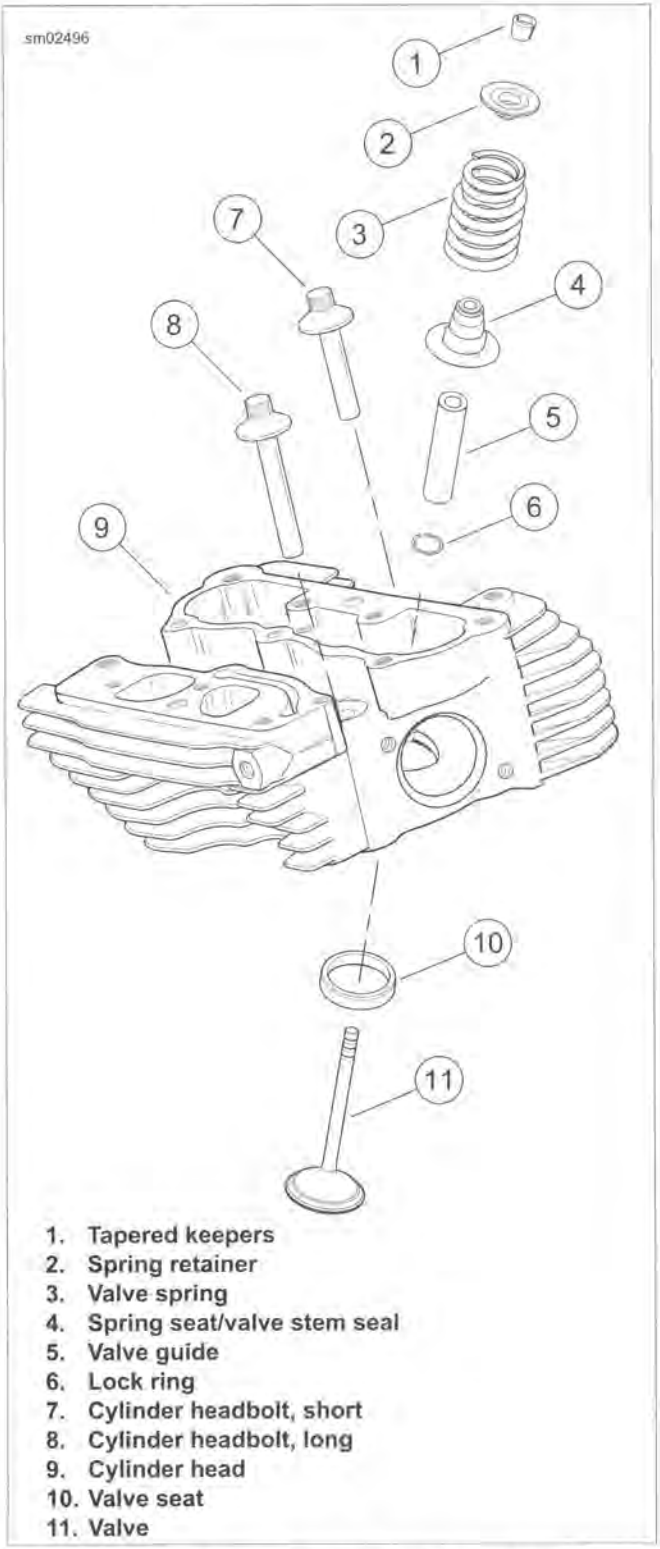
Figure 3-38. Cylinder Head Holding Fixture



1. Holding fixture
2. Compressor

Figure 3-39. Valve Spring Compressor

4. See Figure 3-39. Release valve spring compression.
   a. Place VALVE SPRING COMPRESSOR (Part No. HD-34736-B) (2) over cylinder head. Center blunt end on the valve head. Seat adapter at end of forcing screw on the valve spring retainer.
   b. See Figure 3-40. Rotate forcing screw to compress valve spring until keepers (1) can be removed from the valve stem (11).
   c. Rotate forcing screw to release the valve spring compression.
5. Remove the spring retainer (2) and valve spring (3).
6. Slide the valve (11) from the valve guide (5).
7. Remove valve seal assembly.
8. Mark the valve head F(ront) or R(ear) for identification. Also, separate and tag tapered keepers, valve spring and spring retainer so that they are installed on the same valve at time of assembly.
9. Remove the remaining valve and components.
10. Remove fixture tool from spark plug hole.



1. **Tapered keepers**
2. **Spring retainer**
3. **Valve spring**
4. **Spring seat/valve stem seal**
5. **Valve guide**
6. **Lock ring**
7. **Cylinder headbolt, short**
8. **Cylinder headbolt, long**
9. **Cylinder head**
10. **Valve seat**
11. **Valve**

Figure 3-40. Cylinder Head Assembly

CLEANING

1. See Figure 3-40. Remove old gasket material from cylinder head (9). Gasket material left on sealing surfaces will cause leaks. Scraping may result in scratches or nicks.

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)

NOTE

Bead blasting materials could also enter threaded holes. This would adversely affect fastener engagement and torque indication. Cover all threaded holes before bead blasting.

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.
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.

⚠WARNING

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

5. Dry parts with low pressure compressed air.

INSPECTION

PART NUMBER	TOOL NAME
B-45525	VALVE GUIDE HONE
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-42324-A	CYLINDER TORQUE PLATES

Cylinder Head

1. Check for scratches and nicks on all gasket sealing surfaces.
2. Check for warpage.
   a. Place a straightedge diagonally across the cylinder head gasket surface.
   b. Slide a feeler gauge beneath the straightedge to check the head for warpage.
   c. Repeat the procedure on the opposite diagonal. Discard the head if warpage is 0.006 in. (0.152 mm) or greater.

3. Check for warpage (alternate method.)
   a. Use one of the CYLINDER TORQUE PLATES (Part No. HD-42324-A) in lieu of the straightedge.
   b. Lay the upper plate (without vise grip) flat on the machined surface of the head.
   c. As a preliminary check, see if the plate rocks from side to side. A head on which the plate rocks is immediately suspect.
   d. Insert a feeler gauge between the plate and head at various locations.
   e. Discard the head if warpage is 0.006 in. (0.152 mm) or greater.
4. Verify that oil passageways are open and clean.

Valve Guides

1. Inspect external surfaces, particularly the combustion chamber side, for cracks. Replace as necessary.
2. Prepare valve guides for inspection.
   a. Lightly hone bore using the VALVE GUIDE HONE (Part No. B-45525).
   b. Scrub with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) to remove any dust or debris.
   c. Polish the valve stem with fine emery cloth or steel wool to remove carbon buildup.
3. Check valve stem to guide clearance:
   a. Carefully measure the **inside** diameter of the valve guide using a ball gauge.
   b. Measure the **outside** diameter of the valve stem with a micrometer.
   c. Refer to Table 3-34. If the clearance between stem and guide exceeds the limits shown, the valve stem and/or guide are excessively worn.
   d. Repeat measurements with a **new** valve to determine if the guide must be replaced.

Table 3-34. Valve Stem to Guide Clearance Service Wear Limits

VALVE	IN	MM
Intake	0.0038	0.0965
Exhaust	0.0038	0.0965

Valves

1. Replace the valve if there is evidence of burning or cracking.
2. Inspect the end of the valve stem for pitting or uneven wear. Replace as necessary.
3. Inspect for burrs around the valve stem keeper groove. Remove burrs with a fine tooth file.
4. To determine if the valve stem is excessively worn, see valve guide inspection.

Valve Springs

1. Inspect springs for cracked or discolored coils. Replace as necessary.
2. Set the valve springs on a level surface. Check for proper squareness.
3. Check free length of springs using a caliper and load test using a commercially available valve spring tester. Replace springs if free length or compression force do not meet specifications. See 3.2 SPECIFICATIONS.

Tapered Keepers

Install **new** keepers any time valves are installed.

Valve Seats

1. Inspect seats for cracking, chipping or burning. Replace as necessary.
2. Check seats wear by measuring valve stem protrusion. See 3.22 CYLINDER HEAD, Valve and Seat Refacing.

VALVE GUIDE REPLACEMENT

PART NUMBER	TOOL NAME
B-45523	VALVE GUIDE REAMER
B-45524-1	VALVE GUIDE DRIVER
B-45524-2A	VALVE GUIDE INSTALLER SLEEVE
B-45525	VALVE GUIDE HONE
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-39782-B	CYLINDER HEAD SUPPORT STAND KIT
HD-39786	CYLINDER HEAD HOLDING FIXTURE
HD-39847	REAMER T-HANDLE
HD-39964	REAMER LUBRICANT

Removal

NOTES

- *If valve guide replacement is necessary, always install **new** guide before refacing valve seat.*
- *CYLINDER HEAD SUPPORT STAND KIT (Part No. HD-39782-B) ensures that valve guide and seat are perpendicular. Not keeping cylinder head valve guide bore perpendicular will result in damage during the press procedure.*

1. See Figure 3-41. Prepare cylinder head for valve guide replacement.
   a. Obtain CYLINDER HEAD SUPPORT STAND KIT (Part No. HD-39782-B).
   b. Insert sleeve of appropriate seat adapter (3 or 4) into tube at top of support stand (2).
   c. Position cylinder head so that valve seat is centered on seat adapter.

NOTE

Always press valve guide toward combustion chamber. Carbon buildup on combustion chamber side of guide can damage cylinder head bore. this may prevent a proper interference fit.

2. Remove and discard lock ring from valve guide groove.

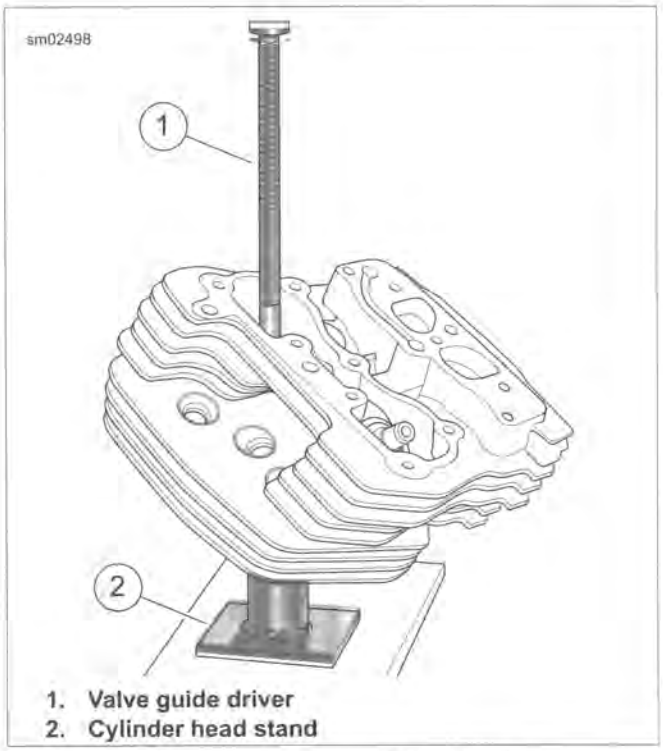
NOTE

Lock ring is present on OEM intake and exhaust valve guides.

3. Insert VALVE GUIDE DRIVER (Part No. B-45524-1) (1) into valve guide bore.
4. See Figure 3-42. Center valve guide driver under ram of arbor press. Apply pressure until valve guide drops free of cylinder head. Discard valve guide.

1. **Valve guide driver**
2. **Cylinder head support stand**
3. **Intake seat adapter**
4. **Exhaust seat adapter**
5. **Valve guide installer sleeve**

Figure 3-41. Valve Guide Replacement Tools



1. **Valve guide driver**
2. **Cylinder head stand**

Figure 3-42. Remove Valve Guide

Installation

1. Check valve guide to valve bore interference fit.
   a. Measure the outside diameter of a **new** standard valve guide.
   b. Measure the cylinder head valve guide bore. The valve guide should be 0.0020-0.0033 in. (0.051-0.084 mm) larger than the bore.
   c. If interference is not within specification, select one of the following oversize guides: 0.001 in. (0.025 mm), 0.002 in. (0.05 mm) or 0.003 in. (0.08 mm).

NOTE

Pressing out guide may remove material. Using the next larger size is not uncommon to guarantee proper interference fit.

2. Select an oversize guide that will provide the correct interference fit.

NOTE

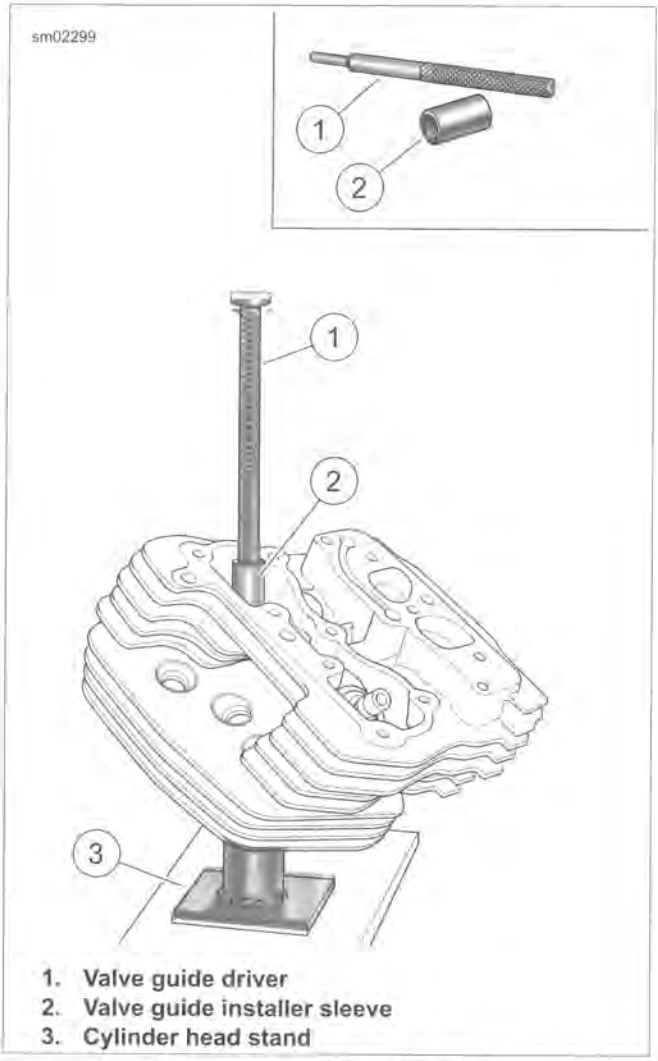
The support stand ensures that valve guide and seat are perpendicular. This alignment helps prevent damage during the press procedure.

3. Prepare cylinder head for valve guide replacement.
   a. See Figure 3-41. Insert sleeve of the appropriate seat adapter (3 or 4) into tube at top of support stand (2). Position cylinder head so that valve seat is centered on seat adapter.
   b. Apply a thin film of petroleum jelly to lightly lubricate external surface of valve guide.
   c. Start valve guide into bore.
   d. See Figure 3-43. Place VALVE GUIDE INSTALLER SLEEVE (Part No. B-45524-2A) (2) over valve guide and then insert valve guide driver (1) into sleeve.
   e. Center valve guide driver under ram of arbor press and apply pressure only until valve guide is started in bore and then back off ram slightly to allow guide to center itself.

NOTE

Always back off ram to allow the valve guide to find center. Pressing guide into cylinder head in one stroke can bend driver, break guide, distort cylinder head casting and/or damage cylinder head valve guide bore.

   f. Verify that support stand (3) and driver (1) are square. Center driver under ram and press valve guide further into bore, then back off ram again to allow valve guide to center itself.
   g. Repeat previous step until installer sleeve contacts machined area of cylinder head.
   h. Install **new** lock ring into valve guide groove. Verify that lock ring is square and fully seated in the groove.



1. **Valve guide driver**
2. **Valve guide installer sleeve**
3. **Cylinder head stand**

Figure 3-43. Install Valve Guide

4. Secure cylinder head for service.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.

1. T-handle
2. Valve guide reamer

Figure 3-44. Reaming Valve Guide Bore

NOTE

Valve guides are reamed to within 0.0005-0.0001 in. (0.013-0.0025 mm) under finished size.

5. See Figure 3-44. Ream the guide.
   a. Install REAMER T-HANDLE (Part No. HD-39847) (1) on VALVE GUIDE REAMER (Part No. B-45523) (2).
   b. Apply a liberal amount of REAMER LUBRICANT (Part No. HD-39964) to valve guide bore and reamer. Start reamer into bore.

NOTE

Never turn reamer counterclockwise.

   c. Apply slight pressure on reamer while rotating clockwise. Squirt additional lubricant onto reamer and into guide as necessary.

NOTE

For best results, do not push reamer or apply pressure to the reamer handle. Excessive pressure results in a rough cut and the bore will be tapered if pressure is not centrally applied.

   d. Continue rotating reamer T-handle until entire bit has passed through valve guide bore.
   e. Remove T-handle from reamer, and carefully draw out reamer through combustion chamber side of valve guide.

⚠WARNING

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

6. Remove metal shavings with low pressure compressed air.
7. See Figure 3-45. Clean valve guide bore with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751).
8. See Figure 3-46. Hone bore to finished size.
   a. Install VALVE GUIDE HONE (Part No. B-45525) in a high-speed electric drill.
   b. Apply reamer lubricant to stones of hone and valve guide bore.
   c. Start stones of hone into bore.
   d. Rotate the hone while moving the stones through the entire length of the bore for 10-12 complete strokes. Work for a crosshatch pattern of approximately 60 degrees.
9. Remove debris with low pressure compressed air. Clean with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751).

NOTE

Always check valve stem to valve guide clearance after honing.

10. Check valve stem to valve guide clearance. Refer to Table 3-35. If the clearance is not within specification, repeat the honing process and recheck.

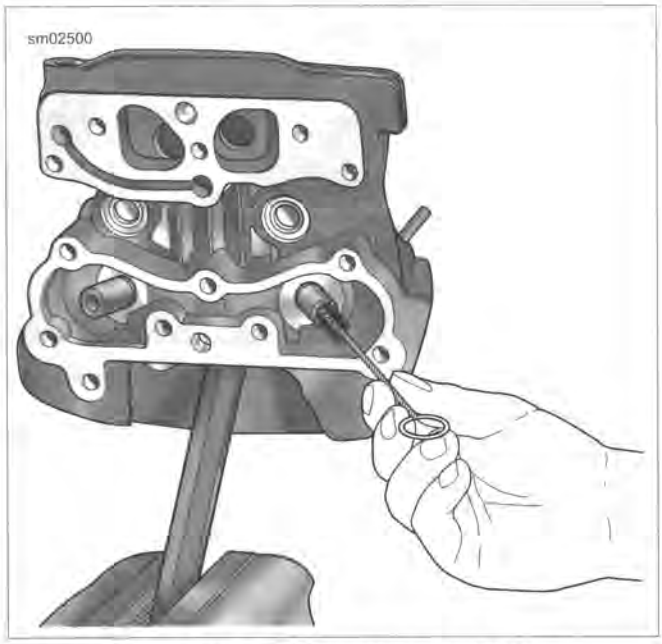


Figure 3-45. Scrubbing Valve Guide Bore

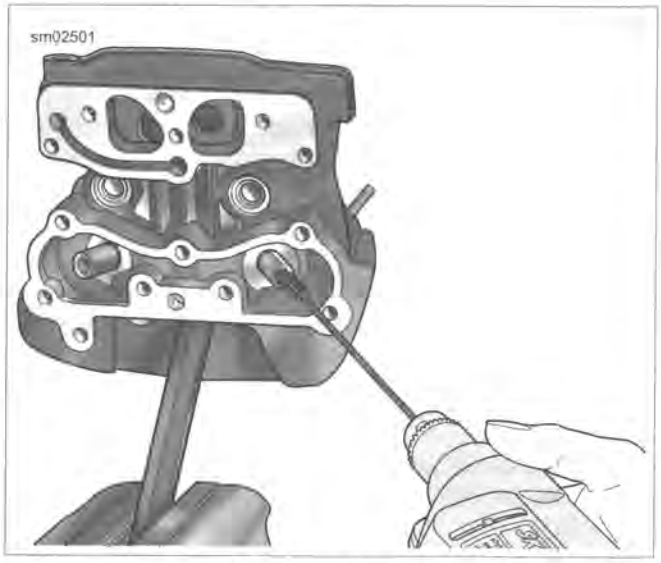


Figure 3-46. Honing Valve Guide Bore

11. Clean cylinder head assembly.
    a. Using cleaning solvent, thoroughly clean cylinder head and valve guide bore.
    b. Scrub valve guide bore with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751). For best results, clean the valve guide bore with the type of swabs or patches found in gun cleaning kits and a thin engine oil.
    c. Continue to wipe bore until a clean cloth shows no evidence of dirt or debris. Follow up with a thorough wash in hot soapy water.

⚠WARNING

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

12. Dry parts with low-pressure compressed air.

Table 3-35. 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

VALVE AND SEAT REFACING

PART NUMBER	TOOL NAME
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-35758-C	NEWAY VALVE SEAT CUTTER SET
HD-39786	CYLINDER HEAD HOLDING FIXTURE

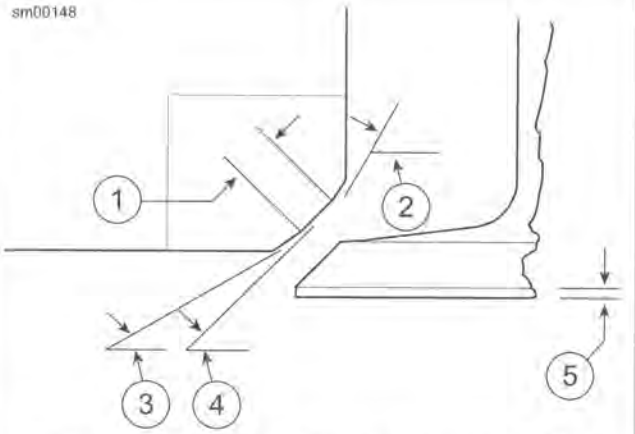
NOTES

- *Verify correct valve stem to valve guide clearance before refacing. If **new** guides must be installed, complete that task before refacing valve seats. Refer to Table 3-35.*
- *This procedure is not based on the lapping of valves. The end result is an interference fit between the 45 degree valve face and the valve seat which will be 46 degrees.*

1. Remove carbon deposits from valve head, face and stem with a wire wheel. Do not remove any metal. Carbon left on stem may affect alignment during valve refacing.
2. Polish valve stem with steel wool or crocus cloth to remove marks left by wire wheel.
3. Grind valve face to a 45 degree angle using a valve grinding machine.

NOTES

- *Do not remove any more metal than necessary to clean up and true the valve face.*
- *Replace the valve if margin is less than 0.0313 in (0.795 mm). See Figure 3-47.*



1. **Minimum: 0.040 in. (1.016 mm) / Maximum: 0.062 in. (1.575 mm)**
2. **60 degrees**
3. **31 degrees**
4. **46 degrees**
5. **Margin**

Figure 3-47. Valve and Seat Dimensions

4. Wipe valve seats and valve faces clean. Install the valve into the valve guide. Push on head of valve until it contacts the valve seat.

5. See Figure 3-48. Measure valve stem protrusion.
   a. Use a dial caliper to check the distance from the top of the valve stem to the machined area on the cylinder head.
   b. If protrusion exceeds 2.069 in. (52.553 mm), replace the valve, valve seat or cylinder head as necessary.

NOTE

Do not shorten the valve by grinding the end of the stem. Grinding removes the hardened case which results in accelerated wear.

6. Secure cylinder head for servicing.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp fixture in vise and further tighten cylinder head onto the fixture to prevent any movement during operation.
   c. Place cylinder head at a 45 degree angle or one that offers a comfortable working position.
7. To determine the correct location of the 46 degree valve seat in the head, measure the diameter of the valve head and subtract 0.080 in. (2.032 mm) from that number.
8. Set the dial caliper to the lesser measurement and lock down for quick reference. This is the diameter of the valve seat.
9. Use a permanent marker to highlight the valve seat area. Highlight all three angles. Allow marker to dry before proceeding.

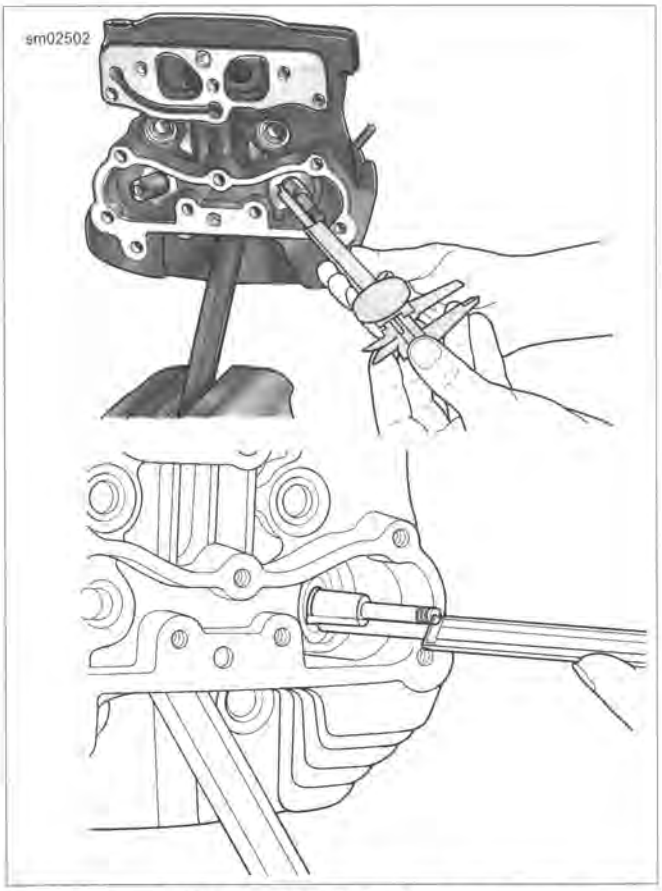


Figure 3-48. Checking Valve Stem Protrusion

NOTES

- *Always verify cutter blades and cutter pilot are clean before beginning the cutting process. The correct cleaning brush is supplied with the Neway tool set.*
- *Always verify the inside of the valve guide is clean by using VALVE GUIDE CLEANING BRUSH (Part No. HD-34751).*

10. See Figure 3-49. Obtain the NEWAY VALVE SEAT CUTTER SET (Part No. HD-35758-C). Choose the cutter pilot that fits properly into the valve guide hole. Securely seat the pilot by pushing down and turning using the installation tool supplied in the tool set.
11. Choose the proper 46 degree cutter (intake or exhaust) and gently slide the cutter onto the pilot. Do not drop the cutter onto the seat.
12. While applying a constant and consistent pressure, remove only enough metal to provide a uniform finish and to remove pitting.

NOTES

- *If the width of the clean-up cut is greater on one side of the seat than the other, the guide may need to be replaced due to improper installation.*
- *If a groove cut completely around the seat is apparent, slightly stagger the blades of the cutter.*

13. Measure the 46 degree cut at the outermost edge at the widest point of the circle to determine what cut will be made next.
    a. If the outer diameter is too large, use the 31 degree cutter to lower the valve seat.
    b. If the outer diameter is too small, use the 46 degree cutter to widen the valve seat or move it away from the port.

NOTES

- *Because the OD measurement of the valve seat is used as a reference point it will usually be necessary to use the 31 degree cutter following the initial 46 degree cut.*
- *Always highlight the valve seat with the permanent marker in order to better view the location of the 46 degree valve seat.*

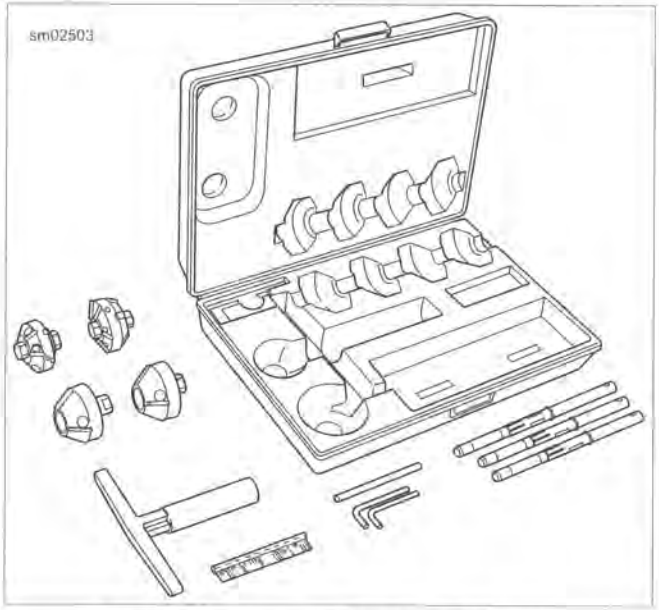


Figure 3-49. Neway Valve Seat Cutter Set

14. If the location of the valve seat is not correct, repeat steps 10 through 13.
15. When a complete clean-up of the 46 degree angle is accomplished and the width is at least 0.062 in. (1.575 mm), proceed to the next step.
16. Select the proper 60 degree cutter and gently slide the cutter down the cutter pilot to the valve seat.
17. Remove just enough material to provide an even valve seat width of 0.040-0.062 in. (1.016-1.575 mm).
18. Remove cutter and cutter pilot.
19. Insert valve into the cylinder head. Use thumb pressure against valve to hold it closed.
20. Completely fill the port with solvent to verify proper seal between valve and valve seat.

NOTE

Hold pressure against the valve for a minimum of 10 seconds. If any leakage occurs, examine the valve and valve seat for irregularities or defects. If necessary repeat the above valve grinding or valve seat cutting process.

21. Repeat the process on any valve seat that needs service.
22. Clean valves, cylinder head and valve seats in solvent. Follow up with a thorough wash in hot soapy water.

⚠WARNING

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

23. Dry parts with low pressure compressed air.

ASSEMBLY

PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-39786	CYLINDER HEAD HOLDING FIXTURE

1. Secure cylinder head for service.
    a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
    b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.

NOTE

At the time of disassembly, all parts should have been marked or tagged so that they are installed on the same valve (and in the same head).

2. Run the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) through the valve guide bore to verify cleanliness.
3. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to valve stem.
4. Install the valve into the cylinder head.
5. To distribute the assembly lube evenly around the valve stem and guide, hand spin the valve as it is installed. Work the valve back and forth in the bore to verify that it slides smoothly and seats properly.
6. Remove the valve and apply a second coat of SCREAMIN' EAGLE ASSEMBLY LUBE to the valve stem. Install the valve.

NOTICE

Failure to install plastic capsule can cause the valve stem seal to catch the edge of the valve stem keeper groove. The resulting damage can cause leakage around the valve stem, excessive oil consumption and valve sticking. (00535b)

7. See Figure 3-50. Hold valve against the valve seat. Slide plastic capsule over valve stem tip and keeper groove.
8. Apply a very thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to capsule.
9. See Figure 3-51. Slide **new** valve stem seal/spring seat over capsule and down valve stem until seated against

cylinder head casting. Remove capsule from valve stem tip.

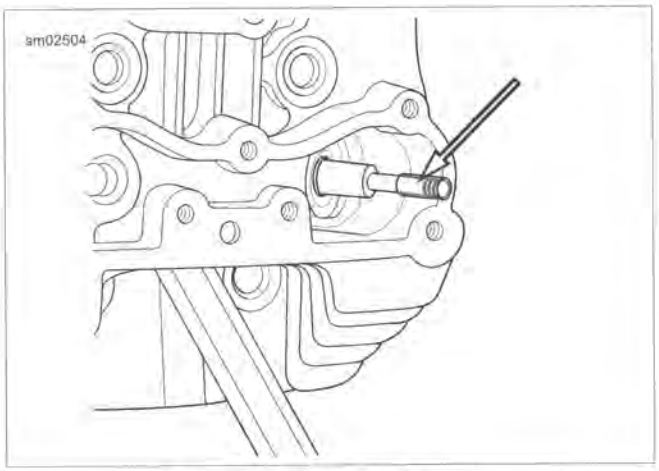
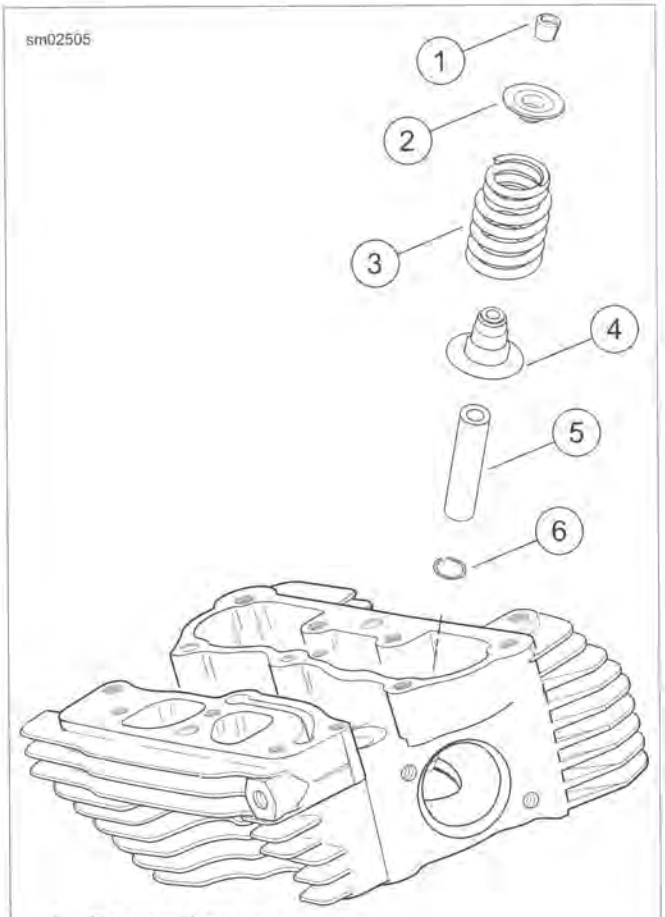


Figure 3-50. Plastic Capsule

Figure 3-51. Valve Stem Seal/Spring Seat Assembly

10. See Figure 3-52. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to valve stem tip and keeper groove (1).
11. With the smaller diameter coils topside, install the valve spring (3). Place the spring retainer (2) on top of the valve spring.
12. Install keepers:
    a. Place VALVE SPRING COMPRESSOR (Part No. HD-34736-B) over cylinder head so that the blunt end is centered on the valve head and adapter at end of forcing screw is seated on the valve spring retainer.
    b. Rotate forcing screw to compress valve spring.
    c. With the tapered side down, fit the keepers into the valve stem groove. For best results, apply a dab of grease to the inboard side of the keepers before installation and use a magnetic rod for easy placement.
    d. Arrange tapered keepers so that the gaps are evenly spaced and release valve spring compression.
13. Tap the end of the valve stem once or twice with a soft mallet to be sure that tapered keepers are tightly seated.
14. Install the other valve and components.
15. **Twin-Cooled models:** Install fittings and lines to cylinder head. See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation.
16. Release the cylinder head holding fixture from the vise. Remove fixture tool from spark plug hole.
17. Cover the cylinder head to protect it from dust and dirt until time of installation.



1. **Tapered keepers**
2. **Spring retainer**
3. **Valve spring**
4. **Spring seat/valve stem set seal**
5. **Valve guide**
6. **Lock ring**

Figure 3-52. Valve Assembly

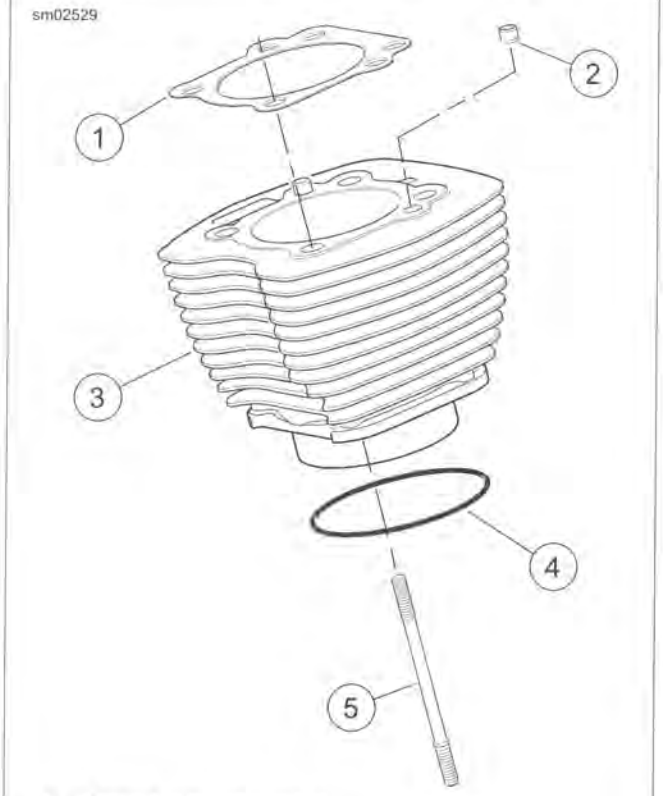
CLEANING

1. See Figure 3-53. Scrape any remaining cylinder head gasket material from the gasket surface at the top of the cylinder (3).

⚠WARNING

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

2. Clean cylinder in a non-volatile cleaning solution or solvent. Dry parts with low pressure compressed air. Verify that oil passageways are clean and open.
3. Inspect the cylinder bore for obvious defects or damage in the ring travel area. Replace cylinders that are severely scored, scuffed, scratched, burnt or gouged.
4. Use a file to carefully remove any nicks or burrs from the machined surfaces of the cylinder.



1. **Cylinder head gasket**
2. **Dowel pin**
3. **Cylinder**
4. **O-ring seal**
5. **Cylinder stud**

Figure 3-53. Cylinder Assembly

INSPECTION

PART NUMBER	TOOL NAME
HD-42324-A	CYLINDER TORQUE PLATES
TA360	SNAP-ON TORQUE ANGLE GAUGE

FASTENER	TORQUE VALUE	
Cylinder torque plate bolts, 1st torque	120-144 **in-lbs**	13.6-16.3 Nm
Cylinder torque plate bolts, 2nd torque	15-17 ft-lbs	20.3-23.0 Nm
Cylinder torque plate bolts, final torque	90 degrees	90 degrees

1. Using dye penetrant, inspect the cylinder for cracks. If no cracks are found, thoroughly wash cylinder to remove traces of dye.
2. See Figure 3-54. Check the machined surfaces for flatness using a feeler gauge and CYLINDER TORQUE PLATES (Part No. HD-42324-A):
   a. Lay gasket side of the upper torque plate (3) flat against the head gasket surface of the cylinder.
   b. As a preliminary check, see if the plate rocks from side to side. A cylinder on which the plate rocks is immediately suspect.
   c. Insert a feeler gauge between the plate and cylinder at various locations.
   d. The head gasket surface must be flat within 0.006 in. (0.15 mm).
   e. Lay the seal side of the lower torque plate (2) flat against the O-ring seal surface and check flatness using a feeler gauge.
   f. The O-ring seal surface must be flat within 0.004 in. (0.102 mm).
   g. Replace the cylinder (and piston) if either surface exceeds specification.

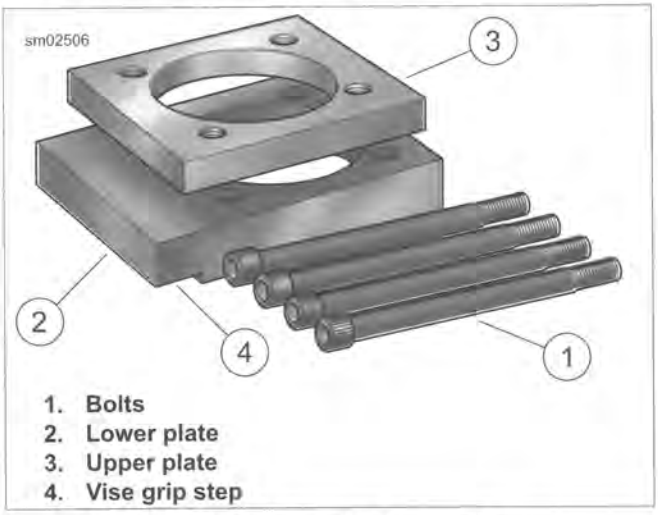
NOTE

Failure to use cylinder torque plates can produce measurements that vary by as much as 0.001 in. (0.025 mm). This may result in the use of parts that are unsuitable for service.

3. Install CYLINDER TORQUE PLATES (Part No. HD-42324-A):
   a. Remove O-ring seal from cylinder sleeve, if installed.
   b. See Figure 3-55. Clamp the stepped side of the lower plate in a vise with soft jaws.
   c. Lightly oil threads and shoulders of four bolts (1) with clean engine oil and slide through holes of lower plate (2).
   d. Slide cylinder onto bolts with the indent in the cooling fins facing upward.
   e. Place a used head gasket on cylinder and install upper plate with blind holes aligned with dowel pins in cylinder. Secure with bolts (1).
   f. See Figure 3-56. Tighten the bolts to 120-144 **in-lbs** (13.6-16.3 Nm) in the sequence shown.
   g. Following the same sequence, tighten each bolt to 15-17 ft-lbs (20.3-23.0 Nm).
   h. Final-tighten each bolt an additional 90 degrees (90 degrees) in the same sequence.

NOTE

For best results use SNAP-ON TORQUE ANGLE GAUGE (Part No. TA360). If the tool is not available, mark a straight line on each bolt head continuing the line onto the lower plate.



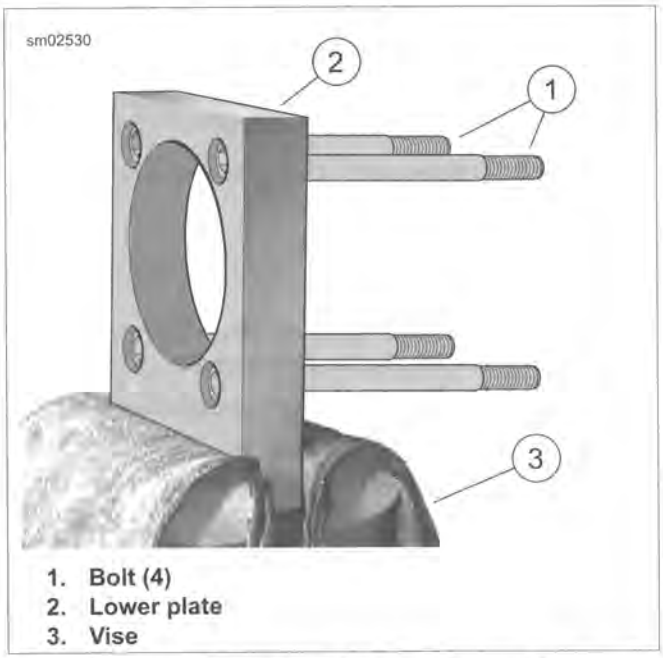
1. **Bolts**
2. **Lower plate**
3. **Upper plate**
4. **Vise grip step**

Figure 3-54. Cylinder Torque Plates

NOTE

Maximum cylinder wear occurs at the top of top ring travel. Minimum wear occurs below ring travel. Always take measurements in both areas.

4. See Figure 3-57. Using an inside micrometer or dial bore gauge, check cylinder bore for out-of round and taper:
   a. At the top of the piston ring travel zone, measure the cylinder diameter at two locations; parallel and perpendicular to the crankshaft. Record the readings.
   b. Repeat the two measurements at the center of the piston ring travel zone and again at the bottom of the bore at a point below the piston ring travel zone.
   c. See 3.3 SERVICE WEAR LIMITS. If the out-of-round or taper measurements are not within specification, the cylinder must be rebored and/or honed to accept the next standard oversize piston. See 3.23 CYLINDER, Boring and Honing Cylinder.
   d. If cylinders are not scuffed or scored and are not worn beyond the service limits, see 3.23 CYLINDER, Deglazing Cylinder.



1. **Bolt (4)**
2. **Lower plate**
3. **Vise**

Figure 3-55. Attaching Cylinder Torque Plates

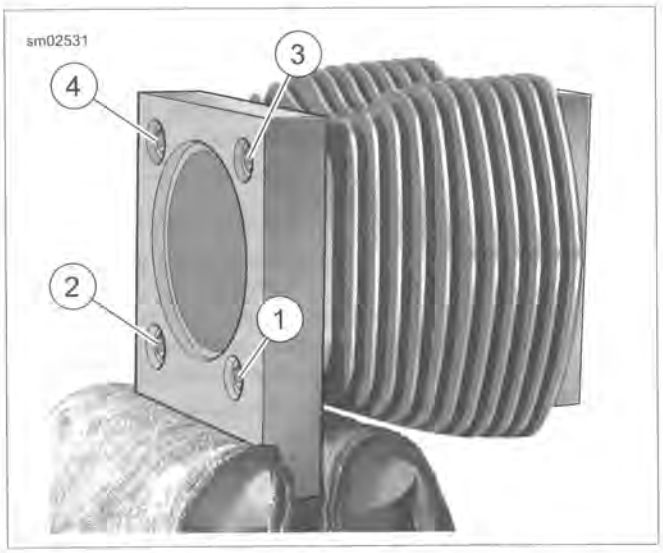


Figure 3-56. Cylinder Torque Plate Bolt Sequence

Figure 3-57. Measure for Out-of-Round and Taper

DEGLAZING CYLINDER

NOTE

Deglazing removes wear patterns, minor scuff marks and scratches without enlarging the bore diameter.

1. Lightly swab the cylinder bore with a cloth dipped in clean engine oil.
2. Obtain a 240 grit flexible ball-type deglazing tool with a bristle tip or finishing stone arrangement able to produce a 60 degree crosshatch pattern.
3. Install the deglazing tool in a slow-speed drill. The speed at which the tool rotates determines the speed at which it must be stroked up and down the bore to produce the desired crosshatch pattern.
4. Starting at the bottom of the cylinder, move the deglazing tool up and down the entire length of the cylinder bore for 10 to 12 complete strokes.
5. Stop to examine the cylinder bore and/or take measurements. A precise 60 degree crosshatch pattern in the piston travel area is the most 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)

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537c)

6. Thoroughly wash the cylinder bore with liquid dishwashing soap and hot water to remove all abrasive particles and residual grit. Continue cleaning until a clean cloth shows no evidence of dirt or debris.
7. Hot rinse the cylinder and dry with moisture free compressed air. Immediately apply a thin film of clean engine oil to a clean white paper towel and thoroughly wipe the inside of the cylinder to prevent the cylinder bore from rusting.

NOTE

*After wiping the cylinder with a clean, oiled paper towel, the towel will be dark with contamination. Repeat this process using a **new** lightly oiled paper towel each time until the towel remains white. The cylinder is now clean.*

8. With the cylinder at room temperature, check the piston clearance in the cylinder in which the piston will run. See 3.24 PISTON, Inspection.

BORING AND HONING CYLINDER

1. Bore cylinder with gaskets and torque plates attached. Refer to Table 3-36. Bore the cylinder to 0.003 in. (0.08 mm) under the desired finished size.

NOTICE

An incorrect crosshatch pattern or too fine a hone will result in insufficient oil retention and possible piston seizure and/or high oil consumption. (00538c)

2. Hone the cylinder to its finished size using a 280 grit rigid hone followed by a 240 grit flexible ball hone. Honing must be done with the torque plates attached. All honing must be done from the bottom (crankcase) end of the cylinder. Work for a 60 degree crosshatch pattern.
3. Stop frequently to examine the cylinder bore and/or take measurements. Remember, a precise 60 degree crosshatch pattern in the piston travel area is important.

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537c)

4. Thoroughly wash the cylinder bore with liquid dishwashing soap and warm water to remove all abrasive particles and residual grit. Continue cleaning until a clean cloth shows no evidence of dirt or debris.
5. Hot rinse the cylinder and dry with moisture free compressed air.
6. Immediately apply a thin film of clean engine oil to a clean white paper towel and thoroughly wipe the inside of the cylinder. This prevents the cylinder bore from rusting.

NOTE

*After wiping the cylinder with a clean, oiled paper towel, the towel will be dark with contamination. Repeat this process using a **new** lightly oiled paper towel each time until the towel remains white. The cylinder is now clean.*

7. With the cylinder at room temperature, check the piston clearance in the cylinder in which the piston will run. See 3.24 PISTON, Inspection.

Table 3-36. Oversize Pistons and Cylinder Bores, Twin Cam 103

PISTON		CYLINDER BORE FINISHED SIZE	
TYPE	SIZE	MINIMUM	MAXIMUM
Standard	STD	3.8750 in (98.425 mm)	3.8755 in (98.438 mm)
Oversize	0.010 in (0.25 mm)	3.8850 in (98.679 mm)	3.8855 in (98.692 mm)

DISASSEMBLY

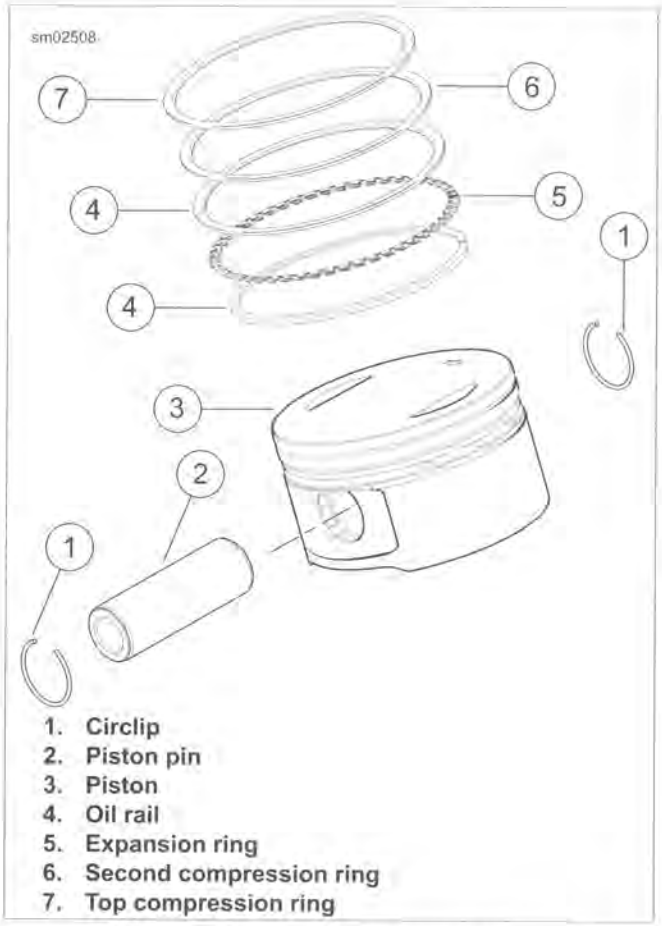
PART NUMBER	TOOL NAME
SNAP-ON PRS8	PISTON RING EXPANDER

Piston Rings

⚠WARNING

Wear safety glasses or goggles when removing or installing compression rings. Compression rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00469c)

1. See Figure 3-58. Carefully remove top (7) and second (6) compression rings using the proper PISTON RING EXPANDER (Part No. Snap-on PRS8).
2. Using your fingers, remove top and bottom oil rails (4) from the third ring groove. Remove the oil rail expansion ring (5).
3. Discard the piston rings.



1. **Circlip**
2. **Piston pin**
3. **Piston**
4. **Oil rail**
5. **Expansion ring**
6. **Second compression ring**
7. **Top compression ring**

Figure 3-58. Piston Assembly

CLEANING

1. Remove all combustion deposits by soaking the pistons in hot water with dishwashing liquid or a cleaner specifically designed to remove carbon and will not corrode aluminum. Follow the manufacturer's instructions when using these cleaners.

NOTE

Do not sand blast or glass bead blast pistons. Bead blasting rounds off ring lands. This will result in oil contamination leading to accelerated wear.

⚠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. Thoroughly rinse the pistons. Dry parts with moisture free compressed air.
3. Clean the oil drain holes leading from the oil control ring groove to the underside of the piston crown. Run a small bristle brush through the passageways. Do not damage or enlarge the holes. Do not use a wire brush.
4. Verify that all other oil holes are clean and open.

NOTE

Avoid scratching the sides of the piston ring grooves.

5. Thoroughly clean the three piston ring grooves of all carbon deposits. A portion of a compression ring properly ground to a sharp chisel-like edge works well for this purpose.
6. Using dye penetrant, inspect the piston for surface cracks. Particularly examine the area around the pin bores, ring lands and oil drain holes beneath the piston crown. If no cracks are found, thoroughly wash piston to remove traces of dye.

INSPECTION

1. See Figure 3-59. Check piston pin. Pin must slide without binding.
   a. Insert a lightly oiled good piston pin into the piston pin bore to feel for the proper interference fit. The pin should slide in and out without binding, but also without pivoting or rocking.
   b. Measure pin and pin bore diameters to determine running clearance. Replace piston and/or pin if clearance exceeds 0.0008 in (0.02 mm).

NOTE

Pistons with superficial wear marks, minor scratching or mild scoring are acceptable for use.

2. Carefully inspect the pistons for damage or excessive wear. Discard if any of the following conditions are found:
   a. Cracked, worn or bent ring lands.
   b. Cracks, gouges, deep scratches or heavy scoring.
   c. Evidence of burning, etching or melting.
   d. Marks or imprints caused by contact with valves.

3. Run your index finger around the edge of the piston crown to feel for dings, nicks or burrs. Lightly file the edge of the crown to remove any defects.

NOTE

Worn ring grooves result in high oil consumption and blow-by of exhaust gases. Blow-by of exhaust gases contaminate the engine oil supply with acids and leaves sludge in the crankcase. It also reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.

4. See Figure 3-60. Measure piston ring side clearance.
   a. Insert the edge of a **new** ring into the piston ring groove. Insert a feeler gauge between the upper surface of the ring and the ring land.
   b. Since the grooves wear unevenly, repeat this check at several locations around the piston groove circumference.
   c. Discard the piston if the side clearance of either compression ring exceeds 0.0045 in (0.11 mm).
   d. Discard the piston if the oil control ring side clearance exceeds 0.010 in (0.25 mm).

NOTES

- *Check the piston clearance in the cylinder in which the piston will run. The cylinder must be deglazed and have torque plates installed when measuring bore.*
- *This inspection is very heat-sensitive. Both the 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 0.0002 in (0.0051 mm).*
- *See upper frame of Figure 3-61. Piston measurement is taken on the bare aluminum for greatest accuracy. The coating has an oval-shaped opening (1) on each side of the piston for proper micrometer placement.*
- *See lower frame of Figure 3-61. The oval openings are too small for a standard flat anvil micrometer which would result in measuring errors. Use a blade or ball anvil style micrometer to measure piston.*

5. See Figure 3-61. Measure running clearance of pistons as follows:
   a. Measure the piston skirt at the bare aluminum openings (1) in the coating. Transfer that measurement to dial bore gauge.
   b. Using a grease pencil, mark the top, middle and bottom of the piston ring travel zone in the cylinder bore. Measure at markings in cylinder parallel and perpendicular to crankshaft.
   c. Replace piston and/or cylinder if running clearance exceeds 0.003 in (0.076 mm).

Figure 3-59. Piston Pin Clearance

Figure 3-60. Measure Piston Ring Side Clearance

1. Bare aluminum opening
2. 4-5 in micrometer
3. Spherical ball anvil adapters

Figure 3-61. Measuring Running Clearance of Piston

ASSEMBLY

PART NUMBER	TOOL NAME
SNAP-ON PRS8	PISTON RING EXPANDER

Checking Piston Ring Gap

NOTES

- *Always use **new** piston rings. Piston rings take a definite set and must not be reused if the engine has been operated. Always deglaze (or hone) the cylinder before installing **new** rings.*
- *Insufficient ring gap may cause the ends to abut at operating temperatures. This will result in ring breakage, cylinder scuffing and/or piston seizure.*
- *Excessive ring gap results in high oil consumption and blow-by of exhaust gases. Blow-by contaminates the oil supply and leaves sludge in the crankcase. It also reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.*

1. See Figure 3-62. Check ring end gap of each ring before placing on the piston. Insert the **new** ring into the cylinder and square it in the bore using the top of the piston. Measure the ring end gap with a feeler gauge. Refer to Table 3-37.

NOTE

Ring end gap dimensions also apply to oversize rings. Replace ring if end gap exceeds specification. If end gap is under specification, filing is permissible.

⚠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. Use compressed air to remove any dirt or dust that may have settled in the oil drain holes and piston ring grooves.

Table 3-37. Piston Ring End Gap

PISTON		IN	MM
Twin Cam 103	Top compression	0.012-0.022	0.305-0.559
	2nd compression	0.015-0.025	0.381-0.635
	Oil control ring	0.010-0.050	0.254-1.270

Figure 3-62. Measuring Ring Gap

Installing Piston Rings

1. See Figure 3-63. Apply clean engine oil to three piston ring grooves.
2. Install expansion ring (4) into third ring groove.
3. Spiral bottom oil rail (5) into space below expansion ring (4). Position gap 90 degrees from the gap in the expansion ring.
4. Spiral top oil rail (3) into space above expansion ring (4). Position gap 180 degrees from the gap in the bottom oil rail.

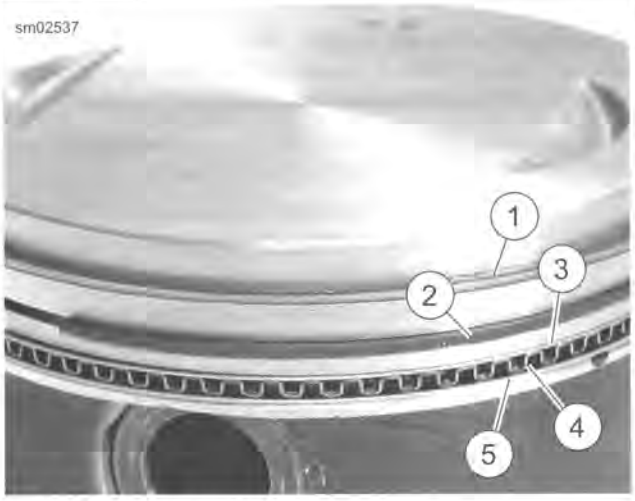
⚠WARNING

Wear safety glasses or goggles when removing or installing compression rings. Compression rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00469c)

NOTES

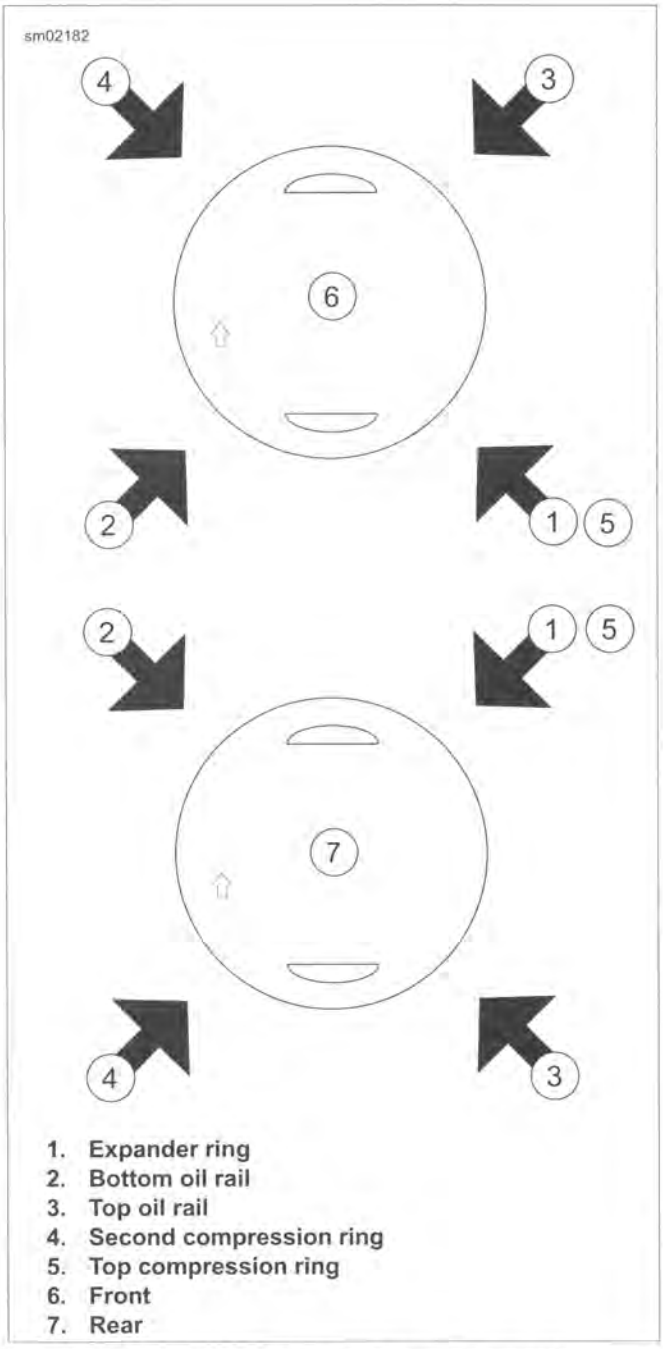
- *Use the proper piston ring spreader to prevent excessive ring twist and expansion. Over expansion may cause the ring to crack. Damaged or distorted rings result in blow-by of exhaust gases. This will result in increased oil consumption and lower service life on valves and other components.*
- *Installing the second compression ring upside down will cause oil to be scraped up into the combustion chamber. This will result in excessive oil consumption and lower service life on valves and other components.*

5. Using PISTON RING EXPANDER (Part No. Snap-on PRS8), carefully install the second compression ring. Make sure the dot (punch mark) near the ring gap faces the piston crown. Rotate the ring so the gap is 180 degrees from the gap in the oil expansion ring.
6. Install the top compression ring. Make sure the dot (punch mark) near the ring gap faces the piston crown. Rotate the ring so the gap is 180 degrees from the gap in the second compression ring.
7. Rotate the three piston rings using the palms of both hands. The rings must rotate freely without sticking.
8. See Figure 3-64. Verify the ring gaps are still properly staggered.



1. **Top compression ring**
2. **Second compression ring**
3. **Top oil rail**
4. **Expansion ring**
5. **Bottom oil rail**

Figure 3-63. Piston Rings



1. **Expander ring**
2. **Bottom oil rail**
3. **Top oil rail**
4. **Second compression ring**
5. **Top compression ring**
6. **Front**
7. **Rear**

Figure 3-64. Piston Ring Gap Alignment

GENERAL

NOTES

- *It is assumed that each step performed on one cylinder is automatically repeated on the other.*
- *Do not use 2006 and earlier connecting rods with 2007 and later pistons. 2007 and later pistons have a tapered wrist pin boss. The wrist pin portion of the 2007 and later connecting rod is tapered to match the boss on the piston.*

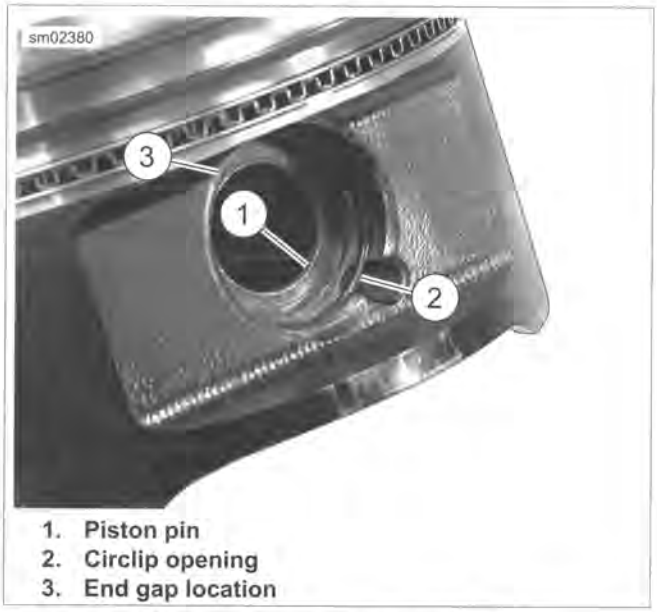
This section provides a sequential process for top end assembly after a complete disassembly. If only a partial disassembly was performed, start where necessary and continue to the end of the section.

PISTON

PART NUMBER	TOOL NAME
HD-42317-A	PISTON PIN CIRCLIP REMOVER/INSTALLER

1. Slide approximately 6.0 in. (152 mm) of plastic tubing, rubber hose or conduit over each cylinder stud, if removed. Use material with I.D. of 0.5 in. (12.7 mm) to protect cylinder studs and piston from damage.
2. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to piston pin, piston bosses and upper connecting rod bore.
3. Remove water pipe insulation from connecting rod shank.
4. See Figure 3-65. Place piston over rod end so that the arrow stamped at the top of the piston points toward the front of the engine.
5. See Figure 3-66. Insert piston pin (1) through pin bore and upper connecting rod bore. Push pin until it contacts circlip installed in opposite pin boss. Verify that end gap (3) for circlip is 180 degrees from opening (2).
6. Place clean shop towels over the cylinder and lifter bores to prevent the piston pin circlip from falling into the crankcase. Verify that the circlip groove is clean and free of dirt and grime.

Figure 3-65. Piston Installation Arrow



1. **Piston pin**
2. **Circlip opening**
3. **End gap location**

Figure 3-66. Pre-Installed Circlip

NOTE

Do not reuse piston pin circlips. They could weaken during removal causing them to break or dislodge during engine operation. This condition will result in engine damage.

7. Install **new** piston pin circlip with the PISTON PIN CIRCLIP REMOVER/INSTALLER (Part No. HD-42317-A).
   a. See Figure 3-67. Slide circlip down nose of tool until it contacts claw. Lightly squeeze handles of tool to capture circlip in claw.
   b. Releasing pressure on handles, rotate circlip so that the end gap is centered at top of tool and then recapture in claw.
   c. Tilt the circlip forward until the end gap contacts nose of tool.
   d. See Figure 3-68. Insert the tool (1) into the piston pin bore until claw is aligned with slot (2) in piston.
   e. Firmly push the tool into the piston pin bore until it bottoms. Release handles and remove tool.
   f. Inspect the circlip to verify that it is fully seated in the groove.

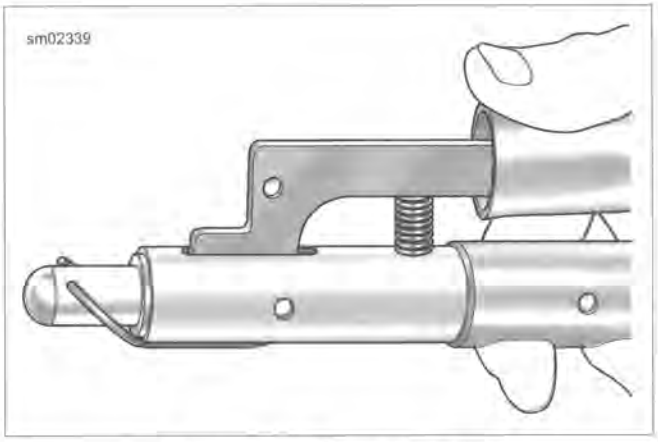
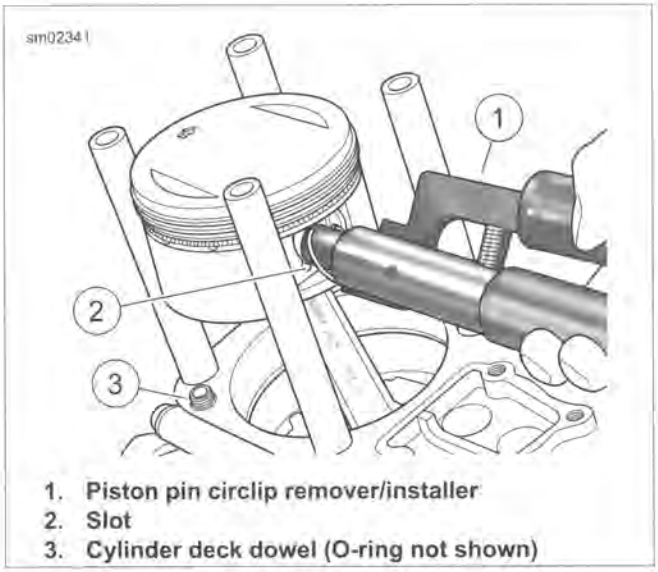


Figure 3-67. Aligning Circlip



1. **Piston pin circlip remover/installer**
2. **Slot**
3. **Cylinder deck dowel (O-ring not shown)**

Figure 3-68. Pin Circlip Installation

CYLINDER

PART NUMBER	TOOL NAME
HD-42322	PISTON SUPPORT PLATE
HD-95952-1	THREADED CYLINDERS
HD-95952-33C	CONNECTING ROD CLAMPING TOOL
HD-96333-51F	PISTON RING COMPRESSOR

1. See Figure 3-68. Apply a very thin film of clean engine oil to **new** O-rings for both lower cylinder deck dowels. Install and verify that O-ring is properly seated in groove.
2. See Figure 3-69. Apply a very thin film of clean engine oil to **new** O-ring seal for the bottom of the cylinder liner. Install **new** O-ring seal.

NOTE

Excessive lubrication of cylinder sleeve O-ring seal will result in oil weepage between cylinder and crankcase as engine is run. This condition may be incorrectly diagnosed as an oil leak.

3. See Figure 3-70. Verify that the piston ring end gaps are staggered. Rotate each ring to position the gap 90 to 180 degrees from the gap in the ring above it. Locate the top piston ring (5) gap towards the intake port.
4. Apply clean engine oil to piston, piston rings and cylinder bore.
5. Remove protective covers from cylinder studs. Rotate engine until piston is at top dead center. If necessary, see 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate for different methods of engine rotation.
6. See Figure 3-71. Install the PISTON SUPPORT PLATE (Part No. HD-42322).
   a. Slide both adjustable knobs (2) on support plate (1) down away from forked end. Tighten knobs when contact is made with flats at end of slots.
   b. With the forked end of the tool pointing towards the center of the engine and the adjustable knobs facing downward, capture shank of connecting rod in fork. Lay tool on cylinder deck so that adjustable knobs contact wall of cylinder bore.
   c. Rotate engine until piston skirt is centered and firmly seated on top of support plate.
7. See Figure 3-72. Install cylinder using PISTON RING COMPRESSOR (Part No. HD-96333-51F).
   a. Fit tabs on pliers (1) into slots of ring compressor band (2). The arrow stamped on the band indicates the side that faces up. The word "bottom" refers to the piston bottom.
   b. Place band around piston. Press the lever on the right side of the pliers to open the jaws for band expansion.
   c. Orient tool so that the top of the band is positioned between the top compression ring and the piston crown.
   d. Tightly squeeze handles of tool to compress piston rings. The ratcheting action of the tool allows release of the handles after the rings are compressed.
   e. With the indent in the cooling fins facing the right side of the engine, gently slide cylinder over the cylinder studs and the piston crown resting it on the top of the ring compressor band.
   f. Place the palms of both hands at the top of the cylinder. Push down on the cylinder with a sharp, quick motion to pass the piston ring area.
   g. Rotate the engine slightly to raise piston off support plate. Remove pliers from band and then remove band from around shank of connecting rod. Remove piston support plate.
8. Remove shop towels from around the crankcase bore and keep out any dirt or debris.
9. Carefully set the cylinder over the two dowel pins in the cylinder deck. Push down on the cylinder until it is fully seated in the crankcase bore.
10. See Figure 3-73. Install THREADED CYLINDERS (Part No. HD-95952-1) from CONNECTING ROD CLAMPING TOOL (Part No. HD-95952-33C) onto cylinder studs with the knurled side down.

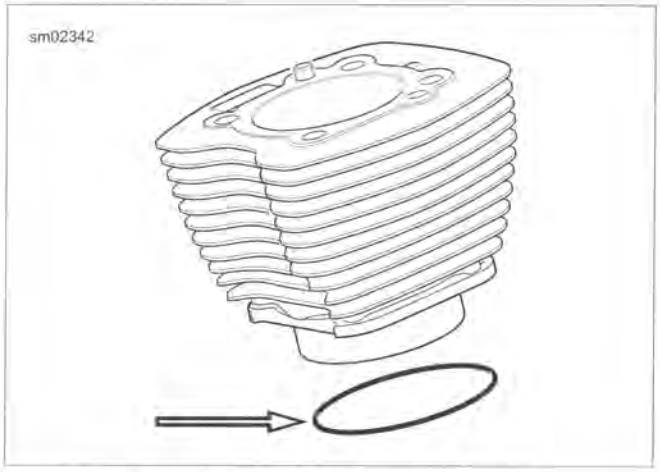
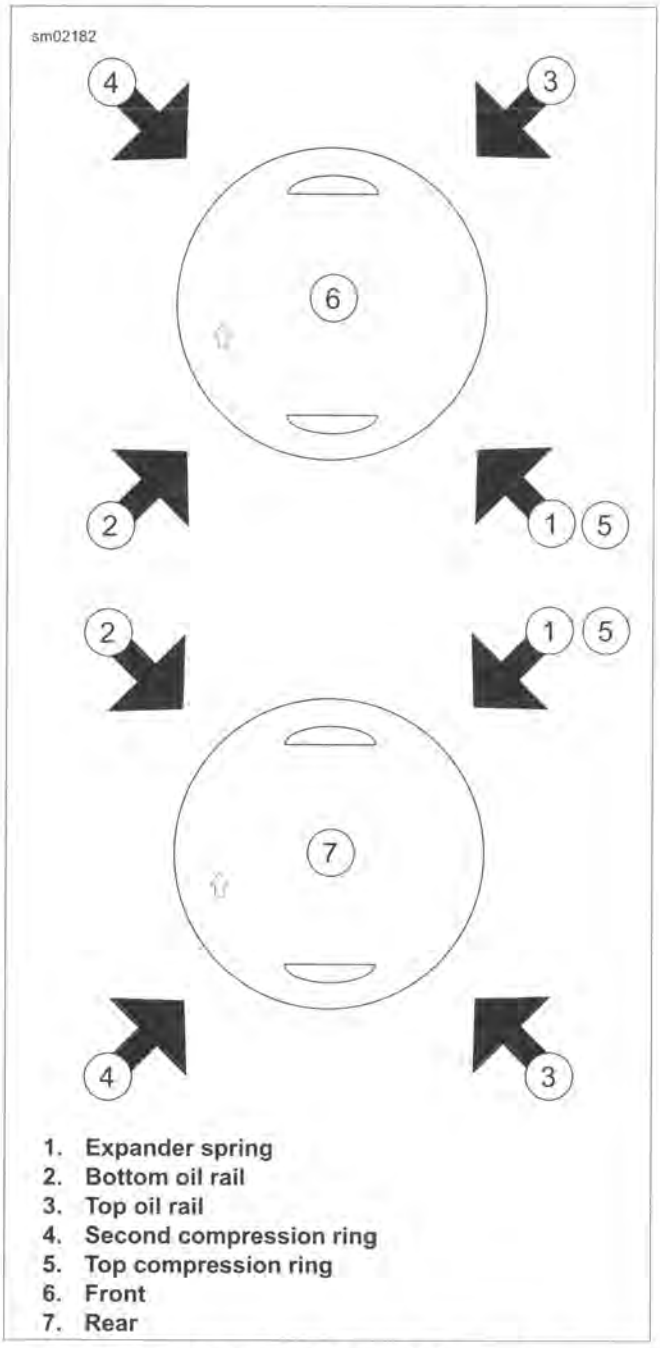
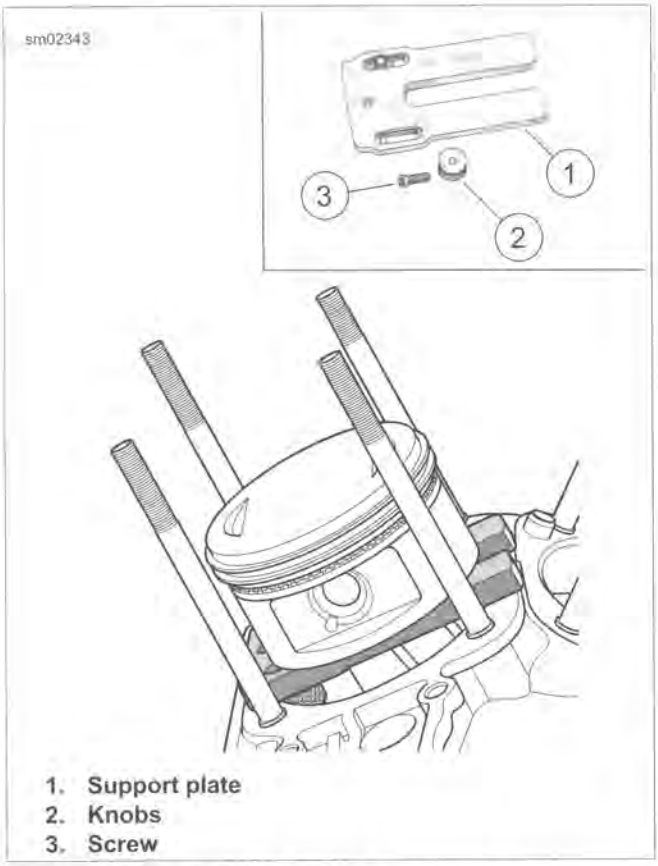


Figure 3-69. O-ring Seal For Cylinder



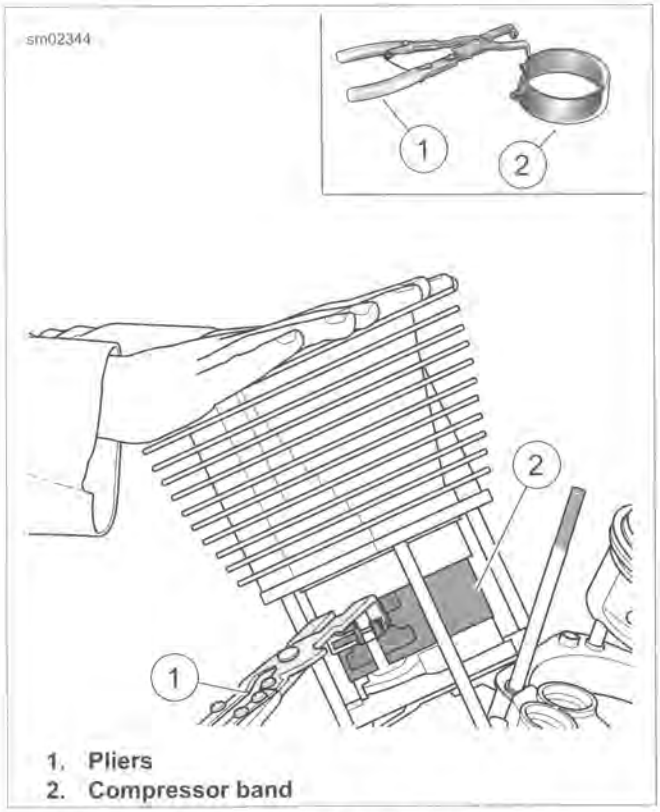
1. Expander spring
2. Bottom oil rail
3. Top oil rail
4. Second compression ring
5. Top compression ring
6. Front
7. Rear

Figure 3-70. Piston Ring Alignment



1. Support plate
2. Knobs
3. Screw

Figure 3-71. Piston Support Plate



1. Pliers
2. Compressor band

Figure 3-72. Piston Ring Compressor

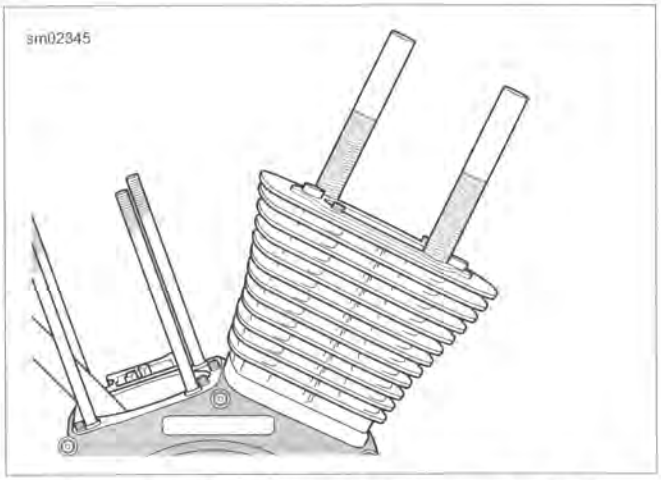


Figure 3-73. Install Threaded Cylinders to Studs

CYLINDER HEAD

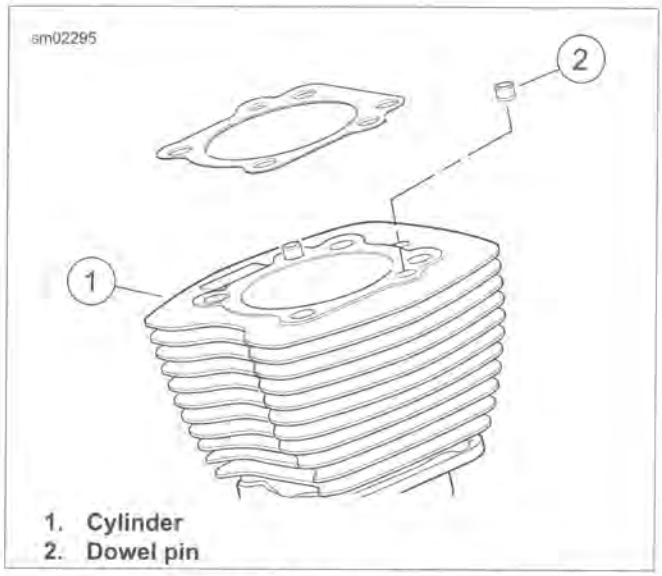
PART NUMBER	TOOL NAME
TA360	SNAP-ON TORQUE ANGLE GAUGE

FASTENER	TORQUE VALUE	
Cylinder headbolts, 1st torque	120-144 **in-lbs**	13.6-16.3 Nm
Cylinder headbolts, 2nd torque	15-17 ft-lbs	20.3-23.0 Nm
Cylinder headbolts, final torque	90 degrees	90 degrees
Rocker housing bolts	120-168 **in-lbs**	13.6-19.0 Nm

NOTES

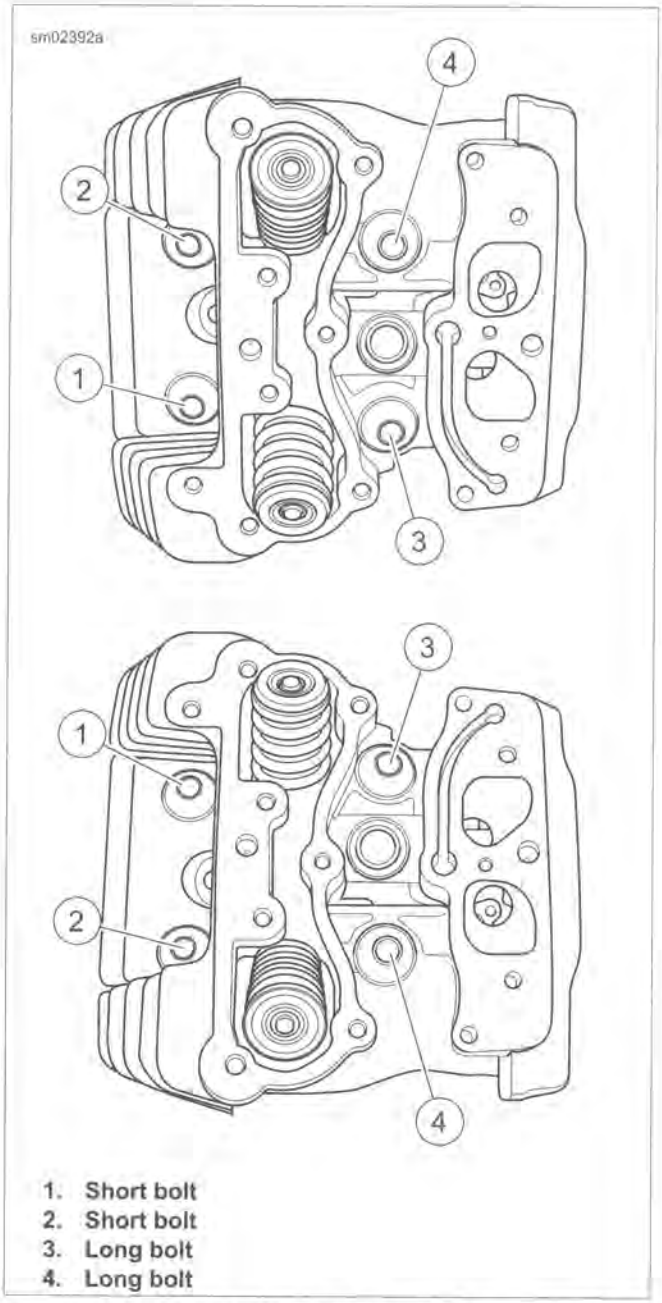
- *"Front" or "Rear" is cast into the top of the cylinder head to verify proper installation. The indent in the cooling fins always faces the right side of the engine.*
- *Lower the cylinder head at an angle that closely approximates the angle of the crankcase to avoid damage to machined surfaces or the dowel pins.*
- *Thoroughly clean and lubricate the threads of the cylinder headbolts before installation. Friction caused by dirt and grime results in a false torque indication.*

1. See Figure 3-74. With the part number facing up, place the head gasket over the two dowel pins in the upper flange of the cylinder.
2. Slide cylinder head squarely over the two cylinder flange dowel pins.
3. Lightly coat the threads and bottom face of the cylinder headbolts in clean engine oil. Wipe off any excess oil.
4. See Figure 3-75. Loosely install the cylinder headbolts. Place two short bolts on the left side of the engine and two long bolts on the right.



1. Cylinder
2. Dowel pin

Figure 3-74. Cylinder Dowel Pins



1. Short bolt
2. Short bolt
3. Long bolt
4. Long bolt

Figure 3-75. Cylinder Head Bolt Torque Sequence (Top: Front Cylinder Head, Bottom: Rear Cylinder Head)

NOTE

Improperly tightened cylinder headbolts may result in gasket leaks, stud failure or distortion of the cylinder and/or cylinder head.

5. Tighten the cylinder headbolts:
   a. See Figure 3-75. Following sequence shown, turn each cylinder headbolt until finger-tight.
   b. Following the same sequence, tighten the cylinder headbolts to 120-144 **in-lbs** (13.6-16.3 Nm).
   c. Continuing the same sequence, tighten each bolt to 15-17 ft-lbs (20.3-23.0 Nm).
6. See Figure 3-76. Final-tighten each bolt an additional 90 degrees (90 degrees) in the same sequence. For best

results, use SNAP-ON TORQUE ANGLE GAUGE (Part No. TA360).

a. If using a grease pencil, mark a straight line on the cylinder headbolt continuing the line over onto the cylinder head.

b. Use the marks as a guide to achieve the 90 degrees.

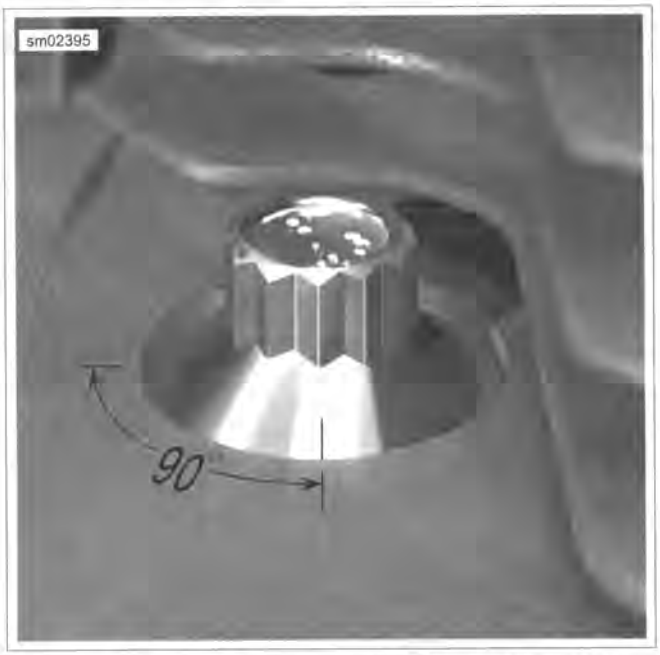


Figure 3-76. Final Tightening for Cylinder Head Bolts

NOTE

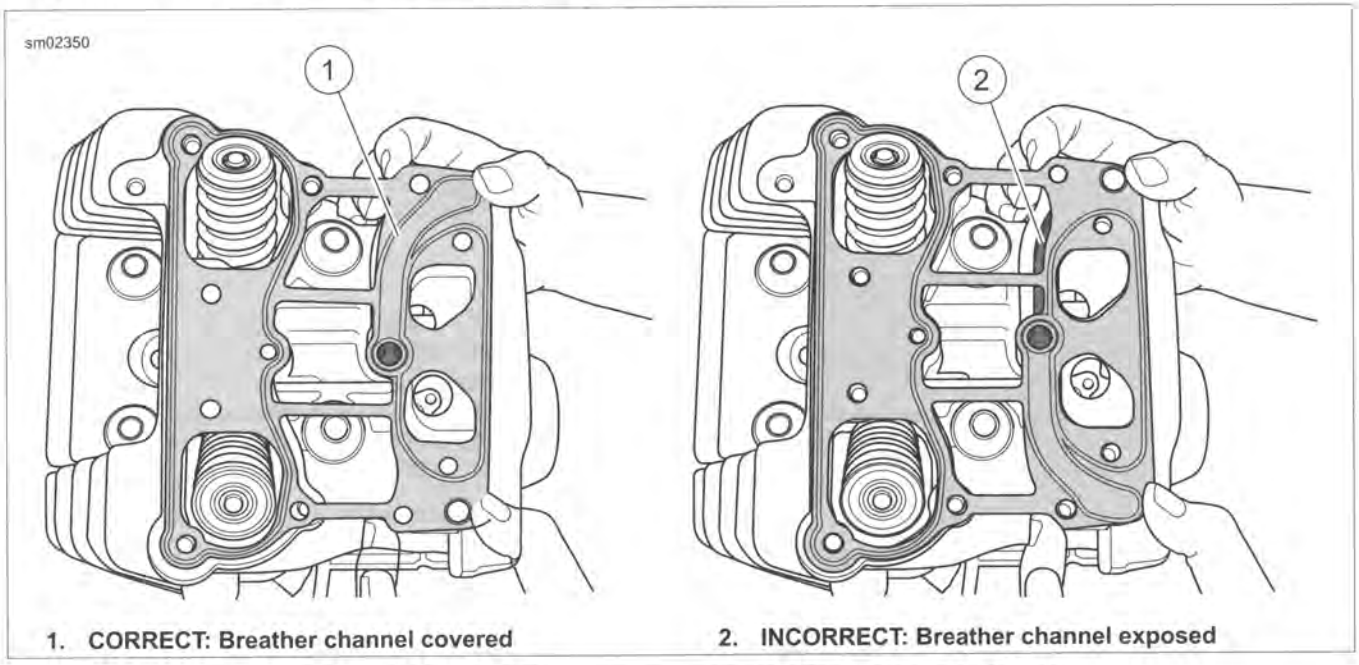
The tips of ACR solenoids for Twin-Cooled engines are approximately 0.500 in (13 mm) longer than those for air-cooled engines. Twin-Cooled ACR's will contact the pistons of an air-cooled engine.

7. **103 and larger engines:** Install the ACR. See 7.19 AUTOMATIC COMPRESSION RELEASE (ACR).

NOTES

- *The rocker housing gasket can be installed upside down resulting in an open breather channel. This causes a major oil leak when the vehicle is started, possibly resulting in engine and/or property damage.*
- *On front cylinder head, install side of gasket marked "front" facing up. On rear cylinder head, install side of gasket marked "rear" facing up.*

8. See Figure 3-77. Install a **new** rocker housing gasket on the cylinder head. Verify that the rocker housing gasket covers the breather channel.



1. **CORRECT: Breather channel covered**
2. **INCORRECT: Breather channel exposed**

Figure 3-77. Install Rocker Housing Gasket (Rear Cylinder Shown)

9. See Figure 3-79. Install rocker housing.
   a. With the indent (1) facing forward, place the rocker housing into position aligning the holes in the housing with those in the gasket.
   b. See Figure 3-78. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of six rocker housing bolts.
   c. Loosely install the rocker housing bolts.
   d. Place two long bolts on the left side of the engine and four intermediate bolts in the interior.
   e. Tighten the bolts in the sequence shown to 120-168 **in-lbs** (13.6-19.0 Nm).

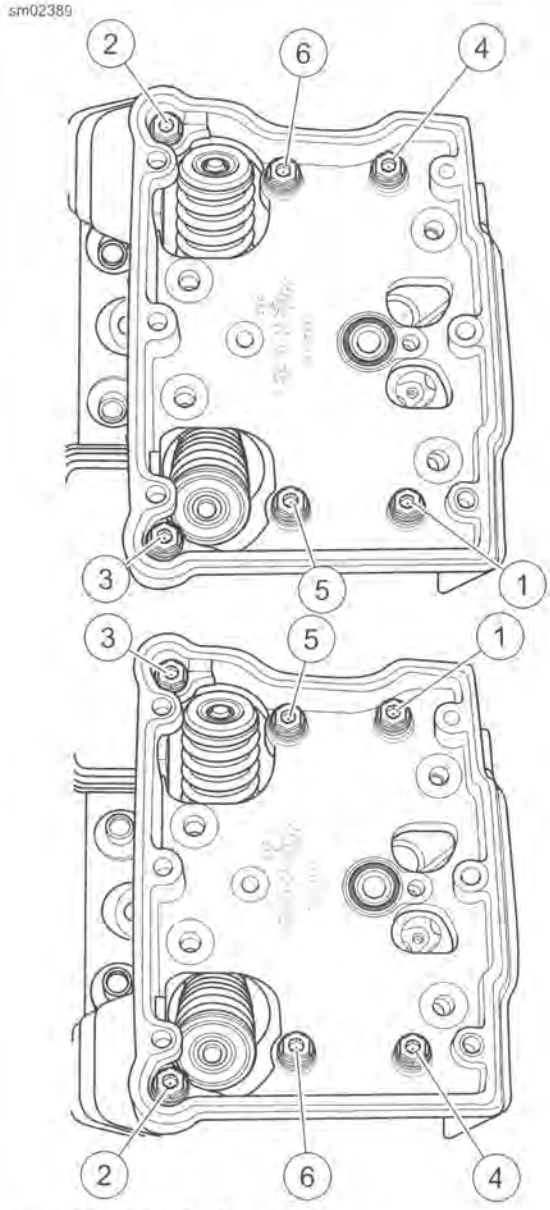
NOTES

- *If the engine was left in the chassis for service, final tighten the rear left rocker housing bolt (rear cylinder) using a torque wrench with a 1/4 in. drive.*
- *Since many O-rings are similar in size and appearance, always use **new** O-rings, keeping them packaged until use to avoid confusion. Use of the wrong O-ring will result in either oil leakage or low oil pressure. Keep them packaged until use to avoid confusion.*

10. See Figure 3-79. Apply a very thin film of clean engine oil to **new** baffle hole O-ring (2). Install **new** O-ring in groove around breather baffle hole in rocker housing.

NOTE

Do not confuse breather baffle hole O-ring (Part No. 11270, large inner diameter) with the top pushrod O-ring (Part No. 11293, small inner diameter).



1. **Short bolt, 1.25 in. (31.8 mm)**
2. **Long bolt, 1.75 in. (44.5 mm)**
3. **Long bolt, 1.75 in. (44.5 mm)**
4. **Short bolt, 1.25 in. (31.8 mm)**
5. **Short bolt, 1.25 in. (31.8 mm)**
6. **Short bolt, 1.25 in. (31.8 mm)**

Figure 3-78. Rocker Housing Torque Sequence and Bolt Size

1. **Indent**
2. **Breather baffle hole O-ring**

Figure 3-79. Rocker Housing Alignment

PUSHRODS, LIFTERS AND COVERS

FASTENER	TORQUE VALUE	
Lifter cover screws	90-120 **in-lbs**	10.2-13.6 Nm

1. Remove any labels used on the hydraulic lifters. Apply a thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to outer surface of each lifter. Pour a small amount onto each cam lobe.
2. Install lifters in the crankcase bores with the oil hole on the inboard side and the flats on the lifters facing forward and rearward. To avoid damage, do not drop lifters onto cam lobes.
3. See Figure 3-80. Place the anti-rotation pin (4) on the machined flat between the blocks cast into the crankcase.
4. Install **new** O-rings in the lifter cover bores and the cylinder head pushrod cover bores.

NOTE

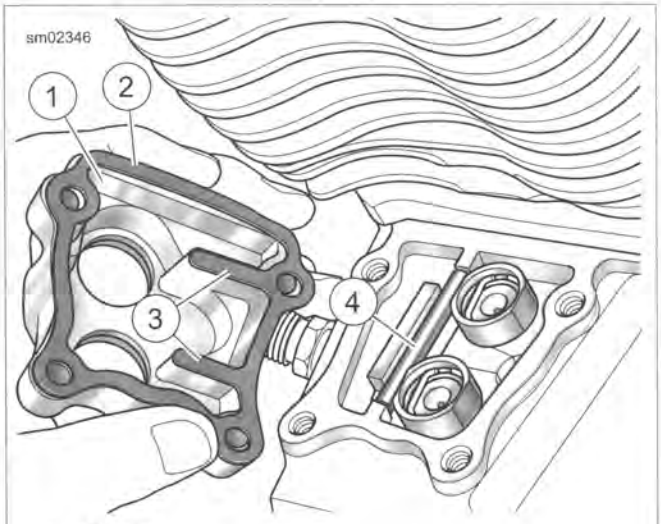
During cover installation, verify that the anti-rotation pin (4) is held in place by the ribs (3) cast into the inboard side of the lifter cover. Movement or loss of the pin can result in lifter rotation causing engine damage.

5. Install the lifter cover (1) and **new** gasket (2). Install four socket head screws. Tighten the lifter cover screws to 90-120 **in-lbs** (10.2-13.6 Nm) in a crosswise pattern.
6. Install pushrod covers.
   a. Assemble pushrod covers with **new** O-rings.
   b. Hand compress the pushrod cover assembly and fit the pushrod cover into the lifter cover bore.
   c. Extending the assembly, fit the pushrod cover into the cylinder head bore.
   d. Do not install the spring cap retainers at this time.

NOTE

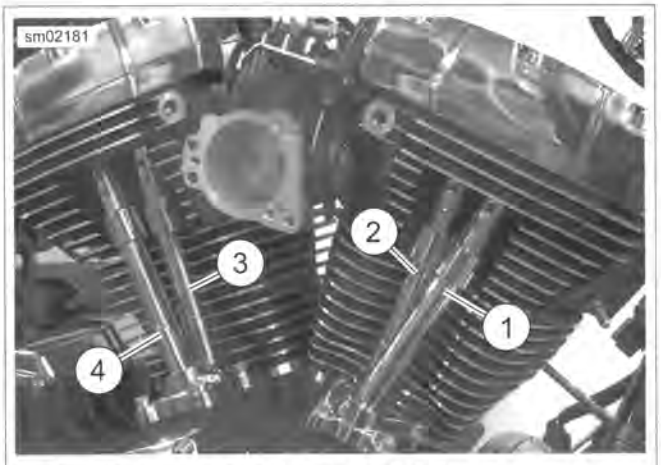
To install spring cap retainers, see 3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate.

7. Apply a small amount of SCREAMIN' EAGLE ASSEMBLY LUBE to the ends of each pushrod.
8. See Figure 3-81. Install the pushrods. If installing original parts, install them in their original locations and orientation. Always remove any tags that may have been used for identification.



1. **Cover**
2. **Gasket**
3. **Ribs on cover**
4. **Anti-rotation pin**

Figure 3-80. Installing Lifters



1. **Front cylinder exhaust pushrod**
2. **Front cylinder intake pushrod**
3. **Rear cylinder intake pushrod**
4. **Rear cylinder exhaust pushrod**

Figure 3-81. Pushrod Locations

ROCKER ARM SUPPORT PLATE

PART NUMBER	TOOL NAME
FRDH161	SNAP-ON "DOG BONE" TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Rocker arm support plate bolts	18-22 ft-lbs	24.4-29.8 Nm

NOTE

Installing the rocker arms and rotating the crankshaft with the valve train loaded can result in bent pushrods, damaged bushings or a warped support plate.

1. Rotate the crankshaft to position both lifters of the cylinder being serviced on the base circle (or lowest position) of the cam lobe.
2. See Figure 3-82. Place the rocker arm support plate assembly into the rocker housing and loosely install four rocker arm support plate bolts with flat washers.

NOTE

Engine in chassis: *Final tighten rocker arm support plate bolt on rear left side of rear cylinder using 3/8 in. drive torque wrench with 1/2 in. flank drive SNAP-ON "DOG BONE" TORQUE ADAPTER (Part No. FRDH161) or equivalent.*

3. Tighten rocker arm support plate bolts.
   a. Following the sequence shown, alternately tighten each of the four rocker arm support plate bolts 1/4 turn at a time until snug.
   b. Following the same sequence, tighten the bolts to 18-22 ft-lbs (24.4-29.8 Nm).
4. Verify that both pushrods spin freely.

NOTE

Always service each cylinder separately. After the first cylinder is serviced rotate the crankshaft to find the base circle on the second cam.

5. Repeat steps on remaining cylinder.

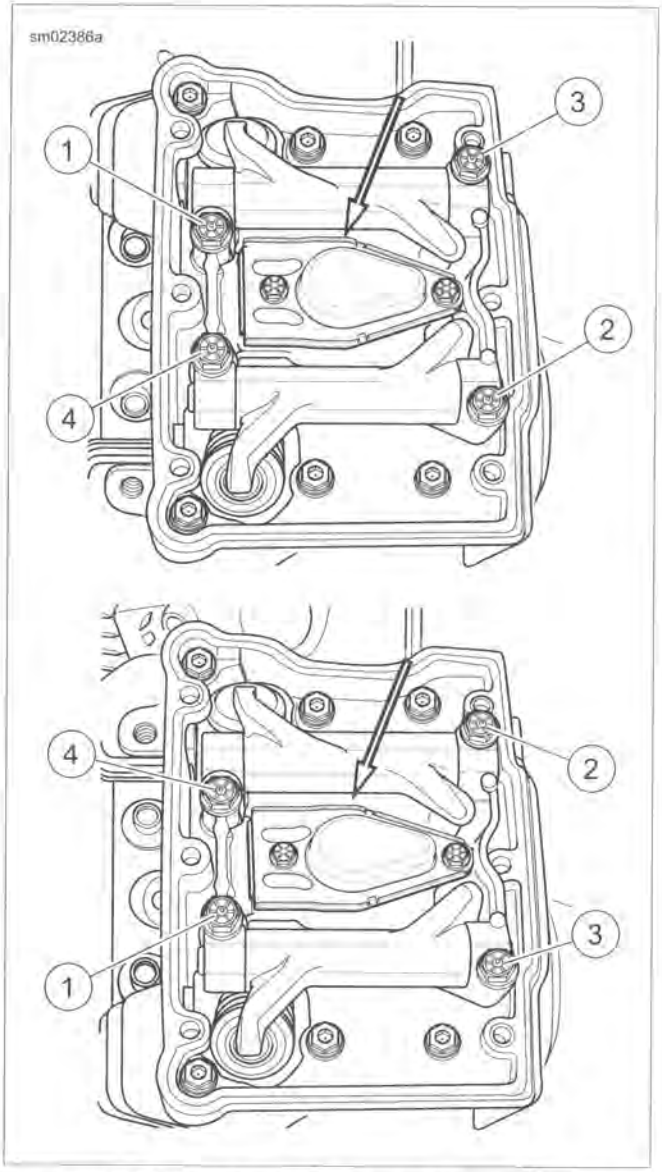


Figure 3-82. Rocker Arm Support Screw Sequence

6. Complete installation of the pushrod covers.
   a. Verify that the O-ring ends of the upper and lower pushrod covers fit snugly into the cylinder head and lifter cover bores.
   b. Insert the upper edge of spring cap retainer into the cylinder head bore leaving the bottom edge free.
   c. Insert blade of small screwdriver between bottom edge of spring cap retainer and top of spring cap.

   NOTE

   For best results, verify that screwdriver, spring cap and spring cap retainer are free of grease and oil.

   d. See Figure 3-83. Press spring cap down with tip of screwdriver and slide bottom edge of retainer towards tip of screwdriver.
   e. Verify that spring cap retainer seats tightly against upper pushrod cover.

Figure 3-83. Install Spring Cap Retainers

BREATHER AND ROCKER COVER

PART NUMBER	TOOL NAME
SNAP-ON FRDH141	"DOG BONE" TORQUE ADAPTER

FASTENER	TORQUE VALUE	
Breather assembly screws	120-156 **in-lbs**	13.6-17.6 Nm
Rocker cover screws	15-18 ft-lbs	20.3-24.4 Nm

NOTE

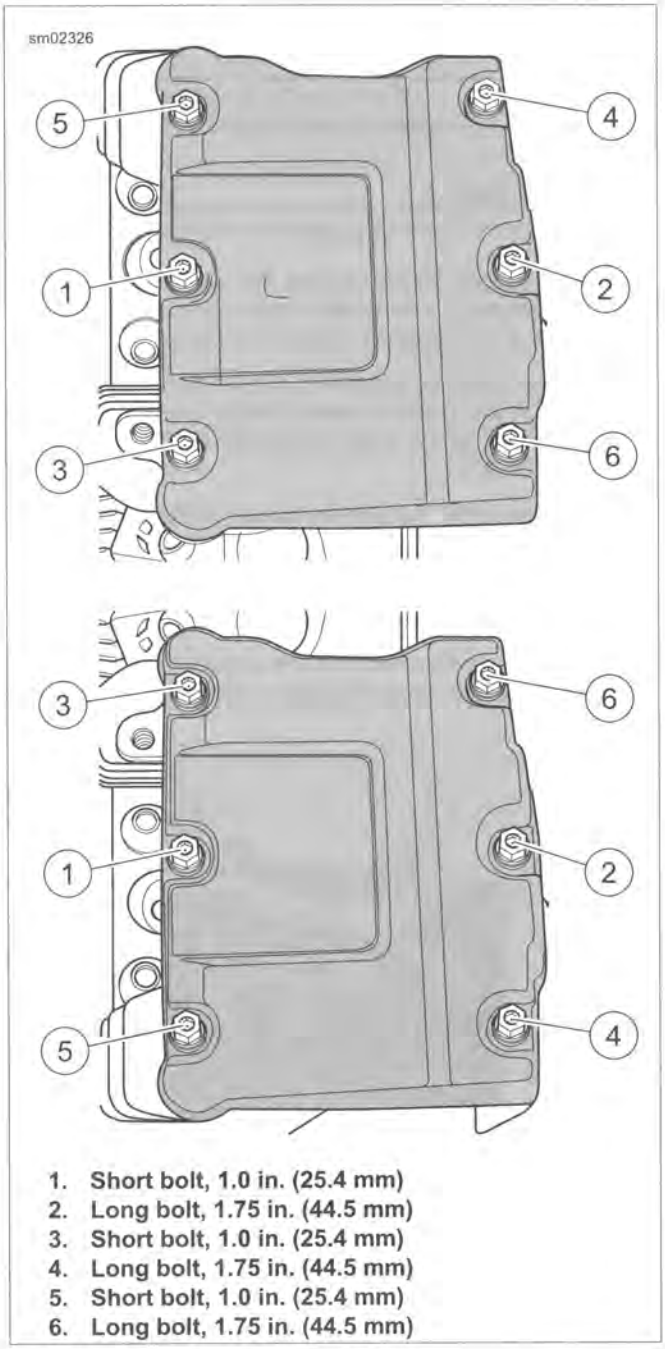
For breather assembly service procedures, see 3.19 BREATHER ASSEMBLY.

1. To secure breather assembly, tighten two screws to 120-156 **in-lbs** (13.6-17.6 Nm).

NOTE

If the engine is in the chassis, final tighten the three rocker cover bolts on the left side of the rear cylinder using a 3/8 in. drive torque wrench with a 7/16 in. flank drive "DOG BONE" TORQUE ADAPTER (Part No. Snap-on FRDH141). Failure to properly use this combination will over-tighten the bolts causing distortion of the rocker cover.

2. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of rocker cover screws.
3. See Figure 3-84. Install rocker cover and a **new** rocker cover gasket. Tighten screws following the sequence shown to 15-18 ft-lbs (20.3-24.4 Nm).
4. Complete motorcycle assembly.
   a. If engine was left in the chassis for service, see 3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE.
   b. If engine was removed for service, see 3.17 INSTALLING ENGINE IN CHASSIS.



1. **Short bolt, 1.0 in. (25.4 mm)**
2. **Long bolt, 1.75 in. (44.5 mm)**
3. **Short bolt, 1.0 in. (25.4 mm)**
4. **Long bolt, 1.75 in. (44.5 mm)**
5. **Short bolt, 1.0 in. (25.4 mm)**
6. **Long bolt, 1.75 in. (44.5 mm)**

Figure 3-84. Rocker Cover Bolts Torque Sequence

TWIN-COOLED ENGINE

Install upper coolant lines. See C.5 COOLING SYSTEM REPAIR. Fill and bleed cooling system. See 1.8 COOLANT.

CAM SUPPORT PLATE AND COVER REMOVAL

PART NUMBER	TOOL NAME
93979-10	SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

Prepare Engine

NOTE

The following steps outline removal with the rest of the engine intact. If performing a complete engine overhaul, perform all steps under 3.18 TOP END OVERHAUL: DISASSEMBLY.

1. Remove breather assembly, rocker arm support plate, pushrods and pushrod covers. Do not remove lifters. See appropriate topics under 3.18 TOP END OVERHAUL: DISASSEMBLY.
2. See Figure 3-86. Support lifters using SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS (Part No. 93979-10).

NOTE

Label cam cover screws to aid during assembly.

3. See Figure 3-85. Remove the socket head screws to release the cam cover. Remove and discard the cam cover gasket.

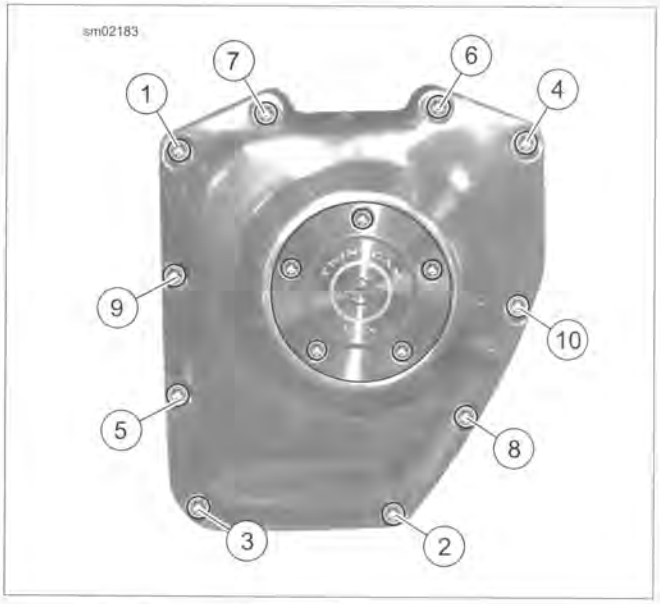


Figure 3-85. Cam Cover Screws

Figure 3-86. SCREAMIN' EAGLE Magnetic Lifter Holder

Cam Chain and Sprockets Removal

1. See Figure 3-87. Using a colored marker, mark one of the links (1) of the primary cam chain to identify the visible side. Maintaining the original direction of rotation during assembly may prolong service life.

NOTE

Use a piece of wire in retention hole (6) to keep cam chain tensioner components assembled.

2. Remove primary cam chain tensioner fasteners (4) and primary cam chain tensioner (3).

NOTE

Verify side of tool labeled "crank side" faces crankshaft sprocket.

3. See Figure 3-88. Install CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (Part No. HD-47941) between cam sprocket (2) and crank sprocket (5).

⚠WARNING

Be sure to follow manufacturer's instructions when using propane torches. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00465c)

- **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.**

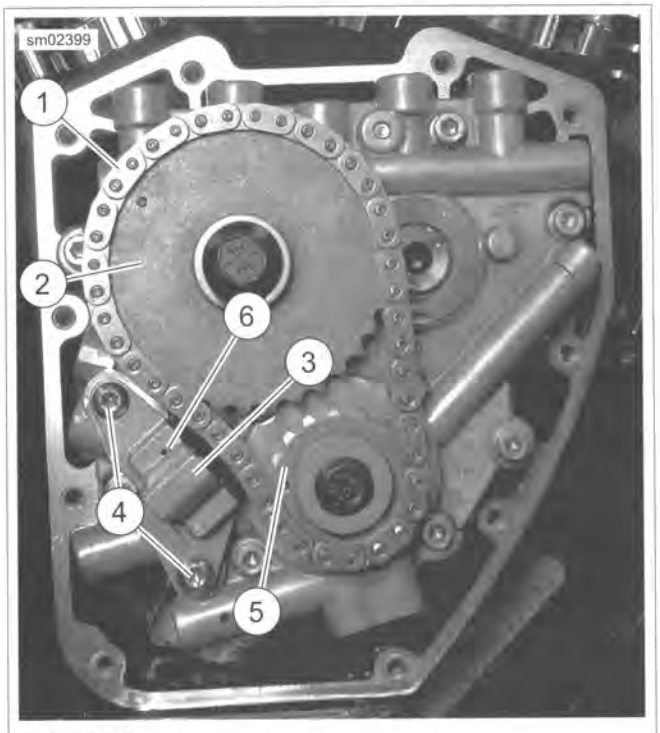
NOTES

- *Only use approved methods for removing rear cam bolt. Other methods of removal, such as the use of a large*

breaker bar, may result in damage to chain drive and other components.

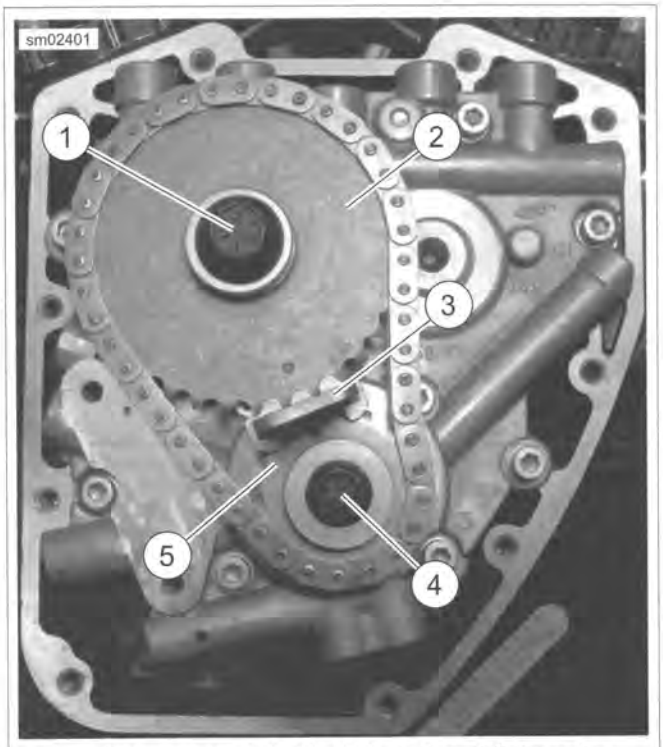
- *If necessary, soften threadlocker by using heat from a small propane torch. Apply flame evenly around bolt in a circular motion, but do not allow bolt to turn blue.*

4. Remove the rear cam sprocket bolt and flat washer (1) from the rear cam sprocket (2).
5. Remove the crank sprocket bolt and flat washer (4) from the crank sprocket (5).
6. Remove camshaft locking tool.
7. Use a small pry bar between rear cam sprocket and cam support plate to carefully ease off rear cam sprocket until loose on camshaft.
8. Use a small pry bar to ease off crank sprocket. Remove both sprockets and primary cam chain.



1. **Link**
2. **Rear cam sprocket**
3. **Primary cam chain tensioner**
4. **Primary cam chain tensioner fasteners**
5. **Crank sprocket**
6. **Retention hole**

Figure 3-87. Cam Support Plate Assembly



1. **Rear cam sprocket bolt (large) and flat washer**
2. **Rear cam sprocket**
3. **Camshaft locking tool**
4. **Crank sprocket bolt (small) and flat washer**
5. **Crank sprocket**

Figure 3-88. Cam Support Plate Assembly

Cam Support Plate Removal

1. See Figure 3-89. Following the sequence shown, remove four socket head screws.
2. See Figure 3-90. Following the sequence shown, remove six socket head screws to release the cam support plate from the crankcase.
3. See Figure 3-91. Use a small pry bar between the cam support plate and crankcase flange in areas near the ring dowels (2, 3). Work cam support plate and camshafts from end of crankshaft.

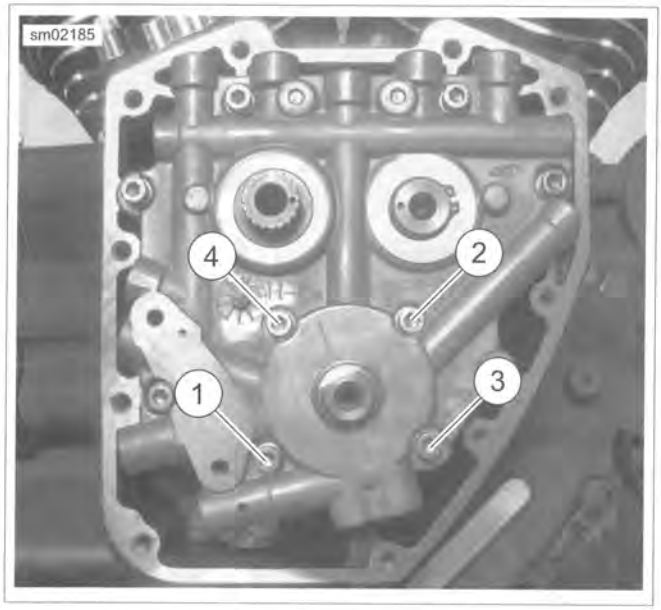


Figure 3-89. Oil Pump Torque Sequence

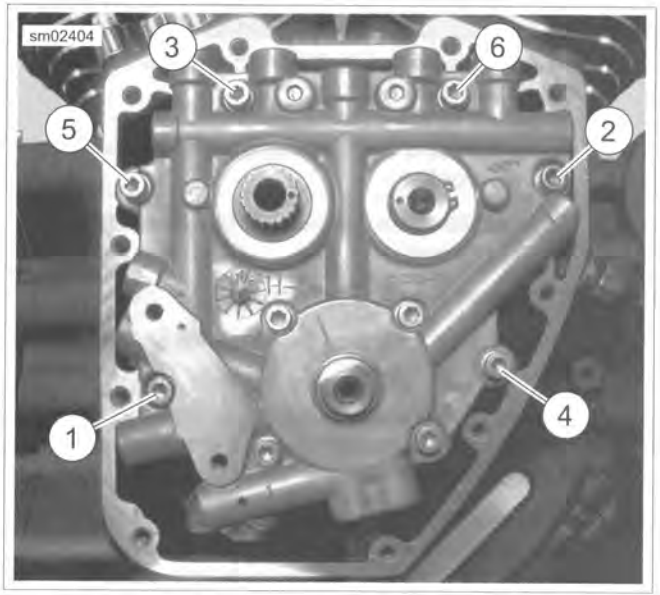
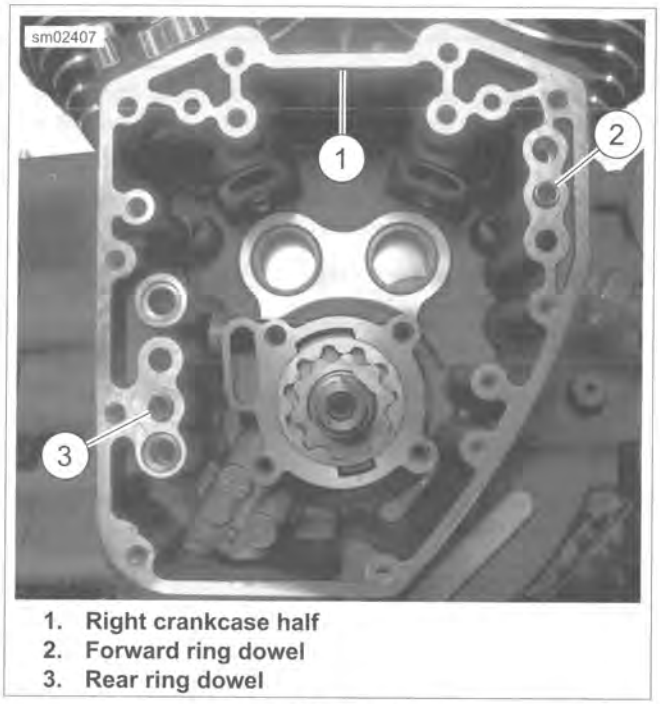


Figure 3-90. Cam Support Plate Torque Sequence



1. Right crankcase half
2. Forward ring dowel
3. Rear ring dowel

Figure 3-91. Ring Dowels

CAM SUPPORT PLATE CLEANING AND INSPECTION

Oil Pressure Valve

Inspect oil pressure valve. See 3.26 CAM COMPARTMENT AND COMPONENTS, Oil Pressure Relief Valve.

Cam Support Plate

1. Measure the diameters of the camshaft bores and crankshaft bore. See 3.3 SERVICE WEAR LIMITS, General.
2. Measure flatness of support plate. See 3.3 SERVICE WEAR LIMITS, General.
3. Inspect gerotor area for excessive wear or deep grooves.
4. Verify that all oil holes are clean and open.

NOTE

The oiling system is carefully designed for optimum efficiency. All oil holes and passageways are specially sized. Avoid enlarging oil holes during cleaning. Any modification of the oiling system will adversely affect oil pressure or cooling and lubrication efficiency.

CAMSHAFTS

PART NUMBER	TOOL NAME
HD-47956	CAMSHAFT ASSEMBLY TOOL

FASTENER	TORQUE VALUE	
Secondary cam chain tensioner fastener	90-120 **in-lbs**	10.2-13.6 Nm

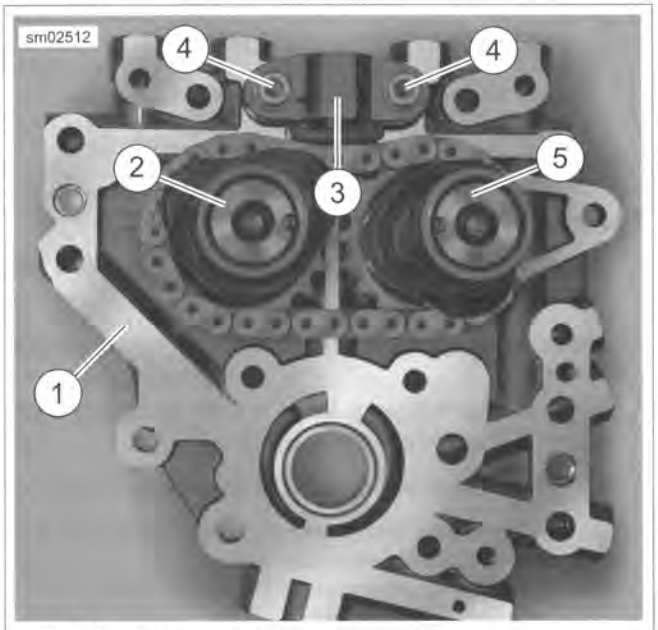
Removal

1. See Figure 3-92. Remove screws (4) and remove secondary cam chain tensioner (3).

⚠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. Remove retaining ring securing front camshaft. Discard retaining ring.
3. Remove spacer from front camshaft. Do not mix front and rear camshaft spacers. Front spacer is 0.100 in. (2.54 mm) thick.
4. Using a colored marker, mark one of the links of the secondary cam chain. Maintaining the original direction of rotation during assembly may prolong service life.
5. Slide camshafts and secondary cam chain out of cam support plate.
6. Remove secondary cam chain from cam sprockets.



1. **Cam support plate**
2. **Front cam**
3. **Secondary cam chain tensioner**
4. **Secondary cam chain tensioner fasteners**
5. **Rear cam**

Figure 3-92. Camshafts

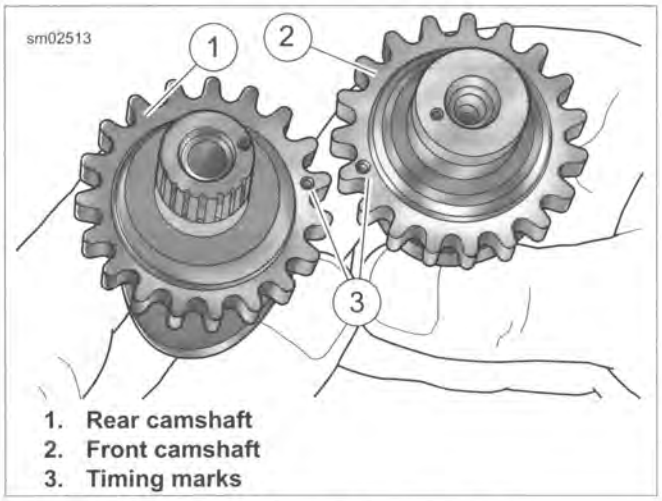
Installation

1. See Figure 3-93. Align timing marks on teeth of secondary cam sprockets.

NOTE

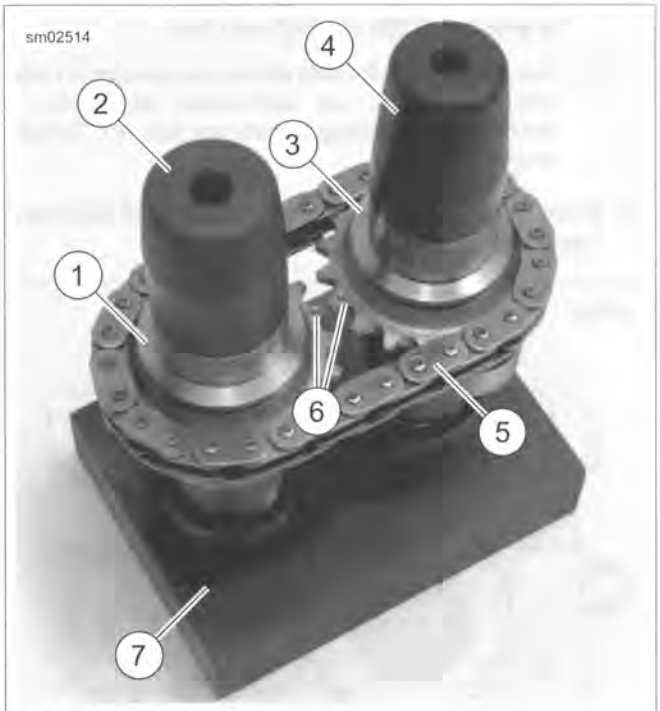
Do not mix camshafts during installation. The rear camshaft, identified by the splined shaft, must go into the hole at the rear of the cam support plate.

2. Place secondary cam chain around sprockets of both front and rear camshafts while keeping timing marks (3) in alignment. To maintain original direction of rotation, verify mark placed on chain link during disassembly is visible during installation.



1. **Rear camshaft**
2. **Front camshaft**
3. **Timing marks**

Figure 3-93. Camshaft Timing Marks



1. **Rear camshaft**
2. **Small guide**
3. **Front camshaft**
4. **Large guide**
5. **Cam chain**
6. **Timing marks**
7. **Assembly tool base**

Figure 3-94. Camshaft Assembly Tool

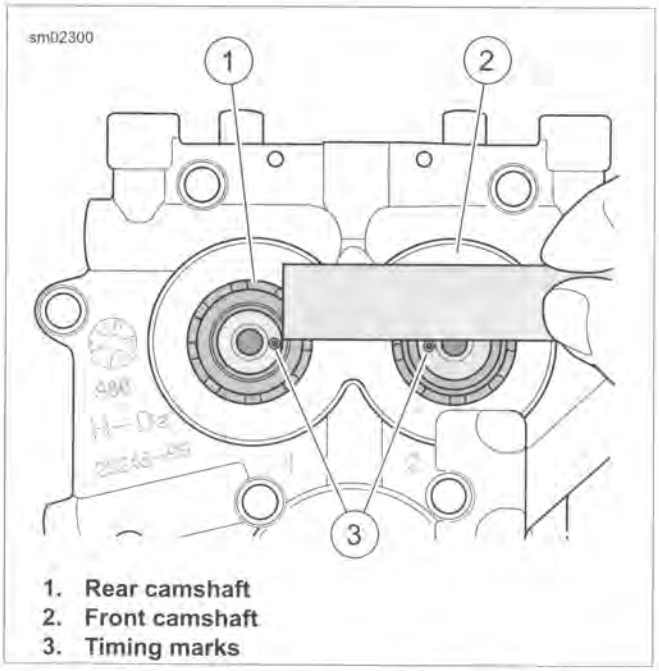
3. See Figure 3-94. Obtain CAMSHAFT ASSEMBLY TOOL (Part No. HD-47956). Place crankcase side of camshaft/cam chain assembly into assembly tool base (7) while maintaining cam timing mark (6) alignment.
4. Place small guide (2) on rear camshaft (1). Place large guide (4) on front camshaft (3).
5. Lubricate support plate camshaft cavities with SCREAMIN' EAGLE ASSEMBLY LUBE.
6. Install cam support plate over guides.

7. Remove guides and base.
8. See Figure 3-95. Using a straightedge, verify that the timing marks are in alignment. If they are not, then the camshafts must be removed, realigned and reinstalled.
9. Install 0.100 in. (2.54 mm) thick front camshaft spacer over end of front camshaft.

⚠WARNING

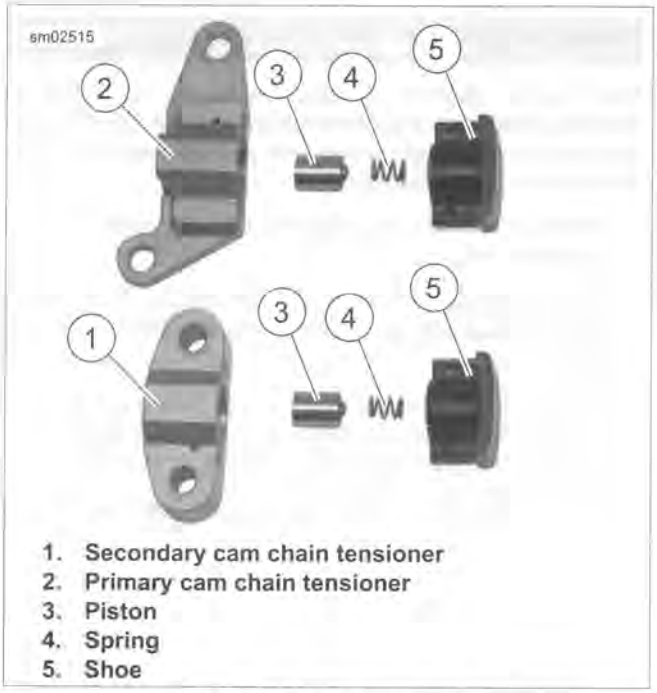
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

10. With the sharp edge out, install **new** retaining ring in groove at end of front camshaft.
11. Inspect primary and secondary cam chain tensioners.
    a. Inspect tensioners for wear. Replace tensioners if damaged or if chain contact portion of shoe material is less than 0.060 in. (1.52 mm) thick.
    b. See Figure 3-96. Be sure primary and secondary cam chain tensioners are assembled as shown. If assembled incorrectly, tensioners will not function properly.
12. Install secondary cam chain tensioner and fasteners. Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).



1. **Rear camshaft**
2. **Front camshaft**
3. **Timing marks**

Figure 3-95. Verify Alignment of Timing Marks



1. **Secondary cam chain tensioner**
2. **Primary cam chain tensioner**
3. **Piston**
4. **Spring**
5. **Shoe**

Figure 3-96. Cam Chain Tensioner Assemblies

OIL PRESSURE RELIEF VALVE

Removal

1. See Figure 3-97. Secure the cam support plate in a vise with soft jaws.
2. Measurement between piston and bore in cam support plate:
    a. With piston in place, insert straight stiff wire into bore until it bottoms in the piston.
    b. Mark wire at edge of bore in cam support plate.
    c. Remove wire and measure distance from the end to the mark. With piston fully seated in the bore, depth should be approximately 2.25 in (57.15 mm).
    d. If it is less than specified, the piston is not fully seated and a low oil pressure condition will likely be the result.
3. Use a 1/8 in punch to remove roll pin (1). Discard roll pin.
4. Remove spring (2) and piston (3) from bypass port.

Inspection

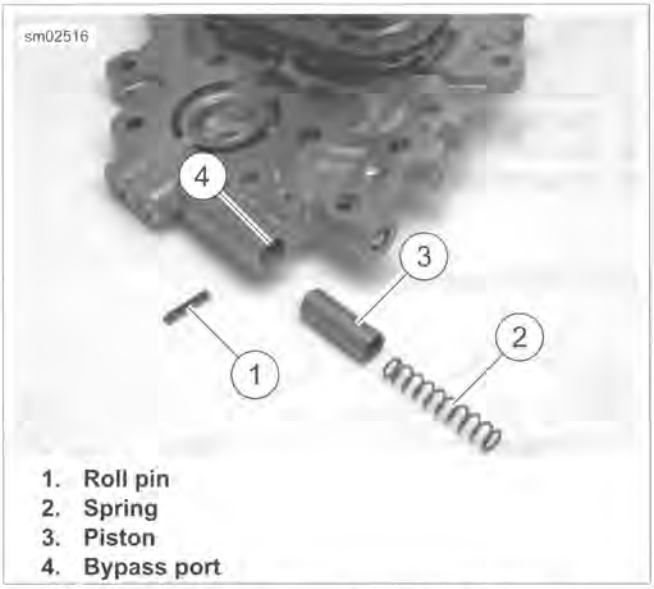
NOTE

A stretched spring or sticking piston can result in high oil pressure.

1. Inspect spring for stretching, kinks and distortion.
2. Inspect piston and bore for burrs, scoring or other damage. Look for steel particles or aluminum chips. Replace cam support plate and piston if any of these conditions are found.
3. Measure running clearance of piston in bore. If running clearance exceeds 0.003 in (0.076 mm), install **new** piston and measure again. Replace cam support plate if running clearance still exceeds specification.

Installation

1. Secure the cam support plate in a vise with soft jaws.
2. See Figure 3-97. Lubricate piston (3) with SCREAMIN' EAGLE ASSEMBLY LUBE. Slide piston into bypass port of cam support plate with the open side facing outward.
3. Slide spring (2) into bypass port until seated in piston.
4. Start **new** roll pin (1) into hole in cam support plate. Compress spring using the blade of a small screwdriver.
5. Hold spring compressed and tap roll pin into cam support plate until it approaches pin hole on opposite side.
6. Remove screwdriver to release spring. Verify that spring is straight and square in bore.
7. Use a 1/8 in punch to install roll pin until flush with casting.



1. **Roll pin**
2. **Spring**
3. **Piston**
4. **Bypass port**

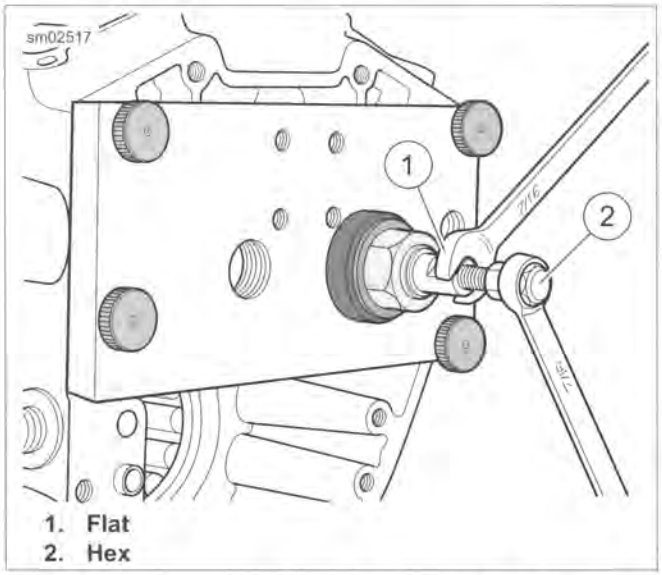
Figure 3-97. Oil Pressure Relief Valve Assembly

CAM NEEDLE BEARINGS

PART NUMBER	TOOL NAME
HD-42325-A	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER

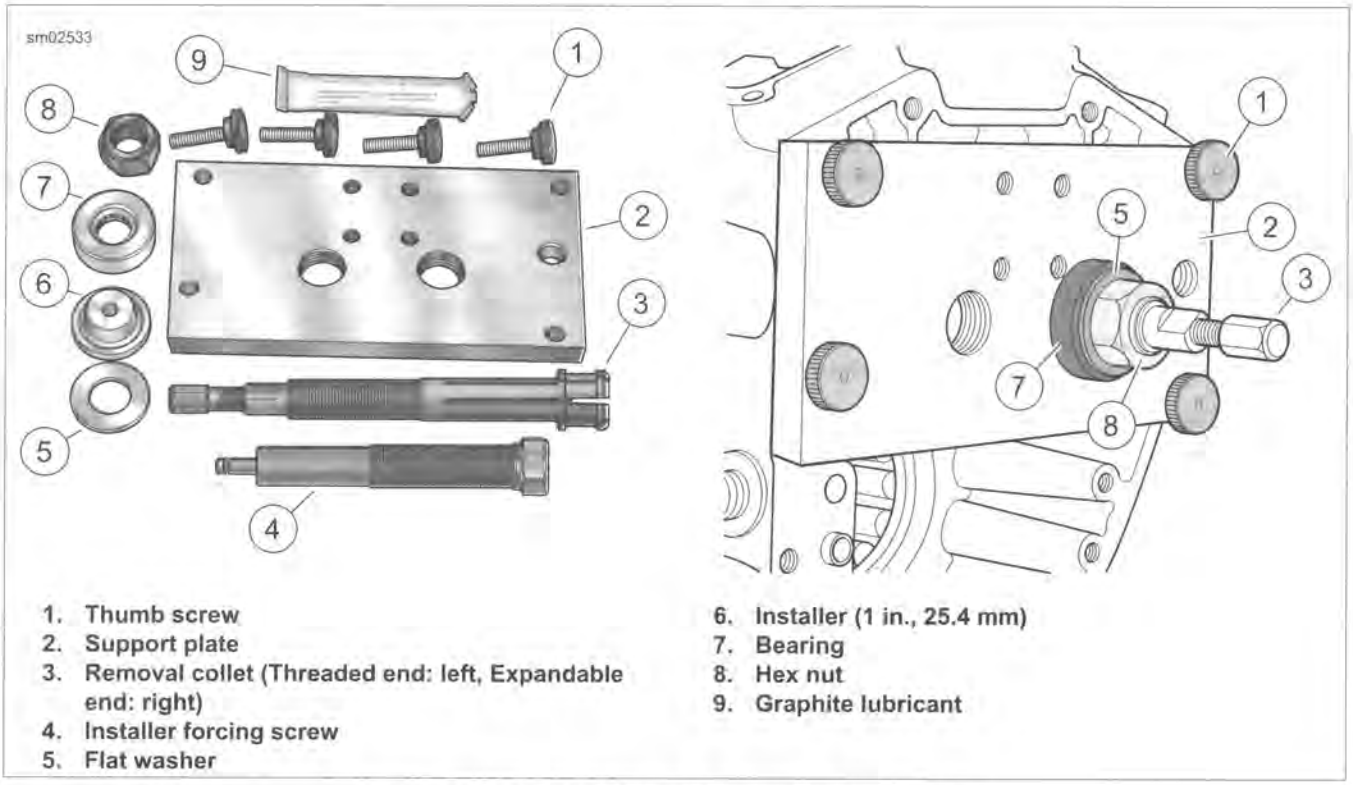
Removal

1. Obtain the CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER (Part No. HD-42325-A).
2. See Figure 3-99. Remove four thumb screws (1) from threaded holes in support plate (2), if installed.
3. Sparingly apply clean engine oil (9) to threads of collet (3) to prolong service life and verify smooth operation.
4. Slide collet through support plate so that threaded end exits stamped side of plate.
5. Aligning two large holes in support plate with needle bearing bores, hang right side of plate on ring dowel in crankcase flange.
6. Install thumb screws to secure support plate to crankcase.
7. Center expandable end of collet in bearing bore and slide bearing (7) and flat washer (5) on threaded end. Start hex nut (8) on threaded end.
8. Push expandable end of collet through bearing bore into flywheel compartment. Feel for inside edge of needle bearing using end of collet and then back off slightly.



1. **Flat**
2. **Hex**

Figure 3-98. Expanding Collet by Turning Hex Clockwise



1. **Thumb screw**
2. **Support plate**
3. **Removal collet (Threaded end: left, Expandable end: right)**
4. **Installer forcing screw**
5. **Flat washer**
6. **Installer (1 in., 25.4 mm)**
7. **Bearing**
8. **Hex nut**
9. **Graphite lubricant**

Figure 3-99. Camshaft Needle Bearing Remover/Installer

9. Holding collet to prevent lateral movement, finger tighten hex nut until bearing contacts support plate.
10. See Figure 3-103. Hold flat on collet to prevent rotation and expand collet by turning hex at end of shaft clockwise. Expandable end of collet makes contact with needle bearing ID.
11. See Figure 3-98. Turn hex nut clockwise until bearing is free. If necessary, hold flat on collet to prevent rotation.
12. Remove four thumb screws and pull support plate from crankcase.
13. Holding flat on collet, turn hex at end of shaft counterclockwise to close collet. Remove and discard needle bearing.
14. Repeat procedure to remove second needle bearing.

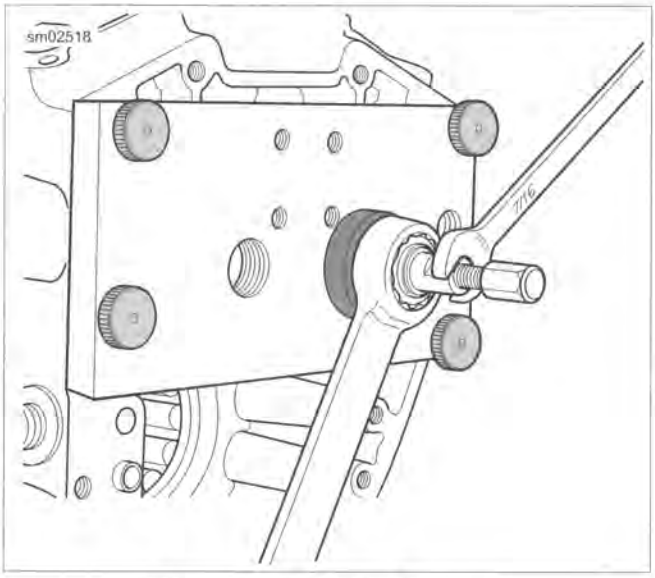


Figure 3-100. Bearing Removal

Installation

1. Obtain the CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER (Part No. HD-42325-A).

NOTE

To avoid engine damage, install needle bearings to the correct depth.

2. See Figure 3-101. Using a dial caliper, measure thickness of support plate.
3. Determine the required distance from the top of the support plate to the edge of the installed needle bearing by adding

support plate thickness to 3.10 in. (78.7 mm). Record this value.

NOTE

For example, if the support plate is 0.50 in. (12.7 mm) thick, then the measurement from the top of the support plate to the edge of the needle bearing should be 3.60 in. (91.4 mm).

4. See Figure 3-99. Sparingly apply clean engine oil to threads of installer forcing screw (4) to prolong service life and verify smooth operation.
5. Thread installer forcing screw into stamped side of support plate (2) until threads begin to emerge from opposite side.
6. Place installer (6) at end of installer forcing screw.
7. Place **new** needle bearing on installer with lettered side facing shoulder of installer.
8. See Figure 3-102. Aligning two large holes in support plate with needle bearing bores, hang right side of plate on ring dowel in crankcase flange.
9. Install thumb screws to secure support plate to crankcase.

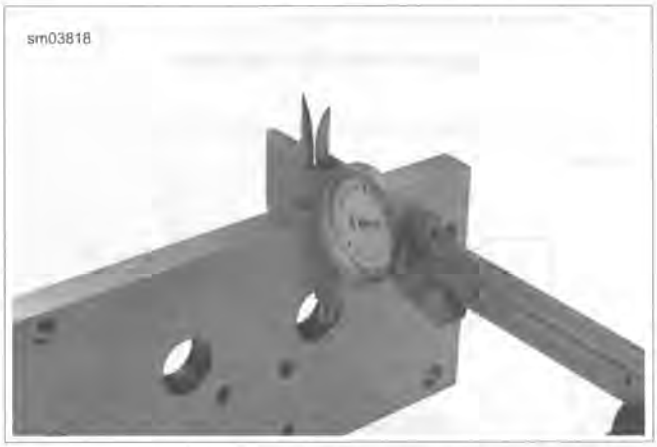


Figure 3-101. Measure Thickness of Support Plate

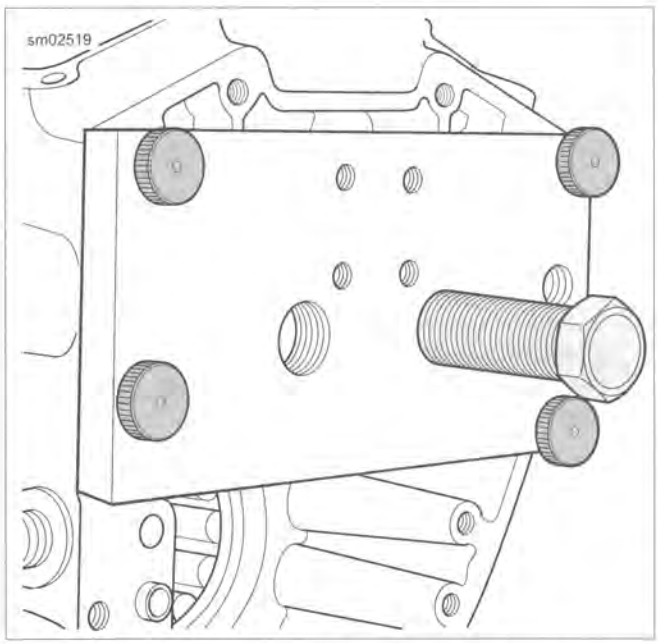


Figure 3-102. Installer Forcing Screw Installation

10. Install first needle bearing as follows:
    a. See Figure 3-103. Turn forcing screw clockwise to press needle bearing into bore.
    b. Back out forcing screw and remove installer. Remove forcing screw from support plate.
    c. See Figure 3-104. Insert dial caliper through forcing screw bore and measure distance from top of support plate to edge of needle bearing.
    d. Repeat steps until bearing is at correct installed depth. Temporarily leave tool in this position.
11. See Figure 3-105. Once the bearing is at correct depth, measure from head (top) of installer forcing screw to support plate. Record this measurement.
12. Remove forcing screw from support plate and install over second needle bearing bore. Place installer at end of forcing screw. Place **new** needle bearing on installer with lettered side facing shoulder of installer.
13. Turn forcing screw until distance from head (top) of forcing screw to support plate equals measurement obtained previously.

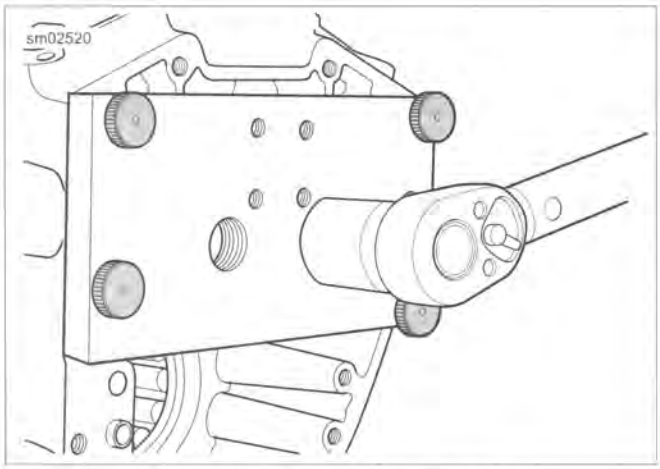


Figure 3-103. Bearing Installation

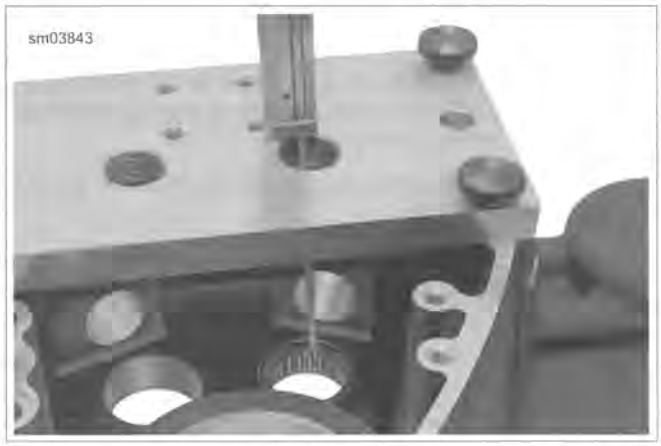


Figure 3-104. Measure from Top of Support Plate to Edge of Needle Bearing

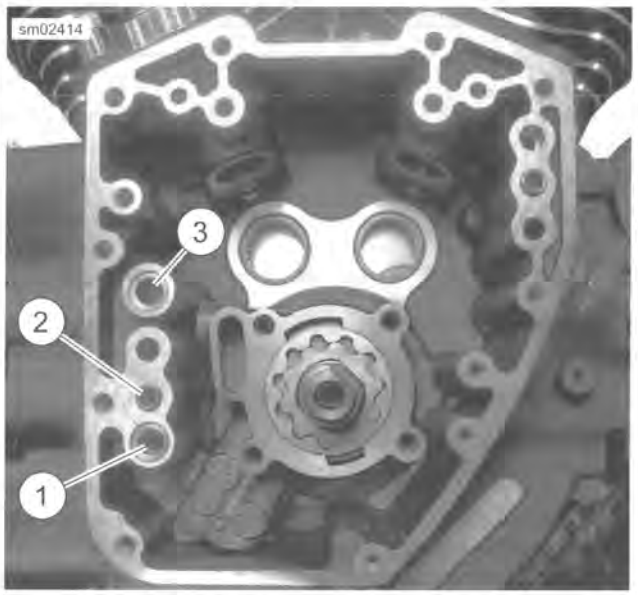
Figure 3-105. Measure from Top of Forcing Screw to Support Plate

CAM SUPPORT PLATE AND COVER INSTALLATION

PART NUMBER	TOOL NAME
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

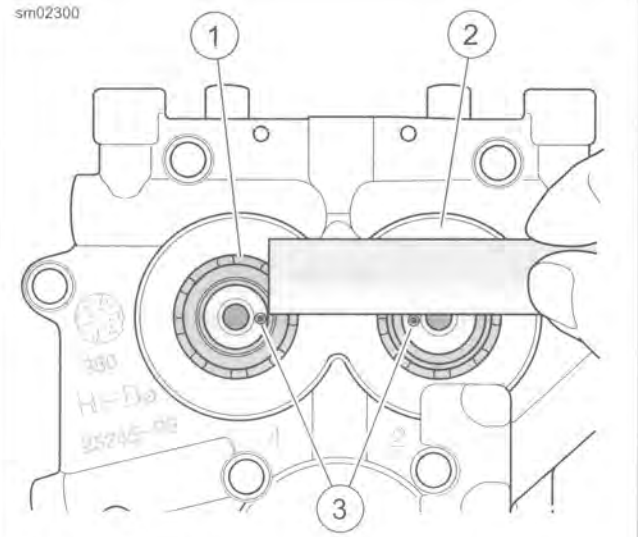
FASTENER	TORQUE VALUE	
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm
Oil pump screws, 1st torque	40-45 **in-lbs**	4.5-5.1 Nm
Oil pump screws, final torque	90-120 **in-lbs**	10.2-13.6 Nm
Cam sprocket flange bolt, 1st torque	15 ft-lbs	20.3 Nm
Crankshaft sprocket bolt, 1st torque	15 ft-lbs	20.3 Nm
Cam sprocket flange bolt, final torque	34 ft-lbs	46.1 Nm
Crankshaft sprocket bolt, final torque	24 ft-lbs	32.5 Nm
Cam chain tensioner fasteners	90-120 **in-lbs**	10.2-13.6 Nm
Cam cover screws	90-120 **in-lbs**	10.2-13.6 Nm

1. See Figure 3-106. Apply a very thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to **new** O-ring (1) and install in groove around oil feed hole.
2. Lubricate cam needle bearings with SCREAMIN' EAGLE ASSEMBLY LUBE.
3. See Figure 3-107. Verify that the timing marks on the ends of the front and rear camshafts are in alignment.



1. **Oil feed hole O-ring**
2. **Rear ring dowel**
3. **O-ring on crankcase post**

Figure 3-106. Oil Feed Hole



1. **Rear camshaft**
2. **Front camshaft**
3. **Timing marks**

Figure 3-107. Verify Alignment of Timing Marks

4. Slide cam support plate over crankshaft and onto two ring dowels in crankcase flange. Use a rubber mallet to fully seat cam support plate on ring dowels.
5. See Figure 3-108. Install cam support plate screws. Tighten to 90-120 **in-lbs** (10.2-13.6 Nm) in the sequence shown.

NOTES

- *Rotating the crankshaft while tightening screws will allow the oil pump to find its natural center. For methods of*

crankshaft rotation, see 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate.

- *Numbers cast adjacent to the bolt holes indicate the oil pump torque sequence.*

6. See Figure 3-109. Secure oil pump.
   a. Start four screws to secure oil pump.
   b. While rotating the crankshaft, install screws (1 and 2) until snug.
   c. Install screws (3 and 4) until snug.
   d. Tighten all four screws to 40-45 **in-lbs** (4.5-5.1 Nm) in the sequence shown.
   e. Final tighten all four screws to 90-120 **in-lbs** (10.2-13.6 Nm) in the sequence shown.
7. With the lettering facing inboard, install rear cam sprocket spacer onto the rear camshaft.

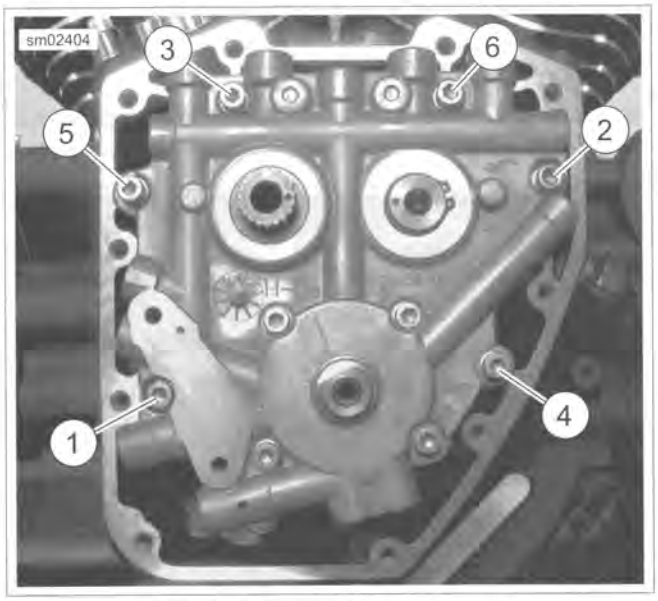


Figure 3-108. Cam Support Plate Torque Sequence

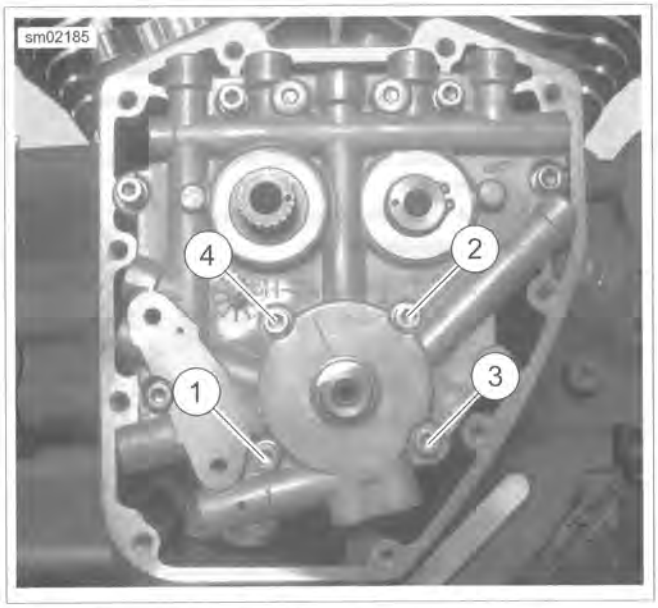


Figure 3-109. Oil Pump Torque Sequence

8. **Engines with one or more of the following new parts:** cam support plate, camshafts, primary cam sprocket, crankshaft sprocket or flywheel assembly.
   a. Install primary cam sprocket without chain using the long flange bolt with thicker flat washer.
   b. Install crankshaft sprocket without chain using the short flange bolt and a smaller diameter flat washer from bulk inventory.
   c. Position the CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (Part No. HD-47941) between the crankshaft and primary cam sprockets. Tighten both sprocket flange bolts to 15 ft-lbs (20.3 Nm). Remove the sprocket locking tool.
   d. Rotate engine stand so cam compartment is pointing upward. Push on crankshaft and rear camshaft to eliminate endplay.
   e. If engine was not removed from motorcycle, install compensating sprocket assembly to pull the crankshaft to the left side of the engine. Push on crankshaft and rear camshaft to eliminate endplay.
   f. See Figure 3-110. Place a straightedge across the sprocket faces. Attempt to insert a 0.010 in. (0.254 mm) feeler gauge between the straightedge and each sprocket face. If the feeler gauge will not fit at either location, sprocket offset is within specification. Remove both sprockets and discard temporary small washer.
   g. If measurement is not within specification, replace the rear cam sprocket spacer using Table 3-38 as a guide.
   h. Repeat alignment inspection with the **new** spacer installed. Remove both sprockets when measurement is within specification and discard temporary small washer.

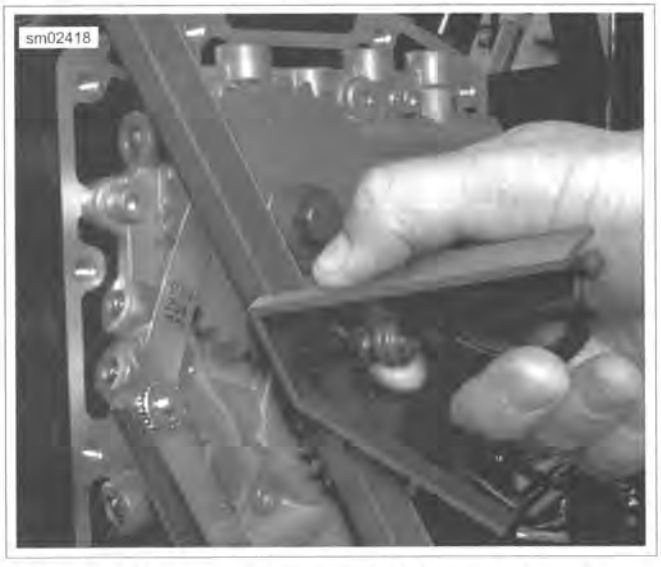


Figure 3-110. Check Alignment of Crank and Rear Cam Sprocket Faces

Table 3-38. Rear 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

9. See Figure 3-111. Apply a light film of SCREAMIN' EAGLE ASSEMBLY LUBE to splines on rear cam. Install the primary cam chain and sprocket assembly.
   a. Place both cam sprockets (2, 4) in the primary chain with the timing marks aligned. Verify that the colored mark placed on the chain link (7) is on the same side as the timing marks and is visible during installation.
   b. With the timing marks in alignment, start the rear cam sprocket onto the end of the rear camshaft. Note that the sprocket has an integral key that must be aligned with the keyway in the camshaft.
   c. Maintaining the position of the crankshaft sprocket on the chain, rotate the rear cam sprocket clockwise until the flat on the crankshaft sprocket is aligned with the flat on the crankshaft. Install the crankshaft sprocket.
10. Rotate the crankshaft clockwise until the timing marks on the sprockets are aligned and also aligned with alignment mark (5) on cam support plate.

NOTES

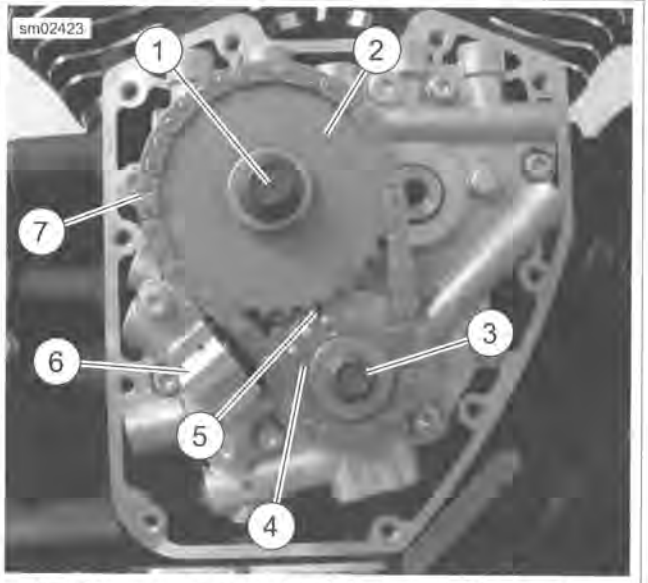
- *Both crank and rear cam sprocket flange bolts are specially hardened and the flat washers are of a special diameter.*
- *Use only genuine Harley-Davidson parts when replacement is necessary.*
- *If **new** flange bolts are not available, thoroughly clean both internal and external threads.*
- *Apply a **small** amount of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) before installation.*
- *Both sprocket bolts must install freely by hand.*
- *The crankshaft and rear cam sprocket flange bolts and flat washers are **not** interchangeable.*
- *Refer to Table 3-38.*

11. Apply a film of oil to bottom of both sprocket bolt heads and washers. Loosely install to secure sprockets.
12. Position the CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (Part No. HD-47941) between the crankshaft and rear cam sprockets to prevent rotation. The handle of the tool is stamped "Crank" and "Cam" to verify proper orientation.
    a. Tighten both sprocket bolts (1, 3) to 15 ft-lbs (20.3 Nm).
    b. Loosen both bolts one revolution (360 degrees).
    c. Final tighten the rear cam sprocket bolt (1) to 34 ft-lbs (46.1 Nm).
    d. Final tighten the crankshaft sprocket bolt (3) to 24 ft-lbs (32.5 Nm).
    e. Remove the sprocket locking tool.
13. Install primary cam chain tensioner. Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
14. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to both sprockets.

NOTE

Inserting a screw into a blind hole with debris can damage the crankcase.

15. Clean all blind holes in crankcase.
16. See Figure 3-112. Install cam cover and **new** cam cover gasket.



1. **Rear cam sprocket bolt (large) and flat washer**
2. **Rear cam sprocket**
3. **Crank sprocket bolt (small) and flat washer**
4. **Crank sprocket**
5. **Alignment mark on support plate**
6. **Primary chain tensioner**
7. **Marked link**

Figure 3-111. Primary Chain and Sprockets

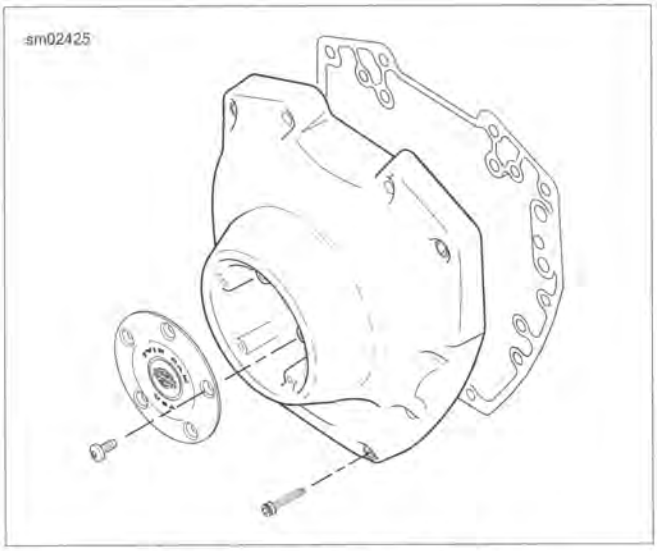


Figure 3-112. Cam Cover Gasket

17. See Figure 3-113. Secure cover with socket head screws. Following the sequence shown, tighten the screws to 90-120 **in-lbs** (10.2-13.6 Nm).

18. Complete motorcycle assembly.
    a. If engine was completely overhauled, see 3.25 TOP END OVERHAUL: ASSEMBLY. Perform all steps.
    b. If only cam compartment components were serviced, install pushrod covers, pushrods, rocker arm support plate and breather assembly. See appropriate topics under 3.25 TOP END OVERHAUL: ASSEMBLY.

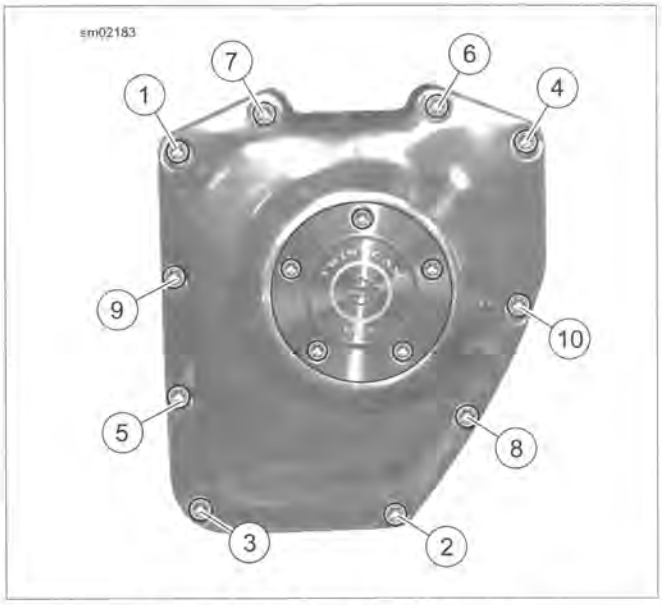
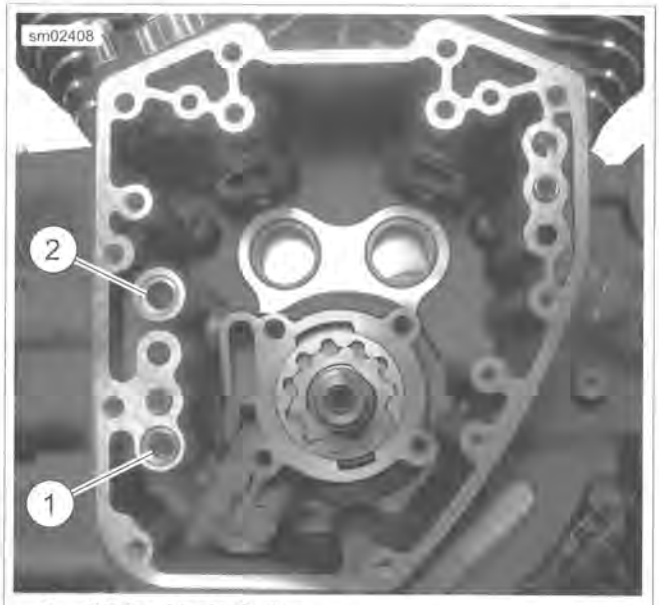


Figure 3-113. Cam Cover Screws

REMOVAL

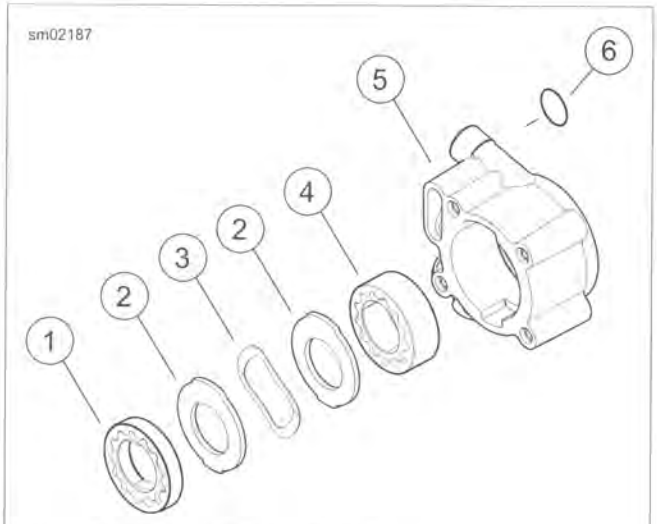
PART NUMBER	TOOL NAME
93979-10	SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS

1. See 3.18 TOP END OVERHAUL: DISASSEMBLY.
   a. Remove breather assembly.
   b. Remove rocker arm support plate.
   c. Remove pushrods and pushrod covers. Do not remove lifters or lifter covers.
   d. Support hydraulic lifters from dropping into the cam compartment using SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS (Part No. 93979-10). See 3.26 CAM COMPARTMENT AND COMPONENTS.
2. Remove cover and cam support plate. See 3.26 CAM COMPARTMENT AND COMPONENTS.
3. Carefully remove oil pump assembly from crankshaft.
4. See Figure 3-114. Remove and discard O-rings (1, 2).
5. See Figure 3-115. Disassemble and inspect oil pump components.



1. **Oil feed hole O-ring**
2. **O-ring on crankcase post**

Figure 3-114. Oil Pump O-rings



1. **Narrow gerotor set (feed)**
2. **Separator plate**
3. **Wave washer**
4. **Wide gerotor set (scavenge)**
5. **Oil pump housing**
6. **Scavenge port O-ring**

Figure 3-115. Assembling Oil Pump

CLEANING AND INSPECTION

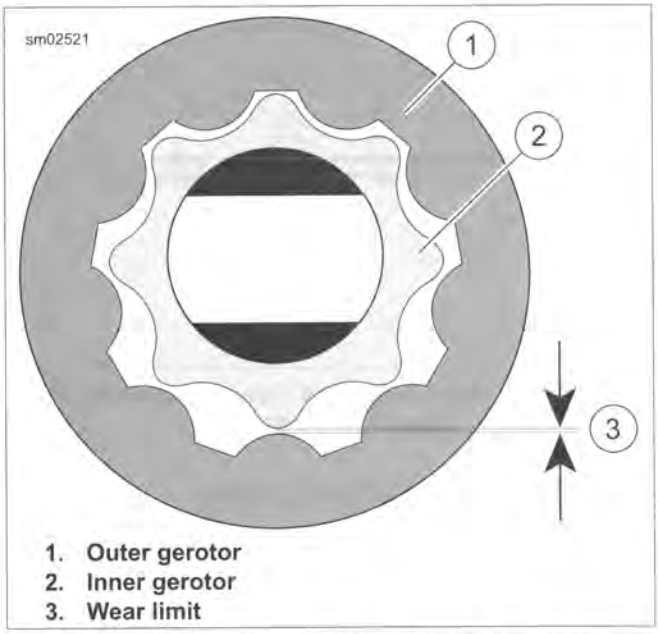
1. Clean all parts in a non-volatile cleaning solution or solvent.

⚠WARNING

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

2. Dry parts using low pressure compressed air. Verify that all oil passages are clean and open.
3. Inspect for scoring, gouging or cracking caused by foreign material.
4. Inspect for grooves or scratches on the cam support plate.
5. Check for excessive wear or damage on lobes of outer and inner gerotor gears.
6. See Figure 3-116. Check gerotor wear.
   a. Mesh rotors of one gerotor set together.
   b. Use a feeler gauge to determine clearance between tips of lobes on inner and outer gerotors.
   c. Replace gerotors as a set if clearance exceeds 0.004 in. (0.10 mm). Inspect second gerotor set in the same manner.
7. Measure and compare thickness of each rotor in both gerotor sets. Replace the gerotor set if the difference exceeds 0.001 in. (0.025 mm).

8. See Figure 3-117. Assemble the oil pump.
9. Verify that feed gerotors extend past the oil pump surface 0.015-0.025 in. (0.38-0.64 mm).
10. If measurement is less than 0.015 in. (0.38 mm), remove feed gerotor set and reassemble using **new** wave washer.
11. Repeat measurement and replace oil pump body if not within specification.



1. **Outer gerotor**
2. **Inner gerotor**
3. **Wear limit**

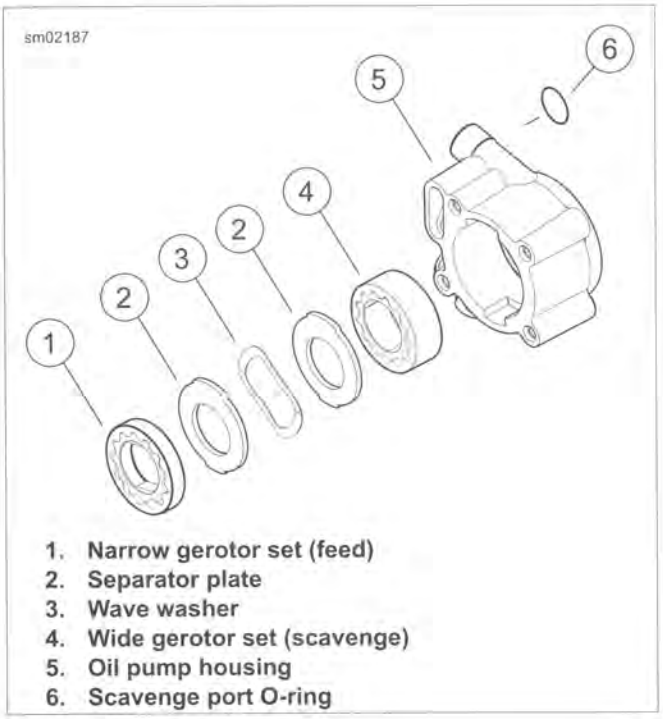
Figure 3-116. Measure Gerotor Sets for Wear

INSTALLATION

NOTE

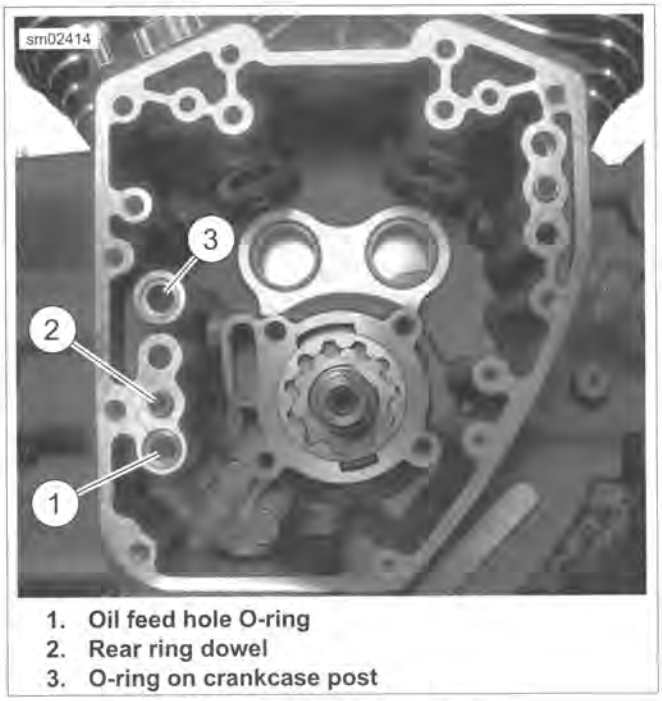
Lubricate parts with SCREAMIN' EAGLE ASSEMBLY LUBE during assembly.

1. See Figure 3-117. Apply a very thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to **new** scavenge port stub O-ring (6). Install O-ring on scavenge port stub of oil pump housing.
2. Slide oil pump housing (5) onto crankshaft while fitting O-ring on scavenge port stub into crankcase bore.
   a. Firmly push on scavenge port stub with thumb to verify that it is snug in bore.
   b. Inspect O-ring to verify that it is not pinched or distorted.
3. Assemble the wide gerotor set (4). Install on the crankshaft until it bottoms in the oil pump housing.
4. Install inside separator plate (2) on the crankshaft until it contacts the wide gerotor set (4). Install wave washer (3) and outside separator plate (2).
5. Assemble the narrow gerotor set (1). Install on the crankshaft until it contacts the outside separator plate (2).
6. See Figure 3-118. Apply a very thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to **new** O-ring (3) for crankcase post. Install **new** O-ring in groove on crankcase post.
7. Complete engine assembly. See 3.26 CAM COMPARTMENT AND COMPONENTS and 3.25 TOP END OVERHAUL: ASSEMBLY.



1. **Narrow gerotor set (feed)**
2. **Separator plate**
3. **Wave washer**
4. **Wide gerotor set (scavenge)**
5. **Oil pump housing**
6. **Scavenge port O-ring**

Figure 3-117. Assembling Oil Pump



1. **Oil feed hole O-ring**
2. **Rear ring dowel**
3. **O-ring on crankcase post**

Figure 3-118. Oil Feed Hole

CRANKCASE DISASSEMBLY

1. Remove oil pump from crankshaft.

NOTE

Do NOT rotate left crankcase half in the engine stand so the flywheel sprocket shaft is facing up. The flywheel assembly will fall out of the case.

2. Rotate crankcase in the engine stand so that the cam cover flange is facing straight upward.
3. See Figure 3-119. Remove the nine crankcase bolts in the sequence shown.

NOTE

Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and may be dropped.

4. Separate case halves. Lift right crankcase half off end of crankshaft.
5. See Figure 3-120. Remove two dowel pins in split line face of right case half.
6. Remove flywheel assembly from the crankcase. Inspect crankshaft/flywheel assembly. See 3.29 FLYWHEEL AND CONNECTING RODS.

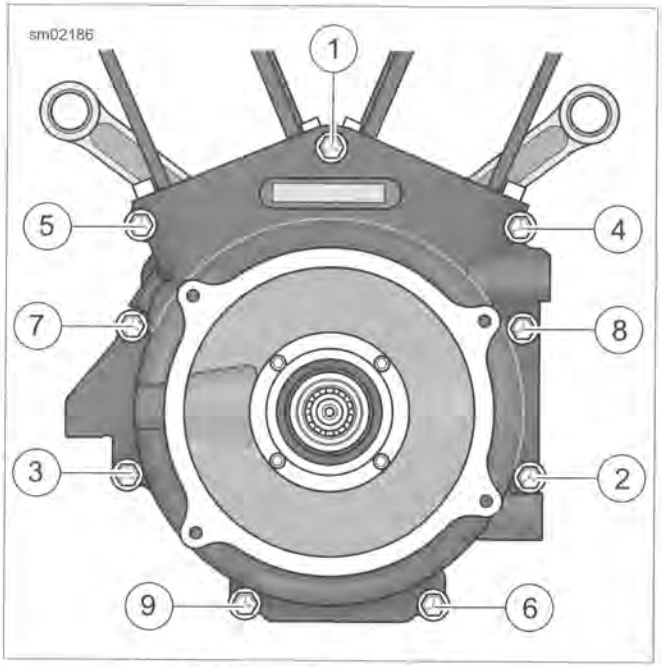


Figure 3-119. Crankcase Bolt Sequence

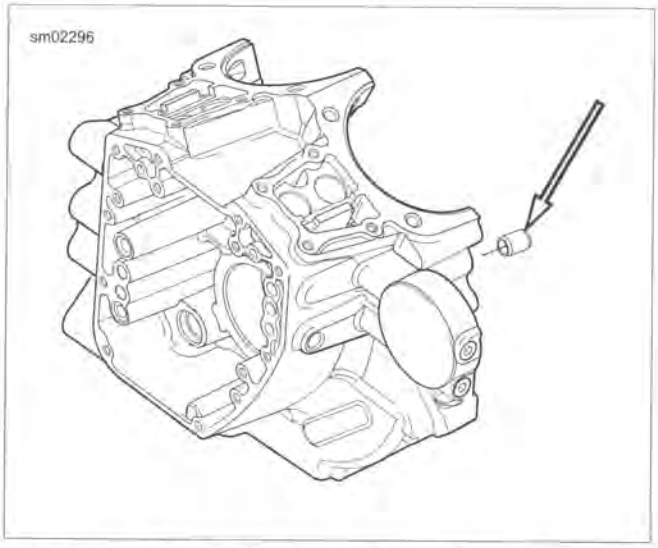


Figure 3-120. Right Crankcase Forward Dowel Pin (Rear Dowel Pin Not Shown)

CLEANING AND INSPECTION

1. Scrape old gasket material from the crankcase flanges. Old gasket material left on mating surfaces will cause leaks.
2. Clean all parts in a non-volatile cleaning solution or solvent.

⚠WARNING

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

3. Dry parts with moisture free compressed air.
4. Verify that all oil holes and passageways are clean and open.
5. Check ring dowels for looseness, wear or damage. Replace as 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 3.29 FLYWHEEL AND CONNECTING RODS.

RIGHT CRANKCASE HALF

PART NUMBER	TOOL NAME
B-45655	CRANKCASE BEARING REMOVER/INSTALLER
HD-42720-4	CRANKSHAFT BEARING DRIVER SHIM
HD-42720-5	REMOVER/INSTALLER SUPPORT TUBE

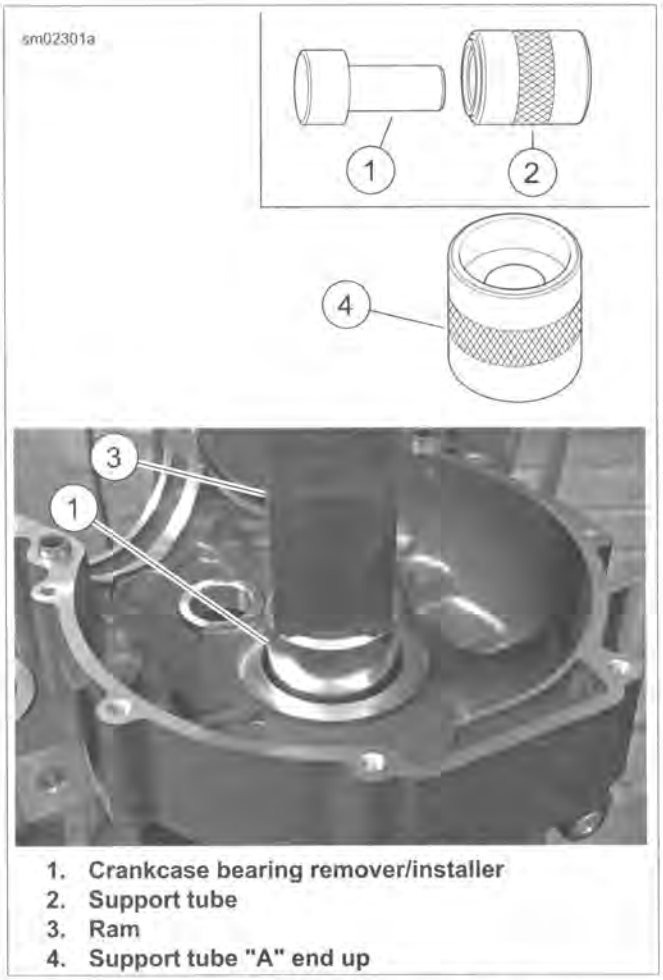
FASTENER	TORQUE VALUE	
Main bearing, right, retaining screws	40-70 **in-lbs**	4.5-7.9 Nm
Piston jet screws	25-35 **in-lbs**	2.8-3.9 Nm

Main Bearing Removal

NOTE

Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and may be dropped.

1. See Figure 3-123. Remove two main bearing retaining screws (5) from the cam compartment side.
2. See Figure 3-121. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and REMOVER/INSTALLER SUPPORT TUBE (Part No. HD-42720-5).
3. Place support tube (4) on hydraulic press table with the "A" end up. Note that the sides of the support tube are stamped to verify proper orientation.
4. With the cam compartment side facing downward, position main bearing bore over support tube.
5. Slide remover/installer (1) through bearing into support tube.
6. Center remover/installer under ram (3) of press. Apply pressure until bearing is free.
7. Remove crankcase, remover/installer and bearing from support tube. Discard bearing.



1. **Crankcase bearing remover/installer**
2. **Support tube**
3. **Ram**
4. **Support tube "A" end up**

Figure 3-121. Right Main Bearing Removal

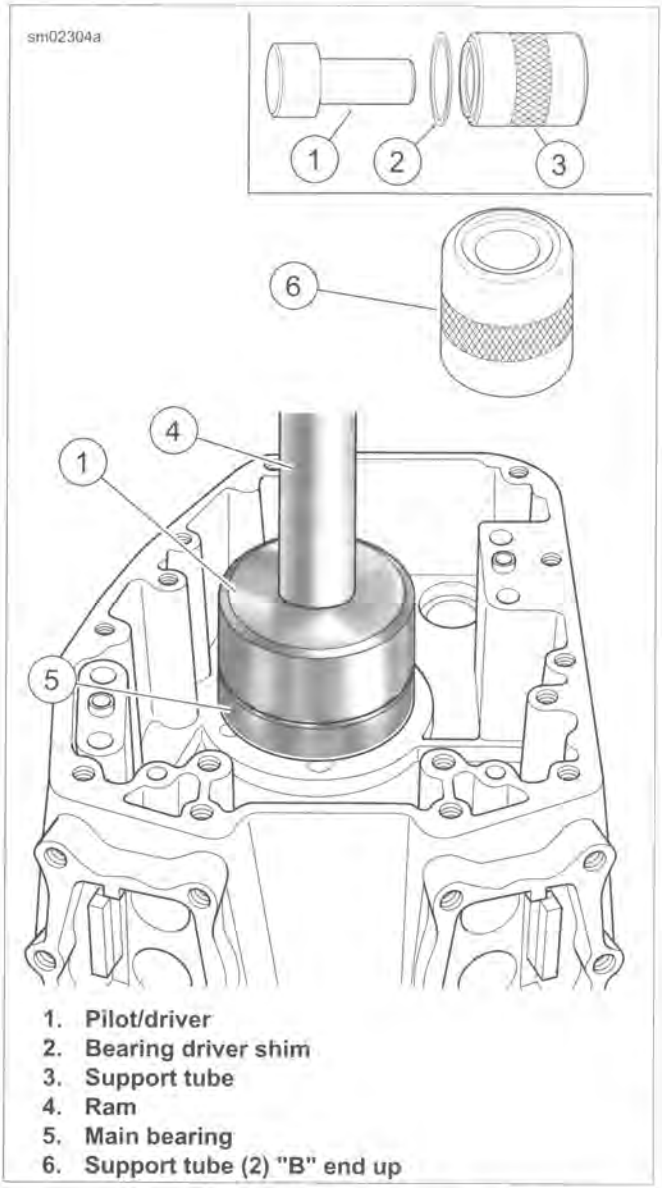
Main Bearing Installation

1. See Figure 3-122. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655), CRANKSHAFT BEARING DRIVER SHIM (Part No. HD-42720-4) and REMOVER/INSTALLER SUPPORT TUBE (Part No. HD-42720-5).
2. Spread a thin film of clean engine oil on OD of **new** bearing (5).
3. Place support tube (3) on press table with the "B" end is up. The ends of the support tube are stamped "A" and "B" to verify proper orientation.
4. Place CRANKSHAFT BEARING DRIVER SHIM (Part No. HD-42720-4) (2) on support tube (3).
5. With the cam compartment side facing upward, position main bearing bore over support tube.
6. Start the **new** bearing in bearing bore with the lettering facing into the cam compartment (up).
7. Slide remover/installer (1) through bearing into support tube.
8. Center remover/installer under ram (4) of press. Apply pressure until resistance is felt and bearing is bottomed on the support tube.
9. Remove remover/installer and crankcase half from support tube.

NOTES

- *Verify that the bearing is flush or slightly below the surface of the crankcase. Never "push" the bearing into position using the retaining screws.*
- *If **new** retaining screws are not available, apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads of screws before installation.*

10. See Figure 3-123. Install two **new** main bearing retaining screws (5) from the cam compartment side. Tighten screws to 40-70 **in-lbs** (4.5-7.9 Nm).

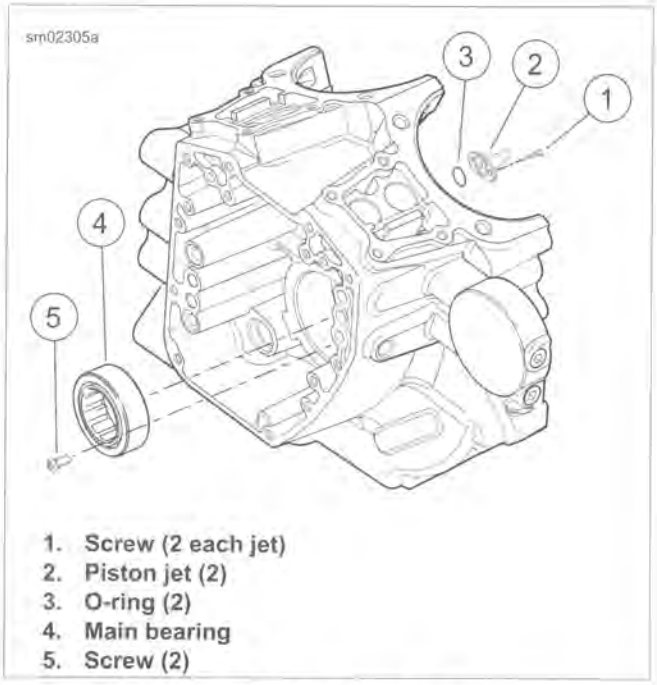


1. **Pilot/driver**
2. **Bearing driver shim**
3. **Support tube**
4. **Ram**
5. **Main bearing**
6. **Support tube (2) "B" end up**

Figure 3-122. Right Main Bearing Installation

Piston Jets Removal

1. See Figure 3-123. Remove two screws (1) to free piston jet (2) from crankcase.
2. Remove O-ring (3) from groove in mounting flange of jet. Discard O-ring.



1. **Screw (2 each jet)**
2. **Piston jet (2)**
3. **O-ring (2)**
4. **Main bearing**
5. **Screw (2)**

Figure 3-123. Piston Jets

Piston Jets Installation

NOTE

If piston jet is being reused, apply LOCTITE 222 LOW STRENGTH THREADLOCKER AND SEALANT (purple) to threads of screws before installation.

1. See Figure 3-123. Apply a very thin film of clean engine oil to **new** O-ring (3). Install **new** O-ring in groove of jet mounting flange.
2. With jet pointed upward, secure piston jet (2) with two screws (1). Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

LEFT CRANKCASE HALF

PART NUMBER	TOOL NAME
B-45655	CRANKCASE BEARING REMOVER/INSTALLER
HD-42720-5	CRANKCASE BEARING REMOVER/INSTALLER BASE

Main Bearing Removal

NOTE

Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and may be dropped.

⚠CAUTION

Do not rotate left crankcase half in engine stand such that flywheel sprocket shaft is facing up. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00552b)

1. Hold flywheel assembly to prevent it from falling out of left crankcase half. Rotate bottom end assembly in engine stand so assembly is upright and flywheel shafts are horizontal.

2. Carefully slide flywheel assembly out of left crankcase and place it in a clean safe place.
3. Remove thrust washer from outboard side of crankcase half by pulling it past oil seal. Set thrust washer aside for inspection or reuse.
4. Remove oil seal from crankcase bore. Discard oil seal.
5. See Figure 3-124. Using a flat blade screwdriver, carefully lift edge of bearing retaining ring up out of its groove in crankcase.
6. Slide screwdriver tip around edge of bearing, lifting retaining ring up and out of groove. Do not damage lip of groove in crankcase.

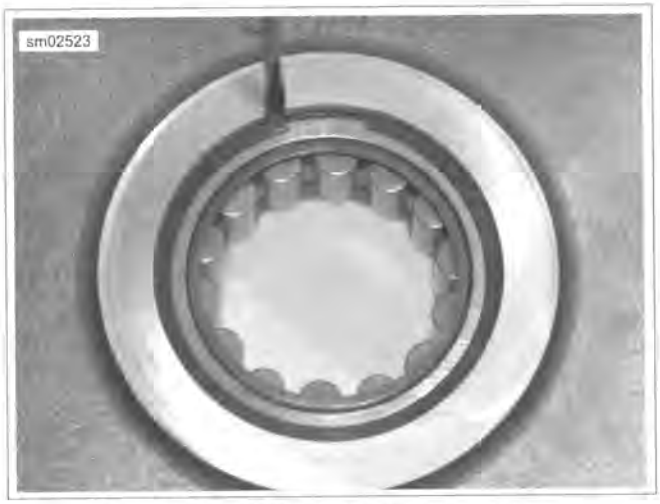
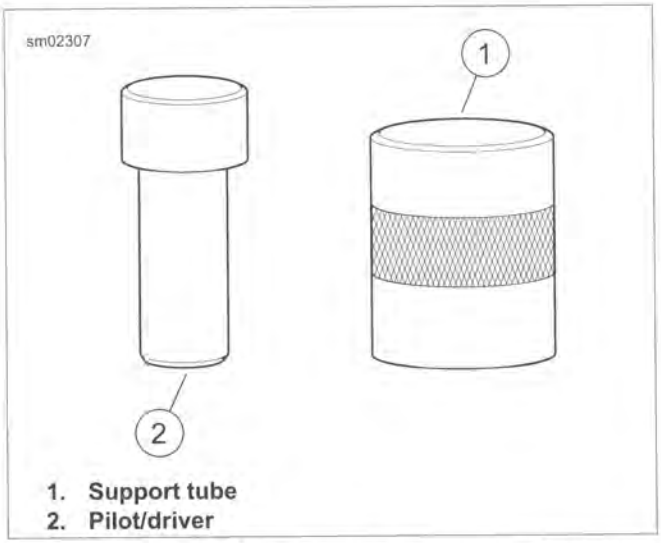
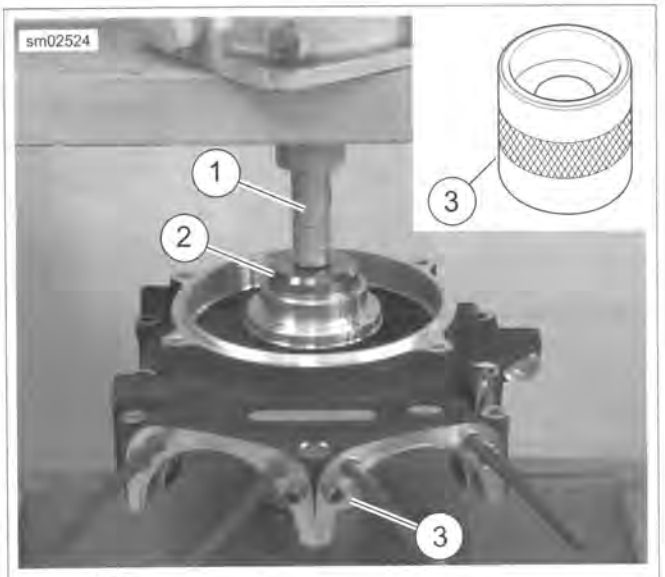


Figure 3-124. Removing Retaining Ring



1. **Support tube**
2. **Pilot/driver**

Figure 3-125. Left Main Bearing Remover and Installer Tools



1. **Ram**
2. **Pilot/driver**
3. **Support tube ("A" end up)**

Figure 3-126. Left Main Bearing Removal

NOTE

See Figure 3-125. If the ram of the press is wider than the head of pilot/driver (2), a suitable press plug will be needed in order to remove the main bearing.

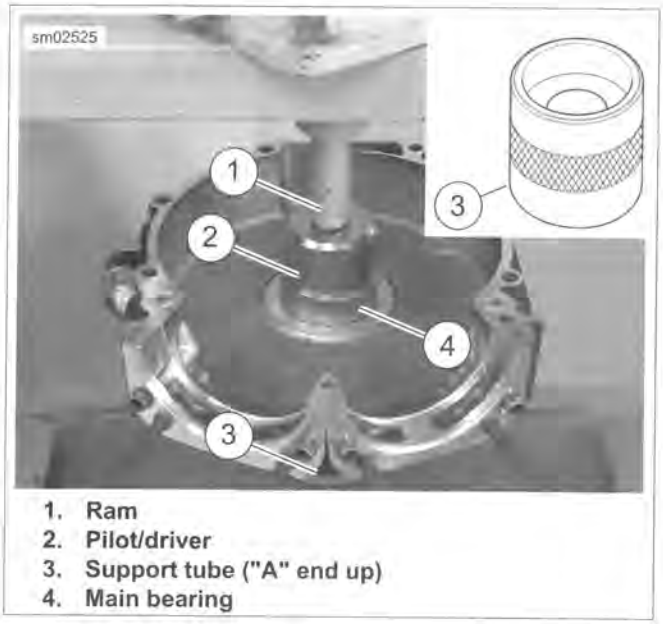
7. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and CRANKCASE BEARING REMOVER/INSTALLER BASE (Part No. HD-42720-5).
8. See Figure 3-126. Place support tube (3) on press table with "A" end up. Note that support tube is stamped "A" and "B" to provide proper orientation.
9. With the outboard side of the left crankcase half facing upward, position main bearing bore over support tube.
10. Slide pilot/driver (2) through the main bearing into support tube (3).
11. Center pilot/driver under ram (1) of press. Apply pressure to pilot/driver until bearing is free.
12. Remove crankcase half, pilot/driver and bearing from support tube. Discard bearing.

Main Bearing Installation

NOTES

- *Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and may be dropped.*
- *Always replace sprocket shaft bearing inner race whenever left main bearing is replaced. See 3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race.*

1. See Figure 3-125. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and CRANKCASE BEARING REMOVER/INSTALLER BASE (Part No. HD-42720-5).



1. **Ram**
2. **Pilot/driver**
3. **Support tube ("A" end up)**
4. **Main bearing**

Figure 3-127. Left Main Bearing Installation

2. See Figure 3-127. Place a thin film of clean engine oil on outer diameter of **new** main bearing (4).
3. Place support tube (3) on hydraulic press table with the "A" end up.
4. With the inboard side of the left crankcase half facing upward, position main bearing bore over support tube.
5. Start **new** main bearing in bearing bore, letter side down.
6. Slide pilot/driver (2) through bearing into support tube.
7. Apply pressure to pilot/driver until bearing is lightly bottomed in main bearing bore.
8. Remove crankcase half and pilot/driver from support tube.
9. Install **new** retaining ring in bearing bore groove, being careful not to damage edges of groove. Make sure retaining ring is fully seated in groove.

NOTE

If retaining ring will not fit into groove, the bearing may not be fully seated in the bore. Inspect bearing and bore. If necessary, remove bearing, clean bore and install bearing. Then install retaining ring.

SPROCKET SHAFT BEARING INNER RACE

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-34902-B	MAINSHAFT BEARING INNER RACE PULLER/INSTALLER
HD-44358	FLYWHEEL SUPPORT FIXTURE
HD-95637-46B	WEDGE ATTACHMENT
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

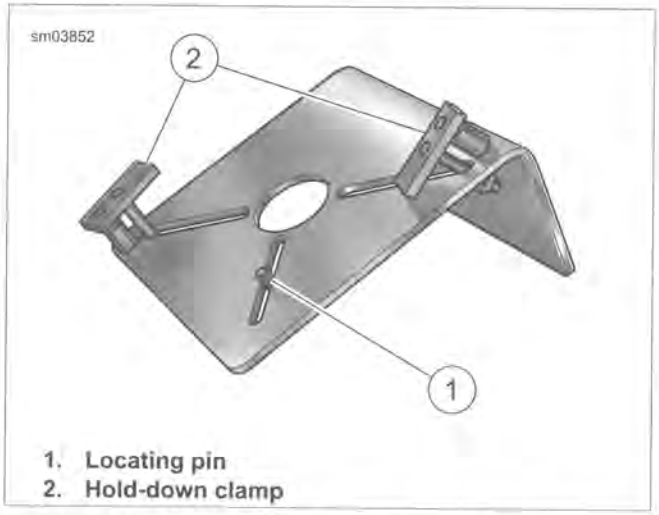
Removal

If reusing flywheel, remove bearing inner race and thrust washer as follows:

1. See Figure 3-128. Install brass jaws or shop towels around teeth of vise to prevent damage to tool. Obtain FLYWHEEL SUPPORT FIXTURE (Part No. HD-44358). Clamp tool in vise with the round hole topside.
2. Insert crankshaft end through hole resting flywheel assembly on fixture. Slide knurled locating pin down slot in tool to engage crank pin hole. Hand tighten locating pin.
3. Slide hold-down clamp down slot to engage inboard side of right flywheel half, and then hand tighten knurled nut at bottom to secure. Repeat step to secure hold-down clamp on opposite side of flywheel.

NOTE

For proper clamping force, hold-down clamp must not be tilted. Rotate hex on outboard stud until clamp is level.



1. **Locating pin**
2. **Hold-down clamp**

Figure 3-128. Flywheel Holding Fixture

4. Position WEDGE ATTACHMENT (Part No. HD-95637-46B) on inboard side of thrust washer and turn hex nuts an equal number of turns to draw halves of wedge together.

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)

5. Obtain two 3/8-16 inch bolts 7-1/2 inches long (with flat washers). Install flat washers on bolts. Obtain bridge and forcing screw from MAINSHAFT BEARING INNER RACE PULLER/INSTALLER (Part No. HD-34902-B). Also obtain a suitable hardened washer to use between the puller screw and the end of the shaft.
6. Slide one bolt into channel on each side of bridge so that flat washer is between bridge and bolt head. Thread bolts into wedge attachment an equal number of turns.
7. Sparingly apply graphite lubricant to threads of forcing screw to prolong service life and verify smooth operation. Start forcing screw into center hole of bridge.

NOTE

Failure to use hardened washer may result in damage to forcing screw and/or sprocket shaft.

8. Place hardened washer against end of sprocket shaft. Thread forcing screw into bridge until the steel ball at the end of the screw makes firm contact with hardened washer.

⚠WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

9. Using the ROBINAIR HEAT GUN (Part No. HD-25070), uniformly heat the bearing inner race for about 30 seconds using a circular motion.

NOTE

To assist removal without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

10. Turn forcing screw until thrust washer and bearing inner race move approximately 1/8 in. (3.2 mm).
11. Turn hex nuts an equal number of turns to separate halves of WEDGE ATTACHMENT (Part No. HD-95637-46B).
12. After bottoming thrust washer on shaft, reposition WEDGE ATTACHMENT (Part No. HD-95637-46B) on inboard side of bearing inner race. Turn hex nuts an equal number of turns to draw halves of wedge together.

NOTICE

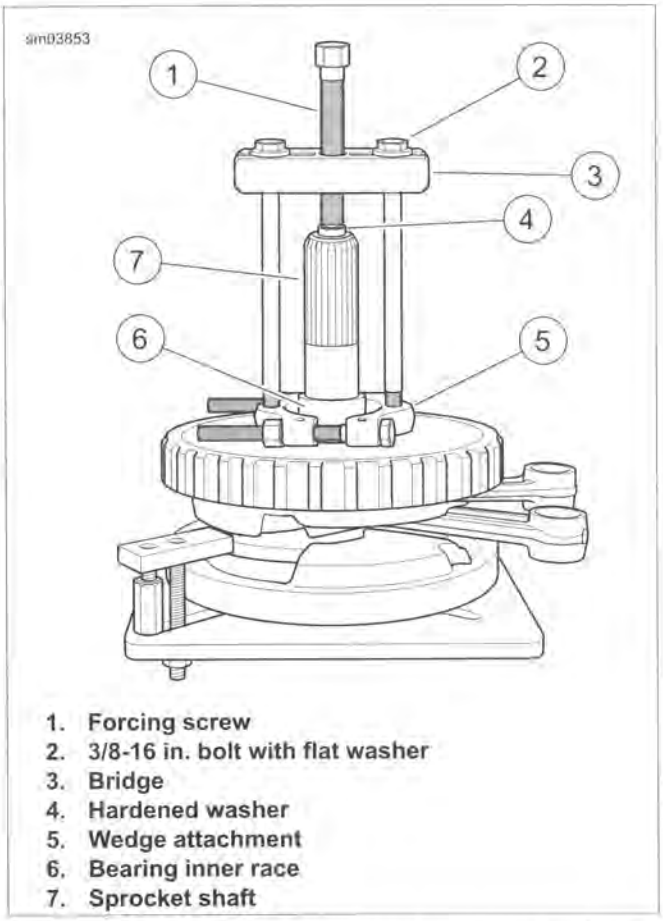
Install wedge attachment only so far as necessary to ensure positive contact with bearing inner race. Installing tool with more contact than necessary will result in damage to the flywheel (00500b)

13. See Figure 3-129. Verify that the tool assembly is square, so that the bearing inner race is not cocked during removal.
14. Using the ROBINAIR HEAT GUN (Part No. HD-25070), uniformly heat the bearing inner race for about 30 seconds using a circular motion.

NOTE

To assist removal without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

15. Turn forcing screw until bearing inner race is pulled free of sprocket shaft.
16. Remove thrust washer from sprocket shaft.



1. **Forcing screw**
2. **3/8-16 in. bolt with flat washer**
3. **Bridge**
4. **Hardened washer**
5. **Wedge attachment**
6. **Bearing inner race**
7. **Sprocket shaft**

Figure 3-129. Remove Inner Race from Sprocket Shaft

Installation

1. Place **new** thrust washer over sprocket shaft.
2. Place **new** bearing inner race on bench top. Using the ROBINAIR HEAT GUN (Part No. HD-25070), uniformly heat bearing inner race for about 60 seconds using a circular motion.
3. Wearing suitable gloves to protect hands from burns, place heated bearing inner race over sprocket shaft.

⚠WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

NOTE

To assist installation without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

4. See Figure 3-130. Obtain the SPROCKET SHAFT BEARING INSTALLER (Part No. HD-97225-55C). Assemble tool as described below.
   a. See Figure 3-131. Thread pilot adapter into sprocket shaft.
   b. Thread pilot shaft onto pilot adapter.
   c. Slide long collar over pilot shaft until it contacts bearing inner race.
   d. Slide short collar over pilot shaft until it contacts long collar.
   e. Slide bearing and large flat washer over pilot shaft.
   f. Sparingly apply graphite lubricant to threads of pilot shaft to prolong service life and verify smooth operation.
   g. See Figure 3-132. Thread handle onto pilot shaft.
5. See Figure 3-133. Rotate handle of tool clockwise until bearing inner race makes firm contact with thrust washer. Verify that thrust washer cannot be rotated by hand.
6. Remove handle, flat washer, bearing, short collar, long collar, pilot shaft and pilot adapter from sprocket shaft.

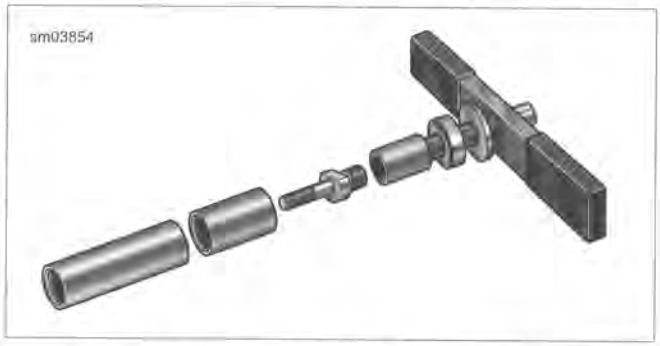


Figure 3-130. Sprocket Shaft Bearing Installer

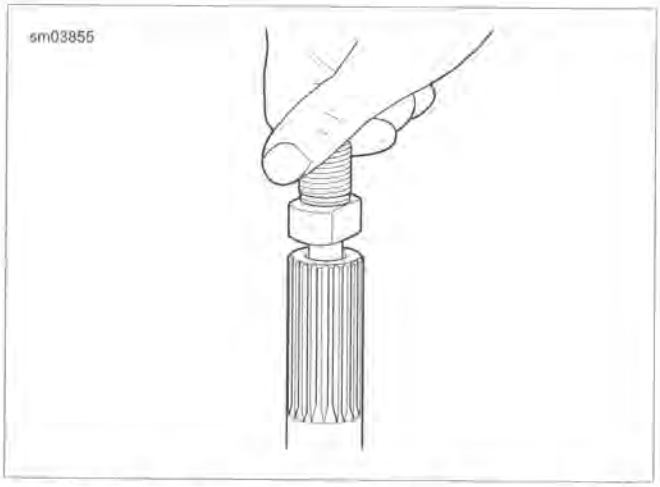
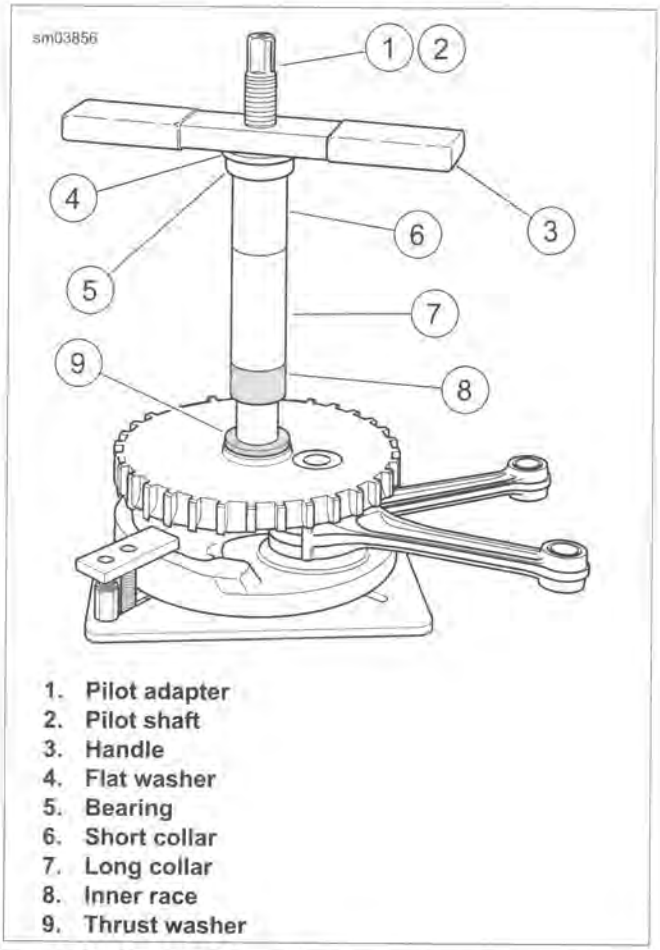


Figure 3-131. Thread Pilot Adapter into Sprocket Shaft



1. **Pilot adapter**
2. **Pilot shaft**
3. **Handle**
4. **Flat washer**
5. **Bearing**
6. **Short collar**
7. **Long collar**
8. **Inner race**
9. **Thrust washer**

Figure 3-132. Press Inner Race onto Sprocket Shaft: Setup

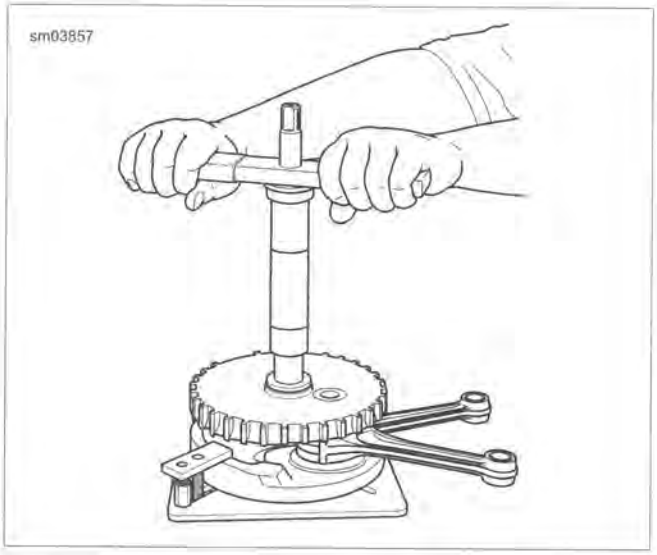


Figure 3-133. Press Inner Race onto Sprocket Shaft: Operation

CYLINDER STUDS

FASTENER	TORQUE VALUE	
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm

Removal

1. Thread a nut onto cylinder stud.
2. Thread a second nut onto stud until it contacts the first.
3. Placing wrench on first nut installed, remove stud.

Installation

1. Place a steel ball inside a head screw. Put the head screw on the end of the cylinder stud without the collar.
2. Start the stud in the cylinder deck with the collar side down. Tighten using air gun until collar reaches crankcase.
3. Hand tighten stud to 120-240 **in-lbs** (13.6-27.1 Nm).

PIPE PLUG AND OIL FITTINGS

FASTENER	TORQUE VALUE	
Crankcase pipe plugs	120-144 **in-lbs**	13.6-16.3 Nm

Removal

See Figure 3-134. Turn pipe plug counterclockwise until free.

Installation

1. Apply LOCTITE 565 THREAD SEALANT to threads.
2. Install pipe plug. Tighten to 120-144 **in-lbs** (13.6-16.3 Nm).

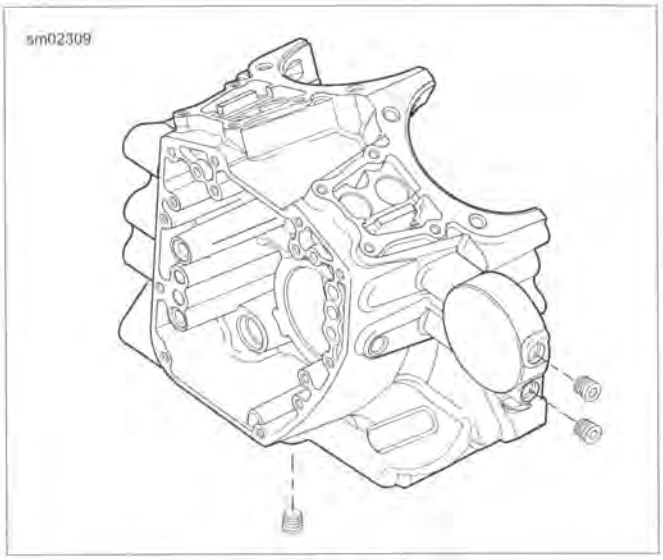


Figure 3-134. Pipe Plug

GENERAL

Symptoms

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, resulting in a loss of oil pressure.

If a very 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 oil pan or oil tank. See 1.26 TROUBLESHOOTING 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 will be resolved by following the checklist in 1.26 TROUBLESHOOTING.

If correct chassis set-up has been verified and other items in 1.26 TROUBLESHOOTING have been eliminated, checking left crankshaft runout is appropriate.

INSPECTION

NOTE

Do not attempt to straighten connecting rods. Straightening rods will damage both the upper bushing and lower bearing.

1. Replace the flywheel/connecting rod assembly if any of the following conditions are noted:
   a. Connecting rods are bent or twisted.
   b. Connecting rods do not fall under their own weight or are in a bind.
   c. Sprocket teeth are worn in an irregular pattern or chipped.
   d. The crankshaft (roller) bearing inner races are brinelled, burnt, scored, blued or damaged.
   e. The crankshaft runout exceeds specification.

NOTE

Bluing on connecting rods is part of the hardening process and is considered a normal condition.

2. Check connecting rod bearing clearance. Orient the assembly as shown in Figure 3-135.
   a. Holding the shank of each rod just above the bearing bore, pull up and down on the connecting rods.
   b. Any discernible up and down movement indicates excessive lower bearing clearance. Replace the flywheel/connecting rod assembly.
3. Measure crankshaft runout if the crankshaft is suspected of being out-of-true.

NOTE

If the flywheel, connecting rods or right side bearing inner race need to be replaced, then replace the entire flywheel assembly.

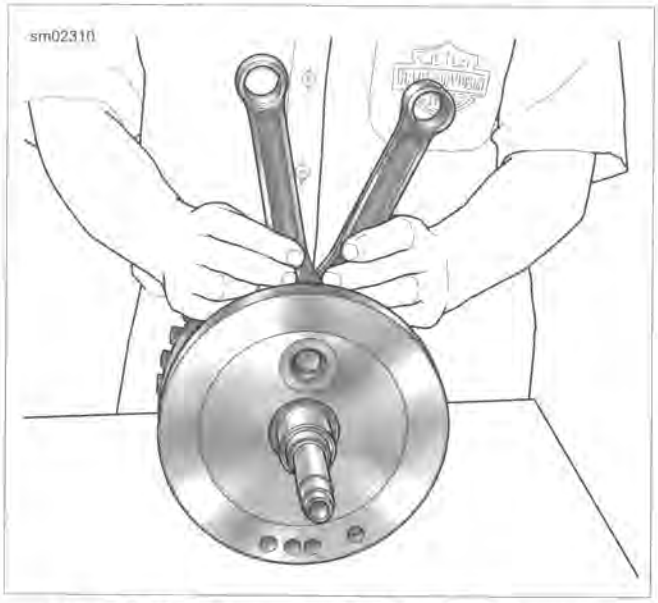


Figure 3-135. Connecting Rod Bearing Clearance

MEASURING CRANKSHAFT RUNOUT

Crankshaft Installed

NOTES

- *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 3.26 CAM COMPARTMENT AND COMPONENTS.
   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 3-39.

2. **Left Side**

a. Remove spark plugs.

b. Remove the primary cover and compensating sprocket. See 5.4 DRIVE COMPONENTS.

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 3-39. If the total indicator reading exceeds service wear limit, remove the crankshaft/flywheel assembly and check on a truing stand.

Crankshaft Removed

NOTES

- *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 3-136. 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

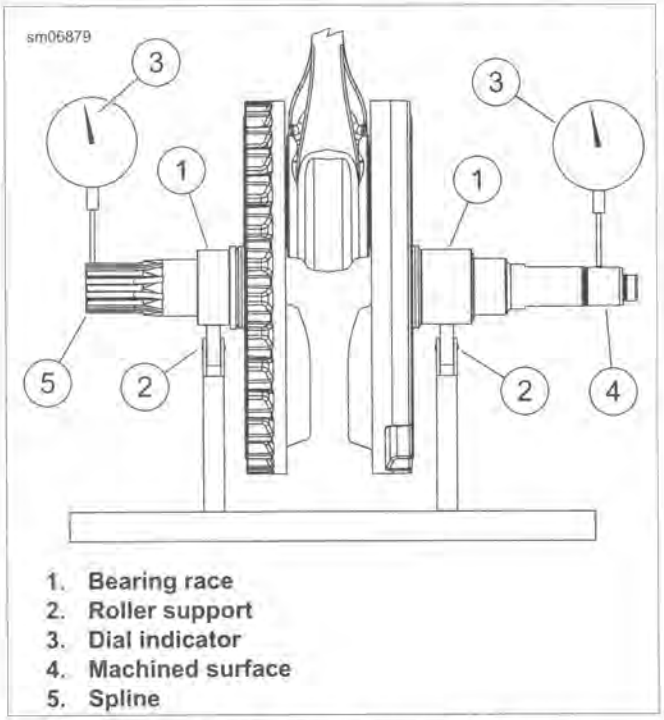
Dial indicators must be perpendicular to the shaft in both directions.

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 3-39.



1. **Bearing race**
2. **Roller support**
3. **Dial indicator**
4. **Machined surface**
5. **Spline**

Figure 3-136. Checking Crankshaft Runout

Table 3-39. Flywheel

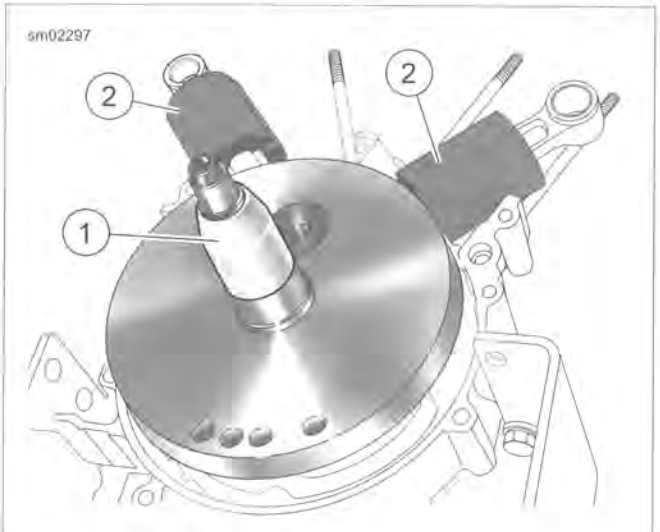
FLYWHEEL	REPLACE IF WEAR EXCEEDS	
	IN	MM
Runout (shaft measured in case)	0.012	0.305
Runout (measured in truing stand)	0.005	0.127
End play	0.013	0.330

CRANKCASE ASSEMBLY

PART NUMBER	TOOL NAME
99650-02	HIGH-PERFORMANCE SEALANT, GRAY
HD-39361-B	SPROCKET SHAFT OIL SEAL INSTALLER
HD-42326-B	CRANKSHAFT GUIDE
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

FASTENER	TORQUE VALUE	
Crankcase screws, 1st torque	120 **in-lbs**	13.6 Nm
Crankcase screws, final torque	15-19 ft-lbs	20.3-25.8 Nm

1. Secure left crankcase half upright in engine stand.
2. Slide CRANKSHAFT GUIDE (Part No. HD-42326-B) onto flywheel sprocket shaft.
3. Slide flywheel assembly into left crankcase half. Remove crankshaft guide tool.
4. Rotate crankcase assembly so flywheel sprocket shaft is pointing straight up.
5. Verify that both dowel pins are installed in split line face of right case half.
6. Apply a bead of HIGH-PERFORMANCE SEALANT, GRAY (Part No. 99650-02) approximately 0.056 in. (1.42 mm) wide to the split line face and around the two dowel pins of right crankcase half.
7. See Figure 3-137. Place CRANKSHAFT GUIDE (Part No. HD-42326-B) over end of crankshaft until it contacts shoulder on shaft.
8. Mate case halves. Remove crankshaft guide.



1. **Crankshaft guide**
2. **Water pipe insulation**

Figure 3-137. Crankshaft Guide

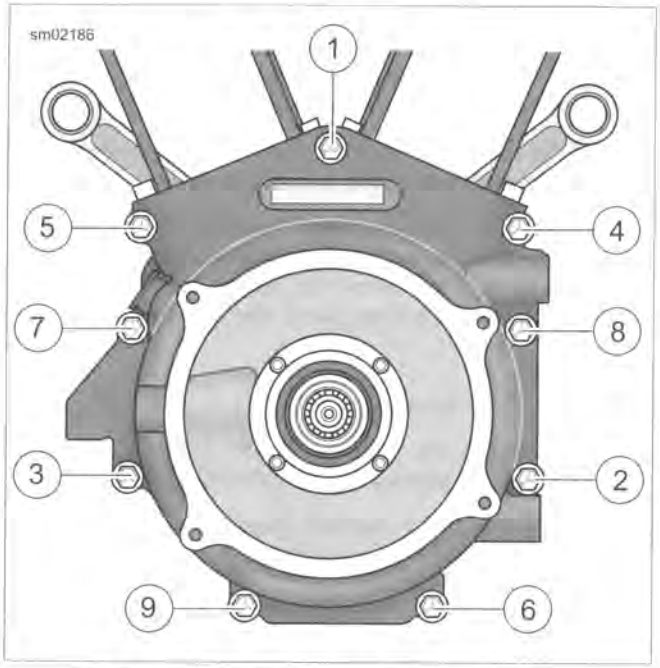


Figure 3-138. Tightening Crankcase Bolts

9. See Figure 3-138. Start the nine crankcase bolts and tighten in the following sequence.
   a. Finger-tighten each crankcase bolt.
   b. Tighten the crankcase bolts to 120 **in-lbs** (13.6 Nm) in the order shown.
   c. Following the same sequence, tighten each bolt to 15-19 ft-lbs (20.3-25.8 Nm).
10. Rotate crankcase assembly so sprocket shaft is pointing straight up.
11. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to the main bearing. Rotate flywheel assembly to distribute lube.
12. Install thrust washer on sprocket shaft with "THIS SIDE OUT" facing out (and the chamfer inboard). If using original part without markings, orient as required to preserve existing wear pattern.
13. See Figure 3-139. Install **new** oil seal into bearing bore. Obtain pilot adapter, pilot shaft, short collar, bearing, large

flat washer and handle from SPROCKET SHAFT BEARING INSTALLER (Part No. HD-97225-55C).

a. Thread pilot adapter into sprocket shaft.

b. Thread pilot shaft onto pilot adapter.

c. Verify that lip garter spring is in place on both sides of oil seal.

d. Install sprocket shaft spacer in oil seal bore.

e. With the lettering on the oil seal facing outward, slide sprocket shaft spacer and oil seal over pilot shaft until it contacts bearing bore.

f. Slide SPROCKET SHAFT OIL SEAL INSTALLER (Part No. HD-39361-B) over pilot shaft until it contacts oil seal.

NOTE

Sparingly apply graphite lubricant to threads of pilot shaft to prolong service life and provide smooth operation.

g. Slide short collar, bearing and large flat washer onto pilot shaft. Thread handle on to complete assembly of tool.

14. Rotate handle clockwise until oil seal installer makes firm contact with crankcase stator mount.

15. Remove tool components from sprocket shaft.

16. Rotate crankcase in engine stand so cam cover flange is facing upward.

17. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to the main bearing. Rotate flywheel assembly to distribute lube.

18. Install oil pump and cam support plate. See 3.26 CAM COMPARTMENT AND COMPONENTS.

19. Complete engine assembly.

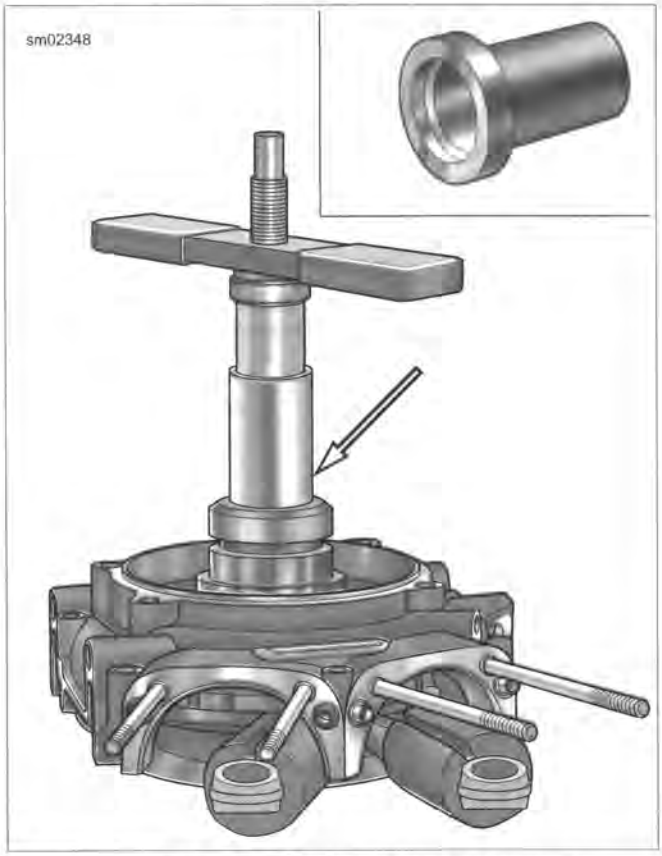


Figure 3-139. Sprocket Shaft Oil Seal Installer

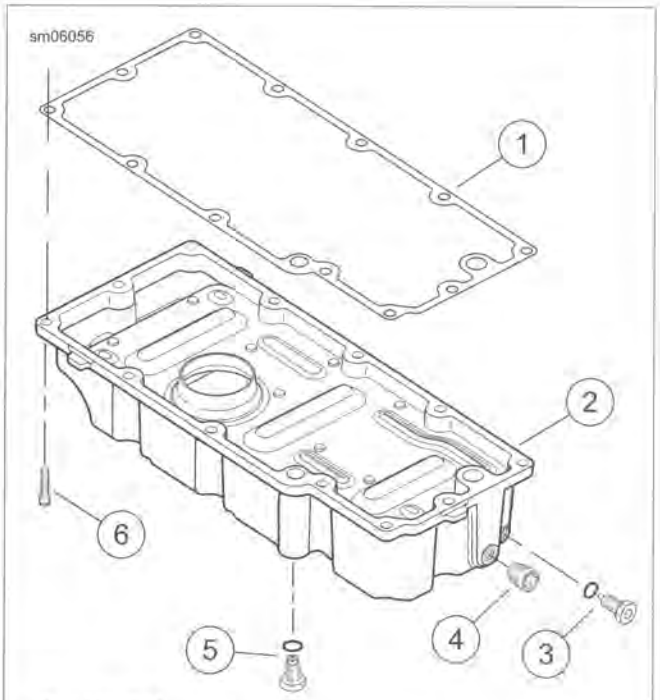
REMOVAL

1. Position motorcycle on a suitable lift.
2. See Figure 3-140. Remove the engine oil drain plug (3), fill plug/dipstick and oil filter. Drain oil into suitable container.
3. Remove the transmission drain plug (5) and drain transmission fluid into suitable container.
4. Remove the rear wheel. See 2.5 REAR WHEEL.
5. Remove the left muffler, exhaust crossover pipe and crossover pipe clamp bracket from the transmission. See 4.18 EXHAUST SYSTEM.
6. See Figure 3-140. Remove 12 fasteners (6) that secure the oil pan to the transmission.

NOTE

Always remove the engine oil fill plug/dipstick to prevent damage during oil pan removal.

7. Slide oil pan (2) rearward to remove. Remove and discard oil pan gasket (1).
8. If necessary, remove tapered plug (4).
9. Thoroughly inspect and clean the oil pan, especially if there was a major engine failure. Debris that remains in the pan will cause a repeat failure. Install a **new** oil pan if necessary.



1. **Gasket**
2. **Pan/baffle assembly**
3. **Engine oil drain plug and O-ring**
4. **Tapered pipe plug**
5. **Transmission drain plug and O-ring**
6. **Fastener (12)**

Figure 3-140. Oil Pan Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Oil pan tapered plug	18-22 ft-lbs	24.4-29.8 Nm
Oil pan fasteners	132-156 **in-lbs**	14.9-17.6 Nm
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm
Exhaust crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm

1. See Figure 3-140. Clean and examine transmission and oil pan flanges.
2. If removed, install tapered plug (4) using LOCTITE 565 THREAD SEALANT. Tighten to 18-22 ft-lbs (24.4-29.8 Nm).
3. Apply a thin coat of HYLOMAR GASKET AND THREAD SEALANT® gasket sealer to oil pan flange.
4. Place **new** gasket (1) on oil pan flange. Allow sealer to dry until tacky.

NOTE

*If oil pan fasteners are to be reused, apply 1-2 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue). **New** fasteners have a lock patch applied.*

5. Position oil pan with gasket on bottom of transmission and loosely install fasteners (6).
6. Verify the gasket is properly positioned and tighten oil pan fasteners (6) to 132-156 **in-lbs** (14.9-17.6 Nm) following sequence shown in Figure 3-141.
7. Clean engine and transmission drain plugs. Replace O-rings as required.
8. Install transmission drain plug and O-ring (5). Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
9. Install engine oil drain plug and O-ring (3). Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
10. Install exhaust crossover pipe hanger bracket and tighten fasteners to 84-132 **in-lbs** (9.5-14.9 Nm).
11. Install exhaust crossover pipe and left muffler. See 4.18 EXHAUST SYSTEM.
12. Install rear wheel. See 2.5 REAR WHEEL.
13. Add fluids.
    a. Add transmission fluid and check level. See 1.11 TRANSMISSION LUBRICANT.
    b. Install engine oil filter. Add engine oil and check level. See 1.6 ENGINE OIL AND FILTER.

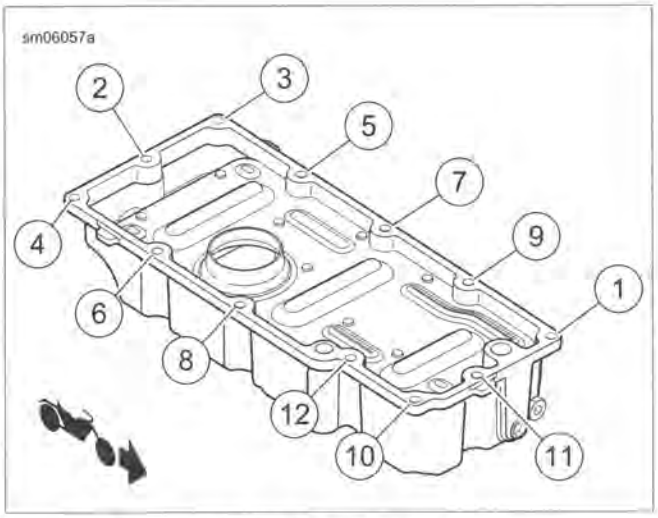


Figure 3-141. Oil Pan Torque Sequence

NOTES

SUBJECT	PAGE NO.
4.1 FASTENER TORQUE VALUES	4-1
4.2 SPECIFICATIONS: FUEL SYSTEM	4-2
4.3 FUEL PRESSURE TEST	4-3
4.4 INTAKE LEAK TEST	4-5
4.5 AIR CLEANER ASSEMBLY	4-7
4.6 FUEL TANK	4-9
4.7 FUEL TANK TOP PLATE	4-13
4.8 FUEL FILTER	4-15
4.9 FUEL PRESSURE REGULATOR	4-16
4.10 FUEL LEVEL SENDER	4-17
4.11 TWIST GRIP SENSOR (TGS)	4-18
4.12 THROTTLE CONTROL ACTUATOR (TCA)	4-21
4.13 INDUCTION MODULE	4-22
4.14 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP)	4-24
4.15 HEATED OXYGEN SENSORS (HO2)	4-25
4.16 FUEL INJECTORS	4-27
4.17 FUEL PUMP	4-29
4.18 EXHAUST SYSTEM	4-31
4.19 ACTIVE EXHAUST: HDI	4-34
4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM	4-36

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Breather bolts	22-24 ft-lbs	29.8-32.5 Nm	4.5 AIR CLEANER ASSEMBLY, Installation/metric
Charcoal canister screws	15-20 **in-lbs**	1.7-2.3 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
Console fastener, front	20-30 **in-lbs**	2.3-3.4 Nm	4.6 FUEL TANK, Console
Console fastener, rear	36-60 **in-lbs**	4.1-6.8 Nm	4.6 FUEL TANK, Console
Exhaust crossover clamp to transmission bracket fastener	14-18 ft-lbs	19.0-24.4 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust crossover pipe clamp	25-30 ft-lbs	33.9-40.7 Nm	4.18 EXHAUST SYSTEM, System Installation/Always use a new clamp
Exhaust crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, 1st torque	9-18 **in-lbs**	1-2 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, 1st torque	9-18 **in-lbs**	1-2 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust side bracket carriage bolt	20-25 ft-lbs	27.1-33.9 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust valve actuator screws	32-40 **in-lbs**	3.6-4.5 Nm	4.19 ACTIVE EXHAUST: HDI, Exhaust Valve Actuator
Fuel door lock	30-40 **in-lbs**	3.4-4.5 Nm	4.6 FUEL TANK, Fuel Door
Fuel door screws	25-30 **in-lbs**	2.8-3.4 Nm	4.6 FUEL TANK, Fuel Door
Fuel supply line quick-connect fitting	22-26 ft-lbs	29.8-35.3 Nm	4.6 FUEL TANK, Fuel Supply Check Valve/Tube/metric
Fuel supply tube clamp screw	66-82 **in-lbs**	7.5-9.3 Nm	4.16 FUEL INJECTORS, Installation/metric
Fuel tank front screws	15-20 ft-lbs	20.3-27.1 Nm	4.6 FUEL TANK, Installation
Fuel tank rear bracket screws	15-20 ft-lbs	20.3-27.1 Nm	4.6 FUEL TANK, Installation
HO2 sensor	14 ft-lbs	19 Nm	4.15 HEATED OXYGEN SENSORS (HO2), Installation/metric
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm	4.18 EXHAUST SYSTEM, Mufflers
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm	4.18 EXHAUST SYSTEM, Mufflers
TMAP screw	84-108 **in-lbs**	9.5-12.2 Nm	4.14 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP), Installation/metric

SPECIFICATIONS

Table 4-1. Fuel Capacity

FUEL TANK CAPACITY	GALLONS	LITERS
Total	6.0	22.7
Reserve (warning light on)	1.0	3.79

GENERAL

Improper fuel system pressure may contribute to one of the following conditions:

- Cranks, but will not run.
- Cuts out (may feel like ignition problem).
- Hesitation, loss of power or poor fuel economy.

See the electrical diagnostic manual for further information on the function and testing of the fuel system.

TESTING

PART NUMBER	TOOL NAME
HD-41182	FUEL PRESSURE GAUGE
HD-44061	FUEL PRESSURE GAUGE ADAPTER

NOTE

Avoid kinking the fuel supply line when installing/removing the fuel pressure gauge and adapters.

⚠WARNING

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

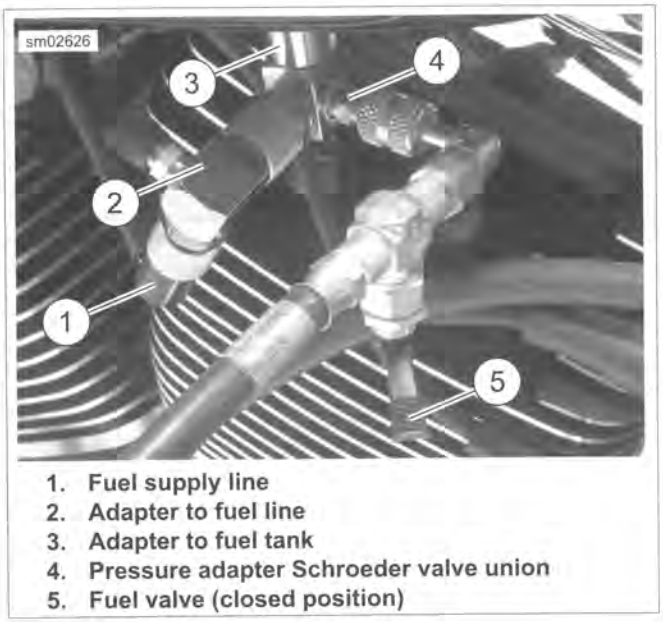
1. Purge and disconnect fuel supply line. See 4.6 FUEL TANK, Removal. Leave the fuel pump connector separated.

NOTE

Use two fuel pressure gauge adapters to prevent twisting of the fuel supply line. Tug on all connections to verify they are secure.

2. Install fuel pressure gauge adapters as follows:
   a. See Figure 4-1. Connect two FUEL PRESSURE GAUGE ADAPTER (Part No. HD-44061) together.
   b. Connect fuel line to adapter assembly.
   c. Connect adapter assembly to quick-connect fitting on fuel tank.

Figure 4-1. Fuel Pressure Gauge Adapters



1. **Fuel supply line**
2. **Adapter to fuel line**
3. **Adapter to fuel tank**
4. **Pressure adapter Schroeder valve union**
5. **Fuel valve (closed position)**

Figure 4-2. Fuel Line

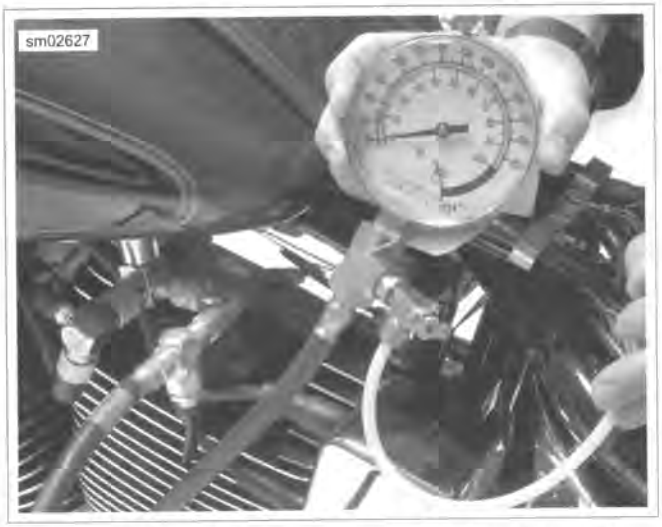


Figure 4-3. Fuel Pressure Gauge Installed (Typical)

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

3. Verify that the fuel valve and air bleed petcock on the FUEL PRESSURE GAUGE (Part No. HD-41182) are closed.
4. See Figure 4-2. Connect fuel pressure gauge to Schroeder valve closest to the fuel tank.
5. Mate fuel pump connector.
6. Start and idle engine to pressurize the fuel system. Open the fuel valve.

7. Position the clear air bleed tube in a suitable container and purge the gauge and hose of air. Close the petcock.
8. Vary the engine speed and note the reading of the pressure gauge. Fuel pressure should remain steady at 55-62 psi (380-425 kPa).

NOTE

If the fuel pressure is not within specification, see the electrical diagnostic manual for further diagnosis.

⚠WARNING

Gasoline can drain from the fuel line and adapter when removed. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00255a)

9. Turn off the engine. Purge the fuel pressure gauge of gasoline and remove fuel pressure gauge from Schroeder valve. Install protective cap.
10. Remove adaptor fitting assembly from fuel supply line and quick-connect fitting on fuel tank.

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

11. Connect fuel supply line fitting to fuel tank quick-connect. Tug on fuel supply line fitting to verify that it is secure.

GENERAL

⚠WARNING

Do not allow open flame or sparks near propane. Propane is extremely flammable, which could cause death or serious injury. (00521b)

⚠WARNING

Read and follow warnings and directions on propane bottle. Failure to follow warnings and directions can result in death or serious injury. (00471b)

NOTES

- *To prevent false readings, keep air cleaner cover installed when performing test.*
- *Do not direct propane into air cleaner. It will cause false readings.*
- *Be careful when testing vehicle with Screamin' Eagle air cleaner assembly. This type of air cleaner has an open backplate. Even with air cleaner cover on, directing nozzle too close to backplate can give false readings.*

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

Parts List

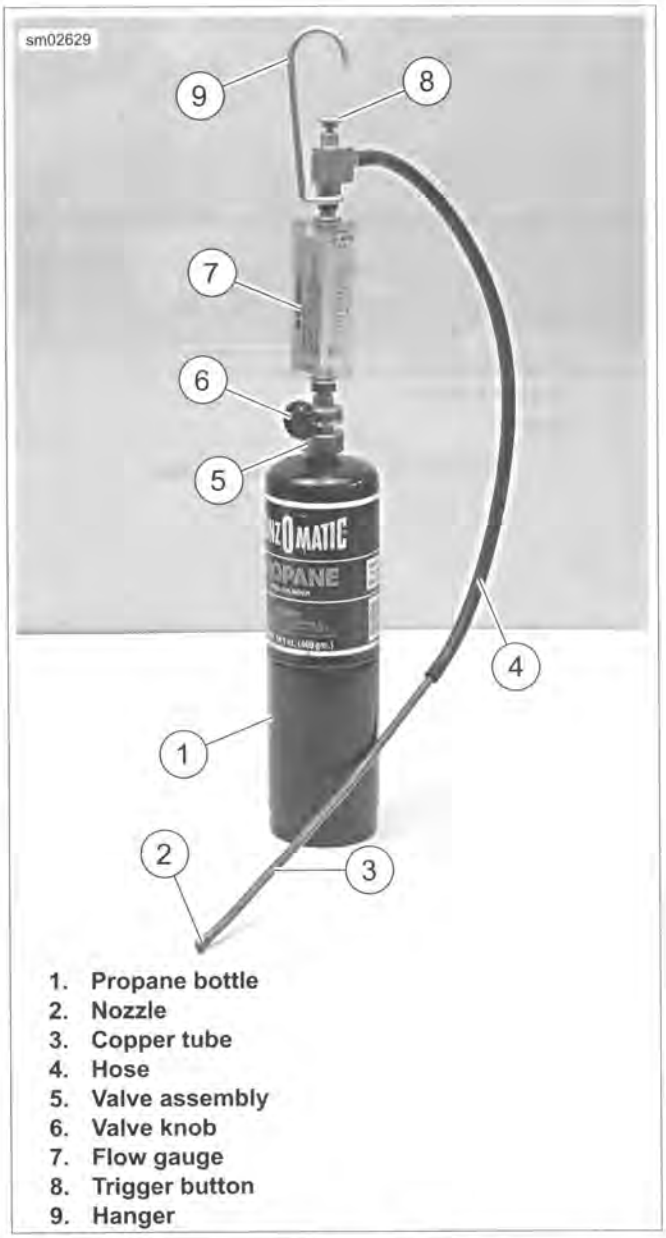
- Standard 14 oz propane cylinder.
- PROPANE ENRICHMENT KIT (Part No. HD-41417).

Tester Assembly

1. See Figure 4-4. Make sure valve knob (6) is closed (fully clockwise).
2. Screw valve assembly (5) onto propane bottle (1).

Tester Adjustment

1. See Figure 4-4. Press and hold trigger button (8).
2. Slowly open valve knob (6) until pellet in flow gauge (7) rises 5-10 SCFH on gauge.
3. Release trigger button.



1. **Propane bottle**
2. **Nozzle**
3. **Copper tube**
4. **Hose**
5. **Valve assembly**
6. **Valve knob**
7. **Flow gauge**
8. **Trigger button**
9. **Hanger**

Figure 4-4. Leak Tester

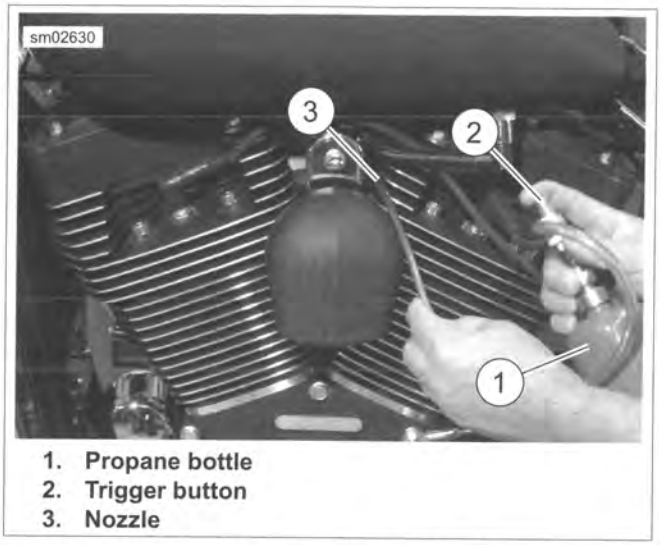
PROCEDURE

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

NOTE

Do not direct propane stream toward air cleaner. Propane in the air cleaner creates false indicators.

2. See Figure 4-5. Aim nozzle (3) toward possible sources of leak such as intake manifold mating surfaces.
3. Press and release trigger button (2) to dispense propane. The tone of the engine changes when propane enters source of leak. Repeat as necessary to detect leak.
4. When test is finished, close valve knob (turn knob fully clockwise).



1. Propane bottle
2. Trigger button
3. Nozzle

Figure 4-5. Checking for Leaks

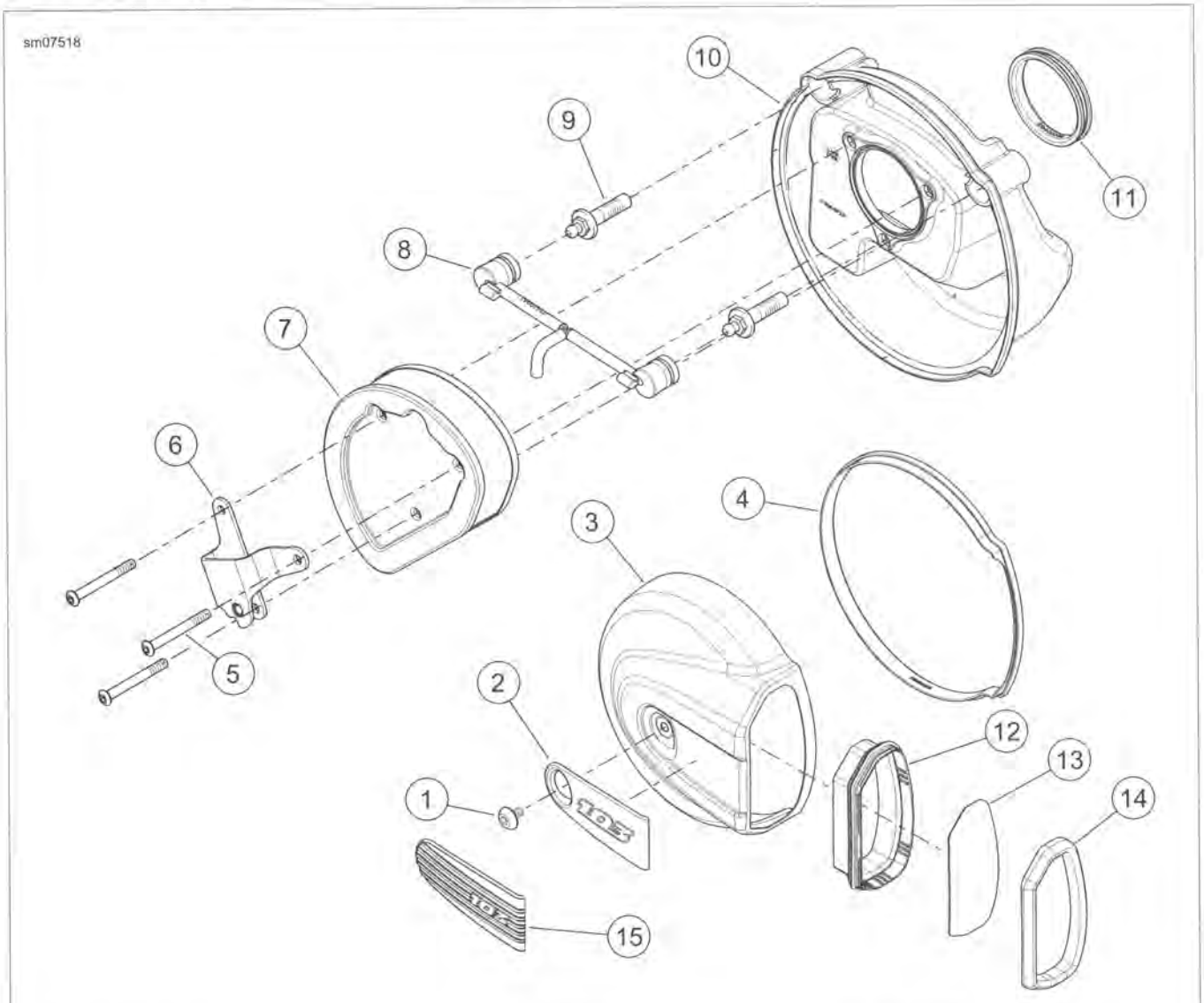
REMOVAL

1. See Figure 4-6. Remove air cleaner cover and filter. See 1.7 AIR CLEANER AND EXHAUST SYSTEM.
2. Remove breather tube (8) from fittings on breather bolts.
3. Remove two breather bolts (9).
4. Remove backplate (10).
5. Remove seal ring (11) from backplate. Discard seal ring.

⚠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)

6. Inspect filter element. See 1.7 AIR CLEANER AND EXHAUST SYSTEM. Replace the filter element if damaged or if filter media cannot be adequately cleaned.



1. Cover screw
2. Insert with screw access
3. Air cleaner cover
4. Rubber seal
5. Screw (3)
6. Cover bracket
7. Filter element
8. Breather tube
9. Breather bolt (2)
10. Backplate
11. Seal ring
12. Snorkel
13. Screen
14. Bezel
15. Insert without screw access

Figure 4-6. Air Cleaner Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Breather bolts	22-24 ft-lbs	29.8-32.5 Nm

1. See Figure 4-6. Install seal ring (11) on backplate (10).
2. Install backplate with breather bolts (9). Tighten to 22-24 ft-lbs (29.8-32.5 Nm).
3. Install breather tubes (8) onto breather bolts.

NOTE

Air cleaner mounting without installation of the breather tubes allows crankcase vapors to be vented into the atmosphere in violation of legal emissions standards.

4. Install air filter and cover. See 1.7 AIR CLEANER AND EXHAUST SYSTEM.

AIR CLEANER REPAIR

Insert: With Screw Access

1. See Figure 4-6. Remove air cleaner cover (3).
2. Apply heat from a heat gun to inside of cover in area of cover insert (2).
3. Remove old cover trim.
4. Thoroughly remove all remaining adhesive from cover.
5. Install **new** cover trim plate using supplied adhesive.

Insert: Without Screw Access

1. See Figure 4-6.Pull on front edge of insert (15) to remove.
2. Remove old trim retainer material.
3. Thoroughly remove all remaining adhesive from cover.
4. Carefully align **new** decorative plate with retainer material attached. Press and hold in position on cover (3) for 10 seconds.

NOTE

Do not remove decorative plate for 24 hours.

Snorkel

1. See Figure 4-6. Pry bezel (14) off. A pry point is provided on the bottom of the bezel rim.
2. Remove snorkel (12) from cover.
3. Replace screen (13) if necessary.
4. Assemble components back onto cover making sure that snorkel and bezel are securely mated.

CONSOLE

FASTENER	TORQUE VALUE	
Console fastener, front	20-30 **in-lbs**	2.3-3.4 Nm
Console fastener, rear	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. See Figure 4-7. Separate fuel pump connector (4). Separate rider headset harness connector (5) if equipped.
2. Remove screws to release front and rear of console from fuel tank.
3. **Road King Models:** Remove console.
4. **All but Road King Models:** Remove filler cap. Remove console.

Installation

1. **Road King Models:** Position console on fuel tank.
2. **All but Road King Models:** Remove filler cap and position console on fuel tank. Install filler cap.
3. Verify that harnesses and vent tube are not pinched.
4. Install screws to fasten front and rear of console to fuel tank.
   a. Tighten front fastener to 20-30 **in-lbs** (2.3-3.4 Nm).
   b. Tighten rear fastener to 36-60 **in-lbs** (4.1-6.8 Nm).
5. Mate connectors (4, 5).

FUEL DOOR

FASTENER	TORQUE VALUE	
Fuel door screws	25-30 **in-lbs**	2.8-3.4 Nm
Fuel door lock	30-40 **in-lbs**	3.4-4.5 Nm

Door Replacement

1. Remove screws securing hinge.
2. Separate door from hinge. Remove door.
3. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the treads of the screws.
4. Secure door to hinge with screws. Tighten to 25-30 **in-lbs** (2.8-3.4 Nm).

Lock Replacement

1. Remove nut securing lock assembly.
2. Remove lock assembly.
3. Secure lock assembly with nut. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).

REMOVAL

NOTE

The fuel tank can be removed without draining. However, draining is necessary whenever the fuel tank or internal components are serviced.

Purge and Disconnect Fuel Line

⚠WARNING

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

NOTE

The gasoline in the fuel supply line is under high pressure: 58 psi (400 kPA). To avoid an uncontrolled discharge or spray of gasoline, always purge the line before disconnecting.

1. Remove seat. See 2.30 SEAT.
2. See Figure 4-7. Disconnect fuel pump connector (gray) (4).
3. Start the engine and allow the motorcycle to run until engine stalls. Operate starter an extra 3 seconds to remove remaining fuel from fuel supply line.
4. Remove main fuse.
5. Mate fuel pump connector (gray).
6. See Figure 4-8. Pull up on chrome sleeve of quick-connect fitting and pull down on fuel supply line fitting to disconnect.

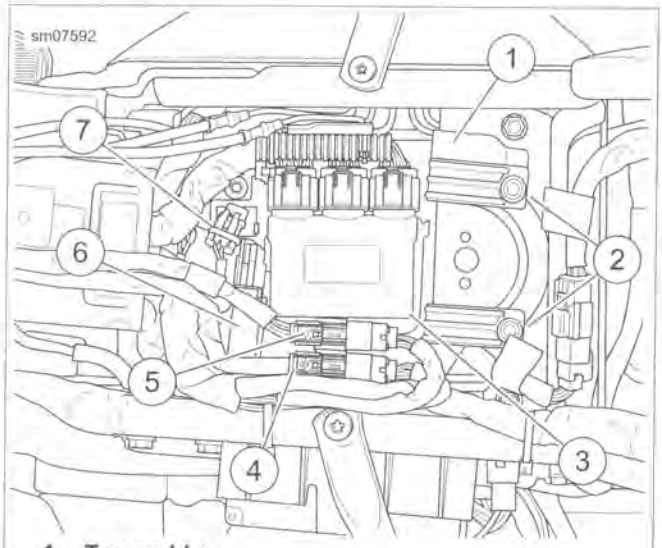
Remove Tank

1. Remove console. See 4.6 FUEL TANK, Console.
2. Carefully remove fuel vapor vent tube from vapor valve fitting on top plate.
3. Remove fuel level sender/fuel pump connector [141] from top plate.
4. **Road King Models:** Draw fuel gauge connector out of tunnel under fuel tank. Separate connector.

⚠WARNING

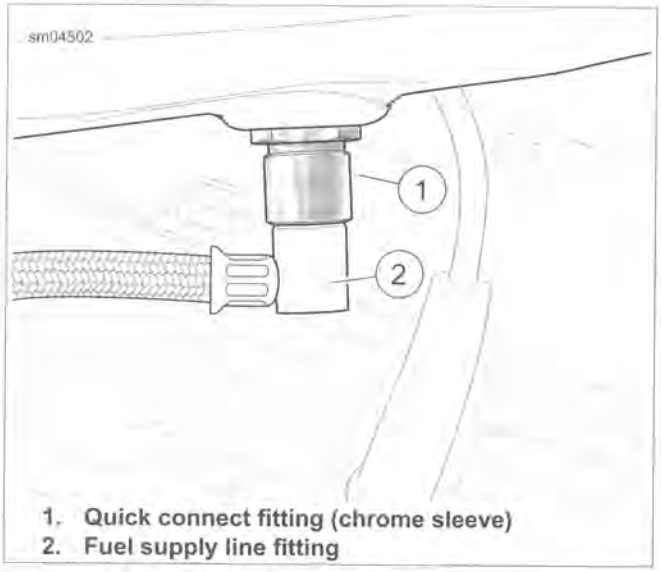
Gasoline can drain from the fuel line when disconnected from fuel tank. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00260a)

5. Remove rubber caps from front fuel tank screws. Remove screws.
6. Remove two screws to release rear tank bracket from frame backbone.
7. Remove fuel tank.



1. Top caddy
2. Screw (2)
3. ECM
4. Connector, grey
5. Connector, black
6. HFSM antenna
7. Purge valve solenoid

Figure 4-7. Top Caddy



1. Quick connect fitting (chrome sleeve)
2. Fuel supply line fitting

Figure 4-8. Fuel Tank (Left Side View)

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel tank rear bracket screws	15-20 ft-lbs	20.3-27.1 Nm
Fuel tank front screws	15-20 ft-lbs	20.3-27.1 Nm

1. Place fuel tank onto frame backbone and start front fuel tank fasteners.
2. Secure rear fuel tank bracket to frame backbone with two screws. Tighten to 15-20 ft-lbs (20.3-27.1 Nm). If removed, install plastic trim cover over bracket.
3. Tighten front fuel tank screws to 15-20 ft-lbs (20.3-27.1 Nm). Install rubber caps over screws. Left and right caps are not interchangeable.

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

4. Connect quick-connect fitting to fuel tank. While pushing up on bottom of fitting, pull down on chrome sleeve. After completing installation, tug on fuel line fitting to verify that it is locked in position.
5. **Road King Models:** Mate fuel gauge connector. Feed connector into tunnel at front of fuel tank.
6. See Figure 4-9. Connect fuel vapor vent tube to vapor valve fitting (1) on top plate.
7. If equipped, connect overflow hose (2) to top plate and route along inner downtube as shown. Secure to brake line with cable strap (3). Do not over-tighten cable strap.
8. Install fuel level sender/fuel pump connector [141], 4-place Delphi. For best clearance with cam ring, tilt connector at 35 degree angle before installation.
9. Install console. See 4.6 FUEL TANK, Console.
10. Install seat. See 2.30 SEAT.
11. Install main fuse, left side cover and saddlebag.

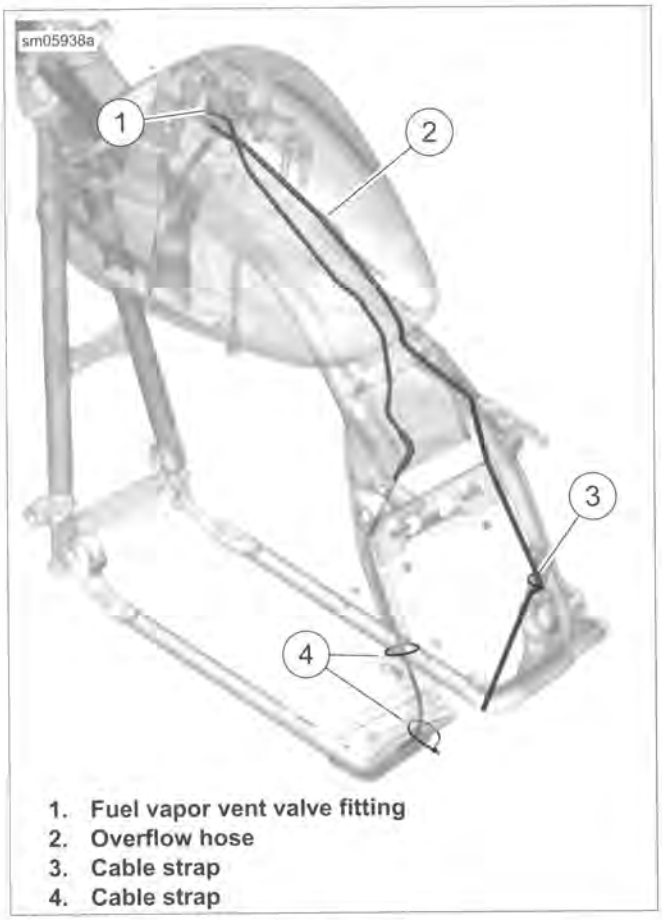
NOTE

The low fuel lamp will not turn off until there is sufficient fuel in the tank, the ignition switch has been turned off and back on, and the vehicle has begun forward movement.

VENT TUBE: MODELS WITHOUT EVAP SYSTEM

Removal

1. Remove seat. See 2.30 SEAT.
2. Remove console. See 4.6 FUEL TANK, Console.
3. See Figure 4-9. Remove vapor tube from fitting (1) on fuel tank top plate.
4. Remove two cable straps (4) securing tube to rear frame downtube.
5. Remove tube.
6. Inspect for deterioration, chaffing or other damage. Replace as necessary.



1. **Fuel vapor vent valve fitting**
2. **Overflow hose**
3. **Cable strap**
4. **Cable strap**

Figure 4-9. Vent Tube

Installation

1. See Figure 4-9. Route tube down along inner side of rear left downtube. Install two cable straps (4) to secure to frame.
2. Route line along center of fuel tank and connect to fitting (1) on fuel tank top plate.
3. Install console. See 4.6 FUEL TANK, Console.
4. Install seat. See 2.30 SEAT.

FUEL SUPPLY CHECK VALVE/TUBE

FASTENER	TORQUE VALUE	
Fuel supply line quick-connect fitting	22-26 ft-lbs	29.8-35.3 Nm

Removal

NOTE

The in-tank check valve is housed in the quick-connect fitting. The check valve prevents the fuel tank from draining when the external supply line is disconnected.

1. Remove top plate. See 4.7 FUEL TANK TOP PLATE.

⚠WARNING

Gasoline can drain from the fuel line when disconnected from fuel tank. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00260a)

2. Pull up on chrome sleeve and pull down on fuel supply line fitting to disconnect fuel line from tank.
3. See Figure 4-10. Loosen quick-connect fitting.
4. Remove the fitting and fuel supply tube from fuel tank.

Installation

NOTE

Carefully inspect fuel supply tube for damage. Replace as necessary.

1. See Figure 4-11. Apply a light film of clean engine oil to **new** O-ring. Slide O-ring into groove of quick-connect fitting.
2. Feeding fuel supply tube through hole at bottom of fuel tank, turn quick-connect fitting into bore.
3. Tighten fitting to 22-26 ft-lbs (29.8-35.3 Nm).
4. Install top plate. See 4.7 FUEL TANK TOP PLATE.

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

5. Connect quick-connect fitting to fuel tank. While pushing up on bottom of fitting, pull down on chrome sleeve. Tug on fuel line fitting to verify that it is locked in position.

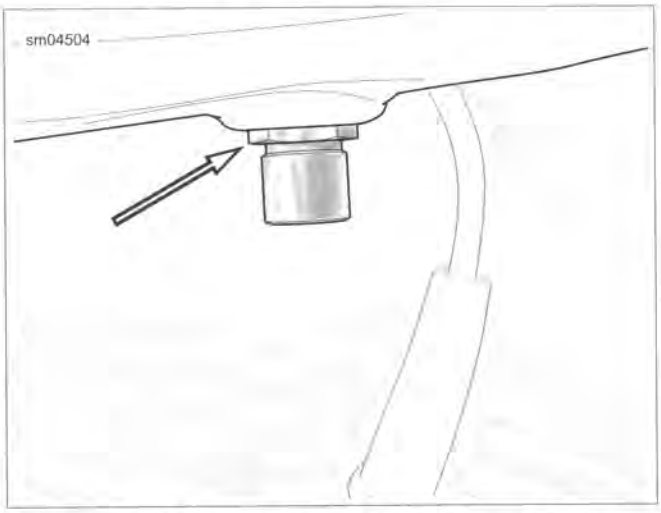
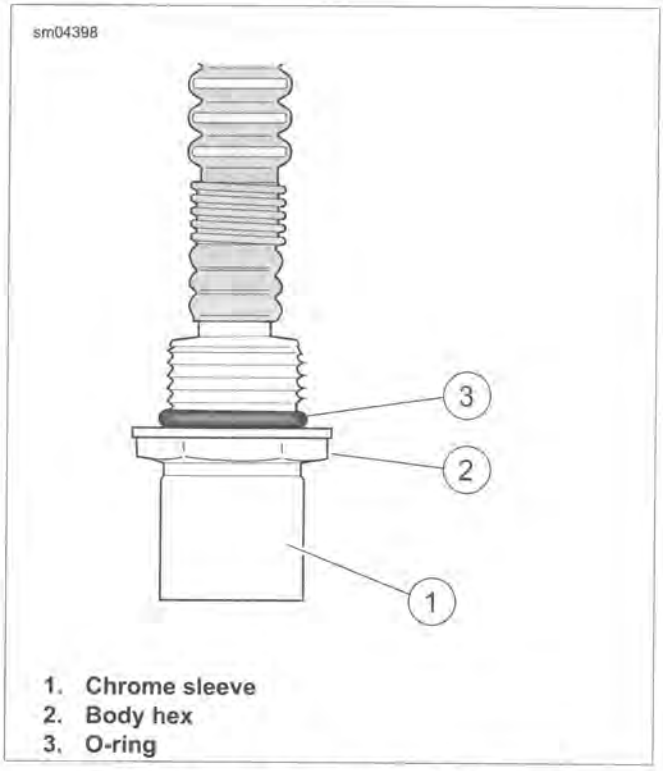


Figure 4-10. Engage Hex on Quick-Connect Fitting



1. Chrome sleeve
2. Body hex
3. O-ring

Figure 4-11. Fuel Supply Check Valve/Tube

REMOVAL

PART NUMBER	TOOL NAME
HD-48646	CAM RING REMOVER/INSTALLER

⚠WARNING

When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

NOTE

The gasoline in the fuel supply line is under high pressure (58 psi (400 kPa). To avoid an uncontrolled discharge or spray of gasoline, always purge the line before disconnecting.

1. Relieve pressure from fuel system. See 4.6 FUEL TANK, Removal.
2. Drain fuel from tank. Use a common pump or siphon and an approved gasoline storage container of sufficient capacity.
3. Remove console. See 4.6 FUEL TANK, Console.
4. See Figure 4-12. Remove cam ring using CAM RING REMOVER/INSTALLER (Part No. HD-48646) and raise top plate.

NOTE

See Figure 4-13. Always hold on to both the Cam Ring Remover/Installer and ratchet to prevent unexpected separation resulting in possible damage to the fuel tank.

5. Remove connector at bottom of top plate using a small screwdriver.
6. See Figure 4-14. Disconnect ground wire spade terminal from slot of top plate.
7. See Figure 4-15. Press tabs on fuel line retainers (3) to remove lines from fittings on fuel filter shell.
8. If top plate replacement is necessary, remove fuel filter shell. See 4.8 FUEL FILTER.

Figure 4-12. Cam Ring Remover/Installer (HD-48646)

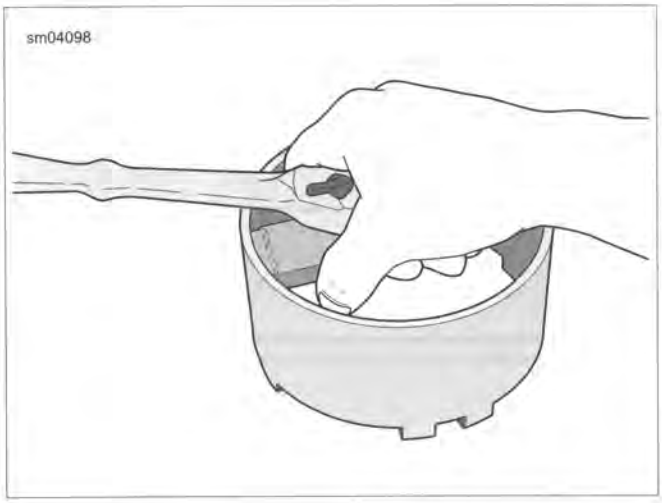


Figure 4-13. Hold Both Tool and Ratchet During Handling

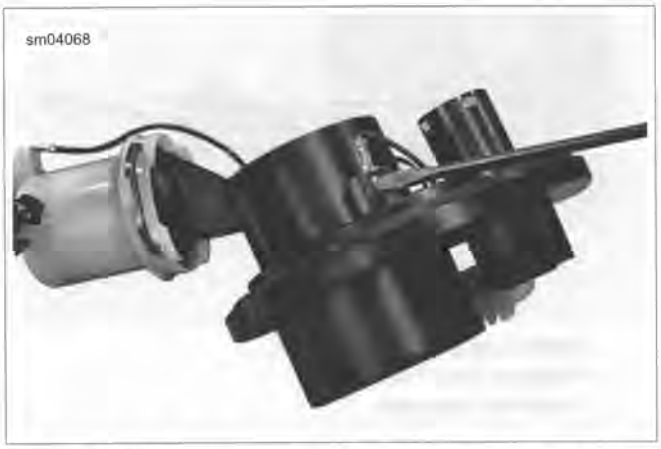
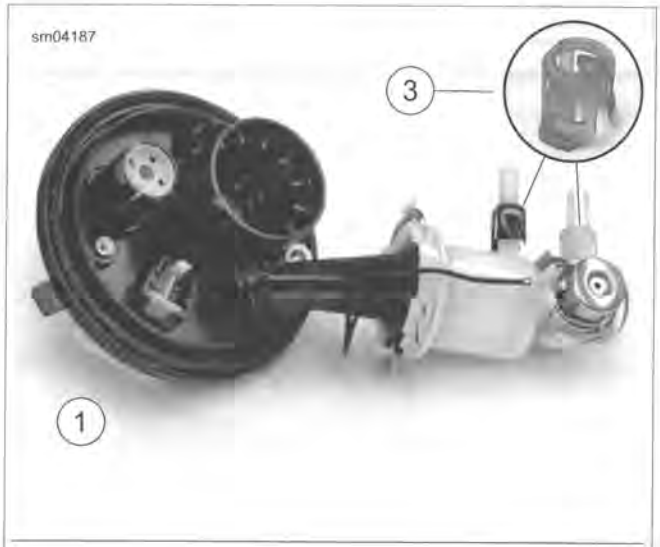
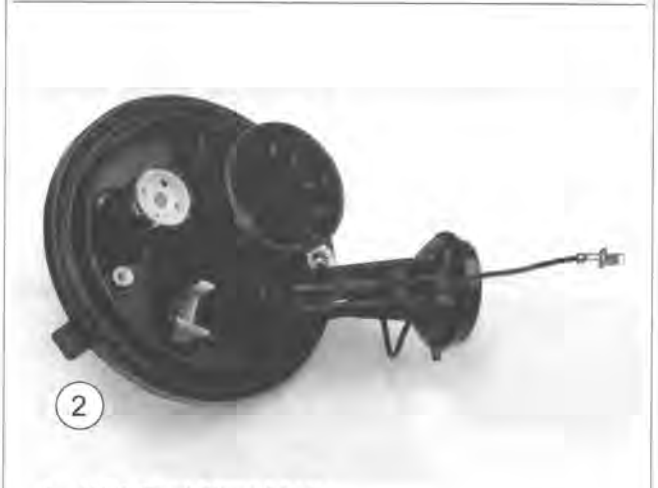


Figure 4-14. Remove Ground Wire Spade Terminal From Top Plate





1. **With Fuel Filter Shell**
2. **Without Fuel Filter Shell**
3. **Fuel line retainers**

Figure 4-15. Top Plate Assembly

INSTALLATION

PART NUMBER	TOOL NAME
HD-48646	CAM RING REMOVER/INSTALLER

1. If installing a **new** top plate, first install fuel filter shell. See 4.8 FUEL FILTER.
2. Inspect seal ring at bottom of top plate for damage. If necessary, install **new** seal ring with the nubs contacting the ring groove walls.
3. See Figure 4-15. Verify retainers (3) are secure on fuel filter fittings, and that they are not damaged. Note that retainers are of different sizes to prevent improper assembly.
4. Aligning latches and push tubes onto fittings of fuel filter shell until an audible click is heard. Pull on tubes to verify they are attached securely.
5. Install connector at bottom of top plate.
6. Route ground wire (from top plate connector) along inboard side of vapor valve and install spade terminal into slot in top plate.
7. Install fuel tank top plate engaging index tab in slot at front of fuel tank collar.
8. See Figure 4-16. Install cam ring over fuel tank top plate with the TOP stamp up.
9. Engage CAM RING REMOVER/INSTALLER (Part No. HD-48646) in top plate. Push down on tool and rotate clockwise until each of four index tabs begin to engage slots in fuel tank collar.
10. Install ratchet and rotate until cam ring is fully installed.

NOTE

See Figure 4-13. Always hold on to both the Cam Ring Remover/Installer and ratchet to prevent unexpected separation resulting in possible damage to the fuel tank.

11. Install console. See 4.6 FUEL TANK, Console.
12. Install seat. See 2.30 SEAT.

⚠WARNING

Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)

13. Fill fuel tank. Carefully inspect for leaks. Start engine and repeat inspection.

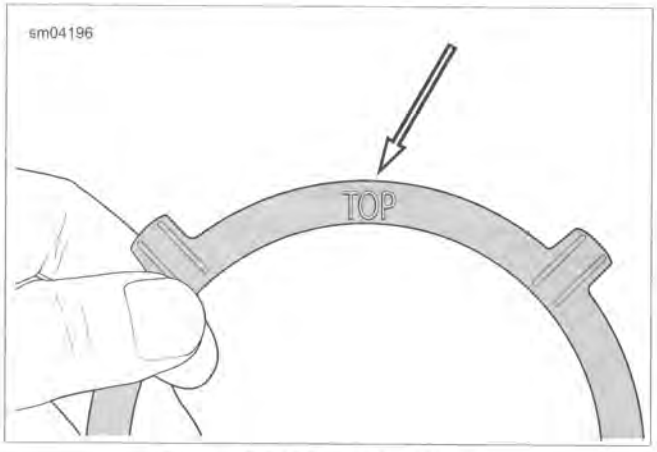


Figure 4-16. Cam Ring Stamp

REMOVAL

⚠WARNING

When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

⚠WARNING

Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

1. Remove top plate. See 4.7 FUEL TANK TOP PLATE.
2. Locate ground wire spade terminal in slot of fuel filter shell. Insert tip of small flat blade screwdriver through window to press tang, and then pull terminal from slot. See Figure 4-17.
3. See Figure 4-18. Gently raise locking arm and pull U-clip (2) from holes in fuel filter shell.
4. Remove fuel filter shell (1) from end cap.
5. Remove O-ring (3) and filter (4) from fuel filter shell.

Figure 4-17. Remove Ground Wire Spade Terminal From Fuel Filter Shell

1. **Filter shell**
2. **U-clip**
3. **O-ring**
4. **Filter**

Figure 4-18. Fuel Filter Assembly

INSTALLATION

1. Install **new** filter in fuel filter shell.
2. Seat O-ring on counterbore at top of filter.
3. Install fuel filter shell over end cap, so that slot in fuel filter shell engages index pin on end cap.
4. Holding parts together, slide U-clip through holes on locking arm side of fuel filter shell. Push U-clip until ends exit holes on opposite side. Retract U-clip until contact is made with step in locking arm.
5. Route ground wire (from top plate TORX screw) around index pin side of end cap and install spade terminal into slot in fuel filter shell. Gently tug on wire to verify that terminal is locked.

NOTE

If terminal does not lock, use a thin blade to bend tang slightly away from terminal body.

6. Install top plate. See 4.7 FUEL TANK TOP PLATE.

REMOVAL

⚠WARNING

When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

1. Remove top plate. See 4.7 FUEL TANK TOP PLATE.
2. See Figure 4-19. Remove ground wire spade terminal from slot of fuel filter shell.
3. Remove spring clip from fuel pressure regulator. For best results, free one side first and then the other.
4. See Figure 4-20. Remove fuel pressure regulator, regulator seat, large O-ring, screen and small O-ring.

Figure 4-19. Remove Ground Wire Spade Terminal From Fuel Filter Shell

1. **Spring clip**
2. **Fuel pressure regulator**
3. **Regulator seat**
4. **Large O-ring**
5. **Screen**
6. **Small O-ring**

Figure 4-20. Fuel Pressure Regulator Assembly

INSTALLATION

1. See Figure 4-20. Insert small O-ring at top of pressure port bore.
2. Install screen at top of pressure regulator bore, so that sleeve on ID faces small O-ring. Install regulator seat to evenly press screen into bore. Remove regulator seat.
3. Install large O-ring at top of screen.
4. Install regulator seat and fuel pressure regulator.
5. Install spring clip, so that indented sides engage top of center rib on fuel pressure regulator, while rounded side engages bottom of tabs on housing.
6. Route ground wire around index pin side of end cap and install spade terminal into slot in fuel filter shell.
7. Install top plate. See 4.7 FUEL TANK TOP PLATE.

REMOVAL

⚠WARNING

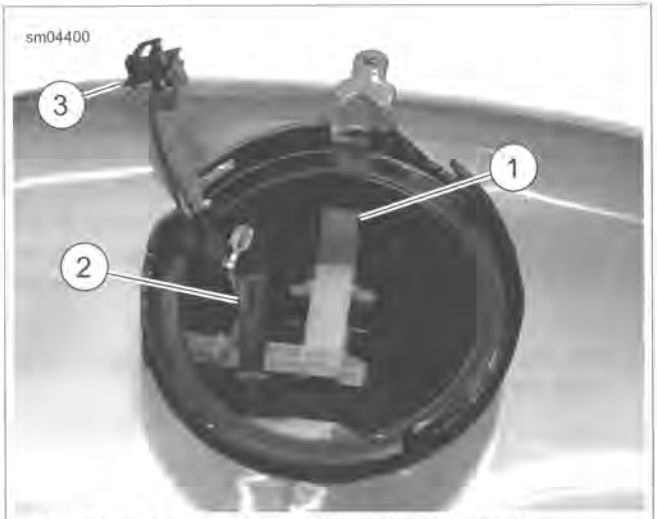
When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

1. Remove top plate. See 4.7 FUEL TANK TOP PLATE.
2. Disconnect 2-place connector to release fuel level sender from wire harness.

NOTE

See Figure 4-21. Look into fuel tank at bracketry. Note that finger (1) on front bracket points forward, while finger on rear bracket points rearward.

3. Pull up on front finger (1) and slide fuel level sender bracket rearward until four ears on bracket are free of catches at top of tunnel.
4. Remove fuel level sender from left side of fuel tank. See Figure 4-22.



1. **Fuel level sender bracket (front finger)**
2. **Fuel level sender connector**
3. **Top plate connector**

Figure 4-21. Front Finger (Fuel Level Sender Bracket)

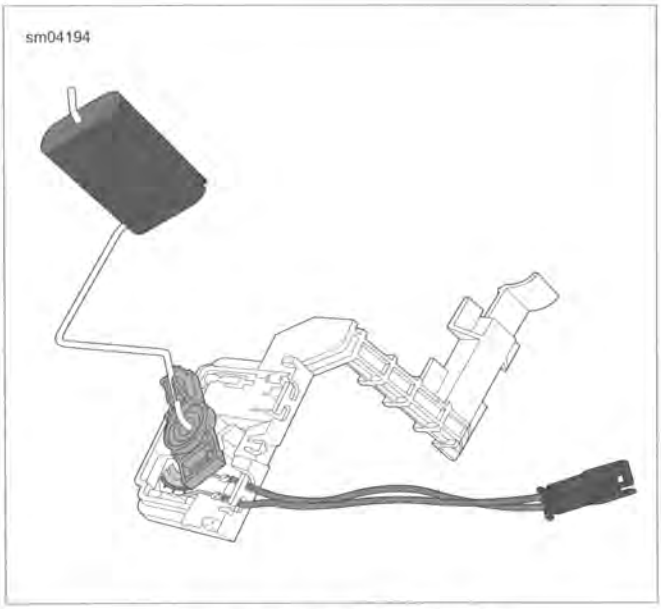


Figure 4-22. Fuel Level Sender

INSTALLATION

1. With the finger on the fuel level sender bracket pointing forward, install fuel level sender into left side of fuel tank.
2. Engage four ears on fuel level sender bracket with front set of catches at top of tunnel. Push fuel level sender bracket forward until ears are fully engaged.
3. Connect 2-place connector to attach fuel level sender to wire harness.
4. Install top plate. See 4.7 FUEL TANK TOP PLATE.

NOTE

The low fuel lamp will not turn off until there is sufficient fuel in the tank, the ignition switch has been turned off and back on, and the vehicle has begun forward movement.

REMOVAL

1. Remove main fuse.
2. Release the right switch housing and front brake control from the handlebar. See 7.37 HANDLEBAR SWITCH PACKS.
3. **Models with heated hand grips:** Pry end cap from handgrip and pull connector out through end of hand grip. See 2.28 HANDLEBARS, Heated Hand Grips. It is not necessary to disconnect the heated hand grip power or interconnect connectors.

NOTE

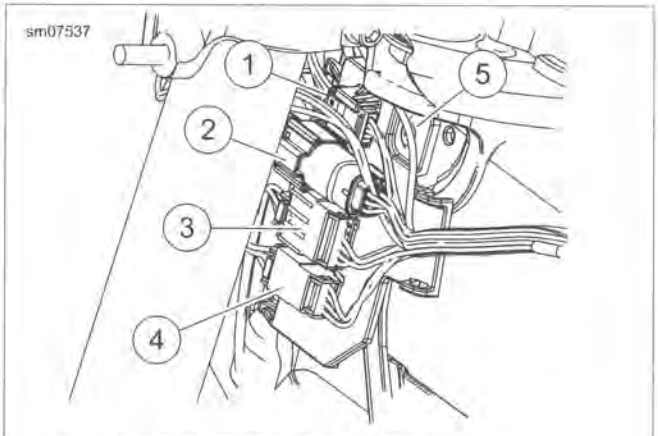
To remove the hand grip, a slight tug may be necessary.

4. Remove the hand grip from the end of the handlebar.
5. If present, remove two harness retainers from holes in handlebar.

NOTE

The TGS jumper harness connector [204] is a 6-place Molex (black).

6. **Road King models:** See Figure 4-23. Remove headlamp and handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS. Disconnect TGS connector (2). Cut cable strap securing harness to right riser.
7. **Fairing models:**
   a. Remove outer fairing.
   b. See Figure 4-24. Disconnect TGS connector.
   c. Rotate inner fairing. See 2.39 INNER FAIRING, Rotate Inner Fairing.
   d. See Figure 4-30. Cut cable straps securing harness to handlebar.



1. **Left handlebar switch module**
2. **TGS**
3. **Right auxiliary/fog/turn signal lamps**
4. **Left auxiliary/fog/turn signal lamps**
5. **Caddy retainer**

Figure 4-23. Left Side Connectors: Road King

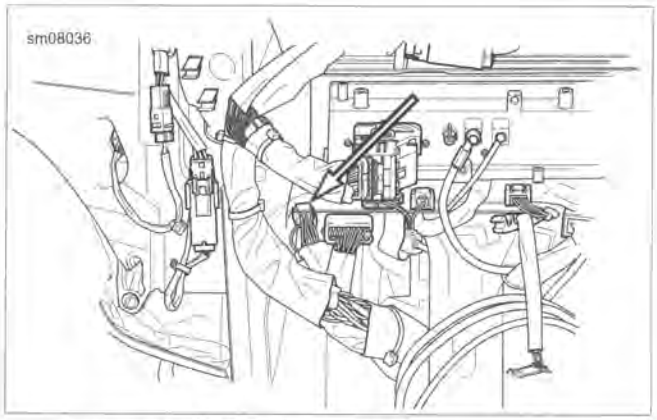


Figure 4-24. TGS Connector: Fairing Models

NOTE

The internal TGS connector can break if the TGS is pulled too hard. The connector is not serviceable. Damage requires replacement of the TGS jumper harness or TGS assembly.

8. Carefully pull TGS out of handlebar while feeding jumper harness into center of handlebar. Pull out only far enough to access the connectors.

NOTE

The latch on the pin housing is very fragile. Use care when releasing it. The connector is not serviceable and can only be obtained as part of the twist grip sensor jumper harness.

9. See Figure 4-25. Gently insert a small flat blade screwdriver between pin and socket housings and separate housings. Do not pivot or rotate screwdriver after insertion or damage to pin housing may occur.
10. See Figure 4-26. **Models with heated hand grips:** Separate the interconnect harness connector (2).
11. Remove TGS.

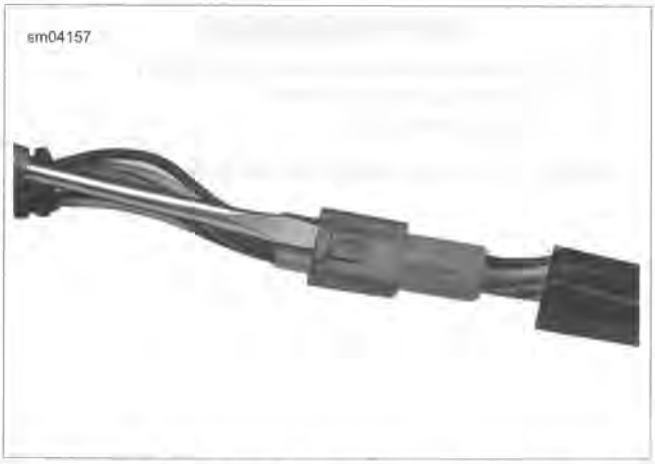
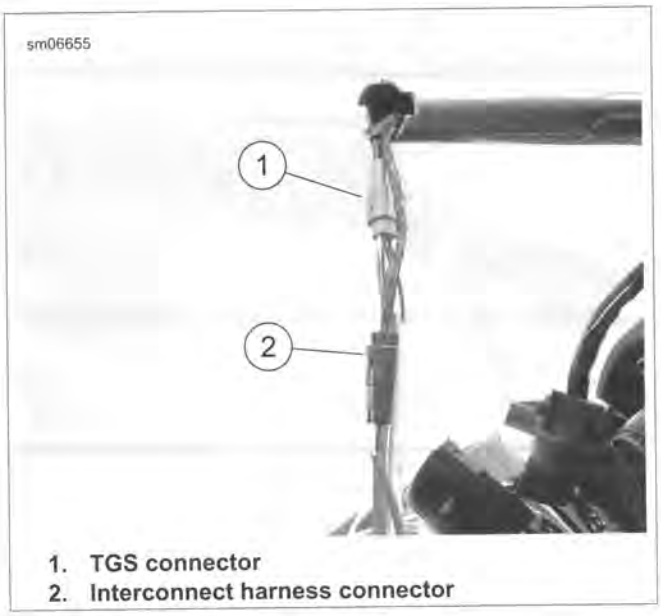


Figure 4-25. Gently Insert Screwdriver to Disconnect Twist Grip Sensor Connector



1. **TGS connector**
2. **Interconnect harness connector**

Figure 4-26. Heated Handgrip Connectors

INSTALLATION

NOTE

See Figure 4-27. The seal cap protects the TGS terminals from dirt and moisture and also serves as a retention device for installation of the throttle grip.

1. Verify that seal cap is installed at end of twist grip sensor. If seal cap is not present, it may remain inside throttle grip.
   a. Check condition of O-ring on seal cap. O-ring is only available as part of the seal cap assembly.
   b. See Figure 4-27. Install seal cap engaging legs in slots at end of twist grip sensor.
2. Mate TGS connector to TGS jumper harness.
3. **Models with heated hand grips:** See Figure 4-26. Mate the interconnect harness connector (2).
4. See Figure 4-28. Gently draw jumper harness into handlebar while guiding TGS into end of handlebar. Align index tabs on twist grip sensor into slots in handlebar. Verify that the TGS is completely engaged into the slots in the handlebar.
5. Position hand grip so any cosmetic features are properly positioned. Install the hand grip and rotate to verify that internal splines are engaged with the twist grip sensor.
6. **Models with heated hand grips:** Install hand grip and connect heated hand grip connector. See 2.28 HANDLEBARS, Heated Hand Grips. Install end cap.

NOTE

Always follow the procedure in 7.37 HANDLEBAR SWITCH PACKS when installing right switch housing to be sure the twist grip operates correctly.

7. Install switch housing and brake lever/master cylinder assembly. See 7.37 HANDLEBAR SWITCH PACKS.

Figure 4-27. Install Seal Cap (models without heated grips)

Figure 4-28. Install Twist Grip Sensor

8. Connect TGS jumper harness connector.
9. **Road King models:** Install handlebar clamp shroud and headlamp. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS. Secure TGS harness and brake line to right handlebar riser with a **new** cable strap.
10. **Fairing models:**
    a. Rotate inner fairing. See 2.39 INNER FAIRING, Rotate Inner Fairing.
    b. See Figure 4-26. Connect TGS connector.
    c. Install outer fairing.
    d. See Figure 4-30. Loop TGS jumper harness across handlebar. Secure with **new** cable straps (1).
11. If present, install two cable clips on handlebar switch conduit into holes in handlebar.
12. Install main fuse.

NOTE

*Whenever a **new** TGS (or ECM) is installed, idle speed must be reset. The ECM uses the first four ignition cycles to establish*

the optimum idle speed. If the procedure is not performed, initial performance problems may result.

- *Place the engine run/stop switch in the RUN position.*
- *Turn the ignition/light keyswitch to IGNITION and then back to OFF four times without starting engine. Allow at least three seconds to elapse between ignition cycles.*

TWIST GRIP SENSOR JUMPER HARNESS

Removal

1. Remove twist grip sensor. See 4.11 TWIST GRIP SENSOR (TGS), Removal.
2. See Figure 4-29. Securely attach chaser wire to jumper harness.
3. Gently pull jumper harness out through slot at center of handlebar. Remove chaser wire from jumper harness.

Installation

1. Securely attach chaser wire to jumper harness. If equipped, secure heated handgrip connector to harness with electrical tape.
2. Carefully draw connector and jumper harness through handlebar while feeding harness into handlebar.
3. Remove chaser wire from jumper harness.
4. Install twist grip sensor. See 4.11 TWIST GRIP SENSOR (TGS), Installation.
5. See Figure 4-30. Secure TGS jumper harness to handlebar with **new** cable straps.

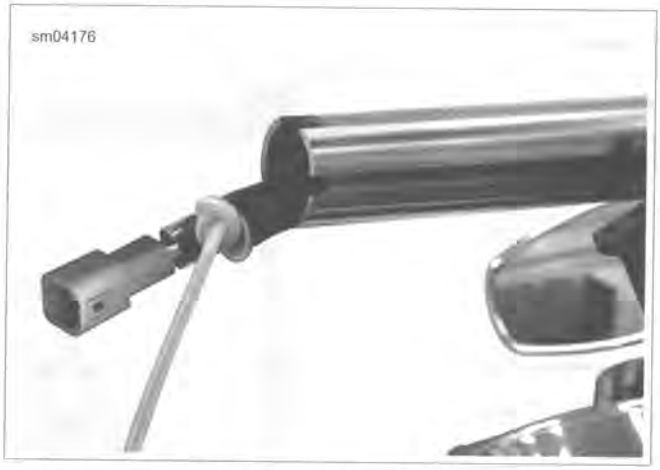
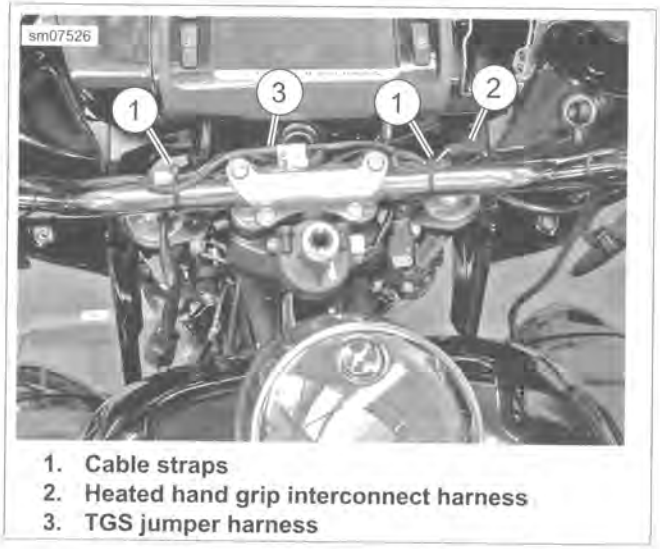


Figure 4-29. Attach Chaser Wire to Twist Grip Sensor Jumper Harness



1. **Cable straps**
2. **Heated hand grip interconnect harness**
3. **TGS jumper harness**

Figure 4-30. Secure Harness to Handlebar

GENERAL

NOTE

See Figure 4-31. The TCA is not sold separately. Failure requires replacement of the complete induction module. Tampering with or removing the TCA cover voids warranty.

See the electrical diagnostic manual for information on the function and testing of the TCA.

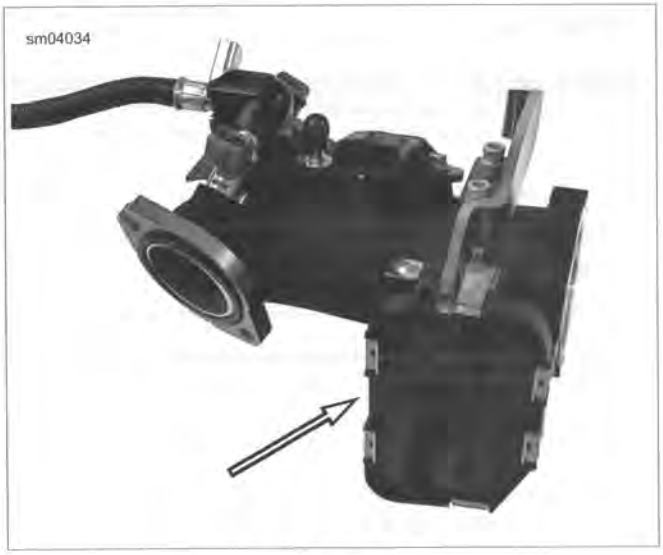
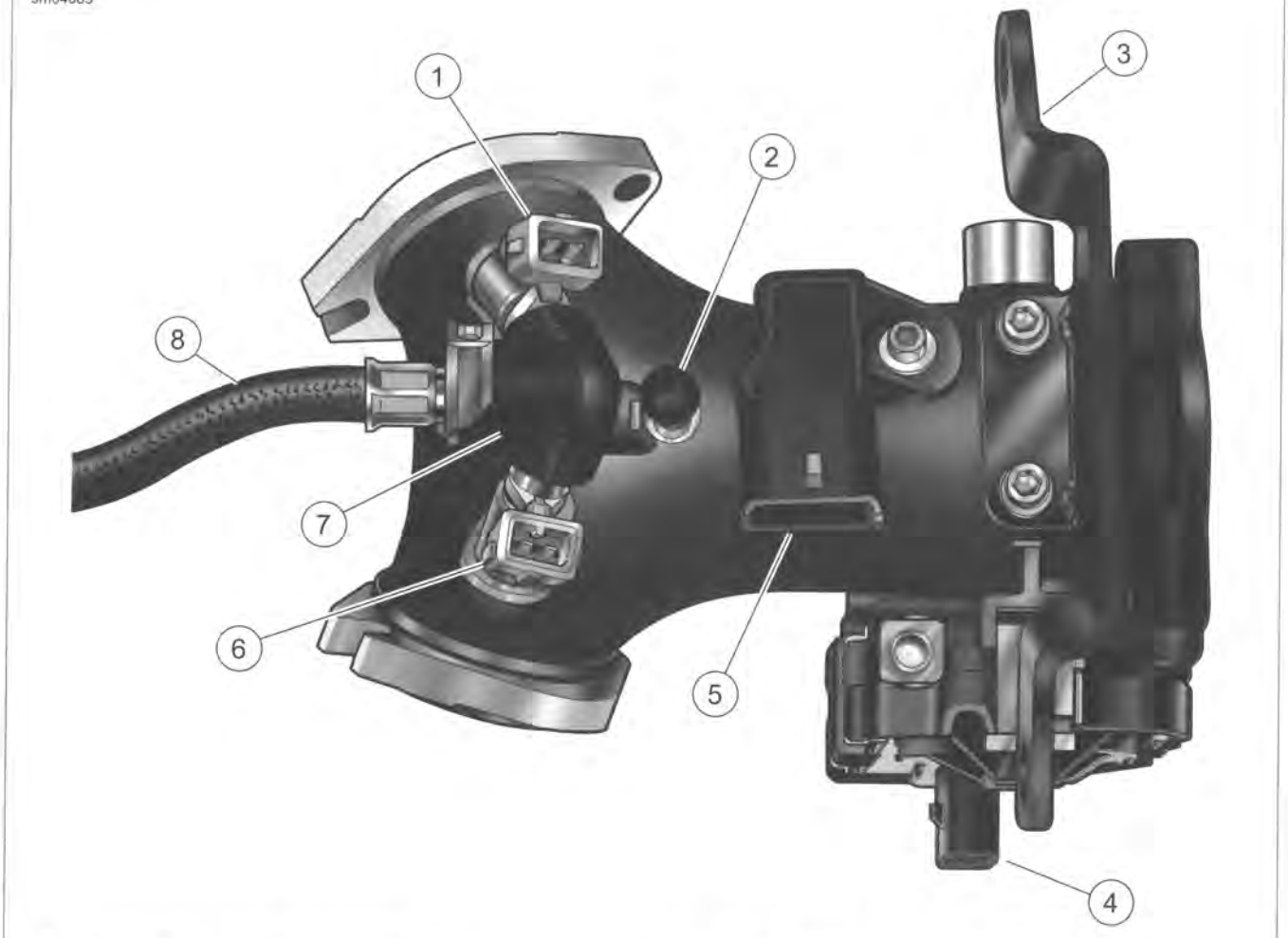


Figure 4-31. TCA

REMOVAL

PART NUMBER	TOOL NAME
HD-47250	INTAKE MANIFOLD WRENCH

1. Remove fuel tank. See 4.6 FUEL TANK.
2. Remove air cleaner and backplate. See 4.5 AIR CLEANER ASSEMBLY.
3. See Figure 4-32. Remove ACR connectors and retainer from mounting bracket (3).
4. **Twin-Cooled models:** Drain coolant and remove upper coolant lines from cylinder heads. See C.5 COOLING SYSTEM REPAIR.
5. **California models only:** Pull purge tube from fitting (2) at top of induction module.
6. Remove TMAP sensor connector (5).
7. Remove front fuel injector connector (1) and rear fuel injector connector (6).
8. Remove TCA connector (4). Cut anchored cable strap to release connector conduit from front right side of induction module.
9. Remove right side screws from front and rear cylinder head flange adapters. For best results, use the INTAKE MANIFOLD WRENCH (Part No. HD-47250). See Figure 4-33.
10. Loosen left side screws from flange adapters. Slots in flanges make removal of screws unnecessary.
11. Slide induction module out right side of motorcycle.
12. Remove seals from flange adapters. Discard seals. Remove flange adapters from outlet ports of induction module.



1. **Front fuel injector connector [84]**
2. **Purge tube fitting/cap**
3. **Mounting bracket**
4. **TCA connector [211]**
5. **TMAP sensor connector [80]**
6. **Rear fuel injector connector [85]**
7. **Fuel rail**
8. **Fuel supply tube**

Figure 4-32. Induction Module Assembly

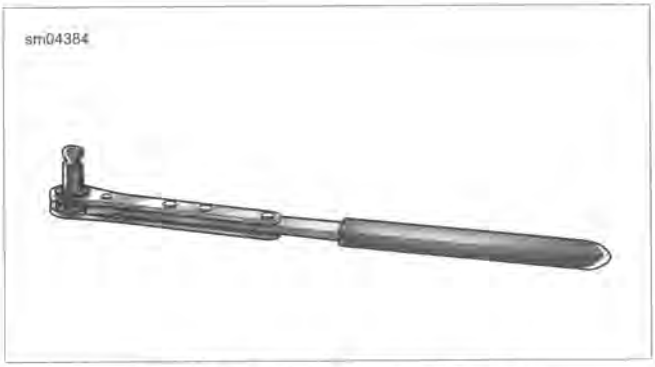


Figure 4-33. Intake Manifold Wrench

INSTALLATION

PART NUMBER	TOOL NAME
HD-47250	INTAKE MANIFOLD WRENCH

FASTENER	TORQUE VALUE	
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm

1. With the counterbore facing outward, slide flange adapters onto the induction module.
2. Place a **new** seal in each flange adapter with the beveled side against the counterbore.
3. See Figure 4-32. Slide induction module into position until slots engage screws on left side.
4. Start right side screws. For best results, use the INTAKE MANIFOLD WRENCH (Part No. HD-47250).
5. Loosely install two breather bolts to temporarily fasten mounting bracket to cylinder heads.
6. Tighten right side flange adapter screws until snug. Tighten left side screws to 96-144 **in-lbs** (10.9-16.3 Nm).
7. Tighten right side screws to 96-144 **in-lbs** (10.9-16.3 Nm).
8. See Figure 4-32. Install rear fuel injector connector (6) and front fuel injector connector (1).
9. Install TMAP sensor connector (5).
10. Route TCA connector and harness straight down between induction module and front cylinder staying inboard of mounting bracket. Loosely capture TCA harness to hole at front right side of induction module with **new** anchored cable strap.
11. Route conduit rearward under induction module and install TCA connector (4). Tighten cable strap. Remove excess cable strap material.
12. Connect purge tube to fitting (2) (California models only). On non-California models, inspect rubber cap for damage. Replace cap if damaged or missing.
13. **Twin-Cooled models:** Install upper coolant lines to cylinder heads. Fill and bleed cooling system. See C.5 COOLING SYSTEM REPAIR.
14. Install ACR connector retainer on mounting bracket (3) and secure connectors to it.
15. Install fuel tank. See 4.6 FUEL TANK.
16. Install backplate and air cleaner. See 4.5 AIR CLEANER ASSEMBLY.

TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP) 4.14

REMOVAL

1. Remove fuel tank. See 4.6 FUEL TANK.
2. Remove hex screw to release TMAP sensor bracket from induction module. Discard screw.
3. See Figure 4-34. While rotating TMAP sensor slightly, pull straight up to release pressure port from hole in induction module.

Figure 4-34. TMAP Sensor

INSTALLATION

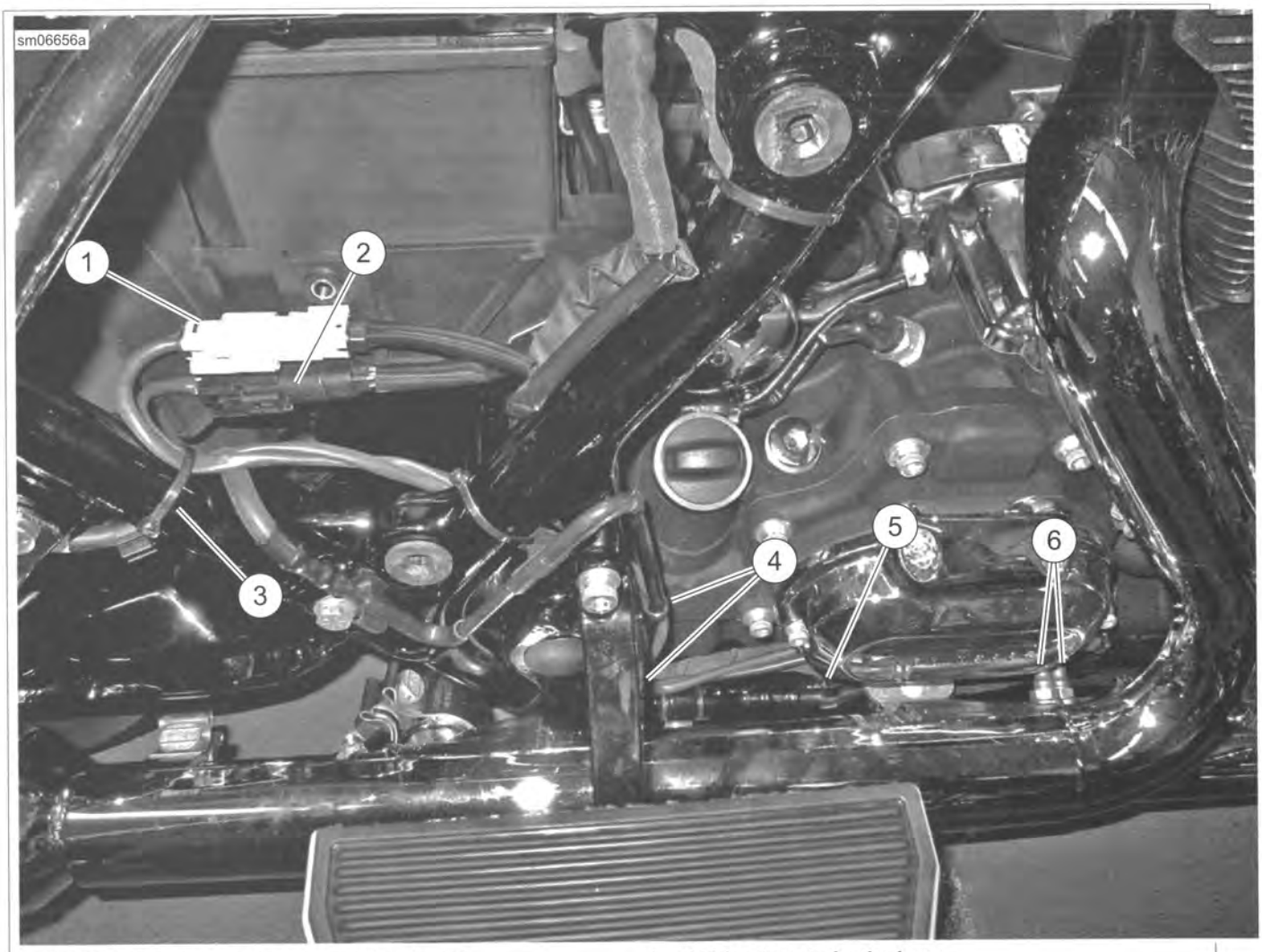
FASTENER	TORQUE VALUE	
TMAP screw	84-108 **in-lbs**	9.5-12.2 Nm

1. Inspect O-ring on pressure port for cuts, tears or signs of deterioration. Install **new** O-ring if necessary.
2. With the electrical connector facing toward the rear of the induction module, insert pressure port on TMAP sensor into hole in induction module.
3. Align hole in TMAP sensor bracket with threaded hole in induction module.
4. Install **new** hex screw and tighten to 84-108 **in-lbs** (9.5-12.2 Nm).
5. Install fuel tank. See 4.6 FUEL TANK.

REMOVAL

PART NUMBER	TOOL NAME
HD-50017	OXYGEN SENSOR WRENCH

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. See Figure 4-35. Cut cable straps (3, 4) and disconnect oxygen sensor connector (1 or 2).
3. Release harness from retainer (5).
4. Using OXYGEN SENSOR WRENCH (Part No. HD-50017), remove oxygen sensor (6).



1. Front oxygen sensor connector (grey)
2. Rear oxygen sensor connector (black)
3. Cable strap to frame
4. Cable strap to brake hose
5. Cable retainer
6. Oxygen sensors

Figure 4-35. Oxygen Sensors (non-ABS model shown)

INSTALLATION

PART NUMBER	TOOL NAME
HD-50017	OXYGEN SENSOR WRENCH

FASTENER	TORQUE VALUE	
HO2 sensor	14 ft-lbs	19 Nm

NOTES

- *Do not install sensors that have been dropped or impacted by other components. The sensing element may be damaged.*
- *Replacement sensor assemblies have threads coated with anti-seize lubricant and a* ***new*** *gasket.*
- *If HO2 sensor will be reused, replace the gasket. Use high-quality professional grade sidecutters for gasket removal.*
- *If HO2 sensor will be reused, apply a thin coat of ANTI-SEIZE LUBRICANT to threads of each sensor prior to installation. Do not use any other grease or sealant product on sensor threads.*
- *The electrical connector must be clean and free of any dielectric grease.*

1. If reusing HO2 sensor:
   a. Remove used seal. Install a **new** one.
   b. Apply a light coating of ANTI-SEIZE LUBRICANT to threads.
2. Using OXYGEN SENSOR WRENCH (Part No. HD-50017), install oxygen sensor. Tighten to 14 ft-lbs (19 Nm).
3. See Figure 4-35. Route harness along lower frame and above the rear engine mount. Secure in harness retainer (5).

NOTE

Verify connector halves are clean and free of grease or other contaminants. NEVER apply dielectric grease, cleaning agents or any other lubricants, sealants or fluids to HO2 sensor connectors. Any such application will result in corrupted signals and sensor failure.

4. Connect sensor connector (1 or 2). Secure sensor harnesses with **new** cable straps to rear frame down tube (3) and brake hose (4).
5. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

GENERAL

⚠WARNING

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

⚠WARNING

Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

See the electrical diagnostic manual for information on the function and testing of the fuel injectors.

REMOVAL

1. Remove induction module. See 4.13 INDUCTION MODULE.
2. Remove screw to release fuel supply tube clamp from fuel rail.
3. See Figure 4-36. Rotate fuel supply tube clamp 90 degrees clockwise. Remove from groove in fuel supply tube fitting.
4. Pull fuel supply tube from fuel rail bore and remove two O-rings and two sealing washers. Discard O-rings and sealing washers.
5. Pull fuel injectors with attached fuel rail from induction module. Gently rock assembly back and forth while pulling.
6. Remove fuel injectors from fuel rail.
7. Remove O-rings from fuel injectors. Discard O-rings.

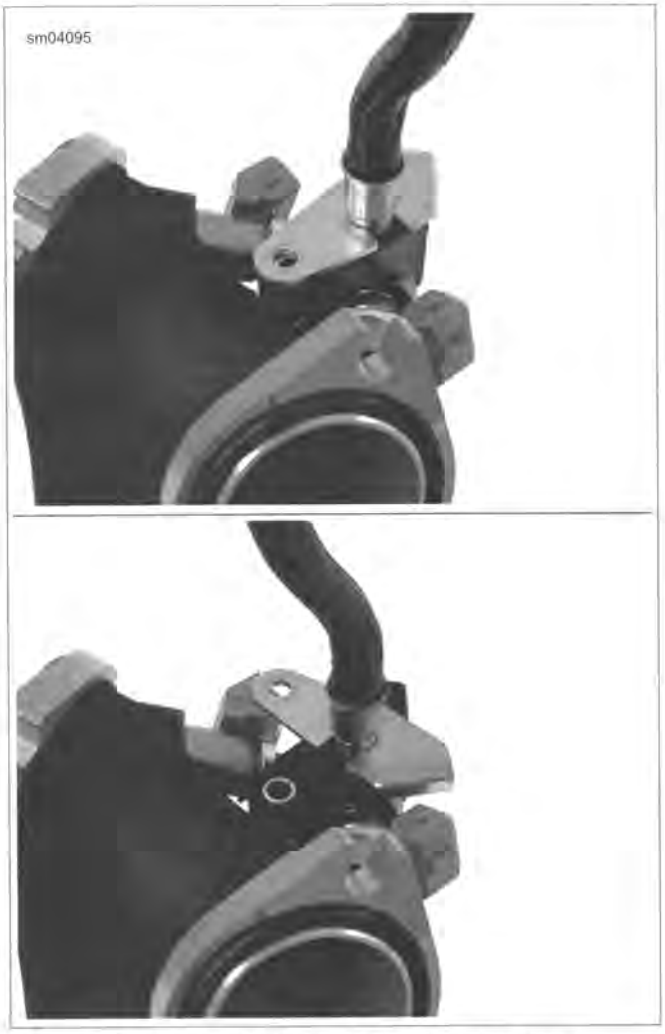


Figure 4-36. Rotate Fuel Supply Tube Clamp

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel supply tube clamp screw	66-82 **in-lbs**	7.5-9.3 Nm

1. Apply a very light film of clean engine oil to **new** O-rings. Install O-rings on fuel injectors.
2. Push open end of fuel injectors (opposite cone spray) into fuel rail.
3. Rotate fuel injectors until the electrical connectors are on the outboard side. Push cone spray end of fuel injectors into bores of induction module until slot at bottom of fuel rail engages machined tab at top of induction module.
4. Install **new** O-ring and sealing washer in fuel rail bore. Install second O-ring and second sealing washer.
5. Push fuel supply tube into fuel rail bore.
6. Rotate fuel supply tube clockwise until tapered end of quick connect fitting is pointing upward. Now rotate tube an additional 90 degrees until fitting is pointing rearward (toward TCA on induction module).

7. Engage slot on fuel supply tube clamp in groove of fuel supply tube fitting. Rotate fuel supply tube clamp 90 degrees counterclockwise until curled lip on fuel supply tube clamp engages flange on fuel rail.
8. Secure fuel rail and fuel supply tube clamp to induction module with screw. Tighten to 66-82 **in-lbs** (7.5-9.3 Nm).
9. Install induction module. See 4.13 INDUCTION MODULE.

GENERAL

⚠WARNING

When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

⚠WARNING

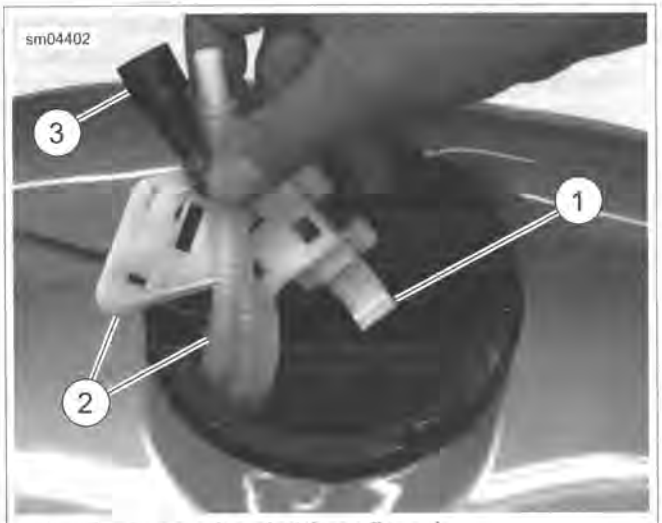
Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

Carefully inspect tubes for damage. Even a small hole can cause a reduction in fuel pressure. Replace fuel pump as necessary.

See the electrical diagnostic manual for information on the function and testing of the fuel pump.

REMOVAL

1. Remove top plate. See 4.7 FUEL TANK TOP PLATE.
2. Remove fuel level sender. See 4.10 FUEL LEVEL SENDER.
3. Pull up on transfer tube bracket to release two tabs at bottom from slots at top of fuel pump bracket.
4. Press collar on each side of fitting to disconnect transfer tube from transfer tube bracket.
5. See Figure 4-37. Pull up on rear finger and slide fuel pump bracket forward until four ears on bracket are free of catches at top of tunnel.
6. See Figure 4-38. Remove fuel pump from left side of fuel tank. Rotate fuel pump assembly 90 degrees clockwise until transfer tube connection is pointing rearward. Remove from fuel tank.
7. If necessary, further disassemble fuel pump assembly:
   a. Reaching into fuel tank, release transfer tube from weld clip on right side of tunnel and remove from fuel tank.
   b. Press arms on fuel inlet strainer and remove from slots in fuel pump housing.
   c. Inspect the condition of the fuel pump wiring. If the wiring needs to be replaced, see 4.17 FUEL PUMP, Fuel Pump and Fuel Level Sender Wire Harness.



1. **Fuel pump bracket (rear finger)**
2. **Transfer tube/bracket**
3. **Fuel pump to fuel filter fitting**

Figure 4-37. Rear Finger (Fuel Pump Bracket)

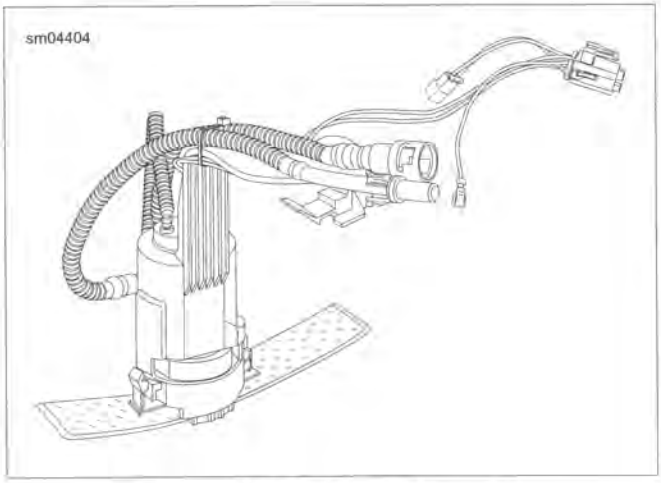


Figure 4-38. Fuel Pump Assembly

INSTALLATION

1. If removed, assemble fuel pump assembly:
   a. Reaching into fuel tank, capture transfer tube in weld clip on right side of tunnel.
   b. Install fuel inlet strainer to bottom of fuel pump.
2. Install fuel pump into left side of fuel tank. Hold fuel pump assembly so that transfer tube connection is pointing rearward and insert into fuel tank. Rotate assembly 90 degrees counterclockwise.
3. Look into fuel tank to verify that fuel inlet strainer lies flat and that ends are not folded under fuel pump. Also verify that wire harness is still captured in molded clip at front of fuel pump bracket.
4. With the finger on the fuel pump bracket pointing rearward, engage four ears on bracket with rear set of catches at

top of tunnel. Push fuel pump bracket rearward until ears are fully engaged.

5. Install transfer tube onto transfer tube bracket. Fit two tabs at bottom of transfer tube bracket into slots at top of fuel pump bracket. Verify that transfer tube is still captured in weld clip on right side of tunnel. Verify that free end is in contact with bottom of fuel tank.
6. Install fuel level sender. See 4.10 FUEL LEVEL SENDER.
7. Install top plate. See 4.7 FUEL TANK TOP PLATE.

NOTE

The low fuel lamp will not turn off until there is sufficient fuel in the tank, the ignition switch has been turned off and back on, and the vehicle has begun forward movement.

FUEL PUMP AND FUEL LEVEL SENDER WIRE HARNESS

Removal

NOTE

Damaged wiring, terminals and/or connectors requires replacement of the wire harness. Do not replace the special teflon coated wiring with ordinary bulk wire. Ordinary insulation materials may deteriorate when in contact with gasoline.

1. Remove fuel pump. See 4.17 FUEL PUMP.
2. Cut cable strap to release wire harness and both fuel pump and transfer tubes from arm of fuel pump bracket.
3. Release wire harness from molded clip at front of fuel pump bracket.
4. Remove connector at top of fuel pump.

Installation

1. Install connector at top of fuel pump.
2. Route wire harness rearward and then forward under arm of fuel pump bracket. Install **new** cable strap at elbow capturing fuel pump and transfer tubes at top of arm and wire harness at bottom. See Figure 4-39.
3. Route wire harness through molded clip at front of fuel pump bracket. See Figure 4-40.
4. Install fuel pump. See 4.17 FUEL PUMP.

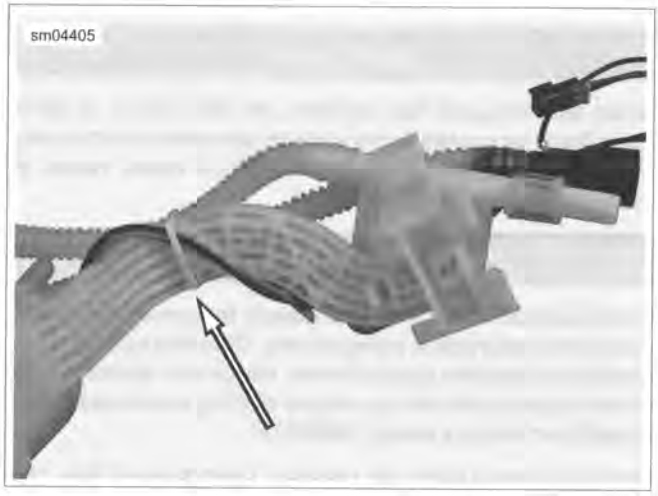


Figure 4-39. Cable Wires in Cable Strap

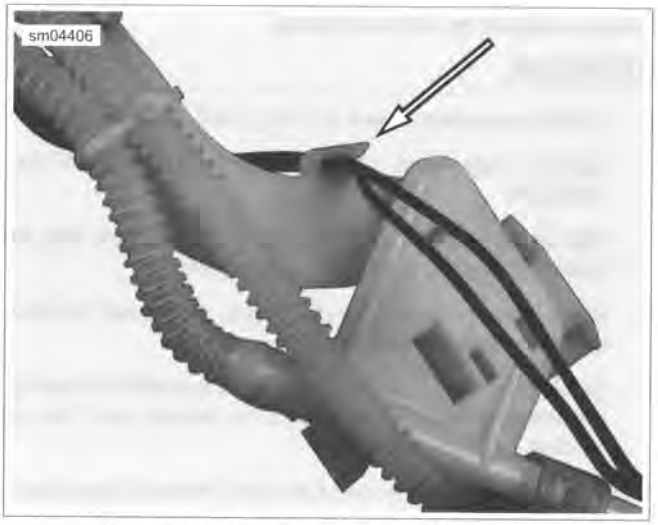


Figure 4-40. Capture Wires in Molded Clip

MUFFLERS

FASTENER	TORQUE VALUE	
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm

Removal

1. Remove saddlebags. See 2.31 SADDLEBAGS.
2. See Figure 4-41. Remove two fasteners (2) and lock-washers.
3. Loosen clamp (23).
4. Pull and twist muffler to remove.
5. Inspect rubber mount (1) for deterioration or damage. Replace as necessary.

Installation

1. Slide **new** muffler clamp onto muffler. Push muffler squarely onto exhaust pipe.
2. Secure muffler to bracket (3) with fasteners (2) and lock-washers. Tighten to 96-144 **in-lbs** (10.8-16.3 Nm).
3. Tighten clamp (23) to 38-43 ft-lbs (51.5-58.3 Nm).
4. Install saddlebags. See 2.31 SADDLEBAGS.

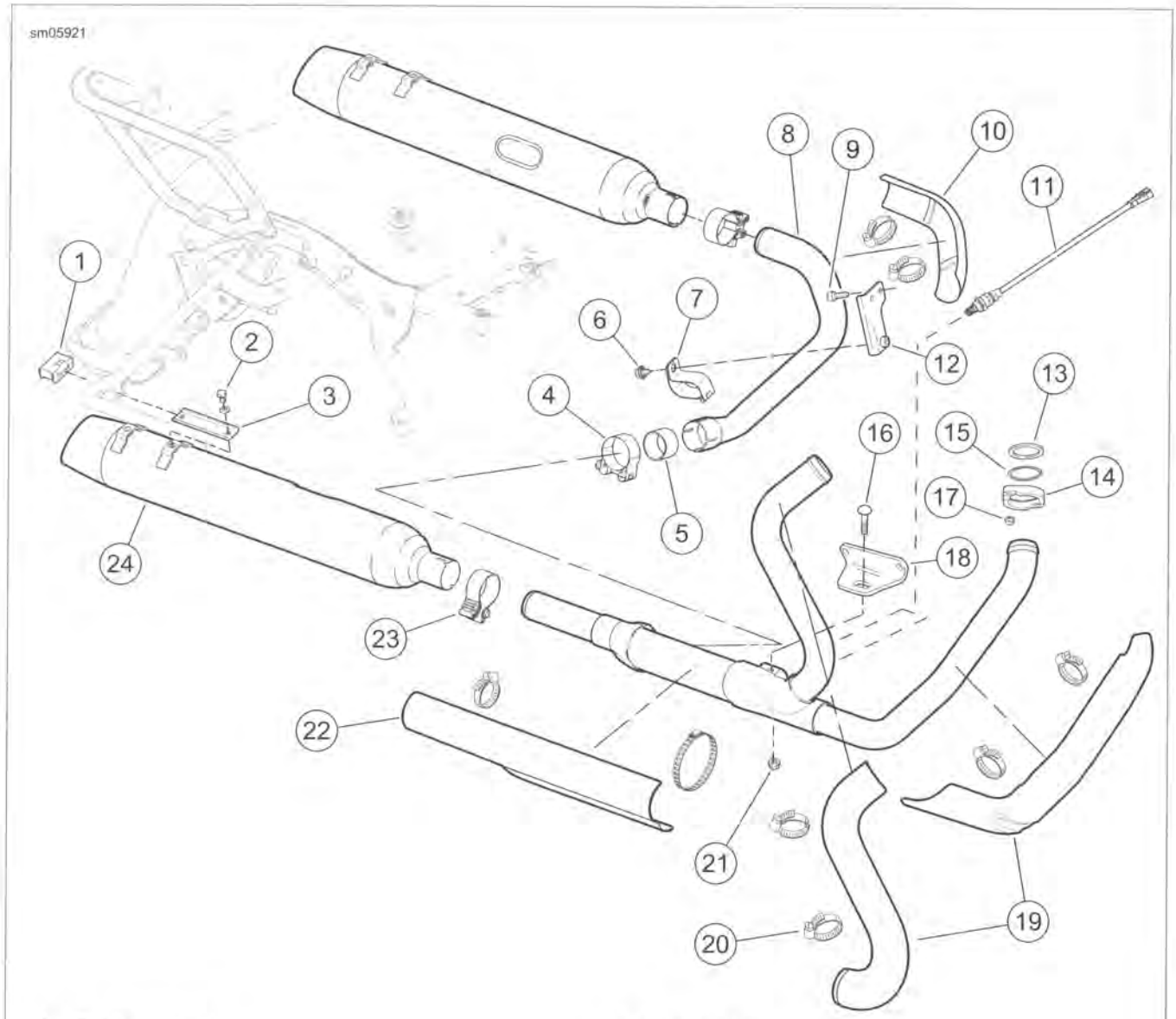
SYSTEM REMOVAL

1. Remove saddlebags. See 2.31 SADDLEBAGS.
2. Remove mufflers. See 4.18 EXHAUST SYSTEM, Mufflers.
3. Remove seat. See 2.30 SEAT.
4. Remove right side front footboard and brackets from frame. See 2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards.
5. **HDI models:** Disconnect cable to exhaust valve actuator:
   a. Locate active exhaust valve just forward of the right side muffler. Push cam rearward to remove tension from cable, and then release ball end from slot.
   b. Remove cable clip from slotted flange at front of active exhaust valve.
6. Disconnect front and rear HO2 sensor connectors.
7. See Figure 4-41. Remove heat shields (10, 19, 22) from pipes.

NOTE

Some models are equipped with only a single muffler on the right side.

8. Loosen clamp (4).
9. Remove fastener (6) and clamp (7).
10. Pull and twist on crossover pipe to remove (8).
11. Remove two flange nuts (17) to release front header pipe from studs of front cylinder head. Slide exhaust flange down header pipe to improve clearance around exhaust port.
12. Remove two flange nuts (17) to release rear header pipe from studs of rear cylinder head.
13. Remove flange nut (21) and carriage bolt (16).
14. Remove exhaust header pipe.
15. Remove and discard gaskets (13) from front and rear exhaust ports.
16. Inspect retaining rings (15) and flanges (14). Replace as necessary.



1. Rubber mount
2. Fastener (4)
3. Bracket (2)
4. Clamp
5. Gasket
6. Flange bolt
7. Exhaust support clamp
8. Crossover pipe
9. Fastener (2)
10. Heat shield, crossover pipe
11. O2 Sensor (2)
12. Transmission exhaust bracket
13. Gasket (2)
14. Exhaust flange (2)
15. Retaining ring (2)
16. Carriage bolt
17. Flange nut (4)
18. Exhaust bracket
19. Heat shields, header pipe, front
20. Worm clamps
21. Flange locknut
22. Heat shield, header pipe, rear
23. Muffler clamp
24. Muffler

Figure 4-41. Exhaust System

SYSTEM INSTALLATION

FASTENER	TORQUE VALUE	
Exhaust crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm
Exhaust flange adapter nuts, 1st torque	9-18 **in-lbs**	1-2 Nm
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm
Exhaust flange adapter nuts, 1st torque	9-18 **in-lbs**	1-2 Nm
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm
Exhaust side bracket carriage bolt	20-25 ft-lbs	27.1-33.9 Nm
Exhaust crossover pipe clamp	25-30 ft-lbs	33.9-40.7 Nm
Exhaust crossover clamp to transmission bracket fastener	14-18 ft-lbs	19.0-24.4 Nm
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm

1. See Figure 4-41. If removed, install transmission exhaust bracket (12) and tighten fasteners (9) to 84-132 **in-lbs** (9.5-14.9 Nm).
2. Install **new** gaskets in both the front and rear cylinder head exhaust ports with the tapered side out.
3. Place exhaust header pipe into position. Start two exhaust flange nuts to secure front header pipe to cylinder head.
4. Roll pipe into position at rear cylinder with welded bracket on header pipe below the side exhaust bracket (18).
5. Start two exhaust flange nuts to secure rear header pipe to studs of rear cylinder head.
6. Secure header pipe to side exhaust bracket (18) with carriage bolt (16) and flange locknut (21). Do not tighten at this time.

NOTE

Some models are equipped with only a single muffler on the right side.

7. Slide **new** clamp (4) onto crossover pipe.
8. Install **new** gasket (5). Twist and push crossover pipe (8) onto exhaust header pipe.
9. Install exhaust support clamp (7) and secure with fastener (6). Do not tighten.
10. Install mufflers. See 4.18 EXHAUST SYSTEM, Mufflers.

NOTES

- *Verify that the exhaust components do not contact the motorcycle frame or any mounted components.*
- *Verify that no components are in a bind before and during tightening. This reduces the chance of unwanted noise or vibration.*

11. Tighten the exhaust system:
    a. Tighten the bottom nut of the rear cylinder exhaust flange to 9-18 **in-lbs** (1-2 Nm). Tighten the top nut to 100-120 **in-lbs** (11.3-13.6 Nm). Final tighten the bottom nut to 100-120 **in-lbs** (11.3-13.6 Nm).
    b. Tighten the top nut of the front cylinder exhaust flange to 9-18 **in-lbs** (1-2 Nm). Tighten the bottom nut to 100-120 **in-lbs** (11.3-13.6 Nm). Final tighten the top nut to 100-120 **in-lbs** (11.3-13.6 Nm).
    c. Tighten flange locknut (21) to 20-25 ft-lbs (27.1-33.9 Nm).
    d. Tighten crossover pipe clamp (4) to 25-30 ft-lbs (33.9-40.7 Nm).
    e. Tighten fastener (6) to 14-18 ft-lbs (19.0-24.4 Nm).

NOTES

- *Verify that the heat shields do not contact the motorcycle frame or any mounted components.*
- *See Figure 4-42. Install crossover pipe heat shield with the longer straight portion toward the muffler.*

Figure 4-42. Crossover Pipe Heat Shield

12. Install heat shields. Position each worm drive clamp so that screw is on the outboard side in the most accessible position. Tighten to 20-40 **in-lbs** (2.3-4.5 Nm).
13. Connect O2 sensor connectors and install **new** cable strap to secure leads to rear frame. Secure in harness retainer on lower frame.
14. **HDI models:** connect cable to exhaust valve actuator:
    a. Install cable clip onto slotted flange at front of active exhaust valve.
    b. Push cam rearward and install ball end of cable into slot. Verify that cable is properly seated in channel of active exhaust valve.
15. Install right side front footboard and brackets. See 2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards.
16. Install seat. See 2.30 SEAT.
17. Install saddlebags. See 2.31 SADDLEBAGS.

EXHAUST VALVE ACTUATOR

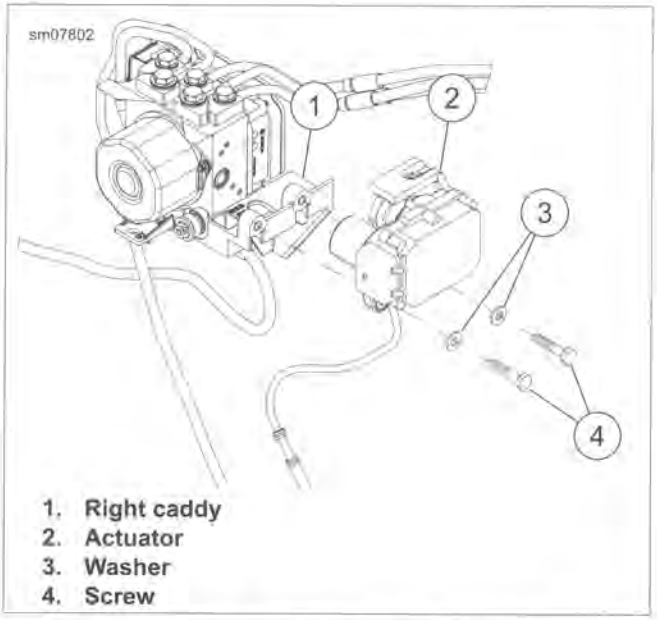
FASTENER	TORQUE VALUE	
Exhaust valve actuator screws	32-40 **in-lbs**	3.6-4.5 Nm

Removal

1. Remove right saddlebag and side cover.
2. Remove right mid-frame air deflector. See 2.40 AIR DEFLECTORS. .
3. Disconnect electrical connector from actuator.
4. See Figure 4-43. Remove two screws (4) and washers (3) to release active exhaust valve actuator (2) from right side caddy (1).
5. Disconnect cable from actuator spool:
   a. Release plastic insert from actuator bracket.
   b. Release cable end from spool.
6. Remove actuator.

Installation

1. Connect cable to actuator spool:
   a. Push cable end into hole in actuator spool until cable engages groove at center.
   b. Push to engage plastic insert in slot of actuator bracket.
2. Secure active exhaust valve actuator to right side caddy with screws and washers. Tighten to 32-40 **in-lbs** (3.6-4.5 Nm).
3. Mate electrical connector. Install mid-frame air deflector. See 2.40 AIR DEFLECTORS
4. Verify cable is secured in anchor on rear frame downtube.
5. Install right saddlebag and side cover.



1. **Right caddy**
2. **Actuator**
3. **Washer**
4. **Screw**

Figure 4-43. Active Exhaust Actuator

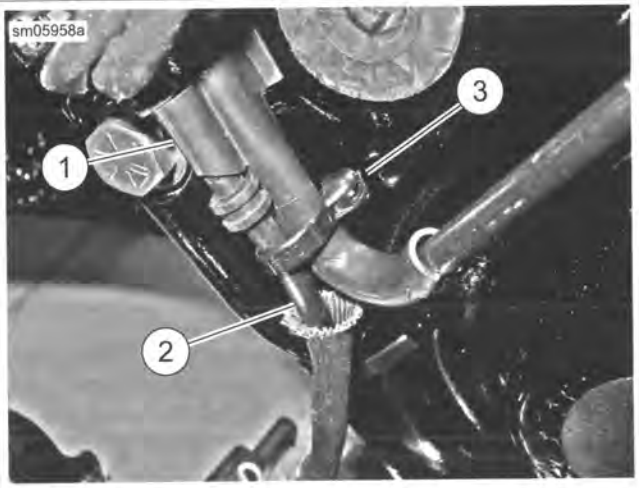
EXHAUST VALVE ACTUATOR CABLE

Removal

1. Remove exhaust valve actuator. See 4.19 ACTIVE EXHAUST: HDI, Exhaust Valve Actuator.
2. Disconnect cable from exhaust valve:
   a. Push metal cable retainer off bracket on exhaust pipe.
   b. Release cable end from spool.
3. See Figure 4-44. Cut cable strap (3). Release cable housing (2) from cable clip (1).

Installation

1. Install cable on exhaust valve:
   a. Install cable end into notch in exhaust valve spool.
   b. Push on metal cable retainer onto bracket on exhaust pipe.
2. Install exhaust valve actuator. See 4.19 ACTIVE EXHAUST: HDI, Exhaust Valve Actuator.
3. See Figure 4-44. Secure cable housing (2) in cable clip (1). Secure cable housing to brake line with cable strap (3).



1. Cable clip
2. Cable housing
3. Cable strap

Figure 4-44. Cable Routing

ACTIVE EXHAUST VALVE

General

The active exhaust valve is not repairable. Replace the rear exhaust header pipe if the valve is damaged or fails. See 4.18 EXHAUST SYSTEM.

GENERAL

Motorcycles sold in some markets are equipped with an evaporative (EVAP) emissions control system. See Figure 4-45. The EVAP system functions as follows:

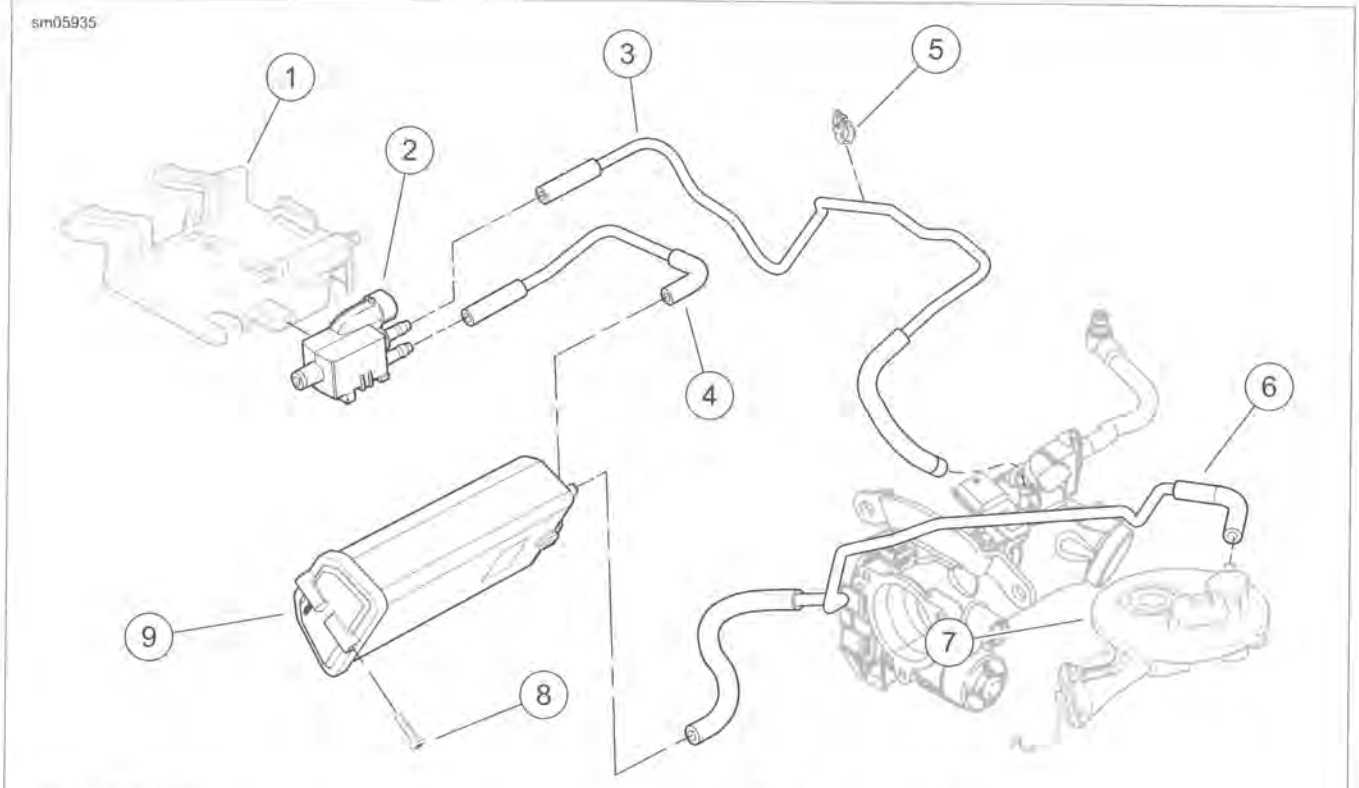
- The fuel vapor vent tube is connected to the vent tube on the fuel tank top plate. It allows fuel vapors in the fuel tank to be vented to the charcoal canister.
- Under certain engine conditions, the ECM (working in conjunction with the EFI system relay) opens the purge solenoid. Negative pressure (vacuum) draws the fuel vapors in the charcoal canister through the purge tube to the induction module. They are then burned as part of the normal combustion process.

⚠WARNING

Keep evaporative emissions vent lines away from exhaust and engine. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00266a)

NOTE

The EVAP system has been designed to operate with a minimum of maintenance. Check that all tubes are correctly routed and properly connected. Also, verify that the tubes are not pinched or kinked. Verify that there is no contact between the tubes and engine parts.



1. **Top caddy**
2. **Purge solenoid**
3. **Canister-to-induction module tube**
4. **Canister-to solenoid tube**
5. **Cable clip**
6. **Fuel vapor vent tube**
7. **Fuel tank top plate**
8. **Fastener (2)**
9. **Charcoal canister**

Figure 4-45. Evaporative Emissions Control System (EVAP)

VAPOR VALVE

NOTE

See Figure 4-46. The vapor valve is not serviceable. Damage or failure of the vapor valve requires replacement of the fuel tank top plate. See 4.7 FUEL TANK TOP PLATE.

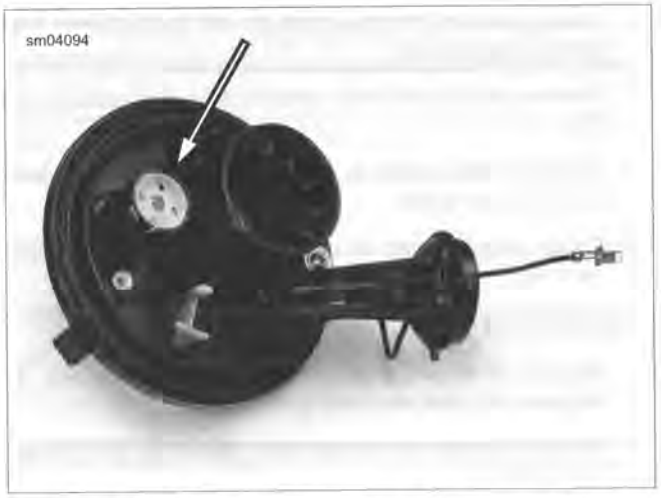


Figure 4-46. Fuel Tank Top Plate With Vapor Valve

FUEL VAPOR VENT TUBE

Removal

1. Remove seat. See 2.30 SEAT.
2. Remove console. See 4.6 FUEL TANK, Console.
3. See Figure 4-45. Remove fuel vapor vent tube (6) from vapor valve fitting on fuel tank top plate (7).
4. Disconnect vent tube from fitting on canister (9).
5. Remove vapor vent tube from motorcycle.

Installation

1. See Figure 4-45. Connect fuel vapor vent tube (6) onto vapor valve fitting of fuel tank top plate (7).
2. Connect vent tube to fitting on charcoal canister (9) marked "TANK".
3. Install console. See 4.6 FUEL TANK, Console.
4. Install seat. See 2.30 SEAT.

CANISTER-TO-SOLENOID TUBE

Removal

1. Remove seat. See 2.30 SEAT.
2. See Figure 4-47. Remove purge tube (2) from fitting of purge solenoid and canister.

Installation

1. Install end of purge tube with curved hose onto lower fitting of canister.
2. Install opposite end onto purge solenoid.
3. Install seat. See 2.30 SEAT.

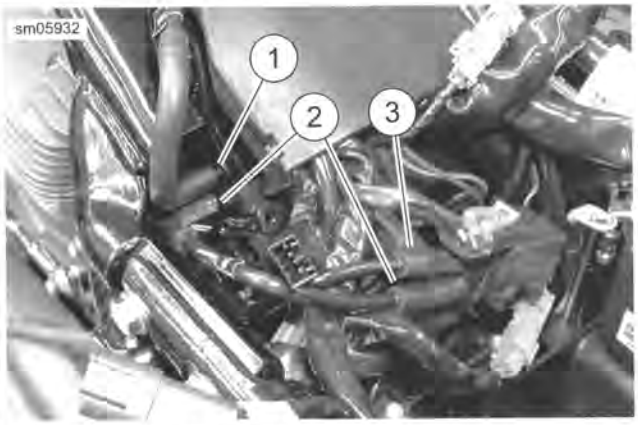
SOLENOID-TO-INDUCTION MODULE TUBE

Removal

1. Remove seat. See 2.30 SEAT.
2. Remove fuel tank. See 4.6 FUEL TANK.
3. See Figure 4-47. Remove purge tube (3) from purge solenoid.
4. Remove cable clip on purge tube from frame backbone.
5. Disconnect tube from fitting on induction module.
6. Remove purge tube.

Installation

1. Route purge tube rearward under frame crossmember and into area near purge solenoid, then along bottom of frame backbone toward induction module. Connect to fitting on induction module.
2. See Figure 4-47. Route purge tube under frame crossmember and install on upper fitting (3) of purge solenoid.
3. Secure purge tube to bottom of frame backbone with **new** retainer.
4. Install fuel tank. See 4.6 FUEL TANK.
5. Install seat. See 2.30 SEAT.



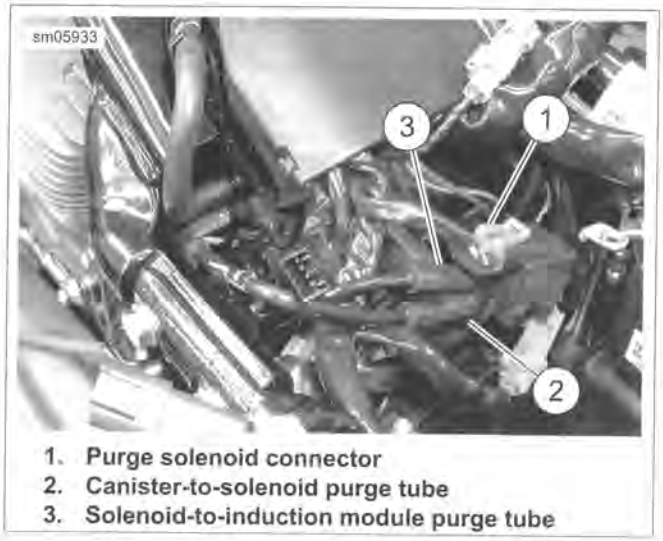
1. **Fuel vapor vent tube**
2. **Canister-to-solenoid purge tube**
3. **Solenoid-to-induction module purge tube**

Figure 4-47. Purge Tube Connections

PURGE SOLENOID

Removal

1. Remove seat. See 2.30 SEAT.
2. Remove top electrical caddy and remove purge solenoid from caddy. Lay caddy aside. See 7.6 ELECTRICAL CADDIES.
3. See Figure 4-48. Remove purge solenoid connector (1).
4. Remove purge tubes (2, 3) from purge solenoid.
5. Remove purge solenoid from motorcycle.



1. **Purge solenoid connector**
2. **Canister-to-solenoid purge tube**
3. **Solenoid-to-induction module purge tube**

Figure 4-48. Purge Solenoid

Installation

1. See Figure 4-48. Install purge tube to induction module (3) onto fitting of purge solenoid closest to the connector cavity.
2. Install purge tube from charcoal canister (2) onto purge solenoid.
3. Install purge solenoid connector (1).
4. Secure solenoid to top caddy and install top caddy. See 7.6 ELECTRICAL CADDIES.
5. Check all routing to be sure that tubes are not pinched or kinked, and that there is no contact with hot exhaust or engine parts.
6. Install seat. See 2.30 SEAT.

CHARCOAL CANISTER

FASTENER	TORQUE VALUE	
Charcoal canister screws	15-20 **in-lbs**	1.7-2.3 Nm
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm

Removal

1. Remove seat. See 2.30 SEAT.
2. Remove saddlebags. See 2.31 SADDLEBAGS.
3. Remove side covers.
4. Remove battery. See 1.22 BATTERY MAINTENANCE.
5. Remove two screws securing battery hold-down bracket and ignition coil.
6. See Figure 4-49. Remove screws securing left side caddy to frame.
7. See Figure 4-50. Disconnect fuel vapor vent tube (1) from canister fitting marked "TANK."
8. Disconnect purge tube (2) from canister fitting marked "PURGE."
9. See Figure 4-51. Remove three ground ring terminals from left ground stud (1).
10. Remove two ground ring terminals from right ground stud (2).
11. Remove two screws to release charcoal canister from frame crossmember.
12. Guide canister down into battery tray, right end first, and remove.

Installation

1. Slide the charcoal canister under electrical harnesses, fitting end first, and work into place.
2. Secure canister with two screws. Tighten to 15-20 **in-lbs** (1.7-2.3 Nm).
3. See Figure 4-51. Install three ground ring terminals on left ground stud (1).
4. Install two ground ring terminals on right ground stud (2). Place battery chassis ground terminal on stud first.
5. See Figure 4-50. Connect purge tube (2) (charcoal canister to purge solenoid) to lower canister fitting marked "PURGE."
6. Connect fuel vapor vent tube (1) (vapor valve to charcoal canister) to upper canister fitting marked "TANK."
7. See Figure 4-49. Install left electrical caddy with two fasteners. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).

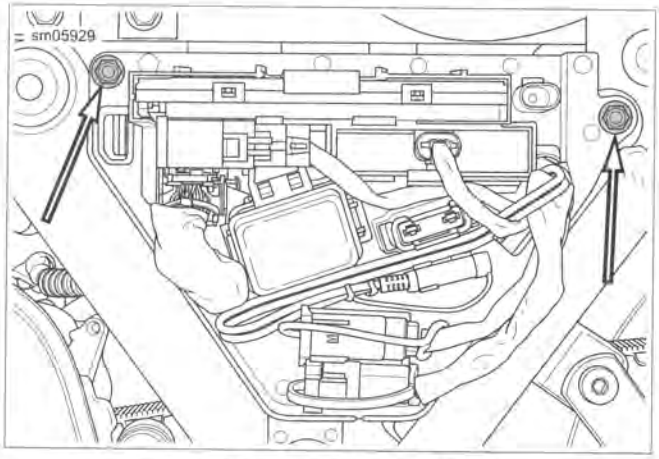
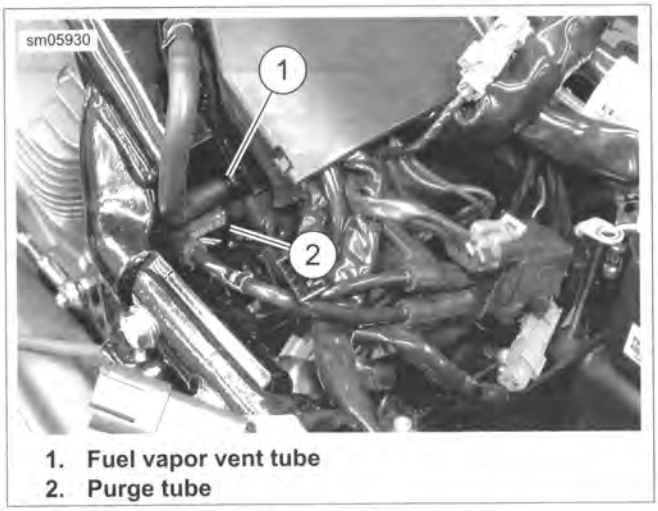
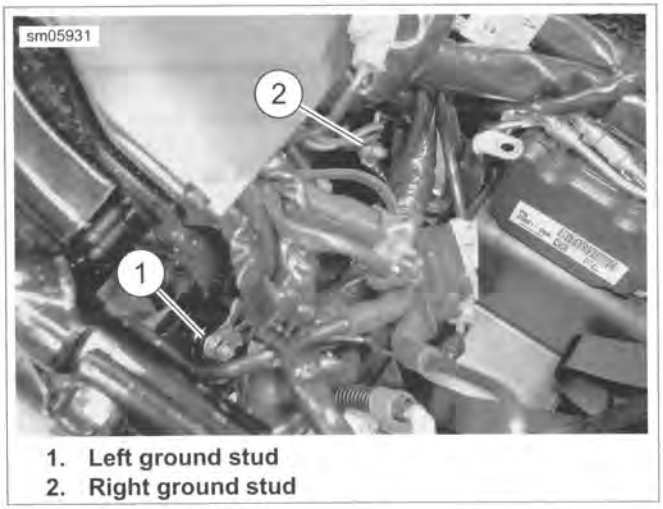


Figure 4-49. Left Electrical Caddy



1. Fuel vapor vent tube
2. Purge tube

Figure 4-50. Purge Tube Connections



1. Left ground stud
2. Right ground stud

Figure 4-51. Chassis Ground Studs

8. Check all routings to be sure that tubes are not pinched or kinked, and that there is no contact with hot exhaust or engine parts.
9. Secure battery hold-down bracket and coil with two screws. Tighten to 32-40 **in-lbs** (3.6-4.5 Nm).
10. Install battery. See 1.22 BATTERY MAINTENANCE.
11. Install side covers.
12. Install saddlebags. See 2.31 SADDLEBAGS.
13. Install seat. See 2.30 SEAT.

NOTES

SUBJECT	PAGE NO.
5.1 FASTENER TORQUE VALUES	5-1
5.2 SPECIFICATIONS: DRIVE	5-2
5.3 PRIMARY CHAINCASE COVER	5-3
5.4 DRIVE COMPONENTS	5-5
5.5 PRIMARY CHAINCASE HOUSING	5-10
5.6 CLUTCH	5-14
5.7 HYDRAULIC CLUTCH RELEASE BEARING AND PUSHROD	5-19
5.8 TRANSMISSION SPROCKET	5-21
5.9 DRIVE BELT	5-23

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Clutch diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm	5.6 CLUTCH, Clutch Pack Only
Clutch hub mainshaft nut	70-80 ft-lbs	94.9-108.5 Nm	5.4 DRIVE COMPONENTS, Installation
Clutch inspection cover	84-108 **in-lbs**	9.5-12.2 Nm	5.7 HYDRAULIC CLUTCH RELEASE BEARING AND PUSHROD, Installation
Compensating sprocket bolt, 1st torque	100 ft-lbs	135.6 Nm	5.4 DRIVE COMPONENTS, Installation/Loosen then final tighten
Compensating sprocket bolt, final torque	175 ft-lbs	237.3 Nm	5.4 DRIVE COMPONENTS, Installation
Primary chaincase sealing fasteners	26-28 ft-lbs	35.3-38.0 Nm	5.5 PRIMARY CHAINCASE HOUSING, Installation
Primary chain tensioner fasteners	21-24 ft-lbs	28.5-32.6 Nm	5.4 DRIVE COMPONENTS, Installation
Primary cover fasteners	12-13 ft-lbs	16.3-17.6 Nm	5.3 PRIMARY CHAINCASE COVER, Installation/See sequence in the procedure
Shift lever pinch screw, heel and toe levers	18-22 ft-lbs	24.4-29.8 Nm	5.3 PRIMARY CHAINCASE COVER, Installation
Transmission sprocket lockplate screws	90-120 **in-lbs**	10.2-13.6 Nm	5.8 TRANSMISSION SPROCKET, Installation/LOCTITE patch, use 3-5 times
Transmission sprocket nut, 1st torque	100 ft-lbs	135.6 Nm	5.8 TRANSMISSION SPROCKET, Installation/Apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to last few threads. Loosen one full turn after 1st torque.
Transmission sprocket nut, 2nd torque	35 ft-lbs	47.5 Nm	5.8 TRANSMISSION SPROCKET, Installation/plus 35-40 degrees
Transmission sprocket nut, final torque	35-40 degrees	35-40 degrees	5.8 TRANSMISSION SPROCKET, Installation/Do not loosen to align lockplate screws.

SPECIFICATIONS

Table 5-1. Sprocket Teeth

DRIVE	ITEM	NUMBER OF TEETH
Primary	Engine	34
	Clutch	46
Final	Transmission	32
	Rear wheel	68

Table 5-2. Clutch Specifications

CLUTCH	DESCRIPTION
Type	Wet-multiple disc
Clutch lever free play (after internal adjustment)	1/16-1/8 in (1.6-3.2 mm)

Table 5-3. Overall Drive Ratios

GEAR	RATIO
1st Gear	9.593
2nd Gear	6.650
3rd Gear	4.938
4th Gear	4.000
5th Gear	3.407
6th Gear	2.875

NOTE

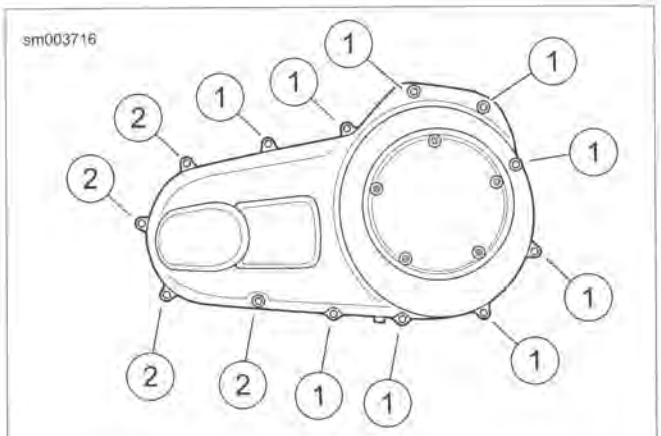
Overall gear ratios indicate number of engine revolutions required to drive rear wheel one revolution.

REMOVAL

⚠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.
2. Drain the primary chaincase lubricant. See 1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.
3. Remove left passenger footboard and bracket. See 2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards.
4. Remove screw securing jiffy stand interlock sensor, if equipped. See 2.48 JIFFY STAND, Jiffy Stand Interlock Sensor.
5. Remove fastener to release rider footboard forward bracket. Remove two fasteners to free jiffy stand and rider footboard rear bracket.
6. Mark position of heel shift lever in relation to shaft.
7. Remove pinch screw securing heel shift lever. Remove heel shift lever.
8. See Figure 5-1. Remove nine short (1) and four long (2) cover fasteners. Remove cover.



1. **Short cover fasteners (9)**
2. **Long cover fasteners (4)**

Figure 5-1. Primary Chaincase Cover: Touring Models

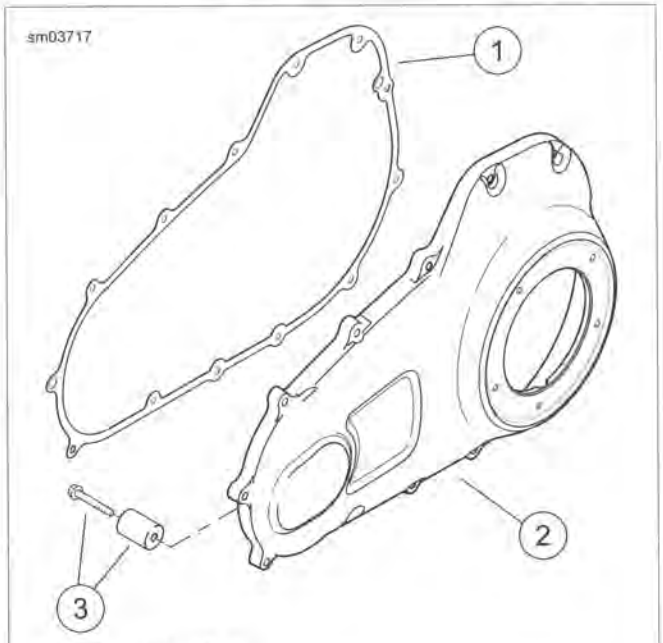
INSTALLATION

FASTENER	TORQUE VALUE	
Primary cover fasteners	12-13 ft-lbs	16.3-17.6 Nm
Shift lever pinch screw, heel and toe levers	18-22 ft-lbs	24.4-29.8 Nm

NOTE

*Always install a **new** gasket between primary cover and housing. Not replacing this gasket may cause primary chaincase leaks.*

1. Verify that all debris is washed from the inside ribs of the cover.
2. See Figure 5-2. Install **new** cover gasket (1).
3. See Figure 5-1. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to each cover fastener. Install nine short (1) and four long (2) fasteners in positions shown. Snug fasteners.
4. See Figure 5-3. Tighten primary cover fasteners to 12-13 ft-lbs (16.3-17.6 Nm) in the sequence shown.



1. **Cover gasket**
2. **Primary chaincase cover**
3. **Mass dampener/screw (Japan only)**

Figure 5-2. Primary Chaincase Cover Gasket

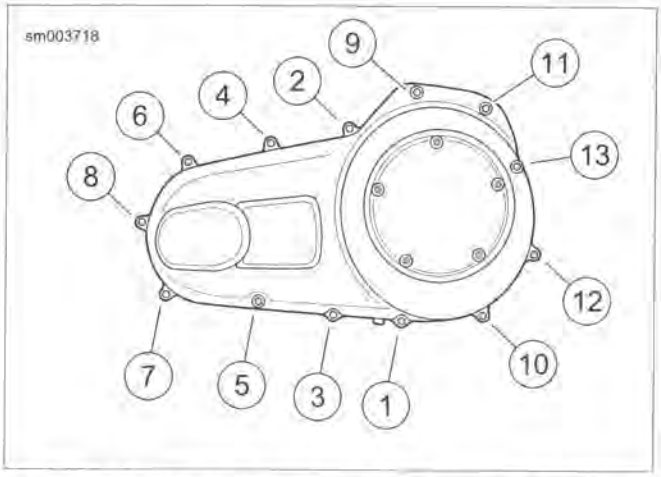


Figure 5-3. Primary Chaincase Cover Torque Sequence: Touring Models

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)

5. Place motorcycle in an upright position and fill primary chaincase. See 1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.
6. Install heel shift lever. Align marks made during disassembly.
7. Install pinch screw. Tighten to 18-22 ft-lbs (24.4-29.8 Nm).
8. Install jiffy stand, rider footboard and interlock sensor if equipped. See 2.48 JIFFY STAND, Jiffy Stand Bracket.
9. Install passenger left footboard. See 2.47 FOOTBOARDS AND FOOTRESTS.
10. Verify shift lever operation.
11. Connect negative battery cable.

REMOVAL

PART NUMBER	TOOL NAME
HD-48219	PRIMARY DRIVE LOCKING TOOL
SNAP-ON STX70E OR EQUIVALENT	T70 SOCKET BIT

NOTE

To remove the primary chain, remove compensating sprocket, clutch assembly and primary chain as an assembly.

⚠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.
2. Remove primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
3. See Figure 5-4. Secure chain tensioner with a cable strap as shown. Install so the tail of the cable strap hangs down past the primary housing. This serves as a reminder to remove the cable strap before installing the primary cover.
4. See Figure 5-5. Remove chain tensioner fasteners (2). Remove chain tensioner (1).
5. Mark one of the links of the primary chain. Maintaining the original direction of rotation during assembly may prolong service life.

⚠WARNING

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

6. See Figure 5-6. Loosen locknut (3).
7. Remove retaining ring (1) and release plate (2).

NOTE

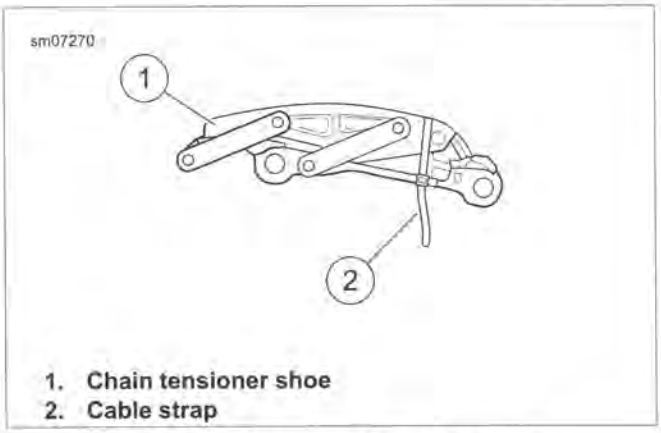
The mainshaft nut has left-hand threads. Turn clockwise to remove.

8. See Figure 5-7. Place the PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) between the teeth of the engine and clutch sprockets as shown.
9. Rotate clutch hub mainshaft nut (4) clockwise to remove.
10. See Figure 5-8. Place the primary drive locking tool between the teeth of the engine and clutch sprockets as shown.

NOTE

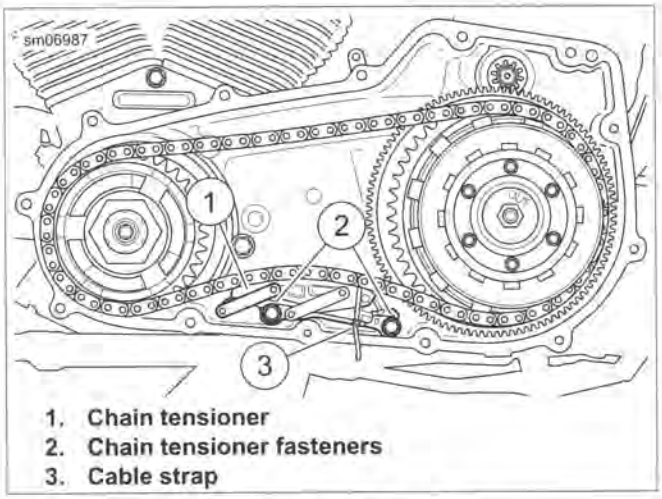
The compensating sprocket bolt is a T70 drive. Use T70 SOCKET BIT (Part No. Snap-on STX70E or equivalent)

11. Rotate compensating sprocket bolt (1) counterclockwise to remove.
12. See Figure 5-9. Remove bolt (10), retainer (9), thrust bearing (8) and thrust washers (7).
13. Inspect thrust bearing and thrust washers for damage.
14. Clean sprocket retainer (9). Verify that oil holes are clear.
15. See Figure 5-10. Remove clutch assembly, primary chain and compensating sprocket assembly as a single assembly.



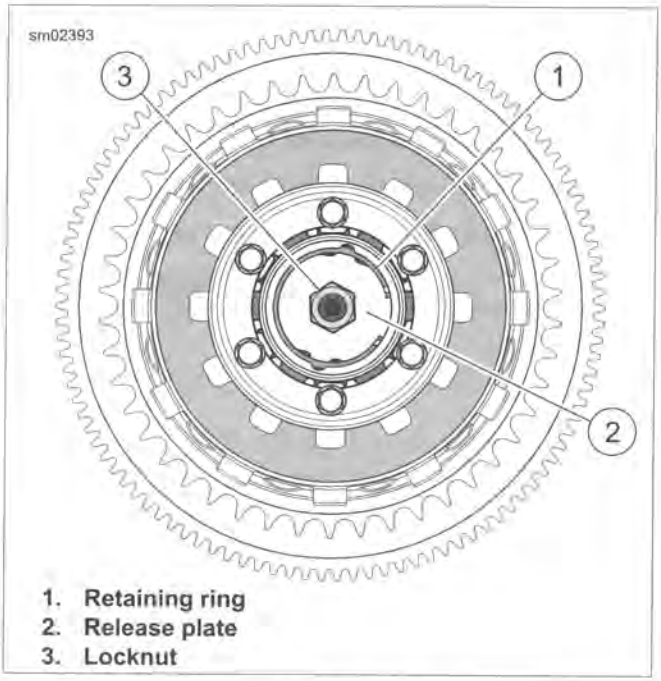
1. **Chain tensioner shoe**
2. **Cable strap**

Figure 5-4. Securing Chain Tensioner



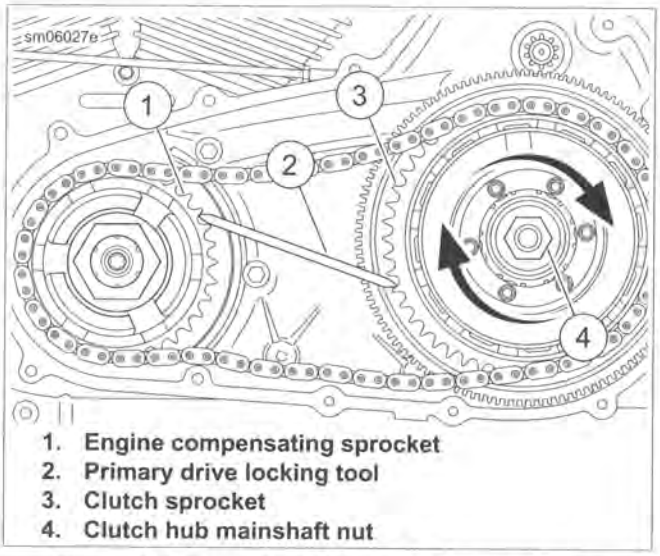
1. **Chain tensioner**
2. **Chain tensioner fasteners**
3. **Cable strap**

Figure 5-5. Chain Tensioner



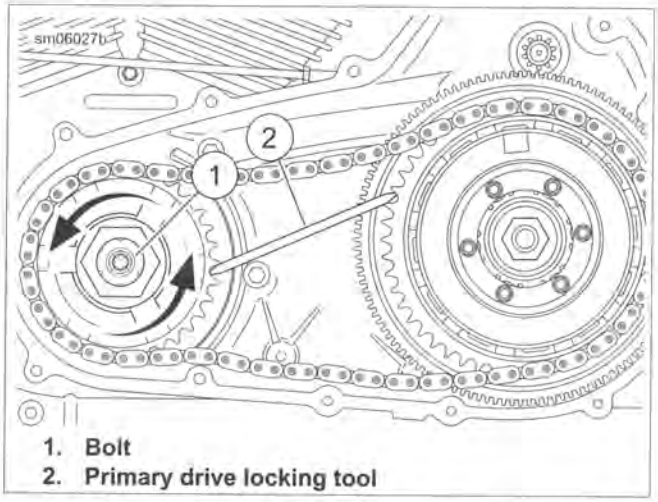
1. Retaining ring
2. Release plate
3. Locknut

Figure 5-6. Clutch



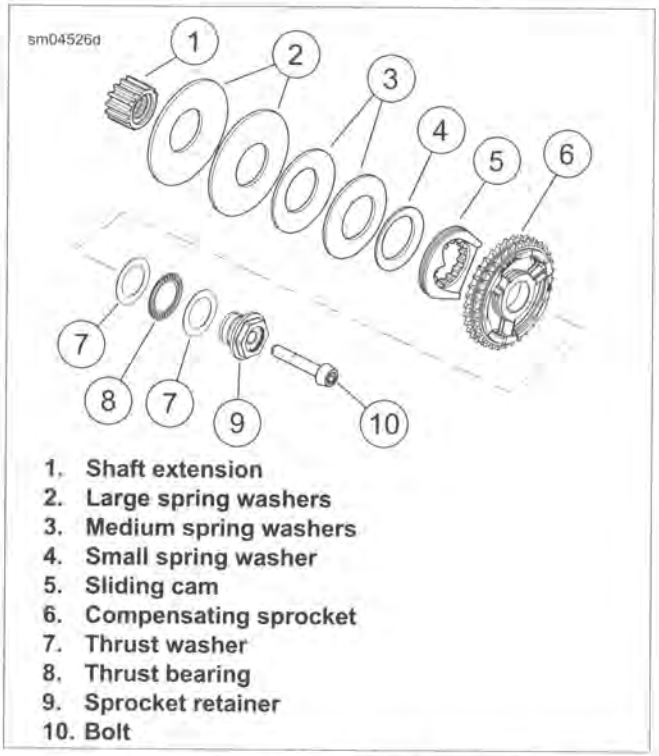
1. Engine compensating sprocket
2. Primary drive locking tool
3. Clutch sprocket
4. Clutch hub mainshaft nut

Figure 5-7. Removing Clutch Hub Mainshaft Nut



1. Bolt
2. Primary drive locking tool

Figure 5-8. Removing Engine Compensating Sprocket Bolt



1. Shaft extension
2. Large spring washers
3. Medium spring washers
4. Small spring washer
5. Sliding cam
6. Compensating sprocket
7. Thrust washer
8. Thrust bearing
9. Sprocket retainer
10. Bolt

Figure 5-9. Engine Compensating Sprocket Assembly

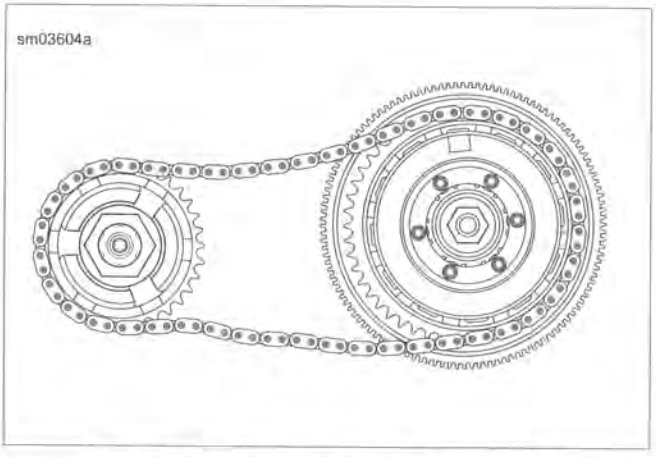


Figure 5-10. Remove Drive Components

INSTALLATION

PART NUMBER	TOOL NAME
HD-48219	PRIMARY DRIVE LOCKING TOOL
SNAP-ON STX70E OR EQUIVALENT	T70 SOCKET BIT

FASTENER	TORQUE VALUE	
Compensating sprocket bolt, 1st torque	100 ft-lbs	135.6 Nm
Compensating sprocket bolt, final torque	175 ft-lbs	237.3 Nm
Clutch hub mainshaft nut	70-80 ft-lbs	94.9-108.5 Nm
Primary chain tensioner fasteners	21-24 ft-lbs	28.5-32.6 Nm

NOTES

- *Install the primary chain, compensating sprocket and clutch as a single unit.*
- *The O-ring inside the sprocket extension is for manufacturing assembly only and has no replacement part.*

1. See Figure 5-9. Apply a thin layer of primary chaincase oil to the inner diameter of the compensating sprocket (6) and the splines of shaft extension (1). Assemble shaft extension, large spring washers (2) and medium spring washers (3).

NOTE

Outer diameter of spring washers must contact each other.

2. Install small spring washer (4) so outer diameter will contact sliding cam (5).
3. Install the drive components (primary chain, compensating sprocket and clutch assembly).
4. Lightly lubricate thrust bearing (8). Install thrust washers (7), bearing (8), retainer (9) and **new** screw (10). Hand tighten.

NOTE

Clutch hub mainshaft nut has left-hand threads. Turn counterclockwise to install.

5. Clean and prime threads of clutch hub mainshaft nut. Apply two drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to the threads. Start nut onto mainshaft. Hand-tighten.
6. See Figure 5-12. Place the PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) between the teeth of the engine and clutch sprockets as shown.

NOTE

The compensating sprocket bolt is a T70 drive. Use T70 SOCKET BIT (Part No. Snap-on STX70E or equivalent).

7. Tighten compensating sprocket bolt (1) to 100 ft-lbs (135.6 Nm).
8. Loosen one-half turn.
9. Final tighten to 175 ft-lbs (237.3 Nm).
10. See Figure 5-13. Install the PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) between the teeth of the engine and clutch sprockets as shown.
11. Tighten clutch hub mainshaft nut (2) to 70-80 ft-lbs (94.9-108.5 Nm). Remove primary drive locking tool.
12. See Figure 5-14. Install release plate (2) with locknut (3) and adjuster screw into clutch hub bore. The word "OUT" stamped on the release plate faces out.

⚠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)

13. Inspect retaining ring (1) and replace if necessary. Install retaining ring in clutch hub bore. Verify the retaining ring is completely seated in the groove.
14. Adjust clutch. See 1.12 CLUTCH CABLE: ROAD KING, Adjustment.

NOTES

Primary chain tensioner is non-repairable. If tensioner is worn or damaged, replace assembly.

15. Tensioner parts can be disassembled. If primary chain tensioner becomes disassembled, assemble in order shown:
    a. See Figure 5-15. Locate end of spring rod (2) on roll pin (3).
    b. See Figure 5-16. Slide wedge of primary chain tensioner in direction of arrow until all travel is removed.
    c. See Figure 5-17. 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 end of cable strap is located below primary chain tensioner. Cable strap will hang below primary cover gasket surface and serve as a reminder to remove before installing primary cover.

NOTE

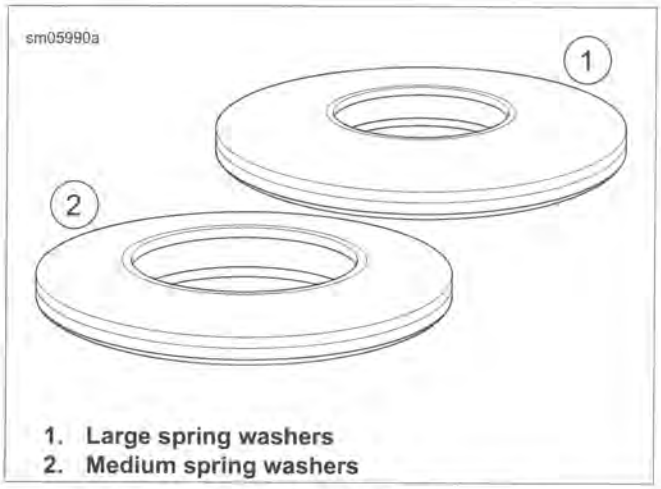
Primary chain tensioner will not complete chain adjustment until vehicle is ridden. Test ride vehicle after tensioner removal/installation to verify proper adjustment.

16. See Figure 5-18. Install primary chain tensioner (1) with fasteners (2). Tighten to 21-24 ft-lbs (28.5-32.6 Nm). Remove cable strap.

NOTES

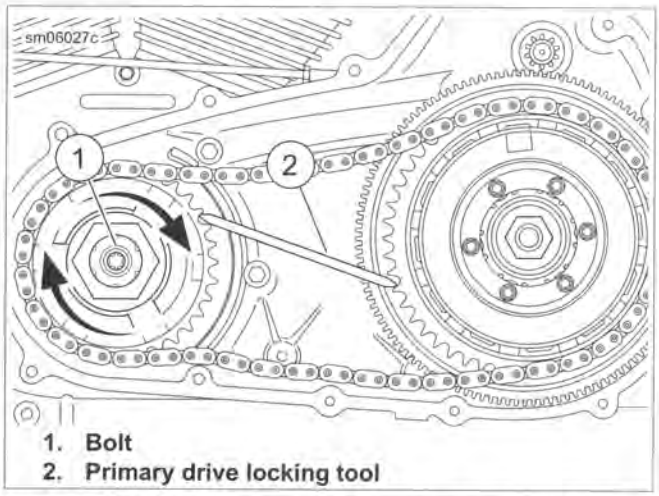
- *Always install a **new** gasket between primary cover and housing. Not replacing this gasket may cause primary chaincase leaks.*
- *Verify that all debris is washed from the inside ribs.*

17. Install primary chaincase cover. Fill primary chaincase. See 5.3 PRIMARY CHAINCASE COVER, Installation.
18. Connect negative battery cable.



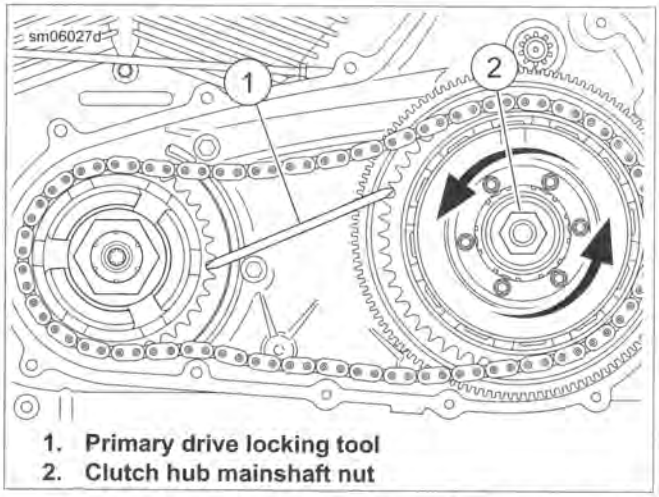
1. Large spring washers
2. Medium spring washers

Figure 5-11. Spring Washer Orientation



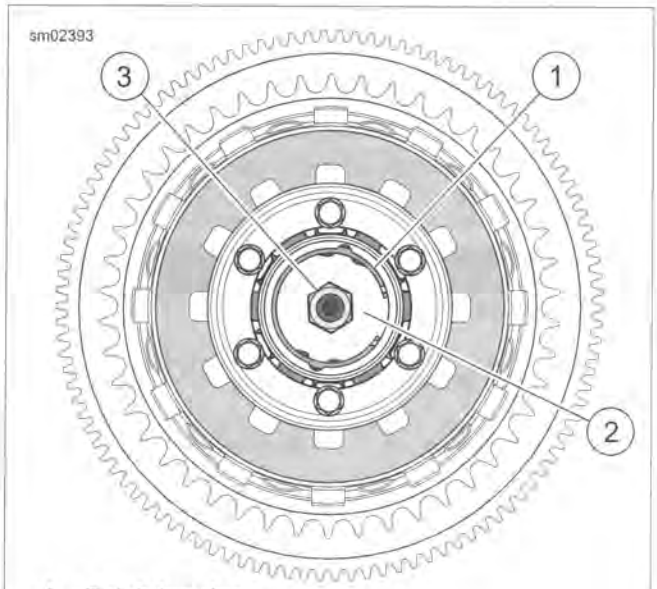
1. Bolt
2. Primary drive locking tool

Figure 5-12. Installing Engine Compensating Sprocket Bolt



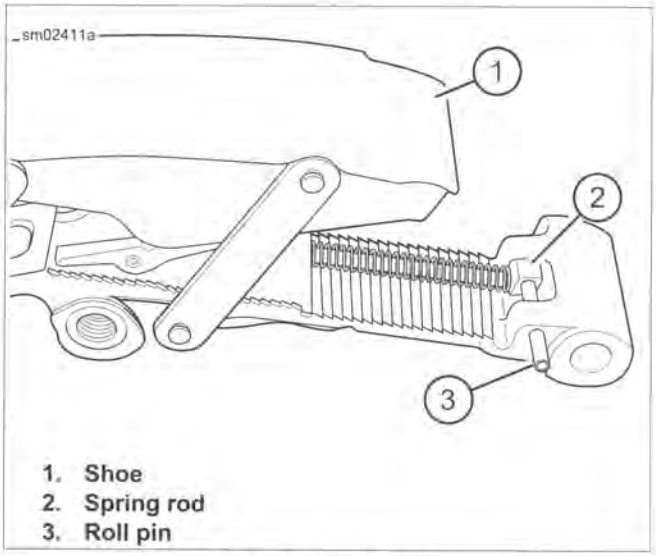
1. Primary drive locking tool
2. Clutch hub mainshaft nut

Figure 5-13. Installing Clutch Hub Mainshaft Nut



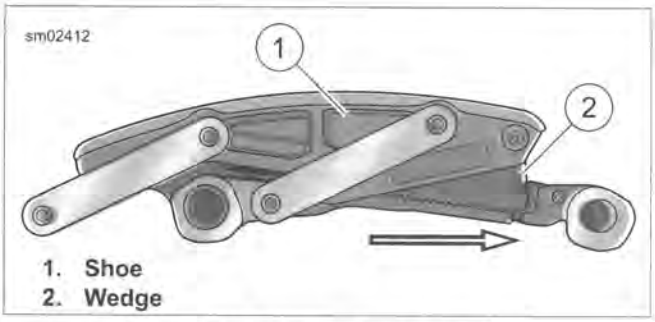
1. Retaining ring
2. Release plate
3. Locknut

Figure 5-14. Clutch



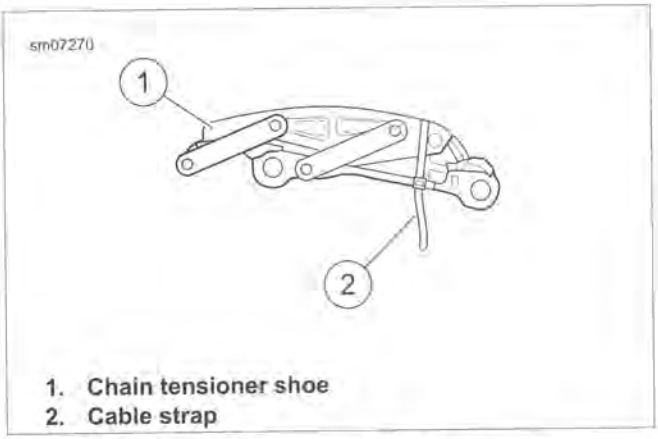
1. Shoe
2. Spring rod
3. Roll pin

Figure 5-15. Spring Rod Location



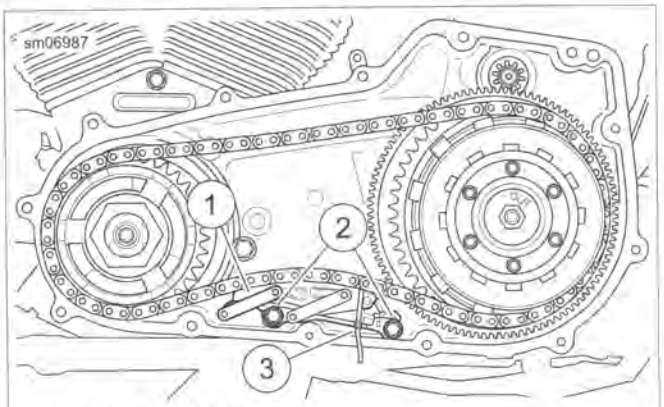
1. Shoe
2. Wedge

Figure 5-16. Primary Chain Tensioner



1. Chain tensioner shoe
2. Cable strap

Figure 5-17. Securing Chain Tensioner



1. Chain tensioner
2. Chain tensioner fasteners
3. Cable strap

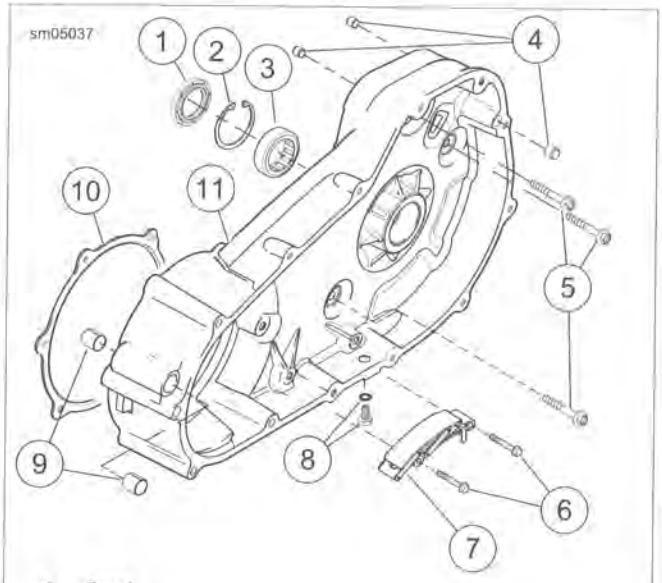
Figure 5-18. Chain Tensioner

REMOVAL

⚠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.
2. Remove primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
3. Remove starter. See 7.8 STARTER, Removal.
4. Remove primary chain, clutch and compensating sprocket. See 5.4 DRIVE COMPONENTS, Removal.
5. See Figure 5-19. Remove five sealing fasteners (5) and remove primary chaincase housing (11). Discard the crankcase gasket (10) and sealing fasteners.



1. **Seal**
2. **Retaining ring**
3. **Bearing**
4. **Dowel pin**
5. **Sealing fastener (5)**
6. **Chain tensioner fasteners**
7. **Chain tensioner**
8. **Drain plug and O-ring**
9. **Shifter shaft bushings**
10. **Crankcase gasket**
11. **Primary chaincase housing**

Figure 5-19. Primary Chaincase Housing

INSPECTION

1. Inspect primary chaincase for cracks or damaged gasket surface.
2. Check the mainshaft bearing. Replace if bearing does not rotate freely. Replace the lip seal. See 5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing and Seal.
3. Inspect shifter shaft bushings. Replace if worn or damaged. See 5.5 PRIMARY CHAINCASE HOUSING, Shifter Shaft Bushings.

MAINSHAFT BEARING AND SEAL

Removal

⚠WARNING

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

1. See Figure 5-19. Remove seal (1). Use a seal remover or rolling head pry bar for best results.
2. Remove retaining ring (2).

NOTE

Support the bearing support area on the transmission side of the primary chaincase while pressing bearing out.

3. Place inner primary chaincase in an arbor press with clutch side up.
4. Press out bearing from clutch side applying pressure to the outer race.

Installation

1. Inspect the bearing bore to verify that it is clean and smooth.

NOTE

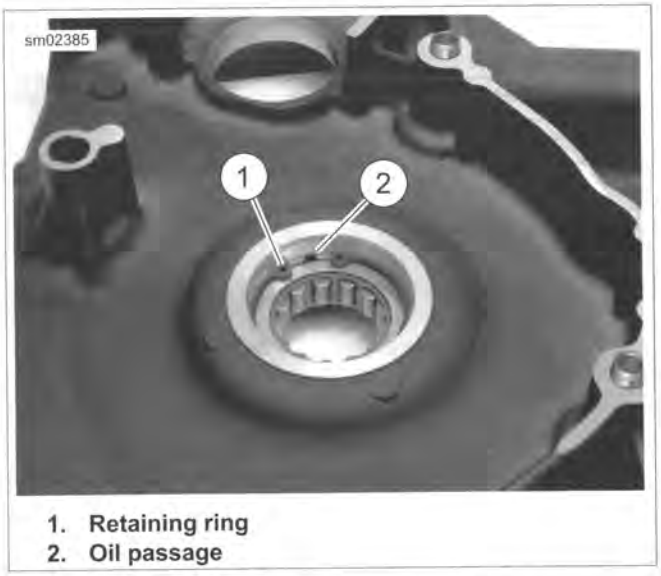
Support the bearing support area on the clutch side of the primary chaincase while pressing bearing in.

2. Place primary chaincase in arbor press with the transmission side up.
3. Apply a thin film of oil to outer diameter of bearing.
4. Applying pressure to the outer race, press **new** bearing letter side up until it makes solid contact with the bearing support area.
5. See Figure 5-20. Retaining ring (1) must be oriented as shown to prevent blocking of oil passage (2). Install retaining ring. Verify that the ring is fully seated in the groove and is properly oriented.

NOTES

- *The garter spring side of the oil seal is also identified by the words "OIL SIDE."*
- *Install oil seal with a seal driver that will press only against outer rim of oil seal, NOT against the inner area.*
- ***Minimum allowable depth:** Oil seal case is flush with machined surface of primary housing.*
- ***Maximum allowable depth:** Oil seal case contacts retaining ring.*

6. Install mainshaft oil seal:
   a. Lubricate the OD of the **new** seal with SCREAMIN' EAGLE ASSEMBLY LUBE. Place over bore with the lip garter spring side (stamped "OIL SIDE") facing toward the bearing.
   b. See Figure 5-21. Press the seal into bore until outer edge of seal is flush with machined surface of inner primary housing.
7. Lubricate the bearing and seal lip with multi-purpose grease or SCREAMIN' EAGLE ASSEMBLY LUBE.



1. **Retaining ring**
2. **Oil passage**

Figure 5-20. Retaining Ring Orientation

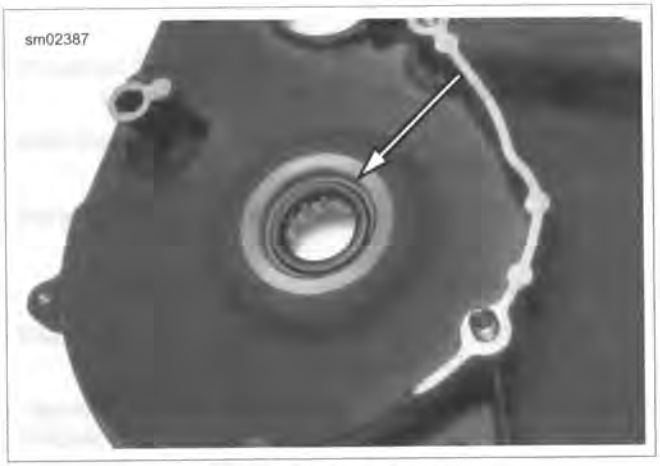


Figure 5-21. Oil Seal

MAINSHAFT BEARING INNER RACE

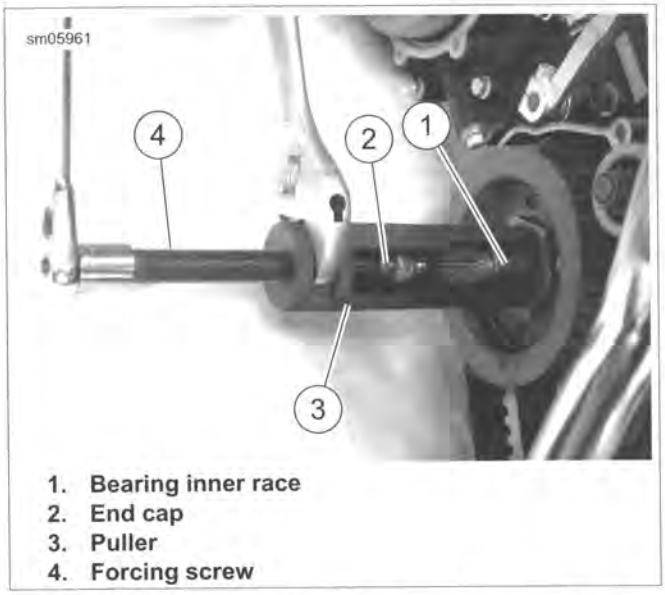
PART NUMBER	TOOL NAME
HD-34902-C	MAINSHAFT BEARING INNER RACE REMOVER/INSTALLER

Removal

NOTE

Bearing outer race installation requires properly aligned bearing inner race. Use the recommended tool, MAINSHAFT BEARING INNER RACE REMOVER/INSTALLER (Part No. HD-34902-C).

1. See Figure 5-22. Install end cap (2) into end of mainshaft.
2. Position puller (3) around mainshaft, under bearing inner race.
3. Turn forcing screw (4) clockwise while holding puller to remove bearing.



1. **Bearing inner race**
2. **End cap**
3. **Puller**
4. **Forcing screw**

Figure 5-22. Pulling Mainshaft Inner Bearing Race

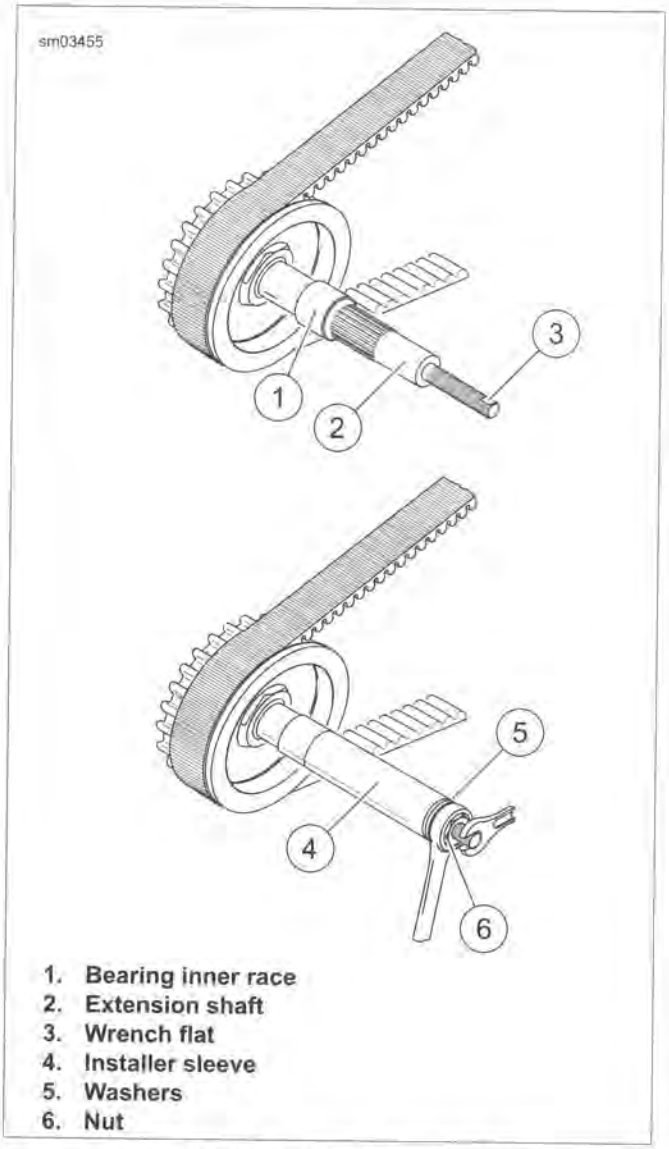
Installation

1. See Figure 5-23. Slide bearing inner race (1) onto mainshaft.

NOTE

Extension shaft has left-hand threads.

2. Install extension shaft (2) onto end of mainshaft.
3. Position installer sleeve (4) over extension shaft and against bearing inner race. Apply graphite lubricant to threads of extension shaft.
4. Place two washers (5) over threaded portion of extension shaft and install nut.
5. Tighten nut (6) while holding extension shaft stationary with wrench on flats (3) at end of screw threads. Press race onto shaft until edge of race contacts step on shaft.
6. Lubricate race with SCREAMIN' EAGLE ASSEMBLY LUBE.

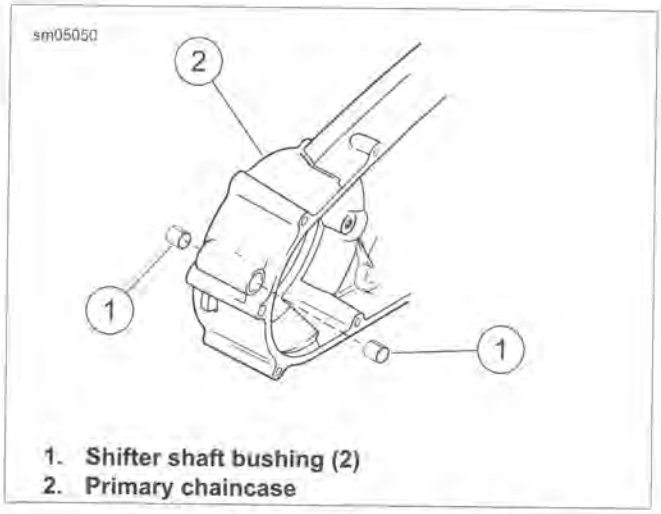


1. **Bearing inner race**
2. **Extension shaft**
3. **Wrench flat**
4. **Installer sleeve**
5. **Washers**
6. **Nut**

Figure 5-23. Installing Bearing Race

SHIFTER SHAFT BUSHINGS

1. See Figure 5-24. Press out old bushings (1) using an arbor press. Inspect the bushing bore to verify that it is clean and smooth.
2. Press **new** bushings into each side of the bore using an arbor press. Installed bushing must be flush to 0.010 in. (0.25 mm) below edge of bore.



1. **Shifter shaft bushing (2)**
2. **Primary chaincase**

Figure 5-24. Shifter Shaft Bushings

INSTALLATION

FASTENER	TORQUE VALUE	
Primary chaincase sealing fasteners	26-28 ft-lbs	35.3-38.0 Nm

NOTE

Cover mainshaft clutch hub splines with tape to prevent the splines damaging the inner primary cover oil seal.

1. Verify pivot shaft torque. See 2.22 REAR FORK, Installation.

NOTE

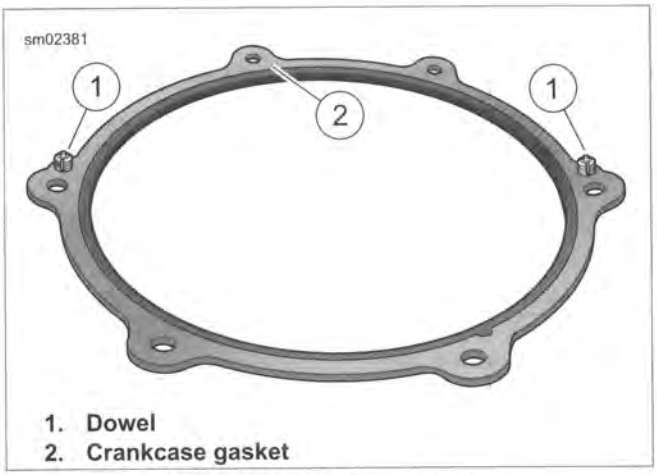
See Figure 5-25. Dowels (1) in crankcase gasket (2) must engage holes in crankcase.

2. See Figure 5-26. Position gasket on gasket surface (2). Verify dowels in gasket engage dowel holes (3).
3. Spread a thin film of oil on mainshaft oil seal lip and rubber portion of crankcase gasket.
4. Install chaincase. Avoid damaging mainshaft seal during installation.
5. See Figure 5-27. Insert **new** sealing fasteners.
6. See Figure 5-28. Tighten fasteners in sequence shown to 26-28 ft-lbs (35.3-38.0 Nm).
7. Install the primary chain, clutch, and compensating sprocket as an assembly. See 5.4 DRIVE COMPONENTS, Installation.
8. Install chain tensioner assembly.
9. Install starter. See 7.8 STARTER, Installation.

NOTE

*Always install a **new** gasket between primary chaincase cover and chaincase. Failure to replace this gasket may cause primary chaincase leaks.*

10. Install primary chaincase cover. Fill primary chaincase with lubricant. See 5.3 PRIMARY CHAINCASE COVER, Installation.
11. Adjust rear belt tension.
12. Connect negative battery cable.



1. Dowel
2. Crankcase gasket

Figure 5-25. Crankcase Gasket

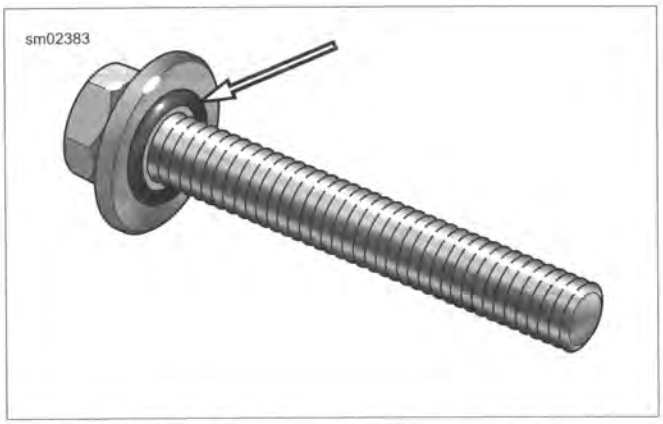
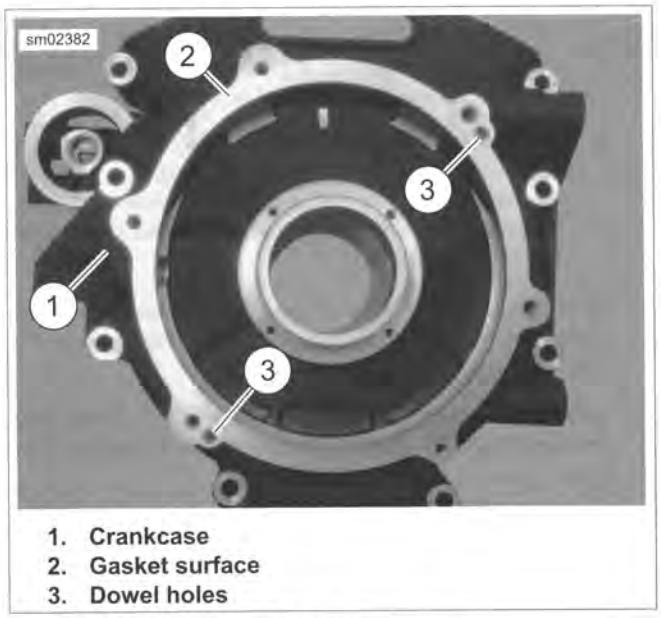


Figure 5-27. Primary Chaincase Sealing Fastener



1. Crankcase
2. Gasket surface
3. Dowel holes

Figure 5-26. Crankcase

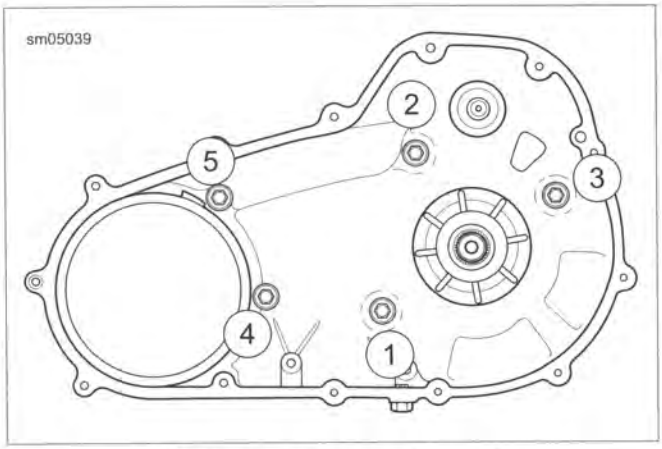


Figure 5-28. Sealing Fastener Torque Sequence

REMOVAL AND INSTALLATION

To remove the clutch without disassembly or for installation instructions, see 5.4 DRIVE COMPONENTS, Removal.

CLUTCH PACK ONLY

FASTENER	TORQUE VALUE	
Clutch diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm

Partial Disassembly

This procedure can be performed on the motorcycle without removing the clutch shell or hub.

1. Remove primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
2. See Figure 5-29. Remove six bolts (1) (metric) to release diaphragm spring retainer (2) from clutch hub. Loosen each bolt gradually and in a star sequence around the hub.
3. Remove diaphragm spring retainer, diaphragm spring (3) and pressure plate (4) from clutch hub.
4. Remove friction plates (5, 7), steel plates (6), damper spring (8) and damper spring seat (9) from clutch hub (11).

Cleaning And Inspection

⚠WARNING

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

1. Wash all parts in cleaning solvent, except for friction plates and bearing, if removed. Dry parts with low pressure compressed air.
2. Check **friction plates**:
   a. Use compressed air to remove all lubricant from the friction plates. Do not wipe off with a rag.
   b. Measure the thickness of each plate with a dial caliper or micrometer.
   c. If the thickness of any plate is less than 0.143 in. (3.62 mm), discard all friction plates and replace with an entirely **new** set.
   d. Look for worn or damaged fiber surface material (both sides).

NOTE

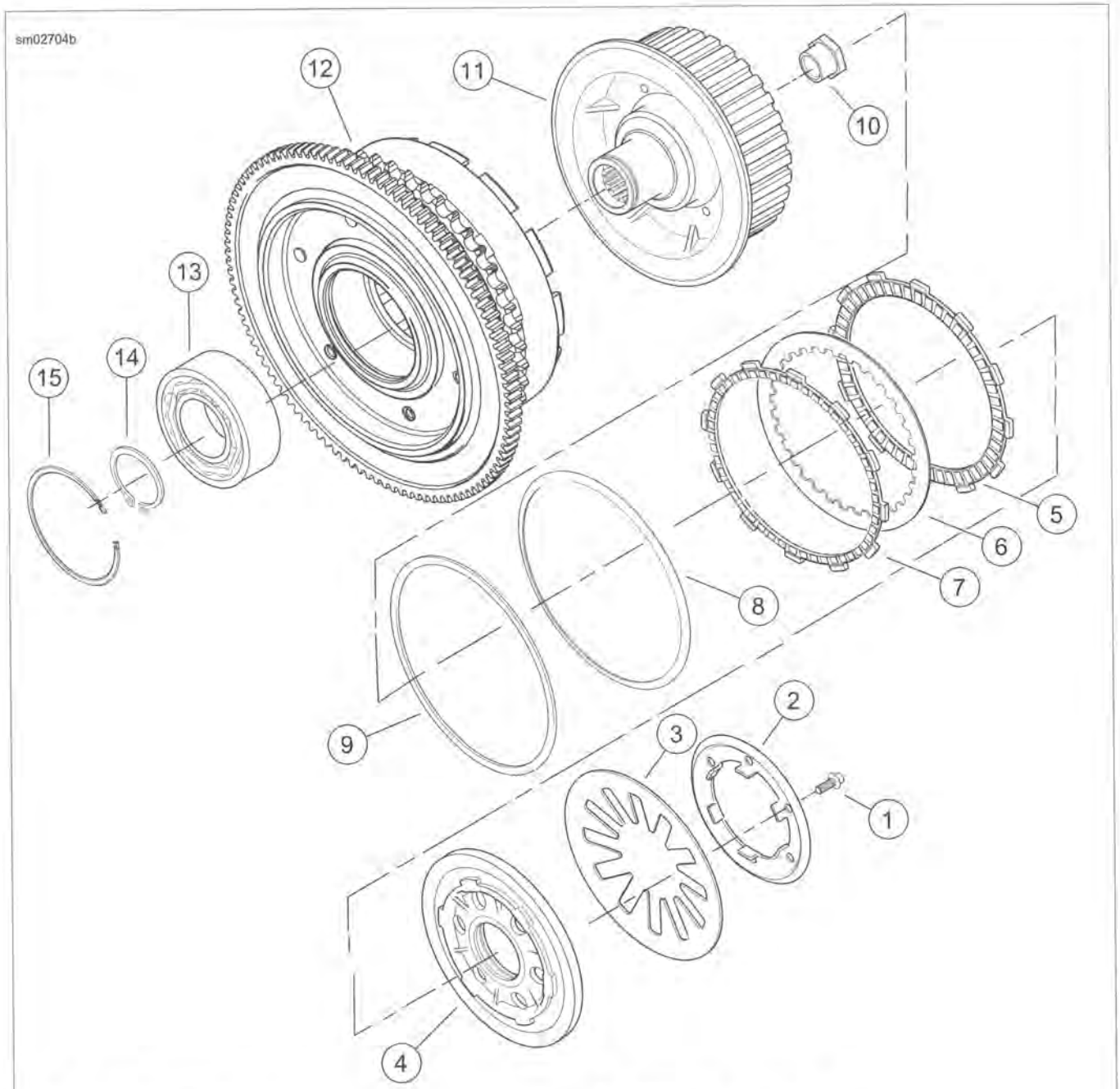
*Replace all nine friction plates with an entirely **new** set if any individual plate shows evidence of wear or damage.*

3. Check the **steel plates**:
   a. Discard any plate that is grooved or bluish in color. Blue plates are likely warped or distorted.
   b. Check each plate for distortion. Lay the plate on a precision flat surface. Insert a feeler gauge between the plate and the flat surface in several places. Replace any steel plate that is warped more than 0.006 in. (0.15 mm).
4. Hold the clutch hub and rotate the clutch shell to check bearing for smooth operation. Replace the bearing if it runs rough, binds or has any end play.
5. Inspect the primary chain sprocket and the starter ring gear on the clutch shell. Replace the clutch shell if either are badly worn or damaged.
6. Check the slots that mate with the clutch plates on both the clutch shell and hub. Replace if slots are worn or damaged.

NOTE

Springs are identified by a dab of paint on one face. See the parts catalog to verify the correct spring is installed.

7. Check the diaphragm spring and diaphragm spring retainer for cracks or bent tabs. Replace part if either condition exists.



1. **Bolt (6) (metric)**
2. **Diaphragm spring retainer**
3. **Diaphragm spring**
4. **Pressure plate**
5. **Friction plate (9)**
6. **Steel plate (8)**
7. **Narrow friction plate**
8. **Damper spring**
9. **Damper spring seat**
10. **Mainshaft nut (metric)**
11. **Clutch hub**
12. **Clutch shell**
13. **Bearing**
14. **Retaining ring**
15. **Retaining ring**

Figure 5-29. Clutch Shell Assembly

Assembly

NOTE

Submerge and soak all friction plates in primary chaincase lubricant for at least five minutes.

1. See Figure 5-30. Install the narrow friction plate on the clutch hub.
2. See Figure 5-29. Install damper spring seat (9) on clutch hub (11). It must sit inboard of narrow friction plate (7).

NOTE

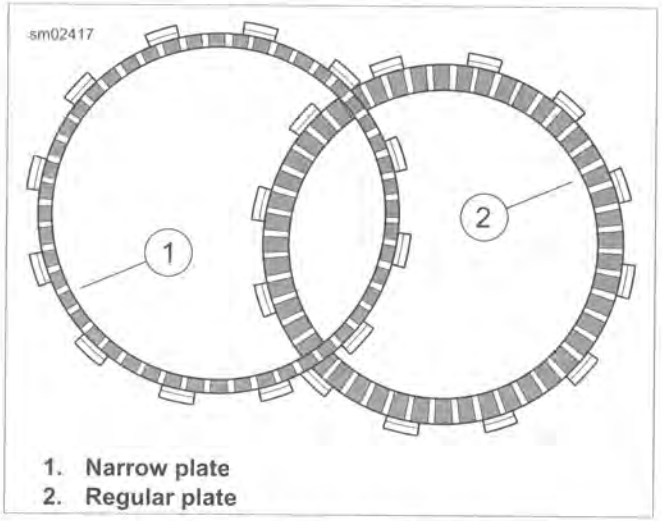
See Figure 5-35. Notice damper spring (4) orientation with respect to damper spring seat (3).

3. See Figure 5-29. Install damper spring (8) on clutch hub with the concave side facing away from damper spring seat.
4. Install a steel plate (6) with round edge outward and then a friction plate (5) on the clutch hub. Install seven remaining sets in the same manner, alternating between steel plates and friction plates.
5. Install pressure plate (4) on clutch hub aligning holes in plate with threaded bosses on hub.
6. Seat diaphragm spring (3) in recess of pressure plate with the concave side inward.
7. Align holes in diaphragm spring retainer (2) with threaded bosses on clutch hub. Tabs on spring retainer contact flats on inboard side of bosses.
8. Install six bolts (1) (metric) to secure diaphragm spring retainer to clutch hub. Alternately tighten to 70-100 **in-lbs** (7.9-11.3 Nm).

NOTE

*Always install a **new** gasket between primary chaincase cover and chaincase. Failure to replace this gasket may cause primary chaincase leaks.*

9. Install primary chaincase cover. Fill primary chaincase with lubricant. See 5.3 PRIMARY CHAINCASE COVER, Installation.



1. **Narrow plate**
2. **Regular plate**

Figure 5-30. Friction Plates

CLUTCH PACK AND BEARING

Complete Disassembly

1. Remove the primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
2. Remove clutch assembly. See 5.4 DRIVE COMPONENTS, Removal.
3. Follow all partial disassembly information under 5.6 CLUTCH, Clutch Pack Only.

NOTE

Do not disassemble the clutch shell and hub assembly unless the bearing, hub or shell require replacement. Replace the bearing if disassembled.

⚠WARNING

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

4. See Figure 5-31. Remove retaining ring.
5. See Figure 5-32. Support clutch shell in arbor press with ring gear side up. Use a suitable press plug to press hub from bearing in clutch shell.
6. See Figure 5-33. Remove retaining ring from groove in clutch shell bore.
7. See Figure 5-34. Support clutch shell in arbor press with ring gear side is down. Use a suitable press plug to remove bearing.
8. Clean and inspect components. See 5.6 CLUTCH, Clutch Pack Only.

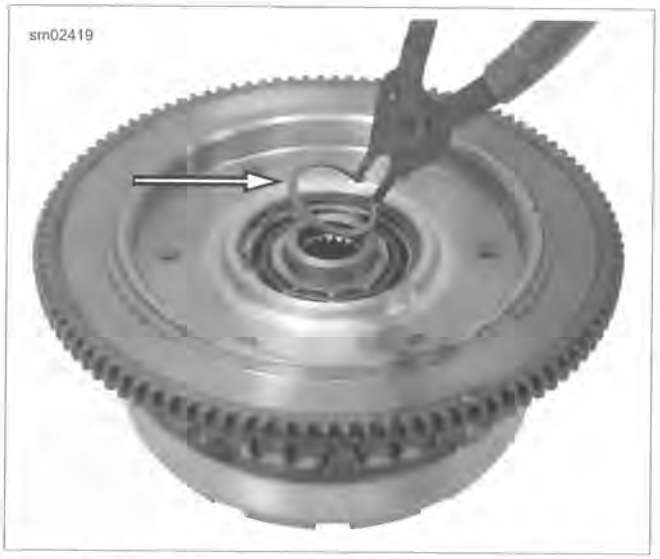


Figure 5-31. Clutch Hub Retaining Ring

Figure 5-32. Pressing Clutch Hub From Bearing

Assembly

1. Place clutch shell in arbor press with ring gear side up. Support clutch shell bore on sprocket side to avoid damage to ears on clutch basket.
2. Using a suitable press plug, press against outer race until bearing contacts shoulder in clutch shell bore.

⚠WARNING

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

3. See Figure 5-33. Install retaining ring with flat side toward bearing.
4. Place clutch shell in arbor press with sprocket side up. Center hub in bearing. Support bearing inner race with a sleeve on transmission side.
5. Press hub into bearing until shoulder contacts bearing inner race.
6. See Figure 5-31. Turn assembly over. Install retaining ring in groove of clutch hub.
7. Assemble clutch components. See 5.6 CLUTCH, Clutch Pack Only.
8. Install clutch. See 5.4 DRIVE COMPONENTS, Installation.

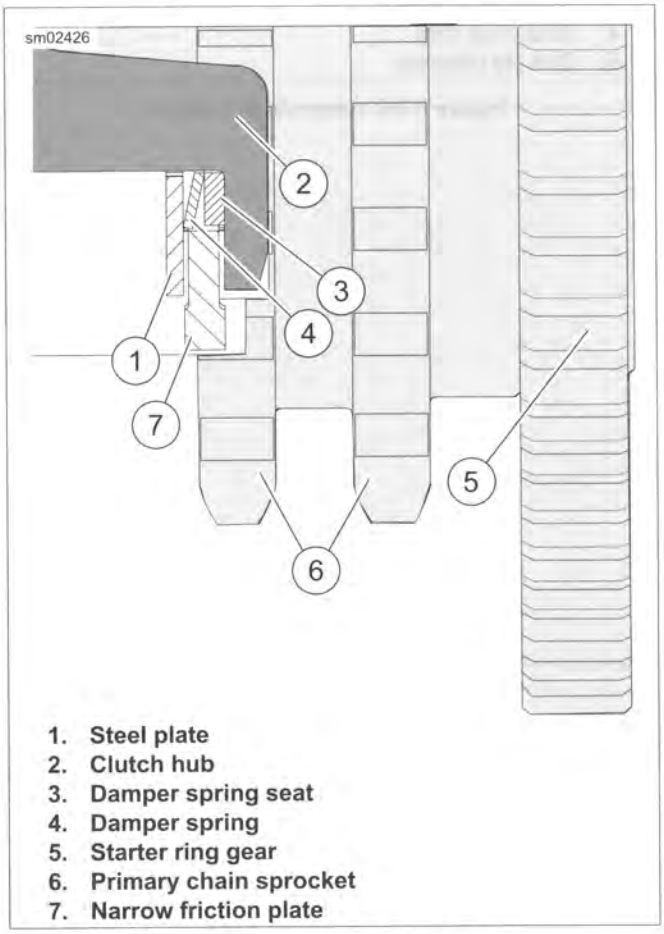
NOTE

*Always install a **new** gasket between primary chaincase cover and chaincase. Failure to replace this gasket may cause primary chaincase leaks.*

9. Install primary chaincase cover. Fill primary chaincase with lubricant. See 5.3 PRIMARY CHAINCASE COVER, Installation.

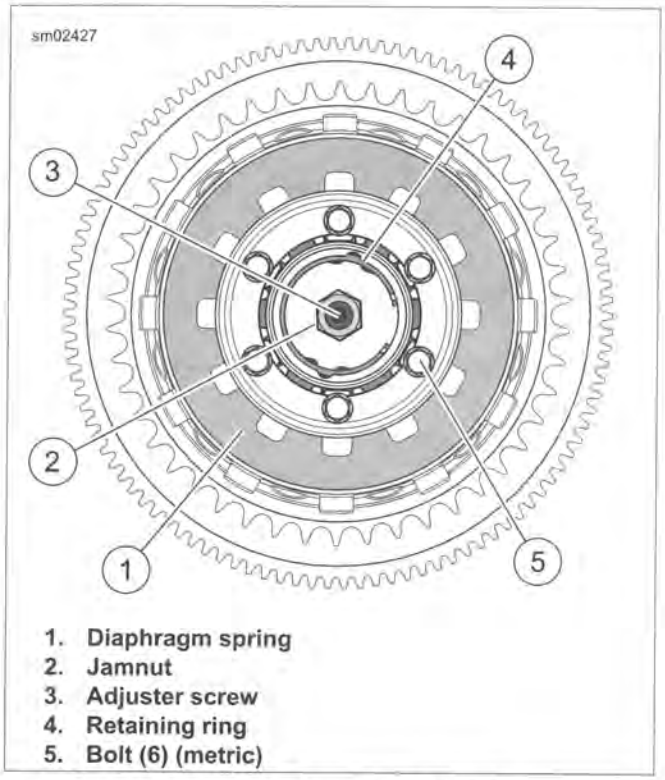
Figure 5-33. Install Clutch Shell Retaining Ring with Flat Side Against Bearing

Figure 5-34. Pressing Bearing From Clutch Shell



1. **Steel plate**
2. **Clutch hub**
3. **Damper spring seat**
4. **Damper spring**
5. **Starter ring gear**
6. **Primary chain sprocket**
7. **Narrow friction plate**

Figure 5-35. Clutch Stackup



1. Diaphragm spring
2. Jamnut
3. Adjuster screw
4. Retaining ring
5. Bolt (6) (metric)

Figure 5-36. Assembled Clutch

REMOVAL

1. Remove seat.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

2. Remove negative cable from battery.
3. See Figure 5-37. Remove clutch inspection cover.
4. See Figure 5-38. Remove bearing plate retaining ring (1).
5. Pull out release bearing plate (3) with release bearing (4) and pushrod (5).
6. Remove pushrod retainer (2).
7. Press release bearing out of bearing plate.

INSTALLATION

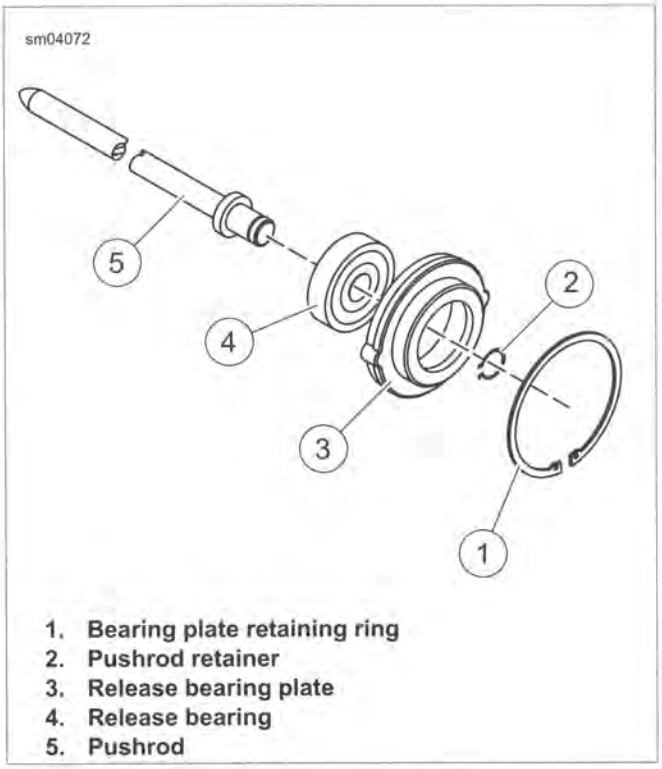
FASTENER	TORQUE VALUE	
Clutch inspection cover	84-108 **in-lbs**	9.5-12.2 Nm

1. See Figure 5-38. Pressing on the outer race, press a **new** release bearing (4) into bearing plate (3).
2. Assemble pushrod (5) to bearing.
3. Snap in pushrod retainer (2).
4. Slide pushrod and clutch release bearing assembly through clutch pack to secondary clutch actuator.
5. Snap in bearing plate retaining ring (1).

NOTE

Before installing clutch inspection cover check pushrod and release plate movement.

Figure 5-37. Clutch Release Bearing



1. **Bearing plate retaining ring**
2. **Pushrod retainer**
3. **Release bearing plate**
4. **Release bearing**
5. **Pushrod**

Figure 5-38. Pushrod and Release Bearing

Measure Release Plate Movement

1. Attach a dial indicator to measure pushrod axial movement.

⚠WARNING

Insufficient clutch-release plate movement can lead to difficulty or inability to shift, causing loss of control, which could result in death or serious injury. (00345a)

2. Actuate the clutch lever to measure the axial movement of the pushrod and the clutch-release plate assembly. The minimum axial movement must be as specified. Refer to Table 5-4.

NOTE

Proper bleeding of the system will typically yield plate movement greater than specification. If clutch release plate movement is less than specification, bleed system and measure plate movement again.

Table 5-4. Minimum Release Plate Movement Specification

IN	MM
0.080	2.03

Install Clutch Inspection Cover

1. Thoroughly clean all gasket material from clutch inspection cover and mating surface on primary cover.

2. See Figure 5-39. Install clutch inspection cover with **new** gasket. Make sure the correct side of the gasket faces the clutch inspection cover. In sequence shown, tighten fasteners to 84-108 **in-lbs** (9.5-12.2 Nm).
3. Connect negative battery cable to battery.

⚠WARNING

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

4. Install seat.

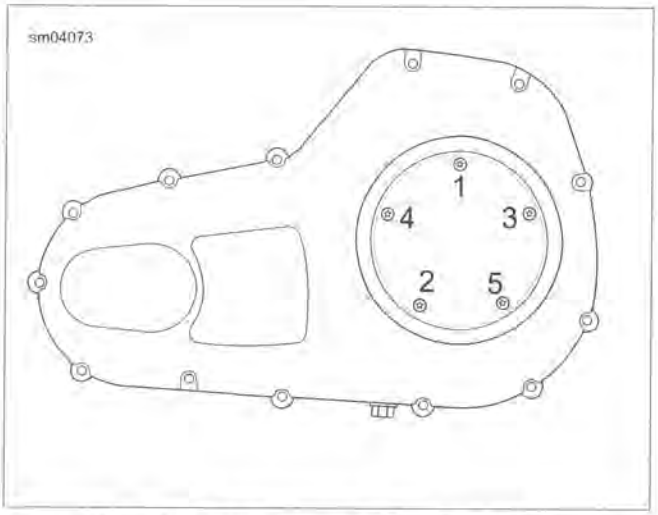


Figure 5-39. Clutch Inspection Cover Torque Sequence

REMOVAL

PART NUMBER	TOOL NAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT

1. Remove primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
2. Loosen drive belt tension. See 1.14 DRIVE BELT AND SPROCKETS.

NOTE

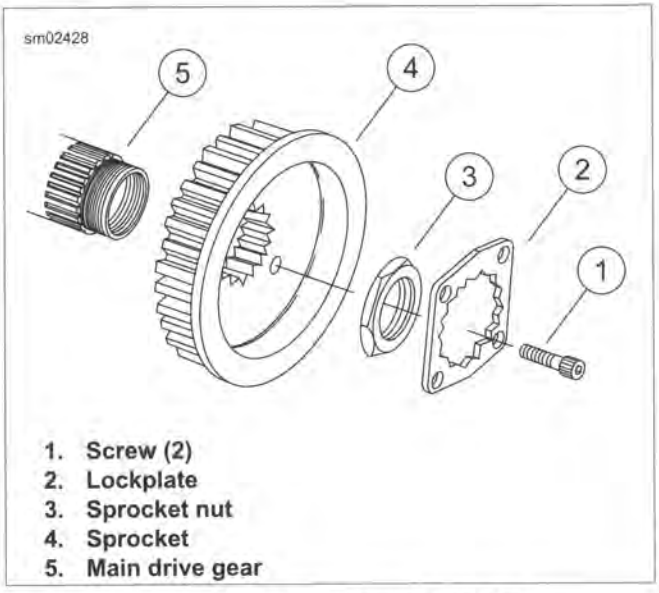
Remove sprocket nut only while transmission is installed in frame. Failure to do so will result in damage to transmission and/or transmission stand.

3. See Figure 5-40. Remove two screws (1) and lockplate (2).
4. See Figure 5-41. Install FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-46282A) (2) so that arm of tool rests against bottom of rear fork pivot (1).

NOTE

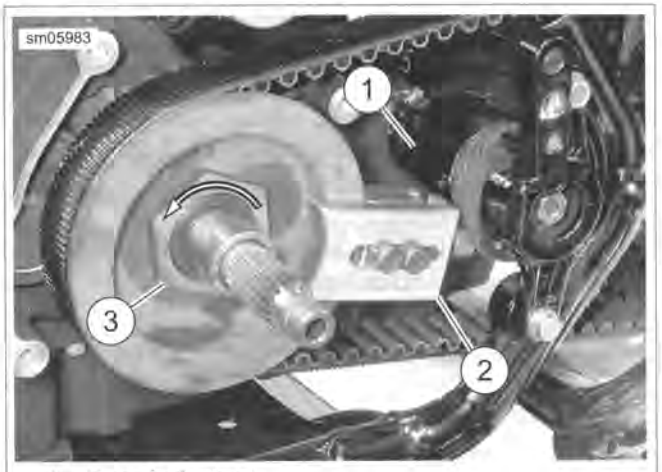
Sprocket nut has a right-hand thread.

5. Install PILOT (Part No. HD-94660-2) on mainshaft.
6. Remove the sprocket nut (3) using MAINSHAFT LOCKNUT WRENCH (Part No. HD-47910) (1).
7. 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 5-40. Transmission Sprocket



1. **Rear fork pivot**
2. **Final drive sprocket locking tool**
3. **Sprocket nut**

Figure 5-41. Sprocket Nut Removal

CLEANING AND INSPECTION

1. Using a non-volatile cleaning solvent, clean sprocket of all grease and dirt.
2. Inspect belt and sprocket. See 1.14 DRIVE BELT AND SPROCKETS, Inspection.
3. Inspect both main drive gear and mainshaft seals. Replace if damaged.

INSTALLATION

PART NUMBER	TOOL NAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT
SNAP-ON TA360	TORQUE ANGLE GAUGE

FASTENER	TORQUE VALUE	
Transmission sprocket nut, 1st torque	100 ft-lbs	135.6 Nm
Transmission sprocket nut, 2nd torque	35 ft-lbs	47.5 Nm
Transmission sprocket nut, final torque	35-40 degrees	35-40 degrees
Transmission sprocket lock-plate screws	90-120 **in-lbs**	10.2-13.6 Nm

NOTE

Install sprocket nut only while transmission is installed in frame. Failure to do so will result in damage to transmission and/or transmission stand.

1. Place transmission sprocket in position. Install the belt on the sprocket as the sprocket is installed.

2. If reusing the sprocket nut, apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to the threads of the sprocket nut.

NOTES

- *Never get oil on the threads of the sprocket nut or the integrity of the lock patch may be compromised.*
- *The transmission sprocket nut has **right-hand** threads. Turn the nut **clockwise** to install.*

3. See Figure 5-40. Apply a thin film of clean engine oil on the inner face of the sprocket nut (3) and the outer face of the sprocket (4) where the two parts contact each other. Install the sprocket nut finger-tight.
4. See Figure 5-42. Lock transmission sprocket with the FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-46282A) (2). The locking tool must rest against the rear fork pivot (3).
5. Install PILOT (Part No. HD-94660-2) on mainshaft.
6. Using MAINSHAFT LOCKNUT WRENCH (Part No. HD-47910), tighten sprocket nut to 100 ft-lbs (135.6 Nm) initial torque.
7. Loosen sprocket nut one full turn.
8. Tighten to 35 ft-lbs (47.5 Nm).

NOTE

See Figure 5-43. To determine proper angles during final tightening, scribe lines (3) or use TORQUE ANGLE GAUGE (Part No. SNAP-ON TA360) after the 35 ft-lbs (47.5 Nm) torque is applied.

9. Continue an additional 35-40 degrees (35-40 degrees).

NOTE

The lockplate has four screw holes and can be installed either side out. If the screw holes cannot be properly aligned, tighten the nut slightly to align. Do not exceed 45 degrees. Never LOOSEN nut to align the screw holes.

10. Install lockplate over transmission sprocket nut with two lockplate holes aligned with tapped holes in sprocket.

NOTES

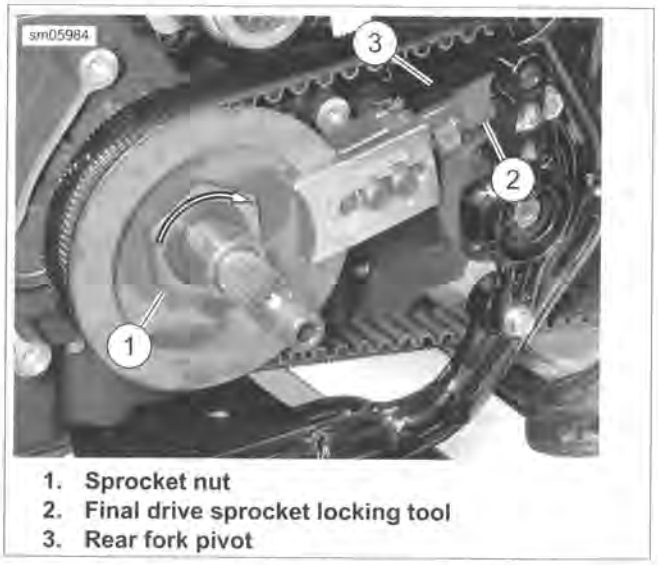
- ***New** screws have lock patches.*
- *Screws can be reused up to three times if LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) is applied before installation.*
- *Always install BOTH screws.*

11. See Figure 5-40. Install two screws (1) to secure lockplate (2). Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
12. Install primary chain assembly. See 5.4 DRIVE COMPONENTS.

NOTE

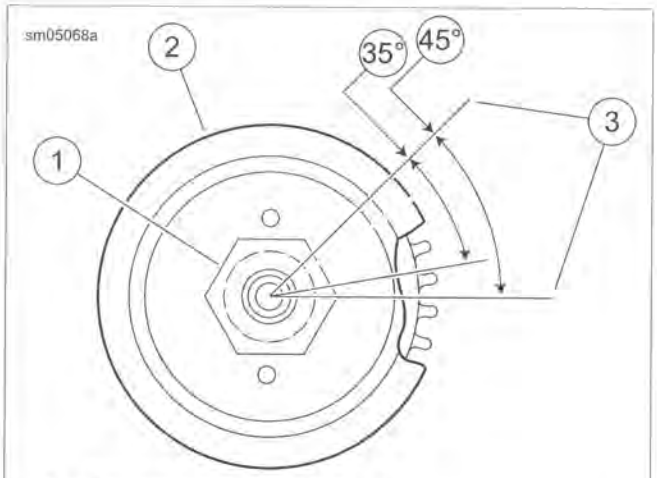
*Always install a **new** gasket between primary cover and housing. Not replacing this gasket may cause primary chaincase leaks.*

13. Install primary chaincase cover. Fill primary chaincase. See 5.3 PRIMARY CHAINCASE COVER.
14. Verify pivot shaft torque. See 2.22 REAR FORK.
15. Adjust drive belt deflection. See 1.14 DRIVE BELT AND SPROCKETS.



1. **Sprocket nut**
2. **Final drive sprocket locking tool**
3. **Rear fork pivot**

Figure 5-42. Sprocket Nut Installation



1. **Transmission sprocket nut**
2. **Transmission sprocket**
3. **Scribed lines**

Figure 5-43. Transmission Sprocket Nut Final Tightening

REMOVAL AND ADJUSTMENT

Adjustment

See 1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection.

Removal

1. Remove rear wheel and rear fork. See 2.22 REAR FORK.
2. Remove primary chain, clutch, engine compensating sprocket and chain adjuster as an assembly. See 5.4 DRIVE COMPONENTS.
3. Remove primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING, Removal.
4. Remove belt from transmission sprocket.

INSTALLATION

⚠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. Install belt over transmission sprocket.
2. Install the primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING, Installation.

NOTE

*Always install a **new** gasket between primary chaincase cover and chaincase. Failure to replace this gasket may cause primary chaincase leaks.*

3. Install primary chain assembly. See 5.4 DRIVE COMPONENTS.
4. Install primary chaincase cover. Fill primary chaincase with lubricant. See 5.3 PRIMARY CHAINCASE COVER.
5. Install rear fork and rear wheel. See 2.22 REAR FORK.
6. Adjust belt tension. See 1.14 DRIVE BELT AND SPROCKETS.

NOTES

SUBJECT	PAGE NO.
6.1 FASTENER TORQUE VALUES	6-1
6.2 SPECIFICATIONS: TRANSMISSION	6-2
6.3 TRANSMISSION	6-3
6.4 SHIFTER LINKAGE	6-5
6.5 CLUTCH RELEASE COVER: CABLE CLUTCH	6-7
6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH	6-9
6.7 SECONDARY CLUTCH ACTUATOR	6-10
6.8 TRANSMISSION ASSEMBLY	6-11
6.9 MAIN DRIVE GEAR AND BEARING	6-23
6.10 TRANSMISSION CASE	6-30

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Clutch cable fitting	90-120 **in-lbs**	10.2-13.6 Nm	6.5 CLUTCH RELEASE COVER: CABLE CLUTCH, Assembly and Installation
Clutch release cover screws	132-156 **in-lbs**	14.9-17.6 Nm	6.5 CLUTCH RELEASE COVER: CABLE CLUTCH, Assembly and Installation
Mainshaft/countershaft nuts	85-95 ft-lbs	115.3-128.8 Nm	6.8 TRANSMISSION ASSEMBLY, Assembly
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	6.10 TRANSMISSION CASE, Installation
Secondary clutch actuator	100-120 **in-lbs**	11.2-13.6 Nm	6.7 SECONDARY CLUTCH ACTUATOR, Replacement
Shift drum detent arm fastener	120-150 **in-lbs**	13.6-17.0 Nm	6.8 TRANSMISSION ASSEMBLY, Assembly
Shift drum lock plate fasteners	57-63 **in-lbs**	6.4-7.1 Nm	6.8 TRANSMISSION ASSEMBLY, Assembly
Shifter pawl centering screw	18-23 ft-lbs	24.4-31.2 Nm	6.10 TRANSMISSION CASE, Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	6.4 SHIFTER LINKAGE, Heel-Toe Shift Levers
Shifter rod jamnut	80-120 **in-lbs**	9.0-13.6 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Adjustment
Shifter rod lever pinch screw, front lever	90-110 **in-lbs**	10.2-12.4 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Lever, Front
Shifter rod lever pinch screw, transmission lever	18-22 ft-lbs	24.4-29.8 Nm	6.10 TRANSMISSION CASE, Assembly
Shifter rod to front lever nut	70-90 **in-lbs**	7.9-10.2 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Adjustment
Shifter rod to front lever nut	70-90 **in-lbs**	7.9-10.2 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Lever, Front
Shift lever pinch screw, heel and toe levers	18-22 ft-lbs	24.4-29.8 Nm	6.4 SHIFTER LINKAGE, Heel-Toe Shift Levers
Transmission bearing housing screws	22-25 ft-lbs	29.8-33.9 Nm	6.8 TRANSMISSION ASSEMBLY, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.8 TRANSMISSION ASSEMBLY, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.10 TRANSMISSION CASE, Installation
Transmission inner side cover screw	100-120 **in-lbs**	11.2-13.6 Nm	6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH, Installation
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	6.10 TRANSMISSION CASE, Installation
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm	6.10 TRANSMISSION CASE, Installation
Transmission outer side cover screw	100-120 **in-lbs**	11.2-13.6 Nm	6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH, Installation
Transmission top cover	90-120 **in-lbs**	10.2-13.6 Nm	6.8 TRANSMISSION ASSEMBLY, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	6.10 TRANSMISSION CASE, Installation

SPECIFICATIONS

Table 6-1. 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 (dry)	32 oz. (946.4 ml)

Table 6-2. Transmission Gear Ratios

GEAR	GEAR RATIO
First (low)	3.34
Second	2.31
Third	1.72
Fourth	1.39
Fifth	1.19
Sixth (high)	1.00

NOTE

Final gear ratios indicate the number of mainshaft revolutions required to drive the output sprocket one revolution.

SERVICE WEAR LIMITS

Table 6-3. Main Drive Gear Specifications

MAIN DRIVE GEAR (6th)	IN	MM
Bearing fit in transmission case (loose)	0.0003-0.0017	0.0076-0.043
Fit in bearing (press-fit)	0.001-0.003	0.025-0.076
End play	none	none

Table 6-4. Mainshaft Tolerance Specifications

MAINSHAFT TOLERANCE	IN.	MM
Mainshaft runout	0.000-0.003	0.00-0.08
Mainshaft end play	none	none
5th gear end play (axial)	0.002-0.026	0.05-0.66
5th gear clearance (radial)	0.0004-0.0020	0.009-0.052
Main drive gear (6th) fit	0.0009-0.0022	0.023-0.056

Table 6-5. 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
1st gear end play (axial)	0.001-0.023	0.03-0.58
1st gear clearance (radial)	0.0004-0.0020	0.010-0.052
2nd gear end play (axial)	0.001-0.40	0.03-1.02
2nd gear clearance (radial)	0.0004-0.0020	0.010-0.052
3rd gear end play (axial)	0.001-0.042	0.03-1.07
3rd gear clearance (radial)	0.0004-0.0020	0.010-0.052
4th gear end play (axial)	0.001-0.028	0.03-0.71
4th gear clearance (radial)	0.0004-0.0020	0.010-0.052

Table 6-6. Shifter Dog Clearance Specifications

SHIFTER DOG	IN	MM
1st	0.013-0.121	0.33-3.07
2nd	0.016-0.138	0.41-3.51
3rd	0.010-0.125	0.25-3.17
4th	0.018-0.129	0.46-3.28
5th	0.007-0.117	0.18-2.97
6th	0.022-0.131	0.56-3.33

Table 6-7. 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 6-8. 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

POWER FLOW

See Figure 6-1. 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 1st, 2nd, 3rd and 4th gears are rotating. No power is transferred to the countershaft since countershaft 1st, 2nd, 3rd and 4th gears are freewheeling gears.

First Gear

When the transmission is shifted into first gear, the dog ring between countershaft 1st and 2nd, which rotates with the countershaft, engages countershaft 1st, which has been spinning freely on the countershaft driven by mainshaft 1st.

Now countershaft 1st is no longer freewheeling, but locked to the countershaft causing the countershaft and countershaft 6th to turn. Countershaft 6th 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 1st and 2nd is shifted out of countershaft 1st and engages countershaft 2nd. This locks countershaft 2nd 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 1st and 2nd to its neutral position. At the same time another fork engages the dog ring between countershaft 3rd and 4th with countershaft 3rd. This locks countershaft 3rd to the countershaft to complete the power flow as shown (3).

Fourth Gear

Fourth gear is engaged when the dog ring between countershaft 3rd and 4th is shifted out of countershaft 3rd and engages countershaft 4th. This locks countershaft 4th 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 3rd and 4th to its neutral position. At the same time another fork engages the dog ring between mainshaft 5th and 6th with mainshaft 5th. This locks mainshaft 5th 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 5th and 6th is shifted out of mainshaft 5th. It is shifted directly into the main drive gear (6th 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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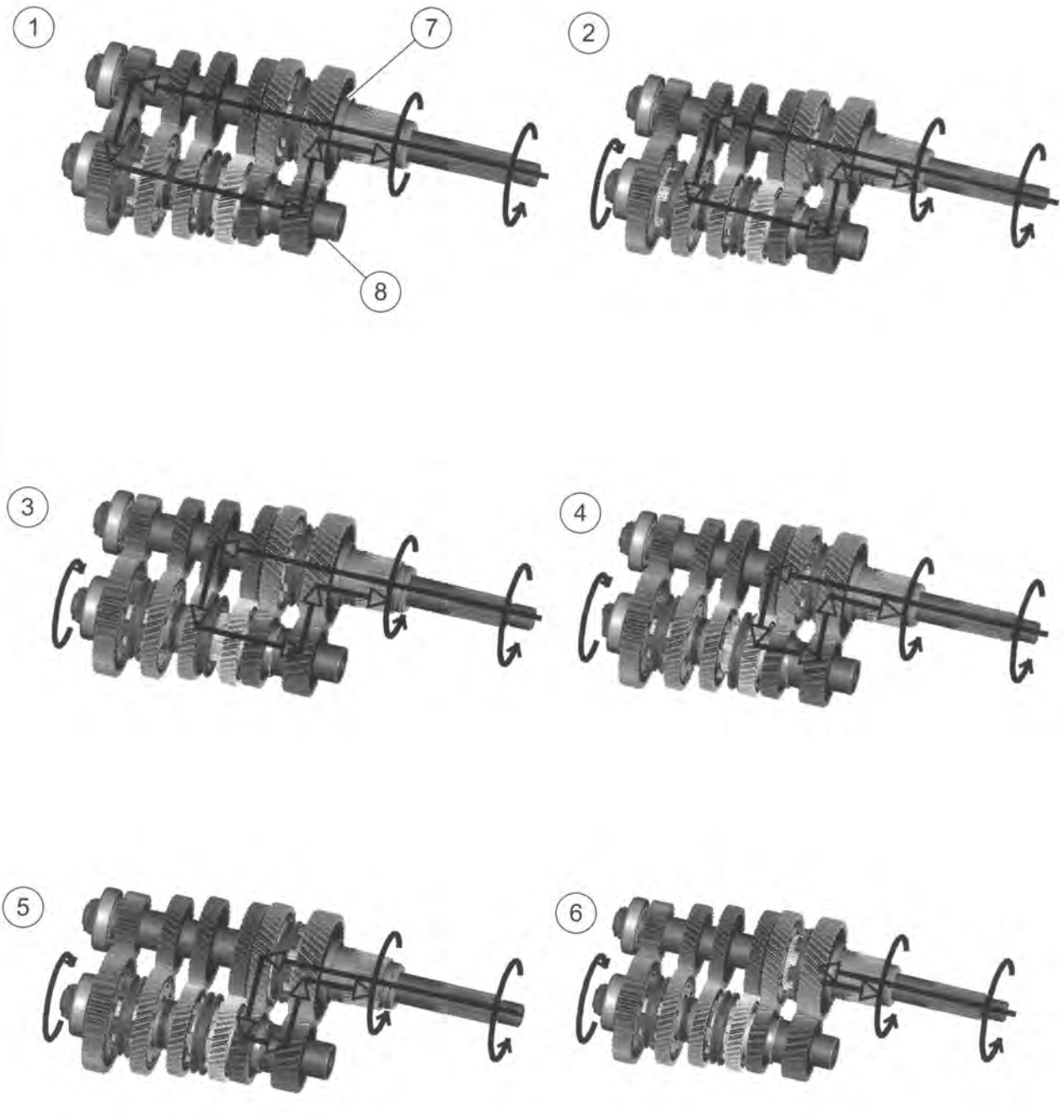


1. First gear
2. Second gear
3. Third gear
4. Fourth gear
5. Fifth gear
6. Sixth gear
7. Mainshaft
8. Countershaft

Figure 6-1. Transmission Power Flow

SHIFTER ROD ADJUSTMENT

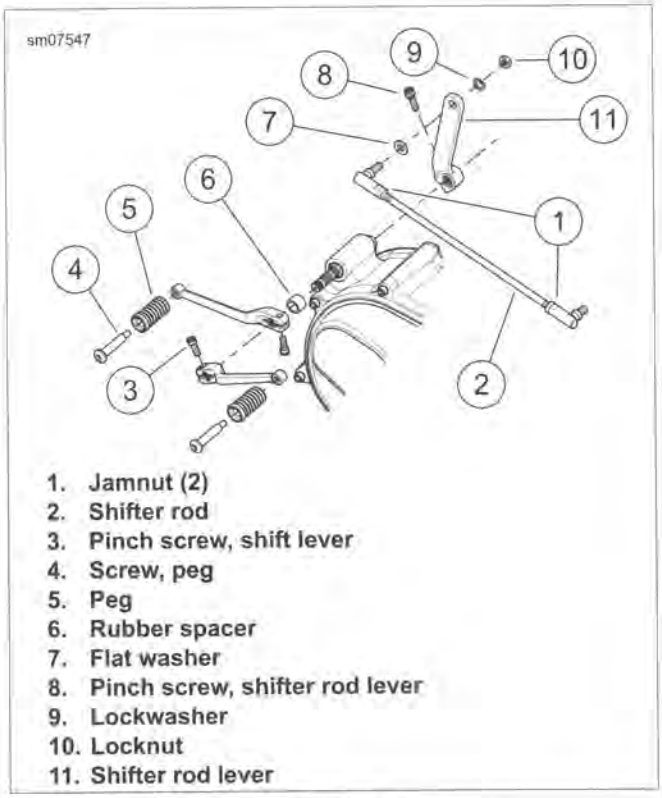
FASTENER	TORQUE VALUE	
Shifter rod to front lever nut	70-90 **in-lbs**	7.9-10.2 Nm
Shifter rod jamnut	80-120 **in-lbs**	9.0-13.6 Nm

The shifter rod length is set at the factory and should not require adjustment under normal circumstances. However, if full engagement or full lever travel is not achieved, adjust the shifter rod.

NOTE

Do not allow shift levers to contact footboard when shifting. This prevents proper gear engagement. Contact may also damage the transmission.

1. See Figure 6-2. Remove nut (10), lockwasher (9) and flat washer (7) to free front end of shifter rod from inner shift arm.
2. Loosen jamnuts (1) and adjust rod (2) as necessary.
3. Install flat washer, lockwasher and nut to fasten shifter rod to inner shift arm.
4. Tighten locknut (10) to 70-90 **in-lbs** (7.9-10.2 Nm).
5. Tighten jamnuts (1) to 80-120 **in-lbs** (9.0-13.6 Nm).



1. **Jamnut (2)**
2. **Shifter rod**
3. **Pinch screw, shift lever**
4. **Screw, peg**
5. **Peg**
6. **Rubber spacer**
7. **Flat washer**
8. **Pinch screw, shifter rod lever**
9. **Lockwasher**
10. **Locknut**
11. **Shifter rod lever**

Figure 6-2. Shifter Linkage

HEEL-TOE SHIFT LEVERS

FASTENER	TORQUE VALUE	
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm
Shift lever pinch screw, heel and toe levers	18-22 ft-lbs	24.4-29.8 Nm

Removal

1. See Figure 6-2. Mark position of levers in relation to shaft.
2. Remove pinch screws securing heel and toe shift levers.
3. Remove levers from shaft.
4. Remove rubber spacer.

Repair

1. Remove screw securing rubber peg to lever. Separate screw from peg.
2. Assemble peg to lever with screw. Tighten to 96-144 **in-lbs** (10.9-16.3 Nm).

Installation

1. Install rubber spacer.

NOTE

Shift lever peg height is a customer preference. During installation, check operation of both shift levers. To achieve proper gear engagement and to avoid damage to transmission, the pegs must not contact the footboard when shifting.

2. Install heel and toe levers. Align to marks made during removal.
3. Install pinch screws. Tighten to 18-22 ft-lbs (24.4-29.8 Nm).
4. Verify shift lever operation.

SHIFTER ROD LEVER, FRONT

FASTENER	TORQUE VALUE	
Shifter rod lever pinch screw, front lever	90-110 **in-lbs**	10.2-12.4 Nm
Shifter rod to front lever nut	70-90 **in-lbs**	7.9-10.2 Nm

Removal

1. See Figure 6-2. Remove nut (10) and lockwasher (9) to free linkage.
2. Mark position of shifter rod lever in relation to shaft.
3. Remove pinch screw. Remove shifter rod lever.

Installation

1. Install shifter rod lever. Align to marks made during removal.
2. Install pinch screw. Tighten to 90-110 **in-lbs** (10.2-12.4 Nm).
3. Install flat washer on shift linkage stud.

4. Secure linkage to shifter rod lever with flat washer, lockwasher and nut. Tighten to 70-90 **in-lbs** (7.9-10.2 Nm).
5. Verify shift lever operation.

REMOVAL AND DISASSEMBLY

1. Remove main fuse.
2. Remove exhaust system if needed. See 4.18 EXHAUST SYSTEM.
3. Drain transmission. See 1.11 TRANSMISSION LUBRICANT.

NOTE

Actuating the clutch hand lever after removing the six screws will help break the cover free.

4. See Figure 6-3. Remove six screws securing the clutch release cover. Remove the clutch release cover. Discard the gasket.
5. Add free play to clutch cable. See 1.12 CLUTCH CABLE: ROAD KING.

⚠WARNING

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

6. See Figure 6-4. Remove retaining ring (4). Lift inner ramp (5) and ramp coupling (3) out of clutch release cover. Disconnect clutch cable end (2) from the ramp coupling (3).
7. Remove coupling (3) from inner ramp.
8. See Figure 6-5. Remove balls (4) and outer ramp (2).
9. Remove clutch cable fitting from clutch release cover.

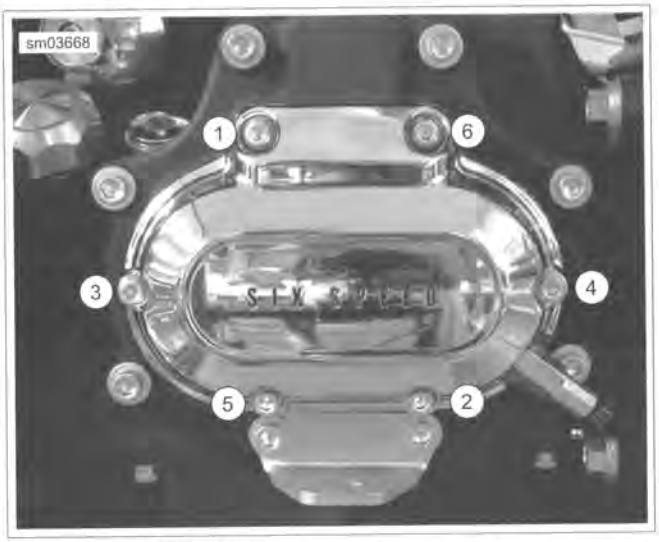
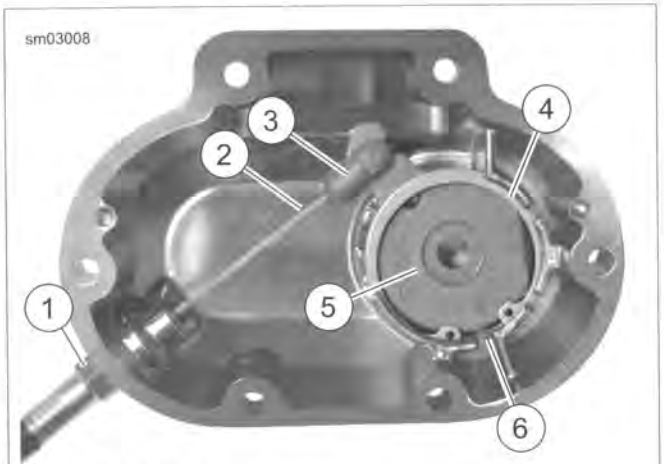
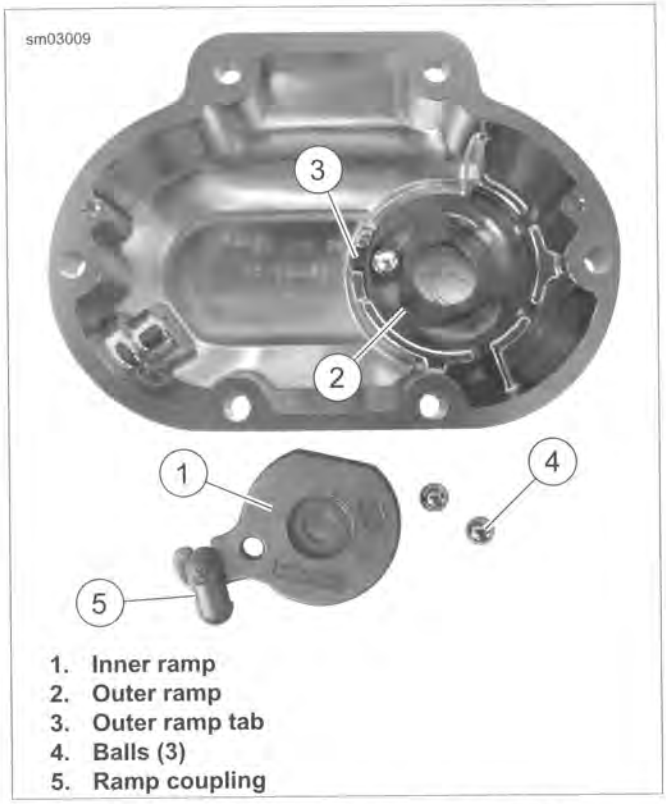


Figure 6-3. Clutch Release Cover Torque Sequence (Short Screws at Locations 1 and 6)



1. **Cable fitting**
2. **Clutch cable end**
3. **Ramp coupling**
4. **Retaining ring**
5. **Inner ramp**
6. **Retaining ring opening**

Figure 6-4. Clutch Cable Connection



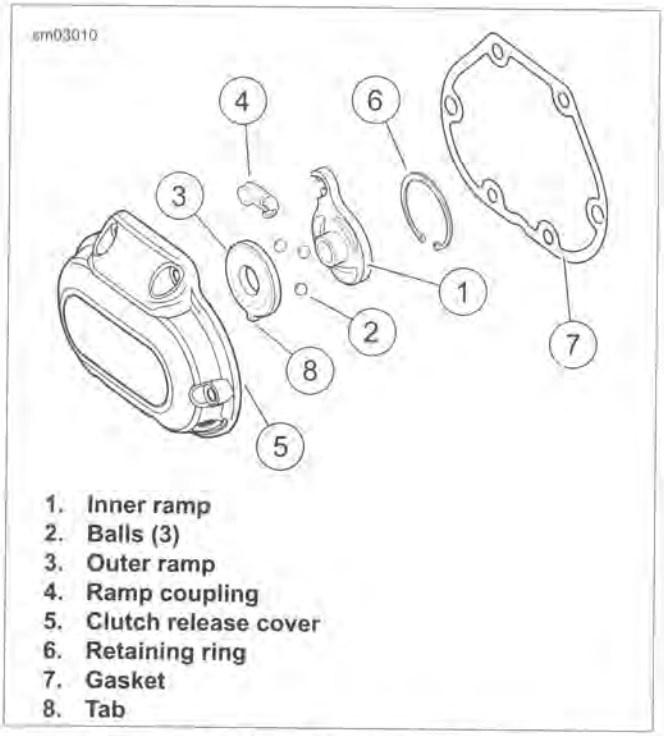
1. **Inner ramp**
2. **Outer ramp**
3. **Outer ramp tab**
4. **Balls (3)**
5. **Ramp coupling**

Figure 6-5. Coupling and Ramp Assembly

CLEANING AND INSPECTION

1. See Figure 6-6. 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 O-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.



1. **Inner ramp**
2. **Balls (3)**
3. **Outer ramp**
4. **Ramp coupling**
5. **Clutch release cover**
6. **Retaining ring**
7. **Gasket**
8. **Tab**

Figure 6-6. Release Mechanism Assembly

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Clutch release cover screws	132-156 **in-lbs**	14.9-17.6 Nm
Clutch cable fitting	90-120 **in-lbs**	10.2-13.6 Nm

NOTE

Replace cable fitting O-ring if damaged.

1. See Figure 6-4. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the clutch cable fitting (1). Install in clutch release cover. Do not tighten at this time.
2. See Figure 6-6. Place outer ramp (3) with ball socket side up in clutch release cover. Confirm tab (8) is in clutch release cover slot.
3. Apply a multi-purpose grease to the balls and outer ramp sockets. Place a ball in each of the outer ramp sockets.
4. See Figure 6-4. Connect cable end to ramp coupling (3). Install coupling on inner ramp (5). Place inner ramp and coupling in position in clutch release cover.

⚠WARNING

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

NOTE

Center the opening of the retaining ring above the break in the ribbing at bottom of the clutch release cover.

5. Install retaining ring (4).
6. Verify that two dowel pins are in place on transmission bearing housing flange. Place a **new** gasket on dowel pins.

NOTE

See Figure 6-3. Clutch release cover screws in positions (1) and (6) are shorter than the others.

7. See Figure 6-3. Install clutch release cover. Tighten to 132-156 **in-lbs** (14.9-17.6 Nm) in sequence shown.
8. Tighten clutch cable fitting to 90-120 **in-lbs** (10.2-13.6 Nm).
9. Fill transmission to proper level with fresh transmission fluid. See 1.11 TRANSMISSION LUBRICANT, Changing Transmission Lubricant.
10. Adjust clutch cable. See 1.12 CLUTCH CABLE: ROAD KING.
11. Install exhaust system if removed. See 4.18 EXHAUST SYSTEM.
12. Install main fuse.

REMOVAL

1. Remove seat.

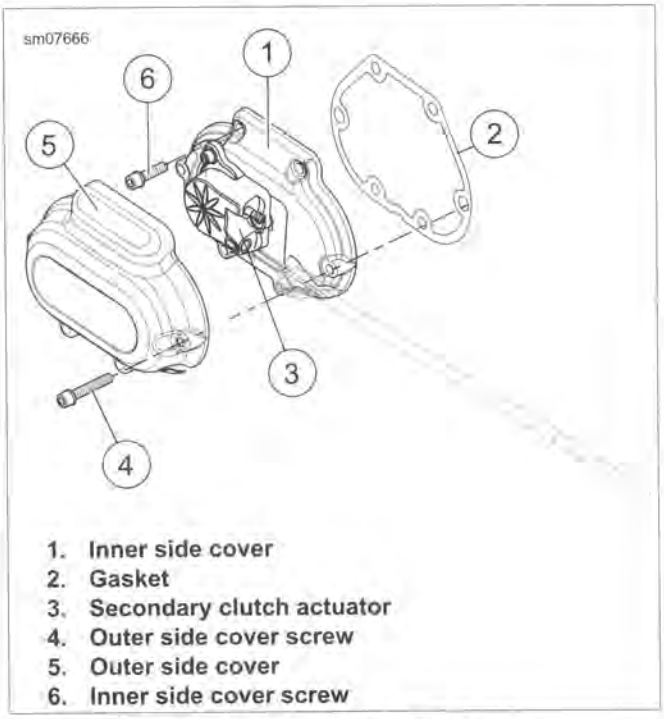
⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

2. Disconnect negative battery cable.
3. Remove transmission filler plug/dipstick.
4. Drain transmission.
5. Remove components necessary to access side covers.
6. See Figure 6-7. Remove outer side cover (5).
7. If necessary, remove secondary clutch actuator (3). See 6.7 SECONDARY CLUTCH ACTUATOR.
8. Remove inner side cover (1). Discard gasket (2).
9. Clean and inspect inner side cover. Clean with denatured alcohol only.

NOTE

If damaged, replace locating dowels in inner side cover.



1. **Inner side cover**
2. **Gasket**
3. **Secondary clutch actuator**
4. **Outer side cover screw**
5. **Outer side cover**
6. **Inner side cover screw**

Figure 6-7. Transmission Side Covers

INSTALLATION

FASTENER	TORQUE VALUE	
Transmission inner side cover screw	100-120 **in-lbs**	11.2-13.6 Nm
Transmission outer side cover screw	100-120 **in-lbs**	11.2-13.6 Nm

1. See Figure 6-7. Place a **new** clutch release gasket (2) on locating dowels and position inner side cover on transmission.
2. Tighten inner side cover fasteners to 100-120 **in-lbs** (11.2-13.6 Nm).
3. If removed, install secondary clutch actuator (3). See 6.7 SECONDARY CLUTCH ACTUATOR.
4. Install outer transmission side cover. Tighten to 100-120 **in-lbs** (11.2-13.6 Nm).
5. Fill transmission lubricant.
6. Install other components that were removed.
7. Install main fuse.

REPLACEMENT

FASTENER	TORQUE VALUE	
Secondary clutch actuator	100-120 **in-lbs**	11.2-13.6 Nm

1. Remove the transmission outer side cover. See 6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH.

⚠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 6-8. Loosen clutch fluid line (2) and allow clutch fluid to drain.

NOTE

Clutch fluid line O-ring may remain inside the secondary clutch actuator. Use a non-metallic pick to remove old O-ring and other debris.

3. Remove and discard O-ring (3) from clutch fluid line.

NOTE

A small amount of transmission lubricant will drain when secondary clutch actuator is removed.

4. Remove three screws (4) and secondary clutch actuator (5).

5. Remove and discard O-ring (6) from secondary clutch actuator.

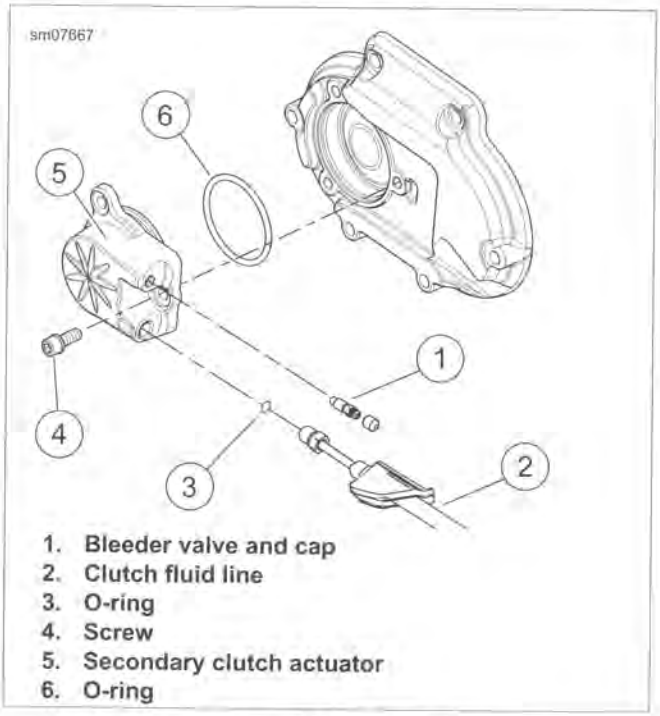
NOTES

- *The secondary clutch actuator is not serviceable. Replace as needed.*
- *Secondary clutch actuator and O-ring must be seated in cover before tightening screws to specification.*

6. Lubricate **new** O-ring with transmission lubricant prior to installing. Install **new** O-ring on secondary clutch actuator.

7. Install three screws (4) attaching secondary clutch actuator (5) to transmission inner side cover. Tighten to 100-120 **in-lbs** (11.2-13.6 Nm).

8. Bleed clutch. See 2.27 BLEEDING CLUTCH CONTROL SYSTEM.



1. **Bleeder valve and cap**
2. **Clutch fluid line**
3. **O-ring**
4. **Screw**
5. **Secondary clutch actuator**
6. **O-ring**

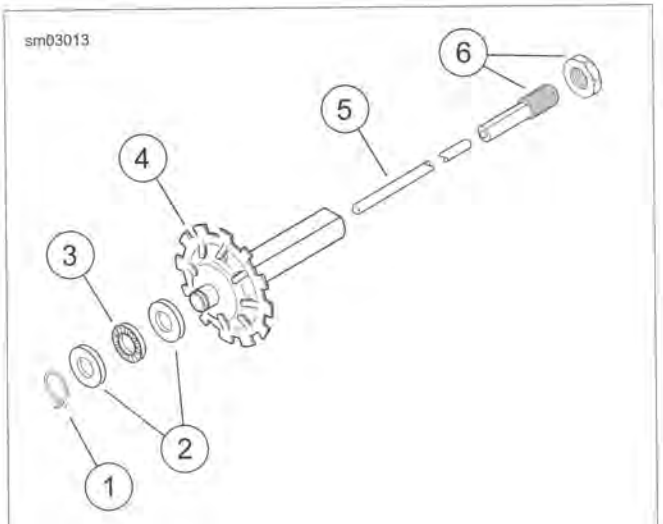
Figure 6-8. Secondary Clutch Actuator

REMOVAL

NOTE

Leave the transmission case in the frame unless the case itself requires replacement. For illustration purposes, some photographs may show the case removed. For information on case removal see 6.10 TRANSMISSION CASE.

1. Remove exhaust system. See 4.18 EXHAUST SYSTEM.
2. Relieve drive belt tension. See 1.14 DRIVE BELT AND SPROCKETS.
3. Remove primary chaincase cover, clutch assembly, primary chain, compensating sprocket assembly and primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING, Removal.
4. Remove the transmission mainshaft bearing inner race. See 5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing Inner Race.
5. Remove the clutch release cover. See 6.5 CLUTCH RELEASE COVER: CABLE CLUTCH, Removal and Disassembly.
6. See Figure 6-9. Remove oil slinger assembly from mainshaft. Insert long rod through mainshaft bore and remove pushrod.
7. Remove transmission top cover, leaving the cover gasket in place.
8. See Figure 6-10. Rotate the shifter pawl forward enough to raise the free end and place shifter cam pawl on top cover gasket.



1. **Retaining ring**
2. **Thrust washer (2)**
3. **Throw out bearing**
4. **Oil slinger**
5. **Pushrod**
6. **Pushrod end, left side**

Figure 6-9. Pushrod Assembly: Cable Clutch

1. **Shifter pawl**
2. **Top cover gasket surface**

Figure 6-10. Set Shifter Pawl on Gasket

NOTES

- *Remove and install sprocket nut only while transmission is in vehicle frame. Removing or installing sprocket nut with transmission in transmission stand may cause damage to transmission or stand.*
- *Replace the main drive gear bearing and retainer if the main drive gear is removed. The bearing will be damaged during the removal procedure.*

9. If main drive gear is to be removed, see 6.9 MAIN DRIVE GEAR AND BEARING, Removal.
10. Cover mainshaft clutch hub splines with tape to prevent the splines damaging the main drive gear bearings.
11. See Figure 6-12. Remove the transmission bearing housing mounting hardware. Remove exhaust bracket, if equipped.

NOTE

See Figure 6-11. Never tap on shafts with a hammer to remove transmission assembly. The bearing housing bearings will be damaged. Pry loose using indents at each side of bearing housing.

12. Pry the bearing housing loose. Remove bearing housing, mainshaft, countershaft and shifter cam from transmission case as an assembly. Discard gasket.

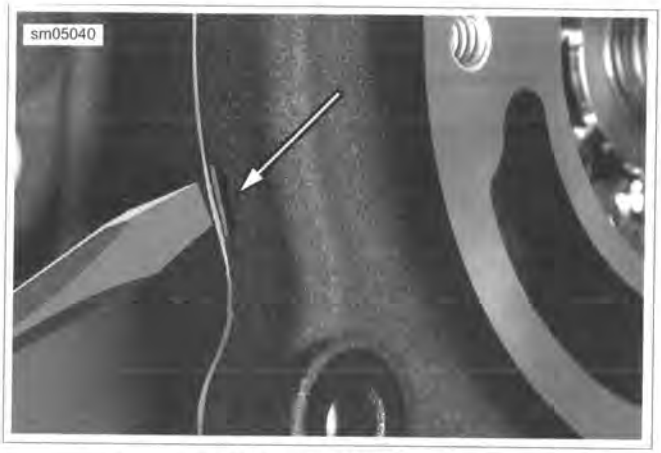
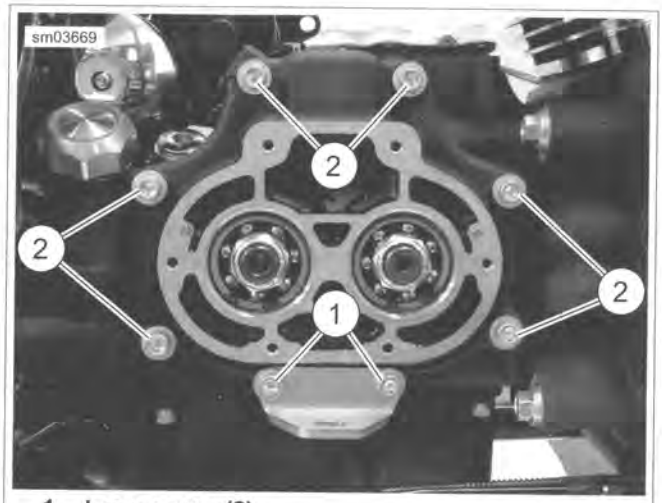


Figure 6-11. Bearing Housing Pry Point



1. **Long screw (2)**
2. **Short screw (6)**

Figure 6-12. Bearing Housing Hardware

DISASSEMBLY

PART NUMBER	TOOL NAME
J-5586A	TRANSMISSION SHAFT RETAINING RING PLIERS

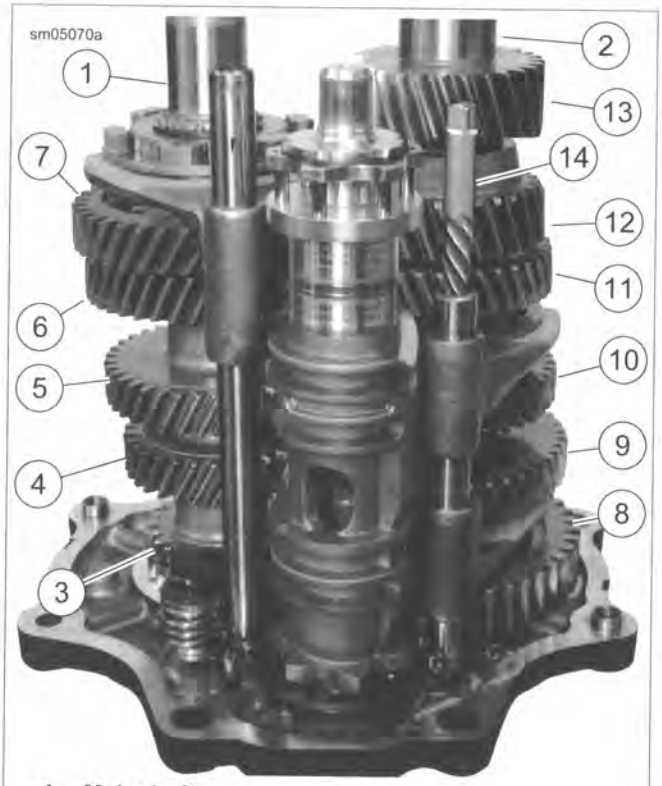
Shifter Cam/Shifter Forks

1. See Figure 6-13. Disassemble bearing housing assembly:
   a. Place bearing housing on end (shafts pointing upward).
   b. Remove shift fork shafts using easy-out screw extractor (14) (non-flute design) or vise grips. Shafts have slight interference fit. Shafts can be reused; do not damage end of shaft.
   c. Mark end of shaft to aid during assembly.
2. Remove shift forks from dog rings.
3. See Figure 6-14. Remove lock plate fasteners (3) from lock plate (2). Discard fasteners.
4. See Figure 6-15. Insert screwdriver and gently pry back detent arm (4) to remove detent spring (3) tension from shift cam (5). Remove shift cam.
5. If servicing detent assembly, remove detent screw (2), detent arm (4), sleeve and detent spring (3). Discard detent screw.

NOTE

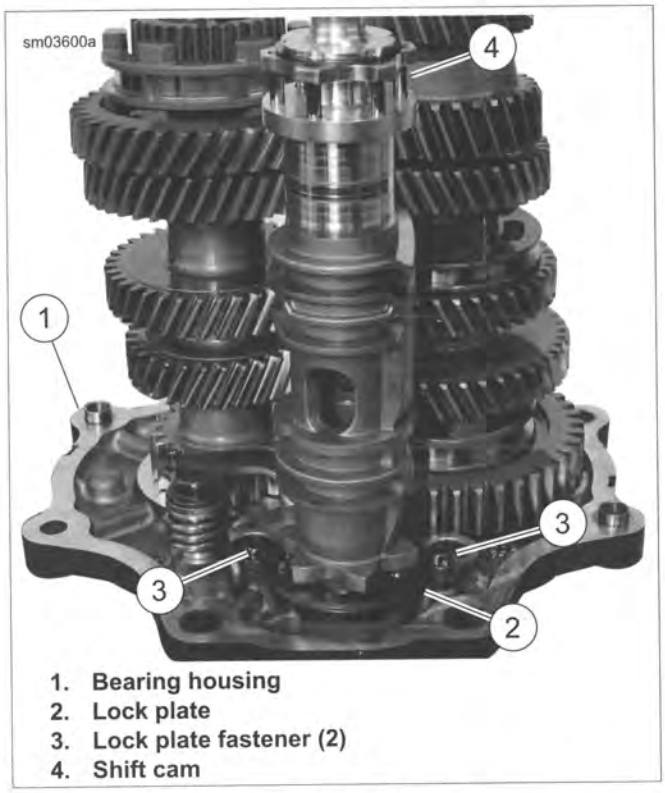
Many transmission parts can be installed in either direction. To prolong usable life, install used parts in same direction as when removed.

6. See Figure 6-16. Using dog rings, lock two gears in place. Temporarily place transmission assembly into transmission case.
7. Remove mainshaft and countershaft locknuts.
8. Remove transmission assembly from transmission case.



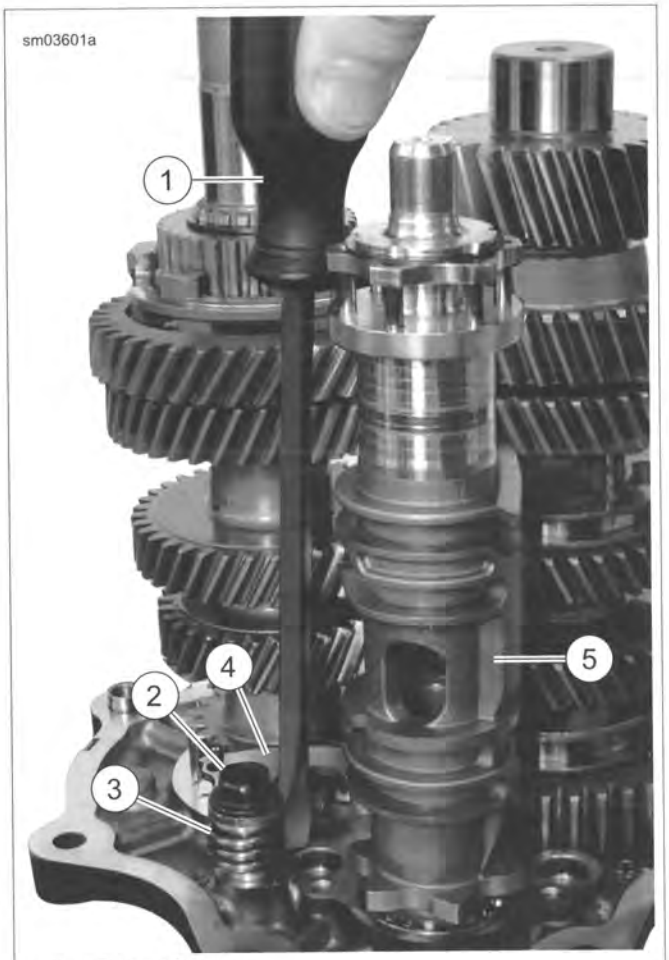
1. **Mainshaft**
2. **Countershaft**
3. **Mainshaft 1st gear**
4. **Mainshaft 2nd gear**
5. **Mainshaft 3rd gear**
6. **Mainshaft 4th gear**
7. **Mainshaft 5th gear**
8. **Countershaft 1st gear**
9. **Countershaft 2nd gear**
10. **Countershaft 3rd gear**
11. **Countershaft 4th gear**
12. **Countershaft 5th gear**
13. **Countershaft 6th gear**
14. **Screw extractor**

Figure 6-13. Gear Set



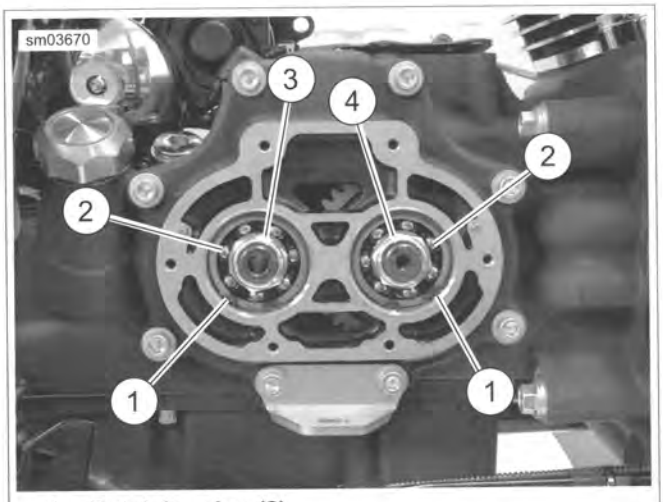
1. Bearing housing
2. Lock plate
3. Lock plate fastener (2)
4. Shift cam

Figure 6-14. Shift Drum



1. Screwdriver
2. Detent fastener
3. Detent spring
4. Detent arm
5. Shift cam

Figure 6-15. Detent Assembly



1. Retaining ring (2)
2. Bearing (2)
3. Mainshaft locknut
4. Countershaft locknut

Figure 6-16. Bearing Housing Locknuts

Mainshaft

⚠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

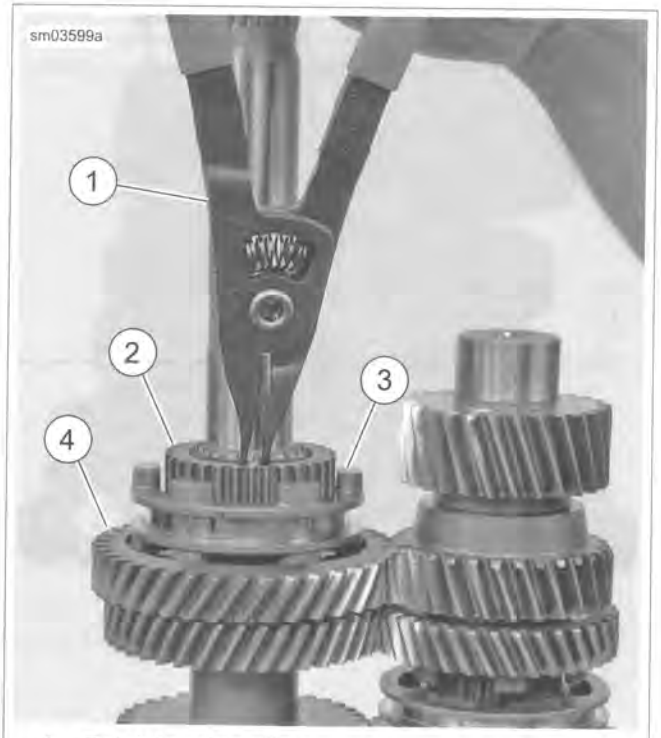
The mainshaft 4th gear, 3rd gear, 2nd gear and 1st gear are integral parts of the shaft. Damage to any gear requires mainshaft replacement.

1. See Figure 6-17. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A), remove retaining ring. Remove dog ring (3), guiding hub (2), mainshaft 5th gear (4) and bearing.

NOTE

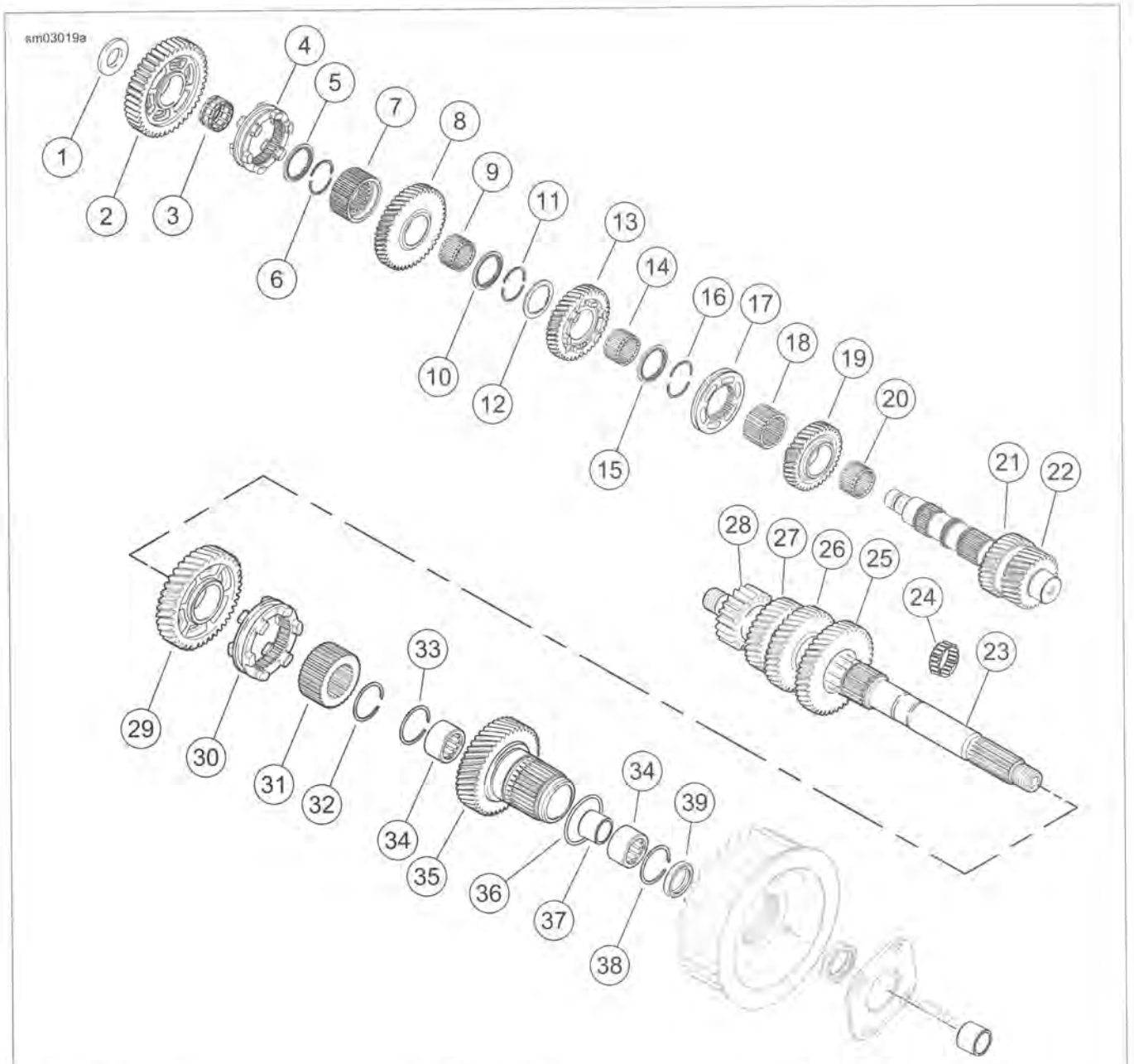
Do not press directly on the end of the mainshaft. Place a spacer such as a washer between the end of the mainshaft and the press ram.

2. Place transmission assembly in arbor press. Press mainshaft out of bearing housing bearings.



1. **Retaining ring pliers**
2. **Guiding hub**
3. **Dog ring**
4. **Mainshaft 5th gear**

Figure 6-17. Mainshaft Retaining Ring



1. Spacer
2. Countershaft 1st gear
3. Bearing
4. Dog ring
5. Lock ring
6. Securing segment (2)
7. Guiding hub
8. Countershaft 2nd gear
9. Bearing
10. Lock ring
11. Securing segment (2)
12. Internal spline washer
13. Countershaft 3rd gear
14. Bearing
15. Lock ring
16. Securing segment (2)
17. Dog ring
18. Guiding hub
19. Countershaft 4th gear
20. Bearing
21. Countershaft 5th gear (part of countershaft)
22. Countershaft 6th gear (part of countershaft)
23. Mainshaft
24. Bearing
25. Mainshaft 4th gear
26. Mainshaft 3rd gear
27. Mainshaft 2nd gear
28. Mainshaft 1st gear
29. Mainshaft 5th gear
30. Dog ring
31. Guiding hub
32. Retaining ring
33. Retaining ring
34. Main drive gear bearing (2)
35. Main drive gear
36. O-ring
37. Bearing spacer
38. Retaining ring
39. Oil seal

Figure 6-18. Mainshaft and Countershaft Assembly

Countershaft

NOTES

- *If removing countershaft without removing the mainshaft, hold countershaft 3rd and 4th gear shift dog up while pressing countershaft out of bearing housing bearings.*
- *Do not press directly on the end of the countershaft. Place a spacer such as a washer between the end of the countershaft and the press ram.*

1. Press countershaft out of bearing housing bearings.
2. See 6.8 TRANSMISSION ASSEMBLY for bearing housing bearing replacement.
3. See Figure 6-19. Remove washer (1), countershaft 1st gear (2) and bearing.

NOTE

See Figure 6-20. Note the direction that the 2nd gear locking ring is installed.

4. Remove countershaft 2nd gear lock ring.
5. See Figure 6-21. Remove securing segments (1). Remove dog ring (3), guiding hub (2), countershaft 2nd gear (4) and bearing.

1. **Washer**
2. **Countershaft 1st gear**

Figure 6-19. Countershaft 1st Gear

Figure 6-20. Lock Ring

1. **Securing segment**
2. **Guiding hub**
3. **Dog ring**
4. **Countershaft 2nd gear**

Figure 6-21. Securing Segment

NOTE

See Figure 6-22. Note the direction that the 3rd gear locking ring is installed.

6. Remove countershaft 3rd gear lock ring.
7. See Figure 6-23. Remove securing segments (1), internal spline washer (2), countershaft 3rd gear (3) and bearing.

NOTE

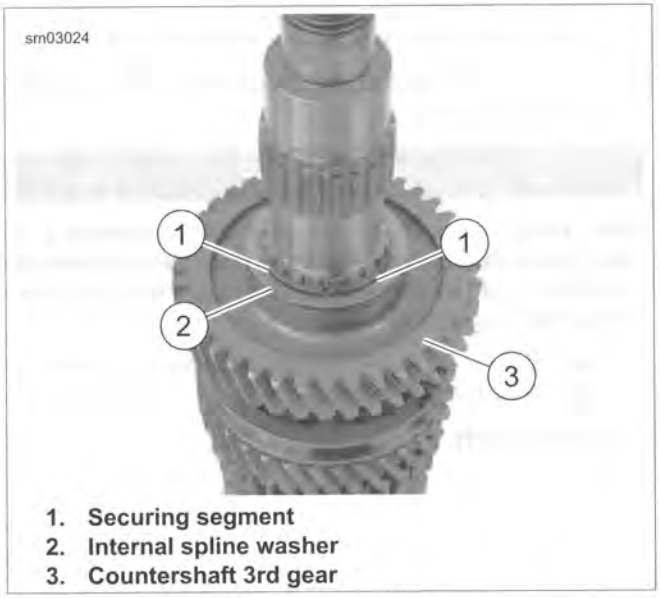
See Figure 6-24. Note the direction that the 4th gear locking ring is installed.

8. Remove 4th gear lock ring (1), securing segments, dog ring (3), guiding hub (2) and countershaft 4th gear (4) and bearing.

NOTE

The countershaft 5th gear and 6th gear are integral parts of the shaft. Damage to either gear requires countershaft replacement.

Figure 6-22. Third Gear Lock Ring



1. **Securing segment**
2. **Internal spline washer**
3. **Countershaft 3rd gear**

Figure 6-23. Countershaft Third Gear

1. **4th gear lock ring**
2. **Guiding hub**
3. **Dog ring**
4. **Countershaft 4th gear**

Figure 6-24. Countershaft Assembly

Removing Bearing Housing Bearings

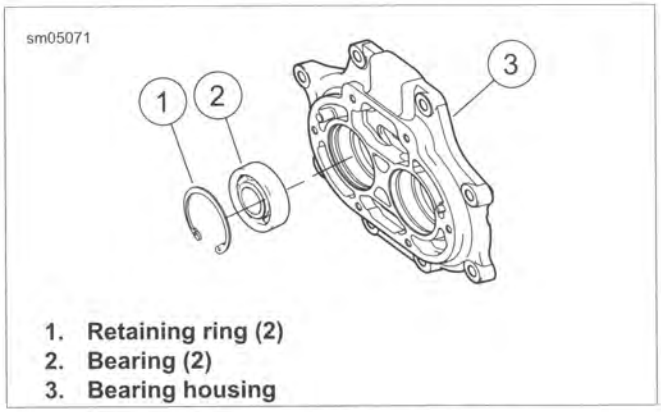
NOTE

Always replace bearing housing bearing if the shaft is pressed out.

⚠WARNING

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

1. See Figure 6-25. Remove the retaining rings (1).
2. Press the bearings out of the bearing housing.



1. **Retaining ring (2)**
2. **Bearing (2)**
3. **Bearing housing**

Figure 6-25. Bearing Housing Bearings

CLEANING AND INSPECTION

⚠WARNING

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

1. Clean all parts with solvent. Dry parts with low pressure compressed air.
2. Check gear teeth for damage. Replace gears that are pitted, scored, rounded, cracked or chipped.
3. Inspect the engaging dogs and pockets on the dog rings. Replace the dog rings if dogs and/or pockets are rounded, battered or chipped.
4. Inspect guiding hubs. Replace guiding hubs if splines are rounded, battered or chipped.
5. Inspect shift fork shafts. Replace if bent or damaged.
6. Inspect shift forks for wear or signs of overheating. Replace a shift fork if it is excessively worn or shows signs of overheating.
7. See Figure 6-26. Using a small square, verify the shift forks are square. If shift fork does not rest directly on the square, then it is bent and must be replaced.
8. Inspect shift drum and bearing. Replace shift drum assembly if drum or bearing are damaged.
9. Clean shift cam lock plate mounting holes in transmission bearing housing.
10. Inspect bearing housing bearings. Bearings must rotate freely without drag. Replace the bearings if pitted, grooved or if the shafts were removed.

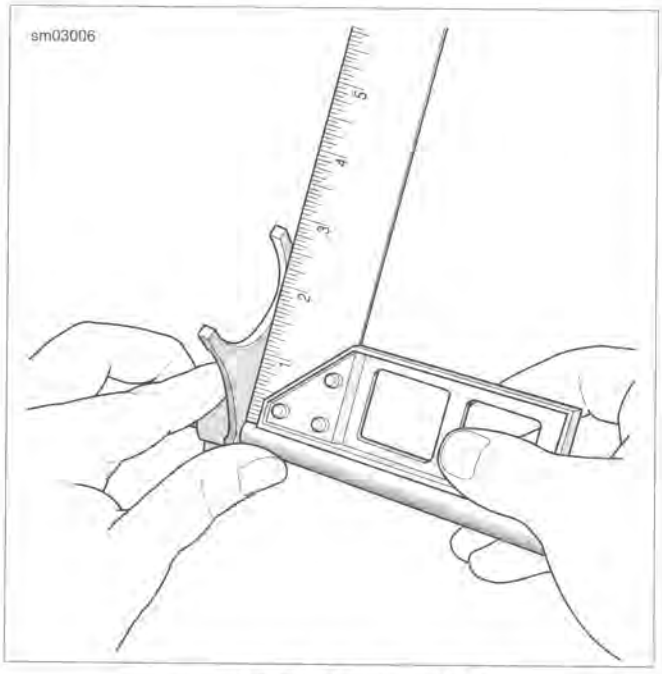


Figure 6-26. Checking Fork

ASSEMBLY

PART NUMBER	TOOL NAME
J-5586A	TRANSMISSION SHAFT RETAINING RING PLIERS

FASTENER	TORQUE VALUE	
Mainshaft/countershaft nuts	85-95 ft-lbs	115.3-128.8 Nm
Shift drum detent arm fastener	120-150 **in-lbs**	13.6-17.0 Nm
Shift drum lock plate fasteners	57-63 **in-lbs**	6.4-7.1 Nm

Installing Bearing Housing Bearings

NOTES

- *Always replace bearing housing bearing if the shaft was pressed out.*
- *Always use a plate to support the bearing housing when pressing in bearings.*
- *When pressing **new** bearings into bearing housing, press on the outside diameter of the bearing side with the numbers stamped on it.*

1. Support the bearing housing from the opposite side at the bearing bores with a flat plate.
2. Position **new** bearing over bore with number side UP.
3. Press the outer diameter of the bearing until the bearing seats in the bore.

⚠WARNING

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

4. See Figure 6-25. Install beveled retaining ring (1) with the flat side against the bearing.

Countershaft

NOTES

- *Replace retaining ring and all gear roller bearings with **new** parts during assembly. Lubricate needle bearings and races with SCREAMIN' EAGLE ASSEMBLY LUBE before installation.*
- *Install securing segments so the side with the rounded edge is facing up and the side with the straight edge is down. Verify segments fully engage grooves in countershaft.*
- *One side of the 2nd, 3rd and 4th gear lock rings have a waved, stepped face. The waved, stepped face always faces the securing segments.*

1. See Figure 6-24. Install **new** needle bearing, countershaft 4th gear (4), guiding hub (2), dog ring (3) securing segments and 4th gear lock ring (1) on countershaft.
2. See Figure 6-23. Install **new** needle bearing, countershaft 3rd gear (3), internal spline washer (2) and securing segments (1).

3. See Figure 6-22. Place countershaft 3rd gear lock ring over securing segments.

NOTES

- *In next step, the side of the guiding hub with the deeper counterbore faces countershaft 2nd gear.*
- *Countershaft 2nd gear bearing is wider than other bearings on the countershaft.*

4. See Figure 6-21. Install **new** needle bearing, countershaft 2nd gear (4), guiding hub (2), dog ring (3) and securing segments (1) on countershaft.
5. See Figure 6-20. Place lock ring over securing segments with the stepped face of the lock ring against the securing segments.
6. See Figure 6-19. Install **new** needle bearing, countershaft 1st gear (2) and washer (1).

NOTES

- *If installing countershaft only, hold countershaft 3rd and 4th gear shift dog up while pressing bearing housing bearing on to countershaft.*
- *Failure to press on inner bearing races while pressing bearings on the shafts will damage the bearings.*

7. See Figure 6-27. Place countershaft in an arbor press supporting countershaft 6th gear. Using a suitable sleeve, press on inner bearing race until bearing housing bearing contacts countershaft 1st gear washer.

Figure 6-27. Installing Countershaft

Mainshaft

NOTES

- *Failure to press on inner bearing race while pressing bearing on the shaft will damage the bearing.*
- *See Figure 6-28. Hold dog ring so that it is engaged with countershaft 3rd gear during the press procedure. Otherwise bearing and gear damage is possible.*

1. Place mainshaft in an arbor press, supporting mainshaft 4th gear.
2. Place rear bearing housing bearing over mainshaft. Using a suitable sleeve, press on inner bearing race until bearing housing bearing contacts mainshaft 1st gear.
3. See Figure 6-17. With bearing housing on end (shafts pointing upward), install **new** bearing and mainshaft 5th gear (4).
4. Verify guiding hub counterbore is facing mainshaft 5th gear. Install guiding hub (2) and dog ring (3).

⚠WARNING

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

5. Install **new** retaining ring using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A) (1).

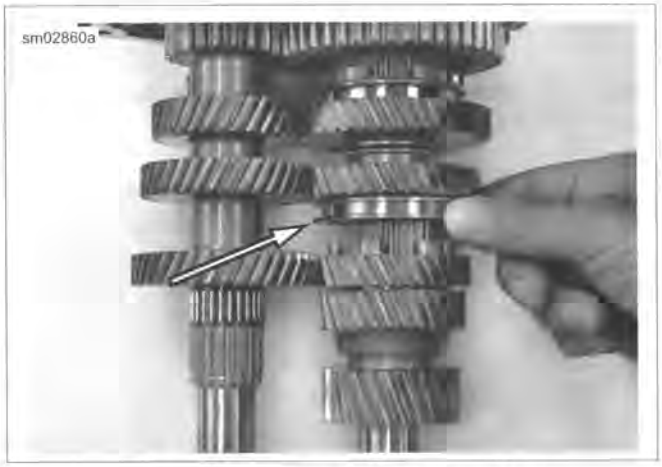


Figure 6-28. Raise and Hold Dog Ring

Shifter Cam/Shifter Forks

1. Using dog rings, lock two gears in place. Temporarily place transmission assembly into transmission case.
2. Install **new** nuts on mainshaft and countershaft. Tighten to 85-95 ft-lbs (115.3-128.8 Nm).
3. Remove transmission assembly from case.
4. Place bearing housing on bench with shafts pointing upward.
5. If removed, install detent arm assembly:
   a. See Figure 6-29. Clean detent screw mounting hole in transmission bearing housing.
   b. Assemble **new** detent screw, detent arm, sleeve and detent spring. Make certain to orient spring and detent arm as shown.
   c. Mount detent assembly in bearing housing as shown.
   d. Tighten to 120-150 **in-lbs** (13.6-17.0 Nm).
6. See Figure 6-30. Using screwdriver (1), pull detent arm back to allow installation of shift cam assembly.

7. Install shift cam assembly (5).
8. See Figure 6-31. Install lock plate (2) and **new** lock plate fasteners (3). Tighten to 57-63 **in-lbs** (6.4-7.1 Nm).

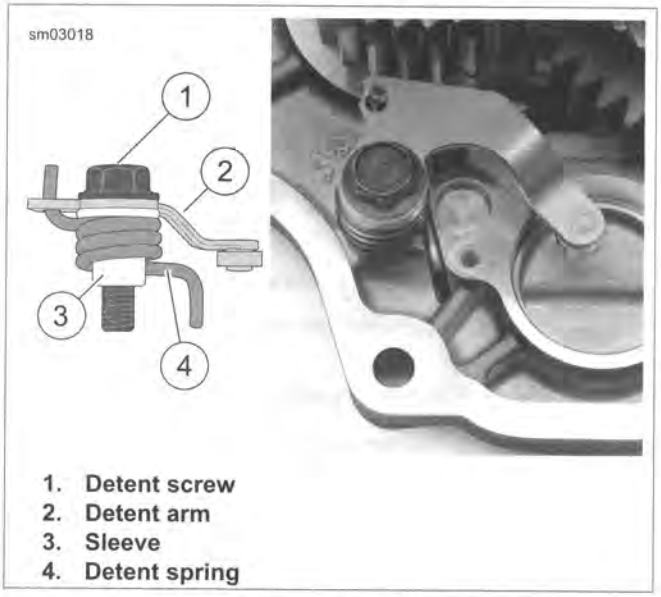
NOTE

See Figure 6-32. The forks are different from each other and are identified as shown.

9. See Figure 6-33. Insert shifter fork (2) into the slot of the dog ring in between mainshaft 5th and 6th gear.
10. Slide long shift shaft through 5th and 6th gear shifter fork. Install shaft in hole in bearing housing.
11. Install short shift shaft:
    a. Insert shifter fork (6) into the slot of the dog ring in between countershaft 3rd and 4th gear.
    b. Insert shifter fork (9) into the slot of the dog ring in between countershaft 1st and 2nd gear.
    c. Slide short shift shaft through countershaft shifter forks.
    d. Install shaft in hole in bearing housing.

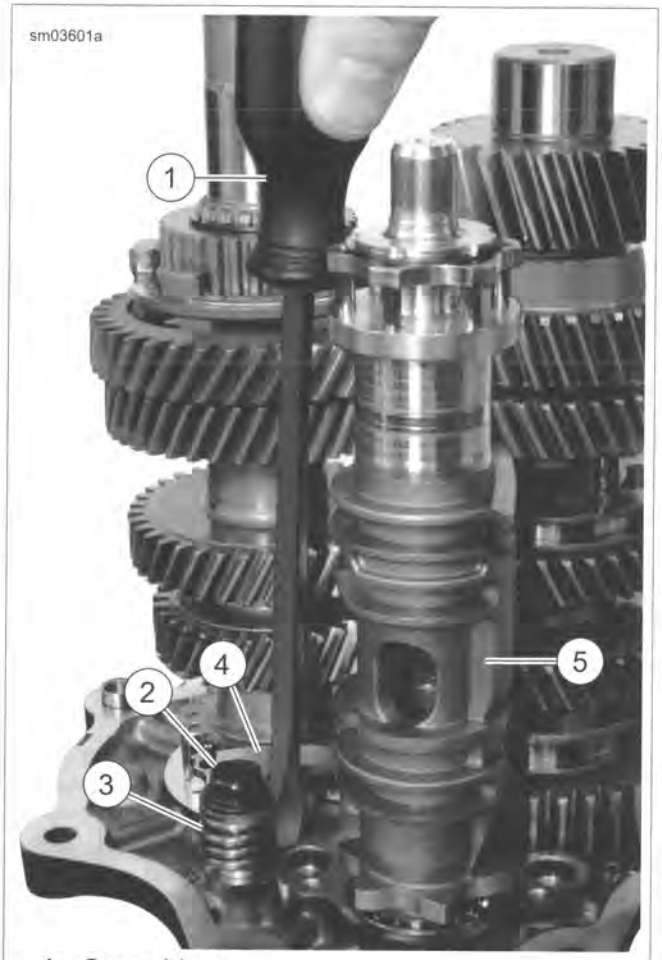
NOTE

If main drive gear was removed, install it now. See 6.9 MAIN DRIVE GEAR AND BEARING.



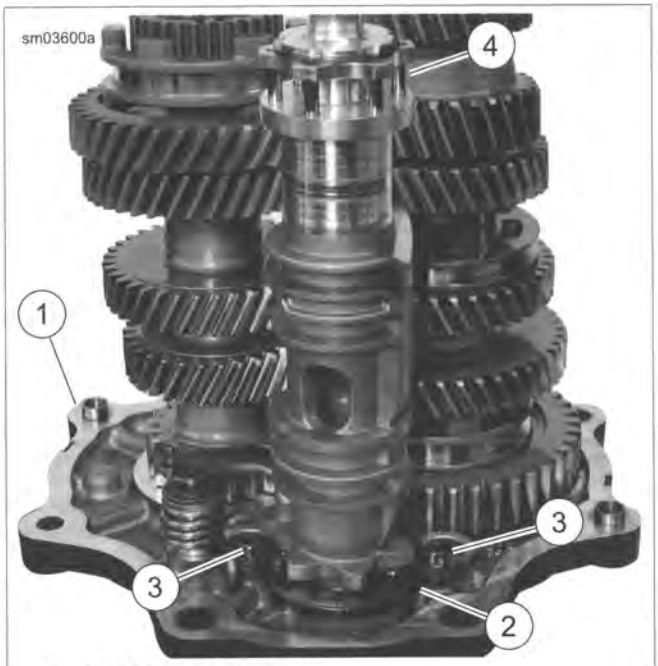
1. **Detent screw**
2. **Detent arm**
3. **Sleeve**
4. **Detent spring**

Figure 6-29. Detent Assembly



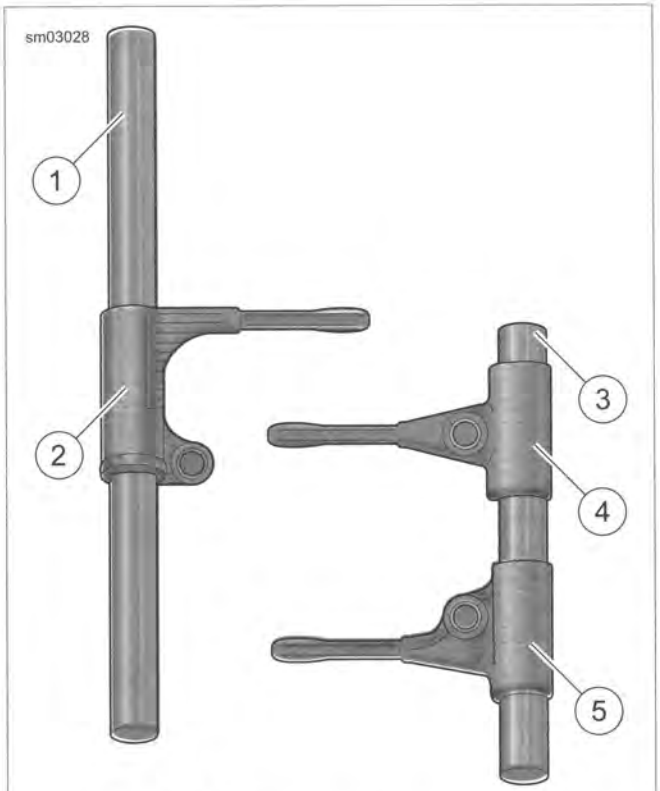
1. **Screwdriver**
2. **Detent fastener**
3. **Detent spring**
4. **Detent arm**
5. **Shift cam**

Figure 6-30. Detent Assembly



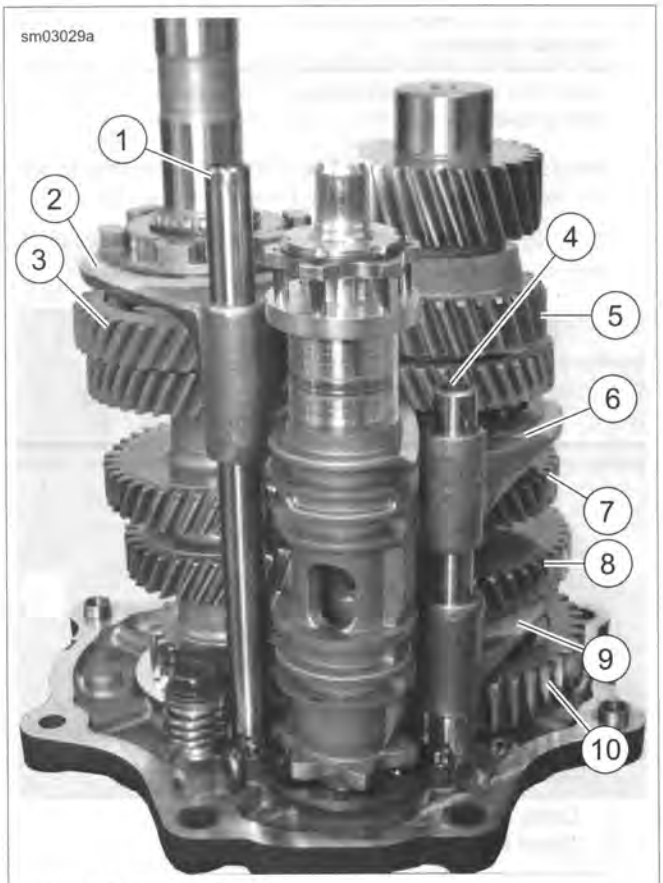
1. Bearing housing
2. Lock plate
3. Lock plate fastener (2)
4. Shift cam

Figure 6-31. Shift Drum



1. Long shift shaft
2. 5th and 6th gear shifter fork
3. Short shift shaft
4. 3rd and 4th gear shifter fork
5. 1st and 2nd gear shifter fork

Figure 6-32. Shifter Forks and Shafts



1. Long shift shaft
2. 5th and 6th gear shifter fork
3. 5th gear
4. Short shift shaft
5. 5th gear
6. 3rd and 4th gear shifter fork
7. 3rd gear
8. 2nd gear
9. 1st and 2nd gear shifter fork
10. 1st gear

Figure 6-33. Transmission Gears and Shifter Forks

INSTALLATION

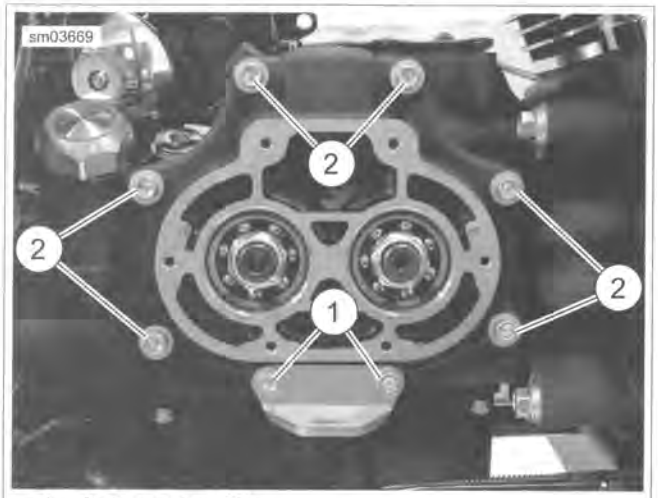
FASTENER	TORQUE VALUE	
Transmission bearing housing screws	22-25 ft-lbs	29.8-33.9 Nm
Transmission top cover	90-120 **in-lbs**	10.2-13.6 Nm
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm

1. Cover mainshaft clutch hub splines with tape to prevent the splines damaging the main drive gear oil seal.
2. Verify that two ring dowels are in place on bearing housing flange. Place a **new** gasket on the ring dowels.
3. Apply clean transmission lubricant to the main drive gear bearings.

NOTE

Contact with the dipstick will prevent installation of transmission assembly.

4. Remove the transmission dipstick before installing transmission assembly.
5. Install the transmission assembly in the transmission case with a **new** gasket.
6. See Figure 6-34. Install exhaust bracket using long screws (1). Install remaining bearing housing screws (2).
7. See Figure 6-35. Tighten bearing housing screws in the sequence shown to 22-25 ft-lbs (29.8-33.9 Nm).



1. **Long screw (2)**
2. **Short screw (6)**

Figure 6-34. Bearing Housing Hardware

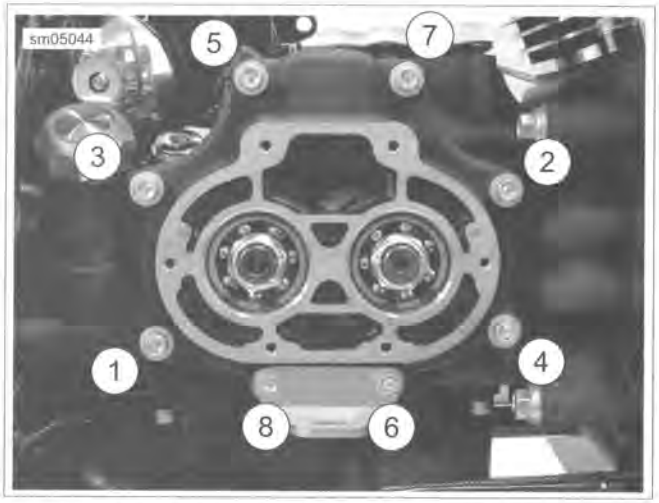
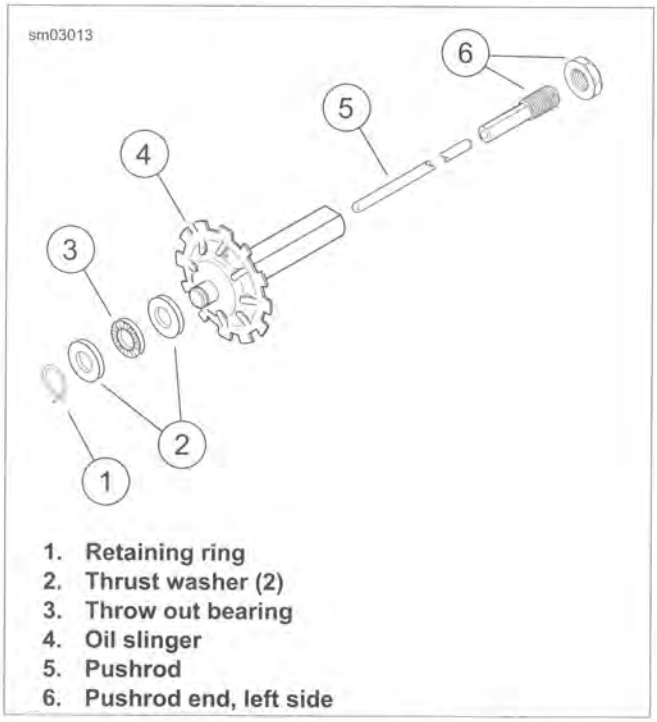


Figure 6-35. Bearing Housing Torque Sequence

8. Install mainshaft bearing inner race. See 5.8 TRANSMISSION SPROCKET.
9. See Figure 6-36. Install pushrod assembly (items 2-5) in mainshaft hole. Secure with **new** retaining ring (1) if removed.
10. Install the clutch release cover, using a **new** gasket. See 6.5 CLUTCH RELEASE COVER: CABLE CLUTCH.
11. Rotate shifter cam pawl forward and lower into place on shift cam. Install **new** transmission top cover gasket. Install transmission top cover. Tighten fasteners to 90-120 **in-lbs** (10.2-13.6 Nm).
12. Install vent hose to top cover fitting, if removed.
13. Install transmission sprocket nut. See 5.8 TRANSMISSION SPROCKET.
14. Install primary chaincase, clutch assembly and primary cover. See 5.3 PRIMARY CHAINCASE COVER, Installation.
15. Clean transmission drain plug. Install drain plug with **new** O-ring. Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
16. Fill transmission to proper level with fresh transmission fluid. See 1.11 TRANSMISSION LUBRICANT.
17. Adjust drive belt tension. See 1.14 DRIVE BELT AND SPROCKETS.
18. Install exhaust system. See 4.18 EXHAUST SYSTEM.



1. **Retaining ring**
2. **Thrust washer (2)**
3. **Throw out bearing**
4. **Oil slinger**
5. **Pushrod**
6. **Pushrod end, left side**

Figure 6-36. Pushrod Assembly: Cable Clutch

REMOVAL

PART NUMBER	TOOL NAME
HD-35316-10	PILOT
HD-35316-11	RECEIVER CUP
HD-35316-3A	CROSS PLATE
HD-35316-4A	8 IN. BOLT
HD-35316-5	12 IN. BOLT
HD-35316-7	WASHER
HD-35316-9	BEARING DRIVER
HD-35316-C	MAIN DRIVE GEAR/BEARING REMOVER AND INSTALLER
HD-95637-10	LONG BOLTS
HD-95637-46B	WEDGE ATTACHMENT
RS-25100-200	BEARING

NOTE

Leave transmission case in the frame unless the case itself must be replaced. For illustration purposes, some photographs may show the case removed.

1. Remove exhaust system. See 4.18 EXHAUST SYSTEM.
2. Remove primary chaincase cover, clutch assembly, primary chain, compensating sprocket, and primary chaincase and remove bearing inner race from the transmission mainshaft. See 5.5 PRIMARY CHAINCASE HOUSING.
3. Remove transmission bearing housing. See 6.8 TRANSMISSION ASSEMBLY.

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. Use MAIN DRIVE GEAR/BEARING REMOVER AND INSTALLER (Part No. HD-35316-C).

4. Remove retaining ring.

NOTES

- *The main drive gear bearing and retaining ring must be replaced if the main drive gear is removed. The bearing will be damaged during the removal procedure.*
- *The CROSS PLATE (Part No. HD-35316-3A) is stamped, "UP 6 SPEED". Mount cross plate with this end pointing up.*

5. See Figure 6-37. Place CROSS PLATE (Part No. HD-35316-3A) (1) on right side of transmission case as shown, and secure with two screws (2). Position cross plate so that large bolt hole in cross plate is lined up with center of main drive gear (4).
6. Apply a light coat of graphite lubricant to the threads of the 12 IN. BOLT (Part No. HD-35316-5) (3) and insert through cross plate and main drive gear.
7. At left side of transmission case, place WASHER (Part No. HD-35316-7), BEARING (Part No. RS-25100-200) (6), flat washer (7) and nut (8) over end of bolt. Tighten nut until main drive gear is free.

NOTES

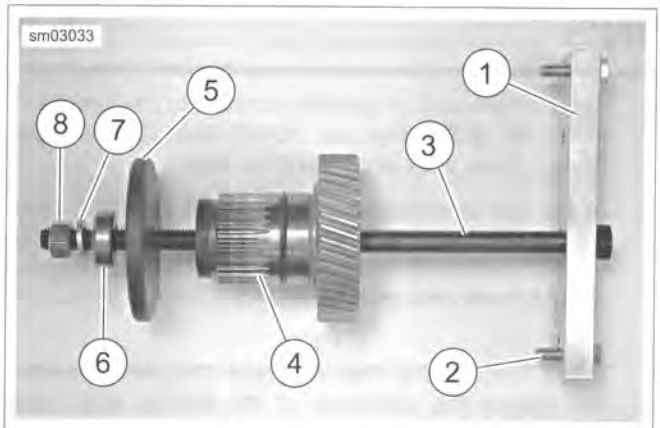
- *When removing the main drive gear, the gear is pressed out against the resistance of the bearing inner race. Without any support at the inner race, the bearing is destroyed. Whenever the main drive gear is removed the main drive gear bearing must also be replaced.*
- *See Figure 6-38. When the main drive gear is removed, a portion of the bearing inner race remains attached to the main drive gear. If the main drive gear is to be reused, this inner race must be removed first.*

8. Remove tool and remove gear from gearcase.
9. See Figure 6-38. Use WEDGE ATTACHMENT (Part No. HD-95637-46B) and LONG BOLTS (Part No. HD-95637-10) to remove inner race from main drive gear.
10. Remove large main drive gear oil seal.
11. Remove retaining ring from bearing bore.
12. See Figure 6-39. Slide PILOT (Part No. HD-35316-10) (3) over small end of BEARING DRIVER (Part No. HD-35316-9) (2).
13. Apply a light coat of graphite lubricant to the threads of the 8 IN. BOLT (Part No. HD-35316-4A) (1) and insert through bearing driver and pilot.
14. Insert bolt with bearing driver and pilot into right side of transmission case, through main drive gear bearing (4). Make sure bearing driver fits up against main drive gear bearing and pilot is centered in bearing bore.
15. At left side of case, slide RECEIVER CUP (Part No. HD-35316-11) (5) onto bolt and over main drive gear bearing. Install BEARING (Part No. RS-25100-200) (6), flat washer (7) and nut (8) over end of bolt.

NOTE

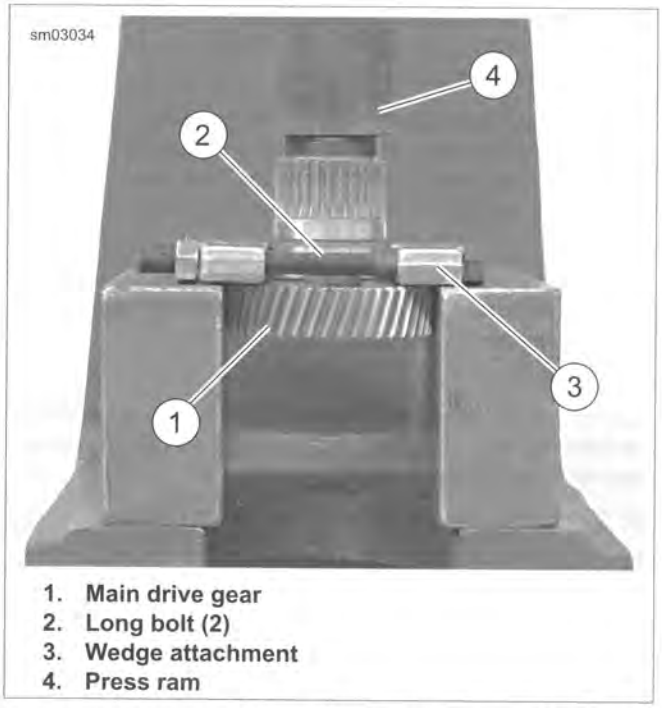
Support bearing remover assembly as you remove bearing in the following step. Entire assembly will fall out of transmission case when bearing comes free.

16. Tighten nut until main drive gear bearing is free.
17. Discard main drive gear bearing.



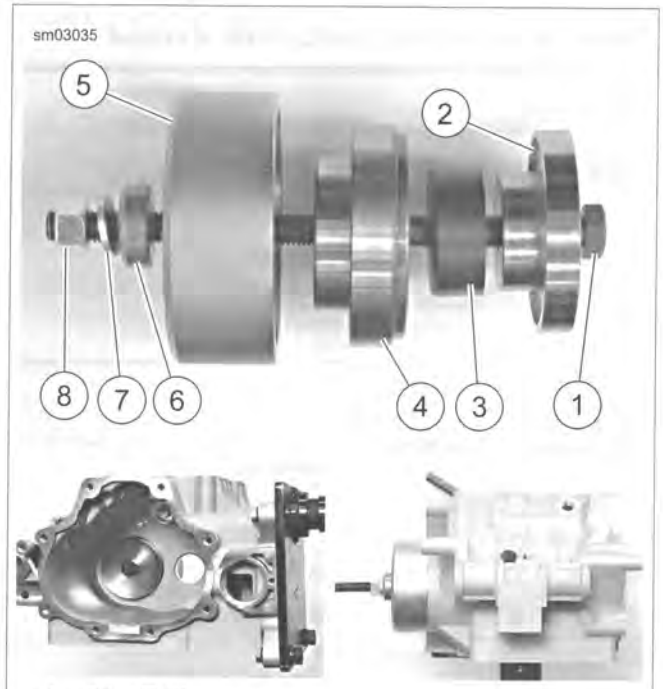
1. Cross plate
2. Screw (2)
3. 12 in. bolt
4. Main drive gear
5. Washer
6. Bearing
7. Flat washer
8. Nut

Figure 6-37. Removing Main Drive Gear



1. Main drive gear
2. Long bolt (2)
3. Wedge attachment
4. Press ram

Figure 6-38. Removing Inner Bearing Race From Main Drive Gear



1. 8 in. Bolt
2. Bearing driver
3. Pilot
4. Main drive gear bearing
5. Receiver cup
6. Bearing
7. Flat washer
8. Nut

Figure 6-39. Removing Main Drive Gear Bearing

CLEANING AND INSPECTION

PART NUMBER	TOOL NAME
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL

⚠WARNING

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

1. Clean all parts in solvent except the transmission case and needle bearings. Dry with compressed air.

NOTE

Never wash the transmission case and needle bearings with solvent unless replacing the needle bearings. Normal cleaning methods will wash dirt or other contaminants into the bearing case (behind the needles) and will lead to bearing failure.

2. Inspect the main drive gear for pitting and wear. Replace if necessary.
3. Inspect the needle bearings inside the main drive gear. Replace the needle bearings if the mainshaft race is pitted or grooved.

4. Replace the sprocket if teeth are cracked or worn. See 5.8 TRANSMISSION SPROCKET, Cleaning and Inspection for more information.

5. Inspect the needle bearings on the inside of the main drive gear. If mainshaft race surface appears pitted or grooved, replace these bearings.

NOTE

If replacing the main drive gear needle bearings and/or seal, continue as follows. Otherwise, proceed to 6.10 TRANSMISSION CASE, Assembly.

Needle Bearing Replacement

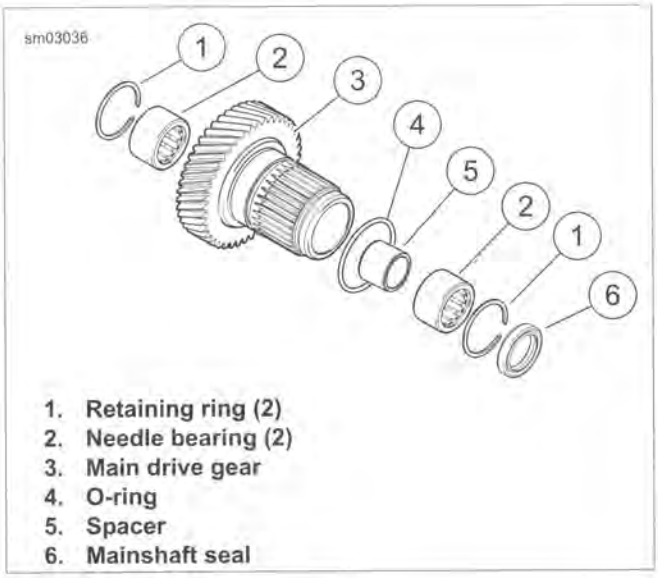
⚠WARNING

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

NOTES

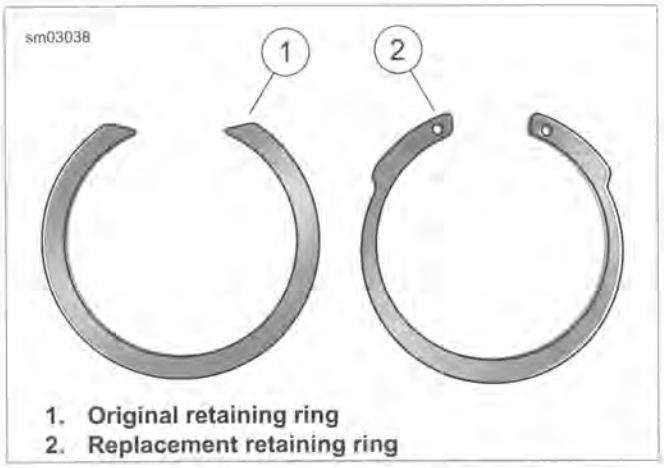
- *See Figure 6-41. When replacing needle bearings, discard original retaining rings (1) and install replacement retaining rings (2).*
- *To install the inner main drive gear needle bearings and mainshaft seal, use MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (Part No. HD-47932).*

1. See Figure 6-40. Remove mainshaft seal (6). Remove retaining rings (1), needle bearings (2) and spacer (5) from main drive gear (3). Discard retaining rings.
2. Remove and discard O-ring (4).



1. **Retaining ring (2)**
2. **Needle bearing (2)**
3. **Main drive gear**
4. **O-ring**
5. **Spacer**
6. **Mainshaft seal**

Figure 6-40. Main Drive Gear Assembly



1. **Original retaining ring**
2. **Replacement retaining ring**

Figure 6-41. Main Drive Gear Retaining Rings

3. See Figure 6-42. Install clutch side needle bearing using an arbor press and the 0.400 in. step end of tool as shown. Press until tool contacts gear.

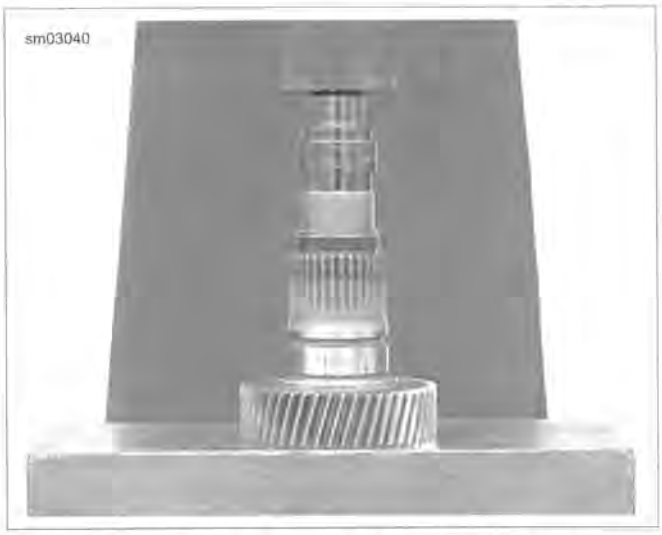


Figure 6-42. Installing Clutch Side Needle Bearing in Main Drive Gear

NOTE

An alternative method is provided which allows the mainshaft seal to be pressed into place after installation of the main drive gear. See 6.9 MAIN DRIVE GEAR AND BEARING, Mainshaft Seal Replacement.

4. See Figure 6-43. Turn over tool and press in mainshaft seal using the 0.090 in. step with garter spring side down.
5. Install spacer.
6. See Figure 6-44. Turn over the main drive gear in the arbor press. With the tool at the 0.188 in. step, press inner bearing until tool contacts gear.

⚠WARNING

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

7. See Figure 6-40. Install **new** retaining rings (1).
8. Install **new** O-ring (4) into groove in main drive gear.

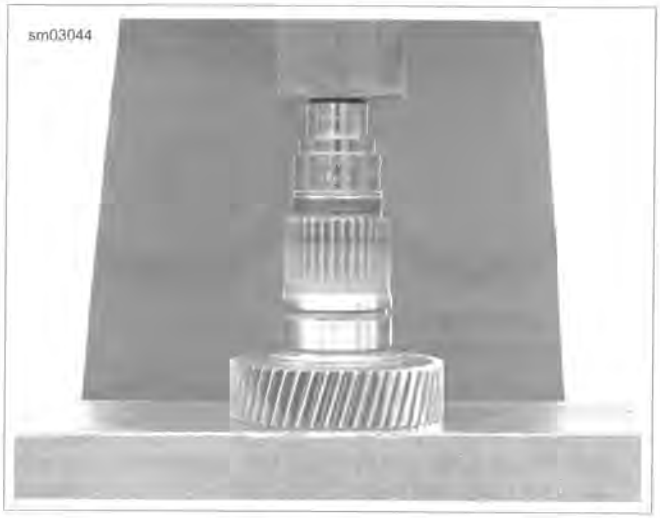


Figure 6-43. Pressing in Seal

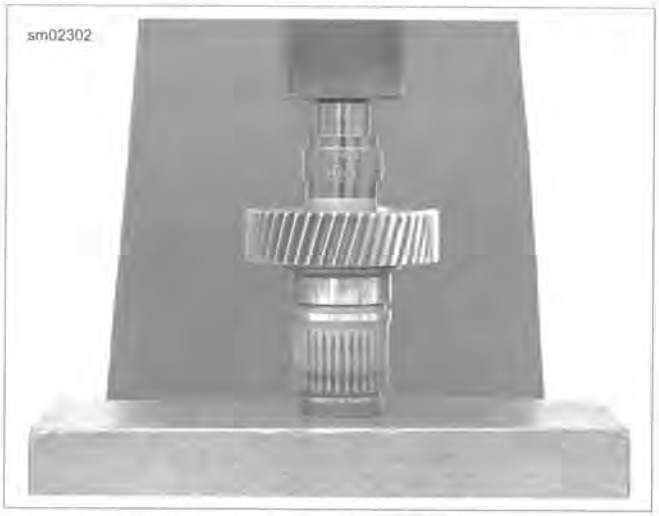
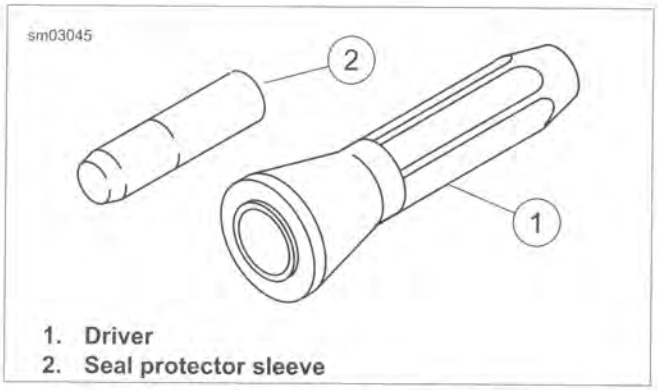


Figure 6-44. Installing Transmission Side Needle Bearing in Main Driver Gear

MAINSHAFT SEAL REPLACEMENT

PART NUMBER	TOOL NAME
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER

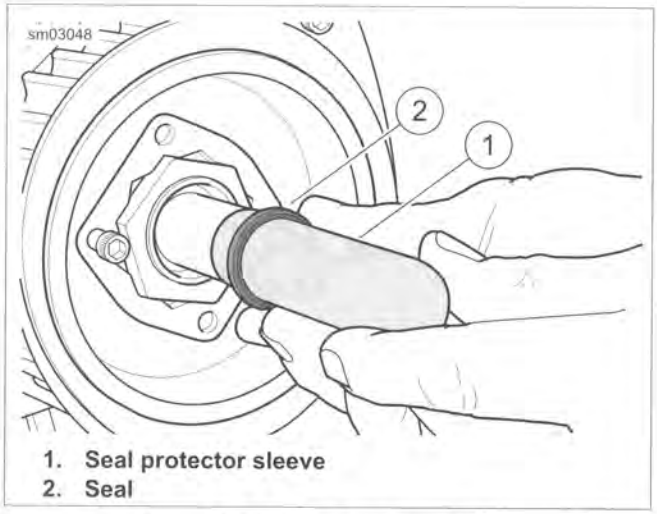
See Figure 6-45. To replace the mainshaft seal with the main drive gear installed, use the MAIN DRIVE GEAR SEAL INSTALLER (Part No. HD-47933).



1. **Driver**
2. **Seal protector sleeve**

Figure 6-45. Main Drive Gear Seal Installer

1. Remove the damaged seal using a seal remover or rolling head pry bar.
2. Inspect bore to be sure it is clean and smooth.
3. See Figure 6-46. Place the seal protector sleeve (1) over the end of the mainshaft. Lightly lubricate the protector sleeve and seal ID with clean transmission oil.
4. Verify that the garter spring is in place on the lip of the **new** oil seal. Apply a light coat of clean oil to the seal lip.
5. Squarely seat the mainshaft seal (2) on the seal protector sleeve with the garter spring facing the bearing.
6. See Figure 6-47. Using MAIN DRIVE GEAR SEAL INSTALLER (Part No. HD-47933), hand press seal onto place until seal driver contacts end of main drive gear. A rubber mallet may be used to lightly tap driver, if necessary.



1. **Seal protector sleeve**
2. **Seal**

Figure 6-46. Seal Protector Sleeve

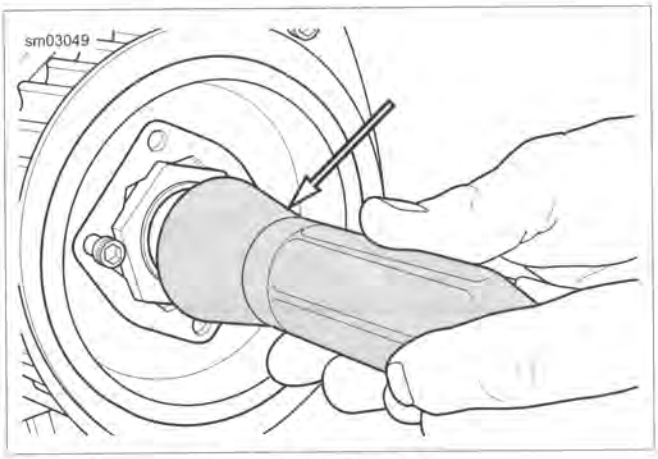


Figure 6-47. Seal Driver

INSTALLATION

PART NUMBER	TOOL NAME
HD-35316-12	INSTALLER CUP
HD-35316-3A	CROSS PLATE
HD-35316-4A	8 IN. BOLT
HD-35316-5	12 IN. BOLT
HD-35316-7	WASHER
HD-35316-8	BEARING DRIVER
HD-47856-1	INSTALLER
HD-47856-2	PILOT
HD-47856-3	ADAPTER
HD-47856-6	NUT
HD-47856-7	CROW'S FOOT WRENCH

NOTICE

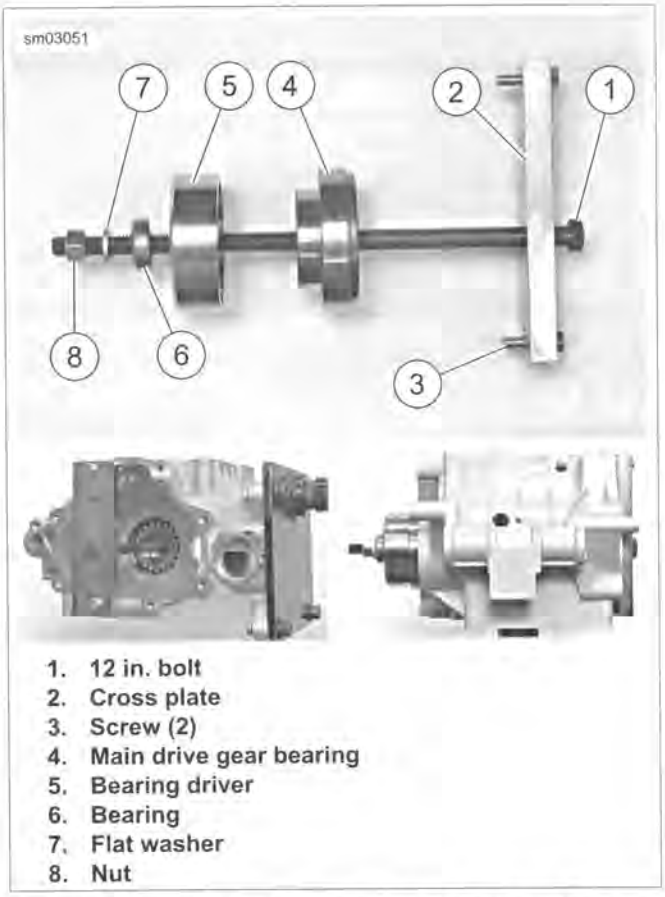
Improper tightening of sprocket nut can cause drive component damage. (00541b)

Installing Main Drive Gear Bearing

NOTE

CROSS PLATE (Part No. HD-35316-3A) will retrofit to earlier transmissions. Note that one end of cross plate is stamped, "UP 6 SPEED". Mount cross plate with this end pointing up for 6 speed transmissions.

1. See Figure 6-48. Secure CROSS PLATE (Part No. HD-35316-3A) (2) on right side of transmission case with two screws (3). Position cross plate with large bolt hole aligned with center of main drive gear bearing bore.
2. Apply a light coat of graphite lubricant to the threads of 12 IN. BOLT (Part No. HD-35316-5) (1) and install through cross plate and main drive gear bearing bore.
3. Place main drive gear bearing (4), BEARING DRIVER (Part No. HD-35316-8) (5), BEARING (6), FLAT WASHER (7) and NUT (8) over end of bolt.
4. Tighten nut until main drive gear bearing bottoms against lip cast into transmission case bearing bore.



1. **12 in. bolt**
2. **Cross plate**
3. **Screw (2)**
4. **Main drive gear bearing**
5. **Bearing driver**
6. **Bearing**
7. **Flat washer**
8. **Nut**

Figure 6-48. Installing Main Drive Gear Bearing (Typical)

Installing Main Drive Gear

NOTE

*See Figure 6-49. Make sure **new** O-ring (4) is installed onto main drive gear (3). Lubricate O-ring with clean engine oil.*

1. See Figure 6-49. Apply a light coat of graphite lubricant to the threads of 8 IN. BOLT (Part No. HD-35316-4A) (1) and insert through WASHER (Part No. HD-35316-7) (2) and main drive gear (3). Insert assembly into transmission case, through main drive gear bearing.
2. Place INSTALLER CUP (Part No. HD-35316-12) (5), BEARING (6), FLAT WASHER (7) and NUT (8) over end of bolt.
3. Tighten nut until main drive gear contacts main drive gear bearing.

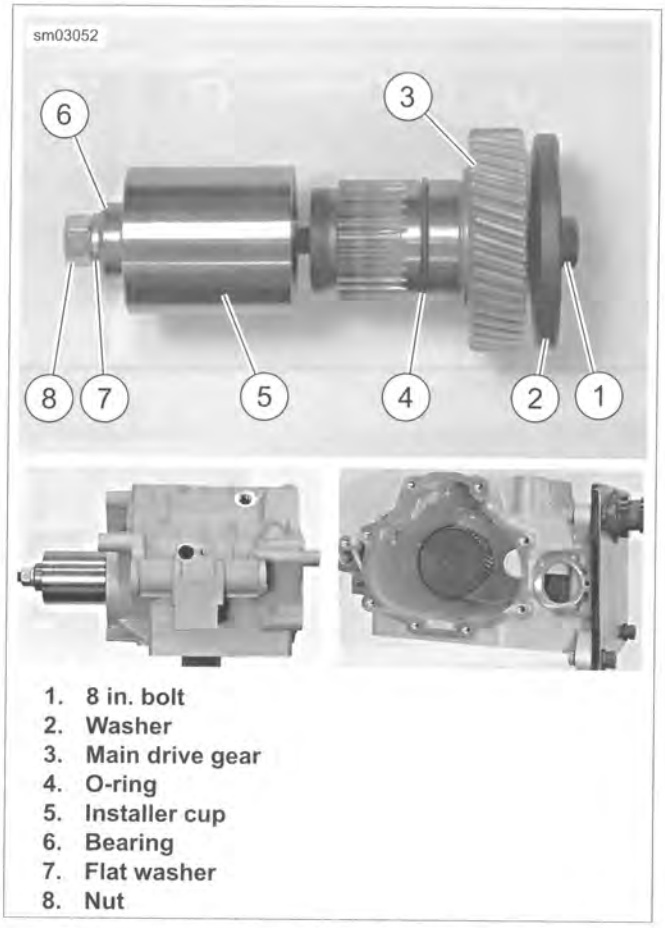
⚠WARNING

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

NOTE

See Figure 6-50. Retaining ring must be installed with the flat side facing the bearing and the opening within the ninety degree range shown.

4. See Figure 6-51. Install **new** retaining ring (2).



1. 8 in. bolt
2. Washer
3. Main drive gear
4. O-ring
5. Installer cup
6. Bearing
7. Flat washer
8. Nut

Figure 6-49. Installing Main Drive Gear (Typical)

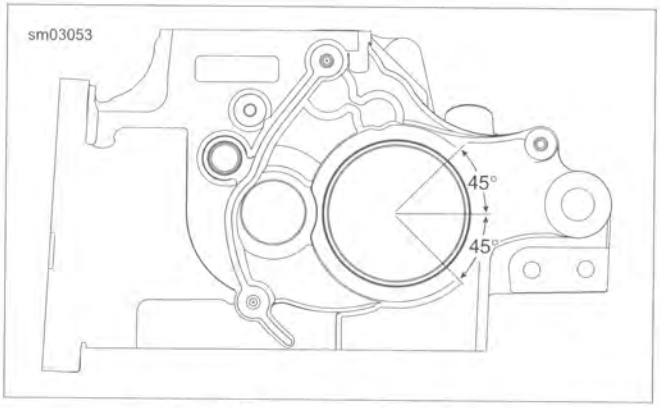


Figure 6-50. Retaining Ring Opening

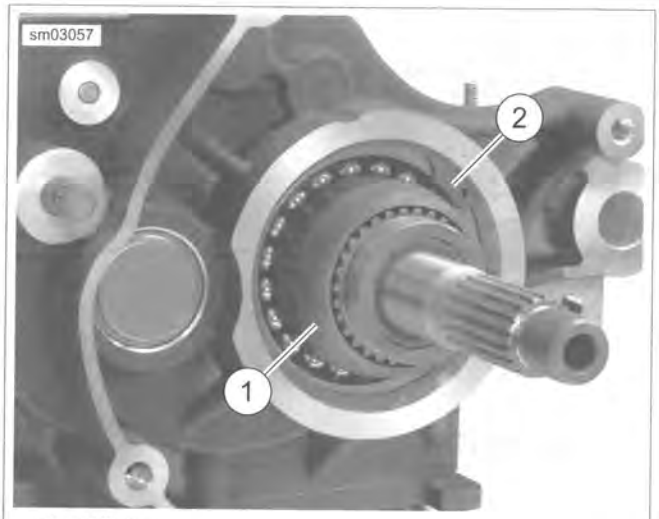
Installing Main Drive Gear Large Seal

1. See Figure 6-51. Install PILOT (Part No. HD-47856-2) over end of main drive gear bearing inner race.
2. Coat lips of **new** main drive gear seal with transmission lubricant.
3. See Figure 6-52. Place seal over pilot with garter spring facing bearing, and position seal squarely in end of crankcase bore.

NOTE

ADAPTER (Part No. HD-47856-3) and main drive gear have right-hand threads.

4. See Figure 6-53. Install ADAPTER (Part No. HD-47856-3) onto end of main drive gear until it contacts main drive gear.



1. Pilot
2. Retaining ring

Figure 6-51. Install Pilot

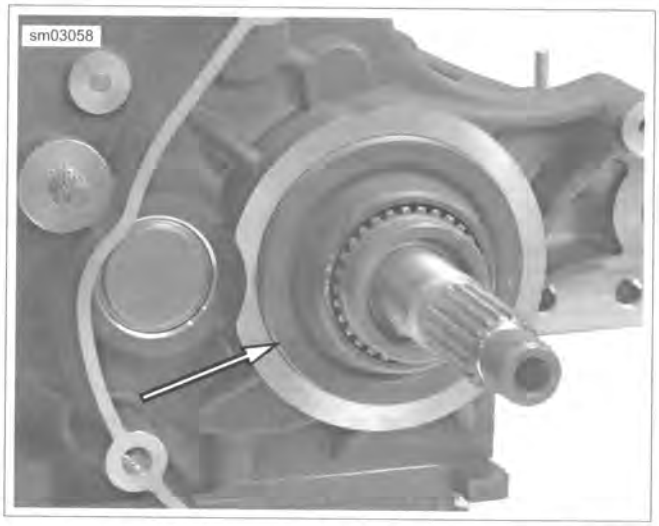


Figure 6-52. Place Main Drive Gear Seal Over Pilot

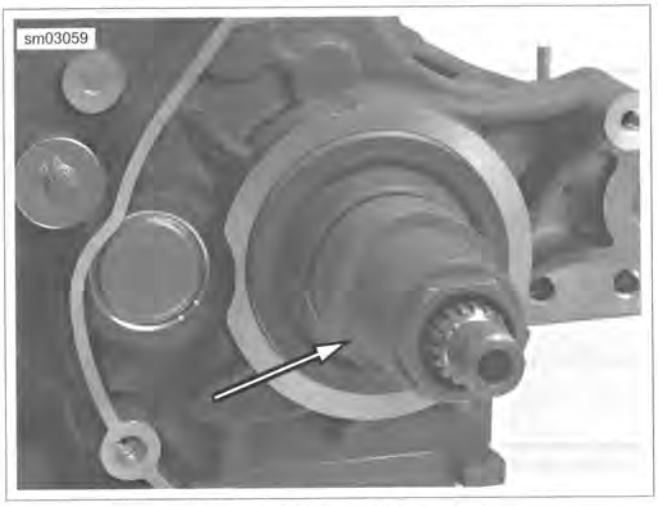


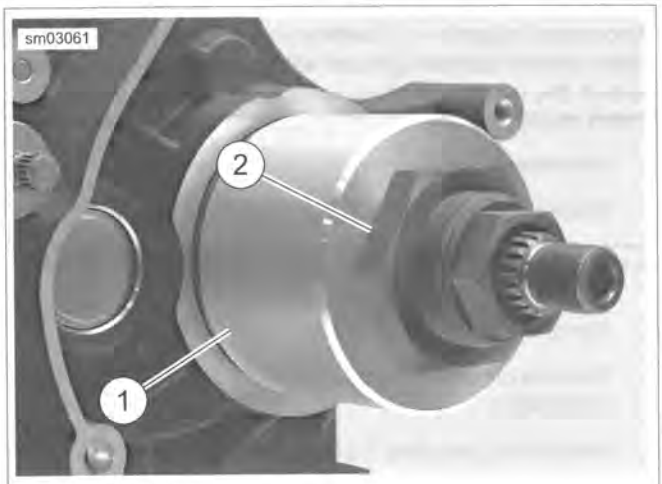
Figure 6-53. Install Adapter

5. See Figure 6-54. Slide INSTALLER (Part No. HD-47856-1) (1) over adapter until cupped end of installer is flat against seal.
6. Install NUT (Part No. HD-47856-6) (2) onto end of adapter against installer.
7. See Figure 6-55. Hold adapter from rotating and tighten large nut with CROW'S FOOT WRENCH (Part No. HD-47856-7) (1) attached to a 1/2 in breaker bar (2) until outer face of seal is flush with outer edge of transmission bore.

NOTE

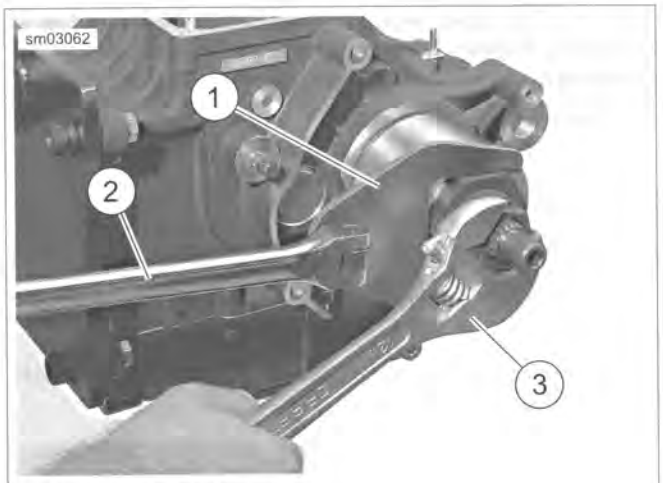
Seal depth will be controlled by tool. Seal can be recessed as much as 0.030 in. (0.762 mm) below outer edge of bore.

8. Remove nut, installer, adapter and pilot.
9. Install bearing housing and transmission components. See 6.8 TRANSMISSION ASSEMBLY, Installation.
10. Install sprocket and drive belt. See 5.8 TRANSMISSION SPROCKET. Do not adjust belt at this time.
11. Install the bearing inner race on the transmission mainshaft. See 6.8 TRANSMISSION ASSEMBLY, Assembly.
12. Install the primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING, Installation.
13. Install the clutch assembly, primary chain, chain tensioner assembly and compensating sprocket components. See 5.4 DRIVE COMPONENTS, Installation.
14. Install the primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Installation.
15. Adjust the drive belt. See 1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection.
16. Install exhaust system. See 4.18 EXHAUST SYSTEM.



1. **Installer**
2. **Nut**

Figure 6-54. Installer and Nut



1. **Crow's foot wrench**
2. **1/2 in breaker bar**
3. **Adjustable wrench**

Figure 6-55. Press Seal Into Crankcase

REMOVAL

⚠WARNING

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

1. Disconnect battery.
2. Drain engine oil. See 1.6 ENGINE OIL AND FILTER.
3. Drain transmission. See 1.11 TRANSMISSION LUBRICANT.
4. Remove starter. See 7.8 STARTER.
5. Remove transmission assembly. See 6.8 TRANSMISSION ASSEMBLY.
6. Remove oil pan. See 3.31 OIL PAN, Removal.

NOTICE

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

7. 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.
8. Remove rear fork. See 2.22 REAR FORK.
9. Disconnect vehicle speed sensor (VSS). See 7.22 VEHICLE SPEED SENSOR (VSS).
10. Disconnect neutral switch. See 7.24 NEUTRAL SWITCH, Removal.
11. Remove fastener from ground post at top of transmission case and remove battery negative ring terminal.
12. Move aside the harness that terminates at the O2 sensor, starter solenoid, neutral switch and VSS.
13. Mark splines on shift arm and shift shaft to help with assembly. Remove shift arm from shift shaft.
14. In a crosswise pattern, remove four fasteners that connect transmission to engine.

NOTE

See Figure 6-56. 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.

15. Move transmission rearward until two ring dowels in lower flange are free of crankcase. Remove transmission case from left side of the motorcycle.

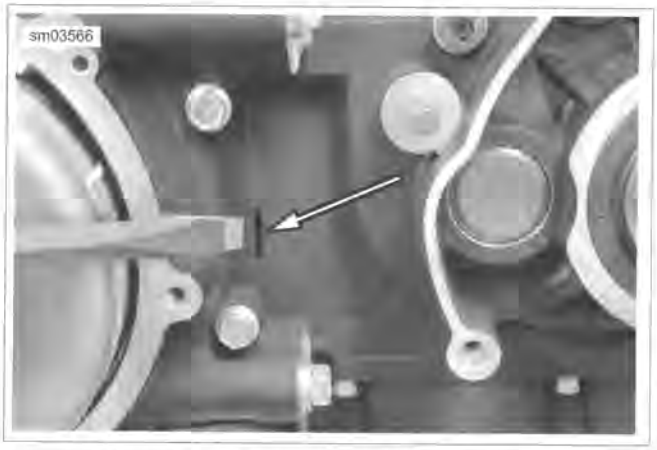


Figure 6-56. Transmission Case Pry Point

INSTALLATION

FASTENER	TORQUE VALUE	
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm

1. Install **new** ground post at top of transmission case. Tighten ground post until snug.

NOTE

*A **new** transmission case comes with the shifter shaft sleeve and seal, centering screw, countershaft needle bearing and main drive gear bearing and seal installed.*

2. Thoroughly wipe all engine oil from pockets in crankcase flange.
3. Install **new** engine-to-transmission gasket engaging two index pins in holes of transmission flange.
4. Verify that transmission dowels are seated. Place transmission case into position behind crankcase. Mate engine and transmission flanges.
5. Install and tighten fasteners.
   a. Install shorter fasteners at the top, longer fasteners at the bottom. **Hand tighten** fasteners in a crosswise pattern.
   b. See Figure 6-57. Tighten bolts in the sequence shown to 15 ft-lbs (20.3 Nm) in the same crosswise pattern.
   c. Final tighten bolts to 34-39 ft-lbs (46.1-52.9 Nm).
6. Install oil pan. See 3.31 OIL PAN.
7. Install rear fork. See 2.22 REAR FORK, Installation.
8. Install shift arm on shift shaft. Align marks made during disassembly.

9. Install transmission and bearing housing assembly. See 6.8 TRANSMISSION ASSEMBLY, Installation.
10. Connect battery ground cable to ground post at top of transmission case. Tighten securely.
11. Adjust drive belt tension. See 1.14 DRIVE BELT AND SPROCKETS.
12. Install primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
13. Install drive components. See 5.4 DRIVE COMPONENTS.

NOTE

*Always install a **new** gasket between primary chaincase cover and chaincase. Failure to replace this gasket may cause primary chaincase leaks.*

14. Install primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER.
15. Install neutral switch. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
16. Install VSS with screw. Tighten to 84-132 **in-lbs** (9.5-14.9 Nm).
17. Mate VSS, O2 sensors, starter solenoid and neutral switch connectors to main harness.
18. Install starter. See 7.8 STARTER, Installation.
19. Install exhaust system. See 4.18 EXHAUST SYSTEM.
20. Install drain plug. Tighten to 14-21 ft-lbs (19.0-28.5 Nm). Fill transmission. See 1.11 TRANSMISSION LUBRICANT.

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)

21. Fill primary chaincase. See 1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.
22. Fill engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter.

⚠WARNING

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

23. Connect battery cables.

Figure 6-57. Transmission Housing to Crankcase Torque Sequence

DISASSEMBLY

Shifter Arm Assembly

1. See Figure 6-58. After removing bearing housing assembly, remove screw (8) and shifter rod lever (9) from the shifter pawl lever assembly (1).
2. Remove retaining ring (7), washer (6) and seal (5). Discard retaining ring and seal. Pull shifter pawl lever assembly out of the transmission case.
3. Inspect sleeve (2) inside transmission case.

CLEANING AND INSPECTION

⚠WARNING

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

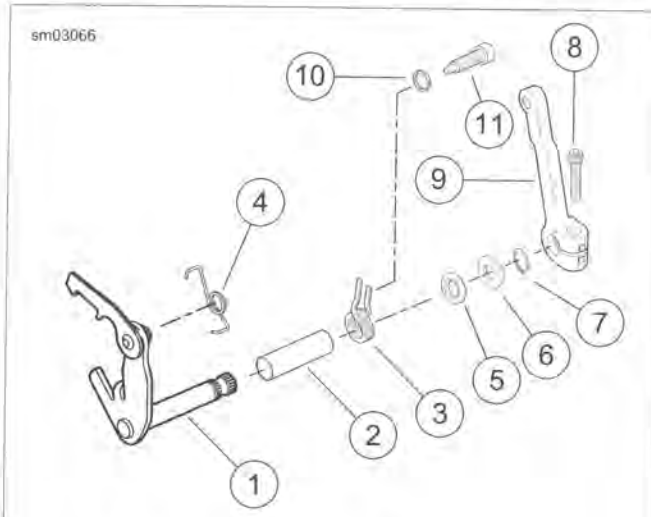
1. Clean all parts in solvent except the case and main drive gear needle bearings. Dry parts with low pressure compressed air.

NOTE

Never wash the transmission case and needle bearings with solvent. Normal cleaning methods will wash dirt or other contaminants into the bearing case (behind the needles) leading to bearing failure.

2. See Figure 6-58. 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 spring (4). Replace if the spring fails to hold the pawl on the cam pins.

4. Thoroughly clean the oil pan with solvent.
5. Inspect preformed transmission top cover vent hose for damage. Replace as necessary. Use low-pressure compressed air to verify that hose and fitting are unobstructed.



1. **Shifter pawl lever assembly**
2. **Sleeve (inside transmission case)**
3. **Shift lever centering spring**
4. **Shifter shaft lever spring**
5. **Seal**
6. **Washer**
7. **Retaining ring**
8. **Screw**
9. **Shifter rod lever**
10. **Washer**
11. **Screw**

Figure 6-58. Shifter Arm Assembly

ASSEMBLY

PART NUMBER	TOOL NAME
HD-51337	SHIFTER SHAFT SEAL INSTALLATION TOOL

FASTENER	TORQUE VALUE	
Shifter pawl centering screw	18-23 ft-lbs	24.4-31.2 Nm
Shifter rod lever pinch screw, transmission lever	18-22 ft-lbs	24.4-29.8 Nm

Countershaft Needle Bearing Replacement

1. Find a suitable bearing driver 1.25 in (31.75 mm) in diameter.
2. Check bearing position.
   a. From the outside of the transmission case place the needle bearing open end first next to the bearing bore.
   b. Hold the driver squarely against the closed end of the bearing and tap the bearing into place.
   c. The bearing is properly positioned when it is driven inward flush with the outside surface of the case or to a maximum depth of 0.030 in (0.76 mm).
3. Lubricate the bearing with SCREAMIN' EAGLE ASSEMBLY LUBE.

Shifter Pawl Lever Assembly

1. See Figure 6-58. Verify that sleeve (2) is inside transmission case.
2. Install screw (11) and washer (10) into side of transmission case. Tighten to 18-23 ft-lbs (24.4-31.2 Nm).
3. See Figure 6-59. Slide shifter lever centering spring (3) over shaft of shifter pawl lever assembly (2). Align opening on spring with tab on lever.
4. Place shifter shaft lever spring (4) on shifter pawl lever assembly.

NOTE

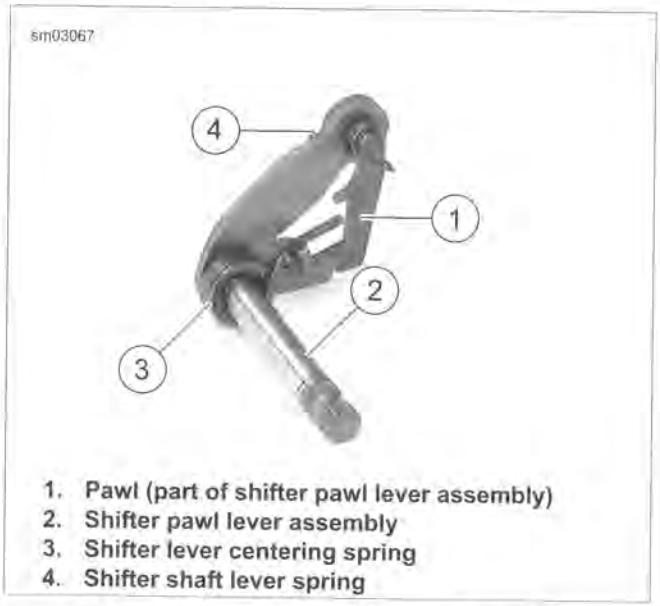
Do not bend shifter shaft lever spring more than necessary for assembly.

5. See Figure 6-60. Insert the assembly into the transmission case.
6. See Figure 6-61. Verify that pin sits inside shifter shaft lever spring.
7. See Figure 6-62. Using SHIFTER SHAFT SEAL INSTALLATION TOOL (Part No. HD-51337), install a **new** seal. Make sure the seal's garter spring faces the transmission. Drive the seal in until the tool bottoms out on the transmission case. This installs the seal to the correct depth.
8. See Figure 6-60. Install washer (1) and a **new** retaining ring (2).

NOTE

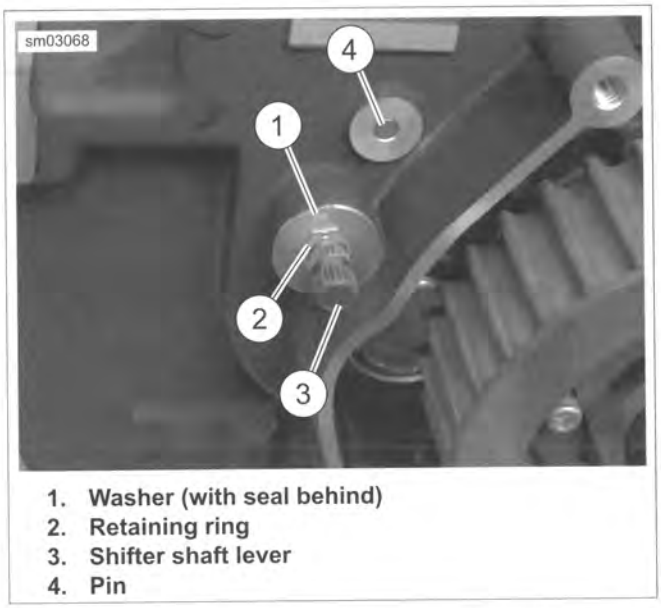
In next step, shifter rod lever must be installed so angle of lever is toward front of vehicle, one spline from vertical.

9. See Figure 6-58. Install shifter rod lever (9) on the shifter pawl lever assembly shaft end using screw (8). Tighten to 18-22 ft-lbs (24.4-29.8 Nm).



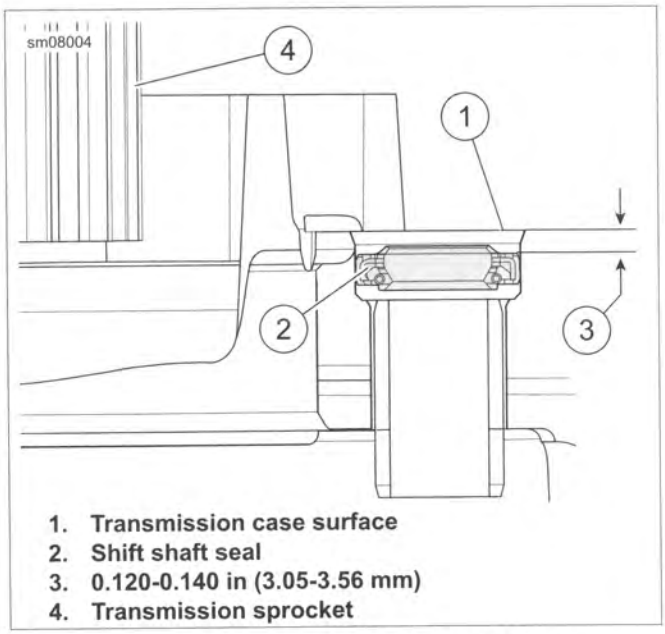
1. **Pawl (part of shifter pawl lever assembly)**
2. **Shifter pawl lever assembly**
3. **Shifter lever centering spring**
4. **Shifter shaft lever spring**

Figure 6-59. Shifter Pawl Lever Assembly



1. Washer (with seal behind)
2. Retaining ring
3. Shifter shaft lever
4. Pin

Figure 6-60. Shifter Shaft Lever, Exterior View



1. Transmission case surface
2. Shift shaft seal
3. 0.120-0.140 in (3.05-3.56 mm)
4. Transmission sprocket

Figure 6-62. Shift Shaft Seal Installation

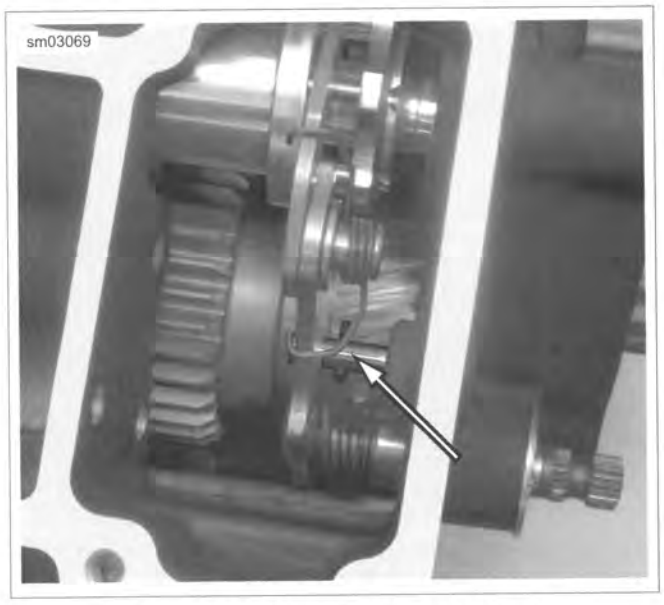


Figure 6-61. Shifter Shaft Lever Spring

NOTES

SUBJECT	PAGE NO.
7.1 FASTENER TORQUE VALUES	7-1
7.2 SPECIFICATIONS: ELECTRICAL	7-5
7.3 SYSTEM FUSES AND RELAYS	7-6
7.4 ELECTRONIC CONTROL MODULE (ECM)	7-7
7.5 BODY CONTROL MODULE (BCM)	7-8
7.6 ELECTRICAL CADDIES	7-9
7.7 IGNITION COIL	7-12
7.8 STARTER	7-13
7.9 HEADLAMP	7-17
7.10 AUXILIARY/FOG LAMPS AND BRACKETS	7-18
7.11 REAR LIGHTING	7-21
7.12 FENDER TIP LAMPS	7-26
7.13 TOUR-PAK LIGHTS	7-28
7.14 TURN SIGNAL LAMPS	7-31
7.15 IGNITION SWITCH AND FORK LOCK	7-39
7.16 DASH PANEL SWITCHES	7-42
7.17 CRANKSHAFT POSITION SENSOR (CKP)	7-43
7.18 ENGINE TEMPERATURE SENSOR (ET)	7-44
7.19 AUTOMATIC COMPRESSION RELEASE (ACR)	7-45
7.20 VOLTAGE REGULATOR	7-47
7.21 ALTERNATOR	7-49
7.22 VEHICLE SPEED SENSOR (VSS)	7-51
7.23 WHEEL SPEED SENSORS	7-52
7.24 NEUTRAL SWITCH	7-54
7.25 OIL PRESSURE SWITCH OR SENDER	7-55
7.26 STOP LAMP SWITCHES	7-56
7.27 HORN	7-57
7.28 FAIRING POWER OUTLET	7-59
7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS	7-60
7.30 GAUGES AND INSTRUMENTS: ROAD KING MODELS	7-61
7.31 INDICATOR LAMPS: ROAD KING MODELS	7-63
7.32 BOOM! BOX INFOTAINMENT SYSTEM	7-64
7.33 ANTENNA CABLES	7-70
7.34 WIRE TROUGH	7-73
7.35 MAIN WIRING HARNESS	7-75
7.36 FAIRING HARNESS	7-82
7.37 HANDLEBAR SWITCH PACKS	7-84
7.38 HFSM MAINTENANCE	7-89
7.39 PERSONAL IDENTIFICATION NUMBER (PIN)	7-91
7.40 H-DSSS ACTUATION	7-92
7.41 SECURITY SIREN	7-93

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
ABS module locknuts	53-88 **in-lbs**	6-10 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
ACR	132-180 **in-lbs**	14.9-20.3 Nm	7.19 AUTOMATIC COMPRESSION RELEASE (ACR), Installation/Apply three equally spaced dots of LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue) around lower third of threads
Auxiliary/fog lamp bracket acorn nuts: Fairing models	120-180**in-lbs**	13.6-20.3 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Turn Signal/Auxiliary/Fog Lamp Bracket
Auxiliary/fog lamp bracket acorn nuts: Road King models	72-108 **in-lbs**	8.1-12.2 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Turn Signal/Auxiliary/Fog Lamp Bracket
Auxiliary/fog lamp door screw	6-10 **in-lbs**	0.7-1.1 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Bulb Replacement
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.8 STARTER, Installation
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.21 ALTERNATOR, Installation
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
Battery tray screws	132-156 **in-lbs**	14.9-17.6 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Brake lever clamp screws	72-108 **in-lbs**	8.1-12.2 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
CB antenna base set screw	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
CB antenna stud nut	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
CB antenna stud nut	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
CB module bracket to speaker enclosure screw	25-35 **in-lbs**	2.8-4.0 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, CB Module
CB module to speaker enclosure screw	25-35 **in-lbs**	2.8-4.0 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, CB Module
CKP mount screw	100-120 **in-lbs**	11.3-13.6 Nm	7.17 CRANKSHAFT POSITION SENSOR (CKP), Installation
Clutch lever bracket clamp screws	72-108 **in-lbs**	8.1-12.2 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Coolant down tubes to front frame	90-110 **in-lbs**	10.2-12.4 Nm	7.20 VOLTAGE REGULATOR, Installation
Dash panel screws	25-30 **in-lbs**	2.8-3.4 Nm	7.36 FAIRING HARNESS, Harness Service
Engine mount end cap fasteners, front	42-48 ft-lbs	56.9-65.0 Nm	7.26 STOP LAMP SWITCHES, Rear Stop Lamp Switch
Engine mount end cap fasteners, front	42-48 ft-lbs	56.9-65.0 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)
ET sensor	120-180 **in-lbs**	13.6-20.3 Nm	7.18 ENGINE TEMPERATURE SENSOR (ET), Installation
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm	7.36 FAIRING HARNESS, Harness Service
Fairing speaker enclosure to fairing screws	48-60 **in-lbs**	5.4-6.8 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fairing speaker enclosure to fairing support screws	20-24 ft-lbs	27.1-32.5 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers

FASTENER	TORQUE VALUE		NOTES
Fairing speaker grille screws	9-13 **in-lbs**	1.0-1.4 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fairing speaker screw	14-20 **in-lbs**	1.6-2.3 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fender, rear, lights harness stud plate flange nuts	60-96 **in-lbs**	6.8-10.9 Nm	7.11 REAR LIGHTING, Rear Fender Lights Harness: all except FLHX/S
Fender tip lamp, front	20-25 **in-lbs**	2.3-2.8 Nm	7.12 FENDER TIP LAMPS, Front Fender Tip Lamp
Fender tip lamp, rear, harness P-clamp locknut	45-85 **in-lbs**	5.1-9.6 Nm	7.12 FENDER TIP LAMPS, Rear Fender Tip Lamp
Fender tip lamp, rear, screws	12-18 **in-lbs**	1.4-2.0 Nm	7.12 FENDER TIP LAMPS, Rear Fender Tip Lamp
Fender trim strips, front	10-15 **in-lbs**	1.1-1.7 Nm	7.12 FENDER TIP LAMPS, Front Fender Tip Lamp
Fork lock screws: Road King	36-60 **in-lbs**	4.1-6.8 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Road King Models
Gauges, 2 inch diameter gauge screws	8-12 **in-lbs**	1.0-1.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, 2-Inch Diameter Gauges
Gauges, instrument cluster screws	8-12 **in-lbs**	1.0-1.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, Speedometer/Tachometer Instrument Cluster
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.7 IGNITION COIL, Installation
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)/(10 mm)
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm	7.9 HEADLAMP, Headlamp
Headlamp retaining screws: Road King models	23-26 **in-lbs**	2.6-2.9 Nm	7.9 HEADLAMP, Headlamp
Horn bracket acorn nut	80-120 **in-lbs**	9.0-13.6 Nm	7.27 HORN, Installation
Horn bracket to cylinder head screws	35-40 ft-lbs	47.5-54.2 Nm	7.27 HORN, Installation
Horn cover to bracket	35-55 **in-lbs**	3.9-6.2 Nm	7.27 HORN, Installation
Horn rubber mount	10-20 ft-lbs	13.6-27.1 Nm	7.27 HORN, Installation/Apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red)
Horn stud flange nut	80-100 **in-lbs**	9.0-11.3 Nm	7.27 HORN, Installation
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.7 IGNITION COIL, Installation
Ignition switch housing nut, fairing models	13-15 ft-lbs	17.5-20.9 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Fairing Models
Ignition switch housing screws, fairing models	19-28 **in-lbs**	2.1-3.2 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Fairing Models
Ignition switch screws: Road King	25-35 **in-lbs**	2.8-3.9 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Road King Models
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Left electrical caddy fasteners	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Left Side Caddy
License plate bracket screws	60-90 **in-lbs**	6.8-10.2 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
License plate bracket screws	60-90 **in-lbs**	6.8-10.2 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	7.24 NEUTRAL SWITCH, Installation
Oil pressure sender	96-144 **in-lbs**	10.8-16.3 Nm	7.25 OIL PRESSURE SWITCH OR SENDER, Installation

FASTENER	TORQUE VALUE		NOTES
Passenger audio switch screws	25-30 **in-lbs**	2.8-3.4 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Rear Speaker Enclosures
Radio (or storage box) to fairing support bracket screws	60-84 **in-lbs**	6.8-9.5 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Radio
Radio antenna inner set screw	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
Radio antenna stud nut	16-19 **in-lbs**	1.8-2.1 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	7.11 REAR LIGHTING, Rear Fascia Lamp
Rear speaker enclosure to Tour-Pak screws	20-25 **in-lbs**	2.3-2.8 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Rear Speaker Enclosures
Right caddy screw	36-40 **in-lbs**	4.1-4.5 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
Right caddy to battery tray screw	36-40 **in-lbs**	4.1-4.5 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	7.8 STARTER, Solenoid
Solenoid terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm	7.8 STARTER, Drive Assembly
Solenoid terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm	7.8 STARTER, Installation
Starter end cover screw	90-110 **in-lbs**	10.2-12.4 Nm	7.8 STARTER, Drive Assembly
Starter mounting screws	22-24 ft-lbs	29.8-32.5 Nm	7.8 STARTER, Installation/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue).
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	7.8 STARTER, Solenoid
Starter through bolts	39-65 **in-lbs**	4.4-7.3 Nm	7.8 STARTER, Drive Assembly
Stator mounting screws	55-75 **in-lbs**	6.2-8.5 Nm	7.21 ALTERNATOR, Installation/Always use new screws
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm	7.26 STOP LAMP SWITCHES, Rear Stop Lamp Switch/Use LOCTITE 565 THREAD SEALANT
Tail lamp circuit board screw	40-48 **in-lbs**	4.5-5.4 Nm	7.11 REAR LIGHTING, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Tail Lamp Bulb Replacement
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Rear Fender Lights Harness: all except FLHX/S
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Rear Fender Lights Harness: FLHX/S
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.12 FENDER TIP LAMPS, Rear Fender Tip Lamp
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
Thermostat screw	48-60 **in-lbs**	5.4-6.8 Nm	7.20 VOLTAGE REGULATOR, Installation
Top caddy screws	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Top Caddy
Tour-Pak ground plate screws	20-25 **in-lbs**	2.3-2.8 Nm	7.13 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
Tour-Pak side marker lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	7.13 TOUR-PAK LIGHTS, Tour-Pak Side Lamps/Trim Strips
Tour-Pak wrap-around lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
Turn signal, front, lamp to bracket screw: Bullet Style, auxiliary/fog lamp equipped	96-120 **in-lbs**	10.9-13.5 Nm	7.14 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Turn signal, front, lamp to bracket screw: Bullet Style, without auxiliary/fog lamps	15-20 ft-lbs	20.3-27.1 Nm	7.14 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Turn signal lamp, front, mounting bracket screws: FLHR/C, FLHT/C/U	30-60 **in-lbs**	4.1-6.8 Nm	7.14 TURN SIGNAL LAMPS, Front Turn Signal Lamp

FASTENER	TORQUE VALUE		NOTES
Turn signal lamps bracket, rear, screws	84-144 **in-lbs**	9.5-16.3 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE 271 HIGH STRENGTH THREADLOCKER (red)
Turn signal lamps bracket, rear, screws	84-144 **in-lbs**	9.5-16.3 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE 271 HIGH STRENGTH THREADLOCKER (red)
Turn signal lamp screw, front	96-120 **in-lbs**	10.9-13.5 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Housing
Turn signal lamp to auxiliary/fog lamp stud locknut	20-24 ft-lbs	27.1-32.5 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Housing
Turn signal lamp to rear turn signal lamps bracket screws	30-50 **in-lbs**	3.4-5.6 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
Upper support bracket to speaker enclosure screws	48-60 **in-lbs**	5.4-6.8 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm	7.20 VOLTAGE REGULATOR, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	7.22 VEHICLE SPEED SENSOR (VSS), VSS

SPECIFICATIONS

Table 7-1. Ignition

IGNITION	DATA
Idle speed	1000 ± 50 rpm
Spark plug size	12 mm
Spark plug gap	0.038-0.043 in
	0.97-1.09 mm
Spark plug type	Harley-Davidson No. 6R12 (no substitute)
Ignition coil primary resistance	0.5-0.7 ohms
Ignition coil secondary resistance	5500-7500 ohms

Table 7-2. Fuses

FUSE	AMPS
Main fuse	50
System power	7.5
P&A	20
Radio power	20
Cooling	10
Battery	5

Table 7-3. Charging System

CHARGING SYSTEM	DATA
Battery	28 amp hour/405 CCA
Alternator AC voltage output	16-23 VAC per 1000 RPM
Alternator stator coil resistance	0.1-0.2 ohms
Regulator voltage output @ 3600 RPM	14.3-14.7 @ 75 °F (24 °C)
Regulator amperes @ 3000 RPM	35-50 amps

Table 7-4. Starter Specifications

STARTER DATA	
Free speed	3000 rpm (min) @ 11.5 V
Free current	90 A (max) @ 11.5 V
Cranking current	200 A (max) @ 68 °F
Stall torque	8.0 ft-lbs (10.8 Nm) @ 2.4 V

MAIN FUSE

Removal

1. Remove left side saddlebag. See 2.31 SADDLEBAGS.
2. Remove left side cover.
3. **Siren Equipped Models:** With security fob present, turn ignition switch ON.
4. See Figure 7-1. Pull main fuse from main fuse holder.

Installation

1. See Figure 7-1. Insert main fuse into main fuse holder.
2. Install left side cover.
3. Install left side saddlebag. See 2.31 SADDLEBAGS.

SYSTEM FUSES AND RELAYS

NOTE

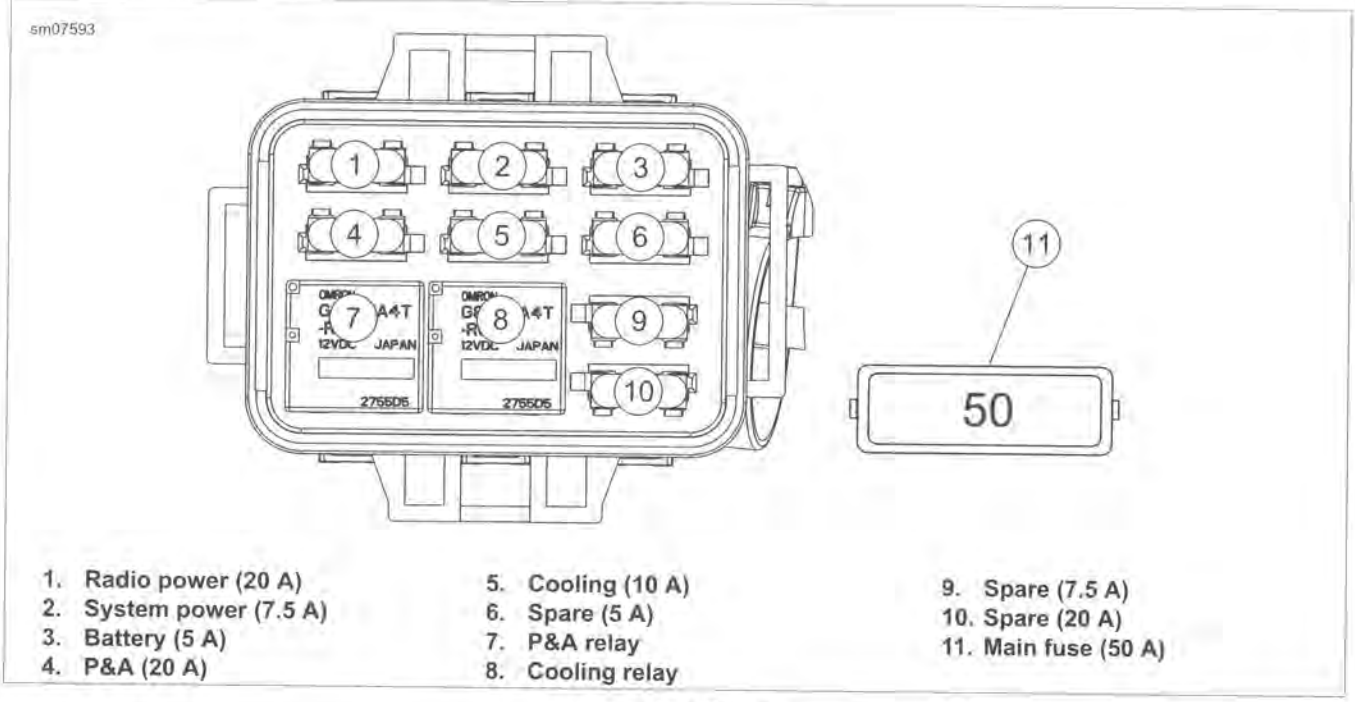
All Touring model motorcycles use a common fuse block. Actual fuse assignment may vary based on model and options.

Removal

1. Remove left saddlebag. See 2.31 SADDLEBAGS.
2. Remove left side cover.
3. Press in tabs on the left and right sides of fuse block cover. Remove the cover.
4. See Figure 7-1. Remove system fuse or relay from fuse block. Replace fuse if the element is burned. Automotive type ATO fuses are used.

Installation

1. See Figure 7-1. Install system fuse or relay in fuse block.
2. Install fuse block cover.
3. Install left side cover.
4. Install left saddlebag. See 2.31 SADDLEBAGS.



1. **Radio power (20 A)**
2. **System power (7.5 A)**
3. **Battery (5 A)**
4. **P&A (20 A)**
5. **Cooling (10 A)**
6. **Spare (5 A)**
7. **P&A relay**
8. **Cooling relay**
9. **Spare (7.5 A)**
10. **Spare (20 A)**
11. **Main fuse (50 A)**

Figure 7-1. Fuses

FUSE BLOCKS

Main Fuse Holder

See 7.6 ELECTRICAL CADDIES for removal and installation of the main fuse holder. See A.9 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING for terminal removal and installation.

System Fuse Block

See 7.6 ELECTRICAL CADDIES for removal and installation of the system fuse block. See A.6 DELPHI 280 METRI-PACK UNSEALED CONNECTORS for terminal removal and installation.

ECM

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Removal

1. Remove seat. See 2.30 SEAT.
2. Free ECM from top caddy.
3. Disconnect three ECM connectors. See A.22 TYCO GET 64 SEALED CONNECTOR.

Installation

1. Connect ECM connectors.

NOTE

Connectors are keyed to install only in the correct location. The color of each connector is also imprinted on the ECM adjacent to each connector.

2. Secure ECM in top caddy.

⚠WARNING

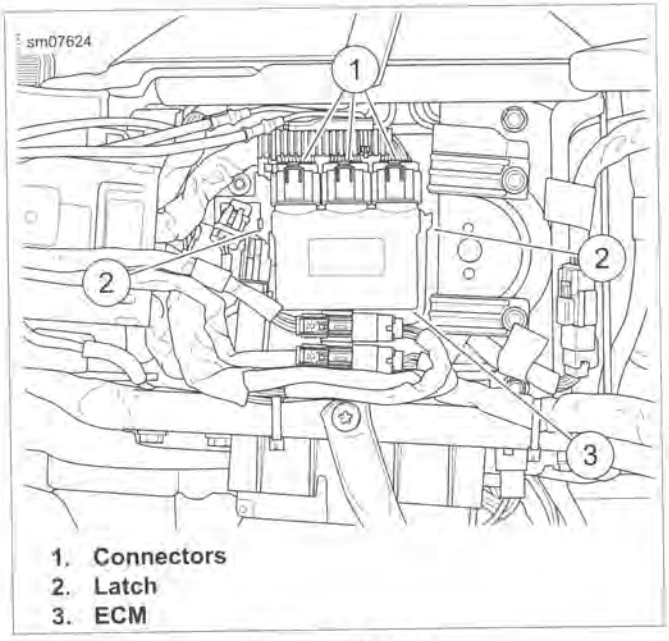
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

3. Install seat. See 2.30 SEAT.
4. If installing a new ECM, it must be set up using DIGITAL TECHNICIAN II (Part No. HD-48650):
   a. Choose the REFLASH icon.
   b. Follow the on-screen prompts.

NOTES

- *Whenever a **new** TGS or ECM is installed, idle speed must be reset. The ECM uses the first four ignition cycles to establish the optimum idle speed. Failure to perform these steps can result in initial performance problems.*
- *After installing ECM, the password learn procedure must be performed.*

5. If a **new** ECM was installed, reset idle speed.
   a. Place the engine run/stop switch in the RUN position.
   b. Turn the ignition switch to IGNITION and then OFF four times without starting engine. Allow at least three seconds to elapse between ignition cycles.



1. **Connectors**
2. **Latch**
3. **ECM**

Figure 7-2. ECM

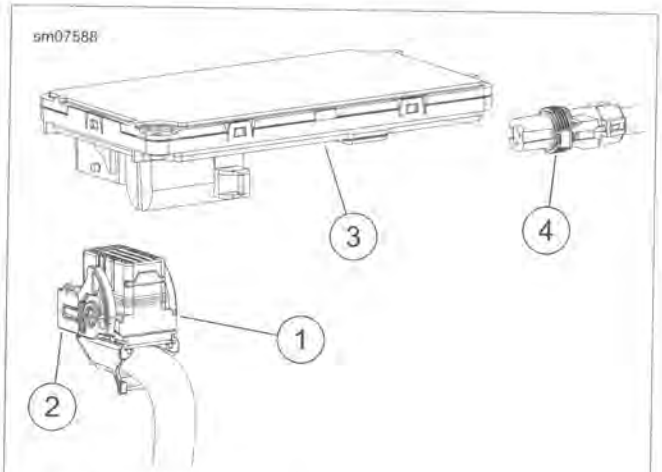
REMOVAL

1. Remove left side cover.
2. **Siren Equipped Models:** With security fob present, turn ignition switch ON.
3. Remove main fuse.
4. Lift retaining tab and pull BCM from left caddy.
5. See Figure 7-3. Remove BCM power wire connector (4).
6. Push lock latch and rotate lock (2) until a click is heard. Remove BCM connector (1).

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

1. See Figure 7-3. Install BCM connector and rotate lock to secure.
2. Connect BCM power wire.
3. Install BCM in left caddy. Install main fuse.
4. Install side cover.
5. If installing a new BCM, it must be set up using DIGITAL TECHNICIAN II (Part No. HD-48650):
   a. Choose the VEHICLE SETUP icon.
   b. Follow the on-screen prompts.



1. **BCM connector**
2. **Lock**
3. **BCM**
4. **BCM power wire connector**

Figure 7-3. BCM

TOP CADDY

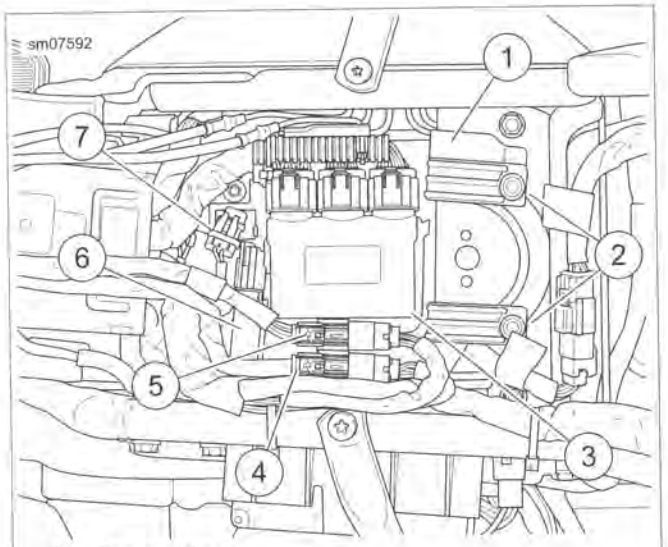
FASTENER	TORQUE VALUE	
Top caddy screws	72-96 **in-lbs**	8.1-10.9 Nm

Removal

1. Remove seat. See 2.30 SEAT.
2. See Figure 7-4. Remove HFSM antenna (6), if present.
3. Lift up on ECM (3) until free of caddy.
4. Remove connectors (4, 5) from retaining devices.
5. Remove screws (2).
6. Lift caddy and slide purge valve solenoid (7) from caddy, if present. Remove caddy.

Installation

1. See Figure 7-4. Install purge valve solenoid (7) on caddy (1). Place caddy into position over battery.
2. Install screws (2). Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
3. Install ECM (3).
4. Install HFSM antenna (6) onto caddy, if present.
5. Secure connectors (4, 5) to retaining devices.
6. Install seat. See 2.30 SEAT.



1. **Top caddy**
2. **Screw (2)**
3. **ECM**
4. **Connector, grey**
5. **Connector, black**
6. **HFSM antenna**
7. **Purge valve solenoid**

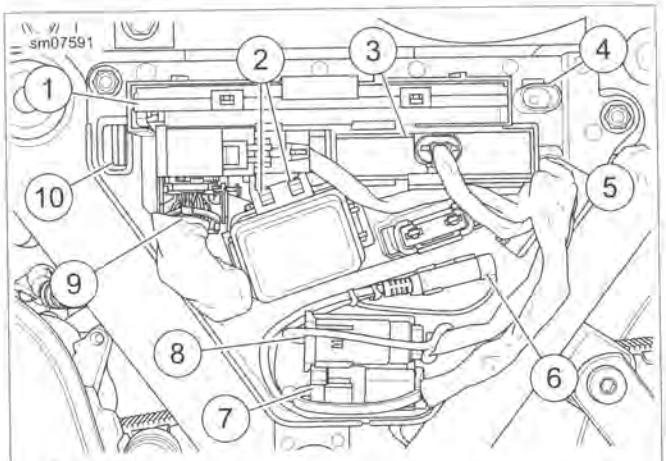
Figure 7-4. Top Caddy

LEFT SIDE CADDY

FASTENER	TORQUE VALUE	
Left electrical caddy fasteners	72-96 **in-lbs**	8.1-10.9 Nm

Removal

1. Remove left saddlebag. See 2.31 SADDLEBAGS.
2. Remove left side cover.
3. Remove seat. See 2.30 SEAT.
4. **Siren Equipped Models:** With security fob present, turn ignition switch ON.
5. Remove main fuse.
6. Disconnect rear fender lights harness connector. Remove connector from retaining device.
7. See Figure 7-5. Disconnect and remove BCM (1). See 7.5 BODY CONTROL MODULE (BCM).
8. Disconnect and remove siren (3), if equipped. If not equipped, remove connector from storage location (4) on caddy.
9. Release data link connector (8), auxiliary device connector (7) and battery tender connector (6) from caddy.
10. Remove fuse block cover.
11. Remove two screws securing caddy.



1. **BCM**
2. **Fuse block latch locations (lower two are not visible)**
3. **Siren (if equipped)**
4. **Siren connector storage**
5. **Cable strap, rear**
6. **Battery tender connector**
7. **Auxiliary device connector**
8. **Data link connector**
9. **Cable strap, BCM harness**
10. **Cable strap, main harness**

Figure 7-5. Caddy Components

12. Remove cable straps (5, 9, 10).

13. Pull harnesses back through openings in caddy.
14. Use a thin tool to release four latches (2) securing fuse block. Push fuse block back through opening in caddy.
15. From back side of caddy, squeeze tabs of main fuse holder and pull away from caddy.

Installation

1. See Figure 7-5. Route harnesses through openings.
2. Loosely install a **new** cable strap on the BCM harness.
3. Loosely secure main harness to anchor on back side of caddy with cable strap (10).
4. Install main fuse holder into caddy. Confirm the latches on the fuse holder are secured to the caddy.
5. Insert fuse block from back side of caddy. Confirm the latches (2) are secured to the fuse block.
6. Loosely secure BCM harness to tab with previously installed cable strap (9).
7. Loosely secure harnesses to tab at rear opening with a cable strap (5).

NOTE

Tighten cable straps only enough to secure harnesses but still allow movement.

8. Tighten the main harness, BCM harness then rear harness cable straps until snug.
9. Route rear fender lights connector through opening in battery tray and up through opening in frame. Secure caddy with two screws. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
10. Secure auxiliary device connector (7), data link connector (8), and battery tender connector (6) to caddy.
11. Install fuse block cover.
12. Install siren (3) and attach electrical connector, if equipped. If not equipped, attach connector to storage location (4).
13. Connect and install BCM (1). See 7.5 BODY CONTROL MODULE (BCM).
14. Connect rear fender lights harness connector. Secure to retaining device.
15. Install main fuse.
16. Install seat. See 2.30 SEAT.
17. Install left side cover.
18. Install left saddlebag. See 2.31 SADDLEBAGS.

⚠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)

RIGHT SIDE CADDY

FASTENER	TORQUE VALUE	
ABS module locknuts	53-88 **in-lbs**	6-10 Nm
Right caddy screw	36-40 **in-lbs**	4.1-4.5 Nm
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm

Removal

1. Remove right saddlebag.
2. Remove right side cover.
3. Remove battery. See 1.22 BATTERY MAINTENANCE.
4. Remove O2 sensor connector anchors.
5. Remove wheel speed sensor connector anchor, if equipped.
6. Remove ignition coil screws and battery hold-down bracket.
7. See Figure 7-6. Remove screw (1) securing right side caddy to battery tray.
8. Remove four screws securing battery tray to frame.
9. Disengage latch on bottom of caddy. Release caddy from dovetails while lowering battery tray into frame.

NOTE

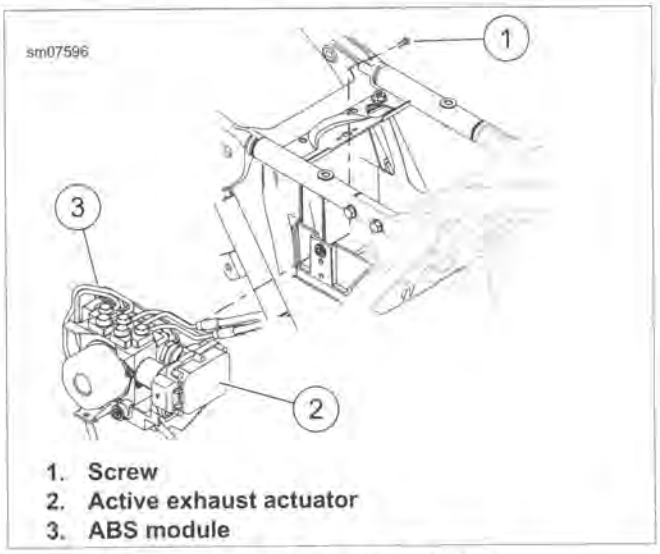
Stud on bottom of ABS module is a tight fit in grommet. Considerable effort may be needed to remove module.

10. Loosen nuts securing ABS module assembly (3), if equipped. Remove ABS module from caddy.
11. Remove exhaust valve actuator (2), if equipped. Disconnect cable from actuator. See 4.19 ACTIVE EXHAUST: HDI.
12. Remove caddy.

Installation

1. Install exhaust valve actuator, if equipped. See 4.19 ACTIVE EXHAUST: HDI.
2. Install ABS module to caddy. Apply glass cleaner to grommets to aid installation. Tighten to 53-88 **in-lbs** (6-10 Nm).
3. Engage right side caddy onto dovetails while lifting battery tray up into position. Verify latch on bottom of caddy is engaged.
4. Install screw to retain caddy to battery tray. Tighten to 36-40 **in-lbs** (4.1-4.5 Nm).
5. Install four screws securing battery tray to frame. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
6. Install battery hold-down bracket and screws to secure ignition coil. Tighten to 32-40 **in-lbs** (3.6-4.5 Nm).
7. Secure O2 sensor connector anchors. Locate the gray connector in the outboard position.
8. Secure the wheel speed sensor connector anchor, if equipped.

9. Install battery and top caddy. See 1.22 BATTERY MAINTENANCE.
10. Install seat. See 2.30 SEAT.
11. Install side cover and saddlebag.



1. **Screw**
2. **Active exhaust actuator**
3. **ABS module**

Figure 7-6. Right Side Caddy

BATTERY TRAY

FASTENER	TORQUE VALUE	
Right caddy to battery tray screw	36-40 **in-lbs**	4.1-4.5 Nm
Battery tray screws	132-156 **in-lbs**	14.9-17.6 Nm
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm

Removal

1. Remove seat. See 2.30 SEAT.
2. Remove battery. See 1.22 BATTERY MAINTENANCE.
3. Remove screws securing left side caddy. Pull caddy away from frame while pulling rear fender lights harness out through battery tray.
4. Remove ignition coil screws and battery hold-down bracket. See 7.7 IGNITION COIL.
5. Remove screw securing right side caddy, if equipped.
6. **Models without right side caddy:** Release O2 sensor connectors from retaining devices.
7. **Models without active exhaust:** Remove actuator connector from cavity in battery tray.
8. Remove four screws securing battery tray to frame.
9. **Models with right side caddy:** Disengage latch on bottom of caddy. Release caddy from dovetails while lowering battery tray into frame.
10. Roll front of battery tray up and out of frame.

Installation

1. Roll rear of battery tray down into frame.
2. **Models with right side caddy:** Engage right side caddy onto dovetails while lifting battery tray up into position. Verify latch on bottom of caddy is engaged.
3. Install screw to retain caddy to battery tray. Tighten to 36-40 **in-lbs** (4.1-4.5 Nm).
4. Install four screws securing battery tray to frame. Tighten to 132-156 **in-lbs** (14.9-17.6 Nm).
5. **Models without active exhaust:** Install actuator connector to cavity in battery tray.
6. **Models without right side caddy:** Secure O2 sensor connectors to retaining devices.
7. Install battery hold-down bracket and screws to secure ignition coil. Tighten to 32-40 **in-lbs** (3.6-4.5 Nm).
8. Route rear fender lights connector through opening in battery tray and up through opening in frame. Secure left side caddy with screws. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
9. Mate rear fender lights connector. Secure to retaining device.
10. Secure main harness to left top frame with two cable straps.
11. Install battery and top caddy. See 1.22 BATTERY MAINTENANCE.
12. Install seat. See 2.30 SEAT.
13. Install side covers and saddlebags.

⚠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)

REMOVAL

1. Remove battery. See 1.22 BATTERY MAINTENANCE.
2. See Figure 7-7. Remove spark plug wires (1, 2) from ignition coil towers.
3. Remove ignition coil connector.
4. See Figure 7-8. Remove screws (2) and battery hold-down bracket (3).
5. Loosen ground terminal nut (4). While holding ground terminal wires out of the way, remove ignition coil (1).

INSTALLATION

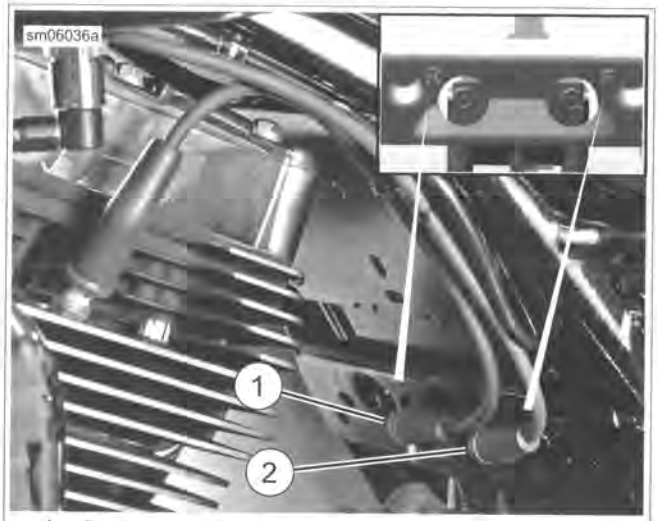
FASTENER	TORQUE VALUE	
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm

1. See Figure 7-8. While holding ground terminal wires out of the way, place ignition coil (1) into position.
2. Install battery hold-down bracket (3) and screws (2). Tighten to 32-40 **in-lbs** (3.6-4.5 Nm).
3. Tighten ground terminal nut (4) to 50-90 **in-lbs** (5.7-10.2 Nm).
4. See Figure 7-7. Install ignition coil connector.

NOTE

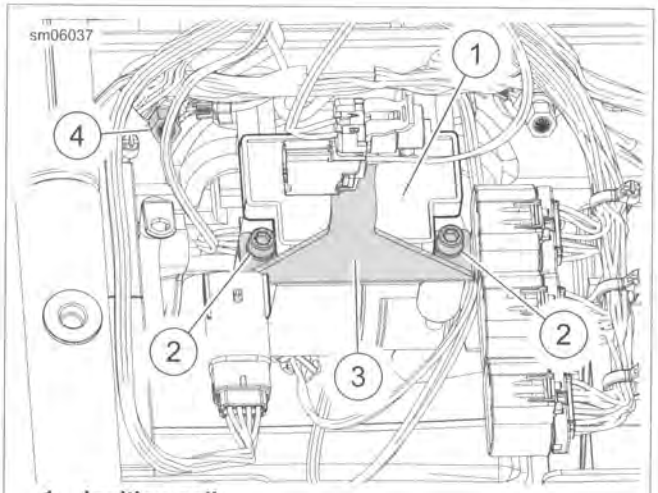
Frame is stamped with "F" and "R" near the coil towers to identify correct cable attachment.

5. Connect spark plug wires (1, 2) to ignition coil towers.
6. Install battery. See 1.22 BATTERY MAINTENANCE.



1. **Rear**
2. **Front**

Figure 7-7. Spark Plug Wires



1. **Ignition coil**
2. **Screw (2)**
3. **Battery hold-down bracket**
4. **Ground terminal nut**

Figure 7-8. Ignition Coil

GENERAL

The starter assembly includes a field coil, solenoid and drive assembly.

NOTES

- *For troubleshooting and diagnostic information see the electrical diagnostic manual.*
- *Use touch-up paint as necessary prior to installation. Paint flaking does not require starter replacement.*

REMOVAL

1. Remove seat. See 2.30 SEAT.

⚠WARNING

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

2. Remove negative cable from battery.

NOTE

The battery positive cable and power wire for the main fuse are crimped together at the starter ring terminal.

3. Remove battery positive and main fuse power cable ring terminal from starter solenoid stud.
4. Remove starter solenoid connector [128] at front of starter.
5. Remove engine oil filler cap/dipstick. Cover fill spout with clean shop cloth to keep out dirt and debris.
6. Remove starter mounting screws.
7. Remove starter. Avoid losing the ring dowels.

DRIVE ASSEMBLY

FASTENER	TORQUE VALUE	
Starter through bolts	39-65 **in-lbs**	4.4-7.3 Nm
Solenoid terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm
Starter end cover screw	90-110 **in-lbs**	10.2-12.4 Nm

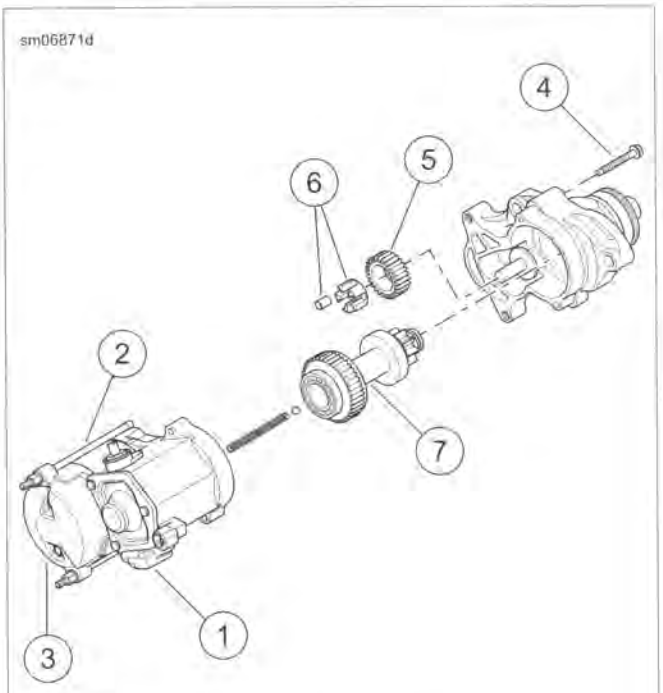
Disassembly

1. Remove end cover if equipped.
2. Remove two nuts to release end cover bracket from through bolts, if equipped.
3. See Figure 7-9. Pull up rubber boot (1) and remove hex nut with captive lockwasher to release field wire from terminal post on solenoid housing.
4. Loosen two through bolts (2) to release field coil housing from solenoid housing.

NOTE

Do not remove armature and brush plate from housing. No replacement parts are available.

5. Remove armature housing (3) keeping all contents together for reassembly.
6. Remove two screws to release drive housing from solenoid housing. Use a rubber mallet to separate drive and solenoid housings, if necessary.
7. Remove idler gear (5) from bearing cage in drive housing. Remove bearing cage with five roller bearings (6) from shaft in drive housing.
8. Push on end of drive shaft to remove clutch starter sub assembly (7) from drive housing.
9. Remove solenoid spring and ball from the output shaft of the clutch starter sub assembly.



1. **Rubber boot**
2. **Field coil housing through bolts**
3. **Armature housing**
4. **Screws (2)**
5. **Idler gear**
6. **Bearing cage with roller bearings (5)**
7. **Clutch starter sub-assembly**

Figure 7-9. Clutch Starter Sub-Assembly and Housing

Inspection

1. Inspect two O-rings on drive housing for damage. Replace if necessary.
2. See Figure 7-9. Verify that the idler gear (5) rotates freely without drag or sticking.
3. Remove and inspect idler gear. Replace starter motor if the gear is damaged.
4. Inspect roller bearings (6). Bearings must rotate freely without drag or sticking. Replace starter motor if the bearings are pitted or grooved.
5. Inspect the steel ball for damage. Replace if necessary.

NOTE

Replace entire starter motor if solenoid return spring fails.

Assembly

1. See Figure 7-9. Assemble starter.
   a. Lubricate parts with high temperature grease such as LUBRIPLATE 110 during assembly.
   b. Install bearing cage with five roller bearings (6) onto shaft in drive housing.
   c. Confirm that all five roller bearings are installed in grooves of bearing cage and install idler gear (5) over bearing cage.
2. Lubricate bearings with LUBRIPLATE 110 before installation. Install **new** clutch starter sub assembly (7) in drive housing seating the larger bearing in the counterbore.
3. Apply a light film of LUBRIPLATE 110 to solenoid plunger shaft. Install return spring on solenoid plunger shaft.

NOTE

Before mating the solenoid and drive housings, apply a thin layer of HARLEY-DAVIDSON HIGH PERFORMANCE SEALANT - GRAY to drive housing between the two housings.

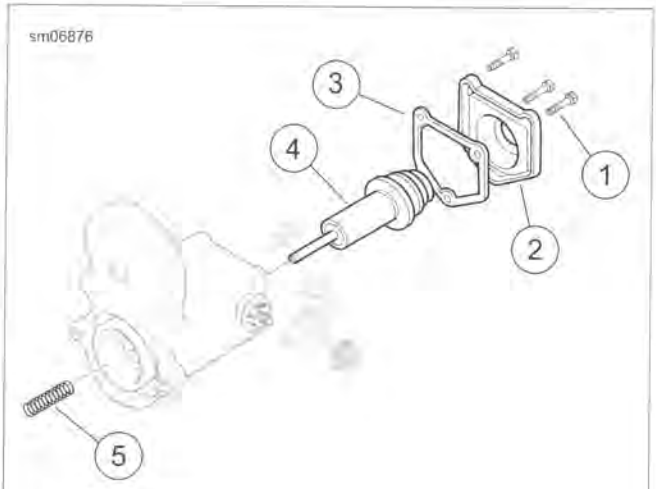
4. Mate the solenoid and drive housings with two screws. Alternately tighten until snug.
5. Install through bolts to fasten field coil to solenoid housing. Tighten to 39-65 **in-lbs** (4.4-7.3 Nm).
6. Secure field wire ring terminal to short post on solenoid housing with hex nut with captive lockwasher. Tighten to 70-90 **in-lbs** (7.9-10.2 Nm). Cover field wire ring terminal with rubber boot (1).
7. Install end cover bracket onto through bolts, if equipped. Orient longest end of bracket on the field wire side. Install two nuts. Tighten until snug.
8. Install end cover, if equipped. Tighten to 90-110 **in-lbs** (10.2-12.4 Nm).

SOLENOID

FASTENER	TORQUE VALUE	
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm

Cover and Plunger Removal

1. See Figure 7-10. Remove fasteners (1), cover (2) and gasket (3).
2. Remove the plunger (4) with spring (5).

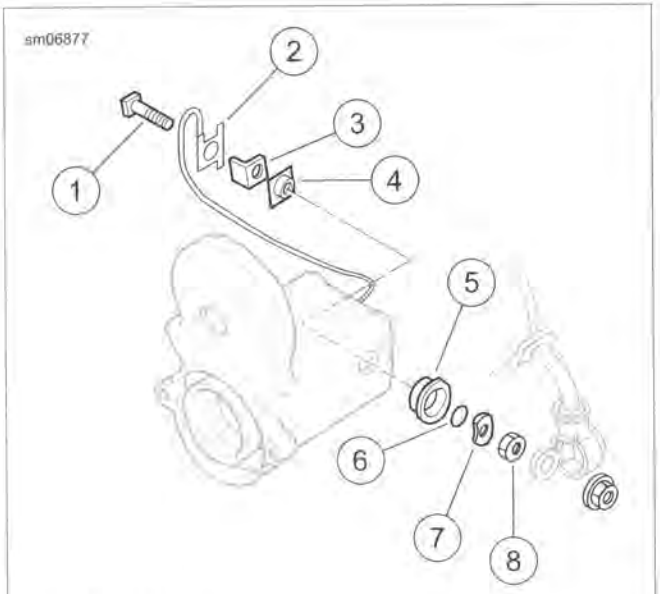


1. **Fasteners**
2. **Cover**
3. **Gasket**
4. **Plunger**
5. **Spring**

Figure 7-10. Solenoid Plunger

Short Post Contact: Starter

1. Disassemble the short post contact:
   a. Remove the hex nut and the ring terminal from the post.
   b. See Figure 7-11. Remove jamnut (8), wave washer (7), O-ring (6) and round bushing (5).
   c. Remove the post bolt (1).
   d. Remove the hold-in terminal (2) from the post bolt.
   e. Remove the contact plate (3) and the square bushing (4).
2. Assemble the short post contact:
   a. Insert the square bushing into the housing.
   b. Install the contact plate with the 90 degree part of the contact plate against the solenoid winding.
   c. Install the post bolt through the hold-in terminal, the contact plate and the square bushing.
   d. Install the round bushing, O-ring, wave washer and jamnut.



1. **Post bolt**
2. **Hold-in terminal**
3. **Contact plate**
4. **Square bushing**
5. **Round bushing**
6. **O-ring**
7. **Wave washer**
8. **Jamnut**

Figure 7-11. Short Post Contact (starter)

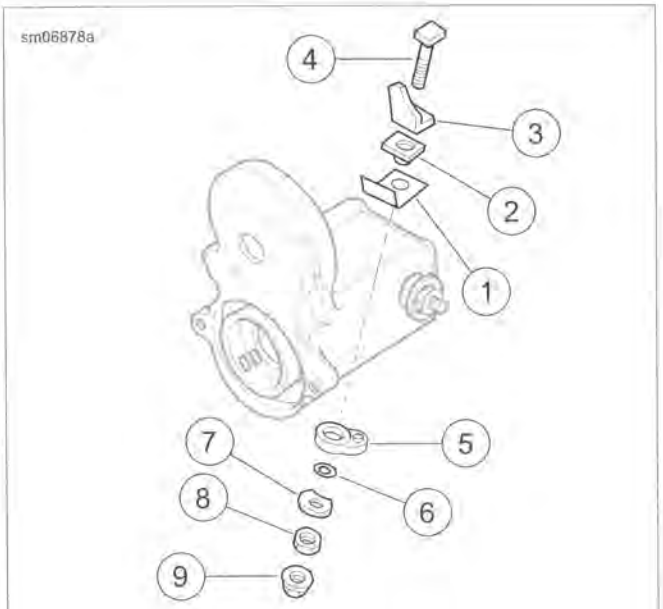
Long Post Contact: Battery Positive

1. See Figure 7-12. Remove the long post contact:
   a. Remove hex nut (9).
   b. Remove jamnut (8), wave washer (7), O-ring (6) and the round bushing (5).
   c. Remove post bolt (4), contact plate (3), square bushing (2) and paper insulator (1).
2. Install the long post contact:
   a. Insert the square bushing through the paper insulator into the housing.
   b. Install the contact plate with the foot against the solenoid winding.
   c. Install the post bolt.

   NOTE

   Check that the index pin on the round bushing fits the blind hole in the housing.

   d. Install the round bushing, O-ring, wave washer and jamnut.



1. **Paper insulator**
2. **Square bushing**
3. **Contact plate**
4. **Post bolt**
5. **Round bushing**
6. **O-ring**
7. **Wave washer**
8. **Jamnut**
9. **Hex nut**

Figure 7-12. Long Post Contact (battery)

Plunger and Cover Installation

1. Apply LUBRIPLATE 110 to the plunger shaft. Install the spring.
2. Install the plunger and spring in the housing.
3. While compressing the plunger, alternately tighten the contact post jamnuts to 65-80 **in-lbs** (7.3-9.0 Nm).
4. Check that the contact plates are aligned to the solenoid winding.
5. Install the cover:
   a. Install a **new** gasket on the cover.
   b. Install the cover.
   c. Install the fasteners until snug.
6. Install the starter positive ring terminal.
7. Install the hex nut. Tighten to 60-80 **in-lbs** (6.8-9.0 Nm).

INSTALLATION

FASTENER	TORQUE VALUE	
Starter mounting screws	22-24 ft-lbs	29.8-32.5 Nm
Solenoid terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm

1. Verify that two ring dowels are installed in the primary chaincase or starter flange.

2. Lubricate O-ring on starter and bore of primary chaincase with light film of clean primary chaincase lubricant.
3. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the starter mounting screws.
4. Install starter and start both mounting screws. Tighten to 22-24 ft-lbs (29.8-32.5 Nm).
5. Install engine oil filler cap/dipstick.
6. Install battery positive cable on stud of solenoid. Tighten to 70-90 **in-lbs** (7.9-10.2 Nm). Pull down rubber boot over terminal connections.
7. Install starter solenoid connector [128] at front of starter.

NOTICE

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

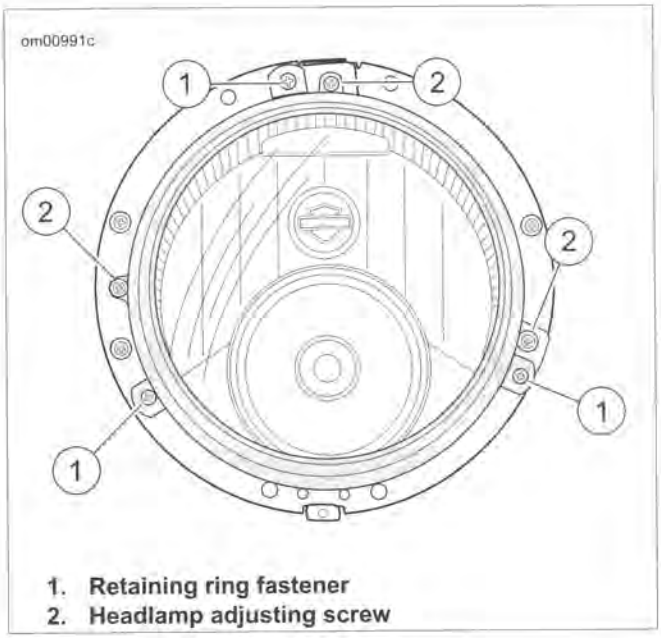
8. Connect battery negative cable to battery. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
9. Install seat. See 2.30 SEAT.

HEADLAMP

FASTENER	TORQUE VALUE	
Headlamp retaining screws: Road King models	23-26 **in-lbs**	2.6-2.9 Nm
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm

Removal

1. Remove screw at bottom of headlamp door (chrome ring).
2. Rotate door counterclockwise a few degrees. Pull headlamp door straight forward to remove.
3. See Figure 7-13. Remove screws (1) securing retaining ring.
4. Remove headlamp. Disconnect headlamp connectors.



1. **Retaining ring fastener**
2. **Headlamp adjusting screw**

Figure 7-13. Headlamp Retaining Ring

Installation

1. Install headlamp connectors.
2. Secure headlamp assembly with retaining ring and screws (1). Tighten to 23-26 **in-lbs** (2.6-2.9 Nm).
3. Install the headlamp door (chrome ring):
   a. Verify that rubber seal is in place on headlamp door. Apply glass cleaner to seal to ease installation.
   b. With the headlamp door rotated a few degrees counterclockwise, push headlamp door straight onto headlamp.
   c. Rotate clockwise until screw can be installed. Tighten to 9-18 **in-lbs** (1.0-2.0 Nm).

Bulb Replacement: Halogen Type

⚠WARNING

Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)

NOTICE

When replacement is required, use only the specified sealed beam unit or bulb, available from a Harley-Davidson dealer. An improper wattage sealed beam or bulb, can cause charging system problems. (00209a)

NOTE

This headlamp assembly uses separate quartz halogen bulbs for the low beam and the high beam. HDI models also contain a position lamp bulb.

1. Remove headlamp assembly.
2. Disconnect wire harness connectors from the bulbs.
3. Rotate bulb assembly 1/4 turn counterclockwise to remove from the reflector/lens.

NOTICE

Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Handle the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210b)

4. Insert **new** bulb into reflector/lens and rotate 1/4 turn clockwise.
5. **HDI models:** Rotate position lamp bulb retainer 1/4 turn counterclockwise to remove. Replace bulb and install bulb retainer in lamp housing.
6. Connect the wiring harness connectors to the bulbs.
7. Secure the headlamp assembly and headlamp door.

Bulb Replacement: LED Type

LED headlamp contains no replacement bulbs. Replace the entire assembly if failure occurs.

AUXILIARY/FOG LAMP BULB REPLACEMENT

FASTENER	TORQUE VALUE	
Auxiliary/fog lamp door screw	6-10 **in-lbs**	0.7-1.1 Nm

⚠WARNING

Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)

NOTICE

Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Handle the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210b)

NOTE

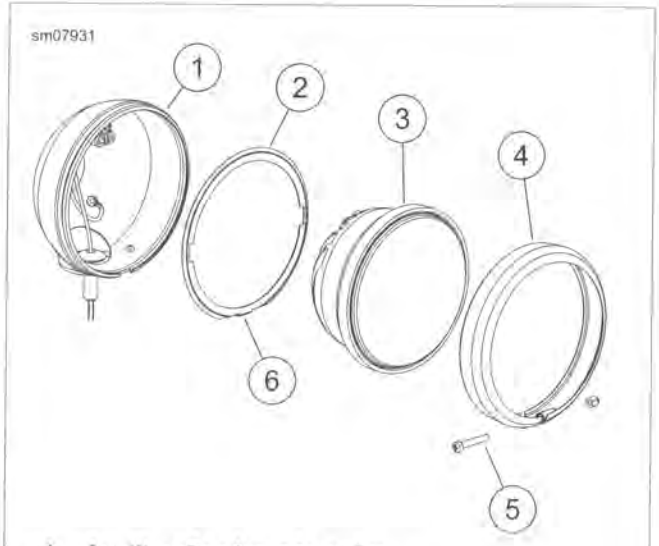
Some models have LED auxiliary lamps. LED lamps contain no replacement bulbs. Replace the lamp assembly if it fails.

Removal

1. See Figure 7-14. Loosen screw (5). Pull door (4) from lip of lamp housing.
2. Disconnect auxiliary/fog lamp connector. Remove lamp (3).
3. Remove nesting ring (2).
4. **Quartz Halogen:** Rotate bulb housing 1/4 turn counterclockwise to remove from lamp.

Installation

1. **Quartz Halogen:** Install **new** bulb/housing assembly. Rotate 1/4 turn clockwise.
2. See Figure 7-14. Place nesting ring (2) on back of lamp (3) with tab facing away from lamp.
3. Mate connector.
4. Engage nesting ring index tab (6) in slot at bottom of lamp housing.
5. Hold nesting ring in place and rotate lamp so that index tabs engage slots in nesting ring.
6. Install lamp door (4) on lamp housing with screw centered at bottom. Tighten door screw (5) to 6-10 **in-lbs** (0.7-1.1 Nm).



1. **Auxiliary/fog lamp housing**
2. **Nesting ring**
3. **Lamp**
4. **Door**
5. **Door screw**
6. **Nesting ring index tab**

Figure 7-14. Auxiliary/Fog Lamp

AUXILIARY/FOG LAMP HOUSING

PART NUMBER	TOOL NAME
SNAP-ON® FRX181	FLARE NUT SOCKET

FASTENER	TORQUE VALUE	
Turn signal lamp to auxiliary/fog lamp stud locknut	20-24 ft-lbs	27.1-32.5 Nm
Turn signal lamp screw, front	96-120 **in-lbs**	10.9-13.5 Nm

Removal

1. Disassemble auxiliary/fog lamp. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Bulb Replacement.
2. Remove lamp and bracket:
   a. **Road King models:** See Figure 7-16. Disconnect auxiliary/fog lamps connector (2 or 3).
   b. **Fairing models:** Remove auxiliary/fog lamp/bracket assembly. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Turn Signal/Auxiliary/Fog Lamp Bracket.
3. Remove appropriate terminal(s) from connector housing. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Table 7-5. FLHTC/U, FLHTK Auxiliary/Fog Lamps [31L/R]

LEFT SIDE [31L]		RIGHT SIDE [31R]	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Gray/Black	4	Gray/Black	4
Note: Terminals 1, 2 and 3 are reserved for the turn signal lamp.			

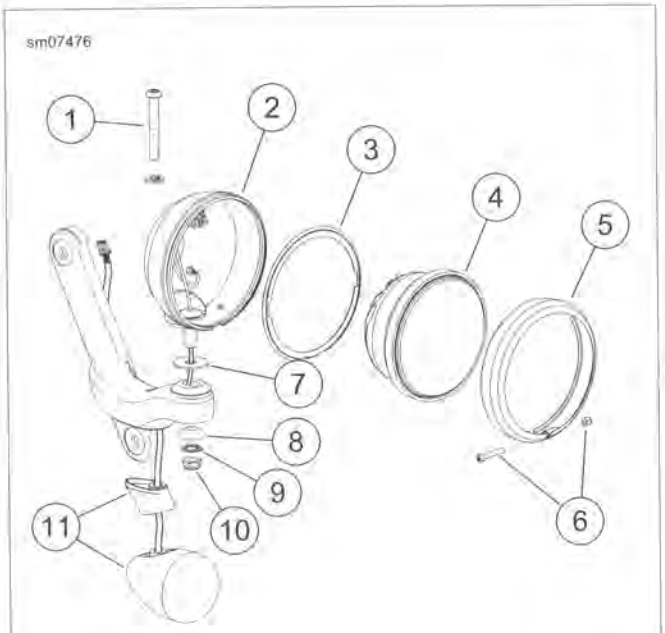
Table 7-6. FLHR/C Auxiliary/Fog Lamps [73]

LEFT SIDE		RIGHT SIDE	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Gray/Black	1	Gray/Black	2

4. See Figure 7-15. Remove screw (1) and washer to release turn signal lamp (11) from bracket.
5. Use FLARE NUT SOCKET (Part No. Snap-on® FRX181) to remove locknut (10), lockwasher (9) and clamp block (8).
6. Remove auxiliary/fog lamp from bracket.
7. Remove rubber washer (7).

Installation

1. Lay old auxiliary/fog lamp next to **new** auxiliary/fog lamp and cut wire to length.
2. Strip 3/16 in (4.8 mm) of insulation off wire and crimp on **new** socket terminal. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
3. See Figure 7-15. Install rubber washer (7) on stud.
4. Position auxiliary/fog lamp housing on bracket. Install clamp block (8), lockwasher (9) and locknut (10).
5. Using FLARE NUT SOCKET (Part No. Snap-on® FRX181), tighten locknut to 20-24 ft-lbs (27.1-32.5 Nm).
6. Route wire through passage in bracket and protective conduit.
7. Install terminal(s) into connector housing. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR. Refer to Table 7-5 or Table 7-6 for terminal location.
8. Install turn signal lamp and secure with screw (1). Tighten to 96-120 **in-lbs** (10.9-13.5 Nm).
9. Install lamp/bracket assembly:
   a. **Road King models:** Route harness up through lower fork bracket and mate connector. Secure harness to lower fork bracket with cable strap.
   b. **Fairing models:** Mate connector and install lamp bracket. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Turn Signal/Auxiliary/Fog Lamp Bracket.
10. Assemble auxiliary/fog lamp. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Bulb Replacement.
11. Check for proper operation and alignment. Adjust if necessary.



1. **Screw, turn signal**
2. **Auxiliary/fog lamp housing**
3. **Nesting ring**
4. **Lamp**
5. **Door**
6. **Screw and nut**
7. **Rubber washer**
8. **Clamp block**
9. **Lockwasher**
10. **Locknut**
11. **Turn signal lamp and standoff**

Figure 7-15. Auxiliary/Fog Lamp Assembly

TURN SIGNAL/AUXILIARY/FOG LAMP BRACKET

FASTENER	TORQUE VALUE	
Auxiliary/fog lamp bracket acorn nuts: Fairing models	120-180**in-lbs**	13.6-20.3 Nm
Auxiliary/fog lamp bracket acorn nuts: Road King models	72-108 **in-lbs**	8.1-12.2 Nm

Removal

NOTE

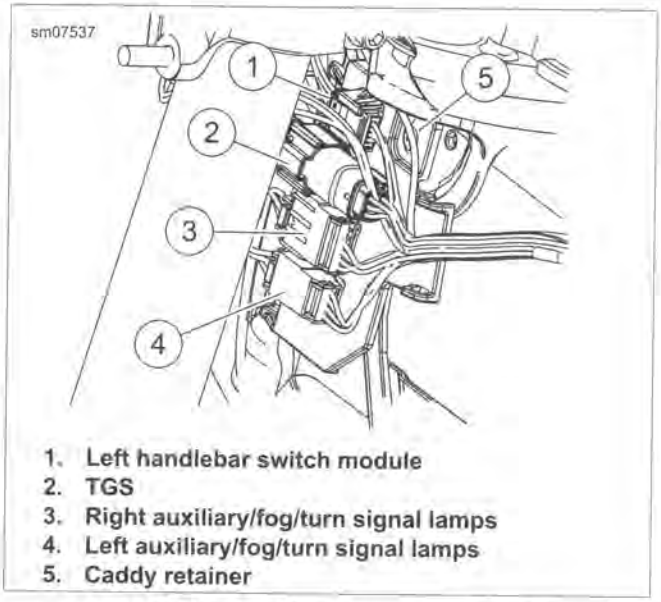
On models not equipped with auxiliary/fog lamps, removal of lamp bracket is similar.

1. **Road King Models:**
   a. See Figure 7-16. Disconnect both lamp connectors (3, 4) located on left steering head.
   b. Cut cable straps securing harnesses to lower fork bracket.
   c. Pull harnesses down through openings in lower fork bracket.
   d. Loosen acorn nuts securing lamp bracket.

2. **Fairing Models:**
   a. Remove acorn nuts securing lamp brackets.
   b. Pull lamp bracket away from fork and separate electrical connector.
3. Remove auxiliary/fog lamp bracket.

Installation

1. **Fairing Models:**
   a. Mate electrical connector.
   b. Install auxiliary/fog lamp bracket.
   c. Install acorn nuts. Tighten to 120-180**in-lbs** (13.6-20.3 Nm).
2. **Road King Models:**
   a. Install auxiliary/fog lamp bracket with bushings outside bracket.
   b. Tighten acorn nuts to 72-108 **in-lbs** (8.1-12.2 Nm).
   c. See Figure 7-16. Pull harnesses up through openings in lower fork bracket.
   d. Connect both lamp connectors (3, 4).
   e. Install cable straps securing harnesses to lower fork bracket.



1. **Left handlebar switch module**
2. **TGS**
3. **Right auxiliary/fog/turn signal lamps**
4. **Left auxiliary/fog/turn signal lamps**
5. **Caddy retainer**

Figure 7-16. Left Side Connectors: Road King

ADJUSTMENT

See 1.23 HEADLAMP ALIGNMENT for alignment procedures.

TAIL LAMP BULB REPLACEMENT

FASTENER	TORQUE VALUE	
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm

Removal

1. Remove two screws to release tail lamp assembly from chrome base.
2. See Figure 7-17. Disconnect tail lamp connector (3).
3. Rotate bulb socket (4) 1/4 turn counterclockwise and remove from tail lamp assembly. Pull bulb from socket.

Installation

1. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT. Install **new** bulb in socket.
2. See Figure 7-17. Insert socket (4) into tail lamp assembly and rotate 1/4 turn clockwise.
3. Connect tail lamp connector (3).
4. Place tail lamp into position against chrome base.

NOTE

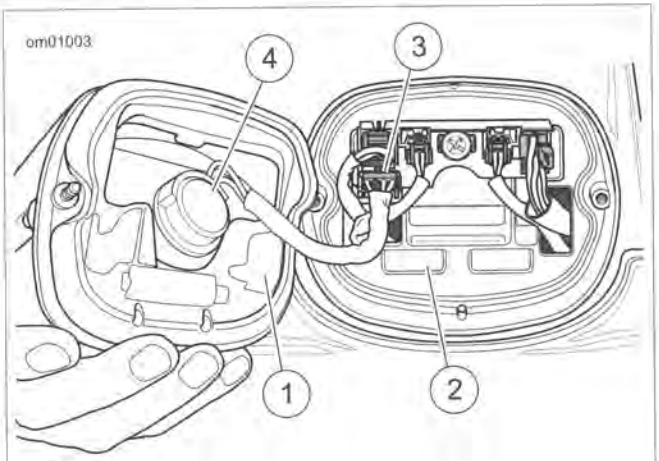
Over-tightening screws can crack the lens.

5. Install two screws. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

⚠WARNING

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

6. Test tail lamp operation.



1. **Lens**
2. **Base**
3. **4-pin multilock connector**
4. **Bulb socket**

Figure 7-17. Tail Lamp Assembly

CIRCUIT BOARD/CHROME BASE

FASTENER	TORQUE VALUE	
Tail lamp circuit board screw	40-48 **in-lbs**	4.5-5.4 Nm
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm

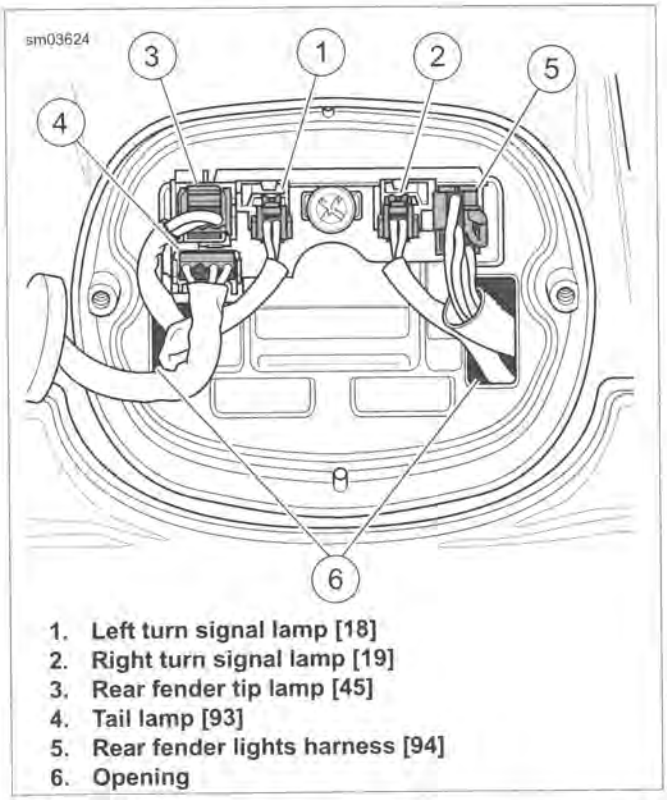
Removal

1. Remove two screws to release tail lamp assembly from chrome base.
2. See Figure 7-18 and Figure 7-19. Disconnect all connectors.

NOTE

See Figure 7-19. To release turn signal lamp connectors, use a pick or small screwdriver to press latch.

3. Remove screw at center of chrome base. Push chrome base upward until it is free of fender and pull out of fender hole.
4. Remove chrome base.
5. Remove pin housing/circuit board from chrome base.



1. **Left turn signal lamp [18]**
2. **Right turn signal lamp [19]**
3. **Rear fender tip lamp [45]**
4. **Tail lamp [93]**
5. **Rear fender lights harness [94]**
6. **Opening**

Figure 7-18. Rear Fender Lights Assembly

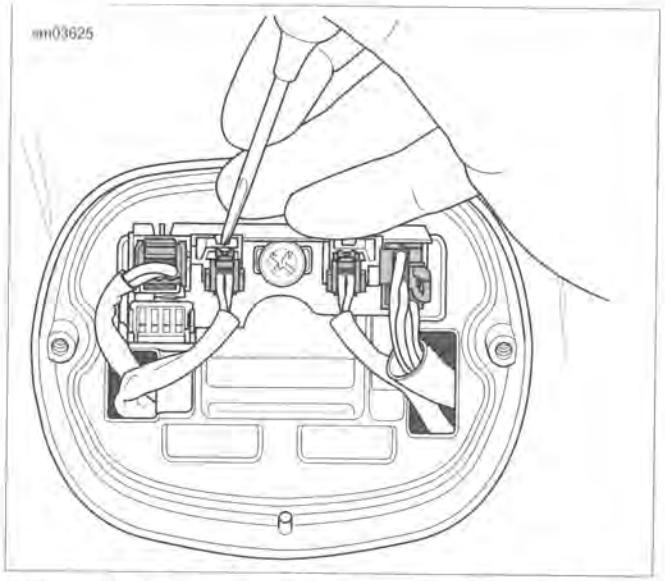


Figure 7-19. Use Pick Tool to Release Left Turn Signal Lamp Socket

Installation

1. See Figure 7-18. Feed connectors through openings in chrome base. For best results, feed the larger socket housings first.
2. Fit bottom of chrome base into fender hole and push down.
3. See Figure 7-20. Install pin housing/circuit board with screw. Tighten to 40-48 **in-lbs** (4.5-5.4 Nm).
4. Install connectors into circuit board.
5. See Figure 7-17. To avoid stressing wires, verify that tail lamp harness is positioned on the outboard side of the rear fender tip lamp and left turn signal lamp harness.
6. Install tail lamp with two screws. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

⚠WARNING

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

7. Test tail lamp operation.

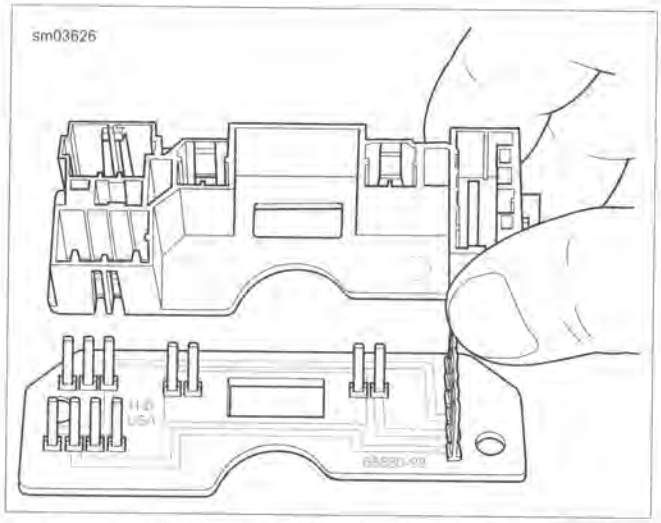


Figure 7-20. Place Pin Housing Over Circuit Board

REAR FENDER LIGHTS HARNESS: ALL EXCEPT FLHX/S

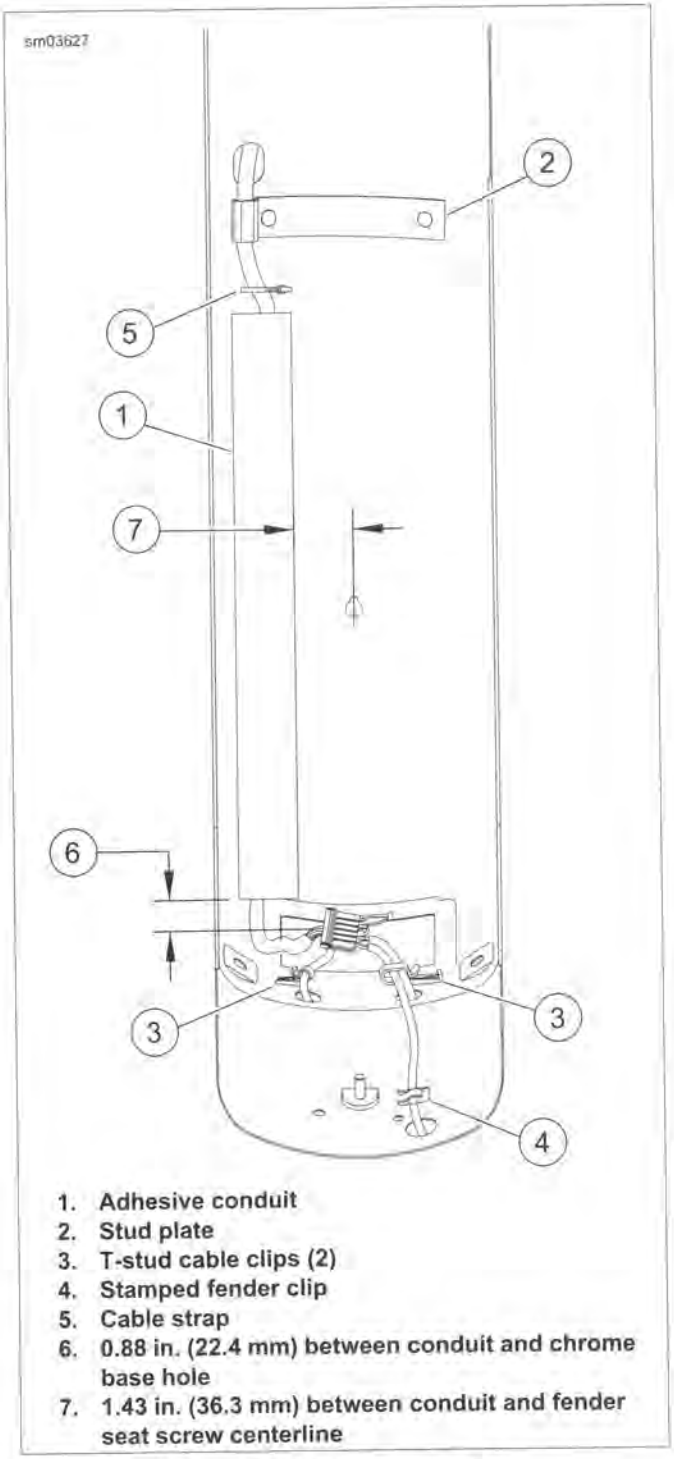
FASTENER	TORQUE VALUE	
Fender, rear, lights harness stud plate flange nuts	60-96 **in-lbs**	6.8-10.9 Nm
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm

Removal

NOTE

FLHTC models use a jumper harness between the fender harness connector and the main harness connector located in the left electrical caddy. That harness can be removed and installed independent of the fender harness.

1. Remove rear fender. See 2.44 REAR FENDER.
2. Remove and disconnect tail lamp assembly from chrome base.
3. See Figure 7-18. Disconnect connector (5) and feed through opening to inboard side of fender.
4. See Figure 7-21. Release turn signal lamp wires from cable clips (3). On FLHTC/U, FLHTK models, release wire from stamped fender clip (4).
5. Release harness from channel in stud plate (2). Loosen flange nuts if necessary.
6. Remove adhesive conduit (1) with wire harness from fender well.
7. If replacing only conduit (1):
   a. Carefully cut adhesive conduit and remove wire harness.
   b. Remove rear connector from harness. See B.1 CONNECTORS.



1. **Adhesive conduit**
2. **Stud plate**
3. **T-stud cable clips (2)**
4. **Stamped fender clip**
5. **Cable strap**
6. **0.88 in. (22.4 mm) between conduit and chrome base hole**
7. **1.43 in. (36.3 mm) between conduit and fender seat screw centerline**

Figure 7-21. Rear Fender Well

Installation

1. Clean fender:
   a. Thoroughly clean fender well with soap and water. Do not use solvents or harsh chemicals that may damage painted surfaces.
   b. Remove all residual adhesive using 3M GENERAL PURPOSE ADHESIVE REMOVER.
   c. See Figure 7-21. Using a soapy non-abrasive scouring pad, thoroughly clean fender well in area of adhesive conduit.
   d. Rinse with clear water and thoroughly dry with a clean white cloth. Repeat until clean cloth shows no evidence of dirt.
   e. Swab area with isopropyl alcohol. Allow to dry.
2. If replacing only the adhesive conduit:
   a. Verify cable strap (3) is installed as shown in Figure 7-22 to prevent rearward movement of the harness.
   b. Draw harness through **new** conduit until progress is halted by installed cable strap (3).
3. Install connector housing on harness. See B.1 CONNECTORS. Refer to Table 7-7 for proper wire location.
4. See Figure 7-21. Remove paper backing and lightly press conduit in location shown in graphic.
5. Use a wallpaper seam roller to press conduit securely in place.
6. Allow the adhesive 72 hours to fully cure. Installation of the fender may proceed, but exercise caution to avoid pulling or repositioning adhesive conduit.
7. Feed forward connector housing of harness through hole in front of fender.
8. Capture harness in channel of stud plate (2). If loosened, tighten flange nuts to 60-96 **in-lbs** (6.8-10.9 Nm).
9. Feed rear harness connectors through openings in fender and capture turn signal lamp wires in cable clips (3). On FLHTC/U, FLHTK models, capture rear fender tip lamp wire in stamped fender clip (4).
10. See Figure 7-18. Mate tail lamp connectors (3, 4) to tail lamp base.
11. Verify that tail lamp harnesses are routed as shown in Figure 7-17.
12. Install tail lamp. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).
13. Install rear fender. See 2.44 REAR FENDER.

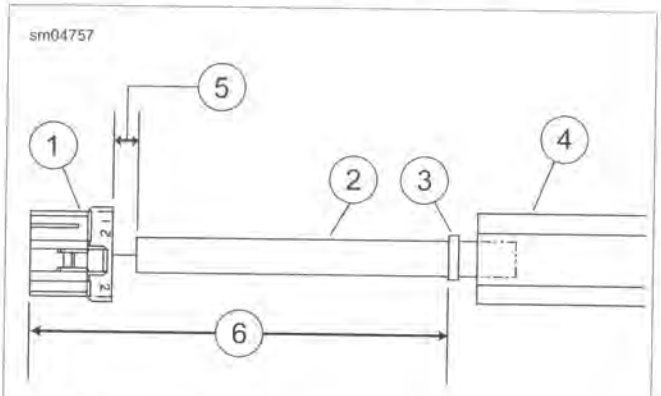
⚠WARNING

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

14. Test tail lamp operation.

Table 7-7. Rear Fender Lights [94]

WIRE COLOR	CHAMBER NUMBER	WIRE COLOR	CHAMBER NUMBER
Orange/White	1	Red/Yellow	4
Brown	2	Violet	5
Blue	3	Black	6



1. Connector [7B]
2. Conduit
3. Cable Strap
4. Adhesive Conduit
5. 0.25 in. (6.35 mm)
6. 8.75 in. (222.25 mm)

Figure 7-22. Install Cable Strap on Conduit

REAR FASCIA LAMP

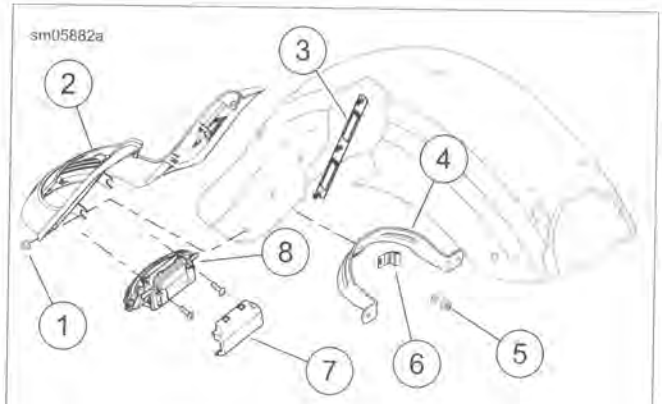
FASTENER	TORQUE VALUE	
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm

Removal

1. See Figure 7-23. Remove shield (7) and disconnect rear lights harness and tail light jumper harness from fascia lamp.
2. Remove screws securing lamp (8).

Installation

1. See Figure 7-23. Secure lamp (8) with two screws. Tighten to 18-22 **in-lbs** (2.0-2.5 Nm).
2. Connect rear lights harness and tail lamp jumper harness to fascia lamp.
3. Install shield (7).



1. Flange nut (6)
2. Fascia
3. Stud plate (2)
4. Fender support
5. Nut
6. P-clip
7. Shield
8. Fascia lamp

Figure 7-23. Rear Fascia

REAR FENDER LIGHTS HARNESS: FLHX/S

FASTENER	TORQUE VALUE	
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm

Removal

1. Remove left saddlebag and left side cover.
2. See Figure 7-24. Cut cable strap (3).
3. Separate connector (2).
4. See Figure 7-25. Release harness from upper clips (1).
5. Release harness from molded clips (2) on fascia.
6. Disconnect harness from fender tip lamp.
7. Note harness routing. Remove harness.

NOTE

Canadian models have both a turn signal light bar and tail lamp, and include an extra jumper harness.

8. **Canadian Models:** See Figure 7-26.
   a. Remove rear fender. See 2.44 REAR FENDER.
   b. Remove tail lamp lens.
   c. Disconnect jumper harness (2) from the rear fascia lamp and the tail lamp.
   d. Release jumper harness from clamps (1, 3) and remove from fender.

Installation

1. **Canadian Models:** See Figure 7-26.
   a. Route jumper harness (2) from tail lamp to the fascia lamp and connect to each lamp.

NOTE

Do not over-tighten screws.

b. Install tail lamp lens and tighten screws to 20-24 **in-lbs** (2.3-2.7 Nm).

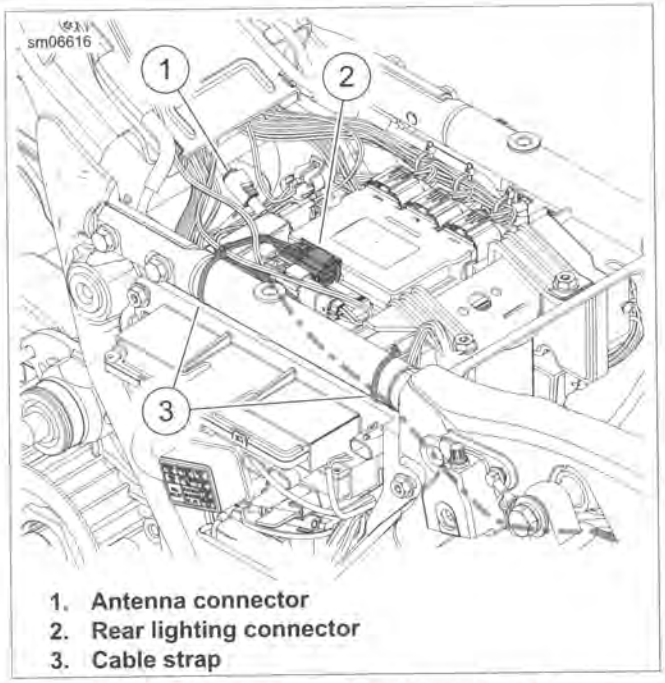
c. Secure jumper harness with clamps (1, 3). Install fender. See 2.44 REAR FENDER.

2. See Figure 7-24 and Figure 7-25. Route harness in approximate position, passing back under frame cross member and through opening in left caddy.
3. See Figure 7-25. Pass harness over antenna mount (3). Secure harness in molded clips (2) on inside of fascia. Connect to fender tip lamp. Pull harness up to remove slack near fender tip lamp.
4. Secure harness in three upper clips (1).
5. See Figure 7-24. Pull slack from harness. Secure rear lighting harness and antenna cable to left upper frame with **new** cable strap (3).
6. Mate connector (2). Secure connector housing to upper caddy.
7. Install side cover and saddlebag.

⚠WARNING

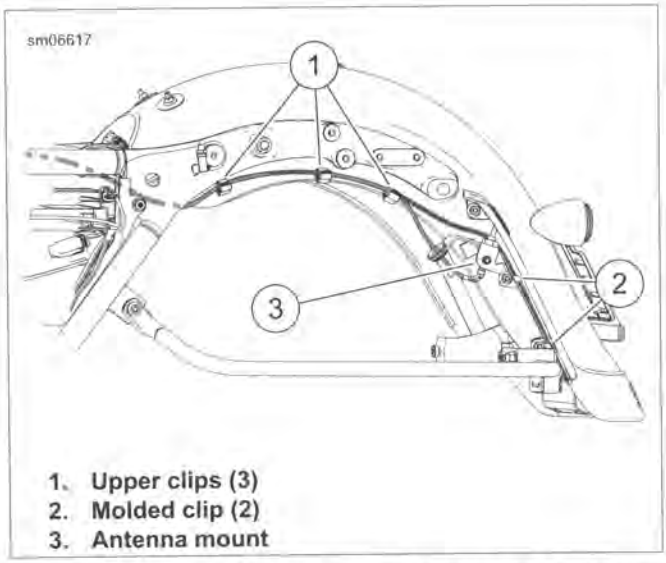
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

8. Check operation of all lamps.



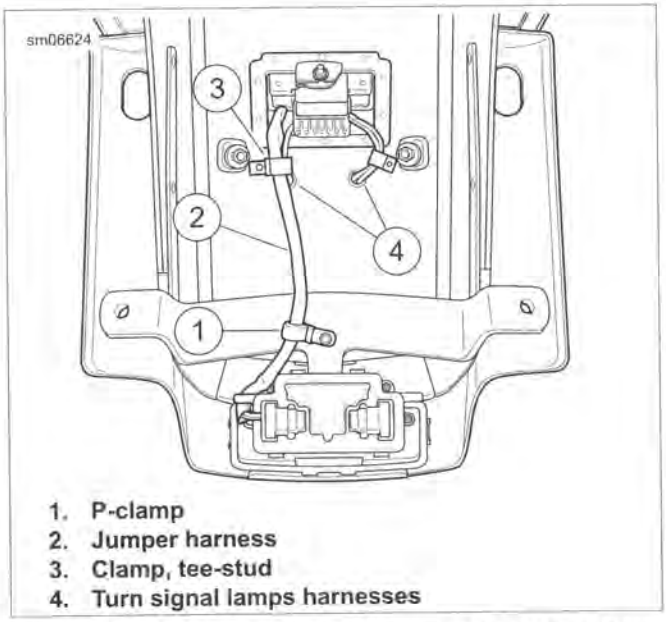
1. **Antenna connector**
2. **Rear lighting connector**
3. **Cable strap**

Figure 7-24. Rear Fender Lamps Harness and Antenna Cable Routing: FLHX/S



1. **Upper clips (3)**
2. **Molded clip (2)**
3. **Antenna mount**

Figure 7-25. Rear Fender Lamps Harness and Antenna Cable: FLHX/S



1. **P-clamp**
2. **Jumper harness**
3. **Clamp, tee-stud**
4. **Turn signal lamps harnesses**

Figure 7-26. Tail Lamp Jumper Harness (models with tail lamp)

FRONT FENDER TIP LAMP

FASTENER	TORQUE VALUE	
Fender tip lamp, front	20-25 **in-lbs**	2.3-2.8 Nm
Fender trim strips, front	10-15 **in-lbs**	1.1-1.7 Nm

Removal

1. Remove outer fairing and front fender. See 2.43 FRONT FENDER.
2. See Figure 7-27. Remove nuts (2) securing left fender trim strip. Remove trim strip.
3. Remove nuts (3) securing fender tip lamp. Remove lamp and harness assembly.

Installation

NOTE

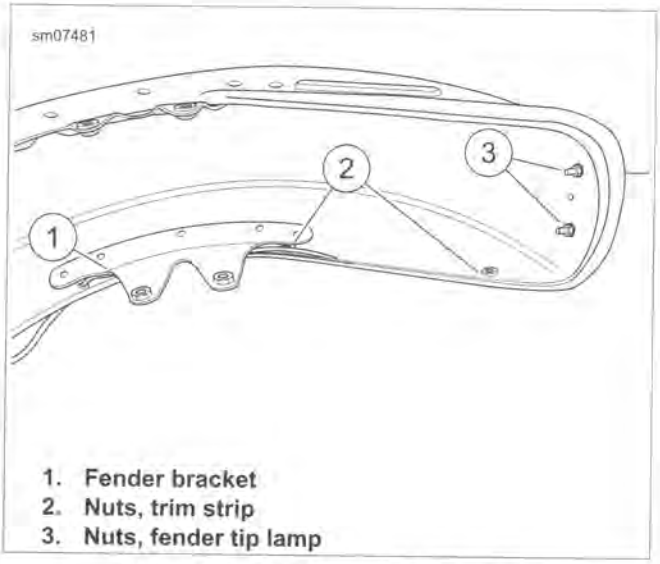
Over-tightening screws can crack the bracket or scratch the fender paint.

1. See Figure 7-27. Mount fender tip lamp. Secure with nuts (3). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
2. See Figure 7-28. Route harness through trim strip and into oblong hole (5). Confirm harness routes between trim strip and tee bolt.
3. Secure trim strip with two nuts. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).
4. See Figure 7-27. Route harness between fender and fender mounting bracket (1).
5. Route harness out through grommet and install connector housing.
6. Install fender and outer fairing. See 2.43 FRONT FENDER.

⚠WARNING

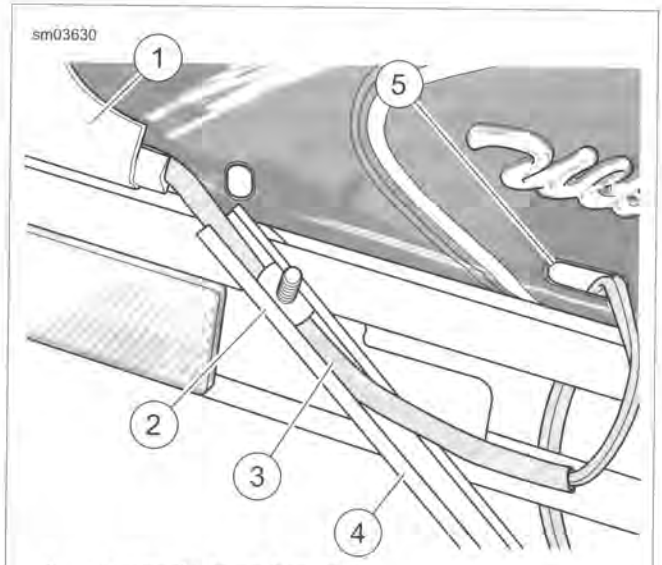
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

7. Test lamp for proper operation.



1. **Fender bracket**
2. **Nuts, trim strip**
3. **Nuts, fender tip lamp**

Figure 7-27. Front Fender Underside



1. **Fender tip lamp bracket**
2. **Tee bolt**
3. **Wire conduit**
4. **Trim strip**
5. **Oblong hole**

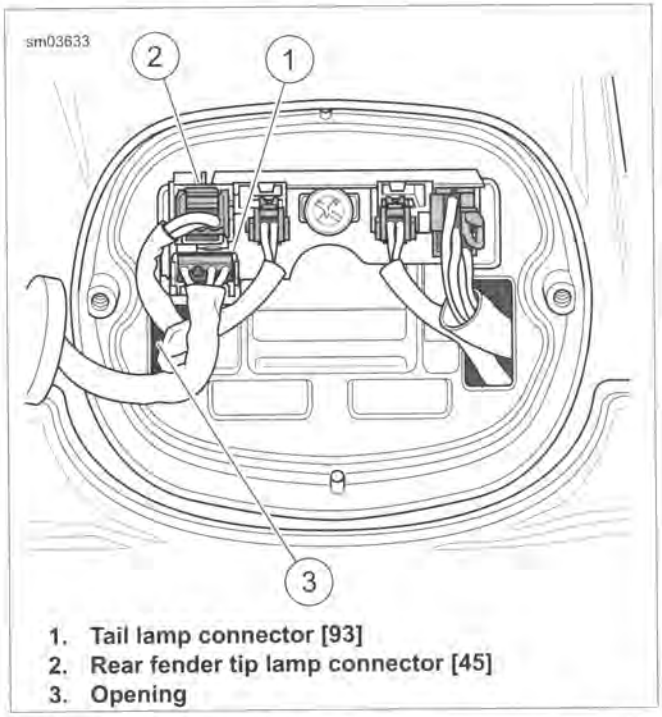
Figure 7-28. Install Conduit in Trim Strip

REAR FENDER TIP LAMP

FASTENER	TORQUE VALUE	
Fender tip lamp, rear, harness P-clamp locknut	45-85 **in-lbs**	5.1-9.6 Nm
Fender tip lamp, rear, screws	12-18 **in-lbs**	1.4-2.0 Nm
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm

Removal

1. Remove and disconnect tail lamp assembly from chrome base.
2. See Figure 7-29. Disconnect rear fender tip lamp connector [45] (2).
3. Remove harness from upper clip on inner side of fender.
4. Remove locknut, washer and P-clamp securing harness near lamp.
5. See Figure 7-30. Remove two screws (2).
6. Remove fender tip lamp.

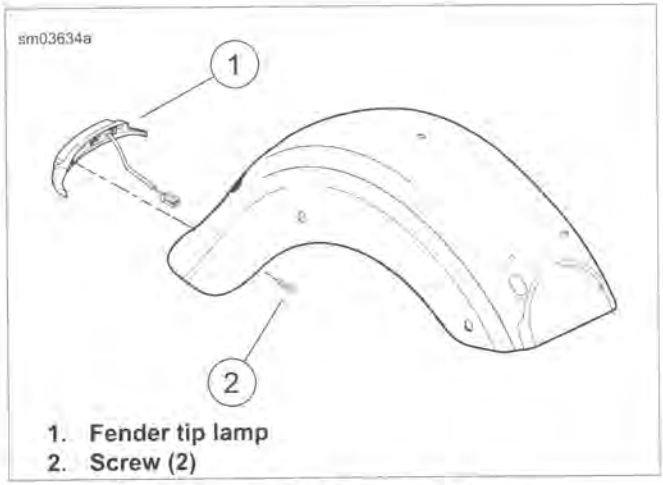


1. **Tail lamp connector [93]**
2. **Rear fender tip lamp connector [45]**
3. **Opening**

Figure 7-29. Depress Button to Release Socket from Pin Housing

Installation

1. See Figure 7-29. Route rear fender tip lamp harness through hole at bottom of fender and back through opening (3). Attach rear fender tip lamp connector [45] (2).
2. Secure lamp harness to upper clip on inner side of fender.
3. Secure lower portion of harness with P-clamp, washer and locknut. Tighten to 45-85 **in-lbs** (5.1-9.6 Nm).
4. See Figure 7-30. Place fender tip lamp into position. Secure with two screws (2). Tighten to 12-18 **in-lbs** (1.4-2.0 Nm).
5. See Figure 7-29. Attach tail lamp connector [93] (1).
6. Install tail lamp with two screws. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).



1. **Fender tip lamp**
2. **Screw (2)**

Figure 7-30. Rear Fender Tip Lamp

⚠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)

7. Test lamp operation.

TOUR-PAK SIDE LAMPS/TRIM STRIPS

FASTENER	TORQUE VALUE	
Tour-Pak side marker lamp screws	20-25 **in-lbs**	2.3-2.8 Nm

Removal

NOTE

The Tour-Pak may be equipped with either side marker lamps or trim strips depending on model. Removal and installation are similar.

1. Remove Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.
2. Remove Tour-Pak. See 2.33 TOUR-PAK.

NOTE

See Figure 7-31. Screws (3) secure both the ground plate and marker lamp/trim strip.

3. See Figure 7-31. Remove four screws (3) securing ground plate. Disconnect two ground connectors. Remove ground plate.
4. **Lamp equipped:**
   a. Disconnect side marker lamp connector (4 or 6).
   b. Remove split bushing. Pull harness and connector through hole.

Installation

1. **Lamp equipped:**
   a. See Figure 7-31. Feed connector through hole in Tour-Pak and place side marker lamp into position.
   b. Install split bushing.
   c. Connect side marker lamp connector (4 or 6).
2. Install ground plate with four screws (3). While holding lamps or trim strips in position, tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
3. Mate two ground connectors to ground plate.
4. Install Tour-Pak. See 2.33 TOUR-PAK.
5. Install Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.

TOUR-PAK LIGHTS HARNESS

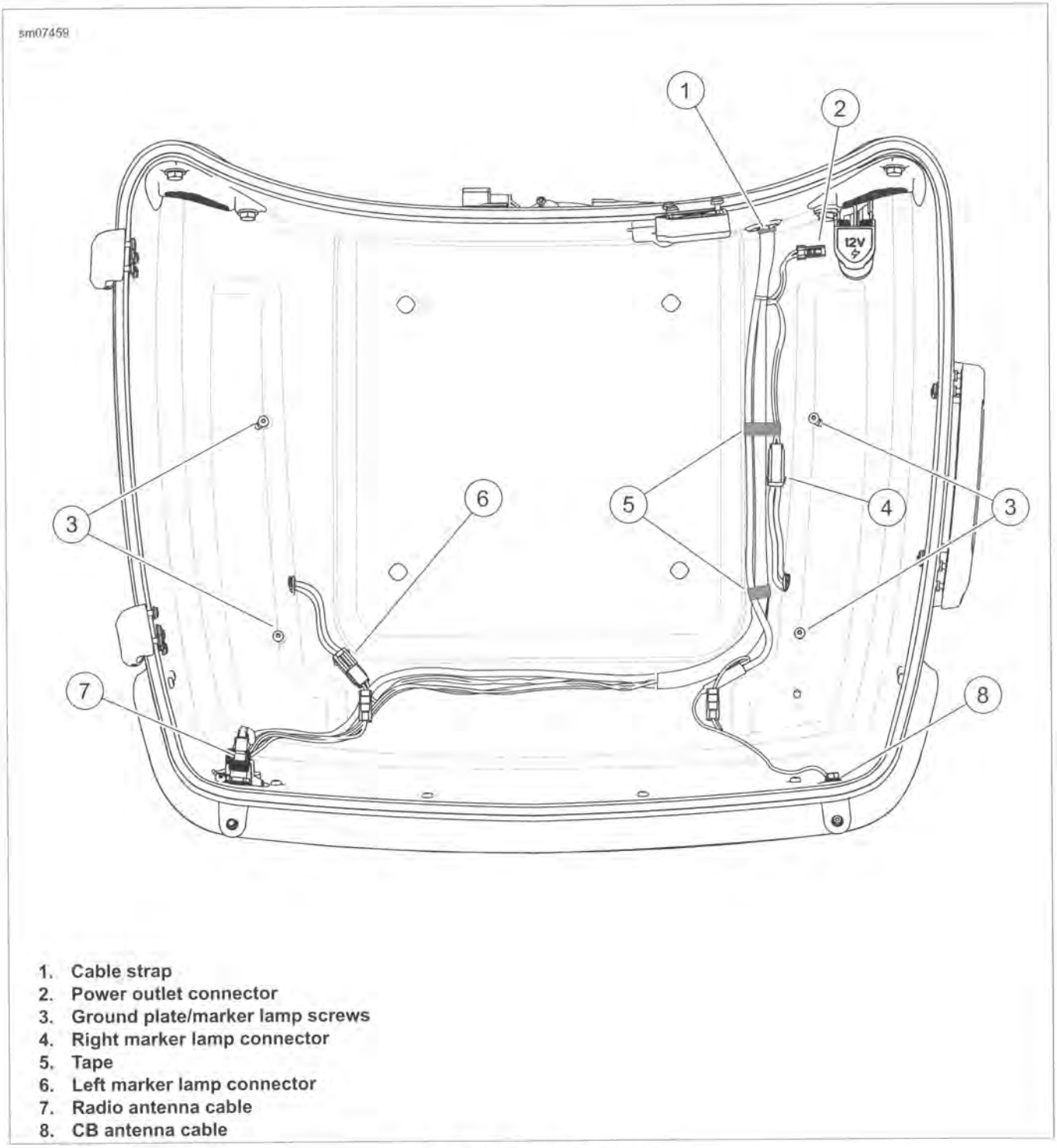
FASTENER	TORQUE VALUE	
Tour-Pak ground plate screws	20-25 **in-lbs**	2.3-2.8 Nm
CB antenna stud nut	14-16 **in-lbs**	1.6-1.8 Nm

Removal

1. Remove Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.
2. Remove Tour-Pak. See 2.33 TOUR-PAK.
3. See Figure 7-31. Remove radio antenna cable (7).
4. Remove nut and ring terminal securing CB antenna cable (8).
5. Remove four screws (3) securing ground plate. Disconnect two ground connectors. Remove ground plate.
6. Disconnect side marker lamp connectors (4, 6).
7. Disconnect power outlet connector (2).
8. Push grommet with harness out toward front. Remove Tour-Pak lights harness.

Installation

1. See Figure 7-31. Install rubber grommet on harness with the split down. Position next to cable strap (1).
2. Route Tour-Pak lights harness through hole into Tour-Pak. Install grommet.
3. Place harness at bottom of Tour-Pak.
4. Mate marker lamp (4, 6) and power outlet (1) connectors.
5. Install ground plate with four screws (3). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
6. Connect audio radio antenna cable (7).
7. Install CB antenna cable (8), flat washer and nut onto stud. Tighten to 14-16 **in-lbs** (1.6-1.8 Nm).
8. Install Tour-Pak. See 2.33 TOUR-PAK.
9. Install Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.



1. Cable strap
2. Power outlet connector
3. Ground plate/marker lamp screws
4. Right marker lamp connector
5. Tape
6. Left marker lamp connector
7. Radio antenna cable
8. CB antenna cable

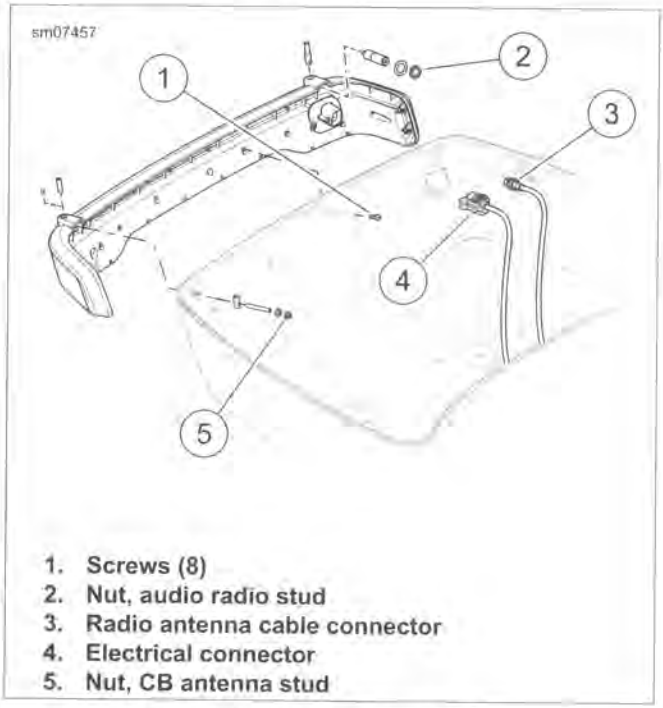
Figure 7-31. Tour-Pak Harness

WRAP-AROUND LAMP (IF EQUIPPED)

FASTENER	TORQUE VALUE	
Radio antenna inner set screw	14-16 **in-lbs**	1.6-1.8 Nm
CB antenna base set screw	14-16 **in-lbs**	1.6-1.8 Nm
Tour-Pak wrap-around lamp screws	20-25 **in-lbs**	2.3-2.8 Nm
Radio antenna stud nut	16-19 **in-lbs**	1.8-2.1 Nm
CB antenna stud nut	14-16 **in-lbs**	1.6-1.8 Nm

Removal

1. Remove Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.
2. Remove both antenna masts from lamp housing.
3. See Figure 7-32. Disconnect radio antenna cable connector (3).
4. Disconnect electrical connector (4).
5. Disconnect CB antenna cable connector if equipped.
6. Remove nut (5), washer and ring terminal from CB antenna stud.
7. Remove nut (2), ring terminal and large flat washer from AM/FM radio antenna stud.



1. **Screws (8)**
2. **Nut, audio radio stud**
3. **Radio antenna cable connector**
4. **Electrical connector**
5. **Nut, CB antenna stud**

Figure 7-32. Wrap-around Lamp

8. Remove eight screws (1) to free lamp assembly from Tour-Pak.

Repair

1. Remove CB antenna stud and remove antenna base from lamp housing.
2. Using the original nut and a 1/2 in.-20 UNF nut as a jamnut, remove connector stud from radio antenna base.
3. Remove inner stud. Remove antenna base from lamp housing.
4. Install radio antenna base with inner set screw. Tighten to 14-16 **in-lbs** (1.6-1.8 Nm).
5. Install radio antenna connector stud. Tighten securely. Remove nuts.
6. If equipped, install CB antenna base into lamp housing and secure with set screw. Tighten to 14-16 **in-lbs** (1.6-1.8 Nm).

Installation

1. See Figure 7-32. Install lamp and secure with eight screws (1). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
2. Install electrical connector (4).
3. Install large flat washer, ring terminal and nut (2) onto AM/FM radio antenna stud. Tighten to 16-19 **in-lbs** (1.8-2.1 Nm).
4. Connect AM/FM radio antenna cable connector (3).
5. Install ring terminal, flat washer and nut (5) onto CB antenna stud. Tighten to 14-16 **in-lbs** (1.6-1.8 Nm). Connect CB antenna cable if equipped.
6. Install both antenna masts.
7. Install Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.

TURN SIGNAL BULB REPLACEMENT: BULLET STYLE

1. See Figure 7-33. Insert a coin or the blade of a small screwdriver into the notch at the bottom of the lens cap. Carefully twist until the lens cap pops out of the lamp housing.
2. Push bulb in and rotate counterclockwise. Pull bulb from socket.
3. Inspect condition of electrical contacts in socket. If necessary, clean with a small wire brush and electrical contact cleaner.
4. Apply ELECTRICAL CONTACT LUBRICANT to contacts in socket and at bottom of **new** bulb.
5. Align pins on **new** bulb with pin guides in bulb socket. Push bulb in and turn clockwise to lock in place.
6. Snap lens cap onto the lamp housing with notch at bottom.

⚠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)

7. Test lamp operation.

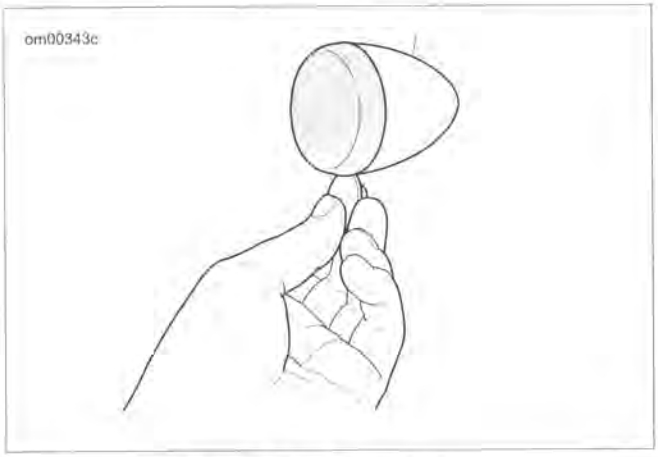


Figure 7-33. Remove Lens

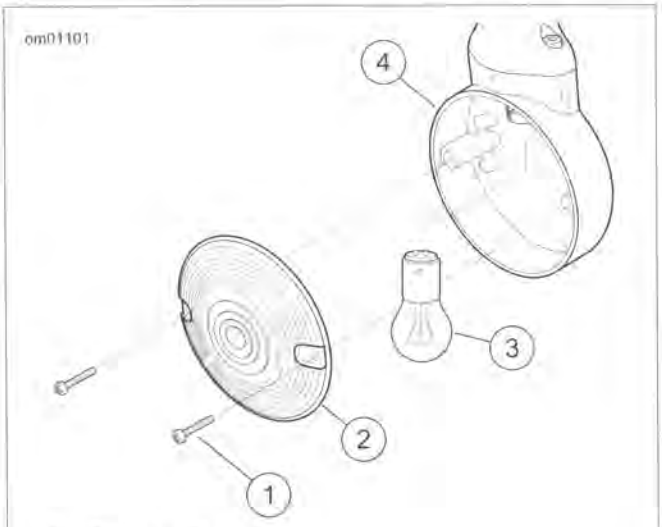
TURN SIGNAL BULB REPLACEMENT: FLAT LENS STYLE

1. See Figure 7-34. Remove two screws to release lens from lamp housing.
2. Push bulb in and rotate counterclockwise to remove bulb from socket.
3. Inspect condition of electrical contacts in socket. If necessary, clean with a small wire brush and electrical contact cleaner.
4. Apply ELECTRICAL CONTACT LUBRICANT to contacts in socket and at bottom of **new** bulb.
5. Align index pins on **new** bulb with pin guides in bulb socket. Push bulb in and turn clockwise to lock in place.
6. Seat lens in lamp and install two screws.

⚠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)

7. Test lamp operation.



1. **Screws (2)**
2. **Lens**
3. **Bulb**
4. **Lamp housing**

Figure 7-34. Turn Signal Lamp Assembly: Flat Lens Style

FRONT TURN SIGNAL LAMP

FASTENER	TORQUE VALUE	
Turn signal lamp, front, mounting bracket screws: FLHR/C, FLHT/C/U	30-60 **in-lbs**	4.1-6.8 Nm
Turn signal, front, lamp to bracket screw: Bullet Style, without auxiliary/fog lamps	15-20 ft-lbs	20.3-27.1 Nm
Turn signal, front, lamp to bracket screw: Bullet Style, auxiliary/fog lamp equipped	96-120 **in-lbs**	10.9-13.5 Nm

Removal: Flat Lens Style

1. See Figure 7-35. Remove headlamp assembly. See 7.9 HEADLAMP. Disconnect front turn signal lamps connector.
2. Remove terminal(s) from connector housing. Refer to Table 7-8 or Table 7-9. See A.17 JAE MX19 SEALED CONNECTORS.

Table 7-8. Front Turn Signal Lamps [31] (Road King)

LEFT SIDE		RIGHT SIDE	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Blue (DOM)	4	Black	1
Violet	5	Brown	2
Black	6	Blue (DOM)	3

Table 7-9. Front Turn Signal Lamps [31L/R] (fairing models)

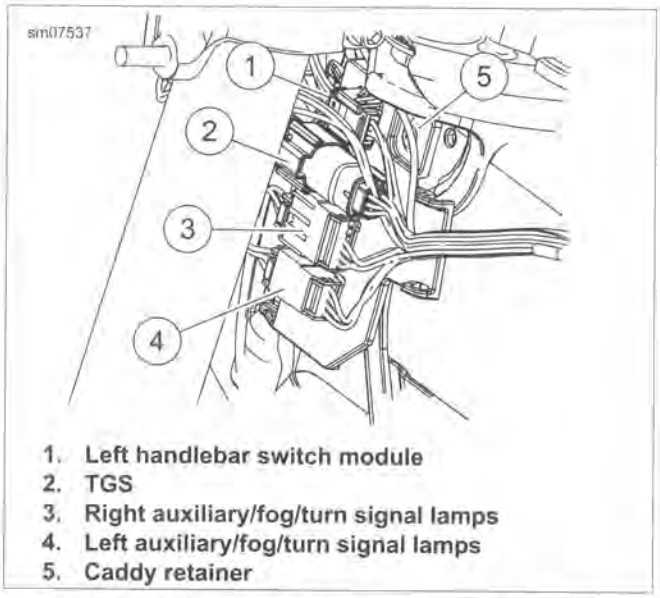
LEFT SIDE [31L]		RIGHT SIDE [31R]	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Blue	1	Blue	1
Violet	2	Brown	2
Black	3	Black	3
Note: Terminal 4 is reserved for the auxiliary/fog lamp.			

3. See Figure 7-34. Remove two screws to release turn signal lamp from mounting bracket.

NOTE

Be sure that chaser wire is of sufficient strength to pull terminals through conduit without breaking. Wire lengths must also be long enough so that free ends are not lost in conduit when pulled.

4. See Figure 7-36. Obtain three equal lengths of strong flexible wire for use as chaser wires. Securely attach a chaser wire to terminal of each wire.
5. Carefully pull wires to draw terminals through both sections of conduit. For best results, pull one wire at a time.
6. Remove chaser wire from terminals.



1. **Left handlebar switch module**
2. **TGS**
3. **Right auxiliary/fog/turn signal lamps**
4. **Left auxiliary/fog/turn signal lamps**
5. **Caddy retainer**

Figure 7-35. Left Side Connectors: Road King

Installation: Flat Lens Style

1. Lay old turn signal lamp next to **new** turn signal lamp and cut wires to length.
2. Strip 3/16 in. (4.8 mm) of insulation off wires and crimp on **new** terminals. See A.17 JAE MX19 SEALED CONNECTORS.
3. Secure chaser wires to terminals. Carefully draw terminals back through conduit.
4. Remove chaser wires.
5. Install terminals into connector housing. Refer to Table 7-8 or Table 7-9. See A.17 JAE MX19 SEALED CONNECTORS.
6. See Figure 7-34. Start two screws to secure turn signal lamp to mounting bracket. Verify that conduit fits in slot at back of bracket and is not pinched. Tighten screws to 30-60 **in-lbs** (4.1-6.8 Nm).
7. Connect front turn signal/auxiliary/fog lamp connector.
8. See Figure 7-35. Secure anchor to fork stem nut lockplate. Install headlamp assembly. See 7.9 HEADLAMP.

⚠WARNING

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

9. Test lamp operation.

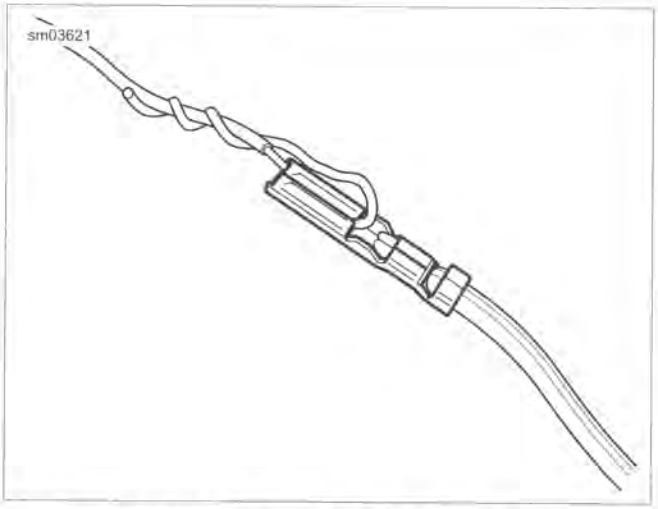
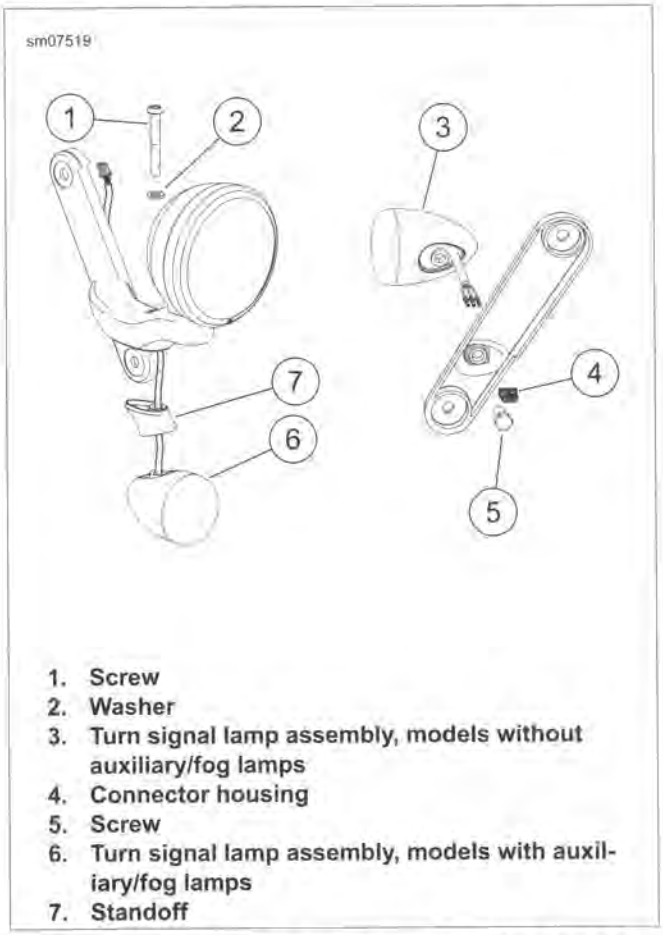


Figure 7-36. Fix Chaser Wire to Socket Terminal

Removal: Bullet Style, Fork Mounted

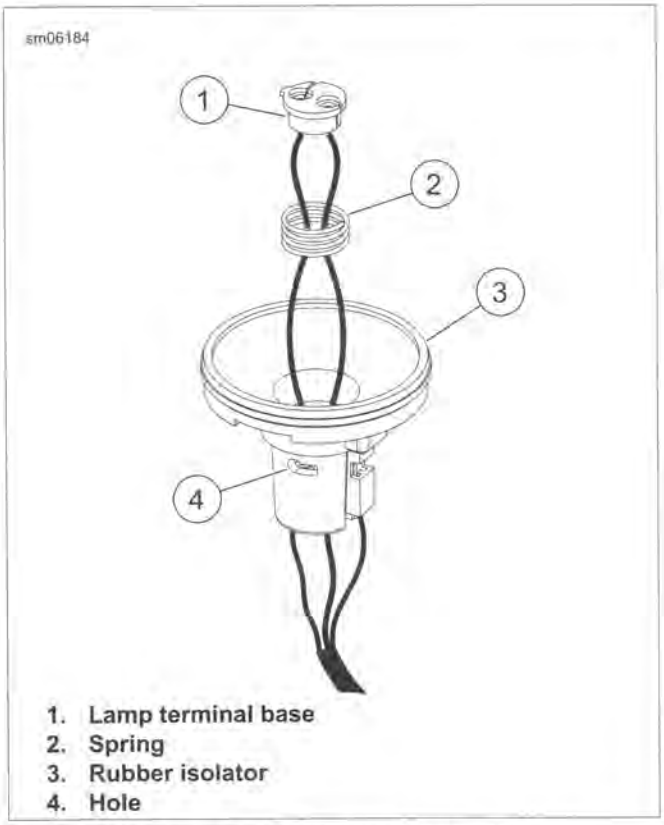
1. Remove turn signal/auxiliary/fog lamp bracket. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS.
2. See Figure 7-37. Remove terminals from connector housing (4). See A.17 JAE MX19 SEALED CONNECTORS.
3. Remove screw (1 or 5). Remove lamp assembly from bracket.

4. Remove reflector assembly:
   a. Remove mounting bracket from harness.
   b. Remove lens and bulb.
   c. See Figure 7-38. Insert a right angle pick or a small hex key from inside the bulb socket through hole (4). Pull reflector from lamp.
   d. Remove rubber isolator (3).



1. **Screw**
2. **Washer**
3. **Turn signal lamp assembly, models without auxiliary/fog lamps**
4. **Connector housing**
5. **Screw**
6. **Turn signal lamp assembly, models with auxiliary/fog lamps**
7. **Standoff**

Figure 7-37. Front Turn Signal Lamp (Fairing Models)



1. **Lamp terminal base**
2. **Spring**
3. **Rubber isolator**
4. **Hole**

Figure 7-38. Reflector Assembly

Installation: Bullet Style, Fork Mounted

1. Install reflector assembly:
   a. Seat reflector assembly in rubber isolator, aligning tab on reflector with slot in isolator.
   b. Feed wires through lens opening and out through unthreaded hole.
   c. Aligning tab on reflector with slot inside lamp, use thumbs of both hands and apply even pressure around outer edge of reflector assembly until fully seated.
   d. Liberally apply dielectric grease to contacts in socket and at bottom of bulb. Install bulb and lens with slot at bottom of lamp.
   e. Feed wires through hole in mounting bracket.
2. See Figure 7-37. Install lamp on mounting bracket. Tighten to:
   a. **Models without auxiliary/fog lamps:** 15-20 ft-lbs (20.3-27.1 Nm).
   b. **Models with auxiliary/fog lamps:** 96-120 **in-lbs** (10.9-13.5 Nm).
3. Install terminals into connector housing as shown in Table 7-10. See A.17 JAE MX19 SEALED CONNECTORS.

Table 7-10. Turn Signal Lamp Connector (Bullet Style)

LEFT SIDE [31L]		RIGHT SIDE [31R]	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Blue	1	Blue	1
Violet	2	Brown	2
Black	3	Black	3
Empty	4	Empty	4

4. Install turn signal/auxiliary/fog lamp bracket. See 7.10 AUXILIARY/FOG LAMPS AND BRACKETS.

⚠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 lamp operation.

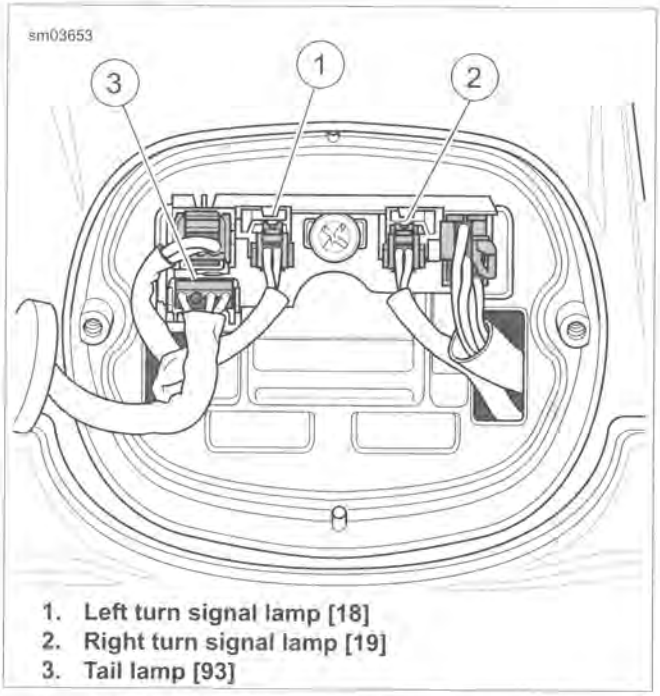
REAR TURN SIGNAL LAMP

PART NUMBER	TOOL NAME
SNAP-ON FABL5	LONG SHANK BALL END SOCKET

FASTENER	TORQUE VALUE	
Turn signal lamp to rear turn signal lamps bracket screws	30-50 **in-lbs**	3.4-5.6 Nm
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm

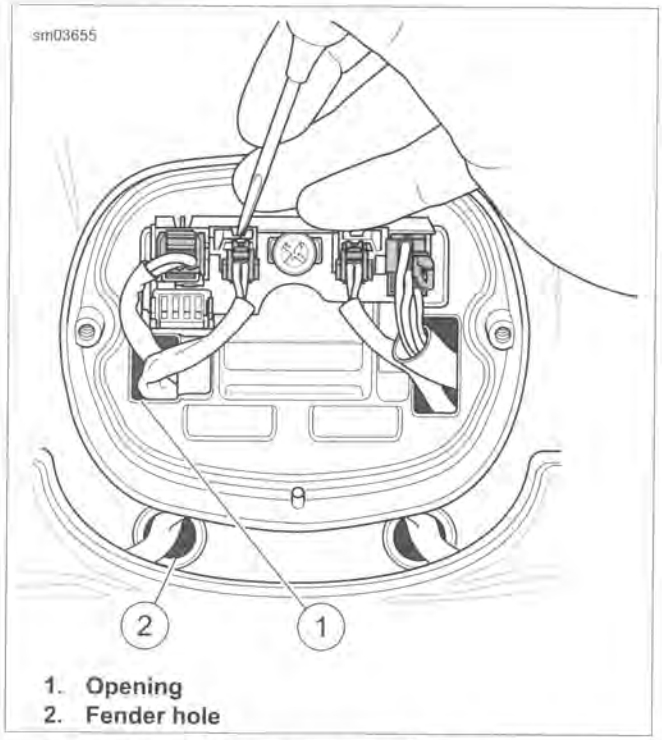
Removal: All but FLHX/S

1. Remove saddlebag as necessary. See 2.31 SADDLEBAGS.
2. See Figure 7-39. Remove and disconnect tail lamp assembly from chrome base.



1. **Left turn signal lamp [18]**
2. **Right turn signal lamp [19]**
3. **Tail lamp [93]**

Figure 7-39. Release Tail Lamp Connector



1. **Opening**
2. **Fender hole**

Figure 7-40. Release Turn Signal Lamp Connector

3. See Figure 7-40. Disconnect turn signal lamp connector (2-place Multilock). Use a pick or small screwdriver to press latch.
4. Feed connector to inboard side of rear fender.
5. Release harness from cable clip inside fender.
6. Draw out harness and connector through fender hole (2).
7. Draw connector through channel on inboard side of rear turn signal lamp bracket, so that length of conduit hangs below turn signal lamp.
8. Remove two screws to release turn signal lamp assembly. Use a LONG SHANK BALL END SOCKET (Part No. Snap-on FABL5) or equivalent through the channel in the bracket.
9. Remove terminals from connector. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Installation: All but FLHX/S

1. Place **new** turn signal lamp assembly next to discarded unit and cut wires to proper length.
2. Crimp **new** terminals onto turn signal lamp wires. Install terminals into connector housing. Refer to Table 7-11. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Table 7-11. Rear Turn Signal Lamps Connector (models with tail lamp)

WIRE COLOR	CAVITY NUMBER
Violet	1
Black	2

3. Install turn signal lamp assembly. Tighten to 30-50 **in-lbs** (3.4-5.6 Nm).

4. See Figure 7-40. Route connector through channel in bracket, then through fender hole (2).
5. Capture harness in cable clip under fender.
6. Feed connector through opening (1) in chrome base.
7. See Figure 7-39. Connect turn signal harness connector (1 or 2).
8. Connect tail lamp connector (3). Verify that tail lamp harness is positioned outboard of the rear fender tip lamp and left turn signal lamp harnesses.
9. Install tail lamp. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

⚠WARNING

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

10. Test lamp operation.
11. Install saddlebag.

Removal: FLHX/S

NOTES

- *This procedure covers replacement of the rear turn signal lamp reflector/ isolator assembly only.*
- *Individual LEDs cannot be replaced. Replace assembly upon failure. See 7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.*

1. **Models with tail lamp:**
   a. Remove circuit board and chrome base. See 7.11 REAR LIGHTING.
   b. Remove terminals from turn signal lamp connector housing. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   c. Release harness from cable clip inside fender.
   d. Draw harness and terminals through hole to outboard side of fender. Proceed with reflector/isolator removal.
2. **Models without tail lamp:**
   a. Remove turn signal lamps bracket. See 7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.
   b. Remove grommet from harness.
   c. Remove license plate bracket.
   d. Remove screws securing license plate lamp.
   e. Remove terminals from connector housing. See A.11 DELPHI MICRO 64 SEALED CONNECTORS.
   f. Pull wires through main conduit.

Installation: FLHX/S

1. **Models with tail lamp:**
   a. Install **new** terminals onto wires. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   b. Feed terminals through hole to inboard side of fender.
   c. Install terminals into connector housing. Refer to Table 7-11. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   d. Capture harness in cable clip inside fender.
   e. Install chrome base and circuit board assembly. See 7.11 REAR LIGHTING.
2. **Models without tail lamp:**
   a. Feed wires through main conduit. Install **new** terminals and install in connector housing. Refer to Table 7-12 or Table 7-13. See A.11 DELPHI MICRO 64 SEALED CONNECTORS.
   b. Route both turn signal lamp harnesses under license plate lamp area. Install license plate lamp and license plate bracket. See 7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.
   c. Install turn signal lamps bracket. See 7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.

⚠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 lamp operation.

Table 7-12. Rear Turn Signal Lamps Connector (Incandescent) (models without tail lamp)

WIRE COLOR	CAVITY NUMBER	FUNCTION
Violet/Brown	1	Right turn
Violet	2	Left turn
Plug	3	-
Plug	4	-
Black	5	Left ground
Black	6	Right ground
Black	7	License plate lamp
Blue	8	Left tail
Blue	9	Right tail
Plug	10	-
Black	11	License plate lamp ground
Plug	12	-

Table 7-13. Rear Turn Signal Lamps Connector (LED) (models without tail lamp)

WIRE COLOR	CAVITY NUMBER	FUNCTION
GN/W	1	Right turn
W/BK	2	Right tail
R/W	3	Right stop
Y/W	4	Right ground
Black	5	License plate lamp ground
Plug	6	-
Green	7	Left turn
White	8	Left tail
Red	9	Left stop
Black	10	License plate lamp
Yellow	11	Left ground
Plug	12	-

Lamp Repair

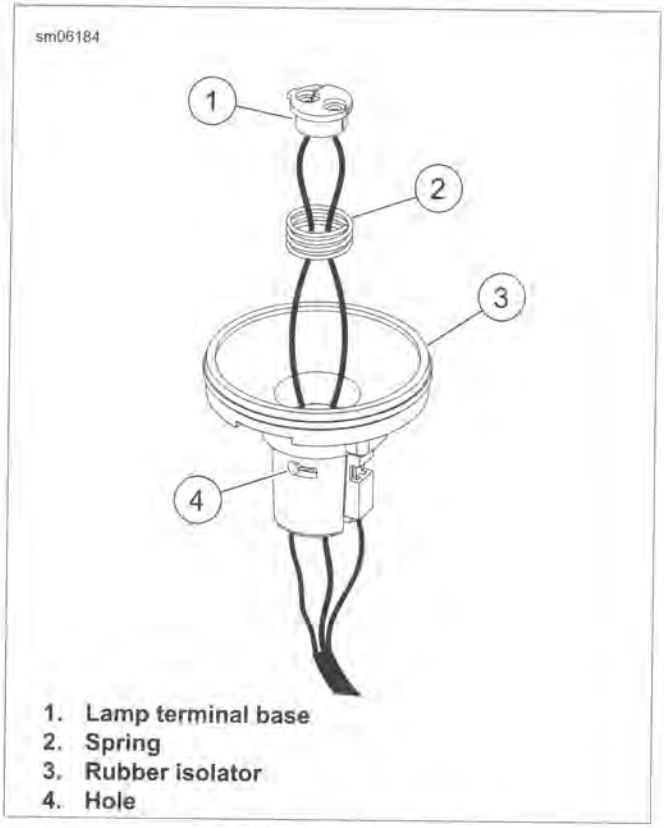
NOTE

LED type lamps are not serviced separately. Replace the light bar assembly.

1. Remove lens and bulb.

Push grommet into lamp housing. Lubricate grommet with glass cleaner, if necessary.

2. See Figure 7-41. Insert a right angle pick or a small hex key from inside the bulb socket through hole (4). Pull reflector from lamp.
3. Remove rubber isolator (3).
4. Install rubber isolator (3).
5. Place **new** reflector assembly next to discarded unit and cut wires to proper length.
6. Seat reflector assembly in rubber isolator, aligning tab on reflector with slot in isolator.
7. Feed wires through lens opening and out through hole in lamp housing.
8. Install grommet in lamp housing. Lubricate grommet with glass cleaner, if necessary.
9. Align tab on reflector with slot inside lamp. Use thumbs of both hands to apply even pressure around outer edge of reflector assembly until fully seated.
10. Liberally apply dielectric grease to contacts in socket and at bottom of bulb. Install bulb and lens with slot at bottom of lamp.



1. **Lamp terminal base**
2. **Spring**
3. **Rubber isolator**
4. **Hole**

Figure 7-41. Reflector Assembly

REAR TURN SIGNAL LAMPS BRACKET

FASTENER	TORQUE VALUE	
License plate bracket screws	60-90 **in-lbs**	6.8-10.2 Nm
Turn signal lamps bracket, rear, screws	84-144 **in-lbs**	9.5-16.3 Nm
License plate bracket screws	60-90 **in-lbs**	6.8-10.2 Nm
Turn signal lamps bracket, rear, screws	84-144 **in-lbs**	9.5-16.3 Nm

Removal: All but FLHX/S

1. Remove circuit board and chrome base. See 7.11 REAR LIGHTING.
2. Remove rear turn signal lamps from bracket. See 7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp.
3. If equipped with license plate lamp on turn signal bracket, remove terminals from license plate lamp connector. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
4. Remove two screws to free rear turn signal lamps bracket from rear fender.
5. Remove two screws to free license plate bracket and lamp, if equipped.

Installation: All but FLHX/S

1. Install license plate bracket and lamp, if equipped, onto turn signal bracket. Tighten to 60-90 **in-lbs** (6.8-10.2 Nm).
2. Apply one drop of LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to screws.

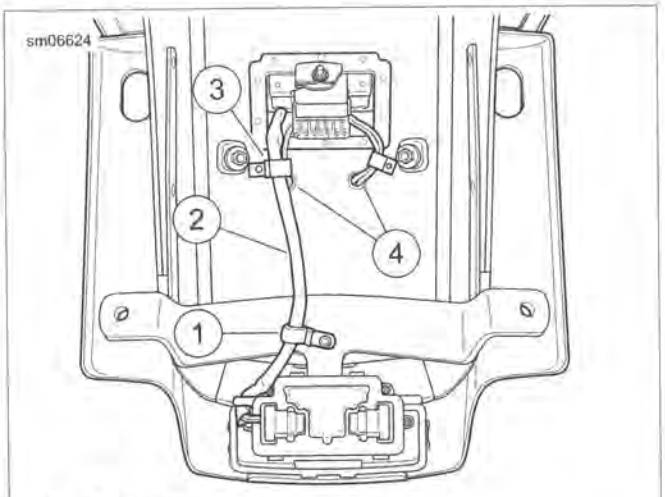
3. Install rear turn signal lamps bracket. Tighten to 84-144 **in-lbs** (9.5-16.3 Nm).
4. If equipped with license plate lamp on turn signal bracket, route wires through hole in fender and install terminals into license plate lamp connector. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR. Also refer to Table 7-14.
5. Install rear turn signal lamps in bracket. See 7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp.
6. Install chrome base and circuit board assembly. See 7.11 REAR LIGHTING.

Removal: FLHX/S

1. **Models with tail lamp:**
   a. Remove circuit board and chrome base. See 7.11 REAR LIGHTING.
   b. See Figure 7-42. Release turn signal lamp harnesses (4) from cable clips.
   c. Remove terminals from license plate lamp connector. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
2. **Models without tail lamp:**
   a. See Figure 7-43. Disconnect turn signal connector (3) from rear fascia lamp.
   b. Release harness from J-clamp (2) located above fascia lamp.
   c. Push grommet (1) rearward out of hole in fender.
3. Remove two screws to release rear turn signal lamps bracket. Remove bracket and harnesses
4. Remove screws to release license plate bracket and lamp from turn signal bracket.

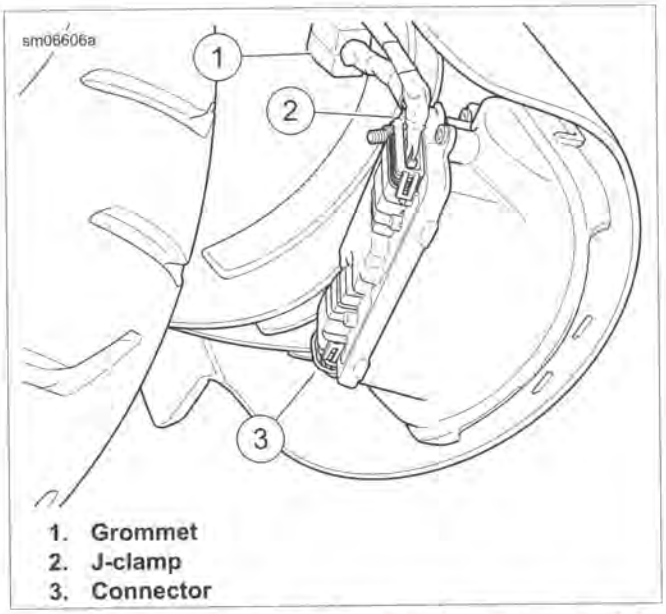
Table 7-14. License Plate Lamp Connector [45]

WIRE COLOR	CHAMBER NUMBER
Black	1
Not Used	2
Black	3



1. **P-clamp**
2. **Jumper harness**
3. **Clamp, tee-stud**
4. **Turn signal lamps harnesses**

Figure 7-42. Tail Lamp Jumper Harness (models with tail lamp)



1. **Grommet**
2. **J-clamp**
3. **Connector**

Figure 7-43. Rear Turn Signal Lights Connector (models without tail lamp)

1. **Grommet**
2. **License plate bracket screws**

Figure 7-44. Rear Turn Signal Lamps and Harness (models without tail lamp)

Installation: FLHX/S

1. Install license plate lamp and bracket onto turn signal bracket. Tighten to 60-90 **in-lbs** (6.8-10.2 Nm).
2. **Models with tail lamp:** Feed socket housings of left and right rear turn signal lamps and license plate wire terminals through respective holes to inboard side of fender.
3. **Models without tail lamp:**
   a. See Figure 7-44. Install grommet (1) and orient as shown.
   b. Route harness through hole in fender and seat grommet in hole.
4. Apply one drop of LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to screws.
5. Install rear turn signal lamps bracket. Tighten to 84-144 **in-lbs** (9.5-16.3 Nm).
6. **Models with tail lamp:**
   a. Install terminals into license plate lamp connector. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR. Also refer to Table 7-14.
   b. Install chrome base and circuit board assembly. See 7.11 REAR LIGHTING.
7. **Models without tail lamp:**
   a. See Figure 7-43. Install connector (3).
   b. Secure harness in J-clamp (2) and under tab on end of fascia lamp.

FAIRING MODELS

PART NUMBER	TOOL NAME
HD-51198	IGNITION SWITCH ALIGNMENT TOOL

FASTENER	TORQUE VALUE	
Ignition switch housing screws, fairing models	19-28 **in-lbs**	2.1-3.2 Nm
Ignition switch housing nut, fairing models	13-15 ft-lbs	17.5-20.9 Nm

Removal

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove the ignition switch knob:
   a. Insert the ignition switch key and turn to the UNLOCK position. Leave the key installed.
   b. See Figure 7-45. Rotate the knob to FORK LOCK.
   c. Press and hold the release button at bottom (left side) of the knob, and turn key 60 degrees counterclockwise.
   d. Lift knob to remove. Spring will drop out of bore at underside of knob when removed.

NOTE

See Figure 7-47. Use IGNITION SWITCH ALIGNMENT TOOL (Part No. HD-51198) to move the switch to other positions as required. Insert tool until bottom of handle contacts top of ignition switch. Rotate handle to the selected position.

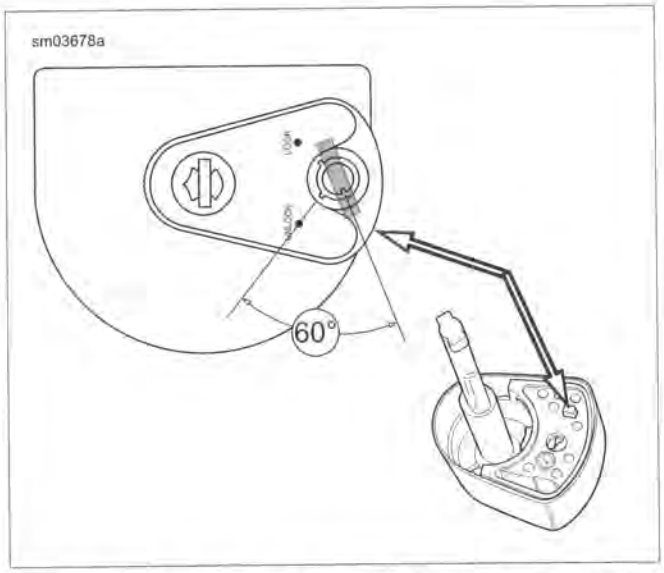


Figure 7-45. Ignition Switch Knob Release Button (Top and Bottom Views)

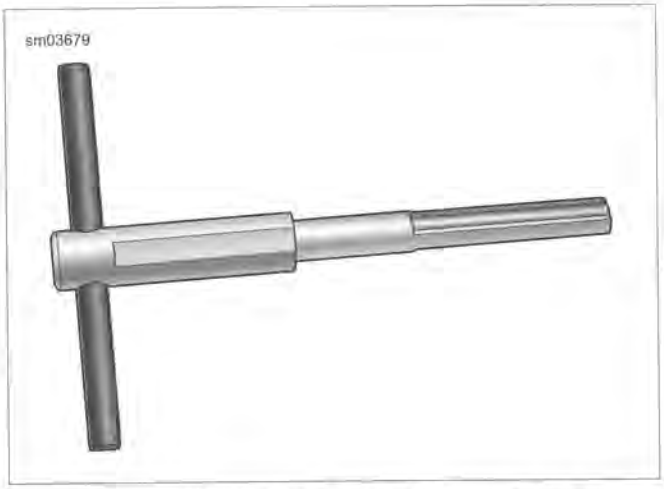


Figure 7-46. Ignition Switch Alignment Tool

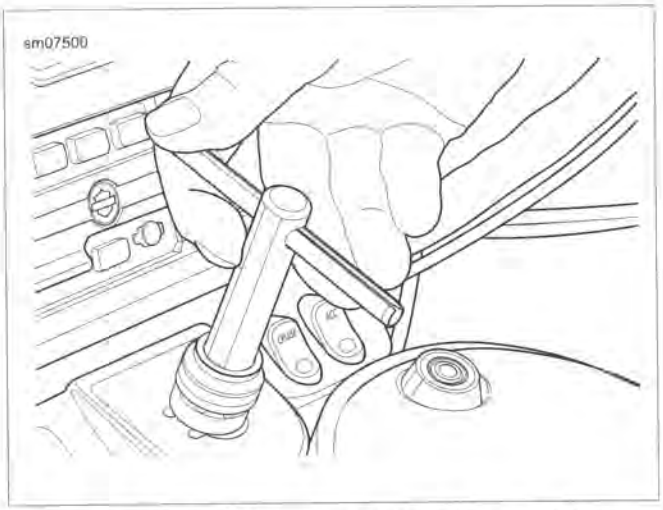


Figure 7-47. Bottom Alignment Tool in Threaded Post and Rotate to Desired Position

3. Remove nut and collar from ignition switch.
4. Remove dash panel. See 2.38 DASH PANEL.
5. Disconnect ignition switch connector [33].
6. **Domestic models:** Remove two screws and flat washers securing ignition switch assembly.

⚠CAUTION

Always wear proper eye protection when drilling or grinding. Flying debris could cause serious eye injury. (00402e)

7. **International models:** Remove two break-away screws:
   a. Rotate inner fairing to access screws. See 7.3 SYSTEM FUSES AND RELAYS.
   b. Use a center punch to make a pilot hole at the top of each break-away screw.
   c. Use a 1/8 inch left handed bit in drill. Set the drill to REVERSE and use to spin out the screws.

NOTE

If the above method fails, use a 3/16 inch bit to drill off heads of the screws to remove switch. Use pliers to remove remainder of screws from upper fork bracket.

8. Remove ignition switch.

Installation

1. Place ignition switch into position.
2. **Domestic models:** Install two screws and flat washers. Tighten to 19-28 **in-lbs** (2.1-3.2 Nm).
3. **International models:**
   a. Verify that the threads in the upper fork bracket are clean and in good condition. Dirty and/or damaged threads may cause the heads of the break-away screws to snap off before the switch housing is properly tightened.

   NOTE

   Use care to avoid losing heads of break-away screws in motorcycle. Vibration may cause captured heads to scratch finished surfaces, chafe wires or cause other damage.

   b. Install two **new** break-away screws and flat washers. Tighten until heads snap off.
   c. Rotate inner fairing into position and secure. See 7.3 SYSTEM FUSES AND RELAYS.
4. Install ignition switch connector.
5. Install dash panel. See 2.38 DASH PANEL.
6. Install collar and nut. Tighten to 13-15 ft-lbs (17.5-20.9 Nm).
7. Place spring into bore at underside of knob.
8. Install ignition switch knob:
   a. See Figure 7-45. Verify that button at bottom of knob is pressed and key is turned 60 degrees counterclockwise of the UNLOCK position.
   b. With the knob pointing toward the FORK LOCK position, insert shaft into ignition switch.
   c. Hold the knob down and the turn key clockwise to the UNLOCK position. An audible "click" is heard when knob and switch are properly engaged.
   d. Release the knob. Rotate through all four switch positions to verify proper operation. If knob does not install properly, proceed to next step.
9. **Knob was removed in the ACCESS position or switch was moved out of the FORK LOCK position:**
   a. See Figure 7-47. Insert alignment tool until bottom of handle contacts top of ignition switch. While holding front forks at the left fork stop, rotate handle of tool counterclockwise until fork locks.
   b. Remove tool. Install knob.
   c. If knob does not install properly, proceed to next step.
10. **Detent and switch position lugs are misaligned:**
    a. Insert knob into ignition switch and rotate until it drops into the partially installed position. Take note whether it is pointing toward the rear, or to ACCESS, IGNITION or OFF.
    b. See Figure 7-48. Remove knob. Insert and hold alignment tool so that the bottom of the handle is approximately 0.50-0.75 in (12.7-19.1 mm) from the top of the ignition switch.
    c. Rotate alignment tool counterclockwise the number of positions needed to get to FORK LOCK.
    d. Install knob.
11. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

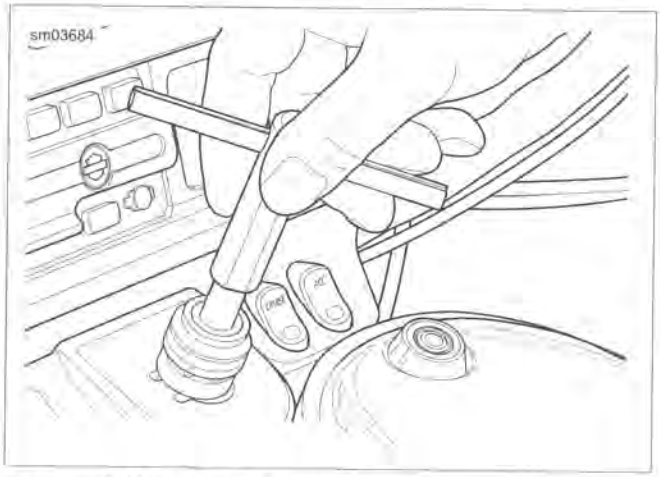


Figure 7-48. Rotate Alignment Tool Without Bottoming

ROAD KING MODELS

FASTENER	TORQUE VALUE	
Ignition switch screws: Road King	25-35 **in-lbs**	2.8-3.9 Nm
Fork lock screws: Road King	36-60 **in-lbs**	4.1-6.8 Nm

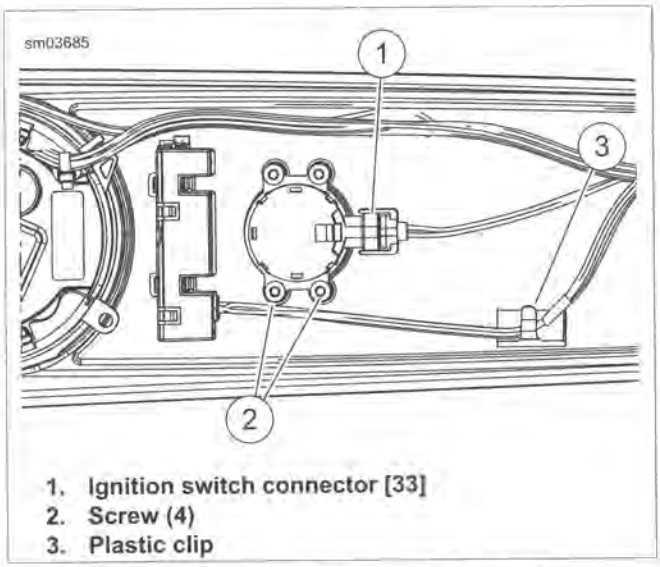
Ignition/Light Key Switch: Removal

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove seat. See 2.30 SEAT.
3. Remove console. See 4.6 FUEL TANK, Console.
4. See Figure 7-49. Disconnect ignition switch connector [33]. Release ignition switch conduit from plastic clip, if necessary.
5. Remove four screws to release ignition switch from console.

Ignition/Light Key Switch: Installation

1. See Figure 7-49. Install ignition switch. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm) in a crosswise pattern.
2. Connect ignition connector [33]. Capture ignition switch conduit in plastic clip, if removed.

3. Using caution to avoid pinching wire harness and vent tube, install console. See 4.6 FUEL TANK, Console.



1. **Ignition switch connector [33]**
2. **Screw (4)**
3. **Plastic clip**

Figure 7-49. Instrument Console (Road King)

4. Install seat. See 2.30 SEAT.
5. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

Fork Lock: Removal

1. Remove handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
2. Start acorn nuts on both the left and right side fork bracket studs to keep halves of headlamp nacelle on motorcycle.
3. **US models:** See Figure 7-50. Remove two screws (with flat washers).
4. **International models:** Remove two break-away screws:
   a. Center punch the top of each break-away screw.
   b. Use a 1/8 inch left-handed drill bit. Set the drill to REVERSE and use to spin out the break-away screws.

NOTE

If the above method fails:

- *Use a 3/16 inch bit to carefully drill off heads of break-away screws.*
- *Use pliers to remove remainder of screws once the switch is removed.*

5. Remove fork lock assembly from upper fork bracket bore.

Fork Lock: Installation

1. See Figure 7-50. Position fork lock assembly into bore of upper fork bracket.
2. **US models:** Install two screws (with flat washers). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
3. **International models:**
   a. Verify that the threads in the upper fork bracket are clean and in good condition. Dirty and/or damaged threads may cause the heads of the break-away screws to snap off before the fork lock is properly tightened.

NOTE

Do not lose heads of break-away screws in motorcycle. Vibration may cause captured heads to scratch finished surfaces, chafe wires or cause other damage.

   b. Install two **new** break-away screws (with flat washers). Tighten until heads snap off.

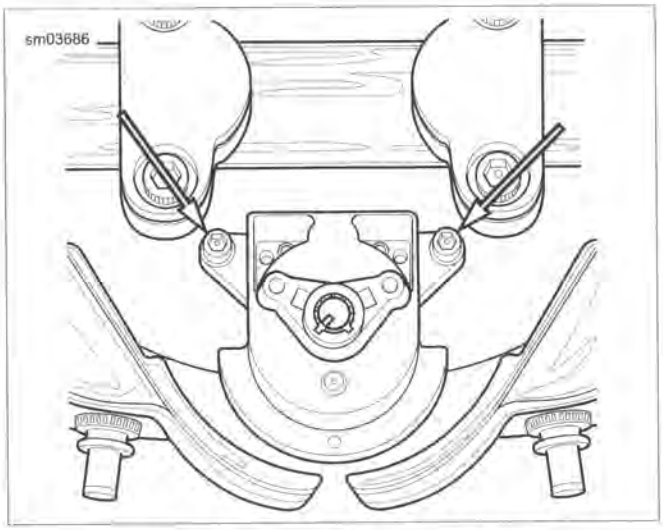


Figure 7-50. Fork Lock (Road King)

4. Install handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.

REMOVAL

NOTE

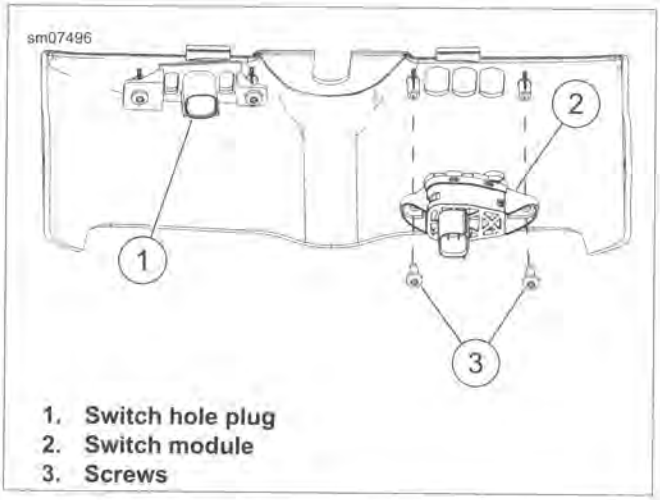
Maximum current rating for each switch is 2A.

1. Remove dash panel. See 2.38 DASH PANEL.
2. See Figure 7-51. Remove two screws (3). Remove switch module (2) or hole plug (1).

NOTES

- *Record positions of switches and plunger types for assembly.*
- *The switch module assembly can house either active switch plungers or static plungers depending on equipment. Active plungers can be push-push type or momentary. All are removed and installed in the same manner.*
- *See Figure 7-52. Lock (3) extracts approximately 1/8 in (3.2) and does not come free from housing.*

3. Gently pry lock (3) outward to release switch plunger (2).
4. Remove switch plunger from switch module.



1. **Switch hole plug**
2. **Switch module**
3. **Screws**

Figure 7-51. Dash Panel Switches

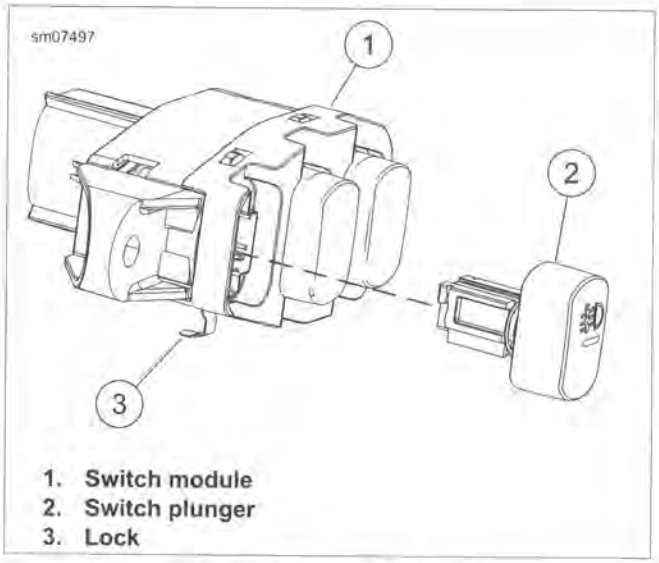
INSTALLATION

1. See Figure 7-52. Push plunger (2) into switch module. Push lock (3) into place.

NOTE

Verify that switches are located as recorded during disassembly.

2. See Figure 7-51. Secure switch module to dash panel with two screws (3). Tighten securely. Over-tightening will cause damage to dash panel.
3. Install dash panel. See 2.38 DASH PANEL.
4. Operate all switches to verify repair.



1. **Switch module**
2. **Switch plunger**
3. **Lock**

Figure 7-52. Switch Module Components

GENERAL

The crank position sensor (CKP) is a variable reluctance (VR) sensor. It generates an AC signal by sensing the passing of the 30 teeth machined in the left side flywheel. Two consecutive teeth are missing in the flywheel to establish a reference point. The CKP sends a signal to the electronic control module which references engine position (TDC) and engine speed.

NOTE

CKP sensor connector is not serviceable. Replace the entire assembly if it fails.

REMOVAL

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

NOTE

CKP sensor connector is fixed to front caddy at bottom of lower frame crossmember.

2. Push connector to the right to detach from caddy T-stud.
3. Separate connector.
4. See Figure 7-53 and Figure 7-54. Remove screw to free CKP sensor. Pull sensor from bore.

INSTALLATION

FASTENER	TORQUE VALUE	
CKP mount screw	100-120 **in-lbs**	11.3-13.6 Nm

1. Install **new** O-ring on sensor body if damaged. Apply a thin film of clean engine oil to O-ring before installation.
2. See Figure 7-53. Secure sensor with screw. Tighten to 100-120 **in-lbs** (11.3-13.6 Nm).
3. Route connector and convoluted tubing downward at rear of front engine stabilizer link to front caddy at bottom of lower frame crossmember.
4. Mate connector [79].

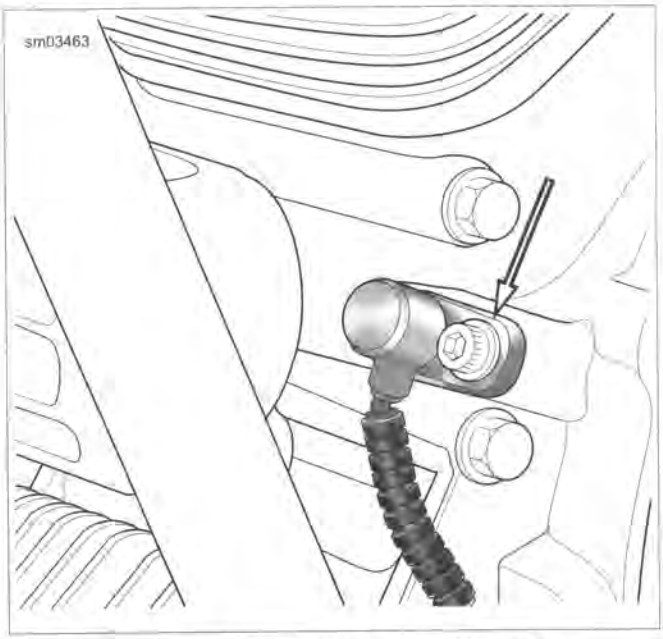


Figure 7-53. Remove CKP Sensor Mount Screw

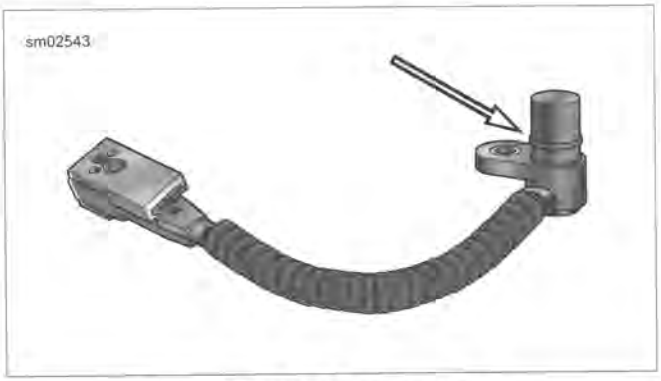


Figure 7-54. CKP Sensor O-Ring

5. Mount connector to caddy T-stud.
6. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

REMOVAL

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Loosen horn bracket bolt to front cylinder head. Remove horn bracket bolt (with flat washer) from rear cylinder head and swing horn bracket forward.
3. Pull back boot at back of front cylinder and remove ET sensor connector [90].
4. See Figure 7-55. Remove sensor.

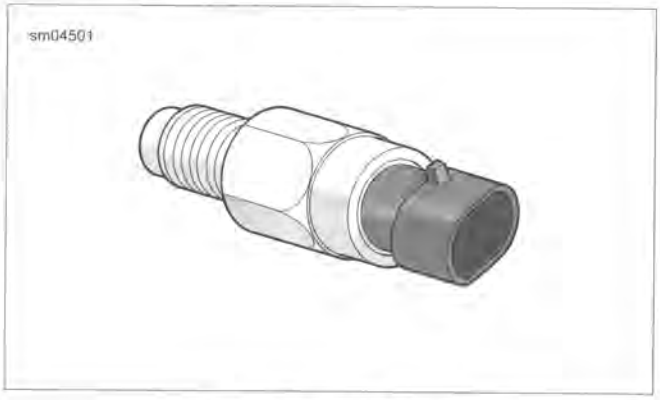


Figure 7-55. ET Sensor

INSTALLATION

FASTENER	TORQUE VALUE	
ET sensor	120-180 **in-lbs**	13.6-20.3 Nm

1. Hand start **new** ET sensor into bore at back of front cylinder.
2. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
3. Install ET sensor connector [90]. Pull boot over connector.
4. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

GENERAL

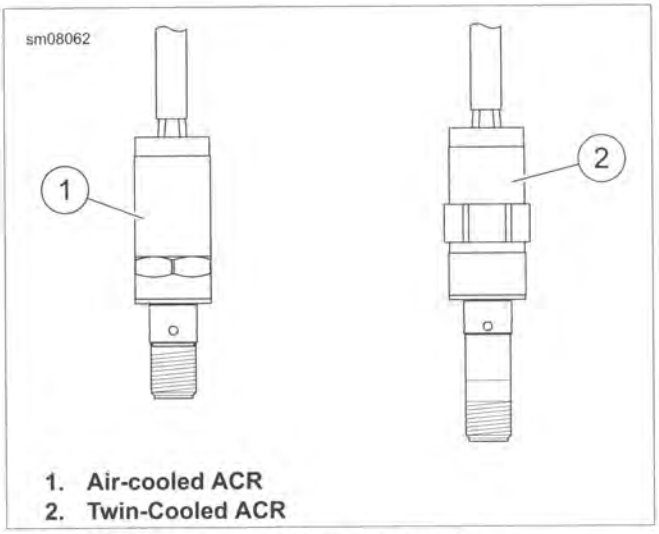
NOTES

- *ACR is used only on 103 cu. in. and larger engines.*
- *See Figure 7-56. The tip of ACR solenoids for Twin-Cooled engines are approximately 0.500 in (13 mm) longer than those for air-cooled engines. Twin-Cooled ACR's will contact the pistons of an air-cooled engine.*

See Figure 7-57. The ACR is opened and closed by the ECM to assist starting.

See Figure 7-58. When open, compressed gases are released through the exhaust port.

Twin-Cooled models: ACR service requires the removal and installation of the upper coolant hoses to access the rocker covers. See C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Removal.



1. **Air-cooled ACR**
2. **Twin-Cooled ACR**

Figure 7-56. ACR Solenoids

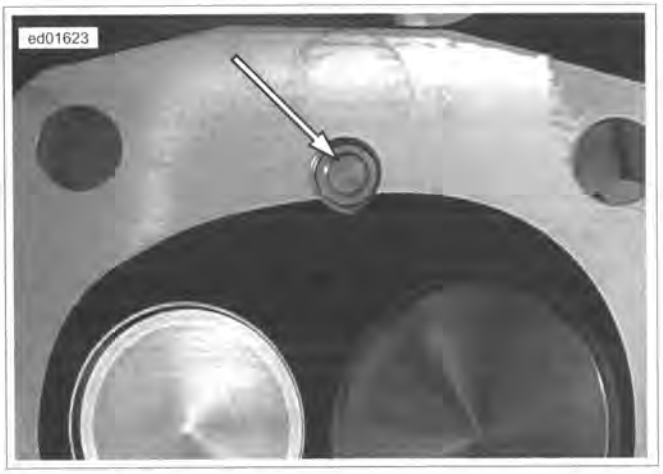


Figure 7-57. ACR Valve in Combustion Chamber

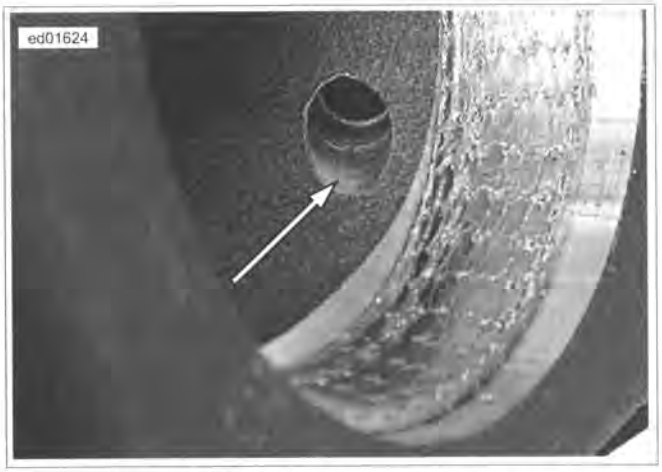


Figure 7-58. ACR Exhaust Port Release

REMOVAL

PART NUMBER	TOOL NAME
HD-48498-A	ACR SOLENOID SOCKET

1. Remove the rocker cover and the rocker box. See 3.18 TOP END OVERHAUL: DISASSEMBLY.
2. Separate the ACR rear [203R] or front [203F] connector from the main wiring harness and remove connectors from retainer clip.
3. See Figure 7-62. Use ACR SOLENOID SOCKET (Part No. HD-48498-A) to remove the ACR from the cylinder head.

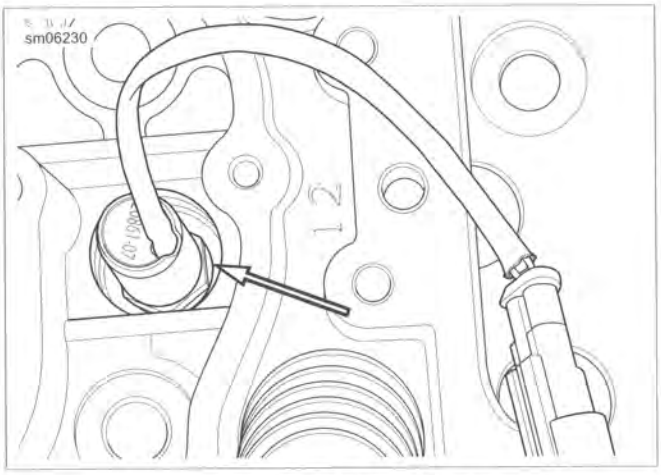


Figure 7-59. ACR in Head

INSTALLATION

PART NUMBER	TOOL NAME
HD-48498-A	ACR SOLENOID SOCKET

FASTENER	TORQUE VALUE	
ACR	132-180 **in-lbs**	14.9-20.3 Nm

1. Verify that the copper seal washer is in place on the ACR.
2. See Figure 7-60. Identify a location around the threads of the ACR approximately 1/3 of the way up from the end.
3. See Figure 7-61. Apply three equally spaced dots of LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue) on threads.
4. To prevent cross threading, install and finger tighten.
5. See Figure 7-62. Using ACR SOLENOID SOCKET (Part No. HD-48498-A), tighten to 132-180 **in-lbs** (14.9-20.3 Nm).
6. Route the wire harness between the cylinders.
7. Install rocker box and rocker cover. See 3.25 TOP END OVERHAUL: ASSEMBLY.
8. Mate the ACR connectors [203R] and [203F] to the main wiring harness. Secure connectors to retaining clip.

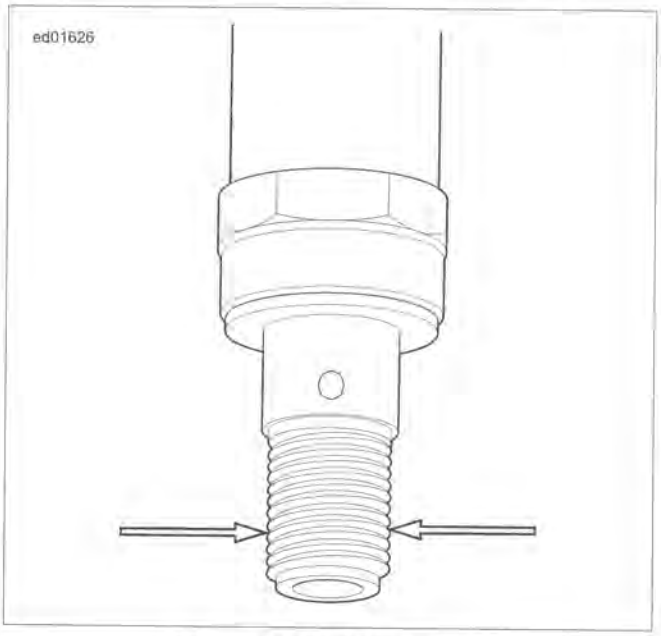


Figure 7-60. Bottom Third

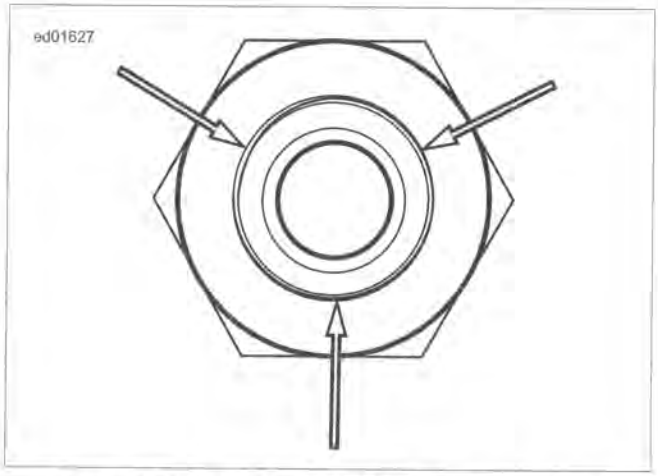


Figure 7-61. Three Dots of LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue)

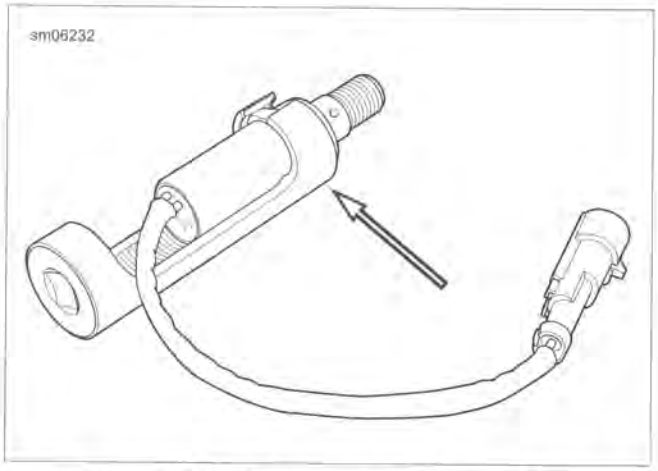
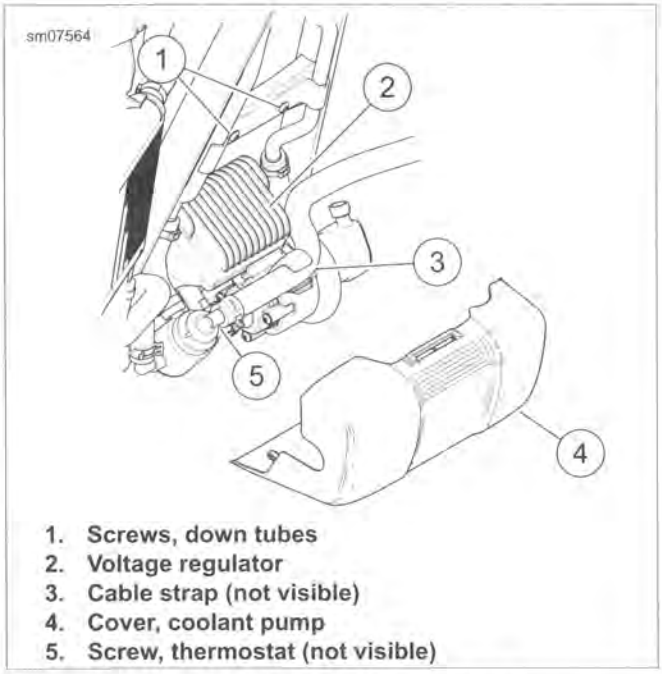


Figure 7-62. ACR Solenoid Socket and ACR

REMOVAL

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Twin-Cooled:
   a. See Figure 7-63. Remove coolant pump cover (4). Cut cable strap (3).
   b. Remove screws (1) securing coolant downtubes.
   c. Remove screw (5) securing thermostat.
   d. Pull down tube assembly away from frame to access nut securing voltage regulator.
3. Remove regulator from lower frame:
   a. Remove locknuts from studs on lower frame cross-member.
   b. Lift voltage regulator off studs. Allow voltage regulator to hang upside down at front of lower frame cross-member.
4. See Figure 7-65. Release locking latch and remove voltage regulator connector [77] (2).
5. Release locking latch and remove stator connector [46] (1).



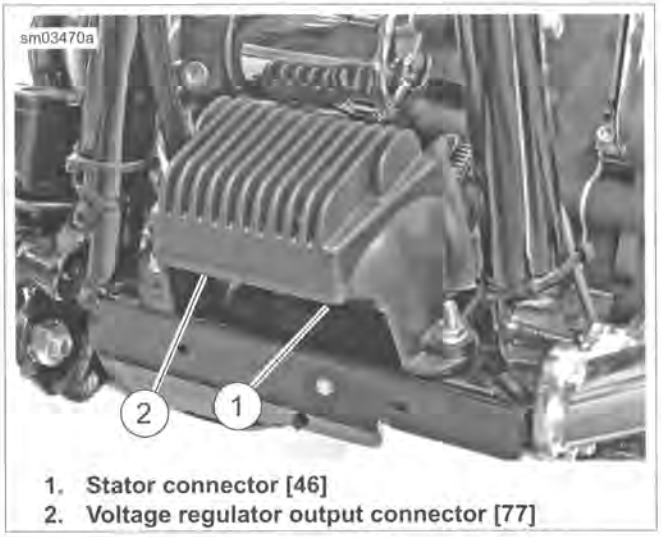
1. **Screws, down tubes**
2. **Voltage regulator**
3. **Cable strap (not visible)**
4. **Cover, coolant pump**
5. **Screw, thermostat (not visible)**

Figure 7-63. Cooling Components

INSTALLATION

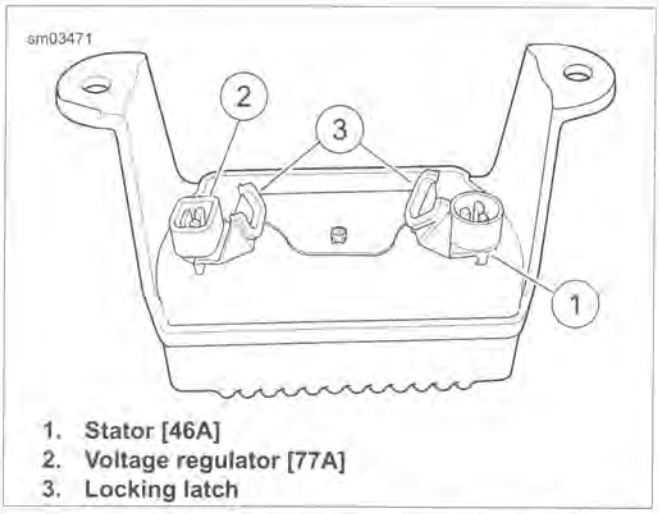
FASTENER	TORQUE VALUE	
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm
Thermostat screw	48-60 **in-lbs**	5.4-6.8 Nm
Coolant down tubes to front frame	90-110 **in-lbs**	10.2-12.4 Nm

1. See Figure 7-65. Install stator connector [46] (1). Secure connector with locking latch (3).
2. Install voltage regulator connector [77] (2). Secure connector with locking latch (3).
3. See Figure 7-64. Install voltage regulator with locknuts on studs. Tighten to 70-100 **in-lbs** (7.9-11.3 Nm).
4. Verify that wires are properly secured.
5. Twin-Cooled:
   a. See Figure 7-63. Install screw (5) securing thermostat. Tighten to 48-60 **in-lbs** (5.4-6.8 Nm).
   b. Install screws (1) securing coolant down tubes. Tighten to 90-110 **in-lbs** (10.2-12.4 Nm).
   c. Install **new** cable strap (3). Install coolant pump cover (4).
6. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
7. Verify charging system operation.



1. **Stator connector [46]**
2. **Voltage regulator output connector [77]**

Figure 7-64. Voltage Regulator (Left Side View)



1. Stator [46A]
2. Voltage regulator [77A]
3. Locking latch

Figure 7-65. Voltage Regulator (Bottom View)

REMOVAL

1. Remove seat. See 2.30 SEAT.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

2. Remove battery negative cable (black) from battery.
3. Remove the primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.

⚠CAUTION

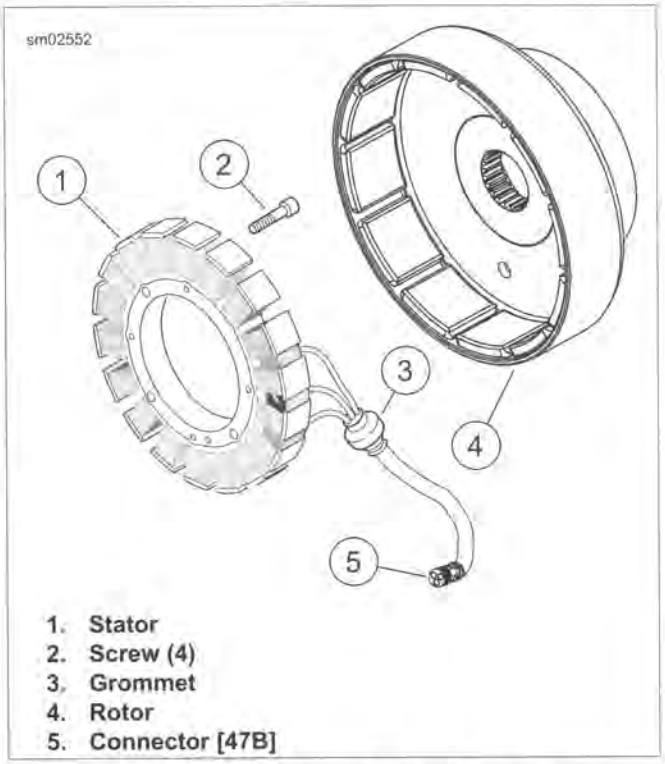
The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

4. Disconnect stator connector from voltage regulator. See 7.20 VOLTAGE REGULATOR.
5. See Figure 7-66. Remove alternator rotor (4). Use two bolts inserted through the holes in the rotor face to aid during removal.
6. Cut anchored cable strap securing stator wiring to frame.

NOTE

The rubber molded stator connector is not serviceable. Damage to terminals or molding requires stator and/or voltage regulator replacement.

7. Remove four screws to free stator from crankcase. Discard screws.
8. See Figure 7-67. Using point of awl or small screwdriver, carefully move grommet away from crankcase and squirt isopropyl alcohol or glass cleaner into opening. Repeat this step at one or two other locations around grommet.
9. Push on the grommet from outside of crankcase while pulling through the bore with needle nose pliers. Do not pull on the wires unless the stator will be replaced. Exercise caution to avoid damaging ribs on grommet if stator is to be reused.
10. Draw conduit and connector through crankcase bore as stator is removed.

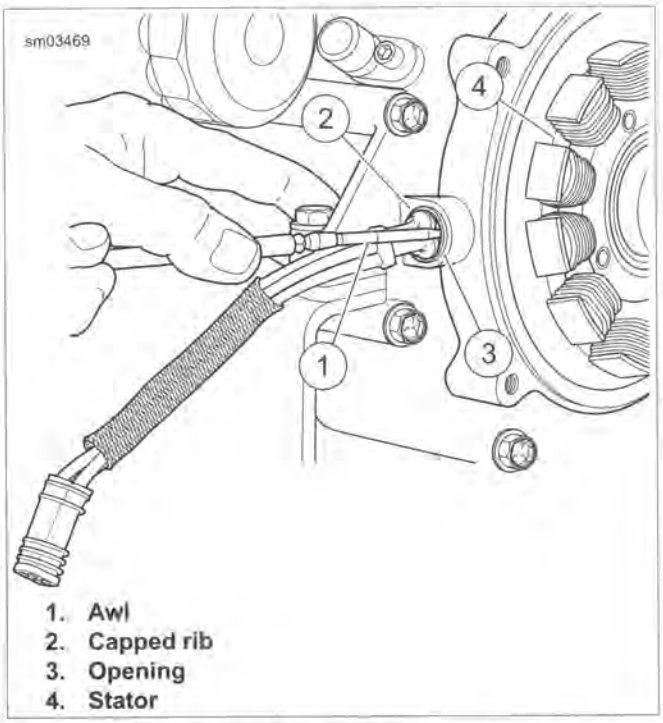


1. **Stator**
2. **Screw (4)**
3. **Grommet**
4. **Rotor**
5. **Connector [47B]**

Figure 7-66. Rotor and Stator (Typical)

CLEANING AND INSPECTION

1. Check inside of rotor and remove any metal fragments captured by magnets.
2. Clean the rotor using a petroleum solvent. Clean the stator and grommet by wiping it with a clean cloth.



1. **Awl**
2. **Capped rib**
3. **Opening**
4. **Stator**

Figure 7-67. Remove Grommet From Crankcase

INSTALLATION

FASTENER	TORQUE VALUE	
Stator mounting screws	55-75 **in-lbs**	6.2-8.5 Nm
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm

1. Feed connector and conduit through hole in crankcase from inside crankcase.
2. Lubricate parts with glass cleaner or isopropyl alcohol. Ribs of grommet must be clean and free of dirt and oily residue.
3. Push grommet into crankcase bore while carefully pulling on outside cable. Installation is complete when cable stop contacts casting and capped rib of grommet exits crankcase bore.

NOTE

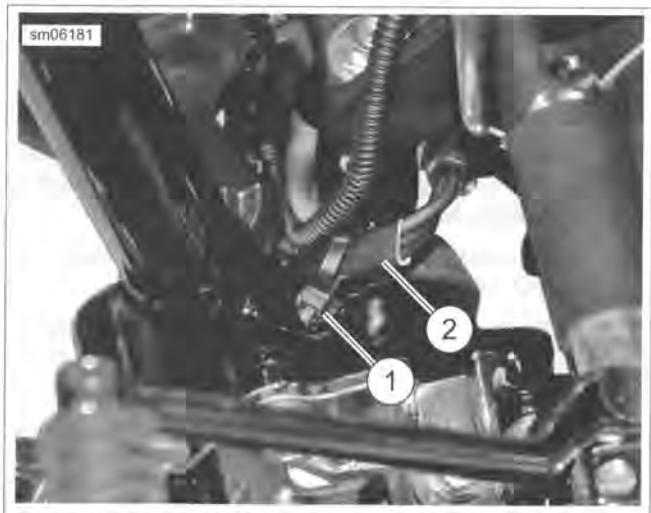
Do not reuse stator mounting screws. The threads of the screws contain a locking compound in pellet form. When the screw is started, the pellet breaks, releasing the compound.

4. Secure stator to crankcase using four **new** screws. Tighten to 55-75 **in-lbs** (6.2-8.5 Nm).
5. See Figure 7-68. Install **new** anchored cable strap (1) on stator wiring (2). Push anchor into hole in frame.
6. Install connector to voltage regulator and engage locking latch.

⚠CAUTION

The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

7. Install rotor onto the compensating sprocket shaft.
8. Install primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING.
9. Connect negative battery cable. Tighten bolt to 60-70 **in-lbs** (6.8-7.9 Nm).
10. Install seat. See 2.30 SEAT.



1. **Anchored cable strap**
2. **Stator wiring**

Figure 7-68. Stator Wiring

VSS

FASTENER	TORQUE VALUE	
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm

Removal

1. Remove starter. See 7.8 STARTER.
2. See Figure 7-69. Disconnect VSS connector.
3. Remove screw and pull sensor from transmission case.

Installation

1. Inspect VSS O-ring damage. Replace as necessary.
2. Insert sensor into transmission case with screw. Tighten to 84-132 **in-lbs** (9.5-14.9 Nm).
3. Connect VSS connector.
4. Install starter. See 7.8 STARTER.

Figure 7-69. VSS Location

FRONT WHEEL SPEED SENSOR (WSS)

Removal

NOTES

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

1. **Fairing models:** Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. See Figure 7-70. Separate sensor connector (2). Remove sensor cable from caddy.
3. Release sensor cable from conduit clips and cut cable straps securing cable to brake hoses.
4. See Figure 7-71. Release sensor cable from clip at caliper:
   a. Push on lip (1) at rear of clip to disengage from bracket. Rotate tab (2) (stamped ABS) rearward until clip is perpendicular to bracket and remove cable.
   b. Rotate tab (2) forward until clip is aligned with bracket and apply pressure to tab until lip (1) engages.
5. Retract axle until front WSS is free. See 2.4 FRONT WHEEL.

NOTE

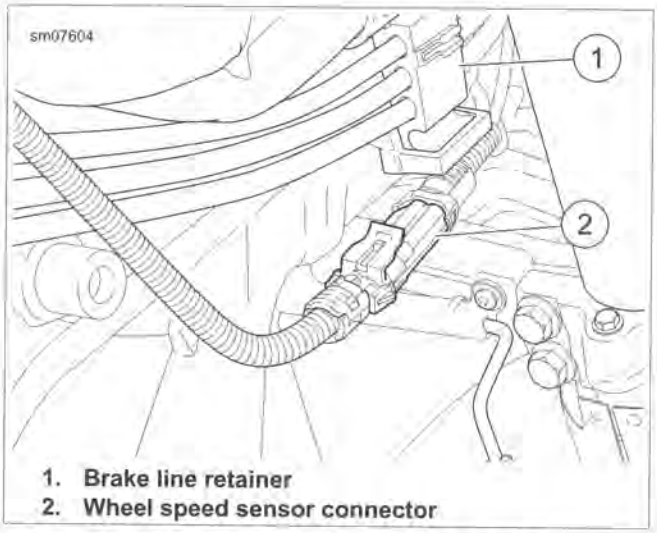
The WSS works in conjunction with the ABS encoder bearing installed in the wheel hub. If necessary, see 2.10 SEALED WHEEL BEARINGS for bearing removal and installation instructions.

Installation

NOTE

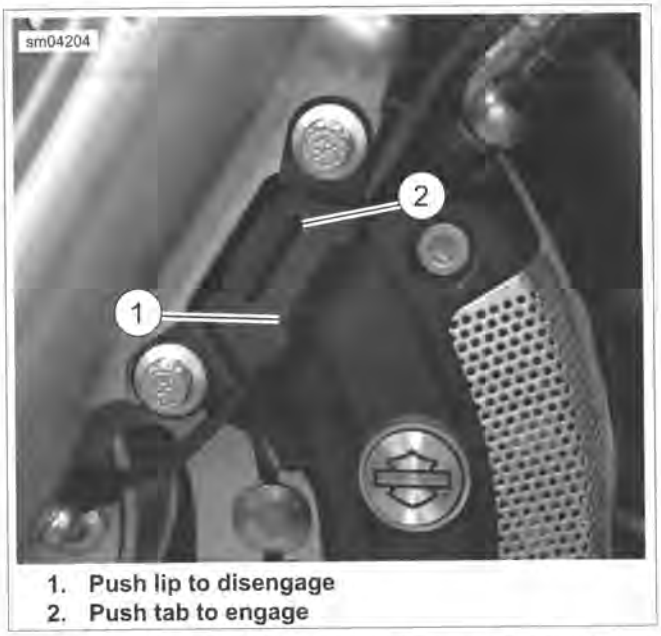
Install WSS with index pin on the outboard side.

1. Push axle through **new** front WSS and left fork slider.
2. Secure front wheel. See 2.4 FRONT WHEEL. Rotate WSS until it makes contact with fork slider. Back off just enough to maintain clearance between the WSS wire stem and fork slider.
3. Route sensor cable up to lower fork bracket following brake hose.
4. Route connector up through opening in lower fork bracket. Continue to right steering head caddy.
5. Mate connector and secure cable to caddy.
6. Secure the sensor cable and fender tip lamp wires using three **new** cable straps:
   a. On the brake hose lower crimp capturing WSS cable and brake hose.
   b. Midway between the upper and lower brake hose crimps capturing WSS cable, brake hose and front fender tip lamp wires, if equipped.
   c. On upper crimp capturing WSS cable, brake hose and front fender tip lamp wires, if equipped.
7. See Figure 7-71. Install WSS cable in clip:
   a. Push on lip (1) at rear of clip to disengage from bracket. Rotate tab (2) (stamped ABS) rearward until clip (1) is perpendicular to bracket and install cable.
   b. Rotate tab (2) forward and apply pressure until lip (1) engages. Gently tug on cable to verify that clip is properly installed.
8. **Fairing models:** Capture WSS cable to three retainers on brake hoses near steering head. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.



1. Brake line retainer
2. Wheel speed sensor connector

Figure 7-70. Steering Head Caddy (right side shown)



1. **Push lip to disengage**
2. **Push tab to engage**

Figure 7-71. Front Wheel Speed Sensor Cable Clip

REAR WHEEL SPEED SENSOR

Removal

NOTES

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

1. Remove right saddlebag. See 2.31 SADDLEBAGS.
2. Remove right side cover.
3. Release rear WSS connector from anchor on right side battery tray. Disconnect connector.
4. Rear WSS cable and rear brake hose are secured to the rear fork with two cable retainers. The sensor cable is additionally secured to the brake hose with a conduit clip. Free rear WSS cable from all three.
5. Retract axle until rear WSS is free. See 2.5 REAR WHEEL.

NOTE

The WSS works in conjunction with the ABS encoder bearing installed in the wheel hub. If necessary, see 2.10 SEALED WHEEL BEARINGS for bearing removal and installation instructions.

Installation

NOTE

Install WSS with index pin on the outboard side.

1. See Figure 7-72. Hold **new** rear WSS in place with index pin outboard toward rear fork, and push axle through sensor, caliper bracket and right side of rear fork.
2. Secure rear wheel. See 2.5 REAR WHEEL. Rotate rear WSS until index pin makes contact with caliper bracket at point shown in Figure 7-72.
3. Route rear WSS cable forward along top of rear fork.
4. Capture rear WSS cable and brake hose in rear cable clips on top of rear fork. Secure cable to brake hose with conduit clip placed 1.25 in. (31.8 mm) ahead of the rear brake hose crimp.
5. Route cable to outboard right side of battery caddy. Connect pin and socket housings. Secure to anchor.
6. Install right side cover.
7. Install right saddlebag. See 2.31 SADDLEBAGS.

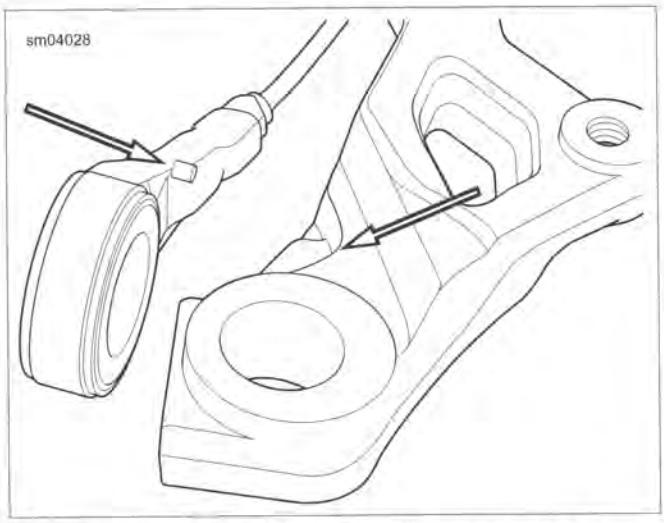


Figure 7-72. Rear Wheel Speed Sensor Index Pin

REMOVAL

1. Place transmission in NEUTRAL.
2. See Figure 7-73. Remove two elbow connectors from neutral switch posts.
3. Remove neutral switch from transmission case.

INSTALLATION

FASTENER	TORQUE VALUE	
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm

1. See Figure 7-74. Inspect O-ring for damage. Replace as necessary. Lightly lubricate **new** O-ring with clean transmission oil before installation.
2. Verify that transmission is in NEUTRAL.
3. Install neutral switch in transmission case. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).

NOTE

The neutral switch is not polarity sensitive. Install connectors on either post.

4. Install both connectors onto neutral switch posts.
5. Verify proper operation of neutral switch.
   a. Turn ignition/light key switch to IGNITION.
   b. Verify that neutral indicator light illuminates.

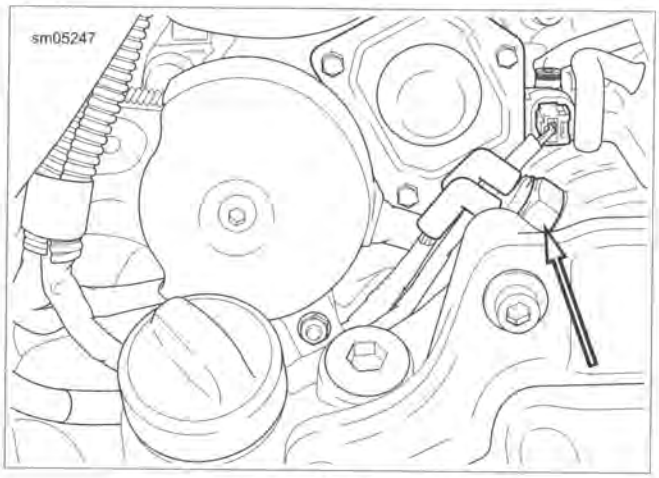


Figure 7-73. Neutral Switch

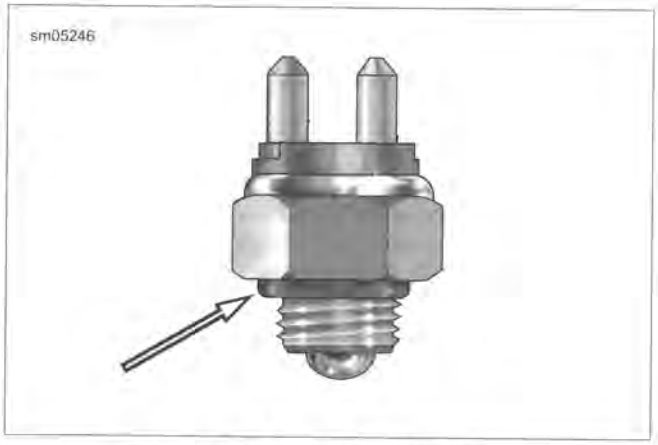


Figure 7-74. Neutral Switch O-Ring

REMOVAL

1. See Figure 7-75. Remove connector (2) from oil pressure switch or sender.
2. Remove switch or sender from crankcase.

INSTALLATION

FASTENER	TORQUE VALUE	
Oil pressure sender	96-144 **in-lbs**	10.8-16.3 Nm

NOTE

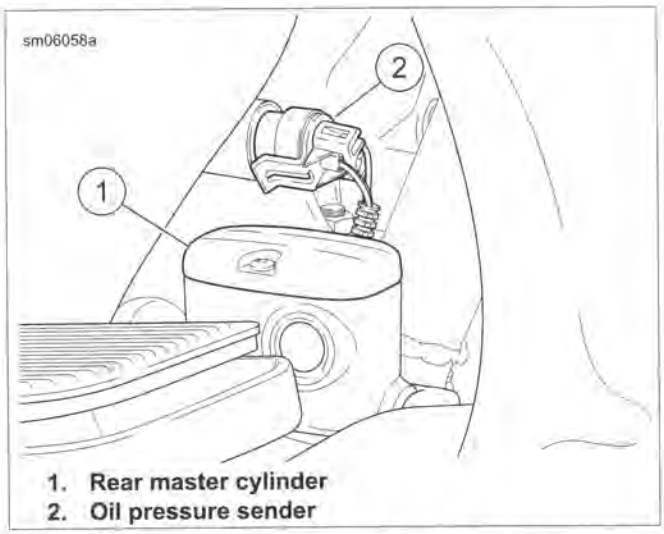
If reusing oil pressure switch or sender, apply LOCTITE 565 THREAD SEALANT to threads.

1. See Figure 7-75. Start oil pressure switch or sender into crankcase bore. Tighten to 96-144 **in-lbs** (10.8-16.3 Nm).

NOTE

Make sure harness is routed inside front downtube.

2. Connect harness.
3. Test oil pressure switch/sender for proper operation and check for leaks.



1. Rear master cylinder
2. Oil pressure sender

Figure 7-75. Oil Pressure Switch/Sender

FRONT STOP LAMP SWITCH

Removal/Installation

See 7.37 HANDLEBAR SWITCH PACKS.

REAR STOP LAMP SWITCH

FASTENER	TORQUE VALUE	
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm
Engine mount end cap fasteners, front	42-48 ft-lbs	56.9-65.0 Nm

Removal

NOTICE

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

NOTE

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

1. See Figure 7-76. Remove rear brake master cylinder:
   a. Support front of engine.
   b. Remove screws securing front right engine mount end cap.
   c. Carefully pull off end cap mount with footboard, master cylinder and brake pedal attached. Allow to lay beside the vehicle.
2. Remove stop lamp switch connectors (1).

NOTE

Wrap banjo fittings with pieces of lint-free shop towel to absorb any loss of brake fluid.

3. Hold brake line fitting (3) and remove rear stop lamp switch (2).

Installation

1. Apply LOCTITE 565 THREAD SEALANT to rear stop lamp switch.
2. See Figure 7-76. Install rear stop lamp switch (2) into rear brake line fitting (3).
3. Hold brake line fitting and tighten to 12-15 ft-lbs (16.3-20.3 Nm).
4. Install rear brake master cylinder:
   a. Support front of engine.

   NOTE

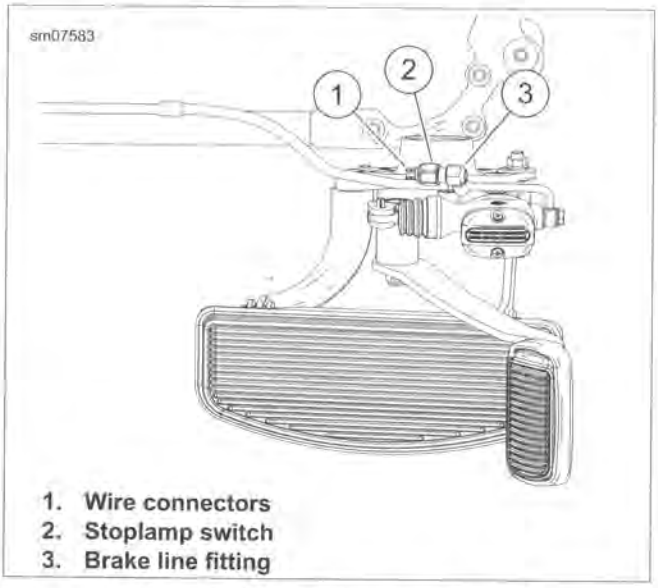
   Confirm oil switch/sender wires are inboard of rubber mount.

   b. Remove screws securing front right engine mount end cap.
   c. Install stop lamp switch connectors (1).
   d. Install engine mount end cap. Tighten to 42-48 ft-lbs (56.9-65.0 Nm).
5. Bleed brake system. See 2.18 BLEEDING BRAKES.

⚠WARNING

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

6. Verify tail lamp and stop lamp operation.



1. **Wire connectors**
2. **Stoplamp switch**
3. **Brake line fitting**

Figure 7-76. Rear Stop Lamp Switch

INSPECTION

If the horn fails to sound or does not sound satisfactorily, check for loose, frayed or damaged wires leading to horn terminal, discharged battery or corroded ground.

The horn cannot be repaired or adjusted for tone. Only the mounting hardware is replaceable.

REMOVAL

1. See Figure 7-77. Remove acorn nut and flat washer to free horn assembly from rubber mount stud.
2. Remove terminal contacts and release harness from J-clamp.
3. Remove flange nut (metric) from back of horn bracket. Remove horn from chrome horn cover.
4. If necessary, remove two screws and washers securing horn bracket to cylinder heads.

INSTALLATION

FASTENER	TORQUE VALUE	
Horn bracket to cylinder head screws	35-40 ft-lbs	47.5-54.2 Nm
Horn rubber mount	10-20 ft-lbs	13.6-27.1 Nm
Horn cover to bracket	35-55 **in-lbs**	3.9-6.2 Nm
Horn stud flange nut	80-100 **in-lbs**	9.0-11.3 Nm
Horn bracket acorn nut	80-120 **in-lbs**	9.0-13.6 Nm

1. See Figure 7-77. If removed, install horn bracket to cylinder heads with two screws (8) and washers. Tighten to 35-40 ft-lbs (47.5-54.2 Nm).
2. Install mount (7) if removed:
   a. Apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to mount stud.
   b. Install in bracket (9). Tighten to 10-20 ft-lbs (13.6-27.1 Nm).
3. Install bracket (6). Tighten to 35-55 **in-lbs** (3.9-6.2 Nm).
4. Fit horn into chrome cover. Apply two drops of LOCTITE 222 LOW STRENGTH THREADLOCKER AND SEALANT (purple) to threads of horn stud.

NOTE

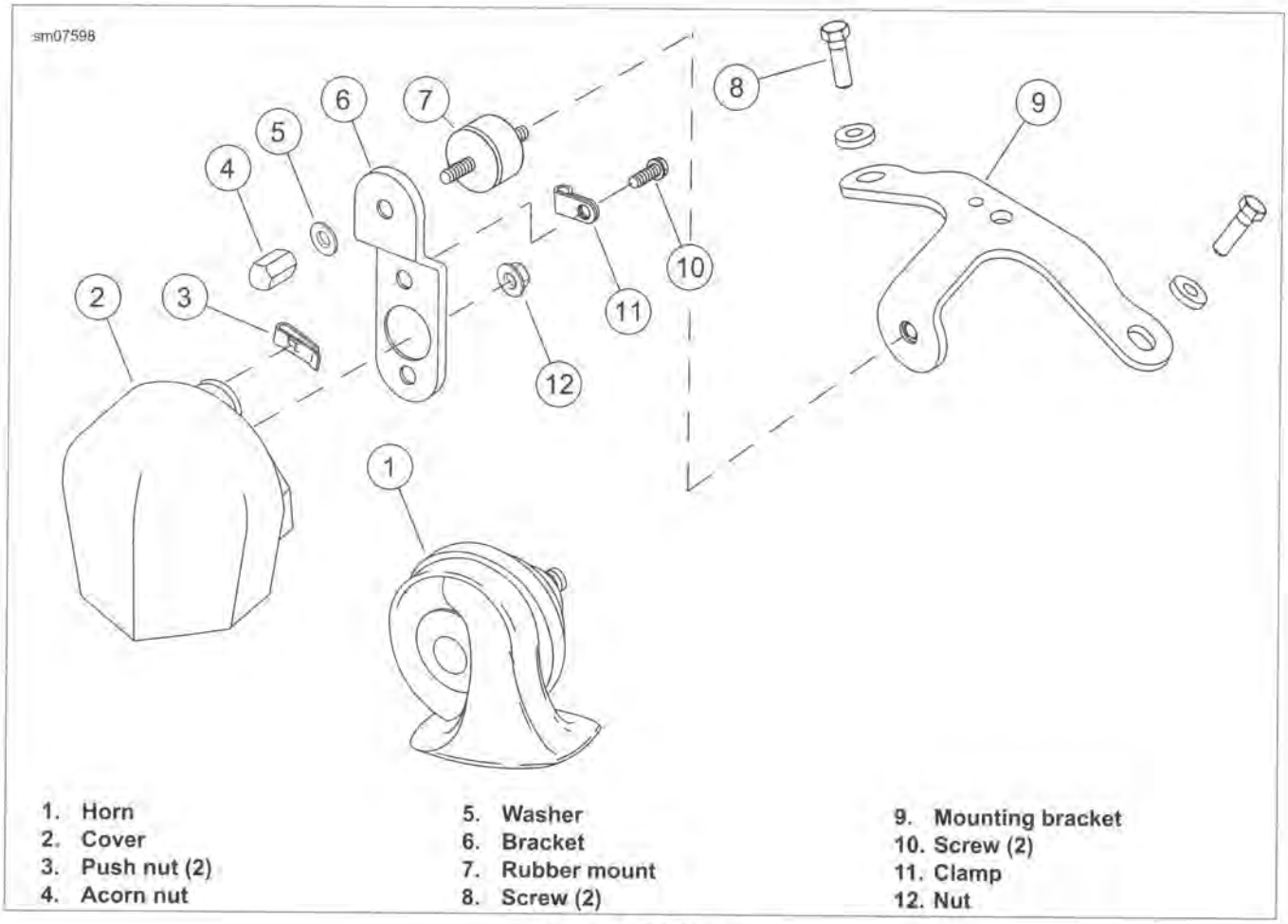
Over-tightening the flange nut can cause permanent horn damage resulting in reduced volume and tone quality.

5. Install flange nut (12). Tighten to 80-100 **in-lbs** (9.0-11.3 Nm).

NOTE

The horn is not polarity sensitive. Attach terminals to either spade contact.

6. Attach terminals.
7. Install horn bracket (6) onto rubber mount with flat washer and acorn nut. Tighten to 80-120 **in-lbs** (9.0-13.6 Nm).



1. Horn
2. Cover
3. Push nut (2)
4. Acorn nut
5. Washer
6. Bracket
7. Rubber mount
8. Screw (2)
9. Mounting bracket
10. Screw (2)
11. Clamp
12. Nut

Figure 7-77. Horn

TROUBLESHOOTING

NOTE

Do not use the power outlet as a cigarette lighter. Damage to the socket may occur.

1. Turn ignition/light key switch to ON or ACCESSORY position.
2. If accessory does not work, substitute a known good accessory.
3. If outlet is still inoperative, check for 12 vdc at center socket contact and ground at outer shell contact.
4. Refer to applicable wiring diagram in B.2 WIRING DIAGRAMS if 12 vdc or ground are not present. Use voltage checks to isolate problem.

REMOVAL

NOTE

Do not use the power outlet as a cigarette lighter. Damage to the socket may occur.

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Disconnect power outlet connector.
3. Hold socket and loosen outer shell. Remove socket and outer shell from inner fairing.

INSTALLATION

1. Slide socket of power outlet through bore in fairing. Install outer shell and tighten securely.
2. Install power connector.
3. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

2-INCH DIAMETER GAUGES

FASTENER	TORQUE VALUE	
Gauges, 2 inch diameter gauge screws	8-12 **in-lbs**	1.0-1.3 Nm

Removal

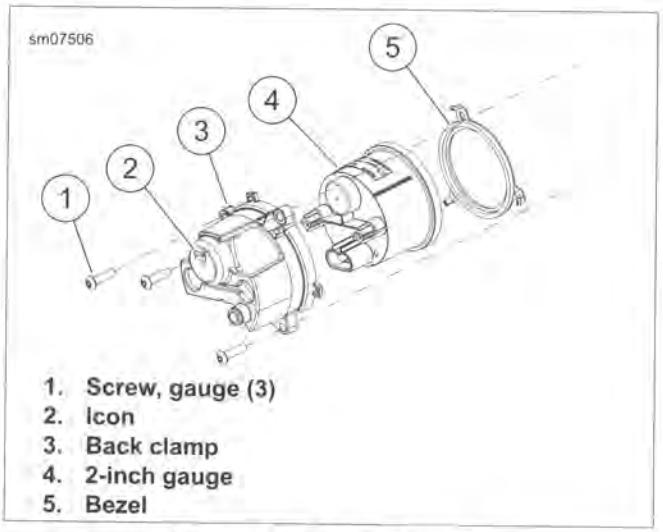
1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Remove fairing vent. See 2.39 INNER FAIRING, Fairing Vent.
3. Remove upper fairing support. See 2.39 INNER FAIRING, Upper Support Bracket.
4. Disconnect electrical connector.
5. See Figure 7-78. Remove screws (1). Remove back clamp (3), gauge (4) and bezel (5).

Installation

NOTE

See Figure 7-78. Fuel and battery icons (2) are cast into the back clamp and inner fairing near each gauge opening to identify correct location. The voltmeter is always mounted on the right side and uses the tan back clamp. The fuel gauge is always mounted on the left side and uses the black back clamp.

1. Assemble gauge (4), back clamp (3) and bezel (5).
2. Install gauge in inner fairing. Secure with screws (1). Tighten to 8-12 **in-lbs** (1.0-1.3 Nm).
3. Install electrical connector.
4. Install upper fairing support. See 2.39 INNER FAIRING, Upper Support Bracket.
5. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.



1. **Screw, gauge (3)**
2. **Icon**
3. **Back clamp**
4. **2-inch gauge**
5. **Bezel**

Figure 7-78. 2-Inch Gauge

SPEEDOMETER/TACHOMETER INSTRUMENT CLUSTER

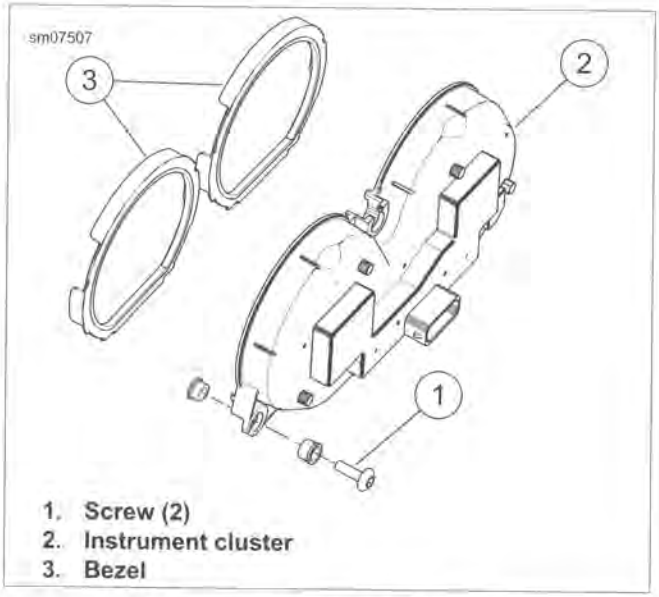
FASTENER	TORQUE VALUE	
Gauges, instrument cluster screws	8-12 **in-lbs**	1.0-1.3 Nm

Removal

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Remove fairing vent. See 2.39 INNER FAIRING, Fairing Vent.
3. Remove upper fairing support. See 2.39 INNER FAIRING, Upper Support Bracket.
4. Disconnect electrical connector.
5. See Figure 7-79. Remove screw (1). Remove instrument cluster and bezels.

Installation

1. See Figure 7-79. Carefully align bezels in openings.
2. Install instrument cluster in inner fairing. Secure with screw (1). Tighten to 8-12 **in-lbs** (1.0-1.3 Nm).
3. Install electrical connector.
4. Install upper fairing support. See 2.39 INNER FAIRING, Upper Support Bracket.
5. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.



1. **Screw (2)**
2. **Instrument cluster**
3. **Bezel**

Figure 7-79. Instrument Cluster

FUEL GAUGE

Removal

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Draw fuel gauge connector out of tunnel under left side of fuel tank and disconnect.
3. Remove terminals from connector housing. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
4. Remove convoluted tubing from wires.
5. Remove the gauge from the fuel tank. Do not twist during removal. Pull upward just far enough to free the gauge from the fuel tank.
6. Remove fuel gauge from motorcycle while feeding wires and terminals up through tube.
7. If reusing gauge, inspect rubber gasket for damage. Replace gasket if necessary. Install **new** seal with flat side contacting edge of gauge.

Installation

1. Place **new** fuel gauge assembly next to discarded unit and cut wires to proper length.
2. Crimp **new** pin terminals onto wires. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
3. Install gauge:
   a. Feed wires down into tube while lowering gauge into position.
   b. When terminals exit bottom of fuel tank, gently pull wires while lowering the fuel gauge.

   NOTE

   Do not twist the gauge during installation.

   c. Hold the gauge firmly and press downward until it snaps in place.
4. Install convoluted tubing on wires.
5. See Figure 7-80. Install terminals into connector housing. See A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
6. Route connector forward and then inboard between front of crossover hose fitting and bottom of fuel tank. Mate fuel gauge connector and push into tunnel of fuel tank.
7. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

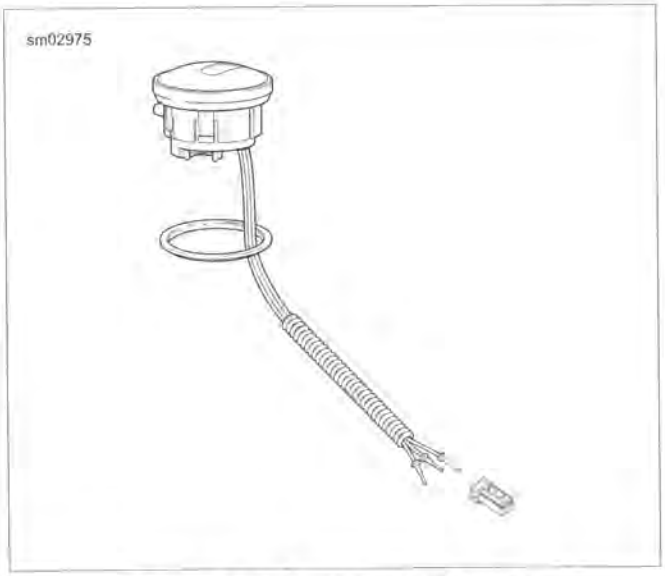


Figure 7-80. Fuel Gauge (FLHR/C)

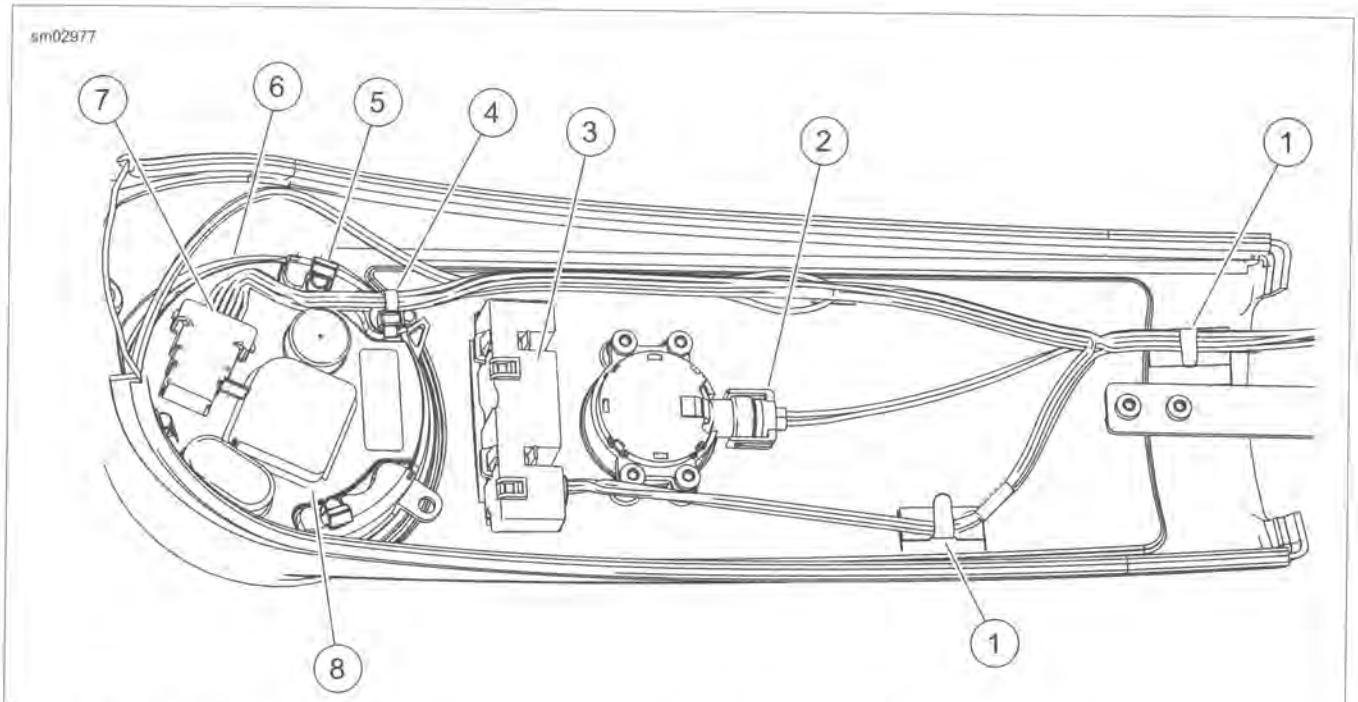
Table 7-15. FLHR/C Fuel Gauge [17]

WIRE COLOR	CHAMBER NUMBER
Orange	1
Yellow/White	2
-	3
Black	4

SPEEDOMETER

Removal

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove seat. See 2.30 SEAT.
3. Remove console. See 4.6 FUEL TANK, Console.
4. See Figure 7-81. Remove speedometer connector (7).
5. Remove anchored cable strap (4) from speedometer.
6. Gently pry three latches (5) upward to release lock ring (6) from back of speedometer.
7. Remove speedometer from top side of console.
8. Remove rubber gasket from speedometer bore.



1. **Metal clip (3)**
2. **Ignition switch connector [33]**
3. **Indicator lamp assembly**
4. **Anchored cable strap**
5. **Latch (1 of 3)**
6. **Lock ring**
7. **Speedometer connector [39]**
8. **Speedometer**

Figure 7-81. Instrument Console Assembly (FLHR/C)

Installation

1. Lubricate groove in rubber gasket with isopropyl alcohol or glass cleaner. Place the gasket into position around the console speedometer bore.
2. Install speedometer into rubber gasket. Lubricate gasket with isopropyl alcohol or glass cleaner, if necessary. The speedometer should fit snugly against the gasket without movement.
3. See Figure 7-81. Place lock ring over back of speedometer aligning two slots with console bosses. Press latches (5) down until they lock into position.
4. Connect speedometer connector (7).
5. Insert anchored cable strap (4).
6. Exercising caution to avoid pinching wire harness and vent tube, install console. See 4.6 FUEL TANK, Console.
7. Install seat. See 2.30 SEAT.
8. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

INDICATOR LAMPS

Removal

NOTES

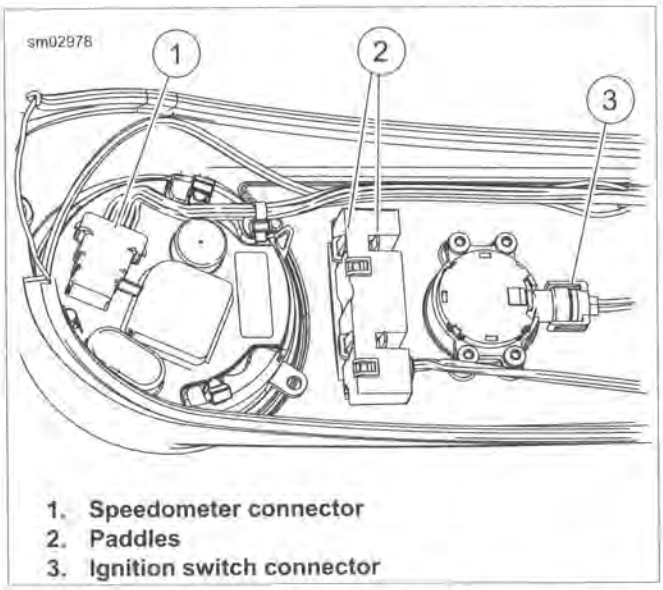
Indicator lamps are Light Emitting Diodes (LEDs). If one LED fails, the indicator lamp assembly must be replaced.

Indicator lamp assembly is part of the console harness assembly and not serviced separately.

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove seat. See 2.30 SEAT.
3. Remove console. See 4.6 FUEL TANK, Console.
4. See Figure 7-82. Disconnect ignition switch connector (3) and speedometer connector (1).
5. Free harness from metal clips.
6. Remove indicator lamp assembly from console:
   a. Insert the blade of a large screwdriver under rear corner of indicator lamp assembly.
   b. Squeeze front and rear paddles (2) on same side of assembly while rotating screwdriver.
   c. When one side of assembly becomes free, repeat procedure on opposite side to release unit from console.

Installation

1. Install indicator lamp assembly into console:
   a. Place assembly into position in console. Engage four paddles in slots of indicator lamp assembly.
   b. While pushing down on assembly, push up on lens on outboard side of console until assembly fits snugly.



1. **Speedometer connector**
2. **Paddles**
3. **Ignition switch connector**

Figure 7-82. Release Paddles to Free Indicator Lamp Assembly (FLHR/C)

2. Mate speedometer connector and ignition switch connector. Secure harness under metal clips to capture harness.
3. Exercising caution to avoid pinching wire harness and vent tube, install console. See 4.6 FUEL TANK, Console.
4. Install seat. See 2.30 SEAT.
5. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

RADIO FACE PROTECTIVE FILM

Replacement

The touch screen on the radio is covered by a protective film. The film can wear in time and require replacement. Replacement instructions are included in the film replacement kit. Screen damage due to using the radio without a protector is not a warrantable condition.

RADIO

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Radio (or storage box) to fairing support bracket screws	60-84 **in-lbs**	6.8-9.5 Nm

Removal

NOTE

Never operate vehicle with the radio or upper support bracket removed. These components provide important structural support to the fairing. Temporarily install the Police glove box assembly if the vehicle must be operated while the radio is removed. Damage to the fairing assembly can result if operated without either of these components installed.

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
3. Remove fairing vent and upper support bracket. See 2.39 INNER FAIRING, Upper Support Bracket.
4. Remove instrument cluster. See 7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS.

NOTE

Some connectors are not used on all models.

5. See Figure 7-83. Disconnect:
   a. Radio connector (15).
   b. USB connector (3).
   c. Radio antenna cable connector (4).
   d. GPS connector (5).
6. See Figure 7-85. Remove four screws (1) to release radio from fairing support brackets.
7. Pull radio up and forward to remove.

NOTE

The XM module is very fragile and is sensitive to static discharge.

8. **XM equipped:**
   a. Remove screws securing XM module in radio frame.
   b. Transfer XM module into new radio immediately. If new radio is not available, place XM module in a static proof bag and store in a safe place.
   c. Tighten screw securely.

Installation

NOTE

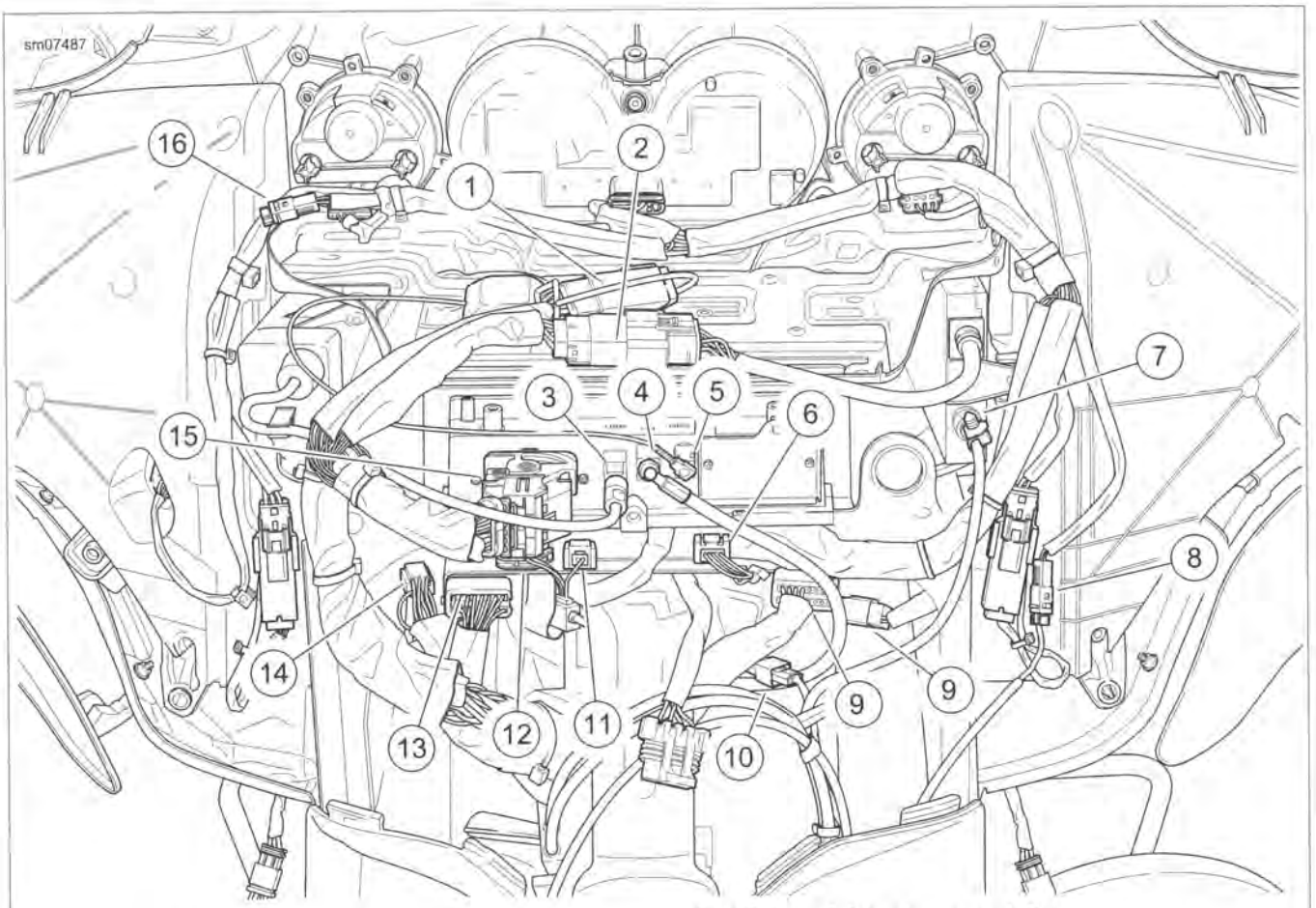
Confirm foam tape is in place on inner fairing near radio opening.

1. Position radio on fairing support brackets and push toward opening in inner fairing.
2. See Figure 7-85. Install four screws (1). Leave fasteners loose.
3. Install instrument cluster. See 7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS.
4. See Figure 7-84. Install upper support bracket (3). Tighten upper bracket screws in the sequence shown in 2.39 INNER FAIRING, Upper Support Bracket.
5. See Figure 7-85. Tighten screws (1) to 60-84 **in-lbs** (6.8-9.5 Nm).

NOTE

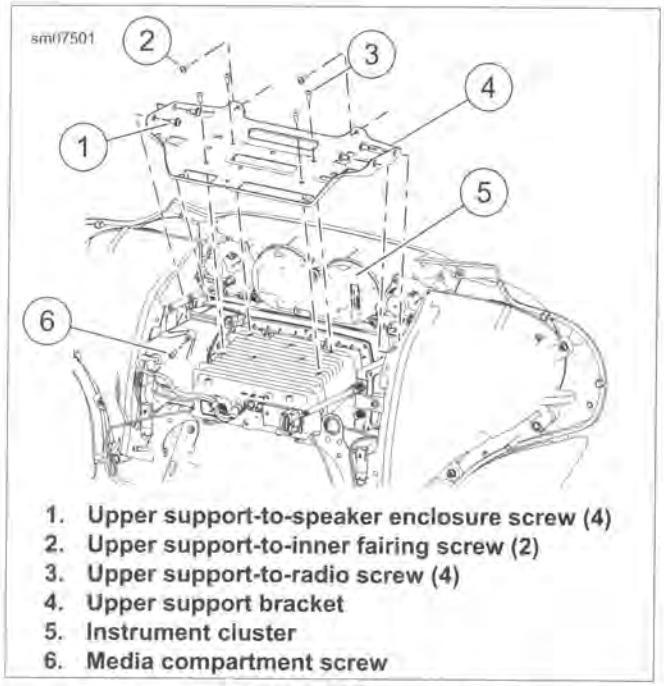
Some connectors are not used on all models.

6. See Figure 7-83. Mate connectors:
   a. Radio connector (15).
   b. USB connector (3).
   c. Radio antenna cable connector (4).
   d. GPS connector (5).
   e. Secure connectors (1, 2) to upper support bracket.
7. Install fairing vent and outer fairing. See 2.39 INNER FAIRING, Fairing Vent.
8. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
9. If installing a new radio, it must be set up using DIGITAL TECHNICIAN II (Part No. HD-48650):
   a. Choose the REFLASH icon.
   b. Follow the on-screen prompts. If the vehicle has an amplifier, it must also be configured after configuring the radio.



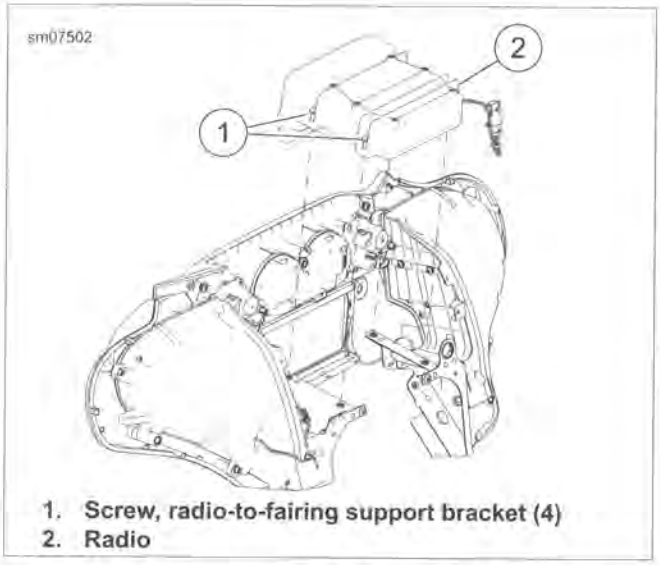
1. CB module
2. P&A audio
3. USB cable
4. AM/FM radio antenna
5. GPS antenna
6. Left handlebar switch harness
7. CB antenna
8. Front fender tip lamp
9. Main-to-fairing harness, left
10. Heated hand grip power, if equipped
11. Run/stop switch
12. Right handlebar switch harness
13. Main-to-fairing harness, right
14. TGS
15. Radio
16. Accessory power

Figure 7-83. Inner Fairing Harness Connectors



1. **Upper support-to-speaker enclosure screw (4)**
2. **Upper support-to-inner fairing screw (2)**
3. **Upper support-to-radio screw (4)**
4. **Upper support bracket**
5. **Instrument cluster**
6. **Media compartment screw**

Figure 7-84. Upper Support Bracket



1. **Screw, radio-to-fairing support bracket (4)**
2. **Radio**

Figure 7-85. Remove Radio from Fairing Brackets

CB MODULE

FASTENER	TORQUE VALUE	
CB module to speaker enclosure screw	25-35 **in-lbs**	2.8-4.0 Nm
CB module bracket to speaker enclosure screw	25-35 **in-lbs**	2.8-4.0 Nm

Removal

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
3. See Figure 7-83. Disconnect:
   a. CB antenna cable connector (7).
   b. CB module connector (1).
4. Remove screw to release CB module from speaker enclosure. Remove CB module.

Installation

1. Slide CB module into place. Verify the alignment pins engage the holes in the enclosure.
2. Install screw to secure CB module to speaker enclosure. Tighten to 25-35 **in-lbs** (2.8-4.0 Nm).
3. See Figure 7-83. Mate connectors:
   a. CB antenna cable connector (7).
   b. CB module connector (1).
4. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
5. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

CB Module Bracket

1. Remove upper fairing support. See 2.39 INNER FAIRING, Upper Support Bracket.
2. Remove screw securing bracket to speaker enclosure.
3. Install bracket to speaker enclosure. Tighten to 25-35 **in-lbs** (2.8-4.0 Nm).
4. Install upper fairing support. See 2.39 INNER FAIRING, Upper Support Bracket.

FRONT FAIRING SPEAKERS

FASTENER	TORQUE VALUE	
Fairing speaker screw	14-20 **in-lbs**	1.6-2.3 Nm
Fairing speaker enclosure to fairing screws	48-60 **in-lbs**	5.4-6.8 Nm
Fairing speaker enclosure to fairing support screws	20-24 ft-lbs	27.1-32.5 Nm
Upper support bracket to speaker enclosure screws	48-60 **in-lbs**	5.4-6.8 Nm
Fairing speaker grille screws	9-13 **in-lbs**	1.0-1.4 Nm

Removal

NOTE

Never operate vehicle with the speaker enclosures removed. These components provide important structural support to the fairing. Operating without these components can result in damage to fairing assembly.

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. Remove harness anchors from speaker enclosure.
3. See Figure 7-86. Disconnect speaker connector (7).
4. Right side: Disconnect power outlet connector.
5. Left side: Remove CB module if equipped. See 7.32 BOOM! BOX INFOTAINMENT SYSTEM, CB Module.

6. Remove three screws (1) securing enclosure to fairing support (6).
7. Remove two screws (2) securing enclosure to upper support bracket.
8. Remove three screws (8). Remove speaker enclosure from fairing.

NOTE

Do not remove screws securing speaker enclosure halves together.

9. Remove four screws to free speaker from enclosure.
10. Disconnect wires and remove speaker from enclosure.
11. If necessary, remove grommet and harness.

Installation

NOTE

Verify that grommet is correctly installed. A misinstalled grommet can result in poor audio, whistling or a rattle.

1. If removed, install harness and grommet.
2. Attach speaker wire connectors.

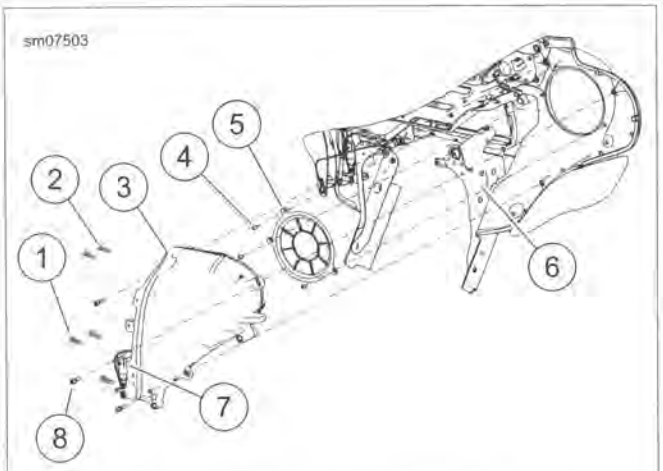
NOTE

Verify hole in speaker frame mates with alignment pin on enclosure.

3. Install speaker and secure with four screws. Tighten to 14-20 **in-lbs** (1.6-2.3 Nm).
4. See Figure 7-86. Install speaker enclosure to inner fairing. Secure with three screws (8). Tighten to 48-60 **in-lbs** (5.4-6.8 Nm).
5. Secure enclosure to fairing support (6) with three screws (1). Tighten to 20-24 ft-lbs (27.1-32.5 Nm).
6. Secure enclosure to upper support bracket with two screws (2). Tighten to 48-60 **in-lbs** (5.4-6.8 Nm).
7. Mate speaker and power outlet connectors. Secure harness anchors to speaker enclosure.
8. Install CB module if equipped. See 7.32 BOOM! BOX INFOTAINMENT SYSTEM, CB Module.
9. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

Speaker Grille

1. Remove speaker enclosure. See 7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers.
2. See Figure 7-86. Remove three screws (4).
3. Remove speaker grille (5).
4. Install speaker grille and secure with screws (4). Tighten to 9-13 **in-lbs** (1.0-1.4 Nm).
5. Install speaker enclosure.



1. **Enclosure-to-fairing support screw (3)**
2. **Upper bracket-to-enclosure screw (2)**
3. **Speaker enclosure**
4. **Speaker grill screw (3)**
5. **Speaker grill**
6. **Fairing support**
7. **Speaker connector**
8. **Enclosure-to-fairing screw (3)**

Figure 7-86. Speaker Enclosure

REAR SPEAKER ENCLOSURES

FASTENER	TORQUE VALUE	
Rear speaker enclosure to Tour-Pak screws	20-25 **in-lbs**	2.3-2.8 Nm
Passenger audio switch screws	25-30 **in-lbs**	2.8-3.4 Nm

Removal

NOTE

It is not necessary to remove the enclosure to service the internal components.

1. Remove Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.
2. See Figure 7-87. Separate rear audio connector from main harness.

NOTE

If both speaker enclosures are removed, connector disassembly is not required.

3. Remove appropriate terminals from housing. Refer to Table 7-16.

NOTE

See Figure 7-88. Screws securing right speaker enclosure also secure power outlet (4).

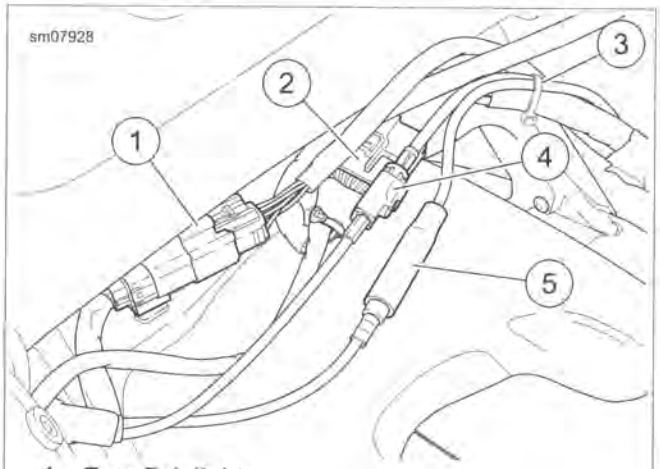
4. Remove three screws (6) with flat washers (5) to free speaker enclosure from Tour-Pak.
5. Remove gasket (2) and sound port (3).

Table 7-16. Rear Audio Connector

WIRE COLOR	CAVITY NO.
Left Speaker	
Pink/Orange	1
Pink/Gray	2
Pink/Green	3
Black	4
Pink/Blue	5
Red	6
Black	7
Shield	8
Right Speaker	
Pink	9
Pink/Black	10
White/Red	14
White/Brown	15
White	16

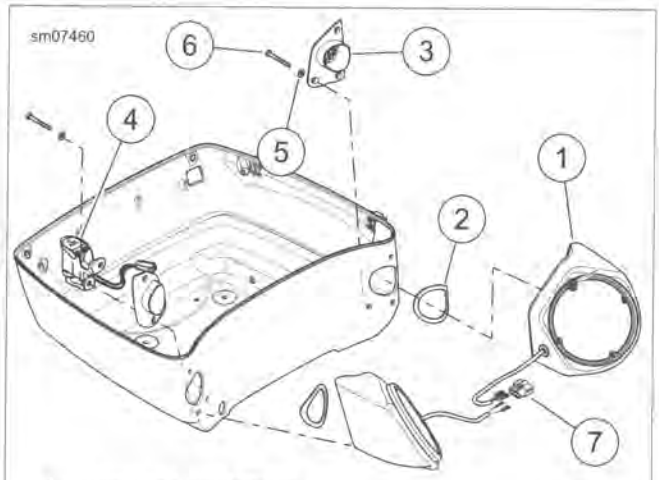
Installation

1. See Figure 7-88. Install sound port and **new** gasket (2).
2. Install three screws with flat washers to secure speaker enclosure, sound port and power outlet (right side only) to Tour-Pak. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
3. Install terminals in connector housing. Refer to Table 7-16 for cavity assignments.
4. Mate rear audio connector to main harness.
5. Install Tour-Pak liner. See 2.34 TOUR-PAK SERVICE, Tour-Pak Liner.



1. **Tour-Pak lights**
2. **Speaker pod jumper**
3. **Cable strap**
4. **Radio antenna**
5. **CB antenna**

Figure 7-87. Tour-Pak Harness Connectors



1. **Speaker enclosure**
2. **Gasket**
3. **Sound port**
4. **Power outlet**
5. **Washers**
6. **Screws**
7. **Connector**

Figure 7-88. Speaker Enclosures

Disassembly

1. See Figure 7-89. Remove four screws (4).
2. Remove speaker and grille from enclosure. Disconnect terminals.
3. Right speaker:
   a. Remove well nut (2) to access switch screw.
   b. Remove screws securing switch assembly.
   c. Remove harness and switch assembly.
   d. Remove switch bezel.

NOTE

It is not necessary to remove the enclosure to service the rear speaker components.

4. Left speaker:
   a. Remove nut and weather cap from passenger headset connector.
   b. Remove passenger headset connector and harness assembly.
5. See Figure 7-88. To separate left and right harnesses, remove terminals from connector (7).
6. Remove harness grommet.

Assembly

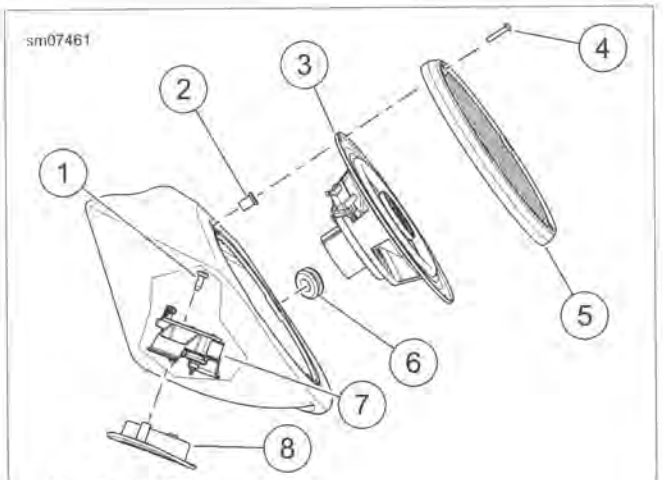
1. Install harness grommet. The left enclosure grommet has the larger hole.
2. See Figure 7-88. If separated, assemble left and right harnesses to connector (7). Refer to Table 7-16 for cavity assignments.

3. Right speaker:
   a. Install switch bezel.
   b. Install harness and switch assembly with wires nearest to wall of speaker enclosure.
   c. Install screws securing switch assembly. Tighten to 25-30 **in-lbs** (2.8-3.4 Nm).
   d. Install well nut removed to access screw.
   e. Route harness through grommet.
4. Left speaker:
   a. Install passenger headset connector and harness assembly.
   b. Install weather cap and nut to secure passenger headset connector. Tighten securely.
   c. Route harness under boss and through grommet.
5. See Figure 7-89. Install cable strap on harness next to inside of grommet (6) to act as strain relief.
6. Connect terminals to speaker.

NOTE

Over-tightening screws (4) can cause well nuts to pull through mounting holes.

7. Secure speaker and grille with four screws (4). Tighten carefully.



1. **Screw (2)**
2. **Well nut (4)**
3. **Speaker**
4. **Screw (4)**
5. **Grill**
6. **Grommet**
7. **Switch**
8. **Bezel**

Figure 7-89. Rear Speaker (typical)

PASSENGER AUDIO CONTROLS

NOTE

It is not necessary to remove the enclosure to service the rear speaker components.

Perform disassembly and assembly procedures for left rear speaker enclosure. See 7.32 BOOM! BOX INFOTAINMENT SYSTEM, Rear Speaker Enclosures.

FRONT HEADSET CONNECTOR

Removal

1. Remove console. See 4.6 FUEL TANK, Console.
2. See Figure 7-90. Place pin punch in either notch of lock ring and rotate counterclockwise to loosen.
3. Remove lock ring and cap.
4. Remove headset connector and harness assembly.

Installation

1. Insert headset connector through hole in console.
2. Slide weather cap over headset connector.
3. With the notches on the outboard side, thread lock ring onto headset connector.
4. See Figure 7-90. Place pin punch in either notch and rotate lock ring clockwise until tight.
5. Install console on fuel tank capturing wire harness and front headset connector harnesses in metal clips. See 4.6 FUEL TANK, Console.
6. Test operation of headset connector.

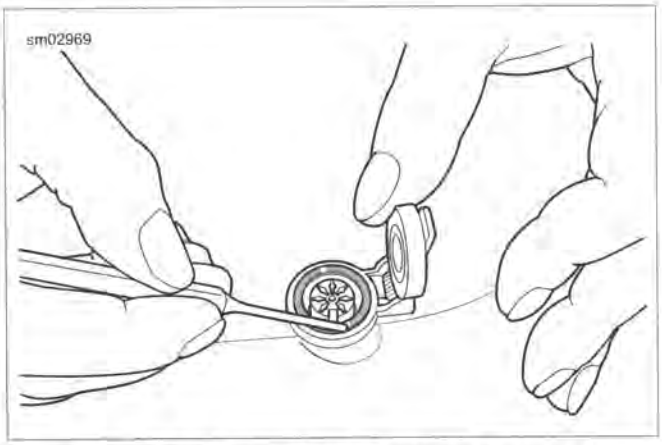


Figure 7-90. Remove Lock Ring from Receptacle

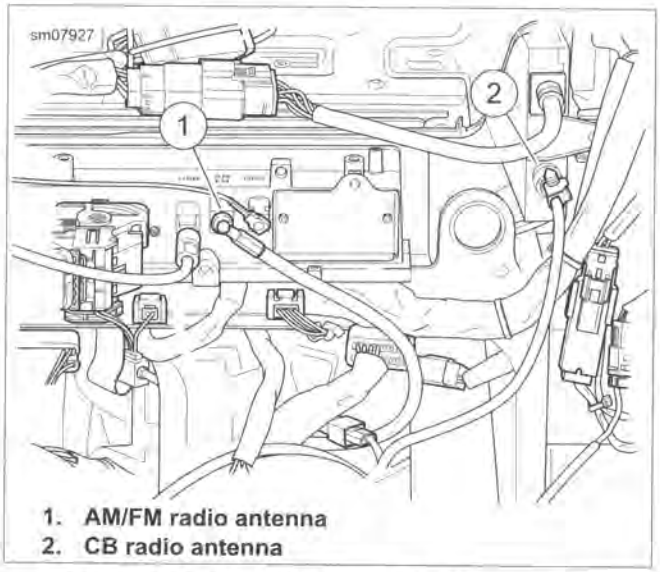
REMOVAL

Main Cable

NOTES

- *Replacement of the radio and CB antenna cables is basically the same.*
- *Most of the original cable will remain within the main harness conduit.*

1. Remove seat and fuel tank. See 4.6 FUEL TANK.
2. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
3. See Figure 7-91. Disconnect antenna cable from radio. Cut cable where it exits front and rear of the main harness.
4. Remove wire trough cover.
5. See Figure 7-92. Disconnect antenna cable connector at rear fender.
6. Cut cable strap (3). Remove antenna cable.

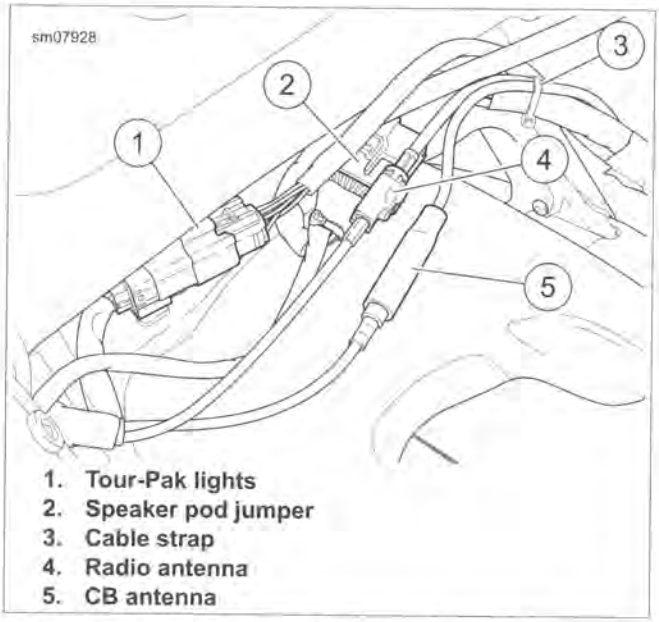


1. **AM/FM radio antenna**
2. **CB radio antenna**

Figure 7-91. Radio Antenna Cable Connectors

Cable Extension: Models with Tour-Pak

1. Remove Tour-Pak harness. See 7.13 TOUR-PAK LIGHTS, Tour-Pak Lights Harness.
2. See Figure 7-94. Cut cable strap (2). Peel away the forward wrap (3).
3. **CB antenna cable (6):**
   a. Remove tape (5) securing cable to harness.
   b. Remove antenna cable.
4. **Radio antenna cable (7):**
   a. Cut antenna cable extension where it exits each end of harness wrap.
   b. Remove antenna cable.

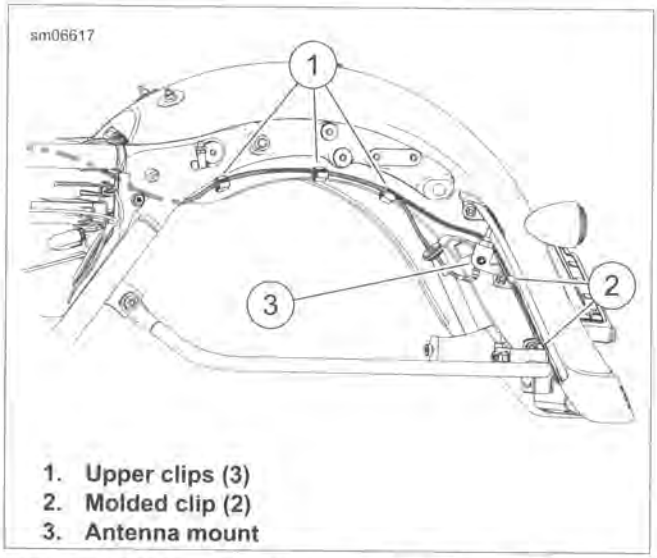


1. **Tour-Pak lights**
2. **Speaker pod jumper**
3. **Cable strap**
4. **Radio antenna**
5. **CB antenna**

Figure 7-92. Tour-Pak Harness Connectors

Cable Extension: FLHX/S

1. Remove left saddlebag.
2. See Figure 7-93. Release antenna cable from three upper clips (1).
3. Disconnect antenna cable from antenna.
4. See Figure 7-95. Disconnect antenna cable connector (1). Remove cable.



1. **Upper clips (3)**
2. **Molded clip (2)**
3. **Antenna mount**

Figure 7-93. Rear Fender Lamps Harness and Antenna Cable: FLHX/S

INSTALLATION

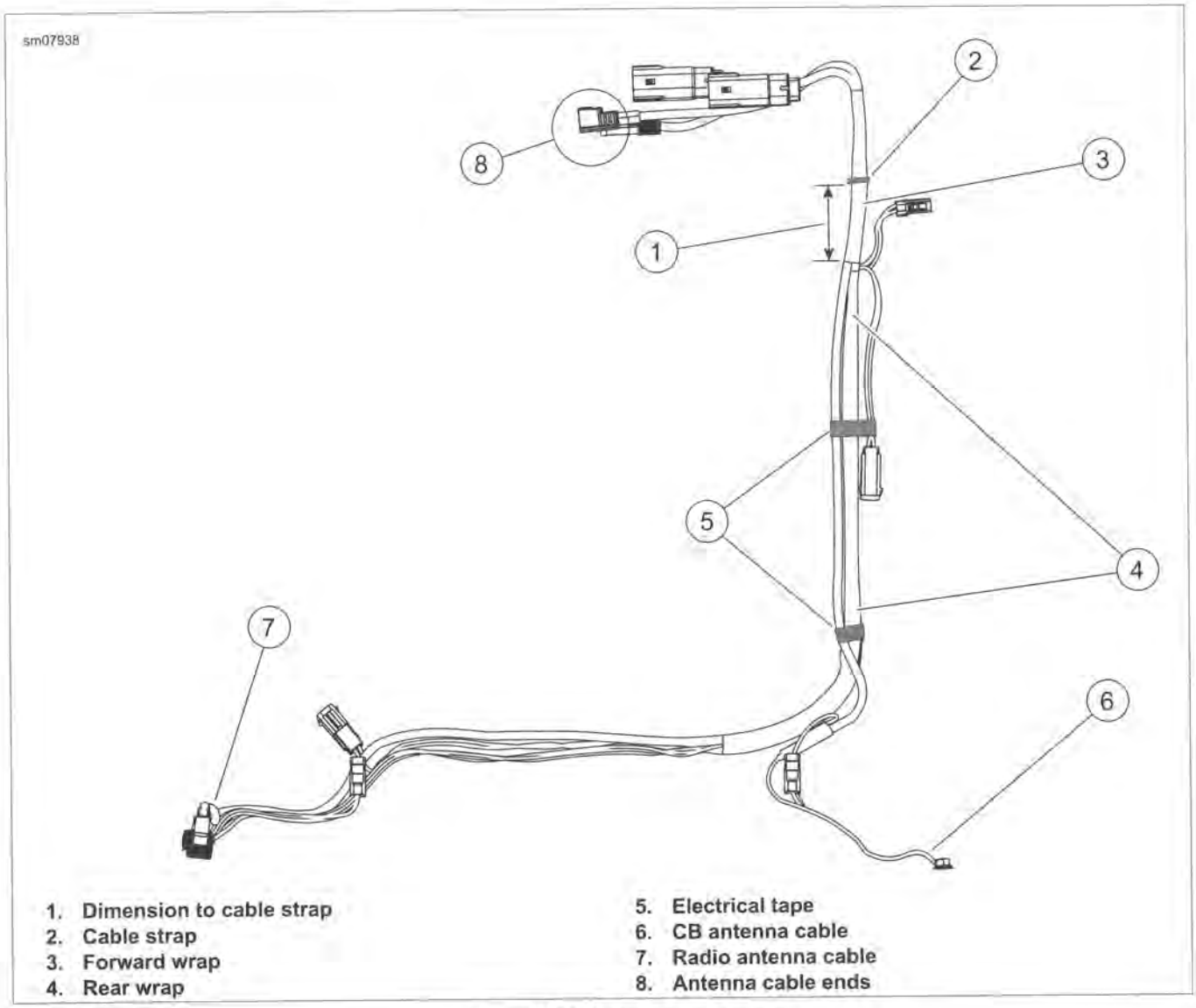
Main Cable

1. See Figure 7-91. Connect **new** radio antenna cable connector to radio.

2. Route free end of radio antenna cable rearward along left side of steering head and rearward through left side of wire trough. Continue along inboard side of left upper frame tube and rearward to top of rear fender.
3. See Figure 7-92. Mate antenna cable connectors at top of rear fender. Install cable strap (3).
4. Capture antenna cable and main harness in steering head retainer.
5. Install two **new** cable straps to secure antenna cable and main harness to left upper frame tube.
6. Install wire trough cover. Verify that all latches are fully engaged.
7. Install fuel tank and seat. See 4.6 FUEL TANK.
8. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

Cable Extension: Models with Tour-Pak

1. See Figure 7-94. Lay **new** antenna cable along harness with front connector approximately even with the other antenna cable connector (8).
2. Secure cable to harness with tape (5).
3. Install **new** forward wrap (3) next to rear wrap (4) remaining on harness.
4. Install **new** cable strap (2) 2 in (51 mm) (1) from end of forward wrap.
5. Install Tour-Pak harness. See 7.13 TOUR-PAK LIGHTS, Tour-Pak Lights Harness.



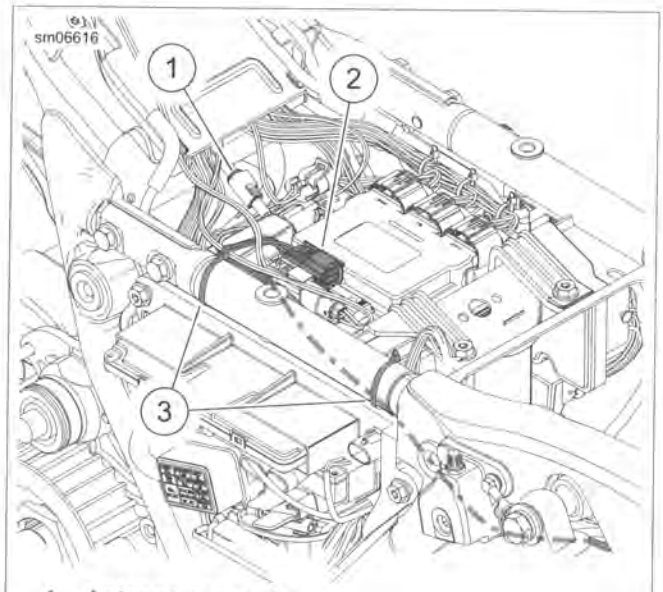
1. **Dimension to cable strap**
2. **Cable strap**
3. **Forward wrap**
4. **Rear wrap**
5. **Electrical tape**
6. **CB antenna cable**
7. **Radio antenna cable**
8. **Antenna cable ends**

Figure 7-94. Antenna Leads

Cable Extension: FLHX/S

1. See Figure 7-95. Route antenna cable back along upper left frame, passing back under frame cross member and through opening in left caddy. Continue along saddlebag support to antenna.
2. See Figure 7-93. Pass connector through grommet and connect to bottom of antenna.
3. Capture cable in three upper clips (1).
4. See Figure 7-95. Pull cable snug. Capture antenna cable and rear lighting harness with **new** cable strap (3).

5. Mate to connector (1)
6. Install left saddlebag.



1. Antenna connector
2. Rear lighting connector
3. Cable strap

Figure 7-95. Rear Fender Lamps Harness and Antenna Cable Routing: FLHX/S

REMOVAL

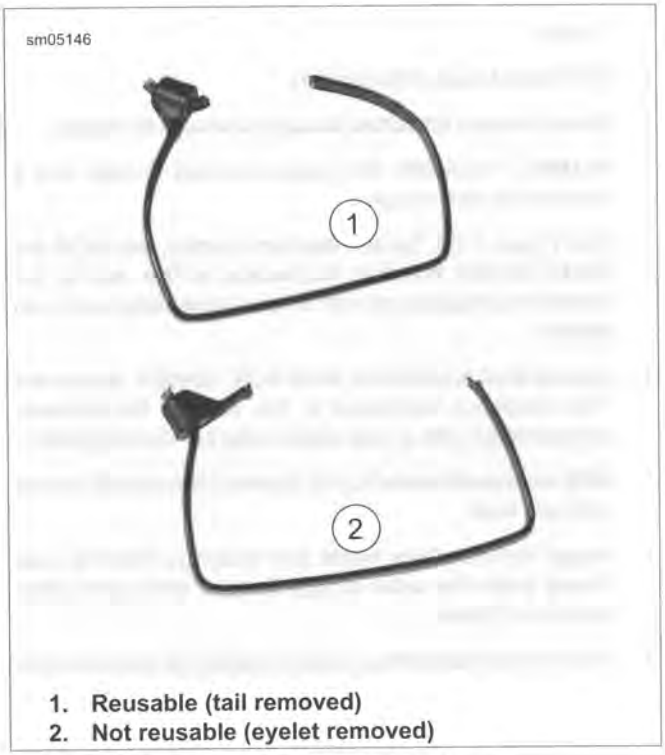
1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove fuel tank. See 4.6 FUEL TANK.
3. Remove air cleaner and backplate. See 4.5 AIR CLEANER ASSEMBLY.
4. Remove TMAP sensor connector [80]. Pull back yellow lock, push down firmly on latch and disconnect connector.
5. Remove front [84] and rear [85] fuel injector connectors.
6. Remove TCA connector [211]. Release anchored cable strap securing harness to induction module.
7. Disconnect ACR connectors and release connector housings from induction module support.
8. Disconnect terminals from horn and release harness conduit from J-clamp. Release anchored cable strap securing harness to horn bracket.
9. Disconnect ET sensor connector [90].
10. Draw connectors removed in previous steps to right side of motorcycle.
11. **ABS models:** Release brake lines from wire trough.
12. See Figure 7-96. Cut two cable straps to release breakout harnesses from right side of wire trough.
13. Remove wire trough cover.
14. See Figure 7-97. Using a paint pen, draw a line on both sides of each cable strap securing wire bundles.

NOTE

There are six cable straps. three cable straps secure the position of the harnesses inside the wire trough and three secure the breakouts on the right side.

Figure 7-96. Wire Trough and ABS Brake Lines

Figure 7-97. Mark Location of Cable Straps



1. **Reusable (tail removed)**
2. **Not reusable (eyelet removed)**

Figure 7-98. Cut Cable Straps

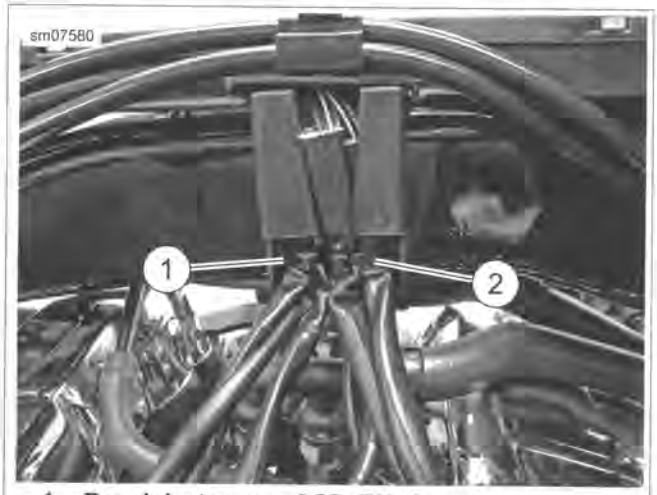
NOTE

See Figure 7-98. When removing cable straps, cut off the tail and not the eyelet. The cable strap can then be reused to gather wires when removing harness from wire trough.

15. Cut cables straps and temporarily use to bundle wires:
    a. Cut tails of cable straps inside the wire trough as close to the eyelet as possible.
    b. Remove each cable strap from slots in wire trough and remove the tail remnant from the eyelet.
    c. Install the cable strap back on the harness near the painted lines to gather the bunch of wires. Verify each wire of the harness is captured.
16. Pull breakout harnesses out through slot in breakout compartment. If ABS equipped, move harnesses outboard of brake lines.
17. **FLHR/C:** Remove fuel gauge harness from slot in front of wire trough.
18. Pry anchor pins at rear of wire trough from holes in frame backbone.
19. Remove wire trough.

INSTALLATION

1. Thread six **new** cable straps through slots inside wire trough.
2. Slide wire trough into position.
3. Route forward branches through channels in trough.
4. **FLHR/C:** Route the fuel gauge harness through slot in front-left of wire trough.
5. See Figure 7-99. Secure rear fuel injector, rear ACR and TMAP sensor breakout harnesses in the rear of the breakout compartment with a **new** cable strap but do not tighten.
6. Secure front fuel injector, front ACR, horn/ET sensor and TCA breakout harnesses in the front of the breakout compartment with a **new** cable strap but do not tighten.
7. **ABS equipped models:** Pull breakout harnesses inboard of brake lines.
8. Adjust harness wires inside wire trough so they are positioned within the cable straps. Engage each cable strap but do not tighten.
9. Remove the cable straps used to gather the wire bunches.
10. Secure rear of wire trough into holes in frame backbone.
11. Align the painted lines with the cable straps. Tighten and trim cable straps.
12. Align the painted lines on branches exiting the breakout compartment with cable straps. Tighten and trim cable straps.
13. Secure cover to wire trough starting at the rear and working forward. Verify that all latches are fully engaged.
14. **ABS equipped models:** Secure brake lines as shown in Figure 7-96.
15. Install TMAP sensor connector. Engage yellow lock.
16. Install rear fuel injector connector, front fuel injector connector, ET sensor connector and terminals onto horn contacts. Capture horn harness in J-clamp and also secure anchored cable strap.
17. Install TCA connector. Secure harness to hole at front of induction module with **new** anchored cable strap. Cut excess cable strap material.
18. Connect ACR connectors. Secure to induction module support.
19. Install fuel tank. See 4.6 FUEL TANK.
20. Install air cleaner. See 4.5 AIR CLEANER ASSEMBLY.
21. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.



1. **Rear injector, rear ACR, TMAP**
2. **Front injector, front ACR, TCA, horn/ET sensor**

Figure 7-99. Breakout Harnesses

REMOVAL: ALL MODELS (PART 1)

1. Remove fuel tank. See 4.6 FUEL TANK.
2. Remove battery. See 1.22 BATTERY MAINTENANCE.
3. Remove saddlebags. See 2.31 SADDLEBAGS.
4. Remove left and right side covers.

NOTE

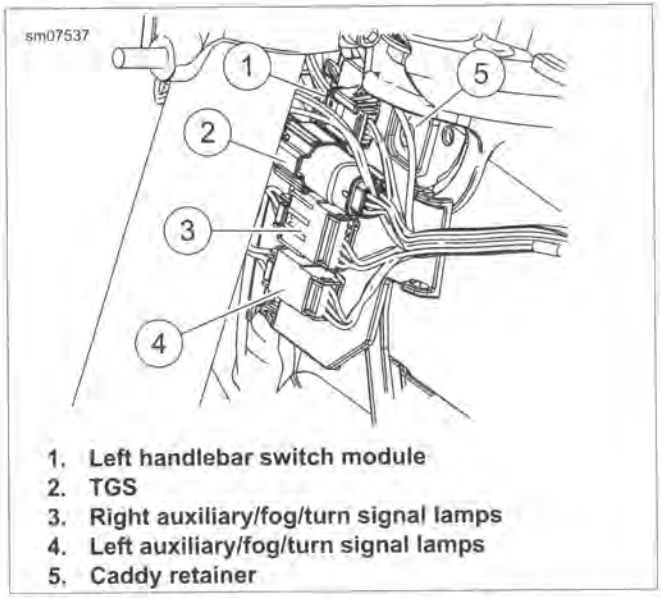
Depending upon model, continue procedure at 7.35 MAIN WIRING HARNESS, Removal: Road King Models (Part 2), 7.35 MAIN WIRING HARNESS, Removal: Fairing Models (Part 2).

REMOVAL: ROAD KING MODELS (PART 2)

1. Remove headlamp assembly. See 7.9 HEADLAMP.
2. See Figure 7-100. Separate connectors (1-4) at left steering head caddy. Leave main harness connectors secured to caddy.
3. Separate ground wire leading to left upper fork bracket.
4. See Figure 7-101. Separate connectors (1, 2) at right steering head caddy. Leave main harness connectors secured to caddy.
5. Remove brake line retainer (4). Leave lines captured in retainer.
6. Loosen caddy retainer screw (5). Remove retainer securing each steering head caddy.
7. Remove both caddies from steering head.
8. Disconnect nacelle switch connectors (3).

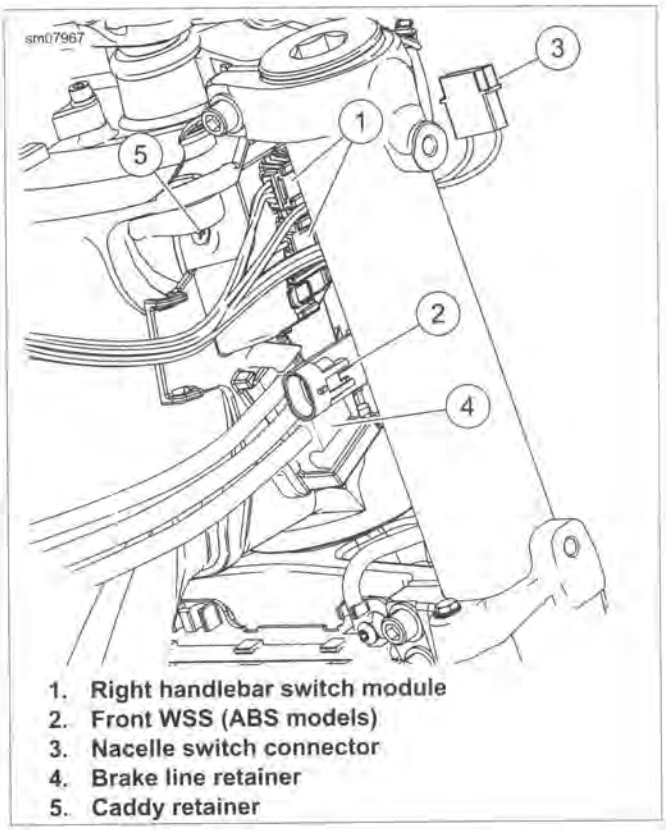
NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Removal: All Models (Part 3).



1. Left handlebar switch module
2. TGS
3. Right auxiliary/fog/turn signal lamps
4. Left auxiliary/fog/turn signal lamps
5. Caddy retainer

Figure 7-100. Left Side Connectors: Road King



1. Right handlebar switch module
2. Front WSS (ABS models)
3. Nacelle switch connector
4. Brake line retainer
5. Caddy retainer

Figure 7-101. Right Side Connectors: Road King

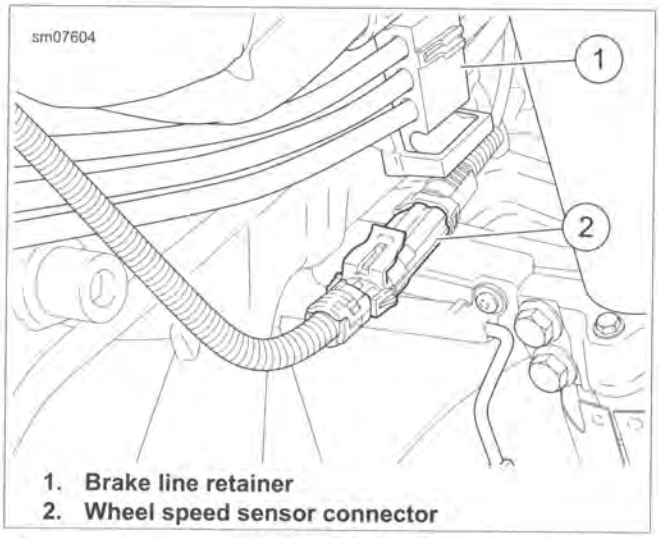
REMOVAL: FAIRING MODELS (PART 2)

1. Remove outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
2. See Figure 7-104. Separate connectors (1-9) and remove from retaining devices if present.
3. Remove dash panel. Disconnect switches. See 2.38 DASH PANEL.
4. Disconnect ignition switch connector. See 7.15 IGNITION SWITCH AND FORK LOCK.
5. Pull dash panel switch and ignition switch harnesses forward into fairing area.
6. **ABS equipped:** See Figure 7-103. Separate wheel speed sensor connector (2).
7. Release brake line retainer (1) from steering head caddy.
8. See Figure 7-102. Loosen retainer screw and pull retainer securing each steering head caddy.
9. Remove both caddies from steering head.
10. Pull main harnesses rearward and allow to hang.

NOTE

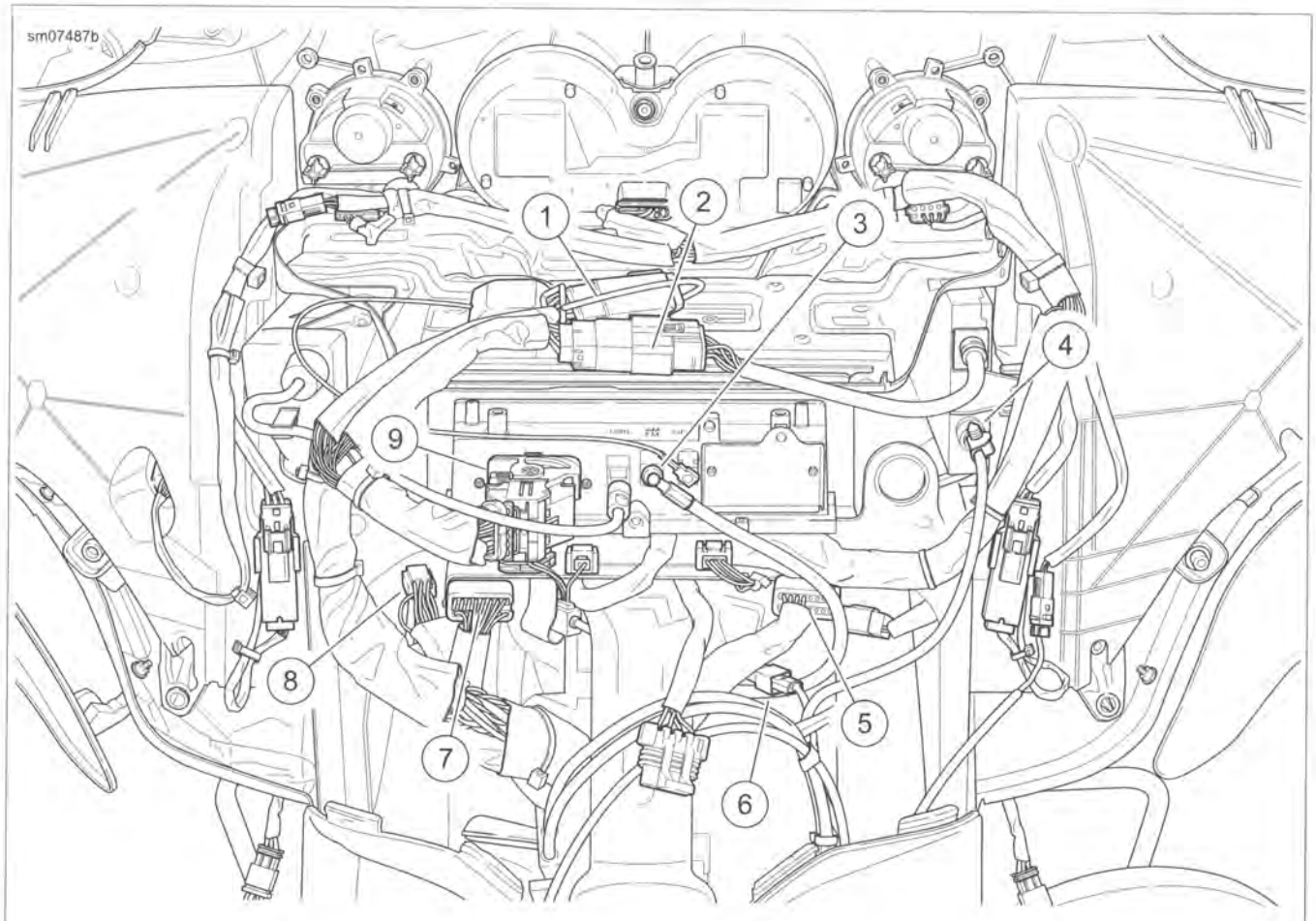
Continue procedure at 7.35 MAIN WIRING HARNESS, Removal: All Models (Part 3).

Figure 7-102. Steering Head Caddy (right side shown)



1. Brake line retainer
2. Wheel speed sensor connector

Figure 7-103. Steering Head Caddy (right side shown)

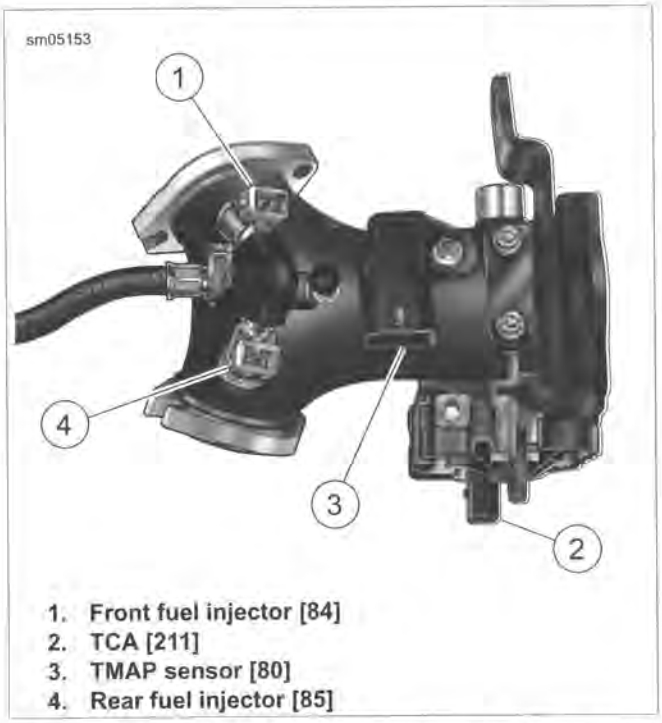


1. CB module
2. P&A audio
3. AM/FM radio antenna
4. CB radio antenna
5. Main-to-fairing harness, left
6. Ground wire, fork bracket
7. Main-to-fairing harness, right
8. TGS
9. Radio

Figure 7-104. Main Harness Fairing Connectors (typical)

REMOVAL: ALL MODELS (PART 3)

1. Remove air cleaner cover and backplate. See 4.5 AIR CLEANER ASSEMBLY.
2. Disconnect ACR connectors.
3. See Figure 7-105. Remove connectors from induction module:
   a. Disconnect TMAP sensor connector (3). Pull back yellow lock, push down firmly on latch and disconnect connector.
   b. Disconnect fuel injector connectors (1, 4).
   c. Disconnect TCA connector (2). Release anchored cable strap securing harness to induction module.



1. **Front fuel injector [84]**
2. **TCA [211]**
3. **TMAP sensor [80]**
4. **Rear fuel injector [85]**

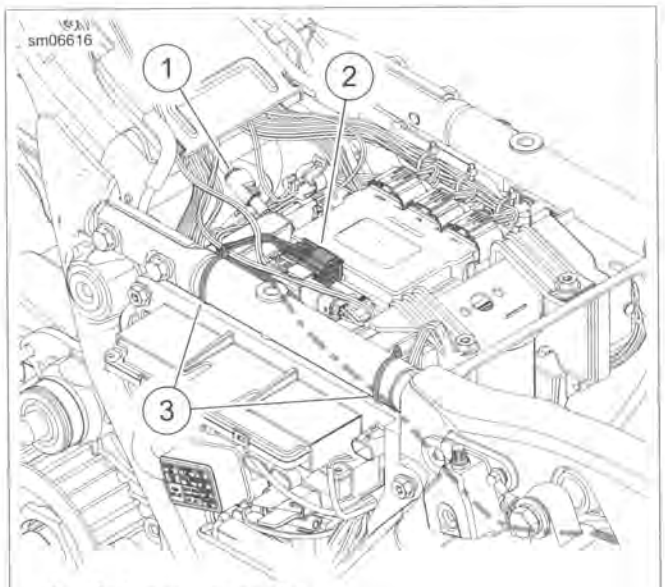
Figure 7-105. Induction Module Assembly (Top View)

4. Disconnect terminals from horn and release harness conduit from J-clamp. Release anchored cable strap securing harness to horn bracket.
5. Disconnect ET sensor connector [90].
6. Draw harness branch to right side of motorcycle.
7. **ABS equipped:** Release brake lines from wire trough.
8. Cut cable straps securing harnesses to left upper frame rails.
9. Disconnect purge solenoid connector [95], if equipped.
10. Disconnect ECM connectors.
11. Disconnect ignition coil connector [83].

NOTE

Record harness ground ring terminal orientation when removing.

12. Remove main harness ground ring terminals from left and right frame ground studs (metric) located ahead of battery tray.
13. Pry anchor pins at rear of wire trough from holes in frame backbone.
14. Disconnect siren if equipped. Remove siren from left side caddy.
15. Remove BCM. See 7.5 BODY CONTROL MODULE (BCM).
16. Remove screws securing left side caddy. See 7.6 ELECTRICAL CADDIES.
17. **FLHR/C Only:**
   a. Pull anchor on ignition switch jumper harness connector [222], 4-place Packard, from hole in left caddy. Disconnect connector.
   b. Disconnect instrument console connector [20], 16-place Molex, inboard of left upper frame tube. Remove instrument console.
18. **FLHX/S:**
   a. See Figure 7-106. Disconnect radio antenna cable connector (1).
   b. Disconnect rear lighting connector (2).

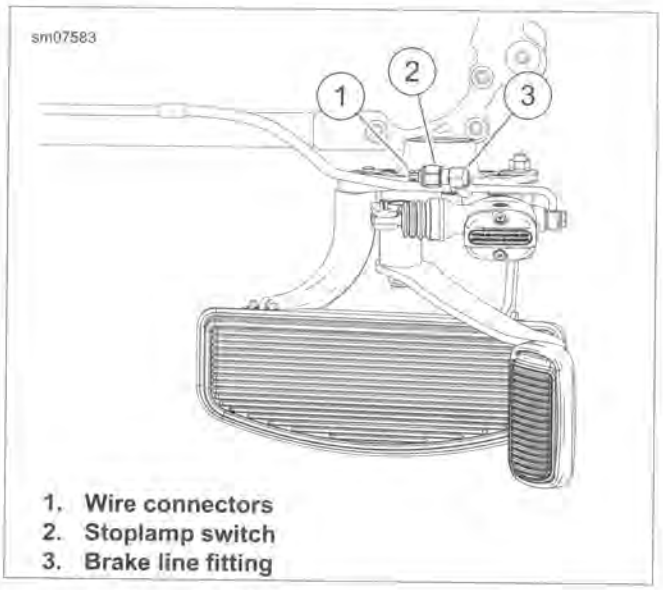


1. **Antenna connector**
2. **Rear lighting connector**
3. **Cable strap**

Figure 7-106. Rear Fender Lamps Harness and Antenna Cable Routing: FLHX/S

19. **Models with Tour-Pak:** Disconnect rear audio harness, antenna and Tour-Pak lighting connectors located near Tour-Pak. Release audio connector from anchor.
20. Disconnect oxygen sensor connectors. Remove from anchors.
21. Disconnect connector [179] from active exhaust valve actuator or from mock pin housing on right side of battery tray, as equipped.
22. **ABS Equipped Only:**
   a. Disconnect ABS module connector [166].
   b. Disconnect rear wheel speed sensor connector [168].

23. Draw harness branch into battery tray.
24. Remove main power cable ring terminal from starter solenoid post. Draw out cable through opening at rear of left side caddy.
25. Remove starter and disconnect VSS connector. See 7.22 VEHICLE SPEED SENSOR (VSS).
26. Remove connectors from neutral switch.
27. Draw harness branch into battery tray.
28. Disconnect voltage regulator. See 7.20 VOLTAGE REGULATOR.
29. Disconnect and remove CKP sensor connector from front lower caddy. See 7.17 CRANKSHAFT POSITION SENSOR (CKP).
30. Disconnect jiffy stand interlock sensor connector [133].
31. Disconnect oil pressure switch/sender at front right side of crankcase.
32. See Figure 7-107. Disconnect rear stop lamp switch connectors:
    a. Support front of engine.
    b. Remove screws securing front right engine mount end cap.
    c. Carefully pull off end cap mount with footboard, master cylinder and brake pedal attached. Allow to lay beside the vehicle.
    d. Remove stop lamp switch connectors (1).
    e. Temporarily fasten the engine mount end cap.



1. **Wire connectors**
2. **Stoplamp switch**
3. **Brake line fitting**

Figure 7-107. Rear Stop Lamp Switch

33. **Twin-Cooled:** Disconnect pump, left fan and right fan connectors.
34. Free main harness clamp from front engine mounting bracket.
35. Free main harness from two clips anchored to lower-right frame tube.
36. Cut cable straps to release harness from middle frame down tube.
37. Pull up harness branch through battery tray.
38. While pulling left side caddy away from motorcycle, feed wire trough and harnesses out through opening.

INSTALLATION: ALL MODELS (PART 1)

FASTENER	TORQUE VALUE	
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm
Engine mount end cap fasteners, front	42-48 ft-lbs	56.9-65.0 Nm

1. Feed front end of wire trough in through opening between left frame downtubes, then pull up and out through opening at top of battery tray. Lay wire trough on top of frame backbone.
2. Push anchor pins at rear of wire trough into holes in frame backbone.
3. Locate the lower front branch terminating at the voltage regulator, stop lamp switch, oil pressure switch, and so forth. Route down inside of mid down tube and to front of motorcycle following the lower frame tube.
4. Locate branch terminating in the VSS, neutral switch and starter solenoid connectors. Route down through opening right of ignition coil to top of transmission.
5. Locate branch terminating in oxygen sensor, ABS module (if equipped) and rear wheel speed sensor connectors. Route down to area of right caddy.
6. **Models with Tour-Pak:** Locate branch terminating in the Tour-Pak lights and audio harness connectors. Route along left upper frame tube to area near Tour-Pak. Mate connectors. Secure audio connector to anchor.
7. Route starter power cable and ignition coil connector down through opening left of ignition coil.
8. Route rear fender lights connector through opening at rear of battery tray and up through frame crossmember. Install left side electrical caddy. See 7.6 ELECTRICAL CADDIES.
9. **All except FLHX/S:** Mate rear fender lights connector. Secure to top of fender.
10. **FLHX/S:** Mate rear fender lights connector. Secure to top caddy.
11. Install BCM. See 7.5 BODY CONTROL MODULE (BCM).
12. Connect VSS and neutral switch.
13. Install ignition coil connector [83].
14. Install starter. See 7.8 STARTER.
15. Install purge solenoid connector [95] if equipped.

16. Install main harness ground ring terminals:
    a. Install two main harness ground ring terminals onto left frame ground stud. Secure with nut.
    b. Install remaining ground ring terminal on right frame ground stud under starter ground cable ring terminal. Secure with nut.
    c. Tighten both nuts (metric) to 50-90 **in-lbs** (5.7-10.2 Nm).

NOTE

Replace conduit clips if damaged, deteriorated or missing. With the slotted side up, push hole in conduit clip over T-stud to install.

17. Route lower front branch inboard of front engine mounting bracket.
18. **Twin-Cooled:** Route pump and fan connectors under the front engine mount.
19. Connect and install voltage regulator. See 7.20 VOLTAGE REGULATOR.
20. Connect CKP sensor connector [79]. Push anchor on connector into hole in front caddy.
21. Connect jiffy stand interlock sensor connector [133]. Secure to T-stud on front caddy.
22. Connect oil pressure switch/sender connector.
23. See Figure 7-107. Connect brake lamp switch connectors:
    a. Support front of engine.
    b. Remove screws securing front right engine mount end cap.
    c. Carefully pull off end cap mount with footboard, master cylinder and brake pedal attached. Allow to lay beside the vehicle.
    d. Install stop lamp switch connectors (1).

NOTE

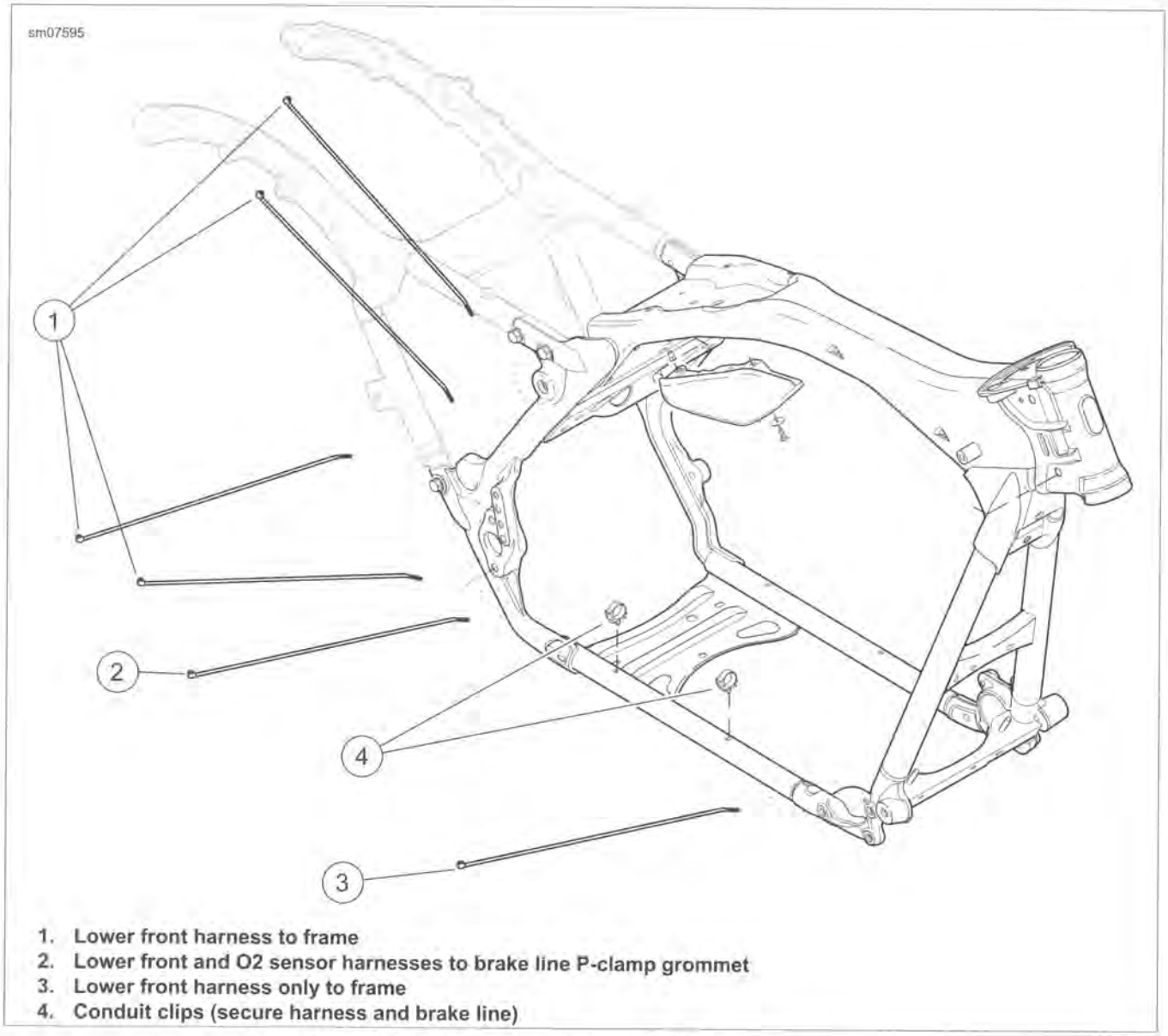
Confirm oil switch/sender wires are inboard of rubber mount.

    e. Install engine mount end cap. Tighten to 42-48 ft-lbs (56.9-65.0 Nm).

24. **Twin-Cooled:** Mate pump, left fan and right fan connectors. Secure to anchors.
25. Secure lower front branch to mid-frame down tube. See Figure 7-108 for location of **new** cable straps.
26. Secure horizontal portion to conduit clips (5).
27. Install connector [179] to the active exhaust valve actuator or to mock connector housing on right side of battery tray, as equipped.
28. **ABS equipped:** Connect ABS module connector [166] and rear wheel speed sensor connector [168].
29. Connect oxygen sensor front (gray) and rear (black) connectors. Secure connectors to anchors on right caddy.
30. Secure harnesses to left upper frame tube with two **new** cable straps.
31. **FLHR/C Only:**
    a. Lay a clean shop towel on forward part of rear fender. Lay console upside down on shop towel.
    b. Connect instrument console connector [20].
    c. Connect ignition switch jumper harness connector [222]. Secure connector in hole in left side of battery tray.
32. Connect ECM connectors.
33. **ABS equipped:** Secure brake lines to wire trough.
34. See Figure 7-107. Install connectors to induction module:
    a. Install TMAP sensor connector (3). Engage yellow lock.
    b. Install TCA connector (2). Install **new** anchored cable strap in hole at front right side of induction module.
    c. Install fuel injector connectors (1, 4).
35. Mate ACR connectors. Secure to anchors.
36. Install air cleaner assembly. See 4.5 AIR CLEANER ASSEMBLY.
37. Route the branch to the horn and ET sensor to the left side of the engine and under the horn bracket. On Twin-Cooled Models, route the branch under coolant lines.
38. Connect ET sensor connector. Pull boot over sensor.
39. Connect horn spade terminals. Capture conduit in J-clamp. Secure to horn bracket with anchored cable strap.

NOTE

Depending upon model, continue procedure at 7.35 MAIN WIRING HARNESS, Installation: Road King Models (Part 2), 7.35 MAIN WIRING HARNESS, Installation: Fairing Models (Part 2).



1. **Lower front harness to frame**
2. **Lower front and O2 sensor harnesses to brake line P-clamp grommet**
3. **Lower front harness only to frame**
4. **Conduit clips (secure harness and brake line)**

Figure 7-108. Lower Front Harness Cable Strap Locations

INSTALLATION: ROAD KING MODELS (PART 2)

1. Route front right section of main harness forward along right side of steering head and into headlamp nacelle.
2. See Figure 7-101. Secure caddy with retainer (5).
3. Mate connectors (1, 2).
4. See Figure 7-100. Route front left section of main harness forward along left side of steering head and into headlamp nacelle.
5. Secure caddy with retainer (5).
6. Mate connectors (1-4).
7. Mate nacelle switch connectors (3).
8. Install headlamp assembly. See 7.9 HEADLAMP.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Installation: All Models (Part 3).

INSTALLATION: FAIRING MODELS (PART 2)

1. Route main harness forward along each side of steering head and into inner fairing area.
2. See Figure 7-102. Secure steering head caddies and install retainer. Push in retainer screw until fully seated.
3. **Right side:** Secure brake lines to caddy. Mate front wheel speed sensor connector and secure to caddy, if equipped.
4. See Figure 7-104. Mate connectors (1-9). Secure to anchors if present.
5. Route dash panel and ignition switch connectors back between handlebar and upper fork bracket.
6. Connect ignition switch connector. See 7.15 IGNITION SWITCH AND FORK LOCK.
7. Connect dash panel switch connectors. Install dash panel. See 2.38 DASH PANEL.

8. Mate ground wire leading to upper fork bracket.
9. Route clutch cable through loop on left steering caddy, through loop in inner fairing bracket and out through grommet to clutch lever. Connect and adjust clutch cable. See 2.23 CLUTCH CABLE.
10. Install outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Installation: All Models (Part 3).

INSTALLATION: ALL MODELS (PART 3)

1. Install side covers.
2. Install saddlebags. See 2.31 SADDLEBAGS.
3. Install fuel tank. See 4.6 FUEL TANK.
4. Install battery, top caddy and seat. See 1.22 BATTERY MAINTENANCE.

HARNESS SERVICE

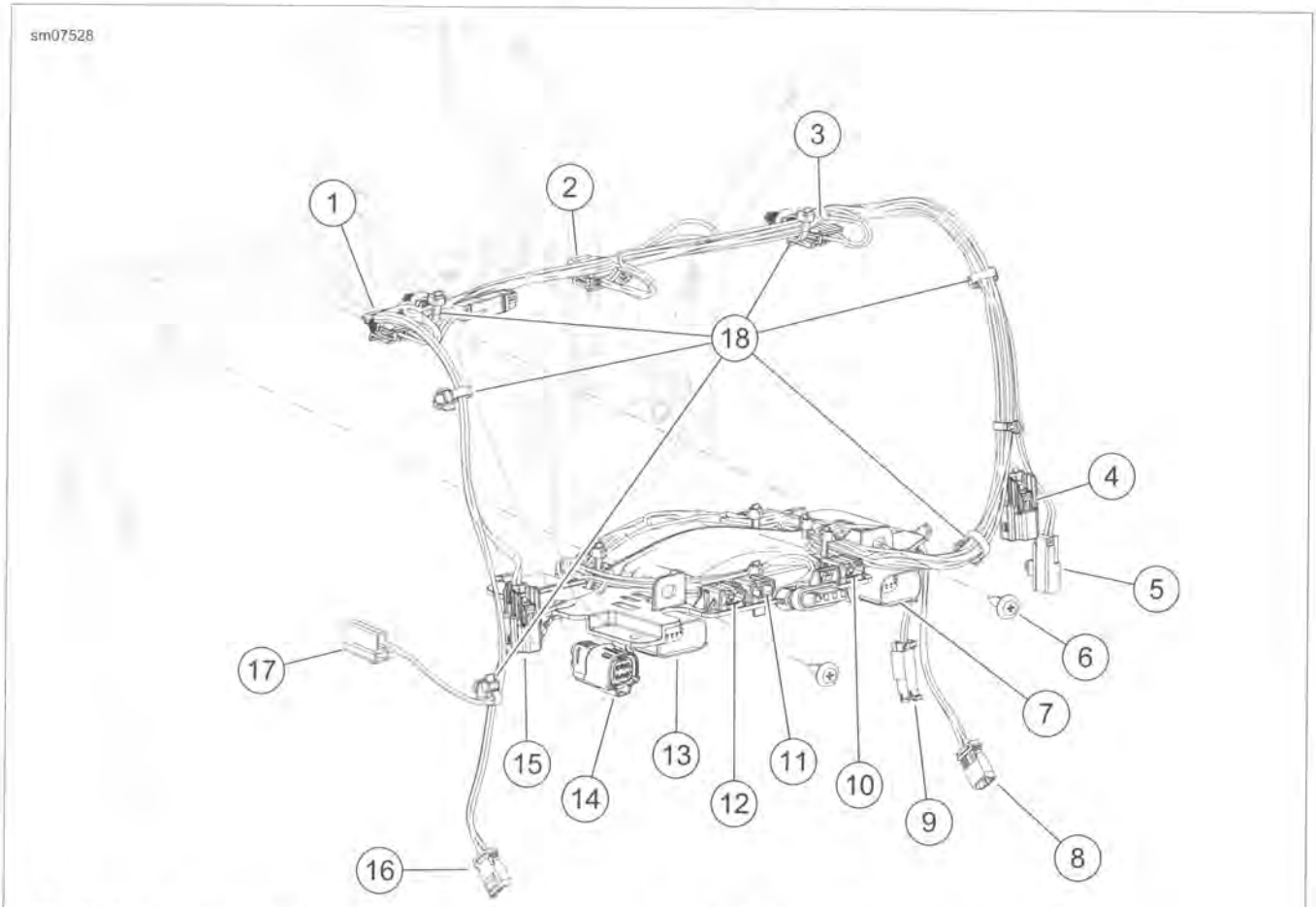
FASTENER	TORQUE VALUE	
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm
Dash panel screws	25-30 **in-lbs**	2.8-3.4 Nm

Removal

1. Remove main fuse. See 7.3 SYSTEM FUSES AND RELAYS.
2. Remove lamp brackets and outer fairing. See 2.37 UPPER FAIRING AND WINDSHIELD.
3. See Figure 7-109. Disconnect connectors (1-5). Remove from retaining devices, if present.
4. Disconnect connectors (7, 9-15, 17). Remove from retaining devices, if present.
5. Release five anchored cable straps (18) securing fairing harness.
6. **FLHTK:** Disconnect heated grips power connector (9).
7. Remove two fasteners (6) securing electrical caddy.
8. Remove fairing harness and electrical caddy as an assembly.

Repair

1. Remove cable straps securing harness to caddy.
2. Repair connectors and harnesses as necessary.
3. Secure harnesses and connectors to caddy with **new** cable straps.



1. Voltmeter connector
2. Instrument cluster connector
3. Fuel gauge connector
4. Left speaker connector
5. Front fender tip lamp connector
6. Fastener (2)
7. Main-to-fairing harness connector, left
8. Left front lighting
9. Auxiliary power connector (heated handgrip power: FLHTK)
10. Left handlebar switches connector
11. Run/stop switch connector
12. Right handlebar switches connector
13. Main-to-fairing harness connector, right
14. TGS connector anchor
15. Right speaker connector
16. Right front lighting
17. Power outlet connector
18. Anchored cable straps

Figure 7-109. Inner Fairing Harness

Installation

1. Remove screws securing dash panel.
2. Remove double studs securing inner fairing to fork brackets.
3. Lift inner fairing straight up and hold.
4. While holding inner fairing up, push electrical caddy into place. Mate tabs on caddy with slots in lower fairing brackets.
5. See Figure 7-109. Secure caddy with fasteners (6).
6. Secure fairing harness with anchored cable straps (18).
7. Mate connectors (1-5). Secure to retaining devices, if present.
8. Mate connectors (7, 9-15, 17). Secure to retaining devices, if present.
9. **FLHTK:** Mate heated grips power connector (9).
10. Install double studs securing inner fairing to fork brackets. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
11. Install screws securing dash panel. Tighten to 25-30 **in-lbs** (2.8-3.4 Nm).
12. Install outer fairing and lamp brackets. See 2.37 UPPER FAIRING AND WINDSHIELD.
13. Install main fuse. See 7.3 SYSTEM FUSES AND RELAYS.

REMOVAL

NOTES

- *The handlebar switches are modular and serviced as assemblies only, including the clutch interlock switch and front brake lamp switch.*
- *Several switch configurations are used on Touring models. The service procedures are the same for all.*
- *Switch assemblies are different between cable clutch and hydraulic clutch models. Install the correct switch module assembly. Installation of the incorrect switch will allow the engine to start in gear with the clutch engaged.*

Handlebar Controls

1. See Figure 7-110. Remove screws (3) and clamp (4). Remove hand control assembly.
2. **Left switch module:**
   a. See Figure 7-112. With a small screwdriver, carefully pry between trigger finger switch cap and switch plunger.
   b. Slide trigger finger switch cap outboard to remove.

NOTE

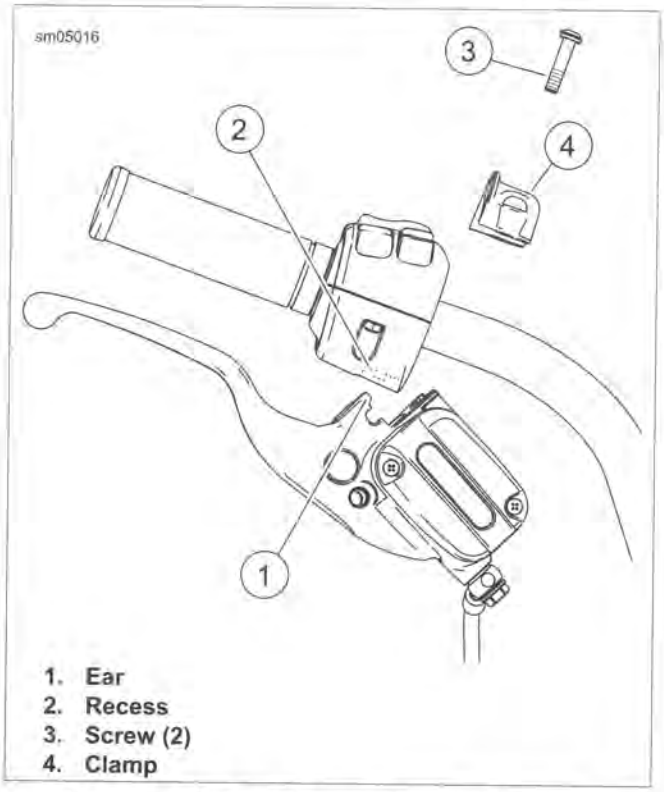
See Figure 7-113. The switch housing screws (5) are captive.

3. Loosen switch housing screws (5). Remove switch housings.

NOTE

See Figure 7-113. The latches on connectors are fragile. Use care when disconnecting.

4. Remove connectors:
   a. Using a pick, carefully press latch down.
   b. Use a prying motion on latch while pulling on connector to remove.
5. See Figure 7-113. Release switch latch (2) and rotate switch (1) down.
6. Remove module assembly from handlebar. Release wires from switch pack.



1. Ear
2. Recess
3. Screw (2)
4. Clamp

Figure 7-110. Hand Control Assembly (typical)

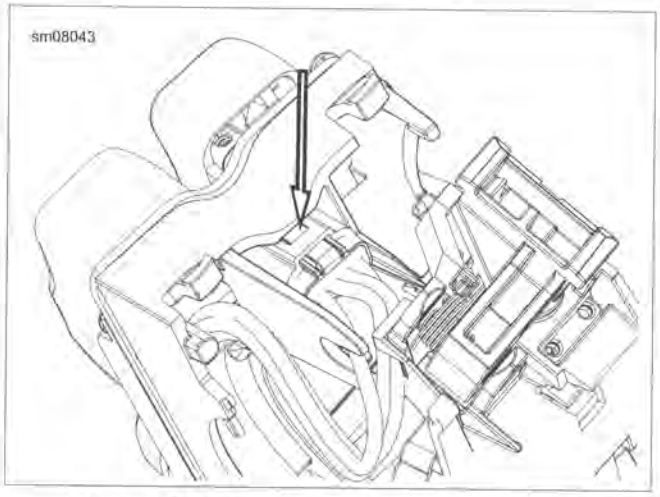


Figure 7-111. Switch Pack Connector (typical)

INSTALLATION

FASTENER	TORQUE VALUE	
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm
Brake lever clamp screws	72-108 **in-lbs**	8.1-12.2 Nm
Clutch lever bracket clamp screws	72-108 **in-lbs**	8.1-12.2 Nm
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm

Right Handlebar Controls

1. Install throttle hand grip:
   a. Verify that TGS is installed and fully engaged in the slots in handlebar.
   b. Position hand grip with cosmetic features properly positioned. Install hand grip on handlebar and fully engage on TGS splines until it bottoms.
   c. **Heated hand grips:** Mate connector. See 2.28 HANDLEBARS, Heated Hand Grips.

⚠WARNING

Verify that the hand control housing bushings and switch pack metal shield are in place. If the shield or either bushing is missing, the switches could fail. Brake light and signal light functionality could be interrupted, reducing rider visibility, which could result in death or serious injury. (00633b)

NOTE

See Figure 7-112. Bushings (2) must be in place to provide proper switch function. If bushings are missing or damaged, replace switch housing.

2. See Figure 7-112. Verify that bushings (2) are in place on both switch housings.
3. See Figure 7-113. Mate electrical connectors (3). Route harness through fingers (4) and into channel in switch module.

NOTE

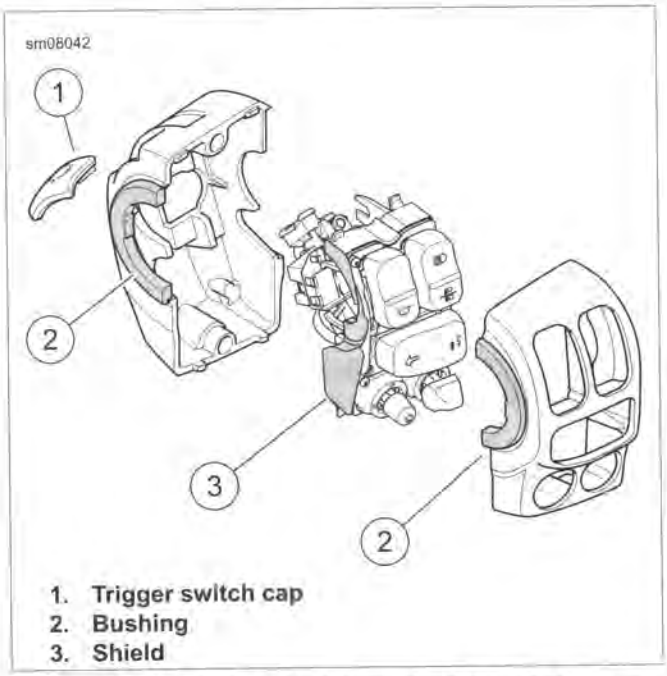
See Figure 7-112. Shield (3) must be in place to provide proper switch function. If shield becomes loose during disassembly or assembly, hold shield in place while installing switch pack and inner switch housing. Replace the switch pack if the shield is missing or deformed.

4. See Figure 7-113. Place module on handlebar. Rotate switch (1) up and snap latch (2) into place.
5. Verify that wire harness is in the recess at bottom of handlebar.
6. Install switch housings. Tighten screws (5) until snug.
7. See Figure 7-110. Install brake control assembly. Position for rider comfort.
   a. Engage ear (1) in recess (2).
   b. Rotate into position.
   c. Install clamp (4) and screws (3).
8. Tighten switch housing:
   a. Push hand grip inboard to verify that hand grip is fully seated.
   b. Move the switch housing assembly inboard (away from grip) to remove all end play. Then move the switch housing outboard 0.040-0.080 in (1.0-2.0 mm) to introduce end play.
   c. While holding switch housing in place, tighten switch housing screws to 35-45 **in-lbs** (4.0-5.0 Nm).
   d. Verify that hand grip has slight inboard-outboard free play.
   e. Verify that hand grip rotates and returns freely.
9. Tighten brake control clamp screws (3) to 72-108 **in-lbs** (8.1-12.2 Nm). Again verify hand grip rotation and slight end play.

⚠WARNING

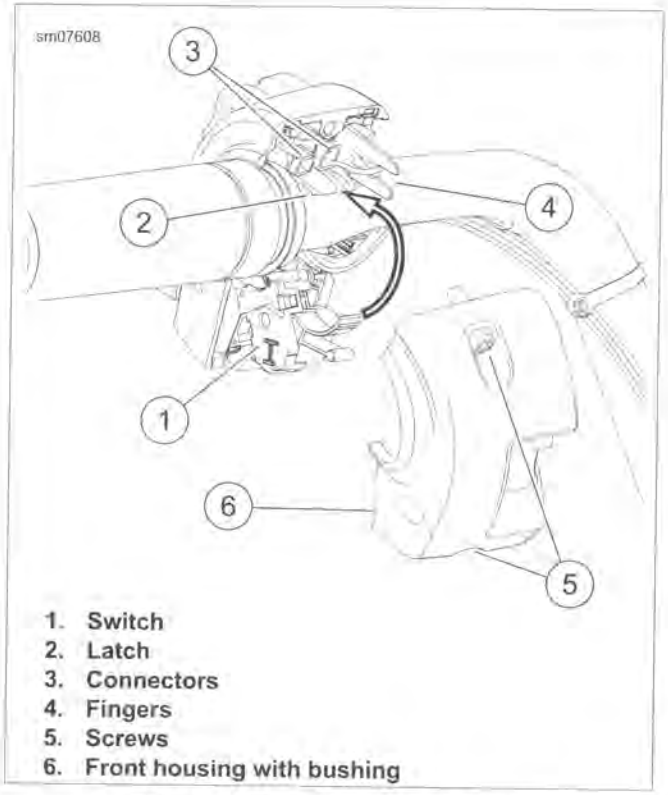
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

10. Test switches for proper operation.



1. **Trigger switch cap**
2. **Bushing**
3. **Shield**

Figure 7-112. Switch Pack (typical): Left Side Shown



1. **Switch**
2. **Latch**
3. **Connectors**
4. **Fingers**
5. **Screws**
6. **Front housing with bushing**

Figure 7-113. Switch Pack (typical)

Left Handlebar Controls

NOTE

Never install a switch from a different model. Although they are similar and will physically install, certain features are different and will cause the clutch interlock to not operate properly.

1. Install **new** hand grip, if removed. See 2.28 HANDLEBARS, Left Hand Grip.

⚠WARNING

Verify that the hand control housing bushings and switch pack metal shield are in place. If the shield or either bushing is missing, the switches could fail. Brake light and signal light functionality could be interrupted, reducing rider visibility, which could result in death or serious injury. (00633b)

NOTE

See Figure 7-112. Bushings (2) must be in place to provide proper switch function. If bushings are missing or damaged, replace switch housing.

2. See Figure 7-112. Verify that bushings (2) are in place on both switch housings.
3. See Figure 7-113. Mate electrical connectors (3). Route harness through fingers (4) and into channel in switch pack.

NOTE

See Figure 7-112. Shield (3) must be in place to provide proper switch function. If shield becomes loose during disassembly or assembly, hold shield in place while installing switch pack and inner switch housing. Replace the switch pack if the shield is missing or deformed.

4. See Figure 7-113. Place module on handlebar. Rotate switch (1) up and snap latch (2) into place.
5. Verify that wire harness is in the recess at bottom of handlebar.
6. Install switch housings. Tighten screws (5) until snug.
7. See Figure 7-110. Install clutch control assembly. Position for rider comfort.
   a. Engage ear (1) in recess (2).
   b. Rotate into position.
   c. Install clamp (4) and screws (3).
8. Position control for rider comfort. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
9. Tighten switch housing screws to 35-45 **in-lbs** (4.0-5.0 Nm).
10. See Figure 7-112. Slide trigger finger switch cap (1) until it clicks into place.

⚠WARNING

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

11. Test switches for proper operation.

⚠WARNING

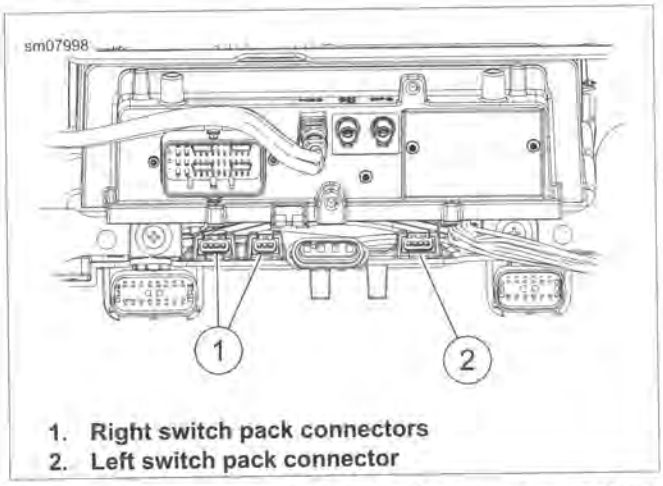
The left hand control switch pack controls the clutch interlock. A motorcycle with the wrong switch pack installed can start in gear causing loss of control, which could result in death or serious injury. Verify clutch interlock function whenever switch pack is replaced. (00632b)

12. Verify clutch interlock operation. Perform the following steps in order. Do not skip any steps. If any test fails, stop and diagnose the condition before proceeding.
    a. Remove spark plug cables from spark plugs.
    b. Straddle vehicle. Press and hold the rear brake pedal.
    c. Turn ignition switch ON. Turn the run/stop switch to RUN.
    d. Shift into neutral and release the clutch lever. Briefly push the start switch. The starter should operate.
    e. Shift into the highest gear. Pull in the clutch lever and briefly press the start switch. The starter should operate.
    f. With the clutch lever released and transmission in gear, briefly press the start switch. The starter should not operate.
    g. Turn off the ignition and run/stop switches.
    h. Install spark plug cables.

SWITCH PACK HARNESS

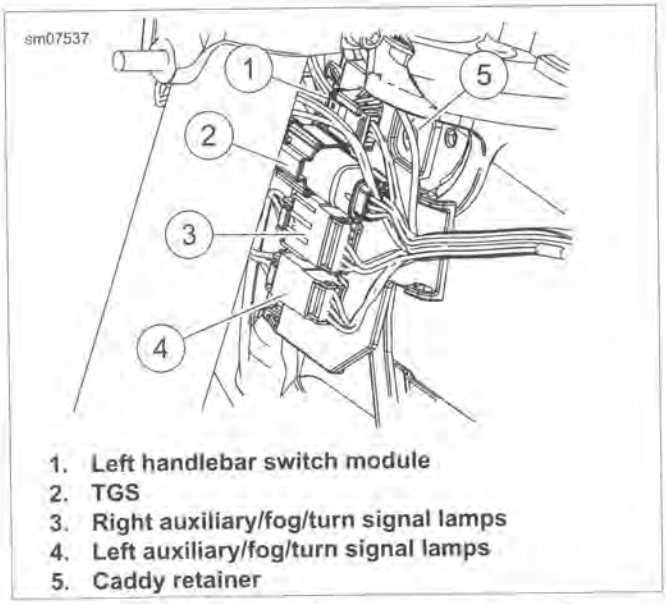
Removal

1. **Fairing models:** Remove outer fairing and dash panel. See 2.37 UPPER FAIRING AND WINDSHIELD and 2.38 DASH PANEL respectively.
2. **FLHR/C models:** Remove handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.
3. Remove switch module. See 7.37 HANDLEBAR SWITCH PACKS, Removal.
4. Disconnect harness from switch module.
5. Release harness from handlebar:
   a. **Fairing models:** Cut cable strap securing harness to handlebar.
   b. **FLHR/C models:** Remove two retainers from handlebar. Remove retainers from harness.
6. Disconnect switch pack harness from main harness:
   a. See Figure 7-114. Fairing models: Disconnect from forward caddy.
   b. See Figure 7-115 or Figure 7-116. FLHR/C: Disconnect from steering head caddy.
7. Pull harness forward to remove.



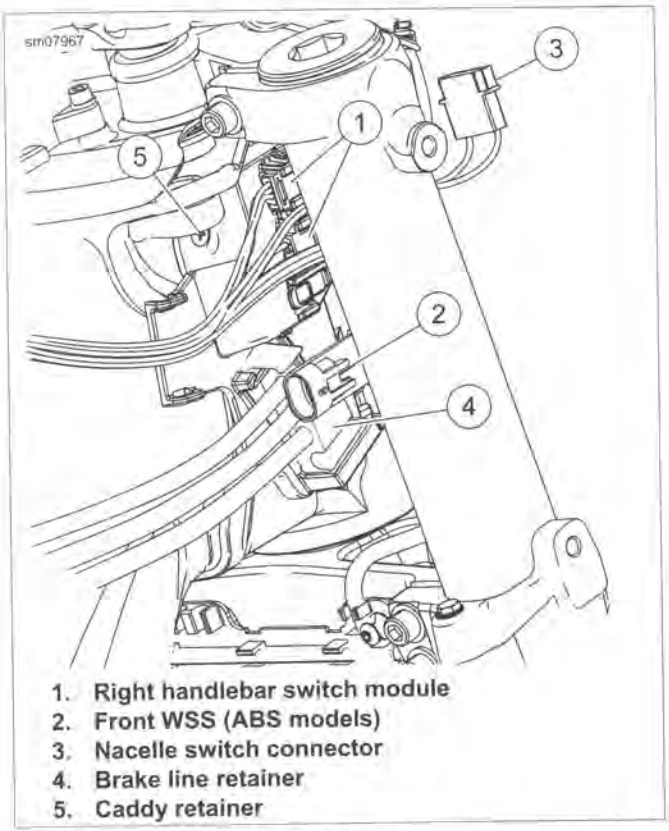
1. **Right switch pack connectors**
2. **Left switch pack connector**

Figure 7-114. Handlebar Switch Pack Connectors: Fairing Models



1. **Left handlebar switch module**
2. **TGS**
3. **Right auxiliary/fog/turn signal lamps**
4. **Left auxiliary/fog/turn signal lamps**
5. **Caddy retainer**

Figure 7-115. Left Side Connectors: Road King



1. **Right handlebar switch module**
2. **Front WSS (ABS models)**
3. **Nacelle switch connector**
4. **Brake line retainer**
5. **Caddy retainer**

Figure 7-116. Right Side Connectors: Road King

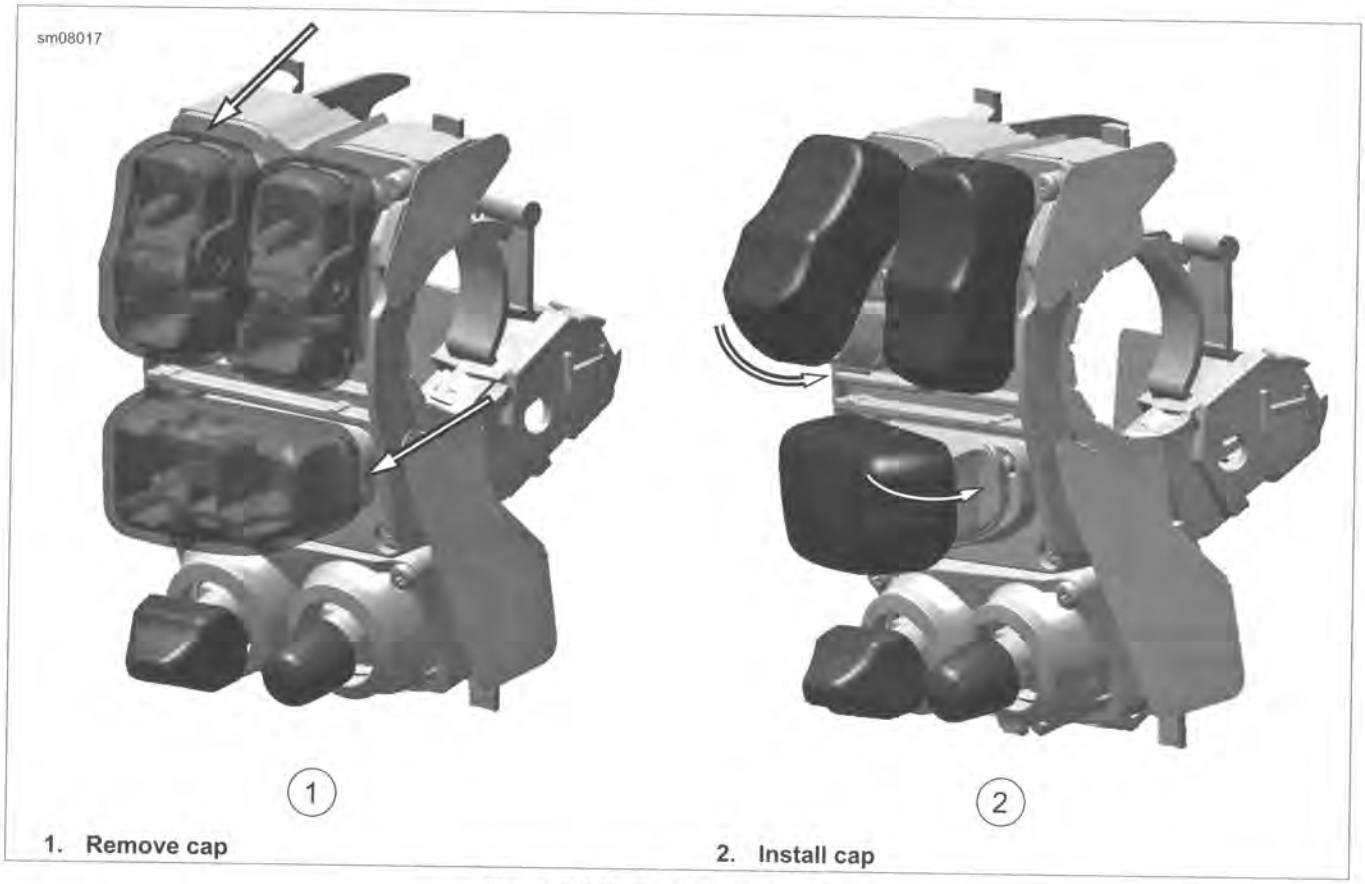
Installation

1. Route harness rearward between handlebar and upper fork bracket. Continue to the switch module.
2. Connect harness to switch module. Install switch module and housings. See 7.37 HANDLEBAR SWITCH PACKS, Installation.

3. Connect switch module harness to main harness:
   a. See Figure 7-114. Fairing models: Install to connectors on forward caddy.
   b. See Figure 7-115. FLHR/C: Install to connectors steering head caddy.
4. Secure harness to handlebar:
   a. **Fairing models:** Install **new** cable strap securing harness to handlebar.
   b. **FLHR/C models:** Install two retainers to holes in handlebar.
5. **Fairing models:** Install outer fairing and dash panel. See 2.37 UPPER FAIRING AND WINDSHIELD and 2.38 DASH PANEL respectively.
6. **FLHR/C models:** Install handlebar clamp shroud. See 2.42 HEADLAMP NACELLE: ROAD KING MODELS.

HANDLEBAR SWITCH CAPS

1. Remove handlebar switch housing. See 7.37 HANDLEBAR SWITCH PACKS, Removal.
2. Remove switch cap:
   a. **Rocker switch caps:** See Figure 7-117. Entering from the end, carefully pry between the switch cap and switch plunger. Remove switch cap.
   b. **Toggle and joystick caps:** Grasp with pliers and pull straight off. Removal will destroy cap.
3. Remove switch cap:
   a. **Rocker switch caps:** Hook **new** cap on one end and rotate into place. An audible snap will be heard when securely installed.
   b. **Toggle and joystick caps:** Push straight on with finger.
4. Install switch housing. See 7.37 HANDLEBAR SWITCH PACKS, Installation.



1. **Remove cap**
2. **Install cap**

Figure 7-117. Replace Switch Caps

GENERAL

The TSSM and HFSM use batteries in the fob and siren. These are the only parts requiring periodic maintenance.

FOB BATTERY

Battery Replacement Schedule

Replace the fob battery every year.

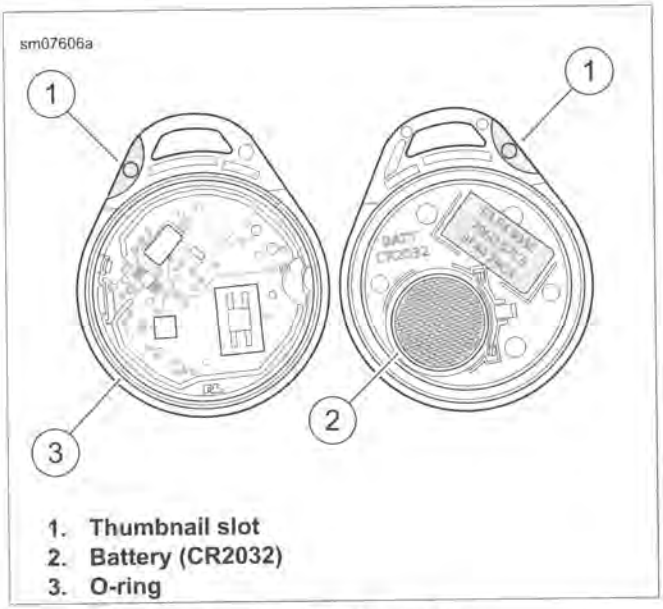
Battery Replacement

1. Open the fob case.
   a. See Figure 7-118. Place a thin blade in the thumbnail slot (1) between the two halves of the case.
   b. Slowly twist the blade.

NOTE

Use a CR2032 or equivalent battery.

2. Replace the battery.
   a. Remove the original battery.
   b. Install a **new** battery with the positive side down.
3. Close the case.
   a. See Figure 7-118. With O-ring (3) in place, align case halves.
   b. Snap case halves together.



1. **Thumbnail slot**
2. **Battery (CR2032)**
3. **O-ring**

Figure 7-118. Open Fob

SMART SIREN (IF INSTALLED)

Battery Replacement Schedule

The siren's internal 9V battery is rechargeable and does not require replacement on a regular basis. Battery life under normal conditions is approximately three to six years.

NOTE

The internal siren battery may not charge if the motorcycle's battery is less than 12.5V.

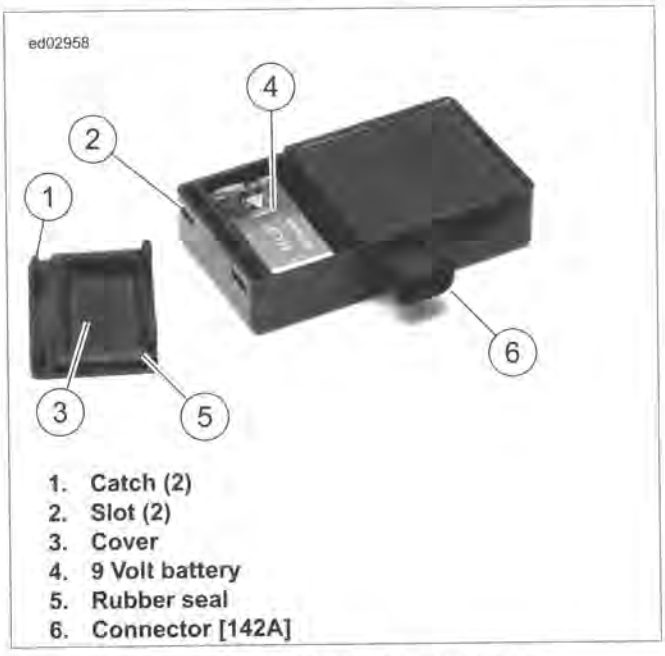
Battery Replacement

1. Disarm system and remove siren.
2. See Figure 7-119. With a small screwdriver or pick, push the catches (1) in through the two slots (2) in the end of the siren to release the battery cover (3).

NOTES

- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on **new** battery.*
- *Use only a 9V nickel metal hydride battery in the siren.*

3. Replace battery (4) by removing old battery from polarized battery clip.
4. Recharge and install or install a **new** 9V nickel metal hydride battery.
5. Install battery cover (3).
   a. Carefully replace the rubber seal (5) on the cover.
   b. Align battery cover with case placing round corners on cover away from connector [142A] (6).
   c. Snap cover into place.
6. Install siren and check operation. Two chirps after an arming command indicate a working siren.



1. **Catch (2)**
2. **Slot (2)**
3. **Cover**
4. **9 Volt battery**
5. **Rubber seal**
6. **Connector [142A]**

Figure 7-119. Battery Compartment

HFSM ANTENNA

Removal

1. Remove seat.

2. See Figure 7-120. Release HFSM antenna (6) from top caddy.
3. Disconnect HFSM antenna harness.

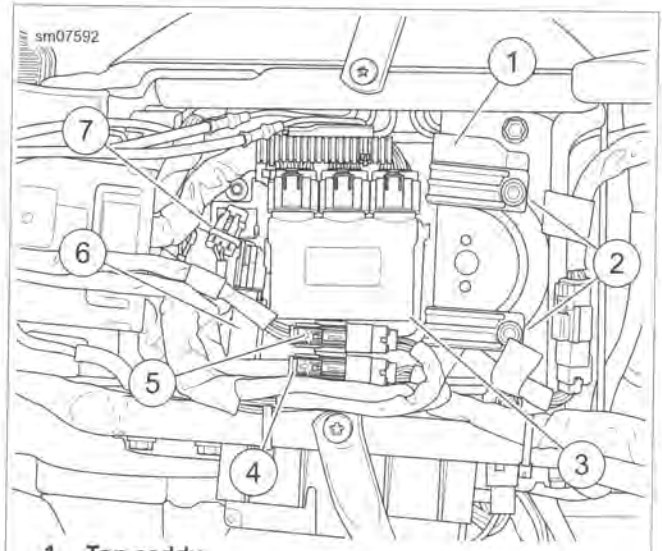
Installation

1. See Figure 7-120. Connect HFSM antenna (2) to harness.
2. Engage groove on HFSM antenna on tongue at front of top caddy.

⚠WARNING

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

3. Install seat.
4. Test all security system functions.



1. Top caddy
2. Screw (2)
3. ECM
4. Connector, grey
5. Connector, black
6. HFSM antenna
7. Purge valve solenoid

Figure 7-120. Top Caddy

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 7-17.

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 7-17. Changing the PIN: HFSM

STEP	ACTION	CONFIRMATION	NOTES
1	Select a five-digit (1 through 9) PIN and record in the owner's manual and on the wallet card.		
2	With fobs present, cycle ignition switch IGNITION-OFF-IGNITION-OFF-IGNITION.		
3	Press **left** turn signal button twice.	Turn signals flash 3 times.	
4	Press **right** turn signal button once.	Current PIN will appear in odometer. The first digit will flash.	
5	Enter first digit (a) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
6	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The second digit flashes.	
7	Enter second digit (b) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
8	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The third digit flashes.	
9	Enter third digit (c) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
10	Press **right** turn signal button once.	The new digit replaces the dash in the odometer. The fourth digit flashes.	
11	Enter fourth digit (d) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
12	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The fifth digit flashes.	
13	Enter fifth digit (e) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
14	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The first digit flashes.	
15	Turn the ignition switch to **OFF**.		Turning ignition switch to OFF stores PIN.

SIDECAR CONFIGURATION

⚠WARNING

Do not add sidecar to this motorcycle. Operating motorcycle with sidecar can cause loss of vehicle control, which could result in death or serious injury. (00590d)

ACTUATION

Activation consists of assigning two fobs to the system and entering an initial PIN. The PIN can be changed by the owner. See 7.39 PERSONAL IDENTIFICATION NUMBER (PIN), Changing The PIN.

1. Configure vehicles by assigning both fobs to the vehicle.
2. Configure vehicles by entering a PIN picked by the owner. The personal code allows the owner to operate the system if the fob is lost or inoperable. Record the PIN in the owner's manual. Instruct the customer to carry a copy (use the wallet card found in the owner's manual). See 7.39 PERSONAL IDENTIFICATION NUMBER (PIN).

Once the system has been activated, it will "arm" within 5 seconds of switching the OFF/RUN switch to OFF and no motorcycle motion.

FOB ASSIGNMENT

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Use DIGITAL TECHNICIAN II (Part No. HD-48650) to assign both fobs to the H-DSSS. Follow the menu prompts to scan the fob serial number with the bar code reader. Alternatively, enter the number using the keyboard. The initial PIN entry should be performed using DIGITAL TECHNICIAN II (Part No. HD-48650) in conjunction with fob assignment.

NOTE

Each fob has a unique serial number. Attach fob label to a blank NOTES page in the owner's manual for reference.

REMOVAL

1. Remove left side saddlebag. See 2.31 SADDLEBAGS.
2. Remove left side cover.
3. With security fob present, turn ignition on.
4. See Figure 7-122. Remove main fuse (3).

NOTES

Brazil markets with anti-theft module:

- *See Figure 7-121. The anti-theft tracking module is combined with the security siren. An antenna is hard wired to the anti-theft module and needs to be detached from its mounting position.*
- *Cutting antenna wire will activate anti-theft device. See the electrical diagnostic manual for more information.*
- *Note the routing of the anti-theft module antenna wire for installation.*

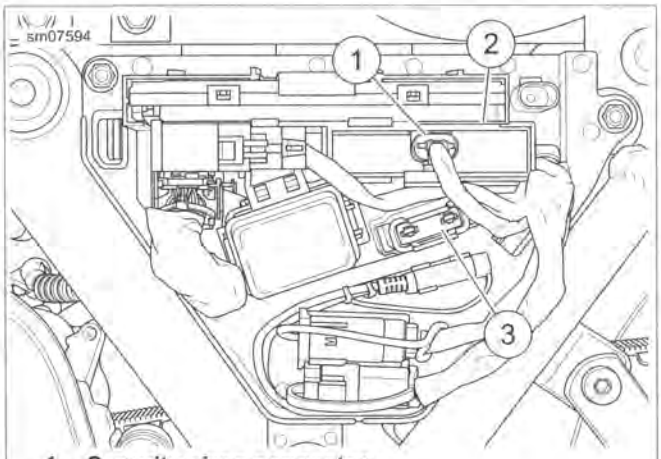
5. Disconnect security siren connector [142] (1).
6. Remove security siren (2).

1. **Anti-theft module**
2. **Antenna**

Figure 7-121. Anti-Theft Module (Brazil market)

INSTALLATION

1. See Figure 7-122. Install security siren (2).
2. Connect security siren connector [142] (1).
3. Install main fuse (3) into holder.
4. Install left side cover.
5. Install left side saddlebag. See 2.31 SADDLEBAGS.



1. **Security siren connector**
2. **Security siren**
3. **Main fuse**

Figure 7-122. Security Siren

NOTES

SUBJECT	PAGE NO.
A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTORS	A-1
A.2 BOSCH COMPACT 1.1M CONNECTOR	A-2
A.3 BOSCH BTC SEALED CONNECTOR	A-3
A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR	A-6
A.5 DELPHI 150 METRI-PACK SEALED CONNECTORS	A-8
A.6 DELPHI 280 METRI-PACK UNSEALED CONNECTORS	A-10
A.7 DELPHI 480 METRI-PACK UNSEALED CONNECTORS	A-11
A.8 DELPHI 630 METRI-PACK UNSEALED CONNECTORS	A-12
A.9 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING	A-13
A.10 DELPHI METRI-PACK TERMINAL REPAIR	A-14
A.11 DELPHI MICRO 64 SEALED CONNECTORS	A-16
A.12 DELPHI GT 150 SEALED CONNECTORS	A-19
A.13 DEUTSCH DT SEALED CONNECTORS	A-21
A.14 DEUTSCH DT SEALED TERMINAL REPAIR	A-25
A.15 DEUTSCH DTM SEALED MINI TERMINAL REPAIR	A-26
A.16 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR	A-27
A.17 JAE MX19 SEALED CONNECTORS	A-29
A.18 MOLEX CMC SEALED CONNECTORS	A-30
A.19 MOLEX MX 150 SEALED CONNECTORS	A-32
A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR	A-36
A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR	A-38
A.22 TYCO GET 64 SEALED CONNECTOR	A-41
A.23 TYCO MCP SEALED CONNECTOR	A-43
A.24 SEALED SPLICE CONNECTORS	A-45

NOTES

AUTOFUSE UNSEALED ELECTRICAL CONNECTORS

AUTOFUSE UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
GA500A	SNAP-ON TERMINAL PICK

General

Autofuse Unsealed connector terminals are found in ignition switches and some fuse blocks.

Disassembly

1. See Figure A-1 or Figure A-2. Insert smallest pair of pins on the SNAP-ON TERMINAL PICK (Part No. GA500A) into chamber on mating end of socket housing to press tangs on each side of terminal simultaneously.
2. Gently pull on wire to remove terminal from wire end of socket housing.
3. If necessary, crimp **new** terminals on wires.

Assembly

1. Carefully bend tang on each side of terminal outward away from terminal body. Use the thin flat blade from a hobby knife.
2. With the open side of the terminal facing rib on wire end of socket housing, insert terminal into chamber until it locks in place.

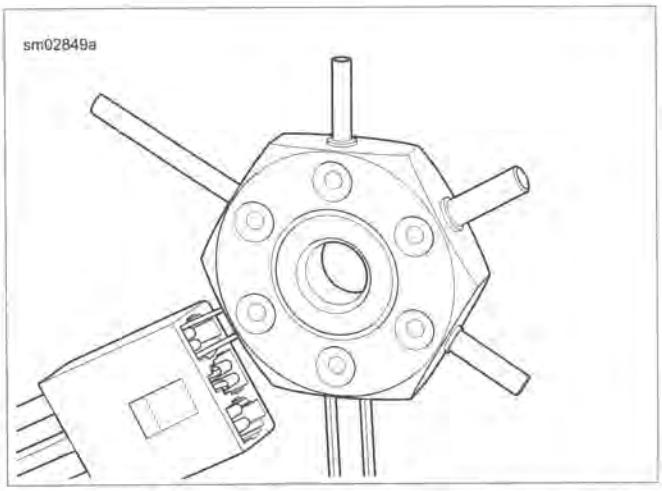


Figure A-1. Removing Autofuse Unsealed Terminal from Ignition Switch

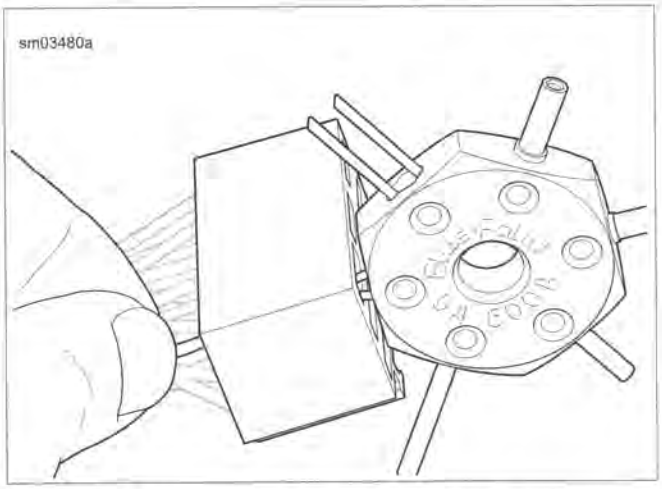


Figure A-2. Removing Autofuse Unsealed Terminal from Fuse Block

BOSCH COMPACT 1.1M CONNECTOR

PART NUMBER	TOOL NAME
GA500A	SNAP-ON TERMINAL PICK

General

See Figure A-3. The Bosch Compact 1.1M connector is found on MAP and TMAP sensors.

Housings

Separate: Snap back the secondary lock. Press on the latch while pulling the socket connector from the sensor.

Join: Align the sockets and press the housings together until the latch snaps. Snap in the secondary lock.

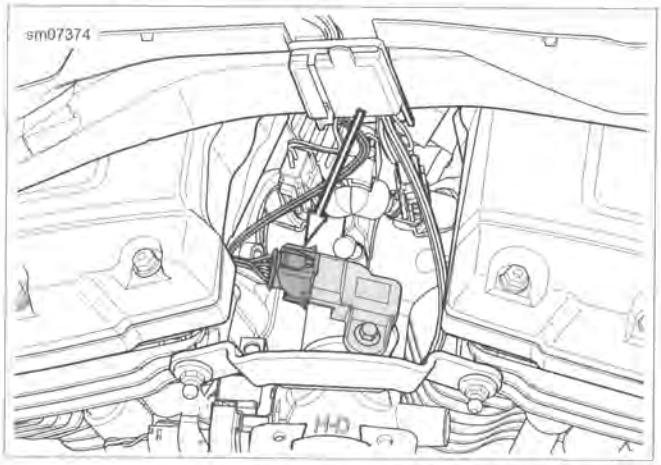


Figure A-3. Bosch Compact 1.1M Connector

Removing Socket Terminal

1. See Figure A-4. Slide the locking bar off the terminal housing.
2. Insert the smallest pins of the SNAP-ON TERMINAL PICK (Part No. GA500A) into the gaps on each side of the socket to compress the tangs on each side of the terminal.
3. Gently pull on the wire to remove the terminal.

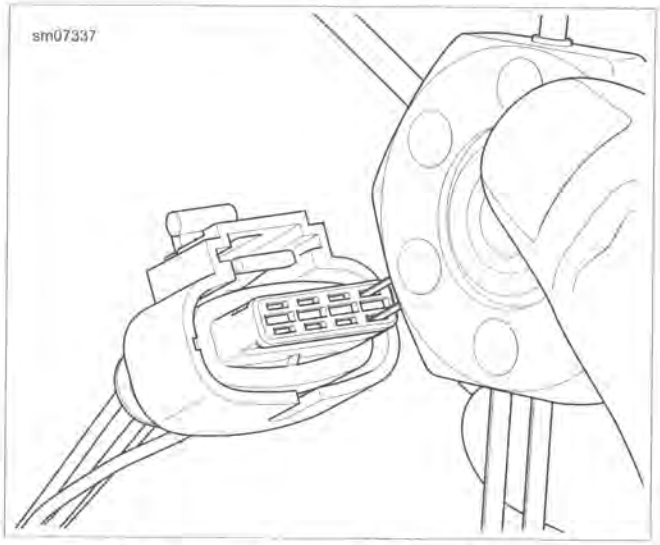


Figure A-4. Terminal Removal: Bosch Compact 1.1M Connector

Installing Socket Terminal

1. See Figure A-5. Use a hobby knife to bend the tangs on each side of the terminal outward.
2. Align terminal to socket housing. Press terminal into housing until it snaps.

NOTE

The teeth on the locking bar face down.

3. Slide the locking bar onto the connector.

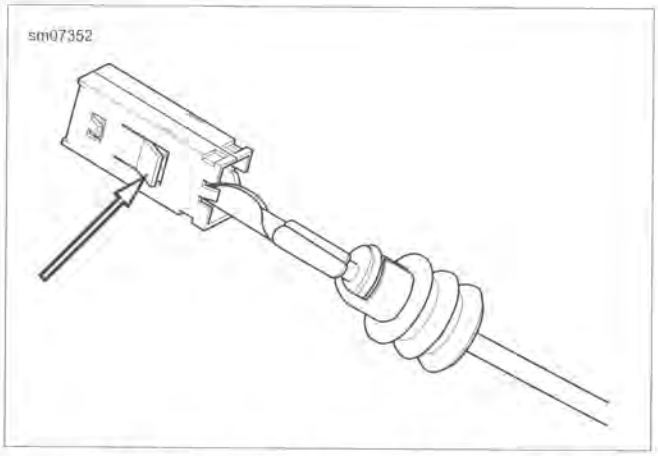


Figure A-5. Tangs: Bosch Compact 1.1M Socket Terminal

BOSCH BTC SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B50085	TERMINAL EXTRACTOR TOOL
HD-50120-A	BOSCH TERMINAL REPAIR KIT

The Bosch BTC sealed connector is used to connect the ABS module to the wire harness on Touring models.

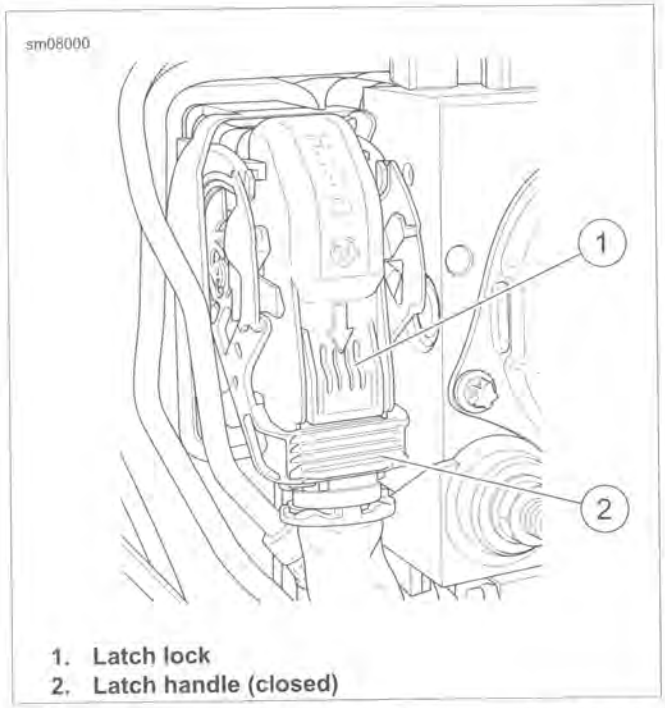
Plugging and Unplugging Connector

1. See Figure A-6. To unplug connector:
   a. While pressing latch lock (1), lift latch handle (2).
   b. See Figure A-7. Raise latch handle into the full upward (open) position (1).
   c. Pull connector straight out of socket.

NOTE

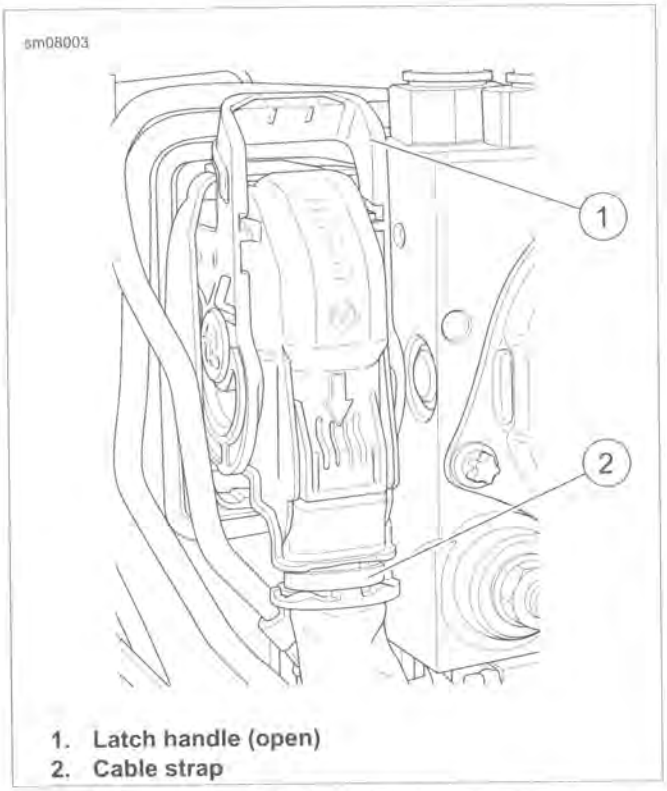
Do not attempt to close latch handle while connector is out of socket. Damage to latch mechanism could result.

2. To plug in connector:
   a. Insert connector. Press gently into socket.
   b. Pull latch handle down (closed) until it clicks.



1. Latch lock
2. Latch handle (closed)

Figure A-6. Bosch BTC Sealed Connector (Latched)

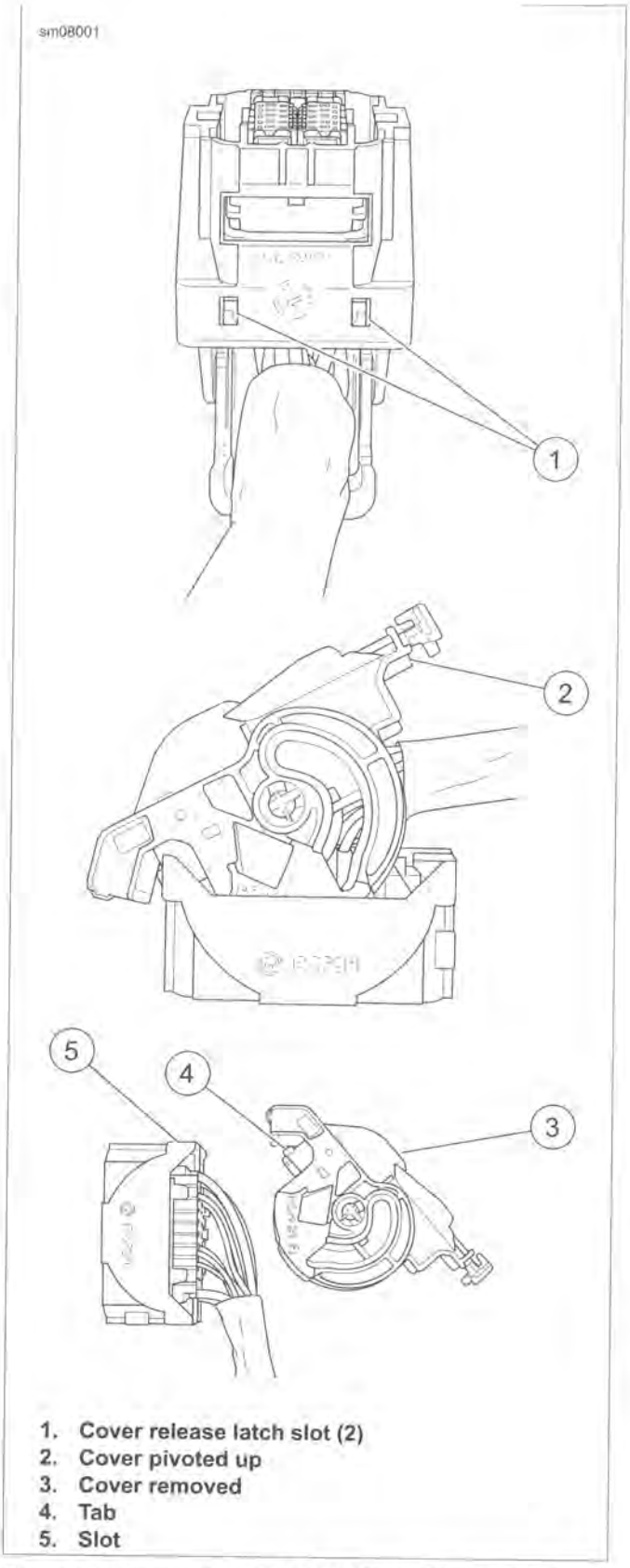


1. Latch handle (open)
2. Cable strap

Figure A-7. Bosch BTC Sealed Connector (Unlatched)

Removing and Installing Connector Cover

1. To remove connector cover:
   a. See Figure A-7. Remove and discard cable strap (2).
   b. See Figure A-8. Insert the blade of a small screwdriver into cover release latch (1) slot.
   c. Gently pry the cover away from the tab on the body of the connector. Repeat for other release latch slot.
   d. Grasp cover and pivot up (2) and away from connector.
2. To install connector cover:
   a. See Figure A-8. Start cover into connector body at an angle. Engage tabs (4) in slots (5).
   b. Rotate cover down onto body until an audible click is heard, indicating that cover is locked in place.
   c. See Figure A-7. Install **new** cable strap (2).



1. Cover release latch slot (2)
2. Cover pivoted up
3. Cover removed
4. Tab
5. Slot

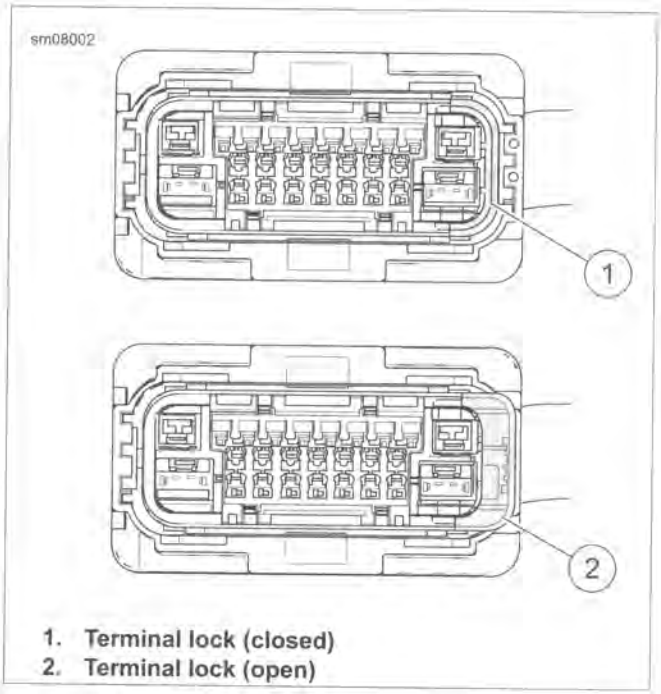
Figure A-8. Removing Bosch BTC Sealed Connector Cover

Removing and Installing Wire Terminals

NOTE

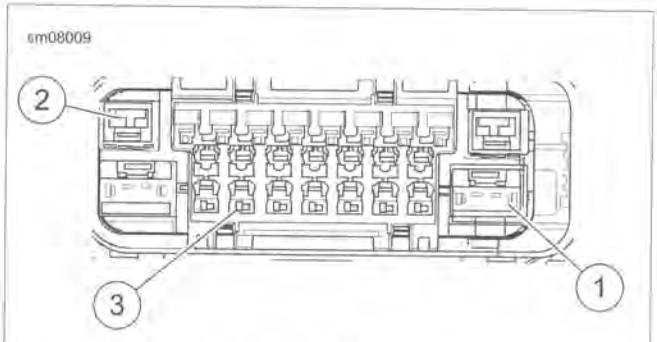
See Figure A-10. The Bosch BTC Sealed connector has three sizes of terminals: 12 gauge, 14 gauge and 20 gauge.

1. To remove terminals from connector:
   a. See Figure A-9. With the blade of a small screwdriver, gently pry the terminal lock (1) open (2).
   b. See Figure A-10. Insert TERMINAL EXTRACTOR TOOL (Part No. B50085) into cavity next to terminal being removed. Carefully pry terminal latch back. Grasp wire and gently pull terminal from terminal cavity.
2. To install terminals in connector:
   a. Carefully insert terminal with wire lead into appropriate terminal cavity.
   b. Gently push terminal into cavity until it clicks, indicating that it is locked in place.
   c. When all terminals are in place, use the blade of a small flat screwdriver to pry the terminal lock closed (1).



1. Terminal lock (closed)
2. Terminal lock (open)

Figure A-9. Bosch BTC Sealed Connector Terminal Lock



1. 12 ga terminal cavity (2)
2. 14 ga terminal cavity (2)
3. 20 ga terminal cavity (22)

Figure A-10. Bosch BTC Sealed Connector Terminals

Crimping Terminals to Leads

The BOSCH TERMINAL REPAIR KIT (Part No. HD-50120-A) contains the crimper tool, dies and all terminals necessary to repair the Bosch BTC sealed connector. For the correct terminal crimping procedure, refer to the instruction sheet provided with the tool or available through h-dnet.com.

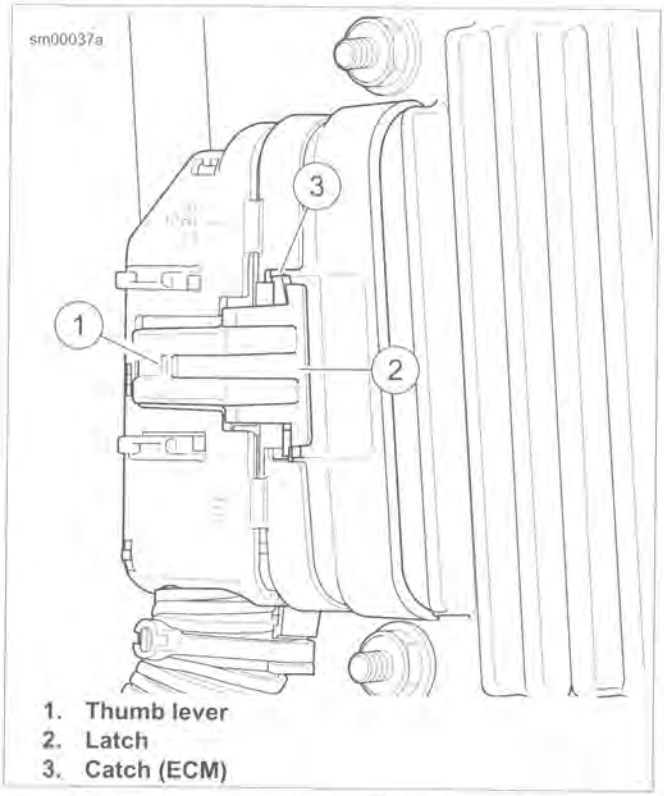
DELPHI 100W MICRO-PACK SEALED CONNECTOR REPAIR

General

A Delphi 100W Micro-Pack Sealed connector connects the electronic control module (ECM) to the main harness.

Separating Socket Housing From ECM

See Figure A-11. While pressing the connector into the ECM, press the thumb lever (1) against the connector until the latch (2) pops out of the catch (3) on the ECM.

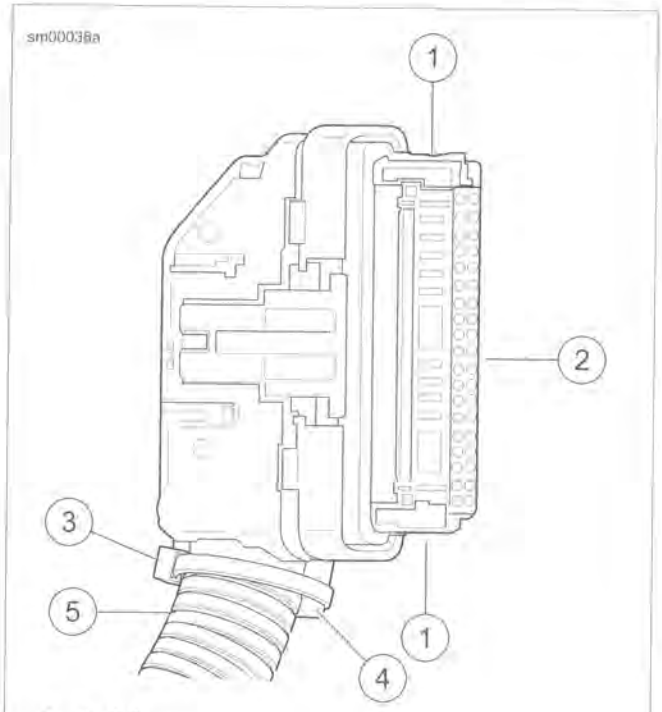


1. Thumb lever
2. Latch
3. Catch (ECM)

Figure A-11. Delphi 100W Micro-Pack Sealed Connector to ECM

Mating Socket Housing To ECM

Push the connector into the ECM until the latch is captured by the catch on the ECM.



1. Latch
2. Secondary lock
3. Cable strap
4. Strain relief collar
5. Conduit

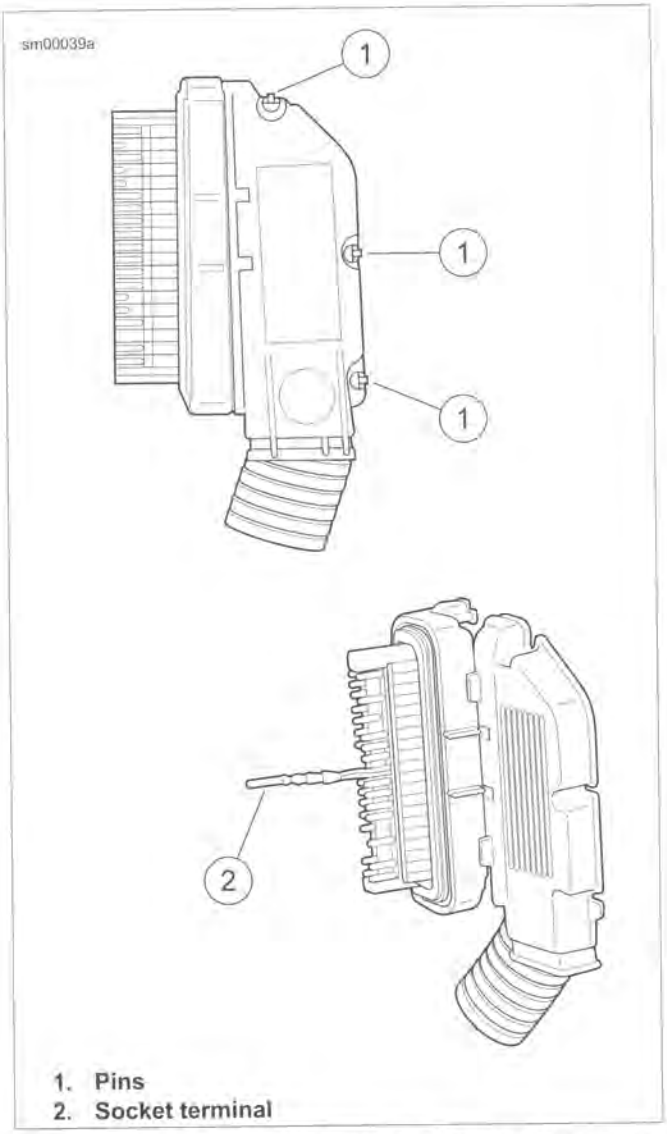
Figure A-12. Delphi 100W Micro-Pack Sealed Connector

Removing Socket Terminal

1. See Figure A-12. To remove, gently press latch (1) on each side of the clear plastic secondary lock (2). For best results, release one side at a time.
2. Carefully cut cable strap (3) to free strain relief collar (4) from conduit (5).
3. See Figure A-13. Using a thin blade, gently pry at seam at back of socket housing to release three plastic pins (1) from slots in housing. Separate and spread halves of socket housing.
4. Push on wire lead to free terminal from chamber.

Installing Socket Terminal

1. From inside socket housing, gently pull on wire to draw terminal into chamber.
2. Exercising caution to avoid pinching wires, press halves of socket housing together until three plastic pins fully engage slots in housing.
3. Install **new** cable strap in groove of strain relief collar capturing cable conduit.
4. With the two ribs on the secondary lock on the same side as the external latch, install over terminals until latches lock in place.



1. Pins
2. Socket terminal

Figure A-13. Delphi 100W Micro-Pack Sealed Connector: Separate Halves of Socket Housing

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-7	DELPHI 100W MICRO-PACK SEALED DIE

1. Strip the wire insulation to specification. Refer to Table A-1.
2. Install the DELPHI 100W MICRO-PACK SEALED DIE (Part No. HD-50120-7) in the handle of the HAND CRIMP FRAME (Part No. HD-50120-2) of the UNIVERSAL CRIMPER SET (Part No. HD-50120).
3. Place the **new** terminal in the specified nest.
4. Insert the wire to the wire stop. Crimp the terminal.
5. Inspect the crimped terminal.

Table A-1. Delphi 100W Micro-Pack Crimper Die (Part No. HD-50120-7)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Socket: 18 AWG	72076-00	0.200	5.1	B
Socket: 20-22 AWG	72568-08	0.200	5.1	C

DELPHI 150 METRI-PACK SEALED CONNECTOR REPAIR

General

Delphi 150 Metri-Pack Sealed connectors are embossed with the initials (P.E.D.).

There are two types of connectors in this series:

- Pull-to-Seat
- Push-to-Seat

Separating Pin and Socket Housings

Bend back the external latch slightly and separate the pin and socket halves of the connector.

Mating Pin and Socket Housings

Align the wire colors. Push the pin and socket halves of the connector together.

Removing Socket Terminal

1. See Figure A-14 for pull-to-seat connector or Figure A-15 for push to seat connector. Remove wire lock (1) from wire end of socket housing on push-to-seat type connectors.

NOTE

For best results, free one side of wire lock first and then release the other side.

2. Find the locking tang in the mating end of the connector.

NOTE

The tangs are always positioned in the middle of the chamber. The tangs are on the same side as the external latch.

3. Gently insert a small diameter straight pin into the chamber about 1/8 in (3.2 mm).
   a. **For pull-to-seat:** Stay between the terminal and the chamber wall and pivot the end of the pin toward the terminal body.
   b. **For push-to-seat:** There is a small opening for the pin.
4. When a click is heard, remove the pin and repeat the procedure.

NOTE

The click is the sound of the tang returning to the locked position as it slips from the point of the pin.

5. Pick at the tang until the clicking stops and the pin seems to slide in deeper. This indicates the tang is pressed in.

NOTE

After repeated terminal extractions, the click may not be heard, but pivot the pin as if the click was heard at least three times.

6. Remove the pin.
   a. **For pull-to-seat:** Push on the lead to extract the terminal from the mating end of the connector.
   b. **For push-to-seat:** Pull on the lead to draw the terminal out the wire end.

Inserting Socket Terminal

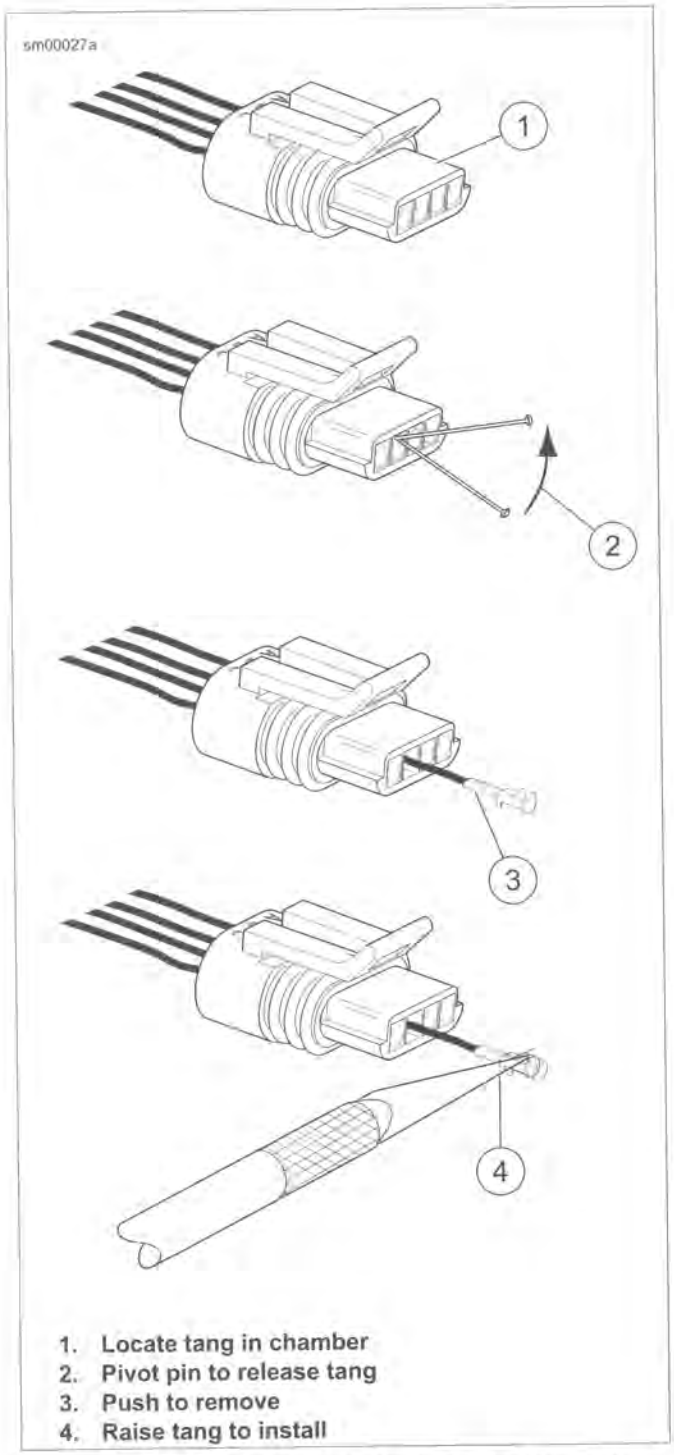
NOTE

For wire location purposes, alpha characters are stamped into the socket housings.

1. See Figure A-14 for pull-to-seat connector or Figure A-15 for push to seat connector. Carefully bend tang on each side of terminal outward away from terminal body. Use the thin flat blade from a hobby knife.
2. Gently pull or push on the lead to install the terminal back into the chamber. A click is heard when the terminal is properly seated.
3. Gently pull or push on the lead to verify that the terminal is locked in place.

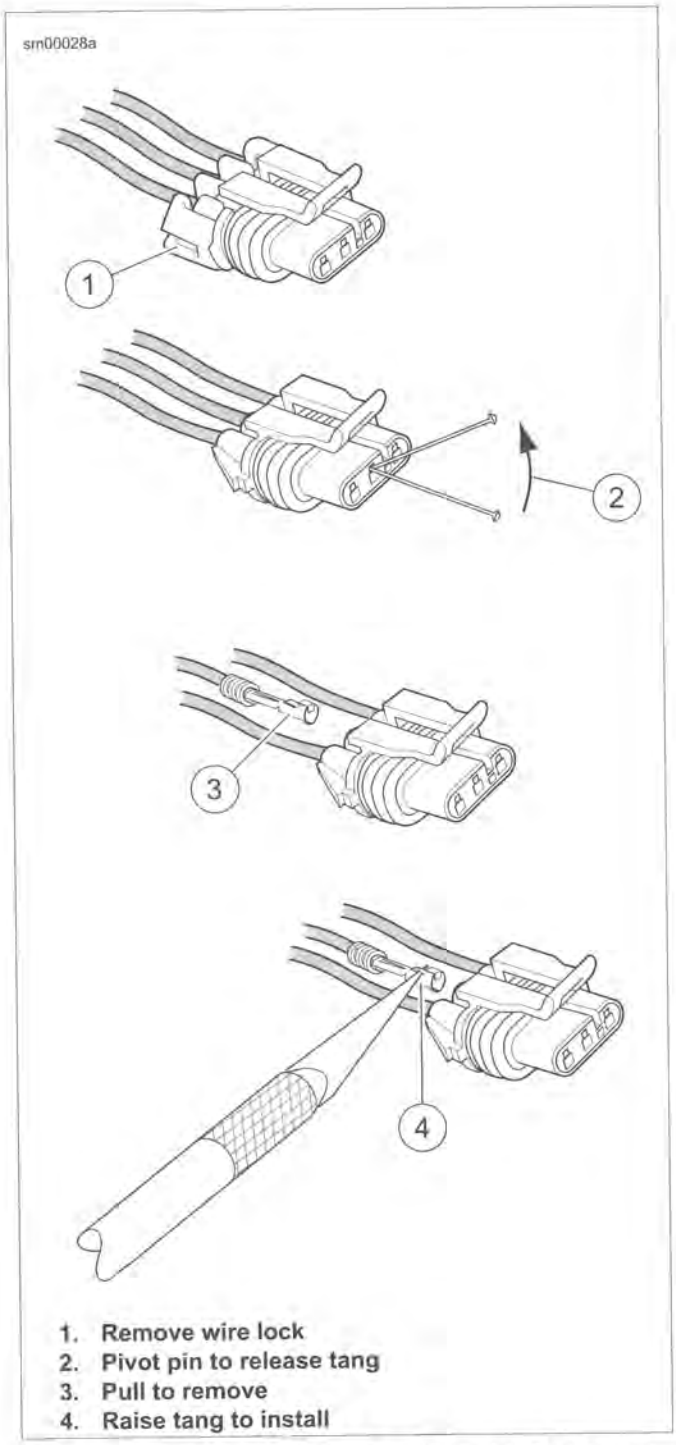
NOTE

***For push-to-seat:** See Figure A-15. Seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.*



1. Locate tang in chamber
2. Pivot pin to release tang
3. Push to remove
4. Raise tang to install

Figure A-14. Delphi 150 Metri-Pack Sealed Connector: Pull-to-Seat



1. Remove wire lock
2. Pivot pin to release tang
3. Pull to remove
4. Raise tang to install

Figure A-15. Delphi 150 Metri-Pack Sealed Connector: Push-to-Seat

FUSE BLOCK REPAIR

Removing Socket Terminals

1. See Figure A-16. To remove secondary locks, insert end of small flat blade screwdriver (1) under lip of locking wedge (2) and gently pry up secondary lock.

NOTE

For best results, start with locking wedge on outboard side of secondary lock.

2. Looking into chamber at top of fuse block, note the tang next to each socket terminal.
3. Use the thin flat blade from a hobby knife. Gently push tang away from terminal and tug on wire to back terminal out.

Installing Socket Terminals

1. Match the wire lead color to the fuse block terminal cavity.

NOTES

- *Refer to the main harness wiring diagram for wire lead color codes.*
- *See Figure A-17. Alpha (1) and numeric (2) coordinates identify the main fuse block terminal cavity. Refer to the main harness wiring diagram.*

2. With the open side of the socket terminal facing the tang, push lead into chamber at the wire end of the fuse block. A click is heard when the terminal is properly engaged.
3. Gently tug on the wire to verify that the terminal is locked in place.
4. Install the secondary locks. With the locking wedges positioned above the tangs in each chamber, slide flat side of secondary lock into slot between rows. Push down until it bottoms.

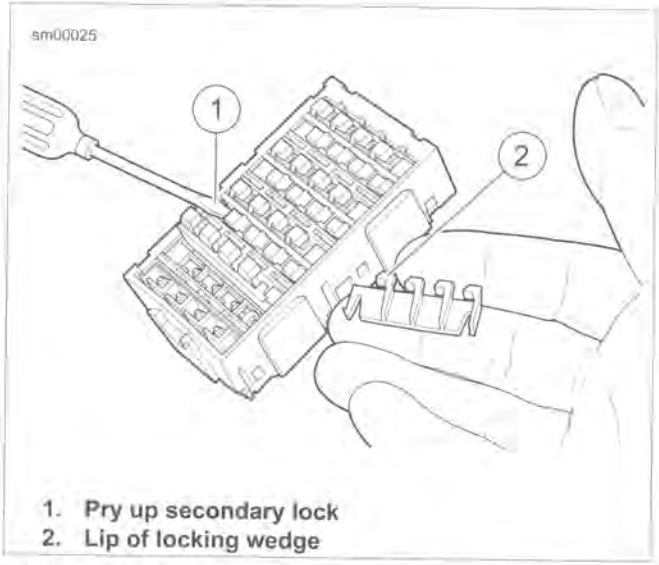
Crimping Terminals

Terminals are crimped twice: once over the wire core and a second time over the insulation/seal.

A correctly crimped terminal may require different crimping dies found on separate crimpers.

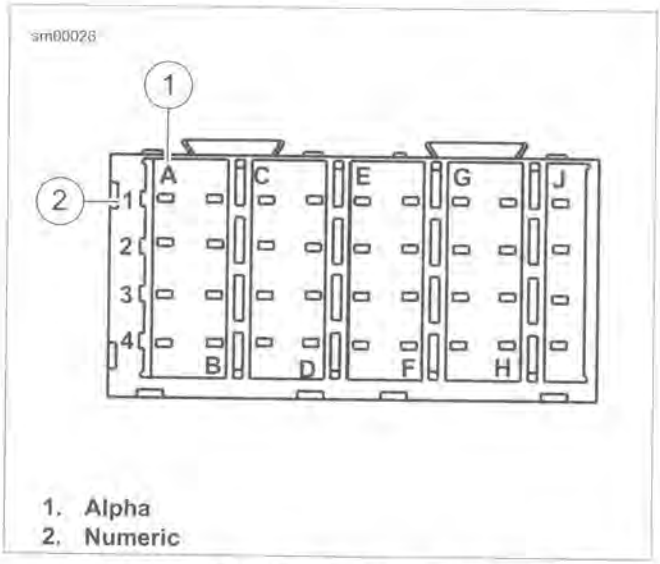
NOTE

The wiring diagram indicates when one socket terminal is being crimped to two wire leads.



1. **Pry up secondary lock**
2. **Lip of locking wedge**

Figure A-16. Fuse Block: Remove Secondary Locks



1. **Alpha**
2. **Numeric**

Figure A-17. Fuse Block: Coordinates (typical)

DELPHI 480 METRI-PACK UNSEALED CONNECTOR REPAIR

General

A 480 Metri-Pack connector is frequently used for the B+ (battery voltage) connector to power P&A accessories.

See Figure A-18. An AFL housing (5) is used on many ignition/light switches. The secondary lock (4) must be opened before removing the terminal from the housing.

Separating Pin and Socket Housings

NOTES

- *Record position of cable straps anchoring wire conduits of the pin and socket housing before removing them.*
- *Cut any cable strap anchoring the wire conduits of the pin (accessory connector housing) and the socket (B+) housing.*

See Figure A-18. Using small flat blade screwdriver, press button (1) on pin housing (red wire) side of the connector and pull apart the pin and socket housings.

Mating Pin and Socket Housings

Orient the latch on the socket housing to the button catch on the pin housing and press the housings together.

Removing Socket Terminals

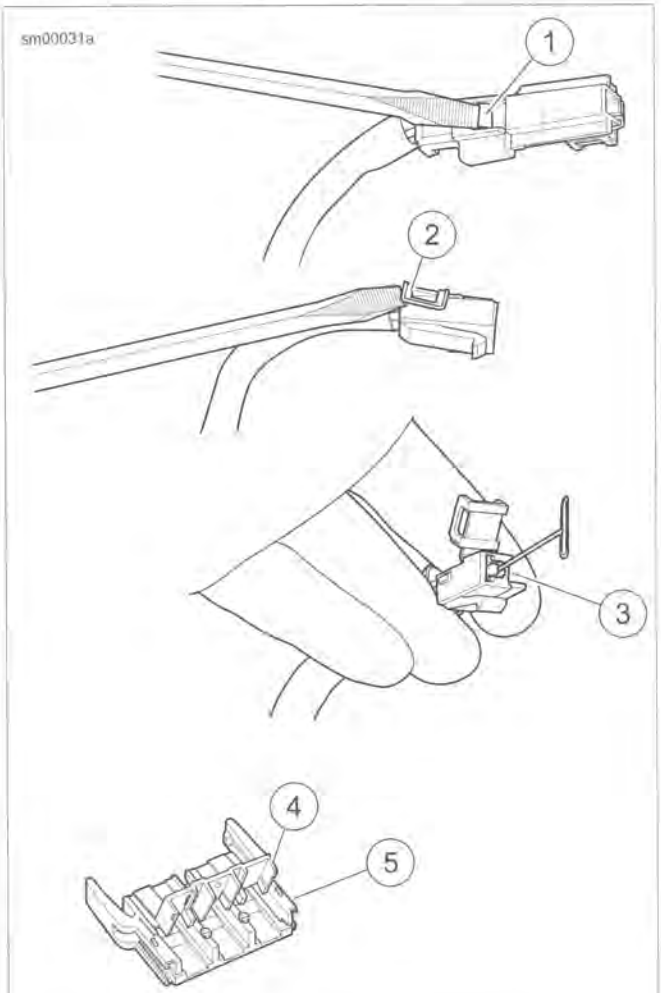
1. See Figure A-18. Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped opening centered next to the terminal. Gently insert the point of a stick pin or large safety pin into the opening (3) between the tang and the chamber wall until it stops.
3. Pivot the end of the pin toward the terminal body to press the tang.
4. Remove the pin and then pull terminal out of the wire end of connector housing.
5. If necessary, crimp **new** terminals on wires. See A.10 DELPHI METRI-PACK TERMINAL REPAIR.

Installing Socket Terminals

1. Carefully bend the tang outward away from the terminal body.
2. With the tang on the same side as the square shaped opening in the mating end of the connector housing, feed terminal into wire end of connector housing until it clicks in place.
3. Verify that terminal will not back out of the chamber. A slight tug on the cable will confirm that it is locked.
4. Rotate the hinged secondary lock inward until latches fully engage tabs on both sides of connector housing.

NOTE

*If removed, install **new** anchored cable strap in original equipment location. Tighten cable strap to capture conduit of both accessory connector and B+ connector approximately 1.0 in (25.4 mm) from housings.*



1. **Button on pin housing**
2. **Secondary lock latch**
3. **Opening between tang and chamber wall**
4. **Secondary lock (shown open)**
5. **AFL housing**

Figure A-18. Delphi 480 Metri-Pack Unsealed Connector: Remove Socket Terminal

DELPHI 630 METRI-PACK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
SNAP-ON TT600-3	SNAP-ON PICK

Separating Pin and Socket Housings

NOTE

If necessary, remove connector from barbed anchor or other retaining device.

Bend back the external latch slightly and separate pin and socket halves of the connector.

Mating Pin and Socket Housings

Orient the latch to the catch. Push the pin and socket halves of the connector together until the latch "clicks".

NOTE

If removed, install connector on barbed anchor or other OE retaining device.

Removing Socket Terminal

1. Bend back the latch slightly and free one side of the secondary lock. Repeat the step to unlatch the other side.
2. Rotate the secondary lock outward on hinge to view the terminals in the chambers of the connector housing. The locking tang is on the side opposite the crimp tails. It engages a rib in the chamber wall to lock the terminal in place.
3. Moving to the mating end of the connector, find the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. SNAP-ON TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to press the locking tang.
5. Remove the pick and gently tug on the wire to pull the terminal from the wire end of the connector. Repeat steps if the terminal is still locked in place.
6. If necessary, crimp **new** terminals on wires. See A.10 DELPHI METRI-PACK TERMINAL REPAIR.

Installing Socket Terminal

NOTE

Refer to the wiring diagrams to match wire lead colors to alpha characters molded into the secondary locks of each connector housing.

1. Carefully bend tang on each side of terminal outward away from terminal body. Use the thin flat blade from a hobby knife.
2. With the tang facing the chamber wall, push the lead into the chamber at the wire end of the connector. A click is heard when the terminal is properly seated.
3. Gently tug on wire ends to verify that all terminals are locked.
4. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING REPAIR

Removing Socket Terminals

⚠WARNING

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

1. Disconnect battery.
2. See Figure A-19. Disengage slots (1) on secondary lock (2) from tabs (3) and remove secondary lock.
3. Insert flat blade of pick or small screwdriver into opening (4) until it stops.
4. Tug on cable to pull socket from connector housing. Pivot the pick toward the terminal body to release the latch if necessary.
5. Repeat to remove remaining socket terminal.

NOTE

The battery positive cable and power wire for the main fuse are crimped together at the starter ring terminal. Replace both as an assembly if either requires replacement.

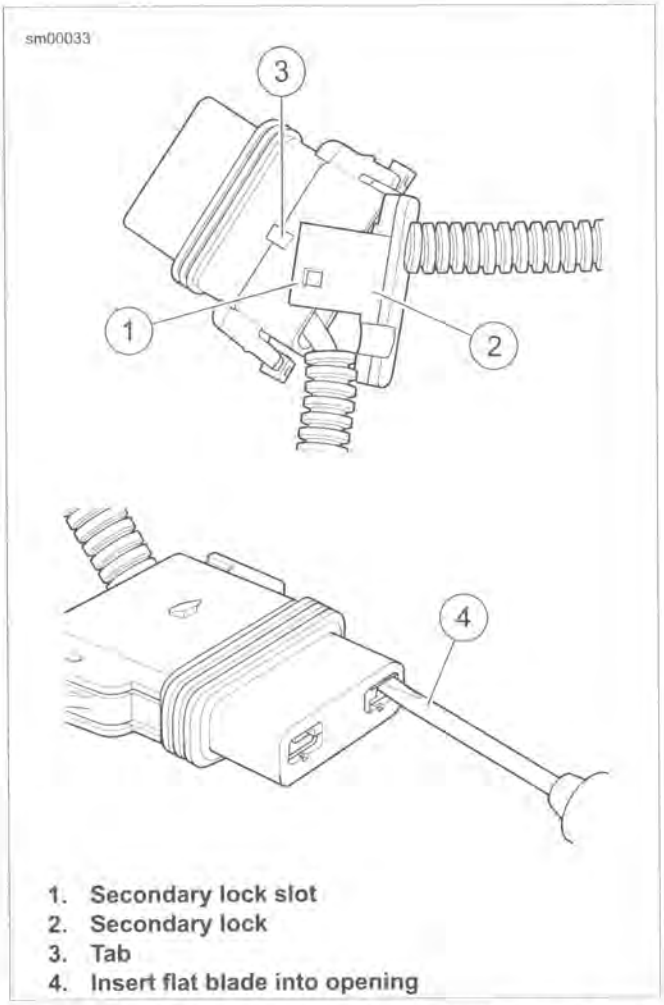
Installing Socket Terminals

1. See Figure A-20. Carefully bend tang outward away from the terminal body.
2. Properly orient terminal to the cavity in the housing. Push terminal into connector housing until it clicks in place. Verify that socket will not back out of chamber.
3. Push rubber seal into connector housing.
4. Repeat to install remaining socket terminal.
5. Install secondary lock onto connector housing. Verify slots engage tabs on sides of connector housing.

⚠WARNING

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

6. Connect battery cables.



1. **Secondary lock slot**
2. **Secondary lock**
3. **Tab**
4. **Insert flat blade into opening**

Figure A-19. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Remove Socket Terminals

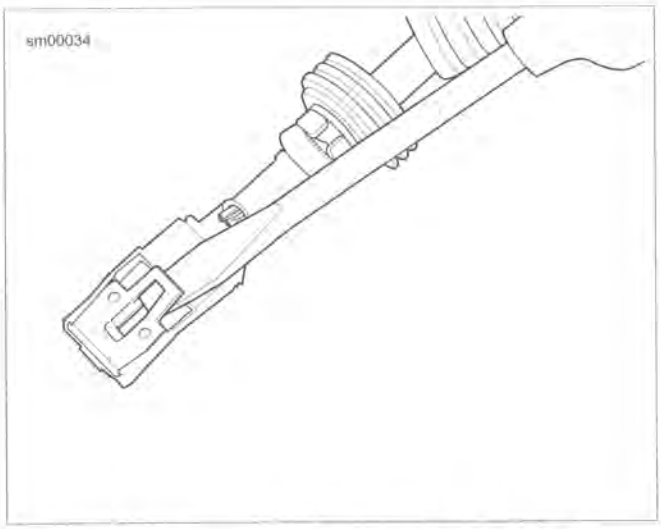


Figure A-20. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Bend Tang

METRI-PACK TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-6	PACKARD TERMINAL CRIMP TOOL
HD-38125-7	PACKARD TERMINAL CRIMPER
HD-38125-8	PACKARD CRIMPING TOOL

Matching Terminal To Crimper

Metri-Pack connectors embossed with the initials P.E.D. require Packard crimp tools to crimp terminals to wire leads.

Terminals are crimped twice to a wire lead, once over the wire core and a second time over the insulation/seal.

See Figure A-21. A crimp can require two crimping dies. The dies are found on the PACKARD TERMINAL CRIMP TOOL (Part No. HD-38125-6) and the PACKARD TERMINAL CRIMPER (Part No. HD-38125-7). The terminal and the wire gauge determine the core crimp die and the insulator/seal die.

NOTE

The PACKARD CRIMPING TOOL (Part No. HD-38125-8) also crimps sealed splice connectors in wire gauge sizes 18-20, 14-16 and 10-12.

Preparing Wire Lead

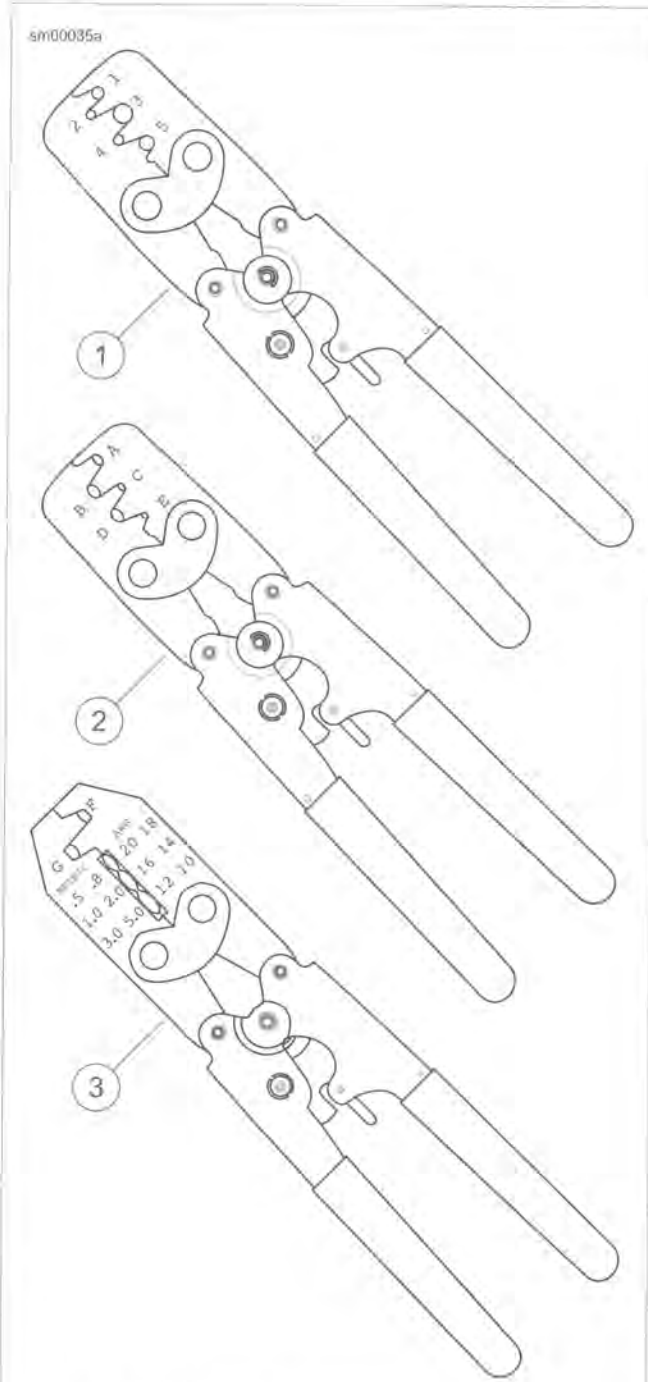
Strip 5/32 in (4.0 mm) of insulation from the wire lead.

Crimping Wire Core

NOTE

Metri-Pack terminal crimps require two steps. Always perform ***Crimping Wire Core*** *before* ***Crimping Insulation/Seal****.*

1. Squeeze and release handles until ratchet automatically opens.
2. Identify the corresponding sized nest for the core crimp.
3. Position the core crimp in the die. Make sure that the core crimp tails are facing the forming jaws.
4. Gently squeeze the handles only until crimpers secure the core crimp tails.
5. Insert stripped wire between crimp tails. Verify that wire is positioned so that short pair of crimp tails squeezes core wire strands, while long pair is positioned over the insulation or seal material.
6. Squeeze handles tightly closed. Release grip and the tool automatically opens.



1. **HD-38125-6 sealed terminals**
2. **HD-38125-7 non-sealed terminals**
3. **HD-38125-8 non-sealed terminals**

Figure A-21. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

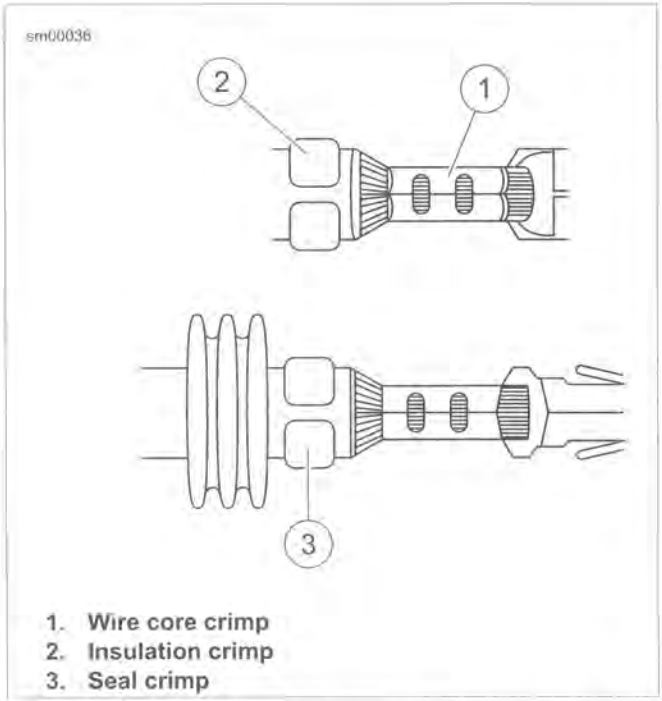
NOTE

Always perform ***Crimping Wire Core*** *before* ***Crimping Insulation/Seal.***

1. See Figure A-22. Identify the correct die for the insulation/seal crimp (2).
2. Position the insulation/seal crimp in the nest. Make sure that the core crimp tails are facing the forming jaws.
3. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimp is complete.

Inspecting Crimps

1. See Figure A-22. Inspect the wire core crimp (1). Make sure that the tails are folded in on the wire core without any distortion or excess wire strands.
2. Inspect the insulation (2) or seal (3) crimp. Make sure that the tails of the terminal are wrapped around the insulation without distortion.



1. **Wire core crimp**
2. **Insulation crimp**
3. **Seal crimp**

Figure A-22. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps

DELPHI MICRO 64 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-45928	TERMINAL REMOVER
HD-45929	TERMINAL CRIMPER

General

Delphi Micro 64 Sealed connectors are frequently found on speedometers, tachometers and the ECM of Touring Models.

Separating Pin and Socket Housings

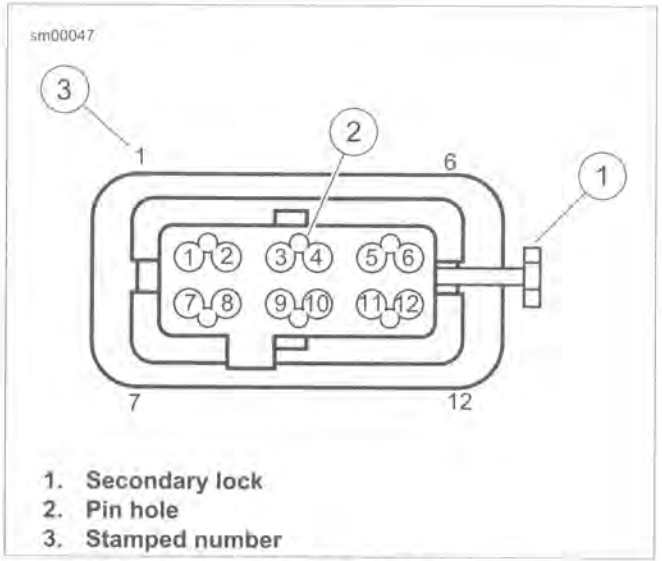
Bend back the external latches slightly and separate the pin and socket housings.

Mating Pin and Socket Housings

Orient the wire lead colors. Align pin and socket housings. Push the pin and socket housings of the connector together until the latches click.

Removing Terminal

1. See Figure A-23. Locate the head of the secondary lock (1) on one side of the connector housing.
2. Insert the blade of a small screwdriver between the center ear of the lock and the connector housing and gently pry out lock. When partially removed, pull lock from connector housing.
3. Locate pin hole (2) between terminals on mating end of connector.



1. **Secondary lock**
2. **Pin hole**
3. **Stamped number**

Figure A-23. Delphi Micro-64 Sealed Connector: Housing

4. See Figure A-24. Obtain the TERMINAL REMOVER (Part No. HD-45928).
5. See Figure A-25. Push the adjacent terminals all the way into the connector housing and then insert tool into hole until it bottoms.
6. Leaving the tool installed, gently tug on wires to pull either one or both terminals from wire end of connector. Remove tool.

Figure A-24. Terminal Remover (HD-45928)

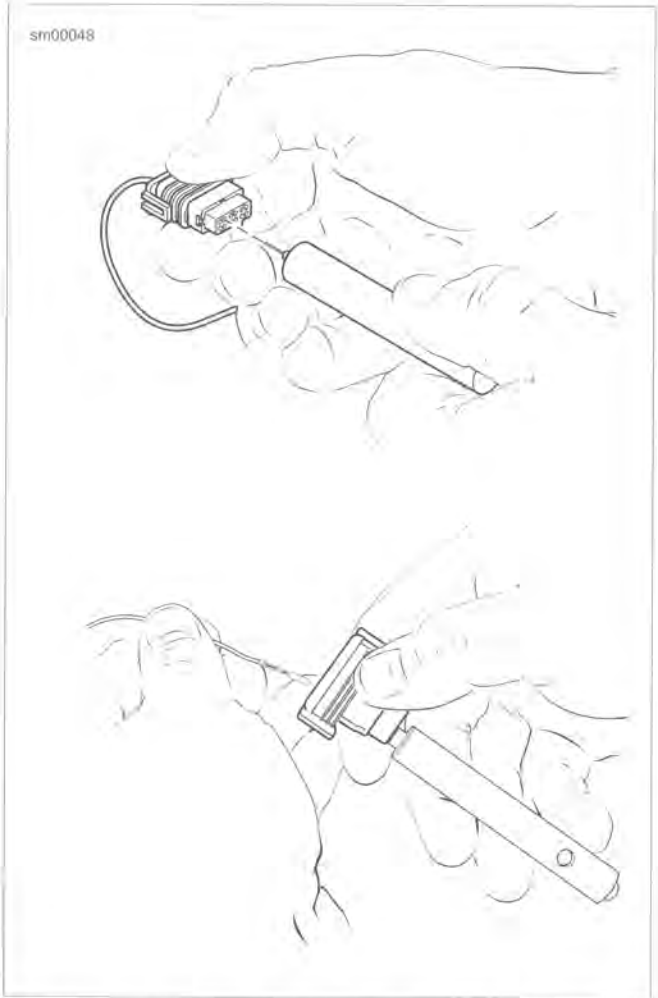


Figure A-25. Delphi Micro-64 Sealed Connector: Insert Tool and Remove Terminal

Installing Terminal

1. Insert terminal into its respective numbered chamber on wire end of connector. No special orientation of the terminal is necessary.

NOTE

See Figure A-23. For wire location purposes, the corners of the socket housing are stamped (3) with the numbers 1, 6, 7 and 12, representing terminals 1-6 on one side, and 7-12 on the other.

2. Bottom the terminal in the chamber and then gently tug on the wire to verify that it is locked in place.

NOTE

Once removed, the terminal may not lock in place when first installed. Until the lock engages, move the terminal back and forth slightly while wiggling the lead.

3. Since the terminal remover tool releases two terminals simultaneously, repeat step 2 on the adjacent terminal even if it was not pulled from the connector housing.

4. With the center ear on the head of the secondary lockpin facing the mating end of the connector, push secondary lock in until head is flush with the connector housing.

Preparing Wire Leads for Crimping

Strip 1/8 in (3.0 mm) of insulation from the wire lead.

Crimping Terminals

1. Inspect **new** socket terminal for bent or deformed contact and crimp tails. Replace as necessary.

2. See Figure A-27. Squeeze the handles of the TERMINAL CRIMPER (Part No. HD-45929) to cycle the tool to the fully open position (1).

3. Raise locking bar and barrel holder by pushing up on bottom tab with index finger (2).

4. With the crimp tails facing upward, insert terminal through locking bar into front hole in barrel holder (20-22 gauge wire) (3).

5. Release locking bar to lock position of contact. When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails and the closed side of the terminal rests on the outer nest of the crimp tool.

6. Insert wires between crimp tails until ends make contact with locking bar. Position wire that the wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.

7. Squeeze handle of crimp tool until tightly closed (4). Tool automatically opens when the crimping sequence is complete.

8. Raise locking bar and barrel holder to remove contact.

Inspecting Crimps

Inspect the quality of the core and insulation crimps. Distortion should be minimal.

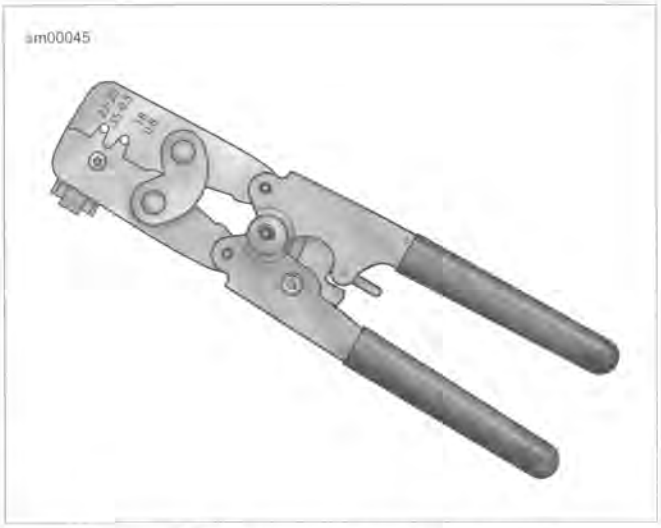
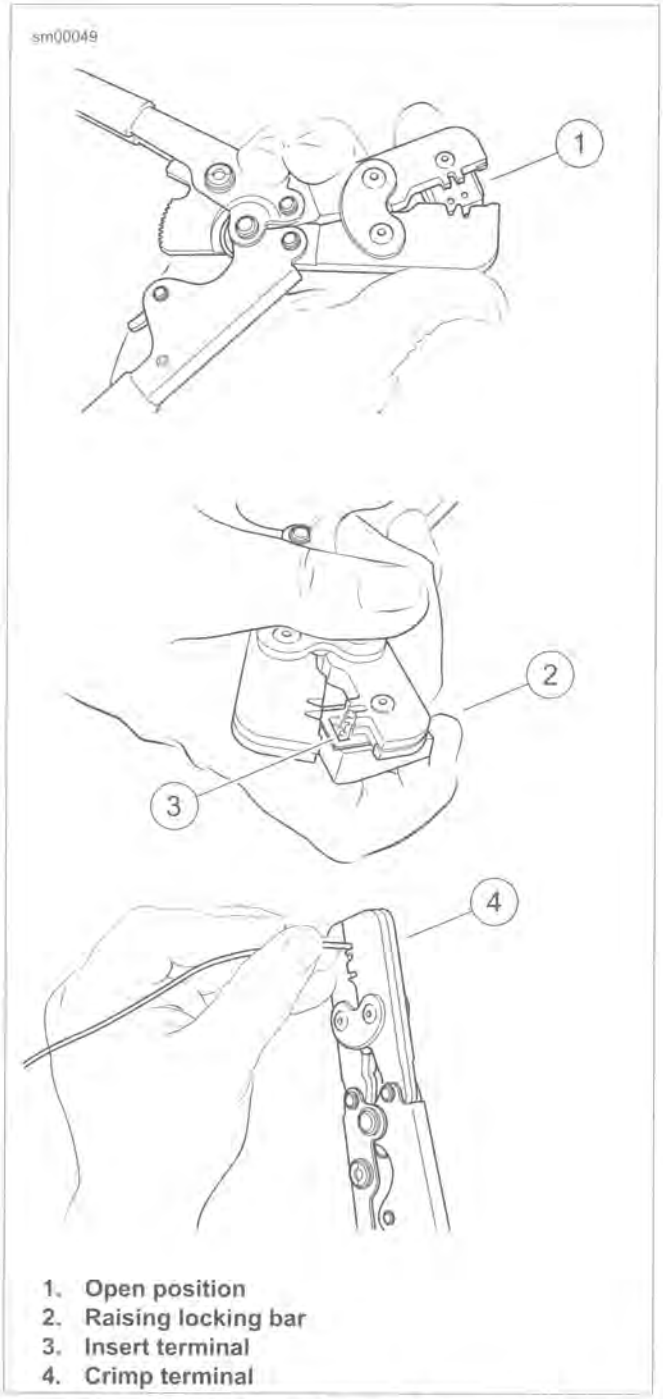


Figure A-26. Terminal Crimper (HD-45929)



1. Open position
2. Raising locking bar
3. Insert terminal
4. Crimp terminal

Figure A-27. Delphi Micro-64 Sealed Connector: Terminal in Crimper

DELPHI GT 150 SEALED CONNECTOR REPAIR

General

Delphi connectors are embossed with the brand name, Delphi, on the housing latch or terminal block.

Separating Pin and Socket Housings

See Figure A-28. Bend back the external latch(es) slightly and separate pin and socket halves of the connector.

Mating Pin and Socket Housings

Push pin and socket halves of connector together until external latch(es) engage.

Removing Socket Terminals

NOTE

Although the parts of the different Delphi connectors vary in appearance, these instructions are universal.

1. See Figure A-29. If present, free one side of wire lock (1) from ear on wire end of socket housing. Release the other side if necessary. Release wires from channels in wire lock. Remove appropriate terminals from housing.
2. Use a fingernail to pry colored terminal lock (2) loose. Remove from mating end of socket housing.
3. Use the thin flat blade from a hobby knife. Gently pry tang (3) outward away from terminal. Tug on wire to back terminal out wire end of chamber. Do not pull on wire until tang is released or terminal will be difficult to remove.

Installing Socket Terminals

NOTE

For wire location purposes, alpha or numeric characters are stamped into the wire end of each socket housing.

1. Gently push tang on socket housing inward toward chamber. With the open side of the terminal facing the tang, push terminal into chamber at wire end of socket housing.
2. Gently tug on wire to verify that terminal is locked, preventing it from backing out of chamber. If necessary, use fingernail to push tang into engagement with terminal.
3. Install colored terminal lock onto mating end of socket housing.
4. If present, seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.

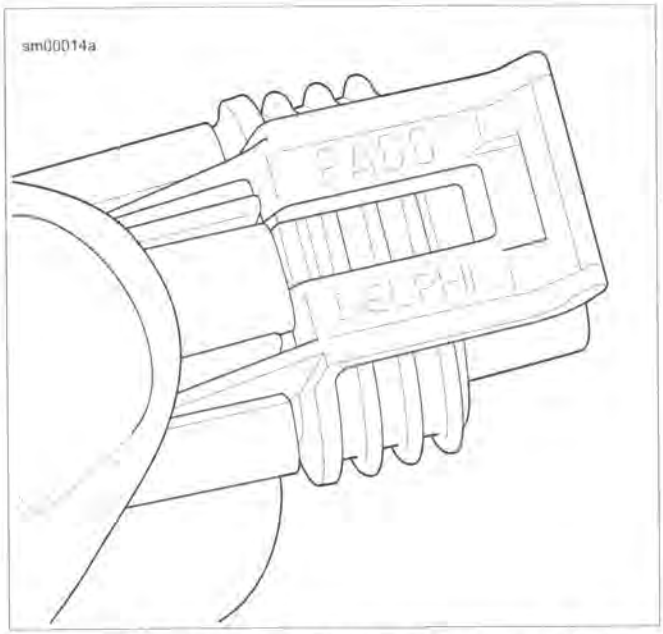


Figure A-28. Delphi GT 150 Sealed Connector: Socket Housing Latch

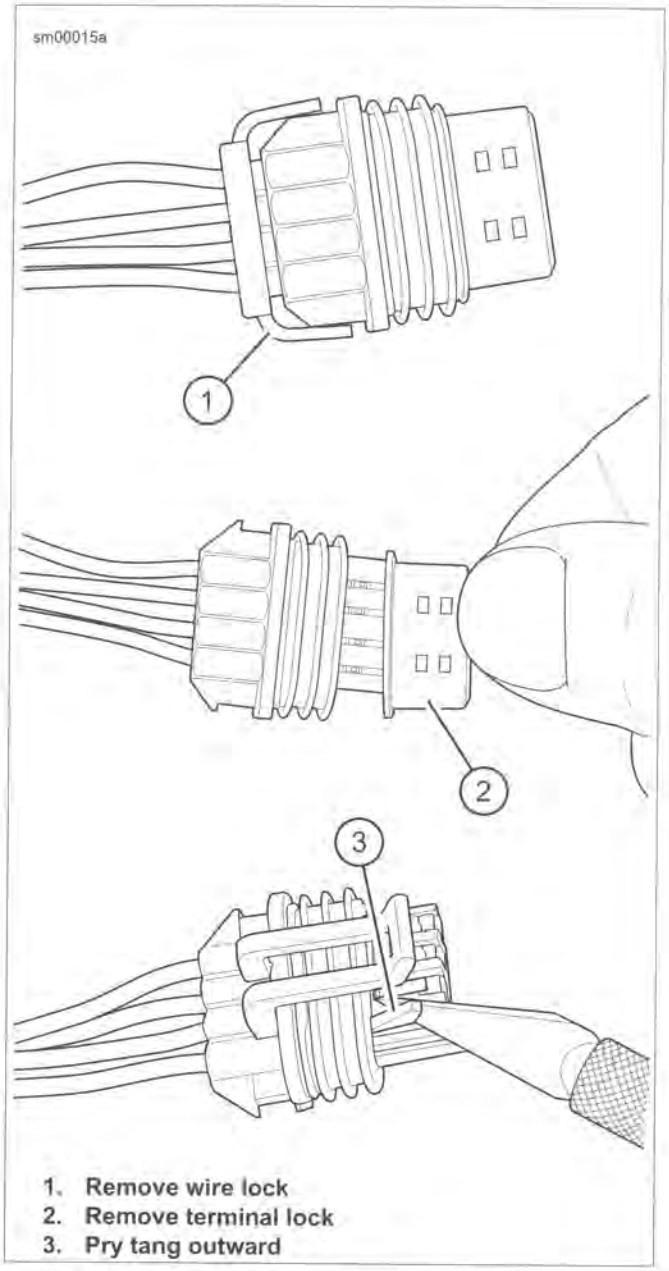


Figure A-29. Delphi GT 150 Sealed Connector: Removing Socket Terminals

DEUTSCH DT SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41475	DEUTSCH TERMINAL REPAIR KIT
HD-41475-100	FLAT BLADE L-HOOK

General

Deutsch DT sealed connectors are colored coded for location purposes. DT connectors associated with **left** side accessories, such as the front and rear **left** turn signals, are **gray**. All other DT connectors are **black**.

NOTES

- *A DEUTSCH TERMINAL REPAIR KIT (Part No. HD-41475) contains a selection of seals and seal plugs, locking wedges, attachment clips and terminals.*
- *Also included is a FLAT BLADE L-HOOK (Part No. HD-41475-100) used to remove locking wedges, compartmented storage box and carrying case.*

Separating Pin and Socket Housings

See Figure A-30. To separate the connector halves, Press the external latch(es) (1) on the socket housing (2) while rocking the pin (3) and socket housings.

NOTES

- *Generally, the socket housing is found on the accessory side, while the pin housing is attached to the wiring harness.*
- *Six-place and smaller Deutsch connectors have one latch on the connector.*
- *Eight- and twelve-place connectors have a latch on each side. Simultaneously press both latches to separate the connector.*

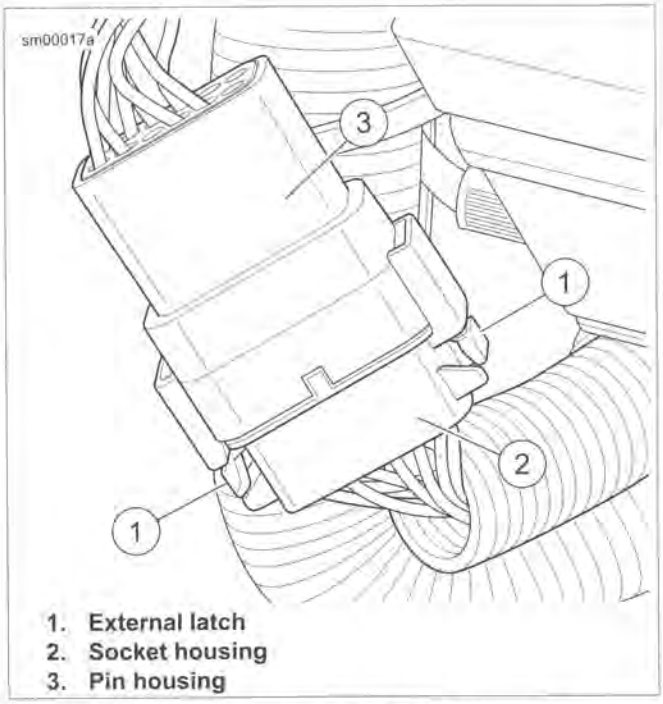
Mating Pin and Socket Housings

1. Align the connectors to match the wire lead colors.
   a. **For One External Latch:** Six-place and smaller Deutsch connectors have one external latch on the socket housing. To join the housings, align the latch on the socket side with the latch cover on the pin side.
   b. **For Two External Latches:** Align the tabs on the socket housing with the grooves on the pin housing.
2. Insert socket housing into pin housing until it snaps or clicks into place.

NOTE

For Two External Latches: *If latches do not click (latch), press on one side of the connector until that latch engages then press on the opposite side to engage the other latch.*

3. If necessary, fit the attachment clip to the pin housing.
4. Place large end of slot on attachment clip over T-stud on frame. Push assembly forward to engage small end of slot.



1. **External latch**
2. **Socket housing**
3. **Pin housing**

Figure A-30. Deutsch DT Sealed Connector

Removing Socket Terminals

1. See Figure A-31. Insert a small screwdriver between the socket housing and locking wedge in-line with the groove (in-line with the pin holes if the groove is absent). Turn the screwdriver 90 degrees to pop the wedge up and remove the secondary locking wedge.
2. See Figure A-34. Use a pick or small screwdriver to press terminal latches inside socket housing and back out sockets through holes in rear wire seal.

NOTE

If wire leads require ***new*** *terminals, see the instructions for crimping terminals.*

Installing Socket Terminals

1. Match wire lead color to connector cavity.
2. See Figure A-33. Fit rear wire seal (1) into back of socket housing (2), if removed.
3. Grasp wire lead (3) approximately 1.0 in (25.4 mm) behind the socket terminal. Gently push socket through hole in wire seal into its chambers until it clicks in place.
4. A tug on the wire will confirm that it is properly locked in place.

NOTE

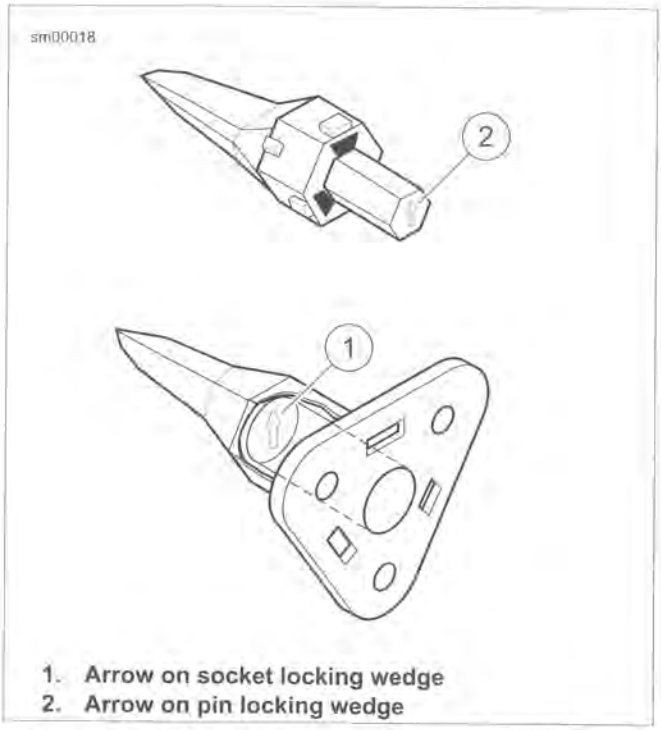
Install seal plugs (6) into unused chambers. If removed, seal plugs must be replaced to seal the connector.

5. Install internal seal (4) on lip of socket housing, if removed.
6. Insert tapered end of secondary locking wedge (5) into socket housing and press down until it snaps in place. The wedge fits into the center groove within the socket housing and holds the terminal latches tightly closed.

NOTES

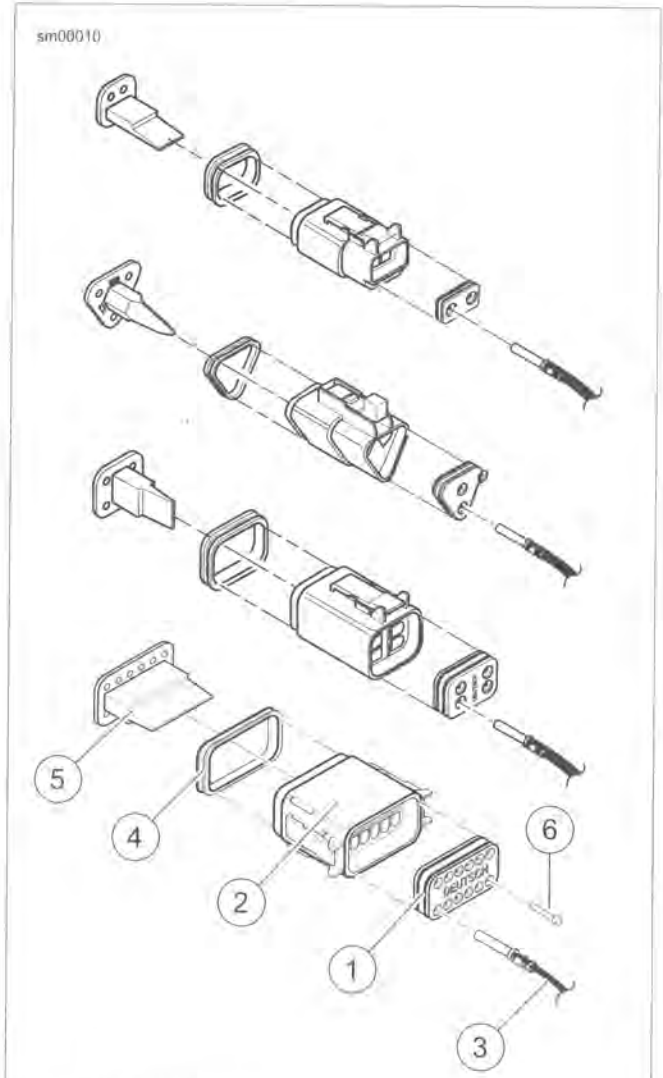
- *See Figure A-32. While rectangular wedges do not require a special orientation, align arrow (1) on conical secondary locking wedge towards external latch for three-place connectors.*
- *If the secondary locking wedge does not slide into position easily, check the installation of all the terminals. Unseated terminals prevent the locking wedge from proper installation.*

Figure A-31. Deutsch DT Sealed Connector: Remove Secondary Locking Wedge



1. **Arrow on socket locking wedge**
2. **Arrow on pin locking wedge**

Figure A-32. Deutsch DT Sealed Connector: 3-Place Locking Wedges



1. **Wire seal**
2. **Socket housing**
3. **Wire lead**
4. **Internal seal**
5. **Secondary locking wedge**
6. **Seal plug**

Figure A-33. Deutsch DT Sealed Connector: 2, 3, 4 and 12-Place Socket Housings

Removing Pin Terminals

1. Use the hooked end of a stiff piece of mechanics wire, a needle nose pliers or the FLAT BLADE L-HOOK (Part No. HD-41475-100) to remove the secondary locking wedge.
2. Gently press terminal latches inside pin housing and back out pins through holes in wire seal.

NOTES

- *If wire leads require **new** terminals, see the instructions for crimping terminals.*
- *The 8-place and 12-place gray and black connectors are not interchangeable. If replacing both the socket and pin housings, the black may be substituted for the gray.*
- *The socket and pin housings of all other connectors are interchangeable. Black may be mated with the gray since the alignment tabs are absent and the orientation of the external latch is the same.*

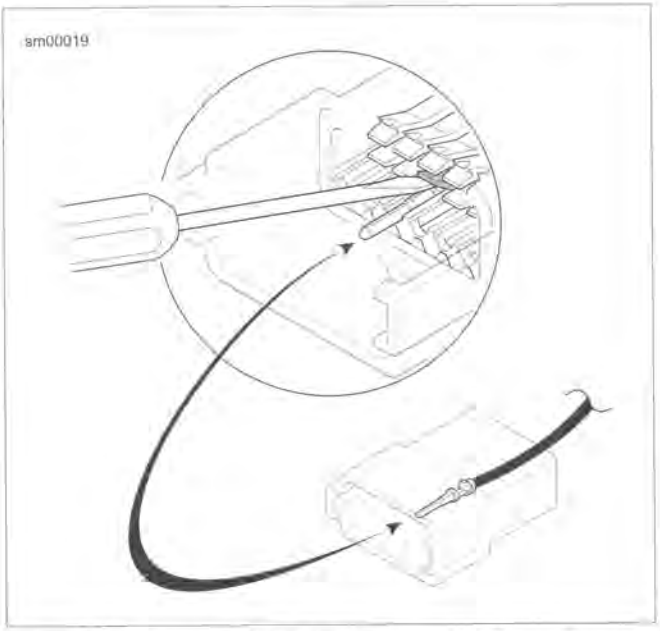


Figure A-34. Deutsch DT Sealed Connector: Press Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See Figure A-35. Fit wire seal (1) into back of pin housing (2).
2. Grasp wire lead approximately 1.0 in (25.4 mm) behind the pin terminal (3). Gently push pin through holes in wire seal into its respective numbered chamber until it "clicks" in place.

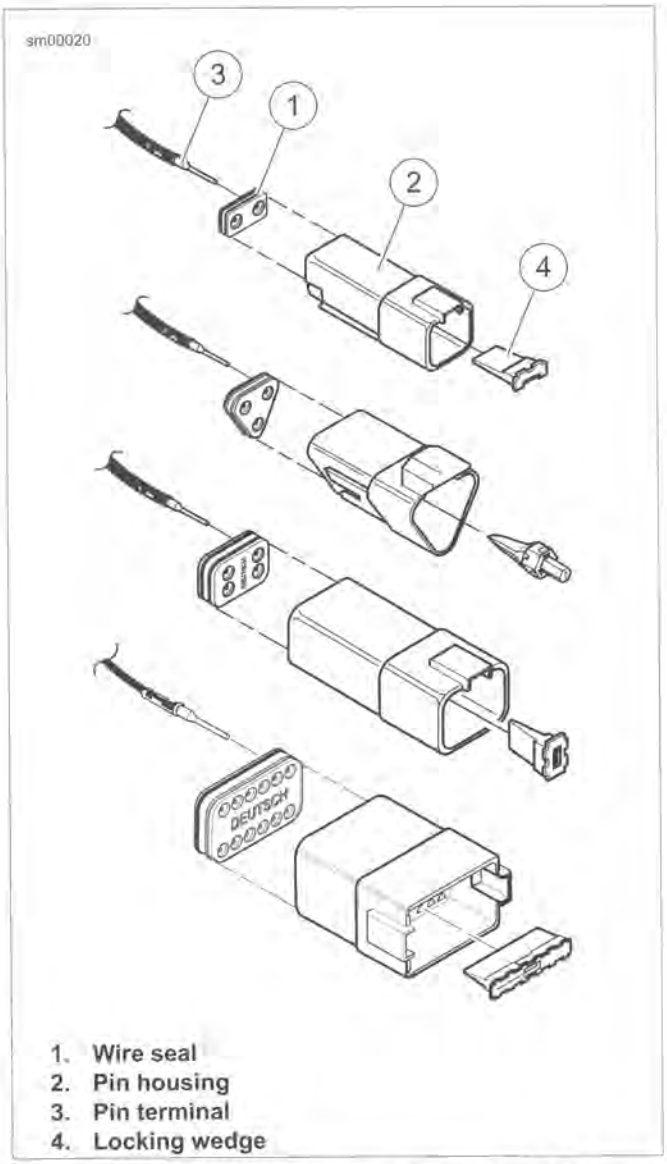
NOTE

A tug on the wire lead will confirm that a pin is locked in place.

3. Insert tapered end of secondary locking wedge (4) into pin housing. Press down until it snaps in place.

NOTES

- *The wedge fits in the center groove of the pin housing and holds the terminal latches tightly closed.*
- *See Figure A-32. While rectangular wedges do not require a special orientation, align arrow (1) on conical secondary locking wedge towards external latch for three-place connectors.*
- *If the secondary locking wedge does not slide into position easily, check the installation of all the terminals. Unseated terminals prevent the locking wedge from proper installation.*



1. **Wire seal**
2. **Pin housing**
3. **Pin terminal**
4. **Locking wedge**

Figure A-35. Deutsch DT Sealed Connector: 2, 3, 4 and 12-Place Pin Housings

Crimping Terminals

Identify which of the types of Deutsch terminals are used with the connector. Follow the corresponding crimping instructions. Refer to Table A-2.

Table A-2. Deutsch Connector: Terminal Crimping Instructions

TYPE	CRIMPING INSTRUCTIONS
DT Sealed (with crimp tails)	A.14 DEUTSCH DT SEALED TERMINAL REPAIR
DTM Mini Sealed Terminal (solid barrel)	A.16 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR
DTM Mini Sealed Terminal (with crimp tails)	A.15 DEUTSCH DTM SEALED MINI TERMINAL REPAIR

DEUTSCH DT SEALED TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL

Preparing Wire Leads for Crimping

1. Use a shop gauge to determine gauge of wire lead.
2. Strip 5/32 in (4.0 mm) of insulation from the wire lead.

Crimping Terminal to Lead

1. See Figure A-36. Squeeze the handles of the DEUTSCH TERMINAL CRIMP TOOL (Part No. HD-39965-A) to open the jaws. Push the locking bar (1) up.
2. Match the wire gauge to the crimp tool die. Refer to Table A-3.

NOTE

Rest the rounded side of the contact barrel in the nest (concave split level area) with the crimp tails facing up.

3. Insert (2) terminal (socket/pin) through hole of the locking bar.
4. Release locking bar to lock terminal in die.

NOTE

If the crimp tails are slightly out of alignment, the crimp tool rotates the terminal to face the tails upward. When positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.

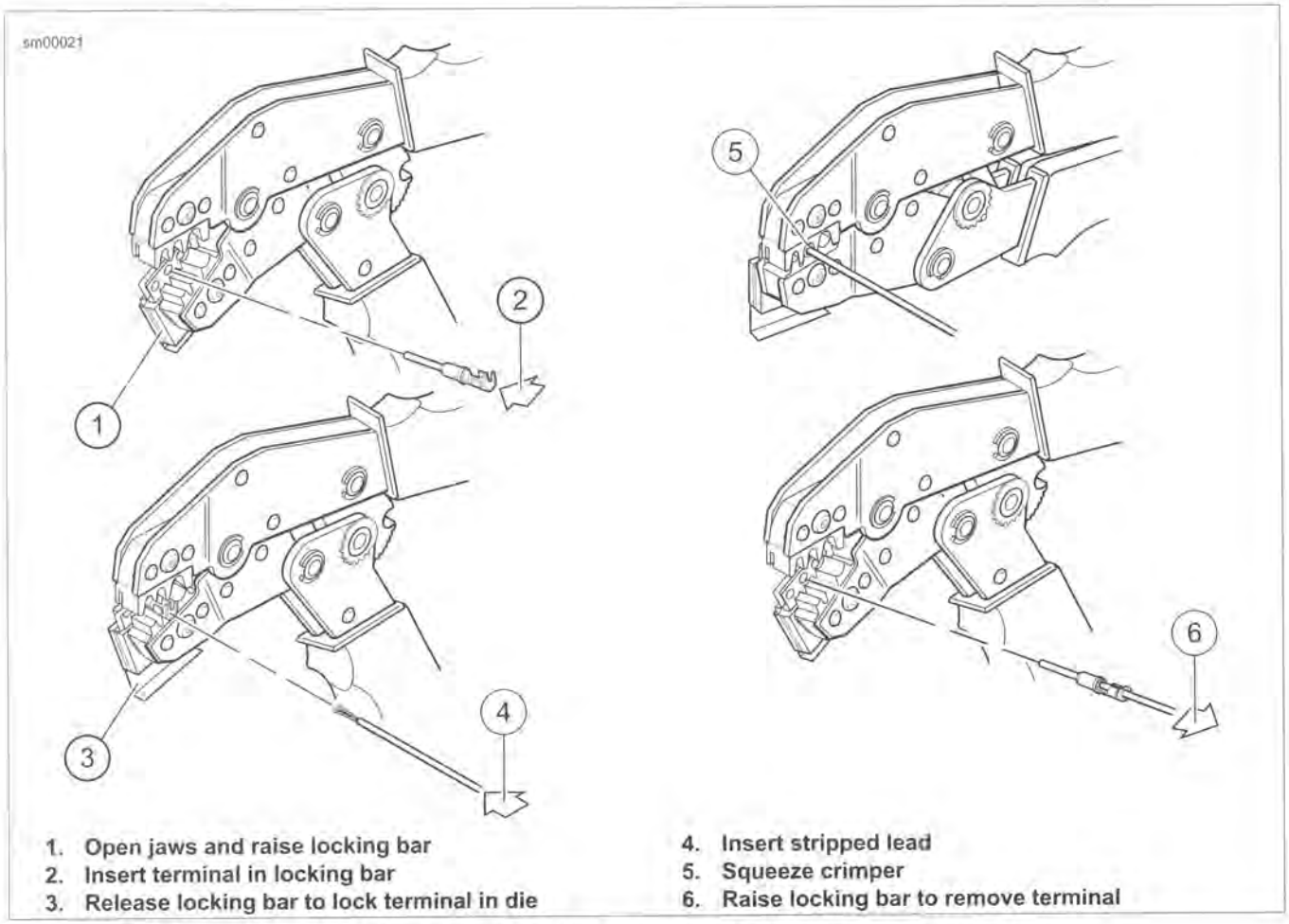
5. Insert stripped wire core between crimp tails until ends make contact with locking bar. Position wire that the wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.
6. Squeeze handle of crimp tool until tightly closed. Tool automatically opens after the terminal is crimped.
7. Raise locking bar up to remove wire lead and terminal.

Inspecting Crimps

Inspect the wire core and insulation crimps. Distortion should be minimal.

Table A-3. Deutsch DT Sealed Terminal Crimp: Wire Gauge To Die

WIRE GAUGE (AWG)	CRIMP TOOL DIE
20	Front
16-18	Middle



1. Open jaws and raise locking bar
2. Insert terminal in locking bar
3. Release locking bar to lock terminal in die
4. Insert stripped lead
5. Squeeze crimper
6. Raise locking bar to remove terminal

Figure A-36. Crimping a Deutsch DT Sealed Terminal

DEUTSCH DTM SEALED MINI TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-7	PACKARD TERMINAL CRIMPER

Preparing Wire Leads for Crimping

Strip 5/32 in (4.0 mm) of insulation from the wire lead.

Crimping a Mini Terminal to Wire Lead

1. See Figure A-37. Compress the handles of PACKARD TERMINAL CRIMPER (Part No. HD-38125-7) until the ratchet (2) automatically opens.

NOTE

Always perform core crimp before insulation crimp.

2. Position the core crimp on die E (1) of the crimper. Verify the core crimp tails are facing the forming jaws.
3. Gently apply pressure to handles of tool until crimpers just secure the core crimp tails.
4. Insert stripped wire core stands between crimp tails. Position wire that the short pair of crimp tails squeeze bare wire strands, while long pair squeeze over the insulation.
5. Squeeze handle of crimper until tightly closed. Tool automatically opens when the crimping sequence is complete.

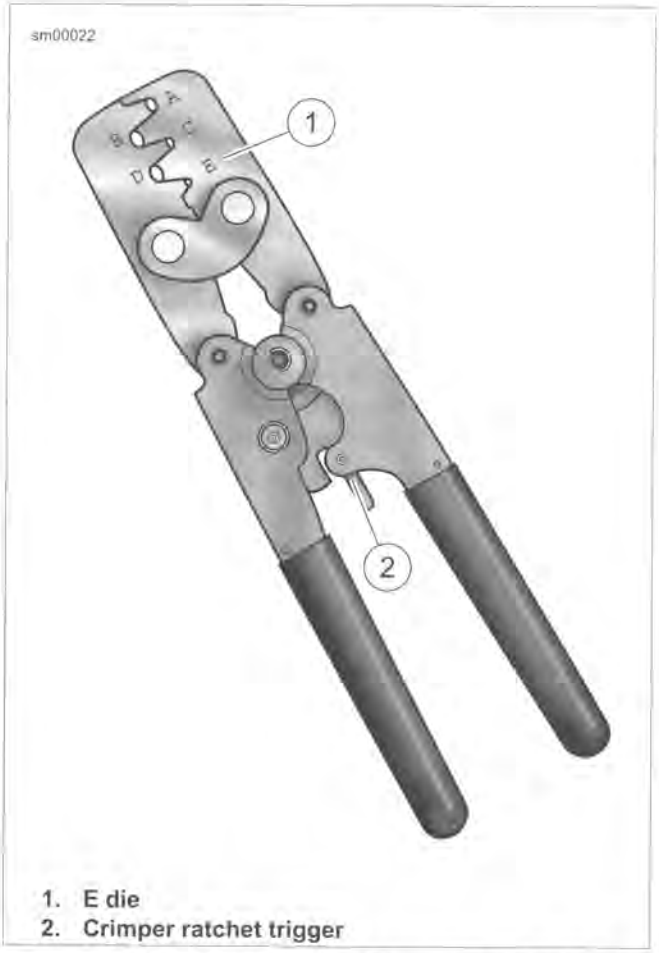
NOTE

If the crimper does not open, squeeze the ratchet trigger (2).

6. Position the insulation crimp on nest C of the crimper. Verify the insulation crimp tails are facing the forming jaws.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.

Inspecting Crimps

Inspect the core and insulation crimps. Distortion should be minimal.



1. **E die**
2. **Crimper ratchet trigger**

Figure A-37. Packard Terminal Crimper (HD-38125-7)

DEUTSCH DTM SEALED SOLID BARREL TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-42879	ELECTRICAL CRIMPER TOOL

Preparing Wire Leads For Crimping

For size 20, 16 and 12 contacts, wire ranges 26-12 AWG.

Strip 1/4 in (6.4 mm) of insulation from the wire lead.

Adjusting Crimper Tool

1. See Figure A-38. Squeeze the ELECTRICAL CRIMPER TOOL (Part No. HD-42879) handles to cycle the crimp tool to open.
2. Remove locking pin (1) from selector knob (2).
3. Raise selector knob. Rotate knob until selected wire size stamped on wheel is aligned with "SEL. NO." arrow (3).
4. Loosen knurled locknut (4) and turn adjusting screw (5) clockwise (in) until it stops.

Crimping a Barrel Contact To Wire Lead

1. See Figure A-39. Turn tool over and drop contact barrel (1) into indentor cover (2) hole with the wire end out.
2. Turn adjusting screw counterclockwise (out) until contact is flush with bottom of recess in indentor cover. Tighten knurled locknut.
3. Slowly squeeze handles of crimp tool until contact centers between the four indentor points (3).
4. Insert bare wire core strands of stripped wire lead (4) into contact barrel. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
5. Remove wire lead with crimped contact from indentor.

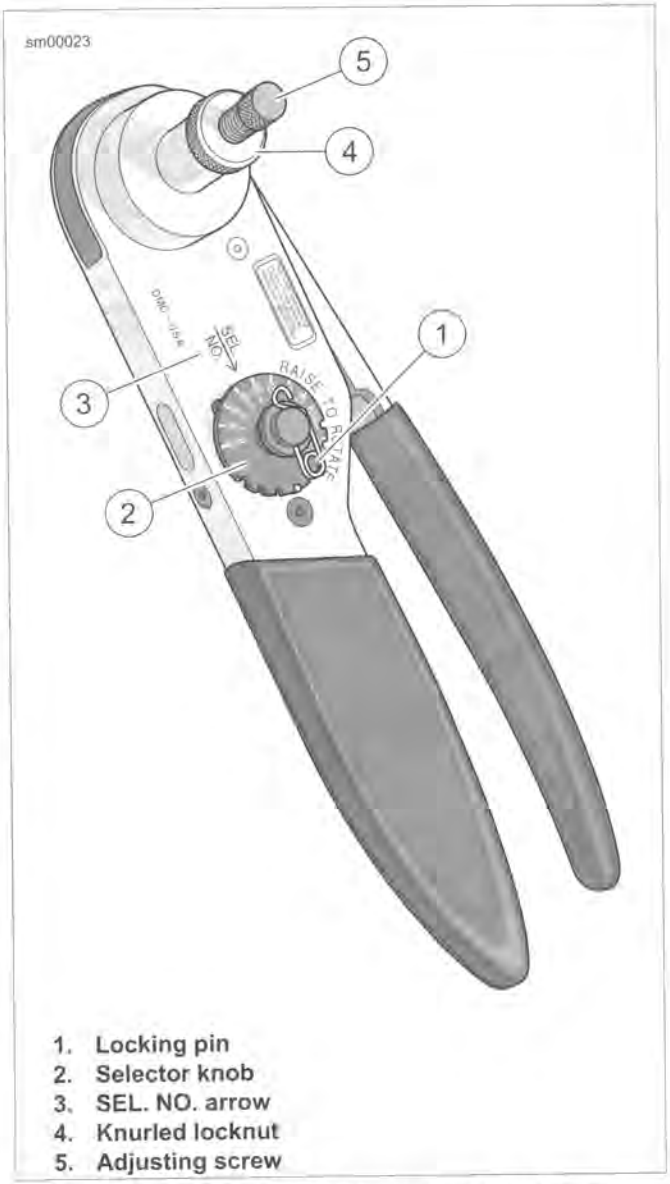
NOTE

Adjust the crimper tool for each contact/wire size.

6. Install pin to lock selector knob.

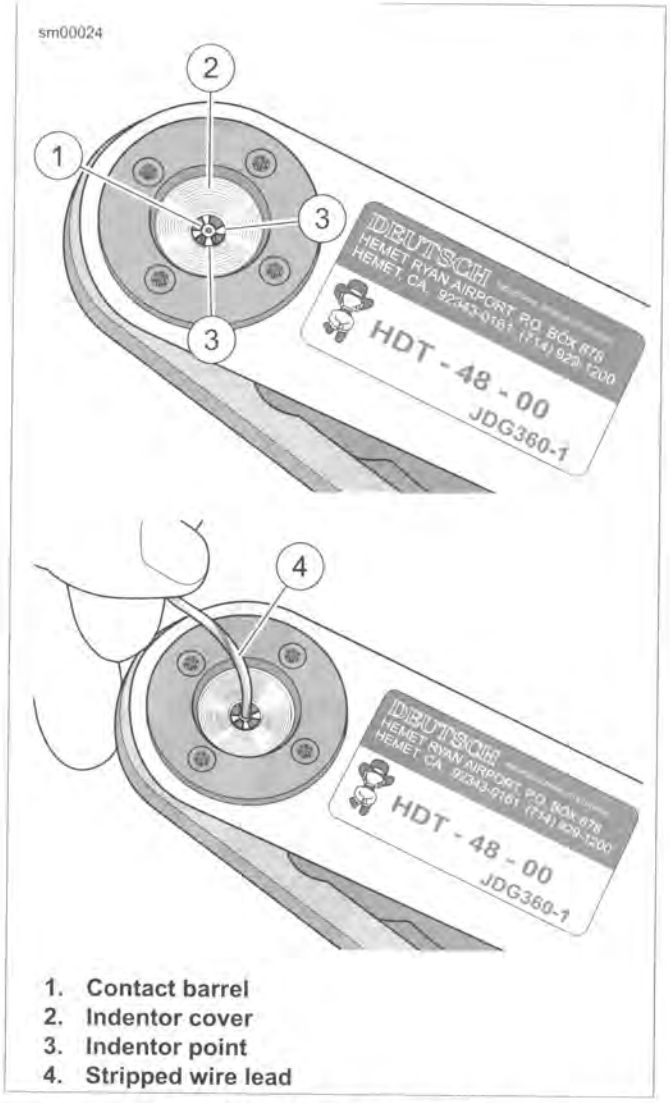
Inspecting Crimps

Inspect the crimp. All core wire strands are to be crimped in the barrel.



1. **Locking pin**
2. **Selector knob**
3. **SEL. NO. arrow**
4. **Knurled locknut**
5. **Adjusting screw**

Figure A-38. Electrical Crimper Tool (HD-42879)



1. Contact barrel
2. Indentor cover
3. Indentor point
4. Stripped wire lead

Figure A-39. Deutsch Solid Barrel

JAE MX19 SEALED CONNECTORS

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

Connector Housings

Separate Housings: See Figure A-40. Press the two release buttons on each side of the housing to separate the connector.

Connect Housings: Align housings. Press together until the locking tabs click.

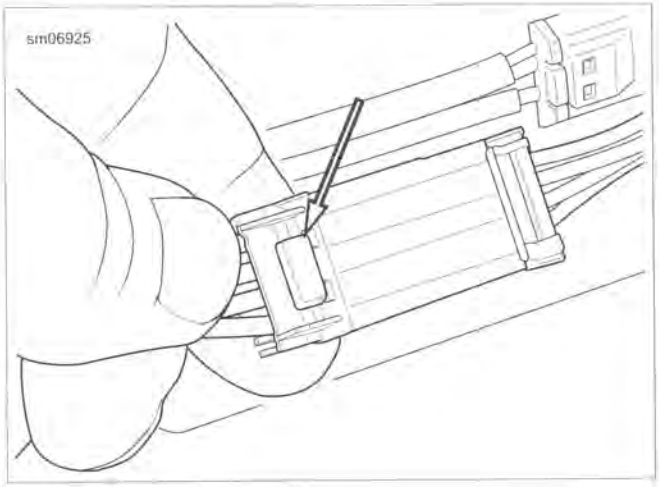


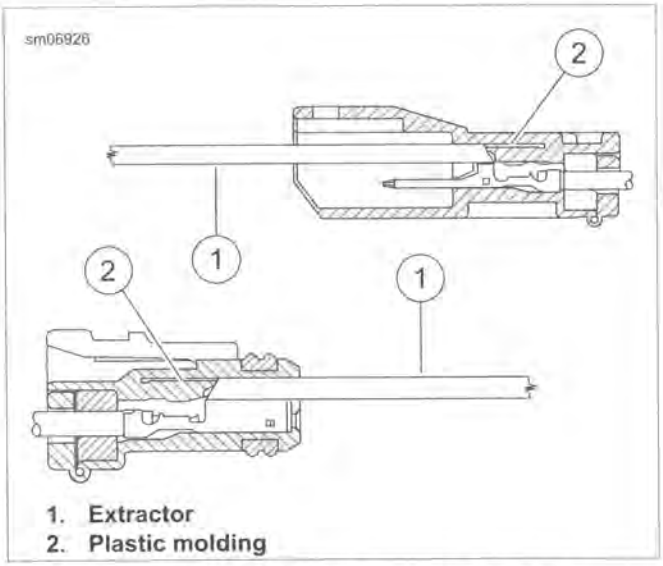
Figure A-40. Release Buttons: JAE MX19 Sealed Connector

Removing Terminals

1. Modify a TERMINAL EXTRACTOR (Part No. B-50085) by filing the front edge to 45 degrees.
2. See Figure A-41. Insert the extractor (1) into the opening above the terminal and press the plastic molding (2) up and out of the way.
3. Pull the wire lead and terminal out of the back of the housing.

Installing Terminals

1. Inspect the plastic molding and replace the connector housing if necessary.
2. Orient the terminal to the housing. Push terminal into housing until it clicks into place.



1. **Extractor**
2. **Plastic molding**

Figure A-41. JAE MX19 Terminal Removal

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-6	JAE DIE

1. Strip the wire insulation to specification. Refer to Table A-4.
2. Install the JAE DIE (Part No. HD-50120-6) in the handle of the HAND CRIMP FRAME (Part No. HD-50120-2) of the UNIVERSAL CRIMPER SET (Part No. HD-50120).
3. Place the **new** terminal in the specified nest.
4. Insert the wire to the wire stop. Crimp the terminal.
5. Inspect the crimped terminal.

Table A-4. JAE MX19 Crimper Die (Part No. HD-50120-6)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Socket	72910-11	0.051-0.098	2.0-2.5	B
Pin	72909-11	0.051-0.098	2.0-2.5	A

MOLEX CMC SEALED CONNECTORS

PART NUMBER	TOOL NAME
HD-50423	0.6 MM TERMINAL EXTRACTOR TOOL
HD-50424	1.5 MM TERMINAL EXTRACTOR TOOL

Separating the Connector

Release: See Figure A-42. Press the catch and rotate the lever arm down.

Connect: Press on the front guard to release the latch and rotate the lever arm up until the catch clicks in place.

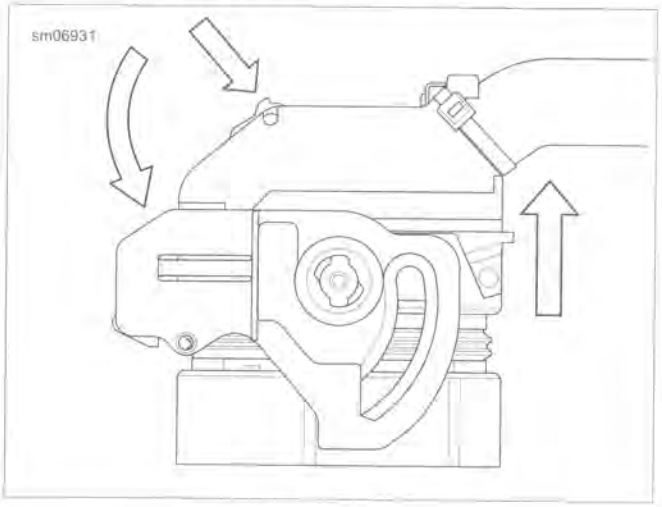


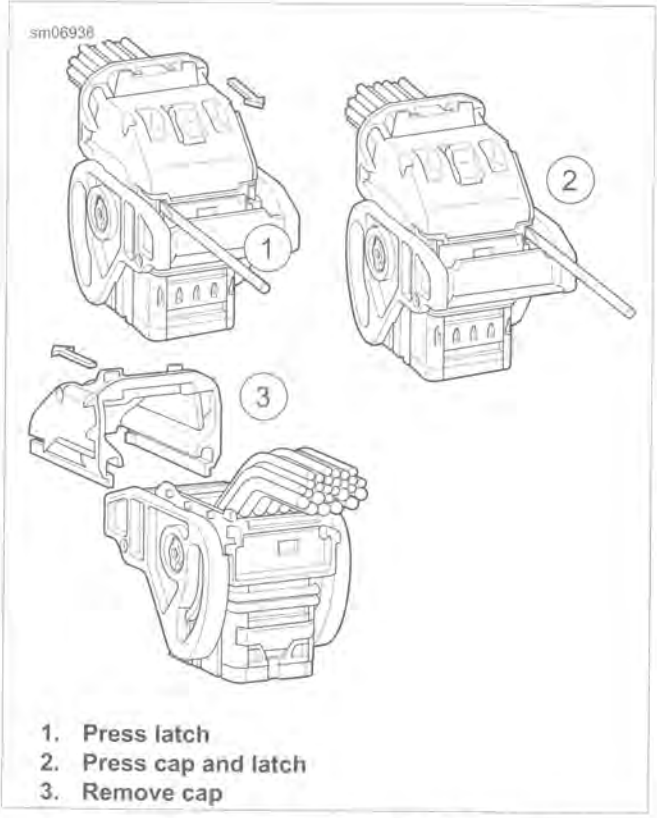
Figure A-42. Release

Removing Terminals

1. With the lever arm open, cut the cable strap around the wire bundle.
2. See Figure A-43. Open a wire cap latch (1) with a small screwdriver.
3. Maintain pressure on the cap and open the opposite latch (2) with the screwdriver.
4. Slide the cap off (3).
5. See Figure A-44. Use the screwdriver to open the secondary lock. Pull the locking bar all the way out.
6. See Figure A-45. Locate the wire lead cavity by the alpha-numeric coordinates.
7. Identify the size of the terminal and select either the CMC extractor 0.6 MM TERMINAL EXTRACTOR TOOL (Part No. HD-50423) or the 1.5 MM TERMINAL EXTRACTOR TOOL (Part No. HD-50424).
8. See Figure A-46. Insert the pins of the CMC extractor tool (1) into the access slots (2) of the terminal cavity and retract the lead and terminal.

Installing Terminals

1. Orient the terminal to the housing cavity. Snap the terminal in place.
2. Slide the cap over the lead bundle. Snap the cap in place.
3. Install a cable strap through the guide and around the lead bundle.



1. **Press latch**
2. **Press cap and latch**
3. **Remove cap**

Figure A-43. Remove the Wire Lead Cap

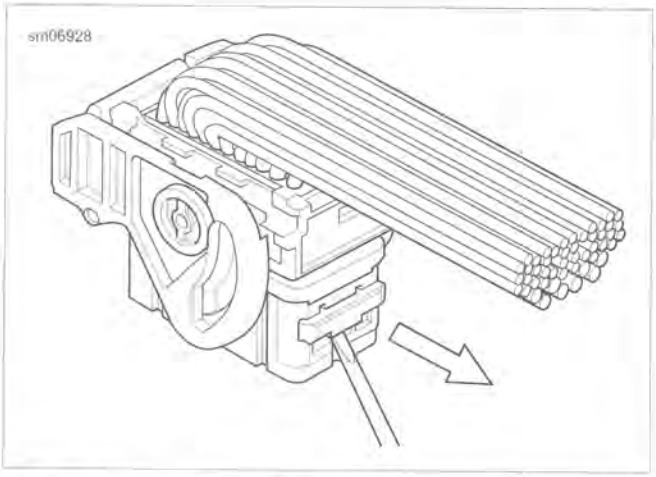
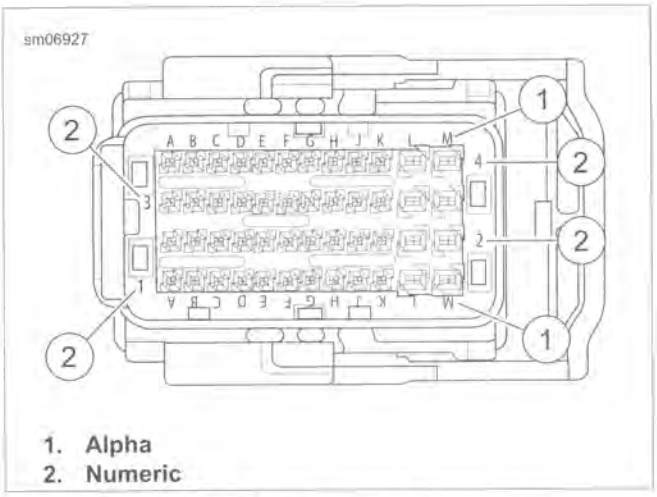
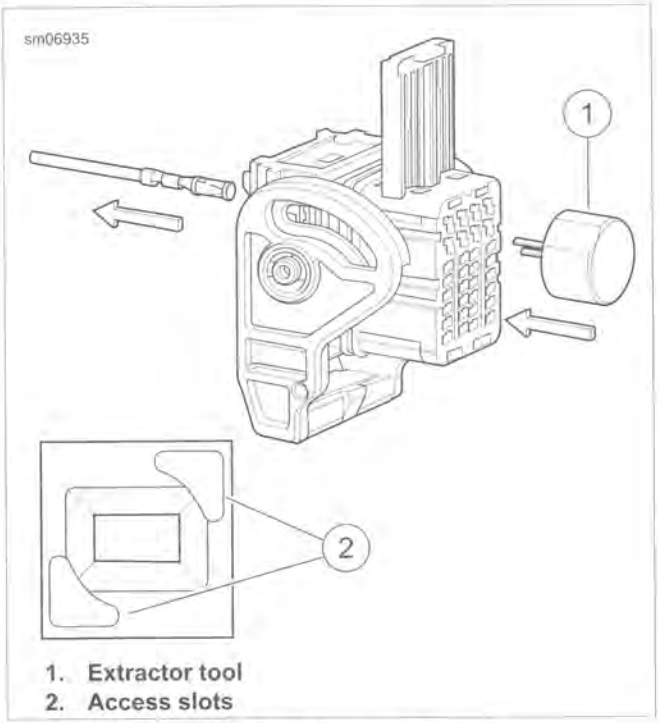


Figure A-44. Molex CMC Sealed Connector Secondary Lock



1. Alpha
2. Numeric

Figure A-45. Alpha-Numeric Coordinates



1. Extractor tool
2. Access slots

Figure A-46. Terminal Removal

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-3	JAE DIE
HD-50120-4	JAE DIE

1. Select the crimper die according to the terminal part number from the UNIVERSAL CRIMPER SET (Part No. HD-50120).
2. Strip the wire insulation to specification. Refer to Table A-5 or Table A-6.
3. Install the JAE DIE (Part No. HD-50120-3) or JAE DIE (Part No. HD-50120-4) in the handle of the HAND CRIMP FRAME (Part No. HD-50120-2).
4. Place the **new** terminal in the specified nest.
5. Insert the wire to the wire stop. Crimp the terminal.
6. Inspect the crimped terminal.

Table A-5. Molex CMC Sealed Crimper Die (Part No. HD-50120-3)

PART NO.	TERMINAL: WIRE GAUGE	STRIP LENGTH		NEST
		in	mm	
72226-11	Socket: 16 AWG	0.177	4.5	B
72227-11	Socket: 18 AWG	0.177	4.5	A

Table A-6. Molex CMC Sealed Crimper Die (Part No. HD-50120-4)

PART NO.	TERMINAL: WIRE GAUGE	STRIP LENGTH		NEST
		in	mm	
72222-11	Socket: 18 AWG	0.138	3.5	B
72222-11	Socket: 20 AWG	0.138	3.5	A

MOLEX MX 150 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-48114	TERMINAL REMOVER

Separating Pin and Socket Housings

See Figure A-47. Press the latch while pulling the pin and socket housings apart.

Mating Pin and Socket Housings

1. Orient the latch on the pin housing to the latch pocket on the socket housing so the rails on the outside of the pin housings lines up with the tunnels on the socket housing.
2. Press the housings together until the latch clicks.

Removing Terminals

1. Pull the secondary lock up, approximately 3/16 in (4.8 mm), until it stops.
   a. **Socket Housing:** See Figure A-48. Use a small screwdriver in the pry slot. The slot next to the external latch provides a pivot point.
   b. **Pin Housing:** See Figure A-49. Use needle nose pliers to engage the D-holes in the center of the secondary lock.

NOTE

Do not remove the secondary lock from the connector housing.

2. See Figure A-50. Insert TERMINAL REMOVER (Part No. HD-48114) into the pin hole next to the terminal until the tool bottoms.
   a. **Socket Housing:** The pin holes are inside the terminal openings.
   b. **Pin Housing:** The pin holes are outside the pins.
3. Pressing the terminal remover to the bottom of the pin hole, gently pull on the wire to remove wire terminal from its cavity.

Installing Terminals

1. See Figure A-51. From the wiring diagram, match the wire color to its numbered terminal cavity.

NOTE

Cavity numbers (1) are stamped on the housing at the ends of the cavity rows. Determine the cavity number by counting the cavities up or down along the row from each stamped number.

2. Orient the terminal that the tang (2) opposite the open crimp engages the slot (3) in the cavity.
3. Push the terminal into the cavity.
4. Gently tug on wire to verify that the terminal is captured by the secondary lock.
5. With all terminals installed, push the secondary lock into the socket housing to lock the wire terminals into the housing.

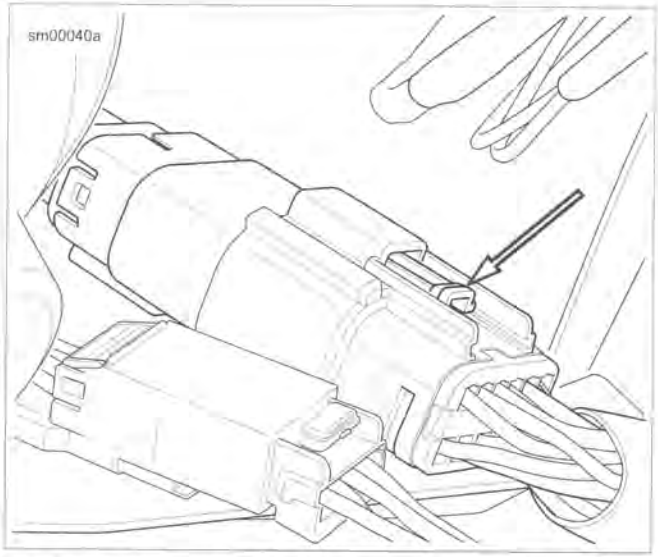


Figure A-47. Molex MX 150 Sealed Connector: Latch

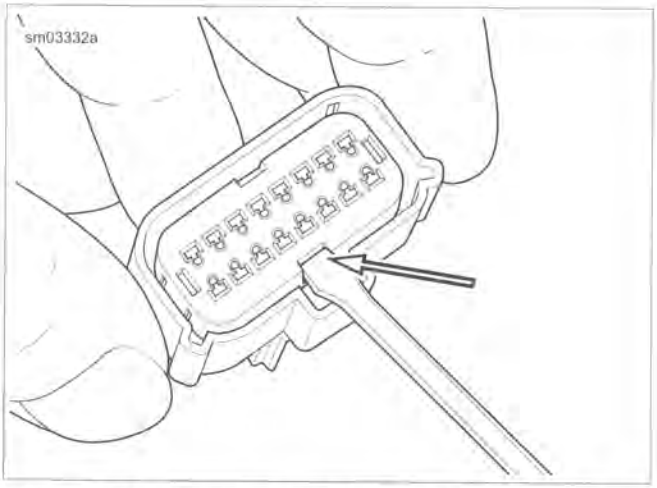


Figure A-48. Secondary Lock Pry Slot (Socket Housing)

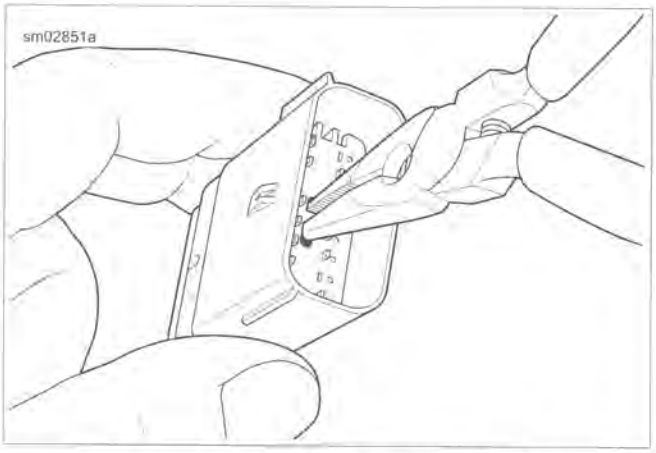


Figure A-49. Pull Up Secondary Lock

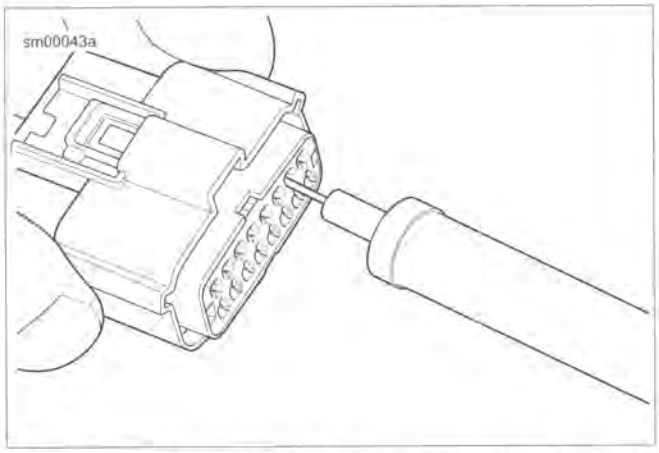
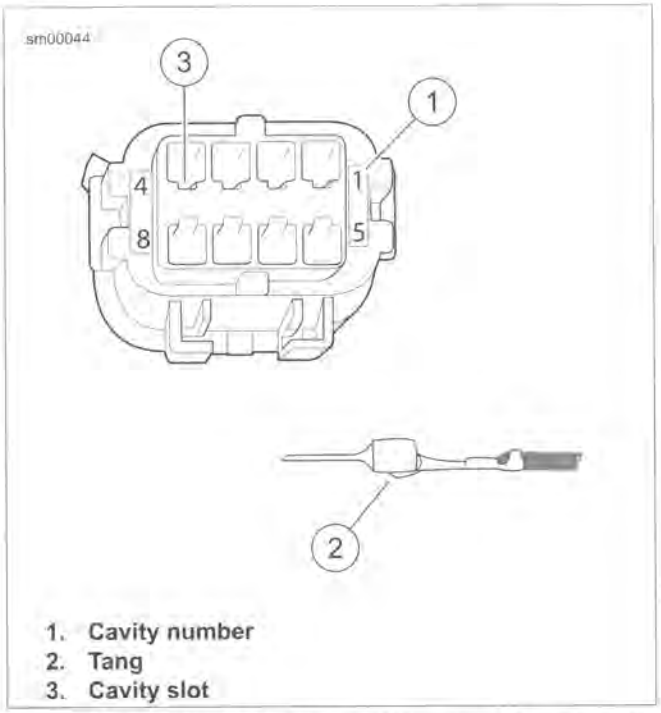


Figure A-50. Molex MX 150 Sealed Connector: Terminal Remover (HD-48114)



1. Cavity number
2. Tang
3. Cavity slot

Figure A-51. Molex MX 150 Sealed Connector: Pin Cavities and Wire Terminal

CRIMP TERMINAL TO LEAD

PART NUMBER	TOOL NAME
HD-48119	TERMINAL CRIMPER

Prepare Lead

1. Cut the damaged terminal close to the back of the terminal to leave as much wire length as possible.
2. Strip wire lead removing 3/16 in (4.70-5.60 mm) of insulation.

NOTE

The strip length is the same for both pin and socket terminals and for wire gauges from 22 to 14.

Prepare Tool

1. Identify the punch/die in the jaws of the TERMINAL CRIMPER (Part No. HD-48119) for the wire gauge. Refer to Table A-7.
2. Squeeze and release the handles to open the tool.

NOTE

The crimp tool automatically opens when the handles are released.

3. See Figure A-52. Hold fully open tool at approximately 45 degrees.

NOTE

Do NOT tighten the locknut holding the locator bars. The bars must float to accommodate the different terminal gauges.

Table A-7. Crimp Tool Wire Gauge Punch/Die

AWG (WIRE GAUGE)	PUNCH/DIE
22	Left
18-20	Middle
14-16*	Right
* Crimp 16 AWG **pin** terminals in the 18-20 middle die.	

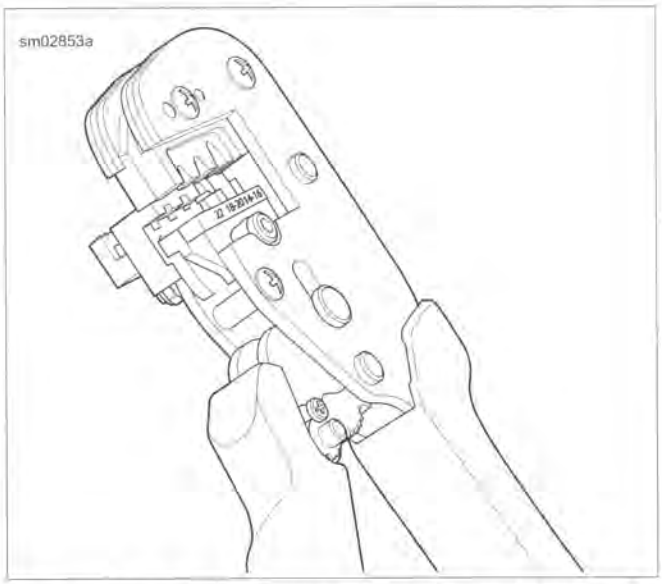
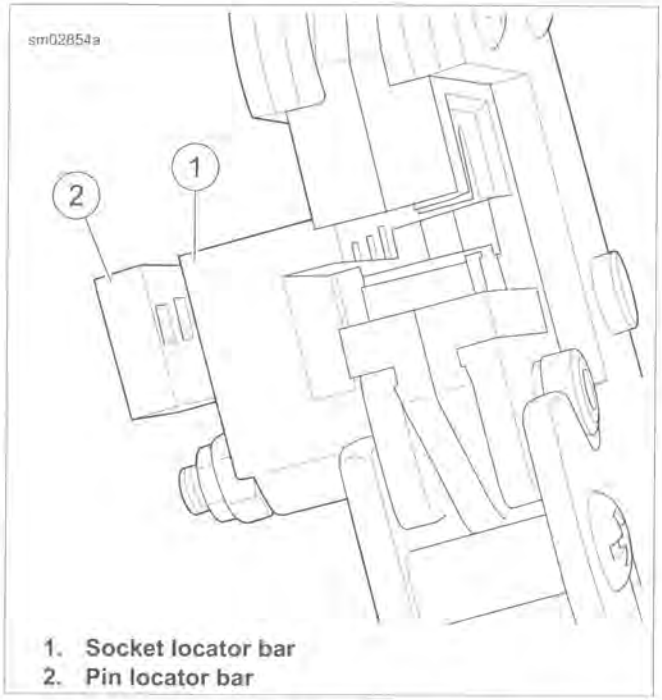


Figure A-52. Open Terminal Crimper (HD-48119) at 45 Degrees



1. **Socket locator bar**
2. **Pin locator bar**

Figure A-53. Terminal Locator Bars

Position Terminal in the Punch/Die

1. See Figure A-54. With the crimp tails up, place the terminal through the punch/die into the square opening in the socket locator bar.
   a. **Socket Terminal:** See Figure A-53. A socket terminal stops against the back face of the socket locator bar (1).
   b. **Pin Terminal:** See Figure A-55. The tip of a pin terminal passes through the socket locator bar and stops in the notch in the face of the pin locator bar.
2. See Figure A-56. Ratchet the handles together until the crimp tails are held in vertical alignment between the punch and the die.

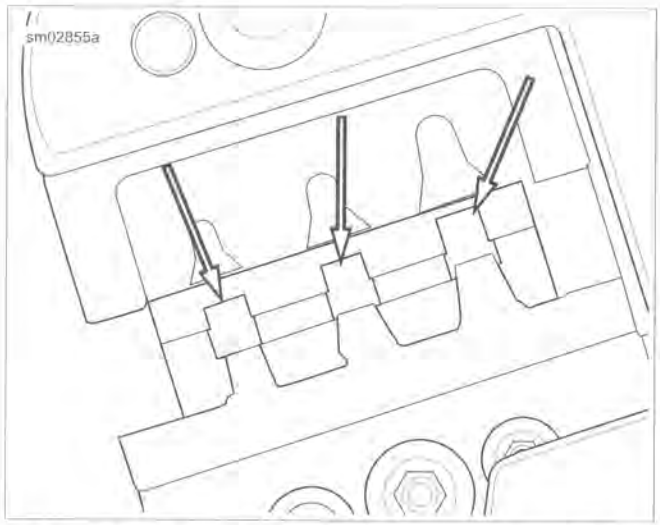


Figure A-54. Square Openings in Socket Locator Bar

Insert Stripped Lead

See Figure A-57. Insert the stripped end (wire core) between the crimp tails at an up angle until the wire core touches the face of the socket locator bar above the square opening.

NOTES

- *The insulation must extend through the insulation crimp tails.*
- *Insert the wire with little or no pressure. Pressing on the lead will bend the wire core.*

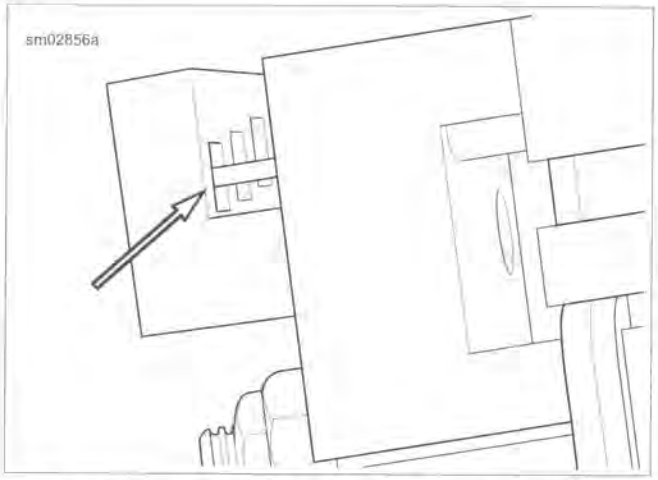


Figure A-55. Pin Terminal against Pin Locator Bar

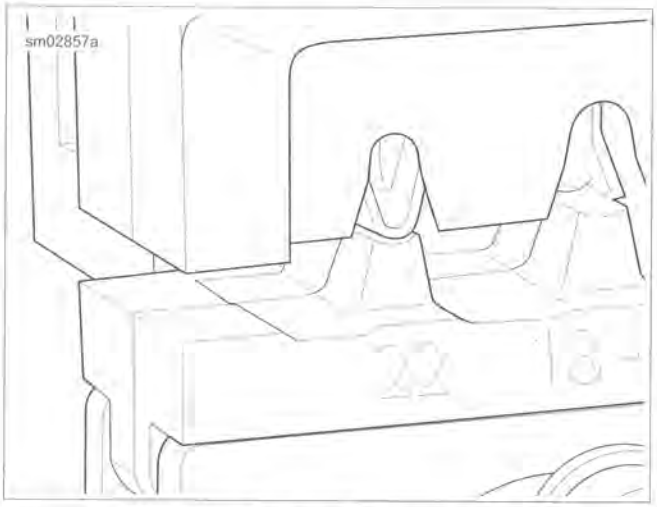


Figure A-56. Crimp Tails in Vertical Alignment between Punch and Die

Crimp Terminal to Lead

1. Holding the wire lead in position touching the locator face at an angle, quickly and smoothly squeeze the crimp tool closed.
2. Final squeeze the handles to open the tool and release the terminal.

NOTE

Open a stuck or jammed tool by pressing the ratchet release lever found between the handles. Do ***not*** *force the handles open or closed.*

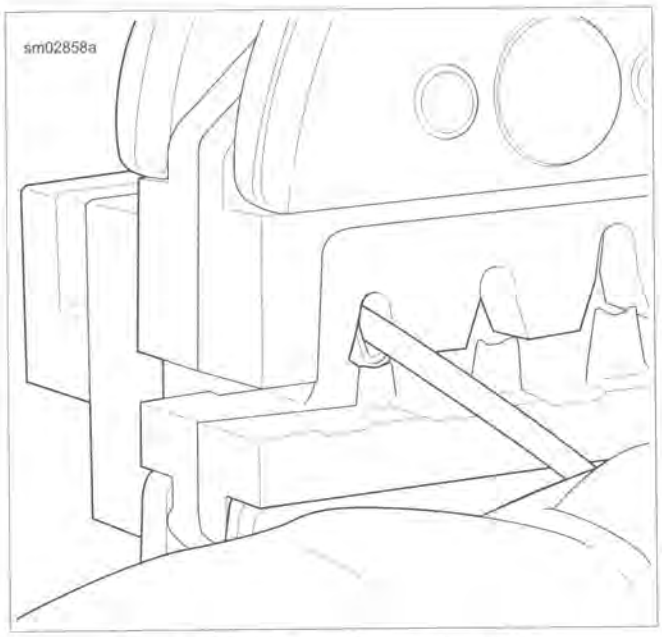
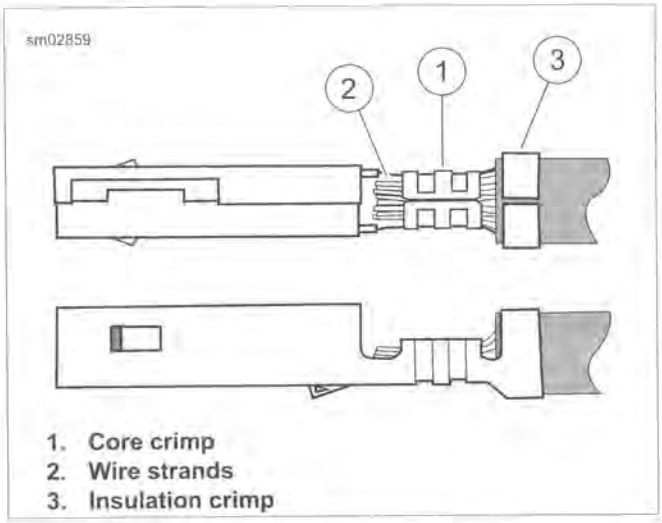


Figure A-57. Stripped Lead at Up Angle

Inspect Crimp

1. **Inspect Crimp:** Inspect the core and insulation crimp.
   a. See Figure A-58. The core tails should be creased into the wire strands at the core crimp (1).
   b. Strands (2) of wire should be visible beyond the core crimp but not forward into the terminal shell.
   c. The insulation tails should be folded into the insulation (3) without piercing or cutting the insulation.
   d. Distortion should be minimal.
2. **Test Crimp:** Hold the terminal. Pull the lead.



1. Core crimp
2. Wire strands
3. Insulation crimp

Figure A-58. Terminal Crimp

TYCO 040 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
HD-44695-A	MULTI-LOCK CRIMPER

General

Tyco 040 Multilock Unsealed connectors are found between wire harnesses and component wiring.

See Figure A-59. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

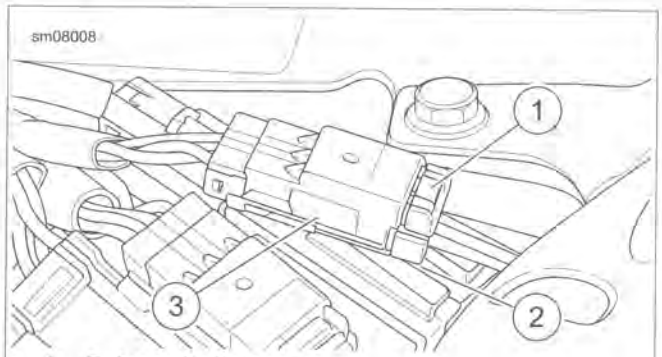
Use the MULTI-LOCK CRIMPER (Part No. HD-44695-A) for terminal crimping.

Separating Pin and Socket Housings

1. See Figure A-59. Press the release button (1) on the socket terminal side of the connector.
2. Pull the socket housing (2) out of the pin housing (3).

Mating Pin and Socket Housings

1. Hold the housings to match wire color to wire color.
2. Insert the socket housing into the pin housing until it clicks in place.



1. **Release button**
2. **Socket housing**
3. **Pin housing**

Figure A-59. Tyco 040 Multilock Unsealed Connector

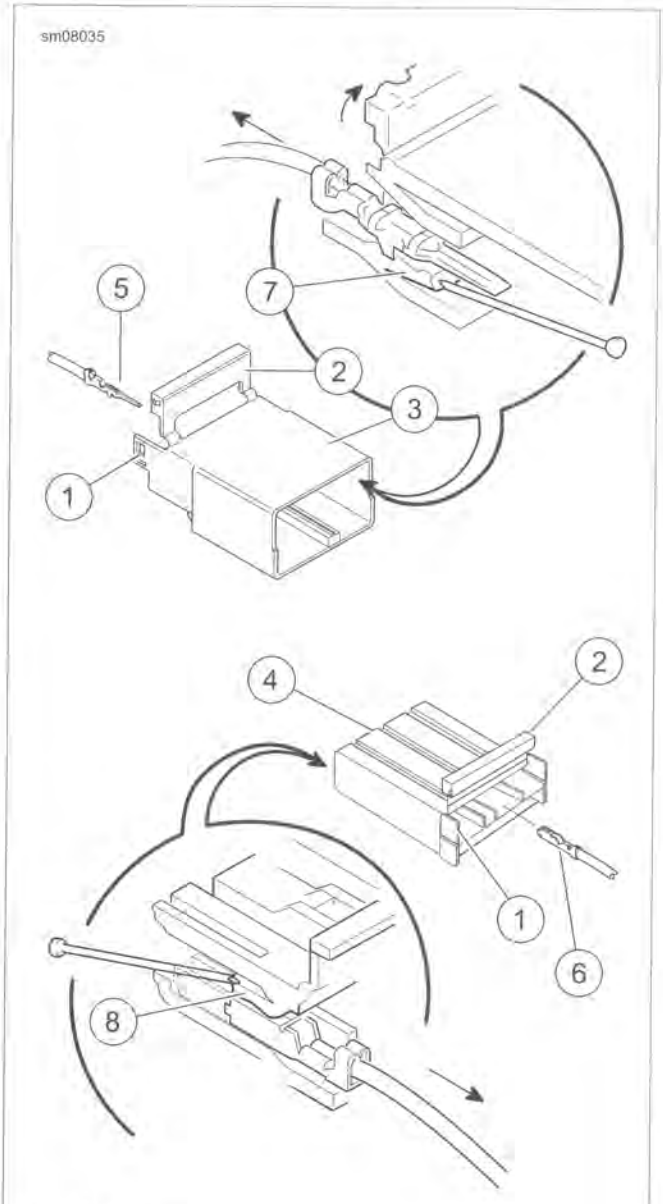
Removing Terminals from Housing

1. See Figure A-60. Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Using TERMINAL EXTRACTOR (Part No. B-50085), press the tang in the housing to release the terminal.
   a. **Socket:** Lift the socket tang (8) up.
   b. **Pin:** Press the pin tang (7) down.

NOTE

If the tang is released, a click is heard.

4. Gently tug on wire to pull wire and terminal from cavity.



1. **Latch**
2. **Secondary lock open**
3. **Pin housing**
4. **Socket housing**
5. **Pin terminal**
6. **Socket terminal**
7. **Tang (pin)**
8. **Tang (socket)**

Figure A-60. Tyco 040 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

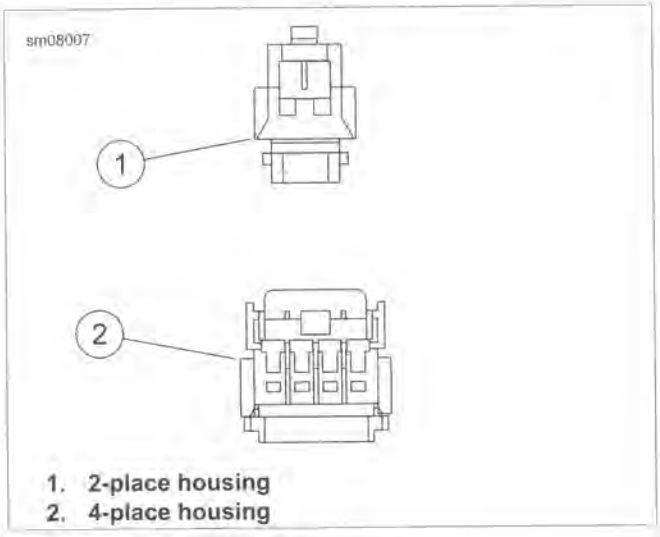
See Figure A-61. Match the wire color to the cavity number found on the wiring diagram.

1. Hold the terminal so the catch faces the tang in the chamber. Insert the terminal into its cavity until it snaps in place.

NOTES

- *The release button is always on the top of the connector.*
- *On the pin side of the connector, tangs are positioned at the bottom of each cavity. Therefore, the slot in the pin terminal (on the side opposite the crimp tails) must face downward.*
- *On the socket side, tangs are at the top of each cavity. Therefore, the socket terminal slot (on the same side as the crimp tails) must face upward.*

2. Gently tug on wire ends to verify that all terminals are locked.
3. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.



1. 2-place housing
2. 4-place housing

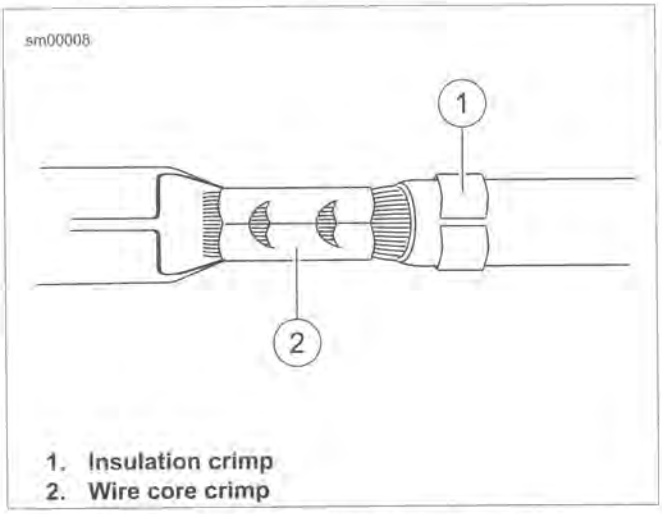
Figure A-61. Tyco 040 Multilock Unsealed Connector (socket housings shown)

Crimping Terminals to Leads

Terminals are crimped twice: once over the wire core and a second time over the insulation tails. For the correct terminal crimping procedure, refer to the instruction sheet provided with the MULTI-LOCK CRIMPER (Part No. HD-44695-A) or available through h-dnet.com.

Inspecting Crimped Terminals

See Figure A-62. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. Insulation crimp
2. Wire core crimp

Figure A-62. Tyco 040 Multilock Unsealed Connector: Terminal Crimp

TYCO 070 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
HD-41609	AMP MULTI-LOCK CRIMPER

General

Tyco 070 Multilock Unsealed connectors are found between wire harnesses and component wiring. They are either floating or anchored to the frame with attachment clips.

See Figure A-63. Attachment clips (1) on the pin housings are fitted to T-studs on motorcycle frame. The T-studs identify OE connector locations. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

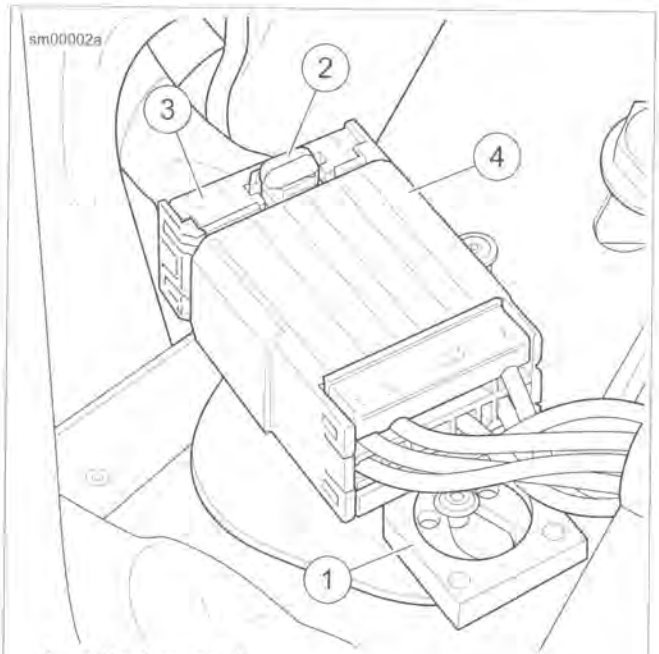
Use the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) for terminal crimping.

Separating Pin and Socket Housings

1. If necessary, slide connector attachment clip so T-stud is in the large end of the clip opening. Remove connector from T-stud.
2. See Figure A-63. Press the release button (2) on the socket terminal side of the connector.
3. Pull the socket housing (3) out of the pin housing (4).

Mating Pin and Socket Housings

1. Hold the housings to match wire color to wire color.
2. Insert the socket housing into the pin housing until it clicks in place.
3. If OE location is a T-stud, fit large opening end of attachment clip over T-stud. Slide connector to engage T-stud to small end of opening in clip.



1. **Attachment clip**
2. **Release button**
3. **Socket housing**
4. **Pin housing**

Figure A-63. Tyco 070 Multilock Unsealed Connector

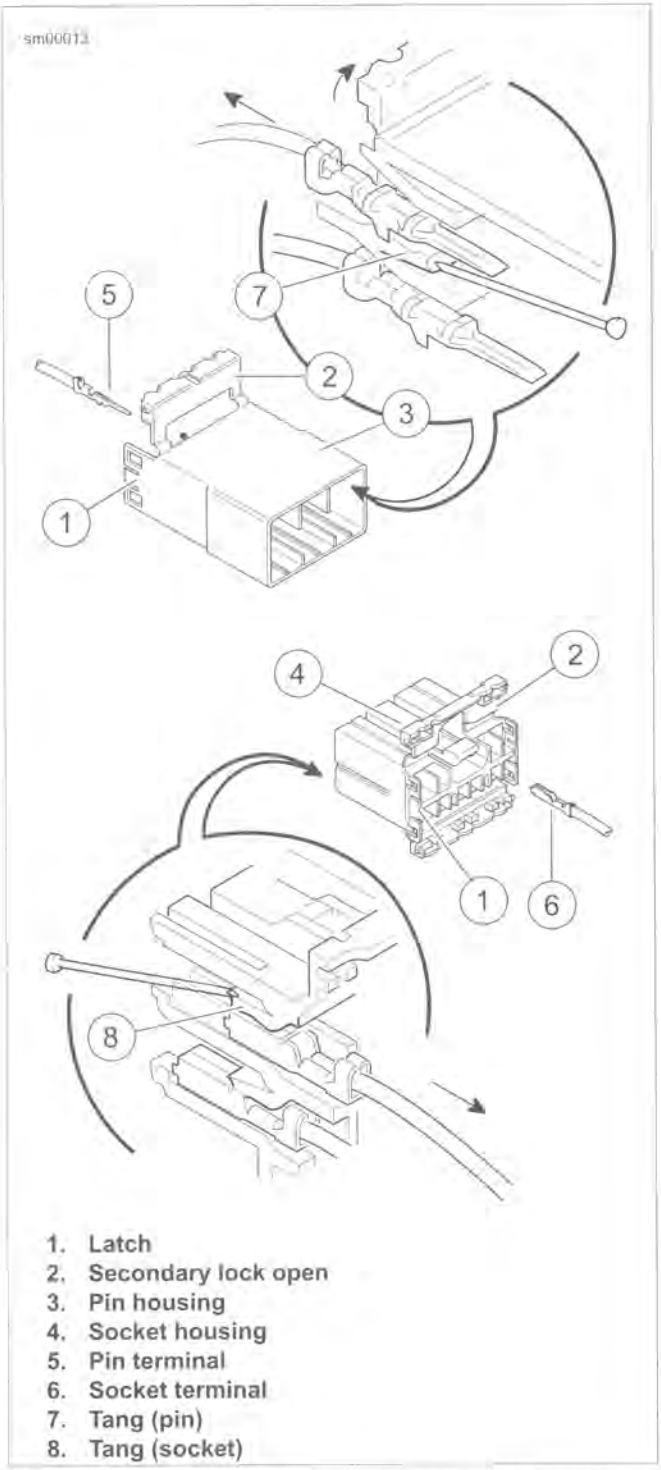
Removing Terminals from Housing

1. See Figure A-64. Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Using TERMINAL EXTRACTOR (Part No. B-50085), press the tang in the housing to release the terminal.
   a. **Socket:** Lift the socket tang (8) up.
   b. **Pin:** Press the pin tang (7) down.

NOTE

If the tang is released, a click is heard.

4. Gently tug on wire to pull wire and terminal from cavity.



1. Latch
2. Secondary lock open
3. Pin housing
4. Socket housing
5. Pin terminal
6. Socket terminal
7. Tang (pin)
8. Tang (socket)

Figure A-64. Tyco 070 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

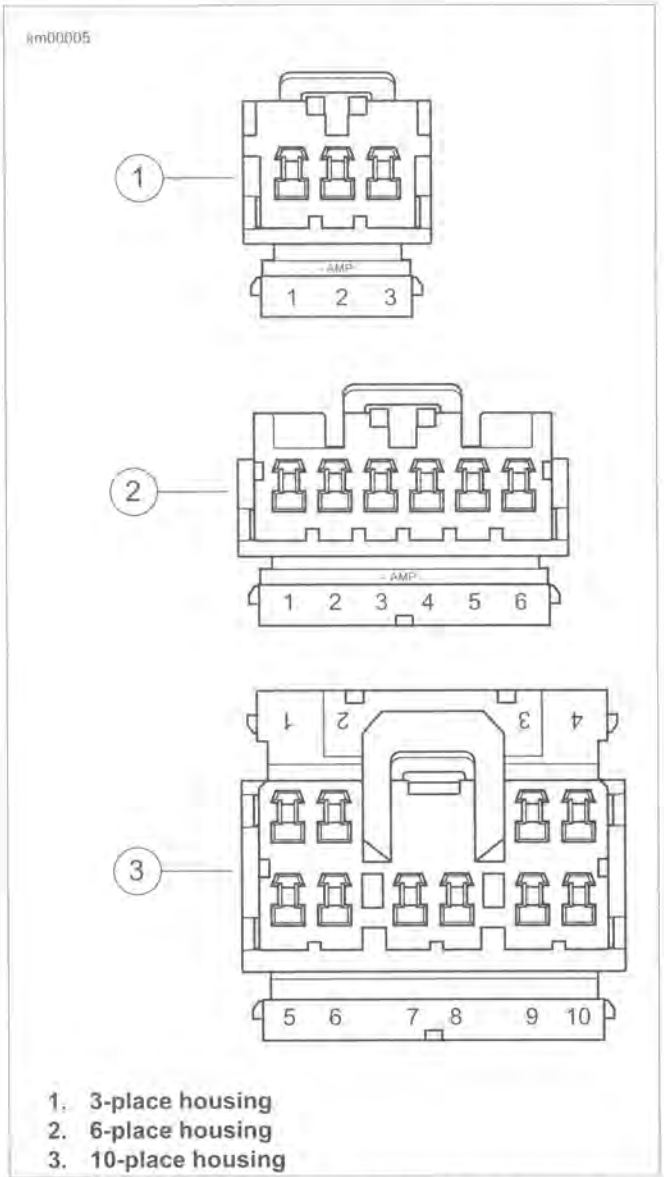
See Figure A-65. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

1. Hold the terminal so the catch faces the tang in the chamber. Insert the terminal into its numbered cavity until it snaps in place.

NOTES

- *The release button is always on the top of the connector.*
- *On the pin side of the connector, tangs are positioned at the bottom of each cavity. Therefore, the slot in the pin terminal (on the side opposite the crimp tails) must face downward.*
- *On the socket side, tangs are at the top of each cavity. Therefore, the socket terminal slot (on the same side as the crimp tails) must face upward.*

2. Gently tug on wire ends to verify that all terminals are locked.
3. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.



1. 3-place housing
2. 6-place housing
3. 10-place housing

Figure A-65. Tyco 070 Multilock Unsealed Connector: Cavity Numbers on Secondary Locks (socket housings shown)

Crimping Terminals to Leads

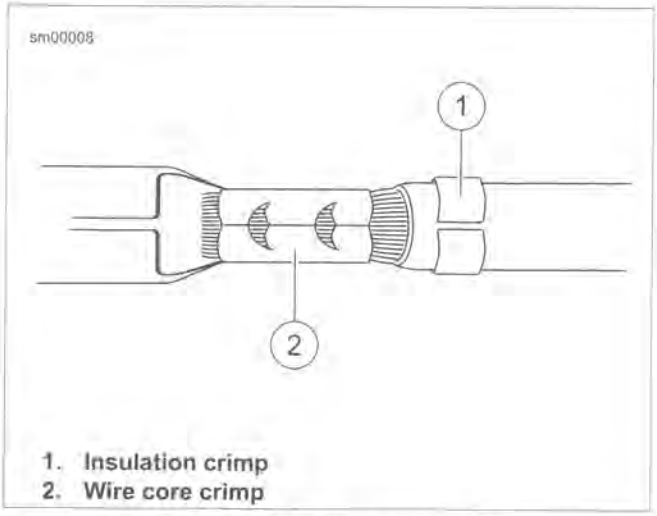
NOTE

Crimping with the AMP Multi-lock Crimper is a one-step operation. One squeeze crimps both the wire core and the insulation tails.

For the correct terminal crimping procedure, refer to the instruction sheet provided with the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) or available through h-dnet.com.

Inspecting Crimped Terminals

See Figure A-66. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. Insulation crimp
2. Wire core crimp

Figure A-66. Tyco 070 Multilock Unsealed Connector: Terminal Crimp

TYCO GET 64 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

General

See Figure A-67. The Tyco GET 64 Sealed connector is found on the ECM of most models.

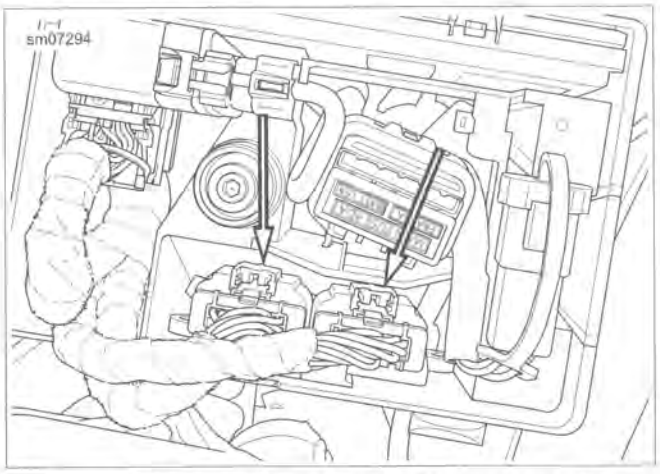
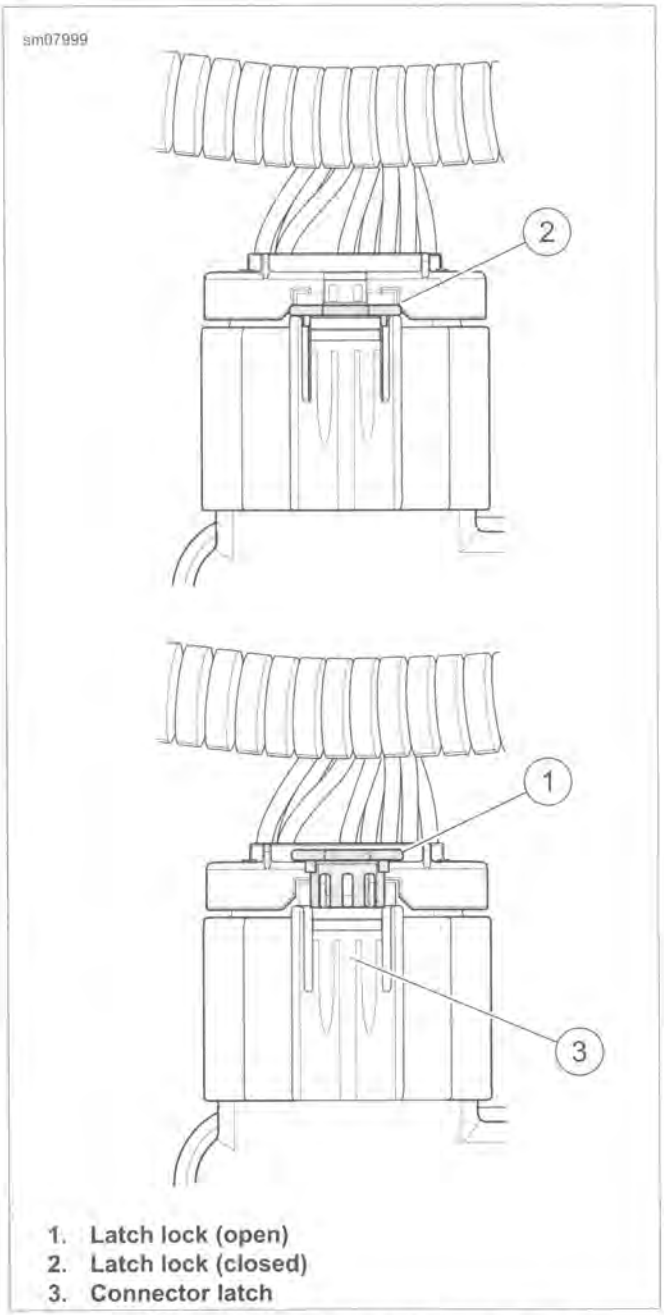


Figure A-67. Tyco GET 64 Sealed Connector Latch

Housings

See Figure A-68. **Separate:** Lift the latch lock to open (1). Press the latch (3). Pull the socket housing off the ECM.

Join: Align the socket housing latch with the catch on the ECM. Press housing onto ECM. Press down the latch lock to close (2).



1. **Latch lock (open)**
2. **Latch lock (closed)**
3. **Connector latch**

Figure A-68. Tyco GET 64 Sealed Connector Latch and Lock

Removing Socket Terminals

1. Remove the black wrap to access the back of the connector.
2. See Figure A-69. Use needle nose pliers to pull the secondary lock out of the housing.
3. See Figure A-70. Orient the bevel of the TERMINAL EXTRACTOR (Part No. B-50085) (1) to the upper or lower terminal row. Insert the extractor into the slot next to the terminal.

4. Rotate the extractor to release the retention beam and simultaneously pull on the wire lead to remove the terminal.

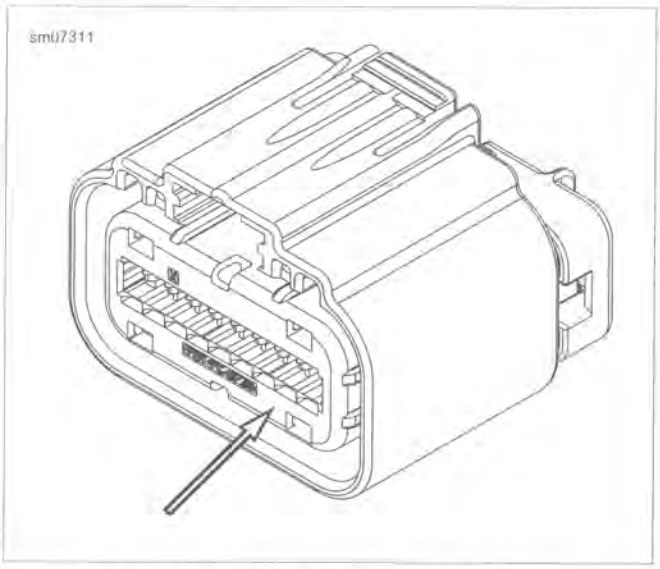
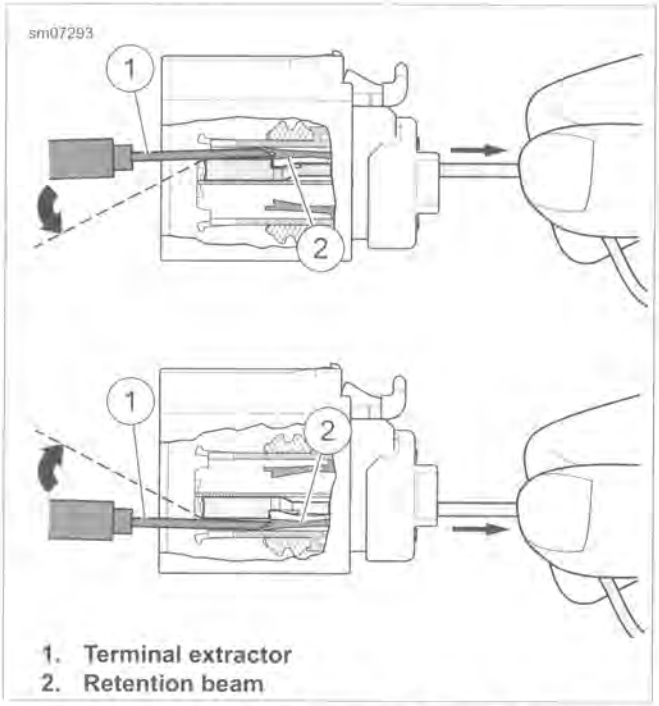


Figure A-69. Tyco GET 64 Secondary Lock



1. Terminal extractor
2. Retention beam

Figure A-70. Removing Terminals: Tyco GET 64 Sealed Connector

Installing Socket Terminals

1. See Figure A-71. Locate the wire lead cavity by number.
2. See Figure A-72. Orient the open side of the crimp to the lower or the upper terminal row.
3. Press the terminal in through the rear cover and the seal until it clicks.
4. Press the secondary lock into the locked position.
5. Black wrap the wire lead bundle.

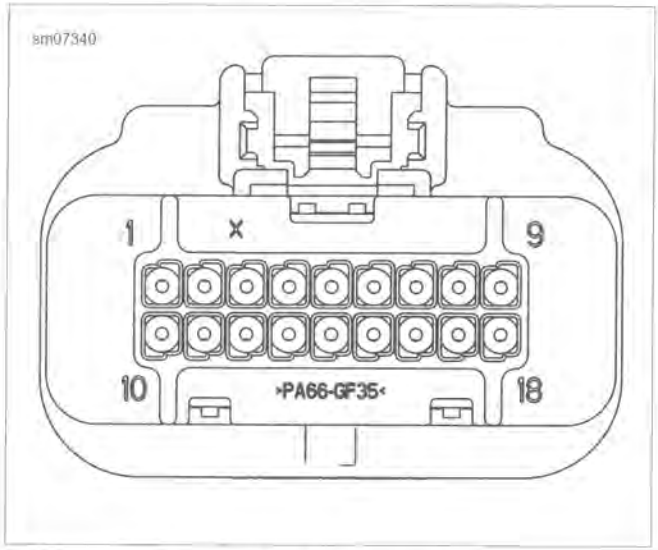


Figure A-71. Cavity Numbers

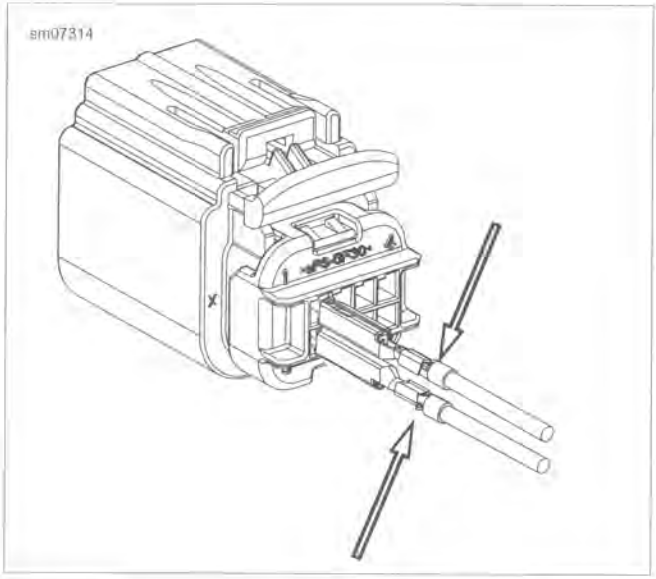


Figure A-72. Socket Terminal Orientation: Crimp Open Side

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-7	TYCO GET 64 DIE

Crimping Tyco GET 64 terminals requires the use of the TYCO GET 64 DIE (Part No. HD-50120-7) in the HAND CRIMP FRAME (Part No. HD-50120-2). These items are included in the UNIVERSAL CRIMPER SET (Part No. HD-50120).

For the correct terminal crimping procedure, refer to the instruction sheet provided with the tool or available on h-dnet.com.

TYCO MCP SEALED CONNECTOR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
GA500A	SNAP-ON TERMINAL PICK

General

The Tyco MCP sealed connector is used on certain ABS modules.

Housing

Separate: See Figure A-73. Press and hold the lock tab. Pulling on both ends of the lever, open the lever.

Join: Gently mate the pins to the socket. Press and hold the lock tab. Pressing on both ends of the lever, close the lever.

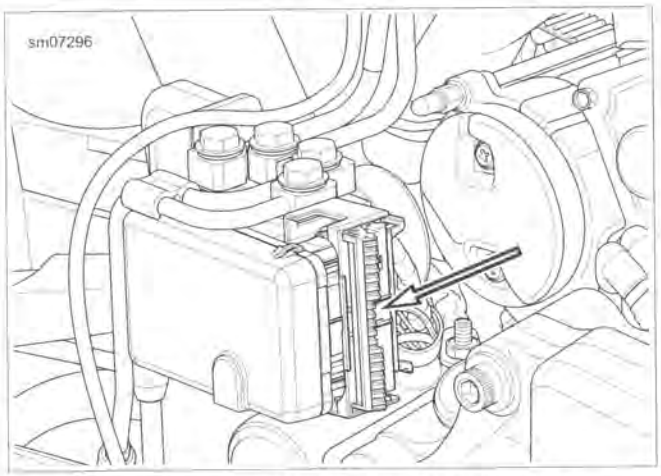


Figure A-73. Tyco MCP Connector Release Bar

Removing the Large Terminals

1. Snap the wire harness cover off of the back of the connector

NOTE

Insert a thin flat bladed screwdriver all the way to the bottom behind the tab of the secondary lock.

2. See Figure A-74. Gently slide the secondary lock out of the connector with a screwdriver.
3. See Figure A-75. Insert the smallest pins of the SNAP-ON TERMINAL PICK (Part No. GA500A) into the gaps on each side of the socket to compress the tangs on each side of the terminal.
4. Gently pull on the wire to remove the terminal.

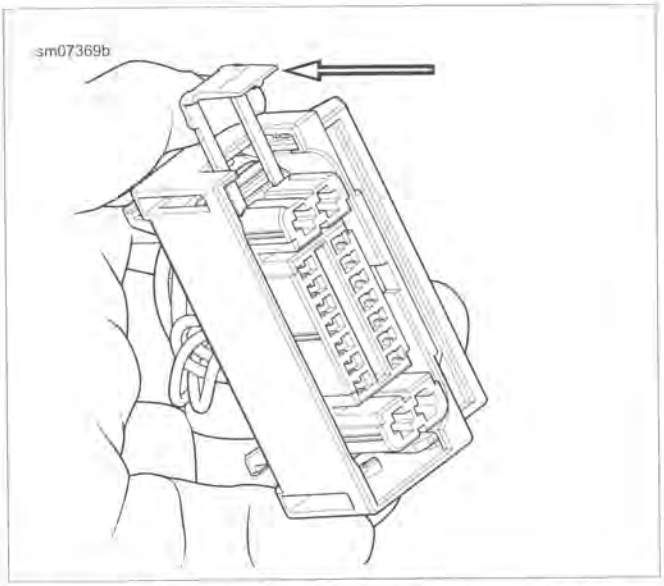


Figure A-74. Tyco MCP Connector Secondary Lock

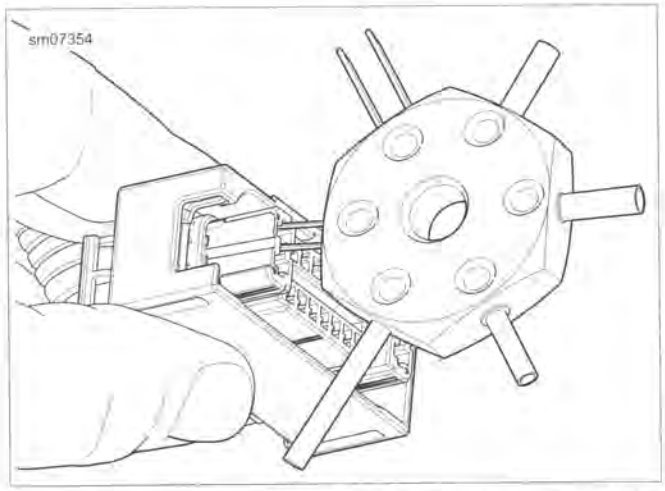


Figure A-75. Removing Large Socket Terminals: Tyco MCP Connector

Removing the Small Terminals

1. Snap the wire harness cover off of the back of the connector

NOTE

Insert a thin flat bladed screwdriver all the way to the bottom behind the tab of the secondary lock.

2. See Figure A-74. Gently slide the secondary lock out of the connector with a screwdriver.
3. See Figure A-76. Insert the TERMINAL EXTRACTOR (Part No. B-50085) into the cavity on the outside of the terminal.
4. Tilt the extractor to lift the molding latch and release the terminal.
5. Gently pull on the wire to remove the terminal.

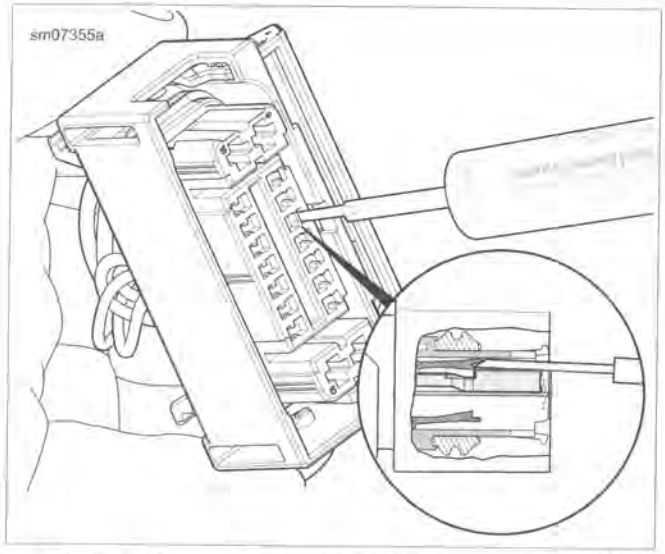


Figure A-76. Removing Small Socket Terminal: Tyco MCP Connector

Installing Terminals

1. See Figure A-77. Locate the wire lead cavity by number.
2. Use a hobby knife to bend the tangs on each side of the terminal outward.
3. Align the socket.
4. Push the socket in until it clicks.
5. Press the secondary lock back into the connector.
6. Snap the wire cover in place.

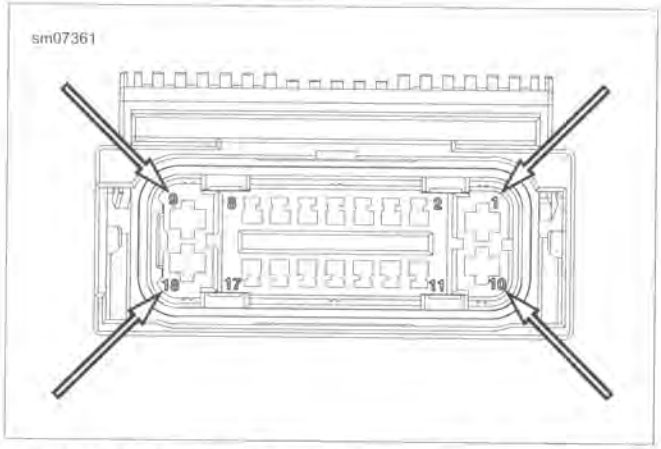


Figure A-77. Tyco MCP Sealed Connector Cavity Numbers

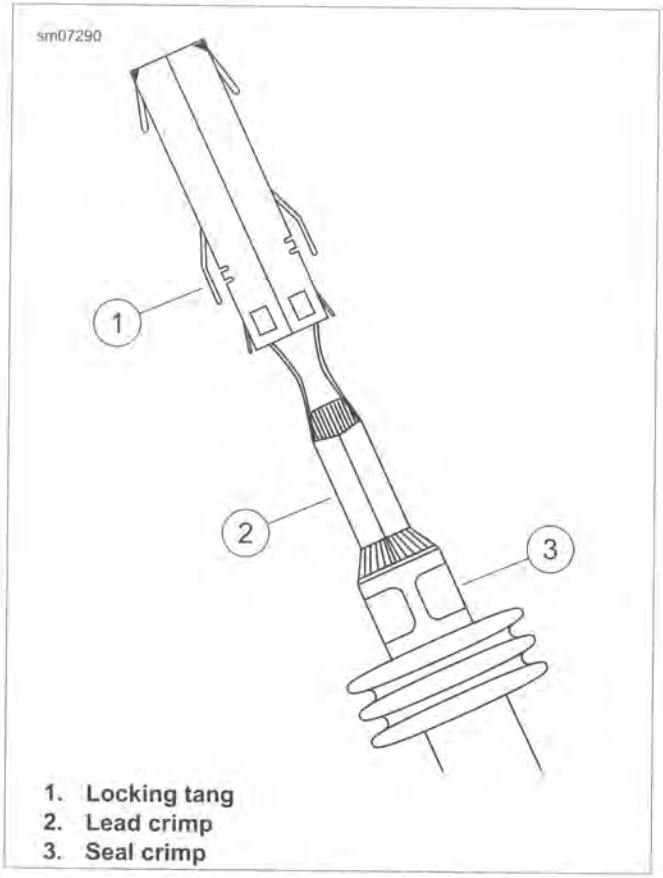
CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-8	TYCO MCP DIE

1. Strip the wire insulation to specification. Refer to Table A-8.
2. Install the TYCO MCP DIE (Part No. HD-50120-8) in the handle of the UNIVERSAL CRIMPER SET (Part No. HD-50120).
3. Place the **new** terminal in the specified nest.
4. Insert the wire to the wire stop.
5. Crimp the terminal.
6. Inspect the crimped terminal.

Table A-8. Tyco MCP Crimper Die (Part No. HD-50120-8)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Large socket: 14 AWG	72579-12	0.165-0.189	4.2-4.8	A
Large socket: 16 AWG	72579-12	0.165-0.189	4.2-4.8	B
Small socket: 20 AWG	72580-12	0.130-0.153	3.3-3.9	C



1. **Locking tang**
2. **Lead crimp**
3. **Seal crimp**

Figure A-78. Tyco MCP Socket Terminal Crimp

SEALED SPLICE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN
HD-38125-8	PACKARD CRIMPING TOOL
HD-39969	ULTRA TORCH
HD-41183	HEAT SHIELD ATTACHMENT

General

Splice connectors and several OE ring terminal connectors use heat shrink covering to seal the connection.

Preparing Wire Leads

NOTE

When splicing adjacent wires, stagger the splices that the sealed splice connectors will not touch each other.

1. Using a shop gauge, identify the gauge of the wire.
2. Match the wire gauge to a sealed splice connector by color and part number. Refer to Table A-9.
3. Strip insulation off the wire lead. Refer to Table A-9.

Table A-9. Sealed Splice Connectors

WIRE GAUGE	COLOR	PART NO.	STRIP LENGTH	
			in	mm
18-20 (0.5-0.8 mm)	Red	70585-93	3/8	9.5
14-16 (1.0-2.0 mm)	Blue	70586-93	3/8	9.5
10-12 (3.0-5.0 mm)	Yellow	70587-93	3/8	9.5

NOTE

If any copper wire strands are cut off of the wire core, trim the end and strip the wire again in a larger gauge stripper.

Splicing Wire Leads

NOTE

See Figure A-80. The connector is crimped on one side and then the other.

1. See Figure A-79. Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
2. Match the connector color to the wire gauge crimp die in the jaws. Insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See Figure A-80. Feed the stripped end of a wire into the connector until the wire stops inside the metal insert (1).
5. Squeeze the handles tightly closed to crimp the lead in the insert (2). The tool automatically opens when the crimping is complete.
6. Slide the connector to the other half of the metal insert. Insert the stripped wire lead (1) until it stops. Crimp the lead in the insert (2).

⚠WARNING

Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)

- Avoid directing heat toward any electrical system component that is not being serviced.
- Always keep hands away from tool tip area and heat shrink attachment.

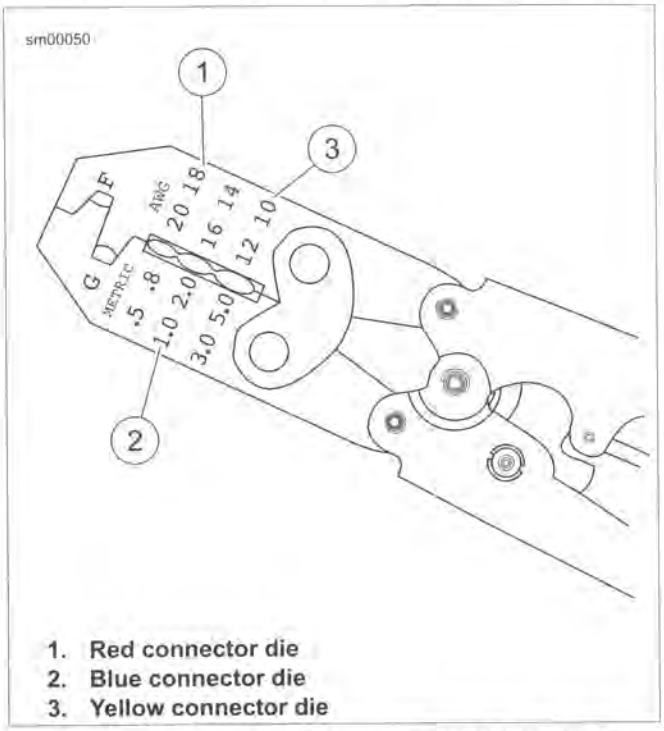
7. Use an ULTRA TORCH (Part No. HD-39969), or a HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

NOTE

It is acceptable for the splice to rest against the heat shrink tool attachment.

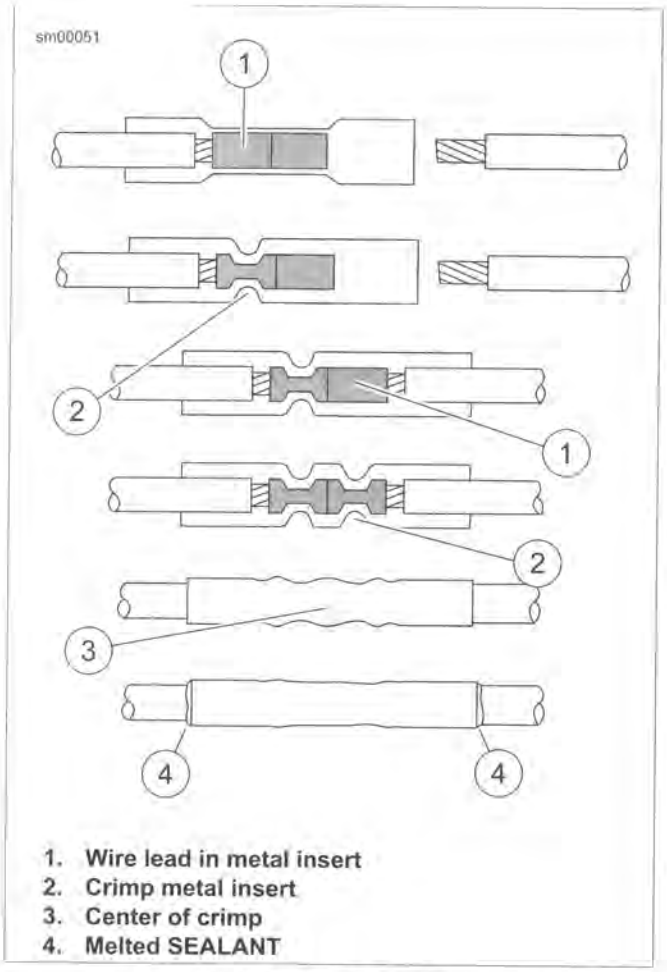
Inspecting Seals

See Figure A-80. Allow the splice to cool and inspect the seal. The insulation should appear smooth and cylindrical. Melted sealant will have extruded out the ends (4) of the insulation.



1. **Red connector die**
2. **Blue connector die**
3. **Yellow connector die**

Figure A-79. Packard Crimping Tool (HD-38125-8)



1. Wire lead in metal insert
2. Crimp metal insert
3. Center of crimp
4. Melted SEALANT

Figure A-80. Sealed Splice Connector

SUBJECT	PAGE NO.
B.1 CONNECTORS	B-1
B.2 WIRING DIAGRAMS	B-6

NOTES

CONNECTOR LOCATIONS

Function/Location

All vehicle connectors are identified by their function and location. Refer to Table B-1.

Place and Color

The place (number of wire cavities of a connector housing) and color of the connector can also aid identification.

Connector Number

On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets.

Repair Instructions

The repair instructions in Appendix A are by connector type. Refer to Table B-1.

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[1]	Main to interconnect harness	16-place Molex MX 150 Sealed (BK)	Gray	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex MX 150 Sealed (GY)	Gray	Inner fairing - left radio support bracket
[4]	P&A accessory	8-way Molex MX150 (GY)	Gray	Under left side cover
[5]	Main fuse	2-place Delphi 800 Metri-Pack Sealed (BK)	Red	Under left side cover
[7]	Rear fender lights harness	6-way Molex MX150 Sealed (BK)	Gray	Top of rear fender (under seat)
[12]	Tour-Pak lights	6-way Molex MX150 Sealed (BK)	Gray	Under seat Just in front of Tour-Pak
[12-2]	Right side marker light	2-way Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak
[12-3]	Left side marker light	2-way Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak
[13]	Fuel tank harness	4-way Molex MX150 Sealed (GY)	Gray	Behind fuel tank (under seat)
[18]	Right rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[19]	Left rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[20]	Console harness	8-way Molex MX150 Sealed (BK)	Gray	Under seat
[22-1]	RHCM main harness	4-place JAE MX19 Sealed (BK)	Yellow	Inner fairing - under radio right side (with fairing) Inside headlamp nacelle (without fairing)
	RHCM	4-place JST JWPF Sealed (W)	Light blue	Inside RHCM housing
[22-2]	RHCM main harness	2-place JAE MX19 Sealed (BK)	Yellow	Inner fairing - under radio right side (with fairing) Inside headlamp nacelle (without fairing)
	RHCM	2-place JST JWPF Sealed (W)	Light blue	Inside RHCM housing
[24]	LHCM main harness	4-place JAE MX19 Sealed (BK)	Yellow	Inner fairing - under radio left side (with fairing) Inside headlamp nacelle (without fairing)
	LHCM	4-place JST JWPF Sealed (W)	Light blue	Inside LHCM housing
[27]	Radio	48-way Molex CMC Sealed (BK)	Breakout Box	Inner fairing - back of radio (right side)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[29]	Position lamp (if equipped)	2-way EPC (BK)	Gray	Inside headlamp nacelle
[31L]	Left front turn signal/auxiliary lamp	4-way Tyco 070 Multilock Unsealed (BK) (without fairing) 4-way JAE MX19 Sealed (BK) (with fairing)	Gray Yellow	Inside headlamp nacelle (without fairing) Inside left front turn signal/Aux lamp support (with fairing)
[31R]	Right front turn signal/auxiliary lamp	6-way Tyco 070 Multilock Unsealed (BK) (without fairing) 4-way JAE MX19 Sealed (BK) (with fairing)	Gray Yellow	Inside headlamp nacelle (without fairing) Inside right front turn signal/Aux lamp support (with fairing)
[32]	Front fender tip lamp jumper harness (if equipped)	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - below upper for bracket (left side) (with fairing) Inside headlamp nacelle (without fairing)
[33]	Ignition switch	2-way Delphi GT 150 3.5mm sealed (GY)	Gray	Bottom of ignition switch (with fairing) Under console (without fairing)
[34-1]	Right front speaker	2-Way Molex MX150 (BK)	Gray	Inner fairing (right speaker enclosure)
[34-2]	Right front speaker	Tyco Insulated Spade terminals (BK)	Gray	Inner fairing (back of right speaker)
[35-1]	Left front speaker	2-Way Molex MX150 (BK)	Gray	Inner fairing (left speaker enclosure)
[35-2]	Left front speaker	Tyco Insulated Spade terminals (BK)	Gray	Inner fairing (back of left speaker)
[36+] [36-]	Left rear speaker	Tyco Insulated Spade terminals (BK)	Gray	Inside left speaker POD (back of left speaker)
[37+] [37-]	Left rear speaker	Tyco Insulated Spade terminals (BK)	Gray	Inside right speaker POD (back of right speaker)
[38]	Headlamp	4-way Delphi 150 Metri-Pack (BK)	Gray	Inner fairing back of headlamp
[38HI]	Headlamp high beam	2-way Tyco (GY)	Gray	Inside headlamp nacelle
[38LO]	Headlamp low beam	2-way Tyco (BK)	Gray	Inside headlamp nacelle
[39]	Speedometer (without fairing) IM (with fairing)	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Back of speedometer under console (without fairing) Inner fairing back of IM (with fairing)
[41+] [41-]	Right saddlebag speaker	Tyco Insulated Spade terminals (BK)	Gray	Inside right saddlebag (back of speaker)
[42+] [42-]	Left saddlebag speaker	Tyco Insulated Spade terminals (BK)	Gray	Inside left saddlebag (back of speaker)
[45]	Rear fender tip lamp (if equipped)	2-way Tyco 070 Unsealed	Gray	Circuit board under tail lamp assembly
[47]	Stator	3-place Dekko (BK)	Green	Bottom of voltage regulator (left side)
[50]	CB antenna cable			Inner fairing - back of CB module
[51]	Radio antenna cable			Inner fairing - back of radio (left side)
[52]	Radio antenna cable to mast			Inside of Tour-Pak
[53]	Rider headset	6-way Molex MX150 (BK)	Gray	Under seat
[64]	Fuse block	24-way fargo fuse block unsealed (BK)	Gray	Under left side cover
[65]	VSS	3-place Delphi GT 150 Sealed (BK)	Gray	Top of transmission case (under starter)
[67]	Accessory switch	4-place Tyco Mate-N-lok Unsealed (BK)	Gray	Inside headlamp nacelle

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[73]	Auxiliary/fog lamps	2-way Delphi 280 Metri-Pack Sealed (BK)	Purple	Inside auxiliary/fog lamps
[76]	Passenger headset	7-place DIN (BK)		Below rear left speaker box
[77]	Voltage regulator	2-place Dekko (BK)	Green	Bottom of voltage regulator (right side)
[78-1]	ECM	18-way Tyco (BK)	Breakout Box	Under seat
[78-2]	ECM	18-way Tyco (GY)	Breakout Box	Under seat
[78-3]	ECM	18-way Tyco (BN)	Breakout Box	Under seat
[79]	CKP sensor	2-place Deutsch DTM Sealed (BK)	Brown	Rear of lower front frame cross-member
[80]	TMAP sensor	4-place Bosch Compact 1.1M Sealed (BK)	Gray	Top of induction module
[83]	Ignition coil	4-place Delphi GT 150 Sealed (BK)	Gray	Bottom front of battery tray
[84]	Front fuel injector	2-place Molex BPT Sealed (BK)	Purple	Below fuel tank (left side)
[85]	Rear fuel injector	2-place Molex BPT Sealed (BK)	Purple	Below fuel tank (left side)
[90]	ET sensor	2-place Delphi GT 150 Sealed (BK)	Gray	Back of front cylinder (left side)
[91]	DLC	4-place Deutsch DT Sealed (GY)	Black	Under left side cover
[91-2]	DLC	6-way Deutsch DT sealed (GY)	Black	Under left side cover
[93]	Tail lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[95]	Purge solenoid	2-place Delphi 150 Metri-Pack Sealed (R)	Gray	Under seat
[97]	Right cooling fan	2-way Delphi 150 Metri-Pack Sealed (BK)	Gray	Inside right lower fairing
[105L]	OE dash switch pack	6-way Molex MX150 Sealed (BK)	Gray	Behind switch cover (left side)
[105R]	P&A dash switch pack	6-way Molex MX150 Sealed (BK)	Gray	Behind switch cover (right side)
[107]	AAT sensor	2-way Molex MX64 Unsealed (BK)	Light blue	Steering head, left side
[109]	Auxiliary lamps switch (without fairing)	4-place Tyco Mate-N-Lok Unsealed (BK)	Gray	Inside headlamp nacelle
[111]	Voltmeter	4-way Delphi GT 150 3.5mm Sealed (BK)	Gray	Inner fairing (back of voltmeter)
[117]	Fuel gauge	4-way Tyco 040 Multilock unsealed (BK) (without fairing) 4-way Delphi GT 150 3.5mm Sealed (BK) (with fairing)	Gray	Inner fairing (back of fuel gauge) (with fairing) Bottom fuel tank left side (without fairing)
[120]	Oil pressure switch	Push On Right Angle Molded terminal (BK)	Black	Front right crankcase
[121-1] [121-2]	Rear brake switch	Push On Molded terminals (BK)	Red	Mid-chassis, lower right side between frame and exhaust pipe)
[122-1] [122-2]	Horn	Flag terminals (BK)	Red	Between cylinders (left side)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[128]	Starter solenoid	Delphi 56 Spade terminal (W)	Red	Top of starter
[131-1] [131-2]	Neutral switch	Push On Right Angle Molded terminals (BK)		Top of transmission (right side)
[132]	Power outlet	2-way Tyco 070 multilock Unsealed (BK)	Gray	Inner fairing
[133]	JSS	3-place Molex MX 150 Sealed (BK)	Gray	Rear of lower front frame cross-member
[137]	HO2S rear	4-place Molex MX 150 Sealed (BK)	Gray	Under right side cover
[138]	HO2S front	4-place Molex MX 150 Sealed (GY)	Gray	Under right side cover
[139]	Oil pressure sender	4-place Delphi 150 Metri-Pack Sealed (BK)	Gray	Front right crankcase
[141]	Fuel pump and fuel level sender	4-place Delphi GT 280 Sealed (BK)	Gray	Under console on top of fuel tank canopy
[142]	Security siren	3-place Delphi GT 150 Sealed (BK)	Gray	Under left side cover
[143]	Front fender tip lamp (if equipped)	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Under front fender tip lamp bracket
[149-1]	Audio amplifier 1	23-place Tyco AMPSEAL Sealed (BK)	Black	Under fairing above radio
[149-2]	Audio amplifier 2	23-place Tyco AMPSEAL Sealed (BK)	Black	Inside left saddlebag
[162]	Rear audio	6-way Molex MX150 (BK) (without Tour-Pak) 16-way Molex MX150 (BK) (with Tour-Pak)	Gray	Inner fairing - above radio (FLHX/S) Under seat just in front of Tour-Pak (FLHT)
[166]	ABS module	26-way Bosch BTC Sealed (BK)	Breakout Box	Under right side cover
[167]	Front WSS	2-way Delphi 150 Metri-Pack Sealed (BK) (with fairing) 2-way Deutsch DTM Sealed (BK) (without fairing)	Gray Brown	Just below upper fork bracket right side (with fairing) Inside headlamp nacelle (without fairing)
[168]	Rear WSS	2-place Delphi 150 Metri-Pack Sealed (BK)	Gray	Under right side cover
[179]	Active exhaust actuator	5-place Tyco Superseal 1.5 Sealed (BK)	Gray	HDI: Under right side cover
[184]	CB module	12-way Molex MX150 Sealed (BK)	Gray	Inner fairing - left side of radio
[189]	Heated handgrip to main harness	2-way Tyco 040 multilock Unsealed (BK)	Gray	Inside outer fairing, left side
[203F]	ACR (front)	2-place Tyco Superseal 1.5 Sealed	Gray	Bracket attached to the throttle body
[203R]	ACR (rear)	2-place Tyco Superseal 1.5 Sealed	Gray	Bracket attached to the throttle body
[204]	TGS jumper harness	6-place Molex MX 150 Sealed (BK)	Gray	Inner fairing - right side below radio (with fairing) Inside headlamp nacelle - fork stem nut lock plate (without fairing)
[206]	Heated handgrip interconnect	2-place Tyco 040 Unsealed	Gray	Inside outer fairing, right side

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[209]	Security antenna	2-way Molex MX64 Unsealed (BK)	Light blue	Under seat
[211]	TCA	6-place Molex MX 150 Sealed (BK)	Gray	Right side of engine (induction module)
[215]	Left cooling fan	2-way Delphi 150 Metri-Pack Sealed (BK)	Gray	Inside left lower fairing
[224]	TGS	7-place Tyco Mini Multilock (BK)		Handlebar throttle (inside right side handlebar)
[225]	Driver headset	7-place DIN (BK)		Under Console
[226]	Rear lighting jumper harness	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Rear fender tip fascia module
[232R]	Right cooling fan jumper	2-way Molex MX150 Sealed (BK)	Gray	Under voltage regulator
[232L]	Left cooling fan jumper	4-way Molex MX150 Sealed (BK)	Gray	Under voltage regulator
[235]	Cooling pump	2-way Delphi GT 150 3.5mm Sealed (BK)	Gray	Under voltage regulator
[236]	ECT sensor	2-way Delphi GT 150 3.5mm Sealed (BK)	Gray	Inside left lower fairing
[237]	Right heated grip	2-place Tyco 040 Unsealed		Inside handlebars, right side
[242]	BCM	48-way Molex CMC Sealed (BK)	Breakout Box	Under left side cover
[258]	Power outlet	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak
[259]	BCM power	1-way Delphi 800 Metri-Pack Sealed (BK)	Red	Under left side cover
[262]	Rear lighting jumper harness	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Rear fender tip fascia module
[280]	P&A audio	12-way Molex MX150 Sealed (GY)	Gray	Inner fairing - above radio
[281]	Battery tender	2-way overmold (BK)		Under left side cover
[287]	Tour-Pak lights	5-way Delphi 150 Metri-Pack	Gray	Inside Tour-Pak
[288]	Left saddlebag speaker	12-place Deutsch DT Sealed (BK)	Black	Inside left saddlebag
[296]	Speaker interconnect	16-way Moles MX150 (BK)	Gray	Under seat just in front of Tour-Pak
[297]	Speaker interconnect	16-way Moles MX150 (BK)	Gray	Under seat just in front of Tour-Pak
[298]	Right saddlebag	2-way Molex MX150 (BK)	Gray	Inside right saddlebag
[299]	P&A accessory power	2-place Tyco 070 Multilock Unsealed (BK)		Inner fairing
[GND1] [GND2] [GND2A]	Harness grounds	Ring terminals		Under seat
[GND3]	Fork bracket ground	1-way Push On Molded terminal (BK)		Steering head, left side

WIRING DIAGRAM INFORMATION

Wire Color Codes

Wire traces on wiring diagrams are labeled with alpha codes. Refer to Table B-2.

For Solid Color Wires: See Figure B-1. The alpha code identifies wire color.

For Striped Wires: The code is written with a slash (/) between the solid color code and the stripe code. For example, a trace labeled GN/Y is a green wire with a yellow stripe.

Wiring Diagram Symbols

See Figure B-1. On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets [ ]. The letter inside the brackets identifies whether the housing is a socket or pin housing.

A=Pin: The letter A and the pin symbol after a connector number identifies the pin side of the terminal connectors.

B=Socket: The letter B and the socket symbol after a connector number identifies the socket side of the terminal connectors. Other symbols found on the wiring diagrams include the following:

Diode: The diode allows current flow in one direction only in a circuit.

Wire break: The wire breaks are used to show option variances or page breaks.

No Connection: Two wires crossing over each other in a wiring diagram that are shown with no splice indicating they are not connected together.

Circuit to/from: This symbol indicates a more complete circuit diagram on another page. The symbol is also identifying the direction of current flow.

Splice: Splices are where two or more wires are connected together along a wiring diagram. The indication of a splice only indicates that wires are spliced to that circuit. It is not the true location of the splice in the wiring harness.

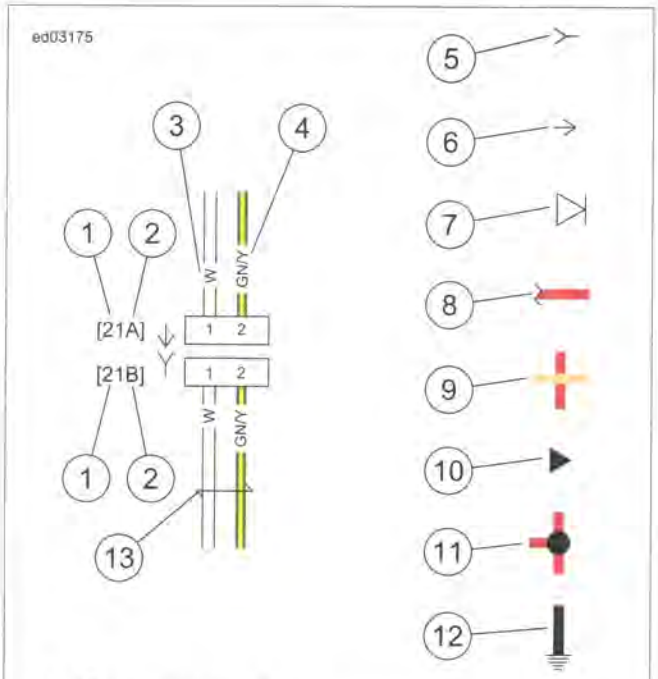
Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules.

NOTE

Clean grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit.

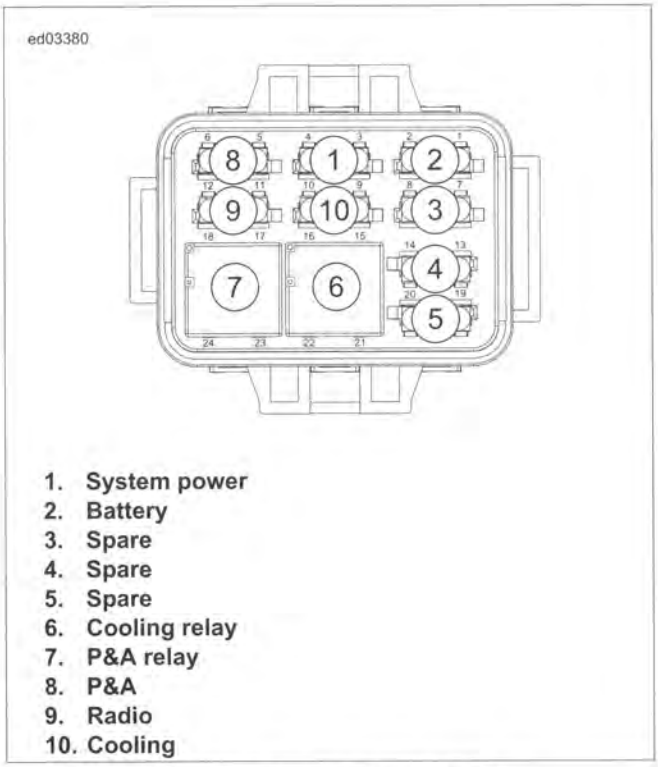
Dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

Twisted pair: This symbol indicates the two wires are twisted together in the harness. This minimizes the circuit's electromagnetic interference from external sources. If repairs are necessary to these wires they should remain as twisted wires.



1. **Connector number**
2. **Terminal code (A=pin, B=socket)**
3. **Solid wire color**
4. **Striped wire color**
5. **Socket symbol**
6. **Pin symbol**
7. **Diode**
8. **Wire break**
9. **No connection**
10. **Circuit to/from**
11. **Splice**
12. **Ground**
13. **Twisted pair**

Figure B-1. Connector/Wiring Diagram Symbols



1. System power
2. Battery
3. Spare
4. Spare
5. Spare
6. Cooling relay
7. P&A relay
8. P&A
9. Radio
10. Cooling

Figure B-2. Fuse Block [64B]

Table B-2. Wire Color Codes

ALPHA CODE	WIRE COLOR
BE	Blue
BK	Black
BN	Brown
GN	Green
GY	Gray
LGN	Light Green
O	Orange
PK	Pink
R	Red
TN	Tan
V	Violet
W	White
Y	Yellow

Wiring Diagram List

DIAGRAM	LOCATION
Battery Power Distribution: With Fairing	Figure B-3
Battery Power Distribution: Without Fairing	Figure B-4
Ignition and ACC: 2014 Touring	Figure B-5
Sensor Grounds: 2014 Touring	Figure B-6
Ground Circuit: 2014 Touring	Figure B-7
Front Lighting and Hand Controls: 2014 Touring	Figure B-8
Fairing Harness: 2014 Touring	Figure B-9
Main Harness (1 of 3): 2014 Touring (With Fairing)	Figure B-10
Main Harness (2 of 3): 2014 Touring (With Fairing)	Figure B-11
Main Harness (3 of 3): 2014 Touring (With Fairing)	Figure B-12
Main Harness (1 of 3): 2014 Touring (Without Fairing)	Figure B-13
Main Harness (2 of 3): 2014 Touring (Without Fairing)	Figure B-14
Main Harness (3 of 3): 2014 Touring (Without Fairing)	Figure B-15
Rear Lighting: 2014 Touring	Figure B-16
OE Radio: 2014 Touring (Except FLHX/S)	Figure B-17
OE Radio: 2014 Touring (FLHX/S)	Figure B-18
P&A Radio w/1 Amp: 2014 Touring	Figure B-19
P&A Radio w/2 Amps (1 of 2): 2014 Touring	Figure B-20
P&A Radio w/2 Amps (2 of 2): 2014 Touring	Figure B-21

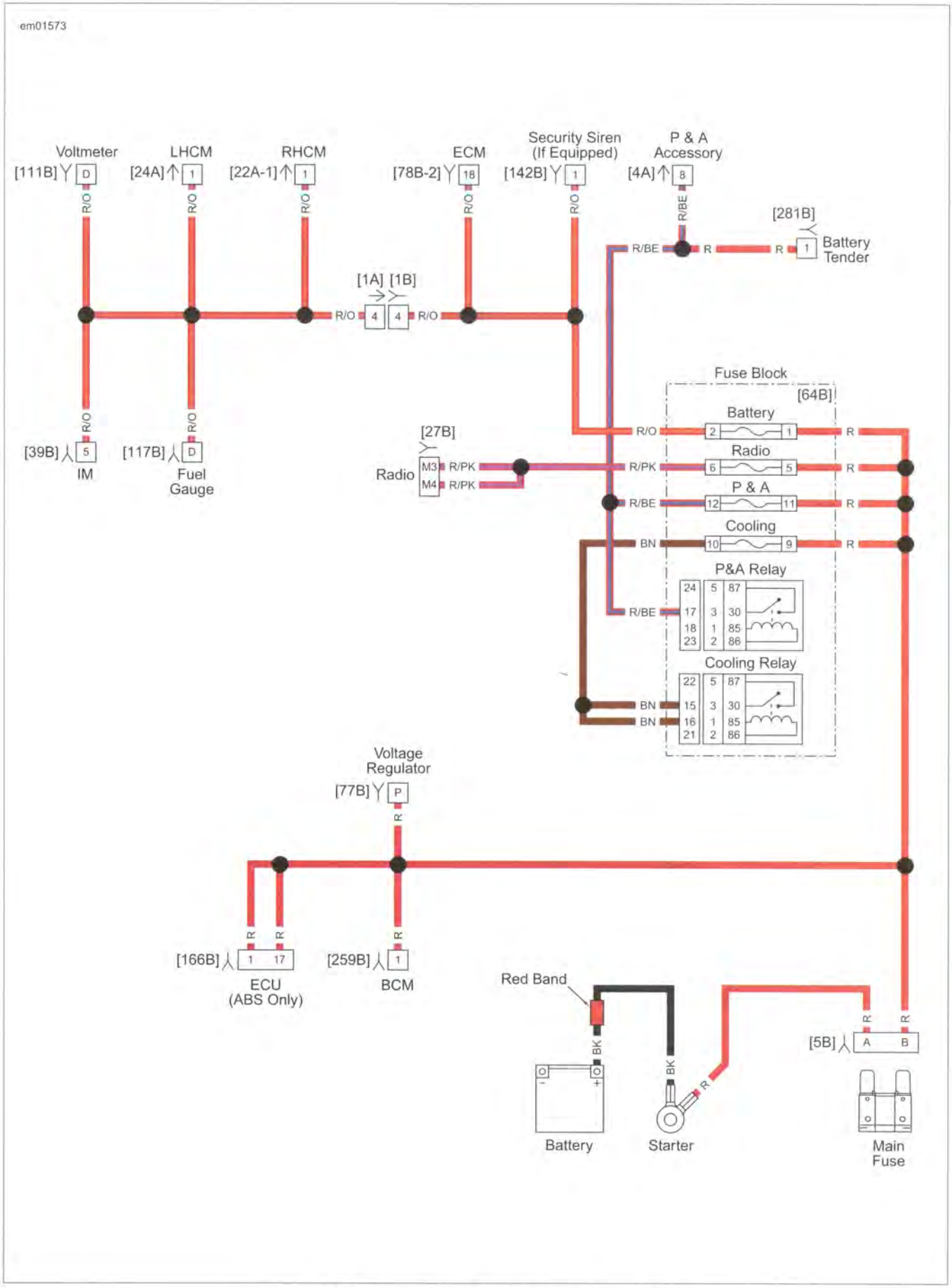


Figure B-3. Battery Power Distribution: With Fairing

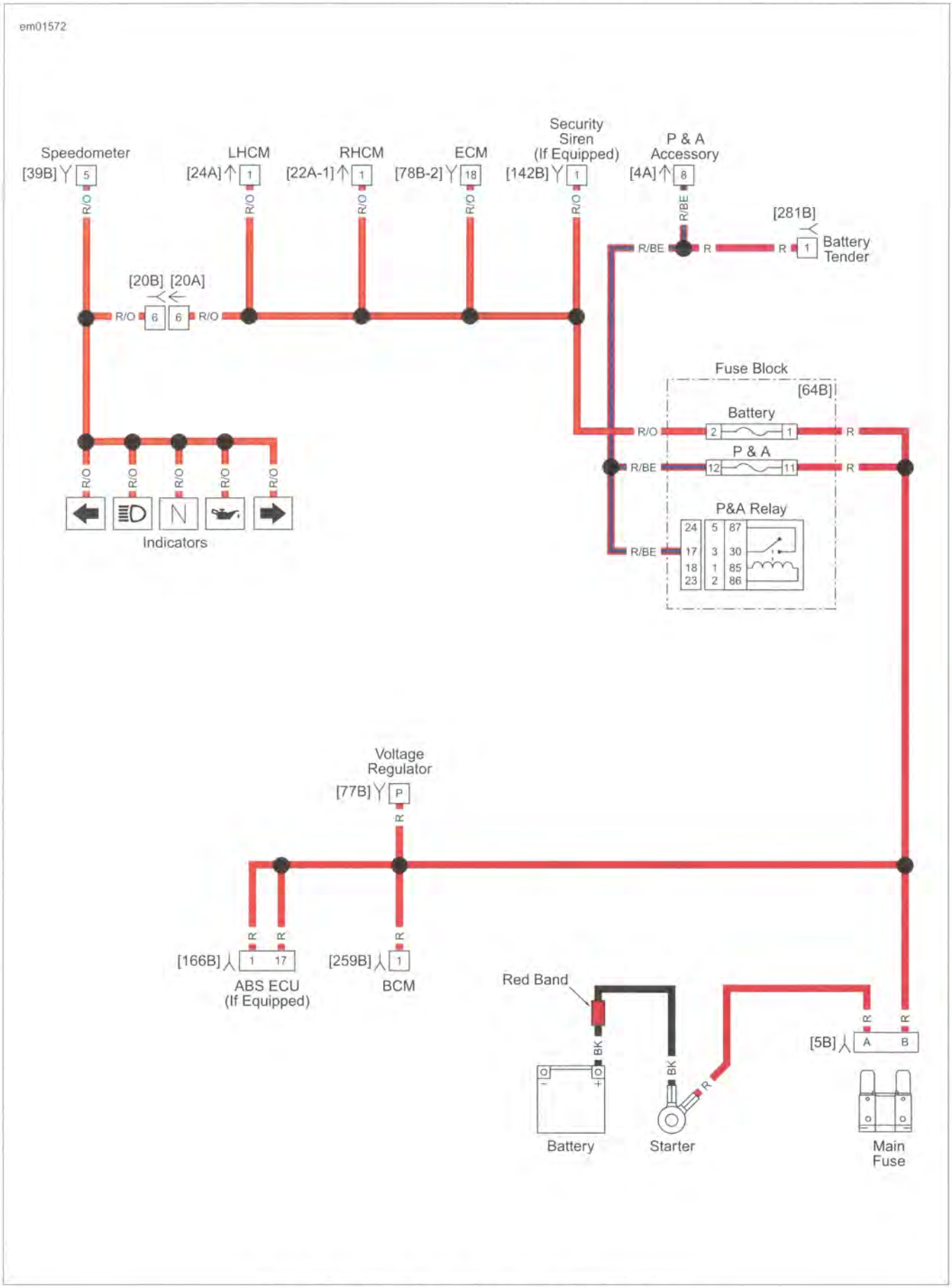


Figure B-4. Battery Power Distribution: Without Fairing

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P&A Accessory Power [299A] 1 V/BE
Front Power Outlet [132A] 1 V/BE
[189B] 1 V/BE
[2A] [2B] 2 2 V/BE
OE Dash Switch Pack [105LB] 5 V/BE
P&A Dash Switch Pack [105RB] 5 V/BE
P&A Accessory [4B] 3 V/BE
CB Module [184A] 9 R/BE V/BE
P&A Audio [280A] 9 V/BE
Accessory Switch [67A] 1 V/BE
P&A Accessory [4B] 3 V/BE
With Fairing
W/O Fairing V/BE
Fuel Gauge [162A] 14 R/Y
Auxiliary Lamps Switch [109A] 1 R/Y
[162A] 14 R/Y
W/O Fairing R/Y
With Fairing, Except FLHX R/Y
ECM [78B-2] 16 R/GN
Rear Fuel Injector [85B] A R/GN
Front Fuel Injector [84B] A R/GN
Ignition Coil [83B] A R/GN
Fuse Block [64B]
7.5A System Power 4 3
R/GN V/GN
P&A Relay
24 5 87
17 3 30
18 1 85
23 2 86
V/BE R/Y
DLC [91A] 5 R/Y
Except FLHX R/Y R/Y
FLHX R/Y R/Y
R/Y
Purge Solenoid [95B] A V/GN
ACR Front [203FB] 1 V/GN
HO2S Front [138A] 1 V/GN
[1A] [1B] 10 10 13 13
BE BE/BK
[32A] 1 BE
Front Fender Tip Lamp Jumper Harness
[31LA] 1 4 BE/BK BE
Left Front Turn Signal/ Auxiliary Lamps
[31RA] 1 4 BE/BK BE
Right Front Turn Signal/ Auxiliary Lamps
[38A] 1 BE
Head Lamp
With Fairing, Except FLHX
[12A] [12B] 3 3 1 1 BE V/BE
[258A] 1 V/BE
Rear Power Outlet
[12-2A] 2 V/BE
Right Side Marker Light
[12-3A] 2 V/BE
Left Side Marker Light
[287A] B BE
Tour-Pak Lights (If Equipped)
[7A] 3 1 BE R/Y
See Rear Lighting
[13B] 1 R/BN
[13A] 1
[141B] 1
Fuel Pump And Fuel Level Sender
[139B] A B W/O W/O
Oil Pressure Sender With Fairing
[141B] 1 W/O
Oil Pressure Switch W/O Fairing
W/O
[242B] [242A] E3 F4 J3 L3 L4 M2 W/O R/BN BE R/GN BE/BK R/Y
Oil Pressure Input
Fuel Pump Power
Running/Position light Power
System Power
AUX Lamp Power
Accessory Power
BCM
[179B] 1 V/GN
Active Exhaust Actuator (If Equipped)
[203RB] 1 V/GN
ACR Rear
[137A] 1 V/GN
HO2S Rear
R
[259B] 1
[259A] 1
Red Band
Battery
Starter
[5B] A B R R
50A Main Fuse

Figure B-5. Ignition and ACC: 2014 Touring

Figure B-5.
Ignition and ACC: 2014 Touring

Figure B-5.
Ignition and ACC: 2014 Touring

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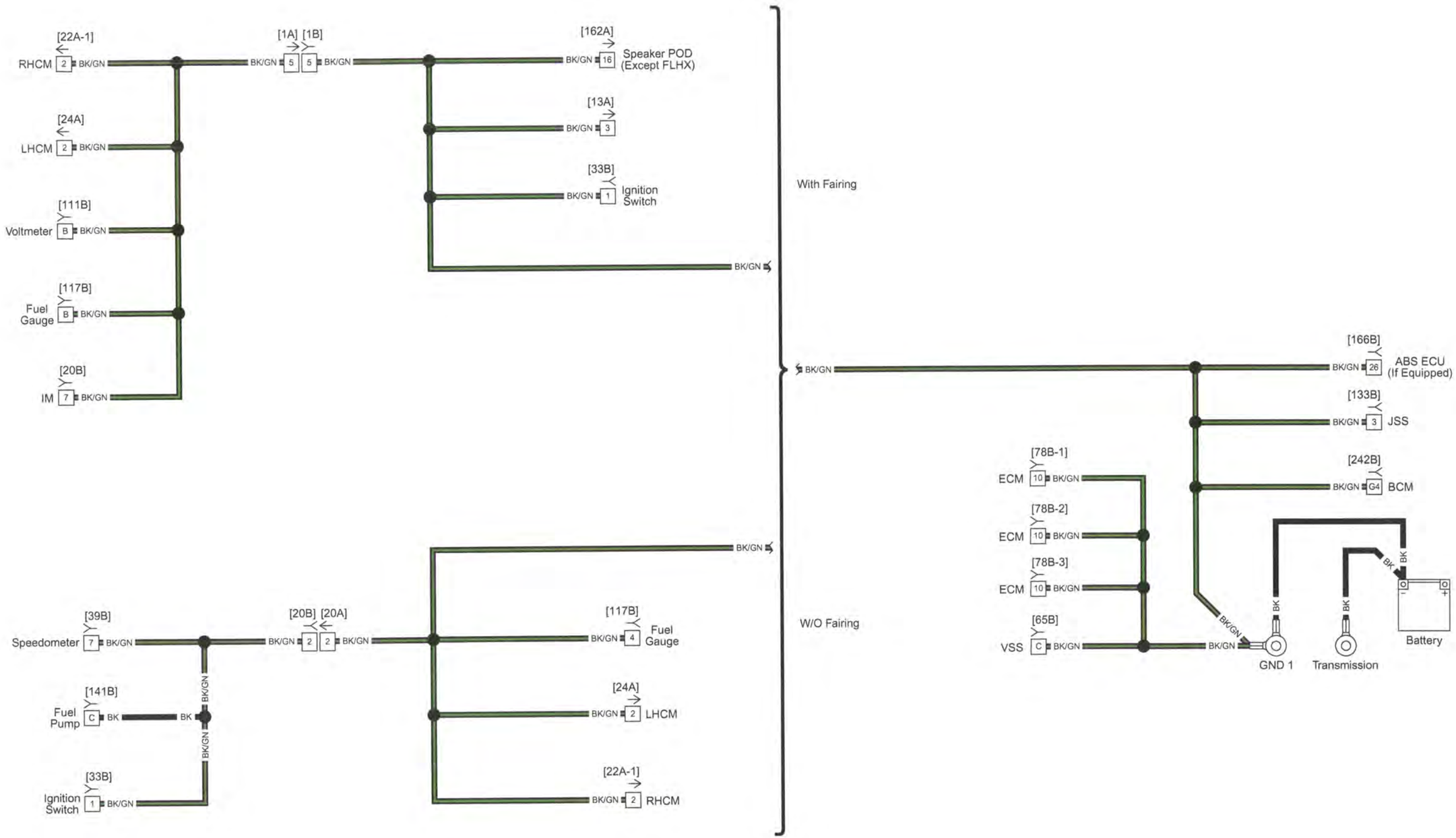

Figure B-6. Sensor Grounds: 2014 Touring

Figure B-6.
Sensor Grounds: 2014 Touring

Figure B-6.
Sensor Grounds: 2014 Touring

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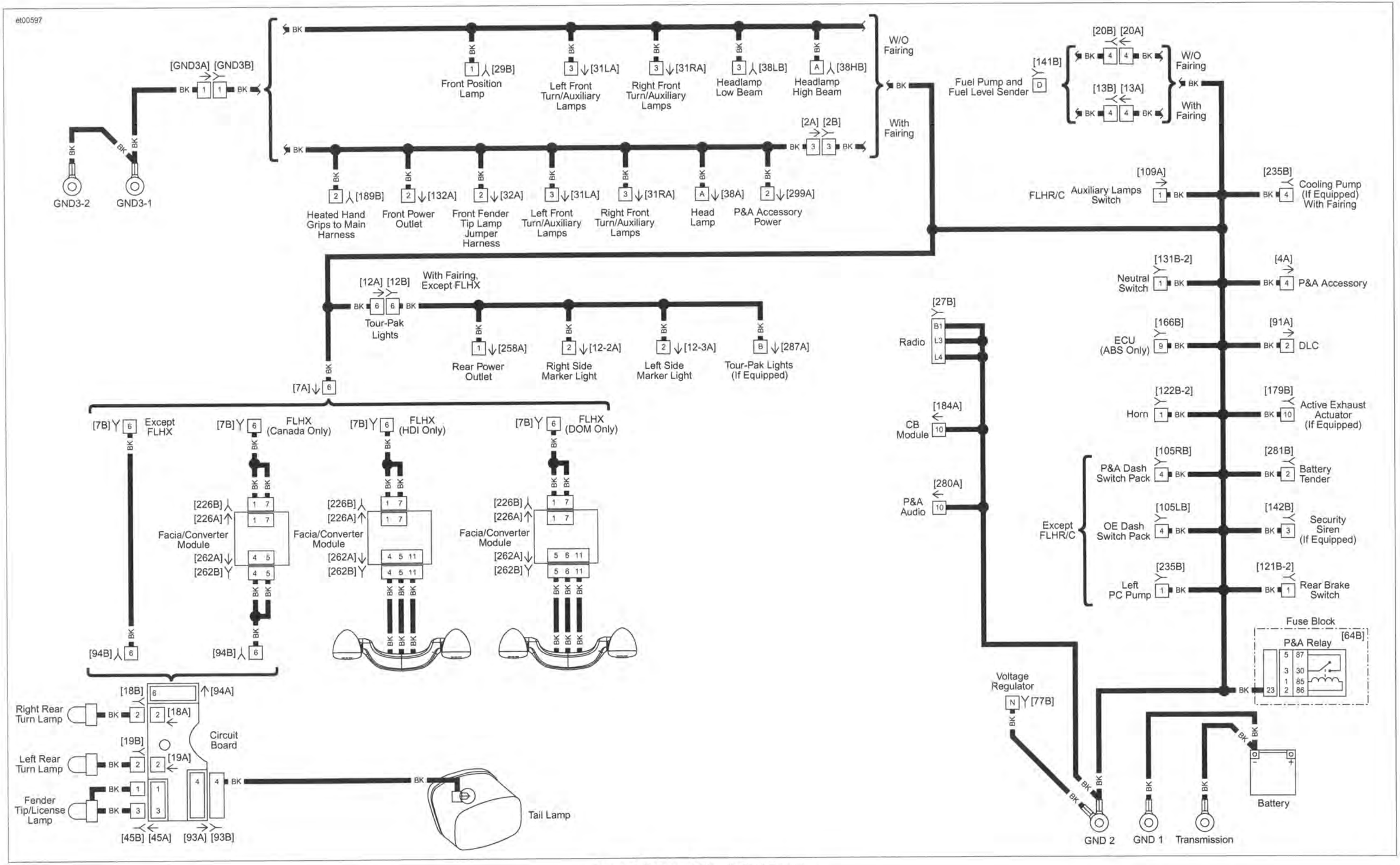

Figure B-7. Ground Circuit: 2014 Touring

Figure B-7.
Ground Circuit: 2014 Touring

Figure B-7.
Ground Circuit: 2014 Touring

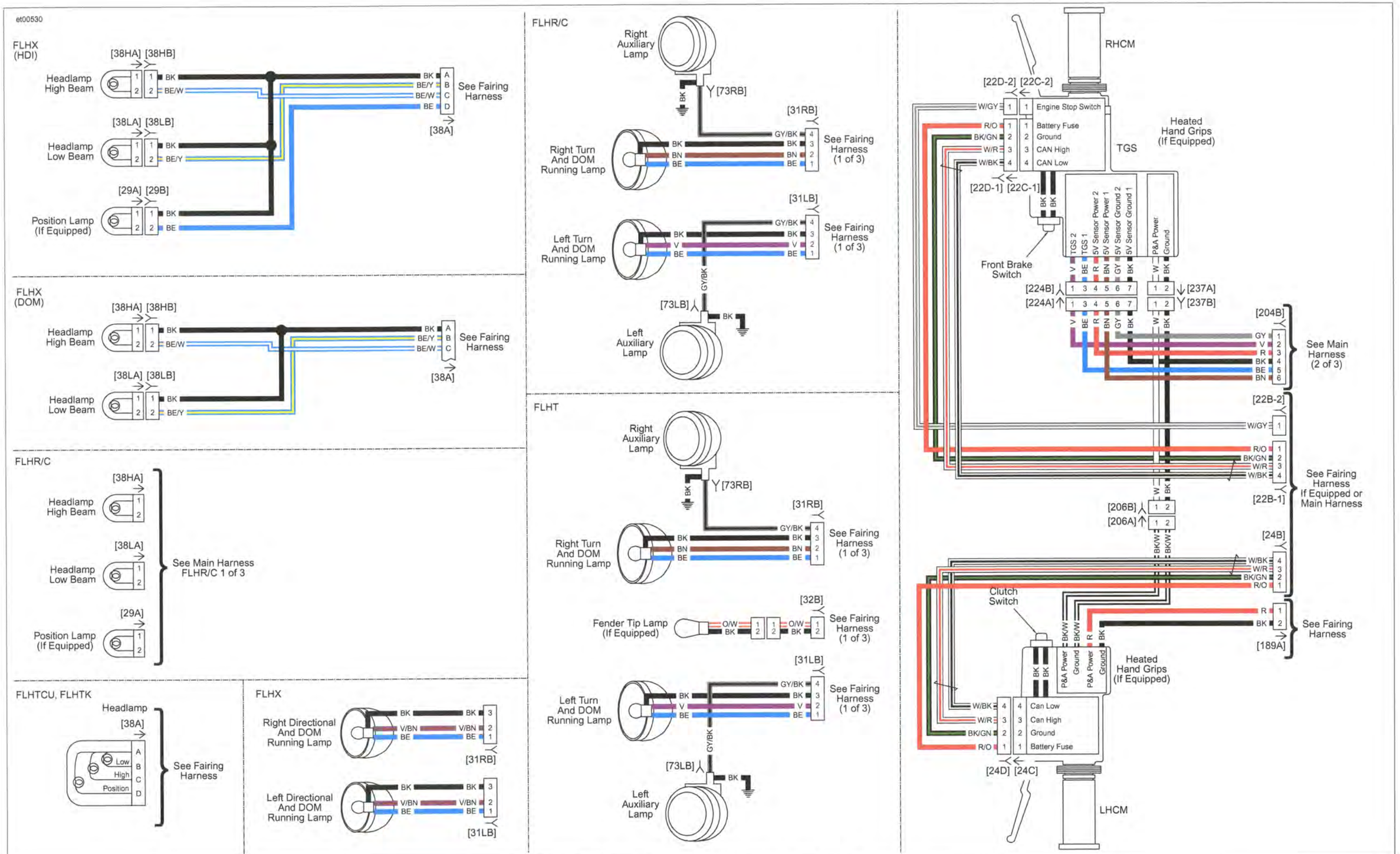

Figure B-8. Front Lighting and Hand Controls: 2014 Touring

Figure B-8.
Front Lighting and Hand Controls: 2014 Touring

Figure B-8.
Front Lighting and Hand Controls: 2014 Touring

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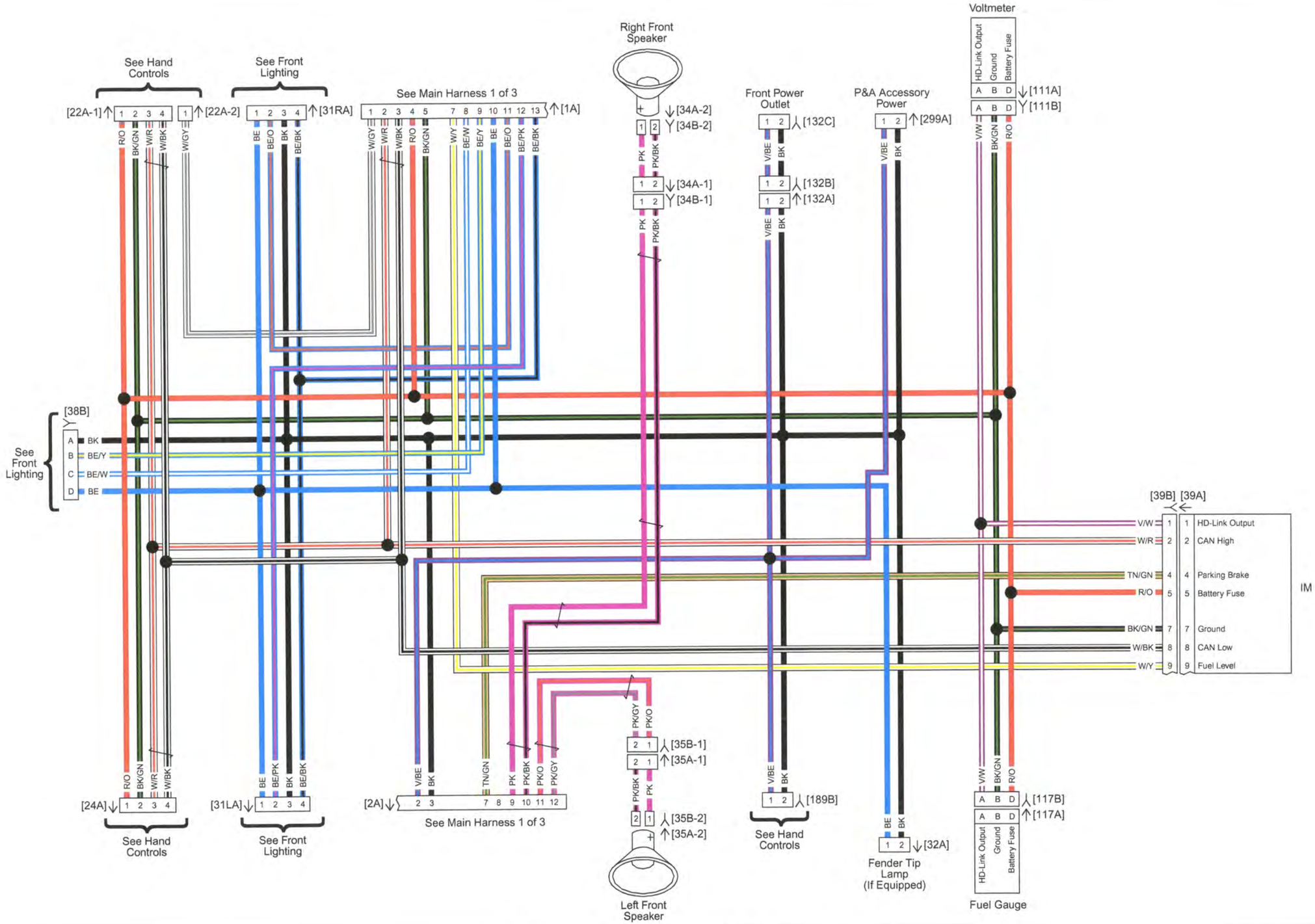

Figure B-9. Fairing Harness: 2014 Touring

Figure B-9.
Fairing Harness: 2014 Touring

Figure B-9.
Fairing Harness: 2014 Touring

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Radio

CAN (+) A1 W/R
CAN (-) A2 W/BK
AUX CAN (-) A3 W/BN
AUX CAN (+) A4 W/PK
Ground B1 BK
Rear Switch Input B2 LBE/PK
Microphone Front (+) C1 R
Microphone Common (-) C2 BK
Microphone Sum Out (+) C3 R
Microphone Rear (+) D1 R/W
Microphone Shield D2 BK/W
Microphone Sum Out (-) D3 BK
Headset Left Rear (+) E1 LBE/W
Headset Right Rear (+) E2 LBE/V
Headset Common (-) E3 BK/PK
Headset Left Front (+) F1 PK/GN
Headset Right Front (+) F2 PK/BE
External AMP Power Control F4 LBE/BN
Speaker Left Rear (-) H1 LBE/GY
Audio In 1 Right (+) H2 R
Audio In 1 Shield/Mono (-) H3 BK
Speaker Left Rear (+) J1 LBE/O
Audio In 1 Left/Mono (+) J2 W
Audio In 3 Left/Mono (+) J3 W
Speaker Right Rear (+) K1 LBE
Speaker Right Rear (-) K2 LBE/BK
Audio In 3 Right (+) K3 R
Audio In 3 Shield/Mono (-) K4 BK/Y
Speaker Left Front (-) L1 PK/GY
Speaker Left Front (+) L2 PK/O
Ground L3 BK
Ground L4 BK
Speaker Right Front (+) M1 PK
Speaker Right Front (-) M2 PK/BK
Radio Fuse M3 R/PK
Radio Fuse M4 R/PK

[27A] [27B]

Antenna [51A] 1 BK

P&A Audio [280A] 1 2 3 4 5 6 7 8 9 10 11
R R/W BK PK/BE PK/GN BK/PK LBE/V LBE/W V/BE BK LBE/BN

CB Module
Mic Out (+) Y
Mic Out (-) W
CB Audio (+) R
CB Audio (-) BK
Power R/O
Ground BK/GN
CAN (+) Y/O
CAN (-) Y/V
1 2 3 4 5 6 7 8 9 10 11 12 [184B]
1 2 3 4 5 6 7 8 9 10 11 12 [184A]
R BK R W BK R W BK/Y R/BE BK W/PK W/BN
Shield

C.B. Antenna [50A] 1 BK

Front WSS (If Equipped) [167A] [167B]
Front WSS High R
Front WSS Low BK
A B
O/BE O/BK

Driver Headset (If Equipped) [225B] [53B] [53A]
2 5 6 3 4 1 TAB
PK/GN BK PK/BE R BK Shield
1 2 3 4 5 6
PK/GN BK/PK PK/BE R BK Shield

CAV	CIR	DESCRIPTION
1	BK	MICROPHONE, COMMON (-)
2	BK	HEADSET, COMMON (-)
3	PK/BE	HEADSET, RT FRONT (+)
4	R	MICROPHONE, FRONT (+)
5	PK/GN	HEADSET, LT FRONT (+)
6	BK	JUMPER
7		N/C
TAB	SHIELD	MIRCRPHONE, SHIELD

[162A] 1 2 3 4
LBE/O LBE/GY LBE LBE/BK

1 2 3 4 5 6 7 8 9 10 14 15 16 [162A]
LBE/O LBE/GY LBE/W BK/PK LBE/V R BK Shield LBE LBE/BK R/Y LBE/PK BK/GN

FLHX Except FLHX

Horn
Ground 1 BK
Horn Power 1 R/V
[122A-2] [122B-2] [122A-1] [122B-1]

ET Sensor
Engine Temperature GN
5V Sensor Ground BK/W
A B [90A] [90B]

BK BK GN BK/W W/Y W/V W/R W/BK BK/GN R/GN LGN/BN GY/BE GN/BE R/O BK BK
See Main Harness With Fairing Page 2 of 3

BE V/BE R/Y R/V LBE/R LBE/GN BE/GY R/PK LBE/V LBE/W W/BE LBE/Y W/GY BE/W BE/Y BE/O BE/PK BE/BK R
See Main Harness With Fairing Page 3 of 3

[GND3B] [GND3A] 1 BK
BK BK BK
GND 3-1 GND 3-2

[2B] 2 3 9 10 11 12
V/BE BK PK PK/BK PK/O PK/GY
See Fairing Harness

[105LB] [105LA] 1 2 3 4 5
LBE/R LBE/GN BE/GY BK V/BE
OE Switch Output B
OE Switch Output A
Auxiliary Lamp Switch
Ground
P&A Relay Power
OE Dash Switch Pack

[107B] [107A] 1 2
W/V BK/W
Ait Temperature
5V Sensor Ground
AAT Sensor

[1B] 1 2 3 4 5 6 7 8 9 10 11 12 13
W/GY W/R W/BK R/O BK/GN W/Y BE/W BE/Y BE BE/O BE/PK BE/BK
See Fairing Harness

[166B] [166A] 1 9 10 14 15 17 18 23 24 26
R BK W/BK O/BN O/BE R W/R O/PK O/BK BK/GN
Battery Power (Motor)
Ground
CAN -
Rear Wheel Speed Sensor -
Front Wheel Speed Sensor +
Battery Power (Solenoids)
CAN +
Rear Wheel Speed Sensor +
Front Wheel Speed Sensor -
Ground (ECU)
ABS ECU (If Equipped)

[168B] [168A] A B
O/PK O/BN
R BK
Rear WSS High
Rear WSS Low
Rear WSS (If Equipped)

[105RB] 1 2 3 4 5
LBE/V LBE/W LBE/Y BK V/BE
P&A Dash Switch Pack

[33B] [33A] 1 2
BK/GN W/BE
IGN
OFF
ACC
800Ω
200Ω
Ignition Switch

[83B] [83A] A B C D
R/GN LGN/BN GY/BE GN/BE
System Power
ION Sense
Rear Ignition Coil
Front Ignition Coil
Ignition Coil

Figure B-10. Main Harness (1 of 3): 2014 Touring (With Fairing)

Figure B-10.
Main Harness (1 of 3): 2014 Touring (With Fairing)

Figure B-10.
Main Harness (1 of 3): 2014 Touring (With Fairing)

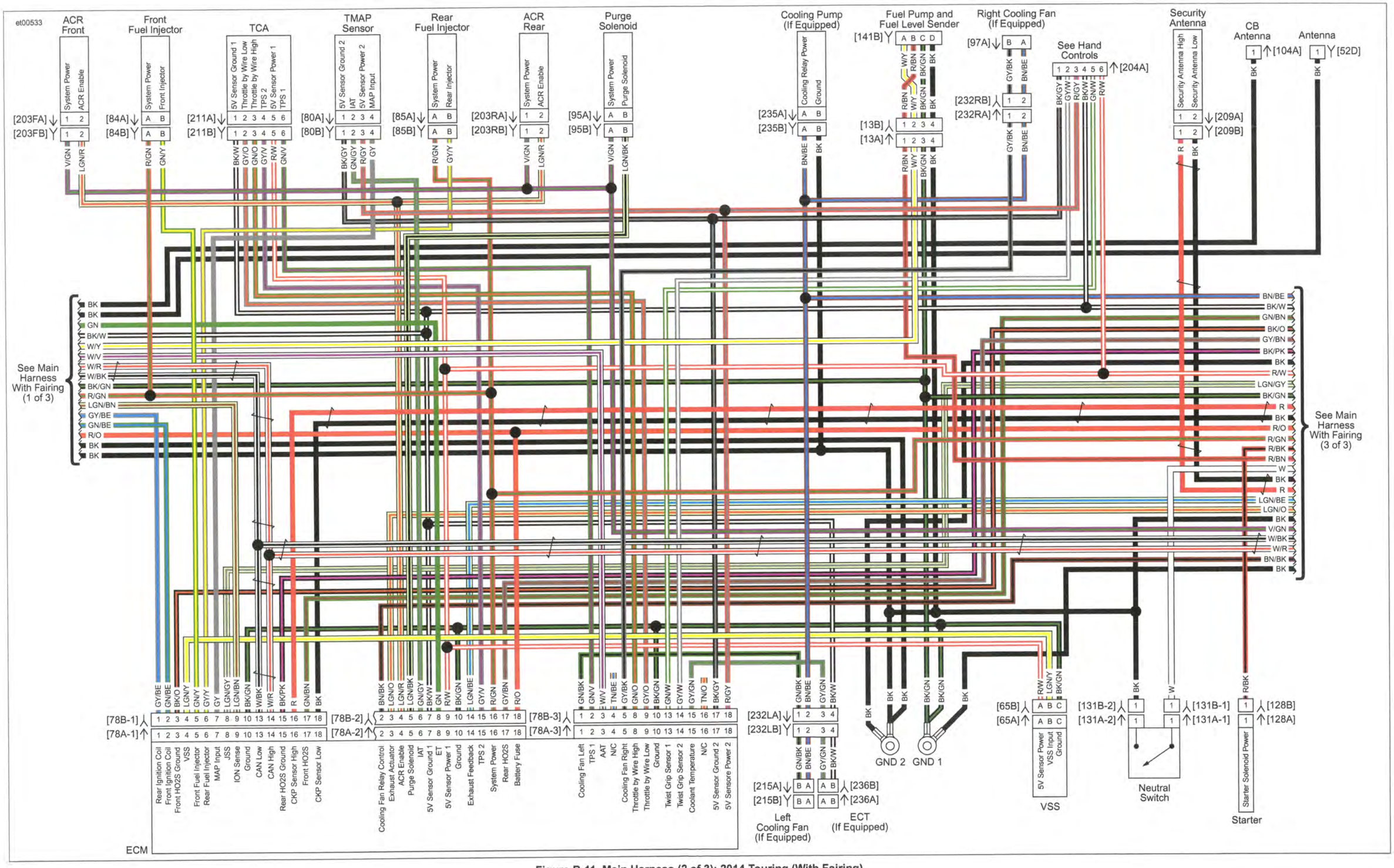

Figure B-11. Main Harness (2 of 3): 2014 Touring (With Fairing)

Figure B-11.
Main Harness (2 of 3): 2014 Touring (With Fairing)

Figure B-11.
Main Harness (2 of 3): 2014 Touring (With Fairing)

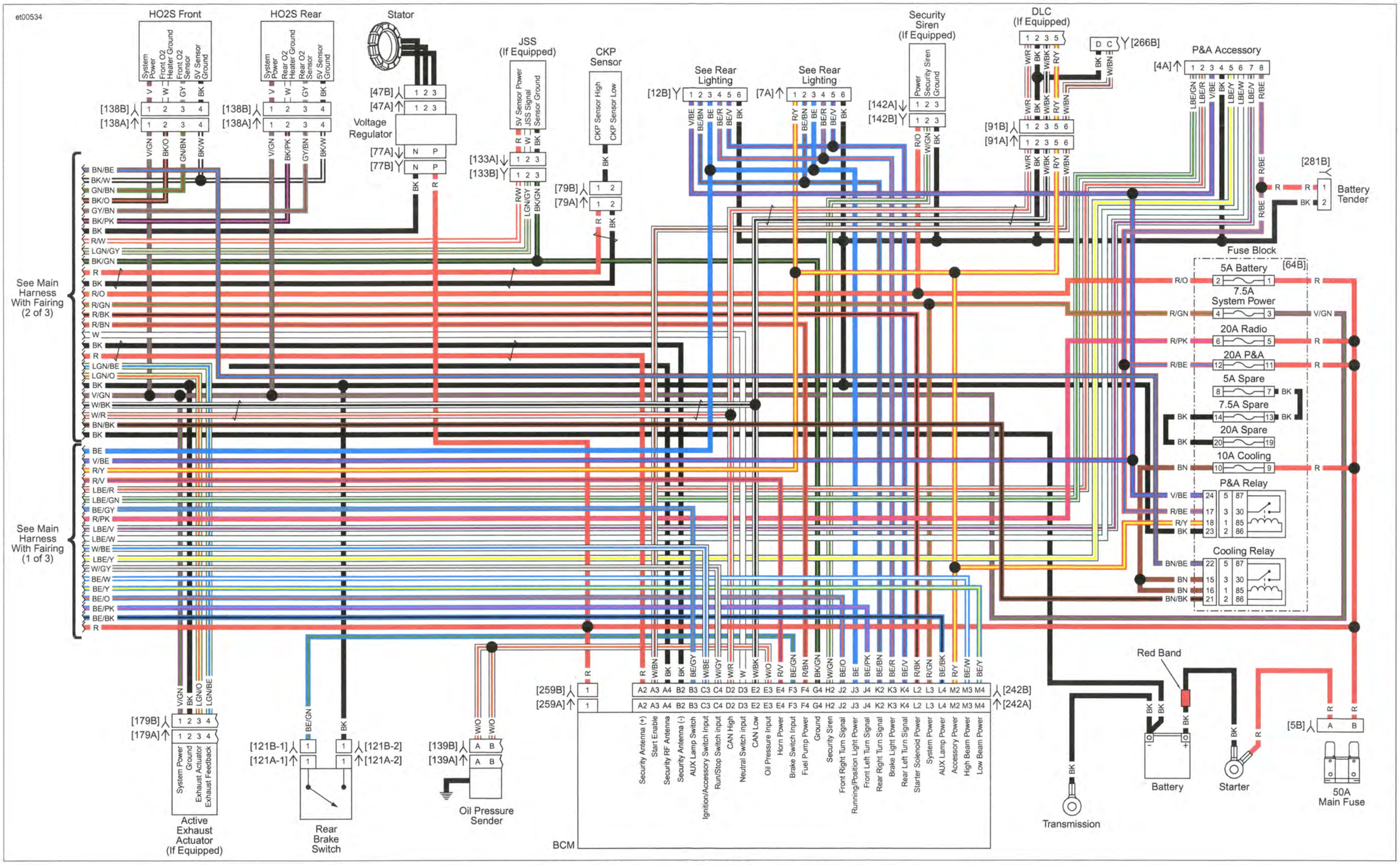

Figure B-12. Main Harness (3 of 3): 2014 Touring (With Fairing)

Figure B-12.
Main Harness (3 of 3): 2014 Touring (With Fairing)

Figure B-12.
Main Harness (3 of 3): 2014 Touring (With Fairing)

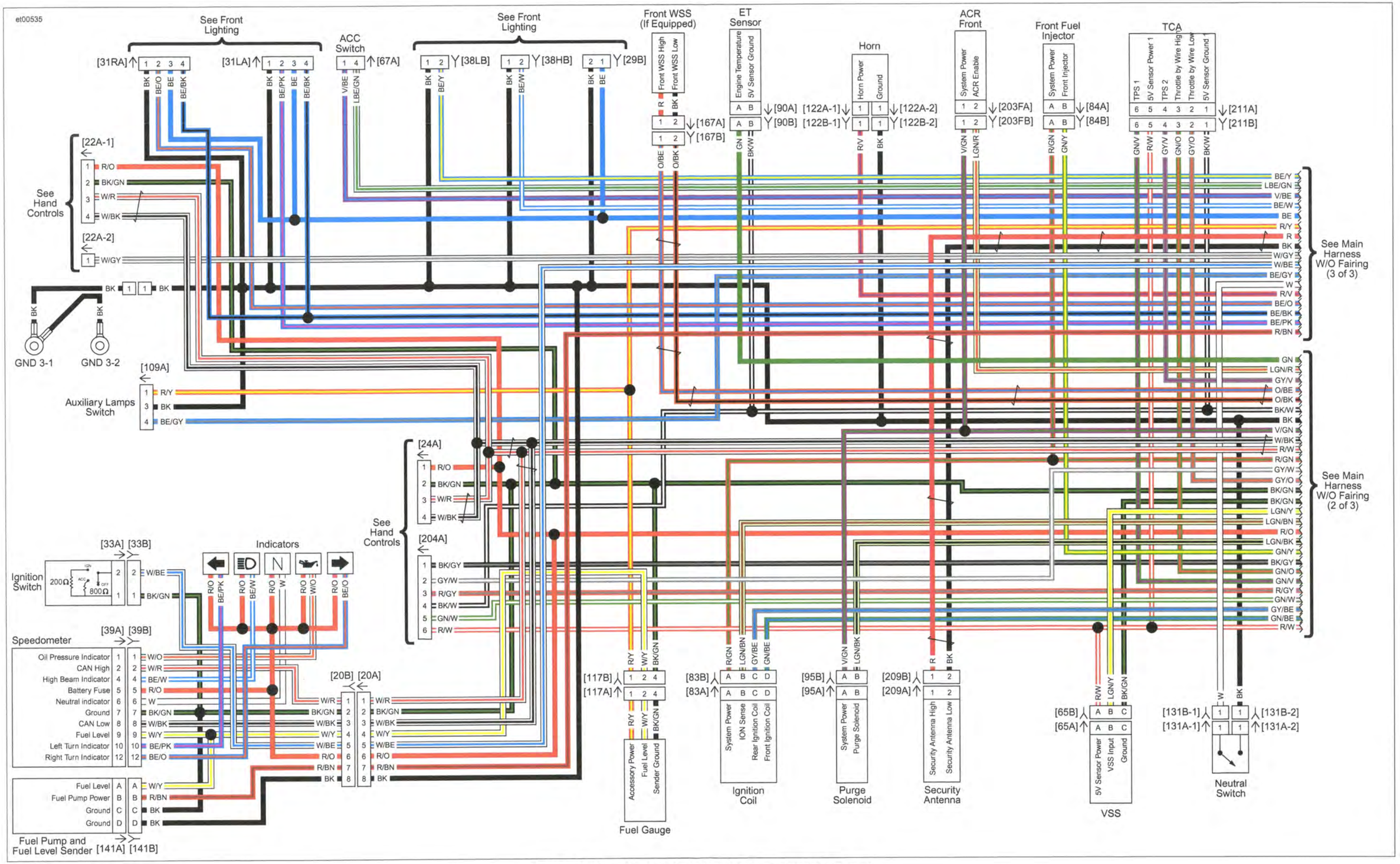

Figure B-13. Main Harness (1 of 3): 2014 Touring (Without Fairing)

Figure B-13.
Main Harness (1 of 3): 2014 Touring (Without Fairing)

Figure B-13.
Main Harness (1 of 3): 2014 Touring (Without Fairing)

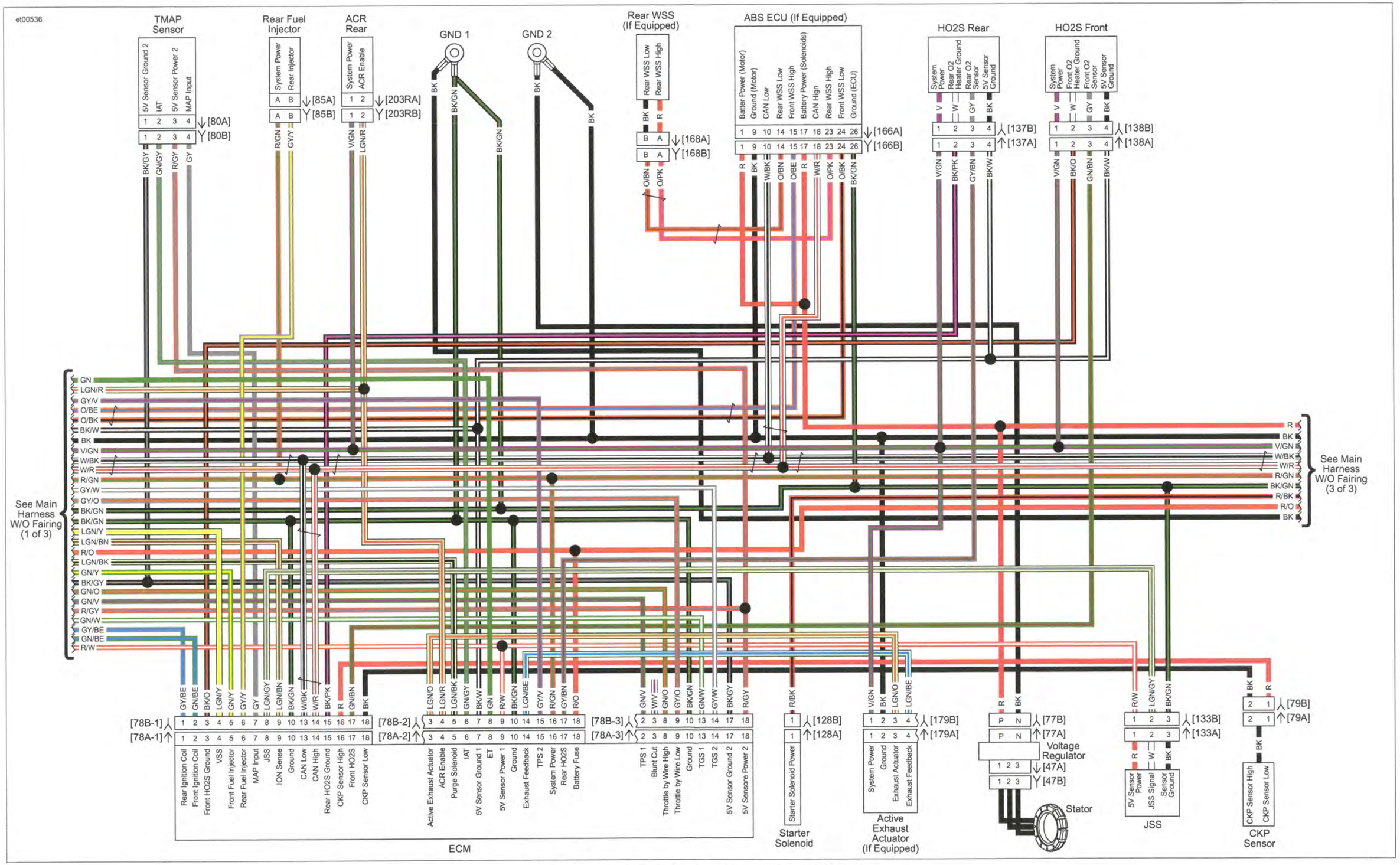

Figure B-14. Main Harness (2 of 3): 2014 Touring (Without Fairing)

Figure B-14.
Main Harness (2 of 3): 2014 Touring (Without Fairing)

Figure B-14.
Main Harness (2 of 3): 2014 Touring (Without Fairing)

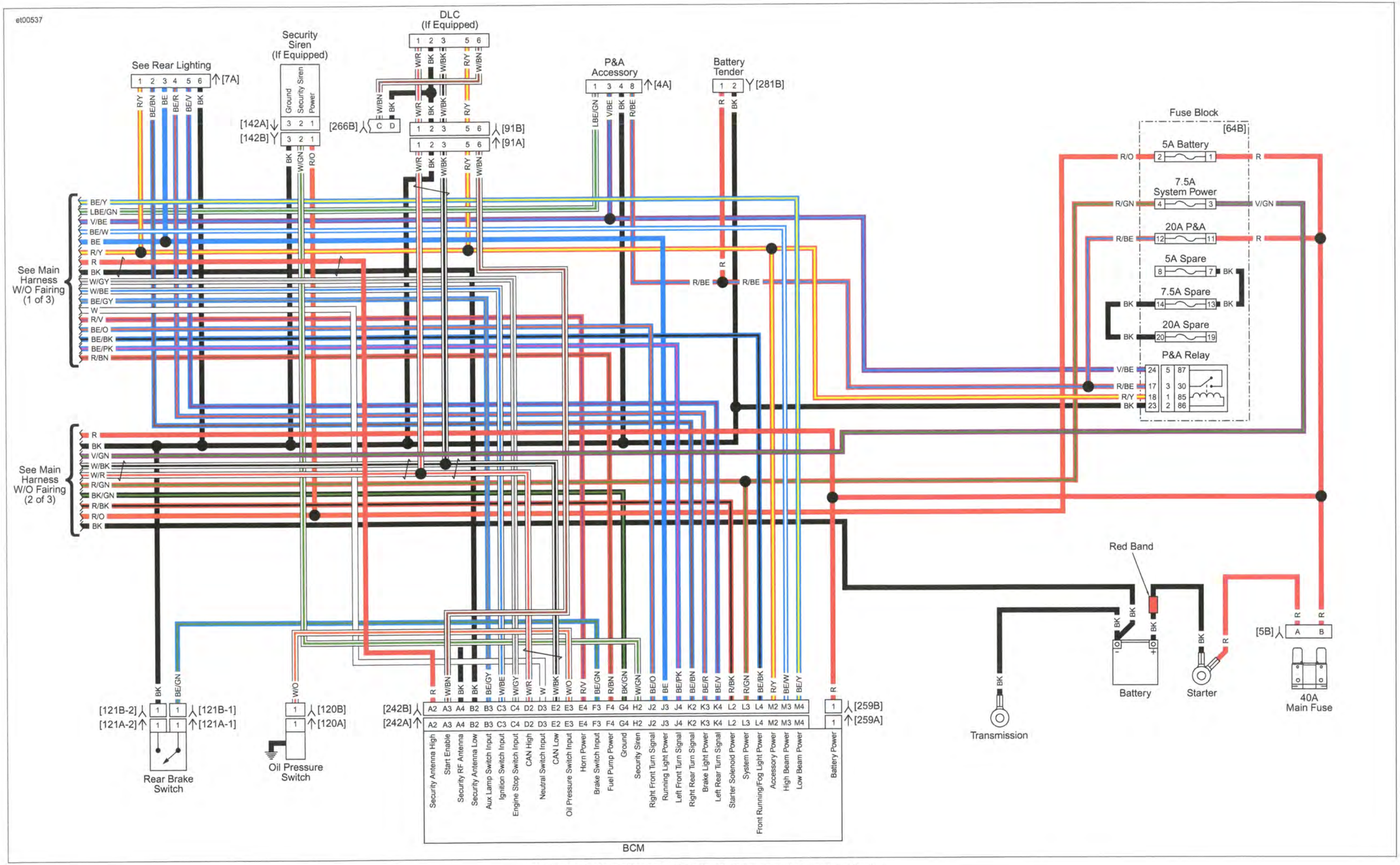

Figure B-15. Main Harness (3 of 3): 2014 Touring (Without Fairing)

Figure B-15.
Main Harness (3 of 3): 2014 Touring (Without Fairing)

Figure B-15.
Main Harness (3 of 3): 2014 Touring (Without Fairing)

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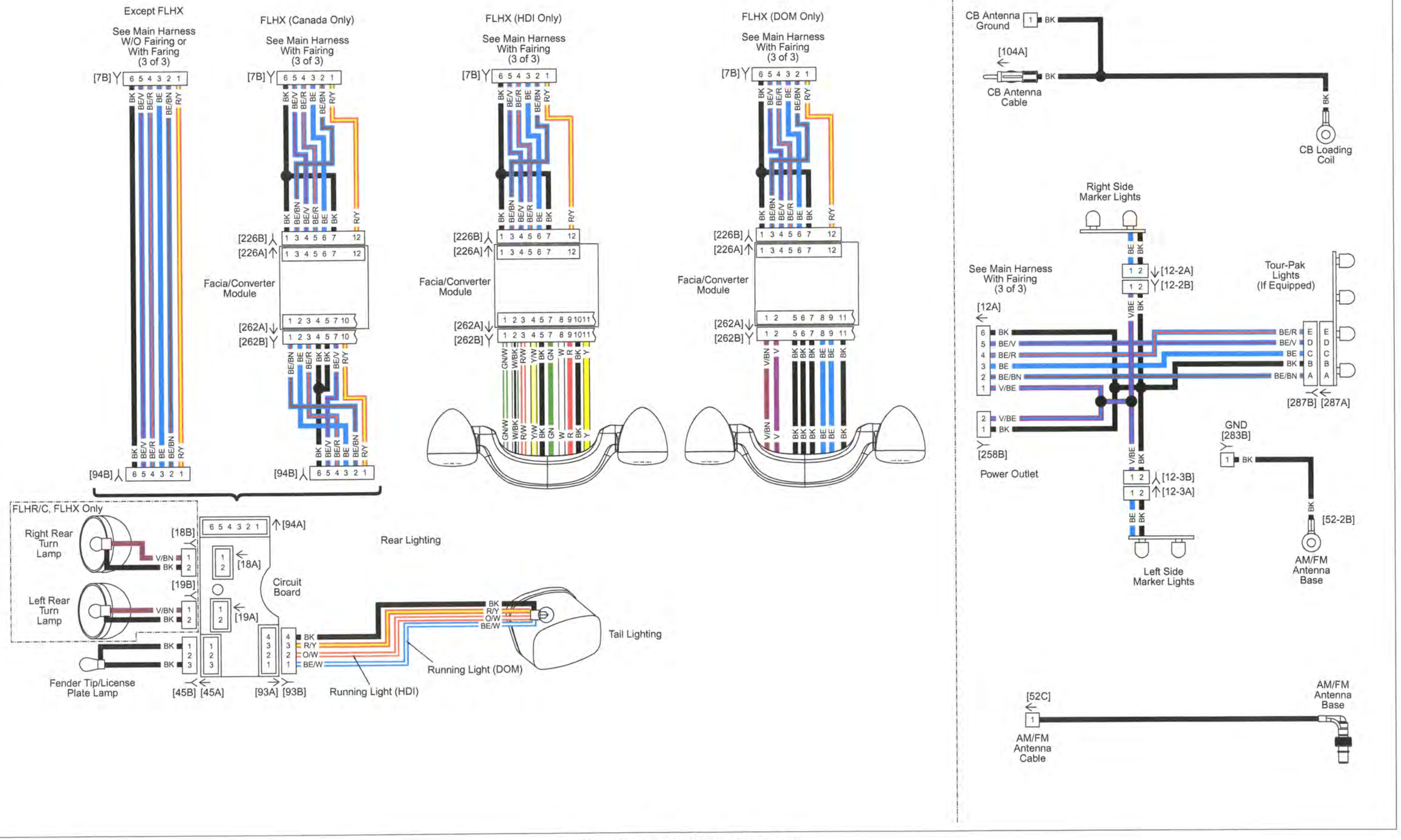

Figure B-16. Rear Lighting: 2014 Touring

Figure B-16.
Rear Lighting: 2014 Touring

Figure B-16.
Rear Lighting: 2014 Touring

et00575

Figure B-17. OE Radio: 2014 Touring (Except FLHX/S)

Figure B-17.
OE Radio: 2014 Touring (Except FLHX/S)

Figure B-17.
OE Radio: 2014 Touring (Except FLHX/S)

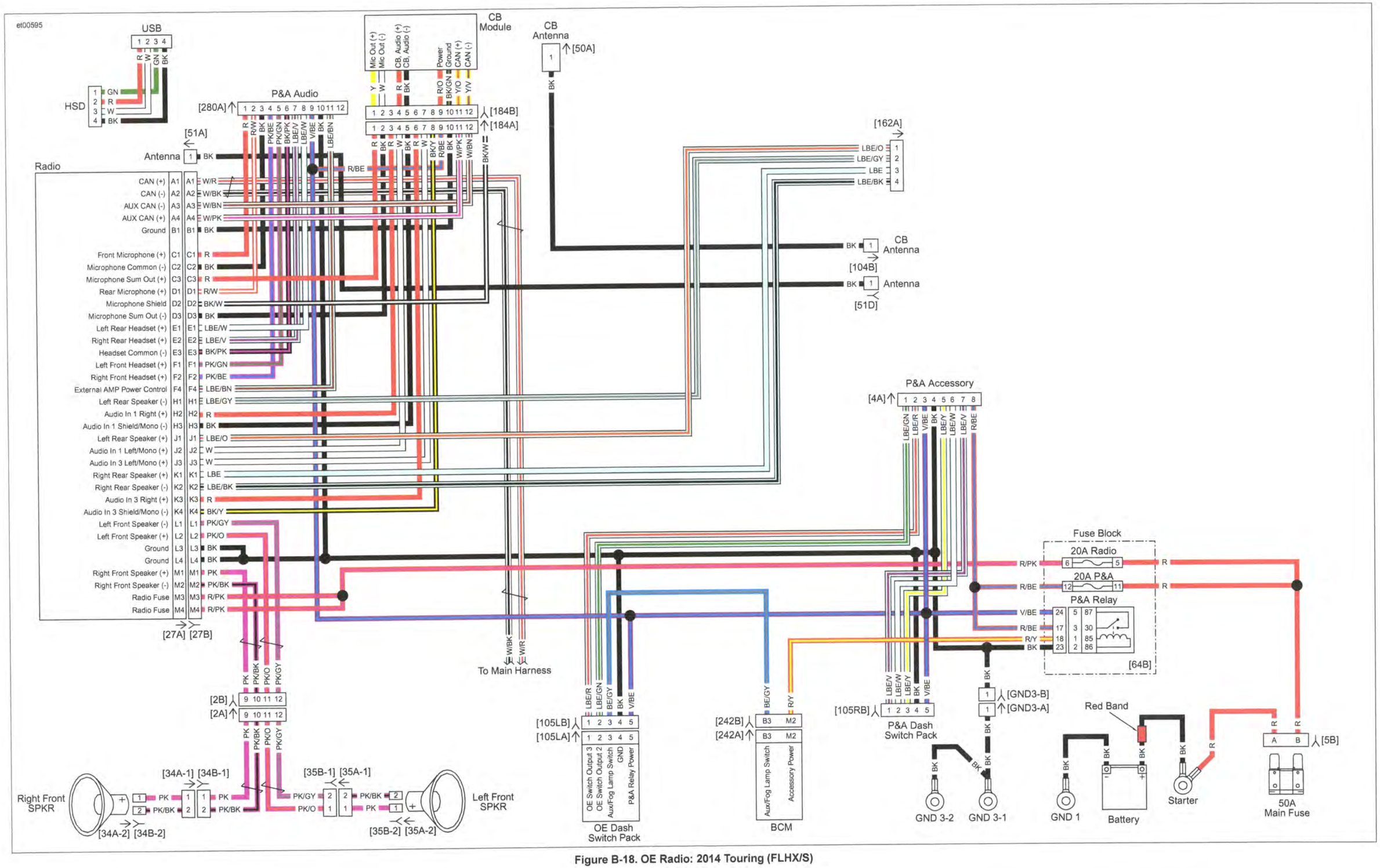

Figure B-18. OE Radio: 2014 Touring (FLHX/S)

Figure B-18.
OE Radio: 2014 Touring (FLHX/S)

Figure B-18.
OE Radio: 2014 Touring (FLHX/S)

et00642

Left Front SPKR
[35A-2] [35B-2]
PK
PK/BK
BN/O
BN/GY
[35A-1] [35B-3]

Right Front SPKR
[34B-2] [34A-2]
BN/GN
BN/PK
PK/BK
PK
[34B-3] [34A-1]

To RHCM
R/O
BK/GN
W/R
W/BK
[22B-1]
[22A-3]

Amplifier #1
RR OUT + 1 1 LBE
RR OUT - 2 2 LBE/BK
LR OUT + 3 3 LBE/O
LR OUT - 4 4 LBE/GY
LF OUT + 5 5 BN/O
LF OUT - 6 6 BN/GY
RF OUT + 7 7 BN/PK
RF OUT - 8 8 BN/GN
Power 9 9 R
Ground 10 10 BK
CAN + 11 11 W/R
Power 16 16 R
Ground 17 17 BK
CAN - 18 18 W/BK
SW ACCY 19 19 V/BE
L IN (-) 20 20 PK/GY
L IN (+) 21 21 PK/O
R IN (+) 22 22 PK
R IN (-) 23 23 PK/BK
[149A-1] [149B-1]

PK
PK/BK
[34A-3]
[34B-1]
PK/O
PK/GY
[35A-3]
[35B-1]

R
[43]
40A Inline Fuse
B
A

PK
PK/BK
PK/O
PK/GY
[2B]
[2A]

V/BE
BK
[132B]
[132A]

BK
[GND3B]
[GND3A]

R/O
BK/GN
W/R
W/BK
[22B-3]
[22A-1]

LBE
LBE/BK
LBE/O
LBE/GY
[297C]

To Main Harness
LBE/O
LBE/GY
LBE
LBE/BK
BK/GN
[162A]
[162C]
BK
W
To Rear Speaker Pod

PK/BK
PK
PK/GY
PK/O
[297D]
[297A] [297B]
[296A]
Not Used

[297D]
[42B]
[42A]
Left Saddle SPKR
[41B]
[41A]
Left Saddle SPKR

[35LB]
[35LA]
Lower Fairing LT SPKR
[34LB]
[34LA]
Lower Fairing RT SPKR

Radio
CAN (+) A1 A1 W/R
CAN (-) A2 A2 W/BK
Left Front Speaker (-) L1 L1 PK/GY
Left Front Speaker (+) L2 L2 PK/O
Ground L3 L3 BK
Ground L4 L4 BK
Right Front Speaker (+) M1 M1 PK
Right Front Speaker (-) M2 M2 PK/BK
Radio Fuse M3 M3 R/PK
Radio Fuse M4 M4 R/PK
[27A] [27B]

GND 3
Radio Fuse
Battery
To Fairing Harness
GND 3-2
GND 3-1
To Main Harness

Figure B-19. P&A Radio w/1 Amp: 2014 Touring

Figure B-19.
P&A Radio w/1 Amp: 2014 Touring

Figure B-19.
P&A Radio w/1 Amp: 2014 Touring

et00593

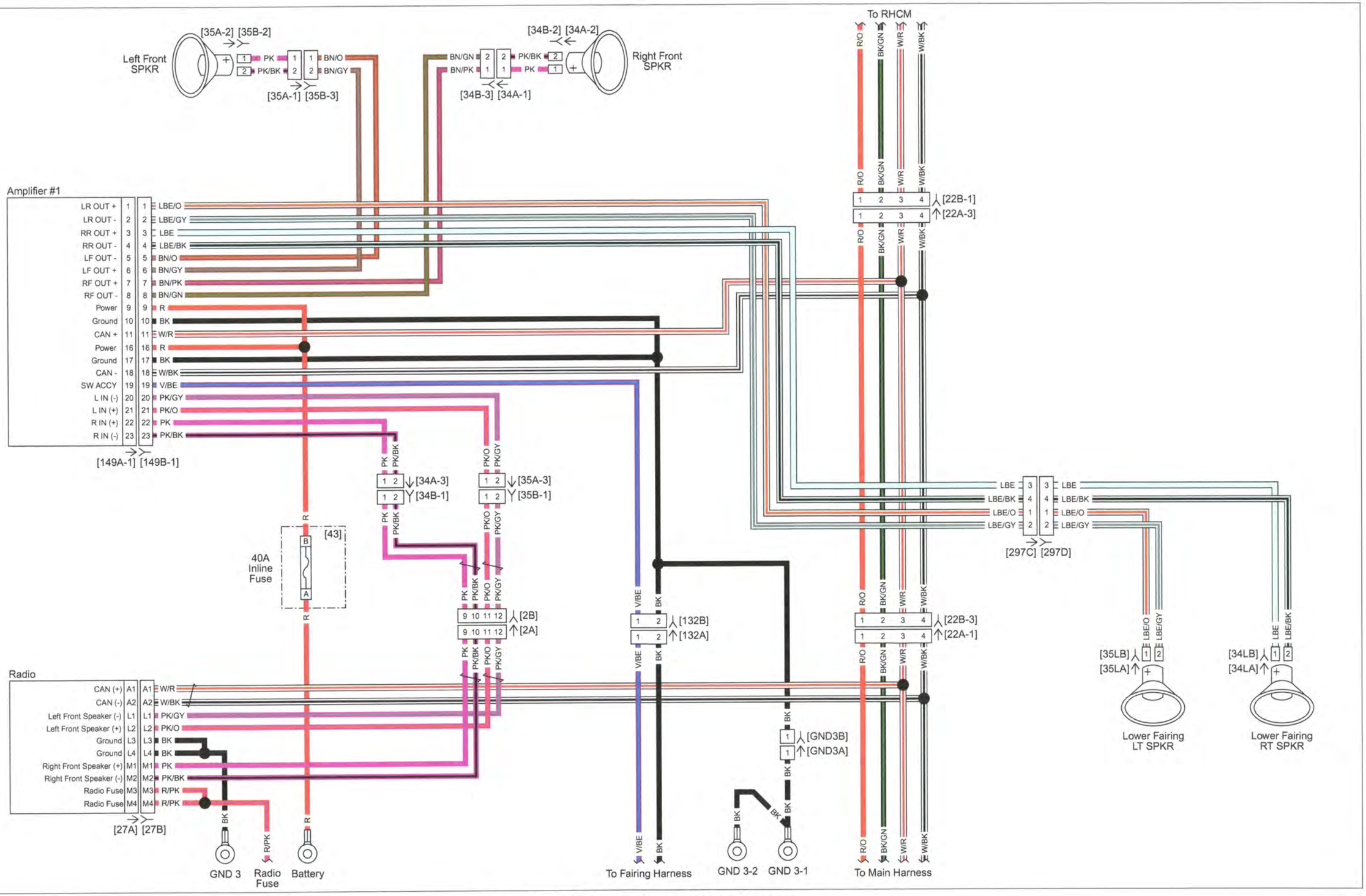

Figure B-20. P&A Radio w/2 Amps (1 of 2): 2014 Touring

Figure B-20.
P&A Radio w/2 Amps (1 of 2): 2014 Touring

Figure B-20.
P&A Radio w/2 Amps (1 of 2): 2014 Touring

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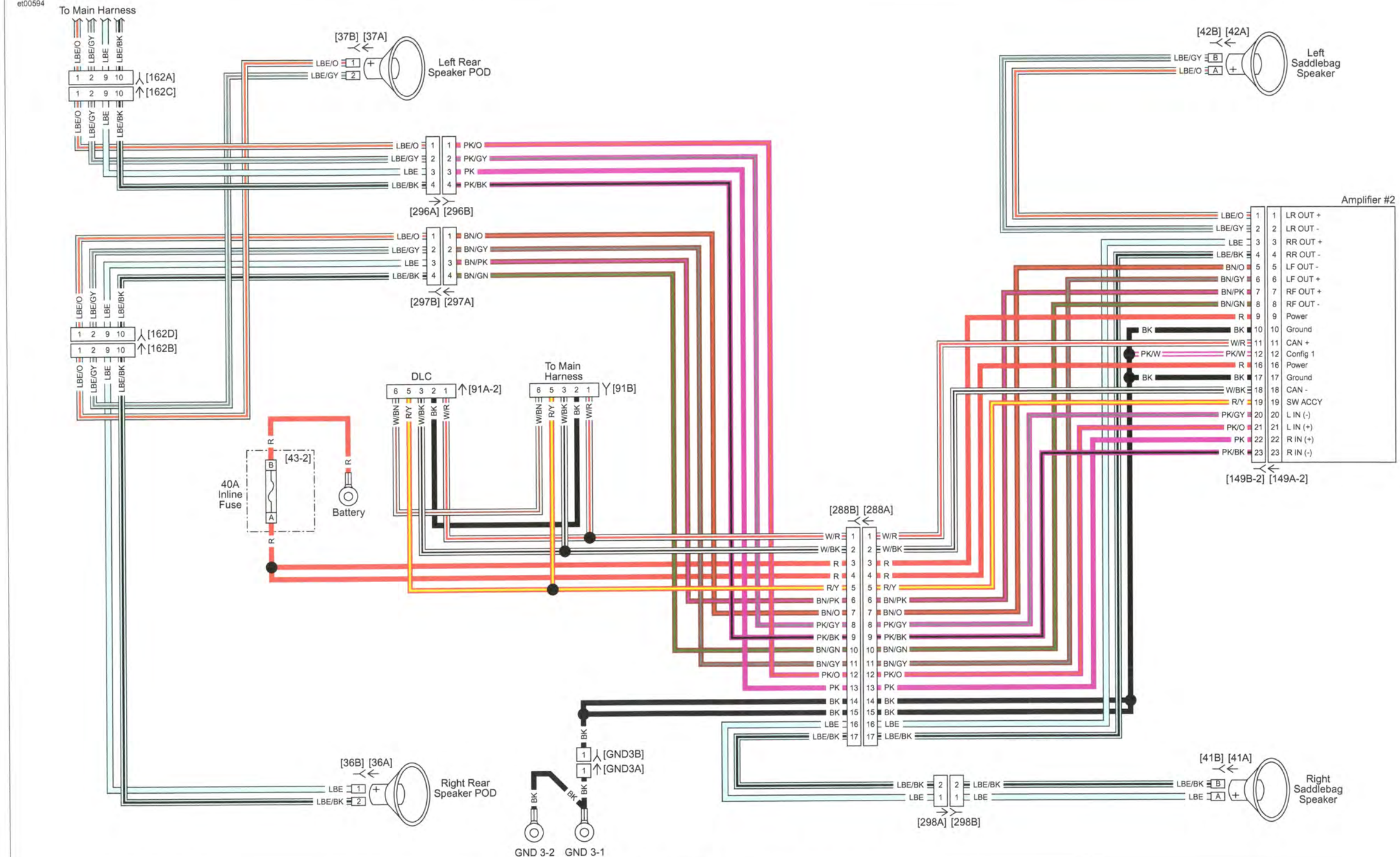


Figure B-21. P&A Radio w/2 Amps (2 of 2): 2014 Touring

Figure B-21.
P&A Radio w/2 Amps (2 of 2): 2014 Touring

Figure B-21.
P&A Radio w/2 Amps (2 of 2): 2014 Touring

SUBJECT	PAGE NO.
C.1 FASTENER TORQUE VALUES	C-1
C.2 SPECIFICATIONS: COOLING SYSTEM	C-2
C.3 COOLING SYSTEM OPERATION	C-3
C.4 TESTING AND DIAGNOSTICS	C-4
C.5 COOLING SYSTEM REPAIR	C-6

NOTES

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Air duct nut, lower fairing	65-75 **in-lbs**	7.3-8.4 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Air duct screws, lower fairing	65-75 **in-lbs**	7.3-8.4 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Coolant adapter fitting in head	108-156 **in-lbs**	12.2-17.6 Nm	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation
Coolant bottle nut	65-75 **in-lbs**	7.3-8.4 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Coolant down tubes to front frame	90-110 **in-lbs**	10.2-12.4 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Down Tubes
Coolant line P-clamp nut	36-60 **in-lbs**	4.1-6.8 Nm	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation
Coolant line retainer plate screw	48-72 **in-lbs**	5.4-8.1 Nm	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation
Coolant pump bracket	20-22 ft-lbs	27.1-29.8 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Distribution Components
Glove box screws, lower fairing	12-16 **in-lbs**	1.4-1.8 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Lower fairing, upper nuts	30-35 **in-lbs**	3.4-3.9 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Lower fairing cap flange nut	30-35 **in-lbs**	3.4-3.9 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Temperature sensor, radiator	13.3-16.2 ft-lbs	18-22 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Distribution Components
Thermostat screw	48-60 **in-lbs**	5.4-6.8 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Distribution Components

GENERAL

Table C-1. Capacities

ITEM	QUARTS	LITERS
Engine coolant	1.1	1.0

Table C-2. Coolant Pressure

ITEM	PSI	KPA
Cap lower limit	18	124
Rated cap pressure	20	138
Cap upper limit	22	152

Table C-3. Coolant Temperatures

ITEM	°F	°C
Thermostat initially opens	165	74
Thermostat fully open	190	88
Engine temperature lamp	266	130
Antifreeze protection	-34	-36.7

Table C-4. Fan Operation *

STATUS	°F	°C
On (below 15 mph)	221	105
Off (below 15 mph)	203	95
On (above 15 mph)	244	118
Off (above 15 mph)	230	110
Fans and pump will run after vehicle shutdown until 203 °F (95 °C) is reached or three minutes, whichever occurs first.		

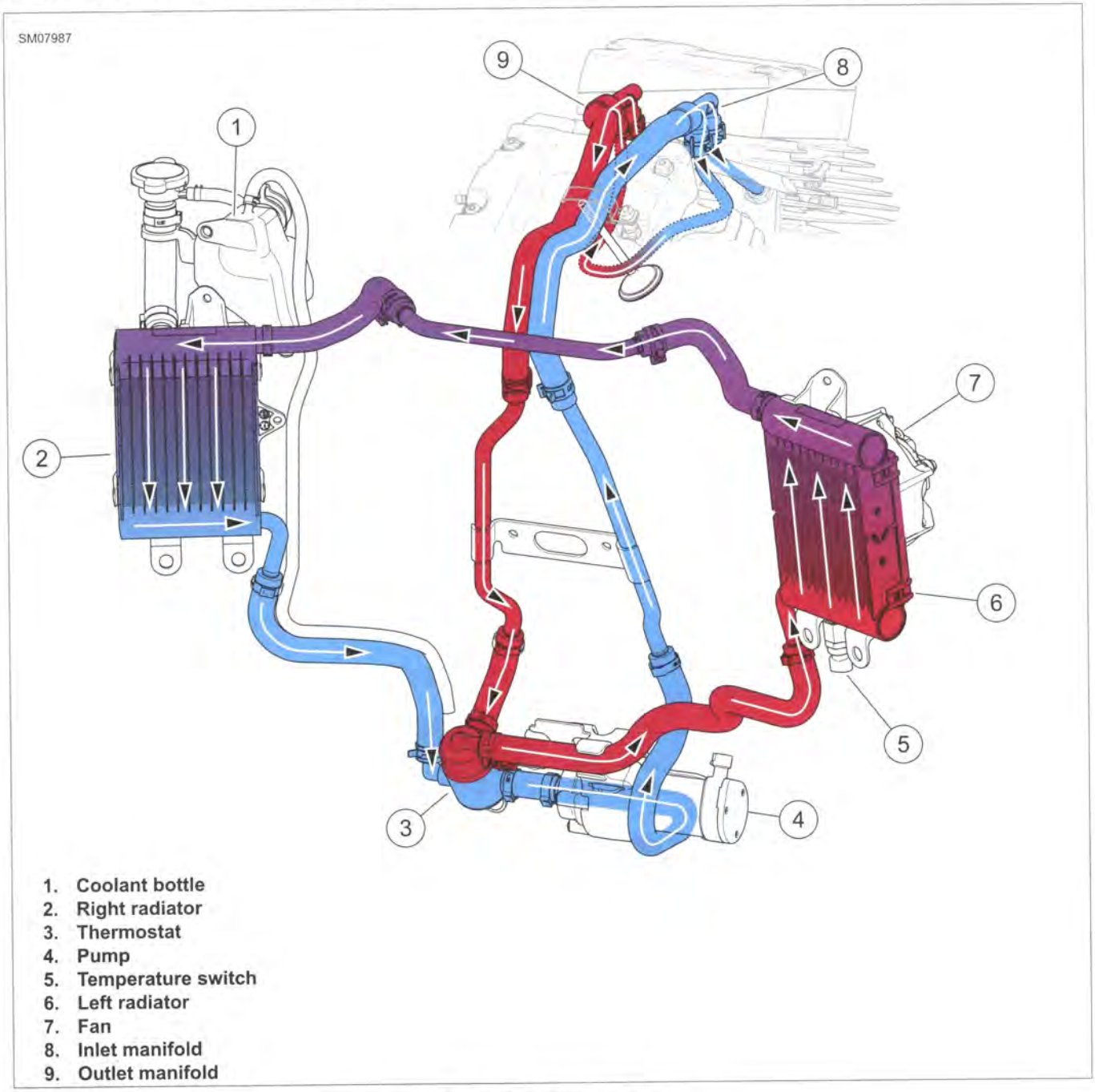
OPERATION

An electric pump (4) mounted near the voltage regulator circulates the coolant through the system. A thermostat (3) controls coolant flow to the radiators.

Coolant flows from the pump (4) up through an external line to a manifold (8) between the cylinders. Coolant flows through passages around the exhaust valve seat in each cylinder head. Coolant then exits both cylinder heads to a collection manifold (9) which combines the flow and returns coolant to the thermostat housing (3). If the coolant temperature is below 165 °F (74 °C), the coolant is routed through the pump and back to the engine. Above 165 °F (74 °C), the thermostat opens and the coolant flows to the left radiator (6), then across to the right radiator (2) before returning to the pump through the bottom portion of the thermostat housing.

A fan (7) is mounted behind each radiator to boost air flow at low road speeds and at engine idle. The fans and pump are controlled by temperature switch (5) mounted in the left radiator.

The coolant bottle (1) stores extra coolant to control coolant expansion and contraction during operation.



1. Coolant bottle
2. Right radiator
3. Thermostat
4. Pump
5. Temperature switch
6. Left radiator
7. Fan
8. Inlet manifold
9. Outlet manifold

Figure C-1. Coolant Flow

TROUBLESHOOTING

⚠WARNING

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

Low Engine Temperature

1. Thermostat is stuck open.

High Engine Temperature

1. Thermostat stuck closed.
2. Blocked hoses, pipes or passages.
3. Restricted air flow through radiator.
4. Defective cooling fan.
5. Faulty coolant pump.
6. Low coolant level.
7. Air in system.
8. Defective pressure cap.
9. Defective engine coolant sensor.

Coolant Leaks

1. Pressure cap not properly installed.
2. Damaged pressure cap gasket.
3. Deteriorated O-rings on coolant pump or manifolds.
4. Leaking hose or hose connection.

PRESSURE CAP TEST

PART NUMBER	TOOL NAME
HD-45335	COOLANT SYSTEM PRESSURE TESTER

Test pressure cap for the correct operating range every time the antifreeze is changed or any cooling system maintenance performed.

⚠WARNING

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

1. Remove pressure cap.
2. Inspect cap for gasket deterioration and inoperative springs.
3. See Figure C-2. Connect COOLANT SYSTEM PRESSURE TESTER (Part No. HD-45335) to pressure cap.

NOTE

*To test a **new** cap, wet the upper sealing gasket before turning onto adapter.*

Pump handle to pressurize pressure limiting valve in cap. Stop pumping when pressure valve in cap opens.

4. Replace pressure cap if:
   a. Leaks below low limit, 18 psi (124 kPa).
   b. Opens above high limit, 22 psi (152 kPa).
   c. Pressure falls rapidly when pressurized within range.
5. Remove adapter and cap.

Figure C-2. Pressure Cap Test

SYSTEM PRESSURE TEST

PART NUMBER	TOOL NAME
HD-45335	COOLANT SYSTEM PRESSURE TESTER

Pressure test the cooling system to identify a leak.

1. See Figure C-3. Before troubleshooting cooling system, be sure that engine coolant level is at or slightly above COLD FULL mark on overflow bottle (3).

⚠WARNING

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

2. Pull filler neck from retainer on coolant bottle. Remove cap.

NOTE

Damaged filler neck cams, safety stops and sealing surfaces can cause cap to leak or affect pressure limiting valve. Replace the filler neck if damaged. Damaged cap stop can also cause a coolant leak. Replace cap is damaged.

3. Clean and inspect filler neck, upper and lower sealing seats, overflow tube and overflow bottle.

NOTE

Wet the upper sealing surfaces before turning adapter onto tester head.

4. Connect COOLANT SYSTEM PRESSURE TESTER (Part No. HD-45335) to the filler neck (2).

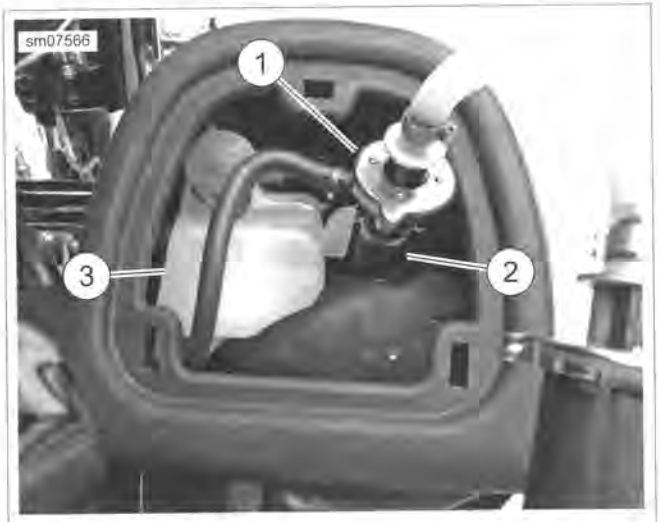
NOTE

When performing the coolant system pressure test, never exceed the upper limit rating of the pressure cap. Excessive pressure can rupture cooling pipes, hoses and radiator.

5. Pump tester until pressure reaches 20 psi (138 kPa).
6. Observe pressure gauge and proceed as indicated in Table C-5.
7. Release system pressure before removing tester from filler neck.

Table C-5. System Pressure Test

NEEDLE MOVEMENT	LEAK	ACTION
Holds steady for 2 minutes	None	None
Drops slowly	Small	Dye test
Drops quickly	Major	Visual



1. **Tester adapter**
2. **Filler neck**
3. **Bottle**

Figure C-3. System Pressure Test

LEAK DETECTION DYE TEST

PART NUMBER	TOOL NAME
HD-29545-6	COOLANT FLUORESCENT LEAK DETECTION DYE
HD-35457	BLACK LIGHT LEAK DETECTOR

NOTE

If the coolant overflow bottle is empty when the engine is cold, it is possible that air has been drawn into the coolant system. Fill system with coolant and purge any trapped air.

1. Before troubleshooting cooling system, make sure that engine coolant level is at COLD FULL mark on overflow bottle.

⚠WARNING

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

2. Remove filler cap.
3. If filler neck is full of coolant, remove an amount of coolant equal to the amount of dye.
4. See Figure C-6. Pour COOLANT FLUORESCENT LEAK DETECTION DYE (Part No. HD-29545-6) into filler neck.

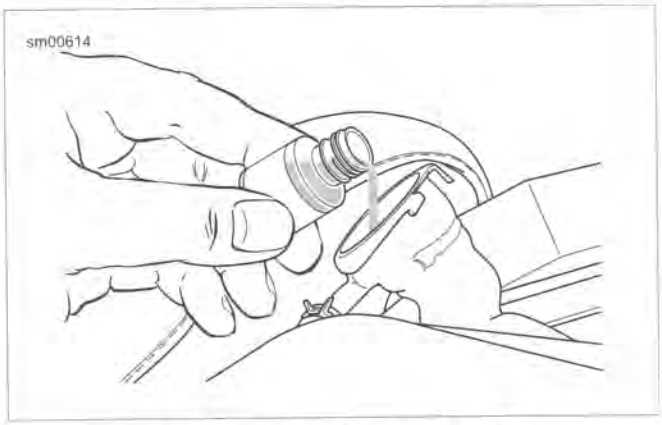


Figure C-4. Pouring Dye into Filler Neck

5. Install pressure cap. Run engine for 10 minutes.
6. Use BLACK LIGHT LEAK DETECTOR (Part No. HD-35457) to illuminate entire cooling system. A yellow fluorescence indicates a leak.
7. Inspect engine oil for yellow dye.

NOTE

Dye in the oil may indicate a damaged engine head gasket. Draining and replacing coolant contaminated oil is necessary as part of engine service.

CRIMP CLAMPS

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

Removal

NOTE

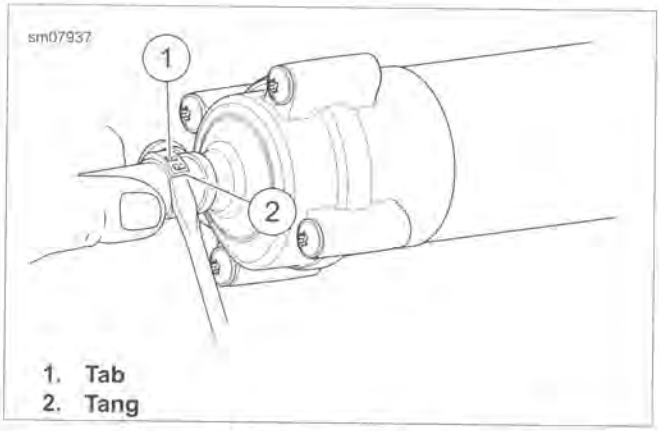
It is preferable to pry overlap to release crimp clamps. If clamps must be cut, use a sharp high-quality wire cutter. To prevent breaking plastic fittings, do not twist clamp while cutting.

1. See Figure C-5. Push the tip of a small screwdriver under end of tang (2).

NOTE

Plastic fittings are fragile. Use care when prying to free clamp.

2. Pry until tang is free of tab (1).
3. Remove clamp.



1. Tab
2. Tang

Figure C-5. Removing Crimp Clamp

Installation

1. Install **new** clamp.
2. Tighten clamp using HOSE CLAMP PLIERS (Part No. HD-41137).

UPPER COOLANT LINE REMOVAL

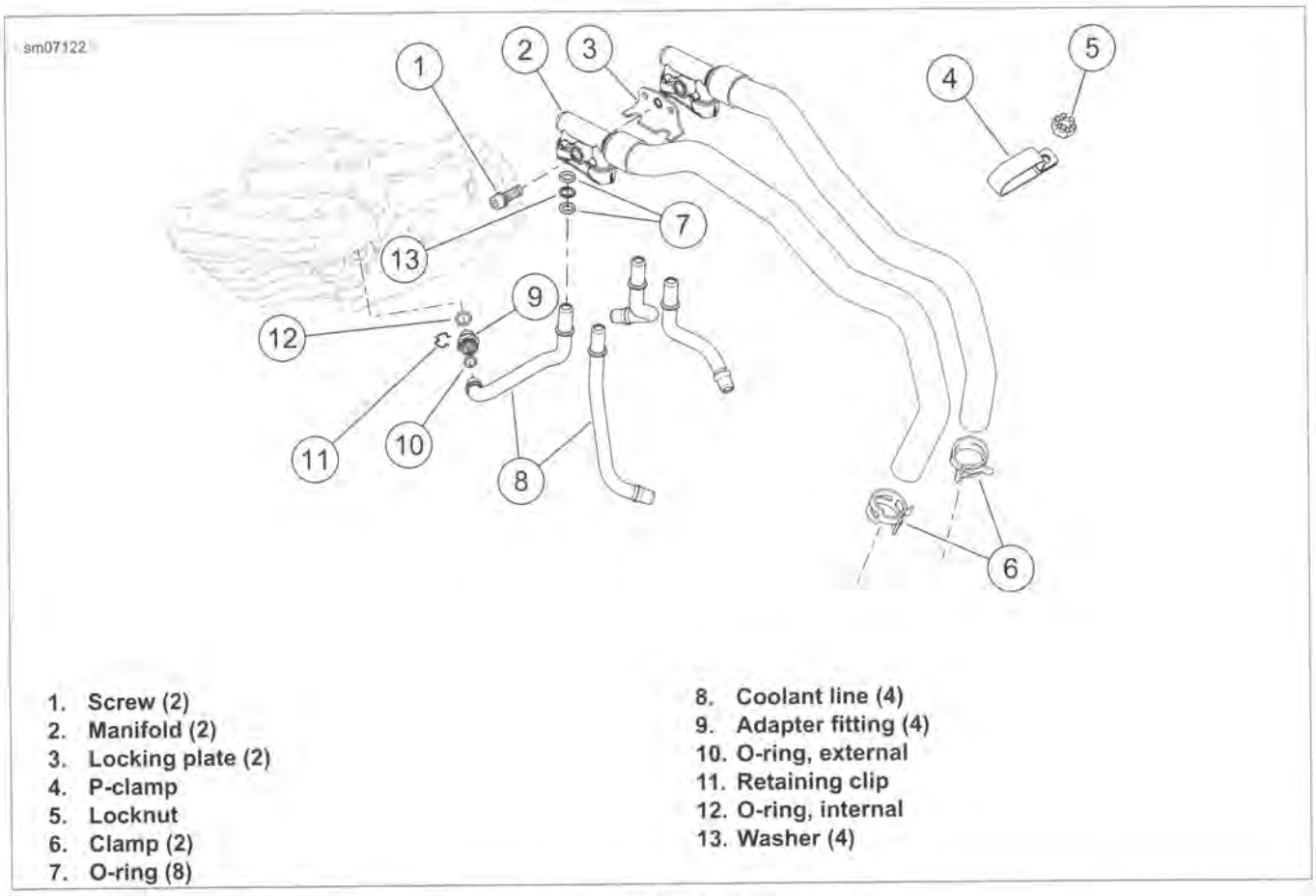
PART NUMBER	TOOL NAME
B-41623-B	OIL LINE REMOVER
LDTSP4	SNAP-ON

Hose and Manifold Removal

1. Remove fuel tank. See 4.6 FUEL TANK.
2. See Figure C-6. Remove locknut (5) and P-clamp (4) from stud on forward rocker cover. Remove clamp from hoses.
3. Remove screws (1) and plates (3).
4. Disconnect coolant manifolds (2) from the coolant lines (8).
5. Remove hose clamps (6) at top of coolant down tubes. Separate hoses from down tubes. Remove hoses.
6. Remove O-rings (7) and washer (13).

Cylinder Head Coolant Lines and Adapters

1. See Figure C-6. Disconnect coolant manifolds (2) from the coolant lines (8).
2. **Return lines:** Remove induction module. See 4.13 INDUCTION MODULE.
3. Using OIL LINE REMOVER (Part No. B-41623-B) or SNAP-ON (Part No. LDTSP4), release retaining clip (11). Remove coolant line from adapter (9).
4. Remove adapter (9) from cylinder head.
5. Remove and discard O-rings (10, 12).



1. **Screw (2)**
2. **Manifold (2)**
3. **Locking plate (2)**
4. **P-clamp**
5. **Locknut**
6. **Clamp (2)**
7. **O-ring (8)**
8. **Coolant line (4)**
9. **Adapter fitting (4)**
10. **O-ring, external**
11. **Retaining clip**
12. **O-ring, internal**
13. **Washer (4)**

Figure C-6. Upper Cooling Components

UPPER COOLANT LINE INSTALLATION

FASTENER	TORQUE VALUE	
Coolant adapter fitting in head	108-156 **in-lbs**	12.2-17.6 Nm
Coolant line retainer plate screw	48-72 **in-lbs**	5.4-8.1 Nm
Coolant line P-clamp nut	36-60 **in-lbs**	4.1-6.8 Nm

Cylinder Head Coolant Lines and Adapters

1. See Figure C-6. Install **new** O-rings (10, 12) in adapter (9).
2. Install adapter (9). Tighten to 108-156 **in-lbs** (12.2-17.6 Nm).
3. Lightly lubricate the end of the coolant line. Install coolant lines in adapter. Verify that each line is securely installed.
4. Install induction module if removed. See 4.13 INDUCTION MODULE.
5. Install **new** O-rings (7) and washer (13) over each coolant line (8).
6. Lightly lubricate O-rings (7). Install manifold (2) onto the coolant lines.

Hose and Manifold Installation

1. See Figure C-6. Install hose to ends of coolant down tubes. Secure with hose clamps (6).
2. Install **new** O-rings (7) and washer (13) over each coolant line (8).
3. Lightly lubricate O-rings (7). Install manifold (2) onto the coolant lines.
4. Install retainer plate (3) with screw (1). Tighten to 48-72 **in-lbs** (5.4-8.1 Nm).
5. Install P-clamp (4) on hoses. Secure with locknut (5). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
6. Fill system with GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE AND COOLANT. See 1.8 COOLANT.
7. Install fuel tank. See 4.6 FUEL TANK.
8. Run the engine. Allow engine to reach normal operating temperature and check for coolant leaks. Add coolant as required.

COOLANT DOWN TUBES

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

FASTENER	TORQUE VALUE	
Coolant down tubes to front frame	90-110 **in-lbs**	10.2-12.4 Nm

Removal

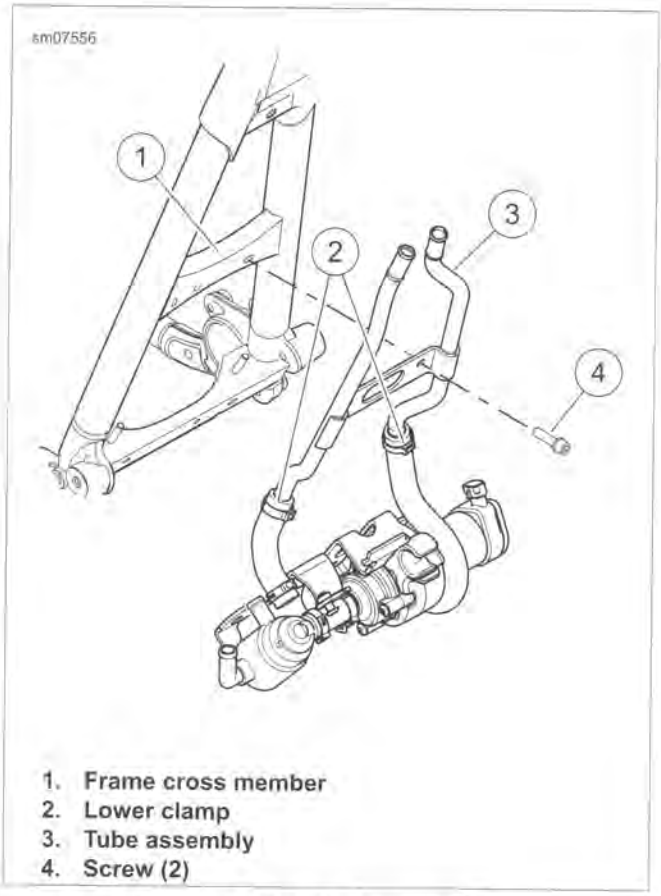
NOTE

Removal of the front fender will increase working room and help prevent cosmetic damage. Add cosmetic protection or remove the fender as needed.

1. Drain coolant. See 1.8 COOLANT, Drain and Fill Cooling System.
2. Remove upper hose clamps.
3. See Figure C-7. Remove lower hose clamps (2). See C.5 COOLING SYSTEM REPAIR, Crimp Clamps.
4. Remove screws (4). Remove tube assembly.

Installation

1. Install tube assembly with screws (4). Tighten to 90-110 **in-lbs** (10.2-12.4 Nm).
2. Install hoses and clamps. Tighten lower clamps using HOSE CLAMP PLIERS (Part No. HD-41137).
3. Fill and bleed coolant system. See 1.8 COOLANT, Drain and Fill Cooling System.



1. **Frame cross member**
2. **Lower clamp**
3. **Tube assembly**
4. **Screw (2)**

Figure C-7. Coolant Down Tubes

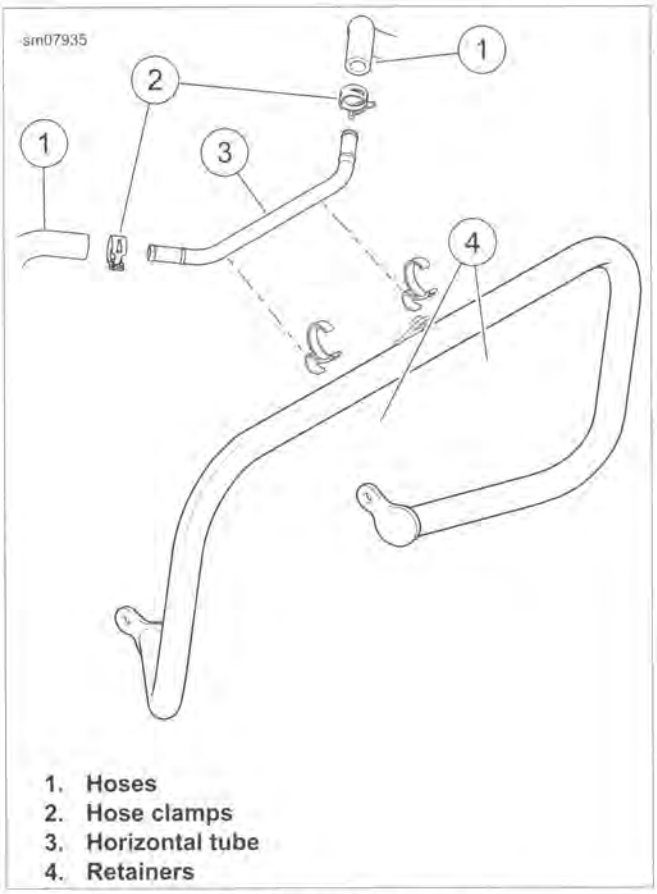
HORIZONTAL COOLANT TUBE

Removal

1. Drain coolant. See 1.8 COOLANT, Drain and Fill Cooling System.
2. See Figure C-8. Release retainers (4).
3. Remove clamps (2).
4. Disconnect hoses (1). Remove horizontal tube (3).

Installation

1. See Figure C-8. Place horizontal tube into position. Connect hoses (1).
2. Install retainers (4).
3. Install clamps (2).
4. Fill and bleed coolant system. See 1.8 COOLANT, Drain and Fill Cooling System.



1. **Hoses**
2. **Hose clamps**
3. **Horizontal tube**
4. **Retainers**

Figure C-8. Coolant Horizontal Line

RADIATOR

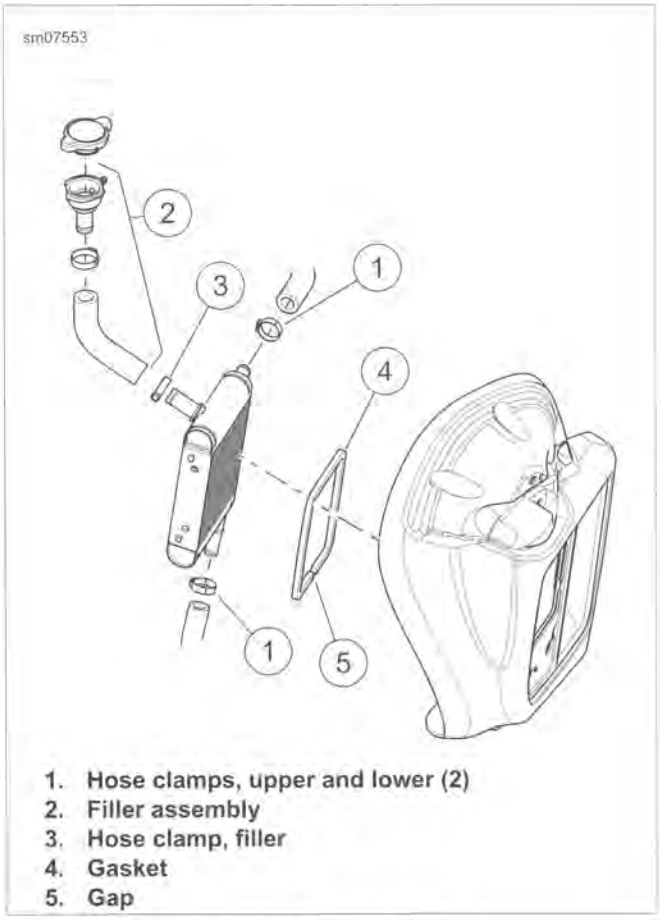
PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

Removal

1. Remove main fuse.
2. Remove fan. See C.5 COOLING SYSTEM REPAIR, Cooling Fan.
3. Drain coolant. See 1.8 COOLANT, Drain and Fill Cooling System.
4. See Figure C-9. Remove clamps (1). See C.5 COOLING SYSTEM REPAIR, Crimp Clamps.
5. Disconnect upper and lower hoses. Remove radiator.
6. **Right side:** Remove clamp (3). Remove filler assembly (2).
7. If necessary, remove gasket (4).

Installation

1. See Figure C-9. If removed, install **new** gasket (4). Carefully align to bosses and place gap (5) at bottom center.
2. **Right side:** Install filler assembly using new clamp (3).
3. Connect hoses to radiator using **new** clamps.
4. Tighten clamps using HOSE CLAMP PLIERS (Part No. HD-41137).
5. Install fan and assemble lower fairing. See C.5 COOLING SYSTEM REPAIR, Cooling Fan.
6. Install main fuse.
7. Fill and bleed coolant system. See 1.8 COOLANT, Drain and Fill Cooling System.



1. **Hose clamps, upper and lower (2)**
2. **Filler assembly**
3. **Hose clamp, filler**
4. **Gasket**
5. **Gap**

Figure C-9. Radiator

COOLANT DISTRIBUTION COMPONENTS

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

FASTENER	TORQUE VALUE	
Coolant pump bracket	20-22 ft-lbs	27.1-29.8 Nm
Thermostat screw	48-60 **in-lbs**	5.4-6.8 Nm
Temperature sensor, radiator	13.3-16.2 ft-lbs	18-22 Nm

Coolant Pump/Thermostat Removal

⚠CAUTION

Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)

NOTES

- *Removal of the front fender will increase working room and help prevent cosmetic damage. Add cosmetic protection or remove the fender as needed.*
- *The thermostat assembly contains no service parts.*
- *The pump assembly contains no service parts.*

1. Remove main fuse.
2. Remove pump/thermostat cover.
3. Drain coolant. See 1.8 COOLANT, Drain and Fill Cooling System.
4. See Figure C-10. Remove screw (12).

NOTE

If the overlap of the crimp clamp securing hose (3) to thermostat cannot be accessed, remove hose from the down tube (5). Remove hose from thermostat after pump/thermostat assembly is removed.

5. Remove crimp clamp from hose (3). See C.5 COOLING SYSTEM REPAIR, Crimp Clamps.
6. Remove hoses (2, 3, 9) from thermostat.
7. Disconnect pump power connector. Pull pump/thermostat and mount (8) off tabs of mounting bracket (7).
8. Remove clamp. Disconnect hose (11) to separate pump from thermostat.
9. If necessary, remove bracket (7).

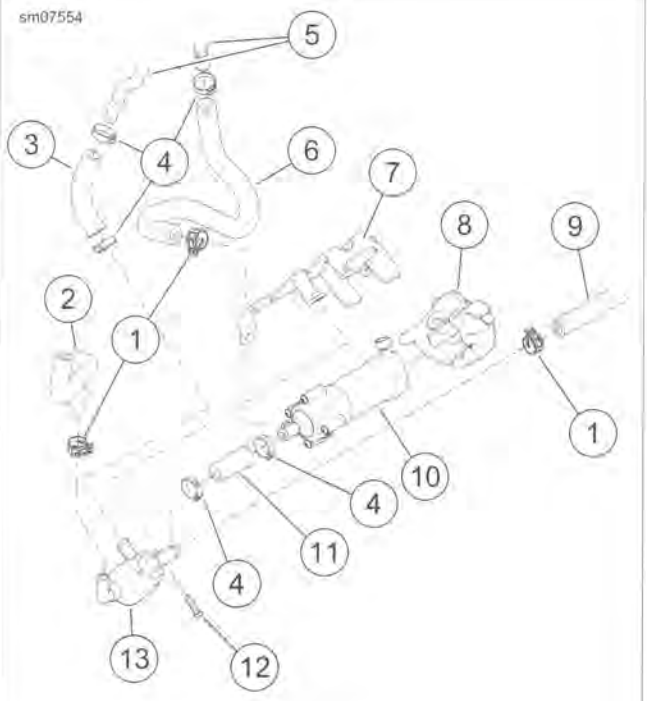
Coolant Pump/Thermostat Installation

1. If removed, install bracket (7). Tighten to 20-22 ft-lbs (27.1-29.8 Nm).
2. Place new clamp onto hose (11). Assemble pump to thermostat.
3. Install pump/thermostat and mount on tabs of mounting bracket. Apply window cleaner or rubbing alcohol to ease installation.
4. Secure thermostat with screw (12). Tighten to 48-60 **in-lbs** (5.4-6.8 Nm).
5. Place**new** crimp clamp on hose (3). Place spring clamps on hoses (2, 9).

NOTE

Verify that clamps are not installed on the barbed area of the fitting.

6. Install hoses (2, 3, 9). Install spring clamps.
7. Tighten crimp clamp on hose (3) using HOSE CLAMP PLIERS (Part No. HD-41137).
8. See Figure C-11. Route pump harness (4) as shown. Mate power connector to pump.
9. Secure any connectors moved during disassembly:
   a. Secure connectors (2, 3) to the mounting bracket.
   b. Secure main harness with anchored cable strap (1).
   c. Secure left and right fan harness to the respective coolant hose with a **new** cable strap (5).
10. Install pump/thermostat cover.
11. Fill and bleed coolant system. See 1.8 COOLANT, Drain and Fill Cooling System.



1. **Hose clamps, spring type (3)**
2. **Hose, radiator to thermostat, right**
3. **Hose, engine to thermostat**
4. **Hose clamps, ear type (5)**
5. **Down tube assembly**
6. **Hose, pump to engine**
7. **Bracket**
8. **Pump mount**
9. **Hose, radiator to thermostat, left**
10. **Coolant pump**
11. **Hose, pump to thermostat**
12. **Screw, thermostat mounting**
13. **Thermostat**

Figure C-10. Coolant Distribution Components

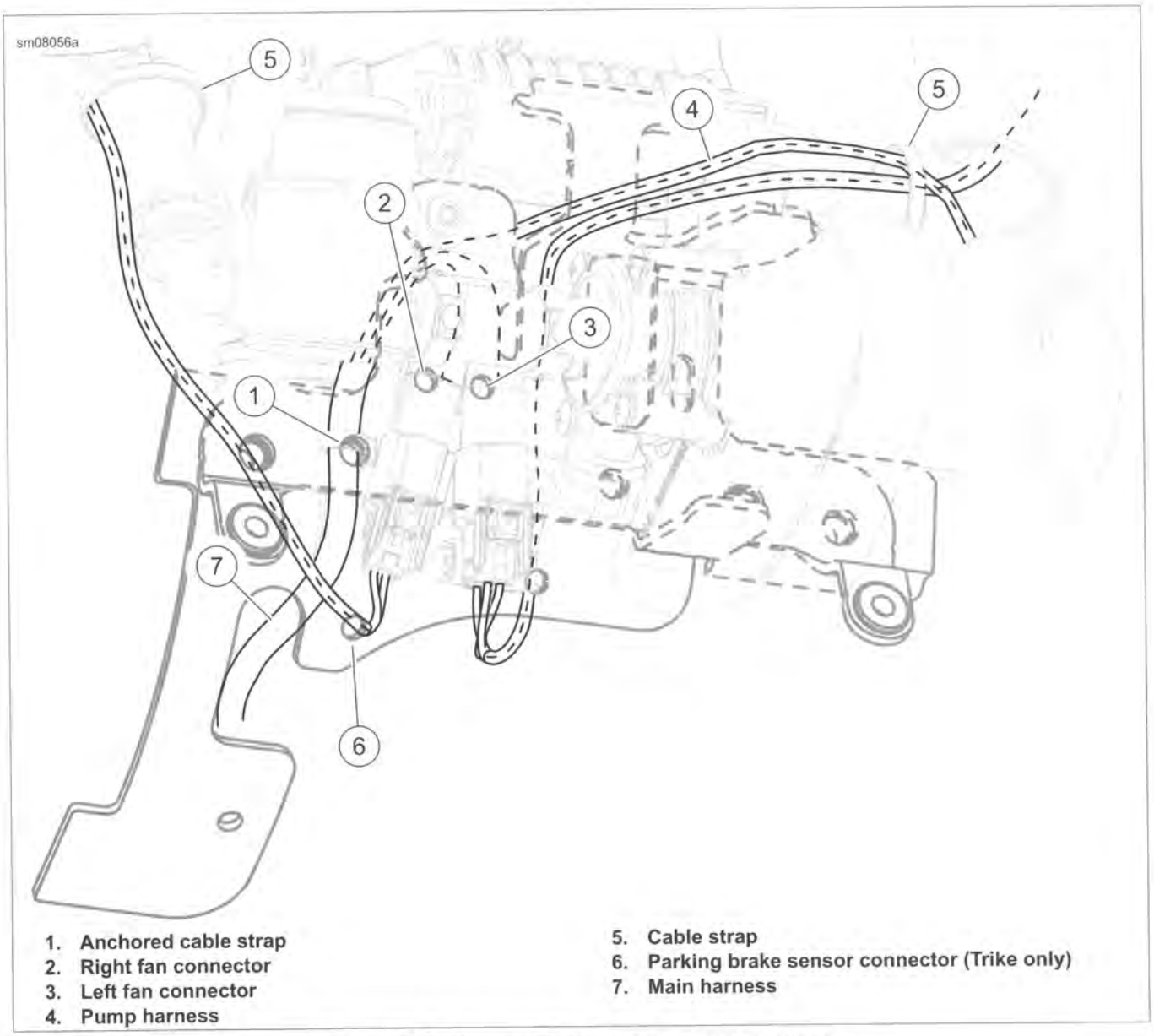


Figure C-11. Harness Routing and Anchor Locations

Coolant Temperature Sensor

1. Drain coolant. See 1.8 COOLANT, Drain and Fill Cooling System.
2. Disassemble left lower fairing. See C.5 COOLING SYSTEM REPAIR, Cooling Fan.

NOTE

Hold hex on radiator while removing and installing sensor.

3. Remove sensor from bottom of left radiator.
4. Apply LOCTITE 565 THREAD SEALANT to threads of sensor. Avoid getting sealant on sensor probe.
5. Install sensor. Tighten to 13.3-16.2 ft-lbs (18-22 Nm).
6. Assemble left lower fairing. See C.5 COOLING SYSTEM REPAIR, Cooling Fan.
7. Install main fuse.
8. Fill and bleed coolant system. See 1.8 COOLANT, Drain and Fill Cooling System.

COOLING FAN

FASTENER	TORQUE VALUE	
Air duct screws, lower fairing	65-75 **in-lbs**	7.3-8.4 Nm
Air duct nut, lower fairing	65-75 **in-lbs**	7.3-8.4 Nm
Coolant bottle nut	65-75 **in-lbs**	7.3-8.4 Nm
Glove box screws, lower fairing	12-16 **in-lbs**	1.4-1.8 Nm
Lower fairing, upper nuts	30-35 **in-lbs**	3.4-3.9 Nm
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm
Lower fairing cap flange nut	30-35 **in-lbs**	3.4-3.9 Nm

Removal

⚠CAUTION

Cooling fans operate automatically, even when the ignition switch is off. Keep hands away from fan blades. Contact with a rotating fan blade can result in minor or moderate injury. (00093a)

NOTE

Always remove the main fuse when servicing these fans or pump.

1. Remove main fuse.
2. Remove access panel. (Pry the center top and near each lower corner to release clips.)
3. Remove nut securing lower fairing cap. Remove fairing cap.
4. See Figure C-12. Remove lower fairing clamp screw and nut (8).
5. Remove nuts (7) securing upper clamp. Move lower fairing away from engine guard to access screws (6).
6. Remove three screws (6) securing glove box frame (1). Loosely install upper clamp.
7. Pull glove box frame away releasing two clips (14). Disconnect vent linkage from vent door lever.
8. **Right side:** Remove nut (3) securing coolant bottle (4). Release bottle from stud and lower grommet.
9. **Left side:** Disconnect temperature sensor.
10. Remove screws (13).
11. Remove nut (2). Remove air duct (12).
12. Separate fan power connector (10). Remove connector anchor.
13. Pull radiator/fan assembly away from lower fairing.
14. Release latches securing fan to radiator. Remove fan.

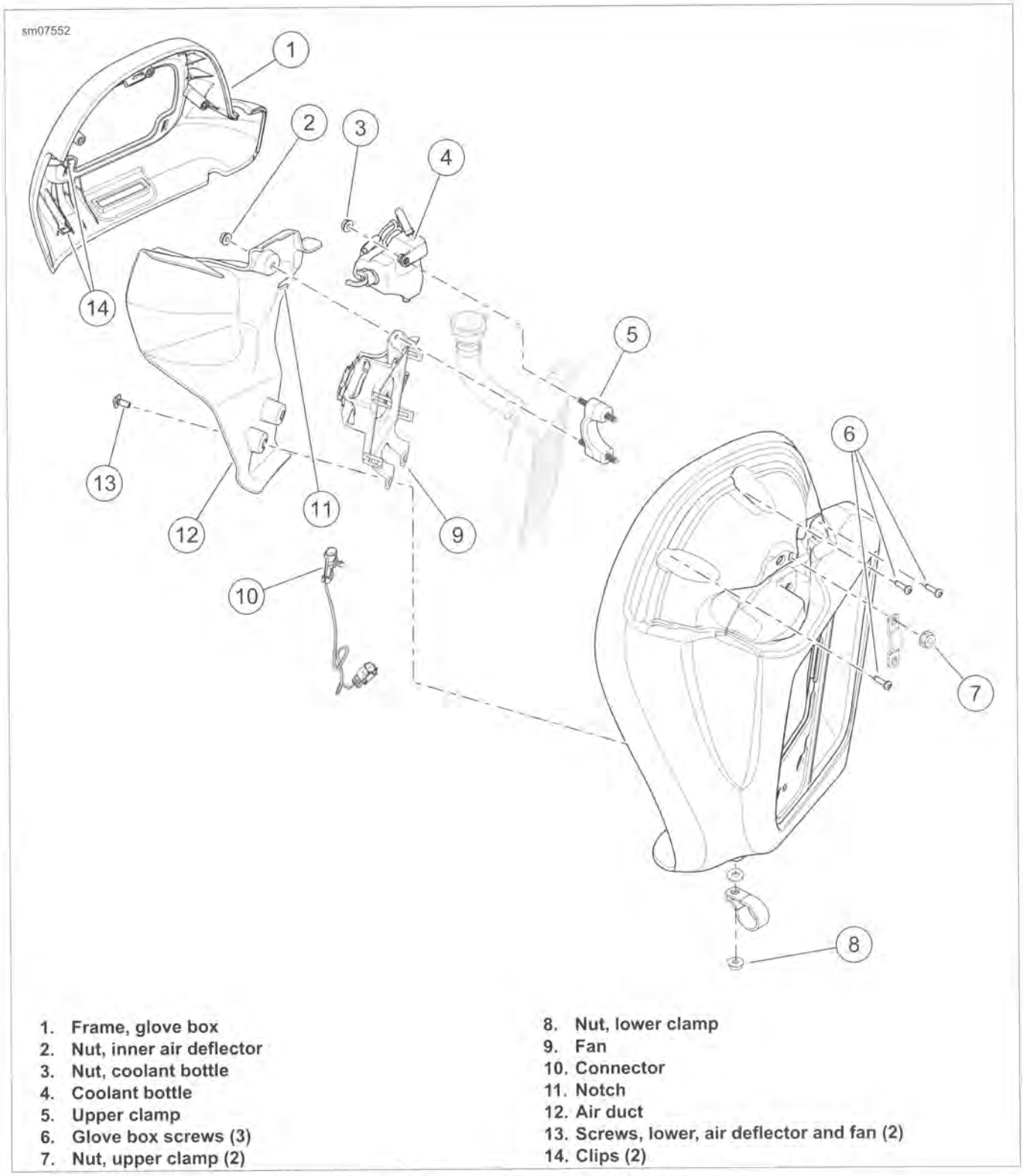
Installation

1. If removed, install upper clamp (5). The left upper clamp has only one stud facing the inside. Install it with the single stud at the bottom.
2. Latch fan onto radiator.
3. See Figure C-12. Mate connector (10) and install anchor in fan housing.

NOTE

Route overflow vent hose through notch (11) when installing air duct.

4. Install air duct. Verify lower radiator mounts are aligned with bosses. Tighten screws (13) to 65-75 **in-lbs** (7.3-8.4 Nm). Tighten nut (2) to 65-75 **in-lbs** (7.3-8.4 Nm).
5. **Right side:** Install coolant bottle into rubber grommet and onto stud. Capture filler neck in retainer. Install nut (3). Tighten to 65-75 **in-lbs** (7.3-8.4 Nm).
6. **Left side:** Connect temperature sensor.
7. Move glove box frame (10) into place and connect vent linkage.
8. Secure glove box frame with screws (6). Tighten to 12-16 **in-lbs** (1.4-1.8 Nm).
9. Secure lower fairing to engine guard. Tighten upper flange nuts (7) to 30-35 **in-lbs** (3.4-3.9 Nm). Tighten lower screw and nut (8) to 90-100 **in-lbs** (10.2-11.3 Nm).
10. Install lower fairing cap with flange nut. Tighten to 30-35 **in-lbs** (3.4-3.9 Nm).
11. Install access panel.
12. Install main fuse.



1. Frame, glove box
2. Nut, inner air deflector
3. Nut, coolant bottle
4. Coolant bottle
5. Upper clamp
6. Glove box screws (3)
7. Nut, upper clamp (2)
8. Nut, lower clamp
9. Fan
10. Connector
11. Notch
12. Air duct
13. Screws, lower, air deflector and fan (2)
14. Clips (2)

Figure C-12. Lower Fairing: Twin-Cooled

NOTES

SUBJECT	PAGE NO.
D.1 METRIC CONVERSION	D-1
D.2 FLUID CONVERSION	D-2
D.3 TORQUE CONVERSION	D-3
D.4 GLOSSARY	D-4

NOTES

CONVERSION TABLE

Table D-1. Metric Conversions

MILLIMETERS to INCHES (MM x 0.03937 = IN)								INCHES to MILLIMETERS (IN x 25.40 = MM)							
mm	in	mm	in	mm	in	mm	in	in	mm	in	mm	in	mm	in	mm
.1	.0039	25	.9842	58	2.283	91	3.582	.001	.025	.6	15.240	1-15/16	49.21	3-5/16	84.14
.2	.0078	26	1.024	59	2.323	92	3.622	.002	.051	5/8	15.875	2	50.80	3-3/8	85.72
.3	.0118	27	1.063	60	2.362	93	3.661	.003	.076	11/16	17.462	2-1/16	52.39	3.4	86.36
.4	.0157	28	1.102	61	2.401	94	3.701	.004	.102	.7	17.780	2.1	53.34	3-7/16	87.31
.5	.0197	29	1.142	62	2.441	95	3.740	.005	.127	3/4	19.050	2-1/8	53.97	3-1/2	88.90
.6	.0236	30	1.181	63	2.480	96	3.779	.006	.152	.8	20.320	2-3/16	55.56	3-9/16	90.49
.7	.0275	31	1.220	64	2.519	97	3.819	.007	.178	13/16	20.638	2.2	55.88	3.6	91.44
.8	.0315	32	1.260	65	2.559	98	3.858	.008	.203	7/8	22.225	2-1/4	57.15	3-5/8	92.07
.9	.0354	33	1.299	66	2.598	99	3.897	.009	.229	.9	22.860	2.3	58.42	3-11/16	93.66
1	.0394	34	1.338	67	2.638	100	3.937	.010	.254	15/16	23.812	2-5/16	58.74	3.7	93.98
2	.0787	35	1.378	68	2.677	101	3.976	1/64	.397	1	25.40	2-3/8	60.32	3-3/4	95.25
3	.1181	36	1.417	69	2.716	102	4.016	.020	.508	1-1/16	26.99	2.4	60.96	3.8	96.52
4	.1575	37	1.456	70	2.756	103	4.055	.030	.762	1.1	27.94	2-7/16	61.91	3-13/16	96.84
5	.1968	38	1.496	71	2.795	104	4.094	1/32	.794	1-1/8	28.57	2-1/2	63.50	3-7/8	98.42
6	.2362	39	1.535	72	2.834	105	4.134	.040	1.016	1-3/16	30.16	2-9/16	65.09	3.9	99.06
7	.2756	40	1.575	73	2.874	106	4.173	.050	1.270	1.2	30.48	2.6	66.04	3-15/16	100.01
8	.3149	41	1.614	74	2.913	107	4.212	.060	1.524	1-1/4	31.75	2-5/8	66.67	4	101.6
9	.3543	42	1.653	75	2.953	108	4.252	1/16	1.588	1.3	33.02	2-11/16	68.26	4-1/16	102.19
10	.3937	43	1.693	76	2.992	109	4.291	.070	1.778	1-5/16	33.34	2.7	68.58	4.1	104.14
11	.4331	44	1.732	77	3.031	110	4.331	.080	2.032	1-3/8	34.92	2-3/4	69.85	4-1/8	104.77
12	.4724	45	1.772	78	3.071	111	4.370	.090	2.286	1.4	35.56	2.8	71.12	4-3/16	106.36
13	.5118	46	1.811	79	3.110	112	4.409	.1	2.540	1-7/16	36.51	2-13/16	71.44	4.2	106.68
14	.5512	47	1.850	80	3.149	113	4.449	1/8	3.175	1-1/2	38.10	2-7/8	73.02	4-1/4	107.95
15	.5905	48	1.890	81	3.189	114	4.488	3/16	4.762	1-9/16	39.69	2.9	73.66	4.3	109.22
16	.6299	49	1.929	82	3.228	115	4.527	.2	5.080	1.6	40.64	2-15/16	74.61	4-5/16	109.54
17	.6693	50	1.968	83	3.268	116	4.567	1/4	6.350	1-5/8	41.27	3	76.20	4-3/8	111.12
18	.7086	51	2.008	84	3.307	117	4.606	.3	7.620	1-11/16	42.86	3-1/16	77.79	4.4	111.76
19	.7480	52	2.047	85	3.346	118	4.645	5/16	7.938	1.7	43.18	3.1	78.74	4-7/16	112.71
20	.7874	53	2.086	86	3.386	119	4.685	3/8	9.525	1-3/4	44.45	3-1/8	79.37	4-1/2	114.30
21	.8268	54	2.126	87	3.425	120	4.724	.4	10.160	1.8	45.72	3-3/16	80.96	4-9/16	115.89
22	.8661	55	2.165	88	3.464	121	4.764	7/16	11.112	1-13/16	46.04	3.2	81.28	4.6	116.84
23	.9055	56	2.205	89	3.504	122	4.803	1/2	12.700	1-7/8	47.62	3-1/4	82.55	4-5/8	117.47
24	.9449	57	2.244	90	3.543	123	4.842	9/16	14.288	1.9	48.26	3.3	83.82	4-11/16	119.06

UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this manual are expressed in United States (U.S.) units-of-measure. See below:

- 1 pint (U.S.) = 16 fluid ounces (U.S.)
- 1 quart (U.S.) = 2 pints (U.S.) = 32 fl. oz. (U.S.)
- 1 gallon (U.S.) = 4 quarts (U.S.) = 128 fl. oz. (U.S.)

METRIC SYSTEM

Fluid volume measurements in this manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). To convert between U.S. units-of-measure and metric units-of-measure, refer to the following:

- fluid ounces (U.S.) x 29.574 = milliliters
- pints (U.S.) x 0.473 = liters
- quarts (U.S.) x 0.946 = liters
- gallons (U.S.) x 3.785 = liters
- milliliters x 0.0338 = fluid ounces (U.S.)
- liters x 2.114 = pints (U.S.)
- liters x 1.057 = quarts (U.S.)
- liters x 0.264 = gallons (U.S.)

BRITISH IMPERIAL SYSTEM

Fluid volume measurements in this manual do not include the British Imperial (Imp.) system equivalents. The following conversions exist in the British Imperial system:

- 1 pint (Imp.) = 20 fluid ounces (Imp.)
- 1 quart (Imp.) = 2 pints (Imp.)
- 1 gallon (Imp.) = 4 quarts (Imp.)

Although the same unit-of-measure terminology as the U.S. system is used in the British Imperial (Imp.) system, the actual volume of each British Imperial unit-of-measure differs from its U.S. counterpart. The U.S. fluid ounce is larger than the British Imperial fluid ounce. However, the U.S. pint, quart, and gallon are smaller than the British Imperial pint, quart, and gallon, respectively. To convert between U.S. units and British Imperial units, refer to the following:

- fluid ounces (U.S.) x 1.042 = fluid ounces (Imp.)
- pints (U.S.) x 0.833 = pints (Imp.)
- quarts (U.S.) x 0.833 = quarts (Imp.)
- gallons (U.S.) x 0.833 = gallons (Imp.)
- fluid ounces (Imp.) x 0.960 = fluid ounces (U.S.)
- pints (Imp.) x 1.201 = pints (U.S.)
- quarts (Imp.) x 1.201 = quarts (U.S.)
- gallons (Imp.) x 1.201 = gallons (U.S.)

UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this service manual. To convert units, use the following equations:

- foot pounds (ft-lbs) X 12.00000 = inch pounds (**in-lbs**).
- inch pounds (**in-lbs**) X 0.08333 = foot pounds (ft-lbs).

METRIC SYSTEM

All metric torque specifications are written in Newton-meters (Nm). To convert metric to United States units and United States to metric, use the following equations:

- Newton meters (Nm) X 0.737563 = foot pounds (ft-lbs).
- Newton meters (Nm) X 8.85085 = inch pounds (**in-lbs**).
- foot pounds (ft-lbs) X 1.35582 = Newton meters (Nm).
- inch pounds (**in-lbs**) X 0.112985 = Newton meters (Nm).

ACRONYMS AND ABBREVIATIONS

Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
AAT	Ambient air temperature
ABS	Anti-lock braking system
AC	Alternating current
ACC	Accessory position on ignition switch
ACR	Automatic compression release
AGM	Absorbed glass mat (battery)
Ah	Ampere-hour
AIS	Active Intake Solenoid
AWG	American wire gauge
B+	Battery voltage
bar	Bar
BAS	Bank angle sensor
BCM	Body control module
BOB	Breakout box
BTDC	Before top dead center
°C	Celsius (Centigrade)
CA	California
CAL	Calibration
CAN	Controller area network
CB Tx	CB send transmission
CB Rx	CB receive transmission
cc	Cubic centimeters
CCA	Cold cranking amps
CCW	Counterclockwise
CKP	Crankshaft position
cm	Centimeters
cm^3	Cubic centimeters
CW	Clockwise
DC	Direct current
DLC	Data link connector
DOM	Domestic
DOT	Department of Transportation
DTC	Diagnostic trouble code
DVOM	Digital volt ohm meter
ECM	Electronic control module
ECT	Engine coolant temperature
ECU	Electronic Control Unit
EEPROM	Electrically erasable programmable read only memory
EFI	Electronic fuel injection
EHCU	Electro Hydraulic Control Unit

Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
ET	Engine temperature
ETC	Electronic throttle control
EVAP	Evaporative emissions control system
°F	Fahrenheit
fl oz	Fluid ounce
FPS	Fuel pressure sensor
ft	Feet
ft-lbs	Foot pounds
FTP	Flash to pass
g	Gram
gal	Gallon
GAWR	Gross axle weight rating
GND	Ground (electrical)
GPS	Global positioning system
GVWR	Gross vehicle weight rating
HCU	Hydraulic control unit
HDI	Harley-Davidson International
HD-Link	Networking system
H-DSSS	Harley-Davidson smart security system
HFM	Hands-free mode
HFSM	Hands-free security module
Hg	Mercury
H02S	Heated oxygen sensor
hp	Horsepower
hr	Hour
IAC	Idle air control
IAT	Intake air temperature
IC	Instrument cluster
ID	Inside diameter
IGN	Ignition light/key switch position
in	inch
in^3	Cubic inch
INJ PW	Injector pulse width
INTCM	Intercom
in-lbs	Inch pounds
JSS	Jiffy stand sensor
kg	Kilogram
km	Kilometer
km/h	Kilometers per hour
kPa	Kilopascal
kW	Kilowatt
L	Liter
lb	Pounds
LCD	Liquid crystal display

Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
LED	Light emitting diode
LH	Left hand
LHCM	Left hand control module
LP	License plate
LT	Left
mA	Milliampere
MAP	Manifold absolute pressure
max	Maximum
mi	Mile
min	Minimum
mL	Milliliter
mm	Millimeter
mph	Miles per hour
ms	Millisecond
Nm	Newton-meter
NIM	Navigation interface module
NiMH	Nickel metal hydride
N/A	Not applicable
O2	Oxygen
OD	Outside diameter
OEM	Original equipment manufacturer
oz	Ounce
P&A	Parts and Accessories
Part No.	Part number
PIN	Personal identification number
PND	Personal navigation device
psi	Pounds per square inch
PWM signal	Pulse width modulated signal
qt	Quart
RAD	Radio
RCM	Reverse control module
RDS	Radio data system
RES	Reserve mark on fuel supply valve
RH	Right hand
RHCM	Right hand control module
rpm	Revolutions per minute
RT	Right
s	Seconds
SCFH	Cubic feet per hour at standard conditions
SDARS	Satellite digital audio radio service
SPDO	Speedometer
SPKR	Speaker
STT	Stop/tail/turn
TA	Traffic announcement

Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
TCA	Throttle control actuator
TDC	Top dead center
TGS	Twist grip sensor
TPS	Throttle position sensor
TSM	Turn signal module
TSSM	Turn signal/security module
USB	Universal serial bus
V	Volt
VAC	Volts of alternating current
VDC	Volts of direct current
VIN	Vehicle identification number
VR	Voice recognition
VSS	Vehicle speed sensor
W	Watt
WA	Weather alert
WSS	Wheel speed sensor

NOTES

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
93979-10	SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Removal
93979-10	SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS	3.27 OIL PUMP, Removal
99650-02	HIGH-PERFORMANCE SEALANT, GRAY	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
99863-01A	GLOBAL BATTERY CHARGER	1.22 BATTERY MAINTENANCE, Storage
B-41623-B	OIL LINE REMOVER	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Removal
B-45523	VALVE GUIDE REAMER	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45524-1	VALVE GUIDE DRIVER	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45524-2A	VALVE GUIDE INSTALLER SLEEVE	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45525	VALVE GUIDE HONE	3.22 CYLINDER HEAD, Inspection
B-45525	VALVE GUIDE HONE	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
B50085	TERMINAL EXTRACTOR TOOL	A.3 BOSCH BTC SEALED CONNECTOR, Bosch BTC Sealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.17 JAE MX19 SEALED CONNECTORS, JAE MX19 Sealed Connectors
B-50085	TERMINAL EXTRACTOR	A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR, Tyco 040 Multilock Unsealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.22 TYCO GET 64 SEALED CONNECTOR, Tyco GET 64 Sealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.23 TYCO MCP SEALED CONNECTOR, Tyco MCP Sealed Connector
B-50119	WHEEL BEARING INSTALLER	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
BB200A	SNAP-ON BASIC VACUUM BRAKE BLEEDER	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Drain and Fill
FRDH161	SNAP-ON "DOG BONE" TORQUE ADAPTER	3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate
GA500A	SNAP-ON TERMINAL PICK	A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTORS, Autofuse Unsealed Connector Repair
GA500A	SNAP-ON TERMINAL PICK	A.23 TYCO MCP SEALED CONNECTOR, Tyco MCP Sealed Connector
HD-25070	ROBINAIR HEAT GUN	2.34 TOUR-PAK SERVICE, Tour-Pak Seal
HD-25070	ROBINAIR HEAT GUN	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-25070	ROBINAIR HEAT GUN	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-25070	HEAT GUN	A.24 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-29545-6	COOLANT FLUORESCENT LEAK DETECTION DYE	C.4 TESTING AND DIAGNOSTICS, Leak Detection Dye Test

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-33223-1	CYLINDER COMPRESSION GAUGE	3.8 TROUBLESHOOTING, Compression Test
HD-34633	AIR SUSPENSION PUMP AND GAUGE	2.21 REAR SUSPENSION, Shock Absorber Removal
HD-34633A	AIR SUSPENSION PUMP AND GAUGE	1.21 REAR SUSPENSION ADJUSTMENTS, Air Suspension
HD-34633A	AIR SUSPENSION PUMP AND GAUGE	2.21 REAR SUSPENSION, Air Lines
HD-34736-B	VALVE SPRING COMPRESSOR	3.22 CYLINDER HEAD, Disassembly
HD-34736-B	VALVE SPRING COMPRESSOR	3.22 CYLINDER HEAD, Assembly
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Inspection
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Valve and Seat Refacing
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Assembly
HD-34902-B	MAINSHAFT BEARING INNER RACE PULLER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-34902-C	MAINSHAFT BEARING INNER RACE REMOVER/INSTALLER	5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing Inner Race
HD-35316-10	PILOT	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-11	RECEIVER CUP	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-12	INSTALLER CUP	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-3A	CROSS PLATE	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-3A	CROSS PLATE	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-4A	8 IN. BOLT	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-4A	8 IN. BOLT	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-5	12 IN. BOLT	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-5	12 IN. BOLT	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-7	WASHER	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-7	WASHER	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-8	BEARING DRIVER	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-9	BEARING DRIVER	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-C	MAIN DRIVE GEAR/BEARING REMOVER AND INSTALLER	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-35381A	BELT TENSION GAUGE	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
HD-35381A	BELT TENSION GAUGE	2.5 REAR WHEEL, Installation
HD-35381-A	BELT TENSION GAUGE	1.14 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection
HD-35457	BLACK LIGHT LEAK DETECTOR	C.4 TESTING AND DIAGNOSTICS, Leak Detection Dye Test
HD-35667-A	CYLINDER LEAKDOWN TESTER	3.8 TROUBLESHOOTING, Cylinder Leakdown Test
HD-35758-C	NEWAY VALVE SEAT CUTTER SET	3.22 CYLINDER HEAD, Valve and Seat Refacing
HD-38125-6	PACKARD TERMINAL CRIMP TOOL	A.10 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.10 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-38125-7	PACKARD TERMINAL CRIMPER	A.15 DEUTSCH DTM SEALED MINI TERMINAL REPAIR, Deutsch DTM Sealed Mini Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.10 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.24 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39361-B	SPROCKET SHAFT OIL SEAL INSTALLER	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-39782-B	CYLINDER HEAD SUPPORT STAND KIT	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Disassembly
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Valve and Seat Refacing
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Assembly
HD-39847	REAMER T-HANDLE	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39964	REAMER LUBRICANT	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL	A.14 DEUTSCH DT SEALED TERMINAL REPAIR, Deutsch DT Sealed Terminal Crimps
HD-39969	ULTRA TORCH	A.24 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41137	HOSE CLAMP PLIERS	C.5 COOLING SYSTEM REPAIR, Crimp Clamps
HD-41137	HOSE CLAMP PLIERS	C.5 COOLING SYSTEM REPAIR, Coolant Down Tubes
HD-41177	FORK HOLDING TOOL	2.19 FRONT FORK, Disassembly
HD-41177	FORK HOLDING TOOL	2.19 FRONT FORK, Assembly
HD-41182	FUEL PRESSURE GAUGE	4.3 FUEL PRESSURE TEST, Testing
HD-41183	HEAT SHIELD ATTACHMENT	A.24 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41417	PROPANE ENRICHMENT KIT	4.4 INTAKE LEAK TEST, Leak Tester
HD-41475	DEUTSCH TERMINAL REPAIR KIT	A.13 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair
HD-41475-100	FLAT BLADE L-HOOK	A.13 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-42310	BENCH STAND	3.16 REMOVING ENGINE FROM CHASSIS, Procedure
HD-42310-2	TWIN CAM 88 CRADLE	3.16 REMOVING ENGINE FROM CHASSIS, Procedure
HD-42311	OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
HD-42311	OIL FILTER WRENCH	3.10 OIL COOLER ADAPTER, Removal
HD-42317-A	PISTON PIN RETAINING RING INSTALLER	3.18 TOP END OVERHAUL: DISASSEMBLY, Piston
HD-42317-A	PISTON PIN CIRCLIP REMOVER/INSTALLER	3.25 TOP END OVERHAUL: ASSEMBLY, Piston
HD-42320-B	PISTON PIN REMOVER	3.18 TOP END OVERHAUL: DISASSEMBLY, Piston
HD-42322	PISTON SUPPORT PLATE	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-42324-A	CYLINDER TORQUE PLATES	3.18 TOP END OVERHAUL: DISASSEMBLY, Cylinder Head

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-42324-A	CYLINDER TORQUE PLATES	3.22 CYLINDER HEAD, Inspection
HD-42324-A	CYLINDER TORQUE PLATES	3.23 CYLINDER, Inspection
HD-42325-A	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Needle Bearings
HD-42326-B	CRANKSHAFT GUIDE	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-42326-B	CRANKSHAFT GUIDE	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-42720-4	CRANKSHAFT BEARING DRIVER SHIM	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-4	CRANKSHAFT BEARING DRIVER SHIM	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-5	REMOVER/INSTALLER SUPPORT TUBE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-5	REMOVER/INSTALLER SUPPORT TUBE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-5	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
HD-42720-5	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
HD-42879	ELECTRICAL CRIMPER TOOL	A.16 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR, Deutsch DTM Sealed Solid Barrel Terminal Crimps
HD-43646A	ROLLING STAND	3.16 REMOVING ENGINE FROM CHASSIS, Procedure
HD-44060-10A	COLLET	2.10 SEALED WHEEL BEARINGS, Removal
HD-44060-11A	COLLET	2.10 SEALED WHEEL BEARINGS, Removal
HD-44060C	WHEEL BEARING REMOVER/INSTALLER	2.10 SEALED WHEEL BEARINGS, Removal
HD-44060C	WHEEL BEARING REMOVER/INSTALLER	2.10 SEALED WHEEL BEARINGS, Installation
HD-44061	FUEL PRESSURE GAUGE ADAPTER	4.3 FUEL PRESSURE TEST, Testing
HD-44067A	OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
HD-44358	FLYWHEEL SUPPORT FIXTURE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-44695-A	MULTI-LOCK CRIMPER	A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR, Tyco 040 Multilock Unsealed Connector Repair
HD-44695-A	MULTI-LOCK CRIMPER	A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR, Tyco 040 Multilock Unsealed Connector Repair
HD-45305	FORK OIL SEAL INSTALLER	2.19 FRONT FORK, Assembly
HD-45327	REAR FORK BEARING INSTALLER	2.22 REAR FORK, Disassembly and Assembly
HD-45335	COOLANT SYSTEM PRESSURE TESTER	C.4 TESTING AND DIAGNOSTICS, Pressure Cap Test
HD-45928	TERMINAL REMOVER	A.11 DELPHI MICRO 64 SEALED CONNECTORS, Delphi Micro 64 Sealed Connector Repair
HD-45929	TERMINAL CRIMPER	A.11 DELPHI MICRO 64 SEALED CONNECTORS, Delphi Micro 64 Sealed Connector Repair
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL	5.8 TRANSMISSION SPROCKET, Removal
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL	5.8 TRANSMISSION SPROCKET, Installation
HD-47250	INTAKE MANIFOLD WRENCH	4.13 INDUCTION MODULE, Removal
HD-47856-1	INSTALLER	6.9 MAIN DRIVE GEAR AND BEARING, Installation

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-47856-2	PILOT	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-3	ADAPTER	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-6	NUT	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-7	CROW'S FOOT WRENCH	6.9 MAIN DRIVE GEAR AND BEARING, Installation
HD-47910	MAINSHAFT LOCKNUT WRENCH	5.8 TRANSMISSION SPROCKET, Removal
HD-47910	MAINSHAFT LOCKNUT WRENCH	5.8 TRANSMISSION SPROCKET, Installation
HD-47925	AXLE NUT TORQUE ADAPTER	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
HD-47925	AXLE NUT TORQUE ADAPTER	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
HD-47925	AXLE NUT TORQUE ADAPTER	2.5 REAR WHEEL, Removal
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL	6.9 MAIN DRIVE GEAR AND BEARING, Cleaning and Inspection
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER	6.9 MAIN DRIVE GEAR AND BEARING, Mainshaft Seal Replacement
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Removal
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
HD-47956	CAMSHAFT ASSEMBLY TOOL	3.26 CAM COMPARTMENT AND COMPONENTS, Camshafts
HD-48114	TERMINAL REMOVER	A.19 MOLEX MX 150 SEALED CONNECTORS, Molex MX 150 Sealed Connector Repair
HD-48119	TERMINAL CRIMPER	A.19 MOLEX MX 150 SEALED CONNECTORS, Crimp Terminal to Lead
HD-48219	PRIMARY DRIVE LOCKING TOOL	5.4 DRIVE COMPONENTS, Removal
HD-48219	PRIMARY DRIVE LOCKING TOOL	5.4 DRIVE COMPONENTS, Installation
HD-48219	PRIMARY DRIVE LOCKING TOOL	5.4 DRIVE COMPONENTS, Installation
HD-48283	CRANKSHAFT ROTATING WRENCH	3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate
HD-48498-A	ACR SOLENOID SOCKET	7.19 AUTOMATIC COMPRESSION RELEASE (ACR), Removal
HD-48646	CAM RING REMOVER/INSTALLER	4.7 FUEL TANK TOP PLATE, Removal
HD-48650	DIGITAL TECHNICIAN II	2.17 ABS MODULE, ABS Module
HD-48650	DIGITAL TECHNICIAN II	2.18 BLEEDING BRAKES, Procedure
HD-48650	DIGITAL TECHNICIAN II	7.4 ELECTRONIC CONTROL MODULE (ECM), ECM
HD-48650	DIGITAL TECHNICIAN II	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Radio
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER	2.6 REAR WHEEL COMPENSATOR, Sprocket Bearing Replacement
HD-48985	SPOKE TORQUE WRENCH	1.9 TIRES AND WHEELS, Wheel Spokes
HD-48985	SPOKE TORQUE WRENCH	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-50017	OXYGEN SENSOR WRENCH	4.15 HEATED OXYGEN SENSORS (HO2), Removal
HD-50120	UNIVERSAL CRIMPER SET	A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-50120	UNIVERSAL CRIMPER SET	A.17 JAE MX19 SEALED CONNECTORS, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.18 MOLEX CMC SEALED CONNECTORS, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.22 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.23 TYCO MCP SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.17 JAE MX19 SEALED CONNECTORS, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.18 MOLEX CMC SEALED CONNECTORS, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.22 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120-3	JAE DIE	A.18 MOLEX CMC SEALED CONNECTORS, Crimping Terminals
HD-50120-4	JAE DIE	A.18 MOLEX CMC SEALED CONNECTORS, Crimping Terminals
HD-50120-6	JAE DIE	A.17 JAE MX19 SEALED CONNECTORS, Crimping Terminals
HD-50120-7	DELPHI 100W MICRO-PACK SEALED DIE	A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals
HD-50120-7	TYCO GET 64 DIE	A.22 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120-8	TYCO MCP DIE	A.23 TYCO MCP SEALED CONNECTOR, Crimping Terminals
HD-50120-A	BOSCH TERMINAL REPAIR KIT	A.3 BOSCH BTC SEALED CONNECTOR, Bosch BTC Sealed Connector Repair
HD-50423	0.6 MM TERMINAL EXTRACTOR TOOL	A.18 MOLEX CMC SEALED CONNECTORS. Molex CMC Sealed Connectors
HD-50424	1.5 MM TERMINAL EXTRACTOR TOOL	A.18 MOLEX CMC SEALED CONNECTORS, Molex CMC Sealed Connectors
HD-51198	IGNITION SWITCH ALIGNMENT TOOL	7.15 IGNITION SWITCH AND FORK LOCK, Fairing Models
HD-51337	SHIFTER SHAFT SEAL INSTALLATION TOOL	6.10 TRANSMISSION CASE, Assembly
HD-59000B	FORK OIL LEVEL GAUGE	2.19 FRONT FORK, Assembly
HD-94660-2	PILOT	5.8 TRANSMISSION SPROCKET, Removal
HD-94660-2	PILOT	5.8 TRANSMISSION SPROCKET, Installation
HD-94681-80	SPOKE NIPPLE WRENCH	1.9 TIRES AND WHEELS, Wheel Spokes
HD-94681-80	SPOKE NIPPLE WRENCH	1.9 TIRES AND WHEELS, Wheel Spokes
HD-94681-80	SPOKE NIPPLE WRENCH	2.9 CHECKING AND TRUING WHEELS, Laced Wheel Rim Offset
HD-94681-80	SPOKE NIPPLE WRENCH	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-95637-10	LONG BOLTS	6.9 MAIN DRIVE GEAR AND BEARING, Removal

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-95637-46B	WEDGE ATTACHMENT	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-95637-46B	WEDGE ATTACHMENT	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-95637-46B	WEDGE ATTACHMENT	6.9 MAIN DRIVE GEAR AND BEARING, Removal
HD-95952-1	THREADED CYLINDERS	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-95952-33C	CONNECTING ROD CLAMPING TOOL	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-96333-51F	PISTON RING COMPRESSOR	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-96921-52D	OIL PRESSURE GAUGE SET	3.7 OIL PRESSURE, Checking Oil Pressure
HD-97087-65B	HOSE CLAMP PLIERS	3.9 OIL COOLER, Installation
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-99500-80	WHEEL TRUING AND BALANCING STAND	2.9 CHECKING AND TRUING WHEELS, Checking Wheel Runout
HD-99500-80	WHEEL TRUING STAND	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-99500-80	WHEEL TRUING STAND	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
J-5586A	TRANSMISSION SHAFT RETAINING RING PLIERS	6.8 TRANSMISSION ASSEMBLY, Disassembly
LDTSP4	SNAP-ON	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Removal
RS-25100-200	BEARING	6.9 MAIN DRIVE GEAR AND BEARING, Removal
RS-25100-200	BEARING	6.9 MAIN DRIVE GEAR AND BEARING, Removal
SNAP-ON® FRX181	FLARE NUT SOCKET	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
SNAP-ON® FRX181	FLARE NUT SOCKET	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Housing
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	1.17 BRAKES, Brake Fluid Replacement
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	2.16 BRAKE LINES, Front Brake Line: Non-ABS Equipped
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	2.18 BLEEDING BRAKES, Procedure
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	2.17 ABS MODULE, ABS Module
SNAP-ON FABL5	LONG SHANK BALL END SOCKET	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
SNAP-ON FC018	OPEN END CROWFOOT	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
SNAP-ON FRDH141	"DOG BONE" TORQUE ADAPTER	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
SNAP-ON PRS8	PISTON RING EXPANDER	3.24 PISTON, Disassembly
SNAP-ON STX70E OR EQUIVALENT	T70 SOCKET BIT	5.4 DRIVE COMPONENTS, Removal
SNAP-ON STX70E OR EQUIVALENT	T70 SOCKET BIT	5.4 DRIVE COMPONENTS, Installation
SNAP-ON TA360	TORQUE ANGLE GAUGE	5.8 TRANSMISSION SPROCKET, Installation
SNAP-ON TT600-3	SNAP-ON PICK	A.8 DELPHI 630 METRI-PACK UNSEALED CONNECTORS, Delphi 630 Metri-Pack Unsealed Connector Repair

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
TA360	SNAP-ON TORQUE ANGLE GAUGE	3.23 CYLINDER, Inspection
TA360	SNAP-ON TORQUE ANGLE GAUGE	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head

FASTENER	TORQUE VALUE		NOTES
ABS module locknuts	53-88 **in-lbs**	6-10 Nm	2.17 ABS MODULE, ABS Module
ABS module locknuts	53-88 **in-lbs**	6-10 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
ACR	132-180 **in-lbs**	14.9-20.3 Nm	7.19 AUTOMATIC COMPRESSION RELEASE (ACR), Installation/Apply three equally spaced dots of LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue) around lower third of threads
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Filter
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Filter/Apply LOCTITE 243 (blue) to the threads of screw.
Air duct nut, lower fairing	65-75 **in-lbs**	7.3-8.4 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Air duct screws, lower fairing	65-75 **in-lbs**	7.3-8.4 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Auxiliary/fog lamp bracket acorn nuts: Fairing models	120-180**in-lbs**	13.6-20.3 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Turn Signal/Auxiliary/Fog Lamp Bracket
Auxiliary/fog lamp bracket acorn nuts: Road King models	72-108 **in-lbs**	8.1-12.2 Nm	2.23 CLUTCH CABLE, Installation
Auxiliary/fog lamp bracket acorn nuts: Road King models	72-108 **in-lbs**	8.1-12.2 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Turn Signal/Auxiliary/Fog Lamp Bracket
Auxiliary/fog lamp door screw	6-10 **in-lbs**	0.7-1.1 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Bulb Replacement
Auxiliary/fog lamp flange nut: Models with bullet style turn signal lamps	20-24 ft-lbs	27.1-32.5 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Auxiliary/fog lamp flange nut: Models with flat lens turn signal lamps	15-18 ft-lbs	20.3-24.4 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.13 FRONT BRAKE CALIPER, Installation
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Front Brake Line: Non-ABS Equipped
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Front Caliper
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Front Caliper
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Rear Caliper
Banjo bolt to ABS module, 10 mm	17-19 ft-lbs	23.1-25.8 Nm	2.17 ABS MODULE, ABS Module
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm	2.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Banjo bolt to ABS module, 12 mm	28-30 ft-lbs	38.0-40.6 Nm	2.17 ABS MODULE, ABS Module
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Front Brake Line: Non-ABS Equipped
Banjo bolt to front master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.15 REAR BRAKE CALIPER, Installation
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped

FASTENER	TORQUE VALUE		NOTES
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Rear Caliper
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Banjo bolt to rear master cylinder	17-19 ft-lbs	23.1-25.8 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.22 BATTERY MAINTENANCE, Battery
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.8 STARTER, Installation
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.21 ALTERNATOR, Installation
Battery terminal fastener	60-72 **in-lbs**	6.8-8.1 Nm	1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	2.16 BRAKE LINES, Brake Line: Front Master Cylinder to ABS Module
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	2.16 BRAKE LINES, Brake Line: ABS Module to Front Caliper
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm	2.17 ABS MODULE, ABS Module
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm	2.46 REAR FRAME, Rear Frame
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
Battery tray screws	132-156 **in-lbs**	14.9-17.6 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Brake bleeder valve, front	72-108 **in-lbs**	8.1-12.2 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake bleeder valve, front	72-108 **in-lbs**	8.1-12.2 Nm	2.18 BLEEDING BRAKES, Procedure
Brake bleeder valve, rear	75-102 **in-lbs**	8.5-11.5 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake bleeder valve, rear	75-102 **in-lbs**	8.5-11.5 Nm	2.18 BLEEDING BRAKES, Procedure
Brake caliper, front, mounting screws	28-38 ft-lbs	37.9-51.5 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper, front, mounting screws	28-38 ft-lbs	37.9-51.5 Nm	2.13 FRONT BRAKE CALIPER, Installation/metric
Brake caliper, front, pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new part
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.5 REAR WHEEL, Installation/metric
Brake caliper, rear, mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.15 REAR BRAKE CALIPER, Installation/metric
Brake caliper, rear, pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new part
Brake disc, front, screws (metric)	16-24 ft-lbs	21.7-32.5 Nm	2.4 FRONT WHEEL, Installation/Always use new screws
Brake disc, rear, screws	30-45 ft-lbs	41-61 Nm	2.5 REAR WHEEL, Installation/Always use new part
Brake lever clamp screws	72-108 **in-lbs**	8.1-12.2 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Brake line, rear, P-clamp screw	80-100 **in-lbs**	9.0-11.3 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Brake line, rear, P-clamp screw	80-100 **in-lbs**	9.0-11.3 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Brake master cylinder, front, reservoir cover screws	12-15.0 **in-lbs**	1.3-1.7 Nm	1.17 BRAKES, Brake Fluid Replacement

FASTENER	TORQUE VALUE		NOTES
Brake master cylinder, front, reservoir cover screws	11.5-15.0 **in-lbs**	1.3-1.7 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement
Brake master cylinder, front, reservoir cover screws	12-15.0 **in-lbs**	1.3-1.7 Nm	2.18 BLEEDING BRAKES, Procedure
Brake master cylinder, rear, mounting screws	126-150 **in-lbs**	14.2-17.0 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.17 BRAKES, Brake Fluid Replacement
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.18 BRAKE PADS AND DISCS, Brake Pad Replacement
Brake master cylinder, rear, reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.18 BLEEDING BRAKES, Procedure
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Breather assembly screws	120-156 **in-lbs**	13.6-17.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Breather bolts	22-24 ft-lbs	29.8-32.5 Nm	4.5 AIR CLEANER ASSEMBLY, Installation/metric
Cam chain tensioner fasteners	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam sprocket flange bolt, 1st torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam sprocket flange bolt, final torque	34 ft-lbs	46.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
CB antenna base set screw	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
CB antenna stud nut	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
CB antenna stud nut	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
CB module bracket to speaker enclosure screw	25-35 **in-lbs**	2.8-4.0 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, CB Module
CB module to speaker enclosure screw	25-35 **in-lbs**	2.8-4.0 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, CB Module
Charcoal canister screws	15-20 **in-lbs**	1.7-2.3 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
CKP mount screw	100-120 **in-lbs**	11.3-13.6 Nm	7.17 CRANKSHAFT POSITION SENSOR (CKP), Installation
Clutch adjuster screw jamnut	72-120 **in-lbs**	8.1-13.6 Nm	1.12 CLUTCH CABLE: ROAD KING, Adjustment
Clutch cable adjustment jamnut	120 **in-lbs**	13.6 Nm	1.12 CLUTCH CABLE: ROAD KING, Adjustment
Clutch cable fitting	90-120 **in-lbs**	10.2-13.6 Nm	6.5 CLUTCH RELEASE COVER: CABLE CLUTCH, Assembly and Installation
Clutch diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm	5.6 CLUTCH, Clutch Pack Only
Clutch fluid line flare nut	96-144 **in-lbs**	10.9-16.3 Nm	2.26 CLUTCH FLUID LINE, Replacement
Clutch hub mainshaft nut	70-80 ft-lbs	94.9-108.5 Nm	5.4 DRIVE COMPONENTS, Installation

FASTENER	TORQUE VALUE		NOTES
Clutch inspection cover	84-108 **in-lbs**	9.5-12.2 Nm	5.7 HYDRAULIC CLUTCH RELEASE BEARING AND PUSHROD, Installation
Clutch inspection cover screw	84-108 **in-lbs**	9.5-12.2 Nm	1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant/Torque sequence
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm	1.12 CLUTCH CABLE: ROAD KING, Adjustment
Clutch lever bracket clamp screws	72-108 **in-lbs**	8.1-12.2 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.24 CLUTCH MASTER CYLINDER AND RESERVOIR, Installation
Clutch master cylinder banjo bolt	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.26 CLUTCH FLUID LINE, Replacement
Clutch master cylinder clamp fastener	72-108 **in-lbs**	8.1-12.2 Nm	2.24 CLUTCH MASTER CYLINDER AND RESERVOIR, Installation
Clutch release cover screws	132-156 **in-lbs**	14.9-17.6 Nm	6.5 CLUTCH RELEASE COVER: CABLE CLUTCH, Assembly and Installation
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.13 HYDRAULIC CLUTCH FLUID, Fluid Inspection
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.24 CLUTCH MASTER CYLINDER AND RESERVOIR, Installation
Clutch reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator
Compensating sprocket bolt, 1st torque	100 ft-lbs	135.6 Nm	5.4 DRIVE COMPONENTS, Installation/Loosen then final tighten
Compensating sprocket bolt, final torque	175 ft-lbs	237.3 Nm	5.4 DRIVE COMPONENTS, Installation
Console fastener, front	20-30 **in-lbs**	2.3-3.4 Nm	4.6 FUEL TANK, Console
Console fastener, rear	36-60 **in-lbs**	4.1-6.8 Nm	4.6 FUEL TANK, Console
Coolant adapter fitting in head	108-156 **in-lbs**	12.2-17.6 Nm	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation
Coolant bottle nut	65-75 **in-lbs**	7.3-8.4 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Coolant down tubes to front frame	90-110 **in-lbs**	10.2-12.4 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Down Tubes
Coolant down tubes to front frame	90-110 **in-lbs**	10.2-12.4 Nm	7.20 VOLTAGE REGULATOR, Installation
Coolant line P-clamp nut	36-60 **in-lbs**	4.1-6.8 Nm	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation
Coolant line retainer plate screw	48-72 **in-lbs**	5.4-8.1 Nm	C.5 COOLING SYSTEM REPAIR, Upper Coolant Line Installation
Coolant pump bracket	20-22 ft-lbs	27.1-29.8 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Distribution Components
Crankcase pipe plugs	120-144 **in-lbs**	13.6-16.3 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Pipe Plug and Oil Fittings
Crankcase screws, 1st torque	120 **in-lbs**	13.6 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly/Loosen then final tighten
Crankcase screws, final torque	15-19 ft-lbs	20.3-25.8 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
Crankshaft sprocket bolt, 1st torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Crankshaft sprocket bolt, final torque	24 ft-lbs	32.5 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation

FASTENER	TORQUE VALUE		NOTES
Cylinder headbolts, 1st torque	120-144 **in-lbs**	13.6-16.3 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/ See procedure to tighten
Cylinder headbolts, 2nd torque	15-17 ft-lbs	20.3-23.0 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Cylinder headbolts, final torque	90 degrees	90 degrees	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Cylinder Studs
Cylinder torque plate bolts, 1st torque	120-144 **in-lbs**	13.6-16.3 Nm	3.23 CYLINDER, Inspection/ See procedure to tighten
Cylinder torque plate bolts, 2nd torque	15-17 ft-lbs	20.3-23.0 Nm	3.23 CYLINDER, Inspection
Cylinder torque plate bolts, final torque	90 degrees	90 degrees	3.23 CYLINDER, Inspection
Dash panel screws	25-30 **in-lbs**	2.8-3.4 Nm	2.38 DASH PANEL, Dash Panel
Dash panel screws	25-30 **in-lbs**	2.8-3.4 Nm	7.36 FAIRING HARNESS, Harness Service
Debris deflector screw	65-85 **in-lbs**	7.3-9.6 Nm	2.22 REAR FORK, Installation
Engine guard lower screws	15-20 ft-lbs	20.3-27.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Engine Guard
Engine guard upper screw	22-28 ft-lbs	29.8-37.9 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Engine Guard
Engine mount bracket to engine screws	36-40 ft-lbs	48.8-54.2 Nm	1.24 ENGINE MOUNTS, Inspection
Engine mount bracket to engine screws	36-40 ft-lbs	48.8-54.2 Nm	2.49 FRONT ENGINE MOUNT, Installation
Engine mount end cap fasteners, front	42-48 ft-lbs	56.9-65.0 Nm	7.26 STOP LAMP SWITCHES, Rear Stop Lamp Switch
Engine mount end cap fasteners, front	42-48 ft-lbs	56.9-65.0 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	1.24 ENGINE MOUNTS, Inspection
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module
Engine mount end cap screws, front	42-48 ft-lbs	56.9-65.0 Nm	2.49 FRONT ENGINE MOUNT, Installation
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Engine rubber mount screws, front	40-50 ft-lbs	54.2-67.8 Nm	2.49 FRONT ENGINE MOUNT, Installation
Engine stabilizer bracket to cylinder headbolts	30-35 ft-lbs	40.7-47.5 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	40.7-47.5 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Engine stabilizer link bolt	30-35 ft-lbs	40.7-47.5 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Engine stabilizer link bolt	30-35 ft-lbs	40.7-47.5 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
ET sensor	120-180 **in-lbs**	13.6-20.3 Nm	7.18 ENGINE TEMPERATURE SENSOR (ET), Installation

FASTENER	TORQUE VALUE		NOTES
Exhaust crossover clamp to transmission bracket fastener	14-18 ft-lbs	19.0-24.4 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust crossover pipe clamp	25-30 ft-lbs	33.9-40.7 Nm	4.18 EXHAUST SYSTEM, System Installation/Always use a new clamp
Exhaust crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	3.31 OIL PAN, Installation
Exhaust crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, 1st torque	9-18 **in-lbs**	1-2 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, 1st torque	9-18 **in-lbs**	1-2 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust heat shield clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust side bracket carriage bolt	20-25 ft-lbs	27.1-33.9 Nm	4.18 EXHAUST SYSTEM, System Installation
Exhaust valve actuator screws	32-40 **in-lbs**	3.6-4.5 Nm	4.19 ACTIVE EXHAUST: HDI, Exhaust Valve Actuator
Fairing air deflector screws	15-25 **in-lbs**	1.7-2.8 Nm	2.40 AIR DEFLECTORS, Fairing Air Deflectors
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm	2.39 INNER FAIRING, Rotate Inner Fairing
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm	2.39 INNER FAIRING, Inner Fairing Assembly Removal and Installation
Fairing double studs	120-180 **in-lbs**	13.6-20.3 Nm	7.36 FAIRING HARNESS, Harness Service
Fairing speaker enclosure to fairing screws	48-60 **in-lbs**	5.4-6.8 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Fairing speaker enclosure to fairing screws	48-60 **in-lbs**	5.4-6.8 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fairing speaker enclosure to fairing support screws	20-24 ft-lbs	27.1-32.5 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fairing speaker grille screws	9-13 **in-lbs**	1.0-1.4 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fairing speaker grill screws	9-13 **in-lbs**	1.0-1.5 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Fairing speaker screw	14-20 **in-lbs**	1.6-2.3 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Fairing vent	20-30 **in-lbs**	2.3-3.4 Nm	2.39 INNER FAIRING, Fairing Vent
Fairing vent	20-30 **in-lbs**	2.3-3.4 Nm	2.39 INNER FAIRING, Fairing Vent
Fender, front, attachment screws	16-20 ft-lbs	21.7-27.1 Nm	2.43 FRONT FENDER, Installation
Fender, front, fender tip lamp nuts	20-25 **in-lbs**	2.3-2.8 Nm	2.43 FRONT FENDER, Removal
Fender, front, fender tip screws	20-25 **in-lbs**	2.3-2.8 Nm	2.43 FRONT FENDER, Removal
Fender, front, mounting screws	16-20 ft-lbs	21.7-27.1 Nm	2.43 FRONT FENDER, Removal
Fender, front, trim skirt screws/nuts	10-15 **in-lbs**	1.1-1.7 Nm	2.43 FRONT FENDER, Removal
Fender, front, trim strip T-bolt nut	10-15 **in-lbs**	1.1-1.7 Nm	2.43 FRONT FENDER, Removal
Fender, rear, lights harness stud plate flange nuts	60-96 **in-lbs**	6.8-10.9 Nm	7.11 REAR LIGHTING, Rear Fender Lights Harness: all except FLHX/S
Fender, rear, mounting boss	15-20 ft-lbs	20.3-27.1 Nm	2.44 REAR FENDER, Fender Repair
Fender, rear, mounting screws	15-20 ft-lbs	20.3-27.1 Nm	2.44 REAR FENDER, Installation

FASTENER	TORQUE VALUE		NOTES
Fender, rear, stud plate	60-96 **in-lbs**	6.8-10.8 Nm	2.44 REAR FENDER, Fender Repair
Fender, rear, support to fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.45 REAR FASCIA, Installation
Fender, rear, support to fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.45 REAR FASCIA, Stud Plate
Fender tip lamp, front	20-25 **in-lbs**	2.3-2.8 Nm	7.12 FENDER TIP LAMPS, Front Fender Tip Lamp
Fender tip lamp, rear, harness P-clamp locknut	45-85 **in-lbs**	5.1-9.6 Nm	7.12 FENDER TIP LAMPS, Rear Fender Tip Lamp
Fender tip lamp, rear, screws	12-18 **in-lbs**	1.4-2.0 Nm	7.12 FENDER TIP LAMPS, Rear Fender Tip Lamp
Fender trim strips, front	10-15 **in-lbs**	1.1-1.7 Nm	7.12 FENDER TIP LAMPS, Front Fender Tip Lamp
Footboard/footrest lower fastener, passenger	48-72 **in lbs**	5.4-8.1 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Footboard/footrest upper fastener, passenger	36-42 ft-lbs	48.8-56.9 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Footboard bracket screws, rider	36-42 ft-lbs	48.8-56.9 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Footboard pivot bolt nut, rider	60-80 **in-lbs**	6.8-9.0 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Footrest mounting fastener	36-42 ft-lbs	48.8-56.9 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX/S
Footrest pad screw (FLHX/S)	15-20 ft-lbs	20.3-27.1 Nm	2.47 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX/S/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Fork bracket, lower, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.19 FRONT FORK, Installation/Alternately tighten each screw twice.
Fork bracket, lower, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.19 FRONT FORK, Installation/Alternately tighten each screw twice.
Fork bracket, upper, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.19 FRONT FORK, Installation
Fork bracket, upper, pinch screws	14-18 ft-lbs	19.0-24.4 Nm	2.20 STEERING HEAD BEARINGS, Upper Fork Bracket
Fork damper tube screw (metric)	30-37 ft-lbs	40-50 Nm	2.19 FRONT FORK, Assembly
Fork lock screws: Road King	36-60 **in-lbs**	4.1-6.8 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Road King Models
Fork slider cover screws	24-48 **in-lbs**	2.7-5.4 Nm	2.19 FRONT FORK, Installation/Apply LOCTITE 246 MEDIUM STRENGTH THREADLOCKER (blue) to the threads of screws
Fork tube plug	22-59 ft-lbs	30-80 Nm	2.19 FRONT FORK, Assembly
Front axle nut	70-75 ft-lbs	94.9-101.7 Nm	2.4 FRONT WHEEL, Installation/metric
Front axle pinch screw	18-22 ft-lbs	24.4-29.8 Nm	2.4 FRONT WHEEL, Installation/metric
Fuel door lock	30-40 **in-lbs**	3.4-4.5 Nm	4.6 FUEL TANK, Fuel Door
Fuel door screws	25-30 **in-lbs**	2.8-3.4 Nm	4.6 FUEL TANK, Fuel Door
Fuel supply line quick-connect fitting	22-26 ft-lbs	29.8-35.3 Nm	4.6 FUEL TANK, Fuel Supply Check Valve/Tube/metric
Fuel supply tube clamp screw	66-82 **in-lbs**	7.5-9.3 Nm	4.16 FUEL INJECTORS, Installation/metric
Fuel tank front screws	15-20 ft-lbs	20.3-27.1 Nm	4.6 FUEL TANK, Installation
Fuel tank rear bracket screws	15-20 ft-lbs	20.3-27.1 Nm	4.6 FUEL TANK, Installation
Gauges, 2 inch diameter gauge screws	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement

FASTENER	TORQUE VALUE		NOTES
Gauges, 2 inch diameter gauge screws	8-12 **in-lbs**	1.0-1.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, 2-Inch Diameter Gauges
Gauges, instrument cluster screws	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Gauges, instrument cluster screws	8-12 **in-lbs**	1.0-1.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, Speedometer/Tachometer Instrument Cluster
Glove box screws, lower fairing	12-16 **in-lbs**	1.4-1.8 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm	2.23 CLUTCH CABLE, Installation
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm	2.28 HANDLEBARS, Installation
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	2.28 HANDLEBARS, Installation
Handlebar lower clamp bolt	30-40 ft-lbs	40.7-54.2 Nm	2.28 HANDLEBARS, Rubber Mounts
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.37 HANDLEBAR SWITCH PACKS, Installation
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm	2.28 HANDLEBARS, Adjustment
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm	2.28 HANDLEBARS, Installation
Handlebar upper clamp screws	22-26 ft-lbs	29.8-35.2 Nm	2.28 HANDLEBARS, Installation
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.7 IGNITION COIL, Installation
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)/(10 mm)
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm	7.9 HEADLAMP, Headlamp
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle acorn nuts	72-108 **in-lbs**	8.1-12.2 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle chrome strip flange nut	15-20 **in-lbs**	1.7-2.3 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp retaining screws: Road King models	23-26 **in-lbs**	2.6-2.9 Nm	7.9 HEADLAMP, Headlamp
HO2 sensor	14 ft-lbs	19 Nm	4.15 HEATED OXYGEN SENSORS (HO2), Installation/metric
Horn bracket acorn nut	80-120 **in-lbs**	9.0-13.6 Nm	7.27 HORN, Installation
Horn bracket to cylinder head screws	35-40 ft-lbs	47.5-54.2 Nm	7.27 HORN, Installation
Horn cover to bracket	35-55 **in-lbs**	3.9-6.2 Nm	7.27 HORN, Installation
Horn rubber mount	10-20 ft-lbs	13.6-27.1 Nm	7.27 HORN, Installation/Apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red)
Horn stud flange nut	80-100 **in-lbs**	9.0-11.3 Nm	7.27 HORN, Installation

FASTENER	TORQUE VALUE		NOTES
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.7 IGNITION COIL, Installation
Ignition switch housing nut	13-15 ft-lbs	17.5-20.9 Nm	2.38 DASH PANEL, Dash Panel
Ignition switch housing nut, fairing models	13-15 ft-lbs	17.5-20.9 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Fairing Models
Ignition switch housing screws, fairing models	19-28 **in-lbs**	2.1-3.2 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Fairing Models
Ignition switch screws: Road King	25-35 **in-lbs**	2.8-3.9 Nm	7.15 IGNITION SWITCH AND FORK LOCK, Road King Models
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Jiffy stand bracket fasteners	36-42 ft-lbs	48.8-57.0 Nm	2.48 JIFFY STAND, Jiffy Stand Bracket
Jiffy stand interlock sensor fastener	96-120 **in-lbs**	10.8-13.6 Nm	2.48 JIFFY STAND, Jiffy Stand Interlock Sensor/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) if reusing screw
Jiffy stand leg stop hex screw	15-20 ft-lbs	20.3-27.1 Nm	2.48 JIFFY STAND, Leg Installation
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	2.46 REAR FRAME, Rear Frame
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm	4.20 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Left electrical caddy fasteners	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Left Side Caddy
License plate bracket screws	60-90 **in-lbs**	6.8-10.2 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
License plate bracket screws	60-90 **in-lbs**	6.8-10.2 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
Lifter cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Push-rods, Lifters and Covers
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Twin-Cooled
Lower fairing, lower clamp	90-100 **in-lbs**	10.2-11.3 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Lower fairing, upper nuts	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing, upper nuts	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Twin-Cooled
Lower fairing, upper nuts	30-35 **in-lbs**	3.4-3.9 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan
Lower fairing cap flange nut	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing cap flange nut	40-45 **in-lbs**	4.5-5.1 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Twin-Cooled
Lower fairing cap flange nut	30-35 **in-lbs**	3.4-3.9 Nm	C.5 COOLING SYSTEM REPAIR, Cooling Fan

FASTENER	TORQUE VALUE		NOTES
Lower fairing glove box screws	12.0-16.8 **in-lbs**	1.4-1.9 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing glove box tray screws	12-18 **in-lbs**	1.4-2.0 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Lower fairing vent knob screw	12-18 **in-lbs**	1.4-2.0 Nm	2.36 FAIRING LOWERS AND ENGINE GUARD, Fairing Lower: Air Cooled
Main bearing, right, retaining screws	40-70 **in-lbs**	4.5-7.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Mainshaft/countershaft nuts	85-95 ft-lbs	115.3-128.8 Nm	6.8 TRANSMISSION ASSEMBLY, Assembly
Media compartment screw, lower	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Media compartment screw, lower	8-12 **in-lbs**	1.0-1.3 Nm	2.39 INNER FAIRING, Media Compartment
Media compartment screw, upper	25-35 **in-lbs**	2.8-4.0 Nm	2.39 INNER FAIRING, Upper Support Bracket
Mid-frame air deflector screws	25-35 **in-lbs**	2.8-4.0 Nm	2.40 AIR DEFLECTORS, Mid-Frame Air Deflectors
Mirror flange nut: FLHX/S	20-30 **in-lbs**	2.3-3.4 Nm	2.29 MIRRORS, FLHX/S/metric
Mirror stem acorn nut	60-96 **in-lbs**	6.8-10.8 Nm	2.29 MIRRORS, All Models Except FLHX/S/metric
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm	4.18 EXHAUST SYSTEM, Mufflers
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Muffler to saddlebag support screws	96-144 **in-lbs**	10.8-16.3 Nm	4.18 EXHAUST SYSTEM, Mufflers
Nacelle stud	72-108 **in-lbs**	8.1-12.2 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of stud.
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	6.10 TRANSMISSION CASE, Installation
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	7.24 NEUTRAL SWITCH, Installation
Oil cooler mounting screws	20-22 ft-lbs	27.1-29.8 Nm	3.9 OIL COOLER, Installation
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm	3.10 OIL COOLER ADAPTER, Installation/Apply LOCTITE 246 MEDIUM STRENGTH/HIGH TEMPERATURE THREADLOCKER (blue)
Oil pan fasteners	132-156 **in-lbs**	14.9-17.6 Nm	3.31 OIL PAN, Installation/Torque sequence; LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) with used fasteners
Oil pan tapered plug	18-22 ft-lbs	24.4-29.8 Nm	3.31 OIL PAN, Installation/Apply LOCTITE 565 THREAD SEALANT
Oil pressure sender	96-144 **in-lbs**	10.8-16.3 Nm	7.25 OIL PRESSURE SWITCH OR SENDER, Installation
Oil pump screws, 1st torque	40-45 **in-lbs**	4.5-5.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Oil pump screws, final torque	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Outer fairing screws	20-30 **in-lbs**	2.3-3.4 Nm	2.37 UPPER FAIRING AND WINDSHIELD, Outer Fairing and Windshield
Outer transmission cover screws	100-120 **in-lbs**	11.2-13.6 Nm	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator

FASTENER	TORQUE VALUE		NOTES
Passenger audio switch screws	25-30 **in-lbs**	2.8-3.4 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Rear Speaker Enclosures
Piston jet screws	25-35 **in-lbs**	2.8-3.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Power outlet, front	13-17 **in-lbs**	1.5-1.9 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.10 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Primary chaincase sealing fasteners	26-28 ft-lbs	35.3-38.0 Nm	5.5 PRIMARY CHAINCASE HOUSING, Installation
Primary chain tensioner fasteners	21-24 ft-lbs	28.5-32.6 Nm	5.4 DRIVE COMPONENTS, Installation
Primary cover fasteners	12-13 ft-lbs	16.3-17.6 Nm	5.3 PRIMARY CHAINCASE COVER, Installation/See sequence in the procedure
Radio (or storage box) to fairing support bracket screws	60-84 **in-lbs**	6.8-9.5 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Radio
Radio antenna inner set screw	14-16 **in-lbs**	1.6-1.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
Radio antenna stud nut	16-19 **in-lbs**	1.8-2.1 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
Rear axle cone nut, 1st torque	15-20 ft-lbs	20-27 Nm	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection/For belt adjustment only
Rear axle cone nut, 1st torque	15-20 ft-lbs	20-27 Nm	2.5 REAR WHEEL, Installation/metric
Rear axle cone nut, final torque	95-105 ft-lbs	128.8-142.4 Nm	1.14 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Rear fascia flange nuts	30-45 **in-lbs**	3.4-5.1 Nm	2.45 REAR FASCIA, Installation/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	2.45 REAR FASCIA, Installation
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	7.11 REAR LIGHTING, Rear Fascia Lamp
Rear fork bracket screws	55-65 ft-lbs	74.6-88.1 Nm	2.22 REAR FORK, Installation/Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads
Rear fork pivot shaft fasteners	55-65 ft-lbs	74.6-88.1 Nm	2.22 REAR FORK, Installation/Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads
Rear frame to main frame fastener	40-45 ft-lbs	54.2-61.0 Nm	2.46 REAR FRAME, Rear Frame
Rear speaker enclosure to Tour-Pak screws	20-25 **in-lbs**	2.3-2.8 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Rear Speaker Enclosures
Right caddy screw	36-40 **in-lbs**	4.1-4.5 Nm	7.6 ELECTRICAL CADDIES, Right Side Caddy
Right caddy to battery tray screw	36-40 **in-lbs**	4.1-4.5 Nm	7.6 ELECTRICAL CADDIES, Battery Tray
Rocker arm support plate bolts	18-22 ft-lbs	24.4-29.8 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate
Rocker cover screws	15-18 ft-lbs	20.3-24.4 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Rocker housing bolts	120-168 **in-lbs**	13.6-19.0 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag face plate/hinge screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair

FASTENER	TORQUE VALUE		NOTES
Saddlebag guard to frame screw, lower	32-36 ft-lbs	43.4-48.8 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag guard to frame screw, upper	32-36 ft-lbs	43.4-48.8 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag hinge to latch assembly screw	30-35 **in-lbs**	3.4-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag hinge to saddlebag screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag latch assembly screws	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag latch handle screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock lever nut	25-35 **in-lbs**	2.8-3.9 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag lock screw	20-30 **in-lbs**	2.3-3.4 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag strike screw	15-20 **in-lbs**	1.7-2.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag support casting to frame screw	15-20 ft-lbs	20.3-27.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag support to lower fender support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.45 REAR FASCIA, Stud Plate
Saddlebag support tube screw	70-100 **in-lbs**	7.9-11.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag support tube to support casting fastener, large	23-30 ft-lbs	31.2-40.7 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag support tube to support casting fastener, small	15-20 ft-lbs	20.3-27.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Saddlebag tether screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Saddlebag tether screw	40-45 **in-lbs**	4.5-5.1 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Repair
Seat bumper fastener	32-36 ft-lbs	43.4-48.8 Nm	2.30 SEAT, Seat Bumper
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.30 SEAT, Seat
Seat strap bracket screw	120-144 **in-lbs**	13.6-16.3 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm	2.30 SEAT, Seat
Secondary cam chain tensioner fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Camshafts
Secondary clutch actuator	100-120 **in-lbs**	11.2-13.6 Nm	6.7 SECONDARY CLUTCH ACTUATOR, Replacement
Secondary clutch actuator bleeder screw	31-41 **in-lbs**	3.5-4.6 Nm	2.27 BLEEDING CLUTCH CONTROL SYSTEM, Bleed Fluid Line and Secondary Clutch Actuator
Shift drum detent arm fastener	120-150 **in-lbs**	13.6-17.0 Nm	6.8 TRANSMISSION ASSEMBLY, Assembly
Shift drum lock plate fasteners	57-63 **in-lbs**	6.4-7.1 Nm	6.8 TRANSMISSION ASSEMBLY, Assembly
Shifter pawl centering screw	18-23 ft-lbs	24.4-31.2 Nm	6.10 TRANSMISSION CASE, Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	6.4 SHIFTER LINKAGE, Heel-Toe Shift Levers
Shifter rod jamnut	80-120 **in-lbs**	9.0-13.6 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Adjustment
Shifter rod lever pinch screw, front lever	90-110 **in-lbs**	10.2-12.4 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Lever, Front
Shifter rod lever pinch screw, transmission lever	18-22 ft-lbs	24.4-29.8 Nm	6.10 TRANSMISSION CASE, Assembly
Shifter rod to front lever nut	70-90 **in-lbs**	7.9-10.2 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Adjustment
Shifter rod to front lever nut	70-90 **in-lbs**	7.9-10.2 Nm	6.4 SHIFTER LINKAGE, Shifter Rod Lever, Front

FASTENER	TORQUE VALUE		NOTES
Shift lever pinch screw, heel and toe levers	18-22 ft-lbs	24.4-29.8 Nm	5.3 PRIMARY CHAINCASE COVER, Installation
Shift lever pinch screw, heel and toe levers	18-22 ft-lbs	24.4-29.8 Nm	6.4 SHIFTER LINKAGE, Heel-Toe Shift Levers
Shock absorber air tube fitting	12-17 ft-lbs	16.3-23.0 Nm	2.21 REAR SUSPENSION, Air Shock Repair
Shock absorber air tube fitting	12-17 ft-lbs	16.3-23.0 Nm	2.21 REAR SUSPENSION, Air Lines
Shock absorber mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.21 REAR SUSPENSION, Shock Absorber Installation/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Shock absorber mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.22 REAR FORK, Installation/Use LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue)
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	7.8 STARTER, Solenoid
Solenoid terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm	7.8 STARTER, Drive Assembly
Solenoid terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm	7.8 STARTER, Installation
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.19 SPARK PLUGS, Installation
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	3.8 TROUBLESHOOTING, Compression Test
Speedometer bracket: FLHP	72-108 **in-lbs**	8.1-12.2 Nm	2.42 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	1.9 TIRES AND WHEELS, Wheel Spokes
Spoke nipple	55 **in-lbs**	6.2 Nm	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Starter end cover screw	90-110 **in-lbs**	10.2-12.4 Nm	7.8 STARTER, Drive Assembly
Starter mounting screws	22-24 ft-lbs	29.8-32.5 Nm	7.8 STARTER, Installation/Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue).
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	7.8 STARTER, Solenoid
Starter through bolts	39-65 **in-lbs**	4.4-7.3 Nm	7.8 STARTER, Drive Assembly
Stator mounting screws	55-75 **in-lbs**	6.2-8.5 Nm	7.21 ALTERNATOR, Installation/Always use new screws
Steering head clamp screw	30-40 **in-lbs**	3.4-4.5 Nm	2.26 CLUTCH FLUID LINE, Replacement
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm	2.16 BRAKE LINES, Rear Brake Line: Non-ABS Equipped/Use LOCTITE 565 THREAD SEALANT
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm	2.16 BRAKE LINES, Brake Line: Rear Master Cylinder to ABS Module/Use LOCTITE 565 THREAD SEALANT
Stop lamp switch, rear	12-15 ft-lbs	16.3-20.3 Nm	7.26 STOP LAMP SWITCHES, Rear Stop Lamp Switch/Use LOCTITE 565 THREAD SEALANT
Suspension air valve nut	40-50 **in-lbs**	4.5-5.6 Nm	2.21 REAR SUSPENSION, Air Lines
Suspension air valve nut	40-50 **in-lbs**	4.5-5.6 Nm	2.32 SADDLEBAG SERVICE, Saddlebag Support
Tail lamp circuit board screw	40-48 **in-lbs**	4.5-5.4 Nm	7.11 REAR LIGHTING, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Tail Lamp Bulb Replacement
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Rear Fender Lights Harness: all except FLHX/S

FASTENER	TORQUE VALUE		NOTES
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.11 REAR LIGHTING, Rear Fender Lights Harness: FLHX/S
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.12 FENDER TIP LAMPS, Rear Fender Tip Lamp
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
Temperature sensor, radiator	13.3-16.2 ft-lbs	18-22 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Distribution Components
Thermostat screw	48-60 **in-lbs**	5.4-6.8 Nm	7.20 VOLTAGE REGULATOR, Installation
Thermostat screw	48-60 **in-lbs**	5.4-6.8 Nm	C.5 COOLING SYSTEM REPAIR, Coolant Distribution Components
TMAP screw	84-108 **in-lbs**	9.5-12.2 Nm	4.14 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP), Installation/metric
Top caddy screws	72-96 **in-lbs**	8.1-10.9 Nm	1.22 BATTERY MAINTENANCE, Battery
Top caddy screws	72-96 **in-lbs**	8.1-10.8 Nm	2.46 REAR FRAME, Rear Frame
Top caddy screws	72-96 **in-lbs**	8.1-10.9 Nm	7.6 ELECTRICAL CADDIES, Top Caddy
Tour-Pak adapter mounting screws (APC models)	60-72 **in-lbs**	6.8-8.1 Nm	2.33 TOUR-PAK, Removal and Installation
Tour-Pak catch screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Latch Handle and Catch
Tour-Pak ground plate screws	20-25 **in-lbs**	2.3-2.8 Nm	7.13 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
Tour-Pak hinge screw	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Hinges
Tour-Pak latch handle	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Latch Handle and Catch
Tour-Pak lockset screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tour-Pak Lock
Tour-Pak luggage rack fastener	40-48 **in-lbs**	4.5-5.4 Nm	2.34 TOUR-PAK SERVICE, Luggage Rack
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm	2.33 TOUR-PAK, Removal and Installation
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm	2.33 TOUR-PAK, Removal and Installation
Tour-Pak mounting nuts	60-72 **in-lbs**	6.8-8.1 Nm	2.34 TOUR-PAK SERVICE, Ground Plate
Tour-Pak passenger backrest flange nuts	108-132 **in-lbs**	12.2-14.9 Nm	2.35 TOUR-PAK BACKREST, Passenger Backrest
Tour-Pak passenger backrest flap screws	21-24 **in-lbs**	2.4-2.7 Nm	2.35 TOUR-PAK BACKREST, Passenger Backrest Flap
Tour-Pak side marker lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	2.34 TOUR-PAK SERVICE, Ground Plate
Tour-Pak side marker lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	7.13 TOUR-PAK LIGHTS, Tour-Pak Side Lamps/Trim Strips
Tour-Pak support cover screws	8-18 **in-lbs**	0.9-2.0 Nm	2.33 TOUR-PAK, Tour-Pak Support
Tour-Pak support screws	15-20 ft lbs	20.3-27.1 Nm	2.33 TOUR-PAK, Tour-Pak Support
Tour-Pak tether anchor screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tour-Pak Liner
Tour-Pak tether anchor screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tether
Tour-Pak tether reel screws	25-35 **in-lbs**	2.8-3.9 Nm	2.34 TOUR-PAK SERVICE, Tether
Tour-Pak wrap-around lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	7.13 TOUR-PAK LIGHTS, Wrap-Around Lamp (if equipped)
Transmission bearing housing screws	22-25 ft-lbs	29.8-33.9 Nm	6.8 TRANSMISSION ASSEMBLY, Installation
Transmission dipstick	25-75 **in-lbs**	2.8-8.5 Nm	1.11 TRANSMISSION LUBRICANT, Checking Transmission Lubricant
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.11 TRANSMISSION LUBRICANT, Changing Transmission Lubricant

FASTENER	TORQUE VALUE		NOTES
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	2.23 CLUTCH CABLE, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.8 TRANSMISSION ASSEMBLY, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.10 TRANSMISSION CASE, Installation
Transmission filler plug/dipstick	25-75 **in-lbs**	2.8-8.5 Nm	1.11 TRANSMISSION LUBRICANT, Changing Transmission Lubricant
Transmission inner side cover screw	100-120 **in-lbs**	11.2-13.6 Nm	6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH, Installation
Transmission mounting bolts, 1st torque	15 ft-lbs	20.3 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	6.10 TRANSMISSION CASE, Installation
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm	6.10 TRANSMISSION CASE, Installation
Transmission outer side cover screw	100-120 **in-lbs**	11.2-13.6 Nm	6.6 TRANSMISSION SIDE COVERS: HYDRAULIC CLUTCH, Installation
Transmission sprocket lockplate screws	90-120 **in-lbs**	10.2-13.6 Nm	5.8 TRANSMISSION SPROCKET, Installation/LOCTITE patch, use 3-5 times
Transmission sprocket nut, 1st torque	100 ft-lbs	135.6 Nm	5.8 TRANSMISSION SPROCKET, Installation/Apply LOCTITE 271 HIGH STRENGTH THREADLOCKER (red) to last few threads. Loosen one full turn after 1st torque.
Transmission sprocket nut, 2nd torque	35 ft-lbs	47.5 Nm	5.8 TRANSMISSION SPROCKET, Installation/plus 35-40 degrees
Transmission sprocket nut, final torque	35-40 degrees	35-40 degrees	5.8 TRANSMISSION SPROCKET, Installation/Do not loosen to align lockplate screws.
Transmission top cover	90-120 **in-lbs**	10.2-13.6 Nm	6.8 TRANSMISSION ASSEMBLY, Installation
Turn signal, front, lamp to bracket screw: Bullet Style, auxiliary/fog lamp equipped	96-120 **in-lbs**	10.9-13.5 Nm	7.14 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Turn signal, front, lamp to bracket screw: Bullet Style, without auxiliary/fog lamps	15-20 ft-lbs	20.3-27.1 Nm	7.14 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Turn signal lamp, front, mounting bracket screws: FLHR/C, FLHT/C/U	30-60 **in-lbs**	4.1-6.8 Nm	7.14 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Turn signal lamps bracket, rear, screws	84-144 **in-lbs**	9.5-16.3 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE 271 HIGH STRENGTH THREADLOCKER (red)
Turn signal lamps bracket, rear, screws	84-144 **in-lbs**	9.5-16.3 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE 271 HIGH STRENGTH THREADLOCKER (red)
Turn signal lamp screw, front	96-120 **in-lbs**	10.9-13.5 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Housing
Turn signal lamp to auxiliary/fog lamp stud locknut	20-24 ft-lbs	27.1-32.5 Nm	7.10 AUXILIARY/FOG LAMPS AND BRACKETS, Auxiliary/Fog Lamp Housing
Turn signal lamp to mounting bracket screw: Models with bullet style turn signal lamps	96-120 **in-lbs**	10.9-13.5 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment

FASTENER	TORQUE VALUE		NOTES
Turn signal lamp to mounting bracket screws: Models with flat lens turn signal lamps	36-60 **in-lbs**	4.1-6.8 Nm	1.23 HEADLAMP ALIGNMENT, Auxiliary/Fog Lamp Alignment
Turn signal lamp to rear turn signal lamps bracket screws	30-50 **in-lbs**	3.4-5.6 Nm	7.14 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
Upper steering stem, 1st torque	35 ft-lbs	47.5 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, 1st torque	35 ft-lbs	47.5 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem, final torque: Fairing models	60-65 **in-lbs**	6.8-7.3 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, final torque: Fairing models	60-65 **in-lbs**	6.8-7.3 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem, final torque: Road King models	110-115 **in-lbs**	12.4-13.0 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, final torque: Road King models	110-115 **in-lbs**	12.4-13.0 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem, final torque: Trike models	110-115 **in-lbs**	12.4-13.0 Nm	1.20 STEERING HEAD BEARINGS, Inspection and Lubrication
Upper steering stem, final torque: Trike models	110-115 **in-lbs**	12.4-13.0 Nm	2.20 STEERING HEAD BEARINGS, Steering Stem Installation
Upper steering stem pinch screw	22-26 ft-lbs	29.8-35.2 Nm	1.20 STEERING HEAD BEARINGS, Checking Swing-Back
Upper steering stem pinch screw	22-26 ft-lbs	29.8-35.2 Nm	2.20 STEERING HEAD BEARINGS, Upper Fork Bracket
Upper support bracket to inner fairing screws	10-20 **in-lbs**	1.1-2.2 Nm	2.39 INNER FAIRING, Inner Fairing Shell Replacement
Upper support bracket to inner fairing screws	10-20 **in-lbs**	1.1-2.2 Nm	2.39 INNER FAIRING, Upper Support Bracket
Upper support bracket to radio (storage box) screws	25-35 **in-lbs**	2.8-4.0 Nm	2.39 INNER FAIRING, Upper Support Bracket
Upper support bracket to speaker enclosure screws	48-60 **in-lbs**	5.4-6.8 Nm	2.39 INNER FAIRING, Upper Support Bracket
Upper support bracket to speaker enclosure screws	48-60 **in-lbs**	5.4-6.8 Nm	7.32 BOOM! BOX INFOTAINMENT SYSTEM, Front Fairing Speakers
Valve stem nut	12-15 **in-lbs**	1.4-1.7 Nm	2.11 TIRES, Installation
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm	7.20 VOLTAGE REGULATOR, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	6.10 TRANSMISSION CASE, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	7.22 VEHICLE SPEED SENSOR (VSS), VSS
Windshield screws: Fairing models	25-30 **in-lbs**	2.8-3.4 Nm	2.37 UPPER FAIRING AND WINDSHIELD, Outer Fairing and Windshield
Windshield window screws: Road King models	20-25 **in-lbs**	2.3-2.8 Nm	2.41 WINDSHIELD: ROAD KING MODELS, Windshield Window

A

ABS Module
- Installation . . . 2-57
- Removal . . . 2-56

ABS Operation . . . 2-56
Acronyms and Abbreviations . . . D-4
Active Exhaust
- Active Exhaust Valve . . . 4-35
- Actuator Cable . . . 4-34
- Exhaust Valve Actuator . . . 4-34

Air Cleaner
- Filter Installation . . . 1-18
- Filter Removal . . . 1-18
- Installation . . . 4-8
- Removal . . . 4-7
- Repair . . . 4-8
- Repair . . . 4-8

Air Deflectors
- Mid-Frame . . . 2-123
- Removal and Installation . . . 2-123

Alternator
- Cleaning and Inspection . . . 7-49
- Installation . . . 7-50
- Removal . . . 7-49

Antenna Cables
- Installation . . . 7-70
- Removal . . . 7-70

Assembling Motorcycle after Stripping
- After Cam Compartment Service . . . 3-27
- After Top End Service . . . 3-27

Audio System . . . . . See BOOM! Box Infotainment System
Autofuse Electrical Connector . . . A-1
- Assembly . . . A-1
- Disassembly . . . A-1

Automatic Compression Release (ACR) . . . 7-45
- Installation . . . 7-46
- Removal . . . 7-45

Auxiliary/Fog Lamp
- Housing . . . 7-18

Auxiliary Lamp
- Bracket . . . 7-19
- Bulb Replacement . . . 7-18

B

Battery
- Battery Tender . . . 1-56
- Charging . . . 1-57
- Cleaning . . . 1-55
- Disconnection and Removal . . . 1-55
- Inspection . . . 1-55
- Installation and Connection . . . 1-55
- Maintenance . . . 1-54
- Storage . . . 1-58
- Tray Installation . . . 7-11
- Tray Removal . . . 7-11
- Voltmeter Test . . . 1-56

Battery Positive Cable
- Replace . . . 7-13

BCM
- Installation . . . 7-8
- Removal . . . 7-8

Black Light Leak Detector (HD-35457) . . . C-5
BOOM! Box Infotainment System
- CB Module . . . 7-66
- Front Speaker Grille . . . 7-67
- Front Speakers . . . 7-66
- Headset Connector, Rider . . . 7-69
- Passenger Audio Controls . . . 7-69
- Radio . . . 7-64
- Radio Face Film Replacement . . . 7-64
- Rear Speakers . . . 7-67

Bosch BTC Sealed Connector Repair . . . A-3
Bosch Compact 1.1M Connector . . . A-2
Bottom End Overhaul (Assembly)
- Cam Support Plate and Cover . . . 3-78
- Crankcase . . . 3-94

Bottom End Overhaul (Disassembly)
- Cam Support Plate . . . 3-70
- Crankcase . . . 3-84

Bottom End Service
- Engine in Chassis (Cam Compartment Service) . . . 3-24
- Engine Removed (Flywheel Compartment Service or Complete Engine Overhaul) . . . 3-25

Brake Caliper, Front
- Installation . . . 2-40
- Removal . . . 2-40

Brake Caliper, Rear
- Installation . . . 2-44
- Removal . . . 2-44

Brake Line
- ABS Module to Front Brake Calipers . . . 2-51
- ABS Module to Rear Brake Caliper . . . 2-55
- Master Cylinder to ABS Module, Front . . . 2-49
- Rear Master Cylinder to ABS Module . . . 2-52
- Rear Non-ABS . . . 2-46

Brake Lines
- Inspection . . . 1-41

Brake Master Cylinder (Front)
- Assembly and Installation . . . 2-39
- Cleaning and Inspection . . . 2-38
- Disassembly . . . 2-37
- Removal . . . 2-37

Brake Master Cylinder (Rear)
- Assembly . . . 2-43
- Cleaning and Inspection . . . 2-42
- Disassembly . . . 2-41
- Installation . . . 2-43
- Removal . . . 2-41

Brake Pads and Discs
- Brake Pad Replacement . . . 1-42
- Inspection . . . 1-42

Brakes
- Bleeding . . . 2-58
- Fluid Inspection . . . 1-40

Breather Assembly
- Cleaning and Inspection . . . 3-36
- Disassembly . . . 3-36
- Operation . . . 3-14

Bulb Replacement
- Headlamp (Halogen Type) . . . 7-17
- Specifications (Table) . . . 1-9
- Tail Lamp . . . 7-21
- Turn Signals (Bullet Style) . . . 7-31
- Turn Signals (Flat Lens Style) . . . 7-31

C

Cam Support Plate
- Cam Needle Bearings . . . 3-75
- Camshafts . . . 3-72
- Cleaning and Inspection . . . 3-72
- Installation . . . 3-78
- Oil Pressure Relief Valve . . . 3-74
- Removal . . . 3-70

CB Module . . . 7-66

Cleaning
Bearings . . . 1-5
Cleaning Process . . . 1-5
Part Protection . . . 1-5
Rust or Corrosion Removal . . . 1-5
Clutch
Adjustment . . . 1-31
Clutch Pack and Bearing . . . 5-16
Clutch Pack Only . . . 5-14
Removal and Installation . . . 5-14
Clutch Cable
Installation . . . 2-76
Removal . . . 2-76
Clutch Fluid Line
Bleed Fluid Line and Secondary Clutch Actuator . . . 2-86
Replacement . . . 2-83
Clutch Fluid System
Drain, Fill and Bleed . . . 2-85
Clutch Hand Lever
Installation . . . 2-82
Removal . . . 2-82
Clutch Master Cylinder
Assembly . . . 2-80
Cleaning and Inspection . . . 2-79
Disassembly . . . 2-79
Clutch Master Cylinder/Reservoir
Clutch Fluid Level . . . 1-32
Installation . . . 2-80
Removal . . . 2-78
Clutch Release Bearing and pushrod
Installation . . . 5-19
Clutch Release Bearing and Pushrod
Removal . . . 5-19
Clutch Release Cover
Assembly and Installation . . . 6-8
Cleaning and Inspection . . . 6-7
Installation . . . 6-9
Removal and Disassembly . . . 6-7
Compression Test . . . 3-17
Connectors
Autofuse Unsealed . . . A-1
Bosch Compact 1.1M . . . A-2
Connector Number . . . B-1
Delphi 100W Micro-Pack Sealed . . . A-6
Delphi 150 Metri-Pack Sealed . . . A-8
Delphi 280 Metri-Pack Unsealed . . . A-10
Delphi 480 Metri-Pack Unsealed . . . A-11
Delphi 630 Metri-Pack Unsealed . . . A-12
Delphi 800 Metri-Pack Sealed . . . A-13
Delphi GT 150 Sealed . . . A-19
Delphi Micro 64 Sealed . . . A-16
Description . . . B-1
Deutsch DTM Sealed Mini . . . A-26
Deutsch DTM Sealed Solid Barrel . . . A-27
Deutsch DT Sealed . . . A-21
Function . . . B-1
JAE MX19 Sealed . . . A-29
Location Table . . . B-1
Metri-Pack Terminal Crimps . . . A-14
Molex CMC Sealed . . . A-30
Molex MX 150 Sealed . . . A-32
Repair Instruction . . . B-1
Sealed Splice . . . A-45
Tyco 040 Multilock Unsealed . . . A-36
Tyco 070 Multilock Unsealed . . . A-38
Tyco GET 64 Sealed Connector Repair . . . A-41
Tyco MCP . . . A-43
Console
Fuel Door Repair . . . 4-9
Installation . . . 4-9
Removal . . . 4-9
Conversions
Fluid . . . D-2
Length . . . D-1
Torque . . . D-3
Coolant
Capacity (Table) . . . 2-8
Checking Coolant Level . . . 1-20
Coolant System Pressure Tester (HD-45335) . . . C-4
Coolant System Pressure Tester (HD-45335) . . . C-4
Coolant System Pressure Tester (HD-45335) . . . C-5
Cooling System . . . See Twin-Cooling
, Horizontal Coolant Line . . . C-8
Cylinder Head Coolant Lines and Adapters, Installation . . . C-7
Cylinder Head Coolant Lines and Adapters, Removal . . . C-6
Leak Detection Dye Test . . . C-5
Operation . . . C-3
Pressure Cap Test . . . C-4
Pressure Test . . . C-4
Specifications . . . C-2
Troubleshooting . . . C-4
Upper Coolant Lines, Installation . . . C-7
Upper Coolant Lines, Removal . . . C-6
Cooling System Troubleshooting
Coolant Leaks . . . C-4
High Engine Temperature . . . C-4
Low Engine Temperature . . . C-4
Crankcase
Cleaning and Inspection . . . 3-84
Cylinder Studs . . . 3-91
Left Crankcase Half . . . 3-86
Right Crankcase Half . . . 3-85
Sprocket Shaft Bearing Inner Race . . . 3-88
Crank Position Sensor (CKP) . . . 7-43
Installation . . . 7-43
Removal . . . 7-43
Crankshaft Runout, Measuring
Crankshaft Installed . . . 3-92
Crankshaft Removed . . . 3-93
Crimp Clamps . . . C-6
Cylinder
Boring and Honing . . . 3-54
Cleaning . . . 3-52
Deglazing . . . 3-54
Inspection . . . 3-52
Cylinder Head
Assembly . . . 3-50
Cleaning . . . 3-43
Disassembly . . . 3-42
Inspection . . . 3-43
Inspection: Tapered Keepers . . . 3-44
Inspection: Valve Guides . . . 3-44
Inspection: Valves . . . 3-44
Inspection: Valve Seats . . . 3-44

Inspection: Valve Springs. 3-44
Valve and Seat Refacing. 3-48
Valve Guide Installation. 3-45
Valve Guide Removal. 3-44

D

Dash Panel Switches
Installation. 7-42
Removal. 7-42
Delphi 100W Sealed Connector
Repair. A-6
Delphi 150 Metri-Pack Connector
Repair. A-8
Delphi 280 Metri-Pack Unsealed Connectors. A-10
Delphi 480 Metri-Pack Unsealed Connector
Repair. A-11
Delphi 630 Metri-Pack Unsealed Connector. A-12
Delphi 800 Metri-Pack Sealed Connectors
Repair. A-13
Delphi GT 150 Sealed Connector
Repair. A-19
Delphi Micro-64 Sealed Connector
Repair. A-16
Deutsch Connector
Crimping Standard Terminals. A-25
Deutsch DTM Sealed Mini Connector
Crimping Terminals. A-26
Deutsch DTM Sealed Solid Barrel Connector
Crimping Terminals. A-27
Deutsch DT Sealed Connector
Repair. A-21
Drive Assembly
Starter Motor. 7-13
Drive Belt
Adjusting Deflection. 1-36
Cleaning. 1-33
Deflection. 1-34
Installation. 5-23
Removal. 5-23
Drive Belt and Sprockets
Inspection. 1-33
Drive Components
Installation. 5-7
Removal. 5-5

E

ECM
Installation. 7-7
Removal. 7-7
Electrical Caddies
Battery Tray. 7-11
Left Side Caddy. 7-9
Right Side Caddy. 7-10
Top Caddy. 7-9
Engine
Compression Test. 3-17
Installation in Chassis. 3-29
Removal From Chassis. 3-28
Symptoms For Engine Repair. 3-21
Engine Guard. 2-111
Engine Mounts
Front. 2-144
Inspection. 1-62
Rear. 2-73
Engine Oil
Capacity (Table). 2-8
Changing. 1-16
Checking. 1-15
Recommended Engine Oils. 1-7
Winter Lubrication. 1-8
Engine Oil Flow
Bottom End. 3-9
Oil Feed. 3-7
Oil Return. 3-11
Top End. 3-7
Engine Temperature Sensor (ET)
Installation. 7-44
Removal. 7-44
Evaporative Emissions Control. 4-36
Canister-to-Solenoid Tube. 4-37
Charcoal Canister. 4-38
Purge Solenoid. 4-37
Solenoid-to-Induction Module Tube. 4-37
Tank to Canister Tube. 4-37
Exhaust System
Exhaust System Leak Check. 1-18
Installation. 4-33
Leakage Repair Procedures. 1-19
Mufflers. 4-31
Removal. 4-31
Exhaust Valve Actuator
Cable Replacement. 4-34
Installation. 4-34
Removal. 4-34

F

Fairing, Inner
Fairing Cap. 2-115
Fairing Vent. 2-119
Install Assembly. 2-117
Media Compartment. 2-121
Remove as an Assembly. 2-116
Replacement. 2-118
Rotate. 2-116
Upper Support Bracket. 2-120
Fairing, Lower
Air Cooled. 2-108
Fascia Replacement. 2-109
Twin-Cooled. 2-110
Vent Door Replacement. 2-109
Fairing and Windshield
Outer Fairing and Windshield. 2-113
Fairing Cap. 2-115
Fairing Harness
Installation. 7-83
Removal. 7-82
Fascia, Rear
Fascia Lamp. 7-24
Installation. 2-135
Removal. 2-135
Stud Plate. 2-135
Fender, front
Installation. 2-130
Removal. 2-129
Repair. 2-130

Fender (Front)
Fastener Torque Values (Table). 2-130
Fender (Rear)
Installation. 2-133
Removal. 2-132
Repair. 2-133
Fender Tip Lamps
Front Fender. 7-26
Rear Fender. 7-27
Fluid Conversions. D-2
Flywheel/Connecting Rod
General. 3-92
Inspection. 3-92
FOB
Assignment. 7-92
Footboards and Footrests
Passenger Footboard. 2-139
Passenger Footrest (FLHX/S). 2-139
Rider Footboard. 2-138
Fork, Front
Assembly. 2-63
Cleaning and Inspection. 2-62
Filling and final assembly. 2-63
Installation. 2-64
Leak Check. 2-60
Removal. 2-60
Fork, Rear
Installation. 2-75
Removal. 2-73
Repair. 2-73
Fork Bracket, Upper
Removal. 2-67
Frame, Rear
Installation. 2-136
Removal. 2-136
Thread Repair. 2-137
Front Fork
Leak Check. 2-60
Fuel
Capacity (Table). 2-8
Gasoline Blends. 1-7
Low Fuel Level (Table). 2-8
Recommended Fuel. 1-7
Fuel Door
Repair. 4-9
Fuel Filter
Installation. 4-15
Removal. 4-15
Fuel Injectors. 4-27
Installation. 4-27
Removal. 4-27
Fuel Level Sender
Installation. 4-17
Removal. 4-17
Fuel Pressure Regulator
Installation. 4-16
Removal. 4-16
Fuel Pressure Test. 4-3
Fuel Pump. 4-29
Installation. 4-29
Removal. 4-29
Fuel Pump and Fuel Level Sender Wire Harness
Installation. 4-30
Removal. 4-30
Fuel Supply Check Valve/Tube
Installation. 4-11
Removal. 4-11
Fuel Tank
Console. 4-9
Installation. 4-10
Removal. 4-9
Top Plate Installation. 4-14
Top Plate Removal. 4-13
Vent Tube. 4-10
Fuse Block
Removal and Installation. 7-6
Fuse Block Repair. A-10
Fuses and Relays
Fuse Block Repair. 7-6
Main Fuse. 7-6
Replacement. 7-6

G

Gauges and Instruments (Fairing Models)
2-Inch Diameter. 7-60
Instrument Cluster. 7-60
Gauges and Instruments (Road King)
Fuel Gauge. 7-61
Speedometer. 7-61
Glossary
Acronyms and Abbreviations. D-4

H

Handlebars
Adjustment. 2-87
Installation. 2-89
Left Hand Grip. 2-90
Removal. 2-87
Right Hand Grip. 2-90
Handlebar Switch Assemblies
Harness Replacement. 7-87
Installation. 7-85
Removal. 7-84
Repair. 7-88
Headlamp
Alignment. 1-59
Bulb Replacement (Halogen Type). 7-17
Removal/Installation. 7-17
Headlamp Nacelle (Road King Models)
Installation. 2-127
Removal. 2-127
Headset Connector, Rider
Installation. 7-69
Removal. 7-69
Heated Hand Grips
Replacing Left Hand Grip. 2-91
Replacing Right Hand Grip. 2-92
HFSM Antenna
Removal. 7-89
Horn
Inspection. 7-57
Installation. 7-57
Removal. 7-57
Hydraulic Clutch Fluid
Clutch Fluid Level. 1-32

I

Ignition/Light Key Switch and Fork Lock
- Fairing Models. . . . 7-39
- Road King. . . . 7-40

Ignition Coil
- Installation. . . . 7-12
- Removal. . . . 7-12

Indicator Lamps (FLHR/C)
- Installation. . . . 7-63
- Removal. . . . 7-63

Induction Module
- Installation. . . . 4-23
- Removal. . . . 4-22

Intake Leak Test. . . . 4-5
- Leak Tester: Parts List. . . . 4-5
- Leak Tester: Tester Adjustment. . . . 4-5
- Leak Tester: Tester Assembly. . . . 4-5

J

JAE MX19 Sealed Connectors
- Crimping Terminals. . . . A-7
- Crimping Terminals. . . . A-29
- Housings. . . . A-29
- Installing Terminals. . . . A-29
- Removing Terminals. . . . A-29

Jiffy Stand
- Installation. . . . 2-141
- Jiffy Stand Bracket. . . . 2-142
- Jiffy Stand Interlock Sensor. . . . 2-142
- Removal. . . . 2-141

L

Laced Wheel Rim Offset. . . . 2-27

Light Bulbs (Table). . . . See Bulb Replacement

LOCTITE. . . . i-II

M

Main Drive Gear and Bearing
- Cleaning and Inspection. . . . 6-24
- Installation. . . . 6-27
- Needle Bearing Replacement. . . . 6-25
- Removal. . . . 6-23

Main Fuse
- Installation. . . . 7-6
- Removal. . . . 7-6

Main Fuse Holder
- Removal and Installation. . . . 7-6

Main Harness
- Installation (All Models-Part 1). . . . 7-78
- Installation (All Models-Part 3). . . . 7-81
- Installation (Fairing models). . . . 7-80
- Installation (FLHR/C). . . . 7-80
- Removal (All Models-Part 1). . . . 7-75
- Removal (All Models-Part 3). . . . 7-77
- Removal (Fairing models). . . . 7-75
- Removal (FLHR/C). . . . 7-75

Maintenance
- Brake Line Inspection (Table). . . . 1-41
- Chassis Lubrication. . . . 1-39
- Checking Coolant Level. . . . 1-20
- Drive Belt. . . . 1-34
- Engine Oil Change. . . . 1-16
- Engine Oil Check. . . . 1-15
- Headlamp Bulb Replacement (Halogen Type). . . . 7-17
- Recommended Engine Oils. . . . 1-7
- Tail Lamp Bulb Replacement. . . . 7-21
- Transmission Lubricant Change. . . . 1-29
- Turn Signal Bulb Replacement (Bullet Style). . . . 7-31
- Turn Signal Bulb Replacement (Flat Lens Style). . . . 7-31

Medallions. . . . 2-146

Metric System. . . . D-2

Metri-Pack Terminal Crimps. . . . A-14

Mirrors, Fairing Mounted
- Installation. . . . 2-93
- Removal. . . . 2-93

Mirrors, Handlebar Mounted
- Installation. . . . 2-93
- Removal. . . . 2-93

Molex CMC Sealed Connectors
- Crimping Terminals. . . . A-31
- Housings. . . . A-30
- Installing Terminals. . . . A-30
- Removing Terminals. . . . A-30

Molex MX 150 Sealed Connector
- Repair. . . . A-32
- Terminal Crimps. . . . A-33

N

Neutral Switch
- Installation. . . . 7-54
- Removal. . . . 7-54

O

Oil. . . . See Engine Oil

Oil Cooler
- Installation. . . . 3-19
- Operation. . . . 3-11
- Removal. . . . 3-19

Oil Cooler Adapter
- Disassembly. . . . 3-20
- Installation. . . . 3-20
- Removal. . . . 3-20

Oil Pan
- Installation. . . . 3-96
- Removal. . . . 3-96

Oil Pressure
- Indicator Lamp. . . . 3-15
- Testing. . . . 3-15

Oil Pressure Relief Valve
- Remove, Inspect, and Install. . . . 3-74

Oil Pressure Switch/Sender
- Installation. . . . 7-55
- Removal. . . . 7-55

Oil Pump
- Cleaning and Inspection. . . . 3-82
- Installation. . . . 3-83
- Operation. . . . 3-12
- Removal. . . . 3-82

Oxygen Sensor
- Installation. . . . 4-26
- Removal. . . . 4-25

P

Passenger Audio Controls. . . . 7-69

Passenger Backrest
Removal and Installation. 2-107
Rubber Isolators. 2-107
Pipe Plug and Oil Fittings
Installation. 3-91
Removal. 3-91
Piston
Assembly. 3-58
Cleaning. 3-56
Disassembly. 3-56
Inspection. 3-56
Power Outlet, Front
Installation. 7-59
Removal. 7-59
Troubleshooting. 7-59
Primary Chain
Automatic Chain Adjuster. 1-27
Installation. 5-7
Removal. 5-5
Primary Chaincase
Changing Lubricant. 1-27
Installation. 5-12
Lubricant Capacity (Table). 2-8
Mainshaft Bearing and Lip Seal. 5-10
Shifter Shaft Bushing. 5-12
Primary Chaincase Cover
Installation. 5-3
Removal. 5-3
Primary Chaincase Housing
Inspection. 5-10
Mainshaft Bearing Inner Race. 5-11
Removal. 5-10
Pushrods, Lifters and Covers
Assembly. 3-41
Cleaning and Inspection. 3-40
Disassembly. 3-40
Lifter Inspection. 3-40

R

Radio
Installation. 7-64
Removal. 7-64
Repair and Replacement Procedures
Bearings. 1-4
Bushings. 1-4
Gaskets. 1-4
Gears. 1-5
Hardware and Threaded Parts. 1-4
Lip Type Seals. 1-4
O-Rings. 1-5
Part Replacement. 1-5
Shafts. 1-5
Threadlocking Agents. 1-4
Wiring, Hoses and Lines. 1-4
Rocker Arms
Install Bushings. 3-38
Remove Bushings. 3-38
Shaft to Bushing. 3-38
Shaft to Support Plate. 3-37
Rocker Arm Support Plate. 3-39
Disassembly. 3-37
Inspection. 3-37

S

Saddlebag
Cover. 2-97
Cover Seal. 2-98
Hinge. 2-98
Installation. 2-96
Latch Assembly. 2-98
Lock. 2-97
Removal. 2-96
Saddlebag Guard and Support Rail. 2-99
Strikes. 2-97
Safe Operating Maintenance. 1-3
Sealed Splice Connectors. A-45
Seat
Installation. 2-94
Removal. 2-94
Retention Nut Replacement. 2-94
Seat Bumper. 2-95
Secondary Clutch Actuator
Replacement. 6-10
Security Siren
Installation. 7-93
Removal. 7-93
Security System
Fob Battery. 7-89
Serialized Badges. 2-146
Service Bulletins. . . . . i-I
Service Preparation. . . . . i-I
Service Wear Limits
Engine. 3-5
Transmission. 6-2
Servicing a New Motorcycle. 1-3
Shift Linkage
Heel-Toe Levers. 6-5
Inner Lever. 6-5
Shifter Rod. 6-5
Shock Absorber
Preload Adjustment. 1-52
Shock Absorbers, Rear
Assembly. 2-71
Cleaning. 2-70
Disassembly. 2-71
Inspection. 2-70
Installation. 2-70
Manually Adjustable. 2-72
Removal. 2-70
Shop Practices. 1-3
Checking Torques. 1-4
Cleaning. 1-3
Disassembly and Assembly. 1-4
Disposal and Recycling. 1-3
Magnetic Parts Trays. 1-4
Removing Parts. 1-3
Safety. 1-3
Side Caddy, Left
Installation. 7-10
Removal. 7-9
Sidecar Configuration. 7-92
Solenoid
Long Post Contact. 7-15
Plunger. 7-14
Short Post Contact. 7-14

Spark Plug Cables
Inspection. . . . 1-47
Spark Plugs
Cleaning. . . . 1-46
Inspection. . . . 1-46
Installation. . . . 1-46
Removal. . . . 1-46
Speaker Grille, Front. . . . 7-67
Speakers
Front. . . . 7-66
Special Tools. . . . i-II
Specifications
Capacities (Table). . . . 2-8
Drive. . . . 5-2
Engine. . . . 3-3
Fuel System. . . . 4-2
Quick Reference Maintenance Chart (Table). . . . 1-13
Transmission. . . . 6-2
Speedometer (FLHR/C)
Installation. . . . 7-62
Removal. . . . 7-61
Spokes
Adjustment. . . . 1-25
Starter. . . . 7-13
Drive Assembly. . . . 7-13
Installation. . . . 7-15
Removal. . . . 7-13
Solenoid. . . . 7-14
Steering Head Bearings
Adjustment. . . . 1-49
Adjustment. . . . 2-67
Checking Swing-Back. . . . 1-48
Inspection and Lubrication. . . . 1-50
Installation. . . . 2-67
Removal. . . . 2-66
Removal. . . . 2-66
Stop Lamp Switches
Front Stop Lamp Switch. . . . 7-56
Rear Stop Lamp Switch. . . . 7-56
Storage
Placing In Storage. . . . 1-63
Removal from Storage. . . . 1-63
Suspension, Rear
Adjustment. . . . 1-51
Check. . . . 2-71
Recommended Pressure (Table). . . . 1-52
Repair. . . . 2-71
System Fuses and Relays
Installation. . . . 7-6
Removal. . . . 7-6

T

Tail Lamp
Bulb Replacement. . . . 7-21
Circuit Board/Chrome Base. . . . 7-21
Rear Fender Lighting Harness. . . . 7-22
Rear Fender Lighting Harness (FLHX/S). . . . 7-24
Tank Emblems. . . . 2-146
Temperature/Manifold Absolute Pressure Sensor (TMAP)
Installation. . . . 4-24
Removal. . . . 4-24
TGS
Installation. . . . 4-19
Jumper Harness Installation. . . . 4-20
Jumper Harness Removal. . . . 4-20
Removal. . . . 4-18
Throttle Control Actuator (TCA). . . . 4-21
Tires. . . . 2-33
Checking Runout. . . . 2-35
Cleaning, Inspection and Repair. . . . 2-33
Inspection. . . . 1-24
Installation. . . . 2-34
Pressure (Table). . . . 1-24
Pressure (Table). . . . 2-10
Removal. . . . 2-33
Wear Bar Indicators. . . . 1-24
Wheel Balancing. . . . 2-35
When To Replace. . . . 1-24
Tool Safety
Air Tools. . . . 1-5
Hammers. . . . 1-6
Pliers/Cutters/Pry bars. . . . 1-5
Punches/Chisels. . . . 1-6
Ratchets and Handles. . . . 1-6
Screwdrivers. . . . 1-6
Sockets. . . . 1-6
Storage Units. . . . 1-6
Wrenches. . . . 1-5
Top End Overhaul
Cylinder. . . . 3-61
Disassembly. . . . 3-30
Pushrods, Lifters and Covers. . . . 3-67
Top End Overhaul: Assembly. . . . 3-60
Breather Assembly. . . . 3-69
Piston. . . . 3-60
Rocker Arm Support Plate. . . . 3-68
Top End Overhaul: Disassembly
Cylinder. . . . 3-33
Cylinder Head. . . . 3-32
Piston. . . . 3-34
Pushrods, Lifters and Covers. . . . 3-32
Rocker Arm Support Plate. . . . 3-30
Rocker Covers. . . . 3-30
Top End Service
Engine in Chassis. . . . 3-22
Engine Removed from Chassis. . . . 3-23
Torque Conversion. . . . D-3
Tour-Pak
Cover Seal. . . . 2-103
Ground Plate. . . . 2-105
Installation. . . . 2-101
Luggage Rack. . . . 2-105
Removal. . . . 2-101
Support. . . . 2-101
Tour-Pak Backrest
Passenger Backrest Flap. . . . 2-107
Tour-Pak Service
Hinges. . . . 2-104
Latch Handle/Catch. . . . 2-104
Liner. . . . 2-103
Lock. . . . 2-103
Side Marker Lamps/Trim Strips. . . . 7-28
Tether. . . . 2-104
Tour-Pak Lights Harness. . . . 7-28
Wrap-Around Lamp. . . . 7-30

Wheel Speed Sensor, Front
Installation. 2-15
Installation. 7-52
Removal. 7-52
Wheel Speed Sensor, Rear
Installation. 7-53
Removal. 7-53
Windshield (Road King Models)
Removal and Installation. 2-124
Windshield Window. 2-124
Winter Lubrication. 1-8
Wire Trough
Installation. 7-74
Removal. 7-73
Wiring
Color Codes. B-6
Diagram Symbols. B-6

Tour-Pak Speaker Enclosure
Removal and Installation. 7-67
Trademarks
Harley-Davidson. . . . . i-ii
Referenced Products. . . . . i-ii
Transmission
Assembly. 6-18
Changing Lubricant. 1-29
Checking Lubricant Level. 1-29
Cleaning and Inspection. 6-18
Disassembly. 6-12
Installation. 6-21
Lubricant Capacity (Table). 2-8
Mainshaft Seal Replacement. 6-26
Removal. 6-11
Theory of Operation. 6-3
Transmission Case
Assembly. 6-32
Cleaning and Inspection. 6-31
Disassembly. 6-31
Installation. 6-30
Removal. 6-30
Transmission Side Covers
Removal. 6-9
Transmission Sprocket
Cleaning and Inspection. 5-21
Installation. 5-21
Removal. 5-21
Troubleshooting
Brakes. 1-68
Compression Test. 3-17
Cooling System. C-4
Cylinder Leakdown Test. 3-18
Diagnosing Smoking Engine or High Oil Consumption. 3-18
Diagnosing Valve Train Noise. 3-17
Electrical System. 1-67
Engine. 1-65
Handling. 1-67
Lubrication System. 1-66
Transmission. 1-67
Truing Laced Wheels
Lateral Runout. 2-29
Radial Runout. 2-28
Turn Signal Lamps
Front. 7-31
Front Bracket. 7-19
Rear Turn Signal Lamp. 7-34
Rear Turn Signal Lamps Bracket. 7-36
Turn Signals
Bulb Replacement (Bullet Style). 7-31
Bulb Replacement (Flat Lens Style). 7-31
Twin-Cooling
Bleed Cooling System. 1-21
Coolant Lines. C-8
Coolant Pump. C-9
Draining and Filling. 1-21
Fan. C-12
Radiator. C-9
Temperature Sensor. C-11
Thermostat. C-9
Twist Grip Sensor
Installation. 4-19
Removal. 4-18
Twist Grip Sensor Jumper Harness
Installation. 4-20
Removal. 4-20
Tyco 040 Multilock Unsealed Connector
Repair. A-36
Tyco 070 Multilock Unsealed Connector
Repair. A-38
Tyco GET 64 Sealed Connector. A-41
Crimping Terminals. A-42
Tyco MCP Connectors
Crimping Terminals. A-44
Installing Terminals. A-44
Removing Large Socket Terminals. A-43
Removing Small Socket Terminals. A-43

U

Upper Fork Bracket
Installation. 2-68

V

Vapor Valve
Removal and Installation. 4-36
Vehicle Identification Number (VIN). 2-11
Abbreviated. 2-11
Vehicle Speed Sensor (VSS). 7-51
Voltage Regulator
Installation. 7-47
Removal. 7-47

W

Wheel, Rear
Installation. 2-16
Wheel (Front)
Cleaning and Inspection. 2-13
Installation. 2-14
Removal. 2-13
Wheel (Rear)
Cleaning and Inspection. 2-16
Removal. 2-15
Wheel Bearings
Check End Play. 2-30
Installation. 2-31
Removal. 2-30
Wheel Compensator, Rear
Inspection. 1-38
Isolator. 2-19
Sprocket Bearing. 2-19
Wheel Lacing
16 In. Rear Wheel. 2-23
Angle Flange Hub. 2-21
Wheel Runout
Checking. 2-26
Lateral. 2-26
Radial. 2-26
Wheels
Balancing. 2-35
Laced Wheel Rim Offset. 2-27
Spokes. 1-25
Truing Laced Wheels. 2-28
Weights. 2-36
Wheel Bearing Inspection. 1-24