2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus

FOREWORD

The information printed within this publication includes the latest product information at time of print. The most recent version of this Service Manual is available in electronic format at www.polarisdealers.com.

This Service Manual is designed primarily for use by Indian Motorcycle Dealer technicians in a properly equipped shop and should be kept available for reference. All references to left and right side of the vehicle are from the operator's perspective when seated in a normal riding position.

Some procedures outlined in this manual require a sound knowledge of mechanical theory, tool use, and shop procedures in order to perform the work safely and correctly. Technicians should read the text and be familiar with the service procedures before starting any repair. Certain procedures require the use of special tools. Use only the proper tools as specified. If you have any doubt as to your ability to perform any of the procedures outlined in this Service Manual, contact an authorized dealer for service.

We value your input and appreciate any assistance you can provide in helping make these publications more useful. Please provide any feedback you may have regarding this manual. Authorized dealers can submit feedback using 'Ask Polaris'. Click on 'Ask Polaris', and then click on 'Service Manual / Service Literature Question'.

Publication Printed January 2025 (PN 9860001 R01)

SAFETY WARNINGS

The following signal words and symbols appear throughout this manual and on the vehicle. Your safety is involved when these words and symbols are used. Become familiar with their meanings before reading the manual.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, WILL result in death or serious injury.

⚠ WARNING
SAFETY ALERT WARNING indicates a hazardous situation which, if not avoided, COULD result in death or serious injury.

⚠ CAUTION
SAFETY ALERT CAUTION indicates a hazardous situation which, if not avoided, COULD result in minor to moderate injury.

NOTICE
NOTICE provides key information by clarifying instructions.

IMPORTANT
IMPORTANT provides key reminders during disassembly, assembly and inspection of components.

TRADEMARKS

INDIAN MOTORCYCLE ACKNOWLEDGES THE FOLLOWING PRODUCTS THAT MAY BE MENTIONED IN THIS MANUAL:

LOCTITE®, is a registered trademark of the Henkel Corporation.

DUNLOP®, is a registered trademark of the Dunlop Tire Corporation.

STA-BIL®, is a registered trademark of Gold Eagle.

NYOGEL™, is a trademark of Gold Eagle.

FLUKE ®, is registered trademark of the Fluke Corporation.

XM®, is a registered trademark of XM® Satellite Radio, Inc.

Torx®, is a registered Trademark of Textron.

Garmin®, is a registered trademark of Garmin, Ltd.

Some Indian Motorcycle factory publications can be downloaded from www. polarisindustries. com, purchased from www.purepolaris.com or by contacting the nearest Indian Motorcycle dealer.

REVISION INDEX

REV	DATE	CHANGES
R01	01/27/2025	Initial Release

FEEDBACK FORM

A feedback form has been created for the technician or consumer to provide Polaris with an overall satisfaction rating for this service manual, provide comments on your experience or upload pictures/video. This feedback form is viewable on a mobile device by scanning the QR code or by clicking **HERE** if viewing this document electronically.

2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus

Service Manual

Chapter Summary

CHAPTER 1
GENERAL / SPECIFICATIONS

VEHICLE INFORMATION

MODEL NUMBER DESIGNATION

Example: N25LCACCA1

GRP	MY	TYPE	MODEL	LINE	DISP	NET BRAKE HP	MARKET CONFIG
1st digit	2nd/3rd digit	4th digit*	5th digit*	6th digit*	7th digit*	8th digit	9th digit**
N = Indian Motorcycle	25 = 2025	L = Touring (Liquid Cooled)	C = Challenger D = Pursuit F = Chiefain PowerPlus G = Roadmaster PowerPlus	B = Base D = Dark Horse E = Elite/Limited Edition L = Limited	R = 1768cc (108ci) V-twin S = 1834cc (112ci) V-twin	R = 122 HP / 91 kW S = 126 HP / 94 kW	A = 49 State (49S) B = 50 State (50S) C = Canadian (CAN) E = EU (WVTA) J= Japan (JPN) X = China (XNA)
* = digits that would transfer to 17 digit VIN and are used in digits 4–8 respectively. First 3 digits and 9th digit are used in model number only. They are not used with the 17 digit VIN.							

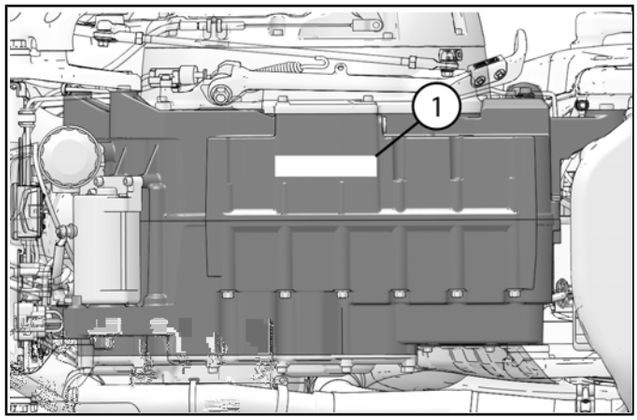
VEHICLE IDENTIFICATION NUMBER (VIN) DESIGNATION

Example: 56KTCAAA0E3000025

World Mfg. ID			Vehicle Descriptors						Vehicle Identifiers							
			Chassis	Type	Disp	HP	Series	Check Digit	MY*	Mfg	Individual Serial No.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
5	6	K	C	C	A	A	A	0	E	3	0	0	0	0	0	0
* Model Year: S = 2025																

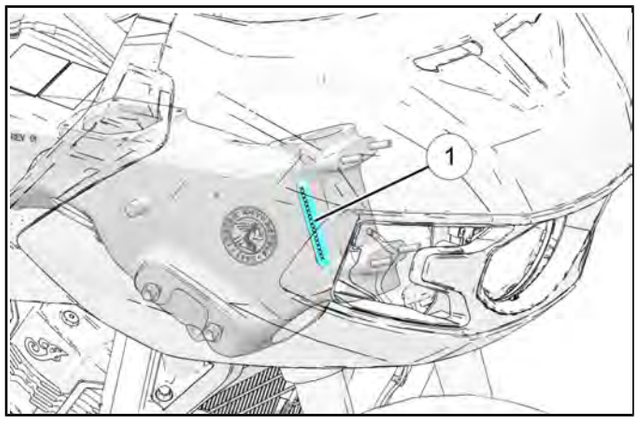
ENGINE NUMBER LOCATION

The engine number ① is stamped into the bottom of the LH engine case.. The stamping identifies the engine model and serial number.



VIN / PIN LOCATION

The vehicle identification number (VIN) ① is stamped on the right side of the steering head.



MANUFACTURER LABEL

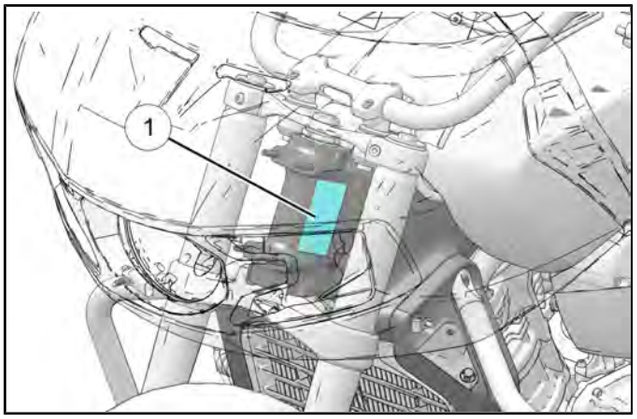
The manufacturer label ① located on the left side of the steering head contains the following information:

Vehicle Identification Number / Product Identification Number (VIN / PIN)

Gross Vehicle Weight Rating (GVWR)

Gross Axle Weight Rating (GAWR)

Tire Type and Load Information.



TIRE INFORMATION LABEL

See **Manufacturer Label page 1.3** for tire information.

GENERAL SPECIFICATIONS
2025 MODEL SPECIFICATIONS
CHALLENGER / PURSUIT

NOTICE
Challenger Shown.

NOTICE
Use of Chassis Mounted Fairing models will be denoted as “CMF” in the Service Manual. . Content shared between CMF and FMF models will be denoted as “Common”

MODEL 2025	CHALLENGER	CHALLENGER DARK HORSE / CHALLENGER LIMITED	CHALLENGER ELITE	PURSUIT DARK HORSE / PURSUIT LIMITED	PURSUIT ELITE
DIMENSIONS					
Overall Length	98.5 in (2503 mm)			101.5 in (2578 mm)	
Overall Width	41.9 in (1063 mm)				
Overall Height to Top of Windshield (lowest position)	53 in (1345 mm)			55.4 in (1407 mm)	
Unladen Seat Height	27 in (686 mm)				
Wheelbase	65.7 in (1668 mm)				
Ground Clearance	5.4 in (137 mm)				
Rake (Frame)/ Trail	25 Degrees				
WEIGHT					
Dry Weight (without Fuel/ Fluids)	806 lb (366 kg)	819 lb (372 kg)	828 lb (376 kg)	901 lb (409 kg)	908 lb (412 kg)
Wet Weight (with Fuel/Fluids)	842 lb (382 kg)	855 lb (388 kg)	864 lb (392 kg)	937 lb (425 kg)	944 lb (428 kg)
Gross Vehicle Weight Rating (GVWR)	1385 lbs (628 kg)				

MODEL 2025	CHALLENGER	CHALLENGER DARK HORSE / CHALLENGER LIMITED	CHALLENGER ELITE	PURSUIT DARK HORSE / PURSUIT LIMITED	PURSUIT ELITE
CAPACITIES					
Radiator Coolant	**2.4 qt (2.3 L)**				
Engine Oil	**5.0 qt (4.7 L)**				
Fuel (Total Usable)	6.0 gal (22.7 l)				
Fuel Reserve (fuel light on)	1.0 gal (3.8 l)				
WHEELS / TIRES					
Front Wheel Size / Type	19" x 3.5" Cast				
Rear Wheel Size / Type	16" x 5" Cast				
Front Tire Type / Size	130/60B19 66H / Metzeler Cruisetec				
Rear Tire Type / Size	180/60R16 80H (I) / Metzeler Cruisetec				
Tire Pressures	**Front: 36 psi (248 kPa)** **Rear: 41 psi (283 kPa)**				
CHASSIS					
Front Suspension Type / Travel	Inverted Telescopic Fork / 5.12" (130 mm)				
Front Suspension Diameter	43 mm				
Rear Suspension Type / Travel	Single shock with hydraulic adjuster / 4.5" (114 mm)		Singe Shock with electronically controlled adjuster / 4.5" (114 mm)		
Front Brakes	Dual / 320 mm Semi-floating Rotor / 4 Piston Caliper				
Rear Brakes	Single / 298 mm Floating Rotor / 2 Piston Caliper				

MODEL 2025	ALL MODELS	
ENGINE		
Engine Type	Power Plus 108	Power Plus 112
Displacement	108 cid (1768 cc)	112 cid (1834 cc)
Compression Ratio	11.0:1	11.4:1
Valve Train	4 Valves per cylinder, SOHC, Hydraulic lifters	
Bore and Stroke	108 mm x 96.5 mm	110 mm x 96.5 mm
Fuel System / Throttle Body Bore	Closed loop fuel injection / 52 mm dual bore	
Exhaust System	Two O2 sensors, one each bank, single three-way catalyst INTL: Three O2 sensors, one each bank, catalyst in the resonator and the head pipe.	
Rev Limit	6500 RPM	
Idle RPM	900 RPM +/- 50 RPM	
Lubrication System	Semi-Dry Sump	
Spark Plug Type Spark Plug Gap	NGK LZMAR8AI-1 0.039 in (1.0 mm)	
Thermostat Opening	Starts to open at 82° C (+/- 2°) Fully open at 95° C	
Cooling Fan	Turns on at 98° C Turns off at 94° C	
DRIVETRAIN		
Primary drive	Gear Drive Wet Clutch	
Crank Gear	55 Tooth	
Clutch Gear	86 Tooth	
Clutch Type	Wet, Multi-Plate, Assist	
Primary Reduction Ratio	1.564:1	
Transmission Type	6 Speed / Constant Mesh / Foot Shift	
1st Gear Ratio	2.733:1	
2nd Gear Ratio	1.864:1	
3rd Gear Ratio	1.385:1	
4th Gear Ratio	1.103:1	
5th Gear Ratio	0.943:1	
6th Gear Ratio	0.811:1	
Gear Shift Pattern	1 Down / 5 Up	
Final Drive Type	Belt Drive , 152 Tooth	
Final Drive Ratio	2.379:1	
Overall Gear Ratio		
1st Gear	10.169:1	
2nd Gear	6.933:1	
3rd Gear	5.151:1	
4th Gear	4.105:1	
5th Gear	3.508:1	
6th Gear	3.017:1	

CHIEFTAIN POWERPLUS / ROADMASTER POWERPLUS

NOTICE
Chieftain PowerPlus Dark Horse Shown

NOTICE
Use of Fork Mounted Fairing models will be denoted as "FMF" in the Service Manual. Content shared between CMF and FMF models will be denoted as "Common".

MODEL 2025	CHIEFTAIN POWERPLUS	CHIEFTAIN POWERPLUS DARK HORSE / CHIEFTAIN POWERPLUS LIMITED	ROADMASTER POWERPLUS DARK HORSE / ROADMASTER POWERPLUS LIMITED
DIMENSIONS			
Overall Length	98.5 in (2503 mm)		101.5 in (2578 mm)
Overall Width	41.9 in (1063 mm)		
Overall Height to Top of Windshield (lowest position)	52.9 in (1343 mm)		56.3 in (1431 mm)
Unladen Seat Height	27.0 in (686 mm)		
Wheelbase	65.7 in (1668 mm)		
Ground Clearance	5.4 in (137 mm)		
Rake (Frame)/Trail	25 Degrees		
WEIGHT			
Dry Weight (without Fuel/ Fluids)	797 lb (362 kg)	806 lb (366 kg)	897 lb (407 kg)
Wet Weight (with Fuel/ Fluids)	833 lb (378 kg)	842 lb (382 kg)	933 lb (423 kg)
Gross Vehicle Weight Rating (GVWR)	1385 lbs (628 kg)		
CAPACITIES			
Radiator Coolant	**2.4 qt (2.3 L)**		
Engine Oil	**5.0 qt (4.7 L)**		
Fuel (Total Usable)	6.0 gal (22.7 l)		
Fuel Reserve (fuel light on)	1.0 gal (3.8 l)		

MODEL 2025	CHIEFTAIN POWERPLUS	CHIEFTAIN POWERPLUS DARK HORSE / CHIEFTAIN POWERPLUS LIMITED	ROADMASTER POWERPLUS DARK HORSE / ROADMASTER POWERPLUS LIMITED
WHEELS / TIRES			
Front Wheel Size / Type	19" x 3.5" Cast		
Rear Wheel Size / Type	16" x 5" Cast		
Front Tire Type / Size	130/60B19 66H / Metzeler Cruisetec		
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Tire Pressures	**Front: 36 psi (248 kPa)** **Rear: 41 psi (283 kPa)**		
CHASSIS			
Front Suspension Type / Travel	Inverted Telescopic Fork / 5.12" (130 mm)		
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Compression Ratio	11.0:1	11.4:1
Valve Train	4 Valves per cylinder, SOHC, Hydraulic lifters	
Bore and Stroke	108 mm x 96.5 mm	110 mm x 96.5 mm
Fuel System / Throttle Body Bore	Closed loop fuel injection / 52 mm dual bore	
Exhaust System	Two O2 sensors, one each bank, single three-way catalyst INTL: Three O2 sensors, one each bank, catalyst in the resonator and the head pipe.	
Rev Limit	6500 RPM	
Idle RPM	900 RPM +/- 50 RPM	
Lubrication System	Semi-Dry Sump	
Spark Plug Type Spark Plug Gap	NGK LZMAR8AI-1 0.039 in (1.0 mm)	
Thermostat Opening	Starts to open at 82° C (+/- 2°) Fully open at 95° C	
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Primary drive	Gear Drive Wet Clutch	
Crank Gear	55 Tooth	
Clutch Gear	86 Tooth	
Clutch Type	Wet, Multi-Plate, Assist	
Primary Reduction Ratio	1.564:1	
Transmission Type	6 Speed / Constant Mesh / Foot Shift	
1st Gear Ratio	2.733:1	
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4th Gear	4.105:1	
5th Gear	3.508:1	
6th Gear	3.017:1	

VEHICLE LOADING

GROSS VEHICLE WEIGHT RATING (GVWR)

⚠ WARNING

Exceeding the gross vehicle weight rating of your motorcycle can reduce stability and handling and could cause loss of control. NEVER exceed the gross vehicle weight rating of your motorcycle.

The *maximum load capacity* of your motorcycle is the maximum weight you may add to your motorcycle *without exceeding the GVWR*. This capacity is determined by calculating the difference between your motorcycle's GVWR and wet weight.

Refer to the specification section of this manual or the Manufacturing Information / VIN/PIN label on the motorcycle frame for model-specific information. Refer to Information label section in this manual for location on the motorcycle.

When determining the weight you will be adding to your motorcycle, to ensure you do not exceed the maximum load capacity, include the following:

- operator body weight
- passenger body weight
- weight of all riders' apparel and items in or on apparel
- weight of any accessories and their contents
- weight of any additional cargo on the motorcycle

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EMMISIONS INFORMATION

EMISSION CONTROL SYSTEMS

The U.S. Environmental Protection Agency and California Air Resources Board (CARB) require manufacturers to certify that their motorcycles comply with applicable exhaust emissions standards during their useful life, and that motorcycles built after January 1, 1983 comply with applicable noise emission standards for one year or 6,000 km (3,730 mi) after the time of sale to the ultimate purchaser, when operated and maintained according to the instructions provided.

EMISSION SOURCES

An internal combustion engine produces carbon monoxide and hydrocarbons during operation. Hydrocarbons must be controlled because under some conditions hydrocarbons react with sunlight to produce photochemical smog. Carbon monoxide must be controlled because it is toxic.

EXHAUST EMISSION CONTROL

Indian Motorcycles have an electronic engine management system which controls fuel delivery and ignition timing to control hydrocarbon and carbon monoxide emissions. If components are replaced that affect idle speed, no adjustments should be made to the system. The Electronic Fuel Injection (EFI) and Electronic Throttle Control (ETC) systems control idle speed.

NOISE EMISSION CONTROL

Tampering with Noise Control Systems is Prohibited. Federal law prohibits the following acts or causing thereof:

1. The removal or rendering inoperative by any person other than for purposes of maintenance, repair or replacement, any device or element of design incorporated into the motorcycle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or
2. The use of the motorcycle after such device or element of design has been removed or rendered inoperative.

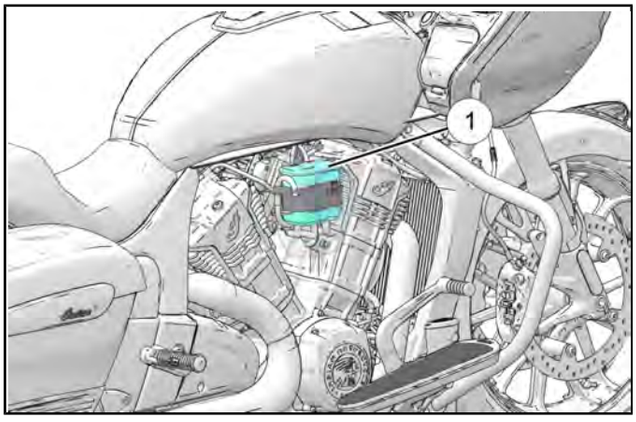
   Among those acts presumed to constitute tampering are the acts listed below:
3. Removal of, or puncturing the muffler, baffles, header pipes or any other component which conducts exhaust gases.
4. Removal or puncturing of any part of the intake system.
5. Lack of proper maintenance.
6. Replacing any moving part of the motorcycle or parts of the exhaust / intake system with parts other than those specified by the manufacturer.

CRANKCASE EMISSION CONTROL

The crankcase emission control system is comprised of a closed system that routes crankcase emissions through the air cleaner into the combustion chamber.

EVAPORATIVE EMISSION CONTROL (CALIFORNIA AND INTERNATIONAL MODELS)

California and International models are equipped with a carbon canister ①. Activated carbon inside the canister temporarily stores fuel system vapors until the engine is started and the motorcycle is driven. The Electronic Control Module (ECM) automatically opens a Purge Control Valve under certain conditions, and engine intake vacuum draws vapors out of the canister.



SPECIAL TOOLS

USING SPECIAL TOOLS

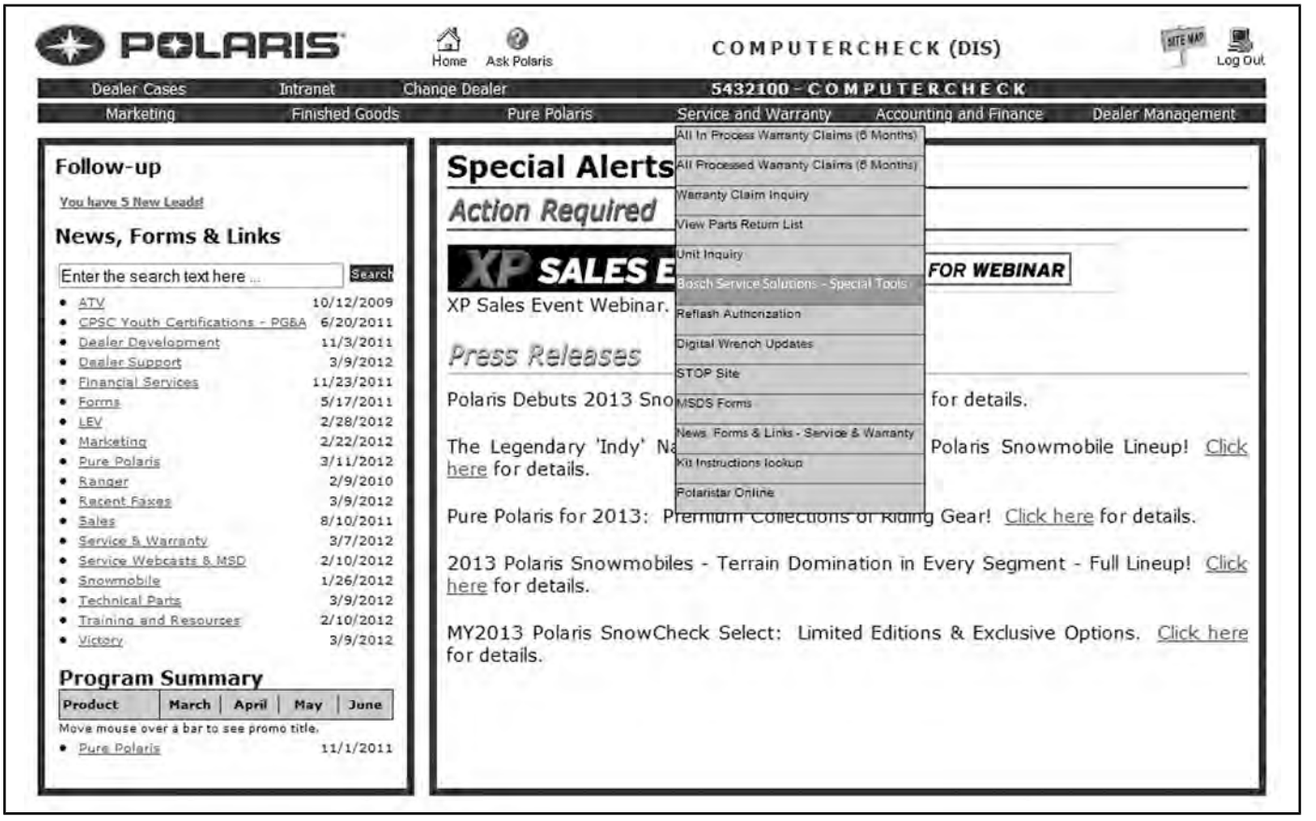
Special tools have been designed exclusively for servicing the specialized components found on Indian Motorcycles. By using these tools, service technicians can maximize efficiency and minimize the likelihood of causing damage to the motorcycle during service.

How To Use This Book

The *Special Tools Index* located in this chapter provides a comprehensive list and pictorial representation of the special tools used throughout this service manual. The *Special Tools* section at the beginning of each chapter provides a short list of the tools required to perform procedures specific to that chapter.

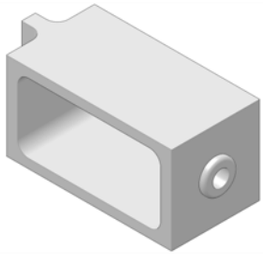
TOOL ORDERING INFORMATION

Special tools may be required while servicing this vehicle. Some of the tools listed or depicted are mandatory, while other tools may be substituted with a similar tool, if available. Indian Motorcycle recommends use of the Special Tools referenced in the chapters of this service manual when servicing any Indian Motorcycle product. Dealers may order special tools through Indian Motorcycle's official tool supplier, Bosch Automotive Service Solutions, by phone at 1-800-328-6657 or on-line via your dealer website.



SPECIAL TOOLS INDEX

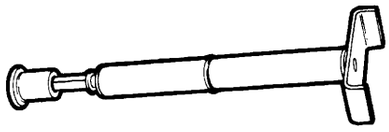
ABS Tool (Brake Lever Reserve)
PV-50104



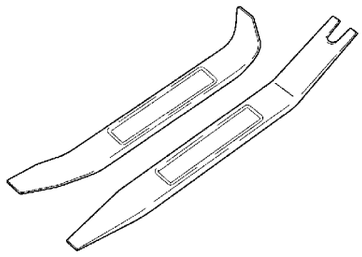
Battery Tester
PU-50296

Bearing Removal Kit
PF-51324-A

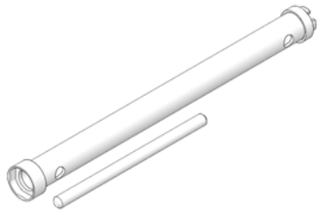
Belt Tension Meter
PV-43532



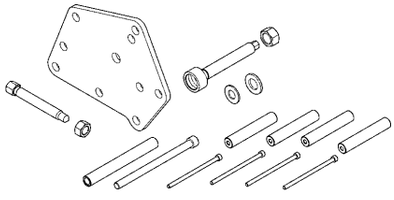
Body Panel Tool Kit
PV-49955



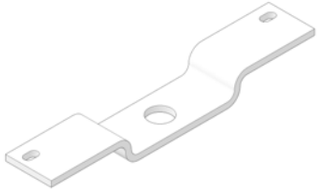
Cartridge Shaft Tool
PV-49452



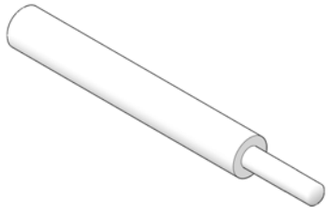
Crankcase Tool
PF-51234-A



Clutch Shaft Holding Tool
PF-51232



Crankshaft Locking Pin
PF-51235-A

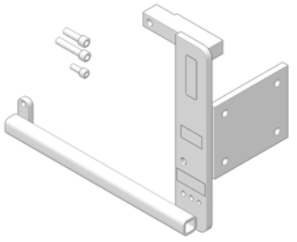


Crankshaft Rotation Tool
PF-51239

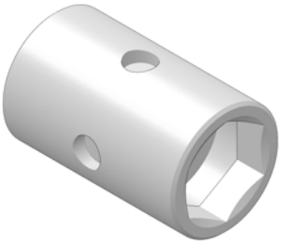
Damper Rod Holder
PV-49453

Electrical Tester Kit
PV-43526

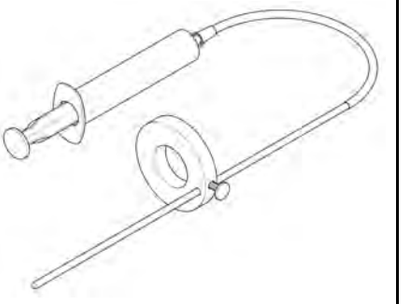
Engine Stand Adapter
PF-51240



Fork Spring Compressor Adapter
PV-49464

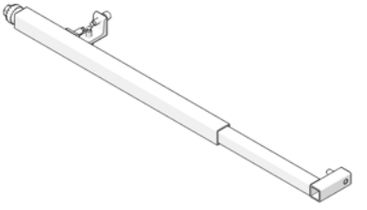


Fork Oil Level Tool
PV-59000-A

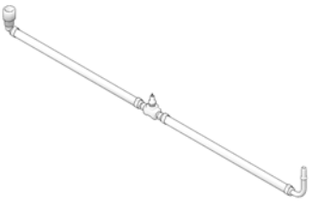


Inverted Fork Seal Installer
PV-47035

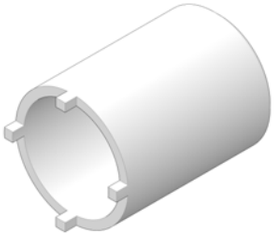
Fork Spring Compressor
PV-49463



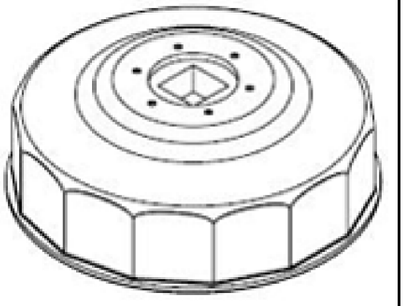
Fuel Pressure Adapter
PV-48656



Spanner Socket (Stem)
PV-43508



Oil Filter Wrench
PU-50105



Fuel Pressure Gauge
PU-43506-A

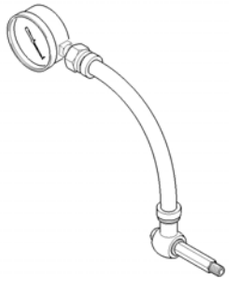
Swing-Arm Bushing Tool
PF-51237

MultiLink XP
PU-52792

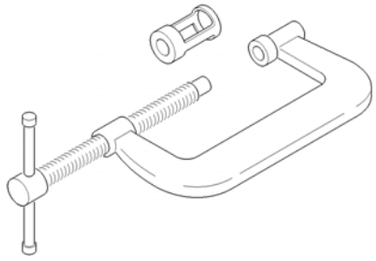
TPMS Activation Tool
PF-51288-A

Rocker Arm Compression Tool
PF-52939

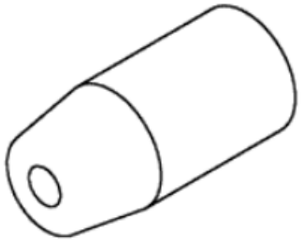
Oil Pressure Gauge
Commercially Available



Valve Spring Compressor Tool
PV-1253



Seal Guide (43mm)
PV-47037



DIGITAL WRENCH

DIGITAL WRENCH II USER MANUAL

NOTICE
Digital Wrench® II is only available for authorized dealers.

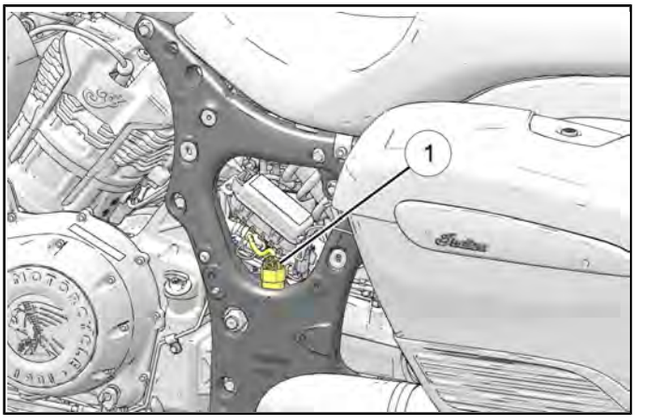
Review the Digital Wrench II user manual for information and details regarding the following:

- Software Installation
- Software Updates
- Software Screens/Menus
- Connecting to a Vehicle

Click HERE to view the Digital Wrench II user manual or visit "Other Publications" on the left navigation menu of the DEX STOP site.

DIGITAL WRENCH DIAGNOSTIC CONNECTOR

The diagnostic connector ① is located under the left-hand side cover, below the fuse box.



Follow these steps to connect the diagnostic interface cable to the vehicle:

1. Assemble the SmartLink Module and attach the PC Interface Cable to your laptop.
2. Unplug the Digital Wrench connector from it's protective receptacle.
3. Connect the Vehicle Interface Cable to the Digital Wrench diagnostic connector.
4. Press the ON button to power up the motorcycle electrical system and switch the STOP / RUN switch to the RUN position.
5. Select the appropriate vehicle and wait for the status to display 'Connected' in the lower left corner of the screen.
6. Once connected, proceed with using Digital Wrench.

NOTICE
Required Digital Wrench Special Tools are listed in the User Manual. See **Digital Wrench II User Manual page 1.16**

REFERENCE

MASTER TORQUE TABLE

CHAPTER 2: MAINTENANCE	
ITEM	**TORQUE**
Airbox Filter Cover Fastener	**88 in-lbs (10 N·m)**
Battery Bracket Fastener	**88 in-lbs (10 N·m)**
Battery Terminal Fastener	**48 in-lbs (5.4 N·m)**
Chin Fairing Fastener	**35 in-lbs (4 N·m)**
Clutch Cable Jam Nut	**53 in-lbs (6 N·m)**
Oil Drain Plug	**15 ft-lbs (20 N·m)**
Oil Filter	**Approximately 3/4 turn after seal has contacted the filter adapter.**
Shift Rod Jam Nut	**88 in-lbs (10 N·m)**
Sidestand Pivot Fastener	**37 ft-lbs (50 N·m)**
Sidestand Mount Fastener	**45 ft-lbs (61 N·m)**
Spark Plug	**88 in-lbs (10 N·m)**

CHAPTER 3: ENGINE / COOLING / EXHAUST	
ITEM	**TORQUE**
ACG Cover Fastener	**88 in-lbs (10 N·m)**
Battery Box Fastener	**18 ft-lbs (24 N·m)**
Breather Fastener	**88 in-lbs (10 N·m)**
Bypass Tube Fastener	**88 in-lbs (10 N·m)**
Camshaft Chain Tensioner	**15 ft-lbs (20 N·m)**
Camshaft Sprocket Fastener	**159 in-lbs (18 N·m)**
Camshaft Thrust Plate Fastener	**62 in-lbs (7 N·m)**
Chain Guide Fastener (All)	**84 in-lbs (10 N·m)**
Connecting Rod Fastener	**1. Torque to 19 ft-lbs (26 N·m) 2. Torque angle to 105 °**
Camshaft Chain oil Jet Fastener	**62 in-lbs (7 N·m)**
Cooling Fan Fastener	**35 in-lbs (4 N·m)**
Coolant Line Fastener	**88 in-lbs (10 N·m)**
Crankcase Fastener	**22 ft-lbs (30 N·m)**
Cylinder Head Bolt	**88 in-lbs (10 N·m)**
Cylinder Head Nut	**1. Torque fasteners to 15 ft-lbs (20 N·m) 2. Back off 90 ° 3. Torque all fasteners to 26 ft-lbs (35 N·m) 4. Torque angle all 360 °**
Cylinder Stud	**25 ft-lbs (34 N·m)**
Dash Closeout Fastener	**35 in-lbs (4 N·m)**
Knock Sensor	**15 ft-lbs (20 N·m)**
Engine Mount Fastener	**45 ft-lbs (61 N·m)**
Exhaust Clamp	**7 ft-lbs (9 N·m)**
Exhaust Manifold Stud	**15 ft-lbs (20 N·m)**
Fairing Louver Fastener	**35 in-lbs (4 N·m)**
Filter Adapter	**22 ft-lbs (30 N·m)**
Flywheel Fastener	**83 ft-lbs (112 N·m)**
Headpipe Nut	**1. Torque front header lower nut to 7 ft-lbs (9 N·m) 2.Torque front header upper nut to 7 ft-lbs (9 N·m) 3.Torque rear header bottom nut to 7 ft-lbs (9 N·m) 4.Torque rear header top nut to 7 ft-lbs (9 N·m) 5.Torque front header nuts (starting with lower) to 15 ft-lbs (20 N·m) 6.Torque rear header nuts (starting with lower) to 15 ft-lbs (20 N·m)**
Heat Shield Clamp	**31 in-lbs (3 N·m)**
Heat Shield Fasteners, Lower	**88 in-lbs (10 N·m)**

Intake Manifold Fasteners (left-hand side) Intake Manifold Fasteners (right-hand side installed with special tool 5264374)	**88 in-lbs (10 N·m)** **80 in-lbs (9 N·m)**
Input Shaft Feed Tube Fastener	**88 in-lbs (10 N·m)**
Lower Fairing Bracket Fastener	**18 ft-lbs (24 N·m)**
Muffler Clamp	**40 ft-lbs (54 N·m)**
Muffler Fastener	**18 ft-lbs (24 N·m)**
Oil Filter Adapter Fastener	**88 in-lbs (10 N·m)**
Oil Pickup Fastener	**88 in-lbs (10 N·m)**
Oil Pressure Feed tube Fastener	**84 in-lbs (10 N·m)**
Oil Pressure Switch	**115 in-lbs (13 N·m)**
Oil Pump Fastener	**88 in-lbs (10 N·m)**
Oil Pump Scavenge Tube Fastener	**88 in-lbs (10 N·m)**
Oil Scavenge Tube Fastener	**88 in-lbs (10 N·m)**
Oxygen Sensor	**14 ft-lbs (19 N·m)**
Piston Cooling Jet Fastener	**62 in-lbs (7 N·m)**
Radiator Mount Fastener	**88 in-lbs (10 N·m)**
Recovery Bottle Fastener (Lower)	**88 in-lbs (10 N·m)**
Recovery Bottle Fastener (Upper)	**35 in-lbs (4 N·m)**
Resonator Mount to Frame / Transmission Shield Fastener (M8)	**18 ft-lbs (24 N·m)**
Resonator Mount to Frame Fastener / Transmission Shield Fastener (M6)	**88 in-lbs (10 N·m)**
Resonator to Resonator Bracket Fastener	**18 ft-lbs (24 N·m)**
Rocker Shaft Cap Fastener	**27 ft-lbs (37 N·m)**
Scavenge Oil Inlet Screen Fastener	**88 in-lbs (10 N·m)**

Sidestand Switch Fastener	**44 in-lbs (5 N·m)**
Speaker Assembly Fastener	**35 in-lbs (4 N·m)**
Sprag Clutch Fastener	**88 in-lbs (10 N·m)**
Stator Fastener	**88 in-lbs (10 N·m)**
Thermostat Cover Fastener	**88 in-lbs (10 N·m)**
Thermostat Mounting Bracket Fastener	**88 in-lbs (10 N·m)**
Transmission Feed Rail Fastener	**88 in-lbs (10 N·m)**
Valve Cover Fastener	**88 in-lbs (10 N·m)**
Water Pump Chain Tensioner Fastener	**88 in-lbs (10 N·m)**
Water Pump Fastener	**88 in-lbs (10 N·m)**
Water Pump Sprocket Fastener	**88 in-lbs (10 N·m)**

CHAPTER 4: FUEL DELIVERY / EFI	
ITEM	**TORQUE**
Airbox Hatch Cover Fastener	**88 in-lbs (10 N·m)**
Airbox Filter Cover Fastener	**88 in-lbs (10 N·m)**
Crankshaft Position Sensor Fastener	**88 in-lbs (10 N·m)**
Cylinder Head Temperature Sensor	**15 ft-lbs (20 N·m)**
Fuel Access Plate Fastener	**44 in-lbs (5 N·m)**
Fuel Cap Fastener	**44 in-lbs (5 N·m)**
Fuel Injector Fastener	**88 in-lbs (10 N·m)**
Fuel Rail Fastener	**62 in-lbs (7 N·m)**
Fuel Tank Console Fastener	**88 in-lbs (10 N·m)**
Fuel Tank Mounting Fastener	**18 ft-lbs (24 N·m)**
Hose Clamp	**26 in-lbs (3 N·m)**
Ignition Coil Fastener	**88 in-lbs (10 N·m)**
Ignition Coil Bracket Fastener	**88 in-lbs (10 N·m)**
Pinion Shaft Retention Fastener	**62 in-lbs (7 N·m)**
Reed Plate Fastener	**62 in-lbs (7 N·m)**
Throttle Body Inlet Adapter Fastener	**88 in-lbs (10 N·m)**
TMAP Sensor Fastener	**18 in-lbs (2 N·m)**
V-Cover Fastener	**88 in-lbs (10 N·m)**
V-Cover Bracket Fastener	**88 in-lbs (10 N·m)**

CHAPTER 5: CLUTCH / PRIMARY / SHIFT	
ITEM	**TORQUE**
Clutch Cable Mount Fastener	**88 in-lbs (10 N·m)**
Cold Start Cover Fastener	**88 in-lbs (10 N·m)**
Clutch Stake Nut	**125 ft-lbs (170 N·m)**
Detent Lever Fastener	**88 in-lbs (10 N·m)**
Locking Plate Fastener	**88 in-lbs (10 N·m)**
Primary Cover Fastener (Inner)	**88 in-lbs (10 N·m)**
Primary Cover Fastener (Outer)	**88 in-lbs (10 N·m)**
Primary Drive Gear Fastener	**83 ft-lbs (112 N·m)**
Shift Star Fastener	**88 in-lbs (10 N·m)**
Stopper Plate Fastener	**62 in-lbs (7 N·m)**

CHAPTER 6: TRANSMISSION / CRANKSHAFT	
ITEM	**TORQUE**
Balance Shaft Gear Fastener	**59 ft-lbs (80 N·m)**
Balance Shaft Shield Fastener	**62 in-lbs (7 N·m)**
Balance Shaft Retainer Fastener	**88 in-lbs (10 N·m)**
Balance Shaft Retainer Plate Fastener	**62 in-lbs (7 N·m)**
Bearing Retainer Plate Fastener	**62 in-lbs (7 N·m)**
Crankshaft Blind Plug	**15 ft-lbs (20 N·m)**
Crankshaft Tone Ring Fastener	**18 ft-lbs (24 N·m)**
Connecting Rod Fastener	**1. Torque to 19 ft-lbs (26 N·m)** **2. Torque angle to 105 °**
Input Shaft Oil Plug	**13 ft-lbs (18 N·m)**

CHAPTER 7: FRAME / BODY	
ITEM	**TORQUE**
ABS Mount Bracket Fastener (Allen Head)	**88 in-lbs (10 N·m)**
ABS Mount Bracket Fastener (Hex Head)	**88 in-lbs (10 N·m)**
Air Deflector Fastener	**35 in-lbs (4 N·m)**
Antenna Harness Fastener (Touring)	**27 in-lbs (3 N·m)**
Antenna Mount Fastener (Touring)	**27 in-lbs (3 N·m)**
Brake Pedal Pad Fastener	**88 in-lbs (10 N·m)**
Cylinder Head Bracket Fastener	**75 ft-lbs (102 N·m)**
Dash Closeout Fastener	**35 in-lbs (4 N·m)**
Dash Fastener	**35 in-lbs (4 N·m)**
Dash Support Fastener	**88 in-lbs (10 N·m)**
Dash Trim Fastener	**35 in-lbs (4 N·m)**
Display Bezel Fastener	**35 in-lbs (4 N·m)**
Enclosure Fastener	**35 in-lbs (4 N·m)**
Fairing Bracket Nut	**18 ft-lbs (24 N·m)**
Fairing Support to Downcast Fastener	**18 ft-lbs (24 N·m)**
Fairing Support to Fairing Bracket Fastener	**18 ft-lbs (24 N·m)**
Fairing Tray Fastener	**35 in-lbs (4 N·m)**
Fender Closeout Lower Fastener	**88 in-lbs (10 N·m)**
Fender Closeout Bracket Fastener	**88 in-lbs (10 N·m)**
Fender Fastener (Front)	**18 ft-lbs (24 N·m)**
Fender Fastener (Rear) M6	**88 in-lbs (10 N·m)**
Fender Fastener (Rear) M8	**18 ft-lbs (24 N·m)**
Floorboard Base Fastener	**18 ft-lbs (24 N·m)**
Floorboard Bracket Fastener	**35 ft-lbs (47 N·m)**
Fog Light Bracket Fastener	**35 in-lbs (4 N·m)**
Footpeg Fastener	**35 ft-lbs (47 N·m)**
Front Downcast Fastener	**45 ft-lbs (61 N·m)**
Fuel Tank Mount Bracket Fastener	**18 ft-lbs (24 N·m)**
Fuse Block Mount Bracket Fastener	**88 in-lbs (10 N·m)**
Grabstrap Fastener	**35 in-lbs (4 N·m)**
Headlight Bezel Assembly Fastener	**35 in-lbs (4 N·m)**
Headlight Fastener (Torx)	**35 in-lbs (4 N·m)**
Headlight Bracket Fastener	**35 in-lbs (4 N·m)**
Highway Bar Fastener	**45 ft-lbs (61 N·m)**
Highway Bar Clamp Fastener	**35 in-lbs (4 N·m)**
Hinge Cover Fastener	**35 in-lbs (4 N·m)**
Inner Duct Fastener	**15 in-lbs (2 N·m)**
Latch Hoop Fastener	**35 in-lbs (4 N·m)**
Leaf Hinge Fastener	**35 in-lbs (4 N·m)**
Limiter Fastener	**15 in-lbs (2 N·m)**
Lower Fairing Fastener	**35 in-lbs (4 N·m)**
Lower Fairing Cubby Fastener	**35 in-lbs (4 N·m)**
Lower Side Cover Accent Fastener	**88 in-lbs (10 N·m)**
Midcast Fastener (M12)	**75 ft-lbs (102 N·m)**
Midcast Fastener (M10)	**35 ft-lbs (47 N·m)**
Outer Duct Fastener	**35 in-lbs (4 N·m)**
Outer Fairing Fastener	**35 in-lbs (4 N·m)**
Passenger Floorboard Pivot Fastener	**19 ft-lbs (25 N·m)**
Passenger Floorboard Mount Fastener	**33 ft-lbs (45 N·m)**
Pivot Shaft	**50 ft-lbs (68 N·m)**
Power Supply Fastener	**88 in-lbs (10 N·m)**
Rear Lower Subframe Fastener	**18 ft-lbs (24 N·m)**

Ride Command Display Fastener	**35 in-lbs (4 N·m)**
Saddlebag Fastener	**18 ft-lbs (24 N·m)**
Saddlebag Lock Fastener	**62 in-lbs (7 N·m)**
Saddlebag Mount Fastener	**88 in-lbs (10 N·m)**
Saddlebag Spool Fastener	**32 ft-lbs (43 N·m)**
Seat Bracket Fastener	**52 in-lbs (6 N·m)**
Seat Fastener	**18 ft-lbs (24 N·m)**
Seat / Trunk Harness Cover Fastener	**35 in-lbs (4 N·m)**
Seat Pan Fastener	**88 in-lbs (10 N·m)**
Shift Linkage Fastener	**88 in-lbs (10 N·m)**
Sidestand Stop Bracket Fastener	**88 in-lbs (10 N·m)**
Speaker Fastener	**25 in-lbs (3 N·m)**
Sprocket Cover Fastener	**88 in-lbs (10 N·m)**
Storage Door Fastener	**35 in-lbs (4 N·m)**
Tipover Cover Fastener	**18 ft-lbs (24 N·m)**
Trunk to frame Fastener	**12 in-lbs (1 N·m)**
Trunk Lock Fastener	**12 in-lbs (1 N·m)**
Trunk to Frame Arm Fastener	**12 in-lbs (1 N·m)**
Trunk Luggage Rack Fastener	**88 in-lbs (10 N·m)**
Trunk Latch Hoop Fastener	**35 in-lbs (4 N·m)**
Trunk Lock Actuator Fastener	**13 ft-lbs (18 N·m)**
Trunk Bezel Fastener	**12 in-lbs (1 N·m)**
Trunk Tail Light Fastener	**12 in-lbs (1 N·m)**
Trunk Speaker Cover / Backrest Fastener	**35 in-lbs (4 N·m)**
Turn Signal Bezel Fastener	**15 in-lbs (2 N·m)**
Turn Signal Fastener	**88 in-lbs (10 N·m)**
Under-Seat Wire Bracket Fastener	**88 in-lbs (10 N·m)**
Upper Duct Fastener	**15 in-lbs (2 N·m)**

Visor Top Fastener	**35 in-lbs (4 N·m)**
VCM2 Fastener	**15 in-lbs (2 N·m)**
Wire Cover Fastener	**15 in-lbs (2 N·m)**
Wire Guide Fastener (Lower)	**15 in-lbs (2 N·m)**
Wire Guide Fastener (Upper)	**88 in-lbs (10 N·m)**
Windshield Fastener	**35 in-lbs (4 N·m)**
Windshield Support to Link Fastener	**88 in-lbs (10 N·m)**
Windshield Support to Motor Fastener	**88 in-lbs (10 N·m)**
Windshield Link to Pivot Fastener	**88 in-lbs (10 N·m)**
Windshield Motor Fastener	**88 in-lbs (10 N·m)**

CHAPTER 8: STEERING / SUSPENSION	
ITEM	**TORQUE**
Axle Nut (Rear)	**65 ft-lbs (84 N·m)**
Belt Guard Fastener	**96 in-lbs (11 N·m)**
Cartridge Screw	**17 ft-lbs (23 N·m)**
Clutch Cable Routing Clip Fastener	**88 in-lbs (10 N·m)**
Clutch Perch Fastener	**96 in-lbs (11 N·m)**
Drive Sprocket Lock Washer Fastener	**88 in-lbs (10 N·m)**
Drive Sprocket Nut	**165 ft-lbs (224 N·m)**
Fork Cap Nut	**11 ft-lbs (15 N·m)**
Fork Cap	**17 ft-lbs (23 N·m)**
Front Axle	**52 ft-lbs (70 N·m)**
Front Axle Pinch Fastener	**19 ft-lbs (26 N·m)**
Gusset Plate Fastener	**96 ft-lbs (130 N·m)**
Handlebar Riser Clamp Fastener	**18 ft-lbs (24 N·m)**
Handlebar Riser Fastener (M12)	**60 ft-lbs (81 N·m)**
Lower Fork Clamp Fastener	**18 ft-lbs (24 N·m)**
Mirror Jam Nut	**12 ft-lbs (16 N·m)**
P-clamp Fastener	**88 in-lbs (10 N·m)**
Rocker Fastener	**96 ft-lbs (130 N·m)**
Rotation Sensor Fastener	**16 ft-lbs (22 N·m)**
Seat Fastener	**18 ft-lbs (24 N·m)**
Shock Adjuster Bracket Mount Fastener M8	**18 ft-lbs (24 N·m)**
Shock Adjuster Bracket Mount Fastener M6	**96 in-lbs (11 N·m)**
Shock Adjuster Fastener	**18 ft-lbs (24 N·m)**
Shock Fastener	**96 ft-lbs (130 N·m)**
Steering Head Nut	**1. Torque to 29 ft-lbs (39 N·m)** **2. Turn assembly lock to lock 5 times** **3. Loosen 60 °** **4. Install Triple clamp and tighten top nut 72 ft-lbs (98 N·m)**
Steering Lock Fastener	**18 ft-lbs (24 N·m)**
Swing-Arm Pivot Shaft	**96 in-lbs (11 N·m)**
Swing-Arm Pivot Jam Nut	**75 ft-lbs (101 N·m)**
Swing-Arm Pivot Nut (Nylock)	**65 ft-lbs (88 N·m)**
Switch Cube Cover Fastener	**12 in-lbs (1 N·m)**
Switch Cube Fastener	**12 in-lbs (1 N·m)**
Tire Pressure Sensor Fastener	**72 in-lbs (8 N·m)**
Top Triple Clamp Nut	**72 ft-lbs (98 N·m)**
Upper Fork Clamp Fastener	**18 ft-lbs (24 N·m)**
Valve Stem Nut	**53 in-lbs (6 N·m)**

CHAPTER 9: BRAKES	
ITEM	**TORQUE**
ABS Module Fastener	**88 in-lbs (10 N·m)**
Banjo Bolt	**18 in-lbs (24 N·m)**
Bleed Screw (Front)	**80 in-lbs (9 N·m)**
Bleed Screw (Rear)	**53 in-lbs (6 N·m)**
Brake Caliper Fastener (Front)	**36 ft-lbs (48 N·m)**
Brake Caliper Fastener (Rear)	**31 ft-lbs (42 N·m)**
Brake Caliper Guide Pin (Rear)	**106 in-lbs (13 N·m)**
Brake Caliper Retainer Fastener (Rear)	**20 ft-lbs (27 N·m)**
Brake Lever Pivot Pin (Front)	**9 in-lbs (1 N·m)**
Brake Lever Pivot Pin Nut (Front)	**52 in-lbs (6 N·m)**
Brake Pad Retaining Pin (Front)	**53 in-lbs (6 N·m)**
Brake Pad Retaining Pin (Rear)	**150 in-lbs (17 N·m)**

Brake Rotor Screw	**22 ft-lbs (30 N·m)**
Junction Block Fastener	**88 in-lbs (10 N·m)**
Master Cylinder Banjo Bolt	**18 ft-lbs (24 N·m)**
Master Cylinder Clamp Fastener (Front)	**96 in-lbs (11 N·m)**
Master Cylinder Cover Fastener (Front)	**13 in-lbs (1.5 N·m)**
Master Cylinder Cover Fastener (Rear)	**13 in-lbs (1.5 N·m)**
Master Cylinder Fastener (Rear)	**18 ft-lbs (24 N·m)**
Under-Seat Bracket Fastener	**88 in-lbs (10 N·m)**
Wheel Speed Sensor Fastener	**88 in-lbs (10 N·m)**

CHAPTER 10: ELECTRICAL	
ITEM	**TORQUE**
Battery Box Fastener	**18 ft-lbs (24 N·m)**
Clutch Switch Fastener	**5 in-lbs (0.55 N·m)**
Clutch Switch Cover Fastener	**5 in-lbs (0.55 N·m)**
Drive Sprocket Shield Fastener	**88 in-lbs (10 N·m)**
Gear Position Sensor Fastener	**44 in-lbs (5 N·m)**
Headlight Carrier Fastener	**12 in-lbs (1 N·m)**
Headlight Retention Ring Fastener	**12 in-lbs (1 N·m)**
Headress Fastener	**35 in-lbs (4 N·m)**
Horn Bracket Fastener	**88 in-lbs (10 N·m)**
IMU Fastener	**62 in-lbs (7 N·m)**
J-Case / Voltage Regulator Fastener	**88 in-lbs (10 N·m)**
License Plate Bracket Fastener	**88 in-lbs (10 N·m)**
License Plate Light Assembly Fastener	**88 in-lbs (10 N·m)**
License Plate Light Fastener	**16 in-lbs (2 N·m)**
Puddle Light Fastener	**88 in-lbs (10 N·m)**
Stator Cover Fastener	**88 in-lbs (10 N·m)**
Stator Fastener	**88 in-lbs (10 N·m)**
Starter Mount Fastener	**88 in-lbs (10 N·m)**
Starter Solenoid Fastener	**88 in-lbs (10 N·m)**
Starter Solenoid Terminal Fastener	**44 in-lbs (5 N·m)**
Starter Terminal Fastener	**88 in-lbs (10 N·m)**
Tail Light Mount Bracket Fastener	**88 in-lbs (10 N·m)**
Turn Signal Fastener (Front)	**15 in-lbs (2 N·m)**
Turn Signal Fastener (Rear)	**88 in-lbs (10 N·m)**
VCM 1 Fastener	**88 in-lbs (10 N·m)**
VCM 2 Fastener	**15 in-lbs (2 N·m)**

SAE TAP DRILL SIZES

THREAD SIZE / DRILL SIZE		**THREAD SIZE / DRILL SIZE**	
#0-80	3/64	1/2-13	27/64
#1-64	#53	1/2-20	29/64
#1-72	#53	9/16-12	31/64
#2-56	#51	9/16-18	33/64
#2-64	#50	5/8-11	17/32
#3-48	5/64	5/8-18	37/64
#3-56	#45	3/4-10	21/32
#4-40	#43	3/4-16	11/16
#4-48	#42	7/8-9	49/64
#5-40	#38	7/8-14	13/16
#5-44	#37	1-8	7/8
#6-32	#36	1-12	59/64
#6-40	#33	1 1/8-7	63/64
#8-32	#29	1 1/8-12	1 3/64
#8-36	#29	1 1/4-7	1 7/64
#10-24	#24	1 1/4-12	1 11/64
#10-32	#21	1 1/2-6	1 11/32
#12-24	#17	1 1/2-12	1 27/64

THREAD SIZE / DRILL SIZE		THREAD SIZE / DRILL SIZE	
#12-28	#15	1 3/4-5	1 9/16
1/4-20	7	1 3/4-12	1 43/64
1/4-28	3	2-4 1/2	1 25/32
5/16-18	F	2-12	1 59/64
5/16-24	I	2 1/4-4 1/2	2 1/32
3/8-16	O	2 1/2-4	2 1/4
3/8-24	Q	2 3/4-4	2 1/2
7/16-14	U	3-4	2 3/4
7/16-20	25/64		

METRIC TAP DRILL SIZES

TAP SIZE	DRILL SIZE	DECIMAL EQUIVA-LENT	NEAREST FRAC-TION
3x.50	#39	0.0995	3/32
3x.60	3/32	0.0937	3/32
4x.70	#30	0.1285	1/8
4x.75	1/8	0.125	1/8
5x.80	#19	0.166	11/64
5x.90	#20	0.161	5/32
6x1.00	#9	0.196	13/64
7x1.00	16/64	0.234	15/64
8x1.00	J	0.277	9/32
8x1.25	17/64	0.265	17/64
9x1.00	5/16	0.3125	5/16
9x1.25	5/16	0.3125	5/16
10x1.25	11/32	0.3437	11/32
10x1.50	R	0.339	11/32
11x1.50	3/8	0.375	3/8
12x1.50	13/32	0.406	13/32
12x1.75	13/32	0.406	13/32

DECIMAL EQUIVALENTS

1/64 in = .0156 in

1/32 in = .0312 in [1 mm = .0394 in]

3/64 in = .0469 in

1/16 in = .0625 in

5/64 in = .0781 in [2 mm = .0787 in]

3/32 in = .0938 in

7/64 in = .1094 in [3 mm = .1181 in]

1/8 in = .1250 in

9/64 in = .1406 in

5/32 in = .1563 in [4 mm = .1575 in]

11/64 in = .1719 in

3/16 in = .1875 in [5 mm = .1969 in]

13/64 in = .2031 in

7/32 in = .2188 in

15/64 in = .2344 in [6 mm = .2362 in]

1/4 in = .25 in

17/64 in = .2656 in [7 mm = .2756 in]

9/32 in = .2813 in

19/64 in = .2969 in

5/16 in = .3125 in [8mm= .3150 in]

21/64 in = .3281 in

11/32 in = .3438 in [9 mm = .3543 in]

23/64 in = .3594 in

3/8 in = .375 in

25/64 in = .3906 in [10 mm = .3937 in]

13/32 in = .4063 in

27/64 in = .4219 in [11 mm =.4331 in]

7/16 in = .4375 in

29/64 in = .4531 in

15/32 in = .4688 in [12 mm = .4724 in]

31/64 in = .4844 in

1/2 in = .5 in [13mm = .5118 in]

33/64 in = .5156 in

17/32 in = .5313 in

35/64 in = .5469 in [14 mm = .5512 in]

9/16 in = .5625 in

37/64 in = .5781 in [15 mm = .5906 in]

19/32 in = .5938 in

39/64 in = .6094 in

5/8 in = .625 in [16mm=. 6299 in]

41/64 in = .6406 in

21/32 in = .6563 in [17 mm = .6693 in]

43/64 in = .6719 in

11/16 in = .6875 in

45/64 in = .7031 in [18 mm = .7087 in]

23/32 in = .7188 in

47/64 in = .7344 in [19 mm = .7480 in]

3/4 in = .75 in

49/64 in = .7656 in

25/32 in = .7813 in [20 mm = .7874 in]

51/64 in = .7969 in

13/16 in = .8125 in [21 mm =. 8268 in]

53/64 in = .8281 in

27/32 in = .8438 in

55/64 in = .8594 in [22 mm = .8661 in]

7/8 in = .875 in

57/64 in = .8906 in [23 mm = .9055 in]

29/32 in = .9063 in

59/64 in = .9219 in

15/16 in = .9375 in [24 mm = .9449 in]

61/64 in = .9531 in

31/32 in = .9688 in [25 mm = .9843 in]

63/64 in = .9844 in

1 in = 1.0 in

FAHRENHEIT TO CELSIUS

°C to °F: 9 (°C + 40) ¸ 5 - 40 = °F

°F to °C: 5 (°F + 40) ¸ 9 - 40=°C

DEGREES F	DEGREES C
32	0
41	5
50	10
59	15
68	20
77	25
86	30
95	35
104	40
113	45
122	50
131	55
140	60
149	65
158	70
167	75
176	80
185	85
194	90
203	95
212	100

MEASUREMENT CONVERSION CHART

UNIT OF MEASURE	MULTIPLIED BY	COVERTS TO
ft-lbs	x 12	= in-lbs
in-lbs	x.0833	= ft-lbs
ft-lbs	x 1.356	= Nm
in-lbs	x.0115	= kg-m
Nm	x.7376	= ft-lbs
kg-m	x 7.233	= ft-lbs
kg-m	x 86.796	= in-lbs
kg-m	x 10	= Nm
in	x 25.4	= mm
mm	x.03937	= in
in	x 2.54	= cm
mile	x 1.6	= km
km	x.6214	= mile
Ounces (oz)	x 28.35	= grams (g)
Fluid Ounce	x 29.57	= CCs
grams (g)	x.035	= Ounces (oz)
cc's	x.03381	= Fluid Ounces (oz)
lbs	x.454	= kg
kg	x 2.2046	= lbs
Cubic Inches	x 16.387	= Cubic Centimeters
Cubic Centimeters	x.061	= Cubic Inches
Imperial pints	x.568	= liters (l)
liters (l)	x 1.76	= Imperial pints
Imperial quarts	x 1.137	= liters (l)
liters (l)	x.88	= Imperial quarts
Imperial quarts	x 1.201	= US quarts
US quarts	x.833	= Imperial quarts
US quarts	x.946	= liters
liters	x 1.057	= US quarts
US gallon	x 3.785	= liter
liter	x .264	= US gallon

UNIT OF MEASURE	MULTIPLIED BY	COVERTS TO
Pounds force per square inch (psi)	x 6.895	= Kilo pascals (kPa)
Kilo pascals (kPa)	x .145	= Pounds force per square inch (psi)
Kilo pascals (kPa)	x .01	= Kilograms force per cm^2
Kilograms force per cm^2	x 98.1	= Kilo pascals (kPa)
p (3.14159) x R^2 x H (height)		= Cylinder Volume

NOTES

CHAPTER 2
MAINTENANCE

2

MAINTENANCE QUICK REFERENCE GUIDE

SPECIFICATIONS – MAINTENANCE

GENERAL SPECIFICATIONS

ITEM	STANDARD	SERVICE LIMIT
Battery Type / CCA	12 Volt / 18 AH / 310 CCA	—
Brake Pad Thickness, Front	.16 in (4.0 mm)	.04 in (1.0 mm)
Brake Disc Thickness, Front	.20 in (5.0 mm)	.18 in (4.5 mm)
Brake Pad Thickness, Rear	.25 in (6.5 mm)	.04 in (1.0 mm) Minimum
Brake Disc Thickness, Rear	.28 in (7 mm)	.26 in (6.5 mm)
Clutch Lever Freeplay	.019–.059" (0.5–1.5 mm)	—
Compression Pressure (Cylinder)	85-115 psi (586-763 kPa)	Below 80 psi (552 kPa)
Drive Belt Deflection (with 10 lbs force)	0.6" (15 mm) - New Belt 0.79" (20 mm) - Belt with 1000+ miles	—
Fuel Pressure (KOEO)	58 psi (400 kPa)	Minimum fuel pressure: 55 psi (380 kPa)
Idle Speed / Fast Idle Speed	900 RPM	±50 RPM
Oil Pressure, Lubrication @ 3000 rpm	60 PSI (414 kPa) ± 15% Engine at operating temperature.	30 PSI (207 kPa)
Ride Height (Rear Spring Pre-Load)	See adjustment procedure outlined in this chapter	—
Spark Plug Type Spark Plug Gap	NGK LZMAR8AI-10 0.039 in (1.0 mm)	—
Tire Pressure	FRONT: 36 PSI (248 kPa)	—
	REAR: 41 PSI (276 kPa)	—
Tire Tread Depth (Minimum)	—	.063 in (1.6 mm)
Valve Lash (Int. / Ex.)	NOT ADJUSTABLE (Lash is self-adjusting via hydraulic lifters)	—

FLUID SPECIFICATIONS

DESCRIPTION	FLUID TYPE	CAPACITY
Brake Hydraulic Fluid	DOT 4	—
Engine / Transmission Oil	Semi-Synthetic 15W60 Engine Oil	**5.0 qts (4.7 L)**
Coolant	50/50 Premix Extended Life Antifreeze	2.5 qts (2.4L)
Fork Oil	Indian Motorcycle Fork Oil	18.1 oz (535 cc) per leg
Fuel	91 Octane (Recommended)	Total Usable: 6.0 gal (22.7 L) / Reserve 1.0 gal (3.8 L)

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INDIAN MOTORCYCLE SERVICE PRODUCTS AND LUBRICANTS

MAINTENANCE PRODUCT PART NUMBERS

PRODUCT		PART NUMBER
All Purpose Grease	14 oz	2872187
Anti-Freeze, 50/50 Extended Life	1 quart (32 oz)	2880966
Brake Fluid, DOT 4	12 oz	2880016
Carbon Cleaner, Fuel	12 oz	2881911
Crankcase Sealant (Loctite Ultra Black 598)		Commercially Available
Fork Oil	1 quart	2884244
Starter Grease	2 oz	2871460
Oil Change Kit	15W-60	2884171
Synthetic 15W-60 Engine Lubricant	1 quart	2880187
	55 gal drum	2880188
Synthetic Transmission Oil (Pre 2013)	1 quart	2880014

MAINTENANCE INTERVALS

The maintenance interval charts outline required maintenance and inspection based on vehicle miles. Each table states the number of miles that service is required on the vehicle. Some items or components may need to be serviced more often due to severe use. When the vehicle goes beyond 50,000 miles, return to the 500 mile chart and start the interval process over.

IMPORTANT
Indian Motorcycle recommends performing a Engine Oil & Filter change every 12 months regardless of milage.

XU - Perform these procedures more often for vehicles subjected to severe use.

D - Have an authorized Indian Motorcycle dealer perform these services.

E - Emission Control System Service (California / International)

500 MILE (800 KM) SERVICE

ITEM		REMARKS
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
D	Drive Belt	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Engine Mount Fasteners	Inspect; tighten, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary. Check and re-torque all sealed exhaust joints
D	Fuel System	Inspect
	Key Fob Battery	Replace at specified interval or every 2 years
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Inspect; lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Inspect
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test

D	COOLING SYSTEM / RADIATOR	INSPECT
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

2,500 MILE (4,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Inspect; clean
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Inspect; adjust if necessary, lubricate with proper lubricant as directed
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Inspect; adjust if necessary, lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

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5,000 MILE (8,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Inspect; clean
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Inspect; lubricate if necessary
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Inspect; lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Replace at specified interval or every 2 years
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Inspect; adjust if necessary, lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

10,000 MILE (16,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Replace
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
D	Engine Compression	Inspect
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary. Check and re-torque all sealed exhaust joints
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
D / E	Spark Plugs	Inspect; torque to specification
	Battery	Check terminals; clean; test
D	Brake Fluid	Replace (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Replace at specified interval or every 2 years
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Lubricate with proper lubricant as directed
D	Gear Position Switch	Inspect; clean.
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Lubricate with proper lubricant as directed
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

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15,000 MILE (24,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Inspect; clean
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Inspect; lubricate if necessary
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Inspect; lubricate if necessary
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Replace
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Inspect; adjust if necessary, lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

20,000 MILE (32,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Replace
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
D	Engine Compression	Inspect
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary. Check and re-torque all sealed exhaust joints
D	Fuel System	Inspect
	Key Fob Battery	Replace
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
D / E	Spark Plugs	Inspect; torque to specification
	Battery	Check terminals; clean; test
D	Brake Fluid	Replace (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Inspect
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Lubricate with proper lubricant as directed
D	Gear Position Switch	Inspect; clean. See Gear Position Switch Replacement page
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Lubricate with proper lubricant as directed
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

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25,000 MILE (40,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Inspect; clean
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Inspect; lubricate if necessary
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Inspect; lubricate if necessary
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Inspect
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Inspect; adjust if necessary, lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

30,000 MILE (48,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Replace
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Replace
	Engine Coolant	Inspect fluid level, add coolant if necessary
D	Engine Compression	Inspect
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary. Check and re-torque all sealed exhaust joints
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
D / E	Spark Plugs	Replace
	Battery	Check terminals; clean; test
D	Brake Fluid	Replace (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Lubricate with proper lubricant as directed
D	Front Fork Oil	Replace
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Lubricate with proper lubricant as directed
D	Gear Position Switch	Inspect; clean. See Gear Position Switch Replacement page
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Lubricate with proper lubricant as directed
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

35,000 MILE (52,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Inspect; clean
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary
D	Fuel System	Inspect; Replace fuel filter using PN **2207067**
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Inspect; lubricate if necessary
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Inspect; lubricate if necessary
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Inspect
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

40,000 MILE (64,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Replace
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
D	Engine Compression	Inspect
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary. Check and re-torque all sealed exhaust joints
D	Fuel System	Inspect
	Key Fob Battery	Replace
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
D / E	Spark Plugs	Inspect; torque to specification
	Battery	Check terminals; clean; test
D	Brake Fluid	Replace (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Inspect
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Lubricate with proper lubricant as directed
D	Gear Position Switch	Inspect; clean. See Gear Position Switch Replacement page
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Lubricate with proper lubricant as directed
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

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45,000 MILE (72,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Inspect; clean
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Inspect fluid level, add coolant if necessary
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
	Battery	Check terminals; clean; test
D	Brake Fluid	Change every two years (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Inspect; lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Lubricate with proper lubricant as directed
D	Front Fork Oil	Replace
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Inspect; adjust if necessary
D	Rear Brake Pedal	Inspect; adjust if necessary
D	Rear Shock Absorber	Inspect; adjust if necessary
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

50,000 MILE (80,000 KM) SERVICE

ITEM		REMARKS
XU	Air Filter	Replace
D	Cooling System / Radiator	Inspect
D	Crankcase Ventilation System	Inspect; tighten, clean, adjust
	Damper, Cushion Drive	Visual inspection for cracks or deformation is required whenever the rear wheel is removed. Replace if damage is found.
D	Drive Belt	Inspect; tighten, clean, adjust
	Engine Coolant	Replace
D	Engine Compression	Inspect
D	Engine Mount Fasteners	Inspect; tighten, adjust
XU	Engine Oil & Filter Change	Change oil and filter, inspect used oil for contaminants
E	Evaporative Emission Control System	Inspect; clean
E	Exhaust System	Inspect; adjust; correct; replace if necessary. Check and re-torque all sealed exhaust joints
D	Fuel System	Inspect
D	Oil Lines / Oil System Inspection	Inspect; clean, adjust if necessary
D / E	Spark Plugs	Inspect; torque to specification
	Battery	Check terminals; clean; test
D	Brake Fluid	Replace (DOT 4)
XU / D	Brake Pads	Inspect pad wear; replace if worn beyond service limit
D	Clutch Lever	Lubricate with proper lubricant as directed
D	Clutch Cable Freeplay	Inspect; adjust if necessary
D	Clutch Cable Ends	Lubricate with proper lubricant as directed
D	Fasteners	Inspect; tighten if necessary
D	Front Brake Lever	Adjust if necessary, lubricate with proper lubricant as directed
D	Front Fork Oil	Inspect
D	Front Forks and Front Axle	Inspect; adjust if necessary
D	Gear Shift Pedal	Lubricate with proper lubricant as directed
D	Gear Position Switch	Inspect; clean. See Gear Position Switch Replacement page
D	Head Light	Inspect; adjust if necessary
D	Rear Brake Pedal	Lubricate with proper lubricant as directed
D	Rear Shock Absorber	Replace
D	Rear Wheel Alignment	Inspect; adjust if necessary
	Road Test	Perform Road Test
D	Sidestand	Lubricate with proper lubricant as directed
D	Steering Bearings	Inspect
D	Suspension Linkage, Rear	Inspect
D	Swing Arm and Rear Axle	Inspect
D	Tires / Wheels	Inspect tread depth, sidewall cracking, wear patterns

NOTICE
When the vehicle goes beyond 50,000 miles, return to the 500 mile chart and start the interval process over.

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GENERAL INFORMATION

SERVICE NOTES – MAINTENANCE

Periodic Maintenance Overview

Inspection, adjustment and lubrication of important components are explained in the periodic maintenance chart.

Inspect, clean, lubricate, adjust and replace parts as necessary. When inspection reveals the need for replacement parts, use genuine Indian Motorcycle parts available from your Indian Motorcycle dealer.

IMPORTANT
Service and adjustments are critical. If you're not familiar with safe service and adjustment procedures, have a qualified dealer perform these operations.

SPECIAL TOOLS – MAINTENANCE

TOOL DESCRIPTION	PART NUMBER
Brake Lever Reserve Tool	PV-50104
Battery Tester	PU-50296
Belt Tension Meter	PV-43532
Oil Filter Wrench	PU-50105

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

BREAK-IN PROCEDURE

Engine break-in for Indian Motorcycles occurs in the first 500 miles (800 km) of operation. Indian Motorcycles are manufactured using the best possible materials and manufacturing techniques, but the final machining process is the break-in. During this break-in period, critical engine parts wear and polish to correct operating clearances. Read, understand and follow all break-in procedures to ensure the long-term performance and durability of the engine.

⚠ CAUTION
Failure to properly follow the engine break-in procedures outlined in this manual can result in serious damage to the engine. Follow all break-in procedures carefully. Avoid full throttle operation and other condition that may place an excessive load on the engine during the break-in period.

Observe the following precautions during the break-in period:

- Upon initial start-up, do not allow the engine to idle for long periods as overheating can occur.
- Avoid fast starts with wide open throttle. Drive slowly until the engine warms up.
- Avoid running the engine at extremely low RPM in higher gears (lugging the engine).

Break-In Guidelines

ODOMETER	BREAK-IN PROCEDURE
0–90 Miles (0–145 km)	Do not operate for extended periods above 1/3 throttle or at any one throttle position. Vary engine speed frequently.
91–300 Miles (146–483 km)	Do not operate for extended periods above 1/2 throttle or at any one throttle position. Vary engine speed frequently.
301–500 Miles (484–805 km)	Do not operate for extended periods above 3/4 throttle.
500 Miles (805 km)	Perform the break-in maintenance procedure outlined in the Periodic Maintenance Interval Table located in this chapter.

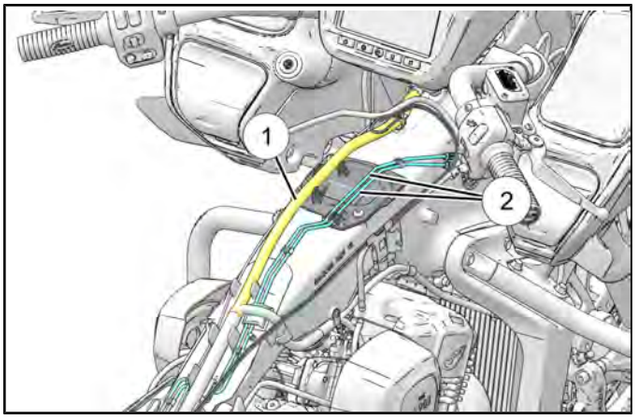
ROUTINE MAINTENANCE PROCEDURES

AIR FILTER REPLACEMENT

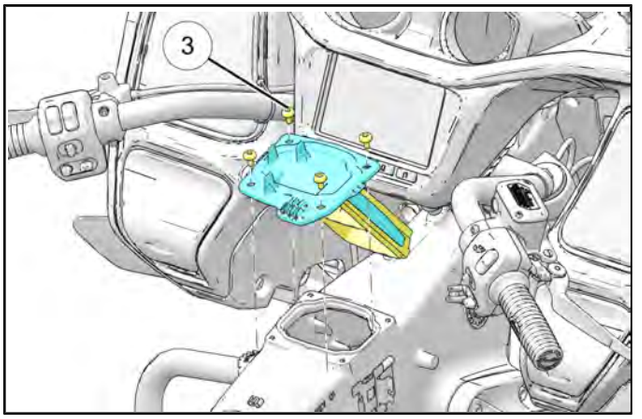
NOTICE
If the motorcycle is operated in wet or dusty conditions, more frequent servicing is required. The air filter element cannot be cleaned. Replace the filter when necessary.

AIR FILTER REMOVAL

1. Remove fuel tank. See **Fuel Tank Removal page 4.24**.
2. Disconnect wiring harness ① from airbox filter cover.

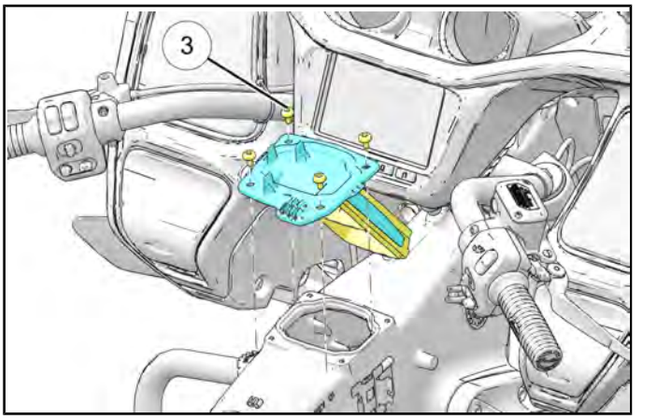


3. Disconnect brake lines ② from airbox filter cover.
4. Remove the airbox filter cover fasteners ③ and remove from the unit.



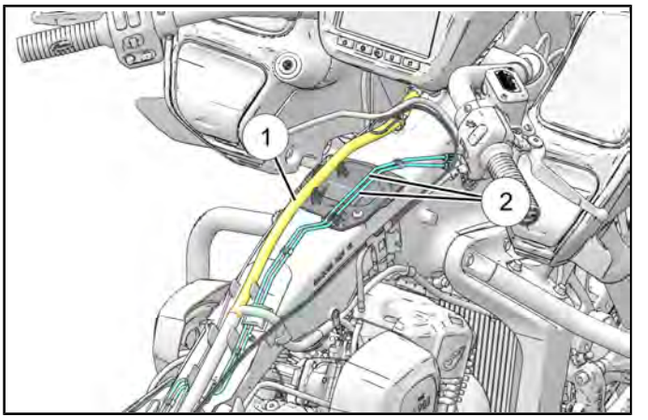
AIR FILTER INSTALLATION

1. Install the airbox filter and cover fasteners ③.



TORQUE
Airbox Filter Cover Fastener: **88 in-lbs (10 N·m)**

2. Connect brake lines ② to airbox filter cover.



3. Connect wiring harness ① to airbox filter cover.
4. Install the fuel tank. See **Fuel Tank Installation page 4.44**.

ENGINE OIL & FILTER CHANGE

IMPORTANT

Change the oil and filter when the engine is at operating temperature. If the engine is cold, start the engine and allow it to run at idle for at least 5 minutes.

IMPORTANT

The total amount of oil required for a oil and filter change is approximately 5 qts. (4.7 L). Follow all instructions carefully. Do not overfill.

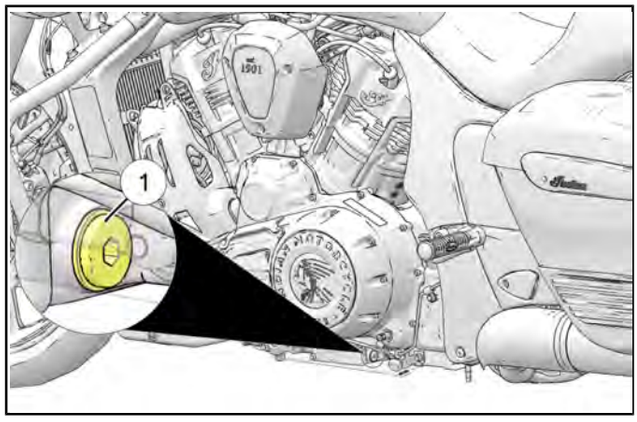
⚠ CAUTION

After an oil change, the low oil pressure indicator may illuminate when the engine is started. If this occurs, do not increase RPM above idle speed until the indicator turns off. Operating above idle speed could result in damage to the engine.

1. Park the motorcycle with the sidestand down on a firm, level surface. If using a service lift, the motorcycle should be centered.
2. Change the oil and filter when the engine is at operating temperature. If the engine is cold, start the engine and allow it to run at idle for at least 5 minutes.
3. Stop the engine once it reaches operating temperature.
4. Clean the area around the scavenge drain plug ①. Place a drain pan under the drain plug.

⚠ CAUTION

Hot oil can cause burns to skin. Do not allow hot oil to contact skin.

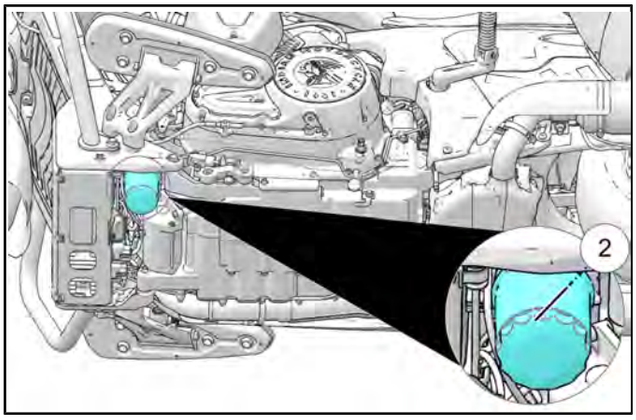


5. Remove the drain plug. Allow the oil to drain completely.
6. Install new sealing washer and o-ring on the drain plug. The sealing surfaces on drain plug and engine should be clean and free of burrs, nicks, or scratches.
7. Reinstall the drain plug.

TORQUE

Drain Plug:
15 ft-lbs (20 N·m)

8. Place a drain pan beneath the oil filter ②. Use an oil filter wrench and remove the oil filter.



9. Use a clean dry cloth to clean the filter sealing surface on the engine.
10. Lubricate the o-ring on the new filter with a film of fresh engine oil. Check to make sure the o-ring is in good condition.
11. Install oil filter.

TORQUE

Oil Filter:
Approximately 3/4 turn after seal has contacted the filter adapter.

12. Remove the dipstick. Add only 4 qts (3.8 L) of Indian Motorcycle 15–W60 oil. Do NOT overfill.
13. Reinstall the dipstick securely.
14. With the unit in an upright, centered position. Start the engine and idle for 30 seconds.
15. Stop the engine and add an additional 1 qts (0.95 L) of oil.

⚠ CAUTION

Do NOT overfill. Overfilling can result in loss of engine performance and an oil saturated air filter. Use a suction device to remove excess oil if overfilled.

16. To ensure the oil level is within the safe operating range, Re-check the oil level. **Engine Oil Level page 3.9**.

⚠ CAUTION

After an oil change, the low oil pressure indicator may illuminate when the engine is started. If this occurs, do not increase RPM above idle speed until the indicator turns off. Operating above idle speed could result in damage to the engine.

17. Dispose of used filter and oil properly.
18. Reset the oil change life in the instrument gauge.

ENGINE OIL LEVEL

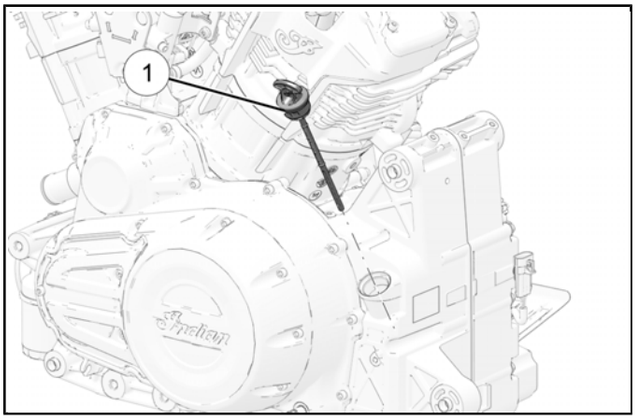
With the semi-dry sump lubrication system, the engine oil level on the dipstick will fluctuate, depending on the motorcycle's position and engine temperature when checked. To ensure a proper reading of the engine oil level, follow all inspection procedures closely.

⚠ WARNING

Operating with insufficient, deteriorated or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, which could result in loss of control and serious injury or death. Check the oil level frequently.

Always check the oil after running a cold engine at idle for 30 seconds. The oil fill/dipstick is located on the left side of the engine. Always use the recommended oil.

1. Position the motorcycle on level ground in the fully upright and centered position.
2. Start the engine (from cold) and allow it to idle for 30 seconds. Stop the engine.
3. Remove the dipstick ① and wipe it clean.



4. Thread the dipstick until fully seated.
5. Remove the dipstick and view the oil level.

⚠ CAUTION

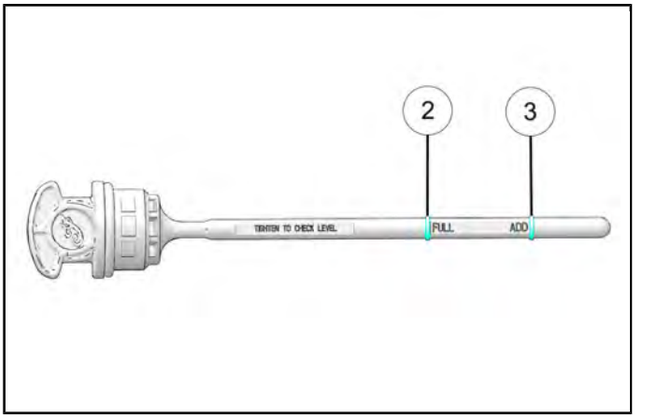
Do not overfill. Overfilling can result in loss of engine performance and an oil-saturated air filter. Use a suction device to remove excess oil if overfilled.

6. Add the recommended oil as needed to bring the level between the ADD and FULL marks. Do not add oil if between the ADD and FULL marks.

NOTICE

Oil should be added only if the proper oil check procedure is followed and the level is below the safe mark.

7. The approximate volume between the FULL ② and ADD ③ marks on the dipstick is 32 oz. (.94 L)



8. Reinstall the dipstick securely.

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TIRE PRESSURE / SPECIFICATIONS

TIRE INSPECTION

⚠ WARNING

Indian motorcycles are produced using the designated tires listed below as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability. See Steering / Suspension chapter for a review of all tire related warnings.

1. Inspect tires for weather checking, cuts, imbedded foreign objects, etc.
2. Inspect front and rear wheels for damage.
3. Measure tread depth at center of tread.
4. Measure in 3-4 places equally spaced around the tire and record the smallest measurement.

⚠ WARNING

It is dangerous to ride with a worn tire. When a tire reaches the minimum tread depth listed below, replace the tire immediately.

MINIMUM TREAD DEPTH (ALL MODELS)

MINIMUM TREAD DEPTH	
Front Tire Minimum Tread Depth	.063 in (1.6 mm)
Rear Tire Minimum Tread Depth	.063 in (1.6 mm)

TIRE PRESSURE TABLE (COLD)

NOTICE

Also refer to Manufacturing Information label.

TIRE PRESSURE	
FRONT: Metzeler Cruisetec (130/60/B19)	**Front: 36 psi (248 kPa)**
REAR: Metzeler Cruisetec (180/60R16 80H (I))	**Rear: 41 psi (283 kPa)**

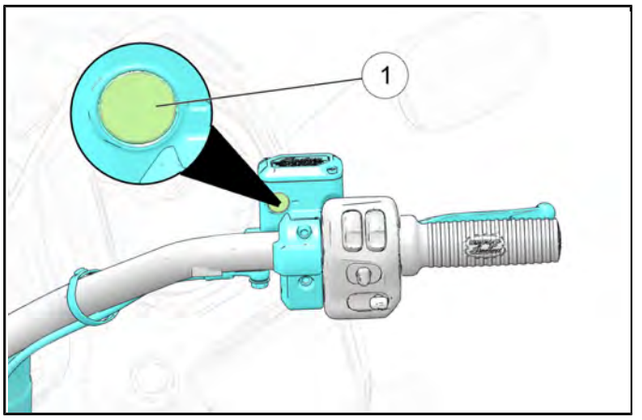
BRAKE FLUID LEVEL INSPECTION

IMPORTANT

The brake fluid level in the reservoir will go down as brake pads wear. If you notice a constant or sudden lowering of the brake fluid level, inspect brake pads for wear and brake system for leaks.

FRONT BRAKE FLUID INSPECTION

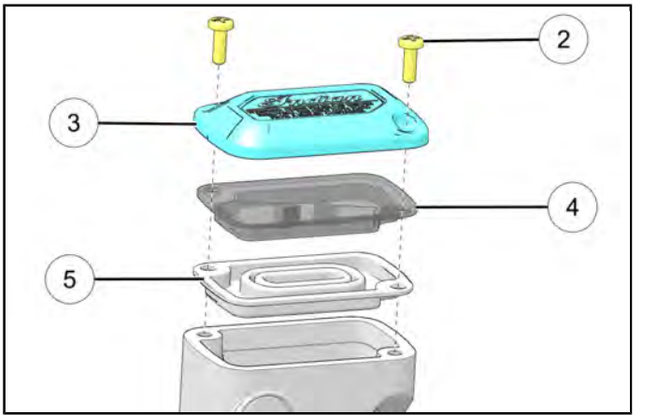
1. Straddle the motorcycle and bring it to the fully upright position. Position the handlebars so that the fluid reservoir is level.
2. View the fluid level through the sight glass ①. The fluid should be clear. Replace cloudy or contaminated fluid.



3. The fluid level should be above the minimum indicator mark next to the sight glass.
4. Wipe area around reservoir cover and fluid container with a clean cloth.

FRONT BRAKE FLUID FILL

1. If the fluid level is low, remove fasteners ②, reservoir cover ③, diaphragm plate ④, and diaphragm ⑤.



IMPORTANT

If diaphragm is extended, return it to the neutral position.

2. Carefully add enough DOT 4 brake fluid to bring level to the upper edge of the sight glass. *Do not overfill.*
3. Install reservoir diaphragm, diaphragm plate, and cover. Torque fasteners to specification.

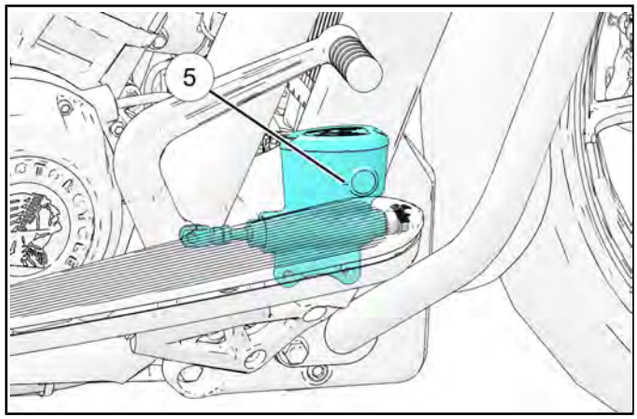
TORQUE

Master Cylinder Cover Fasteners (Front):
13 in-lbs (1.5 N·m)

4. Wipe away any fluid spills. Check for signs of brake fluid leaks around hoses, fittings, reservoir and brake calipers. Check for deterioration of hoses.

REAR BRAKE FLUID INSPECTION

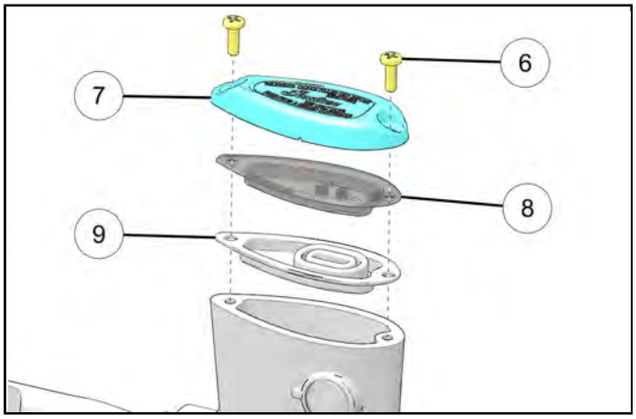
1. Fluid level is checked at the rear brake master cylinder reservoir.
2. View fluid level through reservoir sight glass ⑤. The fluid should be clear and at or above the middle of the sight glass.



3. Wipe area around reservoir cover and fluid container with a clean cloth.

REAR BRAKE FLUID FILL

1. If the fluid level is low, remove fasteners ⑥, reservoir cover ⑦, diaphragm plate ⑧ and diaphragm ⑨.



IMPORTANT

If diaphragm is extended, return it to the neutral position.

2. Carefully add enough DOT 4 brake fluid to bring level to the upper edge of the sight glass. *Do not overfill.*
3. Install diaphragm, plate and cover. Tighten cover fasteners to specification.

TORQUE
Master Cylinder Cover Fasteners (Rear): **13 in-lbs (1.5 N·m)**

4. Wipe away any fluid spills. Check for signs of brake fluid leaks around hoses, fittings, reservoir, and brake calipers.

SPARK PLUG INSPECTION / GAP

⚠ CAUTION

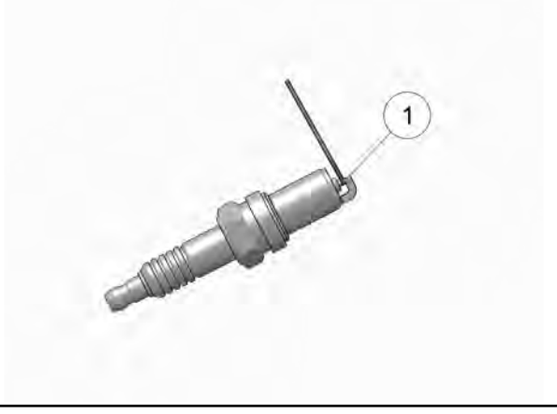
A hot engine can cause serious burns. Allow engine to cool or wear protective gloves when removing the spark plugs.

1. Remove spark plugs. See **Spark Plug Removal page 3.5**.
2. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.
3. Clean with electrical contact cleaner or a glass bead spark plug cleaner only.

⚠ CAUTION

A wire brush or coated abrasive (sandpaper) should not be used to clean electrodes.

4. Measure electrode gap with a wire gauge ①. Adjust gap if necessary by carefully bending the grounding electrode until the specified gap is achieved.



Spark Plug Type:
NGK LZMAR8AI-10

Spark Plug Gap:
0.039 in (1.0 mm)

BATTERY CHARGING AND MAINTENANCE

AGM BATTERY CHARGER RECOMMENDATIONS

Indian Motorcycle recommends using the BatteryMINDer® 2012 AGM - 2 AMP battery charger (PN 2830438) to charge and maintain AGM batteries. The charger can be found on the Polaris and Indian Motorcycle PG&A websites and ordered in DEX – Item Availability.

⚠ CAUTION

If not using the BatteryMINDer® 2012 AGM – 2 AMP battery changer, an automatic/constant monitoring AGM battery charger with a charging rate of 2 amps or less is recommended to prevent damage to the battery.

Batteries that fall below 12.5V run the risk of sulfation, a condition whereby sulfate crystals form inside the battery and significantly reduce performance. AGM chargers are designed specifically for charging AGM type batteries and use high frequency pulses to partially reverse sulfation.

IMPORTANT

The use of non-AGM battery chargers or non-AGM battery tenders may result in a misleading "battery not found" or "open cell" fault message. Please ensure you are using the recommended AGM charger when charging AGM type batteries to prevent damage to the battery.

INDIAN MOTORCYCLE RECOMMENDED AGM BATTERY TESTING PROCEDURE:

1. Test battery using the battery tester PU-50296.
2. If the tester indicates a test result other than "Good Battery," follow the steps below before replacing the battery:
   a. Connect battery to the recommended battery charger. If charging sequence begins as normal, fully charge battery and proceed to step 3.

      The time listed on the PU-50296 battery tester printout is an estimate. The recommended automatic charger will indicate when the battery is fully charged on its display.

   b. If charging sequence does not initialize, follow automatic battery charger manual's instructions on how to charge deeply discharged batteries OR refer to the **AGM Battery Charging Recommendations – Deeply Discharged (below 3 volts)** section to attempt to restore the deeply discharged battery. If charging sequence will not finish as intended, the battery needs to be replaced.
3. Re-test battery. If the test results show that battery failed, proceed with battery replacement.

AGM BATTERY CHARGING RECOMMENDATIONS

The battery will self-discharge when disconnected from a vehicle, and will discharge at a faster rate when connected. Listed below are the recommended battery charging schedules.

- Batteries which are not connected to a vehicle should be charged every 60 days.
- Batteries which are connected to motorcycles should be charged when they arrive at your dealership and at least once every 2 weeks thereafter.
- Showroom bikes used to demonstrate radio, display and infotainment features should be charged daily. If possible, these bikes should be connected to the recommended battery charger continuously.

Always use the recommended automatic battery charger, and wait for the charger to complete the charge cycle before disconnecting it.

AGM BATTERY CHARGING RECOMMENDATIONS – DEEPLY DISCHARGED (BELOW 3 VOLTS)

NOTICE

If the automatic charger's manual does not include instructions on how to charge deeply discharged batteries, then use the following procedure.

AGM batteries discharged to a voltage of 3 volts or less may not be recognized by the recommended automatic battery charger. (The minimum voltage threshold recognized by other battery chargers may be as high as 10.5 volts). Often times deeply discharged batteries can be restored by attaching another, fully-charged, battery to "jump start" the low battery. Follow the steps below to restore a deeply discharged battery.

1. Carefully connect the two batteries' positive terminals, then the negative terminals using jumper cables.
2. Connect the recommended battery charger to the low battery and initiate the charging sequence.

⚠ WARNING

Always check to ensure the positive cables are connected to the positive terminals before powering the charger on. Reversing polarity when charging can damage electrical components and risk personal injury. Be careful not to let battery cable clamps touch each other.

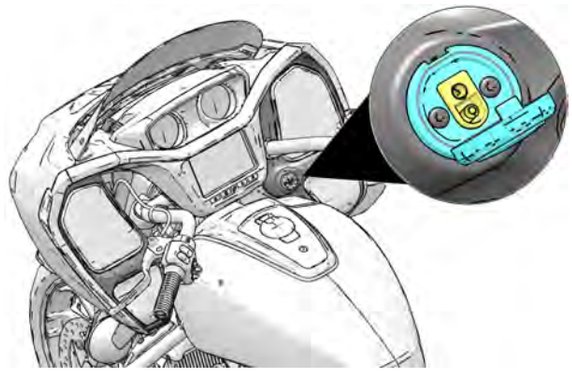
3. After the charging sequence has initiated, disconnect the fully-charged battery. Always disconnect the fully-charged battery positive first, followed by low battery positive, low battery negative, and finally fully-charged battery negative
4. Wait for the charger to complete the charge cycle before disconnecting it.

AGM BATTERY MAINTENANCE TIPS

1. If the motorcycle will not be driven for more than 2 weeks, maintaining the battery with the BatteryMINDer® 2012 AGM - 2 AMP charger (PN 2830438) is recommended.
2. To help prolong battery life, if a power source is not available to use the 12V Battery Charge Port, it is recommended to remove the battery from vehicles stored ONE month or longer. To maximize the life of stored batteries, they should be kept in a cool / dry location. Batteries will self discharge more rapidly when stored in extreme heat. Batteries should be maintained using the recommended battery charger while in storage.
3. Batteries will self-discharge more quickly when dirty. Periodic cleaning of the battery terminals using a terminal brush will help maximize battery life. Wash terminals with a solution of one tablespoon baking soda and one cup water. Rinse well with tap water and dry off with clean shop towels. Coat the terminals with dielectric grease or petroleum jelly.
4. Battery connections should be tightened to the correct torque during installation. This will reduce voltage drop and ensure a reliable connection between the regulator/rectifier and battery.
5. Models are conveniently equipped with a SAE bullet style connector for quick access to charging the battery and a maintenance charger can be connected to it for extended periods (e.g. winter storage). The recommended BatteryMINDer® 2012 charger comes with the mating connector for easy plug and play maintenance.

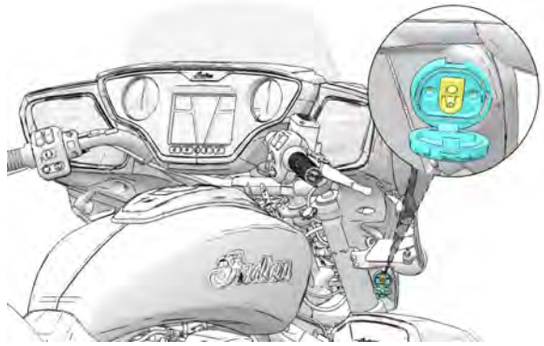
CHALLENGER / PURSUIT

The connector is located on the right hand fairing dash.



CHIEFTAIN POWERPLUS / ROADMASTER POWERPLUS

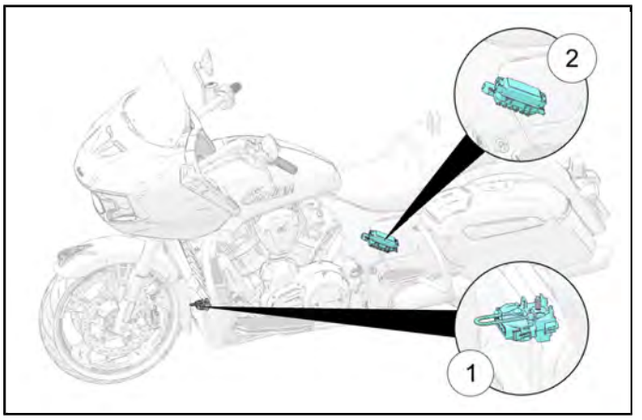
The connector is located on the lower right hand inner fairing.



FUSE REPLACEMENT

There are two fuse boxes utilized on the full size Indian Motorcycle platform.

- The M-Case fuse box ① is located in the front of the bike in the battery box area. The main fuse box ② is located beneath the left-hand upper side cover.

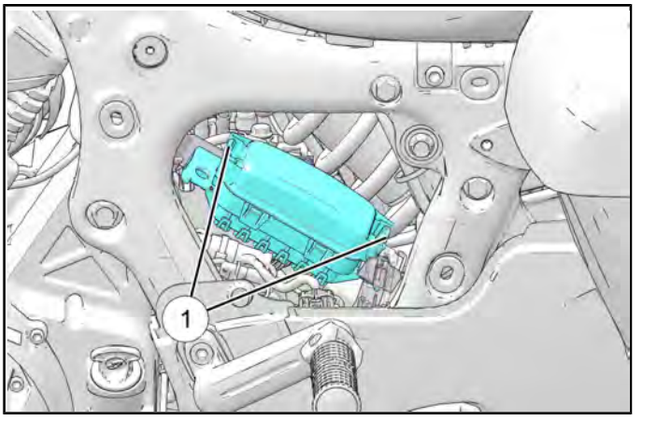


MAIN FUSE BOX

1. Remove the Left-Hand upper side cover.

   See **Side Cover (Upper), Removal page 7.100**.

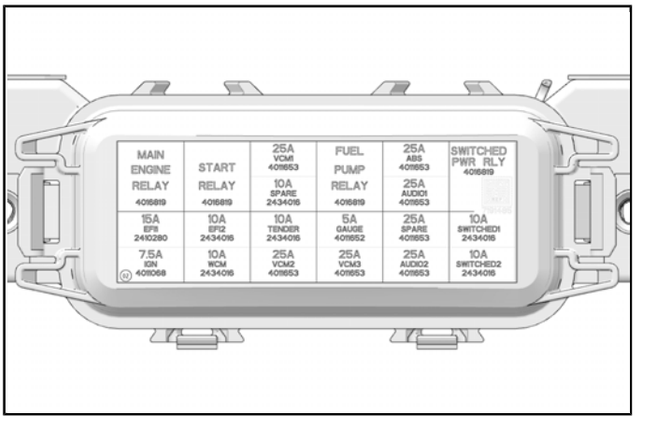
2. Squeeze fuse box tabs ① together and lift cover off of fuse box.



3. If any fuse is blown, turn off main switch. Install new fuse of specified amperage. Turn on switches and see if system operates correctly. Repeat fuse failure indicates an electrical problem.

⚠ CAUTION

Do not use fuses of a higher amperage rating than what is specified.
If the correctly rated fuse continues to blow, something is wrong and needs to be corrected. Substituting a higher amperage fuse can lead to extensive electrical system and vehicle damage.

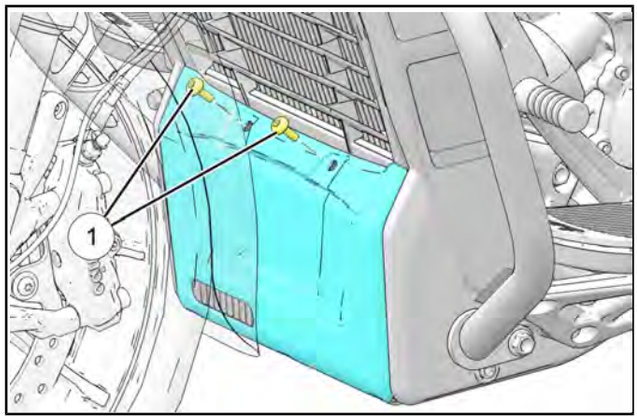


4. Install the fuse box cover.
5. Install the Left-Hand upper side cover.

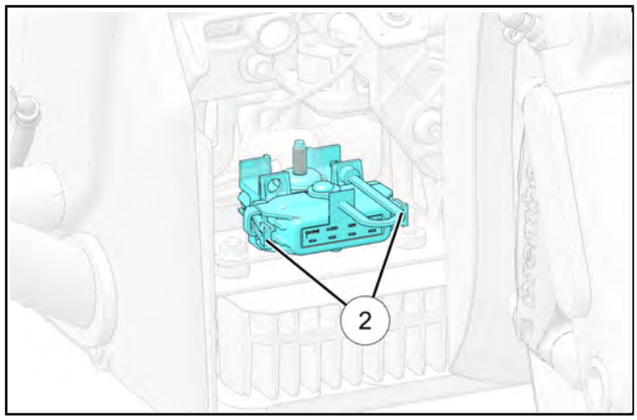
   See **Side Cover (Upper), Install page 7.101**.

M-CASE FUSE BOX

1. Remove chin fairing by removing its fasteners ①.



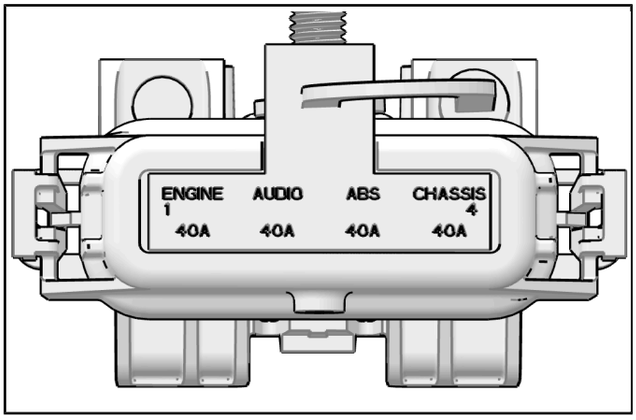
2. Squeeze fuse box tabs ② together and lift cover off of fuse box.



3. If any fuse is blown, turn off main switch. Install new fuse of specified amperage. Turn on switches and see if system operates correctly. Repeat fuse failure indicates an electrical problem.

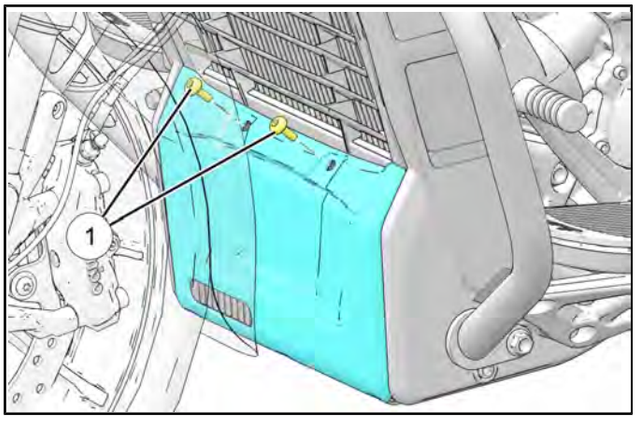
⚠ CAUTION

Do not use fuses of a higher amperage rating than what is specified.
If the correctly rated fuse continues to blow, something is wrong and needs to be corrected.
Substituting a higher amperage fuse can lead to extensive electrical system and vehicle damage.



4. Install the fuse box cover.
5. Install chin faring and fasteners ①.

TORQUE
Chin Fairing Fastener: **36 in-lbs (4 N·m)**



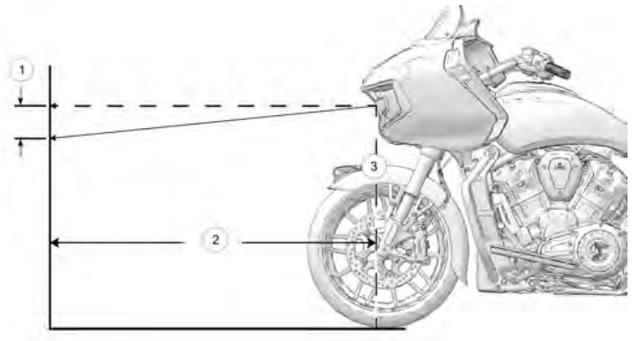
HEADLIGHT AIM INSPECTION

Adjust headlight aim when there is a change in load (rider, cargo, accessories, etc.) or after suspension adjustment.

HEADLIGHT INSPECTION PROCEDURE

1. Check and adjust the tire pressure to specification. See **Service Specifications – Tires page 8.112**.
2. Verify suspension ride height (preload) is set to specification. See **Rear Shock Preload Adjustment page 8.8**.
3. Move the motorcycle to a clear area with a level floor and dim lighting, and place it so the top front edge of the headlight housing is 32 ft. 10 in (10.0 m) from the wall.
4. With the rider and passenger (if applicable) on board, bring the motorcycle to a fully upright position. Center the handlebars in a straight ahead position.
5. Start the engine and switch on the HIGH beam. Observe the headlight aim on the wall.
6. Make any necessary adjustments to center the brightest portion of the high beam straight ahead.
7. Switch the headlight to LOW beam. Observe the headlight aim on the wall.
8. Make any necessary adjustments to headlight aim per the diagram table.

LED HEADLIGHTS

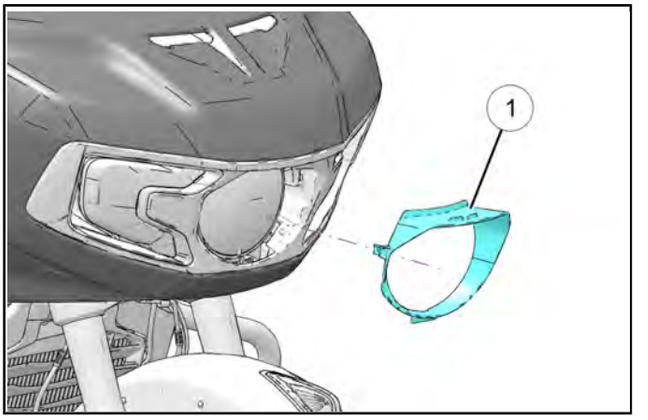


NUM-BER	DESCRIPTION
①	4 in (10 cm) to top cut-off of beam
②	Measure distance = 32 ft. 10 in (10.0 m)
③	Headlight Center

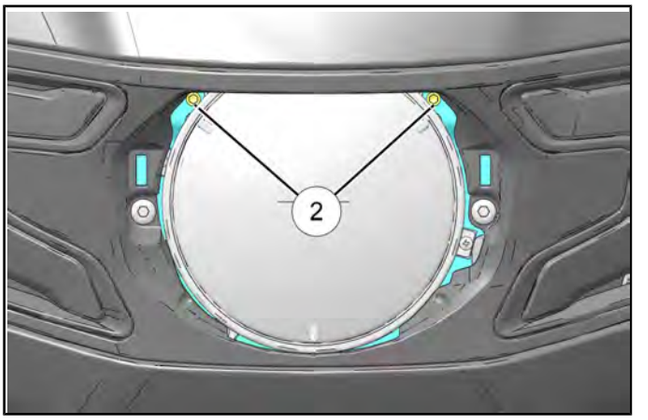
HEADLIGHT AIM ADJUSTMENT

CHALLENGER / PURSUIT

1. Press downward to disengage the top of the bezel, Gently pull outward and remove headlight bezel ①.



2. To adjust the headlight vertically, both adjustment fasteners ② must be turned in or out equally. Turn fasteners in (clockwise) to raise the beam. Turn fasteners out (counter-clockwise) to lower the beam.



3. Adjust the headlight horizontally. From facing the headlight, turn the left adjustment fastener out (counter-clockwise) and/or turn the right adjustment fastener in (clockwise) to adjust the beam to the left.

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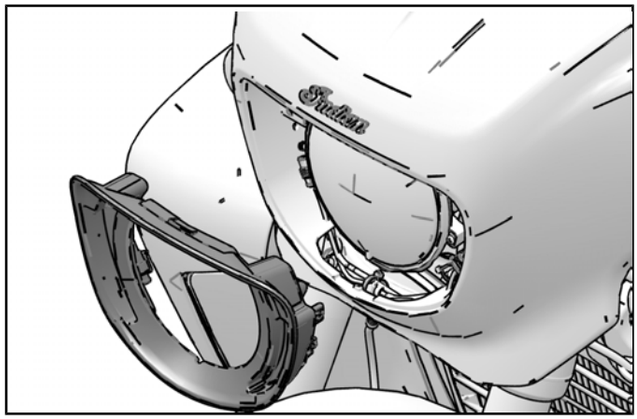
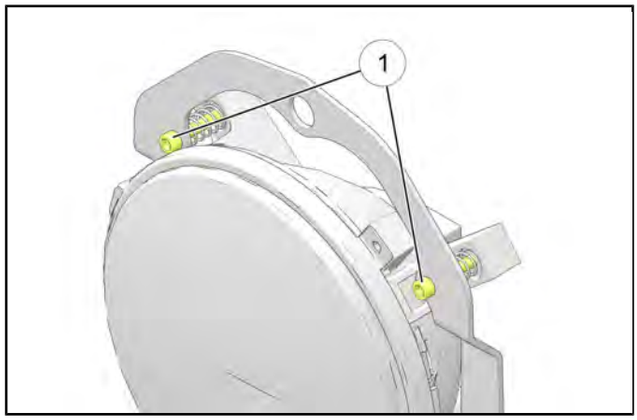
CHIEFTAIN POWERPLUS / ROADMASTER POWERPLUS

1. Press downward to disengage the top of the bezel, gently pull outward and remove headlight bezel.



2. Disconnect two position light connector to remove headlight bezel.
3. To adjust the headlight vertically, both adjustment fasteners ① must be turned in or out equally. Turn fasteners in (clockwise) to raise the beam. Turn fasteners out (counter-clockwise) to lower the beam.



4. Adjust the headlight horizontally. From facing the headlight, turn the left adjustment fastener out (counter-clockwise) and/or turn the right adjustment fastener in (clockwise) to adjust the beam to the left.
5. Connect two position light connector before installing the headlight bezel.

IMPORTANT
Verify connector is properly seated and locked in place by listening for audible "click" when pressing into place. Pull gently on quick connector once seated to ensure a proper connection has been made.

MAJOR MAINTENANCE PROCEDURES

IMPORTANT
Reference the**Maintenance Intervals page 2.4** for details on how often to perform each procedure.

MAINTENANCE PROCEDURE	LOCATION
Coolant Level Inspection	**Coolant Level Inspection page 3.5**
Idle Speed / Fast Idle Speed	**Idle Speed / Fast Idle Speed page 3.5**
Spark Plug Removal	**Spark Plug Removal page 3.5**
Spark Plug Installation	**Spark Plug Installation page 3.6**
Engine Compression Test	**Engine Compression Test page 3.7**
Engine Compression Test (Wet)	**Engine Compression Test (Wet) page 3.8**
Crankcase Ventilation System	**Crankcase Ventilation System page 3.9**
Fuel Tank Vent Inspection	**Fuel Tank Vent Inspection page 4.5**
Evaporative Emission Control System	**Evaporative Emission Control System – 50 State / INTL page 4.7**
Fuel Supply Hose (Fuel Rail) Inspection	**Fuel Rail Inspection page 4.8**
Clutch Cable Inspection / Lubrication	**Clutch Cable Inspection / Lubrication page 5.4**
Clutch Lever Lubrication	**Clutch Lever Lubrication page 5.5**
Clutch Lever Free Play	**Clutch Lever Free Play page 5.5**
Shift Pedal Inspection / Lubrication	**Shift Pedal Inspection / Lubrication page 5.6**
Shift Pedal Adjustment	**Shift Pedal Inspection / Lubrication page 5.6**
Drive Belt Inspection	**Drive Belt Inspection page 8.4**
Drive Belt Tension Measurement	**Drive Belt Tension Measurement page 8.4**
Drive Belt Tension – Specifications	**Drive Belt Tension - Specifications page 8.5**
Drive Belt Adjustment	**Drive Belt Adjustment page 8.62**
Sprocket Inspection	**Sprocket Inspection page 8.6**
Fork / Steering Head Inspection	**Steering Head / Front Wheel Inspection page 8.6**
Swingarm Inspection	**Swing-Arm Inspection page 8.6**
Rear Shock Preload Inspection	**Rear Shock Preload Adjustment page 8.8**
Rear Shock Preload Adjustment	**Rear Shock Preload Adjustment page 8.8**
Rear Shock E-Preload Adjustment	**E-Preload Adjustment page 8.9**
Shock Analysis	**Shock Analysis page 8.11**
Sidestand Inspection	**Sidestand Inspection page 8.11**
Sidestand Removal / Installation	**Sidestand Removal page 8.12 Sidestand Installation page 8.12**
Front Brake Lever Reserve Inspection	**Brake Lever Reserve Inspection page 9.43**

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MAINTENANCE PROCEDURE	LOCATION
Front Brake Lever Lubrication	**Front Brake Lever Lubrication page 9.6**
Front Brake Lever Reach	**Front Brake Lever Reach page 9.7**
Brake Pedal Inspection	**Brake Pedal Inspection page 9.7**
Brake Pedal Lubrication	**Brake Pedal Lubrication page 9.7**
Front Brake Pad Inspection	**Front Brake Pad Inspection page 9.8**
Rear Brake Pad Inspection	**Rear Brake Pad Inspection page 9.8**
Battery Removal	**Battery Removal page 10.14**
Battery Installation	**Battery Installation page 10.14**

NOTES

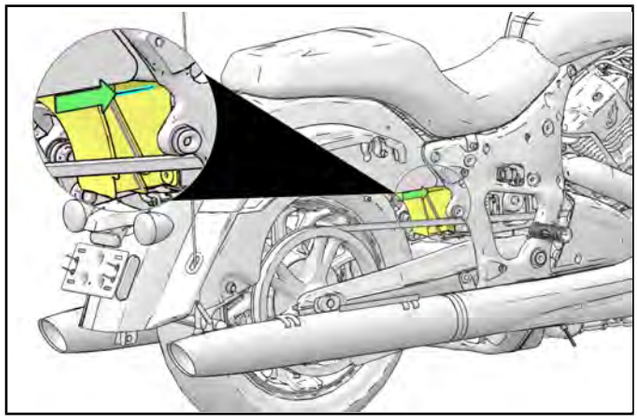
CHAPTER 3
ENGINE / COOLING / EXHAUST

9860001 R01 - 2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus Service Manual

ENGINE / COOLING / EXHAUST MAINTENANCE

COOLANT LEVEL INSPECTION

1. Remove lower right side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
2. Inspect the recovery bottle level.



3. To add coolant reference **Coolant Drain / Fill / Bleed page 3.39**.

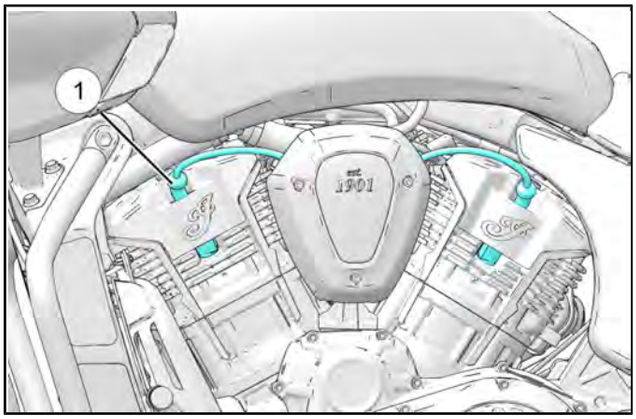
IDLE SPEED / FAST IDLE SPEED

NOTICE
Idle speed is continuously monitored and adjusted by the ECM.

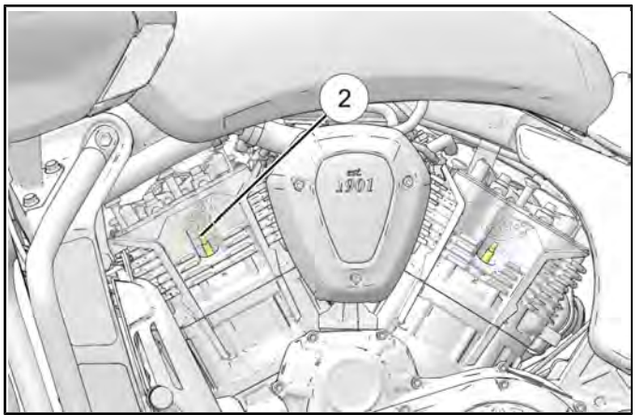
SPARK PLUG REMOVAL

⚠ CAUTION
HOT COMPONENTS **Wear insulated gloves and/or allow engine and exhaust to cool before handling these parts.**

1. With the engine at room temperature, grasp the spark plug boot ① and rotate back and forth slightly to release from the spark plug. DO NOT pull on the wire or spark plug wire may be damaged.



2. Grabbing only the base of the spark plug boot, pull straight out of spark plug well.
3. Clean out spark plug wells with compressed air to remove any loose dirt or debris.
4. Using a 3" extension and a 14mm spark plug socket, remove spark plugs ②.



SPARK PLUG INSTALLATION

1. Inspect spark plug gap with a wire gauge. If gap adjustment is necessary, bend ground electrode carefully using a spark plug gap tool.

Spark Plug Type:
NGK LZMAR8AI-10

Spark Plug Gap:
0.039 in (1.0 mm)

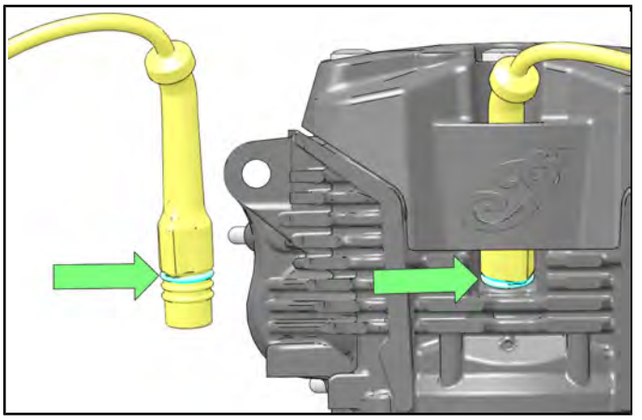
2. Apply anti-seize compound sparingly to spark plug threads, avoiding the bottom 2 - 3 threads.
3. Torque spark plugs to specification.

TORQUE
Spark Plug: **88 in-lbs (10 N·m)**

⚠ CAUTION
Do not over tighten spark plugs. Damage to the cylinder head or spark plug may result.

4. Install spark plug wire boots securely over the plugs.

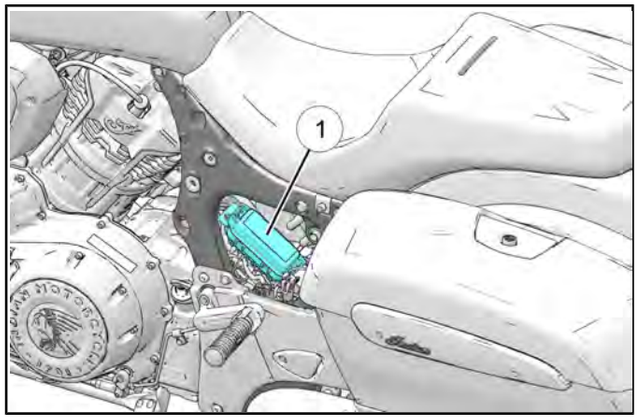
IMPORTANT
The spark plug boot is fully seated when the third rib on the boot is level with the spark plug hole as shown.



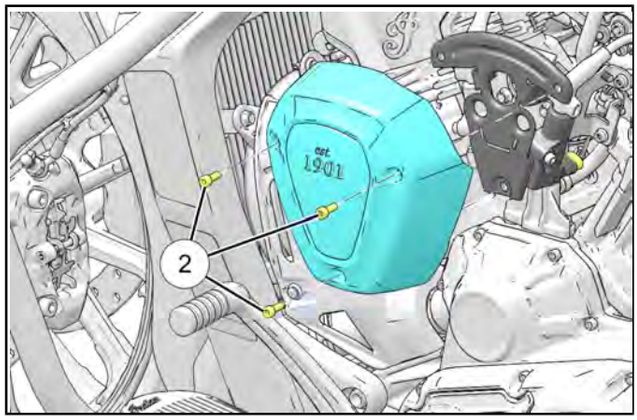
ENGINE COMPRESSION TEST

1. Warm engine to operating temperature.
2. Shift transmission into neutral and stop engine.
3. Remove the LH upper side cover to access the fuse box ①.

   See **Side Cover (Upper), Removal page 7.100**.



4. Remove the Fuel Pump Relay to disable fuel pump.
5. Remove the V-cover by removing its fasteners ②.



6. Disconnect the ignition coil electrical connector to disable ignition system.
7. Disconnect ignition cables from both spark plugs.
8. Remove spark plug from cylinder to be tested. See **Spark Plug Removal page 3.5**.
9. Crank engine for 5 seconds to allow hydraulic lash adjusters to pump up with oil.
10. Install compression tester in the spark plug hole following manufacturer's instructions.
11. Open throttle and crank engine until needle on compression gauge stops rising (about 5 seconds).
12. Repeat procedure on remaining cylinder.

IMPORTANT
Compression should be **88–115 PSI (586 – 793 kPa)**. If compression is low, see wet compression test. See **Engine Compression Test (Wet) page 3.8**.

ENGINE COMPRESSION TEST (WET)

IMPORTANT

Indian Motorcycle strongly recommends using the cylinder leakdown method to determine how well the combustion chamber is sealing.

1. Pour 3-5 cc of clean engine oil into each cylinder through spark plug hole. Repeat cylinder compression test. See **Engine Compression Test page 3.7**.
2. If compression increases substantially, inspect cylinder, piston, and rings.
3. If compression is low but no change with wet test, investigate cam timing (decomp event late). If compression is high, investigate camshaft timing (decomp event early), hydraulic lash adjuster condition, camshaft decompression mechanism functionality, and lube system pressure.

CYLINDER LEAKAGE TEST

IMPORTANT

The engine should be at operating temperature before this test is performed.

A leakage test may be performed in order to measure cylinder/combustion chamber leakage. High leakage may indicate one or more of the following:

- Worn or burnt valves
- Broken valve springs
- Stuck valve lash adjusters
- Incorrect valve lash/adjustment
- Damaged piston
- Worn piston rings
- Worn or scored cylinder bore
- Damaged cylinder head gasket
- Cracked or damaged cylinder head / engine block

1. Disconnect the battery ground negative cable and ensure that all electrical loads are off.
2. Remove spark plugs. See **Spark Plug Removal page 3.5.**
3. Rotate the crankshaft to place the piston in the cylinder being tested at Top Dead Center (TDC) of the compression stroke.
4. Install a commercially available cylinder leakage tester according to the manufacturer's instructions.

NOTICE

It may be necessary to hold the crankshaft balancer bolt to prevent the engine from rotating.

5. Apply shop air pressure to the tester and adjust according to the manufacturer's instructions.
6. Record the cylinder leakage value.

Max Cylinder Leakage:
15%

7. For any cylinder leakage above 15%, inspect for the following conditions:
   - Throttle body or air inlet hose: May indicate a worn or burnt intake valve or a broken valve spring.
   - Exhaust system tailpipe: May indicate a worn or burnt exhaust valve or a broken valve spring.
   - Crankcase, oil level indicator tube: May indicate worn piston rings, a damaged piston, a worn or scored cylinder bore, a damaged engine block or a damaged cylinder head.
   - Cooling system: Air bubbles may indicate a damaged cylinder head or a damaged cylinder head gasket.
8. Perform the leakage test on the remaining cylinders.

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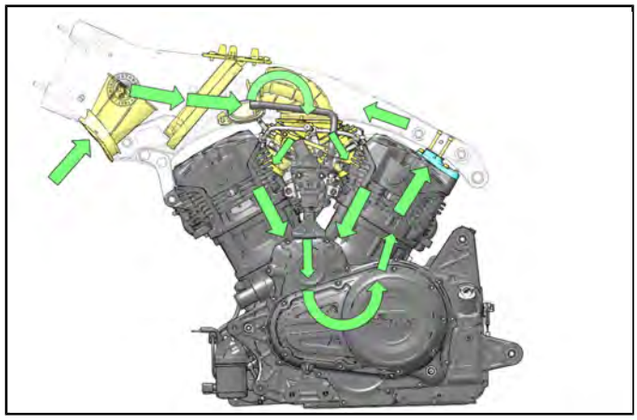
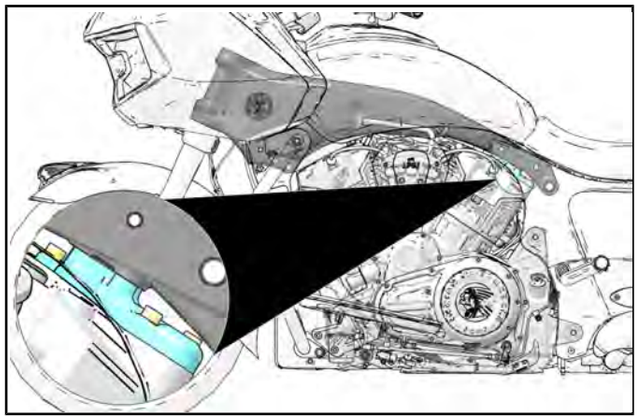
CRANKCASE VENTILATION SYSTEM

The crankcase ventilation system routes blow–by gasses from the engine back into the intake tract.



The crankcase breather can be located on the rear cylinder. The crankcase ventilation system is integrated into the main frame member.

The breather can be visually inspected by looking for leaks or cracks.



ENGINE OIL LEVEL

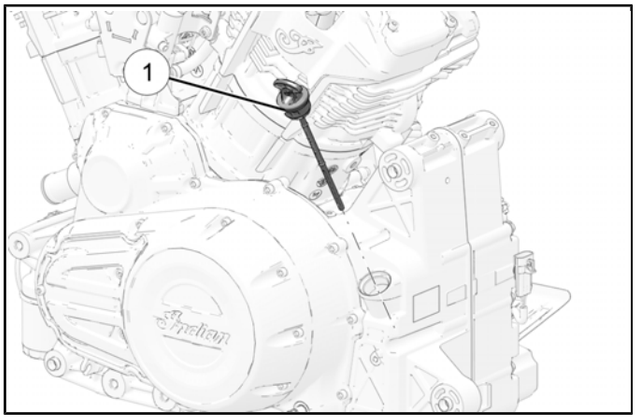
With the semi-dry sump lubrication system, the engine oil level on the dipstick will fluctuate, depending on the motorcycle's position and engine temperature when checked. To ensure a proper reading of the engine oil level, follow all inspection procedures closely.

⚠ WARNING

Operating with insufficient, deteriorated or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, which could result in loss of control and serious injury or death. Check the oil level frequently.

Always check the oil after running a cold engine at idle for 30 seconds. The oil fill/dipstick is located on the left side of the engine. Always use the recommended oil.

1. Position the motorcycle on level ground in the fully upright and centered position.
2. Start the engine (from cold) and allow it to idle for 30 seconds. Stop the engine.
3. Remove the dipstick ① and wipe it clean.



4. Thread the dipstick until fully seated.
5. Remove the dipstick and view the oil level.

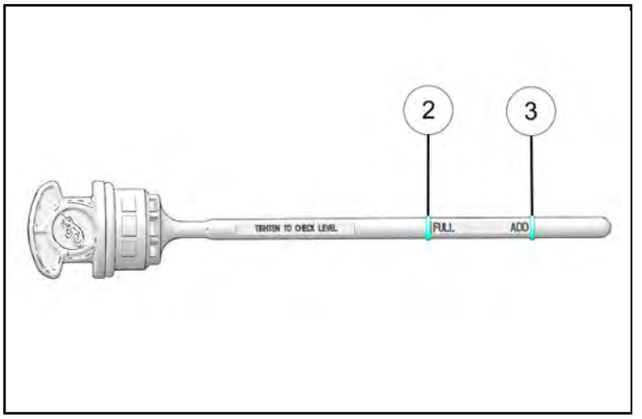
⚠ CAUTION

Do not overfill. Overfilling can result in loss of engine performance and an oil-saturated air filter. Use a suction device to remove excess oil if overfilled.

6. Add the recommended oil as needed to bring the level between the ADD and FULL marks. Do not add oil if between the ADD and FULL marks.

NOTICE
Oil should be added only if the proper oil check procedure is followed and the level is below the safe mark.

7. The approximate volume between the FULL ② and ADD ③ marks on the dipstick is 32 oz. (.94 L)



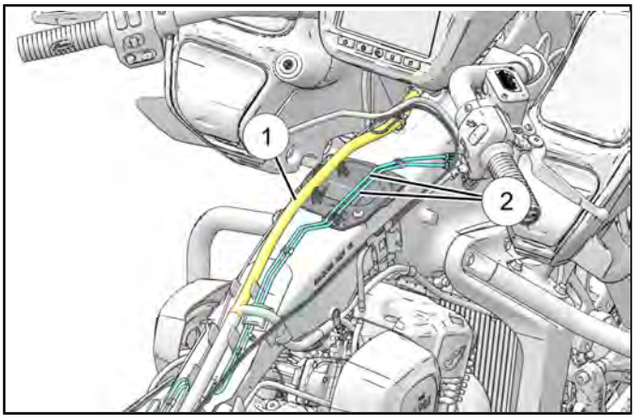
8. Reinstall the dipstick securely.

AIR CLEANER SERVICE

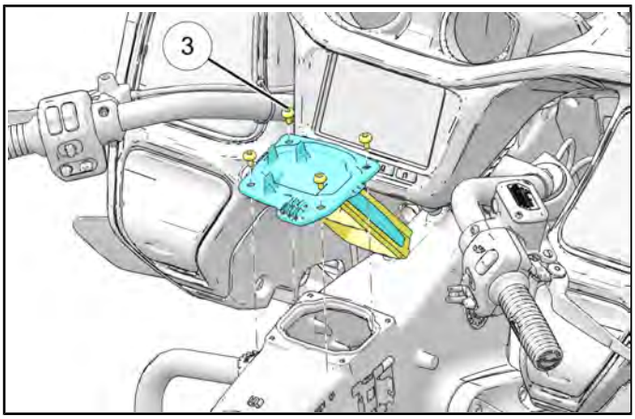
AIR FILTER REPLACEMENT

NOTICE
If the motorcycle is operated in wet or dusty conditions, more frequent servicing is required. The air filter element cannot be cleaned. Replace the filter when necessary.

1. Remove fuel tank. See **Fuel Tank Removal page 4.24**.
2. Disconnect wiring harness ① from airbox filter cover.



3. Disconnect brake lines ② from airbox filter cover.
4. Remove the airbox filter cover fasteners ③ and remove from the unit.



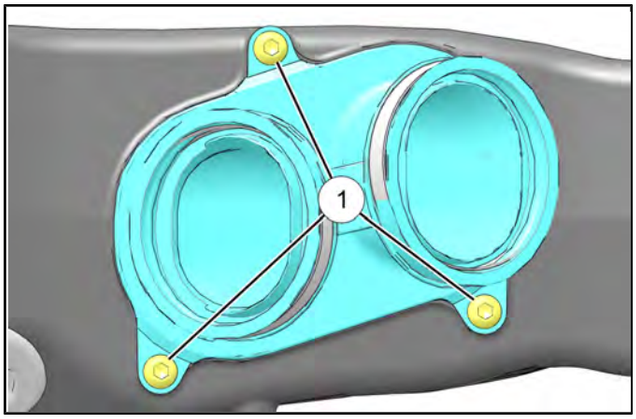
5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Airbox Filter Cover Fastener: **88 in-lbs (10 N·m)**

INLET ADAPTER REMOVAL

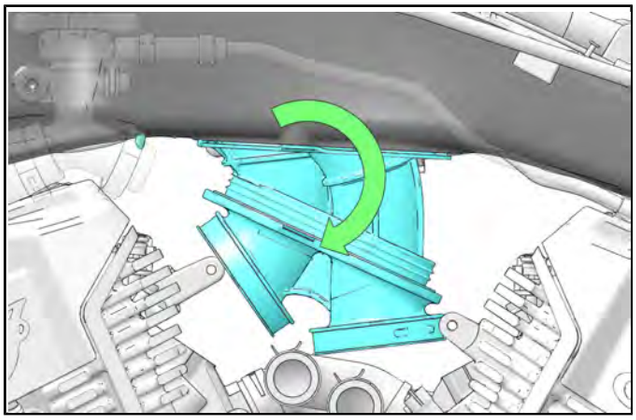
REMOVAL

1. Remove throttle body. See **Throttle Body Removal page 4.81**,
2. Remove inlet adapter fasteners ①.



NOTICE
Image is shown looking up at inlet adapter.

3. Remove the inlet from the frame.



3

INLET ADAPTER INSTALLATION

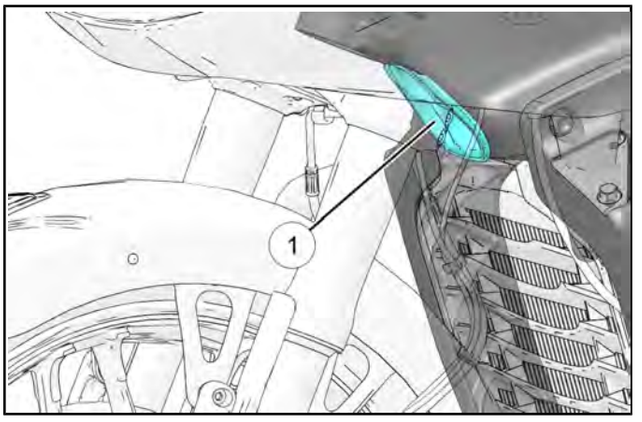
INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

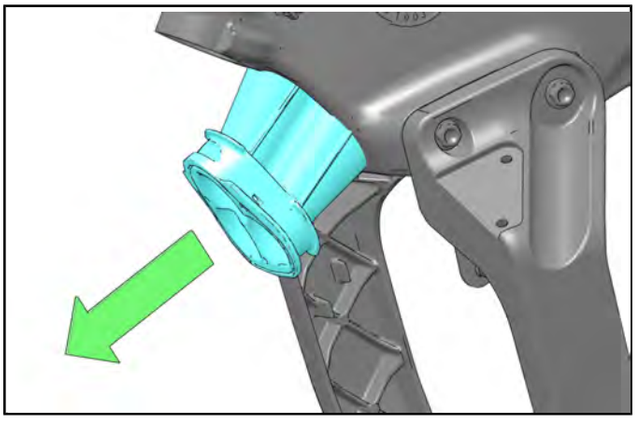
TORQUE
Inlet Adapter Fastener: **88 in-lbs (10 N·m)**

INLET TUBE REPLACEMENT

1. Locate the inlet tube ①.



2. Remove the inlet from the frame.



3. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

ENGINE REMOVAL / INSTALL

GENERAL INFORMATION

SERVICE NOTES – ENGINE REMOVAL / INSTALL

A floor jack or commercially available motorcycle engine lift or hoist is required for engine removal. Arrange for assistance when removing and installing the engine.

Once the engine is removed from frame, an engine stand is recommended for engine disassembly and assembly.

Engine removal and installation methods may differ slightly depending on available equipment, but always be sure the engine and chassis are securely supported at all times.

REQUIRES ENGINE REMOVAL FOR SERVICE	CAN BE SERVICED WITH ENGINE IN FRAME
Camshaft(s) / Bearings	Airbox Removal
Crankshaft & Crankshaft Component Service	Camshaft Chain / Guide / Tensioner Assembly
Cylinder Heads	Fuel Injectors / Throttle Body / Fuel Rail
Cylinders	Voltage Regulator, Stator, Rotor (Flywheel)
Oil Pump	Clutch
Valve Covers *The engine does not need to be fully removed for service but does need to be lowered enough to remove component.	Gearshift Linkage (External)
Balance Shaft	Ignition System
Piston/Cylinder	Oil Pump Drive
Transmission/All Internal Transmission Parts	Output Shaft Seal
	Torque Compensator Assembly
	Starter, Starter One-Way Clutch, Starter Torque Limit Clutch

SERVICE SPECIFICATIONS – ENGINE REMOVAL / INSTALLATION

ITEM	SPECIFICATIONS
Engine Dry Weight	Approximately 268 lbs (122 kg)
Oil Capacity (Dry Fill)	Approximately **5.0 qts (4.7 L)**
Max Cylinder Leakage	**15%**

SPECIAL TOOLS – ENGINE

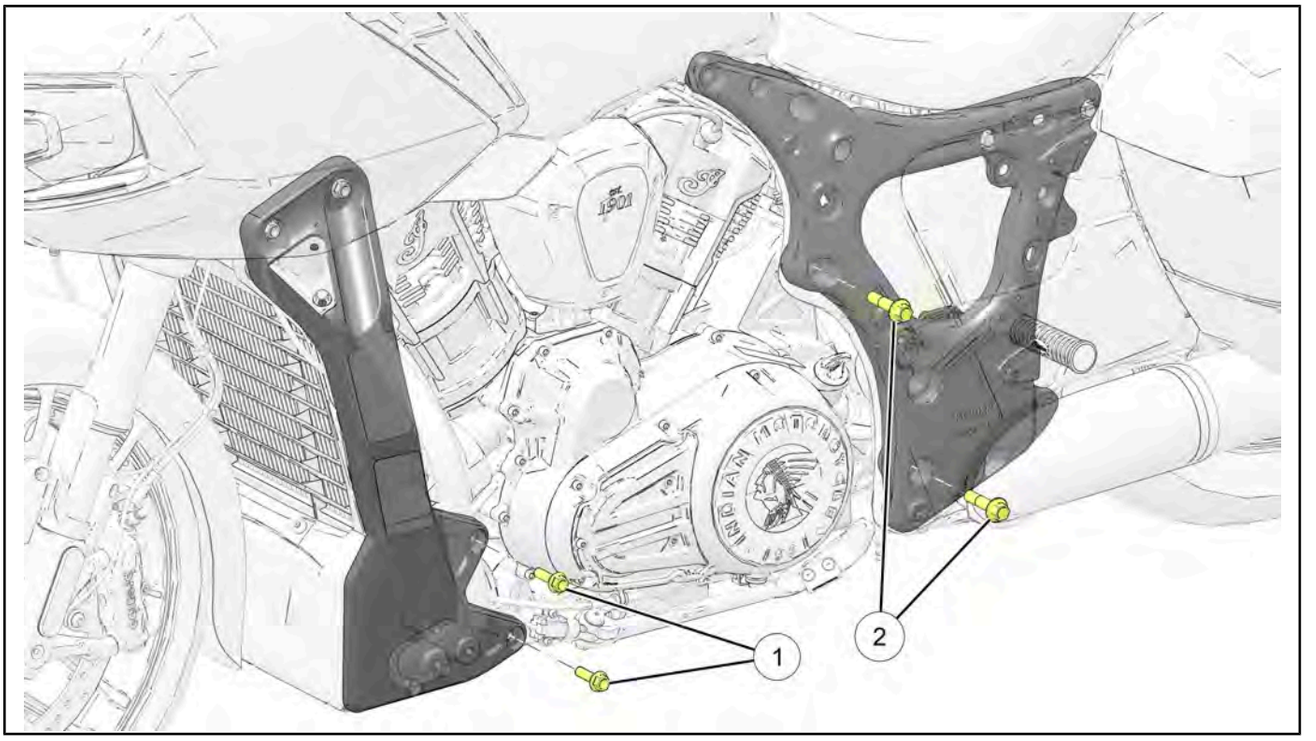
TOOL DESCRIPTION	PART NUMBER
Engine Stand Adapter	PF-51240
Crankshaft Locking Pin	PF-51235-A
Motorcycle Table Lift / Wheel Vise	Commercially Available
12"x12" Platform Jack	Commercially Available
Engine Hoist (Cherry Picker)	Commercially Available
Engine Stand	Commercially Available

Bosch Automotive Service Solutions: 1–800–328–6657 or https://polaris.service-solutions.com/

ASSEMBLY VIEWS

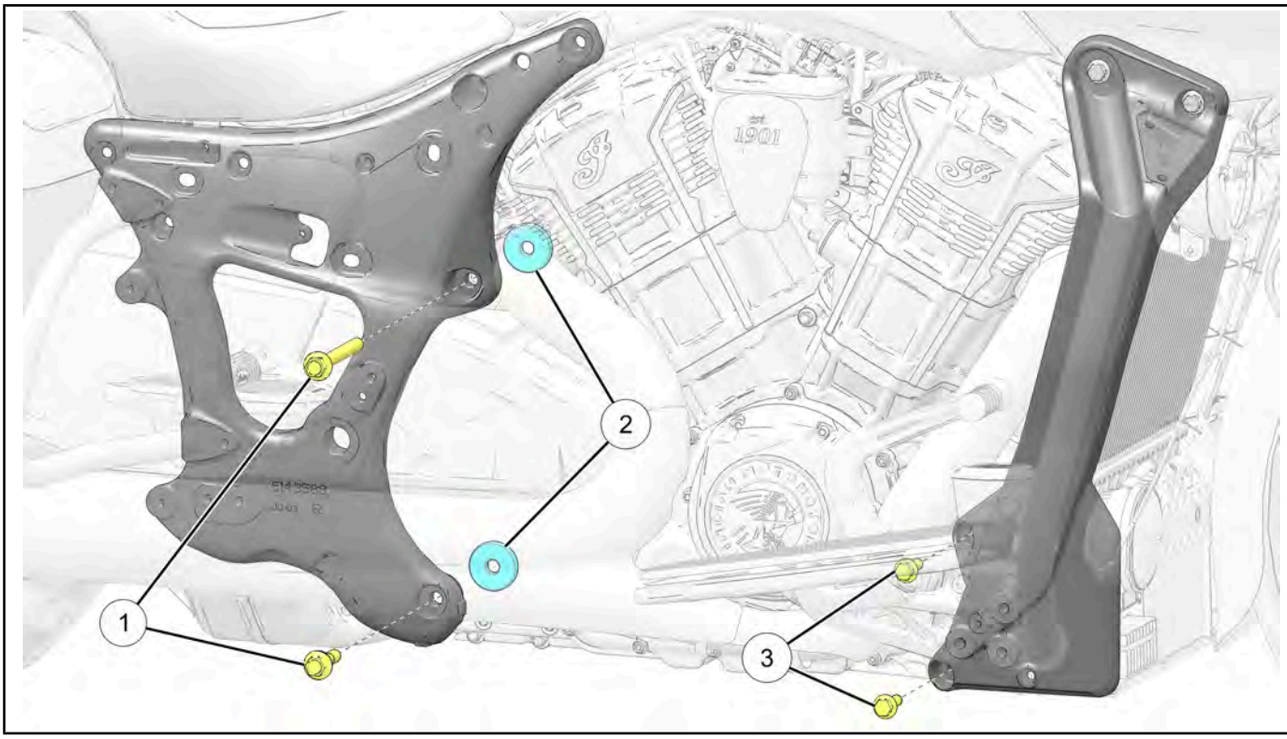
ENGINE BRACKETS / FASTENERS

LEFT SIDE BRACKETS / FASTENERS



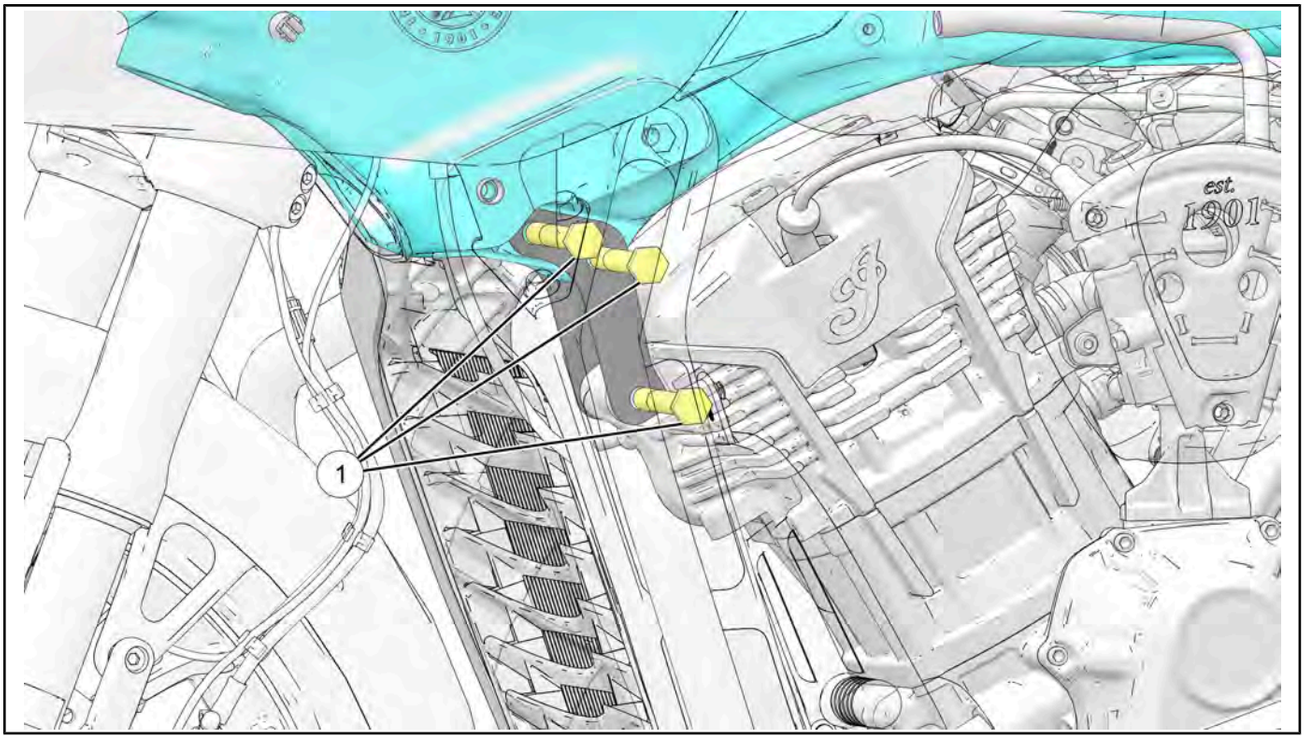
① Front Downcast Fastener **45 ft-lbs (61 N·m)**	② Midcast M12 Fastener **75 ft-lbs (102 N·m)**

RIGHT SIDE BRACKETS / FASTENERS



① Midcast M12 Fastener **75 ft-lbs (102 N·m)**	③ Front Downcast Fastener **45 ft-lbs (61 N·m)**
② Engine / Frame Spacer	

CYLINDER HEAD BRACKET / FASTENER



① Cylinder Head Bracket Fastener
75 ft-lbs (102 N·m)

ENGINE REMOVAL / INSTALLATION

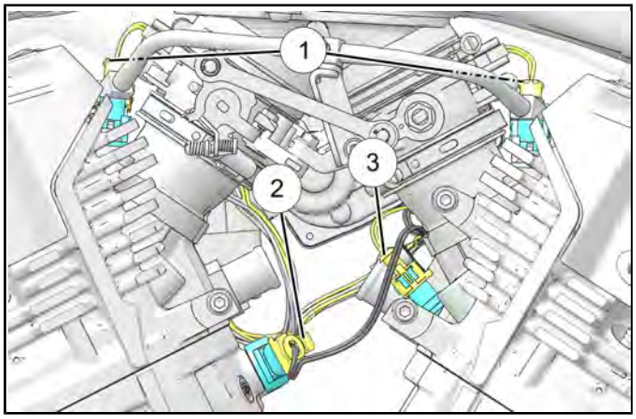
PREPARATION FOR ENGINE REMOVAL

NOTICE
Different methods can be used to remove the engine depending on the equipment available to the technician. All methods require the front wheel to be held securely in an upright position.

IMPORTANT
Note locations of any routing clips. The cable tie should be cut loose from the clip. Any clips removed by extracting or prying must be replaced.

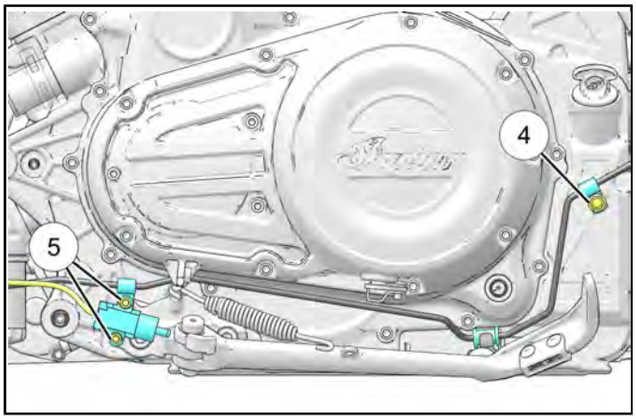
IMPORTANT
Some procedures require the engine to be completely removed for service. In some instances lowering the engine can be sufficient.

1. Secure motorcycle securely in an upright position. Clamp front tire securely in a wheel vise.
2. Remove fuel tank. See **Fuel Tank Removal page 4.24**.
3. Remove radiator. See **Radiator Removal page 3.40**.
4. Remove head pipe. See **Headpipe Removal page 3.107**.
5. Remove driver's floorboard. See **Floorboard Removal page 7.103**.
6. Disconnect drive belt from drive sprocket. Reference **Drive Belt Removal page 8.61**.
7. Remove thermostat assembly. See **Thermostat Removal page 3.48**.
8. Disconnect electrical connector for:

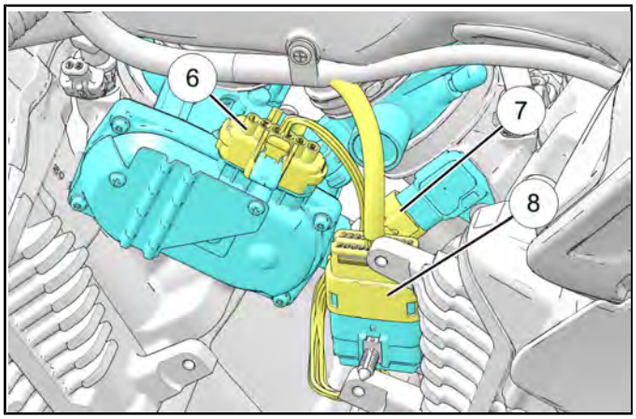


- Fuel injectors ①
- Knock sensor ②
- Cylinder head temperature sensor ③

9. Remove brake line fastener ④.

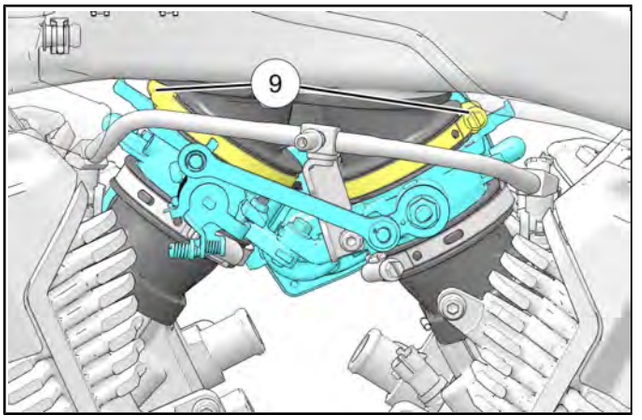


10. Remove sidestand switch by removing its fasteners ⑤.
11. Disconnect electrical connector for:

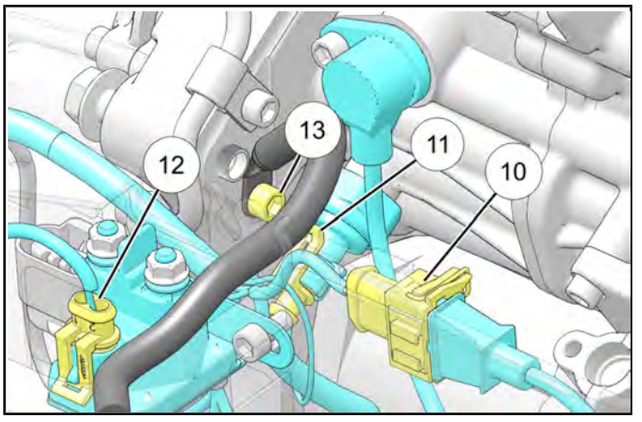


- Throttle body assembly ⑥
- TMAP ⑦
- Chassis ⑧

12. Loosen throttle body to inlet adapter clamps ⑨.

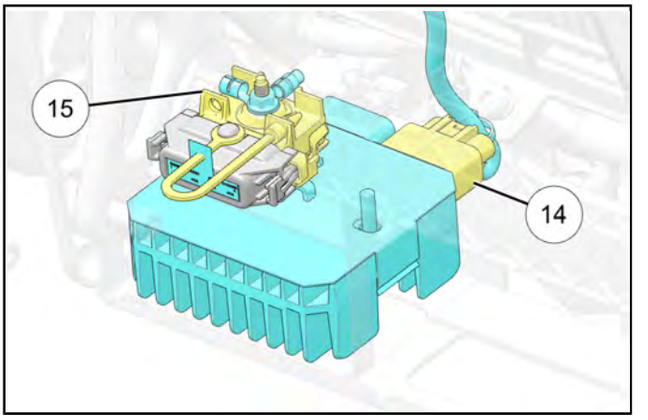


13. Near the battery box, disconnect electrical connector for:

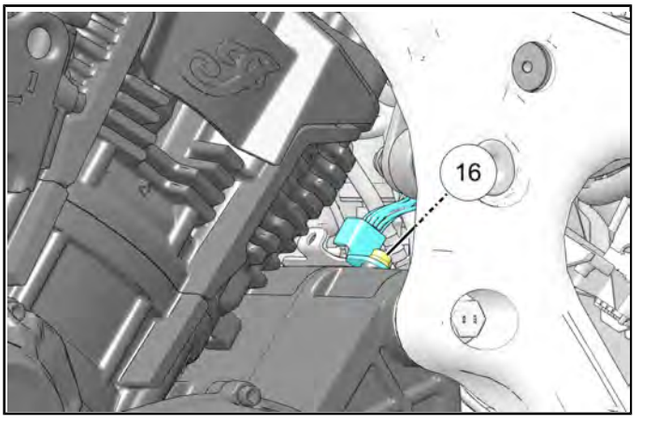


- Crankshaft Position Sensor ⑩
- Oil Pressure Switch ⑪
- Starter Relay ⑫

14. Disconnect fastener securing ground ⑬.
15. Disconnect starter terminal fastener.
16. Disconnect stator electrical connectors ⑭ and M-Case ⑮ connector.

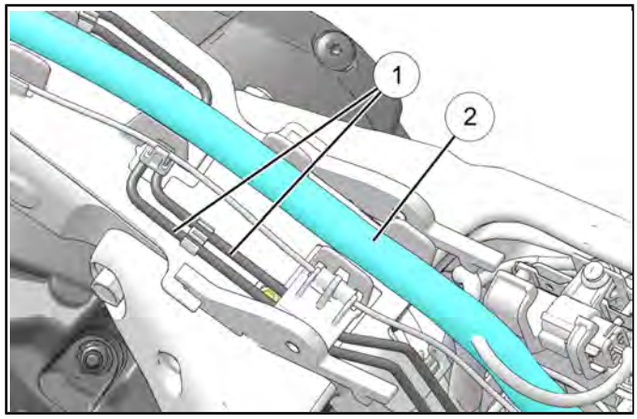


17. Remove engine ground ⑯.

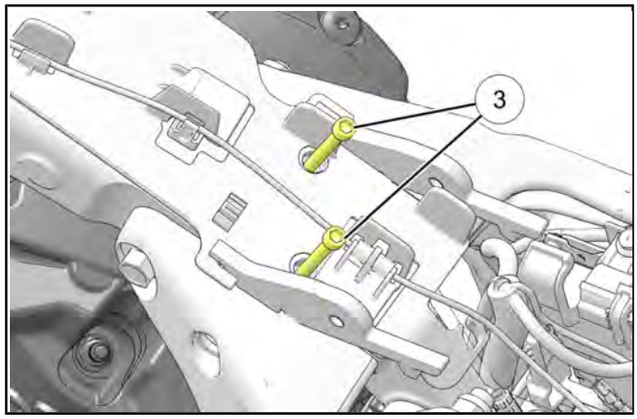


REMOVING ENGINE FROM FRAME

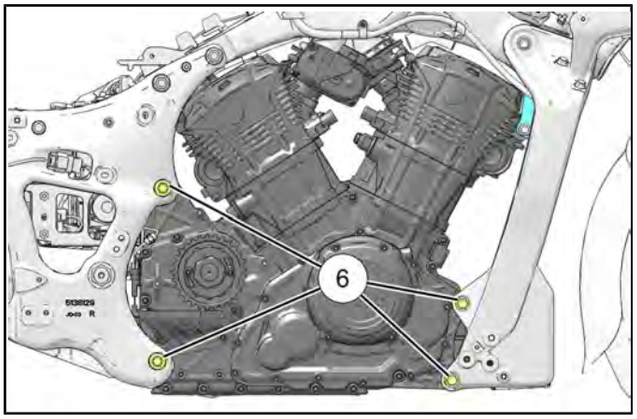
1. Perform the preliminary engine removal steps outlined in this chapter. See **Preparation For Engine Removal page 3.17**.
2. Remove fasteners securing ABS module bracket from engine. Reference **ABS Module Replacement page 9.35**.
3. Place a platform jack beneath the engine and raise enough to support crankcase (Jack should just be touching the crankcase).
4. At the rear of the mainframe, move brake lines ① and electrical harness ② to expose fasteners beneath.



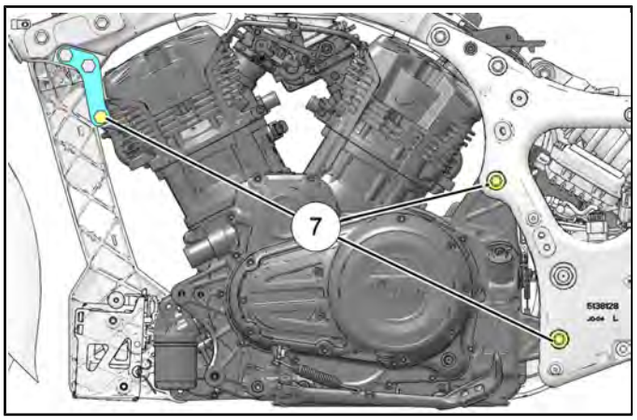
5. Remove fasteners ③ securing mainframe to breather.



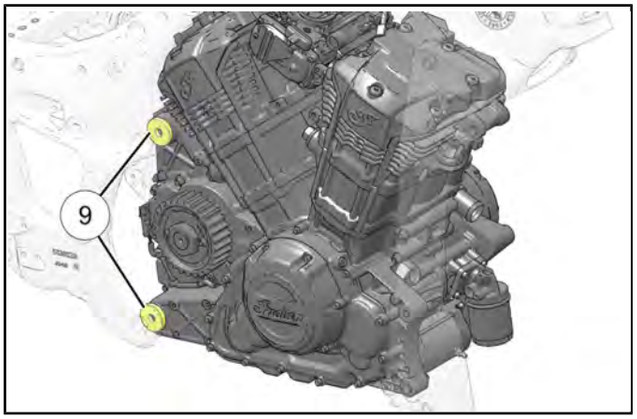
6. Remove the right side engine fasteners ⑥.



7. Remove the engine mount remaining fasteners ⑦ on the left side.



8. During removal, ensure to retrieve frame / engine spacers ⑨.



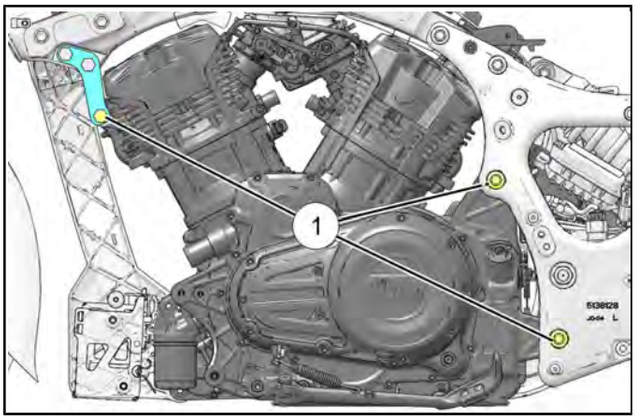
9. Separate engine from alignment dowels. With an assistant, lower the engine from the frame and remove from unit.

ENGINE INSTALLATION

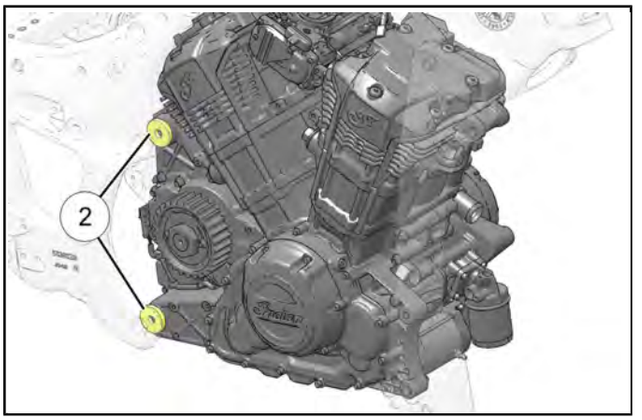
1. Lift engine into position with a scissor jack.

IMPORTANT
While positioning the engine, guide throttle body assembly into inlet adapters.

2. Install engine mount fasteners ① hand tight.



3. Ensure frame/engine spacers ② are in place on the right side.

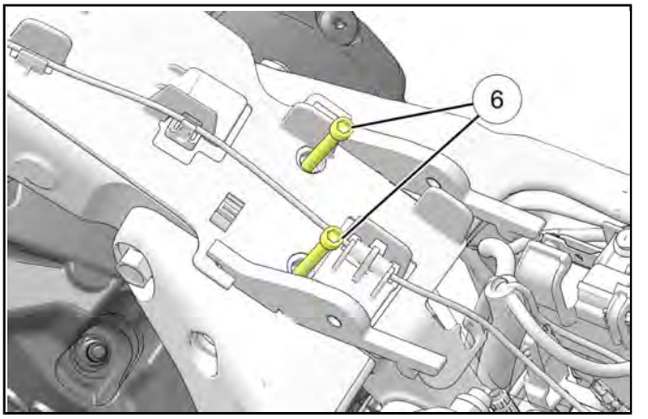


4. Tighten engine mount fasteners.

TORQUE
Engine Mount Fastener: **45 ft-lbs (61 N·m)**

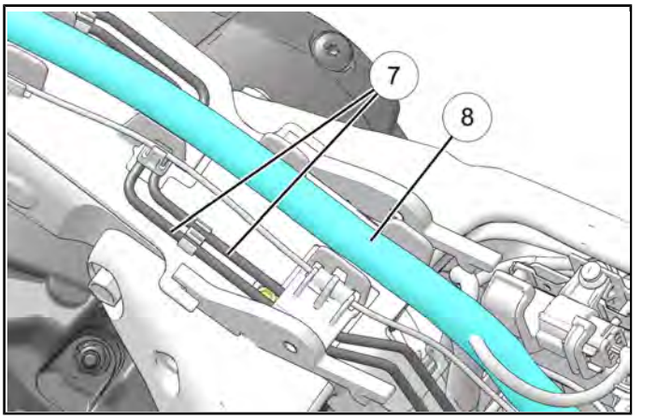
TORQUE
Cylinder Head Bracket Fastener: **75 ft-lbs (102 N·m)**

5. Install breather fastener ⑥.



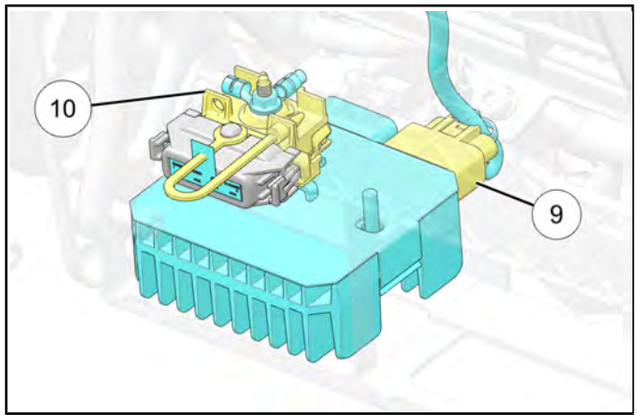
TORQUE
Breather Fastener: **88 in-lbs (10 N·m)**

6. Move brakes lines ⑦ and electrical harness ⑧ into designated routing guides.

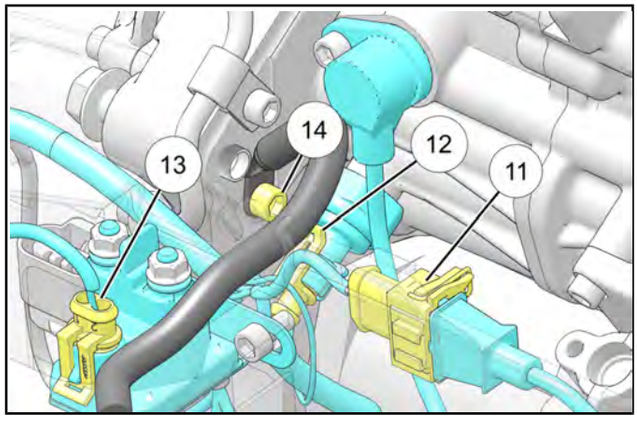


7. Install fasteners securing ABS module bracket to engine. Reference **ABS Module Replacement page 9.35**.

8. Connect the stator electrical connectors ⑨ and M-Case ⑩ connector.



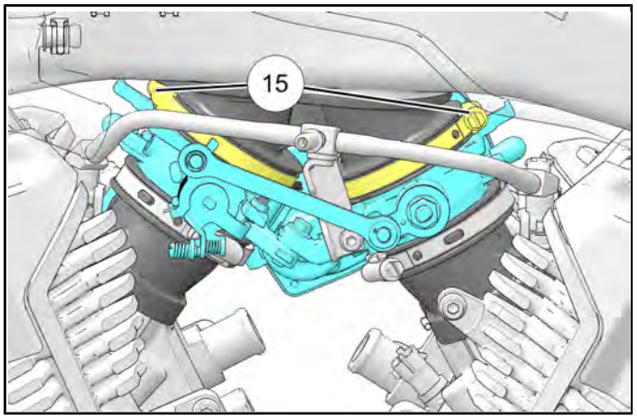
9. Connect electrical connector for:



- Crankshaft Position Sensor ⑪
- Oil Pressure Switch ⑫
- Starter Relay ⑬

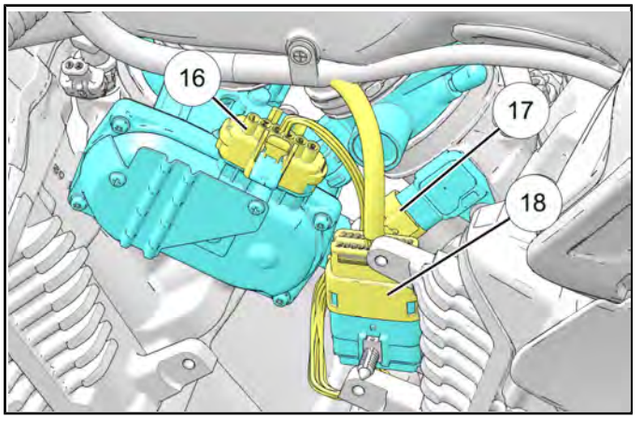
10. Connect fastener securing ground ⑭.

11. Tighten throttle body to inlet adapter clamps ⑮.



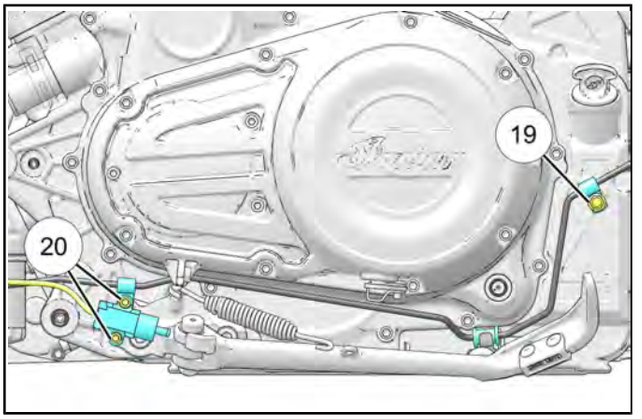
TORQUE
Hose Clamp: **26 in-lbs (3 N·m)**

12. Connect electrical connector for:



- Throttle body assembly ⑯
- TMAP ⑰
- Chassis ⑱

13. Install brake line fastener ⑲.

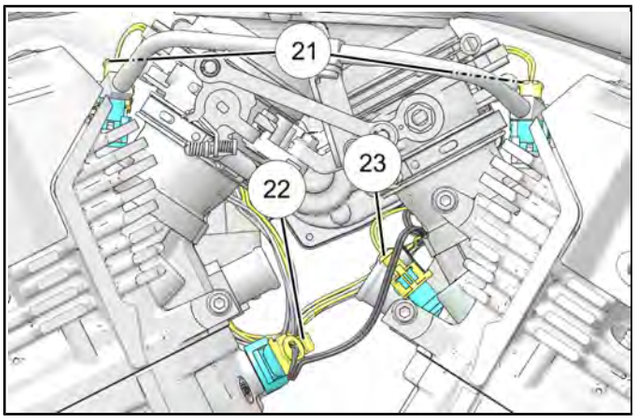


TORQUE
P-clamp: **88 in-lbs (10 N·m)**

14. Install sidestand switch and secure with its fasteners ⑳.

TORQUE
Sidestand Switch Fastener **44 in-lbs (5 N·m)**

15. Connect electrical connector for:



- Fuel injectors ㉑
- Knock sensor ㉒
- Cylinder head temperature sensor ㉓

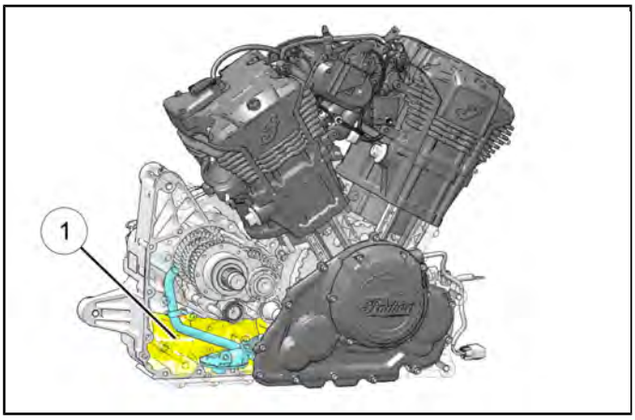
16. Install thermostat assembly. See **Thermostat Installation page 3.49**.
17. Install drive belt. Reference **Drive Belt Installation page 8.61**.
18. Install driver's floorboard. See **Floorboard Installation page 7.104**.
19. Install head pipe. See **Headpipe Installation page 3.108**.
20. Install radiator. See **Radiator Installation page 3.42**.
21. Install fuel tank. See **Fuel Tank Installation page 4.44**.

LUBRICATION / COOLING

GENERAL INFORMATION

SERVICE NOTES — COOLING

The **Power Plus 108** uses a semi-dry sump lubrication system. The engine oil is housed in a separate chamber within the engine cases ① as shown in the image below.



The oil pump has two sets of internal gerotors. One set provides lubrication pressure and the second set provides the scavenge. The oiling system pressure relief valve is also located inside the oil pump.

If the engine is making irregular noises that appear to be coming from rotating parts, check the lubrication side oil pressure. Check the oil pressure before engine disassembly, and recheck the oil pressure after a repair.

TROUBLESHOOTING

LOW OIL PRESSURE	HIGH OIL PRESSURE
Incorrect oil being used or low oil level	Incorrect oil being used
Engine temp above test temperature range	Additives added to oil to increase viscosity
Damaged O-rings or leaks at pipes or fittings	Engine temp below test temperature range
Damaged or worn oil pump or oil pump drive	Restricted oil passages
Pressure relief valve stuck open	Incorrect oil filter
Damaged engine bearings/excessive engine wear.	Pressure relief valve stuck closed
Restricted oil filter, oil filter screen or passages	

SPECIAL TOOLS – COOLING

TOOL DESCRIPTION	PART NUMBER
Oil Pressure Gauge	Commercially Available

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

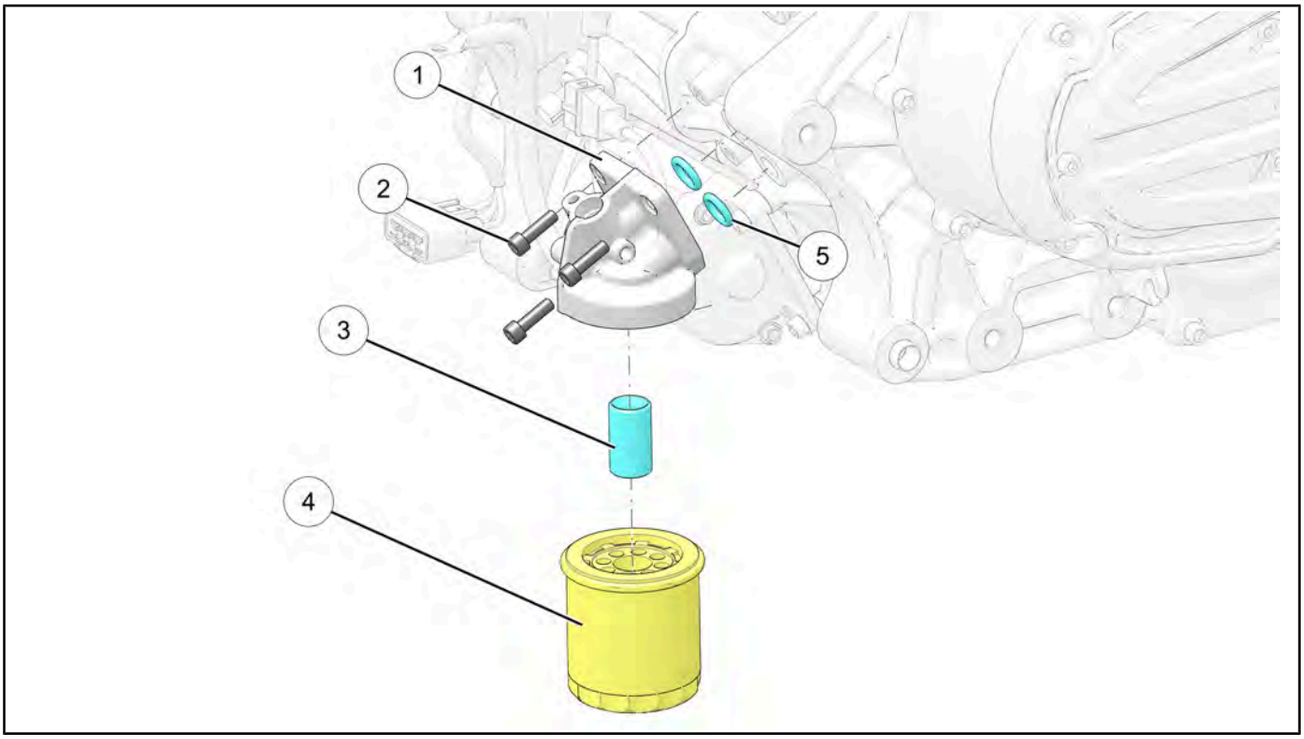
3

SERVICE SPECIFICATIONS – COOLING

ITEM	STANDARD	LIMIT
Engine Oil Capacity (After Disassembly)	5.5 U.S. qts (5.2 L)	Not Applicable
Engine Oil Capacity (At Change with Filter) Follow the oil change procedure outlined in the Maintenance chapter.	**5.0 qts (4.7 L)**	Not Applicable
Recommended Engine Oil if Indian Motorcycle 15W60 is not available, use motorcycle oil with same specifications.	Indian Motorcycle Semi-Synthetic 15W60	Not Applicable
Oil Pressure @ 3000 rpm (supply side) **Engine at operating temperature and specified Indian Motorcycle Engine Oil**	60 psi (513.7 kPa) Readings should be within 20% of the specification.	MINIMUM PRESSURE: 30 psi (206.8 kPa)
Radiator Coolant	2.4 qts (2.3 L)	Not Applicable
Thermostat Opening	Starts to open at 82° C (+/- 2°) Fully open at 95° C	Not Applicable
Cooling Fan	Turns on at 98° C Turns off at 94° C	Not Applicable
OIL PUMP CLEARANCES		
Scavenge Gerotor OD to Oil Pump Body	.006"-.010" (.15 mm-.25 mm)	.015" (.381 mm)
Feed Gerotor OD to Oil Pump Body	.006"-.010" (.15 mm-.25 mm)	.015" (.381 mm)
Oil Pump End Clearance	.0014"-.0032" (.036 mm-.081 mm)	.008" (.203 mm)
Gerotor Tip Clearance	.003"-.005" (.076 mm-.127 mm)	.007" (.178 mm)

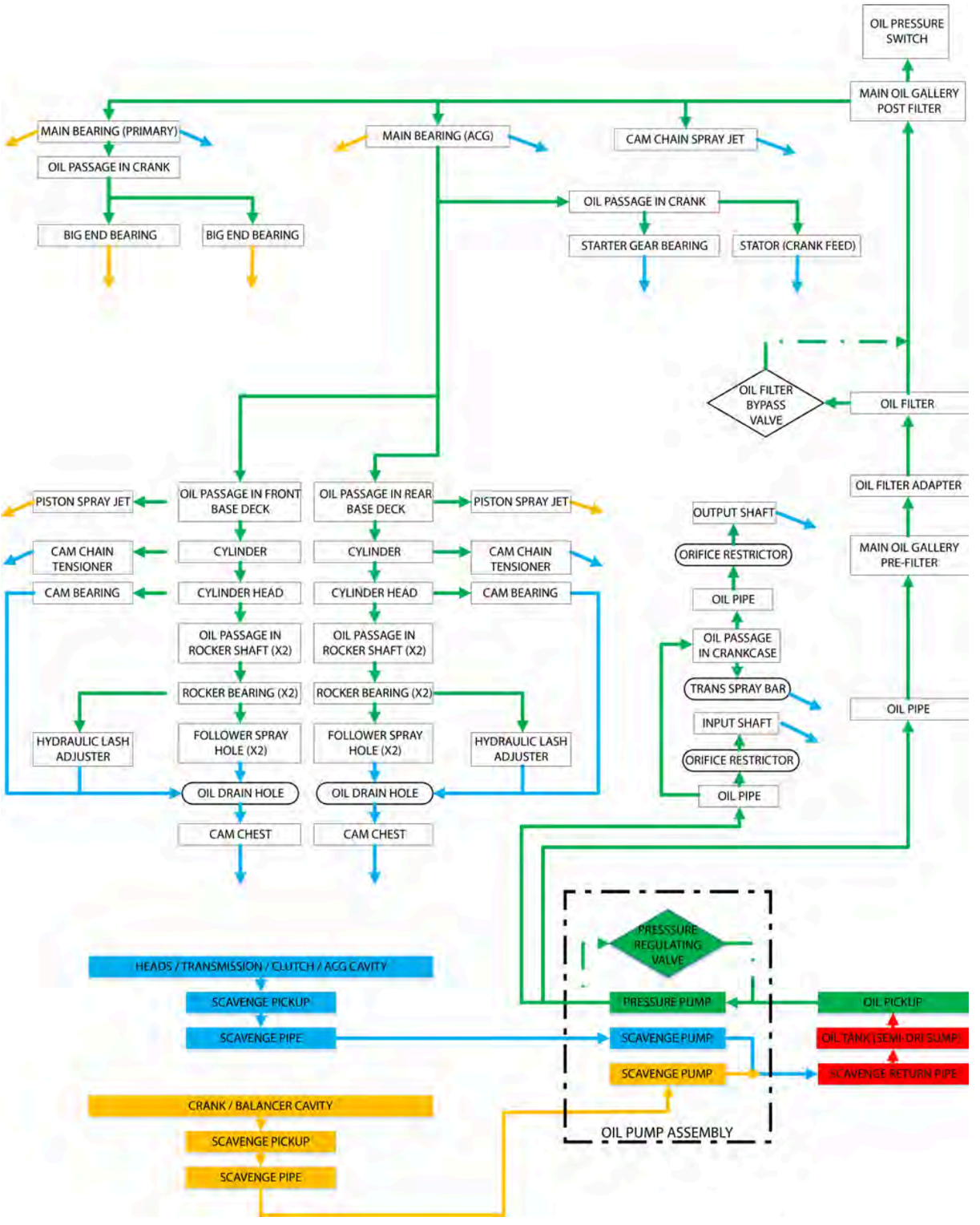
ASSEMBLY VIEWS

FILTER ADAPTER

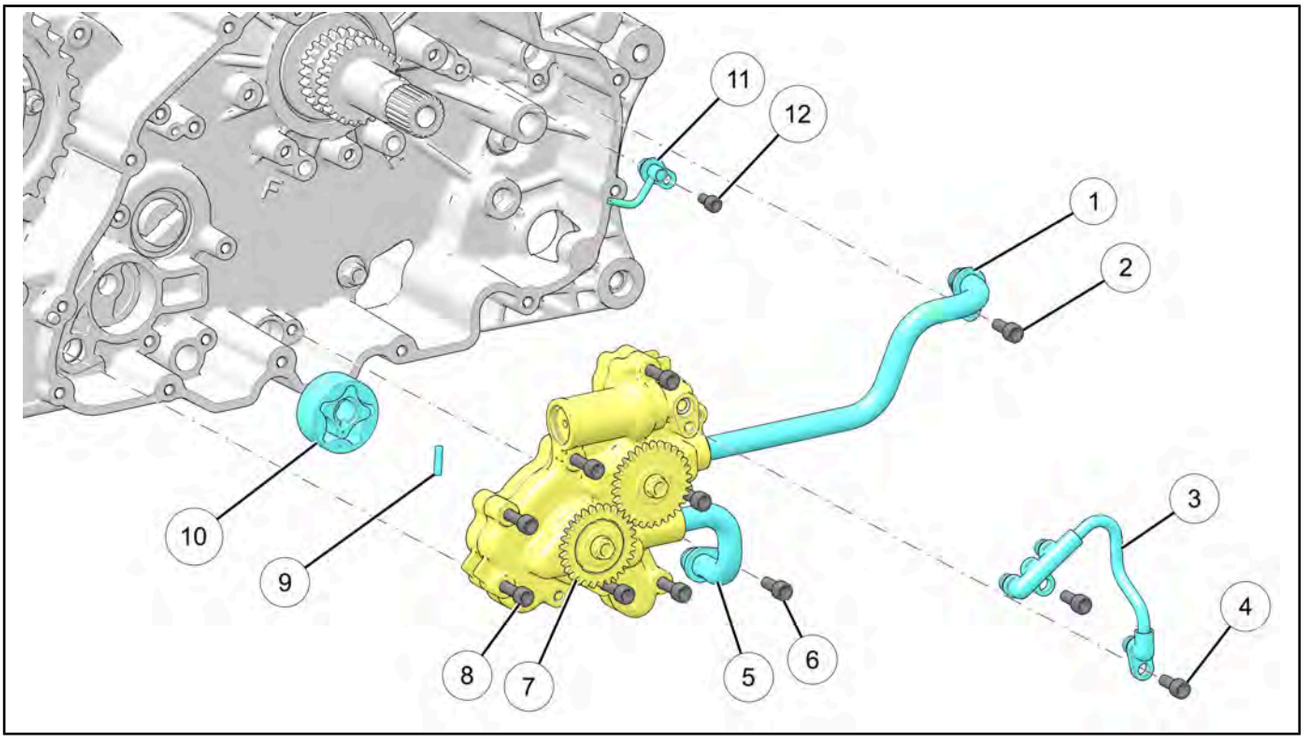


① Oil Filter Adapter	④ Oil Filter **Approximately 3/4 turn after seal has contacted the filter adapter.**
② Oil Filter Adapter Fastener **88 in-lbs (10 N·m)**	⑤ O-Ring
③ Filter Adapter **22 ft-lbs (30 N·m)**	

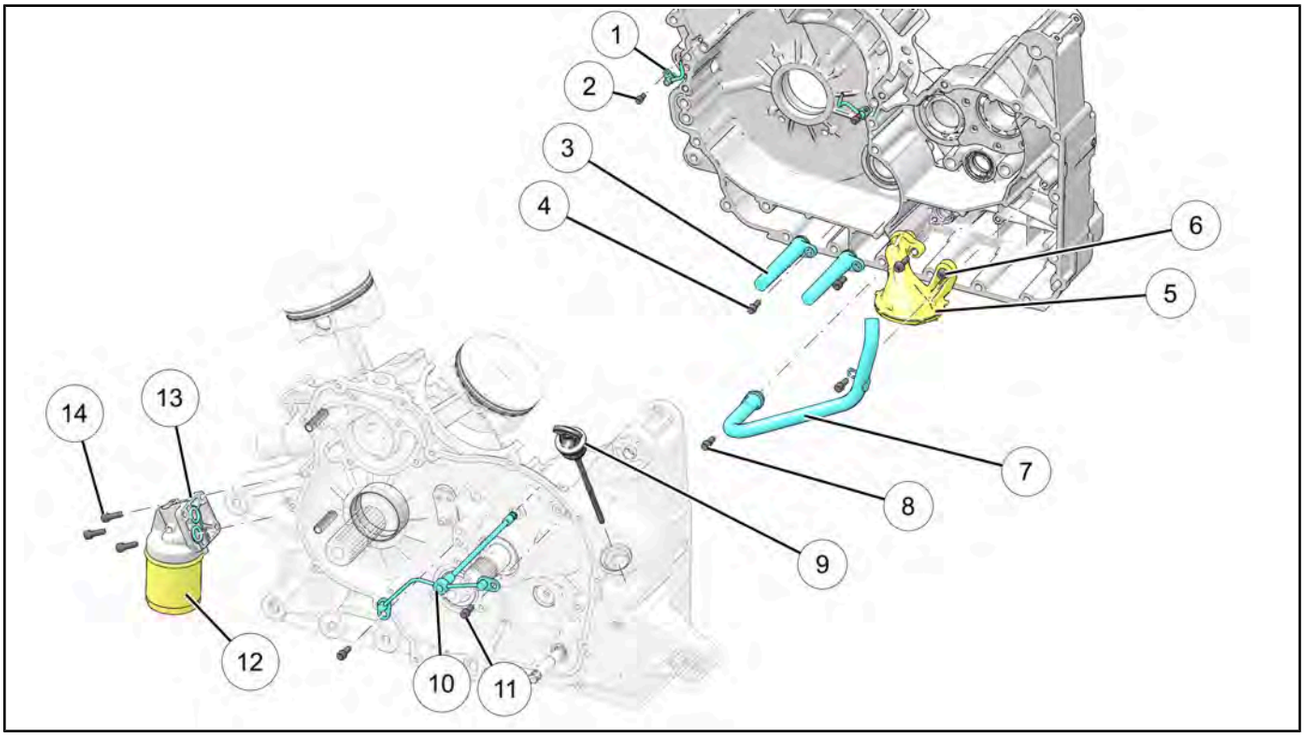
OIL FLOW DIAGRAM



LUBRICATION SYSTEM

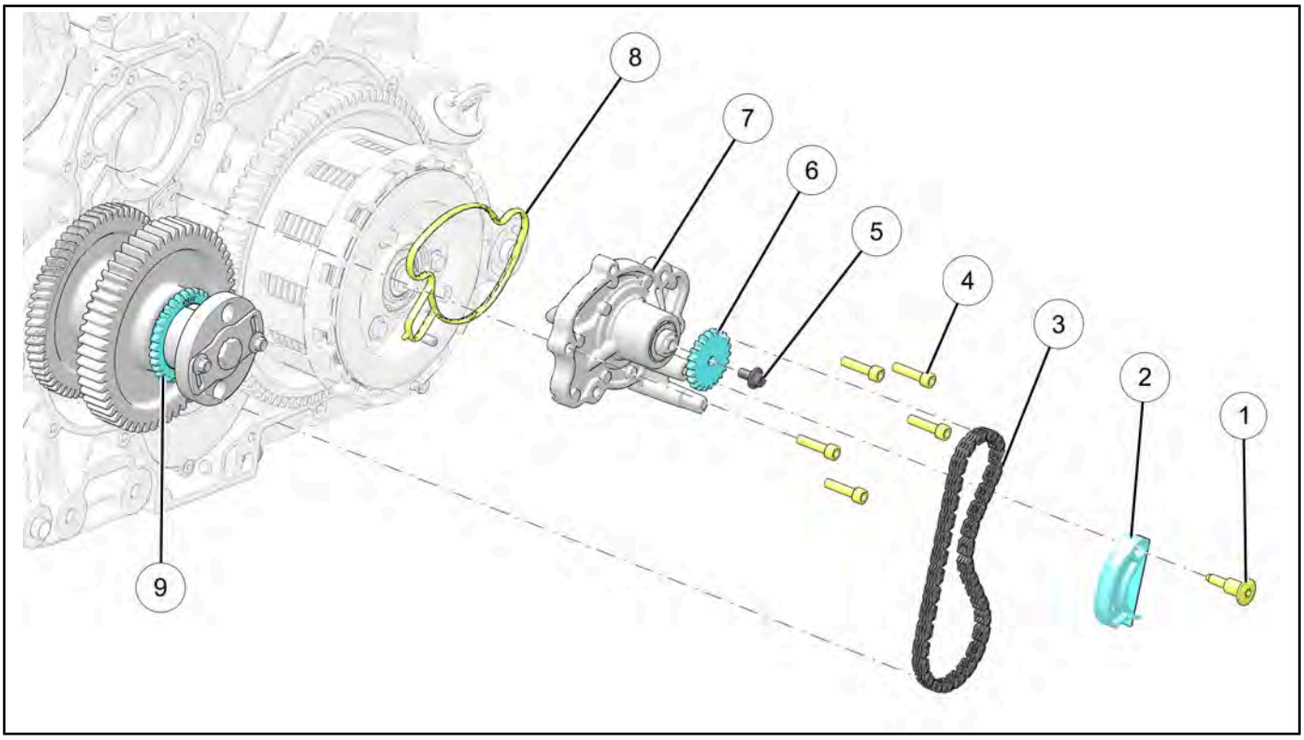


① Oil Pressure Feed Tube	⑦ Oil Pump
② Oil Pressure Feed Tube Fastener **84 in-lbs (10 N·m)**	⑧ Oil Pump Fastener **88 in-lbs (10 N·m)**
③ Input Shaft Feed Tube	⑨ Pin
④ Input Shaft Feed Tube Fastener **88 in-lbs (10 N·m)**	⑩ Gerotor
⑤ Oil Pump Scavenge Tube	⑪ Camshaft Oil Jet
⑥ Oil Pump Scavenge Tube Fastener **88 in-lbs (10 N·m)**	⑫ Camshaft Chain Oil Jet Fastener **62 in-lbs (7 N·m)**



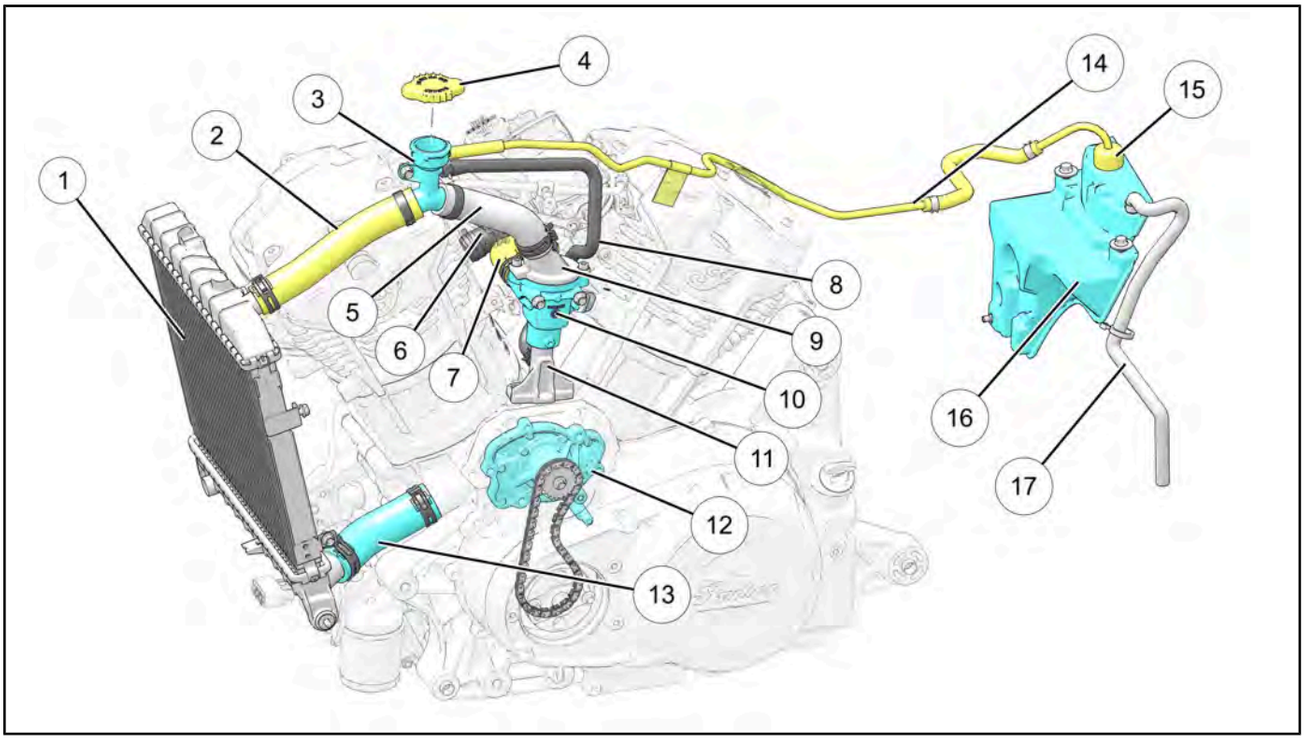
① Piston Cooling Jet	⑧ Oil Scavenge Tube Fastener **88 in-lbs (10 N·m)**
② Piston Cooling Jet Fastener **62 in-lbs (7 N·m)**	⑨ Oil Dipstick
③ Scavenge Oil Inlet Screen	⑩ Transmission Feed Rail
④ Scavenge Oil Inlet Screen Fastener **88 in-lbs (10 N·m)**	⑪ Transmission Feed Rail Fastener **88 in-lbs (10 N·m)**
⑤ Oil Pickup	⑫ Oil Filter **Approximately 3/4 turn after seal has contacted the filter adapter.**
⑥ Oil Pickup Fastener **88 in-lbs (10 N·m)**	⑬ Oil Filter Adapter
⑦ Oil Scavenge Tube	⑭ Oil Filter Adapter Fastener **88 in-lbs (10 N·m)**

WATER PUMP ASSEMBLY VIEW



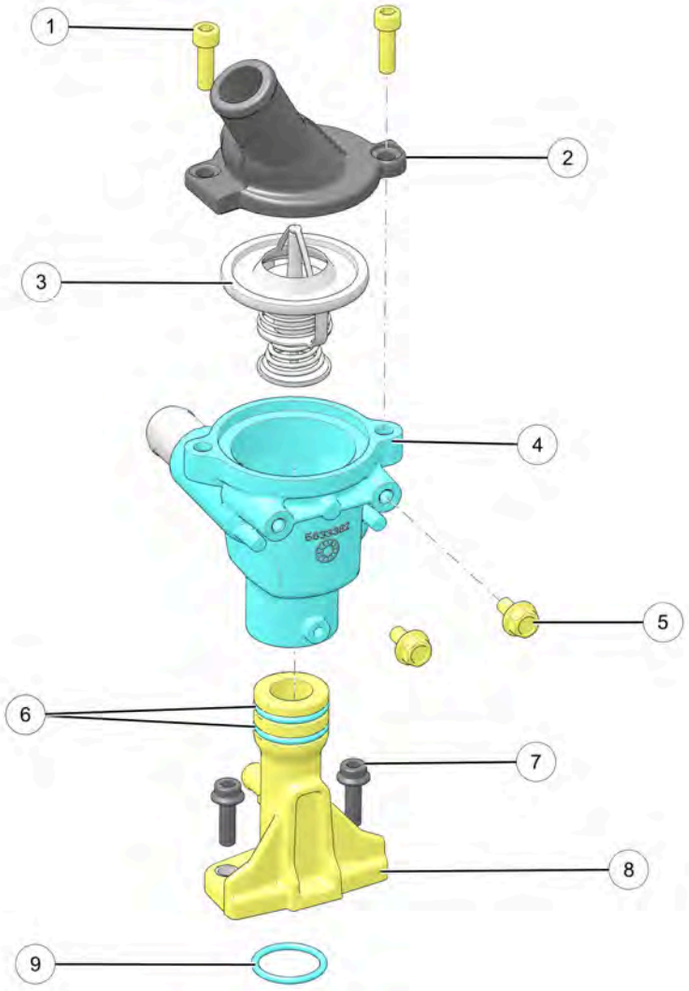
① Water Pump Chain Tensioner Fastener **88 in-lbs (10 N·m)**	⑥ Water Pump Sprocket
② Water Pump Chain Tensioner	⑦ Water Pump
③ Water Pump Chain	⑧ Water Pump Gasket
④ Water Pump Fastener **88 in-lbs (10 N·m)**	⑨ Water Pump Drive Sprocket
⑤ Water Pump Sprocket Fastener **88 in-lbs (10 N·m)**	

COOLING SYSTEM ASSEMBLY VIEW



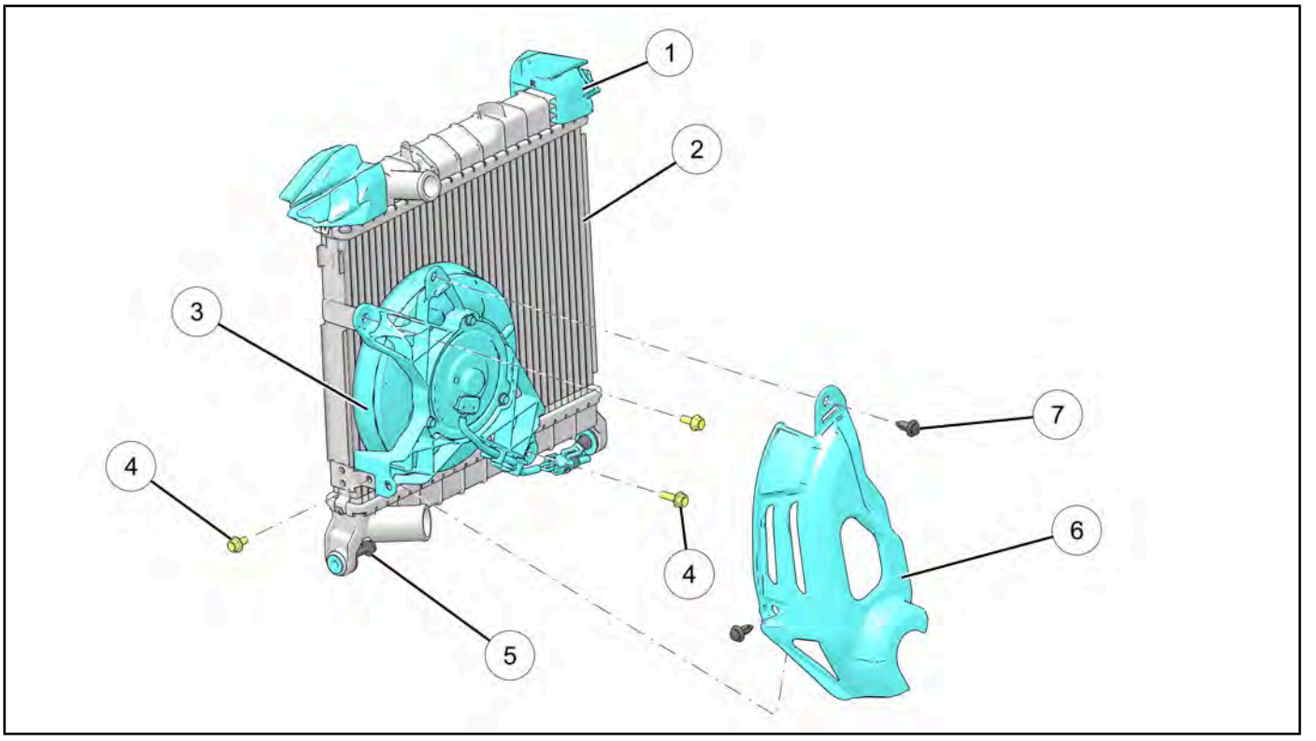
① Radiator	⑩ Thermostat housing
② Radiator Hose (In)	⑪ Bypass Tube
③ Coolant Remote Filler	⑫ Water Pump
④ Pressure Cap	⑬ Radiator Hose (Out)
⑤ Thermostat Hose	⑭ Recovery Bottle Return Hose
⑥ Cylinder Coolant Hose (Front)	⑮ Recovery Bottle Cap
⑦ Cylinder Coolant Hose (Rear)	⑯ Coolant Recovery Bottle
⑧ Coolant Return Line	⑰ Coolant Overflow Hose
⑨ Thermostat Cover	

THERMOSTAT ASSEMBLY VIEW



① Thermostat Cover Fastener **88 in-lbs (10 N·m)**	⑥ O-Ring
② Thermostat Cover	⑦ Bypass Tube Fastener **88 in-lbs (10 N·m)**
③ Thermostat	⑧ Bypass Tube
④ Thermostat Housing	⑨ O-Ring
⑤ Thermostat Mounting Bracket Fastener **88 in-lbs (10 N·m)**	

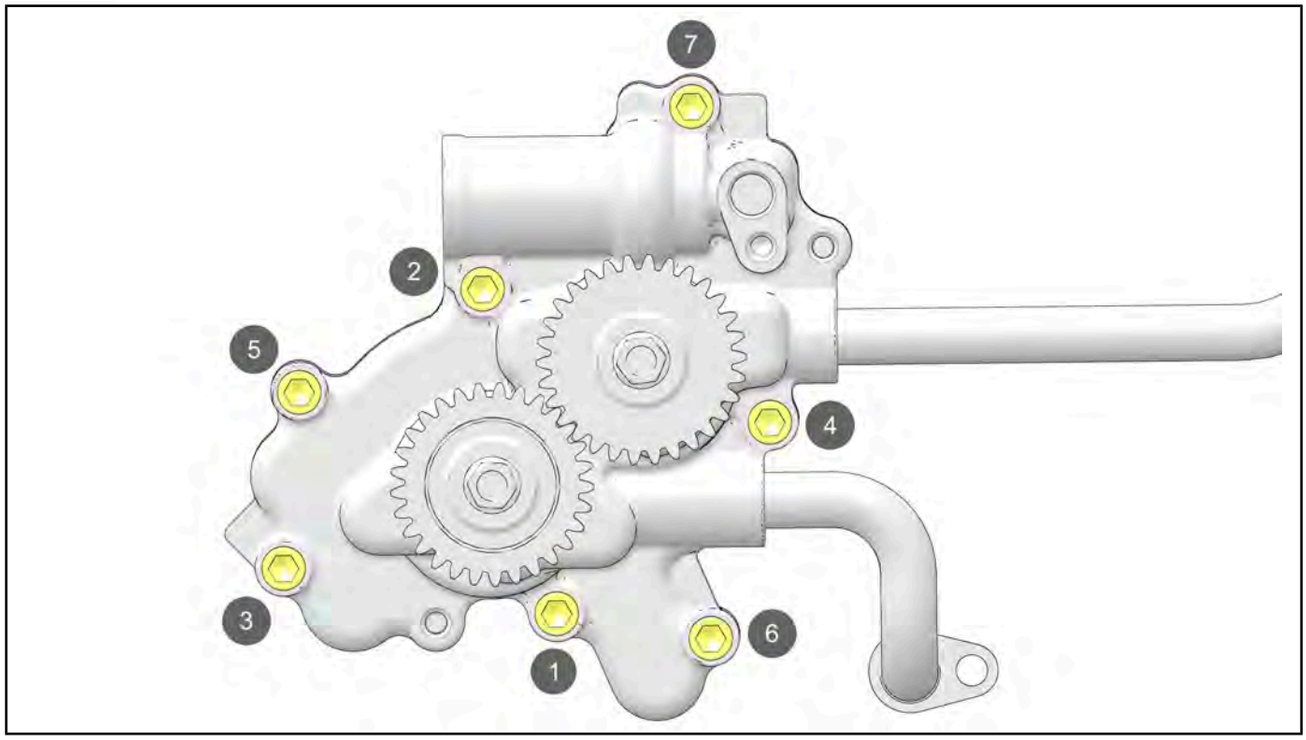
RADIATOR ASSEMBLY VIEW



① Upper Radiator Mount	⑤ Radiator Mount Fastener **88 in-lbs (10 N·m)**
② Radiator	⑥ Fan Shroud
③ Cooling Fan	⑦ Push Pin
④ Cooling Fan Fastener **35 in-lbs (4 N·m)**	

TORQUE SEQUENCE – LUBRICATION / COOLING

OIL PUMP



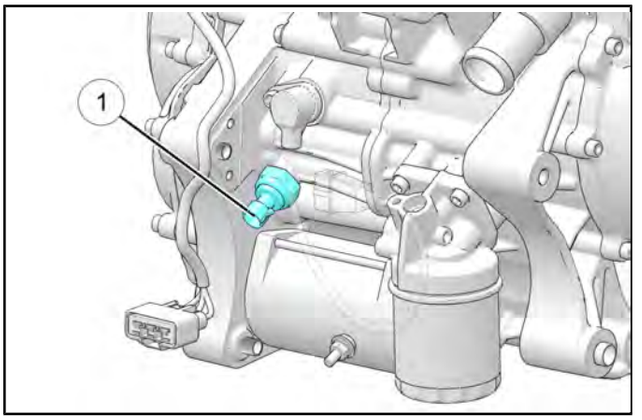
OIL PRESSURE INSPECTION

OIL PRESSURE

⚠ CAUTION
Use caution when working around hot engine oil.

NOTICE
Oil pressure switch activates at 5.5 psi ± 2 psi.

1. Start the engine and run until operating temperature is reached.
2. Turn the engine OFF.
3. Remove chassis harness sensor connector.
4. Remove oil pressure switch ①.



5. Install oil pressure gauge.
6. Use the dipstick to check the engine oil level and add recommended oil, if necessary.
7. Start engine and check oil pressure at 3000 rpm.
8. Compare reading to oil system specifications.
9. Once testing is completed, inspect o-ring and reinstall switch.

TORQUE
Oil Pressure Switch: **115 in-lbs (13 N·m)**

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OIL PUMP SERVICE

OIL PUMP REMOVAL

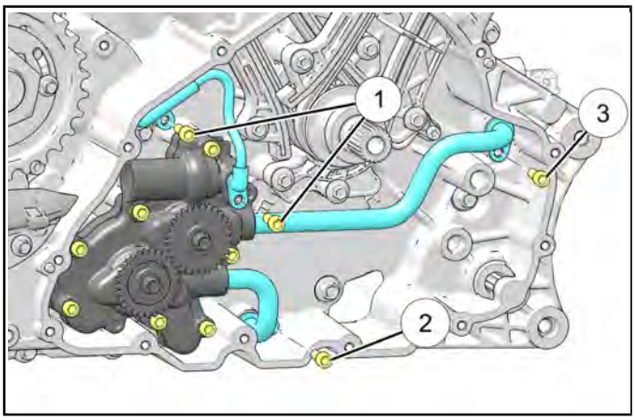
To watch a video of this procedure, scan the QR code or click **HERE**.

https://vimeo.com/343258502/ed02a058f8

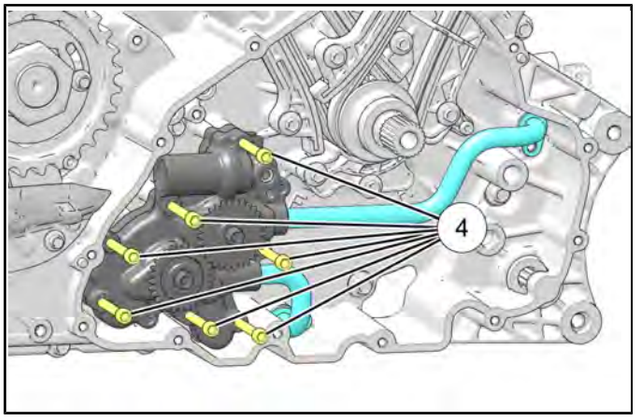
REMOVAL

1. Remove Primary inner cover. See **ACG Cover Removal page 10.31**
2. Remove fasteners ① securing input shaft feed tube. Remove tube and o-rings.

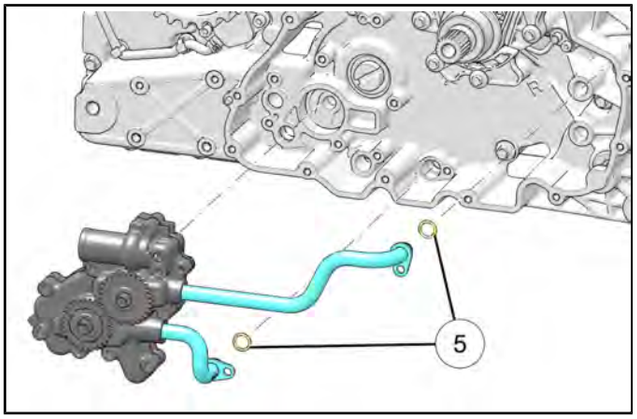
IMPORTANT
Ensure o-rings are removed.



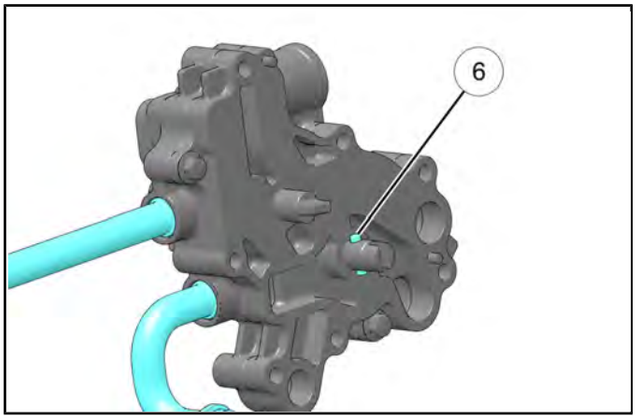
3. Remove oil scavenge tube fastener ②.
4. Remove oil pressure feed tube fastener ③.
5. Remove oil pump fasteners ④.



6. Ensure o-rings ⑤ are removed.



7. Ensure the pin ⑥ is with the oil pump upon removal.



OIL PUMP INSTALLATION

To watch a video of this procedure, scan the QR code or click **HERE**.

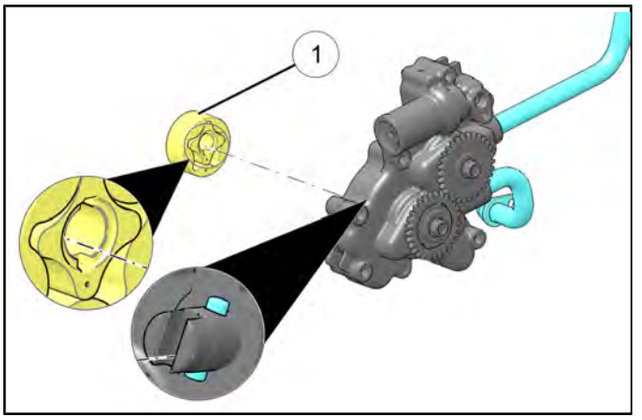
https://vimeo.com/343258502/ed02a058f8

INSTALLATION

⚠ CAUTION

Inspect all o-rings prior to installation. Replace any damaged o-rings, failure to do so can result in oil pressure loss and possible engine damage.

1. Install the gerotor ① onto the oil pump assembly so the pin fits in the recess in the gerotor.



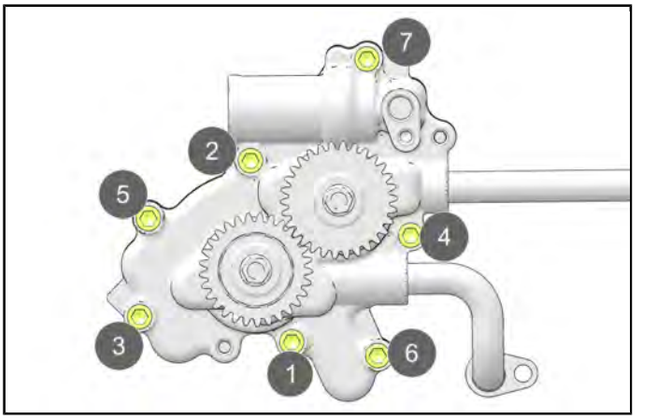
2. Install the oil pump.

NOTICE

To aid in alignment, the oil pump gear can be moved back and forth to seat the gerotor into the casehalf.

3. Torque the oil pump to specification in the sequence as shown.

TORQUE
Oil Pump Fastener **88 in-lbs (10 N·m)**



4. Torque fasteners to specification.

TORQUE
Oil Pressure Feed Tube Fastener: **84 in-lbs (10 N·m)**

TORQUE
Input Shaft Feed Tube Fastener: **88 in-lbs (10 N·m)**

TORQUE
Oil Pump Scavenge Tube Fastener: **88 in-lbs (10 N·m)**

5. Install ACG Cover. See **ACG Cover Installation page 10.31**.

TORQUE
ACG Cover Fasteners: **88 in-lbs (10 N·m)**

TRANSMISSION FEED RAIL

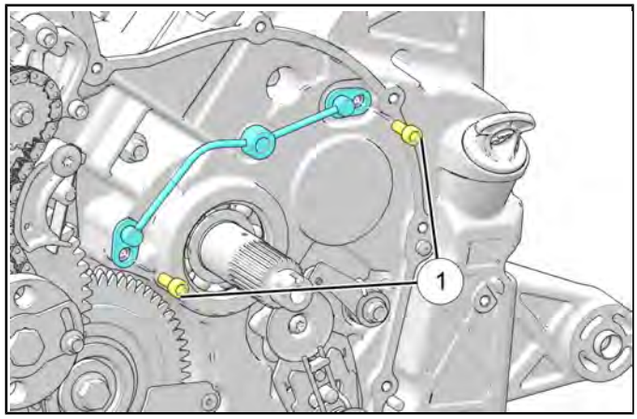
TRANSMISSION FEED RAIL REMOVAL

To watch a video of this procedure, scan the QR code or click **HERE**.

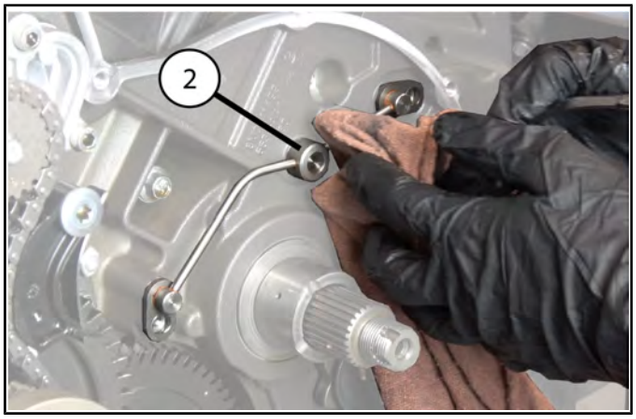
https://vimeo.com/340722321/8d83972c4b

REMOVAL

1. Remove clutch. See **Clutch Removal page 5.19**.
2. Remove fasteners ① securing feed rail.



3. Using a pliers with a rag in the jaws, gently remove feed rail ②.



⚠ CAUTION

Do NOT pry out the feed rail. If the feed rail is damaged upon removal, it may not install properly and cause major engine damage.

IMPORTANT

Ensure the o-rings are removed with the feed rail.

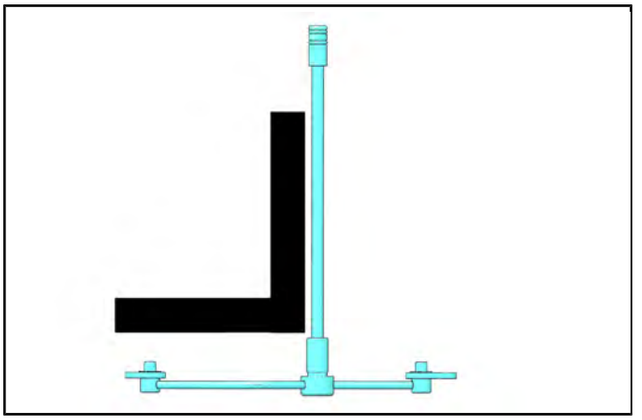
TRANSMISSION FEED RAIL INSTALLATION

To watch a video of this procedure, scan the QR code or click **HERE**.

https://vimeo.com/340722321/8d83972c4b

INSPECTION

1. Ensure transmission feed rail does not show any signs of damage or cracking.
2. Check the straightness of the feed rail with a straight edge.



3. Replace the transmission feed rail if it is bent or damaged.

INSTALLATION

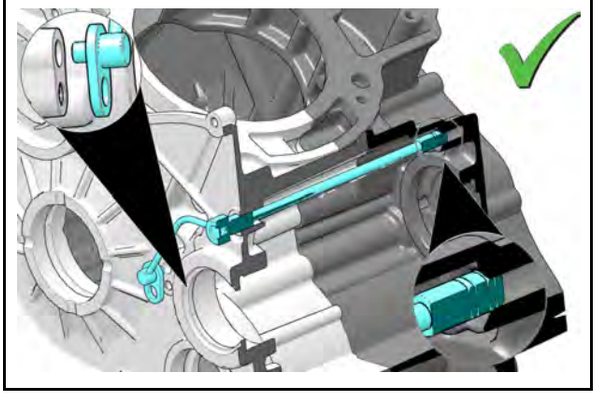
⚠ CAUTION

- The transmission feed line goes through the left case half and into the right casehalf into a tapered hole. There is a potential for incorrectly installing the transmission feed rail. If installed incorrectly, severe engine damage may occur.
- Inspect O-rings prior to installation. Replace if damage is found and lubricate.

1. Install the transmission feed rail. Reference the table below.

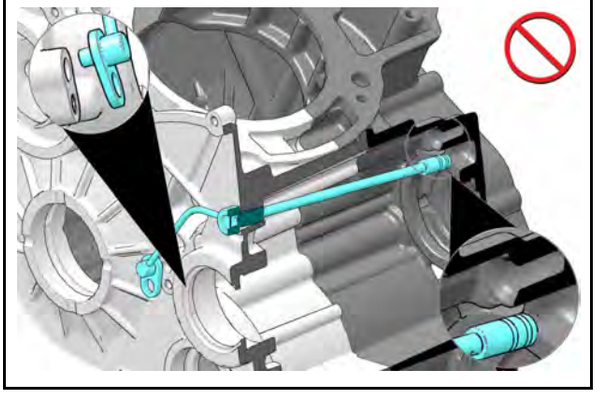
CORRECT

- Some resistance can be felt with the final 0.5–1" from the o-ring seating in the pilot hole.
- The feed rail mounting tabs will be parallel with the case as shown.



INCORRECT

- There will **NO** be no resistance felt due to the o-ring not seating in the pilot hole.
- The feed rail mounting tabs will **NOT** be parallel with the case as shown.



TORQUE
Transmission Feed Rail Fastener: **88 in-lbs (10 N·m)**

2. Install clutch. See **Clutch Installation page 5.23**.

COOLING SYSTEM SERVICE

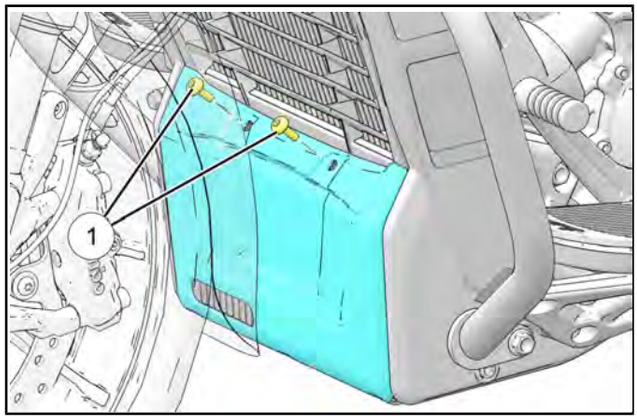
COOLANT DRAIN / FILL / BLEED

DRAIN

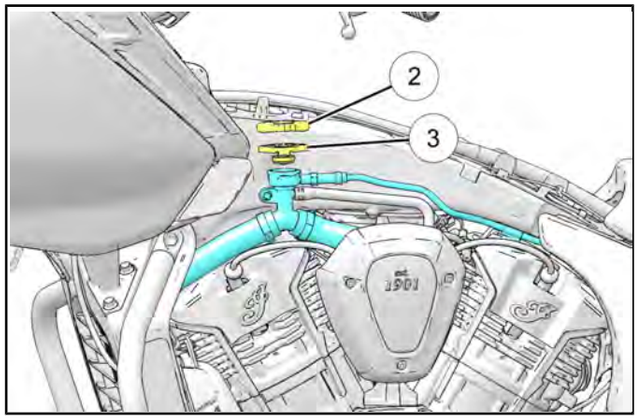
⚠ WARNING

Engine, coolant, and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wait for components to cool sufficiently before working on the machine.

1. Remove fuel tank. See **Fuel Tank Removal page 4.24**.
2. Remove chin fairing by removing its fasteners ①.



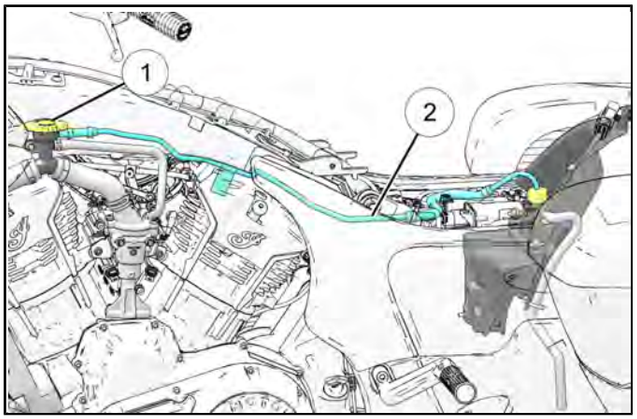
3. Remove pressure cap cover ② and radiator cap ③.



4. Loosen the radiator drain.

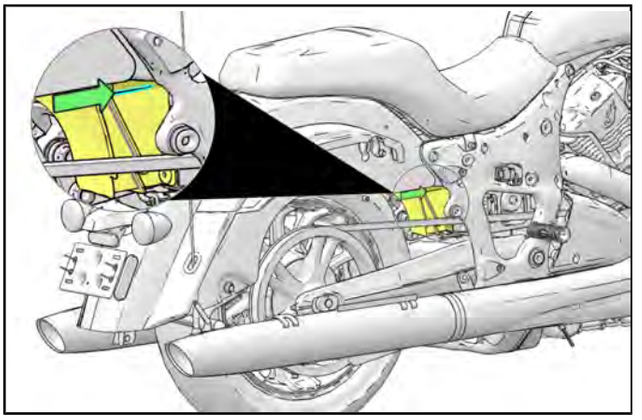
FILL / BLEED

1. Install radiator drain plug.
2. Remove pressure cap ①.



3. Use pinch pliers (commercially available) to pinch off rubber section of coolant line ② between the coolant reservoir and pressure cap.
4. Install a cooling system vacuum fill tool (commercially available) on the pressure cap opening to create a vacuum in the cooling system.
5. Using the vacuum bleeder, draw in Indian Motorcycle extended life 50/50 engine coolant to fill the cooling system.
6. Remove the vacuum bleeder and install the pressure cap.
7. Remove the pinch pliers from the coolant line between the reservoir and thermostat housing.

8. Fill the recovery bottle to the line indicated on the side of the bottle.



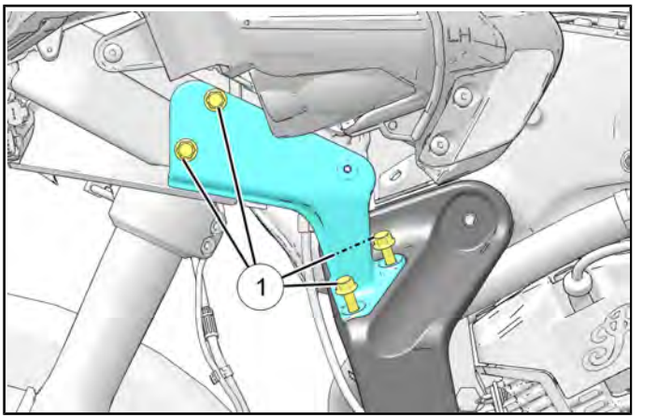
RADIATOR REMOVAL

⚠ WARNING

Engine, cooling, and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wait for components to cool sufficiently before working on the machine.

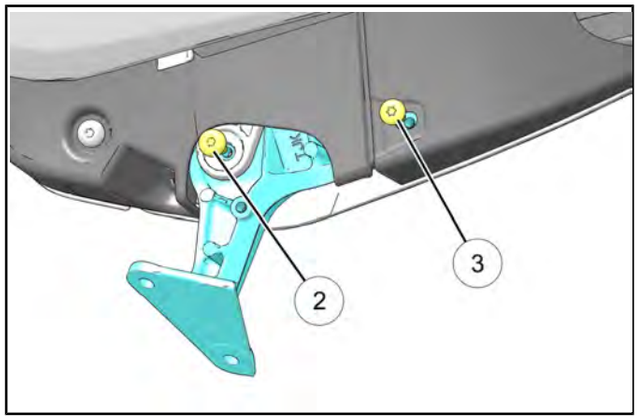
REMOVAL

1. For chassis mounted fairings, remove outer fairing. Reference **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Remove battery. See **Battery Removal page 10.14**.
3. Remove highway bar. See **Highway Bar Removal page 7.106**.
4. Remove driver floorboard assembly. See **Floorboard Removal page 7.103**
5. Drain engine coolant. See **Coolant Drain / Fill / Bleed page 3.39**.
6. For chassis mounted fairings, remove lower fairing bracket fasteners ①.

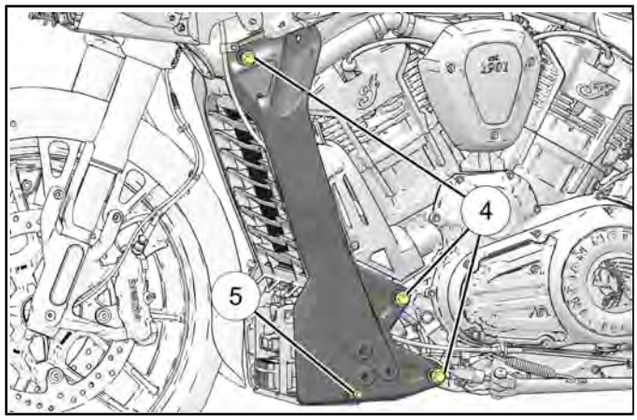


7. On the inside of the fairing bracket, remove the speaker assembly fastener ②, and the dash closeout fastener ③. Remove the bracket.

IMPORTANT
This step only applies to CMF.

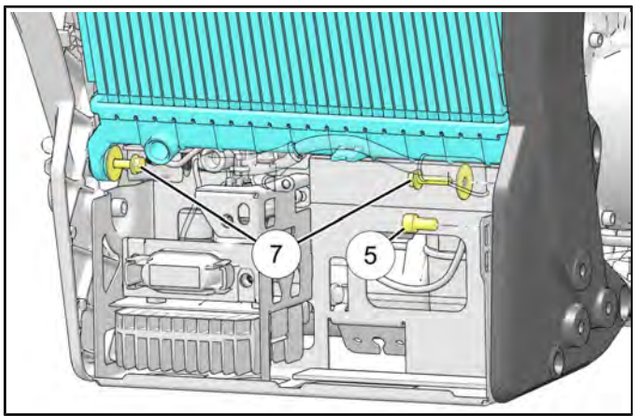


8. Remove downcast fasteners ④ and battery box fastener ⑤.

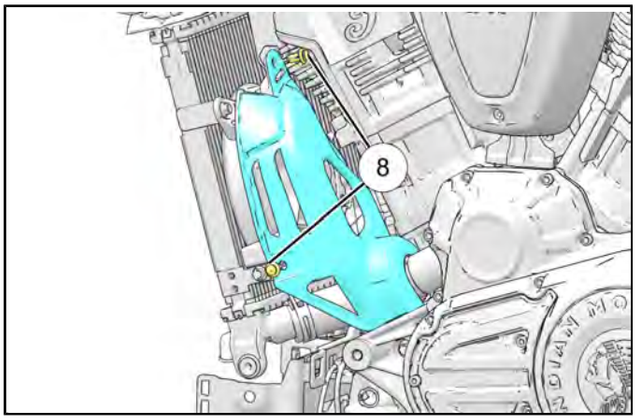


9. Remove fairing louver by removing its fasteners ⑥.

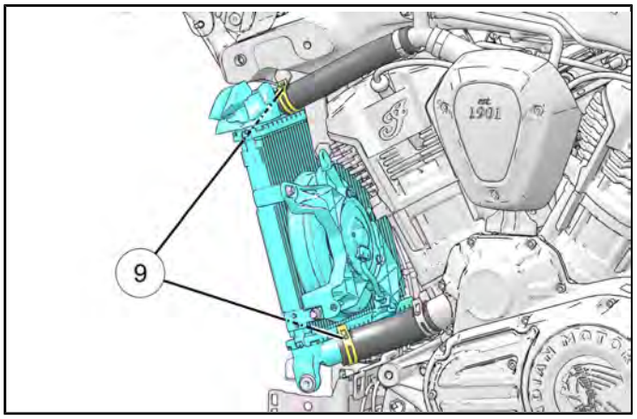
10. Remove radiator fasteners ⑦ and inner battery box fastener ⑤.



11. Remove left hand downcast.
12. Remove fan shroud by removing two push pins ⑧.

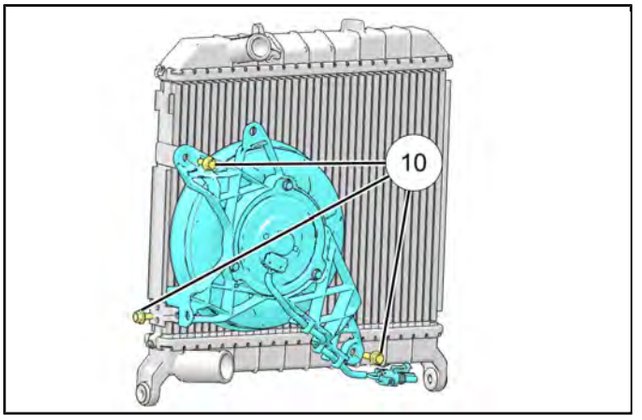


13. Disconnect the fan electrical connector.
14. Disconnect the upper and lower radiator hoses by removing the spring clamps ⑨.



15. Remove assembly.

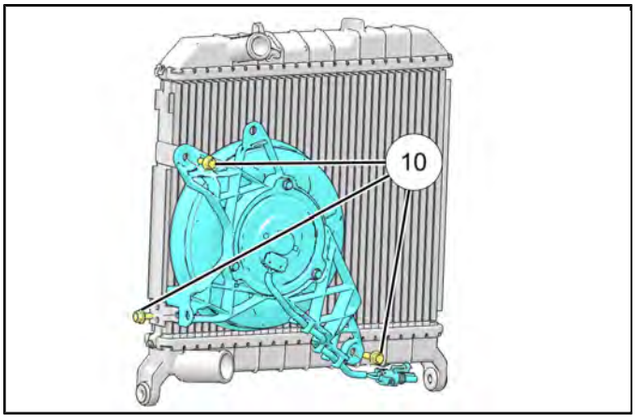
16. Remove fasteners ⑩ securing fan to radiator.



RADIATOR INSTALLATION

INSTALLATION

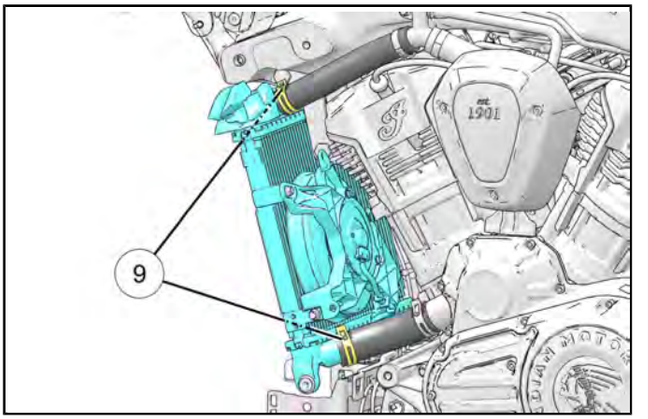
1. Install fasteners ⑩ securing fan to radiator.



TORQUE
Cooling Fan Fastener: **35 in-lbs (4 N·m)**

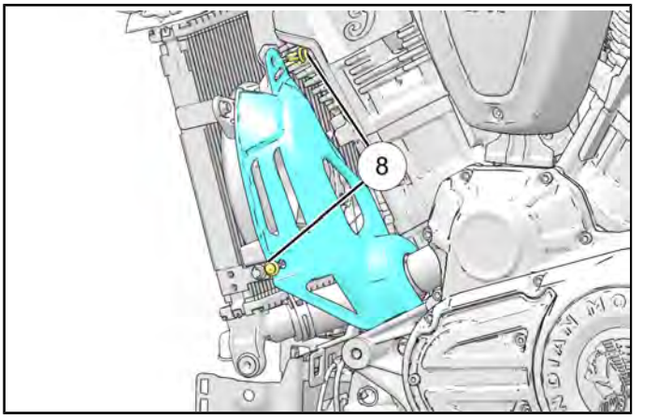
2. Install assembly.

3. Connect the upper and lower radiator hoses by installing the spring clamps ⑨.



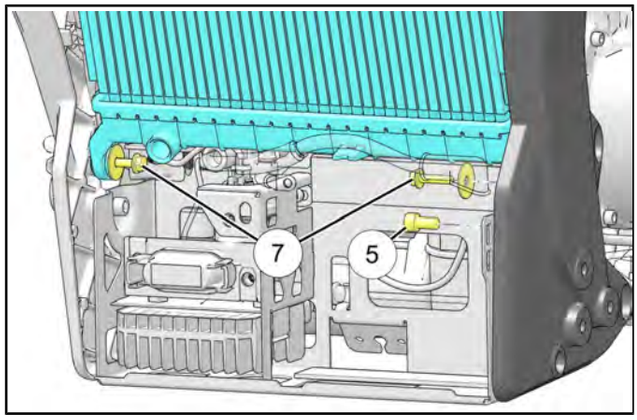
4. Connect the fan electrical connector.

5. Install fan shroud by inserting the two push pins ⑧.



6. Install left hand downcast.

7. Install radiator fasteners ⑦ and inner battery box fastener ⑤.



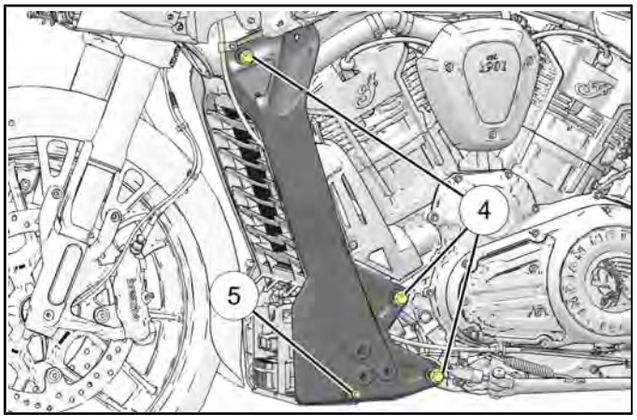
TORQUE
Front Downcast Fastener: **45 ft-lbs (61 N·m)**

TORQUE
Battery Box Fastener: **18 ft-lbs (24 N·m)**

8. Install fairing louver by inserting its fasteners ⑥.

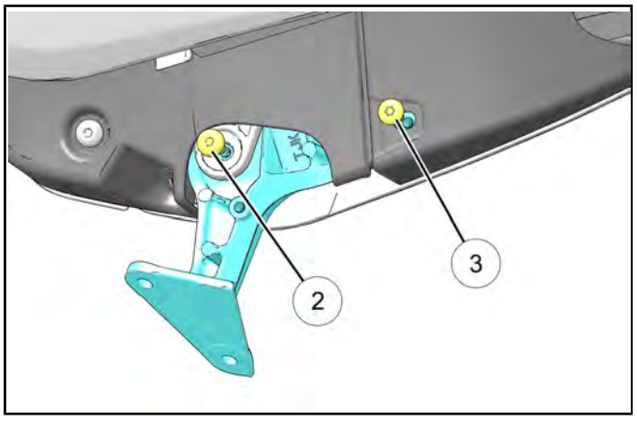
TORQUE
Fairing Louver Fastener: **35 in-lbs (4 N·m)**

9. Install downcast fasteners ④ and battery box fastener ⑤.



TORQUE
Front Downcast Fastener: **45 ft-lbs (61 N·m)**

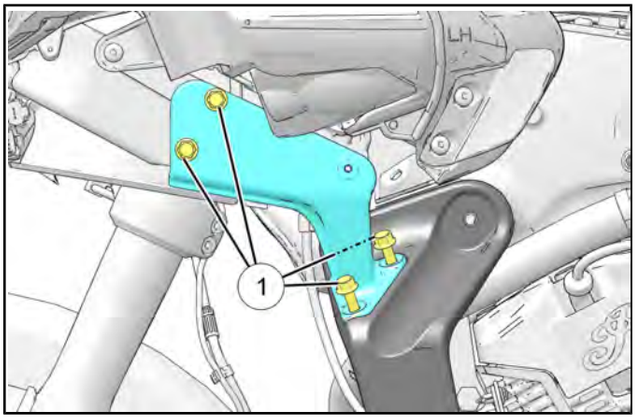
10. For chassis mounted fairings, install the speaker assembly fastener ②, and the dash closeout fastener ③ on the inside of the fairing bracket.



TORQUE
Speaker Assembly Fastener: **35 in-lbs (4 N·m)**

TORQUE
Dash Closeout Fastener: **35 in-lbs (4 N·m)**

11. For chassis mounted fairings, install lower fairing bracket fasteners ①.



TORQUE
Lower Fairing Bracket Fastener: **18 ft-lbs (24 N·m)**

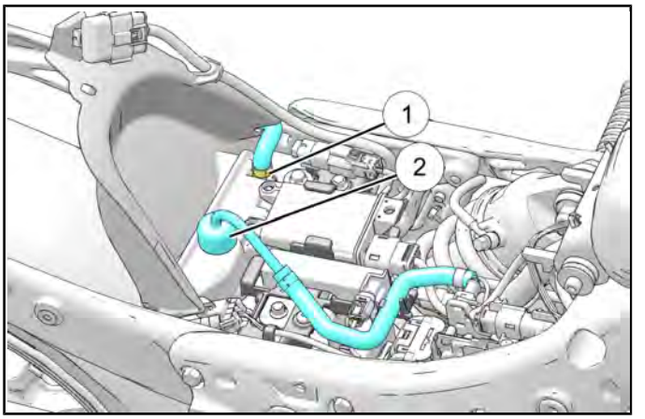
12. Fill engine coolant. See **Coolant Drain / Fill / Bleed page 3.39**
13. Install driver floorboard assembly. See **Floorboard Installation page 7.104**.
14. Install highway bar. See **Highway Bar Installation page 7.106**
15. Install battery. See **Battery Installation page 10.14**
16. Install outer fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**

COOLANT RECOVERY BOTTLE REMOVAL

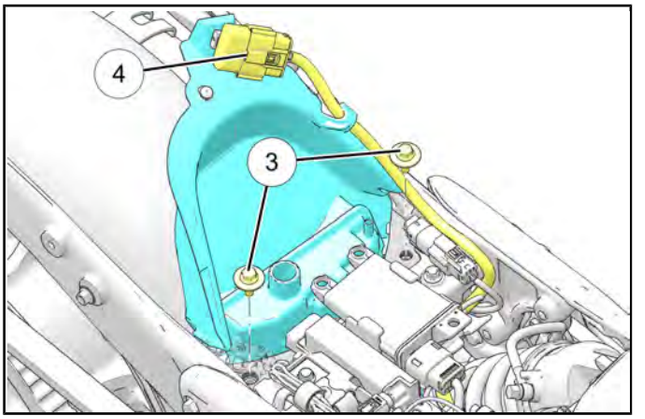
REMOVAL

⚠ WARNING
Engine, cooling, and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wait for components to cool sufficiently before working on the machine.

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove saddlebags. See **Saddlebag Removal page 7.93**
3. Remove rear fender. See **Rear Fender Removal page 7.88**.
4. Remove coolant overflow line ① and coolant pickup line ② from recovery bottle..



5. Remove upper recovery bottle fasteners ③.



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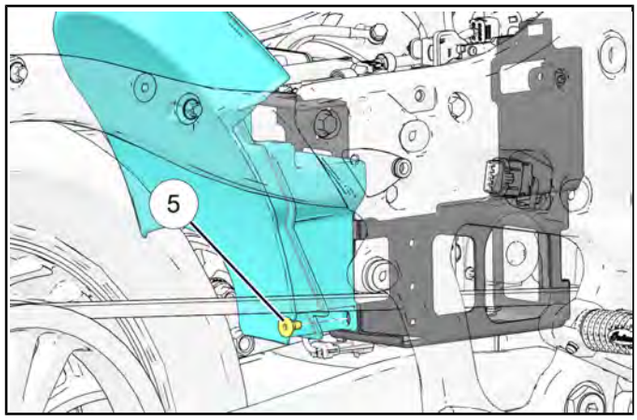
6. Disconnect harness termination clip ④.

NOTICE
The clip can be released from the connector cap by carefully prying out on the clip latch. Replace the clip if it is damaged during removal.

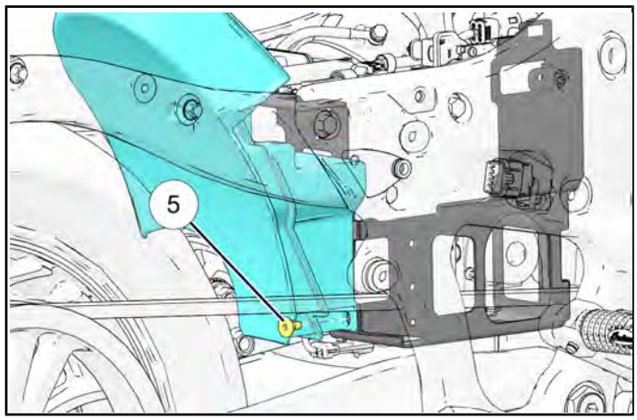
7. Remove lower recovery bottle fastener ⑤.



COOLANT RECOVERY BOTTLE INSTALLATION

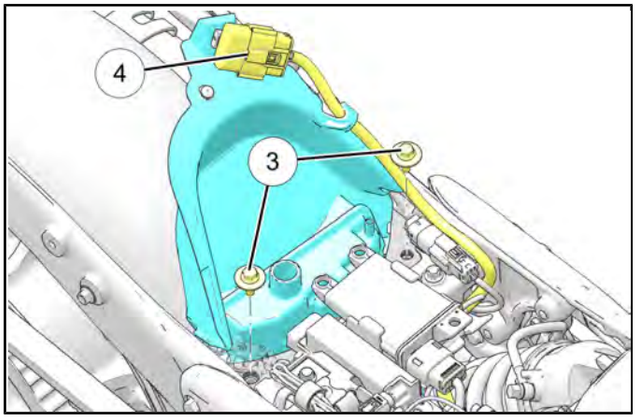
INSTALLATION

1. Install lower recovery bottle fastener ⑤.



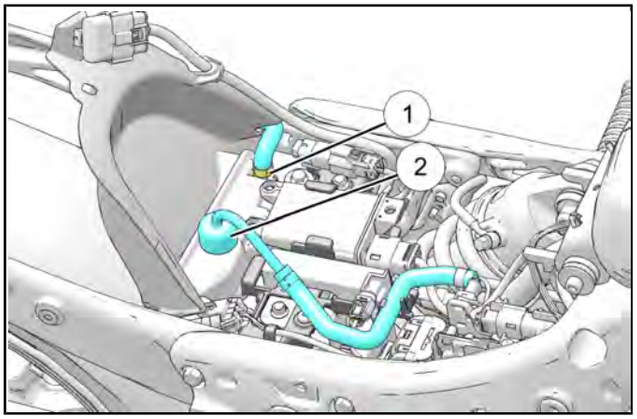
TORQUE
Recovery Bottle Fastener (Lower): **88 in-lbs (10 N·m)**

2. Insert clip into bottle tab and connect harness cap into clip.
3. Connect harness termination clip ④.
4. Install upper recovery bottle fasteners ③.



TORQUE
Recovery Bottle Fastener (Upper): **35 in-lbs (4 N·m)**

5. Install coolant overflow line ① and coolant pickup line ② into recovery bottle..

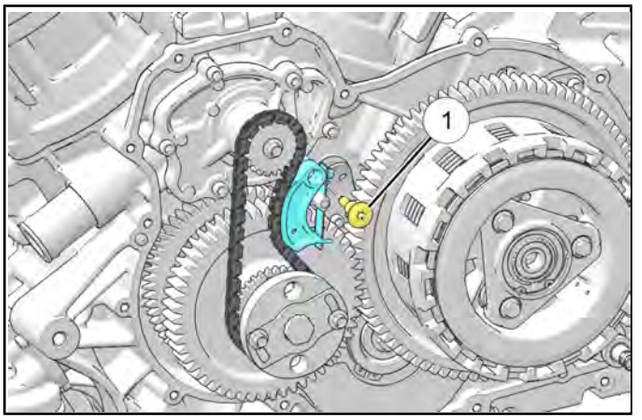


6. Install rear fender. See **Rear Fender Installation page 7.89**
7. Install saddlebag. See **Saddlebag Installation page 7.93**
8. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**,

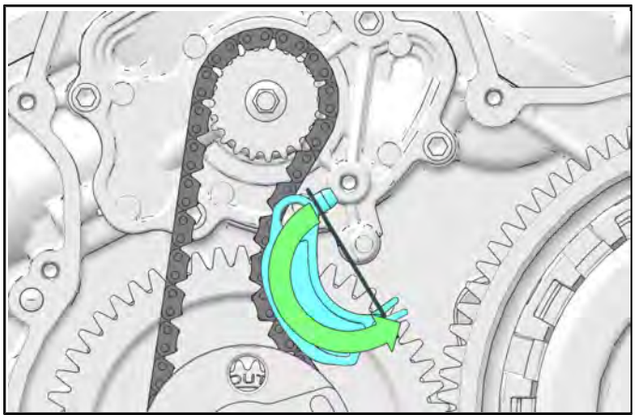
WATER PUMP REMOVAL

REMOVAL

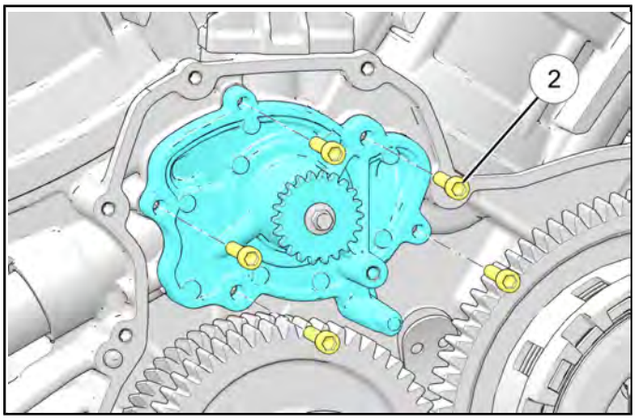
1. Remove primary cover. See **Primary Cover Removal page 5.13**.
2. Remove the fastener ① retaining the water pump chain tensioner.



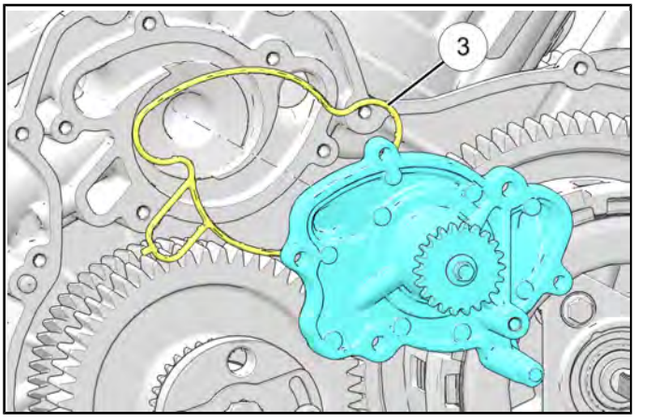
3. Rotate the chain tensioner down and out.



4. Remove the water pump chain.
5. Remove the fasteners ② securing the water pump.



6. Remove the water pump and water pump gasket ③.



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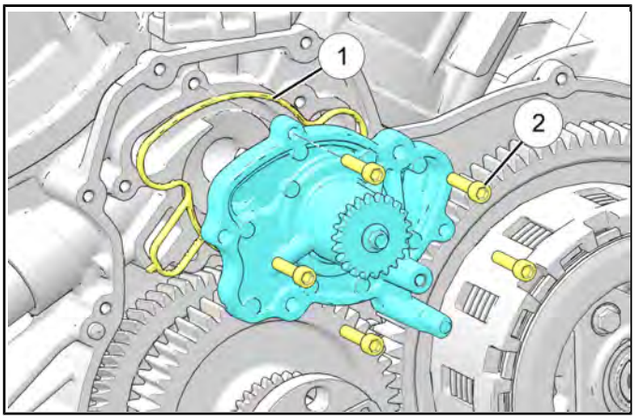
WATER PUMP INSTALLATION

INSTALLATION

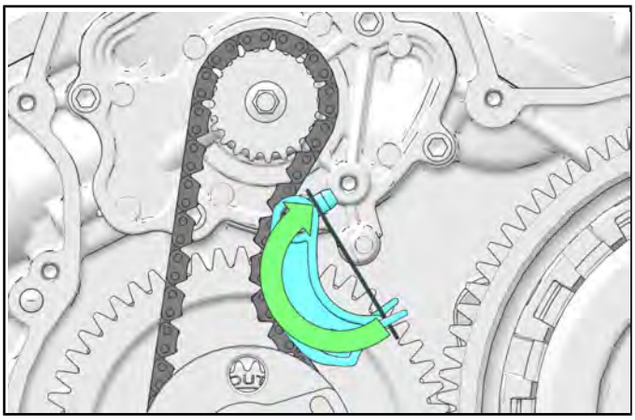
1. Inspect the water pump gasket ① and replace if necessary.



2. Install the water pump and gasket. Secure the water pump with its fasteners ②.

TORQUE
Water Pump Fastener: **88 in-lbs (10 N·m)**

3. Install the water pump chain.
4. Install the water pump chain tensioner by rotating it upward into position.



5. Secure tensioner with its fastener.

TORQUE
Water Pump Chain Tensioner Fastener: **88 in-lbs (10 N·m)**

6. Install primary cover. See **Primary Cover Installation page 5.14**.

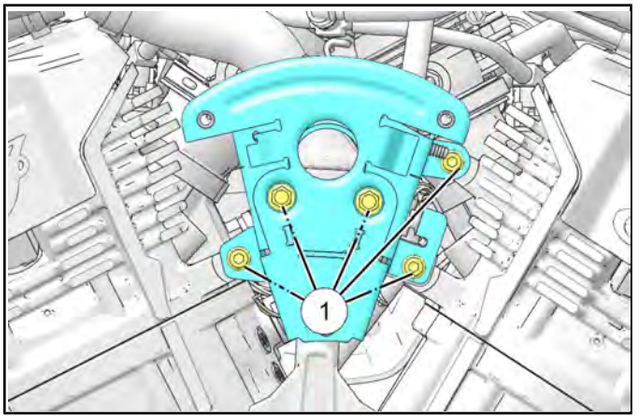
THERMOSTAT REMOVAL

⚠ WARNING

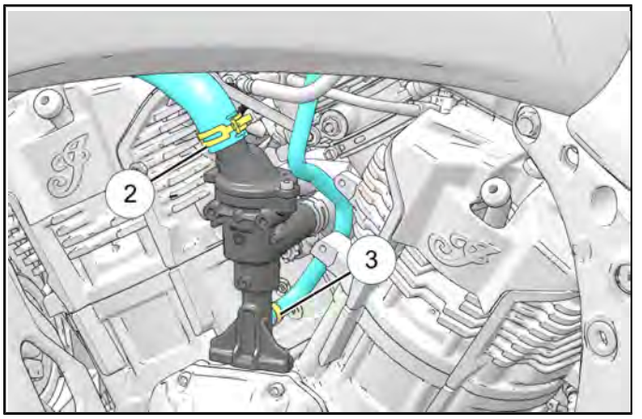
Engine, cooling, and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wait for components to cool sufficiently before working on the machine.

REMOVAL

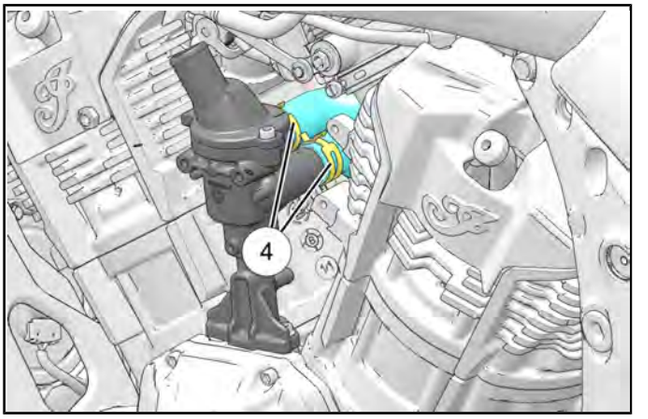
1. Drain engine coolant. See **Coolant Drain / Fill / Bleed page 3.39**.
2. Remove ignition coils. See **Ignition Coil Removal page 10.50**.
3. Remove fasteners ① securing ignition coil bracket.



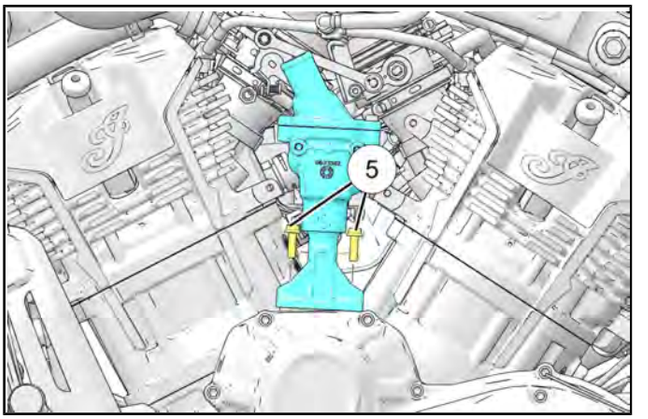
4. Disconnect the wiring harness and coolant return line hose from the ignition coil bracket.
5. Disconnect thermostat hose clamp ② and coolant return line clamp ③.



6. Disconnect cylinder coolant hose clamps ④.



7. Remove bypass tube fasteners ⑤.



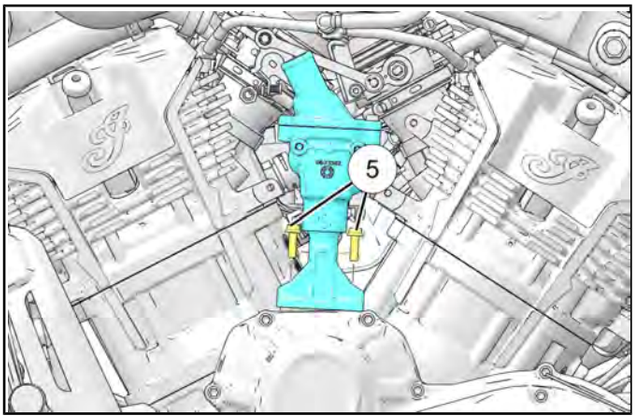
THERMOSTAT INSTALLATION

⚠ WARNING

Engine, cooling, and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wait for components to cool sufficiently before working on the machine.

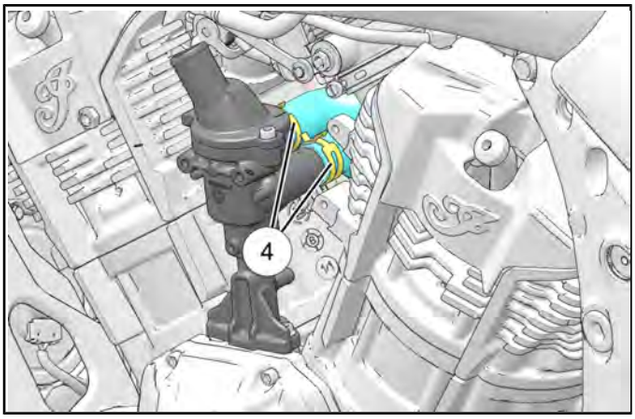
INSTALLATION

1. Install bypass tube fasteners ⑤. Torque fasteners to specification.

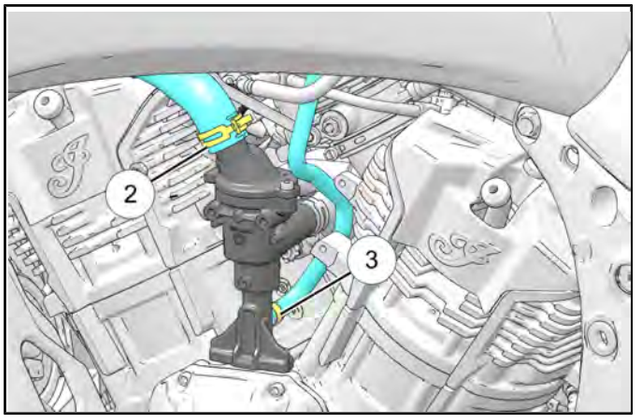


TORQUE
Bypass Tube Fastener: **88 in-lbs (10 N·m)**

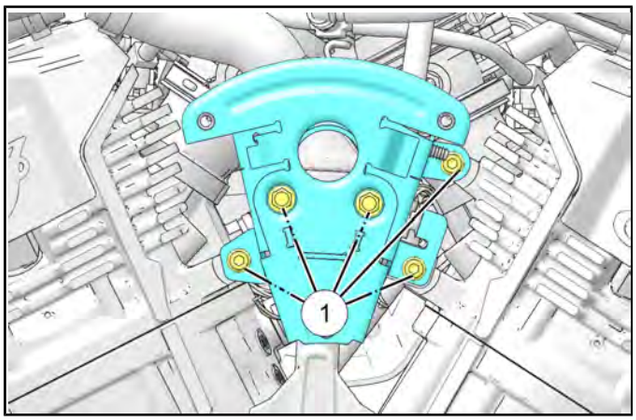
2. Connect cylinder coolant hose clamps ④.



3. Connect thermostat hose clamp ② and coolant return line clamp ③.



4. Connect the wiring harness and coolant return line hose from the ignition coil bracket.
5. Install fasteners ① securing ignition coil bracket. Torque fasteners to specification.



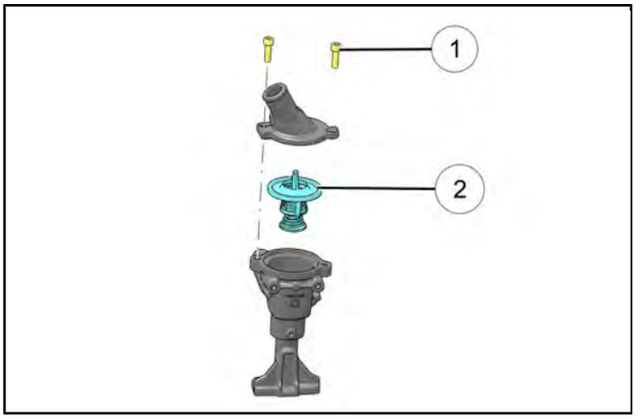
TORQUE
Ignition Coil Bracket: **88 in-lbs (10 N·m)**

6. Fill engine coolant. See **Coolant Drain / Fill / Bleed page 3.39**.

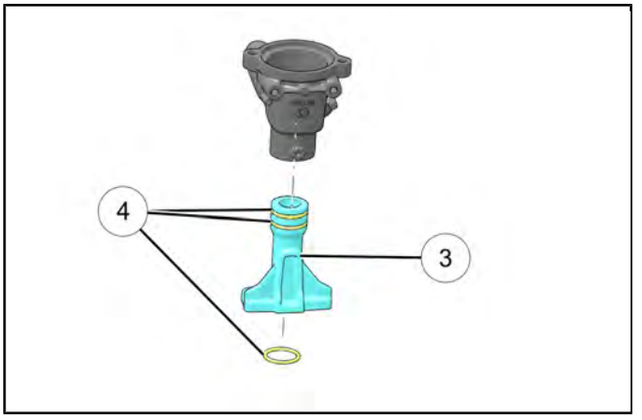
THERMOSTAT DISASSEMBLY / ASSEMBLY

DISASSEMBLY

1. Remove thermostat cover by removing its fasteners ① and remove thermostat ②.



2. Remove coolant bypass tube ③.



3. Inspect O-rings ④ for damage and replace if necessary.

ASSEMBLY

1. **ASSEMBLY IS PERFORMED BY REVERSING THE DISASSEMBLY PROCEDURE.**

IMPORTANT
Replace any damaged o-rings prior to assembly.

TORQUE
Thermostat Cover Fastener: **88 in-lbs (10 N·m)**

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CYLINDER HEAD / VALVES

GENERAL INFORMATION

SERVICE NOTES – CYLINDER HEAD

- This chapter covers service of the cylinder heads, camshafts, cam chain and tensioner, cam chain guide and roller / rocker arms.
- Refer to Engine / Cooling / Exhaust chapter for engine removal and installation.
- If cylinder heads are removed the cylinder base gasket must be replaced also.
- Mark and store all mating parts for correct engine assembly.
- Use Moly Assembly Paste - P/N: 2871460 or Indian Motorcycle Synthetic 15W/60 Engine Oil to lubricate parts where indicated.
- Handle and store all parts in such a way that they will not be damaged or contaminated.
- Some fasteners have a pre-applied locking agent, and must be replaced if loosened or removed. Always replace fasteners that have a pre-applied locking agent or as directed in this service manual.
- There are some precision machining steps to be performed in this section. If you are not sure of your capabilities in these areas, have a competent machinist perform these operations.
- Valve guide and seat reconditioning should be performed by a technician proficient in cylinder head reconditioning techniques using high quality equipment with grinding stones. Do not attempt cylinder head repair without the proper equipment or experience in cylinder head reconditioning techniques.
- The intake and exhaust valves cannot be re-faced.
- Cleanliness of parts is critical to engine life and accurate parts inspection. Use clean solvent to clean all disassembled parts. Dry parts with compressed air and lubricate before engine inspection and engine assembly.

SPECIAL TOOLS – CYLINDER HEAD

TOOL DESCRIPTION	PART NUMBER
Valve Spring Compressor	PV-1253
Crankshaft Locking Tool	PF-51235-A
Crankshaft Rotation Tool	PF-51239
Rocker Arm Compression Tool	PF-52939

*Special Tool PF-51455-A includes both PF-51455 AND PF-52544

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – CYLINDER HEAD

CAMSHAFT DATA

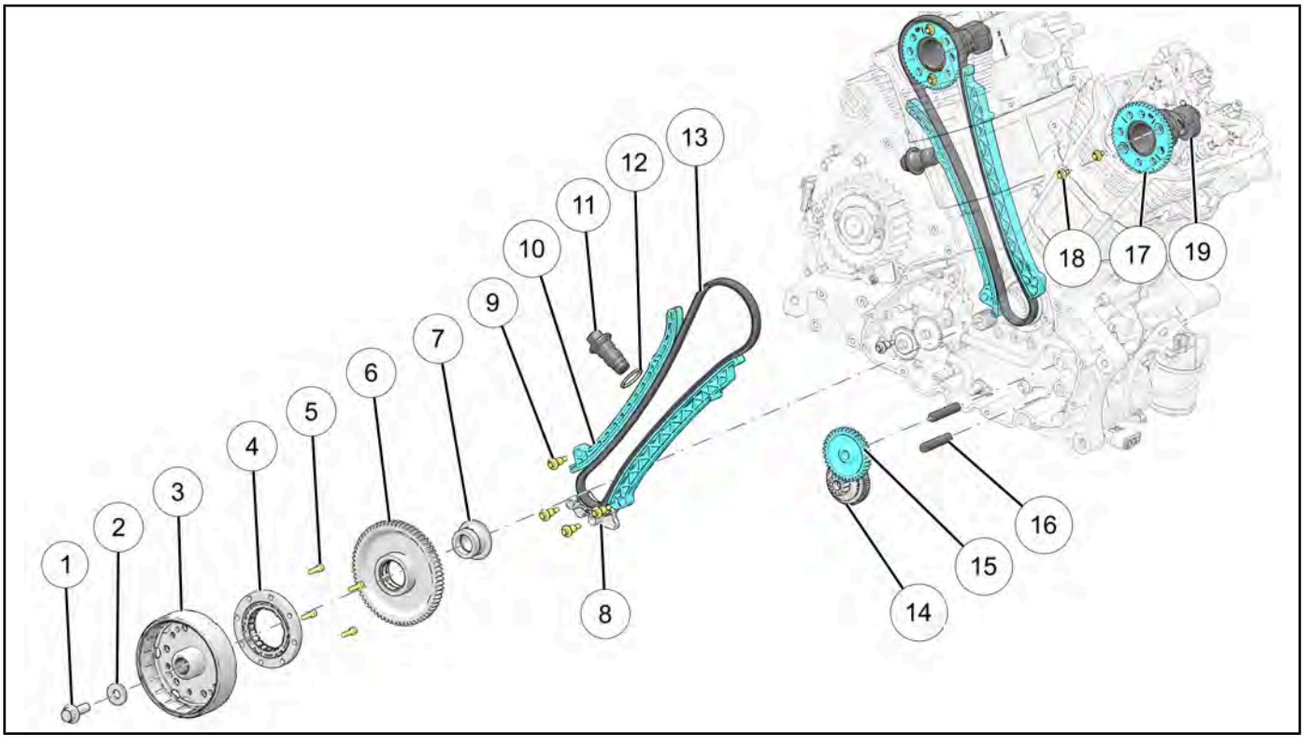
	DESCRIPTION	SPECIFICATION
CAMSHAFT DATA	Valve Train	Over Head Valve / 4 valves per cyl 2 Intake Valve / 2 Exhaust Valve
	Intake Valve Opens At 1 mm Lift	1.0° BTDC
	Intake Valve Closes At 1 mm Lift	39.0° ABDC
	Exhaust Valve Opens At 1 mm Lift	46.5° BBDC
	Exhaust Valve Closes At 1 mm Lift	5.5° ATDC
	Max Lobe Lift INTAKE EXHAUST	 (7.70 mm) (7.25 mm)
	Max Valve Lift INTAKE EXHAUST	 (10.4 mm) (9.80 mm)

CYLINDER HEAD & VALVE TRAIN DATA

ITEM		STANDARD	SERVICE LIMIT
Cam Shaft	Lobe Height INTAKE EXHAUST	1.7991" (45.699 mm) 1.78165" (45.254 mm)	1.7952" (45.599 mm) 1.7778" (45.154 mm)
	Journal O.D. (Large)	2.244 +/- .00039" (57.00 +/- 0.01 mm)	2.2433" (56.98 mm)
	Journal O.D. (Small)	.6244 - .6250" (15.862–15.875 mm)	.6241" (15.852 mm)
Cylinder Head	Warpage (Distortion)	-	.004" (.10 mm)
Rocker Arm, Shaft, & Lifter	Rocker Arm: IN/EX	Non-Serviceable. Replace as an assembly.	Non-Serviceable. Replace as an assembly.
Valve, Valve Guide, Valve Seat	Valve Clearance	Hydraulic/Self Adjusting	-
	Valve Guide Installed Height	0.577 — 0.594" (14.68 — 15.08 mm)	-
	Valve Stem O.D. INTAKE	0.272 —0.274" (6.918 — 6.953 mm)	0.2724" 6.918 mm
	Valve Stem O.D. EXHAUST	0.271 — 0.273" (6.885 — 6.933 mm)	0.2715" 6.896 mm
	Valve Stem Deflection (INTAKE & EXHAUST)	-	.005" (.13 mm)
	Valve Seat Width INTAKE EXHAUST	.047" (1.2 mm) .053" (1.35 mm)	0.049" (1.25 mm) 0.078" (2.00 mm)
	Valve Stem Runout	-	.0005" (.013 mm)
	Valve Head Radial Runout	-	.002" (.05 mm)
	Valve Installed Height INTAKE EXHAUST	2.06" (52.4 mm) 2.07" (52.6 mm)	- -
Valve Spring	Free Length (INTAKE & EXHAUST)	**2.1120" (53.70 mm)**	2.0354" (51.70 mm)
	Intake Valve Maximum Lift	.409" (10.4 mm)	-
	Exhaust Valve Maximum Lift	.386" (9.8 mm)	-
	Spring Installed Height	1.73" (44.00 mm)	-

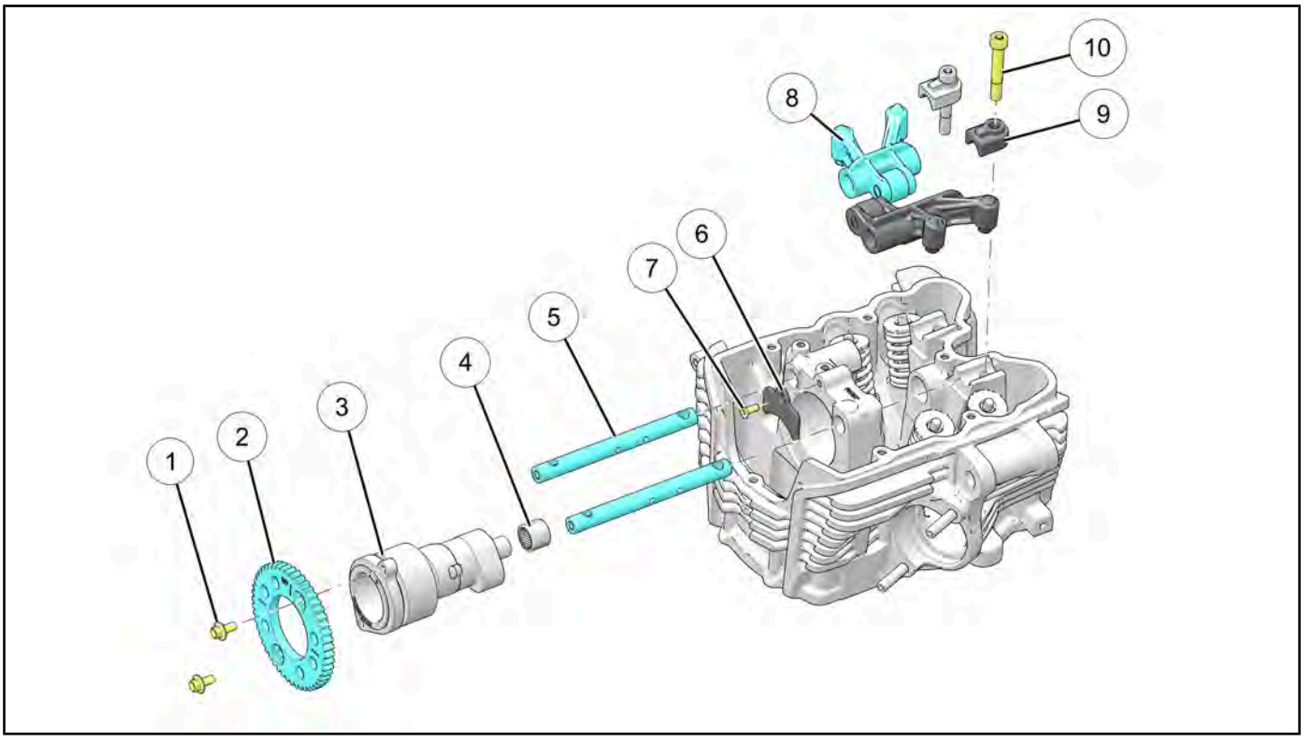
ASSEMBLY VIEWS

CAM CHAIN ASSEMBLY VIEW



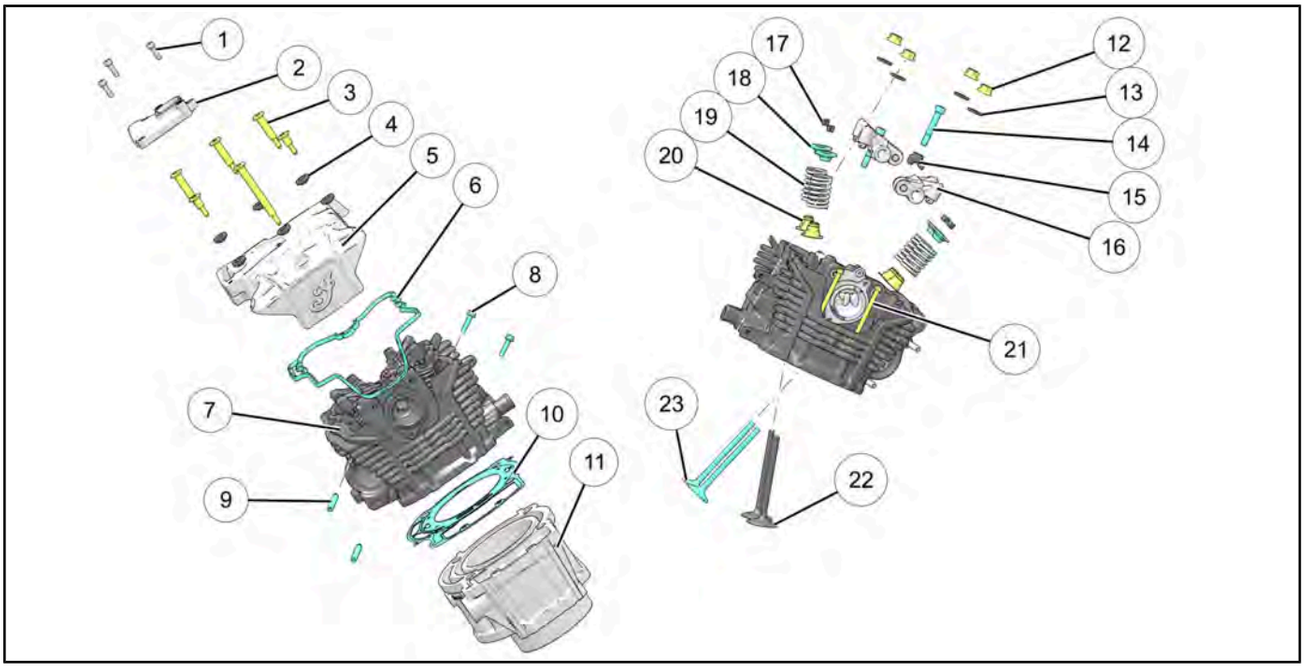
① Flywheel Fastener **83 ft-lbs (112 N·m)**	⑪ Cam Chain Tensioner **15 ft-lbs (20 N·m)**
② Washer	⑫ Cam Chain Tensioner Seal
③ Flywheel	⑬ Cam Chain
④ Sprag Clutch Hub Starter	⑭ Torque Limiting Gear
⑤ Sprag Clutch Fastener **88 in-lbs (10 N·m)**	⑮ Starter idle Gear
⑥ Starter Gear Clutch	⑯ Starter Gear Shaft
⑦ Starter Spacer	⑰ Camshaft Sprocket
⑧ Lower Chain Guide	⑱ Camshaft Sprocket Fastener **159 in-lbs (18 N·m)**
⑨ Chain Guide Fastener (All) **84 in-lbs (10 N·m)**	⑲ Camshaft
⑩ Chain Guide	

CAMSHAFTS ASSEMBLY VIEW



① Camshaft Sprocket Fastener **159 in-lbs (18 N·m)**	⑥ Camshaft Thrust Plate
② Camshaft Sprocket	⑦ Camshaft Thrust Plate Fastener **62 in-lbs (7 N·m)**
③ Camshaft	⑧ Rocker Arm Assembly
④ Camshaft Bearing	⑨ Rocker Shaft Cap
⑤ Rocker Shaft	⑩ Rocker Shaft Cap Fastener **27 ft-lbs (37 N·m)**

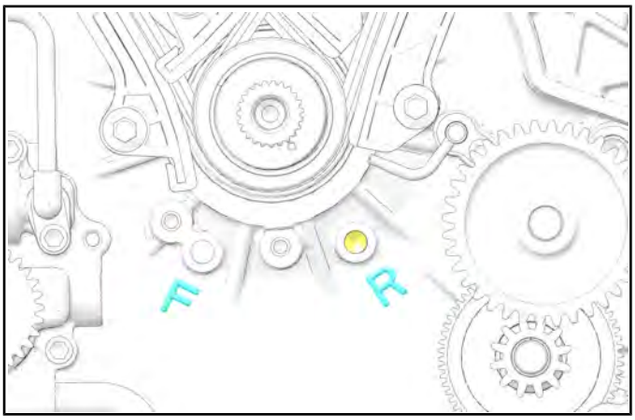
CYLINDER HEAD ASSEMBLY VIEW

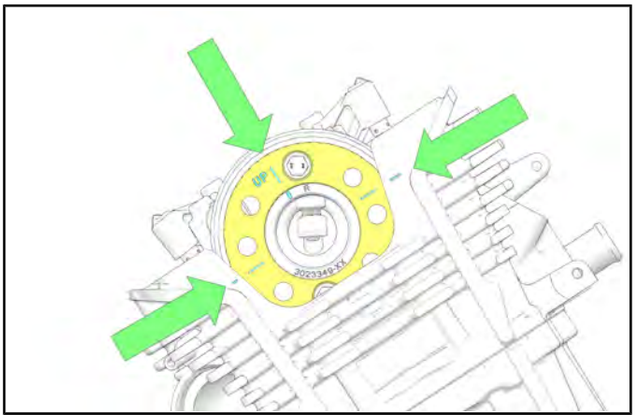


① Breather Fastener **88 in-lbs (10 N·m)**	⑬ Cylinder Head Washer
② Breather Assembly	⑭ Rocker Shaft Cap Fastener **27 ft-lbs (37 N·m)**
③ Valve Cover Fastener **88 in-lbs (10 N·m)**	⑮ Rocker Shaft Cap
④ Valve Cover Isolator	⑯ Rocker Arm Assembly
⑤ Valve Cover	⑰ Keepers
⑥ Valve Cover Gasket	⑱ Valve Spring Retainer
⑦ Cylinder Head (Rear)	⑲ Valve Spring
⑧ Intake Manifold Fastener See **Intake Manifold, Removal / Installation page 4.22.**	⑳ Valve Stem Spring Seat
⑨ Exhaust Stud **15 ft-lbs (20 N·m)**	㉑ Cylinder Head Bolt **88 in-lbs (10 N·m)**
⑩ Head Gasket	㉒ Intake Valve
⑪ Cylinder (Rear)	㉓ Exhaust Valve
⑫ Cylinder Head Nut **1. Torque fasteners to 15 ft-lbs (20 N·m)** **2. Back off 90 °** **3. Torque all fasteners to 26 ft-lbs (35 N·m)** **4. Torque angle all 360 °**	

CAMSHAFT TIMING

REAR CYLINDER



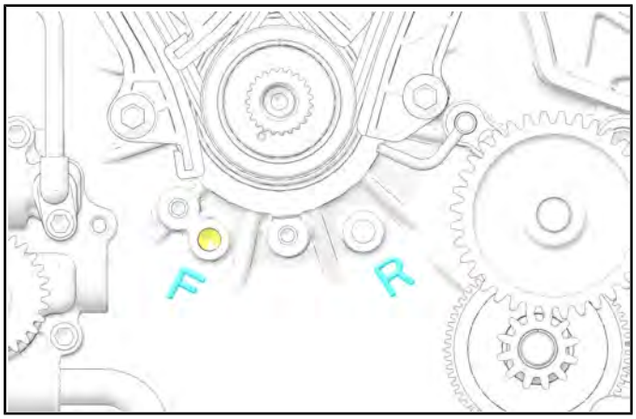


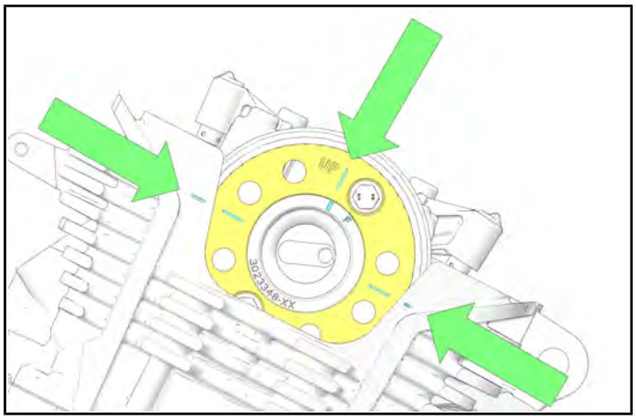
When crankshaft is locked for REAR cylinder at TDC rear camshaft sprocket alignment should be in the position shown.

IMPORTANT

When Timing an engine, start with the rear cylinder first.

FRONT CYLINDER





When crankshaft is locked for the FRONT cylinder the front camshaft sprocket alignment should be in the position shown.

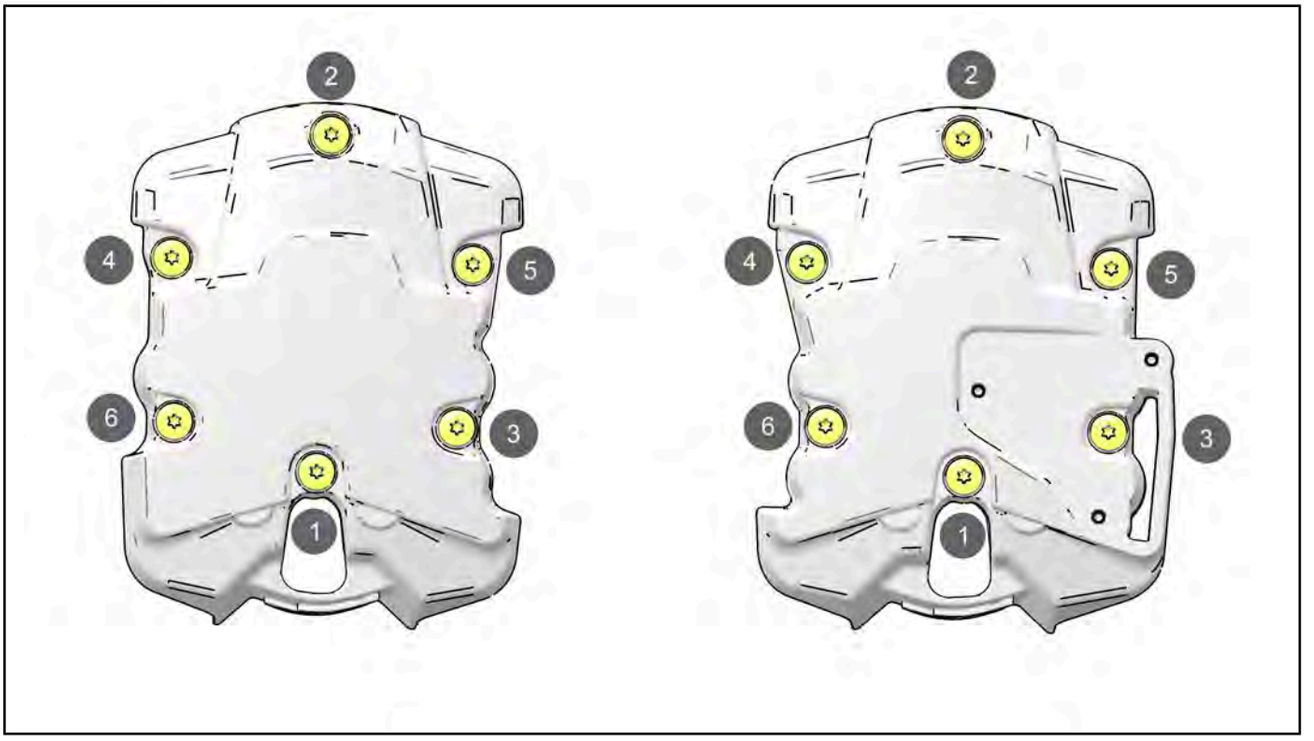
⚠ CAUTION

Failure to properly time the camshafts can lead to engine damage.

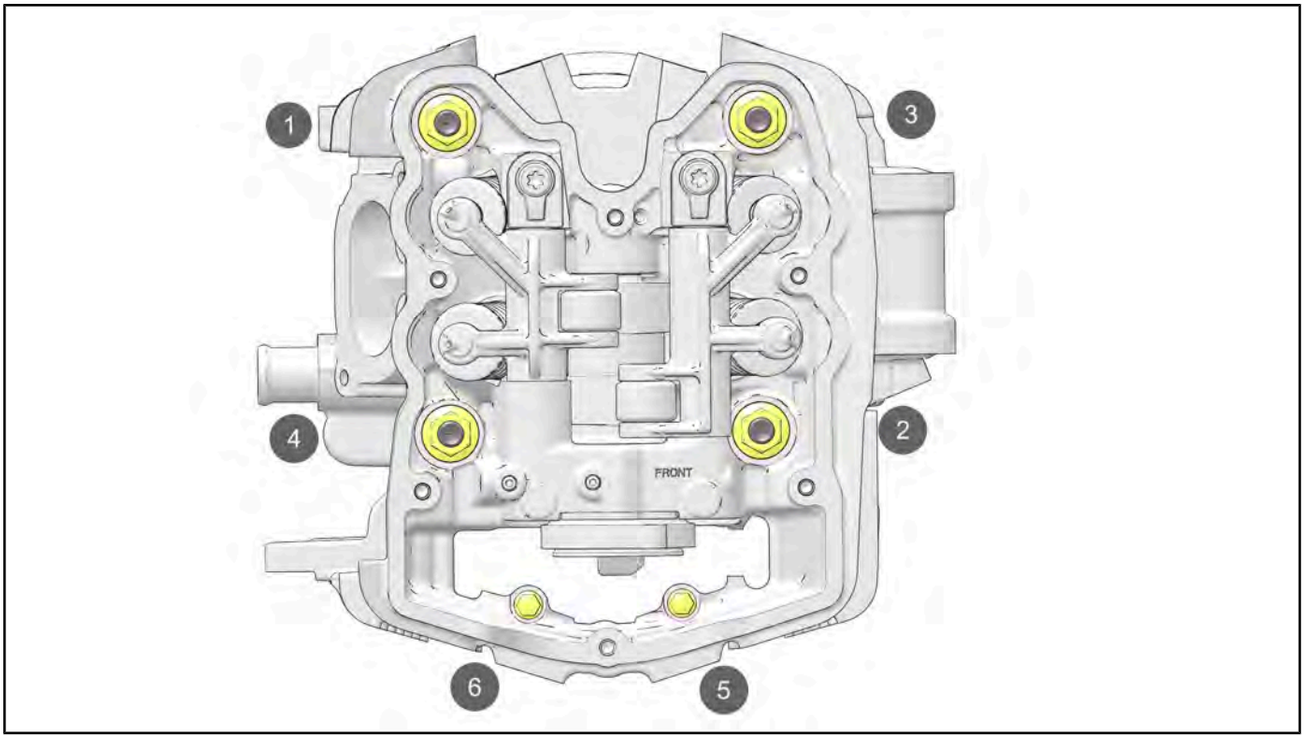
For setting camshaft timing, refer to cam chain installation. See **Cam Chain Installation page 3.65**.

TORQUE SEQUENCE – CYLINDER HEAD / VALVES

VALVE COVER



CYLINDER HEAD



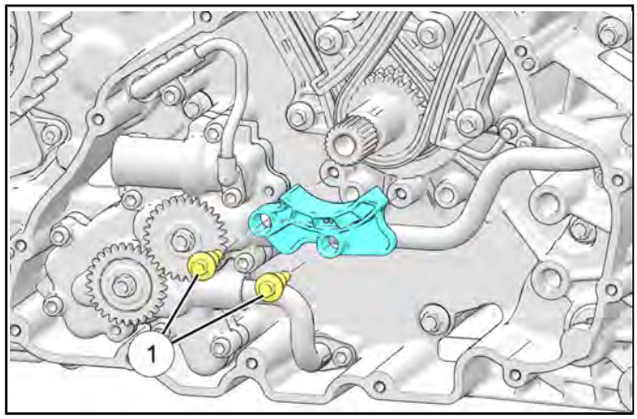
CAM CHAIN SERVICE

LOCKING THE CRANKSHAFT FOR SERVICE

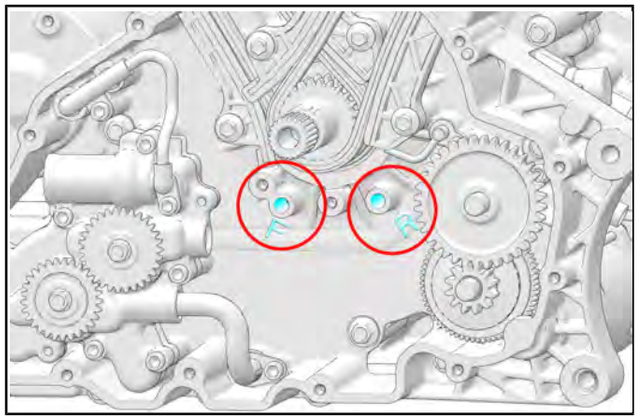
LOCKING THE CRANKSHAFT

This procedure describes how to lock the crankshaft in the Top Dead Center (TDC) position using commercially available hand tools.

1. Remove spark plugs. See **Spark Plug Removal page 3.5**
2. Remove ACG cover. See **ACG Cover Removal page 10.31**.
3. Remove flywheel. See **Flywheel Removal page 3.60**.
4. Remove lower chain guide by removing its fasteners ①.



5. Rotate the crankshaft counterclockwise (primary side) until the front piston is at TDC.
6. Lock the crankshaft by inserting crankshaft locking pin **PF-51135-A** or a 5/16" pin punch (or equivalent) into the locking hole .

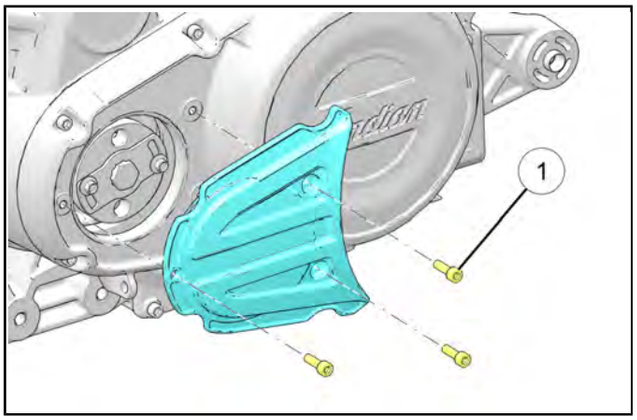


7. It may be necessary to rotate the crankshaft slight forward or back to properly align holes.

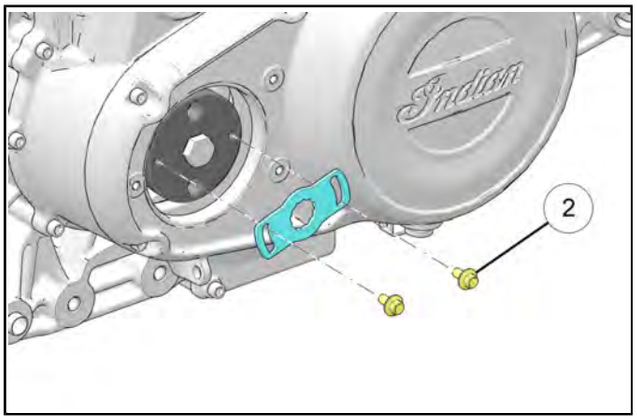
HOLDING THE CRANKSHAFT

The crankshaft / rotating assembly can be held in place by an alternative method, however this method **does NOT** lock it in place.

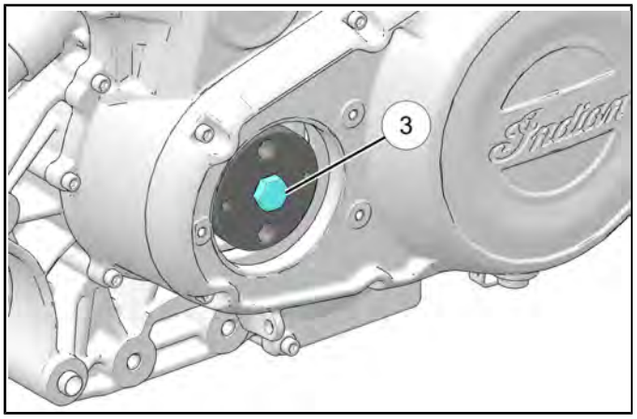
1. Remove the cold start cover by removing its fasteners ①.



2. Remove the locking plate by removing its fasteners ②.



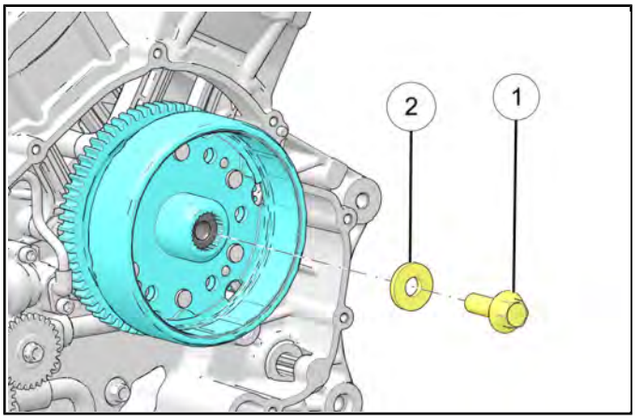
3. Use a socket and wrench to hold the cold test adapter fastener ③.



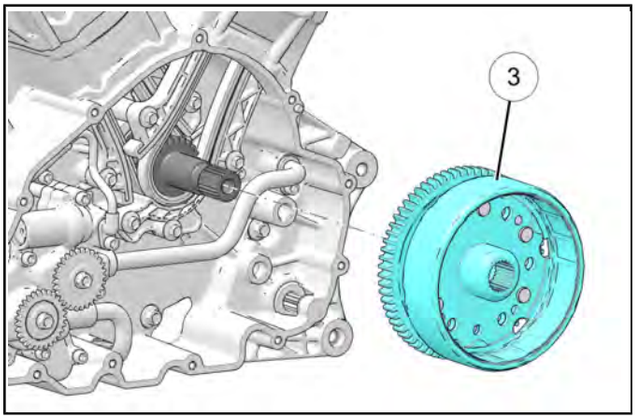
FLYWHEEL REMOVAL

REMOVAL

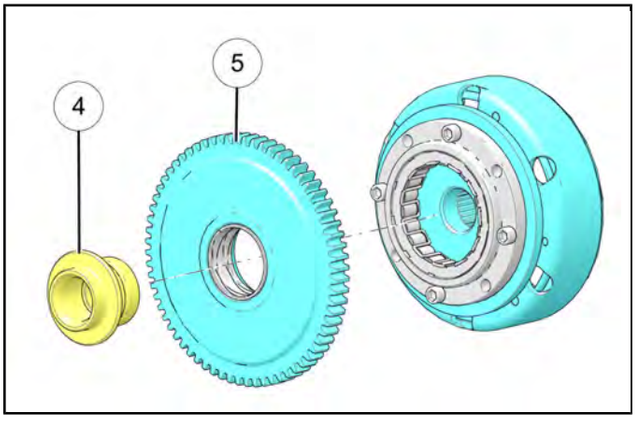
1. Remove stator. See **Stator Removal page 10.32**.
2. Remove ACG Cover. See **ACG Cover Removal page 10.31**.
3. Remove flywheel bolt ① and washer ②.



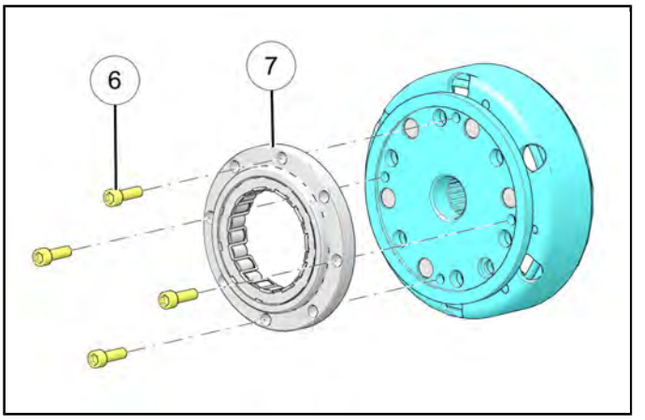
4. Remove flywheel assembly ③.



5. Remove starter/ACG spacer ④.



6. Remove starter clutch gear ⑤.
7. Remove sprag clutch hub ⑦ by removing its fasteners ⑥.



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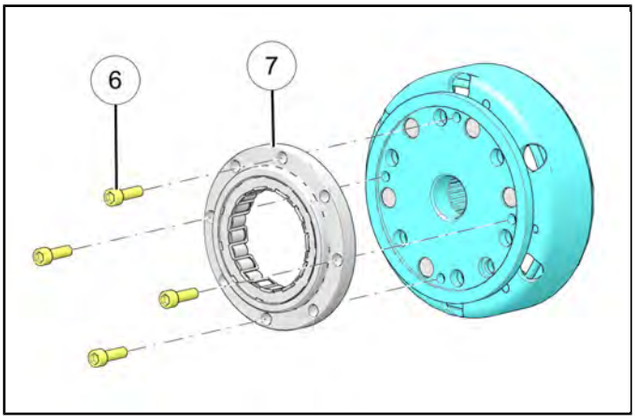
FLYWHEEL INSTALLATION

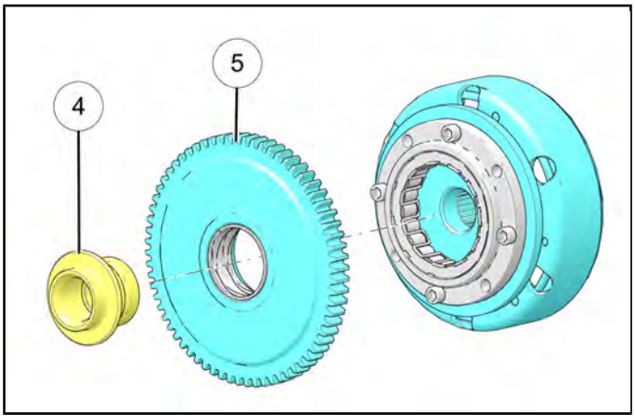
INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**
2. Install sprag clutch hub ⑦ by installing its fasteners ⑥.

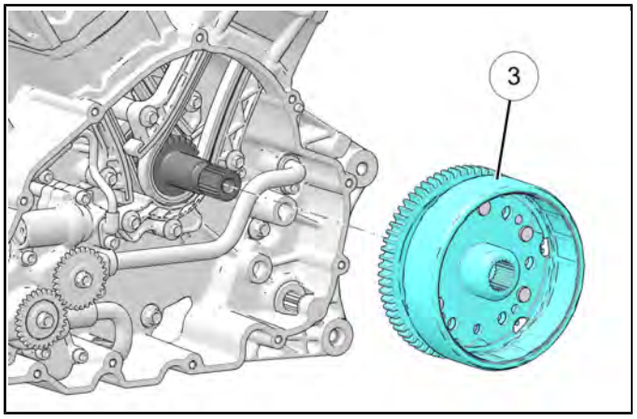


TORQUE
Sprag Clutch Hub Fastener **88 in-lbs (10 N·m)**

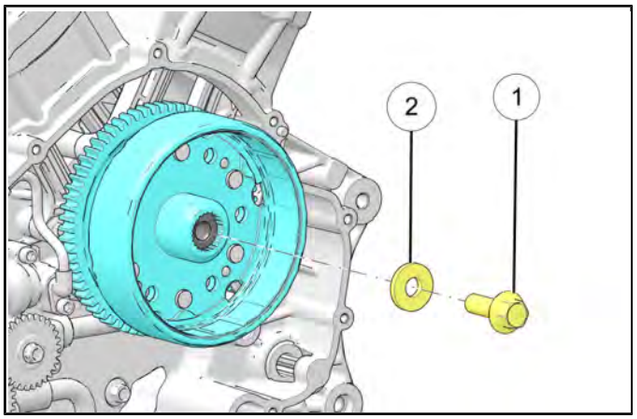
3. Install starter clutch gear ⑤.
4. Install starter/ACG spacer ④.



5. Install flywheel assembly ③.



6. Install flywheel bolt ① and washer ②.



TORQUE
Flywheel Fastener **83 ft-lbs (112 N·m)**

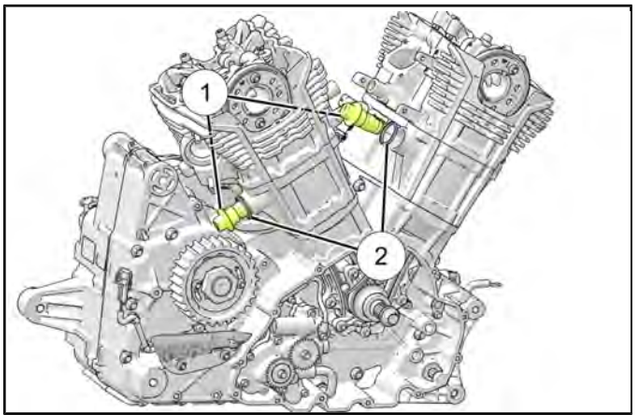
7. Install ACG Cover. See **ACG Cover Installation page 10.31**.
8. Install stator. See **Stator Installation page 10.33**.

CAM CHAIN TENSIONER REMOVAL

⚠ CAUTION

Do not rotate engine with tensioner(s) removed.

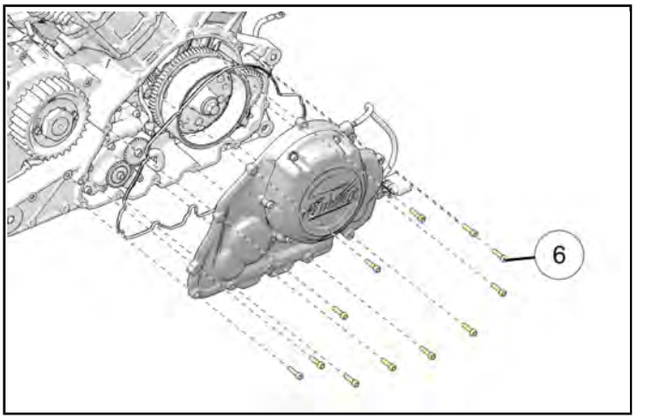
1. Remove valve cover. See **Valve Cover Removal page 3.75**
2. Lock crankshaft for service with the front piston at TDC on the compression stroke. See **Locking the Crankshaft for Service page 3.59**.
3. Remove tensioner ① and sealing washer ②.



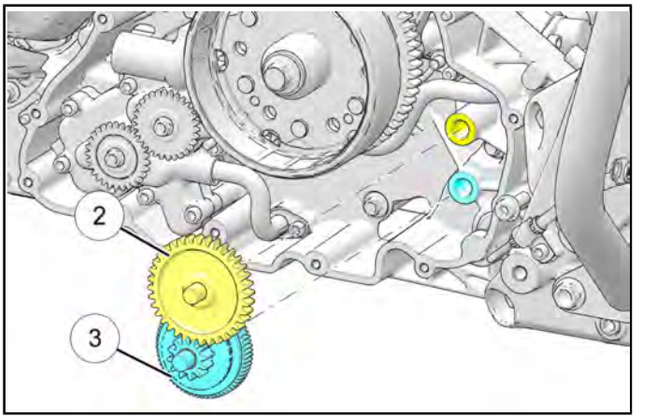
CAM CHAIN REMOVAL

REMOVAL

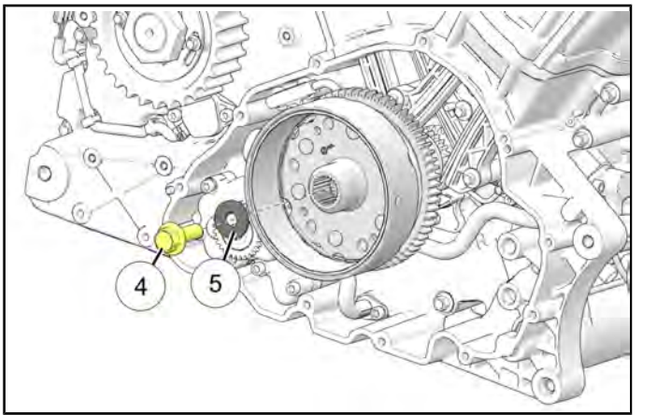
1. Remove valve cover. See **Valve Cover Removal page 3.75**.
2. Remove ACG cover by removing its fasteners ⑥.



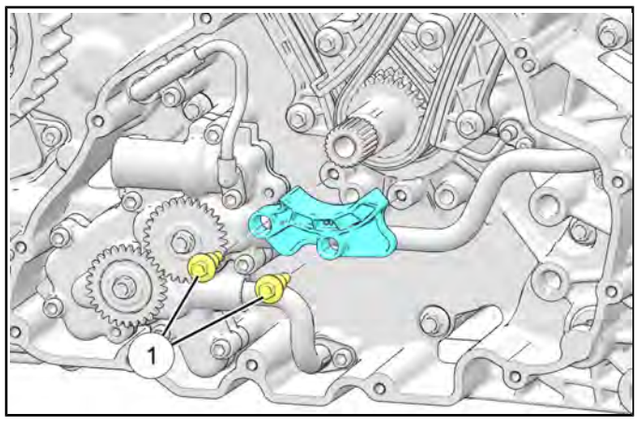
3. Remove starter idler gear ② and starter drive gear ③.



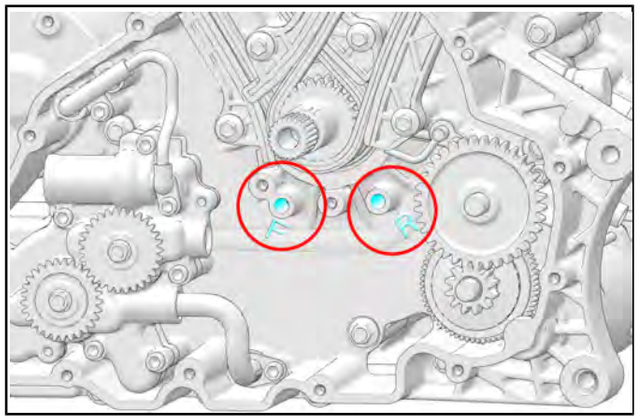
4. Remove flywheel fastener ④, washer ⑤, and flywheel.



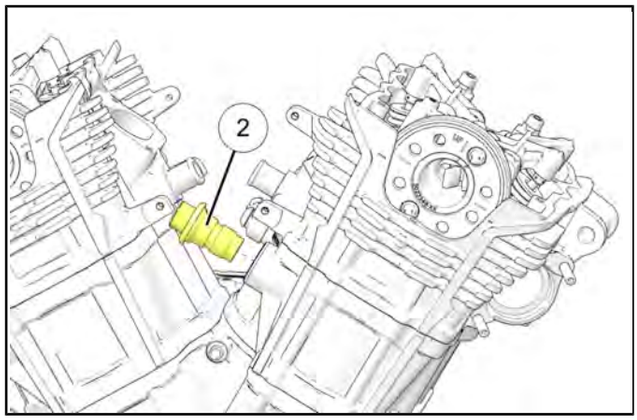
5. Remove lower chain guide by removing its fasteners ①.



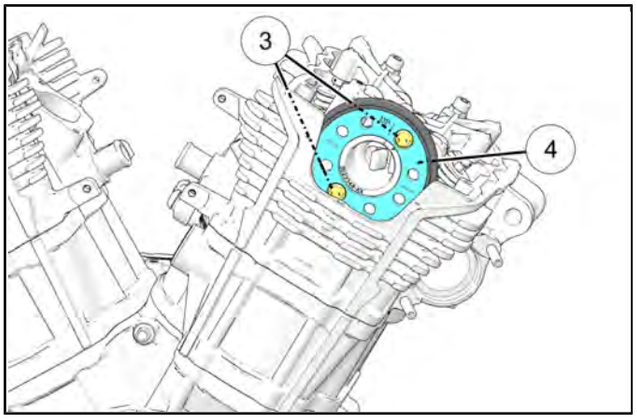
6. Rotate the crankshaft counterclockwise (primary side) until the front piston is at TDC.
7. Lock the crankshaft by inserting crankshaft locking pin **PF-51135-A** or a 5/16" pin punch (or equivalent) into the locking hole Ⓕ.



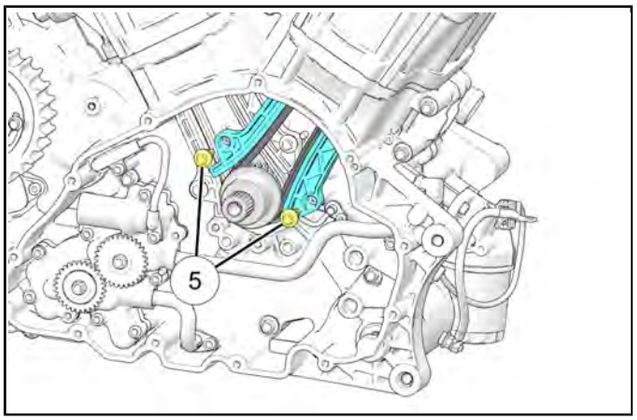
8. It may be necessary to rotate the crankshaft slight forward or back to properly align holes.
9. Remove front cam chain tensioner ②.



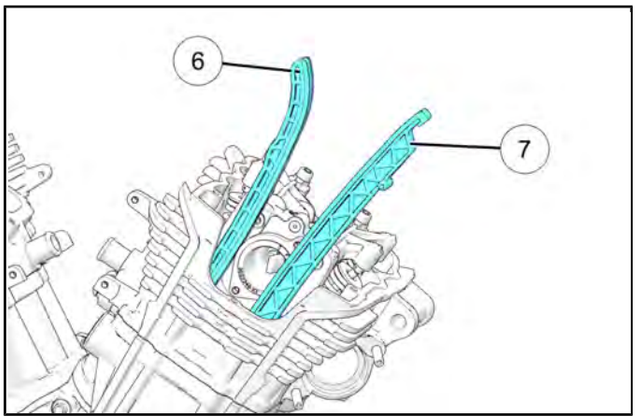
10. Remove front cam chain sprocket fasteners ③ and cam sprocket ④.



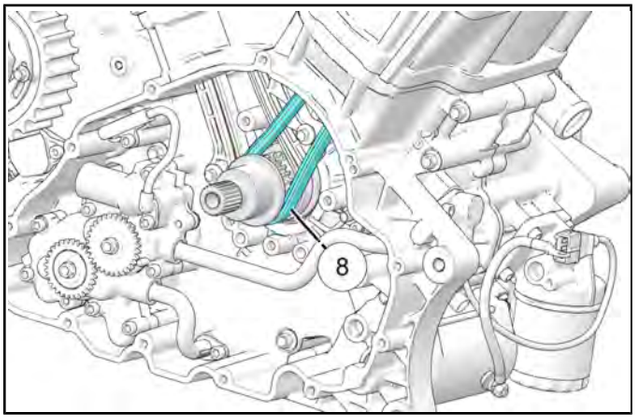
11. Remove front cam chain guide fasteners ⑤.



12. Remove cam chain guides ⑥ and ⑦.



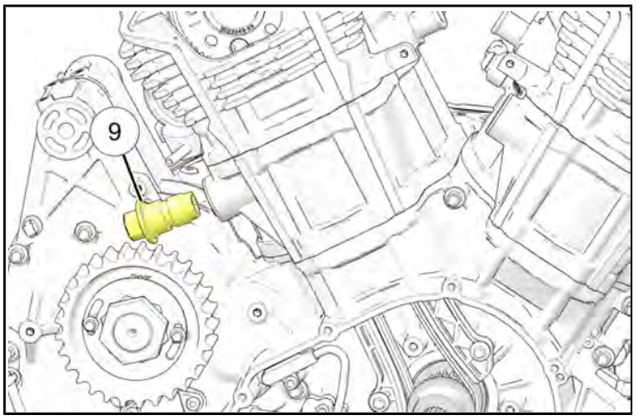
13. Remove front cam chain ⑧.



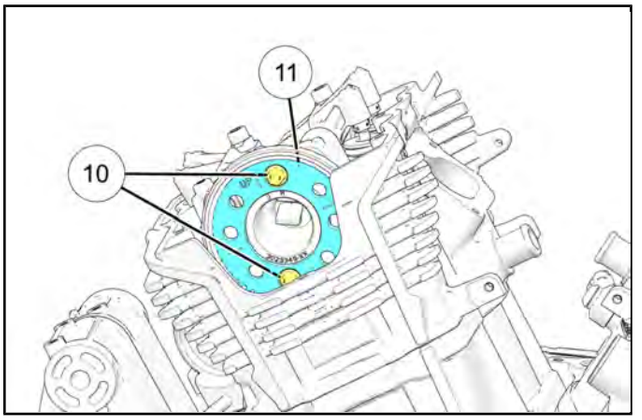
14. Remove the locking pin and rotate crankshaft until the rear cylinder is at TDC.

15. Lock the crankshaft by inserting crankshaft locking pin **PF-51135-A** or a 5/16" pin punch (or equivalent) into the locking hole Ⓡ.

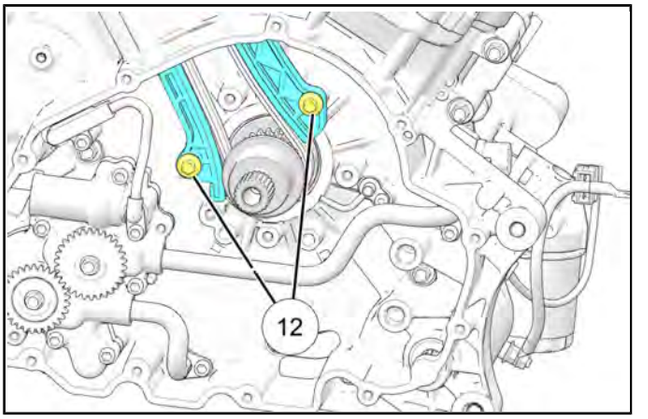
16. Remove rear cam chain tensioner ⑨.



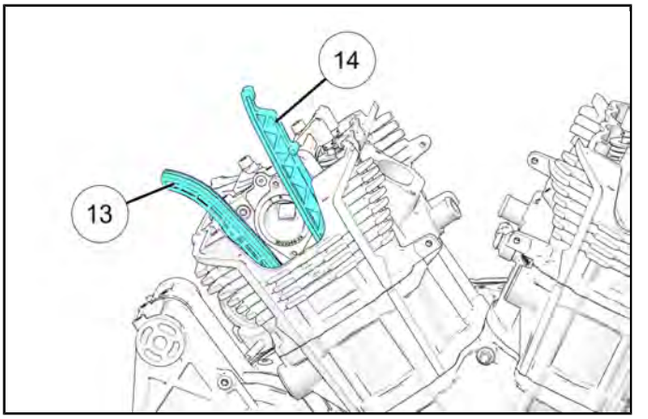
17. remove the cam sprocket fasteners ⑩ and cam sprocket ⑪.



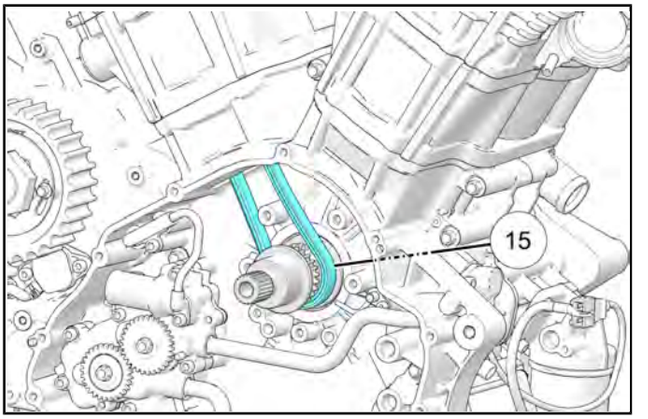
18. Remove the cam chain guide fastners ⑫.



19. remove cam chain guides ⑬ and ⑭.



20. Remove rear cam chain ⑮.

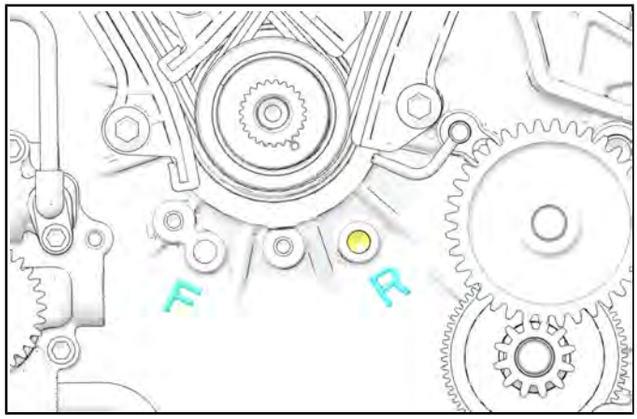


CAM CHAIN INSTALLATION

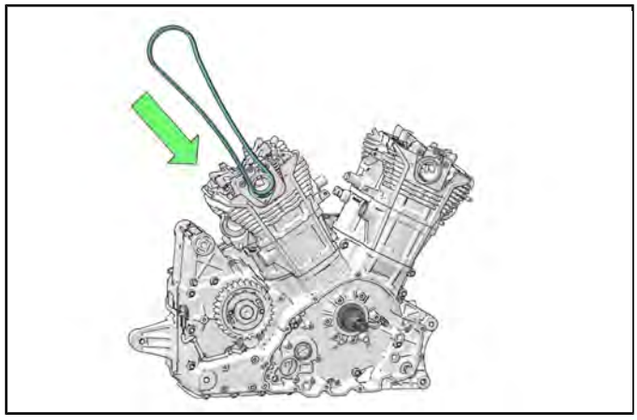
INSTALLATION

IMPORTANT
When Timing an engine, start with the rear cylinder first.

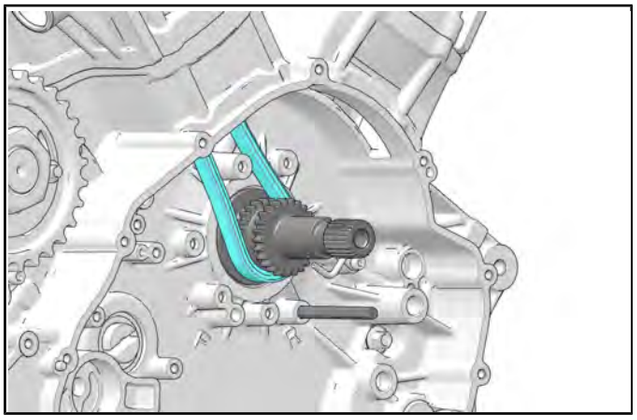
1. Lock the rear cylinder for service. See **Locking the Crankshaft for Service page 3.59**.



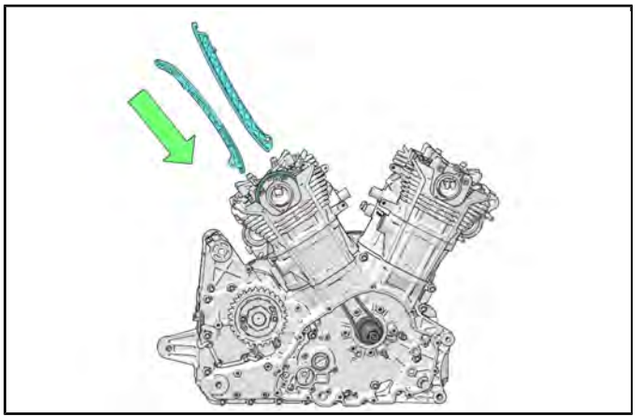
2. Install the rear cam chain through its slot in the cylinder head.



3. Connect the chain to the inside sprocket on the crankshaft.



4. Install rear cylinder chain guides and hand tighten fasteners.



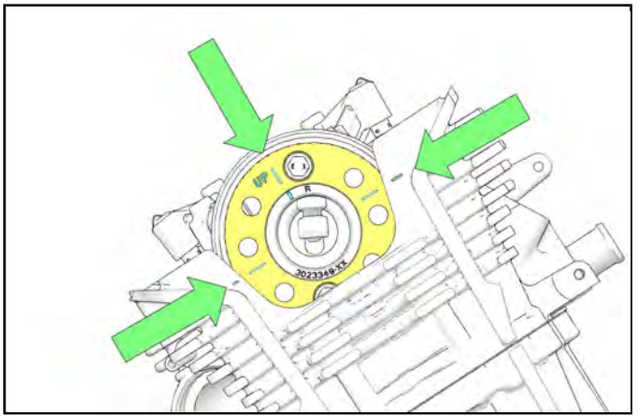
5. Align the camshaft sprocket as shown.

NOTICE

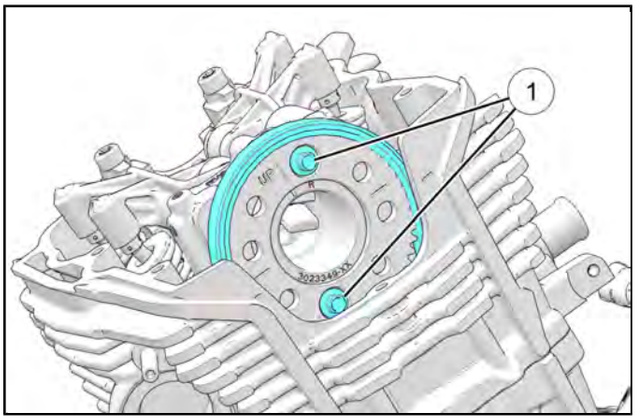
You can reference the Camshaft Timing diagram **Camshaft Timing page 3.57**.

⚠ CAUTION

Failure to properly time the camshafts can lead to engine damage.



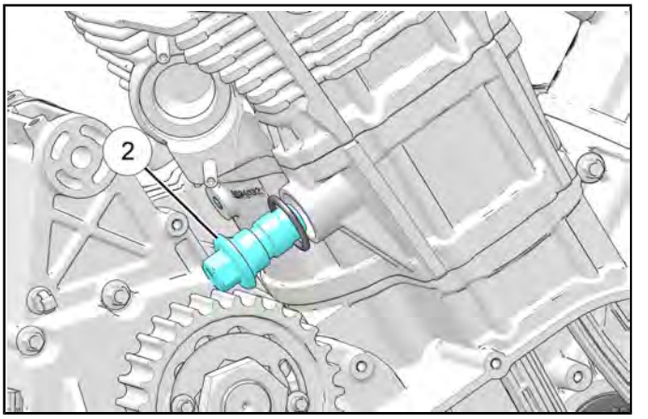
6. Install the camshaft sprocket fasteners ①.



TORQUE

Camshaft Sprocket Fastener:
159 in-lbs (18 N·m)

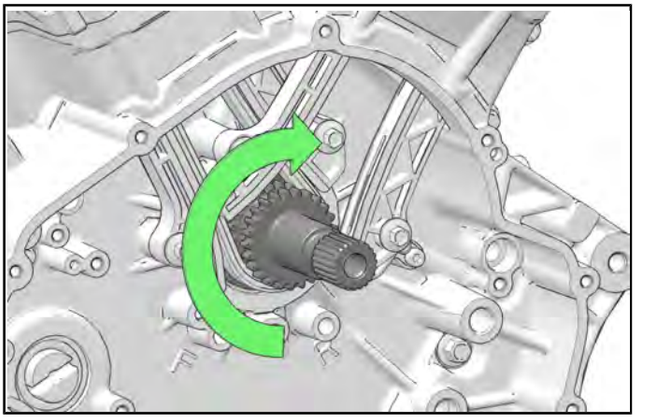
7. Install the rear cam chain tensioner ②.



TORQUE

Cam Chain Tensioner:
15 ft-lbs (20 N·m)

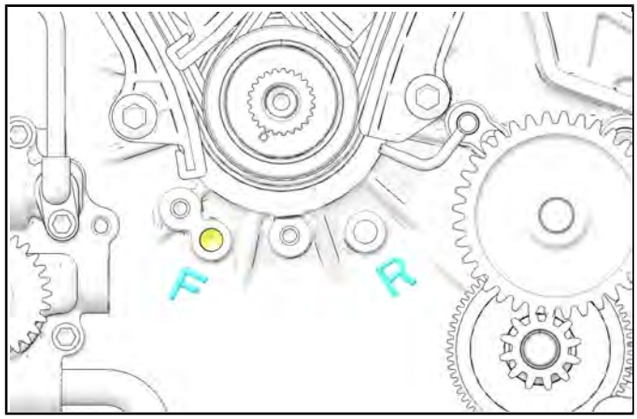
8. While viewing from the right side of the engine, Rotate the crankshaft clockwise 360° then an additional 60° for the angle variance between cylinders.



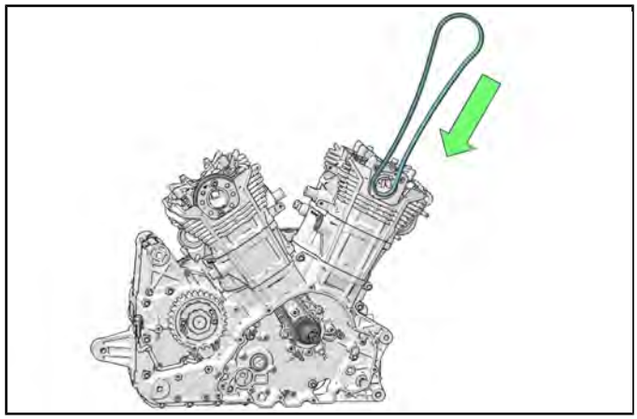
NOTICE

The 60° can measured by lining up the tool used to turn the engine parallel with the rear cylinder, then turn the engine until the tool is lined up parallel to the front cylinder.

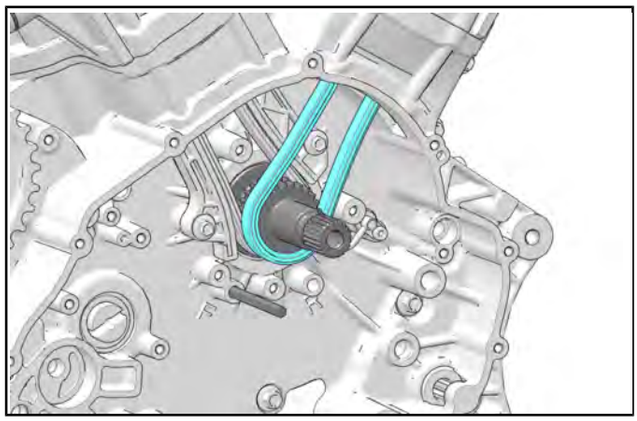
9. Lock the front cylinder for service. See **Locking the Crankshaft for Service page 3.59**.



10. Install the front cam chain through its slot in the cylinder head.



11. Connect the chain to the outside sprocket on the crankshaft.

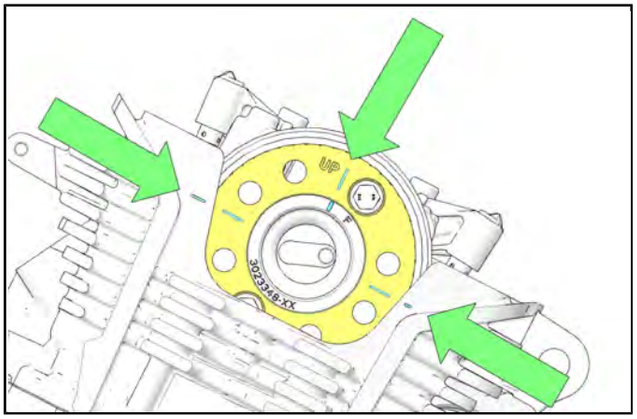


12. Install front cylinder chain guides and hand tighten fasteners.

13. Align the camshaft sprocket as shown.

NOTICE
You can reference the Camshaft Timing diagram **Camshaft Timing page 3.57**.

⚠ CAUTION
Failure to properly time the camshafts can lead to engine damage.



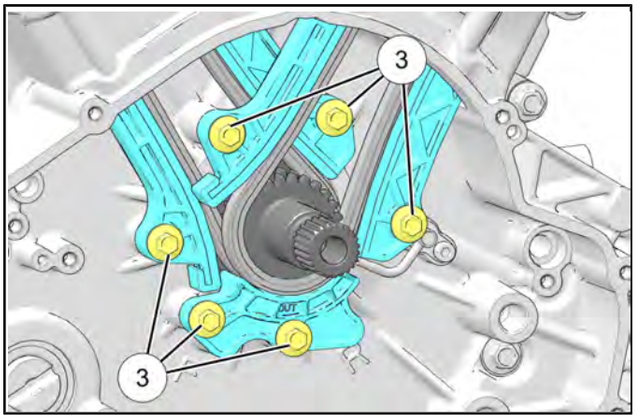
14. Install the camshaft sprocket fasteners.

TORQUE
Camshaft Sprocket Fastener: **159 in-lbs (18 N·m)**

15. Install the front cam chain tensioner.

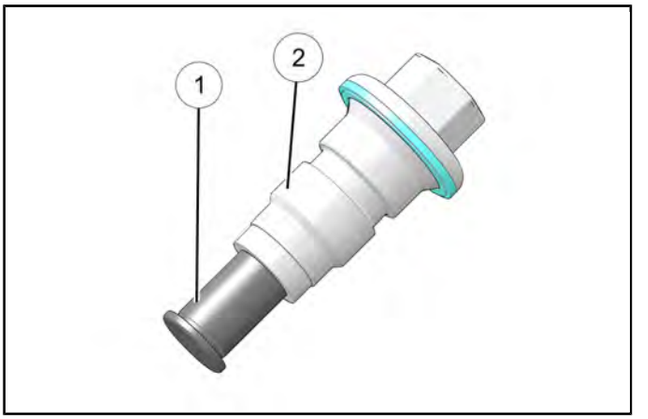
TORQUE
Cam Chain Tensioner: **15 ft-lbs (20 N·m)**

16. Torque all chain guide fasteners ③ to specification.



TORQUE
Chain Guide Fastener (All): **84 in-lbs (10 N·m)**

CAM CHAIN TENSIONER INSPECTION



1. Visually inspect inner plunger ① for damage, scoring, or burns.
2. Lubricate inner plunger with engine oil. Move plunger in and out of outer plunger ② to check for smooth movement without binding.
3. Verify the oil passage opening is free from debris.
4. Replace tensioner seal upon assembly.
5. Replace tensioner assembly if worn or damaged.

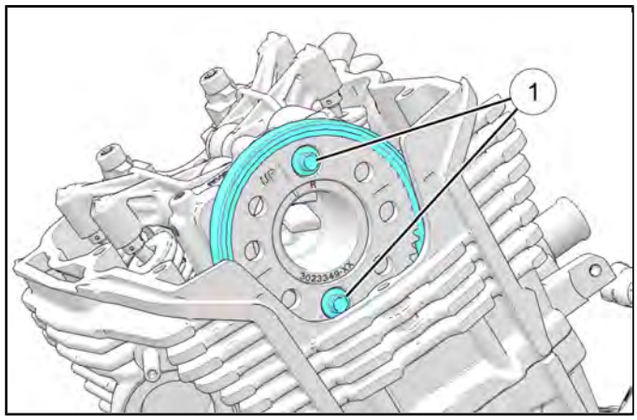
CAMSHAFT SPROCKET REMOVAL

1. Place motorcycle in an upright position with front wheel clamped in a wheel vise.
2. Remove valve cover(s). See **Valve Cover Removal page 3.75**.
3. Remove primary cover. See **Primary Cover Removal page 5.13**.
4. Rotate crankshaft so the front piston is TDC on the compression stroke and lock in position. See **Locking the Crankshaft for Service page 3.59**.
5. Remove the front cam chain tensioner. See **Cam Chain Tensioner Removal page 3.62**.

⚠ CAUTION

Do not rotate the crankshaft with tensioners removed. Engine damage may occur.

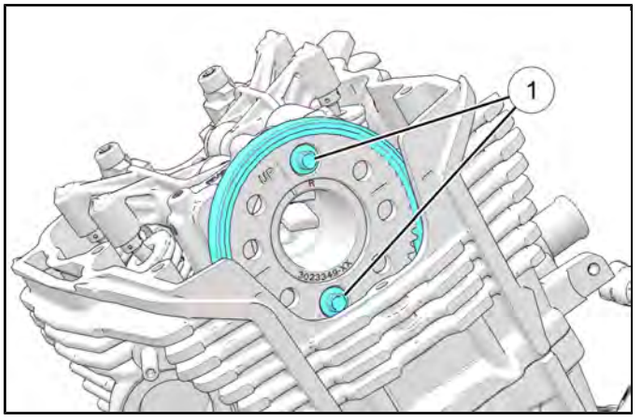
6. Remove the camshaft sprocket bolts ① completely.



IMPORTANT

It will be necessary to use a thin 10 mm spanner to remove the sprocket bolts that are not exposed. the bolts cannot be completely removed until the sprocket is out of the cylinder head.

7. Remove sprockets from camshafts using care not to drop the chain into the cam chain gallery.
8. Rotate the engine until the rear cylinder is at top dead center.
9. Lock the rear cylinder at top dead Center. See **Locking the Crankshaft for Service page 3.59**.
10. Remove the rear cam chain tensioner. See **Cam Chain Tensioner Removal page 3.62**.
11. Remove the camshaft sprocket bolts ① completely.



IMPORTANT

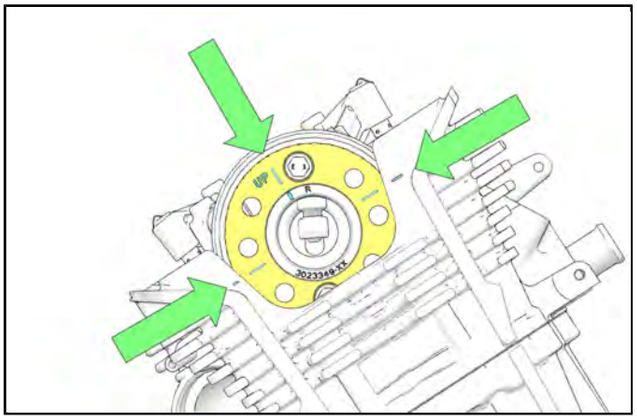
It will be necessary to use a thin 10 mm spanner to remove the sprocket bolts that are not exposed. the bolts cannot be completely removed until the sprocket is out of the cylinder head.

CAMSHAFT SPROCKET INSTALLATION

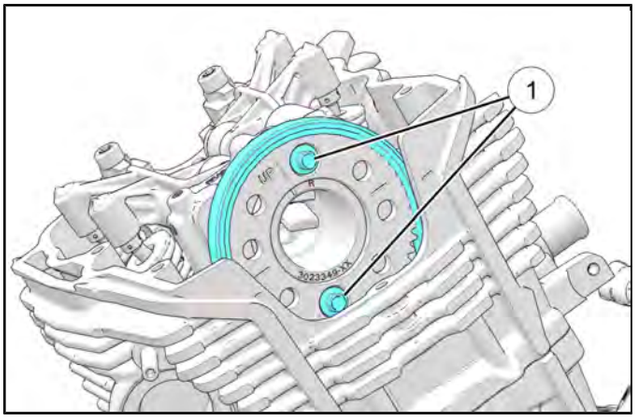
1. Lock the crankshaft so the rear cylinder is at top dead center on the compression stroke. See **Locking the Crankshaft for Service page 3.59**.
2. Align the rear camshaft sprocket as shown.

⚠ CAUTION

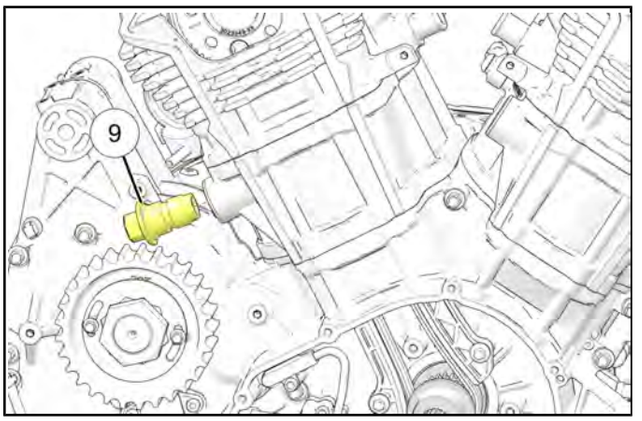
Failure to properly time the camshafts can lead to engine damage.



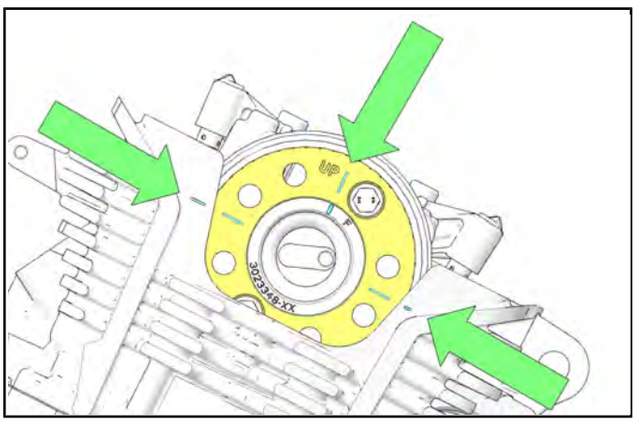
3. Install the camshaft sprocket fasteners ①.



4. Install rear cam chain tensioner.

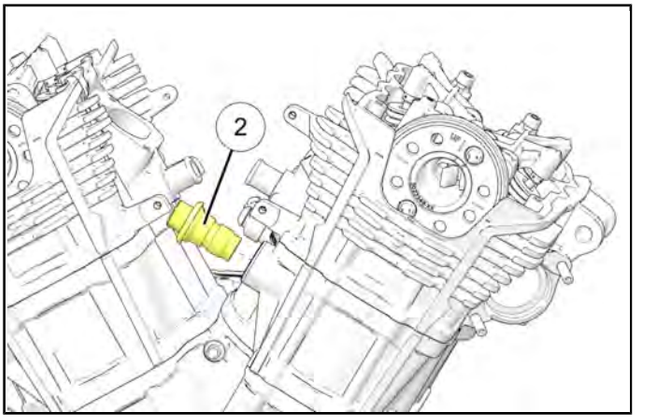


5. Remove locking pin
6. Rotate the engine 420 degrees to lock the front piston at TDC
7. Install cam sprocket as shown.



8. Install Camshaft sprocket fasteners.

9. Install front cam chain tensioner ②.



10. Torque accessible cam shaft sprocket fasteners and mark them with a paint pen.

TORQUE
Cam Sprocket Fastener: **159 in-lbs (18 N·m)**

11. Rotate the Engine and lock the rear cylinder at TDC. Torque the remaining sprocket fasteners.

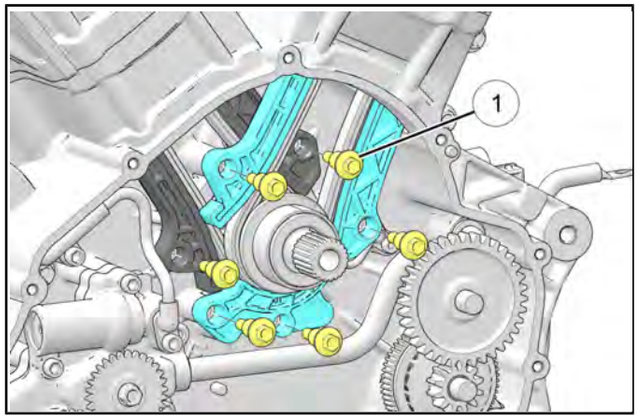
CAM CHAIN TENSIONER INSTALLATION

1. Verify that the engine is at TDC and the timing marks are properly aligned. See **Locking the Crankshaft for Service page 3.59**.
2. Install the tensioner(s) with new sealing washers and torque to specification.

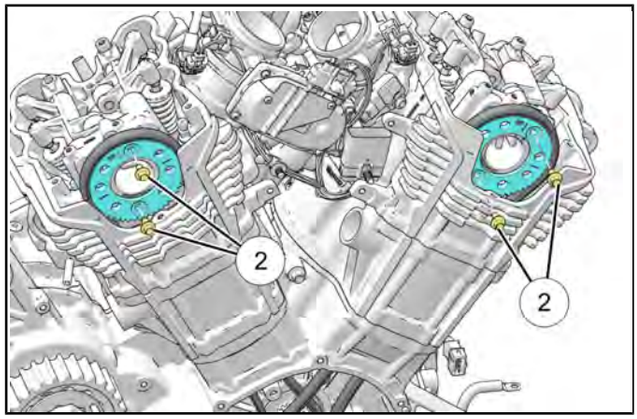
TORQUE
Cam Chain Tensioner: **15 ft-lbs (20 N·m)**

CAM CHAIN GUIDE REMOVAL

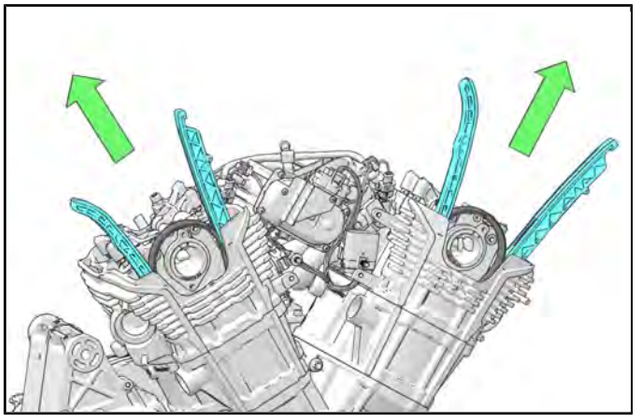
1. Remove valve cover. See **Valve Cover Removal page 3.75**.
2. Lock crankshaft for service. See **Locking the Crankshaft for Service page 3.59**.
3. Remove cam chain tensioners. See **Cam Chain Tensioner Removal page 3.62**.
4. Remove ACG cover. See **ACG Cover Removal page 10.31**.
5. Remove Flywheel. See **Flywheel Removal page 3.60**.
6. Remove cam chain guide fasteners ①.



7. Remove fastener ② securing camshaft sprocket.

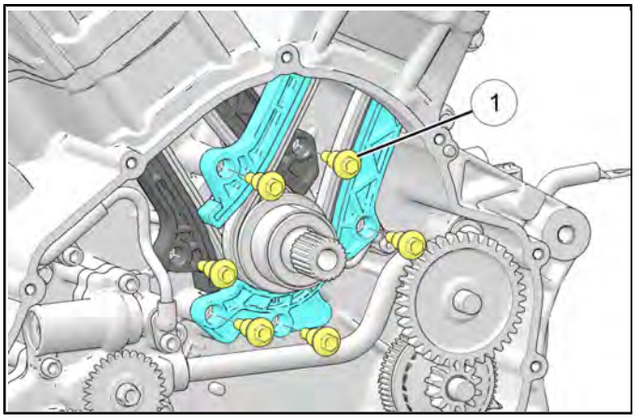


8. Remove cam chain guides.



CAM CHAIN GUIDE INSTALLATION

1. Install chain guides from top of cylinder.
2. Install fasteners ① and torque to specification.



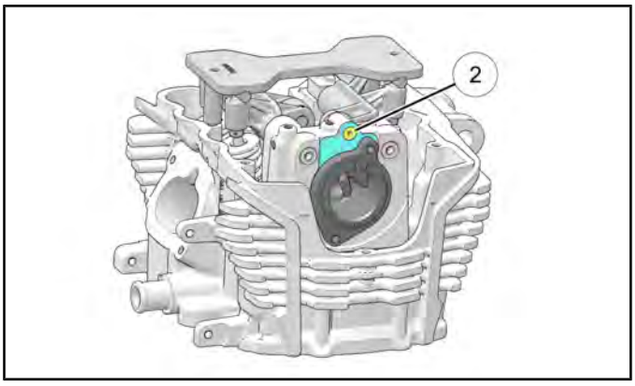
TORQUE
Chain Guide Fastener (All) **84 in-lbs (10 N·m)**

3. Install Flywheel. See **Flywheel Installation page 3.61**.
4. Install stator. See **Starter Motor Installation page 10.23**.
5. Install ACG cover. See **ACG Cover Installation page 10.31**.
6. Install cam chain tensioners. See **Cam Chain Tensioner Installation page 3.70**.
7. Install valve cover. See **Valve Cover Installation page 3.76**.

CAMSHAFT SERVICE

CAMSHAFT INSTALLATION

1. Install the special tool **PF-52939** onto cylinder head.
2. Tighten the fasteners to compress the rocker arm assemblies.
3. Carefully install camshaft.
4. Install the camshaft thrust plate and secure with its fastener ②.



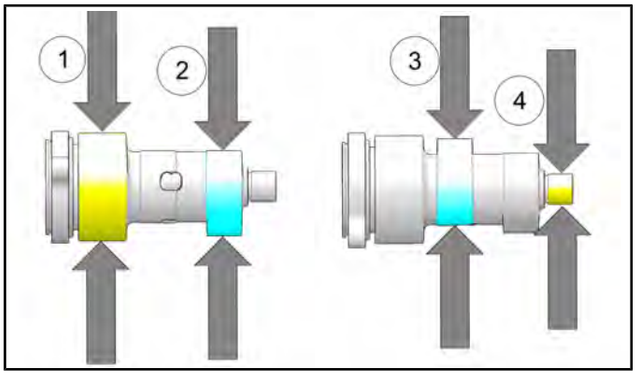
IMPORTANT
Replace thrust plate screws with new screws during reassembly.

TORQUE
Camshaft Thrust Plate Fastener: **62 in-lbs (7 N·m)**

5. Remove the special tool.
6. Rotate crankshaft so the rear piston is TDC on the compression stroke and lock in position. See **Locking the Crankshaft for Service page 3.59**.
7. Time rear cylinder first. Install camshaft sprockets

CAMSHAFT INSPECTION

For the following camshaft inspection procedure, refer to the camshaft service specifications section. See Service Specifications – Cylinder Head page 3.52.

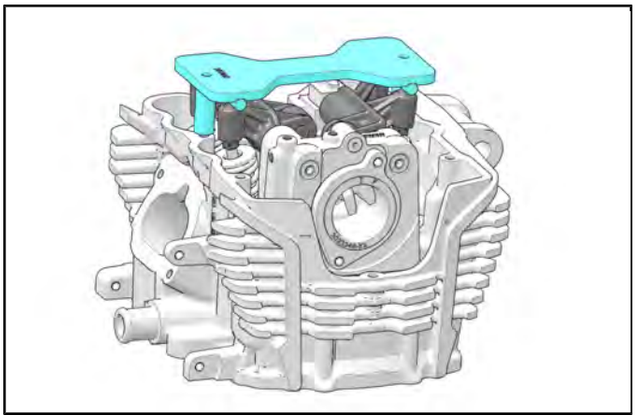


1. Visually inspect camshaft journal surfaces for scoring or signs of insufficient lubrication. Replace camshaft if heavy scoring or damage is noted.
2. Inspect height of each cam lobe. Exhaust cam lobe ③ and intake cam lobe ②.
3. Measure O.D. of each camshaft journal. Journals ① and ④.

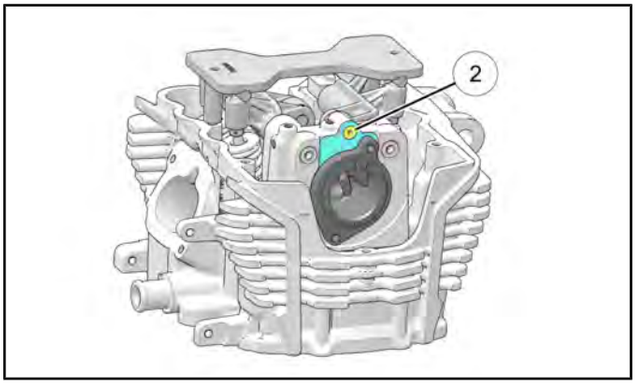
REF	MEASUREMENT
①	**2.24 in (57.0 mm)**
②	**1.799 in (45.706 mm)**
③	**1.811 in (46.001 mm)**
④	**0.6244 – 0.625 in (15.862 – 15.875 mm)**

CAMSHAFT REMOVAL

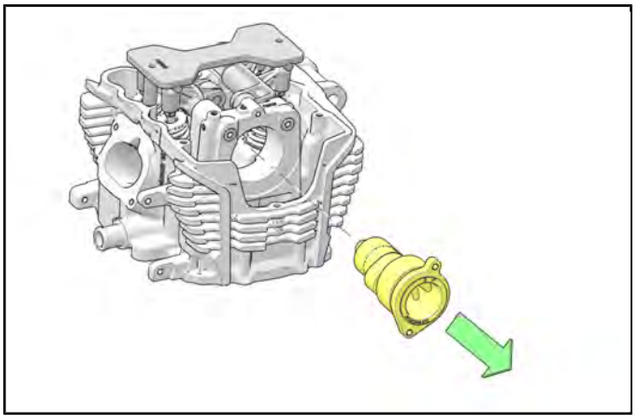
1. Install the special tool **PF-52939** onto the cylinder head as shown.



2. Tighten the fasteners to compress the rocker arm assemblies.
3. Remove the camshaft thrust plate by removing its fastener ②.



4. Remove the camshaft.



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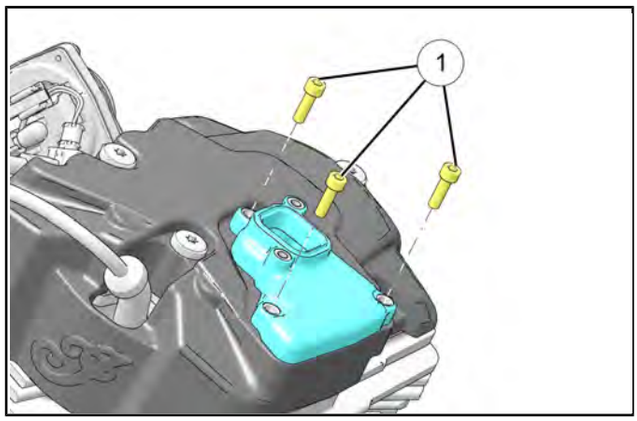
CYLINDER HEAD SERVICE

BREATHER ASSEMBLY REMOVAL

IMPORTANT
The breather assembly can only be serviced with the engine out of the frame.

REMOVAL

1. Remove fasteners ① securing breather.

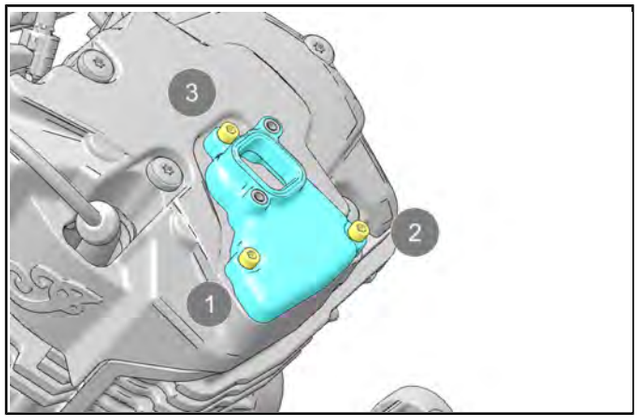


2. Remove breather.

BREATHER ASSEMBLY INSTALLATION

INSTALLATION

1. Install breather.
2. Install fasteners in the proper torque sequence to secure breather.

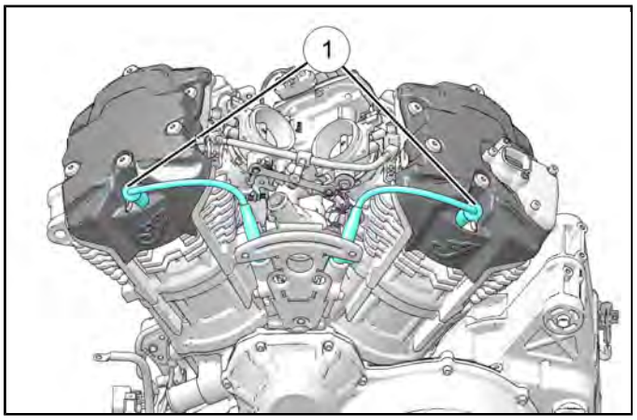


TORQUE
Breather Fastener: **88 in-lbs (10 N·m)**

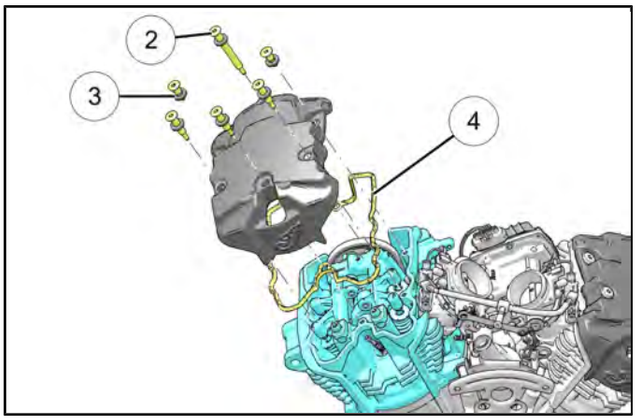
VALVE COVER REMOVAL

IMPORTANT
Due to the proximity of the valve cover in the frame, the engine must be lowered down for access. To lower the engine down, reference **Removing Engine From Frame page 3.19**.

1. Unplug spark plug boots① from spark plugs.

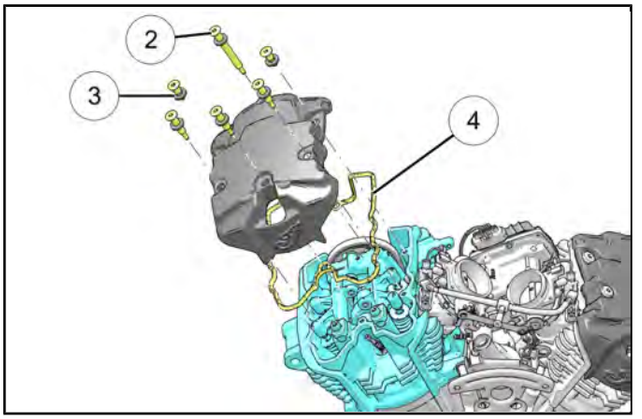


2. Remove valve cover fastener ② and isolators ③.
3. Remove valve cover gasket ④.



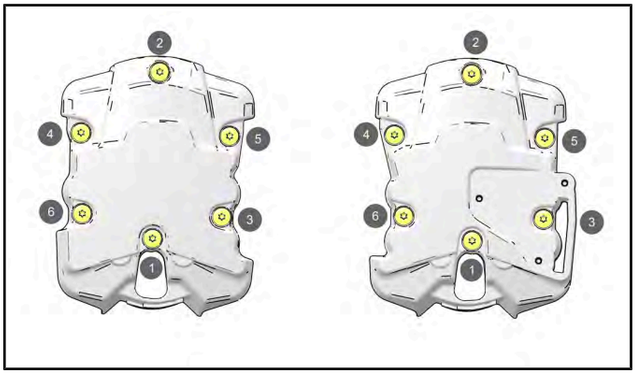
VALVE COVER INSTALLATION

1. Using new gaskets, install the inner valve covers and thread fasteners ① in finger tight.



2. Reference the torque sequence at the beginning of this section and torque inner valve cover fasteners to specification.

TORQUE
Valve Cover Fastener: **88 in-lbs (10 N·m)**

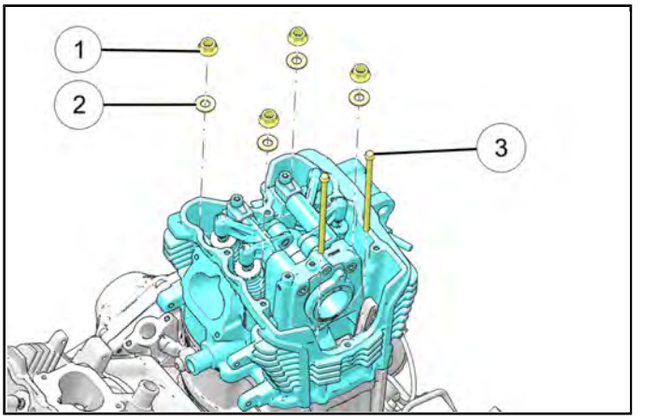


CYLINDER HEAD REMOVAL

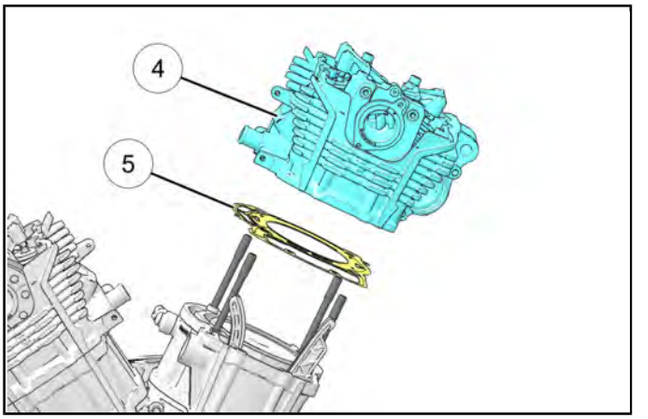
⚠ CAUTION

Cylinder and Cylinder Head heat sink edges are extremely sharp. Gloves should be worn whenever handling these components to prevent personal injury.

1. Remove Timing Chain. See **Cam Chain Removal page 3.62**.
2. Remove cylinder head nuts ①, washers ②, and head bolts ③.



3. Remove cylinder head ④ and head gasket ⑤.



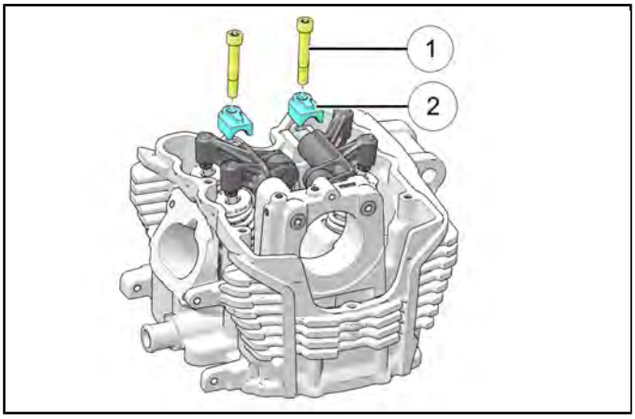
ROCKER ARM ASSEMBLY REMOVAL / INSTALLATION

To watch a video of this procedure, scan the QR code or click **HERE**.

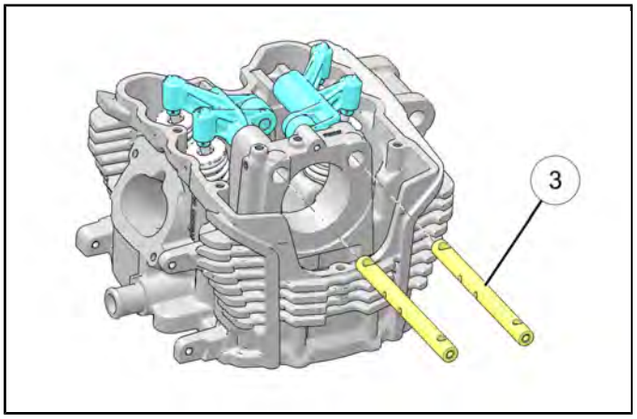
https://vimeo.com/356919452/2858c08b70

REMOVAL

1. Remove camshaft. See **Camshaft Removal page 3.74**.
2. Remove special tool from the cylinder head.
3. Remove rocker shaft cap fastener ① and cap ②.

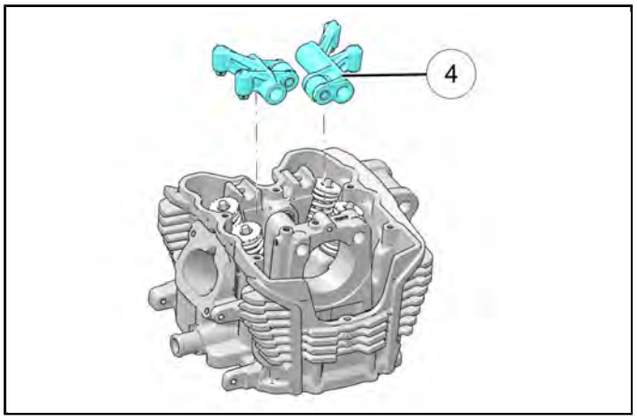


4. Remove rocker shaft ③.



IMPORTANT
Mark the rockers for reassembly. Each rocker can only be correctly installed one way.

5. Remove rocker shaft assembly ④.



INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

IMPORTANT
Lubricate rocker shafts with white lithium grease (PN **1205854**) before reassembly.

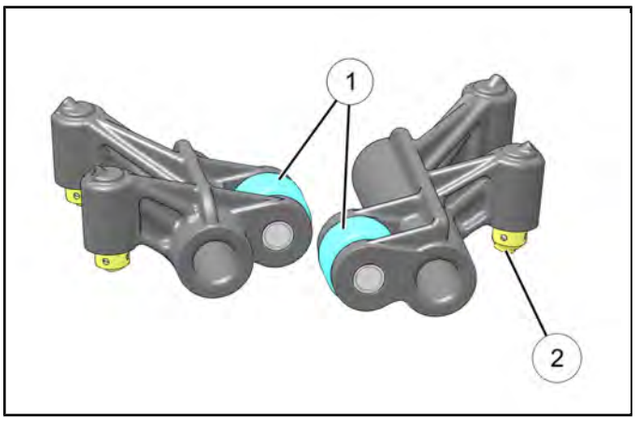
IMPORTANT
If installing new rocker arms, submerge the new rocker arm(s) in clean engine oil prior to installation to ensure proper lubrication.

TORQUE
Rocker Shaft Cap Fastener: **27 ft-lbs (37 N·m)**

ROCKER ARM ASSEMBLY INSPECTION

NOTICE
Rocker arms are non-serviceable and must be replaced as an assembly.

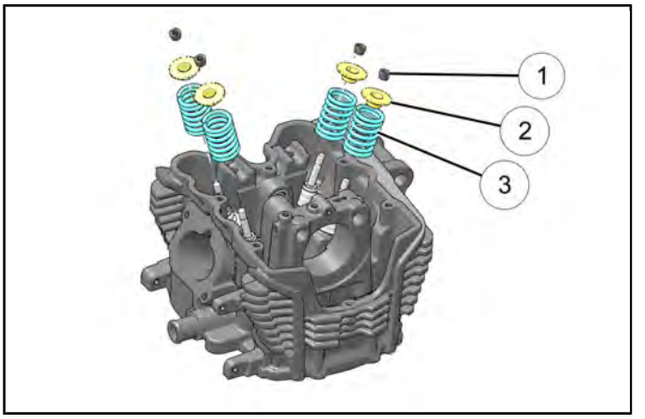
1. Inspect cam rollers ②. Ensure the rollers move freely and have no abnormal wear patterns or flat spots.



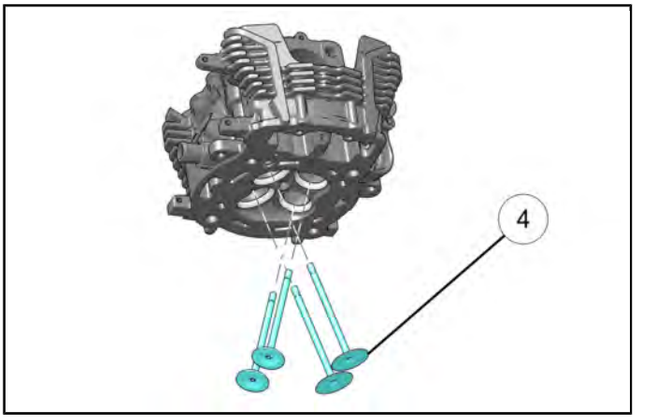
2. Inspect wear pad ②. Ensure it moves up and down freely. Check for abnormal wear.
3. Replace rocker arm assembly if abnormal wear is found.

CYLINDER HEAD DISASSEMBLY

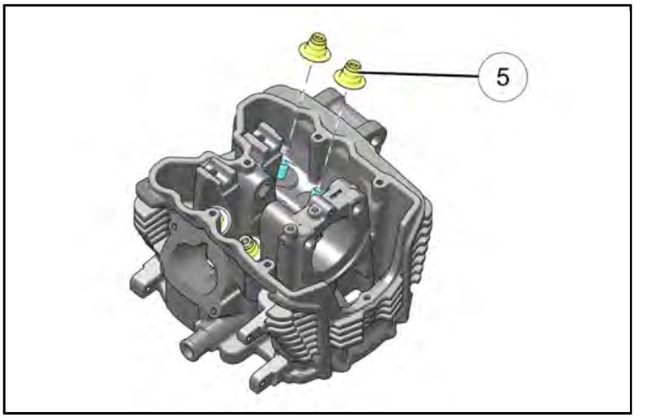
1. Remove the valve keepers ① using a valve spring compressor tool PV-1253. Use a small magnet to remove valve keepers.
2. Remove upper valve spring retainers ② and springs ③ .



3. Remove the valves ④ .



4. Remove and discard the spring seat / valve stem seal assemblies ⑤ .

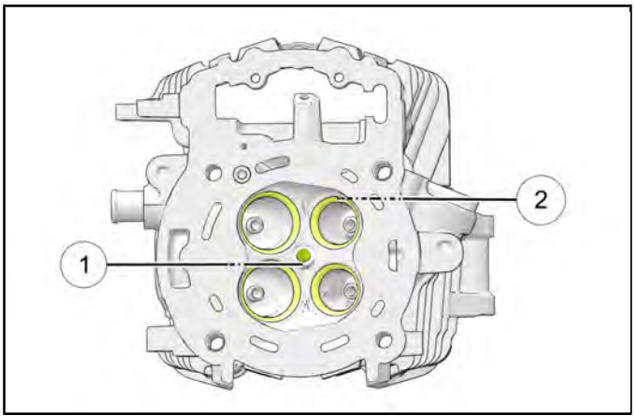


5. Clean carbon deposits from combustion chamber.

6. Clean gasket surfaces.

CYLINDER HEAD INSPECTION

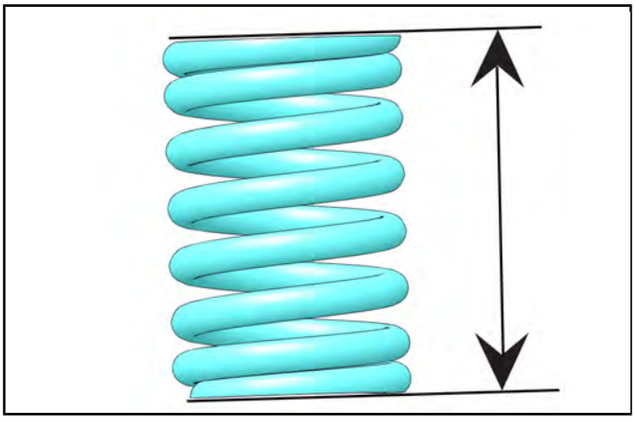
1. Visually inspect cylinder head for cracks or damage. Pay close attention to the areas around spark plug ① and valve seats ② .



2. Inspect cylinder head for distortion with a straight edge and feeler gauge. Check in different directions and locations on the cylinder head. For cylinder head service limits, see **Service Specifications – Cylinder Head page 3.52**.

VALVE SPRING FREE LENGTH INSPECTION

1. Measure free length of valve springs. Replace springs that do not meet specification.



Valve Spring Free Length:
2.1120" (53.70 mm)

NOTICE

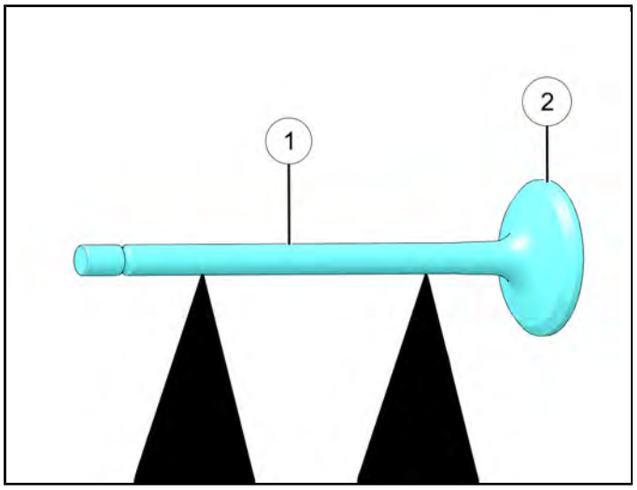
Intake and exhaust springs are identical.

VALVE INSPECTION

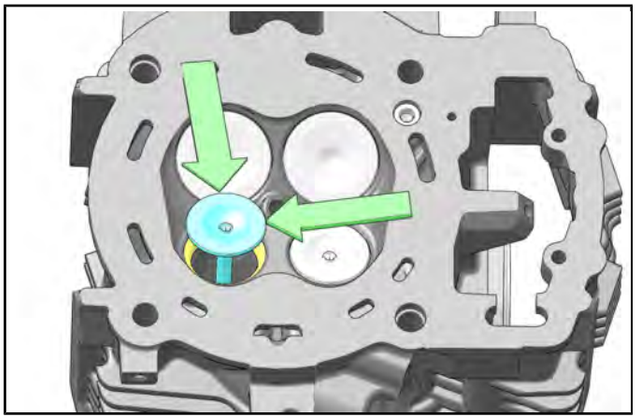
NOTICE

Valve service specifications can be found at the beginning of this chapter. See **Service Specifications – Cylinder Head page 3.52**.

1. Place valves on V-blocks as shown and measure valve stem runout ① using a runout gauge or similar tool..



2. Inspect the valve face for damage from burning, pitting or uneven contact.
3. Place valves on V-block as shown and inspect valve head radial runout ② .
4. Insert valves into their original locations in cylinder head.
5. Inspect that each valve moves up and down smoothly without binding in guide.
6. Measure valve stem deflection for each valve to determine if valve or valve guide requires replacement.



a. Raise valve 10mm (0.400") off of seat.

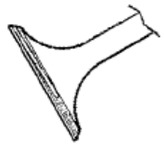
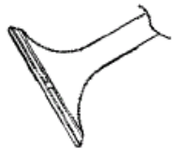
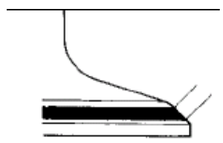
b. Position dial indicator as shown. Measure deflection in two directions perpendicular to each other (X & Y axis).

c. If valve deflection exceeds service limit measure valve stem diameter.

7. Replace valve and repeat step 6 if valve stem O.D. measures outside standard range. If valve stem deflection exceeds service limits with a new valve installed, valve guide must be replaced.

8. Installation of new valve guides and/or new valves requires valve seat reconditioning. This work should be performed by an experienced technician properly equipped to perform cylinder head reconditioning.

VALVE INSPECTION

CONDITION	ILLUSTRATION	POSSIBLE CAUSE	CORRECTIVE ACTION
Uneven seat width		Bent valve stem, worn valve guide	Replace valve and reface seat
Damaged valve face		Burnt, pitted, foreign material damage	Replace valve and reface seat
Contact area too high		Wear, settling of valve seat	Lower with 30° stone
Contact area too low		Wear, settling of valve seat	Raise with 60° stone
Contact area too wide		Wear, settling of valve seat	Narrow with both 30° stone and 60° stone
Contact area too narrow			Use 45° stone
Contact area free of pitting and damage, centered in seat, proper width.		Correct	None

VALVE GUIDE REPLACEMENT

⚠ CAUTION

Replacement of valve guides requires an oven, special equipment and experience to do the job correctly. If you are unsure of your ability to do the repair professionally it is best to sublet the labor to a competent machinist. Valve seat reconditioning is required when valve guides are replaced.

1. Support cylinder head and place valve guide remover into valve guide from the combustion chamber side.
2. Drive or press old valve guides out of cylinder head.

⚠ CAUTION

The cylinder head can be easily damaged if the procedure is done carelessly.

3. Apply 90 weight oil to outside of new valve guides.
4. Drive or press new guides from rocker arm side of head.
5. Measure valve guide height from spring seat:

Valve Guide Installed Height:
14.68–15.08 mm

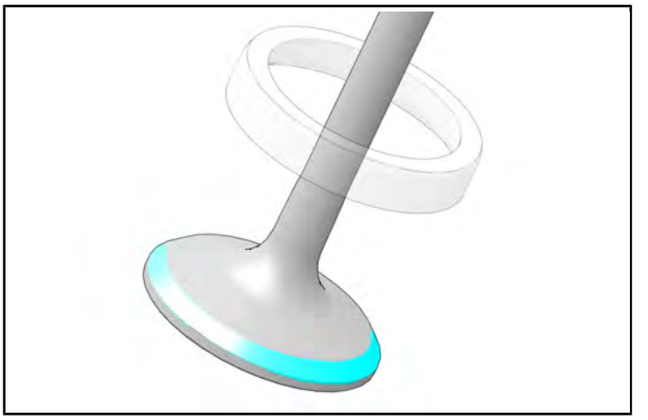
6. Ream new valve guides to size to obtain specified stem-to-guide clearance. Ream from combustion chamber side of head.
7. Clean cylinder head thoroughly with clean solvent.
8. Inspect and recondition valve seats.

VALVE SEAT INSPECTION

NOTICE

Valves cannot be ground. If valve face is burned or badly worn, replace the valve.

1. Remove carbon deposits from valves and seats.
2. Inspect valve face for burning, pitting or uneven contact.
3. Apply a light coating of machinist's layout fluid or paste to valve face.
4. Install valve into valve guide.
5. Tap valve several times to make a clear impression on the valve face. Do not rotate valve.
6. Remove valve and measure contact area (valve seat width). See **Service Specifications – Cylinder Head page 3.52**.



7. If valve seat is incorrect, recondition as needed.

VALVE SEAT RECONDITIONING

NOTICE

Valve seat reconditioning should be performed by a technician proficient in cylinder head reconditioning techniques using grinding stones. The use of carbide cutters is not recommended. Follow recommendations of the manufacturer of the valve seat reconditioning equipment being used. Do not grind seats more than necessary to provide proper seat width and contact point on valve face.

CYLINDER HEAD ASSEMBLY

⚠ CAUTION

Wear eye protection during assembly.

1. Lubricate valve stems with assembly lube.
2. Install valve in head *before* installing seal. Hold valve against seat wipe off the portion that extends above the guide.
3. Apply Indian Motorcycle engine oil to valve guide seal and install seal on valve, rotating the seal as you install it.
4. Press seal firmly in place on top of guide. Be careful not to dislodge spring from seal.
5. Install valve spring and upper retainer.

⚠ CAUTION

Do not compress valve springs more than necessary to install keepers.
Support cylinder head so valves will not be damaged.

6. Compress valve springs using a valve spring compressor and adapter.
7. Apply a small amount of grease to both sides of a valve keeper.
8. Insert both valve keepers in place on valve.
9. Remove spring compressor.
10. Repeat previous steps for remaining valves.
11. Be sure all keepers are fully seated in groove.

CYLINDER HEAD INSTALLATION

NOTICE

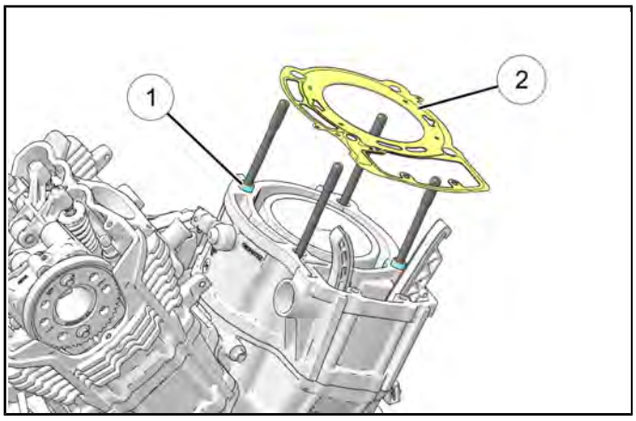
The base gasket seal is broken when the cylinder head is removed and must be replaced. See **Cylinder Installation page 3.98**.

1. Verify that locating dowels ① are in position on the cylinder deck.
2. Thoroughly clean cylinder and cylinder head mating surfaces.

NOTICE

Gaskets and gasket sealing surfaces must be free of oil and grease during assembly.

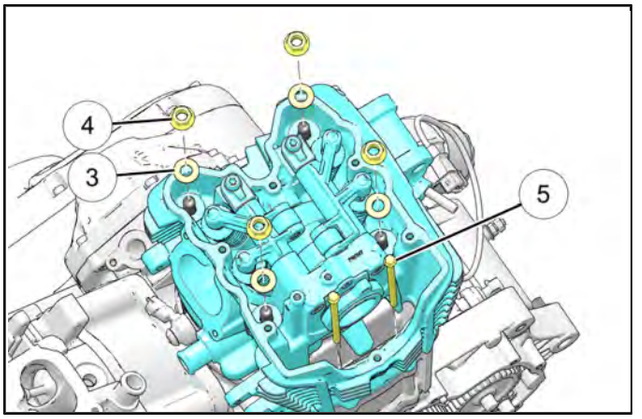
3. Install a new head gasket ② .



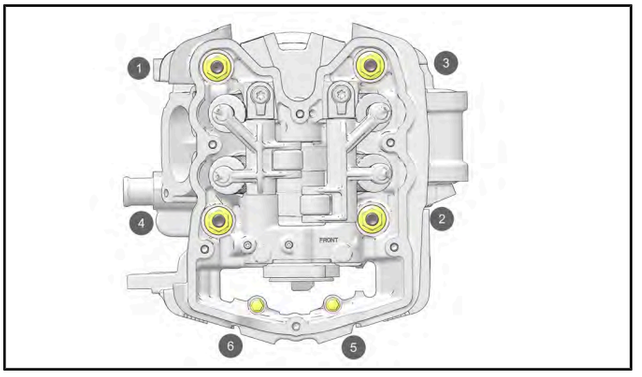
4. Set cylinder head in place on cylinder and press down until fully seated.

5. Install washers ③, nuts ④, and bolts ⑤. Tighten finger tight.

IMPORTANT
Add engine oil to the studs and bottom side of the cylinder head nuts.



6. Fully torque cylinder head following the procedure below to ensure accurate final torque:



TORQUE
Cylinder Head Nuts: **1. Torque fasteners to 15 ft-lbs (20 N·m) 2. Back off 90 ° 3. Torque all fasteners to 26 ft-lbs (35 N·m) 4. Torque angle all 360 °**

TORQUE
Cylinder Head Bolt: **88 in-lbs (10 N·m)**

7. Install chain guides. See **Cam Chain Guide Installation page 3.72**.

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TROUBLESHOOTING, CYLINDER HEAD AND VALVE TRAIN

NOTICE

Cylinder head, valve train and piston/cylinder problems are usually detected by an engine compression test. Other problems associated with this area of the engine are external fluid leaks, excessive oil consumption or abnormal noises.

The troubleshooting tables that follow list *possible* causes of engine mechanical problems. Always thoroughly investigate before disassembling an engine.

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Hard Starting / Won't Start	Low Compression	Worn Valve Guide(s)	Replace Valve Guide(s)
		Poor Seating of Valve(s)	Repair or Replace
		Broken Valve Spring(s)	Replace
		Spark Plug Not Seated	Torque to Specification
		Incorrect Valve Timing	Repair / Retest
		Valve Stuck Open	Repair / Retest
		Cylinder Head Gasket Leak	Repair / Retest
		Slow Starter Motor	Refer to Electrical chapter
		Worn Rings, Piston, or Cylinder	Refer to Engine / Cooling / Exhaust chapter
		Collapsed Hydraulic Lifter (s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
		Ignition Problem	Refer to Electrical chapter
		Fuel Problem	Refer to Fuel Delivery / EFI chapter
Electric Starter Straining to Turn Engine Over	High Compression	Excessive carbon build-up in combustion chamber	De-carbon Combustion Chamber
		Compression Release Mechanism Failure	Inspect/Repair/Replace Compression Release Mechanism
	Excessive Starter Load	Internal Engine / Drive Components Seized or Binding	Determine Cause of Seizure or Binding
Poor idle Quality (Engine Related)	Low Compression	Collapsed Hydraulic Lifter (s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
		Poor Seating of Valve(s)	Repair or Replace
	Excessive Oil in Combustion Chamber	Valve Guides	Replace
		Worn Rings, Piston, or Cylinder	Refer to Engine / Cooling / Exhaust chapter
		Engine Oil Overfilled	Correct Engine Oil Level
Engine Noise	Valve Train Area	Collapsed Hydraulic Lifter (s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
		Broken or Weak Valve Spring(s)	Replace

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
		Worn Camshaft or Rocker Arm	Replace
		Rocker Arm Bearing Damage	Replace
		Cam Bearings Worn or Damaged	Replace
	Piston / Cylinder Area	Worn Pistons and / or Cylinders	Replace
		Worn Wrist Pin, Wrist Pin Bore and / or Connecting Rod	Replace
		Worn Piston Rings or Piston Ring Lands	Replace
	General	Exhaust Leak	Reseal Exhaust
	Timing Chain Area	Chain / Sprocket Worn	Replace
		Chain Tensioner and / or Guide Worn	Replace
	Bottom End Area	Main Bearings	Refer to Transmission / Crankshaft chapter
		Rod Bearings	Refer to Transmission / Crankshaft chapter
		Loose Side Clearance	Refer to Transmission / Crankshaft chapter
	Transmission Area	Bearings	Refer to Transmission / Crankshaft chapter
Poor High-Speed Running	Air Intake Problem	Air Box, Intake Manifold, Throttle Body	Refer to Fuel Delivery / EFI chapter
	Fuel Injection Problem	Fuel Pump, Injectors, Fuel Lines	Refer to Fuel Delivery / EFI chapter
	Ignition Problem	Spark Plugs, Spark Plug Wires, Ignition Coil, Charging System	Refer to Electrical chapter
	Valve Float	Weak Valve Springs	Replace
	Insufficient Valve Travel	Worn Camshaft / Rocker Arms	Replace
	Valves Opening and Closing at Wrong Time	Incorrect Valve Timing	Correct
Lack of Power in all RPM Ranges	Low Compression	Worn Piston, Rings, Cylinder, Poor Valve Seating	Repair / Replace
	Valve Timing Incorrect	Cam Chain and Sprockets	Correct
	Valve Float	Weak Valve Springs	Replace
	Insufficient Valve Lift	Worn Camshaft / Rocker Arms	Replace

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
	Ignition / Fuel Injection System	Fuel Pump, Injectors, Fuel Lines, Spark Plugs, Spark Plug Wires	Refer to Fuel Delivery / EFI or Electrical chapter
	Oiling Problem	Oil Overfilled	Correct Engine Oil Level

CYLINDER / PISTON

GENERAL INFORMATION

SERVICE NOTES

NOTICE
Clean the machine thoroughly before removing engine from frame.

- This section covers service of the cylinder, piston and rings. The engine must be removed from the frame to perform the procedures in this section. Refer to Engine / Cooling / Exhaust chapter for engine removal and installation.
- Mark and store all mated parts for assembly. Assemble engine by putting used parts that pass inspection back in the same location.
- Machined mating surfaces are very delicate. Handle and store all parts in such a way that the mating surfaces will not be damaged.
- Many parts require assembly lubrication. Follow the assembly lubrication procedures carefully.
- There are many precision measuring steps in this section. If you are not sure of your capabilities in these areas, have a competent machinist perform the precision part inspection operations.
- Cleanliness of parts is critical to engine life and proper parts inspection. Use clean solvent and hot, soapy water to clean parts. Dry with compressed air before inspection and engine assembly. Coat parts with fresh lubricant to prevent oxidation after cleaning.

SPECIAL TOOLS – CYLINDER / PISTON

TOOL DESCRIPTION	PART NUMBER
Clutch Shaft Holding Tool	PF-51232
Crankshaft Rotation Tool	PF-51239
Crankshaft Locking Pin	PF-51235-A
Engine Case Splitting Tool	PF-51234-A
Straightedge, Feeler Gauge	Commercially Available
Protective Sleeves For Pistons / Studs	Commercially Available
Ring Compressor	Commercially Available

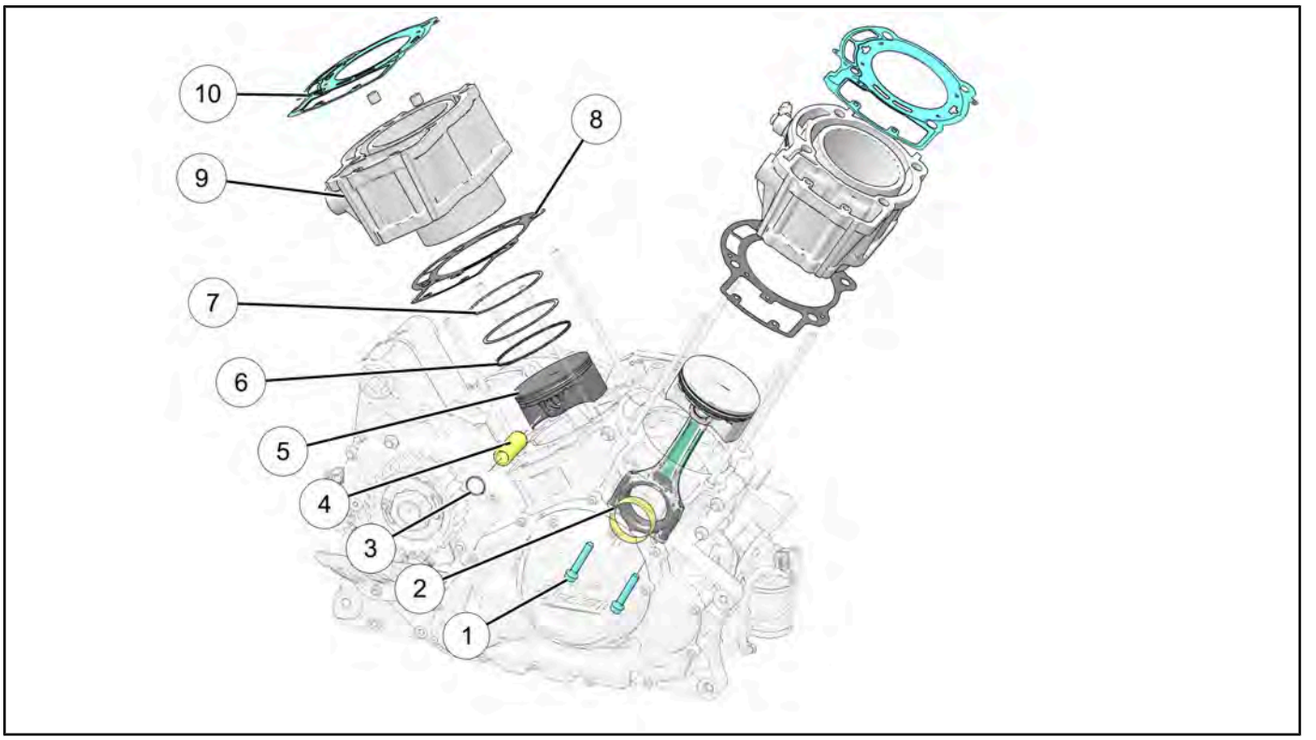
Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – CYLINDER / PISTON

ITEM		STANDARD	SERVICE LIMIT
Cylinder	I.D.	108.000 - 108.016 (4.25197" - 4.25295")	Check taper and out-of-round
	Out of Round	Measure 86 mm up from base gasket surface	0.05 mm (.002")
	Taper		0.05 mm (.002")
	Gasket Surface Warpage	-	.1mm max. (.0039")
Piston	Piston Mark Direction	Piston orientation is determined by arrow on piston crown. Position BOTH pistons so arrows point to front of engine.	
	Piston O.D. (Nominal) (Measured 11.5 mm up from bottom of skirt, 90 degrees to pin)	107.933 - 107.947mm (4.24933 - 4.24988")	Replace if piston-to-cylinder clearance is excessive with good cylinder
	Piston Pin Hole I.D.	23.004 - 23.01 mm (.9057 - .9059")	23.039 mm (.9070")
	Piston Pin O.D.	22.995 - 23.00 mm (.9053 - .9055")	22.96 mm (.9039")
	Piston to Cylinder	.053 - .083 mm (.0021 - .0033")	.17 mm (.0066")
	Piston to Piston Pin	.004 - .015 mm (.0001 - .0006")	.033 mm (.0013")
Piston Ring Clearances	Ring End Gap - Top (Installed) Ring End Gap - 2nd (Installed)Ring End Gap - 3rd (Oil Control Rails) (Installed)	.30 - .45 mm (.012 - .018") .50 - .75 mm (.020 - .029") .25 - .75 mm (.009 - .029")	.90 mm (.0354") 1.50 mm (.0591") 1.50 mm (.0591")
	Piston Ring Marks	-	"MTOP" mark must face UP on all rings.
Piston Ring to Ring Land	Top Ring (1.2mm ring thickness)	.055 - .060 mm (.0022 - .0024")	.11 mm (.0043")
	2nd Ring (1.2mm ring thickness)	.045 - .050 mm (.0018 - .0020")	.10 mm (.0039")
	Oil Control Ring	.220 - .360 mm (.0087 - .0142")	.45 mm (.0177")

ASSEMBLY VIEWS

CYLINDER / PISTON ASSEMBLY VIEW

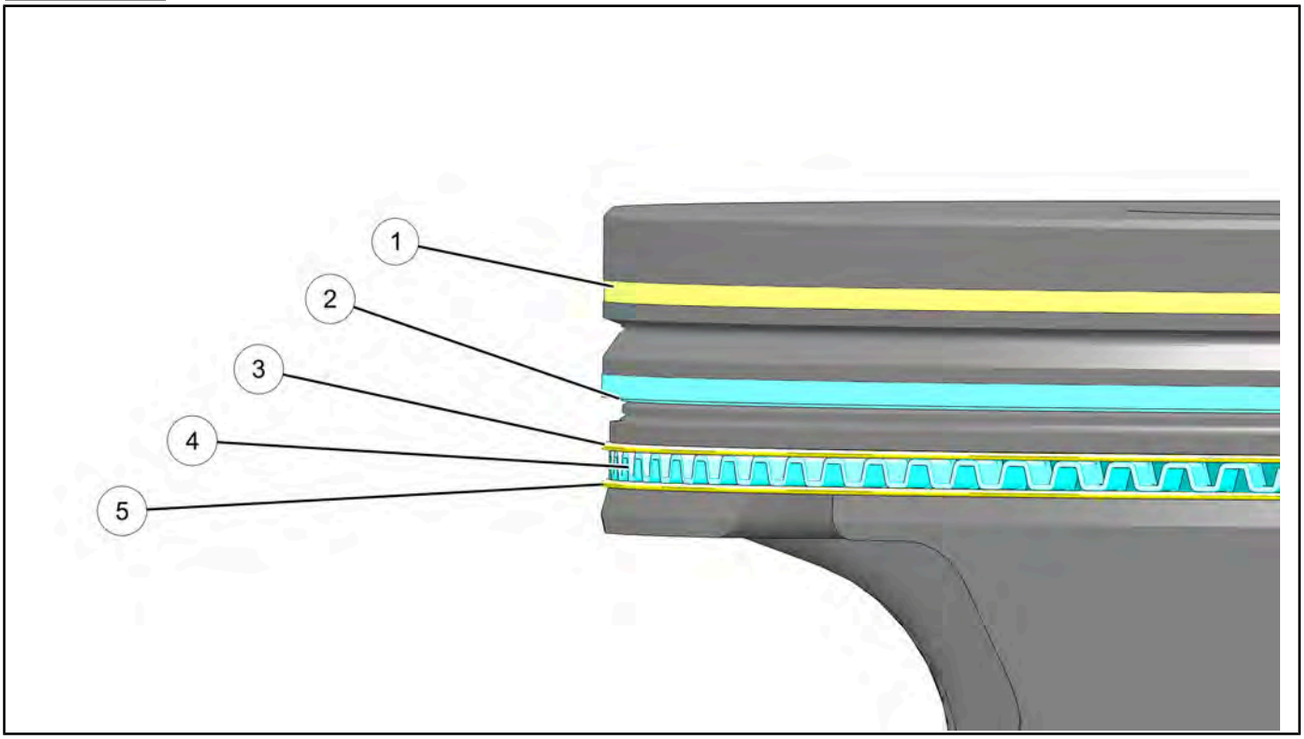


① Connecting Rod Fastener **1. Torque to 19 ft-lbs (26 N·m)** **2. Torque angle to 105 °**	⑥ Oil Control Ring
② Connecting Rod Bearing	⑦ Compression Ring (Top Two Rings)
③ Circlip	⑧ Cylinder Base Gasket
④ Wrist pin	⑨ Cylinder
⑤ Piston	⑩ Head gasket

CYLINDER / PISTON SERVICE

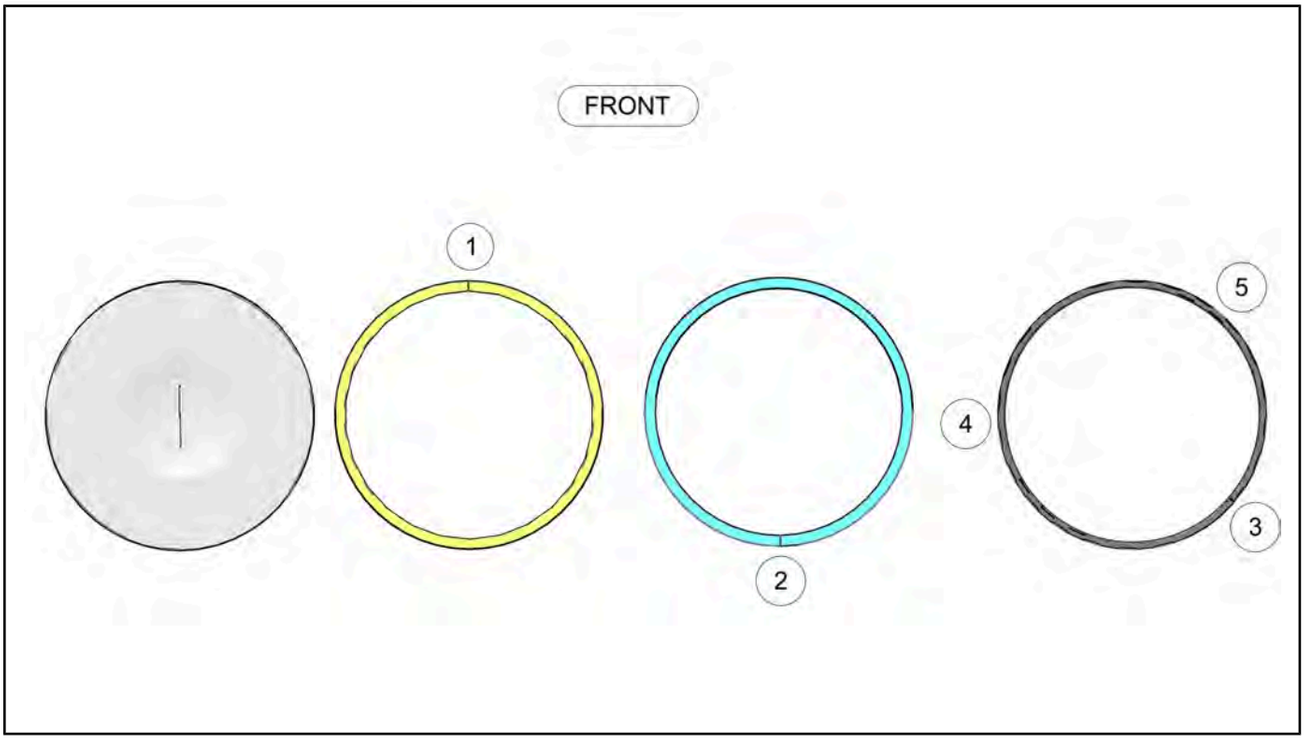
PISTON RING PROFILE AND ORIENTATION

PISTON RINGS



ITEM	DESCRIPTION
①	Top Compression Ring
②	Lower Compression Ring
③	Top Oil Ring
④	Oil Ring Expander
⑤	Lower Oil Ring

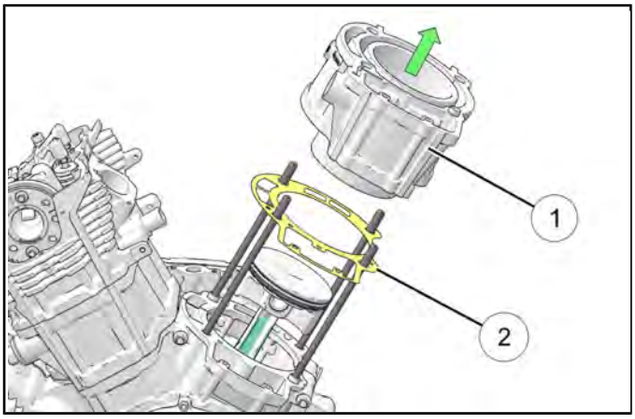
PISTON RING END GAP ORIENTATION



ITEM	DESCRIPTION
①	Top Compression Ring
②	Lower Compression Ring
③	Top Oil Ring
④	Oil Ring Expander
⑤	Lower Oil Ring

CYLINDER REMOVAL

1. Remove cylinder head(s). See **Cylinder Head Removal page 3.76**.
2. Remove cylinder ①. Support pistons to prevent damage. Place a section of hose over the cylinder studs to prevent damage to the piston rings.



3. Remove cylinder base gasket ② .
4. Clean gasket surfaces of cylinders thoroughly.

⚠ CAUTION

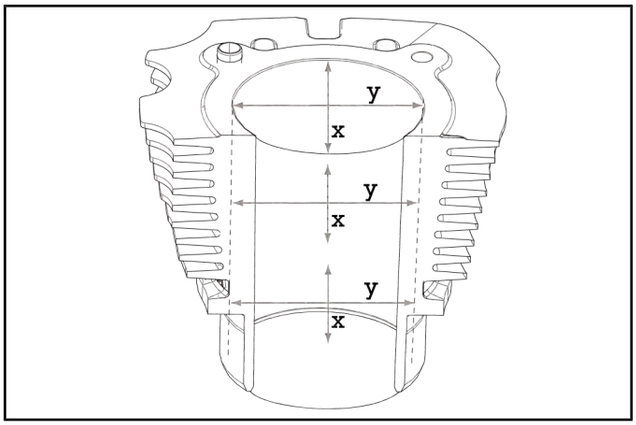
Careless handling of cylinder, pistons or rings may cause irreparable damage. Do not damage gasket surfaces during cleaning.

CYLINDER INSPECTION

1. Visually inspect cylinder bores for scratches and wear.
2. Inspect gasket surfaces for scratches or other damage that may cause an oil leak.

CYLINDER BORE MEASUREMENT

1. Measure each cylinder bore in 6 places to determine:



NOTICE

Bottom measurement should be taken 2.6 in (66 mm) up from base gasket surface.

- Cylinder Bore Inside Diameter
- Cylinder Taper
- Out of Round

2. Use maximum measurement to determine wear.
3. Use the worksheet provided to record measurements and calculate the clearance.

PISTON TO CYLINDER CLEARANCE WORKSHEET

Front Cylinder	Recorded Measurement	Specification
Top “X”		Taper Service Limit: .05mm (.002")
Middle “X”		
Bottom “X”		
Top “Y”		
Middle “Y”		
Bottom “Y”		
Difference between largest “Y” measurement and smallest “Y” measurement	Taper for “Y” axis:	
Difference between largest “X” measurement and smallest “X” measurement	Taper for “X” axis:	
Largest difference between any “X” axis measurement and “Y” axis measurement	Cylinder Out-of-Round:	Out-of-Round Service Limit: .05mm (.002")
Piston Skirt Measurement		
Difference between largest “X” axis measurement and piston measurement	Piston-to-Cylinder Clearance*	Piston-to-Cylinder Clearance Service Limit: .15 mm (.006")

Rear Cylinder	Recorded Measurement	Specification
Top “X”		Taper Service Limit: .05mm (.002")
Middle “X”		
Bottom “X”		
Top “Y”		
Middle “Y”		
Bottom “Y”		
Difference between largest “Y” measurement and smallest “Y” measurement	Taper for “Y” axis:	
Difference between largest “X” measurement and smallest “X” measurement	Taper for “X” axis:	
Largest difference between any “X” axis measurement and “Y” axis measurement	Cylinder Out-of-Round:	Out-of-Round Service Limit: .05mm (.002")
Piston Skirt Measurement		
Difference between largest “X” axis measurement and piston measurement	Piston-to-Cylinder Clearance*	Piston-to-Cylinder Clearance Service Limit: .15 mm (.006")

Compare recorded measurement to specifications. If measured value exceeds service limit replace the appropriate part.

NOTICE

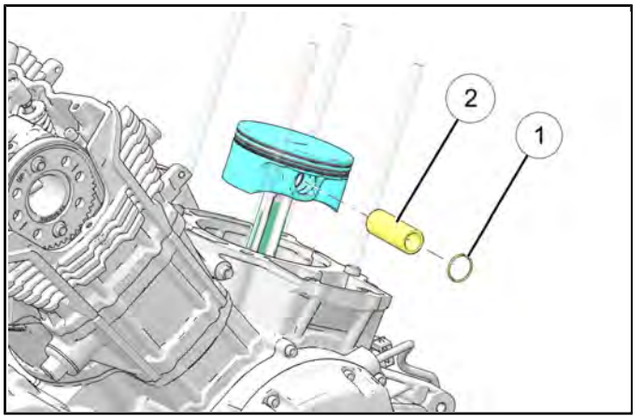
- The cylinders are Ni-SiC plated and cannot be reconditioned by boring or honing. If excessive surface damage, taper or out-of-round exists, the cylinder must be replaced.
- If the piston-to-cylinder clearance exceeds the service limit, *measure a new piston and re-calculate the clearance.* If the piston-to-cylinder clearance exceeds the service limits with a new piston, the cylinder must be replaced.

CYLINDER WARPAGE MEASUREMENT

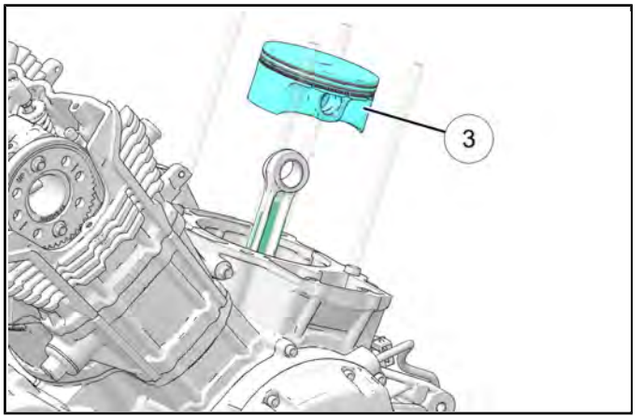
1. Inspect cylinder for warpage at cylinder head surface and base gasket surface.
2. Place a straight edge diagonally across cylinder mating surfaces in several positions. Attempt to slide a .05mm (.002") feeler gauge under the straight edge in each position.
3. Replace cylinder if warped beyond the service limit.

PISTON & PISTON RING REMOVAL

1. Cover crankcase with a clean shop towel to prevent piston circlip from falling into the crankcase.
2. Remove circlip ① .



3. Push piston pin ② and remove the piston ③ .



4. Rotate rings in piston grooves. Rings should rotate freely in grooves.
5. Clean carbon deposits from piston.
6. Spread rings only wide enough to remove them from piston. Spreading rings too wide will damage them.
7. Clean piston ring grooves. Break or cut a piston ring in half. File or grind one edge square and remove all burrs. Use this piston ring to carefully clean piston ring grooves.

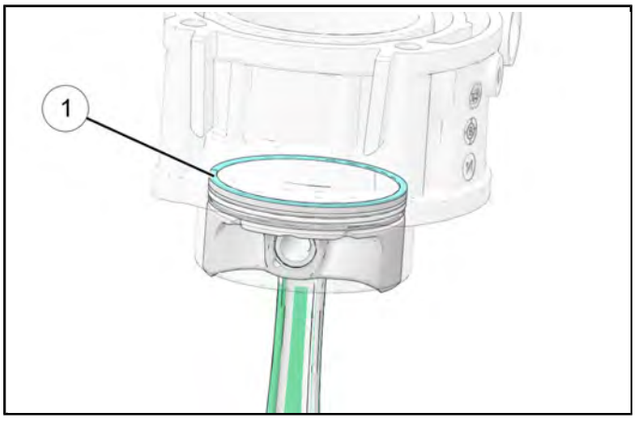
NOTICE
A soft wire brush may be used to only clean the top of the piston. Do not use a wire brush to clean the sides of piston or the piston ring grooves.

PISTON & PISTON RING INSPECTION

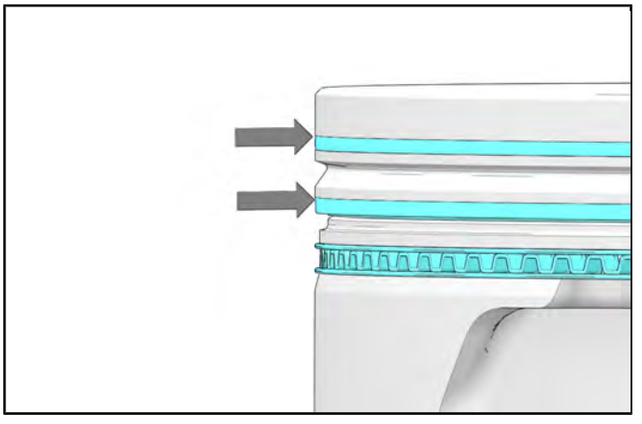
1. Replace parts that do not meet specification.

NOTICE
If piston-to-cylinder clearance exceeds service limit, *measure a new piston and re-calculate clearance*. If piston-to-cylinder clearance exceeds service limits with a new piston, cylinder must be replaced.

2. Use a piston to push the ring ① squarely into cylinder bore from bottom (push rings 25-50 mm into cylinder).



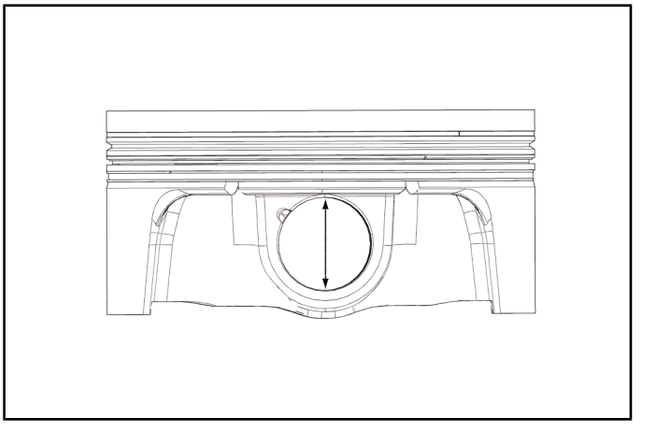
3. Measure installed ring end gap with a feeler gauge and compare to specifications. See **Service Specifications – Cylinder / Piston page 3.89**.
4. Install rings onto a clean piston. Push rings in until they are flush with piston. Using a feeler gauge, measure side clearances for the 1st & 2nd rings.



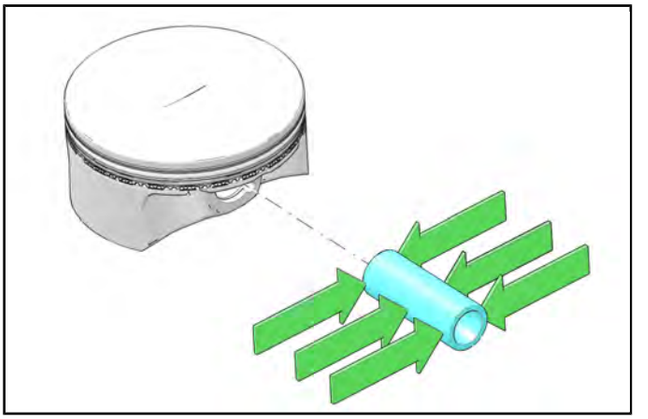
5. Replace parts that exceed service limit.

PISTON PIN / PIN BORE INSPECTION

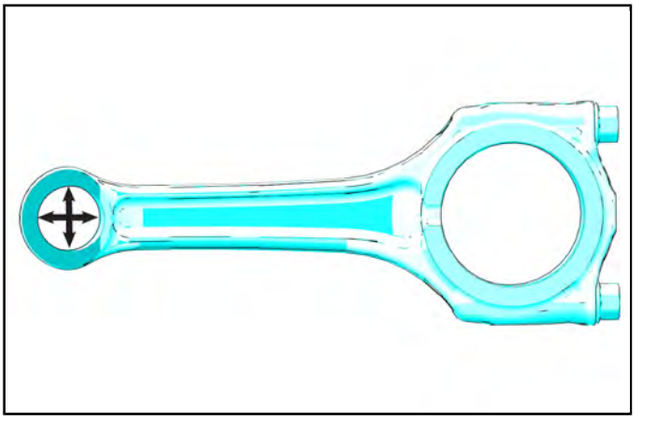
1. Measure piston pin hole I.D. top to bottom (as shown) and as close to the circlip groove as possible with a telescoping gauge. Record the smallest measurement.



2. Measure piston pin O.D. at three locations. Record largest measurement.



3. Calculate piston pin-to-piston clearance. Subtract pin O.D. from pin hole I.D.
4. Measure connecting rod small end I.D. at two locations.



5. Calculate connecting rod-to-piston pin clearance by subtracting pin O.D from rod hole I.D.
6. Compare measurements to specifications and replace any worn parts. See **Service Specifications – Cylinder / Piston page 3.89**.

PISTON RING INSTALLATION

⚠ CAUTION

The rings may be damaged if they are over expanded during installation.

1. Lubricate all rings with engine oil.
2. Carefully install oil control ring expander with end gap located as shown. Reference **Piston Ring Profile And Orientation page 3.91**.
3. Install top and bottom rails with end gap located as shown.
4. Install top ring (marked "C") and second ring (marked "CTOP") with markings facing UP.
5. Compress each ring by hand and rotate to be sure they rotate freely in grooves.
6. Locate ring end gaps as shown below in relation to arrow on piston crown.

PISTON INSTALLATION

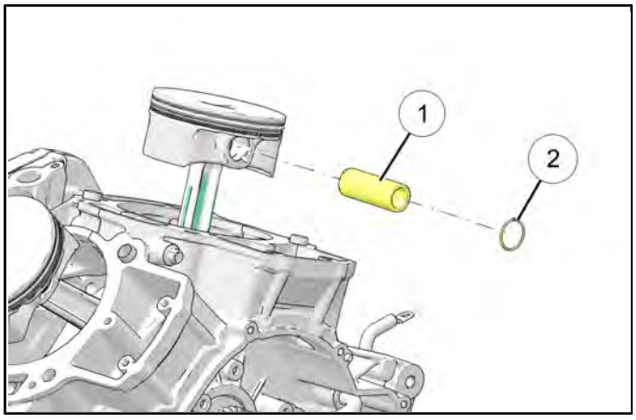
The pistons are marked with an arrow on the crown. Install pistons on connecting rods with arrow facing the FRONT of the engine.

1. Place a clean shop towel over crankcase to prevent foreign material from entering crankcase.
2. Install a new circlip on one side of the piston with end gap facing UP (12:00 position).

IMPORTANT

Never reuse piston pin circlips.

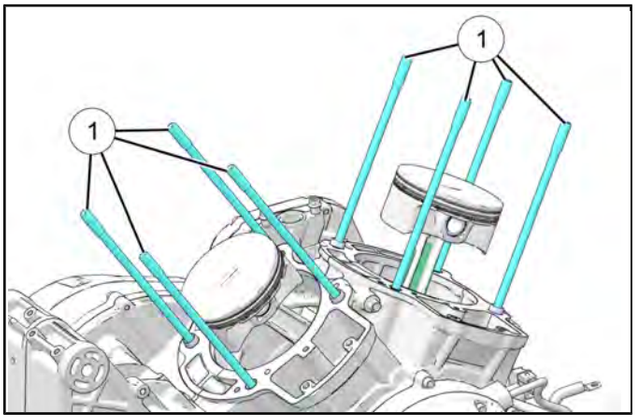
3. Lubricate piston pin and I.D. of connecting rod small end with engine oil or moly lube.
4. Install piston over connecting rod with arrow on piston crown facing FRONT of engine.
5. Push piston pin ① through rod and piston pin hole until it is stopped by circlip.
6. Install remaining circlip ② with end gap facing up (12:00 position.)



7. Make sure both piston circlips are seated properly in the groove.

CYLINDER STUD REPLACEMENT

1. Use a stud extractor to remove 10 mm studs ① .



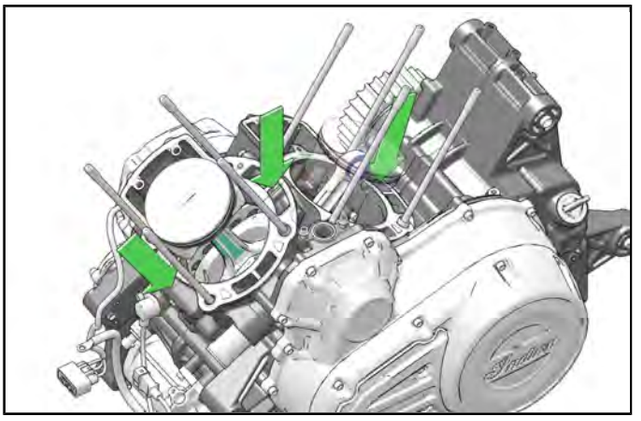
2. Clean threads in cases thoroughly.
3. Apply engine oil to stud threads.
4. Install studs and torque them to specification.

TORQUE
Cylinder Stud: **25 ft-lbs (34 N·m)**

CYLINDER INSTALLATION

NOTICE
Be sure all top end parts are ready for assembly. Sealant on crankcase parting line must not be allowed to dry before top end is assembled and torqued.

1. First wash cylinders with clean solvent, then with hot soapy water.
2. Rinse the cylinders with clear water and immediately dry with compressed air. Cylinder bore should be wiped with a clean white shop towel and engine oil.
3. Apply a light coat of engine oil to piston and rings.
4. Ensure cylinder alignment dowel pins are in place and gasket surfaces are clean and oil-free.
5. Apply a small amount of crankcase sealant to the crankcase parting lines on base gasket surface as shown.



6. Install new cylinder base gaskets onto crankcase.

IMPORTANT
Inspect all sealing surfaces carefully for scratches or imperfections. DO NOT allow oil or grease to contact gaskets or sealing surfaces during the assembly process.

7. Apply a small amount of engine oil to inside surfaces of a piston ring compressor band.
8. Install piston ring compressor over rings and compress rings into ring grooves.

⚠ CAUTION
Be sure compressor band end gap does not align with any ring end gap when compressing the rings.

NOTICE
Install cylinders in their original locations. **Cylinder with Knock Sensor is the front cylinder.**

9. Remove protective covering from crankcase.
10. Carefully install cylinder(s) over piston/ring assembly. Do not force cylinder over piston. Monitor rings carefully. If a piston ring becomes dislodged from the ring compressor; remove cylinder, inspect ring carefully for damage.
11. Remove piston ring compressor when rings are fully captive in cylinder.
12. Slide cylinder down over piston until seated to base gasket and crankcase surface.
13. Repeat for other cylinder.
14. Install cylinder head(s). See **Cylinder Head Installation page 3.83**.

TROUBLESHOOTING, CYLINDER / PISTON

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Hard Starting / Won't Start	Low Compression	Worn Valve Guide(s)	Replace Valve Guide(s)
		Poor Seating of Valve(s)	Repair or Replace
		Broken Valve Spring(s)	Replace
		Spark Plug Not Seated	Torque to Specification
		Incorrect Valve Timing	Repair / Retest
		Valve Stuck Open	Repair / Retest
		Cylinder Head Gasket Leak	Repair / Retest
		Slow Starter Motor	Refer to Electrical chapter
		Worn Rings, Piston, or Cylinder	Refer to Clutch / Primary / Shift chapter
		Collapsed Hydraulic Lifter (s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
		Ignition Problem	Refer to Electrical chapter
		Fuel Problem	Refer to Engine / Cooling / Exhaust chapter
Electric Starter Straining to Turn Engine Over	High Compression	Excessive carbon build-up in combustion chamber	De-carbon Combustion Chamber
	Excessive Starter Load	Internal Engine / Drive Components Seized or Binding	Determine Cause of Seizure or Binding
Poor idle Quality (Engine Related)	Low Compression	Collapsed Hydraulic Lifter (s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
		Poor Seating of Valve(s)	Repair or Replace
	Excessive Oil in Combustion Chamber	Valve Guides or worn valve stem seals	Replace
		Worn Rings, Piston, or Cylinder	Refer to Engine / Cooling / Exhaust chapter
		Engine Oil Overfilled	Correct Engine Oil Level
Engine Noise	Valve Train Area	Collapsed Hydraulic Lifter (s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
		Broken or Weak Valve Spring(s)	Replace
		Worn Camshaft or Rocker Arm	Replace
		Rocker Arm Bearing Damage	Replace
		Cam Bearings Worn or Damaged	Replace

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
	Piston / Cylinder Area	Worn Pistons and / or Cylinders	Replace
		Worn Wrist Pin, Wrist Pin Bore and / or Connecting Rod	Replace
		Worn Piston Rings or Piston Ring Lands	Replace
	General	Exhaust Leak	Reseal Exhaust
	Timing Chain Area	Chain / Sprocket Worn	Replace
		Chain Tensioner and / or Guide Worn	Replace
	Bottom End Area	Main Bearings	Refer to Transmission / Crankshaft chapter
		Rod Bearings	Refer to Transmission / Crankshaft chapter
		Loose Side Clearance	Refer to Transmission / Crankshaft chapter
	Transmission Area	Bearings	Refer to Transmission / Crankshaft chapter
Poor High-Speed Running	Air Intake Problem	Air Box, Intake Manifold, Throttle Body	Refer to Fuel Delivery / EFI chapter
	Fuel Injection Problem	Fuel Pump, Injectors, Fuel Lines	Refer to Fuel Delivery / EFI chapter
	Ignition Problem	Spark Plugs, Spark Plug Wires, Ignition Coil, Charging System	Refer to Electrical chapter
	Valve Float	Weak Valve Springs	Replace
	Insufficient Valve Travel	Worn Camshaft / Rocker Arms	Replace
	Valves Opening and Closing at Wrong Time	Incorrect Valve Timing	Correct
Lack of Power in all RPM Ranges	Low Compression	Worn Piston, Rings, Cylinder, Poor Valve Seating	Repair / Replace
	Valve Timing Incorrect	Cam Chain and Sprockets	Correct
		Damaged Cam Gears	Replace
	Valve Float	Weak Valve Springs	Replace
	Insufficient Valve Lift	Worn Camshaft / Rocker Arms	Replace
	Ignition / Fuel Injection System	Fuel Pump, Injectors, Fuel Lines, Spark Plugs, Spark Plug Wires	Refer to Fuel Delivery / EFI or Electrical chapter
	Oiling Problem	Oil Overfilled	Correct Engine Oil Level

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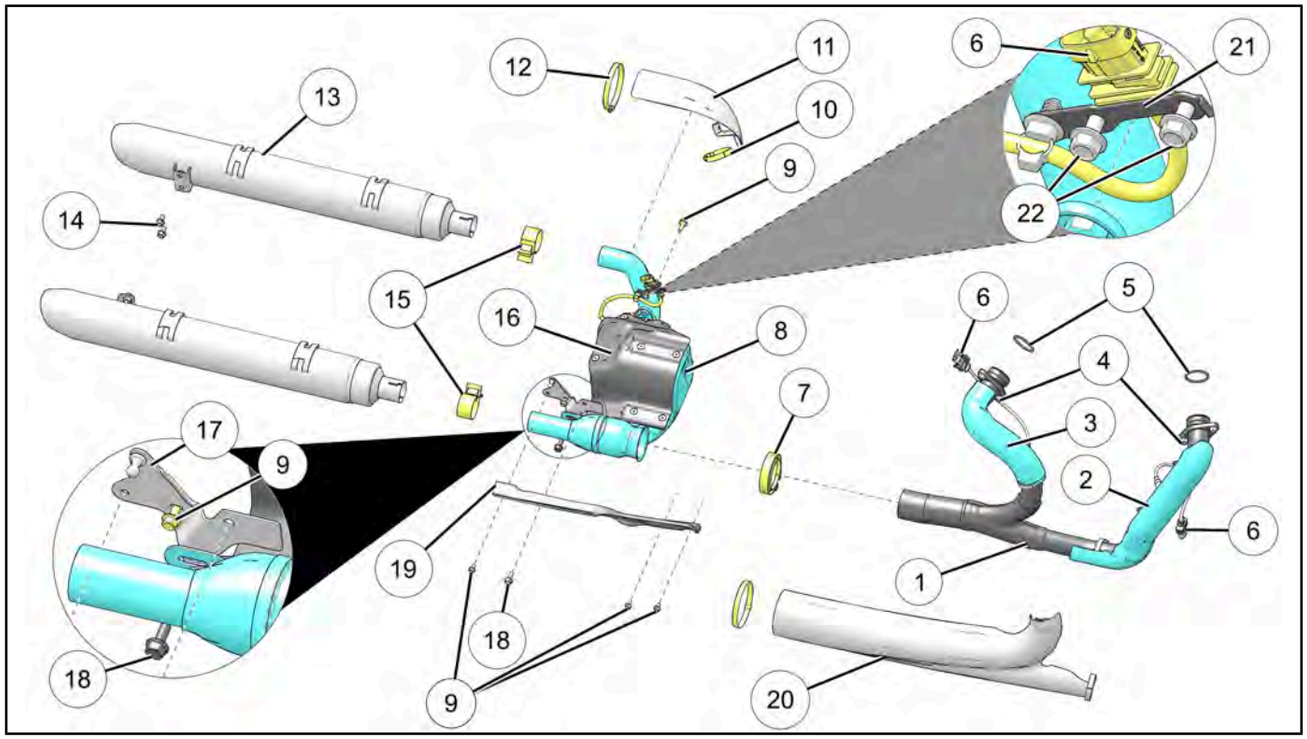
EXHAUST

EXHAUST SYSTEM ASSEMBLY VIEW



① Headpipe	⑫ Heat shield Clamp (Rear) **31 in-lbs (3 N·m)**
② Headpipe Heat Shield (Front)	⑬ Muffler
③ Headpipe Heat Shield (Rear)	⑭ Muffler Fastener **18 ft-lbs (24 N·m)**
④ Headpipe Nuts Reference Headpipe Removal / Installation. See **Headpipe Installation page 3.108**.	⑮ Muffler Clamp **40 ft-lbs (54 N·m)**
⑤ Headpipe Gasket	⑯ Resonator Heat Shield
⑥ Oxygen Sensor **14 ft-lbs (19 N·m)**	⑰ Resonator Bracket
⑦ Exhaust Clamp **7 ft-lbs (9 N·m)**	⑱ Resonator Mount to Frame / Transmission shield Fastener (M8) **18 ft-lbs (24 N·m)**
⑧ Resonator	⑲ Transmission Shield
⑨ Resonator Mount to Frame / Transmission shield Fastener (M6) **18 ft-lbs (24 N·m)**	⑳ Exhaust Shield (Right)

⑩ Heat shield Clamp (Front) **31 in-lbs (3 N·m)**	㉑ Oxygen Sensor Bracket
⑪ Exhaust Shield (Left)	㉒ Oxygen Sensor Bracket Fastener **88 in-lbs (10 N·m)**

EXHAUST SERVICE

MUFFLER REMOVAL

NOTICE

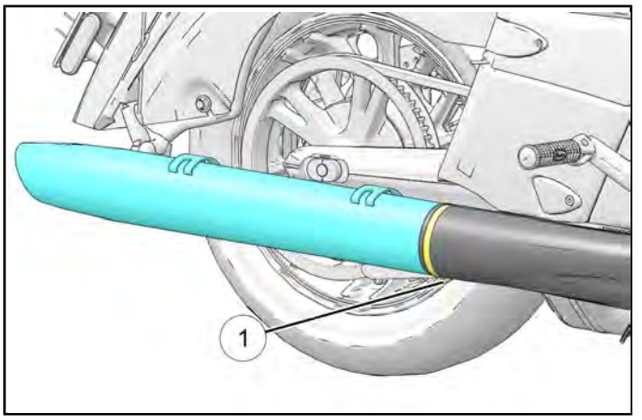
The procedure shows only one muffler being removed for simplicity. Perform the same steps for the opposite side.

⚠ WARNING

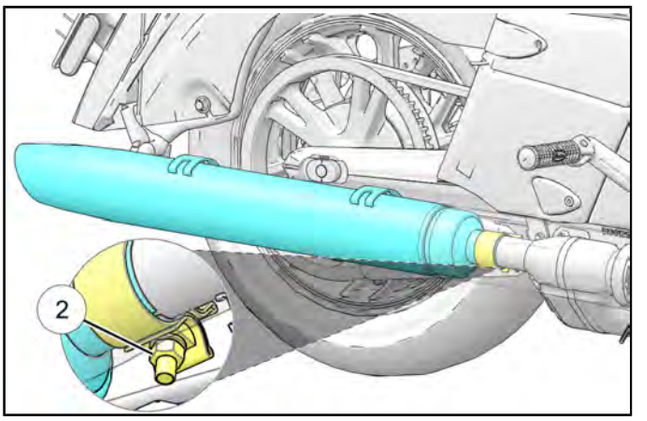
Engine and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wear insulated protective clothing or wait for components to cool sufficiently before working on the machine.

REMOVAL

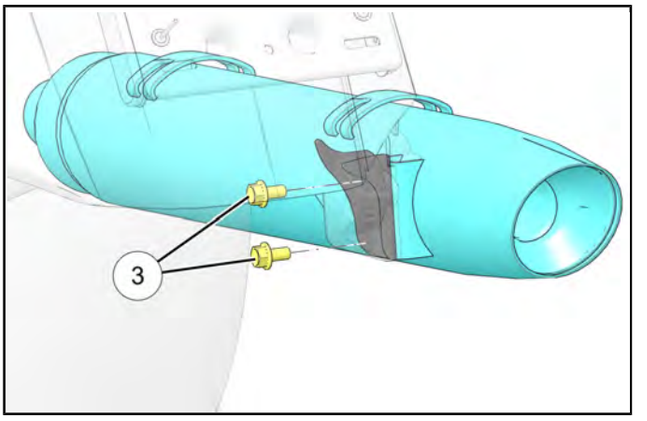
1. Remove saddlebags. See **Saddlebag Removal page 7.93**.
2. Loosen heatshield clamp ①.



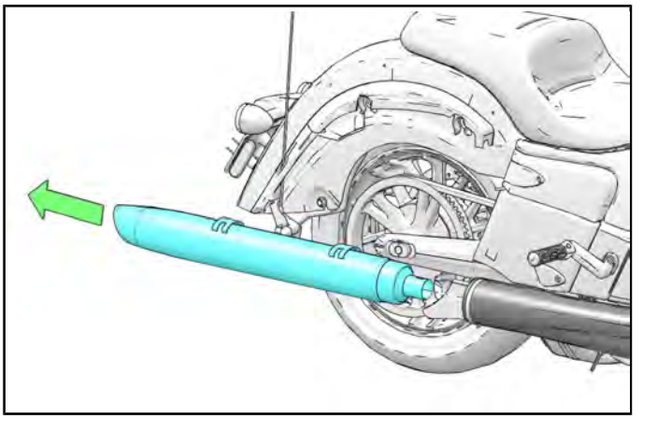
3. Loosen muffler clamp ②.



4. Remove muffler fasteners ③.



5. Remove muffler.



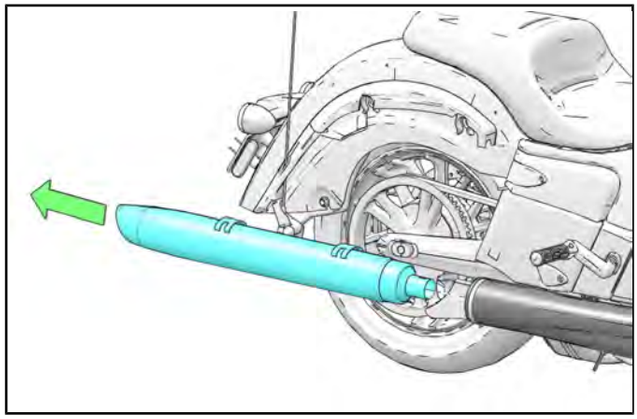
9860001 R01 - 2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus Service Manual

MUFFLER INSTALLATION

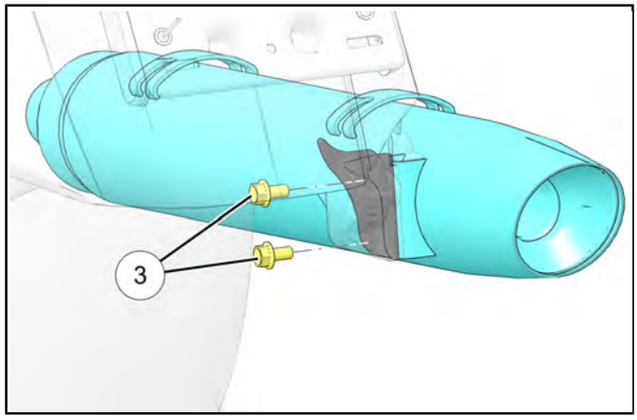
NOTICE
The procedure shows only one muffler being removed for simplicity. Perform the same steps for the opposite side.

INSTALLATION

1. Install muffler.

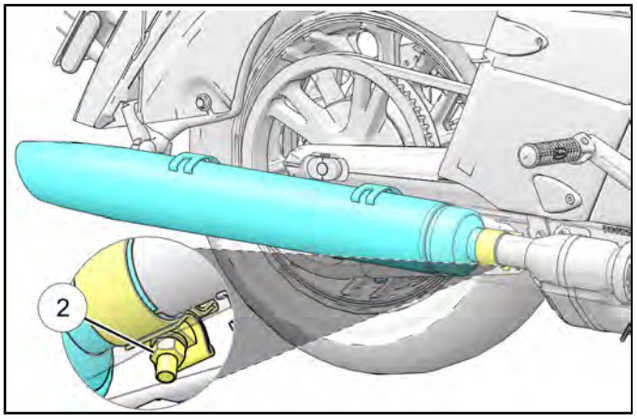


2. Install muffler fasteners ③.



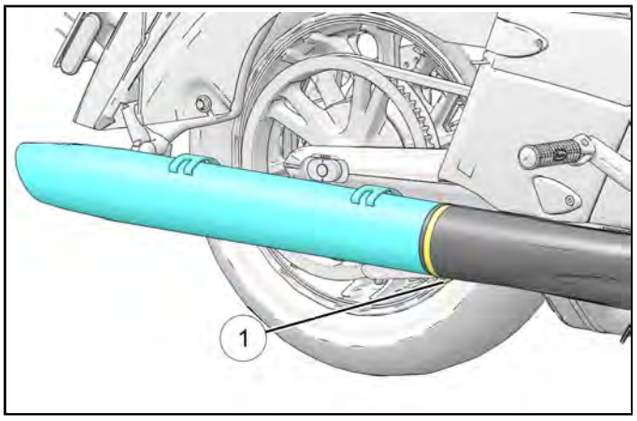
TORQUE
Muffler Fastener: **18 ft-lbs (24 N·m)**

3. Install muffler clamp ②.



TORQUE
Muffler Clamp: **40 ft-lbs (54 N·m)**

4. Install heatshield clamp ①.



TORQUE
Heatshield Clamp: **31 in-lbs (3 N·m)**

5. Install saddlebags. See **Saddlebag Installation page 7.93**.

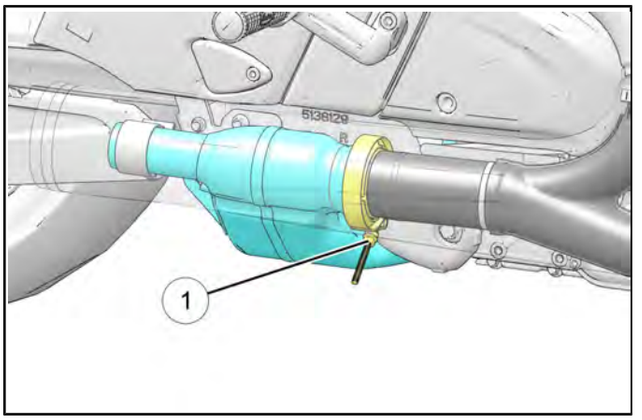
RESONATOR REMOVAL

⚠ WARNING

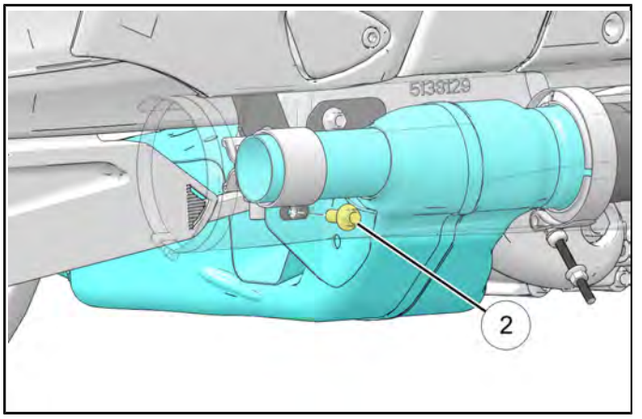
Engine and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wear insulated protective clothing or wait for components to cool sufficiently before working on the machine.

REMOVAL

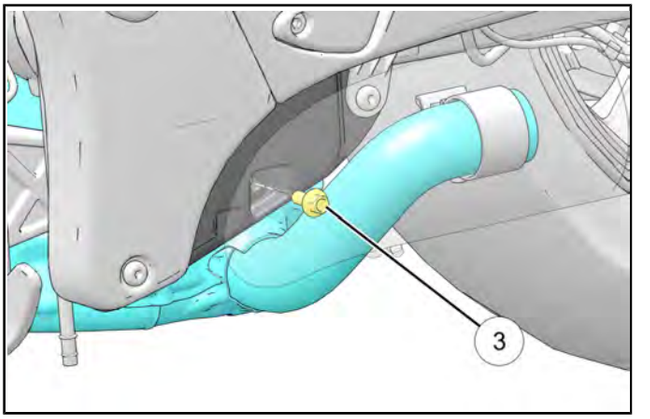
1. Remove mufflers. See **Muffler Removal page 3.102**.
2. From underneath the right heatshield, loosen the exhaust clamp ①. Note orientation of clamp for reassembly.



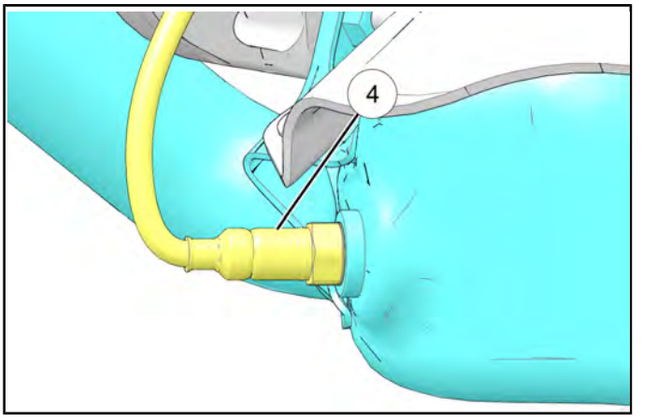
3. From the right side, remove the resonator mount fastener ②.



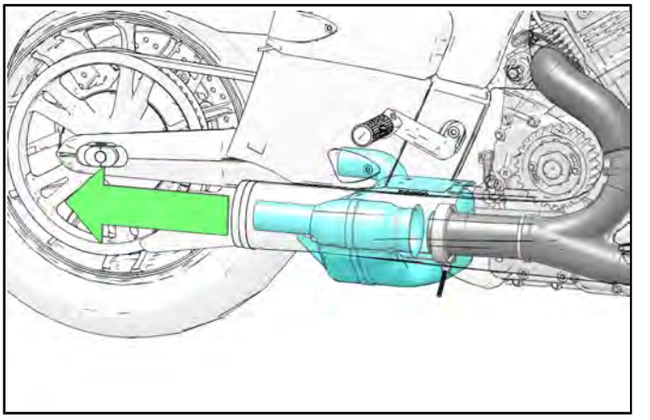
4. From the left side, remove the remaining resonator mount fastener ③.



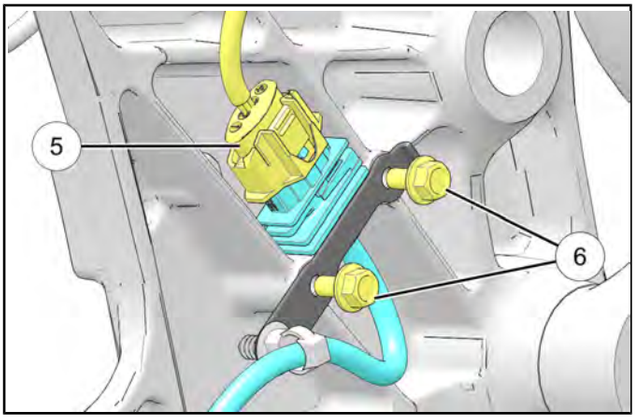
5. Remove oxygen sensor ④ from resonator.



6. Move the resonator rearward and remove.



7. With the resonator removed, disconnect oxygen sensor electrical connection ⑤.



IMPORTANT
Cut table tie to remove sensor wire retention to bracket. Clip must be replaced if removed.

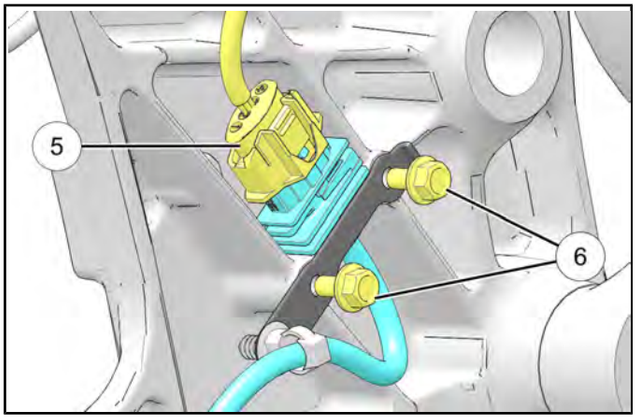
8. Remove fasteners ⑥ securing oxygen sensor bracket.

RESONATOR INSTALLATION

INSTALLATION

1. Install fasteners ⑥ securing oxygen sensor bracket.

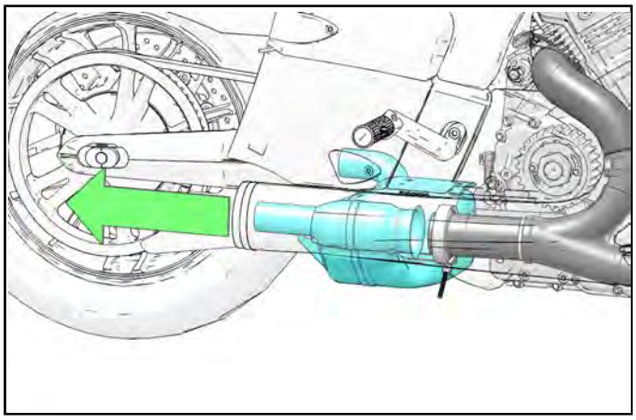
2. With the resonator installed, connect oxygen sensor electrical connection ⑤.



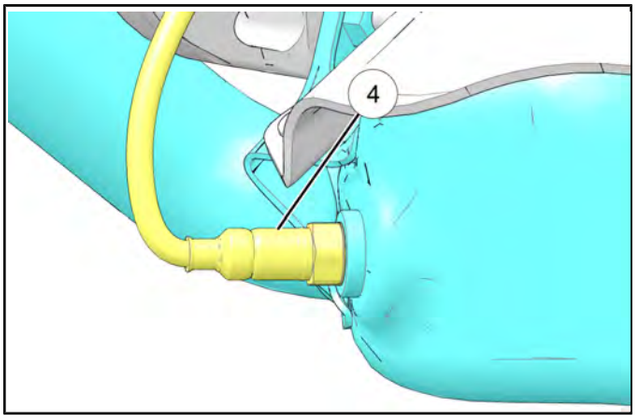
IMPORTANT
Secure sensor wire to fir tree clip on bracket. Fir tree clip must be replaced if removed.

TORQUE
Oxygen Sensor Bracket Fastener: **88 in-lbs (10 N·m)**

3. Move the resonator forward and install.

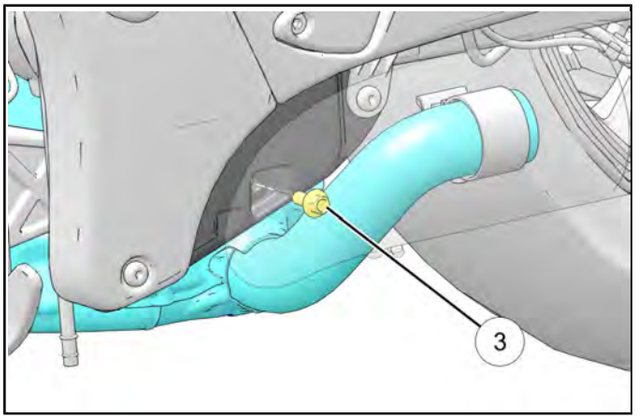


4. Install oxygen sensor ④ onto resonator.

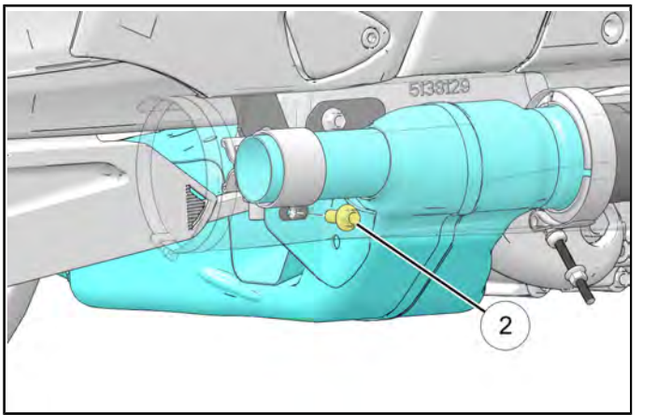


TORQUE
Oxygen Sensor: **14 ft-lbs (19 N·m)**

5. From the right side, install the resonator mount fastener ③.

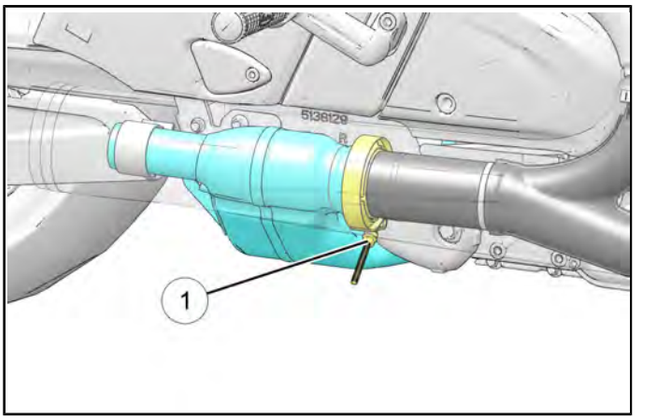


6. From the left side, install the resonator mount fastener ②.



TORQUE
Resonator Mount Fastener: **18 ft-lbs (24 N·m)**

7. From underneath the right heatshield, install the exhaust clamp ①. Note orientation of clamp.



TORQUE
Exhaust Clamp **7 ft-lbs (9 N·m)**

8. Install Muffler. See **Muffler Installation page 3.103**.

HEADPIPE REMOVAL

⚠ WARNING

Engine and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wear insulated protective clothing or wait for components to cool sufficiently before working on the machine.

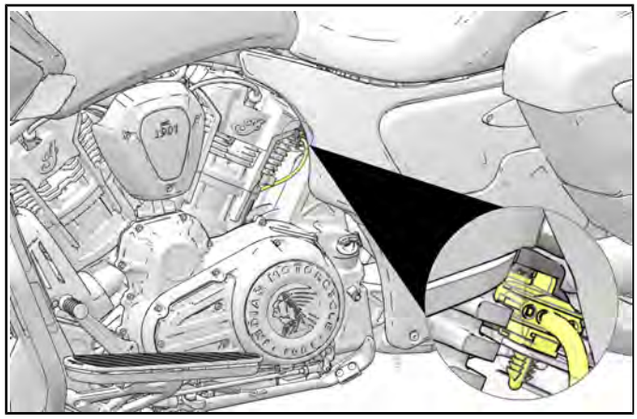
REMOVAL

1. Remove resonator. See **Resonator Removal page 3.104**.
2. Remove right floorboard. See **Floorboard Removal page 7.103**.

⚠ CAUTION

Do NOT allow the assembly to hang off of the brake line. Doing so may damage the brake line.

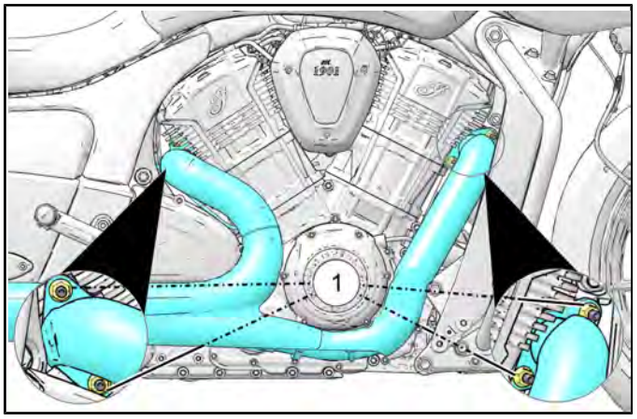
3. From the left side of the unit, slide connection from retention clip, then disconnect the rear cylinder oxygen sensor electrical connector.



NOTICE

The front cylinder oxygen sensor electrical connect can be disconnected while removing the headpipe.

4. Remove headpipe nuts ①.

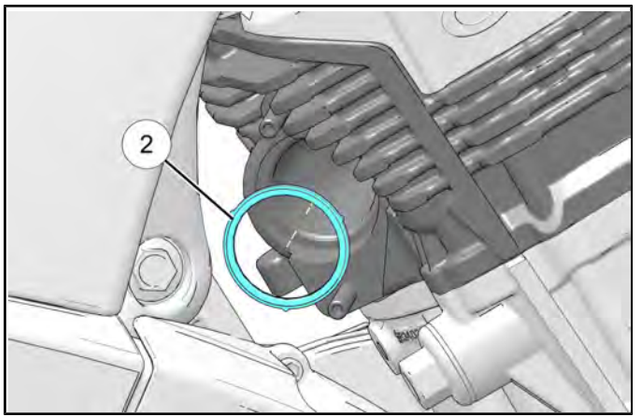


5. Carefully remove headpipe.

IMPORTANT

Be sure to disconnect the remaining oxygen sensor electrical connector during removal.

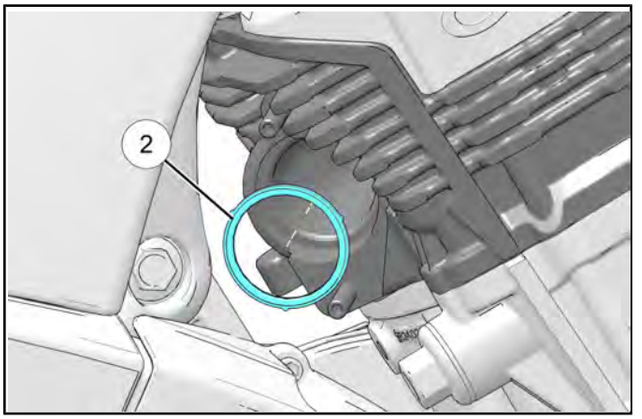
6. Remove and inspect the headpipe gasket ② for damage and replace if necessary.



HEADPIPE INSTALLATION

INSTALLATION

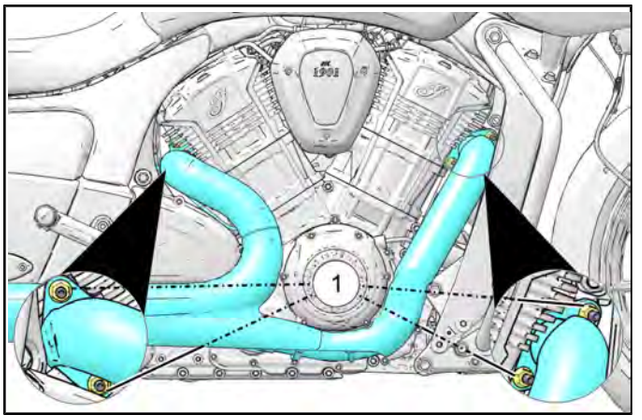
1. Install headpipe gasket ②.



2. Carefully install headpipe.

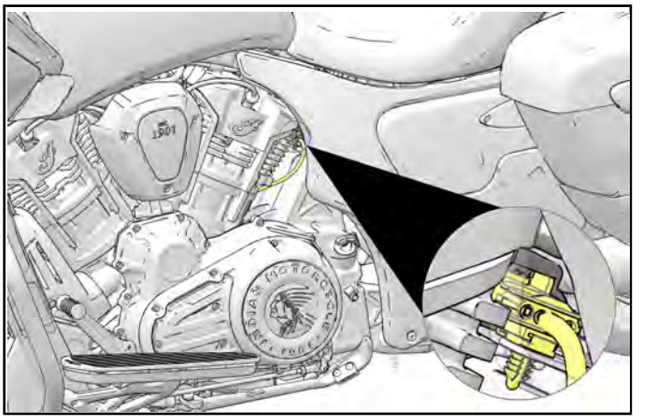
IMPORTANT
Be sure to connect the remaining oxygen sensor electrical connector during installation.

3. Install headpipe nuts ①.



TORQUE
Headpipe Nuts: **1. Torque front header lower nut to 7 ft-lbs (9 N·m)** **2.Torque front header upper nut to 7 ft-lbs (9 N·m)** **3.Torque rear header bottom nut to 7 ft-lbs (9 N·m)** **4.Torque rear header top nut to 7 ft-lbs (9 N·m)5. Torque front header nuts (starting with lower) to 15 ft-lbs (20 N·m)6.Torque rear header nuts (starting with lower) to 15 ft-lbs (20 N·m)**

4. From the left side of the unit, connect the rear cylinder oxygen sensor electrical connector, then slide connection onto connector retention clip.



NOTICE
The front cylinder oxygen sensor electrical connect can be connected while installing the headpipe.

5. Install right floorboard. See **Floorboard Installation page 7.104**.

⚠ CAUTION
Do NOT allow the assembly to hang off of the brake line. Doing so may damage the brake line.

TORQUE
Floorboard Bracket Fastener: **35 ft-lbs (47 N·m)**

6. Install resonator. See **Resonator Installation page 3.105**.

CHAPTER 4
FUEL DELIVERY / EFI

GENERAL INFORMATION

SERVICE NOTES

Many hazards are present when working on or around the fuel injection system. Read and pay close attention to the following warnings and cautions when working on any component in this section.

⚠ WARNING

Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Open flames, sparks and cigarettes must be kept away from gasoline.

⚠ WARNING

Careless handing of the control cables can result in twisting or bending of the cables. This can cause the cables to stick or bind, resulting in loss of vehicle control.

⚠ WARNING

The engine exhaust from this product contains chemicals known to cause cancer, birth defects or other reproductive harm.

⚠ WARNING

The engine and exhaust system become very hot during operation and remains hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled before performing service work.

⚠ WARNING

Always stop the engine and refuel outdoors or in a well ventilated area.

⚠ WARNING

If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately. Never try to syphon gasoline using mouth suction.

⚠ WARNING

Never start the engine or let it run in an enclosed area. Engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

⚠ WARNING

The battery should always be disconnected before working on the fuel system.

When replacing fuel lines, always use genuine Indian Motorcycle replacement parts. This will ensure top performance, function and durability.

Fuel lines remain under pressure at all times. Use caution when disconnecting lines for service.

Remove the fuel pump relay to disable fuel pump and crank engine to release pressure. Always depressurize the fuel system prior to service.

Cover the fuel hose connections with a clean, absorbent towel to minimize spillage while disconnecting.

Don't overlook the basics while troubleshooting the fuel system:

- Except where noted, views of connectors are from WIRE side of the connector.
- A battery in a low state of charge can cause problems. Be sure battery is in good condition and fully charged.
- Air leaks in intake tract / air box - check for air leaks and repair to avoid misdiagnosing the EFI system.
- Contaminated or improper fuel.
- Restricted fuel flow / filters (low fuel pressure).
- Fuel tank vent line / evaporative emission line pinched or obstructed.
- Faulty spark plug(s).
- Corroded, disconnected, or incorrectly connected wiring.
- Poor ground connections - be sure all grounds are clean and tight.
- Exhaust system restriction or improper exhaust.
- Engine mechanical condition.

SPECIAL TOOLS – FUEL DELIVERY / EFI

TOOL DESCRIPTION	PART NUMBER
Electrical Tester Kit	PV-43526
Fuel Pressure Adapter	PV-48656
Fuel Pressure Gauge	PU-43506-A
Relay Bypass	PU-49466
Smartlink Module Kit	PU-47471
USB to Serial Adapter	PU-50621

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

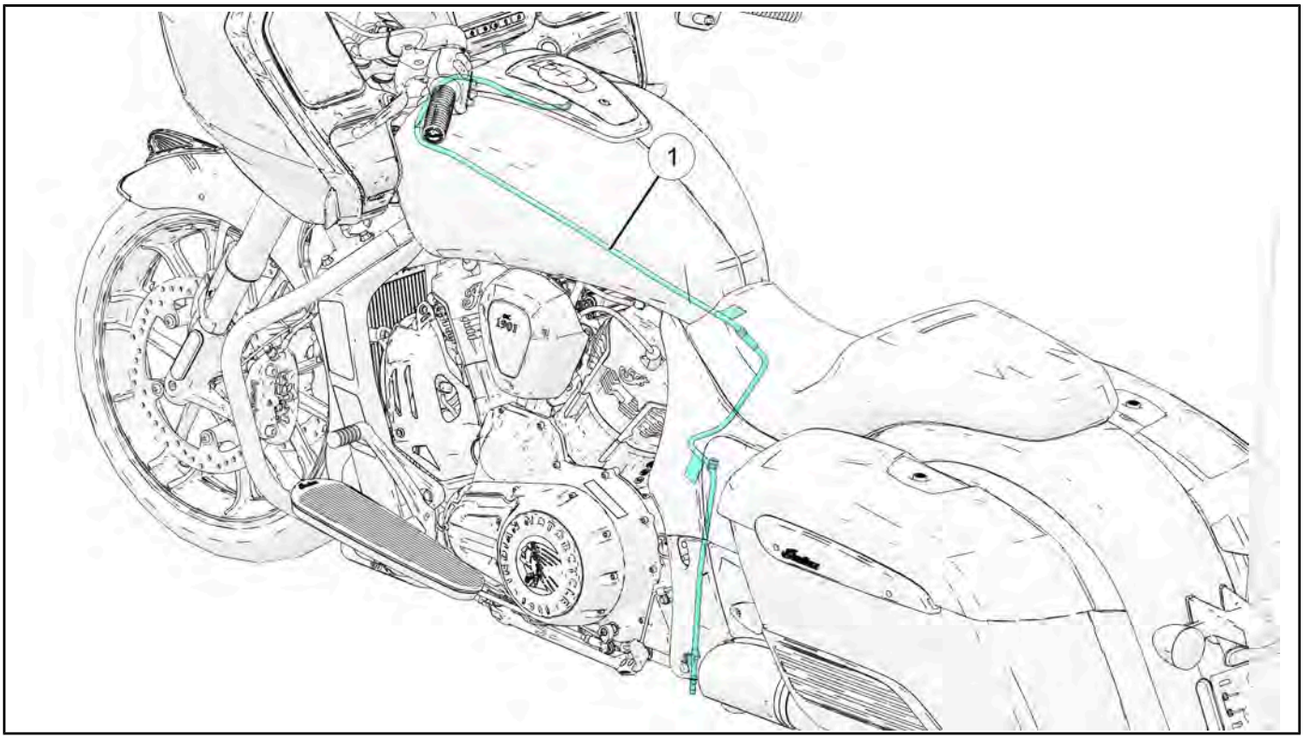
SERVICE SPECIFICATIONS – FUEL DELIVERY / EFI

ITEM	SPECIFICATIONS
Fuel Pump Pressure (Normal Operation)	4.00 BAR (400 kPa) (58 psi)
Idle Speed	850 rpm ± 50 rpm
Fuel Pump Amp Draw (Normal Operation)	3–5 Amps
Recommended Octane	91 Octane Minimum
Injector Resistance	11.4 - 12.6 Ohms

FUEL DELIVERY / EFI MAINTENANCE

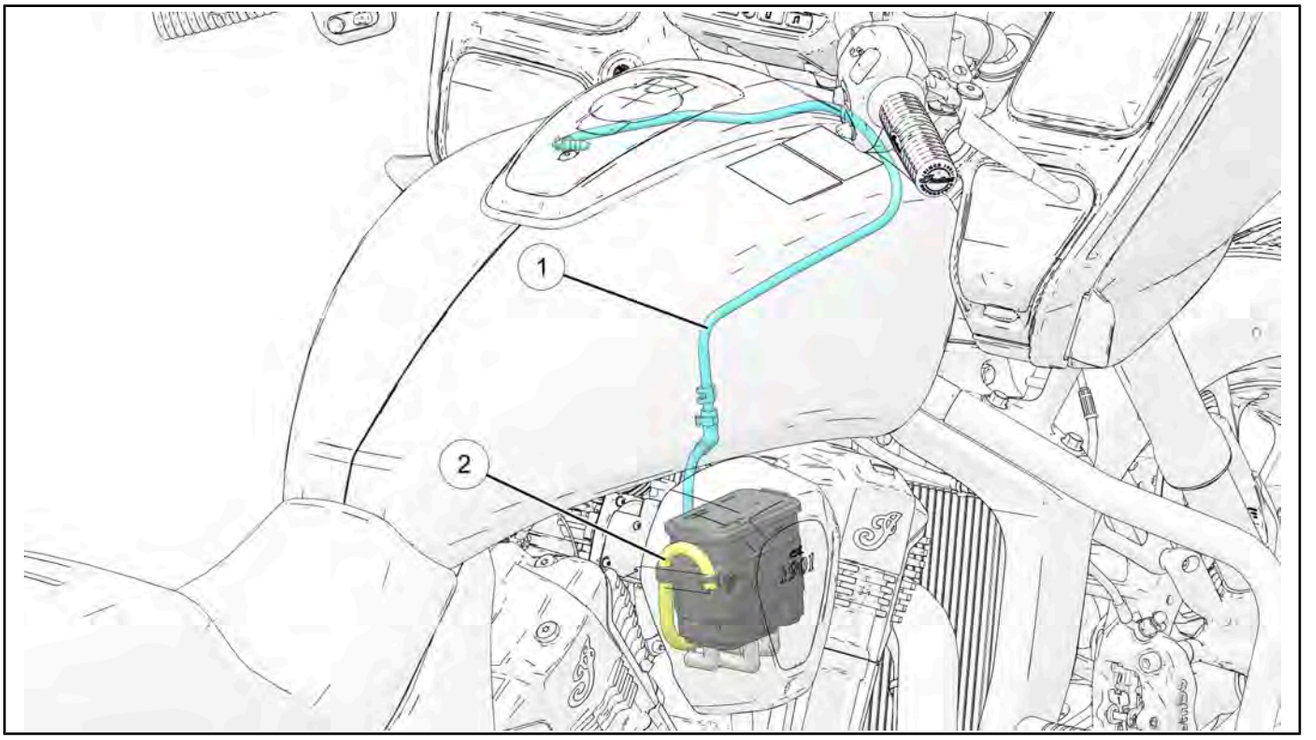
FUEL TANK VENT INSPECTION

49 STATE



1. Inspect fuel tank vent line ① in accordance with periodic maintenance schedule and any time fuel tank has been removed and installed. Be sure the line is clear and not pinched or kinked, and that all connections are tight.

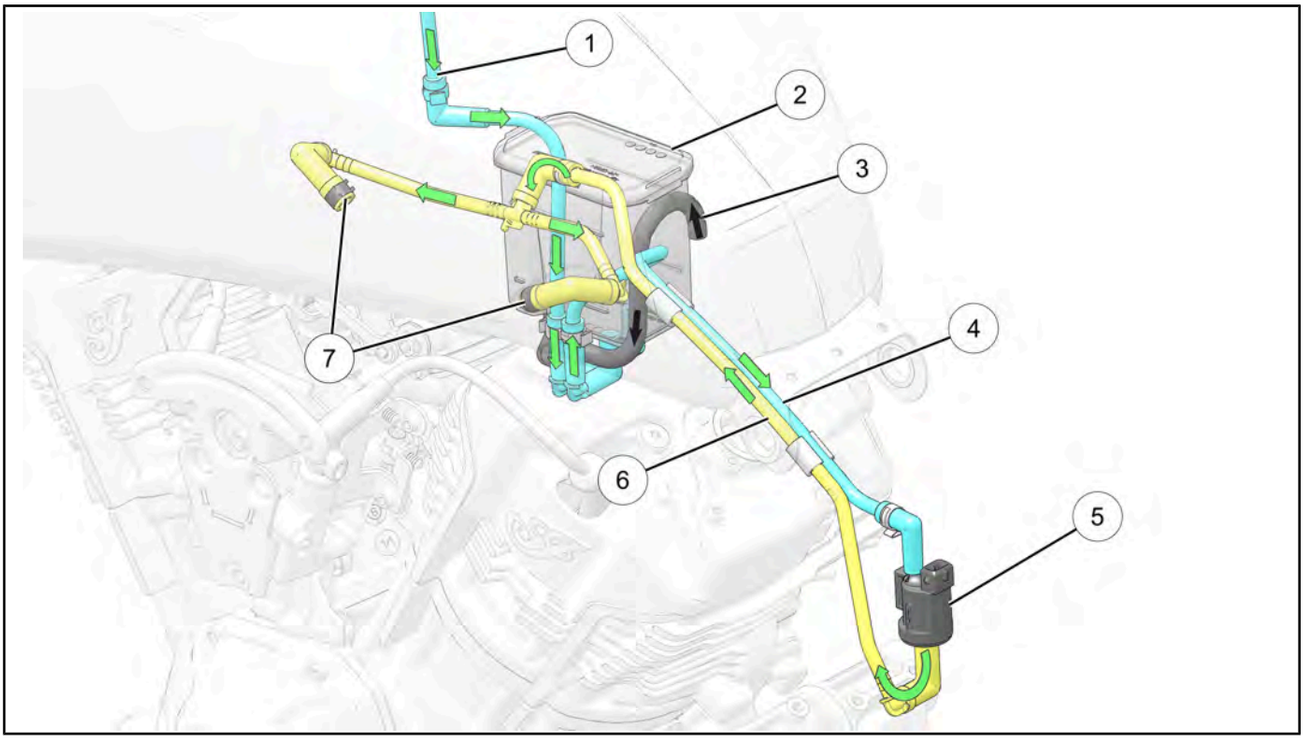
50 STATE / INTL



1. Inspect the Fuel vent to canister line ① in accordance with periodic maintenance schedule and any time fuel tank has been removed and installed. Be sure the line is clear and not pinched or kinked, and that all connections are tight. Inspect the carbon canister vent line ②. Ensure the line is clear and not pinched or kinked.

EVAPORATIVE EMISSION CONTROL SYSTEM – 50 STATE / INTL

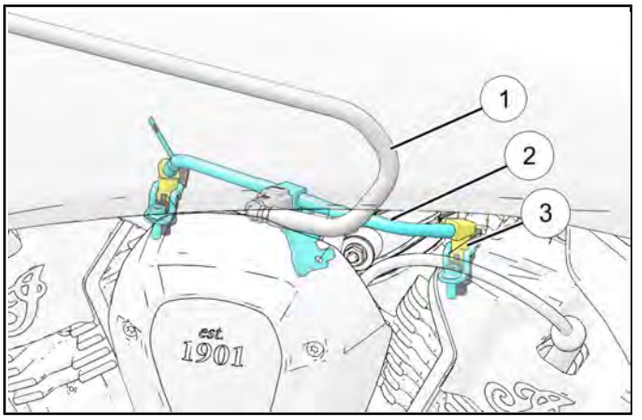
NOTICE
The fuel tank vent line is routed to a carbon canister where the fuel vapor is stored until specific operating parameters are met and the ECM opens the purge valve. Fuel vapor is then routed out of the carbon canister, through the purge valve and into the throttle body for combustion. Inspect all EVAP lines for abrasion or wear. Check that all connections for both vent and canister purge systems are securely attached.



ITEM	DESCRIPTION
①	Fuel Vent to Canister
②	Carbon Canister
③	Carbon Canister Vent Line
④	Carbon Canister to Purge Valve Line
⑤	Purge Valve
⑥	Purge Valve to Throttle Body Line
⑦	Throttle Body Purge Line

FUEL RAIL INSPECTION

1. The fuel hose (fuel rail) can be found behind the V-cover on the LH side of the motorcycle.
2. Inspect fuel line ① and fuel rail ② for deterioration, damage, leakage, or kinked areas. Inspect fuel line-to-fuel injector connection ③ for signs of leakage.



3. Replace any components that fail inspection with genuine Indian Motorcycle replacement parts.

⚠ WARNING

The fuel lines exiting fuel pump are subjected to high pressure. Replace with genuine Indian Motorcycle replacement parts to reduce the possibility of fuel line failure. Be sure fuel lines are routed properly and do not come in contact with sharp or hot objects, or anything that may cause wear or damage.

SERVICE PRECAUTIONS

EFI SYSTEM PRECAUTIONS

NOTICE

While electronic fuel injection is durable and reliable, the components can be damaged or problems may occur if the following precautions are not taken.

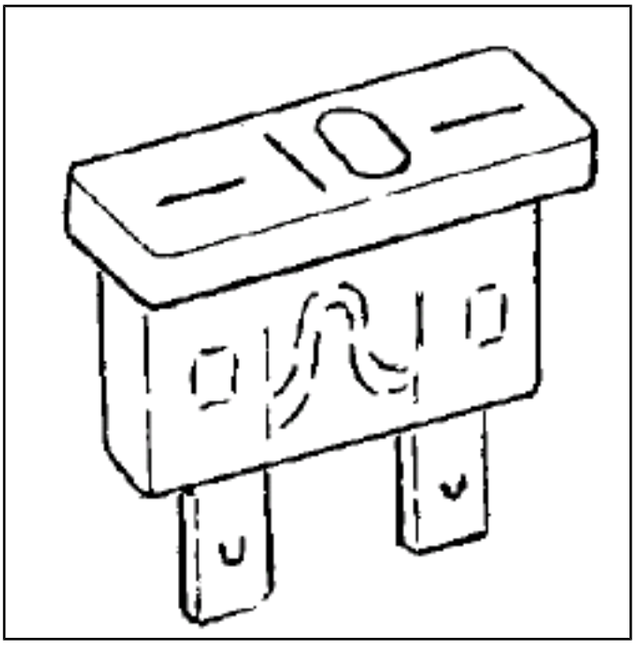
It is not advisable to "jump start" the machine with another battery. Although problems are unlikely to occur if everything is done carefully, the electrical component could be damaged.

Never disconnect the battery while the engine is running.

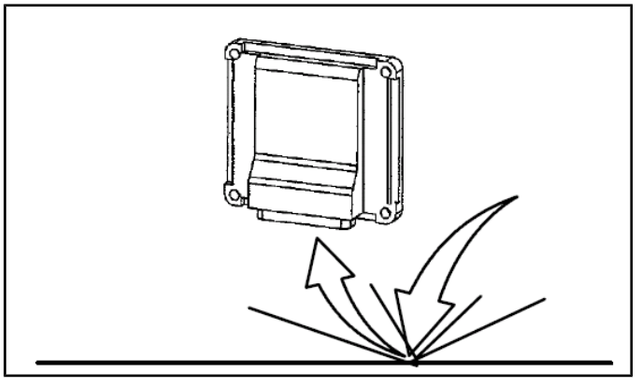
When connecting and disconnecting the battery cables refer to Electrical chapter for complete battery connection and charging information. See **Battery Installation page 10.14**.

Make sure that the ignition is powered down before connecting and disconnecting connections. Best practice is to disconnect the battery before connecting or disconnecting the electrical connections.

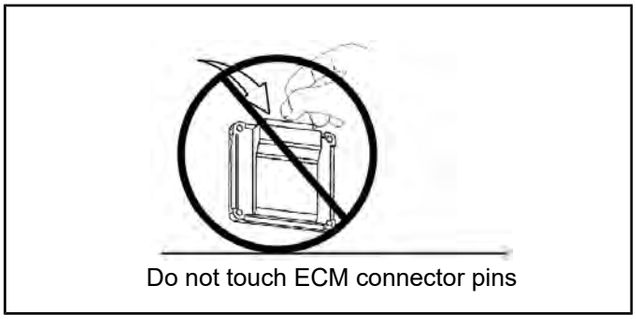
Fuses and circuit breakers protect critical electrical components and circuits. Never replace the fuse with a larger value fuse or "jumper" the fuse with wire, aluminum foil or any other means. Always investigate the cause of the problem and repair before replacing the fuse.



The ECM, VCM and sensors are sensitive pieces of electronic equipment. Dropping or hitting them may cause irreparable damage.



Static electricity can damage the electronic controllers beyond repair. The human body can easily store enough static electricity to damage sensitive electronic components. Before working with any components of the Fuel Injection system, ground yourself to dissipate any static charge. Also take care not to touch any of terminal pins on the ECM.



Do not touch ECM connector pins

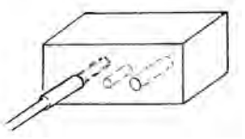
Anti-static wrist strap PV-43541

NOTICE

Some tests require probing of the ECM wiring harness connector. Do not touch or probe the exposed pins on the ECM. Static electricity from your body or the meter can easily damage the ECM.

4

Always use the proper adapter from the Connector Test Adapter Kit when probing the terminals. Most of the connectors are sealed and cannot be back probed. Be extremely careful not damage the connectors by forcing meter probes into the connectors.

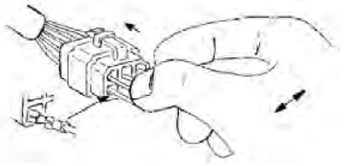


Use proper test adapters on connector pins

Connector test adapter kit PV-43526

Poor connections are the most common cause of Electronic Fuel Injection malfunctions. Inspect connector and wiring connections carefully during troubleshooting.

"SNAP"



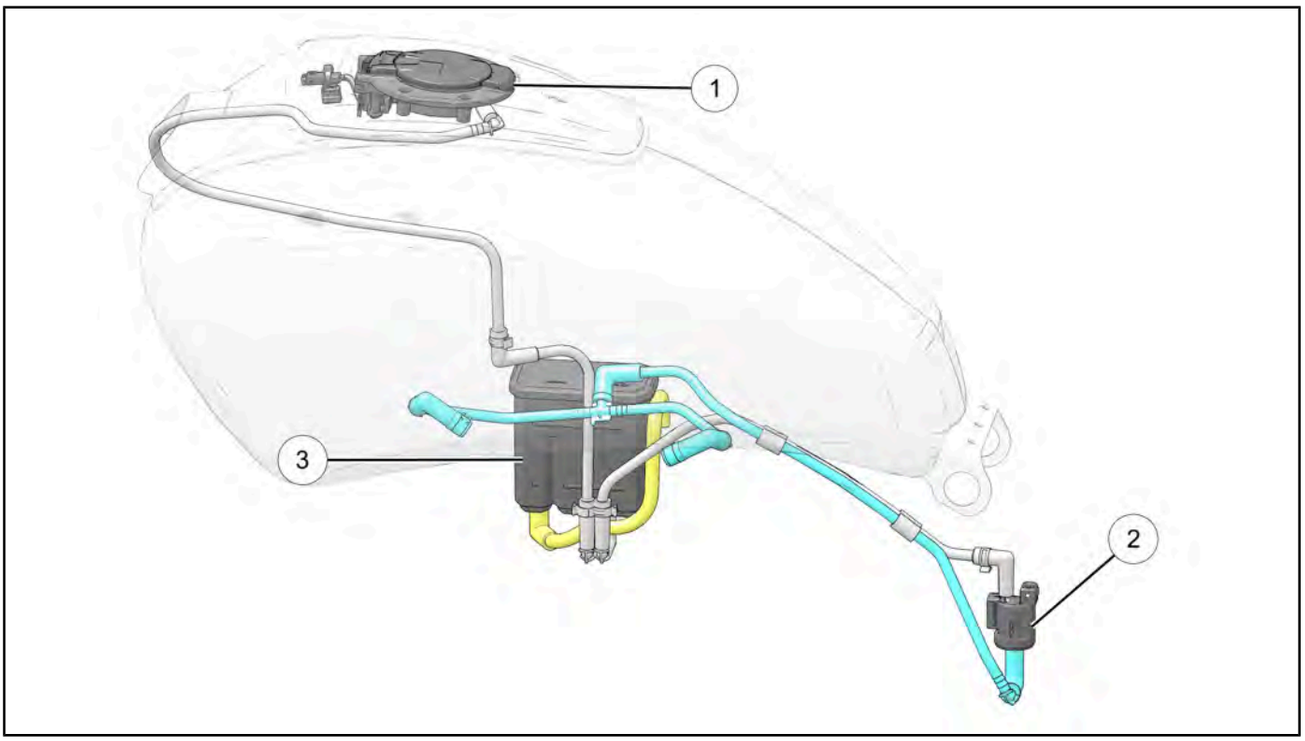
Carefully inspect the connections of the failed circuit before doing any other troubleshooting steps. Wire terminals should be corrosion free and fully seated into the connectors. Connector should snap together and lock.

EVAP SYSTEM

EVAP SYSTEM OVERVIEW

IMPORTANT
Only 50 state and International models are equipped with an EVAP system.

An evaporative emission control system is a system that captures fuel tank vapors that would otherwise be vented to atmosphere. The EVAP system components consist of:



ITEM	DESCRIPTION
①	**Fuel Cap:** It is important to note that Indian Motorcycle does not use an enhanced EVAP control system. This means the system does not detect a gross leak, or restrictions in the EVAP system such as a missing or loose fuel cap. No check engine light will illuminate if the fuel cap is loose or missing. The unit will detect a fuel cap that is not closed when the engine is running or power is on.
②	**Purge Valve:** The purge valve is located near the ECU in the underseat compartment. There are two hose assemblies that connect to the throttle bodies. The purge valve must be installed with the arrow pointing the direction the vapor flows toward the hose assembly that terminates at the engine.
③	**Carbon Canister:** The carbon canister is mounted on the right side of the unit. Fuel vapors from the tank are routed to and absorbed by the canister's carbon granules. When the vehicle is running, vapors are drawn into the engine by intake vacuum. The purge valve controls the movement of the vapors from the canister to the throttle body.

EVAP CONDITIONS AND SYMPTOMS

The following conditions and symptoms should be taken into consideration when working on a vehicle equipped with an EVAP system:

- Cracks in an EVAP hose or canister may cause
  - Fuel Odor
  - Trouble codes being set

NOTICE
A loose fuel cap will NOT trigger a trouble code, but may cause a fuel odor or notification on Ride Command screen.

Excessive hydrocarbon emission may be caused by any of the following:

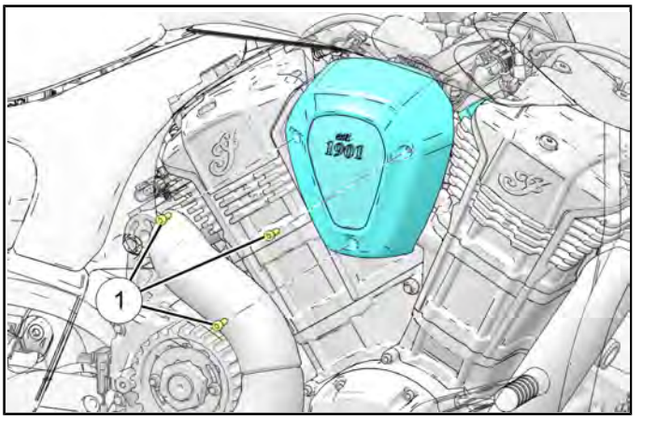
- Ignition misfire
- Improper ignition timing
- Excessively lean or rich air/fuel mixture
- Low compression
- Worn valves or guides
- Worn cylinder or piston rings
- Vacuum leaks
- Dirty fuel injector
- Defective sensor or damaged sensor wiring

Excessive carbon monoxide emissions may be caused by any of the following:

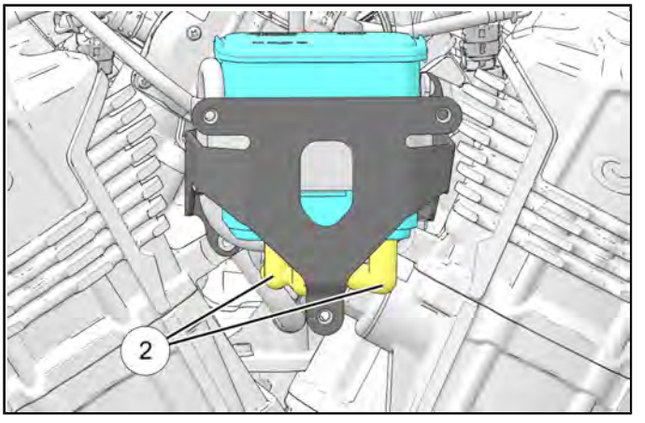
- Rich air/fuel mixture
- Dirty air filter
- Leaking fuel injectors
- Fuel pressure too high / bad regulator
- Plugged or restricted carbon canister vent line

CARBON CANISTER REMOVAL

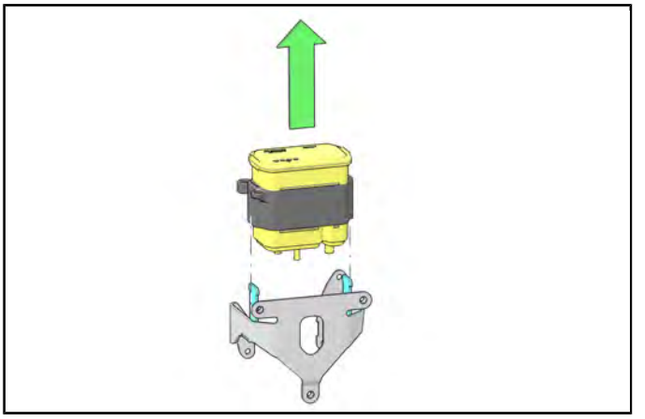
1. Remove fuel tank. See **Fuel Tank Removal page 4.24**
2. Remove right side v-cover by removing its fasteners ①.



3. Disconnect evaporative emissions lines from carbon canister ②.



4. Remove the canister from v-cover bracket by sliding rubber mount off of bracket tabs. The rubber mount should remain attached to the canister.



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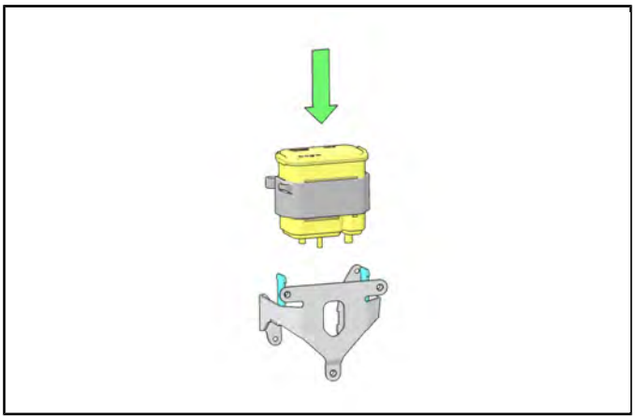
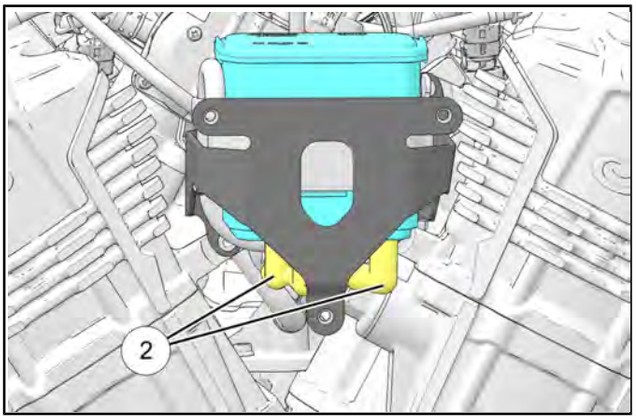
CARBON CANISTER INSTALLATION

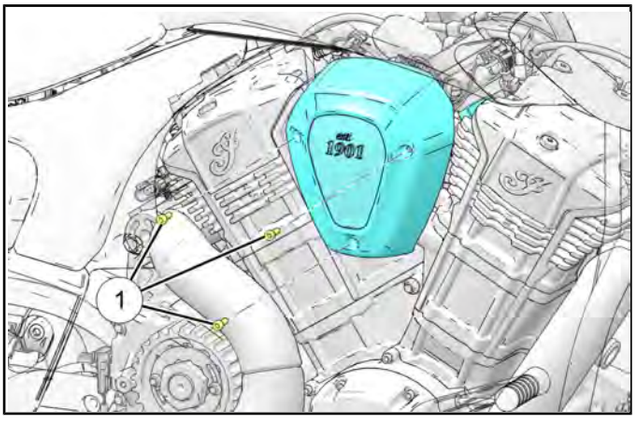
1. Install the canister to v-cover bracket by sliding rubber mount onto the bracket tabs. The rubber mount should remain attached to the canister.



2. Connect evaporative emissions ②.



3. Install right side v-cover by installing its fasteners ①.



TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

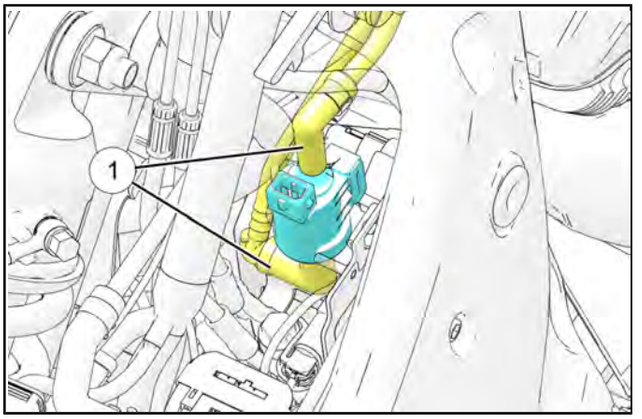
4. Install fuel tank. See **Fuel Tank Installation page 4.44**.

4

PURGE VALVE TESTING / REPLACEMENT

REPLACEMENT

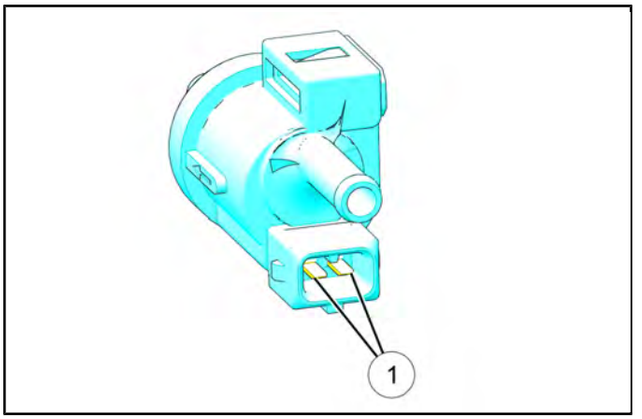
1. Remove right side upper side cover. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove ECM. See **ECM Removal page 4.63**.
3. Unplug purge valve electrical connector.
4. Disconnect the hoses connected to the purge valve ① and remove from bracket.



5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TESTING

1. Use a multi meter to test the resistance of the purge valve between the terminals ①.



Purge Valve Resistance Specification: **17 +/– 2 OHMS**

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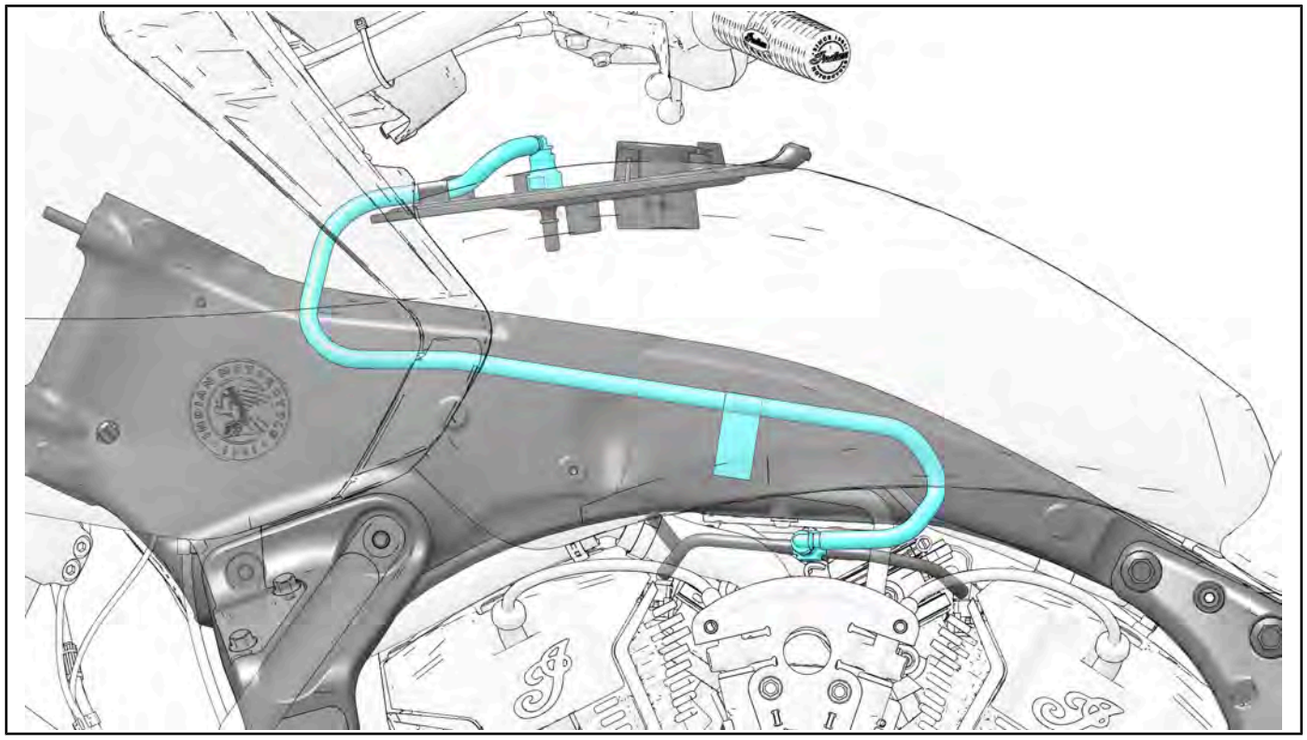
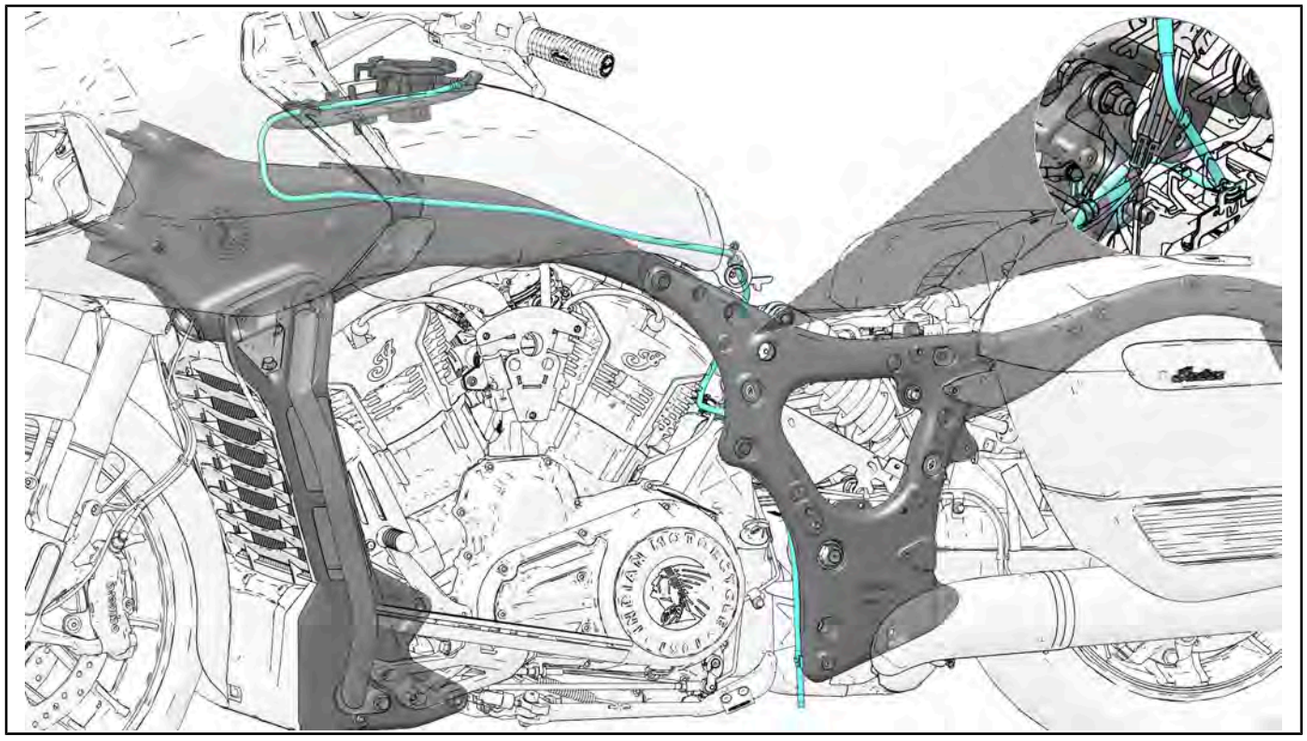
ASSEMBLY VIEWS

FUEL LINE ROUTING – 49 STATE

FUEL LINE ROUTING

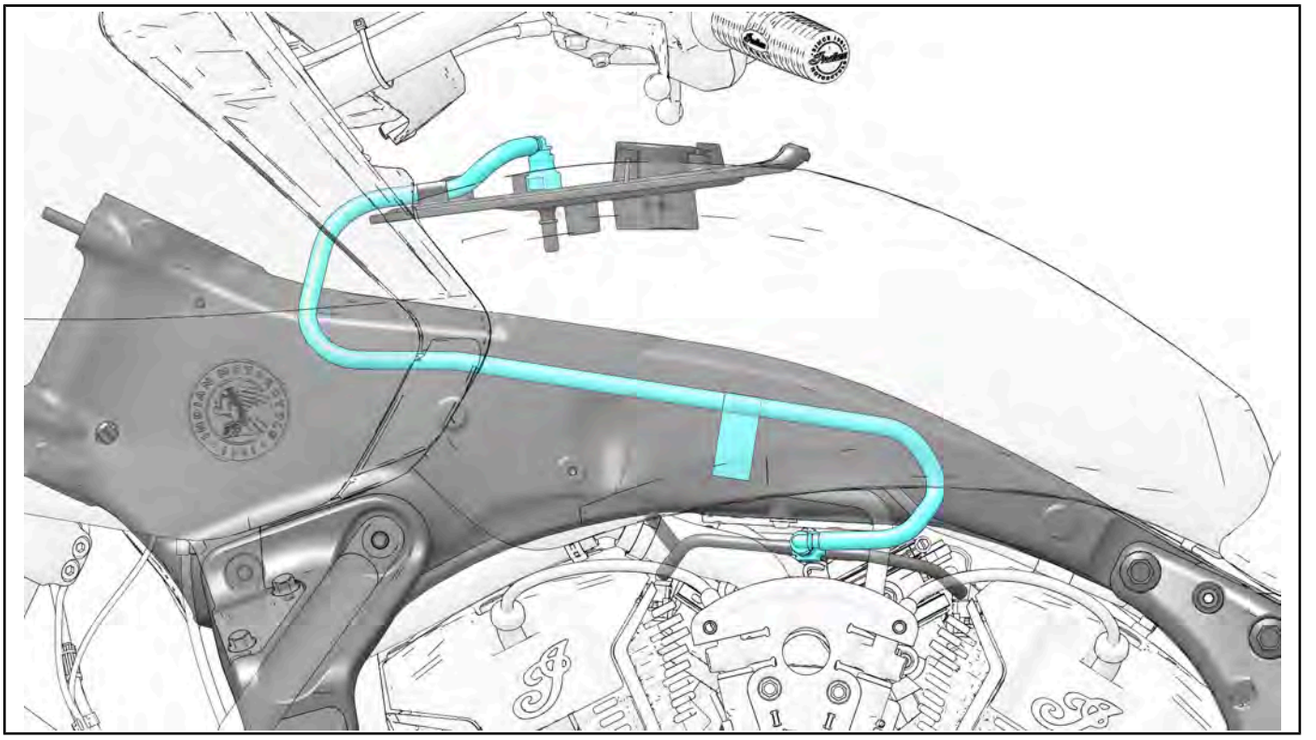


FUEL VENT LINE ROUTING

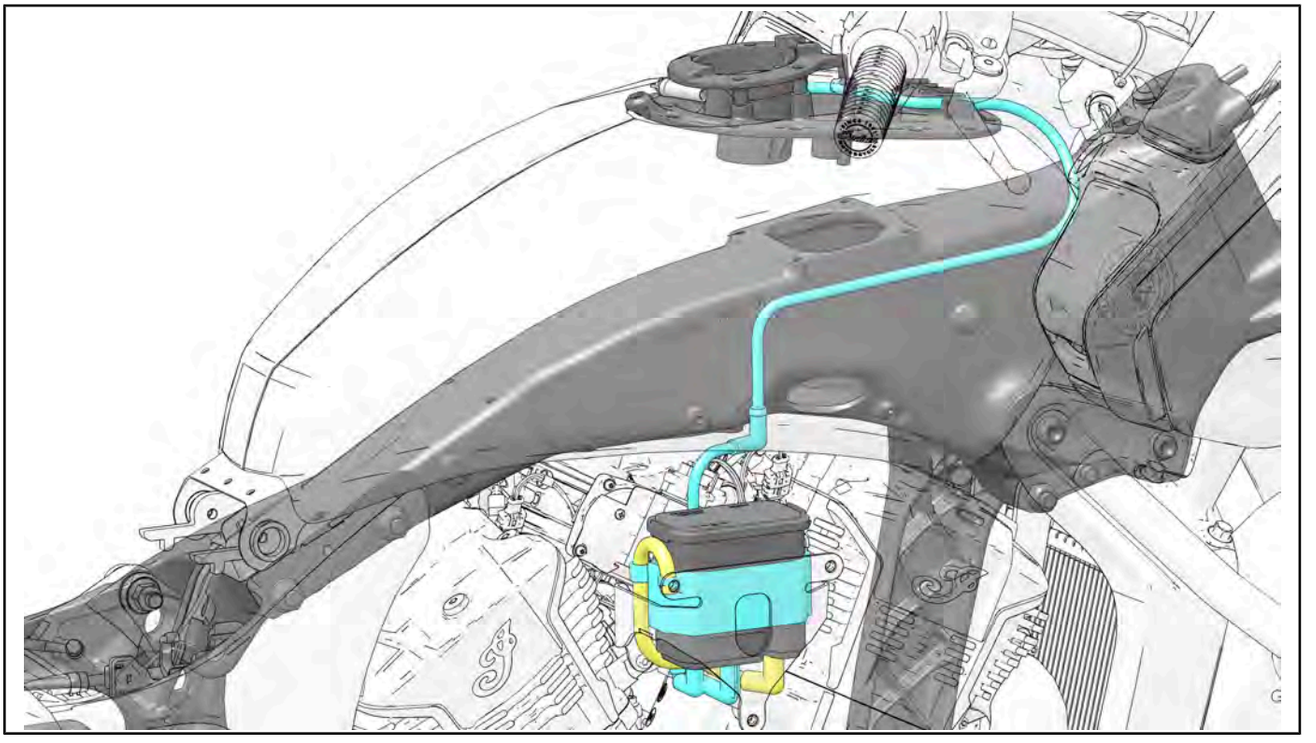


FUEL LINE ROUTING – 50 STATE

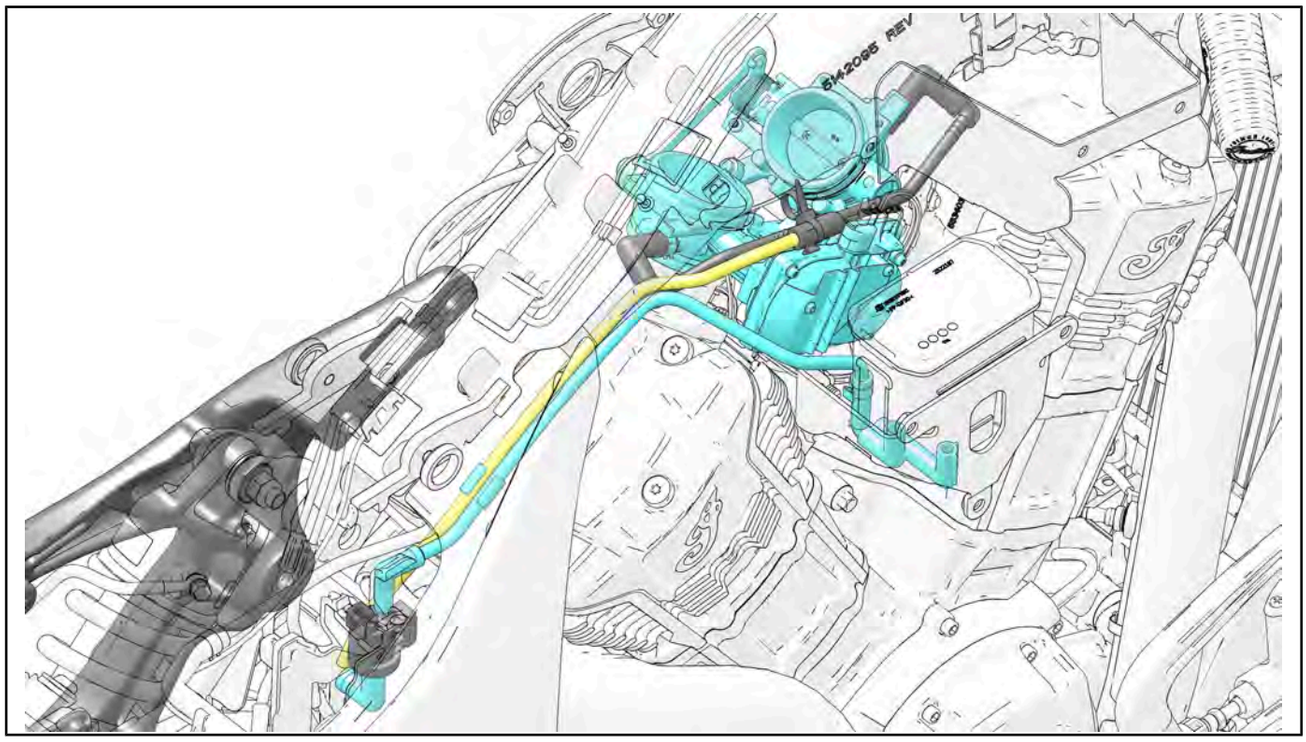
FUEL LINE ROUTING



FUEL EVAPORATIVE EMISSIONS LOAD LINE ROUTING

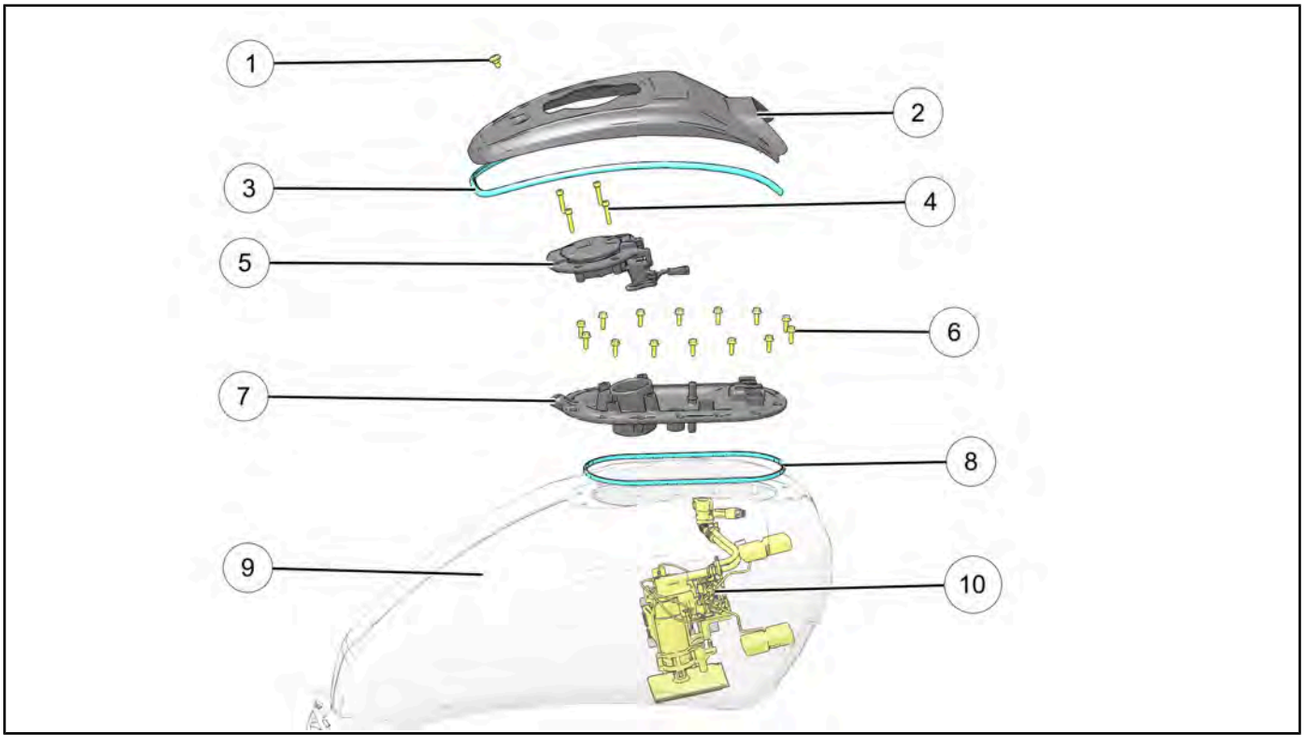


FUEL EVAPORATIVE EMISSIONS PURGE LINE ROUTING



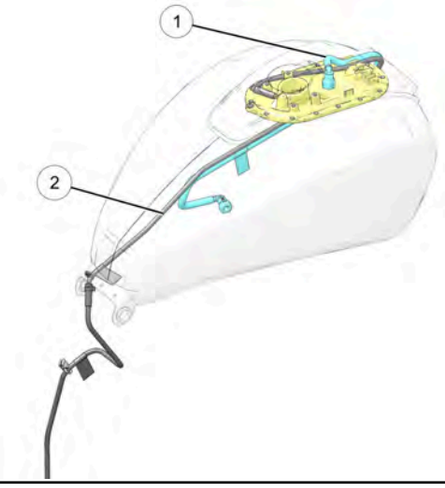
FUEL SYSTEM ASSEMBLY VIEW

49 / 50 STATE



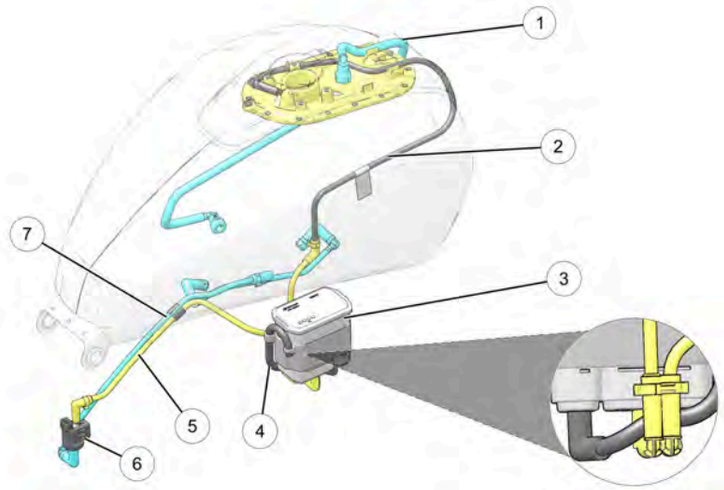
① Fuel Tank Console Fastener **88 in-lbs (10 N·m)**	⑥ Fuel Access Plate Fastener **44 in-lbs (5 N·m)**
② Fuel Tank Console	⑦ Fuel Access Plate
③ Console Trim	⑧ Fuel Access Plate Seal
④ Fuel Cap Fastener **44 in-lbs (5 N·m)**	⑨ Fuel Tank
⑤ Fuel Cap	⑩ Fuel Pump Assembly

49 STATE



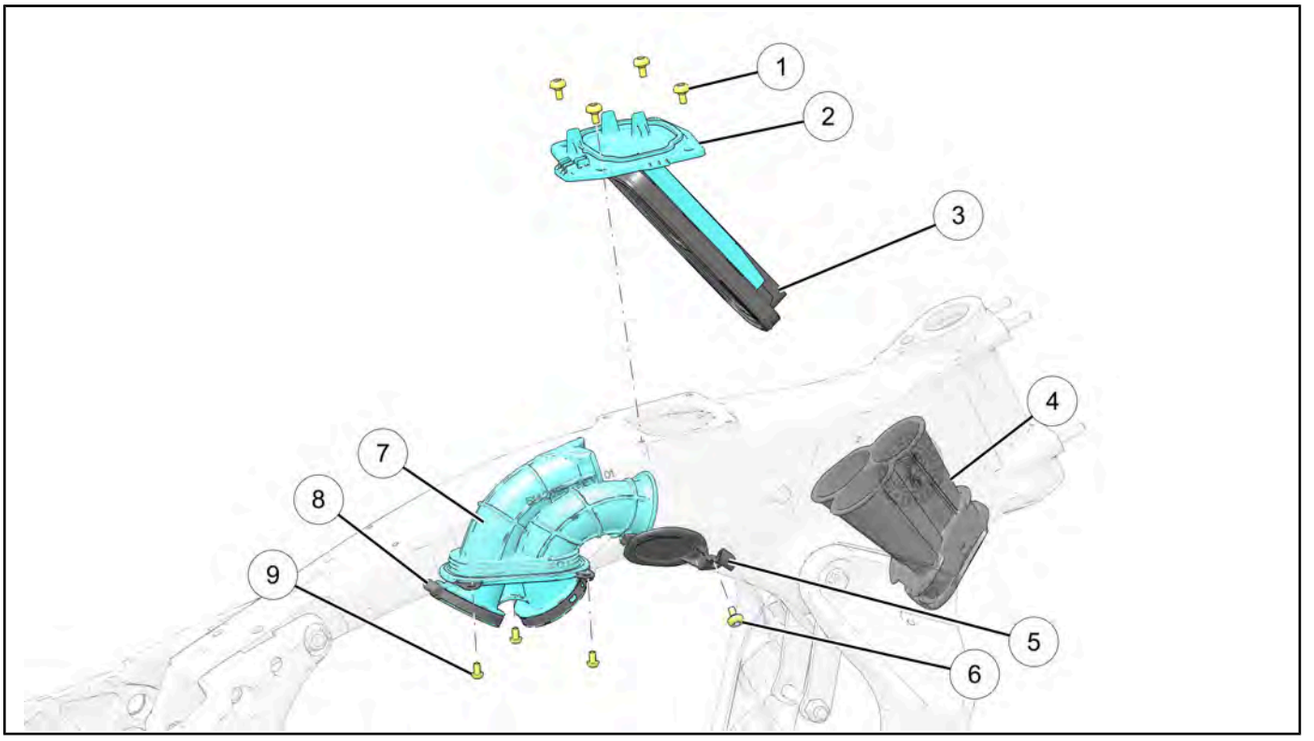
① Fuel Line	② Fuel Vent Line

50 STATE



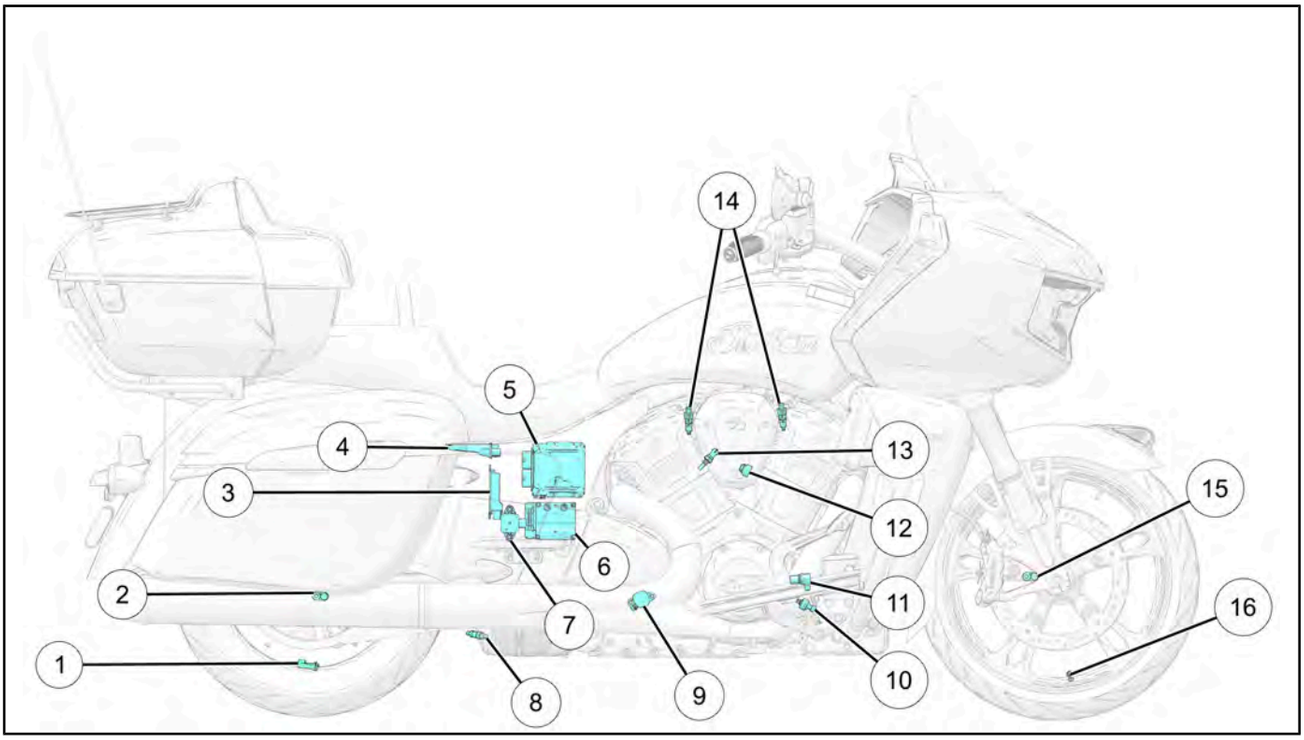
① Fuel Line	⑤ Evaporative Emissions Purge Valve Line
② Evaporative Emissions Load Line	⑥ Purge Valve
③ Carbon Canister	⑦ Evaporative Emissions Throttle Body Purge Line
④ Carbon Canister Vent Line	

AIR BOX ASSEMBLY VIEW



① Airbox Filter Cover Fastener **88 in-lbs (10 N·m)**	⑥ Airbox Hatch Cover Fastener **88 in-lbs (10 N·m)**
② Airbox Filter Cover	⑦ Throttle Body Inlet Adapter
③ Air Filter	⑧ Hose Clamp **26 in-lbs (3 N·m)**
④ Air Inlet Tube	⑨ Throttle Body Inlet Adapter Fastener **88 in-lbs (10 N·m)**
⑤ Airbox Hatch Cover	

SENSORS – POWERTRAIN MANAGEMENT



① TPMS (Tire Pressure Monitoring System) Sensor (Rear)	⑨ Gear Position Sensor
② Wheel Speed Sensor (Rear)	⑩ Oil Pressure Switch
③ VCM 1	⑪ Crank Position Sensor
④ WCM	⑫ Knock Sensor
⑤ ECM	⑬ Coolant Temperature Sensor
⑥ ABS Module	⑭ Fuel Injector
⑦ IMU (Intertial Measurement Unit)	⑮ Wheel Speed Sensor (Front)
⑧ Oxygen Sensor	⑯ TPMS (Tire Pressure Monitoring System) Sensor (Front)

FUEL DELIVERY SERVICE

INTAKE MANIFOLD, REMOVAL / INSTALLATION

IMPORTANT

Due to the rigidity of the intake manifold and inlet adaptor material, it is easier to remove the throttle body and the intake manifold at the same time.

1. To remove the intake manifold. Refer to **Throttle Body Removal page 4.81**.

FUEL PUMP PRESSURE INSPECTION

⚠ WARNING

Gasoline is extremely flammable. Work in a well ventilated area. Open flames, sparks, and cigarettes must be kept away from gasoline. KEEP GASOLINE OUT OF THE REACH OF CHILDREN!

⚠ CAUTION

Wear safety glasses or a face shield when working around the fuel system to protect your eyes.

1. Depressurize fuel system and disconnect fuel line at fuel rail. See **Fuel System Depressurization page 4.23**.
2. Install fuel pressure gauge **PU-43506–A** and fuel pressure gauge adapter **PV-48656**.
3. Start engine and record fuel pressure (or press the power switch ON and cycle the Engine Stop switch to read pressure when pump cycles for 2-3 seconds).

Minimum Fuel Pressure:
3.80 BAR (380 kPa) (55 psi)

4. Turn ignition switch off. Disconnect gauge adapter and re-connect fuel line.

STOP!

Reconnect fuel line to the fuel rail.

FUEL PRESSURE TROUBLESHOOTING

FUEL PRESSURE TOO LOW: INSPECT	FUEL PRESSURE TOO HIGH: INSPECT
* Low fuel level (add fuel) * Pump not running (Fuel pump or circuit malfunction) * Restricted fitting, fuel supply line, or gauge adapter hose * Fuel line kinked or restricted (from tank fitting to rail) * Fuel line leaking (leaking air in or fuel out) * Vent restriction (including evaporative emissions system) * Plugged fuel pickup filter (located in fuel tank) * Pressure regulator malfunction (located on pump) *Fuel pump malfunction (Pump should run for about 2 seconds the instant that the power button or Engine Stop switch are turned ON.	* Plugged fuel return (in tank on pressure regulator) * Pressure regulator malfunction (located on pump).

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FUEL SYSTEM DEPRESSURIZATION

FUEL SYSTEM DEPRESSURIZATION

⚠ CAUTION

Fuel lines remain under pressure at all times. Use caution when disconnecting lines for service. Always depressurize the fuel system prior to service.

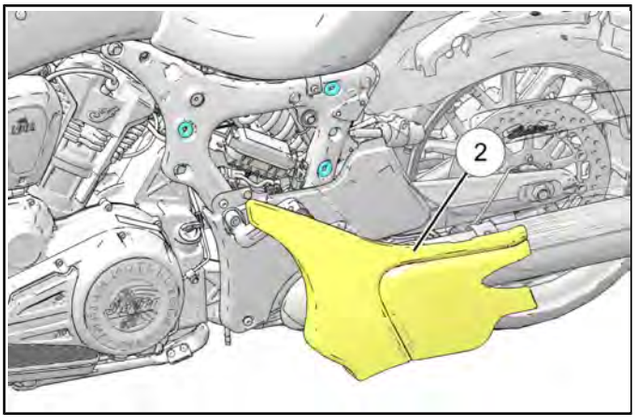
⚠ WARNING

Allow engine and exhaust to cool completely before disconnecting fuel line or removing pump. Wear eye protection.

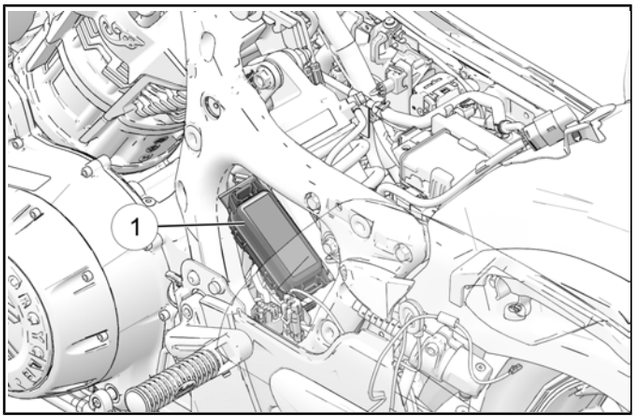
IMPORTANT

Be prepared to place the fuel pump in a secure location with a drain pan positioned to catch any fuel that may leak or drip from disconnected hoses or fittings.

1. Remove left-side upper side cover ②.



2. Locate the fuse box ① and remove its cover.



3. Locate the fuel pump relay. Pull the fuel pump relay and crank the engine over for 5 seconds to release fuel pressure.

4. With the motorcycle powered off, install the fuel pump relay. Install the fuse box cover.

4

FUEL TANK REMOVAL

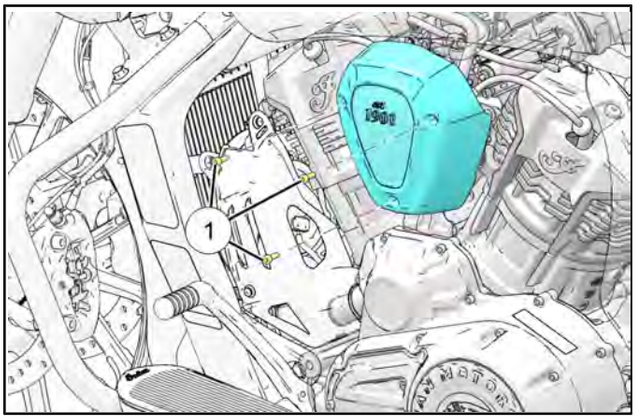
49 STATE

⚠ WARNING

Allow engine and exhaust to cool completely before disconnecting fuel line or removing tank. Protect fuel tank finish when removing, storing, and installing tank.

Be prepared to place the fuel tank in a secure location with a drain pan positioned to catch any fuel that may leak or drip from disconnected hoses or fittings.

1. Depressurize fuel system. See **Fuel System Depressurization page 4.23**.
2. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
3. Remove left side v-cover by removing its fasteners ①.



4. Disconnect the fuel line from the fuel rail by squeezing both release buttons and gently sliding off the fuel rail..

⚠ CAUTION

Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.

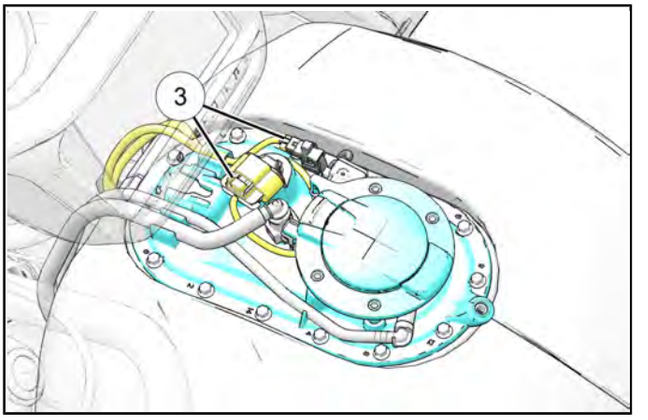
NOTICE

Pay close attention to the fuel line and make sure it doesn't get caught on other components during fuel tank removal.

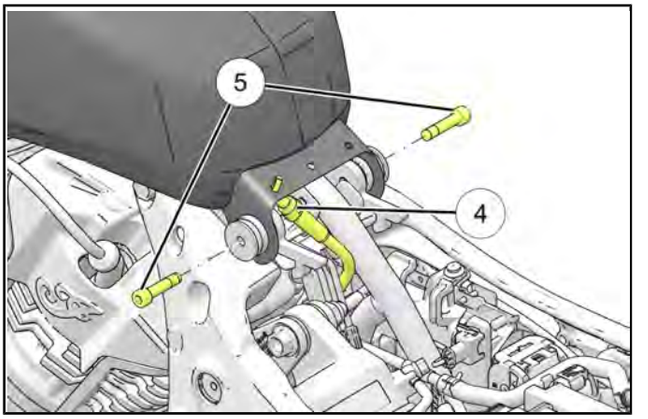
IMPORTANT

Carry the fuel tank flat to avoid any fuel spills.

5. Remove console fastener.
6. Lift rear of console and slide it forward to disengage the mount feature.
7. Disconnect electrical connectors ③.



8. Disconnect fuel vent line ④ at the rear of the tank.



9. Remove fuel tank fasteners ⑤.
10. Lift rear of tank upward and pull rearward to remove.

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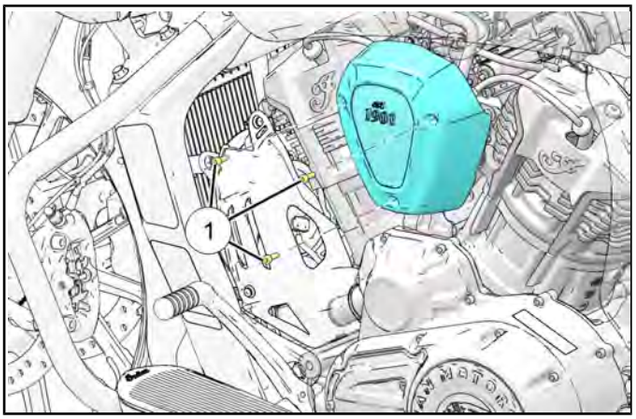
50S AND INTL

⚠ WARNING

Allow engine and exhaust to cool completely before disconnecting fuel line or removing tank. Protect fuel tank finish when removing, storing, and installing tank.

Be prepared to place the fuel tank in a secure location with a drain pan positioned to catch any fuel that may leak or drip from disconnected hoses or fittings.

1. Depressurize fuel system. See **Fuel System Depressurization page 4.23**.
2. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
3. Remove right hand V-Cover.
4. Disconnect evaporative emissions load line. Reference **Carbon Canister Removal page 4.12**.
5. Remove left side v-cover by removing its fasteners ①.

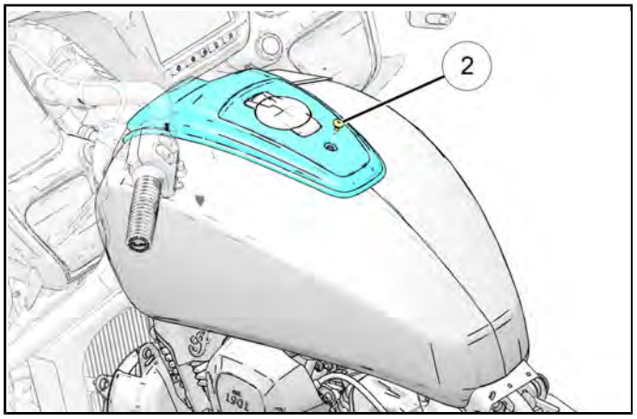


6. Disconnect the fuel line from the fuel rail by squeezing both release buttons and gently sliding off the fuel rail.

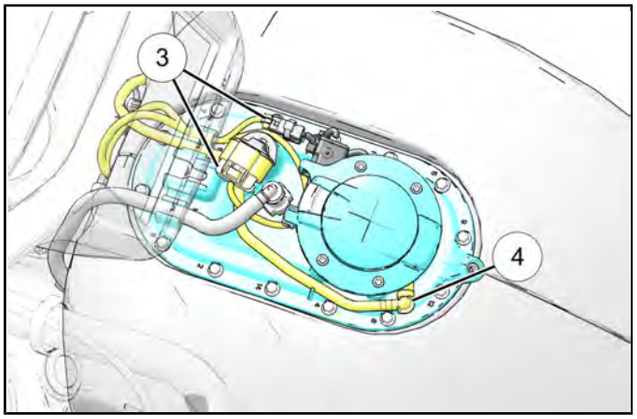
⚠ CAUTION

Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.

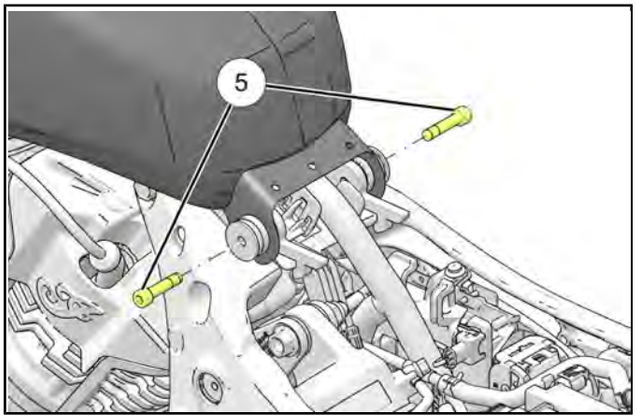
7. Remove fuel tank console fastener ②.



8. Lift rear of console and slide it forward to disengage the mount feature.
9. Disconnect fuel tank electrical connectors ③.

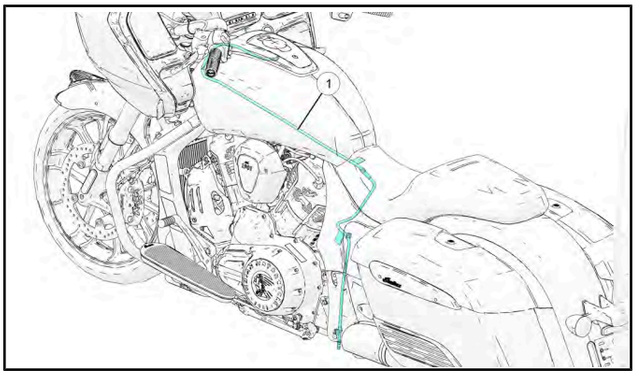


10. Remove fuel tank fasteners ⑤.



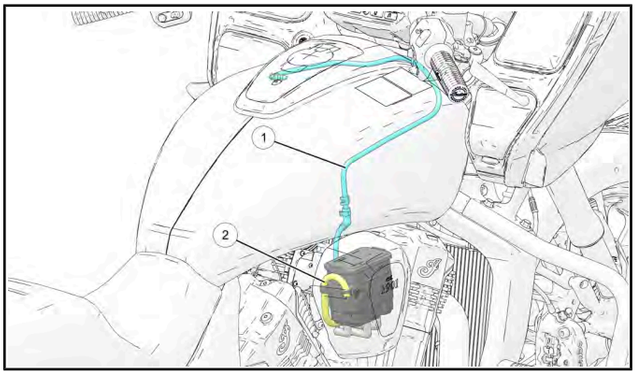
11. Lift rear of tank upward and pull rearward to remove.

49 STATE



1. Inspect fuel tank vent line ① in accordance with periodic maintenance schedule and any time fuel tank has been removed and installed. Be sure the line is clear and not pinched or kinked, and that all connections are tight.

50 STATE / INTL

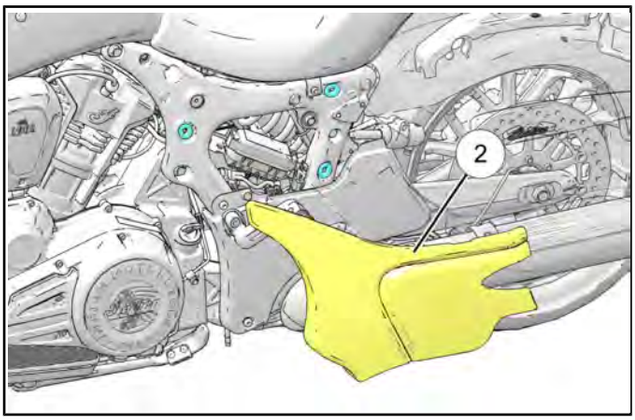


1. Inspect the Fuel vent to canister line ① in accordance with periodic maintenance schedule and any time fuel tank has been removed and installed. Be sure the line is clear and not pinched or kinked. Inspect the carbon canister vent line ②. Ensure the line is clear and not pinched or kinked.

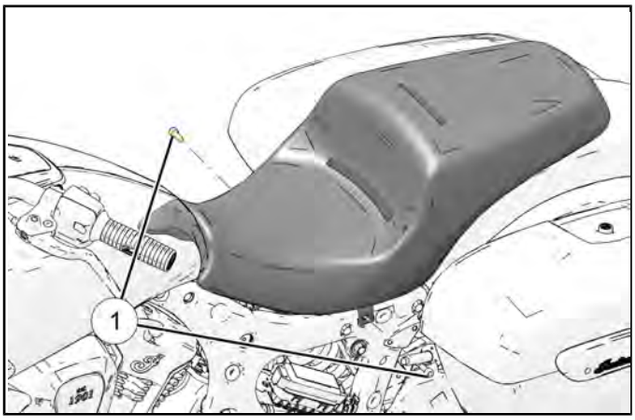
FUEL LINE REPLACEMENT

VEHICLE PREPARATION

1. Park motorcycle on a flat surface, fully extend side stand, and make sure vehicle is stable.
2. Turn the motorcycle OFF.
3. Be prepared to place the fuel tank in a secure location with a drain pan positioned to catch any fuel that may leak or drip from disconnected hoses or fittings.
4. Remove upper side covers ②.

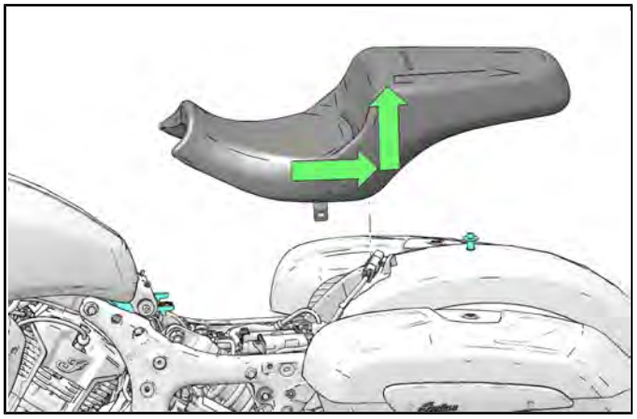


5. If equipped with a trunk, disengage latches and remove
6. Remove seat fasteners ①.

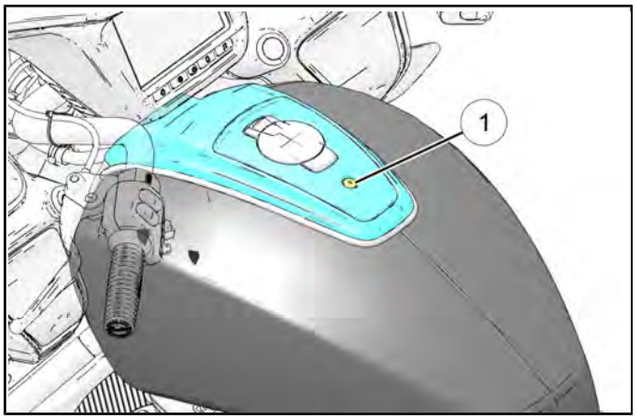


NOTICE
If equipped, disconnect seat electrical connector and/or antenna.

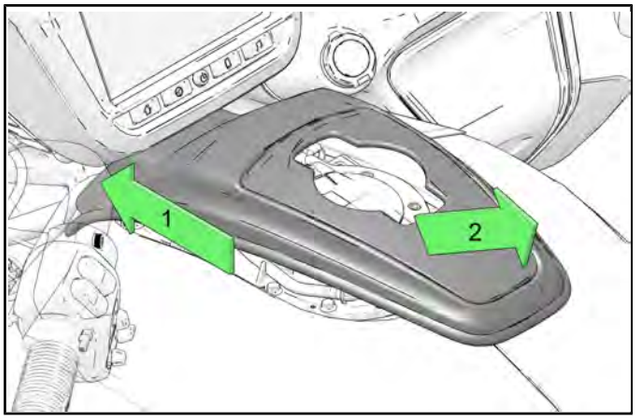
7. Move the seat backward and up to remove.



8. Remove fuel tank console by removing its fastener ①.



9. Slide console forward to release the console retainer and move rearward to remove from vehicle.



4

FUEL SYSTEM DEPRESSURIZATION

⚠ CAUTION

Fuel lines remain under pressure at all times. Use caution when disconnecting lines for service. Always depressurize the fuel system prior to service.

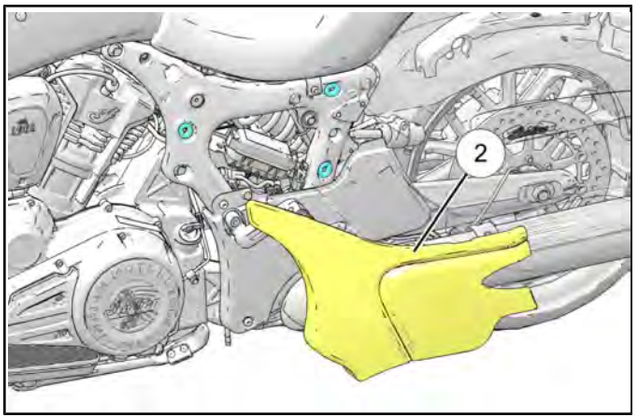
⚠ WARNING

Allow engine and exhaust to cool completely before disconnecting fuel line or removing pump. Wear eye protection.

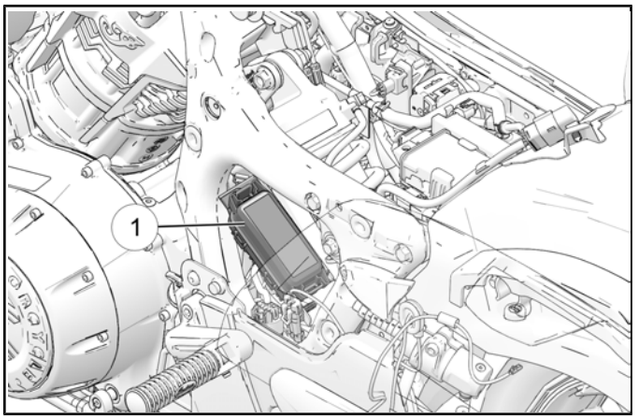
IMPORTANT

Be prepared to place the fuel pump in a secure location with a drain pan positioned to catch any fuel that may leak or drip from disconnected hoses or fittings.

1. Remove left-side upper side cover ②.



2. Locate the fuse box ① and remove its cover.

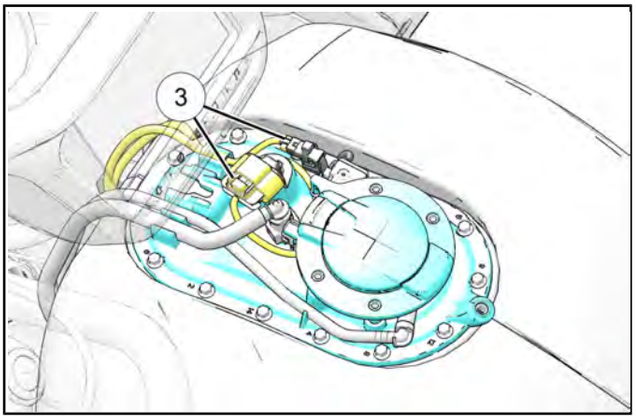


3. Locate the fuel pump relay. Pull the fuel pump relay and crank the engine over for 5 seconds to release fuel pressure.

4. With the motorcycle powered off, install the fuel pump relay. Install the fuse box cover.

FUEL TANK REMOVAL

1. Disconnect electrical connectors ③ and the wires from the fuel tank access plate.



⚠ CAUTION

Do not use anything other than fingers to remove the electrical connectors. The use of tools can damage the connection.

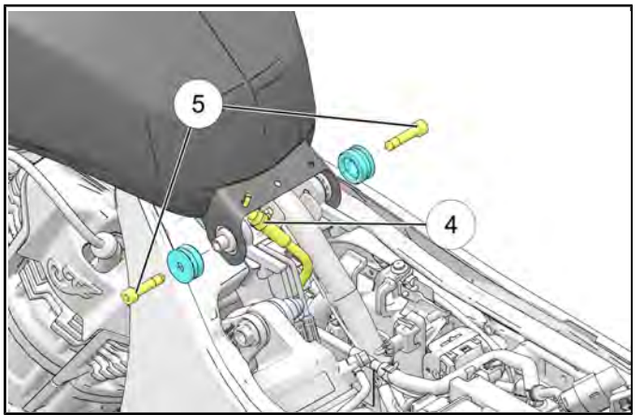
2. Remove the fuel tank fasteners ⑤.

NOTICE

Retain rubber mounting hardware for installation.

3. Disconnect the fuel vent line

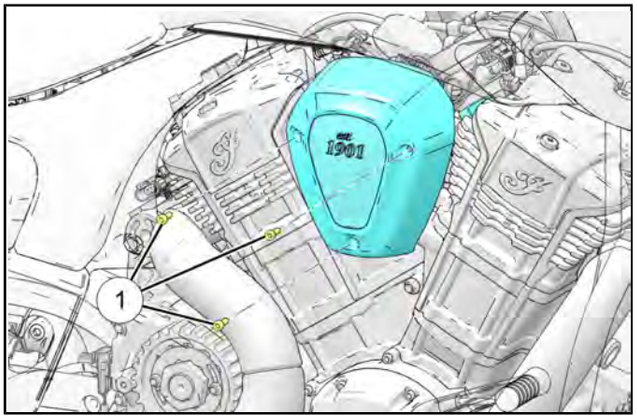
- **49 STATE:** Disconnect the fuel vent line ④ from the fuel tank.



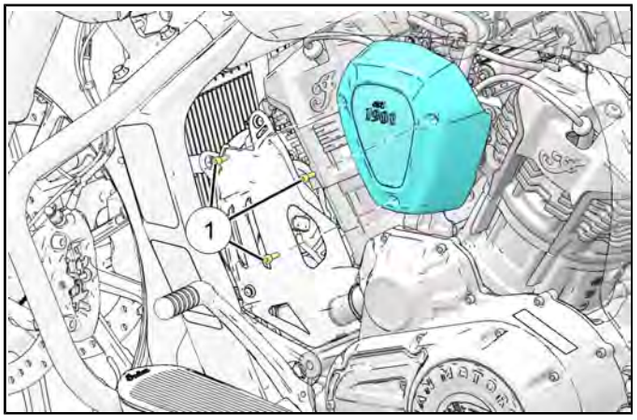
⚠ CAUTION

Use care not to damage the vent line during removal.

- **50 STATE and INTL:** Remove right side v-cover by removing its fasteners ①.



- Remove left side v-cover by removing its fasteners ①.



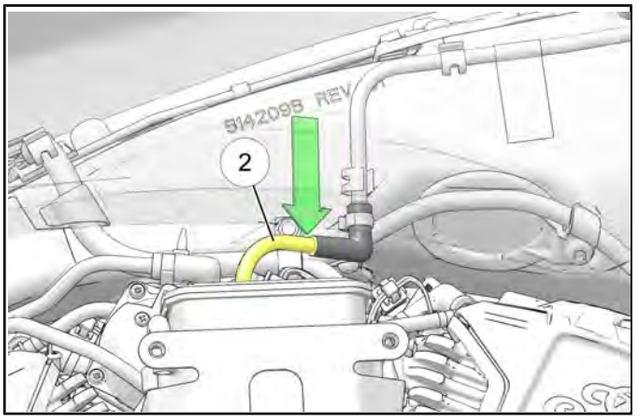
4

- Disconnect the fuel line from the fuel rail by squeezing both release buttons and gently sliding off the fuel rail.

⚠ CAUTION

Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.

- Disconnect evaporative emissions load line ② from the elbow.



⚠ CAUTION

Use care not to damage the evaporative emissions line during removal.

4. Lift the fuel tank upward and pull rearward off the motorcycle and place on a suitable flat, scratch resistant surface to prevent tank damage.

NOTICE

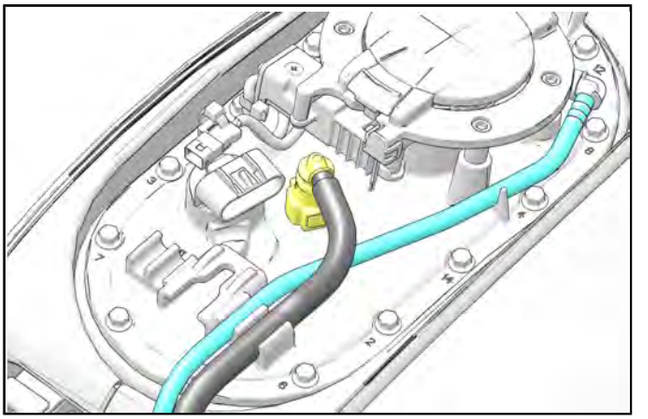
Pay close attention to the fuel line and make sure it doesn't get caught on other components during fuel tank removal.

IMPORTANT

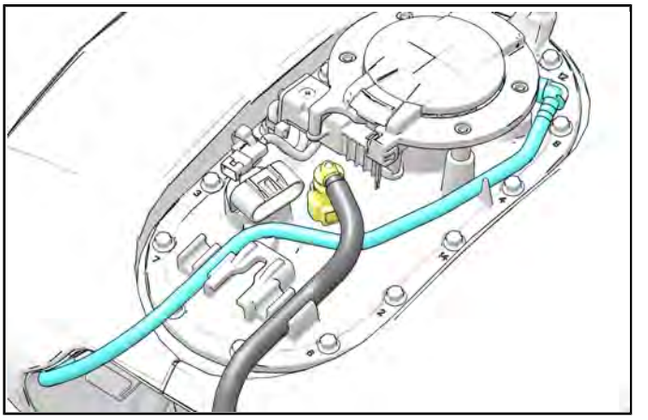
Carry the fuel tank flat to avoid any fuel spills.

FUEL LINE REMOVAL

1. Disconnect fuel line from fuel tank access plate. Squeeze both release buttons (one on each side of fitting) and hold. Gently pull fitting straight off access plate.
   - **49 STATE**



   - **50 STATE**



⚠ CAUTION

Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.

IMPORTANT

Use a shop rag to catch any residual fuel in the system.

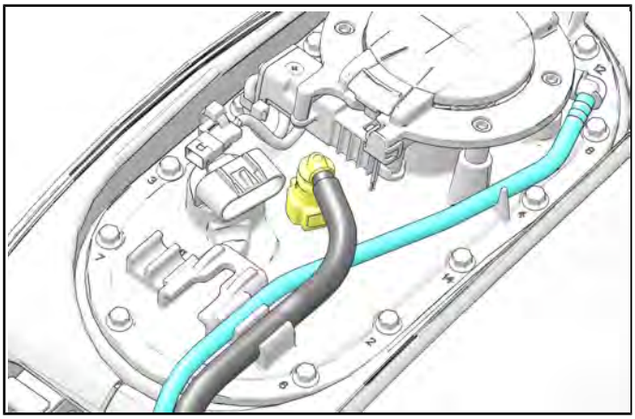
2. Discard the fuel line.

STOP!

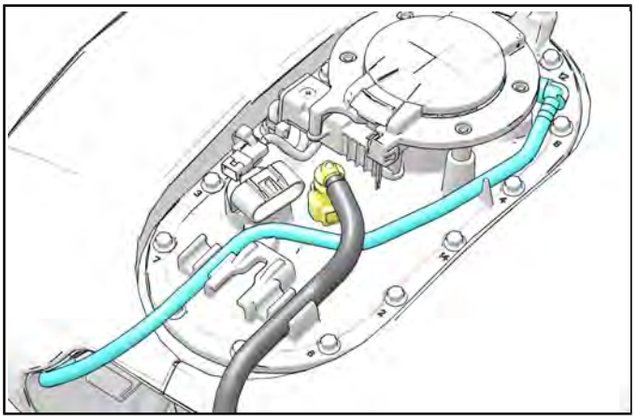
Dispose of the fuel line according to local fuel disposal regulations.

FUEL LINE INSTALLATION

1. Connect the fuel line to the fuel pump access plate.
   - **49 STATE**



   - **50 STATE**

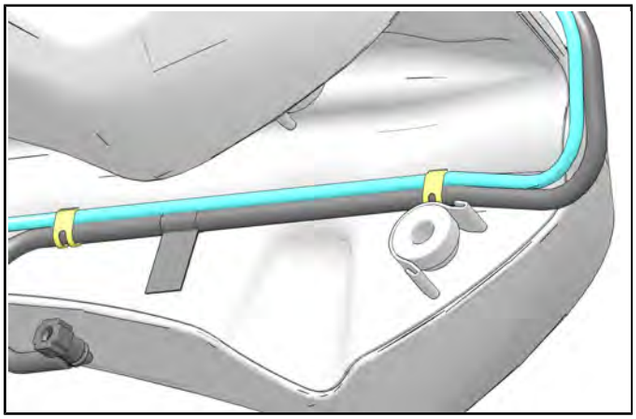


STOP!
Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made. Verify the following: • Fuel line is properly routed, seated onto the fuel pump access plate, and locked in place. • Fuel line connector is fully engaged. • Fuel line connections stay secured when performing push/pull test with at least 5 lbs. of force. **IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.**

NOTICE
Make sure the fuel line and vent line are routed in the guides as shown.

2. Route the NEW fuel line to the clip brackets of the fuel tank.

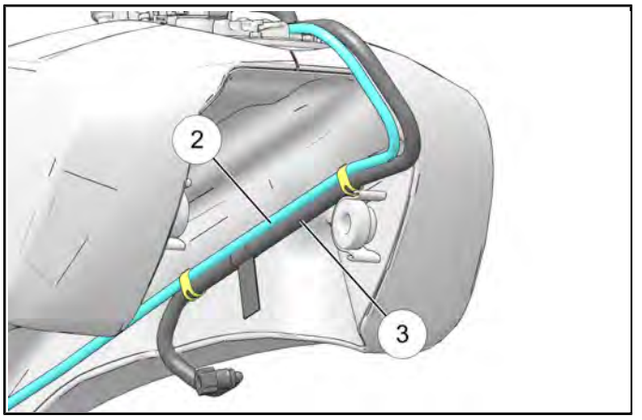
IMPORTANT
Take note of the correct fuel line routing while installing the fuel line.



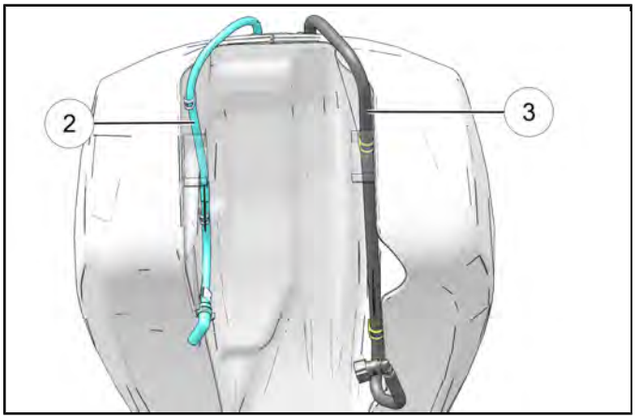
NOTICE
Make sure the fuel and vent line are orientated as shown.

IMPORTANT
Do not place bottom of the fuel tank on a flat surface as damage to the fuel line could occur.

- **49 STATE** The fuel line ③ is routed under the vent line ② as shown.



- **50 STATE** The fuel line ③ is routed independent of the evaporative emissions load line ② as shown.



FUEL TANK INSTALLATION

⚠ CAUTION

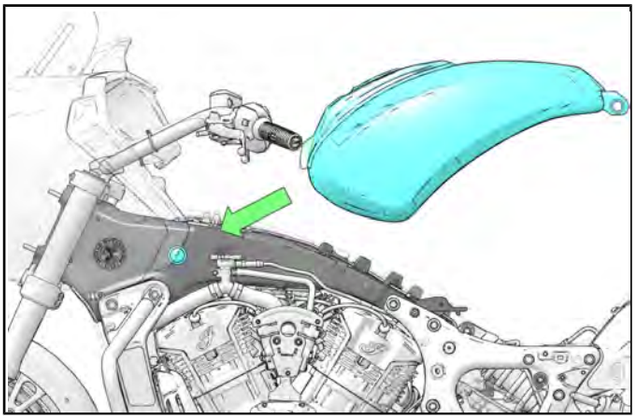
Be careful when performing this procedure to avoid damaging the fuel line, electrical wiring, or vent line.

1. Place a protective cloth on the front of the tank when assembling tank to frame.

NOTICE

Verify that forward tank isolators are in position on the frame mounts and lower tank onto frame.

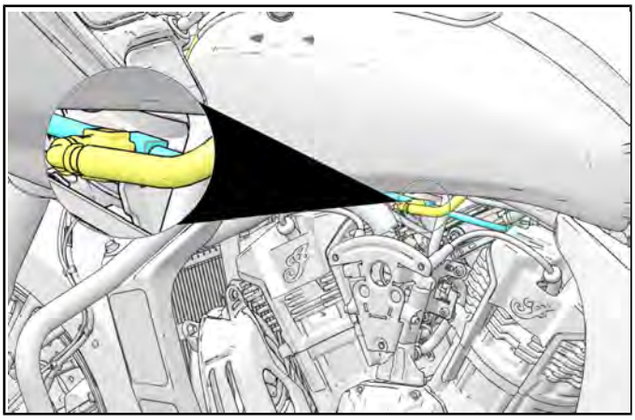
2. Apply a soapy water solution to the isolators and carefully lower the fuel tank onto the frame.



⚠ CAUTION

Use care not to damage the vent line during installation.

3. Slide tank forward until fully seated on forward isolators. Lower the rear of the tank into position over the rear mounting bracket.
4. Connect the NEW fuel line to the fuel rail.



STOP!

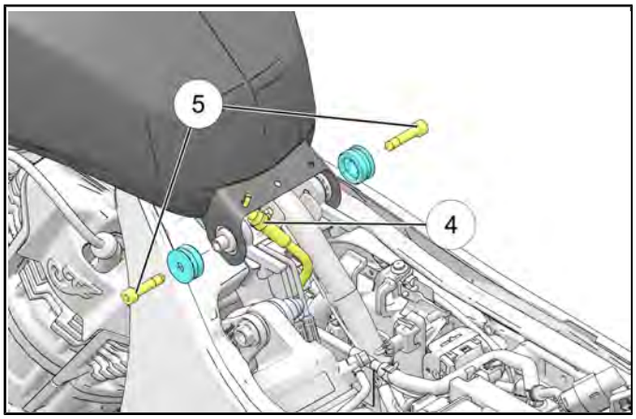
Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made.

Verify the following:

- Fuel line is properly routed, seated onto the fuel rail, and locked in place.
- Fuel line connector is fully engaged.
- Fuel lines connections stay secured when performing push/pull test with at least 5 lbs. of force.

IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.

5. Install isolators and fuel tank fasteners ⑤.

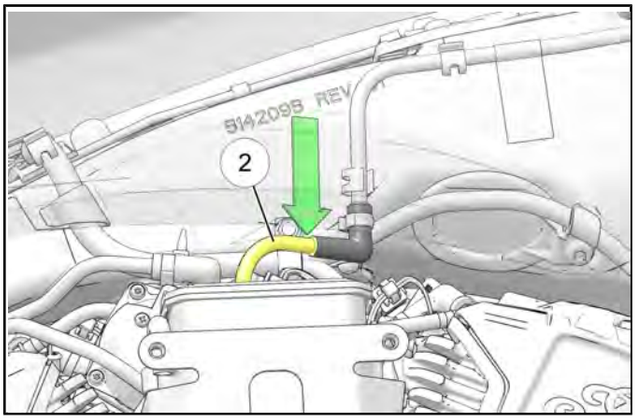


TORQUE

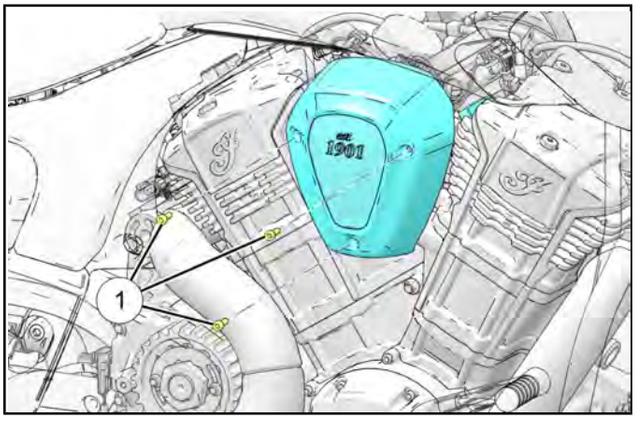
Fuel Tank Mounting Fasteners:
18 ft-lbs (24 N·m)

4

6. Connect fuel vent line.
   - **49 STATE:** Connect the fuel vent line ④ to the fuel tank.
   - **50 STATE:**
   - Connect evaporative emissions load lines ② to the elbow.

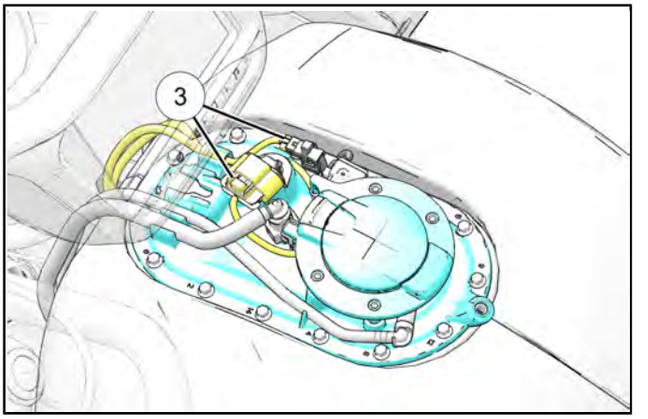


   - Install right side v-cover and secure by installing its fasteners ①. Torque to specification.



TORQUE
V-Cover Fasteners: **88 in-lbs (10 N·m)**

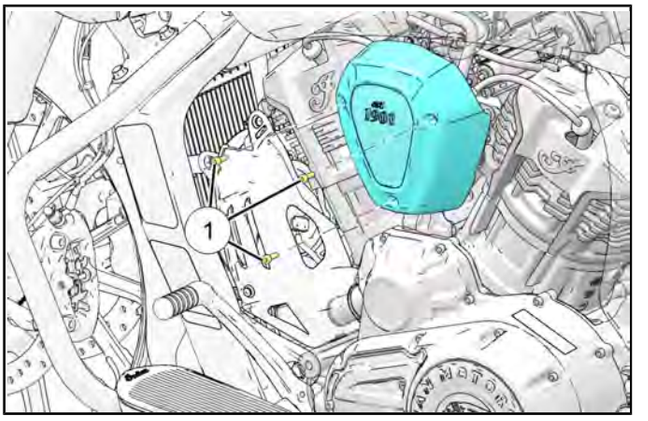
7. Connect the electrical connectors ③.



⚠ CAUTION

Verify electrical connectors are properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on the connector to make sure a proper connection has been made.

8. Install left side v-cover and secure with its fasteners ①.



TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

9. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

PRIMING THE FUEL SYSTEM

1. Power on the motorcycle, **DO NOT START**.

IMPORTANT
Verify the fuel level is above a half tank.

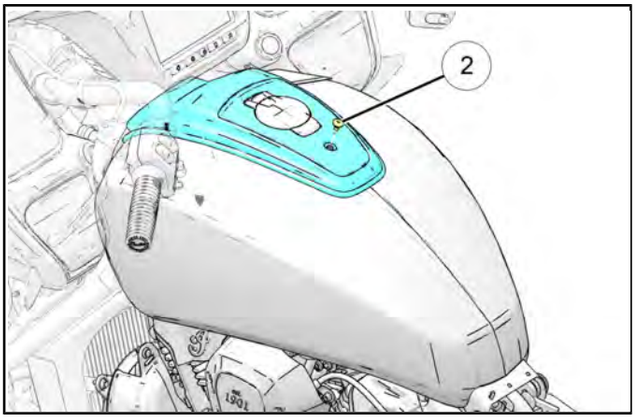
2. Turn stop switch to RUN.
3. Allow switch to remain in RUN position until pump stops running (about 2-3 seconds).

NOTICE
You should hear the fuel pump running to cycle fuel. If you don't, check the electrical connection to the fuel pump.

4. Turn the ignition switch to OFF.
5. *WAIT* approximately 10 seconds.
6. Repeat Steps 4-8 four times to complete the priming procedure.

IMPORTANT
a. Start the motorcycle.
b. Verify no fuel leaks are present around the fuel line connectors.
c. Verify proper fuel level indicator function.

7. Install fuel tank console by engaging the front post into its slot and slide rearward. Retain with its fastener ②. Torque to specification.

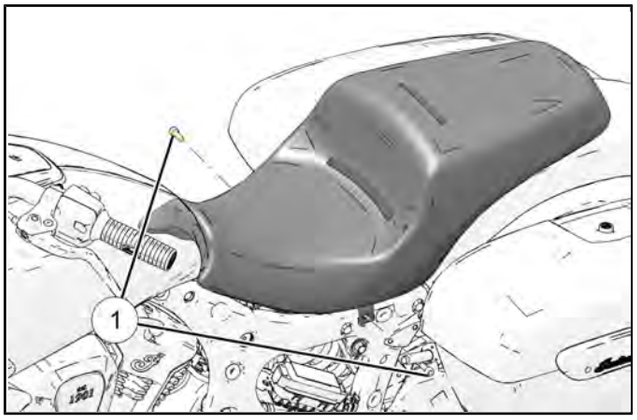


⚠ CAUTION
Do not over torque fastener

TORQUE
Fuel Tank Console Fastener: **88 in-lbs (10 N·m)**

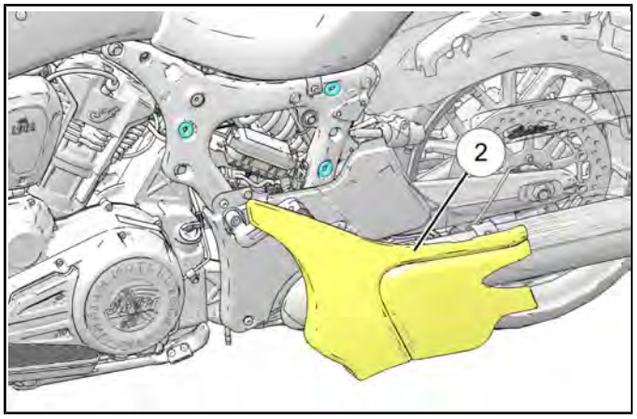
SEAT / SIDE COVER INSTALLATION

1. Install the seat.
2. Install seat fasteners ①. Torque to specification.



TORQUE
Seat Fastener: **18 ft-lbs (24 N·m)**

3. If equipped, connect seat electrical connector and/or antenna.
4. Install upper side covers ②.



4

FUEL PUMP REMOVAL

DRAIN FUEL TANK

1. Park motorcycle on a flat surface, fully extend side stand, and make sure vehicle is stable.
2. Turn the motorcycle OFF.
3. Inspect fuel level. If the fuel level is 50% or more, the tank should be drained to 50% full or lower to make the fuel pump easier to access.
4. If necessary, drain fuel from the tank using a clean vacuum or siphon pump designed for fuel systems.

IMPORTANT

Drain fuel in to a clean container suitable for fuel storage, as it will be added back to the motorcycle later.

5. On the fuel gauge, visually mark the fuel level for verification of fuel level upon new fuel pump installation.

FUEL SYSTEM DEPRESSURIZATION

⚠ CAUTION

Fuel lines remain under pressure at all times. Use caution when disconnecting lines for service. Always depressurize the fuel system prior to service.

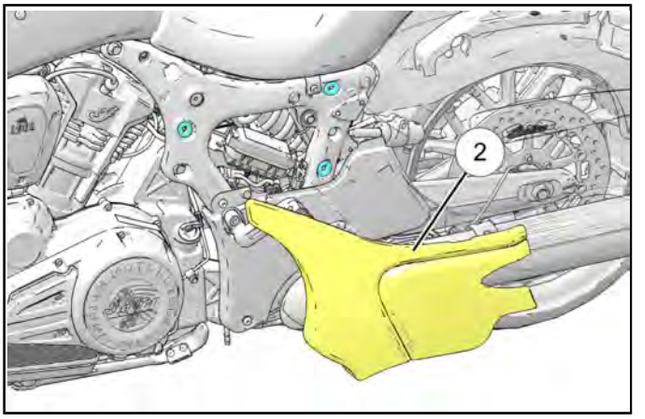
⚠ WARNING

Allow engine and exhaust to cool completely before disconnecting fuel line or removing pump. Wear eye protection.

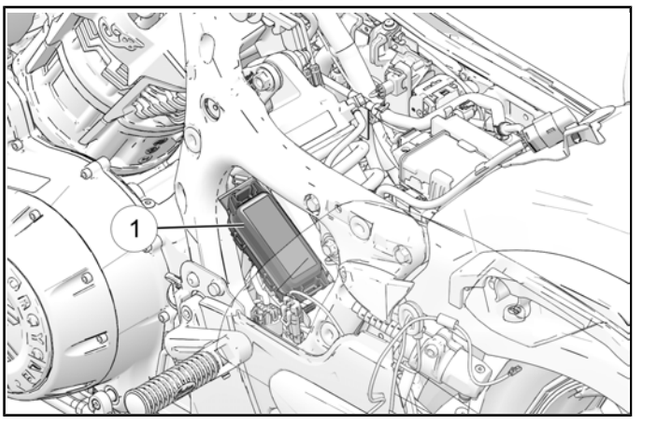
IMPORTANT

Be prepared to place the fuel pump in a secure location with a drain pan positioned to catch any fuel that may leak or drip from disconnected hoses or fittings.

1. Remove left-side upper side cover ②.



2. Locate the fuse box ① and remove its cover.

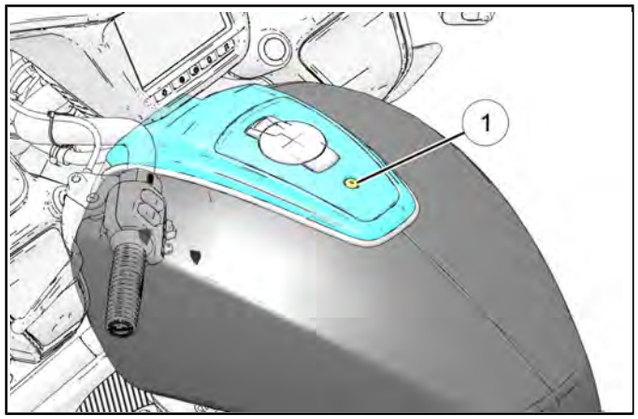


3. Locate the fuel pump relay. Pull the fuel pump relay and crank the engine over for 5 seconds to release fuel pressure.

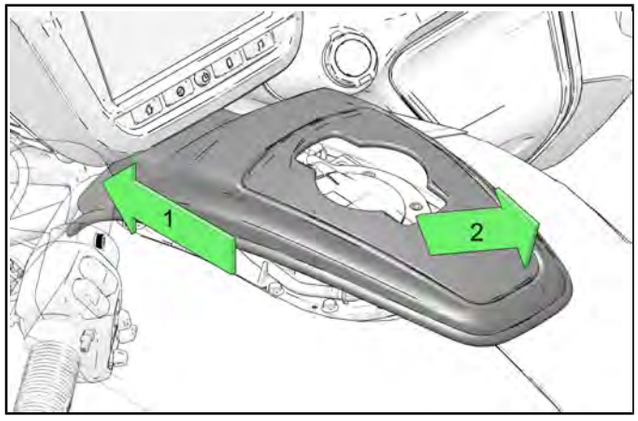
4. With the motorcycle powered off, install the fuel pump relay. Install the fuse box cover.

FUEL PUMP ACCESS

1. Remove fuel tank console by removing its fastener ①.

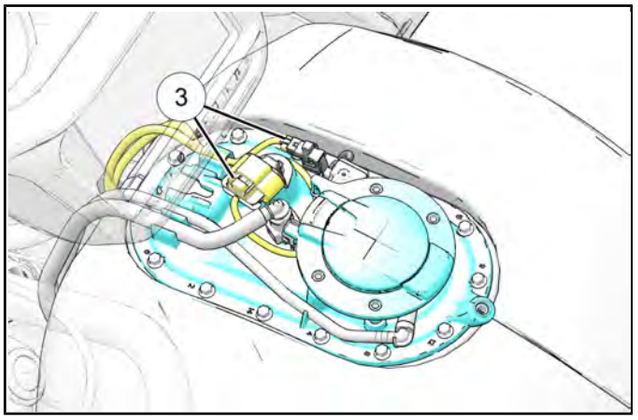


2. Slide console forward to release the console retainer and move rearward to remove from vehicle.



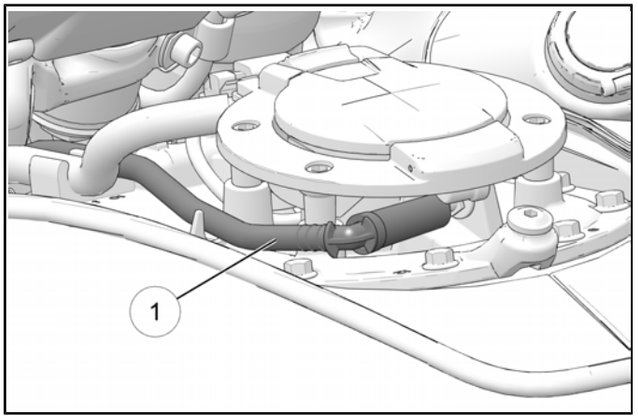
FUEL PUMP REMOVAL

1. Disconnect the fuel pump electrical connectors ③ and move out of the way.



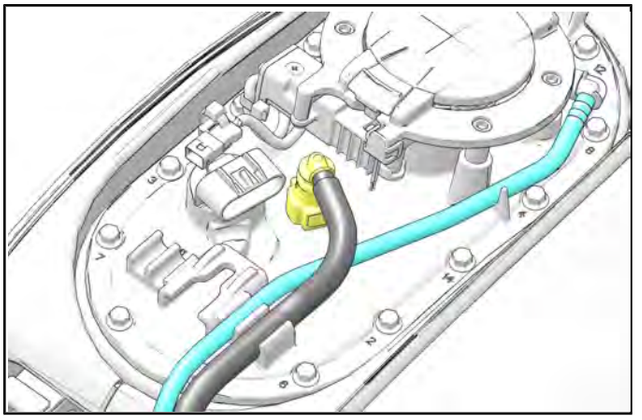
IMPORTANT
Do not use anything other than fingers to remove the electrical connectors. The use of tools can damage the connection.

2. Disconnect the fuel tank vent line ① by sliding the rubber elbow off of the fitting.

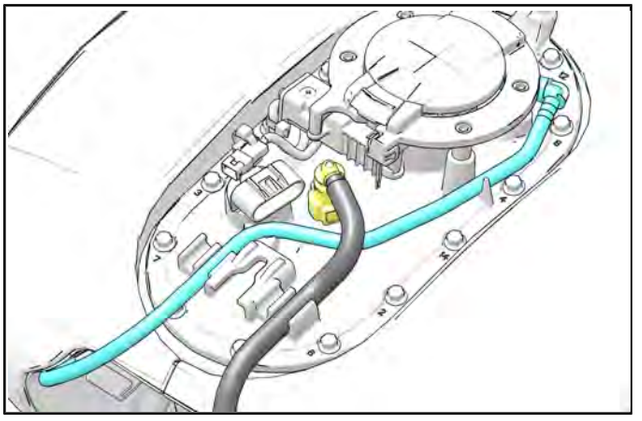


⚠ CAUTION
Use care not to damage the vent line during removal.

3. Disconnect fuel line from fuel tank access plate. Squeeze both release buttons (one on each side of fitting) and hold. Gently pull fitting straight off access plate.
   - **49 STATE**



   - **50 STATE**

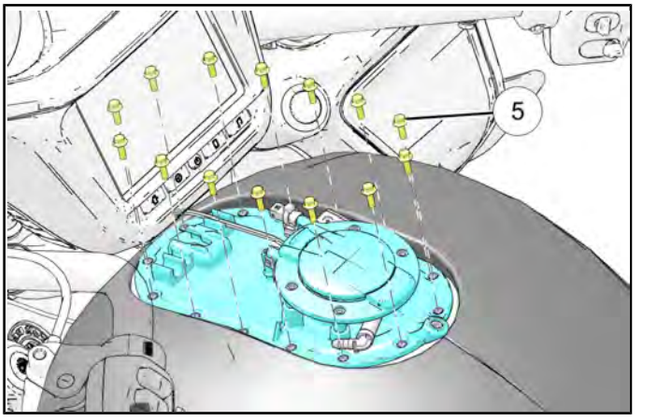


IMPORTANT
Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.

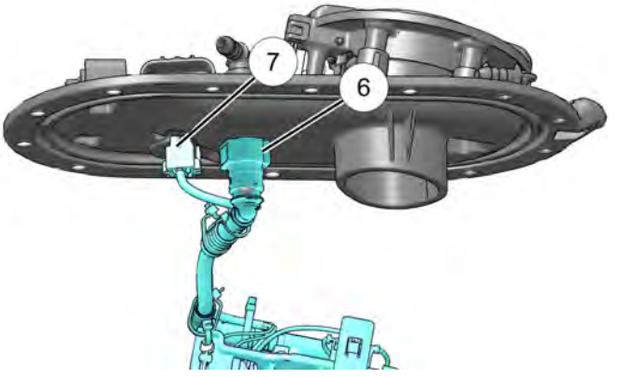
IMPORTANT
Use a shop rag to catch any residual fuel in the system.

4. Cover fuel line fittings to keep debris out.

5. Remove fuel pump access plate fasteners ⑤.

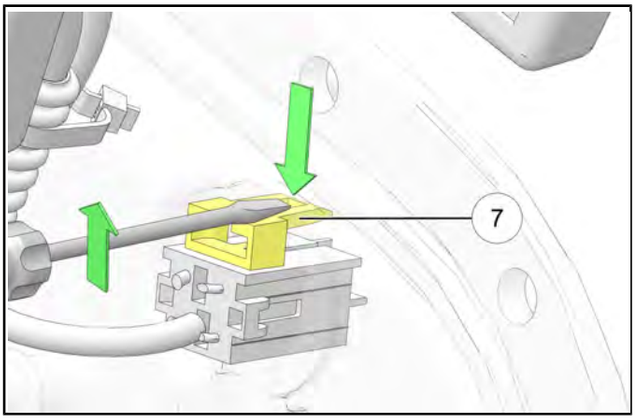


6. Lift up the fuel pump access plate enough to disconnect the fuel line ⑥. Squeeze both release buttons, on the fuel quick connector (one on each side of fitting), and hold. Gently slide fitting straight off the fuel pump access plate.



IMPORTANT
Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.

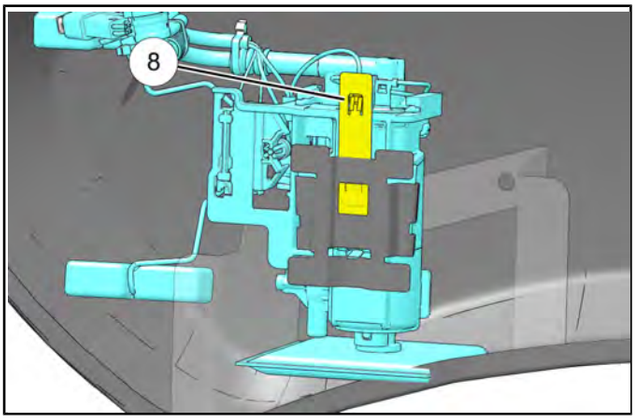
7. **Gently** insert a flat-blade screwdriver on the top of the connector tab and push down to disengage fuel pump electrical connector ⑦ clip from the access plate.



IMPORTANT

Use care not to damage the access plate.

8. Reach in through the fuel pump access opening and gently press the fuel pump retaining tab ⑧ toward the fuel pump.



⚠ CAUTION

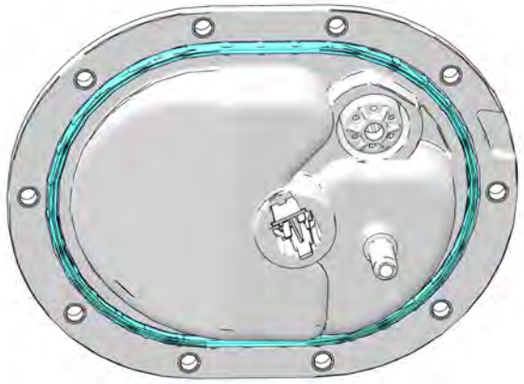
Use care not to damage electrical wires on the fuel tank studs during removal.

9. Carefully maneuver and lift the fuel pump assembly out of the retaining bracket and carefully lift out of the fuel tank.

IMPORTANT

Remove the fuel pump seal, CUT and DISCARD the seal.

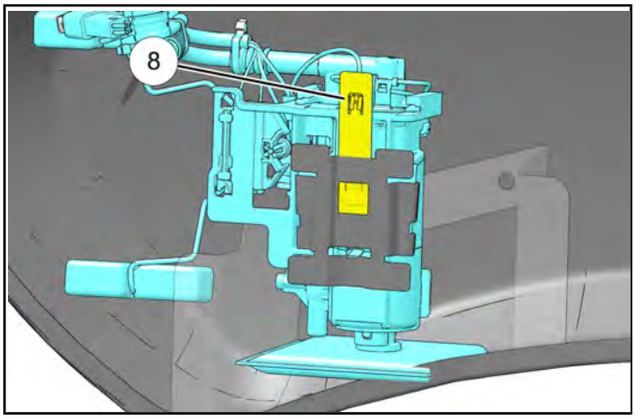
CUT the electrical connector off and DISPOSE of the fuel pump properly according to local regulations.



4

FUEL PUMP INSTALLATION

1. Lower the fuel pump assembly into the access opening with the fuel level sender arm facing forward.
2. Once the pump body is inside the tank, line up the guide rails and retaining tab with the bracket.
3. Slide the fuel pump ⑧ into position.



⚠ CAUTION

Use care not to damage electrical wires on the fuel tank studs during installation.

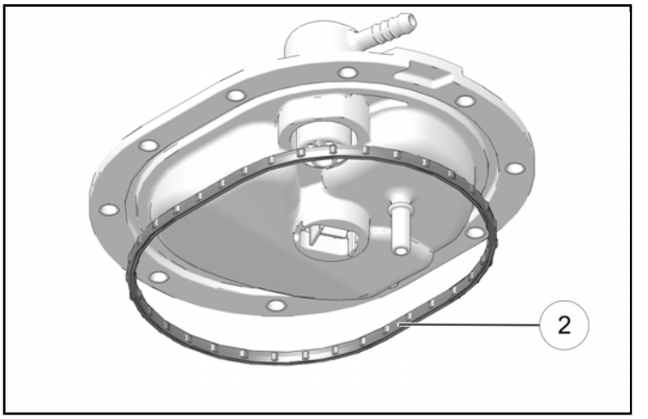
IMPORTANT

Make sure the retaining tab engages and you hear an audible "click". Gently pull straight up on the pump to ensure it is locked in place.

IMPORTANT

Make sure the fuel level sender arm and assembly is not damaged upon installation.

4. Verify that the float moves freely through its full range of motion.
5. Press a **NEW** fuel access panel seal ② into the bottom of the fuel pump access panel.



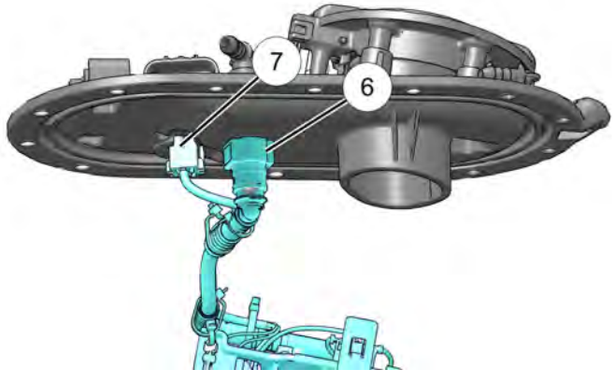
⚠ WARNING

Make sure a NEW seal is used. Failure to use a new seal may result in a fuel leak.

NOTICE

Make sure the new fuel access panel seal is not rolled or missing.

6. Clean the fuel tank surface.
7. Lower the fuel access panel into position. Connect the electrical connector ⑦ and fuel line ⑥ to the access plate.



IMPORTANT

Verify electrical connector is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on electrical connector to make sure a proper connection has been made.

STOP!

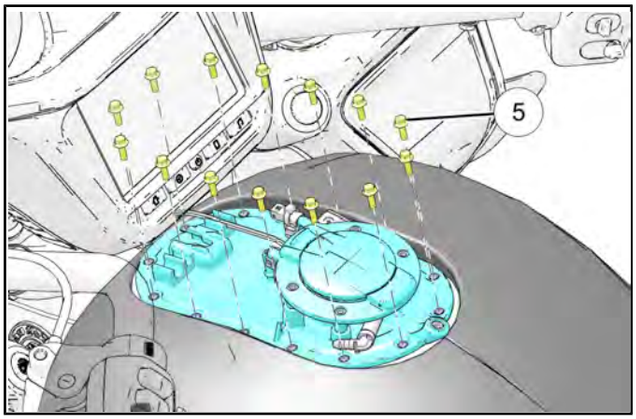
Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made.

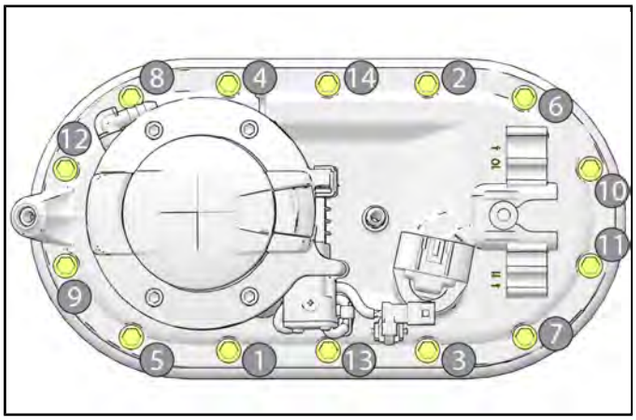
Verify the following:

- Fuel line is properly routed, seated onto the fuel pump access panel, and locked in place.
- Fuel line connector is fully engaged.
- Fuel line connections stay secured when performing push/pull test with at least 5 lbs. of force.

IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL PUMP.

8. Install fuel pump access plate fasteners⑤ and tighten to specification following the torque sequence shown.



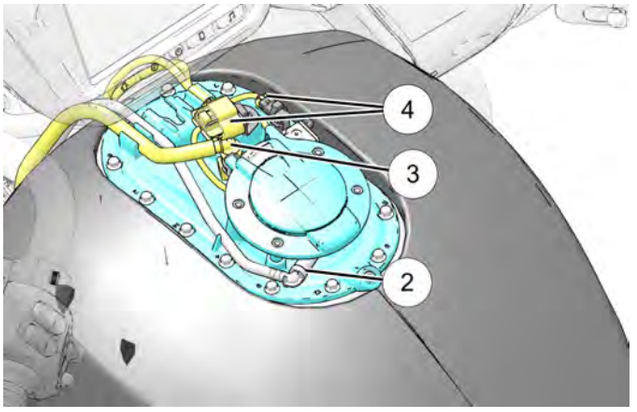


TORQUE

Fuel Pump Access Plate Fastener:
44 in-lbs (5 N·m)

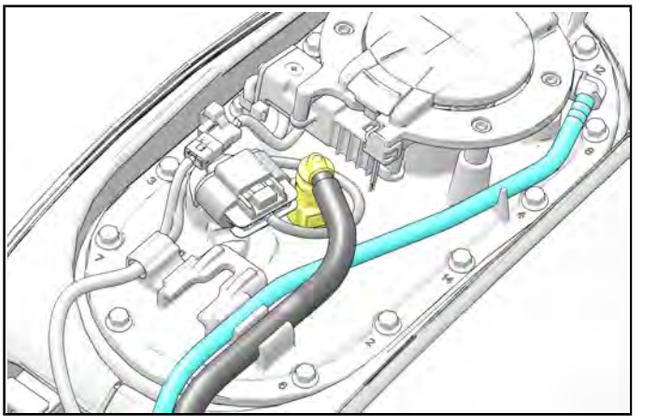
4

9. Connect the electrical connector ④, fuel line ③, and fuel vent line ② to the top of the access plate.

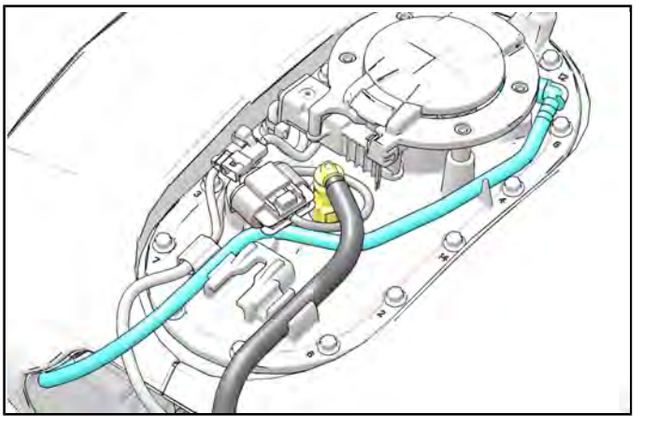


10. Secure fuel line, fuel vent line and wire harness into access plate retaining features.

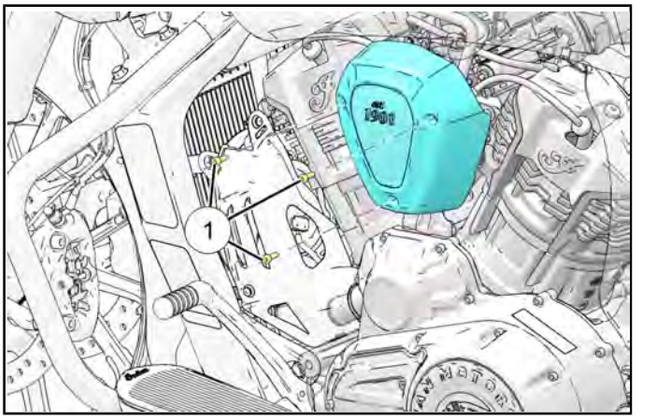
- **49 STATE**



- **50 STATE**



a. Install left side v-cover and secure with its fasteners ①.



TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

STOP!

Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made.

Verify the following:

- Fuel line is properly routed, seated onto the fuel pump, and locked in place.
- Fuel line connector is fully engaged.
- Fuel line connections stay secured when performing push/pull test with at least 5 lbs. of force.

IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.

PRIME THE FUEL SYSTEM

1. Power on the motorcycle, **DO NOT START**.

IMPORTANT

Verify the fuel level noted on the fuel gauge is the same level as noted during "Drain Fuel Tank".

2. Turn stop switch to RUN.
3. Allow switch to remain in RUN position until pump stops running (about 2-3 seconds).

NOTICE

You should hear the fuel pump running to cycle fuel. If you don't, check the electrical connection to the fuel pump.

4. Turn the ignition switch to OFF.
5. *WAIT* approximately 10 seconds.
6. Repeat Steps 4-8 four times to complete the priming procedure.

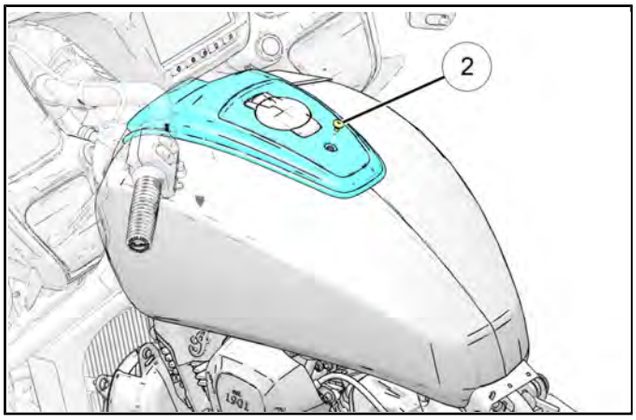
IMPORTANT

a. Start the motorcycle.

b. Verify no fuel leaks are present around the fuel line connectors.

c. Verify proper fuel level indicator function.

7. Fill fuel tank with removed fuel.
8. Install fuel tank console by engaging the front post into its slot and slide rearward. Retain with its fastener ②. Torque to specification.



⚠ CAUTION

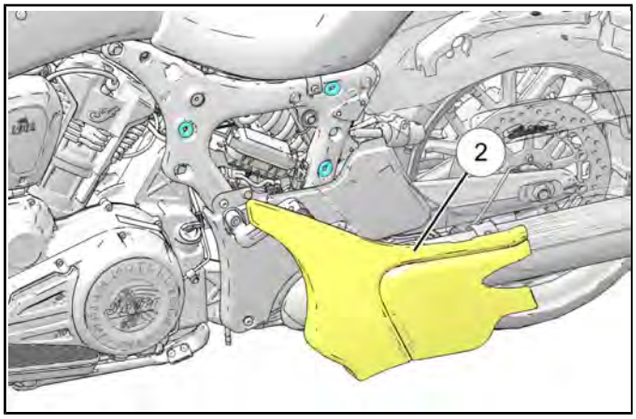
Do not over torque fastener

TORQUE

Fuel Tank Console Fastener:
88 in-lbs (10 N·m)

UPPER SIDE COVER INSTALLATION

1. Install left-side upper side cover ②.



2. Power on motorcycle and check for MIL lights.

4

FUEL TANK INSTALLATION

⚠ CAUTION

Be careful when performing this procedure to avoid damaging the fuel line, electrical wiring, or vent line.

1. Place a protective cloth on the front of the tank when assembling tank to frame.

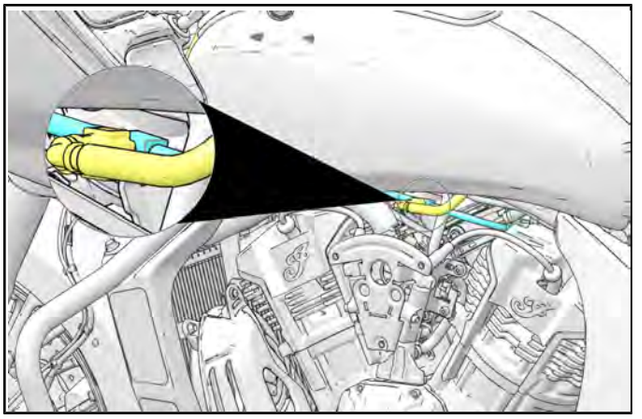
NOTICE

Verify that forward tank isolators are in position on the frame mounts and lower tank onto frame.

⚠ CAUTION

Use care not to damage the vent line and fuel line during installation.

2. Slide tank forward until fully seated on forward isolators. Lower the rear of the tank into position over the rear mounting bracket.
3. Connect the fuel line to the fuel rail.



STOP!

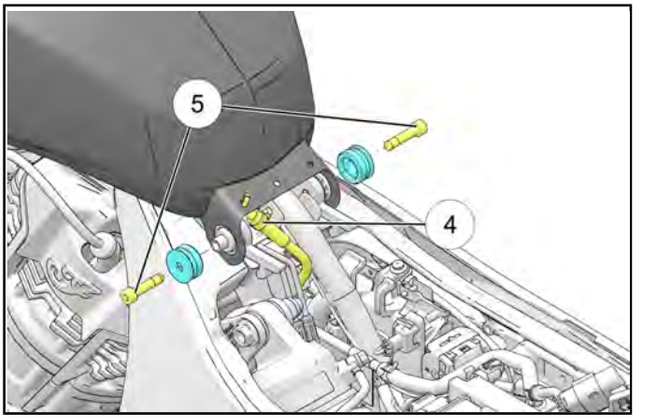
Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made.

Verify the following:

- Fuel line is properly routed, seated onto the fuel rail, and locked in place.
- Fuel line connector is fully engaged.
- Fuel lines connections stay secured when performing push/pull test with at least 5 lbs. of force.

IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.

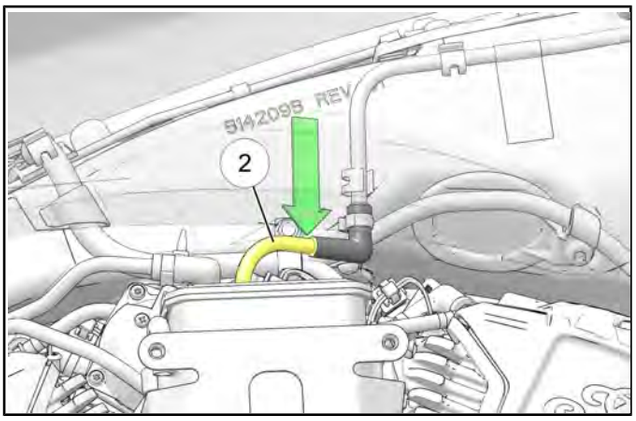
4. Install isolators and fuel tank fasteners ⑤.



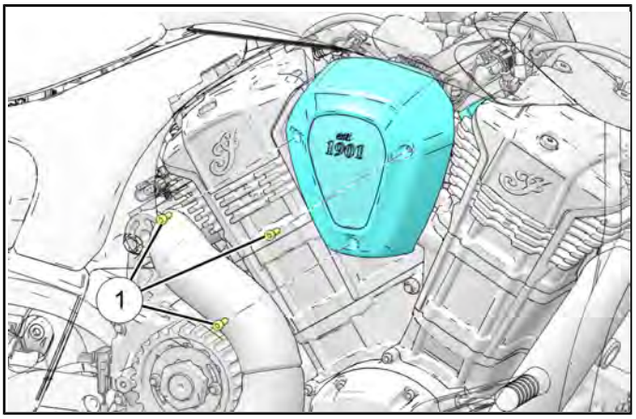
TORQUE
Fuel Tank Mounting Fasteners: **18 ft-lbs (24 N·m)**

5. Connect fuel vent line.
   - **49 STATE:** Connect the fuel vent line ④ to the fuel tank.
   - **50 STATE:**

- Connect evaporative emissions load line ② to the elbow.

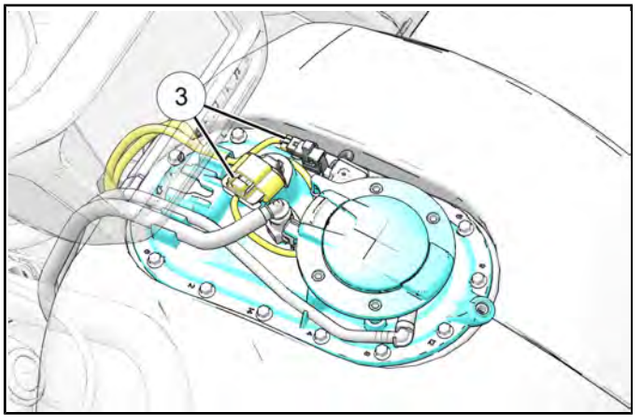


- Install right side v-cover and secure by installing its fasteners ①. Torque to specification.



TORQUE
V-Cover Fasteners: **88 in-lbs (10 N·m)**

6. Connect the electrical connectors ③.



⚠ CAUTION
Verify electrical connectors are properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on the connector to make sure a proper connection has been made.

PRIMING THE FUEL SYSTEM

1. Power on the motorcycle, **DO NOT START**.

IMPORTANT
Verify the fuel level is above a half tank.

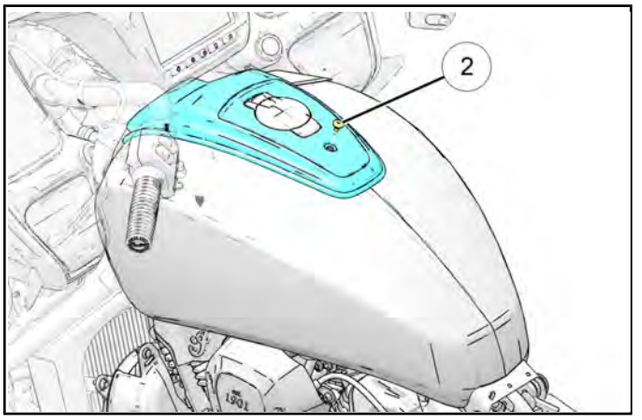
2. Turn stop switch to RUN.
3. Allow switch to remain in RUN position until pump stops running (about 2-3 seconds).

NOTICE
You should hear the fuel pump running to cycle fuel. If you don't, check the electrical connection to the fuel pump.

4. Turn the ignition switch to OFF.
5. *WAIT* approximately 10 seconds.
6. Repeat Steps 4-8 four times to complete the priming procedure.

IMPORTANT
a. Start the motorcycle. b. Verify no fuel leaks are present around the fuel line connectors. c. Verify proper fuel level indicator function.

7. Install fuel tank console by engaging the front post into its slot and slide rearward. Retain with its fastener ②. Torque to specification.

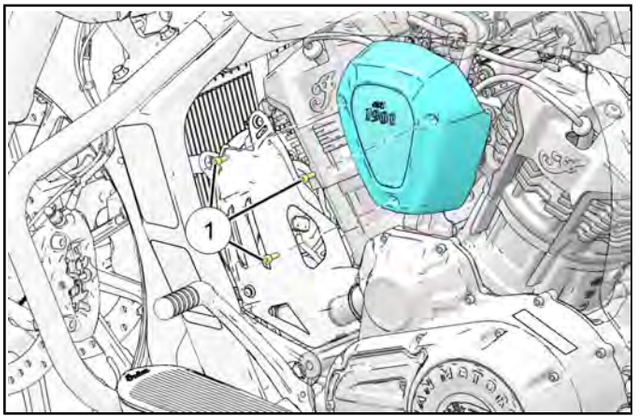


⚠ CAUTION

Do not over torque fastener

TORQUE
Fuel Tank Console Fastener: **88 in-lbs (10 N·m)**

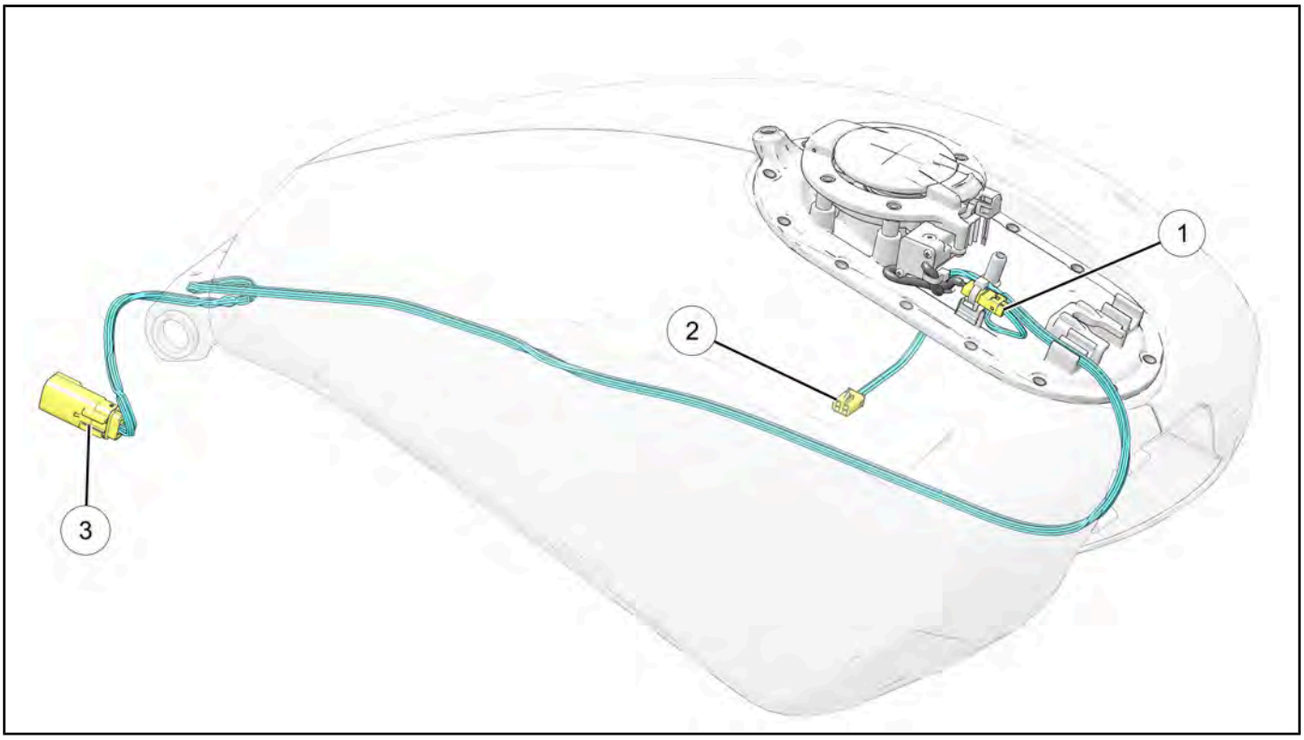
8. Install left side v-cover and secure with its fasteners ①.



TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

9. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

FUEL TANK HARNESS



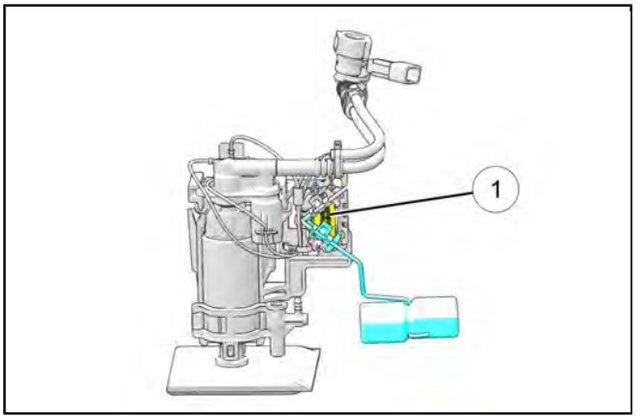
ITEM	DESCRIPTION
①	FTC
②	Fuel Pump
③	Chassis-Fuel

WIRE COLOR	FROM COMPONENT	TO COMPONENT	FUNCTION
VT/YE	Chassis-Fuel Port 4	Fuel Pump Port C	Fuel Pump Power
BK	FTC Port 4	Chassis-Fuel Port 7	FTC Switch Ground
YE/DG	Chassis-Fuel Port 2	Fuel Pump Port B	Fuel Sensor Output
BK	Chassis-Fuel Port 3	Fuel Pump Port D	Fuel Pump Ground
BK/BU	Chassis-Fuel Port 1	Fuel Pump Port A	Fuel Sensor Ground
OG/DG	Chassis-Fuel Port 5	FTC Port 1	FTC Lock + / Unlock –
DG/OG	FTC Port 2	Chassis-Fuel Port 6	FTC Lock – / Unlock +
DB/OG	FTC Port 3	Chassis-Fuel Port 8	FTC Switch Output

FUEL LEVEL SENSOR RESISTANCE TEST

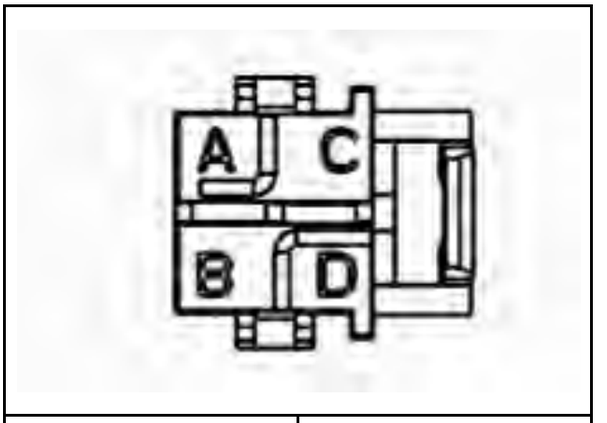
OVERVIEW OF OPERATION:

Fuel level readings are measured by a variable resistance fuel level sensor ①. The fuel level sensor is located inside the fuel tank on the fuel pump.



If fuel level readings are inaccurate when the motorcycle is powered up, or if the fuel gauge isn't indicating fuel level at all, perform the following test and refer to resistance values located at the end of this procedure.

1. Remove the fuel pump. See **Fuel Pump Removal page 4.36**
2. Set multimeter to measure resistance. Attach suitable test probe adaptors to meter leads (**from kit PV-43526**).
3. On the *fuel pump* side of the connector, measure resistance across terminals A & C and compare to the table.



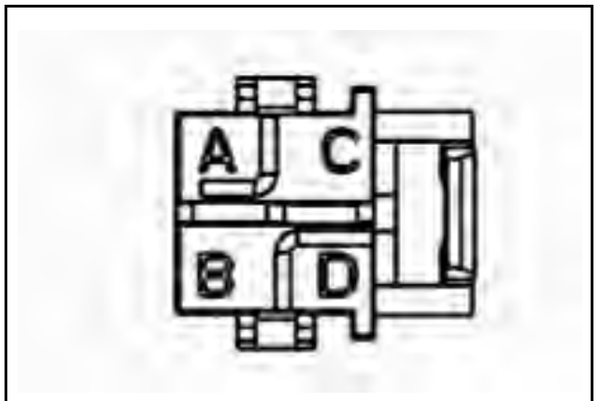
A: Level Sender 1 (Signal Terminal)	C: Level Sender 2 (Larger Terminal)
B: Pump Negative (Larger Terminal)	D: Pump Positive (Small Terminal)

LEVEL SENSOR ARM POSITION	APPROXIMATE RESISTANCE LIMITS
Full (Top of Range)	98–102 Ω
Empty (Bottom of Range)	445–455 Ω

FUEL PUMP SUPPLY VOLTAGE TEST

Before performing this test, verify that battery is fully charged and in good operating condition.

1. Remove the console and access plate. Disconnect the fuel pump / level sensor electrical connector. Reference **Fuel Pump Removal page 4.36**.
2. Connect meter across terminals B & D on the *wire harness* side of connector.



A: Level Sender 1 (Signal Terminal)	C: Level Sender 2 (Larger Terminal)
B: Pump Negative (Larger Terminal)	D: Pump Positive (Small Terminal)

3. Press the POWER ON button to power up the motorcycle electrical system.
4. Turn Engine Stop switch to RUN and read DC voltage on meter when switch is first turned on. Voltage reading should be close to battery voltage for 2-3 seconds after switching Engine Stop switch to RUN.
5. If low or no voltage is delivered to the fuel pump, verify ground wire (Pin D, Black) has good continuity to battery (-) post.
6. If ground is OK, check Gray wire from fuel pump relay to ECM pin #42 . The Gray wire receives a momentary ground from the ECM (for 2-3 seconds) and activates the fuel pump relay which supplies power to the pump on the VT/YE wire.
7. Trace both power and ground circuits to determine fault if battery voltage is not present for 2-3 seconds after power button and STOP / RUN switch are turned on.
8. When a CPS signal is received by the ECM (engine is cranking or running) the ECM maintains the ground on Pin 42 (Gray wire), keeping the pump powered.

FUEL PUMP CURRENT DRAW TEST

NOTICE

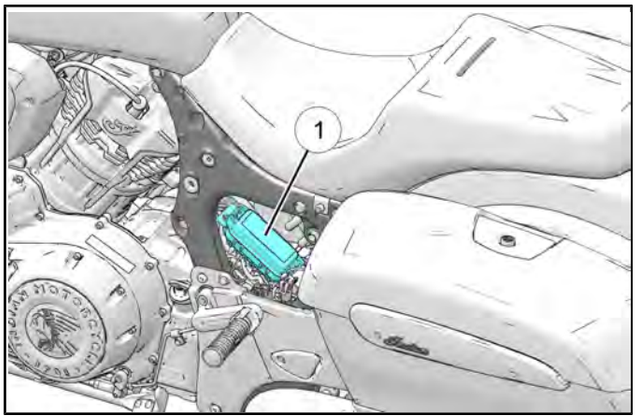
Fuel pump current draw is an indicator of pump condition. Perform draw test if fuel pump operation is suspect, or if fuel pump fuse is found open (blown).

NOTICE

When meter leads are inserted the pump will run, and current draw will be displayed on the meter, even with key and stop switch off. Fuel tank must be completely installed and have enough fuel in it to cover the fuel pickup screens for an accurate test.

1. Remove left upper side cover. See **Side Cover (Upper), Removal page 7.100**.

1. Locate fuse box ①.



2. Remove fuel pump relay.
3. Set meter to DC Amps. Be sure red meter lead is in the 10A jack, and black meter lead is in common (-) jack.
4. Insert one meter lead in pin socket (20) and other meter lead in pin socket (24) of relay block. See **Fuse Application Chart page 10.81**.
5. Read fuel pump current draw on meter and compare to specification.
6. Inspect fuel pump circuit wiring or replace fuel pump if current draw exceeds specification.

SPECIFICATION: Fuel Pump Current Draw
Maximum: 6 DC Amps

PRIMING THE FUEL SYSTEM

PRIMING THE FUEL SYSTEM

1. Power on the motorcycle, **DO NOT START**.

IMPORTANT
Verify the fuel level is above a half tank.

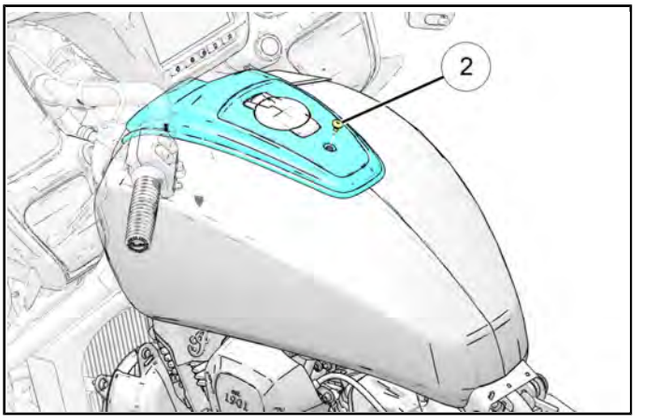
2. Turn stop switch to RUN.
3. Allow switch to remain in RUN position until pump stops running (about 2-3 seconds).

NOTICE
You should hear the fuel pump running to cycle fuel. If you don't, check the electrical connection to the fuel pump.

4. Turn the ignition switch to OFF.
5. *WAIT* approximately 10 seconds.
6. Repeat Steps 4-8 four times to complete the priming procedure.

IMPORTANT
a. Start the motorcycle.
b. Verify no fuel leaks are present around the fuel line connectors.
c. Verify proper fuel level indicator function.

7. Install fuel tank console by engaging the front post into its slot and slide rearward. Retain with its fastener ②. Torque to specification.



⚠ CAUTION
Do not over torque fastener

TORQUE
Fuel Tank Console Fastener: **88 in-lbs (10 N·m)**

9860001 R01 - 2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus Service Manual

EFI SERVICE

FUEL INJECTION SYSTEM – OVERVIEW OF OPERATION

The Electronic Fuel Injection (EFI) system functions to provide the engine with precisely metered fuel under varying loads and conditions.

The Engine Control Module or "ECM", is located beneath the battery box. It is programmed to provide the correct fuel/air mixture and ignition timing based on several sensor input signals (engine load, temp, altitude, manifold pressure etc.). The ECM also provides grounds or voltage to other *EFI related* circuits of the electrical and fuel delivery systems.

An Electronic Throttle Control (ETC) system takes the place of a conventional, cable-operated throttle body. The ETC controls throttle blade angle and provides rate-of-change feedback to the ECM.

The ETC also serves as a plausibility check for the TMAP sensor. The MAP portion of the TMAP sensor is the primary air flow and load sensing device.

An electric fuel pump, mounted inside the fuel tank supplies fuel pressure to the injectors continuously when the engine is running or cranking. A pressure regulator incorporated on the pump keeps fuel pressure steady at approximately 4.0 Bar (400 kPa / 58 PSI). The fuel pump cycles "ON" for 2-3 seconds when the motorcycle is powered up and the Engine Stop switch is turned ON to pressurize the system for start-up.

The fuel injectors inject fuel when they are grounded by drivers inside the ECM. The duration of an injector pulse (length of time the injector circuit is grounded) is controlled by the ECM. Pulse duration determines the amount of fuel delivered to the engine (longer cycles = more fuel). The ECM selects the correct fuel injector pulse by calculating the airflow from the MAP sensor measurement and referencing a three dimensional "map" for the desired air-to-fuel ratio (AFR). The ECM calculates an injection time based on the measured airflow and desired AFR.

Although TMAP and engine RPM are the most influential inputs for selecting a map reference point, the ECM also evaluates feedback from minor sensors in the system, to obtain a more accurate "picture" of the fuel needs at any given moment.

The fuel control system is closed loop. When the engine is at a warm idle and typical cruising engine speeds and loads, the ECM will operate in "closed loop fuel control" mode. The oxygen sensors in each headpipe will provide feedback to the ECM and the injection time will be adjusted for each cylinder to achieve the target AFR.

REAR CYLINDER DEACTIVATION

Designed as an aid to reduce engine and exhaust heat to the rider, Rear Cylinder Deactivation turns off the rear cylinder when the engine gets hot.

The following condition must be met for Rear Cylinder Deactivation to be enabled.

- Engine must be up to operating temperature
- Ambient Temperature must exceed 15 C
- Engine speed must remain below 1000 rpm
- Throttle must be in the closed position (0% throttle)

ECM CONNECTOR MAP

PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
101	—	—	201	GY/YE	Rear Heated Oxygen Sensor Control
102	BN/PK	TMAP 5V Feed	202	YE/BK	Transmission Gear Position Sensor Output
103	—	—	203	—	—
104	—	—	204	—	—
105	—	—	205	—	—
106	—	—	206	—	—
107	—	—	207	—	—
108	—	—	208	—	—
109	RD	Knock Sensor Feed	209	PK	Ignition 1
110	BK	Knock Sensor Return	210	BN/DB	TPS 5V Reference
111	PK/DB	Brake Light Feed	211	RD/BU	GSS 5V Reference
112	DG/YE	Tail Light Feed	212	PK/RD	ETC Motor Positive
113	—	—	213	WH	CPS Positive Signal
114	—	—	214	BK	CPS Negative Signal
115	—	—	215	OG/DG	IAT Sensor Output
116	—	—	216	OG/BN	MAP Sensor Ouput
117	—	—	217	—	—
118	—	—	218	—	—
119	DP/PK	Run/Stop Switch Output	219	—	—
120	BG/BK	Sidestand Switch Signal	220	GY	Fuel Pump Relay Control
121	—	—	221	OG/BN	Starter Relay Control
122	—	—	222	VT/RD	Pedal Position Sensor 1 5V Reference
123	DB	Front Left Turn Signal Lamp Output	223	WH/YE	Pedal Position Sensor 2 5V Reference
124	DB/RD	Front Right Turn Signal Lamp Output	224	YE	ETC Motor Negative
125	—	—	225	BG/WH	Rear Oxygen Sensor Return
126	OG/DB	Front Right Position Control Feed	226	BN/WH	TPS Return
127	—	—	227	GY/YE	Pedal Position Sensor 2 Return
128	—	—	228	GY/DB	Rear Heated Oxygen Sensor Output
129	—	—	229	YE	CANA High
130	—	—	230	DG	CANA Low
131	GY/RD	Front Oxygen Sensor Output	231	—	—
132	BG	Front Heated Oxygen Sensor Return	232	GY/RD	Pedal Position Sensor 2 Output
133	—	—	233	OG/DB	Cylinder Head Temp Sensor Output
134	—	—	234	GY/BK	Engine Relay Control

PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
135	DB	Rear Left Turn Signal Lamp Output	235	VT/YE	Pedal Position Sensor 1 Output
136	DB/RD	Rear Right Turn Signal Lamp Output	236	BK/DG	Fuel Level Sensor Output
137	DG	CANB Low	237	BN/GN	Map Sensor Return
138	YE	CANB High	238	WH/RD	Pedal Position Sensor 1 Return
139	GN	Front Left Position Control Feed	239	YE/RD	Trunk Brake Lamp Feed
140	—	—	240	DB/BK	Canister purge Valve Feed
141	PK/BK	Starter Relay Coil Feed HSD	241	WH/DB	Front Fuel Injector Driver
142	—	—	242	WH/GY	Rear Fuel Injector Driver
143	OG/BN	CHT Return	243	YE/VT	Rear Brake Switch Output
144	BK/BU	Fuel Sender Ground	244	—	—
145	—	—	245	VT/RD	TPS 2 Signal
146	—	—	246	GY/DB	Rear Oxygen Sensor Output
147	—	—	247	OG/DB	Ambient Air Temperature Sensor Output
148	WH/OG	Trunk Tail Light Power	248	OG/YE	TPS 1 Output
149	—	—	249	VT/PK	Engine Relay Output
150	—	—	250	VT/PK	Engine Relay Output
151	—	—	251	BK/WH	ECM Ground
152	BK/GN	Gear Position Ground	252	BK/WH	ECM Ground
153	BKWH	Ambient Air Temperature Ground	253	GY	Rear Coil Signal
154	BK/WH	ECM Ground	254	WH	Front Coil Signal
155	GY/WH	Oxygen Sensor Control	255	—	—
156	—	—	256	—	—

TROUBLE CODES

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
84	2	Vehicle Speed Sensor	Speed signal from ABS Module is not valid	Check Wheel Speed Sensors in ABS Module	—
168	0	System Power	Data Valid But Above Normal Operational Range - Most Severe Level	Check Voltage Regulator and Battery	**P156A**
	1		Data Valid But Below Normal Operational Range - Most Severe Level	Check Voltage Regulator, Stator, Battery and Battery Connections, and Right Hand Control connection	**P156B**
	17		Data Valid But Below Normal Operating Range - Least Severe Level	Check Voltage Regulator, Stator, Battery and Battery Connections, and Left Hand Control connection	—
	18		Data Valid But Below Normal Operating Range - Moderately Severe Level	Check Voltage Regulator, Stator, Battery and Battery Connections, and WCM connection	**P1565**
190	2	Engine Speed	Data erratic, intermittent or incorrect	Check hand control connection check ECM connection, check CANbus for physical issues	**C184C**
	2		Data erratic, intermittent or incorrect		**C185C**
	19		Received Network Data In Error	Check ECM, check Crank Position Sensor, check CANbus for physical issues	—
630	14	Calibration	Special Instructions	Check WCM for proper software	**U2608**

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
1195	2	ATR Password Valid Indicator	Data Erratic, Intermittent Or Incorrect	Cycle Ignition. Then remove battery from WCM if IGN cycling doesn't work.	**U2609**
1196	9	ATR Component Status State	Abnormal Update Rate	Check ECM connection, check WCM connection, check CANbus for physical issues	**U260A**
	19		Received Network Data In Error	Cycle Ignition. Then remove battery from WCM if IGN cycling doesn't work.	**U260B**
1487	19	Illumination Brightness Percent	Received Network Data In Error	Check Tachometer connection, check VCM1 connection, check CANbus for physical issues	—
2348	5	High Beam Lamp	Current Below Normal Or Open Circuit	Check Headlight High Beam for proper lamp function. Check High Beam Wiring for open circuits	—
	6		Current Above Normal Or Grounded Circuit	Check Headlight High Beam for proper lamp function. Check High Beam Wiring for shorted circuits	—
2350	5	Low Beam Lamp	Current Below Normal Or Open Circuit	Check Headlight Low Beam for proper lamp function. Check Low Beam Wiring for open circuits	—
	6		Current Above Normal Or Grounded Circuit	Check Headlight Low Beam for proper lamp function. Check Low Beam Wiring for shorted circuits	—

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
65559	11	CAN1 Bus Hardware	Root Cause Not Known	Check WCM connection, check CANbus for physical issues	**U260C**
	31		Condition Exists	Cycle Ignition. Replace ABS module if Ignition cycling does not fix	**C1130**
	31		Condition Exists	Check all controller connections, check CANbus for physical issues	—
	31		Condition Exists	Check all controller connections, check CANbus for physical issues	—
516097	23	p Module Control Message CRC	Checksum Error	Cycle Ignition, check CANbus wiring, check WCM and all VCM connections	**U260D**
	23		Checksum Error	Cycle Ignition, check CANbus wiring, check WCM and VCM1 connections	—
516115	12	Internal Inertial Measurement Unit	Bad Intelligent Device Or Component	Replace VCM1	—
516116	9	CAN Message PGN 65382	Abnormal Update Rate	Cycle Ignition, check CANbus wiring, check ABS and ECM connections	**U260E**
	9		Abnormal Update Rate		—
	9		Abnormal Update Rate		—
516118	9	CAN Message PGN 65314	Abnormal Rate		**U1109**
516120	9	CAN Message PGN 65265	Abnormal Update Rate	Cycle Ignition, check CANbus wiring, check VCM1 and ABS connections	**U1106**
	9		Abnormal Update Rate		**U260F**
	9				—

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
516121	9	CAN Message PGN 61445	Abnormal Update Rate	Cycle Ignition, check CANbus for physical issues	**U1111**
516125	11	CAN 1	Root Cause Not Known	Cycle Ignition, check CANbus for physical issues	—
	11		Root Cause Not Known		—
516132	31	p Horn Switch	Condition Exists	Check connection at WCM and Left Hand Control, check CANbus for physical issues	—
516136	31	CAN Message Missing - PGN 61441	Condition Exists	Check ABS, Display, and ECM conntections, check CANbus for physical issues	**U1112**
516185	9	PGN_65286	Abnormal Update Rate	Check VCM1 and LHC connection, check CANbus for physical issues	**U2612**
516186	9	PGN_65381	Abnormal Update Rate	Check VCM1 and LHC connection, check CANbus for physical issues	—
	9		Abnormal Update Rate	Check VCM2 and LHC connection, check CANbus for physical issues	—
516197	5	Fuel Lock Motor Driver	Current Below Normal Or Open Circuit	Check Fuel Door Lock actuator physical actuation. Check Fuel Door Lock wiring for short to ground	—
	6				
516198	31	Non-Configurable Address Claim Conflict	Condition Exists	Check to ensure VCM1 and VCM2 are in the correct locations. Check VCM1 and VCM2 for proper software. Check for proper VCM2 location pin connection	**C2314**
	31		Condition Exists		**C2311**

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
516199	31	Configurable Address Claim Conflict	Condition Exists	Check to ensure only one VCM1 is connected. Check VCM1 and VCM2 for proper software. Check for proper VCM2 location pin connection	**C2300**
	31		Condition Exists		**C2301**
516200	31	Software Hardware Mismatch	Condition Exists	Check to ensure VCM's are installed in correct locations	**C2307**
	31		Condition Exists		**C2304**
516201	31	Can't Set Source Address	Condition Exists	Check VCM location pin for physical fault	**C230D**
516202	31	ECU Security Status	Condition Exists	Cycle Ignition, unlock vehicle through other method	—
	31		Condition Exists		—
516203	3	LF Antenna Driver	Voltage Above Normal, Or Shorted To High Source	Check Antenna wiring for shorts to ground. Replace Antenna	**C24C7**
	4		Voltage Below Normal, Or Shorted To Low Source		**C24C8**
	5		Current Below Normal Or Open Circuit		**C24C9**
516207	5	Puddle Light Driver	Current Below Normal Or Open Circuit	Check Puddle Light for proper lamp function. Check Puddle Light wiring for Open circuits	—
	6		Current Above Normal Or Grounded Circuit		—
516240	31	ECU	Condition Exists	Cycle Ignition. Replace WCM.	**C24CA**
520138	31	TC Manually Disabled	Condition Exists	Turn Traction Control back On. Cycle Ignition	**C2434**
520139	9	pTSCF1	Abnormal Update Rate	Check ABS and ECM connections. Check CANbus for physical issues	**U0136**
	22		Counter Error		**U0137**
	23		Checksum Error		**U0138**

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
520141	31	CAN1 Bus Wiring	Condition Exists	Check ABS connection, Check CANbus for physical issues	**C2438**
520293	5	Horn	Current below normal or open circuit	Check Horn functionality -Check Horn wiring for Open Circuit condition -Cycle Ignition	—
	6		Current normal or grounded circuit		—
520294	5	Windshield Motor driver	Current below normal or open circuit	Check Windshield Motor functionality. Check Windshield Motor wiring for Open Circuit condition. Cycle Ignition	—
	6				—
520295	2	Windshield Motor Switch	Data Erratic, Intermittent Or Incorrect	Check Windshield Up/ Dwn Switch for proper operation. Replace Hand Control if issue persists.	**C1749**
520297	31	System On Button	Condition Exists	Check Power Button for proper mechanical operation -Check Power Button for proper electrical operation. Check power button and wire harness for short circuits of the Power Button output	**C24CB**
520299	5	Power Lock Motor	Current Below Normal Or Open Circuit	Check Saddlebag Lock actuator connections. Check Saddlebag Lock wiring for Open Circuit or short to battery	—
	6		Current Above Normal Or Grounded Circuit	Check Saddlebag Lock actuator physical actuation. Check Fuel Door Lock wiring for short to ground	

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
520304	12	Key Fob	Bad Intelligent Device Or Component	Replace Key Fob battery	**P1634**
520312	2	Power Lock Motor Swtich	Data Erratic, Intermittent Or Incorrect	Check Saddlebag lock switch for proper function -Check Saddlebag lock switch wiring for defects	—
520329	9	pOperator Switch Status (pOSS1)	Abnormal Update Rate	Check VCM1 and LHC connection, check CANbus for physical issues	—
520361	9	Requested Percent Fan Duty Cycle	Abnormal Update Rate	Cycle Ignition, Check VCM2 and ECM connection, check CANbus for physical issues	—
	19		Received Network Data In Error	Check VCM2 and ECM for proper software and calibrations	—
520504	5	Primary Fan Driver	Current Below Normal Or Open Circuit	Check for proper Fan operation. Check fan wiring for an Open Circuit	—
	6		Current Above Normal Or Grounded Circuit	Check for proper Fan operation. Check fan wiring for a Short Circuit. Check for debris in Fan	—
524000	19	pEngine Speed	Received Network Data In Error	Reduce Engine speed, check VCM1 and ECM for proper software calibrations	—
524040	2	Run/Stop Switch	Data Erratic, Intermittent Or Incorrect	Check Run/Stop Switch for proper operation. Replace Hand Control if issue persists	**C174B**

SPN	FMI	COMPONENT	CONDITION	ACTION	P-CODE
524042	19	pOperator Button - Chassis Unlock Button Status	Received Network Data In Error	Cycle Ignition, Check VCM1 and WCM software calibrations	—
524047	19	pOperator Button - Horn Switch Status	Received Network Data In Error	Cycle Ignition, Check VCM1 and LHC software calibrations	—
524056	19	High Beam Switch Status	Received Network Data In Error	Cycle Ignition, Check VCM2 and LHC software calibrations	—

SENSOR DIAGNOSTICS

If a sensor fails or reads outside a "normal" range, a "pre-programmed" (default) value is substituted by the ECM until sensor reading returns to normal.

Sensor values can be viewed in Digital Wrench® on the "Sensor Data Grid Or Graphs" screen. Since the sensor reading may either be actual feedback from the sensor OR a default value set by the ECM in the event of a fault in the sensor or wiring, it is important to verify the condition of the sensor.

The Malfunction Indicator Light (MIL) may or may not illuminate to alert the rider of a possible problem, depending on which system fault has occurred. The first step following illumination of the MIL is to perform a visual inspection to see if a cause can be determined.

Connect Digital Wrench® to see what codes are present in memory, and focus your diagnostics on that sensor and the related wiring for that circuit. Refer to wiring diagrams and system break-out diagrams to narrow a problem search.

If multiple codes are set, refer to the wiring diagram and focus your efforts on wiring and connections common to each of the sensors, such as a power supply or common ground. Multiple sensor failure is extremely unlikely.

Many sensor tests described in this section are performed at the ECM wire connector. This method ensures that the data from a sensor is reaching the ECM. Sensor tests can be performed at the sensor if easily accessible, but the wiring between the sensor and the two 56–pin ECM connectors should always be closely examined and the path between the sensor and ECM verified if the sensor itself passes the test.

Poor or corroded connections are the most common cause of system faults. Always check the integrity of the male pins and female receptacles of the connectors in the affected circuit. These may include the sensor connector, the ECM connector, and any wiring between the two, such as jumper harnesses where applicable.

ECM PINOUT TESTING

NOTICE

Tests in this section may require reading resistance and voltages at ECM connector. Once ECM connector has been removed from the ECM:

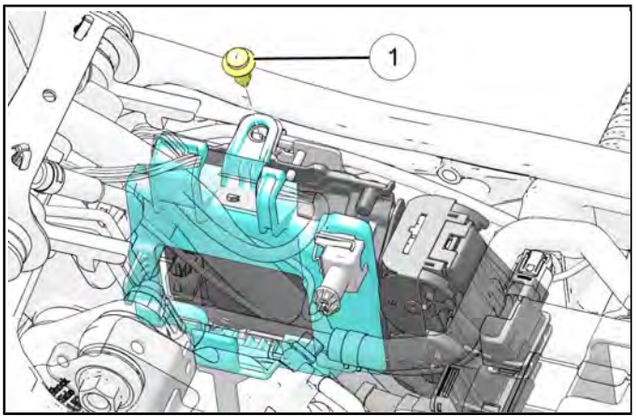
- Do not touch pins on ECM. Static electricity from your body can damage the ECM.
- Do not attempt to perform tests on the ECM unit.
- Always use the appropriate test connector from the Electrical Connector Test Adapter Kit (PV-43526) or an appropriate test probe that will not damage (expand) the connector pin socket.
- DO NOT attempt to use standard meter probes or other devices to probe connector pin sockets. this could expand a terminal socket or damage the connector, create a problem where none existed before, and complicate the diagnostic process.
- Sensor tests on the following pages can often be performed at the sensor connector itself or at the ECM connector based on accessibility of the connector or wiring.
- If a sensor tests within the specified range (OK), then test the circuit wiring. This usually originates at the ECM connectors, but may include other connections.

ECM REMOVAL

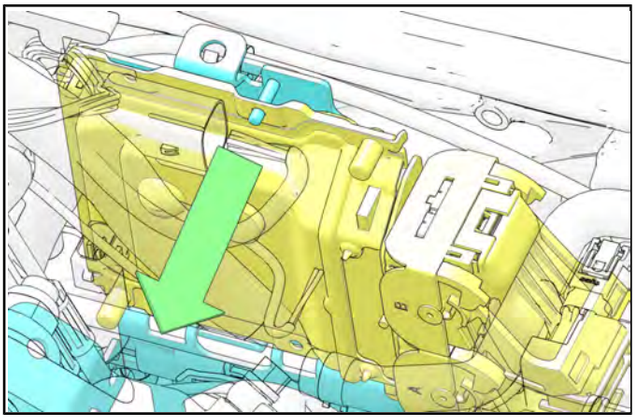
IMPORTANT

Though the ECM appears identical to other heavy weight bike's ECM, they are not interchangeable.

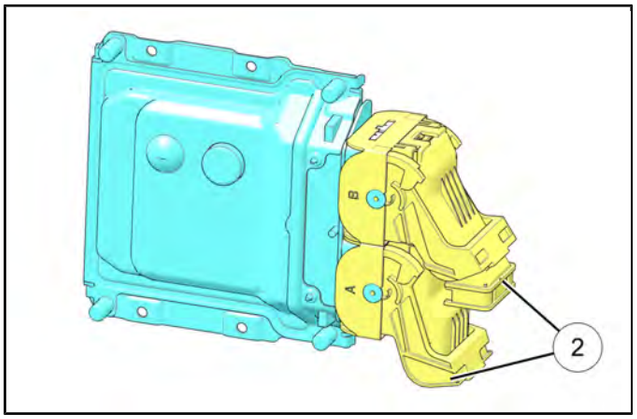
1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove pushdart ① retaining under-seat retention bracket and remove.



3. Slide the ECM off of its pin.



4. Lift the ECM up and disconnect its electrical connections ②.

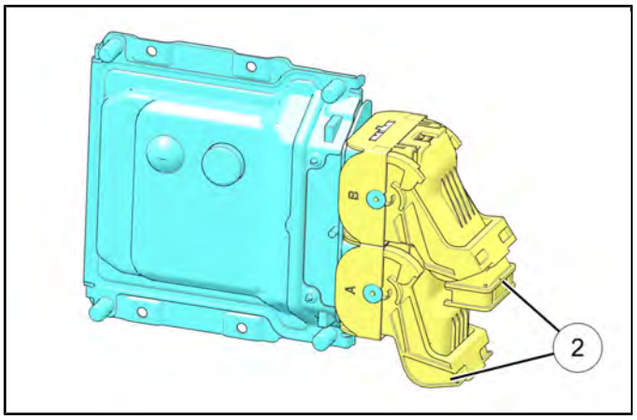


ECM INSTALLATION

IMPORTANT

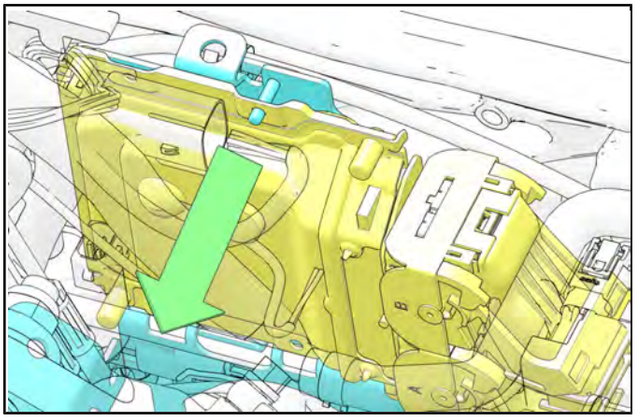
Though the ECM appears identical to other heavy weight bike's ECM, they are not interchangeable.

1. Lift the ECM up and connect its electrical connections ②.

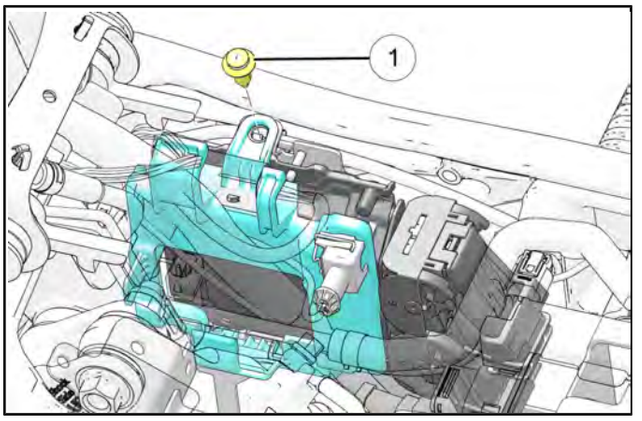


4

2. Slide the ECM onto its pin.



3. Install pushdart ① retaining under-seat retention bracket and install.

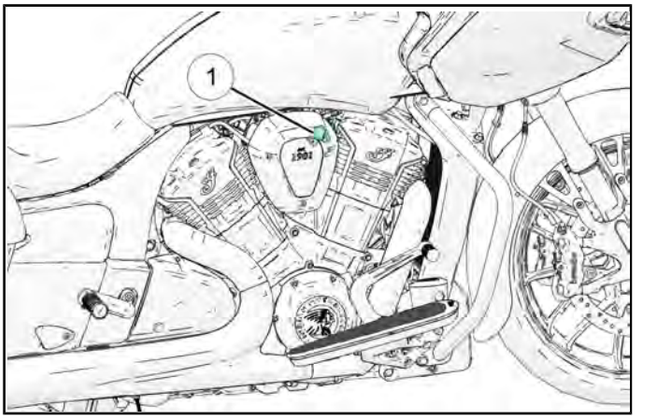


4. Install seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.

TEMPERATURE & MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP)

OPERATION OVERVIEW

Mounted on the intake manifold, the TMAP sensor ① performs two functions in one unit.



Air passing through the intake is measured by the TMAP and relayed to the ECM. These signals, comprised of separate air temperature and manifold absolute pressure readings, are processed by the ECM and compared to its programming for determining the fuel and ignition requirements during operation. The TMAP sensor provides the ECM with engine load data.

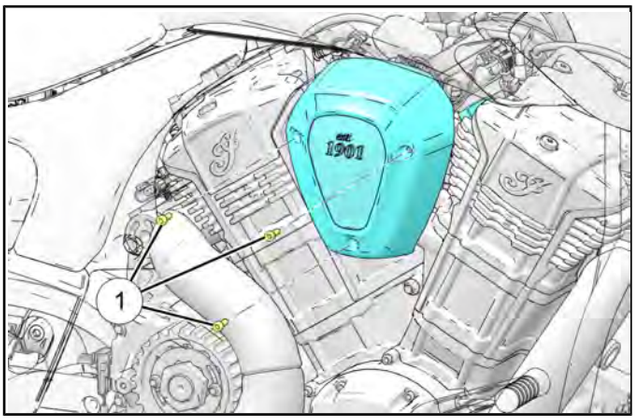
TMAP SENSOR TEST

The TMAP sensor is a non-serviceable item. If it is faulty, it must be replaced

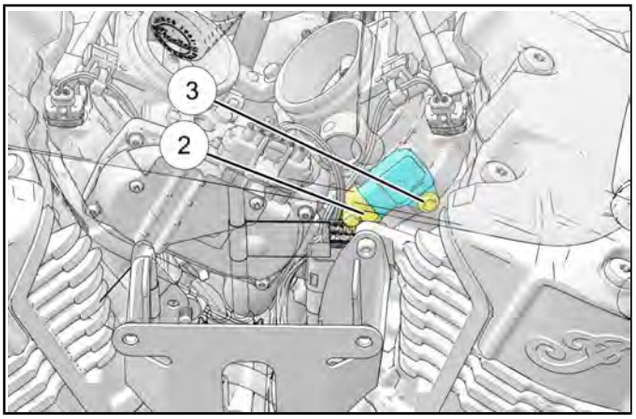
IMPORTANT
This sensor should only be tested using Digital Wrench Diagnostic Software.

TMAP SENSOR REPLACEMENT

1. Remove right side v-cover by removing its fasteners ①.



2. Disconnect the TMAP electrical connector ②.



3. Remove the TMAP sensor fastener ③.
4. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

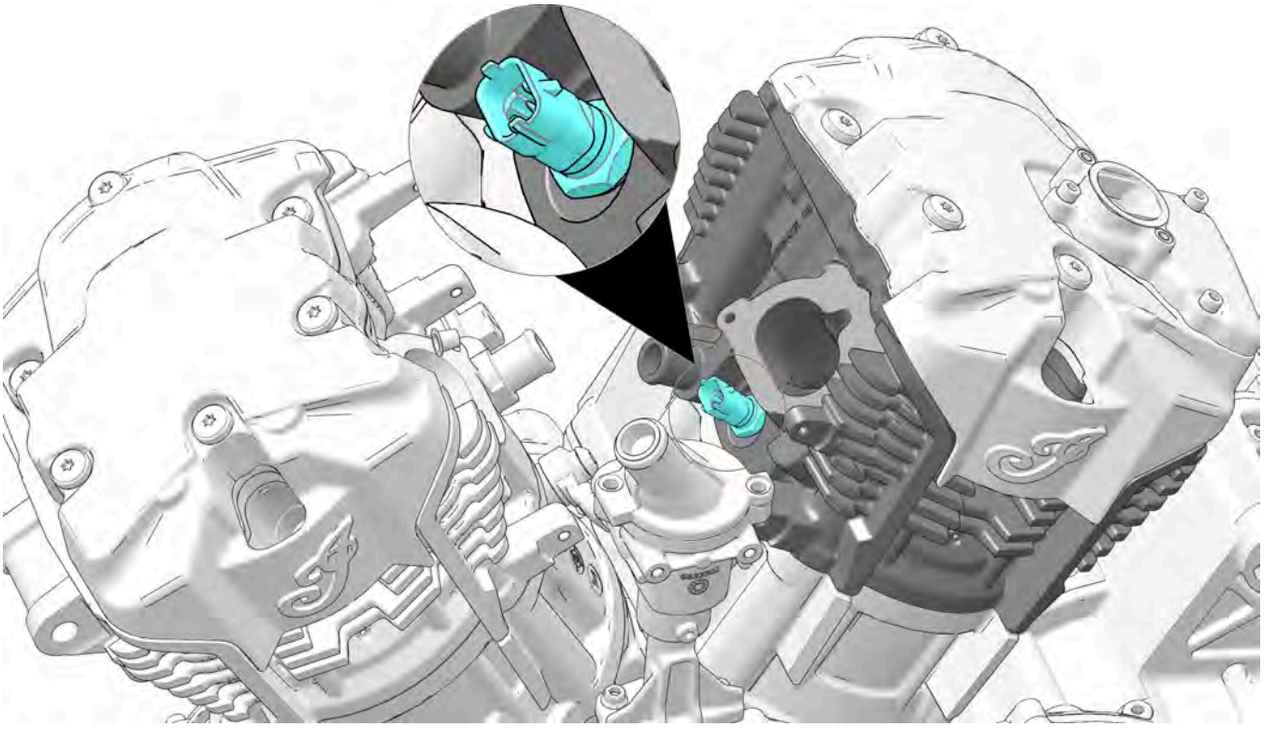
TORQUE
TMAP Sensor Fastener: **18 in-lbs (2 N·m)**

TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

CYLINDER HEAD TEMPERATURE SENSOR, TEST / REPLACE

OPERATION OVERVIEW

CHT TEST OVERVIEW		
INDICATES	**INSPECT**	**LOCATION**
Voltage received at ECM from CHT sensor is outside of parameters.	Resistance readings through sensor and wiring at ECM 2 connector (ECM disconnected). This will test will inspect the wiring, connectors, and CHT sensor resistance.	Under rear cylinder intake port.



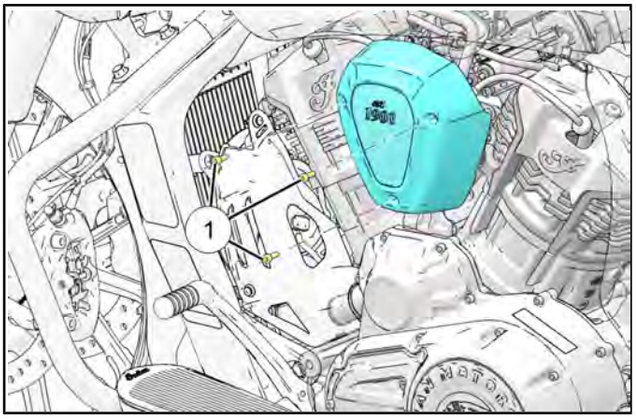
CYLINDER HEAD TEMPERATURE SENSOR TEST

1. Disconnect ECM #2 connector. Reference **ECM Removal page 4.63**.
2. Attach test lead adapters to meter leads.
3. Set multimeter to measure resistance.
4. Measure resistance between pin 43 of the EMC#1 and pin 33 of the ECM #2 connector and compare to specification.
5. If resistance is out of specified range, disconnect sensor and measure the resistance through each wire from ECM connector to the sensor connector. Resistance should be less than 1 Ohm (good continuity).
6. If Step 5 continuity is good, measure the resistance through the sensor and compare to specification.

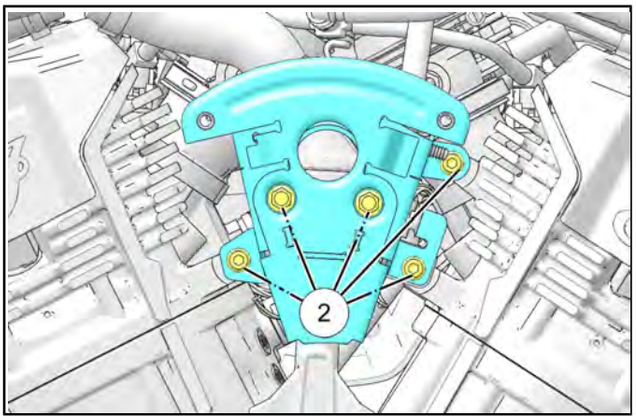
COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10%)
CYLINDER HEAD TEMPERATURE SENSOR	OHMS	Pin #43 to #33	30.5 K Ohms +/- 13% @ 25° C (77° F)

CYLINDER HEAD TEMPERATURE SENSOR REPLACEMENT

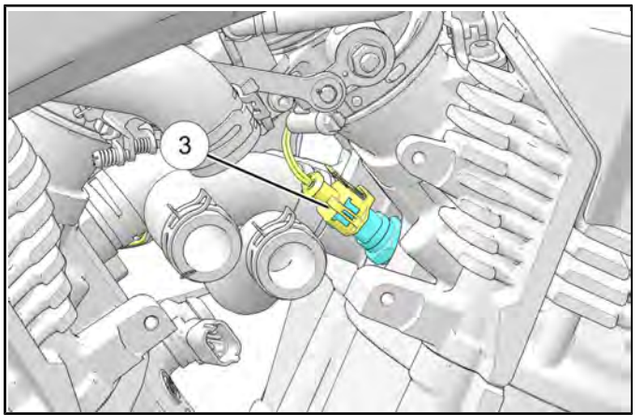
1. Remove left side v-cover by removing its fasteners ①.



2. Remove ignition coils. See **Ignition Coil Removal page 10.50**.
3. Remove fasteners ② securing ignition coil bracket.



4. Disconnect the wiring harness and coolant return line hose from the ignition coil bracket.
5. Remove thermostat. See **Thermostat Removal page 3.48**.
6. Disconnect cylinder head temperature sensor electrical connector ③.



7. Remove cylinder head temperature sensor.

INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Cylinder Head Temperature Sensor: **15 ft-lbs (20 N·m)**

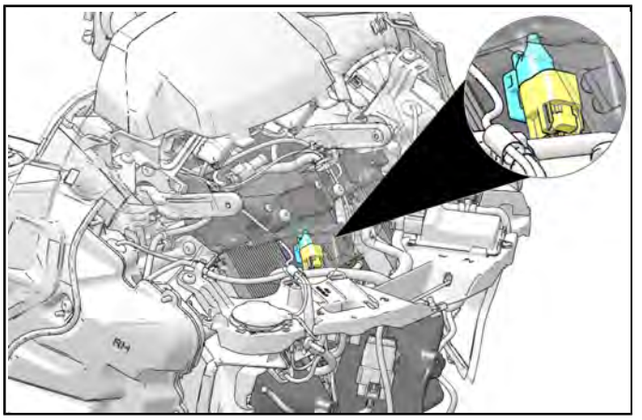
TORQUE
Ignition Coil Bracket: **88 in-lbs (10 N·m)**

TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

4

AMBIENT AIR TEMPERATURE SENSOR

The ambient air temperature sensor is located inside the fairing as shown.



The ambient air temperature sensor can be tested by checking the resistance at different temperatures.

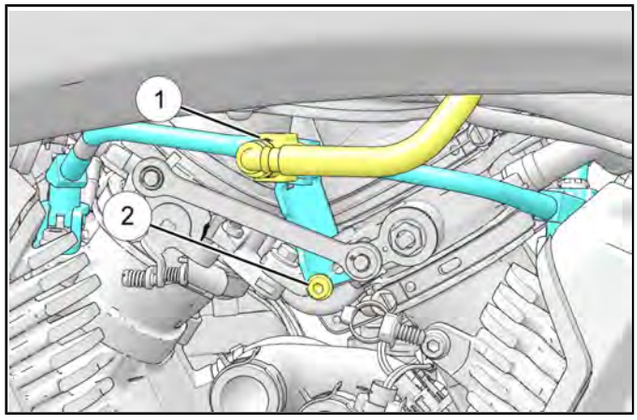
TEMPERATURE (C)	RESISTANCE (k Ohms)
-40	195.652
-20	68.237
0	27.219
20	12.081
40	5.834
60	3.014
80	1.669
85	1.452

FUEL RAIL REMOVAL

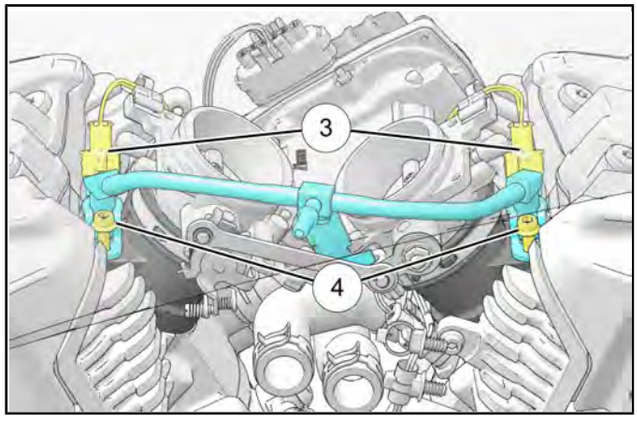
1. Depressurize fuel system. See **Fuel System Depressurization page 4.23**.
2. Remove thermostat assembly. See **Thermostat Removal page 3.48**.
3. Disconnect fuel line ① from fuel rail. Squeeze both release buttons (one on each side of fitting) and hold. Gently slide fitting straight off of fuel rail port.

⚠ CAUTION

Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.



4. Remove the fuel rail fastener ②.
5. Disconnect fuel injector electrical connector ③.



6. Remove fuel injector fastener ④.
7. Remove fuel injectors with the fuel rail.

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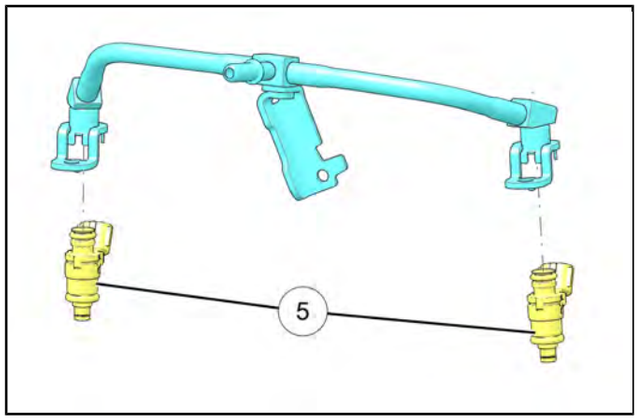
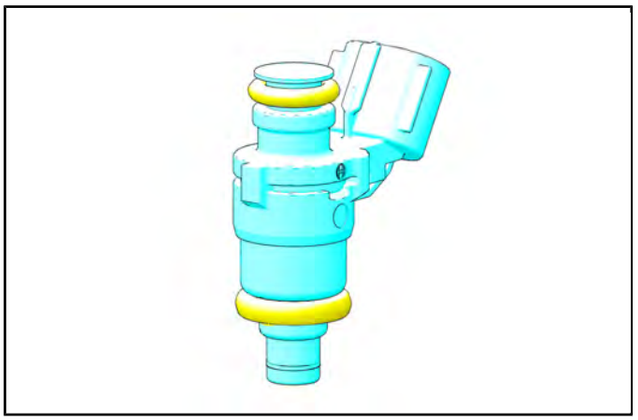
8. Remove the fuel injectors ⑤ from the fuel rail.



FUEL RAIL INSTALLATION

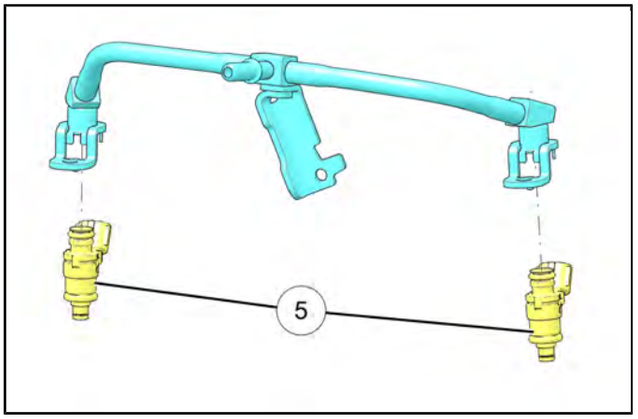
1. Install NEW o-rings onto the fuel injectors.



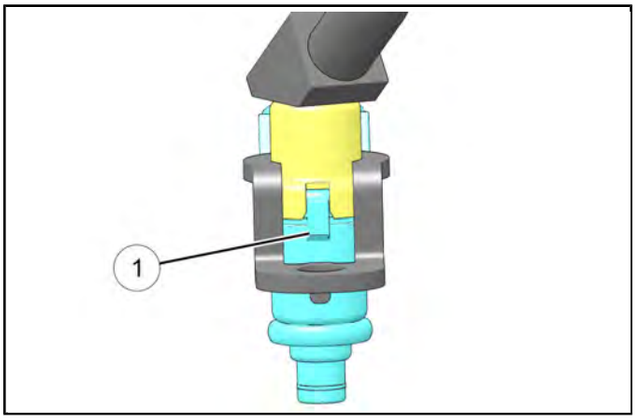
2. Lubricate NEW injector o-rings with clean, silicone-free motor oil.

NOTICE
Apply oil sparingly and avoid contaminating the pintle valve / jet surface and upper inlet port.

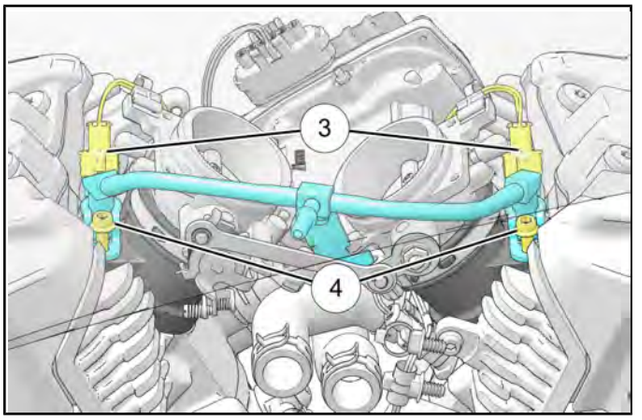
3. Install the fuel injectors ⑤ to the fuel rail.



4. Ensure Injector is positioned so the clocking lug ① fits in the clocking tabs on the fuel rail.



5. Install fuel injector fastener ④. Torque fasteners to specification.



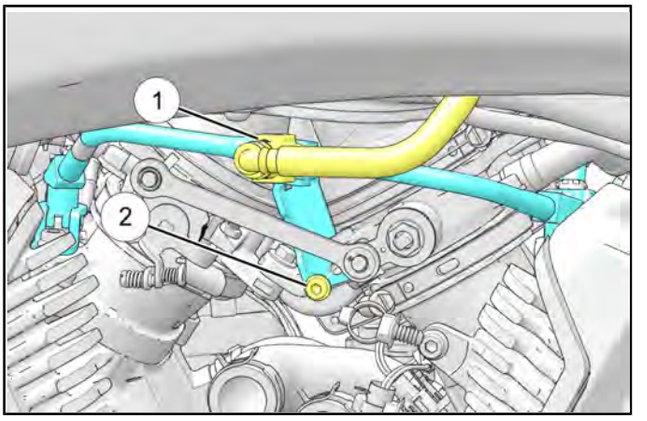
TORQUE
Fuel Injector Fastener: **88 in-lbs (10 N·m)**

6. Connect fuel injector electrical connector ③.
7. Install the fuel rail fastener ②. Torque to specification.

TORQUE
Fuel Rail Fastener: **62 in-lbs (7 N·m)**

8. Connect fuel line ① to fuel rail.

STOP!
Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made. Verify the following: • Fuel line is properly routed, seated onto the fuel rail, and locked in place. • Fuel line connector is fully engaged. • Fuel lines connections stay secured when performing push/pull test with at least 5 lbs. of force. **IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.**



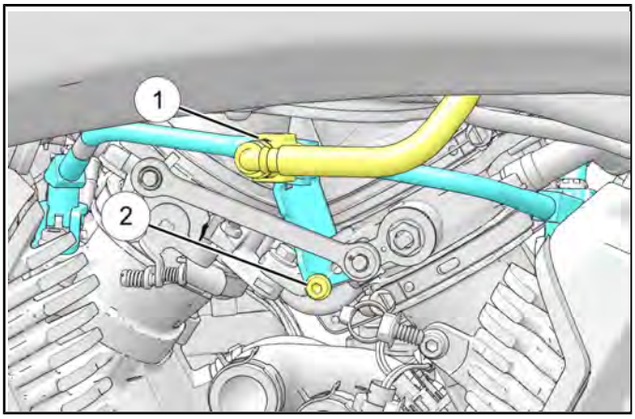
FUEL INJECTOR, REMOVAL

REMOVAL

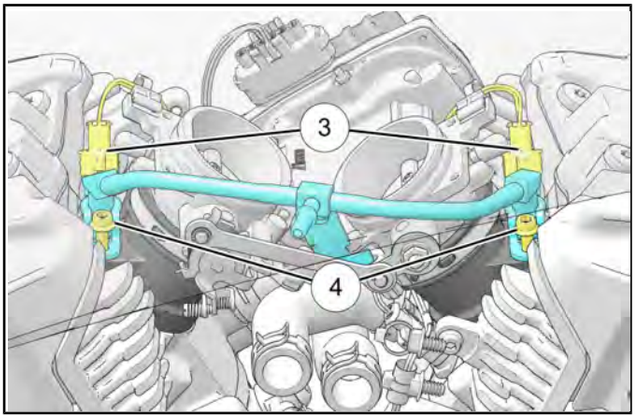
1. Depressurize fuel system. See **Fuel System Depressurization page 4.23**.
2. Remove thermostat assembly. See **Thermostat Removal page 3.48**.
3. Disconnect fuel line ① from fuel rail. Squeeze both release buttons (one on each side of fitting) and hold. Gently slide fitting straight off of fuel rail port.

⚠ CAUTION

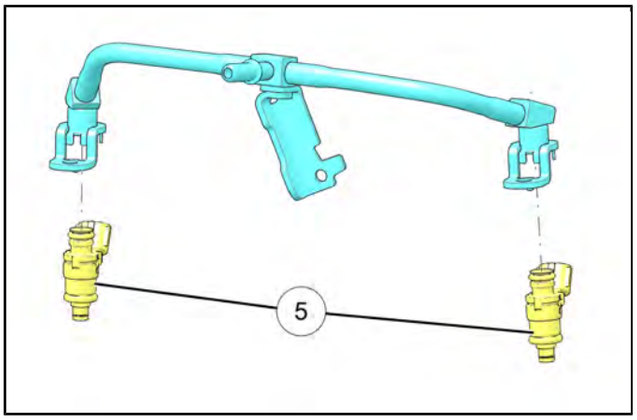
Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.



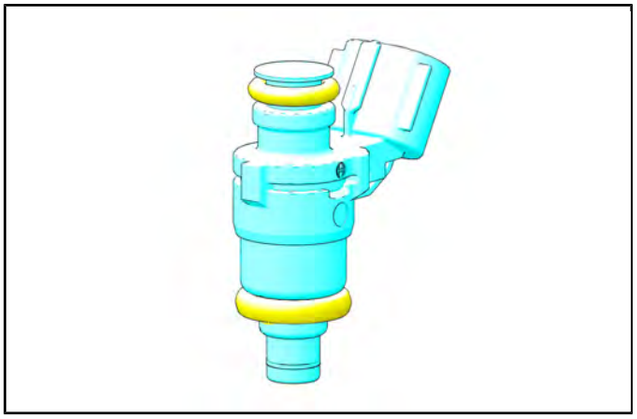
4. Remove the fuel rail fastener ②.
5. Disconnect fuel injector electrical connector ③.



6. Remove fuel injector fastener ④.
7. Remove fuel injectors with the fuel rail.
8. Remove the fuel injectors ⑤ from the fuel rail.



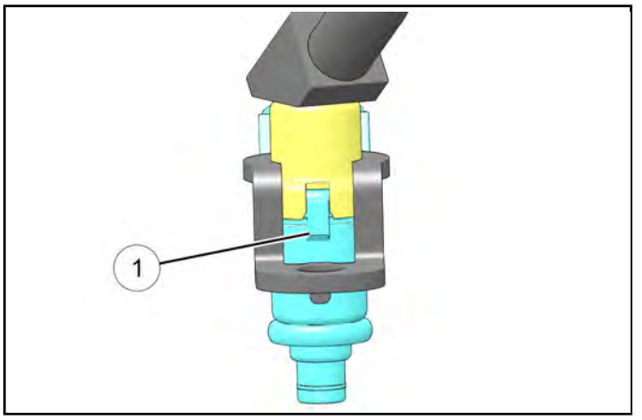
9. Inspect the fuel injector o-rings.



4

FUEL INJECTOR, INSTALLATION

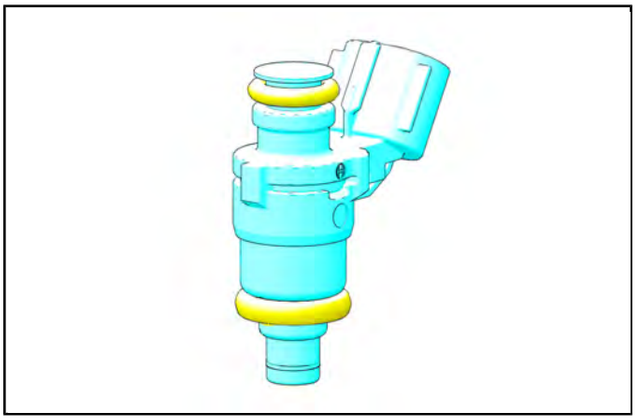
1. Ensure Injector is positioned so the clocking lug ① fits in the clocking tabs on the fuel rail.



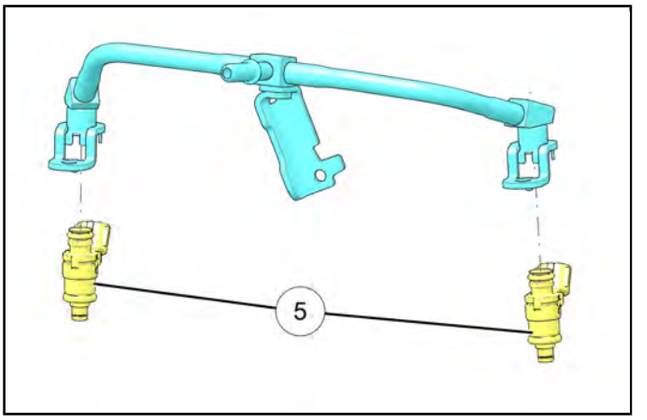
2. Lubricate NEW injector o-rings with clean, silicone-free motor oil.

NOTICE
Apply oil sparingly and avoid contaminating the pintle valve / jet surface and upper inlet port.

3. Inspect the fuel injector o-rings.



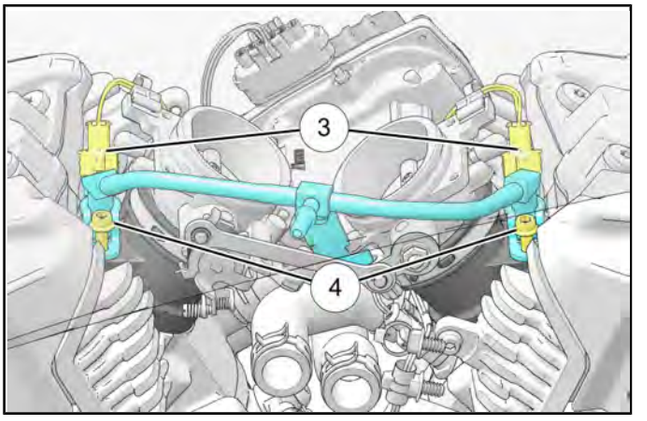
4. Install the fuel injectors ⑤ onto the fuel rail.



5. Install fuel injectors with the fuel rail.
6. Install fuel injector fastener ④.

TORQUE
Fuel Injector Fastener: **88 in-lbs (10 N·m)**

7. Connect fuel injector electrical connector ③.



8. Install the fuel rail fastener ②.

TORQUE
Fuel Rail Fastener: **62 in-lbs (7 N·m)**

9. Connect fuel line ① onto fuel rail.

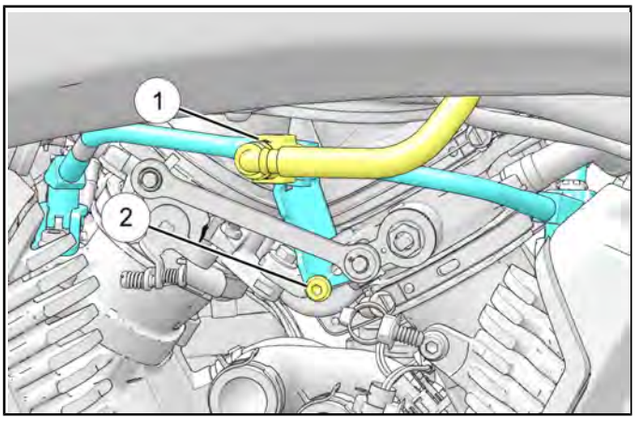
STOP!

Do not use anything other than fingers to install the quick connection. The use of tools can damage the connection.
Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made.

Verify the following:

- Fuel line is properly routed, seated onto the fuel rail, and locked in place.
- Fuel line connector is fully engaged.
- Fuel lines connections stay secured when performing push/pull test with at least 5 lbs. of force.

IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.



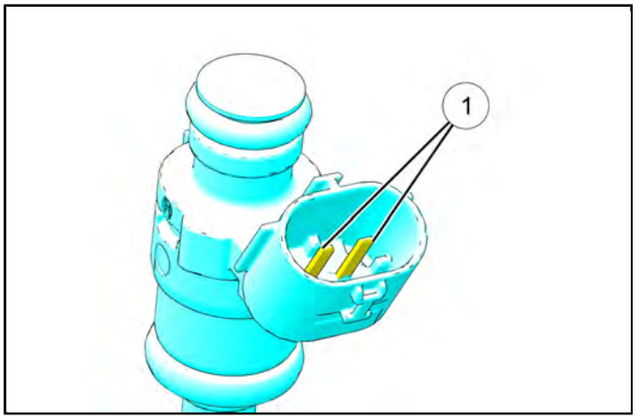
10. Install thermostat assembly. See **Thermostat Installation page 3.49**

FUEL INJECTOR RESISTANCE TEST

IMPORTANT

Take note of front and rear fuel injector harness connectors before disconnecting them.

The fuel injectors are non-serviceable. If diagnosis indicates a problem with either injector, test the resistance of the fuel injector(s) by measuring between the two pin terminals ①.



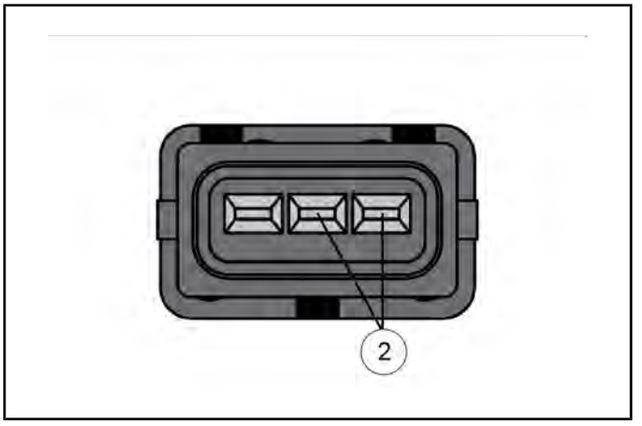
Fuel Injector Resistance Specification:
11.4 Ω — 12.6 Ω

4

CRANKSHAFT POSITION SENSOR, TEST / REPLACE

CPS TEST

1. To access the CPS connector, see the replacement procedure below.
2. Connect an ohmmeter between the pin terminals ② and compare resistance readings to specification below.

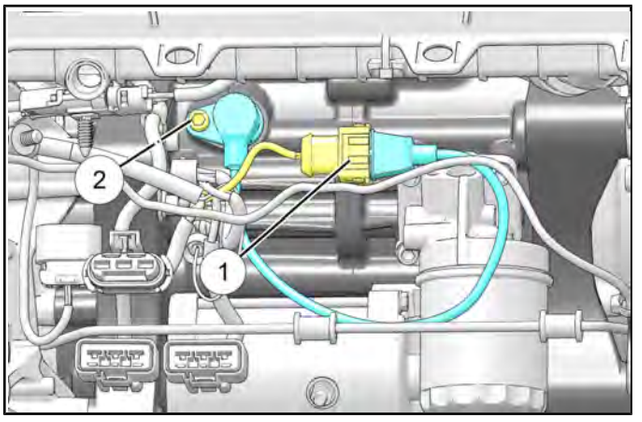


3. If resistance is correct, check to see that the sensor is mounted properly and that the tone wheel has not been damaged and is securely mounted to the crankshaft assembly.

Crankshaft Position Sensor: **945–1,155 Ohms @ 20°C (68°F)**

REPLACEMENT

1. Remove battery box. See **Battery Box Removal / Installation page 10.15**.
2. Disconnect CPS electrical connector ①.



3. Remove CPS fastener ② and remove sensor.

IMPORTANT
Ensure o-ring is removed with CPS.

INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

NOTICE
Apply rubber lubricant to the CPS sensor o-ring to ease installation.

TORQUE
Crankshaft Position Sensor Fastener: **88 in-lbs (10 N·m)**

2. Install battery box. See **Battery Box Removal / Installation page 10.15**.

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KNOCK SENSOR TEST / REPLACE

OVERVIEW

The Knock sensor is a piezoelectric sensor that advances or retards ignition based on load.

⚠ CAUTION

The knock sensor is torque sensitive and must be replaced if removed for any reason.

IMPORTANT

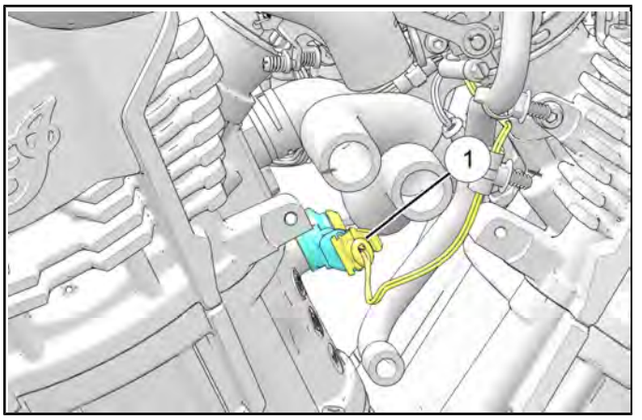
The knock sensor must be torqued to specification or it will not perform correctly. Sensors that have been over-tightened or under-tightened may set a diagnostic trouble code and cause the MIL to illuminate. Use a properly calibrated torque wrench during installation.

KNOCK SENSOR DIAGNOSTIC INFORMATION

COMPONENT	LOCATION	P-CODE	SPN	FMI	DESCRIPTION
Knock Sensor	Rearward face of the front cylinder	P0327	731	4	Knock Sensor 1: Voltage too low
		P1327	520331	3	Positive Line: Voltage too high
		P1328		4	Positive Line: Voltage too low
		P132A	520332	3	Negative Line: Voltage too high
		P132B		4	Negative Line: Voltage too low

TEST 1

1. Disconnect the negative battery cable. See **Battery Removal page 10.14**.
2. Remove thermostat housing. See **Thermostat Removal page 3.48**.
3. Locate the Knock sensor on the front cylinder and disconnect its electrical connector ①.



4. Inspect the sensor-side of the connector for moisture and / or corrosion. Make sure the terminal pins are securely seated in the plug
5. Remove the ECM from the motorcycle to access ECM connector 1. See **ECM Removal page 4.63**.
6. Set multi meter to measure resistance.
7. Measure the resistance through each wire from ECM connector to the sensor connector. Resistance should be less than 1 Ohm (good continuity).

ECM1 Pin 109 to Knock Sensor Connector Pin 1 should be less than 1Ω. ECM1 Pin 110 to Knock Sensor Connector Pin 2 should be less than 1Ω.

8. Measure the resistance across the Knock sensor pins 1 & 2.

Resistance across Knock Sensor Connector Pin 1 & Pin 2: Continuity Resistance should be between 4.5–5.0 MΩ

9. If the resistance does not match the specified value, replace the sensor.

TORQUE
Knock Sensor Fastener: **15 ft-lbs (20 N·m)**

TEST 2

1. Using a multi meter with a low voltage AC frequency scale, connect the meter leads to the connector pins of the Knock sensor.
2. Allow the signal to stabilize to 0 Hz.
3. Lightly tap the front cylinder near the knock sensor with a rubber mallet or other non-metallic object.
4. Watch for frequency fluctuation.
5. If no frequency fluctuation is observed while tapping on the cylinder, replace the sensor.

TORQUE
Knock Sensor Fastener: **15 ft-lbs (20 N·m)**

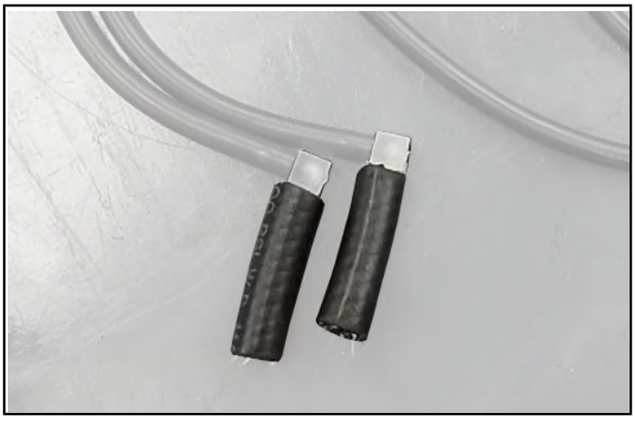
THROTTLE BODY INSPECTION

Indian Motorcycle shipped synchronization gauges to North America dealers the week of 2/24/2020. Although the gauge kit is designed for 4 cylinder engines, only two gauges are to be used for the following procedure. Indian Motorcycle recommends using two gauges that are located next to each other.

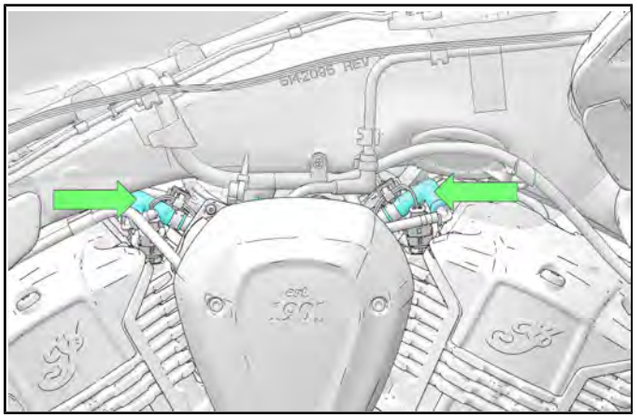
1. If gauges do not read zero at atmospheric pressure, as shown in the picture below, remove the plastic cover and carefully adjust the adjustment screw until needles are in the center of the white strip.

IMPORTANT
Both gauges must read the same value before use.

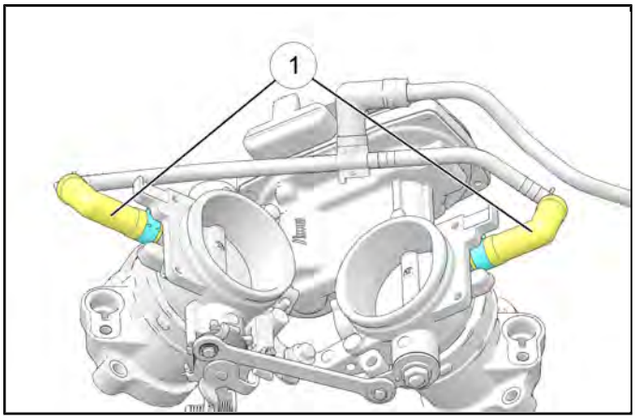
2. Un-wrap the flexible lines and cut them about 4 inches from the ends. Assemble each part of the lines to the plastic needle valve included in the kit. Both valves should be installed the same distance from each of the two gauges to ensure pressure pulses are read the same.
3. Attach short rubber hose/adapter section and 90 degree fitting to the end of the vacuum line that will be attached to the purge port on the throttle body.



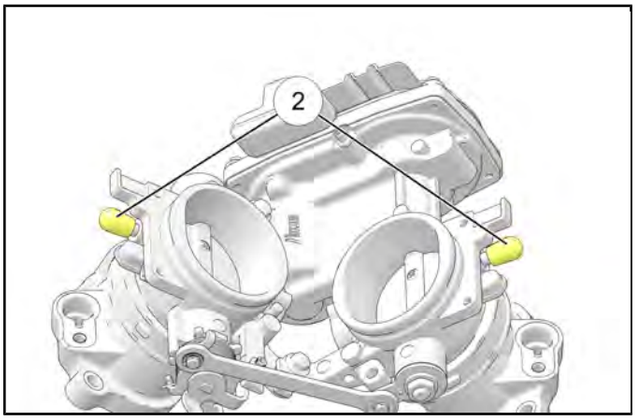
4. Start the motorcycle and allow the engine to run until it reaches operating temperature (the cooling fan turns on).
5. Turn off the motorcycle.
6. Working from the right-hand side of the motorcycle, use long needle-nose pliers to remove both purge lines OR purge line plugs from the throttle body.



- **50 STATE:** Remove both purge lines ① from the throttle body.



- **49 STATE:** Remove the purge line plugs ② from the throttle body.



IMPORTANT
Be careful not to lose the purge line plugs.

7. Connect both rubber hoses to the throttle body purge ports using a set of long needle-nose pliers.

IMPORTANT
Be careful not to damage the fuel injector electrical wires when attaching or removing the rubber hoses.

8. Start the motorcycle and allow the engine to run until the cooling fan turns on.

STOP!
The engine operating temperature is critical to achieve accurate readings. Make sure the engine fan has cycled before testing the throttle body synchronization.

9. Adjust needle valves on both lines to achieve less than 1 inch Hg fluctuation on the gauge (outer graduations). Maintain some gauge flutter to ensure the valve is not closed entirely.

IMPORTANT
Take a picture of the gauge reading

10. Read both gauges in relation to each other.
    Determine the difference in the readings.

EXAMPLE OF A GOOD READING	EXAMPLE OF A BAD READING
	

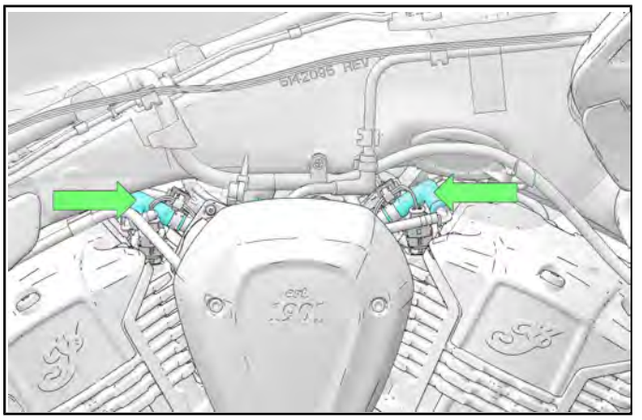
STOP!

- If the difference in readings between each side is **BELOW** 1.5 inches Hg, the throttle body is synchronized. Install both purge lines / plugs and proceed to STEP 11 to complete I-20-01-A.
- If the difference in readings between each side is **AT OR ABOVE** 1.5 inches Hg, the throttle body is not synchronized and must be replaced. Proceed to I-20-01-B

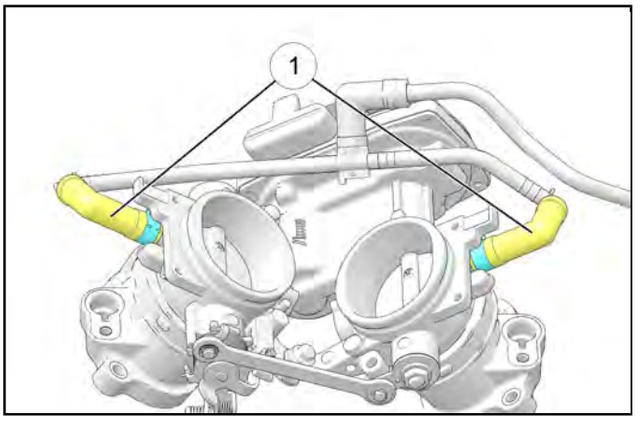
  US/CAN: Submit an Ask Polaris Service & Warranty Question> All Vehicle Diagnostic case.

  INT'L: Contact your Country Service Department.

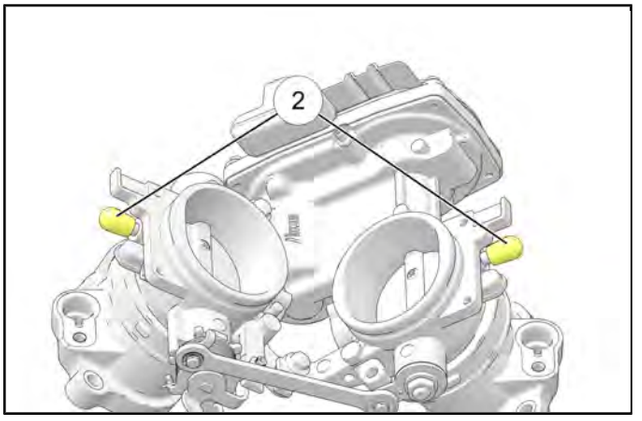
11. Working from the right-hand side of the motorcycle, use long needle-nose pliers to install both purge lines OR purge line plugs to the throttle body.



- **50 STATE:** Install both purge lines ① to the throttle body.



- **49 STATE:** Install the purge line plugs ② to the throttle body.



IMPORTANT
Be careful not to lose the purge line plugs.

12. Test ride the motorcycle to ensure proper operation.

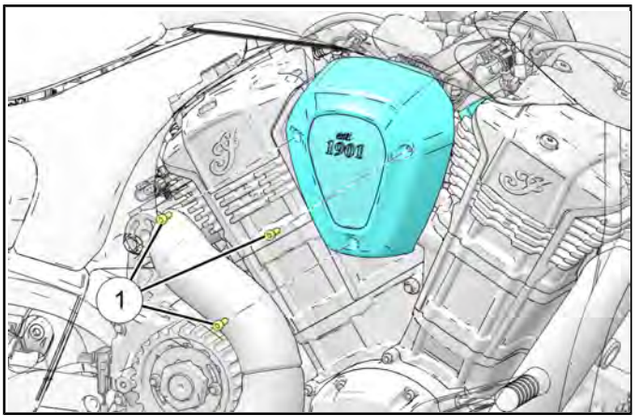
THROTTLE BODY REMOVAL

IMPORTANT

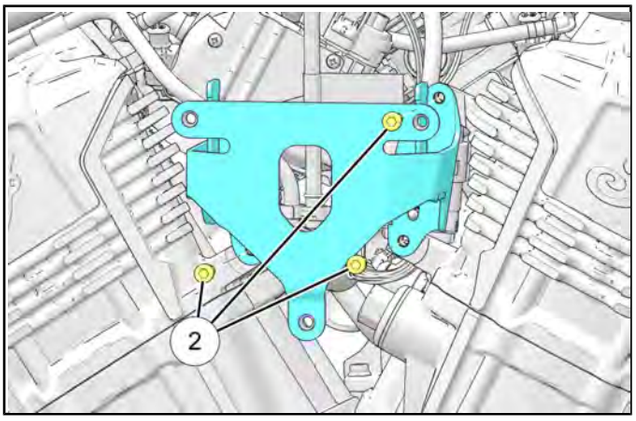
Due to the rigidity of the intake manifold and inlet adaptor material, it is easier to remove the throttle body and the intake manifold at the same time.

REMOVAL

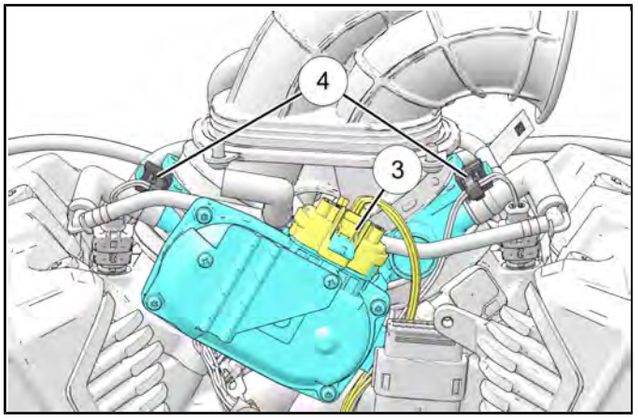
1. Remove ignition coil and bracket. See **Ignition Coil Removal page 10.50**.
2. Remove right side v-cover by removing its fasteners ①.



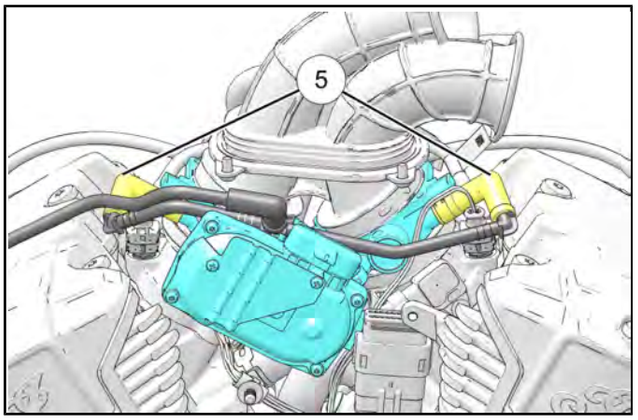
3. If equipped, remove carbon canister. See **Carbon Canister Removal page 4.12**
4. Remove V-cover bracket by removing its fastener ②.



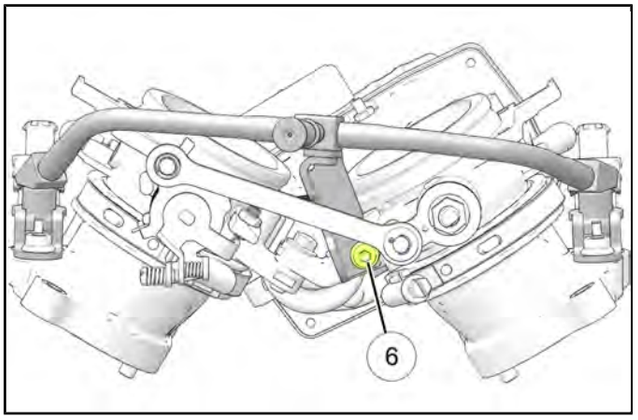
5. Disconnect the wiring harness from the v-cover bracket.
6. Disconnect throttle body electrical connector ③.



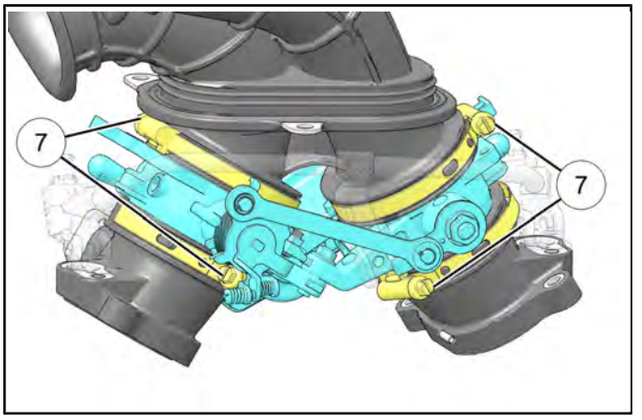
7. Disconnect fuel injector wire routing clips ④ from throttle body.
8. Disconnect fuel injector electrical connectors.
9. If equipped with EVAP, disconnect purge lines ⑤ from throttle body.



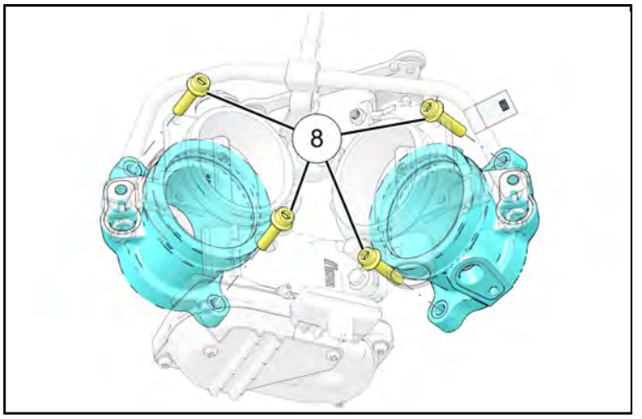
10. On the left side of the unit. Disconnect fasteners ⑥ securing fuel rail to throttle body.



11. Loosen the clamps ⑦ securing the throttle body



12. Remove the intake manifold fasteners ⑧.



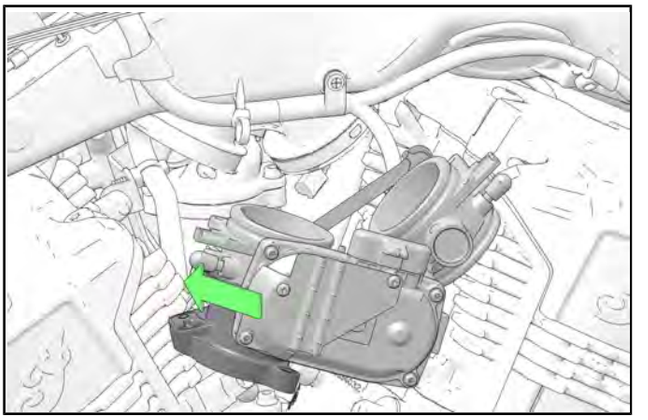
13. Carefully remove the throttle body and intake manifold from the right side of the unit.

THROTTLE BODY INSTALLATION

IMPORTANT

Due to the rigidity of the intake manifold and inlet adaptor material, it is easier to remove the throttle body and the intake manifold at the same time.

1. Fit the rear lower runner to the new throttle body. Carefully slide the throttle body and rear intake manifold into position in the motorcycle.

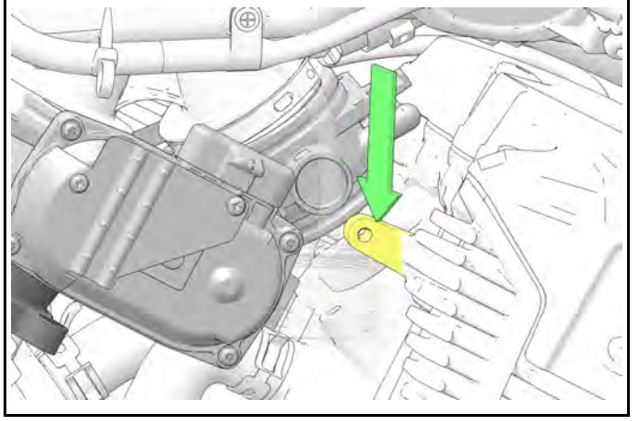


IMPORTANT

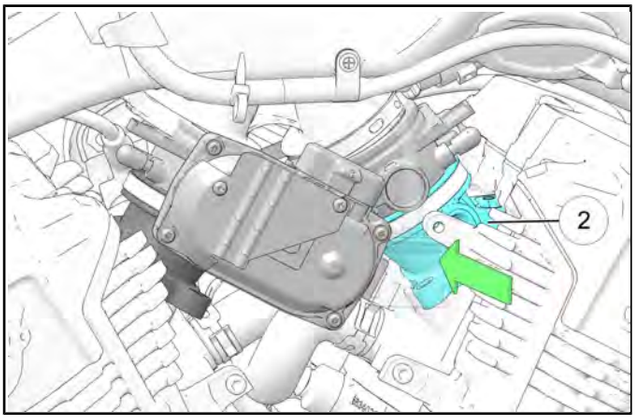
Do not use force when installing the throttle body. Damage to hoses, electrical wires or sensors may occur.

NOTICE

The front of the throttle body needs to clear the engine extrusion before the front intake manifold can be installed.



2. Install the front intake manifold ② to the throttle body and slide into position. Torque clamps to specification.

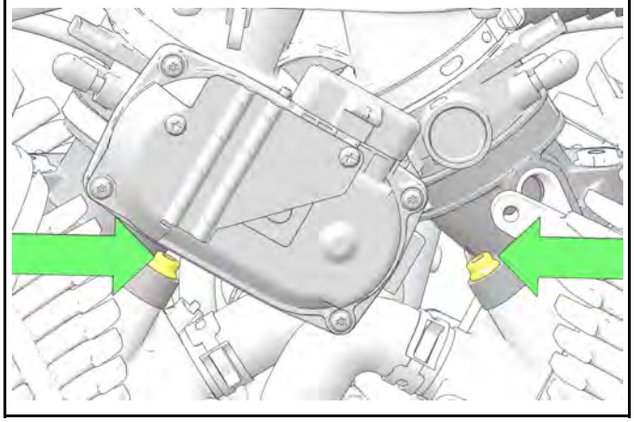


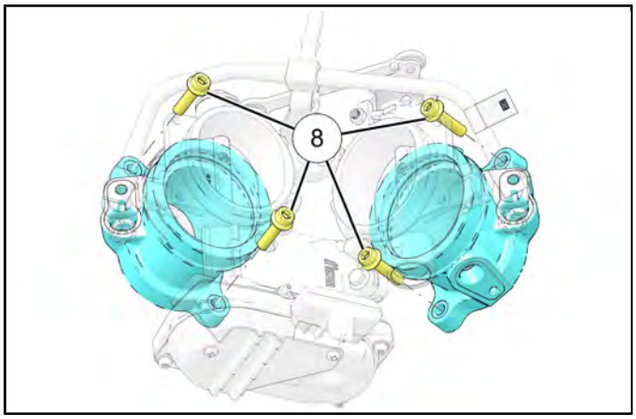
TORQUE
Clamps: **26 in-lbs (3 N·m)**

3. Install the intake manifold fasteners ⑧.

NOTICE

The right hand intake manifold fasteners are difficult to access when torquing. Special Tool 5264374 is recommended when torquing these two fasteners.

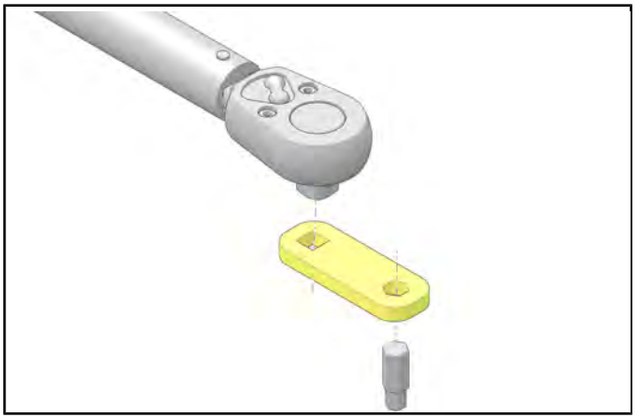




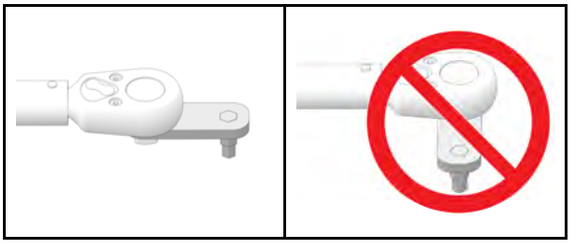
TORQUE
Intake Manifold Fasteners (left-hand side): **88 in-lbs (10 N·m)**

- **RIGHT-HAND SIDE FASTENERS:**

  Install the FUEL RAIL TORQUE TOOL (5264374) onto a ¼ in drive torque wrench. Install a 5 mm allen bit to the hex end of the torque tool as shown.

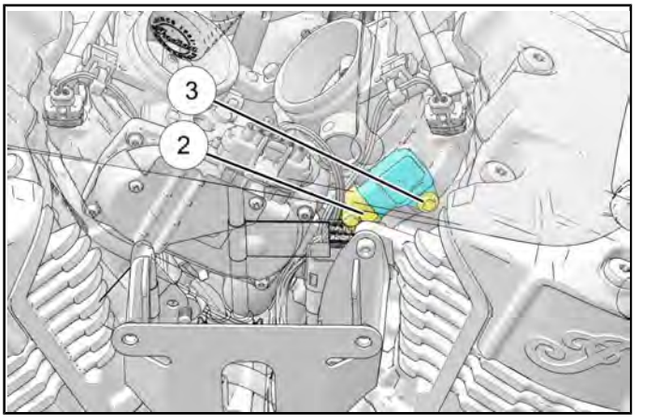


IMPORTANT
Alignment of the special tool is critical to achieve the correct torque. Make sure the TORQUE TOOL remains in-line with the torque wrench while torquing fasteners.



TORQUE
Intake Manifold Fasteners (right-hand side installed with special tool 5264374): **80 in-lbs (9 N·m)**

4. Connect the TMAP electrical connector ②.



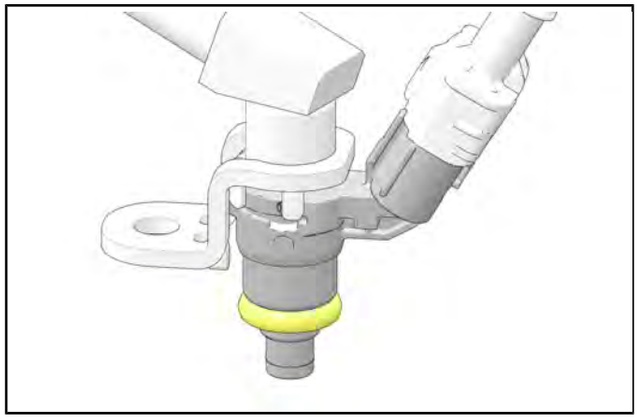
5. Install the TMAP sensor fastener ③. Torque to specification

TORQUE
TMAP Sensor Fastener: **18 in-lbs (2 N·m)**

6. Lubricate NEW injector o-rings with clean, silicone-free motor oil.

NOTICE
Apply oil sparingly and avoid contaminating the pintle valve / jet surface and upper inlet port.

7. Install replacement o-rings onto the bottom of the injectors.



PART	POSITION
5416413	BOTTOM OF INJECTOR

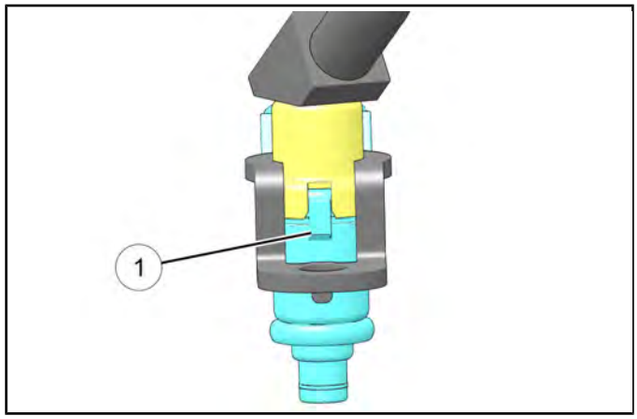
IMPORTANT

Verify that both of the new o-rings have been lubricated and installed correctly onto the injectors.

IMPORTANT

Use care not to fold or displace lower o-ring from seating surface.

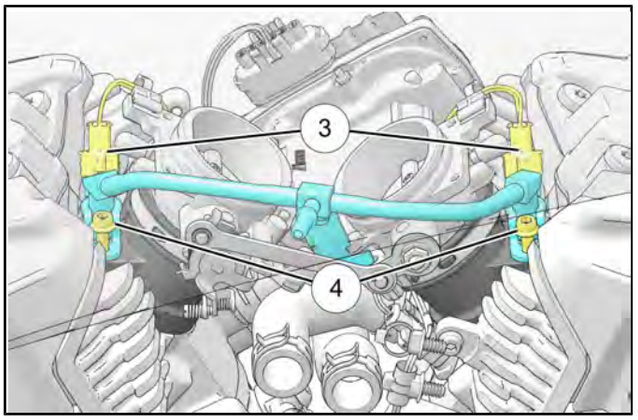
8. Ensure Injector is positioned so the clocking lug ① fits in the clocking tabs on the fuel rail.



IMPORTANT

Use care not to fold or displace lower o-ring from seating surface.

9. Connect fuel injector electrical connectors ③.

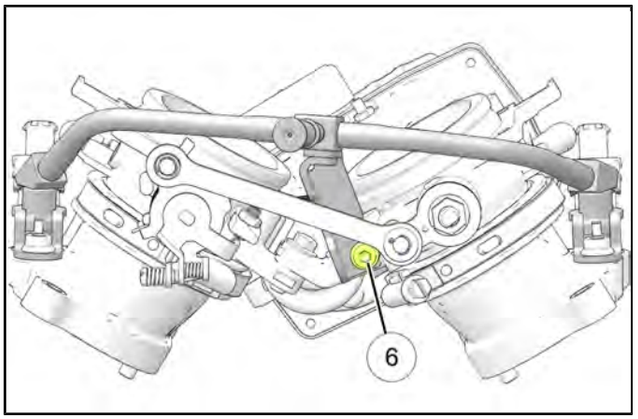


10. Install fuel injector fasteners ④ finger tight.
11. Install a commercially available 5 mm allen 1/4" drive socket onto a 1/4" drive torque wrench. Torque injector fasteners to specification.

TORQUE

Fuel Injector Fastener:
84 in-lbs (10 N·m)

12. On the left side of the unit. fastener ⑥ securing fuel rail to throttle body. Torque fastener to specification.



TORQUE

Fuel Rail Fastener:
62 in-lbs (7 N·m)

13. Connect fuel line ① to fuel rail.

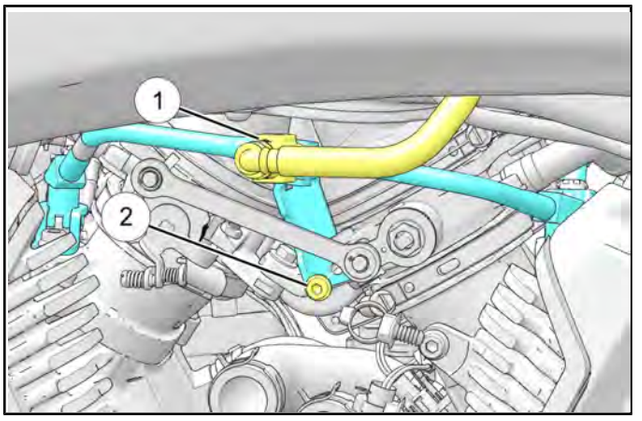
STOP!

Verify fuel line is properly seated and locked in place by listening for an audible "click" when pressing into place. Pull gently on quick connector to make sure a proper connection has been made.

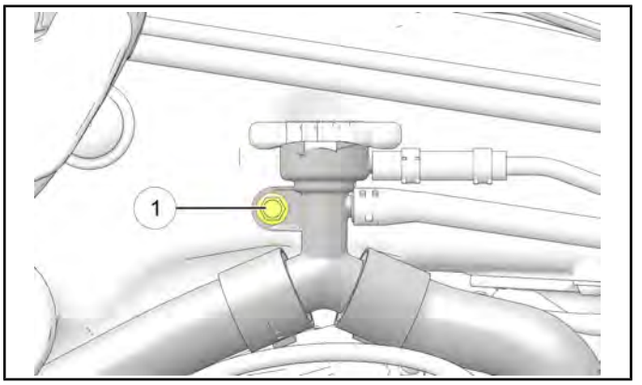
Verify the following:

- Fuel line is properly routed, seated onto the fuel rail, and locked in place.
- Fuel line connector is fully engaged.
- Fuel lines connections stay secured when performing push/pull test with at least 5 lbs. of force.

IF THE FUEL LINE FAILS TO CLICK, OR FAILS THE PULL PORTION OF THE TEST ABOVE, REPLACE THE FUEL LINE.



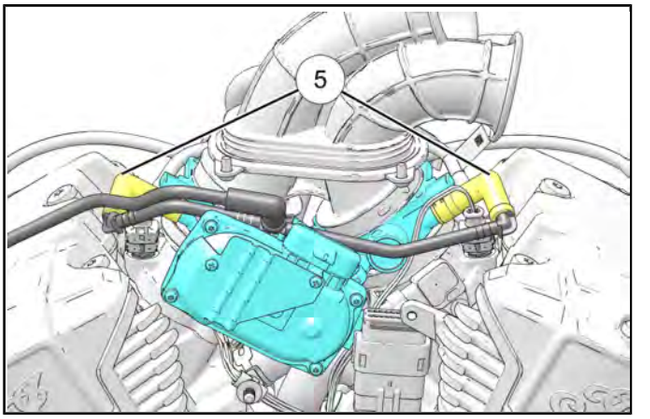
14. Install the coolant line fastener ①. Torque to specification.



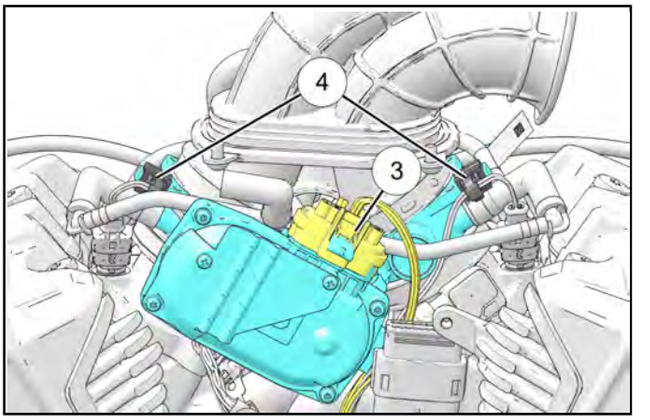
TORQUE

Coolant Line Fastener:
88 in-lbs (10 N·m)

15. If equipped with EVAP, connect purge lines ⑤ to the throttle body.



16. Connect fuel injector electrical connectors.
17. Connect fuel injector wire routing clips ④ to throttle body.
18. Connect throttle body electrical connector ③.



19. If equipped, install carbon canister. See **Carbon Canister Installation page 4.13**

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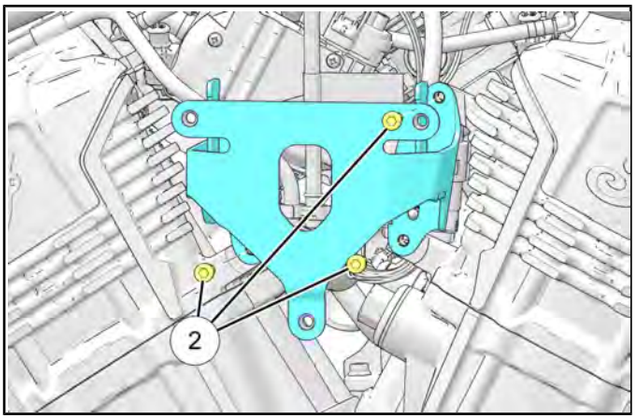
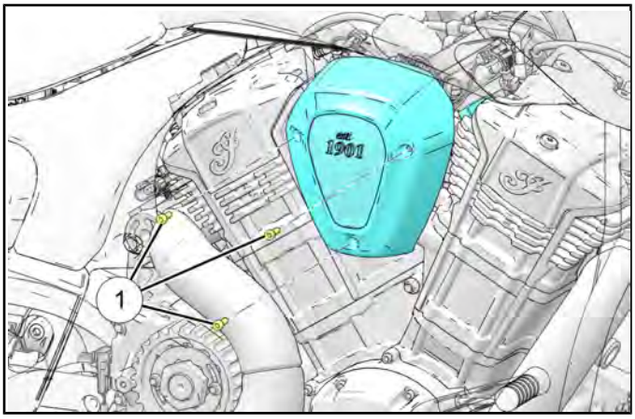
20. Install V-cover bracket and secure with fasteners ②. Torque fasteners to specification



TORQUE
V-cover Bracket Fastener: **88 in-lbs (10 N·m)**

21. Connect the wiring harness to the v-cover bracket.
22. Install ignition coil and bracket. See **Ignition Coil Installation page 10.51**.
23. Install right side v-cover and secure with fasteners ①. Torque fasteners to specification.



TORQUE
V-cover Fastener: **88 in-lbs (10 N·m)**

24. Perform the throttle body learn procedure. Refer to page 4.91
25. Connect the motorcycle to Digital Wrench. Verify no fail codes and no MIL lights are present. Field Test the motorcycle to verify proper operation.

CYLINDER MISFIRE DETECTION

The ECU monitors crankshaft speed via the crankshaft position sensor. A misfire will cause a fluctuation in crankshaft speed. A code will set and flash the check engine light after an engine misfire threshold/rate is detected that is above a pre-determined limit. This threshold varies based on engine speed.

One or more of the following codes will be set if a misfire occurs:

- P0301 (SPN 65591/FMI 7) Misfire Detected, Cylinder 1 (Front)
- P0302 (SPN 65592/FMI 7) Misfire Detected, Cylinder 2 (Rear)
- P0314 (SPN 65590/FMI 7) Misfire Confirmed

If a misfire is detected, the following events will occur:

- The check engine indicator lamp will begin to flash and fuel will be cut to the affected cylinder(s). The check engine indicator lamp will continue to flash until the ignition switch has been moved to the off position. Restarting the engine will clear the flashing indicator and restore fuel to both cylinders.
- If a 2nd misfire occurs, the check engine indicator lamp will resume flashing and fuel will once again be cut to the affected cylinder(s).
- After the 3rd misfire, P0314 misfire fault is determined & set, the check engine light will remain on and fuel will be cut to the affected cylinder(s). If this occurs, follow the troubleshooting section below.

In cases where cylinder misfire is intermittent, or has been repaired in the field (e.g. loose spark plug wire has been reattached), Misfire Detection utilizes a self-healing feature to allow continued operation. Following the 1st or 2nd misfire event, when the ignition is cycled OFF and ON again, the misfire code becomes historic and the MIL turns off. When P0314 is set, after the 3rd misfire event, the MIL will stay on for 3 fault free drive cycles before turning off.

If the MIL turned on solid due to P0314, it will stay on until the misfire condition has been removed and 3 fault free drive cycles have occurred.

NOTICE

DRIVE CYCLE:
A drive cycle consists of cycling the ignition from OFF to ON, then start the engine and run at idle for a period of approximately 4 minutes. Finally, turn off the ignition for approximately 2 1/2 minutes.

If it does not turn off, diagnose by verifying the following items:

TROUBLESHOOTING

- Ignition Coil and connections are good
- Spark plugs wires are secure
- The correct spark plugs are installed and the plugs are not fouled
- Crankshaft Position Sensor tests good
- Wiring to the Crankshaft Position Sensor, ECU and Ignition Coil are not damaged. Chassis ground is clean and tight
- Fuel pressure is within specification
- Fresh/good quality fuel is in the fuel tank
- Engine mechanical is good (leak down, timing)

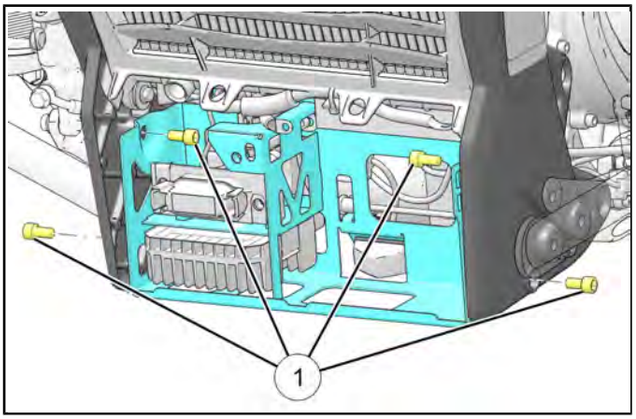
IMPORTANT

Once the systems is repaired and functioning normally, connect to Digital Wrench to clear active and historic codes. Retest to verify the condition is no longer present.

OXYGEN SENSOR REPLACEMENT

FRONT REMOVAL

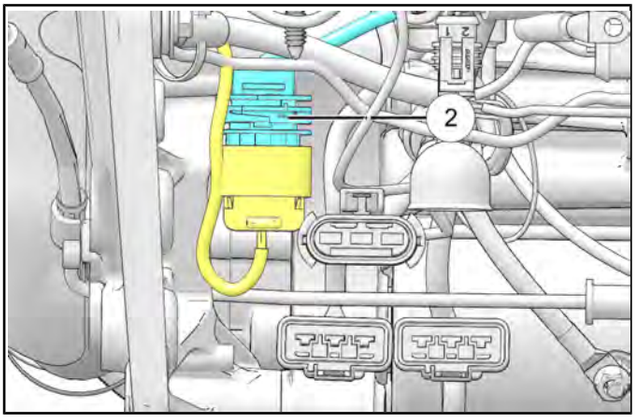
1. Remove battery. See **Battery Removal page 10.14**.
2. Remove battery box fasteners ①.



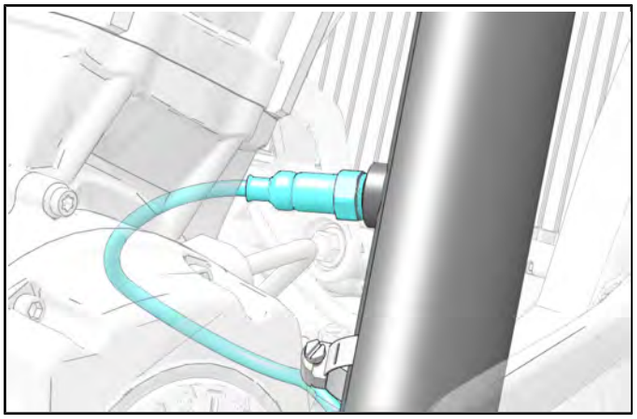
NOTICE
The battery box does not need to be fully removed to access the oxygen sensor electrical connector.

3. Move battery box and harness tray down and to the right to gain access to the oxygen sensor electrical connector.
4. Disconnect oxygen sensor electrical connector ②.

NOTICE
Battery box and harness tray hidden for image clarity.



5. Using 14 mm wrench, remove the oxygen sensor from the headpipe.



FRONT INSTALLATION

1. Install oxygen sensor into headpipe and tighten to specification.

TORQUE
Oxygen Sensor: **14 ft-lbs (19 N·m)**

2. Route the oxygen sensor harness to its connector.
3. Install battery box and secure with fasteners.

TORQUE
Battery Box Fastener **18 ft-lbs (24 N·m)**

4. Install battery.
5. Connect positive (+) then negative (-) battery cables.

TORQUE
Battery Terminal: **48 in-lbs (5.4 N·m)**

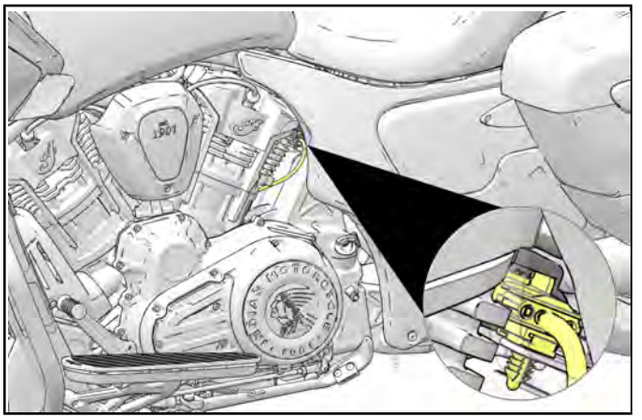
6. Install battery bracket and fastener.

TORQUE
Battery Bracket Fastener: **88 in-lbs (10 N·m)**

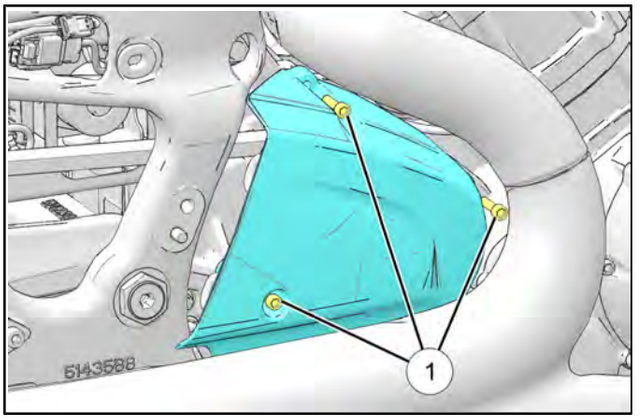
4

REAR REMOVAL

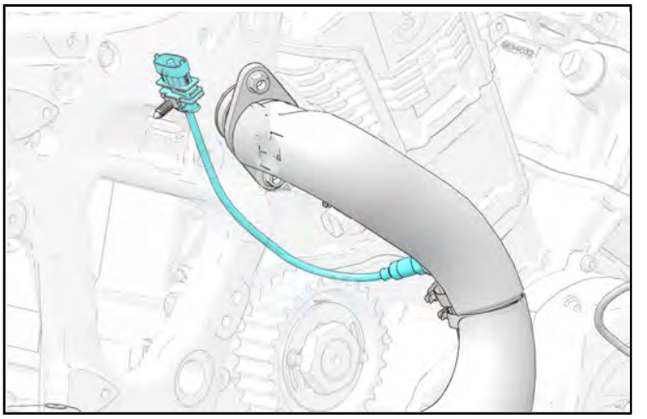
1. Remove right upper side cover. See **Side Cover (Upper), Removal page 7.100**.
2. Remove right side passenger foot peg. See **Passenger Foot Pegs Removal page 7.94**.
3. Remove right lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
4. From the left side of the unit, disconnect the rear cylinder oxygen sensor electrical connector.



5. Remove belt cover by removing its fasteners ①.



6. Using 14 mm wrench, remove the oxygen sensor from the headpipe.



REAR INSTALLATION

1. Install oxygen sensor into headpipe and tighten to specification.

TORQUE
Oxygen Sensor: **14 ft-lbs (19 N·m)**

2. Route the oxygen sensor harness to its connector.
3. Install belt cover.
4. Install lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
5. Install right side passenger foot peg. See **Passenger Foot Pegs Installation page 7.94**.
6. Install right upper side cover. See **Side Cover (Upper), Install page 7.101**

THROTTLE LEARN PROCEDURE

THROTTLE LEARN CONDITIONS

- Engine must be stopped
- Intake air temperature minimum = 5C and Max = 140C
- Engine coolant temperature min = 5C and Max = 100C
- Battery voltage min= 10V and Max = 16V
- Vehicle must be stopped

THROTTLE LEARN PROCEDURE

1. Ensure vehicle is within the throttle learn conditions.
2. Leave ignition powered ON
3. Throttle learn will be initiated within 30 seconds.
4. Throttle learns within 5 seconds.
5. Power ignition off and leave off for 130 seconds.

CAN DIAGNOSTICS

CAN (CONTROLLER AREA NETWORK) DIAGNOSTIC OVERVIEW

Overview

The tachometer and Engine Control Module (ECM) have integrated 120Ω termination resistors. With the tachometer unplugged, check resistance between the CAN terminals at the tachometer connector. The resistance should be 120Ω. With the tachometer connector plugged in, and the ECM connector unplugged the resistance will be 120Ω when measured at the CAN terminals of the ECM connector. With tachometer and ECM connectors plugged in, the resistance will be 60Ω when measured at pins G and H of the diagnostic port.

Baseline CAN Resistance Values

Checking resistance between Yellow CAN High wire and Green CAN Low wire at the specified module connectors below (while unplugged):

- VCM = 60Ω
- ECM = 120Ω
- Tachometer = 120Ω
- Speedometer = 60Ω
- ABS Module = 60Ω
- Diagnostic Connector = 60Ω

Diagnostic Connector Resistance Test on CAN A

If Pins G through H =60Ω: Main Data bus has connection and the ECM and Tachometer are connected.

If Pins G through H =120Ω: Main Data bus is experiencing issues with the terminating resistor in the ECM or tachometer. Check the connection at the ECM and tachometer for pin fit. With one of the modules removed check the resistance at the DG-YE wires leading into each module with the module disconnected. The reading should be 120Ω.

NOTICE
The measurement is the resistance of the terminator resistor in the other module that is still connected.

If the connection to the data bus via the harness checks ok, proceed with replacing the suspect damaged module.

These checks only confirm that the main data bus lines, ECM, and tachometer are connected to the data bus. If a CAN issue is suspected in any of the following modules the module should be removed and resistance checked at each of the CAN wires leading into the module. There should be 60 ohms of resistance between the DG and YE CAN wires at all modules on CAN A if the ECM and the tachometer are still connected. Ohms test are to be done with the motorcycle powered off.

TROUBLESHOOTING

FUEL SYSTEM TROUBLESHOOTING, PART 1

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Engine turns over with electric starter, but won't start	Compression too low	See engine section	
	No spark at spark plugs	See ignition system	
	No fuel reaching intake tract	Out of fuel Blown Fuse Plugged fuel filters / lines Fuel pump not working Fuel pressure regulator Faulty fuel pump relay Open wiring / connector Faulty connection at ECM	Add Fuel Replace Clean/Replace Test / Replace Test / Replace Test / Replace Inspect / Repair Inspect / Repair
	Excessively rich or lean fuel mixture	Fuel pump Fuel pressure regulator Crank Position Sensor Low Battery TMAP sensor CHT sensor Fuel Injector	Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace
	Spark at wrong time or no spark. Fuel delivery timing incorrect.	Timing Wheel or CPS installed incorrectly, damaged, or dirty; faulty CPS	Install correctly, inspect for proper air gap (gap is preset but cover, sensor, and timing wheel must be clean and in good condition).
Poor idle	Excessively rich or lean fuel mixture	Air Leaks Fuel Pump Fuel injector or fuel rail obstructed or leaking Air Filter Wrong Fuel / Old Fuel Crank Position Sensor	Inspect throttle body and stepper motors Inspect fuel pressure Replace Replace Inspect / Replace Inspect / Replace
Poor Running in Higher RPM Range	Air intake restriction Oil Overfilled Ignition problemsLow Battery Voltage Loose, corroded, or wet connector(s) Valve train problems	Air filter Ignition Coil(s) / plug wires Battery ECM and wiring harness Valve springs, valve, head	Inspect Refer to ignition section. Charge or replace Unplug connections - inspect Inspect cylinder head & valves

FUEL SYSTEM TROUBLESHOOTING, PART 2

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Engine Stalls	Fuel Pump Problem	Low battery voltage Faulty fuel pump No signal from ECM Wiring problem	Battery/Charging system Check fuel pressure Repair Wiring Repair/Chk Pump Relay
	Excessive rich or lean fuel/air mixture	TMAP Sensor Plugged fuel filter Fuel pump (pressure) Fuel pressure regulator Vacuum leak Wiring problem Air Filter Low battery voltage	Repair / Replace Test / Replace Pump Assembly Test / Replace Test / Replace Pump Assembly Repair / Replace hoses Repair Replace Ck battery & charging system
	Control Circuit/ Sensors not functioning correctly	Fuel pressure regulator TPS Engine speed sensor Fuel pump relay Rotor Fuse ECM Relay Low battery voltage ECM	Test Pressure / Replace Test / Replace Test / Replace Test / Replace Inspect / Install correctly Replace Replace Inspect Charging system
	Valve train problems or Compression low	Refer to Engine chapter	
Backfiring	Low Battery Voltage Ignition Problem Air leaks Restricted air intake or throttle body	Battery, spark plug fouled, poor wire connection for ignition or fuel injection, loose pin in multi-pin connector for ECM or wiring harness Inlet and Exhaust Intake tract / Throttle body	Refer to battery section Replace plugs / diagnose Inspect wiring connections Disconnect and check pin connections Seal intake or exhaust leaks Clean air inlet tract and throttle body

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FUEL SYSTEM TROUBLESHOOTING, PART 3

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Poor Running in upper rpm ranges	Control Circuit/ Sensors not functioning correctly	CPS ETC Air temperature sensor Manifold Absolute Pressure sensor Intermittent wiring /connector problem ECM	Test / Replace Test / Replace Test / Replace Test / Replace Repair/Replace Test / Replace
	Fuel delivery incorrect	Plugged or kinked fuel and/or vent hoses Fuel pump Fuel regulator Fuel filter Battery/Charging System Fuel Injector plugged Contaminated fuel (water, additives, etc.) Inadequate octane Defective ETC Low battery voltage	Repair/Replace Test / Replace Test Pressure / Replace Test / Replace Pump Assembly Charge/Replace (if applicable) Clean/Replace Clean/Replace Use correct fuel Test / Replace Charging system
	Air intake restriction	Dirty Air Cleaner Intake restriction	Clean Repair
	Air Leak	ETC gasket surfaces Intake manifold ETC	Repair/Replace Repair/Replace Repair/Replace
Engine lacks power	Engine component problems Ignition problems Overfilled with oil	See Engine / Cooling / Exhaust chapter See Electrical chapter See Maintenance chapter	
	Improper fuel delivery	Plugged fuel injector Dirty air cleaner Vacuum leaks Fuel pump Fuel pressure regulator Air temperature sensor TMAP sensor Plugged vent hose Low battery voltage ECM	Repair / Replace Replace Repair Test / Replace Test / Replace Test / Replace Test / Replace Clear Test batt./Charging system

FUEL SYSTEM TROUBLESHOOTING, PART 4

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Engine overheats	Internal Engine Parts Lubrication & Cooling system Low or incorrect oil Brakes dragging Drive belt too tight Ignition timing incorrect Spark plug(s) Low battery voltage	Cooling System Engine Oil Brake systems Drive Belt Ignition Coils Faulty ECM Charging System Faulty Battery Faulty Wiring	Refer to Engine / Cooling / Exhaust chapter Refer to Engine / Cooling / Exhaust chapter Refer to Brakes chapter Refer to Steering / Suspension chapter Refer to Electrical chapter Replace Test / Repair Replace Repair
	Lean Air/Fuel mixture	Fuel pressure regulator Air leak Fuel injector plugged CHT Vent hose plugged / kinked Air leak at throttle body to manifold seal	Repair / Replace Repair Clean / Replace Test / Replace Repair Test / Repair
Won't Accept New Calibration	Non-Current Calibration File Set Low Battery Voltage Attempting Re-Flash Without Proper VIN/ PIN, Calibration I.D. number, or calibration authorization code		Go to Dealer website and download the most current Indian Motorcycle Calibration File Set Attach Battery Charger During Re-Flash, and Re-Charge Battery When Re-Flash Is Completed Enter Authorization Code Sent With Accessory Kit

CHAPTER 5
CLUTCH / PRIMARY / SHIFT

GENERAL INFORMATION

SERVICE NOTES – CLUTCH / PRIMARY / SHIFT

- Clutch and external transmission shift linkage service can be accomplished with the engine in the frame.
- Internal transmission or internal shifting mechanism service requires engine removal and crankcase separation.
- Oil additives of any kind are not recommended by Indian Motorcycle. Using oil additives or oil of the wrong viscosity can have a detrimental affect on clutch performance, operation, and service life.
- Burnt clutch plates are not an indication of defective clutch plates. Burnt clutch plates indicate that a problem exists within the clutch system, the clutch has been used improperly, or plates were contaminated by improper oil or additives.
- Indian Motorcycle 15W/60 motorcycle oil is recommended for all operating temperatures. If Indian Motorcycle 15W/60 oil is not available, a high quality JASO MA compliant/rated, 15W/60 motorcycle oil suitable for use in wet clutch transmissions can be used.
- Lubricate parts during assembly as described in the procedures.
- Corroded or sticking shift linkage pivot points can cause abnormal shifting. Replace any linkage components that are damaged or do not move freely, and lubricate at regular intervals.

SPECIAL TOOLS – CLUTCH / PRIMARY / SHIFT

TOOL DESCRIPTION	PART NUMBER
Case Splitting / Assembly Tool	PF-51234-A
Clutch Shaft Holder	PF-51232
Crankshaft Locking Pin	PF-51235-A
Crankshaft Rotation Socket	PF-51239
Engine Stand Adapter	PF-51240
Moly Assembly Paste	2871460

Bosch Automotive Service Solutions: 1–800–328–6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – CLUTCH / PRIMARY / SHIFT

ITEM		SPECIFICATIONS
Clutch / Gear Shift / Linkage	Clutch Type	Wet, Multi-Disk
	Clutch Operating Mechanism	Manual / Cable Operated
	Primary Reduction Ratio	1.56 : 1
	Transmission Shift Mechanism	Manually Operated, Spring Centered
	Gearshift Pattern	1-N-2-3-4-5-6
	Clutch Spring (Coil Type, QTY.3)	74.4 lbf @ Installed Height
	Clutch Lever Free Play (Cable)	.50-1.50 mm (.020-.060")

CLUTCH / PRIMARY / SHIFT MAINTENANCE

CLUTCH CABLE INSPECTION / LUBRICATION

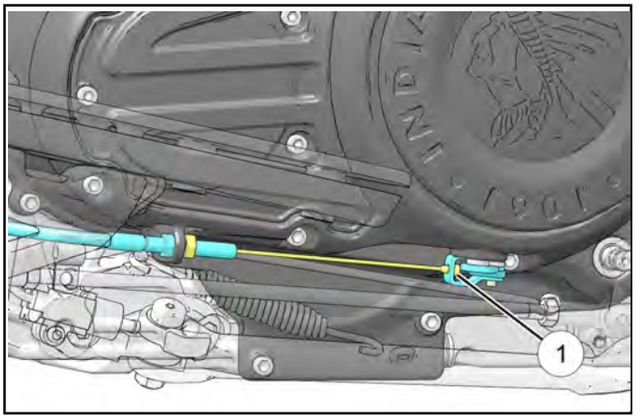
NOTICE

Clutch cable casings are lined with a low friction sleeve and are factory lubricated for reliable operation. Periodic lubrication of cables is not required and could be detrimental to cable performance. Only cable *ends* must be periodically inspected and lubricated in accordance with the Periodic Maintenance Schedule.

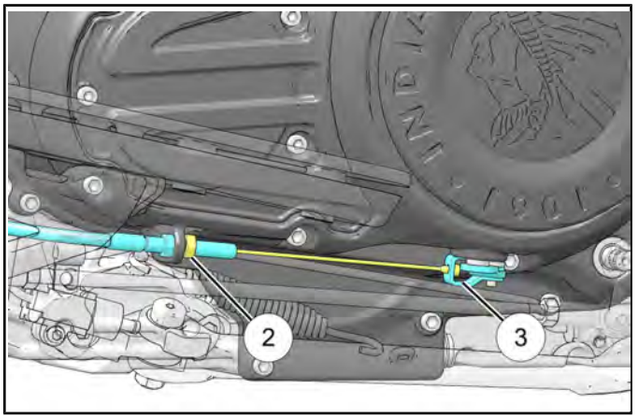
See **Maintenance Intervals page 2.4**.

Inspect inner cable for fraying. Do not kink, bend or twist inner cable or cable casing during removal or installation.

1. Inspect the clutch cable for proper routing, smooth movement, and damage to the external casing.



2. Inspect the lower cable end ① for damage or frayed wires.
3. Loosen cable jam nut ② and loosen adjuster nut to provide maximum clutch cable freeplay .Remove cable from pinion arm ③.



4. Disconnect the cable at the clutch lever.
5. Apply a thin coating of all purpose grease to the clutch perch cable end and pivot point of pinion arm assembly.
6. Reverse steps 3 and 4 to reinstall clutch cable.
7. Adjust cable free play.
8. Tighten the lower cable guide fastener to specification.

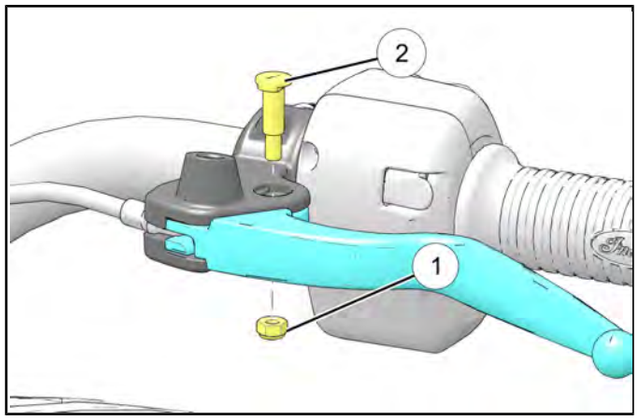
TORQUE
Clutch Cable Jam Nut: **53 in-lbs (6 N·m)**

CLUTCH LEVER LUBRICATION

1. Disconnect clutch cable at primary cover.

   See **Clutch Cable Inspection / Lubrication page 5.4**.

2. Pull cable housing out of lever perch and remove barrel from clutch lever. Do not kink cable.
3. Remove nut ① and push pivot pin ② upward to remove.



4. Inspect both ends of inner cable for frayed strands. Clean parts and apply moly paste to pivot fastener and lever cable end.
5. Assemble lever.
6. Install cable to lever. Rotate cable back through slot in perch, and push outer casing back into perch recess.
7. Attach lower end of cable to pinion arm on primary cover.
8. Adjust clutch lever free play

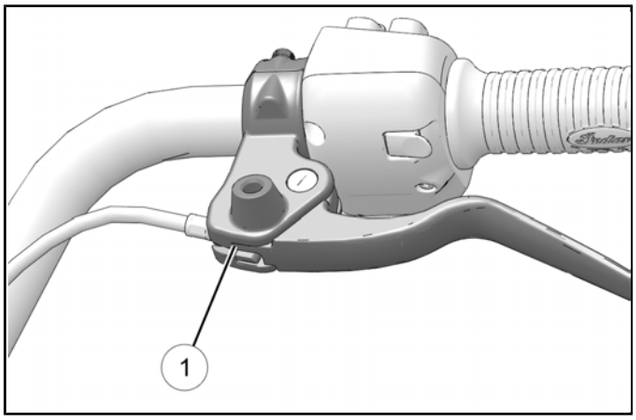
   See **Clutch Lever Free Play page 5.5**.

CLUTCH LEVER FREE PLAY

IMPORTANT

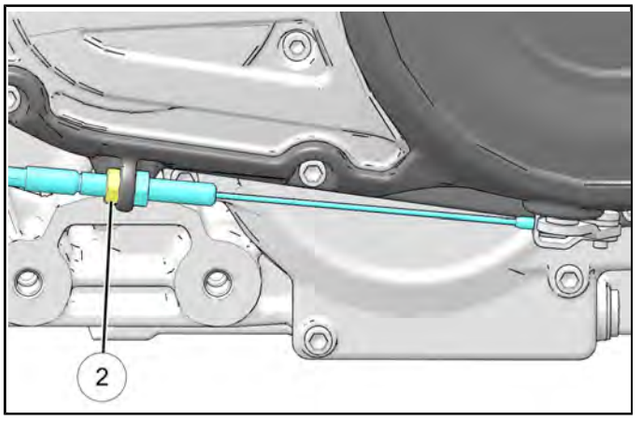
Periodically check the clutch cable free play. As the clutch wears, the cable will get tighter and will require adjustment. If the cable gets too tight, it can result in a slipping clutch situation.

1. With handlebars pointing straight ahead, measure the clutch lever free play at point shown ①



Clutch Lever Free Play:
.019–.059” (0.5–1.5 mm)

2. Compare measurement to specification. If adjustment is required, proceed to Step 3. If no adjustment is required, continue to the next procedure.
3. Locate the clutch cable adjuster nut ② .



4. Hold cable and loosen the adjuster jam nut.
5. Turn adjuster nut in or out until clutch free play is correct.

6. Tighten adjuster jam nut to specification.

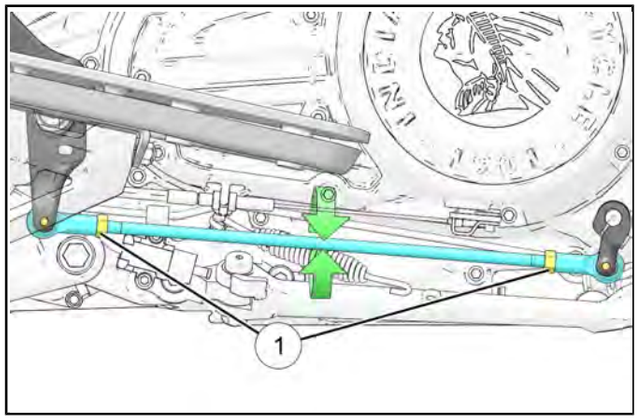
TORQUE
Clutch Cable Nut: **53 in-lbs (6 N·m)**

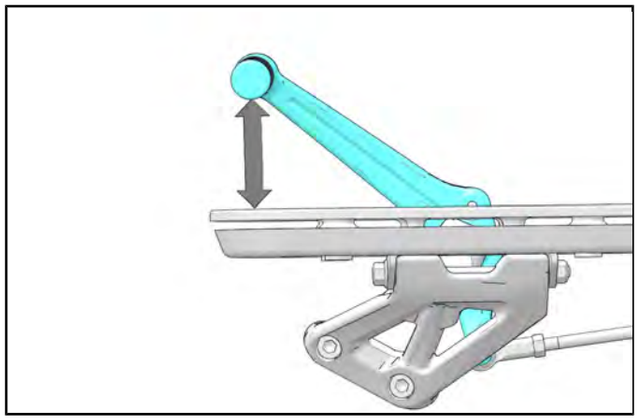
SHIFT PEDAL INSPECTION / LUBRICATION

1. Check all shift pedal and linkage fasteners to be sure they are tight. Torque fasteners to specification. See **Shift Pedal Adjustment page 5.7**.
2. Lubricate shift pedal pivot bushing and all pivots with all-purpose lubricant.

SHIFT PEDAL ADJUSTMENT

1. Loosen jam nuts ①.
2. Rotate linkage rod until pedal angle is correct.





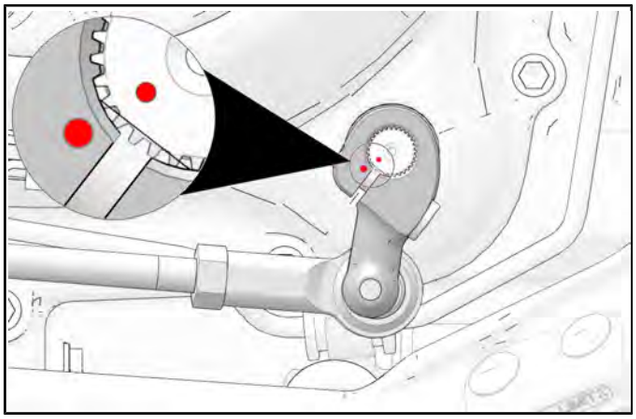
Pedal Height Specification:
2.84 inches +/- .20 (72.18 mm +/- 5.00)

3. Tighten jam nuts ① to specification.

TORQUE
Shift Rod Jam Nuts: **84 in-lbs (10 N·m)**

⚠ CAUTION

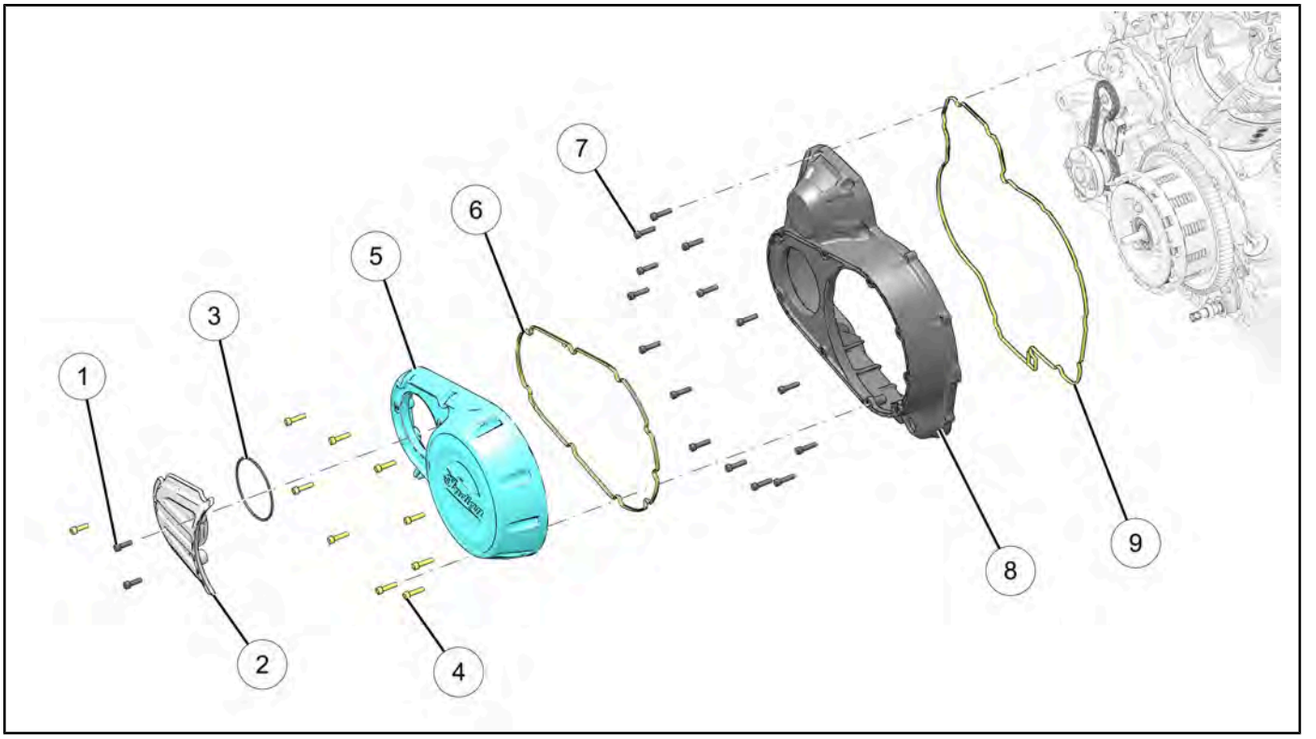
Do not remove and reposition the shift arm on the shift shaft to adjust gear shift pedal height. Dots on shift shaft and shift arm must be aligned for gears to shift correctly.



5

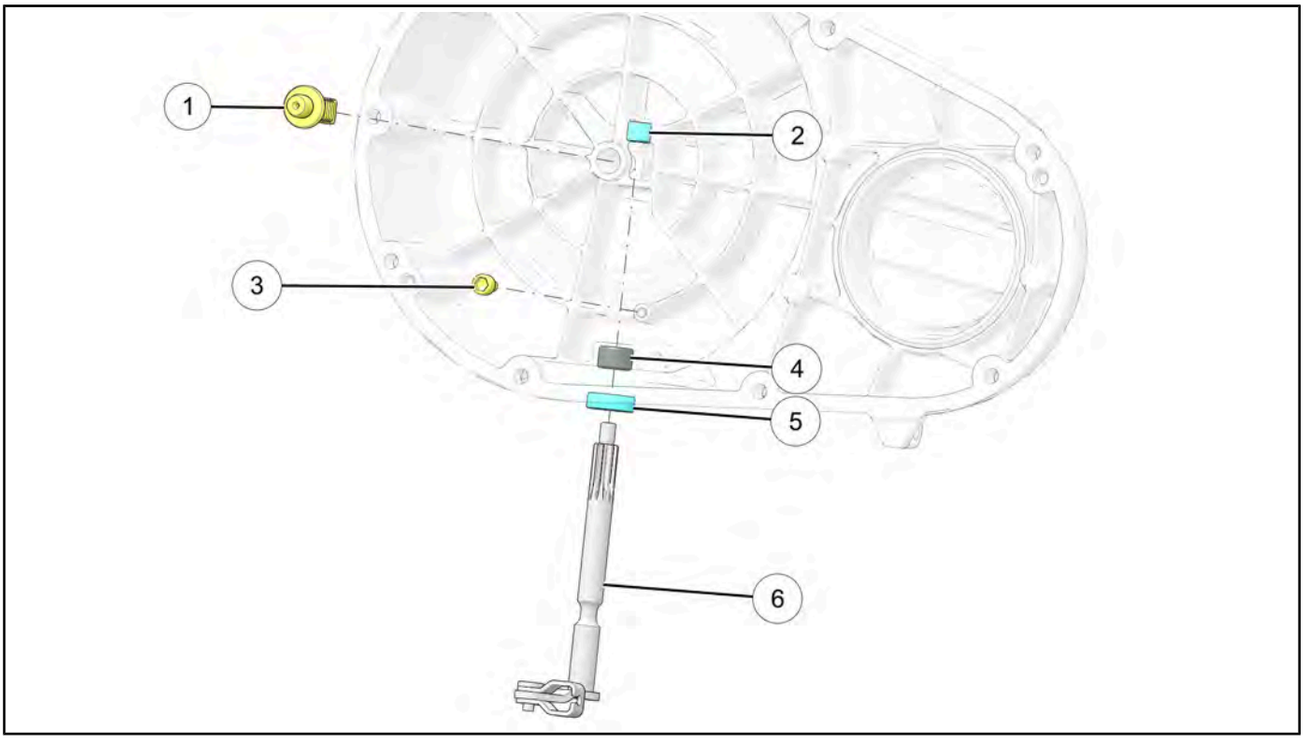
ASSEMBLY VIEWS

PRIMARY COVER ASSEMBLY VIEW



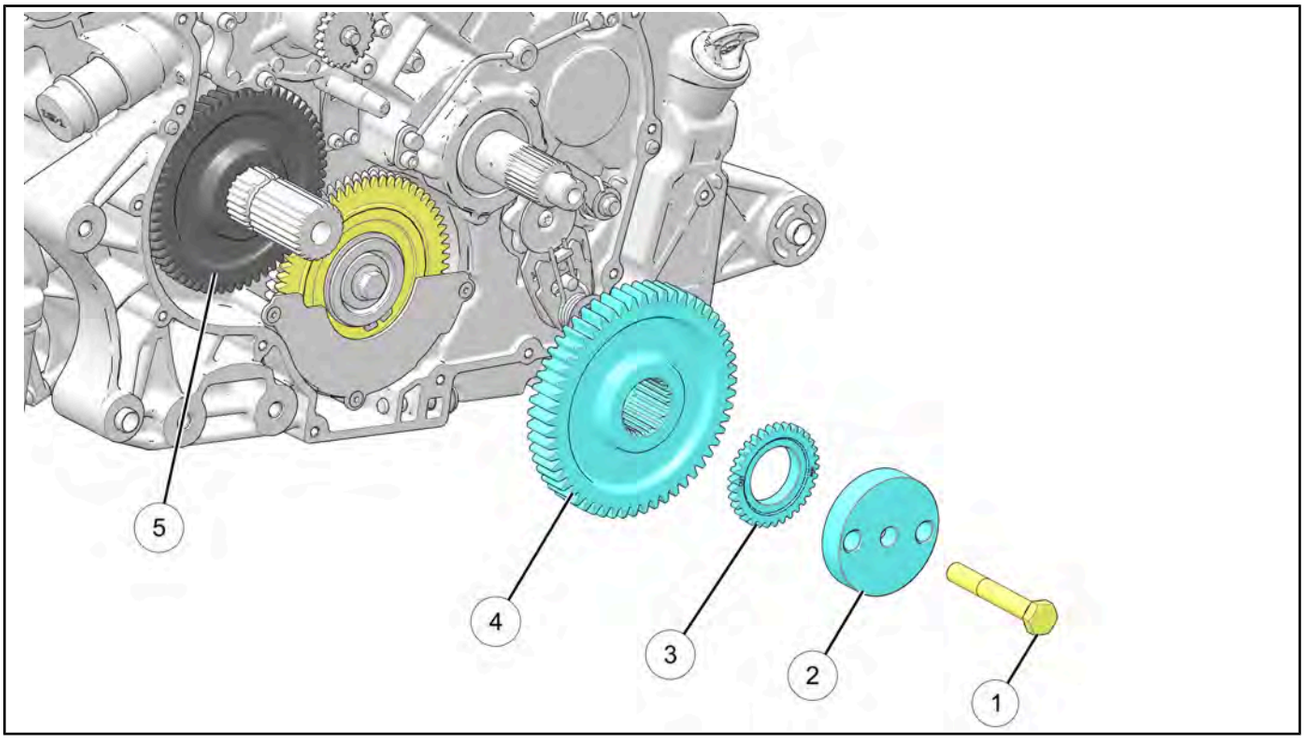
① Cold Start Cover Fastener **88 in-lbs (10 N·m)**	⑥ Outer Primary Cover Gasket
② Cold Start Cover	⑦ Primary Cover Fastener (Inner) **88 in-lbs (10 N·m)**
③ Cold Start Cover O-ring	⑧ Inner Primary Cover
④ Primary Cover Fastener (Outer) **88 in-lbs (10 N·m)**	⑨ Inner Primary Cover Gasket
⑤ Outer Primary Cover	

CLUTCH PINION SHAFT ASSEMBLY VIEW



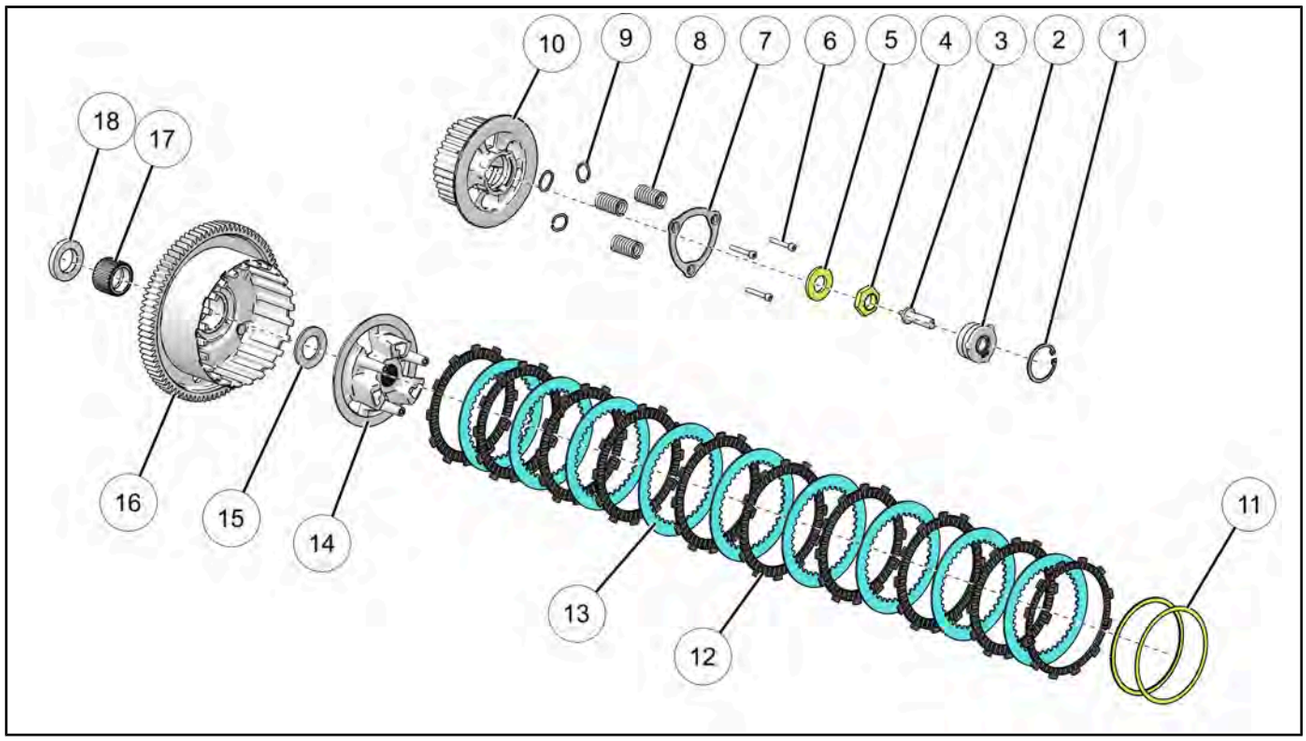
① Lift Rack	④ Bearing M12
② Bearing M7	⑤ Shaft Seal
③ Pinion Shaft Retention Fastener **62 in-lbs (7 N·m)**	⑥ Pinion Shaft

PRIMARY DRIVE GEAR ASSEMBLY VIEW



① Primary Drive Gear Fastener **83 ft-lbs (112 N·m)**	④ Crankshaft Drive Gear
② Cold test splined adapter	⑤ Crankshaft Balance Shaft Gear
③ Water Pump Sprocket	

CLUTCH ASSEMBLY VIEW

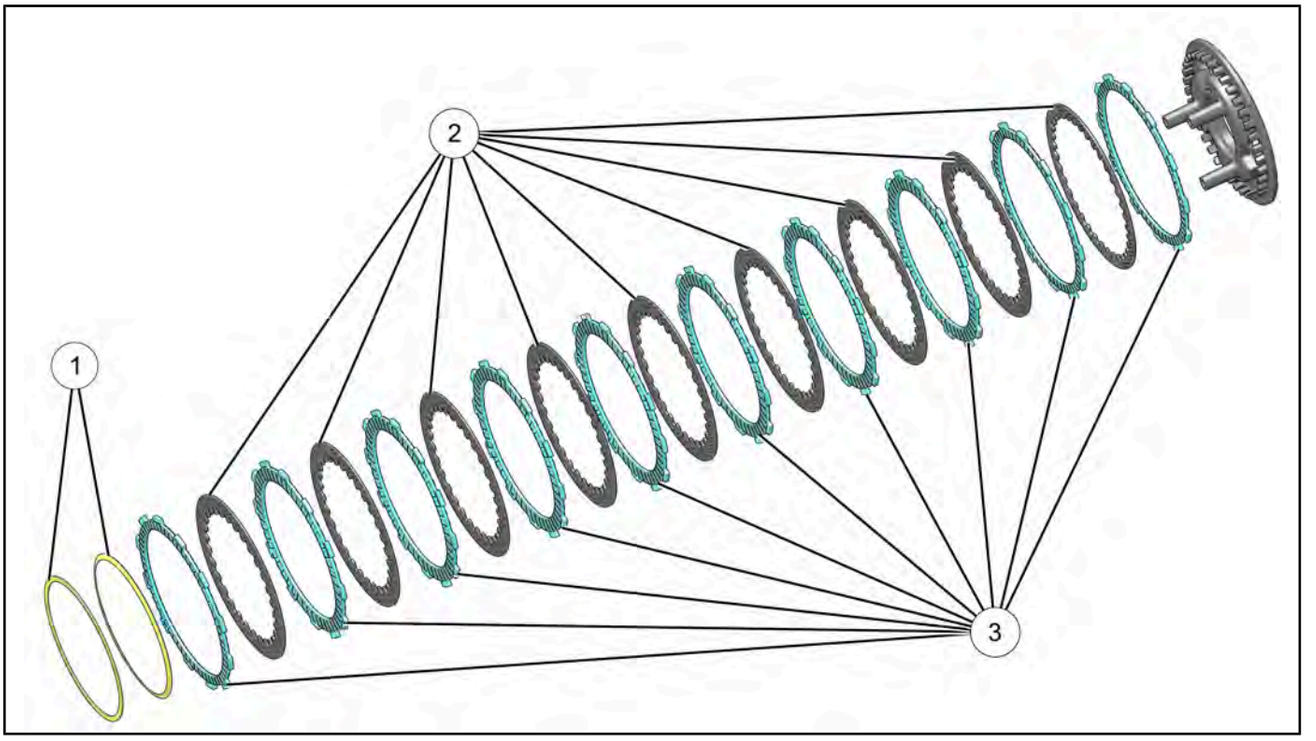


① Internal Retaining Ring	⑩ Pressure Plate
② Clutch, Lifter	⑪ Judder Spring
③ Lift RackClutch Lifter	⑫ Friction Plate
④ Clutch Stake Nut **125 ft-lbs (170 N·m)**	⑬ Separator Plate
⑤ Washer	⑭ Inner Clutch Hub
⑥ Stopper Plate Fastener **62 in-lbs (7 N·m)**	⑮ Washer
⑦ Stopper Plate	⑯ Outer Basket Assembly
⑧ Clutch Spring	⑰ Needle Bearing
⑨ Clutch Seat Spring	⑱ Clutch Adapter

NOTICE

Items ⑰ and ⑱ have two designs. Earlier design has the two parts separate and a later version they are combined into one piece.

CLUTCH PLATE ASSEMBLY VIEW



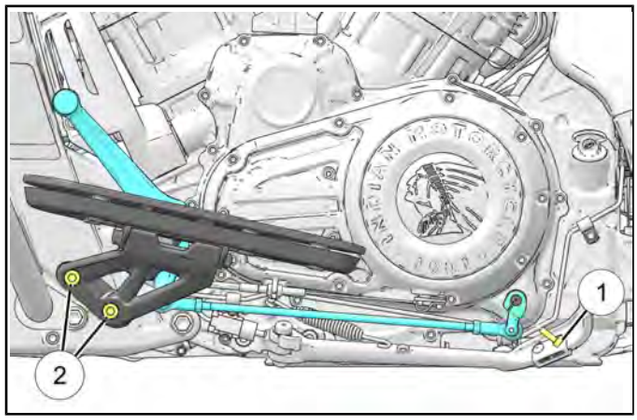
① Judder Spring	③ Clutch Separator Plate
② Friction Disk	

Judder spring must be installed with concave side facing UP (toward outside of clutch). The tallest edge of spring will be outermost.

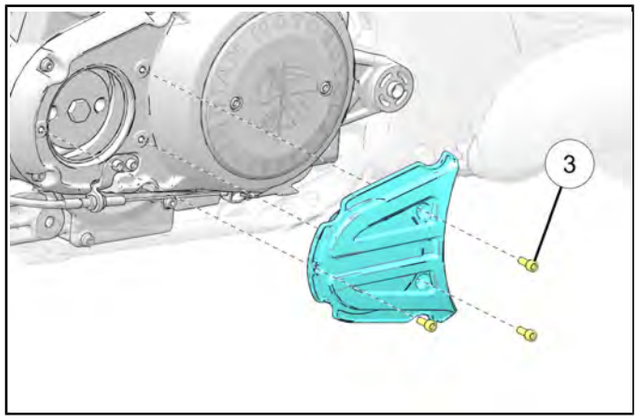
SERVICE PROCEDURES

PRIMARY COVER REMOVAL

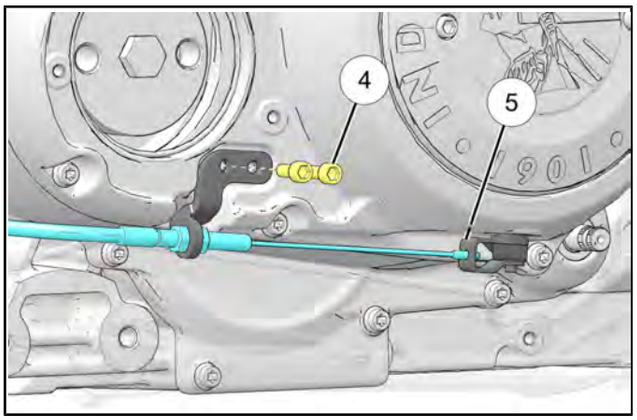
1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Drain oil from engine. See **Engine Oil & Filter Change page 2.19**.
3. Remove shift lever fastener ①.
4. Remove Left Hand floor board assembly by removing its fasteners ②. Remove assembly from unit.



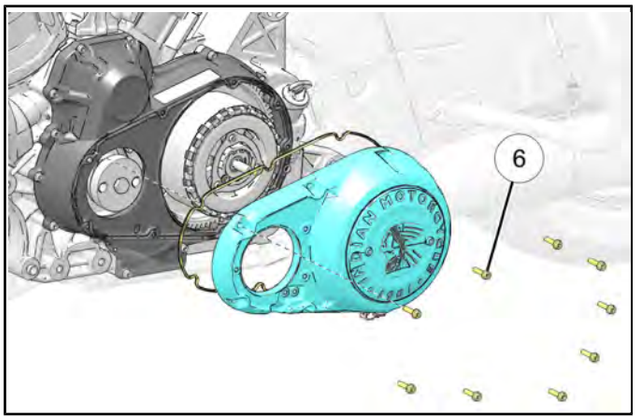
5. Remove cold start cover by removing its fasteners ③.



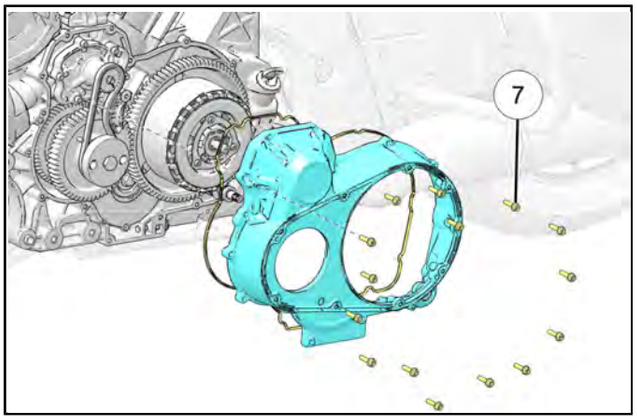
6. Remove fasteners ④ securing clutch cable mount.



7. Disconnect the clutch cable ⑤ from the clutch pinion.
8. Remove Outer primary cover by removing its fasteners ⑥.



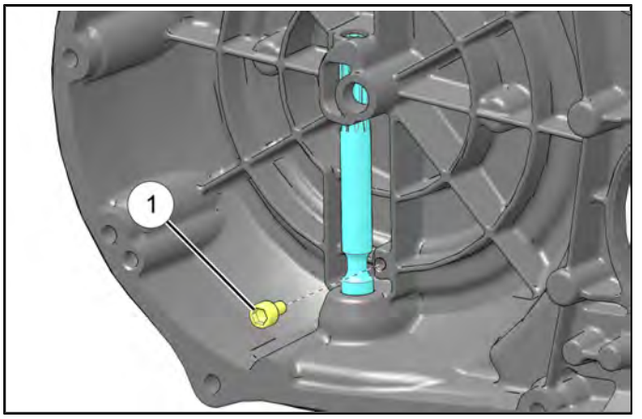
9. Remove Inner primary cover fasteners ⑦.



5

CLUTCH PINION SHAFT REMOVAL

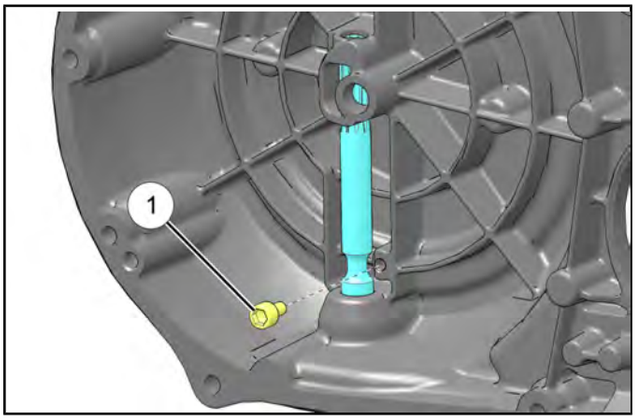
1. Remove pinion shaft retention fastener ①.



2. Remove pinion shaft from the primary cover.

CLUTCH PINION SHAFT INSTALLATION

1. Lubricate and install clutch pinion shaft until fully seated in bearings.
2. Secure pinion shaft with its fastener ①.

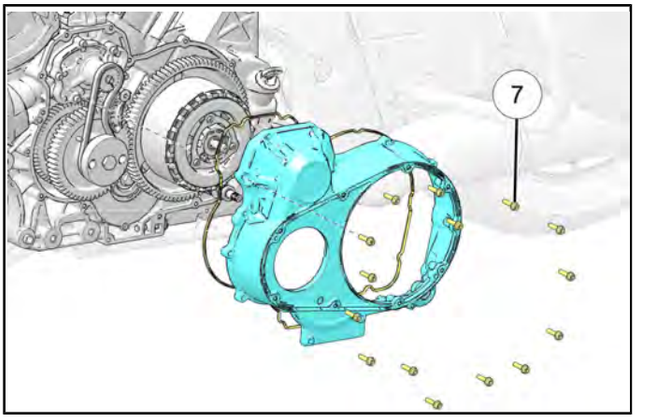


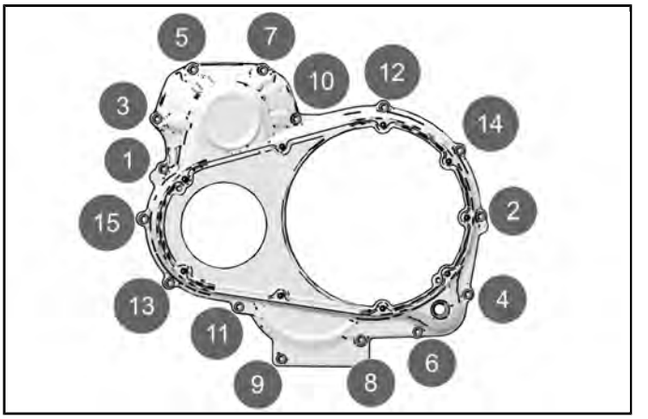
TORQUE
Pinion Shaft Retention Fastener: **62 in-lbs (7 N·m)**

PRIMARY COVER INSTALLATION

1. Clean gasket surfaces of crankcase and cover.
2. Install *new* inner primary cover gasket.
3. Install inner primary cover and secure with fasteners ⑦. Torque in sequence as shown.

TORQUE
Primary Cover Fastener (Inner): **88 in-lbs (10 N·m)**

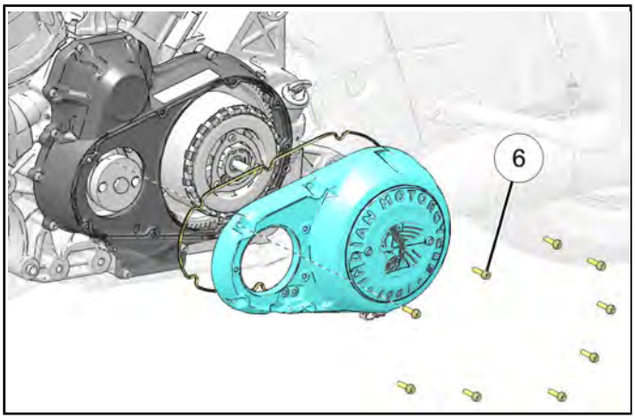


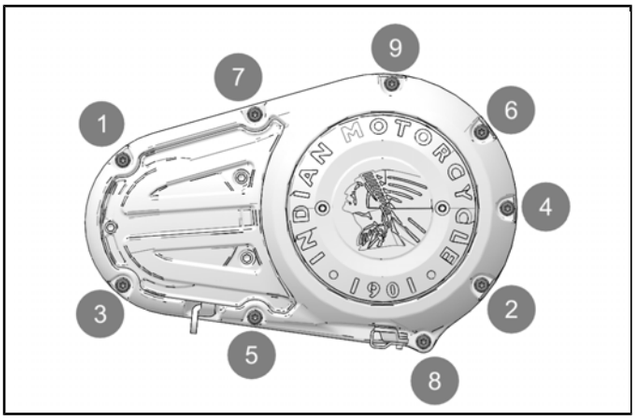


4. Install a *new* outer primary cover gasket.

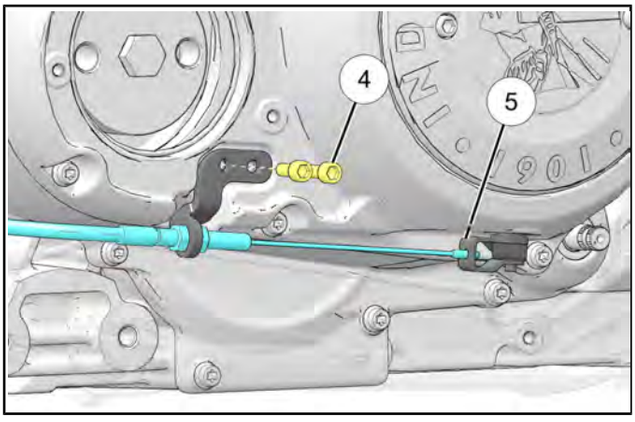
5. Install outer primary cover and secure fasteners ⑥. Torque in sequence as shown.

TORQUE
Primary Cover Fastener (Outer) **88 in-lbs (10 N·m)**





6. Connect the clutch cable ⑤ to the clutch pinion.

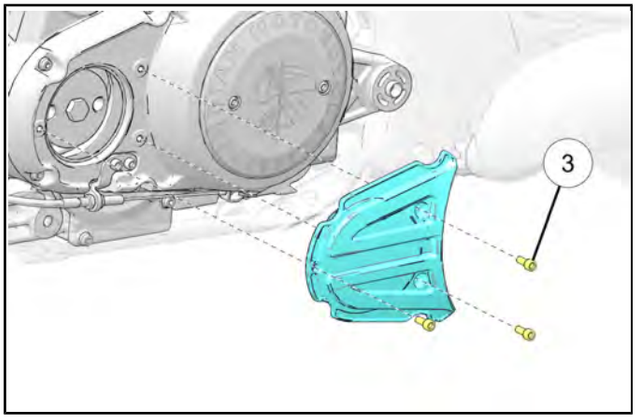


7. Install fasteners ④ securing clutch cable mount.

TORQUE
Clutch Cable Mount Fastener: **88 in-lbs (10 N·m)**

8. Install cold start cover by and fasteners③.

TORQUE
Cold Start Cover Fastener: **88 in-lbs (10 N·m)**



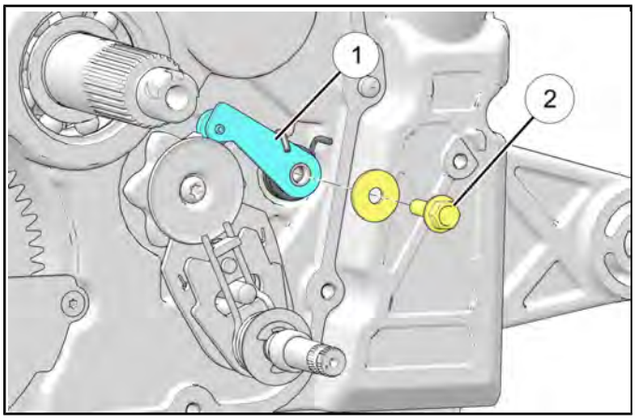
5

CLUTCH PINION SHAFT BEARING INSPECTION

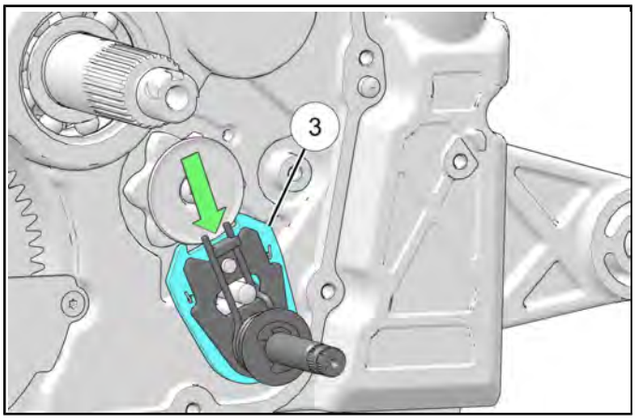
1. Apply engine oil to the bearings.
2. Temporarily install pinion shaft into primary cover.
3. Turn shaft by hand. Replace bearings that feel rough, notched, or loose.

SHIFT RATCHET REMOVAL & INSPECTION

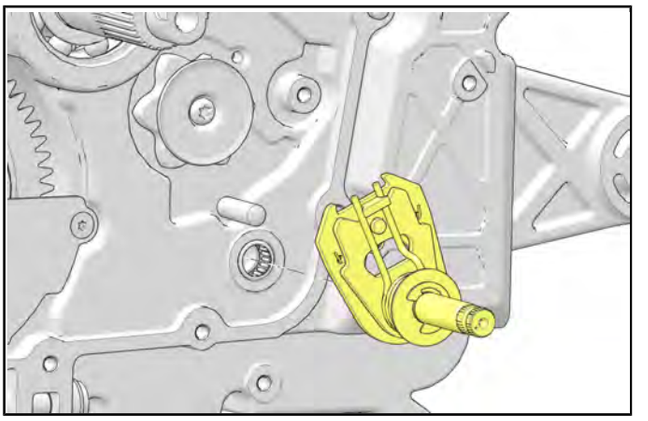
1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Shift transmission into neutral.
3. Remove primary cover. See **Primary Cover Removal page 5.13**.
4. Remove clutch assembly. See **Clutch Removal page 5.19**.
5. Rotate the detent lever ① so the spring is relaxed. Remove the fastener ② securing the detent lever to the engine case and remove lever.



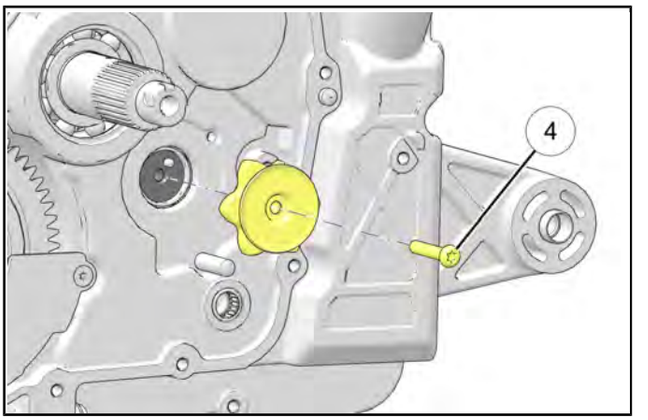
6. Push down on the ratchet plate ③ so it clears the shift star.



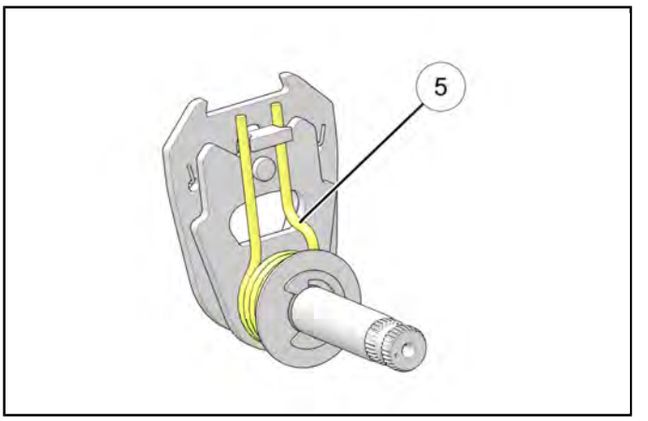
7. Pull the shift lever and spring assembly out of the bore.



8. Remove the fastener ④ securing the shift star to the shift drum and remove shift star.



9. Inspect shift shaft return spring ⑤ for cracks or loss of tension. The spring should have enough tension to keep the shift shaft centered.



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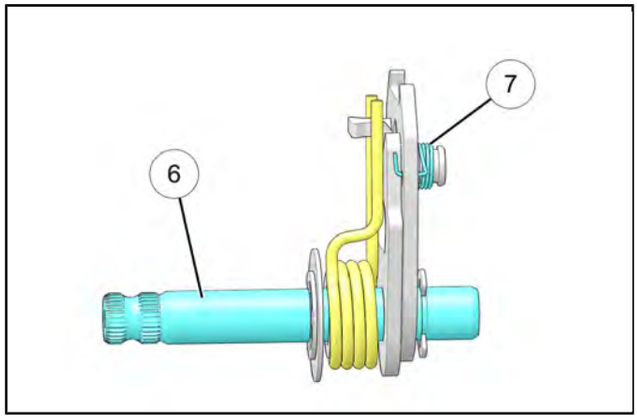
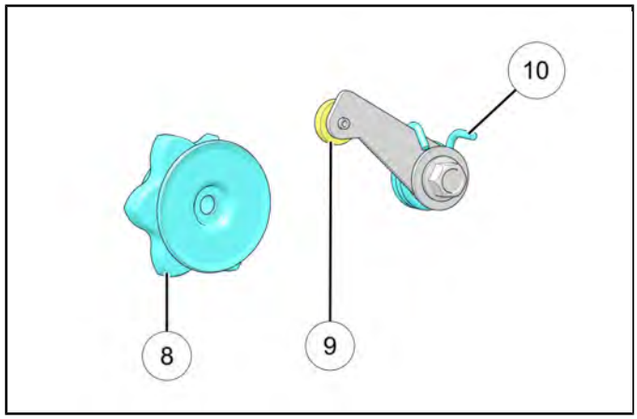
10. Inspect shift shaft ⑥ for wear or damage.



11. Inspect torsion spring ⑦ for tension. The spring should apply enough tension on the shift ratchet mechanism to keep it engaged with the shift star.

12. Inspect shift star ⑧.



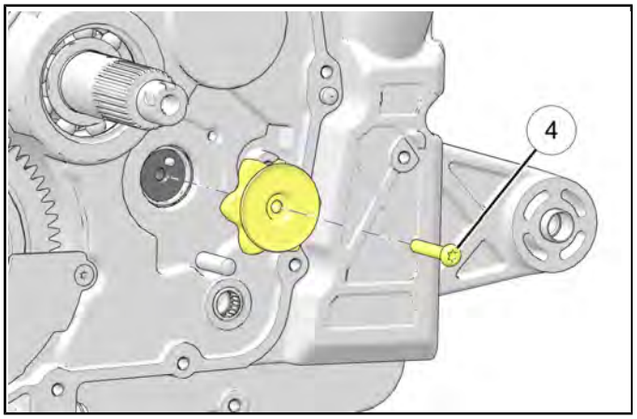
13. Inspect detent roller arm ⑨ for wear or damage.

14. Inspect spring ⑩ for cracks or fatigue.

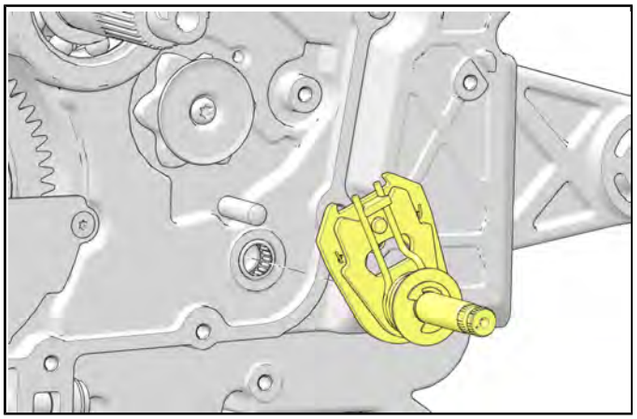
SHIFT RATCHET INSTALLATION

1. Install the shift star to the shift drum and secure with its fastener ④.

TORQUE
Shift Star Fastener: **88 in-lbs (10 N·m)**

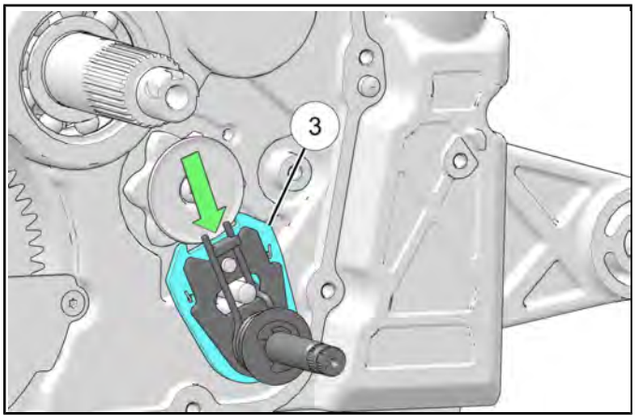


2. Install the shift lever and spring assembly into its bore.



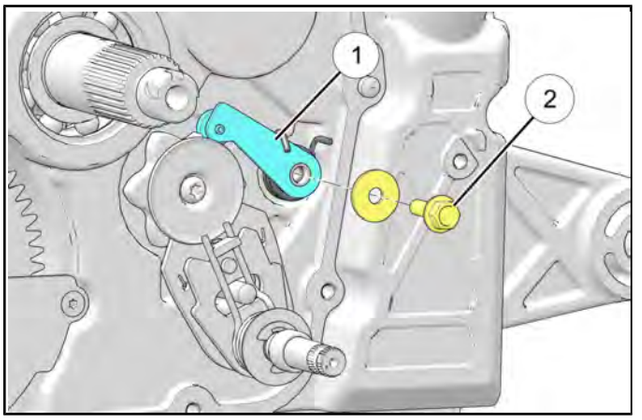
5

3. Push down on the ratchet plate ③ so it clears into shift star.



4. Install the detent lever ① and secure with fastener ②.

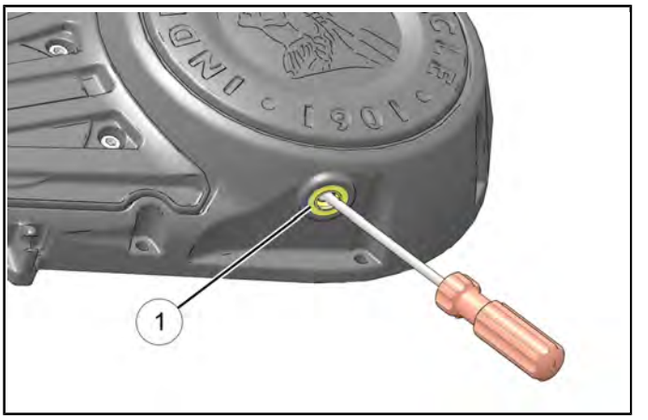
TORQUE
Detent Lever Fastener: **88 in-lbs (10 N·m)**



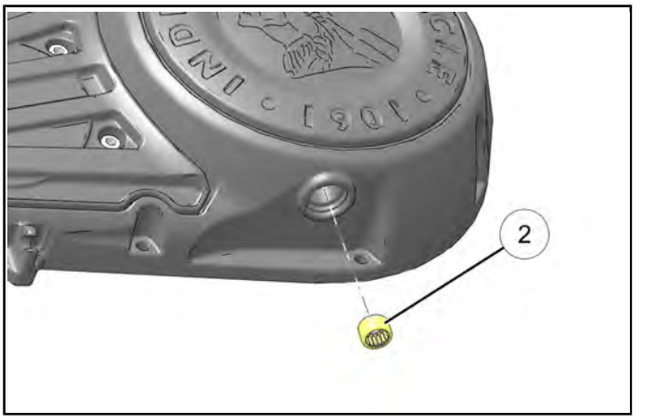
5. Install clutch. See **Clutch Installation page 5.23**.
6. Install primary cover. See **Primary Cover Installation page 5.14**.

SHIFT SHAFT BEARING & SEAL REPLACEMENT

1. Remove primary cover. See **Primary Cover Removal page 5.13**.
2. Carefully pry shift shaft seal ① from cover.



3. Using a suitable arbor and arbor press, press bearing ② from inside of cover to outside.



4. Apply white lithium grease to inner & outer surfaces of new bearing.
5. Press bearing into place with numbered side out until fully seated.
6. Apply a small amount of grease to lip of seal and apply engine oil to outside of seal.
7. Drive seal into place with a seal driver slightly smaller than the O.D. of seal.
8. Install primary cover. See **Primary Cover Installation page 5.14**.
9. After installing primary cover, be sure shift shaft returns freely to the centered position after rotating up or down.

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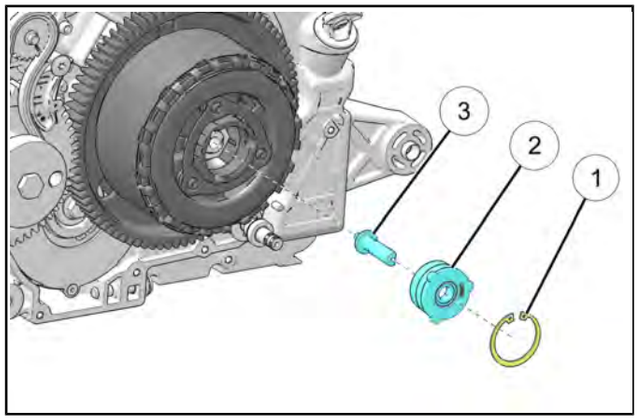
CLUTCH SERVICE

CLUTCH RACK REMOVAL

REMOVAL

1. Remove primary cover. See **Primary Cover Removal page 5.13**.
2. Using an internal snap ring pliers, remove snap ring ①, lift rack ②, and clutch rack ③.



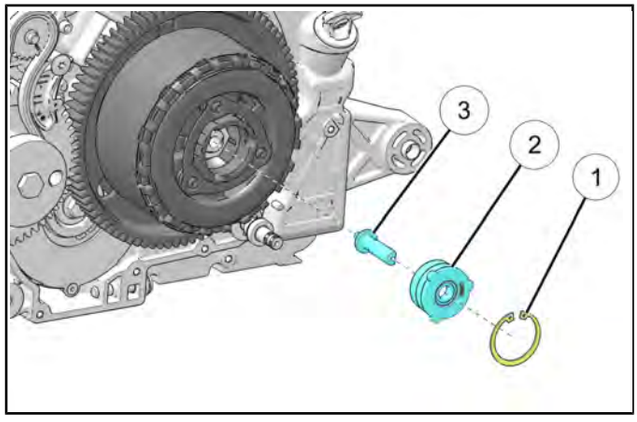
CLUTCH RACK INSTALLATION

INSTALLATION

1. Install the clutch rack ③ and lift rack ②.

⚠ CAUTION

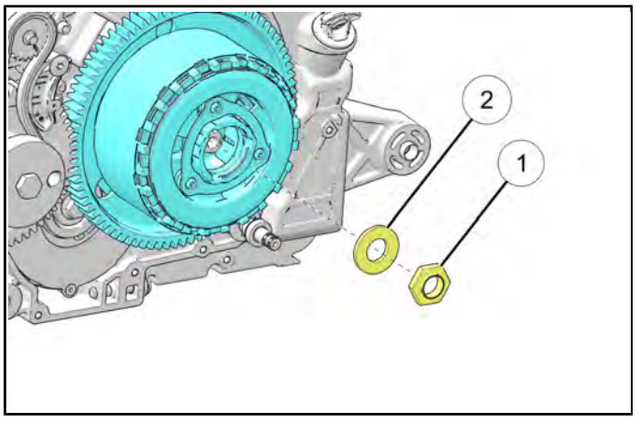
The clutch rack is to be installed with the flat face facing outward. Failure to correctly install the clutch rack will cause improper operation.



2. Install snap ring ① to retain clutch rack ③.

CLUTCH REMOVAL

1. Remove primary cover. See **Primary Cover Removal page 5.13**.
2. Remove clutch rack. See **Clutch Rack Removal page 5.19**.
3. Perform the crankshaft locking procedure. See **Locking the Crankshaft for Service page 3.59**.
4. Remove stake nut ① and washer ②. Discard the stake nut.



IMPORTANT

A new stake nut must be installed upon assembly.

5. Remove clutch assembly from input shaft.

IMPORTANT

Make sure to retrieve the clutch spacer after removing the clutch.

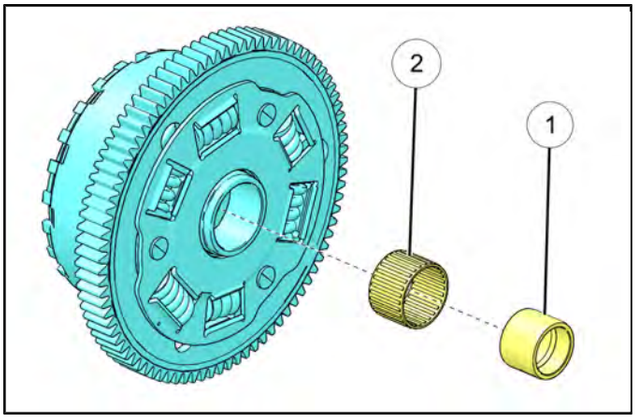
5

CLUTCH DISASSEMBLY

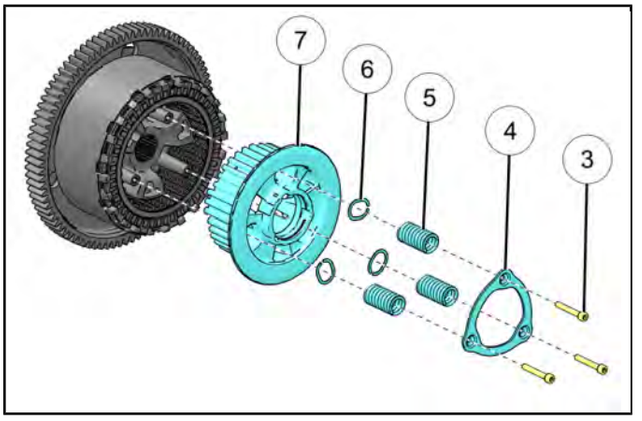
⚠ CAUTION

Clutch is under spring pressure. WEAR EYE PROTECTION.

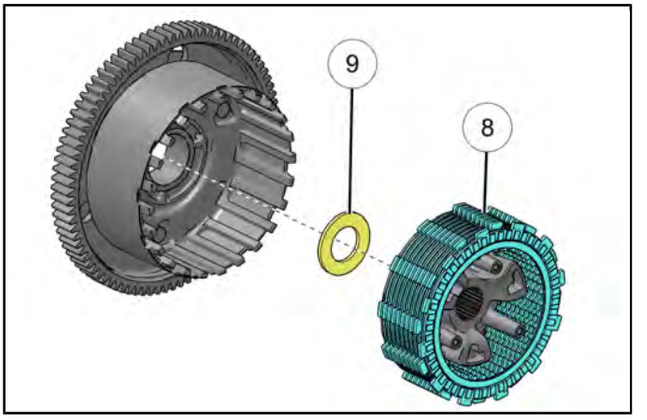
1. Remove the clutch. See **Clutch Removal page 5.19**.
2. Remove the sleeve ① and needle bearing ② from the back side of the clutch assembly.



3. Alternately loosen the pressure plate fasteners ③ until spring tension has released.



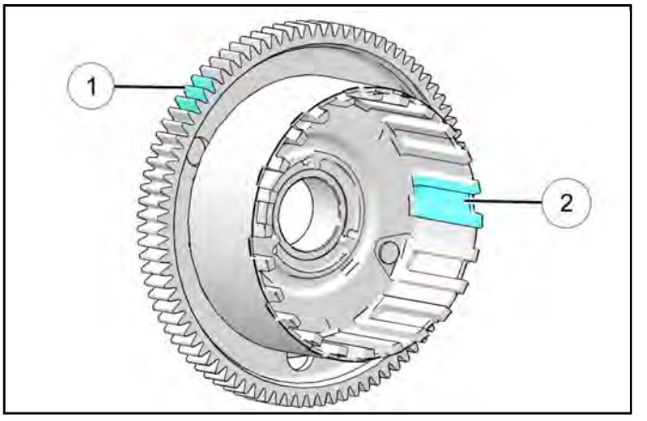
4. Remove stopper plate ④.
5. Remove clutch springs ⑤ and retaining rings ⑥.
6. Remove outer hub ⑦.
7. Remove inner hub and clutch assembly ⑧.



8. Remove thrust washer ⑨.

CLUTCH INSPECTION

1. Clean clutch plates, inner hub, and outer basket.
2. **Clutch Basket** Inspect clutch gear teeth ① for wear, cracks or damage.
3. Inspect inside surfaces ② of basket for cracks or wear (grooves) from clutch plates.



4. Replace parts that fail inspection
5. Rotate hub bearing. Check for smooth rotation. Inner race should have no detectable radial movement.

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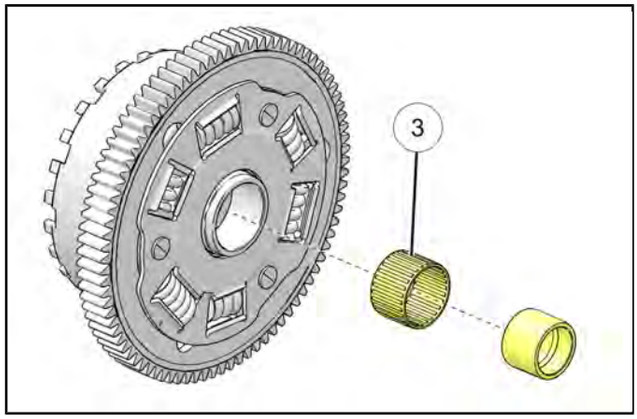
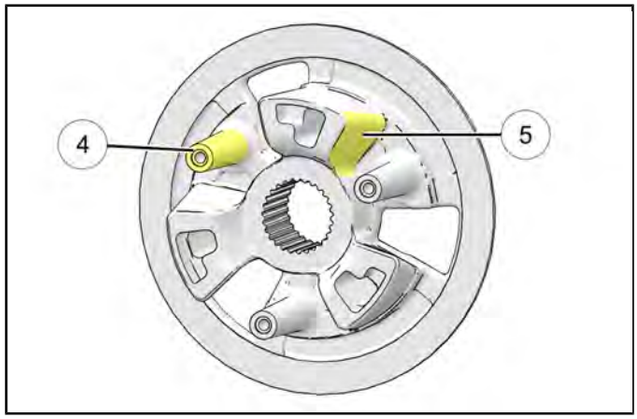
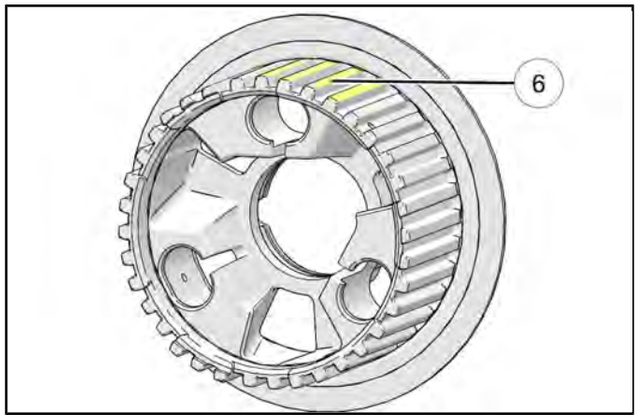
6. Lubricate bearing ③ with engine oil.



7. Inspect posts ④ for cracks or damage.



8. Check the slip ramps ⑤ for damage.
9. Inspect surface of steel plate guides ⑥ on outer edge of hub for wear, groves, or damage.



10. Visually inspect friction and steel plates for wear or damage on both surfaces. Replace plates as a set if any plate is worn or damaged.
11. Replace steel plates if grooved, distorted or discolored. Inspect plates for distortion by placing each plate on a precision flat surface. Insert a feeler gauge between plate and flat surface in several places.

Clutch Steel Plate Warp Service Limit: **.008 in (.20 mm)**

12. Measure thickness of friction plates in several places. Thickness should be the same at each place. Replace plates that fail inspection.

Friction Plate Thickness (Minimum): **.126 in (3.2 mm)**

13. Inspect pressure plate for cracks, scoring, or wear on friction surface. **Clutch Springs**
14. Inspect clutch springs for cracks or distortion.

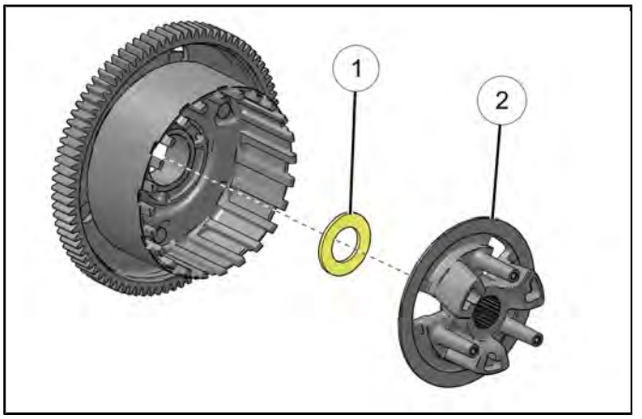
Clutch Release Rack and Bearing

NOTICE
Clutch rack is serviceable as an assembly only.

15. Inspect clutch rack for broken or damaged teeth.
16. Inspect lifter bearing visually for any signs or wear or discoloration. Rotate bearing inner race with your finger and check for smooth movement and no play.
17. Replace clutch rack assembly if necessary.

CLUTCH ASSEMBLY

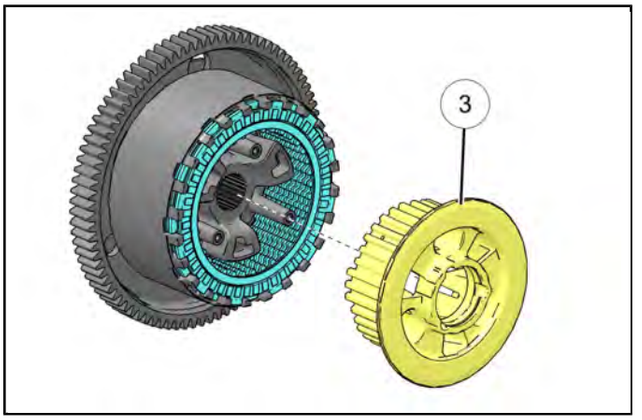
1. Install the thrust washer ① and the clutch hub ② into the clutch basket.



Refer to the Clutch Assembly View outlined in this chapter for clutch plate orientation. See **Clutch Assembly View page 5.11**

NOTICE
If friction plates are new, soak them in clean engine oil for a few minutes before installing.

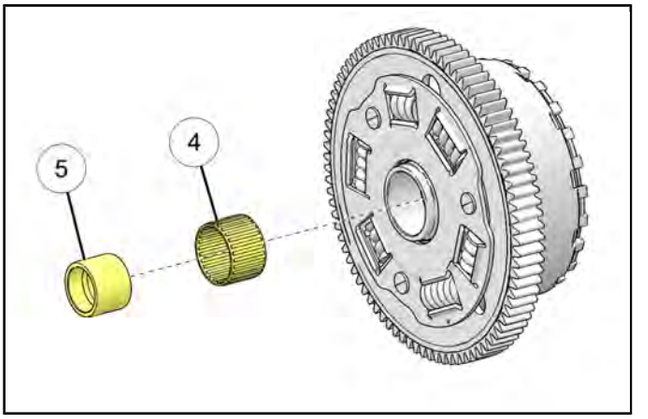
2. Install pressure plate ③.



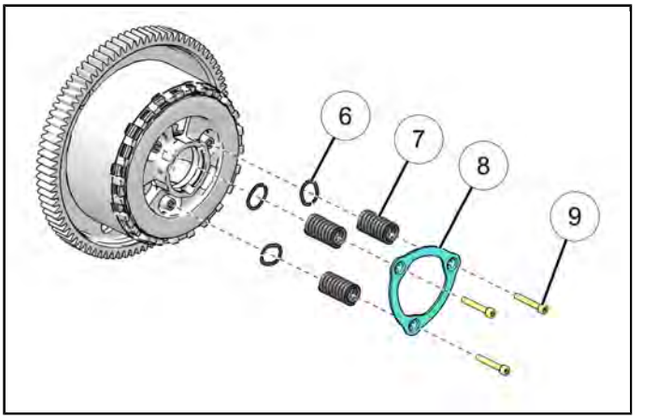
NOTICE
Use care while installing to prevent damage to friction plates and separator plates

3. Apply engine oil to hub bearing ④ .

4. Install the hub bearing and sleeve ⑤ into the clutch assembly.



5. Install spring retaining rings ⑥.



6. Install clutch springs ⑦.

7. Install the stopper plate ⑧ and clutch springs and fasteners ⑨ .

IMPORTANT
Alternately tighten the clutch spring fasteners in a star pattern until fully seated.

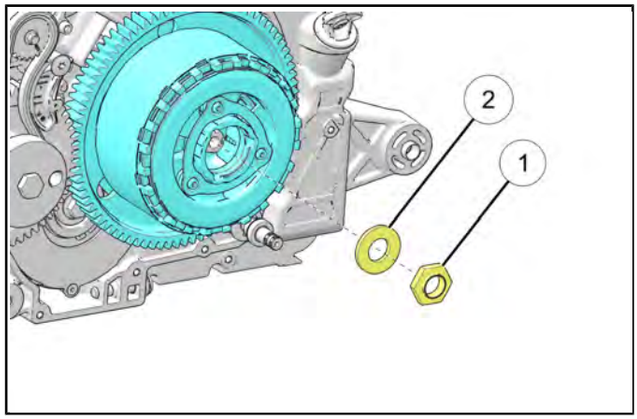
TORQUE
Stopper Plate Fastener: **62 in-lbs (7 N·m)**

CLUTCH INSTALLATION

IMPORTANT
When installing clutch assembly on the input shaft, make sure that the thrust washer between the clutch basket and the clutch hub goes onto the shaft and does not fall between hub and basket.

1. Slide the clutch assembly onto the transmission input shaft until fully seated.
2. Install washer ② and **NEW** stake nut ①.

TORQUE
Clutch Stake Nut **125 ft-lbs (170 N·m)**

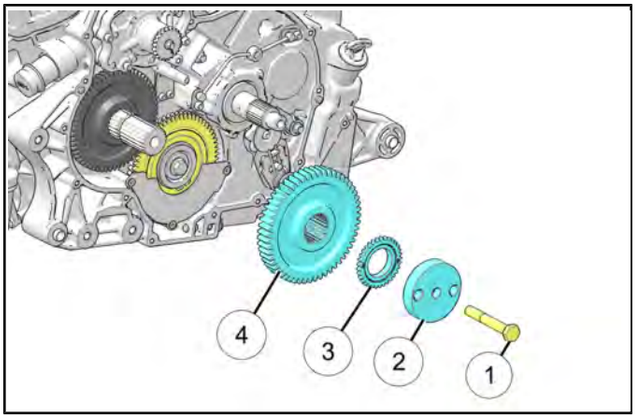


3. Stake the nut.
4. Install clutch rack. See **Clutch Rack Installation page 5.19**.
5. Install primary cover. See **Primary Cover Installation page 5.14**.

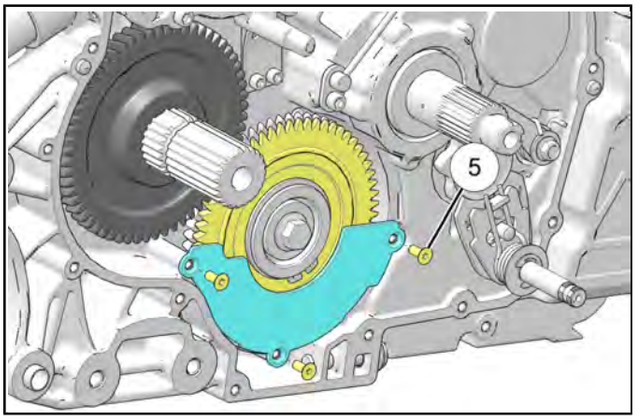
PRIMARY DRIVE GEAR SERVICE

PRIMARY DRIVE GEAR REMOVAL

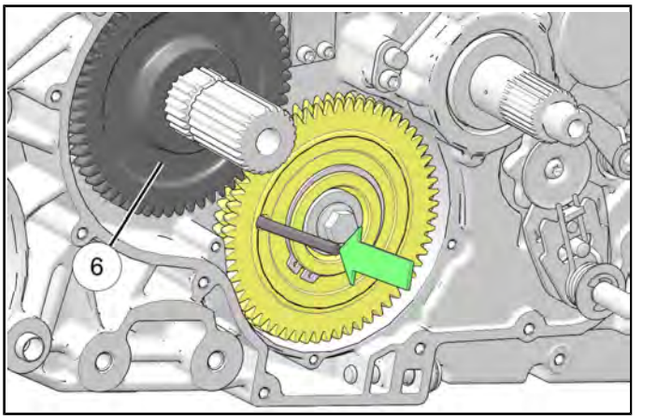
1. Remove primary cover. See **Primary Cover Removal page 5.13**.
2. Perform crankshaft locking procedure. See **Locking the Crankshaft for Service page 3.59**.
3. Remove water pump chain. Reference **Water Pump Removal page 3.46**.
4. Remove the primary drive gear fastener ①.



5. Remove cold test splined adapter. ②.
6. Remove water pump sprocket ③.
7. Remove crank drive gear ④.
8. Remove the balance shaft shield by removing its fasteners ⑤.

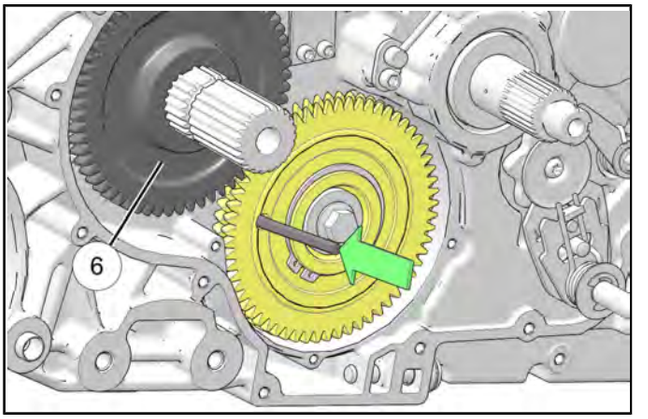


9. Install a punch or similar into the balance shaft split gear hole to relieve pressure off on the crank balance shaft gear ⑥ and remove.

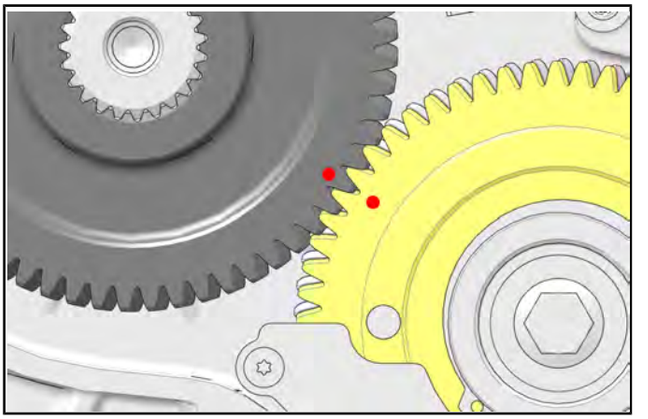


PRIMARY DRIVE GEAR INSTALLATION

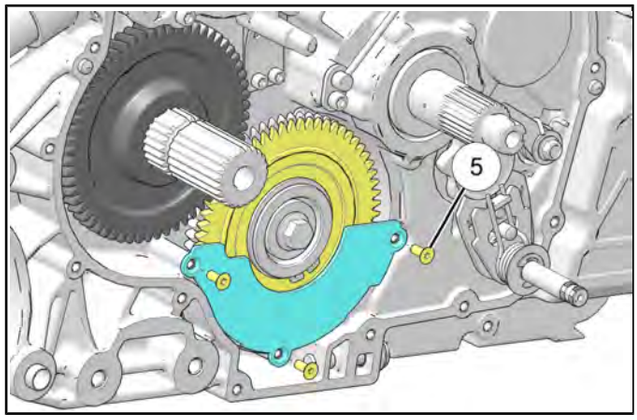
1. Install a punch or similar into the balance shaft split gear hole to align teeth and install crank balance shaft gear ⑥.



2. Ensure the timing marks are aligned.

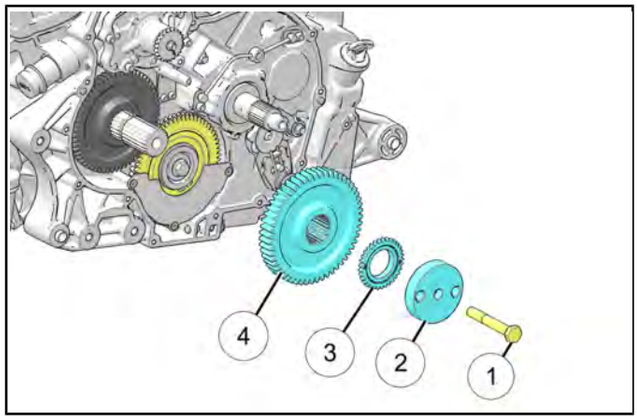


3. Install the balance shaft shield and secure with its fasteners ⑤.



TORQUE
Balance Shaft Shield Fastener: **62 in-lbs (7 N·m)**

4. Install crank drive gear ④.



5. Install water pump sprocket ③.
6. Install cold test splined adapter. ②
7. Install the primary drive gear fastener ①.

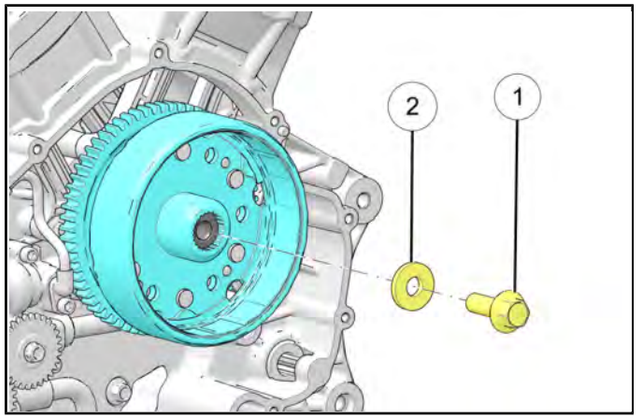
TORQUE
Primary Drive Gear Fastener: **83 ft-lbs (112 N·m)**

8. Install water pump chain. Reference **Water Pump Installation page 3.47**.
9. Install primary cover. See **Primary Cover Installation page 5.14**.

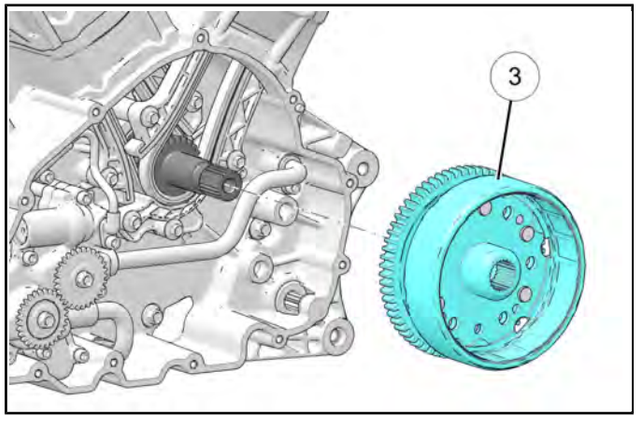
FLYWHEEL REMOVAL

REMOVAL

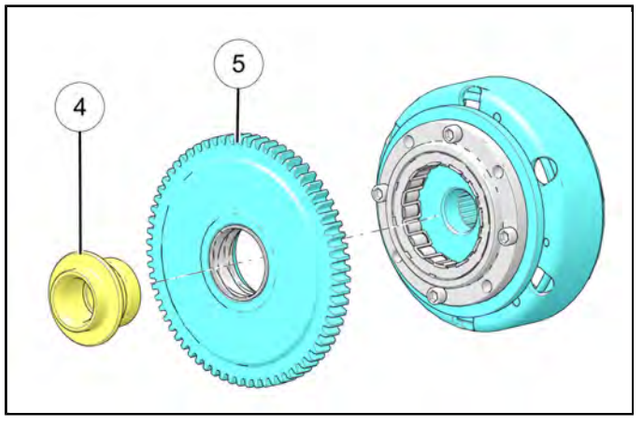
1. Remove stator. See **Stator Removal page 10.32**.
2. Remove ACG Cover. See **ACG Cover Removal page 10.31**
3. Remove flywheel bolt ① and washer ②.



4. Remove flywheel assembly ③.

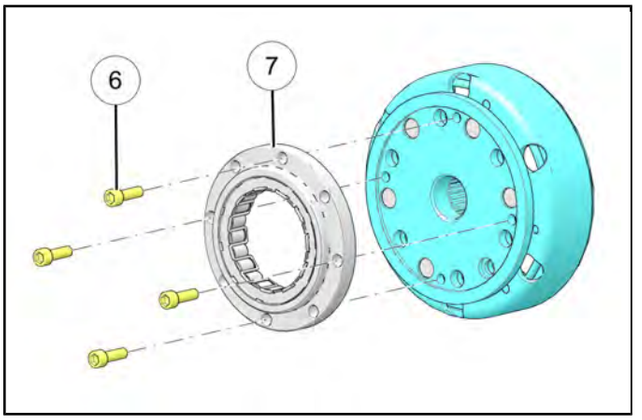


5. Remove starter/ACG spacer ④.



5

6. Remove starter clutch gear ⑤.
7. Remove sprag clutch hub ⑦ by removing its fasteners ⑥.



FLYWHEEL INSTALLATION

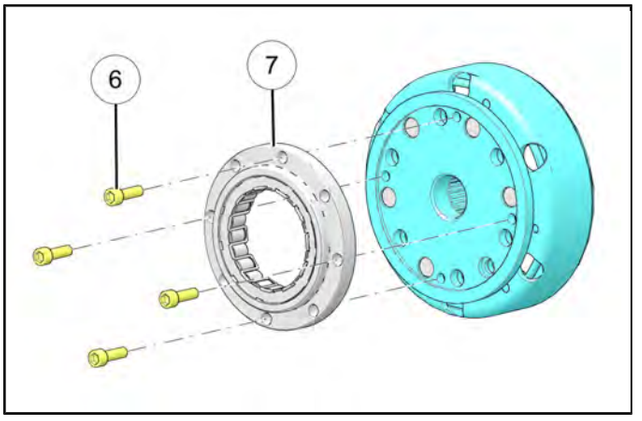
INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

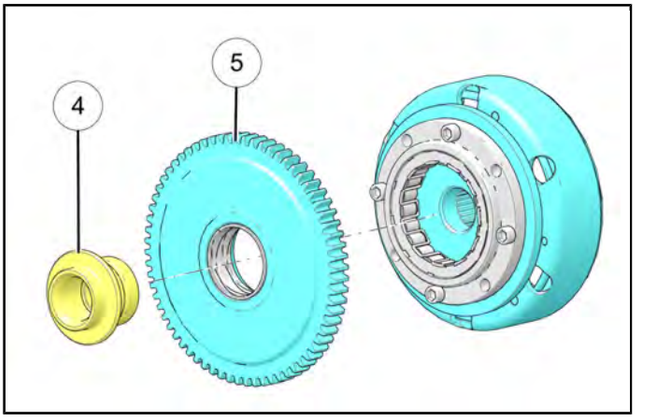
TORQUE
Sprag Clutch Hub Fastener **88 in-lbs (10 N·m)**

TORQUE
Flywheel Fastener **83 ft-lbs (112 N·m)**

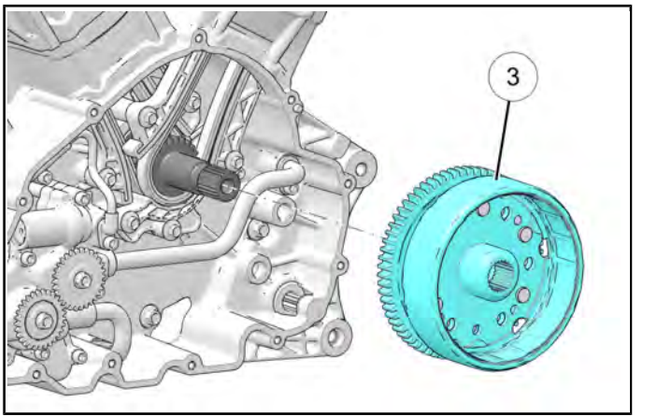
2. Install sprag clutch hub ⑦ by installing its fasteners ⑥.



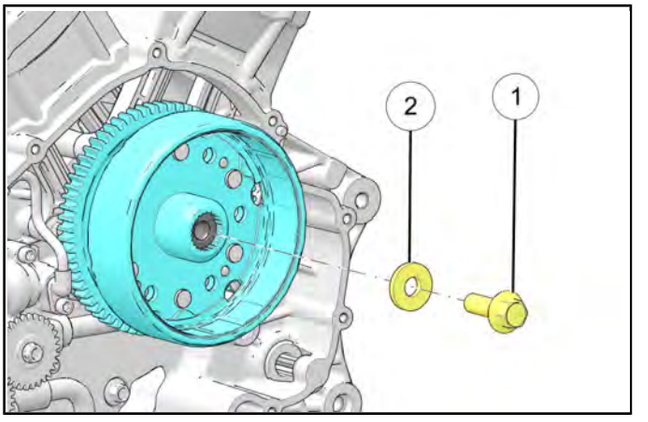
3. Install starter/ACG spacer ④.



4. Install starter clutch gear ⑤.
5. Install flywheel assembly ③.



6. Install flywheel bolt ① and washer ②.



7. Install ACG Cover. See **ACG Cover Installation page 10.31**
8. Install stator. See **Stator Installation page 10.33**.

TROUBLESHOOTING, CLUTCH / PRIMARY / SHIFT

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Clutch Lever Pulls Excessively Hard	Clutch lever pivot, bushings need lubrication	Clutch lever pivot points	Lubricate
	Drive plates catching on primary driven gear basket	Clutch primary driven gear / clutch plates	Replace necessary parts
	Clutch rack bearing damage	Clutch rack	Replace
	Clutch pinion shaft bearing binding	Pinion shaft bearings	Replace
	Clutch Cable Damaged	Clutch Cable	Replace
Clutch Slips	Clutch Cable too tight	Clutch Cable	Verify proper clutch cable free play
	Clutch springs weak	Clutch springs	Replace
	Pressure plate worn or distorted	Pressure plate	Replace
	Clutch plates worn, warped or distorted	Clutch Friction / Separator Plates	Replace plates as necessary
	Clutch rack mechanism sticking	Clutch rack mechanism	Replace
	Engine oil level low	Oil level	Correct oil level
	Oil additives present in oil or used previously	Oil quality	Replace oil & filter (clutch plates may need to be replaced
Dragging clutch (doesn't disengage completely, creeping)	Clutch lever, pivot, cable, or lifter arm sticking	Lever, pivots, bushings, bearings, cable	Inspect
	Oil additives present in oil or used previously	Oil quality	Replace oil & filter (clutch plates may need to be replaced
	Oil level too high	Oil level	Correct
	Oil viscosity too high	Oil quality	Replace oil & filter
	Pressure plate worn, warped or distorted	Pressure plate	Replace
	Clutch plate(s) worn, warped or distorted	Driven plates and / or drive plates	Replace
	Weak clutch springs	Clutch springs	Replace
	Damaged Clutch cable	Clutch Cable	Replace
	Too much clutch cable free play	Clutch Cable	Verify proper clutch cable free play

NOTES

CHAPTER 6
TRANSMISSION / CRANKSHAFT

6

GENERAL INFORMATION

SPECIAL TOOLS – TRANSMISSION / CRANKSHAFT

TOOL DESCRIPTION	PART NUMBER
Case Splitting / Assembly Tool	PF-51234-A
Clutch Shaft Holding Tool	PF-51232
Crankshaft Locking Pin	PF-51235-A
Crankshaft Rotation Socket	PF-51239
Drive Sprocket Seal Installer	PF-51243
Engine Stand Adapter	PF-51240

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SERVICE SPECIFICATIONS – TRANSMISSION / CRANKSHAFT

CONNECTING ROD / CRANKSHAFT SPECIFICATIONS

PART	PART SPECIFIC	STANDARD	SERVICE LIMIT
Connecting Rod	Connecting Rod to Crankshaft Side Clearance	.17 - .45 mm (.0067 - .01772")	.65 mm (.0256")
	Connecting Rod Bearing to Crankshaft Oil Clearance	.028 - .072 mm (.001 - .0028")	.12 mm (.0393")
	Connecting Rod Small End I.D.	23.015 - 23.025 mm (.9061 - .9065")	23.09 mm (.9091")
	Connecting Rod Width	21.05 - 21.15 mm (.8287 - .8326")	20.76 mm (.8173")
	Connecting Rod Big End I.D.	57.000 - 57.008 mm (2.2440 - 2.2444")	57.038 mm (2.2456")
Crankshaft Main Bearing / Rod Journals	Connecting Rod Journal Width	45.472 - 45.552 mm (1.7902 - 1.7934")	43.51 mm (1.712")
	Crankshaft Rod Journal O.D.	53.992 - 54.008 mm (2.1256 - 2.1263")	53.962 mm (2.1245")
	Main Bearing Oil Clearance	Left .020 mm (.00078") Right .050 mm (.00196")	.10 mm (.004")
	Main Bearing Journal O.D.	59.952 – 59.970 mm (2.3603 - 2.3610")	59.9323 mm (2.3595")
	Crankshaft End Play	.08 - .25 mm (.0031 - .0098")	-
Balance Shaft	Journal O.D., Left (Primary Side) Journal O.D., Right (Cam Side)	24.980 - 24.992 mm 24.969 - 24.979 mm	-

TRANSMISSION SPECIFICATIONS

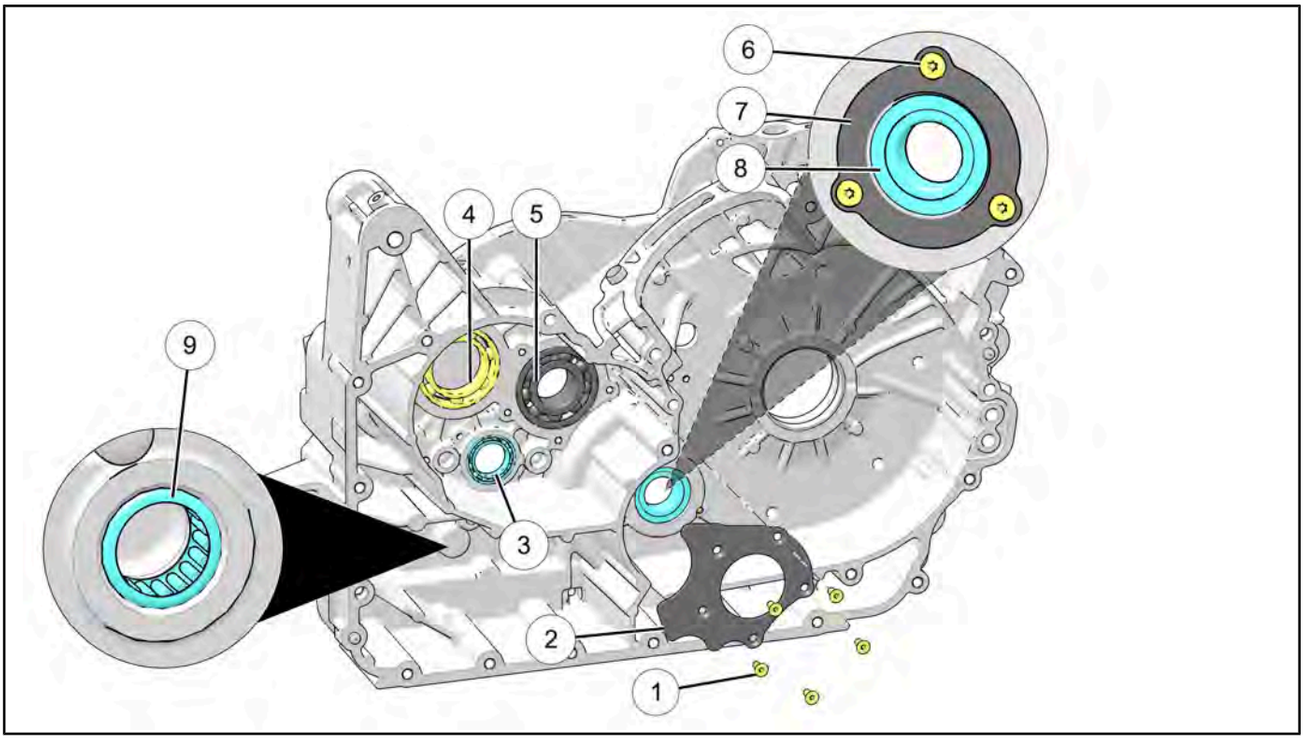
ITEM	PART SPECIFIC	STANDARD	SERVICE LIMIT
Shift Fork	Shift Fork I.D. (Rail)	12.00 - 12.026 mm (.4725 - .4732")	12.05 mm (.4744")
	Shift Fork Pin O.D.	6.036 - 6.136 mm (.2376 - .2416")	6.02 mm (.2370")
Shift Fork Rail	Shift Fork Rail O.D.	11.948 - 11.972 mm (.4704 - .4713")	11.92 mm (.4693")
	Shift Fork Rail Runout	-	.025 mm (.001")
Shift Drum	Shift Drum Groove	-	Replace drum if any wear is evident

ITEM		SPECIFICATIONS
Drive Train (General)	Transmission	6 Speed
	Primary Reduction Ratio	1.56: 1
	Final Reduction Ratio	2.38: 1
Drive Train (Gear Ratios)	Gear Ratio: 1st Gear	2.73: 1
	Gear Ratio: 2nd Gear	1.86: 1
	Gear Ratio: 3rd Gear	1.38: 1
	Gear Ratio: 4th Gear	1.10: 1
	Gear Ratio: 5th Gear	.94: 1
	Gear Ratio: 6th Gear (Overdrive)	0.81: 1

ASSEMBLY VIEWS

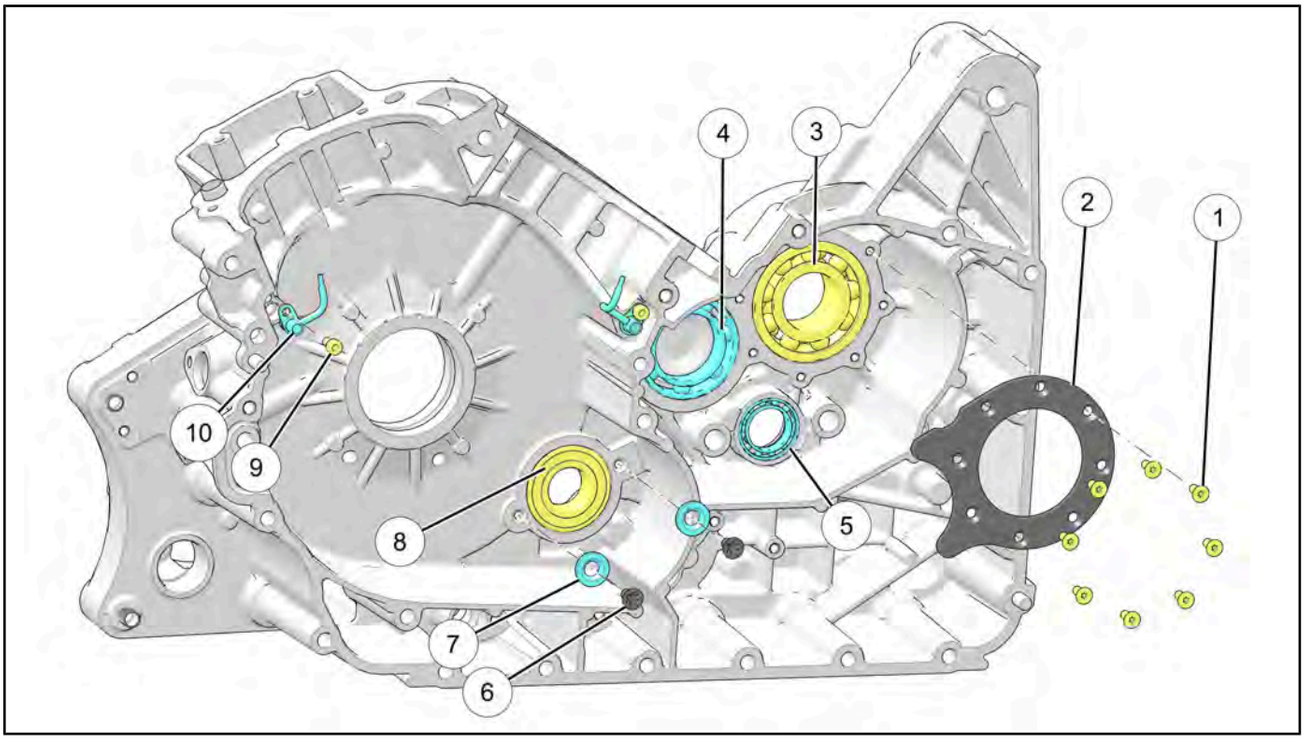
CRANKCASE ASSEMBLY VIEW

LEFT



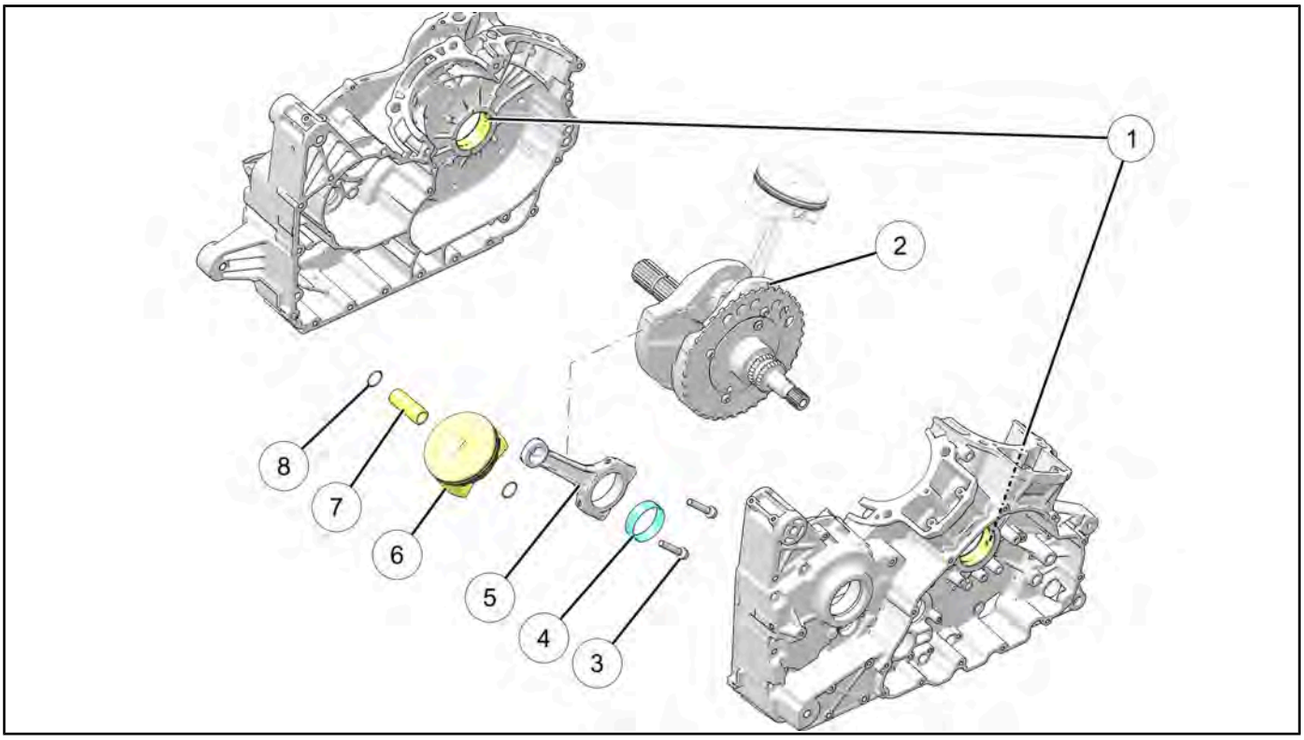
① Bearing Retainer Plate Fastener **62 in-lbs (7 N·m)**	⑥ Balance Shaft Retainer Plate Fastener **62 in-lbs (7 N·m)**
② Bearing Retainer Plate	⑦ Balance Shaft Retainer Plate
③ Shift Drum Bearing	⑧ Balance Shaft Bearing
④ Output shaft bearing	⑨ Shift Shaft Bearing
⑤ Input shaft bearing	

RIGHT



① Bearing Retainer Plate Fastener **62 in-lbs (7 N·m)**	⑥ Balance Shaft Retainer Fastener **88 in-lbs (10 N·m)**
② Bearing Retainer Plate	⑦ Balance Shaft Retainer
③ Output Shaft Bearing	⑧ Balance Shaft Bearing
④ Input Shaft Bearing	⑨ Piston Cooling Jet Fastener **62 in-lbs (7 N·m)**
⑤ Shift Drum Bearing	⑩ Piston Cooling Jet

CRANKSHAFT ASSEMBLY VIEW

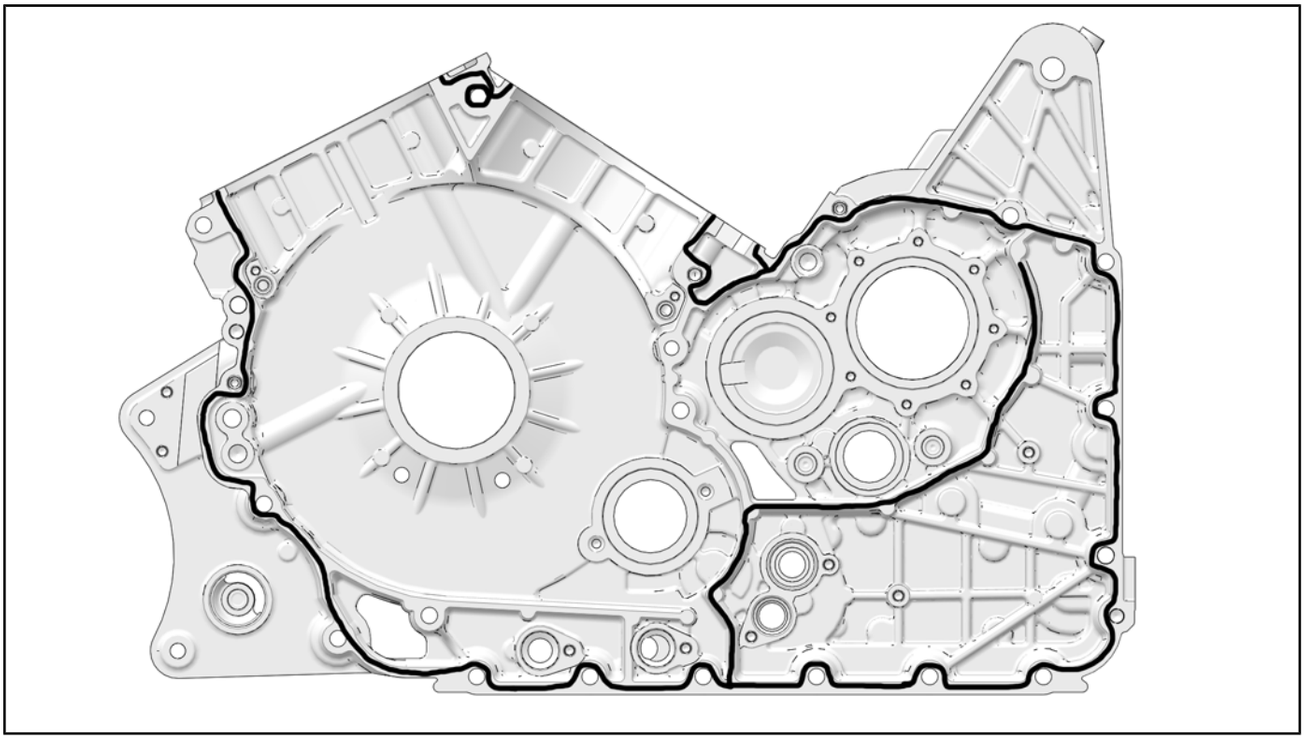


① Crankshaft Bearing	⑤ Connecting Rod
② Crankshaft Assembly	⑥ Piston
③ Connecting Rod Fastener **1. Torque to 19 ft-lbs (26 N·m)** **2. Torque angle to 105 °**	⑦ Wrist Pin
④ Connecting Rod Bearing	⑧ Circlip

6

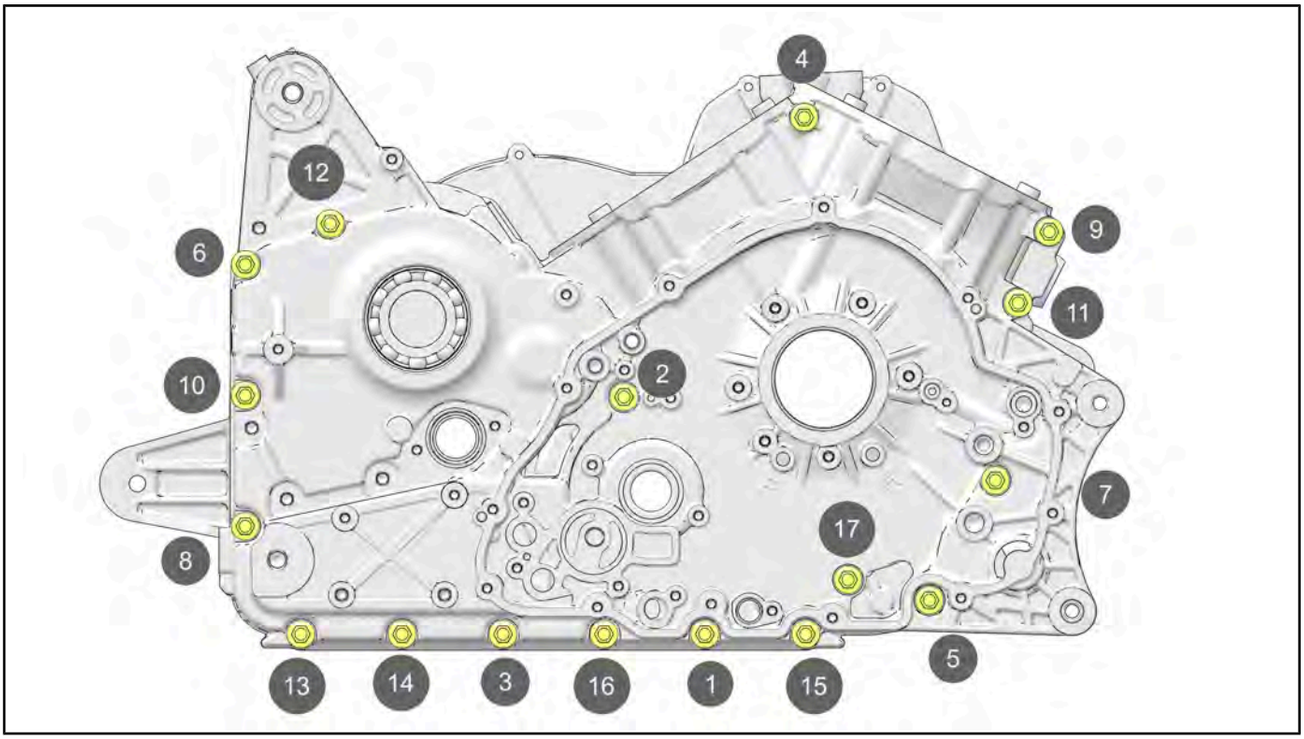
CRANKCASE TORQUE SEQUENCE

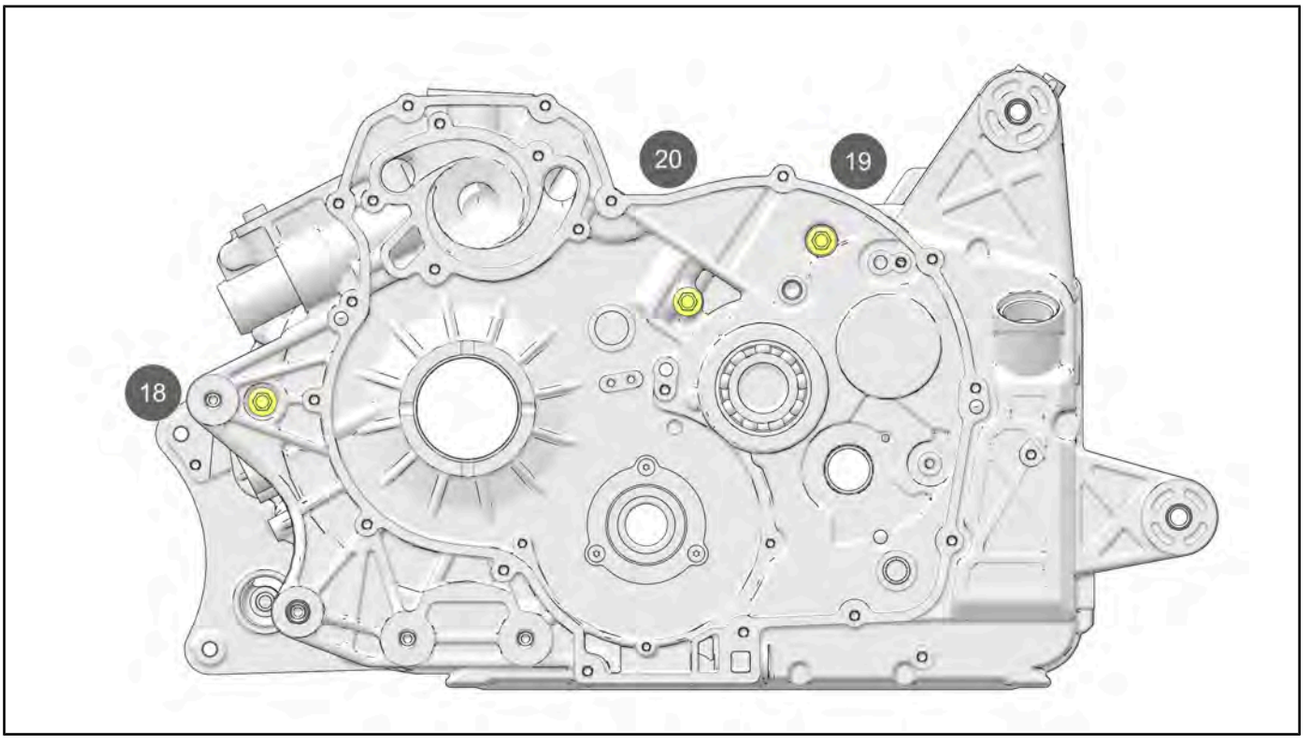
CRANKCASE SEALANT PATH



Use sealant Loctite™ Ultra Black 598 and follow the path shown in the image prior to crankcase assembly.

TORQUE SEQUENCE

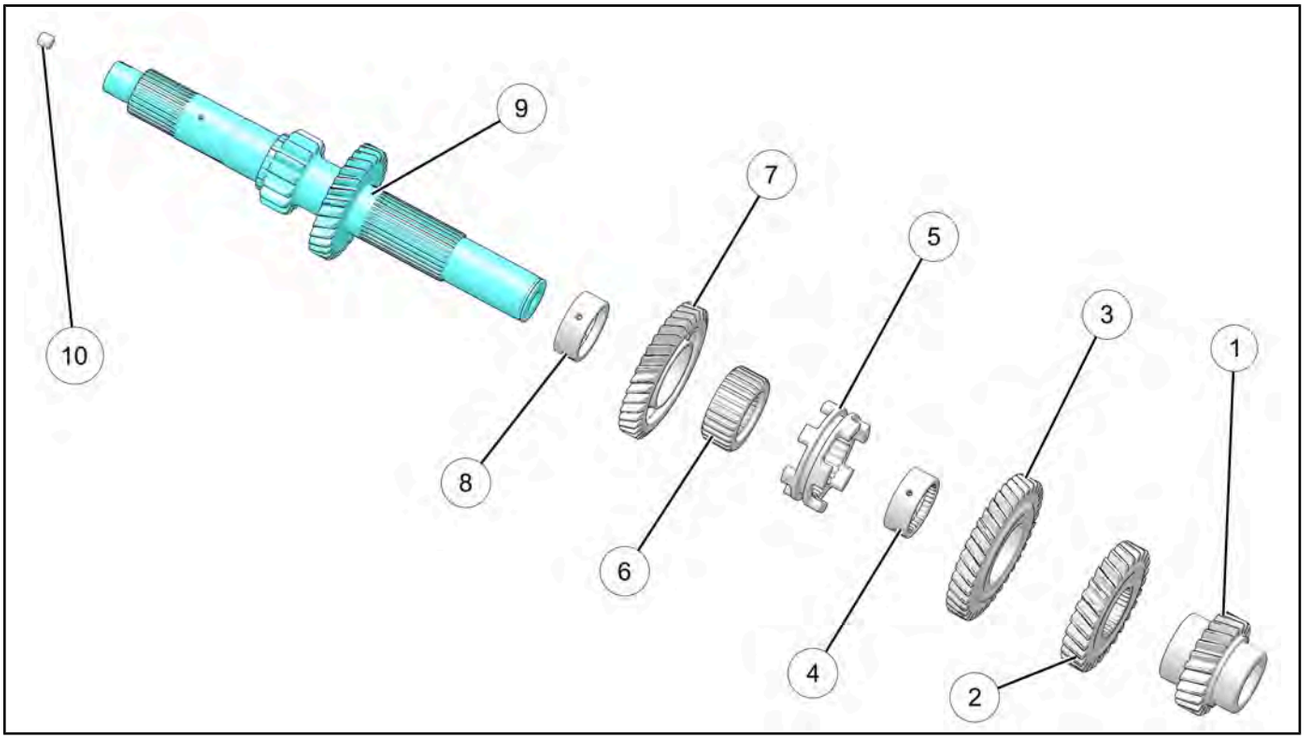




TORQUE
Crankcase Fasteners: **22 ft-lbs (30 N·m)**

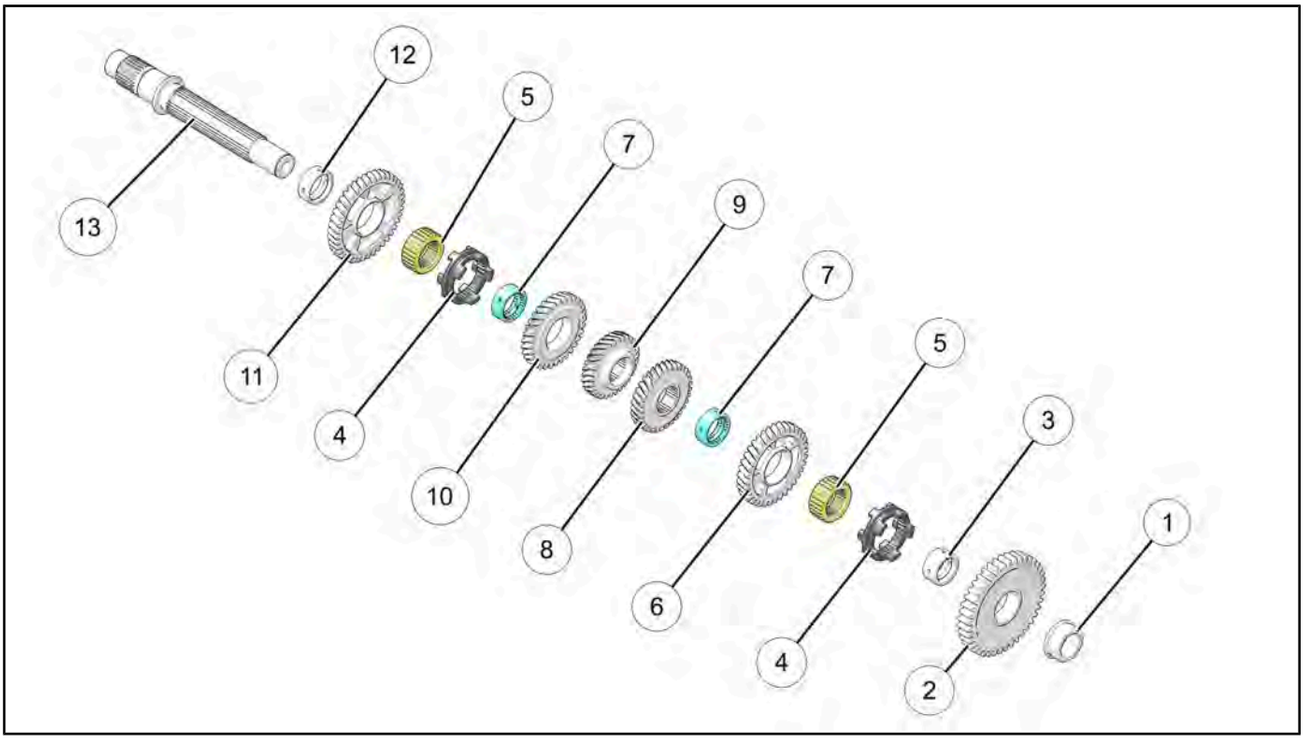
TRANSMISSION ASSEMBLY VIEW

INPUT SHAFT



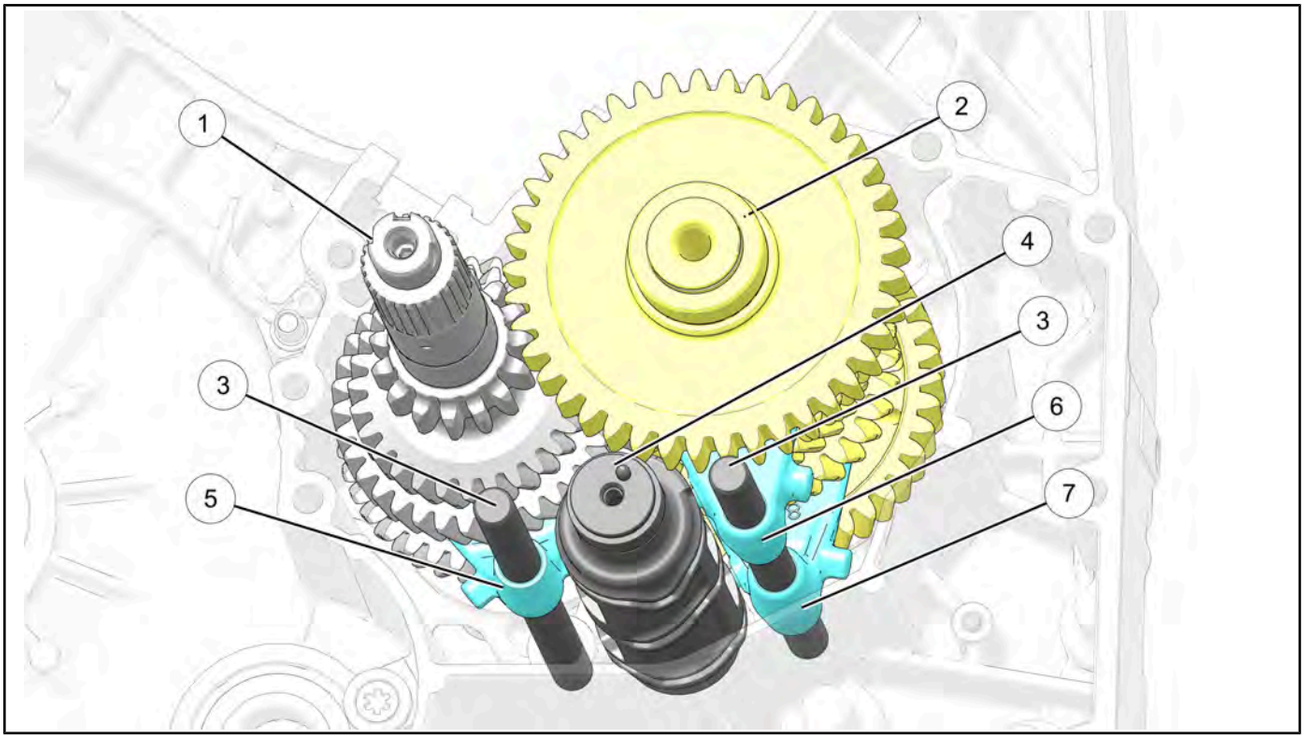
① 2nd Gear	⑥ Splined Spacer
② 4th Gear	⑦ 5th Gear
③ 6th Gear	⑧ Plain Bushing
④ Splined Bushing	⑨ Input Shaft & 1st/3rd Gear
⑤ Dog Ring	⑩ Oil Plug **13 ft-lbs (18 N·m)**

OUTPUT SHAFT



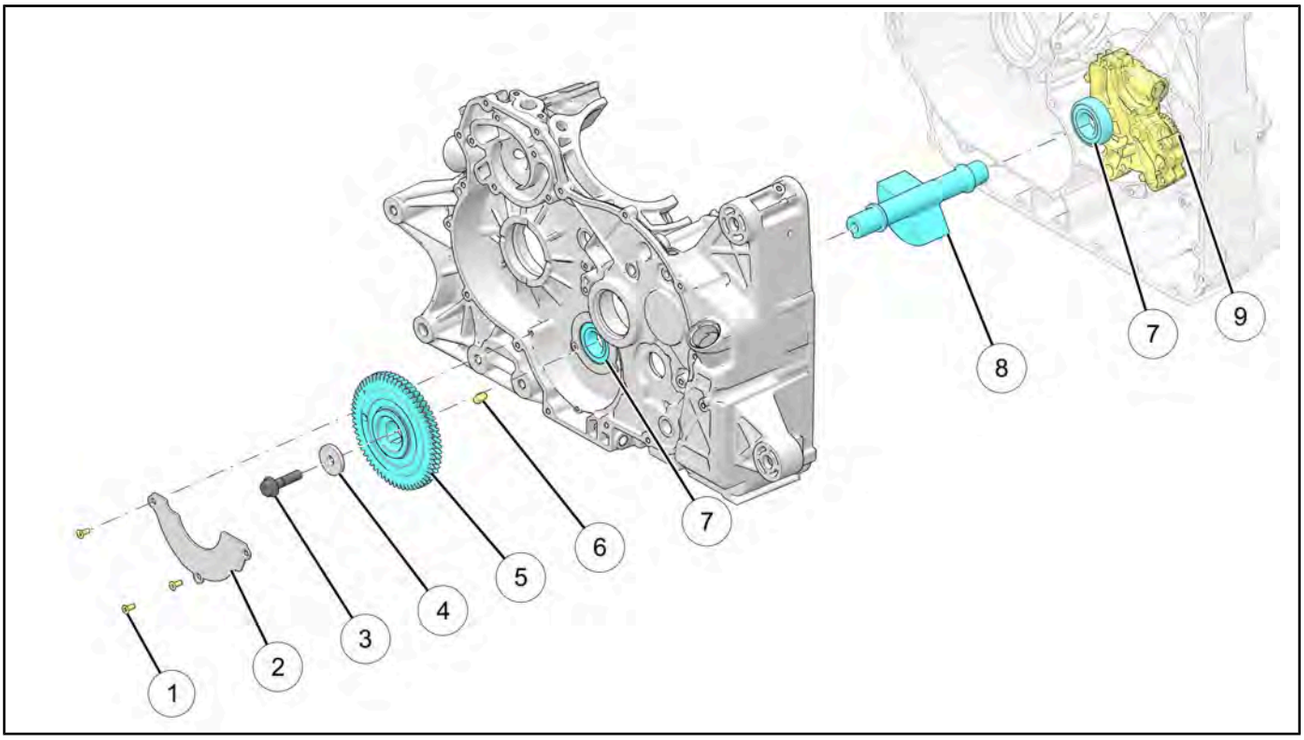
① Output Shaft Spacer	⑧ 5th Gear
② 1st Gear	⑨ 6th Gear
③ Plain Bushing	⑩ 4th Gear
④ Dog Ring	⑪ 2nd Gear
⑤ Splined Spacer	⑫ Plain Bushing
⑥ 3rd Gear	⑬ Output Shaft
⑦ Splined Bushing	

SHIFT DRUM / SHIFT FORK COMPONENTS



① Input Shaft	⑤ Input Shaft Fork Forge Letter: C.XX
② Output Shaft	⑥ Output Shaft Fork Forge Letter: A.XX
③ Shift Rail	⑦ Output Shaft Fork Forge Letter: B.XX
④ Shift Drum	

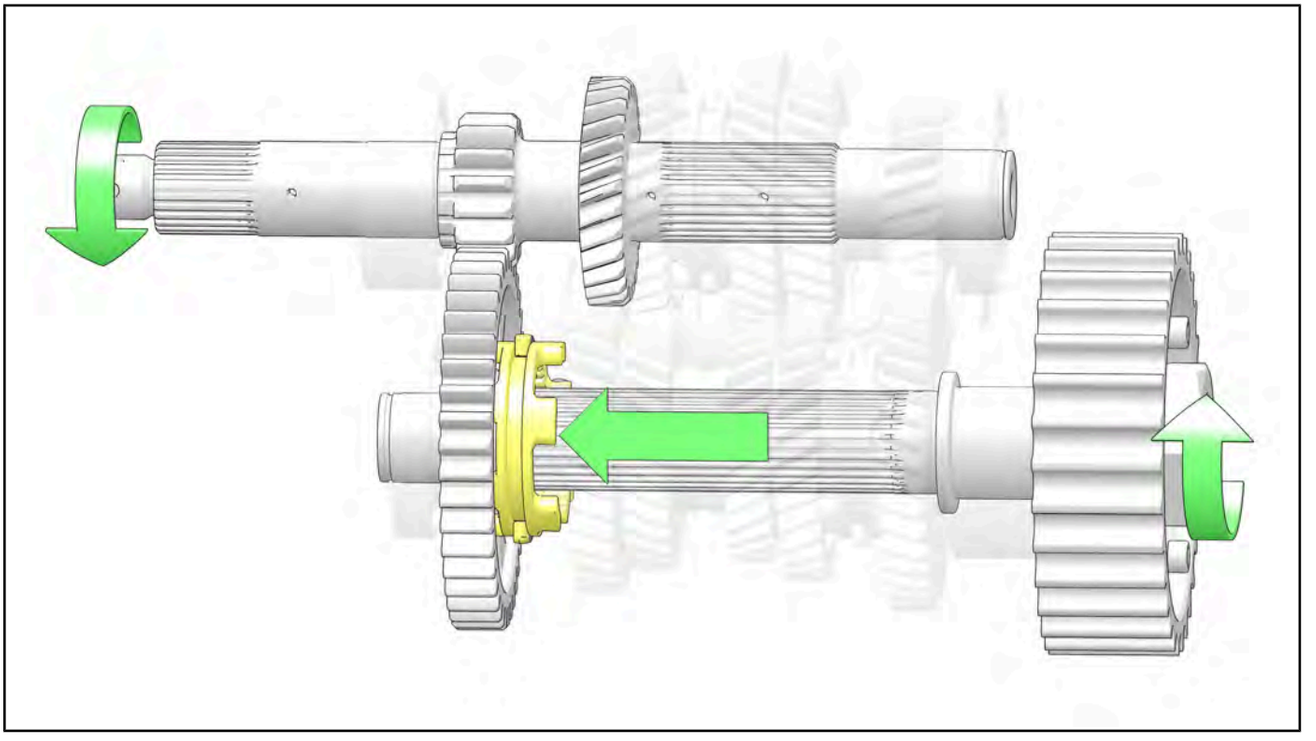
BALANCE SHAFT ASSEMBLY VIEW



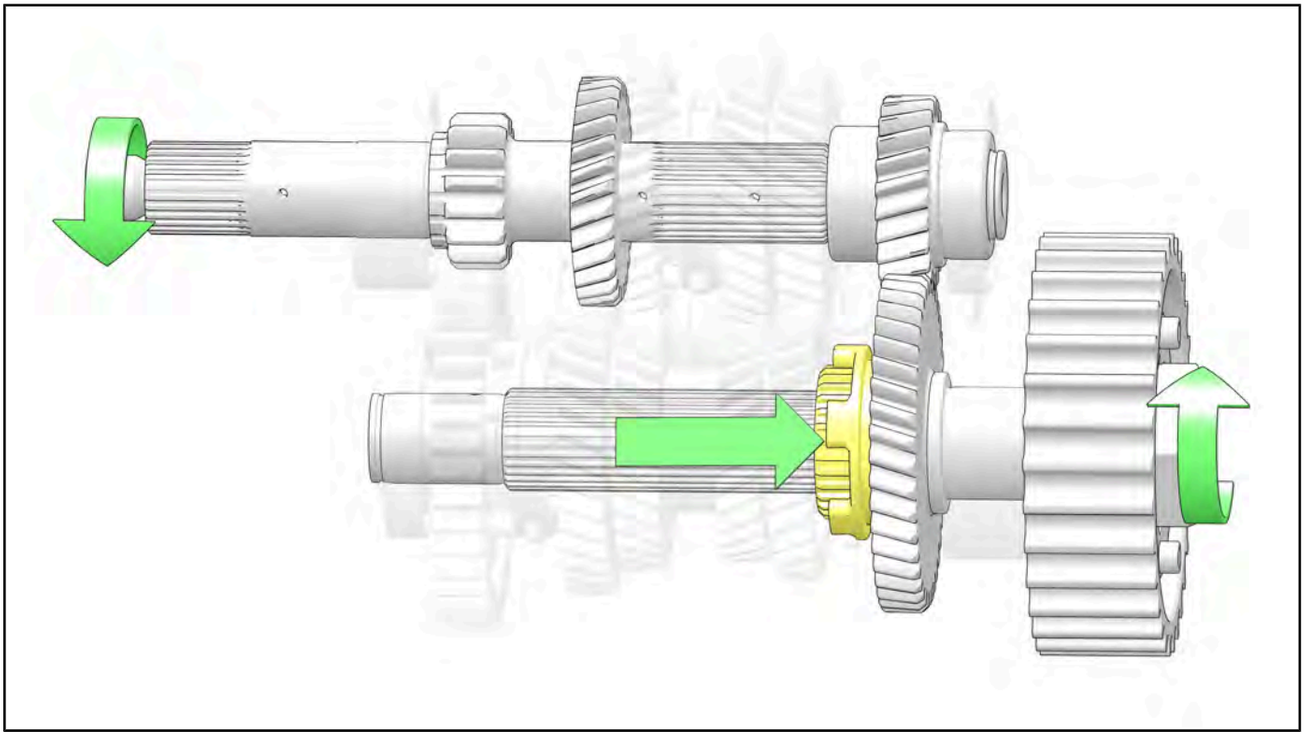
① Balance Shaft Shield Fastener **62 in-lbs (7 N·m)**	⑥ Balance Shaft Key
② Balance Shaft Shield	⑦ Balance Shaft Bearing
③ Balance Shaft Gear Fastener **59 ft-lbs (80 N·m)**	⑧ Balance Shaft
④ Washer	⑨ Oil Pump
⑤ Balance Shaft Gear	

GEAR TRAIN

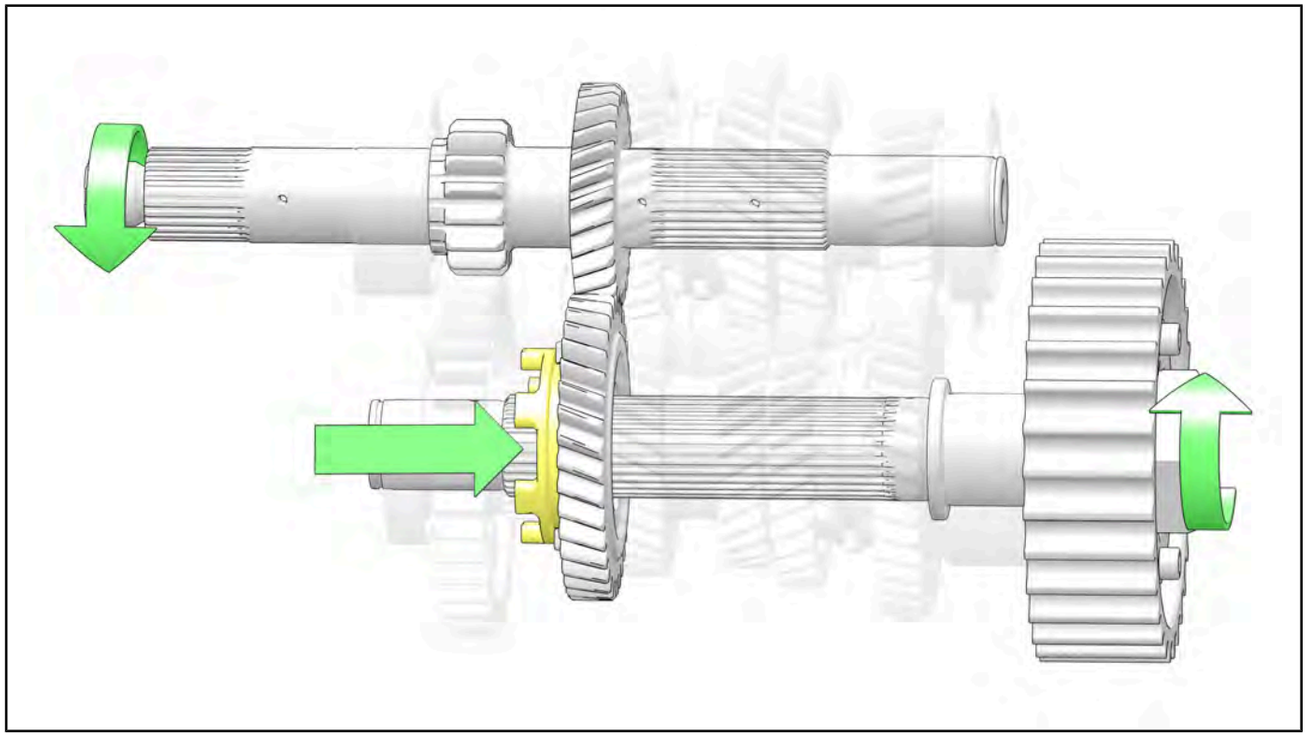
1st Gear



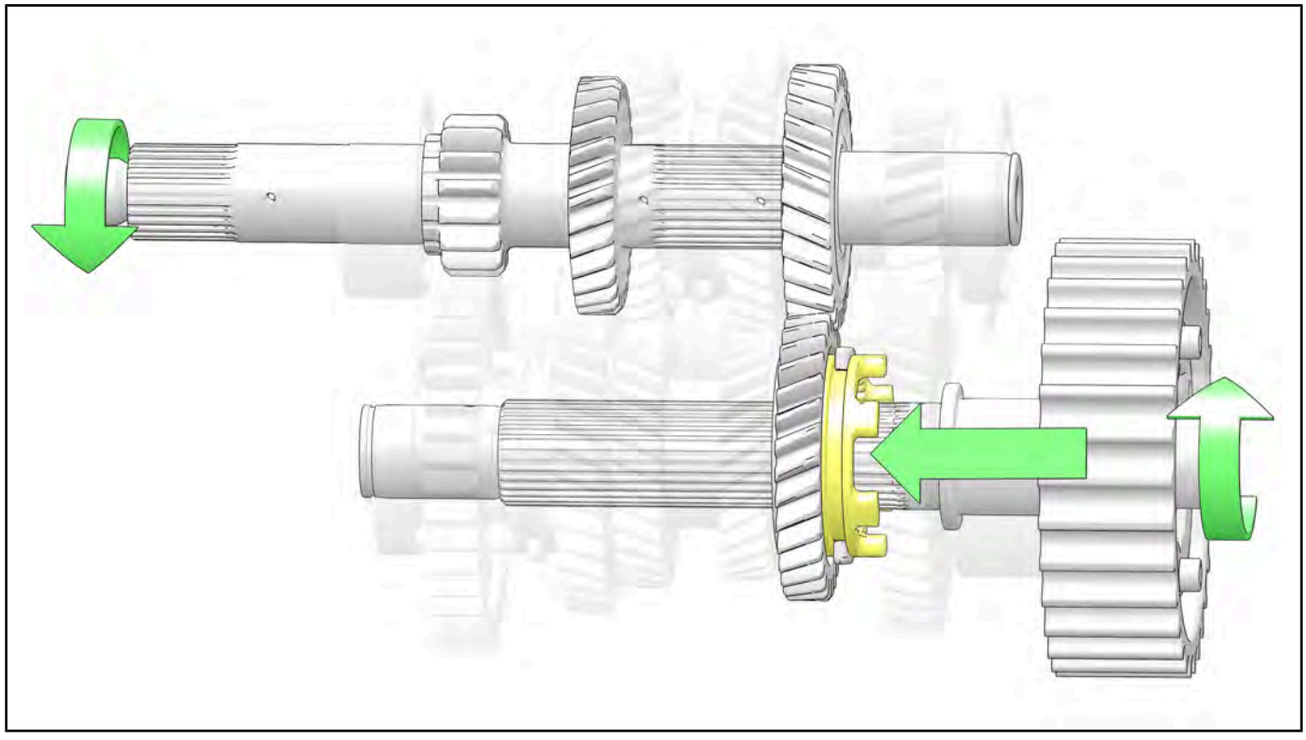
2nd Gear



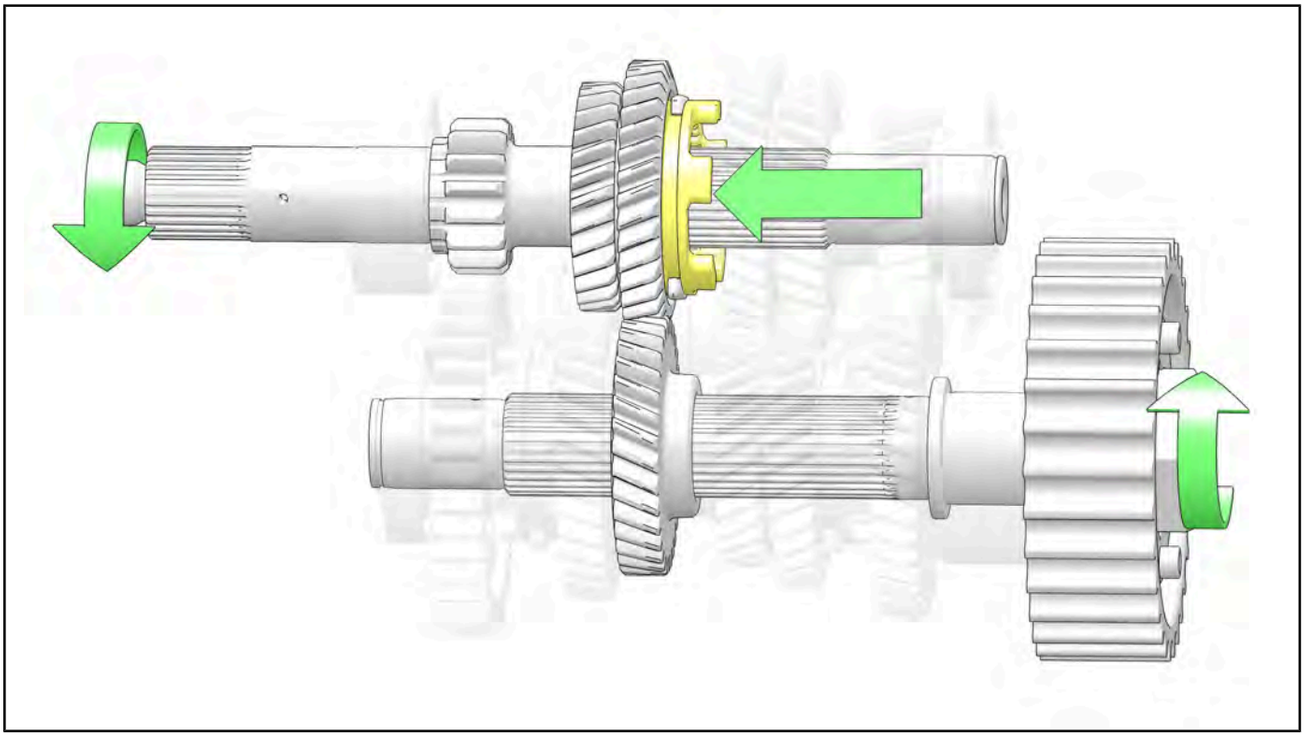
3rd Gear



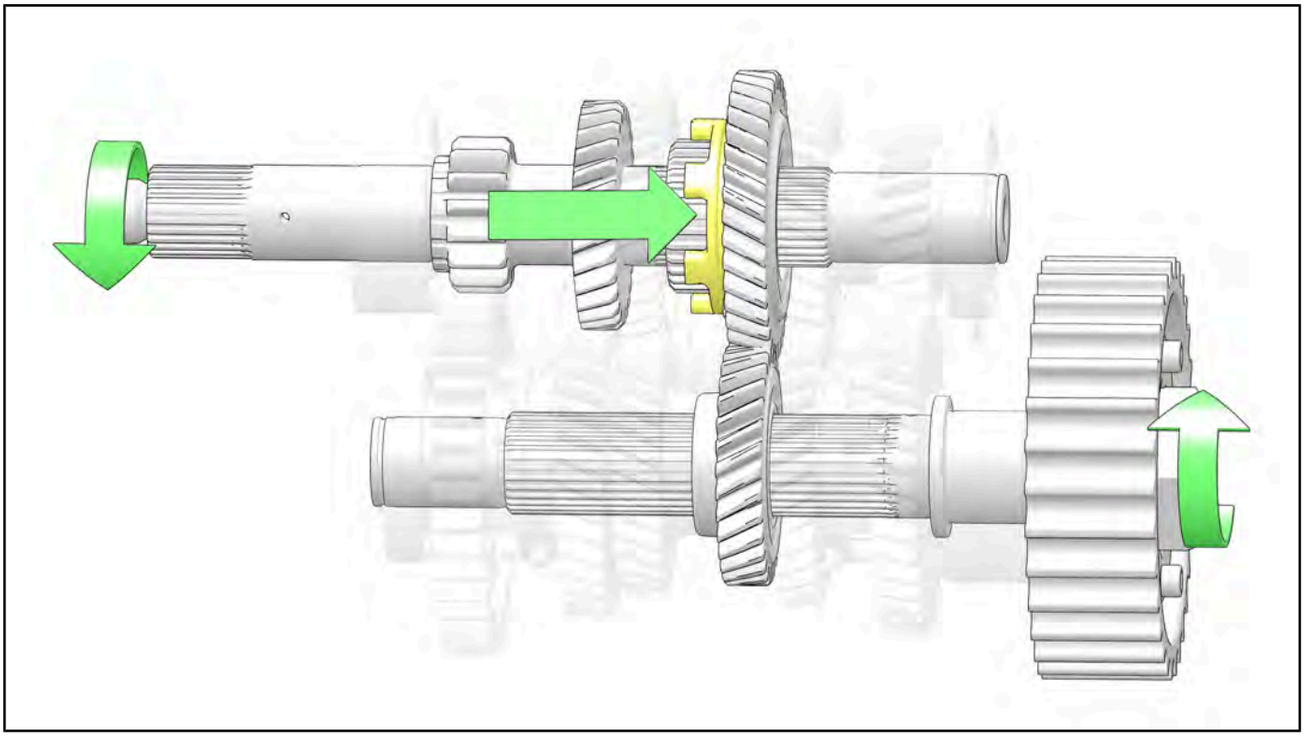
4th Gear



5th Gear



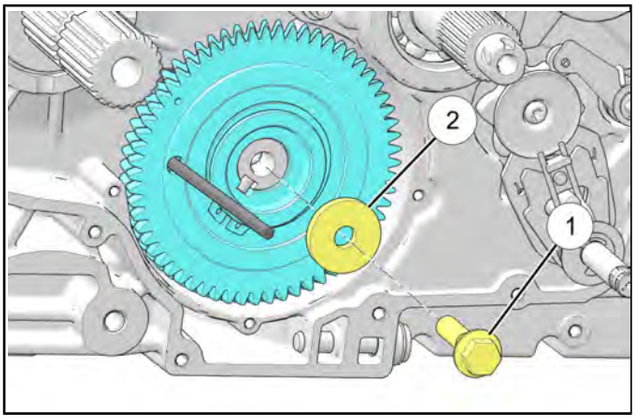
6th Gear



BALANCE SHAFT SERVICE

BALANCE SHAFT REMOVAL

1. Remove primary cover. See **Primary Cover Removal page 5.13**.
2. Remove clutch. See **Clutch Removal page 5.19**.
3. Remove primary drive gear. See **Primary Drive Gear Removal page 5.24**.
4. Remove balance shaft gear fastener ① and washer ② and remove balance shaft gear.



IMPORTANT

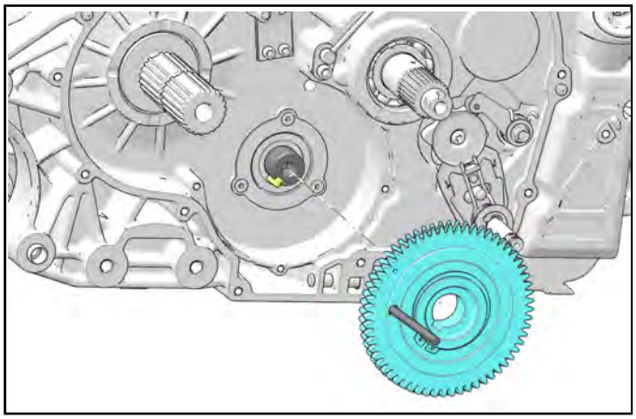
Be sure to collect the woodruff key from the end of the balance shaft once the gear has been removed.

5. Separate the engine cases. See **Crankcase Separation page 6.21**.
6. Rotate balance shaft until counterweights are clear of crankshaft. Grasp balance shaft and remove it from case.

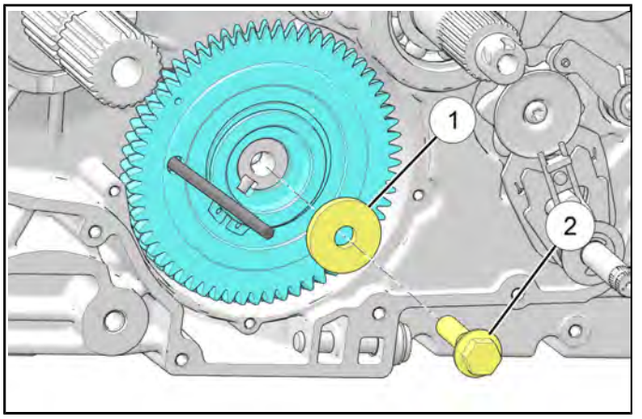
7. Check shaft for runout, or twisting.
8. Rotate right and left balance shaft bearings by hand while observing bearing rotation. Bearings should run smooth and quiet and shaft should be a snug fit in bearing.
9. Visually inspect bearings for damage.

BALANCE SHAFT INSTALLATION

1. Lubricate balance shaft bearings with engine oil.
2. Insert the balance shaft into the primary side bearing until fully seated. Woodruff key slot should be facing the cam side of the engine.
3. Assemble the engine cases. See **Crankcase Assembly View page 6.5**.
4. Lock the crankshaft for service. See **Locking the Crankshaft for Service page 3.59**.
5. Place the woodruff key into the end of the balance shaft.
6. Place a pin punch, or other suitable tool, through hole and preload split gear teeth so they are aligned.



7. Secure balance shaft gear with washer ① and fastener ②.



TORQUE
Balance Shaft Gear Fastener: **59 ft-lbs (80 N·m)**

8. Install primary drive gear and align. See **Primary Drive Gear Installation page 5.24**.

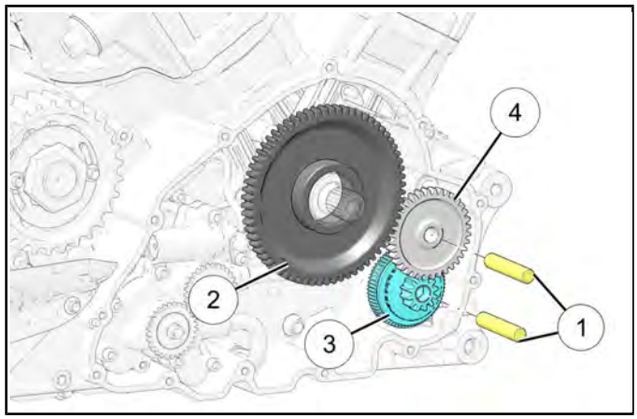
STARTER DRIVE SERVICE

STARTER DRIVE REMOVAL

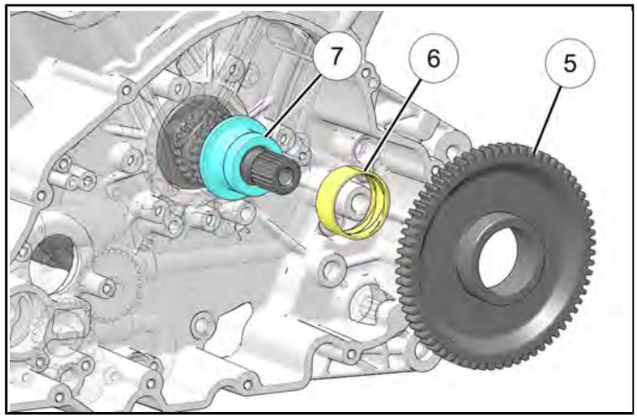
1. To remove starter drive, reference **ACG Cover Removal page 10.31**.

STARTER DRIVE INSPECTION

1. Inspect gear teeth for chips, cracks or excessive wear.
2. Inspect shaft surfaces ① and bushing surfaces ② ③ ④ for excessive wear and scoring.



3. Measure the I.D of the starter gear assembly ⑤ and the O.D. of the spacer ⑦. Inspect the flywheel bushing ⑥. Compare to specifications.

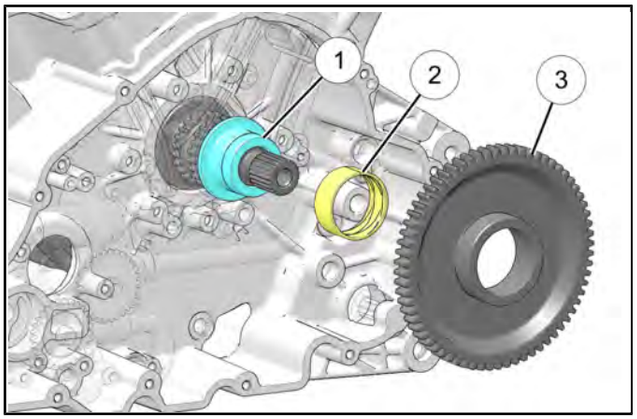


Spacer O.D: **39.985±.015 mm** One-Way Clutch Hub I.D. (Flywheel): **40.025 ± 0.015**

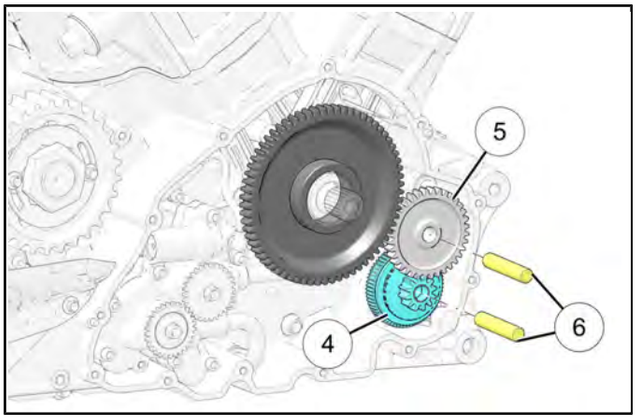
4. Replace if wear or damage is evident.

STARTER DRIVE INSTALLATION

1. Install spacer ①, bushing ②, and flywheel ③.



2. Install starter drive gear ④, and starter idler gear ⑤.



3. Secure with gear shafts ⑥.

6

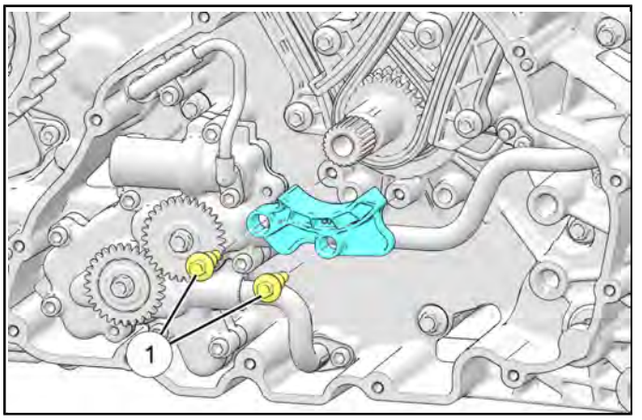
CRANKSHAFT SERVICE

LOCKING THE CRANKSHAFT FOR SERVICE

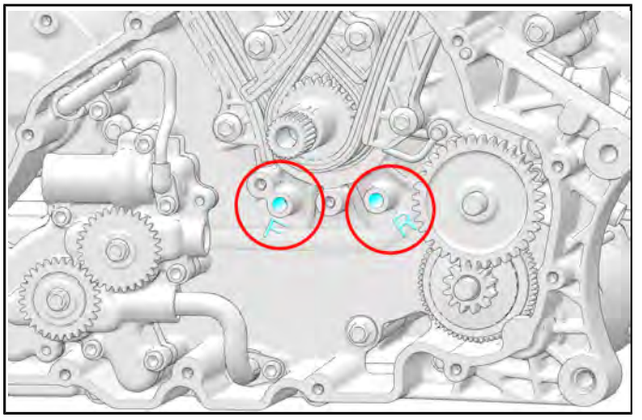
LOCKING THE CRANKSHAFT

This procedure describes how to lock the crankshaft in the Top Dead Center (TDC) position using commercially available hand tools.

1. Remove spark plugs. See **Spark Plug Removal page 3.5**
2. Remove ACG cover. See **ACG Cover Removal page 10.31**.
3. Remove flywheel. See **Flywheel Removal page 5.25**.
4. Remove lower chain guide by removing its fasteners ①.



5. Rotate the crankshaft counterclockwise (primary side) until the front piston is at TDC.
6. Lock the crankshaft by inserting crankshaft locking pin **PF-51135-A** or a 5/16" pin punch (or equivalent) into the locking hole .

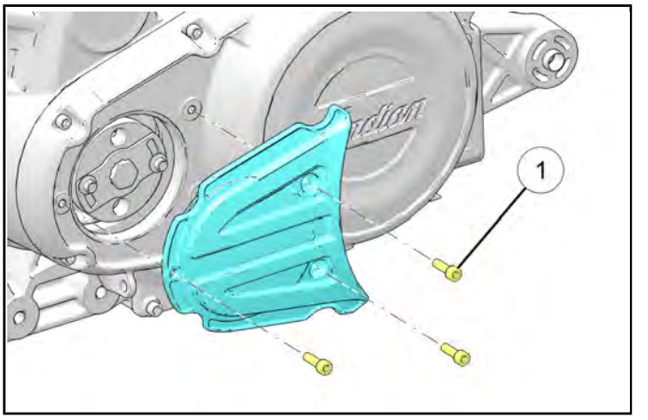


7. It may be necessary to rotate the crankshaft slight forward or back to properly align holes.

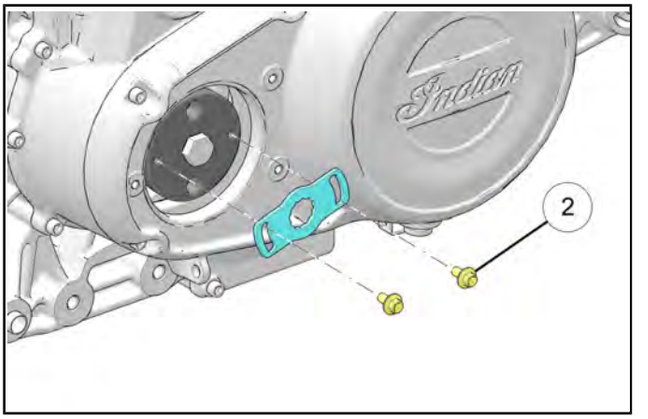
HOLDING THE CRANKSHAFT

The crankshaft / rotating assembly can be held in place by an alternative method, however this method **does NOT** lock it in place.

1. Remove the cold start cover by removing its fasteners ①.



2. Remove the locking plate by removing its fasteners ②.



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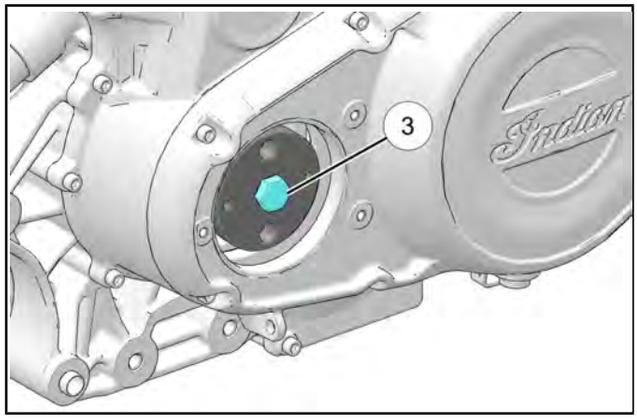
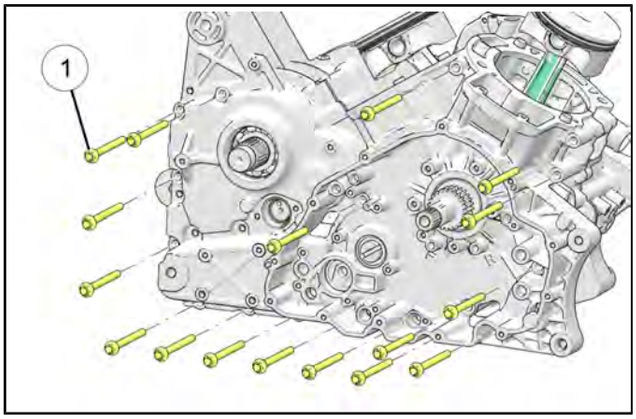
3. Use a socket and wrench to hold the cold test adapter fastener ③.

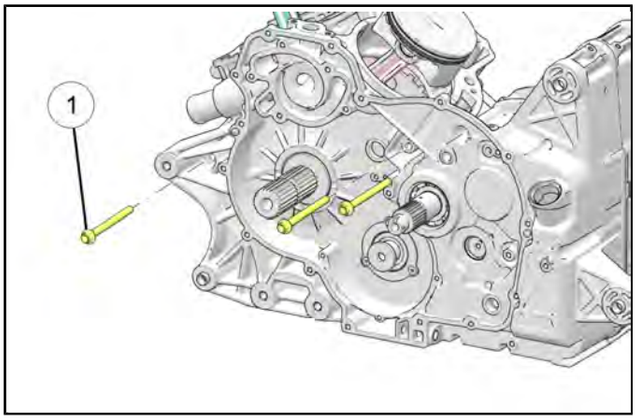


CRANKCASE SEPARATION

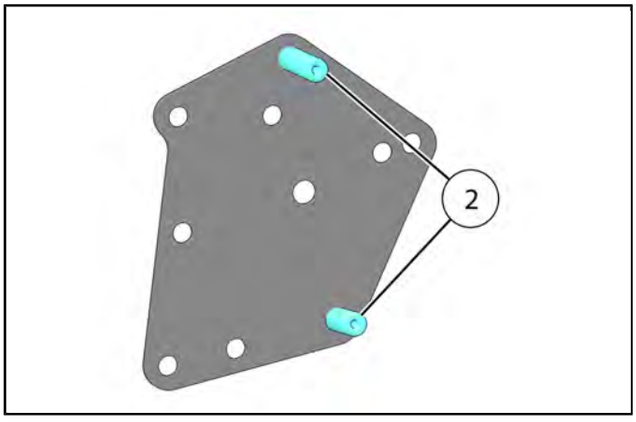
1. Drain engine oil. See **Engine Oil & Filter Change page 2.19**.
2. Remove engine from frame. See **Removing Engine From Frame page 3.19**.
3. Mount engine securely on an engine stand using engine stand adapter tool **PF-51240**.
4. Remove cylinder heads. See **Cylinder Head Removal page 3.76**.
5. Remove cylinders. See **Cylinder Removal page 3.93**.
6. Remove primary cover. See **Primary Cover Removal page 5.13**.
7. Remove water pump. See **Water Pump Removal page 3.46**.
8. Remove primary drive gear. See **Primary Drive Gear Removal page 5.24**.
9. Remove clutch assembly. See **Clutch Removal page 5.19**.
10. Remove the oil pump. See **Oil Pump Removal page 3.35**.
11. Remove drive sprocket. See **Drive Sprocket Removal page 8.65**.
12. Remove balance shaft gear. Reference **Balance Shaft Removal page 6.17**.

13. Remove engine case fasteners ①



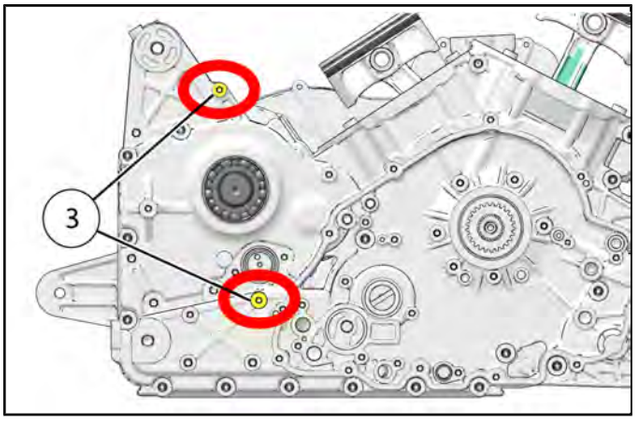


14. Place the Engine Case Splitting / Assembly tool **PF-51234-A** on a flat surface with the part number facing upward.
15. Assemble the threaded spacers ② into the holes marked with the letter "A" as shown.



6

16. The threaded holes ③ shown are used for crankcase separation.

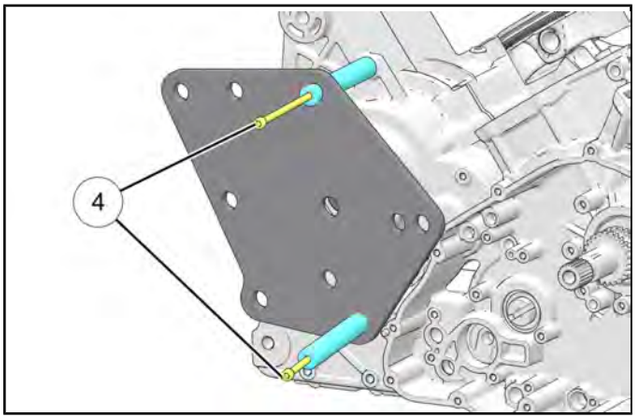


17. Install the adapter over the casehalf. Adjust the threaded spacers so they touch the case and the plate is level.

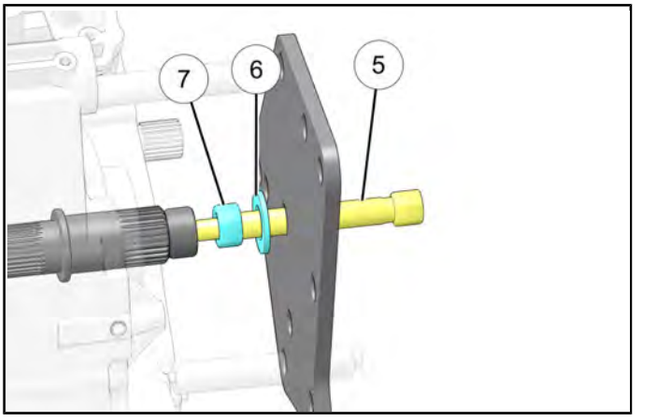
IMPORTANT

- Plate surface should be parallel to the surface of the engine crankcase.
- All threaded spacers must be in contact with engine case prior to fastening on the plate assembly.

18. Install the provided fasteners ④ through the threaded spaces and tighten into the casehalf.
19. The holes used to thread in the separator tool are on the right casehalf.



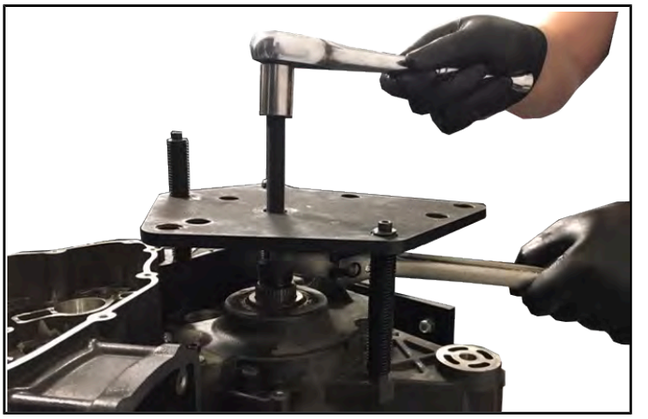
20. Install splitter adapter ⑤, washer ⑥, and nut ⑦.



21. Hold the nut and tighten the splitter.

⚠ CAUTION

While tightening, ensure the casehalf is separating evenly to avoid damage.



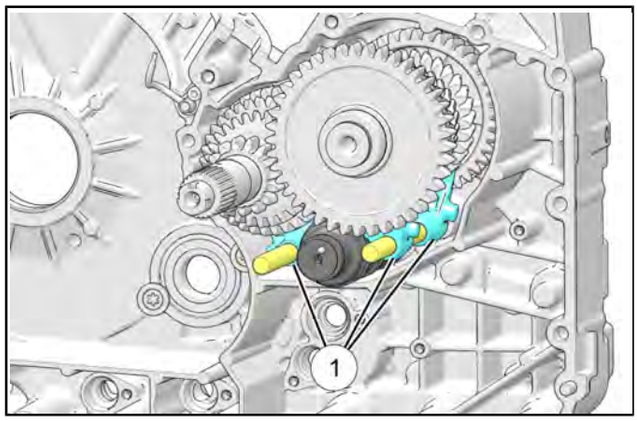
22. Alternately turn the case splitting tool in until resistance is felt, then work around the upper case with a soft-faced mallet until the cases are completely apart.
23. When fully separated, remove the right casehalf.

TRANSMISSION REMOVAL

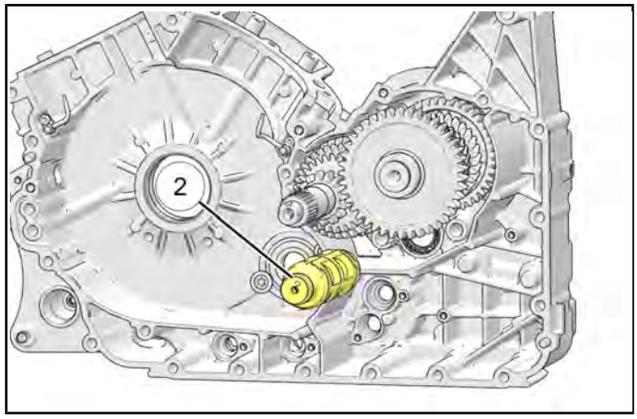
⚠ CAUTION

Gloves should be worn at all times while working on the transmission assembly to avoid personal injury.

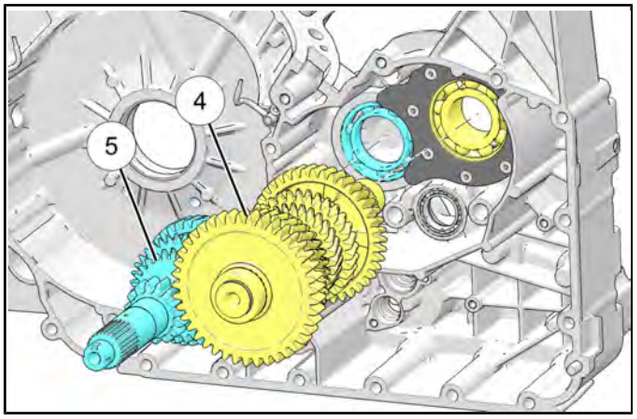
1. Remove the shift ratchet assembly. See **Shift Ratchet Removal & Inspection page 5.16**.
2. Remove the balance shaft. See **Balance Shaft Removal page 6.17**.
3. Separate crankcase. See **Crankcase Separation page 6.21**.
4. Remove shift fork rails ①.



5. Remove shift forks.
6. Lift the shift drum ② out of the bearing.



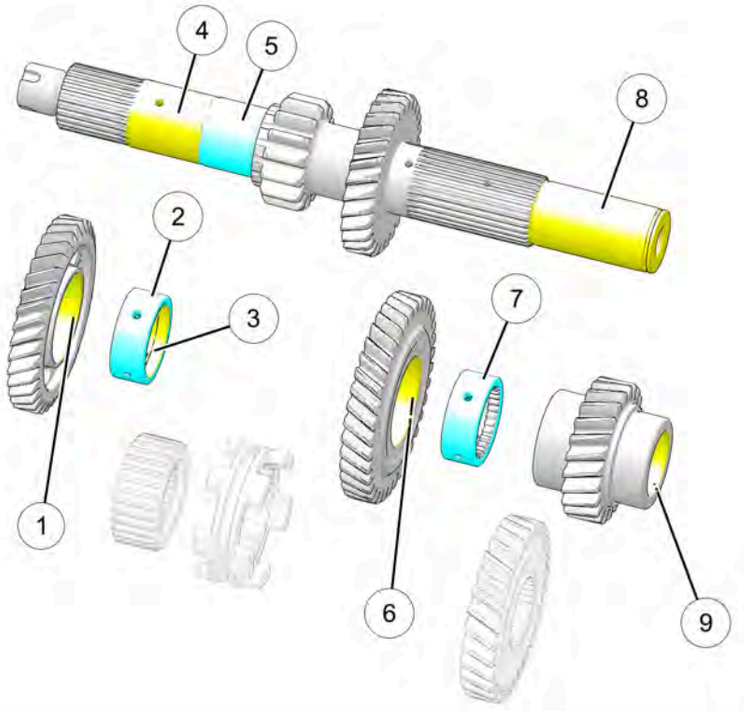
7. Remove input shaft ④ and output shaft ⑤.



6

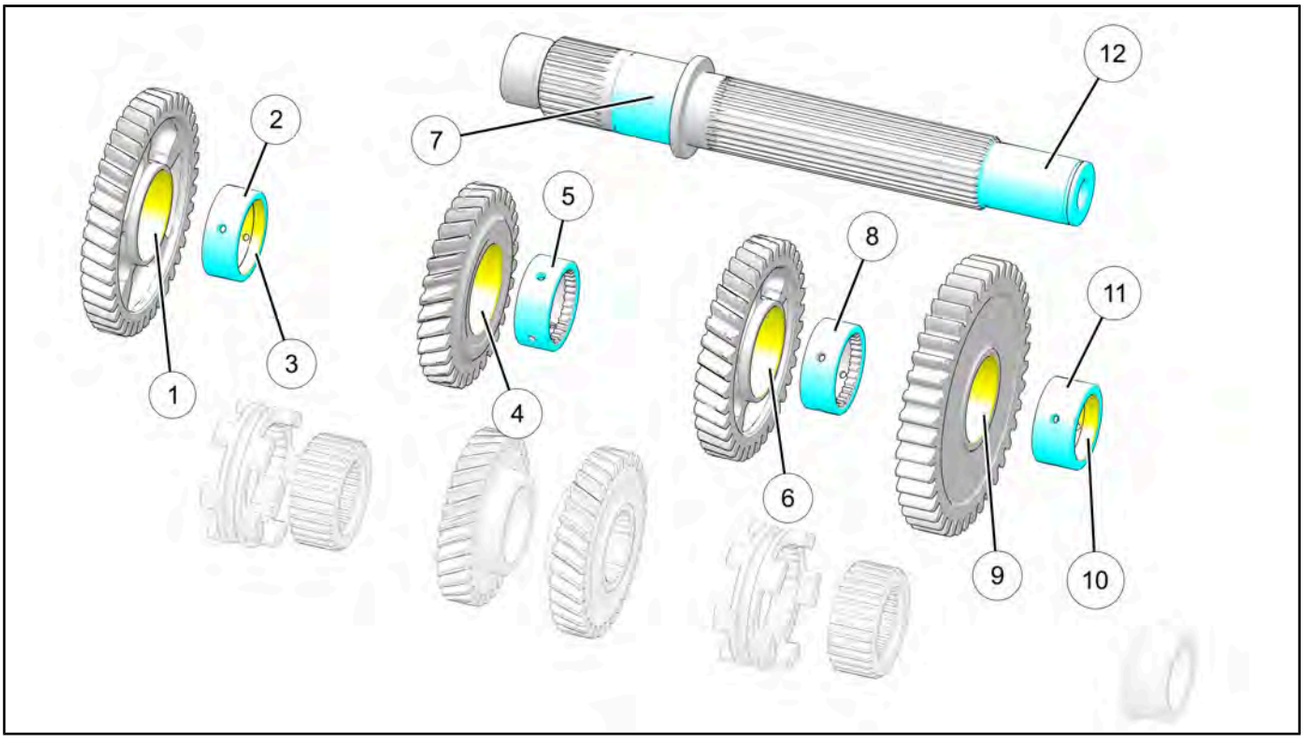
TRANSMISSION INSPECTION

INPUT SHAFT



ITEM	MEASUREMENT LOCATION	DIAMETER SPECIFICATION
①	Gear, 5th — I.D.	39.010 — 39.026 mm
②	Bushing, 5th Gear — O.D.	38.955 — 38.980 mm
③	Bushing, 5th Gear — I.D.	32.010 — 32.035 mm
④	Input Shaft, Clutch Collar Journal	29.470 — 29.485 mm
⑤	Input Shaft, Bearing Journal (Primary Side)	29.976 — 29.990 mm
⑥	Gear, 6th — I.D.	39.010 — 39.026 mm
⑦	Bushing, 6th Gear — O.D.	38.955 — 38.980 mm
⑧	Input Shaft, 2nd Gear Journal (Press Fit)	27.987 — 28.0 mm
⑨	Gear, 2nd — I.D. (Press Fit)	27.884 — 27.909 mm

OUTPUT SHAFT



ITEM	MEASUREMENT LOCATION	DIAMETER SPECIFICATION
①	Gear, 2nd — I.D.	39.010 — 39.026 mm
②	Bushing, 2nd Gear — O.D.	38.955 — 38.980 mm
③	Bushing, 2nd Gear — I.D.	32.010 — 32.035 mm
④	Gear, 4th — I.D.	39.010 — 39.026 mm
⑤	Bushing, 4th Gear — O.D.	38.955 — 38.980 mm
⑥	Gear, 3rd — I.D.	39.010 — 39.026 mm
⑦	Output Shaft, Bearing Journal (Drive Sprocket Side)	34.995 — 35.008 mm
⑧	Bushing, 3rd Gear — O.D.	38.955 — 38.980 mm
⑨	Gear, 1st— I.D.	37.010 — 37.026 mm
⑩	Bushing, 1st Gear — I.D.	28.015 — 28.040 mm
⑪	Bushing, 1st Gear — O.D.	36.965 — 36.990 mm
⑫	Output Shaft, 1st Gear Journal	27.987 — 28.0 mm

NOTICE

Refer to the Assembly View section in this chapter for component locations and exploded diagrams. See **Crankcase Assembly View page 6.5**

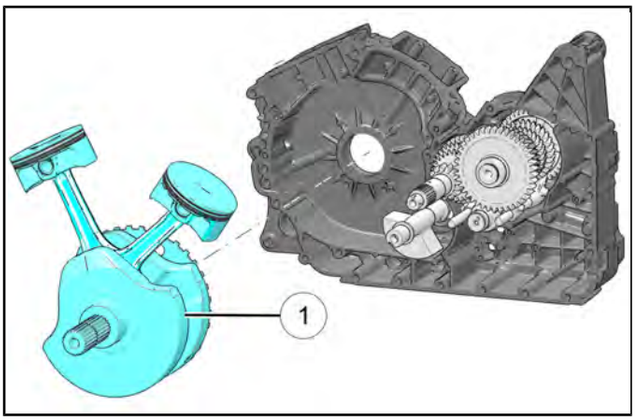
Refer to the Service Specifications section in this chapter for complete transmission specifications. See Service Specifications – Transmission / Crankshaft page 6.3.

SHAFTS

1. Measure outside diameter of shafts and bearing areas for wear and concentricity. Look closely at splines for wear. Inspect ends of shafts for signs of wear:
   - Dull finish
   - Discoloration
   - Rough or uneven surface
   - Measurement outside of specification
2. **Gears** Visually inspect:
   - Gear internal splines
   - Gear teeth
   - Gear dogs for rounding, cracks, chips
   - Gear dog slots for rounding
   - Bearing surfaces
   - Shift fork grooves
3. **Shift Forks, Shift Fork Rails**
4. Inspect all contact surfaces of each shift fork. Replace a shift fork if any part is discolored (overheated), unusually scored, warped, or worn beyond service limit.
5. Inspect each shift fork pin for wear or damage and compare to specifications.
6. Inspect shift fork rails for wear, scoring, or runout.
7. Measure shift fork rail O.D. for wear in 3 or 4 places along the length. The rail O.D. should be consistent over the entire length.
8. Slide rails into crankcase holes and check for a good snug fit.
9. Visually inspect the shift drum bearing in the left crankcase for wear or damage. The bearing must be fully seated in the case and held in position by the retaining plate. Replace the bearing if it is loose in the bore, or if any side play is detected.
10. Temporarily install shift drum into bearing and rotate, checking for smooth bearing operation.
11. **Shift Drum** Inspect shift drum grooves for wear. Pay close attention to corners of grooves where forks change direction.
12. Inspect surface of shift drum star for excessive wear or damage.
13. Inspect right side shift drum bearing.
14. Temporarily install shift drum in right hand case bearing and inspect fit. Spin drum to check for smooth bearing operation.

CRANKSHAFT REMOVAL

1. Separate RH crankcase from LH case. See **Crankcase Separation page 6.21**.
2. Rotate balance shaft until counterweight is clear of crankshaft.
3. Lift crankshaft assembly ① straight up until clear of case.

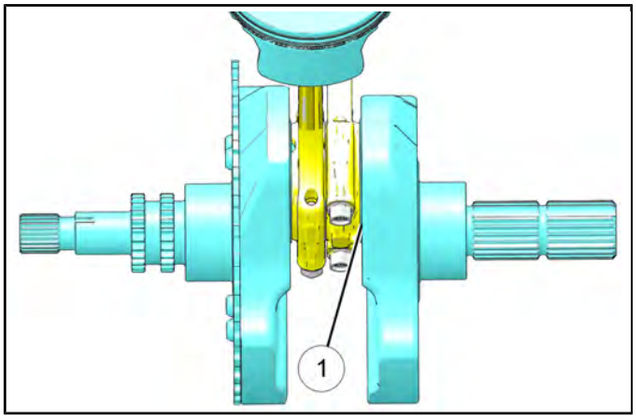


NOTICE

Connecting rod bearings and main bearings are easily damaged. Be careful not to cause damage to these parts when servicing items within the crankcase.

CONNECTING ROD SIDE CLEARANCE INSPECTION

1. Move connecting rods to one side of crankshaft. Insert a feeler gauge ① between one connecting rod and the crankshaft. Compare measurement to specification outlined in this chapter. See **Service Specifications – Transmission / Crankshaft page 6.3**.



2. If clearance recorded exceeds service limit, the crankshaft, connecting rod or both must be inspected and worn parts replaced. See **Crankshaft Inspection page 6.30**.

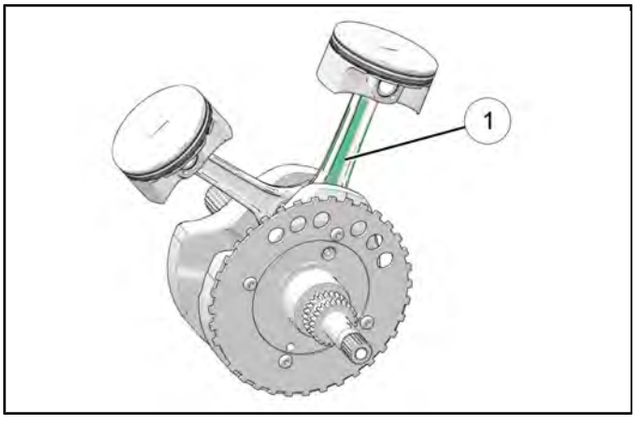
6

CONNECTING ROD REMOVAL / IDENTIFICATION

IMPORTANT

Connecting rods and caps are serialized from the factory. Rod and cap numbers must match and be assembled on the same side of the rod assembly.

1. Use a permanent marker to mark orientation of connecting rods and rod bearing caps. **These parts MUST be installed in their original locations.** EXAMPLE: Right connecting rod must be assembled on the right side with the bearing cap that was removed from it. The bearing cap and connecting rod must be assembled in the same direction as it was removed using the **same fastener.**
2. Mark the outside of both connecting rods prior to removal so they can be assembled in the same direction in relation to the crankshaft.



3. Remove connecting rod fasteners and connecting rod bearing caps.

NOTICE

It may be necessary to lightly tap the caps with a plastic mallet to loosen them.

The mating surface of connecting rod and cap is rough in appearance, which is a normal condition due to the manufacturing process. If rod caps are installed *incorrectly* and tightened, the precision mating surfaces will be damaged. Replace the connecting rod assembly if mating surfaces are damaged.

CONNECTING ROD INSPECTION (BIG END)

IMPORTANT

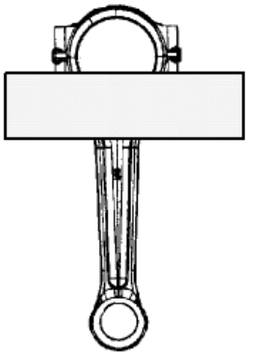
Connecting rod fasteners can only be reused three times. Failure to replace fasteners after completing three torque sequences may result in severe engine damage. Each time a fastener has been torqued to specification, it should be marked with a center punch.

EXAMPLE:

- 1st Torque: Manufacturer installation of connecting rod fasteners.
- 2nd Torque: Torque for inspection per this procedure.
- 3rd Torque: Reinstallation following inspection. **Discard fasteners the next time they are removed.**

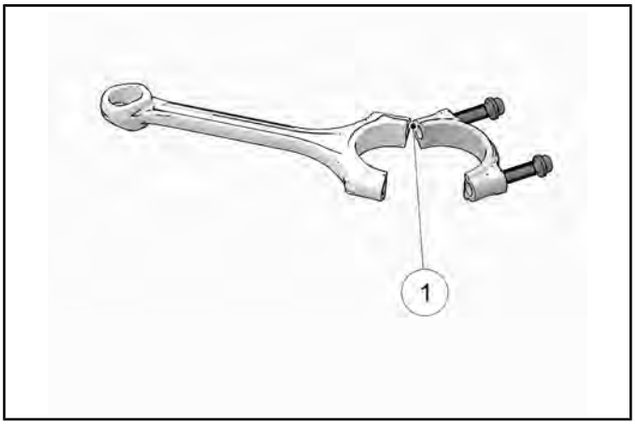
⚠ CAUTION

Be sure to match connecting rod caps with their respective rod and orient the cap properly before installing the cap. Secure the big end of rods in a vise equipped with soft, protective jaws before torquing rod fasteners.



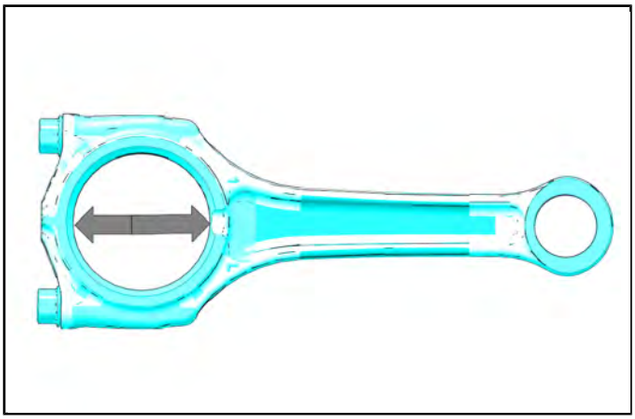
1. Remove bearings and install caps on connecting rods. Be sure mating surfaces ① of rod and cap are clean.

2. Apply engine oil to threads of rod fasteners. Torque fasteners to specification.



TORQUE
Connecting Rod Fasteners: a. Torque to 19 ft-lbs (26 N·m) b. Torque angle to 105 °

3. Measure I.D. of connecting rod big end for size and out of round and compare to specification. See **Service Specifications – Transmission / Crankshaft page 6.3**.



4. Visually inspect connecting rod upper and lower ends for scoring, damage, or excessive wear.

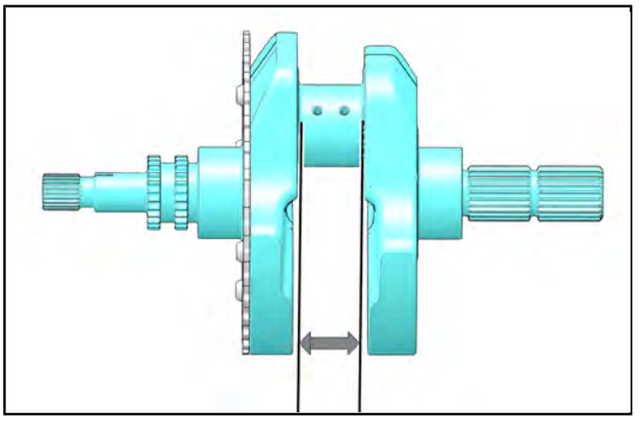
CONNECTING ROD BEARING INSPECTION

Inspect bearing inserts for unusual wear, peeling, scoring, damage etc. Replace as a set if damage is noted. Inspect bearing clearance and refer to the Electronic Parts Catalog for the appropriate connecting rod bearing.

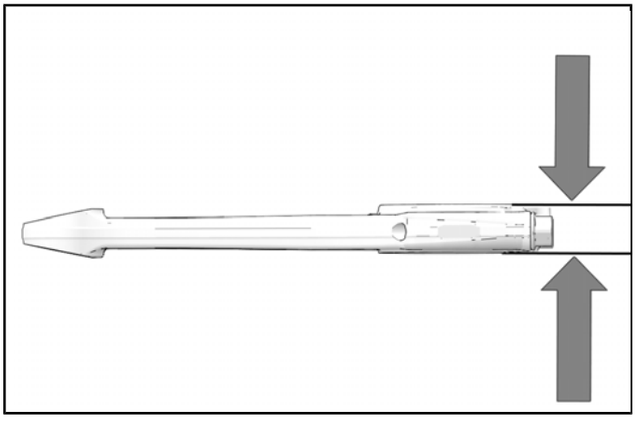
CRANKSHAFT INSPECTION

Record all measurements and compare to specifications. Replace crankshaft if any measurement is worn beyond the service limit. See **Service Specifications – Transmission / Crankshaft page 6.3**.

1. Measure the width of the rod bearing journal.



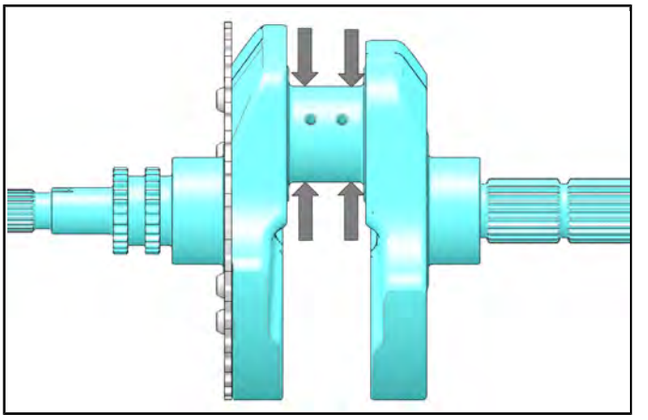
2. Measure width of connecting rods at big end.



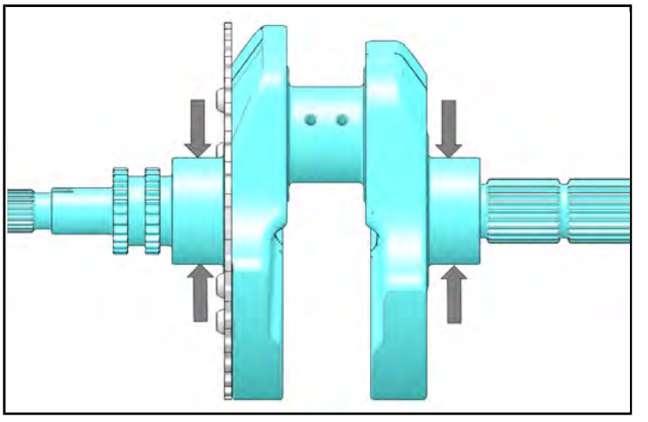
3. Visually inspect all bearing journals for scoring, damage or excessive wear.

4. Crankshaft and connecting rods are identified by color. Be sure to compare measurements to specifications for the proper color (or non-marked) connecting rod or crankshaft.

   Measure O.D. of crankshaft rod journal in four places and compare to specifications.



5. Measure O.D. of main bearing journals.



CONNECTING ROD INSTALLATION

1. Clean all oil off connecting rod, connecting rod cap and bearing inserts.
2. Install bearing inserts into connecting rods and caps. First, install bearing tab into groove, then press the rest of the bearing into place.

NOTICE
Ensure the connecting rod and caps have matching numbers and are on the same side of the rod.

3. Apply white lithium grease to connecting rod bearings and crank pin.
4. Install rods and caps onto the crankshaft, observing the paint mark on the connecting rods. **The paint mark must face away from the center of the crankshaft.** Be sure the identifier marks made previously are aligned.

⚠ CAUTION
Due to the nature of the fracture rods, the cap will only fit onto the connecting rod correctly in ONE way. Failure to correctly fit the cap onto the rod will result in immediate engine damage.

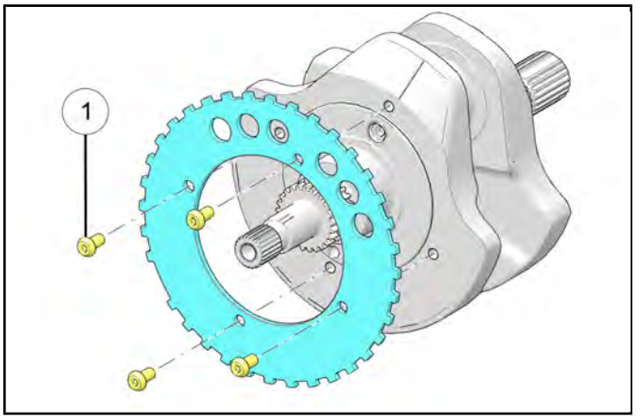
5. Tighten rod cap fasteners:

TORQUE
Connecting Rod Fasteners: **1. Torque to 19 ft-lbs (26 N·m)2. Torque angle to 105 °**

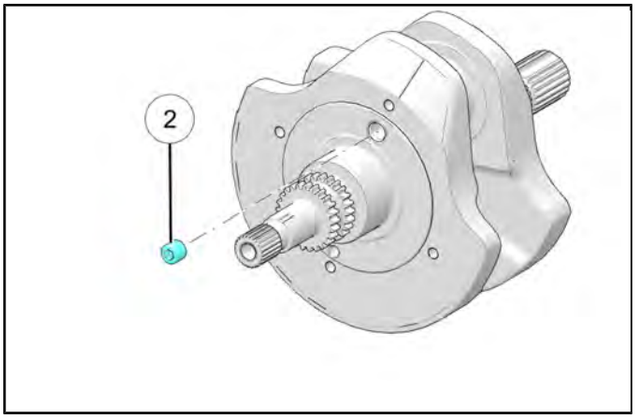
6. Check that the connecting rods rotate smoothly and freely on crankshaft journal.

CRANKSHAFT CLEANING

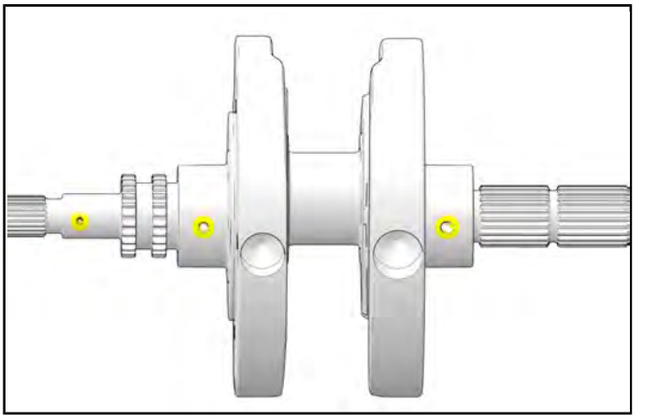
1. Remove tone ring by removing its fasteners ①.

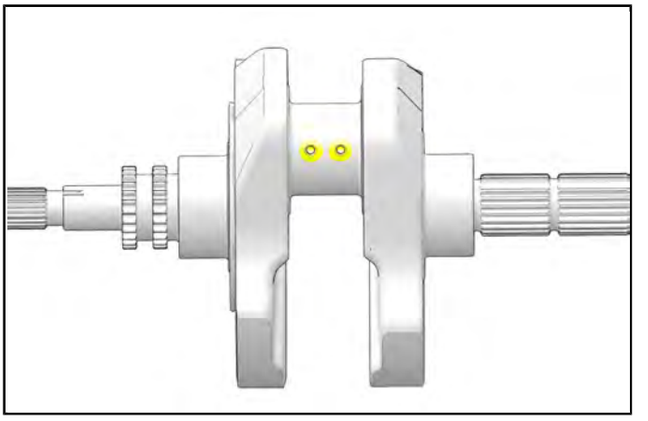


2. Remove blind plug ② from crankshaft to ensure that passages are clear.



3. Ensure all passages are free of debris and dirt.





4. After cleaning passages, install blind plug and torque to specification. Plug should be flush with surface of crankshaft.

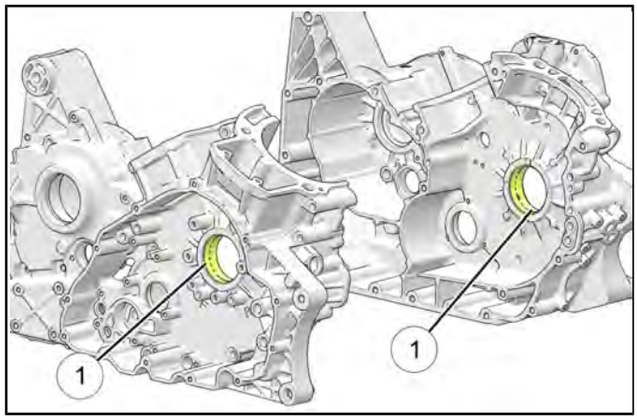
TORQUE
Blind Plug: **15 ft-lbs (20 N·m)**

TORQUE
Tone Ring Fastener: **18 ft-lbs (24 N·m)**

IMPORTANT
Add loc-tite to Tone ring fasteners.

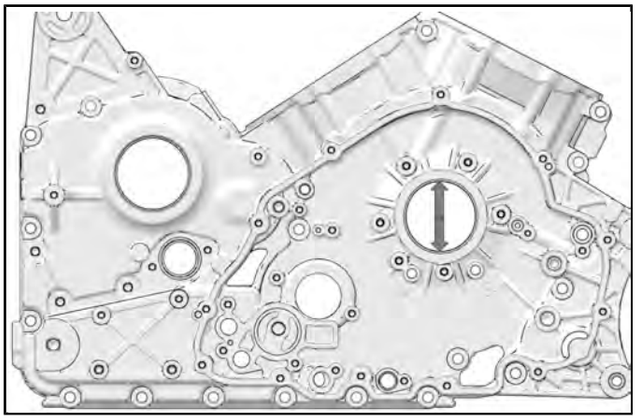
MAIN BEARING INSPECTION

1. Inspect crankcase main bearing surfaces ① for wear, peeling, scoring, or damage.
2. Inspect alignment of bearing lubrication hole in left crankcase half and in right case half. Holes must be aligned with their respective oil passage in crankcase.



MAIN BEARING OIL CLEARANCE INSPECTION

1. Measure main bearing I.D. and concentricity with a dial bore gauge for right and left side. Compare to specification. Subtract crankshaft main journal diameter from main bearing diameter to calculate oil clearance. See **Service Specifications – Transmission / Crankshaft page 6.3**.



2. If crankshaft dimensions are within tolerances and oil clearances are incorrect, the crankcase set must be replaced.

NOTICE
Replace crankcase halves as a set.

6

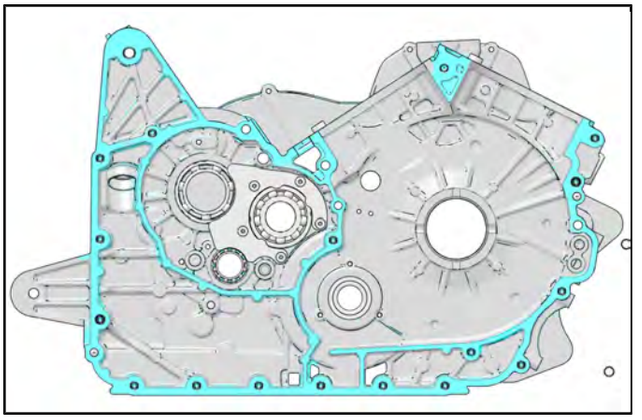
LEFT CRANKCASE ASSEMBLY

Prepare LEFT crankcase for assembly:

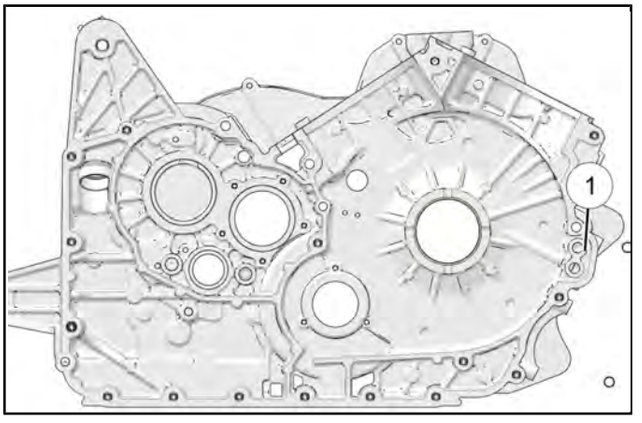
Refer to crankcase assembly view for locations and torque values. See **Crankcase Assembly View page 6.5**.

- Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
- Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
- DO NOT press on inner race of ball bearings.

1. Thoroughly clean any remaining gasket from the sealing path line.

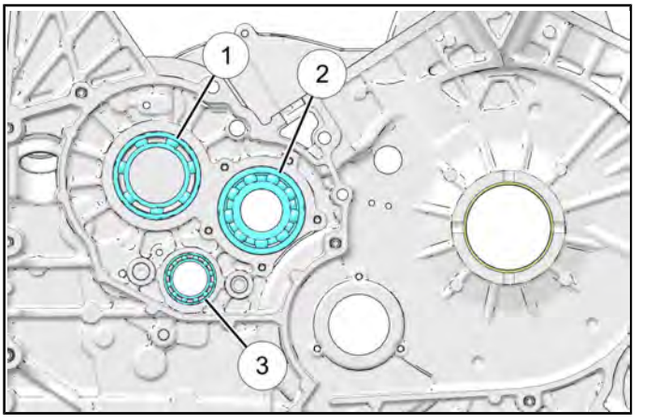


2. Clean crankcase and oil passage ① thoroughly. Rinse and dry with compressed air.

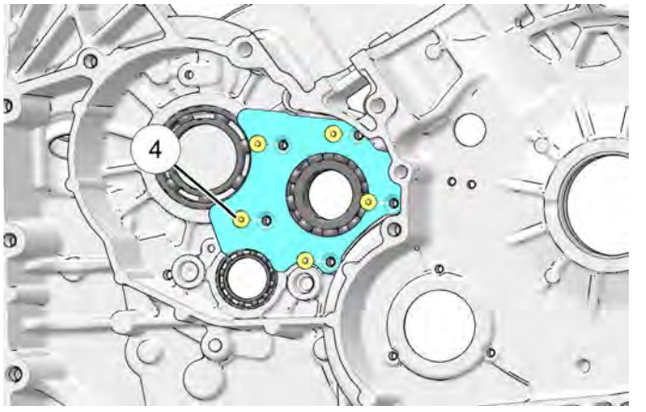


3. Install output shaft bearing ①, input shaft bearing ②, and shift drum bearing ③.

IMPORTANT
Ensure output shaft bearing ① and shift drum bearing ③ are fully seated. Ensure input shaft bearing ② is projected past the retainer plate mounting surface 0.05–0.25” when fully seated.

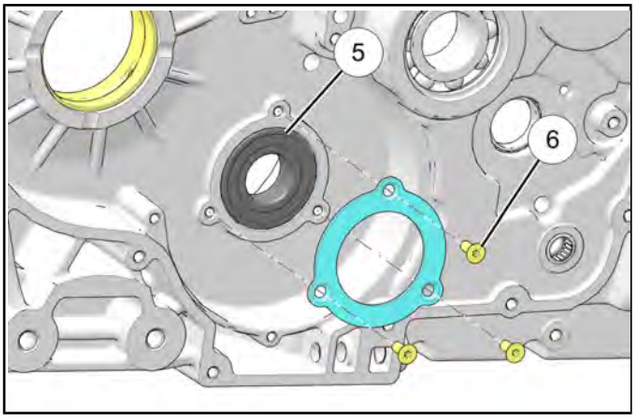


4. Install bearing retainer plate and secure with fasteners ④.



TORQUE
Bearing Retainer Plate Fastener: **62 in-lbs (7 N·m)**

5. Install balance shaft bearing ⑤ and secure with retainer plate and fasteners ⑥.



TORQUE
Balance Shaft Retainer Plate Fastener **62 in-lbs (7 N·m)**

6. Install new bearings in crankcase as required.

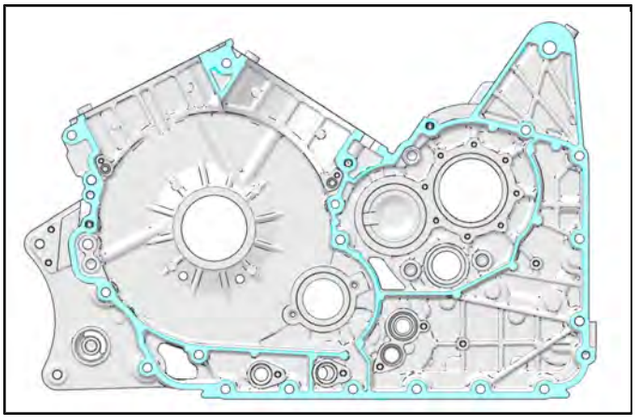
RIGHT CRANKCASE ASSEMBLY

Prepare RIGHT crankcase for assembly:

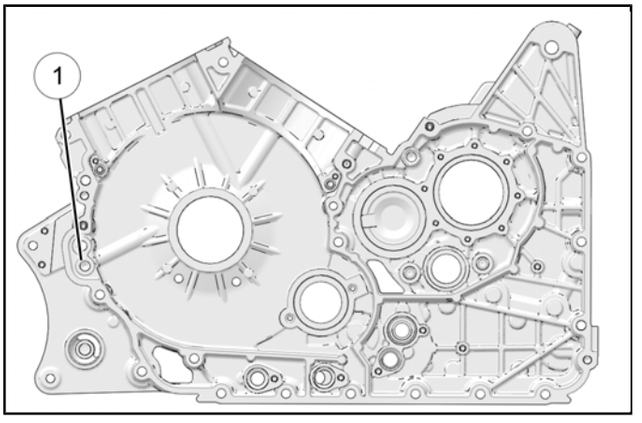
Refer to crankcase assembly view for locations and torque specification. See **Crankcase Assembly View page 6.5**.

- Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
- Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
- DO NOT press on inner race of ball bearings.

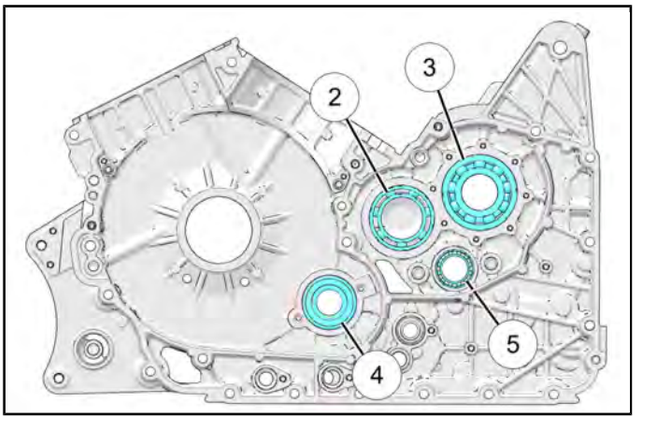
1. Thoroughly clean any remaining gasket material from the sealing path line.



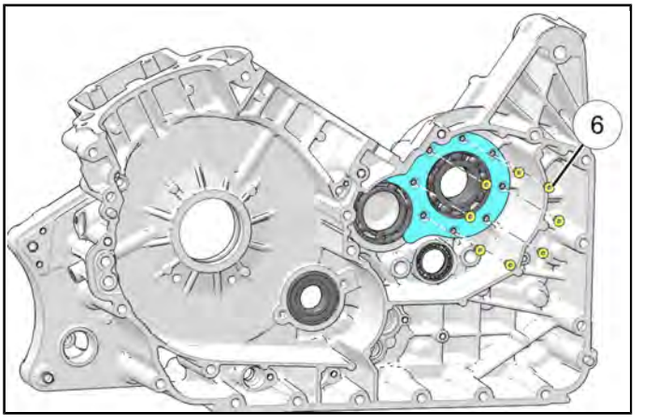
2. Clean crankcase oil passages ① thoroughly. Rinse and dry with compressed air.



3. Install Input Shaft Bearing ②, Output Shaft Bearing ③, Balance Shaft Bearing④, and Shift Drum Bearing⑤

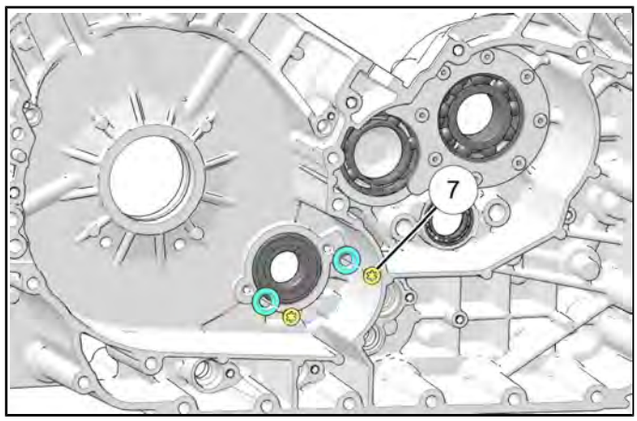


4. Install bearing retainer plate and fasteners ⑥.



TORQUE
Bearing Retainer Plate Fastener **62 in-lbs (7 N·m)**

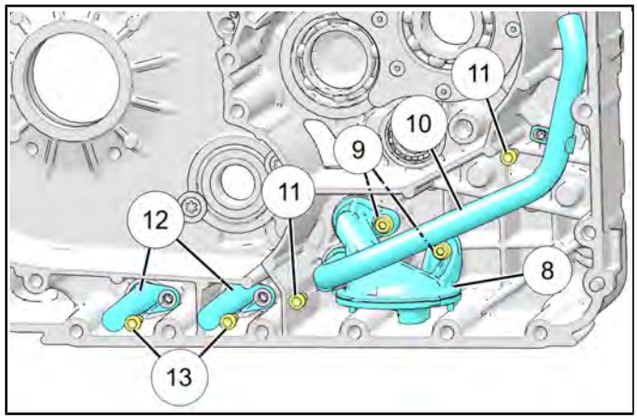
5. Install balance shaft bearing retainers and fasteners ⑦.



TORQUE
Balance Shaft Bearing Retainer Fastener: **62 in-lbs (7 N·m)**

6. Install oil pickup ⑧ and fastener ⑨.

IMPORTANT
Inspect and lubricate all o-rings prior to installation.



TORQUE
Oil Pickup Fastener: **88 in-lbs (10 N·m)**

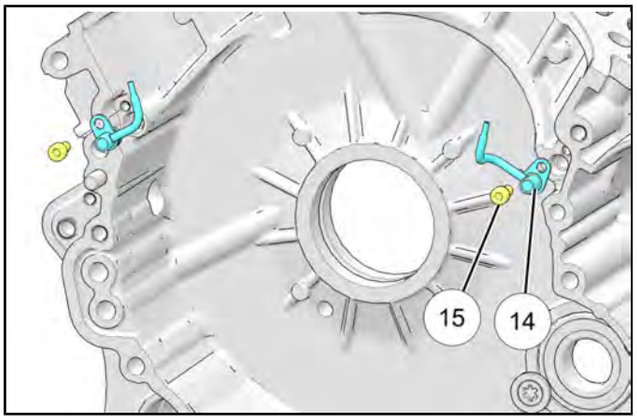
7. Install oil scavenge tube ⑩ and fasteners ⑪.

TORQUE
Oil scavenge tube fastener: **88 in-lbs (10 N·m)**

8. Install oil screen ⑫ and fastener ⑬.

TORQUE
Oil Screen Fastener: **88 in-lbs (10 N·m)**

9. Install piston cooling jets ⑭ and secure with fastener ⑮.

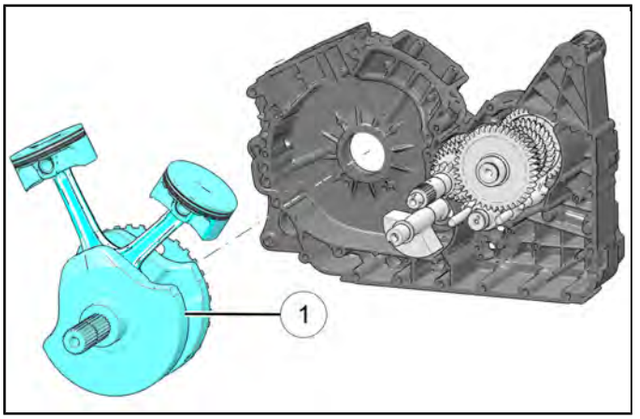


TORQUE
Piston Cooling Jet Fastener: **62 in-lbs (7 N·m)**

CRANKSHAFT INSTALLATION

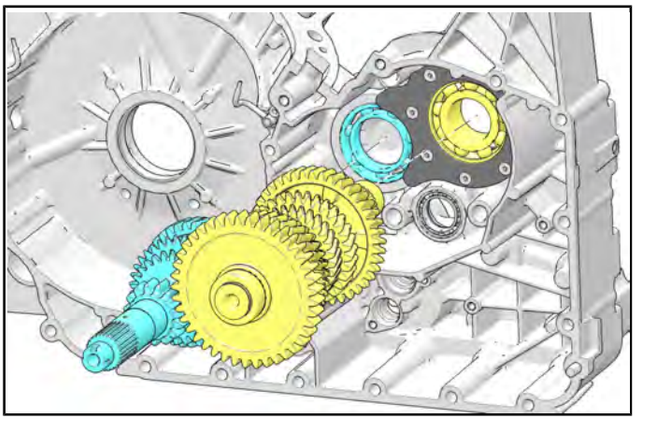
NOTICE
Install left engine case onto an engine stand.

1. If balance shaft is already in place, rotate the balance shaft counter weight out of the way prior to crankshaft installation.
2. Apply white lithium grease to main bearings.
3. Hold crankshaft over right crankcase and position rods so that left side rod is in cutout for rear cylinder and right side rod is in cutout for the front cylinder.
4. Place crankshaft ① into right crankcase half.

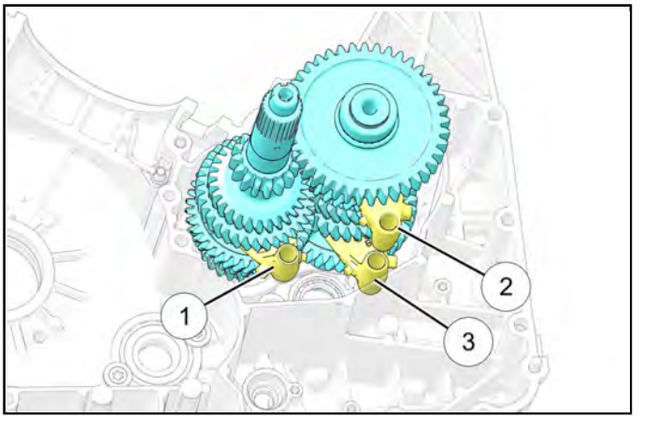


TRANSMISSION INSTALLATION

1. If transmission shaft bearings were replaced, be sure all bearing retainer plate fasteners are installed and tightened to specification. See **Crankcase Assembly View page 6.5**.
2. Assemble the input shaft and output shaft so the gears are properly meshed and insert them into the right case half. Verify both shafts are fully seated and rotate freely.



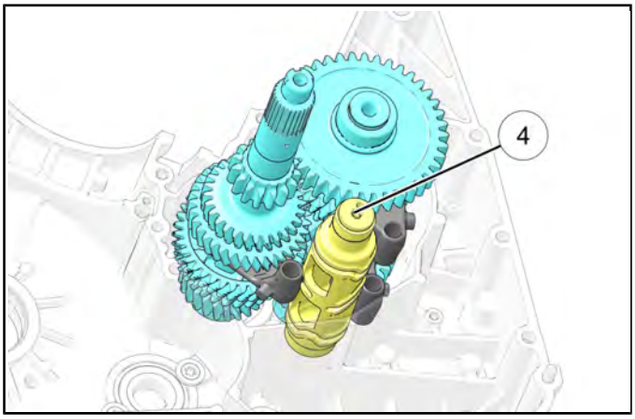
3. Install the shift forks.



IMPORTANT
Each shift fork is different. Ensure shift forks are in the correct location upon assembly. There are numbers forged on the forks for identification.

ITEM	FORGE NUMBER
①	8 943
②	8 942
③	8 941

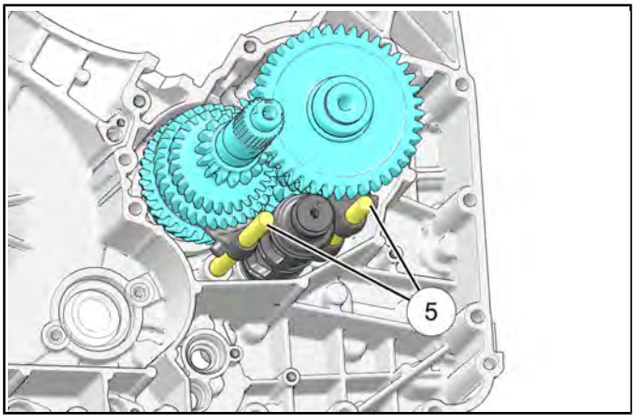
4. Install shift drum ④.



IMPORTANT

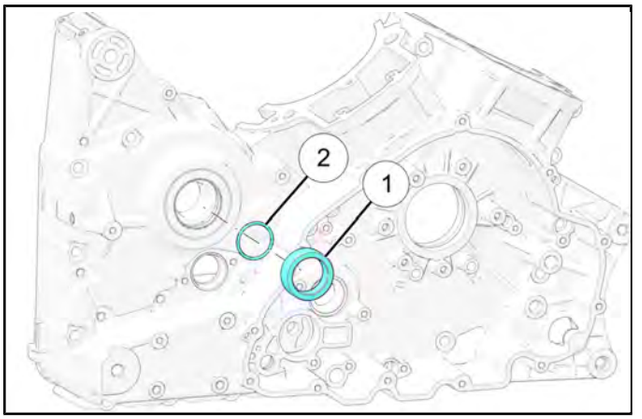
Ensure the shift drum is oriented as follows:
The pin end Ⓐ goes into the LEFT crankcase.
The non-pin end Ⓑ goes into the RIGHT crankcase.

5. Rotate shift drum to align proper grooves with forks.
6. Move shift forks pins into drum grooves and seat rails.
7. Install shift rails ⑤.

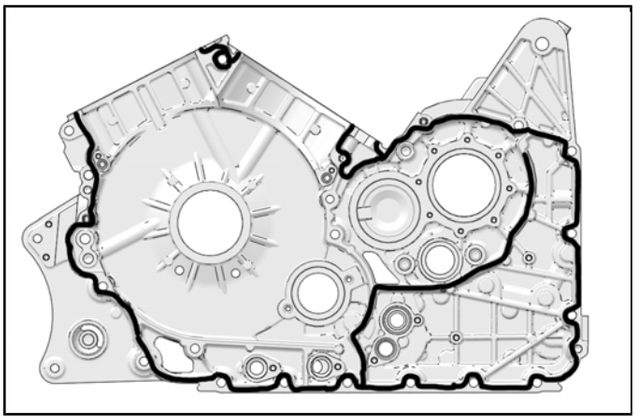


CRANKCASE ASSEMBLY

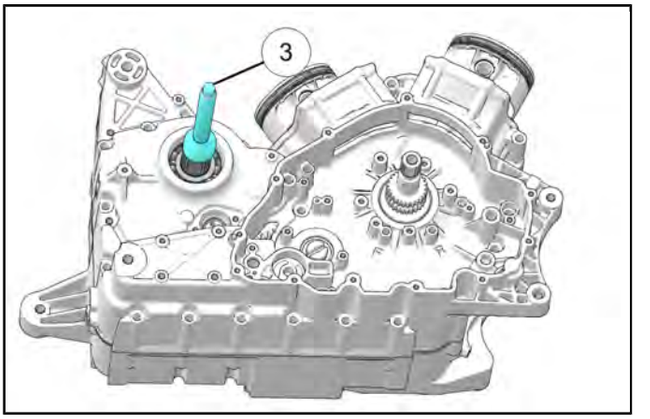
1. Clean crankcase mating surfaces to remove all grease, oil, and old sealant.
2. Check to be sure all shafts are seated properly (crankshaft, balance shaft, shift drum, shift forks, input shaft, output shaft).
3. Remove the drive sprocket spacer ① and o-ring ② from the right-hand crankcase prior to installation.



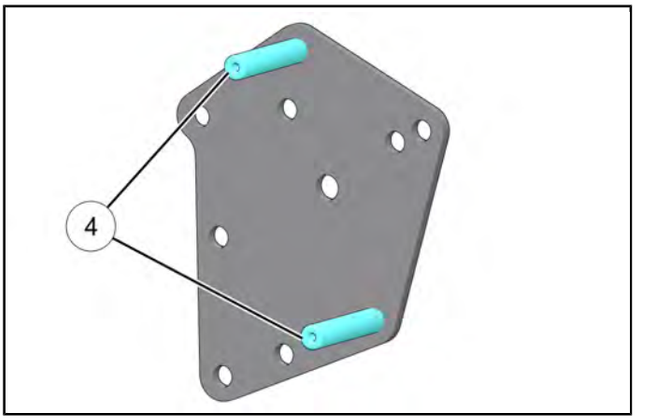
4. Apply a light even bead of Loctite™ Ultra Black 598 to casehalf sealing surface as shown.



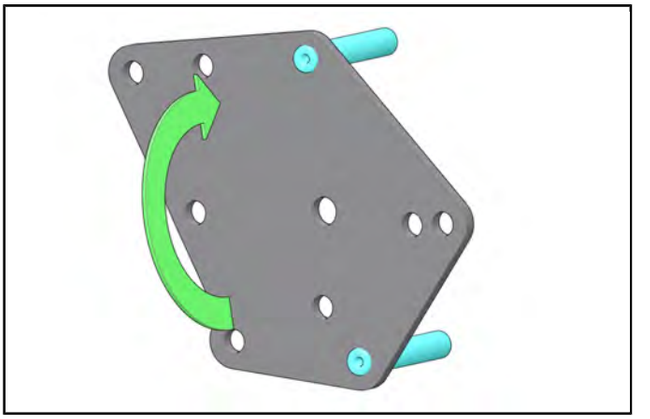
5. Thread the case assembly adapter ③ onto the output shaft.



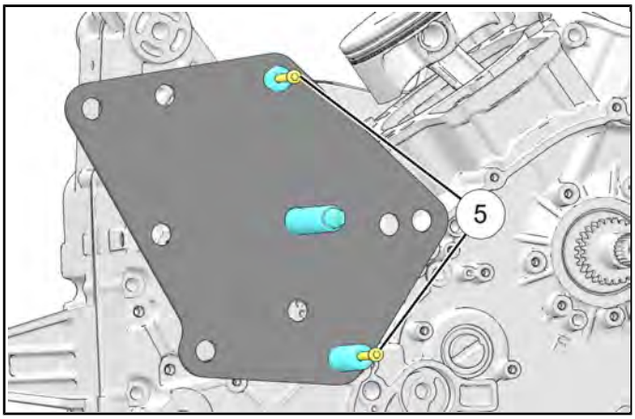
6. Place the Engine Case Splitting / Assembly tool **PF-51234-A** on a flat surface with the part number facing upward.
7. Assemble the threaded spacers ④ into the holes marked with the letter "A" as shown.



8. Flip the plate 180 degrees so the part number facing down.



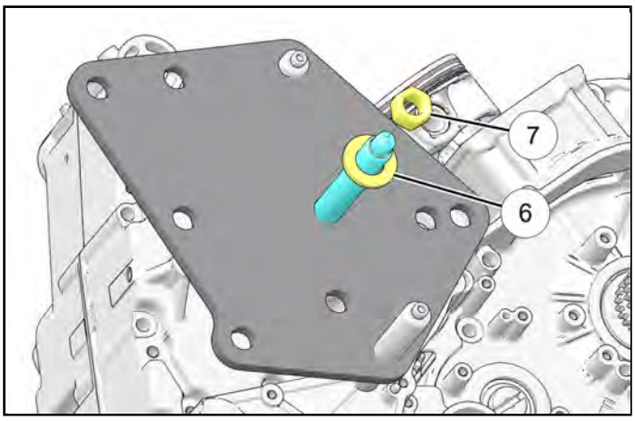
9. Install over the case assembly adapter as shown. Adjust the threaded spacers so they touch the case and the plate is level.



IMPORTANT

- Plate surface should be parallel to the surface of the engine crankcase.
- All threaded spacers must be in contact with engine case prior to fastening on the plate assembly.

10. Install the provided fasteners ⑤ through the threaded spaces and tighten into the casehalf.
11. Install washer ⑥ and nut ⑦.



12. Spread sealant into a thin even layer on entire case mating surface. Be sure all areas are covered.

IMPORTANT

DO NOT ALLOW SEALANT TO DRY. CONTINUE ASSEMBLY UNTIL CASES ARE SEALED AND ALL FASTENERS ARE TIGHT

13. Pull crankcase together by tightening nut and tapping on crankcase with a soft mallet.

NOTICE

The cases will mate before the output shaft is drawn fully into bearing. **IMPORTANT!** Continue to turn nut and tap case until sealant squeezes out along the entire perimeter and resistance is felt when turning nut.

14. Remove the tool.
15. Install crankcase fasteners and torque fasteners in sequence. See **Crankcase Torque Sequence page 6.8**.
16. Apply 10 - 15mL (0.34 - 0.51 oz) of recommended engine oil to the output shaft bearing.
17. Install a new output seal in right-hand crankcase using seal installer **PF-51243**.
18. Install the o-ring and drive sprocket spacer removed in STEP **3** with tapered edge toward the o-ring.
19. Install the gear position switch. See **Gear Position Switch Replacement page 10.170**.
20. Install the drive sprocket. See **Drive Sprocket Installation page 8.66**.
21. Install primary drive gear. See **Primary Drive Gear Installation page 5.24**.
22. Install water pump. See **Water Pump Installation page 3.47**.
23. Install transmission feed rail. See **Transmission Feed Rail Installation page 3.38**.
24. Install shift ratchet. See **Shift Ratchet Installation page 5.17**.
25. Install clutch assembly. See **Clutch Installation page 5.23**.
26. Install primary cover. See **Primary Cover Installation page 5.14**.
27. Install cylinders. See **Cylinder Installation page 3.98**.
28. Install cylinder heads. See **Cylinder Head Installation page 3.83**.
29. Install cam chains. See **Cam Chain Installation page 3.65**.
30. Remove the oil pump. See **Oil Pump Installation page 3.36**.
31. Install the starter drive. See **Starter Drive Installation page 6.19**.
32. Install flywheel. See **Flywheel Installation page 3.61**.

33. Install ACG cover. See **ACG Cover Installation page 10.31**.
34. Install stator. See **Stator Installation page 10.33**.
35. Install engine in frame. See **Engine Installation page 3.20**.

STAKE NUT INSTALLATION

- The Stake nut is located on the clutch side of the transmission input shaft.
- It is important that they are torqued and staked correctly for proper function

IMPORTANT
Do not reuse or reinstall any previously used stake nut. A new stake nut needs to be installed every time the nut is removed or loosened.

Use the following procedure to install the stake nuts correctly:

1. Clean threads on shaft so there is no oil or contaminants.
2. Thread NEW stake nut onto shaft finger tight.
3. Torque stake nut to specification.
4. Stake the stake nut using round side of punch. Do not crack or tear staking lip. Do not use a sharp chisel to stake the nut.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Transmission Will Not Shift	Broken Shift Cam	Shift Cam	Replace shift cam
	Bent Shift Forks	Shift Fork	Replace shift fork(s)
	Worn Gearshift Pawl	Shift Cam	Replace shift cam
	Broken Gears	Transmission Gears	Replace necessary parts
	Damaged/Broken Bearings	Transmission, Shift Cam Bearings	Replace necessary parts
	Worn Gear Shift Ratchet Mechanism	Shifter Ratchet	Refer to Clutch / Primary / Shift chapter
	Broken or out-of-place spring on shift ratchet	Shift Ratchet Spring	Refer to Clutch / Primary / Shift chapter
	Shift Detent Ratchet Stuck	Shift Ratchet	Repair as necessary
	Seized Pivot Point, Bent External Shift Linkage	External Shift Linkage	Repair as necessary
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace Shift Fork Rails
	Debris From Broken Parts Locking Transmission	Transmission Components	Repair as necessary
	Clutch cable not adjusted properly	Clutch Cable	Adjust
	Oil type, condition, and level	Transmission internal components	Replace
Excessive Noise Related to Bottom End of Engine	Worn Main Bearings	Crankshaft and/or Crankshaft Bearings	Repair as necessary
	Worn Connecting Rod Bearings	Connecting Rod Bearings and/or Connecting Rod and/or Rod Bearings	Repair as necessary
	Worn Connecting Rod Small End Bushing	Connecting Rod, Connecting Rod Bushing, Piston Pin, Piston	Repair as necessary
	Worn, seized, chipped or broken gear teeth	Transmission Gears	Repair as necessary
	Worn, seized, chipped or broken Transmission Bearings	Transmission Bearings	Repair as necessary
	Originates from Primary Cover	Clutch, Flywheel, Oil Pump Drive	Repair as necessary
	Oil Pump	Oil Pump, Oil Pump Drive	Refer to Engine / Cooling / Exhaust chapter
	Cam Drive	Cam Chain, Cam Sprocket	Refer to Engine / Cooling / Exhaust chapter

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
	Clutch cable not adjusted properly	Clutch Cable	Adjust
	Oil type, condition, and level	Transmission internal components	Replace

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Transmission Hard to Shift	Improper Clutch Operation	Clutch	Refer to Clutch / Primary / Shift chapter
	Incorrect Oil Viscosity	Engine oil and filter	Refer to Engine / Cooling / Exhaust chapter
	Bent, Rubbing, Sticky, Broken Shift Shaft	Shifter Ratchet Assembly	Refer to Clutch / Primary / Shift chapter
	Sticking Pivot Point, Bent External Shift Linkage	External Shift Linkage	Repair or replace components as necessary
	Bent or Distorted Shift Forks	Shift Forks	Replace bent shift fork
	Damaged Shift Drum Grooves	Shift Drum	Replace damaged shift drum
	Shift Ratchet Bent / Stuck	Shift Ratchet	Repair as necessary
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace Shift Fork Rails
	Clutch cable not adjusted properly	Clutch Cable	Adjust
	Oil type, condition, and level	Transmission internal components	Replace
Transmission Jumps Out of Gear	Broken Shift Stop Pin	Shift Stop Pin	Replace stop pin
	Worn Shift Drum Pawls or Shifter Ratchet	Shift Drum or Shift Linkage	Replace damaged shift drum or shifter ratchet
	Broken Shift Ratchet Spring	Shift Ratchet Spring	Replace spring
	Damaged Shift Drum Grooves	Shift Drum	Replace shift drum
	Bent, Worn, Distorted Shift Forks	Shift Forks	Replace shift forks
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace shift fork rails
	Worn Engagement Dogs on Transmission Gears	Transmission Gears	Replace necessary parts

CHAPTER 7
FRAME / BODY

GENERAL INFORMATION

SERVICE NOTES – FRAME / BODY

This section covers the removal and installation of frame and body components, assemblies and systems. Pay close attention to assembly procedures and torque specifications.

Cables, hoses and tie straps that have been removed during disassembly must be replaced per factory standards during assembly. Caution should be used when tightening body panels. Any deformation on the panel around the fastener is an indication that the fastener is too tight. Do not over tighten body components in order to avoid damage.

SPECIAL TOOLS – FRAME / BODY

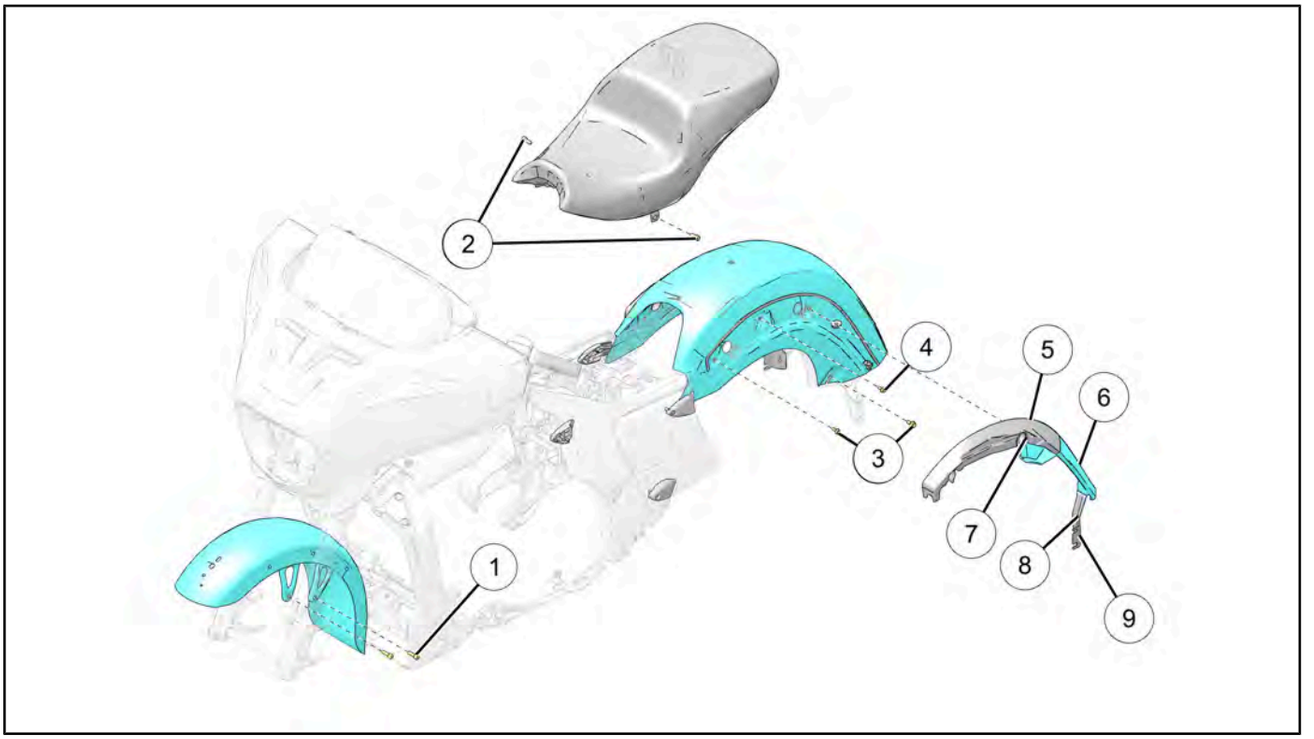
TOOL DESCRIPTION	PART NUMBER
PV-49955	Body Panel Tool Kit

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

ASSEMBLY VIEWS

FORK MOUNTED FAIRING

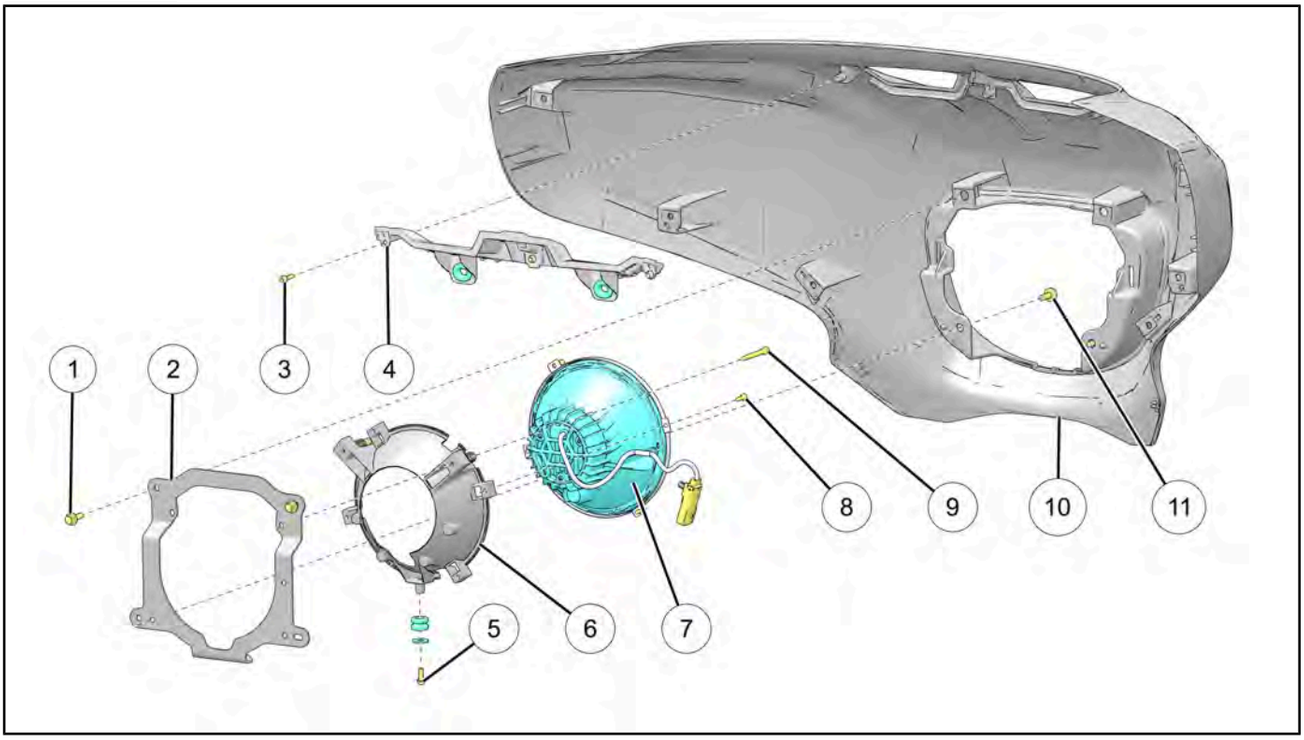
FENDERS / SEAT ASSEMBLY VIEW



① Fender Fastener (Front) **18 ft-lbs (24 N·m)**	⑥ Fender Closeout Lower (LH)
② Seat Fastener **18 ft-lbs (24 N·m)**	⑦ Fender Closeout Lower Fastener **88 in-lbs (10 N·m)**
③ Fender Fastener (Rear) M6 **88 in-lbs (10 N·m)**	⑧ Fender Closeout Bracket
④ Fender Fastener (Rear) M8 **18 ft-lbs (24 N·m)**	⑨ Fender Closeout Bracket Fastener **88 in-lbs (10 N·m)**
⑤ Fender Closeout Upper (LH)	

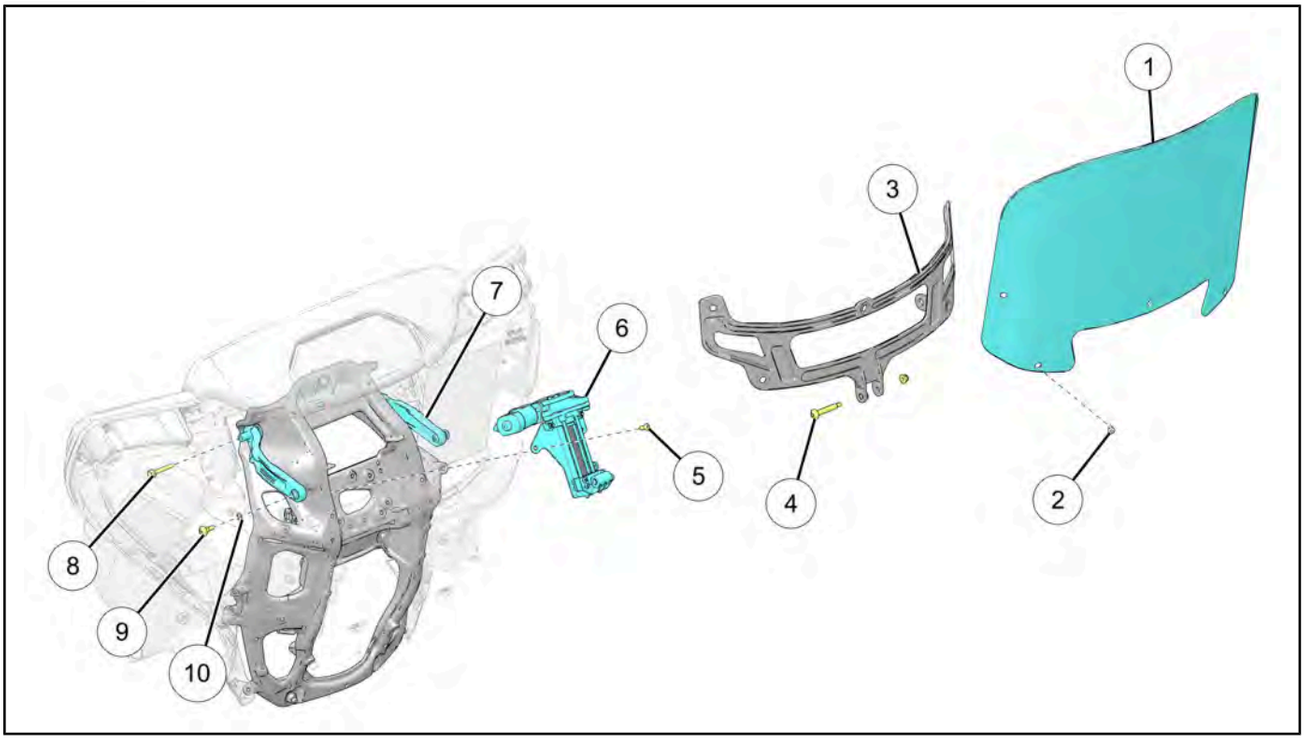
FAIRING ASSEMBLY VIEW FMF

OUTER FAIRING

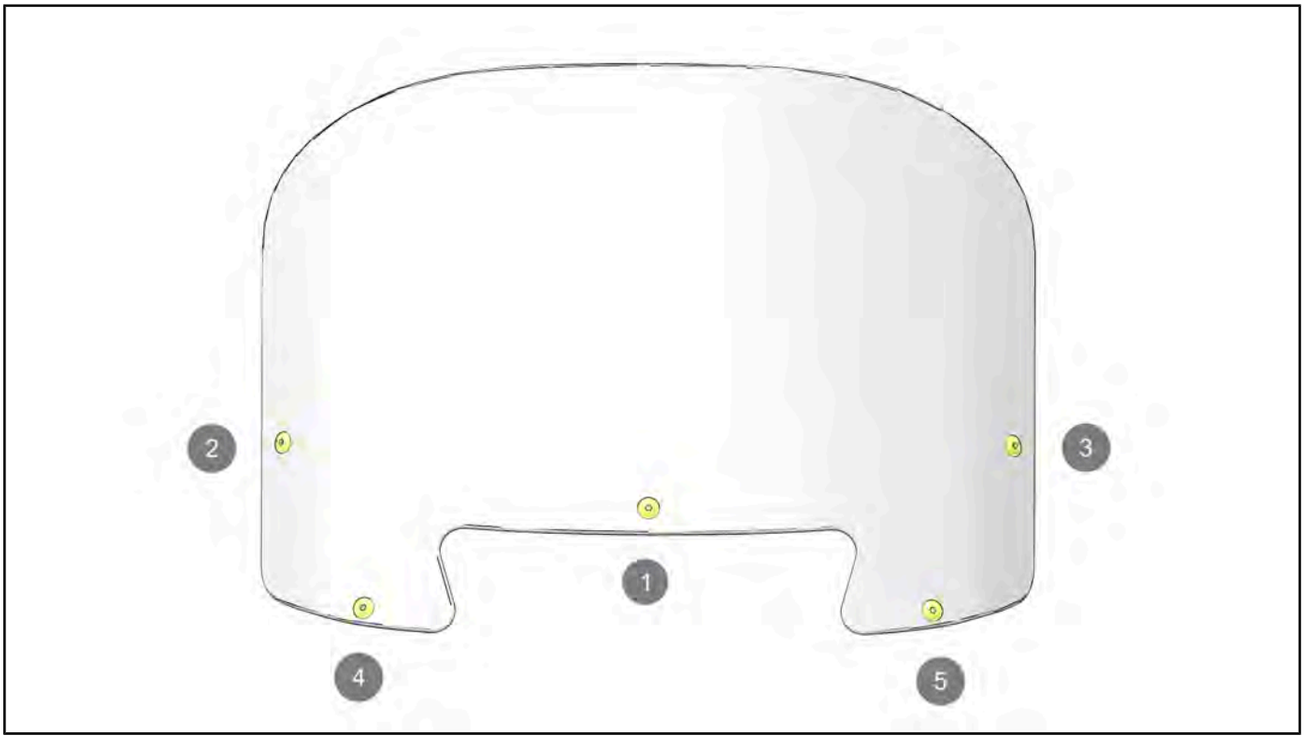


① Headlight Bracket Fastener **35 in-lbs (4 N·m)**	⑦ Headlight
② Headlight Bracket	⑧ Headlight to Headlight Case Fastener **35 in-lbs (4 N·m)**
③ Upper Duct Fastener **15 in-lbs (2 N·m)**	⑨ Headlight Case to Headlight Bracket Fastener **35 in-lbs (4 N·m)**
④ Upper Duct	⑩ Outer Fairing
⑤ Lower Headlight Case Fastener **35 in-lbs (4 N·m)**	⑪ Outer Fairing Fastener **35 in-lbs (4 N·m)**
⑥ Headlight Case **35 in-lbs (4 N·m)**	

WINDSHIELD

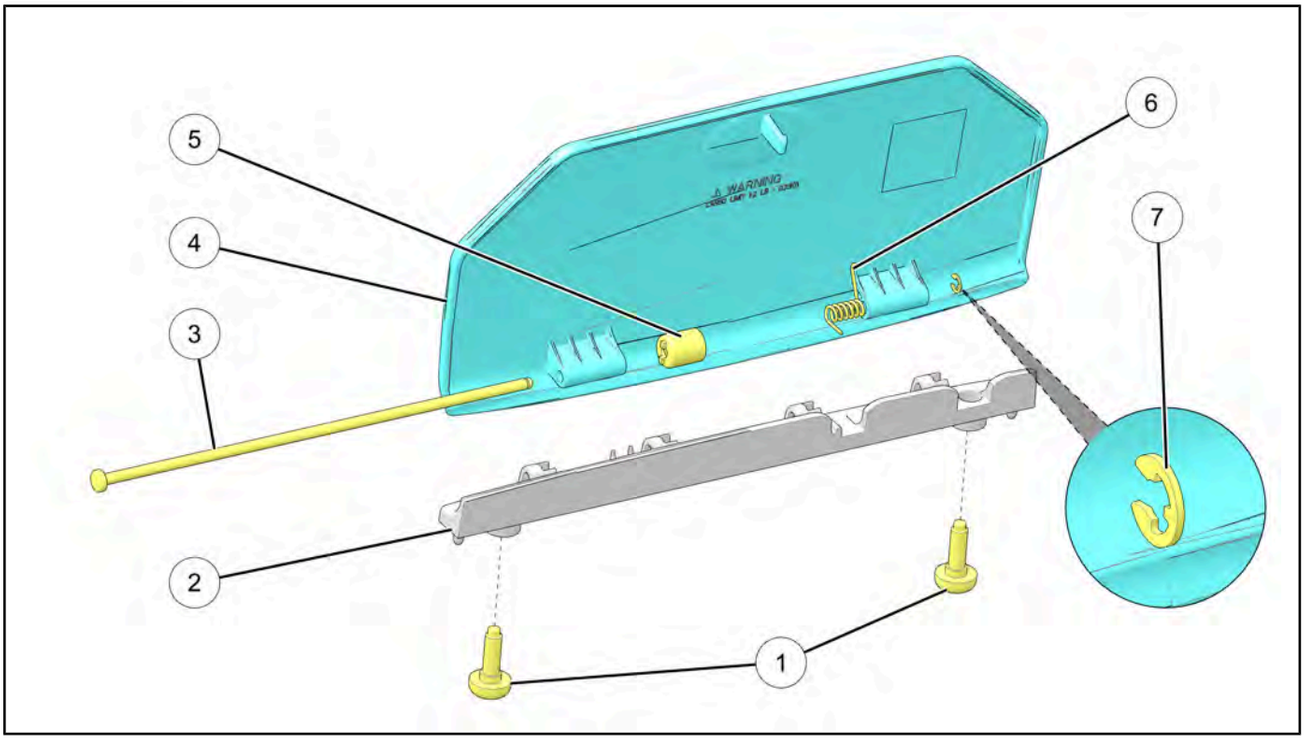


WINDSHIELD TORQUE SEQUENCE



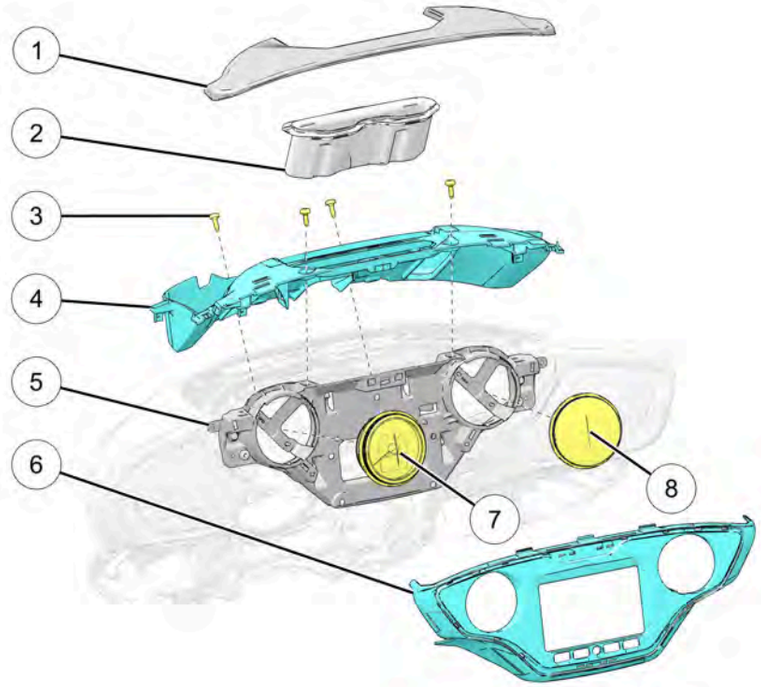
① Windshield	⑥ Windshield Motor
② Windshield Fastener **35 in-lbs (4 N·m)** Torque fasteners in sequence.	⑦ Windshield Link
③ Windshield Support	⑧ Windshield Link to Pivot Fastener **88 in-lbs (10 N·m)**
④ Windshield Support to Motor Fastener **88 in-lbs (10 N·m)**	⑨ Windshield Support to Link Fastener **88 in-lbs (10 N·m)**
⑤ Windshield Motor to Fairing Support Fastener **88 in-lbs (10 N·m)**	⑩ Wave Washer

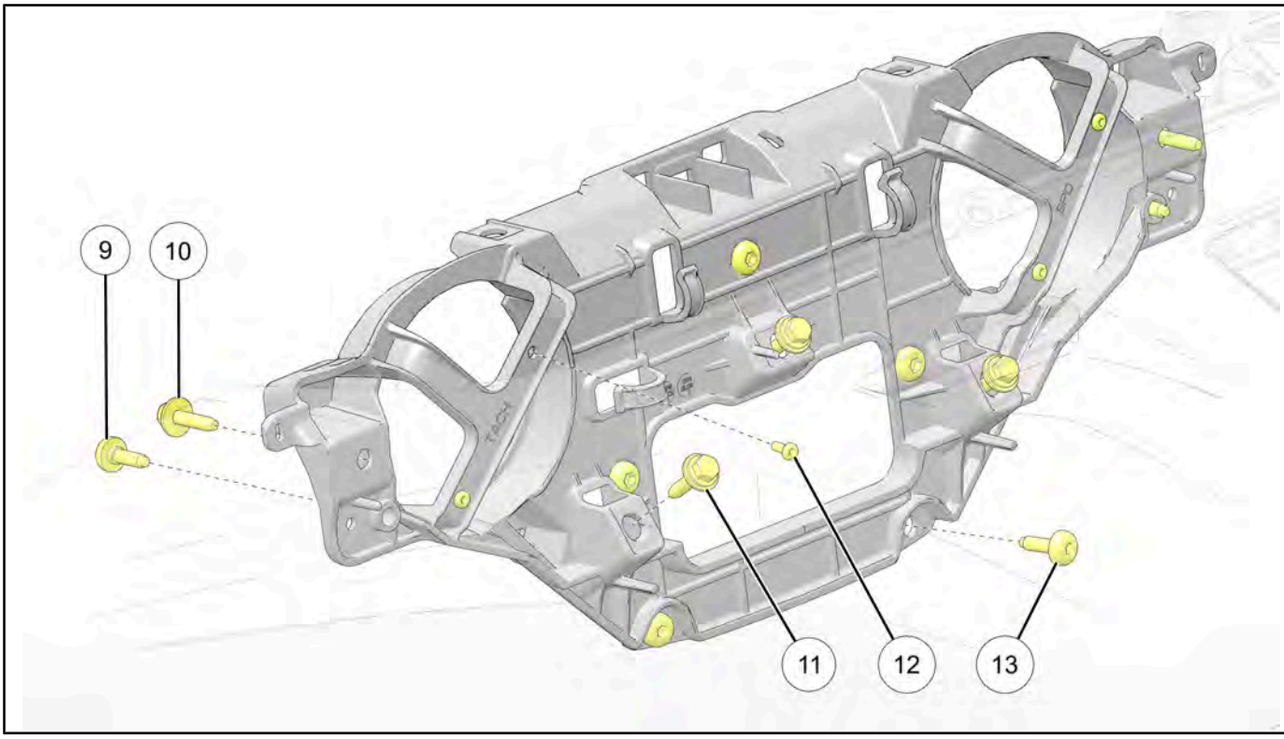
STORAGE DOOR



① Hinge Block Fastener **35 in-lbs (4 N·m)**	⑤ Storage Door Damper
② Hinge Block	⑥ Storage Door Spring
③ Storage Door Pin	⑦EClip
④ Storage Door	

DASH

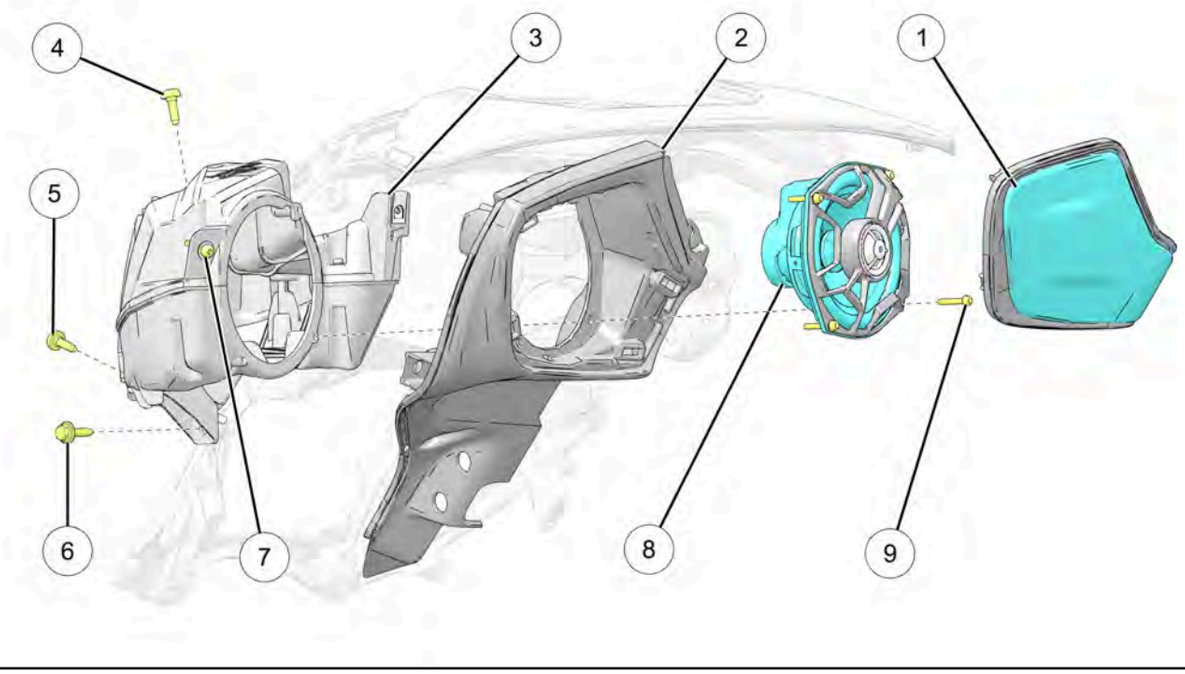




① Visor Top	⑧ Tachometer
② Storage Liner	⑨ Right Hand / Left Hand Dash Fastener

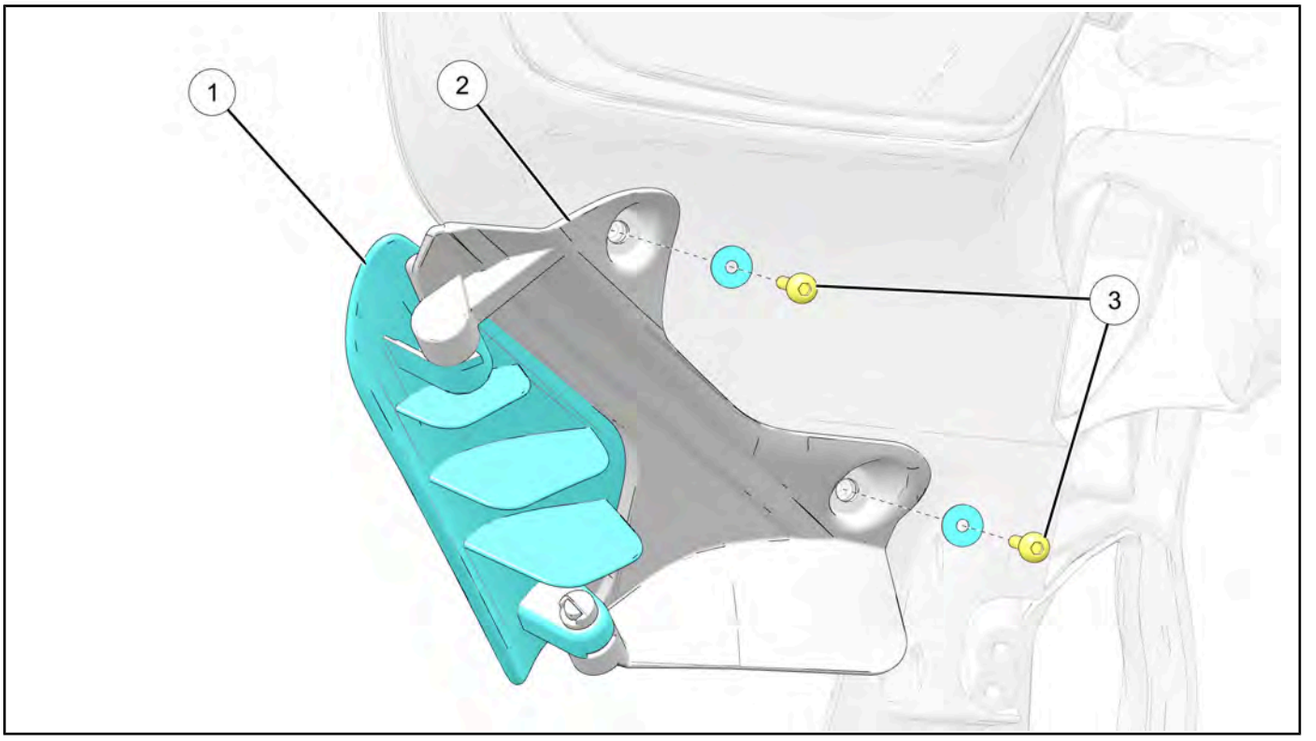
	35 in-lbs (4 N·m)
③ Visor Fastener **35 in-lbs (4 N·m)**	⑩ Dash Support to Speaker Enclosure Fastener **88 in-lbs (10 N·m)**
④ Visor	⑪ Dash Support to Fairing Bracket Fastener **88 in-lbs (10 N·m)**
⑤ Dash Support	⑫ Tachometer / Speedometer Fastener **9 in-lbs (1 N·m)**
⑥ Center Dash	⑬ Dash Support to Center Dash Fastener **35 in-lbs (4)**
⑦ Speedometer	

LEFT HAND / RIGHT HAND FAIRING



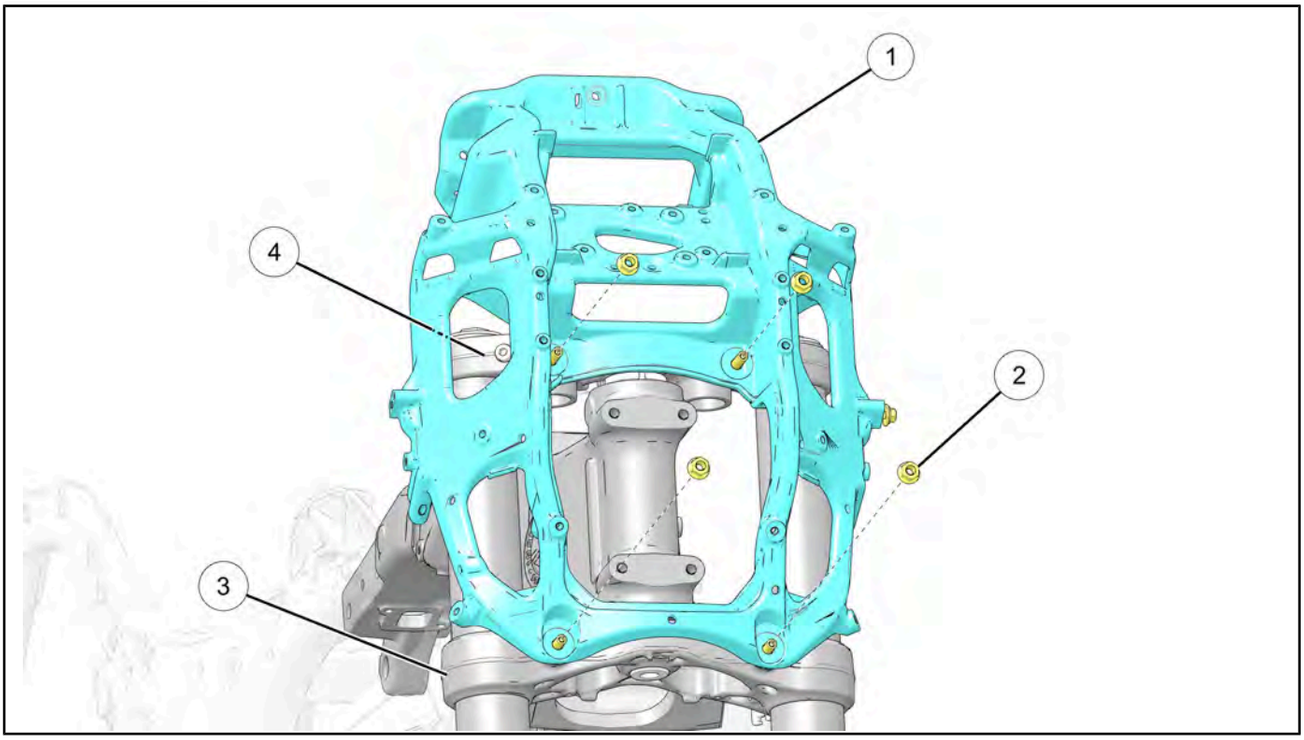
① Speaker Grill	⑥ Speaker Enclosure to Fairing Support Fastener **88 in-lbs (10 N·m)**
② Right Hand / Left Hand Dash	⑦ Right Hand / Left Hand Dash to Outer Shell Fastener **35 in-lbs (4 N·m)**
③ Right Hand / Left Hand Speaker Enclosure	⑧ Speaker
④ Right Hand / Left Hand Top Speaker Enclosure Fastener **88 in-lbs (10 N·m)**	⑨ Speaker Fastener **25 in-lbs (3 N·m)**
⑤ Right Hand / Left Hand Bottom Speaker Enclosure Fastener **35 in-lbs (4 N·m)**	

WIND DEFLECTORS



① LH / RH Wind Deflector	③ Wind Deflector Support to Outer Fairing Fastener **35 in-lbs (4 N·m)**
② Wind Deflector Support	

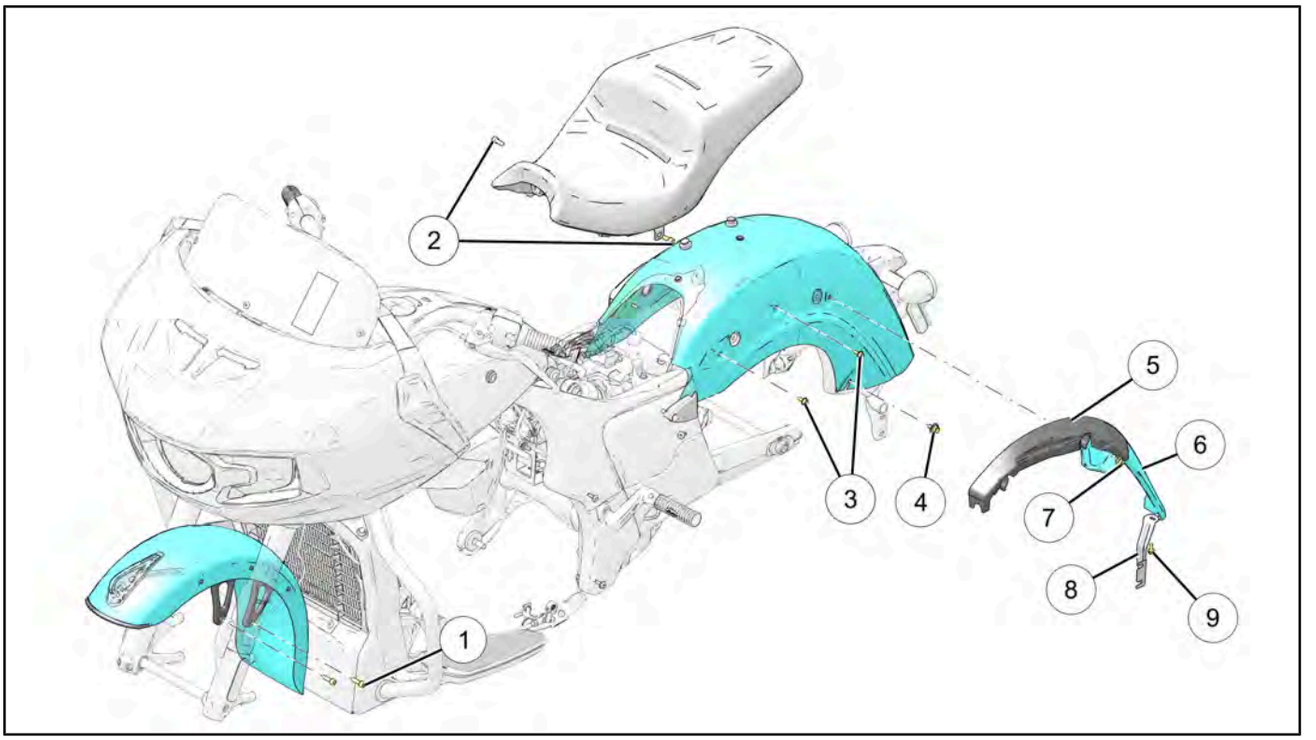
FAIRING BRACKET



① Fairing Bracket	③ Lower Triple Clamp
② Fairing Bracket Nut **18 ft-lbs (24 N·m)**	④ Upper Triple Clamp

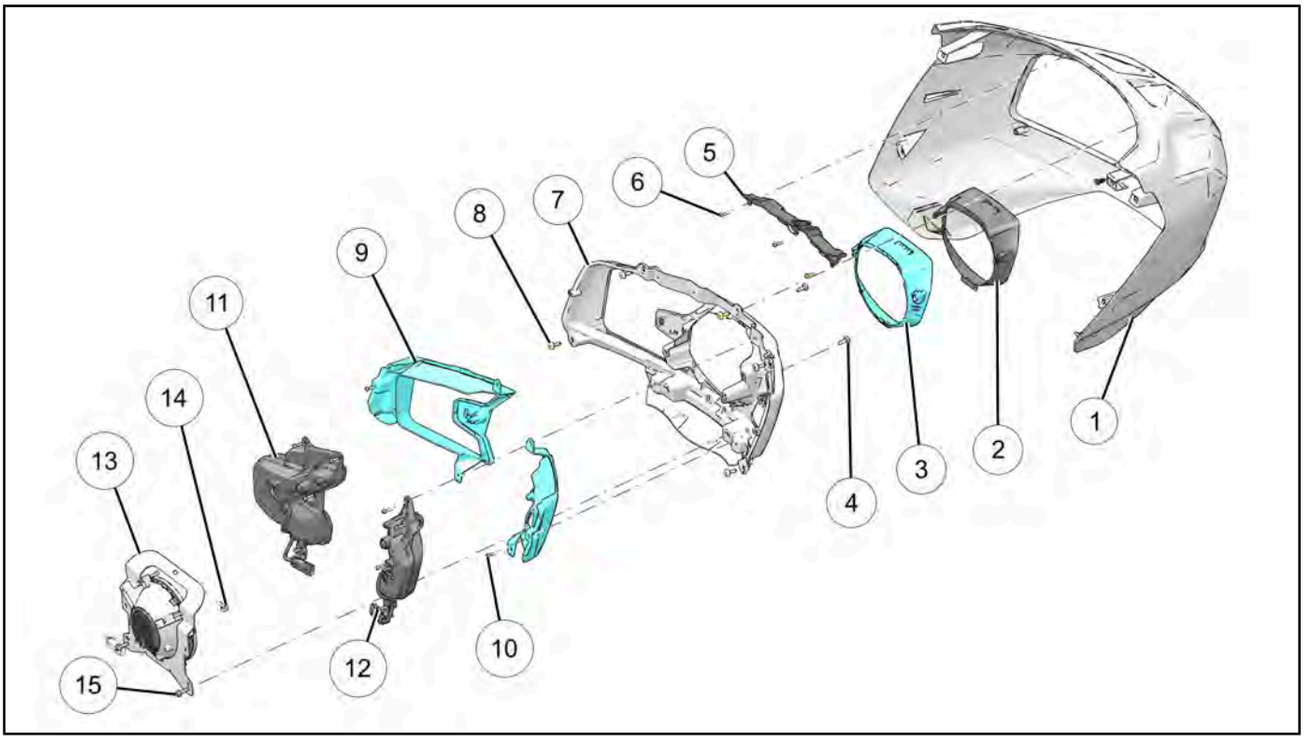
CHASSIS MOUNTED FAIRING

FENDERS / SEAT ASSEMBLY VIEW

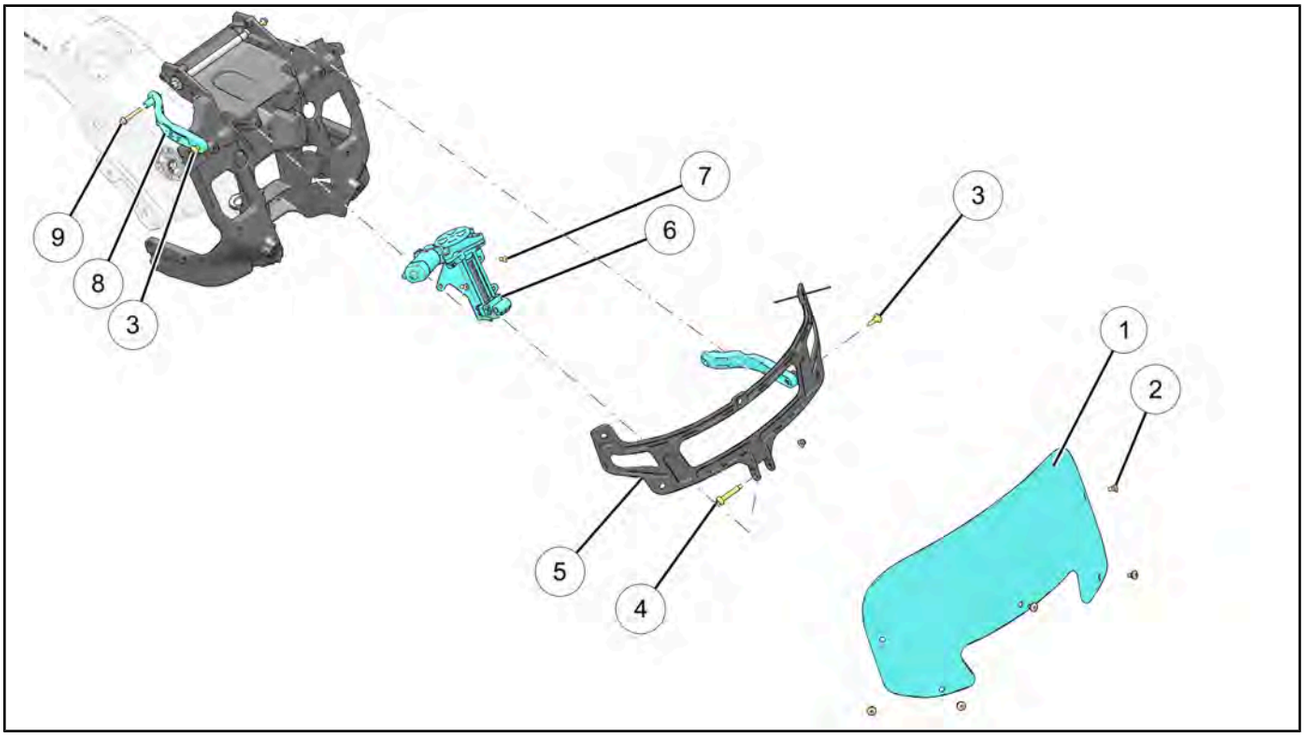


① Fender Fastener (Front) **18 ft-lbs (24 N·m)**	⑥ Fender Closeout Lower (LH)
② Seat Fastener **18 ft-lbs (24 N·m)**	⑦ Fender Closeout Lower Fastener **88 in-lbs (10 N·m)**
③ Fender Fastener (Rear) M6 **88 in-lbs (10 N·m)**	⑧ Fender Closeout Bracket
④ Fender Fastener (Rear) M8 **18 ft-lbs (24 N·m)**	⑨ Fender Closeout Bracket Fastener **88 in-lbs (10 N·m)**
⑤ Fender Closeout Upper (LH)	

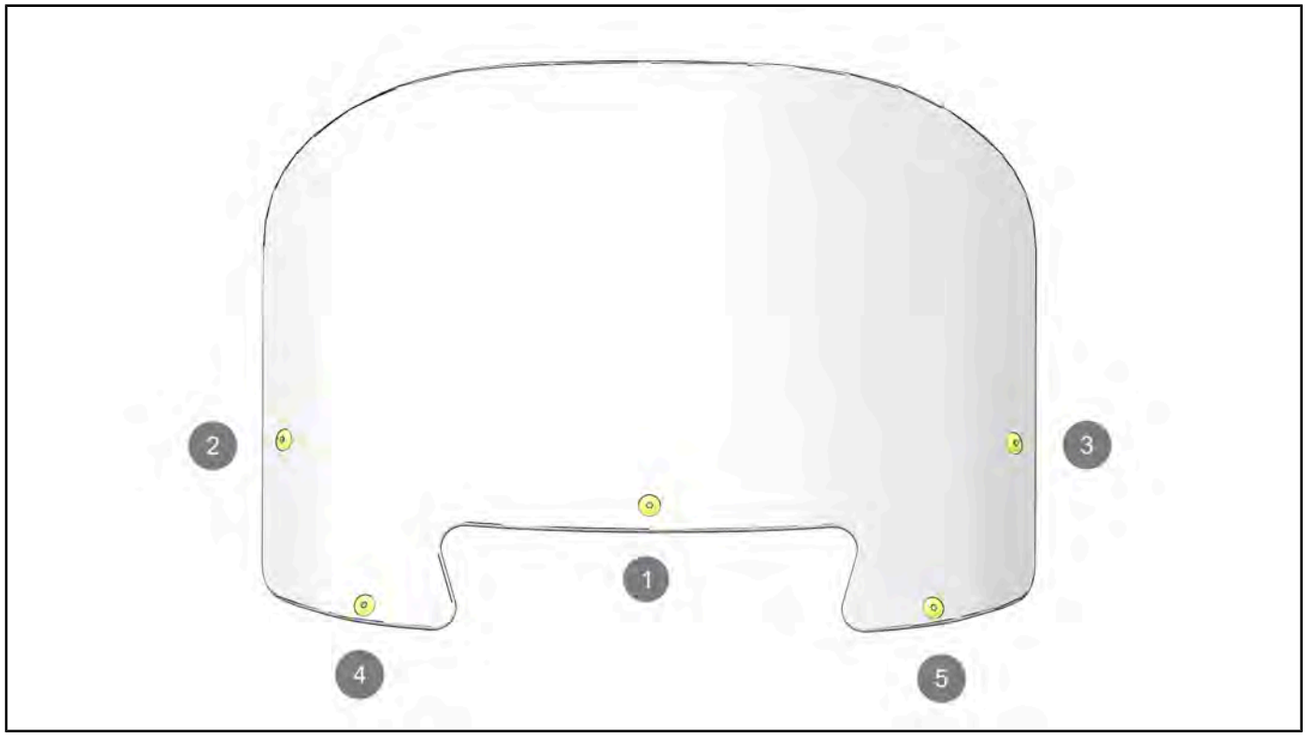
FAIRING ASSEMBLY VIEW

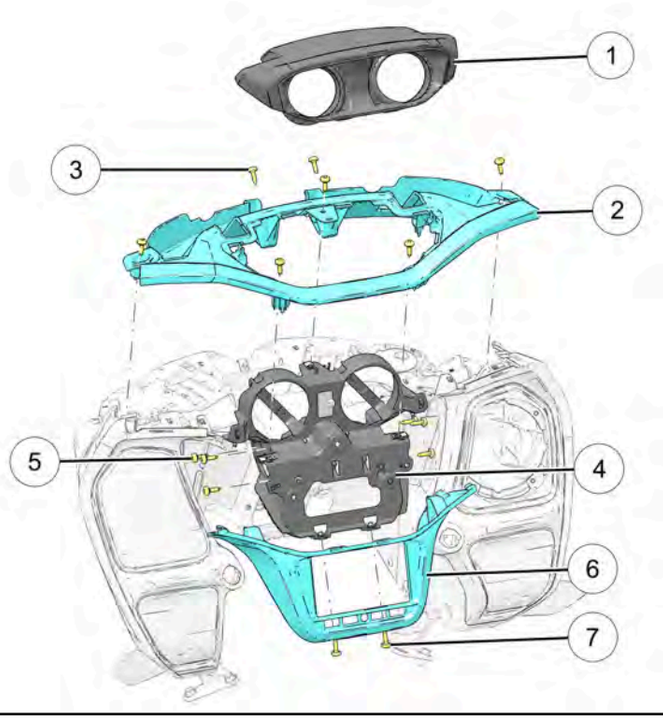


① Outer Fairing	⑨ Turn Signal Bezel (Left)
② Center Headlight Bezel	⑩ Turn Signal Bezel Fastener **15 in-lbs (2 N·m)**
③ Headlight Grommet Bezel	⑪ Turn Signal (Left)
④ Headlight Bezel Assembly Fastener **35 in-lbs (4 N·m)**	⑫ Turn Signal Fastener **88 in-lbs (10 N·m)**
⑤ Upper Duct	⑬ Headlight Assembly
⑥ Upper Duct Fastener **15 in-lbs (2 N·m)**	⑭ Headlight Fastener **35 in-lbs (4 N·m)**
⑦ Headlight Bezel Assembly	⑮ Headlight Bracket Fastener **35 in-lbs (4 N·m)**
⑧ Headlight Bezel Assembly Fastener **35 in-lbs (4 N·m)**	

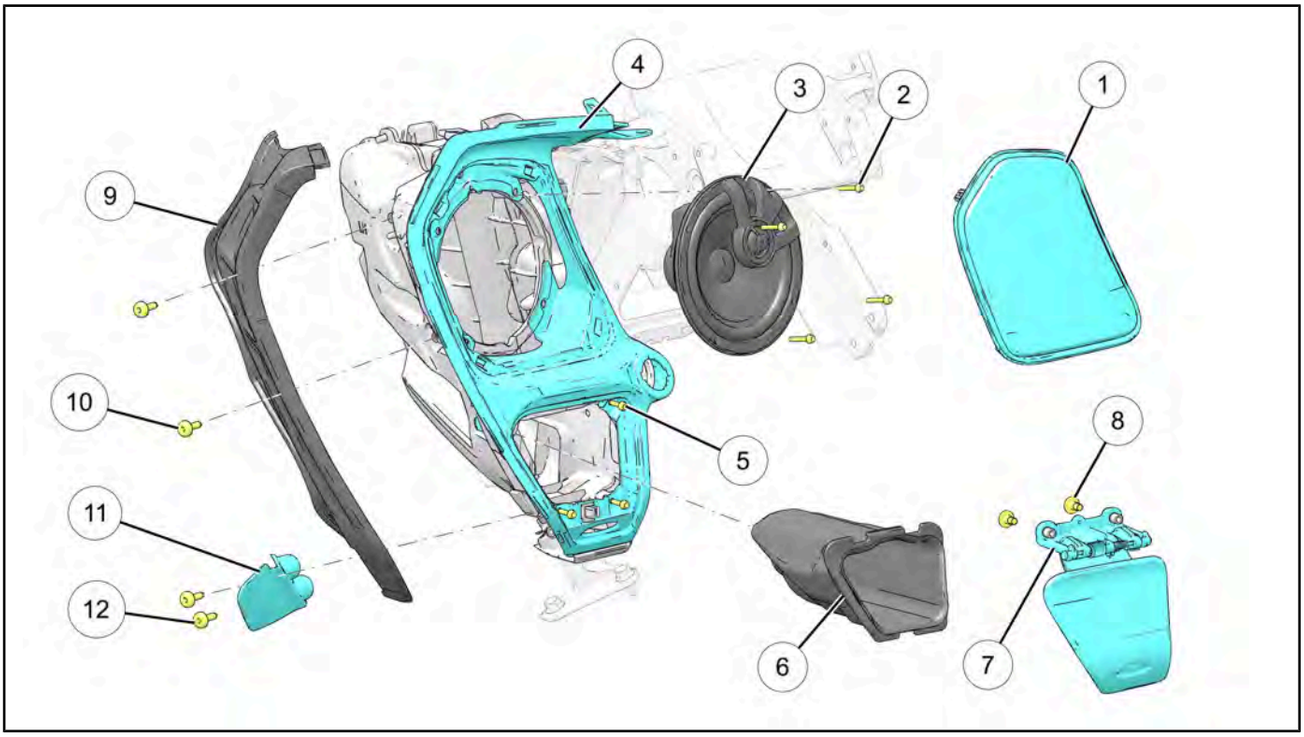


① Windshield	⑥ Windshield Motor
② Windshield Fastener **35 in-lbs (4 N·m)** Torque fasteners in sequence.	⑦ Windshield Motor Fastener **88 in-lbs (10 N·m)**
③ Windshield Support to Link Fastener **88 in-lbs (10 N·m)**	⑧ Windshield Link
④ Windshield Support to Motor Fastener **88 in-lbs (10 N·m)**	⑨ Windshield Link to Pivot Fastener **88 in-lbs (10 N·m)**
⑤ Windshield Support	

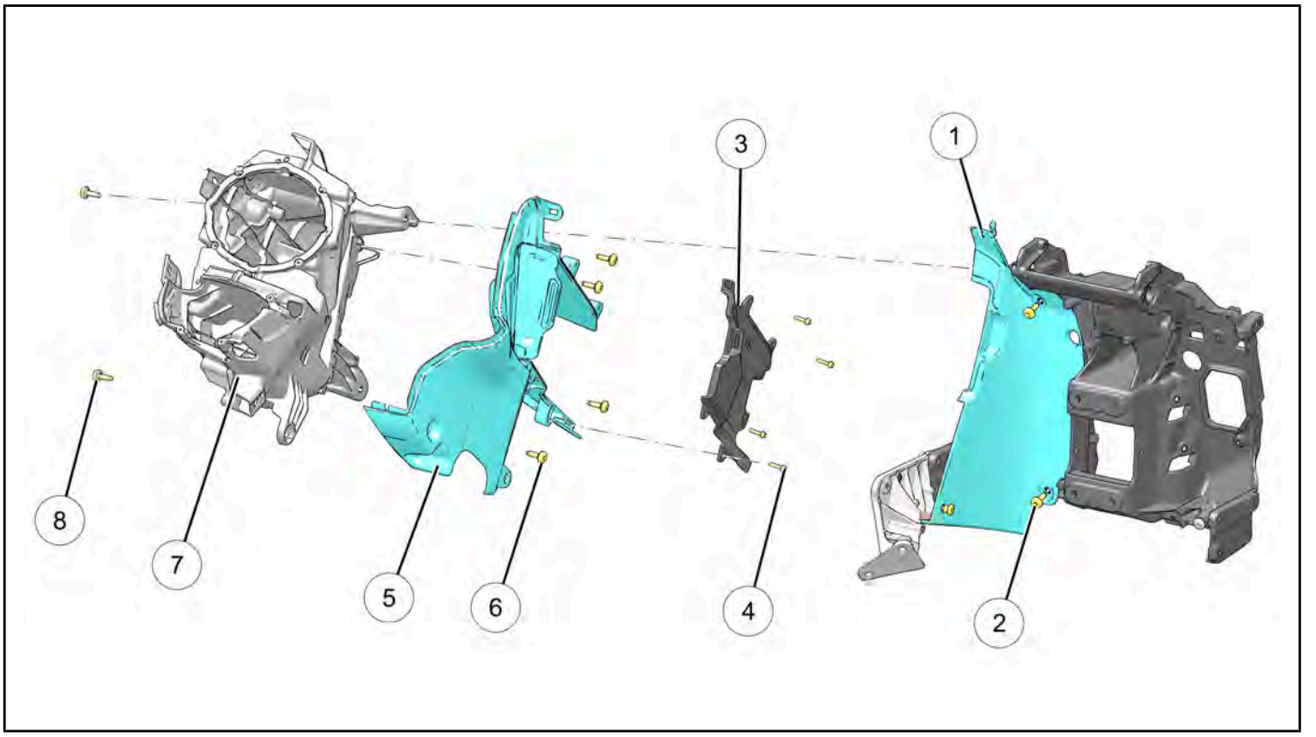




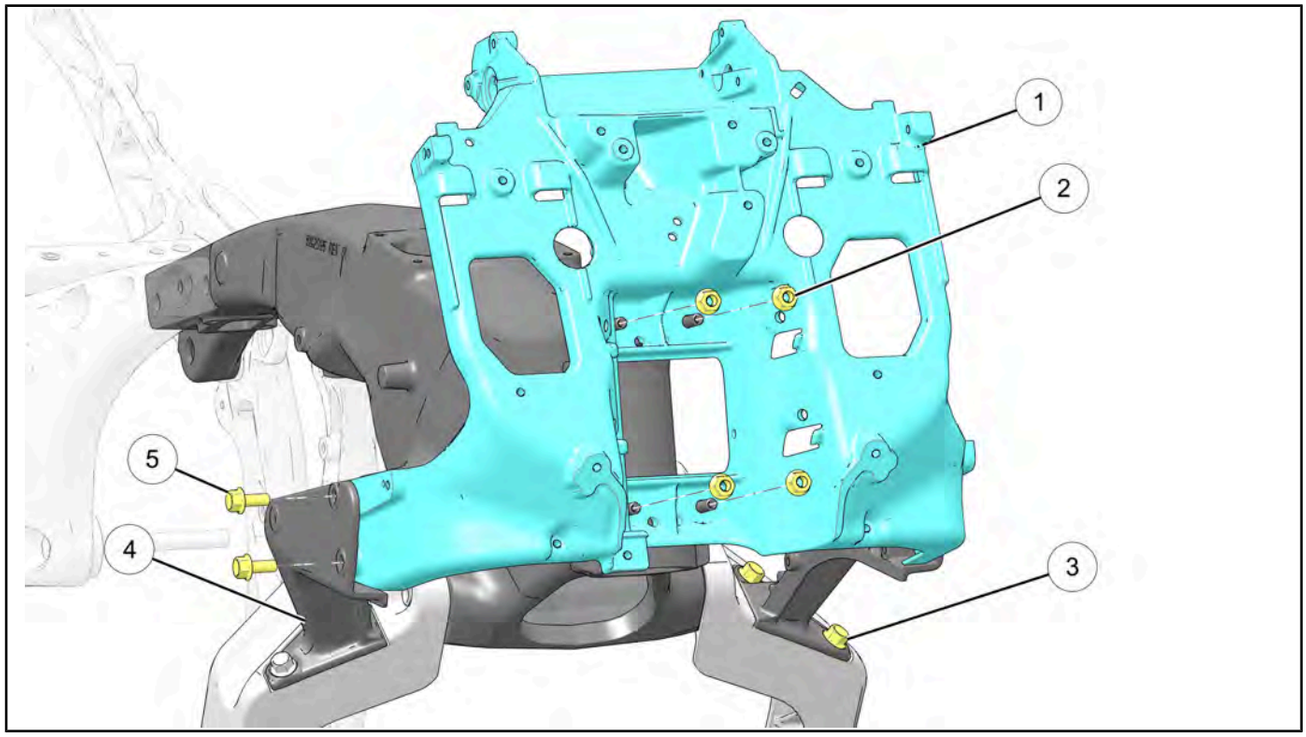
① Hood Gauge	⑤ Dash Support Fastener **35 in-lbs (4 N·m)**
② Visor Top	⑥ Display Bezel
③ Visor Top Fastener **35 in-lbs (4 N·m)**	⑦ Display Bezel Fastener **35 in-lbs (4 N·m)**
④ Dash Support	



① Speaker Grill	⑦ Storage Door Assembly
② Speaker Fastener **25 in-lbs (3 N·m)**	⑧ Storage Door Fastener **35 in-lbs (4 N·m)**
③ Speaker	⑨ Dash Trim
④ Left Hand Dash	⑩ Dash Trim Fastener **35 in-lbs (4 N·m)**
⑤ Left/Right Hand Dash Fastener **35 in-lbs (4 N·m)**	⑪ Air Deflector
⑥ Storage Liner	⑫ Air Deflector Fastener **35 in-lbs (4 N·m)**



① Dash Closeout	⑤ Outer Duct
② Dash Closeout Fastener **35 in-lbs (4 N·m)**	⑥ Outer Duct Fastener **35 in-lbs (4 N·m)**
③ Inner Duct	⑦ Enclosure
④ Inner Duct Fastener **15 in-lbs (2 N·m)**	⑧ Enclosure Fastener **35 in-lbs (4 N·m)**

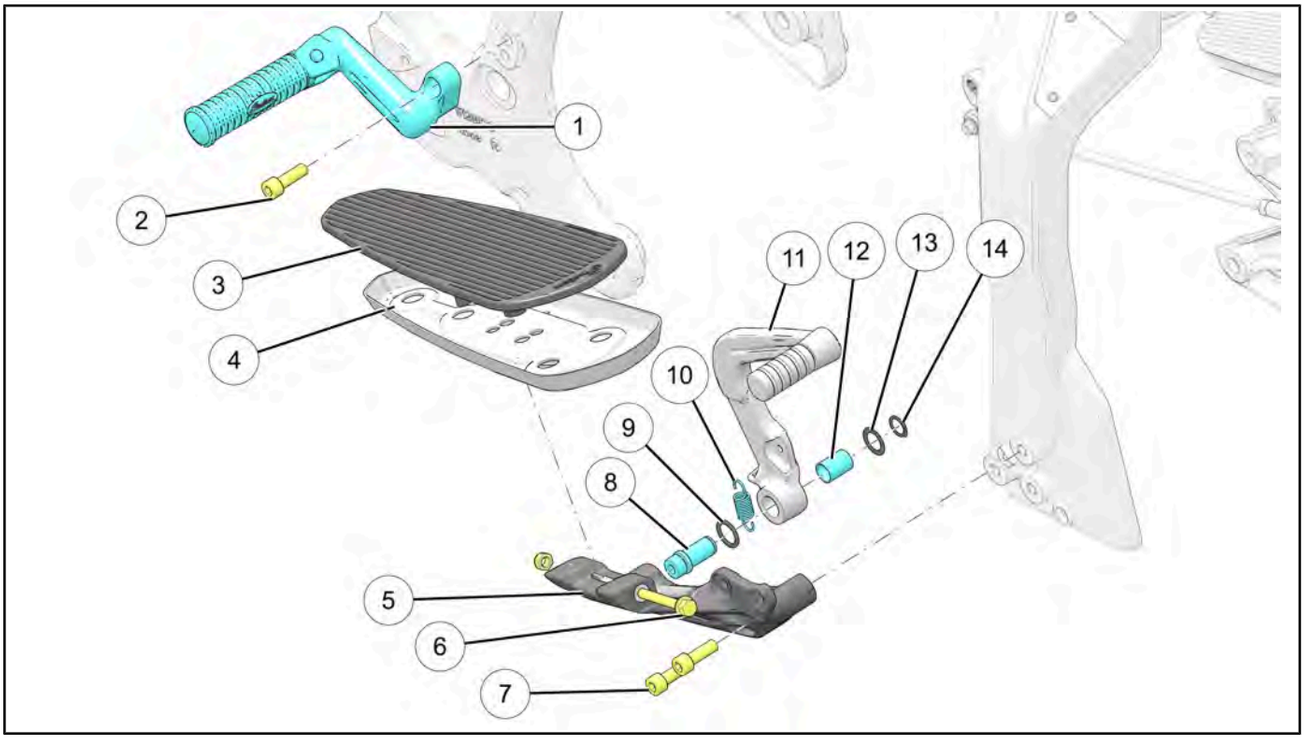


① Fairing Bracket	④ Fairing Support
② Fairing Bracket Nut **18 ft-lbs (24 N·m)**	⑤ Fairing Support to Fairing Bracket Fastener **18 ft-lbs (24 N·m)**
③ Fairing Support to Downcast Fastener **18 ft-lbs (24 N·m)**	

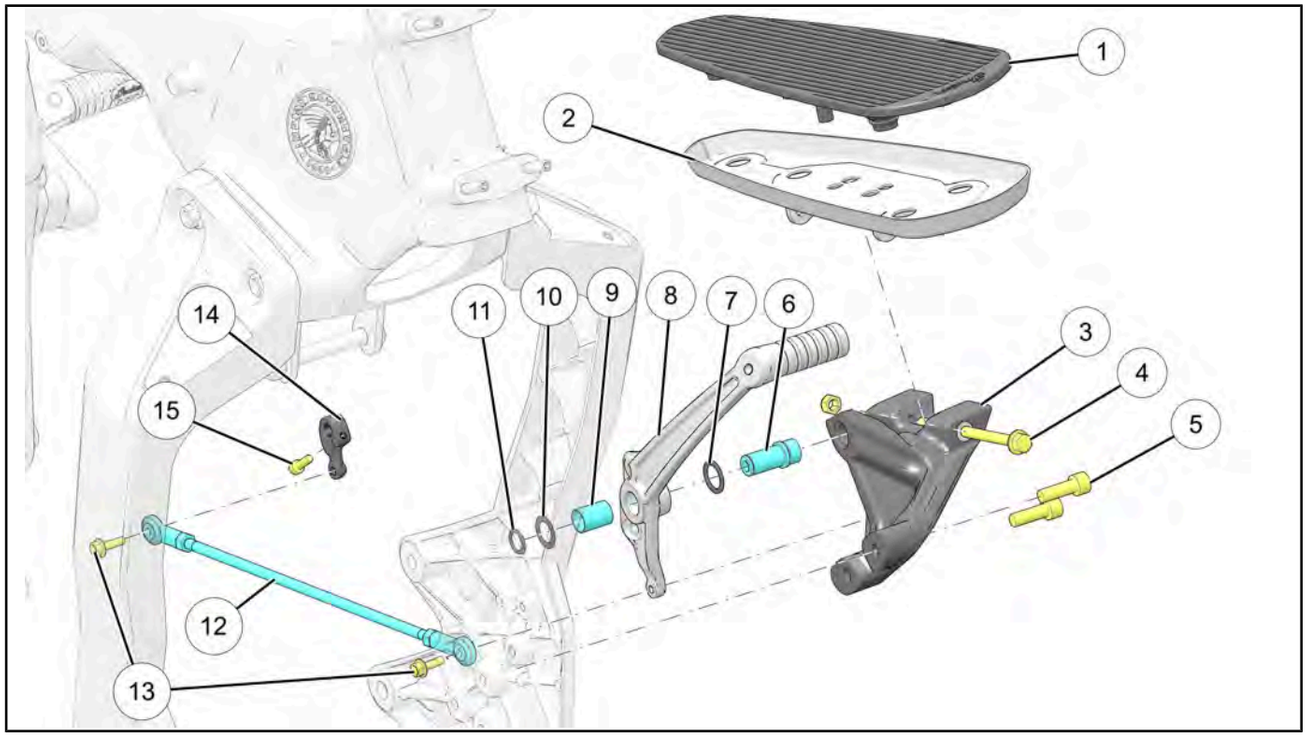
COMMON

FLOORBOARDS ASSEMBLY VIEW

BAGGER

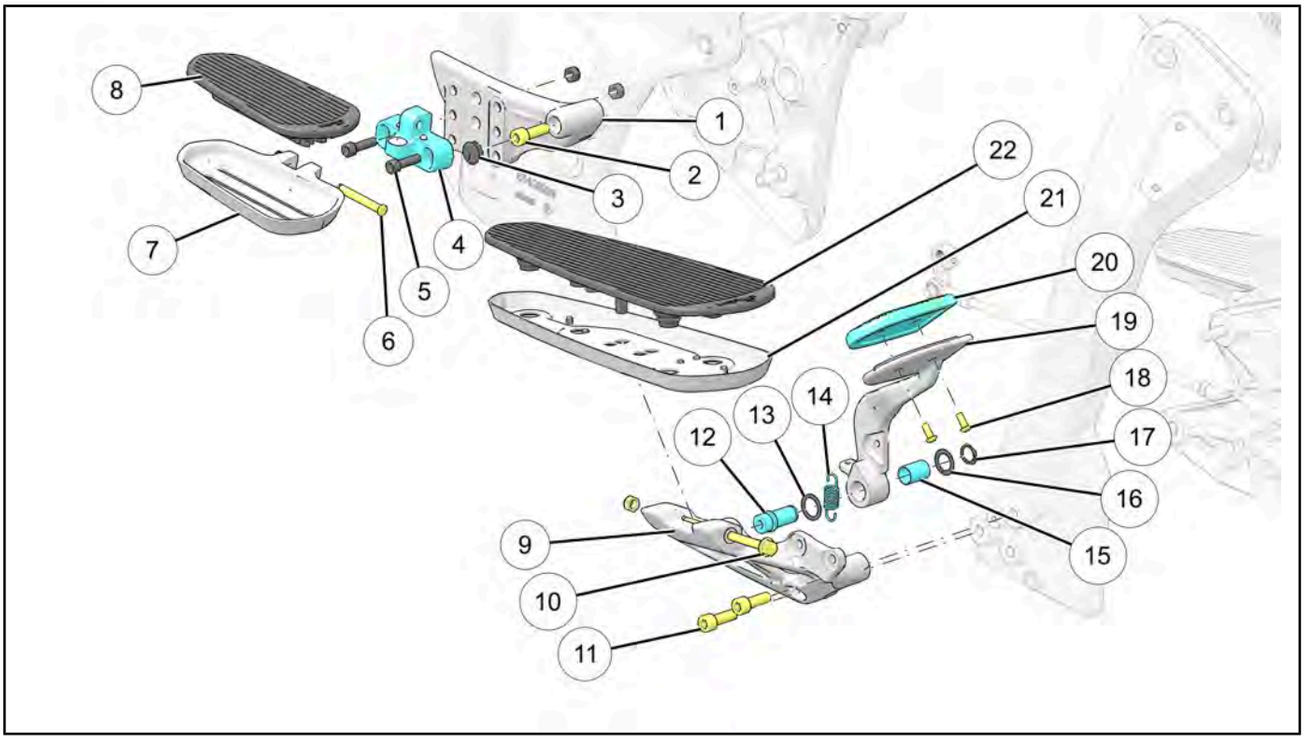


① Footpeg Assembly	⑧ Pivot Shaft **50 ft-lbs (68 N·m)**
② Footpeg Fastener **35 ft-lbs (47 N·m)**	⑨ Washer
③ Floorboard Pad	⑩ Brake Return Spring
④ Floorboard Base	⑪ Brake Pedal
⑤ Floorboard Bracket	⑫ Pivot Shaft Bushing
⑥ Floorboard Base Fastener **18 ft-lbs (24 N·m)**	⑬ Washer
⑦ Floorboard Bracket Fastener **35 ft-lbs (47 N·m)**	⑭ Snap Ring

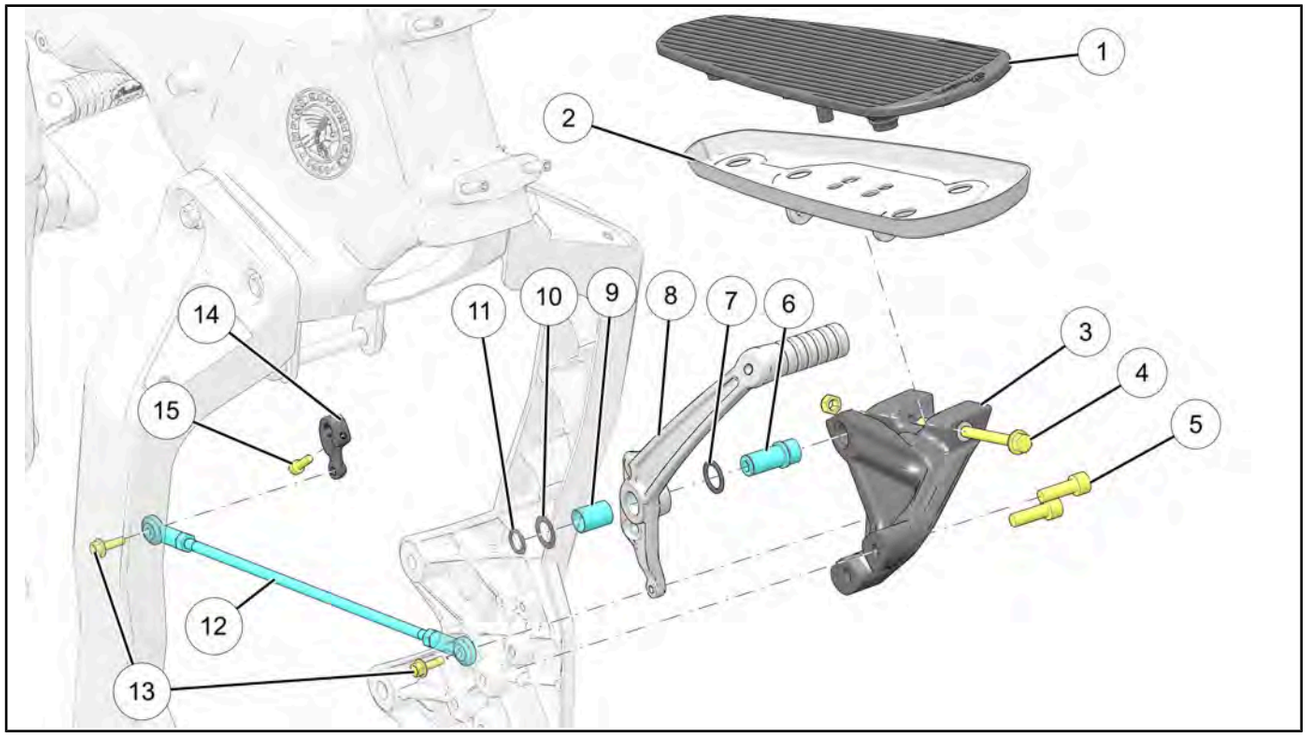


① Floorboard Pad	⑨ Pivot Shaft Bushing
② Floorboard Base	⑩ Washer
③ Floorboard Bracket	⑪ Snap Ring
④ Floorboard Base Fastener **18 ft-lbs (24 N·m)**	⑫ Shift Linkage
⑤ Floorboard Bracket Fastener **35 ft-lbs (47 N·m)**	⑬ Shift Linkage Fastener **88 in-lbs (10 N·m)**
⑥ Pivot Shaft **50 ft-lbs (68 N·m)**	⑭ Shift Lever
⑦ Washer	⑮ Shift Lever Fastener **88 in-lbs (10 N·m)**
⑧ Shift Pedal	

TOURING

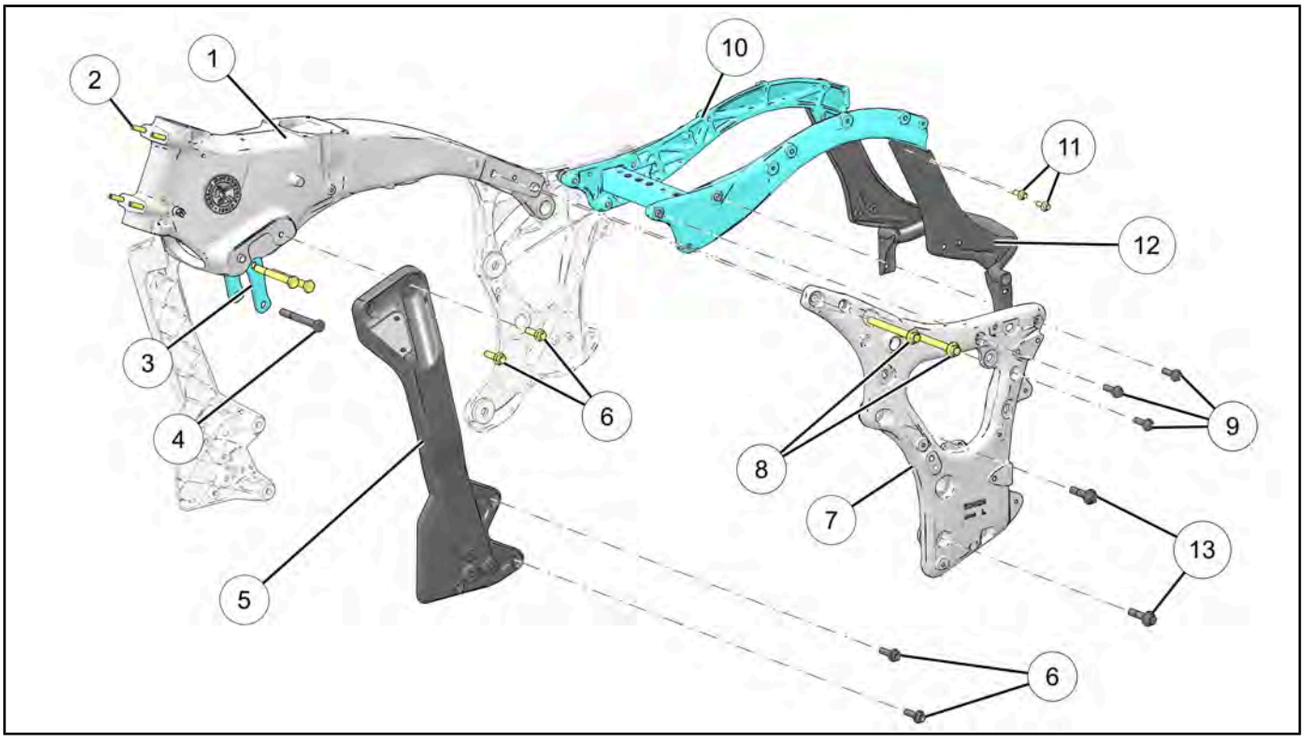


① Passenger Floorboard Mount	⑫ Pivot Shaft **50 ft-lbs (68 N·m)**
② Passenger Floorboard Mount Fastener **33 ft-lbs (45 N·m)**	⑬ Washer
③ Plug	⑭ Brake Return Spring
④ Floorboard Pivot	⑮ Pivot Shaft Bushing
⑤ Passenger Floorboard Pivot Fastener **19 ft-lbs (25 N·m)**	⑯ Washer
⑥ Pivot Pin	⑰ Snap Ring
⑦ Passenger Flooorboard Base	⑱ Brake Pedal Pad Fastener **88 in-lbs (10 N·m)**
⑧ Passenger Floorboard Pad	⑲ Brake Pedal
⑨ Floorboard Bracket	⑳ Brake Pedal Pad
⑩ Floorboard Base Fastener **18 ft-lbs (24 N·m)**	㉑ Floorboard Base
⑪ Floorboard Bracket Fastener **35 ft-lbs (47 N·m)**	㉒ Floorboard Pad

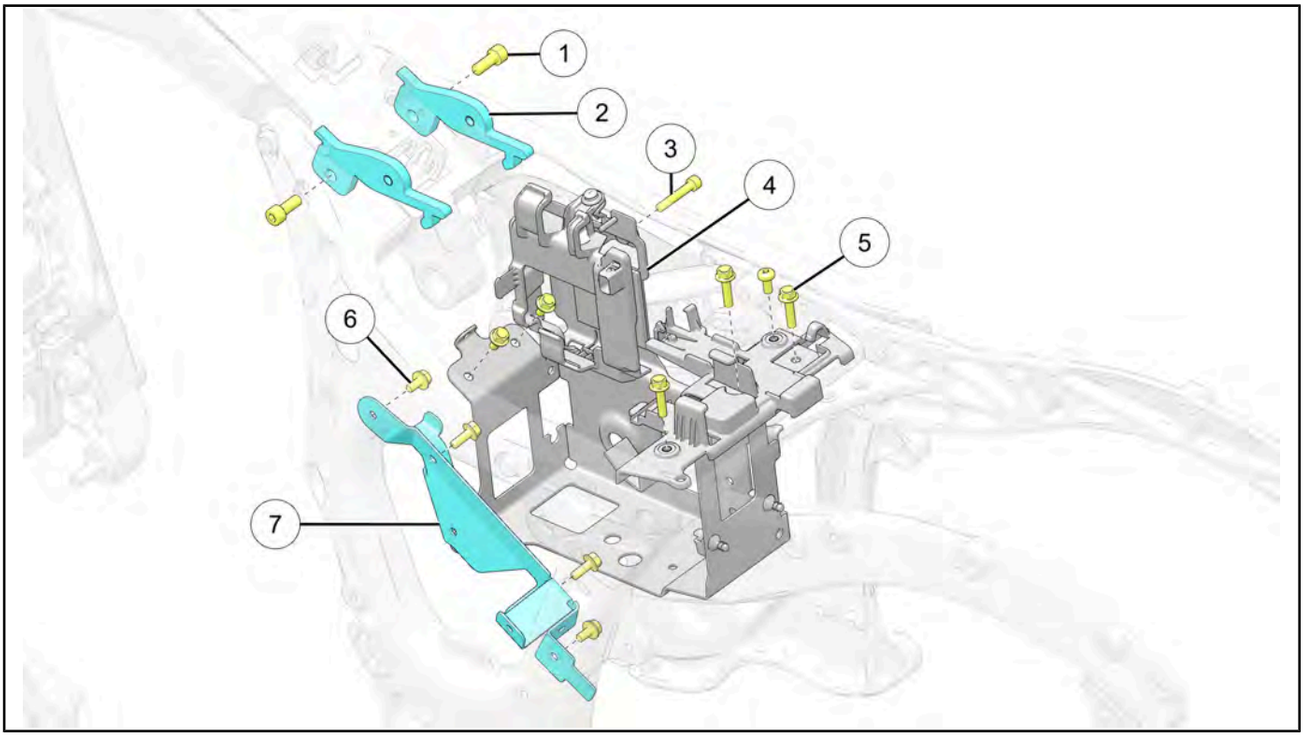


① Floorboard Pad	⑨ Pivot Shaft Bushing
② Floorboard Base	⑩ Washer
③ Floorboard Bracket	⑪ Snap Ring
④ Floorboard Base Fastener **18 ft-lbs (24 N·m)**	⑫ Shift Linkage
⑤ Floorboard Bracket Fastener **35 ft-lbs (47 N·m)**	⑬ Shift Linkage Fastener **88 in-lbs (10 N·m)**
⑥ Pivot Shaft **50 ft-lbs (68 N·m)**	⑭ Shift Lever
⑦ Washer	⑮ Shift Lever Fastener **88 in-lbs (10 N·m)**
⑧ Shift Pedal	

FRAME ASSEMBLY VIEW



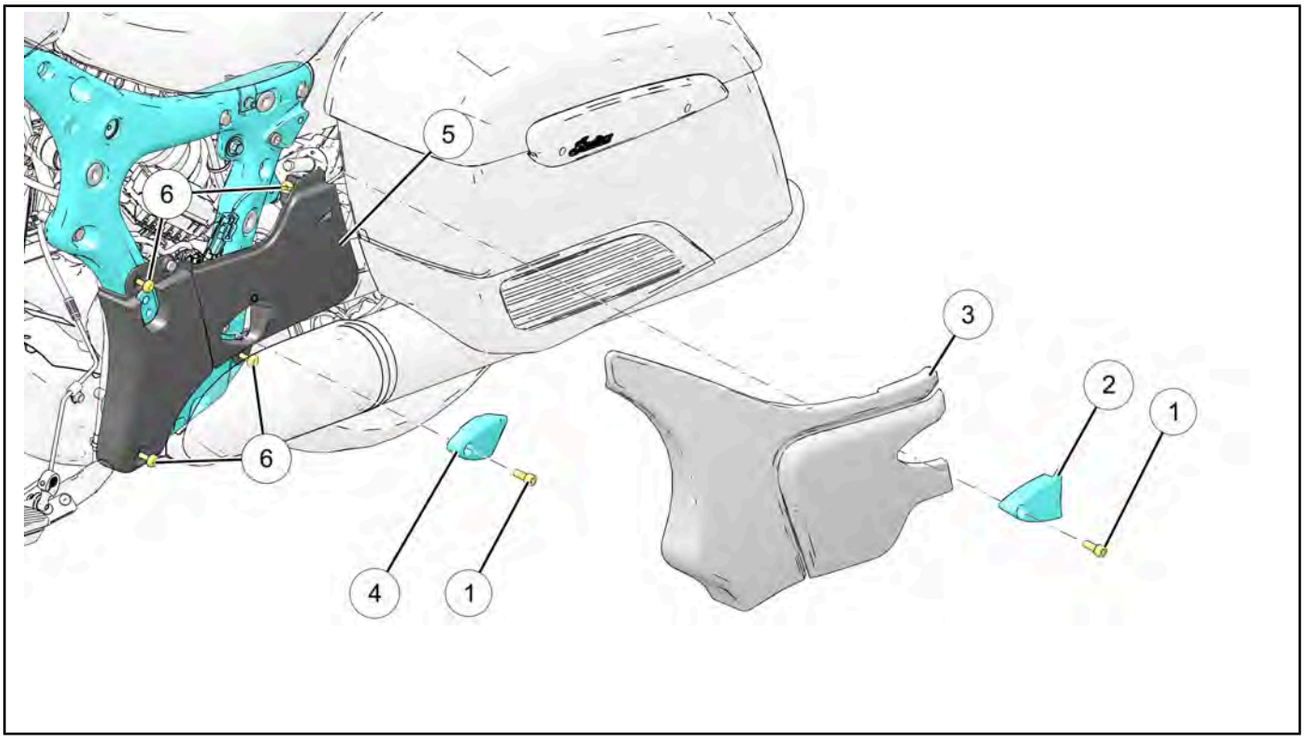
① FMainframe Front	⑧ Midcast M12 Fastener **75 ft-lbs (102 N·m)**
② Neck Stud	⑨ Midcast M10 Fastener **35 ft-lbs (47 N·m)**
③ Cylinder Head Bracket	⑩ Rear Subframe
④ Cylinder Head Bracket Fastener **75 ft-lbs (102 N·m)**	⑪ Rear Lower Subframe Fastener **18 ft-lbs (24 N·m)**
⑤ Front Downcast	⑫ Rear Lower Subframe
⑥ Front Downcast Fastener **45 ft-lbs (61 N·m)**	⑬ Midcast M12 Fastener **75 ft-lbs (102 N·m)**
⑦ Midcast	



① Fuel Tank Mount Bracket Fastener **18 ft-lbs (24 N·m)**	⑤ ABS Mount Bracket Fastener (Hex) **88 in-lbs (10 N·m)**
② Fuel Tank Mount Bracket	⑥ Fuse Block Mount Bracket Fastener **88 in-lbs (10 N·m)**
③ ABS Mount Bracket Fastener (Allen) **88 in-lbs (10 N·m)**	⑦ Fuse Block Mount Bracket
④ ABS Mount Bracket	

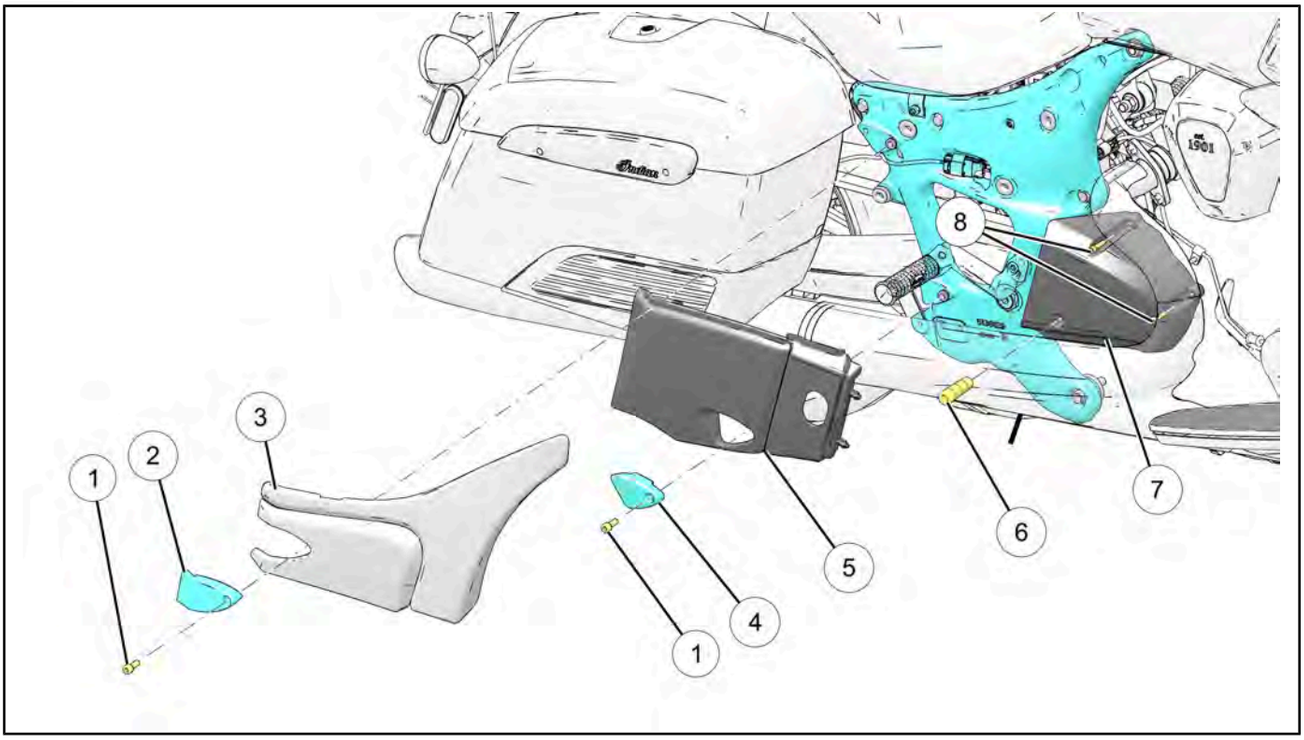
SIDE PANELS ASSEMBLY VIEW

LEFT



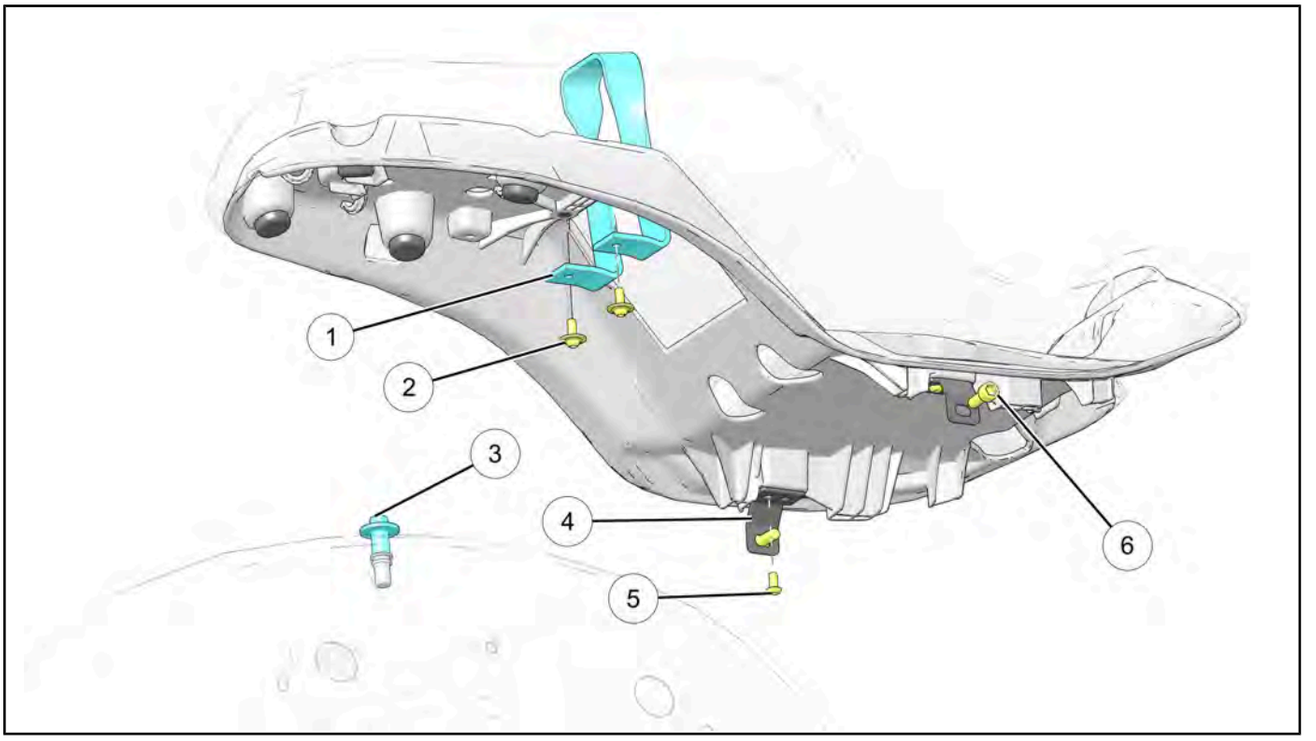
① Tipover Cover Fastener **18 ft-lbs (24 N·m)**	④ Tipover Cover, Lower (Left)
② Tipover Cover, Upper (Left)	⑤ Side Cover, Lower (Left)
③ Side Cover, Upper (Left)	⑥ Lower Side Cover Accent Fastener **88 in-lbs (10 N·m)**

RIGHT



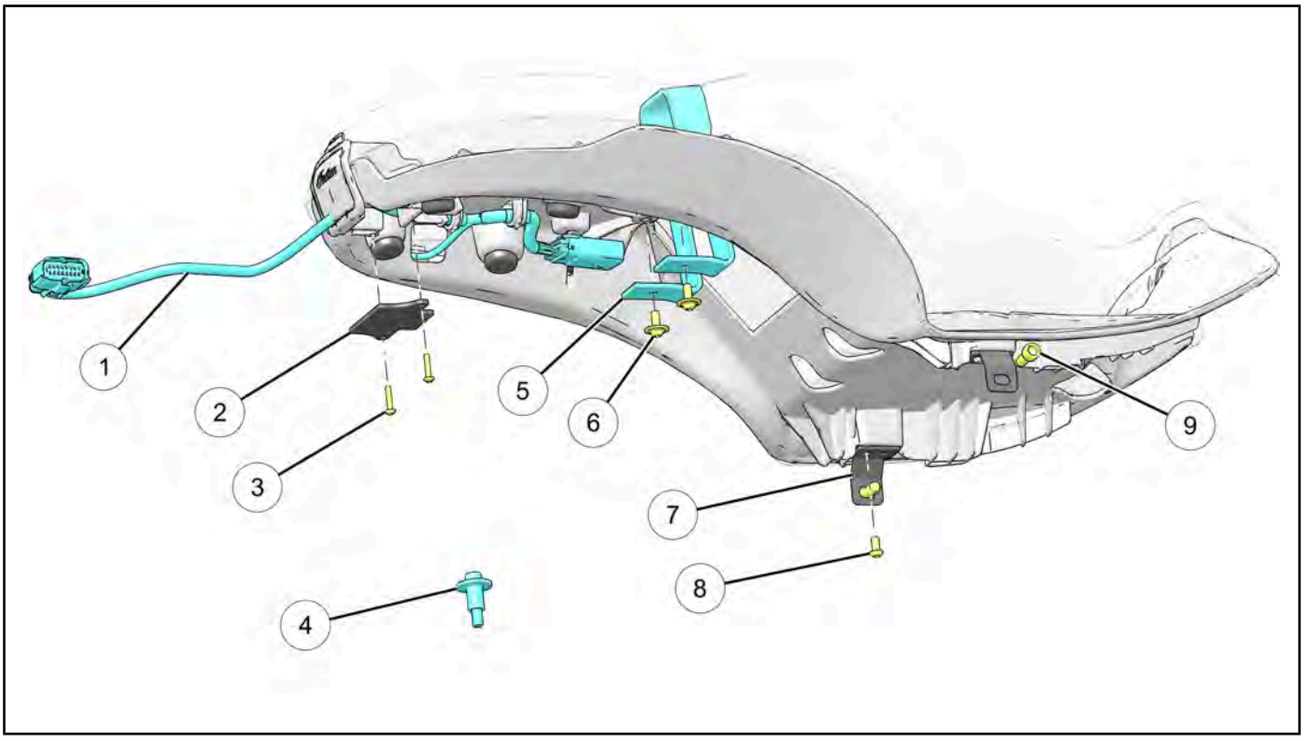
① Tipover Cover Fastener **18 ft-lbs (24 N·m)**	⑤ Side Cover, Lower (Right)
② Tipover Cover, Upper (Right)	⑥ Sprocket Cover Plug
③ Side Cover, Upper (Right)	⑦ Sprocket Cover
④ Tipover Cover, Lower (Right)	⑧ Sprocket Cover Fastener **88 in-lbs (10 N·m)**

SEAT ASSEMBLY VIEW



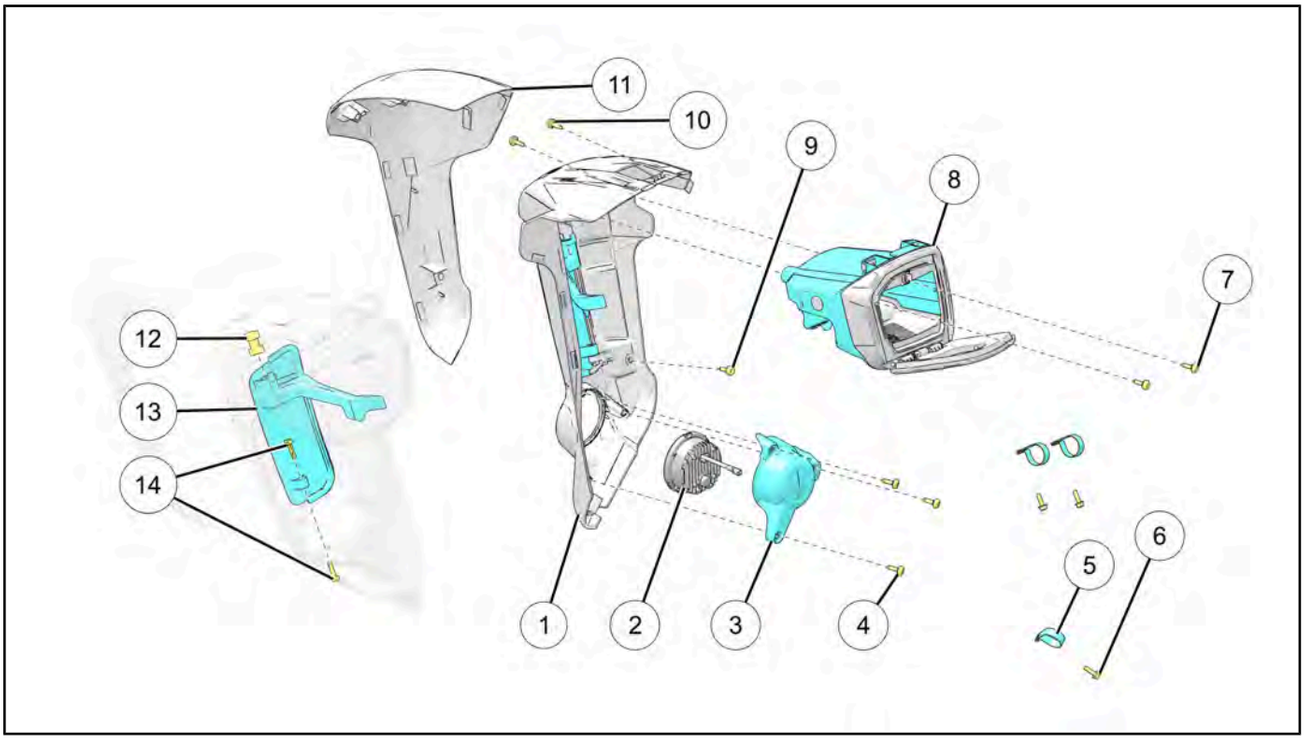
① Grabstrap	④ Seat Bracket
② Grabstrap Fastener **35 in-lbs (4 N·m)**	⑤ Seat Bracket Fastener **52 in-lbs (6 N·m)**
③ Seat Pan Fastener **88 in-lbs (10 N·m)**	⑥ Seat Fastener **18 ft-lbs (24 N·m)**

HEATED SEAT



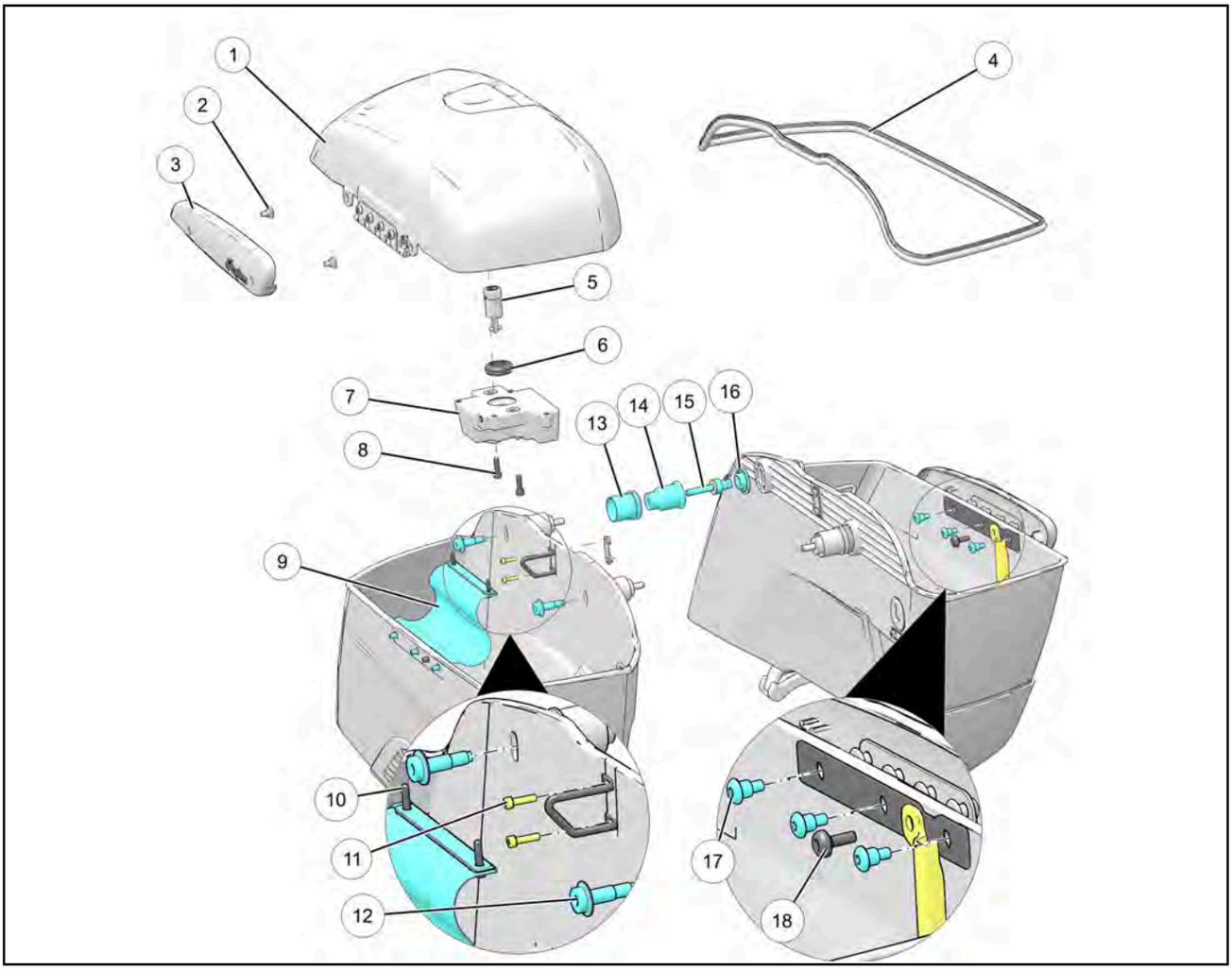
① Seat / Trunk Harness	⑥ Grabstrap Fastener **35 in-lbs (4 N·m)**
② Seat / Trunk Harness Cover	⑦ Seat Bracket Fastener **52 in-lbs (6 N·m)**
③ Seat / Trunk Harness Cover Fastener **35 in-lbs (4 N·m)**	⑧ Seat Fastener **18 ft-lbs (24 N·m)**
④ Seat Pan Fastener **88 in-lbs (10 N·m)**	⑨ Seat Fastener **18 ft-lbs (24 N·m)**
⑤ Grabstrap	

LOWER FAIRING ASSEMBLY VIEW



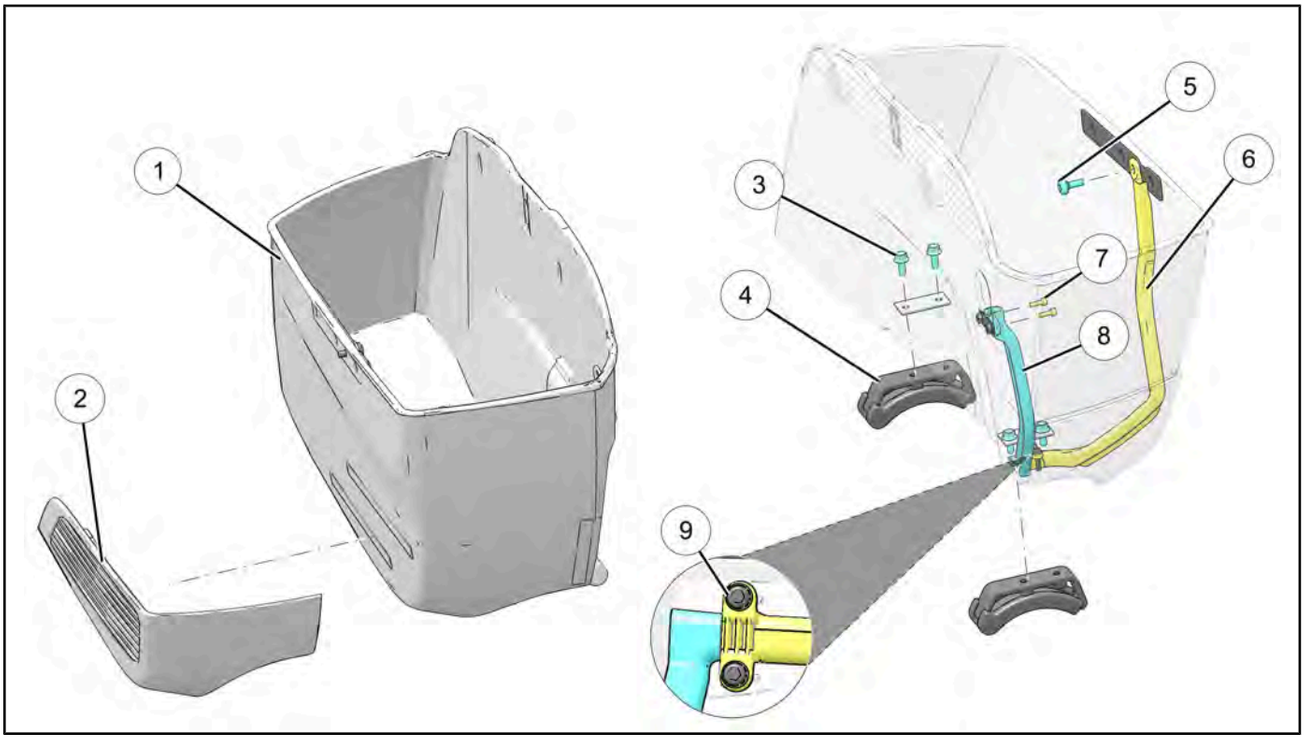
① Inner Lower Fairing	⑧ Lower Fairing Storage Compartment
② Fog Light	⑨ Lower Fairing Fastener **35 in-lbs (4 N·m)**
③ Fog Light Bracket	⑩ Lower Fairing Cubby Fastener **35 in-lbs (4 N·m)**
④ Fog Light Bracket Fastener **35 in-lbs (4 N·m)**	⑪ Outer Lower Fairing
⑤ Highway Bar Clamp	⑫ Lower Fairing Vent Hinge
⑥ Highway Bar Clamp Fastener **35 in-lbs (4 N·m)**	⑬ Lower Fairing Vent
⑦ Lower Fairing Storage Compartment Fastener **35 in-lbs (4 N·m)**	⑭ Lower Fairing Vent Pin

SADDLEBAGS ASSEMBLY VIEW



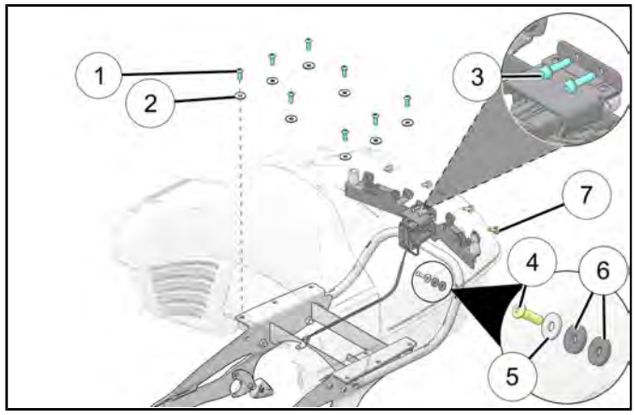
① Saddlebag Lid	⑩ Limiter Fastener **15 in-lbs (2 N·m)**
② Hinge Cover Fastener **35 in-lbs (4 N·m)**	⑪ Latch Hoop Fastener **35 in-lbs (4 N·m)**
③ Hinge Cover	⑫ Saddlebag Fastener **18 ft-lbs (24 N·m)**
④ Saddlebag Seal	⑬ Trunk Spool
⑤ Lock	⑭ Saddlebag Spool
⑥ Lock Seal	⑮ Saddlebag Spool Fastener **32 ft-lbs (43 N·m)**
⑦ Electronic Saddlebag Lock	⑯ Bushing

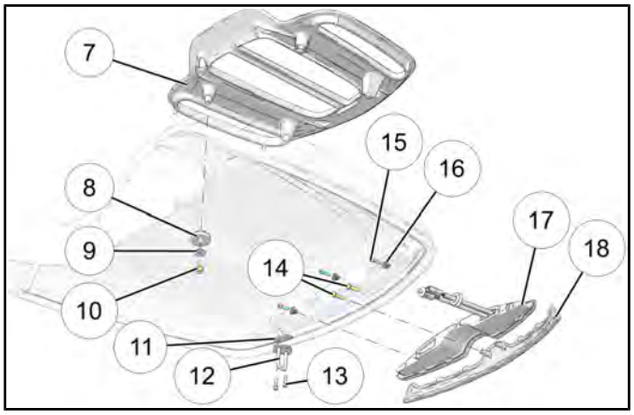
⑧ Saddlebag Lock Fastener **62 in-lbs (7 N·m)**	⑰ Leaf Hinge Fastener **35 in-lbs (4 N·m)**
⑨ Limiter	⑱ Wire Guide Fastener (Upper) **88 in-lbs (10 N·m)**

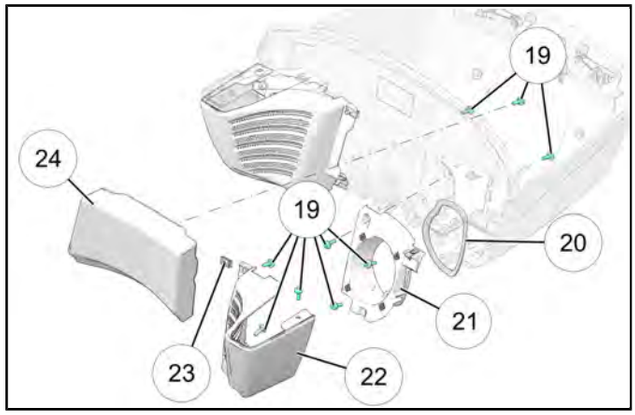


① Saddlebag Bin	⑥ Wire Guide
② Saddlebag Bin Trim	⑦ Wire Cover Fastener **15 in-lbs (2 N·m)**
③ Saddlebag Mount Fastener **88 in-lbs (10 N·m)**	⑧ Wire Cover
④ Saddlebag Mount	⑨ Wire Guide Fastener (Lower) **15 in-lbs (2 N·m)**
⑤ Wire Guide Fastener (Upper) **88 in-lbs (10 N·m)**	

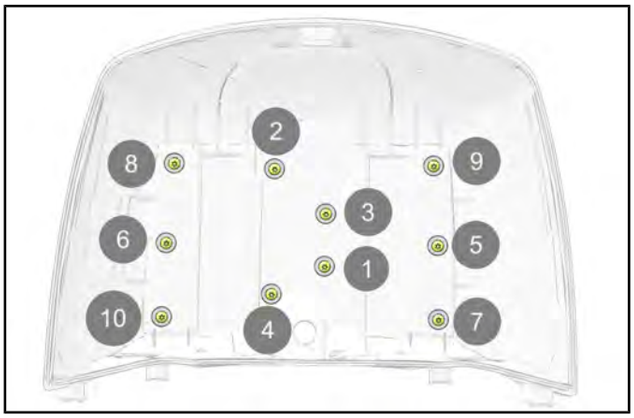
TRUNK ASSEMBLY VIEW

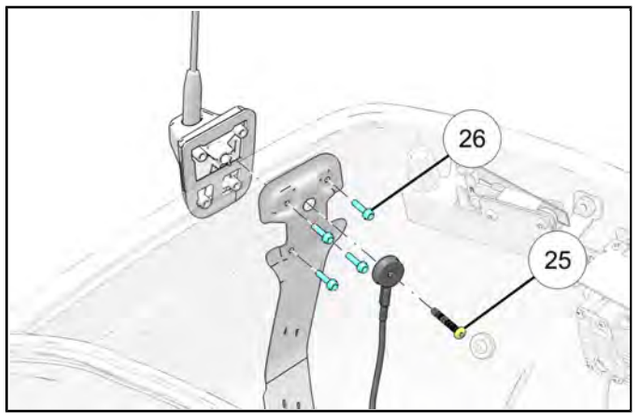






TORQUE SEQUENCE





① Trunk to Frame Arm Fastener **12 in-lbs (1 N·m)**	⑭ Fastener, Bezel **12 in-lbs (1 N·m)**
② Washer	⑮ Trunk Taillight Fastener **12 in-lbs (1 N·m)**
③ Trunk Lock Fastener **12 in-lbs (1 N·m)**	⑯ Bushing
④ Trunk to Frame Arm Fastener **12 in-lbs (1 N·m)**	⑰ Taillight asm.
⑤ Washer	⑱ Bezel, Taillight
⑥ Washer	⑲ Speaker Cover / Backrest Fastener **35 in-lbs (4 N·m)**
⑦ Luggage Rack	⑳ Seal
⑧ Grommet	㉑ Speaker Housing
⑨ Washer	㉒ Speaker Cover
⑩ Luggage Rack Fastener **88 in-lbs (10 N·m)**	㉓ Clip
⑪ Plate	㉔ Backrest
⑫ Latch, Hoop	㉕ Antenna Harness Fastener **27 in-lbs (3 N·m)**
⑬ Latch, Hoop **35 in-lbs (4 N·m)**	㉖ Antenna Mount Fastener **27 in-lbs (3 N·m)**

BODY / FRAME SERVICE

FORK MOUNTED FAIRING

FAIRING DISASSEMBLY AND REMOVAL (FORK MOUNTED)

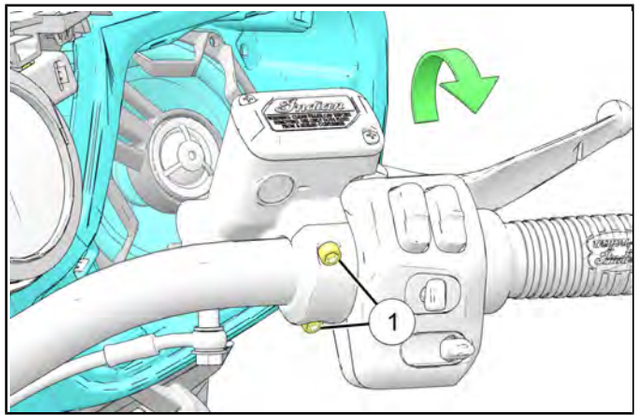
NOTICE
Removal of the fairing requires some disassembly. Steps that are disassembly only will be identified with a note box.

NOTICE
These sections are separated for ease of use.

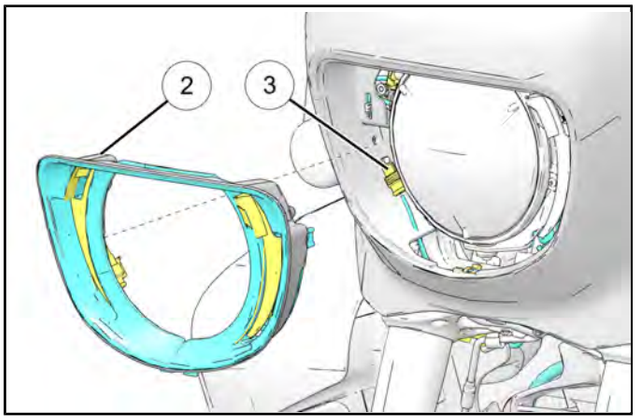
NOTICE
Place the power windshield in the FULL UP position prior to fairing removal.

OUTER FAIRING REMOVAL

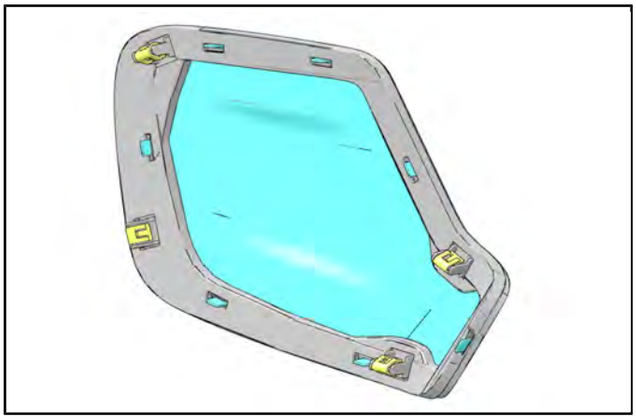
1. Loosen perch clamp fasteners①, and rotate brake and clutch to provide clearance for speaker removal.

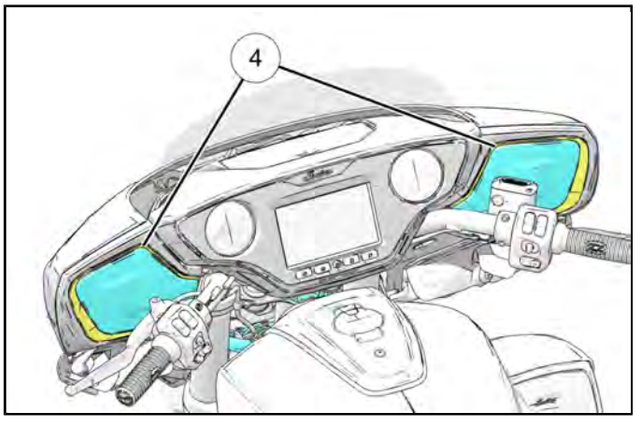


2. Remove headlight bezel ② with a plastic pry bar tool by prying down at the top center to release the snap and then pull forward to release the side body clips and disconnect both position light connectors ③.



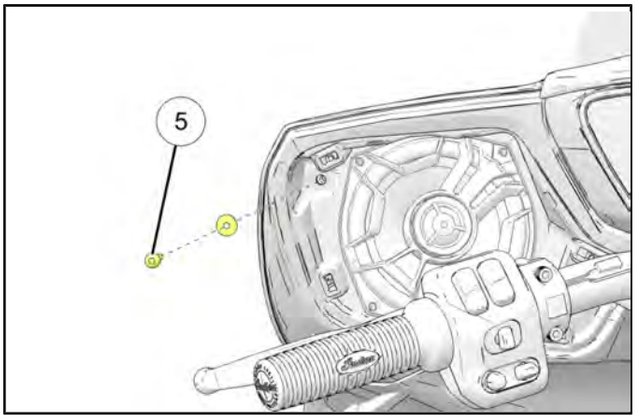
3. Carefully pry off speaker bezels ④ with a plastic pry bar tool. Make note of the speaker bezel clip location when installing the piece from the fairing.



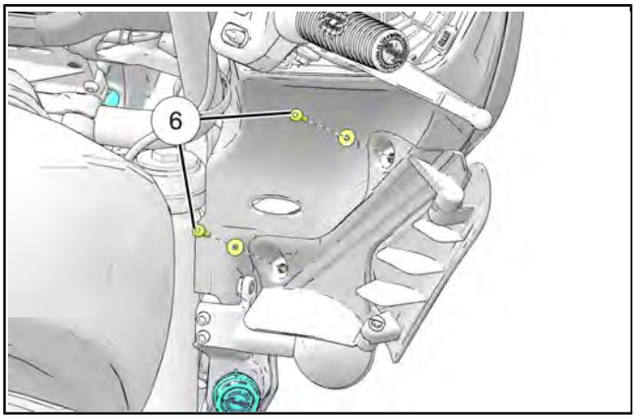


7

4. Remove outer fairing fasteners ⑤.



5. Remove wind deflector fasteners ⑥ and washers.

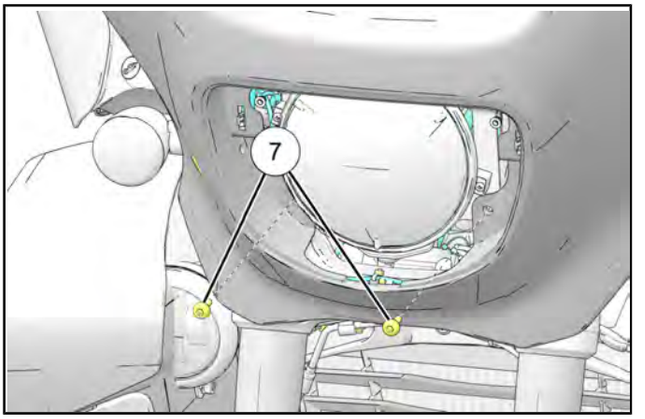


6. Remove wind deflectors.

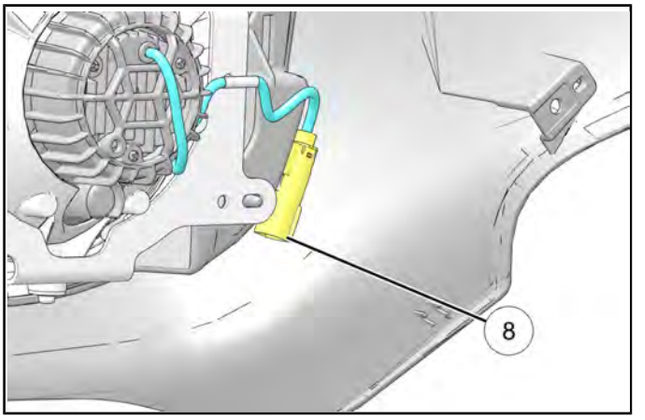
NOTICE
Wind deflectors are only present in touring models.

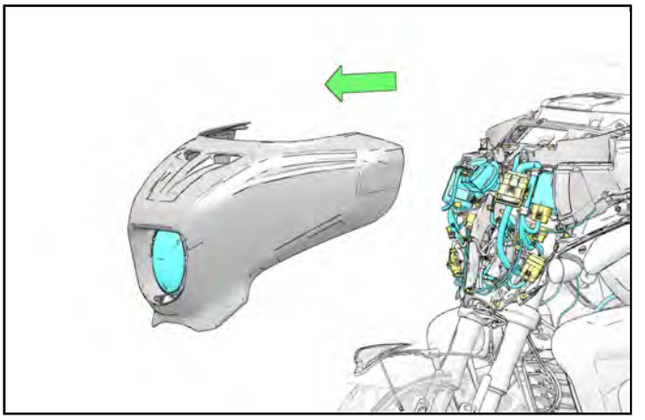
7. Remove outer fairing fasteners ⑦.

NOTICE
There are two darts on rubber grommets that must the outer fairing must disconnect from before the outer fairing can be removed.

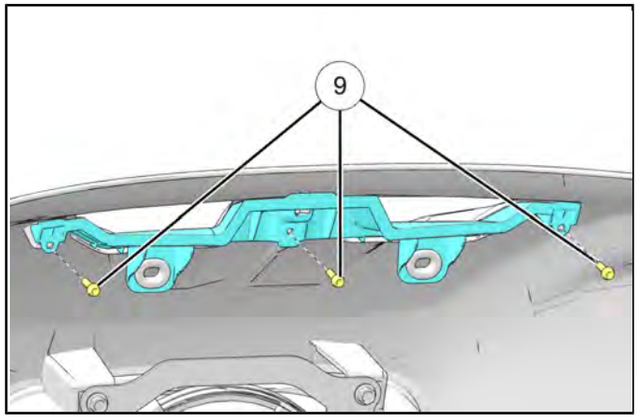


8. Carefully move the outer fairing forward and disconnect the headlight electrical connection ⑧.





9. Remove upper duct fasteners ⑨.

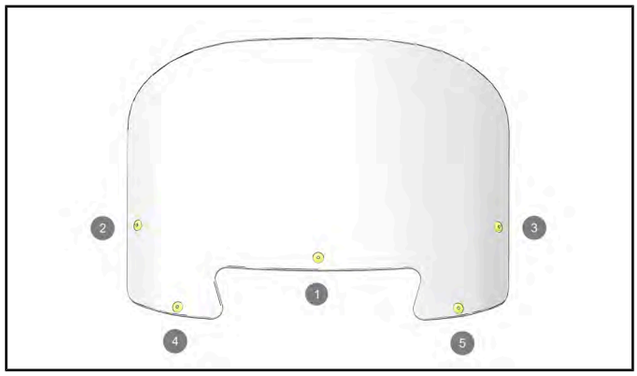


NOTICE
This step is only required for disassembly.

10. Remove upper duct.

VISOR

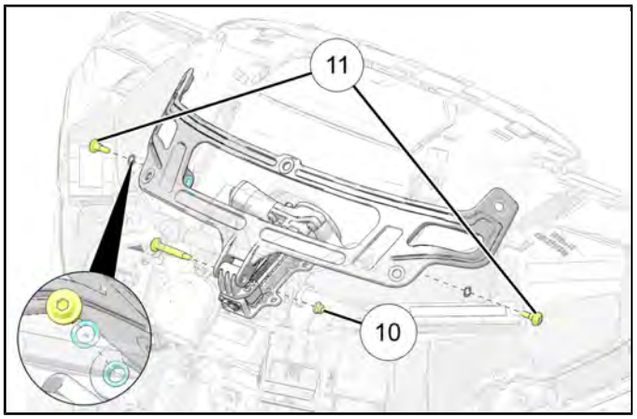
1. Remove windshield fasteners and remove windshield.



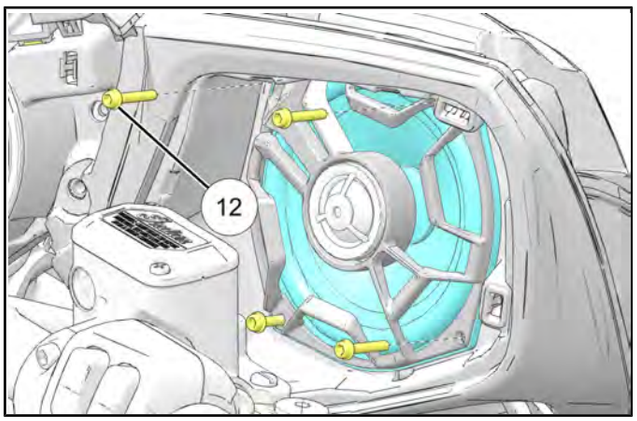
2. Remove windshield link support fastener ⑩.

3. Remove windscreen motor fastener ⑪ and save the wave washers.

IMPORTANT
Do not discard wave washers. Failure to reinstall wave washers will cause significant windshield rattle while operating the motorcycle.

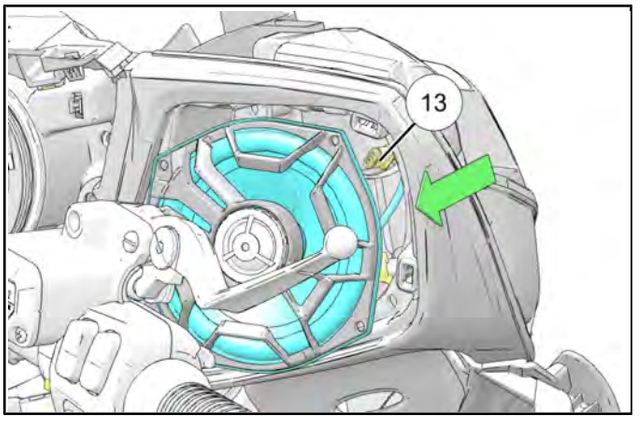


4. Remove speaker fasteners ⑫ on both sides.

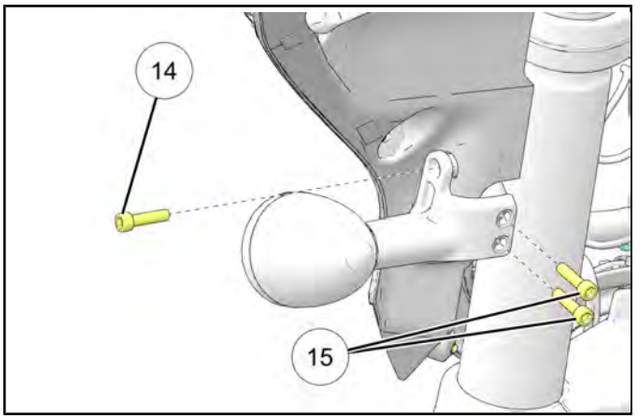


7

5. Carefully pull speaker lose from the fairing just enough to access and disconnect the speaker electrical connector ⑬, then remove the speaker on both sides.

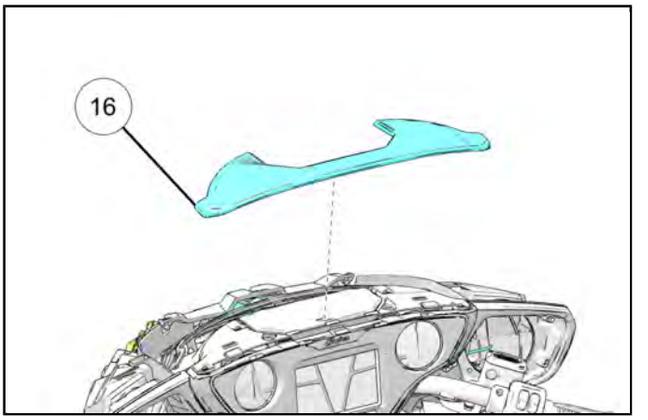


6. Remove turn signal support fastener ⑭ and turn signal to fairing bracket fasteners ⑮ on both both sides.

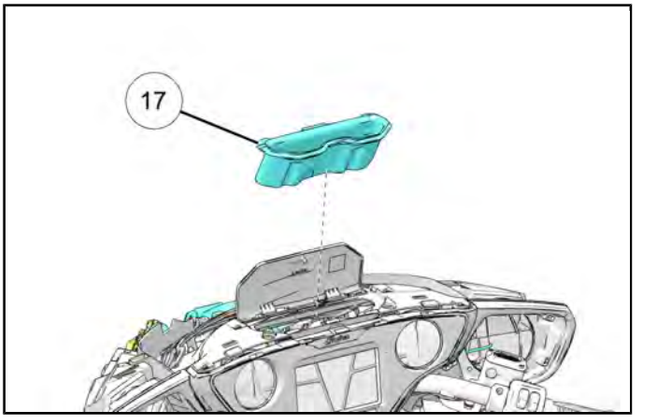


7. Carefully remove the visor top cover ⑯ by using a plastic pry bar on either side to release the retention clips. Work the pry bar to the front retention clips, then remove the part from the snap fit and dual lock pieces.

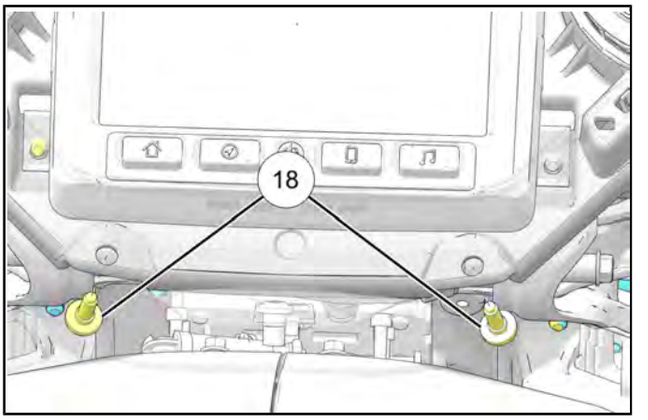
IMPORTANT
Do not remove the rear edge first. Doing so will cause the snap fit pieces to break.



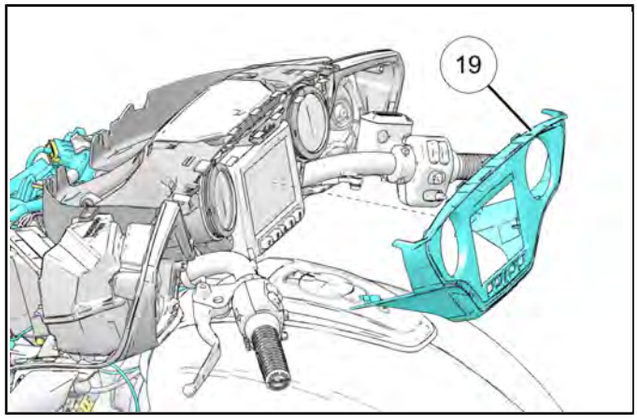
8. Remove storage liner ⑰.



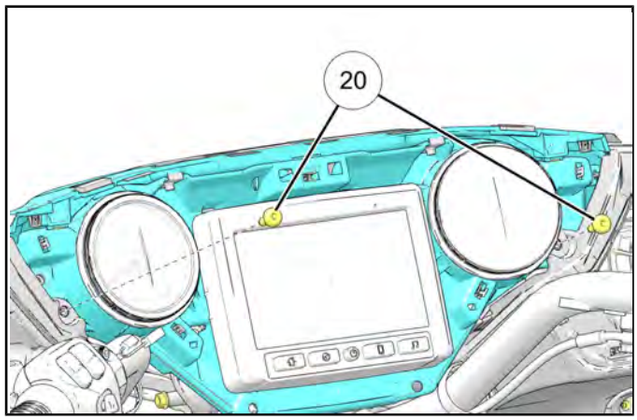
9. Remove dash support to display fasteners ⑱.



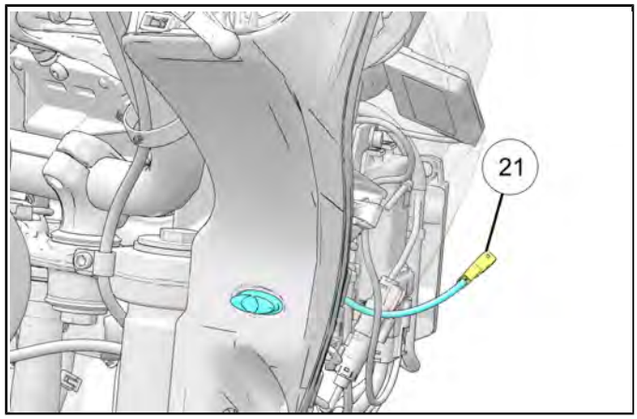
10. Carefully remove front dash fairing ⑲ from retention clips.



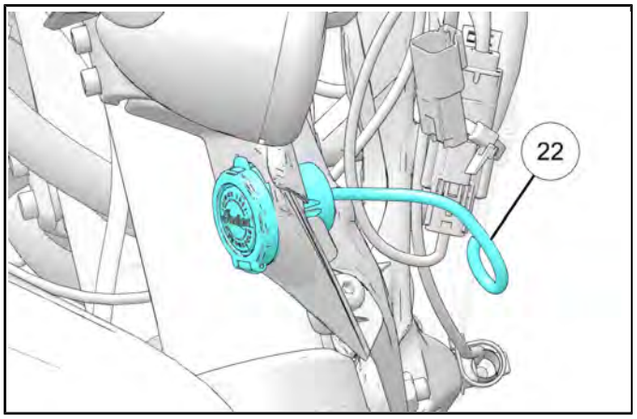
11. Remove side fairing fasteners ⑳.



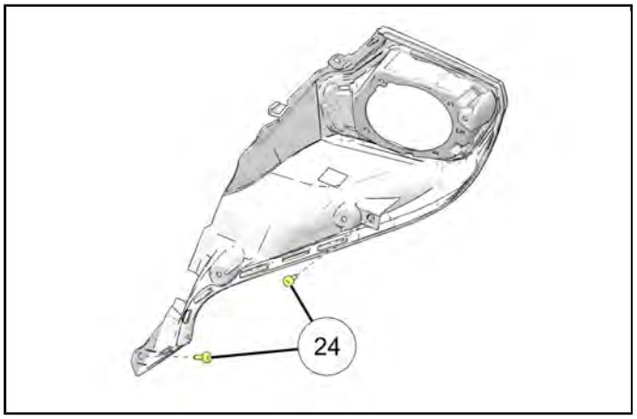
12. Disconnect fuel door button ㉑.



13. Disconnect charge port electrical connector ㉒.

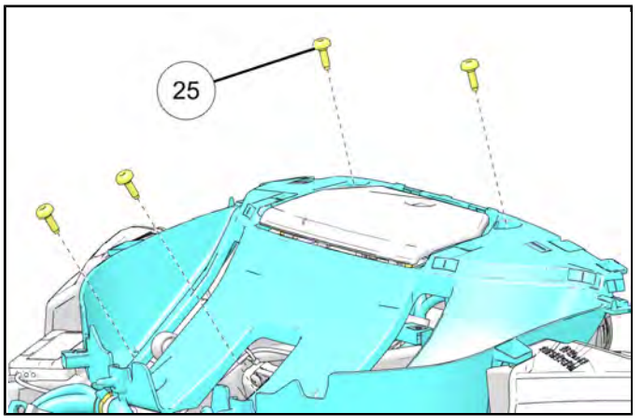


14. Remove outer fairing fasteners ㉔ on both sides.



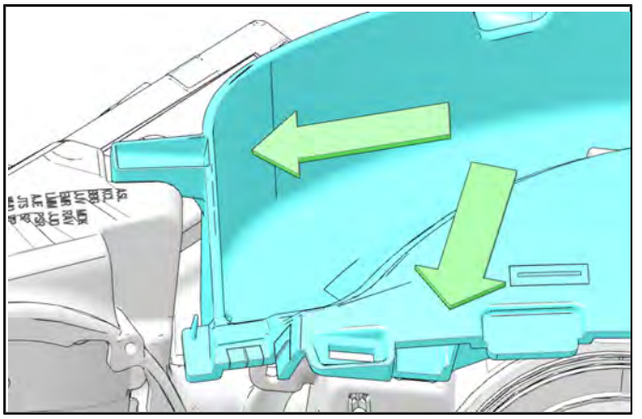
15. Remove right hand and left hand dashes.

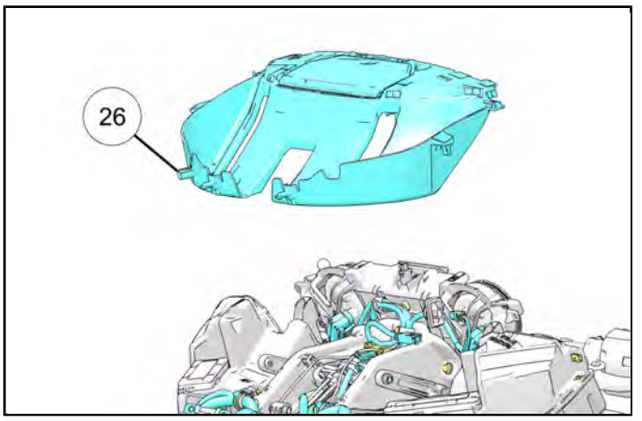
16. Remove visor top fasteners ㉕.



7

17. Carefully remove visor top ㉖ by prying at the connection points on each side.

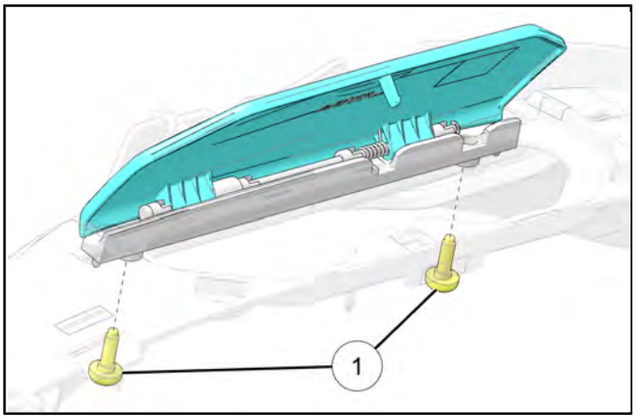




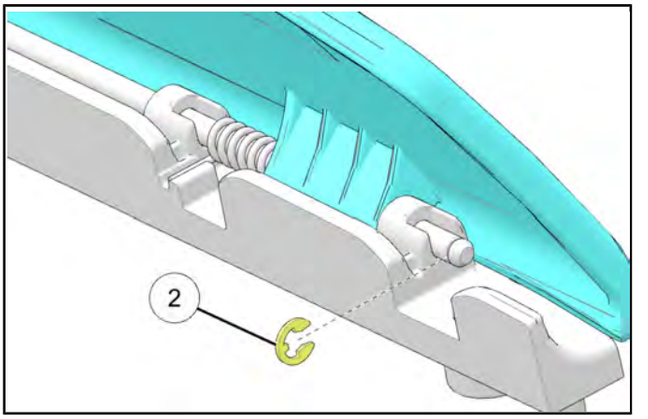
STORAGE DOOR

NOTICE
This section is only required for disassembly.

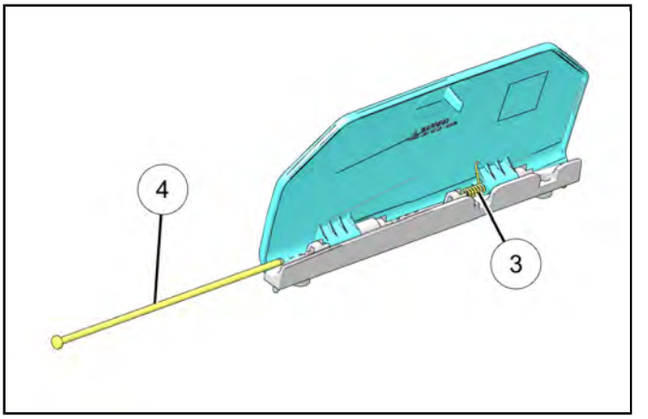
1. Remove hinge block to visor top fasteners ①.



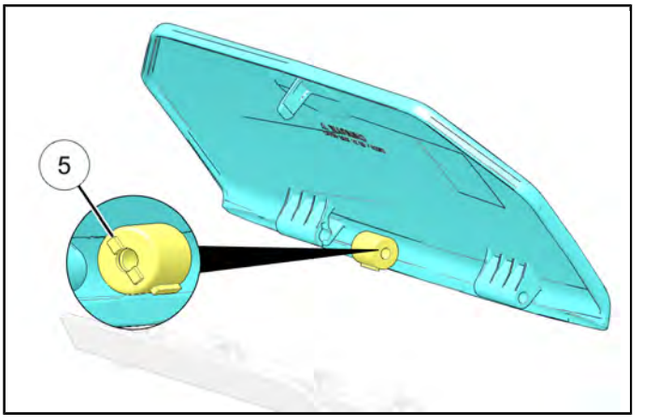
2. Remove eclip ② from storage door pin.



3. Hold door spring ③ in place while removing storage door pin ④.

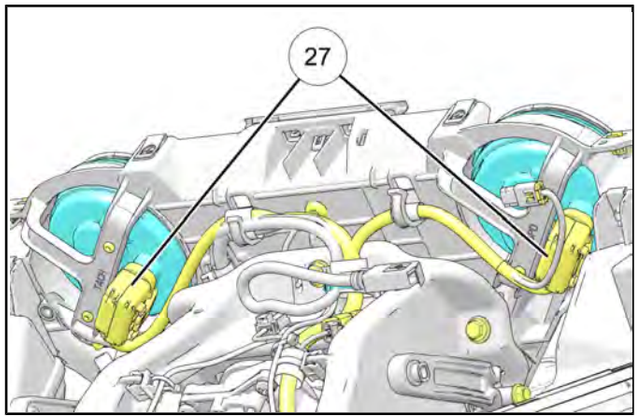


4. Remove storage door damper ⑤.

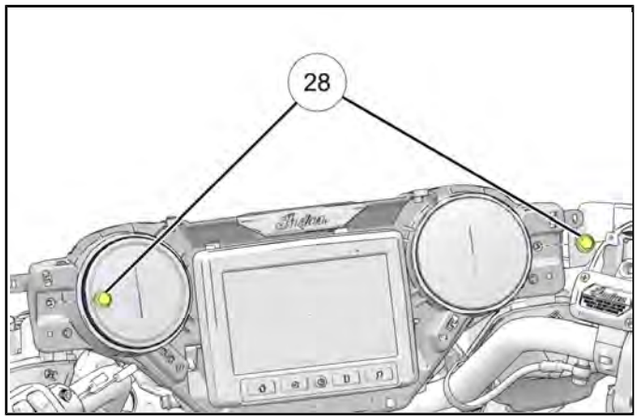


DASH

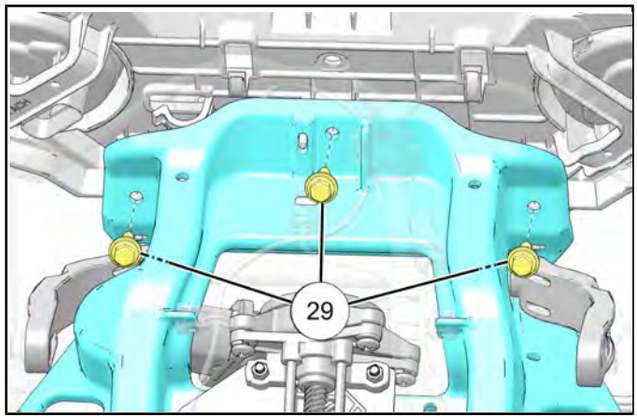
1. Disconnect speedometer and tachometer electrical connections ㉗.



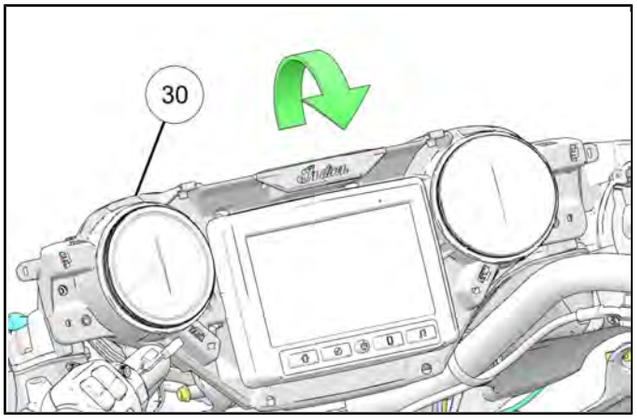
2. Remove dash support to speaker enclosure fasteners ㉘.



3. Remove dash support to fairing bracket fasteners ㉙.

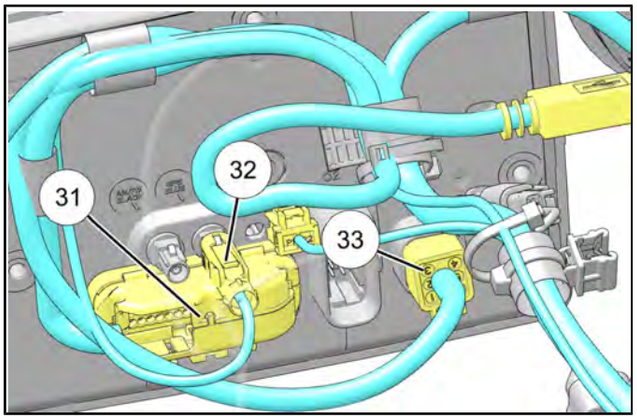


4. Rotate the dash support ㉚ forwards to access the display connectors.

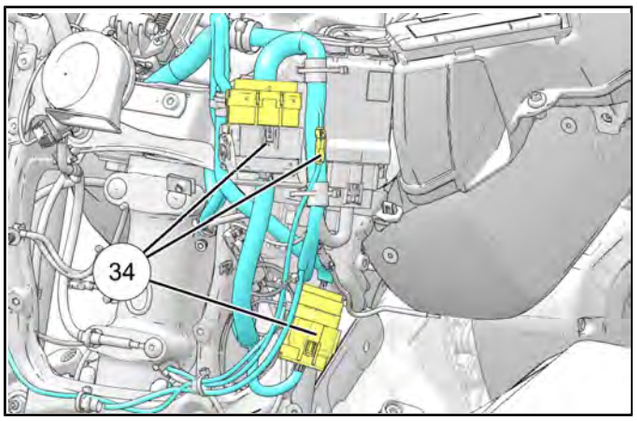


5. Remove display connector ㉛, antenna connector ㉜, and USB connector ㉝.

NOTICE
Non-TCU models will have a single antenna wire.

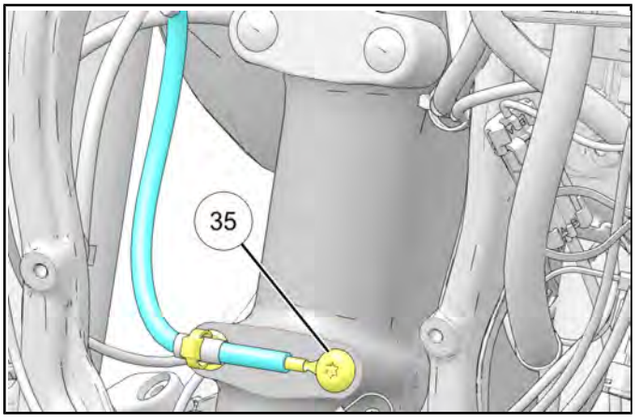


6. Remove the dash support.
7. Disconnect main wiring harness ㉞.

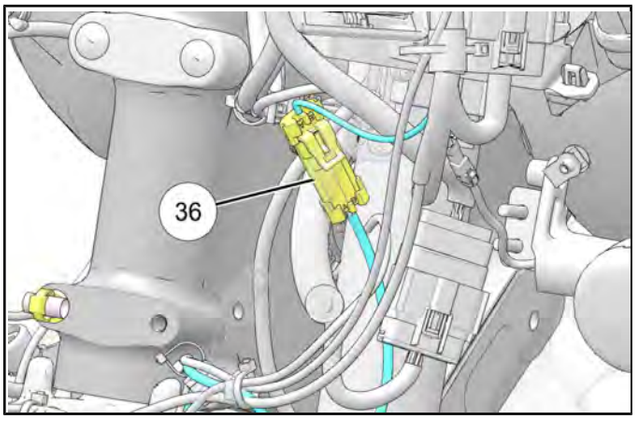


7

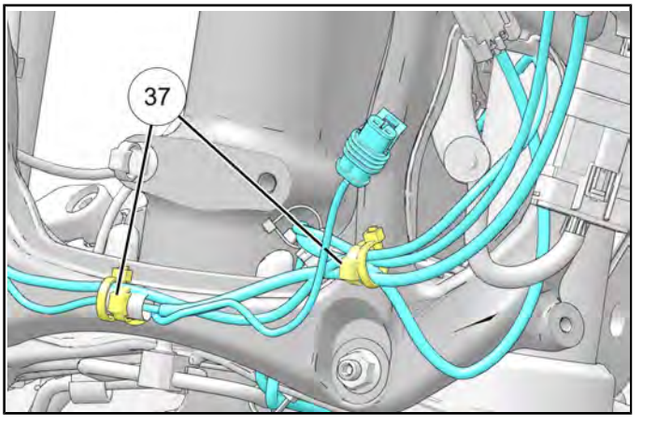
8. Disconnect and remove chassis ground connector ㉟.

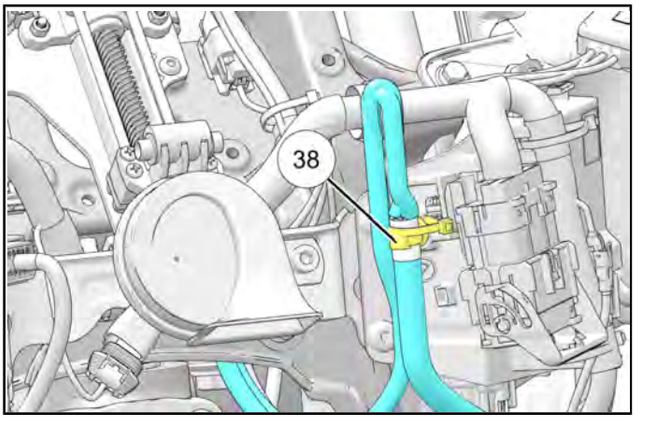


9. Remove wheel speed sensor connector ㊱.



10. Cut cable ties ㊲ and ㊳.

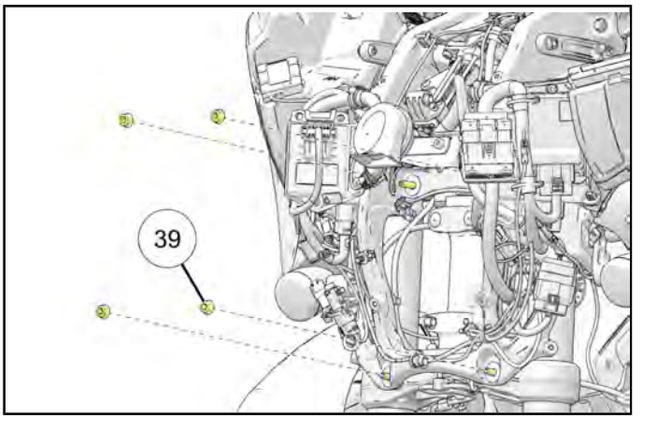




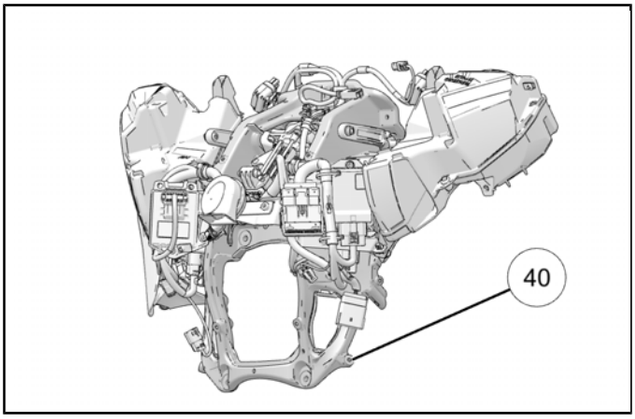
11. Pull all chassis side connectors out through the center of the fairing bracket for fairing bracket removal.

FAIRING SUPPORT

1. Remove fairing bracket nuts ㊴.



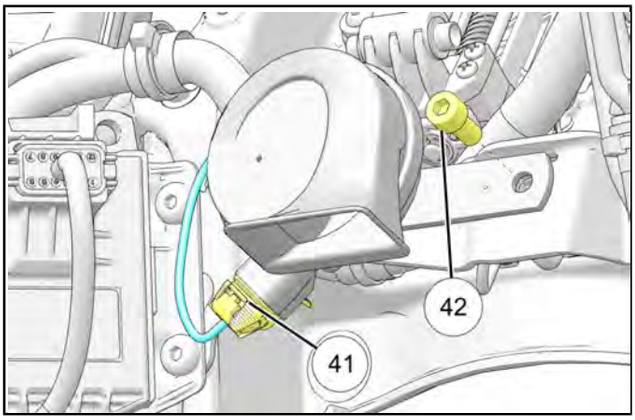
2. Carefully lift and remove fairing bracket assembly ㊵ from the frame.



NOTICE

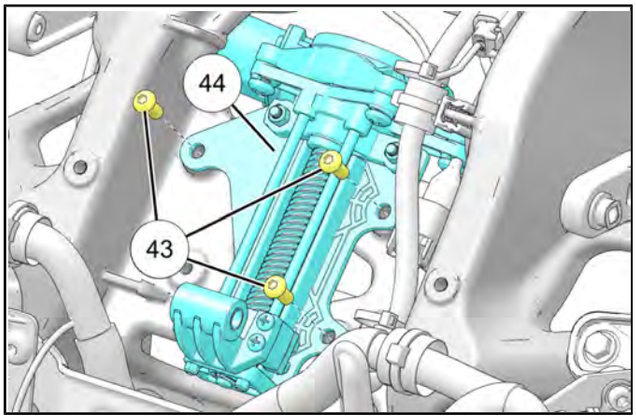
The following steps are for full fairing disassembly only.

3. Disconnect horn electrical connector ㊶ and remove horn bracket fastener ㊷.



4. Remove horn assembly.

5. Remove windshield motor fasteners ㊸ and remove windshield motor ㊹.

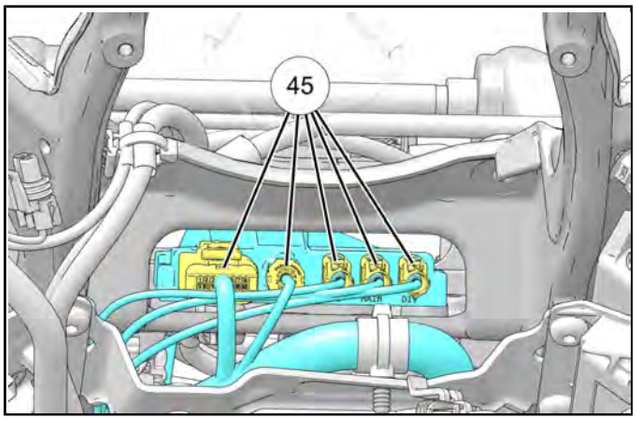


6. Remove fairing wiring harness from fairing bracket.

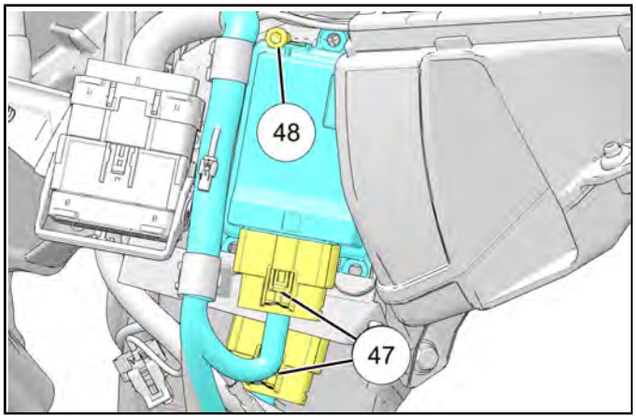
7. Disconnect TCU electrical connectors ㊺.

NOTICE

Non-TCU models do no apply this step.

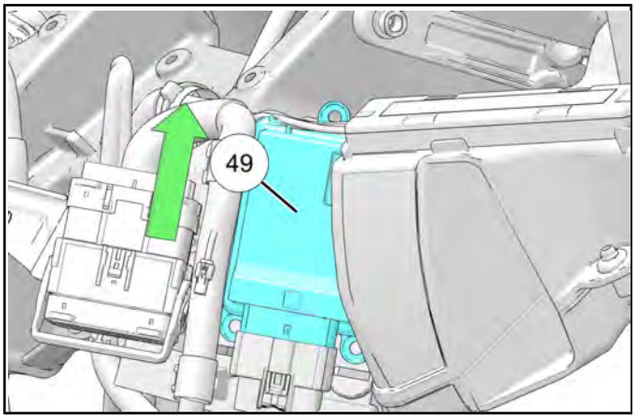


8. Disconnect wiring harness connectors ㊼ and VCM 2 fastener ㊽.

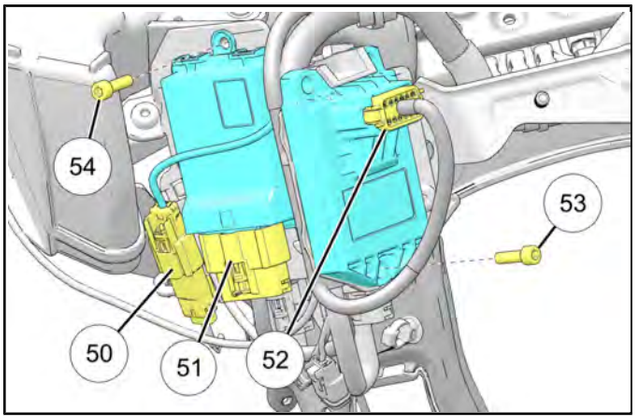


7

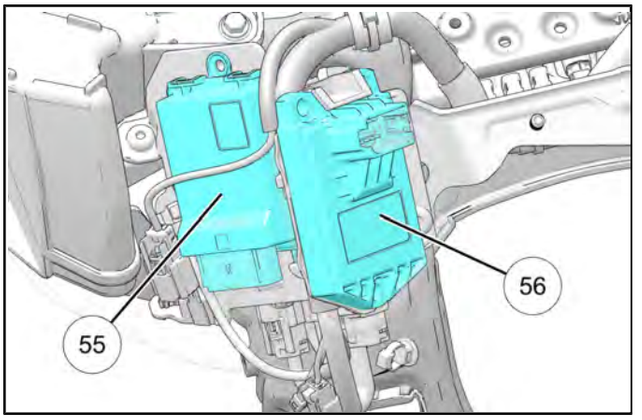
9. Carefully lift up and remove VCM 2㊾.



10. Disconnect ㊿, VCM 3 ㊿①, and GCM ㊿② electrical connectors. Remove GCM fastener ㊿③ and VCM 3 fastener ㊿④.

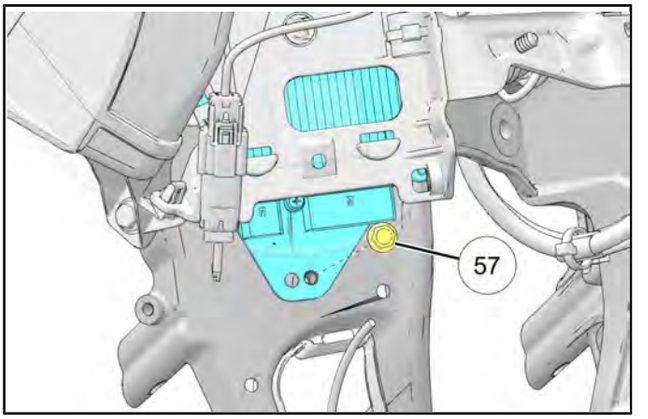


11. Remove VCM 3 ㊿⑤ and GCM ㊿⑥.



12. Disconnect power supply module electrical connectors.

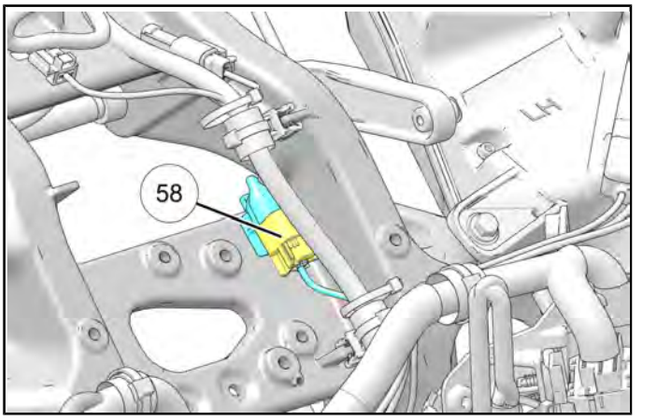
13. Remove power supply module fastener ㊿⑦, and remove power supply module.



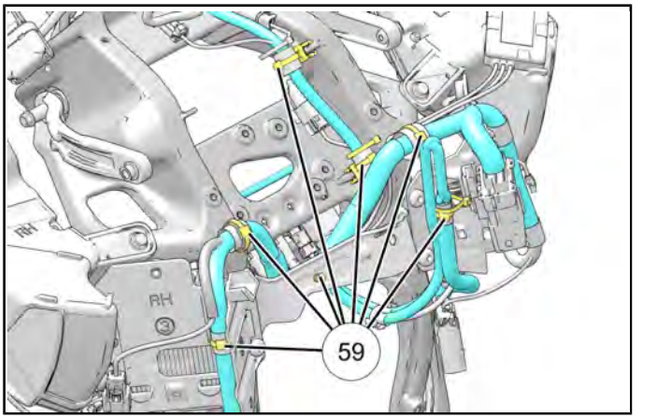
14. Remove power supply module fastener .

15. Remove power supply module.

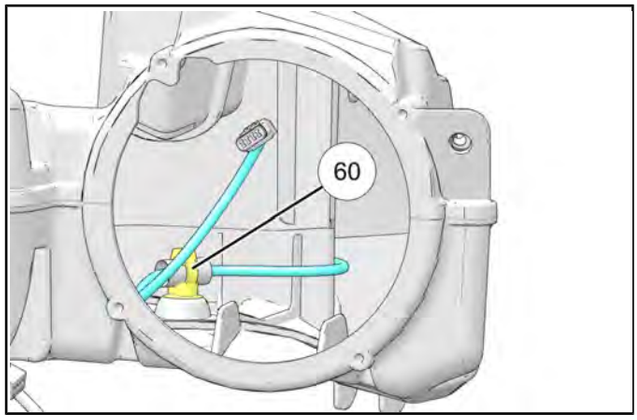
16. Disconnect temperature probe ㊿⑧.



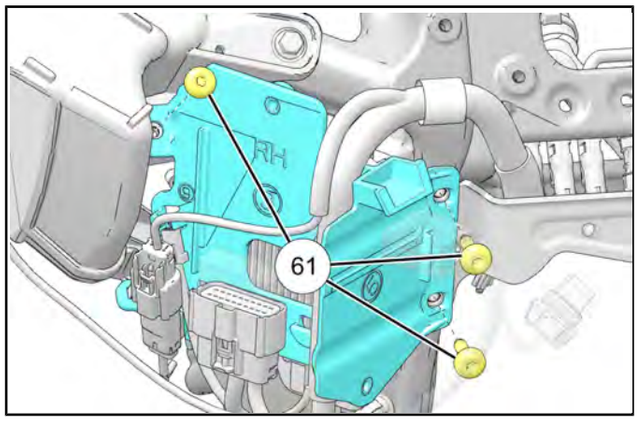
17. Carefully cut cable ties from main wiring harness ㊿⑨.



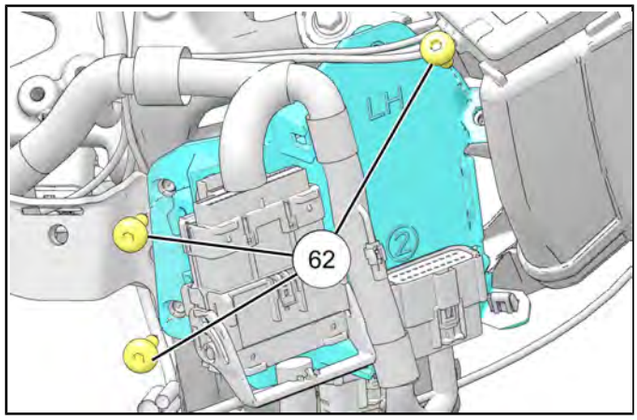
18. Carefully cut speaker electrical connector cable ties ⑥⓪ on both sides.



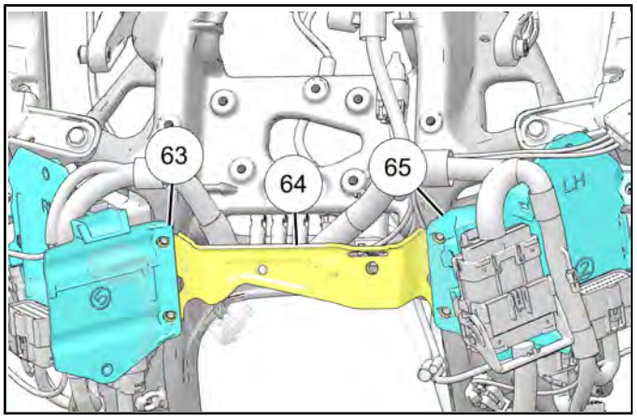
19. Remove right hand fairing bracket fasteners ⑥①.



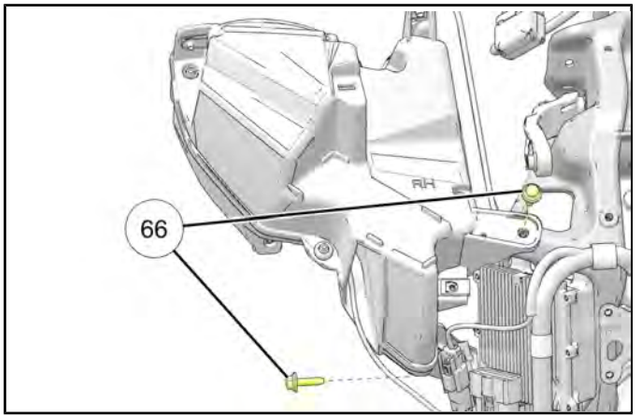
20. Remove left hand fairing bracket fasteners ⑥②.



21. Remove left hand fairing bracket ⑥③, fairing tray ⑥④, and right hand fairing bracket ⑥⑤.



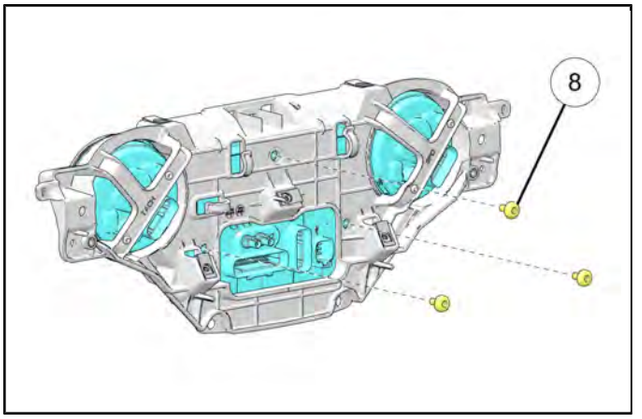
22. Remove speaker enclosure fasteners ⑥⑥.



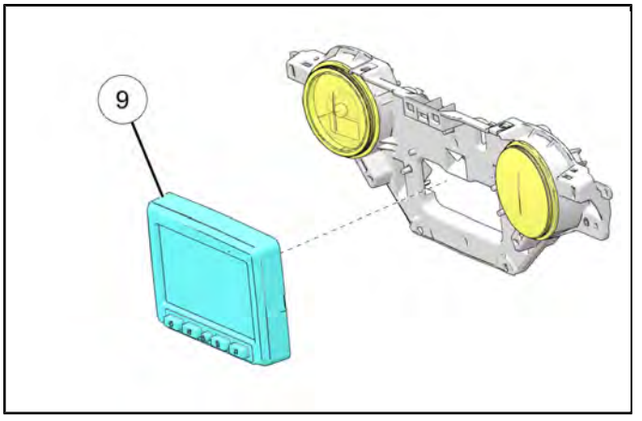
7

DASH

1. Remove the display fasteners ⑧.

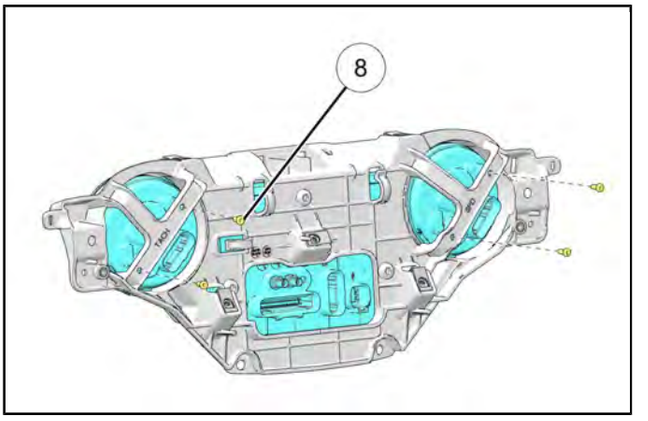


2. Remove the dash display ⑨ from the dash support.

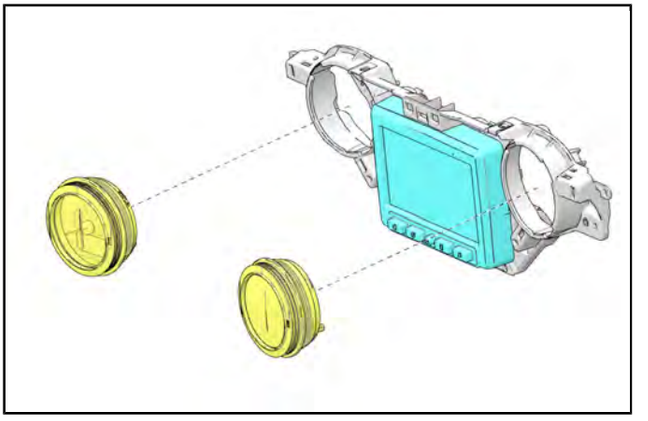


TACHOMETER / SPEEDOMETER

1. Remove the tachometer and speedometer fasteners ⑧.



2. Remove tachometer and speedometer by gently prying it out of the dash support.



FAIRING ASSEMBLY AND INSTALLATION (FORK MOUNTED)

NOTICE
Installation of the fairing requires some assembly. Steps that are assembly only will be identified with a note box.

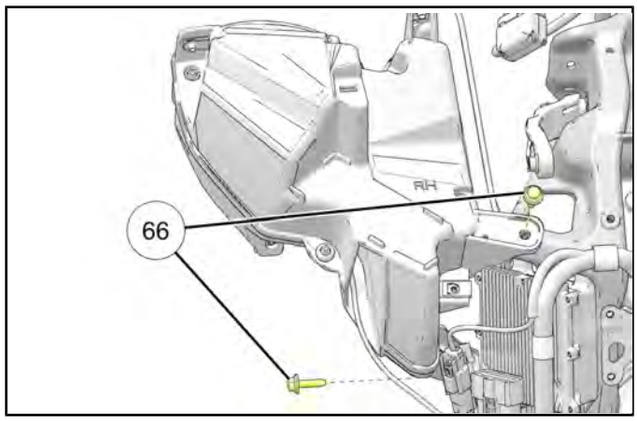
NOTICE
These sections are separated for ease of use.

NOTICE
Place the power windshield in the FULL UP position prior to fairing installation.

FAIRING SUPPORT

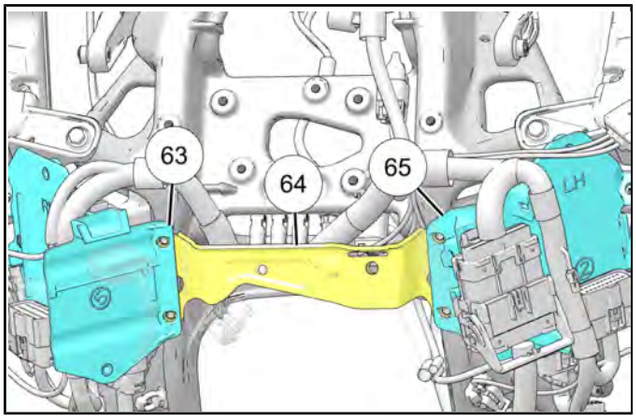
NOTICE
This section is primarily assembly. If performing installation only, perform steps 21–22.

1. Install speaker enclosure fasteners ⑯.

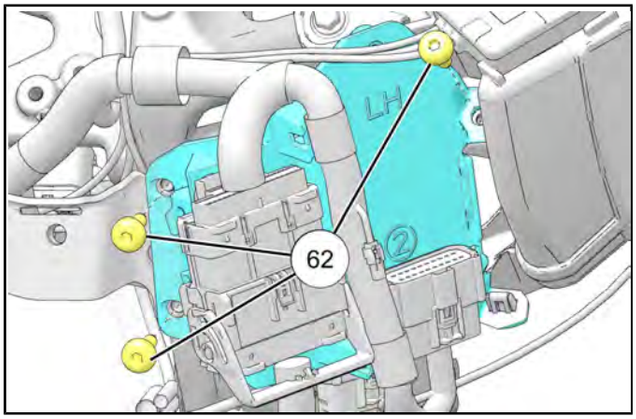


TORQUE
35 in-lbs (4 N·m)

2. Install left hand fairing bracket ⑬, fairing tray ⑭, and right hand fairing bracket ⑮.

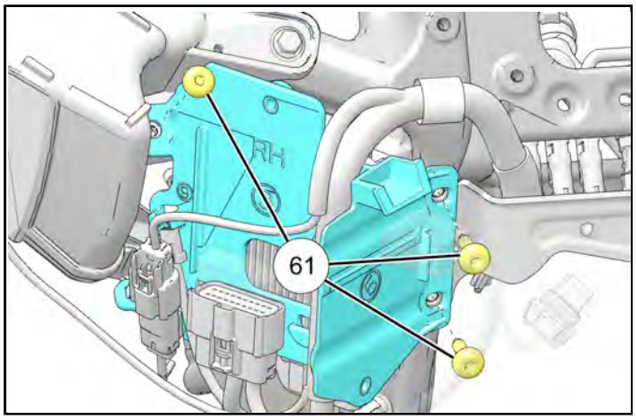


3. Install left hand fairing bracket fasteners ⑫.



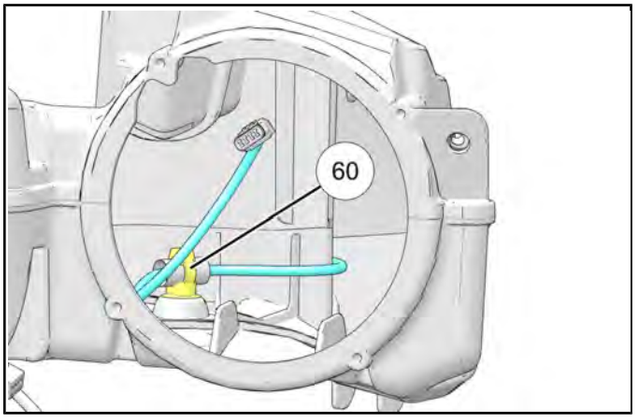
TORQUE
35 in-lbs (4 N·m)

4. Install right hand fairing bracket fasteners ⑪.



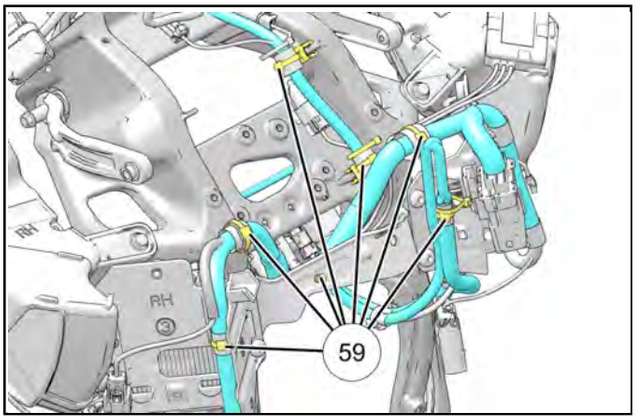
TORQUE
35 in-lbs (4 N·m)

5. Install new speaker electrical connector cable ties ⑥⓪ on both sides.

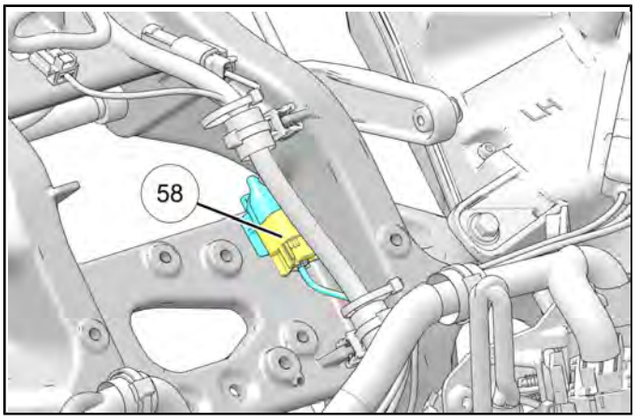


6. Install cable ties onto main wiring harness ⑤⑨.

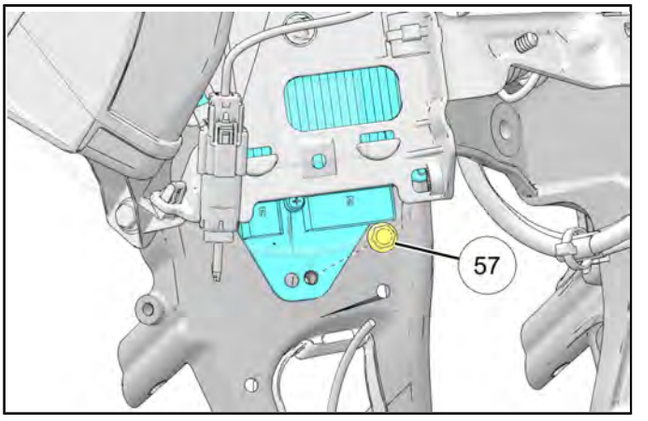
IMPORTANT



7. Connect temperature probe ⑤⑧.

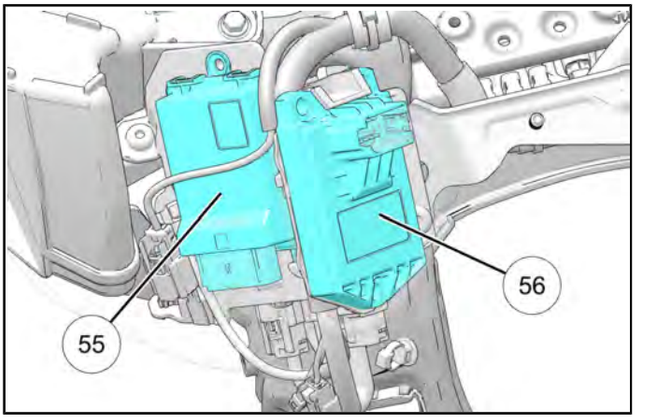


8. Install power supply module, and install power supply module fastener ⑤⑦.

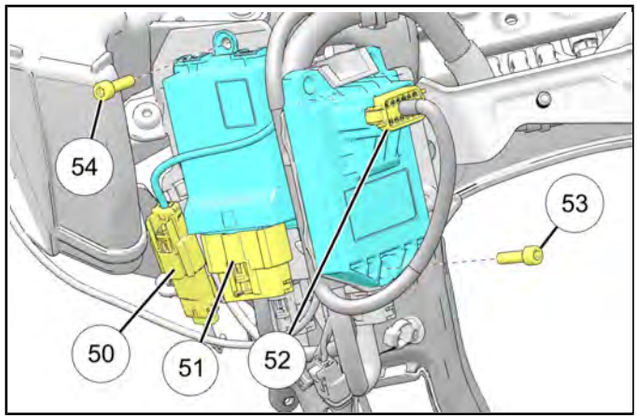


TORQUE
88 in-lbs (10 N·m)

9. Connect power supply module electrical connectors.
10. Install VCM 3 ⑤⑤ and GCM ⑤⑥.

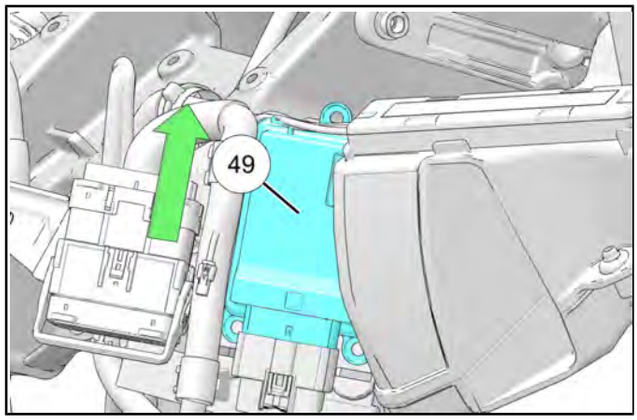


11. Connect ⑤⓪, VCM 3 ⑤①, and GCM ⑤② electrical connectors. Install GCM fastener ⑤③ and VCM 3 fastener ⑤④.

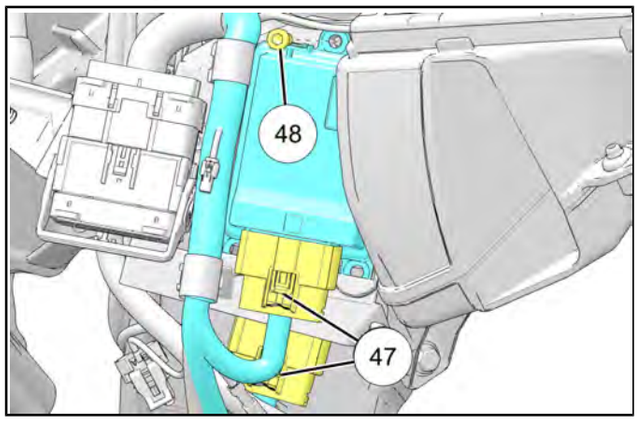


TORQUE
15 in-lbs (2 N·m)

12. Carefully insert bottom tabs and install VCM 2④⑨.

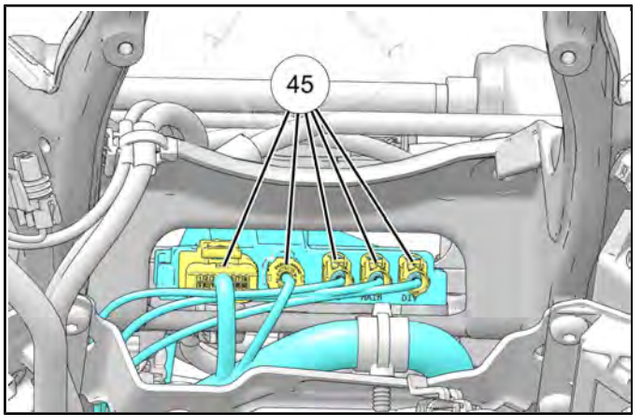


13. Connect wiring harness connectors ④⑦ and VCM 2 fastener ④⑧.



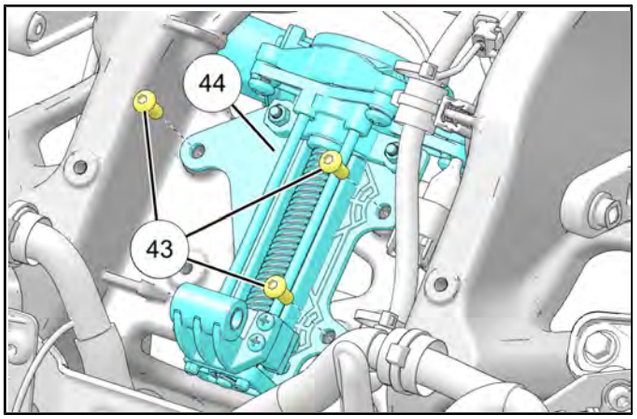
14. Connect TCU electrical connectors ④⑤.

NOTICE
Non-TCU models do no apply this step.



15. Install fairing wiring harness onto fairing bracket.

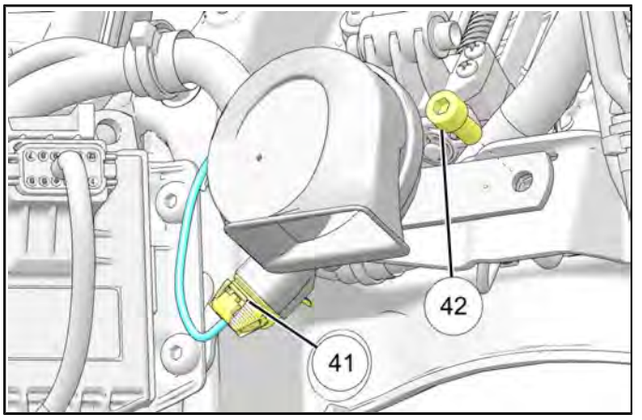
16. Install windshield motor ④④ and install windshield motor fasteners ④③.



TORQUE
88 in-lbs (10 N·m)

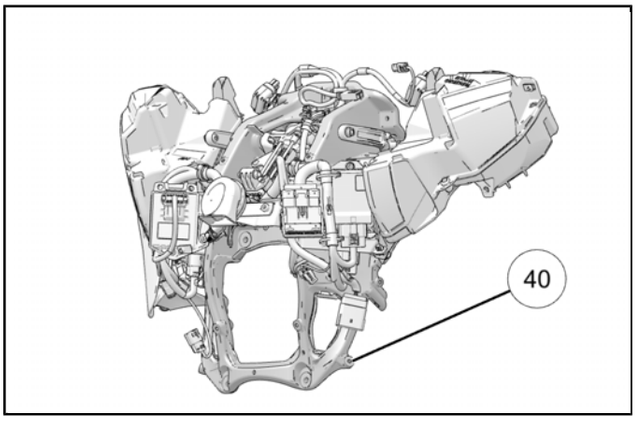
17. Install horn assembly.

18. Connect horn electrical connector ㊶ and install horn bracket fastener ㊷.

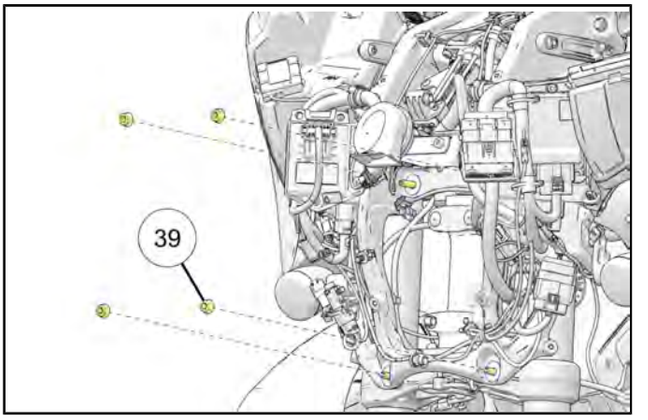


TORQUE
88 in-lbs (10 N·m)

19. Carefully lift and install fairing bracket assembly ㊵ onto the frame.



20. Install fairing bracket nuts ㊴.



TORQUE
Fairing Support Nuts **18 ft-lbs (24 N·m)**

DISPLAY / TACHOMETER / SPEEDOMETER

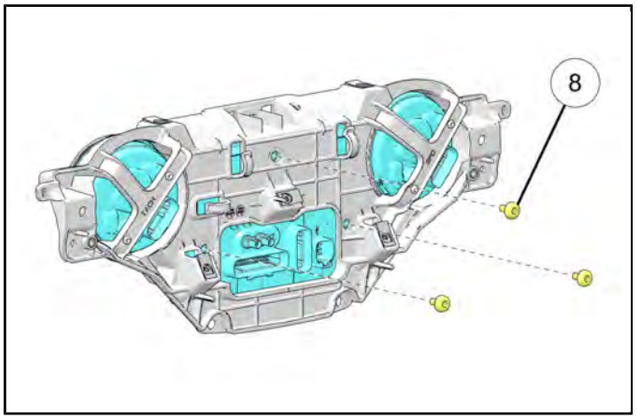
NOTICE
This section is assembly only.

1. Install the rubber grommet into the dash support. Ensure the clocking feature is aligned with the dash support.

2. Using a small amount of soapy water, lubricate the rubber grommet.

3. Insert the speedometer into the dash support. Ensure the clocking feature is aligned with the rubber grommet.

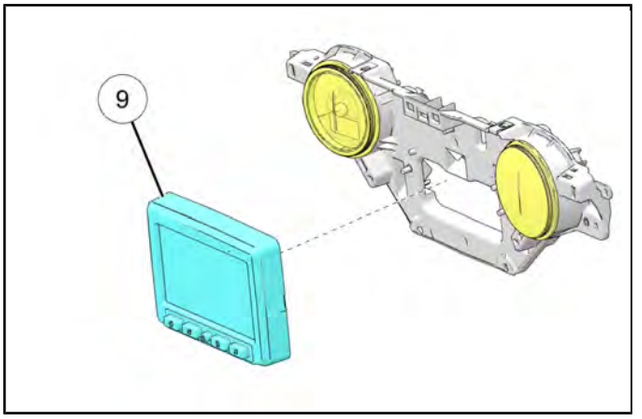
4. Install the display fasteners ⑧.



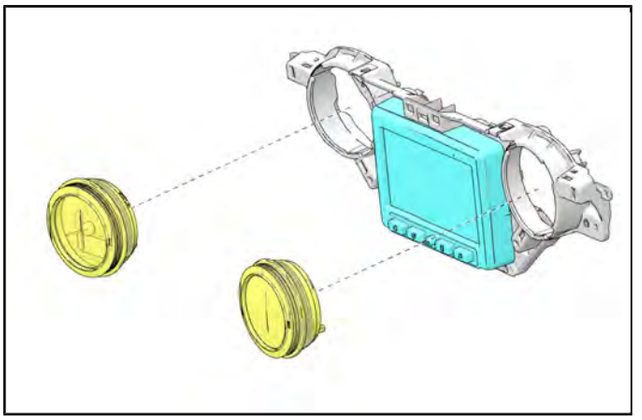
TORQUE
35 in-lbs (4)

7

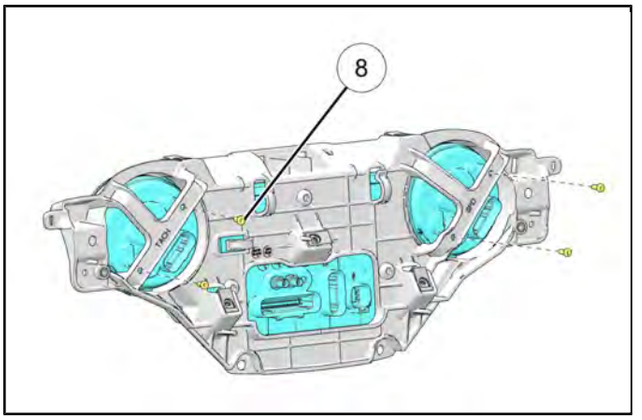
5. Install the dash display ⑨ from the dash support.



6. Install tachometer and speedometer onto the dash support.



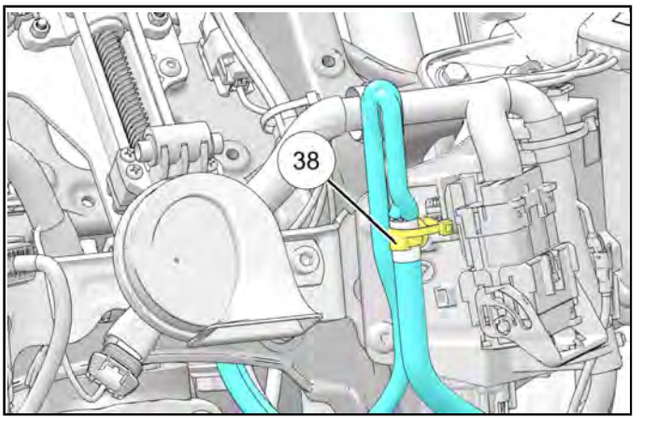
7. Install the tachometer and speedometer fasteners ⑧.

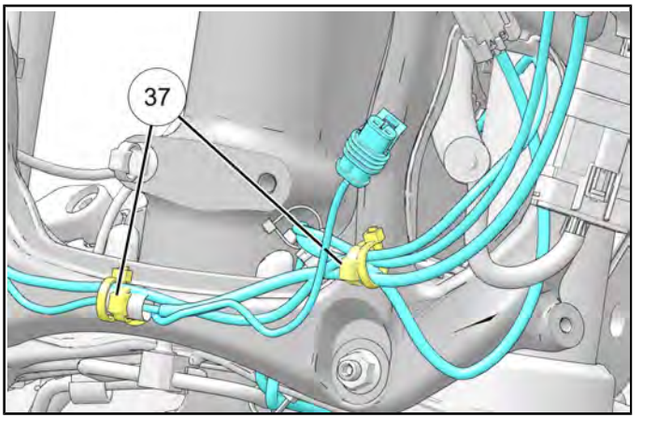


TORQUE
9 in-lbs (1 N·m)

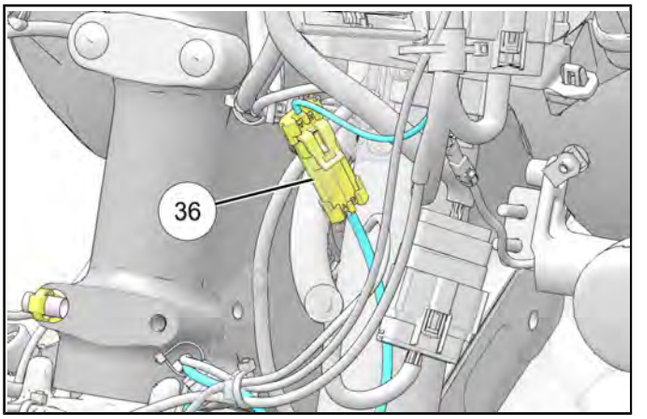
DASH

1. Pull all chassis side connectors through the right hand / left hand lower holes in the fairing bracket for installation.
2. Install cable ties ㊲ and ㊳.

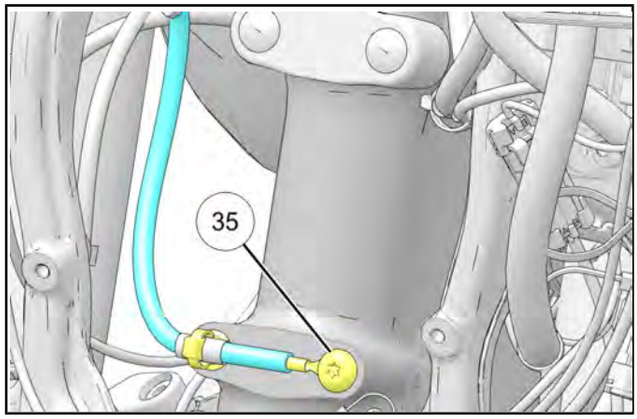




3. Connect wheel speed sensor connector ㊱.

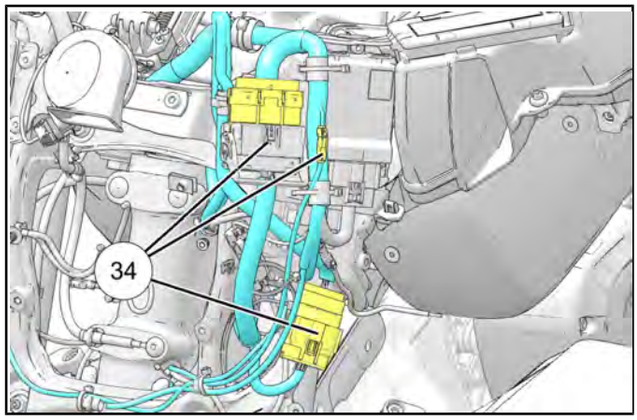


4. Connect and install chassis ground connector ㉟.



TORQUE
Chassis Ground Connector

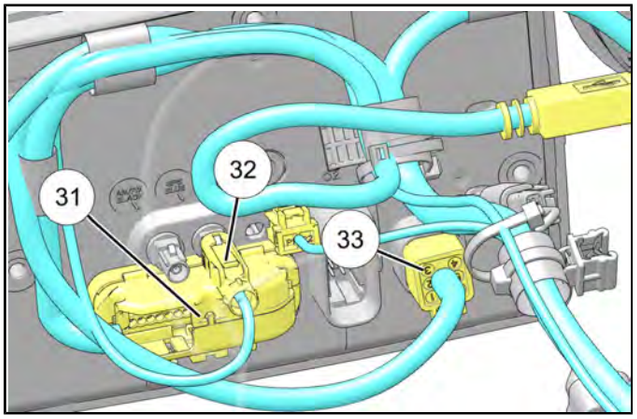
5. Connect main wiring harness ㉞.



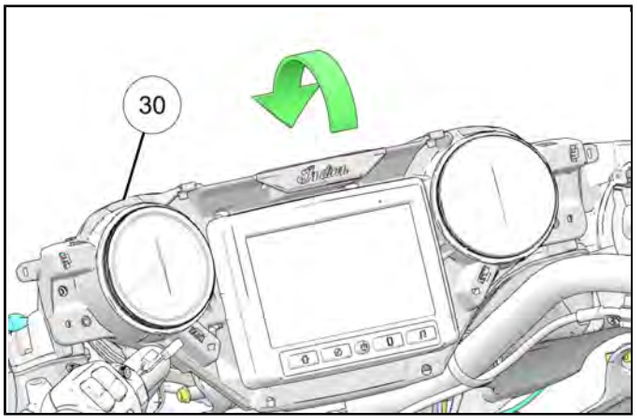
6. Install the dash support.

7. Install display connector ㉛, antenna connector ㉜, and USB connector ㉝.

NOTICE
Non-TCU models will have a single antenna wire.

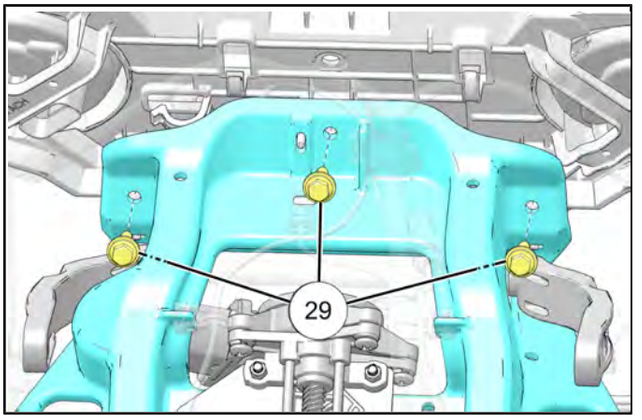


8. Rotate the dash support ㉚ into the dash support.



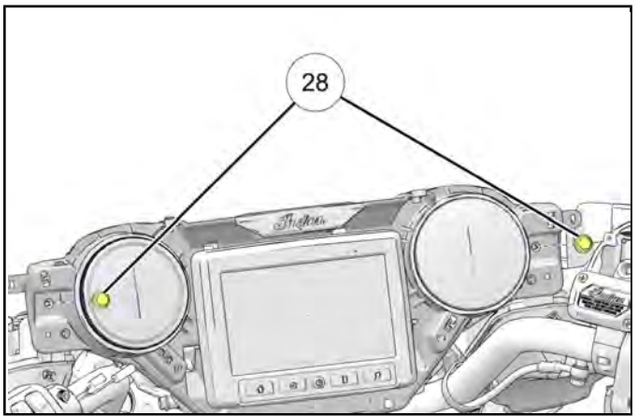
7

9. Install dash support to fairing bracket fasteners ㉙.



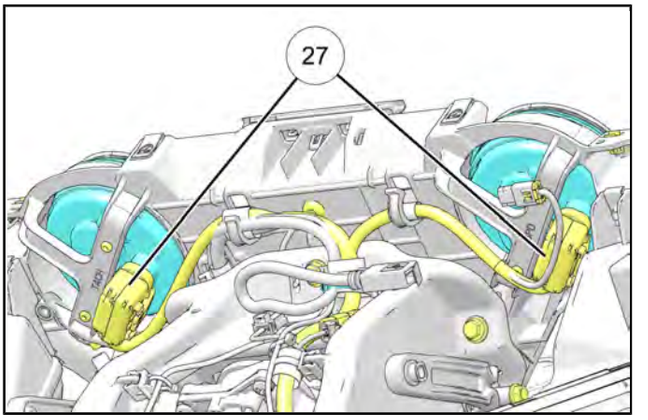
TORQUE
Dash Support to Fairing Bracket Fastener **88 in-lbs (10 N·m)**

10. Install dash support to speaker enclosure fasteners ㉘.



TORQUE
Dash Support to Speaker Enclosure Fastener **88 in-lbs (10 N·m)**

11. Connect speedometer and tachometer electrical connections ㉗.

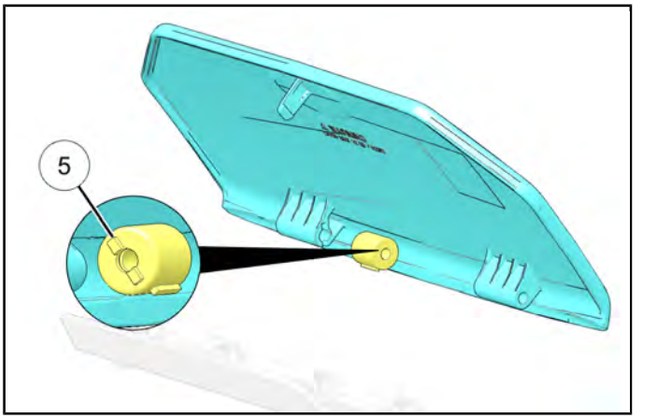


STORAGE DOOR

NOTICE
This section is assembly only.

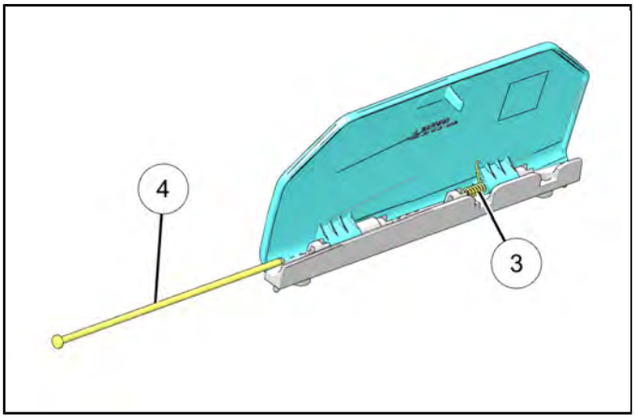
1. Install storage door damper ⑤ into storage door.

IMPORTANT
Make sure to line up the two notches in the storage door damper with the two inserts of the storage door, with the long notch at the bottom.

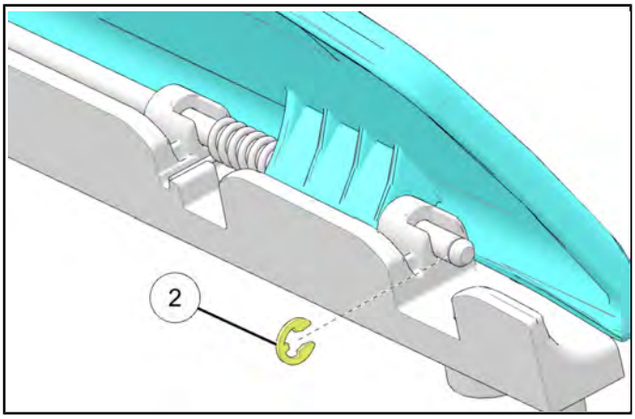


2. Hold door spring ③ in place while installating storage door pin ④.

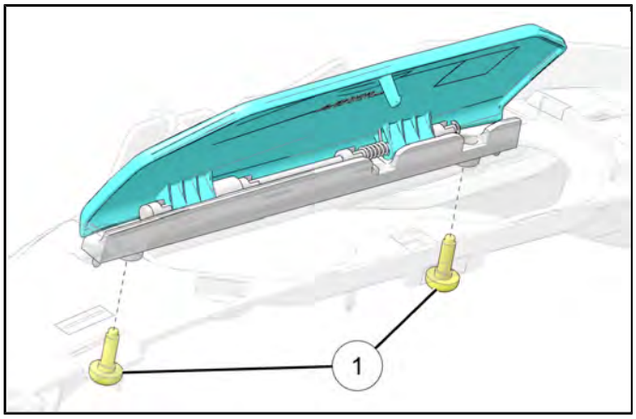
IMPORTANT
Make sure door spring is seated within the insert on the hinge block.



3. Install eclip ② onto the storage door pin.



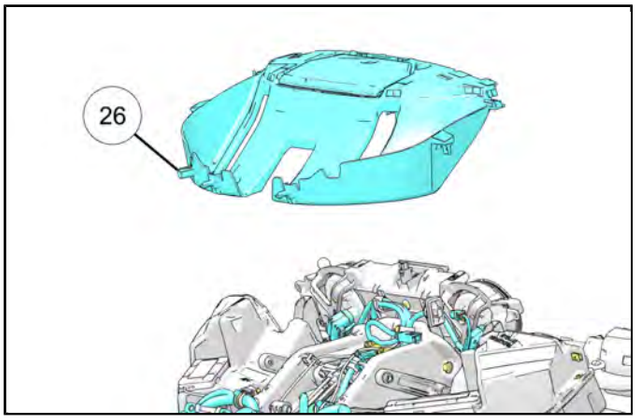
4. Install hinge block to visor top fasteners ①.

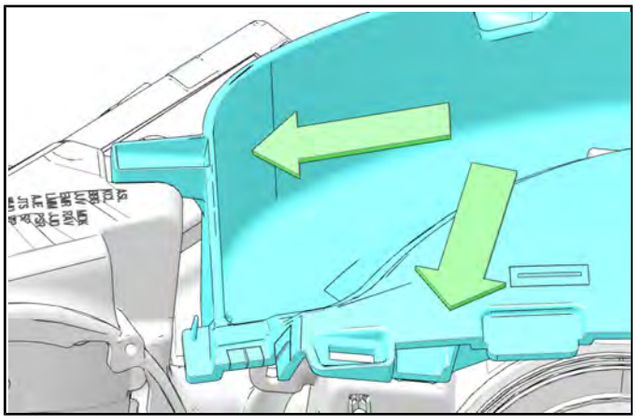


TORQUE
35 in-lbs (4 N·m)

VISOR

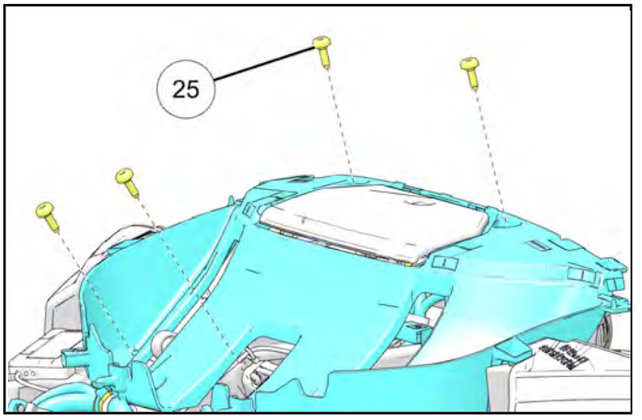
1. Carefully install visor top ㉖ at the connection points on each side.





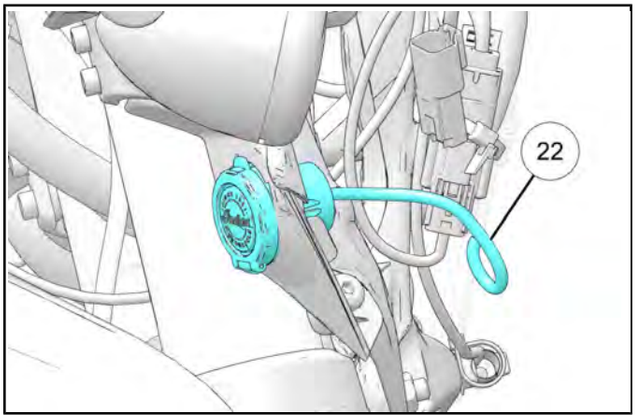
7

2. Install visor top fasteners ㉕.

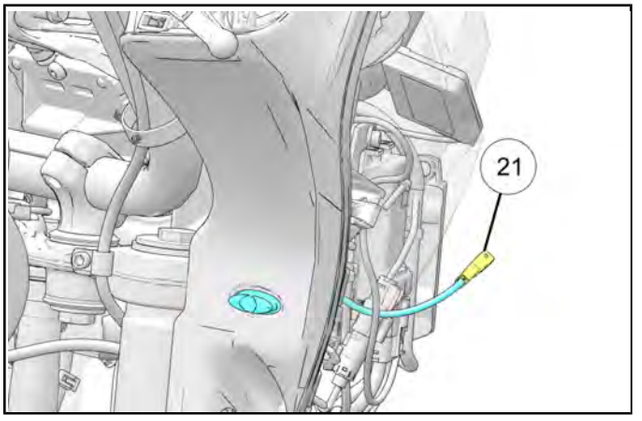


TORQUE
Visor Top Fastener **35 in-lbs (4 N·m)**

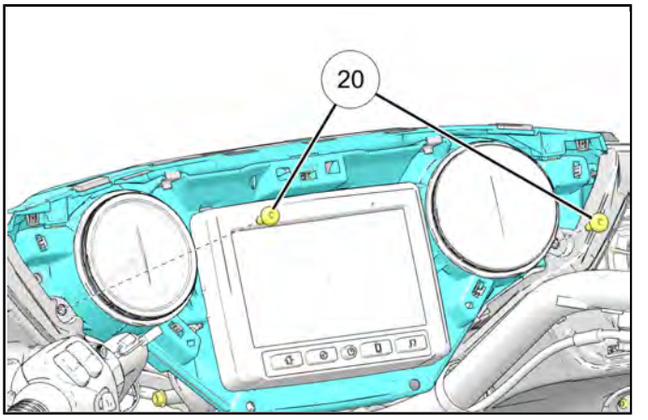
3. Connect charge port electrical connector ㉒.



4. Connect fuel door button ㉑.

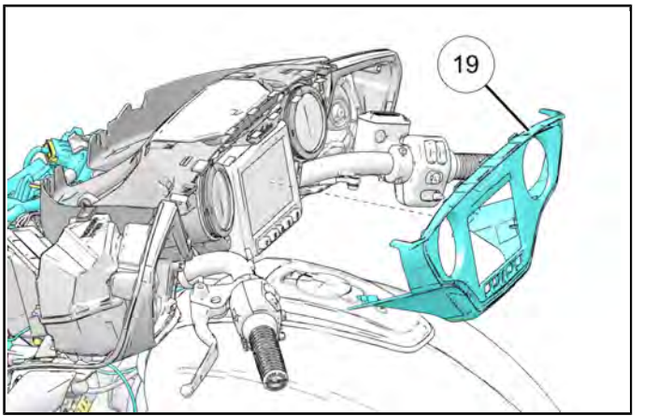


5. Install side fairing fasteners ⑳.

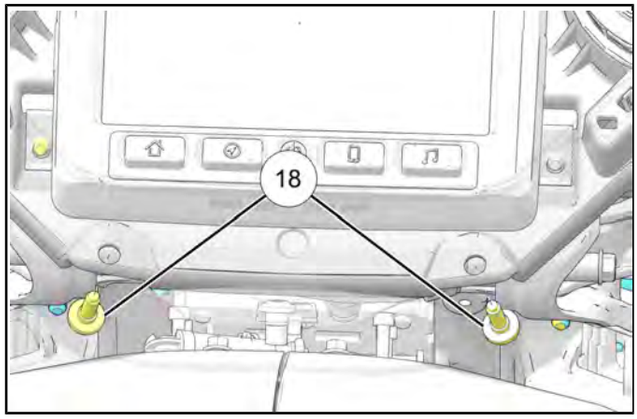


TORQUE
Side Fairing Fastener **35 in-lbs (4 N·m)**

6. Carefully install front dash fairing ⑲ onto retention clips.

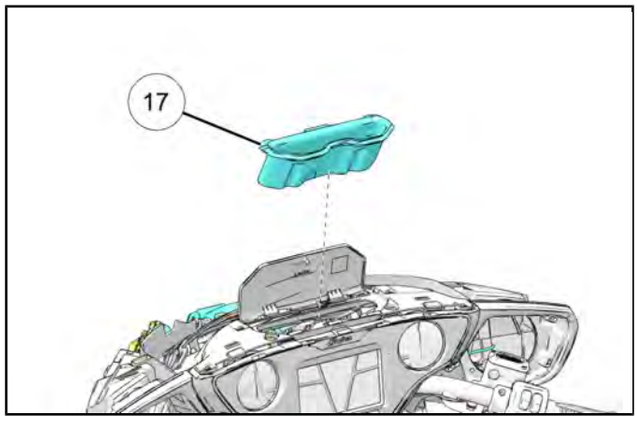


7. Install dash support to display fasteners ⑱.

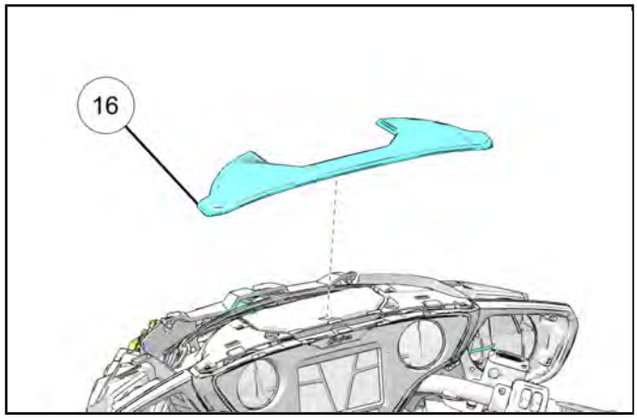


TORQUE
Dash Support to Display Fastener **35 in-lbs (4)**

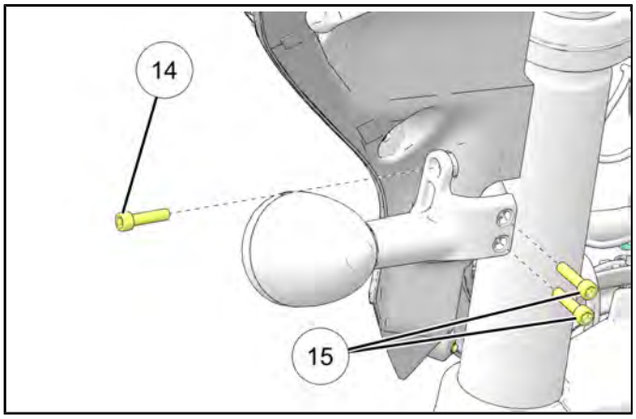
8. Install storage liner ⑰.



9. Carefully install the visor top cover ⑯ on either side to insert the retention clips.

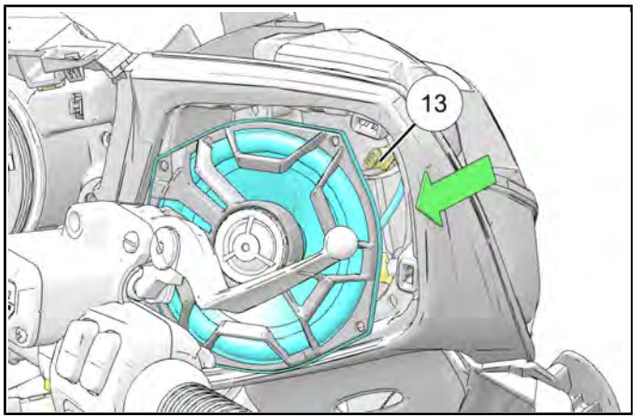


10. Install turn signal support fastener ⑭ and turn signal to fairing bracket fasteners ⑮ on both sides.

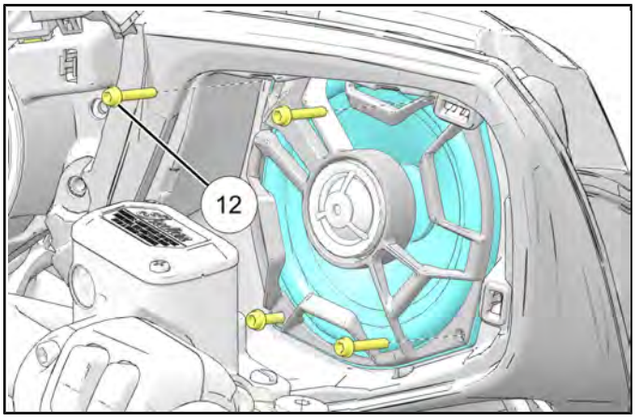


TORQUE
Turn Signal Fastener **88 in-lbs (10 N·m)**

11. Connect the speaker electrical connector ⑬ and carefully install speaker into the fairing..

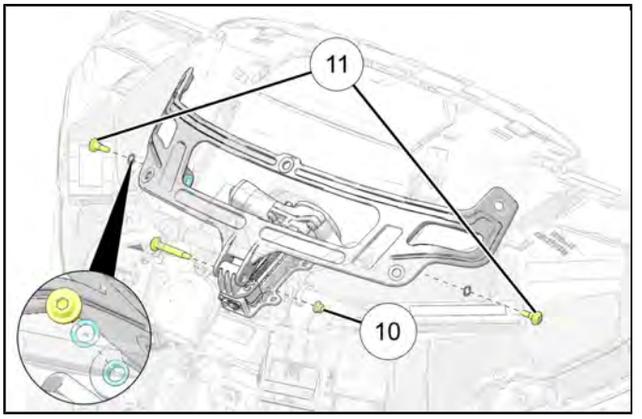


12. Install speaker fasteners ⑫ on both sides.



TORQUE
Speaker Fastener **25 in-lbs (3 N·m)**

13.



14. Install windscreen motor fastener ⑪ and wave washers.

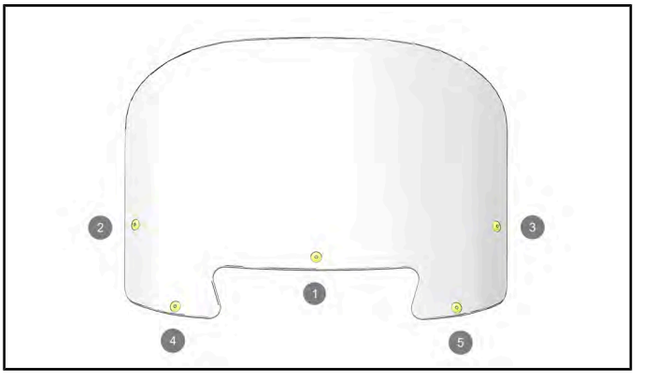
IMPORTANT
Do not discard wave washers. Failure to reinstall wave washers will cause significant windshield rattle while operating the motorcycle.

TORQUE
Windscreen Motor Fastener **88 in-lbs (10 N·m)**

15. Install windshield link support fastener ⑩.

TORQUE
Windshield Link Support Fastener **88 in-lbs (10 N·m)**

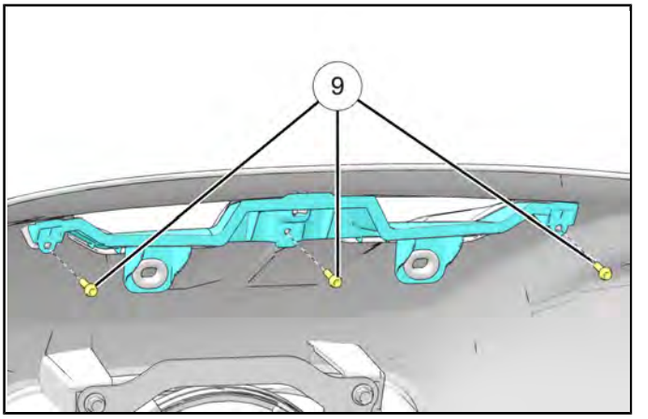
16. Install windshield fasteners and remove windshield. See torque sequence below.



TORQUE
35 in-lbs (4 N·m)

OUTER FAIRING

1. Install upper duct then install upper duct fasteners ⑨.



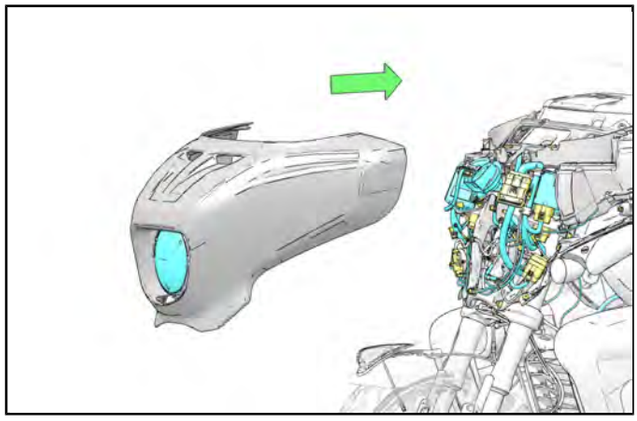
TORQUE
Upper Duct Fastener **15 in-lbs (2 N·m)**

NOTICE
This step is only required for assembly.

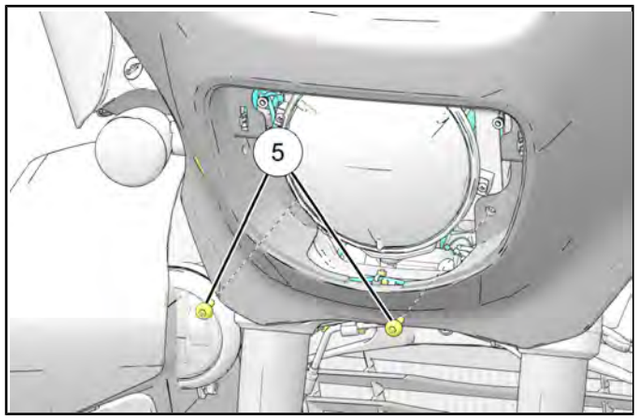
2. Carefully install the outer fairing and connect the headlight and turn signal electrical connectors.

NOTICE
Lubricate the mounting grommets before installation.

NOTICE
Engage the darts into the mounting grommets.

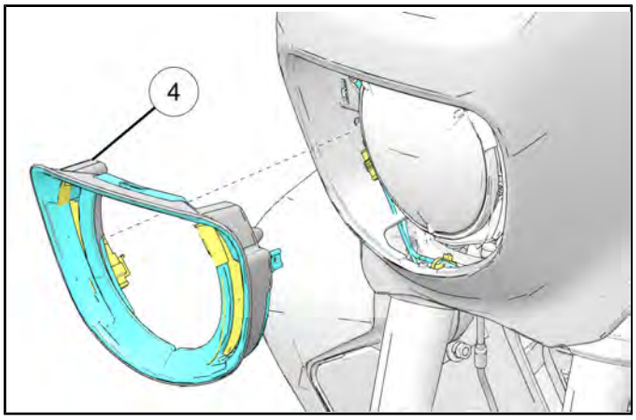


3. Install outer fairing fasteners ⑤.



TORQUE
Outer Fairing Fastener ⑤: **35 in-lbs (4 N·m)**

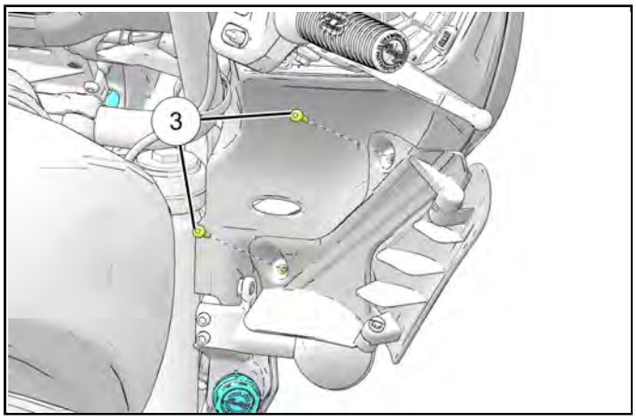
4. Connect both position light connectors, and install headlight bezel ④ by inserting the lower end first, then tilting the top forward to insert into the side body clips



5. Install wind deflectors.

NOTICE
Wind deflectors are only present in touring models.

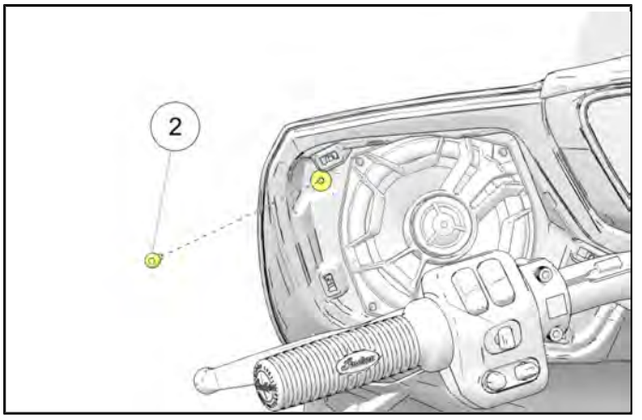
6. Install wind deflector fasteners ③.



TORQUE
Wind Deflector Fastener ③: **35 in-lbs (4 N·m)**

7

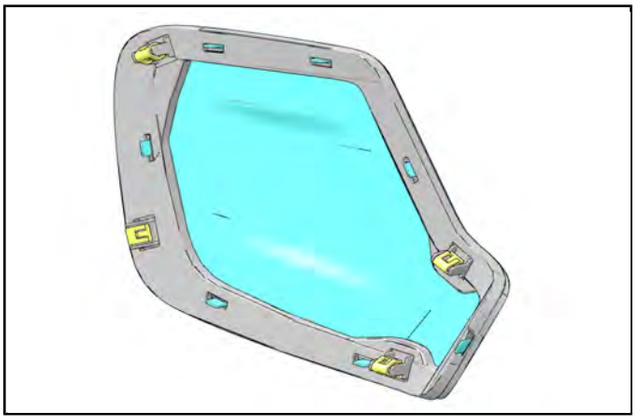
7. Install outer fairing fasteners ②.

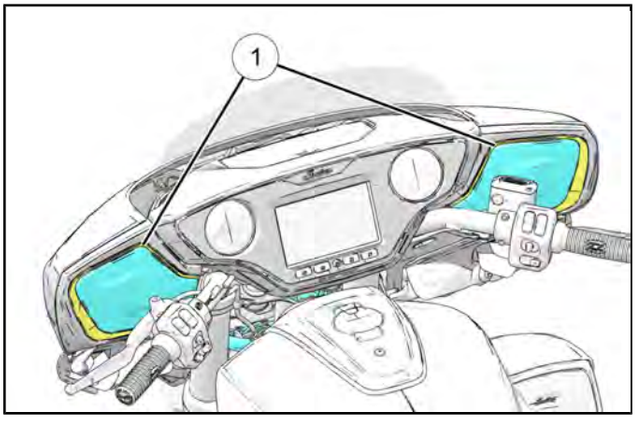


TORQUE
Outer Fairing Fastener ②: **35 in-lbs (4 N·m)**

8. Carefully install speaker bezels ①.

   Make note of the speaker bezel clip location when installing the piece from the fairing.





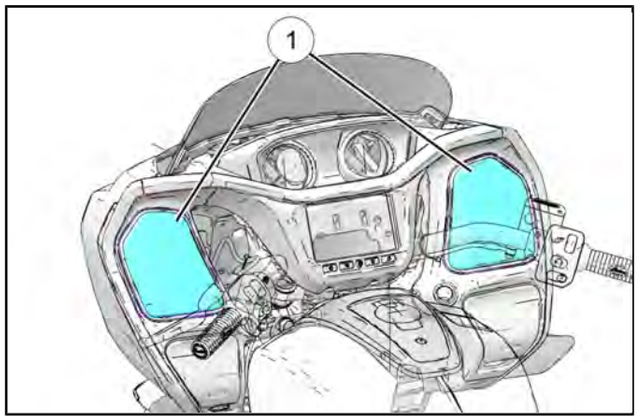
CHASSIS MOUNTED FAIRING

FAIRING DISASSEMBLY

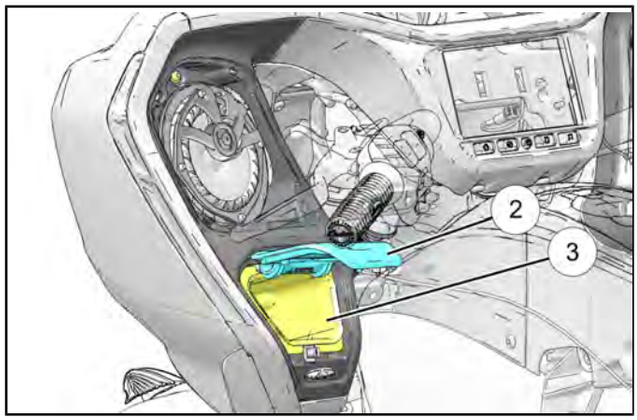
NOTICE
Place the power windshield in the FULL UP position prior to fairing disassembly or removal.

OUTER FAIRING

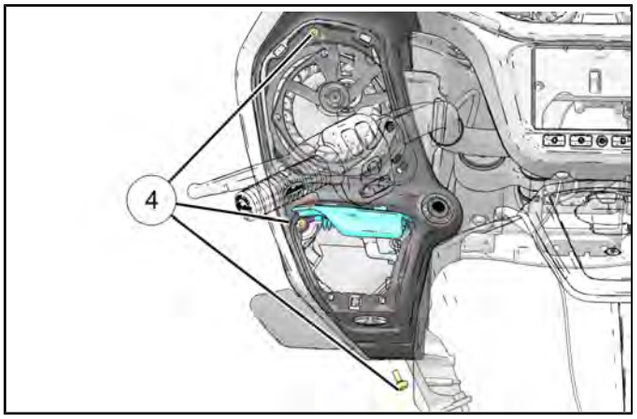
1. Carefully pry off speaker bezels ①.



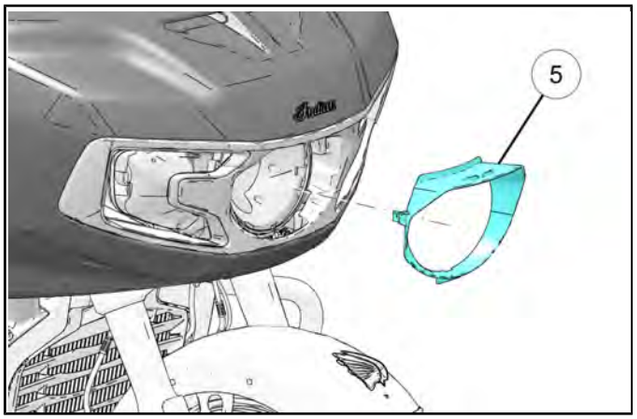
2. Open storage door ② and remove storage liner ③.



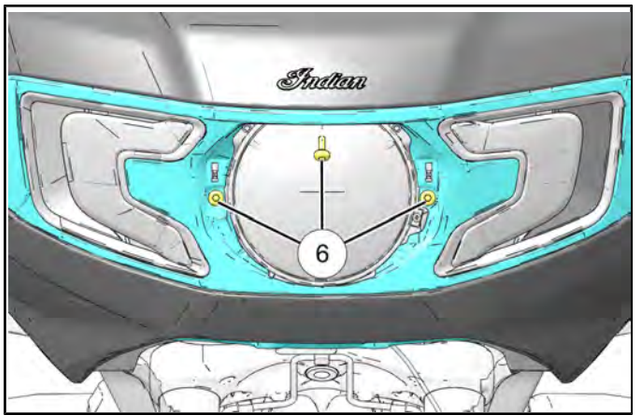
3. Remove outer fairing fasteners ④.



4. Repeat steps 2–3 for the remaining side.
5. Remove headlight bezel ⑤ by prying down at the top center to release the snap and then pull forward to release the side body clips.

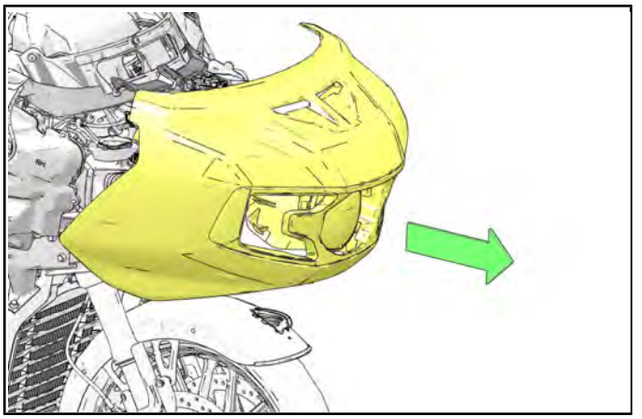


6. Remove outer fairing fasteners ⑥.

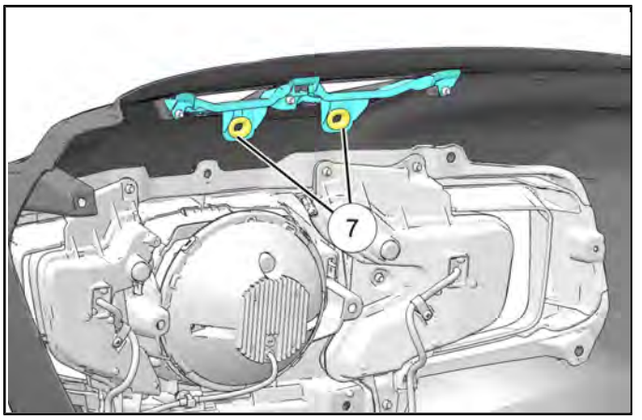


7

7. Carefully move the outer fairing forward and unplug the headlight and turn signal electrical connection.



8. Lubricate rubber grommets ⑦ in upper duct upon installation.



9. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

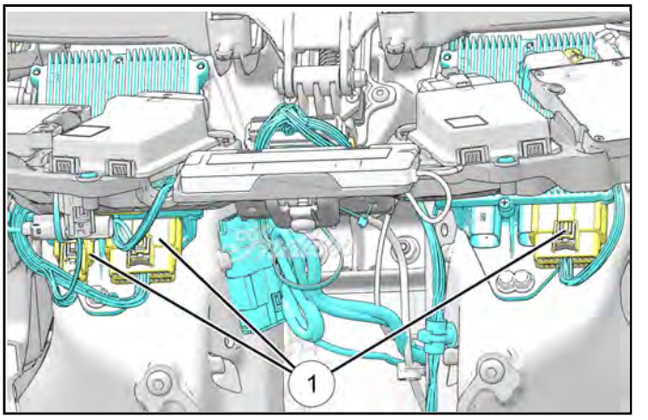
TORQUE
Outer Fairing Fastener ④: **35 in-lbs (4 N·m)**

TORQUE
Headlight Bezel Assembly Fastener ⑥: **35 in-lbs (4 N·m)**

FAIRING TRAY

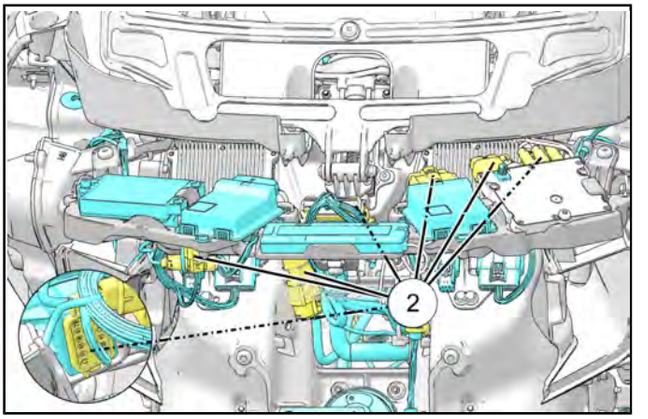
1. Disconnect power supply module electrical connectors ①.

NOTICE
Not all models will have multiple power supply modules or a VCM3 module.

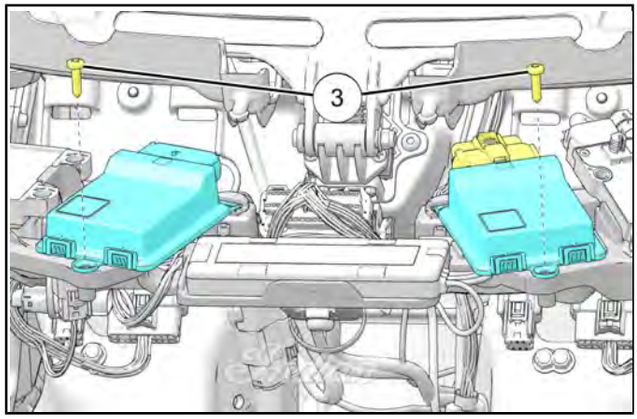


2. Disconnect electrical connectors ② from VCM 2, VCM 3, GCM, TCU, Fog Lights, Charge Port Connector, and Fairing Wiring Harness.

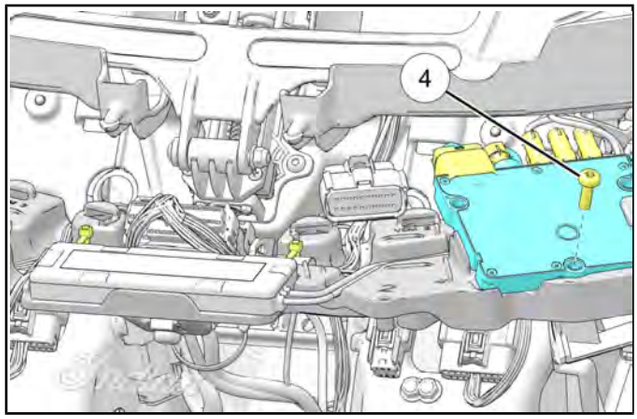
TIP
The GCM can be removed from the fairing tray before disconnecting the electrical connector for easier access.



3. Remove fasteners ③ from VCM 2 and VCM 3.



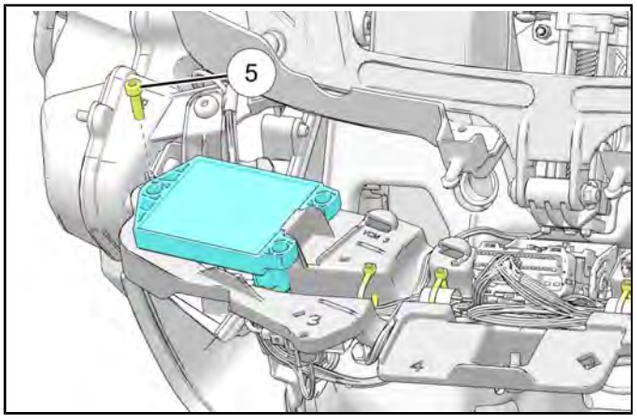
4. Remove VCM 2 and VCM 3.
5. Remove TCU fastener ④.



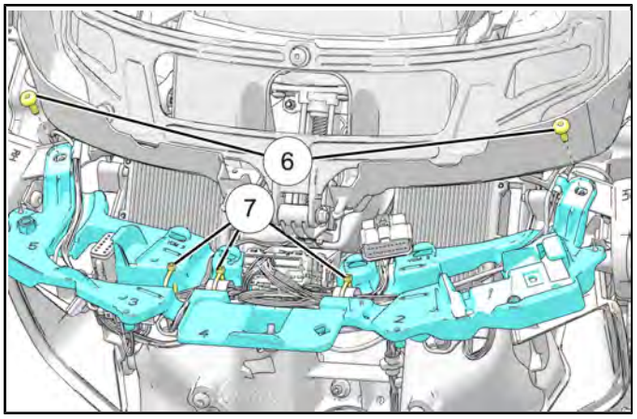
6. Disconnect all electrical connection from TCU, including the antenna module.

IMPORTANT
Do not remove the antenna module.

7. Remove TCU.
8. Remove GCM fastener⑤.



9. Remove GCM.
10. Remove fairing tray fasteners ⑥, and cut cable ties ⑦ at the retention points.

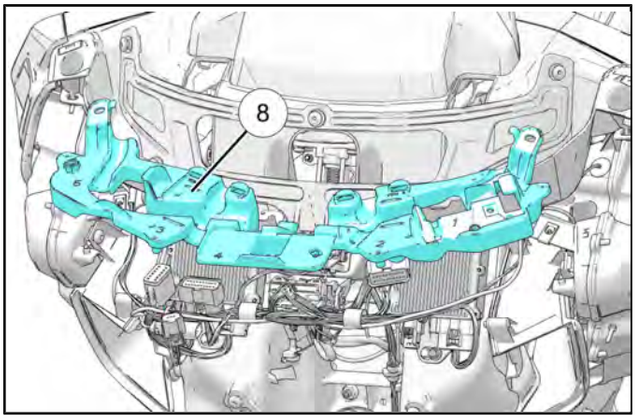


11. Pull fairing wiring harness cables out through the center of the fairing support bracket.

IMPORTANT
Take note of routing locations and make sure all cables are pulled through the fairing support bracket before continuing.

12. Carefully remove the fairing harness from the front fairing.

13. Remove the fairing tray.



14. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Fairing Tray Fastener ⑨: **35 in-lbs (4 N·m)**

TORQUE
VCM2 Fastener ③: **15 in-lbs (2 N·m)**

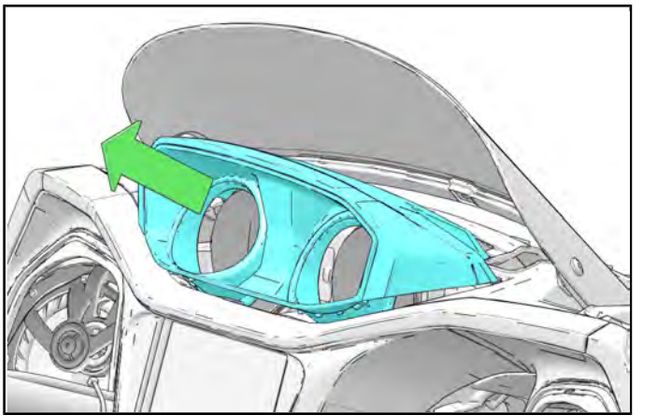
TORQUE
VCM3 Fastener ③: **15 in-lbs (2 N·m)**

TORQUE
TCU Fastener ⑤ **15 in-lbs (2 N·m)**

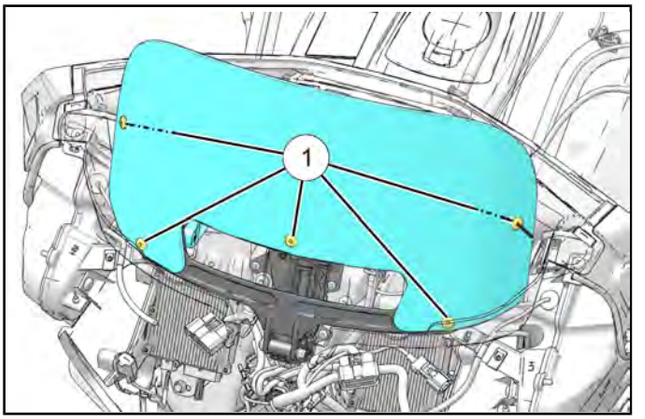
TORQUE
GCM Fastener ⑤ **15 in-lbs (2 N·m)**

VISOR TOP

1. Push up at the top rear of the gauge hood and remove.

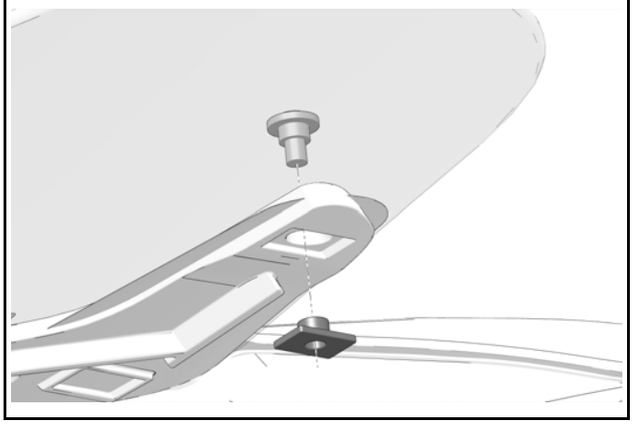


2. Remove windshield by removing its fasteners ①.

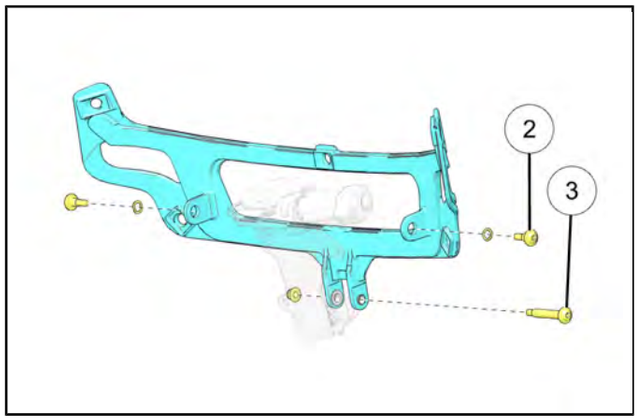


NOTICE

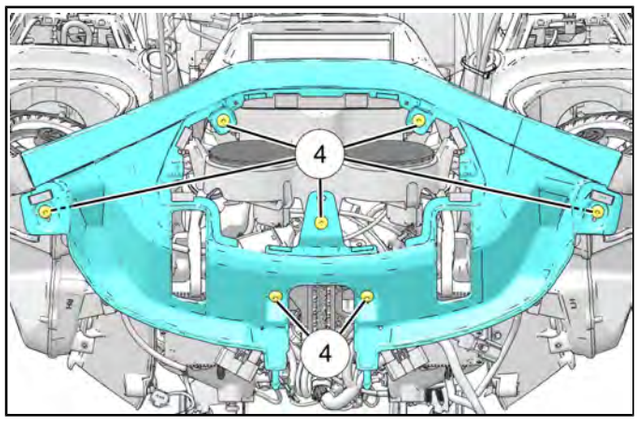
When removing the five windshield fasteners be sure to capture the T-nuts as they are not captive.



3. Remove windshield support by removing link fasteners ② and wave washers, which must be kept for reinstallation.



4. Remove windshield support to windshield motor fastener ③.
5. Remove fasteners ④ securing visor top.



6. Disconnect the visor top from its four trim clips by gently prying the visor top off the unit and remove.
7. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Visor Top Fastener ④: **35 in-lbs (4 N·m)**

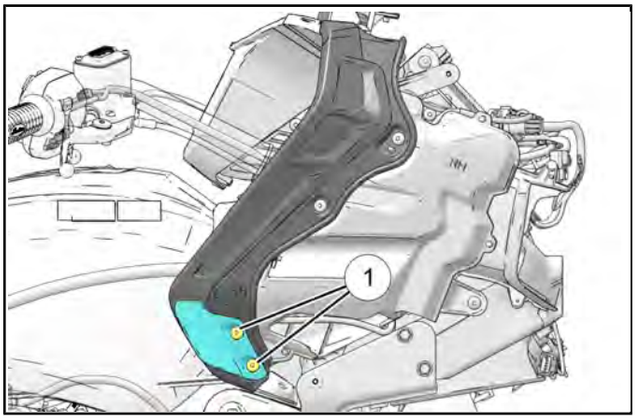
TORQUE
Windshield Support to Link Fastener ②: **88 in-lbs (10 N·m)**

TORQUE
Windshield Support to Motor Fastener ③: **88 in-lbs (10 N·m)**

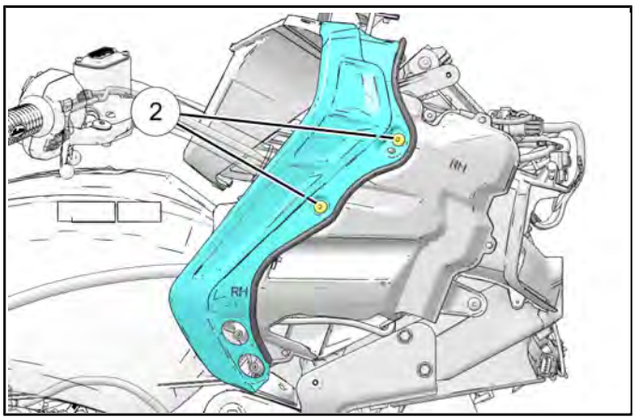
TORQUE
Windshield Fastener ①: **35 in-lbs (4 N·m)**

DASH TRIM

1. Remove fasteners ① securing air deflector.



2. Remove dash trim fasteners ②.



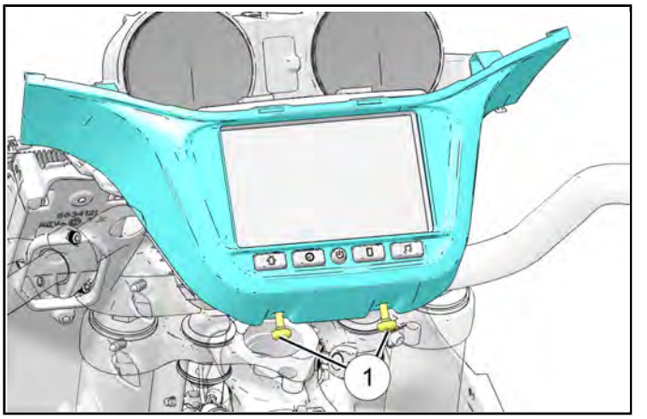
3. Pull on the dash trim to release it from the retention feature.
4. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Dash Trim Fastener ②: **35 in-lbs (4 N·m)**

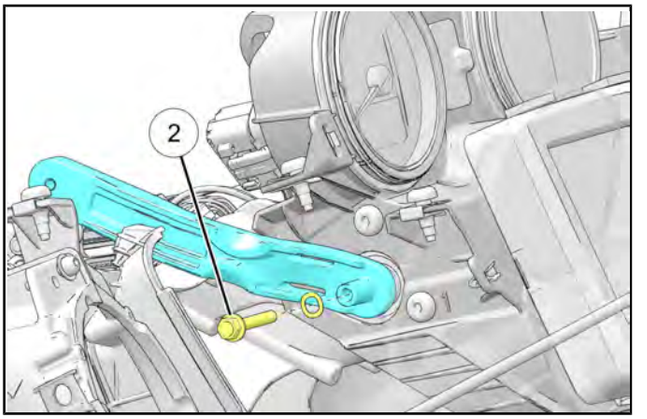
TORQUE
Air Deflector Fastener ①: **35 in-lbs (4 N·m)**

DASH SUPPORT ASSEMBLY

1. Remove display bezel by removing its fasteners ①.



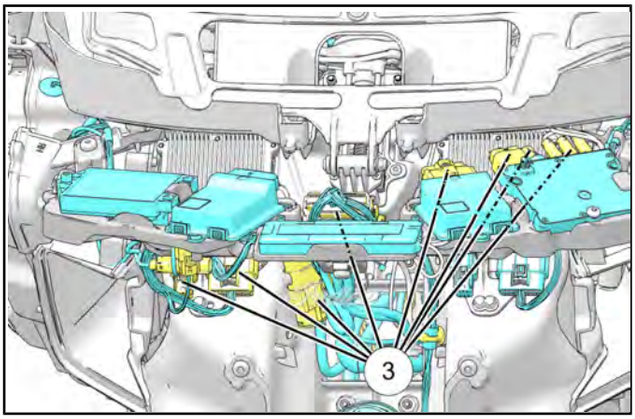
2. Remove the windshield link by removing its fastener ②. Repeat step for remaining side.

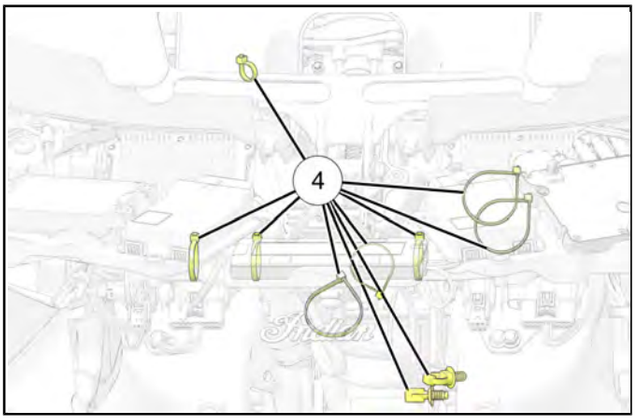


3. Disconnect the harness electrical connectors ③ and disconnect the routing clips ④.

IMPORTANT

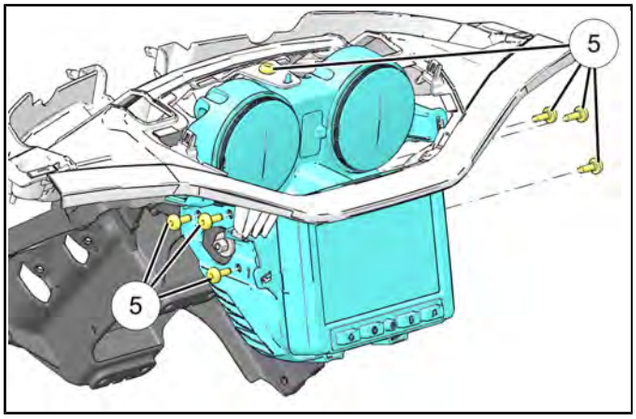
Disconnect the ground fairing harness connector before continuing.



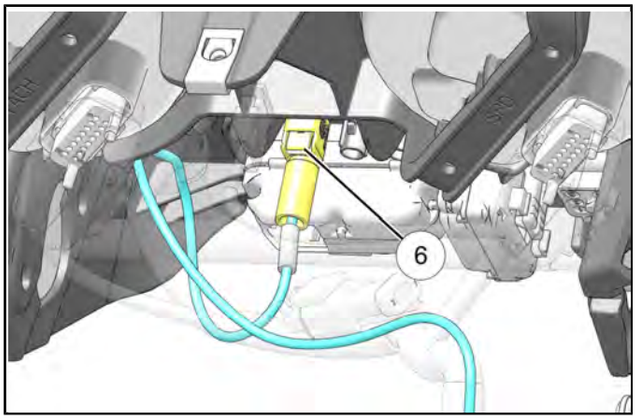


4. Disconnect harness retention clips from fairing bracket.
5. Disconnect electrical ground terminal fastener from the fairing bracket.
6. Remove ground terminal fastener from fairing bracket.

7. Remove the dash support assembly fasteners ⑤.



8. Remove the dash support assembly with the wiring harness. Upon removal, disconnect the antenna electrical connector ⑥ from the back of the display.



9. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Dash Support Assembly Fastener ⑤: **88 in-lbs (10 N·m)**

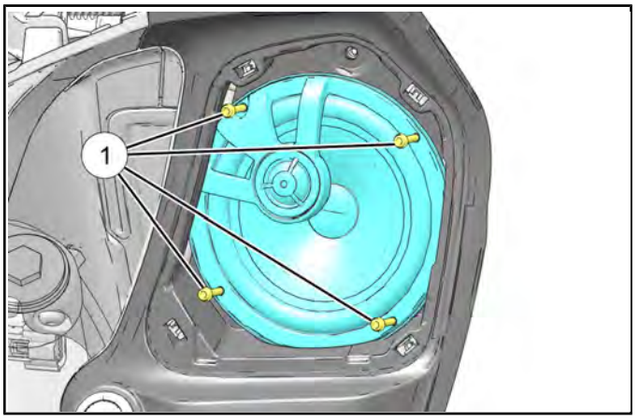
TORQUE
Windshield Link to Pivot Fastener ②: **88 in-lbs (10 N·m)**

TORQUE
Display Bezel Fastener ①: **35 in-lbs (4 N·m)**

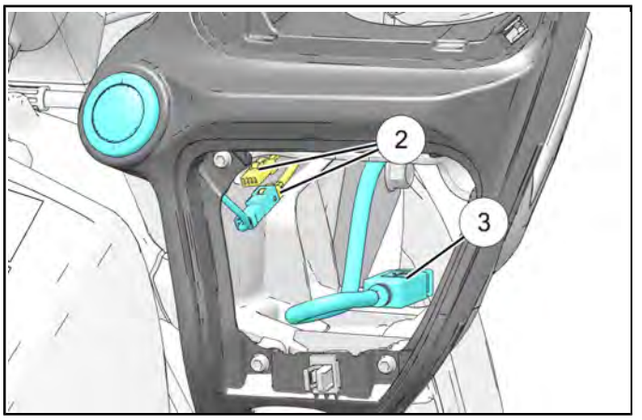
7

RIGHT HAND DASH

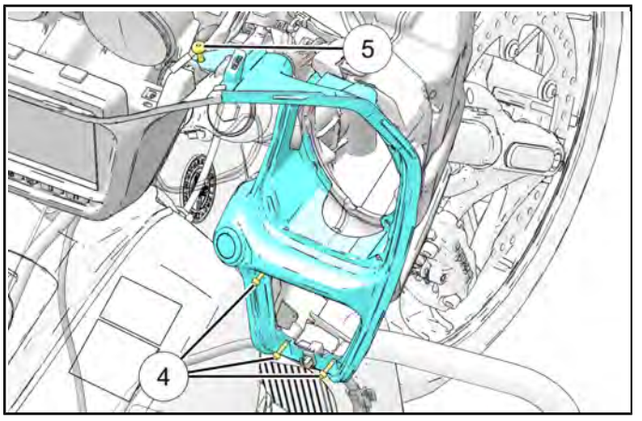
1. Remove fasteners ① securing speaker.



2. Disconnect speaker electrical connector upon removal.
3. Disconnect electrical connectors ②.



4. Route the USB charger ③ to its point of origin.
5. Remove the lower right hand dash fasteners ④ and upper dash fastener ⑤.



6. Remove the right hand dash.
7. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

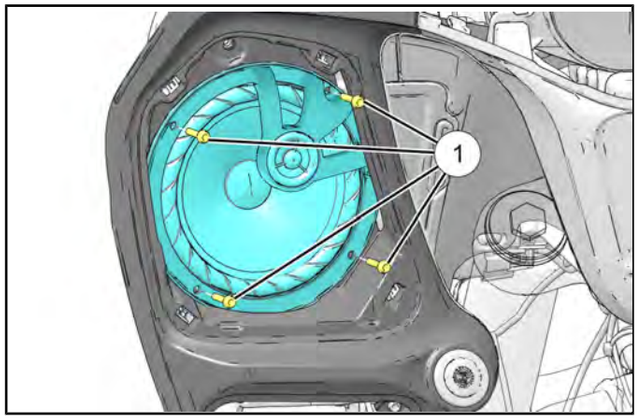
TORQUE
Right/Left Dash Fastener ④: **35 in-lbs (4 N·m)**

TORQUE
Upper Dash Fastener ⑤: **88 in-lbs (10 N·m)**

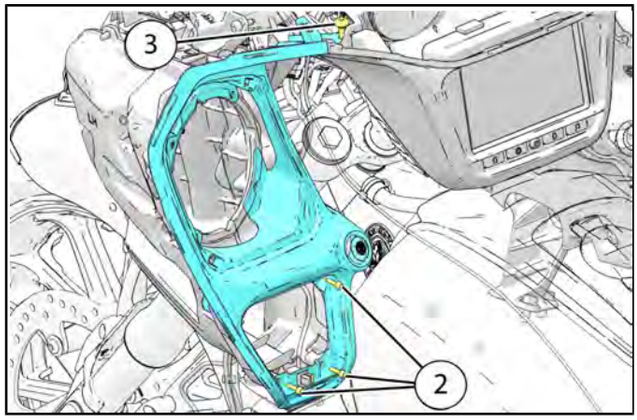
TORQUE
Speaker Fastener ①: **25 in-lbs (3 N·m)**

LEFT HAND DASH

1. Remove fasteners ① securing speaker.



2. Disconnect speaker electrical connector upon removal.
3. Remove the lower left hand dash fasteners ② and upper dash fastener ③.



4. Remove the left hand dash.
5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

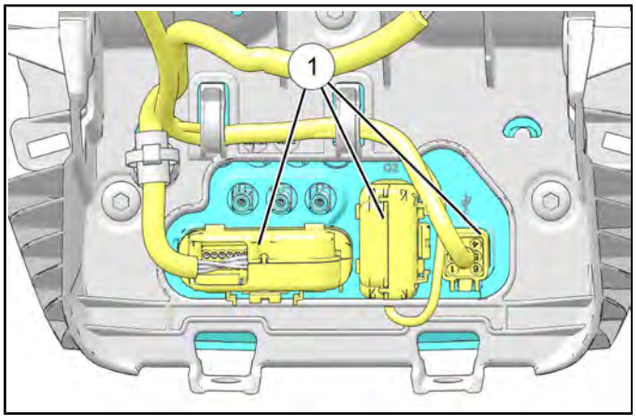
TORQUE
Right/Left Dash Fastener ②: **35 in-lbs (4 N·m)**

TORQUE
Upper Dash Fastener ③: **35 in-lbs (4 N·m)**

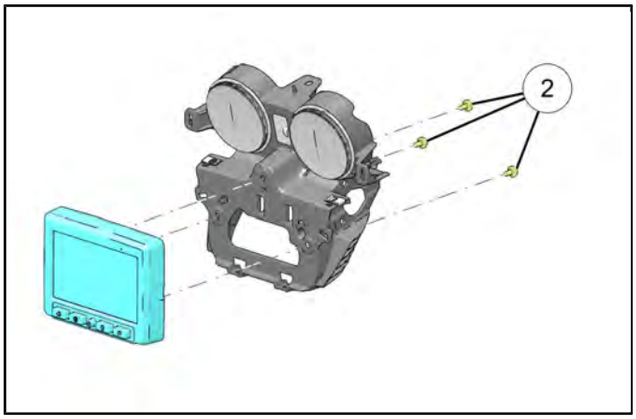
TORQUE
Speaker Fastener ①: **25 in-lbs (3 N·m)**

DASH

1. Disconnect electrical connectors ①.

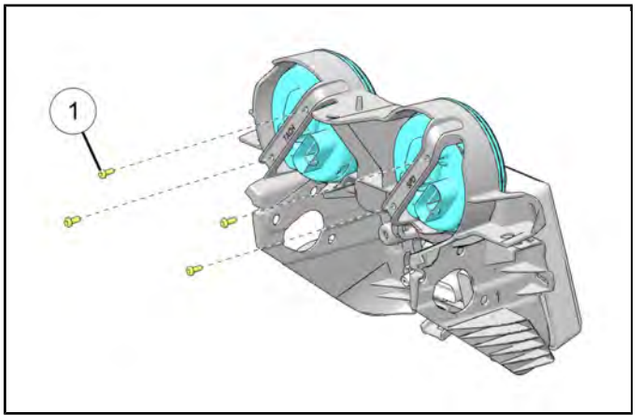


2. Remove fasteners ② securing Ride Command Display to the dash support.



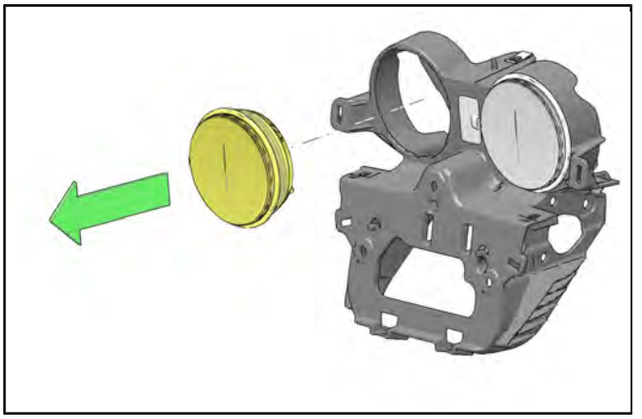
TACHOMETER / SPEEDOMETER

1. Disconnect the speedometer electrical connection if not already done so.
2. Remove speedometer and tachometer fasteners ①



7

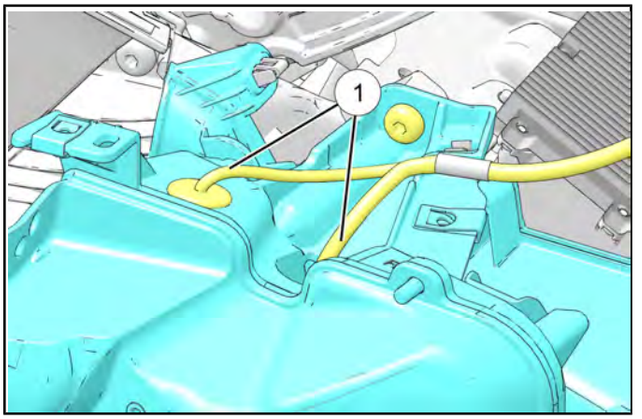
3. Remove speedometer by gently prying it out of the dash support.



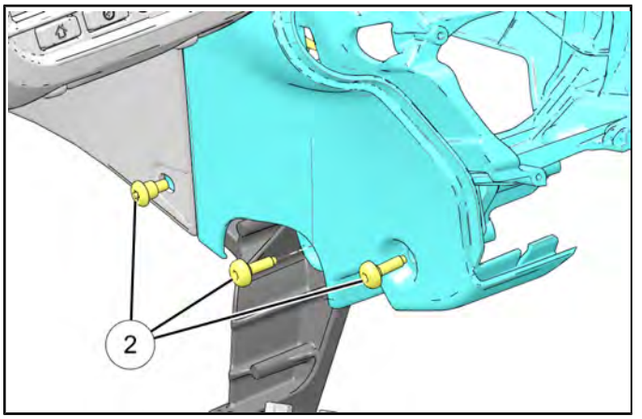
4. Remove the rubber grommet from the dash support.

ENCLOSURE DUCT ASSEMBLY

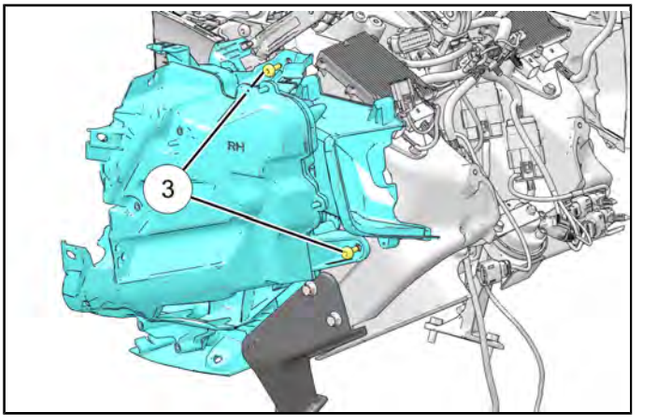
1. Remove the wiring harness ① from the enclosure duct.



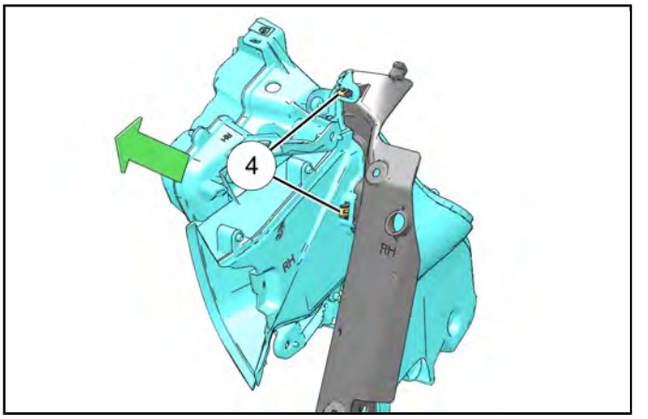
2. Remove lower close off fasteners ② from fairing support.



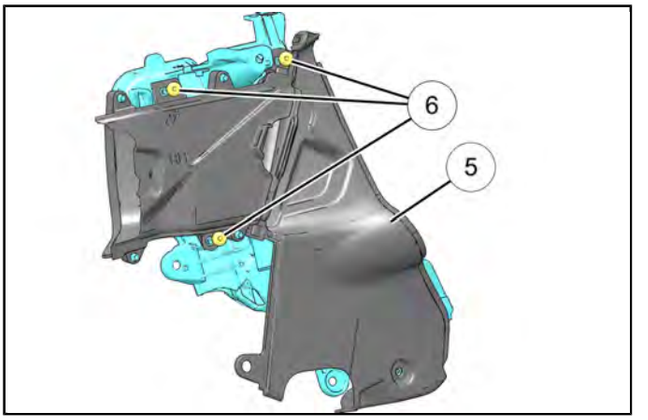
3. Remove enclosure duct fasteners ③.



4. Pull up on the enclosure duct assembly to remove it from its retention features ④.



5. With the assembly removed, the outer duct ⑤ can be removed by removing its fasteners ⑥.



6. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

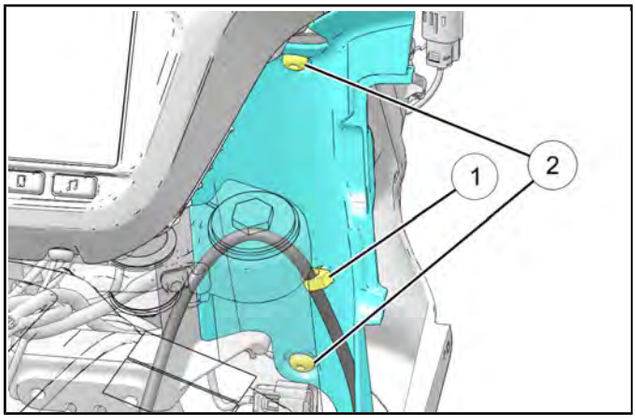
TORQUE
Outer Duct Fastener ⑥: **35 in-lbs (4 N·m)**

TORQUE
Enclosure Fastener ③: **35 in-lbs (4 N·m)**

TORQUE
Dash Closeout Fastener ②: **35 in-lbs (4 N·m)**

DASH CLOSEOUT

1. Remove dash closeout fasteners ② and remove.

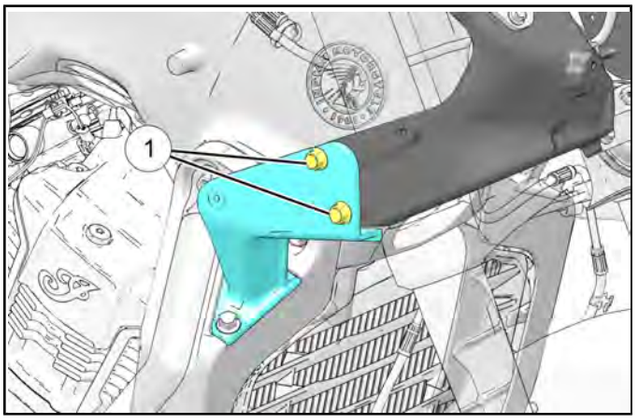


2. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

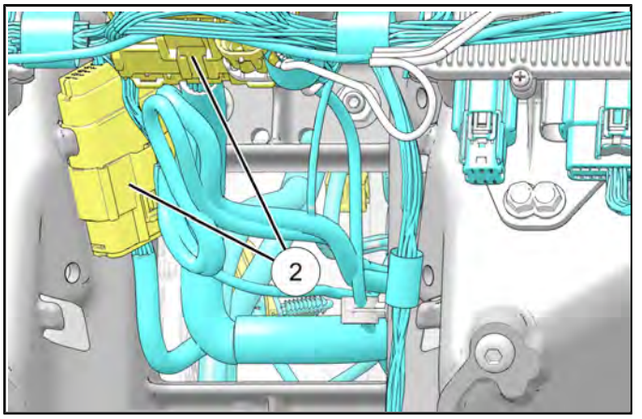
TORQUE
Dash Closeout Fastener ②: **35 in-lbs (4 N·m)**

FAIRING BRACKET

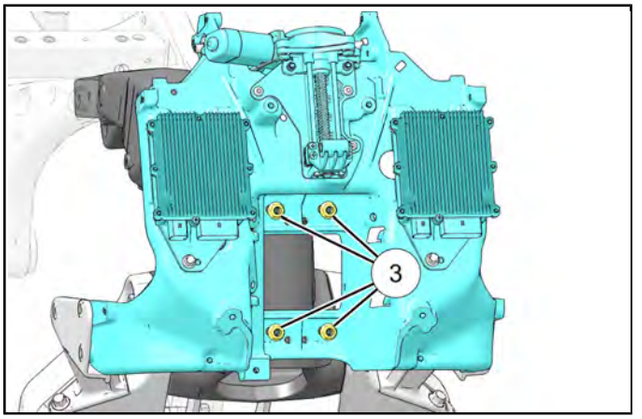
1. Remove fasteners ① securing fairing support to fairing bracket. Repeat step for remaining side.



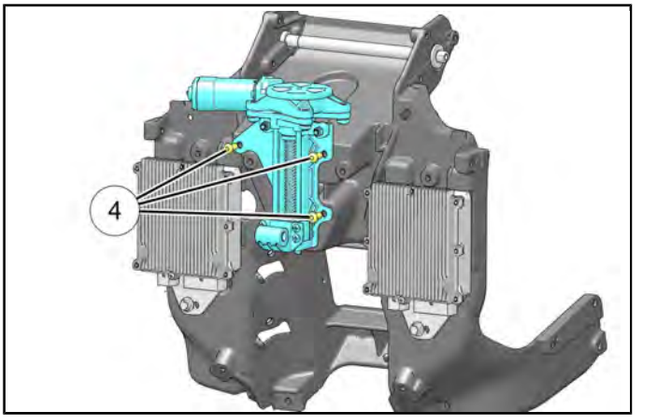
2. Route the harness electrical connectors ② through the opening in the fairing bracket.



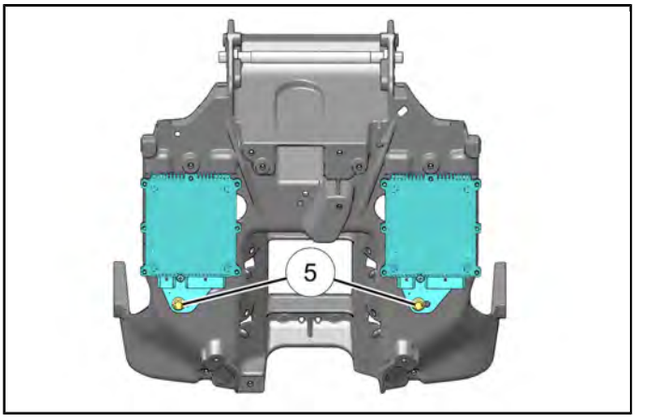
3. Remove nuts ③ securing fairing bracket to frame.



4. Remove windshield motor by removing its fasteners ④.



5. Remove power supply by removing its fastener ⑤.



6. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Power Supply Fastener ⑤: **88 in-lbs (10 N·m)**

TORQUE
Windshield Motor Fastener ④: **88 in-lbs (10 N·m)**

TORQUE
Fairing Bracket Nut ③: **18 ft-lbs (24 N·m)**

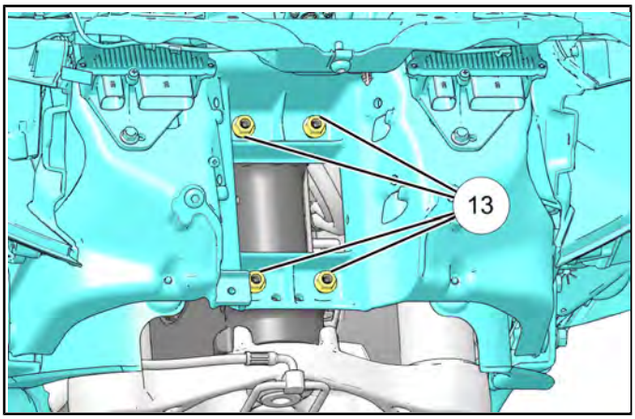
TORQUE
Fairing Support to Fairing Bracket Fastener ①: **18 ft-lbs (24 N·m)**

FAIRING ASSEMBLY AND INSTALLATION (CHASSIS MOUNTED)

NOTICE
Place the power windshield in the FULL UP position prior to fairing installation.

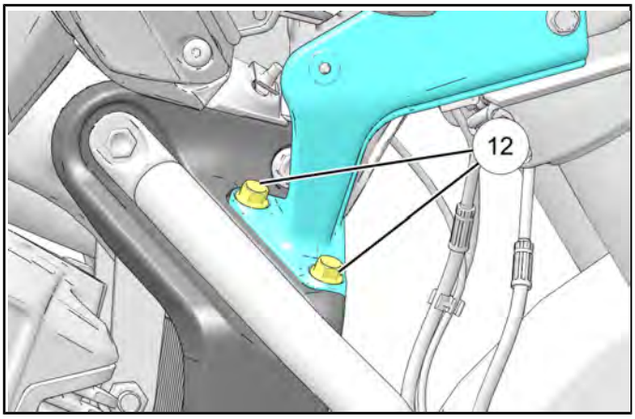
FAIRING BRACKET

1. Install fairing assembly from the unit.
2. Install fairing bracket fasteners ⑬.



TORQUE
Fairing Bracket Nut: **18 ft-lbs (24 N·m)**

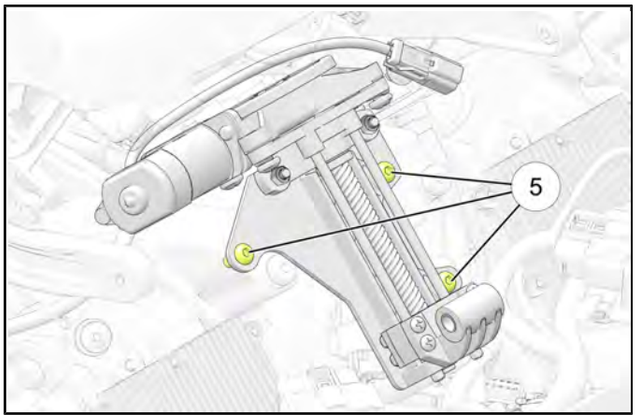
3. Install four fairing support fasteners ⑫. Repeat step for opposite side.



TORQUE
Fairing Support To downcast Fastener: **18 ft-lbs (24 N·m)**

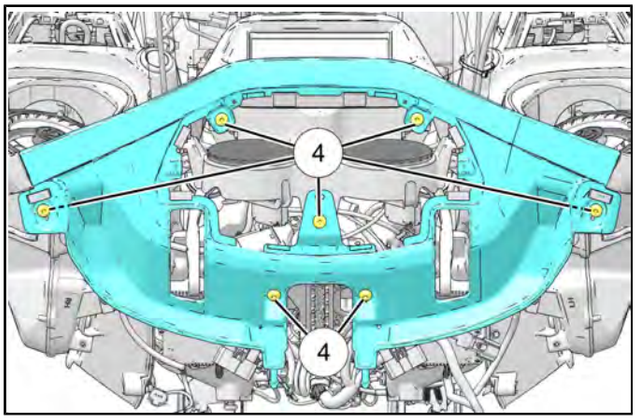
VISOR TOP & WINDSHIELD

1. If the limiter switch is being replaced, attach the switch to the motor assembly at this time.
2. Plug the electrical connector into the windshield lift motor assembly and lower into position.
3. Install motor fasteners ⑤ and torque to specification.



TORQUE
Windshield Motor Fasteners: **88 in-lbs (10 N·m)**

4. Install windshield support and seven fasteners ④. Torque fasteners to specification.

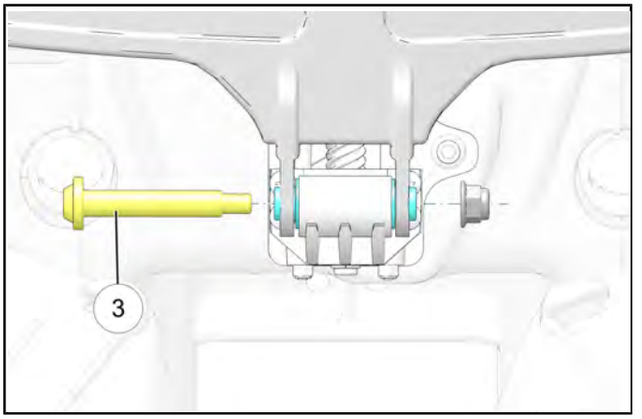


TORQUE
Windshield Support to Motor Fasteners: **88 in-lbs (10 N·m)**

TORQUE
Windshield Fasteners: **35 in-lbs (4 N·m)**

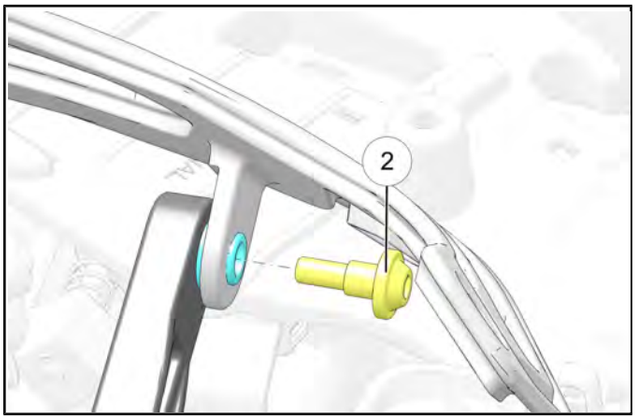
7

5. For FMF, move motor to the upper position before continuing.
6. Loosely install windshield support to windshield motor fastener ③.



NOTICE
Make sure the spacers are retained in place between the bracket and windshield motor during installation.

7. Install wave washer, then loosely install windshield support to link fasteners ②.

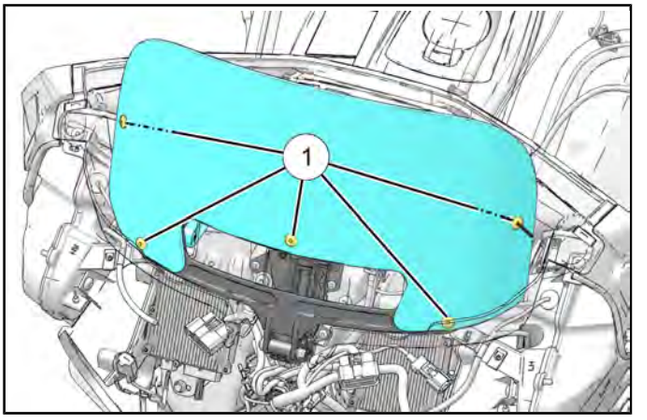


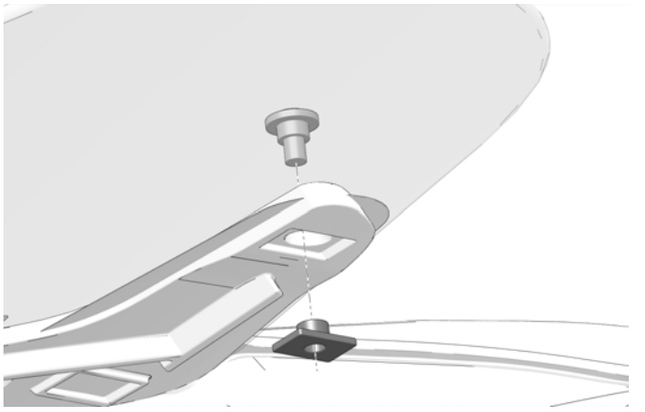
NOTICE
Make sure the spacer is retained in place between the bracket and support link during installation.

8. Torque fasteners windshield support to link fasteners .

TORQUE
Windshield Support to Link Fasteners ②: **88 in-lbs (10 N·m)** Windshield Support to Motor Fastener ③: **88 in-lbs (10 N·m)**

9. Install the windshield, T-nuts and its fasteners ①.





TORQUE
Windshield Fastener: **35 in-lbs (4 N·m)**

10. Verify the windshield moves up and down through the travel range.

TACHOMETER / SPEEDOMETER

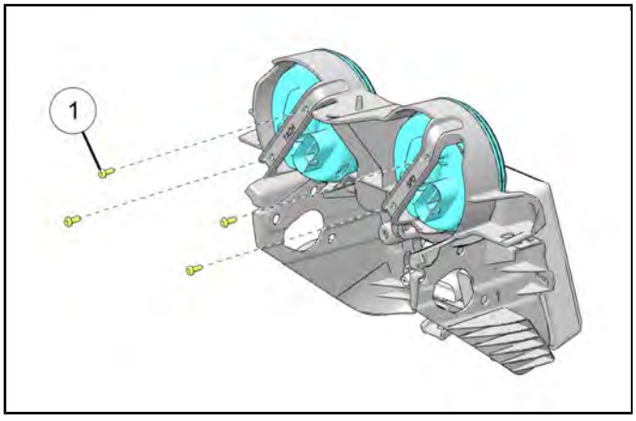
1. Install the rubber grommet into the dash support. Ensure the clocking feature is aligned with the dash support.

2. Using a small amount of soapy water, lubricate the rubber grommet.

3. Insert the speedometer into the dash support. Ensure the clocking feature is aligned with the rubber grommet.

4. Ensure the speedometer is properly aligned and secure.

5. Remove speedometer and tachometer fasteners ①

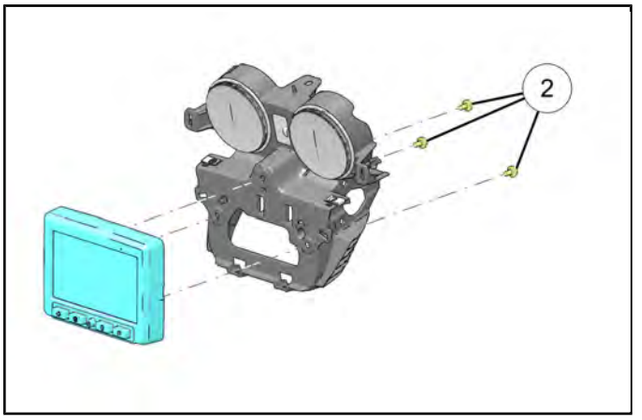


TORQUE
9 in-lbs (1 N·m)

7

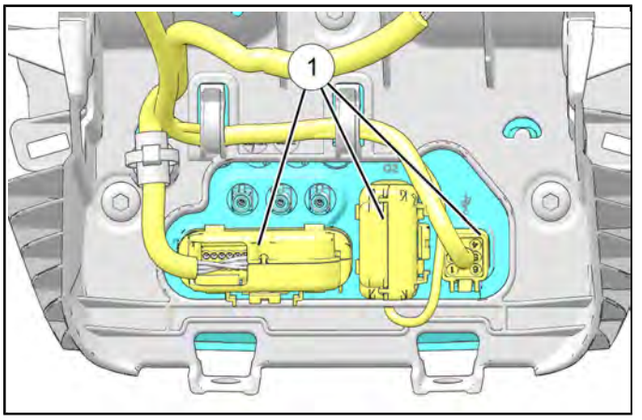
DISPLAY

1. Install fasteners ② to secure Ride Command Display to the dash support.



TORQUE
Ride Command Display Fastener: **35 in-lbs (4 N·m)**

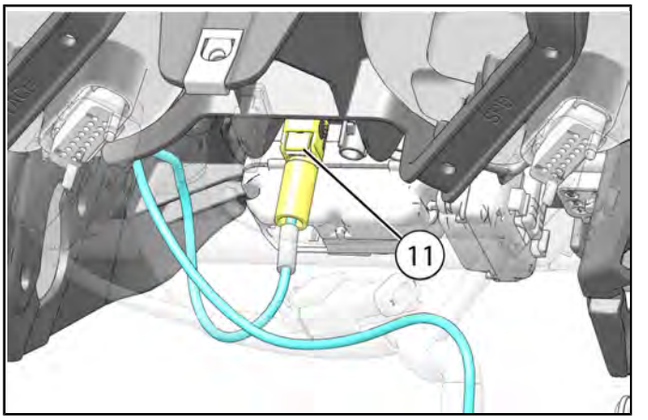
2. Connect electrical connectors ①.



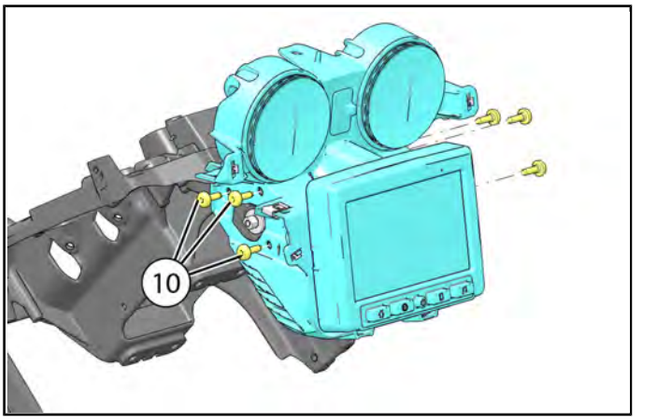
DASH

1. Reinstall cable ties and route the antenna electrical connector through the fairing bracket opening.

2. Lift the up the assembly to access the antenna electrical connector ⑪ and connect.



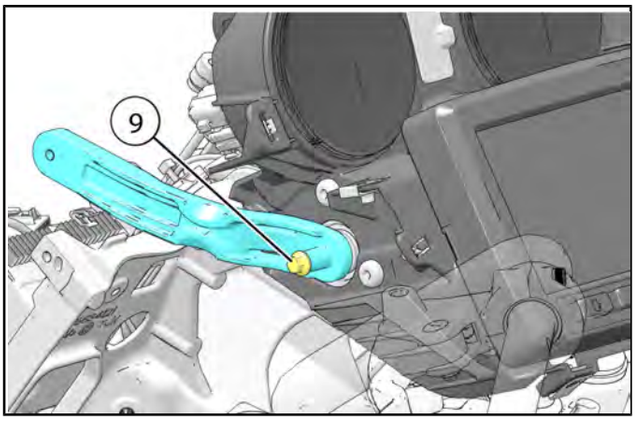
3. Install the dash support assembly fasteners ⑩.



TORQUE
Dash Support Fasteners: **88 in-lbs (10 N·m)**

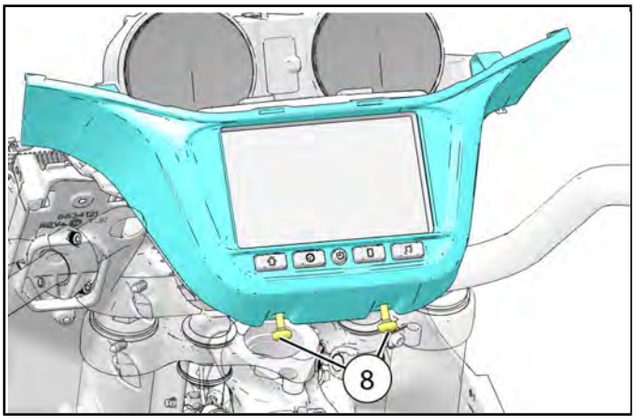
4. Install the windshield link by installing its fastener ⑨. Repeat step for remaining side.

IMPORTANT
Install the wave washers between the link and the fairing casting.



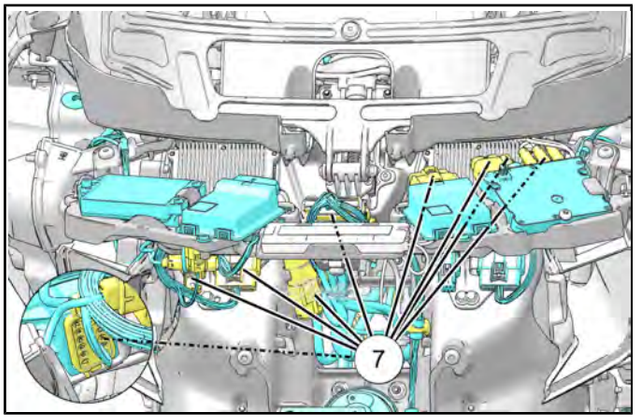
TORQUE
Windshield Support to Link Fastener : **88 in-lbs (10 N·m)**

5. Install display bezel by removing its fasteners ⑧.



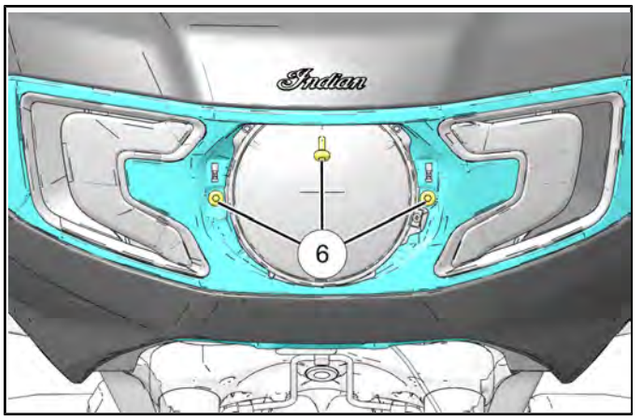
TORQUE
Display Bezel Fastener: **35 in-lbs (4 N·m)**

6. Connect the electrical connections ⑦



OUTER FAIRING

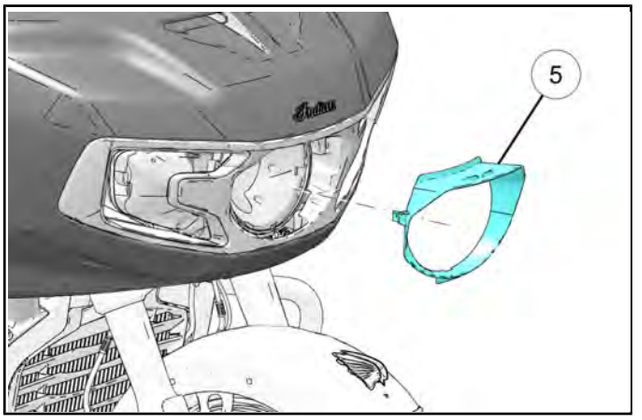
1. Install Visor top. Reference **Power Windshield Motor, Installation page 10.165**
2. Carefully move the outer fairing backward and connect the headlight and turn signal electrical connection.
3. Install outer fairing fasteners ⑥.



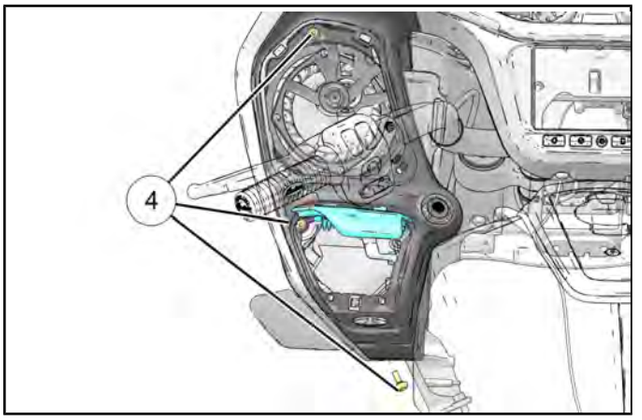
TORQUE
Headlight Bezel Assembly Fastener : **35 in-lbs (4 N·m)**

7

4. Install headlight bezel ⑤ by snapping in at the top center to connect the and then push in to secure the side body clips.

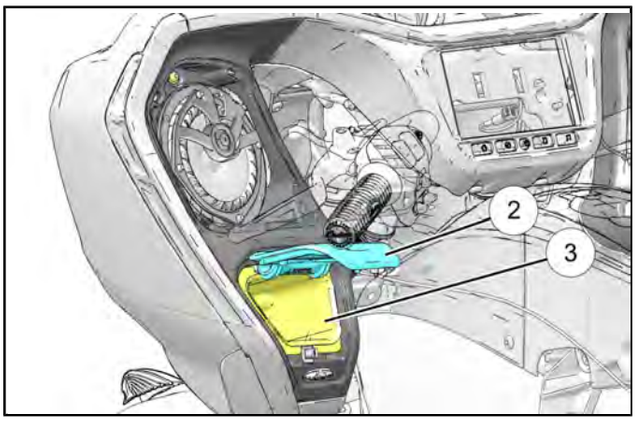


5. Install outer fairing fasteners ④.

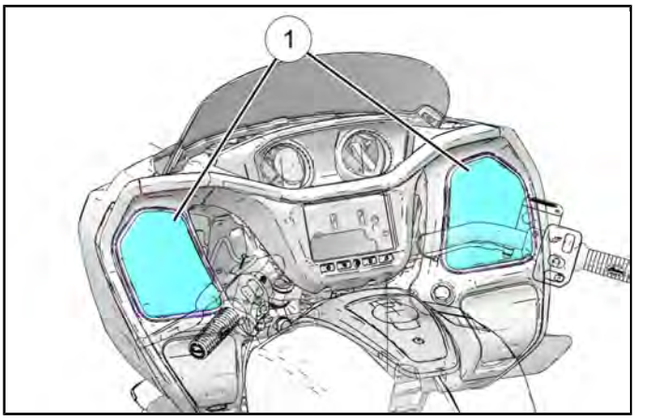


TORQUE
Outer Fairing Fastener: **35 in-lbs (4 N·m)**

6. Open storage door ② and install storage liner ③.



7. Repeat steps 14–15 for the remaining side.
8. Carefully install speaker bezels ①.

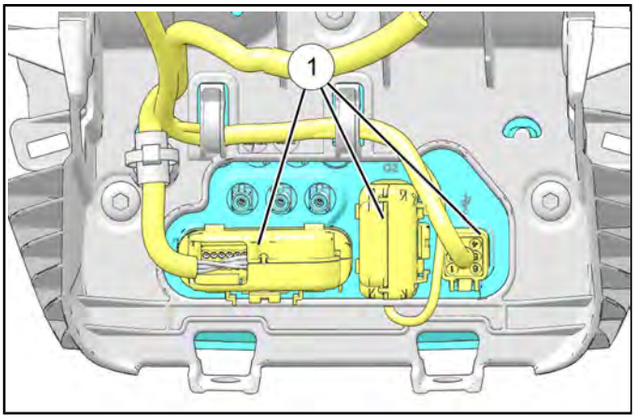


COMMON

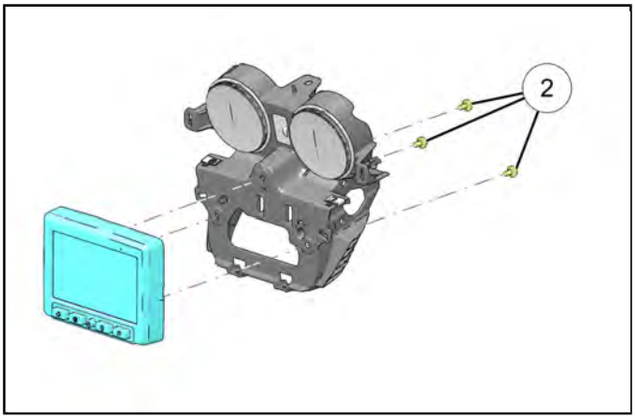
RIDE COMMAND DISPLAY REMOVAL

CMF

1. Remove dash support assembly. Reference **Fairing Disassembly page 7.63**.
2. Disconnect electrical connectors ①.

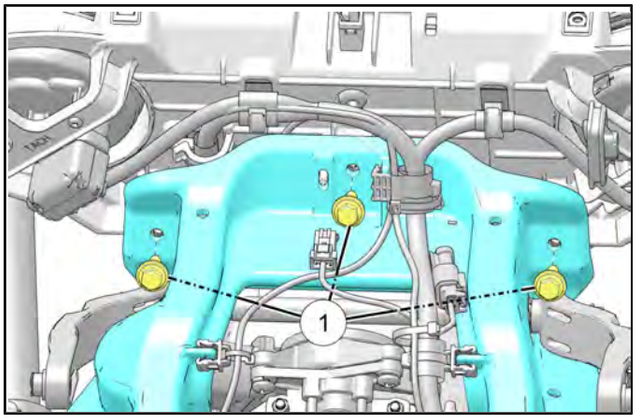


3. Remove fasteners ② securing Ride Command Display to the dash support.

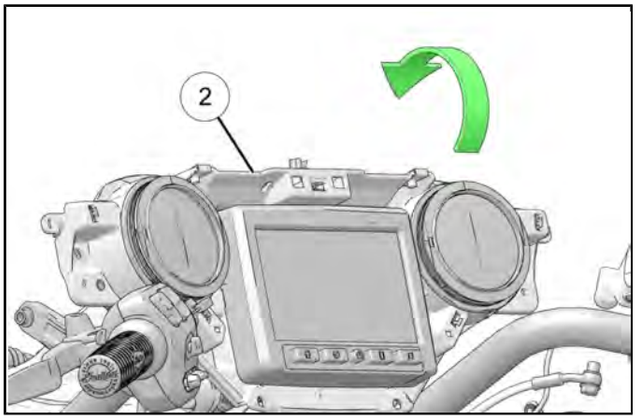


FMF

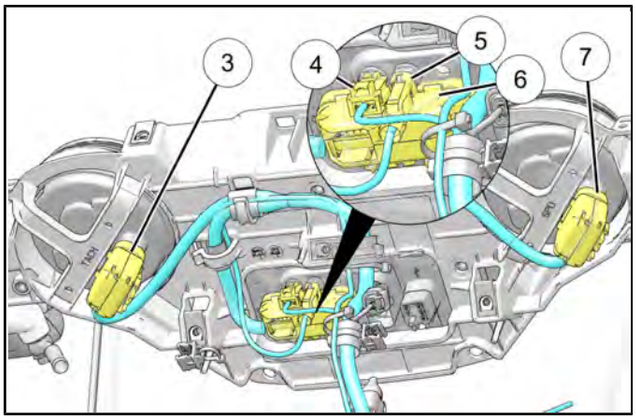
1. Remove outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**
2. Remove dash support fasteners ① from the fairing support.



3. Carefully rotate the dash and dash support ② vertically to access the electrical connections.

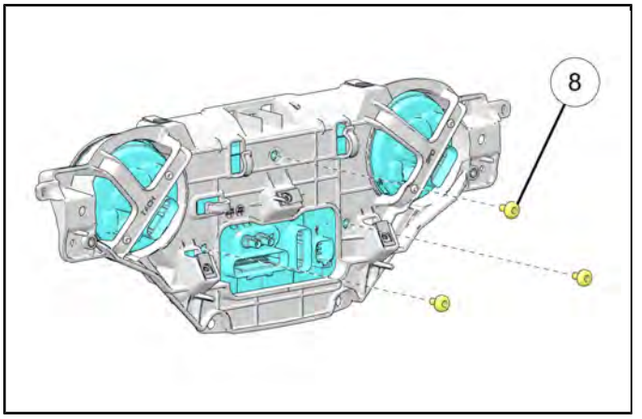


4. Disconnect the tachometer connector ③, TCU connector ④, antenna connector ⑤, dash display connector⑥, and speedometer connector ⑦.

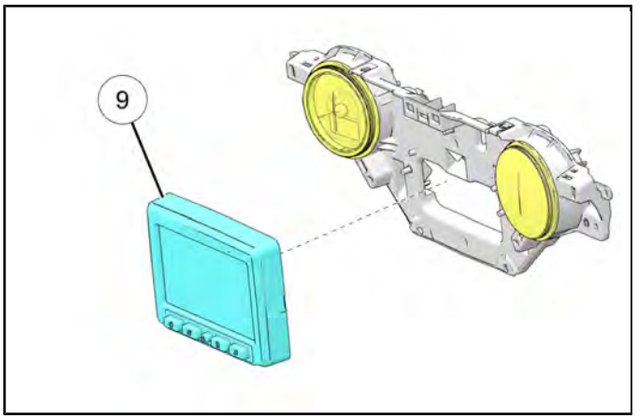


7

5. Remove the display fasteners ⑧.



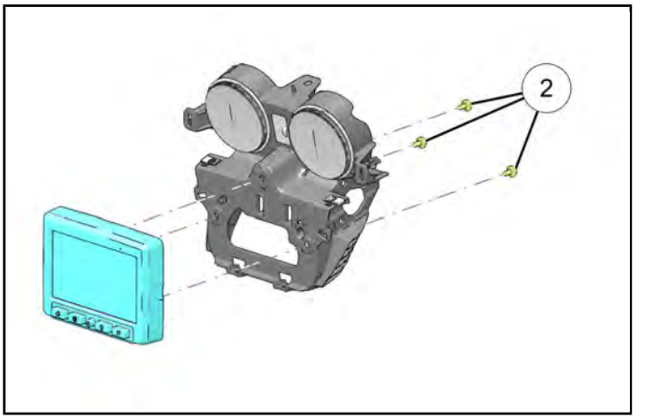
6. Remove the dash display ⑨ from the dash support.



RIDE COMMAND DISPLAY INSTALLATION

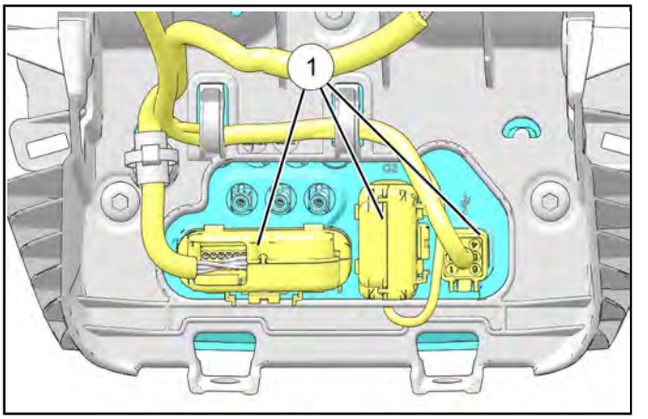
CMF

1. Install fasteners ② to secure Ride Command Display to the dash support.



TORQUE
Ride Command Display Fastener: **35 in-lbs (4 N·m)**

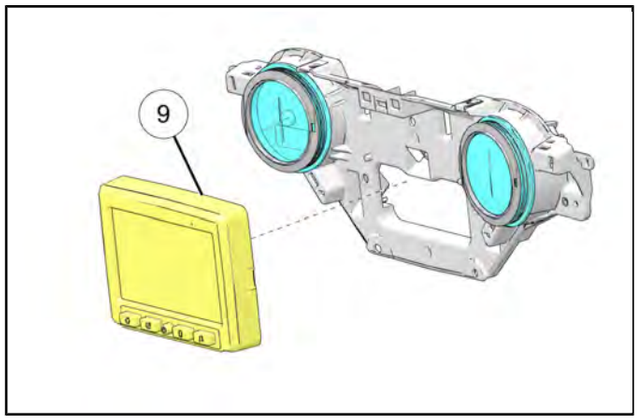
2. Connect electrical connectors ①.



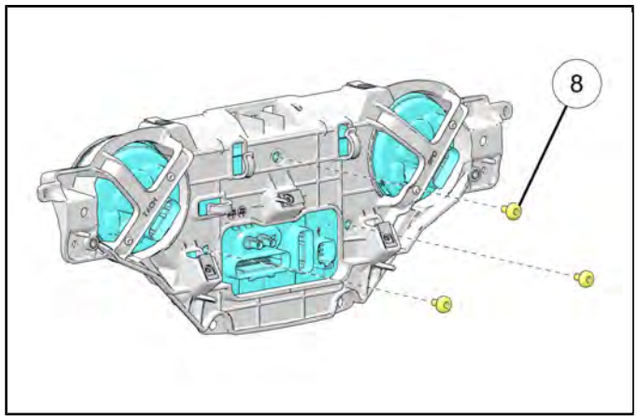
3. Install dash support assembly. Reference **Fairing Assembly and Installation (Chassis Mounted) page 7.75**.

FMF

1. Install the dash display ⑨ onto the dash support.

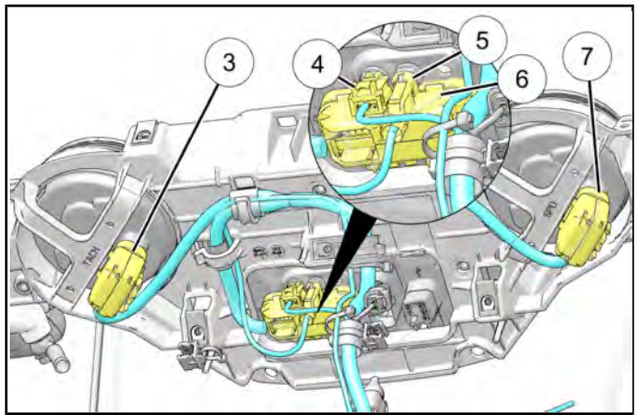


2. Install the display fasteners ⑧.

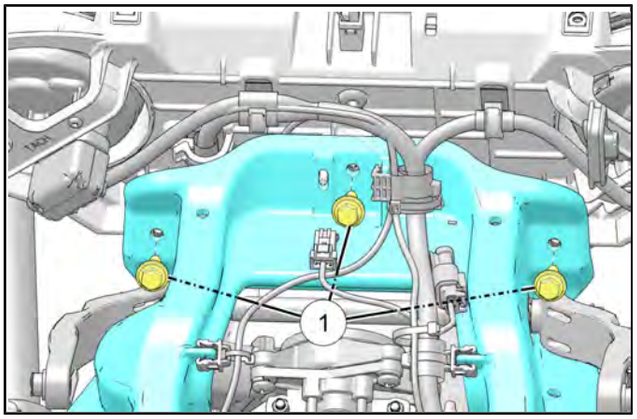


TORQUE
Ride Command Display Fastener: **35 in-lbs (4 N·m)**

3. Connect the tachometer connector ③, TCU connector ④, antenna connector ⑤, dash display connector⑥, and speedometer connector ⑦.



4. Install dash support fasteners ① from the fairing support.



TORQUE
Dash Support Fastener ①: **88 in-lbs (10 N·m)**

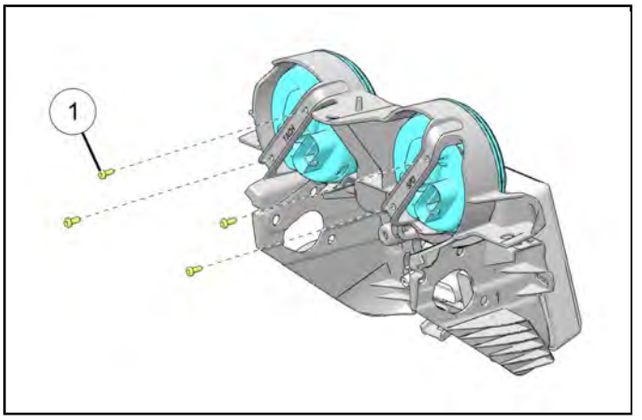
7

SPEEDOMETER / TACHOMETER REMOVAL

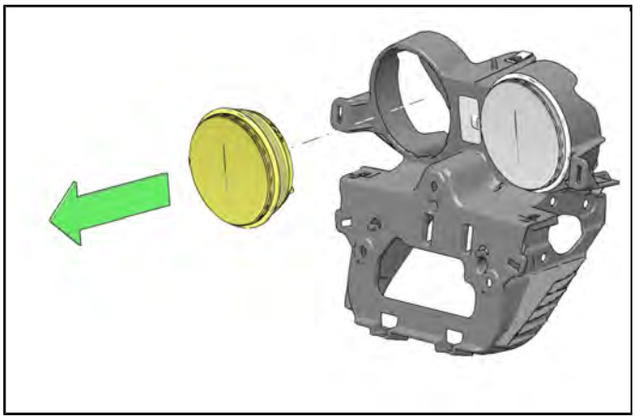
IMPORTANT
Speedometer replacement is being shown. Tachometer replacement can be done by following the same procedure.

CMF

1. Disconnect the speedometer electrical connection if not already done so.
2. Remove hood gauge. Reference **Fairing Disassembly page 7.63**.
3. Remove speedometer and tachometer fasteners ①



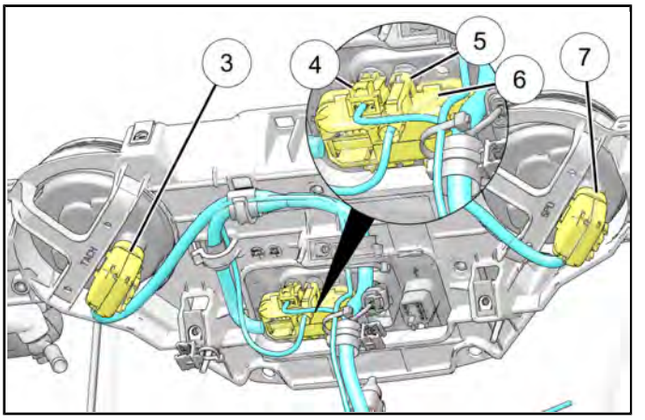
4. Remove speedometer by gently prying it out of the dash support.



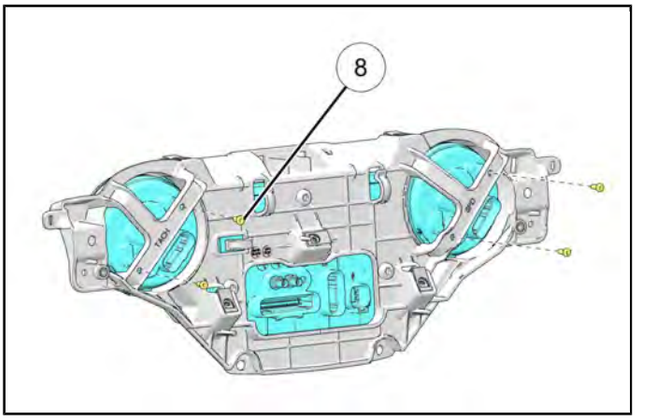
5. Remove the rubber grommet from the dash support.

FMF

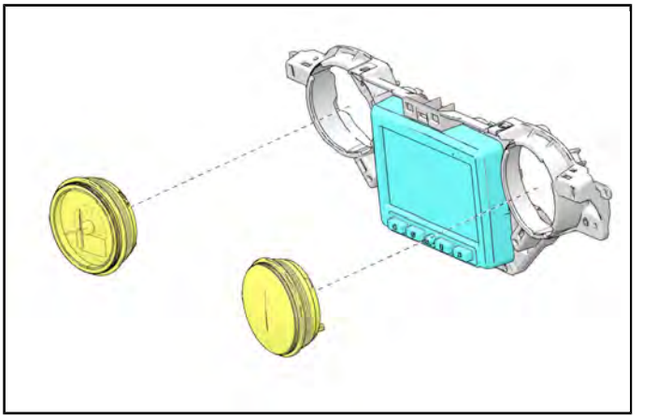
1. Remove outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**
2. Disconnect the tachometer connector ③, TCU connector ④, antenna connector ⑤, dash display connector⑥, and speedometer connector ⑦.



3. Remove the gauge fasteners ⑧.



4. Remove tachometer and speedometer by gently prying it out of the dash support.



5. Reinstall outer fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

SPEEDOMETER / TACHOMETER INSTALLATION

IMPORTANT
Speedometer replacement is being shown. Tachometer replacement can be done by following the same procedure.

CMF

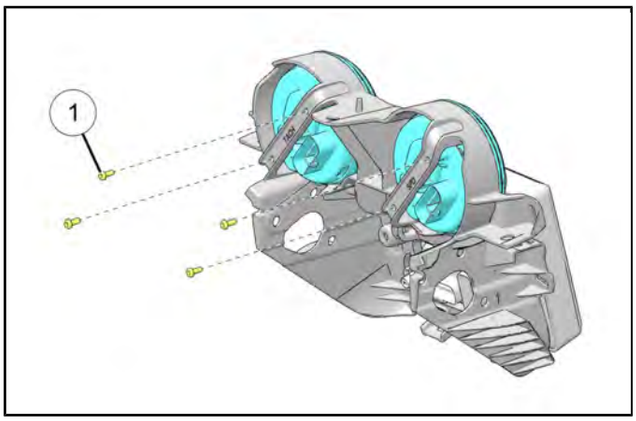
1. Install the rubber grommet into the dash support. Ensure the clocking feature is aligned with the dash support.

2. Using a small amount of soapy water, lubricate the rubber grommet.

3. Insert the speedometer into the dash support. Ensure the clocking feature is aligned with the rubber grommet.

4. Ensure the speedometer is properly aligned and secure.

5. Install speedometer and tachometer fasteners ①

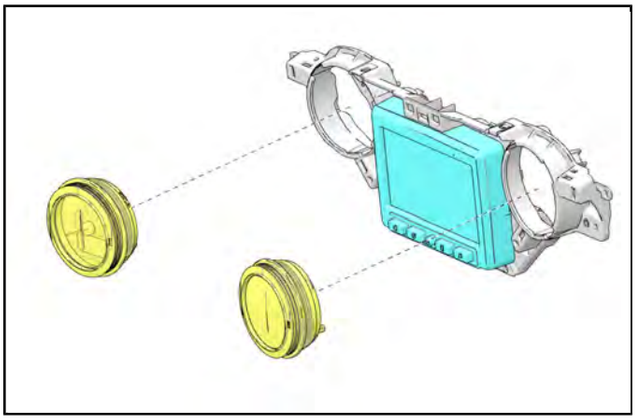


TORQUE
9 in-lbs (1 N·m)

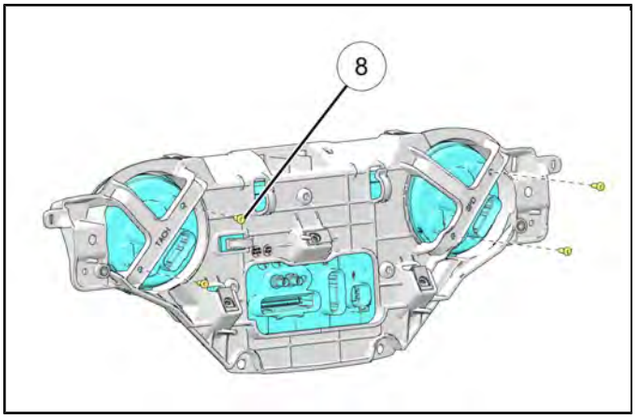
7

FMF

1. Install tachometer and speedometer by gently inserting it into the dash support.

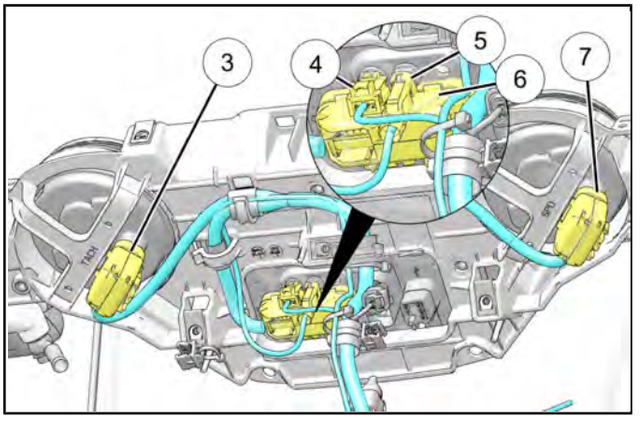


2. Install the gauge fasteners ⑧.



TORQUE
9 in-lbs (1 N·m)

3. Connect the tachometer connector ③, TCU connector ④, antenna connector ⑤, dash display connector⑥, and speedometer connector ⑦.



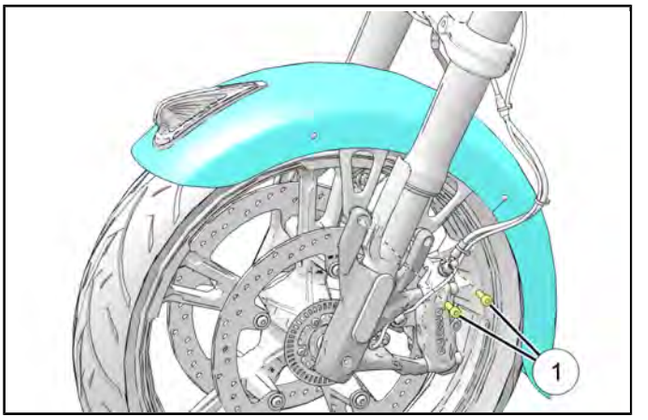
FRONT FENDER REMOVAL

NOTICE
Motorcycle should be parked on a level surface resting on the side stand.

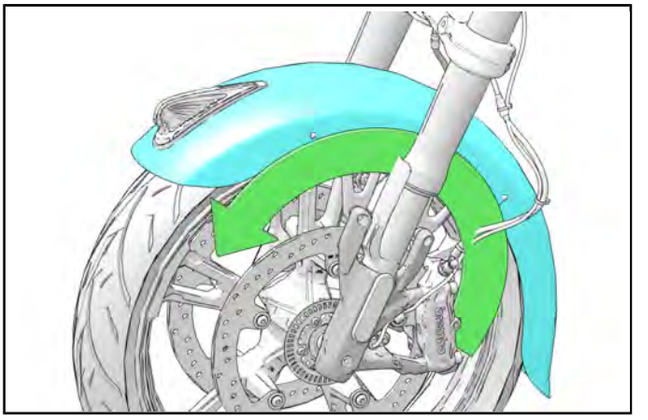
⚠ CAUTION
Use care not to scratch or damage painted surfaces during fender removal and / or installation.

REMOVAL

1. Remove fasteners ① from each side of the motorcycle securing the fender.



2. Follow the fender light harness up into the fairing, locate the connector and disconnect.
3. Rotate the fender forward and remove.



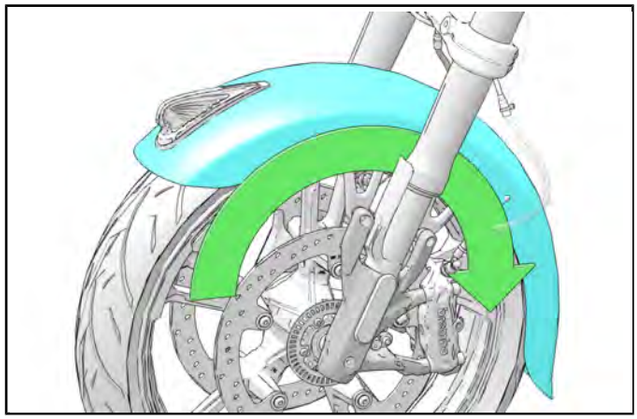
FRONT FENDER INSTALLATION

INSTALLATION

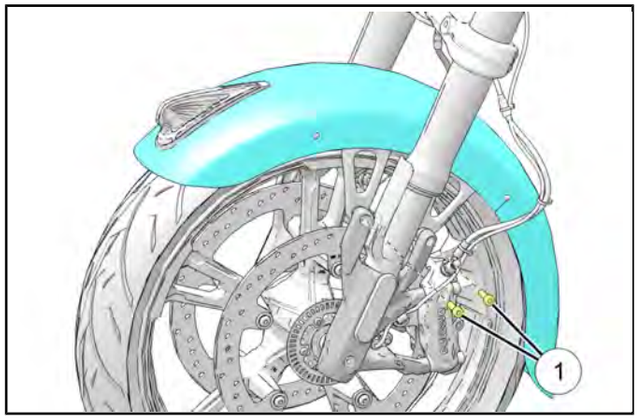
NOTICE
Motorcycle should be parked on a level surface resting on the side stand.

⚠ CAUTION
Use care not to scratch or damage painted surfaces during fender removal and / or installation.

1. Rotate the fender into position between the two front forks.



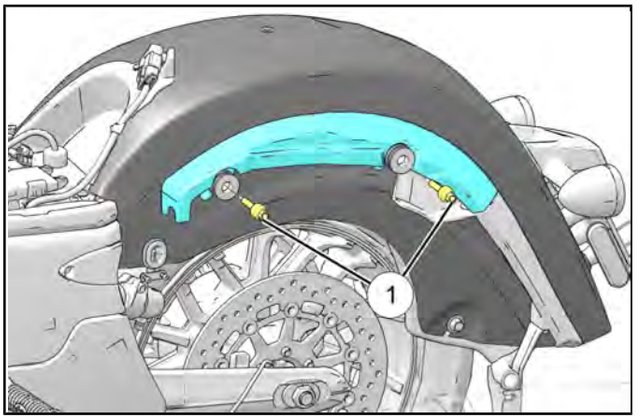
2. Connect the electrical connector to the fender light harness.
3. Install fasteners ① to each side of the motorcycle securing the fender. Torque fasteners to specification



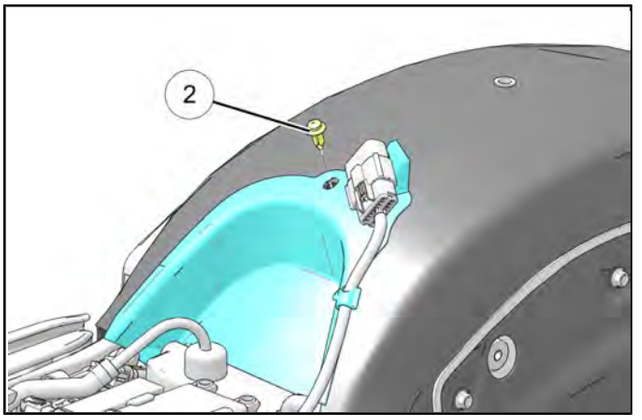
TORQUE
Fender Fastener (Front): **18 ft-lbs (24 N·m)**

REAR FENDER REMOVAL

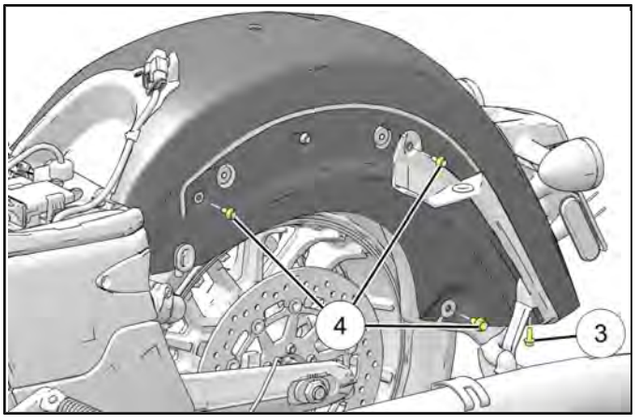
1. Disconnect the antenna cable from the mast.
2. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
3. Remove saddlebags. See **Saddlebag Removal page 7.93**.
4. Remove upper fender closeout by removing fastener ①.



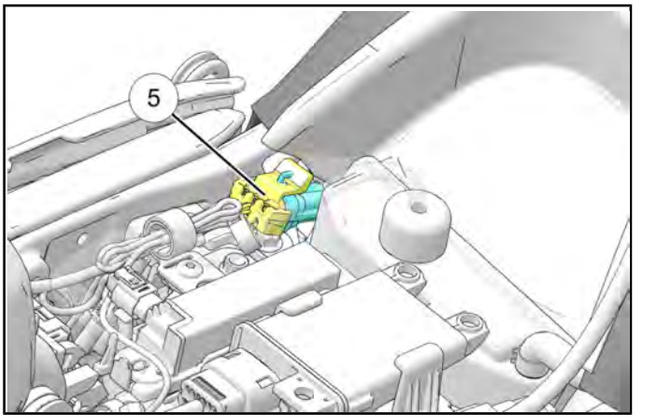
5. Remove push pin ②.



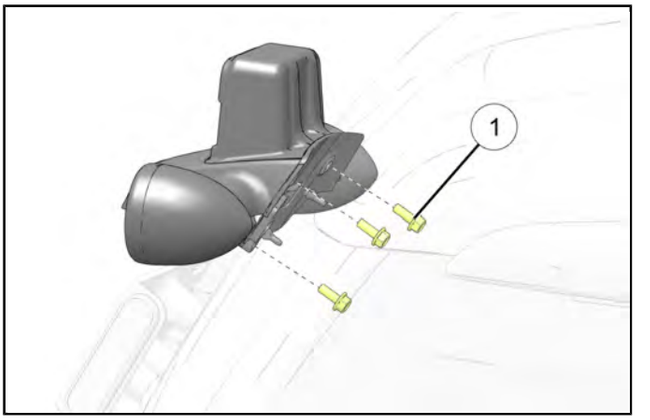
6. Remove closeout support fastener ③.



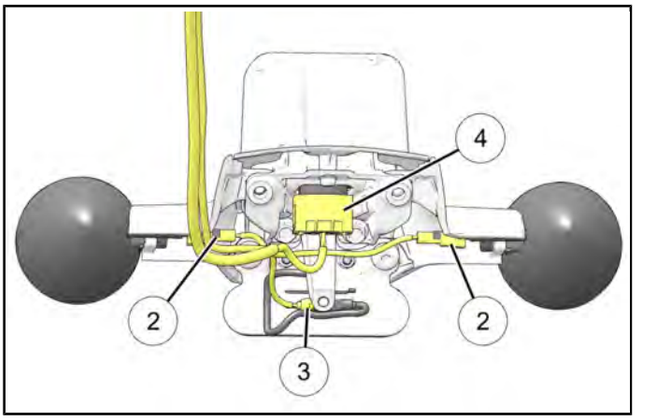
7. Remove fender fasteners ④.
8. Disconnect the electrical connector ⑤.



9. Remove fasteners ① securing turn signal / brake light assembly.



10. Disconnect turn signal electrical connector ②.



11. Disconnect license plate light connector ③.
12. Disconnect radar connector ④.

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13. Remove fender.

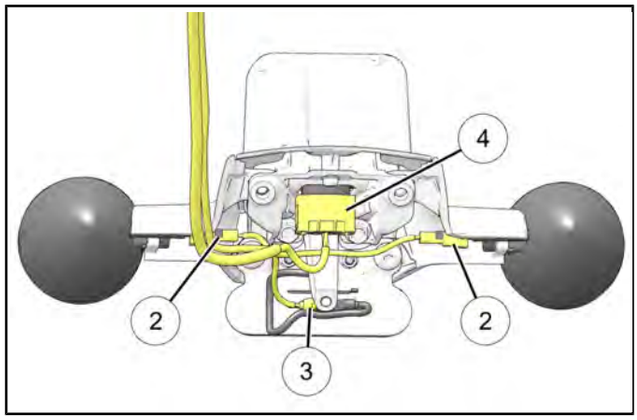
⚠ CAUTION

Be careful not to damage painted surfaces.

REAR FENDER INSTALLATION

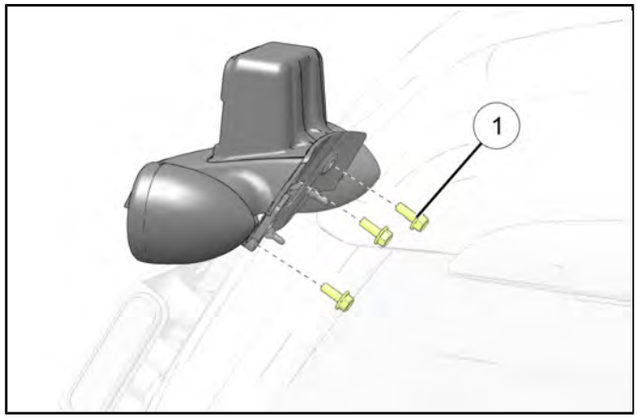
TAIL LIGHT / BRAKE LIGHT INSTALLATION

1. Connect license plate light connector ③.



2. Connect turn signal electrical connector ②.
3. Connect radar connector ④.
4. Install fastener ① securing turn signal / brake light assembly.

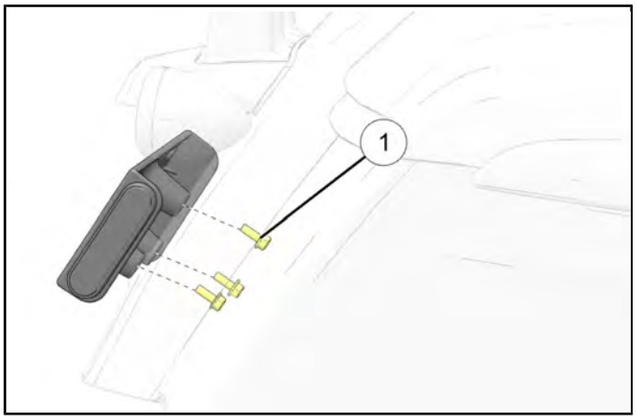
TORQUE
Tail Light Mount Bracket Fastener: **88 in-lbs (10 N·m)**



LICENSE PLATE BRACKET / LIGHT INSTALLATION

1. Install fasteners ① securing license plate assembly.

TORQUE
License Plate Bracket Fastener: **88 in-lbs (10 N·m)**



FENDER

⚠ CAUTION

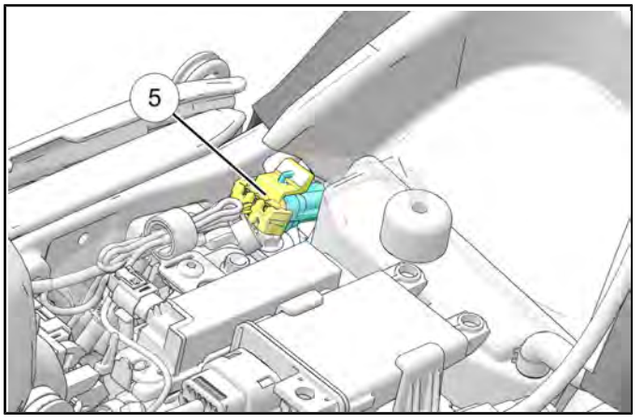
Use care not to scratch or damage painted surfaces during fender removal and / or installation.

1. Install taillight and rear radar module. See **Tail / Brake / License Plate Light / Radar, Installation page 10.127**
2. Install fender.

⚠ CAUTION

Be careful not to damage painted surfaces.

3. Install rear radar module.
4. Connect the electrical connector ⑤.



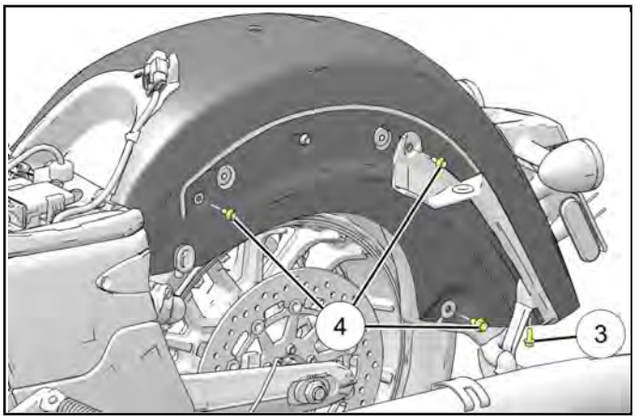
7

5. Install fender fasteners ④.

TORQUE
Fender Fastener (Rear) M6: **88 in-lbs (10 N·m)**

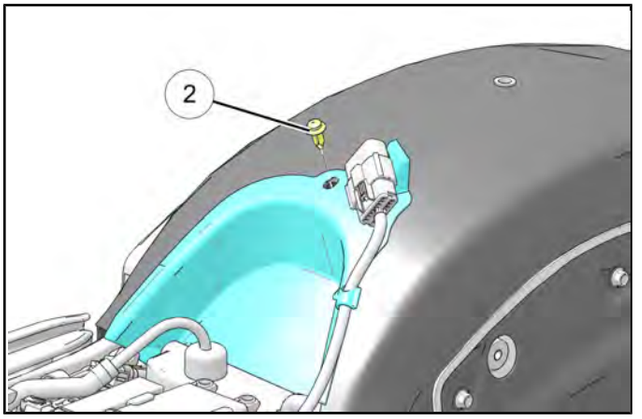
TORQUE
Fender Fastener (Rear) M8: **18 ft-lbs (24 N·m)**

6. Install closeout support fastener ③.

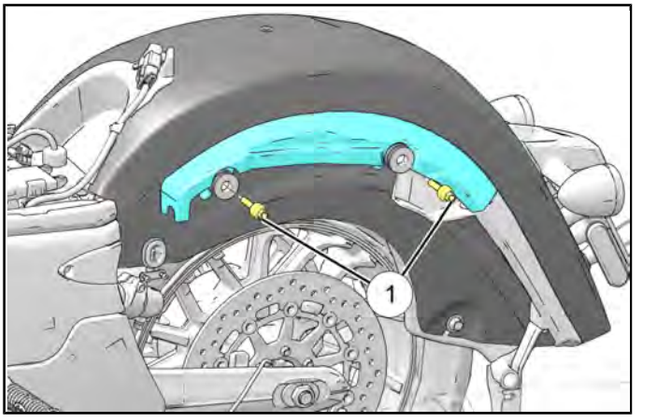


TORQUE
Fender Closeout Lower Fastener: **88 in-lbs (10 N·m)**

7. Install push pin ②.



8. Install upper fender closeout by removing fastener ①.

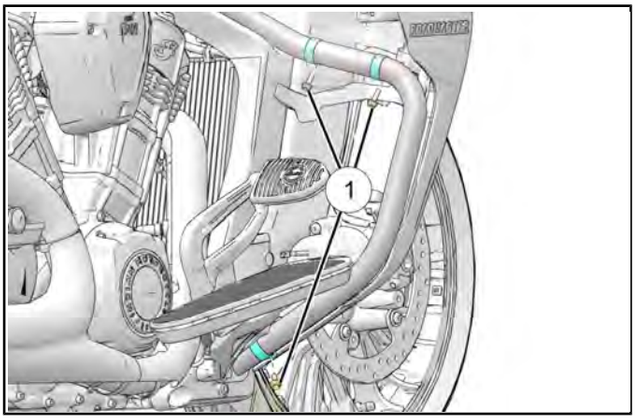


9. Install saddlebags. See **Saddlebag Installation page 7.93**
10. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.
11. Connect the antenna cable from the mast.

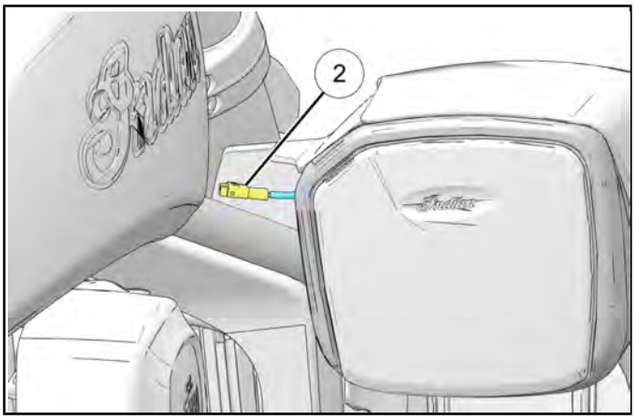
LOWER FAIRING REMOVAL

REMOVAL

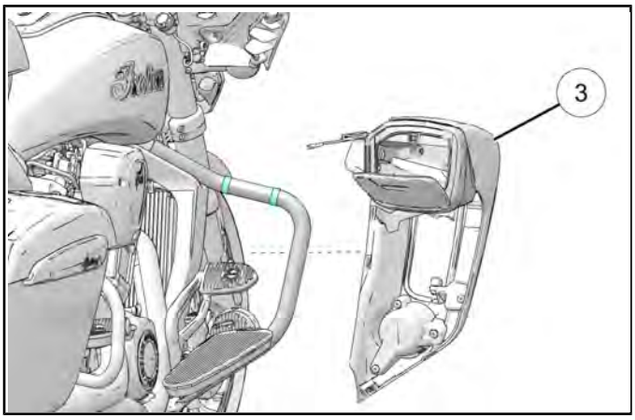
1. Remove fog light. See **Fog Light Removal page 10.101**.
2. Remove lover fairing highway bar clamp fasteners ①.



3. Disconnect lower fairing harness connector.



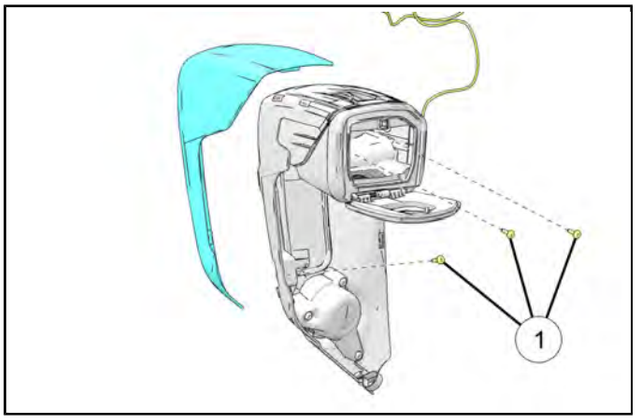
4. Remove lower fairing assembly ③.



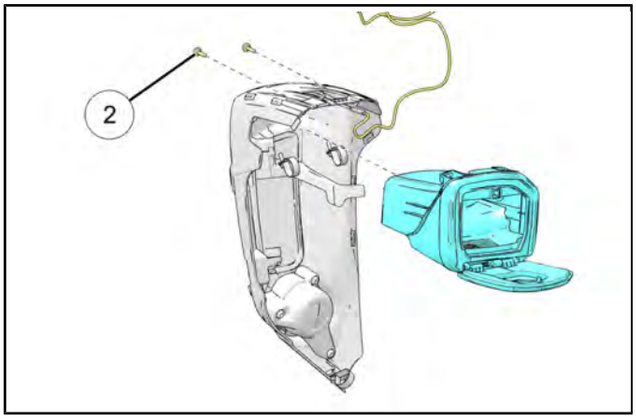
5. Repeat steps for remaining side.

DISASSEMBLY

1. Remove lower fairing fasteners ① and remove lower fairing



2. Remove storage door fasteners ② and remove storage door.

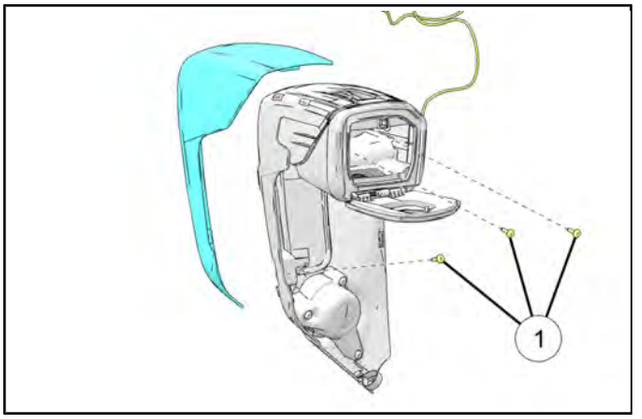


7

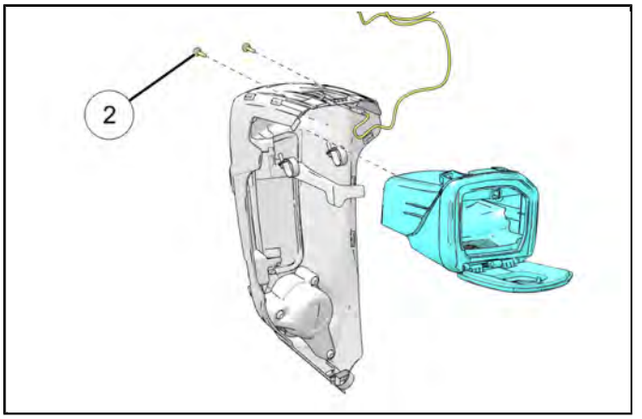
LOWER FAIRING INSTALLATION

ASSEMBLY

1. Install lower fairing and install lower fairing fasteners ①.

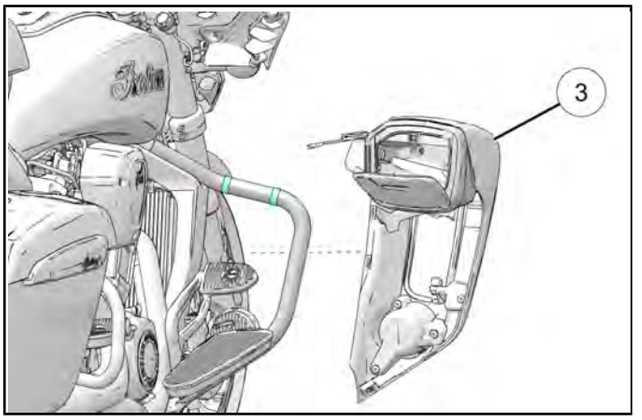


2. Install storage door and install storage door ②.



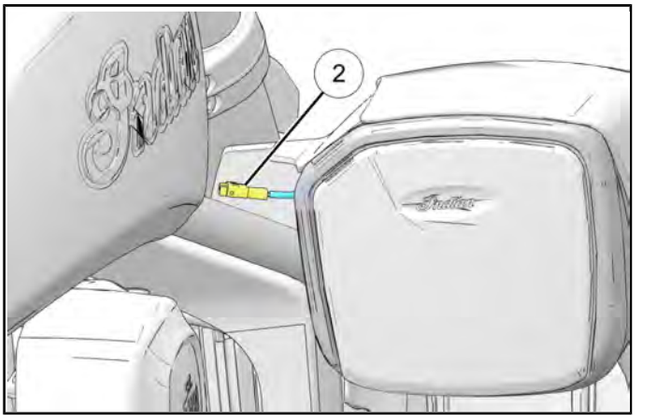
INSTALLATION

1. Install lower fairing assembly ③.

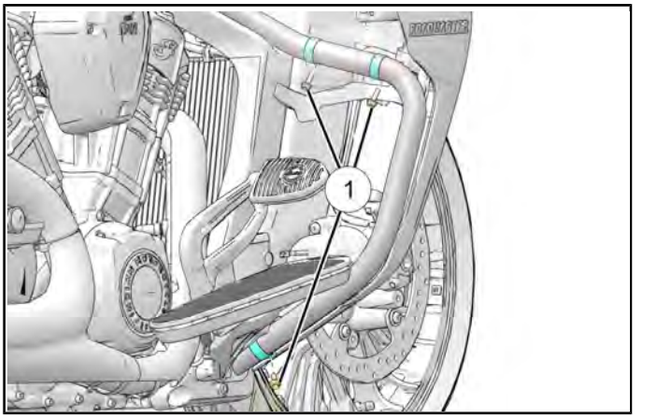


2. Repeat steps for remaining side.

3. Connect lower fairing harness connector ②.



4. Install lover fairing highway bar clamp fasteners ①.



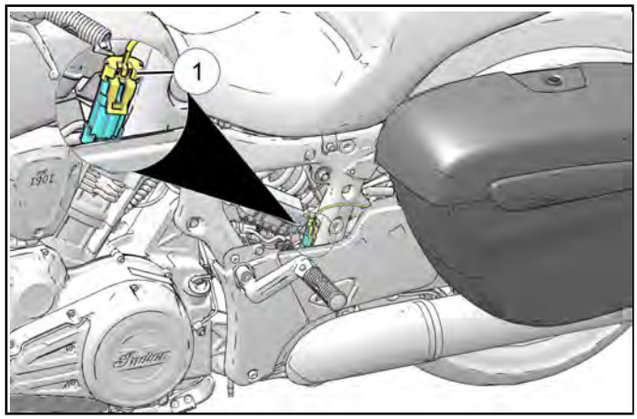
TORQUE
Highway Bar Clamp Fastener: **35 in-lbs (4 N·m)**

5. If equipped, install fog light. See **Fog Light Installation page 10.101**.

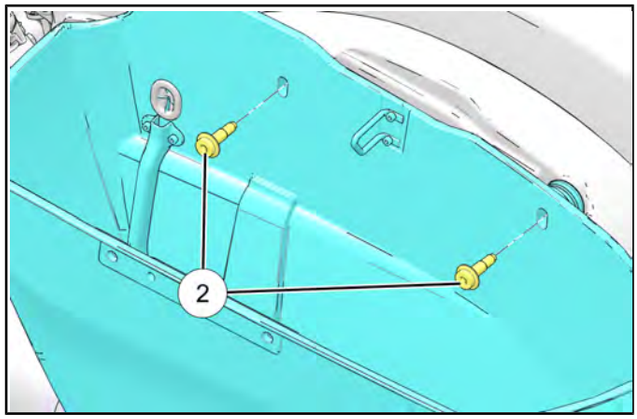
SADDLEBAG REMOVAL

REMOVAL

1. Remove upper side cover. See **Side Cover (Upper), Removal page 7.100**.
2. Disconnect saddle bag electrical connector ①.

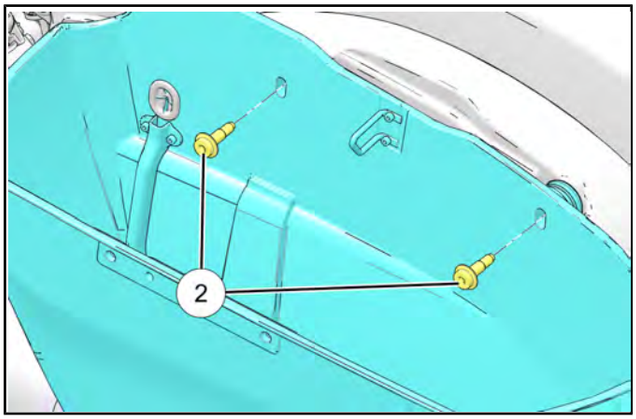


3. Open saddle bag lid.
4. Remove saddlebag by removing its fasteners②.



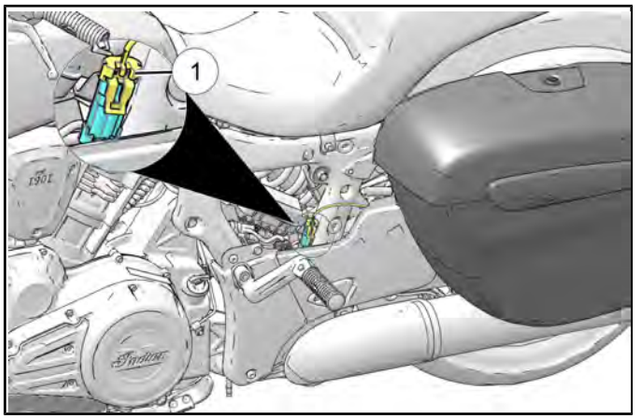
SADDLEBAG INSTALLATION

1. Install saddlebag fasteners②.



Install upper side cover. See **Side Cover (Upper), Install page 7.101**.

2. Disconnect saddle bag electrical connector ①.



3. Install upper side cover. See **Side Cover (Upper), Install page 7.101**.

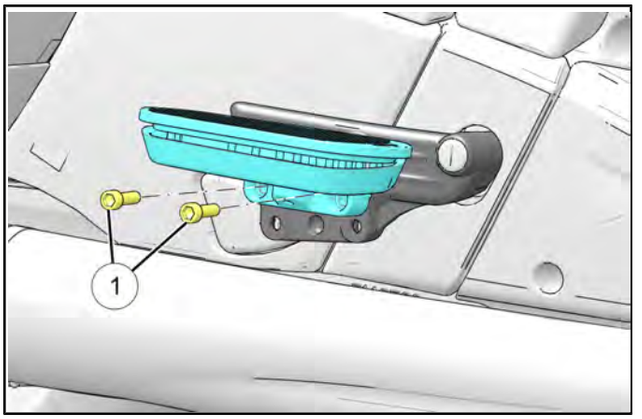
TORQUE
Tipover Cover Fastener: **18 ft-lbs (24 N·m)**

7

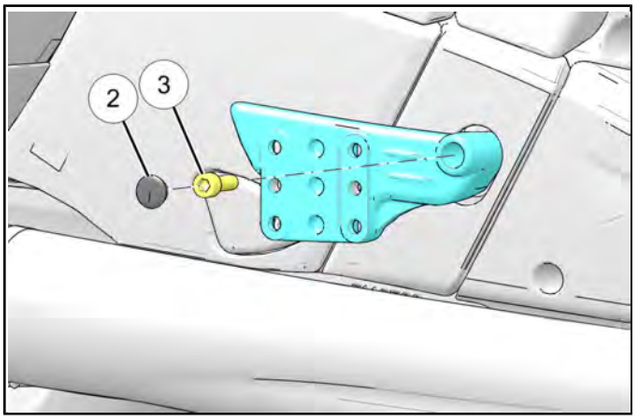
PASSENGER FOOT PEGS REMOVAL

REMOVAL

1. Remove fastener ① securing floorboard pivot bracket to frame.



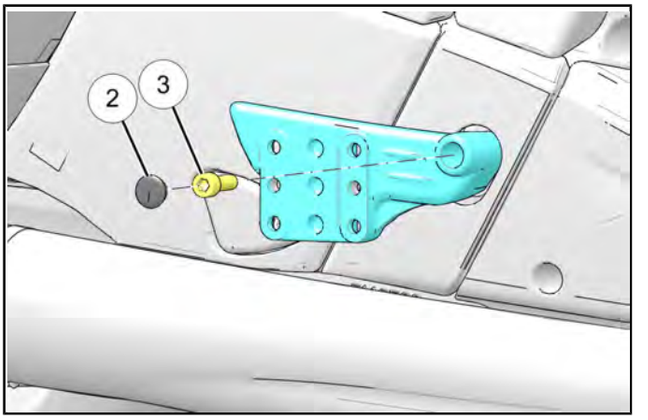
2. Remove Passenger Floorboard Mount by removing the plug ② and fastener ③.



PASSENGER FOOT PEGS INSTALLATION

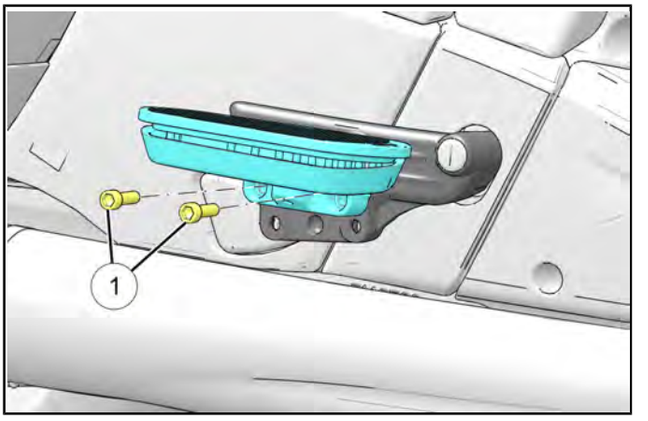
INSTALLATION

1. Install Passenger Floorboard Mount by installing the plug ② and fastener ③.



TORQUE
Passenger Floorboard Mount Fastener: **33 ft-lbs (45 N·m)**

2. Install fastener ① securing floorboard pivot bracket to frame.

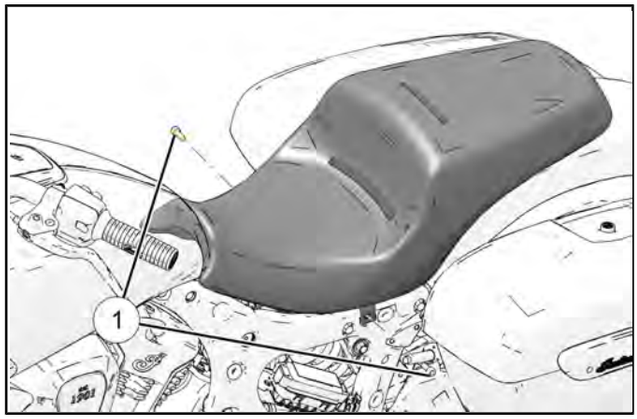


TORQUE
Passenger Floorboard Pivot Fastener: **19 ft-lbs (25 N·m)**

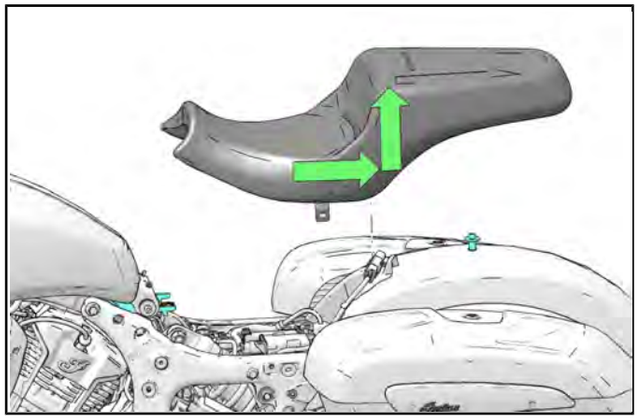
SEAT REMOVAL

REMOVAL

1. Remove side covers. See **Side Cover (Upper), Removal page 7.100**.
2. Remove seat fastener ①.



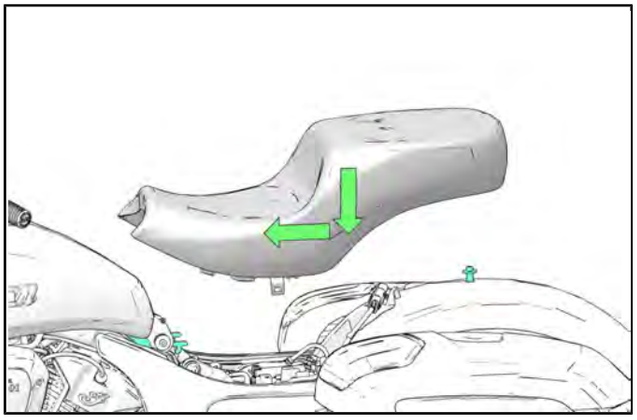
3. If equipped, disconnect seat electrical connector.
4. Remove the seat backward and up to remove.



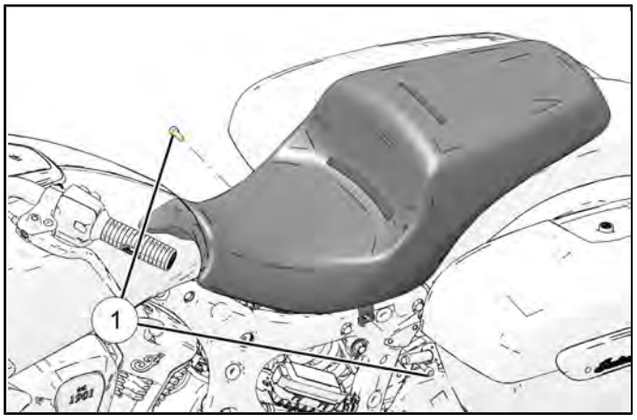
SEAT INSTALLATION

INSTALLATION

1. Install the seat.



2. If equipped, connect seat electrical connector.
3. Install seat fastener ①.



TORQUE
Seat Fastener: **18 ft-lbs (24 N·m)**

4. Install side covers. See **Side Cover (Upper), Install page 7.101**.

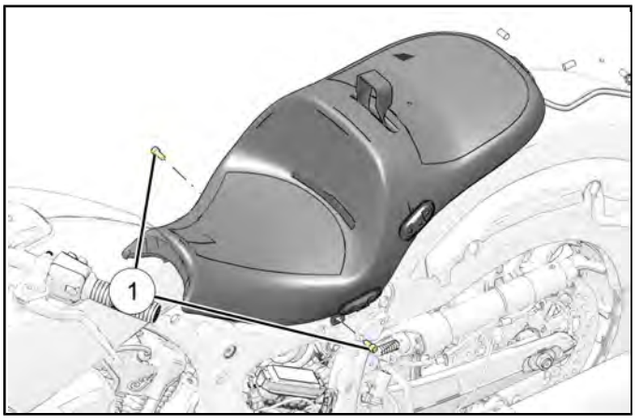
TORQUE
Tipover Cover Fastener: **18 ft-lbs (24 N·m)**

7

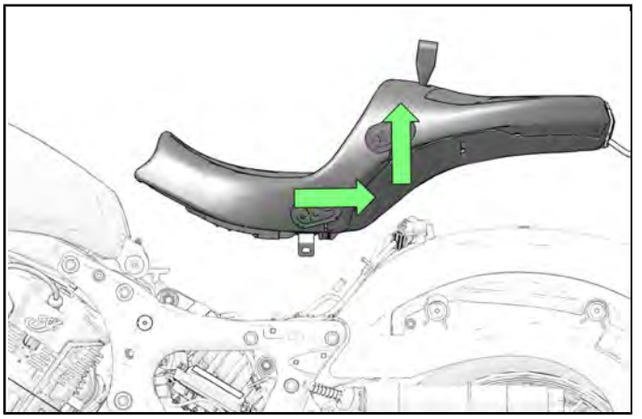
SEAT REMOVAL (TOURING)

REMOVAL

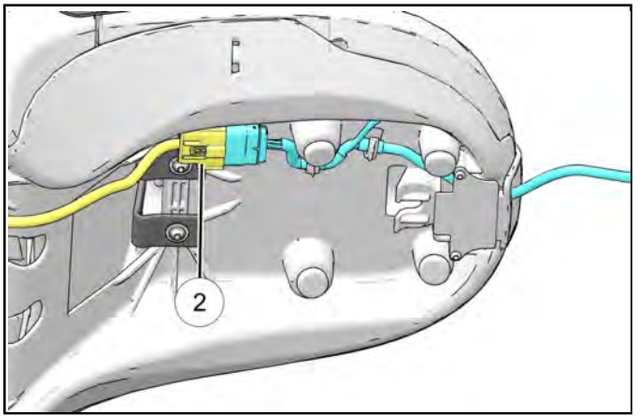
1. Remove Trunk. See **Trunk Removal page 7.97**.
2. Remove side covers. See **Side Cover (Upper), Removal page 7.100**.
3. Remove seat fastener ①.



4. Move the seat backward and up to disconnect from bike.



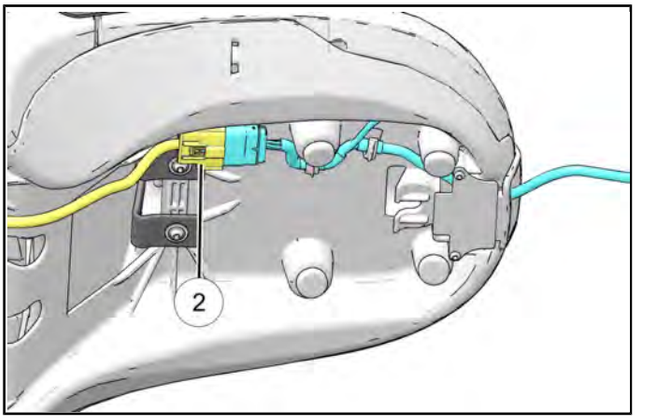
5. Disconnect seat electrical connector.



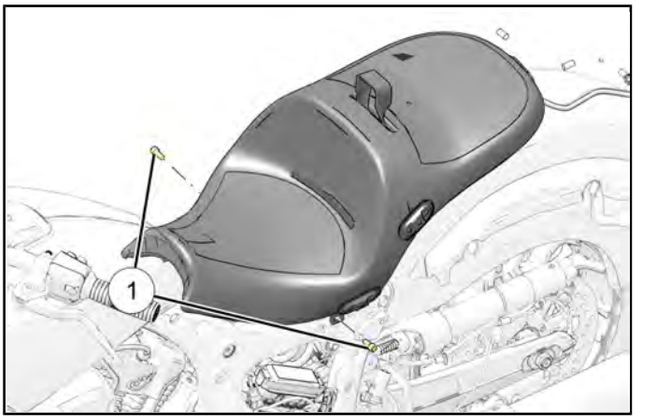
SEAT INSTALLATION (TOURING)

INSTALLATION

1. Install seat electrical connector.



2. Install seat.
3. Install seat fastener ①.



TORQUE
Seat Fastener: **18 ft-lbs (24 N·m)**

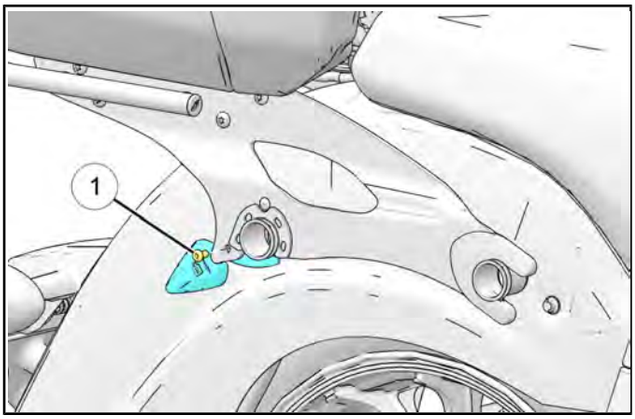
4. Install side covers. See **Side Cover (Upper), Install page 7.101**.

TORQUE
Tipover Cover Fastener: **18 ft-lbs (24 N·m)**

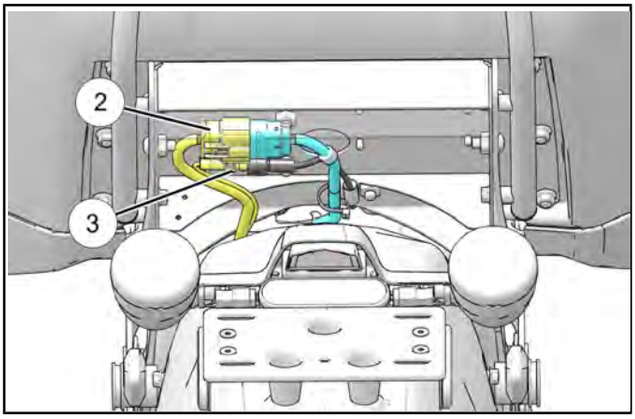
5. Install Trunk. See **Trunk Installation page 7.97**.

TRUNK REMOVAL

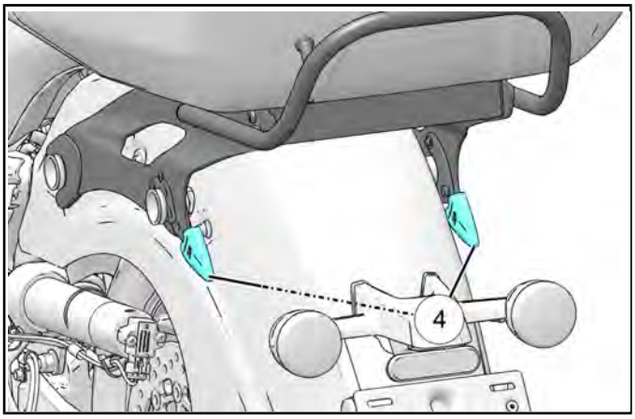
1. Remove the trunk lock fastener ① from each trunk latch.



2. Disconnect the trunk harness ② and the antenna connector ③.



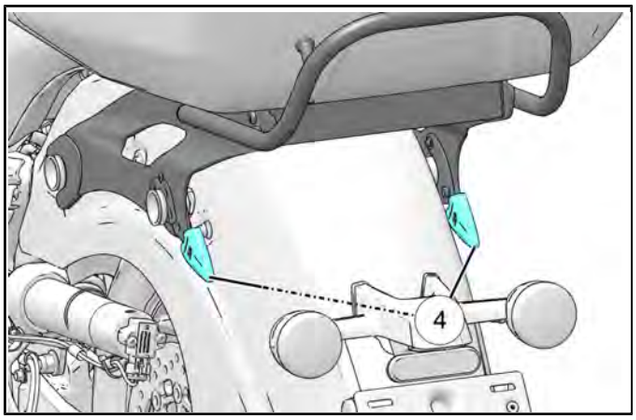
3. Lift the trunk latches ④ to unlock the trunk from the mount.



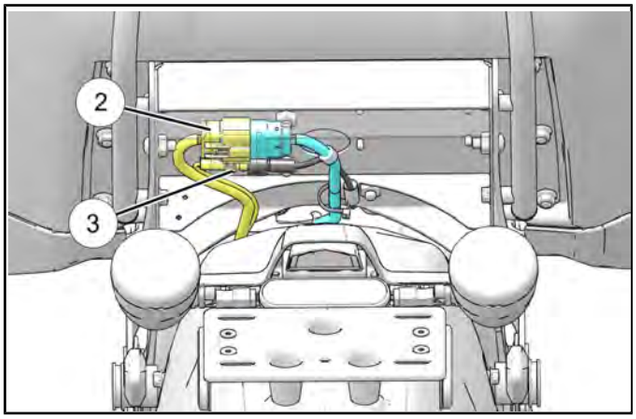
4. Lift up on the rear of the trunk and slide rearward to release the trunk from the motorcycle.

TRUNK INSTALLATION

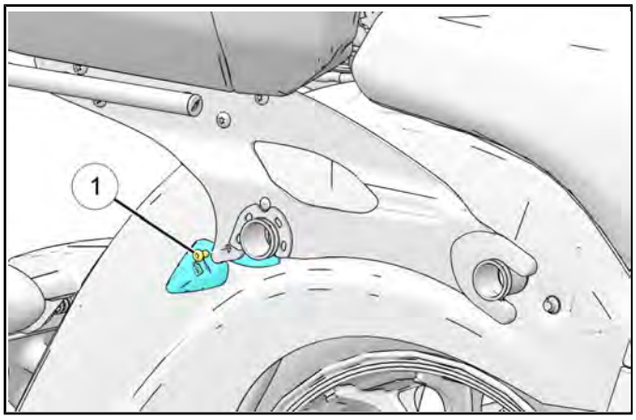
1. Install the trunk onto the motorcycle.
2. Close the trunk latches ④ to lock the trunk onto the mount.



3. Install the trunk harness ② and the antenna connector ③.



4. Install the trunk lock fastener ① on each trunk latch.



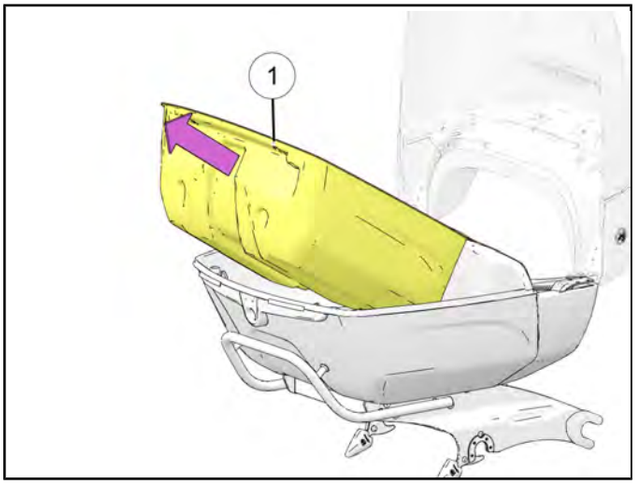
5. If applicable, install the left and right saddlebags. See **Saddlebag Installation page 7.93**.

TRUNK LOCK REPLACEMENT

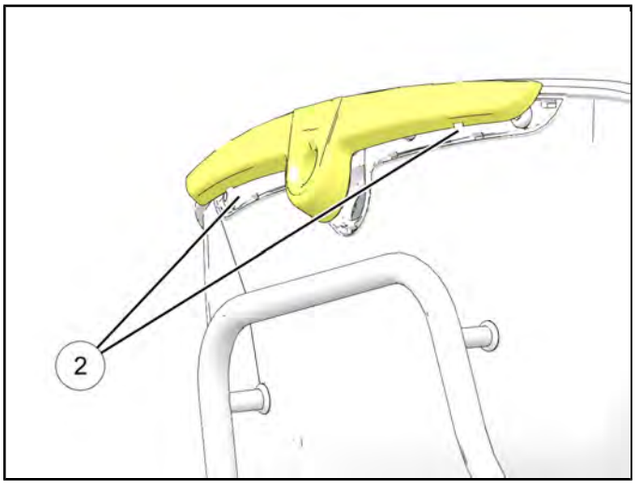
NOTICE
It is recommended that the trunk is removed from the motorcycle prior to disassembly. See **Trunk Removal page 7.97** as outlined in this chapter.

REMOVAL

1. Remove the trunk from the motorcycle and place on flat work surface.
2. Open the trunk lid completely.
3. Lift the trunk liner ① up to remove from trunk base.

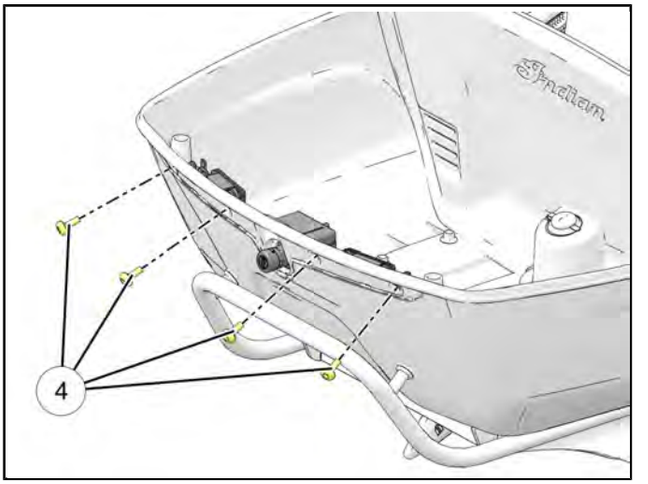


4. Insert body panel tool (PV-49955) or similar into the relief holes ② cut into the bezel and gently pry bezel off of the trunk base.



NOTICE
Bezel is held in place with pressure sensitive adhesive. It will be necessary to replace the adhesive with a suitable alternative (e.g. double sided tape) when the bezel is reinstalled.

5. Remove the four fasteners ④ securing the lock assembly to the trunk.

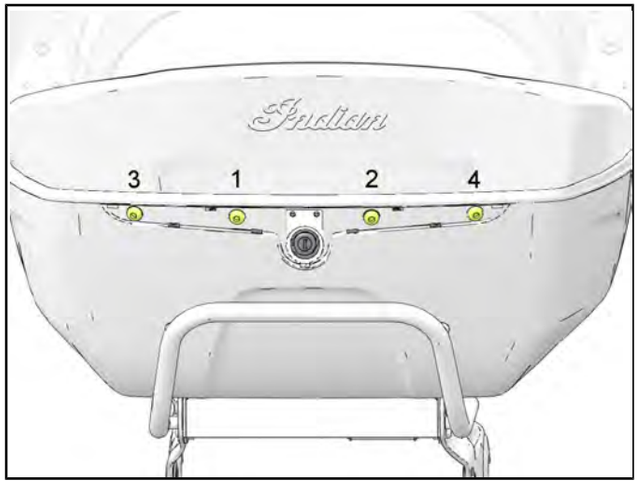


6. Remove the latch and lock actuator together as an assembly.
7. If replacing individual components, disconnect the lock actuator cable from the latch assembly to separate the components.

INSTALLATION

1. Install the latch / lock actuator assembly and tighten fasteners finger-tight.
2. Torque latch fasteners to specification following the torque sequence.

TORQUE
Trunk Latch Fasteners: **18 ft-lbs (24 N·m)**



3. If installing a new latch bezel:

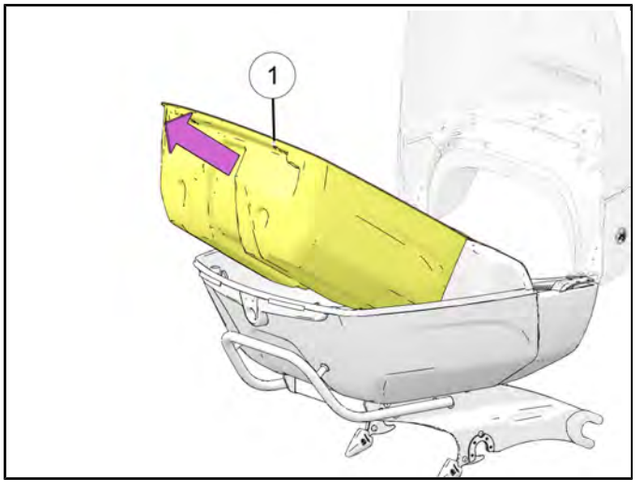
- Peel protective layer off of pressure sensitive adhesive
- Press bezel into place on the trunk bin with constant and even pressure and hold for 30 seconds.

4. Install trunk liner.
5. Operate lock and latch assembly to verify proper operation.

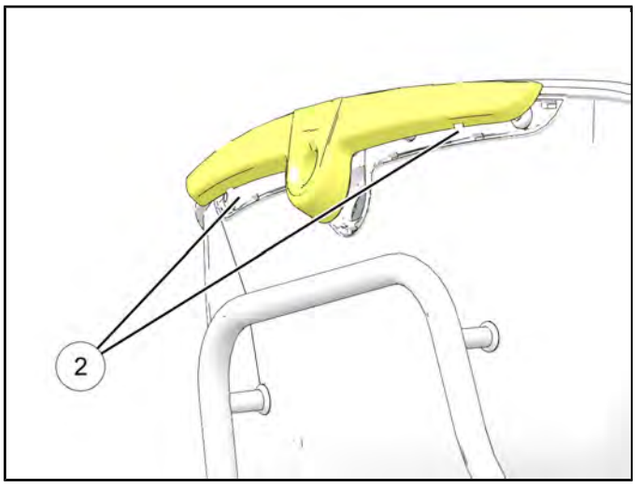
TRUNK LOCK REMOVAL

NOTICE
It is recommended that the trunk is removed from the motorcycle prior to disassembly. See **Trunk Removal page 7.97** as outlined in this chapter.

1. Remove the trunk from the motorcycle and place on flat work surface.
2. Open the trunk lid completely.
3. Lift the trunk liner ① up to remove from trunk base.



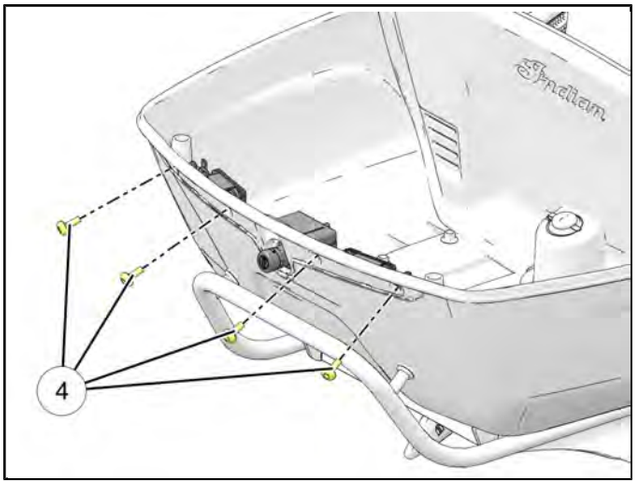
4. Insert body panel tool (PV-49955) or similar into the relief holes ② cut into the bezel and gently pry bezel off of the trunk base.



NOTICE
Bezel is held in place with pressure sensitive adhesive. It will be necessary to replace the adhesive with a suitable alternative (e.g. double sided tape) when the bezel is reinstalled.

7

5. Remove the four fasteners ④ securing the lock assembly to the trunk.



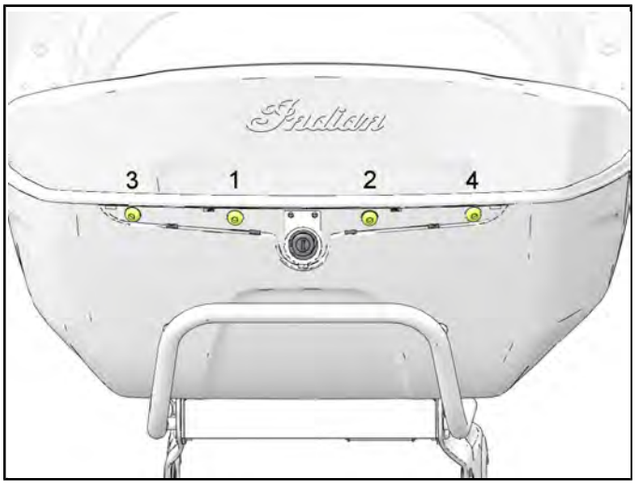
6. Remove the latch and lock actuator together as an assembly.
7. If replacing individual components, disconnect the lock actuator cable from the latch assembly to separate the components.

TRUNK LOCK INSTALLATION

INSTALLATION

1. Install the latch / lock actuator assembly and tighten fasteners finger-tight.
2. Torque latch fasteners to specification following the torque sequence.

TORQUE
Trunk Latch Fasteners: **18 ft-lbs (24 N·m)**



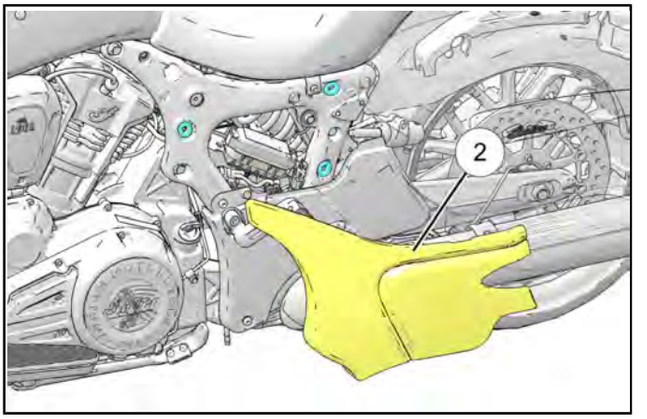
3. If installing a new latch bezel:
   - Peel protective layer off of pressure sensitive adhesive
   - Press bezel into place on the trunk bin with constant and even pressure and hold for 30 seconds.
4. Install trunk liner.
5. Operate lock and latch assembly to verify proper operation.

SIDE COVER (UPPER), REMOVAL

⚠ CAUTION
Use care not to scratch or damage painted surfaces during side cover removal

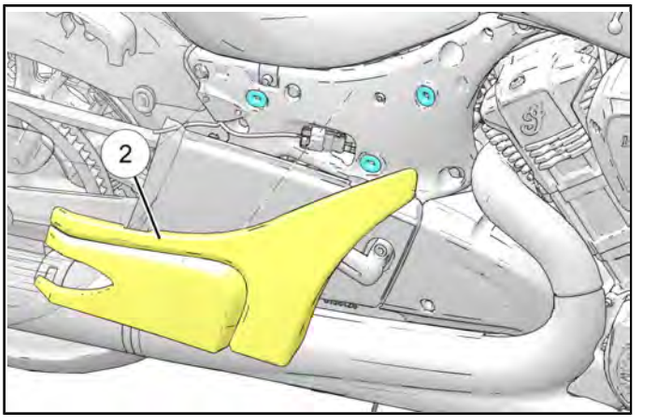
LEFT SIDE REMOVAL

1. Remove upper side cover ②.



RIGHT SIDE REMOVAL

1. Remove upper side cover ②



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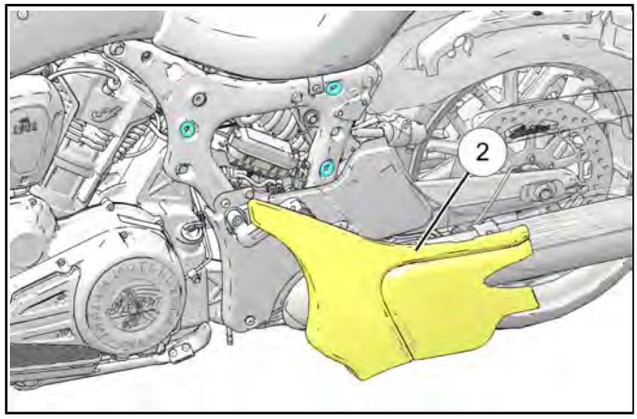
SIDE COVER (UPPER), INSTALL

CAUTION

Use care not to scratch or damage painted surfaces during side cover installation.

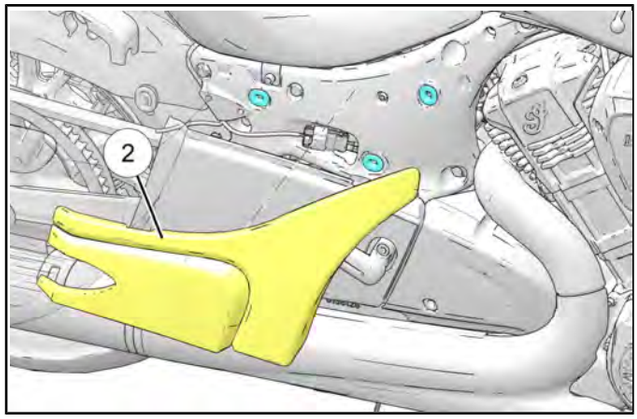
LEFT SIDE INSTALLATION

1. Install upper side cover ②.



RIGHT SIDE INSTALLATION

1. Install upper side cover ②



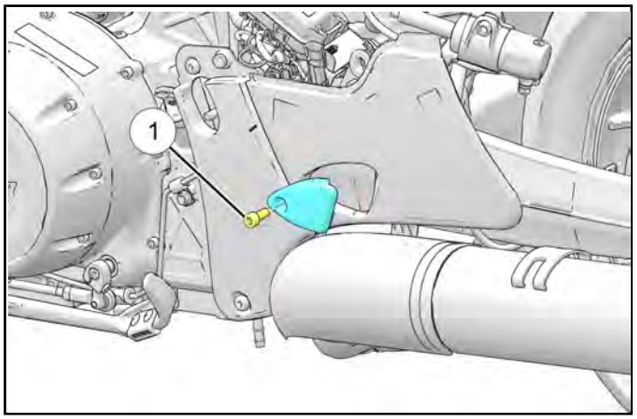
SIDE COVER (LOWER), REMOVAL / INSTALLATION

CAUTION

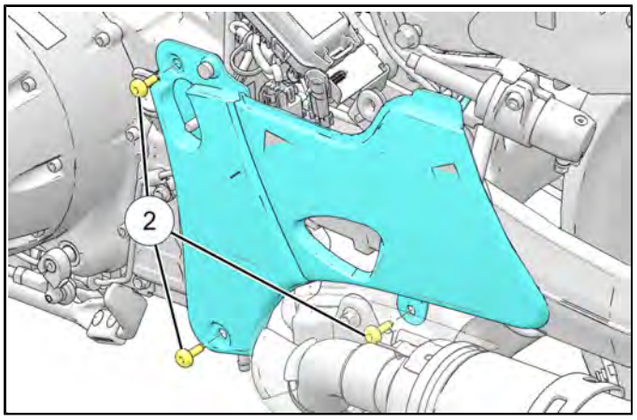
Use care not to scratch or damage painted surfaces during side cover removal / installation.

LEFT SIDE COVER

1. Remove upper side cover. See **Side Cover (Upper), Removal page 7.100**.
2. Remove passenger foot pegs. See **Passenger Foot Pegs Removal page 7.94**.
3. Remove tipover cover by removing its fastener ①.



4. Remove lower side cover fasteners ②.



7

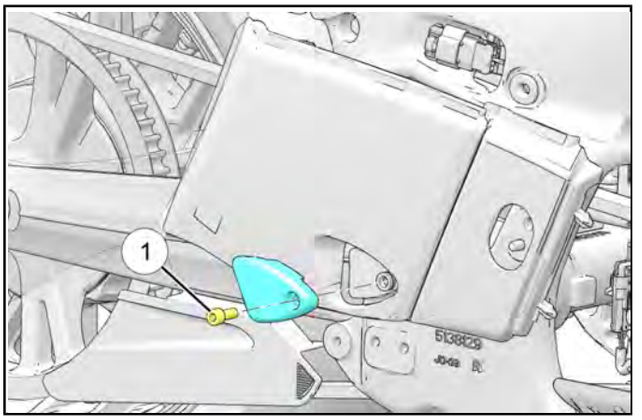
5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Tipover Cover Fastener **18 ft-lbs (24 N·m)**

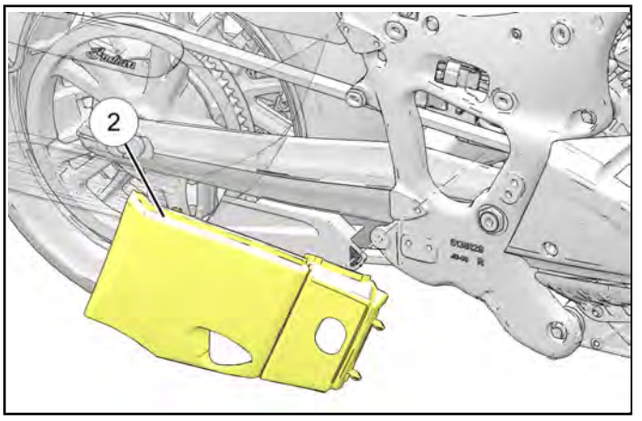
TORQUE
Lower Side Cover Accent Fastener **88 in-lbs (10 N·m)**

RIGHT SIDE COVER

1. Remove upper side cover. See **Side Cover (Upper), Removal page 7.100**.
2. Remove passenger foot pegs. See **Passenger Foot Pegs Removal page 7.94**.
3. Remove drive sprocket cover. See **Drive Sprocket Cover Removal page 8.64**.
4. Remove tipover cover by removing its fastener ①.



5. Remove lower side cover ②.



6. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Tipover Cover Fastener **18 ft-lbs (24 N·m)**

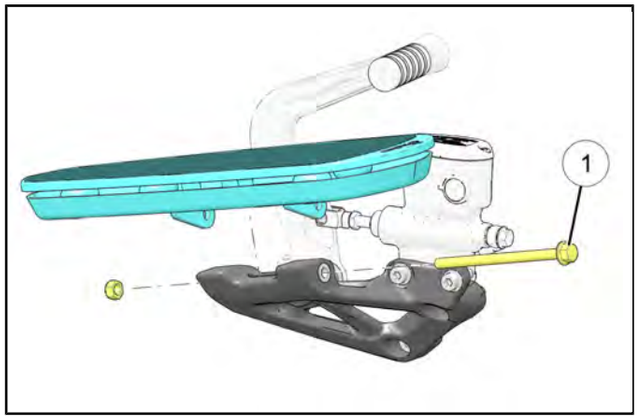
FLOORBOARD REMOVAL

Secure the motorcycle in an upright position.

For detailed floorboard assembly / disassembly information, reference **Floorboards Assembly View page 7.22**.

RIGHT

1. Remove floorboard by removing its fastener ①.



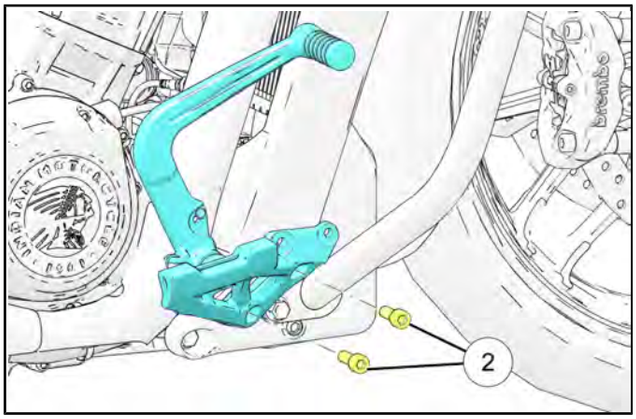
2. Remove rear master cylinder. Reference **Rear Master Cylinder Service page 9.51**.

IMPORTANT
The brake line does NOT need to be disconnected.

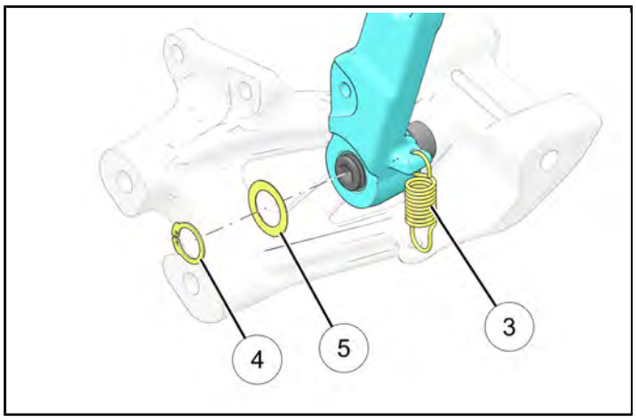
⚠ CAUTION
The master cylinder must be kept upright to prevent air from entering the system.

⚠ CAUTION
Do not allow master cylinder to hang by the brake line.

3. Remove the fasteners ② securing the floorboard bracket.



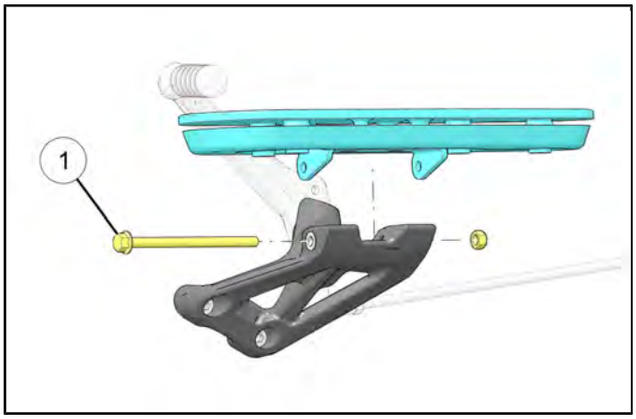
4. Remove return spring ③.



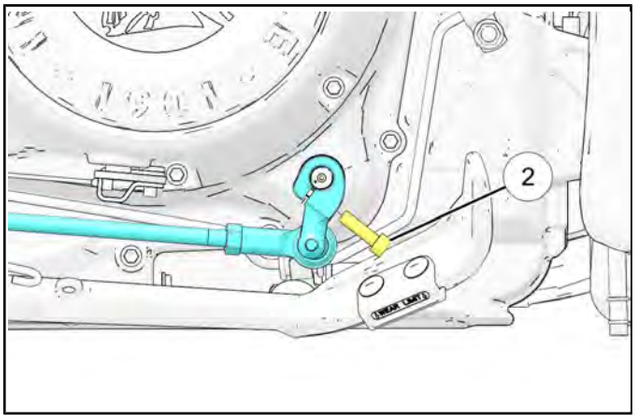
5. Remove snap ring ④ and washer ⑤.
6. Remove brake pedal assembly off of pivot.

LEFT

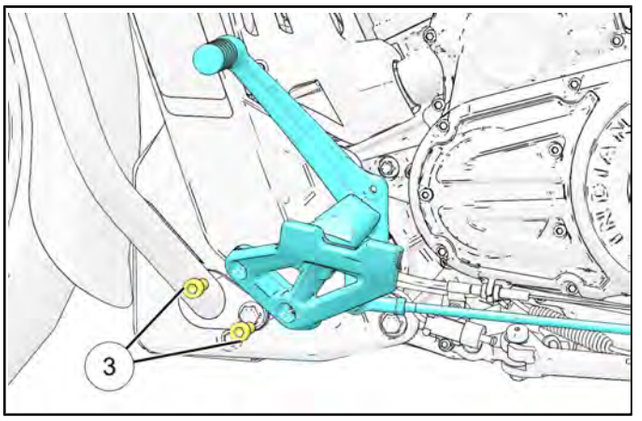
1. Remove floorboard by removing its fastener ①.



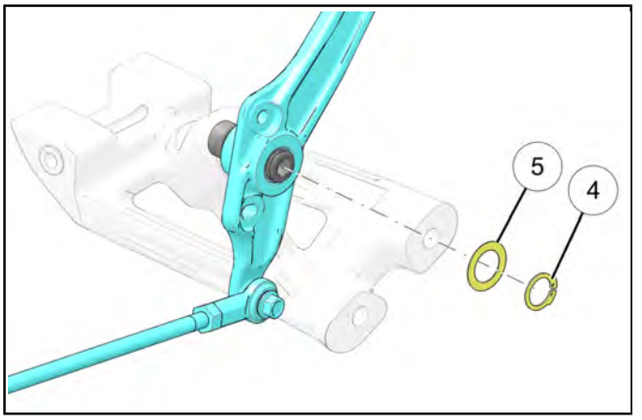
2. Remove fastener ② securing shift lever.



3. Remove the fasteners ③ securing the floorboard bracket.



4. Remove snap ring ④ and washer ⑤.



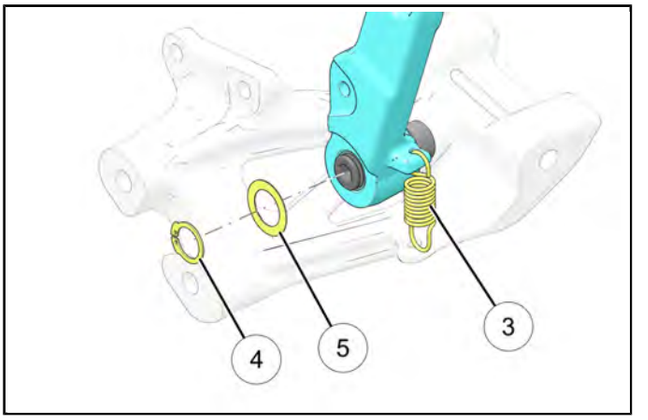
FLOORBOARD INSTALLATION

Secure the motorcycle in an upright position.

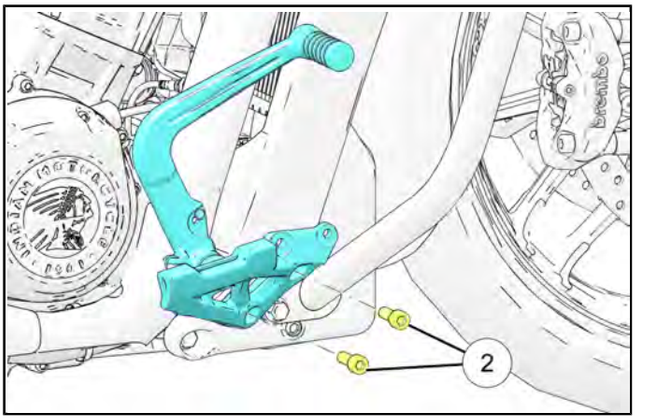
For detailed floorboard assembly / disassembly information, reference **Floorboards Assembly View page 7.22**.

RIGHT

1. Install brake pedal assembly on to pivot.
2. Install snap ring ④ and washer ⑤.
3. Install return spring ③.



4. Install the fasteners ② securing the floorboard bracket.



TORQUE
Floorboard Bracket Fastener: **35 ft-lbs (47 N·m)**

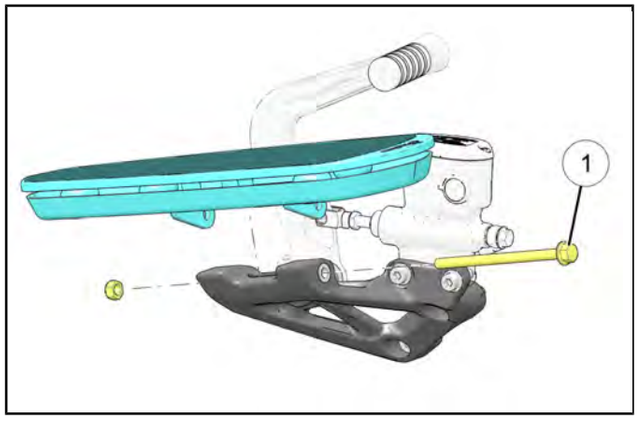
5. Install rear master cylinder. Reference **Rear Master Cylinder Service page 9.51**.

IMPORTANT
The brake line does NOT need to be disconnected.

⚠ CAUTION
Do not allow master cylinder to hang by the brake line.

TORQUE
Master Cylinder Fastener (Rear): **18 ft-lbs (24 N·m)**

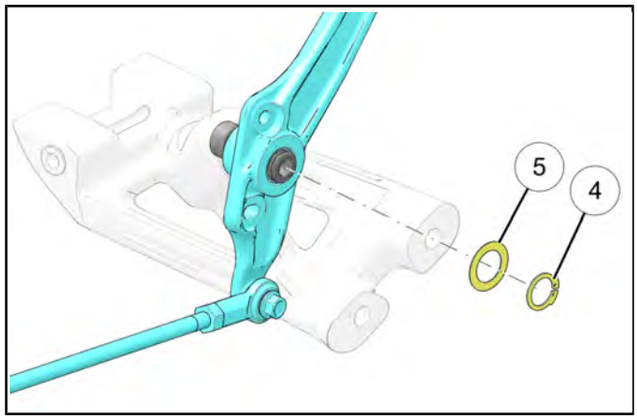
6. Install floorboard by installing its fastener ①.



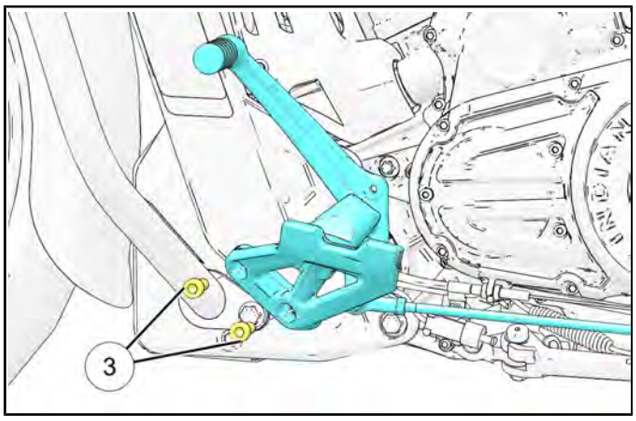
TORQUE
Floorboard Base Fastener: **18 ft-lbs (24 N·m)**

LEFT

1. Install snap ring ④ and washer ⑤.

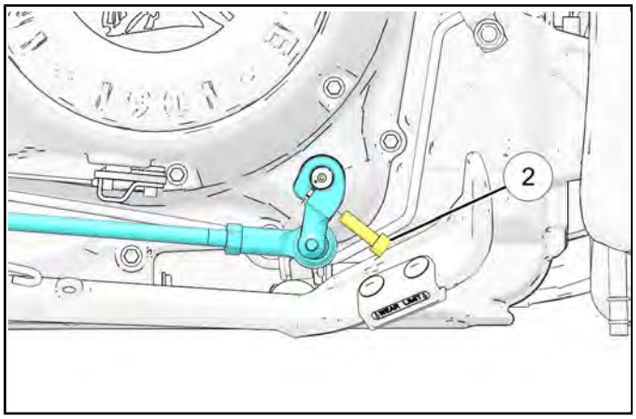


2. Install the fasteners ③ securing the floorboard bracket.



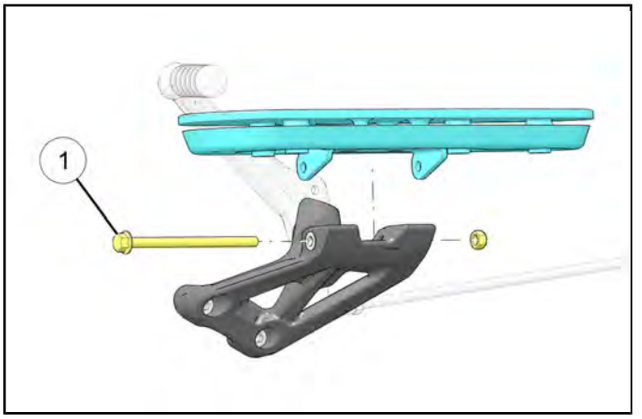
TORQUE
Floorboard Bracket Fastener: **35 ft-lbs (47 N·m)**

3. Install fastener ② securing shift lever.



TORQUE
Shift Linkage Fastener: **88 in-lbs (10 N·m)**

4. Install floorboard fastener ①.



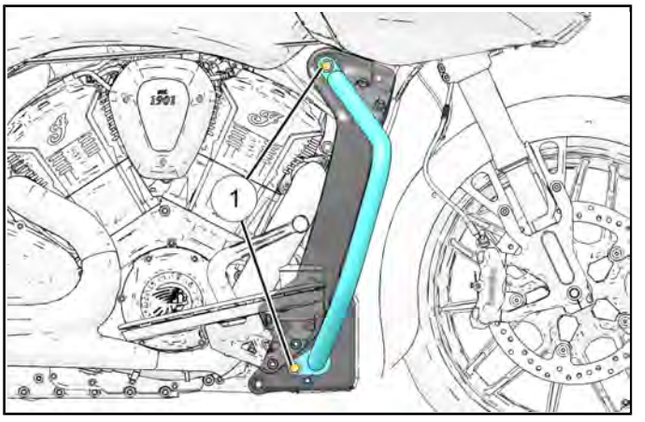
TORQUE
Floorboard Base Fastener: **18 ft-lbs (24 N·m)**

HIGHWAY BAR REMOVAL

⚠ CAUTION
Protect chrome and painted surfaces prior to removal, particularly the front fender.

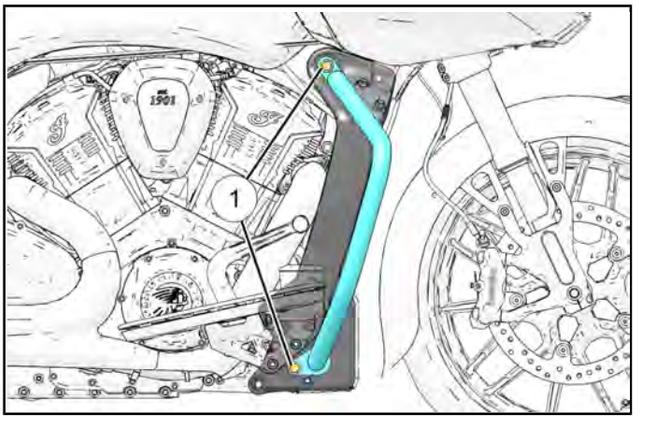
REMOVAL

1. If equipped, remove lower fairing. See **Lower Fairing Removal page 7.91**.
2. Remove the fastener ① retaining highway bar assembly.



HIGHWAY BAR INSTALLATION

1. Install the fastener ① to the highway bar assembly.



TORQUE
Highway Bar Fastener: **45 ft-lbs (61 N·m)**

2. If equipped, install lower fairing. See **Lower Fairing Installation page 7.92**.

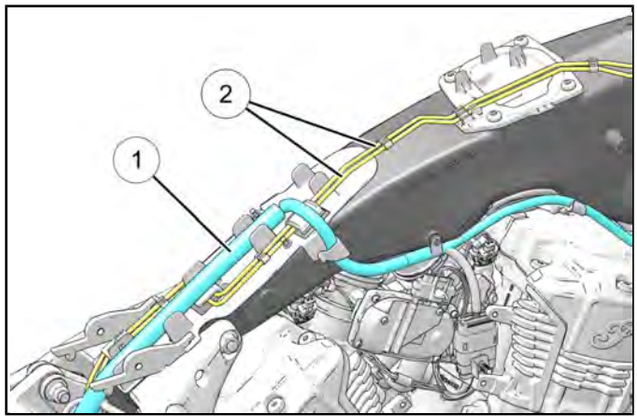
BACKBONE CASTING REMOVAL

⚠ WARNING

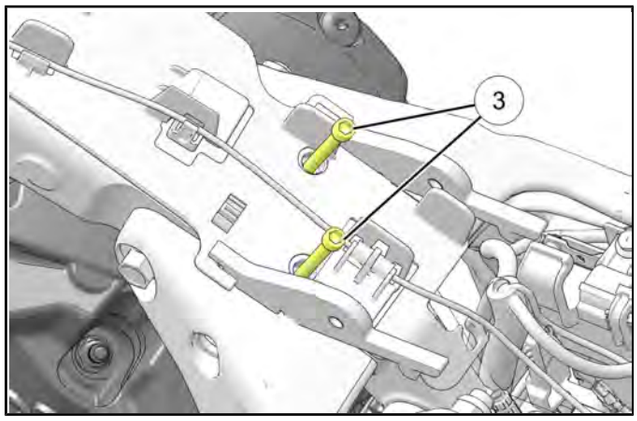
Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death could occur if the motorcycle tips or falls.

REMOVAL

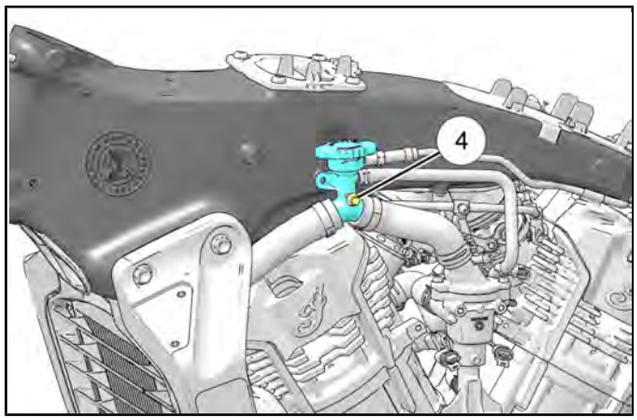
1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove the fuel tank. See **Fuel Tank Removal page 4.24**.
3. Remove headpipe. See **Headpipe Removal page 3.107**.
4. Remove lower side cover. See **Side Cover (Upper), Removal page 7.100**.
5. Completely remove fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37** or **Fairing Disassembly page 7.63**.
6. Remove front fork. See **Front Fork Removal page 8.37**
7. Remove triple clamp. See **Triple Clamp Removal page 8.47**.
8. Remove driver's floorboard. See **Floorboard Removal page 7.103**.
9. Remove highway bar. See **Highway Bar Removal page 7.106**.
10. Remove battery box. See **Battery Box Removal / Installation page 10.15**.
11. Perform steps 1–11 of throttle body removal. See **Throttle Body Removal page 4.81**.
12. Disconnect the electrical harness ① and brake lines ② from the mainframe.



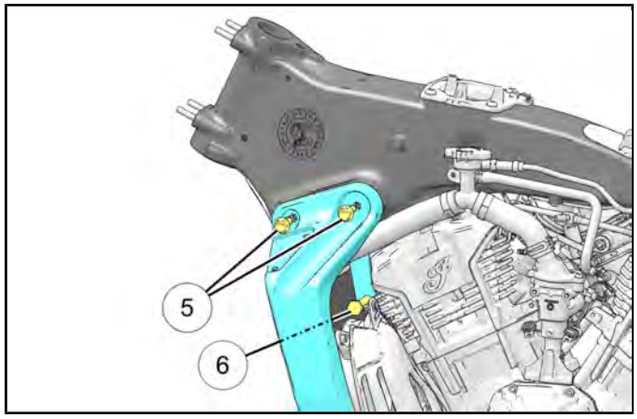
13. Remove fasteners ③ securing mainframe to breather.



14. Remove fastener ④ securing remote fill to mainframe.

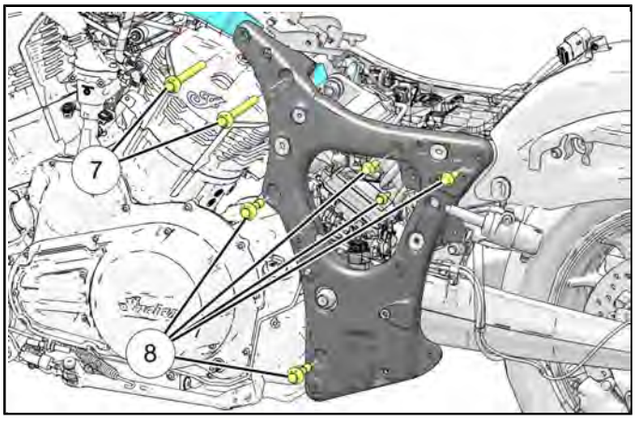


15. Remove downcast fasteners ⑤ and cylinder head fastener ⑥.

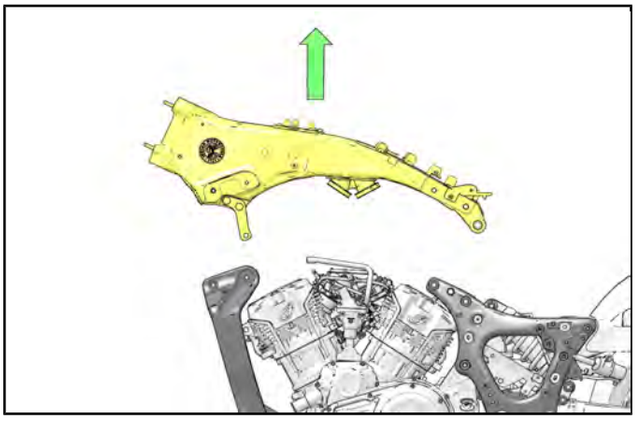


16. Remove downcast fasteners for remaining side.

17. Remove midcast fastener ⑦ and ⑧. Repeat step for remaining side.



18. Remove main casting.



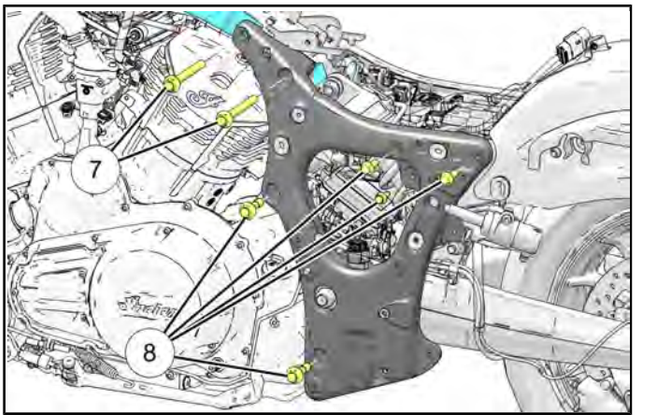
BACKBONE CASTING INSTALLATION

⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death could occur if the motorcycle tips or falls.

INSTALLATION

1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Install main casting.
3. Install midcast fastener ⑦ and ⑧. Repeat step for remaining side.



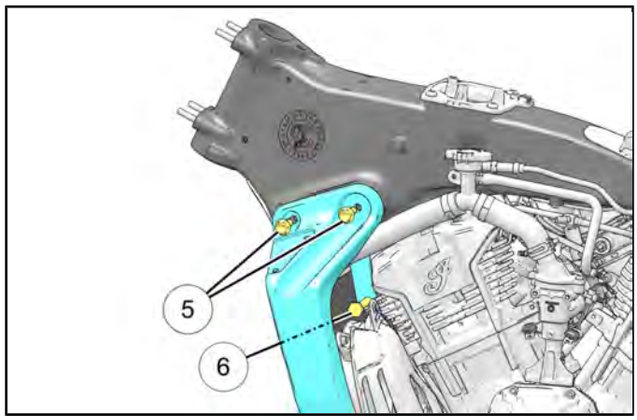
TORQUE
Midcast M12 Fastener: **75 ft-lbs (102 N·m)**

TORQUE
Midcast M10 Fastener: **35 ft-lbs (47 N·m)**

TORQUE
Engine Mount Fastener: **45 ft-lbs (61 N·m)**

4. Install downcast fasteners for remaining side.

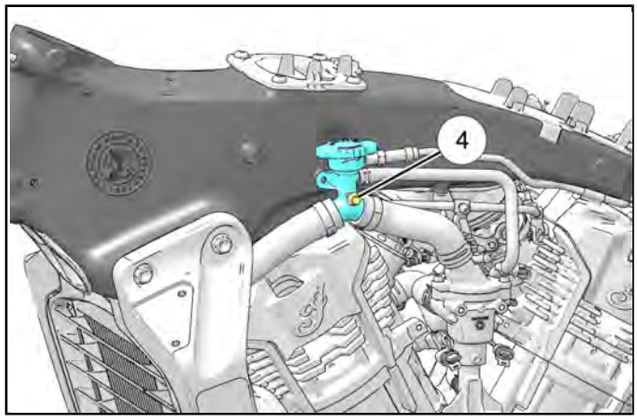
5. Install downcast fasteners ⑤ and cylinder head fastener ⑥.



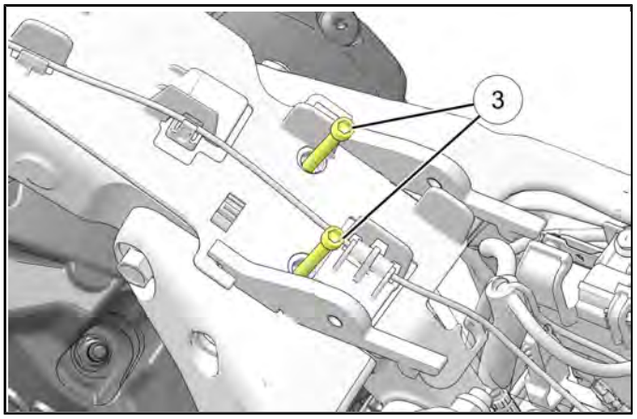
TORQUE
Front Downcast Fastener: **45 ft-lbs (61 N·m)**

TORQUE
Cylinder Head Bracket Fastener: **75 ft-lbs (102 N·m)**

6. Install fastener ④ securing remote fill to mainframe.

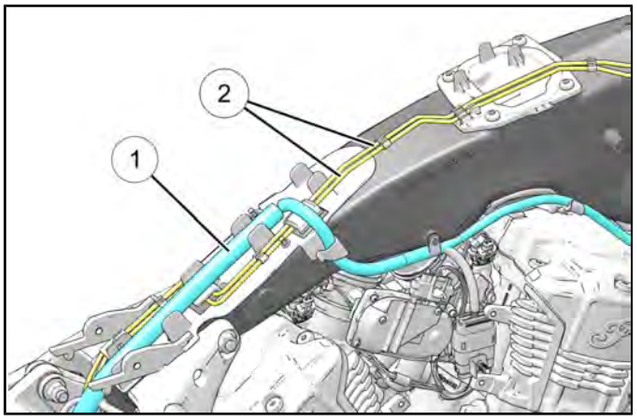


7. Install fasteners ③ securing mainframe to breather.



TORQUE
Mainframe to Breather Fastener: **88 in-lbs (10 N·m)**

8. Install the electrical harness ① and brake lines ② to the mainframe.



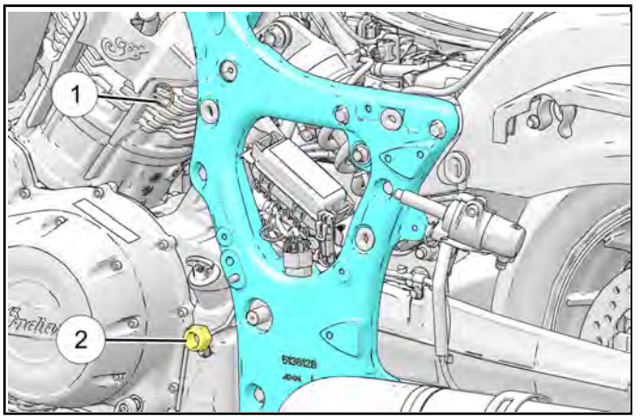
9. Perform steps 1–11 of throttle body installation. See **Throttle Body Installation page 4.82**.
10. Install battery box. See **Battery Box Removal / Installation page 10.15**.
11. Install highway bar. See **Highway Bar Installation page 7.106**.
12. Install driver's floorboard. See **Floorboard Installation page 7.104**.
13. Install triple clamp. See **Triple Clamp Installation / Steering Head Bearing Adjustment page 8.50**.
14. Install front fork. See **Front Fork Installation page 8.46**.

15. Install fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**.
16. Install lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
17. Install headpipe. See **Headpipe Installation page 3.108**.
18. Install the fuel tank. See **Fuel Tank Installation page 4.44**.

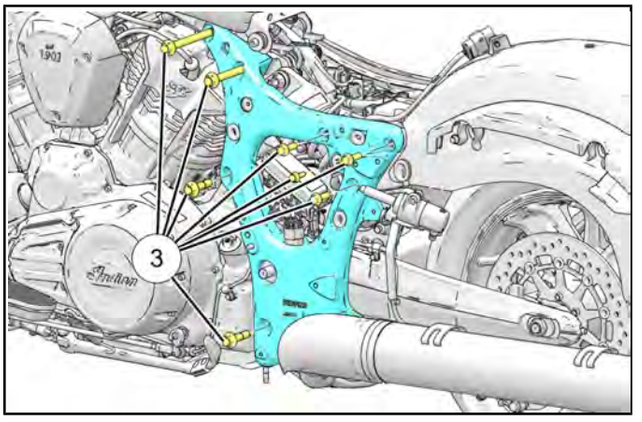
MIDCAST REMOVAL

LEFT MIDCAST

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove Lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
3. Remove shock pivot snap ring ①.

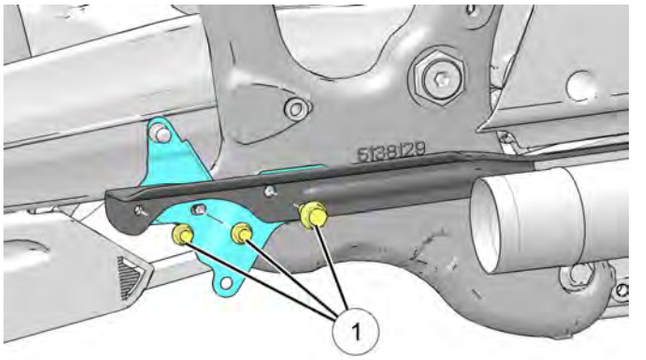


4. Remove Swingarm nut ②.
5. Support the engine with a scissor jack or similar.
6. Remove fasteners securing midcast ③.

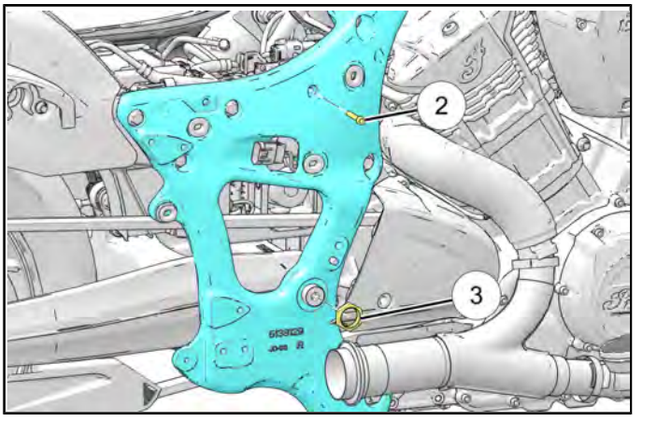


RIGHT MIDCAST

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove Lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
3. Remove resonator. See **Resonator Removal page 3.104**
4. Remove resonator bracket by removing its fasteners ①.

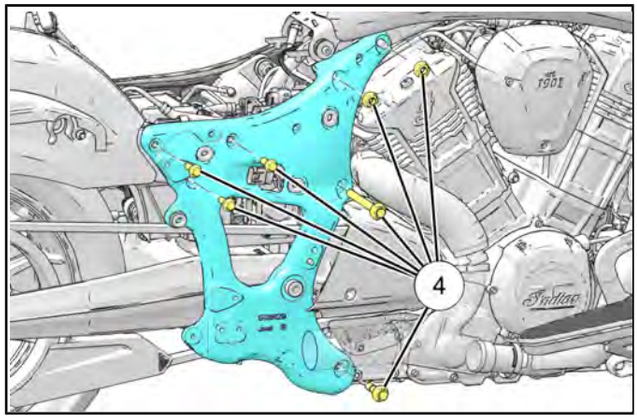


5. Remove ABS mount bracket fastener ②.



6. Remove Swingarm pivot nut ③.
7. Remove swingarm pivot shaft.
8. Disconnect electrical connectors attached to the midcast.
9. Support the engine with a scissor jack or similar.

10. Remove fasteners securing casting ④.



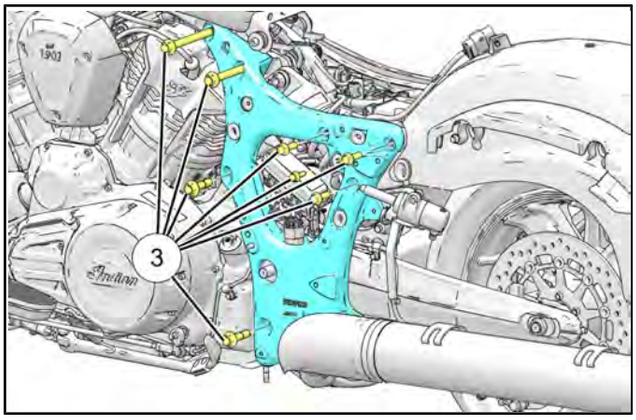
MIDCAST INSTALLATION

LEFT MIDCAST

IMPORTANT
Make sure the dowel pin between the engine and midcase is in place before torquing fasteners.

NOTE
Support the engine with a scissor jack or similar.

1. Install fasteners securing midcast ③.



TORQUE
Midcast M12 Fastener: **75 ft-lbs (102 N·m)**

TORQUE
Midcast M10 Fastener: **35 ft-lbs (47 N·m)**

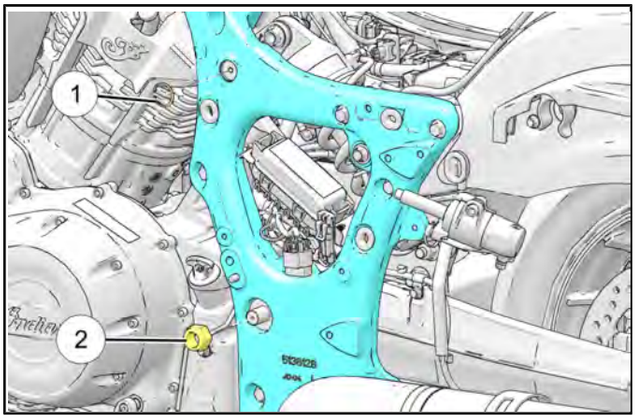
TORQUE
Engine Mount Fastener: **45 ft-lbs (61 N·m)**

TORQUE
Tipover Cover Fastener: **18 ft-lbs (24 N·m)**

2. Install Swingarm nut ②.

TORQUE
Swing-Arm Pivot Jam Nut **75 ft-lbs (101 N·m)**

3. Install shock pivot snap ring ①.



4. Install Lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
5. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

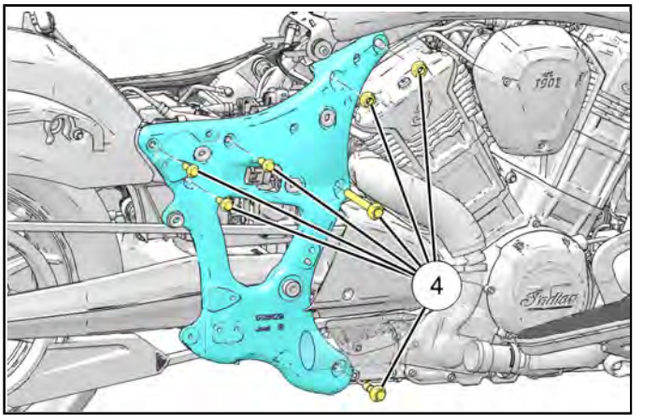
TORQUE
Seat Fastener: **18 ft-lbs (24 N·m)**

RIGHT MIDCAST

NOTE
Support the engine with a scissor jack or similar.

IMPORTANT
Make sure the dowel pin between the engine and midcase is in place before torquing fasteners.

1. Install fasteners securing casting ④.



TORQUE
Resonator Mount to Frame Fastener (M8) **18 ft-lbs (24 N·m)**

TORQUE
Tipover Cover Fastener: **18 ft-lbs (24 N·m)**

TORQUE
Midcast M12 Fastener: **75 ft-lbs (102 N·m)**

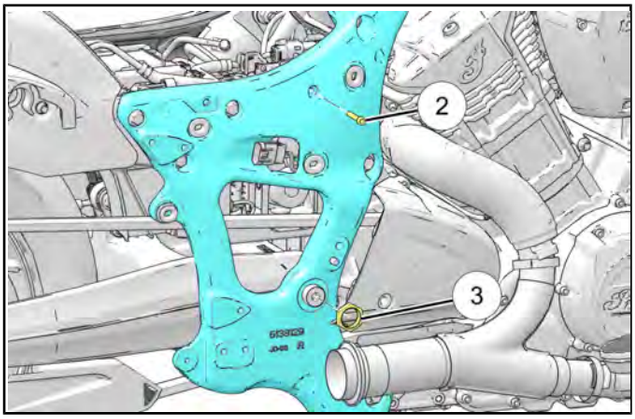
TORQUE
Midcast M10 Fastener: **35 ft-lbs (47 N·m)**

TORQUE
Engine Mount Fastener: **45 ft-lbs (61 N·m)**

2. Install Swingarm pivot nut ③.

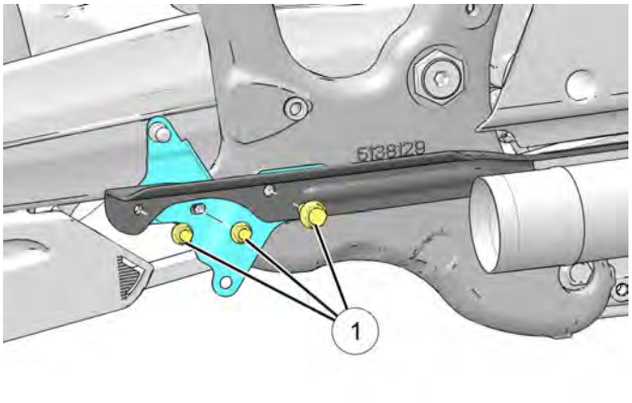
TORQUE
Swing-Arm Pivot Jam Nut **75 ft-lbs (101 N·m)**

3. Install ABS mount bracket fastener ②.



TORQUE
ABS Mount Bracket Fastener (Allen) **88 in-lbs (10 N·m)**

4. Install resonator bracket fasteners ①.



TORQUE
Resonator Mount to Frame Fastener (M6) **88 in-lbs (10 N·m)**

5. Install resonator. See **Resonator Installation page 3.105**
6. Install Lower side cover. See **Side Cover (Lower), Removal / Installation page 7.101**.
7. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

TORQUE
Seat Fastener: **18 ft-lbs (24 N·m)**

NOTES

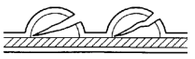
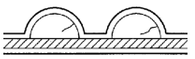
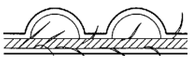
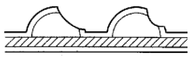
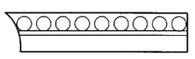
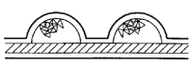
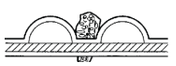
CHAPTER 8
STEERING / SUSPENSION

STEERING / SUSPENSION MAINTENANCE

DRIVE BELT INSPECTION

NOTICE

Inspect drive belt in accordance with Periodic Maintenance Interval Chart and replace at specified intervals regardless of belt condition. See **Maintenance Intervals page 2.4**.

DRIVE BELT WEAR EXAMPLES	CONDITION	SERVICE RECOMMENDATION
	External Tooth Cracks	Replace Belt
	Internal Tooth Cracks	OK to run, but monitor condition
	Fuzzy Edge Cord	OK to run, but monitor condition
	Hook Wear	Replace Belt
	Missing Teeth	Replace Belt
	Bevel Wear (Outer Edge Only)	OK to run, but monitor condition
	Chipping (Not Serious)	OK to run, but monitor condition
	Stone Damage	Belt should be replaced if damage is on the edge of the belt

1. Periodically inspect drive belt for cuts, excessive wear, foreign substance (oil, grit), missing teeth, or any other damage.
2. If any damage is found, belt should be replaced.

NOTICE

Adjust drive belt tension at intervals in accordance with the Periodic Maintenance Interval Chart. See **Maintenance Intervals page 2.4**.

3. If belt or sprocket is being replaced due to damage, inspect the other drive system parts to make sure they are not damaged as well to prevent damage to replaced components.

DRIVE BELT TENSION MEASUREMENT

Special Tool: **Belt Tension Gauge PV-43532**

IMPORTANT

Do not adjust the belt when wet, or immediately after riding. Belt must be *dry* and the drive system must be at ambient temperature (60-80° F). This is extremely important for accuracy.

IMPORTANT

Perform this procedure to achieve proper belt tension *and* alignment. Belt tension should be set before performing the alignment procedure.

⚠ WARNING

A drive belt that is not properly tensioned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

⚠ WARNING

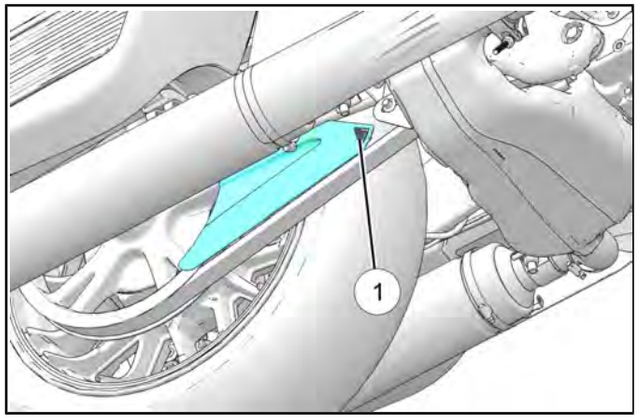
Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

1. Secure motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Shift transmission into NEUTRAL.
3. ELEVATE rear wheel off the ground when checking deflection or adjusting the belt.

   Find Tight Spot In Belt

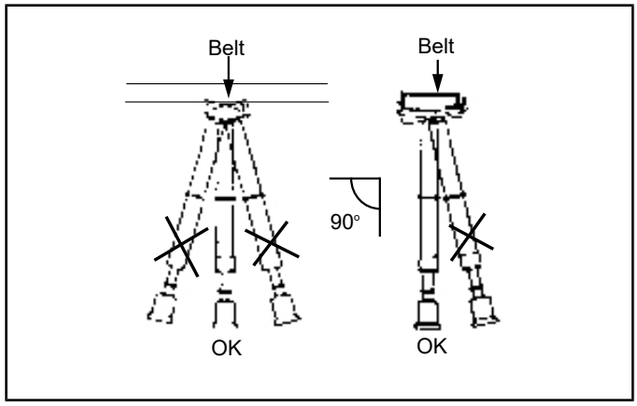
4. Use the tire valve stem as a reference and perform the following Steps:
   - Check / record belt deflection at 4 different points, 90 degrees apart. Rotate wheel in a CLOCKWISE rotation as viewed from belt side of motorcycle.
   - Place a mark on rear wheel at the tightest point (least deflection) to use as a reference.

- Continue to rotate the wheel in normal drive direction (CLOCKWISE) 1-2 revolutions until your reference mark (the tightest point) is lined up with the tension setting window in the lower belt guard ①.



- Adjust belt deflection with wheel in this position.

5. Place tape measure or ruler next to drive belt or use the graduations on lower belt guard for reference.
6. Slide O-ring on belt tension gauge to the 10 lb. mark.
   - Place belt tension gauge squarely against belt at center and keep it at a 90° angle to the belt surface.
   -



7. Push up on gauge until O-ring just touches tool body. See **Drive Belt Tension - Specifications page 8.5** for drive belt deflection specifications.
8. If belt deflects more than the specified distance with 10 lbs. of force, tighten the belt. If deflection is less than specified loosen the belt.

   See **Drive Belt Adjustment page 8.62**.

NOTICE
New drive systems (new vehicle or when belt and sprockets are replaced) should be set to the tight side of the specification and inspected after the first 500 miles (800 km).

DRIVE BELT TENSION - SPECIFICATIONS

SPECIFICATIONS: DRIVE BELT

BELT DEFLECTION	
Model	Deflection @ 10 lbs force
Challenger	0.6" (15 mm) - New Belt 0.79" (20 mm) - Belt with 1000+ miles
SONIC TENSION DATA	
The following data is provided for use with the Gates 507C Sonic Tension Meter or an equivalent. Follow Steps 1-4 and the instructions included with your sonic tension meter.	
Required Data For Sonic Tension Meter	Specification
Span	710 mm
Belt Width	24 mm
Belt Mass Constant	8.4 g/mm
Tension	32 Hz (± 1 Hz) - New Belt 25 Hz (± 1 Hz) - Belt with 1000+ miles

8

SPROCKET INSPECTION

NOTICE

Drive belt and sprocket service life are maximized and drive line noise minimized by proper cleaning. Cleaning interval is approximately every tire change, or more often if operated in dirty, dusty, or high debris environments.

Inspection

1. Clean the drive belt and front and rear sprockets with a mild mixture of dish soap and warm water. Rinse and dry thoroughly.
2. Inspect front and rear sprocket teeth for wear or damage from foreign material.
3. Closely inspect drive belt condition.

STEERING HEAD / FRONT WHEEL INSPECTION

⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

NOTICE

Be sure control cables, hoses and wiring are not interfering with handle bar rotation.

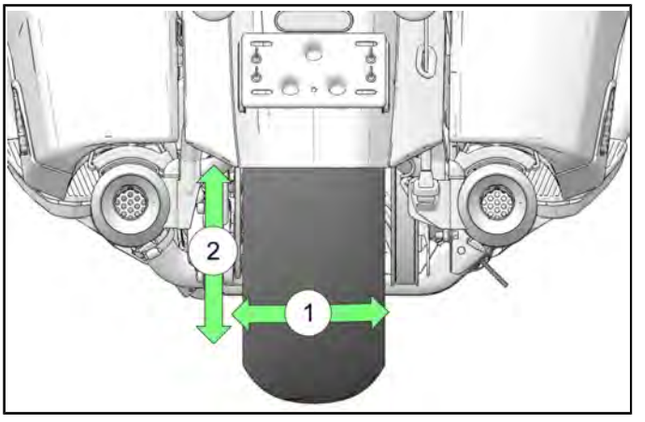
1. Secure motorcycle with front wheel off the floor.
2. Turn handlebars from full left to full right and inspect for smooth, free movement. Point front wheel straight ahead, grasp fork tubes and pull/push fork tubes back and forth. If steering binds, feels rough or uneven, or if movement is detected at steering stem, adjust or replace steering head bearings as necessary.
3. Rotate front wheel and inspect for smooth rotation of front wheel bearings. If roughness or unusual sounds are present, replace front wheel bearings. See Steering / Suspension chapter.
4. Turn handle bars full right or left and hold against the fork stop. Attempt to move front wheel side-to-side. If movement is observed, inspect front axle, wheel, and bearings. See Steering / Suspension chapter.

SWING-ARM INSPECTION

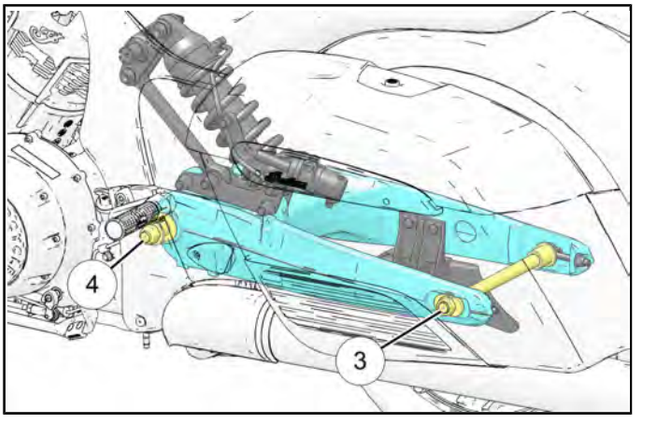
⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

1. Sit astride the motorcycle. Compress the rear suspension several times and check for smooth and quiet operation ②.
2. Secure motorcycle with rear wheel elevated.
3. Inspect for worn Swing-Arm bearings by grasping the rear wheel and attempting to move wheel side-to-side ①.



4. If movement is detected, determine if movement is at axle area ③ or Swing-Arm pivot area ④. Refer to Steering / Suspension chapter for wheel bearing and Swing-Arm bearing replacement.



5. Rotate rear wheel and inspect for smooth rotation of rear wheel bearings. If roughness or unusual sounds are detected, inspect rear wheel bearings, belt tension and alignment, and brake pads.

6. Inspect rear shock for leakage and all rear suspension components for damage or loose fasteners.
7. Inspect suspension pivots and shock mounts for radial movement in all pivot joints. If a joint has radial movement, remove rear shock absorber and inspect suspension pivot linkage. See Steering / Suspension chapter.
8. Verify axle nut is tight.
9. Replace any worn or damaged parts.

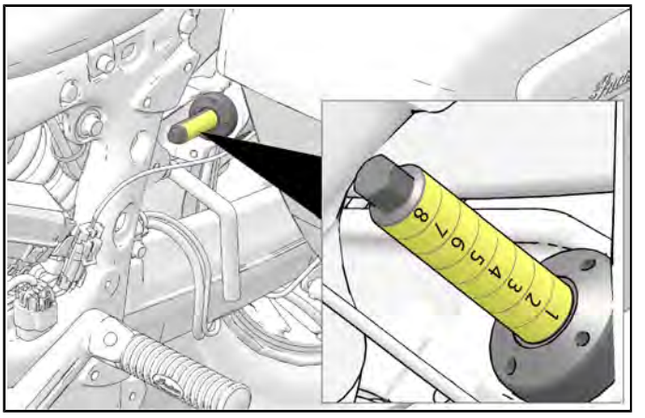
REAR SHOCK PRELOAD ADJUSTMENT

Periodically inspect rear shock preload. For the most comfortable ride and proper ground clearance, adjust preload if ride height is out of specification.

1. Remove upper left hand side panel.
2. Look up suspension setting for the specific loading according to chart (decal applied to the inside of the left-hand upper body panel).

SHOCK: HYDRAULIC ADJUSTER SETTING			
Total Cargo + Riders (lbs)	**Adjustment Setting (No Trunk)**	**Adjustment Setting (Trunk Equipped)**	
150	1	3	**CAUTION:** DO NOT USE IMPACT TOOLS OR EXCEED 10 FT-LBS OF TORQUE WHEN ADJUSTING. DAMAGE TO COMPONENTS MAY OCCUR.
175	1	3	
200	2	3	
225	2	4	
250	2	4	
275	3	5	
300	3	5	
325	3	6	
350	4	6	
375	4	7	
400	4	7	
425	4	8	
450	5	8	
475	5	N/A	
500	5	N/A	

3. Use supplied tool or 10 mm socket to set adjuster to proper setting.



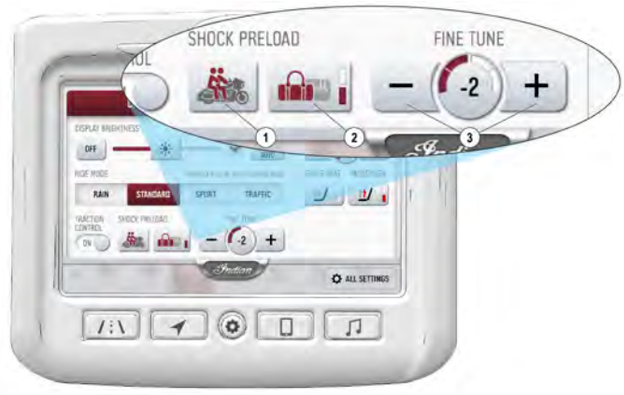
NOTICE

The numbers are biased towards the line which they represent.

E-PRELOAD ADJUSTMENT

DISPLAY

To adjust the electronic preload (EPL), do the following:



1. Press the Menu/Control button to bring up the Control Panel.
2. Tap on the riders button ① to adjust the weights of riders.
3. Tap on the luggage ② to adjust the weight of the luggage setting.
4. Fine weight adjustments can be made using the plus and minus buttons ③.

QUICK ADJUSTMENTS

1. Add / Remove passenger by pressing the rider button.
2. Cycle through No / Medium / Heavy luggage weights.
3. Adjust fine tune (up or down to 2 preload rotations).

EDIT WEIGHTS

To adjust the electronic preload (EPL), do the following:

1. Select **ALL SETTINGS**.
2. Select **BIKE**.
3. Select **SHOCK PRELOAD**.
4. Select **EDIT WEIGHTS**.

FACTORY RESET AND RECALIBRATE

1. Select **ALL SETTINGS**.
2. Select **BIKE**.
3. Select **SHOCK PRELOAD**.
4. Select **ADVANCED**.

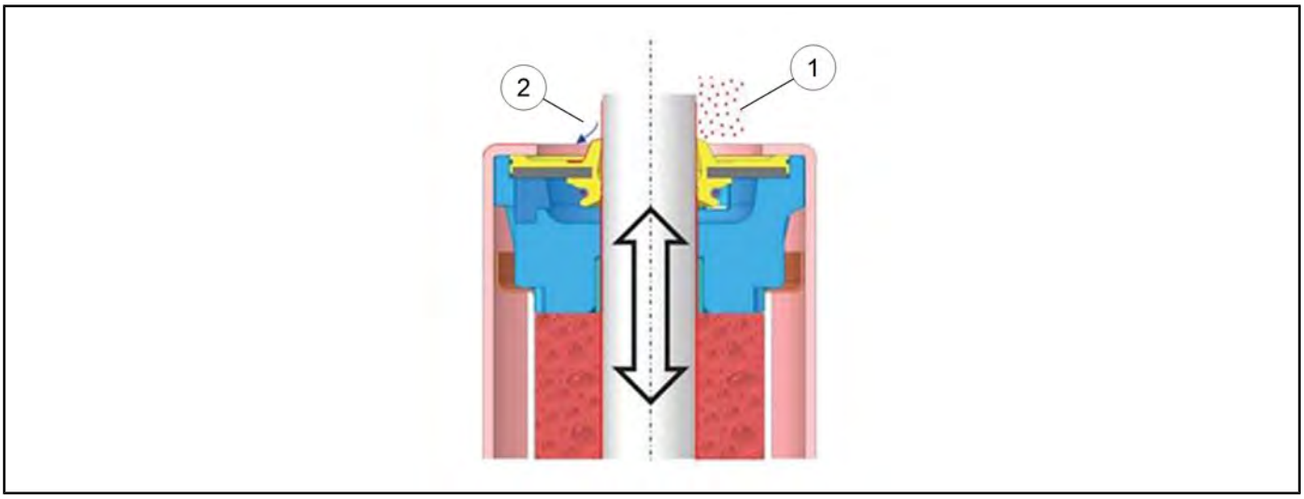
8

Calibrate - This will automatically initiate a learn process where the system will drive the suspension through it's entire range learning the end points. It is recommended that the rider starts the engine and lifts the side stand to ensure they have control of bike prior to activating the learn process. A learn process should be completed anytime the rear shock is removed for service or a VCM 1 is replaced.

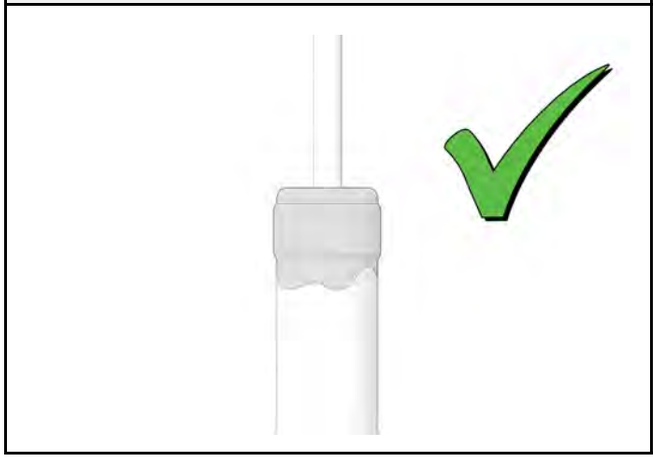
Factory Rest - This will reset the weights back to factory values.

SHOCK ANALYSIS

Shock "misting" ① or "weepage" ② is common and should be present during normal vehicle operation. All shock absorber seals are designed to allow a thin film of oil to pass into and out of the shock. This thin film of oil lubricates the seal to promote low friction and reduces the corrosion rate of the Piston Rod.



Vehicle operating conditions have a high impact on how much shock oil might be present on the seal and shock body (i.e. road conditions and operating temperature). It is important to properly identify the difference between normal operation (weepage or misting) and a shock that has a leak. Below are some images to help determine what is normal and what could be identified as a bad shock.

MISTING OR WEEPAGE	LEAKAGE
	

SIDESTAND INSPECTION

1. Support the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Inspect sidestand spring for damage or loss of tension. Be sure stand returns to fully retracted position.
3. Inspect side stand for smooth movement.
4. Inspect sidestand pivot fastener nut for proper torque.

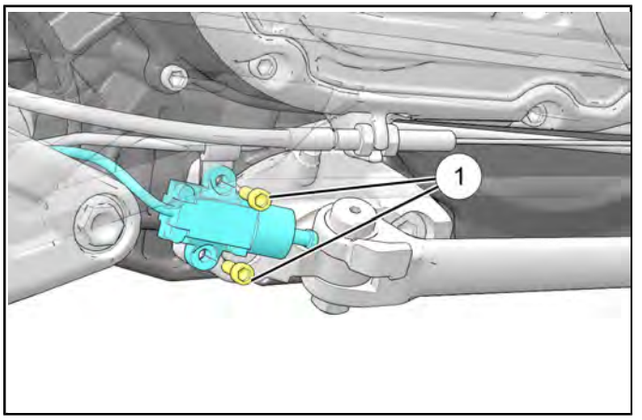
TORQUE
Sidestand Pivot Fastener: **37 ft-lbs (50 N·m)**

5. Replace sidestand if it is bent. Do not attempt to straighten sidestand.

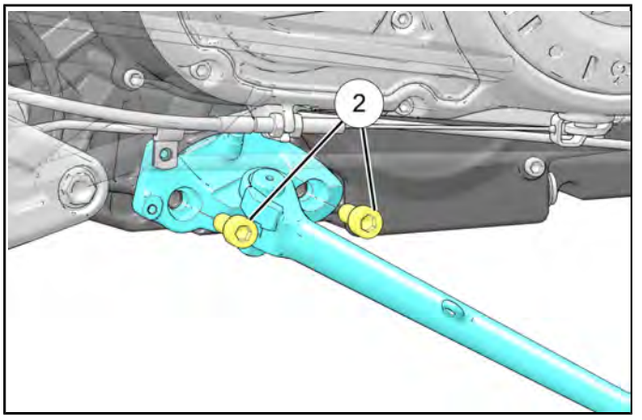
SIDESTAND REMOVAL

REMOVAL

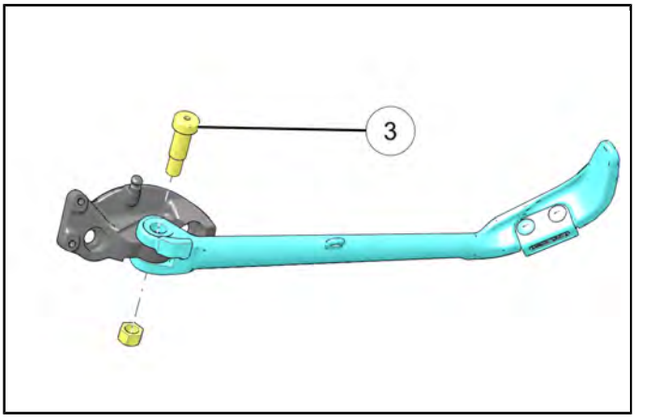
1. Secure motorcycle securely in an upright position. Clamp front tire securely in a wheel vise.
2. Place the sidestand in the upright position.
3. Carefully remove the sidestand spring.
4. Remove the two fasteners ① securing the sidestand switch.



5. Place the sidestand in the down position and remove sidestand mount fasteners ②.



6. Remove side stand pivot fastener ③.



SIDESTAND INSTALLATION

⚠ WARNING

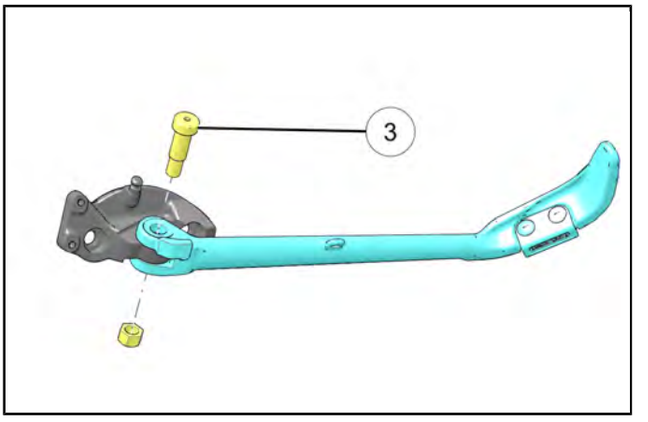
The sidestand spring is under tension. Wear eye and face protection when removing and installing the spring and sidestand. Be sure the vehicle is properly secured before you begin.

IMPORTANT

Sidestand fasteners must be replaced any time the sidestand is removed. The nut is a crushed lock and therefore it can not be reused.

INSTALLATION

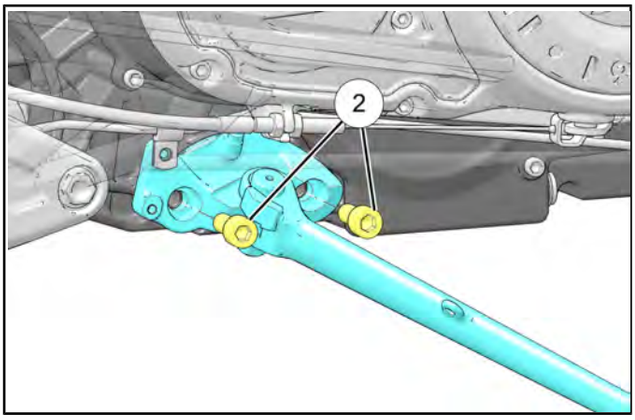
1. Secure motorcycle securely in an upright position. Clamp front tire securely in a wheel vise.
2. Install side stand pivot fastener ③.



TORQUE

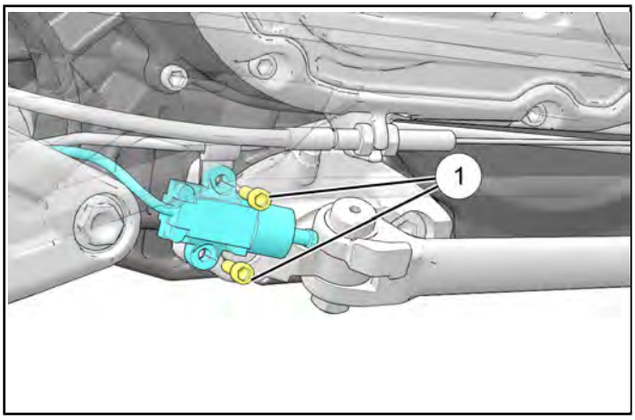
Sidestand Pivot Fastener:
37 ft-lbs (50 N·m)

3. Place the sidestand in the down position and install sidestand mount fasteners ②.



TORQUE
Sidestand Mount Fastener: **45 ft-lbs (61 N·m)**

4. Install the two fasteners ① to secure the sidestand switch.



TORQUE
Sidestand Switch Fastener **44 in-lbs (5 N·m)**

5. Carefully install the sidestand spring.
6. Place the sidestand in the upright position.

FRONT WHEEL / SUSPENSION

GENERAL INFORMATION

SERVICE NOTES – FRONT WHEEL / SUSPENSION

⚠ WARNING

Indian Motorcycles are produced using the designated tires listed as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability which could lead to a crash, resulting in serious injury or death. Use *only* the recommended tires inflated to the recommended tire pressures based on load conditions as listed on the tire information label.

Tubeless tires are used on certain Indian Motorcycle models. Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged rims.

⚠ CAUTION

Work performed to the front end of the motorcycle usually involves supporting the machine with the front end elevated. Take precautions so that the motorcycle is securely supported when the front tire is off the ground. This reduces the possibility of personal injury or damage to the motorcycle.

Leaking front fork seals are a safety hazard and should be replaced immediately if a leak is found. Fork oil could contaminate front brake components which could reduce stopping ability of the motorcycle. Contaminated brake discs or pads greatly reduce available stopping force & increase stopping distance. Brake discs can be cleaned using commercially available brake cleaner. NEVER attempt to clean contaminated brake pads. Replace pads as a set.

SPECIAL TOOLS – FRONT WHEEL / SUSPENSION

TOOL DESCRIPTION	PART NUMBER
Fork Spring Compressor	PV-49463
Fork Spring Compressor Adapter	PV-49464
Cartridge Shaft Tool	PV-49452
Damper Rod Holder	PV-49453
Fork Oil Level Tool	PV-59000-A
Fork Seal Driver	PV-49494
Fork Seal Guide (43mm)	PV-47037
Wheel / Stem Bearing Removal / Installation Kit	PF-51324-A
Spanner Socket (Steering Stem)	PV-43508

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

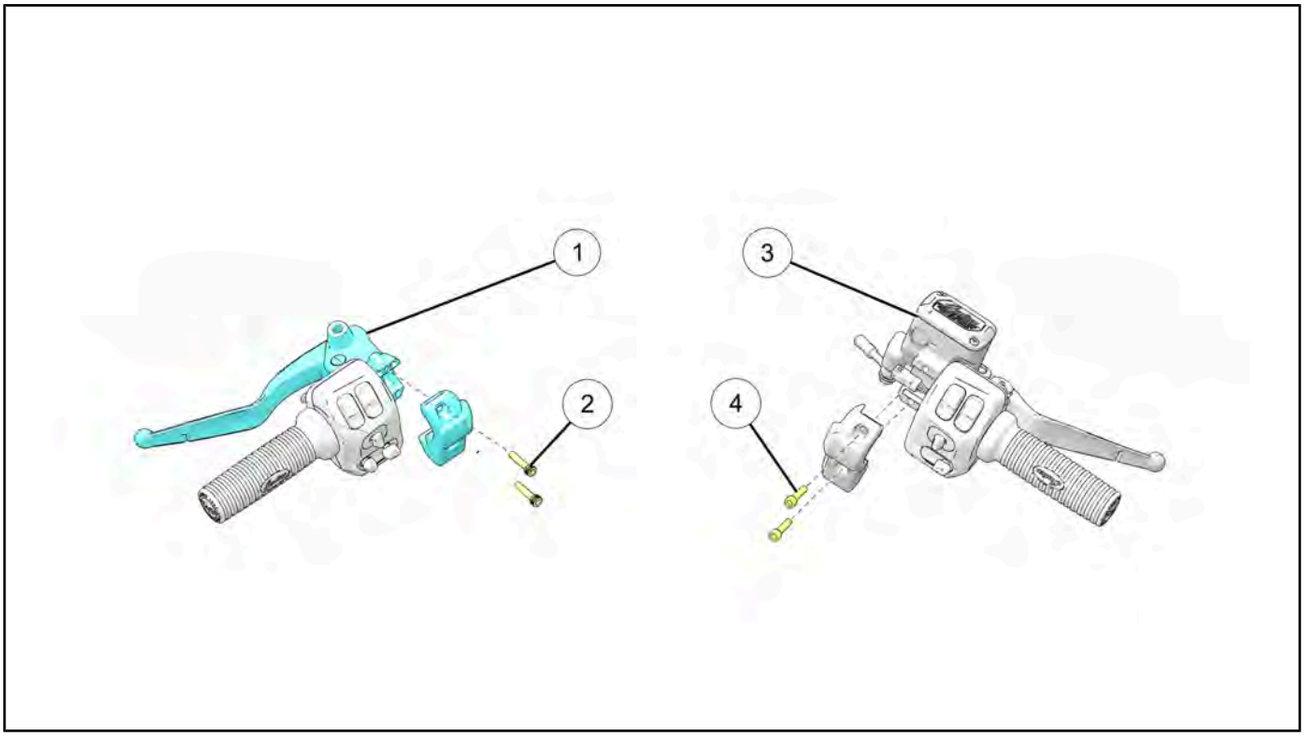
SERVICE SPECIFICATIONS – FRONT WHEEL / SUSPENSION

ITEM		STANDARD	SERVICE
Axle Runout		-	.20 mm (.008")
Front Wheel Runout Cast 3.5'' x 19''	Axial	.50 mm (.020")	2.0 mm (.080'')
	Radial	.50 mm (.020")	2.0 mm (.080'')
Fork Tube Diameter		43 mm	Not Applicable
Fork Tube Runout		-	.20 mm (.008")
Fork Oil Type		Indian Motorcycle Fork Oil (PN: 2884244)	
Fork Oil Level (From Top of Tube)	Measured with spring removed, inner tube fully compressed.	103 mm (4.05")	+1 mm (.039'')
Fork Oil Capacity (per leg, dry)	Oil level must be measured and adjusted to specification.	**535cc** per leg	Set Level

ASSEMBLY VIEWS

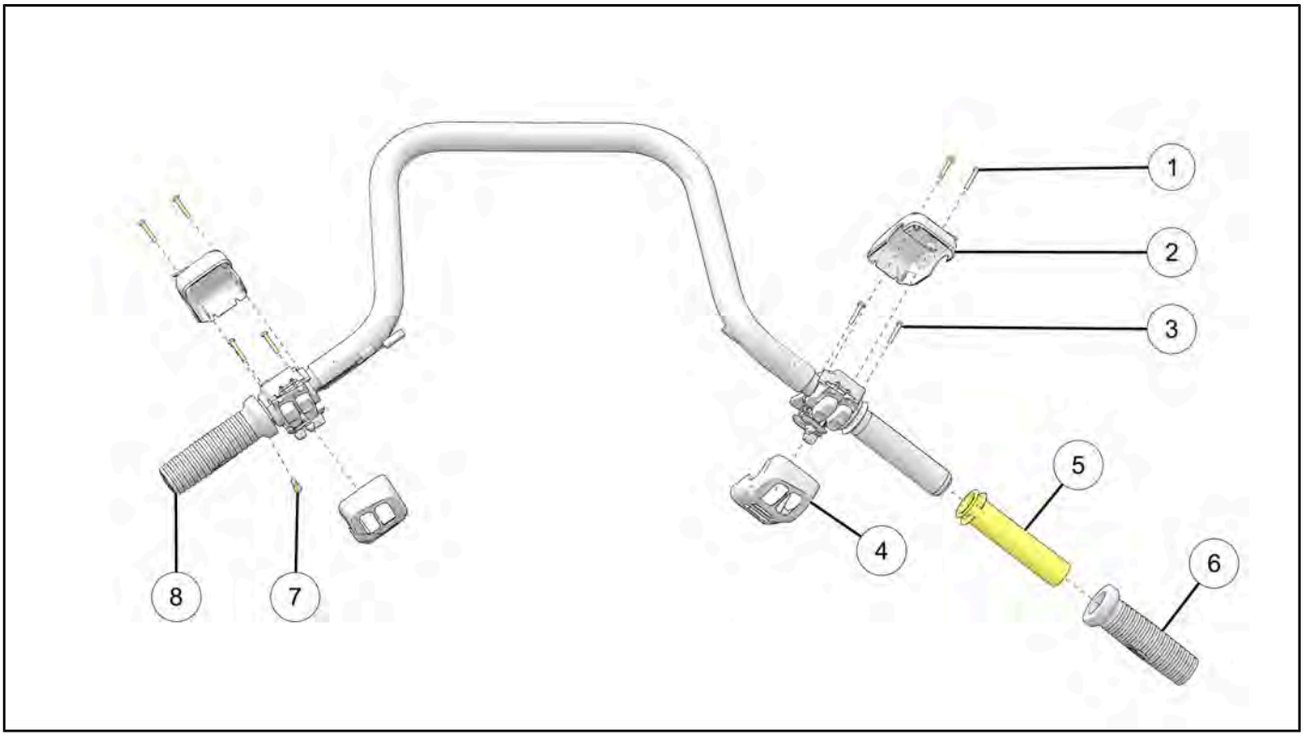
HANDLEBAR CONTROLS ASSEMBLY VIEW

CLUTCH PERCH / MASTER CYLINDER



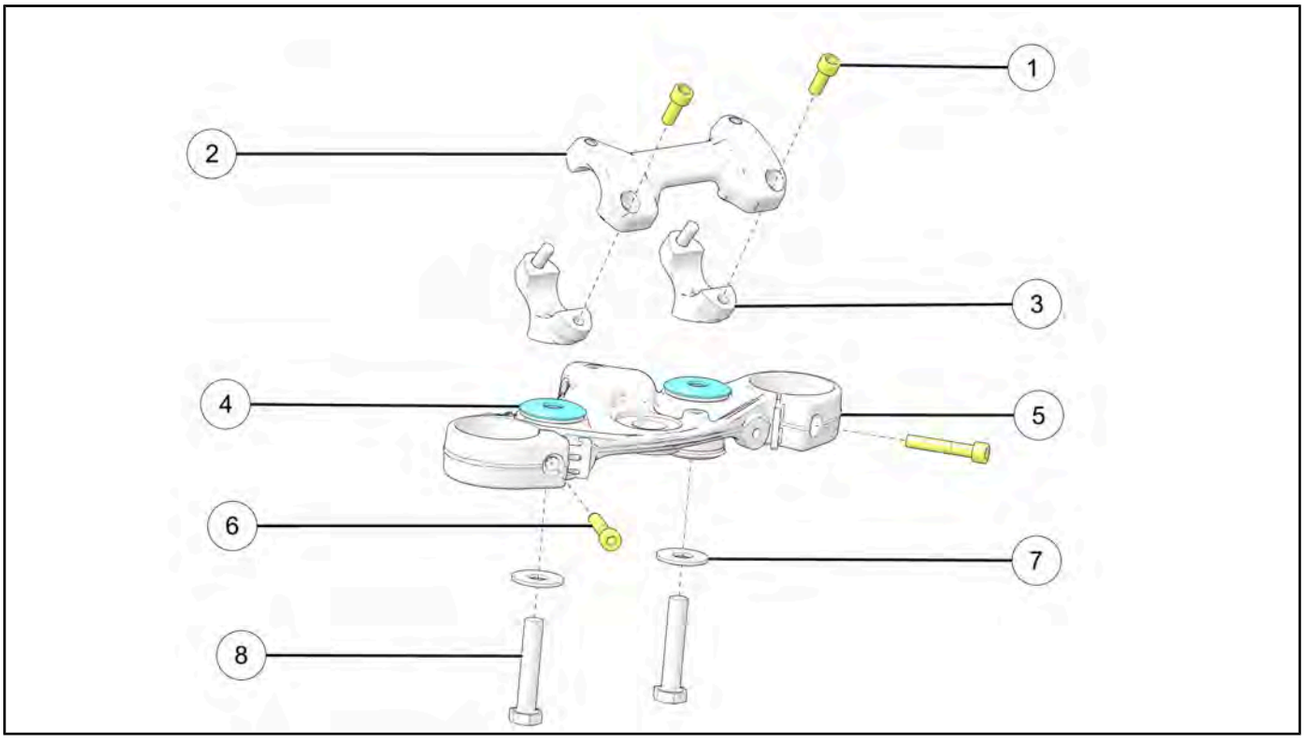
① Clutch Lever Assembly	③ Master Cylinder (Front)
② Clutch Perch Fastener **96 in-lbs (11 N·m)** IMPORTANT Torque the **Clutch Perch** upper fastener first and the bottom fastener second.	④ Master Cylinder Clamp Fastener (Front) **96 in-lbs (11 N·m)** IMPORTANT Torque the **Master Cylinder Clamp** upper fastener first and the bottom fastener second.

HANDLEBAR / CONTROLS



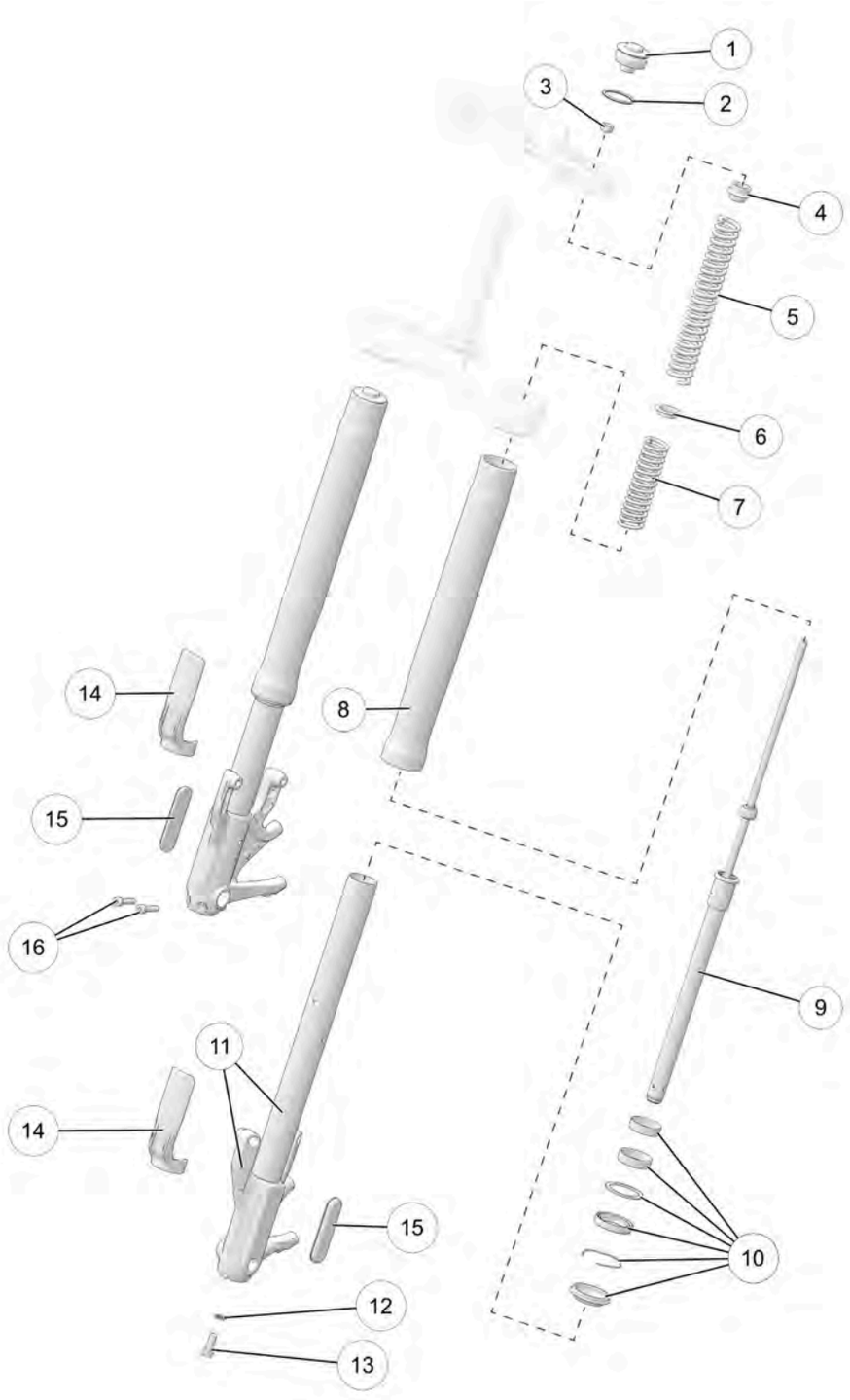
① Switch Cube Cover Fastener **12 in-lbs (1 N·m)**	⑤ Electronic Throttle Control
② Switch Cube Cover (Back)	⑥ Throttle Grip
③ Switch Cube Fastener **12 in-lbs (1 N·m)**	⑦ Grip Fastener **53 in-lbs (6 N·m)**
④ Switch Cube Cover (Front)	⑧ Non-Throttle Grip Assembly

UPPER TRIPLE CLAMP AND RISER



① Riser Cap Fastener **18 ft-lbs (24 N·m)** Torque front fastener then rear.	⑤ Triple Clamp
② Riser Cap	⑥ Triple Clamp Fastener **18 ft-lbs (24 N·m)**
③ Handlebar Riser	⑦ Washer
④ Isolator	⑧ Handlebar Riser Fastener **60 ft-lbs (81 N·m)**

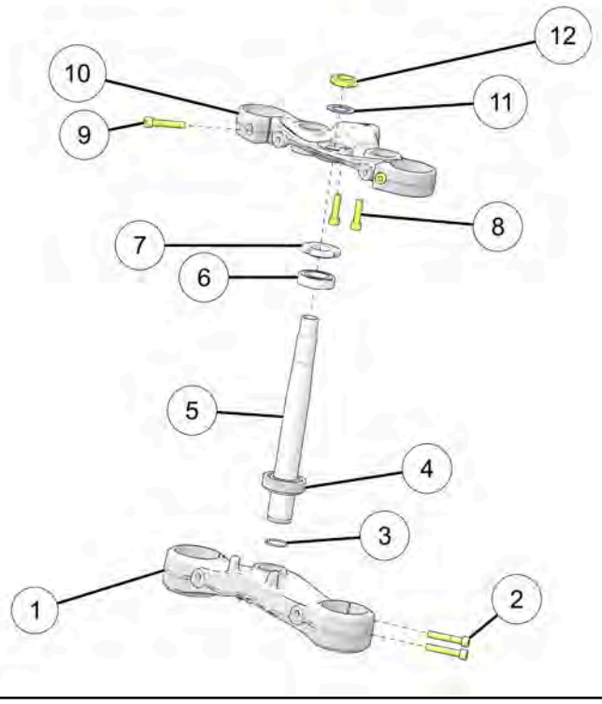
FRONT FORK ASSEMBLY VIEW



① Fork Cap **17 ft-lbs (23 N·m)**	⑨ Cylinder Comp.
② O-Ring	⑩ Kit, Seals

③ Fork Cap Nut **11 ft-lbs (15 N·m)**	⑪ Tube Comp. Inner
④ Spring Guide, Upper	⑫ Sealing Washer
⑤ Spring, Upper	⑬ Cartridge Screw **17 ft-lbs (23 N·m)**
⑥ Spring Guide, Lower	⑭ Guard, Fork
⑦ Spring, Lower	⑮ Reflector
⑧ Comp. Tube, Outer	⑯ Front Axle Pinch Fastener **19 ft-lbs (26 N·m)**

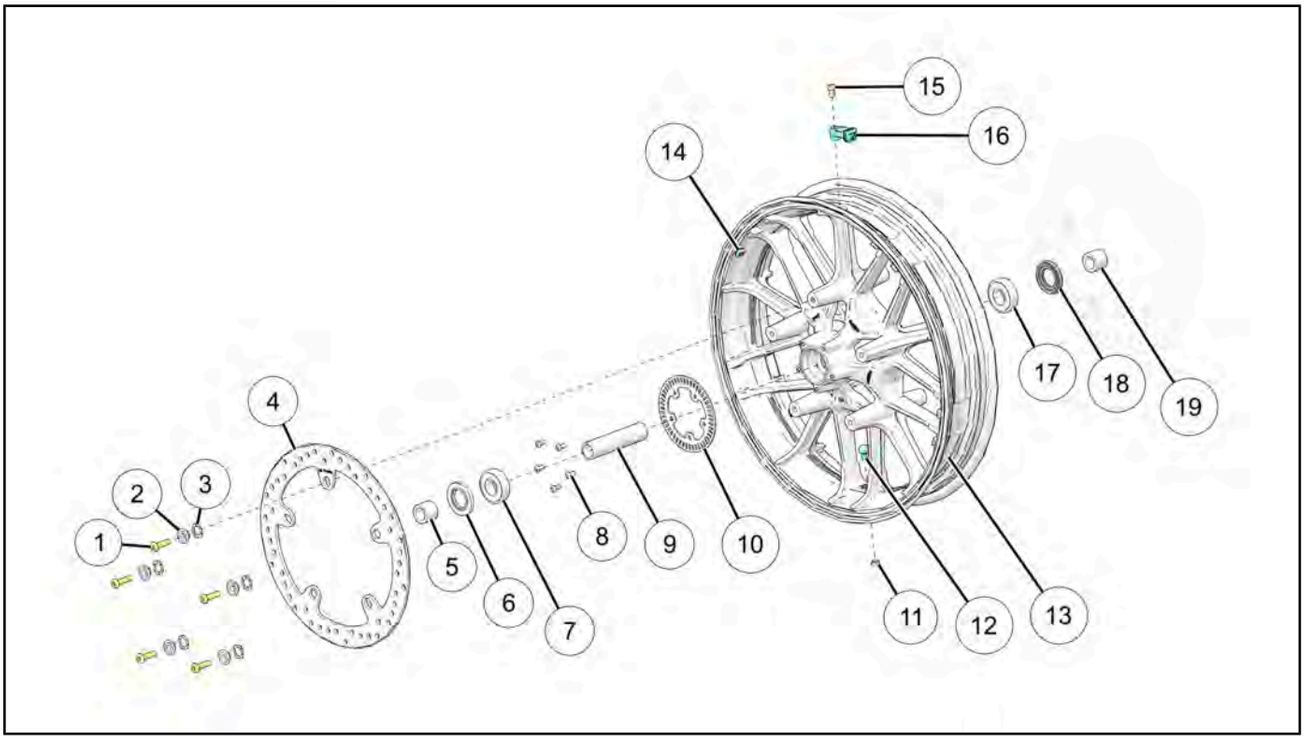
TRIPLE CLAMP ASSEMBLY VIEW



① Lower Triple Clamp	⑦ Steering Head Nut **1. Torque to 29 ft-lbs (39 N·m)** **2. Turn assembly lock to lock 5 times** **3. Loosen 60 °** **4. Install Triple clamp and tighten top nut 72 ft-lbs (98 N·m)**
② Lower Fork Clamp Fastener **18 ft-lbs (24 N·m)**	⑧ Lower Fork Clamp Fastener **18 ft-lbs (24 N·m)**
③ Steering Post Clip	⑨ Upper Fork Clamp Fastener **18 ft-lbs (24 N·m)**
④ Steering Stem Bearing	⑩ Upper Triple Clamp
⑤ Steering Stem	⑪ Upper Triple Clamp Bushing
⑥ Upper Triple Clamp Bearing	⑫ Triple Clamp Nut **72 ft-lbs (98 N·m)**

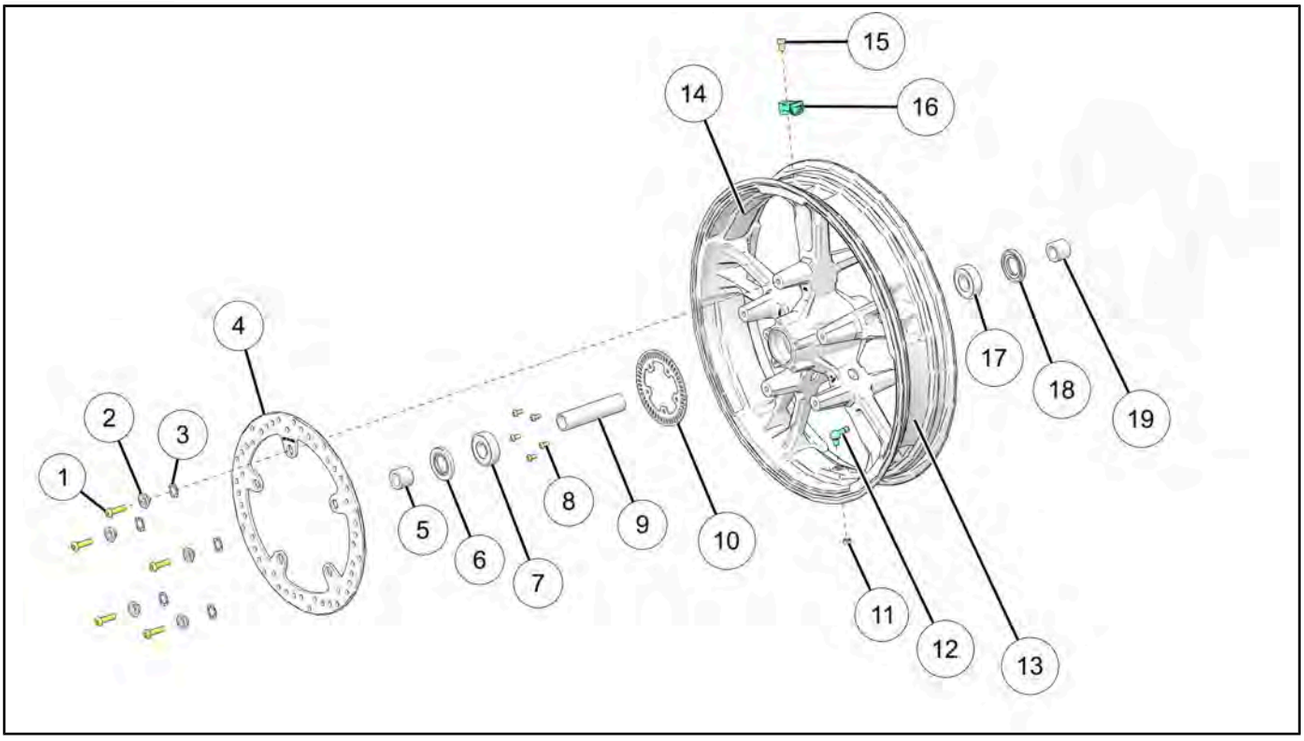
FRONT WHEEL ASSEMBLY VIEW

BASE AND PREMIUM MODELS



① Rotor Screw **22 ft-lbs (30 N·m)**	⑪ Valve Stem Nut **53 in-lbs (6 N·m)**
② Rotor Screw Bushing	⑫ Valve Stem
③ Rotor Screw Washer	⑬ Front Wheel 19 x 3.5
④ Brake Rotor	⑭ Wheel Weight
⑤ Front Wheel Spacer	⑮ Tire Pressure Sensor Fastener **72 in-lbs (8 N·m)**
⑥ Wheel Seal	⑯ Tire Pressure Sensor
⑦ Wheel Bearing	⑰ Wheel Bearing
⑧ Tone Ring Fastener **88 in-lbs (10 N·m)**	⑱ Wheel Seal
⑨ Front Wheel Bearing Spacer	⑲ Front Wheel Spacer
⑩ Tone Ring	

ELITE MODELS



① Rotor Screw **22 ft-lbs (30 N·m)**	⑪ Valve Stem Fastener **53 in-lbs (6 N·m)**
② Rotor Screw Bushing	⑫ Valve Stem
③ Rotor Screw Washer	⑬ Front Wheel 19 x 3.5
④ Brake Rotor	⑭ Wheel Weight
⑤ Front Wheel Spacer	⑮ Tire Pressure Sensor Fastener **72 in-lbs (8 N·m)**
⑥ Wheel Seal	⑯ Tire Pressure Sensor
⑦ Wheel Bearing	⑰ Wheel Bearing
⑧ Tone Ring Fastener **88 in-lbs (10 N·m)**	⑱ Wheel Seal
⑨ Front Wheel Bearing Spacer	⑲ Front Wheel Spacer
⑩ Tone Ring	

SERVICE PROCEDURES

HANDLEBAR REMOVAL

⚠ WARNING

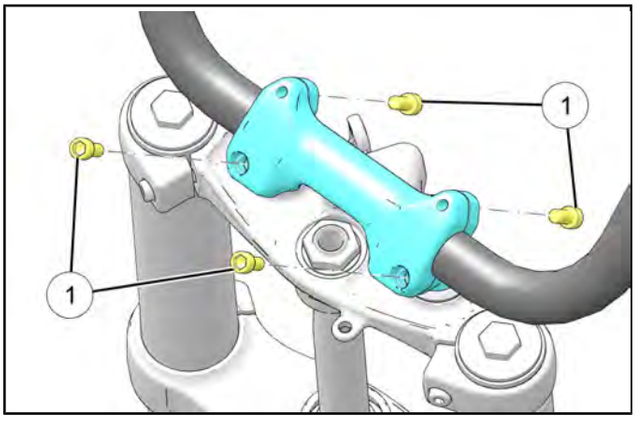
Clutch cable must be routed, installed, and adjusted correctly to function properly. Note how cable is routed and secured before removing the cable. Permanent cable damage may result if the inner cable is bent or twisted during installation. If the cable is incorrectly routed, installed, or adjusted, serious injury or death may occur.

⚠ CAUTION

Cover painted or chrome parts to prevent damage. Use care to protect fuel tank and front fender. Tank removal is recommended. Secure, set aside, or support parts as they are removed.

REMOVAL

1. Remove Fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37** or **Fairing Disassembly page 7.63**.
2. Remove throttle control. See **Throttle Control Removal page 10.135**.
3. Remove front master cylinder, reference **Front Master Cylinder Service page 9.47**.
4. Remove clutch lever assembly. See **Clutch Lever Assembly Removal page 8.25**.
5. Remove riser cap fasteners ①.



6. Remove rise cap and handlebar.

HANDLEBAR INSTALLATION

⚠ WARNING

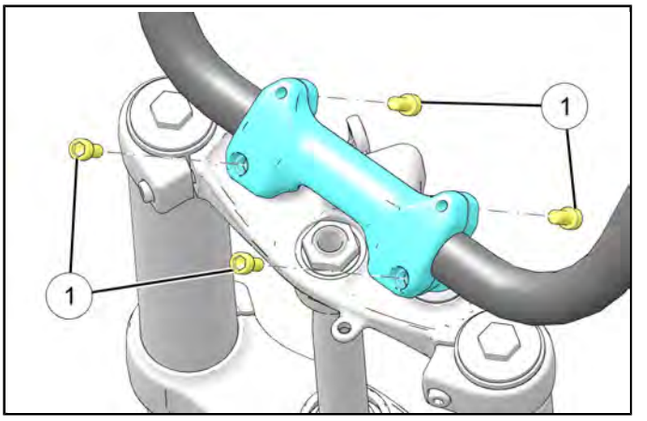
Clutch cable must be routed, installed, and adjusted correctly to function properly. Note how cable is routed and secured before removing the cable. Permanent cable damage may result if the inner cable is bent or twisted during installation. If the cable is incorrectly routed, installed, or adjusted, serious injury or death may occur.

⚠ CAUTION

Cover painted or chrome parts to prevent damage. Use care to protect fuel tank and front fender. Tank removal is recommended. Secure, set aside, or support parts as they are removed.

INSTALLATION

1. Install rise cap and handlebar.
2. Install riser cap fasteners ①.



NOTICE

Torque front fastener then rear.

TORQUE
Riser Cap Fastener: **18 ft-lbs (24 N·m)**

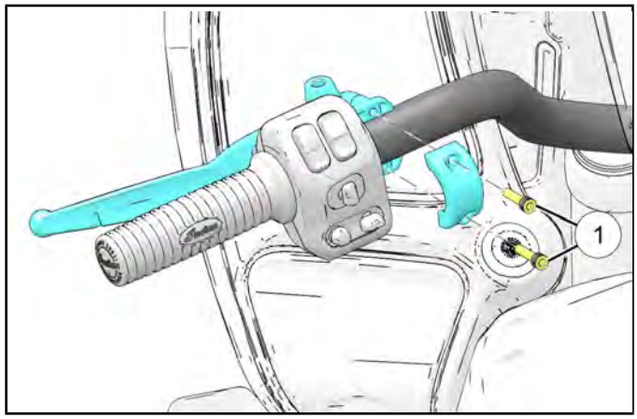
3. Install clutch lever assembly. See **Clutch Lever Assembly Installation page 8.26**.
4. Install front master cylinder, reference **Front Master Cylinder Service page 9.47**.
5. Install throttle control. See **Throttle Control Installation page 10.135**.

6. Install Fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

CLUTCH LEVER ASSEMBLY REMOVAL

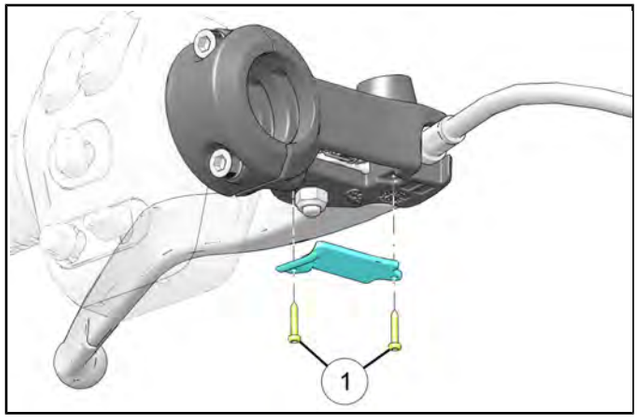
REMOVAL

1. Remove clutch cable from lever assembly. See **Clutch Cable Removal page 8.29**.
2. Remove clutch perch fasteners ① and remove assembly.

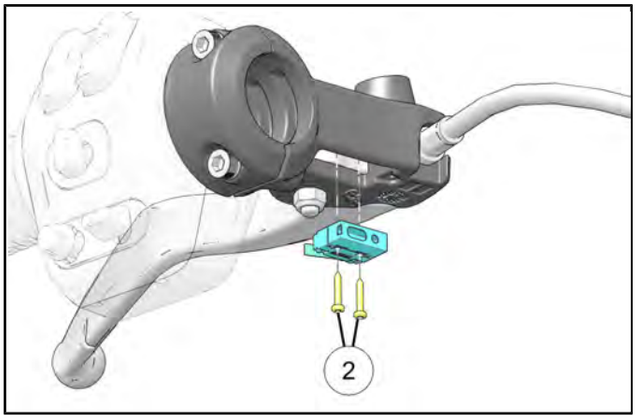


CLUTCH SWITCH

1. Remove clutch switch cover fasteners ① and clutch switch cover .



2. Remove clutch switch retaining fastener②.



3. Gently pull the clutch switch out of the lever perch until the locating pins are free and the switch can be disconnected.

⚠ CAUTION

The clutch switch has two locating pins on the top side which slide into the clutch lever perch. Use caution when removing the clutch switch so the locating pins do not break off.

8

CLUTCH LEVER ASSEMBLY INSTALLATION

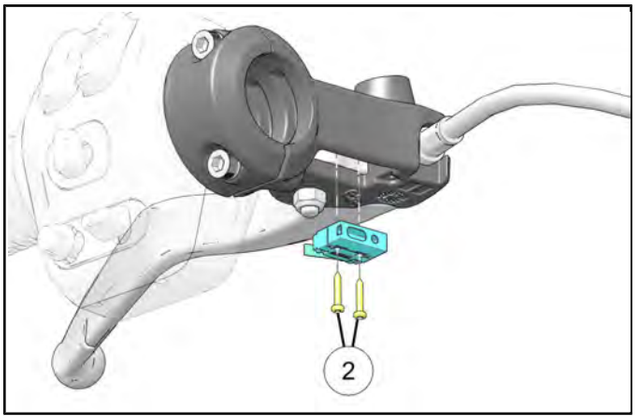
CLUTCH SWITCH

1. Gently install the clutch switch into the lever perch until the locating pins are connected.

⚠ CAUTION

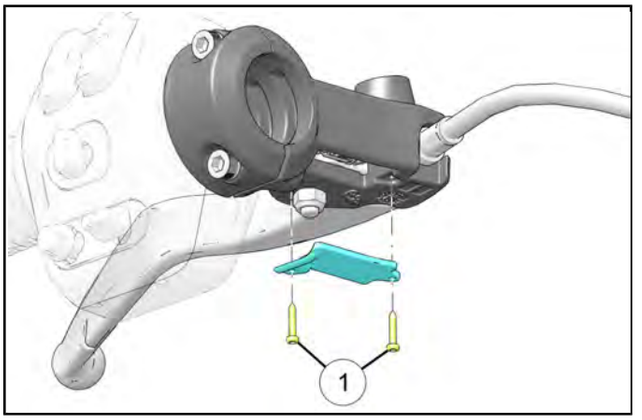
The clutch switch has two locating pins on the top side which slide into the clutch lever perch. Use caution when installing the clutch switch so the locating pins do not break off.

2. Install clutch switch retaining fastener②.



TORQUE
Clutch Switch Fastener: **5 in-lbs (0.55 N·m)**

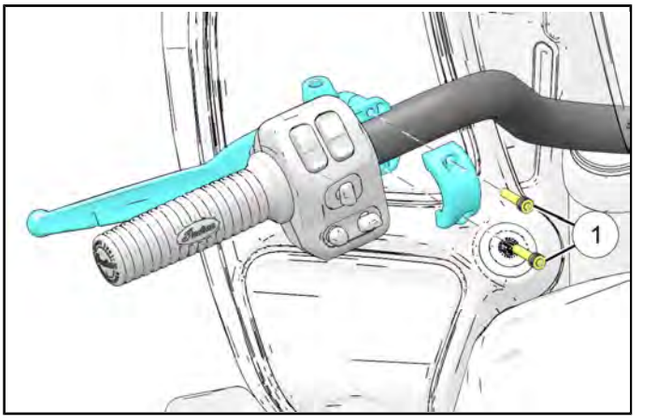
3. Install clutch switch cover fasteners ① and clutch switch cover .



TORQUE
Clutch Switch Cover Fasteners: **5 in-lbs (0.55 N·m)**

INSTALLATION

1. Install clutch perch fasteners ① and install assembly.



IMPORTANT
Torque the **Clutch Perch** upper fastener first and the bottom fastener second.

TORQUE
Clutch Perch Fastener: **96 in-lbs (11 N·m)**

2. Reconnect clutch switch wire to switch cube and reinstall switch cube covers.
3. Install clutch cable onto lever assembly. See **Clutch Cable Installation page 8.30**.

9860001 R01 - 2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus Service Manual

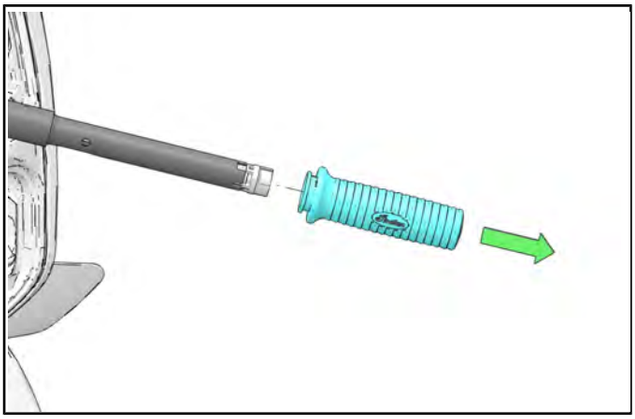
THROTTLE CONTROL REMOVAL

To watch a video of this procedure, scan the QR code or click **HERE**.

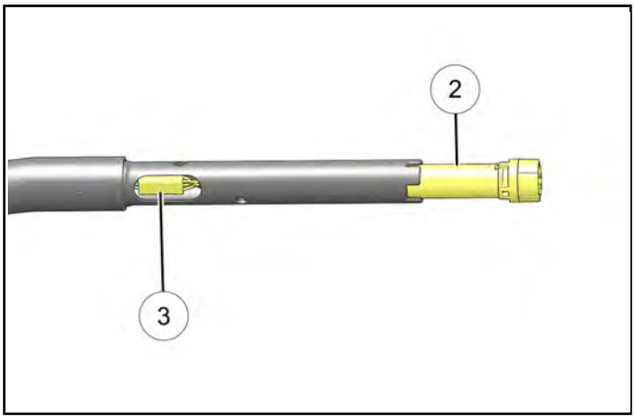
https://vimeo.com/338076741/f1ec51a821

REMOVAL

1. Remove switch cube. See **Switch Cube Replacement page 10.133**.
2. Remove front brake master cylinder.
3. Remove grip.



4. Pull on the throttle control ② until the electrical connection ③ is visible and disconnect.



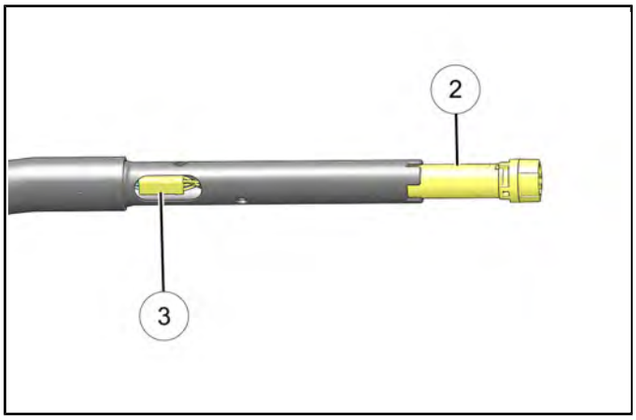
THROTTLE CONTROL INSTALLATION

To watch a video of this procedure, scan the QR code or click **HERE**.

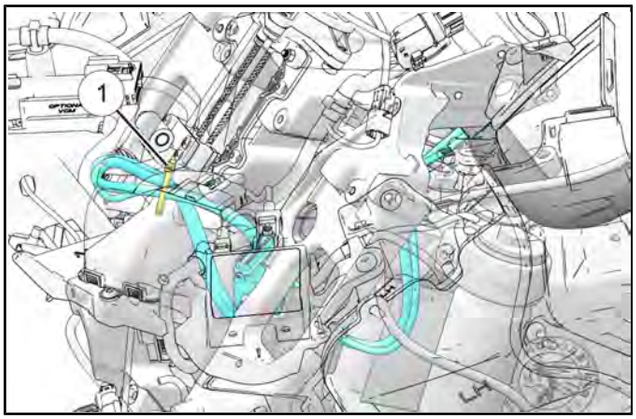
https://vimeo.com/338076741/f1ec51a821

INSTALLATION

1. Push the throttle control ② until the electrical connection ③ is connected.

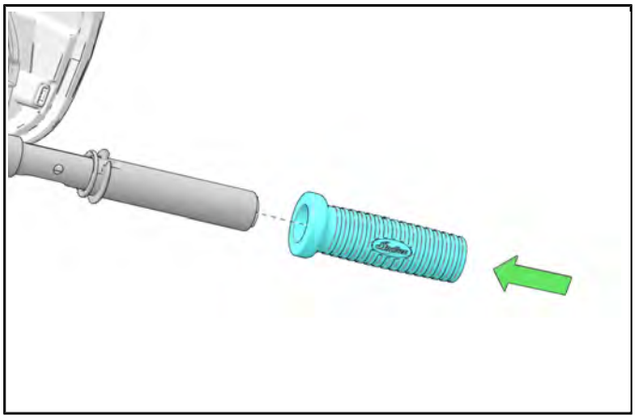


2. Follow the wiring coming out of the handle bars and install the cable tie ① to retain the slack.



8

3. Install grip.

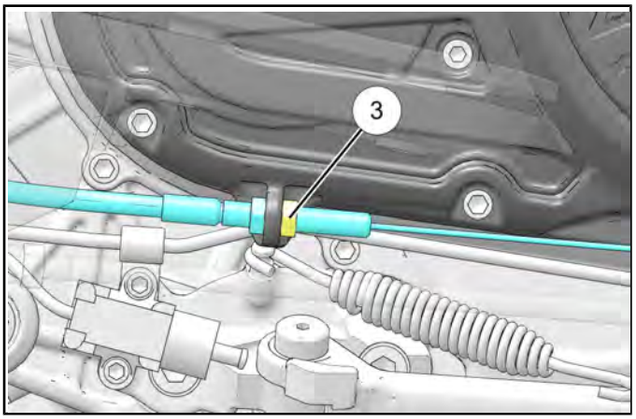


4. Install switch cube. See **Switch Cube Replacement page 10.133**.

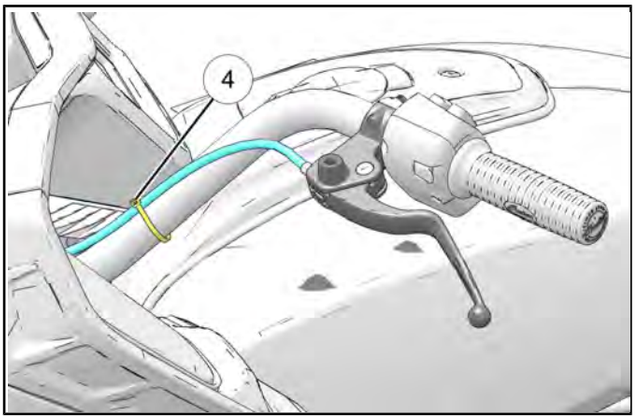
CLUTCH CABLE REMOVAL

REMOVAL

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove clutch cable jam nut ③.

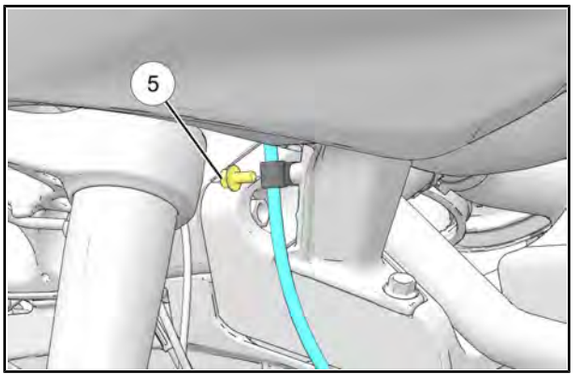


3. Loosen adjuster nut for ease of access.
4. Remove the cable end from the pinion arm.
5. Disconnect the clutch cable from the lever assembly.
6. Route the clutch cable through the rubber strap ④ on the handle bar.

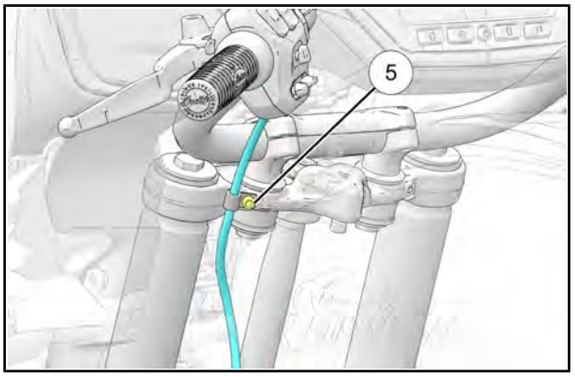


7. On the left side fairing support, remove the clutch cable routing clip fastener ⑤ and p-clamp.

CMF



FMF



8. Carefully remove the clutch cable.

IMPORTANT
Note the routing for reinstallation.

8

CLUTCH CABLE INSTALLATION

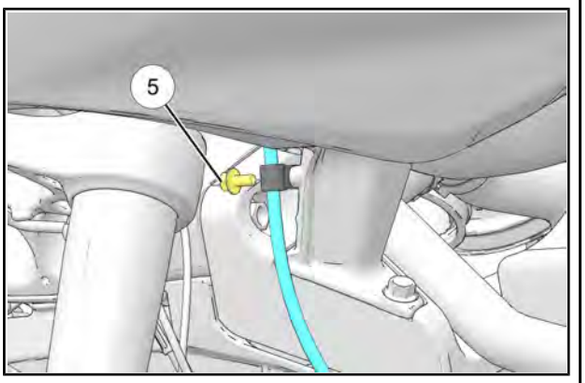
IMPORTANT
Note the routing for reinstallation.

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Carefully install the clutch cable.

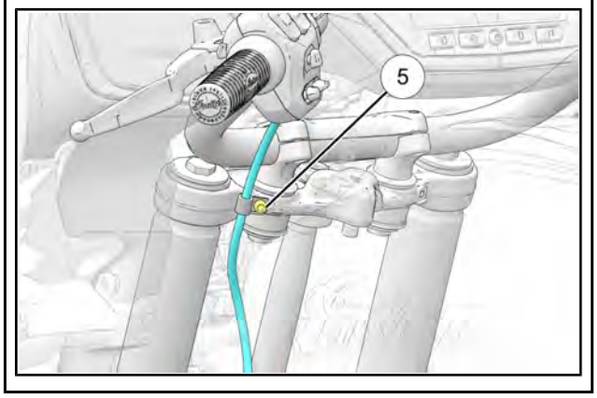
IMPORTANT
FMF cable is routed between chassis harness and frame in the steering stem area. Clip the clutch cable into the frame retention clip.

3. On the left side fairing support, install the clutch cable routing clip fastener ⑤.

CMF

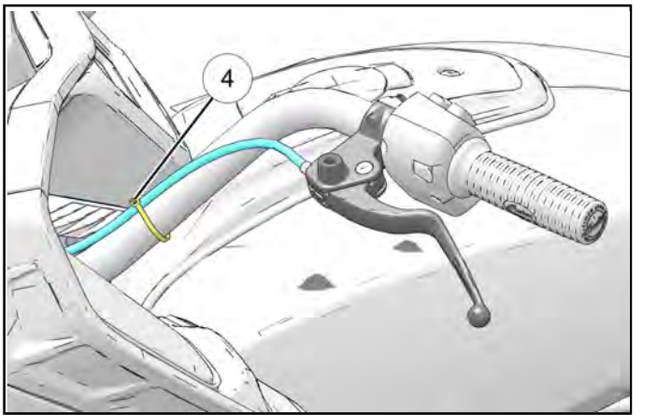


FMF

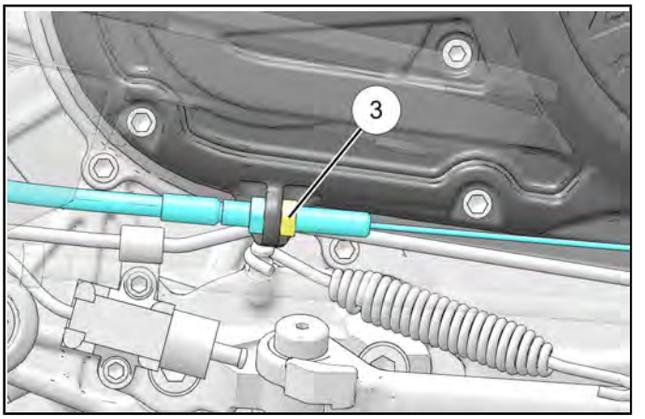


TORQUE
Clutch Cable Routing Clip Fastener: **88 in-lbs (10 N·m)**

4. Route the clutch cable through the rubber strap ④ on the handle bar.



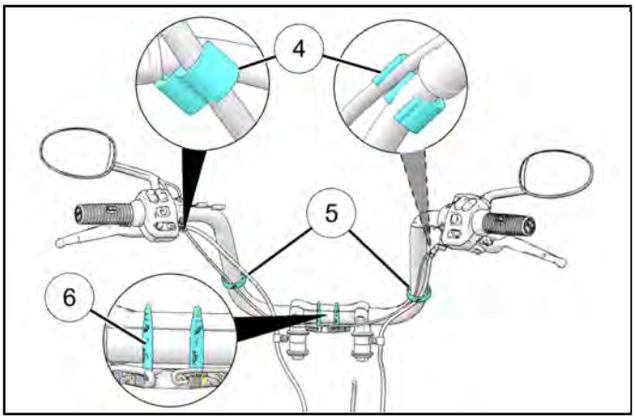
5. Connect the clutch cable to the lever assembly.
6. Install the cable end to the cover.
7. Fully loosen adjuster nut to maximize cable free play.
8. Attach cable to the pinion arm.
9. Set cable free play.
10. Install clutch cable jam nut ③.



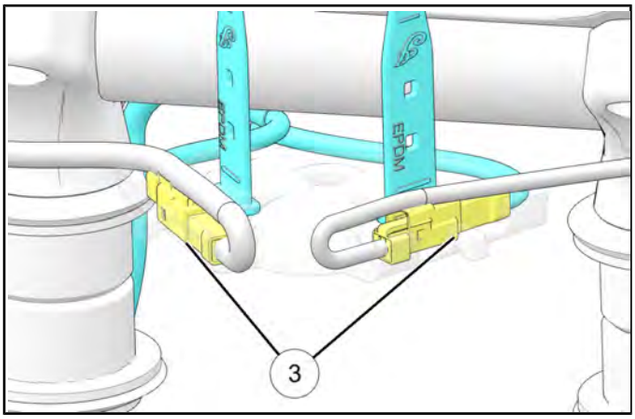
TORQUE
Clutch Cable Jam Nut: **53 in-lbs (6 N·m)**

BLIND SPOT MIRROR REMOVAL

1. Confirm all routing retention points.
2. Remove retention points at the clutch and brake lines ④



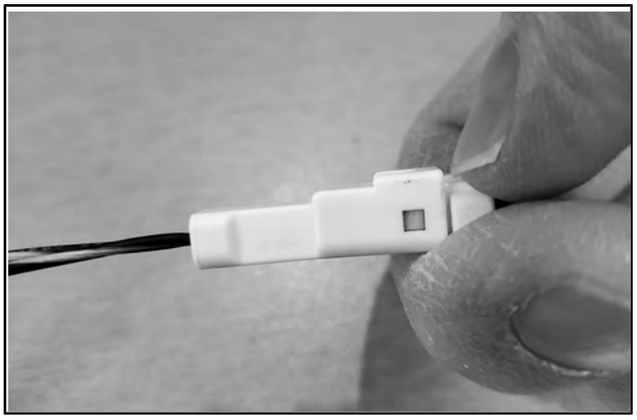
3. Remove rubber straps ⑤.
4. Remove rubber bands ⑥ securing the wire harness to the triple clamp.
5. Disconnect mirror light cable to wiring harness connection above the triple clamp ③.



NOTICE

The harness comes with a small bundle of wire on the mirror connector side. The connector and the looped back bundle of wire are all captured by the rubber straps.

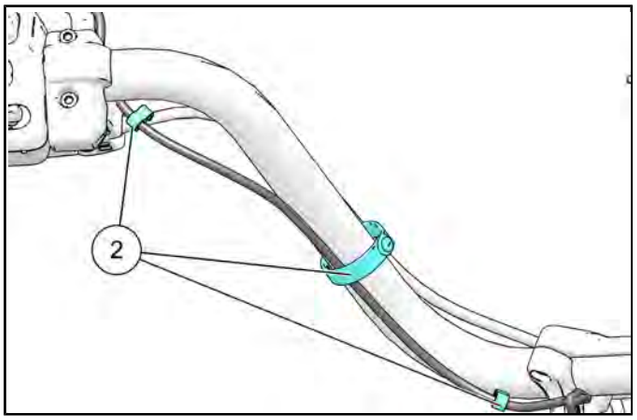
6. Unplug the connectors from the electrical harness.



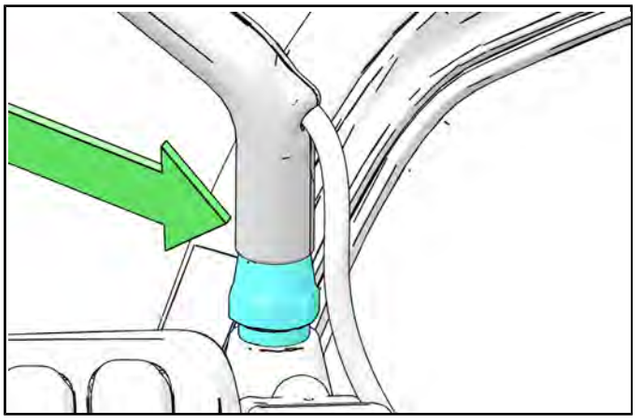
IMPORTANT

Do not use anything other than fingers to remove the connectors. The use of tools can damage the connection.

7. Repeat steps for remaining side.
8. Remove mirror light cable from the handle bar retention points②.

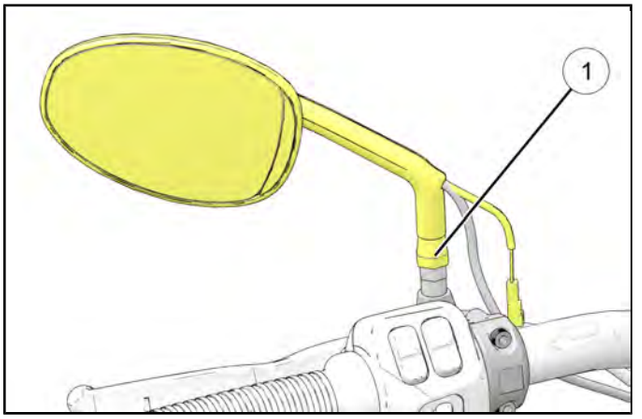


9. Remove the jam nut.



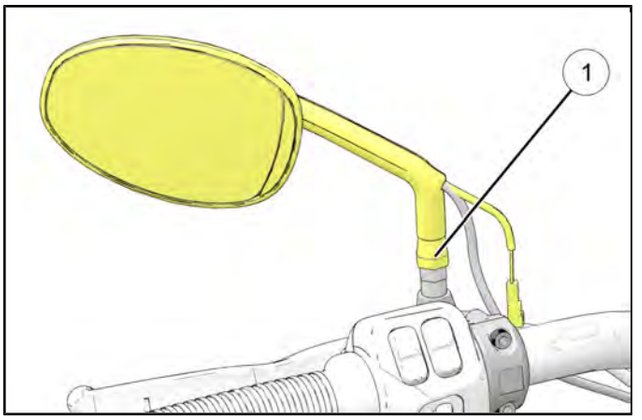
8

10. Remove mirrors ① from hand controls.



BLIND SPOT MIRROR INSTALLATION

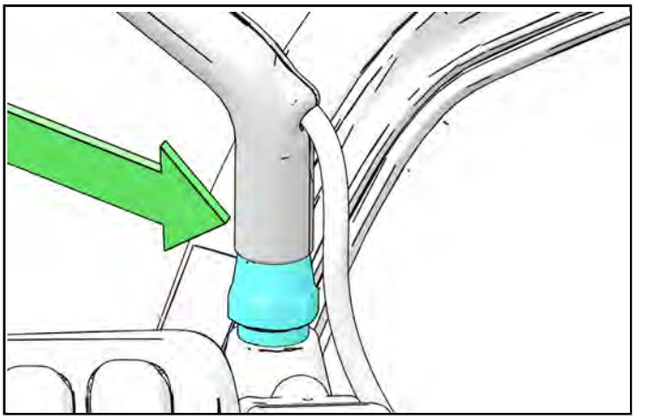
1. Install mirrors ① on to hand controls.



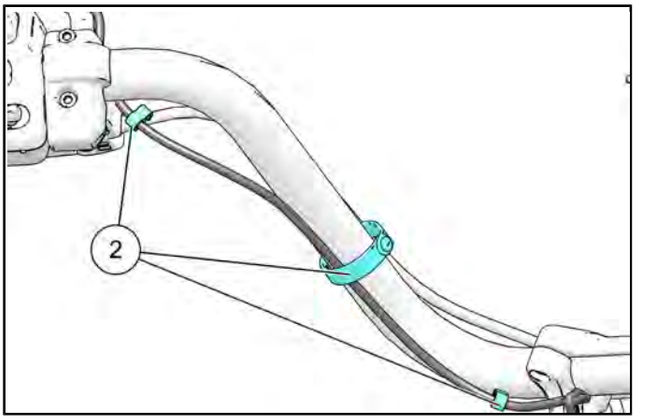
2. Thread the mirror on until it bottoms out.
3. Adjust the mirror accordingly.
4. Tighten the jam nut to specification.

TORQUE
Mirror Jam Nut: **12 ft-lbs (16 N·m)**

5. To tightly retain the wire to the mirror stem, roll the o-ring located on the mirror stem down to just above the jam nut.

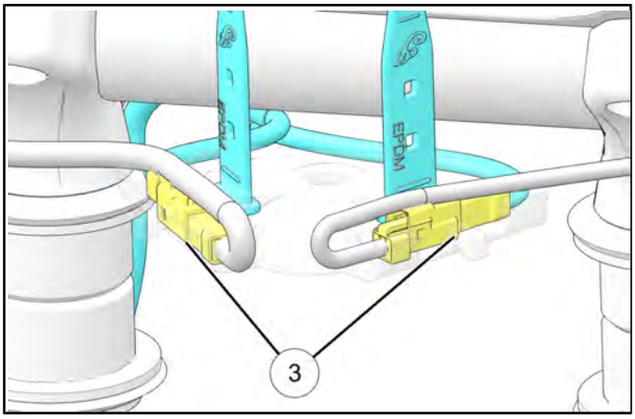


6. Route mirror light cable down the handle bar and retain ②.



7. Repeat steps for remaining side.

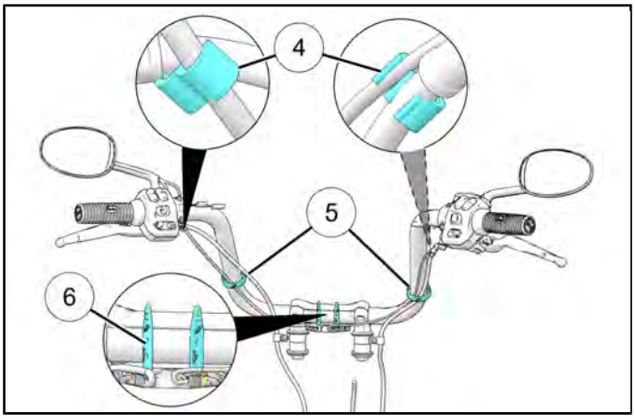
8. Connect mirror light cable to wiring harness connection above the triple clamp ③.



NOTICE

The harness comes with a small bundle of wire on the mirror connector side. The connector and the looped back bundle of wire are all captured by the rubber straps. The rubber straps must be hooked over plastic tab of bracket below the connector.

9. Install rubber bands ⑥ securing the wire harness to the triple clamp.



10. Install rubber straps ⑤.
11. Install retention points at the clutch and brake lines ④
12. Confirm all routing retention points.
13. Power on motorcycle and verify functionality.

IMPORTANT

If the motorcycle has been powered up before the mirror installation a fault code may appear. To clear all fault codes.

a. Select "Auto Identify" to connect to the motorcycle.

b. Select "Trouble Codes"

c. Click the "Clear Codes" button.

FRONT WHEEL REMOVAL

⚠ WARNING

This procedure requires raising and supporting the motorcycle so that the front wheel is off the ground. Precautions should be taken to ensure the motorcycle is properly stabilized at all times. Failure to properly support motorcycle may result in personal injury or damage to the motorcycle.

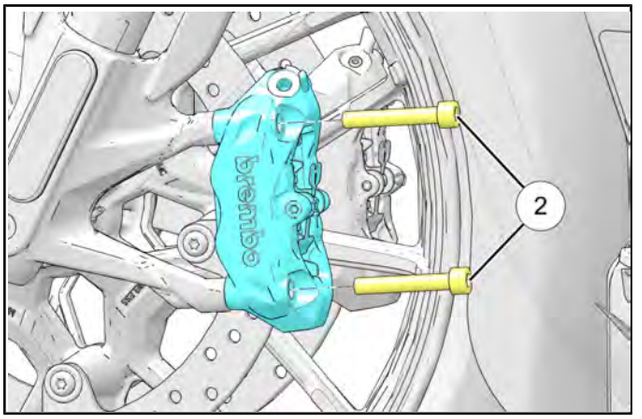
Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

NOTICE

Do not operate the front brake lever with the calipers or wheel removed.

REMOVAL

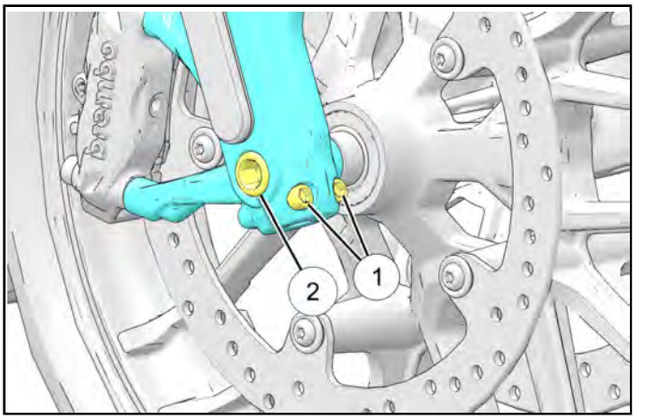
1. Remove the front fender. See **Front Fender Removal page 7.86**.
2. Remove front caliper mounting fasteners ② and remove the caliper.



⚠ CAUTION

Do not twist the brake hose or brake line. Do not allow calipers to hang from the brake hose. Secure calipers in such a way to avoid hose damage.

3. Loosen axle pinch fasteners ① on lower right fork leg.



4. Support wheel and remove axle ②.

FRONT WHEEL INSTALLATION

⚠ WARNING

This procedure requires raising and supporting the motorcycle so that the front wheel is off the ground. Precautions should be taken to ensure the motorcycle is properly stabilized at all times. Failure to properly support motorcycle may result in personal injury or damage to the motorcycle.

Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

NOTICE

Do not operate the front brake lever with the calipers or wheel removed.

INSTALLATION

1. Install front wheel and spacers into fork.
2. Install the axle and torque to specification.

TORQUE
Front Axle: **52 ft-lbs (70 N·m)**

3. Install pinch fasteners. Torque to specification.

TORQUE
Front Axle Pinch Fastener: **19 ft-lbs (26 N·m)**

4. Install brake caliper and fasteners. Torque fasteners to specification.

TORQUE
Brake Caliper Fastener (Front): **36 ft-lbs (48 N·m)**

5. Install the front fender. See **Front Fender Installation page 7.87**.

FRONT AXLE INSPECTION

1. Place axle in V-blocks and inspect runout. Compare to specifications in this chapter. See **Service Specifications – Front Wheel / Suspension page 8.15**.

2. Replace axle if it fails inspection. Do not attempt to straighten a bent axle.

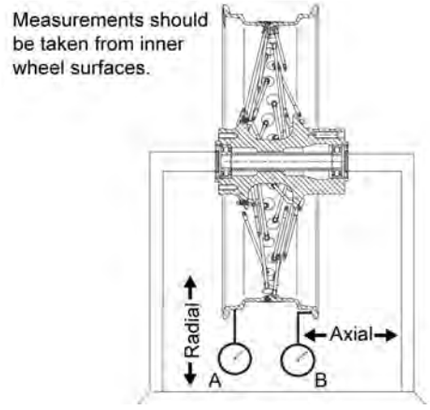
FRONT WHEEL INSPECTION

Refer to **Service Specifications – Front Wheel / Suspension page 8.15** when measuring the radial and axial runout.

1. Install front wheel in truing stand.

NOTICE
Bearings must be in good condition to accurately measure runout.

2. Set up a dial indicator to measure radial runout (up and down) (A) and compare to specifications.
3. Position dial indicator to measure axial runout (side to side) (B) and compare to specifications.

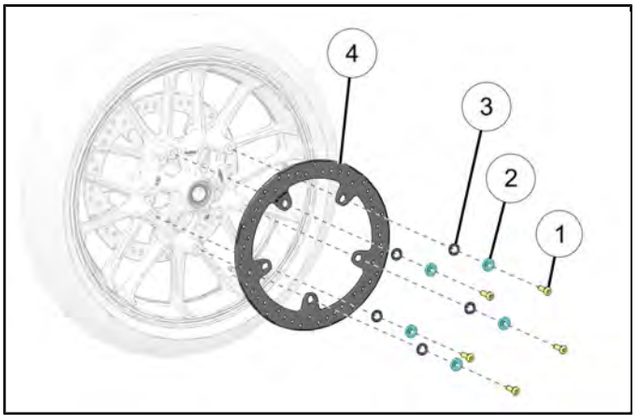


4. Visually inspect wheel for cracks.
5. Replace wheel if it fails visual or measured inspection. Do not attempt to straighten cast or wheels.

BRAKE DISC REMOVAL

REMOVAL

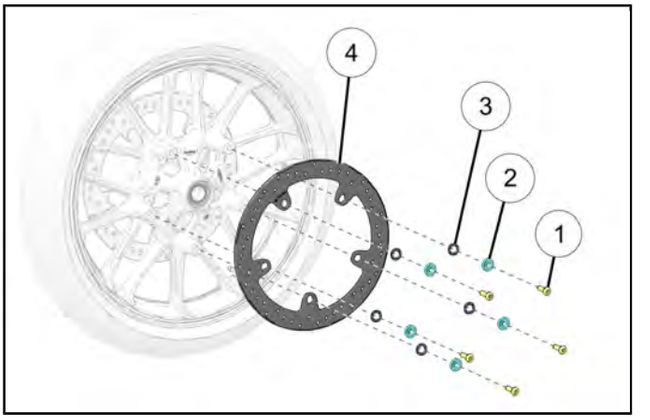
1. Remove front wheel. See **Front Wheel Removal page 8.34**.
2. Remove and discard brake rotor screws ①.
3. Remove bushing ②.
4. Remove spring washers ③.
5. Remove brake disc ④ from wheel.



6. Flip wheel over and repeat procedure to remove opposite side brake disc.

BRAKE DISC INSTALLATION

1. Install brake disc ④ onto wheel.



2. Install spring washers③.
3. Install new brake rotor screws ① and reinstall bushing ②.
4. Flip wheel over and repeat procedure to install opposite side brake disc.

TORQUE
Brake Rotor Screw: **22 ft-lbs (30 N·m)**

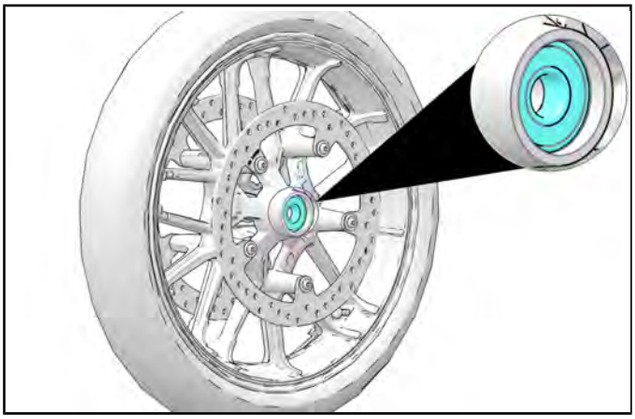
5. Install front wheel. See **Front Wheel Installation page 8.34**.

FRONT WHEEL BEARING INSPECTION

NOTICE

Inspect bearings installed in the wheel. Do not remove to inspect. Bearings cannot be repacked. Replace both wheel bearings if one or both fail inspection, or if either bearing was removed.

1. Visually inspect bearing on each side for wear or damage.



2. Check bearings by turning inner race by hand.

- Look for signs of discoloration, scoring, galling, or contamination from moisture or dirt. Replace bearings if any of the above are present.
- Turn the inner race of the bearings. The bearings should turn smoothly and quietly. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

3. Discard bearings that fail any of the above inspections.

⚠ CAUTION

Do not reuse bearings after removing them from the wheel. Removal damages the bearings internally.

4. Inspect bearing fit into wheel hub. The outer race of the bearing must fit tightly into the bore. You should not be able to move it (or remove it) by hand. Replace the wheel if outer race of a new bearing does not fit tightly in the bore.

FRONT WHEEL BEARING REPLACEMENT

⚠ CAUTION

Do not reuse bearings that have been removed. This procedure requires the Wheel Bearing Removal / Installation Kit**(PF-51324-A)**. Refer to special tool manufacturer instructions for proper use of tool.

REMOVAL

1. Remove front wheel. See **Front Wheel Removal page 8.34**.
2. Remove brake discs. See **Brake Disc Removal page 8.36**.
3. Carefully remove both seals using a suitable seal removal tool and discard. Be careful not to scratch the seal bore.
4. Refer to special tool manufacturer instructions to remove bearing from leftt-hand side of hub.
5. Remove bearing.
6. Remove spacer.
7. Extract or drive bearing from left-hand side of hub.

INSTALLATION

1. Use the Wheel Bearing Removal / Installation Kit **(PF-51324-A)** to install new wheel bearings. Refer to special tool manufacturer instructions for proper use of tool.
2. Install *new* wheel bearing into the LH side of hub followed by the inner bearing spacer.
3. Install *new* wheel bearing into the RH side of hub.
4. Install *new* seals and existing outer bearing spacers into each side of the wheel hub.
5. Install the brake discs. See **Brake Disc Installation page 8.36**.
6. Install the front wheel. See **Front Wheel Installation page 8.34**.

FRONT FORK REMOVAL

⚠ WARNING

This procedure requires raising and supporting the motorcycle so that the front wheel is off the ground. Precautions should be taken to ensure the motorcycle is properly stabilized at all times. Failure to properly support motorcycle may result in personal injury or damage to the motorcycle.

⚠ CAUTION

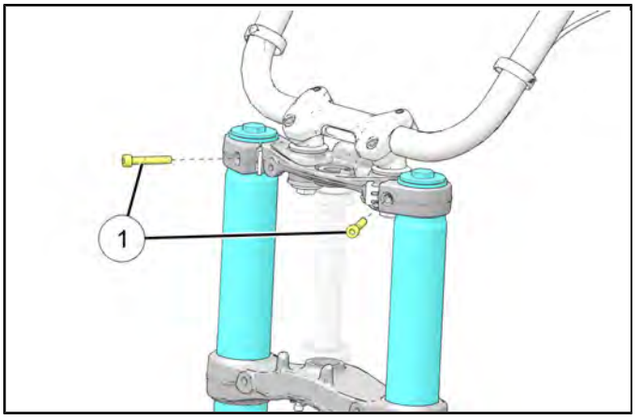
Do not twist the brake hose or brake line. Do not allow calipers to hang from the brake hose. Secure calipers in such a way to avoid hose damage.

1. Remove front fender. See **Front Fender Removal page 7.86**.
2. Remove wheel speed sensor from left hand fork.
3. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

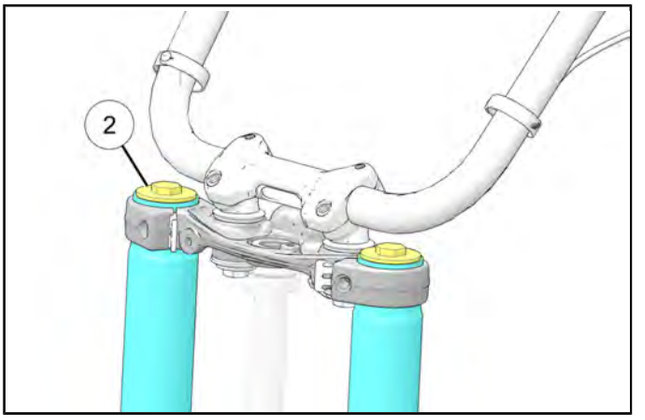
NOTICE

Do not operate the front brake lever with the calipers or wheel removed.

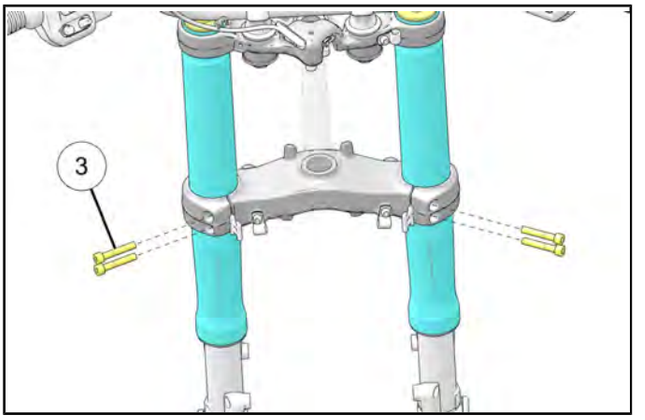
4. Remove front brake calipers and support them so they do not hang by brake hoses. See **Front Caliper Service page 9.49**.
5. Remove front wheel. See **Front Wheel Removal page 8.34**.
6. Remove fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37** or **Fairing Disassembly page 7.63**.
7. If triple clamp will be removed, remove front brake line guides from the upper and lower triple clamps.
8. Loosen upper triple clamp pinch fastener ① for each fork tube.



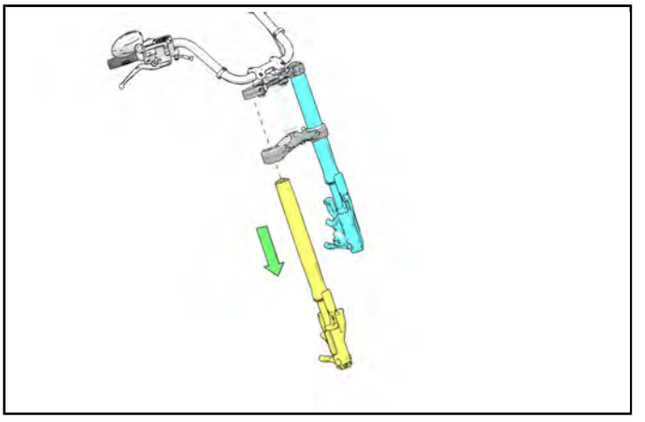
9. If disassembling the fork tube(s), loosen the fork cap(s) ② prior to loosening the lower triple clamp fasteners.



10. Loosen lower triple clamp pinch fasteners ③ for each fork tube.



11. Slide fork legs down and remove.



FRONT FORK DISASSEMBLY

NOTICE

The following procedure requires the use of Fork Spring Compressor (PV-49463).

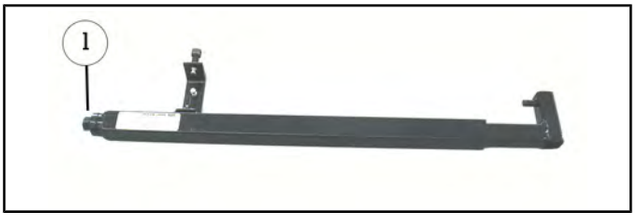
NOTICE

Refer to appropriate Front Fork Exploded View.

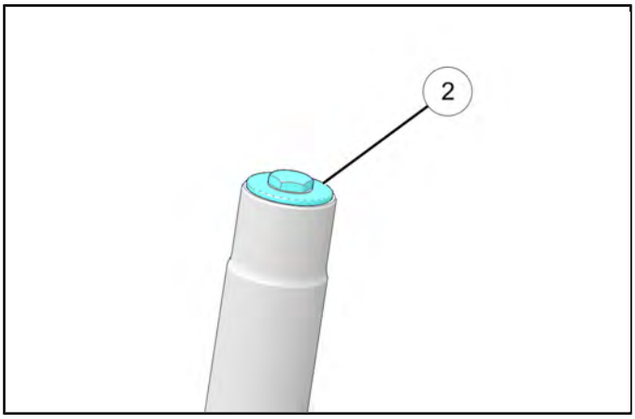
IMPORTANT

Clean fork tubes before disassembly.

1. Secure fork spring compressor **(PV-49463)** vertically in a vise with drive bolt ① UP.



2. Loosen fork cap ② from outer tube.

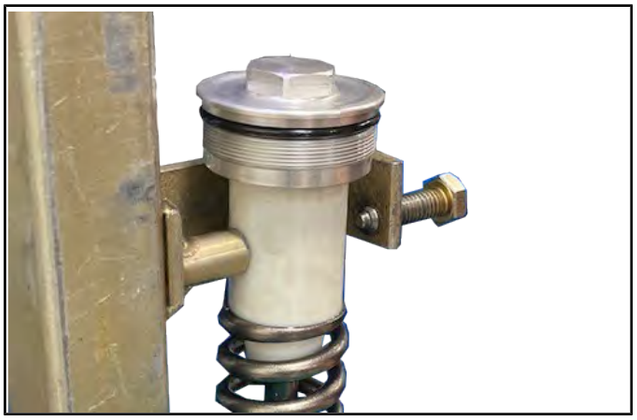


⚠ WARNING

Wear eye / face protection. Be sure spring is engaged properly with pegs of tool as you compress the spring in the following steps.

3. Compress outer tube and drain fork oil.

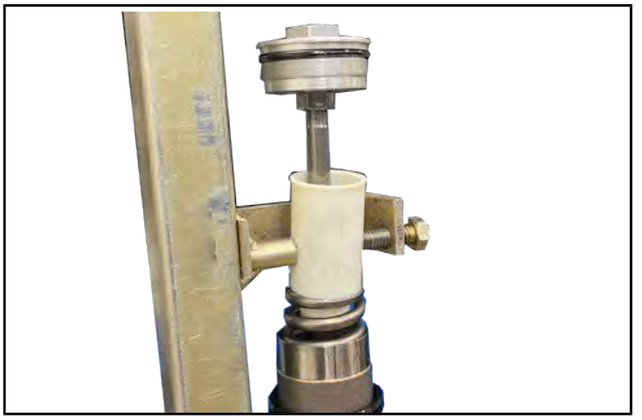
4. Place fork assembly into compressor.
5. Adjust length of spring compressor by turning drive bolt until aligning with holes of the upper spring guide.



6. Tighten thumb screw in remaining hole.

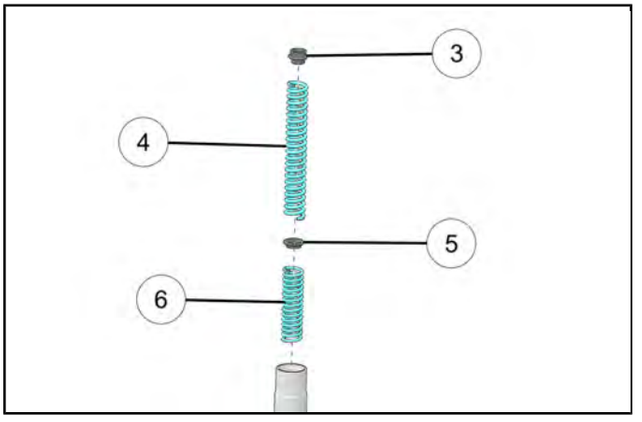
8

7. Compress spring until jam nut is shown.

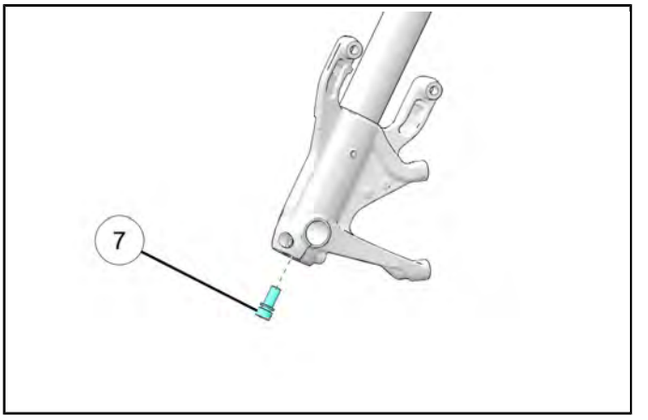


8. Break loose jam nut and remove top cap.

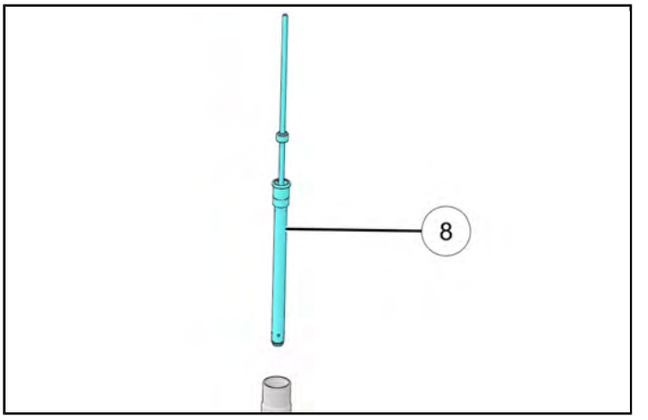
9. Remove tension off the spring compressor.
10. Remove the fork assembly from the spring compressor.
11. Remove upper spring guide ③, upper spring ④, lower spring guide ⑤, and lower spring ⑥.



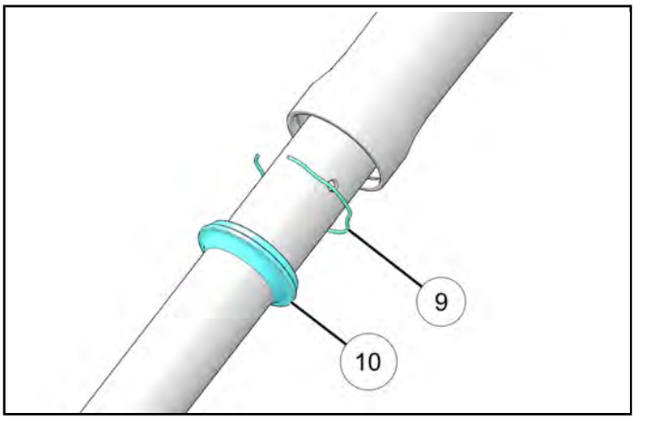
12. Install cartridge holder **PV-49452**.
13. Remove cartridge bolt ⑦.



14. Remove cartridge ⑧.

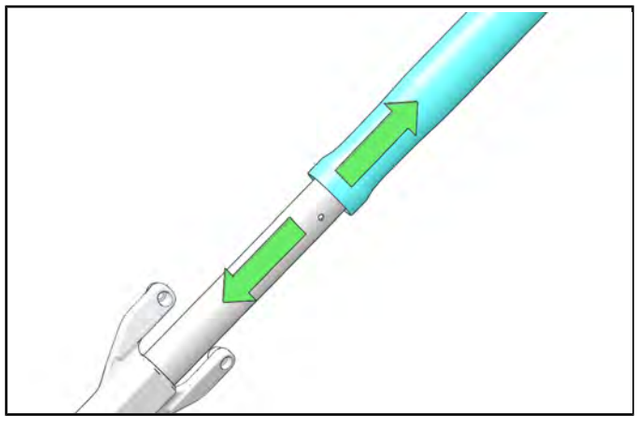


15. Cycle damper rod on the cartridge to remove oil.
16. Remove dust cap ⑩.

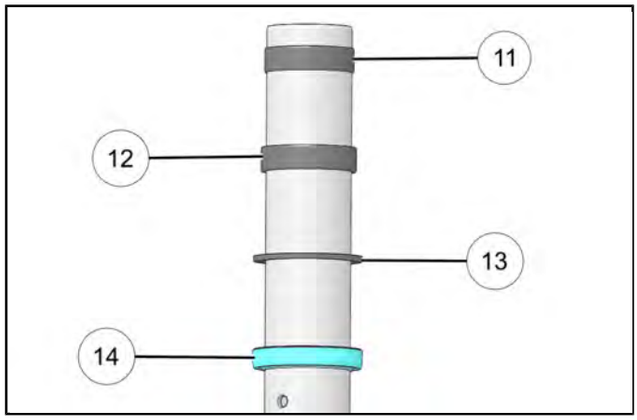


17. Remove snap ring ⑨.

18. Use a slide hammer action to separate the inner and outer tube.



19. Remove upper tube bushing ⑪ by slightly spreading it apart.



20. Remove slider tube bushing ⑫, washer ⑬, and oil seal ⑭.

21. Remove snap ring and dust cap.

FRONT FORK INSPECTION

1. Inspect inner fork tube for scoring, heavy scratches, dents due to rocks or other road debris, or excessive wear. Replace tube if worn or damaged.
2. Place fork tube in V-blocks or truing stand and measure runout. Replace tube if runout exceeds service limit listed on **Service Specifications - Front Wheel / Suspension**.

⚠ WARNING

Do not attempt to straighten bent fork tubes. Doing so will weaken the structural integrity of the forks and make the motorcycle unsafe to operate.

3. **DO NOT loosen or remove set screw**

⚠ WARNING

DO NOT disassemble the inner fork tube. If damaged or worn, the inner fork tube / lower casting must be replaced as an assembly.

4. Inspect outer tube for dents or other damage. Look for cracks in the tube, especially in the clamping zone. Assemble inner and outer fork tube and move inner tube through complete travel range. Check for resistance or binding in suspect area of outer tube. Replace outer tube if binding or resistance is evident, or if tube is cracked.
5. Inspect cartridge by moving shaft through travel range. If binding is evident, replace the assembly.
6. Inspect seals and bushings. Replace as necessary.

FRONT FORK ASSEMBLY

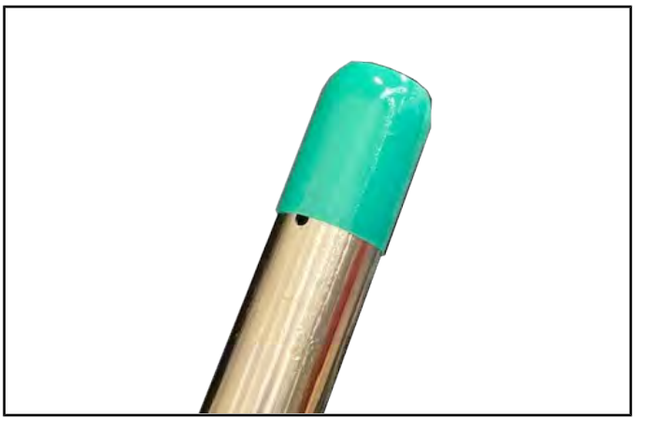
NOTICE

Clean all parts prior to assembly.

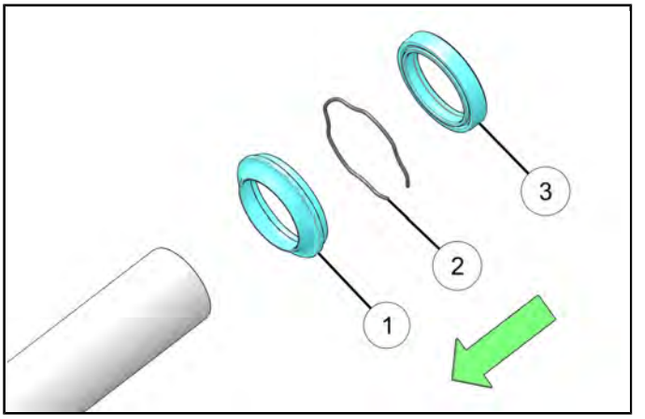
IMPORTANT

Use Indian Motorcycle fork oil PN **2884244**

1. Install seal saver **PV-47037**.



2. Lubricate dust cap inside lip.
3. Install dust cap ①.



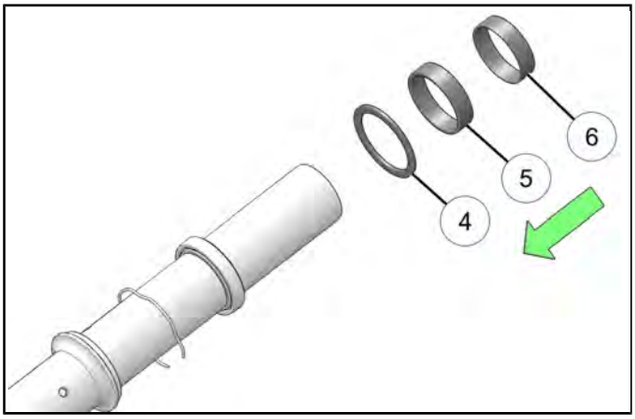
4. Install snap ring ②.
5. Install oil seal ③.

IMPORTANT

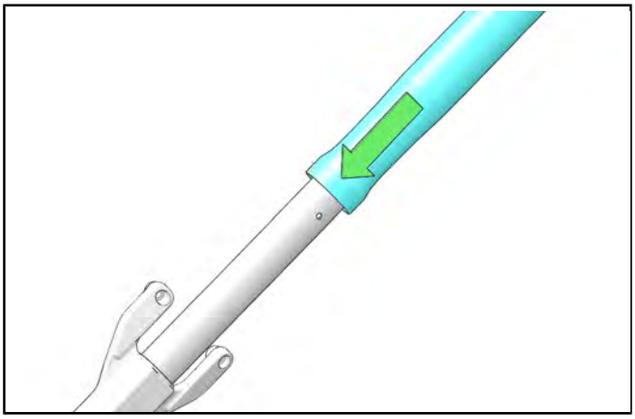
Make sure to install oil seal with the letters / markings facing the dust seal and retaining ring.

6. Remove seal saver from the fork.

7. Install washer ④ smooth side toward seal.



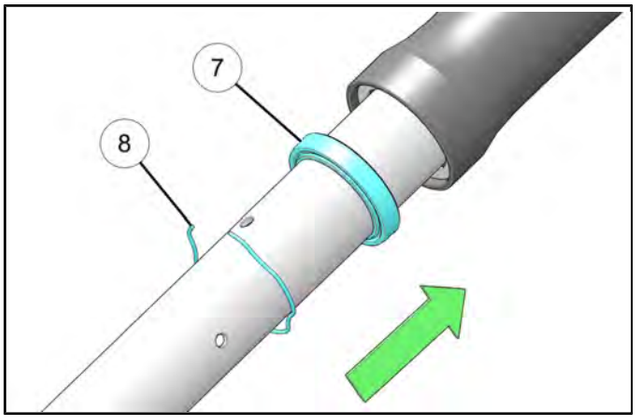
8. Install lower bushing ⑤.
9. Install upper tube bushing ⑥.
10. Slide outer fork tube over inner fork tube.



11. Lightly install lower tube busing and washer into outer fork tube.
12. To properly seat the bushing and washer, use Fork Sealer Installer **(PV-47035)** with the short end of the seal installer positioned down toward the bushing as shown.

IMPORTANT
Fork Seal Installer must be positioned with the short end facing the bushing as shown. Seal damage will result if not positioned correctly.

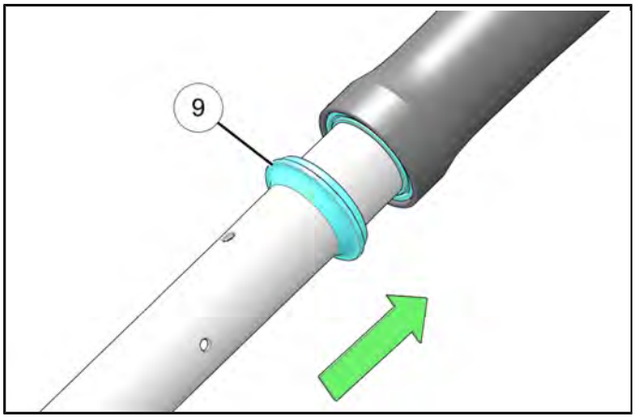
13. Install oil seal into outer tube and use seal driver to seat.



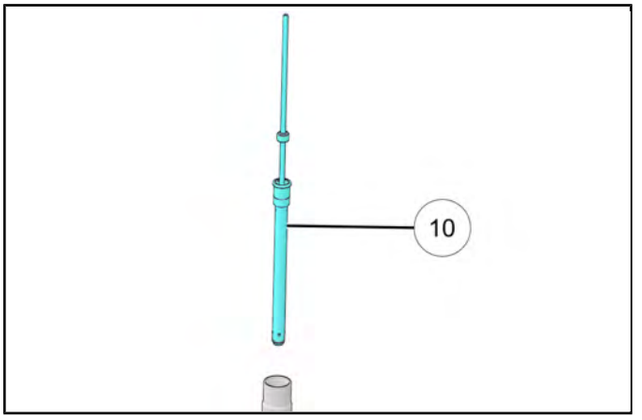
14. Install snap ring ⑧.

IMPORTANT
Make sure snap ring is full retained.

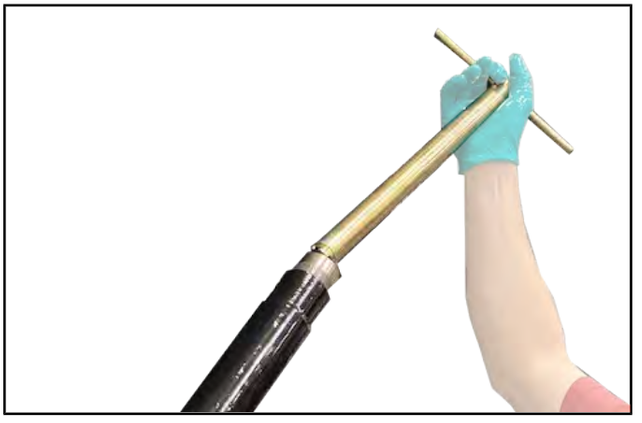
15. Install dust cap ⑨.



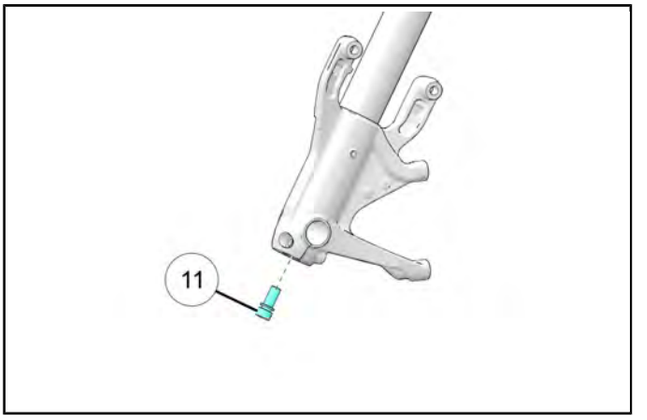
16. Install cartridge ⑩.



17. Install cartridge holder tool **PV-49452**.



18. Install cartridge bolt ⑪ and *new* sealing washer.



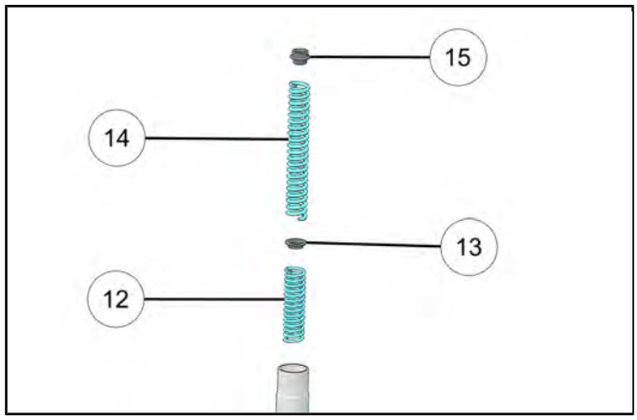
TORQUE
Cartridge Bolt: **17 ft-lbs (23 N·m)**

19. Secure the fork assembly in the vertical position.
20. Add approximately 500 ml of fork oil **(PN: 2884244)**.
21. Cycle damper rod to bleed air bubbles.
22. With the fork compressed, cup your hand over the top of the outer tube to create a vacuum and pull up.
23. With the fork extended, cup your hand over the top of the outer tube and push down. This will eliminate air bubbles.

24. Compress the fork and make sure the damper tube is all the way down.

25. Use **PV-59000-A** to add / remove fluid to specified height. Reference **Service Specifications – Front Wheel / Suspension page 8.15**.

26. Install lower spring ⑫, lower spring guide ⑬, upper spring ⑭, and upper spring guide ⑮.



27. Install the assembly into spring compressor.
28. Thread special tool **PV-49453** onto damper rod.
29. Pull up on damper and compress the assembly.

30. Thread top cap onto damper rod.

IMPORTANT
Make sure the top cap is bottomed out before contacting the jam nut.

31. Tighten jam nut and cap.

32. Remove pressure off compressor and remove fork assembly.
33. Slide tube up to top cap tighten.

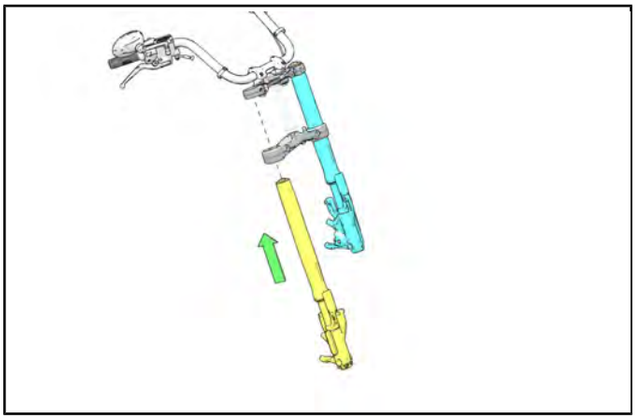
TORQUE
Top Cap: **17 ft-lbs (23 N·m)**

8

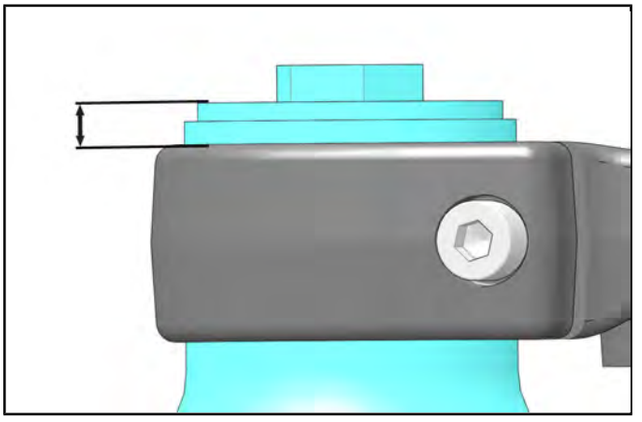
FRONT FORK INSTALLATION

NOTICE
Clean the fork tubes and the clamping surfaces of the triple clamps to remove any oil or grease prior to installation.

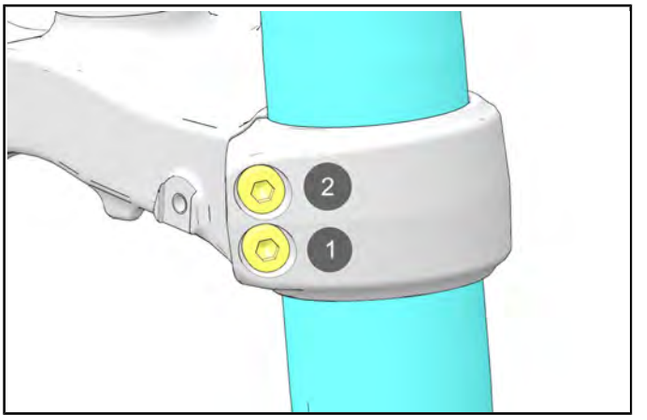
1. Install one fork tube assembly into lower triple clamp.



2. Continue to slide tube through lower triple clamp and into upper triple clamp. The top of the cap to the top of the triple clamp should be **0.26 in (6.60 mm)**.

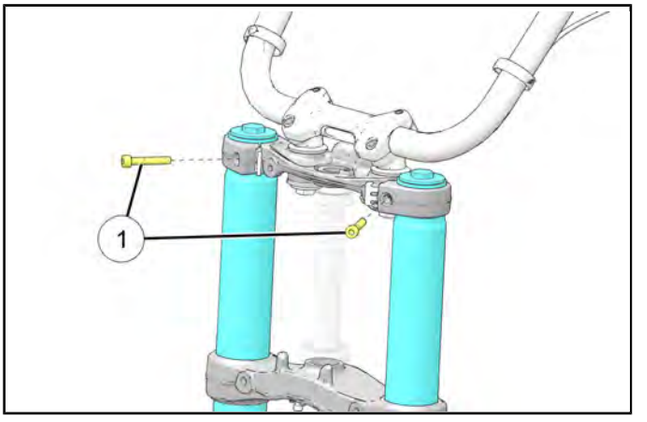


3. Torque the triple clamp fasteners in sequence as shown.



TORQUE
Lower Fork Clamp Fastener: **18 ft-lbs (24 N·m)**

4. Repeat steps 1–3 for the remaining fork tube.
5. Torque the upper triple clamp fastener ① .



TORQUE
Upper Fork Clamp Fastener: **18 ft-lbs (24 N·m)**

6. Install brake line guides (if removed).
7. Install front wheel. See **Front Wheel Installation page 8.34**.
8. Install brake calipers. See **Front Caliper Service page 9.49**.
9. Install front fender. See **Front Fender Installation page 7.87**.

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10. Install fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**.
11. Inspect all fasteners for proper torque. Inspect hoses and wiring for proper routing.
12. Lower front end of motorcycle to the ground and test front suspension / fork operation.

TRIPLE CLAMP REMOVAL

⚠ WARNING

This procedure requires raising and supporting the motorcycle so that the front wheel is off the ground. Precautions should be taken to ensure the motorcycle is properly stabilized at all times. Failure to properly support motorcycle may result in personal injury or damage to the motorcycle.

⚠ CAUTION

Do not twist the brake hose or brake line. Do not allow calipers to hang from the brake hose. Secure calipers in such a way to avoid hose damage.

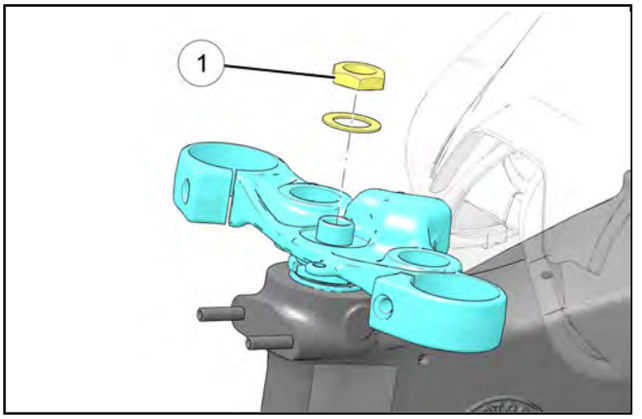
1. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

NOTICE

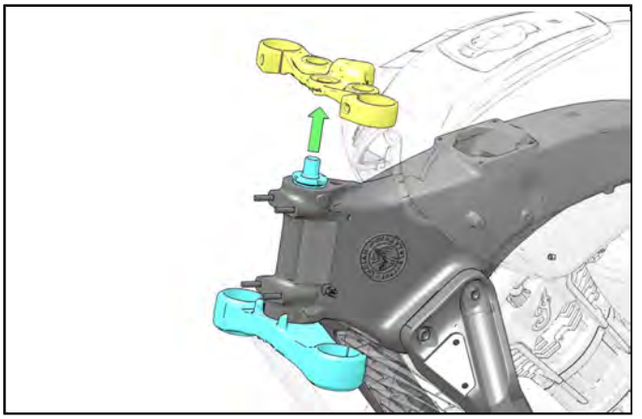
Do not operate the front brake lever with the calipers or wheel removed.

2. Remove front fender. See **Front Fender Removal page 7.86**.
3. Remove front brake calipers and support them so they do not hang by brake hoses. See **Front Caliper Service page 9.49**.
4. Remove front wheel. See **Front Wheel Removal page 8.34**.
5. Remove fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37** or **Fairing Disassembly page 7.63**.
6. Remove the handlebar / riser assembly. See **Handlebar Removal page 8.24**.
7. Remove fork tubes. See **Front Fork Removal page 8.37**.

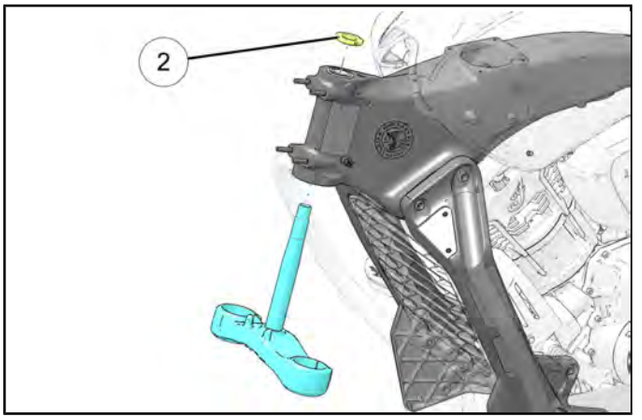
8. Remove center nut ① and washer on upper triple clamp.



9. Slide upper triple clamp off steering stem.



10. Remove stem adjuster nut ② with a suitable spanner socket.

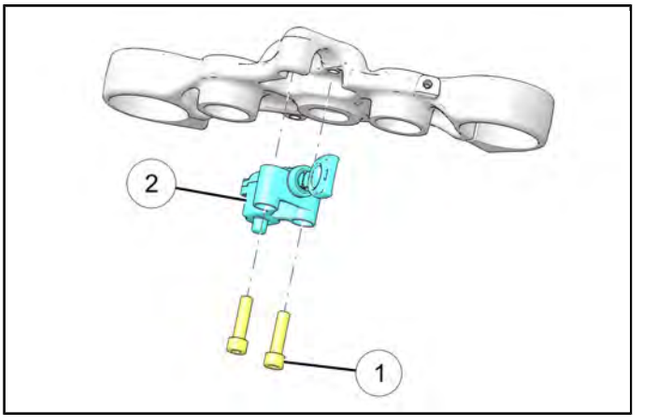


11. Remove lower triple clamp, with steering stem, and lower bearing (outer race will remain in head tube).
12. Inspect bearings and bearing races.

FRONT FORK LOCK REMOVAL

IMPORTANT
Fork lock fasteners must be replaced when fork lock is removed. Do not reuse fork lock fasteners.

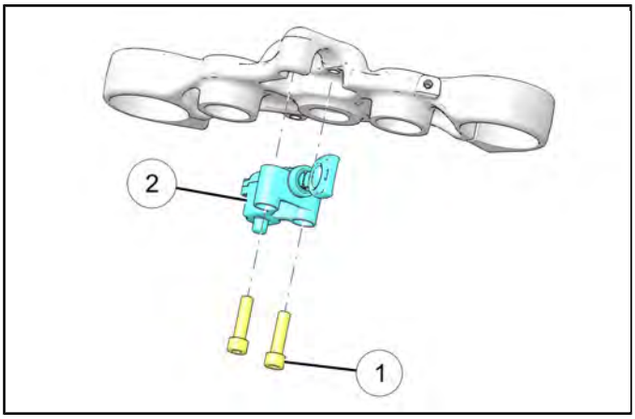
1. Perform steps 1–9 of triple clamp removal procedure. Reference **Triple Clamp Removal page 8.47**.
2. Remove two fork lock fasteners ① and remove fork lock ②.



FRONT FORK LOCK INSTALLATION

IMPORTANT
Fork lock fasteners must be replaced when fork lock is removed. Do not reuse fork lock fasteners.

1. Perform steps 1–9 of triple clamp installation procedure. Reference **Triple Clamp Installation / Steering Head Bearing Adjustment page 8.50**.
2. Install two fork lock fasteners ① and install fork lock ②.

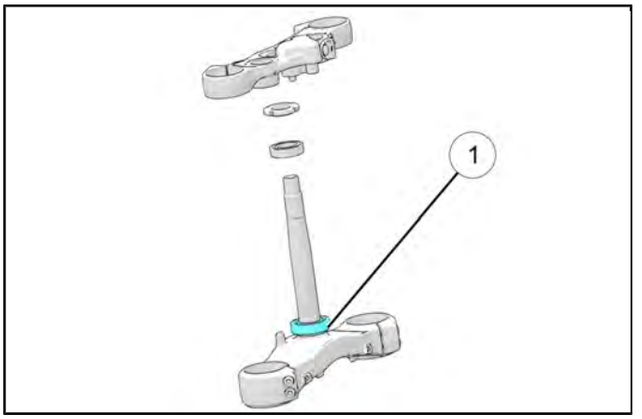


3. Install NEW fork lock ② and Install two NEW fasteners ①. Torque fasteners to specification.

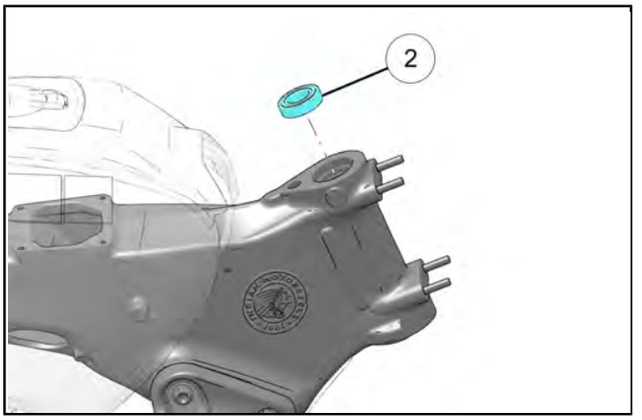
TORQUE
Steering Lock Fastener: **18 ft-lbs (24 N·m)**

TRIPLE CLAMP INSTALLATION / STEERING HEAD BEARING ADJUSTMENT

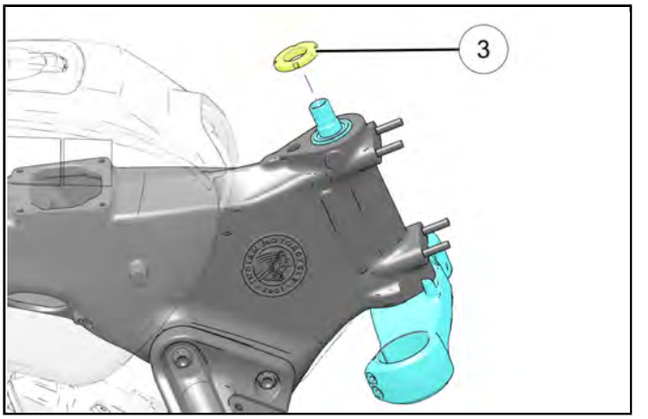
1. Inspect both top and bottom bearing races for pitting, dents, or worn surface. Replace bearings and races as a set if they are worn or damaged.
2. Be sure lower stem bearing ① is seated against step on lower triple clamp. Apply all purpose grease to bearing and install lower triple clamp / stem to frame.



3. Grease and install upper bearing ② onto stem and push it down until seated in upper bearing race.



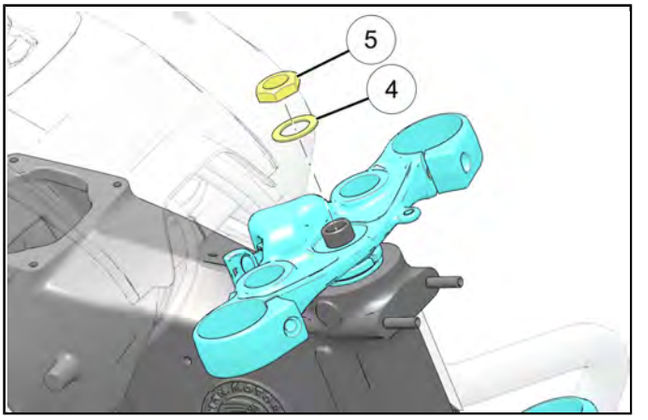
4. Screw adjuster nut ③ (shoulder side down) onto the steering stem until it is finger tight.



5. Turn triple clamp assembly fully to the right.
6. Torque adjuster nut to specification using suitable spanner wrench.

TORQUE
Steering Head Nut: **1. Torque to 29 ft-lbs (39 N·m)2. Turn assembly lock to lock 5 times3. Loosen 60 °4. Install Triple clamp and tighten top nut 72 ft-lbs (98 N·m)**

7. Set upper triple clamp in place on stem. Install washer ④ and nut ⑤ and tighten top nut until it is finger tight.



NOTICE
Nut will be torqued after fork tubes are installed.

8. Slide fork tubes through lower triple clamp and into upper triple clamp. Align top edge of fork cap with top edge of upper triple clamp and hold in position.

9. Tighten top triple clamp pinch fastener enough to hold tubes in place. Leave lower triple clamp pinch fasteners *loose*.
10. Torque the top steering stem nut to specification.

TORQUE
Top Triple Clamp Nut: **72 ft-lbs (98 N·m)**

NOTICE
CHECK STEERING STEM BEARINGS at this time. Pull firmly on fork tubes with a front-to-rear motion. If movement can be felt in steering bearings, disassemble and go back to STEP 4. Tighten steering stem adjuster nut an additional 5 degrees, and reassemble following STEPS 4–10. Repeat this procedure until no play can be felt.

11. Install front forks. See **Front Fork Installation page 8.46**
12. Install handlebar. See **Handlebar Installation page 8.24**
13. Install fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**.
14. Install front wheel. See **Front Wheel Installation page 8.34**
15. Install front caliper. See **Front Caliper Installation page 9.50**
16. Install front fender. See**Front Fender Installation page 7.87**
17. Verify all fasteners are installed and properly torqued.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Heavy Steering	Steering Stem Nut Over Tightened	Torque to specification
	Damaged Steering Stem Bearings or Races	Replace
	Bent Steering Stem	Replace
	Front Tire Damaged or Worn	Replace
	Low Tire Pressure	Inflate to specification
Pulls to One Side or Wanders	Damaged Steering Stem Bearings or Races	Replace
	Steering Stem Nut Over Tightened or Under Tightened	Torque to specification
	Low Tire Pressure	Inflate to specification
	Rear Wheel Not Aligned Correctly	Align
	Bent Front Axle	Replace
	Damaged or Excessively Worn Front Tire / Incorrect Tire	Replace
	Damaged Wheel Bearings	Replace
	Damaged Swing Arm Bearings	Replace
	Loose Swing Arm Pivot Nut	Torque to specification
	Bent Frame or Swingarm	Replace
Handlebars Oscillate (Wobble)	Bent Front Axle	Replace
	Wheel Has Excessive Runout	True (Spoked) / Replace (Cast)
	Tire Mounted Incorrectly	Check Mounting and Balance
	Damaged Tire / Worn Tire	Replace
	Loose Steering Stem Nut	Torque to specification
	Incorrect Tire	Replace
	Incorrect Tire Pressure	Correct
Noise Coming From Front Suspension	Worn Fork Bushings	Rebuild Forks
	Low Fork Fluid	Determine Cause / Replace Fork Oil
	Loose Fasteners	Torque to specification
	Loose Steering Stem Bearings	Determine Cause / Correct
Front Wheel Oscillates (Wobbles)	Bent Front Rim	Replace
	Damaged Front Wheel Bearings	Replace
	Damaged or Incorrect Tire	Replace
	Loose Axle	Torque to specification

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PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
	Fork Tube Height Unequal	Install Correctly
	Fork Oil Level Unequal	Set Correctly
	Fork Spring Free Length Different Between Right & Left	Replace
	Wheel Assembly Out-of-Balance	Balance
	Low Tire Pressure	Inflate to specification
Front Suspension Too Soft	Weak Fork Springs	Replace
	Low Fork Oil Level	Determine Cause/Replace Fork Oil
	Wrong Weight Fork Oil	Replace
	Contaminated and/or Deteriorated Fork Oil	Replace
	Low Tire Pressure	Set Correctly
Front Suspension Too Hard	Tire Pressure Too High	Set Correctly
	Bent Fork Tubes	Replace
	Wrong Weight Fork Oil	Replace
	Too Much Fork Oil	Set Correctly
	Plugged Oil Passages	Rebuild Front Forks
	Damaged Sliders	Replace
	Forks Binding	Correct
Wheel Turns Hard	Damaged Wheel Bearings	Replace
	Front Axle Bent	Replace
	Brake Dragging (Hydraulic or Mechanical Problem)	Repair as Necessary
	Brake Dragging (Bent Disc)	Replace
	Improper Assembly After Repairs	Correct as Necessary

REAR WHEEL / SUSPENSION

GENERAL INFORMATION

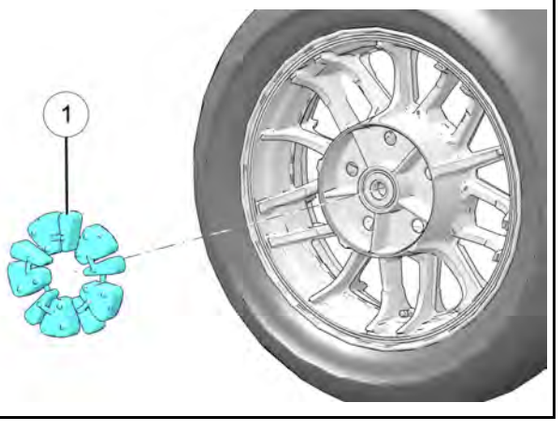
SERVICE NOTES – REAR WHEEL / SUSPENSION

⚠ WARNING

This motorcycle was produced with the designated tires as original equipment. The testing to ensure stability and superior handling was done using the OEM tires. Using non-OEM tires could result in poor motorcycle stability and handling, which can lead to a crash resulting in serious injury or death. Use only the recommended tires inflated to the recommended tire pressures.

IMPORTANT

Visual inspection of the cushion drive damper ① for cracks or deformation is required whenever the rear wheel is removed. Replace damper if damage is found.



Tubeless tires are used on certain Indian Motorcycle models. Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged cast or spoked rims. Always use genuine Indian Motorcycle parts or equivalent so that quality is not compromised. The use of tire valves and valve cores other than original equipment replacement Indian Motorcycle parts could cause tire deflation which may lead to loss of control, resulting in injury or death. Do not allow any motorcycle to leave your service area without tire valve caps securely installed.

- The rear shock absorber is serviceable.
- Refer to Maintenance chapter for maintenance of rear wheel & suspension components, and suspension ride height adjustment.

SPECIAL TOOLS – REAR WHEEL / SUSPENSION

SPECIAL TOOL	PART NUMBER
Swing-arm Bushing Tool	PF-51237
Bearing Removal / Installation Kit	PF-51324-A

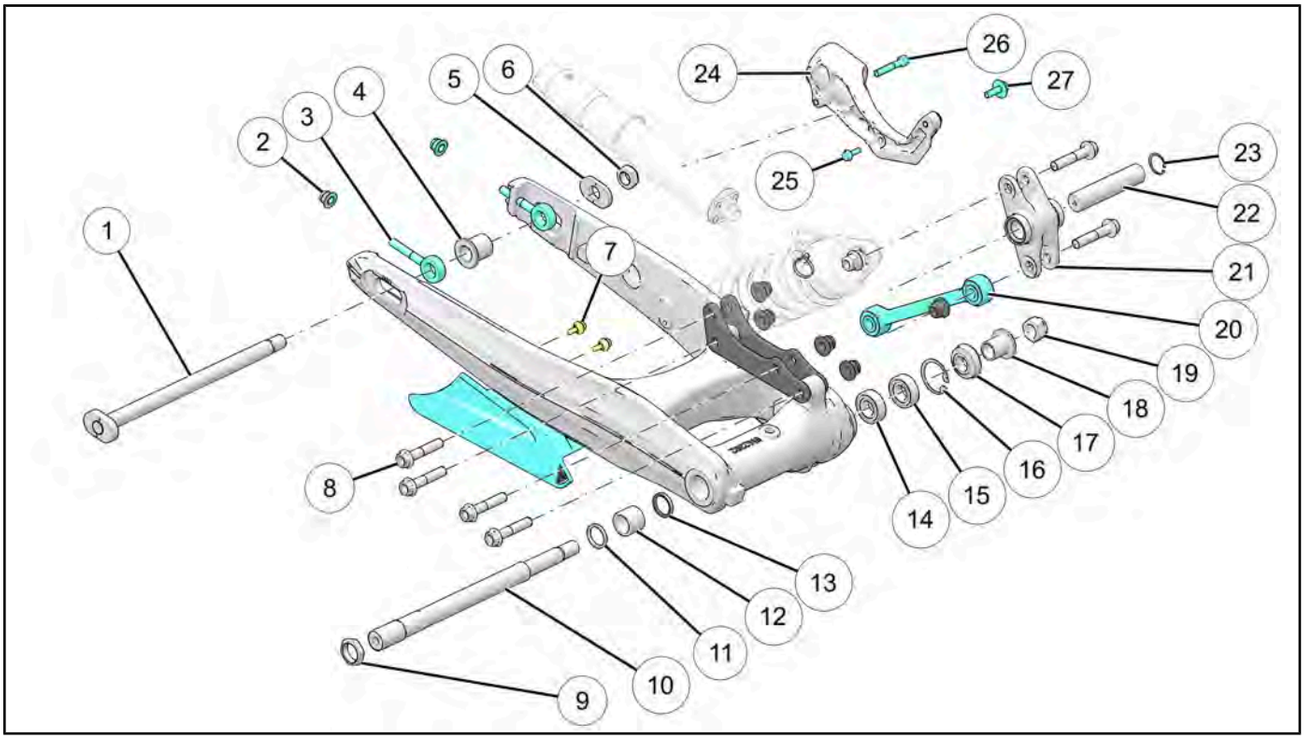
Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – REAR WHEEL / SUSPENSION

ITEM		STANDARD	SERVICE LIMIT
Axle Runout		-	.20 mm (.008")
Rear Wheel Runout	Axial	.80 mm (.030 inch)	2.0 mm (.080")
	Radial	.80 mm (.030 inch)	2.0 mm (.080")
Rear Wheel Size / Type		16" x 5" Cast	–
Rear Wheel Travel		4.5" (11.4 cm)	–
Shock Spring Free Length		8.84" (224.5 mm)	–
Shock Spring Installed Length (Standard)		Perform Ride Height Adjustment	–
Suspension Ride Height		Refer to Maintenance chapter for Ride Height Measurement procedure	–
Spring Rate		650 lbs/in	
Swing Arm Pivot Shaft Runout		Not Applicable	.20 mm (.008")
Swing Arm Pivot Shaft O.D.		LH Ball Bearing Journal: 19.965–19.99 mm / RH Needle Bearing Journal: 24.95–25.00 mm	–
Swing Arm Needle Bearing Bore O.D. (RH)		31.946–31.972 mm	–
Swing Arm Ball Bearing Bore O.D. (LH)		41.967–41.992 mm	–
Wheel bearing O.D. (approx)		51.987–52.00 mm	–
Wheel bearing I.D. (approx)		19.998–20.00 mm	–

ASSEMBLY VIEWS

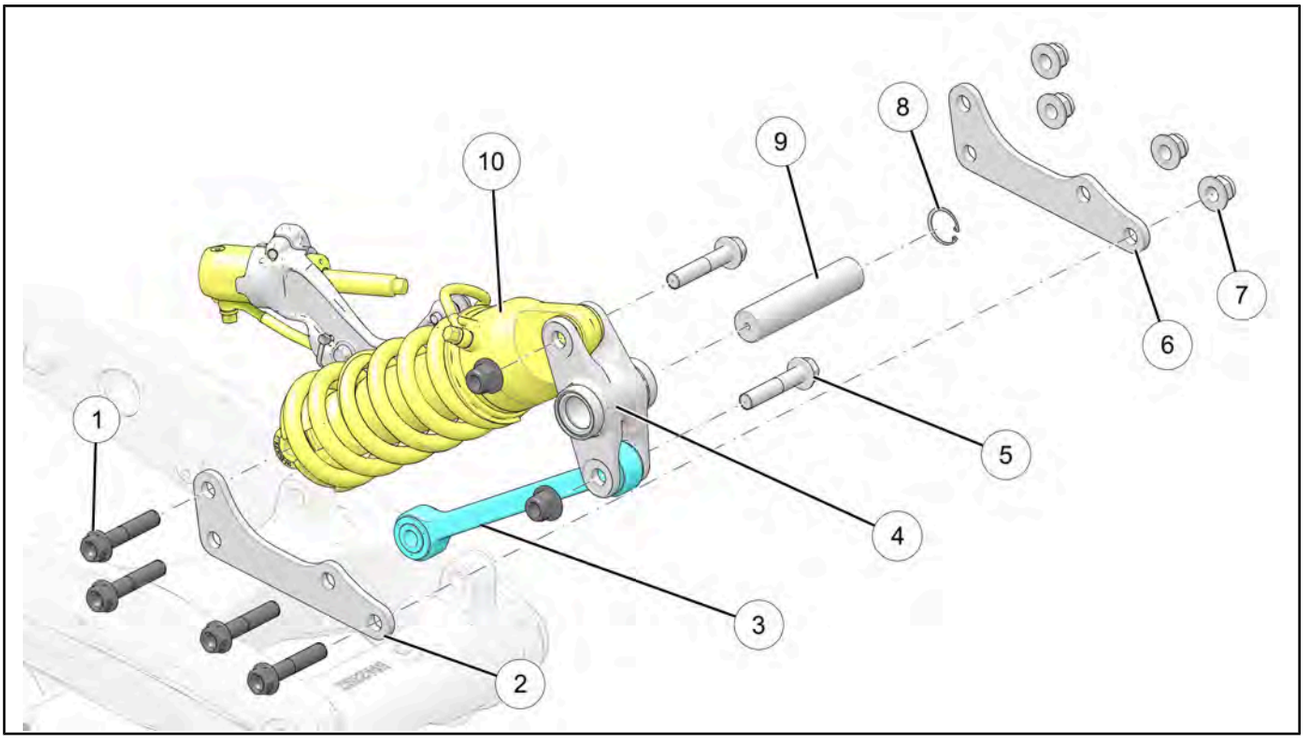
REAR SUSPENSION ASSEMBLY VIEW



① Rear Axle	⑮ Bearing
② Adjuster Nut	⑯ Retaining Ring
③ Axle Adjuster	⑰ Pivot Spacer
④ Wheel Spacer	⑱ Outer Pivot Spacer
⑤ Axle Adjuster Plate	⑲ Swing-Arm Pivot Nut (Nylock) **65 ft-lbs (88 N·m)**
⑥ Axle Nut **65 ft-lbs (84 N·m)**	⑳ Shock Pushrod
⑦ Belt Guard Fastener **96 in-lbs (11 N·m)**	㉑ Rocker Assembly
⑧ Gusset Plate Fastener **96 ft-lbs (130 N·m)**	㉒ Rocker Pivot Shaft
⑨ Swing-Arm Pivot Jam Nut **75 ft-lbs (101 N·m)**	㉓ Retaining Ring
⑩ Swing-Arm Pivot Shaft **96 in-lbs (11 N·m)**	㉔ E-Adjuster Bracket
⑪ Seal	㉕ Shock Adjust Bracket Fastener M6 **96 in-lbs (11 N·m)**

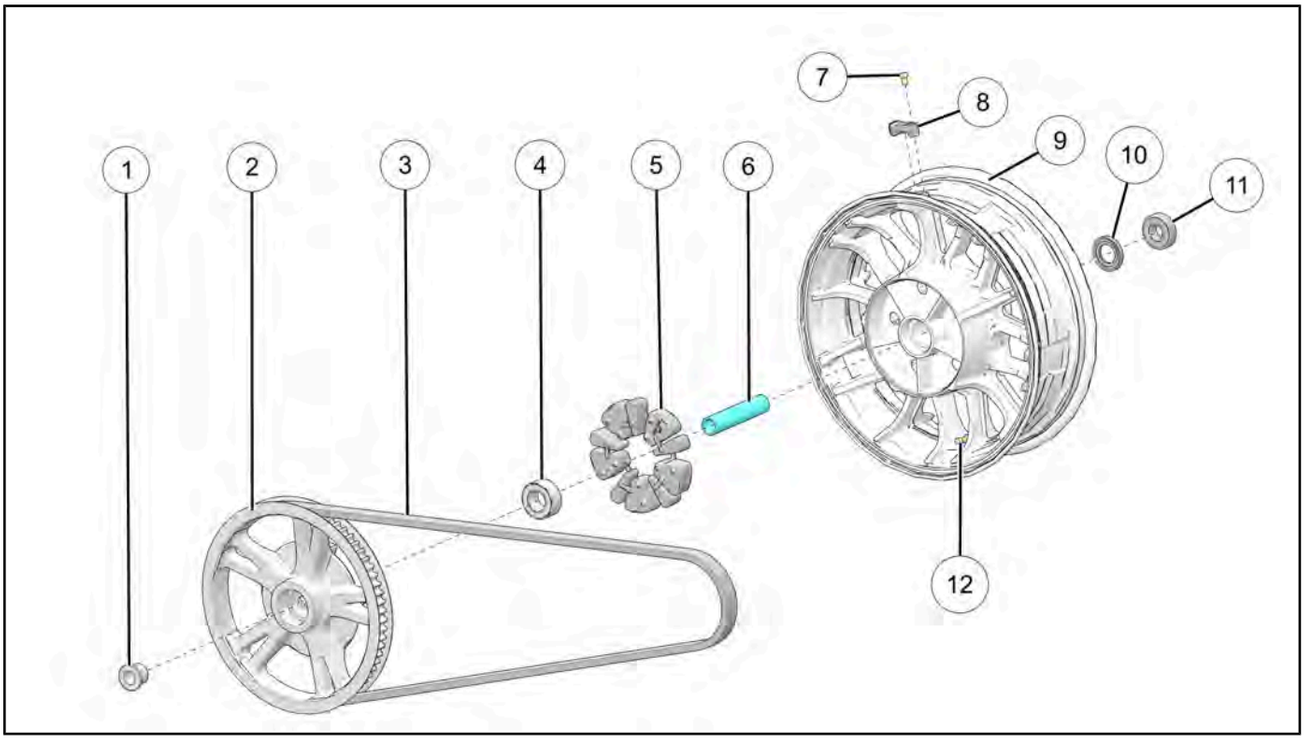
⑫ Roller Bearing	㉖ Shock Adjuster Fastener **18 ft-lbs (24 N·m)**
⑬ Seal	㉗ Shock Adjuster Bracket Fastener M8 **18 ft-lbs (24 N·m)**
⑭ Bearing	

REAR SHOCK / PUSHROD ASSEMBLY VIEW



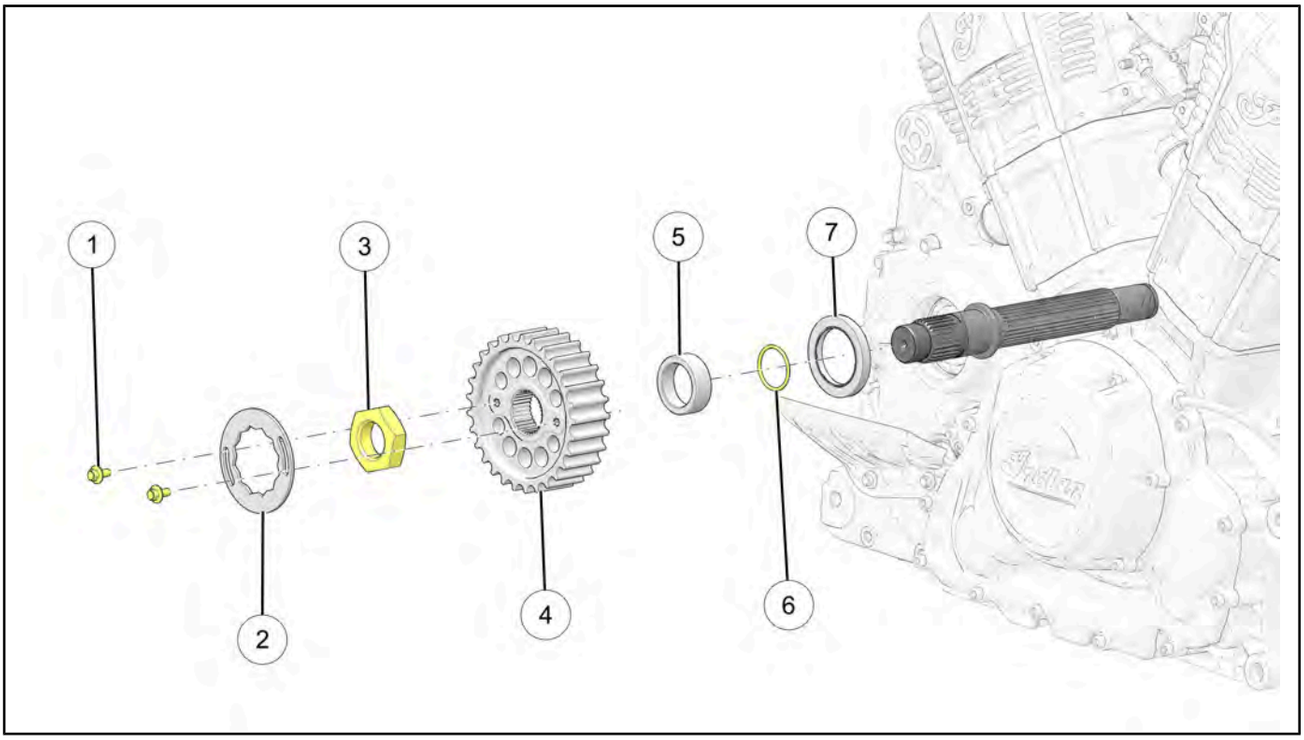
① Gusset Plate Fastener **96 ft-lbs (130 N·m)**	⑥ Gusset Plate
② Gusset Plate	⑦ Gusset Plate Nut **96 ft-lbs (130 N·m)**
③ Shock Pushrod	⑧ Retaining Ring
④ Rocker Assembly	⑨ Rocker Pivot Shaft
⑤ Rocker Fastener **96 ft-lbs (130 N·m)**	⑩ Shock Assembly

REAR WHEEL ASSEMBLY VIEW



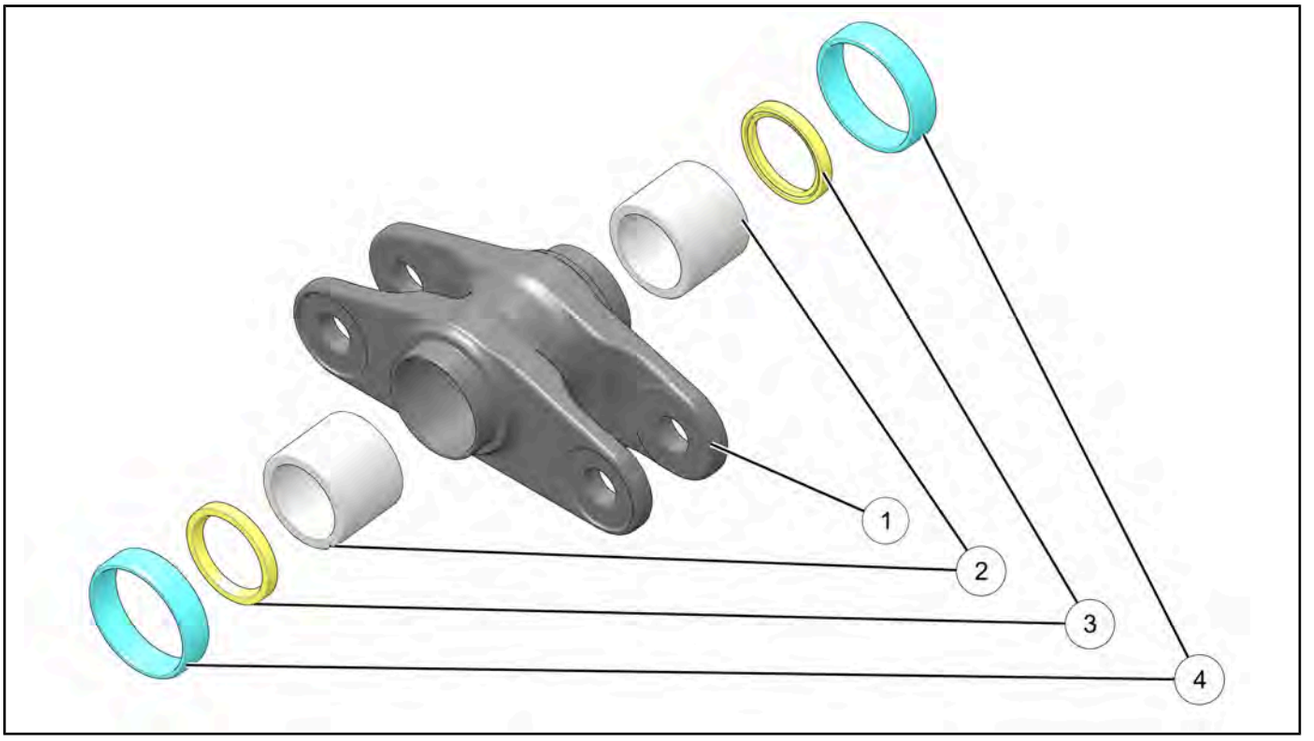
① Wheel Spacer	⑦ TPMS Screw **72 in-lbs (8 N·m)**
② Sprocket	⑧ TMPS
③ Drive Belt	⑨ Rear Wheel
④ Wheel Bearing	⑩ Wheel Seal
⑤ Cush Drive Damper	⑪ Wheel Bearing
⑥ Bearing Spacer	⑫ Tire Valve

DRIVE SPROCKET ASSEMBLY VIEW



① Lock Washer Fastener **88 in-lbs (10 N·m)**	⑤ Drive Sprocket Spacer
② Lock Washer	⑥ O-Ring
③ Drive Sprocket Nut **165 ft-lbs (224 N·m)**	⑦ Seal
④ Drive Sprocket	

ROCKER ASSEMBLY VIEW



① Rocker	③ Seal
② Needle Roller Bearing	④ Thrust Bearing

DRIVE BELT SERVICE

DRIVE BELT INSPECTION

1. Inspect belt tension and adjust if necessary. See **Drive Belt Inspection page 8.4**.
2. If belt or sprocket is being replaced due to damage, inspect the other drive system parts to make sure they are not damaged as well to prevent damage to replaced components.

DRIVE BELT REMOVAL

NOTICE

If belt is to be reinstalled, mark direction of rotation on the outer surface of belt. Reinstall belt in same direction as it was removed.

⚠ WARNING

A misaligned rear axle can cause drive line noise and damage the drive belt, which could cause belt failure and loss of control of the motorcycle.

⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

1. Remove rear wheel. See **Rear Wheel Removal page 8.70**.
2. Remove Swing-Arm assembly. See **Swing-Arm Removal page 8.82**.
3. Remove exhaust assembly. See **Muffler Removal page 3.102**.
4. Remove drive sprocket cover. See **Drive Sprocket Cover Removal page 8.64**.
5. Remove belt from drive sprocket.

DRIVE BELT INSTALLATION

1. Inspect sprockets and verify sprocket fasteners are tight.
2. Install drive belt with the Indian Motorcycle script situated so that it reads correctly when viewed from the RH side of the motorcycle.
3. Install the drive sprocket cover. See **Drive Sprocket Cover Installation page 8.64**.
4. Install the exhaust system. See **Muffler Installation page 3.103**.
5. Install the Swing-Arm assembly. See **Swing-Arm Installation page 8.86**.
6. Install the rear wheel. See **Rear Wheel Installation page 8.71**.
7. Set drive belt alignment and tension. See **Drive Belt Adjustment page 8.62**.

DRIVE BELT ADJUSTMENT

IMPORTANT

Perform this procedure to achieve proper belt tension *and* alignment. Belt tension should be set before performing the alignment procedure.

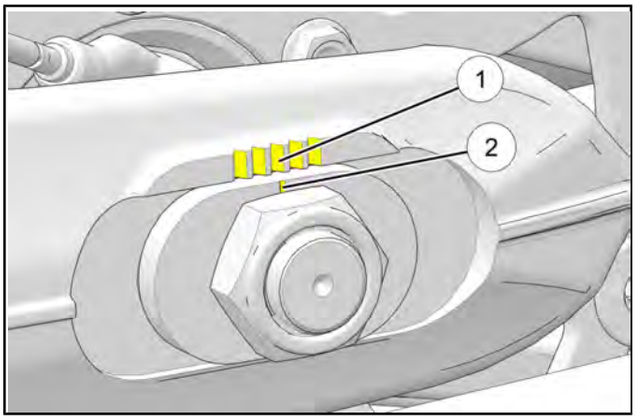
BELT TENSION

⚠ WARNING

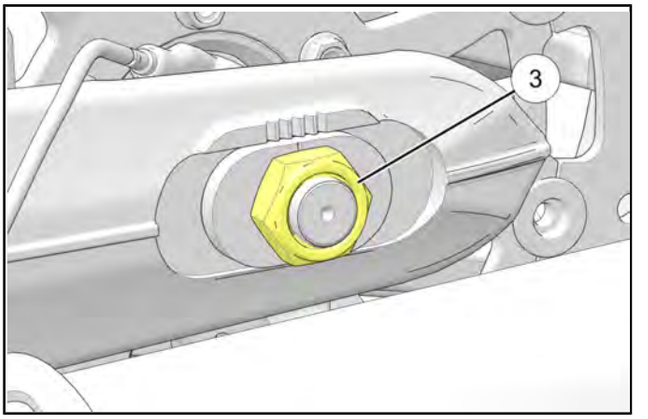
A drive belt that is not properly tensioned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

NOTICE

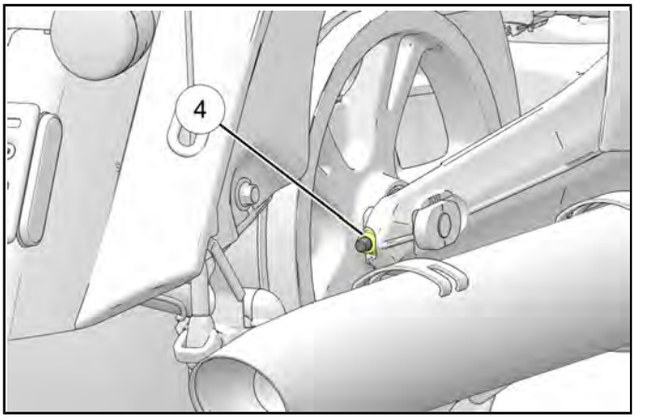
Marks ① and ② are used as a reference for initial wheel alignment. Marks should be in roughly the same position on both left and right sides of wheel.



1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove saddlebags. See **Saddlebag Removal page 7.93**.
3. Make note of adjuster locations ① and ②.
4. Raise the rear of the motorcycle so the rear tire can be freely rotated.
5. Loosen axle nut ③ then tighten to **15 ft-lbs (20 Nm)**.



6. Turn the RIGHT SIDE adjuster nut ④ to achieve proper belt tension. See **Drive Belt Tension Measurement page 8.4**.



BELT ALIGNMENT

1. When belt tension is correct, check and adjust final wheel alignment as follows:

   Belt Alignment

⚠ WARNING

A drive belt that is not properly aligned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

NOTICE

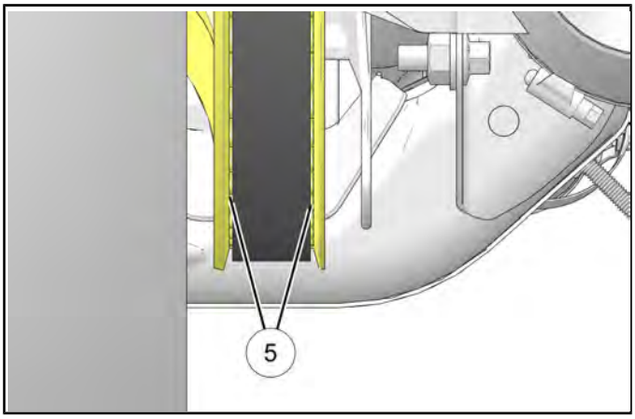
To minimize change in belt tension, use LEFT SIDE adjuster only to make final adjustments to belt alignment.

2. Rotate the wheel BACKWARD. Tighten LEFT SIDE adjuster until belt comes off inside sprocket flange during backward wheel rotation.

IMPORTANT

The belt should track to the center of the sprocket tooth surface when properly aligned ⑤. Sprocket teeth should be visible on both sides of the drive belt.

3. Rotate the wheel in the FORWARD direction and verify that sprocket teeth are still visible on both sides of the drive belt ⑤.



4. If necessary, loosen the axle nut and LEFT SIDE adjuster until belt just moves off the right flange and begins to track down the center of the driven sprocket flange during forward wheel rotation.

NOTICE

It may be necessary to loosen the axle nut and tap the left end of the axle to ensure it moves forward when the adjuster is loosened. The axle nut must be retightened to the ADJUSTMENT SPECIFICATION before proceeding.

5. **Rear wheel alignment is satisfactory when the drive belt remains centered on driven sprocket during forward and backward wheel rotation. Sprocket teeth should be visible from both sides of the drive belt.**
6. Verify that drive belt tension is still within specification. See **Drive Belt Tension Measurement page 8.4**.
7. Tighten rear axle nut to specification.

TORQUE
Axle Nut (Rear): **65 ft-lbs (84 N·m)**

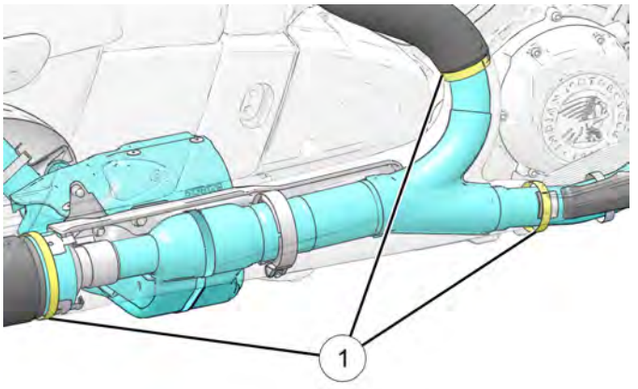
8. Pump rear brake pedal several times to reset brake pad distance.
9. Verify wheel rotates smoothly and freely without drag when brake pedal is released.

DRIVE SPROCKET SERVICE

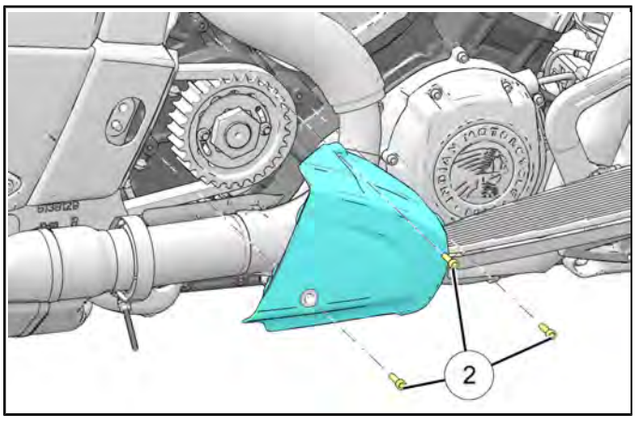
DRIVE SPROCKET COVER REMOVAL

REMOVAL

1. Remove the heat shield by completely loosening the heat shield clamps ①.

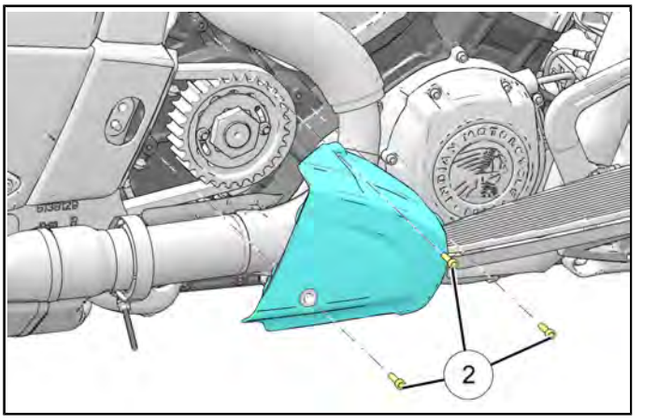


2. Remove fasteners ② securing the cover to the engine.



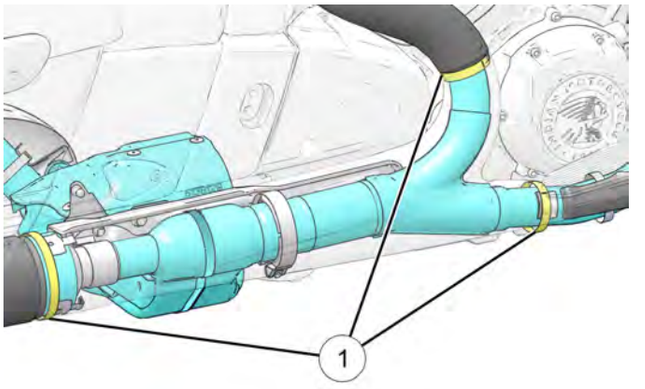
DRIVE SPROCKET COVER INSTALLATION

1. Install fasteners ② securing the cover to the engine.



TORQUE
Drive Sprocket Cover Fastener: **88 in-lbs (10 N·m)**

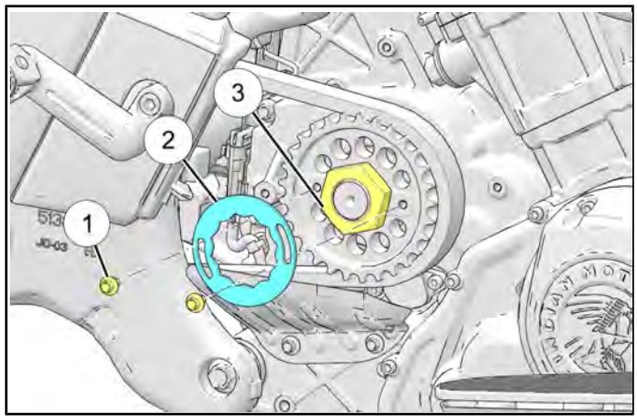
2. Torque drive sprocket cover fasteners to specification.
3. Remove the heat shield by completely loosening the heat shield clamps ①.



TORQUE
Heat Shield Clamp: **31 in-lbs (3 N·m)**

DRIVE SPROCKET REMOVAL

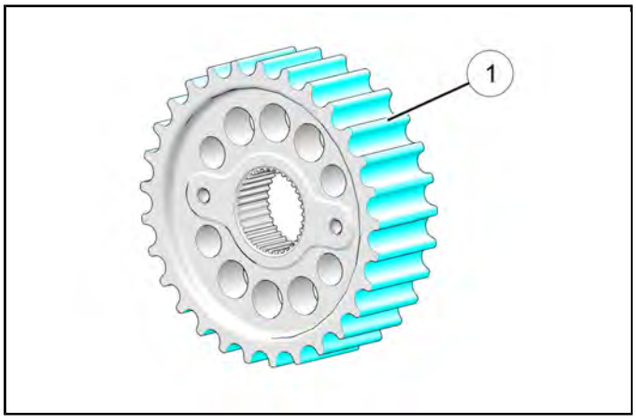
1. Secure the unit on a lift table with the front wheel in a wheel vice.
2. Remove drive sprocket cover. See **Drive Sprocket Cover Removal page 8.64**.
3. Remove drive sprocket lock plate ② by removing its fasteners ①.



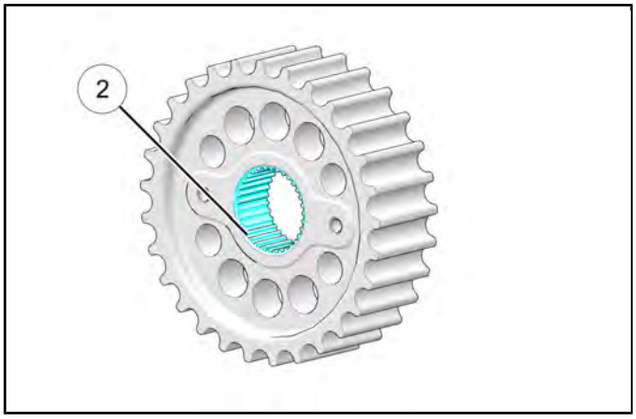
4. With the unit in gear or the rear brake applied, loosen the drive sprocket nut ③.
5. Remove drive belt. See **Drive Belt Removal page 8.61**.
6. Remove drive sprocket.

DRIVE SPROCKET INSPECTION

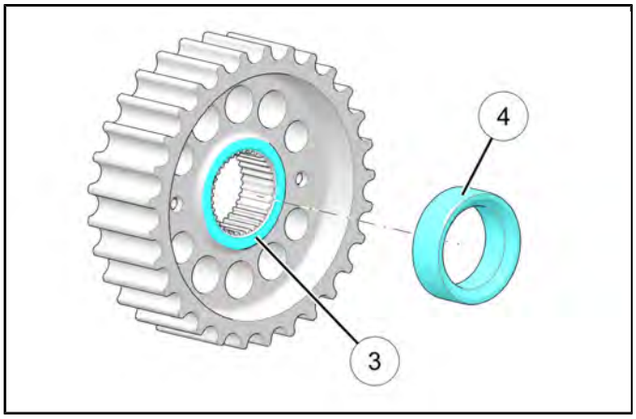
1. Visually inspect sprocket teeth ① for excessive wear and damage.



2. Inspect splines ② for a tight fit on output shaft splines.



3. Inspect the back surface of sprocket hub ③ where it contacts the seal sleeve. Replace if worn or if surface is rough.
4. Inspect the machined sealing surface of the spacer sleeve ④ . Replace the spacer sleeve if it is grooved or otherwise damaged.



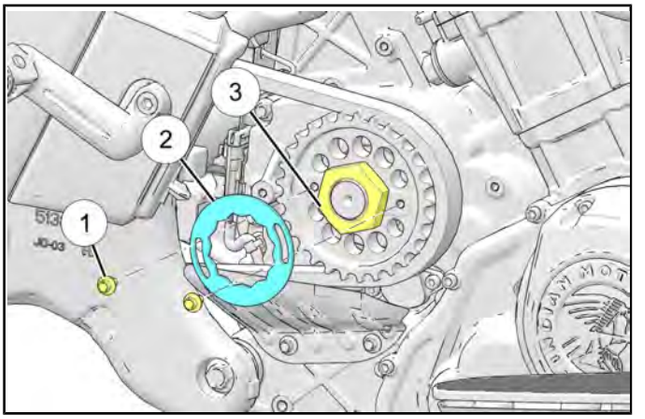
8

5. Sprockets and belt normally exhibit a polished appearance due to normal operation. Belt replacement is not required unless uncharacteristic damage is noted, or if the mileage service interval is reached. Belt or sprocket damage is usually due to debris trapped between belt and sprocket, or from improper maintenance and adjustment.

DRIVE SPROCKET INSTALLATION

NOTICE
If replacing the output shaft seal, it will be necessary to use the Output Shaft Seal Tool **(PF-51243)** for proper installation.

1. Install drive sprocket.
2. Install drive belt. See **Drive Belt Installation page 8.61**
3. Tighten the drive sprocket nut ③.



TORQUE
Drive Sprocket Nut: **165 ft-lbs (224 N·m)**

4. Install the drive sprocket lock plate ② and secure with fasteners ①.

TORQUE
Lock Washer Fastener: **88 in-lbs (10 N·m)**

5. Install drive sprocket cover. See **Drive Sprocket Cover Installation page 8.64**.

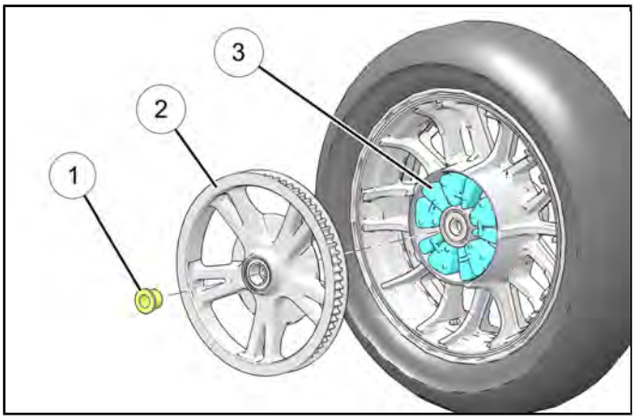
DRIVEN SPROCKET SERVICE

DRIVEN SPROCKET REMOVAL

⚠ CAUTION

Protect brake disc surface while working on wheel.

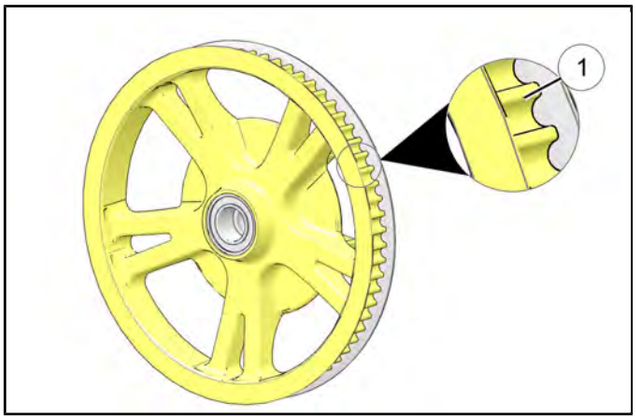
1. Remove rear wheel. See **Rear Wheel Removal page 8.70**.
2. Remove the RH wheel spacer ① from the driven sprocket roller bearing.



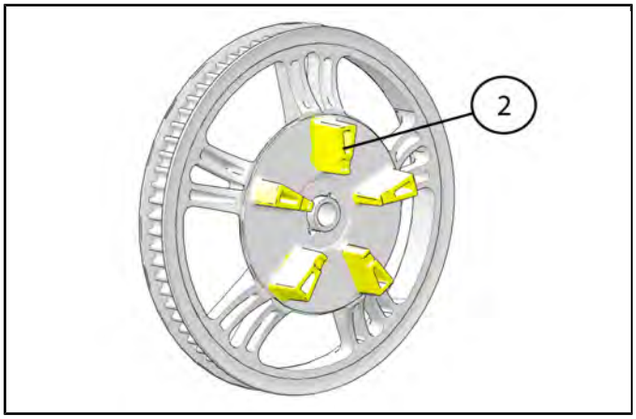
3. Lift the driven sprocket assembly ② off of the drive damper ③.

DRIVEN SPROCKET INSPECTION

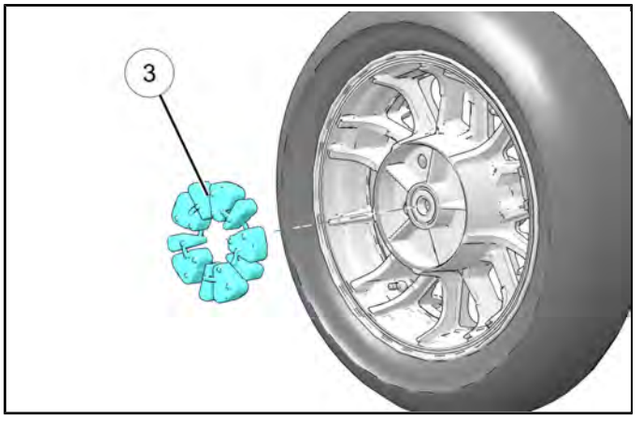
1. Visually inspect sprocket teeth ① for excessive wear and damage from foreign material or road debris.



2. Inspect the back side of the sprocket where it engages the damper ② for wear, galling or roughness. Surface must be smooth, with no burrs or surface irregularities.



3. Visually inspect the cushion drive damper ③ for cracks or deformation. Replace damper if damage is found.



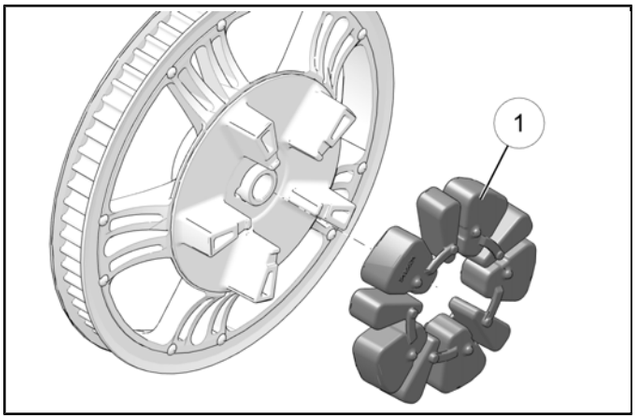
8

DRIVEN SPROCKET BEARING - REPLACEMENT

DRIVEN SPROCKET BEARING REMOVAL

1. Remove the driven sprocket. See **Driven Sprocket Removal page 8.67**.
2. Remove the cushion drive damper ① from the driven sprocket and set aside.

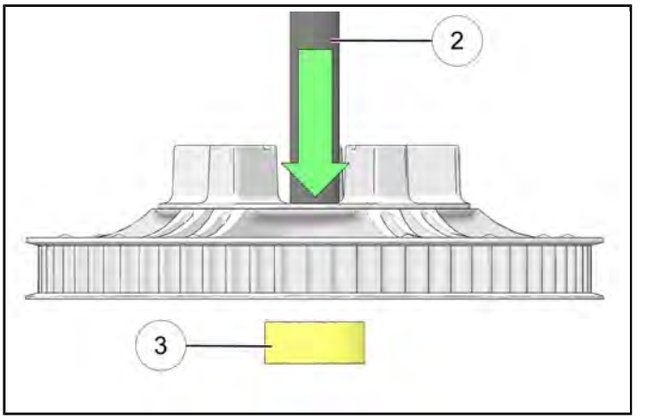
NOTICE
Mark the cushion drive damper and driven sprocket so the damper can be reinstalled in the same position from which it was removed.



3. Place the driven sprocket face down on a suitable press leaving enough space for the bearing to be pressed through.

⚠ CAUTION
The painted surface of the driven sprocket should be resting on a protective surface such as wood or shop rags to ensure the finished surface is not damaged while pressing the bearing out.

4. Locate an arbor that is roughly the same size as the O.D. of the inner sprocket spacer ② and press straight down on the inner spacer to remove the bearing ③.



DRIVEN SPROCKET BEARING INSTALLATION

1. Turn the driven sprocket over on the press, so the face is pointing up toward the press arbor.

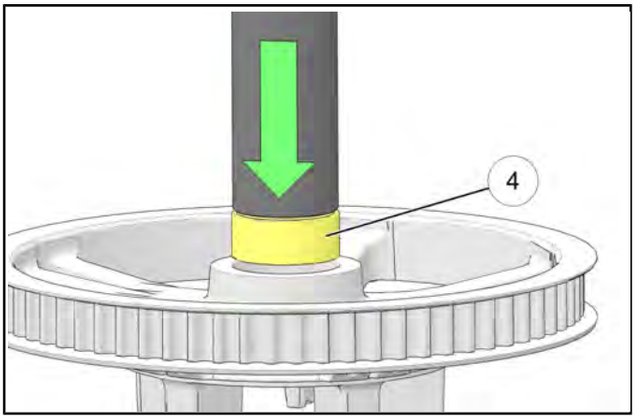
⚠ CAUTION

The cushion drive damper fingers should be resting on a solid, flat surface to prevent warping or damage as the new bearing is being pressed into the driven sprocket.

2. Verify that the inner spacer is in place in the driven sprocket prior to pressing in the new bearing.
3. Apply a thin coat of all-purpose grease to the outer race of the new driven sprocket bearing.
4. Place the new bearing into the bore on the driven sprocket so it is resting flat.
5. Locate an arbor that is roughly the same size as the O.D. of the outer bearing race and press the bearing ④ into position until fully seated.

NOTICE

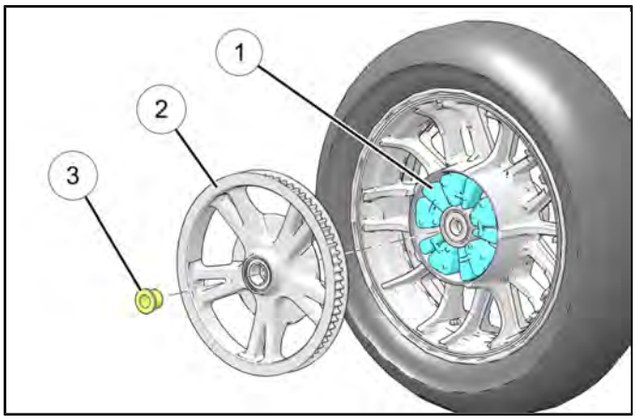
Once seated, the bearing will be approximately .019 in (0.5 mm) proud against the machined face of the driven sprocket.



6. Verify that the inner race of the bearing rotates freely and does not bind.
7. Reinstall the cushion drive damper in the same position from which it was removed.
8. Install the driven sprocket assembly. See **Driven Sprocket Installation page 8.69**.

DRIVEN SPROCKET INSTALLATION

1. Install cushion damper ① into wheel hub.



2. Install sprocket assembly ② onto wheel hub making sure the cushion damper is properly engaged.
3. Install the RH wheel spacer ③ into the sprocket roller bearing.

8

REAR WHEEL SERVICE

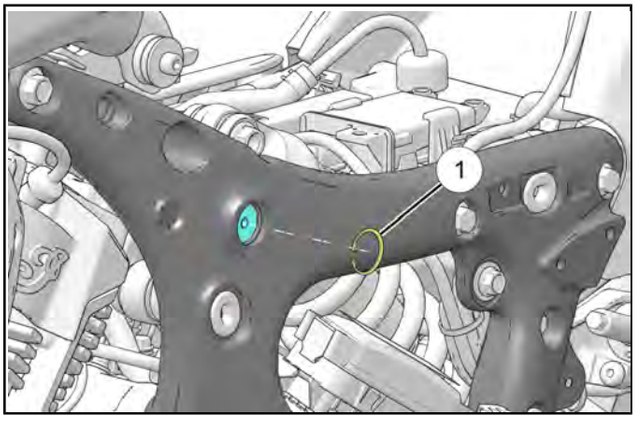
REAR WHEEL REMOVAL

⚠ WARNING

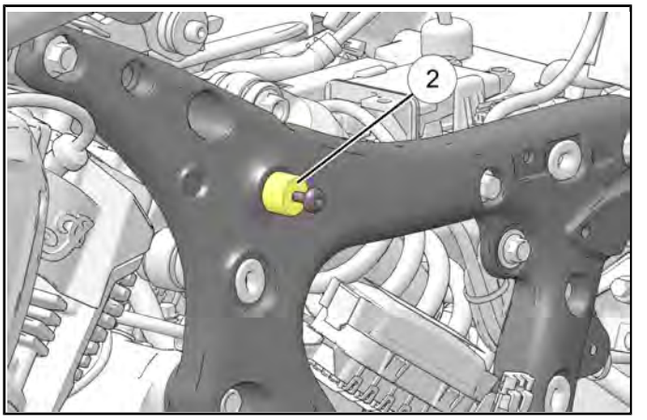
Rear wheel removal involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. Severe personal injury or death can occur if the motorcycle tips or falls.
Make sure the exhaust system has cooled to room temperature before elevating the motorcycle. The drive belt may be damaged if it comes into contact with HOT exhaust components.

REMOVAL

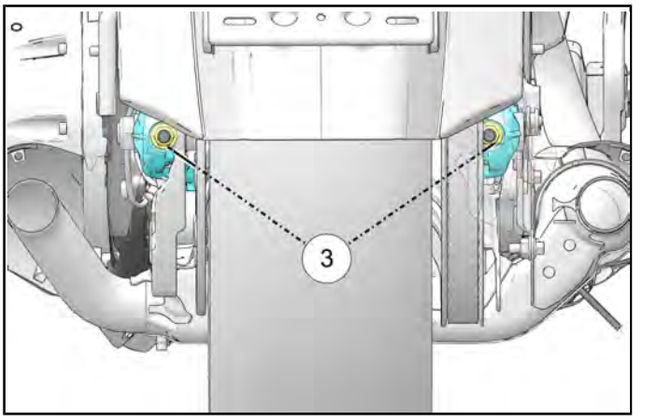
1. Place the motorcycle in an upright position on a lift table with the front wheel clamped in a wheel vise.
2. Remove saddlebags. See **Saddlebag Removal page 7.93**.
3. Remove upper left side panel. See **Side Cover (Upper), Removal page 7.100**.
4. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
5. Position a platform jack beneath the engine cases and raise until the rear tire is barely in contact with the ground.
6. Remove brake caliper. See **Rear Caliper Service page 9.52**.
7. Remove the upper shock pivot pin retaining ring ①.



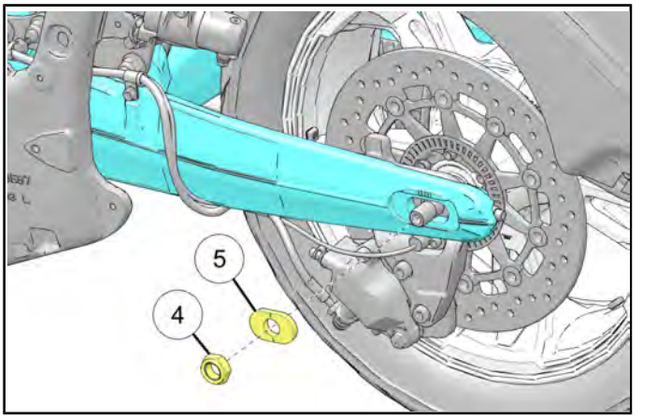
8. Thread a lower side panel fastener into the threaded opening on the pivot pin ② and pull on exposed fastener to withdraw pin from bore.



9. Loosen right and left axle adjusters ③ .



10. Remove rear axle nut ④ and washer ⑤ from left side of Swing-Arm.



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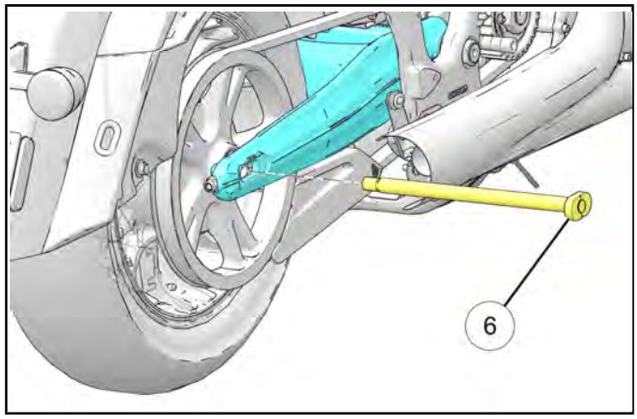
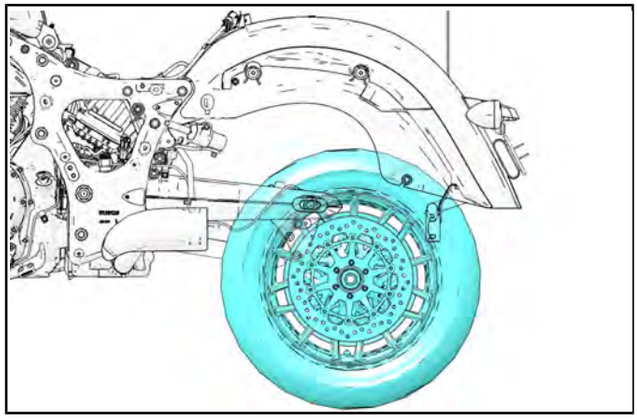
11. Remove axle ⑥ from right side of Swing-Arm.



12. Push wheel forward and slide drive belt to the right side off of the rear sprocket.
13. Remove rear wheel assembly by sliding it to the rear of the motorcycle.



REAR WHEEL INSTALLATION

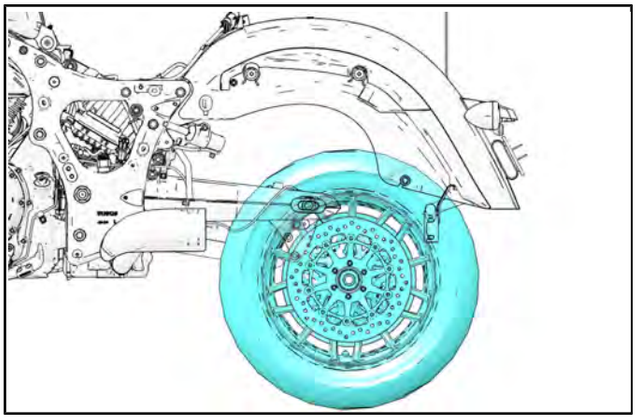
⚠ WARNING

Rear wheel removal involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. Severe personal injury or death can occur if the motorcycle tips or falls.

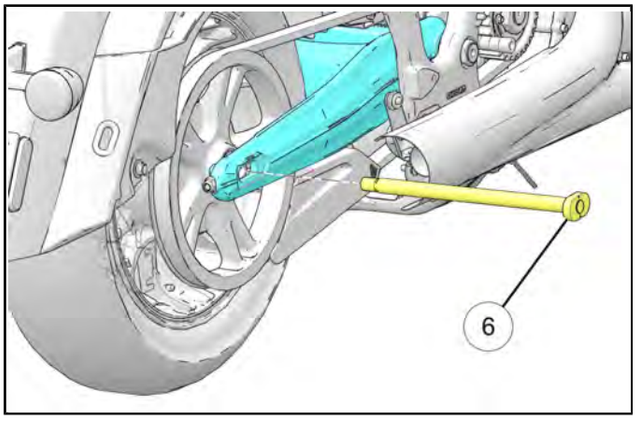
Make sure the exhaust system has cooled to room temperature before elevating the motorcycle. The drive belt may be damaged if it comes into contact with HOT exhaust components.

INSTALLATION

1. Place the motorcycle in an upright position on a lift table with the front wheel clamped in a wheel vise.
2. Position a platform jack beneath the engine cases and raise until the rear tire is barely in contact with the ground.
3. Install rear wheel assembly.

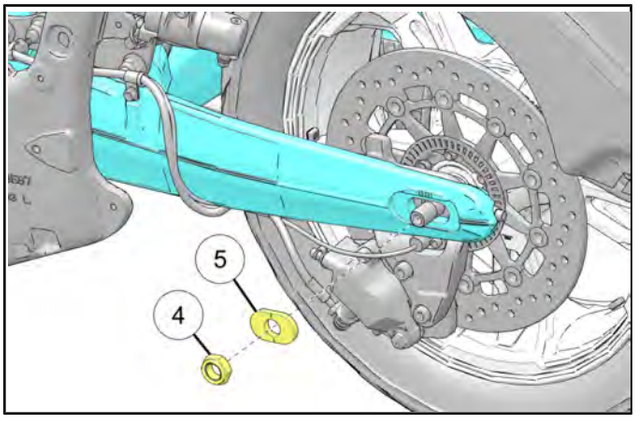


4. Install the axle ⑥ from right side of Swing-Arm.



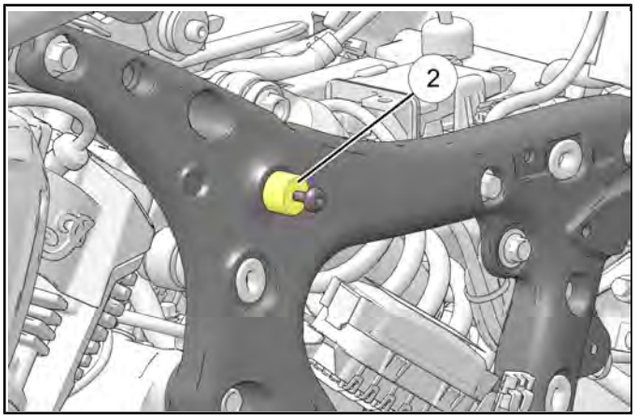
5. Install the drive belt over the rear sprocket.

6. Install washer ⑤ and rear axle nut ④ to the axle. Torque to specification.

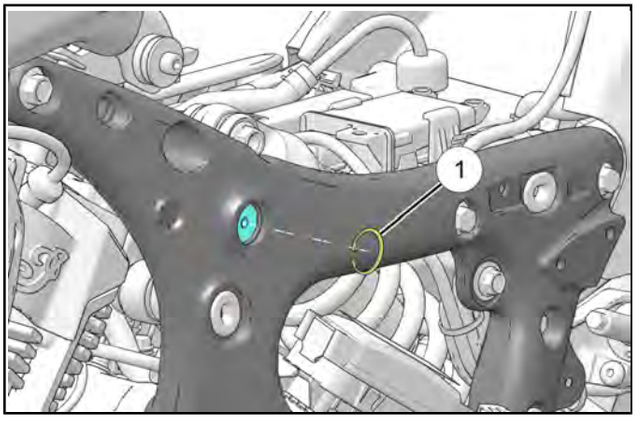


TORQUE
Axle Nut: **65 ft-lbs (84 N·m)**

7. Install the pivot pin ② into position.



8. Install the upper shock pivot pin retaining ring ①.



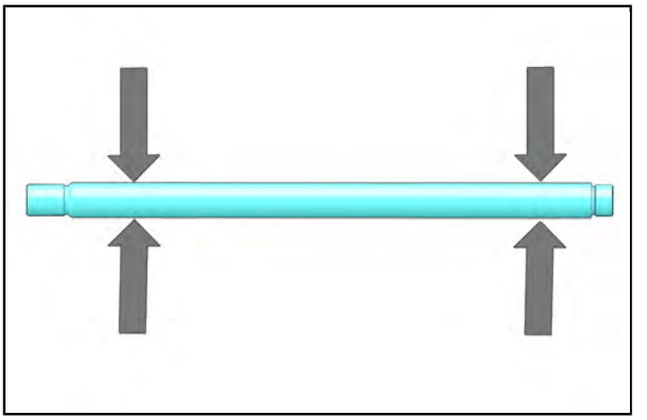
9. Install brake caliper. Torque fasteners to specification.

TORQUE
Rear Caliper Mounting Fasteners: **31 ft-lbs (42 N·m)**

10. Install the seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.
11. Install upper left side panel. See **Side Cover (Upper), Install page 7.101**.
12. Install saddlebags. See **Saddlebag Installation page 7.93**.
13. Perform Drive Belt Adjustment procedure. See **Drive Belt Adjustment page 8.62**.

REAR AXLE INSPECTION

1. Install rear axle in V-blocks and measure runout and compare to service limit.
2. Axle diameter should be measured on bearing surfaces.

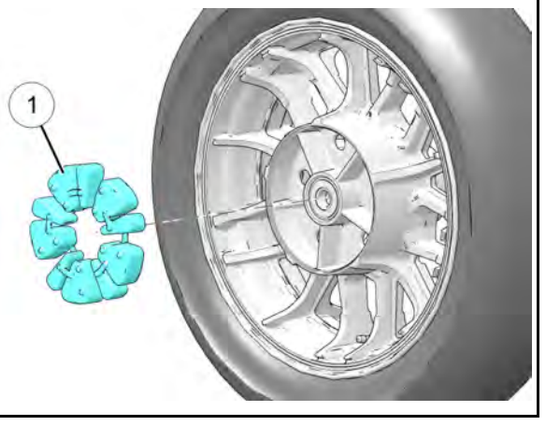


Axle Diameter Measurement:
0.786 - 0.787 inches (19.965 - 19.990 mm)

REAR WHEEL INSPECTION

IMPORTANT

Visual inspection of the cushion drive damper ① for cracks or deformation is required whenever the rear wheel is removed. Replace damper if damage is found.



1. Set up a dial indicator to measure axial and radial runout of the wheel and compare to service limit. See **Visual Inspection & Runout page 8.119**.
2. Visually inspect wheel for cracks or other damage.
3. Replace wheel if it fails visual or measured inspection.

REAR WHEEL BEARING INSPECTION

NOTICE

If possible, also inspect wheel bearings before removing the wheel from the vehicle. Do not remove bearings from wheel to inspect. Bearings cannot be repacked. Replace both bearings if one or both fail inspection, or if either bearing was removed.

1. Visually inspect integral bearing seal for damage.
2. Inspect bearing fit in wheel hub. The outer race of the bearing must fit tightly into the bore. You should not be able to move outer race by hand.
3. Slide axle into wheel and check for smooth rotation and tight fit.

NOTICE

Due to extremely close tolerances, the bearings must be inspected visually, and by feel. Look for signs of discoloration, scoring, galling, or contamination from moisture or dirt. Replace bearings if any of the above are present. Turn the inner race of the bearings. The bearings should turn smoothly and quietly. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

WHEEL BEARING REPLACEMENT

REMOVAL

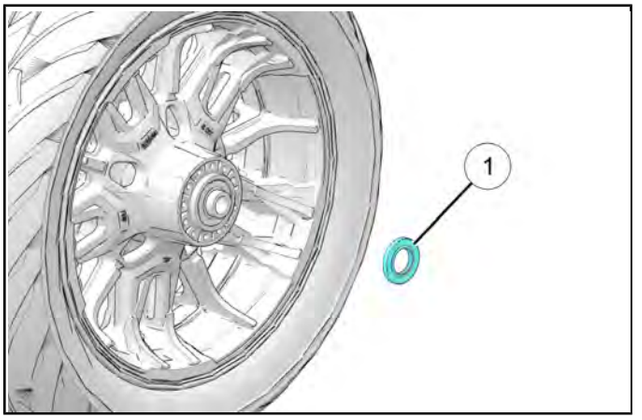
⚠ CAUTION

Do not reuse bearings that have been removed.

NOTICE

This procedure requires the Wheel Bearing Removal / Installation Kit**(PF-51324-A)**. Refer to special tool manufacturer instructions for proper use of tool.

1. Remove rear wheel. See **Rear Wheel Removal page 8.70**.
2. Remove driven sprocket. See **Driven Sprocket Removal page 8.67**.
3. Remove brake disc. See **Brake Disc Removal page 8.36**.
4. Carefully pry seal ① out of left-hand side of hub.



5. Refer to special tool manufacturer instructions to remove bearing from brake disc side of hub.
6. Remove bearing.
7. Remove spacer.
8. Extract or drive bearing from sprocket side.

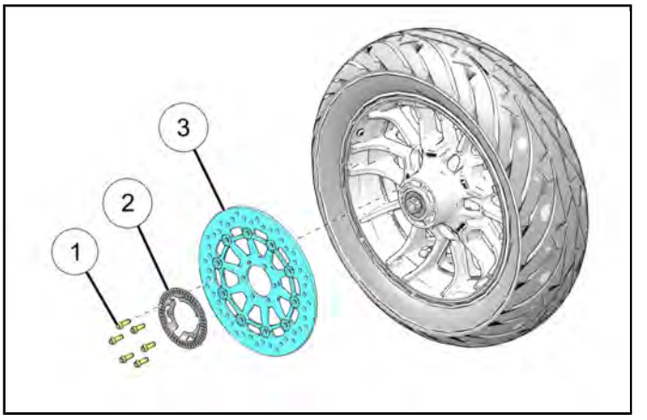
INSTALLATION

1. Use the Wheel Bearing Removal / Installation Kit **(PF-51324-A)** to install new wheel bearings. Refer to special tool manufacturer instructions for proper use of tool.
2. Install new seal into the left-hand side of hub.
3. Install the brake disc. See **Brake Disc Installation page 8.36**.
4. Install driven sprocket. See **Driven Sprocket Installation page 8.69**.
5. Install the rear wheel. See **Rear Wheel Installation page 8.71**.

BRAKE DISC REMOVAL

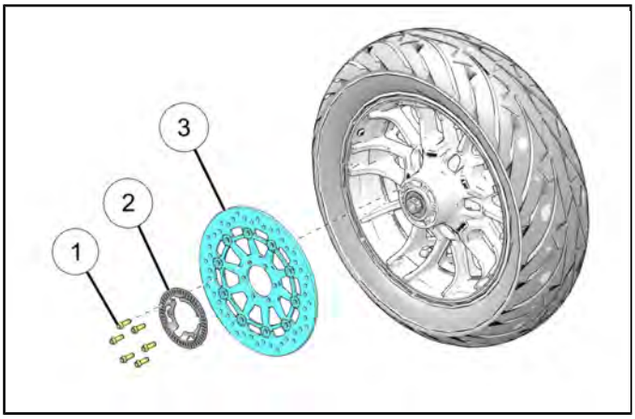
REMOVAL

1. Remove the rear wheel. See **Rear Wheel Removal page 8.70**.
2. Remove brake disc fasteners ① .
3. Remove tone ring ②.
4. Remove the brake disc ③ .



BRAKE DISC INSTALLATION

1. Install the brake disc ③ .



2. Install tone ring ②.
3. Install brake disc fasteners ① .

NOTICE
Torque brake disc fasteners to specification in a star pattern.

TORQUE
Brake Disc Fasteners: **22 ft-lbs (30 N·m)**

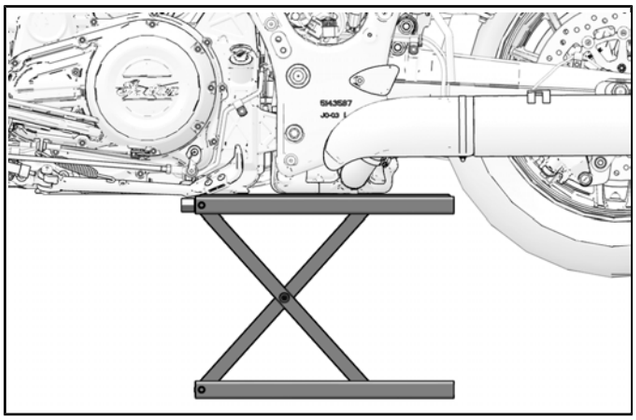
4. Install the rear wheel. See **Rear Wheel Installation page 8.71**.

SHOCK ABSORBER REMOVAL

⚠ WARNING

Shock absorber removal involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. Severe personal injury or death can occur if the motorcycle tips or falls.

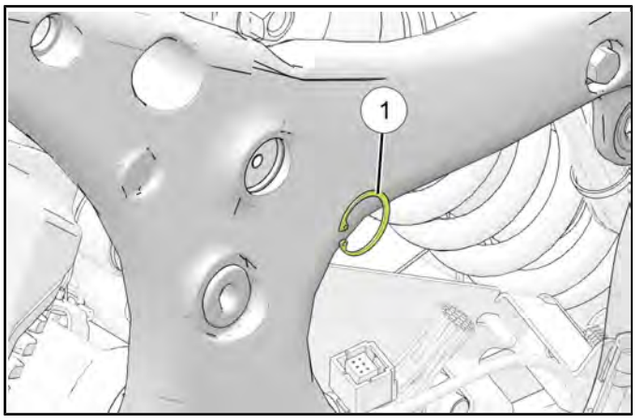
1. Place scissor lift under the motorcycle to take the weight off the suspension.



⚠ CAUTION

Make sure the motorcycle is stable and secured before moving to the next step.

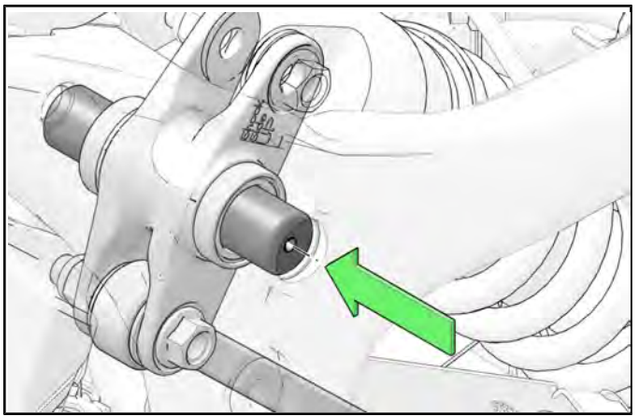
2. Using a snap ring pliers, remove the snap ring ①.



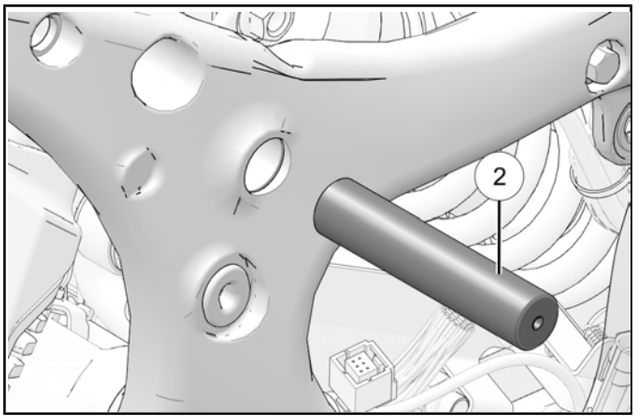
⚠ CAUTION

Do not use a screwdriver or pry on snap ring as damage may occur.

3. Insert a M6 x 1.00 fastener (not provided) into the shock pin that secures the rear shock linkage to the frame.

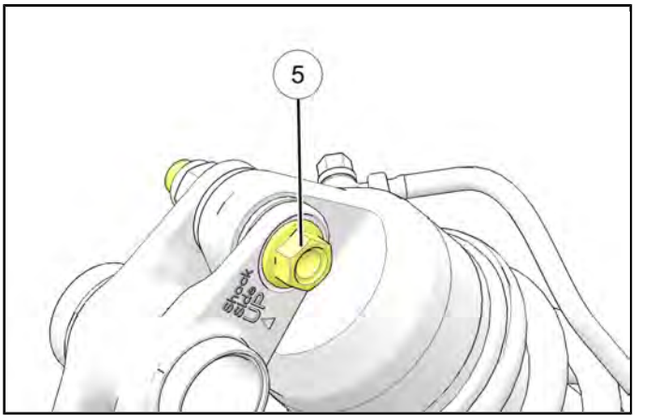


4. Remove the shock pin ②.



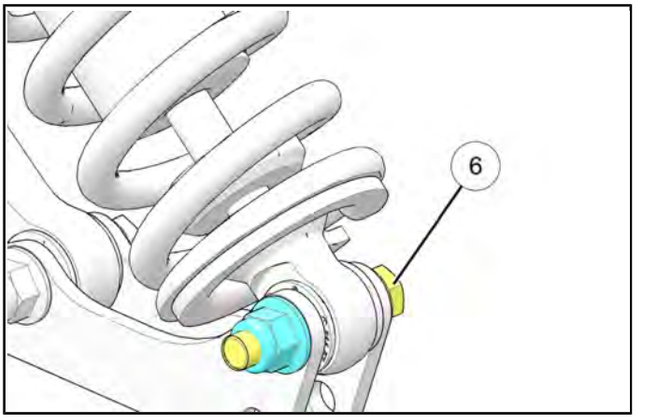
NOTICE
Raise or lower the scissor lift until the tension is free of the shock pin and remove.

5. Remove the shock top mounting fastener ⑤.



IMPORTANT
Make note of the direction the top and bottom fastener positioned in the shock for installation.

6. Raise the scissor lift high enough to gain access to the lower shock fastener. Remove the shock bottom mounting fastener ⑥.

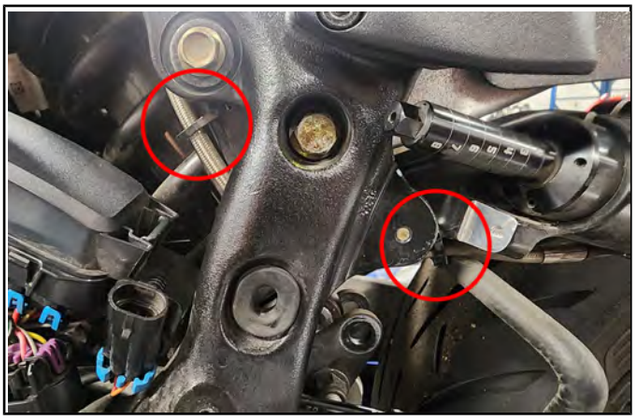


IMPORTANT
Note the direction of the fastener for installation.

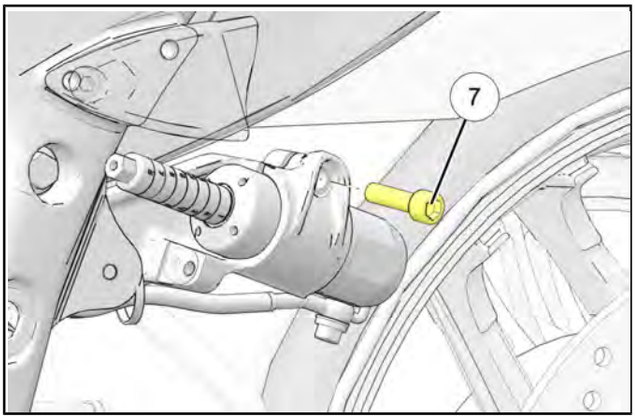
7. Disconnect shock reservoir.

- **Non E-Preload Models:**

a. Cut two cable ties securing the shock reservoir hose to the shock.

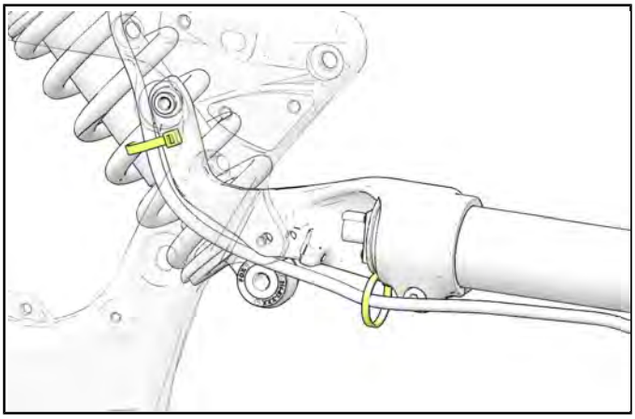


b. Remove reservoir pinch fastener ⑦.

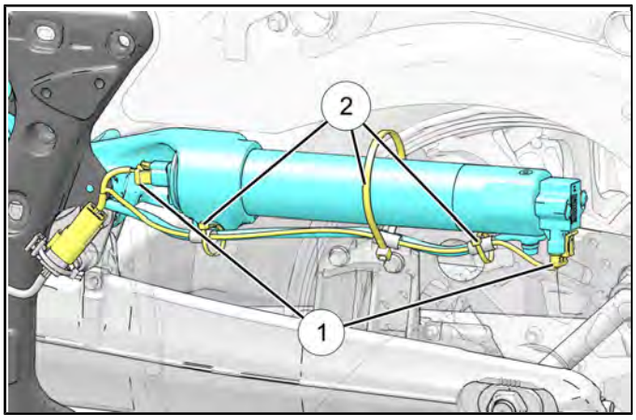


- **E-Preload Models:**

a. Cut and remove two cable ties securing the shock reservoir hose to the bracket.



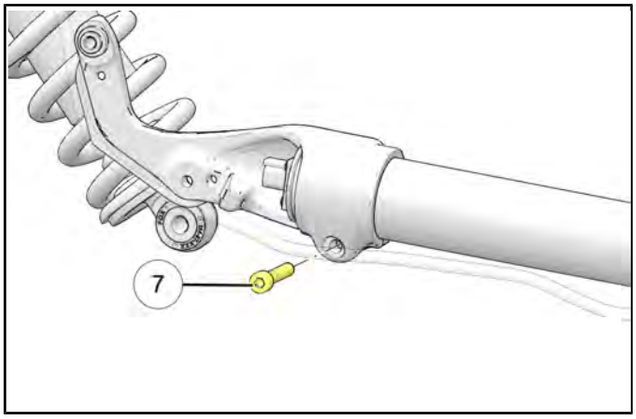
b. Disconnect shock electrical connectors ①. Cut and remove cable ties ②.



⚠ CAUTION

Do not use anything other than fingers to remove electrical connectors. The use of tools can damage the connection.

c. Remove reservoir pinch fastener ⑦.



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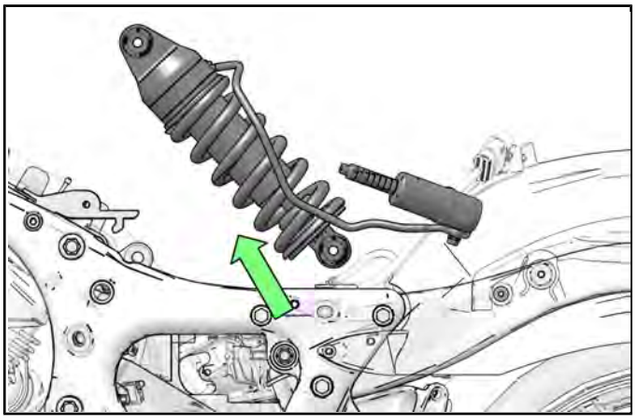
8. Support the reservoir during removal. Position shock and reservoir up through the seat area and remove from the motorcycle.

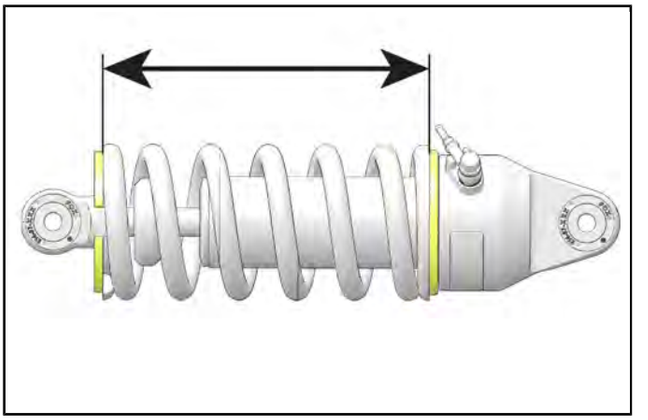


⚠ CAUTION

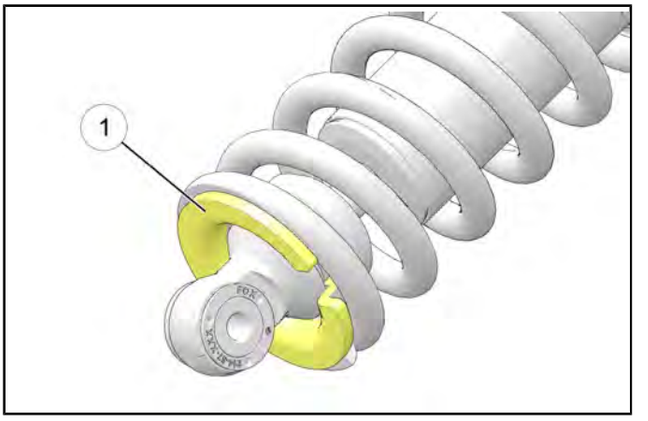
Do not allow the reservoir to hang from the shock.

SHOCK ABSORBER INSPECTION

1. Measure spring installed height and record so ride height adjustment can be returned to rider's preference.

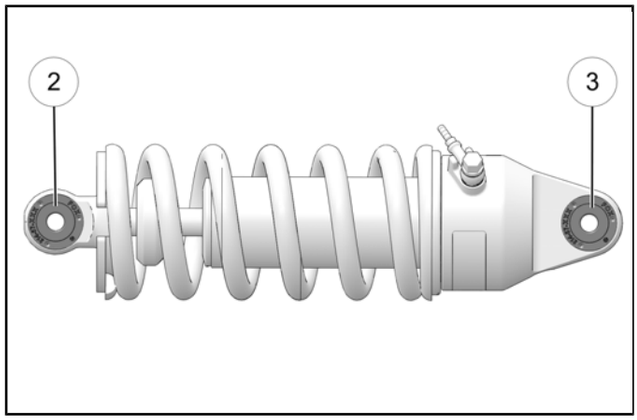


2. Using a commercially available spring compressor, compress shock enough to remove lower spring keeper ① and slide spring off of shock.



3. Thoroughly clean the shock spring.

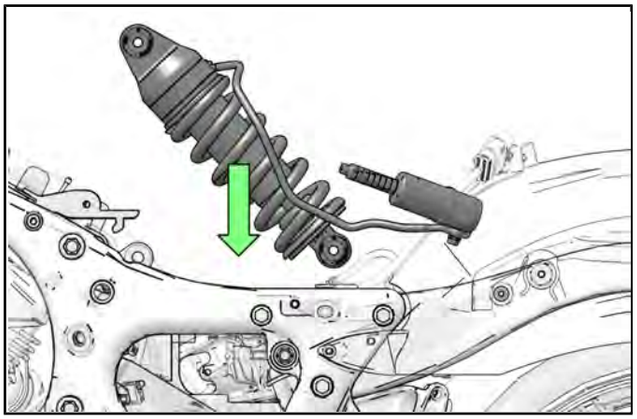
4. Inspect eyelets ② and ③ for cracks, damage or loose fitting eyelet. Replace shock if either eyelet is cracked or damaged.



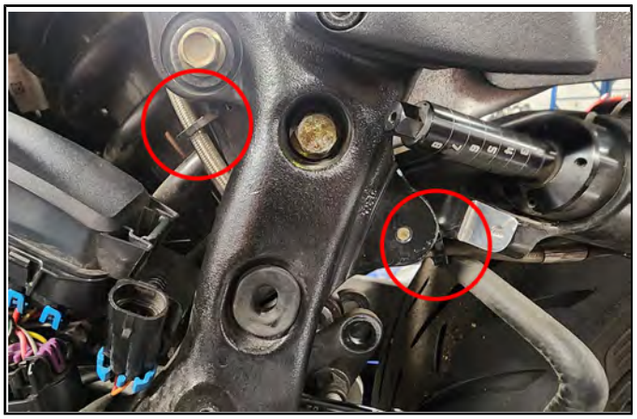
5. With shock upright, move damper rod through entire travel range. Damper rod should move smoothly with consistent damping through the entire travel range, and return to the fully extended position when released.
6. Inspect shock spring for cracks or distortion. Measure free length and compare to specification. See **Service Specifications – Rear Wheel / Suspension page 8.55**.
7. Install spring onto shock body.

SHOCK ABSORBER INSTALLATION

1. Install rear shock through underseat area.



2. Align rear shock and reservoir into mount positions.
   - **Non E-Preload Models:**
     a. Install two cable ties securing the shock reservoir hose to the reservoir bracket.



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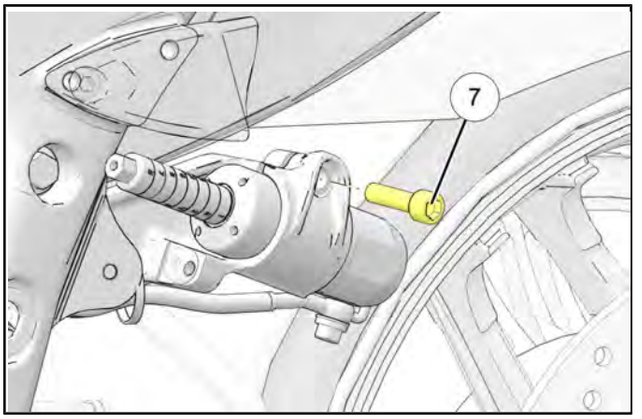
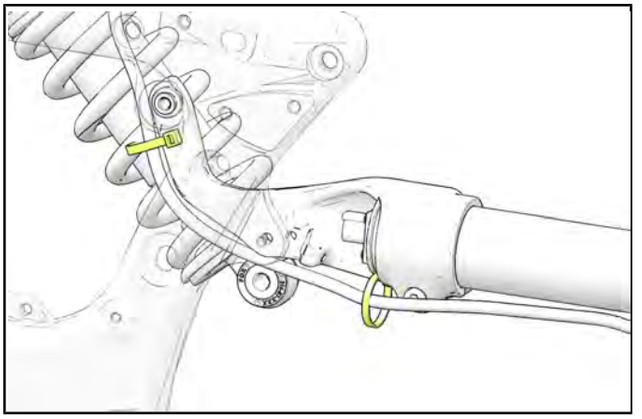
b. Install reservoir pinch fastener ⑦. Torque fastener to specification.



TORQUE
Shock Adjuster Fastener: **18 ft-lbs (24 N·m)**

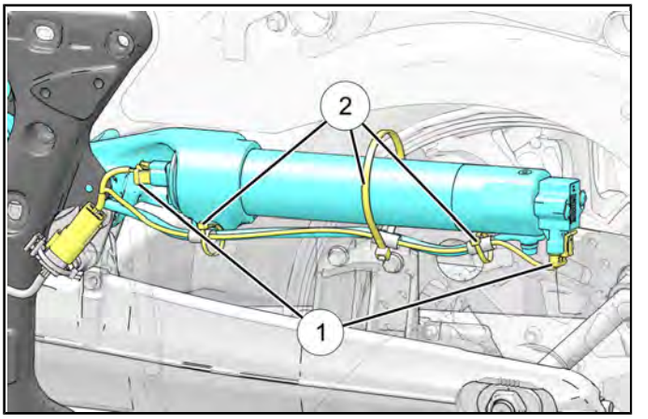
- **E-Preload Models:**

a. Install two cable ties securing the shock reservoir hose to the reservoir bracket.



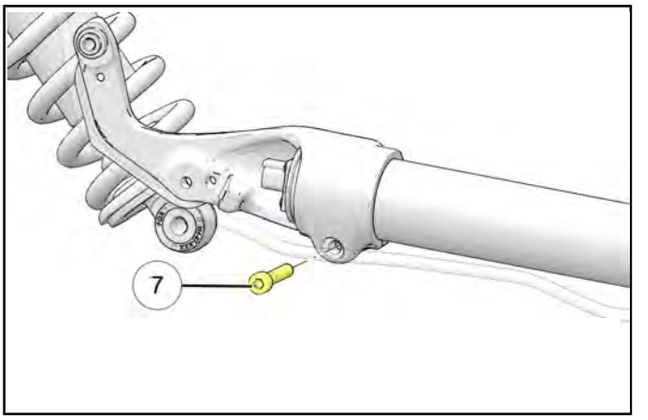
b. Install harness cable ties ②.

c. Connect shock electrical connectors ①.



⚠ CAUTION
Listen for audible "click" when pressing into place. Pull gently on connector once seated to ensure a proper connection has been made.

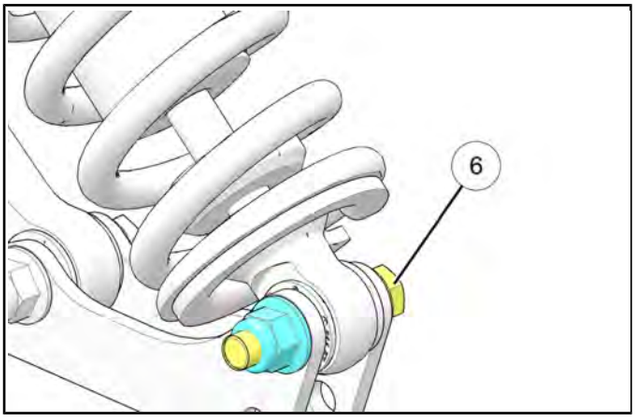
d. Install reservoir pinch fastener ⑦. Torque to specification.



TORQUE
Shock Adjuster Fastener: **18 ft-lbs (24 N·m)**

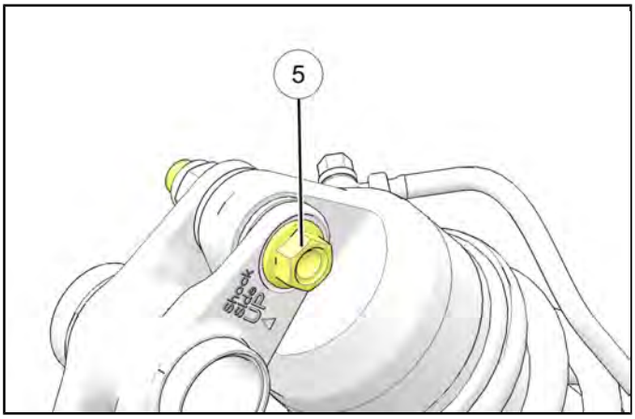
3. Verify the routing and retention points are correct.

4. Install shock fastener ⑥. Torque to specification.



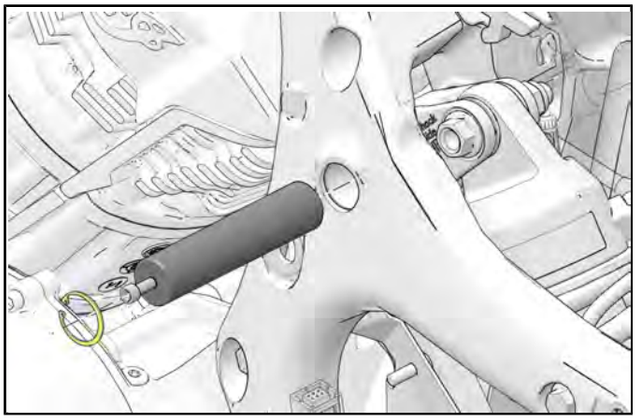
TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

5. Lift the motorcycle if needed and install top shock fastener ⑤. Torque to specification.



TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

6. Install shock pin through the rear shock linkage and frame and secure with snap ring.



NOTICE
Lift/lower rear of the motorcycle to line up shock pin.

IMPORTANT
Verify the snap ring is not bent or damaged and is fully seated in the groove. Submit an ASK Polaris case if a new snap ring is required.

7. Remove the M6 x 1.0 fastener from the shock pin.

8

SWING-ARM SERVICE

SWING-ARM REMOVAL

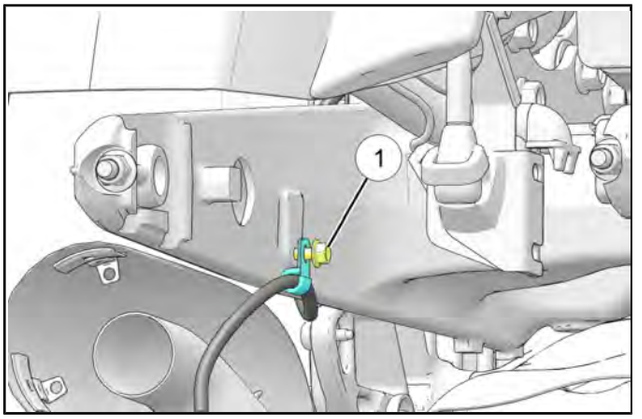
⚠ WARNING

Swing-Arm removal involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. Severe personal injury or death can occur if the motorcycle tips or falls.

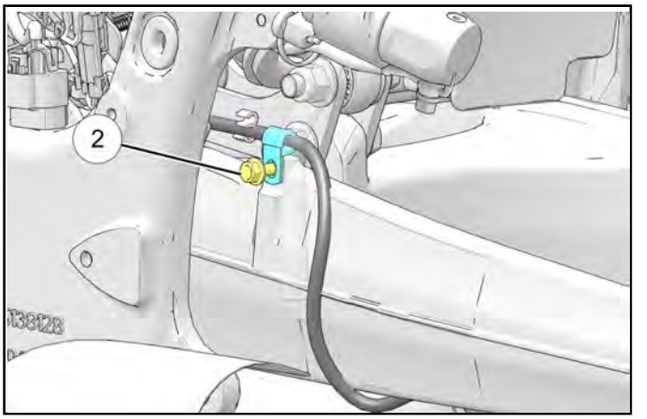
⚠ WARNING

Make sure the exhaust system has cooled to room temperature before elevating the motorcycle. The drive belt may be damaged if it comes into contact with HOT exhaust components.

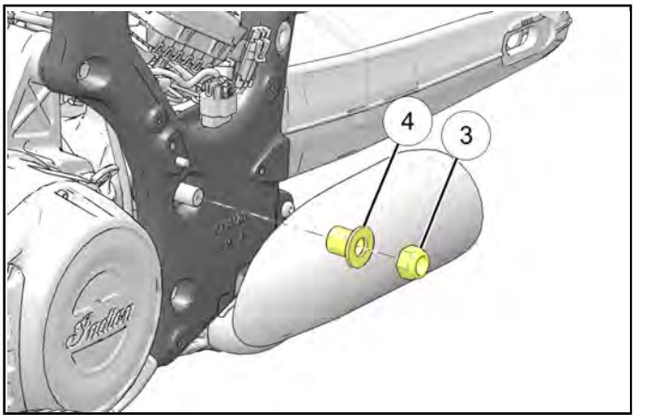
1. Place the motorcycle in an upright position on a lift table with the front wheel clamped in a wheel vise.
2. Position a platform jack beneath the engine cases and raise until it contacts the engine.
3. Remove rear wheel. See **Rear Wheel Removal page 8.70**.
4. Remove p-clamp ① fasteners located on the left inner surface of the Swing-Arm.



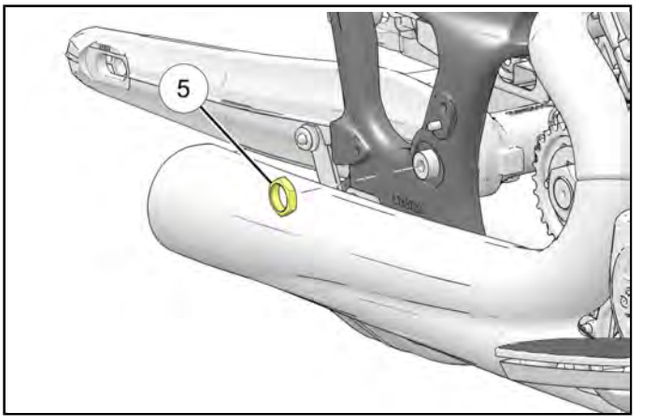
5. Follow the brake line forward and remove the remaining p-clamp ②.



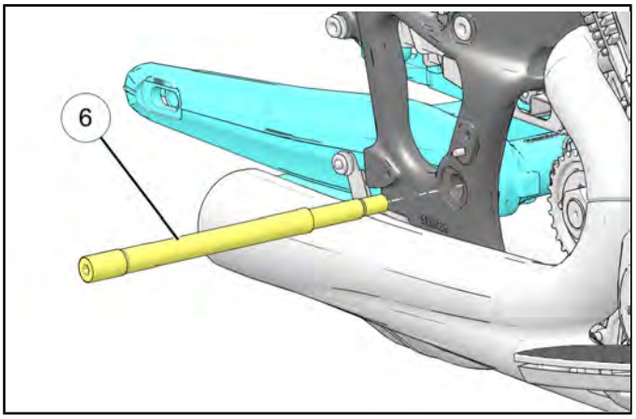
6. Remove Swing-Arm nut ③ and outer pivot spacer ④ from the left side of the Swing-Arm pivot shaft.



7. Remove the pivot jamb nut ⑤ located on the right side of the Swing-Arm pivot shaft.



8. Use an 8 mm hex wrench to thread the Swing-Arm shaft ⑥ out of the right side of the frame.



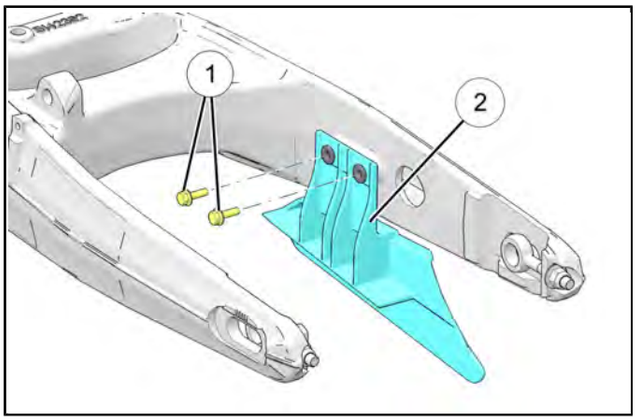
9. Disconnect the preload adjuster.
10. Remove shock rocker pivot shaft snap ring and shaft.
11. Support and remove the Swing-Arm assembly towards the rear of the motorcycle.

SWING-ARM BUSHING / BEARING REPLACEMENT

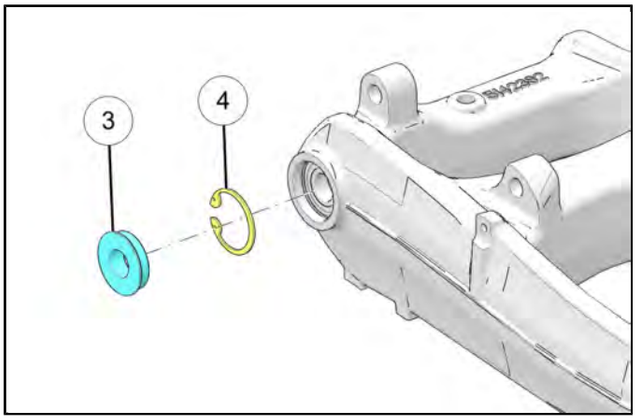
NOTICE
Disassembly and assembly of the Swing-Arm requires Swing-Arm Bushing Tool **(PF-51237)**.

REMOVAL

1. Remove Swing-Arm assembly from motorcycle. See **Swing-Arm Removal page 8.82**.
2. Remove shock absorber assembly from Swing-Arm. See **Shock Absorber Removal page 8.75**.
3. Remove the two fasteners ① and lower belt guard ② .



4. Remove the pivot spacer ③ from the left-hand side of the Swing-Arm followed by internal snap-ring ④ .



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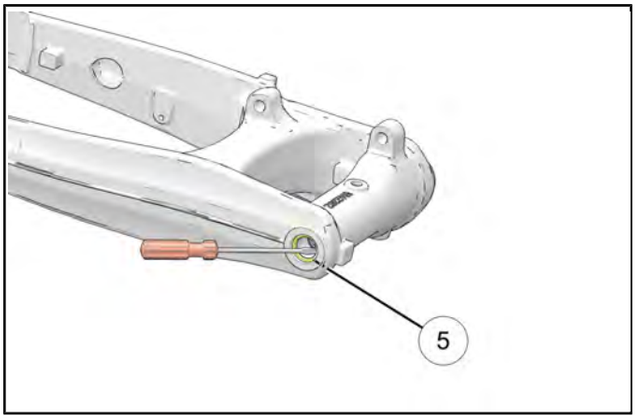
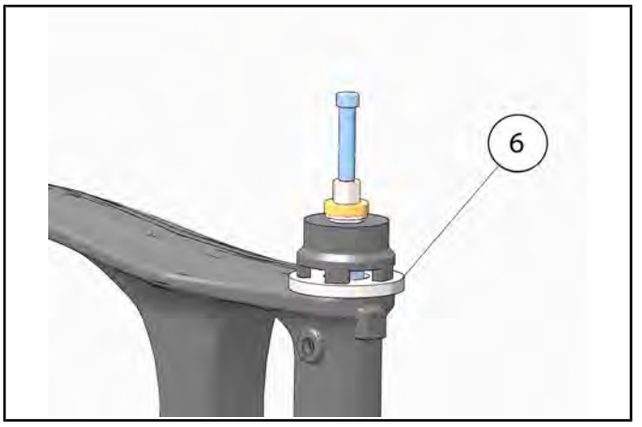
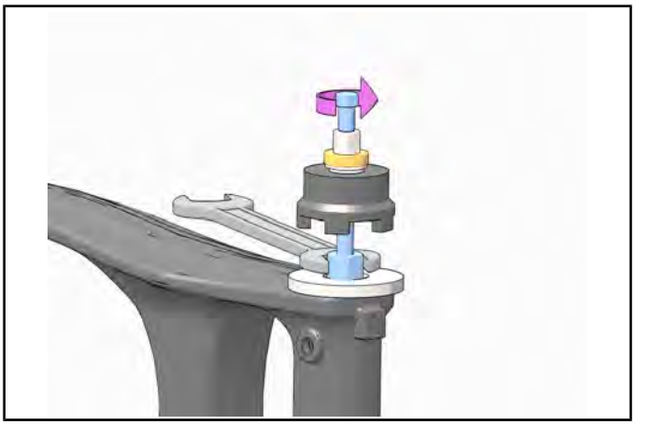
5. Working from the right-hand side of the Swing-Arm, gently pry the seal ⑤ out of the bearing bore.



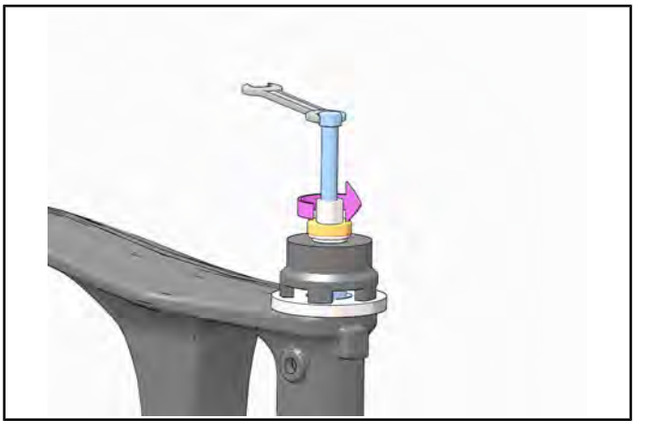
6. Assemble the Swing-Arm Bushing Tool **(PF-51237)**:
7. Lay the press plate ⑥ over the needle bearing and install the Swing-Arm Bushing Tool **(PF-51237)** through the needle bearing as shown.



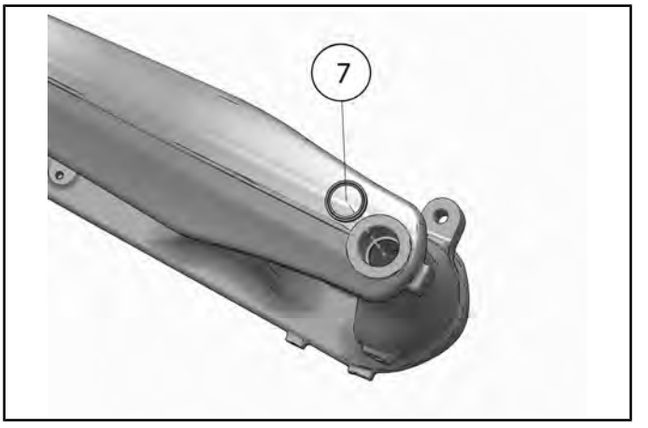
8. Raise the arbor up high enough to hold the adapter in place with an open ended wrench.
9. Turn the top of the threaded rod in until the adapter fingers are spread enough to grab the inner diameter of the needle bearing.



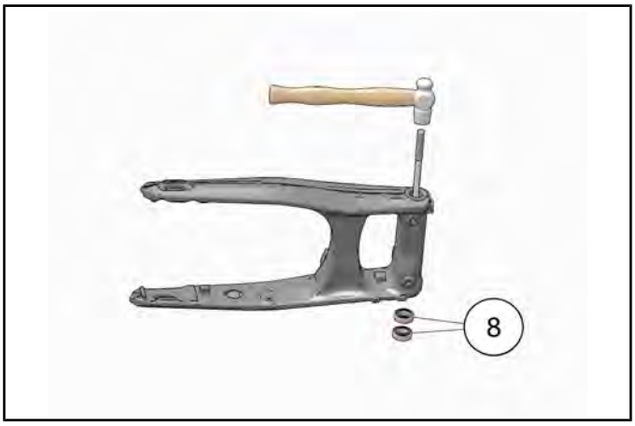
10. Lower the arbor until its seated on the press plate and thread the nut down onto the bearing.
11. Hold the threaded rod in place and turn the nut in until the needle bearing is drawn from the bore.



12. With the needle bearing removed, gently pry the inner seal ⑦ out of the needle bearing bore.



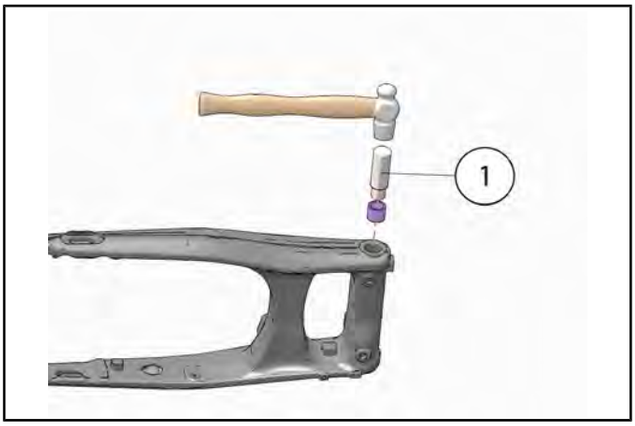
13. Insert a suitable bearing driver or drift through the right-hand side of the Swing-Arm and drive the two bearings ⑧ out through the left-hand side.



14. Inspect bearing bores for any galling or damage.

INSTALLATION

1. Working on the left-hand side of the Swing-Arm, press or drive *new* bearings into the bearing bore using a suitable bearing driver.
2. Install internal snap-ring and spacer removed in STEP 4 of this procedure.
3. Working on the right-hand side of the Swing-Arm, press a new *inner* seal into the bearing bore until seated on the shoulder.
4. Using the bearing driver ① provided in Swing-Arm Bushing Tool **(PF-51237)**, drive a new needle bearing into the right-hand side of the Swing-Arm until fully seated.



5. Press a new *outer* seal into the bearing bore until seated.
6. Install lower belt guard and torque fasteners to specification.

TORQUE
Belt Guard Fasteners: **96 in-lbs (11 N·m)**

7. Install shock absorber assembly. See **Shock Absorber Installation page 8.79**.
8. Install Swing-Arm assembly. See **Swing-Arm Installation page 8.86**.

SWING-ARM INSTALLATION

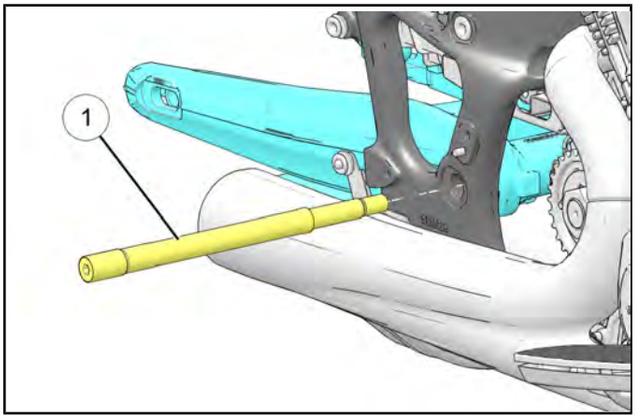
Drive belt must be installed on the drive sprocket prior to installing the Swing-Arm.

IMPORTANT
Drive bet must be installed on the drive sprocket prior to install the Swing-Arm.

1. Clean inside of the Swing-Arm shaft bores in both sides of the frame midcastings.
2. Grease Swing-Arm pivot shaft.
3. Apply a thin film of grease to the LH Swing-Arm spacer and press into position in the LH bearing bore.

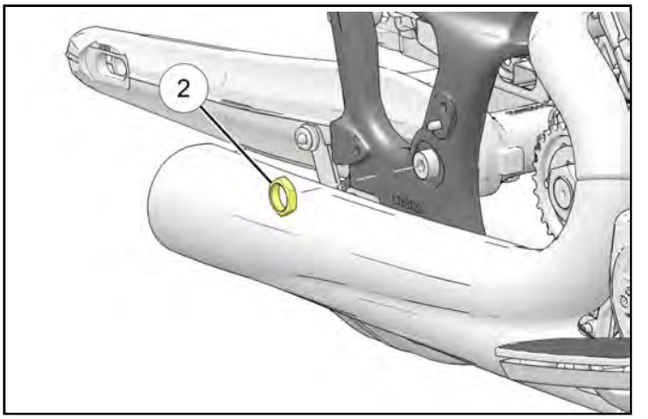
IMPORTANT
Grease should be applied to the left side spacer so it stays in position when Swing-Arm is installed.

4. Lift the Swing-Arm / shock absorber assembly into position in the frame. Make sure the LH spacer stays in position.
5. Use an 8 mm hex wrench to thread the Swing-Arm shaft ① into the right side of the frame.



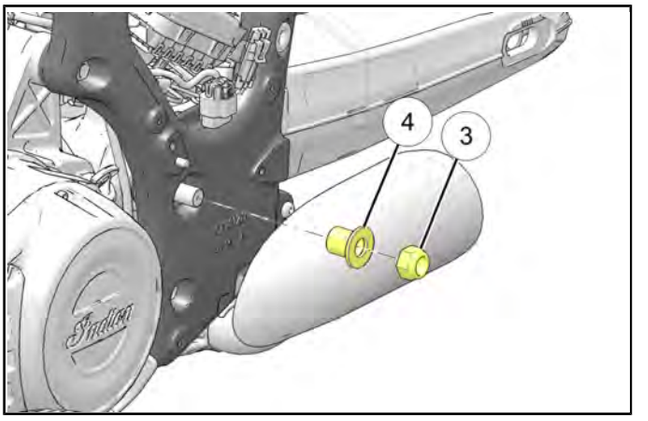
TORQUE
Swing-Arm Pivot Shaft: **96 in-lbs (11 N·m)**

6. Install the Swing-Arm shaft jamb nut ② onto the end of the Swing-Arm shaft on the RH side.



TORQUE
Swing-Arm Pivot Jam Nut: **75 ft-lbs (101 N·m)**

7. Working on the LH side of the motorcycle, install the outer pivot spacer ④ and Swing-Arm nut ③.



NOTICE
The Swing-Arm nut cannot be reused once removed from the Swing-Arm shaft. Apply AP grease to the shoulder of the *new* nut prior to installation.

TORQUE
Swing-Arm Pivot Nut (Nylock): **65 ft-lbs (88 N·m)**

8. Route the rear brake line and install the front and rear p-clamp.

TORQUE
P-Clamp Fasteners: **88 in-lbs (10 N·m)**

9. Install the rear wheel. See **Rear Wheel Removal page 8.70**.
10. Reference**Rear Brake System Assembly View page 9.11** for line routing.
11. Make sure that the following applies:

- The rear wheel turns freely, without any interference between the belt guard, the tire, and the Swing-Arm.
- Brake line is properly routed and secured.
- The left and right axle adjusters are aligned properly (wheel is in alignment).
- The rear brake functions properly.
- All fasteners have been tightened correctly.
- There is adequate clearance between Swing-Arm and exhaust mufflers and mounting.
- The Swing-Arm is not loose, it doesn't wobble from side to side, and it doesn't move up and down more than 1/32 of an inch when pushed and pulled firmly.

12. Test ride motorcycle to be sure rear suspension operates smoothly without binding or abnormal noises.
13. Adjust ride height.

REAR SHOCK SERVICE

E-PRELOAD OVERVIEW

E-Preload allows the user to electronically adjust the rear shock setting. The user can enter the riders and cargo weight. The VCM will then use the input to adjust the pre-loading of the bike. Changes can be entered any time the bike is at a rest but will not adjust until the engine is running and the kickstand is up.

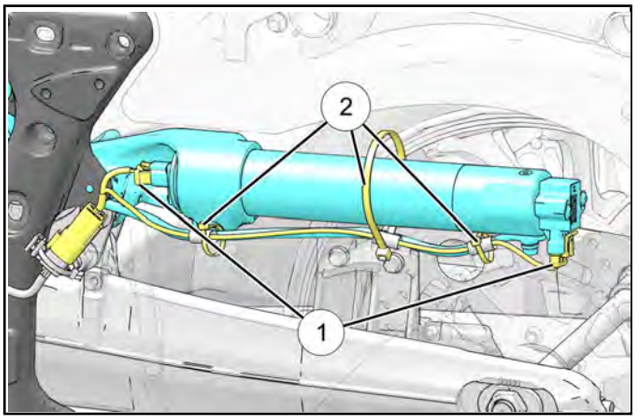
REAR SHOCK REMOVAL

IMPORTANT

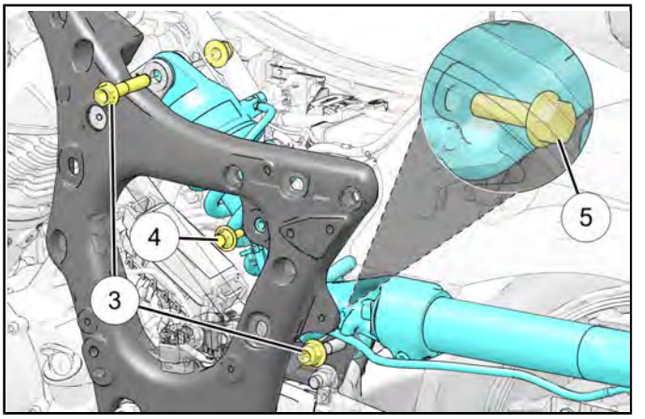
In the event that the shock is serviced, electronic preload will not function properly unless a sensor learn process has been executed. Use Digital Wrench II to execute this process.
Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

REMOVAL

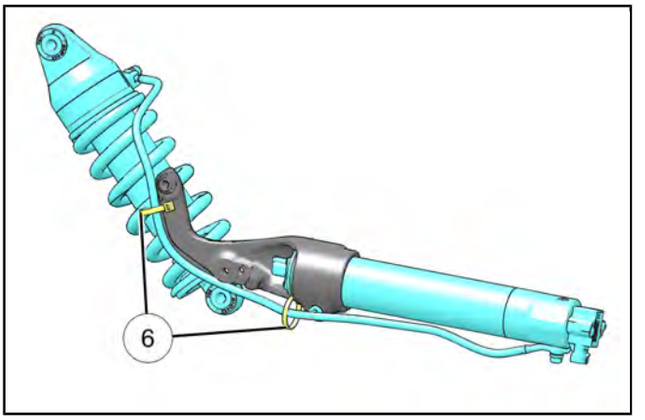
1. Position a platform jack beneath the engine cases and raise until it contacts the engine.
2. Remove saddlebags. See **Saddlebag Removal page 7.93**.
3. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
4. Disconnect shock electrical connectors ①.



5. Remove harness retention points ②.
6. Remove the shock fasteners ③.



7. Due to the proximity of the recovery bottle, it may be necessary to loosen its fasteners to remove the lower shock bolt. Reference **Coolant Recovery Bottle Removal page 3.44**.
8. Remove shock adjuster bracket M8 fastener ④.
9. Remove shock adjust bracket M6 fastener ⑤.
10. Carefully remove the shock assembly from the unit.
11. Cut cable ties ⑥ retaining adjuster line to the bracket.



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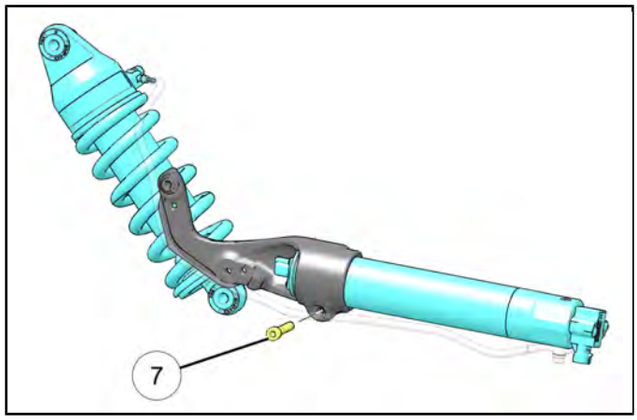
12. Remove adjuster fastener ⑦.

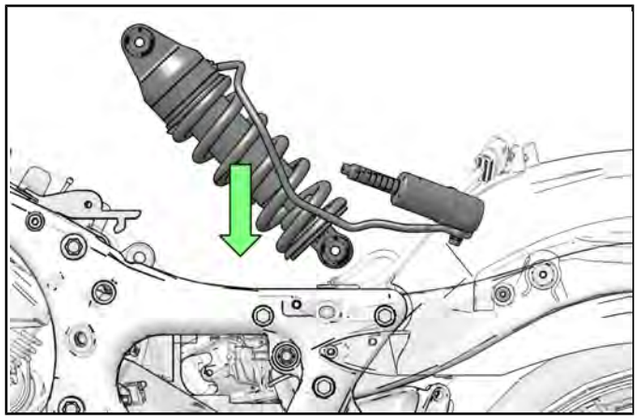


REAR SHOCK INSTALLATION

IMPORTANT

In the event that the shock is serviced, electronic preload will not function properly unless a sensor learn process has been executed. Use Digital Wrench II to execute this process.
Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

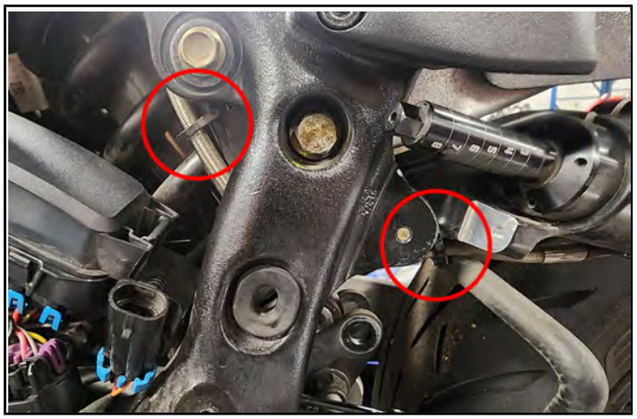
1. Position a platform jack beneath the engine cases and raise until it contacts the engine.
2. Install rear shock through underseat area.



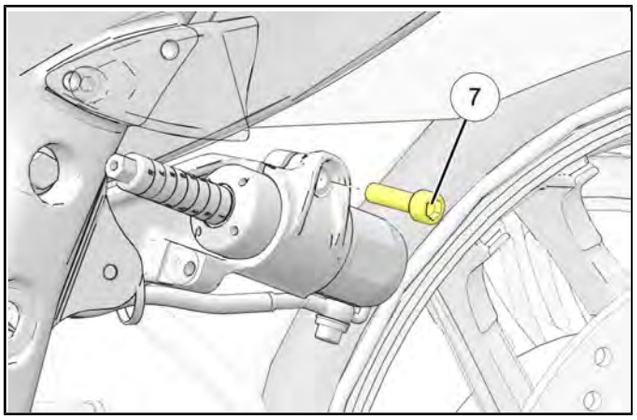
3. Align rear shock and reservoir into mount positions.

- **Non E-Preload Models:**

a. Install two cable ties securing the shock reservoir hose to the reservoir bracket.



b. Install reservoir pinch fastener ⑦. Torque fastener to specification.

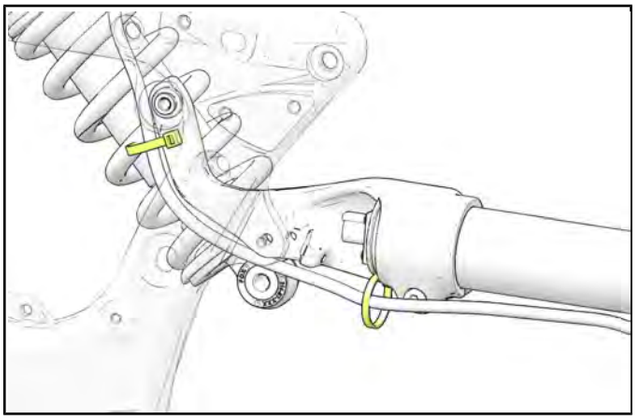


TORQUE
Shock Adjuster Fastener: **18 ft-lbs (24 N·m)**

8

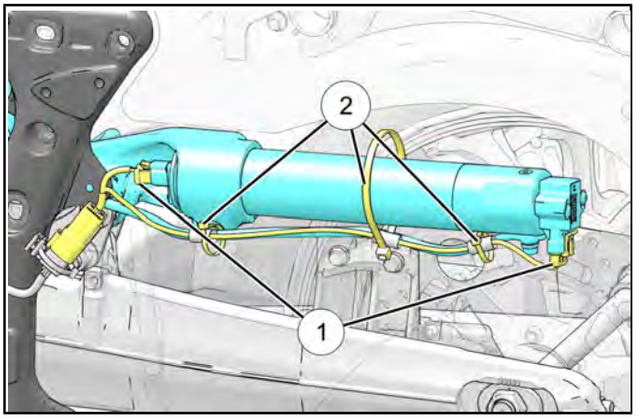
- **E-Preload Models:**

a. Install two cable ties securing the shock reservoir hose to the reservoir bracket.



b. Install harness cable ties ②.

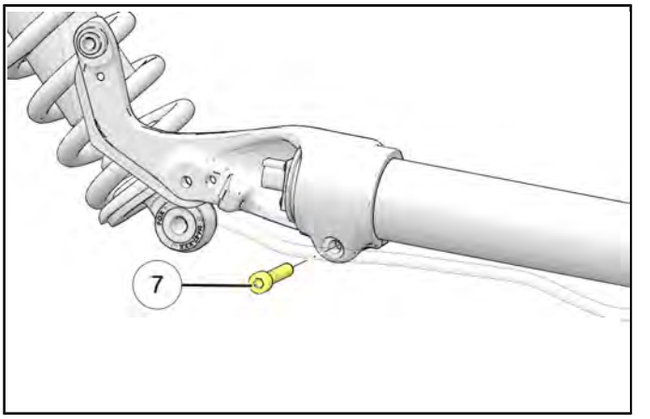
c. Connect shock electrical connectors ①.



⚠ CAUTION

Listen for audible "click" when pressing into place. Pull gently on connector once seated to ensure a proper connection has been made.

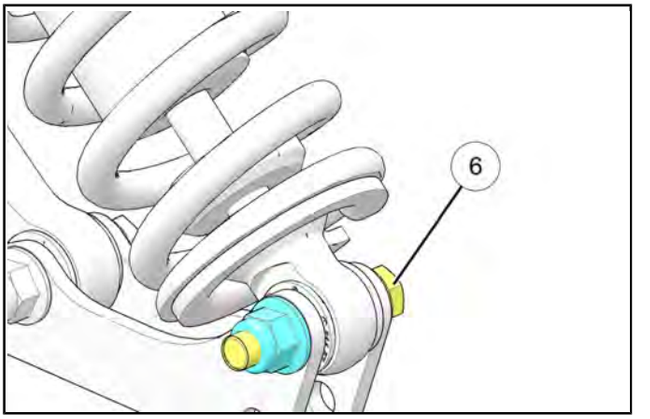
d. Install reservoir pinch fastener ⑦. Torque to specification.



TORQUE
Shock Adjuster Fastener: **18 ft-lbs (24 N·m)**

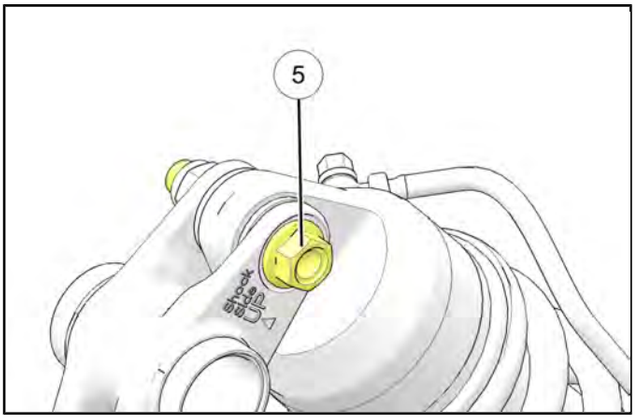
4. Verify the routing and retention points are correct.

5. Install shock fastener ⑥. Torque to specification.



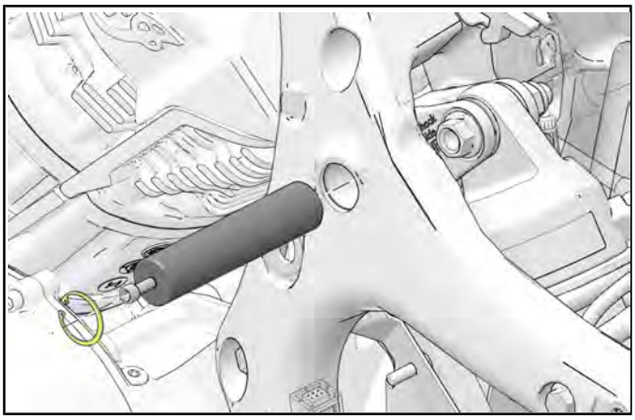
TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

6. Lift the motorcycle if needed and install top shock fastener ⑤. Torque to specification.



TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

7. Install shock pin through the rear shock linkage and frame and secure with snap ring.



NOTICE
Lift/lower rear of the motorcycle to line up shock pin.

IMPORTANT
Verify the snap ring is not bent or damaged and is fully seated in the groove. Submit an ASK Polaris case if a new snap ring is required.

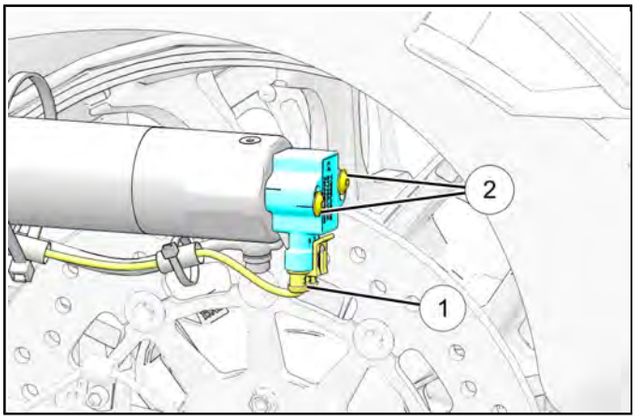
8. Remove the M6 x 1.0 fastener from the shock pin.
9. Install the seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.
10. Install saddlebags. See **Saddlebag Installation page 7.93**.
11. Remove scissor lift.

REAR SHOCK ROTATION SENSOR REPLACEMENT

IMPORTANT

In the event that the shock is serviced, electronic preload will not function properly unless a sensor learn process has been executed. Use Digital Wrench II to execute this process.
Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

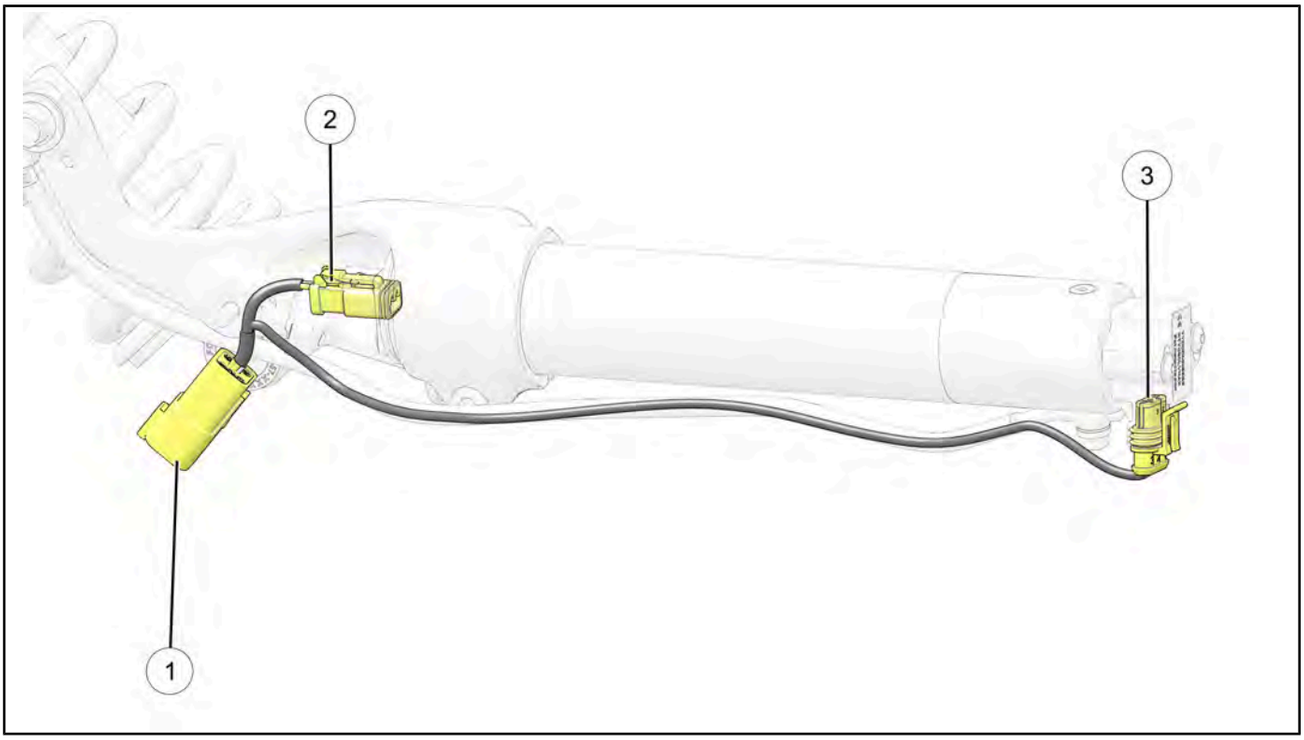
1. Position a platform jack beneath the engine cases and raise until it contacts the engine.
2. Remove saddlebags. See **Saddlebag Removal page 7.93**.
3. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
4. Disconnect rotation sensor electrical sensor ①.



5. Remove rotation sensor by removing its fasteners ②.
6. **Installation is performed by reversing the removal procedure.**

TORQUE
Rotation Sensor Fastener: **16 ft-lbs (22 N·m)**

REAR SHOCK PRELOAD HARNESS



ITEM	DESCRIPTION
①	Chassis Connector
②	Preload Motor Connector
③	Rotation Sensor Connector

8

HARNESS PINOUT

COLOR	FROM	PORT	TO	PORT	FUNCTION
PK / GN	Chassis	1	Rotational Sensor	1	Feedback Sensor Power (12V)
GN / WH	Rotational Sensor	3	Chassis	3	Feedback Sensor Signal
YE / DB	Motor	1	Chassis	5	E-Preload Motor (+)
GN / DB	Chassis	4	Motor	2	E-Preload Motor (–)
BK	Rotational Sensor	2	Chassis	2	Feedback Sensor Ground

REAR SHOCK REBUILDING

IMPORTANT

In the event that the shock is serviced, electronic preload will not function properly unless a sensor learn process has been executed. Use Digital Wrench II to execute this process.

Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

If the rear shock requires rebuilding, take the shock to a FOX approved dealer or distributor.

SHOCK PUSHROD REMOVAL

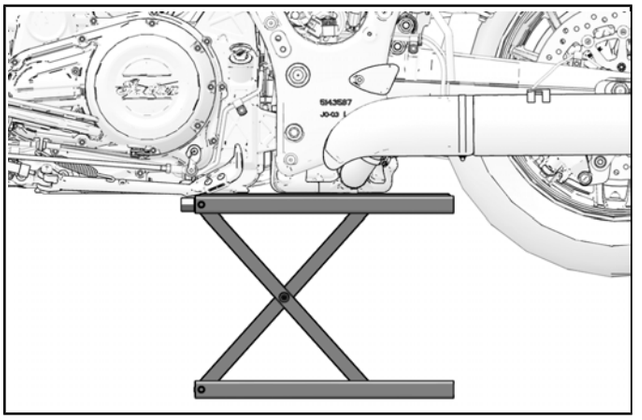
⚠ WARNING

Make sure the exhaust system has cooled to room temperature before elevating the motorcycle. The drive belt may be damaged if it comes into contact with HOT exhaust components.

⚠ WARNING

If working on a motorcycle equipped with a charcoal canister (EVAP), remove the canister prior to elevating the rear of the motorcycle to prevent damage to the canister hose fittings.

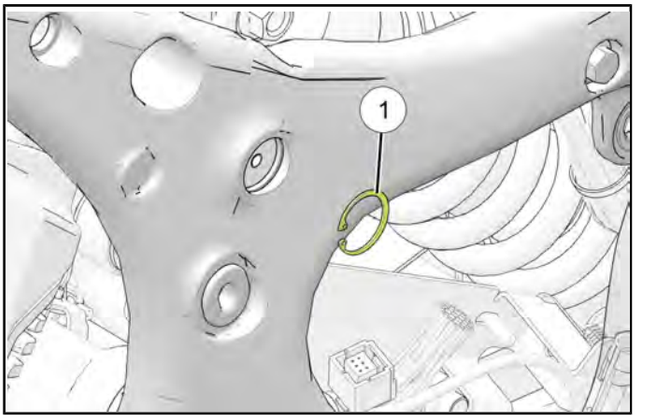
1. Place scissor lift under the motorcycle to take the weight off the suspension.



⚠ CAUTION

Make sure the motorcycle is stable and secured before moving to the next step.

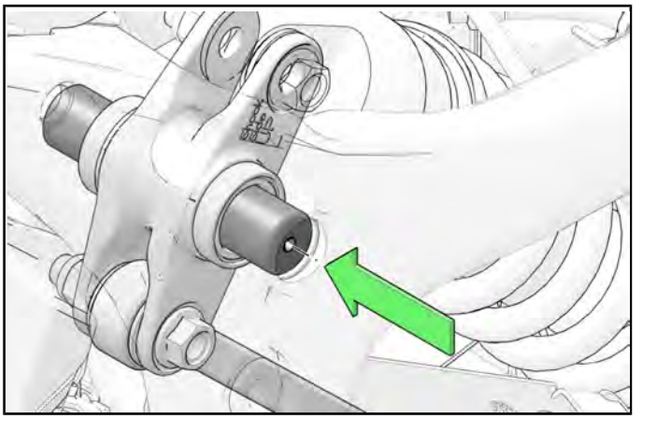
2. Using a snap ring pliers, remove the snap ring ①.



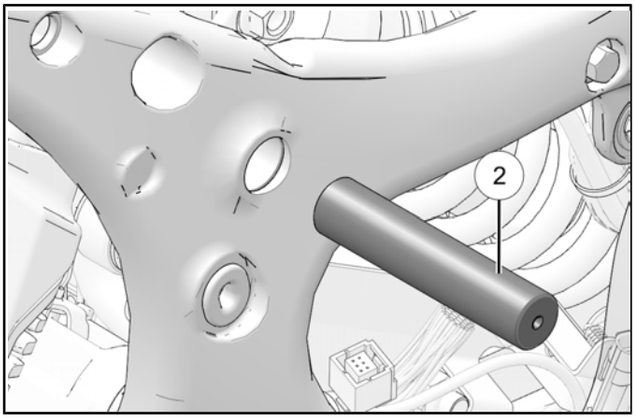
⚠ CAUTION

Do not use a screwdriver or pry on snap ring as damage may occur.

3. Insert a M6 x 1.00 fastener (not provided) into the shock pin that secures the rear shock linkage to the frame.

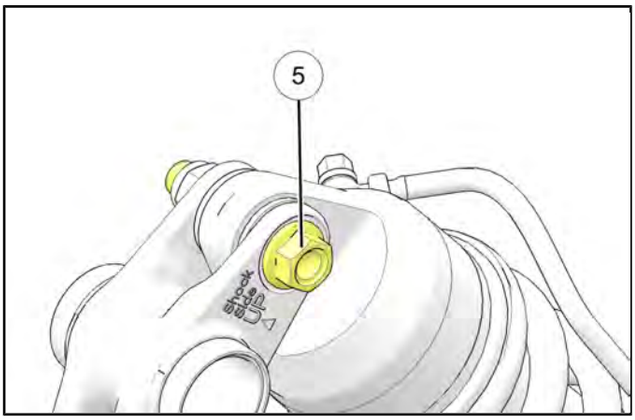


4. Remove the shock pin ②.



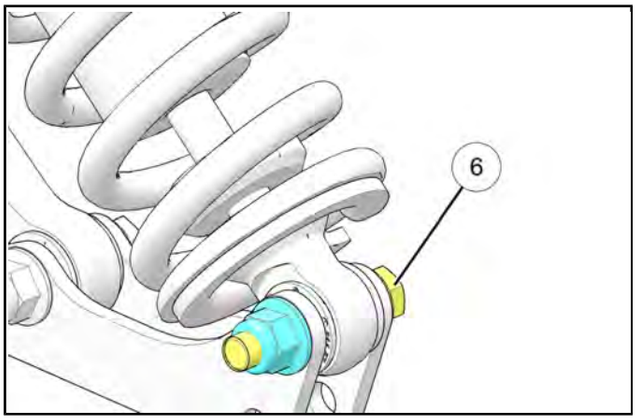
NOTICE
Raise or lower the scissor lift until the tension is free of the shock pin and remove.

5. Remove the shock top mounting fastener ⑤.



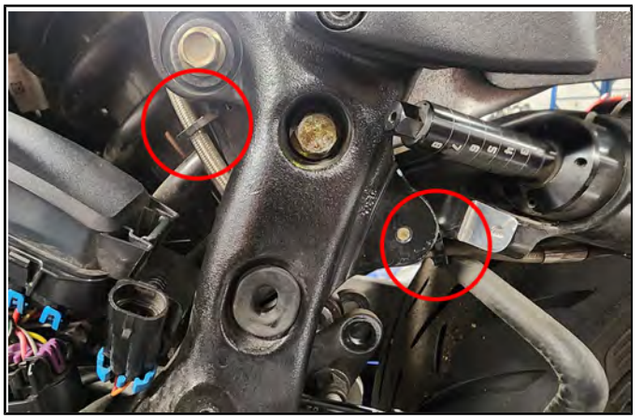
IMPORTANT
Make note of the direction the top and bottom fastener positioned in the shock for installation.

6. Raise the scissor lift high enough to gain access to the lower shock fastener. Remove the shock bottom mounting fastener ⑥.

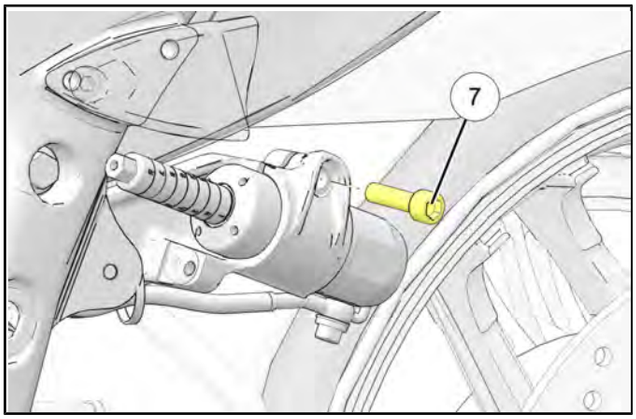


IMPORTANT
Note the direction of the fastener for installation.

7. Disconnect shock reservoir.
   - **Non E-Preload Models:**
   a. Cut two cable ties securing the shock reservoir hose to the shock.



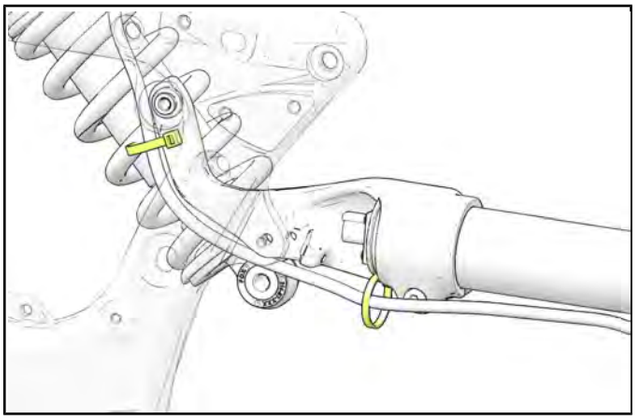
   b. Remove reservoir pinch fastener ⑦.



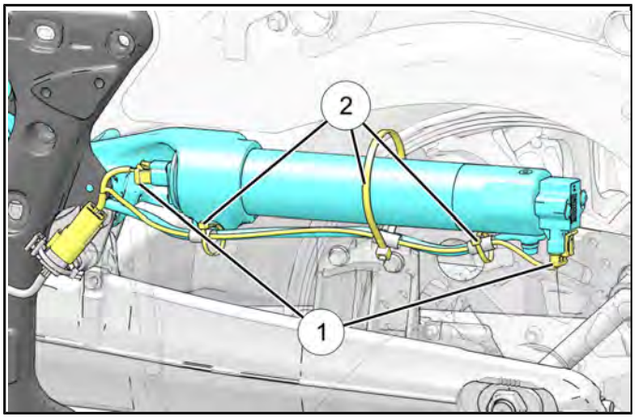
8

- **E-Preload Models:**

a. Cut and remove two cable ties securing the shock reservoir hose to the bracket.



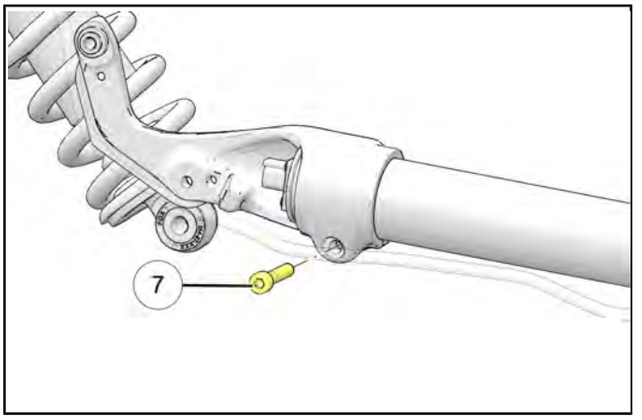
b. Disconnect shock electrical connectors ①. Cut and remove cable ties ②.



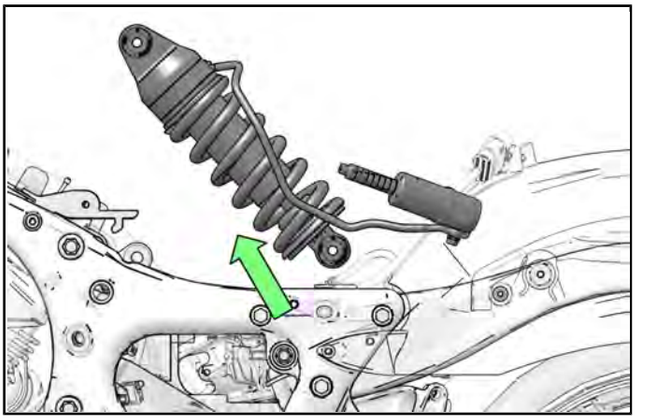
⚠ CAUTION

Do not use anything other than fingers to remove electrical connectors. The use of tools can damage the connection.

c. Remove reservoir pinch fastener ⑦.



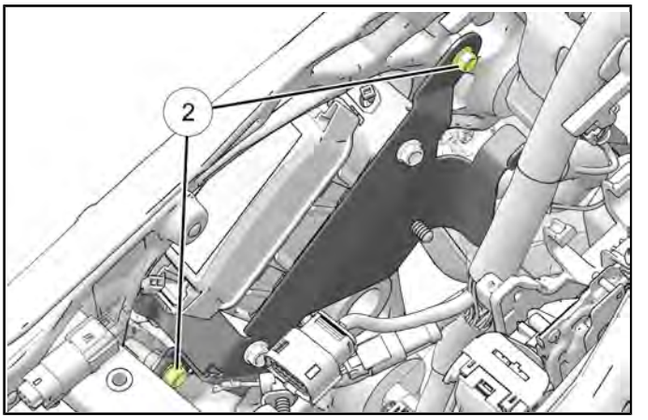
8. Support the reservoir during removal. Position shock and reservoir up through the seat area and remove from the motorcycle.



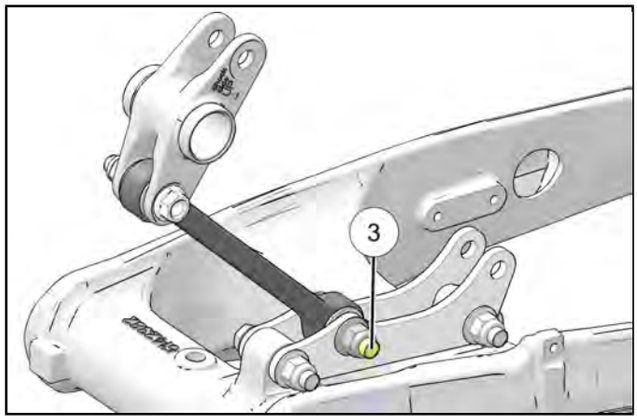
⚠ CAUTION

Do not allow the reservoir to hang from the shock.

9. Remove fasteners ② securing the fuse box plate to the casting.



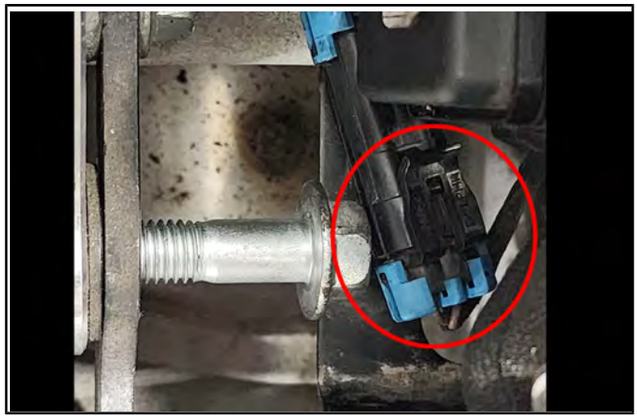
10. Move the fuse box up, and raise the rear of the motorcycle to access the front of the lower pushrod mounting fastener ③.



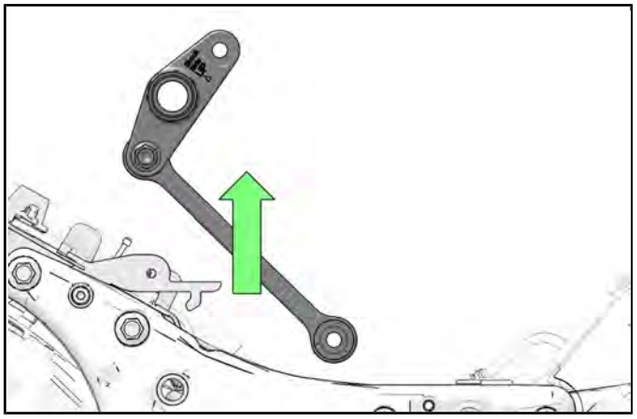
⚠ CAUTION

Do NOT use tools to move the fuse box as damage could occur.

11. Disconnect the wheel speed sensor to allow the lower pushrod mounting fastener to be removed.



12. Remove the pushrod from the underseat area.

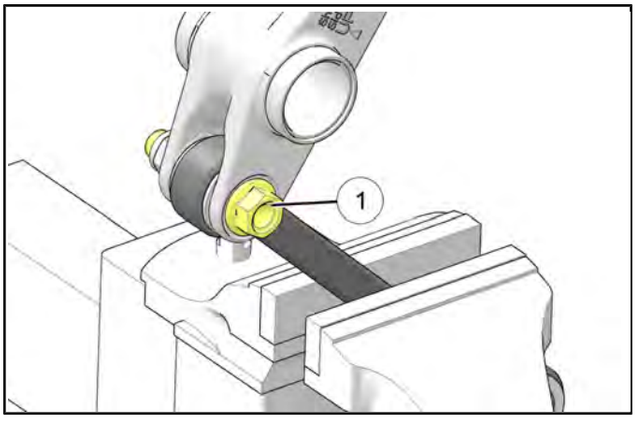


STOP!

Loop a cable tie through the lower pushrod hole. Using a paint pen, mark the pushrod with an X.

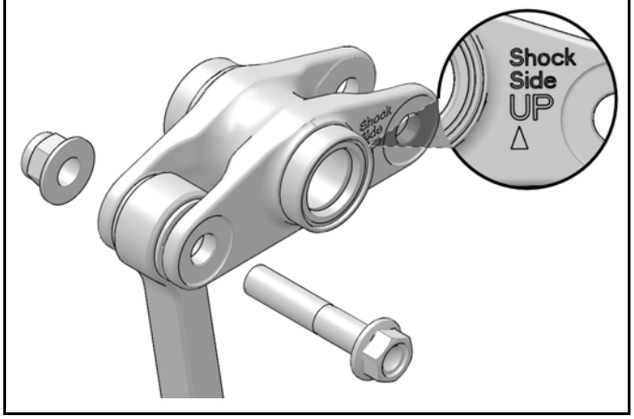
8

13. Secure the pushrod into a bench vise and remove fastener ① and shock top piece.



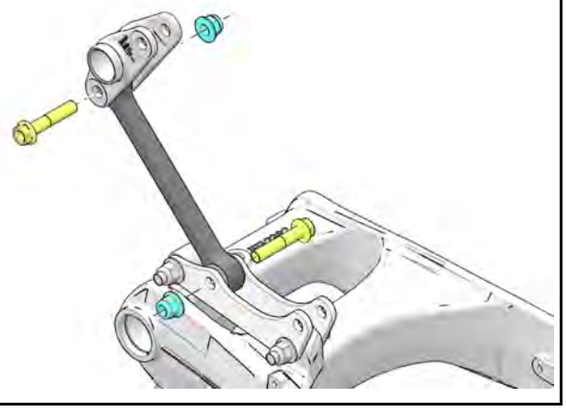
IMPORTANT

Make note of the direction the rocker and fastener position for installation.



IMPORTANT

Note the orientation of the fasteners for installation

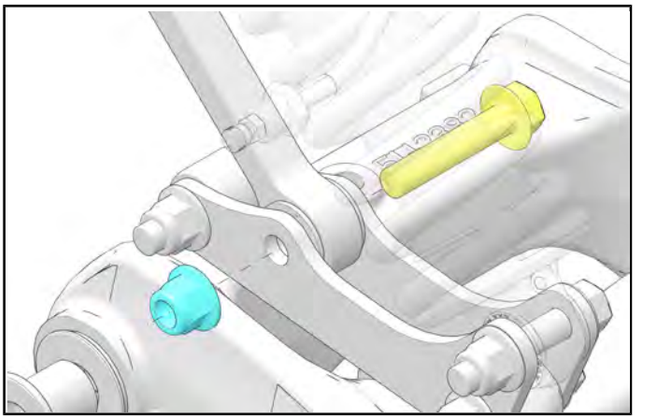


14. Discard the pushrod.

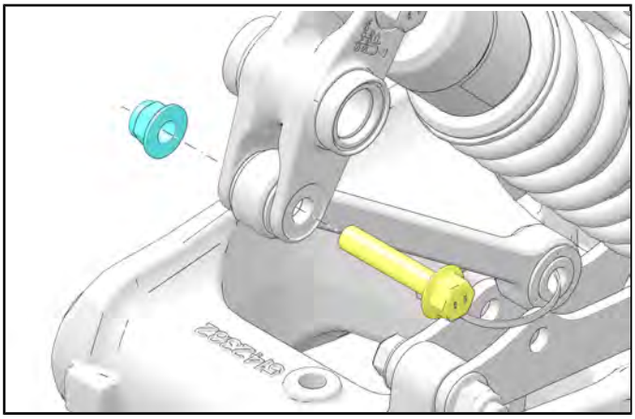
Verify the pushrod being disposed was the marked with an X and has a cable tie looped through one end.

PUSHROD REMOVAL

1. Remove bottom pushrod fastener and nut.

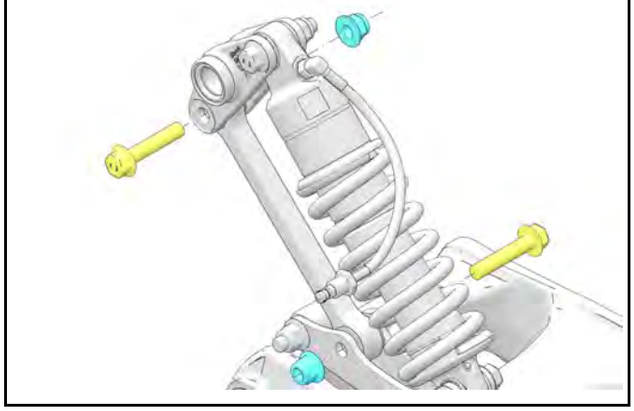


2. Remove fastener ① from the shock rocker.



IMPORTANT

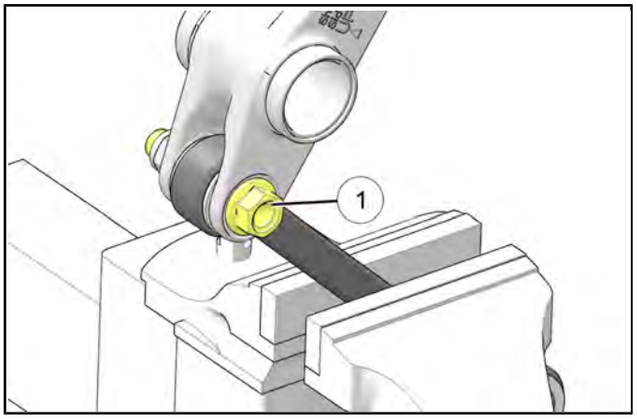
Note the orientation of the fasteners for installation



3. Remove the pushrod.

SHOCK PUSHROD INSTALLATION

1. Install new pushrod into rocker using vise. Install shock fastener ①. Torque to specification.

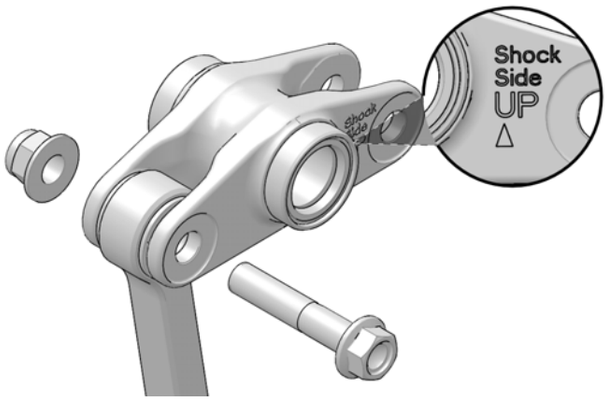


NOTICE

The shock pushrod is not directional.

IMPORTANT

Make note of the direction the rocker and fastener position during installation.

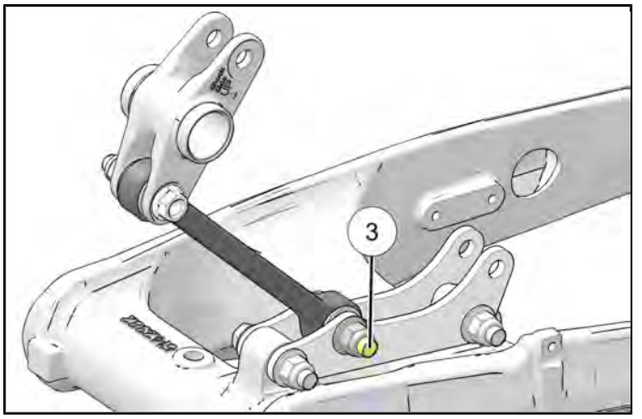


TORQUE

Shock Fastener:
96 ft-lbs (130 N·m)

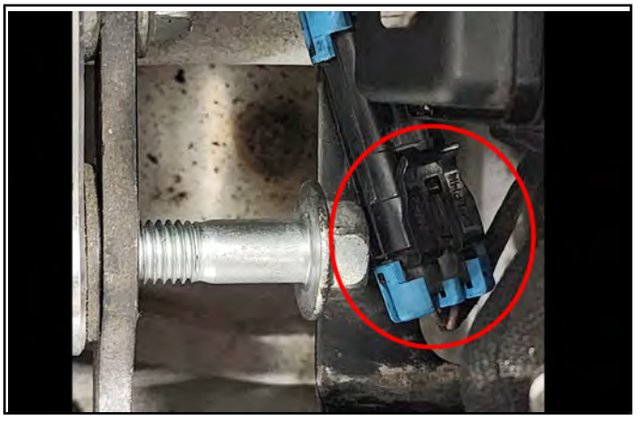
8

2. Install pushrod through underseat area into lower mount. Install lower pushrod fastener ③. Torque to specification.



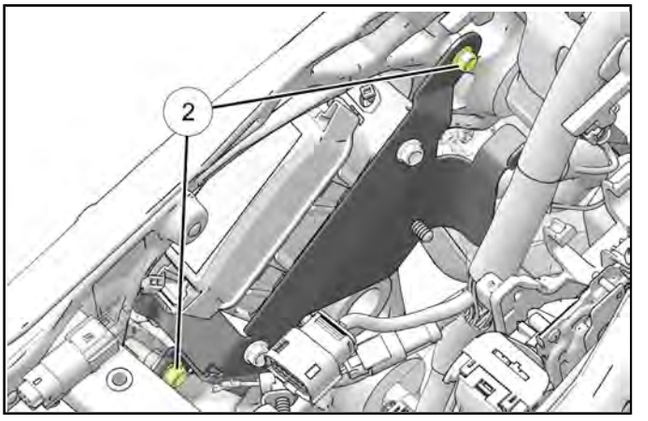
TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

3. Connect the wheel speed sensor.



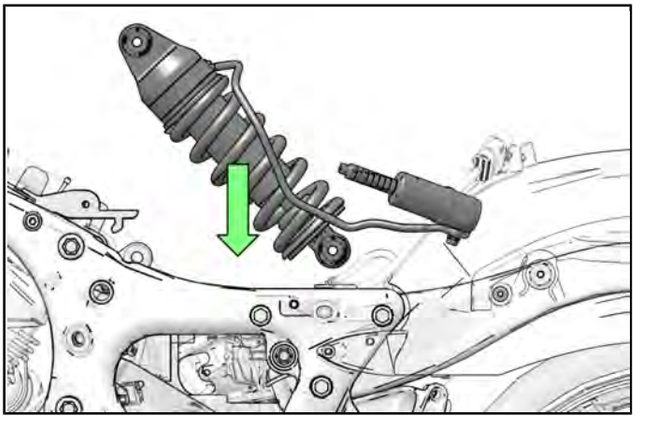
⚠ CAUTION
Listen for audible "click" when pressing into place. Pull gently on connector once seated to ensure a proper connection has been made.

4. Secure fuse box with fasteners ②. Torque fasteners to specification.



TORQUE
Fuse Box Mount Fasteners: **88 in-lbs (10 N·m)**

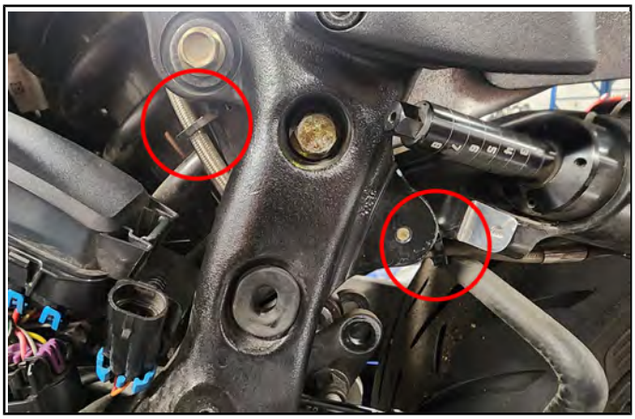
5. Install rear shock through underseat area.



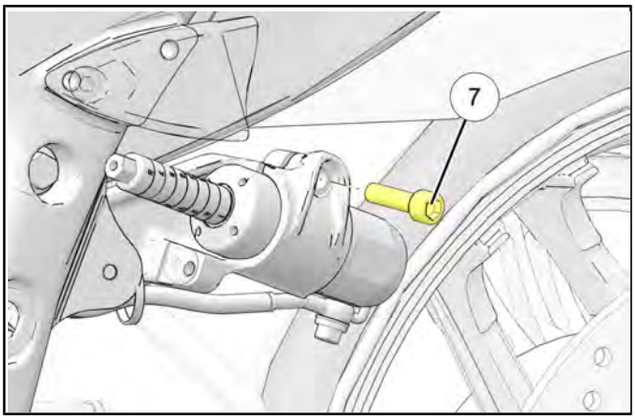
6. Align rear shock and reservoir into mount positions.

- **Non E-Preload Models:**

a. Install two cable ties securing the shock reservoir hose to the reservoir bracket.



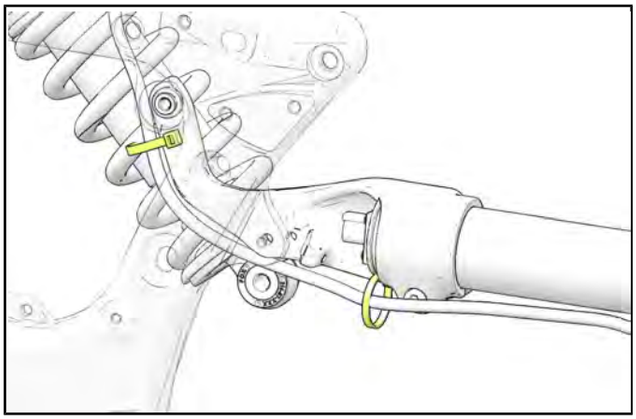
b. Install reservoir pinch fastener ⑦. Torque fastener to specification.



TORQUE
Shock Adjuster Fastener: **18 ft-lbs (24 N·m)**

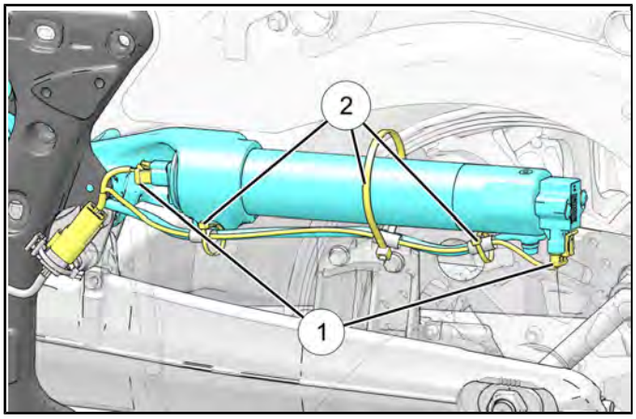
- **E-Preload Models:**

a. Install two cable ties securing the shock reservoir hose to the reservoir bracket.



b. Install harness cable ties ②.

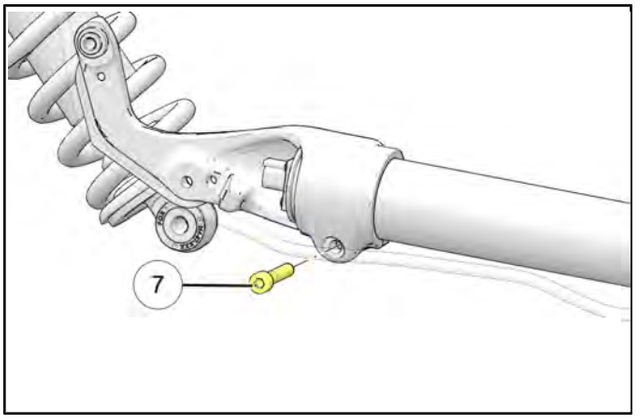
c. Connect shock electrical connectors ①.



⚠ CAUTION
Listen for audible "click" when pressing into place. Pull gently on connector once seated to ensure a proper connection has been made.

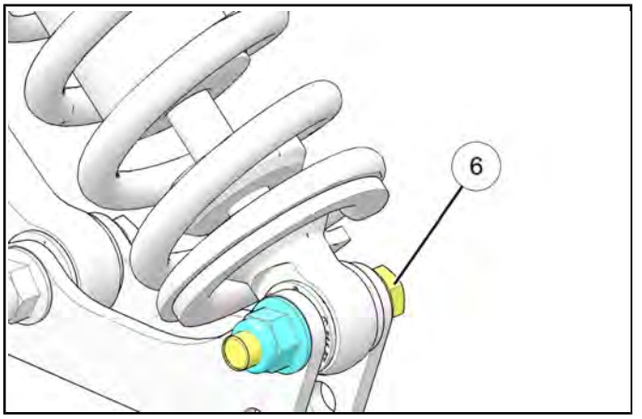
8

d. Install reservoir pinch fastener ⑦. Torque to specification.



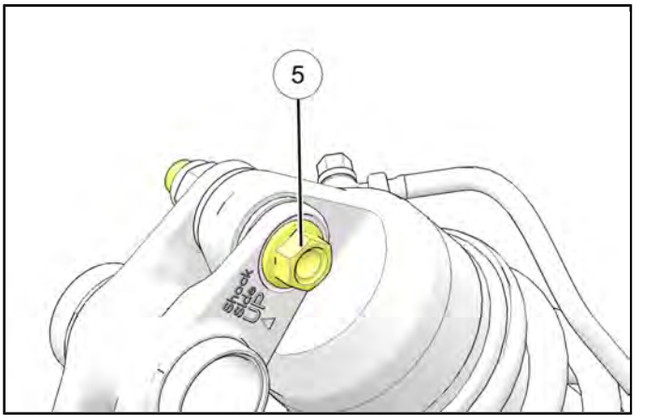
TORQUE
Shock Adjuster Fastener: **18 ft-lbs (24 N·m)**

7. Verify the routing and retention points are correct.
8. Install shock fastener ⑥. Torque to specification.



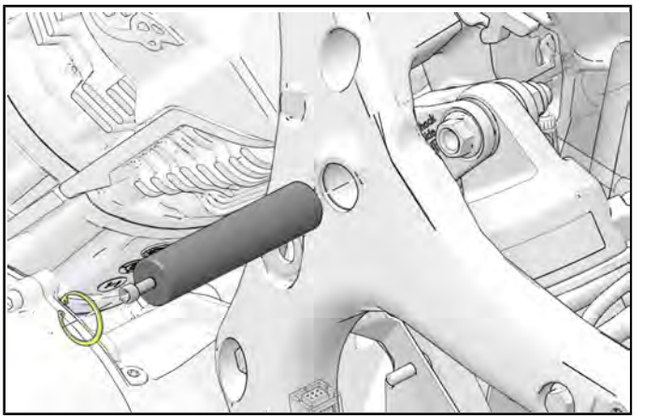
TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

9. Lift the motorcycle if needed and install top shock fastener ⑤. Torque to specification.



TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

10. Install shock pin through the rear shock linkage and frame and secure with snap ring.

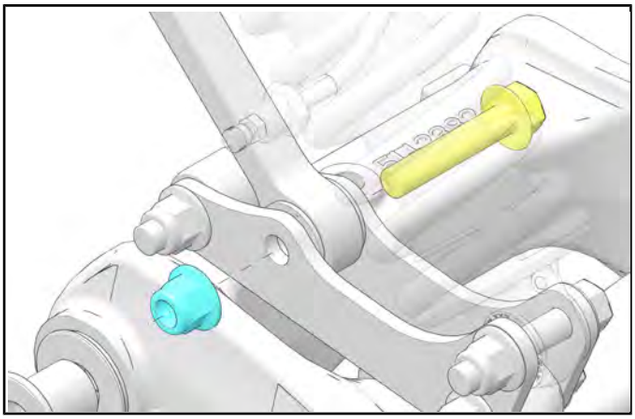


NOTICE
Lift/lower rear of the motorcycle to line up shock pin.

IMPORTANT
Verify the snap ring is not bent or damaged and is fully seated in the groove. Submit an ASK Polaris case if a new snap ring is required.

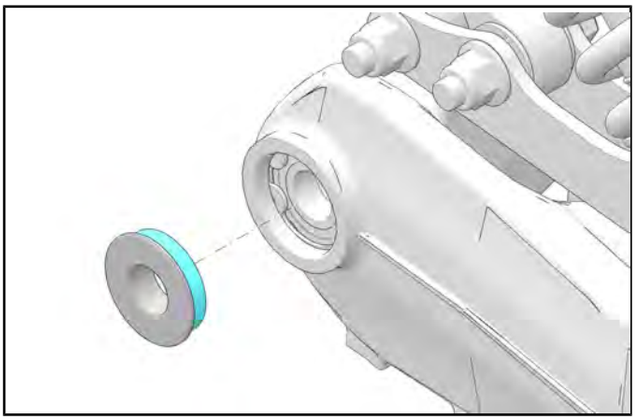
11. Remove the M6 x 1.0 fastener from the shock pin.
12. Remove scissor lift.

13. Install bottom pushrod fastener and nut. Torque to specification.



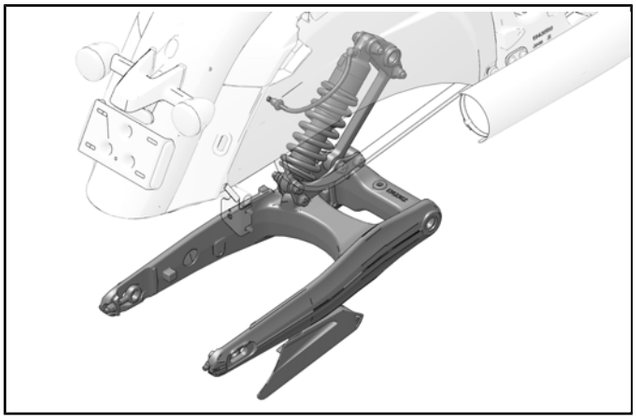
TORQUE
Shock Fastener: **96 ft-lbs (130 N·m)**

14. Apply a thin film of grease to the left-hand swingarm spacer and press into position in the left-hand bearing bore.



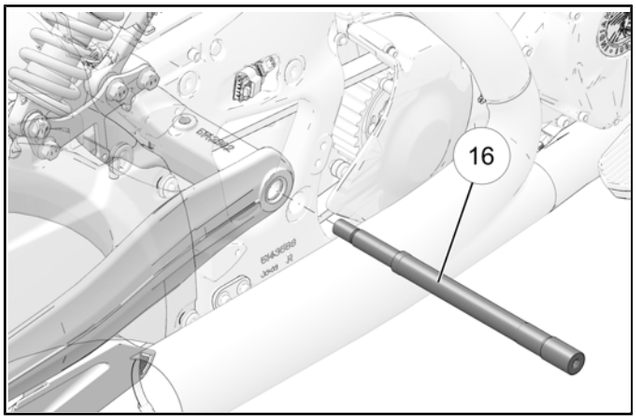
NOTICE
Apply all-purpose grease to the left side spacer so it stays in position when swingarm is installed.

15. With the help of an assistant, install the swingarm assembly.



IMPORTANT
A second technician is important to guide the swingarm into position.

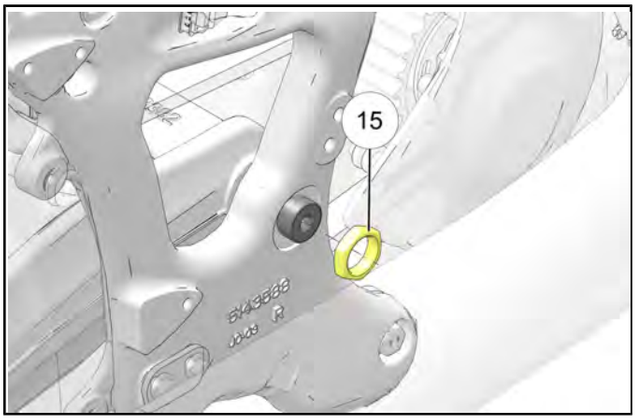
16. Install the swingarm pivot shaft through the right-hand side of the motorcycle. Use an 8 mm hex wrench to thread the pivot shaft ⑯ to the swingarm. Torque to specification.



TORQUE
Swingarm Shaft: **8 ft-lbs (11 N·m)**

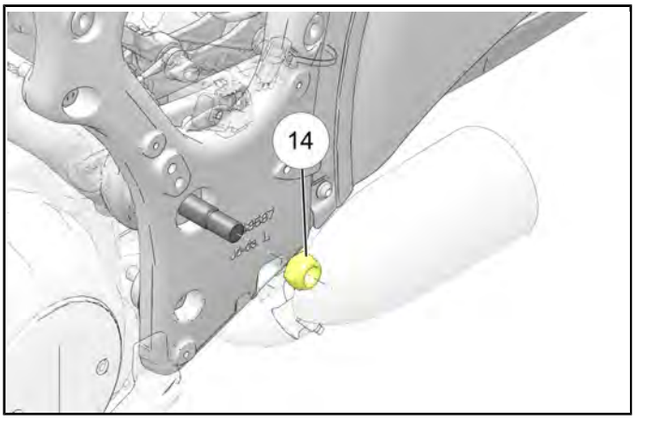
8

17. Install the swingarm shaft jam nut ⑮ onto the end of the swingarm pivot shaft the right-hand side of the motorcycle. Torque jam nut to specification.



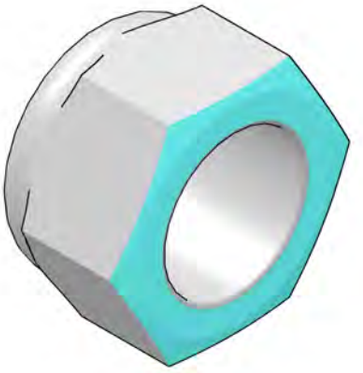
TORQUE
Swingarm Shaft Jam Nut: **75 ft-lbs (102 N·m)**

18. Install NEW swingarm nut ⑭ from the left-hand side of the swingarm pivot shaft.



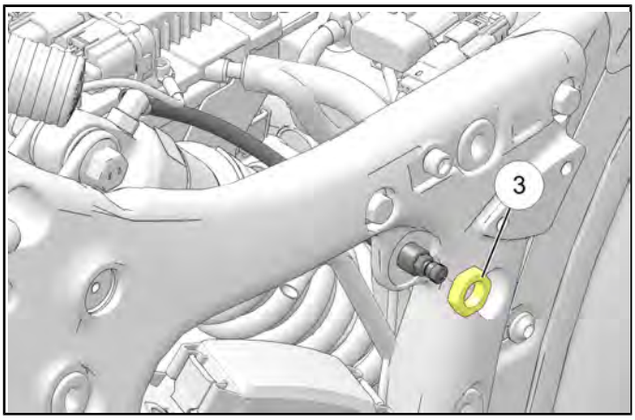
STOP!
Install a NEW swingarm nut ⑭. The swingarm nut cannot be reused once removed from the swingarm shaft.

NOTICE
Apply all-purpose grease to the shoulder of the face of the *new* nut prior to installation.



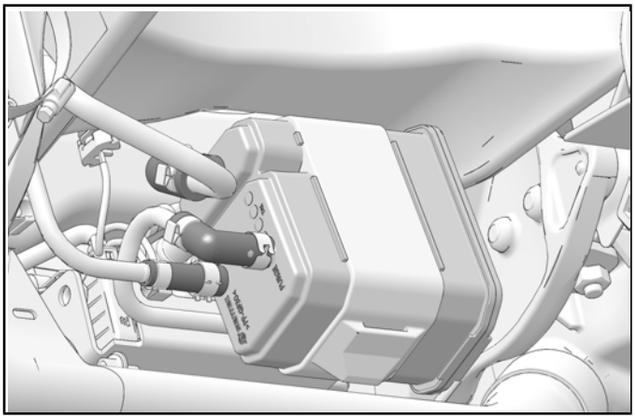
TORQUE
Swingarm Nut: **65 ft-lbs (88 N·m)**

19. Install shock air hose into position and install nut ③ securing the shock air hose to the frame. Torque nut to specification.

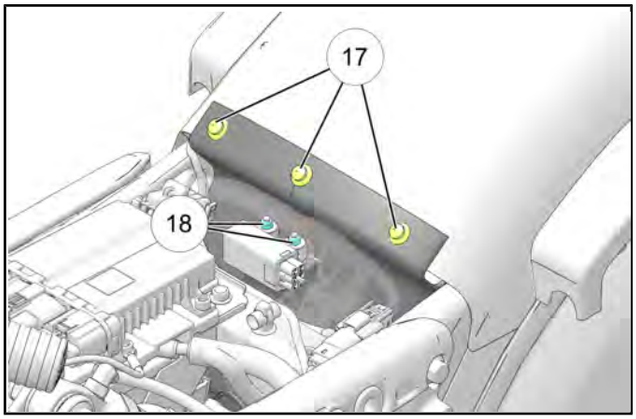


TORQUE
Shock Air Line Jam Nut: **20 ft-lbs (27 N·m)**

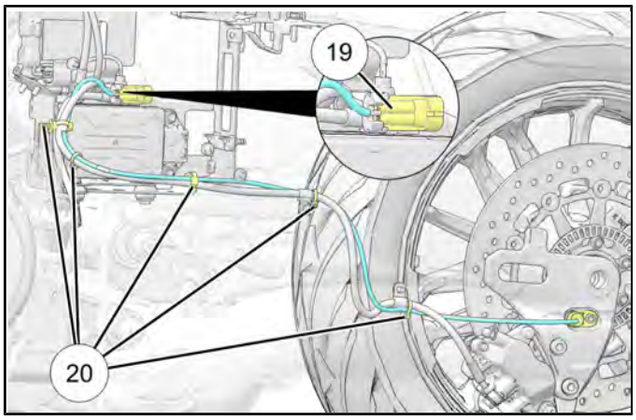
20. Install canister and connect EVAP lines (if equipped).



21. Install the debris flap and three plastic dart clips ⑰ and reconnect the tip over sensor ⑱.



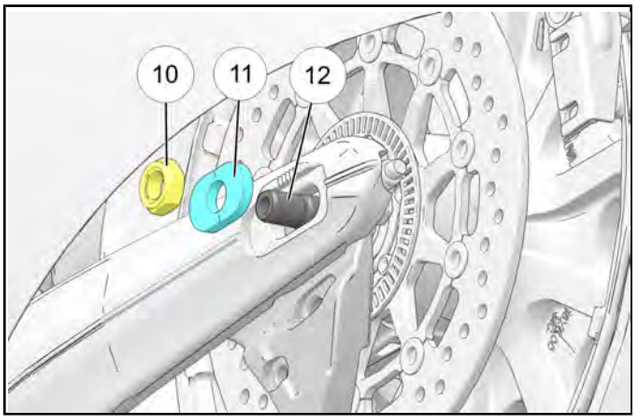
22. Connect the wheel speed sensor located at the front of the swingarm ⑲.



23. Verify the routing and retention points are correct ⑳.
24. Install rear wheel.
25. Push wheel forward and slide drive belt onto the rear sprocket.
26. Install axle ⑫ from right-hand side of the swingarm.

8

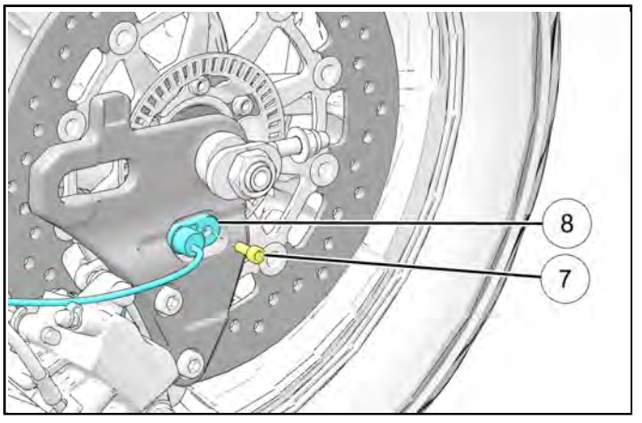
27. Install Washer ⑪ and Axle Nut ⑩ from left-hand side of the swingarm. Torque axle nut to specification.



TORQUE
Axle Nut: **1. Torque to 15 ft-lbs (20 N·m)2. Torque to 65 ft-lbs (88 N·m)**

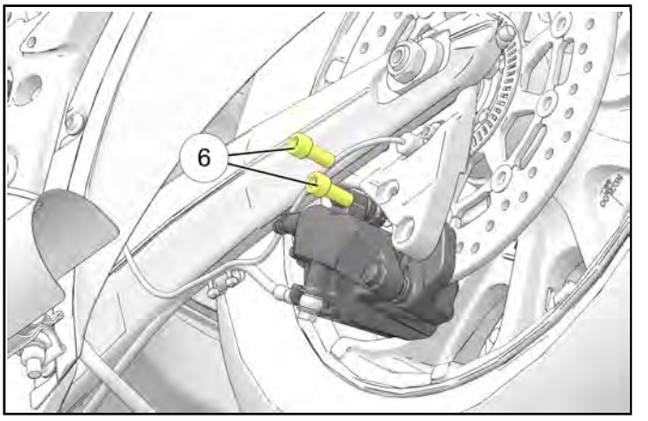
STOP!
Wheel alignment and belt tension should be accurate if the procedure was performed correctly. Verify belt tension using **PV-43532** and wheel alignment.

28. Install rear ABS wheel speed sensor ⑧ , shims ⑨ (if applicable), and sensor mounting fastener ⑦. Torque fastener to specification.



TORQUE
Wheel Speed Sensor Fastener: **88 in-lbs (10 N·m)**

29. Install rear caliper and secure with two caliper mounting fasteners ⑥.



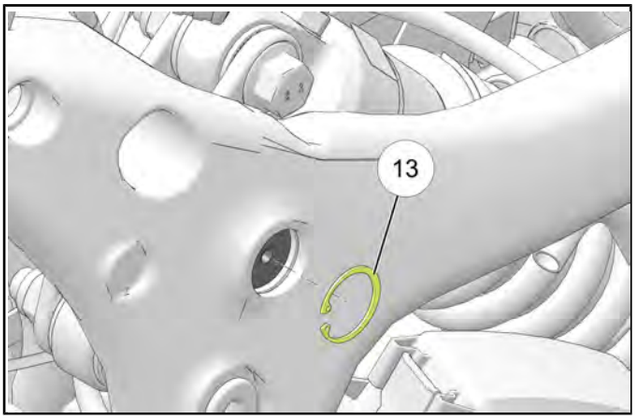
TORQUE
Rear Caliper Mounting Fasteners: **31 ft-lbs (42 N·m)**

30. As shown above, install two cable ties securing the wheel speed sensor and brake line.

31. Install p-clamp fasteners. Torque to specification.

TORQUE
P-Clamp Fasteners: **88 in-lbs (10 N·m)**

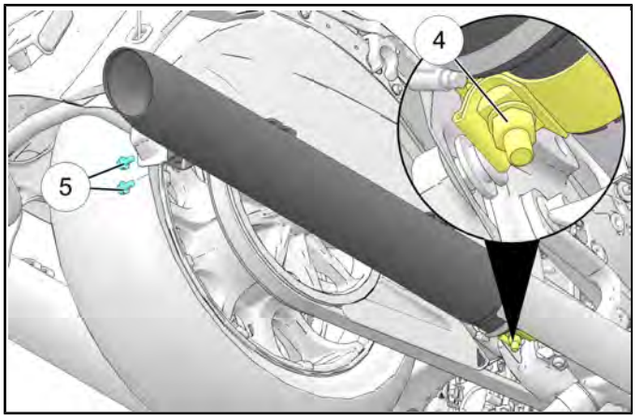
32. Install shock pin through the rear shock linkage and frame and secure with snap ring ⑬.



NOTICE
Lift/lower rear of the motorcycle to line up shock pin.

IMPORTANT
Verify the snap ring is not bent or damaged and is fully seated in the groove. Submit an ASK Polaris case if a new snap ring is required.

33. Remove the M6 x 10 fastener from the shock pin.
34. Remove scissor lift.
35. Install antenna if removed.
36. Install left and right-hand muffler and secure with mounting fasteners ⑤. Torque to specification. Torque clamp ④ to specification.

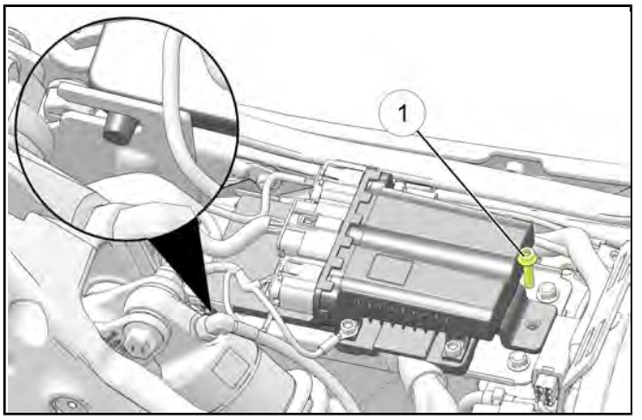


TORQUE
Muffler Mounting Fasteners: **18 ft-lbs (24 N·m)**

TORQUE
Muffler Clamp: **40 ft-lbs (54 N·m)**

37. Remove electrical tape from the negative (-) and positive (+) terminals.
38. Connect positive (+) cable to the battery and torque to specification.
39. Connect negative (-) cable to battery and torque to specification.
40. Apply dielectric grease over terminal areas for corrosion protection.

41. Install the VCM mounting plate to the battery box. Slide the VCM tray toward the rear of the motorcycle to engage with battery box tabs. Install and torque the fastener ① to specification.



⚠ CAUTION

Do not allow VCM to contact the positive battery terminal.

TORQUE
VCM Mounting Plate Fastener: **88 in-lbs (10 N·m)**

TROUBLESHOOTING

TROUBLESHOOTING, REAR WHEEL / SUSPENSION

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel Feels "Loose" or Wobbles	Loose fasteners	Torque to specification
	Distorted (bent) rear wheel	Replace wheel
	Worn or damaged wheel bearings	Replace wheel bearings
	Worn or damaged swing arm bushings.	Replace swing arm bushings
	Damaged or incorrect rear tire	Replace rear tire
	Unbalanced rear wheel assembly	Balance tire/wheel
	Low tire pressure	Inflate to specification
	Loose swing arm, axle or suspension fasteners	Torque to specification
	Pushrod or shock bearing failure	Replace pushrod or shock bearings
Rear Suspension Too Hard	Incorrect preload adjustment	Adjust to rider & load
	Damaged shock absorber	Replace / Rebuild shock
	Damaged or corroded suspension mount bushing	Correct as necessary
	Damaged or corroded swingarm bushings	Replace
	High tire pressure	Deflate to specification
	Drive belt adjustment too tight	Adjust drive belt tension
Rear Suspension Too Soft	Incorrect preload adjustment	Adjust to rider & load
	Damaged shock absorber	Rebuild or replace shock
	Weak shock spring	Replace shock spring
	Excessive load placed on motorcycle	Reduce load weight
	Low tire pressure	Inflate to specification
Rear Suspension Noisy	Loose fasteners	Torque to specification
	Worn wheel bearings	Replace
	Worn swing arm bushings	Replace
	Damaged shock absorber	Replace as necessary
	Worn pushrod or shock bearings	Replace pushrod or shock bearings
Wheel Drags (Turns Hard)	Incorrect drive belt adjustment	Adjust drive belt tension
	Brake problem	Diagnose and Service
	Loose fasteners	Torque to specification
	Bent rear axle	Replace
	Damaged wheel bearings	Replace
	Tire contact with object or chassis	Determine point of contact and correct

TROUBLESHOOTING, FINAL DRIVE

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Belt Shows Excessive Wear On One Side	Out-of-Alignment	Align rear wheel
Belt Squeal	Out-of-Alignment	Align rear wheel
Belt Whine / Noise	Out-of-Alignment Belt Damage Incorrect Belt Tension	Align rear wheel Inspect Belt Adjust Tension
Broken Sprocket Teeth	Foreign material damage / Loose drive belt or sprocket	Replace parts or repair as necessary
Broken or Torn Cogs on Belt	Foreign material damage / Loose drive belt or sprocket	Replace parts as necessary
Belt Jumps Sprocket Teeth	Worn, damaged or out of adjustment belt or sprockets	Replace parts as necessary
	Belt Loose	Adjust Belt
Excessive Wear, Binding Suspension	Belt Tight	Adjust Belt
Broken Belt	Belt weakened by foreign material damage. Belt run excessively tight or loose.	Replace Belt, Replace Sprockets if damaged

TIRES

GENERAL INFORMATION

SERVICE NOTES – TIRES

⚠ WARNING

Indian Motorcycles are produced using the designated tires listed as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability which can lead to a crash resulting in serious injury or death. Use *only* the recommended tires inflated to the recommended tire pressures. Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged rims.

⚠ WARNING

Do not attempt to repair tires that have:

- Punctures with a diameter of greater than 6mm (0.240").
- Cuts with a length of greater than 6mm (0.240").
- Any punctures or cuts on the sidewall of the tire.
- Tread depth of less than 1.6mm (.063") for the front tire.
- Tread depth of less than 1.6mm (.063") for the rear tire.
- Ply separation.
- Tread separation.
- Severe tread cupping.
- Cuts, gouges or scratches on the sealing surface of the bead.
- Flat spots on the tread.
- Bubbles, separation or any unusual damage to the inner liner of the tire.
- Chemical sealants or balance additives added to the tire.

⚠ WARNING

All repairs must be made from inside the tire.

⚠ WARNING

No form of temporary repair should ever be attempted. Secondary damage caused by a penetrating object may not be detected and tire or tube deflation may occur at a later date.

⚠ WARNING

It is dangerous to ride with a worn tire. When a tire reaches the minimum tread depth listed below, replace the tire immediately.

⚠ CAUTION

Two of the biggest factors contributing to premature tire wear are overloading and under-inflation. Do not deviate from the specifications for loading or inflation.

SPECIAL TOOLS – TIRES

TOOL DESCRIPTION	PART NUMBER
TPMS Activation Tool	PF-51288
Tire Changing Machine	Commercially Available

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

8

SERVICE SPECIFICATIONS – TIRES

Refer to **Service Specifications – Front Wheel / Suspension page 8.15** for wheel specifications.

Tire Pressure Table (Cold)

NOTICE
Also refer to Manufacturing Information label.

TIRE TYPE / PRESSURE	
130/60B19 66H / Metzeler Cruisetec	**Front: 36 psi (248 kPa)**
180/60R16 80H (I) / Metzeler Cruisetec	**Rear: 41 psi (283 kPa)**

MINIMUM TREAD DEPTH	
FRONT	.063 in (1.6 mm)
REAR	.063 in (1.6 mm)

TIRE INSPECTION

TIRE WEAR PATTERNS

TIRE WEAR PATTERNS

SYMPTOM	CAUSE
Wear on Left Side	Riding on Crowned Roads
Edges Worn	Underinflation or Excessive Loads
Excess Wear in the Middle of Tire	Over-inflation or Tire Abuse
Cracks in Tread Grooves	Underinflation, Excessive Loads, Suspension Bottoming
Tread Block Cupping (Usually Front Tire -See Below)	Normal Braking Wear

OZONE CRACKING

Ozone cracking usually shows up on the sidewalls of tires and is caused by sunlight, electric motor emissions, smog, or other environmental factors. Ozone cracking does not pose a problem unless the cracks reach the cords. If this occurs, moisture may penetrate the carcass of the tire causing cord separation. Tires showing signs of severe ozone cracking (cords visible at the bottom of the cracks) must be replaced.

FRONT TIRE CUPPING

Front of tread block worn more than rear of tread block:

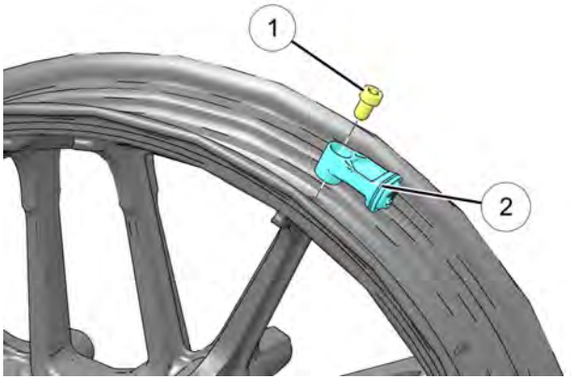
- The cupping of front tires is somewhat normal.
- Rear tires are subjected to forces in both directions. The forces of braking and acceleration result in even tire wear.
- Front tires are subjected only to the forces of braking. When the brakes are applied, tire deflection is increased and wear occurs in only one direction.
- Incorrect tire pressure is the number one cause of excessive tire cupping. Too little tire pressure causes the tire to over-deflect which increases the amount of scrubbing and causes more tire cupping.
- Binding or improperly assembled front forks can also contribute to excessive tire cupping. If the front forks do not react as they should the tire acts as the sole suspension component and tread deflection increases.

TIRE PRESSURE MONITORING SYSTEM (TPMS)

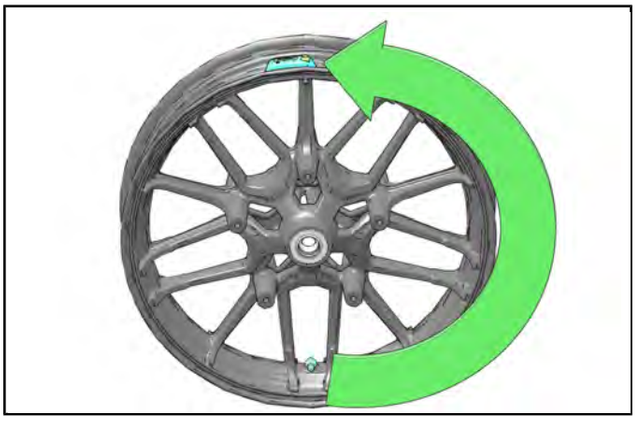
TPMS OVERVIEW

The Indian Challenger Motorcycles are equipped with an electronic tire pressure monitoring system (TPMS). The TPMS provides real-time tire pressure information to the operator of the vehicle and displays it via MFD and a low pressure warning light.

The TPMS sensors ① are located 180° from the valve stem ②. Use caution when servicing tires.



To avoid damaging a sensor, break the bead at the valve stem, then at 90° and 270° from the valve stem as required.



With TPMS, the pressure of each tire can be viewed in the MFD. If the display shows dashes (—) instead of a pressure value while traveling above 15 MPH (24 km/h), the system may not be functioning properly. See your dealer for service.

The TPMS warning indicator will illuminate if low tire pressure is detected. Always correct low tire pressure promptly. Always inspect tire pressure and condition before each ride.

The TPMS display may indicate an increase in tire pressure while riding, a normal occurrence as tires warm up. Riding into colder conditions may result in a drop in tire pressure as tires cool down. Regardless of conditions, low tire pressures should always be corrected promptly.

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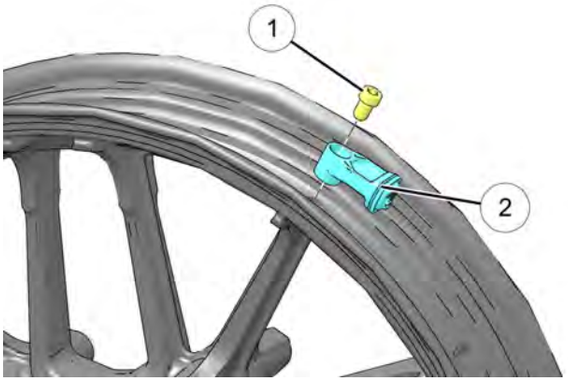
TPMS SENSOR REPLACEMENT

1. Remove tire from rim. See **Tire Removal page 8.117**.
2. Remove fastener ① and sensor ②.



3. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Tire Pressure Sensor Fastener: **72 in-lbs (8 N·m)**

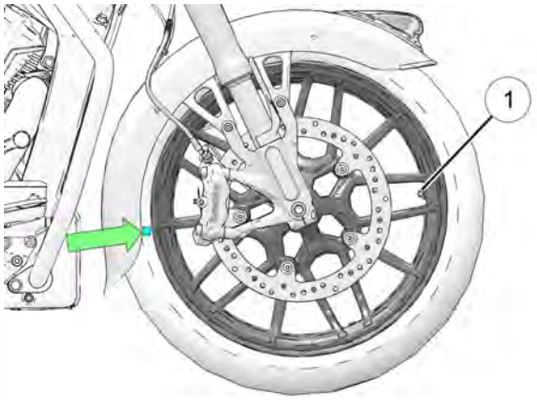
4. Install tire. See **Tire Installation page 8.121**.
5. Perform the **TPMS Activation page 8.115** procedure.

TPMS ACTIVATION

TPMS activation or "Wake Up" requires the use of the TPMS Activation tool (PF-51288).

NOTICE

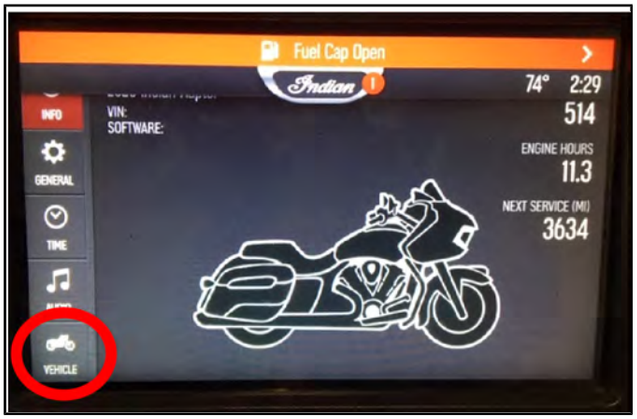
The TPMS sensor is located 180° from the valve stem ①. Locate the position of the front and rear valve stems and place a piece of tape on the tire on the opposite side (180°). Both pieces of tape (front and rear tires) should be visible so the TPMS Activation tool can be held within 3 in (7.6 cm) of the tire where the sensor is located.



NOTICE

The TPMS Activation tool should be held close to the **sidewall of the tire** when activating the sensors. If the Activation tool is held over the aluminum rim, the sensor signal may not be received.

1. Press the power button to power up the motorcycle electrical system.
2. Navigate to the settings.
3. Select the vehicle icon.



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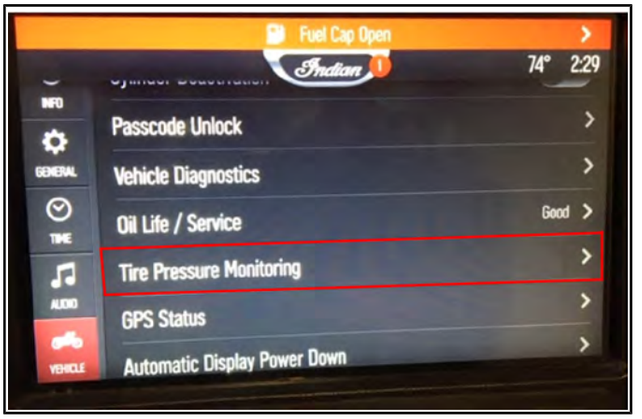
4. Select tire pressure monitoring.



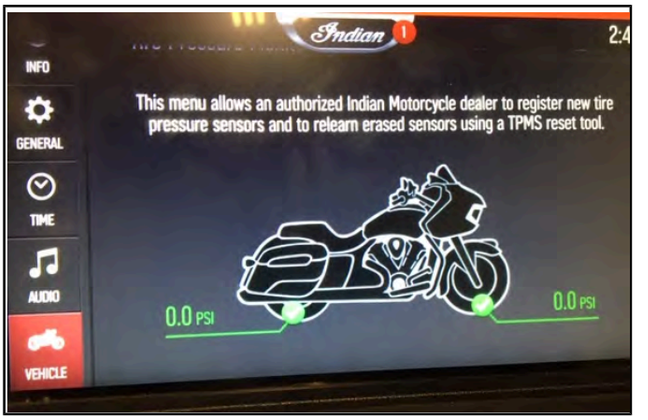
5. Select learn.

6. With the front wheel learning, Use the TPMS Activation tool (PF-51288) on the front wheel.

7. When the sensor has learned, a success message will appear followed by the tire pressure reading.

8. With the rear wheel learning, use the TPMS Activation tool (PF-51288) on the rear wheel.

9. When the sensor has learned, a success message will appear followed by the tire pressure reading.



TIRE REMOVAL

TIRE CHANGING, GENERAL INFORMATION

There are three generally acceptable methods to dismount and mount a motorcycle tire to its rim. For each of the three methods, there are countless variations.

The three general methods are:

- Pneumatic or electrically operated tire machine
- Manually operated tire machine
- Manual manipulation of tire irons

Indian Motorcycle permits and recommends all three of the general methods, but realizes that careless or improper work habits can damage both the tire and rim no matter which method is used. With any of the methods, care must still be taken to avoid damaging the rim, tire, inner tube (if applicable), brake disk, or sprocket.

The pneumatic or electrically operated tire machine is preferred because it is the most efficient method to dismount and mount tires.

The manually operated tire machine is the next preferred method. It can be just as efficient as a power assisted tire machine but with some of the machines it may be necessary to remove the belt driven sprocket in order to gain sufficient clearance for tire removal.

Manual manipulation is the least preferred method since it will generally not deliver the same efficiency as the other methods and greater care needs to be taken when performed. Care must be taken when using tire irons to not damage or stress the tire bead, Also, the opposite bead needs to be in drop center of wheel during mounting and dismounting of the tire.

Be very careful not to damage the rim, tire, inner tube, brake disk, TPMS sensor or sprocket regardless of which method is used.

⚠ CAUTION

On models equipped with a Tire Pressure Monitoring System (TPMS) break beads at the valve stem, then at 90° and 270° from the valve stem as required. If the bead is broken 180° from the valve stem (sensor location) the TPMS sensor may be damaged and require replacement. See **TPMS Overview page 8.114**.

TIRE REMOVAL

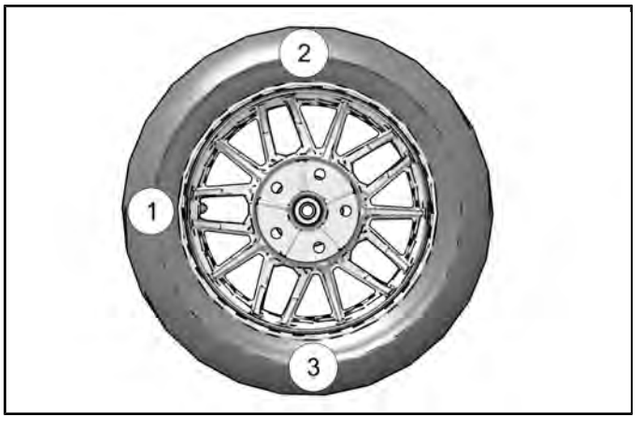
NOTICE

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

1. Remove wheel / tire assembly from motorcycle. See **Front Wheel Removal page 8.34** and **Rear Wheel Removal page 8.70**.
2. Remove valve core from valve stem and let all air escape.
3. Mount the wheel assembly onto a tire bead breaker and break the bead starting at the valve stem ①, then again at 90° ② and again at 270° ③ from the valve stem as necessary.

⚠ CAUTION

The TPMS sensor is located 180° from the valve stem. If the bead is broken 180° from the valve stem the TPMS sensor may be damaged and require replacement.



4. Flip the wheel assembly over and repeat STEP 3 on the other side.

IMPORTANT

Take great care not to bend or otherwise damage the brake disc and/or belt driven sprocket. If the bead breaker being used interferes with either the brake disk and/or belt driven sprocket, remove the disc or sprocket as required.

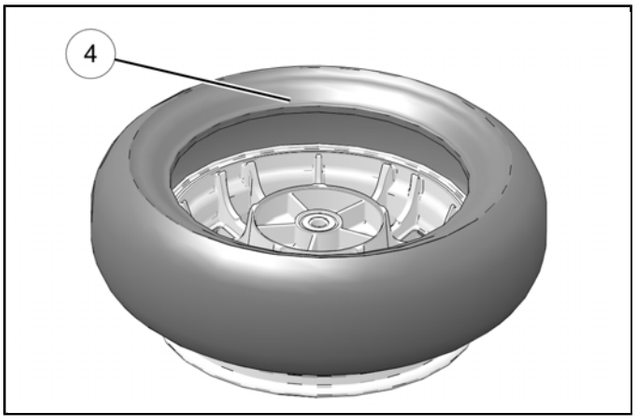
5. Push tire down and lubricate tire bead with tire lubricant on both sides of the tire.

8

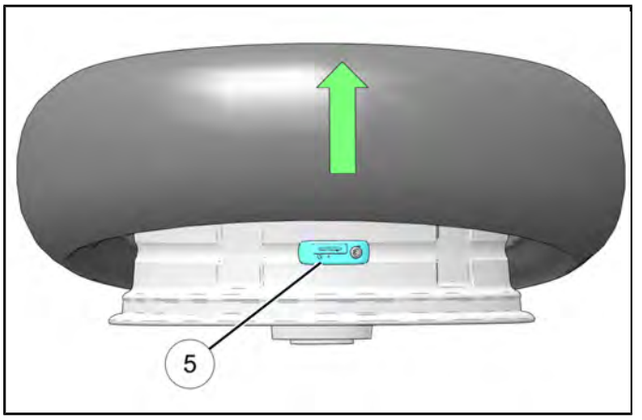
6. Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

NOTICE
Refer to manufacturer's instructions for proper tire changer operation.

7. Carefully work around the circumference of the upper bead ④ with the tire lever until it is completely off of the rim.



8. Paying attention to the location of the TPMS sensor ⑤, lift the lower tire bead up until the tire lever can be positioned and the tire completely removed.

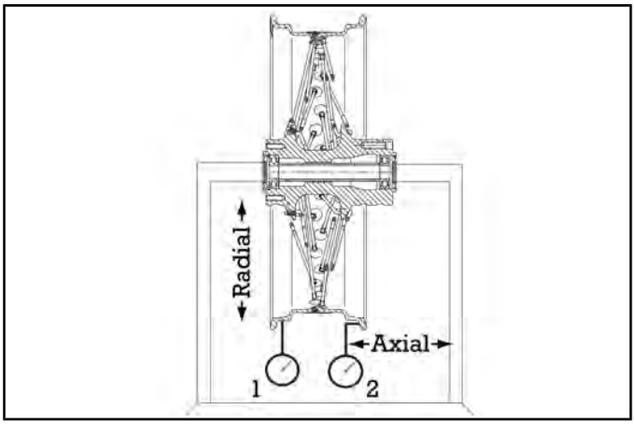


9. Work around the circumference of the rim until the tire can be lifted free of the rim.

WHEEL INSPECTION

VISUAL INSPECTION & RUNOUT

1. Clean the rim of all rubber particles and corrosion.
2. Inspect wheel for cracks and/or distortion.
3. Inspect bead seating area for scratches, distortion, or damage that could prevent proper sealing.
4. Measure wheel for radial runout (1).
5. Measure wheel for axial runout (2).



NOTICE

Measure runout on tire bead sealing surface of wheel. Be sure surface is clean.

6. Compare measurements of axial and radial runout to specifications. See **Service Specifications – Front Wheel / Suspension page 8.15**. Replace wheel if any measurement exceeds Service Limit.
7. Clean the sealing surfaces of the rim thoroughly. Use a soft brush (nylon) soap and water if necessary.

⚠ WARNING

Do not scratch or damage sealing surfaces of rim. Loss of air pressure can cause a loss of control and an accident, resulting in serious injury or death.

TIRE REPAIR PRECAUTIONS

⚠ WARNING

Only permanent plug-patch repairs of small tread area punctures from **inside** the dismounted tire are recommended. Never perform an exterior repair and never use an inner tube as a substitute for a proper repair. Speed should not exceed 50 MPH for the first 24 hours after repair and the repaired tire should never be used over 80 MPH. Inspect inflation pressure after tire cools for at least three hours following initial operation.

VALVE STEM

VALVE STEM INSPECTION

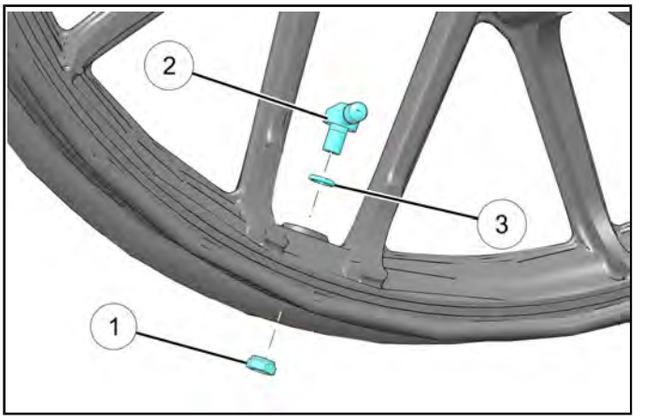
1. Remove the valve stem cap and spray the valve stem down with a mild soap and water solution.
2. Observe the area around the base of the valve stem and valve core area. If any bubbles form over a 1–2 minute period, the valve stem or inner tube should be replaced.
3. Inspect valve stem for cracks or visible damage and replace if necessary.

NOTICE
Tubeless: Valve stem replacement is recommended when tire is being replaced. **Tube Type**: Inner tube replacement is recommended when tire is being replaced.

VALVE STEM REPLACEMENT

IMPORTANT
The Challenger uses directional tires and wheels. Both front and rear valve stem face the right side of the unit.

1. Remove tire from wheel as outlined in this chapter.
2. Remove valve stem nut ① , valve stem ② and o-ring ③ .



3. Clean gasket or o-ring sealing surface of rim.
4. Place new valve stem (with seal washer or O-ring installed) through hole in rim and position it so the stem is perpendicular from wheel center and, valve opening facing the right side of the unit.
5. Hold stem and tighten nut to specification.

TORQUE
Valve Stem Nut: **53 in-lbs (6 N·m)**

6. Install tire as outlined in this chapter.

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TIRE INSTALLATION

NOTICE

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

NOTICE

Balance Dots

Metzeler tires have a yellow dot on the sidewall which corresponds to the lightest part of the tire. This dot is meant to line-up with the tire valve which often is the heaviest part of the rim (although this is not always the case).

Indian Motorcycle does not recommend the use of liquid balancer/sealers. These are a form of temporary repair which may adversely affect ply material and mask secondary damage caused by the penetrating object. Reliance upon sealants can result in sudden tire failure and accident.

Directional Arrows

Tires *and* rims have directional arrows that must be observed when installing tires to rims.

The wheel assemblies must be free of foreign debris that would affect balancing.

Carefully inspect the wheel bearings, seals and axle for damage or corrosion.

1. Lubricate both tire beads with rubber lubricant.

⚠ CAUTION

Never apply grease, oil, gasoline, spray type lubricants or anything other than rubber lubricant or a neutral soap and water solution to the tire bead. Doing so can damage the tire.

2. Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

NOTICE

Refer to manufacturer's instructions for proper tire changer operation.

3. Orient tire correctly as to the balance dot and directional arrows.
4. Push tire on to rim until one bead is installed. It shouldn't be necessary to use tire irons to put one side of the tire onto the rim. Remember to keep bead(s) in the drop center of the wheel whenever possible.

⚠ CAUTION

Use care not to damage the TPMS sensor while installing the tire bead over the edge of the rim.

NOTICE

Confirm tire is positioned correctly by observing directional arrows.

5. Lubricate the tire bead.
6. With your hands, push as much of the remaining tire bead as possible into the rim, pinching both upper and lower beads into the drop center.
7. When no more of tire can be installed by hand, press down on portion of tire in front of you with your knee to keep the top bead in the drop center.
8. Install the tire lever and work around the remaining circumference of the wheel until the bead is fully installed onto the rim.

NOTICE

Be sure both beads are forced as far as possible into the drop center of the rim.

9. Install valve core if it was removed.
10. Line up balance dot.
11. Confirm that the directional arrows are pointing in the correct direction.
12. Bounce tire on the floor several times while rotating tire. This will expand tire bead outward slightly which will make tire inflation easier.
13. Inflate tire observing the precautions listed below.

Tire Inflation & Precautions

- Wear approved eye protection
- Lubricate the tire beads with a tire mounting lubricant before inflation.
- Lock assembly on mounting machine or place in safety cage before inflating to seat beads
- Use extension gauge and hose with slip-on air chuck.
- Stand back with no part of your body within the perimeter of the assembled tire and rim.
- Inflate with core in valve stem
- Never inflate above 42 psi to seat beads
- If beads do not seat by 42 psi. Deflate and repeat procedures. Never use a volatile substance or rubber "donut" to aid bead seating.

14. Inspect the line molded onto the tire side walls. It must be the same distance from the rim all the way around the tire. If the distance varies it indicates that tire is not seated properly.
15. If tire is not seated correctly, deflate and unseat the tire, lubricate the tire beads and repeat inflation procedure.
16. Install wheel assembly onto balance stand and spin. Observe the wheel assembly while it is spinning to make sure the tire is seated properly.
17. Adjust tire pressures to specifications.
18. Balance tire / wheel assembly.

⚠ WARNING

FOR NEW TIRES: Replacement of OEM tires or replacement with differently constructed tires will not immediately produce improved reactions the same as the original tires when new. When new tires are installed, they should not be subjected to maximum power or hard cornering until a reasonable "scrub" period of approximately 100 miles has been covered. This will permit the rider to become accustomed to "feel" of new tires or tire combination, and achieve optimum road grip. Inspect and adjust tire inflation pressure after tire cools down for at least three hours following "run-in".

TIRE BALANCING

⚠ WARNING

It is essential that the wheel assembly be balanced before use and rebalanced each time the tire is removed. Wheel balance affects stability, handling and overall safety of the motorcycle.

All Metzeler street tires should be installed with the yellow balance dot at the tire valve.

The use of liquid balancer/sealer is not recommended.

This procedure will outline balancing wheel assembly in a gravity balance stand. If a pendulum or spin type balancer is being used, reference the manufacturer's instructions that came with the equipment.

1. Mount wheel assembly in a commercially available balance stand.
2. Remove all balance weights. Clean tire and rim thoroughly.

NOTICE

While it is possible to balance a wheel assembly with axle and grease-free wheel bearings as the pivot point, it is not recommended. Use an inspection stand that has knife edge bearings and its own axle.

3. Spin the wheel assembly. Allow it to stop on its own and mark the highest (lightest) part of the wheel.
4. Repeat the spinning process to verify the heaviest part of the wheel.
5. Place balance weights at the lightest portion of wheel in small increments.
6. After each addition of weight, spin the wheel assembly and allow it to stop by itself.
7. When correct amount of weight has been added to wheel, it will no longer stop in the same location and the wheel assembly is balanced.

⚠ CAUTION

Do not add more than 85 grams (3.0 oz.) of weight to the front or rear wheel.

If more than the recommended weight is necessary to balance the wheel, dismount the tire and rotate it 90° without regard to the yellow balance dot, and re-balance the wheel / tire.

Adhesive Weight P/N 1520253

8. Install wheel / tire assembly onto motorcycle. See **Front Wheel Installation page 8.34** and **Rear Wheel Installation page 8.71**.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Worn or damaged swing arm bushings.	Replace as a set
	Damaged or incorrect tire	Replace rear tire
	Wheel assembly out-of-balance	Balance wheel
	Low tire pressure	Inflate to specification
	Loose swing arm, axle or suspension fasteners.	Torque to specification
Handlebars Oscillate (Wobble)	Bent front axle	Replace
	Worn or damaged wheel bearings	Replace as a set
	Tire mounted incorrectly	Inspect and re-mount tire
	Damaged tire	Replace
	Loose steering stem nut	Adjust to specification
	Incorrect tire	Replace
	Incorrect tire pressure	Inflate to specification
Front Wheel Oscillates (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Damaged or incorrect tire	Replace
	Loose axle or axle pinch fasteners	Torque to specification
	Right and left fork not installed at same height	Repair
	Fork oil level incorrect	Fill to specification
	Fork spring free length different between right & left	Replace spring that does not meet specification
	Wheel assembly out-of-balance	Balance wheel

NOTES

CHAPTER 9
BRAKES

GENERAL INFORMATION

SERVICE NOTES – BRAKES

Use only genuine Indian Motorcycle replacement parts when servicing the brake system. Clean all system components prior to disassembly, including the fluid reservoir cover(s) to reduce the chance of debris entering the system during repair or maintenance work. Start with a clean work area away from dust, water or other contamination. Cleanliness is very important for proper brake system maintenance and repair. Follow procedure outlined in this manual carefully, including fastener torques and the application of special lubricant in required areas. Special lubricants are included with service kits.

⚠ WARNING

Contaminated brake discs or pads greatly reduce the amount of stopping force available & increase stopping distance. Brake discs can be cleaned using a commercially available brake disc cleaner. Follow the manufacturer instructions printed on the container. NEVER attempt to clean contaminated brake pads. Always replace pads as a set.

⚠ WARNING

The brake system uses ethylene-glycol based fluid (DOT 4). Do not use or mix with different types of fluid such as silicone-based (DOT 5) or any petroleum-based fluid.

Do not let water or moisture enter the master cylinder when refilling. Water significantly lowers the boiling point of the fluid and can result in poor braking.

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid.

Keep brake fluid containers completely sealed and out of reach of children.

Brake hoses should be replaced whenever the exterior shows signs of deterioration or damage.

Brake hoses should be replaced every four (4) years regardless of their exterior condition.

Bleed the brake system any time it is disassembled or when the brake action is spongy.

Always inspect the operation of the brakes before riding the motorcycle.

Replace sealing washers whenever brake lines are removed.

Always remove the master cylinder fluid reservoir cover and inspect the fluid level when brake pads are replaced.

NOTICE

Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Make sure the master cylinder reservoir being worked on is level and clean before removing the cap.

SPECIAL TOOLS – BRAKES

TOOL DESCRIPTION	PART NUMBER
ABS Tool (Lever Reserve)	PV-50104
Vacuum Brake Bleeder	Commercially Available

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – BRAKES

ITEM	STAND-ARD	SERVICE LIMIT
Specified Brake Fluid	DOT 4	Replace every 24 months or 10,000 miles (16,000 km)
Brake Disc Thickness, Front	5 mm	4.5 mm (.177") (Min)
Brake Disc Thickness, Rear	7 mm	6.5 mm (.256") (Min)
Brake Disc Runout	-	.30 mm (.012") (Max)
Brake Pad Wear Limit (Front & Rear)	-	When wear limit groove is no longer visible
Brake Pedal Free Play (Pedal Clearance)	No Adjust-ment	-
Brake Lever Freeplay (Front)	No Adjust-ment	-

BIKE HOLD CONTROL

Bike Hold Control assists the rider by engaging the rear brake, when requested, to prevent the vehicle from rolling backwards or forwards without the need for the rider to constantly apply the brakes.

The ability for the system to hold the bike stationary may be affected by loose or slippery surfaces or high slope angles. The rider must always exercise caution when engaging Bike Hold Control and remain prepared to take control of the bike.

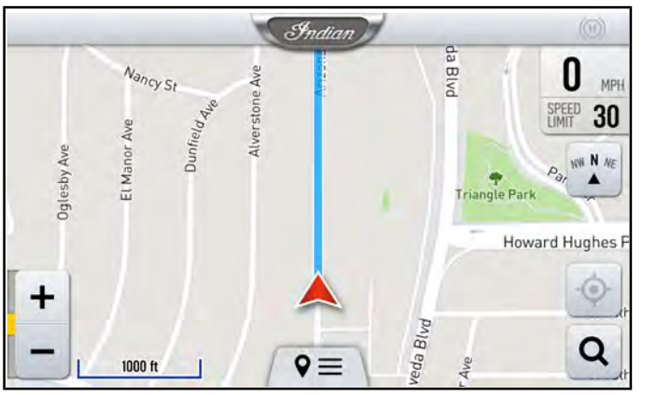
Avoid engaging Bike Hold Control on non-asphalted surfaces or inclines greater than 30%.

Symbol	Indicates
	Bike Hold Control is available to activate.
	Bike Hold Control is actively holding the bike stationary.
	This indicator lamp will flash when Bike Hold Control is about to release or is actively releasing the brakes. This indicator lamp will become solid when Bike Hold Control has a fault.

Bike Hold Control will be available to activate when:

- the bike is stationary
- the engine is running
- the sidestand is up

Once all conditions are met, the grey Bike Hold Control symbol will appear in the upper area of the display screen.



Activate Bike Hold Control by pulling the front lever firmly or pressing the rear brake lever firmly.

Bike Hold Control will deactivate when:

- riding forward by gradually opening the throttle and releasing the clutch (some initial resistance may be felt until Bike Hold releases)
- the front brake lever is pulled firmly with a short pulse
- turning the engine off
- putting the sidestand down

Maximum hold time is 3 minutes. A popup warning covers the screen 15 seconds before Bike Hold Control gradually releases.

⚠ WARNING

Bike Hold Control must not be used as a substitute for a parking brake. The rider must remain seated and attentive while Bike Hold Control is active.

NOTICE

An incorrectly adjusted mechanical clutch lever freeplay can affect Bike Hold Control performance. See the **Clutch Lever Free Play page 5.5** to ensure the mechanical clutch lever freeplay is adjusted correctly.

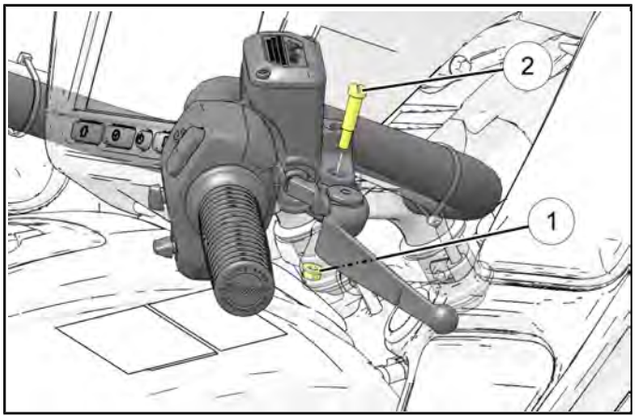
ELECTRONIC COMBINED BRAKING

Electronic Combined Braking is a linked braking system controlled by the ABS module that generates additional stopping power on the opposing brake system. When the front brake is applied the system will actuate the rear brakes, and vice-versa, allowing for approximately 10–30% improved stopping efficiency and reduced stopping distance.

BRAKE MAINTENANCE

FRONT BRAKE LEVER LUBRICATION

1. Remove nut ① and pivot pin ②.



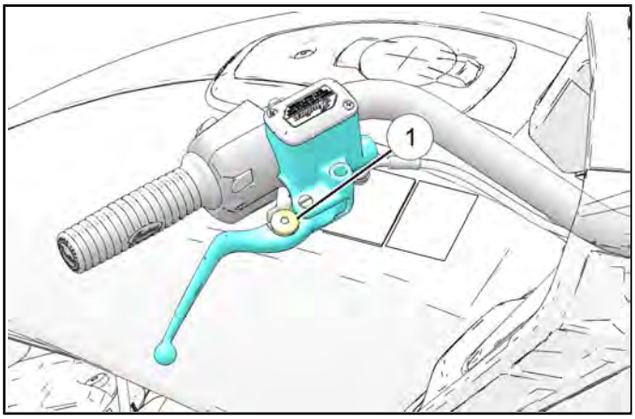
2. Clean pivot pin, lever and lever perch.
3. Remove brake lever and apply grease to pivot pin ②, lever bushing, and contact surface of pushrod.
4. Assemble brake lever.

TORQUE
Brake Lever Pivot Pin: **9 in-lbs (1 N·m)**

TORQUE
Brake Lever Pivot Nut: **52 in-lbs (6 N·m)**

FRONT BRAKE LEVER REACH

1. Lever reach (distance to hand grip) is adjustable:
   - Pull lever forward (away from hand grip) and *hold*.
   - TO ADJUST reach distance, turn dial ① on the lever.



2. The adjustment pin will seat at different depths in the dial at each setting. Stop once the proper brake lever reach is achieved.

IMPORTANT
Make sure the adjustment pin is not resting between pockets on the dial. Once the reach is set, pull the brake lever 2–3 times to verify proper operation.

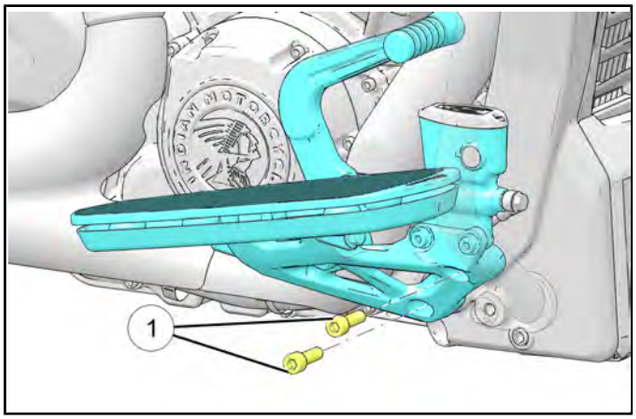
BRAKE PEDAL INSPECTION

1. Press and release brake pedal. It should move freely and smoothly and return to the rest position quickly when released.
2. Press brake pedal and check for firm resistance. If pedal feels spongy or travels too far without resistance, inspect system for leaks and bleed brakes. See **Brake Fluid Replacement & Bleeding Precautions page 9.39**.

BRAKE PEDAL LUBRICATION

Lubricate brake pedal at intervals listed on periodic maintenance table. See **Maintenance Intervals page 2.4**.

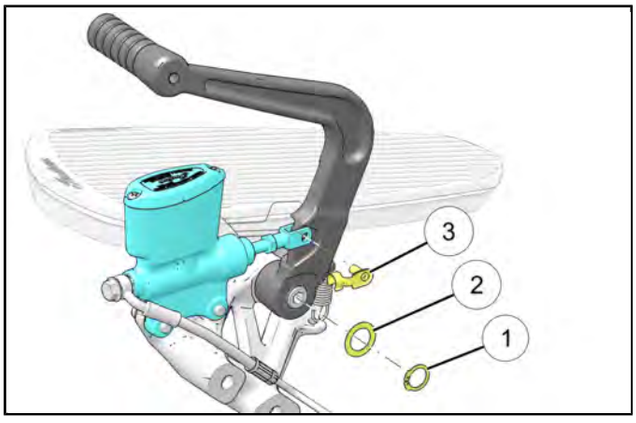
1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Working on the RH side of the motorcycle, remove floorboard support fasteners ① and move floorboard / master cylinder assembly so the brake pedal pivot pin can be accessed.



NOTICE
It is not necessary to disconnect the brake line from the master cylinder to perform this procedure.

IMPORTANT
Keep the floorboard / master cylinder assembly in an upright position at all times to ensure air does not enter the brake system.

3. Remove pushrod pivot pin clip ③. Release the pushrod from the brake pedal.
4. Remove snap ring ① and washer ②. Remove pedal and inner wave washer from post.



5. Clean off old lubricant and dirt from all parts.
6. Apply all-purpose grease to post and pedal bushing.
7. Install wave washer, pedal, flat washer and snap ring. Be sure snap ring is fully seated in the groove.

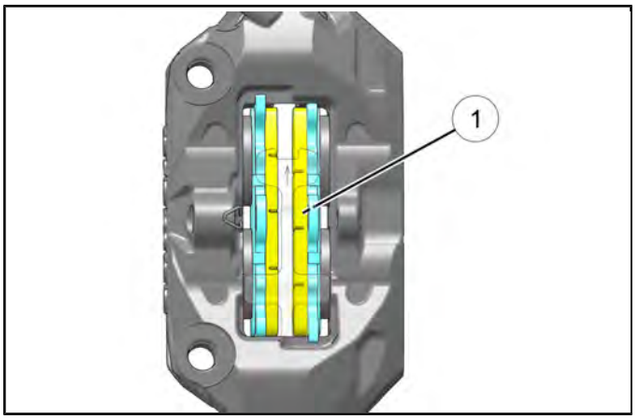
8. Install pushrod pivot pin clip.
9. Assemble floorboard support to frame. Torque mounting fasteners to specification. See **Floorboard Installation page 7.104**.
10. Depress brake pedal to verify proper operation and pedal feel. Bleed brakes if necessary. See **Brake Fluid Replacement & Bleeding Precautions page 9.39**.

FRONT BRAKE PAD INSPECTION

NOTICE

Wear indicator grooves are provided on each front brake pad to allow for a visual inspection without pad removal. Inspect pads by viewing from rear of caliper.
Replace pads if worn to bottom of grooves.
See **Front Brake Pad Replacement page 9.44**.

1. Viewing the front brake pads from the rear of the calipers, locate the wear indicator grooves ①.



2. Wear indicator grooves should be visible on both inboard and outboard brake pads of both calipers.

⚠ CAUTION

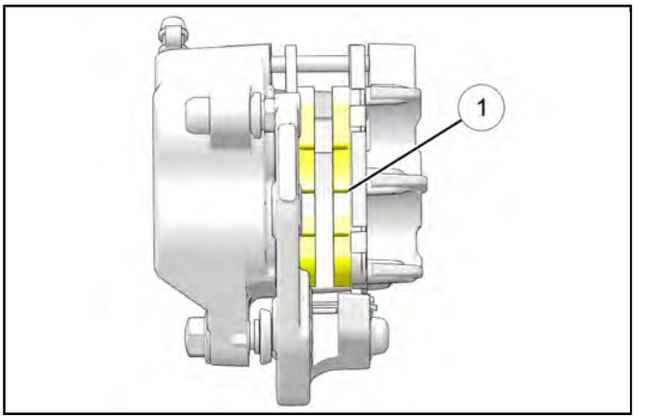
Front brake pads should always be replaced as a complete set. If it is determined that an individual brake pad has worn past the wear indicator groove, both front calipers should receive new pad sets. Failure to replace both sets of front brake pads together may cause reduced braking performance or brake failure, resulting in a vehicle crash.

REAR BRAKE PAD INSPECTION

NOTICE

Wear indicator grooves are provided on each rear brake pad to allow for a visual inspection without pad removal. Inspect pads by viewing from the rear of the motorcycle, directly behind the LH tailpipe.
Replace pads if worn to bottom of grooves.
See **Rear Brake Pad Replacement page 9.45**.

1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Viewing the rear brake pads from behind the motorcycle and below the lip of the rear fender, locate the wear indicator grooves ①.



3. Wear indicator grooves should be visible on both inboard and outboard brake pads.

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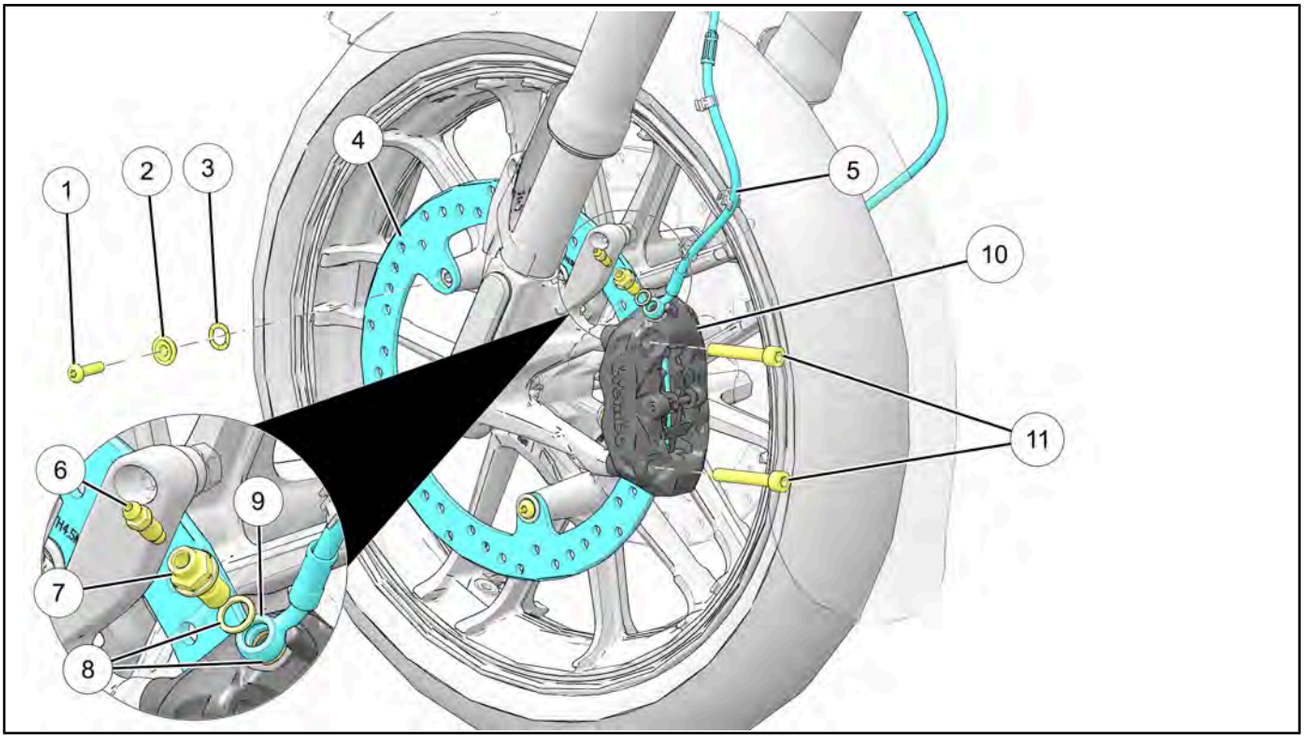
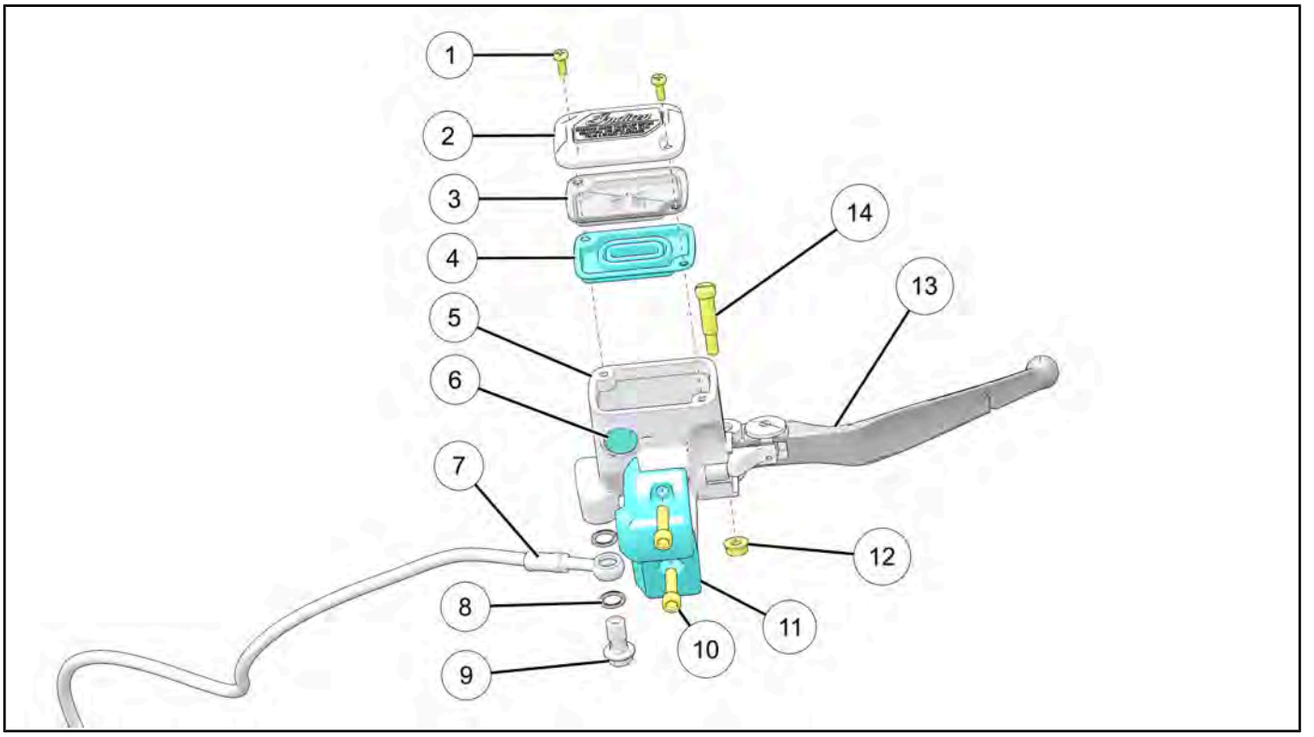
ASSEMBLY VIEWS

FRONT BRAKE SYSTEM ASSEMBLY VIEW

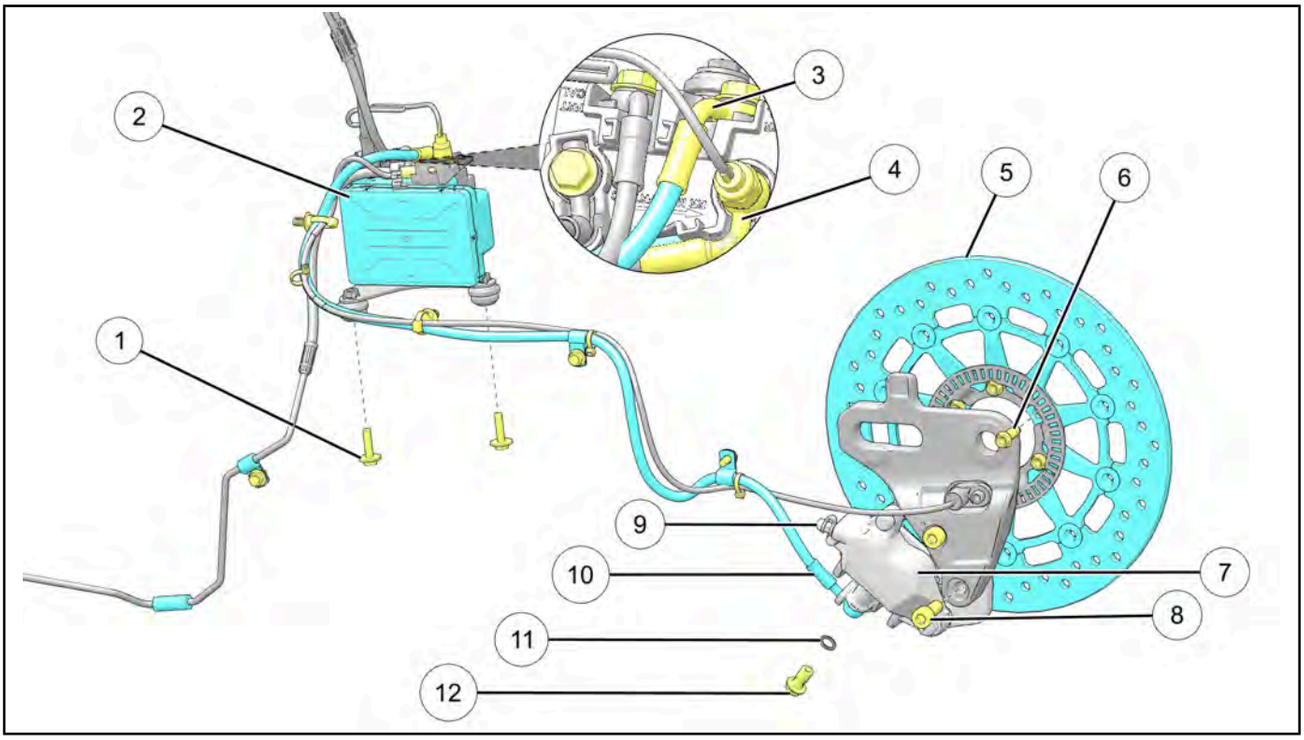


① Rotor Screw **22 ft-lbs (30 N·m)**	⑦ Banjo Bolt **18 in-lbs (24 N·m)**
② Rotor Bushing	⑧ Copper Washer
③ Rotor Washer	⑨ Banjo Fitting
④ Brake Rotor	⑩ Brake Caliper
⑤ Brake Line	⑪ Brake Caliper Fastener (Front) **36 ft-lbs (48 N·m)**
⑥ Bleed Screw **80 in-lbs (9 N·m)**	

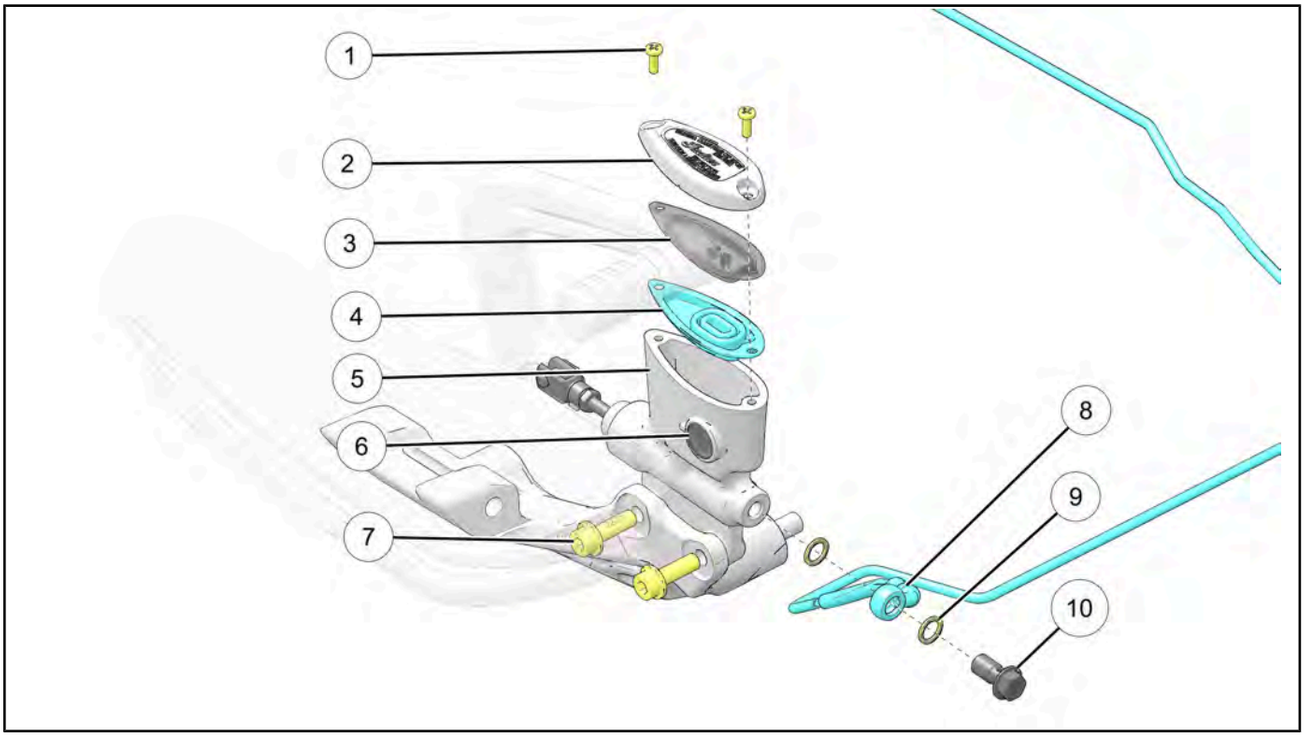


① Master Cylinder Cover Fastener (Front) **13 in-lbs (1.5 N·m)**	⑧ Copper Washer
② Front Master Cylinder Cover	⑨ Master Cylinder Banjo Fastener **18 ft-lbs (24 N·m)**
③ Diaphragm Plate	⑩ Master Cylinder Clamp Fastener (Front) **96 in-lbs (11 N·m)** Torque Upper fastener, then lower.
④ Rubber Diaphragm	⑪ Master Cylinder Clamp
⑤ Master Cylinder	⑫ Brake Lever Pivot Nut (Front) **52 in-lbs (6 N·m)**
⑥ Sight Glass	⑬ Front Brake Lever
⑦ Front Brake Line	⑭ Brake Lever Pivot (Front) **9 in-lbs (1 N·m)**

REAR BRAKE SYSTEM ASSEMBLY VIEW



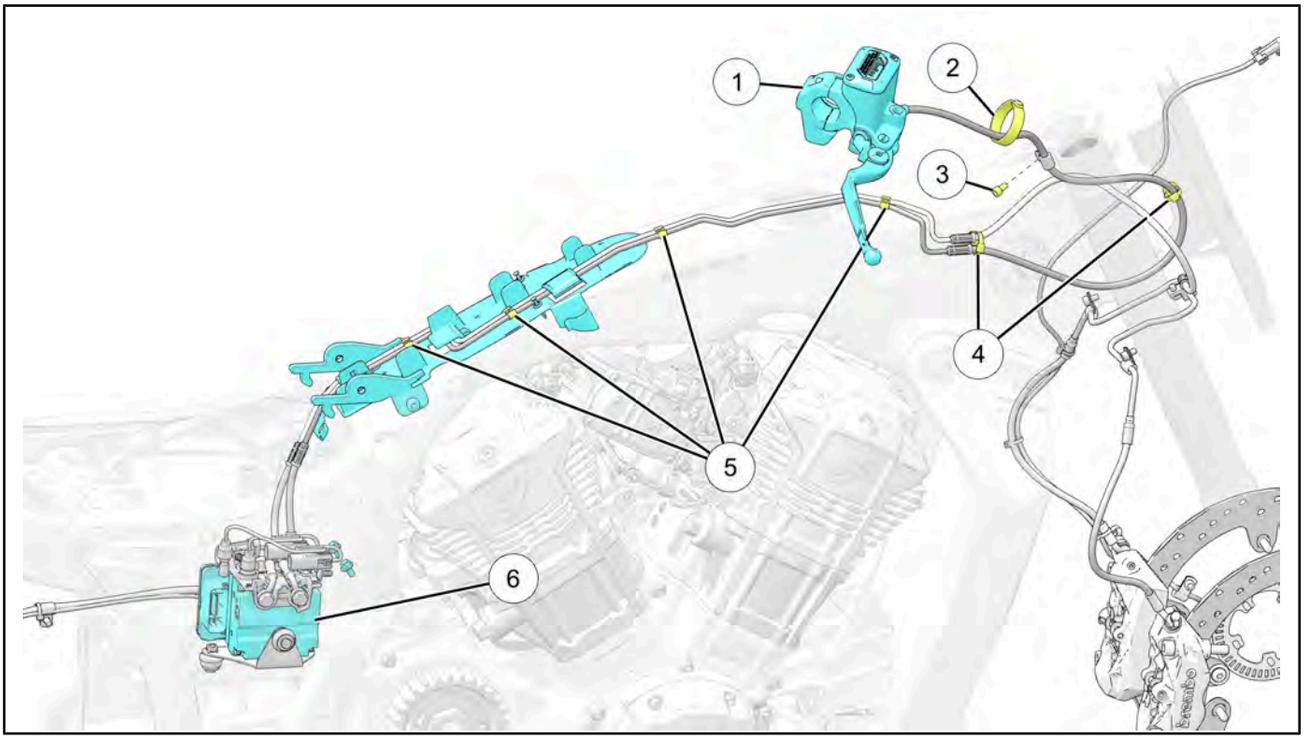
① ABS Module Bracket Fastener **88 in-lbs (10 N·m)**	⑦ Rear Brake Caliper
② ABS Module	⑧ Brake Caliper Fastener (Rear) **31 ft-lbs (42 N·m)**
③ Banjo Bolt **18 in-lbs (24 N·m)**	⑨ Bleed Screw **53 in-lbs (6 N·m)**
④ Brake Pressure Sensor Fitting **18 in-lbs (24 N·m)**	⑩ Banjo Fitting
⑤ Brake Rotor	⑪ Copper Washer
⑥ Brake Rotor Screw (Rear) **22 ft-lbs (30 N·m)**	⑫ Banjo Bolt **18 in-lbs (24 N·m)**



① Master Cylinder Cover Fastener (Rear) **13 in-lbs (1.5 N·m)**	⑥ Sight Glass
② Master Cylinder Cover (Rear)	⑦ Master Cylinder Fastener (Rear) **18 ft-lbs (24 N·m)**
③ Diaphragm Plate	⑧ Brake Line
④ Rubber Diaphragm	⑨ Copper Washer
⑤ Master Cylinder	⑩ Master Cylinder Banjo Bolt **18 ft-lbs (24 N·m)**

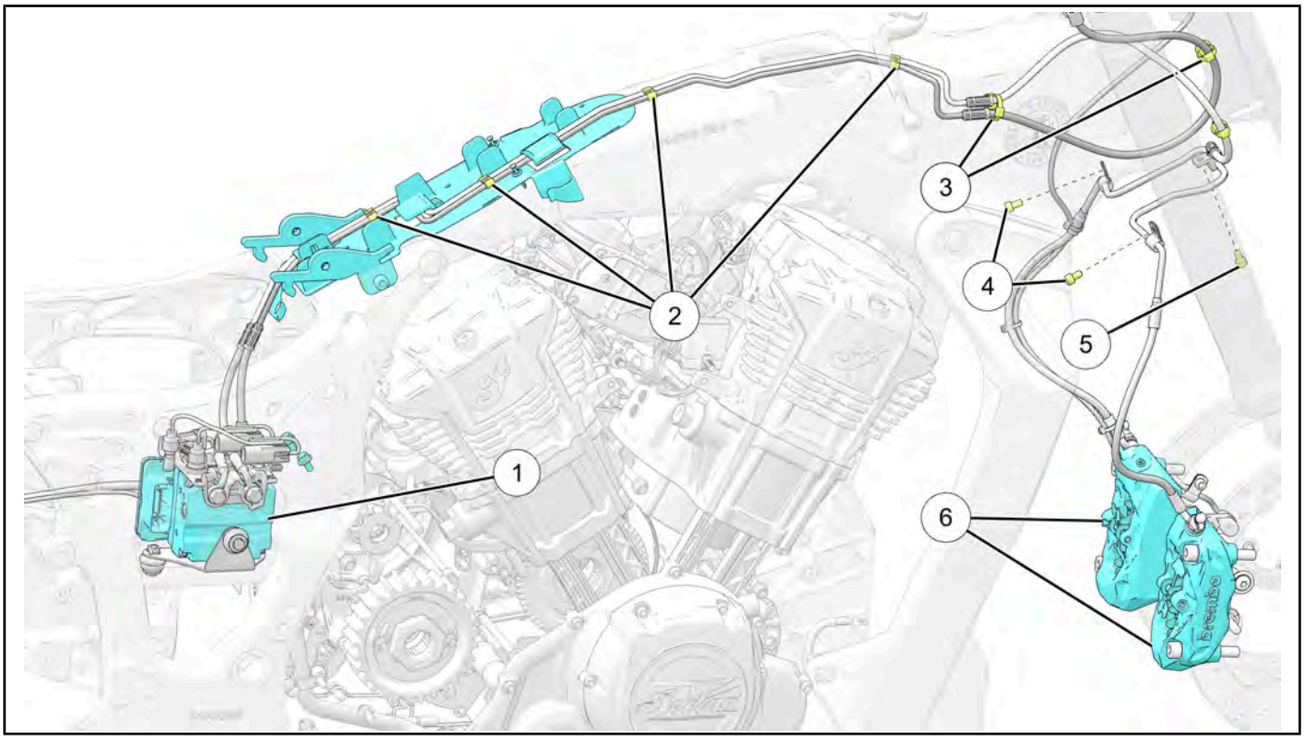
BRAKE LINE ROUTING

FRONT MASTER CYLINDER TO ABS MODULE



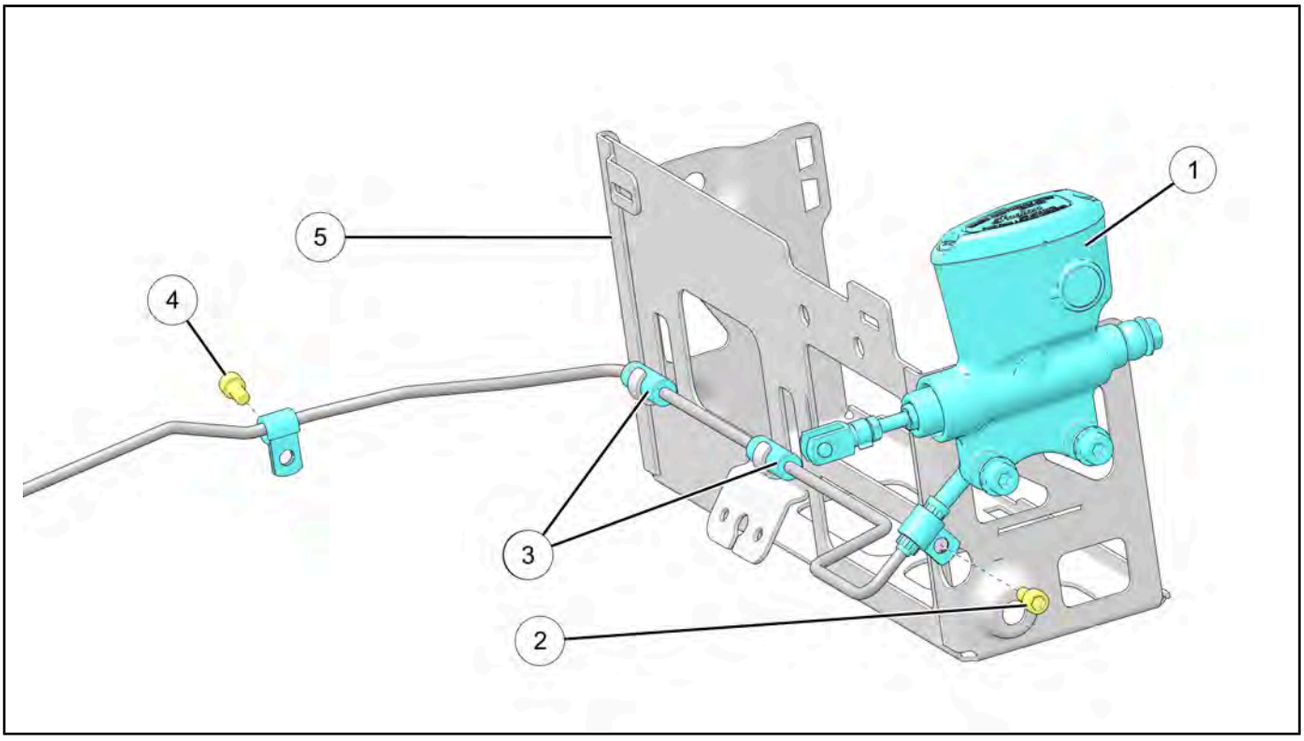
① Front Master Cylinder	④ Routing Clip
② Rubber Strap	⑤ Retention Clip
③ P-Clamp Fastener **88 in-lbs (10 N·m)**	⑥ ABS Module

ABS MODULE TO FRONT BRAKE CALIPER



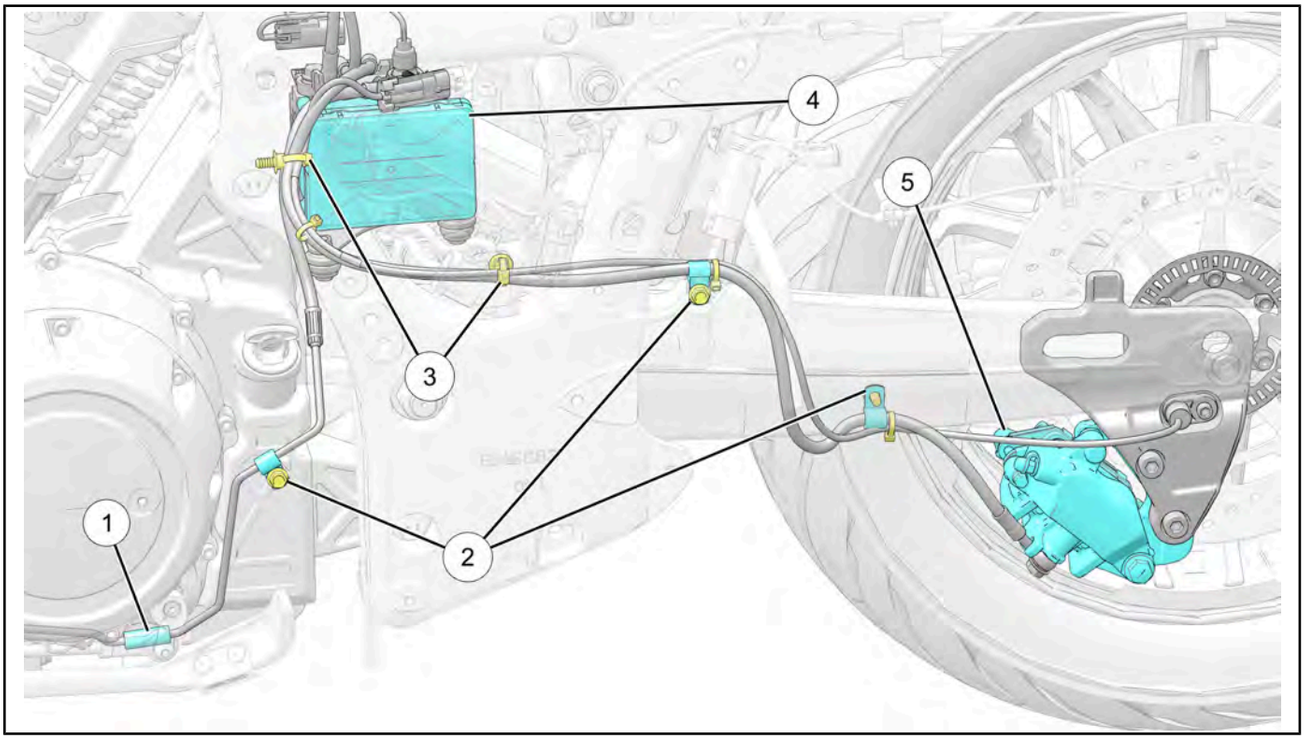
① ABS Module	④ P-clamp Fastener **88 in-lbs (10 N·m)**
② Retention Clip	⑤ Junction Block Fastener **88 in-lbs (10 N·m)**
③ Routing Clip	⑥ Front Brake Calipers

REAR MASTER CYLINDER



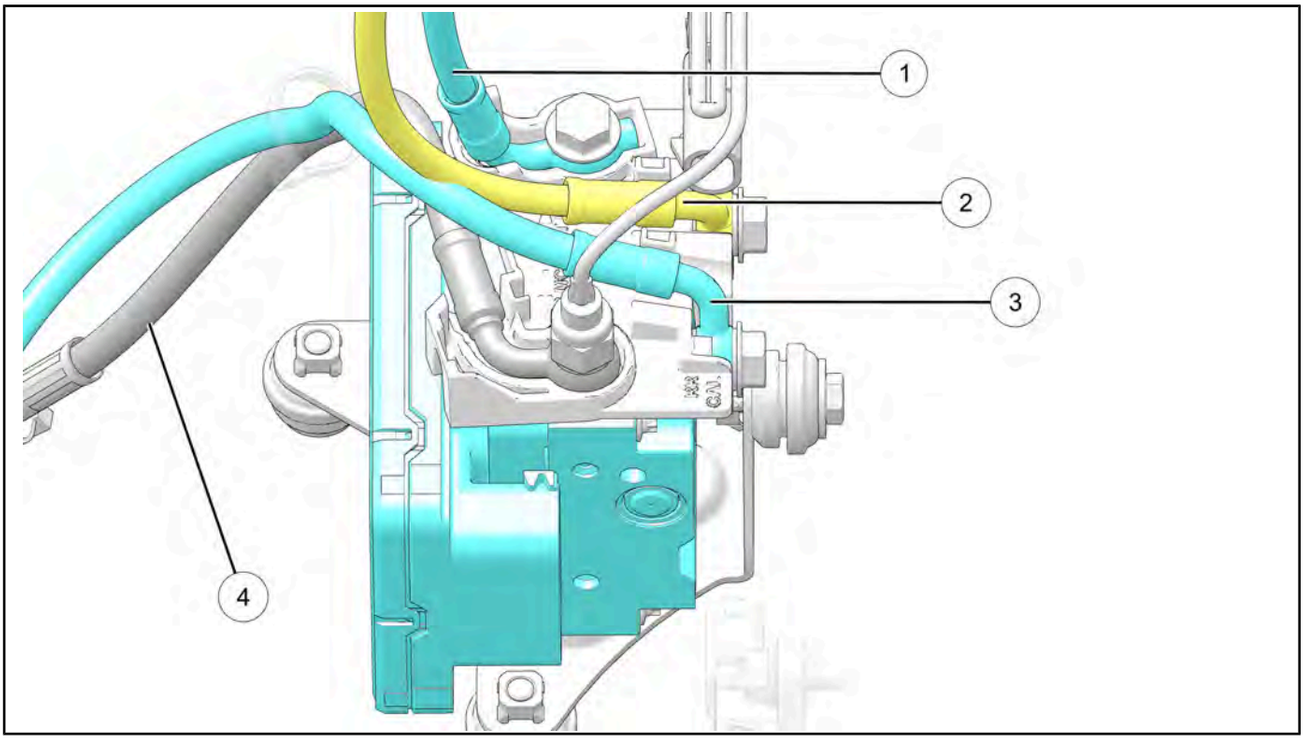
① Master Cylinder	④ Side Stand Switch Fastener **88 in-lbs (10 N·m)**
② P-Clamp Fastener **44 in-lbs (5 N·m)**	⑤ Battery Box
③ Isolator	

REAR MASTER CYLINDER TO ABS MODULE / ABS MODULE TO REAR CALIPER



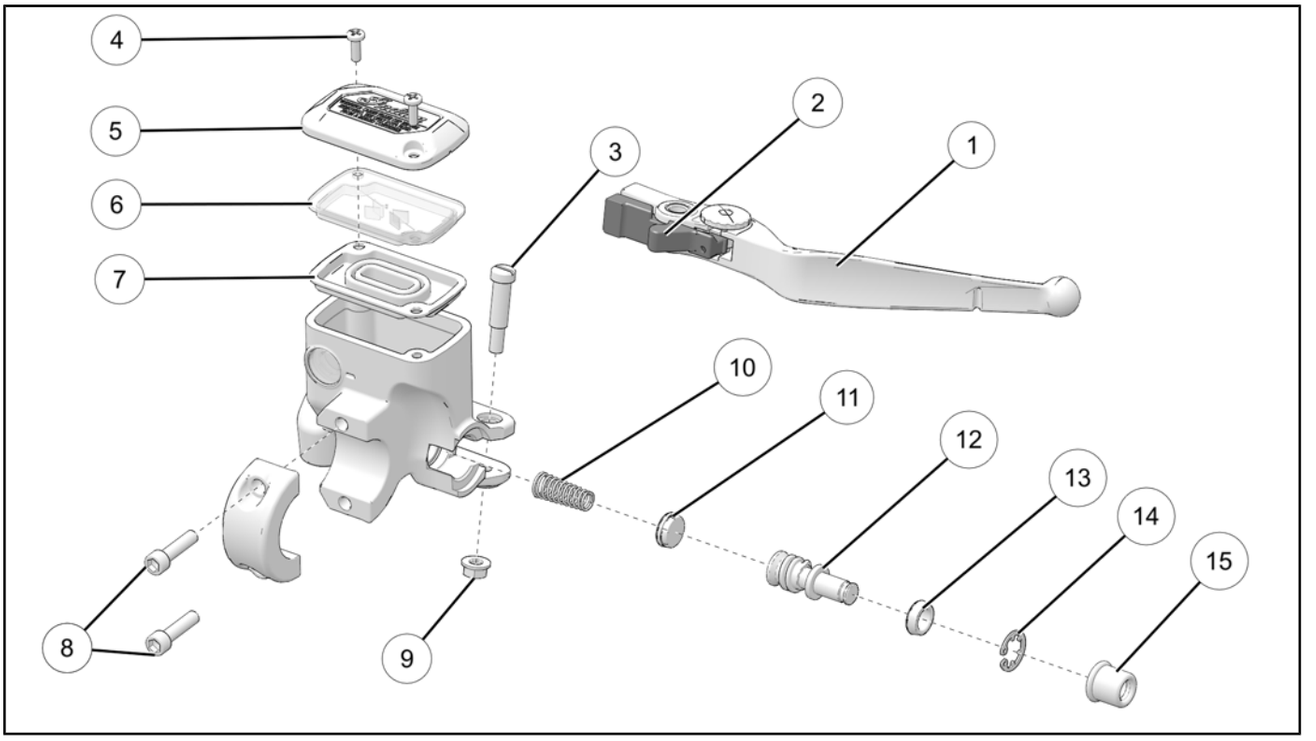
① Isolator	④ ABS Module
② Routing Retention Fastener **88 in-lbs (10 N·m)**	⑤ Brake Caliper
③ Fir Tree Clip	

ABS MODULE BRAKE LINE ORIENTATION



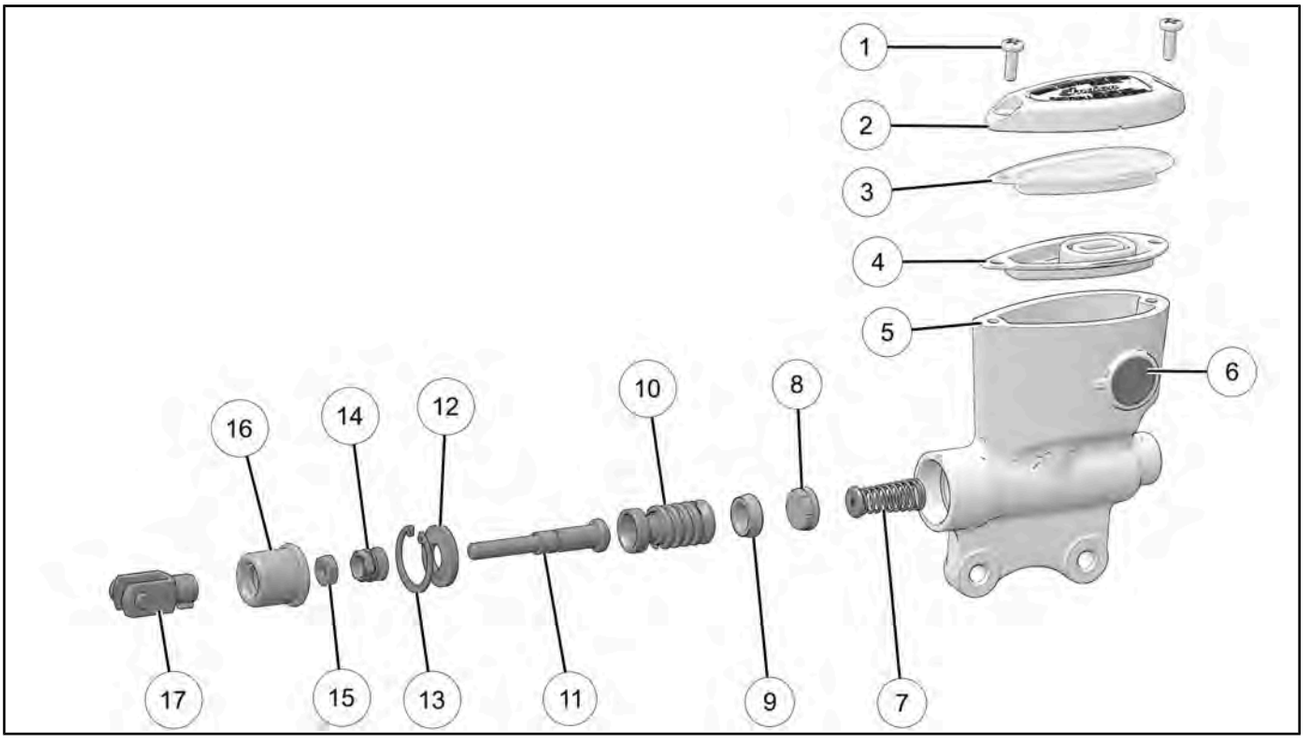
① Front Master Cylinder Brake Line	③ Rear Brake Caliper Line
② Front Caliper Brake Line	④ Rear Master Cylinder Line

FRONT MASTER CYLINDER ASSEMBLY VIEW



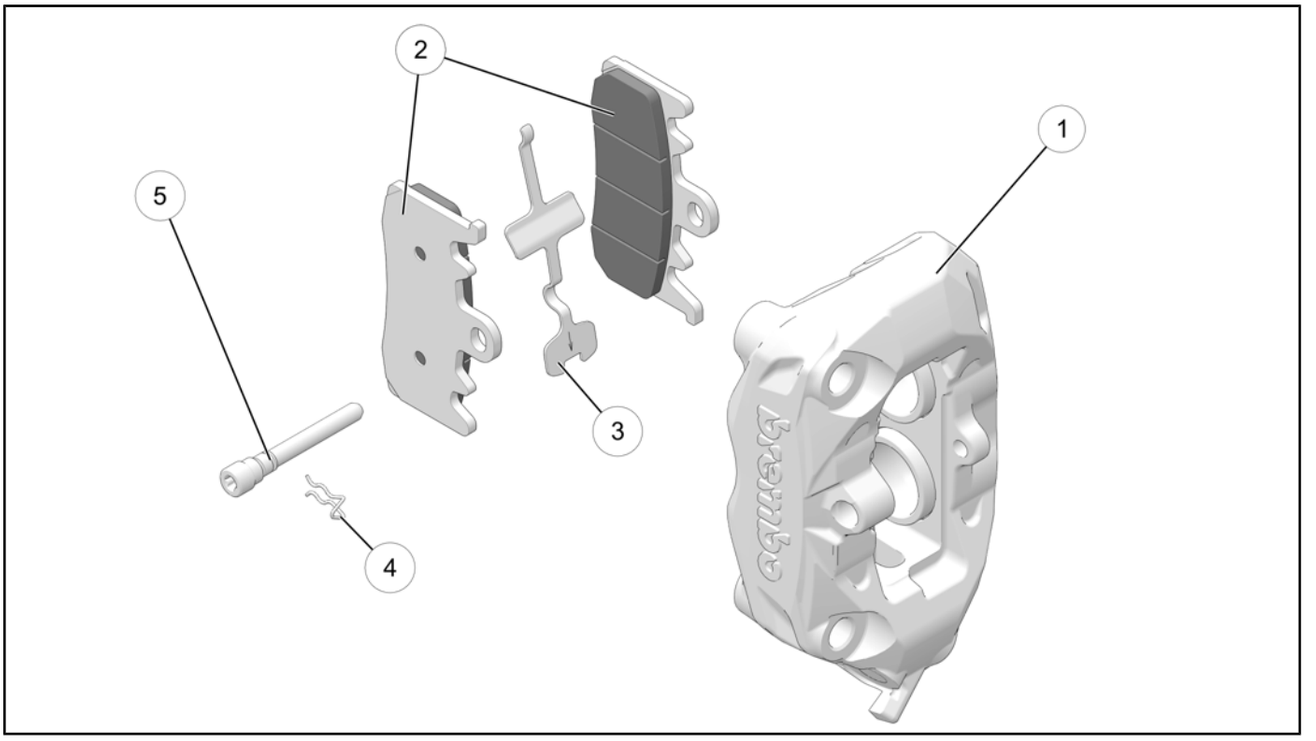
① Brake Lever	⑨ Brake Lever Pivot Nut (Front) **52 in-lbs (6 N·m)**
② Brake Lever Adjuster	⑩ Piston Return Spring
③ Brake Lever Pivot Pin (Front) **9 in-lbs (1 N·m)**	⑪ Primary Cup
④ Master Cylinder Cover Fastener (Front) **13 in-lbs (1.5 N·m)**	⑫ Piston
⑤ Front Master Cylinder Cover	⑬ Secondary Cup
⑥ Diaphragm Plate	⑭ Circlip
⑦ Rubber Diaphragm	⑮ Boot
⑧ Master Cylinder Clamp Fastener (Front) **96 in-lbs (11 N·m)** (Torque Upper Fastener First)	

REAR MASTER CYLINDER ASSEMBLY VIEW



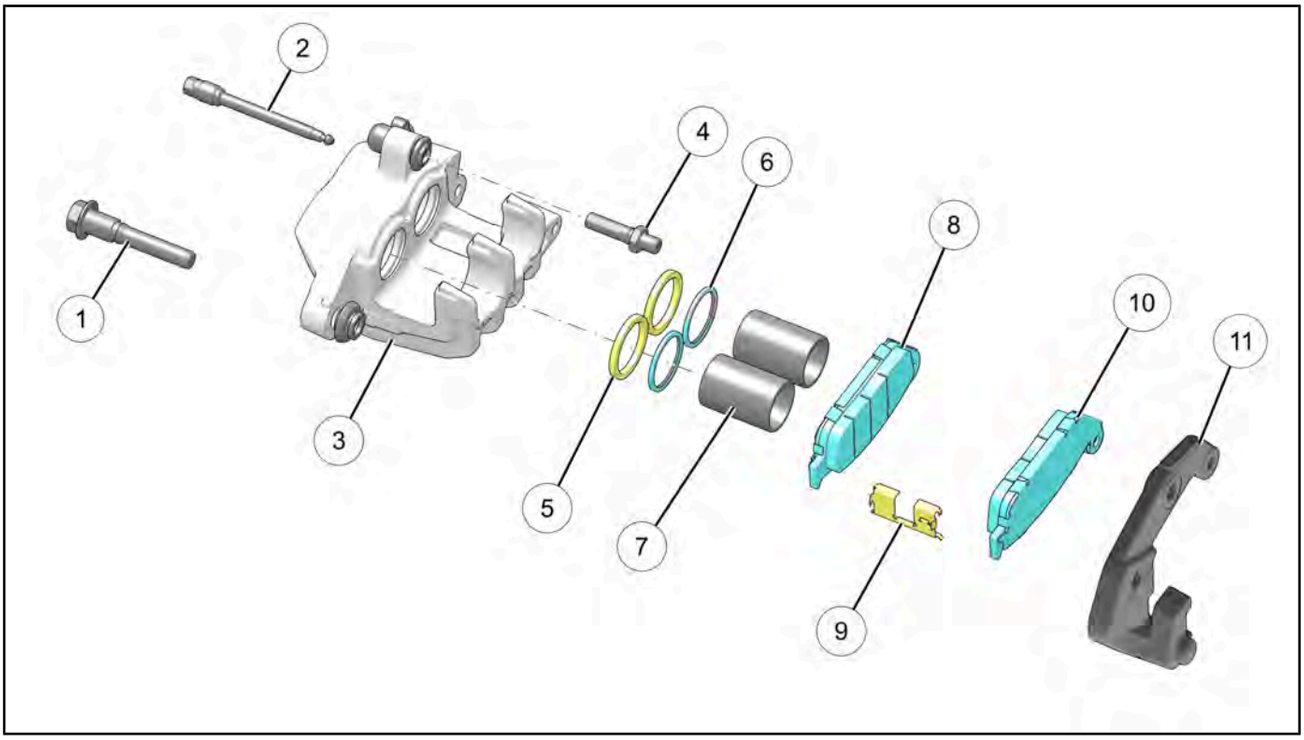
① Master Cylinder Cover Fastener (Rear) **13 in-lbs (1.5 N·m)**	⑩ Piston
② Master Cylinder Cover (Rear)	⑪ Pushrod
③ Diaphragm Plate	⑫ Washer
④ Rubber Diaphragm	⑬ Snap Ring
⑤ Master Cylinder	⑭ Collar
⑥ Sight Glass	⑮ Pushrod Nut **53 in-lbs (6 N·m)**
⑦ Piston Return Spring	⑯ Boot
⑧ Primary Cup	⑰ Clevis
⑨ Secondary Seal	

FRONT BRAKE CALIPER ASSEMBLY VIEW



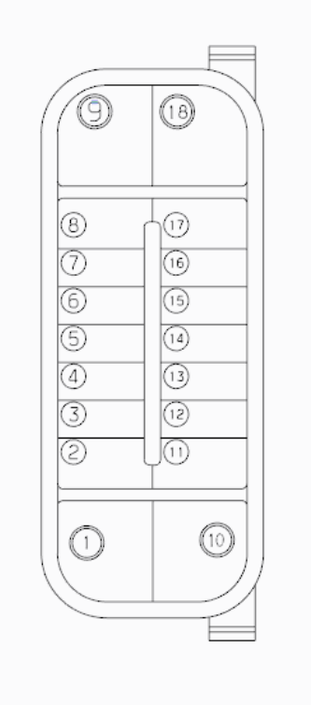
① Caliper Body	④ Pin Clip
② Brake Pads (shims not shown)	⑤ Brake Pad Retaining Pin **53 in-lbs (6 N·m)**
③ Pad Spring	

REAR BRAKE CALIPER ASSEMBLY VIEW



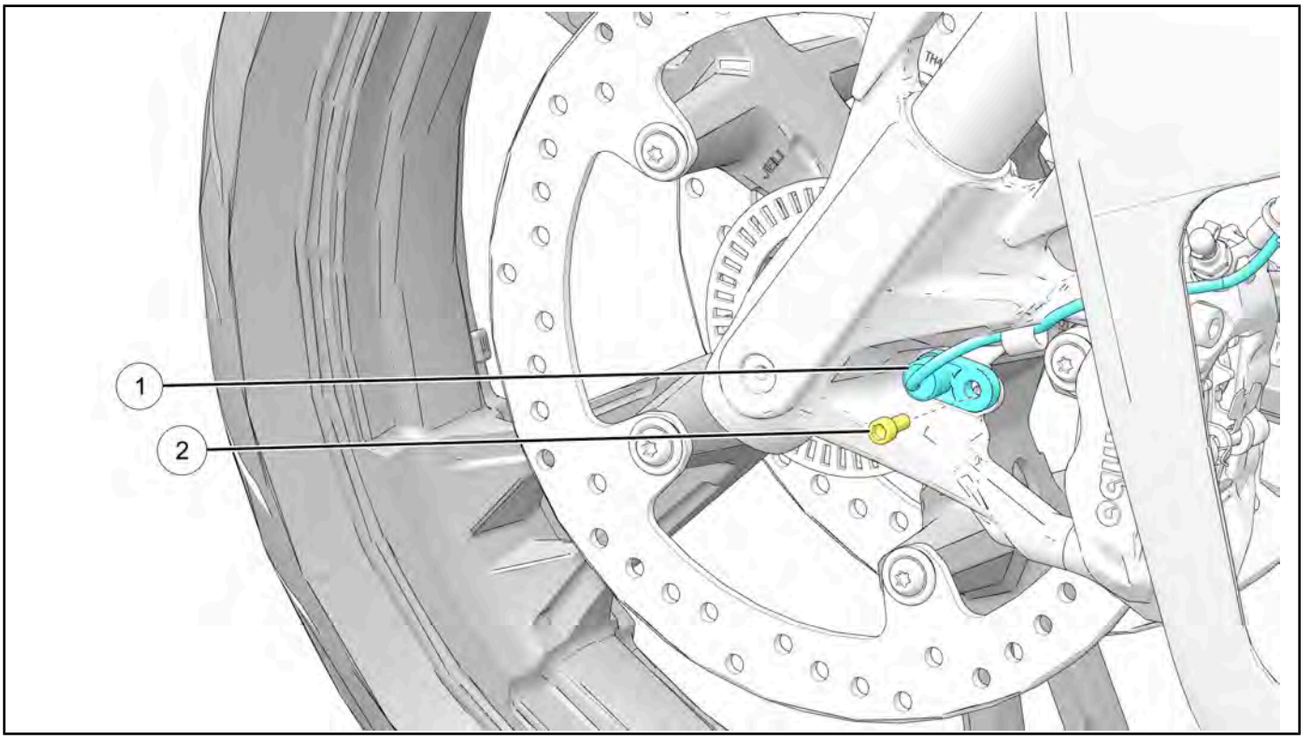
① Caliper Retainer Fastener **20 ft-lbs (27 N·m)**	⑦ Piston
② Brake Pad Retaining Pin (Rear) **150 in-lbs (17 N·m)**	⑧ Brake Pad, Outboard
③ Caliper Body	⑨ Pad Spring
④ Guide Pin **106 in-lbs (13 N·m)**	⑩ Brake Pad, Inboard
⑤ Piston Seal	⑪ Carrier, Caliper
⑥ Dust Seal	

ABS MODULE



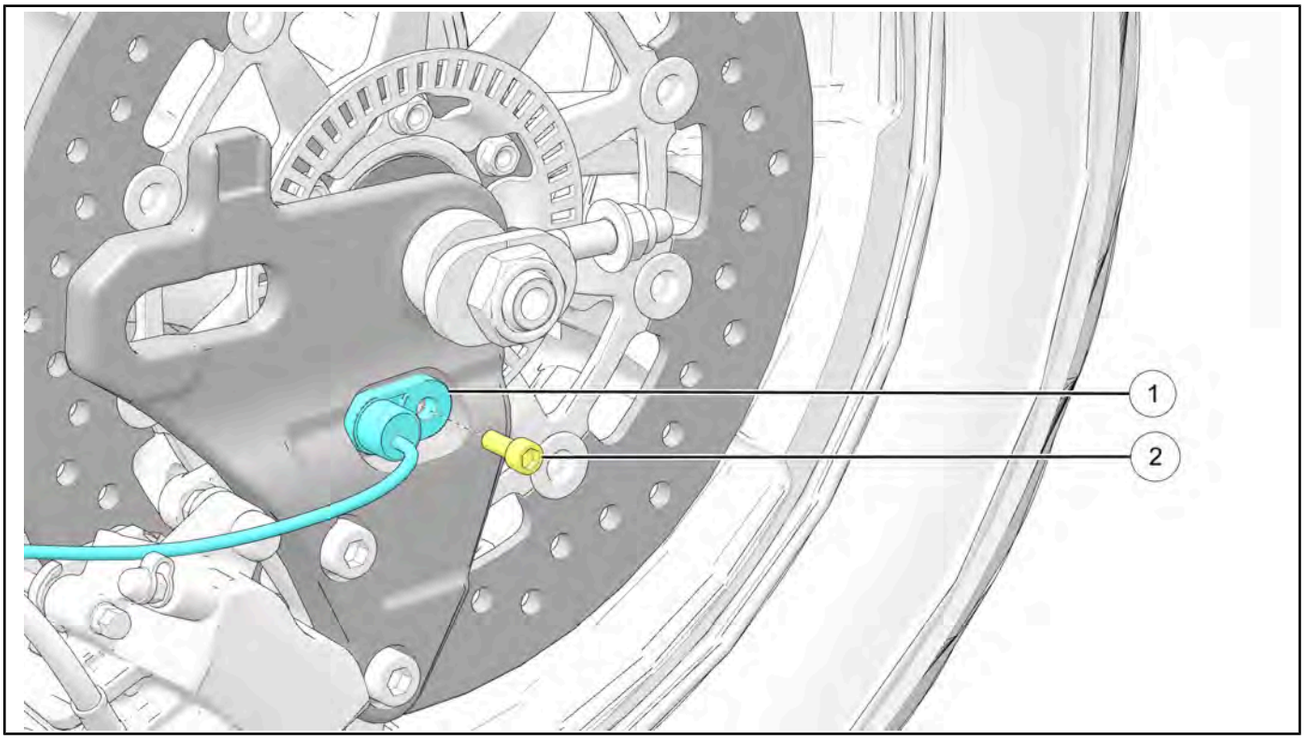
PIN	DESCRIPTION	PIN	DESCRIPTION
1	Ground for ECU	10	Ground for Motor
2	CAN High	11	CAN Low
3	Front Wheel Speed Sensor Signal	12	Front Wheel Speed Sensor Voltage
4	Ignition	13	Rear Wheel Speed Sensor Voltage
5	–	14	Rear Wheel Speed Sensor Signal
6	–	15	–
7	–	16	–
8	–	17	–
9	Voltage Supply ECU	18	Voltage Supply Motor

WHEEL SPEED SENSOR, FRONT



① Wheel Speed Sensor	② Wheel Speed Sensor Fastener **88 in-lbs (10 N·m)**

WHEEL SPEED SENSOR, REAR



① Wheel Speed Sensor	② Wheel Speed Sensor Fastener **88 in-lbs (10 N·m)**

ANTI-LOCK BRAKES SYSTEM (ABS) SERVICE

ABS SYSTEM SAFETY PRECAUTIONS

Before working on an Indian Motorcycle equipped with anti-lock brakes, review and understand all general brake system, brake fluid, and ABS specific precautions and system information. Do not attempt maintenance or repair of the anti-lock brake system without the proper tools.

⚠ WARNING

Proper brake system bleeding is extremely important to ensure adequate lever reserve in the system. Always perform the **Brake Lever Reserve Inspection page 9.43** test after bleeding the anti-lock brake system.

- Operating with non-recommended tires or improper tire pressure may reduce the effectiveness of the anti-lock brake system.
- Always install the recommended size and type of tires specified for the vehicle.
- Always maintain the recommended tire pressure.
- Indian Motorcycle DOT 4 Brake Fluid is required. Change every 10,000 miles (16,000 km) or 2 years, whichever comes first.
- The anti-lock brake system will not prevent wheel lock-up, loss of traction, or loss of control *under all conditions*. Always adhere to all safe motorcycle riding practices as recommended.
- It is not unusual to leave tire marks on the road surface during a hard braking event.
- The anti-lock braking system does not compensate for or reduce the risk associated with:
- Excessive speed
- Reduced traction on rough, uneven or loose surfaces
- Poor judgement
- Improper operation

ABS GENERAL INFORMATION

The Anti-Lock Brake System is a safety feature designed to prevent wheel lock-up and improve control of the motorcycle during extreme braking events, including:

- Panic braking
- Slick surface braking (such as wet road surfaces)
- Surface transitions (from asphalt to oily asphalt or cobblestone, etc.)

Here are a few general points to note about ABS:

- The anti-lock brake system cannot be turned OFF.
- The ABS indicator lamp (located on the Instrument Cluster) will flash slowly when the key is in the ON position and will continue to do so until the anti-lock system becomes available, which occurs when vehicle speed exceeds 3 mph (5 kph).
- If the lamp is not illuminated or illuminated on solid when the key is ON, connect Digital Wrench and perform an ABS System inspection to determine the cause.
- When the ABS lamp is illuminated or flashing slowly, the anti-lock brakes will not activate, but the conventional brake system will continue to operate normally.
- If the lamp continues to flash slowly after the vehicle speed exceeds 3 mph (5 kph), the system is not functioning. Connect Digital Wrench and perform an ABS System inspection to determine the cause.
- When the anti-lock brakes engage during a braking event, the rider will feel pulsing at the brake lever or pedal. *Continue to apply steady pressure to the brakes for the best stopping performance*.
- The wheel speed sensor-to-pulse ring air gap is adjustable.
- The ABS system *can* be reprogrammed.
- The ABS light is controlled via CAN BUS.
- Wheel speed sensors provide feedback for both anti-lock brake operation and vehicle road speed.
- If the fuse is open or removed, the ABS light will remain ON. ABS will not be available. Normal (conventional) braking will be available provided the system components (master cylinder, lines, calipers, etc.) are in working order.

ABS SYSTEM COMPONENTS

- Front Brake Calipers
- Rear Brake Caliper
- Front Master Cylinder
- Rear Master Cylinder
- Brake Light Switch
- Brake Lines
- Wheel Speed Sensors (mounted to the forks in the front and rear caliper bracket in the rear)
- Wheel Speed Sensor Pulse Rings (bolted to the wheels)
- ABS Module Assembly
- ABS Related Wiring
- ABS Indicator Lamp

ABS OVERVIEW OF OPERATION

The ABS system is active and available when vehicle speed exceeds 3 mph (5 kph).

The system uses two independent Hall-Effect *Wheel Speed Sensors*. The front sensor is fastened to the forks and the rear sensor is fastened to the rear caliper bracket. Two *Pulse Rings* are also used, which are bolted to the wheels. When the vehicle is in motion, the multiple reluctor segments on each pulse ring pass by the center pole of the respective wheel speed sensor, generating an electrical pulse signal in the sensor which is sent to the *ABS Module* which is located in front of the rear wheel.

The ABS Module interprets wheel speed signal pulses to determine speed, rate-of-change, and front / rear wheel speed differential to determine if wheel lock-up is about to occur. When wheel lock-up is imminent during a braking event, the ABS Module controls the operation of solenoids and a pressure pump (located inside the *ABS Module)* to regulate the amount of line pressure and cycles (length of time) applied to the caliper pistons and brake pads. This pressure / time modulation can often be felt at the brake lever or the brake pedal during an ABS braking event and is a normal condition. Note that the brake fluid is not diverted inside the module and does not “flow” in the system any more than occurs in a conventional (non-ABS) brake system.

If the surface coefficient changes (such as moving from wet pavement to dry pavement) the ABS system will recalculate (in a matter of milliseconds) and adjust pressure output to caliper(s) as required.

In the event of a system fault, the ABS module turns on the ABS indicator lamp (via the CAN BUS).

If a system fault occurs, the light will remain on (and ABS will not be available) until the ignition key is turned to OFF position and back to ON.

The ABS Module Assembly is serviceable only as an assembly. The module itself is not rebuildable.

Disconnect negative (-) battery cable from battery before servicing ABS brake lines or system components.

ABS TROUBLE CODES

Fault Code	FTB	Fault Name	Fault Setting Condition	Service Action
C2437	04	Control unit failure	ABS Module shall monitor internal Microcontroller and Peripheral Integrated Circuits. If the ABS determines these components have failed a fault shall be set.	Replace ABS module.
C2420	09	Valve relay failure	Valve Relay IC is determined to be Failed due to circuit level faults	Replace ABS module.
C1326	09	front inlet valve failure	Front Inlet Valve is determined to be Failed	Replace ABS module.
C1330	09	rear inlet valve failure	Rear Inlet Valve is determined to be Failed	Replace ABS module.
C1327	09	front outlet valve failure	Front Outlet Valve is determined to be Failed	Replace ABS module.
C1332	09	rear outlet valve failure	Rear Outlet Valve is determined to be Failed	Replace ABS module.
C062D	09	HSV/USV valve failure	HPS valve is determined to be Failed	Replace ABS module.
C2421	A3	Battery over-voltage fault	ABS Source voltage is high above 16.5V	Check input voltage or charging system.
C2421	A2	Battery under-voltage fault	ABS Source voltage is low below 8.5V	Check input voltage or battery health.
C1038	A3	Net over voltage	Battery Voltage of the ABS is greater than 16.5 v for more than 70ms	Check input voltage or charging system.
C1038	A2	Net under voltage	Battery Voltage of the ABS is less than 8.5V for more than 70ms and the Vehicle Speed is greater than 6kph	Check input voltage or battery health.
C101C	07	Pump motor failure	Hardware Level Failures detected with ABS Pump Motor	Replace ABS module.

C2425	1C	Pump motor supply Fault	Abnormal Motor Voltages, Faulty Motor relay, Overheat of motor, Abnormal Pump motor feedback voltage.	Check input voltage.
C05AE	05	Pump motor calibration fault	ABS has not be flashed after hydraulic unit change	Update ABS module, perform ABS replacement procedure or replace ABS module.
C1031	12	Front WSS HW failure	Voltage on the Front Wheel Sensor Signal Line is above threshold	Replace front WSS.
C003D	12	Rear WSS HW failure	Voltage on the Rear Wheel Sensor Signal Line is above threshold.	Replace rear WSS.
C1031	29	Front WSS plausibility failure	Failure is set if the Front Wheel Speed is detected to be in Standstill or detected to have Wheel Speed less than 5% compare to the Rear Wheel Speed Sensor for a period of 60sec.	Inspect front WSS functionality and hardware or replace front WSS.
C003D	02	Rear WSS plausibility failure	Failure is set if the Rear Wheel Speed is detected to be in Standstill or detected to have Wheel Speed less than 5% compare to the Front Wheel Speed Sensor for a period of 60 sec.	Inspect rear WSS functionality and hardware or replace rear WSS.
C1031	64	Front WSS noise suspicious failure front and Rear	1.High frequency received (defined max. speed+150Hz) 2 High wheel acceleration (980m/s2) 3 High gradient of edges from the impulse wheel at low speed (>3edges/5ms) 4 High frequent and intense signal dynamic (500m/s2)	Inspect front WSS functionality and hardware or replace front WSS.

C003D	64	Rear WSS noise suspicious failure front and Rear	1.High frequency received (defined max. speed+150Hz) 2 High wheel acceleration (980m/s2) 3 High gradient of edges from the impulse wheel at low speed (>3edges/5ms) 4 High frequent and intense signal dynamic (500m/s2)	Inspect rear WSS functionality and hardware or replace rear WSS.
C1031	11	WSS generic failure	Voltage on the Front Wheel Sensor Supply /Signal Line is below threshold	Replace front WSS.
C10E7	04	Front Master cylinder pressure sensor hardware failure	Fault with the pressure sensor hardware, Communication fault	Replace ABS module.
C10F2	04	Front wheel caliper pressure sensor hardware failure	Fault with the pressure sensor hardware, Communication fault	Replace ABS module.
C10F0	04	Rear Master cylinder pressure sensor hardware failure	Fault with the pressure sensor hardware, Communication fault	Replace ABS module.
C10F4	04	Rear wheel caliper pressure sensor hardware failure	Fault with the pressure sensor hardware, Communication fault	Replace ABS module.
C10F6	67	Front Master cylinder pressure sensor offset/test pulse power-on failure	Pressure sensor offset out of range	Clear fault and cycle ignition, if fault returns replace ABS module.
C10F2	67	Front wheel caliper pressure sensor offset/test pulse power-on failure	Pressure sensor offset out of range	Clear fault and cycle ignition, if fault returns replace ABS module.
C10F0	67	Rear Master cylinder pressure sensor offset/test pulse power-on failure	Pressure sensor offset out of range	Clear fault and cycle ignition, if fault returns replace ABS module.

C10F4	67	Rear wheel caliper pressure sensor offset/test pulse power-on failure	Pressure sensor offset out of range	Clear fault and cycle ignition, if fault returns replace ABS module.
C0044	64	Front brake circuit pressure sensor plausibility failure	The pressure sensor signal is monitored for interference and signal disturbance like: 1. Non-plausible positive and negative pressure gradients 2. Non-plausible positive and negative pressure values 3. Non-plausible MC and WC pressure values on a brake circuit	Clear fault and cycle ignition, if fault returns replace ABS module.
C0045	64	Rear brake circuit pressure sensor plausibility failure	The pressure sensor signal is monitored for interference and signal disturbance like: 1. Non-plausible positive and negative pressure gradients 2. Non-plausible positive and negative pressure values 3. Non-plausible MC and WC pressure values on a brake circuit	Clear fault and cycle ignition, if fault returns replace ABS module.
C0597	09	CAN bus off failure / CAN controller generic HW failure	CAN Wire short.	Check electrical / CAN connection to ABS module or replace ABS module.
U0100	87	ECM CAN communication timeout fault	Communication between ABS and ECM is lost.	Check connection with ECM module.
U0100	81	ECM CAN communication DLC fault	ECM is transmitting incorrect DLC(Data length) in the CAN frames.	Check connection with ECM module.
U0100	41	ECM CAN communication checksum fault	ECM is transmitting incorrect checksum in the CAN frames.	Check connection with ECM module.
U0100	82	ECM CAN communication alive fault	ECM is transmitting incorrect alive counter in the CAN frames.	Check connection with ECM module.

U0100	02	ECM CAN communication invalid fault	ECM is transmitting incorrect signal values.	Check connection with ECM module or ECM faults.
U1057	87	LHC CAN communication timeout fault	Communication between ABS and LHC is lost.	Check connection with left hand control module.
U1057	81	LHC CAN communication DLC fault	LHC is transmitting incorrect DLC(Data length) in the CAN frames.	Check connection with left hand control module.
U1057	41	LHC CAN communication checksum fault	LHC module is transmitting incorrect checksum values.	Check connection with left hand control module.
U1057	82	LHC CAN communication alive fault	Alive counter value is not updating.	Check connection with left hand control module.
U1057	02	LHC CAN communication invalid fault	LHC is transmitting incorrect signal values.	Check connection with left hand control module.
U1055	87	Display CAN communication timeout fault	Communication between ABS and Display is lost.	Check connection with display.
U1055	81	Display CAN communication DLC fault	Display is transmitting incorrect DLC(Data length) in the CAN frames.	Check connection with display.
U1055	02	Display CAN communication invalid fault	Display is transmitting incorrect signal values.	Check connection with display.
C006A	87	IMU CAN communication timeout fault	Communication between ABS and IMU is Lost	Check connection with IMU.
C006A	81	IMU CAN communication DLC fault	ABS is receiving invalid data length (DLC)messages from IMU.	Check connection with IMU.
C006A	41	IMU CAN communication checksum fault	IMU is transmitting incorrect checksum values in the CAN frames.	Check connection with IMU.
C006A	82	IMU CAN communication alive fault	Alive counter values are not updating in the CAN frames	Check connection with IMU.
C006A	02	IMU Signal failures	ABS is receiving invalid signal values from IMU.	Inspect correct IMU assembly or replace IMU.
C006A	76	IMU wrong mounting failure	IMU not mounted properly.	Inspect correct IMU assembly.

C006A	64	IMU model monitoring	Raw signals are compared to the Physical model based values and if they are not in the limits this fault is triggered.	Inspect correct IMU assembly or replace IMU.
C1042	55	Evac & Fill failure	Evac and Fill routine is not performed or failed	Contact service representative.
C1111	55	Invalid Vehicle feature Configured	ABS Feature config memory objects are not written at EOL.	Reprogram ABS module or perform ABS replacement procedure.
C1082	55	Variant not configured	ABS variant is not written at EOL	Reprogram ABS module or perform ABS replacement procedure.
C1082	56	Variant out of range	Incorrect ABS variant is written at EOL	Reprogram ABS module or perform ABS replacement procedure.

ABS AND LOW BATTERY VOLTAGE

Possible Causes:

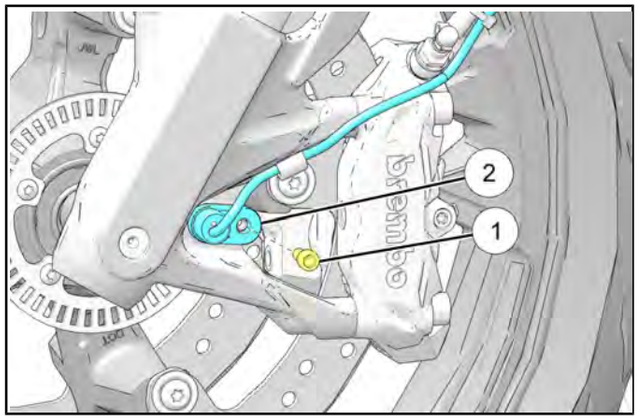
- Low battery voltage - particularly while engine is cranking
- CAN bus communication error between the ABS module and the ECM
- Both front and rear wheel speed sensors are faulty
- Faulty connection at ABS module
- ABS module not programmed (partial ECUID present in Digital Wrench)

When diagnosing this code, make sure the battery is fully charged and passes a load test prior to clearing and retesting.

WHEEL SPEED SENSOR REPLACEMENT

REMOVAL — FRONT

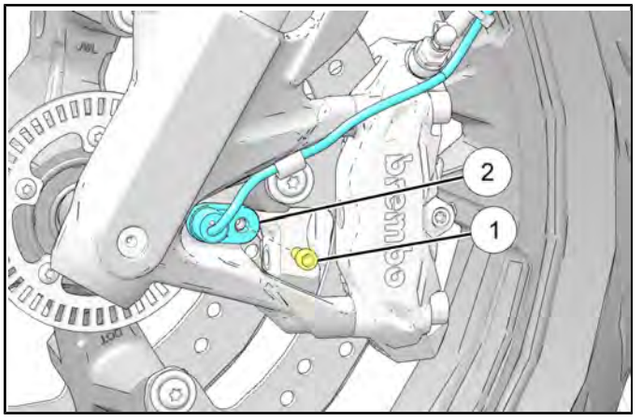
1. Remove the outer fairing to access the wheel speed sensor electrical connection. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37** or **Fairing Disassembly page 7.63**
2. Remove the wheel speed sensor fastener ①.



3. Disconnect the wheel speed sensor electrical connector from the fairing electrical harness.
4. Remove wheel speed sensor from fork leg.
5. Remove the p-clip from the back side of the left hand fork leg.

INSTALLATION — FRONT

1. Connect the wheel speed sensor electrical connector to the fairing electrical harness.
2. Install wheel speed sensor to fork leg.
3. Install the wheel speed sensor fastener ①.



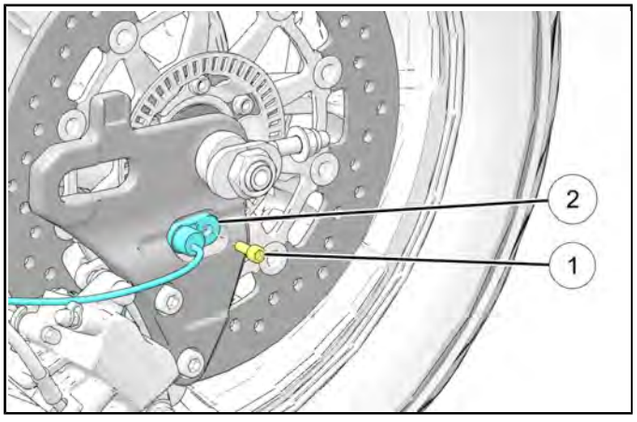
TORQUE
Wheel Speed Sensor Fastener **88 in-lbs (10 N·m)**

IMPORTANT
Inspect the Wheel Speed Sensor air gap. The gap must be between 0.8 and 2.0 mm.

4. Install the outer fairing. See **Fairing Assembly and Installation (Fork Mounted) page 7.49** or **Fairing Assembly and Installation (Chassis Mounted) page 7.75 (Chassis Mounted)**.

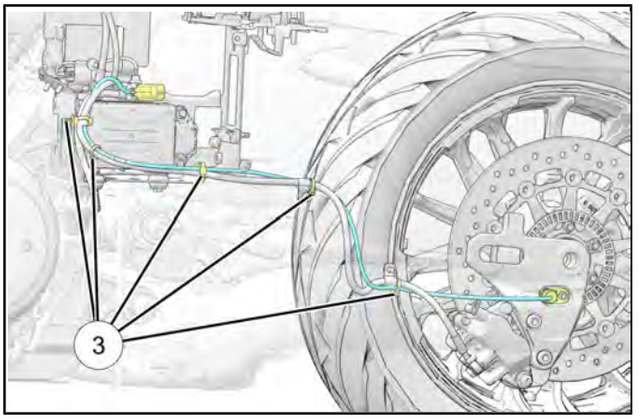
REMOVAL — REAR

1. Remove left hand saddlebag. Reference **Saddlebag Removal page 7.93**.
2. Remove wheel speed sensor fastener①.

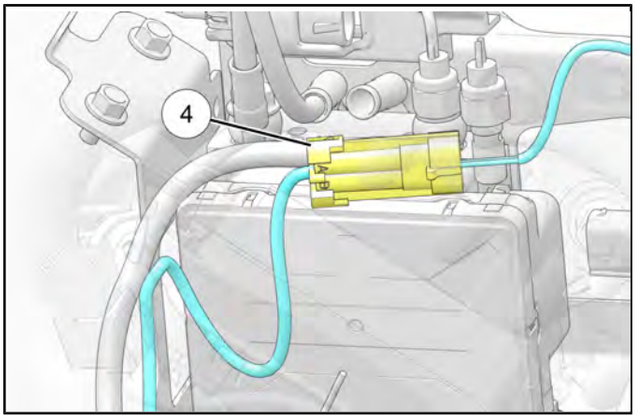


3. Disconnect the wheel speed sensor ②.

4. Remove the zip ties ③ and clips retaining the wheel speed sensor cable.



5. Disconnect the wheel speed sensor connector ④.



INSTALLATION — REAR

INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.

TORQUE
Wheel Speed Sensor Fastener **88 in-lbs (10 N·m)**

NOTICE
Inspect the wheel speed sensor air gap after replacement. The gap must be between 0.8 and 2.0 mm.

ABS MODULE REPLACEMENT

⚠ CAUTION

Brake fluid and brake cleaners could damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Be sure master cylinder reservoir is level before removing cover.

NOTICE

Do not disassemble the ABS module. The ABS module is serviceable only as a sealed (pre-bled) assembly. If ABS module has failed internally, replace complete assembly.

⚠ WARNING

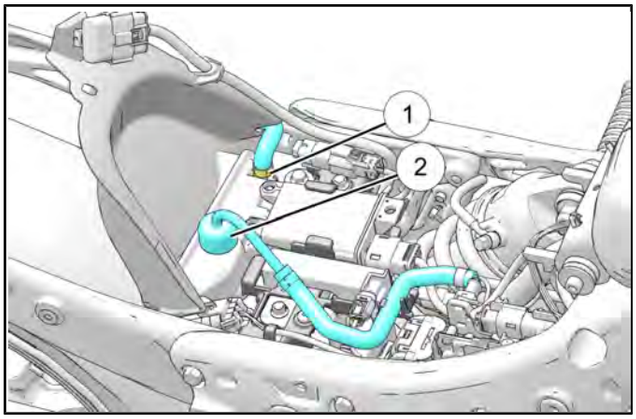
The hydraulic brake system MUST be completely bled following removal or replacement of the ABS module. Follow the brake bleeding procedure outlined in this chapter after ABS module service.

IMPORTANT

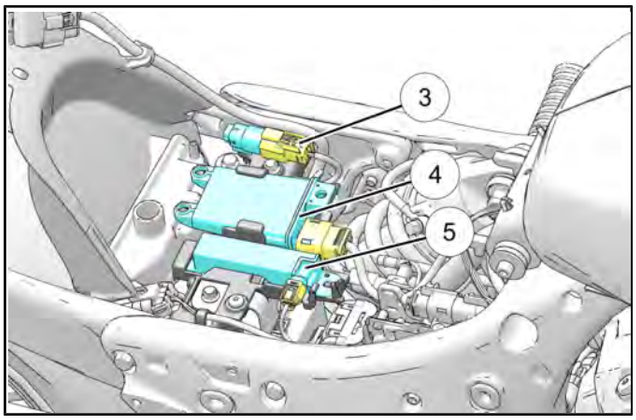
Due to the proximity of the ABS module fasteners, it is easier to remove by removing the module with the under-seat bracket.

REMOVAL

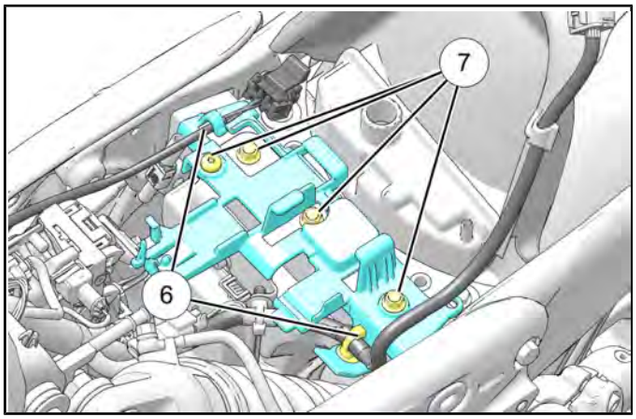
1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Disconnect the negative battery cable.
3. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
4. Remove ECM. See **ECM Removal page 4.63**.
5. Remove coolant overflow line ① and coolant pickup line ② from recovery bottle..



6. Disconnect electrical connection ③.



7. Disconnect WCM ④ electrical connector and remove.
8. Disconnect antenna module ⑤ electrical connector and remove.
9. Disconnect the wiring retained ⑥ to under-seat wire bracket.



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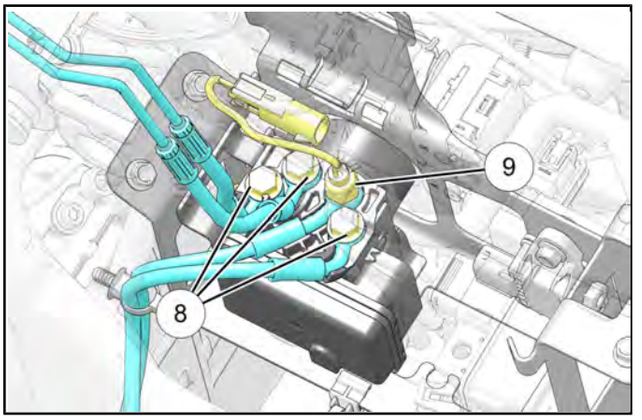
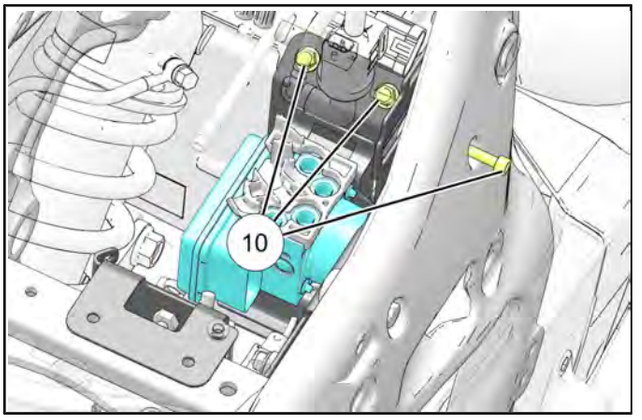
10. Remove under-seat wire bracket by removing its fasteners ⑦.
11. Remove the ABS module banjo fasteners ⑧ and pressure sensor ⑨.



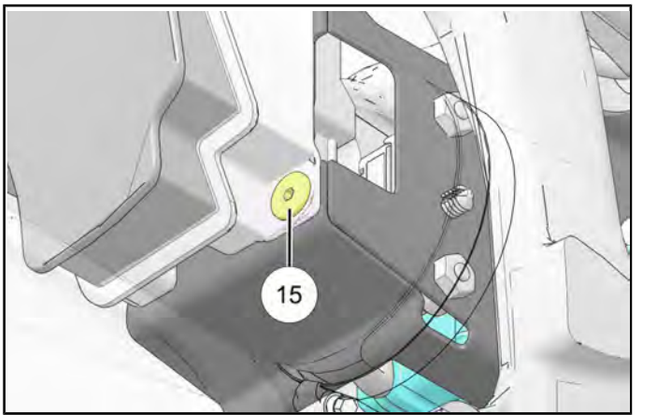
⚠ CAUTION

Failure to place brake lines in correct location on ABS module will result in adverse braking performance during an ABS event.

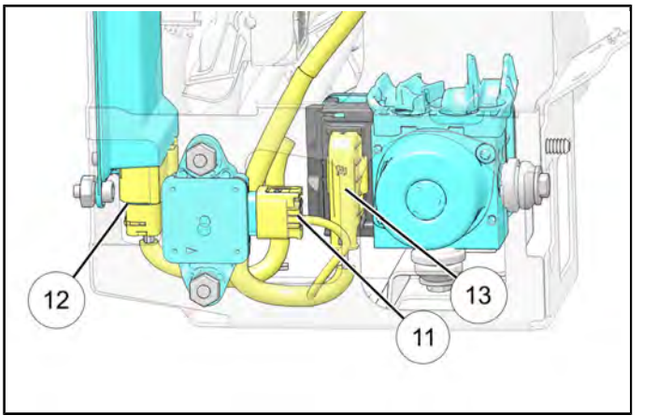
12. Remove fasteners ⑩ securing under-seat bracket.



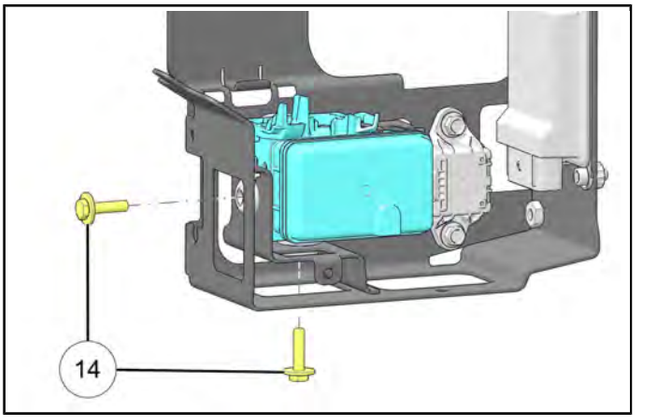
13. Remove fastener ⑮ from the rear of the ABS bracket.



14. While removing the under-seat bracket, disconnect the inertia sensor ⑪ and the VCM ⑫ and ABS module connector ⑬.



15. Remove the ABS module by removing its fasteners ⑭.



INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
ABS Mount Bracket Fastener (Allen): **88 in-lbs (10 N·m)**

TORQUE
ABS Mount Bracket Fastener (Hex): **84 in-lbs (10 N·m)**

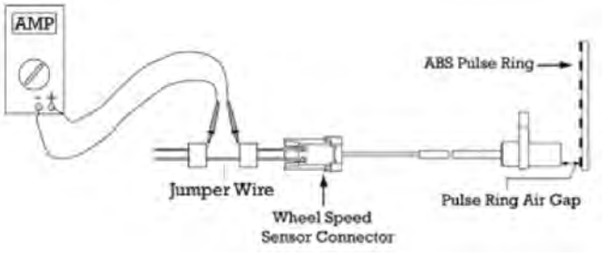
TORQUE
ABS Module Fastener: **88 in-lbs (10 N·m)**

TORQUE
Under-Seat Bracket Fastener: **88 in-lbs (10 N·m)**

TORQUE
Banjo Bolt: **18 in-lbs (24 N·m)**

TORQUE
Under-Seat Wire Bracket Fastener: **88 in-lbs (10 N·m)**

WHEEL SPEED SENSOR TROUBLESHOOTING



Test Wheel Speed Sensors with Digital Volt Ohm Meter:

NOTICE
Wheel Speed can also be seen under ABS in Digital Wrench

- Disconnect the wheel speed sensor from the harness assembly.
- Connect a jumper wire between one pin on the harness and the mating pin on the wheel speed sensor.
- Set your DVOM on milliamp setting. Connect one meter lead to the open pin on the harness and connect the other meter lead to the open pin on the wheel speed sensor.
- Turn the power on for the motorcycle/ignition.
- Spin the wheel and you should observe a varying reading between 6 – 16.5 milliamps.

Repeat the test on the other wheel speed sensor.

NOTICE
If you get a reading of 0 milliamps most meters have a fuse on this circuit. Check/replace the fuse.

NOTE
Disconnect the harness from the ABS modules and complete the following tests. The output should read between 12–12.8v. If the output is below 12.5v, connect the battery to a battery charger.

What is the voltage between pin 10 (BK -ABS Ground) and pin 9 (RD/WH- ABS Main Fused Pos. Power)?

What is the voltage between pin 1 (BK -ABS Ground) and pin 18 (RD- ABS Motor Fused Pos. Power)?

With the key on what is the voltage between pin 10 (ABS Ground) and pin 4 (PK/GN- ABS Switched Pos. Power)?

What is the ohm reading between pin 2 (YE – CAN High) and pin 11 (DG – CAN Low)? Should be 61 ohms +/- 1

Perform an ohm reading of all the wheel speed sensor wires:

What is the ohm reading between pin 13 (BN/RD – Rear WSS +) and pin A (BN/RD at the Rear Wheel Speed Sensor connection)?

What is the ohm reading between pin 14 (BN – Rear WSS -) and pin B (BN at the Rear Wheel Speed Sensor connection)?

What is the ohm reading between pin 12 (GY/RD – Front WSS +) and pin A (GY/RD at the Front Wheel Speed Sensor connection)?

What is the ohm reading between pin 3 (GY – Front WSS -) and pin B (GY at the Front Wheel Speed Sensor connection)?

ABS BRAKE SYSTEM BLEEDING

BRAKE FLUID REPLACEMENT & BLEEDING PRECAUTIONS

⚠ WARNING

Contaminated brake discs or brake pads greatly reduce braking performance and increase stopping distance. Do not attempt to clean contaminated pads. Replace them. Clean the brake disc with brake cleaner.

⚠ WARNING

This brake system requires ethylene-glycol based fluid (DOT 4). Do not use or mix different types of fluid such as silicone-based or petroleum-based.

⚠ WARNING

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid. Brake fluid can accumulate moisture, reducing it's performance.

⚠ WARNING

Brake fluid is poisonous. Keep brake fluid tightly sealed and out of reach of children.

⚠ WARNING

A soft, spongy feeling in the brake lever and/or brake pedal could indicate a hazardous condition in the brake system. Do not operate the motorcycle until the failure in the brake system is corrected.

⚠ WARNING

An unsafe condition exists when air is trapped in the hydraulic brake system. Air in the brake hydraulic system acts like a soft spring and absorbs a large percentage of the pressure developed by the master cylinder. Without this pressure, the braking system cannot develop full braking force to allow for safe, controlled stops. It is extremely important to bleed the brakes properly after any brake system work has been performed or when inspection reveals spongy brakes.

Keep these points in mind when bleeding hydraulic brakes:

- The master cylinder reservoirs have limited capacities. It is easy to empty them during the bleeding procedure. This introduces air into the system which you are trying to purge. Watch the reservoir closely and add fluid when necessary to keep the level above the LOW mark and prevent air from re-entering the system.
- Apply only light to moderate pressure to the lever or pedal when bleeding the brake system. Extreme pressure or rapid movement will cause a surge of fluid through the small orifices of the brake system when the bleeder screw is opened and could introduce air into the system by means of cavitation.
- Small amounts of air can become trapped in the banjo fastener fittings at the master cylinder(s) and junction points of brake lines. These fittings can be purged of air by following a standard bleeding procedure at these fittings (instead of the bleed screw on caliper) if necessary to speed the bleeding process. This is usually only needed if system was completely drained of fluid. Bleed each line connection, starting with the fitting closest to the master cylinder, working toward the caliper, and ending with the bleed screw.
- Always torque banjo fasteners and other brake system fasteners and components to specified torque.
- Always install NEW genuine Indian Motorcycle replacement parts and rubber parts upon assembly. Apply special lubricant where indicated (included in service kits).

ABS BRAKE VACUUM BLEEDER

A vacuum bleeder is recommended for ABS system bleeding and can also be used to bleed conventional (non-ABS) brake systems. One style of bleeder is shown below.

ABS FLUID CHANGE

Review Brake Fluid Replacement and Bleeding Precautions before working with brake fluid.

NOTICE
When bleeding or flushing the system, monitor fluid level in master cylinder reservoir constantly. DO NOT allow fluid level to fall below the LOW level.

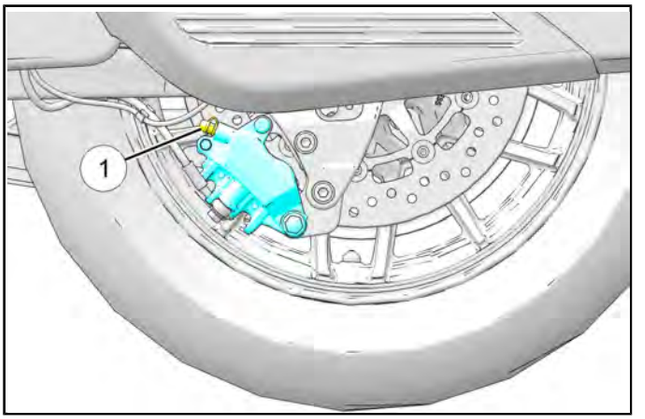
Use only DOT 4 brake fluid from a sealed container.

NOTICE
EMPTY LINES - If system is dry or very low on fluid due to parts replacement or disassembly, fill reservoir and pump lever or pedal slowly through stroke range until air bubbles no longer rise through the fluid into the reservoir. FLUSHING THE SYSTEM - Brake systems should be flushed every 2 years or more often if the fluid is discolored. To flush the system, follow normal brake bleeding process, and pump fluid through the system until fluid moving through the bleeder hose is clear. Do not allow reservoir level to fall below the LOW level or complete system bleeding will be required.

ABS REAR BRAKE BLEEDING

NOTICE
The use of a vacuum bleeder is recommended. DO NOT allow fluid level in reservoir to drop below the LOW mark at any time during the bleeding procedure. Repeat entire bleed procedure at least once.

1. Remove rubber cap from rear caliper bleed screw ① and place a box end wrench on the screw.
2. Attach a tight-fitting clear hose from the vacuum bleeder to the bleed screw and apply vacuum.



3. Fill rear brake fluid reservoir and leave cover off so fluid can be added as it is drawn through the system.
4. Open bleed screw about 1/4 turn.
5. Pump brake pedal repeatedly with smooth full strokes while adding brake fluid to the reservoir as required. For best results pump the pedal at a fairly rapid rate but avoid pumping too fast or fluid may become aerated. After about 2 cups of fluid have been run through the system, the bleeder hose should have clear, bubble-free fluid running through it.
6. Close bleeder screw and fill the brake fluid reservoir.
7. *Repeat the entire bleeding process* to be sure all air is purged from the system.
8. Torque all bleed screws to specification and install the rubber caps.

TORQUE
Caliper Bleeder Screws: **53 in-lbs (6 N·m)**

9. After completing the bleeding procedure a second time, inspect brake fluid level and add if necessary.

10. Clean the reservoir cover, diaphragm plate, diaphragm, and reservoir sealing surface. If diaphragm is extended, return it to normal (flat) position. Install diaphragm, diaphragm plate, and cover.

TORQUE
Cover Fastener: **13 in-lbs (1.5 N·m)**

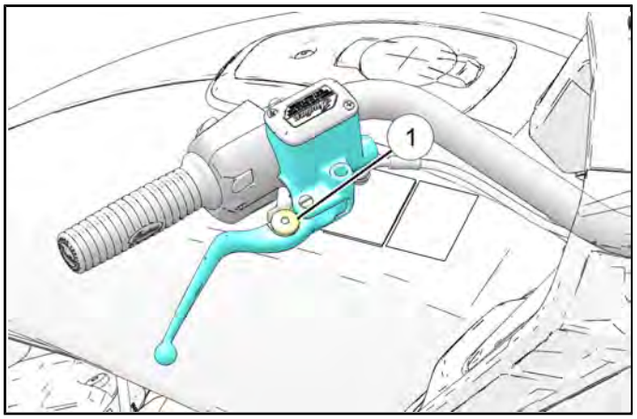
11. If pedal is not firm, repeat bleeding procedure and inspect brake system.

IMPORTANT
The pedal force must achieve 25 lbs prior to the master cylinder pushrod travelling 6mm.

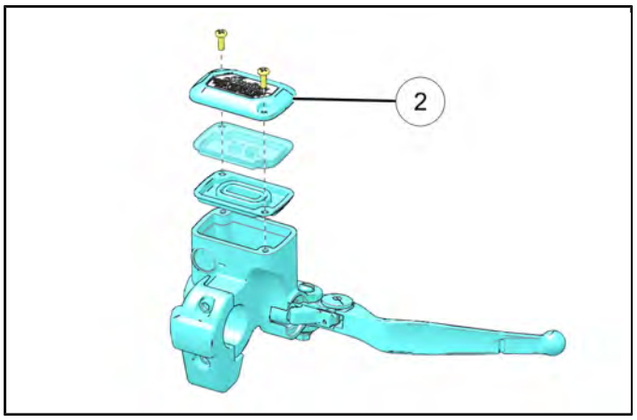
ABS FRONT BRAKE BLEEDING

NOTICE
Bleed left front caliper first then right caliper. Repeat the bleeding procedure at least once.

1. Pull brake lever forward and rotate reach adjustment dial ① to the longest reach setting to maximize lever stroke for bleeding.



2. Remove front brake fluid reservoir cover ② and leave it off so fluid can be added as it is drawn through the system.



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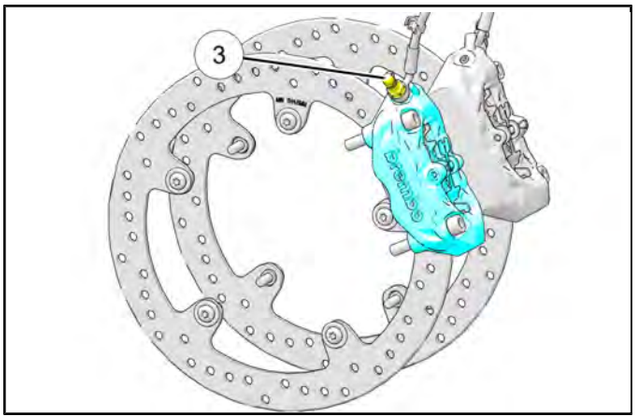
3. Remove rubber cap from bleed screw ③ on *front left* caliper and place a box end wrench on the screw.



4. Attach tight fitting clear hose from vacuum bleeder to bleed screw and apply vacuum.
5. Hold lever to handlebar or hold firm pressure on lever, then open bleed screw about 1/4 turn.
6. Pump brake lever repeatedly with smooth full strokes while adding brake fluid to the reservoir as required. For best results pump the lever at a fairly rapid rate but avoid pumping too fast or fluid may become aerated. After about 2 cups of fluid have been run through the system, the bleeder hose should have clear, bubble-free fluid running through it.
7. Close bleeder screw and fill the brake fluid reservoir.
8. Remove rubber cap from bleeder screw on *front right* caliper and place a box end wrench on the screw.
9. Connect vacuum bleeder hose to the bleed screw and start vacuum.
10. Hold lever to handlebar or hold firm pressure on lever, then open bleed screw about 1/4 turn.
11. Pump brake lever repeatedly with smooth full strokes while adding brake fluid to the reservoir as required. For best results pump the lever at a fairly rapid rate but avoid pumping too fast or fluid may become aerated. After about 2 cups of fluid have been run through the system, the bleeder hose should have clear, bubble-free fluid running through it.
12. Close bleed screw.
13. Once both front calipers have been bled, repeat procedure again on left caliper, then right to ensure all air has been purged.
14. Fill fluid reservoir. If diaphragm is extended, return it to normal (flat) position. Install diaphragm, diaphragm plate, and cover.

15. Torque cover fasteners to specification.

TORQUE
Front Master Cylinder Cover: **13 in-lbs (1.5 N·m)**

TORQUE
Bleed Screw: **80 in-lbs (9 N·m)**

16. Perform Brake Lever Reserve Inspection. See **Brake Lever Reserve Inspection page 9.43**.

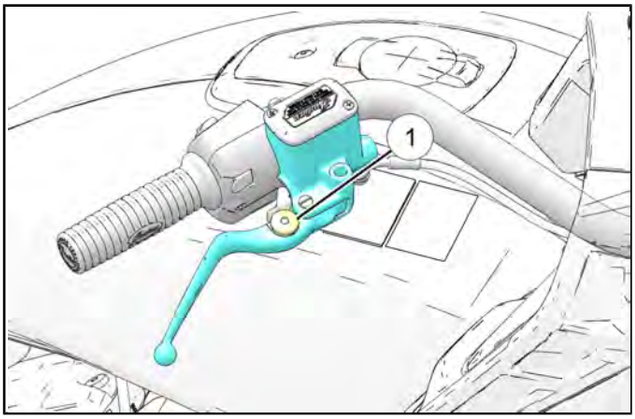
NOTICE
If air is still trapped in the system after following the above procedure, conduct the following. Repeatedly squeeze the lever several times, then squeeze and hold. Open a bleeder screw. While holding the lever to the grip, push that caliper's pistons back into the caliper to push fluid and trapped air out of the caliper. Close the bleeder screw, and repeat as necessary.

BRAKE LEVER RESERVE INSPECTION

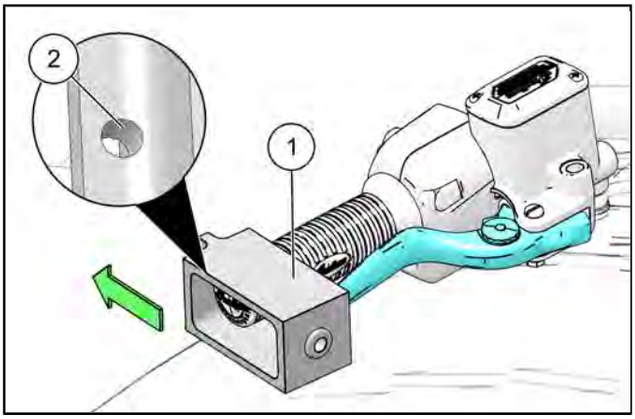
NOTICE
This procedure requires use of the Brake Lever Reserve Tool **(PV-50104)**.

1. Turn handlebars fully RIGHT.
2. Pull and release the front brake lever. It should move freely and smoothly and return to its rest position quickly when released. Lubricate brake lever if binding, or if it does not return quickly and completely when released.

   See **Front Brake Lever Lubrication page 9.6**.
3. Set front brake lever reach adjustment ① to position 3.



4. Place grommet of brake handle pressure tester **PV-50104** ① on ball end of front brake lever.
5. Connect a scale (commercially available) with a minimum of 25 kg / 50 lb capacity to end of tool ②.



6. Keep tool centered so it does not touch hand grip. Pull on scale connected to tool eyelet.

Brake Lever Reserve Force: **37 lbs (16.8 kg)**

7. Safely elevate the front wheel. Verify wheel rotates freely without drag or binding when lever is released.
8. Have an assistant verify brake lever *does not* contact hand grip. Clearance must exist at specified pull force.
9. If the minimum brake lever reserve force is not met before the lever makes contact with the hand grip, the brake system will need to be bled. See **ABS Front Brake Bleeding page 9.41**.

BRAKE SYSTEM SERVICE

FRONT BRAKE PAD REPLACEMENT

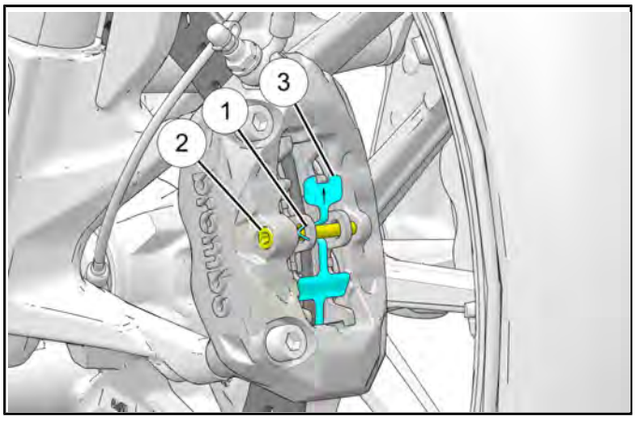
IMPORTANT
Always replace brake pads as a set and always replace pads in both front calipers at the same time.

To watch a video of this procedure, scan the QR code or click **HERE**.

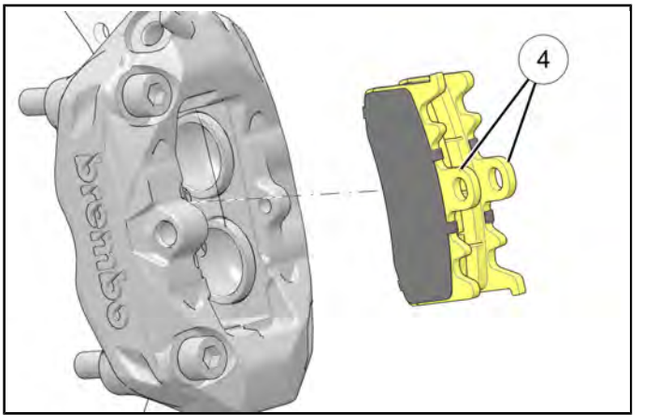
https://vimeo.com/354240031/843e9a9251

REMOVAL

1. Remove pin clip ①.



2. Remove pad retaining pin ②.
3. Remove pad spring ③.
4. Remove brake pads ④.



INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**
2. Wipe brake disc clean with a shop towel sprayed with brake cleaner (commercially available).
3. Inspect caliper piston seals for any sign of fluid leakage.
4. Install isolator on new brake pads. Be sure isolator plate does not protrude from the brake backing plate.
5. Install new brake pads with friction material toward disc.

TORQUE
Brake Pad Retaining Pin (Front): **53 in-lbs (6 N·m)**

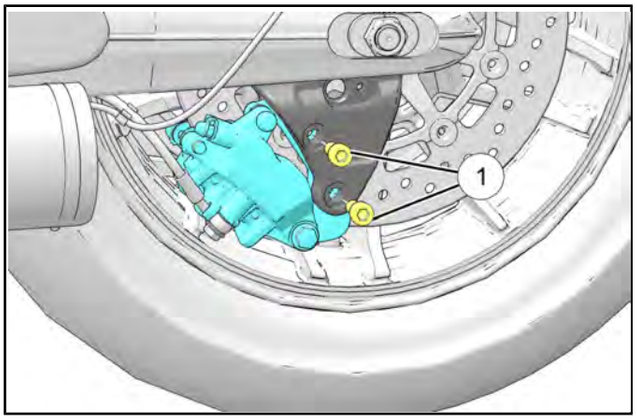
6. Inspect brake fluid in reservoir and set to proper level.
7. Slowly pump lever to set brake pads against disc. Lever should be firm, not spongy. If lever is spongy, inspect pad installation, bleed brake lines and inspect brake disc.
8. Operate brake lever several times until lever is firm and pressure can be felt.

⚠ WARNING
After pad installation or any brake system repair, safely elevate wheel, apply and release brake pedal or lever 2-3 times and release. Verify wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect vehicle to determine cause and then repair as necessary.

REAR BRAKE PAD REPLACEMENT

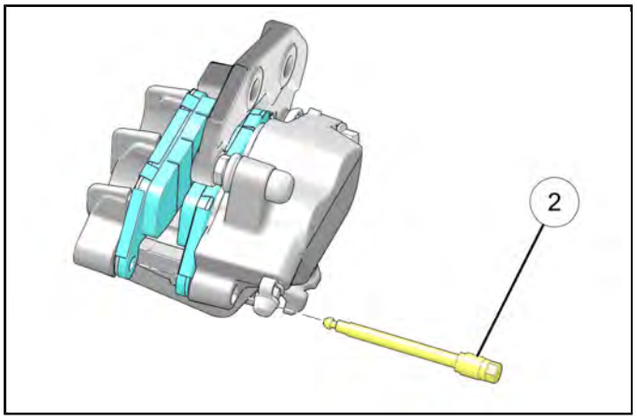
IMPORTANT
Always replace brake pads as a set.

1. Remove left saddlebag. Reference **Saddlebag Removal page 7.93**.
2. Remove muffler. See **Muffler Removal page 3.102**.
3. Push caliper toward wheel to push pad and pistons back and provide clearance for new pad installation.
4. Remove two fasteners retaining brake caliper and remove.



IMPORTANT
Do not twist the brake line or allow the brake caliper to hang on the brake line.

5. Remove pad retaining pin ②.



6. Slide inner pad out front edge of rear caliper. Install new pad. Be sure backing plate is properly installed on new pad with insulator between brake pad and plate. Slide pad into place and engage tab in the back of the caliper.

7. Install new outer brake pad. Be sure tab is engaged with caliper as it is for the inner pad.

IMPORTANT
Make sure the backing plate is properly installed on the new pad with the insulator between the brake pad and plate.

8. Apply silicone grease to O-ring on pad retaining pin.
9. Install pad retaining pin.

TORQUE
Brake Pad Retaining Pin: **150 in-lbs (17 N·m)**

10. Install brake caliper and retain with fasteners.

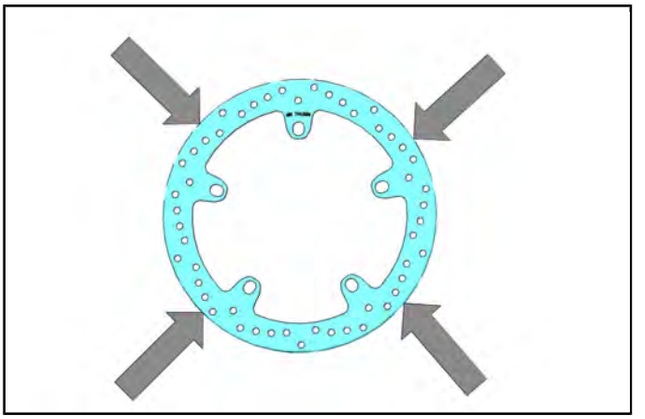
TORQUE
Brake Caliper Fastener: **31 ft-lbs (42 N·m)**

11. Inspect fluid level in the reservoir and adjust as necessary.
12. Pump brake pedal slowly several times to set new pads against disc, until lever is firm and pressure can be felt.
13. Bleed brake system if necessary.

⚠ WARNING
After pad installation or any brake system repair, safely elevate wheel, apply and release brake pedal or lever 2-3 times and release. Verify wheel turns freely without drag. If rear brake drag is evident, inspect pedal clearance. Do not operate the motorcycle if drag is still evident after clearance adjustment. Inspect vehicle to determine cause and repair as necessary.

BRAKE DISC INSPECTION

1. Visually inspect disc for cracks or damage.
2. Measure brake disc thickness in several locations around disc with a micrometer, and along *wear surface* and compare to specifications. See **Service Specifications – Brakes page 9.4**.



NOTICE
Replace the brake disc if any measurement is worn beyond the service limit.

3. With disc mounted to wheel, inspect for brake disc runout / warpage with a dial indicator and compare to specifications. See **Service Specifications – Brakes page 9.4**.

NOTICE
Runout should be measured 2-4mm in from outside edge of disc.

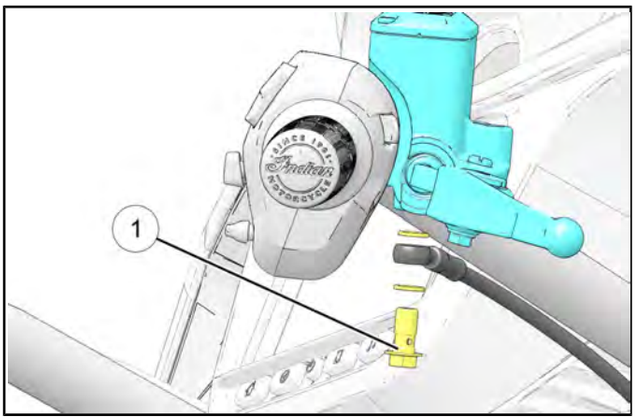
4. Replace brake disc if dial indicator reading displays excessive brake disc runout and other possible causes have been eliminated.

FRONT MASTER CYLINDER SERVICE

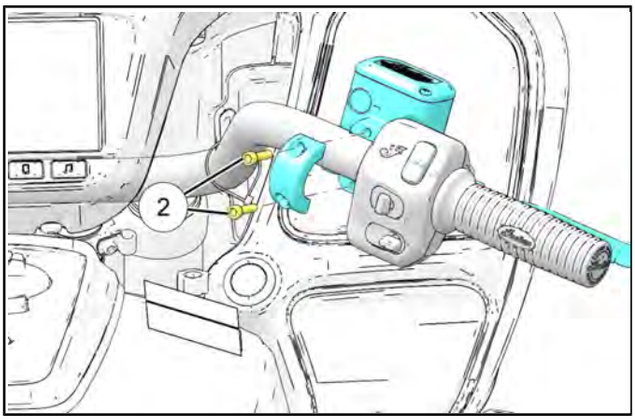
⚠ CAUTION

Brake fluid and brake cleaners could damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Be sure master cylinder reservoir is level before removing cover.

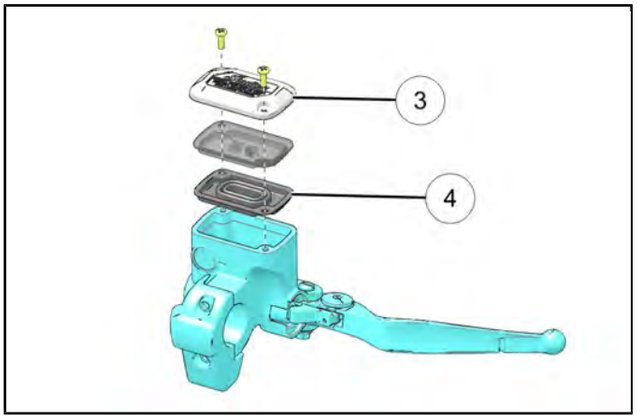
1. Clean the master cylinder. Attach a drain hose to caliper bleed screw and place the end in a suitable container. Drain brake fluid from the front brake system by slowly pumping brake lever.
2. Remove the right-hand side mirror from the lever perch.
3. Remove banjo fastener ① and brake line from master cylinder.



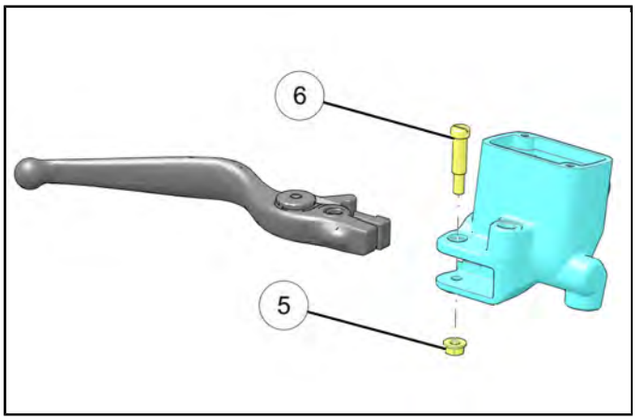
4. Remove fasteners ② , clamp, and master cylinder.



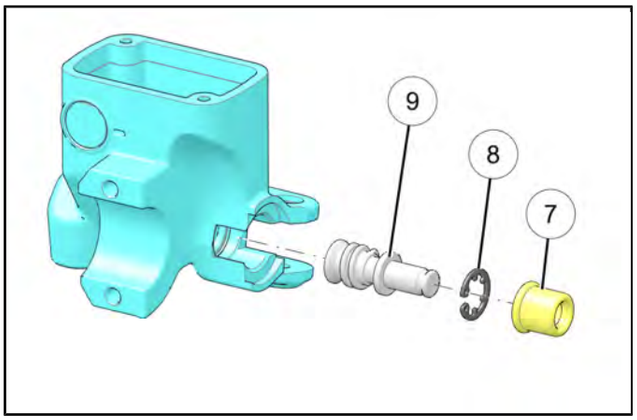
5. Remove reservoir cover ③, diaphragm plate, and diaphragm ④ .



6. Remove the pivot pin nut ⑤ and fastener ⑥. Pull lever assembly out of master cylinder.



7. Remove dust boot ⑦, snap ring ⑧, and piston ⑨.



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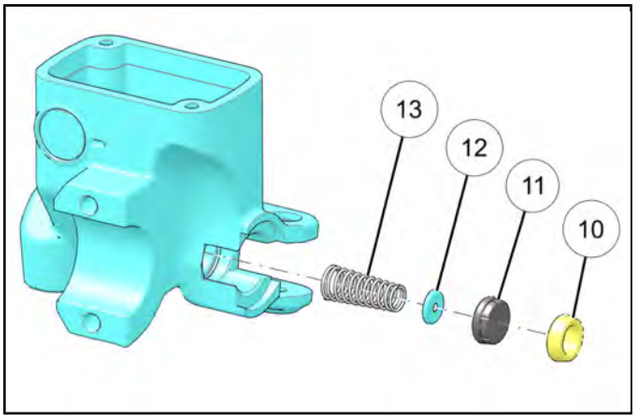
8. Remove secondary seal ⑩, primary seal ⑪, spring retainer ⑫, and spring ⑬.



9. Clean master cylinder with isopropyl alcohol and dry with compressed air. DO NOT soak in alcohol for more than 30 seconds. DO NOT aim pressurized air directly at the level sight glass.
10. Inspect cylinder bore and chamfer of bore for corrosion, scratches, scoring, or pitting. Replace master cylinder if any of these conditions are evident.
11. Clean the compensating port and supply port with compressed air to be sure they are clean and unobstructed.
12. Apply a light film of special lubricant from piston kit to each piston seal cup.
13. Assemble the piston / spring assembly as shown. Large diameter of beveled edge on piston cups face toward spring. Install a new retaining ring on end of piston.
14. Carefully install spring / piston assembly into master cylinder bore. Work the front piston seal carefully past the chamfer and into bore. Use care not to damage or fold the seal when working it past the chamfer.
15. Continue to install the piston until the rear seal is past the chamfer. Push and hold the piston in far enough to allow the retaining ring to be installed.
16. Be sure retaining ring is fully seated in the groove.
17. Clean the bore from the retaining ring outward, so the outer edge of the new dust boot adheres properly and will not dislodge from the bore.
18. Install new boot, seating the outer edge fully in the bore and engage outer lip of boot in piston groove.
19. Apply special lubricant from kit to brake lever contact surface.
20. Install master cylinder on handlebar. Torque clamp fasteners to specification.

IMPORTANT
Torque the **Master Cylinder Clamp** upper fastener first and the bottom fastener second.

TORQUE
Master Cylinder Clamp Fasteners: **96 in-lbs (11 N·m)**

21. Install mirror.

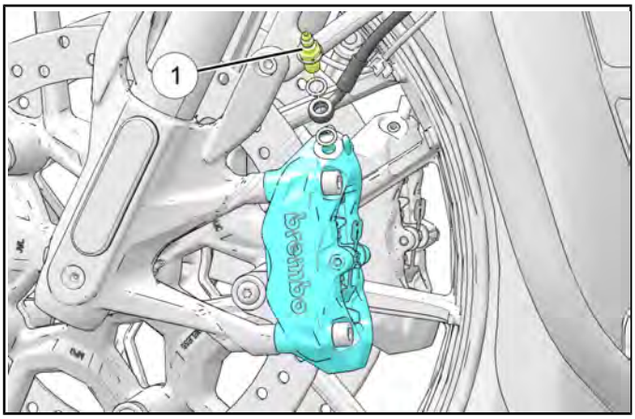
TORQUE
12 ft-lbs (16 N·m)

FRONT CALIPER SERVICE

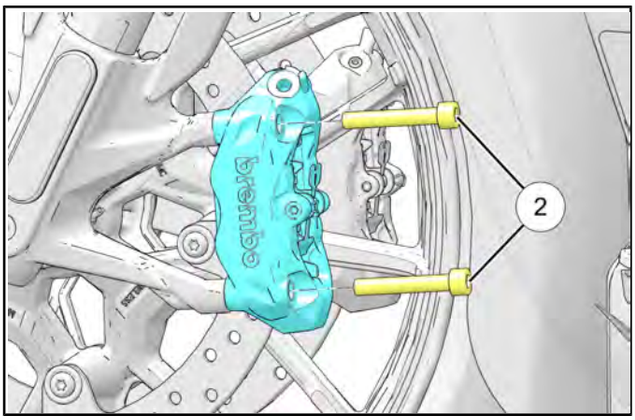
⚠ CAUTION

Brake fluid and brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Make sure the master cylinder reservoir being worked on is level before removing the cap.
Replace all rubber parts upon assembly. Keep parts in order for assembly.

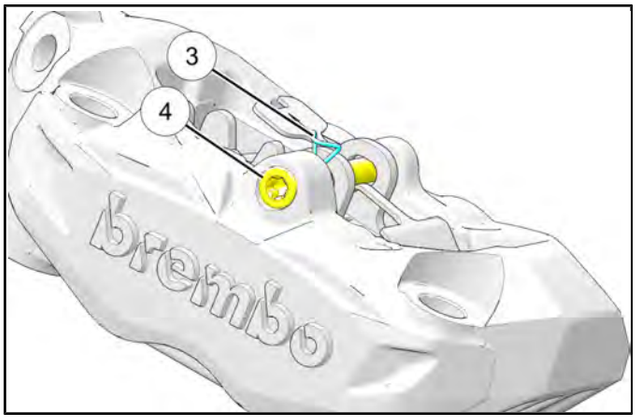
1. Remove banjo fastener ① , sealing washers, and brake hose from caliper assembly and allow it to drain into a container.



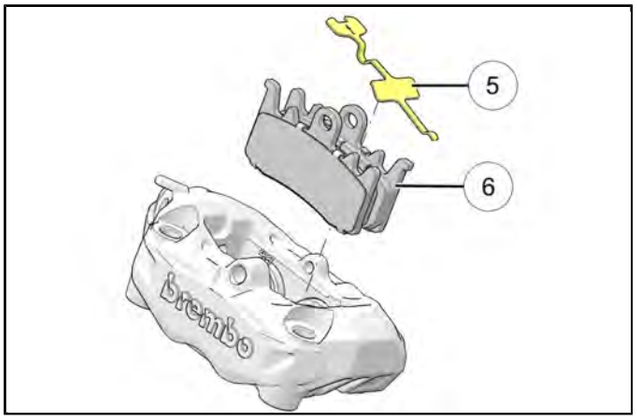
2. Remove front caliper mounting fasteners ② and remove the caliper.



3. Cover the end of brake line(s) to prevent debris from entering.
4. Cover the brake hose connection on the caliper and clean the outer surfaces of caliper assembly with brake cleaner (commercially available) or isopropyl alcohol. Dry with compressed air.
5. Remove the pin clip ③ and pad retaining pin ④.



6. Remove brake pad spring ⑤ and brake pads ⑥.



NOTICE

Pads contaminated with oil or grease must be replaced as a set.

7. The brake caliper itself is a non-serviceable item. If wear or damage is found on the brake caliper, replace it.

9

8. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Brake Pad Retaining Pin: **53 in-lbs (6 N·m)**

TORQUE
Brake Caliper Fastener (Front): **36 ft-lbs (48 N·m)**

TORQUE
Banjo Bolt: **18 in-lbs (24 N·m)**

FRONT CALIPER INSTALLATION

1. Clean mounting surfaces of caliper and fork leg.
2. Apply brake cleaner or isopropyl alcohol to a clean shop towel and wipe brake discs clean.
3. Separate brake pads and install caliper assembly over brake disc.
4. Install caliper mounting fasteners and torque to specification.

TORQUE
Brake Caliper Fastener (Front): **36 ft-lbs (48 N·m)**

5. Connect brake hose to caliper with banjo fastener and new sealing washers. Torque to specification.

TORQUE
Banjo Bolt: **18 in-lbs (24 N·m)**

6. Fill and bleed the front brake hydraulic system. See **ABS Front Brake Bleeding page 9.41**.

⚠ WARNING
After pad installation or any brake system repair, safely elevate the wheel, apply and release the brake pedal or lever 2-3 times and release. Verify the wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect the vehicle to determine the cause and then repair as necessary.

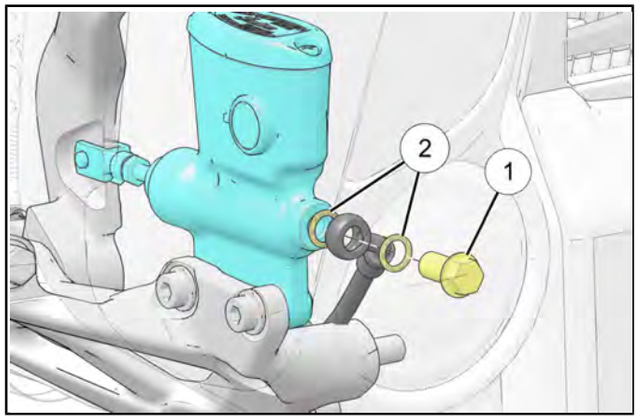
REAR MASTER CYLINDER SERVICE

⚠ CAUTION

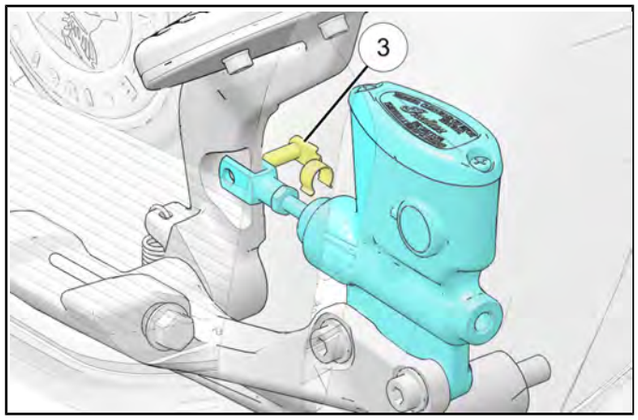
Brake fluid and brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Make sure the master cylinder reservoir being worked on is level before removing the cap. Replace all rubber parts upon assembly.

REMOVAL / DISASSEMBLY

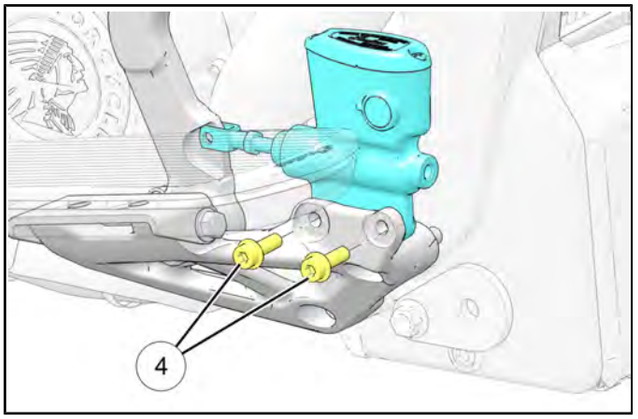
1. Remove brake line banjo fastener ① , sealing washers ② , and brake line. Allow fluid to drain into a container.



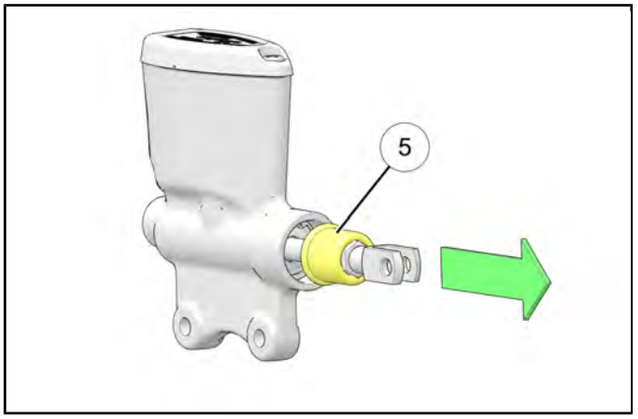
2. Remove clevis pin ③ securing brake pedal to master cylinder.



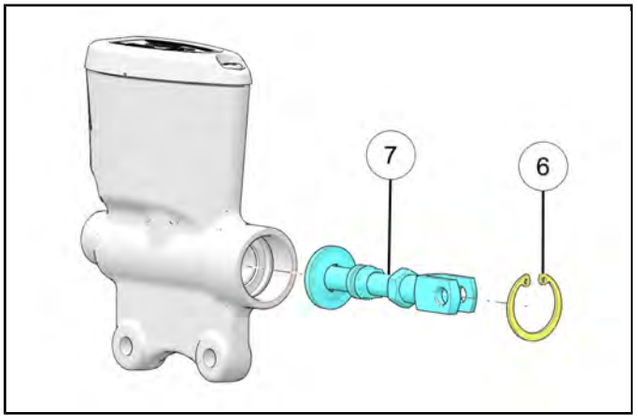
3. Remove fasteners ④ retaining rear master cylinder.



4. Remove dust boot ⑤ from master cylinder.



5. Remove snap ring ⑥ and pushrod ⑦.



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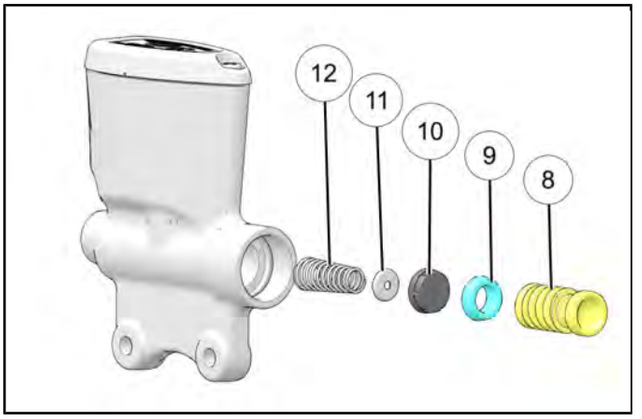
6. Remove piston ⑧.



7. Remove secondary seal ⑨.
8. Remove primary seal ⑩.
9. Remove spring retainer ⑪ and spring ⑫.
10. Inspect cylinder bore and chamfer on the front of the bore for corrosion, scratches, scoring, or pitting. Replace master cylinder if any of these conditions are evident.
11. Clean compensating port and supply port with compressed air to be sure they are clean and unobstructed.

INSTALLATION / REASSEMBLY

1. Clean all parts with isopropyl alcohol.
2. Replace ALL RUBBER PARTS with new. Apply a light film of special lubricant on leading edge of piston cup seals.
3. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

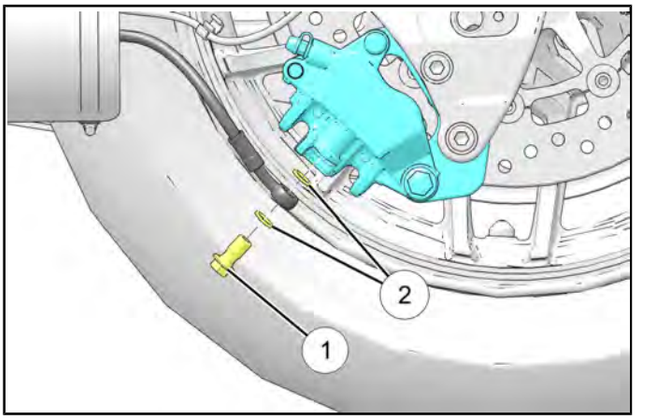
TORQUE
Brake Line Banjo Fastener: **18 in-lbs (24 N·m)**

TORQUE
Master Cylinder Fastener (Rear): **18 ft-lbs (24 N·m)**

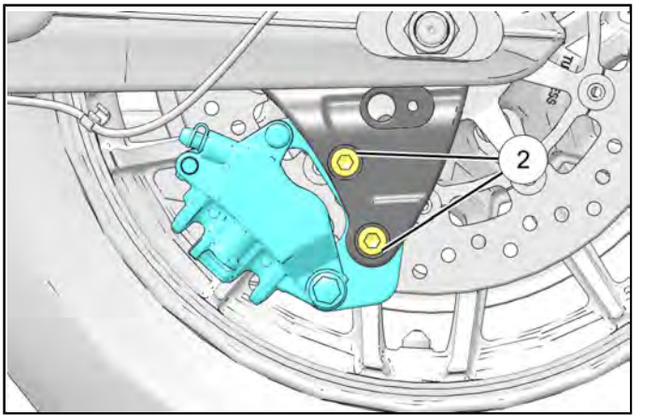
TORQUE
Master Cylinder Cover Fastener (Rear): **13 in-lbs (1.5 N·m)**

REAR CALIPER SERVICE

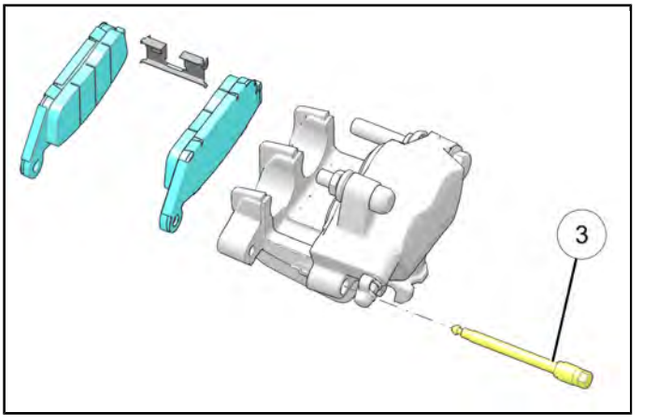
1. Remove left saddlebag. Reference **Saddlebag Removal page 7.93**.
2. Remove muffler. See **Muffler Removal page 3.102**.
3. Remove banjo bolt ① and sealing washers ② and allow fluid to drain into a container.



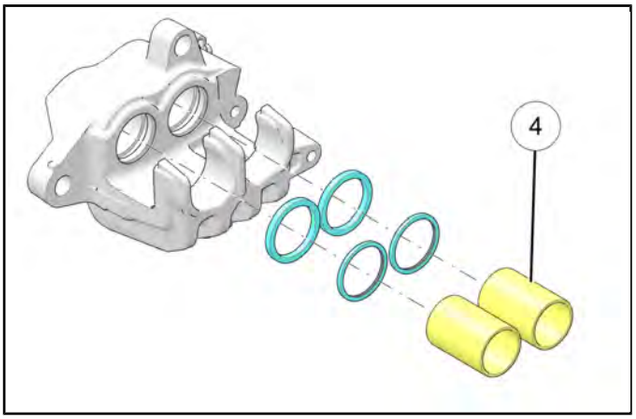
4. Remove caliper fasteners ② and lower caliper off of mounting bracket.



5. Remove brake pad retaining pin ③.



6. Slide caliper bracket off pins and remove spring plate.
7. Remove caliper pistons ④.



8. Remove dust seals and piston seals. Use care not to damage the seal bores.
9. Clean caliper thoroughly with isopropyl alcohol. Dry with compressed air. Clean seal grooves thoroughly. Any residue left behind in the grooves could cause caliper pistons to stick and result in brake drag.
10. Inspect each bore and surface of each piston for corrosion, scratches, scoring, or pitting. Replace caliper assembly if any of these conditions are evident.
11. Measure diameter of each bore and piston. Replace caliper assembly or parts if worn beyond service limit.

Caliper Piston Bore Diameter Service Limit: **27.05 mm (1.0649 in)**

Caliper Piston Diameter Service Limit: **26.35 mm (1.0604 in)**

12. Install all new rubber parts during assembly. Do not reuse old seals or boots. Apply special lubricant from service kit to new piston seals and dust seals.
13. Apply special assembly oil to outer surface of all pistons.
14. Install piston seals and dust seals in caliper body.
15. Install pistons in their bores.
16. Replace caliper pin boot on bracket and on caliper. Apply special lubricant from service kit to boots and both pins.
17. Assemble bracket to caliper. Remove excess lubricant.
18. Install spring plate and outer brake pad with insulator and backing plate. Start pad pin through outer pad.
19. Install inner pad with insulator and backing plate.
20. Torque brake pad retaining pin to specification.

TORQUE
Brake Pad Retaining Pin: **150 in-lbs (17 N·m)**

21. Be sure end tabs of pads are both fully engaged in the heel plate on bracket.
22. Install caliper to bracket and torque caliper fasteners to specification.

TORQUE
Caliper Fasteners: **31 ft-lbs (42 N·m)**

23. Install brake line with new sealing washers and torque banjo fastener to specification.

TORQUE
Banjo Bolt: **18 in-lbs (24 N·m)**

24. Bleed brake system. See **ABS Rear Brake Bleeding page 9.40**.

REAR CALIPER INSTALLATION

1. Install caliper to rear mounting bracket and torque to specification.

TORQUE
Caliper Fasteners: **31 ft-lbs (42 N·m)**

2. Install brake hose, and banjo fastener with new sealing washers.

TORQUE
Banjo bolt: **18 in-lbs (24 N·m)**

3. Fill and bleed the rear hydraulic brake system. See **ABS Rear Brake Bleeding page 9.40**.

⚠ WARNING

After pad installation or any brake system repair, safely elevate the wheel, apply and release the brake pedal or lever 2-3 times and release. Verify the wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect the vehicle to determine the cause and then repair as necessary.

BRAKE LINE REPLACEMENT

⚠ CAUTION

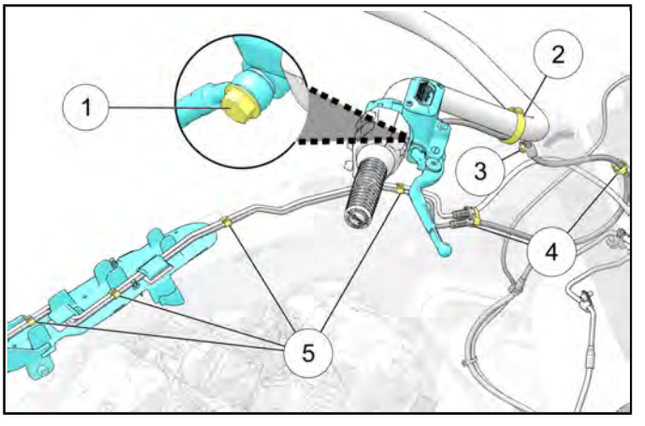
Brake fluid and brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Make sure the master cylinder reservoir being worked on is level before removing the cap.

FRONT (MASTER CYLINDER TO ABS MODULE)

1. Perform steps 1-9 of **ABS Module Replacement page 9.35**.
2. Remove Fuel Tank. See **Fuel Tank Removal page 4.24**.
3. Remove Fairing. See **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
4. Remove master cylinder banjo bolt ①. Have a drain pan ready to catch any brake fluid.
5. Disconnect brake line from its retention band ②, remove p-clamp fastener ③ and cable ties ④.

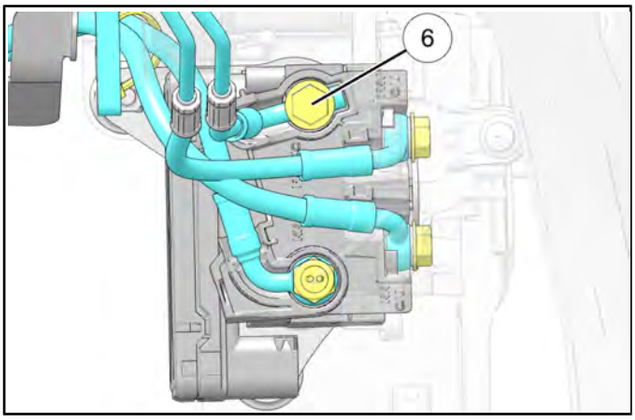
NOTICE

Part ④ is a clip on FMF that can be unclasped.



6. Remove remaining retention features ⑤.

7. Remove banjo bolt from ABS module ⑥.



8. Remove the brake line from the unit.
9. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
ABS Module Banjo Bolt: **18 in-lbs (24 N·m)**

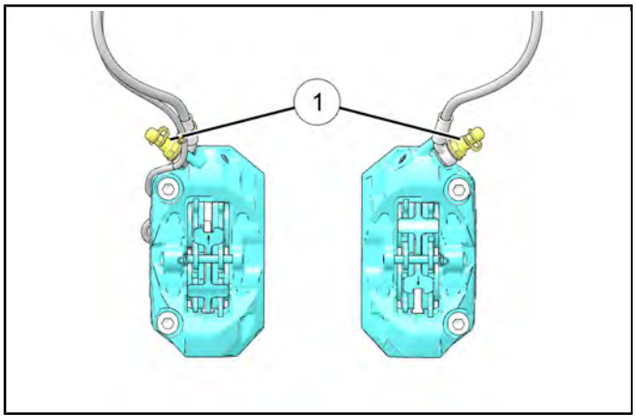
TORQUE
P-Clamp Fastener: **88 in-lbs (10 N·m)**

TORQUE
Master Cylinder Banjo Bolt: **18 in-lbs (24 N·m)**

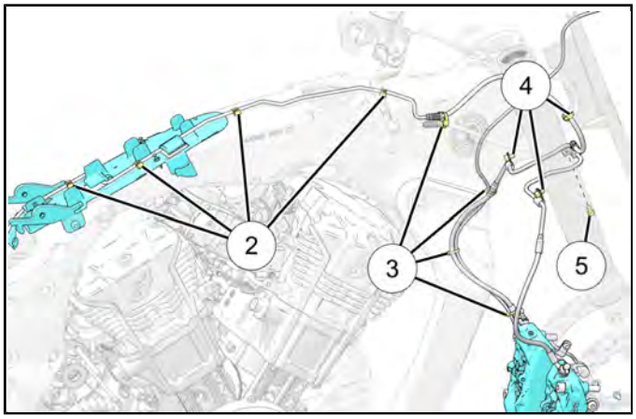
10. Reference **Brake Line Routing page 9.13** for the proper routing.

FRONT (ABS MODULE TO FRONT BRAKE CALIPER)

1. Perform steps 1-10 of **ABS Module Replacement page 9.35**.
2. Remove Fuel Tank. See **Fuel Tank Removal page 4.24**.
3. Remove Fairing. See **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
4. Remove brake caliper banjo bolt ① on the left and right-hand caliper. Have a drain pan ready to catch any brake fluid.

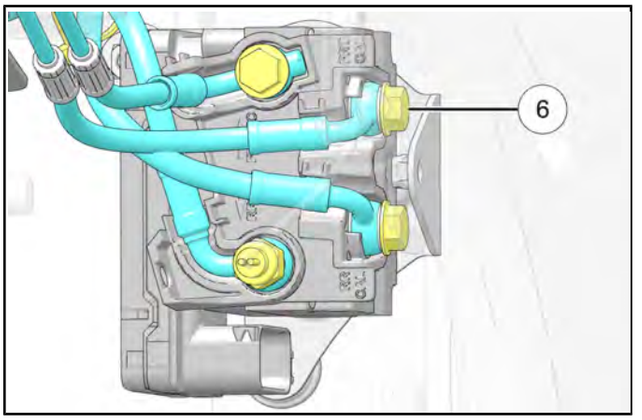


5. Remove zip ties ③, p-clamp fasteners ④, junction block fastener ⑤ and brake line from retention features ②.



9

6. Remove banjo bolt from ABS module ⑥.



7. Remove the brake line from the unit.
8. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
ABS Module Banjo Bolt: **18 in-lbs (24 N·m)**

TORQUE
P-Clamp Fastener: **88 in-lbs (10 N·m)**

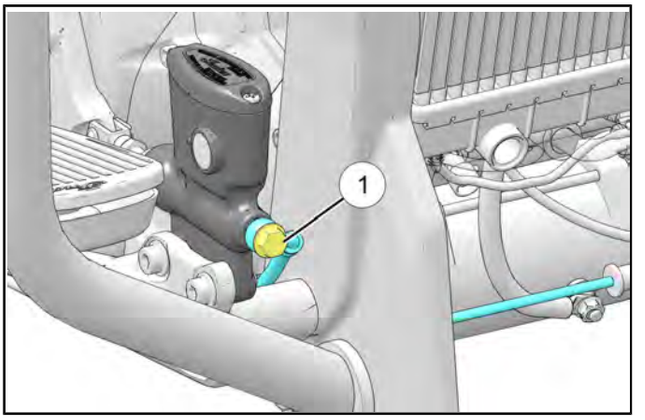
TORQUE
Front Brake Caliper Banjo Bolt: **18 in-lbs (24 N·m)**

TORQUE
Front Junction Block Fastener: **88 in-lbs (10 N·m)**

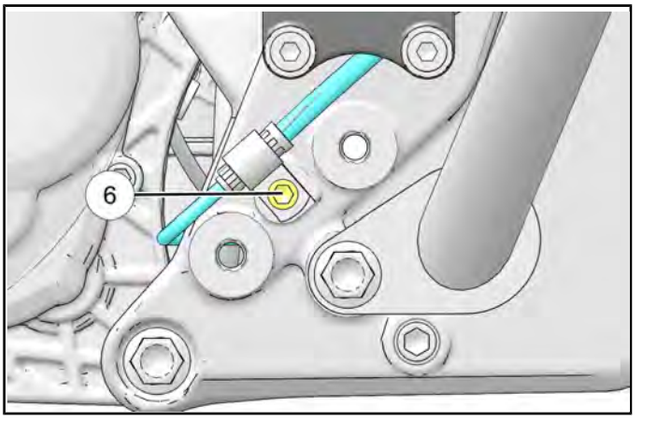
9. Reference **Brake Line Routing page 9.13** for the proper routing.

REAR (MASTER CYLINDER TO ABS MODULE)

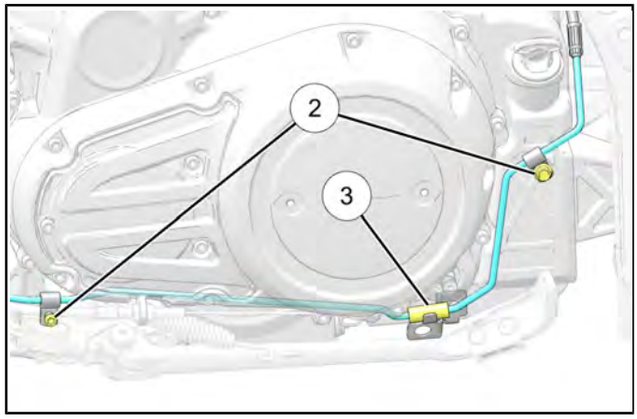
1. Remove battery box. See **Battery Box Removal / Installation page 10.15**.
2. Perform steps 1-10 of **ABS Module Replacement page 9.35**.
3. Remove master cylinder banjo bolt ①. Have a drain pan ready to catch any brake fluid.



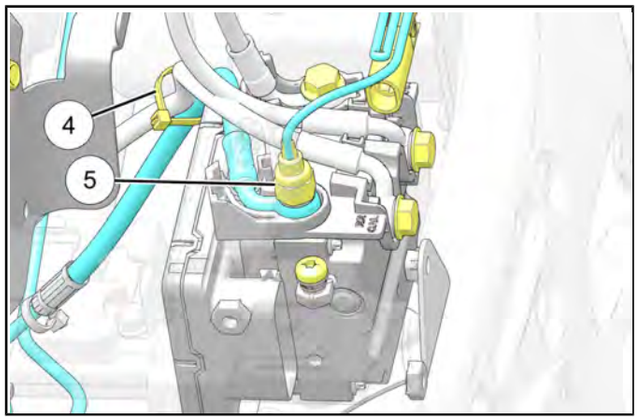
4. Remove right-hand floorboard. See **Floorboard Removal page 7.103**
5. Remove p-clamp fastener ⑥.



6. Remove p-clamp fasteners ②.



7. Disconnect brake line isolator ③.
8. Disconnect routing clip ④.



9. Disconnect brake pressure sensor electrical connector.
10. Remove brake pressure sensor ⑤.
11. Remove brake line from the unit.
12. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Brake Pressure Sensor: **18 in-lbs (24 N·m)**

TORQUE
Side Stand Switch Fastener: **44 in-lbs (5 N·m)**

TORQUE
Master Cylinder Banjo Bolt: **18 in-lbs (24 N·m)**

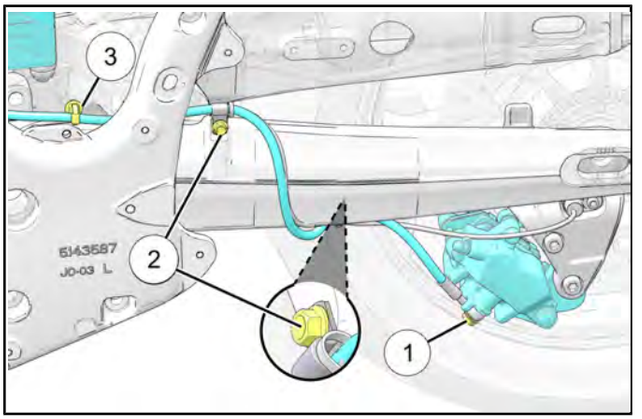
TORQUE
Floorboard Bracket Fastener: **35 ft-lbs (47 N·m)**

TORQUE
P-Clamp Fastener: **88 in-lbs (10 N·m)**

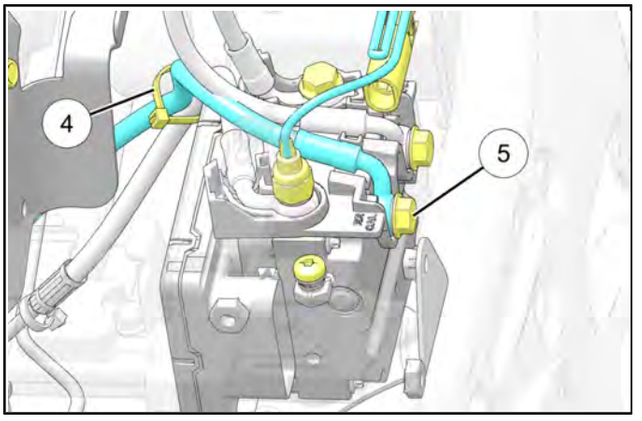
13. Reference **Brake Line Routing page 9.13** for the proper routing.

REAR (ABS MODULE TO REAR CALIPER)

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove ECM. See **ECM Removal page 4.63**.
3. Remove saddlebags. See **Saddlebag Removal page 7.93**.
4. Remove rear caliper banjo bolt ①. Have a drain pan ready to catch any brake fluid.



5. Disconnect brake line from retention clips ③.
6. Remove brake line p-clamp fasteners ②.
7. Disconnect routing clip ④.



8. Remove ABS module banjo bolt ⑤.
9. Remove brake line from unit.
10. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
ABS Module Banjo Bolt: **18 in-lbs (24 N·m)**

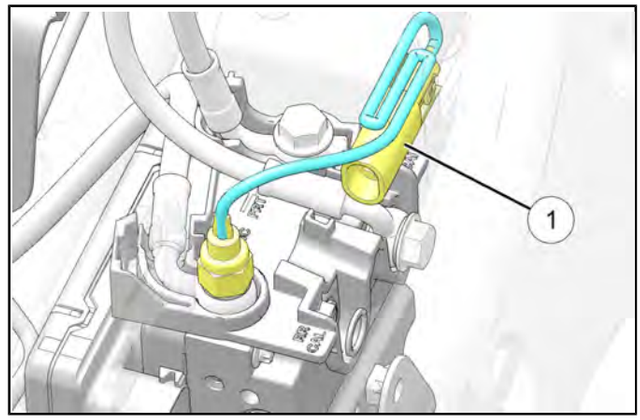
TORQUE
P-Clamp Fastener: **88 in-lbs (10 N·m)**

TORQUE
Rear Brake Caliper Banjo Bolt: **18 in-lbs (24 N·m)**

11. Reference **Brake Line Routing page 9.13** for the proper routing.

BRAKE PRESSURE SENSOR REMOVAL

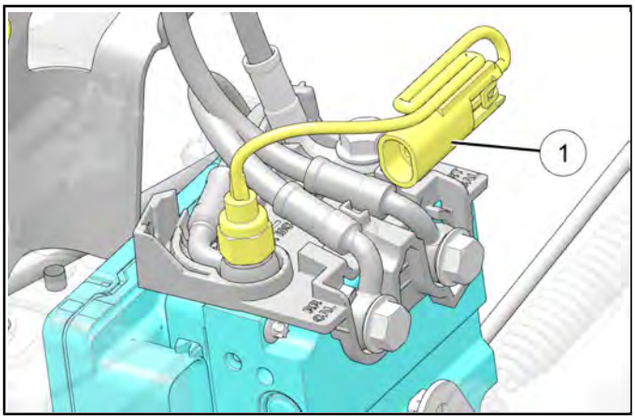
1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove ECM. See **ECM Removal page 4.63**.
3. Unplug the brake pressure sensor electrical connector ①.



4. Remove the sensor.

BRAKE PRESSURE SENSOR INSTALLATION

1. Install the sensor.
2. Connect the brake pressure sensor electrical connector ①.

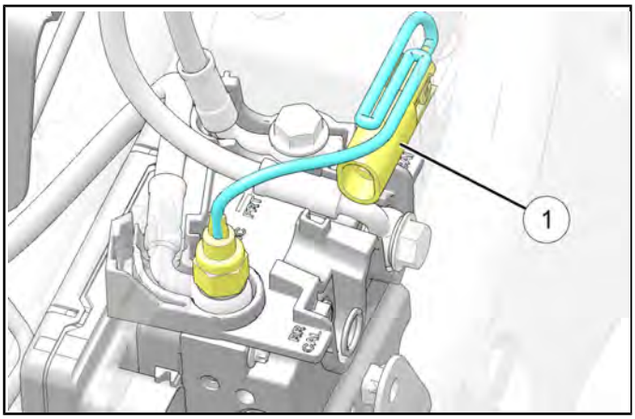


TORQUE
Brake Pressure Sensor **18 in-lbs (24 N·m)**

3. Install ECM. See **ECM Installation page 4.63**.
4. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

BRAKE PRESSURE SENSOR TEST

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Remove ECM. See **ECM Removal page 4.63**.
3. Unplug the brake pressure sensor electrical connector ①.



4. Set the multi meter to read resistance and insert meter leads into the appropriate jacks.
5. Check the resistance of the sensor with the rear brake UN-Applied.

Un-applied Brake Pedal Resistance: 2000 Ω

6. When the rear brake is applied, the resistance should read OL.

9

TROUBLESHOOTING – BRAKES

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Weak Brakes or Erratic Braking Action	Fluid Leakage (External) Fluid Leakage (Internal of Master Cylinder) Worn Pads Oil Contamination of Brake Pads and/or Brake Disc Air In System Low Brake Fluid Level In Reservoir Excessive Brake Disc Runout Worn or Damaged Wheel Bearings Loose Front Axle Nut or Clamps or Loose Rear Axle Caliper Mount Surface Uneven Or Misaligned; Missing or Damaged Fasteners Clogged or Restricted Hydraulic Line Caliper Bracket Misaligned, Bent or Distorted Loose Brake Disc Brake Pads Glazed	Repair or Replace Leaking Component Replace Master Cylinder Replace Brake Pads Pads Must Be Replaced. Disc May Be Cleaned. Bleed Air From System Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Replace Brake Disc. Replace Wheel Bearings. Torque Correctly Inspect / Repair Replace Line(s) Replace Bracket Install New Fasteners. Torque to Specification Replace Pads. Avoid Needless Heavy Braking for 100-200 miles (Burnish New Brake Pads).
Poor Brakes or No Brakes When First Applied. Brake Lever Pressure Present If Lever Is "Pumped".	Air In System Low Brake Fluid Level In Reservoir Brake Disc is Bent or Warped Caliper Misalignment External Leak Internal Leak (master cylinder) Faulty Brake Hose	Bleed Air From System Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Replace Brake Disc Determine Cause and Correct Repair or Replace Damaged Component Repair or Replace Master Cylinder Inspect for Bulges / Replace
Brake Pedal or Brake Lever Pulsates	Brake Disc Bent or Warped Mounting Surface of Brake Disc Uneven / Disc Loose Caliper Mount Surface Uneven Or Misaligned; Missing or Damaged Fasteners	Replace Brake Disc Repair or Replace as Necessary Repair or Replace as Necessary
Excessive Lever or Pedal Travel / Spongy Brake Feel.	Air in System Loose Mounting Hardware Low Brake Fluid Level In Reservoir Incorrect Brake Fluid Used See "Weak / Erratic Brakes" and Poor Brakes" possible causes above.	Bleed Air From System Repair as Necessary Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Flush System and Replace With Correct Fluid
Fluid Leakage	Loose Banjo Fittings Damaged Banjo Fitting Sealing Washers Cracked / Damaged Hose Worn Master Cylinder Piston, Caliper Piston(s) or Seals Diaphragm (master Cylinder reservoir) Leaking Fluid level too high (new brake pads installed without removing added fluid)	Tighten to Specified Torque Replace Replace Repair / Replace Master Cylinder or Wheel Caliper. Inspect / Replace Cover, Cap, Diaphragm or Reservoir as Required Correct fluid level

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PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Brakes Drag Excessively or Self-Apply (Brakes Overheat)	Reservoir Over Filled Brake Pedal Or Lever Not Returning Completely To Rest Position Inadequate Freeplay Compensating Port Plugged Internal Corrosion of Components (Master Cylinder / Caliper) Rear Caliper: Corrosion of Sliding Parts, Bent or Damaged Parts Contaminated Brake Fluid Caliper Pistons Sticking Rider Error (Operator Riding Brakes)	Adjust Level As Necessary Inspect Linkage, Pivots and Mechanism For Cause Of Binding Or Restricted Movement; Repair or Replace Master Cylinder Repair or Replace Master Cylinder Replace Damaged Component Repair or Replace As Necessary Flush System, Install Correct Fluid Repair / Replace Caliper (Corrosion / Buildup of Residue In Caliper Piston Seal Grooves) Educate Operator
Brake Squeal/ Squeak	If noise is minor and inconsistent, some brake squeak / squeal is characteristic of disc brakes and usually caused by dust / dirt on pads and / or brake disc. Pad Not Secure in Caliper Aftermarket (not genuine Indian Motorcycle) Parts Worn or Damaged Wheel Bearing(s) Worn Pads / Disc	Apply non oil-based solvent to a clean shop towel and wipe dust / dirt from brake disc. Repair as Necessary. Inspect Pad Installation Install Genuine Indian Motorcycle Parts Replace Replace

NOTES

CHAPTER 10
ELECTRICAL

9860001 R01 - 2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus Service Manual

ELECTRICAL MAINTENANCE

BATTERY SERVICE NOTES

This motorcycle is equipped with a maintenance free battery which is located at the front of the motorcycle. DO NOT remove cell caps or add distilled water to the battery. If the battery discharges, refer to Electrical chapter for diagnostic information.

NOTICE

Routing clips with cable ties; the cable tie should be cut loose from the clip. Any clips removed by extracting or prying must be replaced.

⚠ WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries. **KEEP CHILDREN AWAY FROM BATTERY.**

⚠ CAUTION

Whenever removing the battery, disconnect the negative (black) cable first. When reinstalling the battery, connect the negative (black) cable last.

Do not remove the battery cables while the engine is running. Doing so may damage the Electronic Control Module (ECM).

Take great care NOT to reverse the battery leads when installing the battery.

STARTING / CHARGING

GENERAL INFORMATION

SERVICE NOTES – STARTING / CHARGING

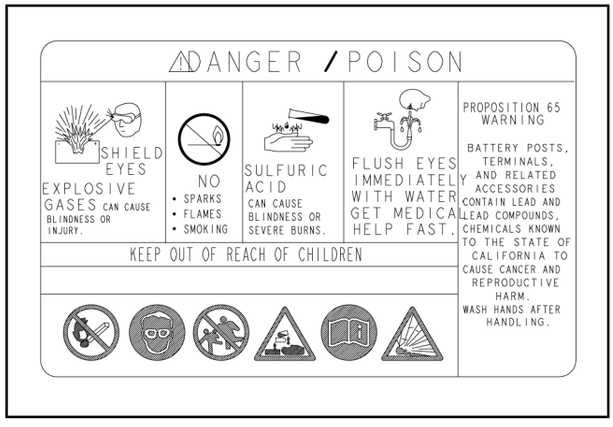
All electrical system and component service can be performed with the engine in the frame.

IMPORTANT

CAUTIONS TO OBSERVE DURING ELECTRICAL SYSTEM SERVICE

- Always turn off ignition switch before disconnecting any electrical component.
- Always verify that bullet-type connectors are free of corrosion, contamination or breaks when troubleshooting electrical problems.
- Verify that bullet-type connectors are firmly seated. Listen and/or feel for a click when connecting them.
- Ensure to release the lock on lock-type couplers before disconnecting them to avoid damaging the connector.
- Pulling on the wires when disconnecting couplers can introduce problems. Hold the connectors themselves when disconnecting them, not their associated wires.
- Inspect each male and female terminal of multi-pin connectors for corrosion, contamination, loose or bent pins.

Battery Label



WARNING

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- **Eyes:** Flush with water for 15 minutes. Call physician immediately.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries.

KEEP BATTERIES AND BATTERY ACID OUT OF REACH OF CHILDREN

The charging system used on the motorcycle is calibrated for the maintenance free battery that is installed as original equipment. Do not replace with a conventional lead-acid battery. Before troubleshooting the charging system, inspect the battery thoroughly. A discharged, poorly charged or faulty battery will make the readings obtained during charging system troubleshooting erroneous or difficult to interpret.

A battery will self-discharge when the motorcycle is not in use. Make sure to properly store the battery as outlined later in this section.

Maximum voltage and service life is only achieved when the battery is properly serviced initially. Make sure to follow instructions outlined later in this section.

Overcharging can be caused by a faulty battery (shorted cell). Test system with a known good battery when diagnosing an overcharge condition.

New batteries must be properly maintained as outlined in this section to ensure proper service life.

CAUTION

Even with a good battery, battery voltage can recover after charging, but under excessive loads the battery voltage will drop quickly and eventually "die". Often the charging system is suspect when it is not the cause of the problem. Always inspect for excessive loads if the battery continues to lose its charge. Items such as incorrect wattage bulbs, sticking brake light switch(s), continuous low rpm operation or leaving the lights on without the engine running for long periods of time can drain a battery even if the charging system is operating correctly.

⚠ CAUTION

WIRE ROUTING

Make sure that all wires are routed and secured correctly away from moving parts, hot exhaust, or sharp edges.

⚠ CAUTION

FUSES

Fuses are in place to protect circuit wiring and components. Always determine the cause of an open fuse before installing a new fuse.

Do not increase the value of the fuse to correct the problem.

Do not use wire, tin foil or other substitutes for fuses.

⚠ CAUTION

ELECTRONIC COMPONENTS

Semiconductor parts used in electronic components will not withstand careless handling.

Do not drop or strike parts that contain semiconductors such as the ECM or rectifier/regulator. Dropping electronic components can cause damage to the component.

Follow instructions supplied in this chapter, including Fuel Delivery / EFI chapter and Electrical chapter, very carefully when working on electronic components. Failure to follow instructions may cause irreparable damage to the part being inspected.

SPECIAL TOOLS – STARTING / CHARGING

TOOL DESCRIPTION	PART NUMBER
Battery Tester	PU-50296
Electrical Tester Kit	PV-43526

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – STARTING / CHARGING

ELECTRICAL SPECIFICATIONS

ITEM		SPECIFICATIONS
Electrical (General)	Ignition System	Distributor-less Transistorized Dual Coil Type Ignition
	Starting System	Electric
	Charging System	Permanent Magnet / 3 Phase / Full Wave Rectification
	Regulator/Rectifier	Solid State Three Phase Voltage Regulator/Rectifier
	Lighting System	12 V DC

CHARGING SPECIFICATIONS

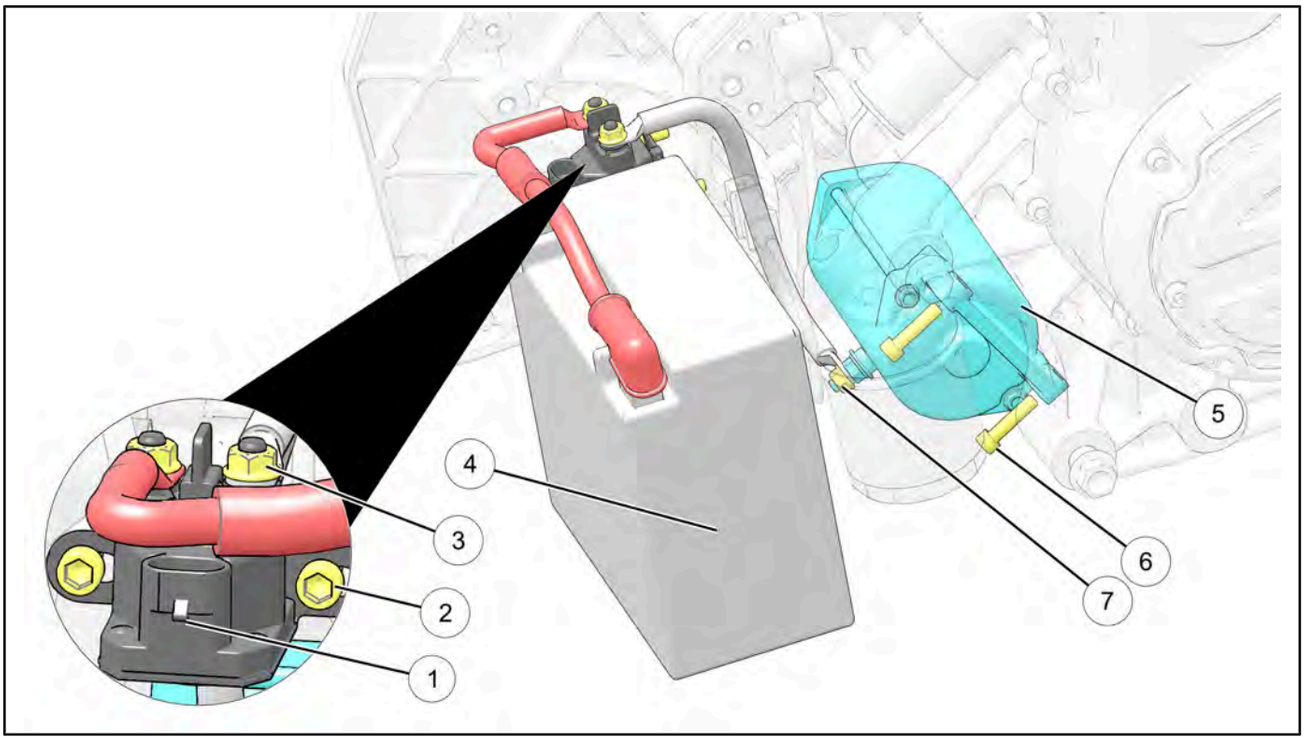
ITEM		SPECIFICATIONS
No Load AC Output @ 800–1000 RPM (Engine cool)		17-26.5 VAC @ Idle
No Load AC Output @ 2000 RPM (Engine cool)		40-45 VAC at 2000 RPM
Stator Coil Resistance (@ 21°C / 70°F) (Black to each other black) (Disconnect regulator - see test.)		90.7 mΩ ± 20%
Stator Coil Resistance To Ground (Each black wire)		Infinity (no continuity)
Regulated Voltage		14.3 - 14.7 V DC
Output (Amps / Watts)		56 A / 710 W @ 2000 RPM
Battery	Type	Yuasa: GYZ20HL-A
	Voltage	12 Volts DC
	Nominal Capacity @ 10 Hr Rate	18 AH
	Recommended Battery Charging Current	Use automatic ≤ 2 Amp charger
	CCA Rating	310

STARTING SYSTEM SPECIFICATIONS

ITEM	SPECIFICATION
Battery Voltage, No Load	Above 12.5 V DC
Resistance: Between Any Two Commutator Bars	Continuity (0 Ohms)
Resistance: Commutator to Armature Shaft	Infinity (OL on Fluke™ 73)
Resistance: Battery Input Terminal to Insulated Brush	Continuity (0 Ohms)
Resistance: Bat. Input Terminal to Starter Motor Case	Infinity (OL on Fluke™ 73)
Starter Motor Operating Amp Draw	140–160 Amps
Starter Motor No Load Amp Draw (Bench Test)	30-37 Amps after initial surge
Starter Torque Limit Clutch Break-Away Torque	50 – 60 ft-lbs (70 - 80 Nm) when new

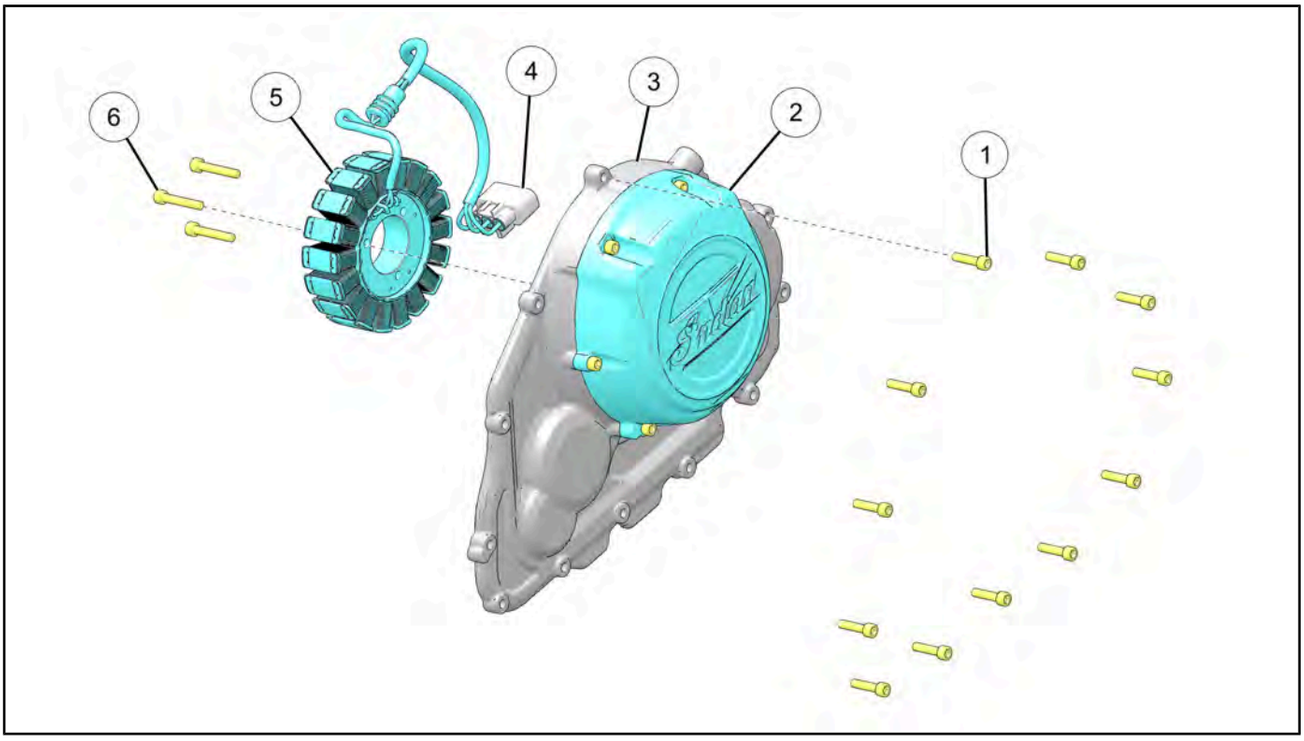
ASSEMBLY VIEWS

STARTER MOTOR / SOLENOID



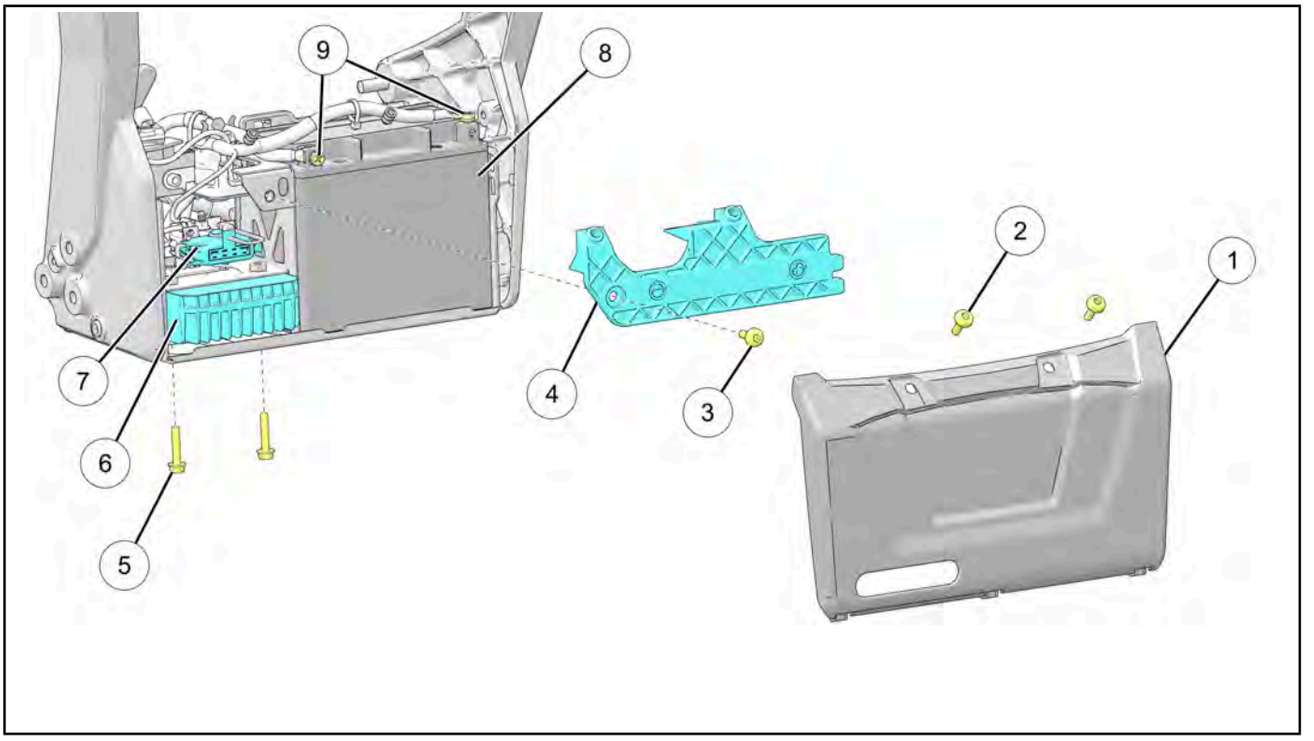
① Starter Solenoid	⑤ Starter
② Starter Solenoid Fastener **88 in-lbs (10 N·m)**	⑥ Starter Mount Fastener **88 in-lbs (10 N·m)**
③ Starter Solenoid Terminal Fastener **44 in-lbs (5 N·m)**	⑦ Starter Terminal Fastener **88 in-lbs (10 N·m)**
④ Battery	

STATOR ASSEMBLY VIEW

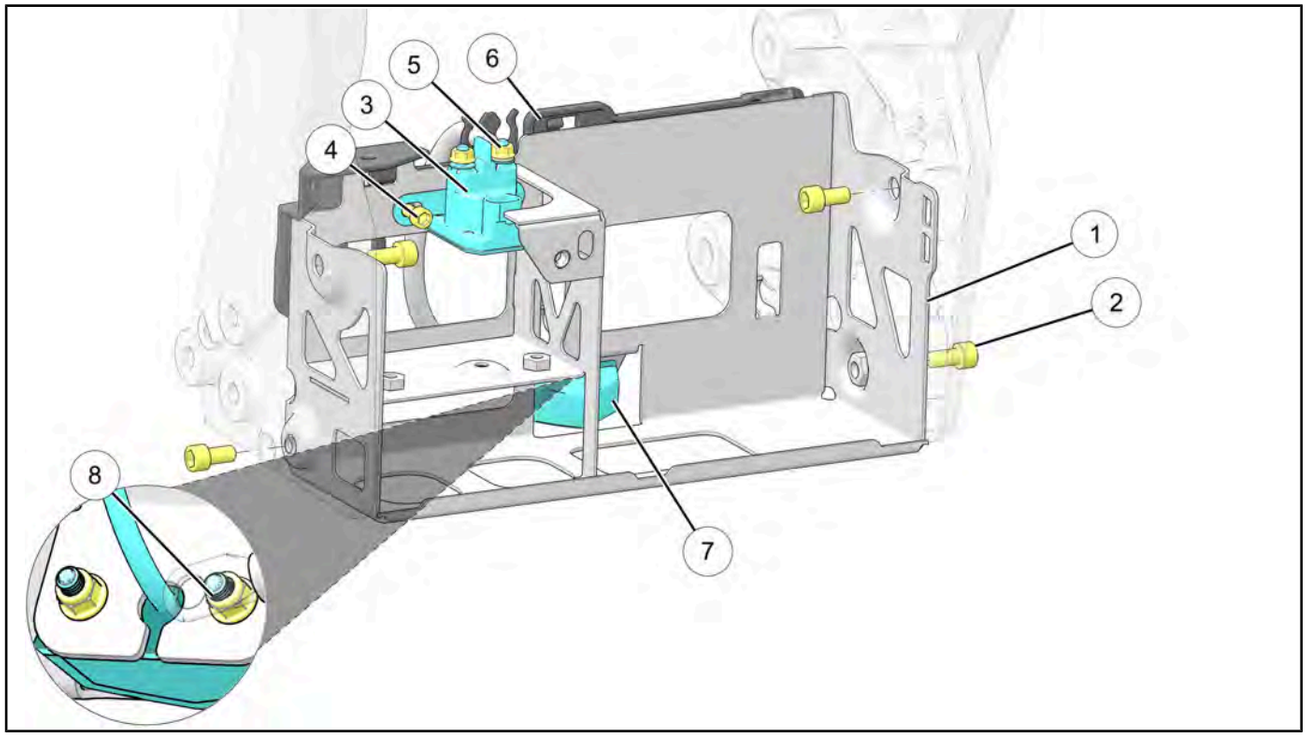


① Stator Cover Fastener **88 in-lbs (10 N·m)**	④ Stator Connector
② Stator Cover (Outer)	⑤ Stator Assembly
③ Stator Cover (Inner)	⑥ Stator Fastener **88 in-lbs (10 N·m)**

BATTERY BOX ASSEMBLY VIEW



① Chin Fairing	⑥ Voltage Regulator
② Chin Fairing Fastener **35 in-lbs (4 N·m)**	⑦ MCase
③ Battery Bracket Fastener **88 in-lbs (10 N·m)**	⑧ Battery
④ Battery Bracket	⑨ Battery Terminal **48 in-lbs (5.4 N·m)**
⑤ MCase / Voltage Regulator Fastener **88 in-lbs (10 N·m)**	

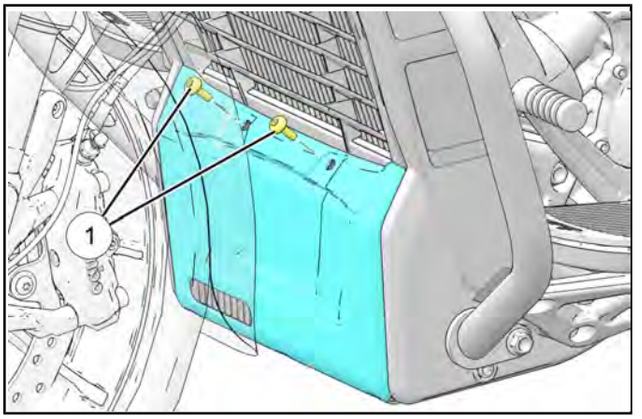


① Battery Box	⑤ Starter Solenoid Terminal Nut **44 in-lbs (5 N·m)**
② Battery Box Fastener **18 ft-lbs (24 N·m)**	⑥ Harness Tray
③ Starter Solenoid	⑦ Puddle Light
④ Starter Solenoid Fastener **88 in-lbs (10 N·m)**	⑧ Puddle Light Fastener **88 in-lbs (10 N·m)**

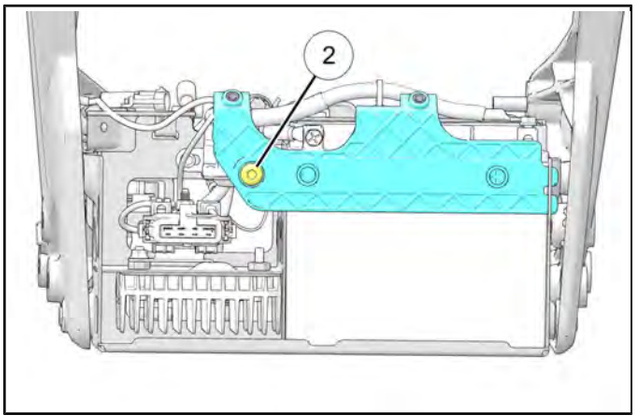
BATTERY SERVICE

BATTERY REMOVAL

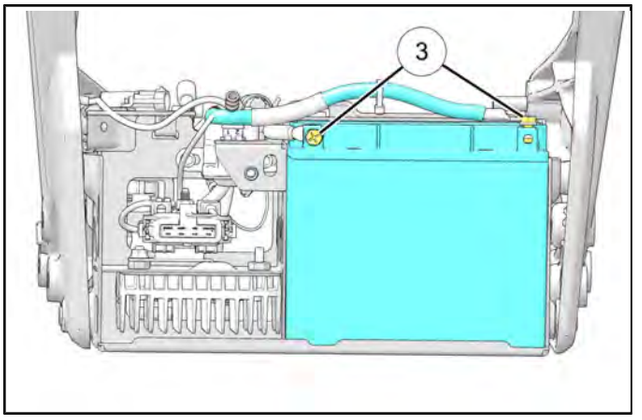
1. Remove chin fairing by removing its fasteners ①.



2. Remove battery bracket by removing its fastener ② and sliding the bracket out of its retention feature.



3. Remove negative (-) and battery positive (+) terminals bolts ③ and remove battery.



BATTERY INSTALLATION

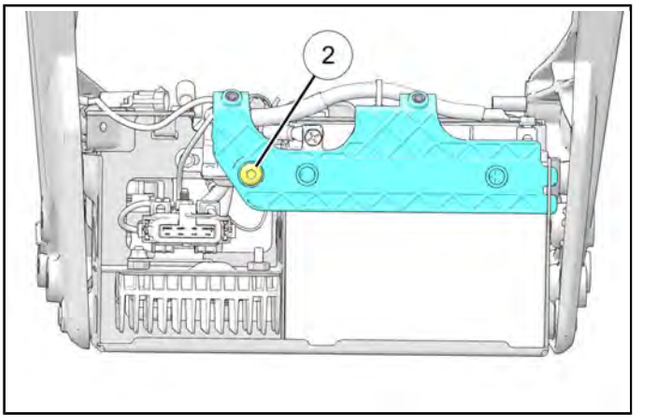
NOTICE
Be sure cable ends and battery terminals are clean. Apply a light film of di-electric grease to terminal fastener threads.

1. Carefully install battery.
2. Connect positive (+) then negative (-) battery cables.

TORQUE
Battery Terminal: **48 in-lbs (5.4 N·m)**

3. Install battery bracket and fastener ②.

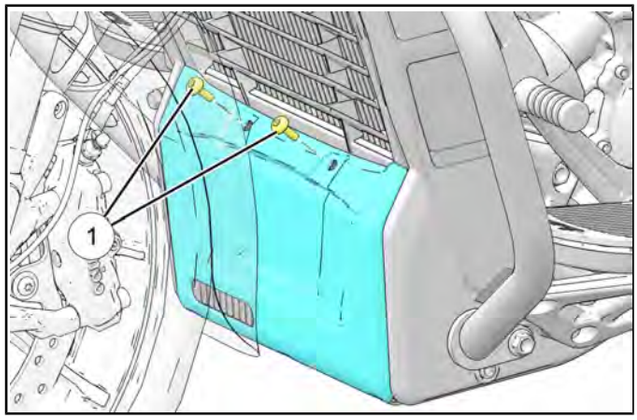
TORQUE
Battery Bracket Fastener: **88 in-lbs (10 N·m)**



4. Apply dielectric grease over terminal areas for corrosion protection.

5. Install chin faring and fasteners ①.

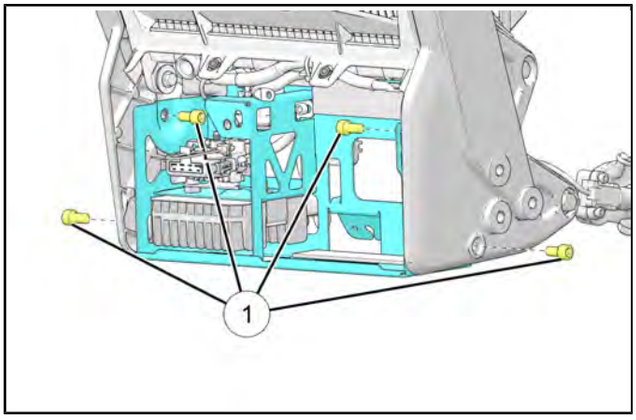
TORQUE
Chin Fairing Fastener: **35 in-lbs (4 N·m)**



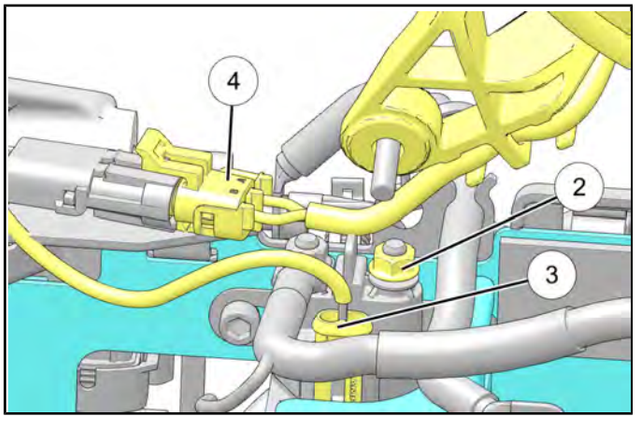
BATTERY BOX REMOVAL / INSTALLATION

REMOVAL

1. Remove battery. See **Battery Removal page 10.14**
2. Remove battery box fasteners ①.



3. Remove starter solenoid nut ② and remove cable going to starter.

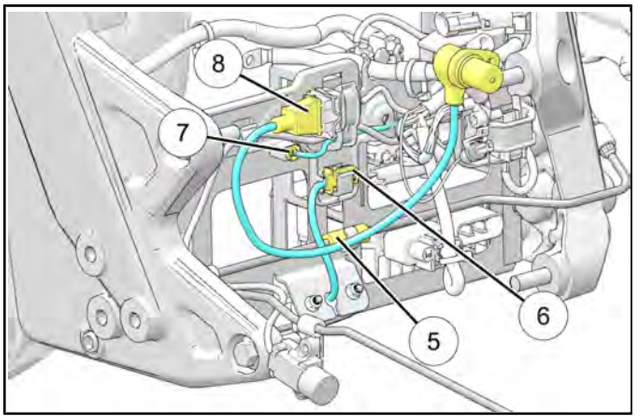


10

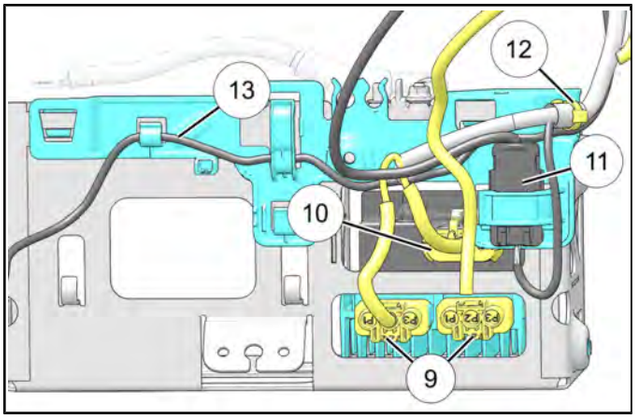
4. Disconnect Starter Solenoid electrical connector ③ and fan electrical connector ④.

IMPORTANT
Release chassis fan connector clip by prying the tab on the connector and slide off clip. DO NOT EXTRACT FIR CLIP FROM THE BATTERY BOX.

Disconnect brake line isolators ⑤ from battery box.



5. Disconnect puddle light electrical connector ⑥ or harness termination connector ⑦.
6. Disconnect crankshaft position sensor connector ⑧ un-clip remaining end from battery box.
7. Disconnect regulator electrical connectors ⑨.



NOTICE
If the battery box is being replaced, the bracket must be transferred with it.

8. Disconnect Mcase electrical connector ⑩.
9. Slide O2 sensor connection ⑪ from the battery bracket by sliding out of clip feature to the left.
10. Cut electrical harness cable tie from fir clip to release harness ⑫ from battery box bracket.
11. Remove kickstand switch wiring ⑬ from the battery box.

INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Starter Solenoid Terminal Nut: **44 in-lbs (5 N·m)**

TORQUE
Battery Box Fastener **18 ft-lbs (24 N·m)**

2. Install battery. See **Battery Installation page 10.14**.

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BATTERY CHARGING AND MAINTENANCE

AGM BATTERY CHARGER RECOMMENDATIONS

Indian Motorcycle recommends using the BatteryMINDer® 2012 AGM - 2 AMP battery charger (PN 2830438) to charge and maintain AGM batteries. The charger can be found on the Polaris and Indian Motorcycle PG&A websites and ordered in DEX – Item Availability.

⚠ CAUTION

If not using the BatteryMINDer® 2012 AGM – 2 AMP battery changer, an automatic/constant monitoring AGM battery charger with a charging rate of 2 amps or less is recommended to prevent damage to the battery.

Batteries that fall below 12.5V run the risk of sulfation, a condition whereby sulfate crystals form inside the battery and significantly reduce performance. AGM chargers are designed specifically for charging AGM type batteries and use high frequency pulses to partially reverse sulfation.

IMPORTANT

The use of non-AGM battery chargers or non-AGM battery tenders may result in a misleading "battery not found" or "open cell" fault message. Please ensure you are using the recommended AGM charger when charging AGM type batteries to prevent damage to the battery.

INDIAN MOTORCYCLE RECOMMENDED AGM BATTERY TESTING PROCEDURE:

1. Test battery using the battery tester PU-50296.
2. If the tester indicates a test result other than "Good Battery," follow the steps below before replacing the battery:
   a. Connect battery to the recommended battery charger. If charging sequence begins as normal, fully charge battery and proceed to step 3.

      The time listed on the PU-50296 battery tester printout is an estimate. The recommended automatic charger will indicate when the battery is fully charged on its display.

   b. If charging sequence does not initialize, follow automatic battery charger manual's instructions on how to charge deeply discharged batteries OR refer to the **AGM Battery Charging Recommendations – Deeply Discharged (below 3 volts)** section to attempt to restore the deeply discharged battery. If charging sequence will not finish as intended, the battery needs to be replaced.
3. Re-test battery. If the test results show that battery failed, proceed with battery replacement.

AGM BATTERY CHARGING RECOMMENDATIONS

The battery will self-discharge when disconnected from a vehicle, and will discharge at a faster rate when connected. Listed below are the recommended battery charging schedules.

- Batteries which are not connected to a vehicle should be charged every 60 days.
- Batteries which are connected to motorcycles should be charged when they arrive at your dealership and at least once every 2 weeks thereafter.
- Showroom bikes used to demonstrate radio, display and infotainment features should be charged daily. If possible, these bikes should be connected to the recommended battery charger continuously.

Always use the recommended automatic battery charger, and wait for the charger to complete the charge cycle before disconnecting it.

AGM BATTERY CHARGING RECOMMENDATIONS – DEEPLY DISCHARGED (BELOW 3 VOLTS)

NOTICE

If the automatic charger's manual does not include instructions on how to charge deeply discharged batteries, then use the following procedure.

AGM batteries discharged to a voltage of 3 volts or less may not be recognized by the recommended automatic battery charger. (The minimum voltage threshold recognized by other battery chargers may be as high as 10.5 volts). Often times deeply discharged batteries can be restored by attaching another, fully-charged, battery to "jump start" the low battery. Follow the steps below to restore a deeply discharged battery.

1. Carefully connect the two batteries' positive terminals, then the negative terminals using jumper cables.
2. Connect the recommended battery charger to the low battery and initiate the charging sequence.

⚠ WARNING

Always check to ensure the positive cables are connected to the positive terminals before powering the charger on. Reversing polarity when charging can damage electrical components and risk personal injury. Be careful not to let battery cable clamps touch each other.

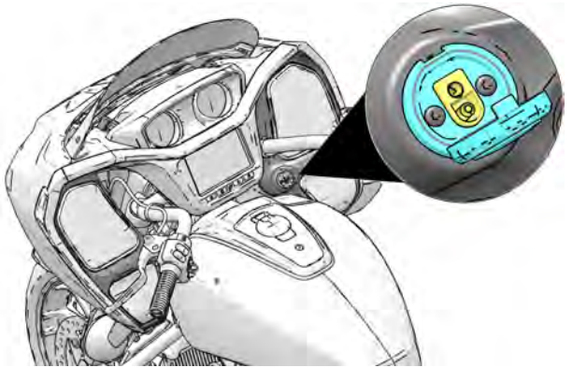
3. After the charging sequence has initiated, disconnect the fully-charged battery. Always disconnect the fully-charged battery positive first, followed by low battery positive, low battery negative, and finally fully-charged battery negative
4. Wait for the charger to complete the charge cycle before disconnecting it.

AGM BATTERY MAINTENANCE TIPS

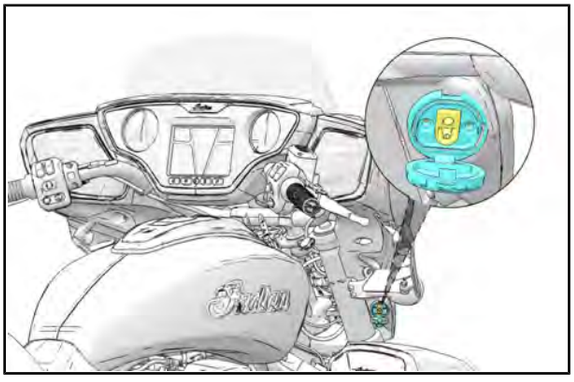
1. If the motorcycle will not be driven for more than 2 weeks, maintaining the battery with the BatteryMINDer® 2012 AGM - 2 AMP charger (PN 2830438) is recommended.
2. To help prolong battery life, if a power source is not available to use the 12V Battery Charge Port, it is recommended to remove the battery from vehicles stored ONE month or longer. To maximize the life of stored batteries, they should be kept in a cool / dry location. Batteries will self discharge more rapidly when stored in extreme heat. Batteries should be maintained using the recommended battery charger while in storage.
3. Batteries will self-discharge more quickly when dirty. Periodic cleaning of the battery terminals using a terminal brush will help maximize battery life. Wash terminals with a solution of one tablespoon baking soda and one cup water. Rinse well with tap water and dry off with clean shop towels. Coat the terminals with dielectric grease or petroleum jelly.
4. Battery connections should be tightened to the correct torque during installation. This will reduce voltage drop and ensure a reliable connection between the regulator/rectifier and battery.
5. Models are conveniently equipped with a SAE bullet style connector for quick access to charging the battery and a maintenance charger can be connected to it for extended periods (e.g. winter storage). The recommended BatteryMINDer® 2012 charger comes with the mating connector for easy plug and play maintenance.

The connector is located on the right hand fairing dash.

CMF



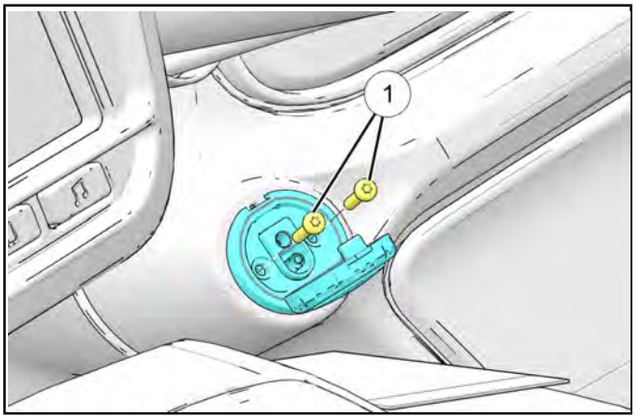
FMF



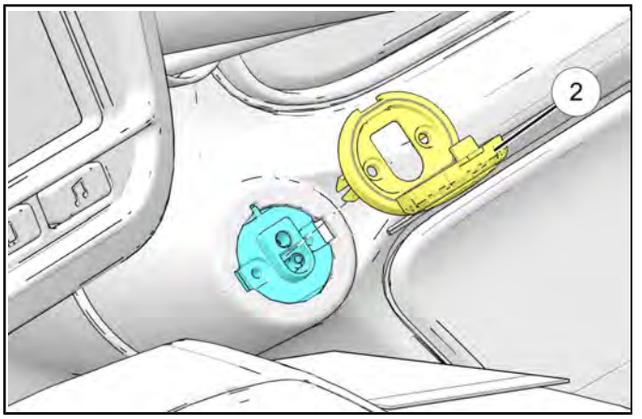
BATTERY CHARGE PORT REMOVAL / INSTALLATION

CMF

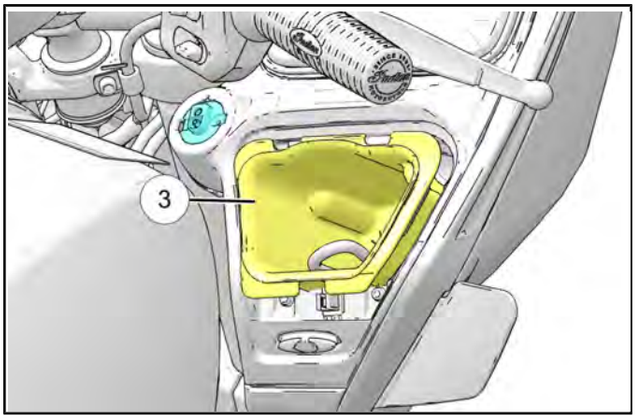
1. Remove the two charge port fasteners ①.



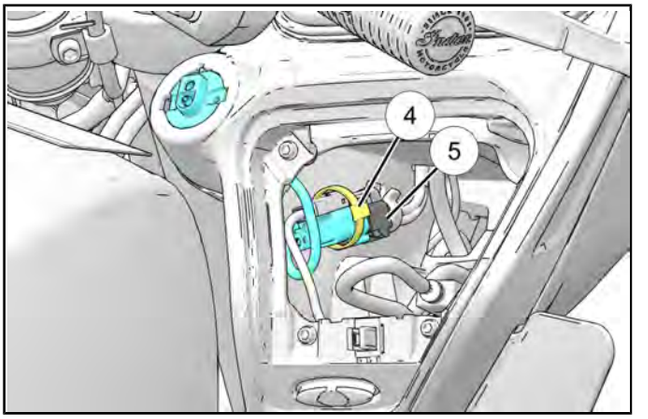
2. Remove the charge port cover.



3. Open the right hand storage door.
4. Remove the storage liner ③.



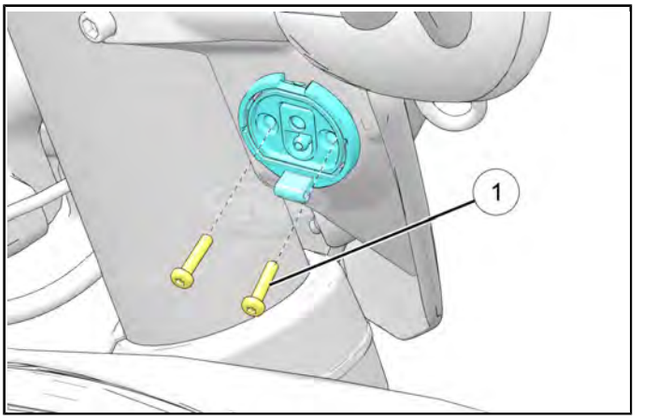
5. Cut the cable tie ④ the retention cable.



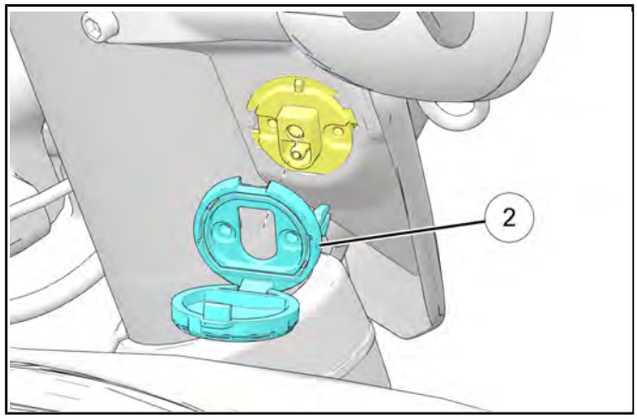
6. Disconnect the charge port electrical connector ⑤.
7. Remove the charge port.
8. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

FMF

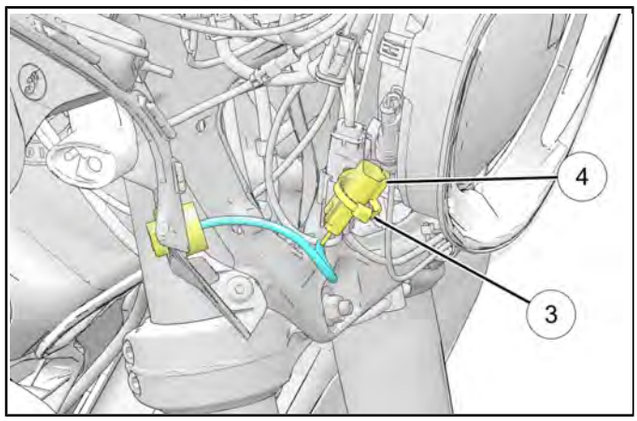
1. Remove the outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Remove the two charge port fasteners ①.



3. Remove the charge port cover.



4. Cut the cable tie ③ the retention cable.



5. Disconnect the charge port electrical connector ⑭.
6. Remove the charge port.
7. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

BATTERY INSPECTION

1. Remove battery. See **Battery Removal page 10.14**.
2. Inspect battery tray and hold-down cover for damage. Be sure all foam strips are in place on battery box.
3. Visually inspect the exterior of the battery. Replace battery if housing is damaged, case is deformed, or if electrolyte is leaking.

> **⚠ CAUTION**
>
> Do not remove the battery cap assembly in an attempt to inspect fluid level, specific gravity or attempt to add fluid to battery. After initial servicing, battery should remain sealed.

4. Inspect terminals for corrosion. If corrosion is found, clean terminals with a solution of baking soda and water. Clean terminals, bolts, and cable ends with a brass wire brush. Rinse well with tap water and dry off with clean shop towels and apply a thin film of dielectric grease or petroleum jelly.
5. Test using the Indian Motorcycle recommended AGM battery testing procedure. See **BATTERY CHARGING AND MAINTENANCE page 10.17**.
6. Install battery. See **Battery Installation page 10.14**.
7. Once connections are secured, apply a thin film of di-electric grease to terminals.

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STARTER MOTOR SERVICE

SAFETY INFORMATION

⚠ WARNING

Always disconnect the battery (negative terminal first) before servicing the starter motor.

- Inspect the condition of the battery before troubleshooting the starter system. Also inspect main engine ground and battery cable connections.
- Inspect both engine to chassis harness grounds. Both grounds can impact function of the starter.

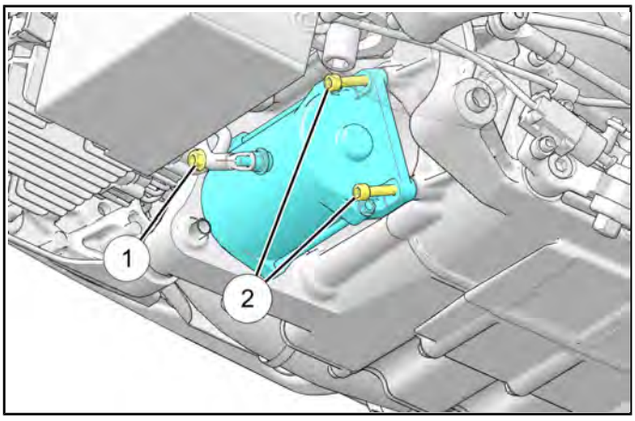
STARTER MOTOR, REMOVAL

REMOVAL

⚠ WARNING

Ensure that the ignition switch is turned off. Remove the negative cable at the battery before removing the starter motor.

1. Disconnect battery cables. Reference **Battery Removal page 10.14**.
2. The oil filter must be removed to access the top starter fastener. Reference **Engine Oil & Filter Change page 2.19**.
3. Disconnect the positive terminal ① from the starter motor.
4. Remove the two fasteners ② from the rear of the starter motor and slide assembly to the LH side of the motorcycle to release from engine case.



5. Remove starter motor.

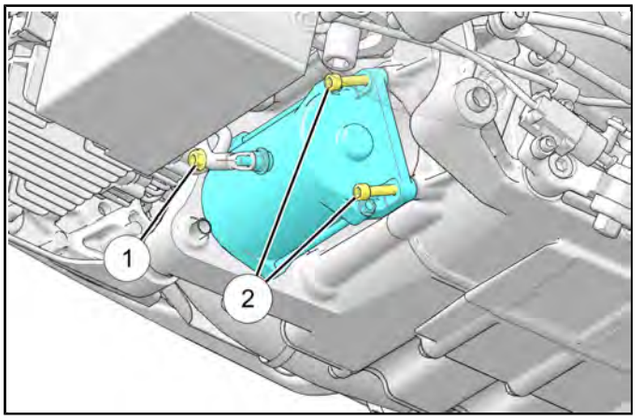
STARTER MOTOR INSTALLATION

INSTALLATION

1. Install starter motor.

TORQUE
Starter Motor Positive Terminal Nut: **88 in-lbs (10 N·m)**

2. Install the two fasteners ② onto the rear of the starter motor and install assembly onto the RH side of the motorcycle..



TORQUE
Starter Mounting Fasteners: **88 in-lbs (10 N·m)**

3. Connect the positive terminal ① onto the starter motor.
4. Install oil filter and inspect oil level. Reference **Engine Oil & Filter Change page 2.19**.

TORQUE
Oil Filter: **Approximately 3/4 turn after seal has contacted the filter adapter.**

5. Connect battery cables. Reference **Battery Installation page 10.14**.

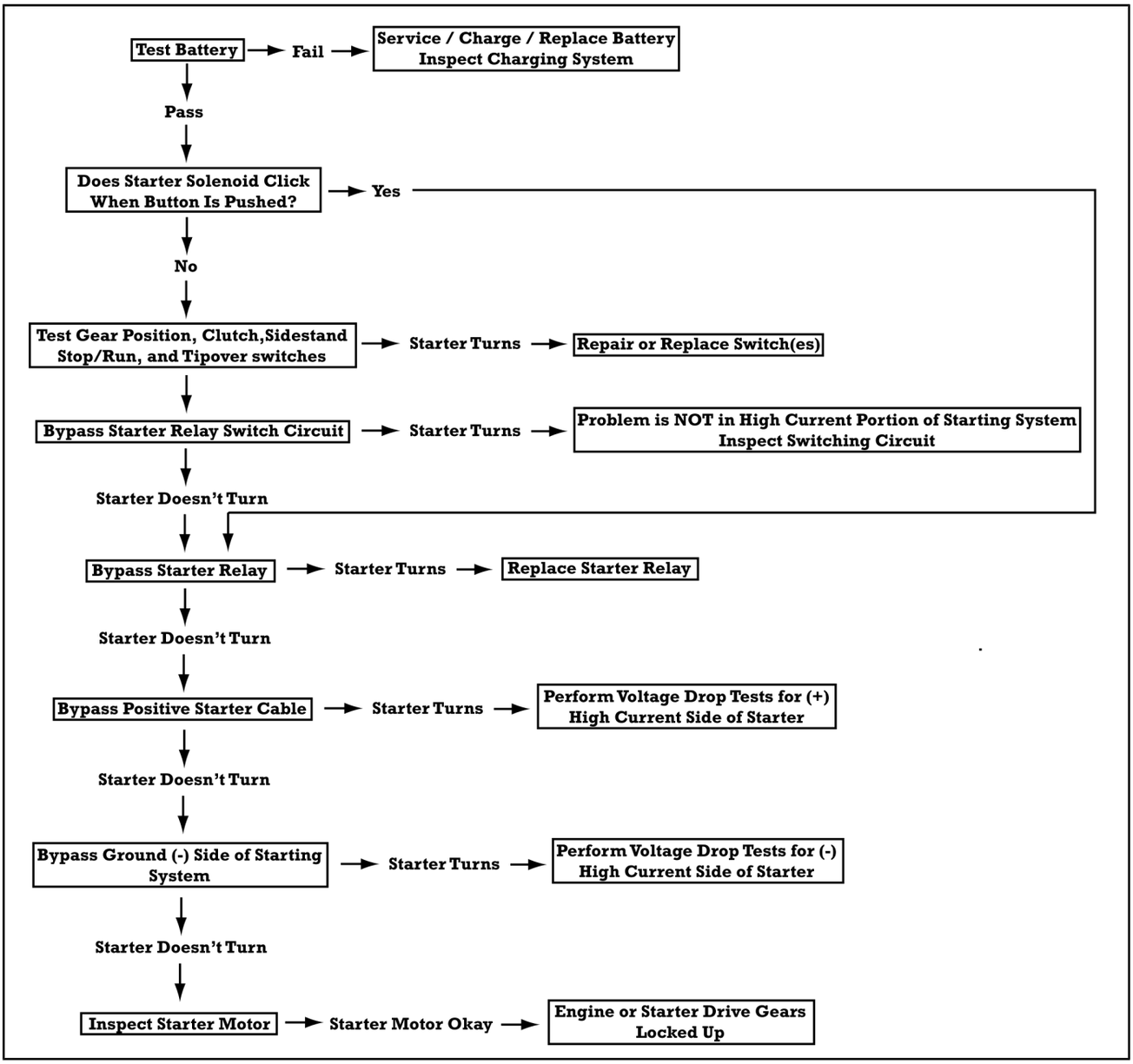
STARTING SYSTEM DIAGNOSTIC TABLE

SYMPTOM	POSSIBLE CAUSE	RECOMMENDATION
Starter motor does not turn with transmission in neutral. Turns with clutch pulled in.	Gear Position Switch or circuit malfunction.	Test Gear Position Switch.
Starter motor does not turn with transmission in gear and clutch lever pulled in. Turns with transmission in neutral.	Clutch Switch or Side Stand switch circuit malfunction.	Test Switches.
Starter motor will not turn.	Low battery voltage. Poor cable connections. Front or rear ground loose.	See Troubleshooting Flow Chart 1
Starter motor turns slowly. Engine may or may not start.	Low battery. Faulty starter motor or drive mechanism. Engine mechanical problem.	See Troubleshooting Flow Chart 2
Starter motor turns, but engine does not turn.	Starter torque limit clutch slipping.	See Troubleshooting Flow Chart 3
Starter motor turns at normal speed, but engine does not start.	Ignition Problem Engine Problem Fuel Delivery Problem	Electrical chapter Engine / Cooling / Exhaust chapter Fuel Delivery / EFI chapter

TROUBLESHOOTING FLOW CHART 1

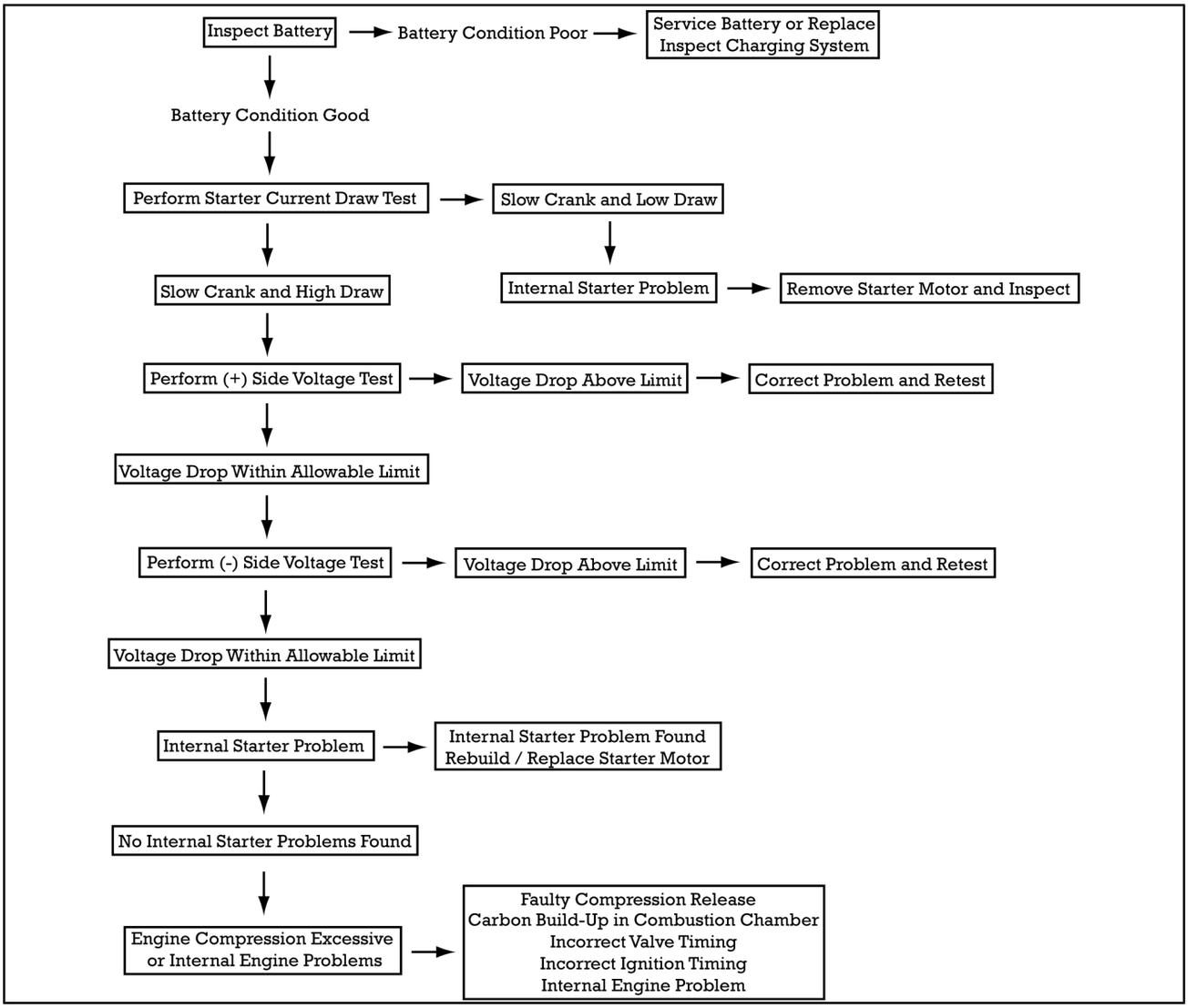
NOTICE

Make sure the Key Fob authorization has occurred before performing troubleshooting.



TROUBLESHOOTING FLOW CHART 2

NOTICE
These procedures require a Digital Multi Meter (DMM) and high a high current shunt, or an inductive ammeter clamp and a DMM.



TROUBLESHOOTING FLOW CHART 3

SYMPTOM	POSSIBLE CAUSE
Starter motor turns, but engine does not turn. The starter motor can be heard spinning.	Starter clutch malfunction.
	Starter torque limit clutch slipping.
	Starter gears damage.

STARTING SYSTEM TESTS

BATTERY LOAD TEST

1. Load test battery using a commercially available battery load tester. Follow the battery load tester manufacturer instructions.

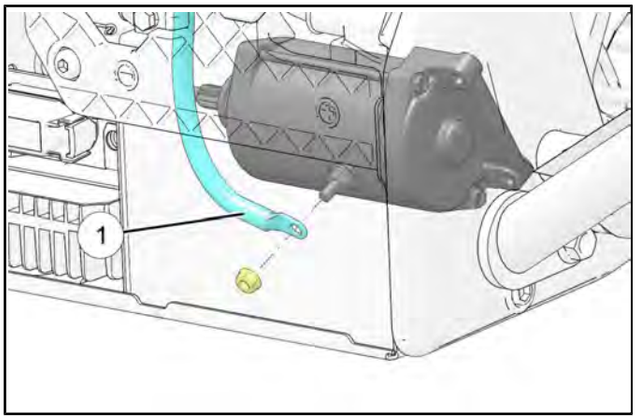
NOTICE
Although not as conclusive, the following test can be used to direct troubleshooting efforts if a battery load tester is not readily available.

2. Charge battery until open circuit voltage is above 12.5 Volts.
3. Install battery and connect battery cables.
4. Connect digital multimeter to battery and keep it connected for duration of test.
5. Press power button to power up electrical system and move head light high beam switch to High Beam for 1 minute (without the engine running).
6. Measure battery voltage.
7. If battery voltage has dropped below 10.5 V DC, re-charge and re-test battery or replace it.

STARTER SOLENOID POSITIVE CIRCUIT TEST

⚠ WARNING
Secure motorcycle on the side stand and place transmission in neutral for the following test.

1. Place the transmission in neutral.
2. Remove the positive cable ① from starter motor.



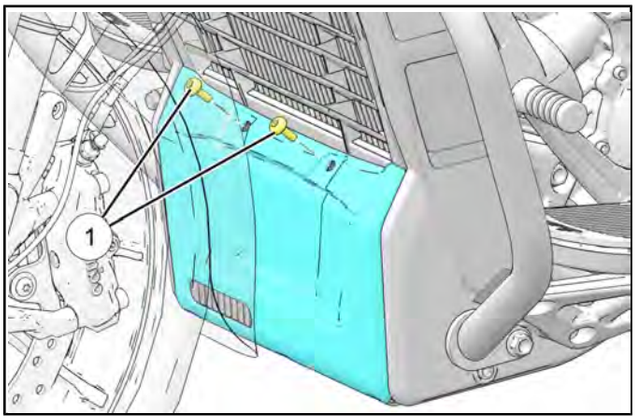
3. Set multi meter to **DC Volts** and insert meter leads in the appropriate jacks.
4. Connect the red meter lead (+) to the positive starter cable eyelet and the black (-) meter lead to chassis ground.
5. Press the power button to power up the electrical system and place the STOP/RUN switch in the RUN position.
6. Press starter button. The meter should display battery voltage. If voltage is more than .2 volts below battery voltage, inspect the power supply circuit.

STARTER SOLENOID GROUND CIRCUIT TEST

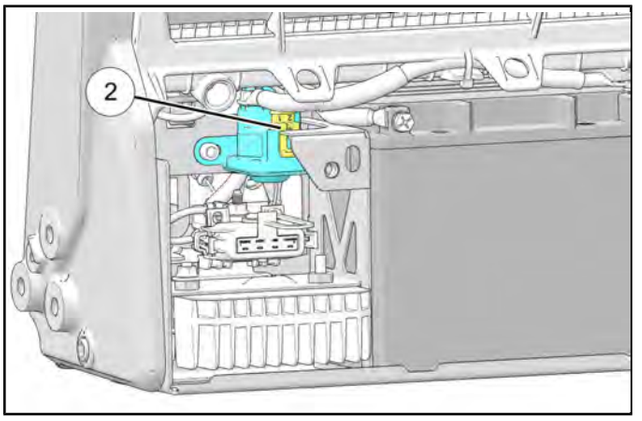
⚠ WARNING

Ensure that the motorcycle is secure and that the transmission is in neutral for the following test.

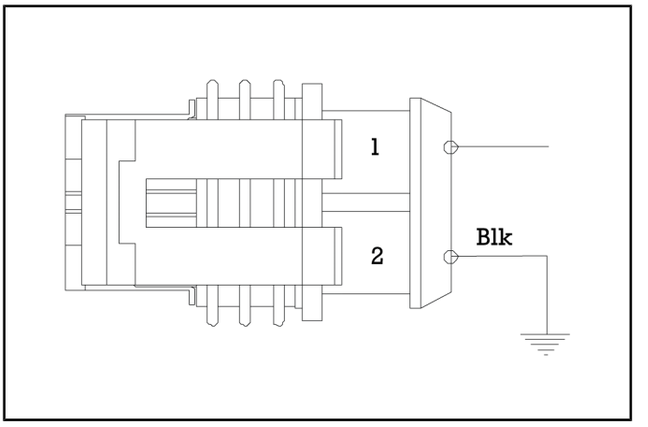
1. Shift transmission to Neutral.
2. Remove chin fairing by removing its fasteners ①.



3. Disconnect the start solenoid connector ② .



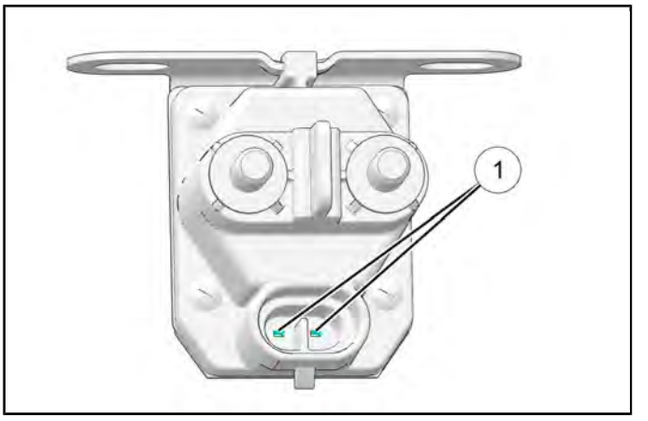
4. Set the multi meter to read resistance and insert meter leads into the appropriate jacks.
5. Working on the vehicle side of the harness, test continuity between terminal 2 (black wire) and chassis ground.



Resistance should be ≤ 0.5 Ω

STARTER SOLENOID RESISTANCE TEST

1. Using a multi-meter check the resistance of start solenoid pins ①.



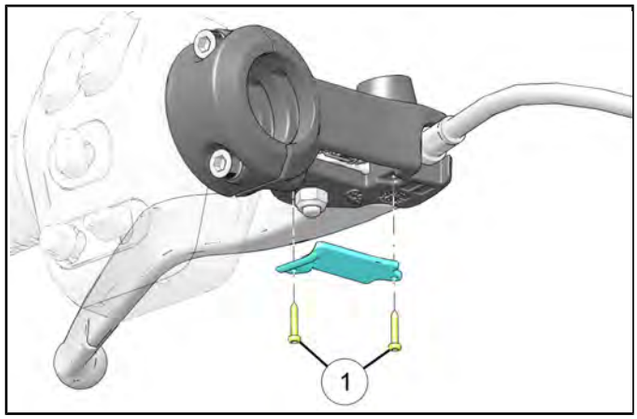
Start Solenoid Resistance:
2.5 Ω

CLUTCH SWITCH CIRCUIT TEST

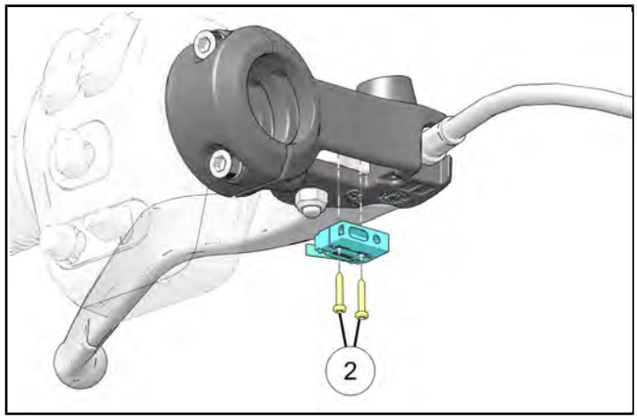
Refer to the Digital Wrench® II User Manual. See **Digital Wrench II User Manual page 1.16**.

CLUTCH SWITCH REMOVAL

1. Remove clutch switch cover fasteners ① and clutch switch cover .



2. Remove clutch switch retaining fastener②.



3. Gently pull the clutch switch out of the lever perch until the locating pins are free and the switch can be disconnected.

⚠ CAUTION

The clutch switch has two locating pins on the top side which slide into the clutch lever perch. Use caution when removing the clutch switch so the locating pins do not break off.

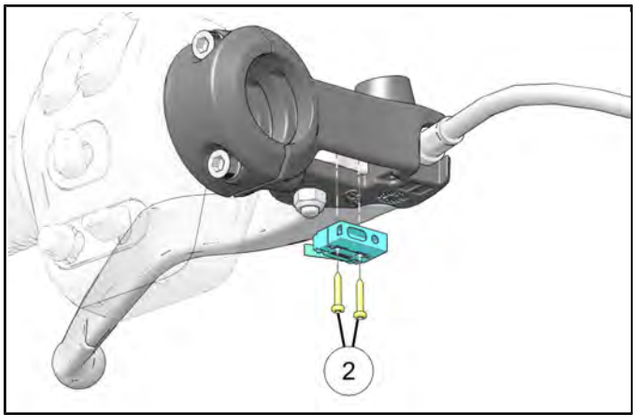
CLUTCH SWITCH INSTALLATION

1. Gently install the clutch switch into the lever perch until the locating pins are connected.

⚠ CAUTION

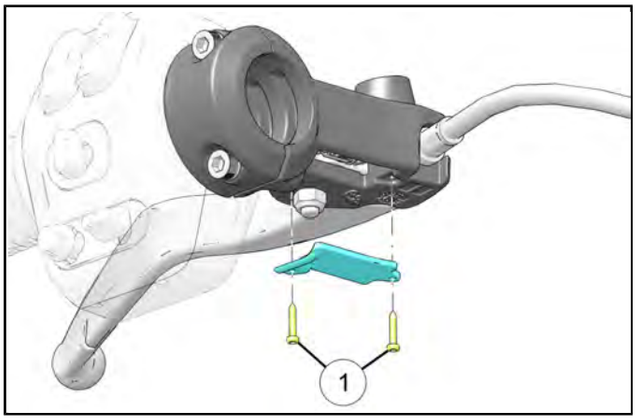
The clutch switch has two locating pins on the top side which slide into the clutch lever perch. Use caution when installing the clutch switch so the locating pins do not break off.

2. Install clutch switch retaining fastener②.



TORQUE
Clutch Switch Fastener: **5 in-lbs (0.55 N·m)**

3. Install clutch switch cover fasteners ① and clutch switch cover .



TORQUE
Clutch Switch Cover Fasteners: **5 in-lbs (0.55 N·m)**

10

STARTER CURRENT DRAW TEST

NOTICE

This procedure requires the use of an inductive ammeter to read current draw and a volt meter to monitor battery voltage during the test.

⚠ WARNING

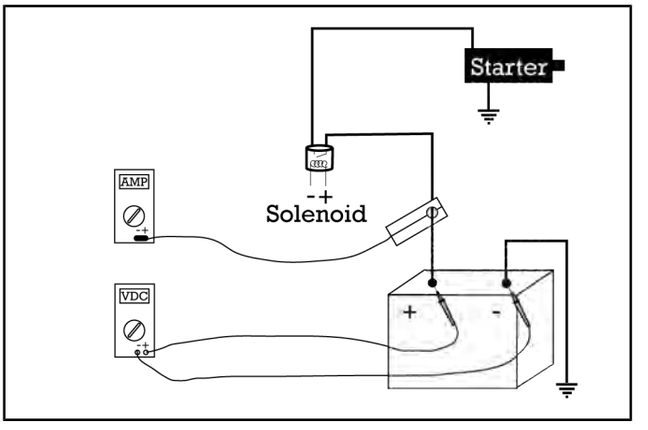
Do not allow any part of the jumper cable clamp to touch the chassis or any other ground.

⚠ CAUTION

Disable the ignition system so that the engine will not start during this test.

- Remove spark plug caps.
- Install test spark plugs into plug caps.
- Ground spark plugs against engine.

1. Inspect the battery. Charge or replace battery as necessary before proceeding.
2. Place transmission in neutral.
3. Position an inductive ammeter clamp on battery positive cable.
4. Set the multi meter to **Volts DC** scale and connect red lead of meter to positive post of battery.
5. Connect black lead of meter to negative post of battery.



6. Press the power button to power up the electrical system and observe ammeter. It should register negative amps. If it does not, turn the ammeter probe around.

7. Check that the engine STOP/RUN switch is in the RUN position, transmission is in neutral, clutch lever pulled in and that the ignition system is disabled.
8. Press starter switch and crank starter for about 5 seconds and observe both meters and the tachometer.
9. The battery voltage should remain above 9.6 volts.
10. The amperage draw of the starter should not exceed 160 amps.

Starter current draw @ 77°F (25°C): ≤**160 Amps**

STARTER CLUTCH REMOVAL

1. Reference **ACG Cover Removal page 10.31**.

CHARGING SYSTEM SERVICE

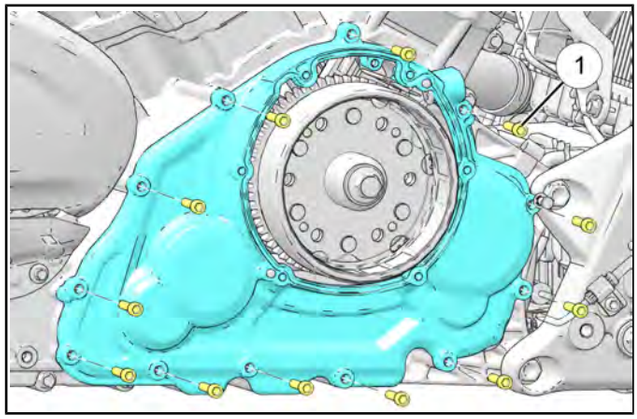
ACG COVER REMOVAL

REMOVAL

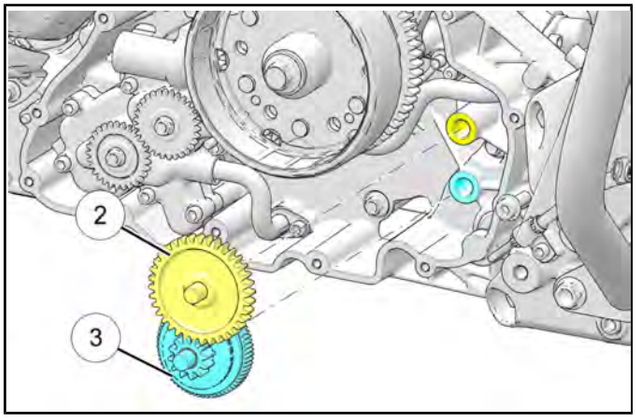
1. Remove the RH floorboard / master cylinder assembly and move out of the way. See **Floorboard Removal page 7.103**.

NOTICE
The RH floorboard and rear brake master cylinder can be removed as an assembly. It is not necessary to disconnect the brake line from the master cylinder while performing this procedure.

2. Remove exhaust headpipe. See **Headpipe Removal page 3.107**.
3. Remove stator. See **Stator Removal page 10.32**.
4. Remove ACG cover by removing its fasteners ①.

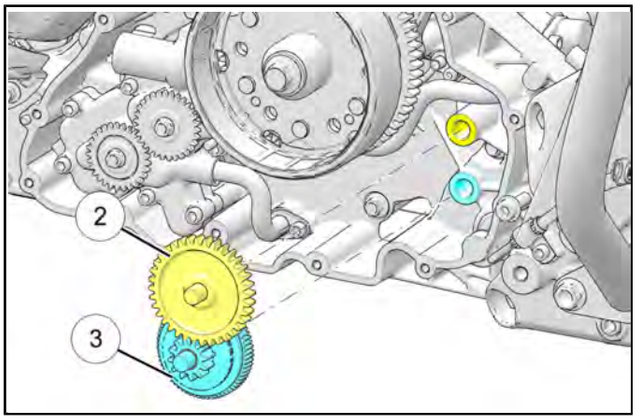


5. Remove starter idler gear ② and starter drive gear ③.

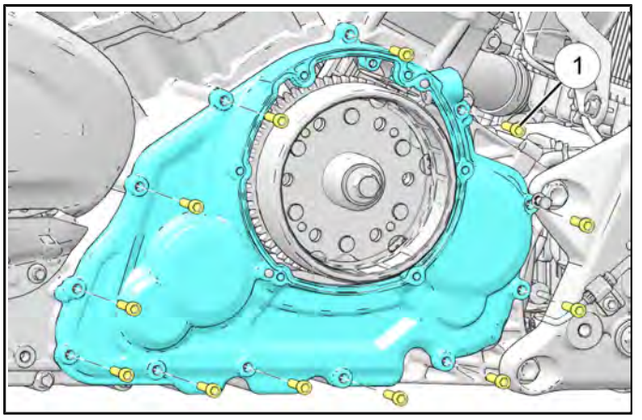


ACG COVER INSTALLATION

1. Clean gasket mating surfaces and install cam chain cover using a new gasket.
2. Install starter idler gear ② and starter drive gear ③.



3. Install ACG cover by removing its fasteners ①.



NOTICE
Torque cam chain cover fasteners following the specified torque sequence.

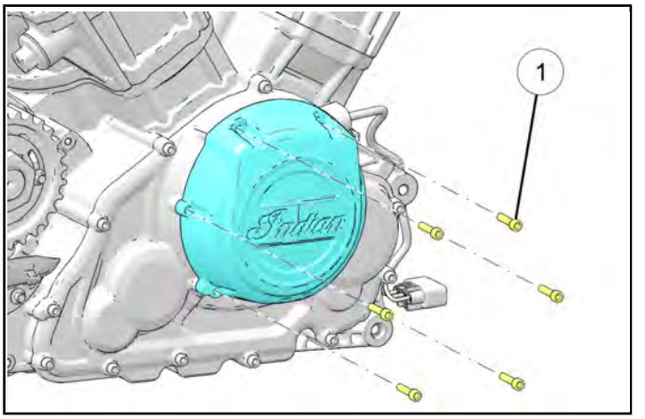
TORQUE
ACG Cover Fasteners: **88 in-lbs (10 N·m)**

4. Install stator. See **Stator Installation page 10.33**.
5. Install exhaust headpipe. See **Headpipe Installation page 3.108**
6. Install the RH floorboard / master cylinder assembly. See **Floorboard Installation page 7.104**.

STATOR REMOVAL

REMOVAL

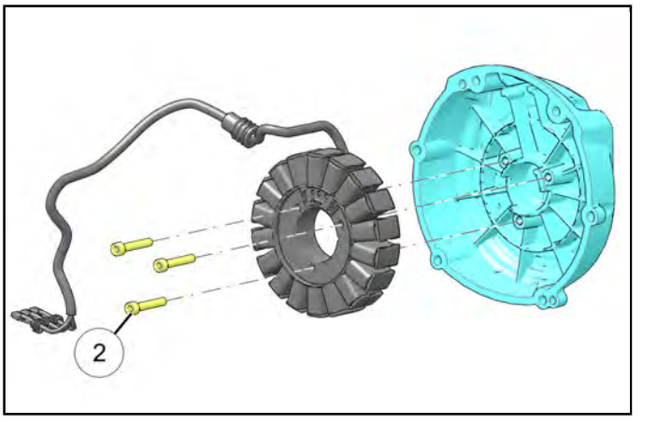
1. Remove stator cover by removing its fasteners ①.



2. Using a flat head screwdriver or similar tool, remove the terminal retainer from the back of the stator connector.
3. Remove the stator assembly with the cover.

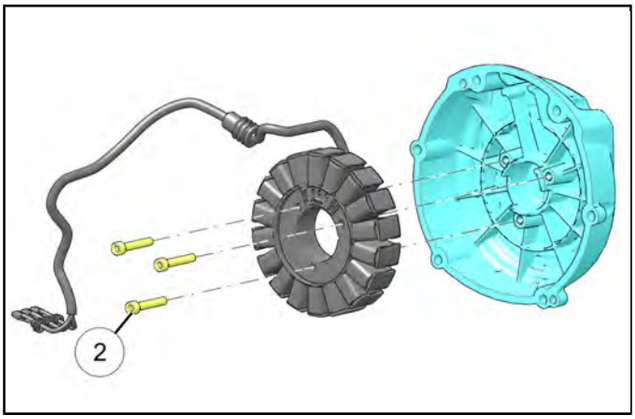
IMPORTANT
Route the stator wiring through the inner ACG case during removal.

4. Remove stator fasteners ② and remove stator from the cover.



STATOR INSTALLATION

1. Install stator fasteners ② and install stator from the cover.

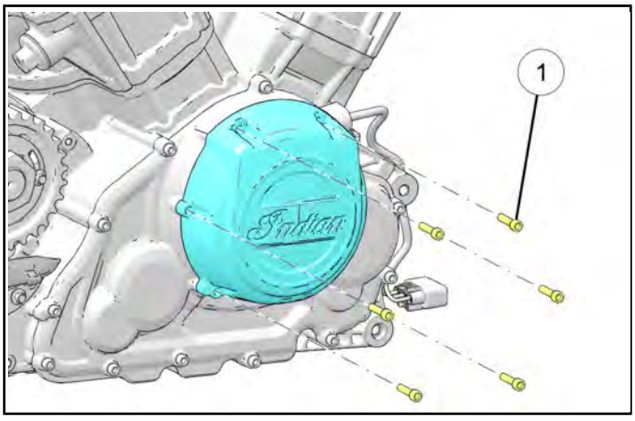


TORQUE
Stator Fastener: **88 in-lbs (10 N·m)**

2. Install the stator assembly with the cover.

IMPORTANT
Route the stator wiring through the inner ACG case during installation.

3. Install the terminal retainer onto the stator connector.
4. Install stator cover its fasteners ①.



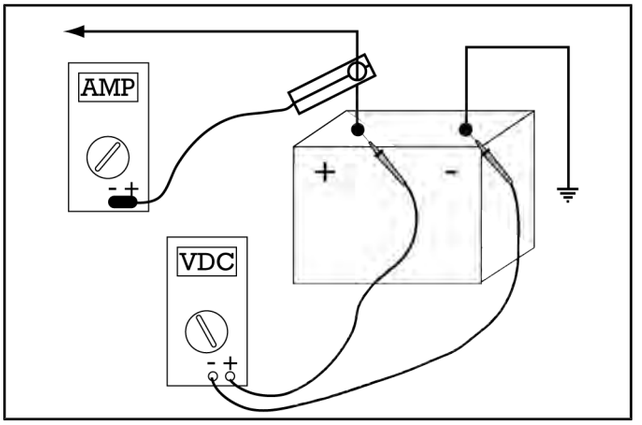
TORQUE
Stator Cover Fastener: **88 in-lbs (10 N·m)**

REGULATED VOLTAGE / AMPERAGE OUTPUT INSPECTION (ALL MODELS)

NOTICE

This procedure requires the use of an inductive ammeter to read current draw and a volt meter to monitor battery voltage during the test.

1. Place the inductive ammeter over the positive (+) battery cable. Reference **Battery Removal page 10.14**.
2. Set multi meter to V DC scale.
3. Connect voltmeter red (+) lead to battery red (+) lead and black (-) voltmeter lead to battery black (-) lead.



4. Start engine and warm to operating temperature.
5. At 1500 RPM or slightly above; the ammeter should reach the "break-even" point (no amperage leaving the battery) and the voltmeter should be rising toward 14 VDC.

Specification: Break-even point for charging System: 1500 RPM ± 25%

6. Increase engine RPM to 2500. The ammeter should rise a slight amount, then stabilize. Volt meter should read above 14 V DC.
7. Use results obtained from preceding tests and the following descriptions to determine if charging system is functioning properly.

   CHARGING SYSTEM OPERATING CORRECTLY: Ammeter goes up a small amount, then stabilizes slightly above +0 amps. Volt meter rises toward 14.8 ± V DC, drops off a little and starts to stabilize.

   LOW BATTERY: Amperage continues to rise, voltage levels off as battery is absorbing voltage. Charging system may be okay. Need to charge battery fully or use a good battery and repeat test. Meters will indicate similar reading to the overcharging chart.

   CHARGING SYSTEM UNDERCHARGING: Ammeter drops to 0 or remains below 0 (negative reading) at all rpm, volt meter remains the same or goes down. Go to voltage drop inspection.

   CHARGING SYSTEM OVERCHARGING: Ammeter rises well above 0 and remains there or continues to rise. Volt meter goes well above 14.8 V DC and may continue to rise.

   EXCESSIVE LOAD: Current levels off or starts to drop, voltage continues to rise. Load may be excessive (accessories or shorted components). Determine if excessive loads are present. Disconnect accessories and re-test.
8. Turn ignition key off.
9. Remove inductive ammeter clamp.

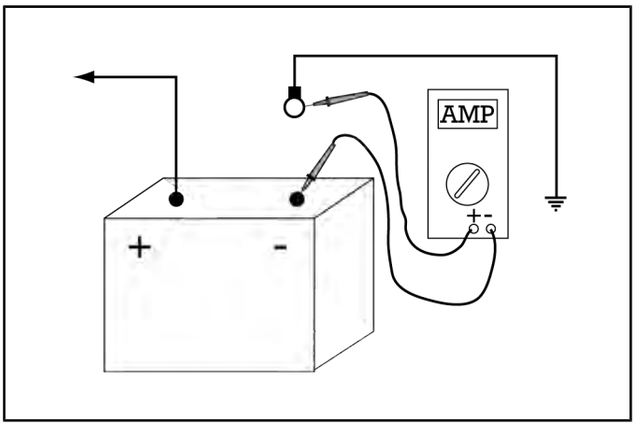
CURRENT DRAIN INSPECTION

IMPORTANT

Current drain should only be measured after all systems have timed out and gone to sleep. Leave power OFF and do not disturb for approximately **12 MINUTES** for an accurate reading.

Current drain is suspect if battery discharges when motorcycle is not in operation (short periods of storage).

1. Disconnect ground cable (-) from battery. Reference **Battery Removal page 10.14**.
2. Set multi meter to read milliamps (mA) and insert meter leads into appropriate jacks. Connect red meter lead to ground cable eyelet and connect black meter lead to battery negative (-) terminal.



NOTICE

Do not operate electric starter or meter fuse will be damaged.

3. With ignition switch off, **and after 12 minutes have passed**, read current drain.
4. If current drain exceeds specifications inspect wiring and components for short to ground.

Parasitic Draw Specification (after 12 minutes with power OFF): 2.0 mA

5. Locate the faulty component or wiring by disconnecting accessories, wiring connections, and fuses one-at-a-time while observing current drain. When current drain falls within specifications, focus efforts on the last circuit or component that was disconnected.

STATOR AC VOLTAGE OUTPUT TEST

NOTICE

Set multi meter to VAC (alternating current). Engine cold. Regulator / Rectifier disconnected (2-pin and 3-pin connector). Engine must be running. Be sure to heed the following Warnings and Cautions.

⚠ WARNING

HOT COMPONENTS:
The engine and exhaust system become very hot during operation and remain hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled sufficiently before working on the machine.

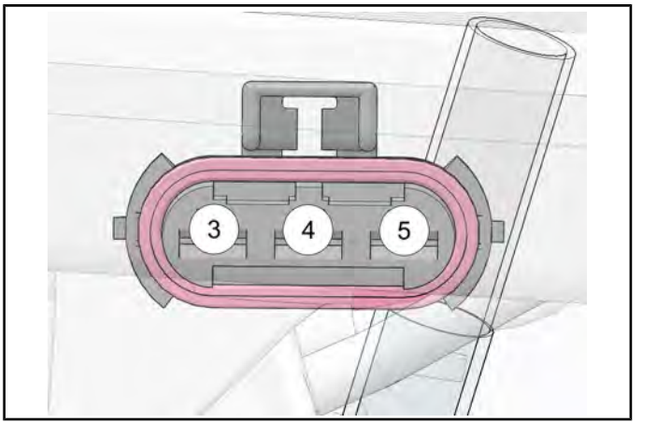
⚠ WARNING

CARBON MONOXIDE:
Never run an engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death. If you must run the engine to do some repairs, do so in an open area or with an exhaust evacuation system operating.

⚠ CAUTION

VOLTAGE / ARCING:
Use caution not to touch any of the connections or allow the exposed terminals to come close to any other part of the vehicle or other objects, as an arc may occur.

1. Disconnect the 3-pin stator connector.
2. Set multi meter to measure AC Volts.
3. Connect one lead of the multi meter to pin A ③ and one lead to pin B ④ on the 3-pin stator connector.



⚠ CAUTION

VOLTAGE / ARCING
Use caution not to touch any of the connections or allow the exposed terminals to come close to any other part of the vehicle or other objects, as an arc may occur.

4. Start the engine and let it run at idle. Observe the multi meter reading.
5. The meter should indicate the following readings:

No load AC Volts @ 800 RPM:
All Models: **22 VAC ±25%**

6. Repeat test for pins A ③ & C ⑤.
7. Repeat test for pins B ④ & C ⑤.

NOTICE

The test results in Steps 6, 7, and 8 can read more than the specified voltage, but it is **important that the reading for each pair of wires is approximately equal.**

8. Increase RPM to 2000. Repeat Steps 4-7.
9. At 2000 RPM the meter should indicate the following readings:

No Load AC Volts @ 2000 RPM:All Models: **40 VAC ± 25%**

NOTICE

The test results obtained in step 10 can read more than the specified voltage, but it is important that they are all approximately equal.

STATOR RESISTANCE TEST

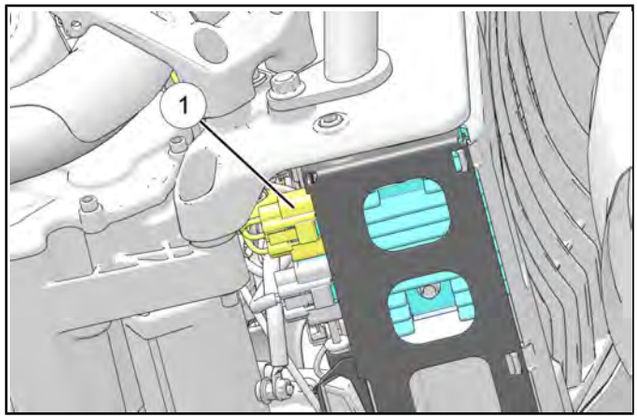
⚠ CAUTION

The *engine must not be running* while performing the following resistance test.

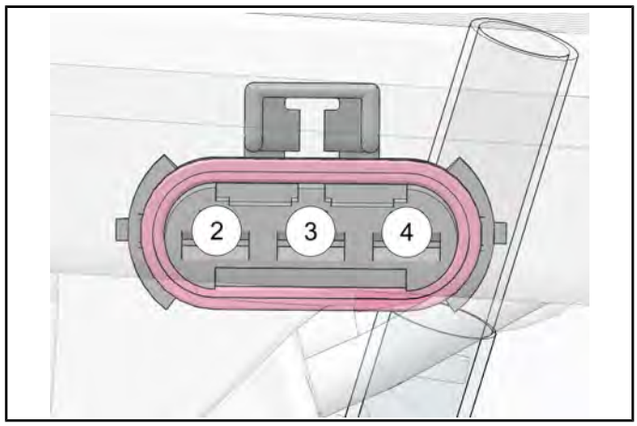
NOTICE

Set multi meter to measure resistance. Engine OFF and cold. Regulator Rectifier 3–pin connector unplugged.

1. Disconnect the stator 3 pin connector ① from the regulator / rectifier.



2. Set the multi meter to measure resistance (Ω) and insert the meter leads in to the appropriate jacks.
3. Connect one meter lead into pin A ② and the other lead into pin B ③ on the stator connector and read resistance value.



Stator Resistance: Less than 1 Ohm

4. Repeat test for pins A ② & C ④.
5. Repeat test for pins B ③ & C ④.
6. If resistance values do not match specification, inspect stator and replace as necessary.

STATOR WINDINGS TO GROUND INSPECTION

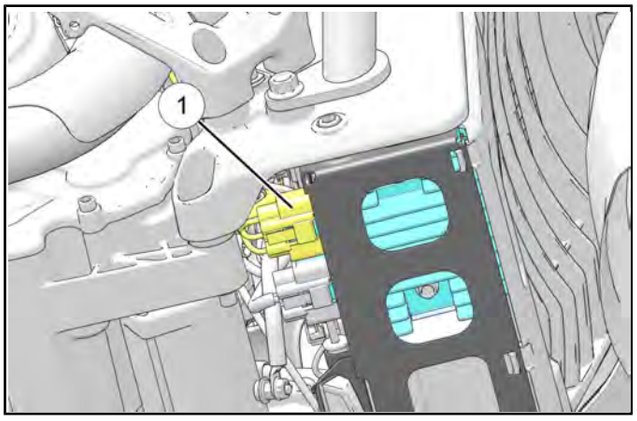
⚠ CAUTION

The *engine must not be running* while performing the following resistance test.

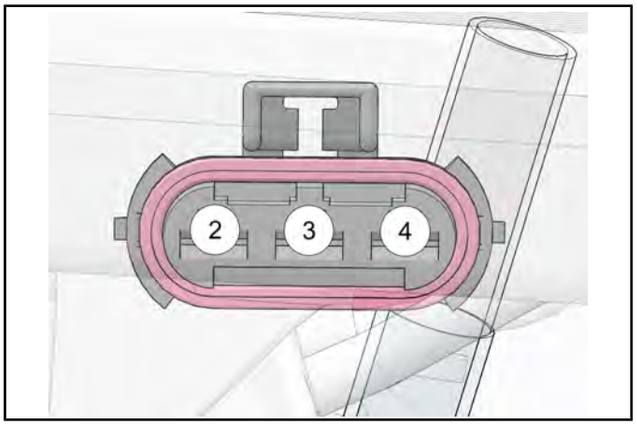
NOTICE

Set multi meter to measure resistance. Engine OFF and cold. Regulator Rectifier 3–pin connector unplugged.

1. Disconnect the stator 3 pin connector ① from regulator / rectifier.



2. Connect one multi meter lead to pin A ② and place the other lead of the multi meter in contact with a good engine ground, observe resistance to ground reading.



Stator to Ground (-) Continuity Specifications: Open Circuit (OL)

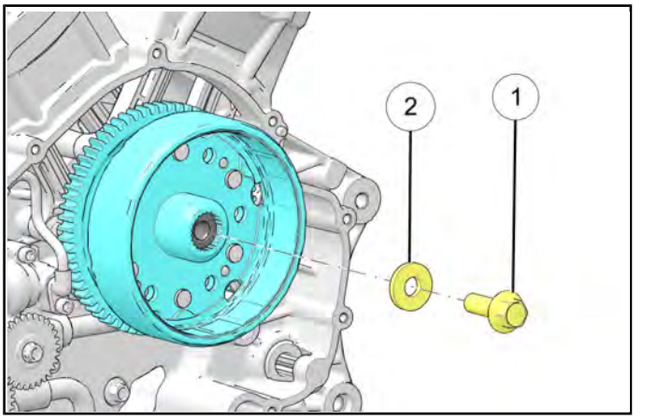
10

3. Repeat test for other two stator leads ③ & ④ to ground.
4. There should be no connection from stator windings to ground.

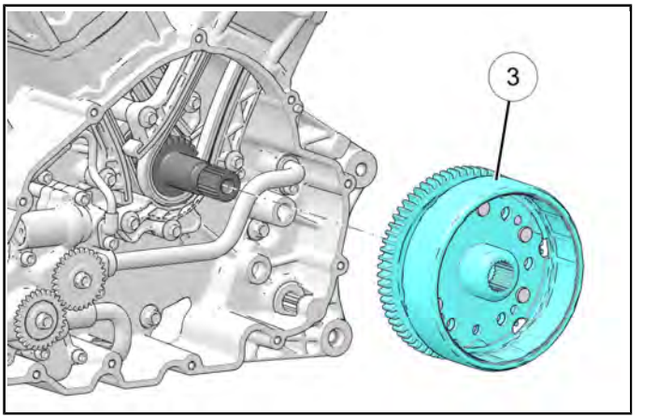
FLYWHEEL REMOVAL

REMOVAL

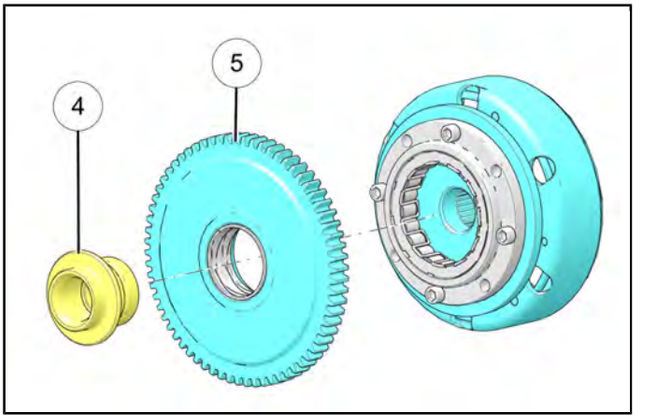
1. Remove stator. See **Stator Removal page 10.32**
2. Remove ACG Cover. See **ACG Cover Removal page 10.31**.
3. Remove flywheel bolt ① and washer ②.



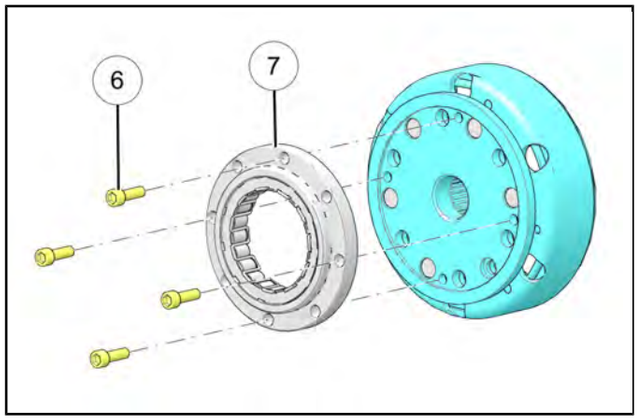
4. Remove flywheel assembly ③.



5. Remove starter/ACG spacer ④.

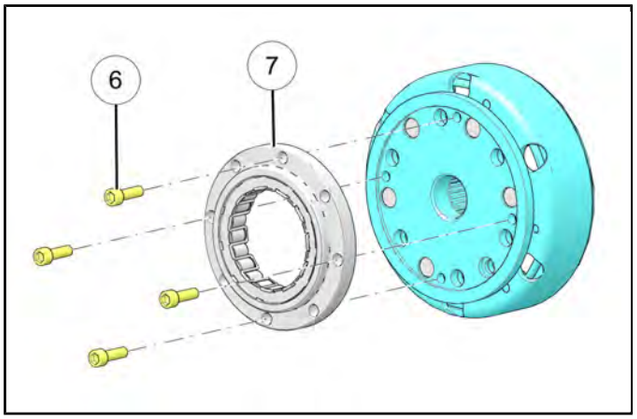


6. Remove starter clutch gear ⑤.
7. Remove sprag clutch hub ⑦ by removing its fasteners ⑥.



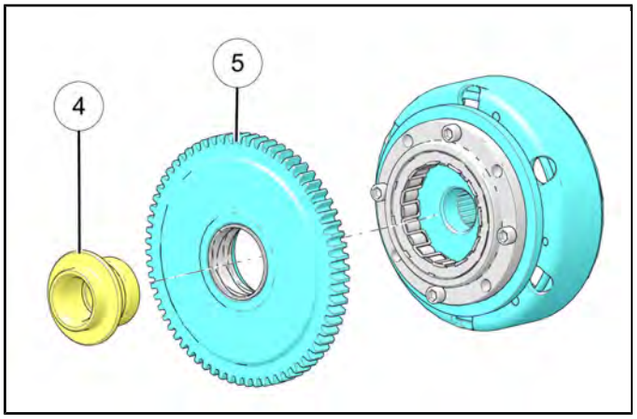
FLYWHEEL INSTALLATION

1. Install sprag clutch hub ⑦and its fasteners ⑥.

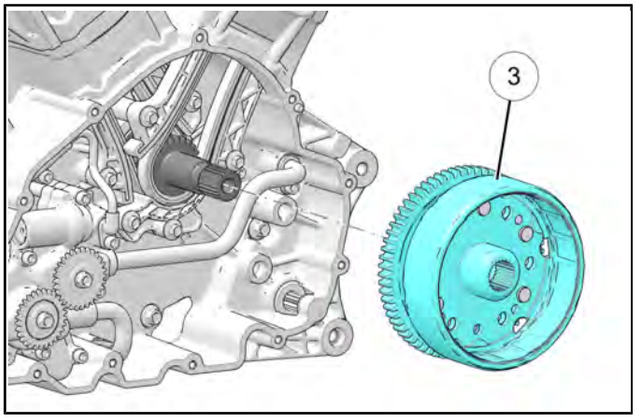


TORQUE
Sprag Clutch Hub Fastener **88 in-lbs (10 N·m)**

2. Install starter clutch gear ⑤.
3. Install starter/ACG spacer ④.



4. Install flywheel assembly ③.



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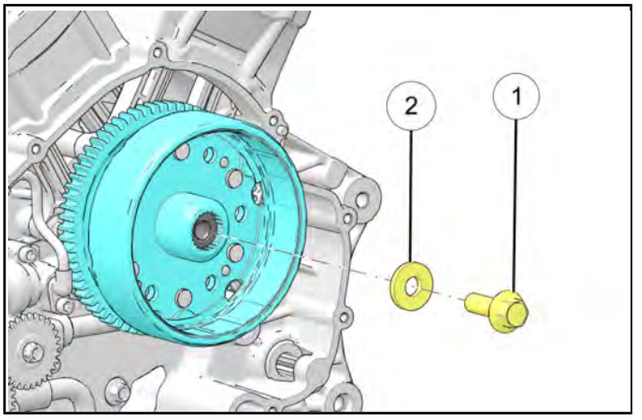
5. Install flywheel bolt ① and washer ②.



TORQUE
Flywheel Fastener **83 ft-lbs (112 N·m)**

6. Install ACG Cover. See **ACG Cover Installation page 10.31**.
7. Install stator. See **Stator Installation page 10.33**

DIAGNOSTICS, CHARGING SYSTEM BATTERY CHECK

1. Electrical connections: Check bolted joints at battery + and – terminals, making sure all cables are tight. Check voltage regulator connections (input from stator and output to battery). Check frame grounds and starter solenoid connections for the positive battery cable.

NOTICE
Both vehicle ground, excluding fairing, are to the right side of the engine case, front and rear.

   a. If any connection was loose, the battery must be fully charged, and the system re-evaluated.

2. Check the State of Charge of the battery using a battery tester (preferred method), at battery + and – terminals, with the vehicle off.

   a. If the battery is less than 60% SoC (12.4V) **and** has been recently fully charged or has been charged by the vehicle (>30 minutes of engine running at higher than idle speed), replace the battery. If the battery has not been recently charged, fully charge and begin evaluation again.

   b. If the battery is greater than 60% SoC proceed to step 3. EXCEPTION: If using a battery tester, and the battery is deemed BAD, replace battery and begin evaluation again.

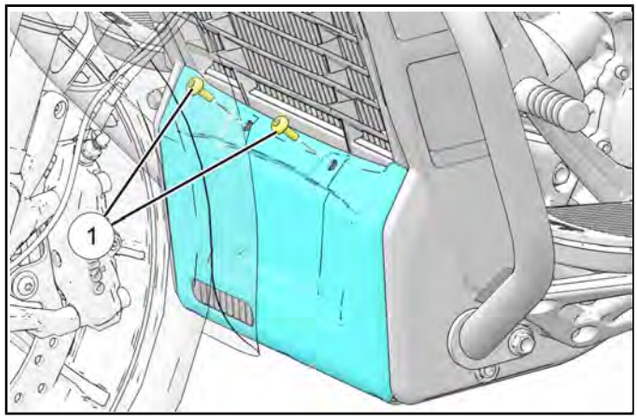
3. Check charging system performance with engine running

   a. Using a DMM check the battery voltage at battery + and – terminals. This should be >14V. (NOTE: Engine may need to be above idle for voltage to increase.)

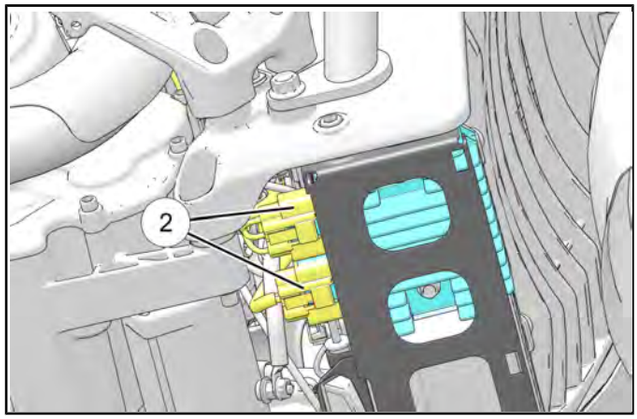
   b. If voltage is low, allow vehicle to run for 5-10 minutes (above idle speed) to see if voltage increases. If voltage remains low, or exceeds 15V, replace voltage regulator and begin evaluation again.

REGULATOR / RECTIFIER REPLACEMENT

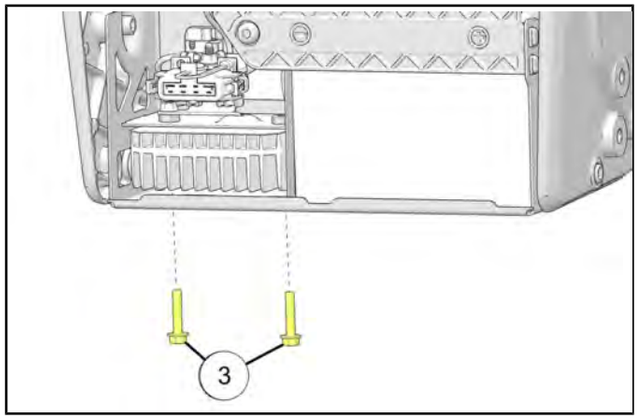
1. Remove chin fairing by removing its fasteners ①.



2. Disconnect the regulator / rectifier electrical connectors ②.



3. Remove the regulator / rectifier fasteners ③



4. Remove the regulator / rectifier from the battery box.

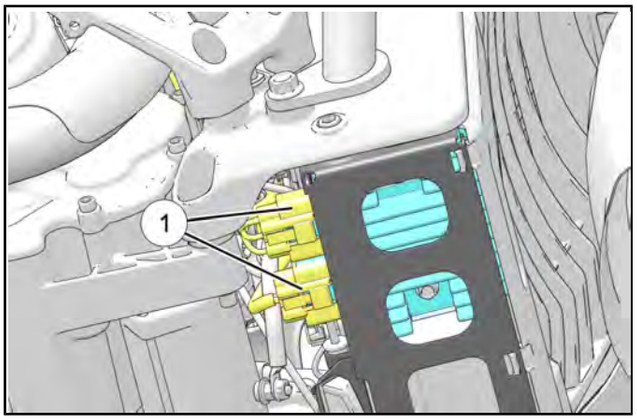
5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Regulator/Rectifier Fastener: **88 in-lbs (10 N·m)**

TORQUE
Chin Fairing Fastener **35 in-lbs (4 N·m)**

RECTIFIER / REGULATOR CONNECTOR INSPECTION

1. Disconnect both connectors ①.

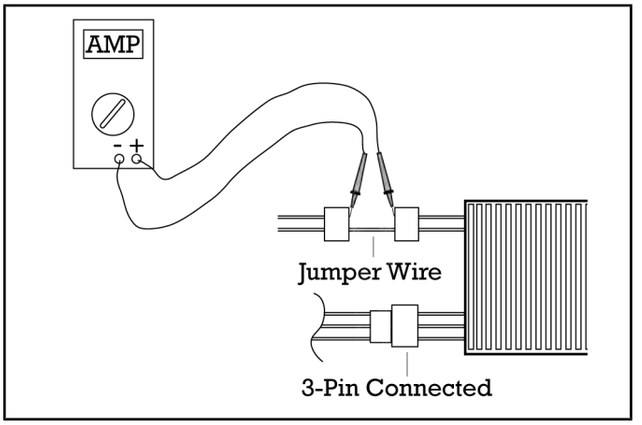


2. Inspect male and female pins in the 3-pin connector and the 2-pin connector carefully. Check for corrosion, loose pins, poor connections, or evidence of overheating or other damage.
3. If the wiring and connectors are undamaged and appear to be clean and tight, inspect the battery, stator, and related wiring. Test the regulator / rectifier for diode leakage.

DIODE LEAKAGE TEST

IMPORTANT
Engine must be OFF. Perform this test at the regulator / rectifier 2-Pin connector. Testing at any other point (between battery and battery cable for example) could include leakage not attributable to the Regulator / Rectifier unit.

1. Disconnect the 2-pin connector at voltage regulator / rectifier unit.
2. Install a jumper across the connectors as shown for the Bk wire to provide a complete ground path.
3. Connect meter as shown, with red (+) meter lead to the RD / BK wire on harness side, and the black meter lead to the RD / BK wire on the regulator / rectifier side.



4. Compare leakage to specification below.

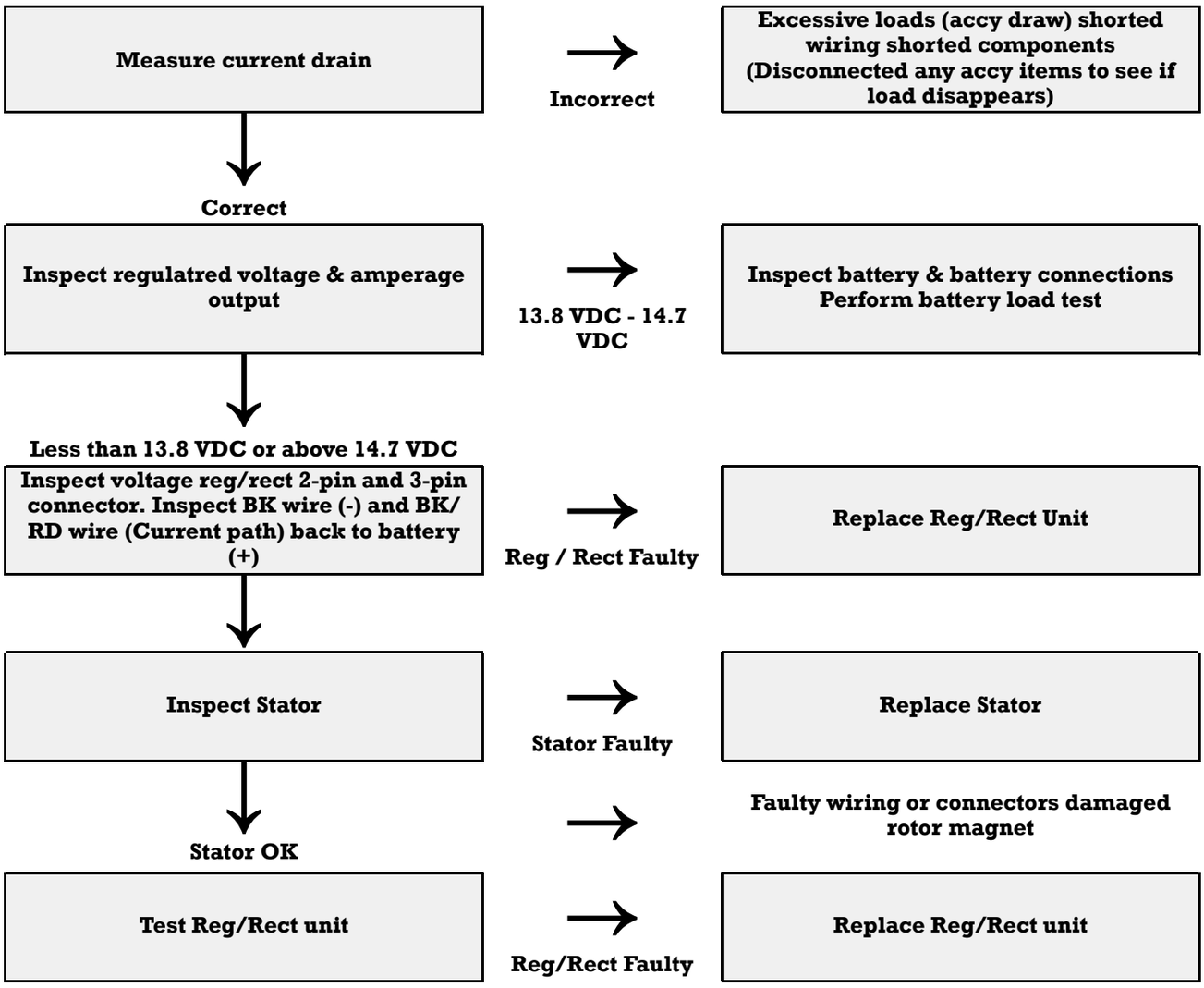
Specification
Leakage: Less than 1.0 mA

9860001 R01 - 2025 Indian Challenger, Pursuit, Chieftain PowerPlus, Roadmaster PowerPlus Service Manual

TROUBLESHOOTING, CHARGING SYSTEM

NOTICE

The battery must be fully charged and in good condition to obtain accurate readings. Battery charging current is automatically reduced by the regulator / rectifier if the regulator / rectifier unit reaches a critical temperature (overheated). The system should be cool when testing DC charging output or when testing the regulator / rectifier to ensure accurate readings. Refer to test procedure for individual charging system components for more information.



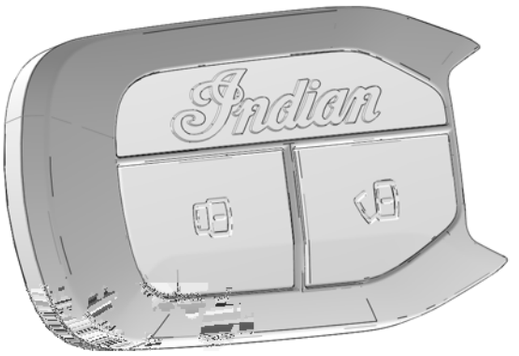
10

KEY FOB

KEY FOB OVERVIEW

Indian Challenger motorcycles utilize a keyless ignition system (Key Fob) for vehicle startup and operation. The Key Fob acts as a two-way transmitter which provides an authentication signal to the Wireless Control Module (WCM) located on the motorcycle. When the Key Fob is detected, the ignition system is enabled and the motorcycle becomes operational.

Challenger models equipped with electronically lockable storage utilize a multi-function Key Fob which, in addition to authentication, allows the user to remotely lock and unlock the saddlebags and/or trunk. Models have an integrated Alarm / Immobilizer feature which is armed and disarmed using the Multi-Function Key Fob.



KEY FOB OPERATION AND PROGRAMMING

Key Fob Operation:

- When the electrical system is activated using the power button or starter switch, the key fob must be within range.
- If the key fob is not detected:
  - The security light and/or power switch will stay on solid for 70 seconds then flash for 10 seconds before shutting down.
  - The PIN can be entered using the display to unlock the security system.
  - The electrical system will automatically shut down. The starter motor will not engage during this time.

Entering a Security System PIN

To change your PIN, you must have either the key fob or your existing valid PIN available to gain access to the security system. If the key fob is not detected or is not available and you cannot remember your PIN, please see your INDIAN MOTORCYCLE dealer.

Please read the entire procedure before beginning.

1. Navigate to the Vehicle Settings menu.
2. Tap Passcode Unlock on the display screen.
3. Tap Change Passcode on the display screen.
4. Enter an existing or master PIN by pressing the corresponding numbers on the display screen.
5. When prompted, enter a new PIN into the display screen. you will be prompted to confirm the new PIN.
6. If the PIN has been accepted, the display screen will display a confirmation.

Driving Key Fob Operation:

- After starting the engine, the Wireless Control Module (WCM) will verify that the key fob is within range again when shifting from neutral into gear and wheel speed is >5 mph. The security light will flash once during this check.
- The WCM will not search for the key fob again as long as the engine continues running. If the key fob is lost during riding, the operator will need to enter their PIN to restart the vehicle.

Programming the Key Fob:

Programming the key fob can only be done by the dealer and must be done using Digital Wrench® II. A single key fob can be programmed to multiple motorcycles. One motorcycle can have up to 4 key fobs programmed to the WCM.

Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

KEY FOB AUTHENTICATION

Four things must occur for the WCM to authenticate the Key Fob and enable the motorcycle for operation:

1. Motorcycle battery is sufficiently charged for normal vehicle operation.
2. Key Fob must be within range of WCM receiver (within **6 feet** of motorcycle)
3. Key Fob battery must have sufficient voltage.
4. Key Fob PIN is properly paired with motorcycle WCM (Digital Wrench)

Authentication Tell Tales

SUCCESSFUL:

- Security Light turns OFF
- Motorcycle Starts / Runs

UNSUCCESSFUL:

- Electrical system shuts down after 70 seconds
- Security Light / Power Button flashes 2x's per second for 10 seconds
- Motorcycle DOES NOT Start / Run

Reference **Key Fob Troubleshooting page 10.47**.

KEY FOB BATTERY REPLACEMENT

1. Remove the battery cover, remove and properly discard old battery.
2. Make sure to select the correct battery (4081311) for installation.

3. Verify the new battery has the required symbol.

4. Install new battery.

5. Install the battery cover back on to the key fob.
6. If applicable, verify the key fob lock and unlock functions work correctly.

KEY FOB TROUBLESHOOTING

1. Test Key Fob Battery (preliminary test).
   a. **Two-Button Fob** – Press LOCK / UNLOCK button and verify that red LED illuminates.
   b. Measure fob battery voltage with DVOM. If voltage measures less than 2.7VDC, replace battery. Does LED illuminate?

      YES — Proceed to STEP 2

      NO — Replace Key Fob Battery
2. Test Key Fob Range (indicates Key Fob battery condition).
   a. Hold the Key Fob 8-12 inches from the motorcycle seat; press the POWER button to energize the electrical system.
   b. Verify that Key Fob LED flashes within 1 second. Does it flash?

      YES — Proceed to STEP 2c

      NO — Replace Key Fob battery and retest. If LED still does not flash, proceed to STEP 3
   c. Move the Key Fob away from the seat in 1 foot increments and verify that the LED flashes when the motorcycle is energized up to 2-3 feet. Does the range test pass?

      YES — Perform STEPS 3a-3b. No further action required.

      NO — Verify motorcycle battery voltage is at least 11.5VDC. If voltage is LOW, charge the battery. If voltage is acceptable, proceed to STEP 4.

NOTICE
If key fob is suspect for decreased range, learn in new key fob and repeat STEP 2.

Normal Range: Up to 2-3 feet. Cannot be closer than 8 inches

3. Verify Key Fob and VCM are paired. This procedure will require Digital Wrench® II

NOTICE
Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

4. Test WCM Receiver Antenna.
   a. Inspect the 21 kHz 2-wire antenna (on top of WCM) using a DVOM. Pin 10 is Antenna OUT B; Pin 11 is Antenna OUT A.

SPECIFICATION 320 mΩ

   b. Does antenna test within specification?

      YES — Replace WCM

      NO — Contact Indian Motorcycle Technical Service.

IGNITION SYSTEM

GENERAL INFORMATION

SERVICE NOTES – IGNITION SYSTEM

There are many hazards present when working on or around the ignition system. Read and pay close attention to the following warnings and cautions when working on any component in this section.

⚠ WARNING

Never run an engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death. If you must run the engine to do some repairs, do so in an open area or with an exhaust evacuation system operating.

⚠ WARNING

The engine and exhaust system become very hot during operation and remain hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled before working on the machine.

⚠ CAUTION

Some procedures call for the engine to be run in order to warm the engine to operating temperature. If this is done the exhaust pipes can "blue" if a cooling air stream is not provided by means of a shop fan directed the exhaust system.

⚠ CAUTION

Parts containing semi-conductors can be easily damaged if handled carelessly. Do not drop or subject the electronic components to shock loads.

⚠ CAUTION

Follow the instructions closely when troubleshooting items in this section. Some electrical components can be damaged if they are connected or disconnected while the ignition is powered ON and current is present.

⚠ CAUTION

Using incorrect heat range spark plugs can damage the engine. Always follow the manufacturer's recommendations for spark plug heat range.

GENERAL PRECAUTIONS

- This ignition system is controlled electronically and no provisions are available to inspect or change ignition timing. A timing light is still valuable as a diagnostic tool.
- Poor connections are the most common cause of ignition problems. Inspect all connections and replace the spark plugs before doing extensive ignition system troubleshooting.
- Make sure the battery is fully charged and that the charging system is operating correctly.
- A signal from the Crankshaft Position Sensor must be present at the ECM for spark to occur.

SPECIAL TOOLS – IGNITION SYSTEM

SPECIAL TOOL	PART NUMBER
Electrical Tester Kit	PV-43526
Digital Multimeter	Commercially Available
Inductive Timing Light	Commercially Available

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

SERVICE SPECIFICATIONS – IGNITION SYSTEM

ITEM		SPECIFICATIONS
Spark Plug		NGK LZMAR8AI-10
Spark Plug Gap		0.039 in (1.0 mm)
Ignition Coil / Cables Resistance Values	Primary	0.58 Ohms ± 10%
	Secondary	See coil test
	Plug Wire (with cap and boot*)	8360 Ohms ± 20%
Crank Position Sensor Resistance		1050 Ohms ± 10% @ 68°F (20°C)
* Spark plug end caps are not removable		

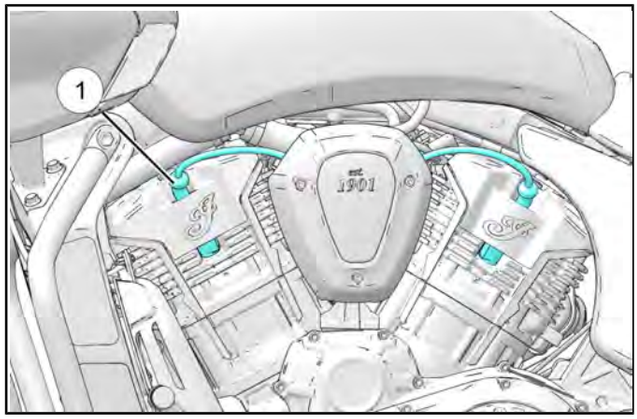
SERVICE

SPARK PLUG REMOVAL

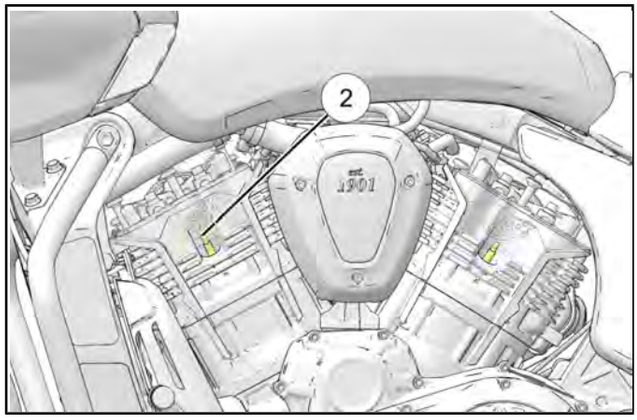
⚠ CAUTION

HOT COMPONENTS
Wear insulated gloves and/or allow engine and exhaust to cool before handling these parts.

1. With the engine at room temperature, grasp the spark plug boot ① and rotate back and forth slightly to release from the spark plug. DO NOT pull on the wire or spark plug wire may be damaged.



2. Grabbing only the base of the spark plug boot, pull straight out of spark plug well.
3. Clean out spark plug wells with compressed air to remove any loose dirt or debris.
4. Using a 3” extension and a 14mm spark plug socket, remove spark plugs ②.



SPARK PLUG INSPECTION / GAP

⚠ CAUTION

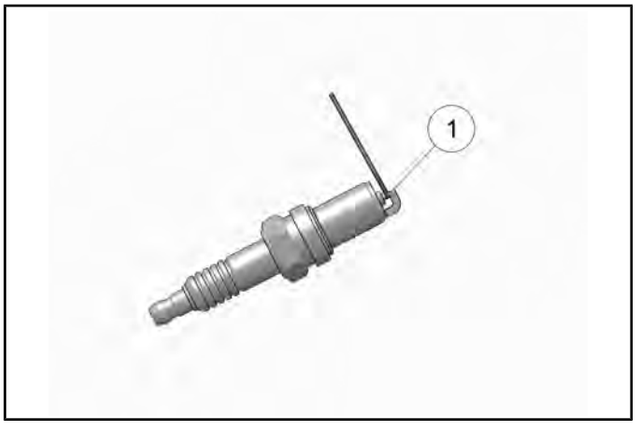
A hot engine can cause serious burns. Allow engine to cool or wear protective gloves when removing the spark plugs.

1. Remove spark plugs. See **Spark Plug Removal page 10.49**.
2. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.
3. Clean with electrical contact cleaner or a glass bead spark plug cleaner only.

⚠ CAUTION

A wire brush or coated abrasive (sandpaper) should not be used to clean electrodes.

4. Measure electrode gap with a wire gauge ①. Adjust gap if necessary by carefully bending the grounding electrode until the specified gap is achieved.



Spark Plug Type:
NGK LZMAR8AI-10

Spark Plug Gap:
0.039 in (1.0 mm)

SPARK PLUG INSTALLATION

1. Inspect spark plug gap with a wire gauge. If gap adjustment is necessary, bend ground electrode carefully using a spark plug gap tool.

Spark Plug Type:
NGK LZMAR8AI-10

Spark Plug Gap:
0.039 in (1.0 mm)

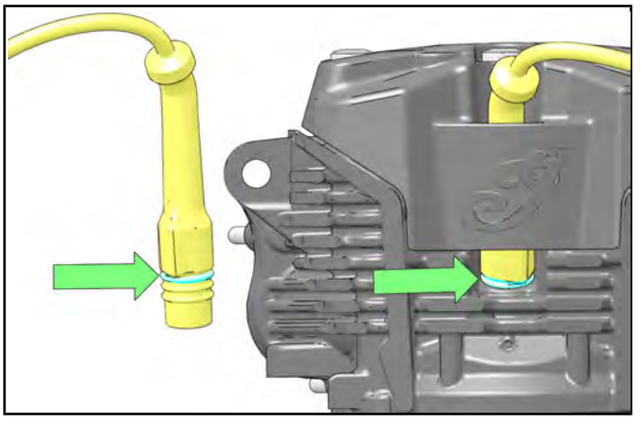
2. Apply anti-seize compound sparingly to spark plug threads, avoiding the bottom 2 - 3 threads.
3. Torque spark plugs to specification.

TORQUE
Spark Plug: **88 in-lbs (10 N·m)**

⚠ CAUTION
Do not over tighten spark plugs. Damage to the cylinder head or spark plug may result.

4. Install spark plug wire boots securely over the plugs.

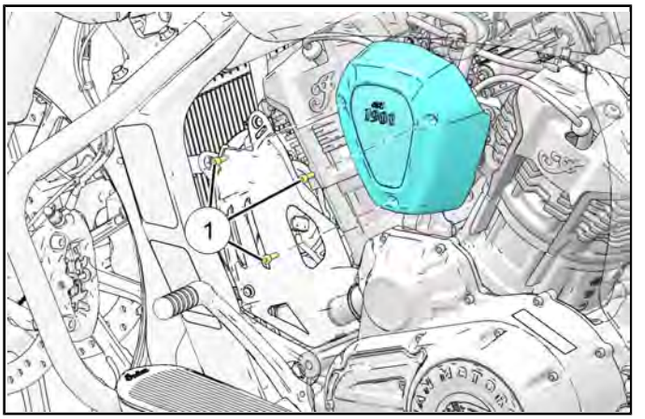
IMPORTANT
The spark plug boot is fully seated when the third rib on the boot is level with the spark plug hole as shown.



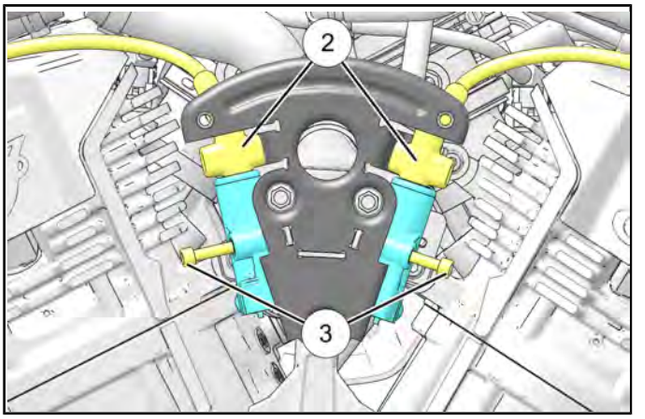
IGNITION COIL REMOVAL

REMOVAL

1. Verify that motorcycle is not powered up and the STOP / RUN switch is in the OFF position.
2. Remove left side v-cover by removing its fasteners ①.

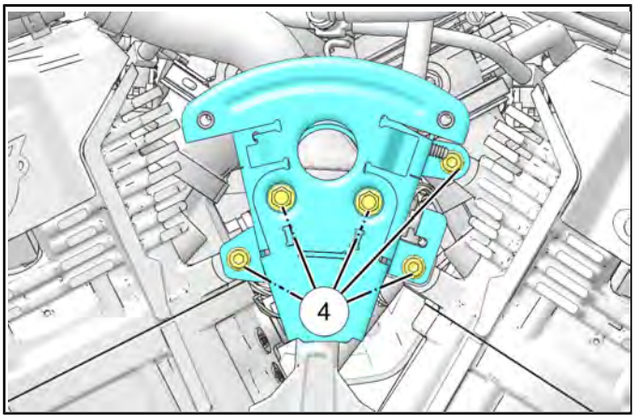


3. On the back side of the ignition coils, disconnect the electrical connector.
4. Disconnect spark plug wires ②.



5. Remove fasteners securing ignition coils ③.

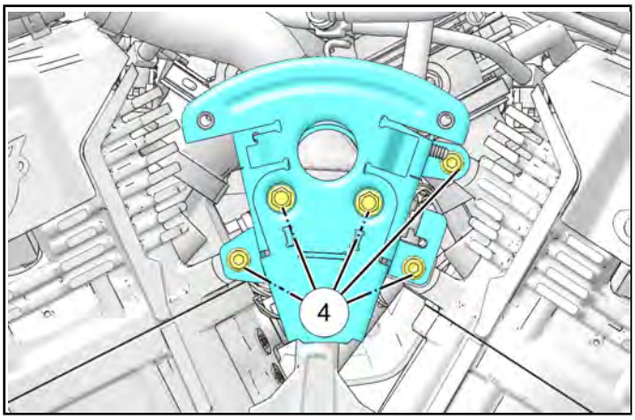
6. Remove ignition coil bracket fasteners ④.



IGNITION COIL INSTALLATION

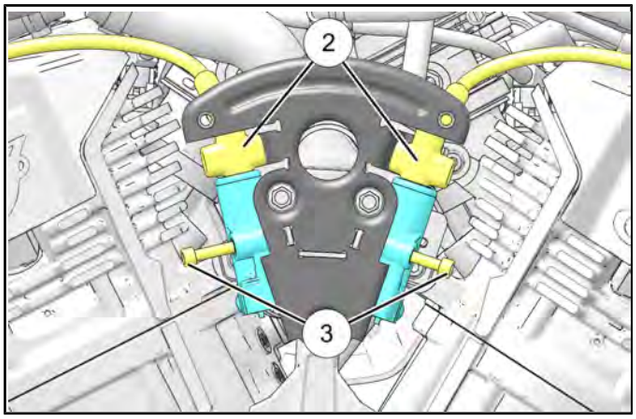
INSTALLATION

1. Verify that motorcycle is not powered up and the STOP / RUN switch is in the OFF position.
2. Install ignition coil bracket fasteners ④.



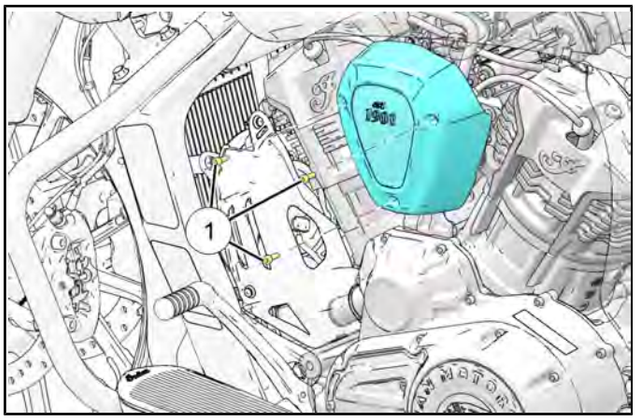
TORQUE
Ignition Coil Bracket: **88 in-lbs (10 N·m)**

3. Install fasteners to secure ignition coils ③.
4. Connect spark plug wires ②.



TORQUE
Ignition Coil Fastener: **88 in-lbs (10 N·m)**

5. On the back side of the ignition coils, connect the electrical connector.
6. Install left side v-cover and its fasteners ①.



TORQUE
V-Cover Fastener: **88 in-lbs (10 N·m)**

TROUBLESHOOTING

BASICS

Before troubleshooting the ignition system, ensure that the engine STOP/RUN switch is in the RUN position, the battery is fully charged, and system related fuses are not open (blown). Check visually for corroded, loose, or broken connections in critical areas (e.g. sensor connector). Check for loose wire pins in the individual sensor connectors and at the ECM (beneath the battery box).

See **ECM Connector Map page 4.52.**

Don't forget the spark plugs!

The Ignition System Troubleshooting flow chart (and the accompanying text) is designed to help you troubleshoot ignition system problems. It will not lead you to faulty or fouled spark plugs. Always inspect spark plug condition *first* (and replace if necessary) when troubleshooting ignition system problems.

Be sure that the spark plugs are the correct heat range and are the correct size specification.

⚠ WARNING

Extremely high voltage is present in the ignition system. Do not touch the ignition coil, wires or spark plugs during test procedures.

TEST LEAD ADAPTER KIT

1. Tests in this section may include the testing of voltage and / or resistance at the connectors for various sensor and system components. Use the appropriate test adapter lead when performing these tests at connector pin(s).
2. Forcing an incorrect or oversized probe into a connector may cause inaccurate test results (due to lack of a solid mechanical connection to the terminal). It can also damage the connector being probed or the connector housing, creating another problem which greatly complicates the diagnostic process. Extreme care must be taken not to introduce problems while probing a connector. **Electrical Tester Kit: PV-43526**

⚠ CAUTION

Once the ECM connector has been disconnected, do not touch the pins on the ECM. Static electricity from your body can damage the ECM. Do not attempt to perform tests on the ECM.

ECM REPLACEMENT

Although the need for ECM replacement is unlikely, a specific replacement procedure is required to ensure that all essential data contained within the original ECM is transferred to the replacement ECM.

This procedure will require Digital Wrench® II

NOTICE

Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

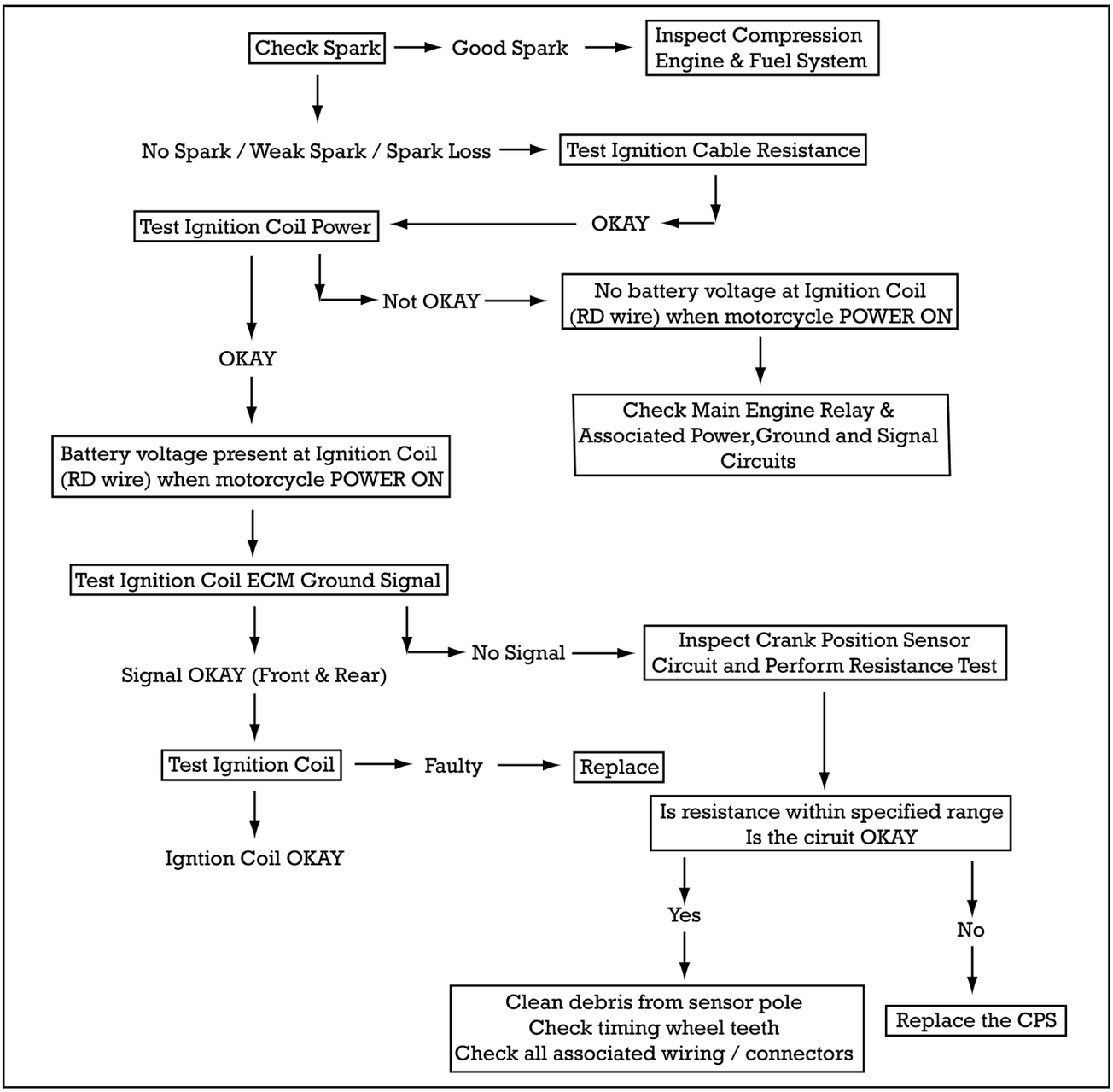
ECM REPROGRAMMING

This procedure will require Digital Wrench® II

NOTICE

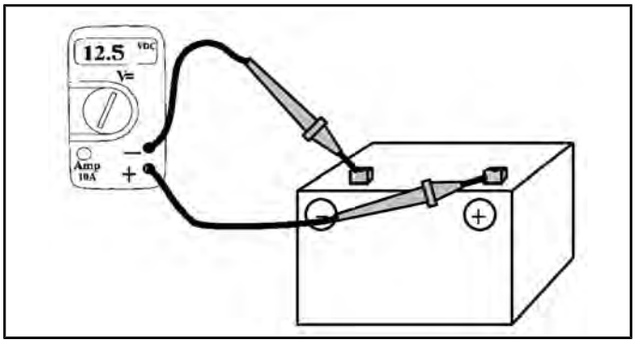
Digital Wrench® II is only available for authorized dealers. Refer to the user guide and carefully follow all instructions provided. See **Digital Wrench II User Manual page 1.16**

IGNITION SYSTEM TEST FLOWCHART



BATTERY VOLTAGE INSPECTION: TEST 1

1. Access the battery. See **Battery Removal page 10.14** .
2. Set multi meter to measure DC Volts.
3. Inspect battery voltage.



4. If the battery voltage is below 12.5 V DC charge or replace the battery with a fully charged battery.

NOTICE
When operating the starter with a low battery, the voltage available for the ignition coils can drop below the minimum required to produce spark.

SPARK INSPECTION: TEST 2

1. Connect an inductive timing light to one spark plug wire.
2. Press ON to power up the motorcycle and place the STOP/RUN switch in the RUN position.
3. Shift transmission into neutral and pull in clutch lever.
4. Depress starter button and observe timing light.
5. Determine if timing light flashes without interruption for both cylinders.
6. Consistent flashes indicate that some secondary voltage is present. The likelihood of an ignition related problem is reduced but not eliminated. Keep the following points in mind:

- There is a threshold voltage and amperage requirement for timing lights below which they will not trigger and therefore, not flash.
- Fouled spark plugs may drop secondary voltage so low that a timing light will not trigger and therefore, not flash.
- With no current flowing (open secondary side of the ignition coil) the timing light will not flash.
- A faulty high tension lead (plug wire) or poor connection is one example of an open secondary.

7. Replace spark plugs, connect plug wires and re-test.
8. If timing light does not flash consistently for one or both cylinders, test high tension leads (Test 3).

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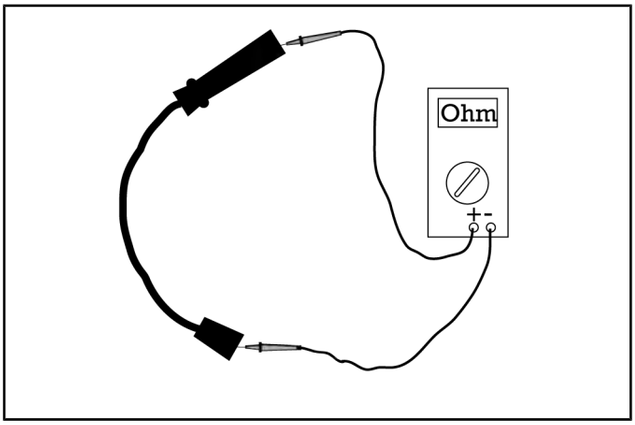
IGNITION CABLE RESISTANCE: TEST 3

1. Remove high tension leads by pulling firmly on the boots at the coil and spark plug. DO NOT pull on the wire or it may become permanently damaged.

NOTICE
The plug caps or coil ends are NOT removable. Wire must be replaced as an assembly.

2. Test each high tension lead with an ohmmeter and compare to specification. Move wire to detect internal breaks or poor connections at terminal ends.



High Tension Lead Resistance: 1860Ω ± 20%

IGNITION COIL POWER & GROUND SIGNAL TEST 4

POWER TO IGNITION COIL

Battery voltage must be present at the ignition coil (Pin B) when the power button is switched on and the electrical system powered up.

1. Disconnect the electrical connector from the ignition coil. See **Ignition Coil Removal page 10.50**.
2. Set the multi meter to measure VDC and insert the meter leads into the appropriate jacks.
3. Connect the black lead to ground (on the engine).
4. Connect a small thin test adapter lead to the center terminal of the ignition coil primary connector and the red meter lead to the test adapter.
5. Press the power button to power up the motorcycle electrical system and place the STOP/RUN switch in the RUN position.
6. Battery voltage should appear on the center terminal of the coil connector (RD wire).
7. With transmission in Neutral, crank the engine. Battery voltage should again be present on center wire.

IGNITION COIL GROUND SIGNAL

The following steps will test the ECM (Ground) Signal To Ignition Coil

ECM ground signal must be present at each of the outer terminals of the ignition coil primary harness connector. The signal will appear as a pulse on the meter between Ground (-) and Open (OL).

1. Set the multi meter to measure resistance (Ω).
2. Place a small thin test adapter into one of the outer terminals of the ignition coil connector (either the WH or BK wire) and connect one meter lead to the test adapter..
3. Ground the other lead to the engine.
4. Place transmission in Neutral.
5. Press the power button to power up the motorcycle electrical system and place the STOP/RUN switch in the RUN position.
6. Crank the engine with the electric starter and watch the display on the multi meter. The meter display should pulse evenly while engine is cranking, indicating a ground signal is present.
7. Repeat the test on the other outside wire in the connector.

- If no pulse is present, test the Crankshaft Position Sensor.
- If the signal is present on one wire and not the other, test related wiring and connections.
- If both signals are present and there was battery voltage on the RD wire (center terminal) but still no spark, test the ignition coil windings. (Test 5).

IGNITION COIL RESISTANCE: TEST 5

Ignition Coil Primary Winding

1. Remove ignition coil. See **Ignition Coil Removal page 10.50**.
2. Set the multi meter to measure resistance (Ω) and insert the meter leads into the appropriate jacks.
3. Measure resistance between terminal A and terminal C on the coil. Compare to specification.

Primary Coil Resistance: 0.58Ω ± 0.06Ω

Ignition Coil Secondary Windings

4. Remove ignition coil. See **Ignition Coil Installation page 10.51**.
5. Set the multi meter to measure resistance (Ω) and insert the meter leads into the appropriate jacks.
6. Measure resistance between terminal A OR terminal C and the cylinder coil. Compare to specification. (Reading should be the same for both terminal A OR terminal C)

Secondary Coil Resistance (w/lead): 9.6 kΩ ± 0.96kΩ

CRANKSHAFT POSITION SENSOR (CPS) RESISTANCE INSPECTION:

See **Crankshaft Position Sensor, Test / Replace page 4.74**.

CHASSIS ELECTRICAL
GENERAL INFORMATION

SERVICE NOTES – CHASSIS ELECTRICAL

Keep the following notes in mind when diagnosing an electrical problem:

- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a resistance value under 10 Ohms, remember to subtract meter lead resistance from the reading. Connect the leads together and record the resistance. The resistance of the component is equal to tested value minus the lead resistance.
- Become familiar with the operation of your meter. Be sure leads are in the proper jack for the test being performed (i.e. 10A jack for current readings). Refer to the Owner's Manual included with your meter for more information.
- Pay attention to the prefix on the multimeter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate the component to be tested. Disconnect it from the wiring harness or power supply.

SPECIAL TOOLS – CHASSIS ELECTRICAL

TOOL DESCRIPTION	PART NUMBER
Electrical Tester Kit	PV-43526
TPMS Activation Tool	PF-51288
USB to Serial Adapter	PU-50621

Bosch Automotive Service Solutions: 1-800-328-6657 or https://polaris.service-solutions.com/

HEATED / COOLED SEATS OPERATION OVERVIEW / TROUBLESHOOTING

NOTICE
The seat assembly can **ONLY** be serviced as an assembly and should not be disassembled. It contains the seat control module, seat control buttons, heating elements, fans, and cooling elements.

- *The Heated seat is only factory installed on Pursuit models*

NOTICE
Heated & Cooled seat are sold as an ACCESSORY ONLY for other Challenger / Pursuit / Roadmaster models.

OPERATION OVERVIEW

- HEATED SEATS: during normal operation, none of the seat LED lights will be on when the vehicle is running, until activated with the seat control buttons.
- HEATED / COOLED SEAT: During normal operation, the red and blue seat LED lights will be dimly lit when the vehicle is running and will become brighter when activated with the seat control buttons.

Seat will disable automatically when source voltage gets low.

In most cases, source voltage when engine is not running is too low for continued operation of the heating or cooling functions. Recommend starting engine prior to selecting riders desired mode of operation.

IMPORTANT
When checking operation of the seat, the engine **must be running** and producing the proper battery voltage.

SEAT BUTTON OPERATION

NOTICE
Heat and Heat/Cool seat control can also be found in the display.

Heating Feature:

1. From the seat OFF position - Press the "plus button" to start **low** heating mode.
   - The "plus button" will become backlit in red once in heating mode.
   - The "minus button" backlight will be OFF.
2. Press the "plus button" a second time for **medium** heating mode.
3. Press the "plus button" a third time for **high** heating mode.
4. Press the "minus button" to go back to **medium** heating mode.
5. Press the "minus button" a second time to go back to **low** heating mode.
6. Press the center button to turn **off** heating mode at anytime.
7. From the seat OFF position - Hold down the "plus button" for 4 seconds to advance directly to **high** heating mode.

Cooling Feature (if equipped):

1. From the seat OFF position - Press the "minus button" to start **low** cooling mode.
   - The blue backlit "minus button" will glow brighter once in cooling mode.
   - The "plus button" backlight will be OFF.
2. Press the "minus button" a second time for **medium** cooling mode.
3. Press the "minus button" a third time for **high** cooling mode.
4. Press the "plus button" to go back to **medium** cooling mode.
5. Press the "plus button" a second time to go back to **low** cooling mode.
6. Press the center button to turn **off** cooling mode at any time.
7. From the seat OFF position - Hold down the "minus button" for 4 seconds to advance directly to **high** cooling mode.

INSPECTION

Before proceeding, visually inspect the seat for abnormal wear / damage, unusual sounds / smells, seat button LED light patterns, blocked airflow passages.

With the motorcycle still powered on, start the engine and verify proper battery voltage is being produced.

HEATED / COOLED SEATS

- *If the issue is related to the cooling function, proceed to steps 1–3.*
- *If the issue is related to the heating function, proceed to steps 4–6.*

1. With the motorcycle still powered on and the engine running – Turn the seat setting on high cooling mode for driver and passenger (if equipped) positions for 15 minutes or until a fault is observed.
2. If a fault is observed, follow the seat button LED fault patterns troubleshooting guide
3. If no faults patterns are observed, the seat is operating correctly
4. With the motorcycle still powered on and the engine running – Turn the seat setting on high heating mode for driver and passenger (if equipped) positions for 15 minutes or until a fault is observed.
5. If a fault is observed, follow the seat button LED fault patterns troubleshooting guide.
6. If no fault patterns are observed, the seat is operating correctly.

TROUBLESHOOTING

The LED fault patterns will identify which position of the seat is experiencing an issue (driver button LED fault pattern indicates an issue with the driver position, passenger button LED fault pattern indicates an issue with the passenger position, driver and passenger button LED fault pattern indicates an issue with the seat assembly

PROBLEM	FAILURE MODE	DIAGNOSTICS STEPS
Seat Turns OFF - No Blinking LED's	Low Voltage Threshold	Power cycle the motorcycle and verify if the concern is repeatable
		Ensure the motorcycle is running and maintaining the proper battery voltage while operating the seat
		Verify there is not excessive power draw on the motorcycle when running due to too many accessories being powered at once (seat will shut off by design if this is the case)
		Verify proper voltage and ground at the seat to chassis connector
		Replace the seat assembly
Red LED Blinking	Temperature Change Rate Incorrect	Power cycle the motorcycle and verify if the concern is repeatable
		Replace the seat assembly
	Temperature Not Within Threshold	Power cycle the motorcycle and verify if the concern is repeatable
		Replace the seat assembly
Blue LED Blinking	Fan Voltage Insufficient	Power cycle the motorcycle and verify if the concern is repeatable
		Verify the fan connectors are fully connected – Accessible via underside of seat
		Replace the seat assembly
	Fan Operation Fault	Power cycle the motorcycle and verify if the concern is repeatable
		Verify the fan connectors are fully connected – Accessible via underside of seat
		Replace the seat assembly
Red & Blue LED's Alternating Blinking	Software Error	Power cycle the motorcycle and verify if the concern is repeatable
		Replace the seat assembly
Red & Blue LED's Blinking Together	Open Circuit or Electrical Short	Power cycle the motorcycle and verify if the concern is repeatable
		Verify proper voltage and ground at the seat to chassis connector
		Replace the seat assembly

CONTROLLER OVERVIEW

CONTROLLER OVERVIEW

OVERVIEW

Listed below are all the electronic controllers found on the **Heavyweight Liquid-Cooled** chassis. Under each electronic controller title is two boxes listing the inputs and outputs for it. There are signals and replaceable components listed within the input and output boxes. The signals are constant communication or rider initiated between the input or outputs and the electronic controller. The outputs are controlled by the electronic controllers they are connected to. Replaceable components are parts on the motorcycle that have communication with the electronic controller they are connected to and can be replaced. They may be replaceable as a single part or as part of an assembly.

- Challenger operates on a quadruple CANbus system
- Each CANbus is listed with which controller connection

ECM (Engine Control Module) Terminator Resistor 1 and 2	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus A • CANbus B • Throttle Position Sensor 1 • Throttle Position Sensor 2 • TMAP Sensor • Side Stand Switch • Rear Brake Switch • Gear Selector Switch • Crankshaft Position Sensor • Knock Sensor • Cylinder Head Temp. Sensor • Pedal Position Sensor 1 • Pedal Position Sensor 2 • Front O2 Sensor • Rear O2 Sensor • Post Catalyst O2 Sensor	• CANbus A • CANbus B • Main Engine Relay Control (Ground) – Front Fuel Injector Power – Rear Fuel Injector Power – Front Ignition Coil Power – Rear Ignition Coil Power • Canister Purge Valve Power • Fuel Pump Relay Power • Electronic Throttle Control Motor Power • Taillight Power • Brake Light Power • Trunk Brake Light Power (if equipped) • Right Front Turn Signal Power • Right Rear Turn Signal Power
• Fuel Level Sensor • Oil Pressure Sensor • Intake Air Temp. Sensor • Ambient Air Temp. Sensor • WCM (Wake Up Signal)	• Left Front Turn Signal Power • Left Rear Turn Signal Power • Starter Relay Power • Starter Solenoid Power • Rear Collision Warning Power
REPLACEABLE COMPONENTS	
• Throttle Body – Throttle Position Sensor 1 – Throttle Position Sensor 2 • TMAP Sensor • Side-Stand Switch • Rear Brake Switch • Gear Selector Switch • Crankshaft Position Sensor • Fuel Pump – Fuel Level Sensor • Oil Pressure Sensor • Intake Air Temp. Sensor • Ambient Air Temp. Sensor	• Main Engine Relay • Canister Purge Valve • Fuel Pump Relay • Fuel Pump • Front Fuel Injector • Rear Fuel Injector • Front Ignition Coils • Rear Ignition Coils • Electronic Throttle Control Motor • Taillight Assembly – Taillight – Brake Light • Right Front Turn Signal Assembly • Right Rear Turn Signal Assembly • Left Front Turn Signal Assembly • Left Rear Turn Signal Assembly • Starter Relay • Starter Solenoid • Rear Collision Lights

VCM 1 (Vehicle Control Module)	
INPUT SIGNALS	**OUTPUT SIGNALS**

10

• CANbus A – Fuel Door Switch – Horn Switch – Blind Spot Warning Event Status – Saddlebag Lock Switch – Heated Grip Switch • E-Preload Sensor	• CANbus A • Lock/Unlock • Heated Hand Grips Power • Fuel Door Solenoid Power • Puddle Light Power • Blind Spot Mirror Telltale Output • Horn Power • Fuel Door Switch Power
REPLACEABLE COMPONENTS	
• Gas Tank Bezel – Fuel Door Switch	• Saddlebag Lock • Blind Spot Mirrors • Trunk Lock • Lock Switch • Heated Hand Grips • Puddle Light • Horn Assembly

VCM 2 (VEHICLE CONTROL MODULE)	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus A – Garage Door – Headlight Switch – Windshield Position Switch – ePreload Position – Fan Control	• CANbus A • Garage Door • Low Beam Headlight Power • High Beam Headlight Power • Windshield Position Motor Power • E-Preload Motor Control • Cooling Fan Power

REPLACEABLE COMPONENTS	
NA	• Windshield Position Motor • Headlight Assembly • E-Preload • Garage Door • Cooling Fan

VCM 3 (VEHICLE CONTROL MODULE)	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus A – Fog Light Switch	• CANbus A • Right Fog Light • Left Fog Light
REPLACEABLE COMPONENTS	
NA	• Right Fog Light Assembly • Left Fog Light Assembly
LEFT-HAND CONTROL Must replace as an assembly	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus A – Heated Grip	• CANbus A – High Beam – Horn Switch Signal – Turn Signal – Heated Grip Power – Clutch Switch Signal
REPLACEABLE COMPONENTS	
NA	• Heated Grip
RIGHT-HAND CONTROL Must replace as an assembly	
INPUT SIGNALS	**OUTPUT SIGNALS**

• CANbus A – Heated Grip	• Run/Stop/Start Switch • CANbus A – Run/Stop/Start Switch Status – Heated Grip Power – Cruise Increase – Cruise Decrease – Cruise On/Off
REPLACEABLE COMPONENTS	
NA	• Heated Grip

WCM (Wireless Control Module)	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus A • LF Antenna Bag Lock and Unlock • Key Fob • Saddlebag Lock and Unlock Switch Input • TPMS • Run/Stop/Start Switch	• CANbus A • ECM (Wake-Up) • Switched Power • Security LED
REPLACEABLE COMPONENTS	
• Key Fob • TPMS Sensor • Low Frequency Antenna	NA

ABS Module (Antilock Brake System)	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus B • Front Wheel Speed Sensor • Rear Wheel Speed Sensor • ABS CAN Resistor (CANB)	• CANbus B – Vehicle Speed – ABS Faults – Bike Hold Control Status • Antilock Brake Signal

REPLACEABLE COMPONENTS	
• Front Wheel Speed Sensor • Rear Wheel Speed Sensor • Terminator Resistor CANB	NA

DISPLAYS (Speedometer, Tachometer) Terminator Resistor 1 Replace Speedometer as an assembly Replace Tachometer as an assembly	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus A • Warning Faults • Engine Codes • Indicator Signals (high beam, cruise, turn, etc.)	• CANbus A • Warning Lights • Indicator Lights (high beam, cruise, turn, etc.)

RIDE COMMAND DISPLAY Terminator Resistor 3 Replace Ride Command Display as an assembly	
INPUT SIGNALS	**OUTPUT SIGNALS**
• CANbus C • Ride Command • Warning Faults • Engine Codes	• CANbus C • Ride Command Display • Cylinder Deactivation Notification • Drive Mode Command

CANA Connections Harness Resistor
• ECM – Terminating Resistor • VCM 1 • VCM 2 • VCM 3 • WCM • Gateway

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• Tachometer • Speedometer • Righthand Control • Lefthand Control
CANB Connections Harness Resistor
• ABS CAN • ECM – Terminating Resistor • MRR • Gateway • IMU
CANC Connections Harness Resistor
• Diagnostic • Display • Power Supply 1 • Power Supply 2 • Gateway – Terminating Resistor • H/C Seats • Info CAN
CAND Connections
• TCU – Terminating Resistor • Gateway

ASSEMBLY VIEWS

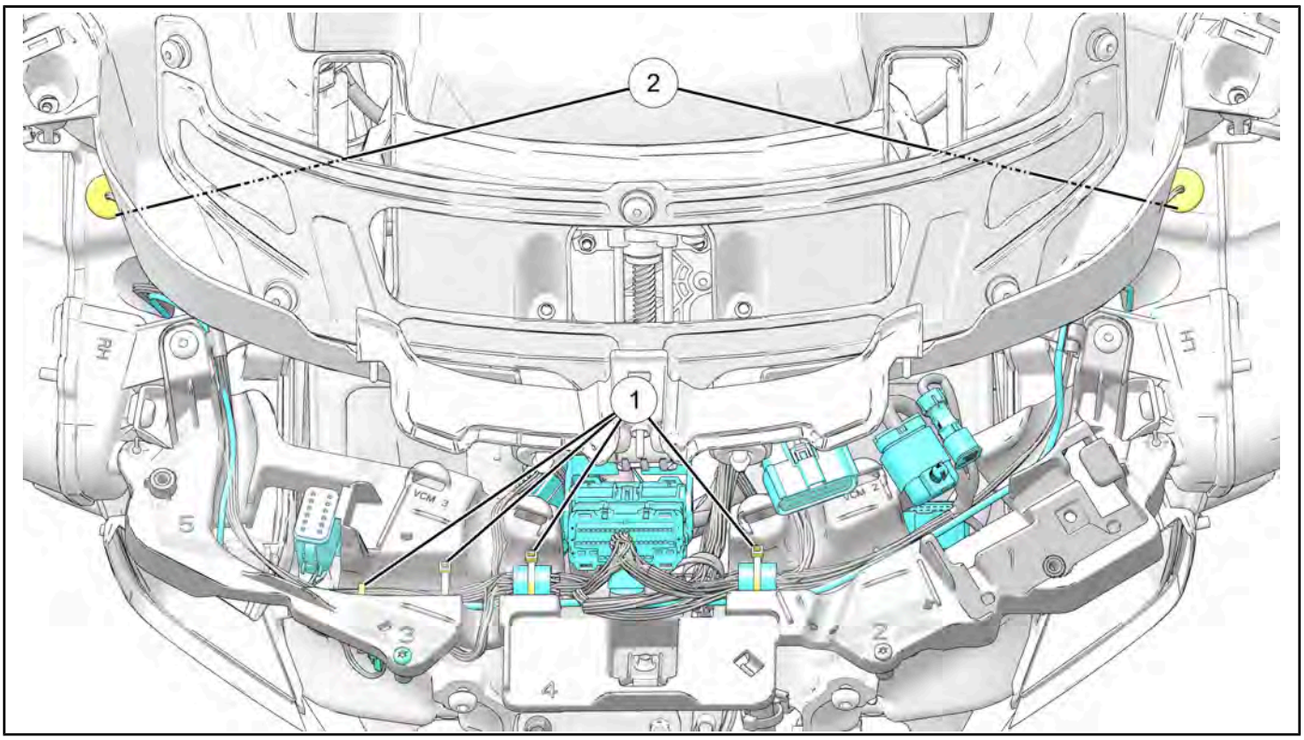
WIRING HARNESS ROUTING / RETENTION

CMF

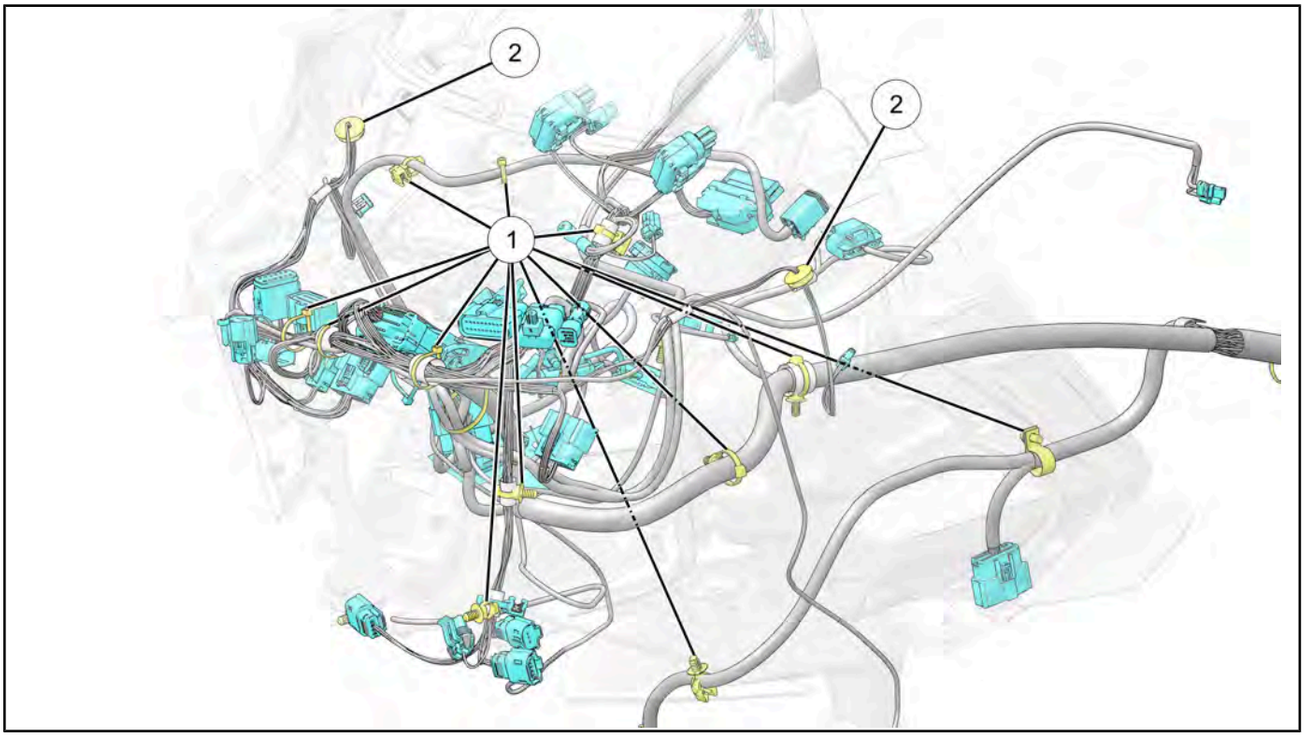
NOTICE
If replacing the harness, note all routing during removal will aid in proper installation.

IMPORTANT
The white tape on the harness signifies a retention point.

IMPORTANT
Do not extract fir clips from the frame, as it will damage the clip and lessen retention effectiveness.



① Retention Point	② Harness Grommet



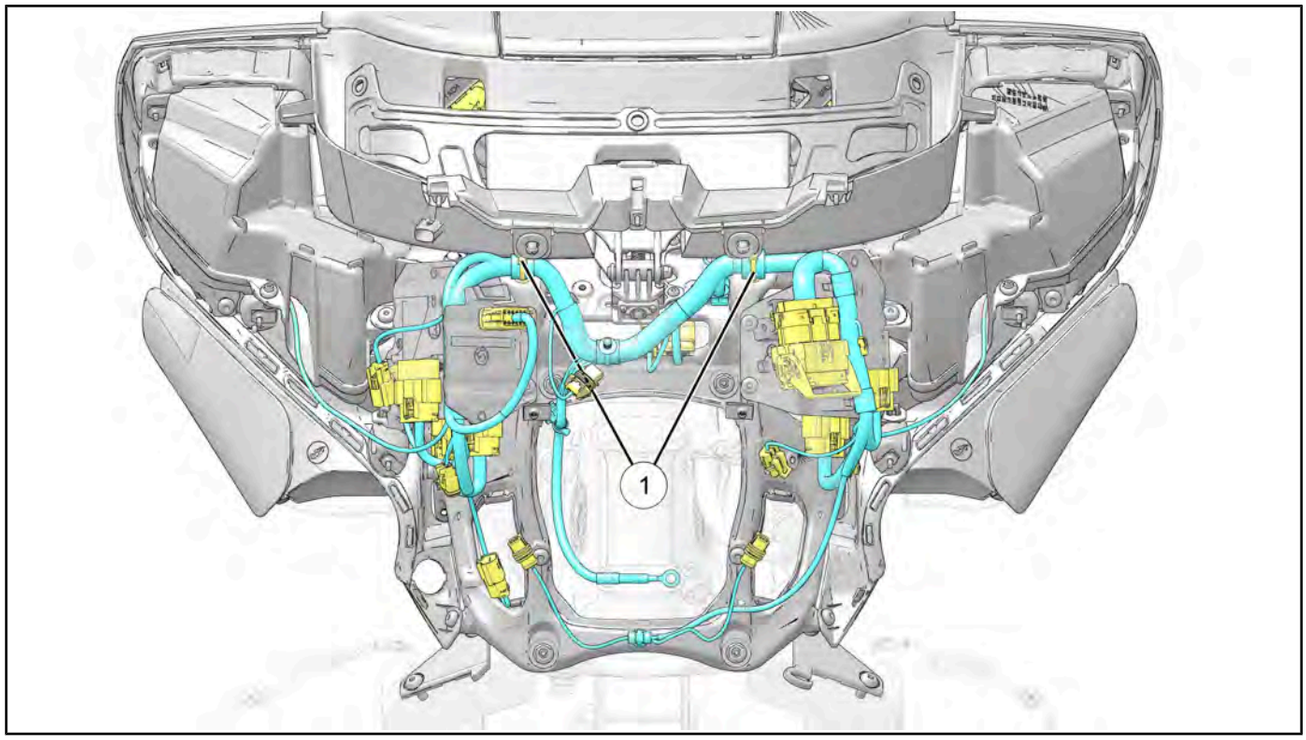
① Retention Point	② Harness Grommet

FMF

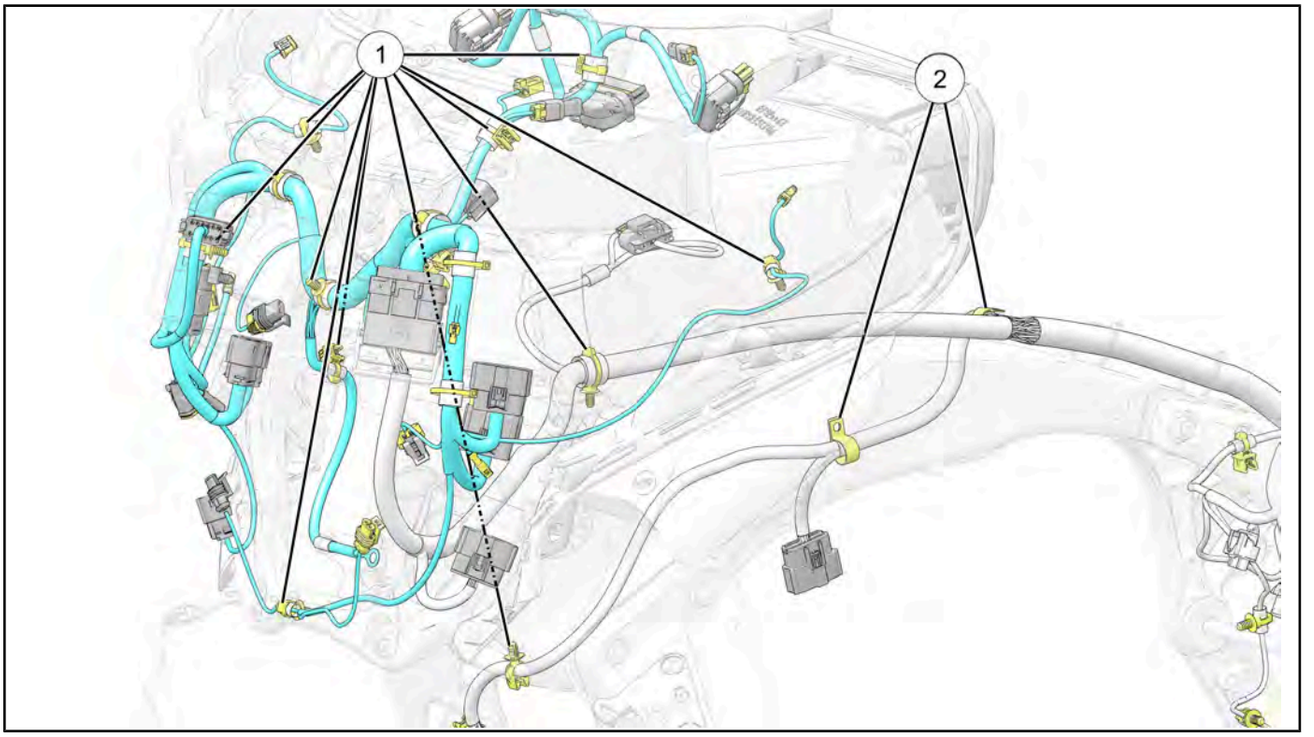
NOTICE
If replacing the harness, Noting routing during removal will aid in proper installation.

IMPORTANT
The white tape on the harness signifies a retention point. Cable ties are to be cut loose from clips for harness removal. Any clips extracted or pried loose, must be replaced with new clip assembly.

IMPORTANT
Do not extract fir clips from the frame, as it will damage the clip and lessen retention effectiveness.

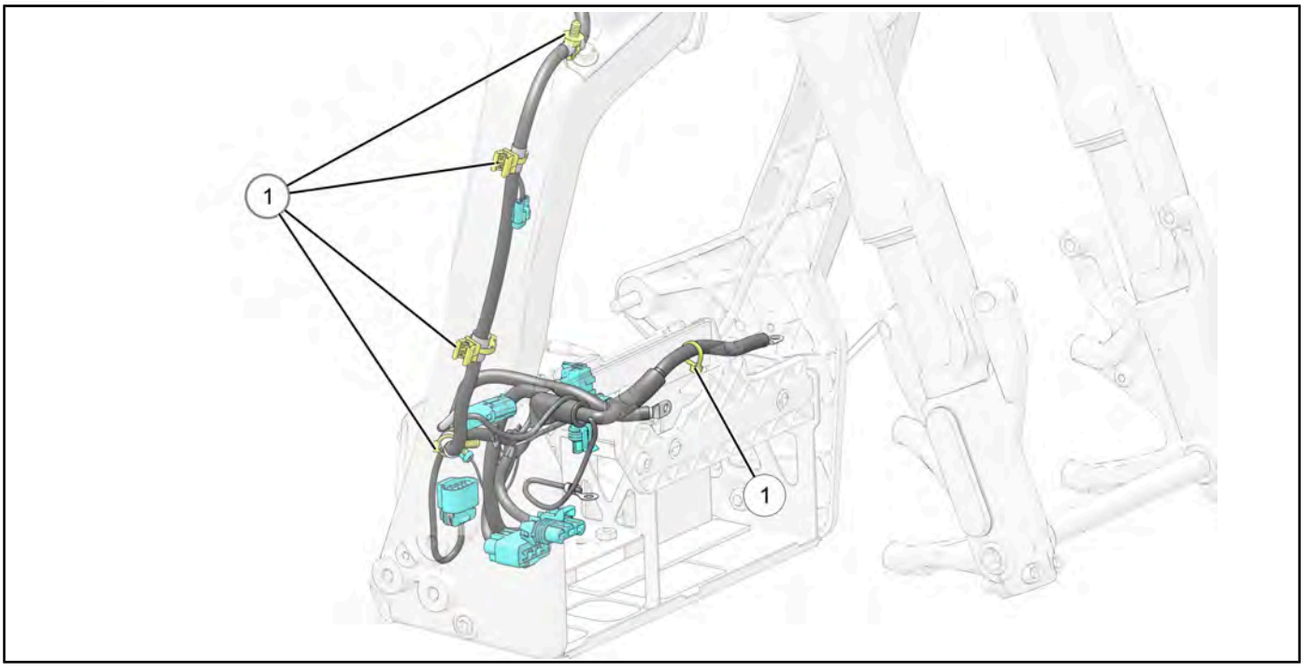


ITEM	DESCRIPTION
①	Retention Point

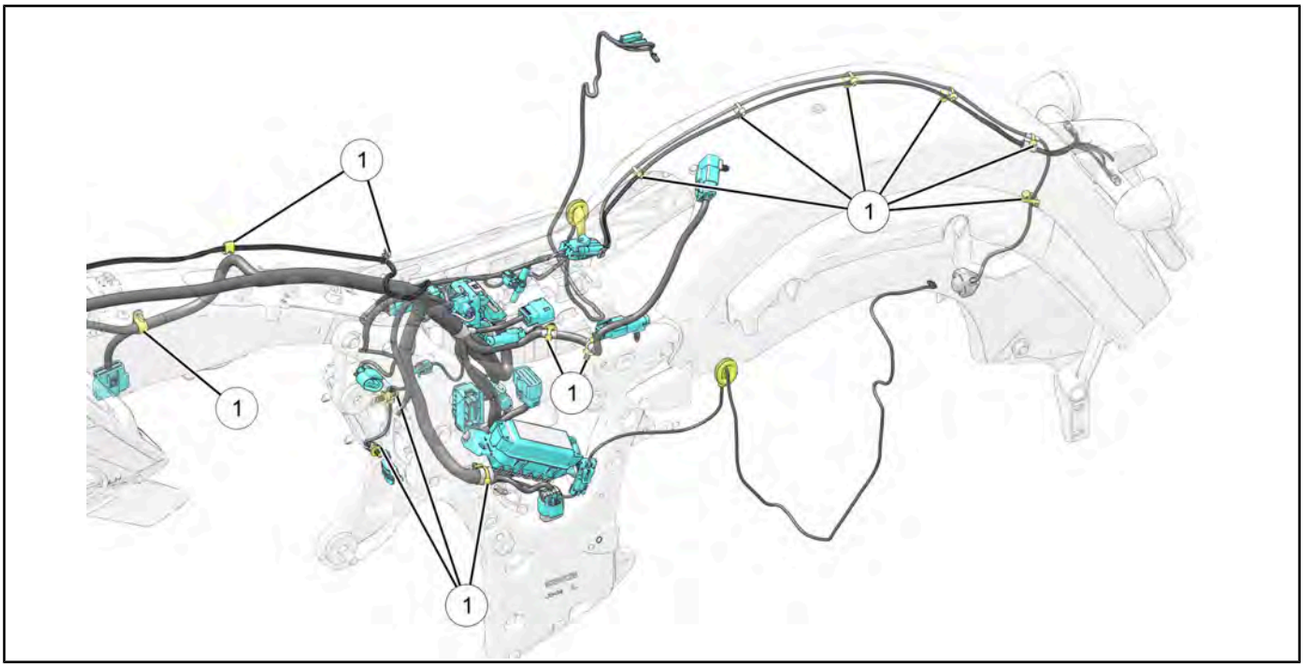


① Retention Point	② Harness Clip

COMMON



① Retention Point	



① Retention Point	

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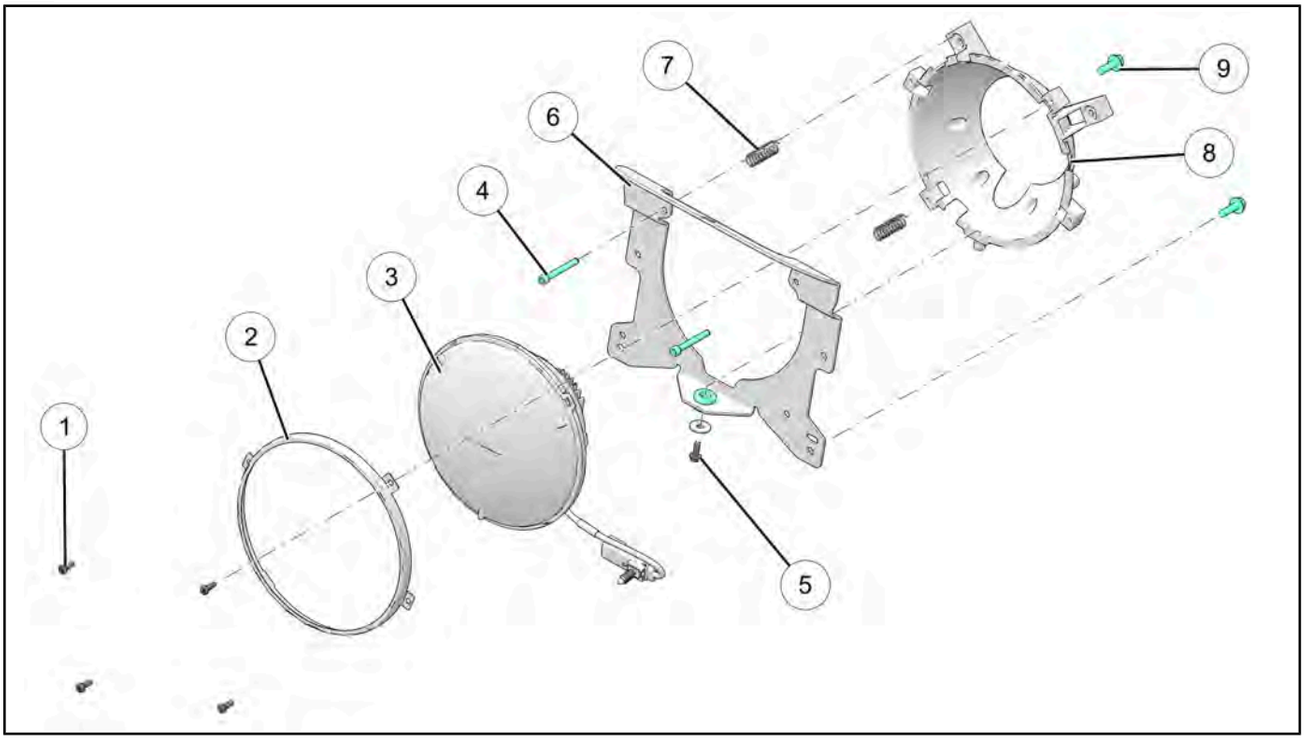
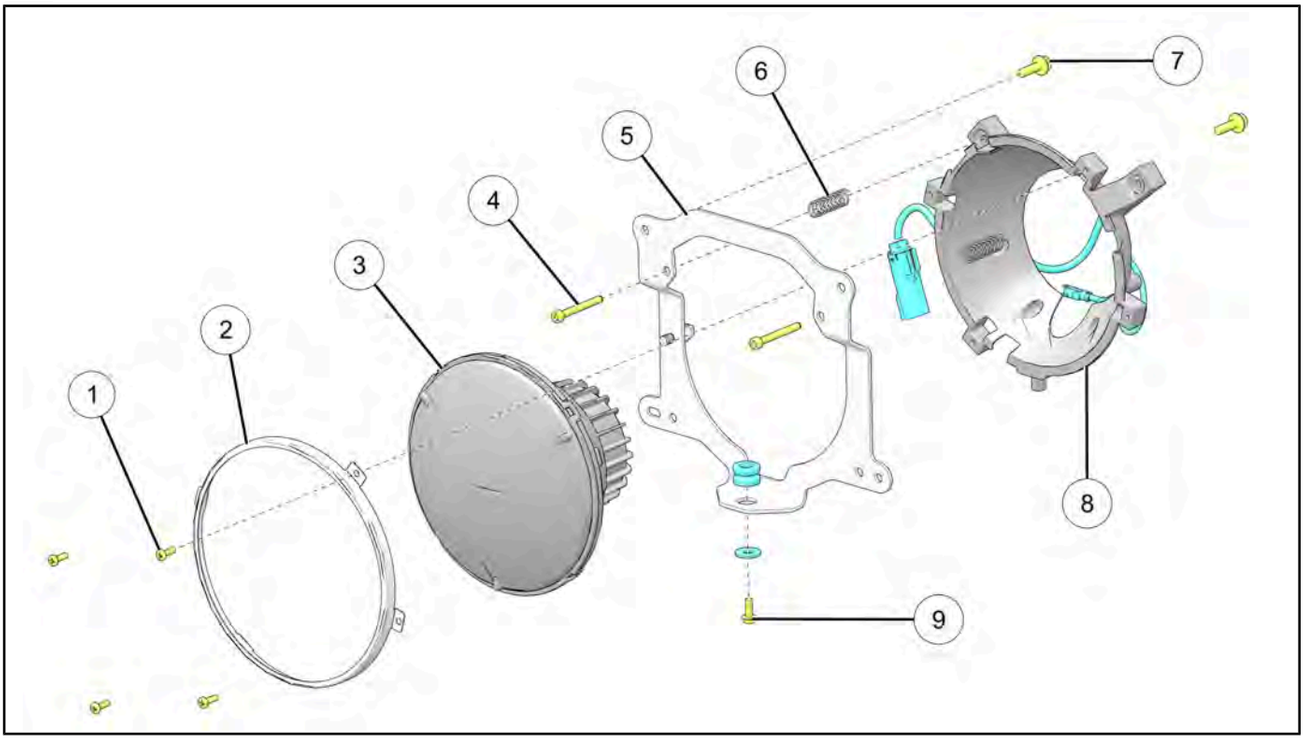
HEADLIGHT ASSEMBLY VIEW

CMF



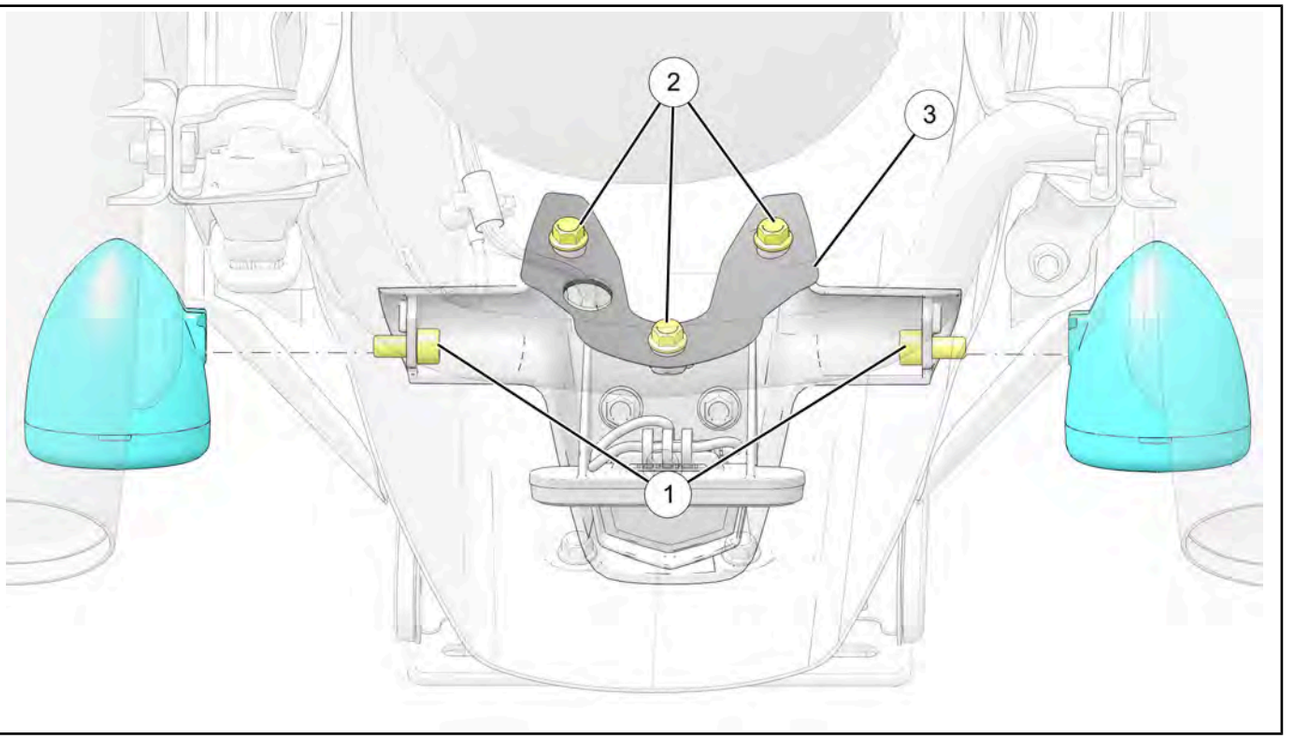
① Headlight Retention Ring Fastener **12 in-lbs (1 N·m)**	⑥ Headlight Bracket
② Headlight Retention Ring	⑦ Spring
③ Headlight	⑧ Headlight Carrier
④ Headlight Adjustment Fastener	⑨ Headlight Bracket Fastener **35 in-lbs (4 N·m)**
⑤ Headlight Carrier Fastener **12 in-lbs (1 N·m)**	

FMF

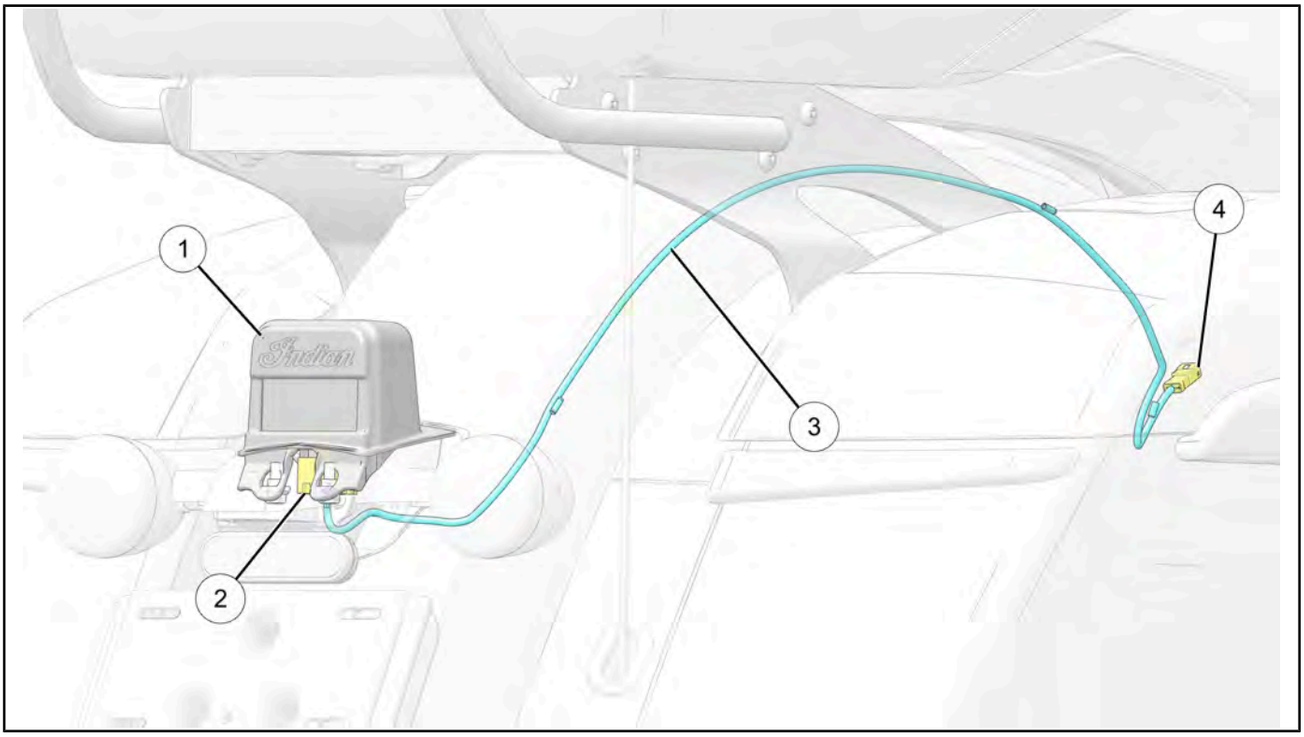


① Headlight Retention Ring Fastener **12 in-lbs (1 N·m)**	⑥ Spring
② Headlight Retention Ring	⑦ Headlight Bracket Fastener **35 in-lbs (4 N·m)**
③ Headlight	⑧ Headlight Carrier
④ Headlight Adjustment Fastener **12 in-lbs (1 N·m)**	⑨ Headlight Carrier Fastener **12 in-lbs (1 N·m)**
⑤ Headlight Bracket	

TAILLIGHT / LICENSE PLATE LIGHT / REAR RADAR ASSEMBLY VIEW



① Turn Signal Fastener **88 in-lbs (10 N·m)**	③ Tail Light Mount Curtain
② Taillight Mount Bracket Fastener **88 in-lbs (10 N·m)**	



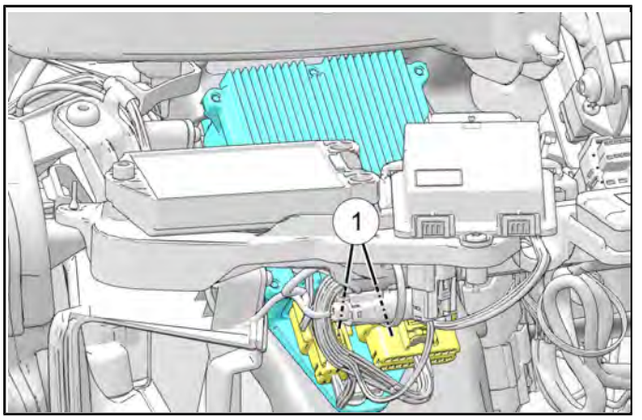
① Rear Radar	③ Rear Radar Harness
② Rear Radar Input Connector	④ Rear Radar Output Connector

POWER SUPPLY

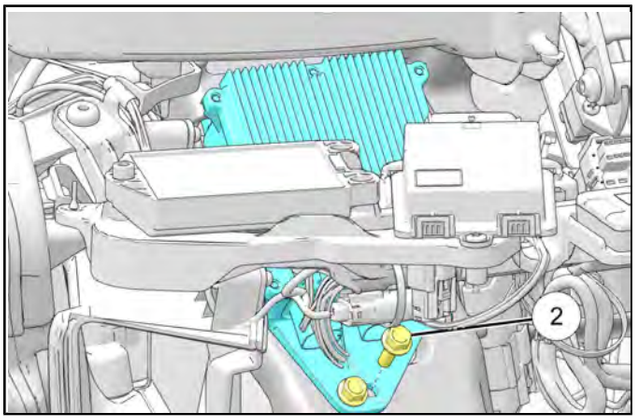
POWER SUPPLY REMOVAL

CMF

1. Remove outer fairing. Reference **Fairing Disassembly page 7.63**.
2. Disconnect power supply electrical connectors ①.



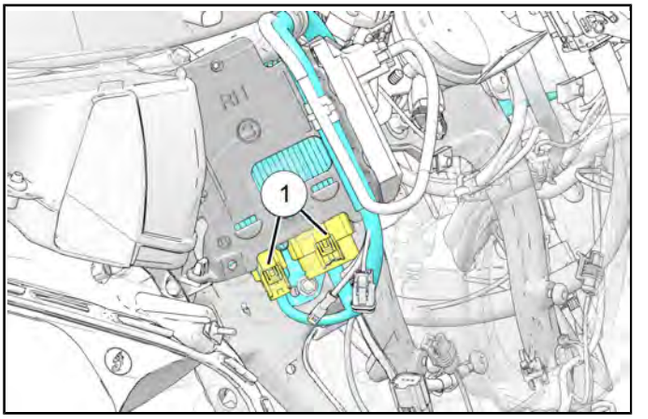
3. Remove power supply fastener ②.



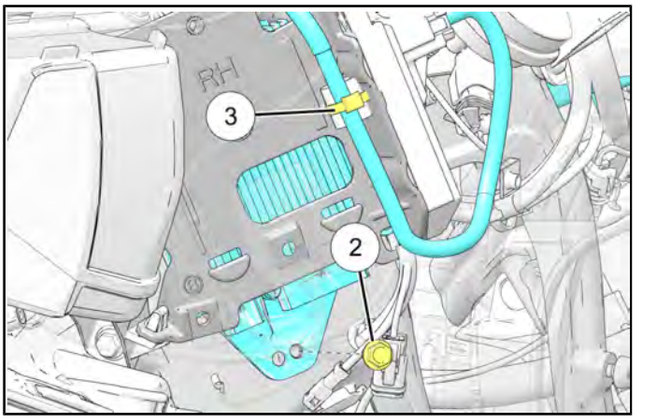
4. Remove the power supply from the unit.
5. Repeat for other side.

FMF

1. Remove outer fairing. Reference **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Disconnect power supply electrical connectors ①.



3. Remove power supply fastener ②.



4. Remove the power supply from the unit.
5. Repeat for other side.

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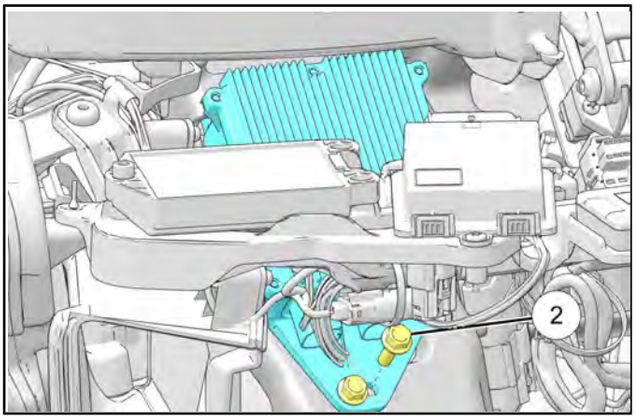
POWER SUPPLY INSTALLATION

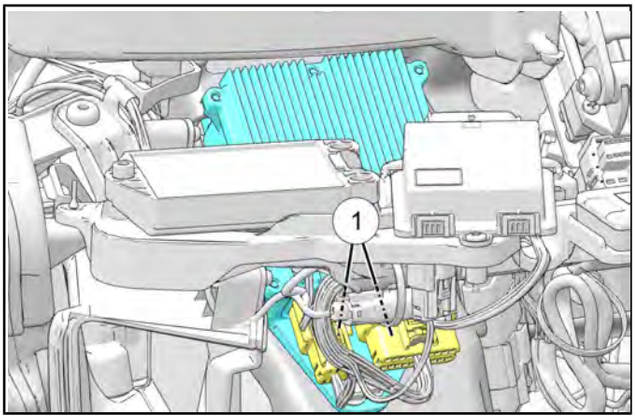
CMF

1. Install the power supply into the unit.
2. Install power supply fastener ②.



TORQUE
Power Supply Fastener: **88 in-lbs (10 N·m)**

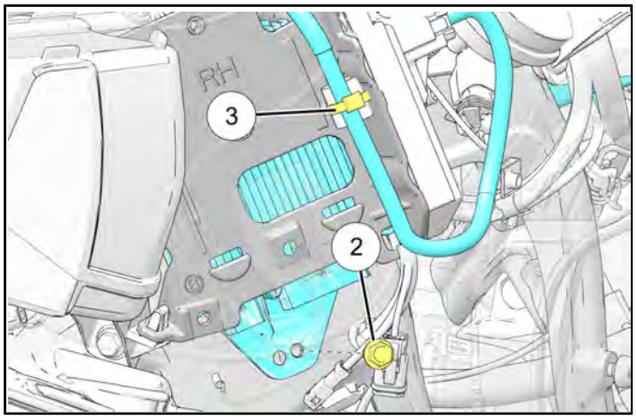
3. Connect power supply electrical connectors ①.



4. Repeat for other side.
5. Install outer fairing. Reference **Fairing Assembly and Installation (Chassis Mounted) page 7.75**.

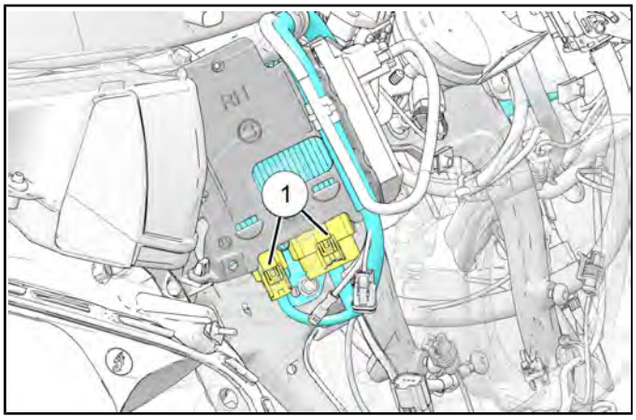
FMF

1. Install the power supply into the unit.
2. Install power supply fastener ②.



TORQUE
Power Supply Fastener: **88 in-lbs (10 N·m)**

3. Connect power supply electrical connectors ①.

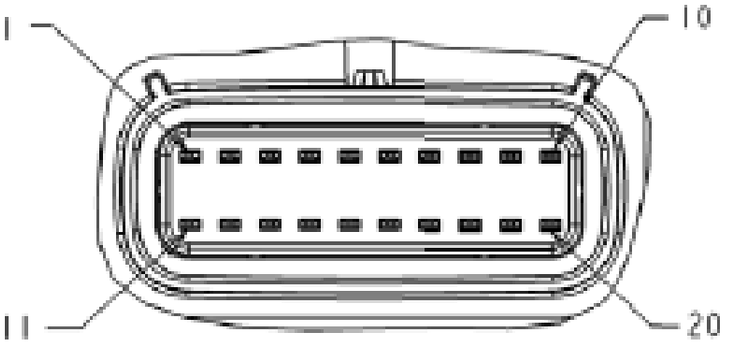


4. Repeat for other side.
5. Install outer fairing. Reference **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

10

POWER SUPPLY CONNECTOR MAP

POWER SUPPLY 1

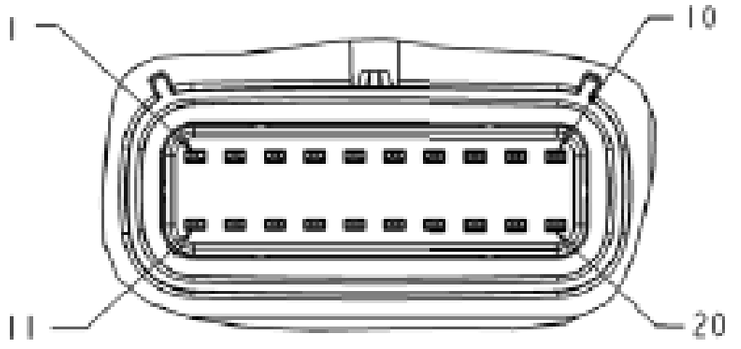


PIN	WIRE COLOR	FUNCTION
①	YE/RD	CAN C HI
②	WH/BK	Front Left Speaker Negative (–)
③	WH	Front Left Speaker Positive (+)
④	GY/BK	Front Right Speaker Negative (–)
⑤	GY	Front Right Speaker Positive (+)
⑥	—	—
⑦	PK/GN	VCM Accessory Power Out
⑧	BK/GN	Main Audio Rear Speaker Power Ground
⑨	BK	Power Supply A Ground
⑩	BK	Power Supply A Ground
⑪	DG/RD	CAN C LO
⑫	GY/YE	Pre-Amp Front Right Speaker Negative (–)
⑬	GY/RD	Pre-Amp Front Right Speaker Positive (+)
⑭	WH/YE	Pre-Amp Front Left Speaker Negative (–)
⑮	WH/RD	Pre-Amp Front Left Speaker Positive (+)
⑯	BK	Main Audio Ground
⑰	—	—
⑱	OG/YE	Main Audio Rear Speaker Power Feed
⑲	BG	Main Audio Power Feed
⑳	BG	Main Audio Power Feed

POWER SUPPLY 1

PIN	WIRE COLOR	FUNCTION
①	DG/BK	Rear Left Speaker Negative (–)
②	DG	Rear Left Speaker Negative (+)
③	BK/YE	Main Audio Rear Speaker Power Ground
④	VT/BK	Rear Right Speaker Negative (–)
⑤	VT	Rear Right Speaker Positive (+)
⑥	OG/WH	Main Audio Rear Speaker Feed

POWER SUPPLY 2



PIN	WIRE COLOR	FUNCTION
①	YE/RD	CAN C High
②	GN/DB	Left Saddlebag Speaker Negative (–)
③	DG/OG	Left Saddlebag Speaker Positive (+)
④	VT/DB	Right Saddlebag Speaker Negative (–)
⑤	VT/PK	Right Saddlebag Speaker Positive (+)
⑥	—	—
⑦	PK/GN	VCM Accessory Power Out
⑧	BK/OG	Saddlebag Speaker Ground
⑨	BK	Power Supply B Ground
⑩	BK	Power Supply B Ground
⑪	DG/RD	CAN C Low
⑫	DG/YE	Pre-Amp Rear Right Speaker Negative (–)
⑬	DG/RD	Pre-Amp Rear Right Speaker Positive (+)
⑭	VT/YE	Pre-Amp Rear Left Speaker Negative (–)
⑮	VT/RD	Pre-Amp Rear Left Speaker Positive (+)
⑯	BK	Power Supply B Ground
⑰	BK	Power Supply B Ground
⑱	OG/DB	Secondary Audio Speaker Power Feed
⑲	BG/WH	Secondary Audio Power Feed
⑳	BG/WH	Secondary Audio Power Feed

POWER SUPPLY 2

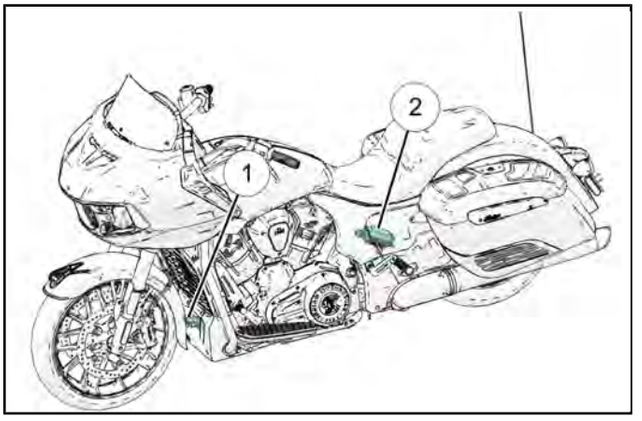
PIN	WIRE COLOR	FUNCTION
①	WH/DB	Lower Fairing Left Speaker Negative (–)
②	WH/OG	Lower Fairing Left Speaker Positive (+)
③	BK/PK	Audio Speaker Power Ground
④	GY/DB	Lower Fairing Right Speaker Negative (–)
⑤	GY/DG	Lower Fairing Right Speaker Positive (+)
⑥	OG/BK	Audio Speaker Power Feed

FUSE BOX

FUSE BOX LOCATION

There are two fuse boxes utilized on the full size Indian Motorcycle platform.

- The MCase fuse box ① is located in the front of the unit in the battery box area.



- The main fuse box ② which is located beneath the left-hand upper side cover.

FUSE APPLICATION CHART

MAIN FUSEBOX

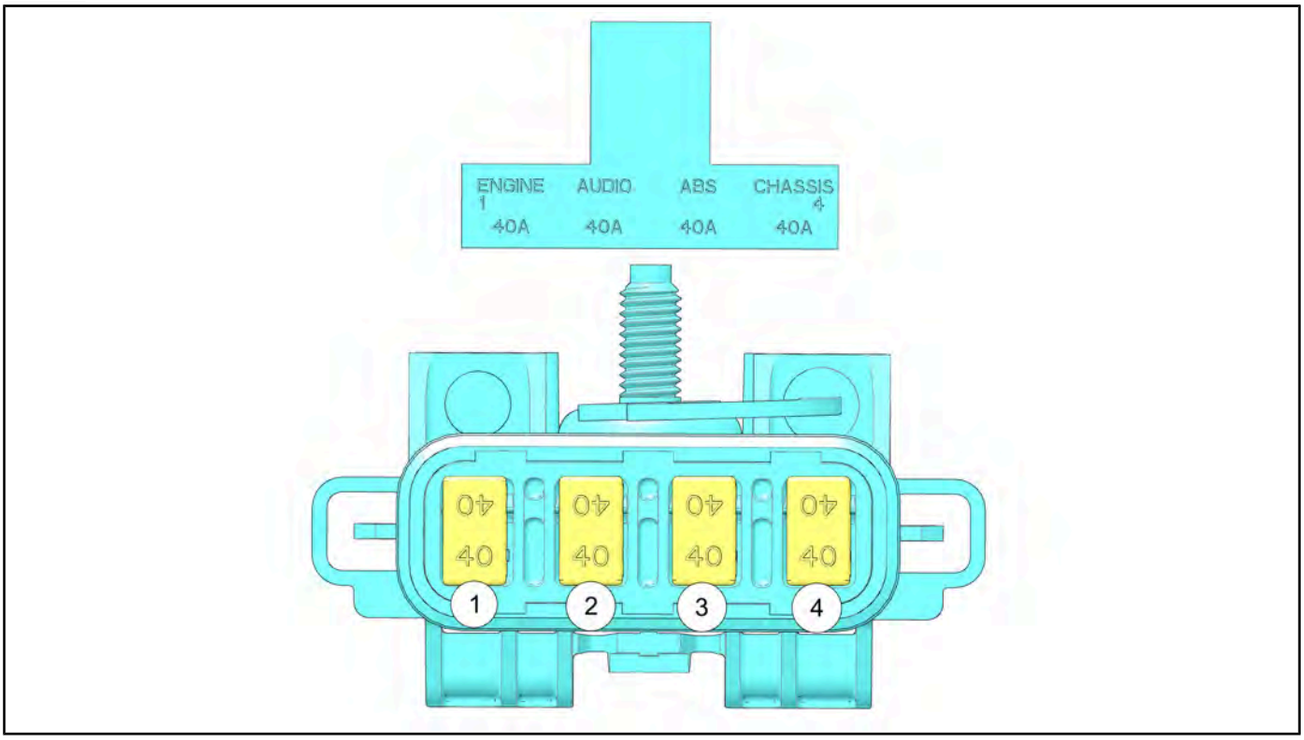
MAIN ENGINE RELAY 4016819	START RELAY 4016819	25A VCM1 4011653 10A SPARE 2434016	FUEL PUMP RELAY 4016819	25A ABS 4011653 25A AUDIO1 4011653	SWITCHED POWER RELAY 4016819
15A EFI1 2410280	10A EFI2 2434016	10A TENDER 2434016	5A GAUGE 4011652	25A SPARE 4011653	10A SWITCHED1 2434016
7.5A IGN 4011068	10A WCM 2434016	25A VCM2 4011653	25A VCM3 4011653	25A AUDIO2 4011653	10A SWITCHED2 2434016

7191485

CIRCUIT	PIN	WIRE COLOR	FUNCTION
Main Engine Relay	48	RD/YE	VCM Control Feed
	47	RD/DG	Main Engine Relay Load
	44	RD	Chassis Main Fuse Output
	43	GY/BK	Engine Relay Control
EFI 1 Fuse 15A	46	RD/DG	Main Engine Relay Load
	42	VT/PK	Engine Relay Output
IGN Fuse 7.5A	45	RD/DG	Main Engine Relay Load
	41	PK/RD	Ignition Coil Feed
Start Relay	40	PK/BK	Starter Relay Coil Feed
	39	DG/WH	Starter Solenoid Feed

	36	VT/PK	Engine Relay Output
	35	OG/BN	Starter Relay Control
EFI 2 Fuse 10A	38	RD/DG	Main Engine Relay Load
	34	DB/PK	AUX Engine Relay Output
WCM Fuse 10A	37	RD	Engine Main Fuse Output
	33	RD/YE	WCM Control Feed
VCM 1 Fuse 25A	32	RD	Engine Main Fuse Output
	28	RD/WH	VCM Feed
Spare 10A	31	—	—
	27	—	—
Tender Fuse 10A	30	RD	Chassis Main Fuse Output
	26	GY/RD	Accessory Constant Fuse Output
VCM 2 Fuse 25A	29	RD	Engine Main Fuse Output
	25	RD/BK	VCM2 Power Feed
Fuel Pump Relay	24	VT/PK	Engine Relay Output
	20	VT/PK	Engine Relay Output
	23	VT/YE	Fuel Pump Feed
	19	GY	Fuel Pump Relay Control
Gauge Fuse 5A	22	RD	Engine Main Fuse Output
	18	OG	Instrumentation Fuse Output
VCM 3 Fuse 25A	21	RD	Engine Main Fuse Output
	17	RD/DG	VCM 3 Power Feed
ABS Fuse 25A	16	RD	Engine Main Fuse Output
	12	RD/BK	ABS Secondary Power Feed
Audio 1 Fuse 25A	15	RD	Audio Main Fuse Output
	11	BG	Main Audio Power Feed
Spare Fuse 25A	14	—	—
	10	—	—
Audio 2 Fuse 25A	13	RD	Audio Main Fuse Output
	9	BG	Secondary Audio Power Feed
Switched Power Relay	8	OG/YE	Switched Power Relay Feed – Coil
	4	RD	Chassis Main Fuse Output
	7	RD/BU	Switched Power Relay Load
	3	BK	Ground
Switched 1 Fuse 10A	6	RD/BU	Switched Power Relay Load
	2	PK/GN	Accessory Power Output
Switched 2 Fuse 10A	5	RD/BU	Switched Power Relay Load
	1	GY/WH	Accessory Switched Output

MCASE

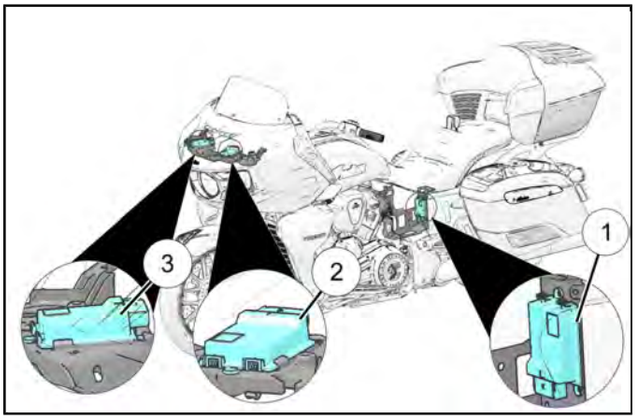


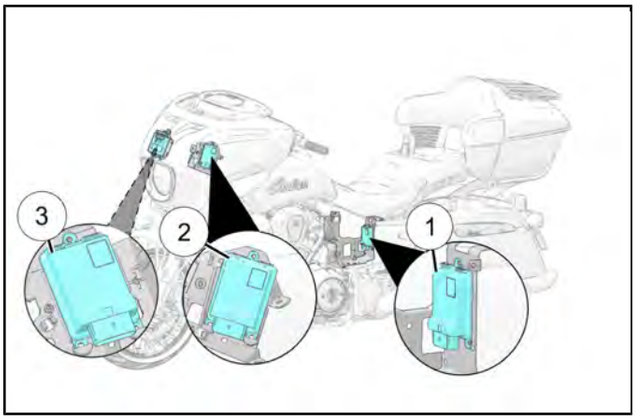
CIRCUIT	PIN	WIRE COLOR	FUNCTION
Engine Main 40A Fuse	1	Red	ABS Fuse Output
Audio Main 40A Fuse	2	Red	Audio Output
ABS Main 40A Fuse	3	Red	Engine Main Fuse Output
Chassis Main 40A Fuse	4	Red	Chassis Main Fuse Output

VEHICLE CONTROL MODULE (VCM)

VEHICLE CONTROL MODULE (VCM) OVERVIEW

See image for locations of VCM 1 ①, VCM 2 ②, and VCM 3 ③.





VCM 1	VCM 2	VCM 3
Fuel Door Switch	Windshield Position Switch	Fog Light Switch
Heated Grips Switch	Fan Control	
Saddle Bag Locks	Garage Door	
Blind Spot Warning Event Status	Headlight Switch	
Horn Switch	ePreload Poistion	

IMPORTANT

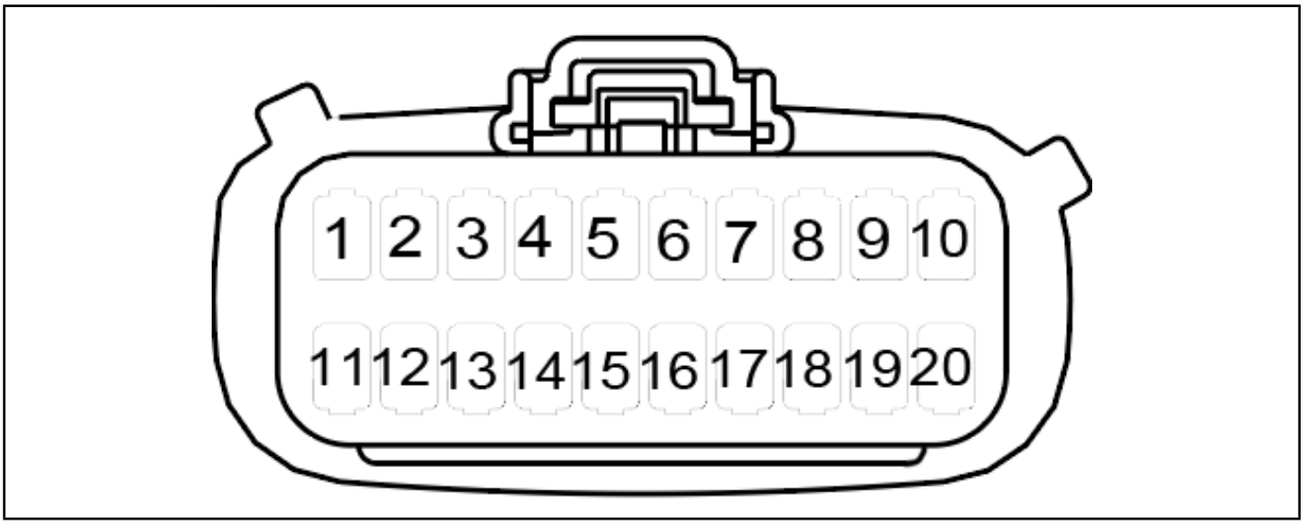
VCM 1, VCM 2, and VCM 3 have separate functions and are not interchangeable.

IMPORTANT

Replacement of the Vehicle Control Module (VCM) should only be performed by a qualified dealer. Vehicle Control Module (VCM) setup and initialization requires the use of Digital Wrench.

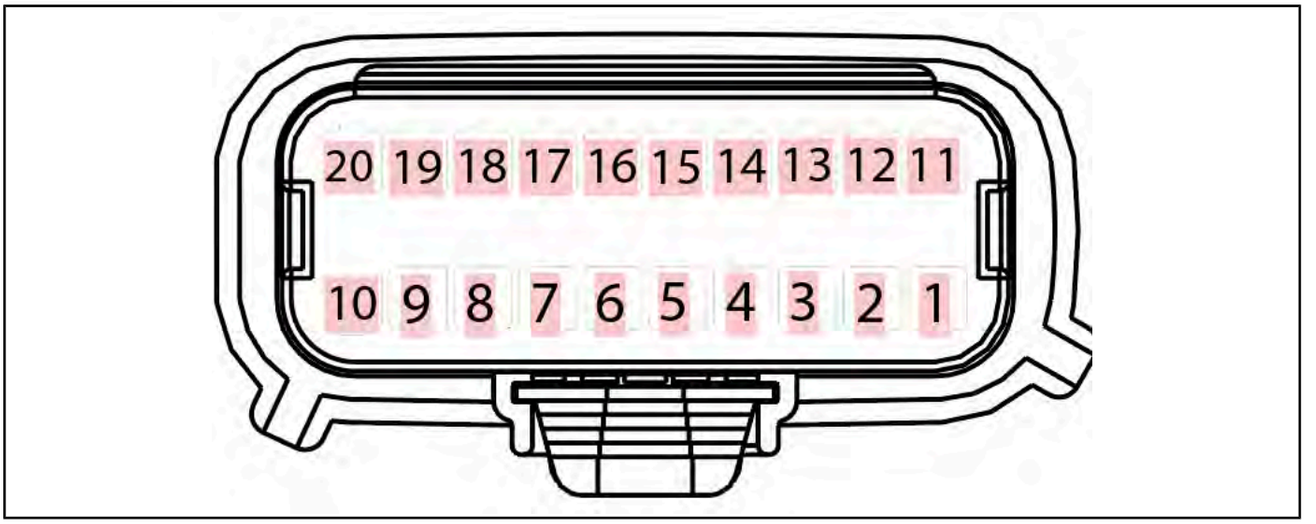
VCM CONNECTOR PINOUT

VCM 1 UNDER SEAT



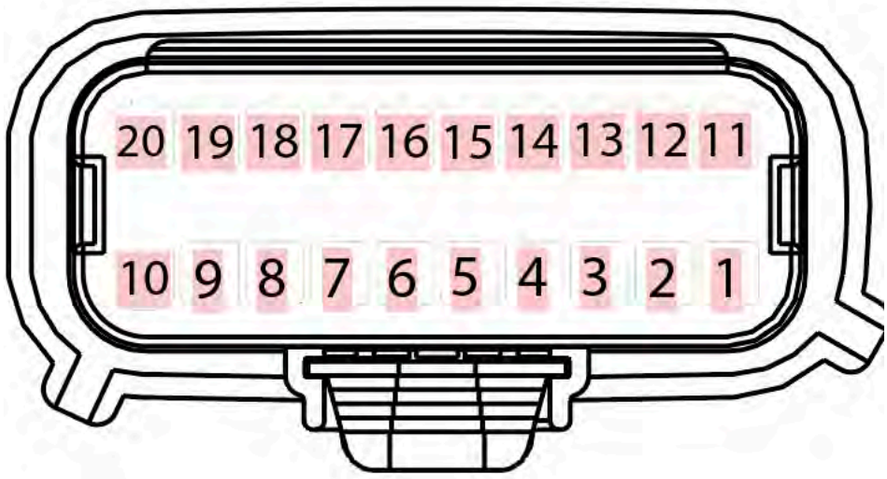
PIN	WIRE COLOR	FUNCTION
1	RD	VCM Feed
2	YE	CANA High
3	DG/OG	Fuel Door Solenoid Negative
4	BU	Puddle Lights
5	PK	Heated Grips Output
6	GN/WH	E-Preload Sensor Signal
7	WH	Horn
8	DB/OG	Fuel Door Switch Output
9	RD/WH	Lock Motor Feed
10	PK/GN	Accessory Power Output
11	DG	CANA Low
12	OG/DG	Fuel Door Solenoid Positive
13	PK	RH BSD Mirror
14	BK	Ground
15	VT/RD	LH BSD Mirror
16	—	—
17	—	—
18	OG/WH	Unlock Motor Feed
19	—	—
20	RD	VCM Feed

VCM 2 FAIRING



PIN	WIRE COLOR	FUNCTION
1	RD/BK	Power Feed
2	YE	CANA High
3	RD/GN	E–Preload Motor (-)
4	–	–
5	DG	Low Beam Output
6	–	–
7	OG/RD	Fan Control
8	–	–
9	GY/DB	Windshield Motor Up
10	PK/GN	VCM Accessory Power Out
11	DG	CANA Low
12	RD/BU	E-Preload Motor (+)
13	YE/BN	Garage Door 1 Feed
14	BK	Ground
15	GN	Garage Door 2 Feed
16	YE	High Beam Output
17	–	–
18	GY/DG	Windshield Motor Down
19	BK	Ground
20	RD/BK	Power Feed

VCM 3 FAIRING



PIN	WIRE COLOR	FUNCTION
1	RD/DG	VCM 3 Power Feed
2	YE	CAN A High
3	—	—
4	—	—
5	—	—
6	—	—
7	—	—
8	—	—
9	—	—
10	PK/GN	VCM Accessory Power Out
11	DG	CAN A Low
12	—	—
13	DG/RD	Left AUX Light Feed
14	BLK	Ground
15	DG/BN	Right AUX Light Feed
16	—	—
17	—	—
18	—	—
19	PK/DB	VCM Accessory Power Out
20	RD/DG	VCM 3 Power Feed

VEHICLE CONTROL MODULE (VCM), REMOVAL

⚠ CAUTION

The negative battery cable MUST be disconnected before the VCM can be removed.
Electrical tape can be used to cover the negative battery terminal and cable end to prevent a short from occurring across the VCM during removal.

IMPORTANT

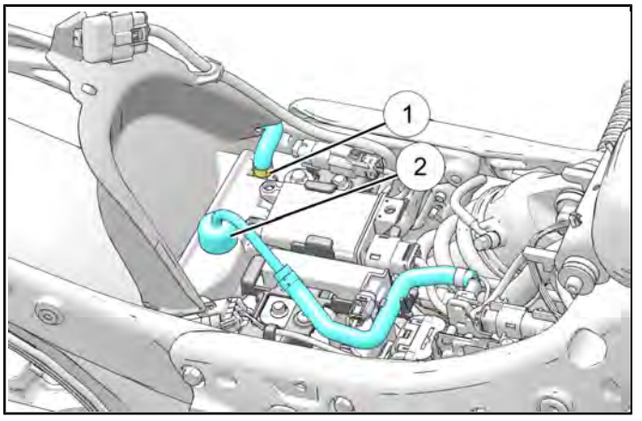
VCM 1, VCM 2, and VCM 3 have separate functions and are not interchangeable.

IMPORTANT

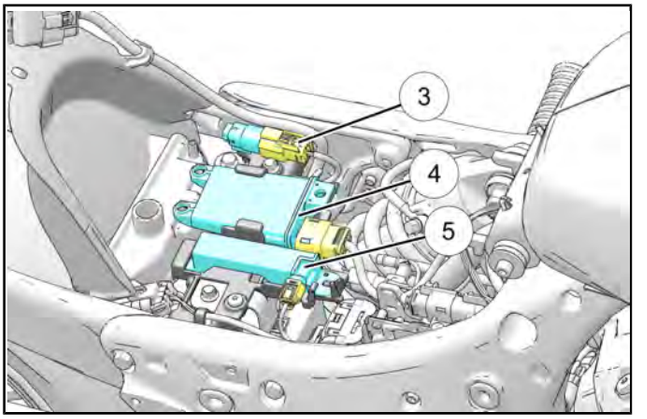
If equipped with electronic preload system, VCM 1 contains calibration data specific to that suspension assembly. A learn process must be executed anytime the VCM 1 is replaced. See **E-Preload Adjustment page 8.9**.

VCM 1

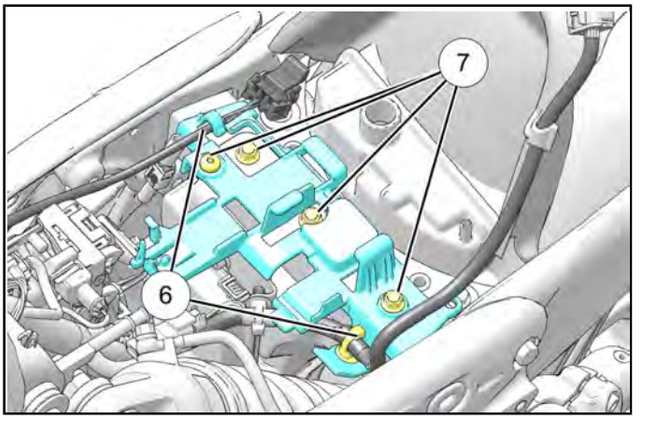
1. Remove seat. See Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Disconnect the negative battery cable.
3. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
4. Remove ECM. See **ECM Removal page 4.63**.
5. Remove coolant overflow line ① and coolant pickup line ② from recovery bottle..



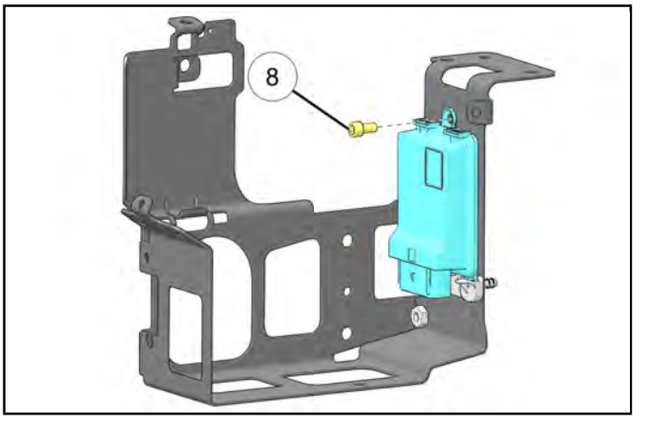
6. Disconnect electrical connection ③.



7. Disconnect WCM ④ electrical connector and remove.
8. Disconnect antenna module ⑤ electrical connector and remove.
9. Disconnecting the wiring retained ⑥ to under-seat wire bracket.



10. Remove under-seat wire bracket by removing its fasteners ⑦.
11. Remove VCM fastener ⑧.



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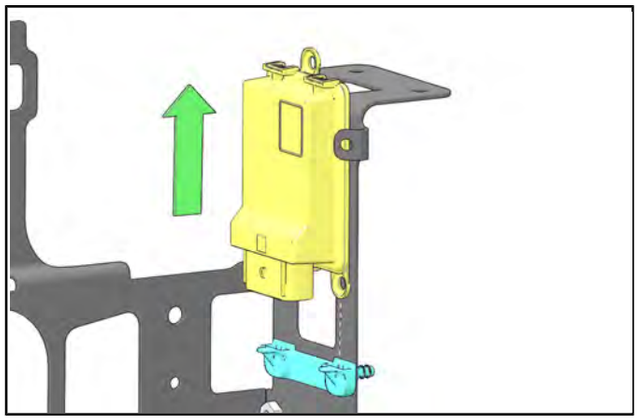
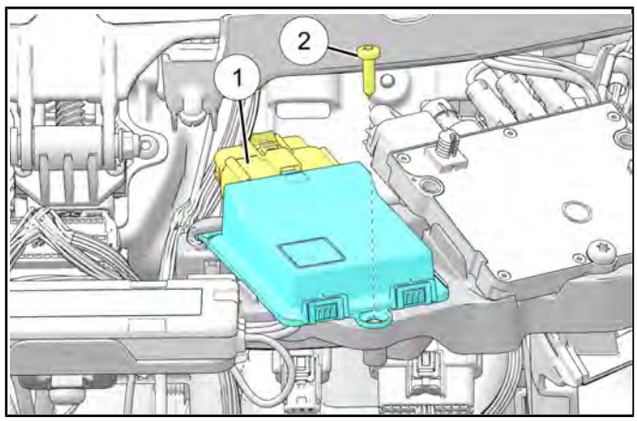
12. Disconnect VCM electrical connector.
13. Lift the VCM up out of rubber mount.



CMF: VCM 2

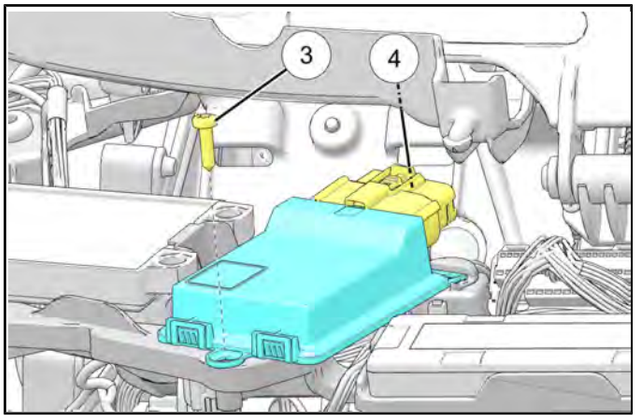
1. Remove outer fairing. See **Fairing Disassembly page 7.63**.
2. Disconnect electrical connector ①.



3. Remove fastener ② securing VCM and remove.

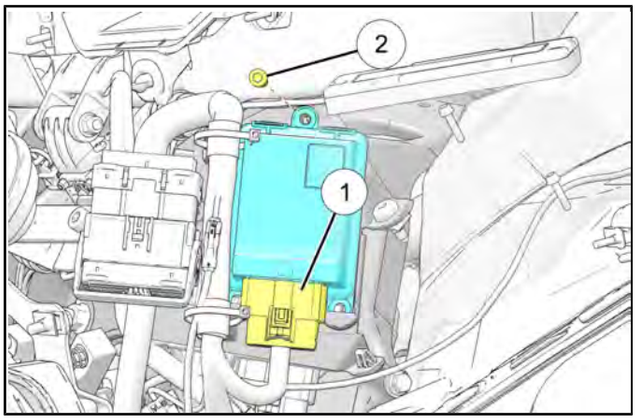
CMF: VCM 3

1. Remove outer fairing. See **Fairing Disassembly page 7.63**.
2. Disconnect electrical connector ④.
3. Remove fastener ③ securing VCM and remove.



FMF: VCM 2

1. Remove outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Disconnect electrical connector ①.
3. Remove fastener ② securing VCM and remove.

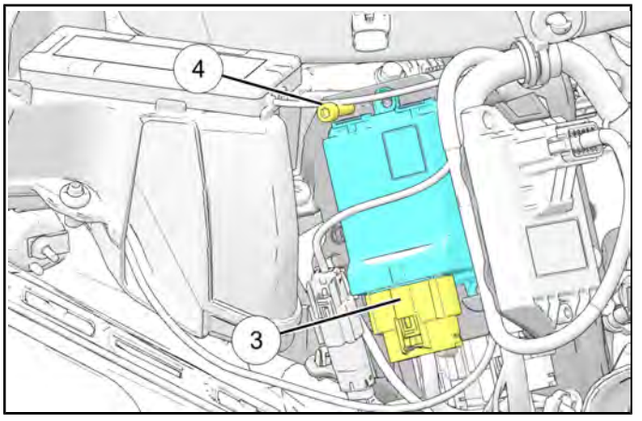


FMF: VCM 3

1. Remove outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.

10

2. Disconnect electrical connector ③.

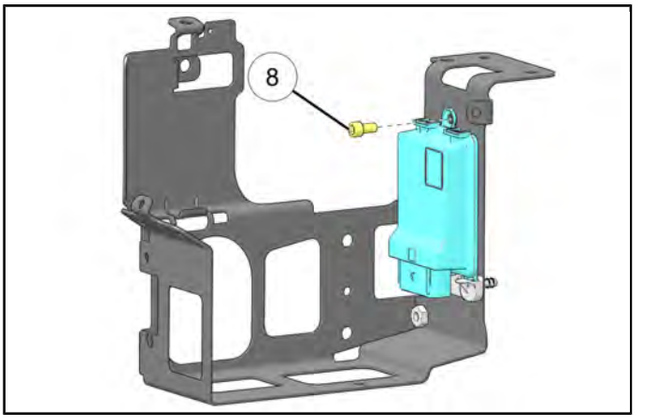


3. Remove fastener ④ securing VCM and remove.

VEHICLE CONTROL MODULE (VCM), INSTALLATION

VCM 1

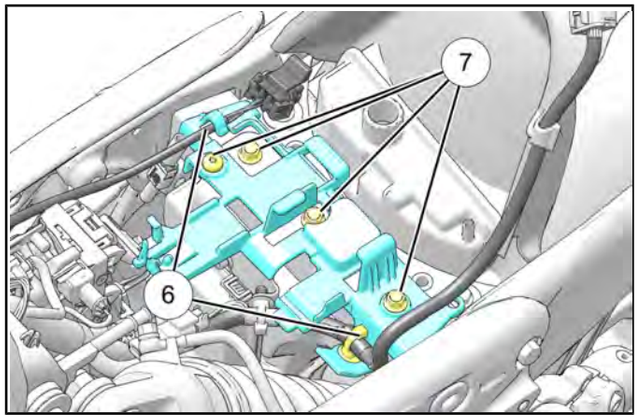
1. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Connect VCM electrical connector.
3. Install the VCM into the rubber mount.
4. Install VCM fastener ⑧.



TORQUE
VCM 1 Fastener: **88 in-lbs (10 N·m)**

5. Install under-seat wire bracket and its fasteners ⑦.

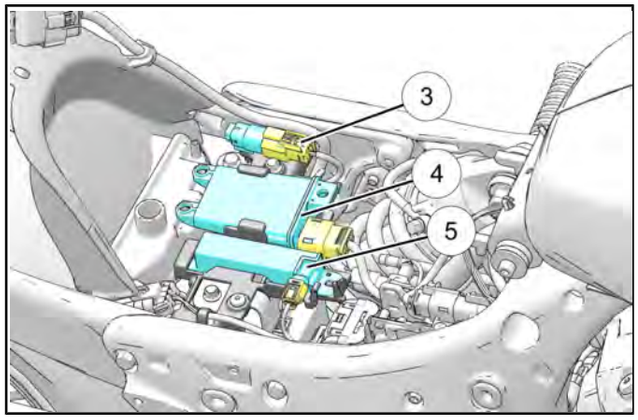
6. Connect the wiring ⑥ and retain to under-seat wire bracket.



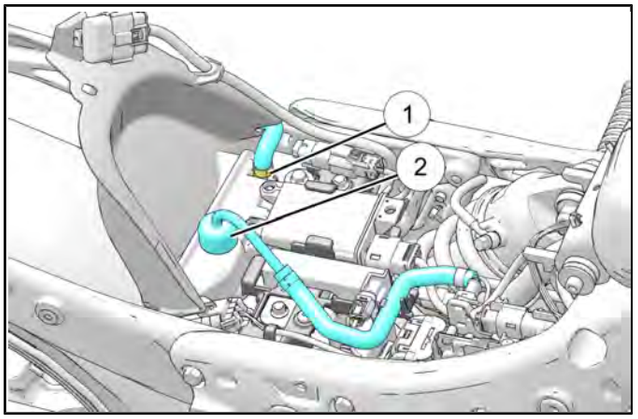
TORQUE
Under-Seat Bracket Fastener: **88 in-lbs (10 N·m)**

TORQUE
Under-Seat Wire Bracket Fastener: **88 in-lbs (10 N·m)**

7. Connect antenna module ⑤ electrical connector and install.
8. Connect WCM ④ electrical connector and install.
9. Connect electrical connection ③.



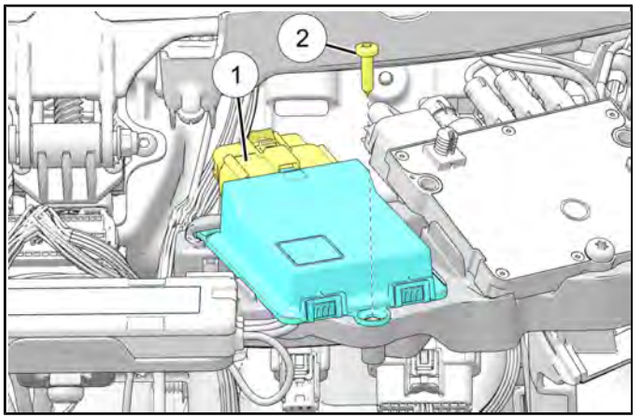
10. Install coolant overflow line ① and coolant pickup line ② into recovery bottle..



11. Install ECM. See **ECM Installation page 4.63**.
12. Connect the negative battery cable.
13. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

CMF: VCM 2

1. Install VCM 2 into fairing tray.
2. Connect electrical connector ①.



3. Install fastener ② into VCM 2.

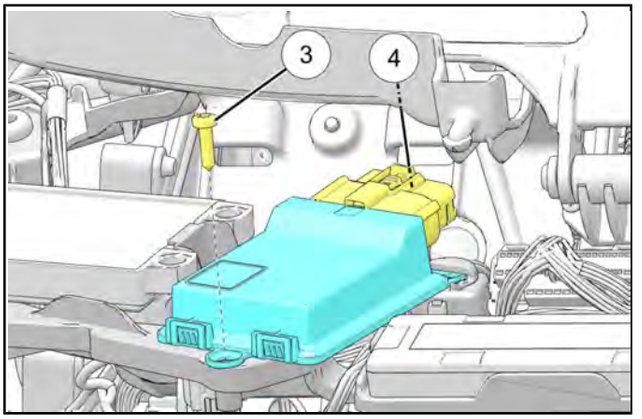
TORQUE
VCM 2 Fastener: **15 in-lbs (2 N·m)**

4. Install outer fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75**.

CMF: VCM 3

1. Install VCM 3 into fairing tray.
2. Connect electrical connector ④.

3. Install fastener ③ into VCM3.

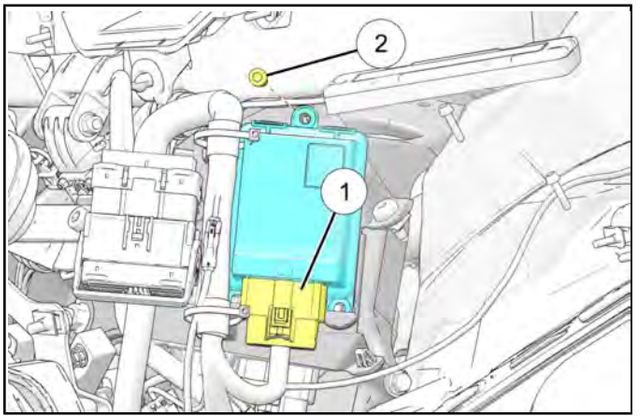


TORQUE
VCM 3 Fastener: **15 in-lbs (2 N·m)**

4. Install outer fairing. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75**.

FMF: VCM 2

1. Install VCM 2 into fairing mount.
2. Connect electrical connector ①.
3. Install fastener ② into VCM 2.

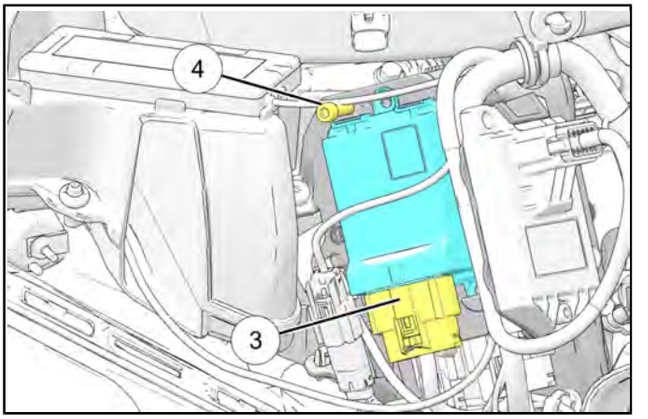


TORQUE
VCM 2 Fastener: **15 in-lbs (2 N·m)**

4. Install outer fairing. See **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

FMF: VCM 3

1. Install VCM 3 into fairing mount.
2. Connect electrical connector ③.



3. Install fastener ④ into VCM 3.

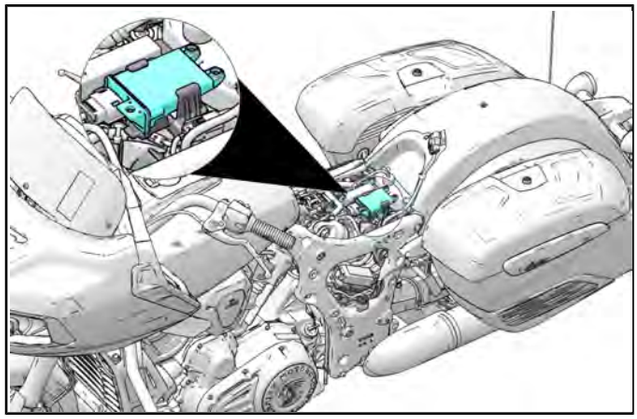
TORQUE
VCM 3 Fastener: **15 in-lbs (2 N·m)**

4. Install outer fairing. See **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

WIRELESS CONTROL MODULE (WCM)

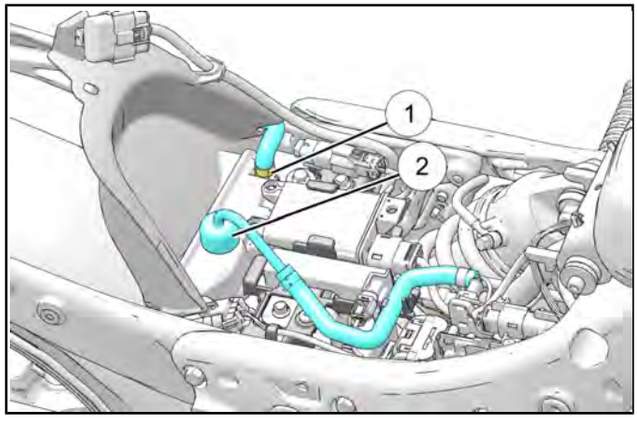
WCM OVERVIEW

The Wireless Control Module (WCM) controls main power, lock switch, key fob authentication, and the TPMS receiver. The WCM is located under the seat as shown.

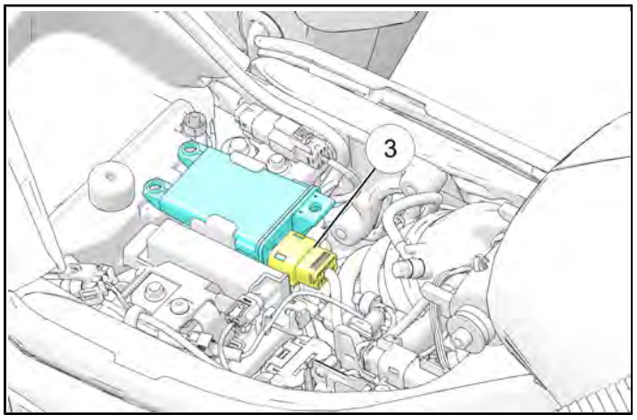


WCM, REMOVAL

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Disconnect the negative battery cable.
3. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
4. Remove ECM. See **ECM Removal page 4.63**.
5. Remove coolant overflow line ① and coolant pickup line ② from recovery bottle..

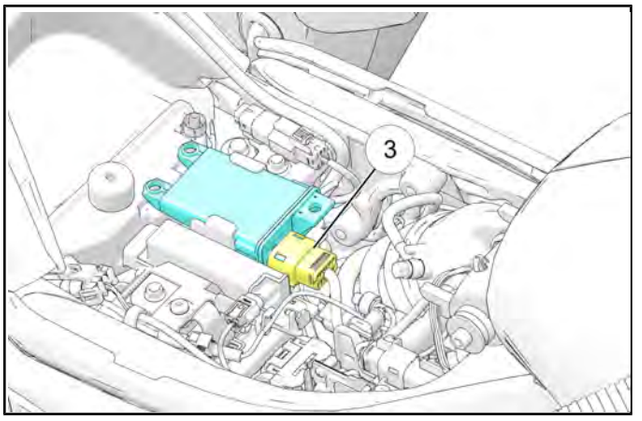


6. Disconnect WCM ③ electrical connector and remove.

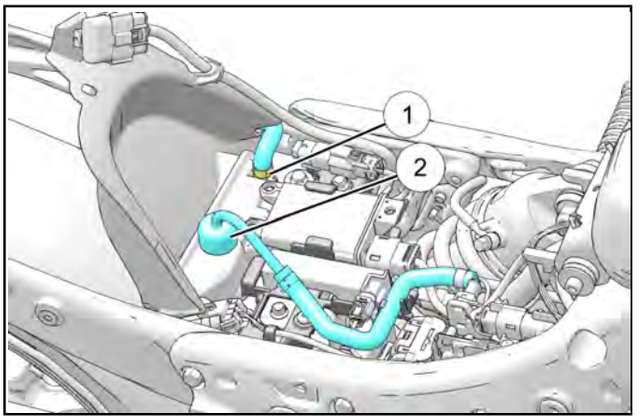


WCM INSTALLATION

1. Install WCM into position and connect WCM electrical connector ③.

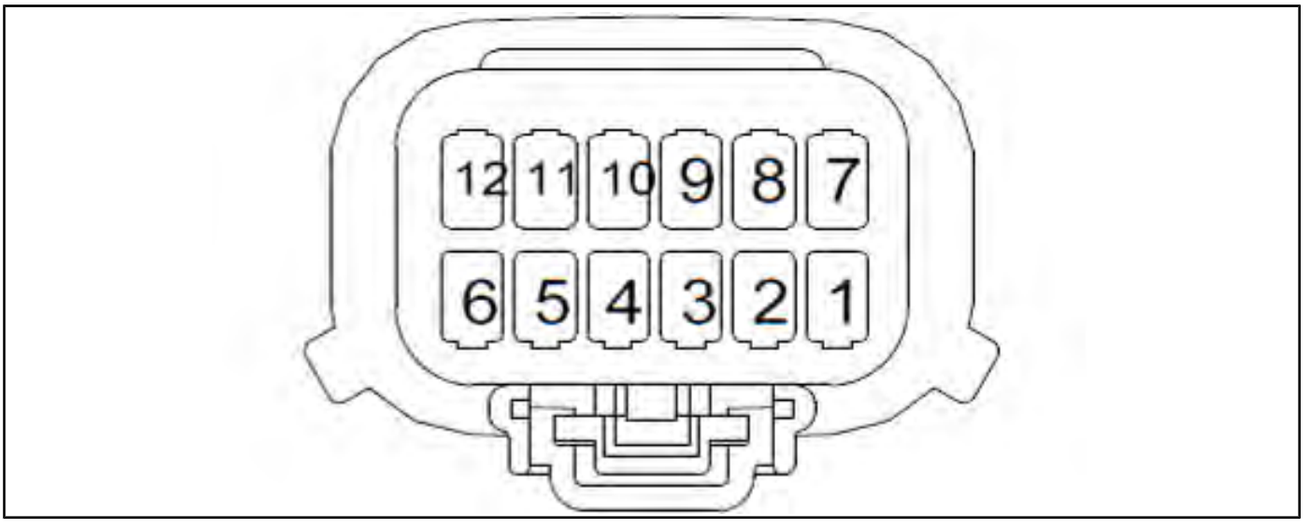


2. Install coolant overflow line ① and coolant pickup line ② to the recovery bottle..



3. Install the ECM. See **ECM Installation page 4.63**.
4. Connect the negative battery cable.
5. Install the seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**.

WCM PINOUT



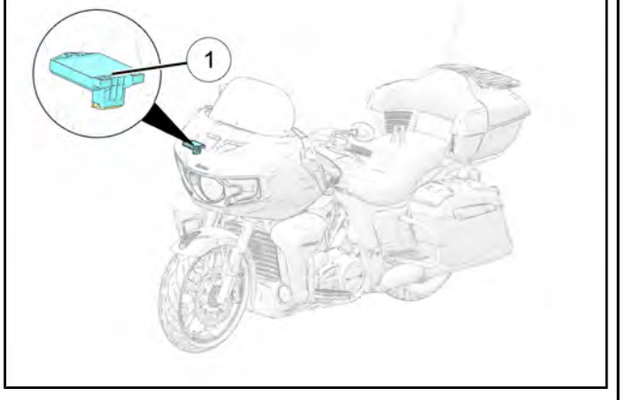
PIN	WIRE COLOR	FUNCTION
1	RD/YE	Battery Voltage Input
2	YE	CAN A High
3	BD/BK	Digital Input - Lock Function
4	DG	CAN A Low
5	DB/WH	Digital Input - Unlock Function
6	VT/YE	Digital Input - Power Button
7	PK	Digital Output - K15 SIGNAL
8	OG/YE	Digital Output - Accessory Power
9	BN/WH	Digital Output - Security Light
10	BK	LF Antenna Connection 1
11	VT/YE	LF Antenna Connection 2
12	BK	Ground

GATEWAY

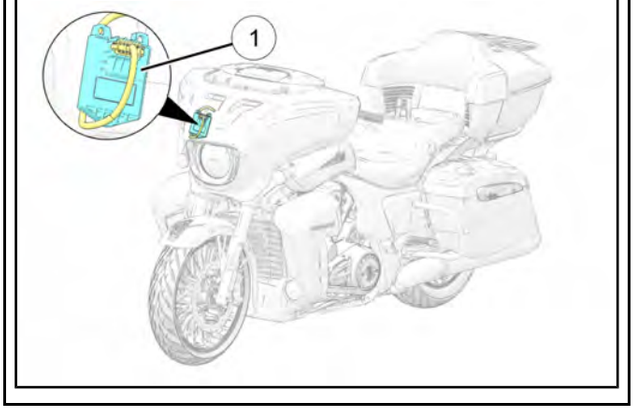
GATEWAY OVERVIEW

MY25+ architecture consists of 4 CAN buses. The gateway ① is responsible for passing through only necessary data from one bus to another to ensure a fully functional vehicle while keeping bus loads low.

CMF



FMF



GATEWAY PINOUT

PINOUT

PIN	WIRE COLOR	FUNCTION
1	DG/BN	CANB Low
2	DG/RD	CANC Low
3	PK/GN	VCM Accessory Power Out
4	OG	Instrumentation Fuse Output
5	DG	CANA Low
6	DG/WH	CAND Low
7	YE/WH	CAND High
8	YE	CANA High
9	BK	Ground
10	—	—
11	YE/RD	CANC High
12	YE/BN	CANB High

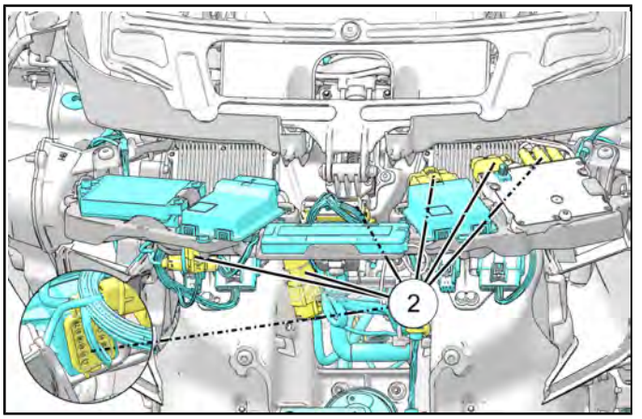
GATEWAY INSTALL / REPLACEMENT

CMF

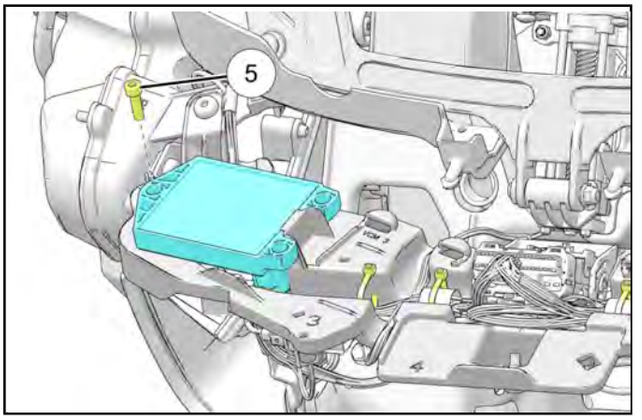
To access the Gateway, remove the outer fairing. See **Fairing Disassembly page 7.63**.

1. Disconnect electrical connector ② from GCM.

TIP
The GCM can be removed from the fairing tray before disconnecting the electrical connector for easier access.



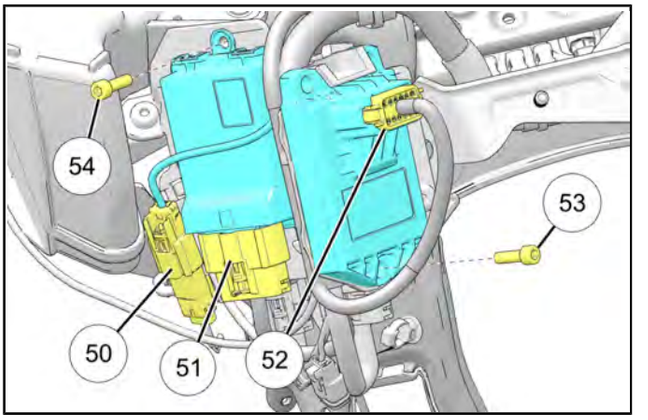
2. Remove GCM fastener⑤.



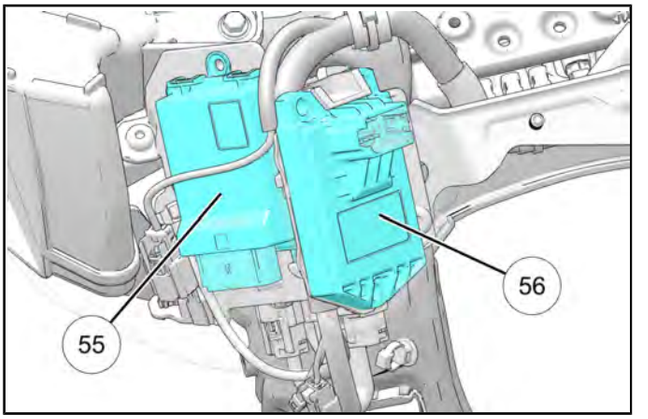
FMF

To access the Gateway, remove the outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.

1. Disconnect GCM ㊿② electrical connectors. Remove GCM fastener ㊸.



2. Remove GCM ㊻.

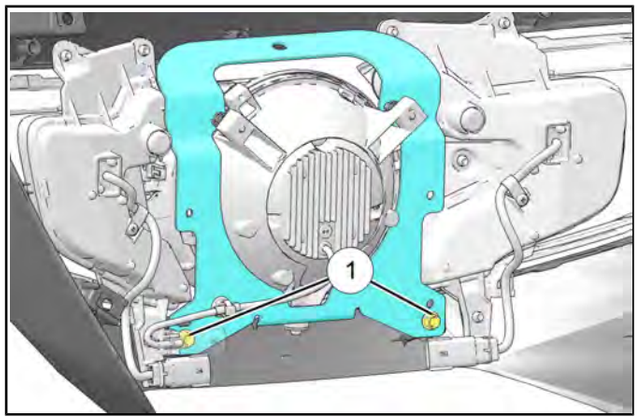


HEADLIGHT SERVICE

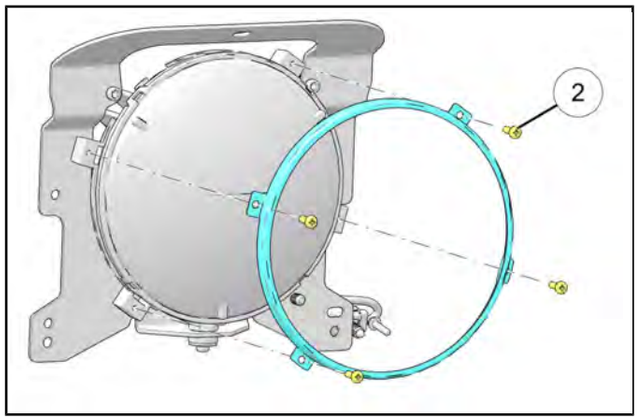
HEADLIGHT REPLACEMENT

CMF: REMOVAL

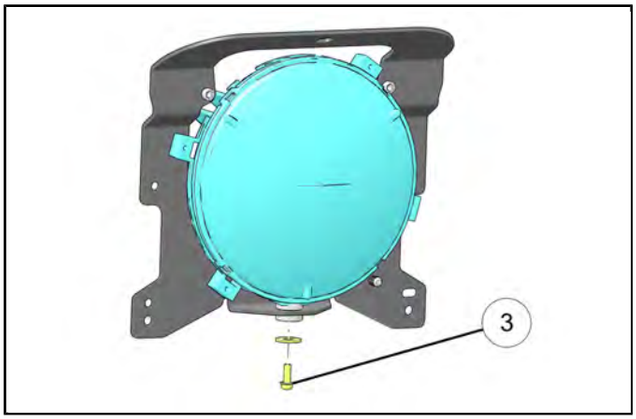
1. Remove outer fairing. Reference **Fairing Disassembly page 7.63**.
2. Remove headlight bracket fasteners ①.



3. Remove headlight retaining ring by removing its fasteners ② and cut the cable tie on the headlight bracket.



4. Remove headlight carrier fastener ③ and remove headlight.



CMF: INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

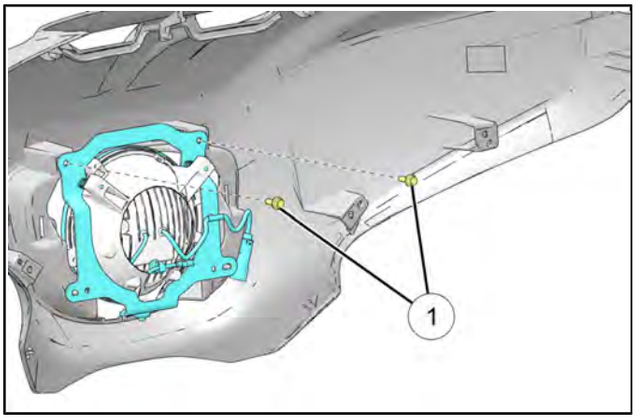
TORQUE
Headlight Retaining Ring Fasteners: **12 in-lbs (1 N·m)**

TORQUE
Headlight Carrier Fastener: **12 in-lbs (1 N·m)**

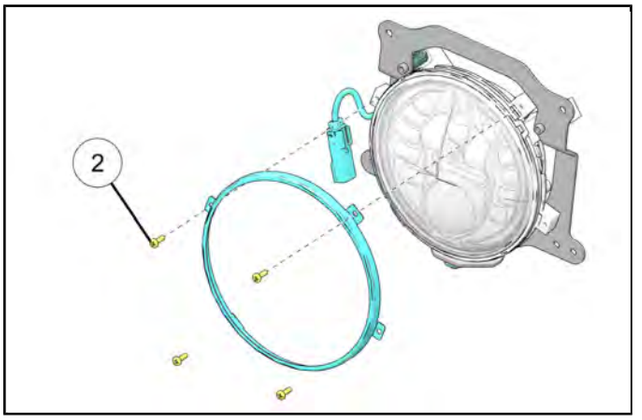
2. Perform headlight adjustment. See **Headlight Aim Inspection page 2.30**.

FMF: REMOVAL

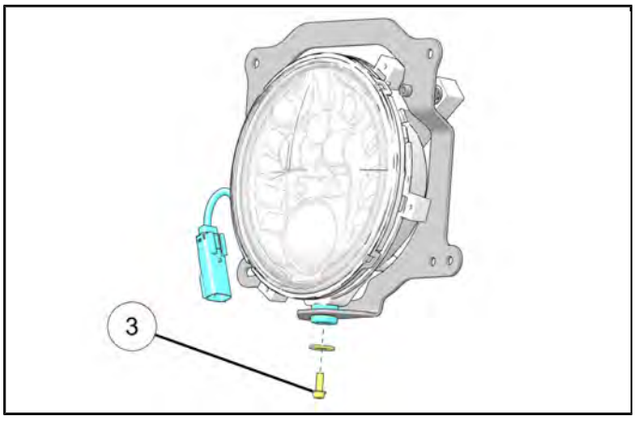
1. Remove outer fairing. Reference **Fairing Disassembly and Removal (Fork Mounted) page 7.37**
2. Remove rear headlight bracket fasteners ①.



3. Remove headlight retaining ring by removing its fasteners ② and cut cable tie on the headlight bracket to remove headlight.



4. Remove headlight carrier fastener ③.



FMF: INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Headlight Retaining Ring Fasteners: **12 in-lbs (1 N·m)**

TORQUE
Headlight Carrier Fastener: **12 in-lbs (1 N·m)**

2. Perform headlight adjustment. See **Headlight Aim Inspection page 2.30**.

HEADLIGHT WARNING INDICATORS

Indian motorcycles are equipped with “tell tales” indicating when a fault occurs with the low or high beam headlight.

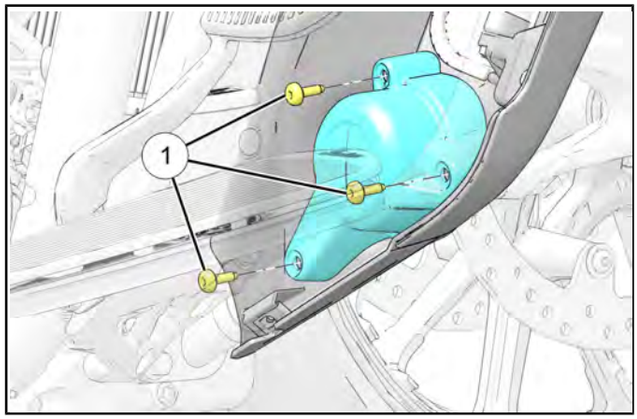
If a fault occurs with the headlight (low or high beam) the high beam indicator light will flash on the instrument cluster. Once the light has been replaced and the issue corrected, the high beam indicator will return to normal operation.

FOG LIGHT SERVICE

FOG LIGHT REMOVAL

NOTICE
Touring Models

1. Remove fog light bracket by removing its fasteners ①.

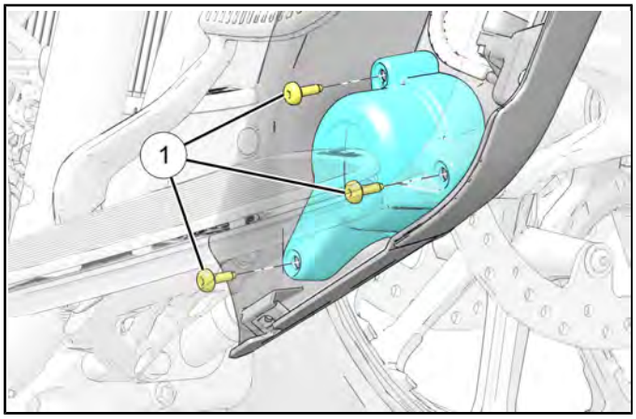


2. Disconnect fog light electrical connector.
3. Remove fog light.

FOG LIGHT INSTALLATION

NOTICE
Touring Models

1. Install fog light.
2. Connect fog light electrical connector.
3. Install fog light bracket and fog light bracket fasteners ①.

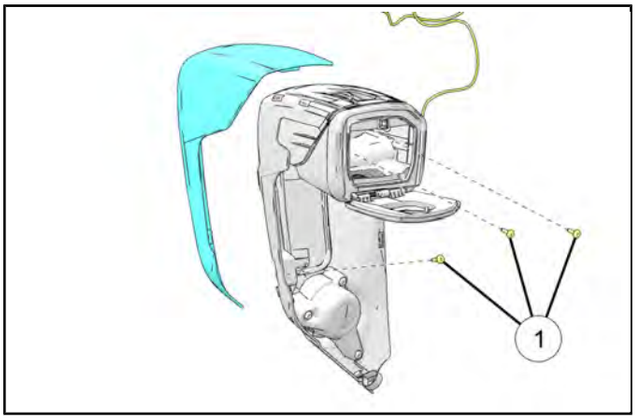


TORQUE
Fog Light Bracket Fastener: **35 in-lbs (4 N·m)**

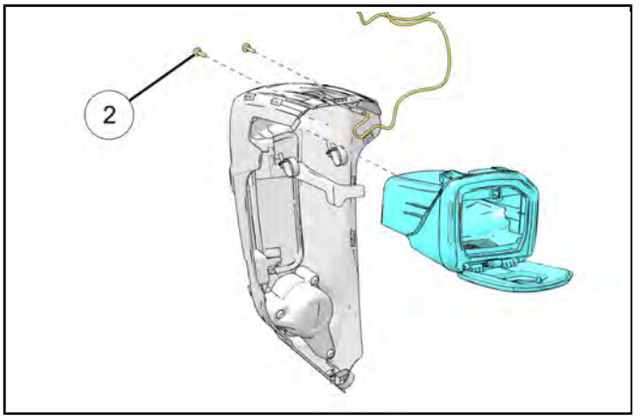
LOWER FAIRING SERVICE

LOWER FAIRING HARNESS REMOVAL

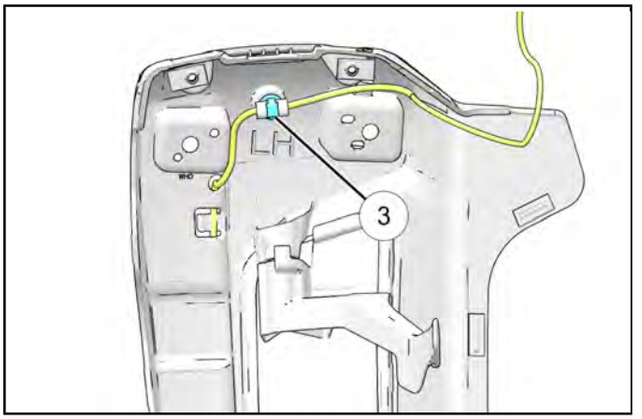
1. Remove lower fairing. See **Lower Fairing Removal page 7.91**.
2. Remove outer fairing cover by removing its fasteners ①.



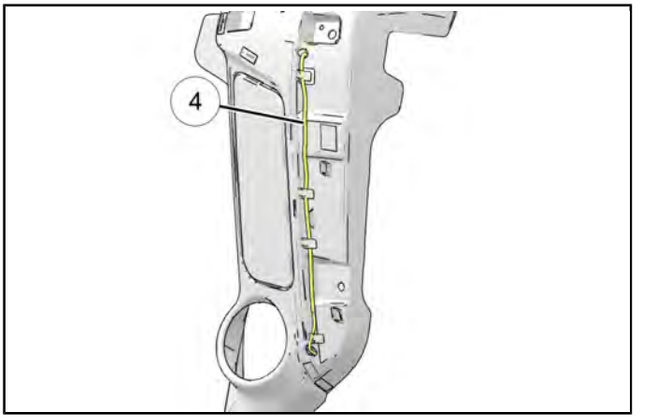
3. Remove lower fairing cubby by removing its fasteners ②.



4. Cut cable tie loose from harness routing clip ③.

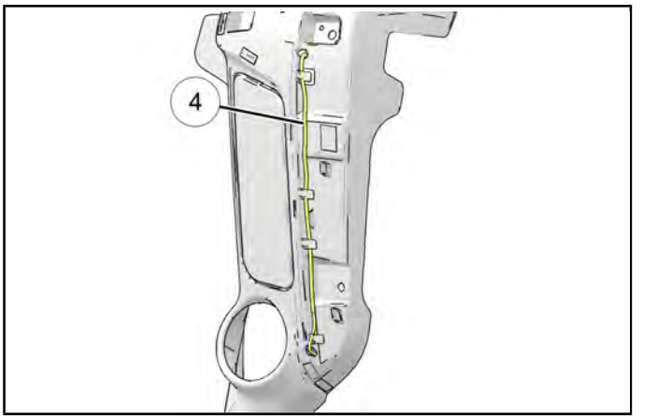


5. Disconnect harness from retention features.

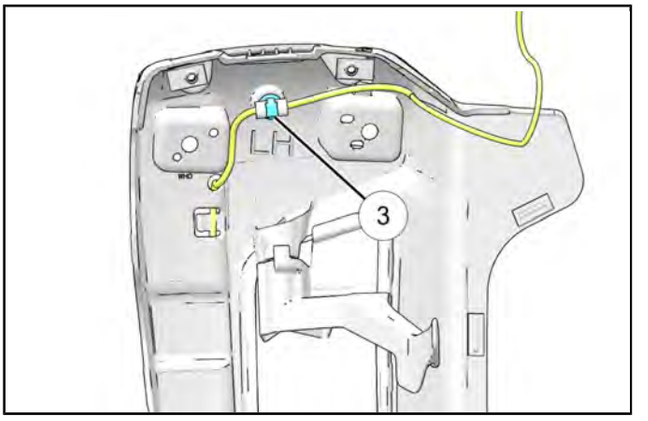


LOWER FAIRING HARNESS INSTALLATION

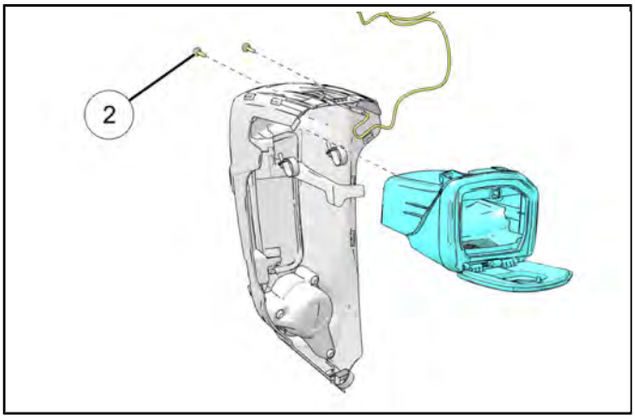
1. Connect harness from retention features.



2. Secure harness to routing clip with new cable tie ③.

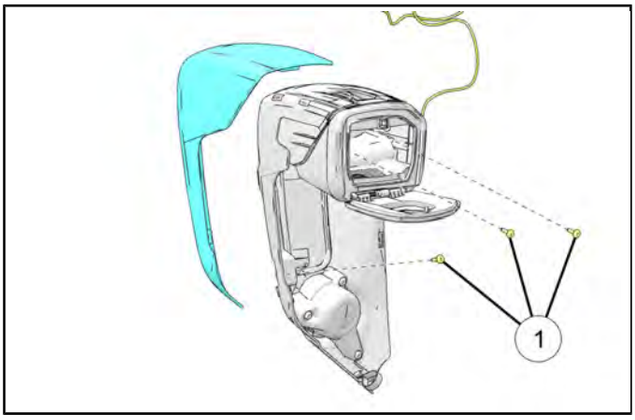


3. Install lower fairing cubby and its fasteners ②.



TORQUE
Lower Fairing Cubby Fastener: **35 in-lbs (4 N·m)**

4. Install outer fairing cover and its fasteners ①.



TORQUE
Lower Fairing Fastener **35 in-lbs (4 N·m)**

5. Install lower fairing. See **Lower Fairing Installation page 7.92**

HEADRESS SERVICE

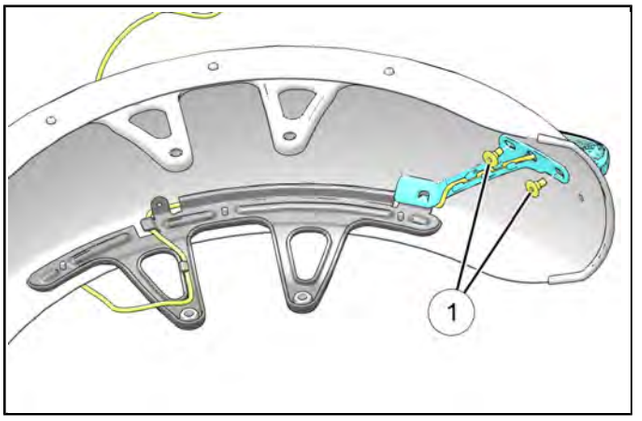
HEADRESS REMOVAL

The front headress is located on the front fender of the unit. Base and International models are **NOT** illuminated.

REMOVAL

Models equipped with an illuminated headress will require the electrical connection to be disconnected. Remove outer fairing, see **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37** Follow headress electrical wire and disconnect.

1. Remove front fender. See **Front Fender Removal page 7.86** .
2. Remove two fasteners ① securing headress.



NOTICE
Cut lose all cable ties securing headdress harness and make note of their locations and quantity, they will be replaced with new parts during re-installation.

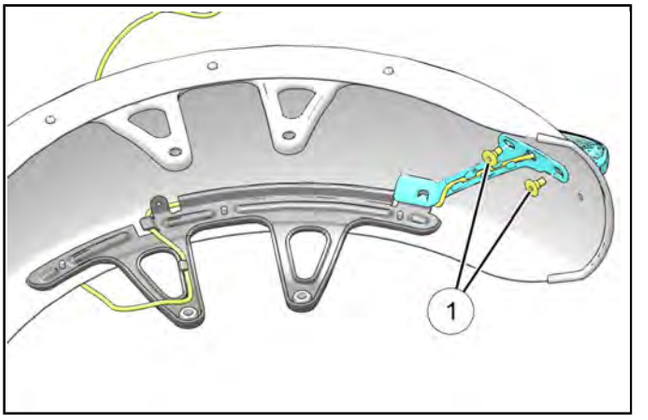
3. Disconnect the electrical wire from the routing features.

HEADRESS INSTALLATION

INSTALLATION

The front headress is located on the front fender of the unit. Base and International models are **NOT** illuminated.

1. Connect the electrical wire through the routing features.
2. Install two fasteners ① securing headress.



NOTICE
Replace all cable ties cut loose during disassembly with new cable ties.

TORQUE
Headress Fastener: **35 in-lbs (4 N·m)**

3. Install front fender. See **Front Fender Installation page 7.87**.

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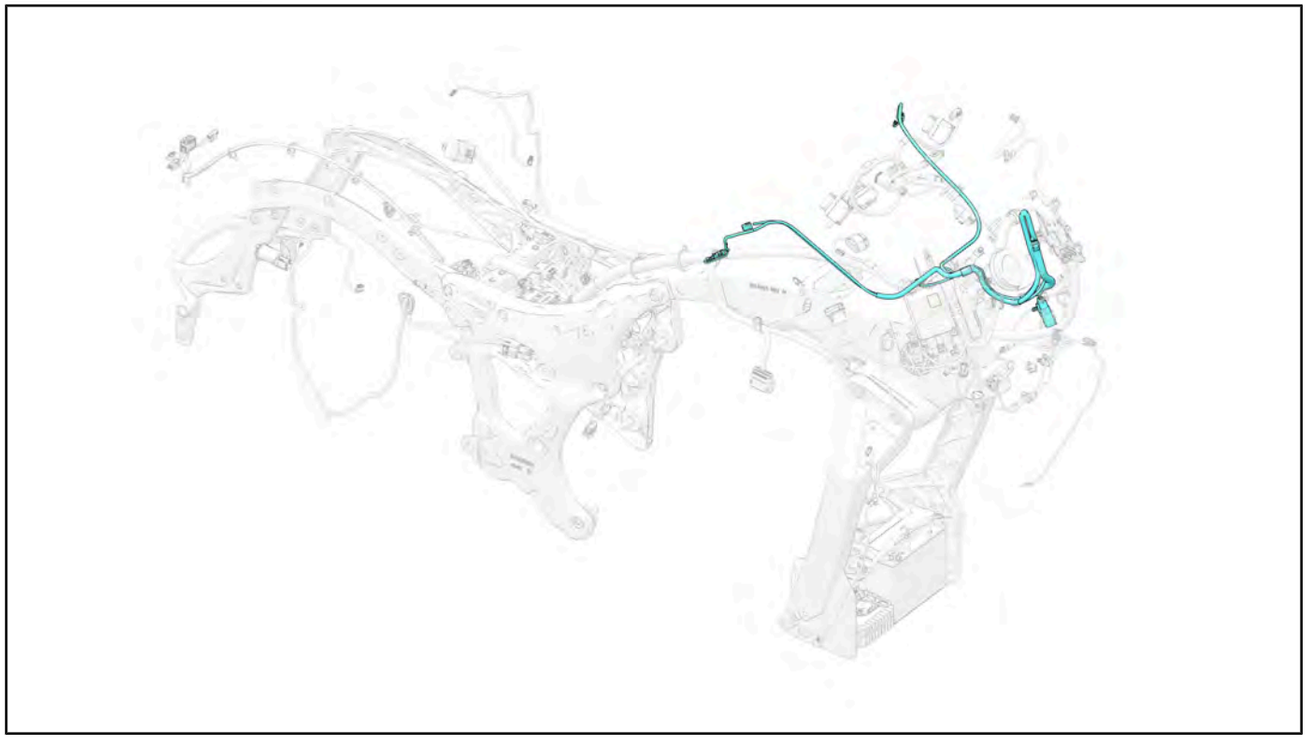
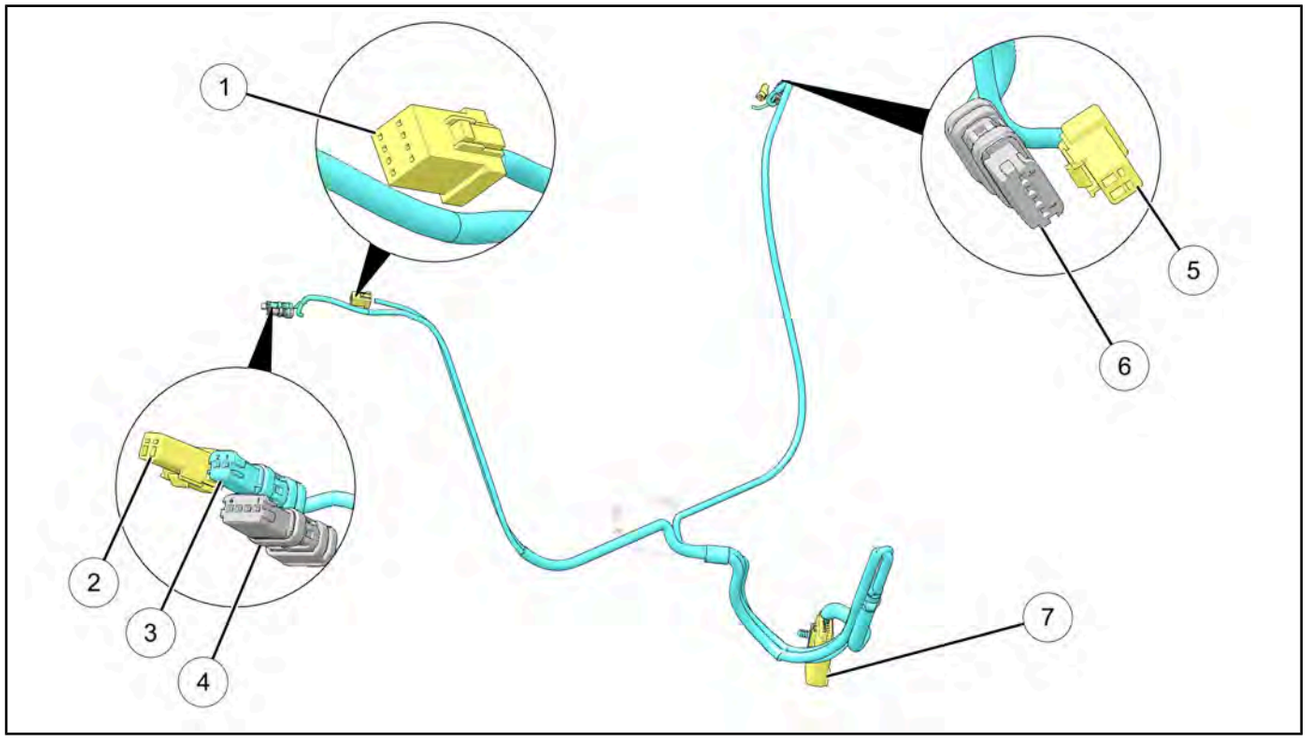
WIRING HARNESS

HANDLEBAR HARNESS CONNECTOR IDENTIFICATION

HANDLEBAR HARNESS

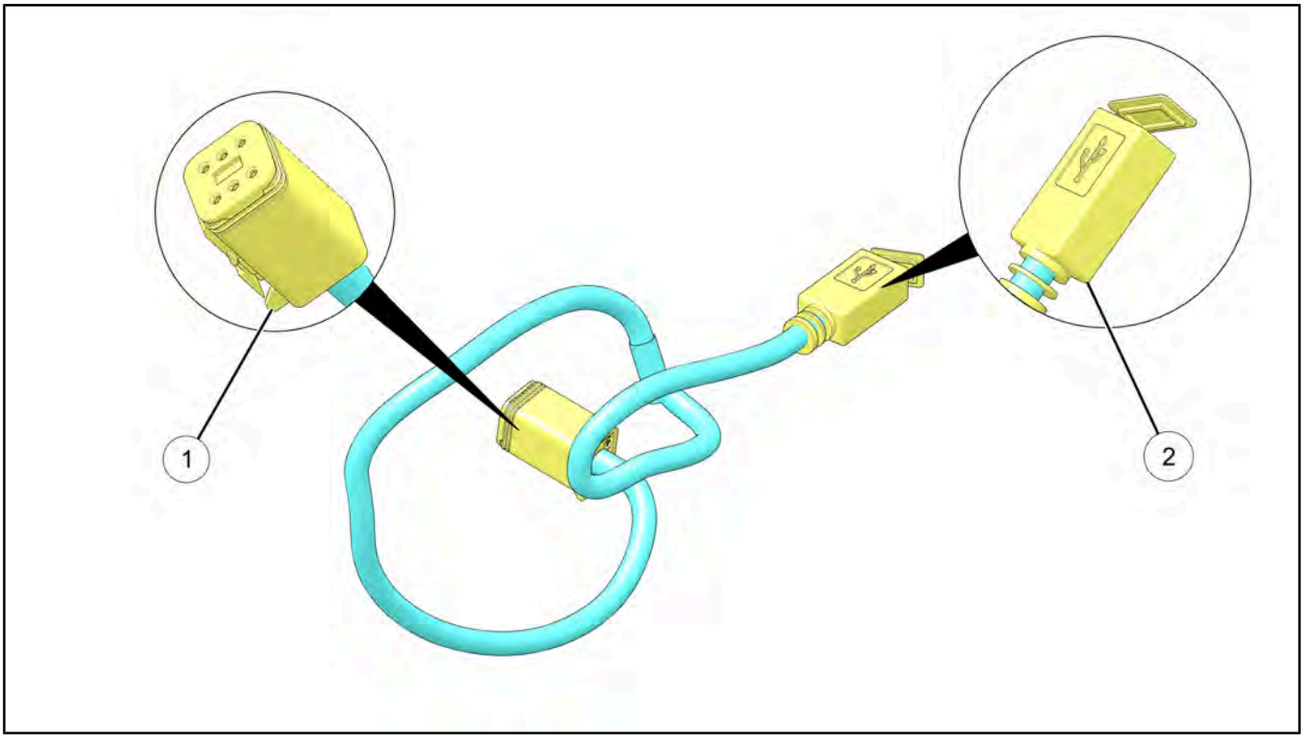




① Twist Grip Sensor	⑤ Heated Grip
② Heated Grip	⑥ Left Switch Cube
③ Right Switch Cube	⑦ Handlebar to Chassis
④ Right Switch Cube	

USB HARNESS CONNECTOR IDENTIFICATION

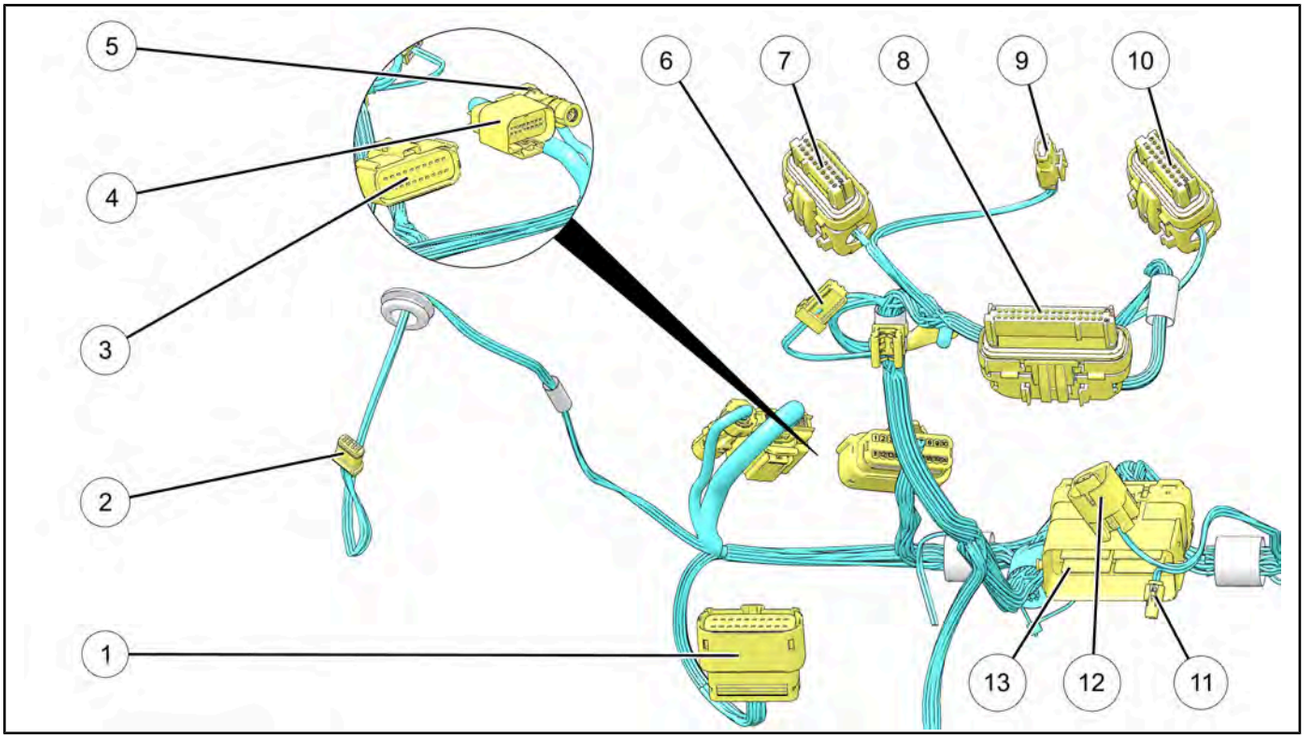
USB HARNESS



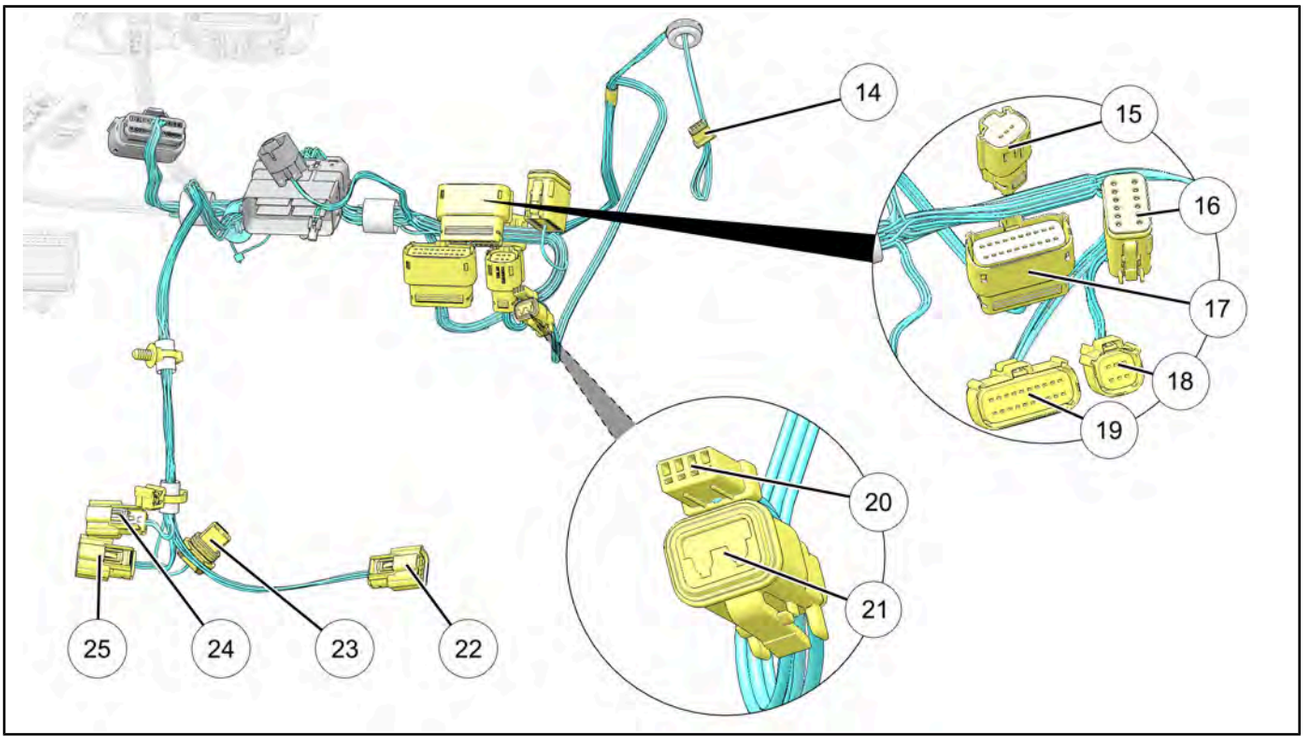
① Display	② USB

CHASSIS MOUNTED FARING CONNECTOR IDENTIFICATION

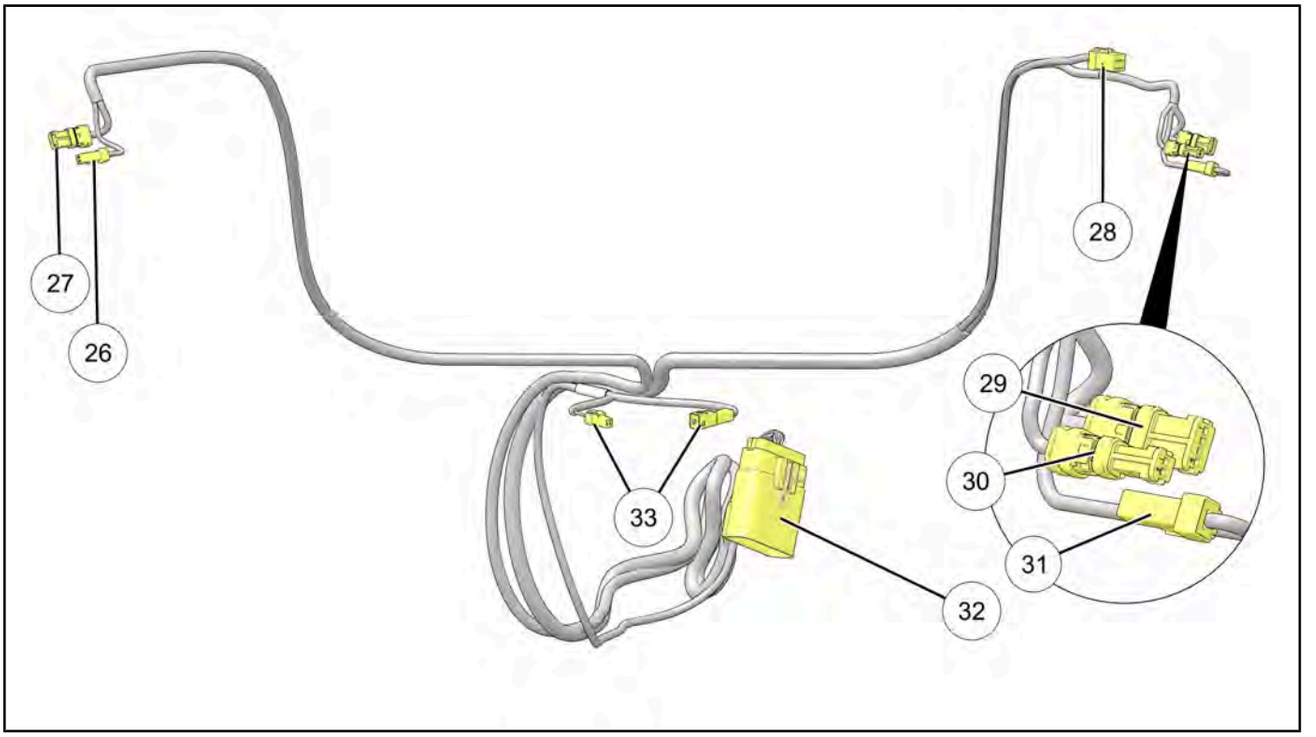
CHASSIS MOUNTED FAIRING HARNESS



① Power Supply 2	⑧ 7 in Display
② Left Speaker	⑨ Homelink
③ VCM2	⑩ Tachometer
④ TCU	⑪ Lit Headdress
⑤ TCU-USB	⑫ Ambient Air Sensor
⑥ Windshield Motor	⑬ Fairing-Chassis Interconnect
⑦ Speedometer	



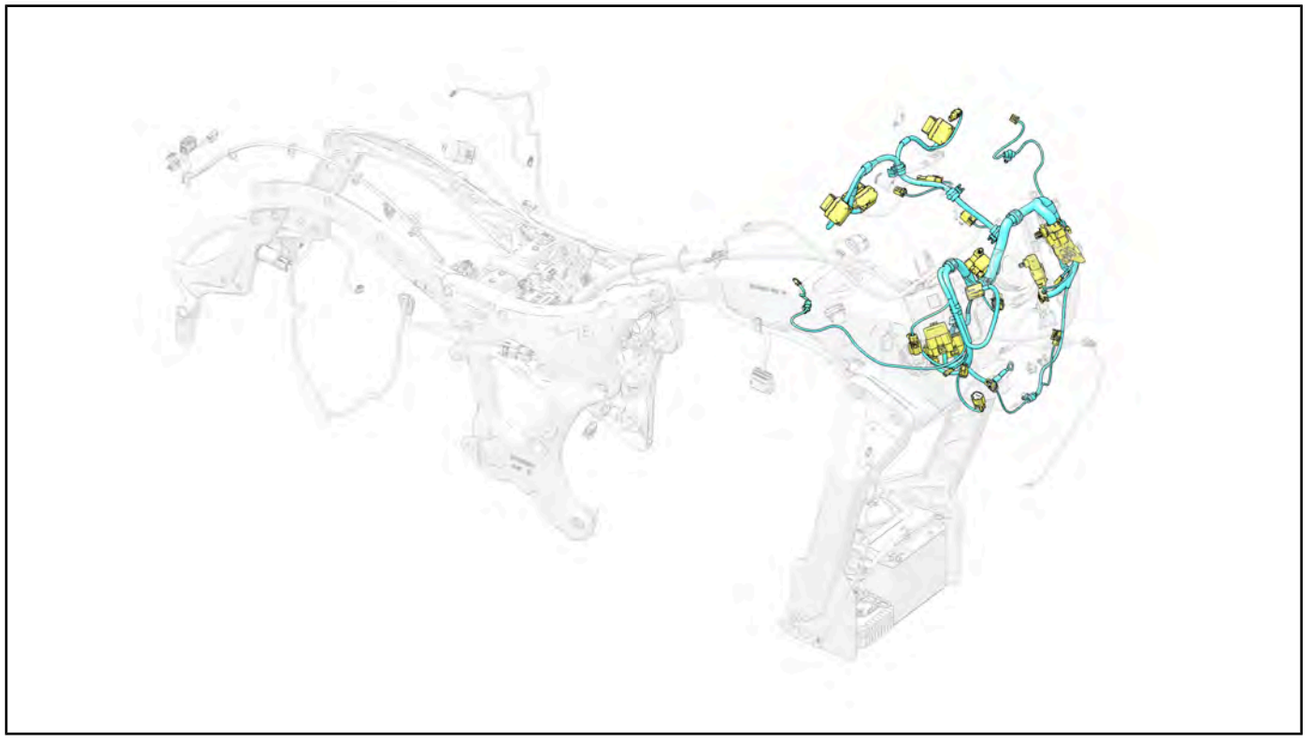
⑭ Right Speaker	⑳ Lock Switch
⑮ Fog Lamps	㉑ Battery Tender
⑯ Gateway	㉒ Right Turn Signal
⑰ VCM3	㉓ Horn
⑱ Power Supply 1B	㉔ Headlight
⑲ Power Supply 1A	㉕ Left Turn Signal

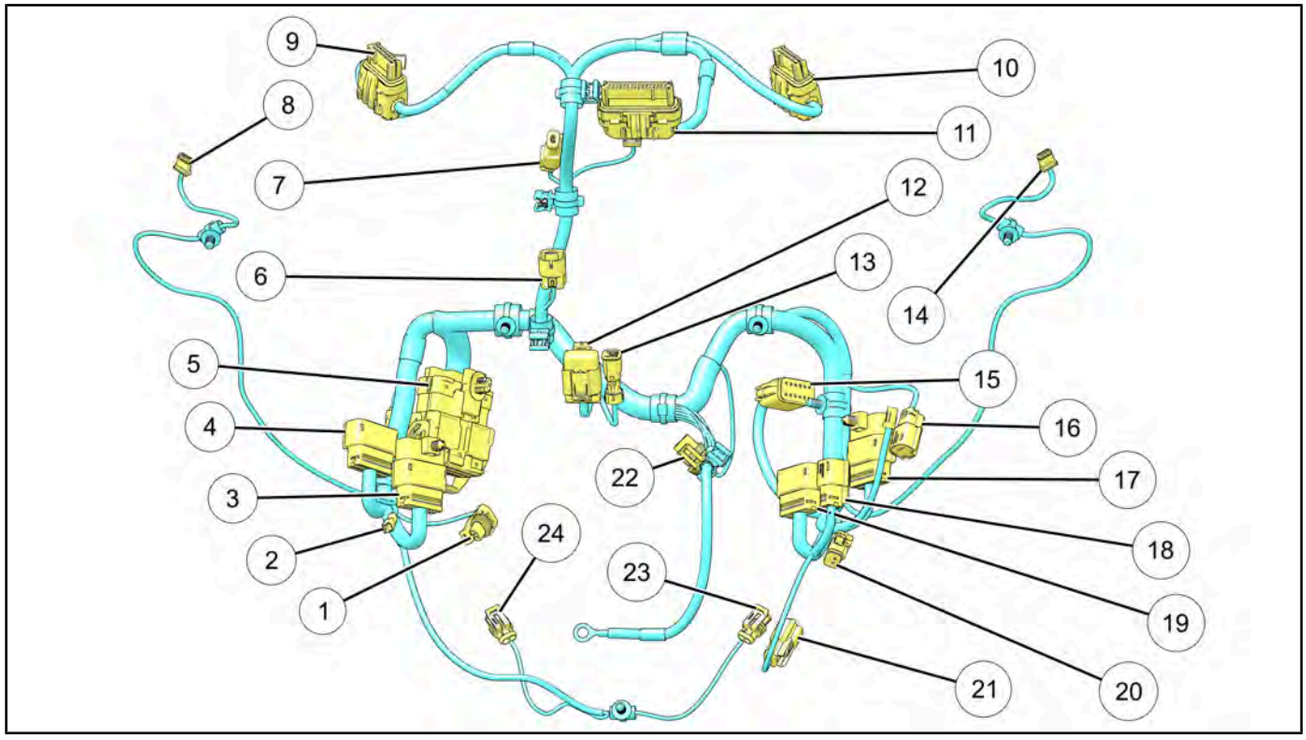


㉖ Left Turn Heated Grip	㉚ Right Hand Switch Cube
㉗ Left Hand Switch Cube 1	㉛ Right Handed Heated Grip
㉘ Twist Grip Sensor	㉜ Chassis Harness Connector
㉙ Right Hand Switch Cube	㉝ Right Hand / Left Hand Blind Spot Mirror Indicator

FORK MOUNTED FAIRING HARNESS CONNECTOR IDENTIFICATION

FORK MOUNTED FAIRING HARNESS

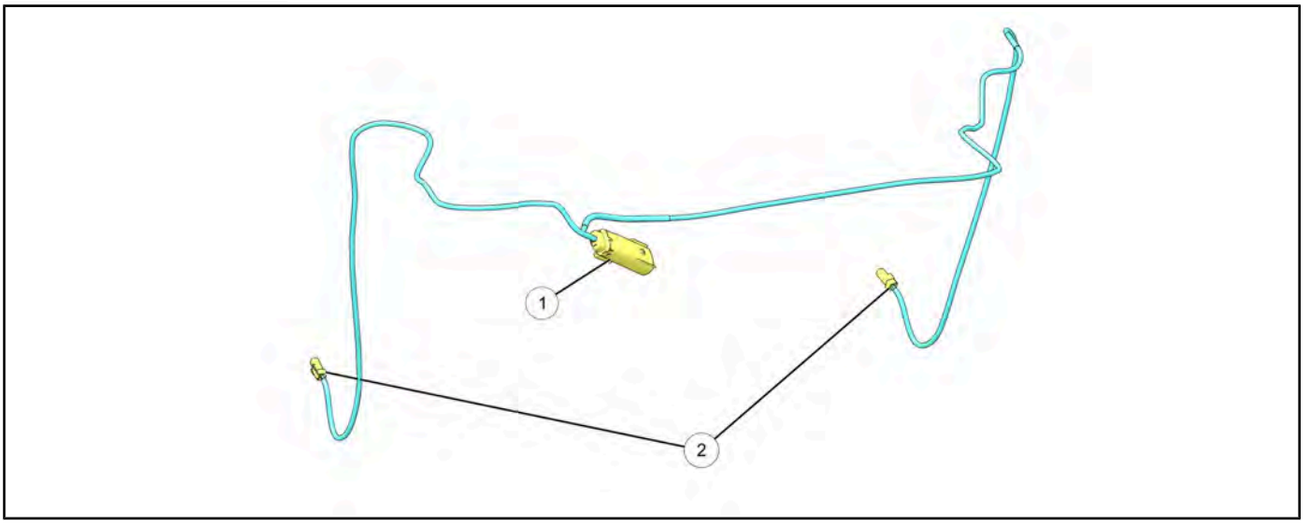




① ABS Front Wheel Speed Sensor	⑬ TCU-USB
② Left Turn	⑭ Right Speaker
③ VCM 2	⑮ Gateway
④ Power Supply 2	⑯ Fog Lamps
⑤ Fairing Main Harness	⑰ VCM3
⑥ Ambient Air	⑱ Power Supply 1B
⑦ Can ABS	⑲ Power Supply 1A
⑧ Left Speaker	⑳ Battery Tender
⑨ Speedometer	㉑ Headlight
⑩ Tachometer	㉒ Horn
⑪ 7 in Display	㉓ Right Accent Light
⑫ TCU	㉔ Left Accent Light

DRIVING LIGHT HARNESS CONNECTOR IDENTIFICATION

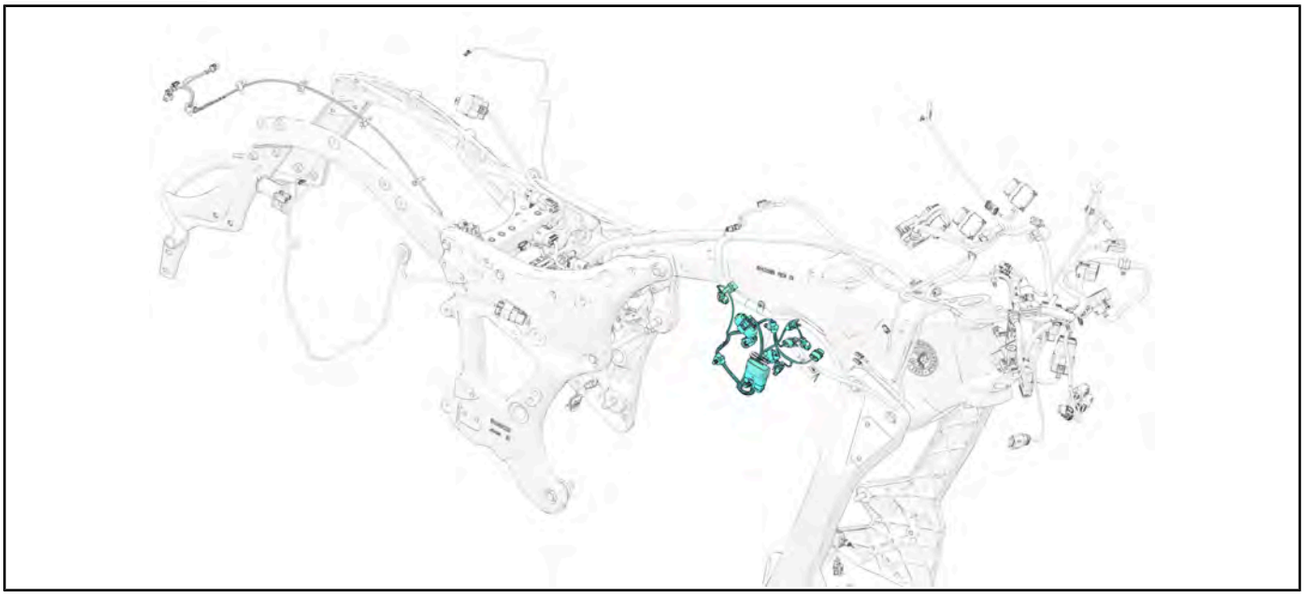
DRIVING LIGHT HARNESS

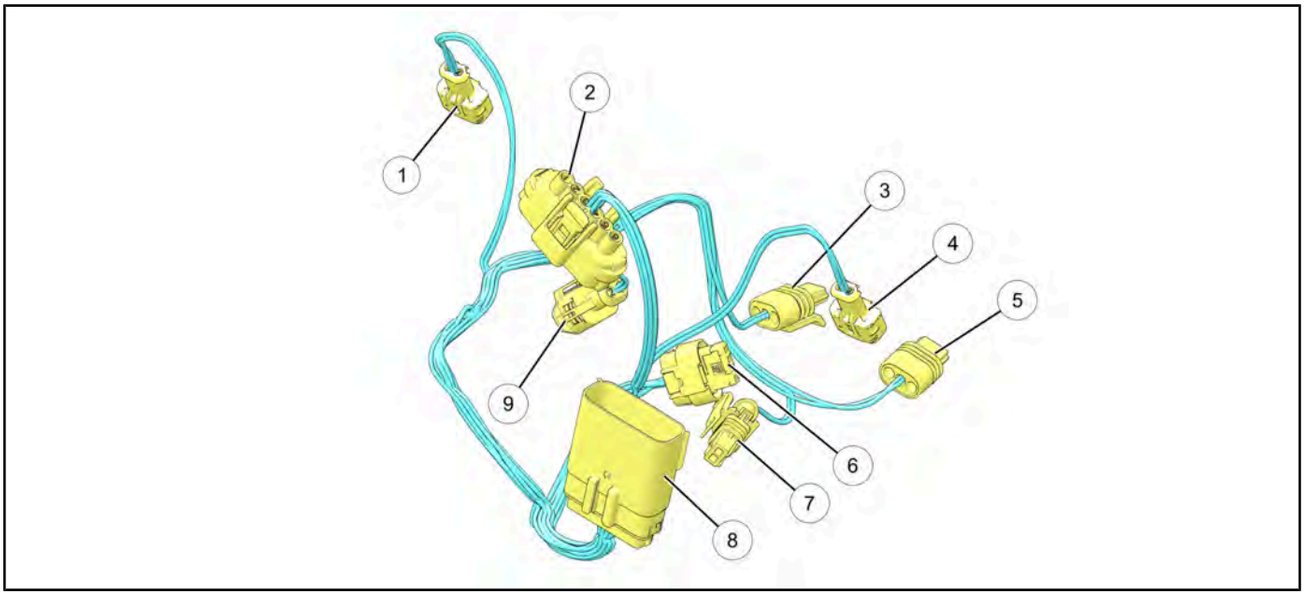


① Fairing Connector	② AUX Light Connector

ENGINE HARNESS CONNECTOR IDENTIFICATION

ENGINE HARNESS

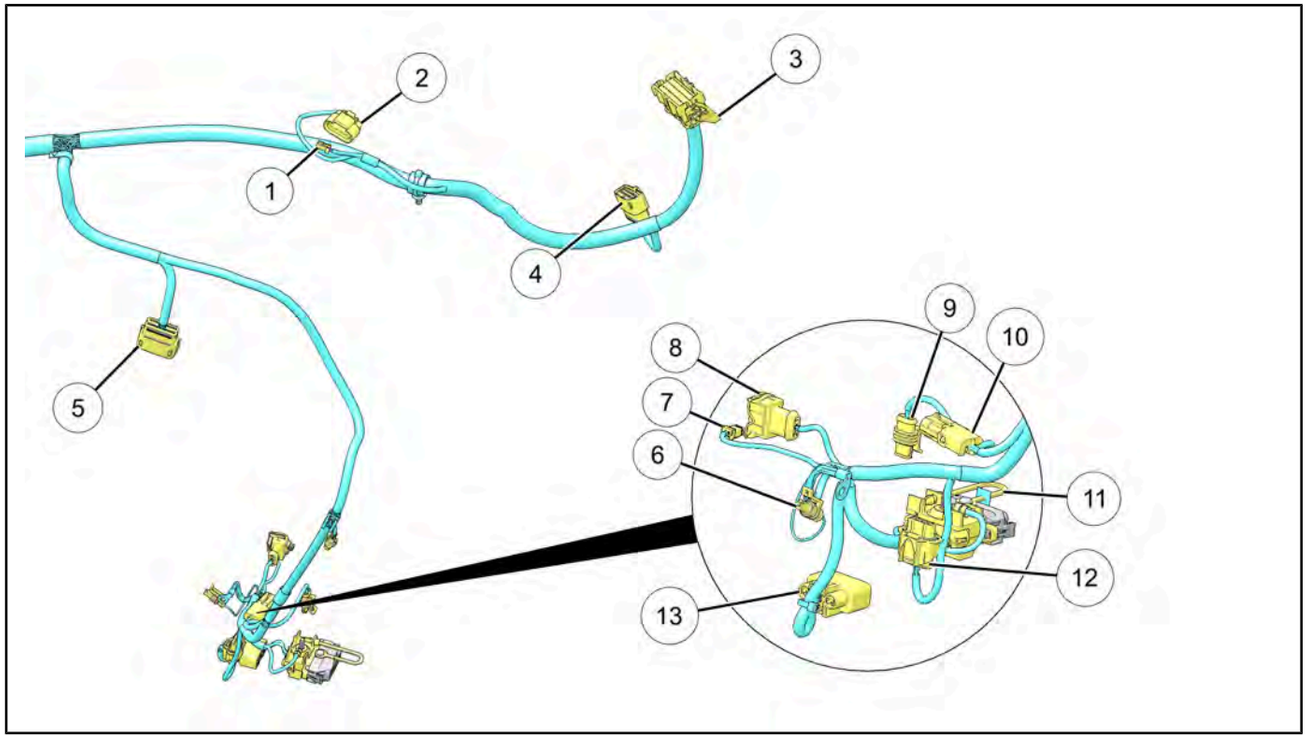




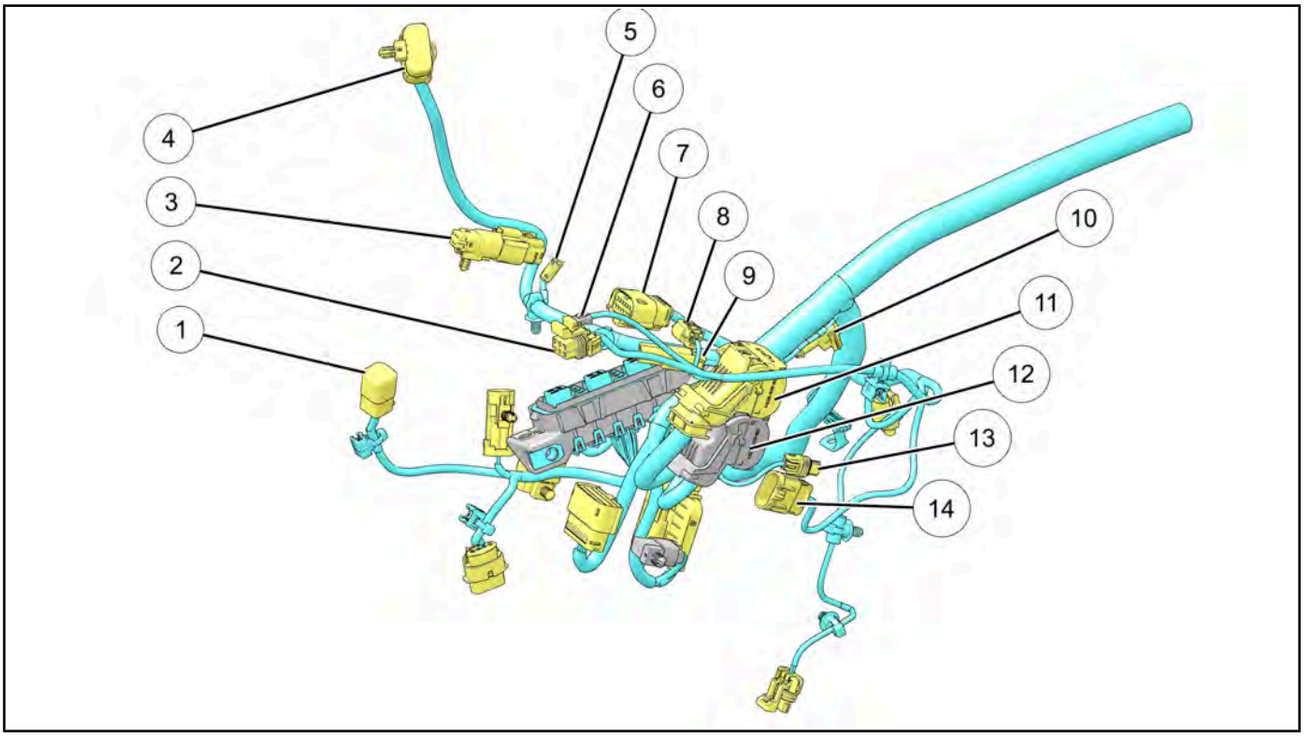
① Rear Fuel Injector	⑥ TMAP
② ETC Motor	⑦ Knock Sensor
③ Rear Ignition Coil	⑧ Engine-Chassis
④ Front Fuel Injector	⑨ Cylinder Head Temperature Sensor
⑤ Front Ignition Coil	

CHASSIS HARNESS CONNECTOR IDENTIFICATION

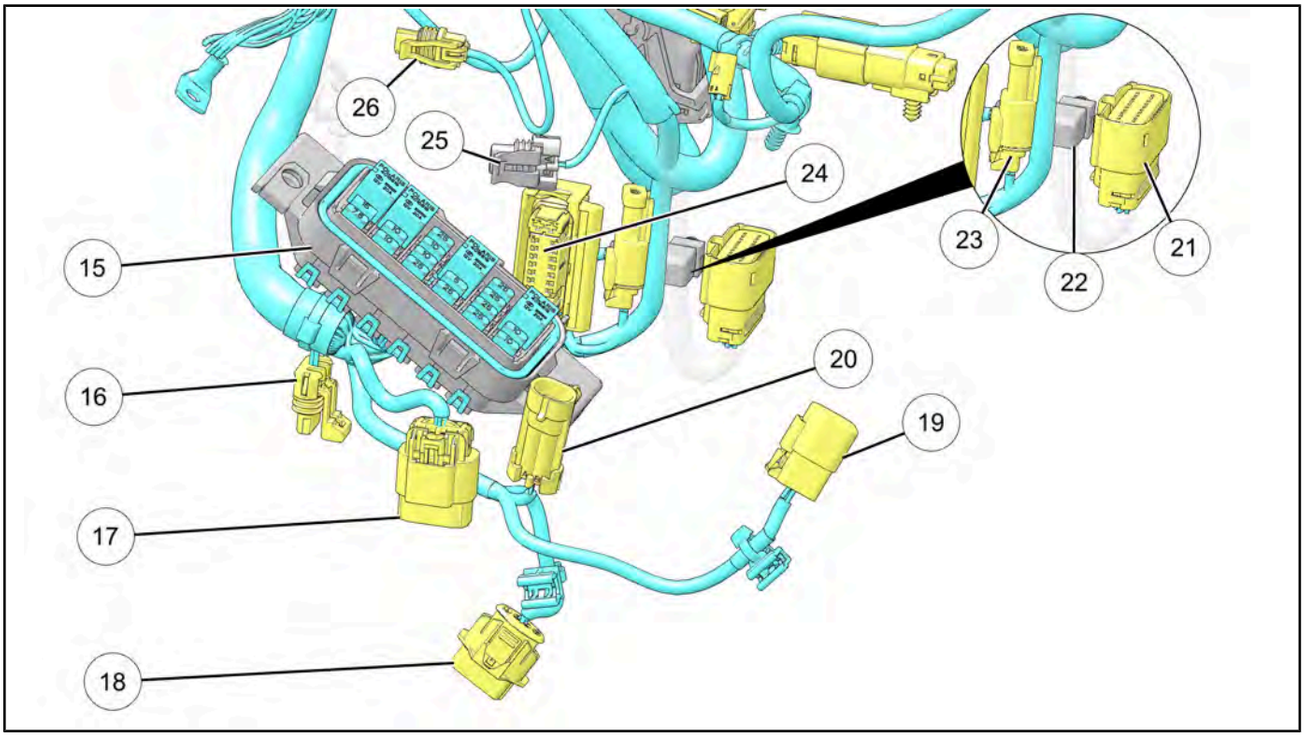
CHASSIS HARNESS



① Fuel Door Lock	⑧ CPS
② Fuel Pump	⑨ Solenoid
③ Fairing Main	⑩ Fan Switch
④ Handlebars	⑪ M-Case
⑤ Chassis Engine	⑫ Front O2
⑥ Oil Pressure	⑬ Regulator
⑦ Puddle Lamp	⑭ Chassis-Engine



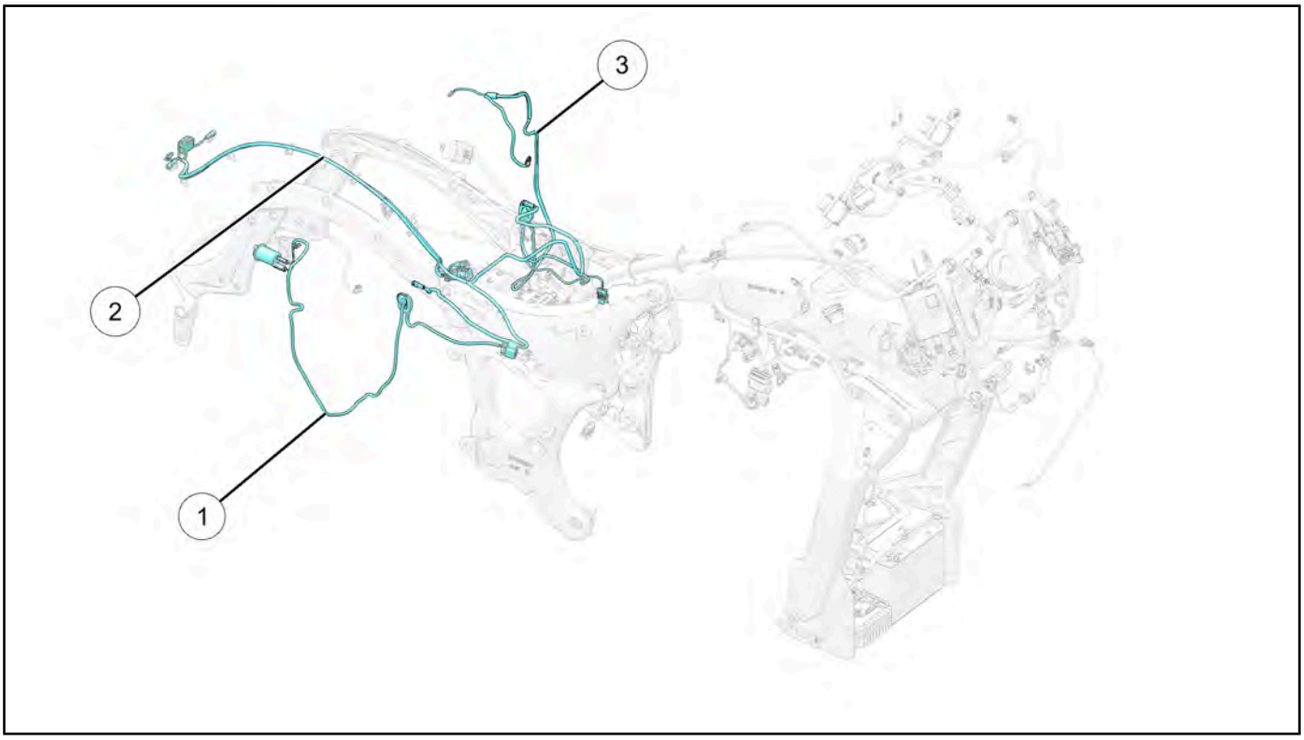
① E-Preload	⑧ Purge
② Rear Lighting	⑨ Chassis CAN
③ Saddlebag Audio	⑩ Purge
④ Trunk	⑪ ECM 2
⑤ Rear 12V Switch	⑫ ECM 1
⑥ Rear Mid Range Radar	⑬ Rear Brake Switch
⑦ WCM	⑭ Right Saddlebag Lock



⑮ Fusebox	㉑ VCM 1
⑯ Ground Speed Sensor	㉒ Info CAN
⑰ Diagnostic port	㉓ Info CAN
⑱ Oxygen Sensor	㉔ ABS
⑲ E-Preload	㉕ Rear Wheel Speed Sensor
⑳ Left Saddlebag Lock	㉖ Rear Brake Switch

REAR SUB-HARNESS CONNECTOR IDENTIFICATION

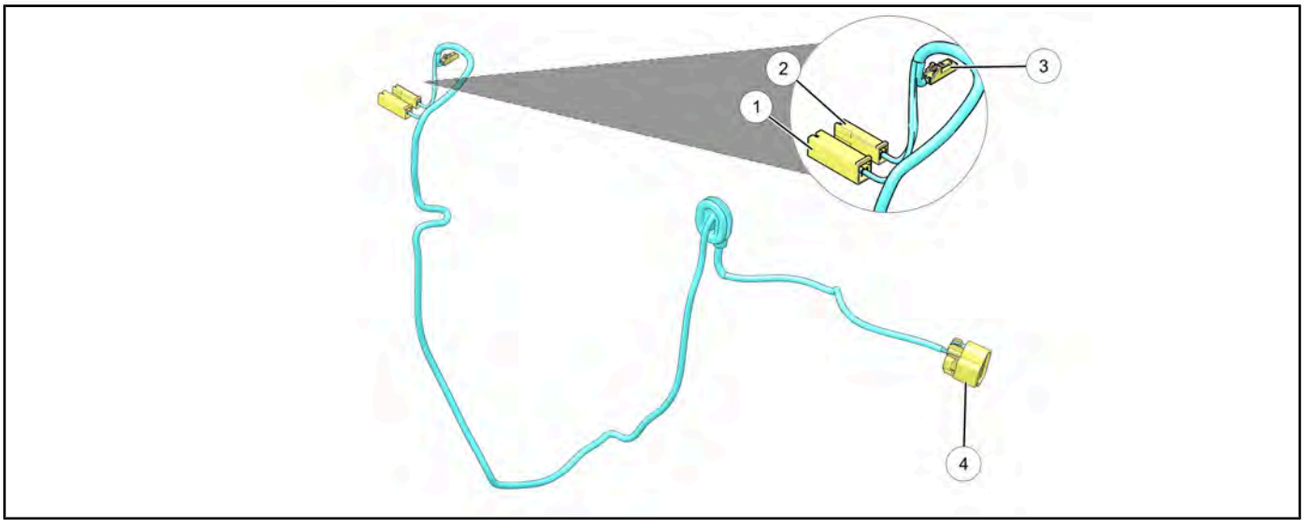
REAR SUB-HARNESSES



① Right Saddlebag Harness	③ Left Saddlebag Harness
② Tail light Harness	

RIGHT SADDLEBAG HARNESS CONNECTOR IDENTIFICATION

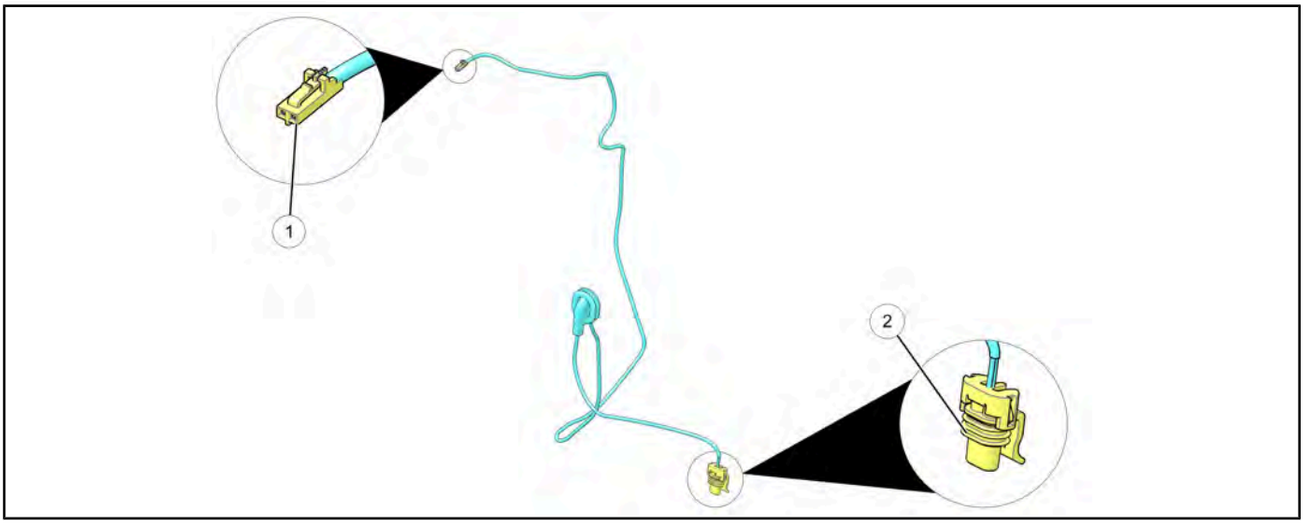
RIGHT SADDLEBAG HARNESS



① 12V (–)	③ Saddlebag Lock
② 12V (+)	④ Chassis-Harness

LEFT SADDLEBAG HARNESS CONNECTOR IDENTIFICATION

LEFT SADDLEBAG HARNESS

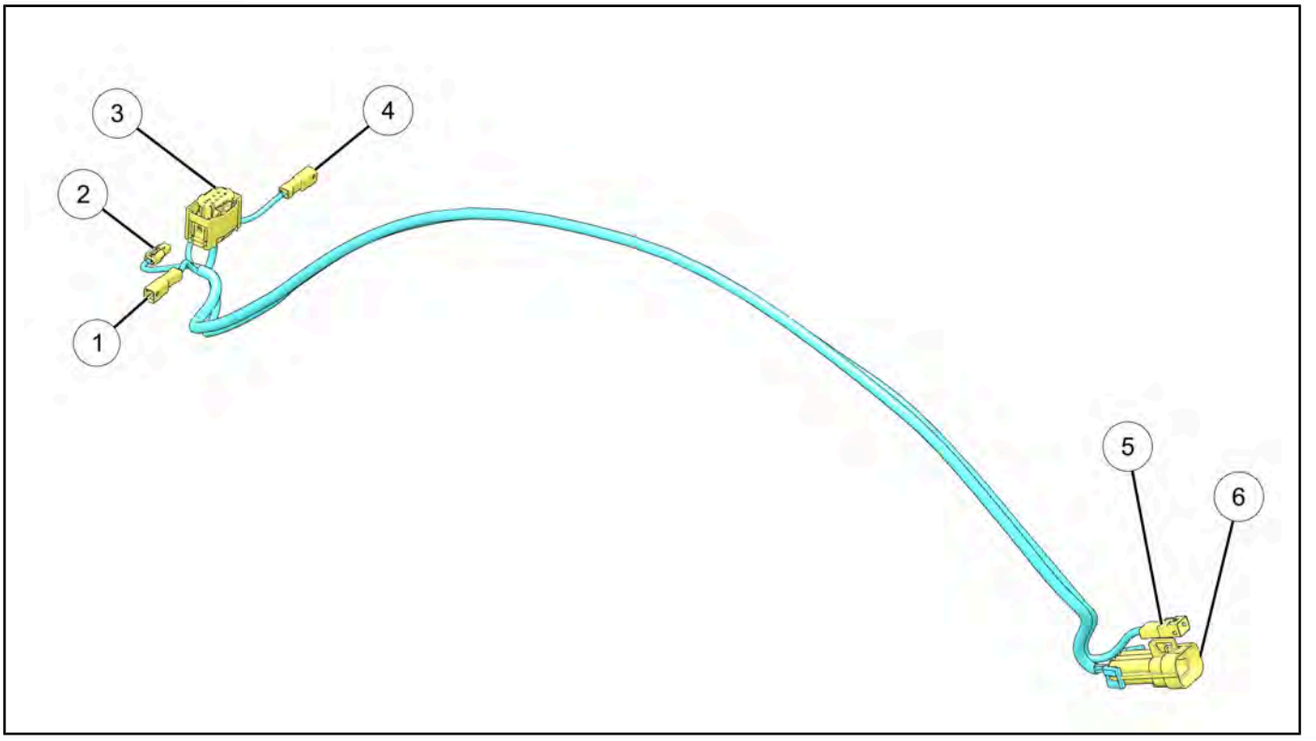


① Saddlebag Lock	② Chassis-Harness

10

TAIL LIGHT HARNESS CONNECTOR IDENTIFICATION

TAIL LIGHT HARNESS



① Right Turn/Stop	③ Left Turn/Stop
② License Plate	④ Chassis-Harness

HORN SERVICE

GENERAL OVERVIEW

The horn uses a load-sensing circuit for diagnostic purposes. The VCM sends a 12V pull-up voltage to the horn through the WH wire.

- With the horn disconnected, you should see 12V at the horn connector when checked with a DVOM.
- When the horn is connected, the 12V pull-up goes away.
- The horn button circuit is a node on the CAN bus. depressing it sends a signal to the VCM. The VCM responds by sending 12V to the horn, making it sound.

LOAD SIDE TESTING

12 VDC is supplied to the WH wire.

- Engage the horn connector to the horn, and back probe the WH wire at the hornconnector with one DVOM probe. Connect the other probe to chassis ground. Key on, voltage reading should be nearly battery voltage when the horn button is depressed.
- With the horn connected, back probe the BK and WH wires at the horn. key on, Depress the horn button. Voltage reading should be near battery voltage.
- With the horn connected, back probe the BK wire at the horn, and place the other probe at battery negative. Your reading should be close to 0 volts.

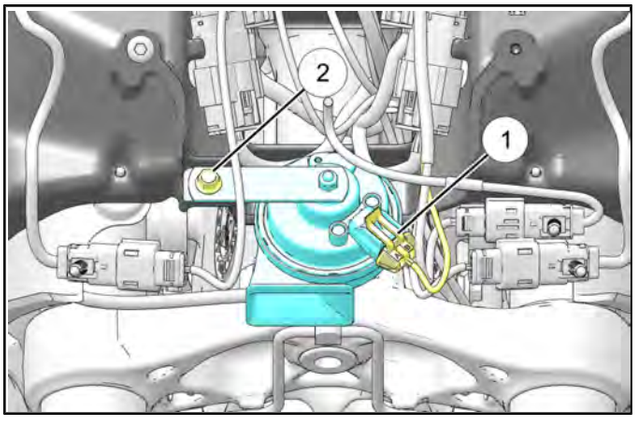
SWITCH SIDE TESTING

- The horn button/switch is on the CAN bus. Disconnect the switch/button, and turn the ignition off.
- Ensure all modules have gone to sleep. The time will vary from model to model, but this may take a few minutes.
- Set your DVOM to ohms, and place one probe on the DARK GREEN, and one on the YELLOW wire. You should read near 60 ohms.
- For more information regarding the CAN Network, refer to: **CAN (Controller Area Network) Diagnostic Overview page 4.92**

HORN REMOVAL

CMF

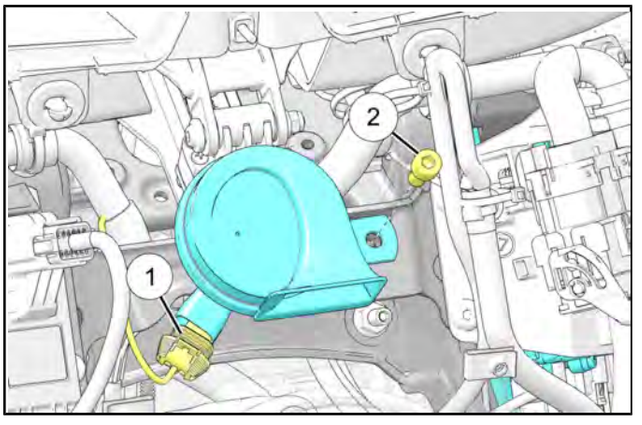
1. Remove outer fairing. Reference **Fairing Disassembly page 7.63**.
2. Disconnect horn electrical connector ①.



3. Remove horn fastener ② and remove.

FMF

1. Remove outer fairing. Reference **Fairing Disassembly and Removal (Fork Mounted) page 7.37**
2. Disconnect horn electrical connector ①.



3. Remove horn fastener ② and remove.

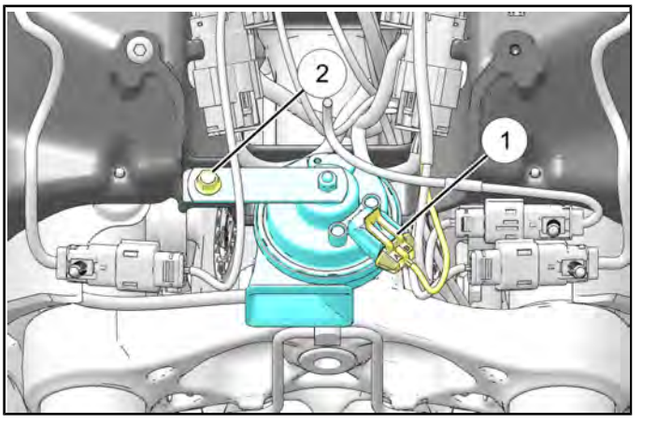
HORN INSTALLATION

CMF

1. Install horn fastener ② and the horn.

TORQUE
Horn to Bracket: **88 in-lbs (10 N·m)**

2. Connect horn electrical connector ①.



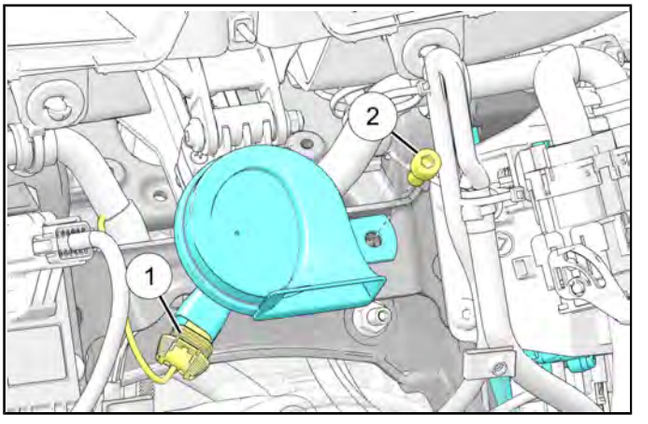
3. Install outer fairing. Reference **Fairing Assembly and Installation (Chassis Mounted) page 7.75**

FMF

1. Install horn fastener ② and the horn.

TORQUE
Horn to Bracket: **88 in-lbs (10 N·m)**

2. Connect horn electrical connector ①.



3. Install outer fairing. Reference **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

TAIL LIGHT SERVICE

LED TAIL / BRAKE LIGHT OPERATION

The multiple LED tail / brake lamp functions much like a conventional incandescent tail / brake lamp. LED lights require a regulated current supply to prevent damage, so a current regulation circuit is incorporated inside the tail lamp unit. Direct 12 volt battery power can be applied directly to the brake or tail lamp wire for testing purposes, but polarity MUST be observed or the LEDs will be permanently damaged.

Tail / Brake Light Power Supply:

When the motorcycle is powered ON, battery voltage is delivered to the TAIL / BRAKE LEDs on the DARK BLUE / PINK wire from the Secondary Engine Relay. Current through each TAIL LED (WHITE wire) is limited (inside tail lamp unit) to approximately 250 mA.

Tail / Brake Light Ground Signal:

The front and rear brake light switches provide a path to ground to the ECM via WHITE / RED wire (front brake switch) and YELLOW / VIOLET wire (rear brake switch). When the ECM receives a grounding signal from either of the brake switches, ground is provided to the tail / brake light LED, thus illuminating the light.

When the motorcycle is powered ON, the ECM provides a ground path to the tail light LED, thus illuminating the light.

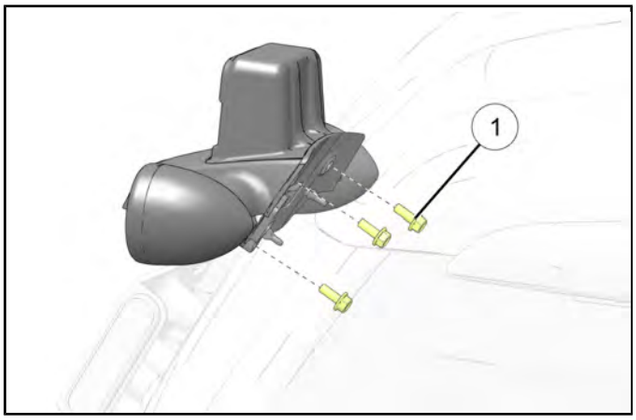
TAIL / BRAKE / LICENSE PLATE LIGHT / RADAR, REMOVAL

NOTICE

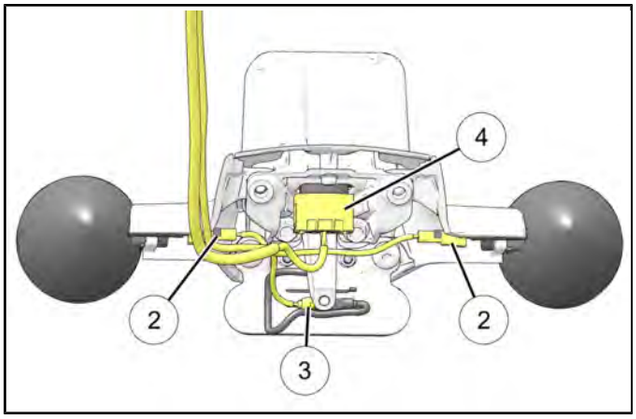
The tail and brake lights are LEDs and cannot be replaced individually. If the lights fail to function when activated, and all circuit tests indicate correct power and ground distribution, the tail /brake light must be replaced as an assembly. The license plate light can be replaced individually.

TAIL LIGHT / BRAKE LIGHT REMOVAL

1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove fasteners ① securing turn signal / brake light assembly.



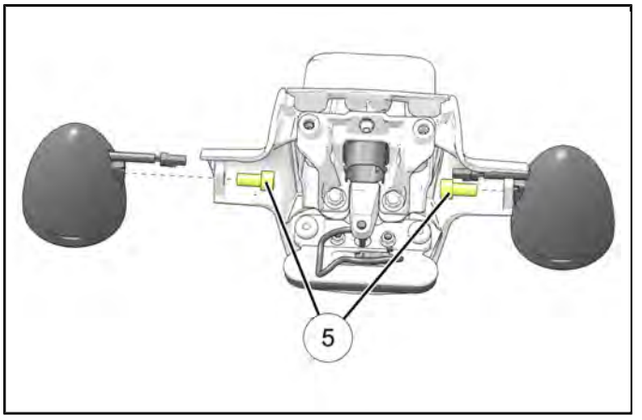
3. Disconnect turn signal electrical connector ②.



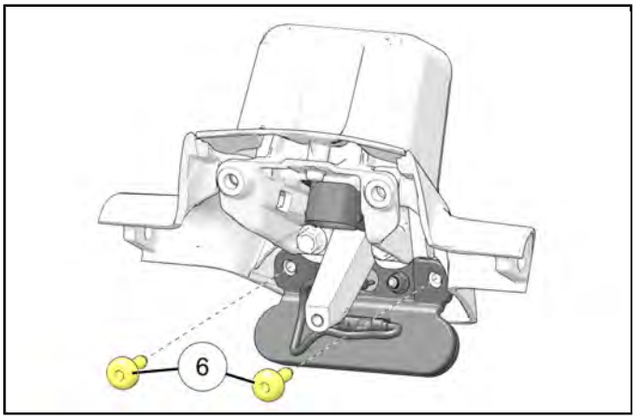
4. Disconnect license plate light connector ③.
5. Disconnect radar connector ④.

10

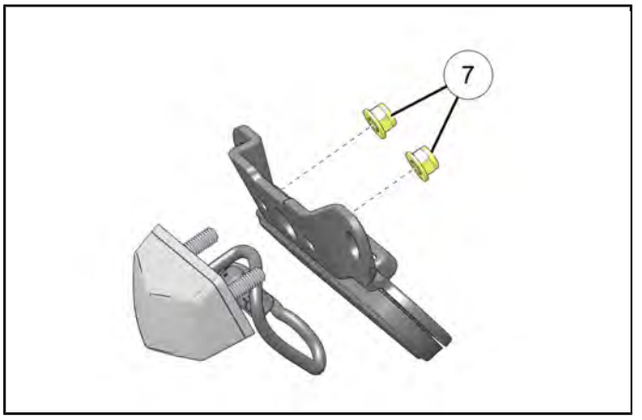
6. Remove fasteners ⑤ securing turn signals.



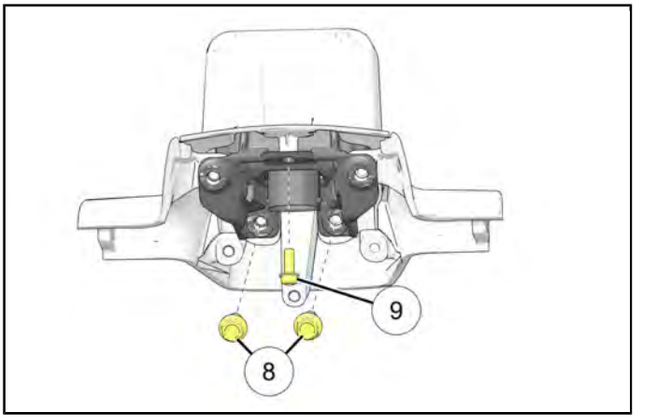
7. Remove fasteners ⑥ securing license plate light assembly.



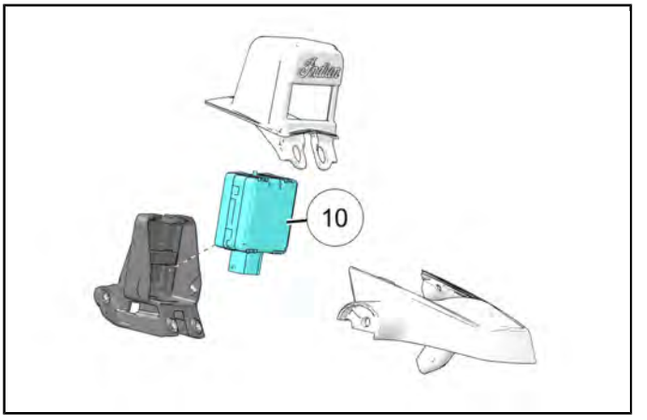
8. Remove fasteners ⑦ securing license plate light to assembly.



9. Remove fasteners ⑧ and ⑨.

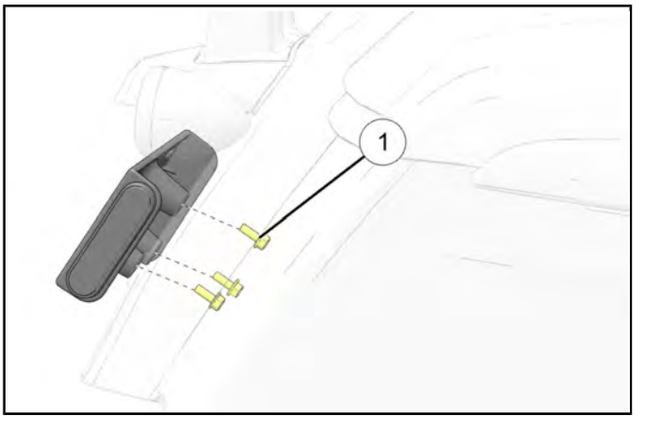


10. Remove the radar ⑩.



LICENSE PLATE ASSEMBLY REMOVAL

1. Remove fasteners ① securing license plate assembly.

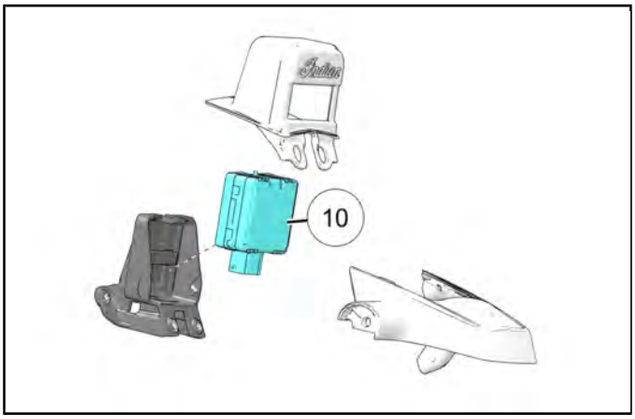


TAIL / BRAKE / LICENSE PLATE LIGHT / RADAR, INSTALLATION

NOTICE
The tail and brake lights are LEDs and cannot be replaced individually. If the lights fail to function when activated, and all circuit tests indicate correct power and ground distribution, the tail /brake light must be replaced as an assembly. The license plate light can be replaced individually.

TAIL LIGHT / BRAKE LIGHT INSTALLATION

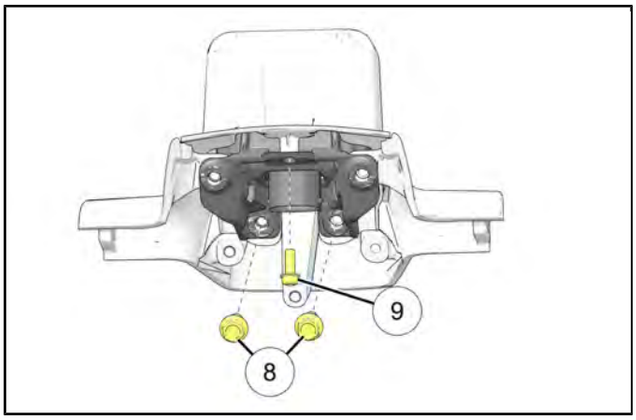
1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Install the radar ⑩.



3. Install fasteners ⑧ and ⑨. Torque to specification.

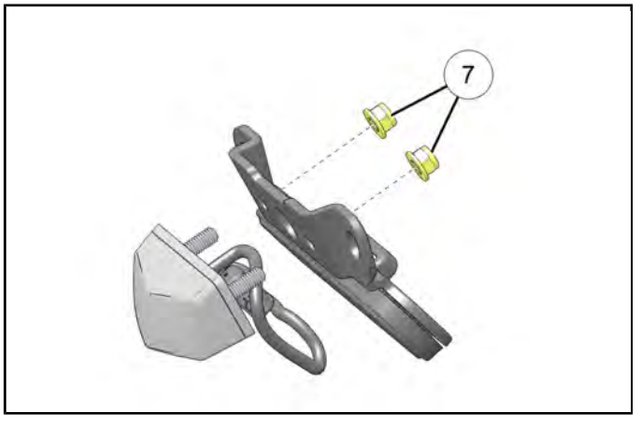
TORQUE
Radar fastener ⑧. **36 in-lbs (4.1 N·m)**

TORQUE
Radar fastener ⑨. **12 in-lbs (1.4 N·m)**



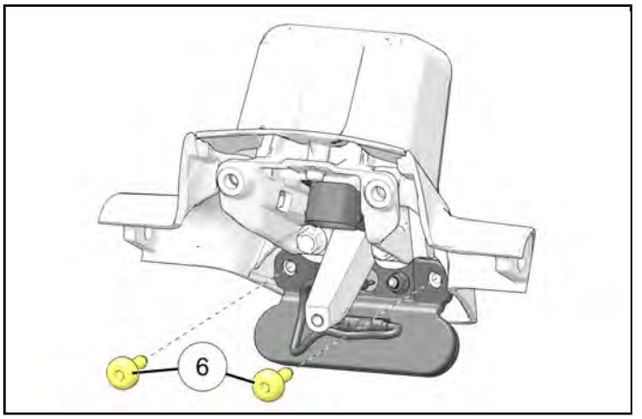
4. Install fasteners ⑦ securing license plate light to assembly.

TORQUE
License Plate Light Fastener: **16 in-lbs (2 N·m)**



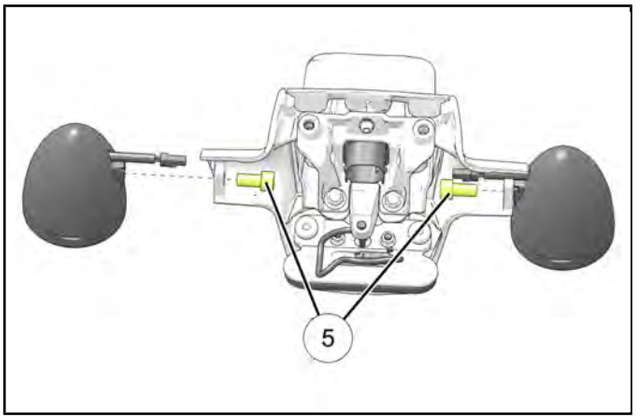
5. Install fasteners ⑥ securing license plate assembly.

TORQUE
License Plate Light Assembly Fastener: **88 in-lbs (10 N·m)**

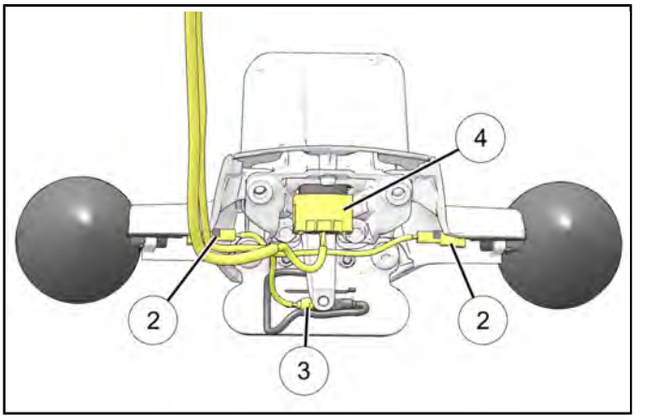


6. Install fasteners ⑤ securing turn signal.

TORQUE
Turn Signal Fastener: **88 in-lbs (10 N·m)**

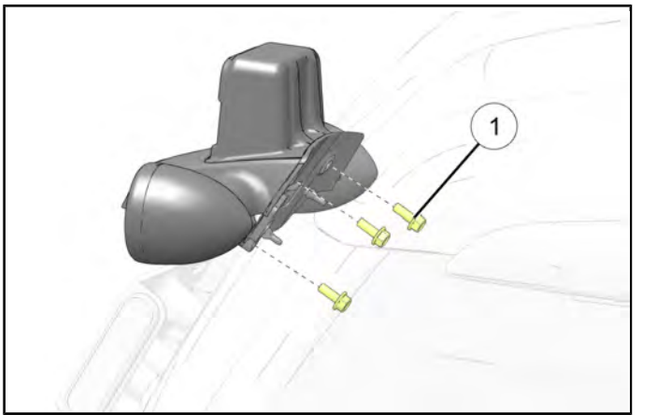


7. Connect license plate light connector ③.



8. Connect turn signal electrical connector ②.
9. Connect radar connector ④.
10. Install fastener ① securing turn signal / brake light assembly.

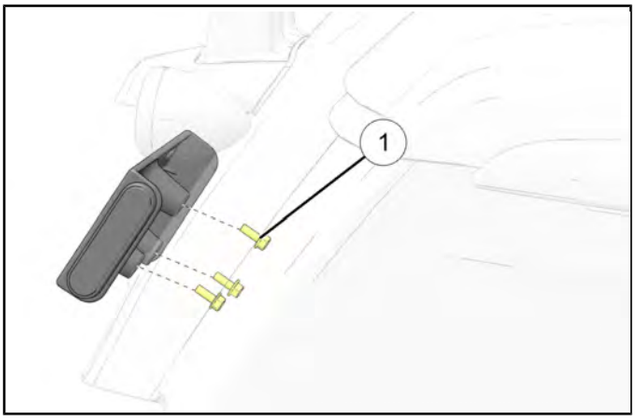
TORQUE
Tail Light Mount Bracket Fastener: **88 in-lbs (10 N·m)**



LICENSE PLATE BRACKET / LIGHT INSTALLATION

1. Install fasteners ① securing license plate assembly.

TORQUE
License Plate Bracket Fastener: **88 in-lbs (10 N·m)**



TURN SIGNAL / HAZARD SYSTEM SERVICE

TURN SIGNAL OPERATION

The turn signal / hazard light system does not utilize a conventional "flasher module", but instead receives a power and ground signal from the ECM. Turn Signal INPUTS & OUTPUTS can be located in the ECM Connector Map and Fuse Application Chart.

See **ECM Connector Map page 4.52**.

See **Fuse Application Chart page 10.81**.

NOTICE

The turn signals use LED lights and must be replaced as an assembly. Bulbs cannot be replaced individually.

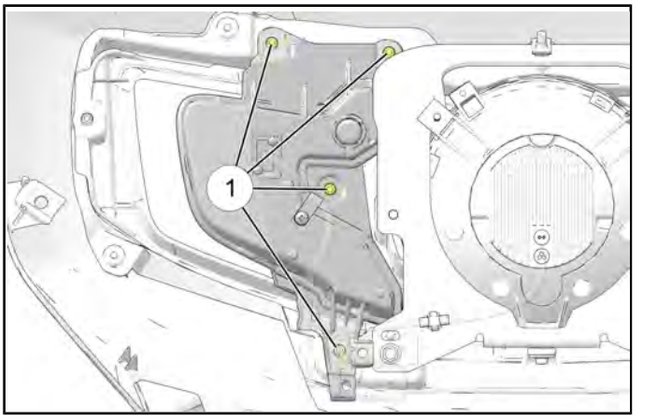
FRONT TURN SIGNAL, REPLACEMENT

NOTICE

The turn signals are LED and must be replaced as an assembly. Bulbs cannot be replaced individually.

CMF REMOVAL

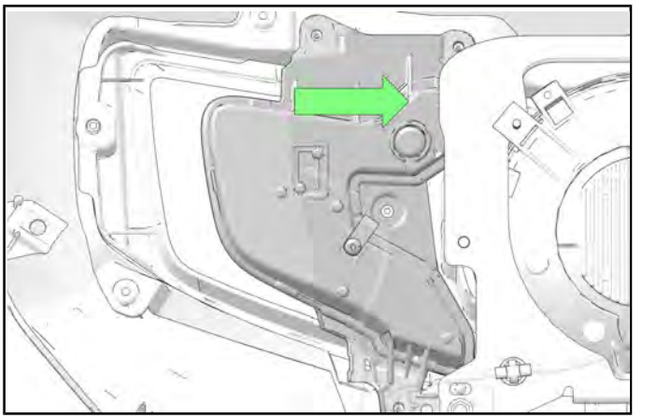
1. Remove Outer Fairing. See **Fairing Disassembly page 7.63**.
2. Disconnect the turn signal electrical connector.
3. From the back side of the outer fairing, remove four turn signal fasteners ①.



4. Slide the turn signal assembly out to the side away from the headlight and remove.

CMF INSTALLATION

1. Slide the new turn signal assembly into position. Insert the top side of the light first, and then the bottom.



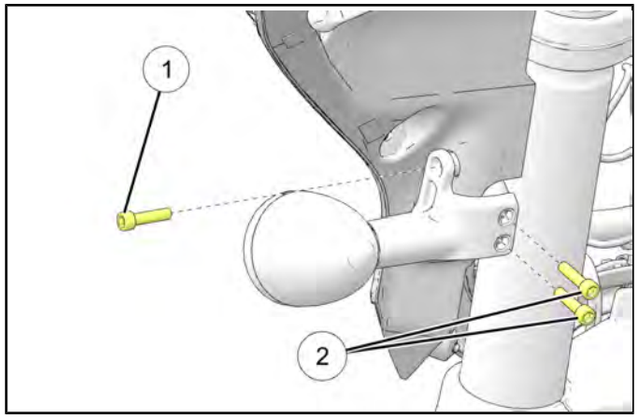
2. Install the four turn signal fasteners ①. Torque fasteners to specification.

TORQUE
Turn Signal Fastener (Front): **15 in-lbs (2 N·m)**

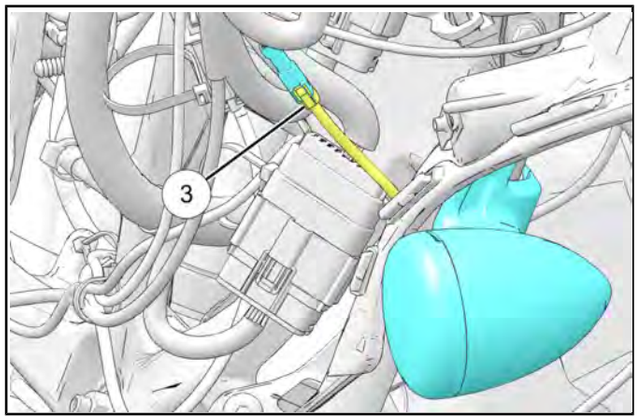
3. Connect electrical connector to the harness.

FMF REMOVAL

1. Remove outer fairing. See **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Remove the turn signal support fastener ① and fairing bracket fasteners ②.

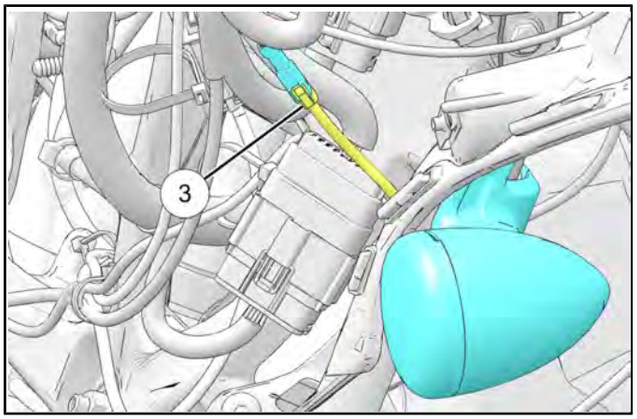


3. Disconnect the turn signal electrical connector ③.

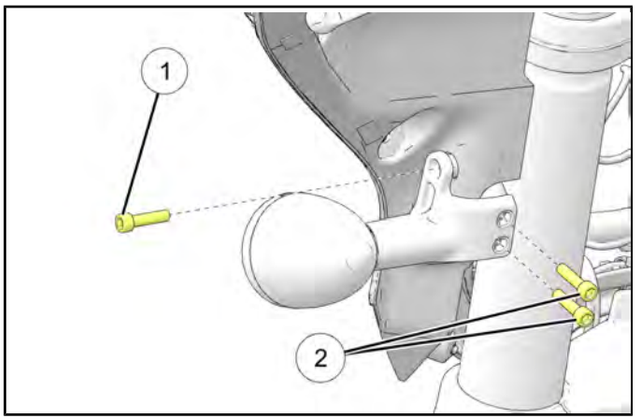


FMF INSTALLATION

1. Connect the turn signal electrical connector ③.



2. Install the turn signal support fastener① and fairing bracket fasteners②.



TORQUE
Turn Signal Support Fastener **88 in-lbs (10 N·m)**

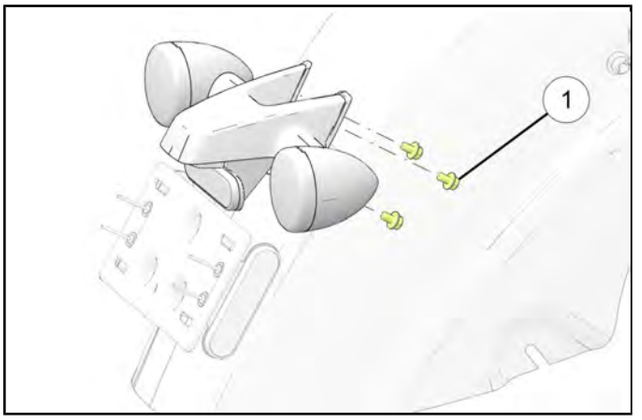
TORQUE
Fairing Bracket Fastener **88 in-lbs (10 N·m)**

3. Install outer fairing. See **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

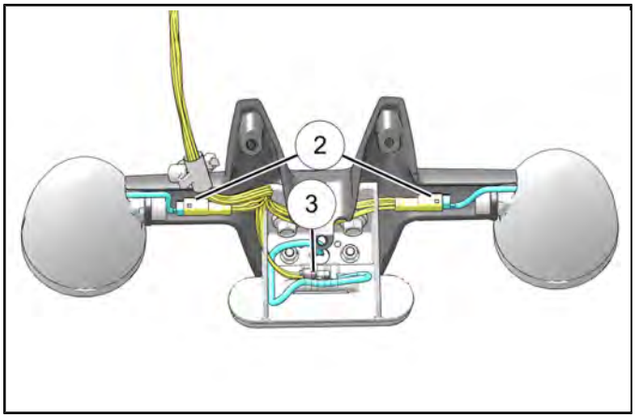
REAR TURN SIGNAL, REPLACEMENT

REMOVAL

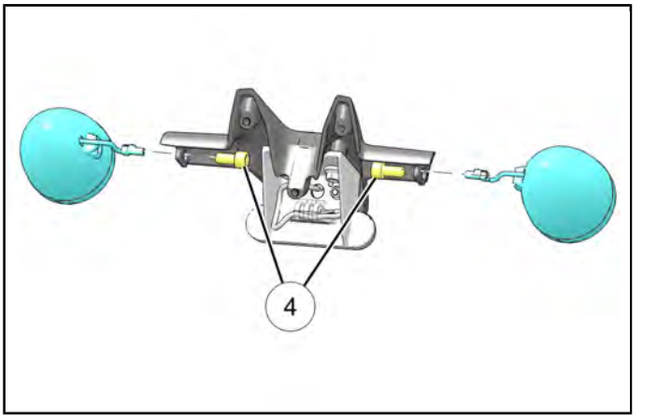
1. Remove fastener ① securing turn signal / brake light assembly.



2. Disconnect turn signal electrical connector ②.



3. Disconnect license plate light connector ③.
4. Remove turn signal fastener ④.



INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Turn Signal Fastener: **88 in-lbs (10 N·m)**

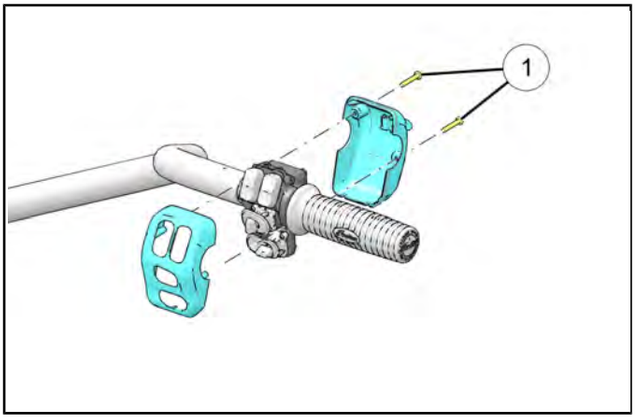
TORQUE
Tail Light Mount Bracket Fastener: **88 in-lbs (10 N·m)**

SWITCH CUBE

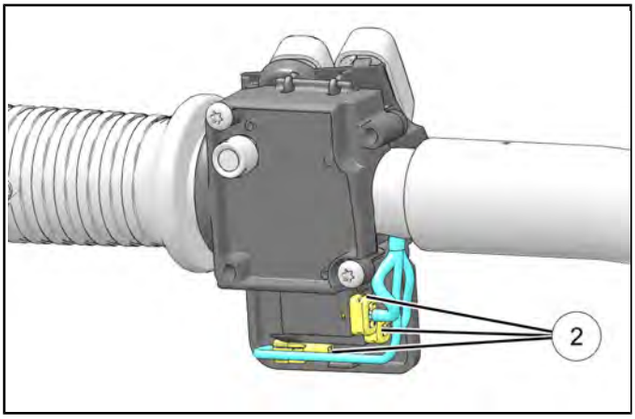
SWITCH CUBE REPLACEMENT

REMOVAL

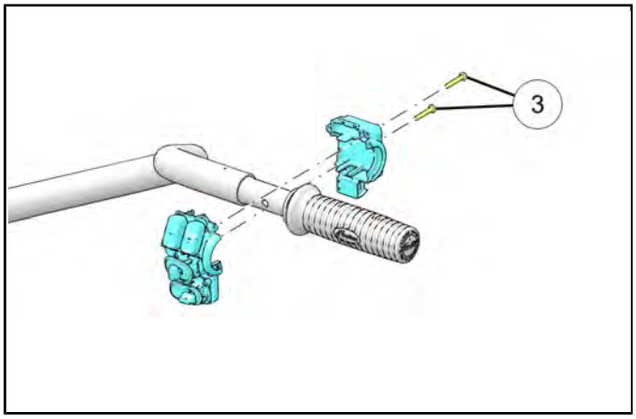
1. Remove clutch switch. See **Clutch Switch Removal page 10.29**.
2. Remove front master cylinder, reference **Front Master Cylinder Service page 9.47**.
3. Remove switch cube cover by removing its fasteners ①.



4. Disconnect switch cube electrical connectors ②.



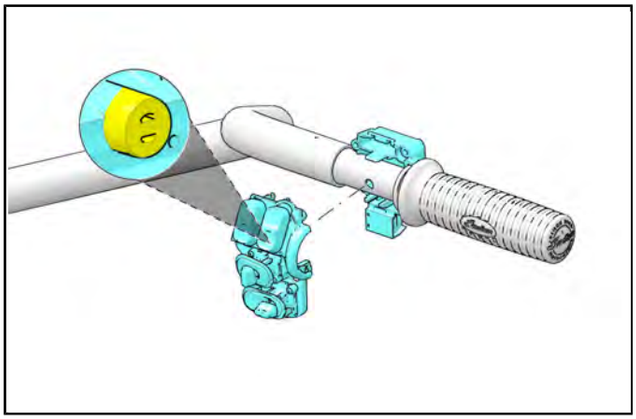
5. Remove inner switch cube fasteners ③.



INSTALLATION

NOTICE
Before assembling cube halves, ensure the wire harness is completely pulled through and no wires are pinched. Confirm there is no wire slack in handlebars.

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**
2. Upon installation, ensure inner switch cube retention feature is secured in locating hole in handlebar.



3. Torque fasteners to specification.

TORQUE
Switch Cube Fastener: **12 in-lbs (1 N·m)**

TORQUE
Switch Cube Cover Fastener: **12 in-lbs (1 N·m)**

10

SWITCH CUBE PINOUT

LEFT SWITCH CUBE

PIN	FUNCTION
1	Switch Cube Feed
2	Ground
3	CAN A High
4	CAN A Low

LEFT HEAT

PIN	FUNCTION
1	Heated Grips Output
2	Ground

RIGHT SWITCH CUBE 1

PIN	FUNCTION
1	VCM Control Feed
2	Ground
3	CAN A High
4	CAN A Low

RIGHT SWITCH CUBE 2

PIN	FUNCTION
1	Run / Stop Switch Output
2	Ignition Switch Signal

RIGHT HEAT

PIN	FUNCTION
1	Heated Grips Output
2	Ground

THROTTLE CONTROL

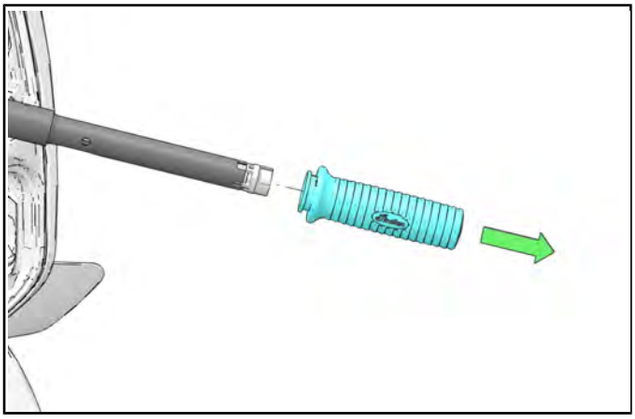
THROTTLE CONTROL REMOVAL

To watch a video of this procedure, scan the QR code or click **HERE**.

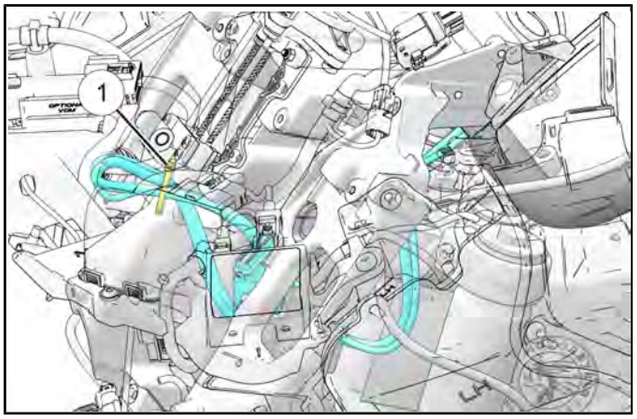
https://vimeo.com/338076741/f1ec51a821

REMOVAL

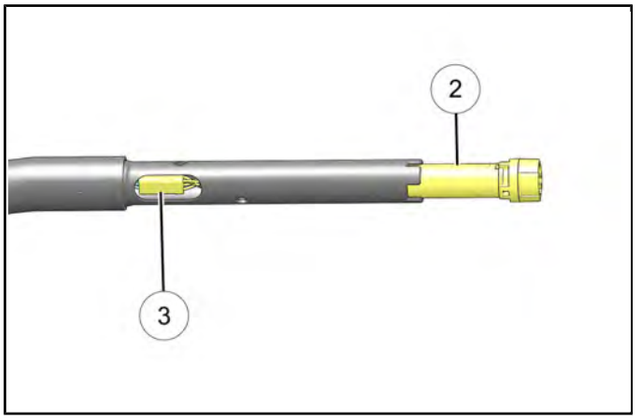
1. Remove outer fairing and dash support. Refer to **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Remove switch cube. See **Switch Cube Replacement page 10.133**.
3. Remove grip.



4. Follow the wiring coming out of the handle bars and cut the cable tie ① retaining the slack.



5. Pull on the throttle control ② until the electrical connection ③ is visible and disconnect.



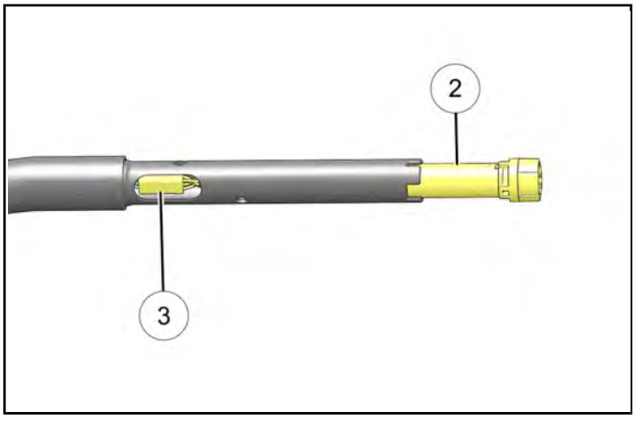
THROTTLE CONTROL INSTALLATION

INSTALLATION

To watch a video of this procedure, scan the QR code or click **HERE**.

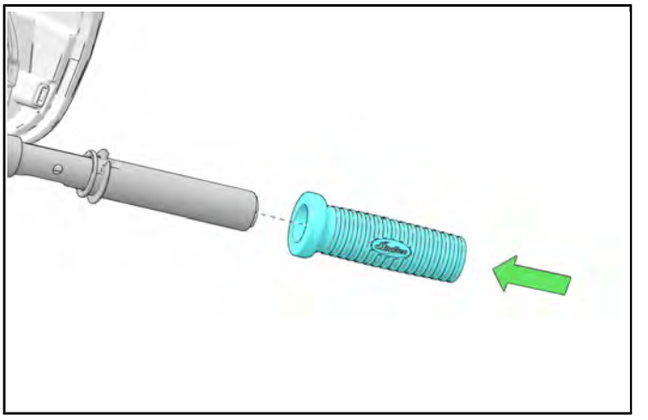
https://vimeo.com/338076741/f1ec51a821

1. Connect the ETC electrical connection ③.



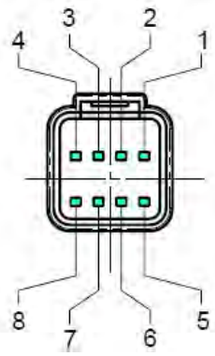
2. Follow the wiring coming out of the handle bars and install the cable tie ① to retain the slack.

3. Install grip.



4. Install switch cube. See **Switch Cube Replacement page 10.133**.
5. Install outer fairing and dash support. See **Fairing Assembly and Installation (Chassis Mounted) page 7.75** or **Fairing Assembly and Installation (Fork Mounted) page 7.49**.

THROTTLE CONTROL PINOUT



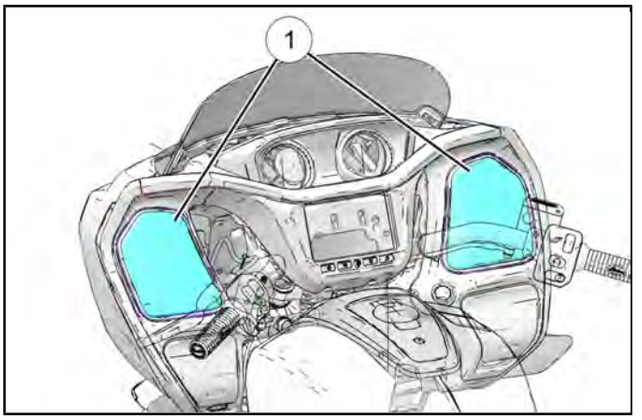
PIN	FUNCTION
1	Throttle Position Sensor 1 Return
2	Throttle Position Sensor 1 +5V Reference
3	Throttle Position Sensor 2 +5V Reference
4	Throttle Position Sensor 2 Return
5	Throttle Position Sensor 1 Output
6	–
7	–
8	Throttle Position Sensor 2 output

INFOTAINMENT SYSTEM

SPEAKER REMOVAL

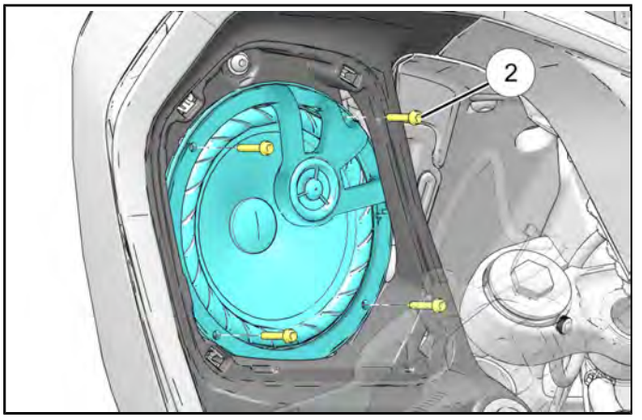
CMF

1. Carefully pry off speaker bezel ①.



Make note of the speaker bezel clip location when removing the piece from the fairing.

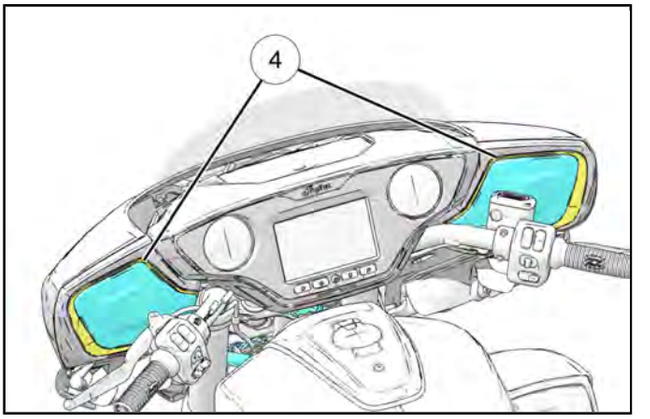
2. Remove fasteners ② securing speaker.



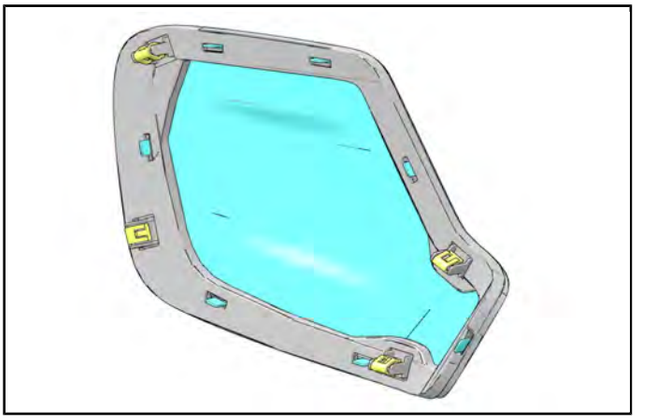
3. Disconnect speaker electrical connector upon removal.

FMF

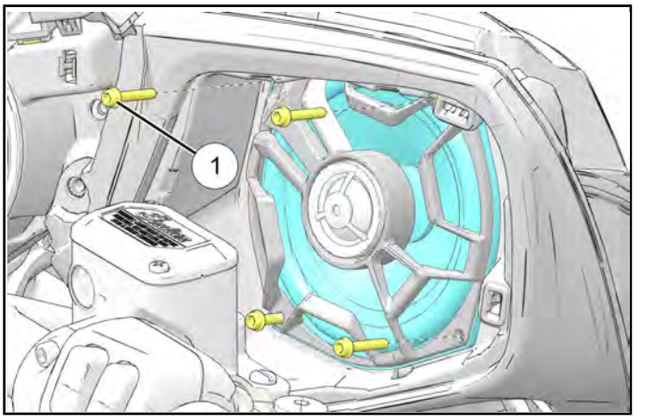
1. Carefully pry off speaker bezel ④.



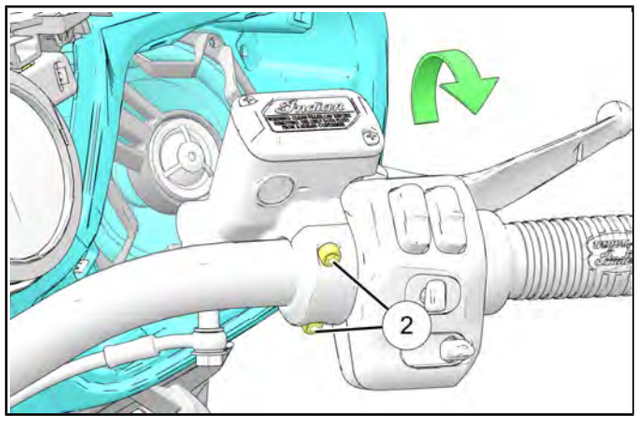
- Make note of the speaker bezel clip location when removing the piece from the fairing.



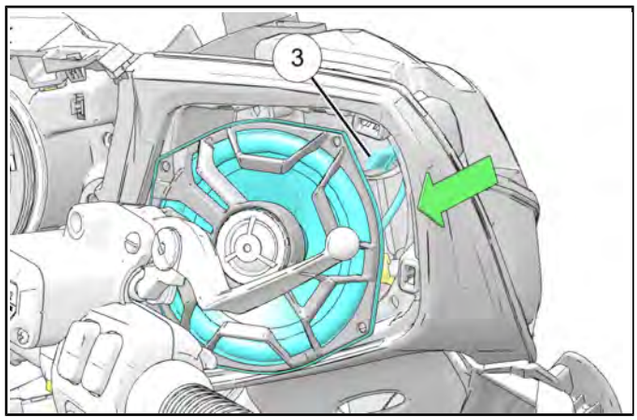
2. Remove fasteners ① securing speaker.



3. Loosen brake and clutch lever clamp fasteners ② and rotate towards the fuel tank



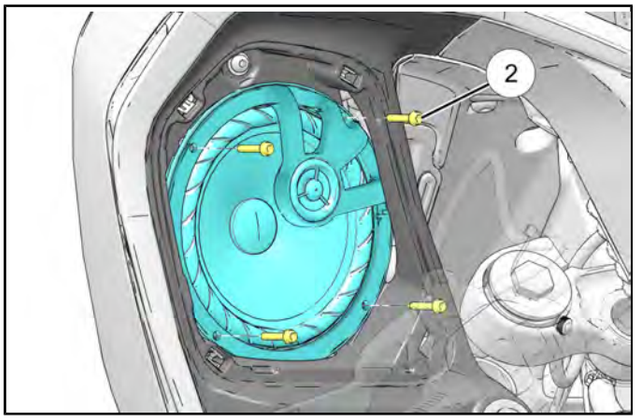
4. Disconnect speaker electrical connector upon removal.



SPEAKER INSTALLATION

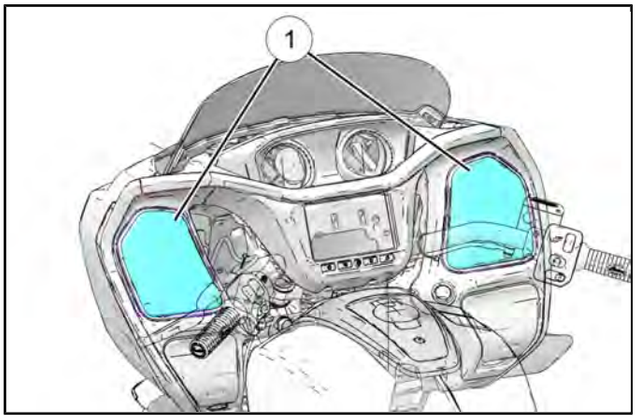
CMF

1. Connect speaker electrical connector.
2. Install fasteners ② securing speaker.



TORQUE
Speaker Fastener ①: **25 in-lbs (3 N·m)**

3. Carefully install speaker bezel ①.

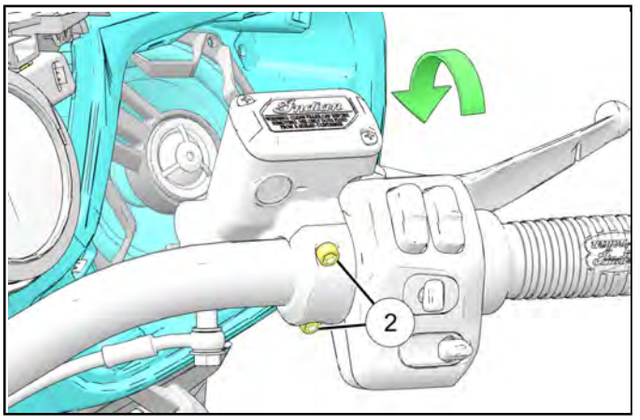


10

FMF

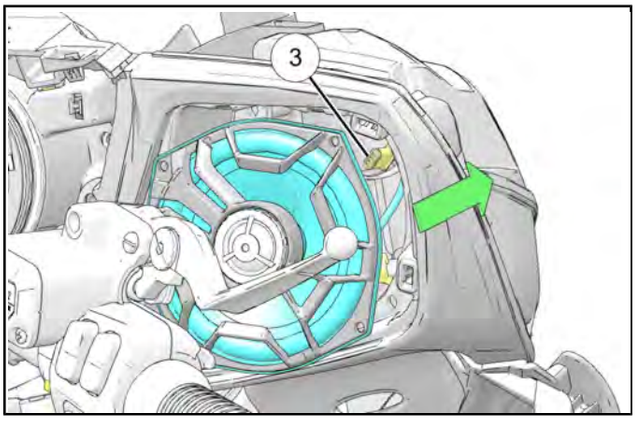
1. Fasten brake and clutch lever clamp fasteners ② and rotate back towards the speakers.

NOTE
Fasten the upper fastener first.

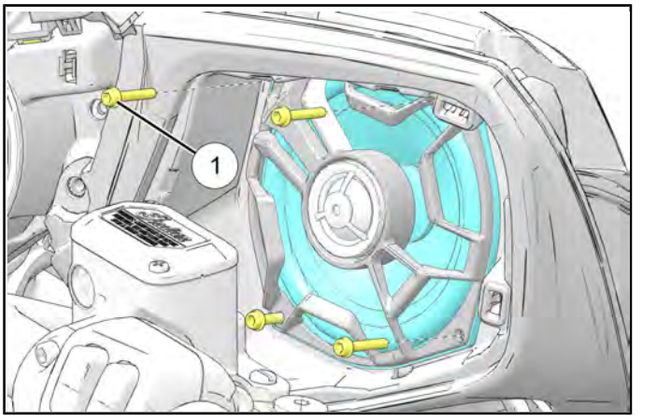


TORQUE
96 in-lbs (11 N·m)

2. Connect speaker electrical connector upon installation.

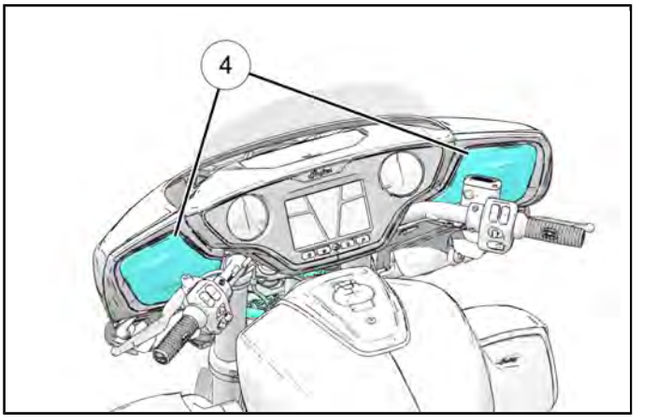


3. Install fasteners ① securing speaker.



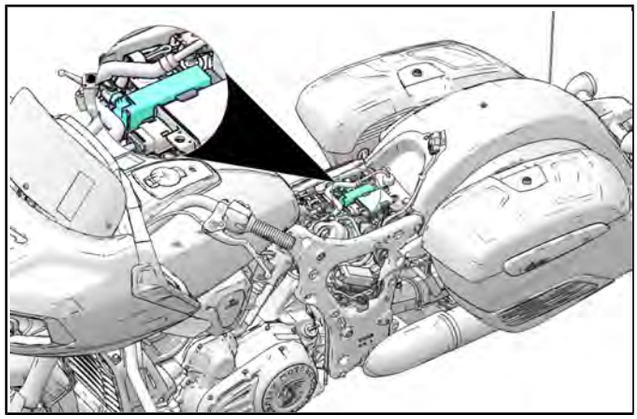
TORQUE
Speaker Fastener ①: **25 in-lbs (3 N·m)**

4. Reverse step 2.
5. Install speaker bezel ④.



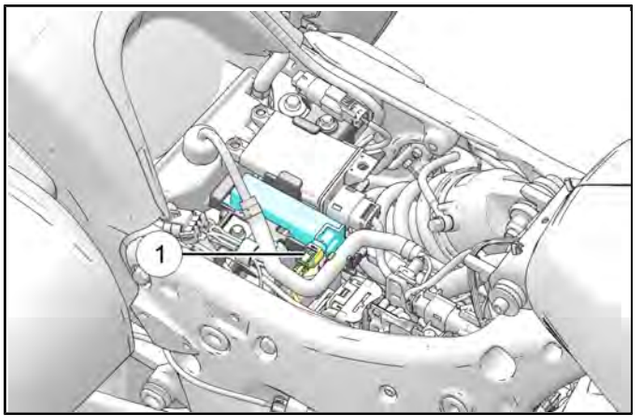
ANTENNA MODULE OVERVIEW

The antenna module is located under the seat as shown.



ANTENNA MODULE REMOVAL

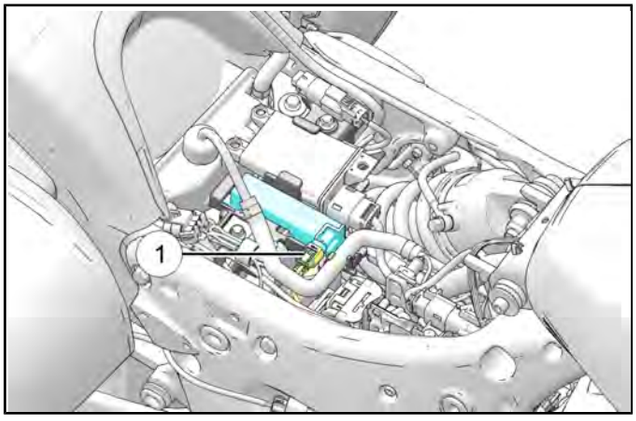
1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
3. Unplug antenna module Electrical connector ①.



4. Remove antenna module from the under-seat wire bracket

ANTENNA MODULE INSTALLATION

1. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Install antenna module from the under-seat wire bracket
3. Install antenna module Electrical connector ①.

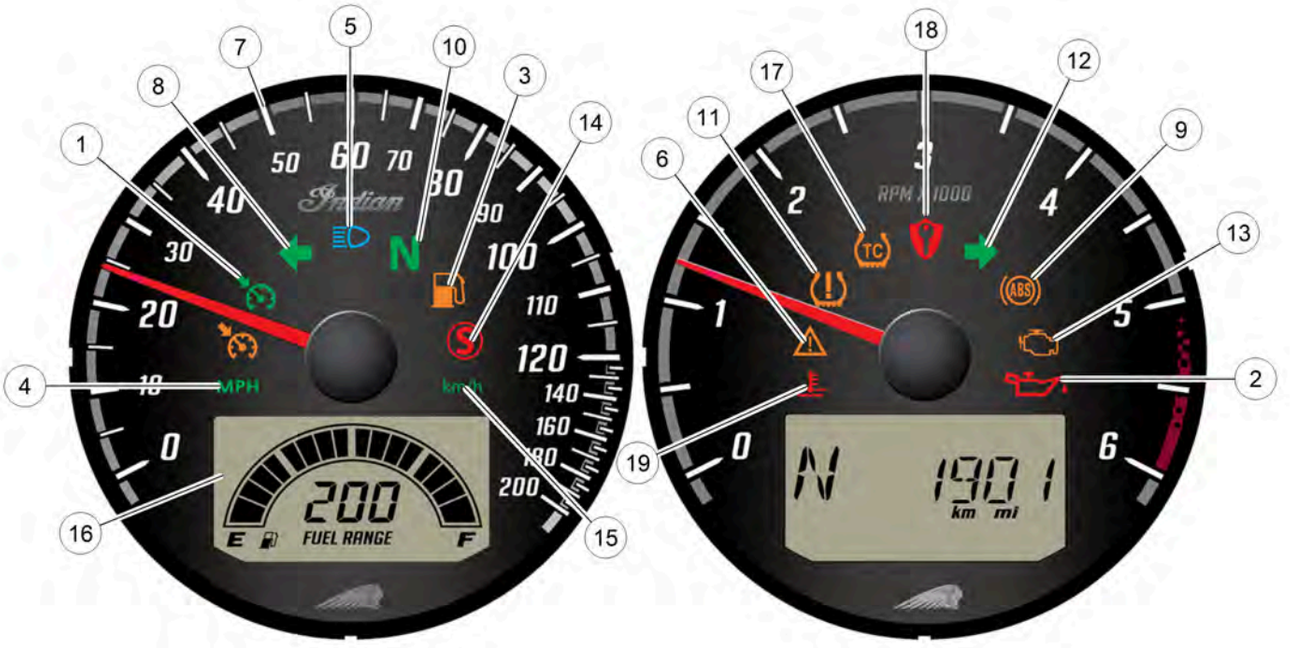


4. Install seat. See **Seat Installation page 7.95** or **Seat Installation (Touring) page 7.96**

10

INSTRUMENTATION

INSTRUMENT CLUSTER



For detailed information regarding MODE selection and Multi-Function Display operation refer to the Indian Motorcycle Owner's Manual.

The instrument cluster includes the speedometer, indicator lamps, Multi-Function Display (MFD) and fuel gauge (where applicable).

NUMBER	LIGHT	INDICATES	CONDITION
①		Cruise Control Status	*Amber Lamp:* Cruise control is enabled, but not set. When flashing, a cruise control related fault exists. *Green Lamp:* Cruise control is set to the desired speed. *Read the safety and operation procedures before using cruise control.*
②		Low Oil Pressure	This lamp illuminates when oil pressure drops below a safe operating pressure while the engine is running. If this lamp illuminates while the engine is running above idle speed, turn the engine off as soon as safely possible and check the oil level. Light will remain on until engine starts again. *If the oil level is correct and the lamp remains on after the engine is restarted, turn the engine off immediately. See your dealer.*
③		Low Fuel	This lamp illuminates when approximately one gallon (3.8 liters) of fuel remains in the fuel tank. The LCD Display will switch into a Low Fuel Mileage Counter Mode to provide the rider with mileage tracking from the time the indicator was activated.
④	MPH	Vehicle speed	When standard mode is selected, speed displays in miles per hour.

NUMBER	LIGHT	INDICATES	CONDITION
⑤		High Beam	The headlight switch is set to high beam. This indicator will flash if there is a problem with the low or high beam light.
⑥		Chassis Fault	The alert symbol illuminates if a chassis fault occurs.
⑦	—	Vehicle Speed	Analog display of vehicle road speed in MPH or km/h.
⑧		Left Turn Signal	The turn signal indicator flashes when the left turn signal (hazard) is active. *If there is a problem in the signal system, the lamps will flash at twice the normal rate.*
⑨		Anti-Lock Brake System Status	The indicator will be flashing until the anti-lock system activates, which occurs when vehicle speed exceeds 3 MPH (5 km/h). When lamp is solid illumination, rider may experience reduced or no functionality of anti-lock brakes. Conventional brake system will continue to operate normally.
⑩		Neutral	The transmission is in neutral.
⑪		Tire Pressure Monitoring System (TPMS)	(If equipped) The TPMS indicator illuminates if low tire pressure is detected. It will also illuminate along with the Low Battery Voltage indicator when TPMS battery power is low, requiring service.
⑫		Right Turn Signal	The turn signal indicator flashes when the right turn signal (hazard) is active. *If there is a problem in the signal system, the lamps will flash at twice the normal rate.*
⑬		Check Engine	*If this lamp illuminates while the engine is running, see your dealer promptly.* The light will remain on if the tilt sensor shuts down the engine. If abnormal sensor or engine operation is detected the light will remain on as long as the fault condition exists. Retrieve the error codes for diagnosis.
⑭		Sidestand Indicator	Illuminates when the sidestand is in the down position.
⑮		Vehicle Speed	When metric mode is selected, speed displays in kilometers per hour.
⑯	—	Multi-Function Display (MFD)	—
⑰		Traction Control	This lamp will flash when traction control is engaged.

NUMBER	LIGHT	INDICATES	CONDITION
⑱		Security System Status	This indicator lamp illuminates while the security system is searching for the key fob signal and when the security system is locked. The lamp flashes if the key fob is not detected within range or if the fob is not programmed properly. It also illuminates with the low battery voltage indicator when the key fob battery is low.
⑲		Engine Hot	This lamp illuminates to indicate an overheated engine. If the indicator flashes, a severe overheating condition exists.

Odometer

The odometer displays total distance traveled.

Trip Odometers

The trip odometers (Trip 1 and Trip 2) display total distance traveled since being reset. To reset a trip odometer, toggle to the trip odometer, then press and hold the LEFT-TOGGLE switch until the trip odometer resets to zero.

Engine Speed

Engine Speed displays in revolution per minute (RPM).

DC Voltage

The volt meter displays battery voltage. If the engine is not running, approximate *battery* voltage displays. If the engine is running, approximate *charging* voltage displays.

Gear Position

Gear position displays at all times while the engine is running, unless a fault occurs with the gear position sensor.

Temperature

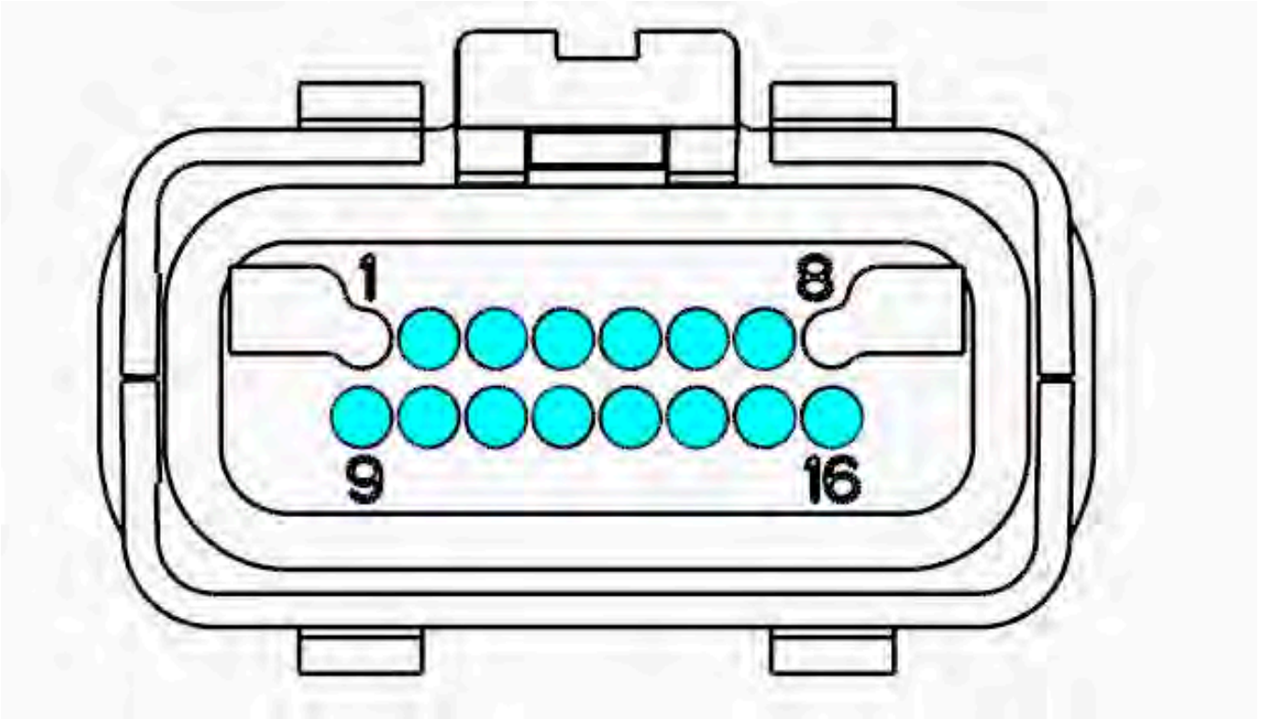
The temperature area displays ambient air temperature.

Fuel Range

The fuel range displays the distance the motorcycle can travel on the remaining fuel in the fuel tank.

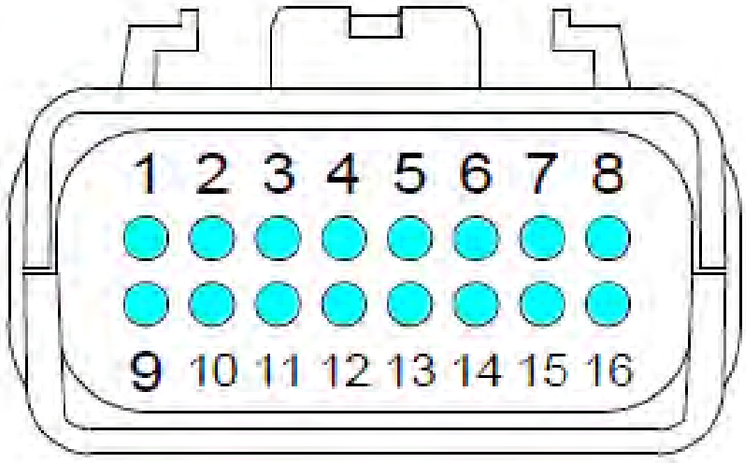
INSTRUMENT CLUSTER PINOUT

SPEEDOMETER



PIN	Wire Color	FUNCTION
1	YE	CAN A High
2	DG	CAN A Low
3	OG/YE	Switched Power
4	OG	Constant Power
5	BK	Power Ground
6	BN/WH	Security Light
7	–	–
8	–	–
9	–	–
10	–	–
11	–	–
12	–	–
13	–	–
14	–	–
15	–	–
16	–	–

TACHOMETER

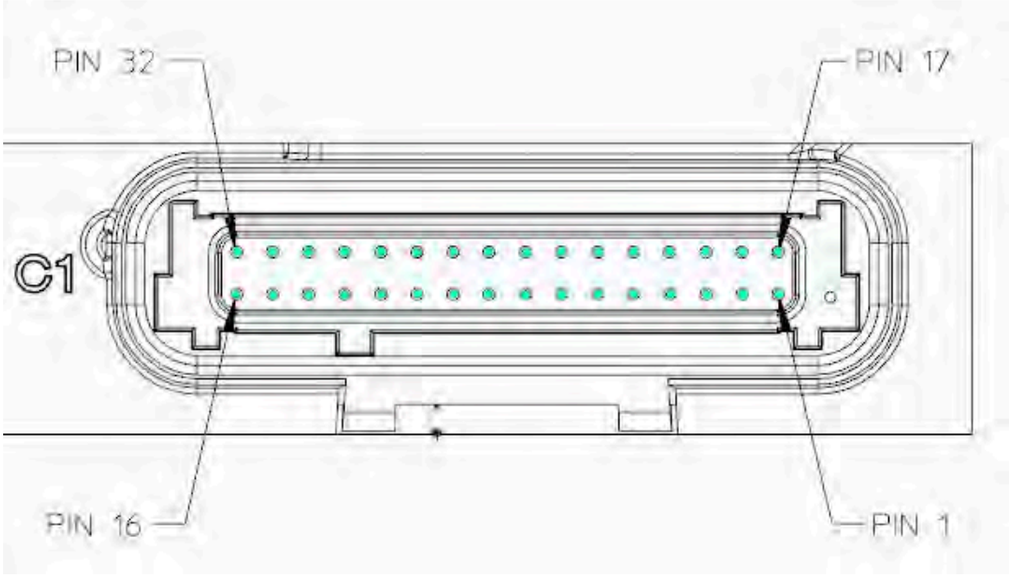


PIN	Wire Color	FUNCTION
1	YE	CANA High
2	DG	CANA Low
3	PK/GN	VCM Accessory Power Out
4	OG	Instrumentation Fuse Output
5	BK	Ground
6	—	—
7	—	—
8	—	—
9	—	—
10	YE/BK	Oil Pressure Switch Output
11	—	—
12	—	—
13	—	—
14	—	—
15	—	—
16	—	—

RIDE COMMAND DISPLAY

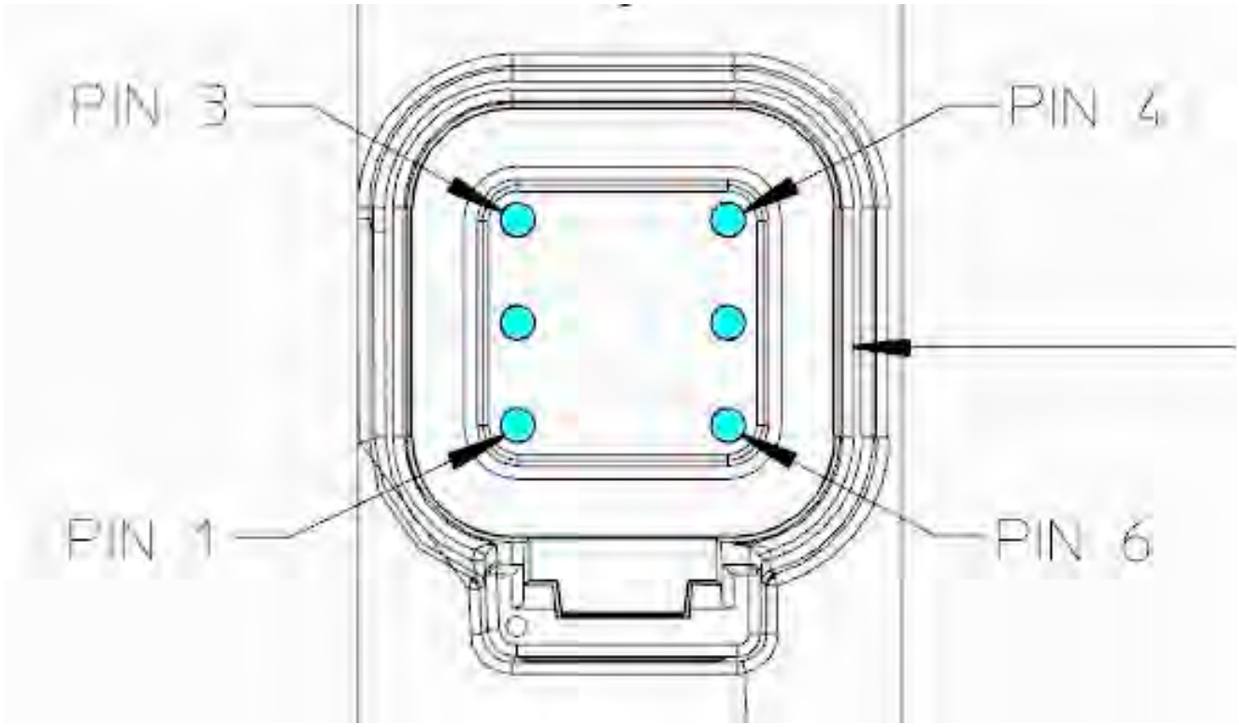
DISPLAY CONNECTOR PINOUT

DISPLAY CONNECTOR

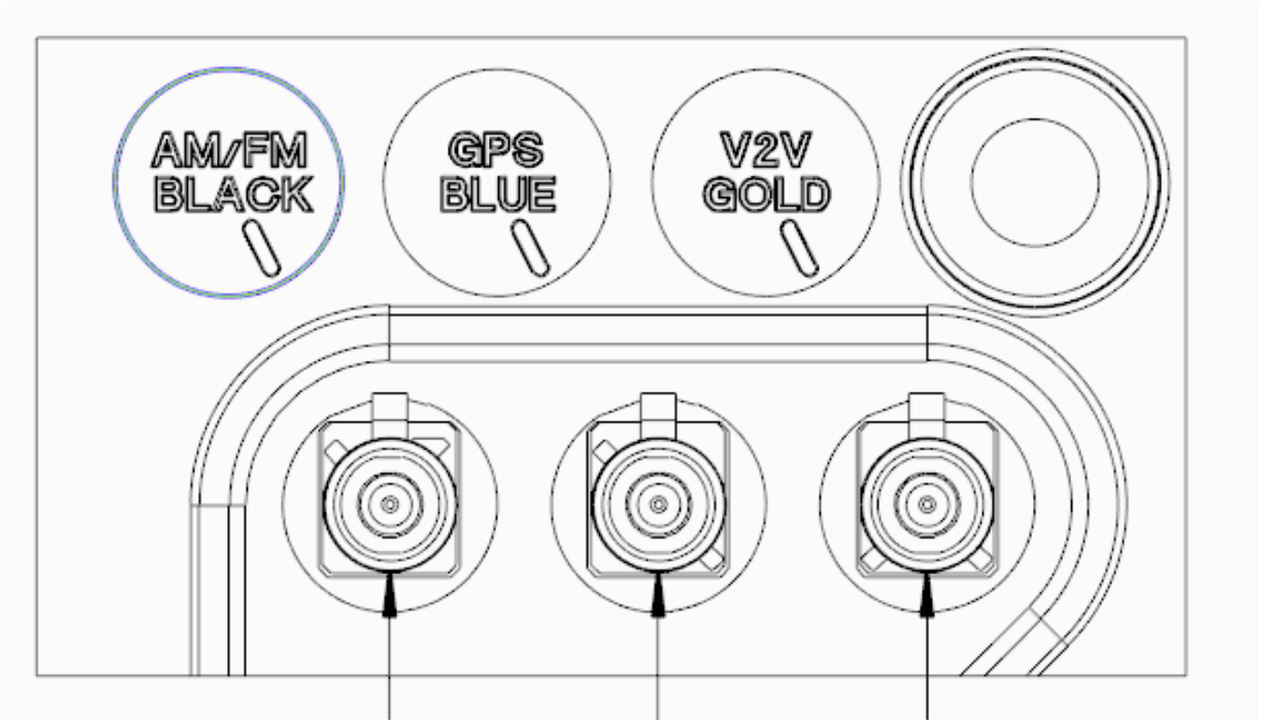


PIN	FUNCTION	PIN	FUNCTION
1	Preamp Rear Right Speaker –	17	Preamp Front Right Speaker +
2	Preamp Rear Right Speaker +	18	Preamp Front Right Speaker –
3	—	19	—
4	Preamp Rear Left Speaker –	20	Preamp Front Left Speaker –
5	Preamp Rear Left Speaker +	21	Preamp Front Left Speaker +
6	—	22	—
7	—	23	—
8	—	24	—
9	—	25	—
10	—	26	—
11	—	27	DATA+
12	USB 1 Ground	28	DATA–
13	+5VDC	29	CAN C High
14	—	30	CAN C Low
15	—	31	Switched Power
16	Ground	32	Instrumentation Fuse Output

USB HARNESS



PIN	FUNCTION
1	Ground
2	+5V BUS
3	Data +
4	Data -
5	Ground – Shield
6	VBUS Remote Sense



RIDE COMMAND DIAGNOSTICS / TROUBLESHOOTING

Problem: Black Screen / Will Not Power On

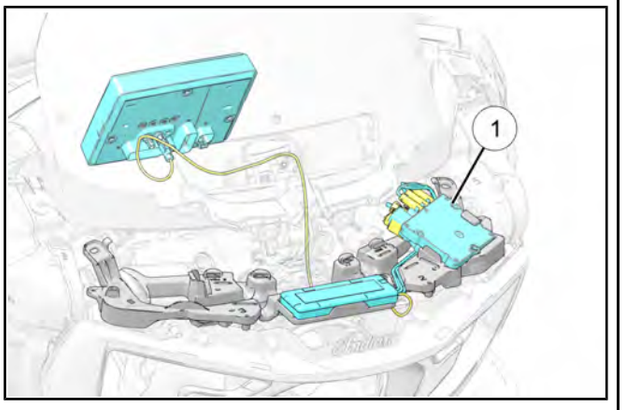
STEP	ACTION	YES	NO
1	Power cycle the bike by switching ignition on and off with main power switch in fairing. ***Did you find and repair the condition?***	Go to Step 8	Go to Step 2
2	Check the 5 amp fuse labeled *Gauge* in the main fuse box under the left side upper panel. Refer to Fuse Box Location page ***Is the fuse blown?***	Go to Step 9	Go to Step 3
3	Reinstall *Gauge* fuse and test screen for proper operation. ***Did you find and repair the condition?***	Go to Step 8	Go to Step 4
4	1. Turn ignition on. 2. Disconnect the display from the harness. 3. Using pin 16 (Ground) as ground reference, check for battery voltage on pins 31 (Switched Power) and 32 (Battery Power) of the display connector. ***Is there Battery Voltage at pins 31 and 32 with the ignition on?***	Go to Step 8	Go to Step 5
5	Refer to the Fairing & Chassis wiring schematic in appendix and check circuits without voltage for continuity and proper operation. ***Did you find any problems in the circuit?***	Go to Step 7	Go to Step 1 and repeat diagnosis
6	Replace display with known good display. ***Did you find and repair the condition?***	Go to Step 8	Go to Step 1 and repeat diagnosis
7	Repair, replace, and check all affected power/ground circuits. Check for battery voltage at pins 31 and 32. ***Is there battery voltage at pins 31 and 32 with the ignition on?***	Go to Step 8	Go to Step 1 and repeat diagnosis
8	Update display with newest software available. Refer to the Owner's Manual for instructions on how to update/ reflash software. ***Is display working properly?***	Confirm display operation and continue use.	Go to Step 6
9	1. Test circuit for continuity and/or shorts in wiring. 2. Fix any shorts in the wiring and reinstall new fuse. ***Did you find and repair the condition?***	Go to Step 8	Go to Step 4

TCU TROUBLESHOOTING

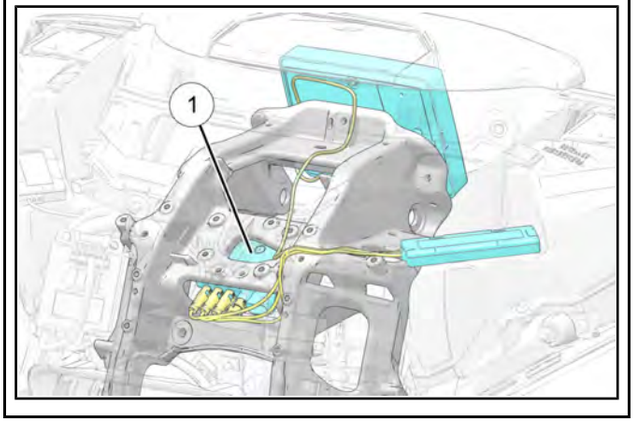
LOCATION

The TCU is located inside the fairing on the fairing tray for CMF, and underneath the fairing bracket for FMF

CMF



FMF



1. Remove Outer Fairing. Reference **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37**.
2. Unplug the GPS and Cell connectors from the TCU ① and display.
3. Plug the GPS / Cell Antenna back into the cell modem and display, making sure connectors are securely seated, and check fro functionality.

NOTICE
Must be in an area with GPS and Verizon 4G cell signal available.

4. If GPS and or cell data is still not present, replace GPS / Cell antenna with new unit.
5. If after replacing the GPS / Cell antenna, there is still no cell data present, move on to TCU troubleshooting (If applicable).

HEADSET TROUBLESHOOTING

If headset is not functioning properly with display:

1. Check volume level on Headset.
2. Ensure Headset has latest software. Visit Headset Manufacturer Website to verify and install most up to date software.
3. Clear all pairings from Headset and re-pair with display
4. Pair Headset with another Bluetooth enabled device and check for proper functionality

ANDROID "OK GOOGLE" ISSUES

1. Ensure Headset and Android phone are paired to the motorcycle.
2. Turn phone screen ON and unlock phone.
3. Press and hold the center button (Mute, Play/ Pause) on the handlebar control.
4. Display should initiate a Voice Command session with phone.
5. Ensure Google App is selected as the default app and that your phone always remembers this selection

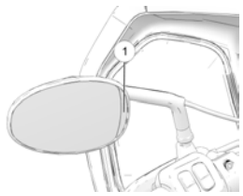
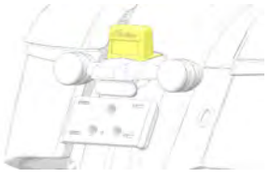
UNCLEAR HEADSET SOUND

1. Unpair and repair headset from Ride Command in bluetooth menu.
2. If this does not resolve the issue, clear all previously paired headsets from Ride Command, and repair the headset.
3. If there is still unclear sound, pair different headset and see if sound quality improves.
4. If sound quality improves, previous headset was malfunctioning.

RIDER ASSIST

BLIND SPOT WARNING

When riding, there is an area behind each side of the motorcycle and rider that is not always visible to the rider even when using the mirrors. These are referred to as the blind spot zones. Blind Spot Warning alerts the rider to vehicles in these blind spots zones. It uses the rear radar to monitor adjacent lanes and activates visual warnings on the display and mirrors when vehicles enter or are approaching the blind spot zones. Blind Spot Warning will only be active above 10 mph (16 km/h). A Blind Spot Warning will not appear if the motorcycle is passing another vehicle faster than 8 mph (13 km/h) relative to the other vehicle.

Rear View Mirrors—Blind Spot Warning Light	
Blind Spot Warning Shown on the Display Screen	
Rear Radar Sensor area	

⚠ WARNING

The Blind Spot Warning is an aid. It does not replace the need for the rider to be aware of all situations when riding.

The rider must always maintain a high level of awareness and concentration while riding, always use the mirrors and check the blind spots. The rider must not solely rely on the Blind Spot Warnings. The rider must also look over their shoulder (head check) prior to overtaking or changing lanes.

The rider is responsible for detecting all other vehicles, estimating the distance between them and the motorcycle, and then maneuvering the motorcycle in a safe and responsible way to avoid any collision.

The rider must also obey all speed limits, observe all road signs and road markings, and react accordingly to any environmental influences such as thick fog, heavy rain, etc.

Operating and riding the motorcycle safely and correctly is always the rider's sole responsibility.

⚠ WARNING

The performance of the rear radar sensor may be affected by smaller vehicles such as bicycles or motorcycles, or vehicles with large flat surfaces such as trailers.

Riders may be warned with a delay, or not at all, due to the time required for the system to calculate and inform the rider of vehicles approaching and entering the blind spot zones at higher speeds.

⚠ WARNING

The rear radar sensor cover may become covered by road dirt, mud, rain, ice, snow, etc.

Always make sure to check and carefully clean the rear radar sensor cover before riding the motorcycle. Ensure only soapy water and a soft sponge are used to clean the rear radar sensor cover and avoid using any abrasive material or chemicals that could damage the cover.

Do not paint over, attach stickers to, or attach other objects to the rear radar sensor.

The rear radar sensor's ability to detect a vehicle in the rider's blind spot may be effected and give incorrect indications. This may lead to a motorcycle accident.

⚠ WARNING

Always make sure that no accessories, luggage, or passenger's items cover or obscure the rear radar sensor cover or sensor range.

When riding with a passenger make sure that their clothing does not overhang the seat and cover the rear radar sensor cover.

The rear radar sensor's ability to detect a vehicle in the rider's blind spot zone will be affected if foreign objects enter or cover the rear radar's field of view and could send incorrect or missing warnings. This may lead to a motorcycle accident.

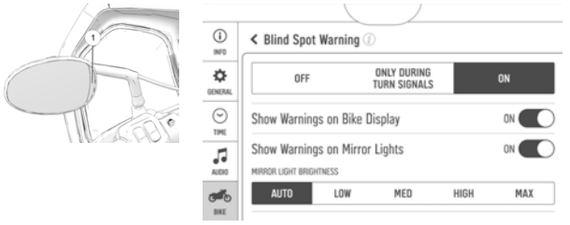
NOTICE

The performance of the rear radar may be affected by incorrectly set rear suspension preload. Refer to the Shock Preload Adjustment section to ensure the rear suspension preload is set correctly for the loading conditions.

BLIND SPOT WARNING SETTINGS

The Blind Spot Warning system can be enabled and disabled manually by the rider.

The mirror light brightness can be changed in the Blind Spot Warning settings. The AUTO setting will continuously adjust the mirror light brightness to account for the ambient light conditions.



There are two levels of warnings when this feature detects a vehicle.

1. Level 1 activates when a vehicle moves into or is approaching the blind spot zone. A warning bar shows on the side of the display and the mirror light activates on the side the vehicle is located.
2. Level 2 activates when a vehicle is in or is approaching the blind spot zone and the rider activates the turn signal on that side of the bike. The car icon in the display warning bar and the mirror light flash.

The ON setting allows both Level 1 and Level 2 warnings. The ONLY DURING TURN SIGNALS setting allows only Level 2 warnings. The OFF setting disables all warnings. Warnings on the bike display or on the mirror can be disabled individually.

Blind Spot Detection will only be active above 10 mph (16 km/h).

TAILGATE WARNING

Tailgate Warning uses the rear radar to monitor the area behind the motorcycle and alerts the rider to vehicles that are following at a close distance. A warning will show on the display when a vehicle is following too close.

Tailgate Warning will only be active above 18 mph (29 km/h).

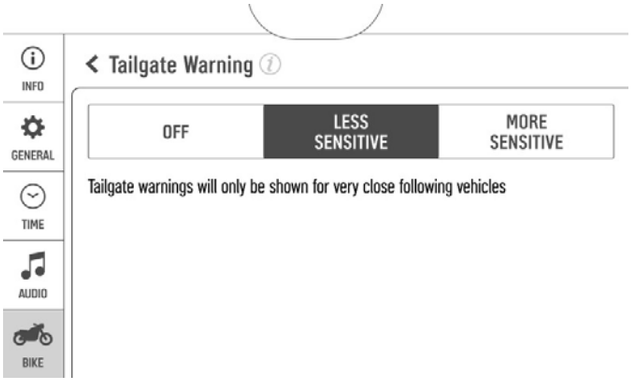
Close following vehicle warning:

Very close following vehicle warning:

NOTICE

When in a group motorcycle ride, this feature may frequently detect motorcycles riding at a close distance. Disable the feature to reduce unwanted warnings.

Less Sensitive	Tailgate warnings will only be shown for very close following vehicles.
More Sensitive	Tailgate warnings will be shown for close and very close following vehicles.
Off	Tailgate warnings are disabled for following vehicles.



REAR COLLISION WARNING LIGHTS

Rear Collision Warning aids in reducing the likelihood of a rear-end collision by flashing lights to warn other vehicles. This feature can be disabled on the Rider Assist menu.

North America Models	Rear saddlebag lights flash 
INTL Models	Turn signal hazard lights flash 

MID-RANGE RADAR (MRR)

MID-RANGE RADAR (MRR) OVERVIEW

OPERATION OVERVIEW

The mid-range range (MRR) detects moving objects, and their relative position, by interpreting reflected radar waves emitted by the MRR. The MRR uses this information for Blind Spot Warning, Tailgate Warning and Rear Collision Warning. The ability for the MRR to detect the position of objects accurately can be influenced by the alignment and the cleanliness of the radar. The radar's performance can be degraded in low visibility conditions such as fog, dust, snow and rain. The area in front of the radar must not be obscured with any foreign object such as accessories or loose clothing, and the radar face must be free of dirt, snow or debris.

The MRR has self-diagnostic features which can detect if it's mis-aligned or it's performance is degraded due to low or obscured visibility.

TROUBLE CODES

See **Mid-Range Radar (MRR) Trouble Codes page 10.157**

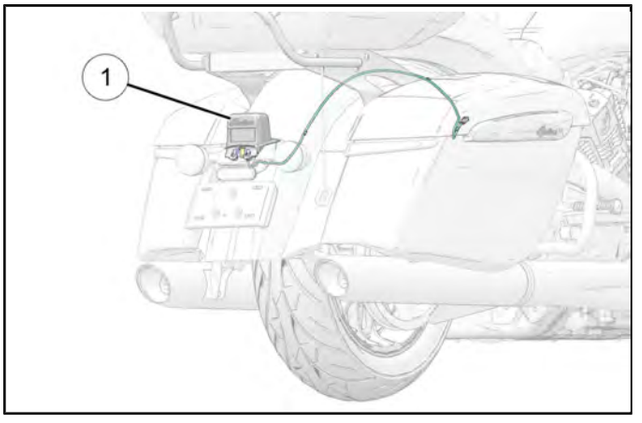
MRR REPLACEMENT

See **Tail / Brake / License Plate Light / Radar, Removal page 10.125**

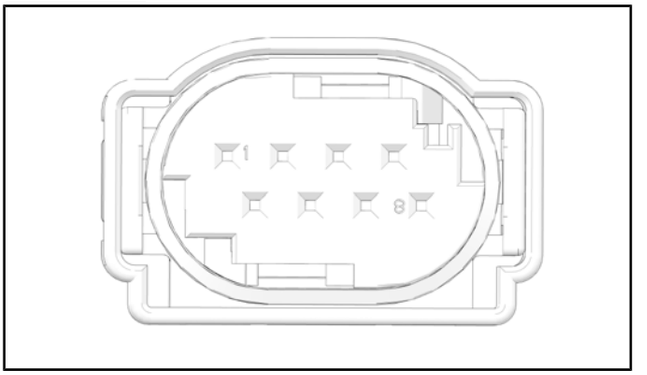
See **Tail / Brake / License Plate Light / Radar, Installation page 10.127**

LOCATION

The MRR ① is located at rear of the bike above the taillight unit



MRR PINOUT



PIN	FUNCTION
1	Ground For Module
2	CAN B High
3	CAN B Low
4	–
5	–
6	–
7	–
8	Voltage Supply

MID-RANGE RADAR (MRR) TROUBLE CODES

Fault Name	DTC Code	FTB	Condition	Fault Setting	Service Action
Rear Radar Hardware Malfunction	C111C	04	Bad Intelligent Device	Internal HW Malfunction	Replace Module
Rear Radar Software Malfunction	C111C	57	Bad Intelligent Device	Internal SW Malfunction	Replace Module
Rear Radar Sensor Interference	C111C	92	Condition Exists	Radar Interference Detected	Check Radar Installation or Replace Module
Internal Voltage Out Of Range	C111C	1C	Voltage Out of Range	Internal Voltage is Below 7V or Greater than 19V.	Check Battery or Alternator Voltage, or Replace Module
System Voltage Out Of Range	C1063	1C	Voltage Out of Range	Input Voltage is Below 9V or Greater than 16V.	Inspect Battery or Alternator Voltage
Internal Temperature High	C111C	98	Temperature Too High	Internal Temperature is Too High	Allow Module to Cool Down, or Replace Module
Implausible Temperature	C111C	64	Bad Intelligent Device	Implausible Temperature Measurement	Replace Module
Rear Radar CAN Bus Off	C111C	09	Condition Exists	CAN Connection Malfunction	Check Connection to Harness
Rear Radar Misalignment	C111C	78	Condition Exists	Radar is Misaligned Horizontally Greater than 3.5 deg or Excessive Vertical Misalignment	Check Radar Installation and Mounting Bracket
Rear Radar Obstructed	C111C	97	Condition Exists	Radar Obstructed by Foreign Object or Component	Clean Rear Radar Face and Check for Objects in Field of View of Radar
Incorrect Tire Diameter Detected	C0078	4A	Condition Exists	Measured Wheel Speed is Out of Tolerance compared to Detected Speed by Radar	Check Correct Tire Sizes and Model are Fitted
Invalid Data Received By Rear Radar	U05B7	81	Data Erratic, Intermittent Or Incorrect	Incorrect or Implausible Data Received	Check Vehicle Condition and Faults

Rear Radar Communication Receive Error	U25D4	87	Abnormal Update Rate	Erratic or Missing CAN from ABS Module	Check Connection to ABS or ABS Operation
ISC Communication Fault	U1055	87	Abnormal Update Rate	Erratic or Missing CAN from Display	Check Connection to Display or Display Operation
Rear Radar Communications Receive Error	U0100	87	Abnormal Update Rate	Erratic or Missing CAN from ECM	Check Connection to ECM or ECM Operation
Rear Radar Communications Receive Error	U25D4	41	Checksum Error	Erratic or Missing CAN from ABS Module	Check Connection to ABS or ABS Operation
Rear Radar Communications Receive Error	U0100	41	Checksum Error	Erratic or Missing CAN from ECM	Check Connection to ECM or ECM Operation
Rear Radar Communications Receive Error	U25D4	82	Counter Error	Erratic or Missing CAN from ABS Module	Check Connection to ABS or ABS Operation
Rear Radar Communications Receive Error	U0100	82	Counter Error	Erratic or Missing CAN from ECM	Check Connection to ECM or ECM Operation
Rear Radar Communications Receive Error	U25D4	02	Data Erratic, Intermittent Or Incorrect	Incorrect or Implausible Data Received from ABS	Check Connection to ABS or ABS Operation

CRUISE CONTROL

CRUISE CONTROL OVERVIEW

The Indian Motorcycle cruise control system operates in conjunction with the Electronic Throttle Control (ETC) eliminating the need for a conventional actuator / cable assembly. The Engine Control Module (ECM) uses several inputs to determine the position of the ETC in order to maintain the desired vehicle speed. Momentary signals are sent to the Vehicle Control Module (VCM) from the right hand switch cube based on operator input. The VCM converts these operator inputs to CAN and relays the message to the Engine Control Module (ECM).
Cruise control only operates in gears 4 — 6.

Cruise Related Control Modules:

- Electronic Throttle Control (ETC)
- Engine Control Module (ECM)
- Anti-Lock Brake Control Module

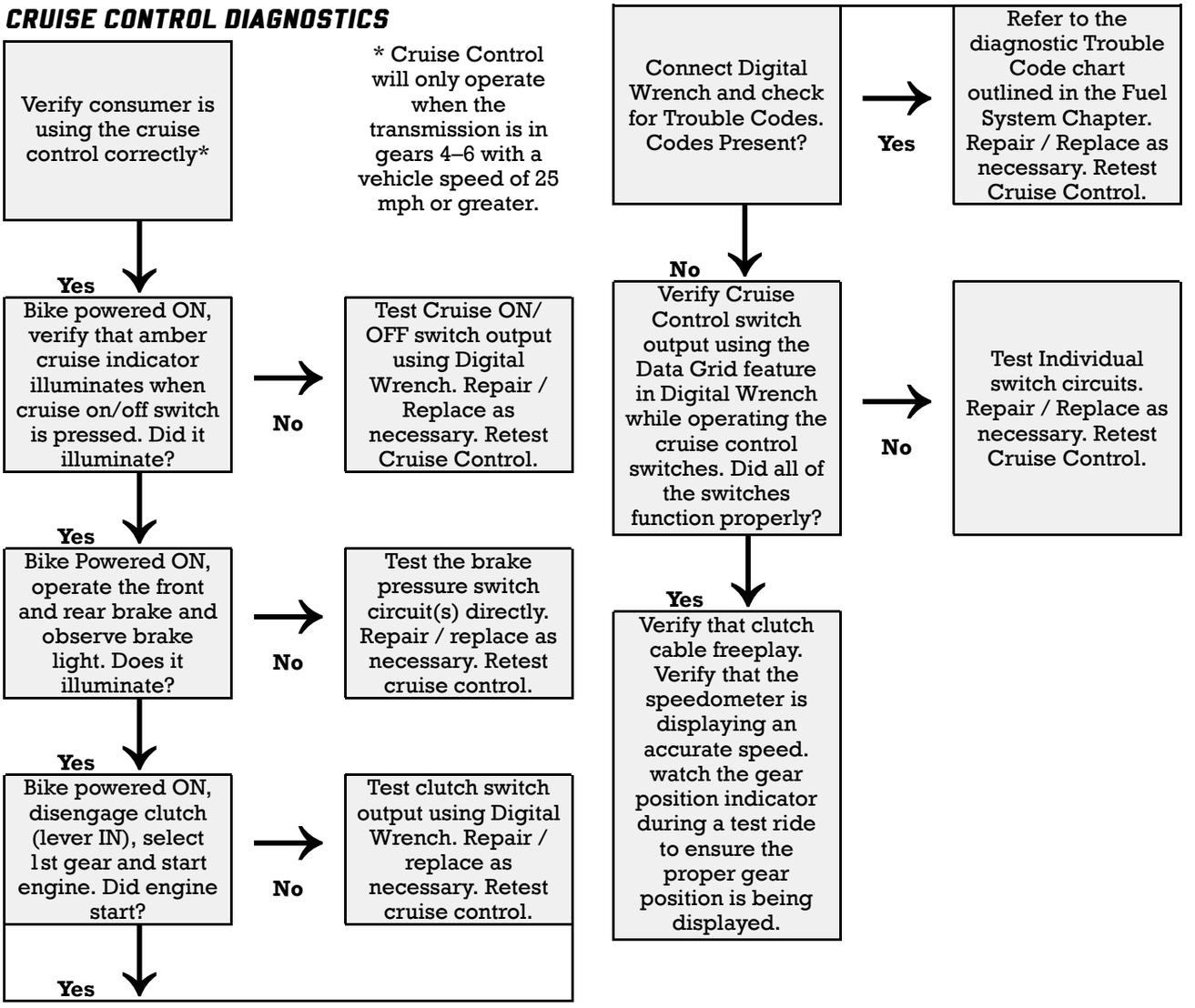
Cruise Related Inputs / Outputs (RH Switch Cube):

- CRUISE ON / OFF — Right hand switch cube module to ECM via CAN
- CRUISE RES / ACC — Discrete input to the VCM then CAN message to ECM
- CRUISE SET / DEC — Discrete input to the VCM then CAN message to ECM

Cruise Related Inputs / Outputs (other controls):

- Brake Pressure Switch (Front & Rear) — Discrete input to ECM
- Clutch Switch — Clutch switch is wired to left hand switchcube input to the CAN and ECM
- Vehicle Speed (Wheel Speed Sensors) — Discrete inputs to ABS module and then CAN message to ECM

CRUISE CONTROL DIAGNOSTICS



SECURITY ALARM

Overview

A 2–button key fob is required for use of the security alarm.
To activate the security alarm, double push the lock button on the key fob. The horn will sound briefly to confirm that the alarm is activated.
With the key fob within range, the following actions will deactivate the alarm.

NOTICE

The security light and / or power switch will turn on briefly until the key fob is detected. If the key fob is not detected within 20 seconds, the horn (alarm) will sound repeatedly for 60 seconds.

- Press the unlock button on the key fob.
- Press the power switch on the center console.
- Press the starter button.
- Press the lock / unlock switch on the center console.
- Move the motorcycle to the fully upright position from leaning on sidestand. (The horn will sound repeatedly if the key fob is not detected within 5 seconds)

NOTICE

Each time the alarm has been deactivated, a double press of the key fob lock button will reactivate.

GUIDED DIAGNOSTICS

NOTICE

Things to consider prior to performing the following diagnostic tests:

- When was the last time the battery was disconnected?
- How many hours are on the vehicle (Fairing bikes only)?
- Has any servicing been done to the bike recently?
- Any other notable events occur before or during the start of this issue?

Bike Does Not Authenticate with Key Fob

A: Does the LED on the key fob blink when the bike is turned on?

B: Does the LED on the key fob blink when a key fob button is pressed?

C: Does the bike lock or unlock when the key fob button is pushed (Fairing bikes only)?

D: Does the Tire Pressure Monitoring System work when the PIN code is used?

A	B	C	D	
No	No	No	No	Look at WCM (1,2)
No	Yes	NA	NA	Antenna or serial number in key fob (2,3)
No	No	NA	NA	Bad key fob battery or key fob (1)
No	Yes	Yes	Yes	Look at 125 kHz antenna (3)
Yes	Yes	NA	NA	Connect to bike with Digital Wrench (2)
Yes				This means the 125 kHz antenna is working properly This means the correct serial number is stored in the WCM
		Yes		This means the correct serial number is stored in the WCM This means the key fob counter is working properly This means the 433 MHz (315 MHz in Japan) receiver is working properly
			Yes	This means the 433 MHz receiver is working properly
		No	Yes	Look at key fob battery and serial number in Digital Wrench (2)
Yes	Yes	No	Yes	Connect to bike with Digital Wrench (2)

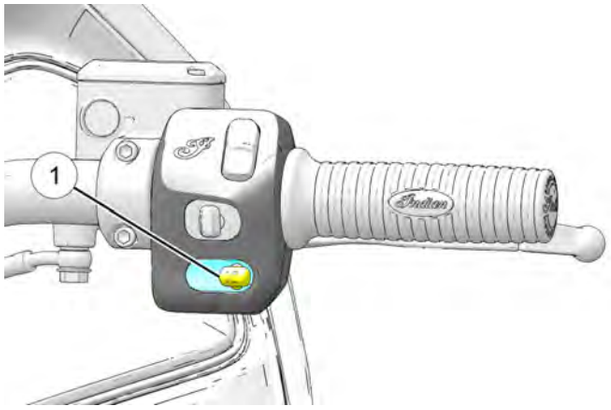
Troubleshooting

1. Remove the key fob battery and test voltage.
   - Is the battery voltage OK?
   - **YES:** Install battery and retest authentication.
   - **NO:** Proceed to next step.

2. Replace key fob battery with new cell.
   - Did this fix the issue?
   - **YES:** No further action required.
   - **NO:** Connect to Digital Wrench and write a new key fob serial number in Slot 2.

3. Connect to Digital Wrench and verify the correct WCM software is installed.
4. Verify that serial numbers match the key fob being used.
5. Inspect the 125 kHz antenna for broken wires.

POWER WINDSHIELD



POWER WINDSHIELD OPERATION

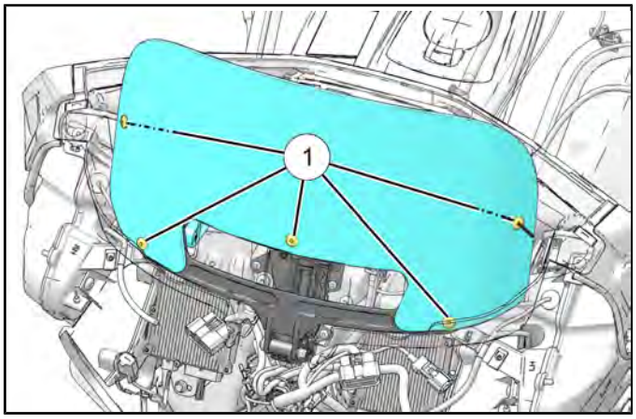
The windshield switch provides CAN data to the VCM 2. The VCM interprets, commands, and moves the windshield accordingly. The windshield command stops when high current at the end of travel is detected. Commands in the same direction will be prevented for a few seconds once end of travel is detected. If double pressed in one direction, it will automatically move the windshield to end of travel in that direction. An additional press in either direction will cancel auto windshield motion.

POWER WINDSHIELD MOTOR, REMOVAL

IMPORTANT

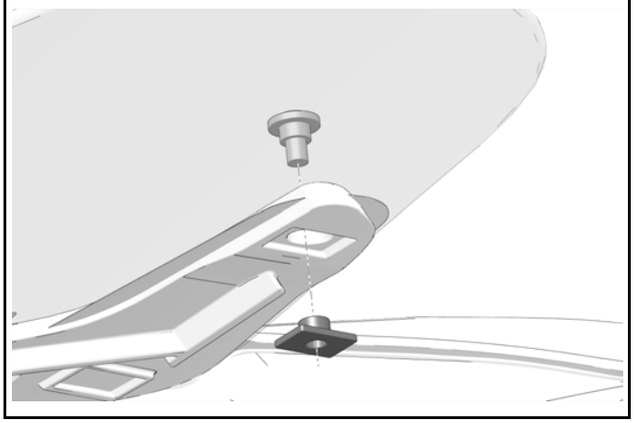
Ensure the windshield is in the full upright position on CMF, and full downward position for FMF.

1. Remove the gauge hood and top visor. See **Fairing Disassembly page 7.63** or **Fairing Disassembly and Removal (Fork Mounted) page 7.37**
2. Remove windshield by removing its fasteners ①.



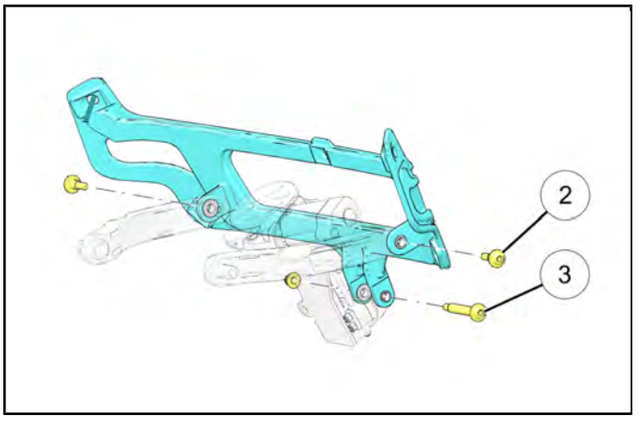
NOTICE

When removing the five windshield fasteners be sure to capture the T-nuts as they are not captive.



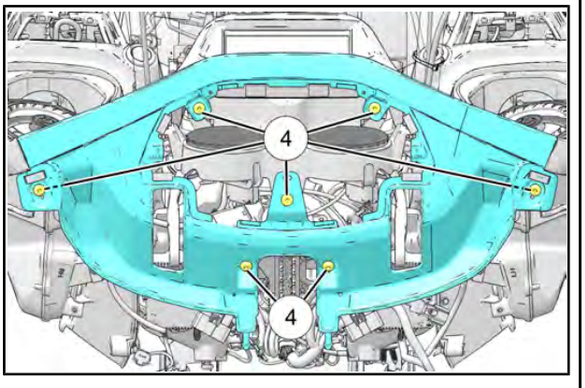
10

3. For CMF, remove windshield support by removing link fasteners ②. Remove windshield support to windshield motor fastener ③. Reverse order for FMF. Retain the washers for reinstallation.

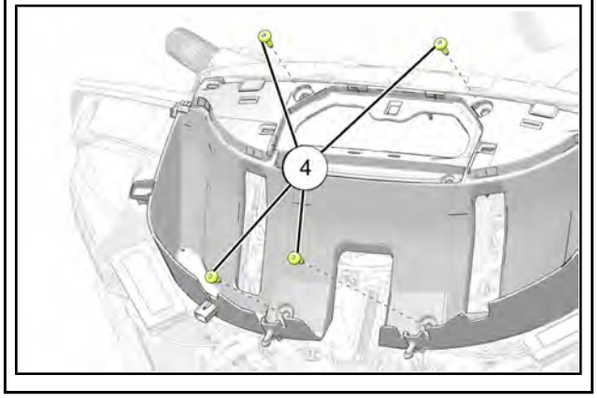


4. Remove fasteners ④ securing visor top and remove.

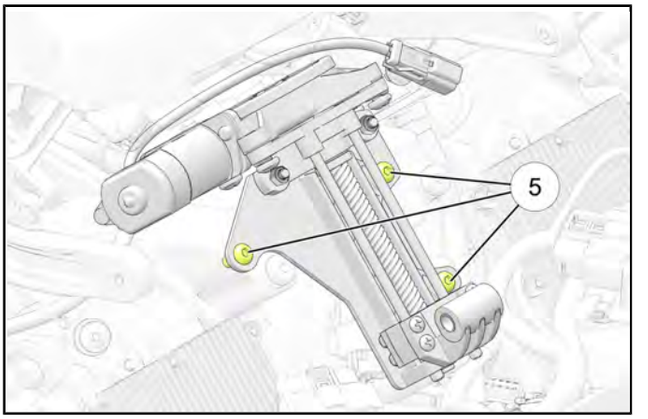
CMF



FMF



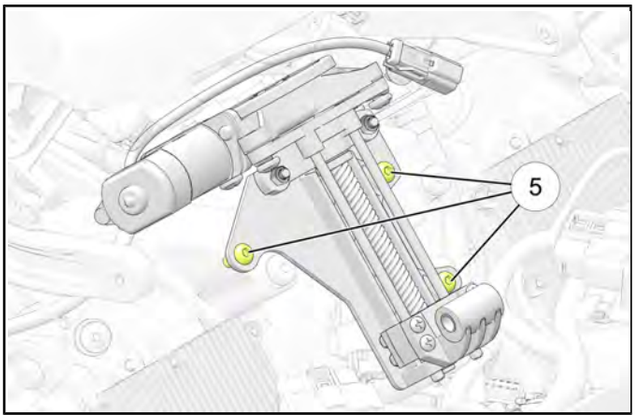
5. Remove the three fasteners ⑤ securing the windshield lift motor to the mounting bracket.



6. Disconnect the electrical connector and remove motor assembly.

POWER WINDSHIELD MOTOR, INSTALLATION

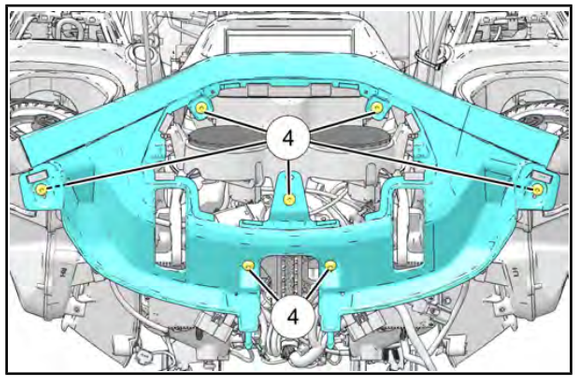
1. If the limiter switch is being replaced, attach the switch to the motor assembly at this time.
2. Plug the electrical connector into the windshield lift motor assembly and lower into position.
3. Install motor fasteners ⑤ and torque to specification.



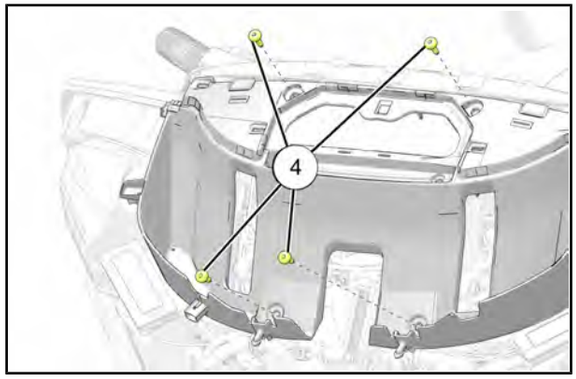
TORQUE
Windshield Motor Fasteners: **88 in-lbs (10 N·m)**

4. Install windshield support and seven fasteners ④. Torque fasteners to specification.

CMF



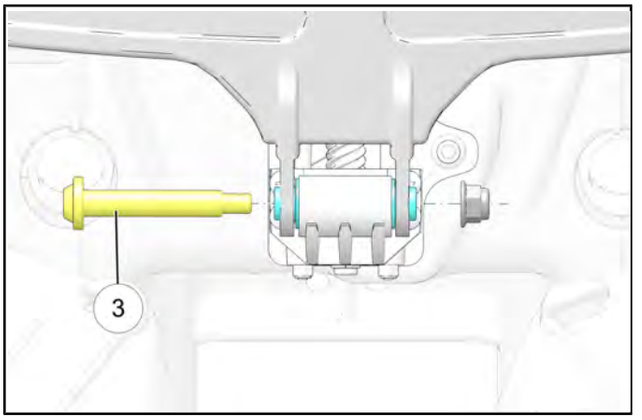
FMF



TORQUE
Windshield Support to Motor Fasteners: **35 in-lbs (4 N·m)**

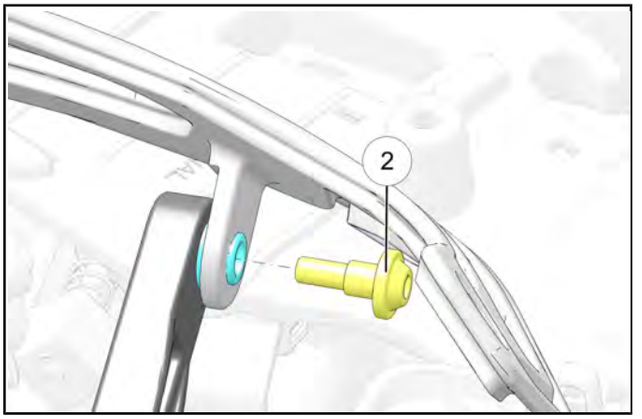
5. For FMF, move motor to the upper position before continuing.

6. Loosely install windshield support to windshield motor fastener ③.



NOTICE
Make sure the spacers are retained in place between the bracket and windshield motor during installation.

7. Install wave washer, then loosely install windshield support to link fasteners ②.

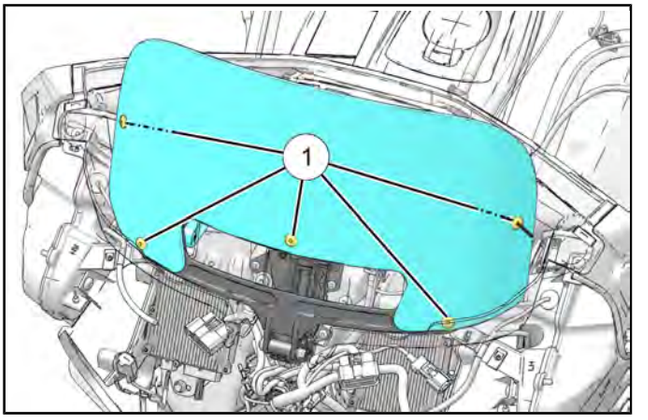


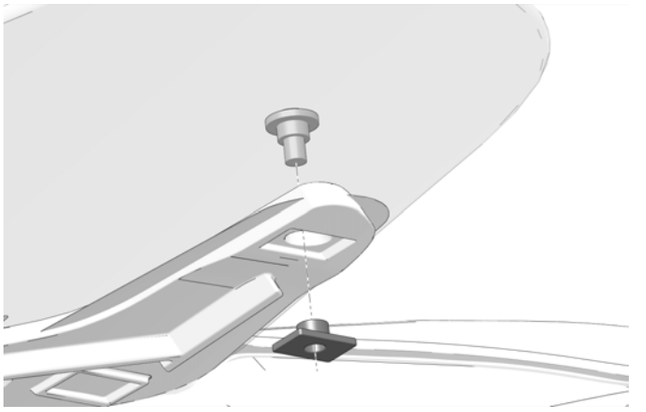
NOTICE
Make sure the spacer is retained in place between the bracket and support link during installation.

8. Torque fasteners windshield support to link fasteners .

TORQUE
Windshield Support to Link Fasteners ②: **88 in-lbs (10 N·m)** Windshield Support to Motor Fastener ③: **88 in-lbs (10 N·m)**

9. Install the windshield, T-nuts and its fasteners ①.



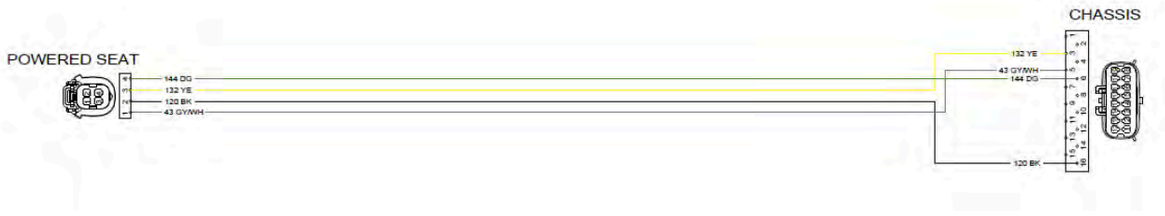


TORQUE
Windshield Fastener: **35 in-lbs (4 N·m)**

10. Verify the windshield moves up and down through the travel range.

SEAT / TRUNK

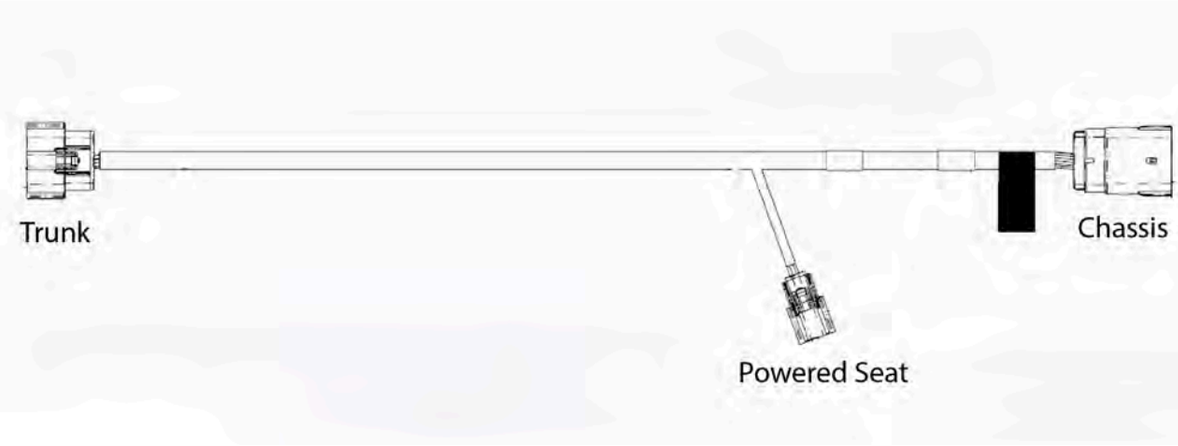
HEATED / COOLED SEAT



WIRE COLOR	FROM COMPONENT	PORT NUMBER	TO COMPONENT	PORT NUMBER	FUNCTION
GY/WH	Chassis	5	Powered Seat	1	Accessory Switched Output
BK	Powered Seat	2	Chassis	16	Rear Amp Ground
YE	Chassis	3	Powered Seat	3	CAN C High
DG	Chassis	6	Powered Seat	4	CAN C Low

SEAT / TRUNK HARNESS

Touring Models



WIRE COLOR	FROM COMPONENT	PORT NUMBER	TO COMPONENT	PORT NUMBER	FUNCTION
RD/WH	Chassis	1	Trunk	1	Lock Motor Feed
OG/WH	Chassis	2	Trunk	2	Unlock Motor Feed
OG/WH	Chassis	12	Trunk	12	Trunk Speaker Power
BK/WH	Chassis	13	Trunk	13	Trunk Speaker Ground
GY/WH	Chassis	5	Powered Seat	1	Accessory Switched Output
BK	Trunk	15	Chassis	15	Trunk Ground
DG	Chassis	8	Trunk	8	Rear left Speaker Positive
DG/BK	Chassis	9	Trunk	9	Rear left Speaker Negative
VT	Chassis	10	Trunk	10	Rear Right Speaker Positive
VT/BK	Chassis	11	Trunk	11	Rear Right Speaker Negative
WH/OG	Chassis	4	Trunk	4	Trunk Tail Light Power
BK	Powered Seat	2	Chassis	16	Rear Amp Ground
YE	Chassis	3	Powered Seat	3	CAN C
DG	Chassis	6	Powered Seat	4	CAN C
YE/RD	Chassis	7	Trunk	7	Trunk Brake Lamp Feed
GY/RD	Trunk	14	Chassis	14	Accessory Constant Fuse Output

TELEMATIC CONTROL UNIT (TCU)

TELEMATIC CONTROL UNIT (TCU) OVERVIEW

OPERATION OVERVIEW

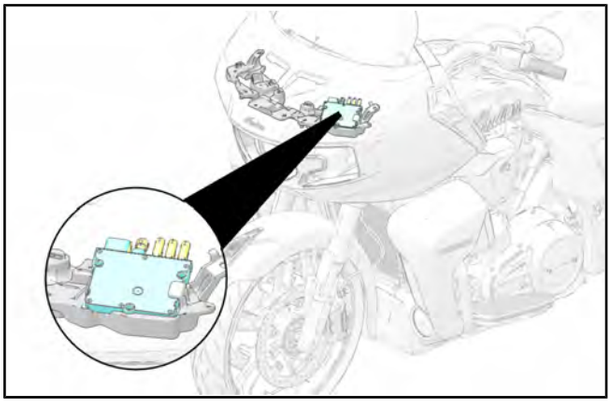
The TCU controls the Ride Command and phone functions on the display.

LOCATION

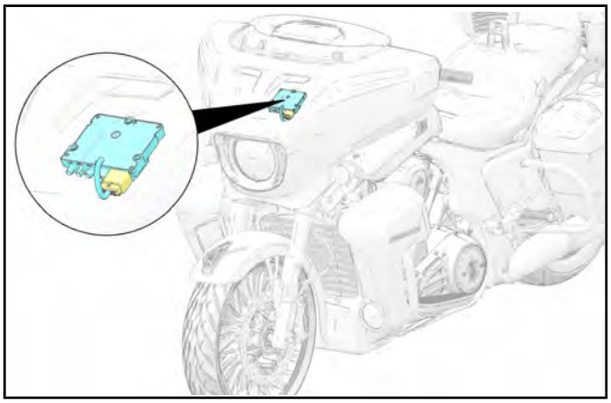
The TCU is located inside the fairing on the fairing tray for CMF.

The TCU is located inside the fairing underneath the fairing casting for FMF.

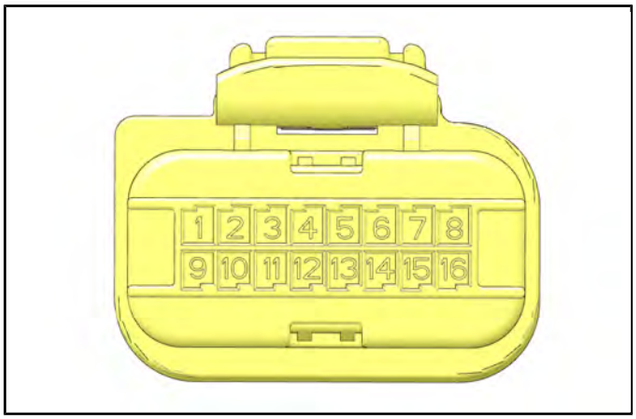
CMF



FMF



PINOUT



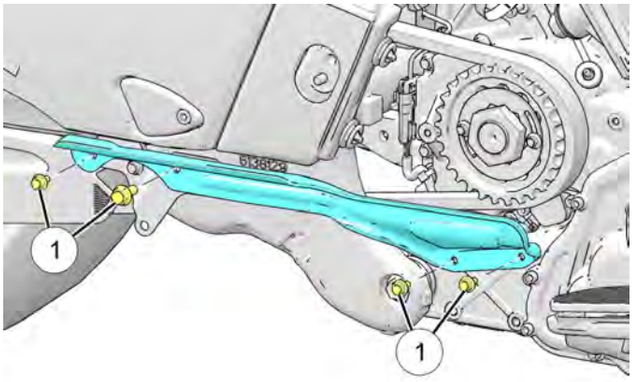
PIN	FUNCTION
2	VCM Accessory Power Out
3	Instrumentation Fuse Output
4	CAN D High
11	Ground
14	CAN D Low

GEAR POSITION SWITCH

GEAR POSITION SWITCH REPLACEMENT

REMOVAL

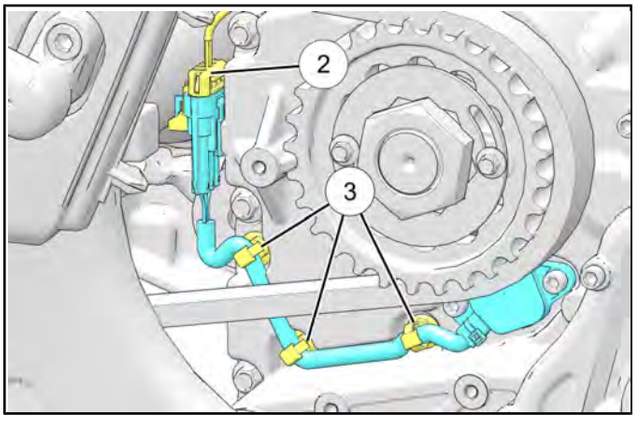
1. Remove drive sprocket shield. See **Drive Sprocket Removal page 8.65**.
2. Remove the transmission shield by removing its fasteners ①.



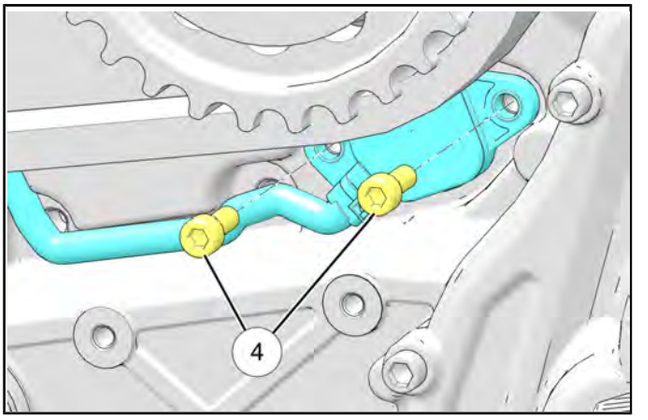
3. Disconnect gear position switch electrical connection ②.

IMPORTANT
Release connector from mounting clip by using a small flat screwdriver to lift the tab on the fir clip.

NOTICE
Cut cable ties from fir tree clips to release harness. If clips are pried from the engine they must be replaced with new clips.



4. Disconnect routing clips ③.
5. Remove fasteners ④ securing gear position switch.



6. Remove the gear position switch o-ring.

NOTICE
Replace the cable ties securing harness to the three fir tree clips.

INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Gear Position Sensor Fastener: **44 in-lbs (5 N·m)**

TORQUE
Drive Sprocket Shield Fastener: **88 in-lbs (10 N·m)**

GEAR POSITION SWITCH TEST

Symptoms of a faulty gear position switch may include:

- Starter motor does not operate when transmission is in neutral,

BUT

- Starter motor does operate when the clutch is pulled in.

1. Access the gear position switch electrical connector. Reference **Gear Position Switch Replacement page 10.170**.
2. Place the ignition switch in the RUN position to power up the electrical system.
3. Place engine stop switch in the RUN position.
4. Shift transmission into Neutral.
5. Observe Neutral indicator light.
6. If indicator is not lit with transmission in neutral:

- Place the RUN/STOP switch in the STOP position and turn motorcycle power off.
- Roll the motorcycle forward and back enough to verify that it is in neutral.

7. Backprobe the connector and view voltage with a multi-meter.

LETTER	WIRE COLOR	FUNCTION
A	RED	VCC
B	BLUE	GROUND
C	BLACK	GEAR

8. Compare the voltage of each gear with the table below.

GEAR	VOLTAGE RANGE
1	0.40–0.72 V
N	0.91–1.09 V
2	1.29–1.52 V
3	1.93–2.13 V
4	2.68–3.05 V
5	3.40–3.77 V
6	4.12–4.52 V

IMPORTANT
Voltage can also be read in digital wrench.

9. If any of the readings are not within the specified parameters, replace or repair wiring as necessary.

INERTIAL MEASUREMENT UNIT (IMU)

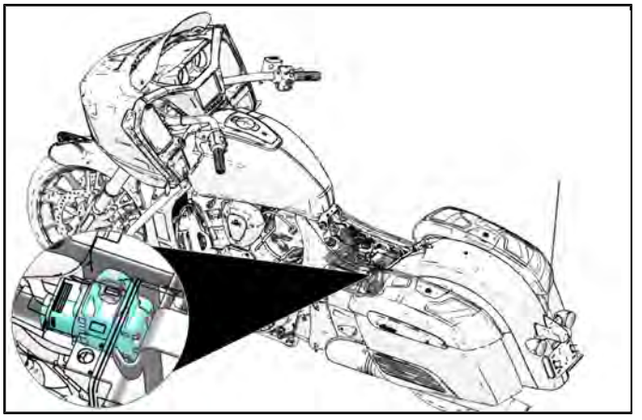
IMU OVERVIEW

OPERATION OVERVIEW

The Inertial Measurement Unit (IMU) uses a six-axis accelerometer/gyro which sends out acceleration data in three linear and three rotational directions. The ABS module uses this information to determine optimal braking and traction control based on lean angle, cornering, and other factors of what the bike is doing. The IMU has some self-diagnostic features which can relay to the ABS module, the ABS module interprets these signals and can log an error code if there is an issue.

LOCATION

The IMU is located near the ABS module on the under-seat bracket.

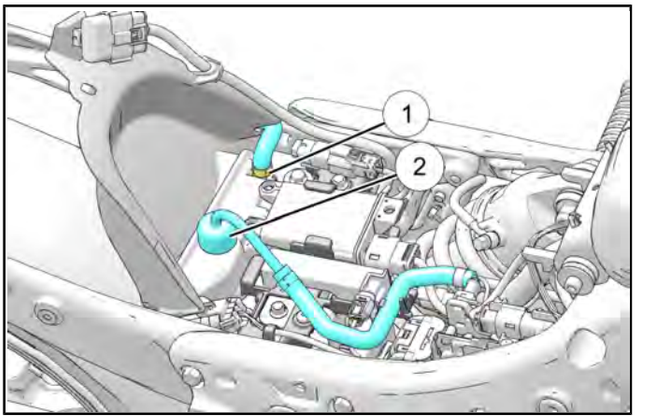


PINOUT

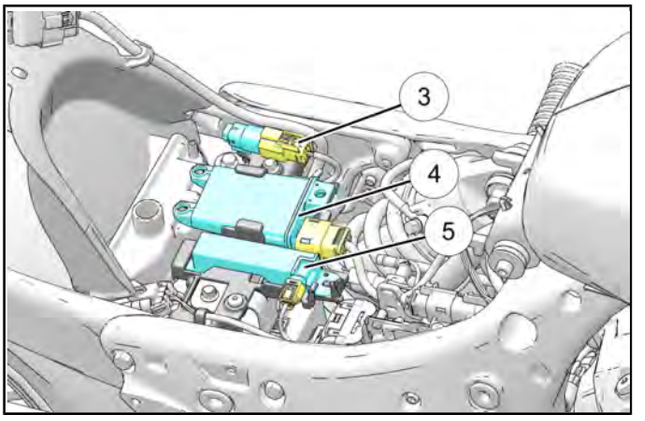
PIN	WIRE COLOR	FUNCTION
1	BK	GROUND
2	DG/BN	CAN B LOW
3	YE/BN	CAN B HIGH
4	PK/GN	UBAT

IMU REPLACEMENT

1. Remove seat. See **Seat Removal page 7.95** or **Seat Removal (Touring) page 7.96**.
2. Disconnect the negative battery cable.
3. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
4. Remove ECM. See **ECM Removal page 4.63**.
5. Remove coolant overflow line ① and coolant pickup line ② from recovery bottle..



6. Disconnect electrical connection ③.



7. Disconnect WCM ④ electrical connector and remove.
8. Disconnect antenna module ⑤ electrical connector and remove.

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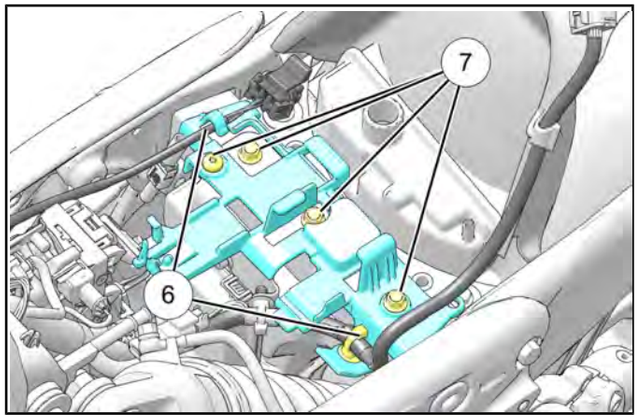
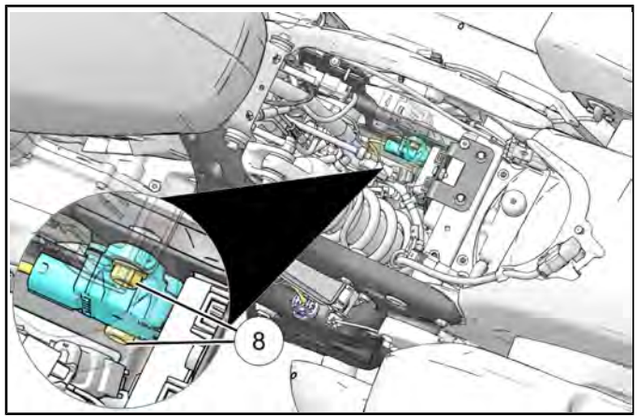
9. Disconnecting the wiring retained ⑥ to under-seat wire bracket.



10. Remove under-seat wire bracket by removing its fasteners ⑦.
11. Disconnect IMU electrical connector.
12. Remove IMU fasteners ⑧.



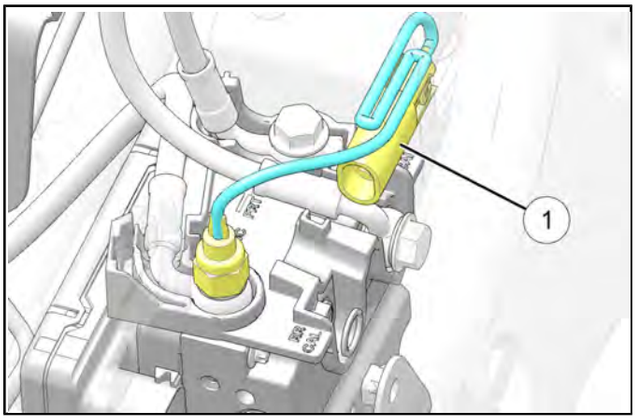
13. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
IMU Fastener: **62 in-lbs (7 N·m)**

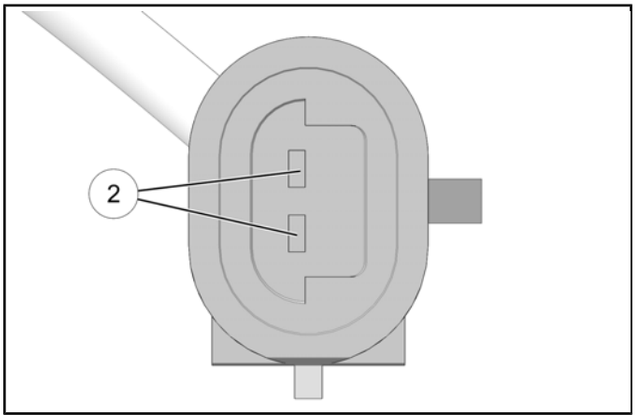
SWITCH TESTING

BRAKE LIGHT SWITCH TEST

1. Access the ABS module by performing steps 1-10 of ABS module replacement. Reference **ABS Module Replacement page 9.35**.
2. Locate the brake light switch connectors ① on the ABS module and disconnect.



3. Set multi meter to measure resistance.
4. Connect meter leads to each terminal of the rear brake switch ② .



5. Apply the rear brake.

Resistance Specification:
Continuity with pedal / lever depressed

IMPORTANT
With the system not pressurized, the meter should read 2k Ohms.

CLUTCH SWITCH TEST

1. Disconnect clutch switch 2 pin connector. Measure the resistance of the switch with lever pulled to handlebar (less than 1 Ohm resistance) and with lever released (OL).

SIDE STAND SWITCH TESTING

1. Inspect side stand. Be sure that when the side stand is fully retracted (UP) that the switch plunger is extended and that when the side stand is extended (down) the plunger is depressed.
2. Remove the voltage regulator bracket to access the side stand switch connector and disconnect. See **Regulator / Rectifier Replacement page 10.41**.
3. Set multi meter to measure resistance and insert meter leads into appropriate jacks.
4. Place one meter lead onto each of the side stand switch connector pins.
5. Read resistance with the side stand switch plunger depressed and extended.

Switch Depressed (Stand DOWN):
No Continuity (OL)
Switch Extended (Stand UP):
Continuity (Less than 1Ω)

ELECTRICAL DIAGNOSTICS

ELECTRICAL SERVICE NOTES

Keep the following notes in mind when diagnosing an electrical problem.

- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a low resistance value (under 10 Ohms), remember to subtract meter lead resistance from the reading. Connect leads together and record the resistance. The resistance of the component is equal to tested value minus the lead resistance.
- Become familiar with the operation of your meter. Be sure leads are in the proper jack for the test being performed (i.e. 10A jack for current readings). Refer to the Owner's Manual included with your meter.
- Voltage, amperage, and resistance values included in this manual are obtained with a Fluke™ 77 Digital Multimeter **(PV-43568)**. This meter is acceptable for use when diagnosing electrical problems. Readings obtained with other meters may differ.
- Pay attention to the prefix on the meter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate component to be tested. Disconnect wire harness or power supply.

DIGITAL MULTI-METER (DMM) NOTES

Polaris advises to only use a high quality DMM that meets the same standards as the Fluke™ 77 (PV-43568) for electrical testing.

Unless you are very familiar with Ohm's Law, and have complete information about the circuit you are trying to diagnose, test lights are likely to provide results that would be misleading. This is especially true if any solid state component is involved, where you will almost certainly not have complete circuit information.

Polaris also specifically advises against the use of other circuit testing devices, including but not limited to:

- Short finders
- Simplified circuit testers
- Fuse piggy-back devices

Testers beside a DMM will only work in one scenario, and slight variables can provide you with misleading results. The testing practices described in this chapter are more certain and rely only on the DMM and your knowledge.

STATIC AND DYNAMIC TESTING

There are many methods for testing a DC circuit. These methods fall into one of two categories, either static or dynamic.

STATIC TESTING

The two most common forms of static testing are:

- Resistance testing (the Ohms setting on your DMM)
- Measuring voltage with the circuit open, such as when the harness connector is off a sensor you are testing. This is commonly referred to as measuring "Available Voltage".

These two tests will help you find the majority of electrical issues. If they do not, we must remember that static circuit testing does not take into account how current actually flows in that circuit. That is only accomplished with dynamic testing.

Before attempting dynamic testing (as it is intrusive on sealed connectors and damage could be done if not careful), verify the following:

- Static voltage testing advised for that circuit has been completed, and is in spec.
- All associated circuits have under 1 ohm of resistance from end to end. **Testing Continuity / Resistance page 10.177**
- All associated circuits have no shorts to ground. **Testing For A Short To Ground page 10.178**
- All associated circuits have no shorts to voltage. **Testing For A Short To Voltage page 10.179**

DYNAMIC TESTING

There are two types of dynamic testing we will advise to use when diagnosing electrical concerns:

- Current flow testing (Amperage) **Testing Current Flow (Amperage) page 10.181**. Measuring Amperage is not a common practice, as you will not typically have a spec to compare your reading to. Also, many components on this machine flow over 10 Amps, which will blow the majority of DMM fuses. The exception to this is a parasitic draw test refer to **Current Drain Inspection page 10.35**.
- Measuring voltage drop. Performing this test correctly will give you understanding of how electrical pressure (voltage) varies in a circuit as current is flowing. **Testing Voltage Drop page 10.183**

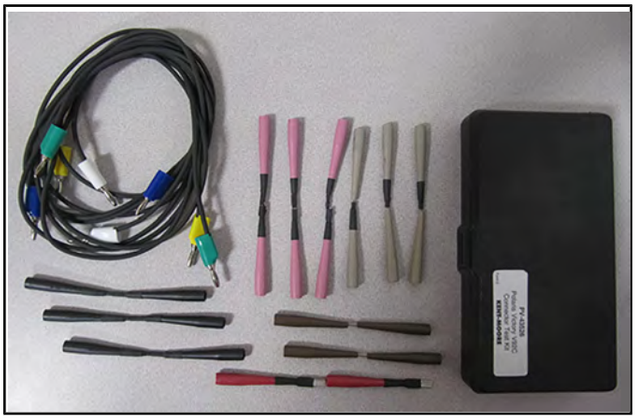
CONNECTOR PROBING GUIDELINES

FRONT PROBING

Front probing is accomplished by pulling the harness connector from the component, and then taking a measurement from the terminal face. This is the measurement taken in most situations.

The terminals in electrical connectors are small and fragile. Do not probe directly with your meter leads, as the meter leads are larger than almost all terminals. Probing with a meter lead will likely damage the terminal by spreading it beyond its design limits, causing no tension. If there is no tension, there will be either no connection or a poor connection.

To avoid causing damage, use of the appropriate adapters is required. Most terminals used on Polaris machines can be tested using terminal test kit PV-43526. It includes male and female adapters that can be plugged into banana connectors to adapt to your meter.



PV-43526 adapters are also used as known good terminal drag testers. Insert the male tester terminal into the female connector on the harness. There should be a noticeable amount of force to install and remove the tester, and you should be able to tip the harness connector with the tester hanging from the connector, and not have the tester fall out.

If very little or no resistance is felt, or if the tester falls out when the connector is held upside down, this is an indication that the female connector in the harness has insufficient tension and will cause connection issues. Replace the harness, or service it by replacing the terminal or attempting to adjust/tighten the tang in the female terminal.

For a video demonstration, scan the QR code below, or right click it and select "open in new tab."

BACK PROBING

Back probing is typically not advisable on sealed connectors because it can easily cause damage to the wire, terminal, connector body, or body to wire seal.

NOTICE
There are commercially available back probe kits. Fine, narrow needles with no coating to block current flow also work well for back probing.

If back probing must be done to see voltage drop while current is flowing in the circuit (dynamic testing), make sure it is done only on connectors that are large enough to accommodate the probe. Make sure back probing is done gently and carefully. Make sure no damage has been done after probing.

For a video demonstration, scan the QR code below, or right click it and select "open in new tab."

BREAK OUT

This is a method of front probing to achieve the goal of back probing, which is to measure the circuit while it is functioning.

You can use test probe kit PV-43526, test leads, and electrical tape to create a bridge with exposed testing areas to have everything exposed but still working.

IMPORTANT
Use electrical tape to cover the exposed conductive parts of the circuit, mainly the clamps of your test leads. If they contact each other, circuit or component damage could occur from a short.

TESTING CONTINUITY / RESISTANCE

The ohmmeter function of a digital multimeter (DMM) is one of the first tests when troubleshooting an electrical issue. It is especially convenient when the wiring diagram provides a resistance spec for the component in the circuit you are diagnosing. It can give a good indication if a part needs to be replaced, or if there might be another circuit issue.

Using the following points in conjunction with the DMM owner's manual will make sure the resistance test is always accurate:

- Only measure resistance on an isolated part of the circuit. This means if testing internal resistance of a component, it cannot be connected to the harness. If measuring a wire (typically from the ECU to a sensor), both the sensor and ECU would need to be unplugged. Most ohmmeters provide a precise amount of current to determine resistance. Any other sources will cause an inaccurate reading.
- Make sure there is good contact by using the proper terminal adapters. **Connector Probing Guidelines page 10.176**
- If not using a self-ranging meter, double check the range setting.
- If continuity is under 1 ohm, leave the harness disconnected and move on to **Testing For A Short To Ground page 10.178** and **Testing For A Short To Voltage page 10.179.**

For a video demonstration, scan the QR code below, or right click it and select "open in new tab."

TESTING FOR A SHORT TO GROUND

Shorts to ground happen when the current flowing in a given circuit bypasses the load. The current flowing from B+ finds an easier way to return to ground (B-), so much more of it can flow than the circuit is designed for. This causes the circuit's protection device (either a fuse or circuit breaker) to open, protecting the circuit from damage.

There are many possible causes of a short to ground, here are some:

- The harness rubbing against a component that is grounded, such as the frame, chassis component, or engine.
- A component's internal circuitry contacting its case.
- Wire-to-wire chaffing causing contact with the conductor of a ground side circuit.
- Corrosion/moisture in a component providing a ground path.
- Moisture in a connector body providing a ground path.

NOTICE
This test is typically done right after checking continuity from sensor to ECU when diagnosing an EFI DTC. It can also be used to help diagnose concerns about blowing fuses. Make sure the concern can be duplicated before testing so that test results point you in the right direction.**Testing for Intermittent Conditions page 10.180**

TESTING PROCEDURE

1. Consult the wiring diagram. Determine which circuit you will be testing.
2. Make sure that any static voltage checks advised in relation to the DTC or concern you are diagnosing have been performed and are in spec.
3. Make sure you have checked continuity of the circuit. **Testing Continuity / Resistance page 10.177**
4. Make sure that neither end of the circuit is connected.
5. Set your DMM to Ohms.
6. Connect one meter lead securely to the battery negative post.
7. Connect the other lead to either end of the disconnected circuit. Make sure you are using the correct adapter.**Connector Probing Guidelines page 10.176**
8. If there is continuity, the harness is damaged and should be repaired or replaced.
9. If the DMM reads OL, there is no short to ground. Leave the harness disconnected on both sides, and proceed to check for a short to voltage. **Testing For A Short To Voltage page 10.179**

For a video demonstration, scan the QR code below, or right click it and select "open in new tab."

TESTING FOR A SHORT TO VOLTAGE

There are three possible short to voltage causes:

1. Internal electronic component short.
2. Harness chaffing leading to contact of the circuit being diagnosed to one with B+ or a different reference voltage.
3. Moisture in a connector or component.

TESTING PROCEDURE

1. Consult the wiring diagram. Determine which circuit you will be testing.
2. Make sure that any static voltage checks advised in relation to the DTC or concern you are diagnosing have been performed and are in spec.
3. Ensure you have checked continuity of the circuit. **Testing Continuity / Resistance page 10.177**
4. Make sure you have checked for a short to ground. **Testing For A Short To Ground page 10.178**
5. Make sure that neither end of the circuit is connected.
6. Set your DMM to DC volts.
7. Connect one meter lead securely to the battery negative post.
8. Connect the other lead to either end of the disconnected circuit. Make sure you are using the correct adapter.**Connector Probing Guidelines page 10.176**
9. If there is voltage present, the harness is damaged and should be repaired or replaced. You may need to remove the protective tape and tubing to inspect.
10. If the DMM reads 0 volts, the concern may be in a component related to the circuit. If so, checking internal continuity of non-electronic components may reveal the concern, but diagnosis at this point may require using known good parts.

For a video demonstration, scan the QR code below, or right click it and select “open in new tab.”

TESTING FOR INTERMITTENT CONDITIONS

Intermittent conditions are very difficult to diagnose, as when you are testing the circuit, you may not have the circuit failing to indicate where the issue is. Intermittent electrical failures are almost always related to a poor connection that only goes open in specific situations, such as going over a certain kind of bump, at a certain temperature, or when the machine is torque loaded in one way.

Here is a list of possible failures that can be associated with an intermittent electrical failure:

- Loose female terminal in an electrical connector.

NOTICE

If the terminals in question are the correct size/series, always use PV–43526 to test the drag when inserting and removing the test terminal adapters. Compare the effort to the drag against the known good tester terminal for reference.

- Poor terminal to wire crimp.
- Terminal crimp that occurred at least partially on insulation instead of the conductor wire strands.
- Terminal fretting corrosion
- Contamination/moisture corrosion
- A full or partial break of the conductor wires in the insulation, with or without visible insulation damage.
- Improper routing, especially when it leads to chaffing or heat damage, especially near exhaust.

You may need to use different techniques to duplicate these concerns. These include but are not limited to:

- Moving the harness by wiggling it or flexing certain areas.
- Pulling at or near the suspected connector.
- Pushing in different directions to flex the connector body and try to isolate poor connections.
- Changing the temperature. This can be accomplished with either heat guns or cold air guns.

⚠ WARNING

Always exercise caution when using these tools, and use them for short periods of time when changing the temperature of an area. Failure to do so can lead to serious injury and/or damage to the machine.

TESTING CURRENT FLOW (AMPERAGE)

Performing a current flow test requires the meter leads be inserted into the correct cavities in the meter, and be placed in series in the circuit to be tested. Refer to your Digital Multi Meter's owner's manual for potential model specific instructions. Ensure you are using acceptable adapters to avoid damaging the connector terminals. See **Connector Probing Guidelines page 10.176**.

NOTICE

Amperage specs are generally not provided for circuits/components. Please only perform this test when advised in the manual.

IMPORTANT

Many circuits on this machine will exceed the 10 Amp fuse in most Digital Multi Meters in normal operation.

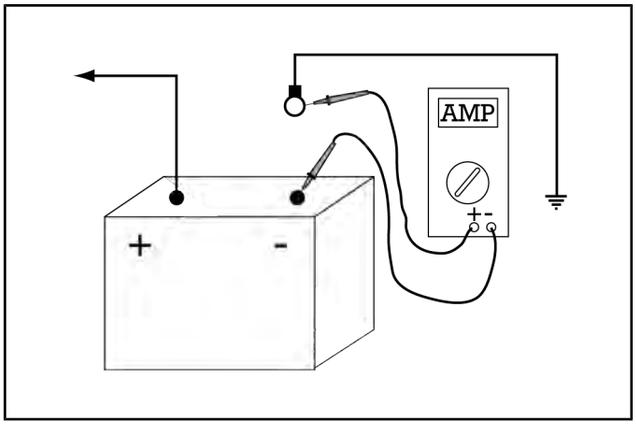
TESTING PARASITIC DRAW

IMPORTANT

Current drain should only be measured after all systems have timed out and gone to sleep. Leave power OFF and do not disturb for approximately **12 MINUTES** for an accurate reading.

Current drain is suspect if battery discharges when motorcycle is not in operation (short periods of storage).

1. Set multimeter to read milliamps (mA) and insert meter leads into appropriate jacks. Connect red meter lead to chassis ground cable eyelet on the frame and connect black meter lead to battery negative (-) terminal.



⚠ CAUTION

Do not operate electric starter or meter fuse will be damaged.

2. Run the unit briefly and shut it off after idle stabilizes.

NOTE

Do not disturb or disconnect the meter leads.

3. With ignition switch off, **and after 12 minutes have passed**, read current drain.

4. If current drain exceeds specifications inspect wiring and components for short to ground.

Parasitic Draw Specification (after 12 minutes with power OFF): 4.5 mA MAX

NOTE
There should be a low draw at or below specification. A reading of no draw can be an inaccurate test. If test results show no current draw inspect the fuse in your meter.

5. Locate the faulty component or wiring by disconnecting accessories, wiring connections, and fuses one-at-a-time while observing current drain. When current drain falls within specifications, focus efforts on the last circuit or component that was disconnected.

CURRENT DRAW - KEY OFF

Parasitic draw is when there is excessive current flow with the key off.

While the most common causes of draws are improperly installed accessories (tapping into un-switched B+ instead of switched) there can be electronic component failures that can cause this as well.

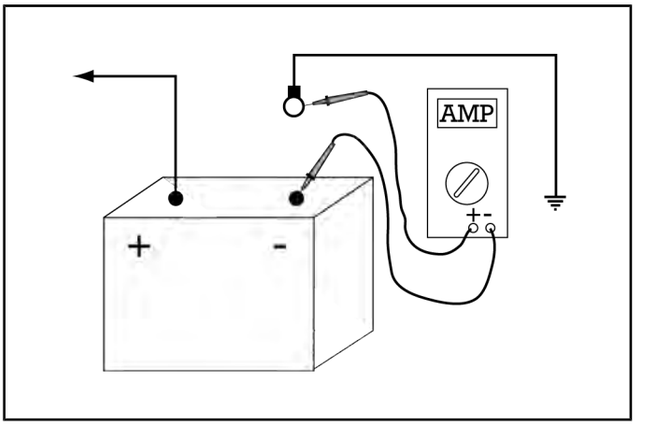
IMPORTANT
Do not connect or disconnect the battery cable, or ammeter with the engine running. Damage to electrical components will occur.

IMPORTANT
Charging system damage will occur if incompatible components are installed. Always see the Polaris Electronic Parts Catalog for the proper part numbers.

NOTICE
Wait 10 minutes with the key off for the ECU to power down. This will avoid a faulty readout while testing amperage draw.

TESTING PROCEDURE

1. Remove the negative cable from the battery.
2. Make sure the meter leads and selector dial are set to measure amperage.
3. Connect the red lead to the battery negative cable terminal.



4. Connect the black lead to the battery negative post.
5. Wait 10 minutes before checking the value. Vehicles will vary, but electronic components will take time to fully go to sleep after switched power is removed.

6. Maximum allowable is 10 milliamps. If the meter is ranged to the 10 Amp scale, this will appear as 0.010 Amps.

Current Draw - Key Off:
Maximum of .01 DCA (10 mA)

7. If over 10 milliamps, go to the fuse block and start systematically removing one fuse at a time until the value drops, indicating the circuit that requires attention.

TESTING VOLTAGE DROP

NOTICE
If you disconnect the connector at the load, and measure voltage with one lead on the power supply wire, and one to ground, you will be measuring available voltage. This is a static test and not dynamic voltage drop testing.

The measurement of voltage is the **DIFFERENCE** in electrical pressure between the two points your DMM leads are touching.

Most circuits will have one load. The load is the component in the circuit that uses the current flow to do work, such as move a solenoid or light a bulb.

Voltage coming into the load should be near battery voltage with current flowing. There will be some loss from moving through electrical contacts in connectors and relays, but it will be minimal.

NOTICE
You will need to backprobe to perform this test. For information about doing this safely, refer to **Connector Probing Guidelines page 10.176** .

Voltage should be near fully depleted by the load. This means that when measuring on the ground side of the circuit, immediately after the load, back to battery negative, you should have near zero pressure difference (voltage).

If you do have a difference in pressure, this means there is something adding resistance to the circuit such as corrosion.

For a video demonstration, scan the QR code below, or right click it and select “open in new tab”.

NOTES

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