2022-2024 Indian Chief / Chief Bobber / Super Chief / Sport Chief

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 certified Indian Motorcycle Master Service 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'.

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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:

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

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REVISION INDEX

REV	DATE	CHANGES
R01	10/03/2023	MY24 Content added
R02	12/11/2023	Updated battery charging information
R03	2/22/2024	Added Rubber Grommet reuse note to Instrument Cluster replacement procedure.

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.

2022-2024 Indian Chief / Chief Bobber / Super Chief / Sport Chief

Service Manual

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CHAPTER 1
GENERAL / SPECIFICATIONS

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VEHICLE INFORMATION

MODEL NUMBER DESIGNATION

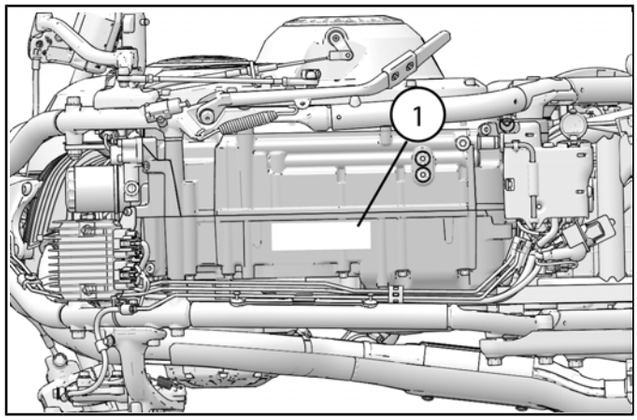
1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th Digit	9th Digit
GRP	MY		TYPE	MODEL	LINE	DISP	NET BRAKE HP	MARKET CONFIG
N= Indian Motorcycle	22 = 2022 23 = 2023 23 = 2024		D = Cruiser	M = Chief L = Chief Bobber B = Super Chief S = Sport Chief	A = Limited / Dark Horse (with ABS) B = Base (with ABS) C = Base (Non-ABS)	A = 1811 cc (111 ci) B = 1890 cc (116 ci)	G = 80 hp (111 ci) H = 88 hp (116 ci)	A = 49 State B = 50 State C = Canadian E = EU WVTA (INT) J = Japan P= Pacific X = China

10th Digit	
COLOR CODE	
Black Onyx **P-800** Ruby Smoke **P-760** Smoke White **P-675** Alumina Jade Smoke **P-827** Black Onyx Smoke **P-866** Spirit Blue Smoke **P-872** Black Azure Crystal **P-878** Silver Quartz Smoke **P-870** Maroon Metallic Smoke **P-833**	Stealth Gray **P-804** Ruby Metallic **P-759** Sagebrush Smoke **P-685** Titanium Metallic Smoke **P-632** Blue Slate Metallic **P-820** Quartz Gray **P-875** Silver Quartz Metallic **P-869** Storm Blue **P-849** Copper Smoke **P-907** Stryker Red Metal **P-904**

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ENGINE NUMBER LOCATION

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



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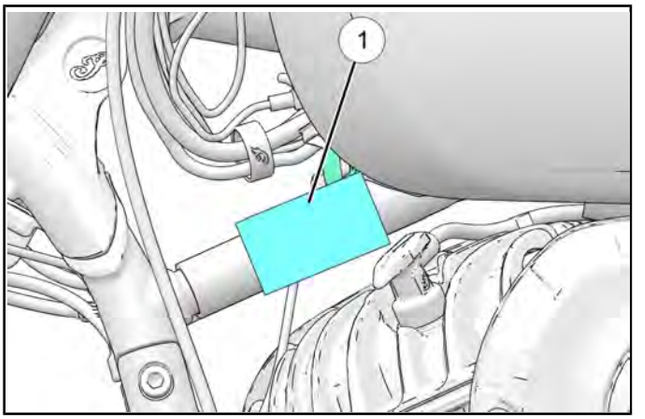
VEHICLE IDENTIFICATION NUMBER / PRODUCT IDENTIFICATION NUMBER (VIN / PIN) DESIGNATION

1	2 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
WMI		Vehicle Descriptor					Check Digit	Model Year	MFG	Sequential Production Number					
Indian Motorcycle (56k)		Make (EU Type)	Type (EU Variant)	Line (EU Version)	Engine Type (Displacement)	Net Brake Horsepower (Rating)									
56k		Same as model number positions						N	3 or 4	Generated by the production line					

MANUFACTURER LABEL

The manufacturer label ① is located on the left side of the lower backbone tube and 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



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GENERAL SPECIFICATIONS
2022 MODEL SPECIFICATIONS



NOTICE
Chief Bobber Shown.

MODEL YEAR 2022	Chief Base	Chief Premium	Chief Bobber Base	Chief Bobber Premium	Super Chief Base	Super Chief Premium
DIMENSIONS						
Overall Length	90.0 in (2286 mm)					
Overall Width	36.3 in (922 mm)		36.0 in (915 mm)		42.5 in (1079 mm))	
Overall Height	49.3 in (1253 mm)		53.1 in (1349 mm)		47.4 in (1203 mm)	
Seat Height	Unladen 27.2 in (690 mm) Laden 26.0 in (662 mm)				Unladen 27.4 in (665 mm) Laden 26.2 in (665 mm)	
Wheelbase	64.0 in (1626 mm)					
Ground Clearance	4.9 in (125 mm)					
Rake (frame)/ Trail	29°/5.2 in (132.1 mm)					
WEIGHT						
Dry Weight (without fuel/ fluids)	647 lb (294 kg)		670 lb (304 kg)		714 lb (324 kg)	
Wet Weight (with fuel/ fluids)	670 lb (304 kg)		694 lb (315 kg)		739 lb (335 kg)	
Gross Vehicle Weight Rating (GVWR)	1160 lb (526 kg)					
Gross Axle Weight Rating (GAWR)	Front 425 lb (193 kg) Rear 735 lb (333 kg)					
Maximum Load Capacity (riders, cargo, accessories)	489 lb (222 kg)		465 lb (211 kg)		421 lb (191 kg)	

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CAPACITIES		
Engine Oil	6.0 qts. (5.7 l) with filter at oil change	
Fuel	4.0 gal (15.1 L)	
Fuel Reserve (fuel light on)	0.6 gal (2.3 L)	
WHEELS / TIRES		
Front Wheel Size/Type	19 in. x 3.5 in. Cast	16 in x 3.0 in Wire Wheel
Rear Wheel Size/Type	16 in. x 5 in. Cast	16 in. x 5 in. Wire Wheel
Front Tire Type/Size	Pirelli Night Dragon 130/60B19 61H	Pirelli Night Dragon 130/90B16 67H
Rear Tire Type/Size	Pirelli Night Dragon 180/65B16 81H	
CHASSIS		
Front Suspension Type/Travel	Telescopic Fork/5.2 in. (132 mm)	
Front Fork Tube Diameter	46 mm	
Rear Suspension Travel	3 in. (76 mm)	
Front Brakes	Single / 300 mm Rotor / 4-Piston Caliper	
Rear Brakes	Single / 300 mm Rotor / 2-Piston Caliper	

MODEL YEAR 2022	CHIEF BASE / CHIEF BOBBER BASE / SUPER CHIEF BASE	CHIEF PREMIUM / CHIEF BOBBER PREMIUM / SUPER CHIEF PREMIUM
ENGINE		
Engine Type	Thunderstroke 111, Air Cooled	Thunderstroke 116, Air Cooled
Configuration	V-Twin	
Displacement	111 cu. in. (1811 cc)	115 cu. in. (1890 cc)
Cooling System	Air Cooled	
Compression Ratio	9.5:1	11.0:1
Valve Train	2 Valves Per Cylinder, Hydraulic Lifters	
Bore and Stroke	3.976" x 4.449" (101 mm x 113 mm)	4.063" x 4.449" (103.2 mm x 113 mm)
Fuel System/ Throttle Body Bore	Closed Loop Fuel Injection / 54 mm bore	
Exhaust System	Two Oxygen sensors, one on each bank, single three-way catalyst	
Rev Limit	5400 RPM	5400 RPM
Idle RPM	800 +/- 50 RPM Fully Warm	900 +/- 50 RPM Fully Warm
Lubrication System	Semi-Dry Sump	
Spark Plug/ Gap	NGK DCPR8E / .034 inch (0.90 mm)	
DRIVETRAIN		
Primary Drive	Gear Drive Wet Clutch	

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MODEL YEAR 2022	CHIEF BASE / CHIEF BOBBER BASE / SUPER CHIEF BASE	CHIEF PREMIUM / CHIEF BOBBER PREMIUM / SUPER CHIEF PREMIUM
ENGINE		
Crank Gear	55 Teeth	
Clutch Gear	86 Teeth	
Clutch Type	Wet, Multi-Plate	
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, 146-Tooth	
Transmission	30-Tooth	
Rear Wheel	66-Tooth	
Ratio	2.2:1	
Overall Gear Ratio		
1st Gear	9.403:1	
2nd Gear	6.411:1	
3rd Gear	4.763:1	
4th Gear	3.796:1	
5th Gear	3.243:1	
6th Gear	2.789:1	

ELECTRICAL	
Stator	710W @ 3500 RPM
Battery	12 volt, 18 amp-hour, 310 CCA (cold cranking amps), Sealed Glass Mat
Voltage Regulator	14.5 volts / 55 amp
Headlight	Non-serviceable LED
Tail/Brake Light	Non-serviceable LED
Turn Signal	Non-serviceable LED
License Plate	Non-serviceable LED
Speedometer	Non-serviceable LED
Indicator Lights	Non-serviceable LED
Position Bulb	Non-serviceable LED

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2023 MODEL SPECIFICATIONS



NOTICE
Chief Bobber Shown.

MODEL YEAR 2023	Chief Base	Chief Premium	Chief Bobber Base	Chief Bobber Premium	Super Chief Base	Super Chief Premium	Sport Chief
DIMENSIONS							
Overall Length	90.0 in (2286 mm)						
Overall Width	36.3 in (922 mm)		36.0 in (915 mm)		42.5 in (1079 mm)		34.0 in (864 mm)
Overall Height	49.3 in (1253 mm)		53.1 in (1349 mm)		47.4 in (1203 mm)		55.0 in (1410 mm)
Seat Height	Unladen 27.2 in (690 mm) Laden 26.0 in (662 mm)				Unladen 27.4 in (665 mm) Laden 26.2 in (665 mm)		Unladen 27.5 in (699 mm) Laden 27.0 in (686 mm)
Wheelbase	64.6 in (1640 mm)						
Ground Clearance	5.9 in (150 mm)						
Rake (frame)/ Trail	29°/4.4 in (111 mm)						
WEIGHT							
Dry Weight (without fuel/fluids)	647 lb (294 kg)		670 lb (304 kg)		714 lb (324 kg)		665 lb (302 kg)
Wet Weight (with fuel/ fluids)	670 lb (304 kg)		694 lb (315 kg)		739 lb (335 kg)		685 lb (311 kg)
Gross Vehicle Weight Rating (GVWR)	1160 lb (526 kg)						

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Gross Axle Weight Rating (GAWR)	Front 425 lb (193 kg) Rear 735 lb (333 kg)			
Maximum Load Capacity (riders, cargo, accessories)	489 lb (222 kg)	465 lb (211 kg)	421 lb (191 kg)	475 lb (215 kg)
CAPACITIES				
Engine Oil	**6.0 qt (5.71 L) with filter at oil change**			
Fuel	4.0 gal (15.1 L)			
Fuel Reserve (fuel light on)	0.6 gal (2.3 L)			
WHEELS / TIRES				
Front Wheel Size/Type	19 in. x 3.5 in. Cast	16 in x 3.0 in Wire Wheel		19 in. x 3.5 in. Cast
Rear Wheel Size/Type	16 in. x 5 in. Cast	16 in. x 5 in. Wire Wheel		16 in. x 5 in. Cast
Front Tire Type/Size	Pirelli Night Dragon 130/60B19 61H	Pirelli Night Dragon 130/90B16 67H **(China Models):** Bridgestone Battle Cruise H50 130/90B16 73H	Pirelli Night Dragon 130/90B16 67H	Pirelli Night Dragon 130/60B19 61H **(China Models):** Bridgestone Battle Cruise H50 130/90B16 73H
Rear Tire Type/Size	Pirelli Night Dragon 180/65B16 81H	Pirelli Night Dragon 180/65B16 81H **(China Models):** Bridgestone Battle Cruise H50 180/95B16 81H	Pirelli Night Dragon 180/65B16 81H	Pirelli Night Dragon 180/65B16 81H **(China Models):** Bridgestone Battle Cruise H50 180/95B16 81H
CHASSIS				
Front Suspension Type/Travel	Telescopic Fork/5.2 in. (132 mm)			Inverted Telescopic Fork / 5.2 (132 mm)
Front Fork Tube Diameter	46 mm			43 mm
Rear Suspension Travel	3 in. (76 mm)			4.0 in (100 mm)

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Front Brakes	Single / 300 mm Rotor / 4-Piston Caliper	Dual / 320 mm Rotor / 4-Piston Calipers
Rear Brakes	Single / 300 mm Rotor / 2-Piston Caliper	

MODEL YEAR 2023	CHIEF BASE / CHIEF BOBBER BASE / SUPER CHIEF BASE	CHIEF PREMIUM / CHIEF BOBBER PREMIUM / SUPER CHIEF PREMIUM / SPORT CHIEF
ENGINE		
Engine Type	Thunderstroke 111, Air Cooled	Thunderstroke 116, Air Cooled
Configuration	V-Twin	
Displacement	111 cu. in. (1811 cc)	115 cu. in. (1890 cc)
Cooling System	Air Cooled	
Compression Ratio	9.5:1	11.0:1
Valve Train	2 Valves Per Cylinder, Hydraulic Lifters	
Bore and Stroke	3.976" x 4.449" (101 mm x 113 mm)	4.063" x 4.449" (103.2 mm x 113 mm)
Fuel System/ Throttle Body Bore	Closed Loop Fuel Injection / 54 mm bore	
Exhaust System	Two Oxygen sensors, one on each bank, single three-way catalyst	
Rev Limit	5400 RPM	5400 RPM
Idle RPM	800 +/- 50 RPM Fully Warm	900 +/- 50 RPM Fully Warm
Lubrication System	Semi-Dry Sump	
Spark Plug/ Gap	NGK DCPR8E / .034 inch (0.90 mm)	
DRIVETRAIN		
Primary Drive	Gear Drive Wet Clutch	
Crank Gear	55 Teeth	
Clutch Gear	86 Teeth	
Clutch Type	Wet, Multi-Plate	
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, 146-Tooth	
Transmission	30-Tooth	
Rear Wheel	66-Tooth	
Ratio	2.2:1	
Overall Gear Ratio		

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MODEL YEAR 2023	CHIEF BASE / CHIEF BOBBER BASE / SUPER CHIEF BASE	CHIEF PREMIUM / CHIEF BOBBER PREMIUM / SUPER CHIEF PREMIUM / SPORT CHIEF
ENGINE		
1st Gear	9.403:1	
2nd Gear	6.411:1	
3rd Gear	4.763:1	
4th Gear	3.796:1	
5th Gear	3.243:1	
6th Gear	2.789:1	

ELECTRICAL	
Stator	710W @ 3500 RPM
Battery	12 volt, 18 amp-hour, 310 CCA (cold cranking amps), Sealed Glass Mat
Voltage Regulator	14.5 volts / 55 amp
Headlight	Non-serviceable LED
Tail/Brake Light	Non-serviceable LED
Turn Signal	Non-serviceable LED
License Plate	Non-serviceable LED
Speedometer	Non-serviceable LED
Indicator Lights	Non-serviceable LED
Position Bulb	Non-serviceable LED

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2024 MODEL SPECIFICATIONS



NOTICE
Chief Base Shown

MODEL YEAR 2024	Chief Base	Chief Premium	Chief Bobber Base	Chief Bobber Premium	Super Chief Base	Super Chief Premium	Sport Chief
DIMENSIONS							
Overall Length	90.0 in (2286 mm)						
Overall Width	36.3 in (922 mm)		36.0 in (915 mm)		42.5 in (1079 mm)		34.0 in (864 mm)
Overall Height	49.3 in (1253 mm)		53.1 in (1349 mm)		47.4 in (1203 mm)		55.0 in (1410 mm)
Seat Height	Unladen 27.2 in (690 mm) Laden 26.0 in (662 mm)				Unladen 27.4 in (665 mm) Laden 26.2 in (665 mm)		Unladen 27.5 in (699 mm) Laden 27.0 in (686 mm)
Wheelbase	64.6 in (1640 mm)						
Ground Clearance	5.9 in (150 mm)						
Rake (frame)/ Trail	29°/4.4 in (111 mm)						
WEIGHT							
Dry Weight (without fuel/fluids)	647 lb (294 kg)		670 lb (304 kg)		714 lb (324 kg)		665 lb (302 kg)
Wet Weight (with fuel/ fluids)	670 lb (304 kg)		694 lb (315 kg)		739 lb (335 kg)		685 lb (311 kg)
Gross Vehicle Weight Rating (GVWR)	1160 lb (526 kg)						

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Gross Axle Weight Rating (GAWR)	Front 425 lb (193 kg) Rear 735 lb (333 kg)			
Maximum Load Capacity (riders, cargo, accessories)	489 lb (222 kg)	465 lb (211 kg)	421 lb (191 kg)	475 lb (215 kg)
CAPACITIES				
Engine Oil	**6.0 qt (5.71 L) with filter at oil change**			
Fuel	4.0 gal (15.1 L)			
Fuel Reserve (fuel light on)	0.6 gal (2.3 L)			
WHEELS / TIRES				
Front Wheel Size/Type	19 in. x 3.5 in. Cast	16 in x 3.0 in Wire Wheel		19 in. x 3.5 in. Cast
Rear Wheel Size/Type	16 in. x 5 in. Cast	16 in. x 5 in. Wire Wheel		16 in. x 5 in. Cast
Front Tire Type/Size	Pirelli Night Dragon 130/60B19 61H	Pirelli Night Dragon 130/90B16 67H **(China Models):** Bridgestone Battle Cruise H50 130/90B16 73H	Pirelli Night Dragon 130/90B16 67H	Pirelli Night Dragon 130/60B19 61H **(China Models):** Bridgestone Battle Cruise H50 130/90B16 73H
Rear Tire Type/Size	Pirelli Night Dragon 180/65B16 81H	Pirelli Night Dragon 180/65B16 81H **(China Models):** Bridgestone Battle Cruise H50 180/95B16 81H	Pirelli Night Dragon 180/65B16 81H	Pirelli Night Dragon 180/65B16 81H **(China Models):** Bridgestone Battle Cruise H50 180/95B16 81H
CHASSIS				
Front Suspension Type/Travel	Telescopic Fork/5.2 in. (132 mm)			Inverted Telescopic Fork / 5.2 (132 mm)
Front Fork Tube Diameter	46 mm			43 mm
Rear Suspension Travel	3 in. (76 mm)			4.0 in (100 mm)

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Front Brakes	Single / 300 mm Rotor / 4-Piston Caliper	Dual / 320 mm Rotor / 4-Piston Calipers
Rear Brakes	Single / 300 mm Rotor / 2-Piston Caliper	

MODEL YEAR 2024	CHIEF BASE / CHIEF BOBBER BASE / SUPER CHIEF BASE	CHIEF PREMIUM / CHIEF BOBBER PREMIUM / SUPER CHIEF PREMIUM / SPORT CHIEF
ENGINE		
Engine Type	Thunderstroke 111, Air Cooled	Thunderstroke 116, Air Cooled
Configuration	V-Twin	
Displacement	111 cu. in. (1811 cc)	115 cu. in. (1890 cc)
Cooling System	Air Cooled	
Compression Ratio	9.5:1	11.0:1
Valve Train	2 Valves Per Cylinder, Hydraulic Lifters	
Bore and Stroke	3.976" x 4.449" (101 mm x 113 mm)	4.063" x 4.449" (103.2 mm x 113 mm)
Fuel System/ Throttle Body Bore	Closed Loop Fuel Injection / 54 mm bore	
Exhaust System	Two Oxygen sensors, one on each bank, single three-way catalyst	
Rev Limit	5400 RPM	5400 RPM
Idle RPM	800 +/- 50 RPM Fully Warm	900 +/- 50 RPM Fully Warm
Lubrication System	Semi-Dry Sump	
Spark Plug/ Gap	NGK DCPR8E / .034 inch (0.90 mm)	
DRIVETRAIN		
Primary Drive	Gear Drive Wet Clutch	
Crank Gear	55 Teeth	
Clutch Gear	86 Teeth	
Clutch Type	Wet, Multi-Plate	
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, 146-Tooth	
Transmission	30-Tooth	
Rear Wheel	66-Tooth	
Ratio	2.2:1	
Overall Gear Ratio		

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MODEL YEAR 2024	CHIEF BASE / CHIEF BOBBER BASE / SUPER CHIEF BASE	CHIEF PREMIUM / CHIEF BOBBER PREMIUM / SUPER CHIEF PREMIUM / SPORT CHIEF
ENGINE		
1st Gear	9.403:1	
2nd Gear	6.411:1	
3rd Gear	4.763:1	
4th Gear	3.796:1	
5th Gear	3.243:1	
6th Gear	2.789:1	

ELECTRICAL	
Stator	710W @ 3500 RPM
Battery	12 volt, 18 amp-hour, 310 CCA (cold cranking amps), Sealed Glass Mat
Voltage Regulator	14.5 volts / 55 amp
Headlight	Non-serviceable LED
Tail/Brake Light	Non-serviceable LED
Turn Signal	Non-serviceable LED
License Plate	Non-serviceable LED
Speedometer	Non-serviceable LED
Indicator Lights	Non-serviceable LED
Position Bulb	Non-serviceable LED

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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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EMISSION 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.

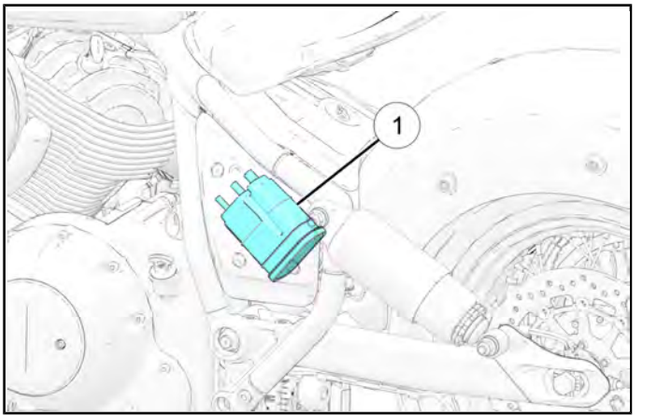
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CRANKCASE EMISSION CONTROL

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 models are equipped with an Evaporative Emissions Canister ①. Activated charcoal 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.



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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.

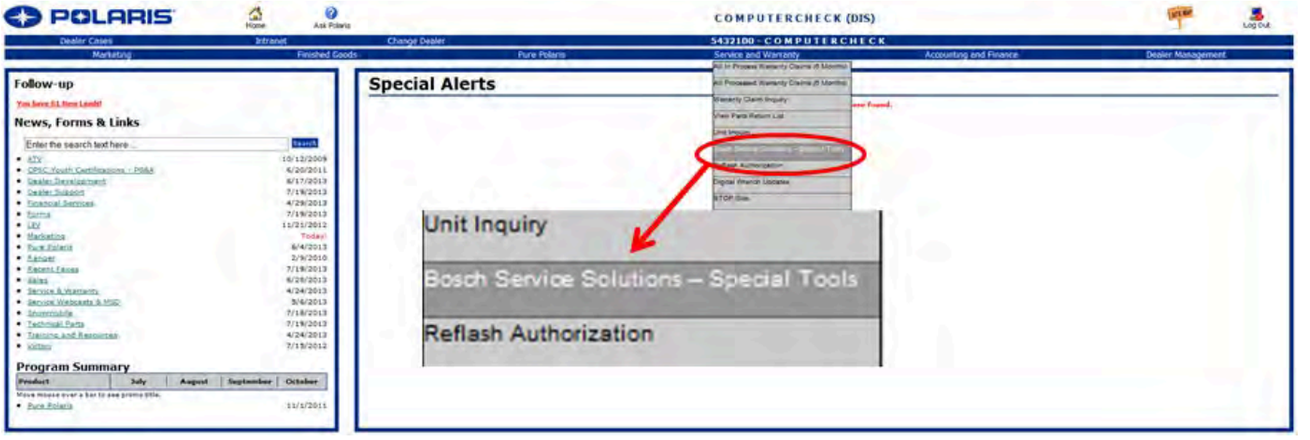
How To Use This Book

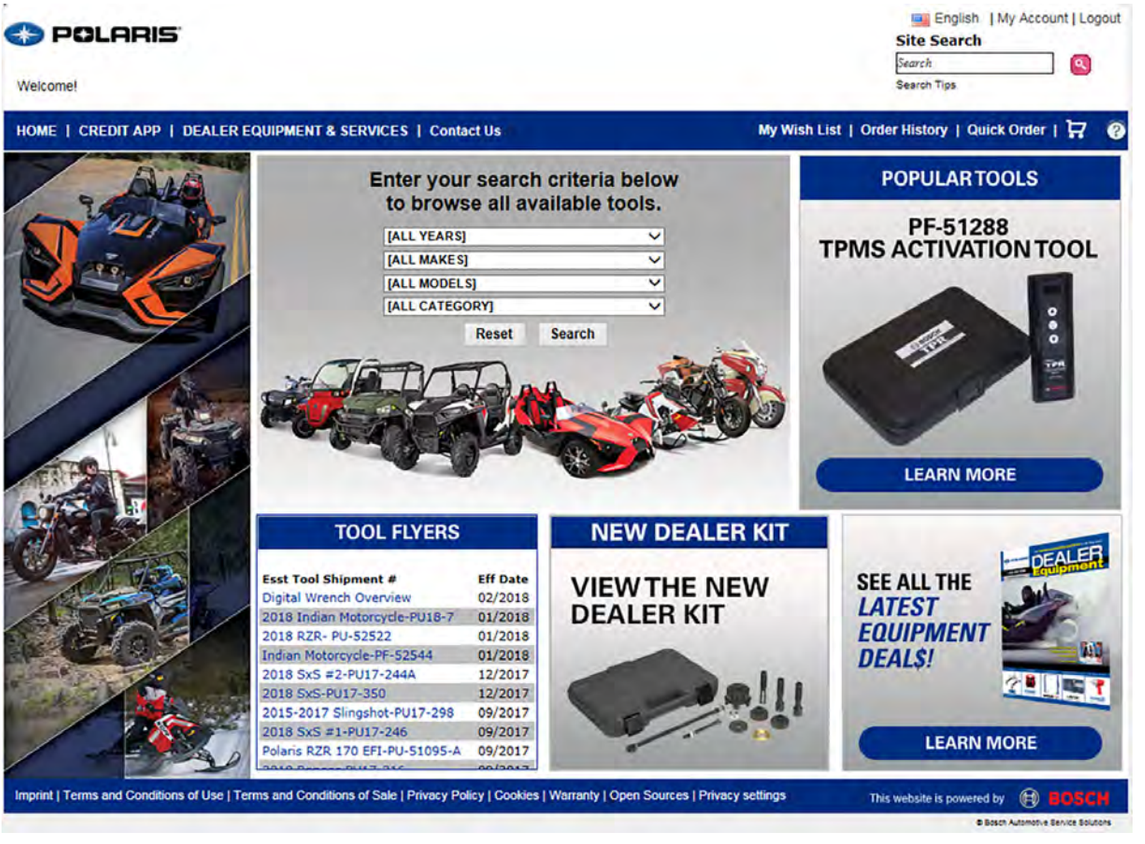
The *Special Tools Index* located in this chapter provides a comprehensive list and pictorial representation of the special tools used throughout this service manual. The *Special Tools* section at the beginning of each chapter provides a short list of the tools required to perform procedures specific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

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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 1-800-345–2233 or on-line via your dealer website at https://polaris.service-solutions.com/ .

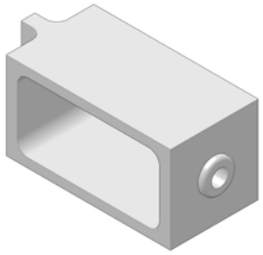




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SPECIAL TOOLS INDEX

ABS Tool
PV-50104



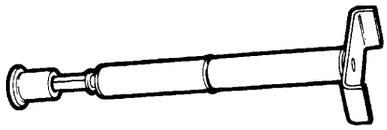
Battery Tester
PU-50296



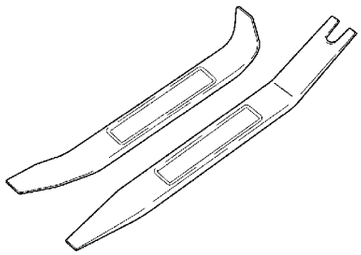
Bearing Removal Kit
PU-51324



Belt Tension Meter
PV-43532



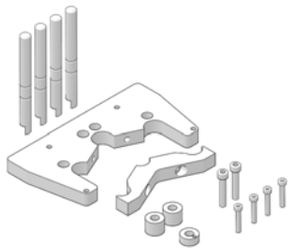
Body Panel Tool Kit
PV-49955



Cartridge Shaft Tool
PF-53122



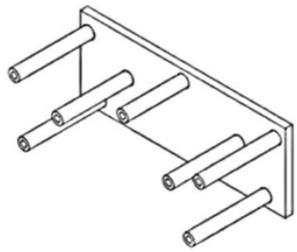
Cam Installation Tool
PF-51455



Engine Transmission Lock Tool
PF-51612



Camshaft Holding Tool
PF-52544

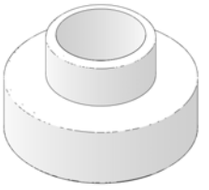


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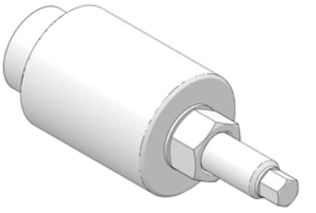
Seal and Bearing Driver Set
PV-43558



Engine Case Assembly Cup
PF-51663



Mainshaft / Crankcase Installer
PV-45030



Cup Adapter
PF-51665



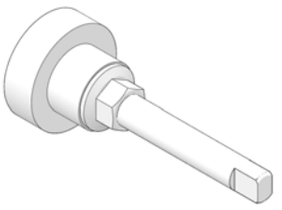
Swingarm Bushing Tool
PF-51237



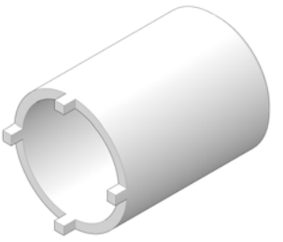
MultiLink XP
PU-52792



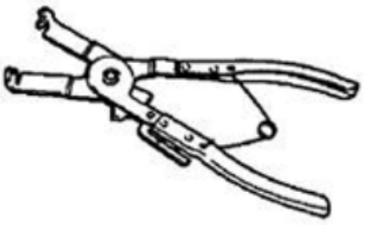
Water Pump Seal Installation Tool
PF-51608



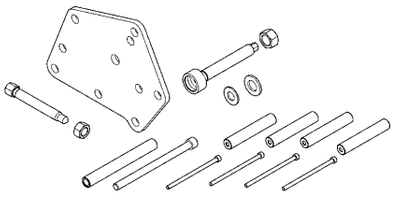
Spanner Socket (Stem)
PV-43508



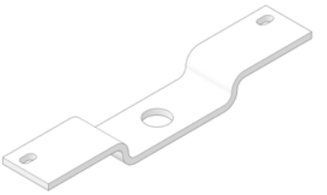
Piston Ring Compressor
PV-43570-A



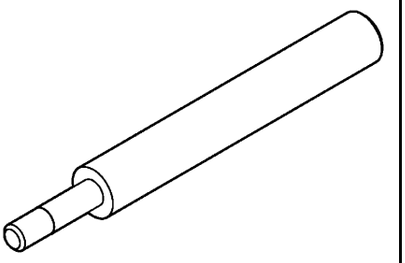
Crankcase Tool
PF-51234



Clutch Shaft Holding Tool
PF-51232



Crankshaft Locking Pin
PF-52135

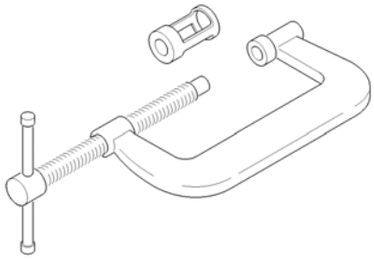


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Crankshaft Rotation Tool
PF-51239



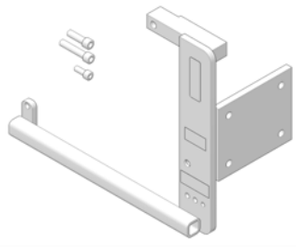
Valve Spring Compressor
PV-1253



Electrical Tester Kit
PV-43526

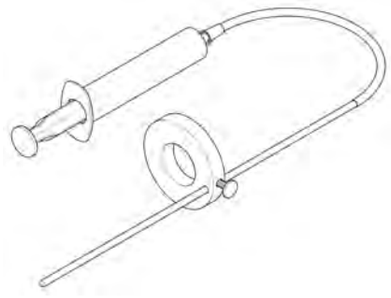


Engine Stand Adapter
PF-51240

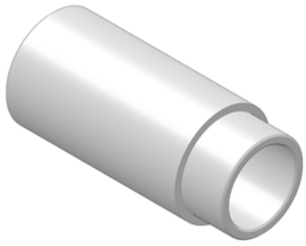


Cylinder Bore Gauge
PV-3017

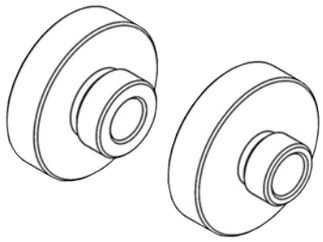
Fork Oil Level Tool
PV-59000A



Fork Seal Tool
PV-49494



Wheel Bearing Adapter
PF-53041



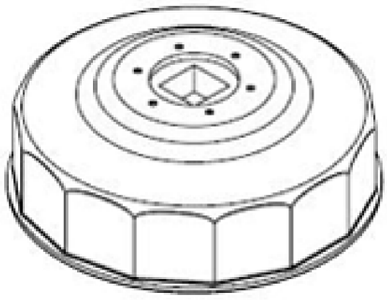
Fuel Pressure Adapter
PV-48656



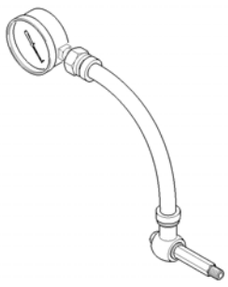
Fuel Pressure Gauge
PU-43506-A



Oil Filter Wrench
PU-50105

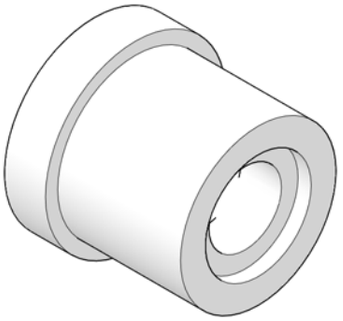


Oil Pressure Gauge
PV-43531

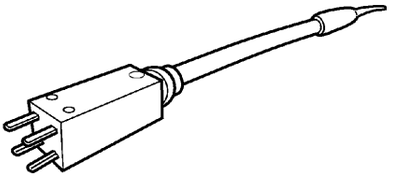


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Output Shaft Seal Tool
PF-51243



Relay Bypass Tool
PU-49466



TPMS Activation Tool
PF-51288



Shock Spanner Wrench
PV-2884811

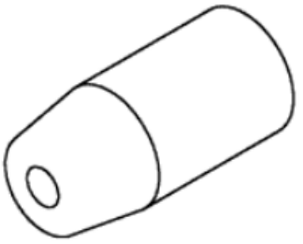


Shock Spanner Wrench
2890086



Ball Joint Service Kit
Commercially Available (Similar to OTC 7249)

Seal Guide (43mm)
PV-47037



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DIGITAL WRENCH

DIGITAL WRENCH II USER MANUAL

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

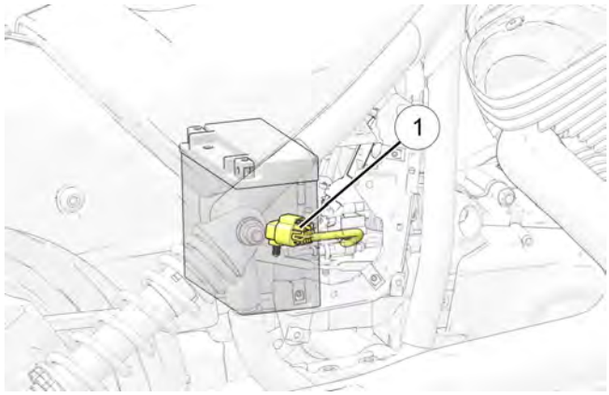
Click HERE to view the Digital Wrench II user manual or visit "Other Publications" on the left navigation menu of the DEX STOP site.



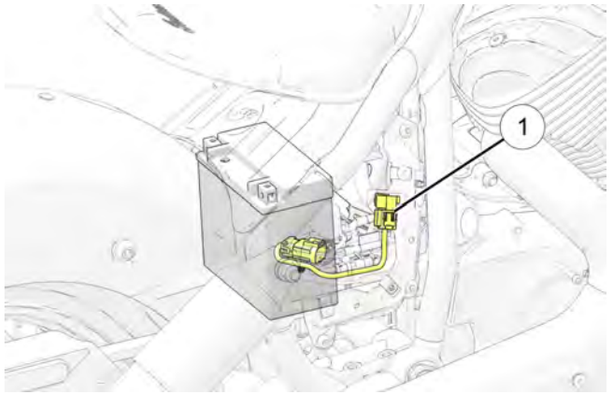
DIGITAL WRENCH DIAGNOSTIC CONNECTOR

The connector ① is located on the right side of the battery.

Digital Wrench Connector



OBD2 Connector



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.

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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 1.25**

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REFERENCE
MASTER TORQUE TABLE

CHAPTER 2: MAINTENANCE	
Air Box Cover Fastener	**88 in-lbs (10 N·m)**
Brake Lever Pivot Nut	**48 in-lbs (6 N·m)**
Brake Lever Pivot Fastener	**9 in-lbs (1 N·m)**
Battery Terminal Fasteners	**48 in-lbs (5.4 N·m)**
Battery Strap Fastener	**35 in-lbs (4 N·m)**
Cable Adjuster Jam Nut	**48 in-lbs (5 N·m)**
Clutch Lever Pivot Nut	**53 in-lbs (6 N·m)**
Drain Plugs	**15 ft-lbs (20 N·m)**
Exhaust Heat Shield Clamp	**31 in-lbs (3.5 N·m)**
Front Master Cylinder Cover Screw	**13 in-lbs (1.5 N·m)**
Rear Axle Nut	**65 ft-lbs (88 N·m)**
Rear Master Cylinder Cover Screw	**13 in-lbs (1.5 N·m)**
Shift Rod Jam Nut	**88 in-lbs (10 N·m)**
Side-stand Pivot Fastener	**37 ft-lbs (50 N·m)**
Spark Plug	**13 ft-lbs (17 N·m)**

CHAPTER 3: ENGINE / COOLING / EXHAUST	
Air Box Base Fastener	**57 in-lbs (6.5 N·m)**
Air Box Cover Fastener	**88 in-lbs (10 N·m)**
Cam Chain Tensioner Fastener	**15 ft-lbs (20 N·m)**
Cam Cover Fastener	**10 ft-lbs (13 N·m)**
Camshaft Bearing Carrier Fastener	**15 ft-lbs (20 N·m)**
Camshaft Bearing Retainer Plate Fastener	**62 in-lbs (7 N·m)**
Camshaft / Crankshaft Sprocket Fastener	**52 ft-lbs (70 N·m)**
Connecting Rod Fastener	**22 ft-lbs (30 N·m) + 90°**
Crossover Heat Shield Fastener	**88 in-lbs (10 N·m)**
Cylinder Head Mount Fastener	**33 ft-lbs (45 N·m)**
Cylinder Head Nuts	**Step 1: 26 ft-lbs (35 N·m)** **Step 2: Turn additional 50°** **Step 3: Turn additional 90°**
Cylinder Studs	**25 ft-lbs (34 N·m)**
Cylinder Head Temperature Sensor	**71 in-lbs (8 N·m)**

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Detonation Sensor Fastener	**15 ft-lbs (20 N·m)**
Engine Mount Fastener (Allen M8)	**18 ft-lbs (25 N·m)**
Engine Mount Fastener (Hex M10)	**44 ft-lbs (60 N·m)**
Engine Mount Fastener (Rear) (Hex M12)	**74 ft-lbs (100 N·m)**
Engine Mount Fastener (Lower) (Allen M10)	**44 ft-lbs (60 N·m)**
Exhaust Clamp Fastener	**41 ft-lbs (55 N·m)**
Exhaust Mount Fastener	**37 ft-lbs (50 N·m)**
Head Pipe Nut	**Step 1: Start all four nuts. Step 2: Torque front upper nut to 88 in-lbs (10 N·m) and back off nut 2 revolutions Step 3: Torque front lower nut to 88 in-lbs (10 N·m). Step 4: Torque rear upper nut to 88 in-lbs (10 N·m) and back off nut 2 revolutions. Step 5: Torque rear lower nut to 88 in-lbs (10 N·m). Step 6: Final Torque 15 ft-lbs (21 N·m) in sequence : Front upper, front lower, rear upper, rear lower.**
Heat Shield Clamp	**31 in-lbs (3.5 N·m)**
Lifter Block Fastener	**88 in-lbs (10 N·m)**
Lifter Retaining Plate Fastener	**62 in-lbs (7 N·m)**
Muffler Fastener	**18 ft-lbs (25 N·m)**
Oil Feed Pipe Fastener	**88 in-lbs (10 N·m)**
Oil Filter Adapter Fastener	**88 in-lbs (10 N·m)**
Oil Filter Fitting	**22 ft-lbs (30 N·m)**
Oil Pressure Switch Adapter	**15 ft-lbs (20 N·m)**
Oil Pressure Switch	**115 in-lbs (13 N·m)**
Oil Pump Fastener	**88 in-lbs (10 N·m)**
Oil Pump Snorkel Tube Fastener	**88 in-lbs (10 N·m)**
Oxygen Sensor	**13 ft-lbs (18 N·m)**
Piston Cooling Jet Fastener	**62 in-lbs (7 N·m)**
Rocker Arm Nut	**22 ft-lbs (30 N·m)**
Side Cover Fastener	**35 in-lbs (4 N·m)**
Tensioner Arm Pivot	**12 ft-lbs (16 N·m)**
Timing Chain Guide Fastener	**71 in-lbs (8 N·m)**
Timing Gear Fastener	**52 ft-lbs (70 N·m)**
Valve Cover Fastener	**88 in-lbs (10 N·m)**

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CHAPTER 4: FUEL DELIVERY / EFI	
Air Box Base Fastener	**57 in-lbs (6.5 N·m)**
Air Box Cover Fastener	**88 in-lbs (10 N·m)**
Air Box Support Fastener	**88 in-lbs (10 N·m)**
Crankshaft Position Sensor (CPS) Fastener	**88 in-lbs (10 N·m)**
Fuel Pump Fastener / Nut	**44 in-lbs (5 N·m)**
Fuel Rail Fastener	**88 in-lbs (10 N·m)**
Fuel Tank Console Fastener	**88 in-lbs (10 N·m)**
Fuel Tank Mount Fastener	**88 in-lbs (10 N·m)**
Intake Manifold Clamp	**11 in-lbs (1.3 N·m)**
Ignition Bracket Fastener	**88 in-lbs (10 N·m)**
Throttle Body Fastener	**88 in-lbs (10 N·m)**
TMAP Sensor Fastener	**18 in-lbs (2 N·m)**

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CHAPTER 5: CLUTCH / PRIMARY / SHIFT	
Clutch Cable Mount Bracket Fastener	**88 in-lbs (10 N·m)**
Clutch Stake Nut	**125 ft-lbs (170 N·m)**
Clutch Pinion Shaft Fastener	**62 in-lbs (7 N·m)**
Detent Roller Fastener	**88 in-lbs (10 N·m)**
Primary Cover Fastener	**177 in-lbs (20 N·m)**
Primary Drive Gear Fastener	**50 ft-lbs (68 N·m) + 38°**
Primary Drive Gear Fastener (2023+)	**83 ft-lbs (112 N·m)**
Shift Star Fastener	**88 in-lbs (10 N·m)**
Stator Fastener	**88 in-lbs (10 N·m)**
Stopper Plate Fastener	**62 in-lbs (7 N·m)**

CHAPTER 6: TRANSMISSION / CRANKSHAFT	
Balance Shaft Driven Gear	**59 ft-lbs (80 N·m)**
Balance Shaft Drive Gear Fastener	**10 ft-lbs (14 N·m)**
Bearing Retainer Fastener	**65 in-lbs (7.3 N·m)**
Case Splitter Main Plate Mounting Fasteners (All)	**88 in-lbs (10 N·m)**
Connecting Rod Cap Fastener	**22 ft-lbs (30 N·m) + 90°**
Crankcase Fastener	**22 ft-lbs (30 N·m)**
Crankshaft Blind Plug	**15 ft-lbs (20 N·m)**
Inner Cam Chain Cover Fastener	**15 ft-lbs (20 N·m)**
Piston Cooling Jet Fastener	**62 in-lbs (7 N·m)**

CHAPTER 7: FRAME / BODY	
ABS Bracket Fastener	**88 in-lbs (10 N·m)**
ABS Tray Fastener	**35 in-lbs (4 N·m)**
Battery Box Fastener M6	**35 in-lbs (4 N·m)**
Battery Box Rear Fastener	**115 in-lbs (13 N·m)**
Brake Line Retention Fastener	**80 in-lbs (9 N·m)**
Brake Return Spring Fastener (Floor Board Controls)	**88 in-lbs (10 N·m)**
Closeout Panel Fastener	**88 in-lbs (10 N·m)**
Cylinder Head Mount Fastener	**33 ft-lbs (45 N·m)**
Engine Mount Fastener (Allen M8)	**18 ft-lbs (25 N·m)**
Engine Mount Fastener (Hex M10)	**44 ft-lbs (60 N·m)**
Engine Mount Fastener (Lower) (Allen M10)	**44 ft-lbs (60 N·m)**

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Engine Mount Fastener (Rear) (Hex M12)	**74 ft-lbs (100 N·m)**
Fender Fastener (Front)	**17 ft-lbs (24 N·m)**
Fender Fastener (Rear)	**18 ft-lbs (25 N·m)**
Fender Tray Fastener	**88 in-lbs (10 N·m)**
Floorboard Fastener	**18 ft-lbs (25 N·m)**
Foot Control Fastener (Floor Board Controls)	**35 ft-lbs (47 N·m)**
Foot Peg Fastener (Passenger)	**35 ft-lbs (47 N·m)**
Foot Peg Pivot Fastener (Mid Controls)	**10 ft-lbs (13 N·m)**
Foot Control Fastener (Forward Controls)	**35 ft-lbs (47 N·m)**
Foot Control Fastener (Mid Controls)	**35 ft-lbs (47 N·m)**
Frame Cradle Fastener	**44 ft-lbs (60 N·m)**
Front Bodywork Fastener	**88 in-lbs (10 N·m)**
Head Light Mount Fastener	**88 in-lbs (10 N·m)**
Ignition Cover Fastener	**88 in-lbs (10 N·m)**
Instrument Cluster Fastener	**17 in-lbs (2 N·m)**
Master Cylinder Fastener (Rear)	**18 ft-lbs (25 N·m)**
Pillion Seat Bracket Fastener (Bagger)	**53 in-lbs (6 N·m)**
Sport Seat Fastener	**13 ft-lbs (18 N·m)**
Pillion Seat Stud (Bagger)	**13 ft-lbs (18 N·m)**
Pillion Strap Assembly Fastener (Bagger)	**53 in-lbs (6 N·m)**
Brake Pedal Pivot Shaft (Forward Controls)	**50 ft-lbs (68 N·m)**
Brake Pedal Pivot Shaft (Mid Controls)	**50 ft-lbs (68 N·m)**
Riser Cap Fastener	**18 ft-lbs (25 N·m) Torque front fasteners, then rear.**
Saddle Bag Fastener	**13 ft-lbs (18 N·m)**
Saddle Bag Spool Fastener	**18 ft-lbs (25 N·m)**
Saddle Bag Support to Frame Fastener	**18 ft-lbs (25 N·m)**
Saddle Bag Support to Saddle Bag Fastener	**88 in-lbs (10 N·m)**
Seat Bracket Fastener (Solo)	**53 in-lbs (6 N·m)**
Seat Closeout Bracket Fastener (Floating Seat)	**35 in-lbs (4 N·m)**
Seat Fastener (Floating Seat)	**18 ft-lbs (25 N·m)**
Seat Fastener (Solo)	**13 ft-lbs (18 N·m)**
Seat Mount Fastener (Floating Seat)	**18 ft-lbs (25 N·m)**
Shift Lever Fastener (Floor Board Controls)	**88 in-lbs (10 N·m)**

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Shift Lever Fastener (Forward Controls)	**88 in-lbs (10 N·m)**
Shift Lever Fastener (Mid Controls)	**88 in-lbs (10 N·m)**
Shift Pedal Pivot Shaft (Mid Controls)	**50 ft-lbs (68 N·m)**
Shift Pedal Pivot Shaft (Forward Controls)	**50 ft-lbs (68 N·m)**
Shift Pedal Pivot Shaft (Floor Board Controls)	**50 ft-lbs (68 N·m)**
Shift Rod Fastener (Floor Board Controls)	**88 in-lbs (10 N·m)**
Shift Rod Fastener (Forward Controls)	**88 in-lbs (10 N·m)**
Shift Rod Fastener (Mid Controls)	**88 in-lbs (10 N·m)**
Side Cover Bracket Fastener	**35 in-lbs (4 N·m)**
Side Cover Fastener	**35 in-lbs (4 N·m)**
Subframe Fastener	**74 ft-lbs (100 N·m)**
Voltage Regulator Bracket Fastener	**88 in-lbs (10 N·m)**
Windshield Spool Fastener	**88 in-lbs (10 N·m)**
Windshield Lock Fastener	**88 in-lbs (10 N·m)**
Windshield Nut / Fastener	**88 in-lbs (10 N·m)**

CHAPTER 8: STEERING / SUSPENSION	
Brake Disc Fastener	**22 ft-lbs (30 N·m)**
Clutch Perch Fastener	**88 in-lbs (10 N·m) Torque upper fastener then lower.**
Drive Sprocket Cover Fastener	**88 in-lbs (10 N·m)**
Drive Sprocket Lock Plate Fastener	**88 in-lbs (10 N·m)**
Drive Sprocket Nut	**180 ft-lbs (244 N·m)**
Exhaust Mount Fastener	**37 ft-lbs (50 N·m)**
Fork Cap	**15 ft-lbs (20 N·m)**
Fork Cap (Inverted Forks)	**17 ft-lbs (23 N·m)**
Fork Cartridge Fastener	**22 ft-lbs (30 N·m)**
Fork Cartridge Fastener (Inverted Forks)	**17 ft-lbs (23 N·m)**
Front Axle	**52 ft-lbs (70 N·m)**
Front Axle Pinch Fastener	**18 ft-lbs (25 N·m)**
Front Axle Pinch Fastener (Inverted Forks)	**19 ft-lbs (26 N·m)**
Front Bodywork Fastener	**88 in-lbs (10 N·m)**
Fork Lock Fastener	**80 in-lbs (9 N·m)**
Gauge Mount Fastener	**18 ft-lbs (25 N·m)**

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Grip Fastener	**53 in-lbs (6 N·m)**
Lower Belt Guard Fastener	**80 in-lbs (9 N·m)**
Lower Triple Clamp Pinch Fastener	**Step 1: Tighten bearing lock by following its tightening procedure. Step 2: Tighten bottom bolts on lower triple clamp. Step 3: Tighten top bolts on lower triple clamp. Step 4: repeat step 2. Step 5: Repeat step 3. Step 6: Tighten top nut by following its tightening procedure. Step 7: Final Torque Pinch fasteners to 17 ft-lbs (24 N·m)**
Master Cylinder Perch Fastener	**88 in-lbs (10 N·m) Torque upper fastener, then lower**
Mirror	**17 ft-lbs (24 N·m)**
Rear Axle Nut	**65 ft-lbs (88 N·m)**
Riser Bottom Fastener	**59 ft-lbs (80 N·m)**
Riser Cap Fastener	**18 ft-lbs (25 N·m) Torque front fasteners, then rear**
Steering Head Nut	**29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**
Swingarm Pivot Nut	**65 ft-lbs (88 N·m)**
Swingarm Pivot Jam Nut	**74 ft-lbs (100 N·m)**
Switch Cube Cover Fastener	**9 in-lbs (1 N·m)**
Switch Cube Fastener	**9 in-lbs (1 N·m)**
Shock Nut	**84 ft-lbs (114 N·m)**
Triple Clamp Top Nut	**72 ft-lbs (98 N·m)**
Tire Pressure Sensor Fastener	**72 in-lbs (8 N·m)**
Upper Belt Guard Fastener	**80 in-lbs (9 N·m)**
Upper Triple Clamp Pinch Bolt	**17 ft-lbs (24 N·m)**
Valve Stem Nut	**44 in-lbs (5 N·m)**

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CHAPTER 9: BRAKES	
ABS Mounting Fastener	**88 in-lbs (10 N·m)**
ABS Bracket Fastener	**88 in-lbs (10 N·m)**
Banjo Bolt	**18 ft-lbs (25 N·m)**
Brake Caliper Pin (Front) (Single Caliper)	**12 ft-lbs (17 N·m)**
Brake Caliper Pin (Front) (Dual Caliper)	**53 in-lbs (6 N·m)**
Brake Disc Fastener	**22 ft-lbs (30 N·m)**
Brake Lever Pivot Nut	**48 in-lbs (6 N·m)**
Brake Lever Pivot Fastener	**9 in-lbs (1 N·m)**
Brake Line Retaining Fastener	**80 in-lbs (9 N·m)**
Brake Manifold Fastener	**80 in-lbs (9 N·m)**
Brake Pad Retaining Pin (Rear)	**12 ft-lbs (17 N·m)**
Caliper Bleed Screw (Rear)	**53 in-lbs (6 N·m)**
Caliper Bleed Screw (Front) (Sport Chief)	**80 in-lbs (9 N·m)**
Caliper Bleed Screw (Front) (Non-Sport Chief)	**53 in-lbs (6 N·m)**
Caliper Body Fastener (Front)	**20 ft-lbs (27 N·m)**
Caliper Fastener (Front) (Non-Sport Chief)	**29 ft-lbs (40 N·m)**
Caliper Fastener (Front) (Sport Chief)	**36 ft-lbs (48 N·m)**
Caliper Fastener (Rear) (Non-Sport Chief)	**29 ft-lbs (40 N·m)**
Caliper Guide Pin (Rear)	**115 in-lbs (13 N·m)**
Caliper Retainer Fastener (Rear)	**20 ft-lbs (27 N·m)**
Front Axle	**52 ft-lbs (70 N·m)**
Front Axle Pinch Fastener	**18 ft-lbs (25 N·m)**
J-Case Fastener	**88 in-lbs (10 N·m)**
Master Cylinder Clevis Nut (Rear)	**12 ft-lbs (17 N·m)**
Master Cylinder Cover Fastener	**13 in-lbs (1.5 N·m)**
Master Cylinder Fastener (Rear)	**18 ft-lbs (25 N·m)**
Master Cylinder Perch Fastener	**88 in-lbs (10 N·m) Torque upper fastener, then lower**
P-Clip Fastener	**80 in-lbs (9 N·m)**
Rear Axle Nut	**65 ft-lbs (88 N·m)**
Wire Form Guide Fastener	**80 in-lbs (9 N·m)**

CHAPTER 10: ELECTRICAL	
Battery Box Fastener M6	**35 in-lbs (4 N·m)**

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Battery Box Rear Fastener	**115 in-lbs (13 N·m)**
Battery Strap Fastener	**35 in-lbs (4 N·m)**
Battery Terminal Fasteners	**48 in-lbs (5.4 N·m)**
Cell Modem Fastener	**17 in-lbs (2 N·m)**
Clutch Switch Cover Fastener	**4.4 in-lbs (0.5 N·m)**
Clutch Switch Fastener	**4.4 in-lbs (0.5 N·m)**
Ground Fastener	**88 in-lbs (10 N·m)**
Head Light Bezel Fastener	**27 in-lbs (3 N·m)**
Head Light Pivot Fastener	**30 ft-lbs (40 N·m)**
Head Light Stop Fastener	**12.4 in-lbs (1.4 N·m)**
Head Light Mount Fastener	**88 in-lbs (10 N·m)**
Horn to Frame Bracket Fastener	**97 in-lbs (11 N·m)**
Instrument Cluster Fastener	**17 in-lbs (2 N·m)**
Ignition Coil Fastener	**88 in-lbs (10 N·m)**
Ignition Cover Fastener	**88 in-lbs (10 N·m)**
J-Case Fastener	**88 in-lbs (10 N·m)**
License Plate Bracket Fastener	**88 in-lbs (10 N·m)**
License Plate Light Fastener	**17 in-lbs (2 N·m)**
Rear Light Mount Fastener	**115 in-lbs (13 N·m)**
Riser Cap Fastener	**18 ft-lbs (25 N·m) Torque front fasteners, then rear.**
Starter Solenoid Fastener	**44 in-lbs (5 N·m)**
Starter Cable Nut	**88 in-lbs (10 N·m)**
Stator Fastener	**88 in-lbs (10 N·m)**
Tip Over Bracket Fastener	**88 in-lbs (10 N·m)**
Turn Signal Fastener (Chief Bobber / Super Chief Front)	**88 in-lbs (10 N·m)**
Turn Signal Fastener (Chief Front)	**35 in-lbs (4 N·m)**
Turn Signal Fastener (Rear)	**18 ft-lbs (25 N·m)**
VCM Fastener	**17 in-lbs (2 N·m)**
Voltage Regulator Nut	**62 in-lbs (7 N·m)**
Starter Motor Fastener	**88 in-lbs (10 N·m)**

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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
#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

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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

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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
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

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UNIT OF MEASURE	MULTIPLIED BY	COVERTS TO
Kilograms force per cm^2	x 98.1	= Kilo pascals (kPa)
p (3.14159) x R^2 x H (height)		= Cylinder Volume

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NOTES

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MAINTENANCE

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MAINTENANCE QUICK REFERENCE GUIDE

MAINTENANCE SPECIFICATIONS

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)
Brake Disc Thickness, Rear	.20 in (5.0 mm)	.18 in (4.5 mm)
Clutch Lever Freeplay	.019 - .059” (0.5–1.5 mm)	—
Compression Pressure (Cylinder)	90-120 psi (620-758 kPa)	Below 80 psi (552 kPa)
Drive Belt Deflection (with 10 lbs force)	.433“ (11 mm)	—
Drive Belt Deflection (with Sonic Tension Meter)	40 Hz	—
Fuel Pressure (KOEO)	58 psi (400 kPa)	55 psi (380 kPa)
Idle Speed / Fast Idle Speed	800 RPM (111 ci) 900 RPM (116 ci)	±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 / Gap	NGK DCPR8E / GAP — .034 in (0.9 mm)	—
Tire Pressure	Front: 36 PSI (248 kPa) Rear: 40 PSI (276 kPa)	—
Tire Tread Depth (Minimum)	—	.063 in (1.6 mm)

FLUID SPECIFICATIONS

DESCRIPTION	FLUID TYPE	MODEL	CAPACITY
Brake Hydraulic Fluid	DOT 4	ALL	—
Engine / Transmission Oil	20W40 Semi-Synthetic	ALL	6.0 Qts (5.7 L) with filter at oil change
Fork Oil	Indian Motorcycle Fork Oil 2208093	NA	466 g (550 cc) per leg
	Fuchs Titan SAF 5113	EU	466 g (550 cc) per leg
Fuel	91 Octane (Recommended)	ALL	4.0 gal (15.1 L) / Reserve 0.6 gal (2.3 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 (Scout)	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	quart	Indian Motorcycle Fork Oil: 2208093
	quart	Fuchs Titan SAF 5113
Starter Grease	2 oz	2871460
Oil Change Kit (Thunderstroke Engines)	20W-40	2880067
Oil Change Kit (Scout)	15W-60	2880191
Synthetic 15W-60 Engine Lubricant (Scout)	quart	2880187
	55 gal drum	2880188
Semi-Synthetic 20W-40 Engine Lubricant (Thunderstroke Engines)	quart	2880012
	55 gal drum	2880013
Synthetic Transmission oil	quart	2880014

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PERIODIC MAINTENANCE INTERVAL TABLE

ENGINE	MILES (KILOMETERS)																			
	500 (800)	2500 (4000)	5000 (8000)		10000 (16000)		15000 (24000)		20000 (32000)		25000 (40000)		30000 (48000)		35000 (56000)		40000 (64000)		45000 (72000)		50000 (80000)
Air Filter		I	I		R		I		R		I		R		I		R		I		R
Crankcase Ventilation System	I	I	I		I		I		I		I		I		I		I		I		I
Drive Belt	I	I	I		I		I		I		I		R		I		I		I		I
Engine Compression					I				I				I				I				I
Engine Mount Fasteners	I																				
Engine Oil*	R		R		R		R		R		R		R		R		R		R		R
Engine Oil Filter*	R		R		R		R		R		R		R		R		R		R		R
Evaporative Emission Control System (CA. Only)	I	I	I		I		I		I		I		I		I		I		I		I
Check and Re-torque all Sealed Exhaust Joints	P		P		P		P		P		P		P		P		P		P		P
Exhaust Heat Shield Worm Clamps	I																				
Fuel System	I	I	I		I		I		I		I		I		I		I		I		R
Oil Lines / Oil System Inspection	I	I	I		I		I		I		I		I		I		I		I		I
Spark Plugs					I				I				R				I				I

Operation Codes:

I - Inspect (tighten, clean, adjust, correct or replace if necessary)

R - Replace/Rebuild

L - Lubricate with proper lubricant as directed

P - Perform

* - Replace at specified interval or annually. If driven in extreme conditions.

** - Replace at specified interval or every 2 years

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CHASSIS	MILES (KILOMETERS)																					
	500 (800)	2500 (4000)	5000 (8000)		10000 (16000)		15000 (24000)		20000 (32000)		25000 (40000)		30000 (48000)		35000 (56000)		40000 (64000)		45000 (72000)		50000 (80000)
Battery	I	I	I		I		I		I		I		I		I		I		I		I
Brake Fluid**	I	I	I		R		I		R		I		R		I		R		I		R
Brake Pads	I	I	I		I		I		I		I		I		I		I		I		I
Clutch Lever	L		I		L		I		L		I		L		I		L		I		L
Control Cable Ends	I		I		L		I		L		I		L		I		L		I		L
Fasteners	I	I	I		I		I		I		I		I		I		I		I		I
Front Brake Lever	L	I	L		L		L		L		L		L		L		L		L		L
Front Fork Oil**	I		I		I		R		I		I		R		I		I		R		I
Front Forks and Front Axle	I	I	I		I		I		I		I		I		I		I		I		I
Gear Shift Pedal	I	I	I		I		I		I		I		I		I		I		I		I
Head Light	I	I			I				I				I				I				I
Rear Brake Pedal	I	I	I		I		I		I		I		I		I		I		I		I
Rear Shock Absorber	I	I	I		I		I		I		I		I		I		I		I		R
Rear Wheel Alignment	I	I	I		I		I		I		I		I		I		I		I		I
Road Test	P	P	P		P		P		P		P		P		P		P		P		P
Sidestand / Sidestand Safety Switch	L	I	L		I		I		I		I		I		I		I		I		I
Steering Bearings	I	I	I		I		I		I		I		I		I		I		I		I
Shock Bushings and Fasteners	I	I	I		I		I		I		I		I		I		I		I		I
Swing Arm, Rear Axle, Swing Arm Pivot, and Pivot Bearings	I	I	I		I		I		I		I		I		I		I		I		I
Tires / Wheels	I	I	I		I		I		I		I		I		I		I		I		I

Operation Codes:

I - Inspect (tighten, clean, adjust, correct or replace if necessary)

R - Replace/Rebuild

L - Lubricate with proper lubricant as directed

P - Perform

* - Replace at specified interval or annually. If driven in extreme conditions.

** - Replace at specified interval or every 2 years

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GENERAL INFORMATION

SERVICE NOTES - GENERAL INFORMATION

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
ABS Tool	PV-50104
Battery Tester	PU-50296
Belt Tension Meter	PV-43532
Oil Filter Wrench	PU-50105
Shock Spanner Wrench	PV-2884811

Bosch Automotive Service Solutions: 1-800-345-2233 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.
- 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.

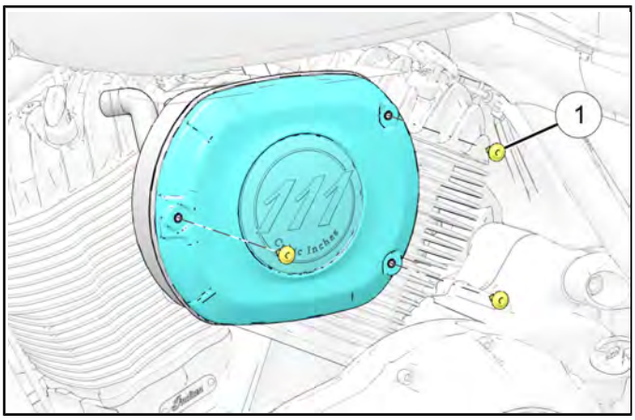
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ROUTINE MAINTENANCE PROCEDURES

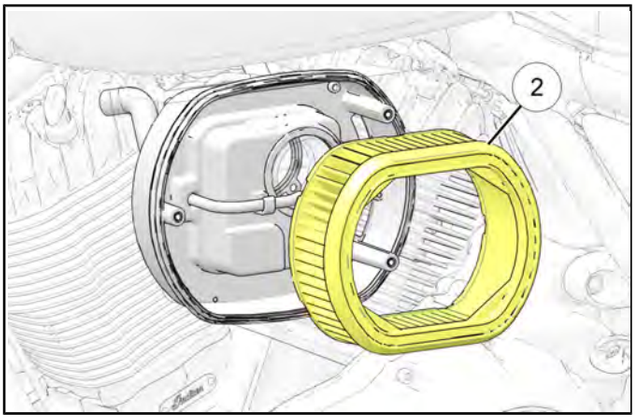
AIR FILTER REPLACEMENT

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.

1. Remove air box cover fasteners ① and air box cover .



2. Remove air filter element ②.



3. **Installation of new filter is performed by reversing the removal procedure.**

TORQUE
Air Box Cover Fasteners ① : **88 in-lbs (10 N·m)**

ENGINE OIL & FILTER CHANGE

Change the engine oil at the intervals specified in the Periodic Maintenance Table beginning on **Periodic Maintenance Interval Table page 2.4**. Change the oil more frequently if the motorcycle is subjected to severe use, especially operation in cold weather.

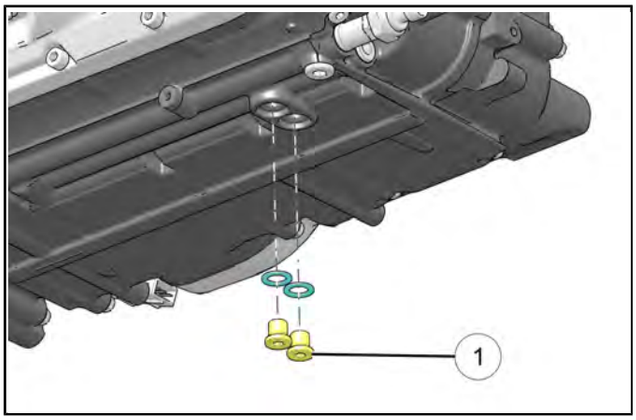
NOTICE
Failure to perform frequent oil changes during cold weather operation can result in condensation forming. Freezing condensation can result in plugged oil lines and serious engine damage.

NOTICE
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.

IMPORTANT
Engine MUST BE WARM while performing the following procedure.

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

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



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4. Remove the drain plugs. Allow the oil to drain completely.
5. Install new sealing washers on the drain plugs. The sealing surfaces on drain plugs and engine should be clean and free of burrs, nicks or scratches.
6. Reinstall the drain plugs. Torque to specifications.

TORQUE
Drain Plugs: **15 ft-lbs (20 N·m)**

7. Place oil pan beneath the oil filter. Using an oil filter wrench, turn the filter counter-clockwise to remove it.
8. Using a clean dry cloth, clean the filter sealing surface on the engine.
9. 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.
10. Install the new filter and rotate it clockwise by hand until the filter gasket contacts the sealing surface, then turn it an additional 3/4 to one full turn.
11. Remove the dipstick. Add only 4.5 qts. (4.25 l) of the recommended oil at this step. *Do not overfill.*
12. Reinstall the dipstick securely.
13. With the motorcycle in an upright, centered position, start the engine and idle for 30 seconds.
14. Stop the engine and check the oil level before adding any additional oil.

IMPORTANT
Add oil in 0.5 qts (0.47 l) increments, checking oil level after each fill, until oil is between ADD and FULL.

IMPORTANT
Total fill with oil filter change will be approximately 5.5 - 6.0 US quarts. The total amount required for the oil and filter change shall not exceed 6.0 US quarts.

15. To ensure the oil level is within the safe operating range, re-check the oil level as outlined in **Engine Oil Level Check page 2.9**.

⚠ 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.

16. Dispose of used filter and oil properly.
17. Check for leaks around drain plug and oil filter.

NOTICE
Recycle used oil and oil filter in accordance with local regulations.

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ENGINE OIL LEVEL CHECK

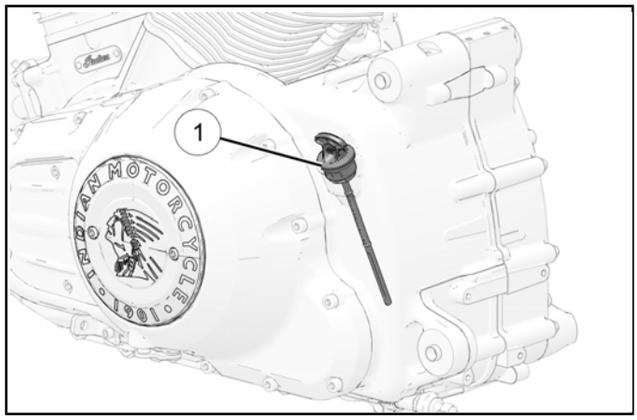
With the semi-dry sump lubrication system, the engine oil level on the dipstick will fluctuate, depending on the motorcycle's position and engine temperature when checked. To ensure a proper reading of the engine oil level, follow all inspection procedures closely.

⚠ 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 motorcycle. 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.

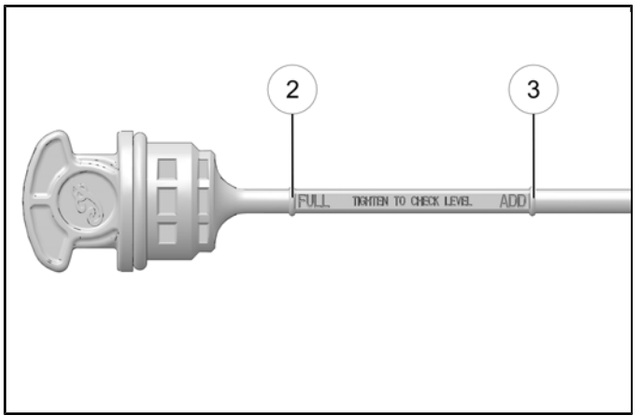
NOTICE

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

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



7. Reinstall the dipstick securely.

⚠ CAUTION

Oil level will NOT be accurate if checked on a cold engine. DO NOT ADD oil to bring to FULL mark on a cold engine, as this can result in overfilling.

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TIRE PRESSURE / SPECIFICATIONS

⚠ 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.

Tire Pressure Table (Cold)

NOTICE

Also refer to Manufacturing Information label.

ALL MODEL YEARS	Chief / Sport Chief	Chief Bobber / Super Chief
WHEELS / TIRES		
Front Wheel Size/Type	19 in. x 3.5 in. Cast	16 in x 3.0 in Wire Wheel
Rear Wheel Size/Type	16 in. x 5 in. Cast	16 in. x 5 in. Wire Wheel
Tire Pressure (Front)	36 PSI (248 kPa)	
Tire Pressure (Rear)	40 PSI (276 kPa)	
Front Tire Type/ Size	Pirelli Night Dragon 130/60B19 61H	Pirelli Night Dragon 130/90B16 67H
	Sport Chief / Chief Bobber (China Models): Bridgestone Battle Cruise H50 130/90B16 73H	
Rear Tire Type/ Size	Pirelli Night Dragon 180/65B16 81H	
	Sport Chief / Chief Bobber (China Models): Bridgestone Battle Cruise H50 180/95B16 81H	

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BRAKE FLUID LEVEL INSPECTION

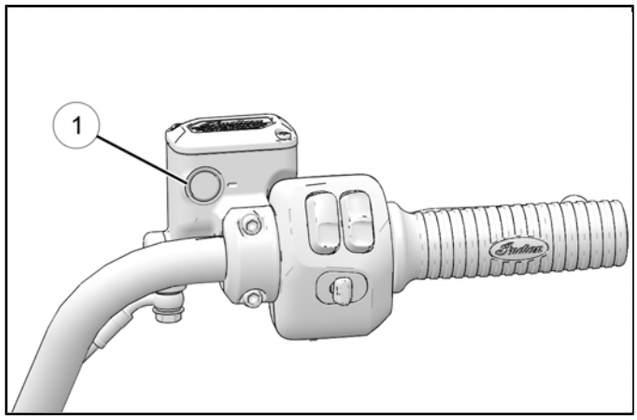
IMPORTANT

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.

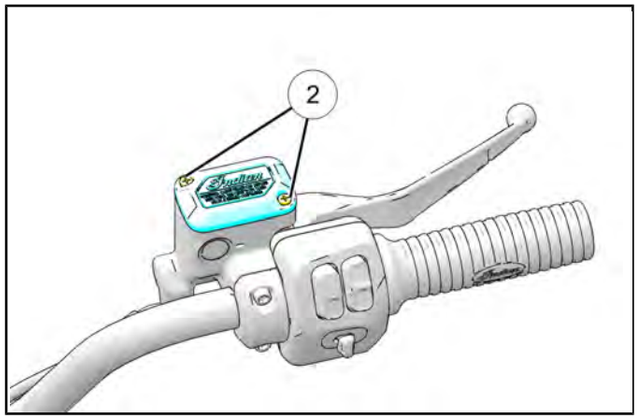
Front Brake Fluid Inspection

FRONT BRAKE FLUID LEVEL

1. Turn handlebars or adjust the motorcycle until top of reservoir is level.



2. View front brake fluid level through sight glass. The fluid should be clear and at the middle of the sight glass ① or above.
3. Wipe area around reservoir cover with a clean cloth.
4. Wipe brake fluid container with a clean cloth.
5. Remove screws ② securing reservoir cover.



6. Remove diaphragm, if extended, return it to the neutral position.

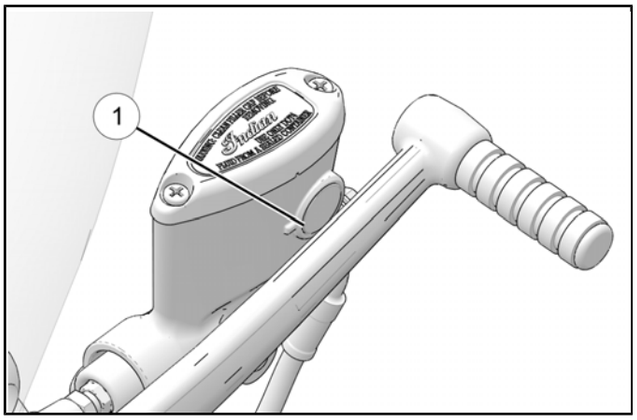


7. Carefully add enough DOT 4 brake fluid to bring level to the upper edge of the sight glass.
8. Reinstall reservoir diaphragm, diaphragm plate, and cover. Torque screws to specification.

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

REAR BRAKE FLUID LEVEL

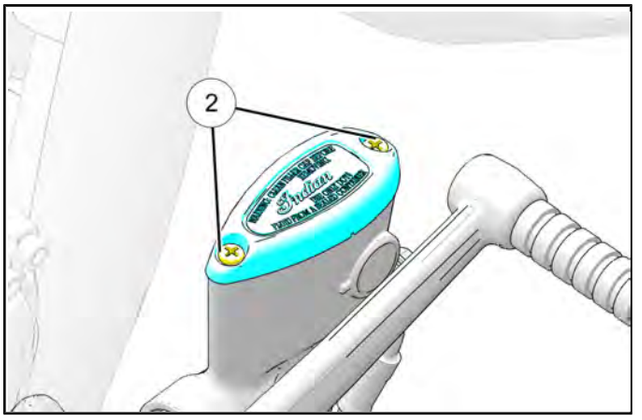
1. Fluid level is checked at the rear brake master cylinder reservoir.
2. View fluid level through reservoir sight glass ①. The fluid should be clear and at or above the middle of the sight glass.



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

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5. Remove screws ② securing reservoir cover.



6. Remove diaphragm, if extended, return it to the neutral position.



7. Carefully add enough DOT 4 brake fluid to bring level to the upper edge of the sight glass.
8. Install diaphragm, diaphragm plate, and cover. Tighten cover screws to specification.

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

SPARK PLUG INSPECTION / GAP

⚠ CAUTION

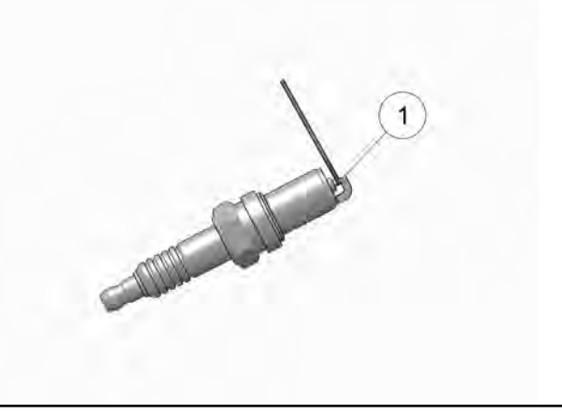
A hot engine can cause serious burns. Allow engine to cool or wear protective gloves when removing the spark plugs.

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: **DCPR8E**

Spark Plug Gap: **.034 in (0.9 mm)**

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BATTERY CHARGING

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 two 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.

NOTICE

When motorcycle is not used for one (1) month or more, either connect a maintenance charger to the battery charge port or remove battery and store it in a cool, dry area and charge according to above instructions as necessary.

BATTERY STORAGE

When the motorcycle is not used for periods of one month or longer the battery should be fully charged prior to operation. Store battery in a cool, dry place.

Battery should be charged every two months using the recommended battery charger.

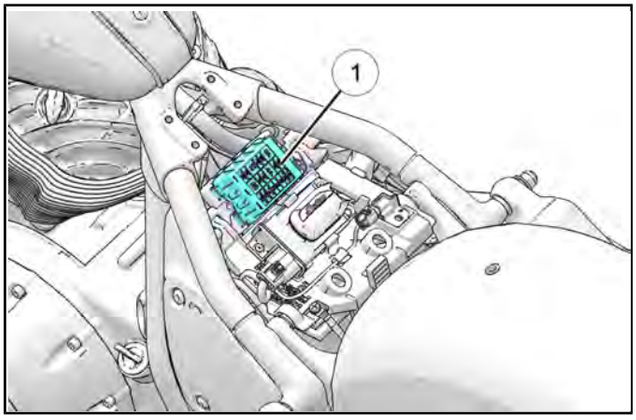
⚠ WARNING

Battery charging can create explosive gasses; keep sparks, flames, cigarettes or anything that could ignite the gasses away. Provide adequate ventilation when charging in an enclosed space. Batteries contain acid that is caustic. Wear protective clothing and a face shield or protective eyewear when working with the battery. KEEP OUT OF REACH OF CHILDREN.

FUSE REPLACEMENT

Fuses and relays are located in the fuse box under the seat.

1. Remove the seat. See **Seat Removal / Installation page 7.27**.
2. Locate the fuse box ① and remove its cover.



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.

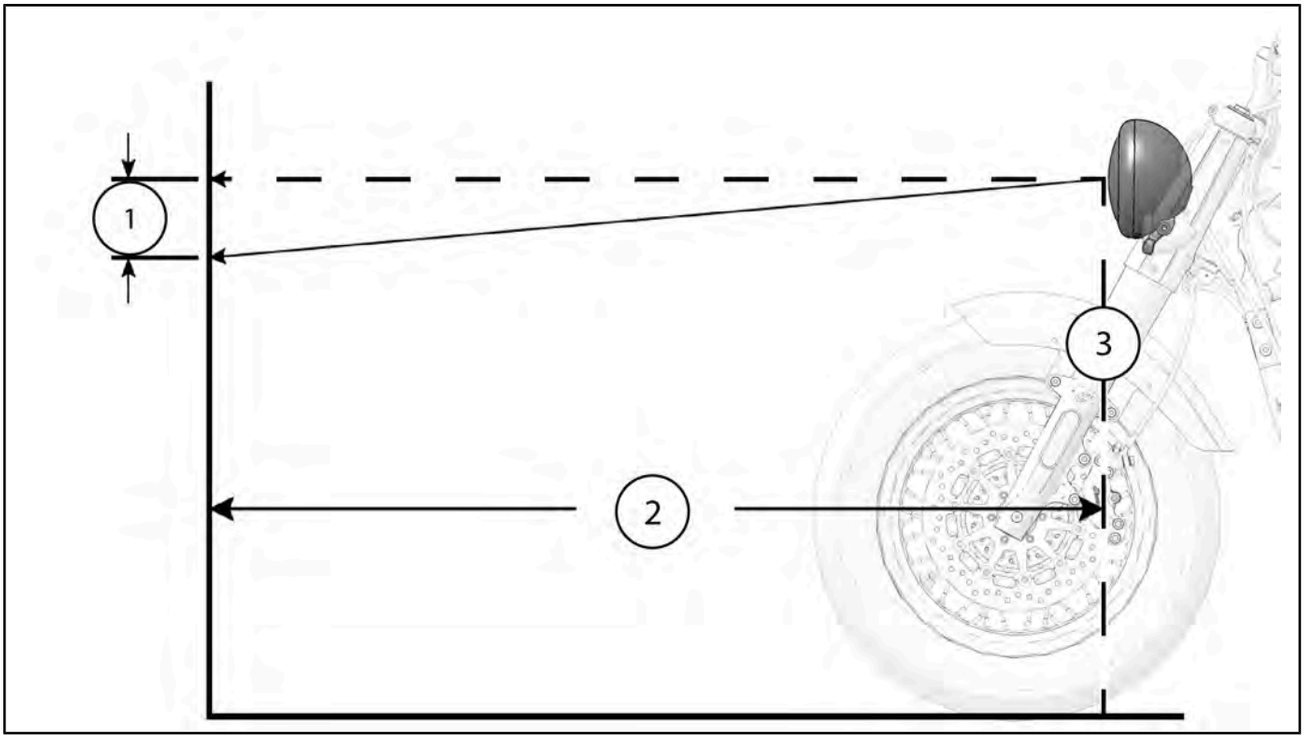
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HEADLIGHT AIM INSPECTION

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

Follow all steps below to ensure accurate aim inspection.

1. Check and adjust the tire pressure. See **Tire Pressure / Specifications page 2.10**.
2. Verify suspension ride height is set correctly. See **Rear Shock Preload Inspection page 8.70**.
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 m) from the wall.
4. Have the rider (and passenger if normally present) straddle the motorcycle in an upright position and sit in the seat(s). Center the handlebars in a straight ahead position.
5. Start the engine and switch the headlight to LOW beam.
6. Compare the position of headlight beam on the wall to the illustration below and adjust if necessary.

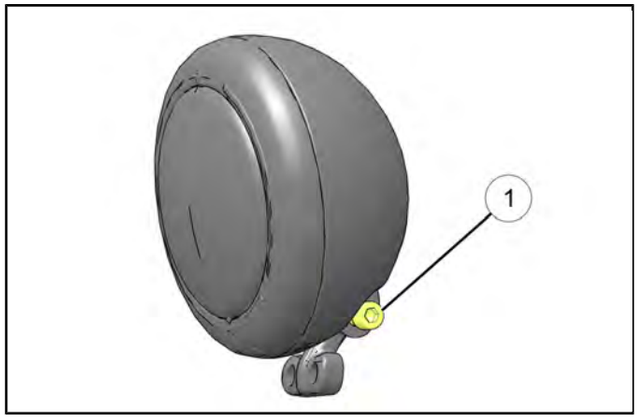


NUMBER	DESCRIPTION
①	measure distance = 4 in (10 cm) (from top of cut-off of beam)
②	measure distance = 32 ft. 10 in (10 m)
③	Headlight Center

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HEADLIGHT AIM ADJUSTMENT

1. To adjust the headlight vertically, loosen the pivot fastener ① and rotate the asssembly up or down.



2. Tighten the fastener to specification.

TORQUE
Headlight Pivot Fastener: **30 ft-lbs (40 N·m)**

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MAJOR MAINTENANCE PROCEDURES

IMPORTANT
Reference the **PERIODIC MAINTENANCE INTERVAL TABLE page 2.4** for details on how often to perform each procedure.

MAINTENANCE PROCEDURE	LOCATION
111 / 116 c.i. Crankcase Information	**111 / 116 C.I. CRANKCASE INFORMATION page 3.4**
Exhaust Heat Shield	**Exhaust Heat Shield page 3.102**
Idle Speed / Fast Idle Speed	**Idle Speed / Fast Idle Speed page 3.5**
Crankcase Ventilation System	**Crankcase Ventilation System 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 3.6**
Engine Compression Test (WET)	**Engine Compression Test (Wet) page 3.7**
Fuel Tank Vent Inspection	**Fuel Tank Vent Inspection page 4.4**
EVAP emission control system	**Evaporative Emission Control System page 4.5**
Fuel Supply Hose / Fuel Rail Inspection	**Fuel Line / Fuel Rail Inspection page 4.5**
Clutch Cable Inspection / Lubrication	**Clutch Cable Inspection / Lubrication page 5.4**
Clutch Lever Lubrication	**Clutch Lever Lubrication page 5.6**
Clutch Lever Freeplay	**Clutch Lever Free Play page 5.6**
Shift Pedal Inspection / Lubrication	**Shift Pedal Inspection / Lubrication page 5.7**
Shift Pedal Adjustment	**Shift Pedal Adjustment page 5.7**
Side-Stand Inspection	**Side-stand Inspection page 7.2**
Side-Stand Removal / Installation	**Side-stand Removal / Installation page 7.3**
Drive Belt Inspection	**Drive Belt Inspection page 8.76**
Drive Belt Specifications	**Drive Belt Specifications page 8.64**
Drive Belt Tension	**Drive Belt Tension page 8.65**
Drive Belt Adjustment	**Drive Belt Adjustment page 8.66**
Sprocket Inspection	**Sprocket Inspection page 8.68**
Steering Head / Front Wheel Inspection	**Steering Head / Front Wheel Inspection page 8.68**
Swingarm Inspection	**Swingarm Inspection page 8.69**
Rear Shock Preload Inspection	**Rear Shock Preload Inspection page 8.70**
Rear Shock Preload Adjustment	**Rear Shock Preload Adjustment page 8.70**
Shock Analysis	**Shock Analysis page 8.63**

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MAINTENANCE PROCEDURE	LOCATION
Front Brake Lever Inspection	**Front Brake Lever Inspection page**
Front Brake Lever Lubrication	**Front Brake Lever Lubrication page 9.5**
Brake Pedal Inspection	**Brake Pedal Inspection page 9.5**
Brake Pedal Lubrication	**Brake Pedal Lubrication page 9.5**
Front Brake Pad Inspection	**Front Brake Pad Inspection page 9.6**
Front Brake Pad Inspection (Sport Chief)	**Front Brake Pad Inspection (Sport Chief) page 9.7**
Rear Brake Pad Inspection	**Rear Brake Pad Inspection page 9.7**
Battery	**Battery page 10.7**
Battery Inspection	**Battery Inspection page 10.20**
Battery Removal / Installation	**Battery Removal / Installation page 10.13**

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NOTES

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ENGINE / COOLING / EXHAUST

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CRANKCASE VENTILATION SYSTEM 3.5
SPARK PLUG REMOVAL 3.5
SPARK PLUG INSTALLATION 3.6
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ENGINE COMPRESSION TEST (WET) 3.7
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ENGINE MAINTENANCE

111 / 116 C.I. CRANKCASE INFORMATION

ENGINE OIL

VISCOSITY:

15W60

SERVICE FILL CAPACITY:

6.0 quarts

SELF HELP

For additional details on the oil check, change, and fill processes, visit the Indian Motorcycle Help Center:

www.indianmotorcycle.com/help and search “Oil Change”.

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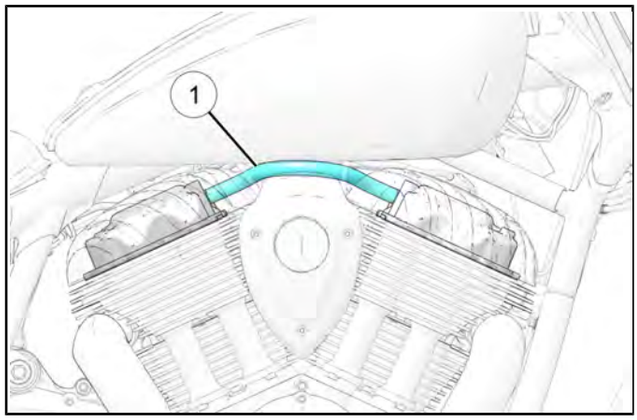
IDLE SPEED / FAST IDLE SPEED

NOTICE

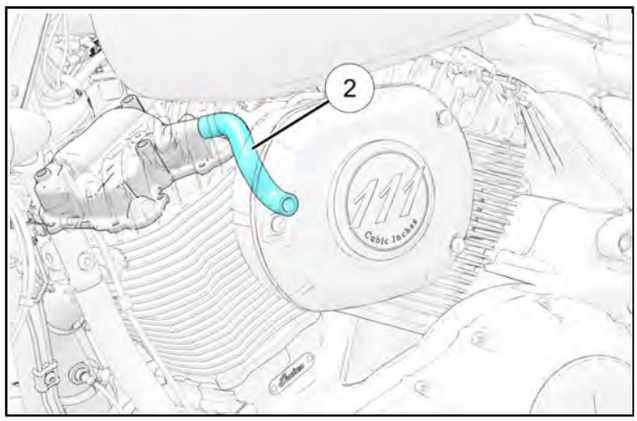
Idle speed cannot be adjusted manually, it is continuously monitored and adjusted by the ECM.

CRANKCASE VENTILATION SYSTEM

1. Inspect condition of ventilation hose ① along its length and at both ends.



2. Inspect condition of ventilation hose ② along its length and at both ends.



3. Be sure hoses are not restricted, kinked, or cracked.
4. Replace hose if worn or damaged.

SPARK PLUG REMOVAL

⚠ CAUTION

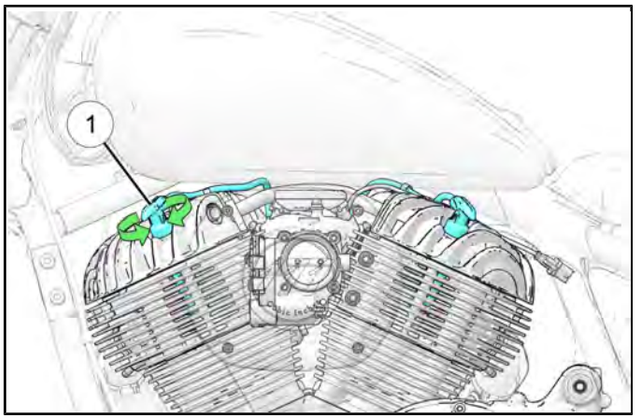
HOT COMPONENTS

Wear insulated gloves and/or allow engine and exhaust to cool before handling these parts.

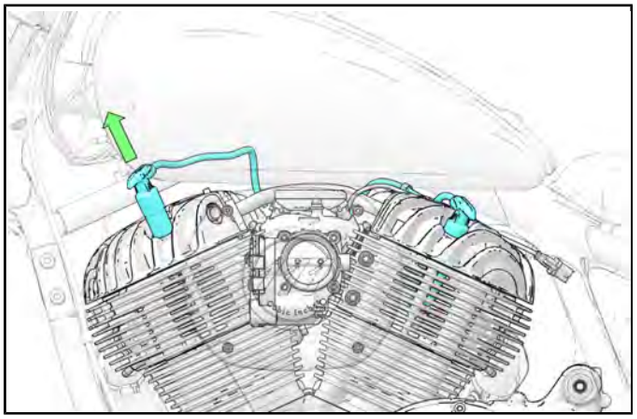
NOTICE

The front spark plug can be removed without having to remove the fuel tank by using a 3" extension and standard 5/8" spark plug socket.

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 5/8" spark plug socket, remove spark plugs.

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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: **DCPR8E**

Spark Plug Gap: **.034 in (0.9 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: **13 ft-lbs (17 N·m)**

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

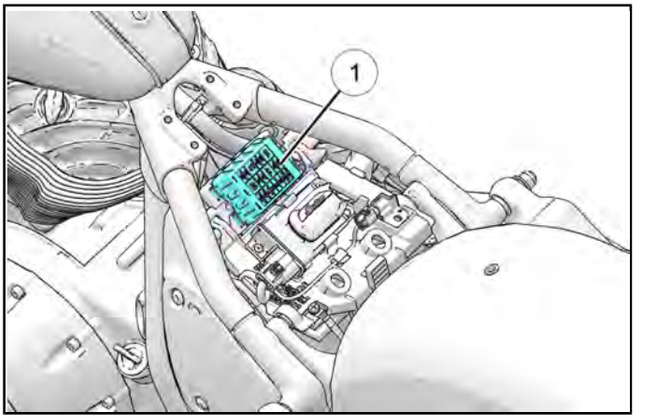
4. Install spark plug wire boots securely over the plugs.

ENGINE COMPRESSION TEST

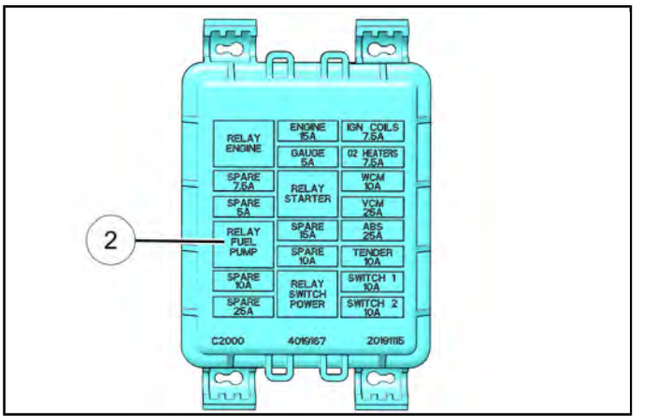
1. Warm engine to operating temperature.

IMPORTANT
The Thunderstroke 111ci / 116ci engine is equipped with a decompression system. Due to this system, cranking speed can greatly affect compression readings. Indian Motorcycle strongly recommends using the cylinder leakdown method to determine how well the combustion chamber is sealing.

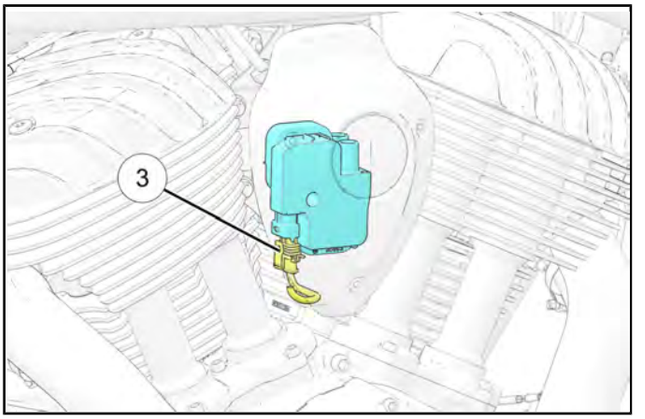
2. Shift transmission into neutral and stop engine.
3. Remove seat. See **Seat Removal / Installation page 7.27**.
4. Locate fuse box ①.



5. Remove the Fuel Pump Relay ② to disable fuel pump.



6. Disconnect the ignition coil ③ 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**.

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9. Install compression tester in the spark plug hole following manufacturers instructions.
10. Open throttle and crank engine until needle on compression gauge stops rising (about 5 seconds).
11. Repeat procedure for other cylinder.

Specification - Thunderstroke 111 / 116: All Models

STD: **111:** 90-110 psi (620-758 kPa)

STD: **116:** 90–120 psi (620–827 kPa)

SERVICE LIMIT: Below 80 psi (552 kPa)

High engine compression may indicate:

- Carbon deposits in combustion chamber
- Engine modification
- Faulty Gauge

Low engine compression may indicate:

- Slow starter motor cranking speed
- Carbon or foreign material on valve seat
- Worn or damaged piston and/or piston rings
- Leaking exhaust or intake valves
- Leaking head gasket
- Valve timing incorrect
- Non-OEM camshafts or faulty gauge

If cylinder compression is below specification, perform a cylinder leakage test to determine where the leak is occurring. Follow the instructions provided with the leakdown tester.

ENGINE COMPRESSION TEST (WET)

IMPORTANT

The 111ci / 116ci engine is equipped with a decompression system. Due to this system, cranking speed can greatly affect compression readings. 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 3.6**.
2. If compression increases substantially, inspect cylinder, piston, and rings.
3. If compression does not increase, inspect valves and valve seats.

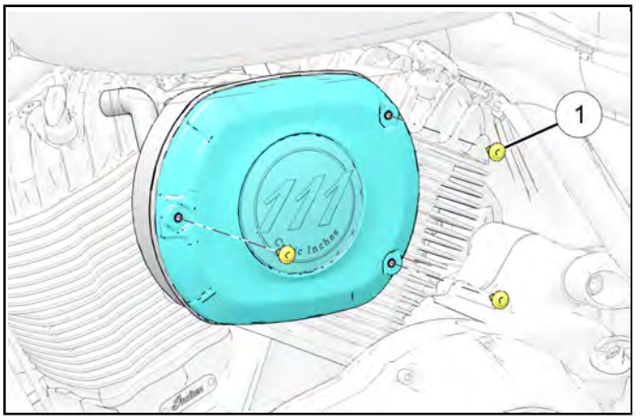
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AIR CLEANER SERVICE

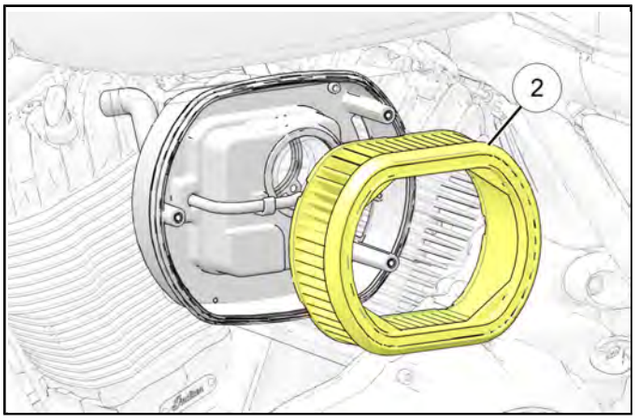
AIR FILTER REPLACEMENT

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 air box cover fasteners ① and air box cover .



2. Remove air filter element ②.

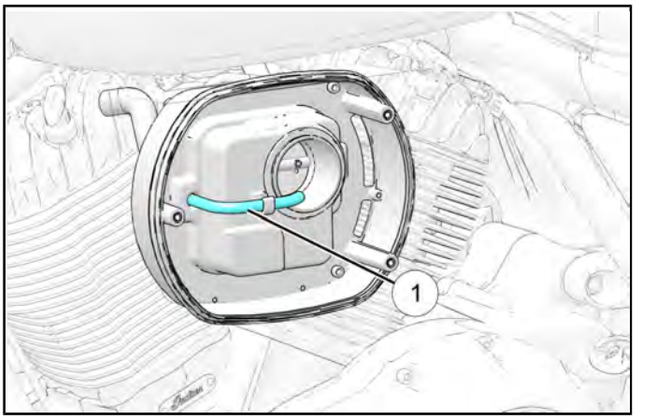


3. **Installation of new filter is performed by reversing the removal procedure.**

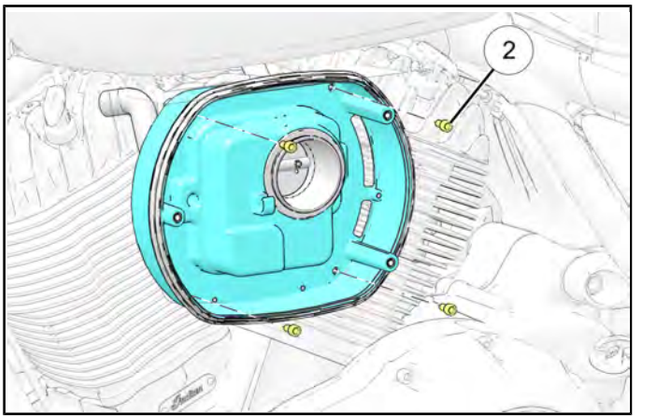
TORQUE
Air Box Cover Fasteners ① : **88 in-lbs (10 N·m)**

AIR BOX REMOVAL / INSTALLATION

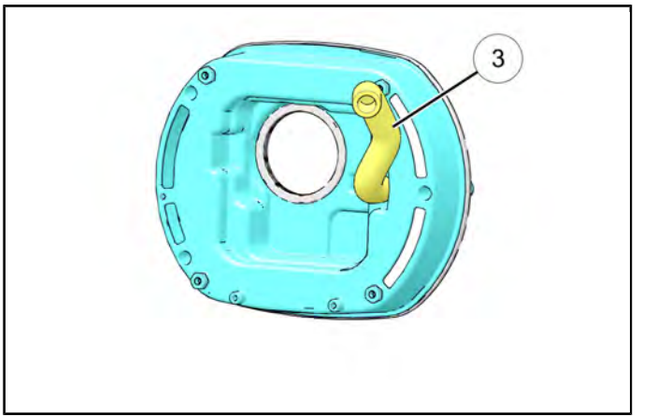
1. Remove air filter. Reference **Air Filter Replacement page 3.8**.
2. Remove vent hose ①.



3. Remove air box by removing its fasteners ②.

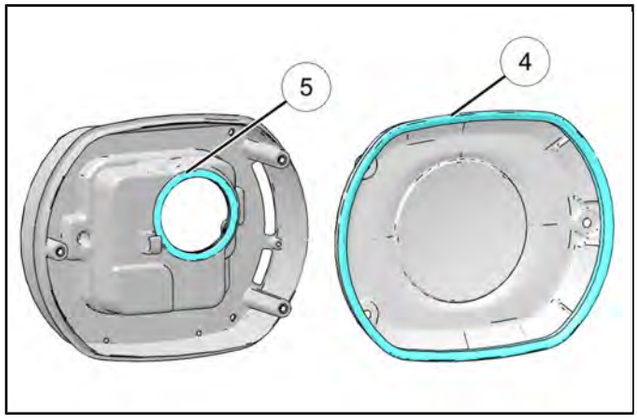


4. While removing the air box, disconnect the breather hose ③ from the back side of the air box.



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5. Inspect the air box seal ④ and the filter retainer plate seal ⑤. Replace if needed.



Installation is performed by reversing the removal procedure.

6. Torque fastener to specification.

TORQUE
Air Box Base Fastener: **57 in-lbs (6.5 N·m)**

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

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ENGINE REMOVAL / INSTALL

GENERAL INFORMATION

SERVICE NOTES

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)
Lifters	Clutch
Oil Pump	Gearshift Linkage (External)
Balance Shaft	Ignition System
Piston/Cylinder	Oil Pump Drive
Pushrods	Output Shaft Seal
Transmission/All Internal Transmission Parts	Torque Compensator Assembly
Valve Covers	Starter, Starter One-Way Clutch, Starter Torque Limit Clutch
Crankshaft Position Sensor Timing Wheel	

SERVICE SPECIFICATIONS

ITEM	SPECIFICATIONS
Engine Dry Weight	Approximately 293 lbs (133 kg)
Oil Capacity (Dry Fill)	Approximately 6.0 Quarts (5.7 Liters)
Max Cylinder Leakage	**30%**

SPECIAL TOOLS – ENGINE / COOLING / EXHAUST

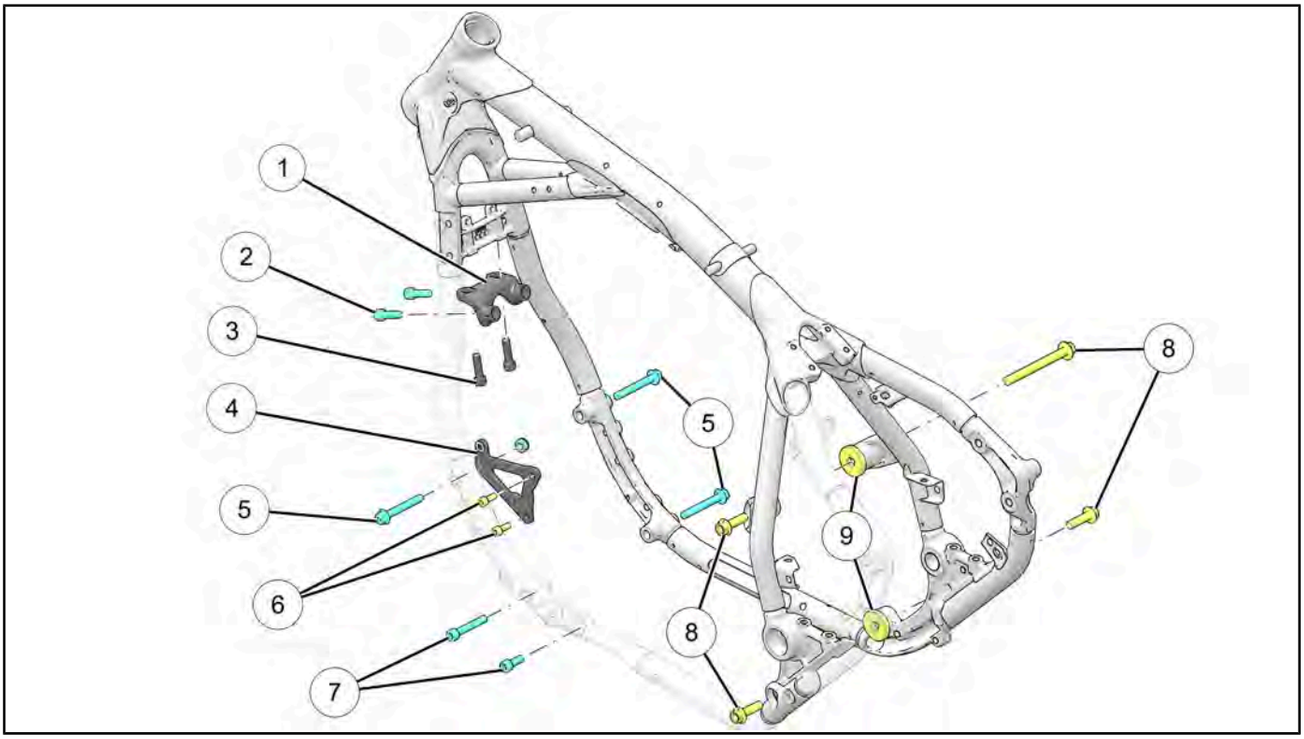
TOOL DESCRIPTION	PART NUMBER
Engine Stand Adapter	PF-51240
Motorcycle Table Lift / Wheel Vise	Commercially Available
12"x12" Platform Jack	Commercially Available
Engine Hoist (Cherry Picker)	Commercially Available
Engine Stand	Commercially Available

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

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ASSEMBLY VIEWS

ENGINE BRACKETS / FASTENERS



ITEM	DESCRIPTION	TORQUE
①	Cylinder Head Mount Bracket	—
②	Cylinder Head Mount Bracket Fastener (to frame)	**33 ft-lbs (45 N·m)**
③	Cylinder Head Mount Bracket Fastener (to engine)	**33 ft-lbs (45 N·m)**
④	Engine Bracket	—
⑤	Engine Mount Fastener (Hex M10)	**44 ft-lbs (60 N·m)**
⑥	Engine Mount Fastener (Allen M8)	**18 ft-lbs (25 N·m)**
⑦	Lower Engine Mount Fastener (Allen M10)	**44 ft-lbs (60 N·m)**
⑧	Rear Engine Mount Fastener (Hex M12)	**74 ft-lbs (100 N·m)**
⑨	Frame Spacer 7.6mm	—

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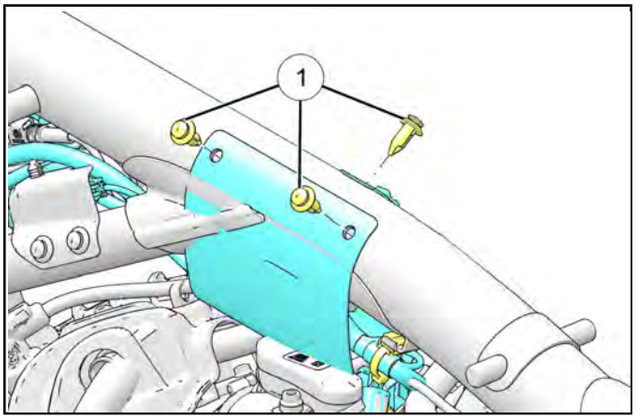
ENGINE REMOVAL / INSTALLATION

PREPARATION FOR ENGINE REMOVAL

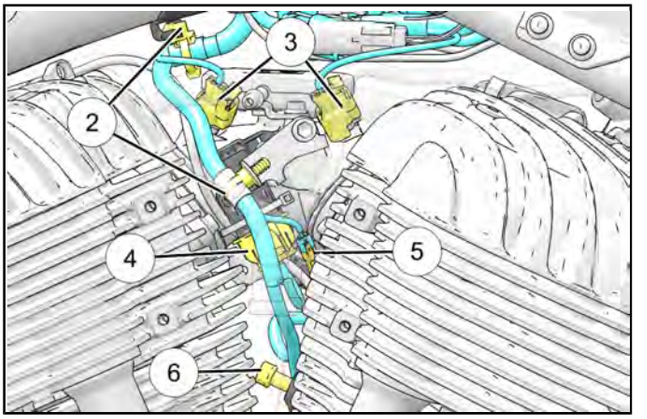
NOTICE

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.

1. Remove battery . See **Battery Removal / Installation page 10.13**.
2. Remove left driver foot peg. See **Driver Foot Peg Removal / Installation page 7.25**.
3. Remove fuel tank. See **Fuel Tank Removal page 4.17**.
4. Remove head pipe assembly . See **Head Pipe Removal / Installation page 3.105**.
5. Remove drive belt. See **Drive Belt Removal / Installation page 8.76**.
6. Remove ABS bracket. See **ABS Bracket Removal / Installation page 9.35**.
7. Remove horn. See **Horn Removal / Installation page 10.79**.
8. Remove side-stand. See **Side-stand Removal / Installation page 7.3**.
9. Remove clutch cable. See **Clutch Cable Removal / Installation page 5.5**.
10. Follow steps 1–10 of **Intake Manifold Removal / Installation page 4.13.**
11. Remove harness retainer by removing its push pins ①.



12. Cut harness retention features ②.

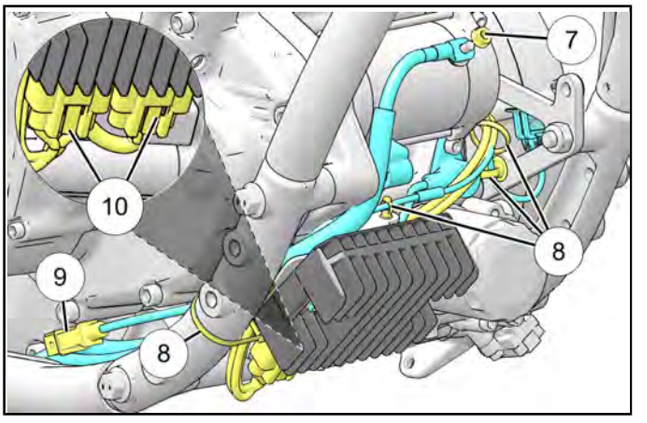


13. Disconnect the fuel injector electrical connectors ③.

IMPORTANT

Disengage Red CPA connection lock before disconnecting injector.

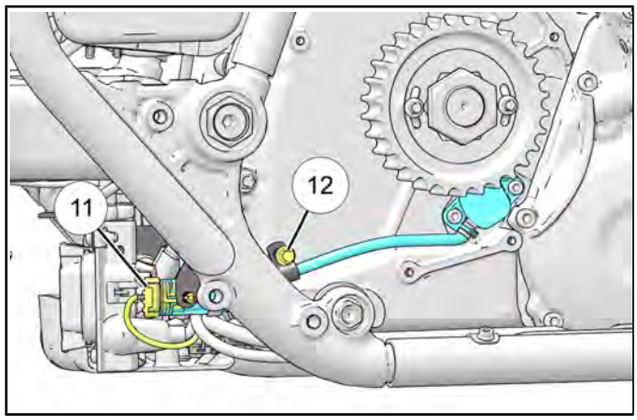
14. Disconnect the TMAP electrical connector ④.
15. Disconnect the CHTS electrical connector ⑤.
16. Remove detonation sensor by removing its fastener ⑥.
17. Disconnect starter cable nut ⑦.



18. Cut harness retention features ⑧.
19. Disconnect crank position sensor electrical connection ⑨.
20. Disconnect voltage regulator electrical connections ⑩.

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21. Disconnect gear position sensor electrical connection ⑪ and disconnect it from the ABS bracket mount.

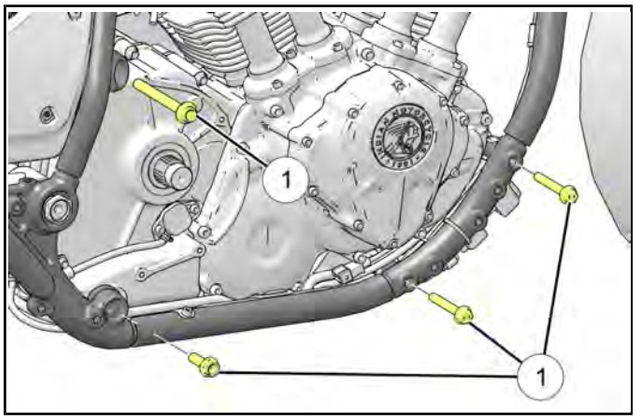


22. Remove p-clamp fastener ⑫.

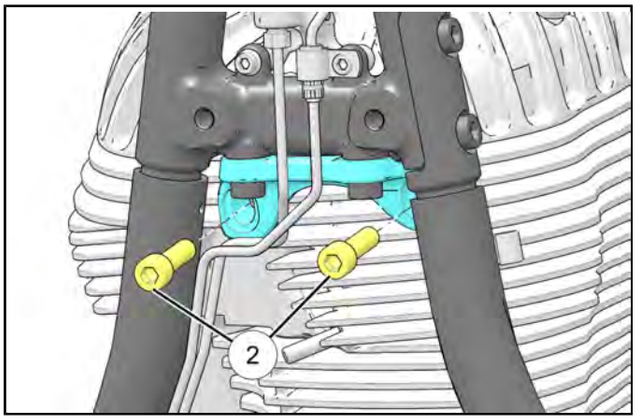
23. Proceed to engine removal. See **Removing Engine From Frame page 3.13**.

REMOVING ENGINE FROM FRAME

1. Place a platform jack beneath the engine and raise enough to support crankcase (Jack should just be touching the crankcase).
2. Perform the preliminary engine removal steps outlined in this chapter. See **Preparation For Engine Removal page 3.12**.
3. Remove right hand engine mounting fastener ①.

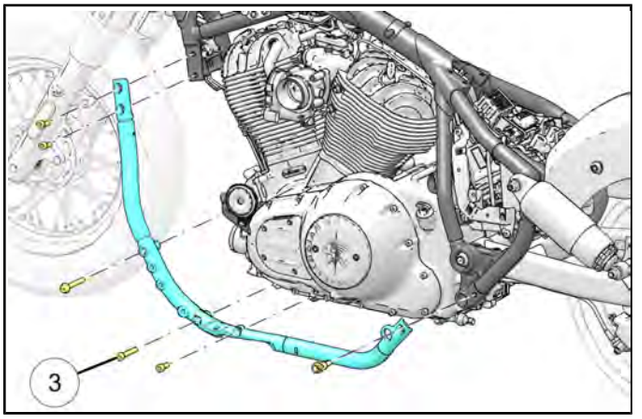


4. Retrieve frame spacers.
5. Remove cylinder head mount bracket fasteners ②.



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6. Remove left hand engine mount and cradle fasteners ③.



7. Push engine slightly to the LH side to free up from alignment dowels. With an assistant, lower the engine from the frame and remove from vehicle.
8. Retrieve the engine to frame spacers for reassembly.

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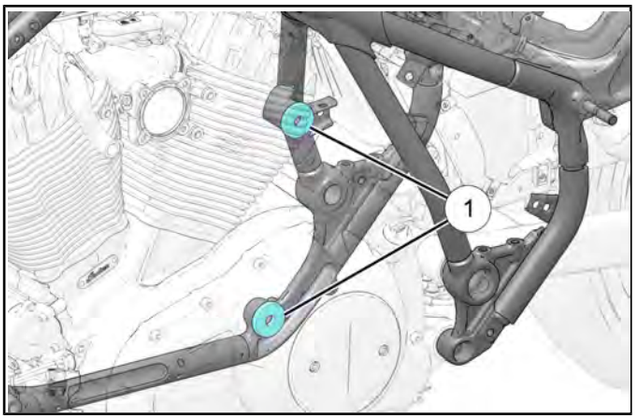
ENGINE INSTALLATION

The following procedure is written assuming the engine has been assembled and is resting on an engine stand, ready for installation.

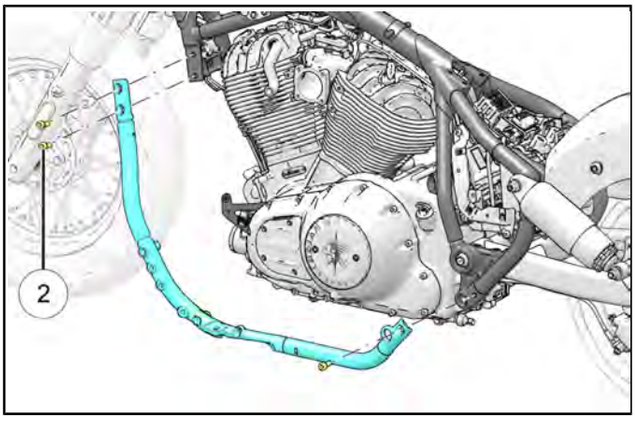
Refer to **Frame Components page 7.16** in this chapter for torque values and assembly views.

> **⚠ CAUTION**
>
> Arrange for assistance when installing engine. The engine must be held securely to prevent damage to engine, frame, wiring, or hoses. The engine is very heavy and could cause severe personal injury if not handled properly. Be sure engine is properly supported before proceeding.

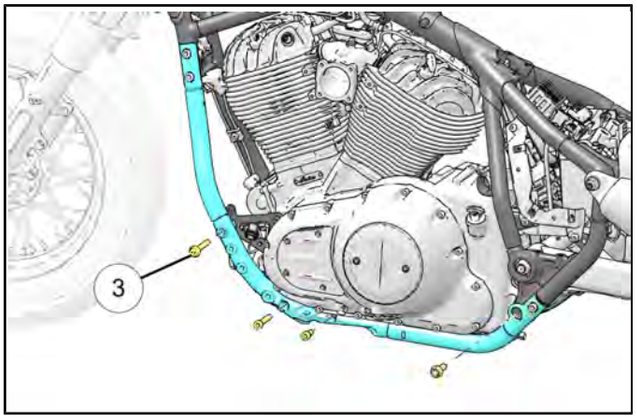
1. Raise the engine up in place and install the frame spacers ① between the engine and the frame.



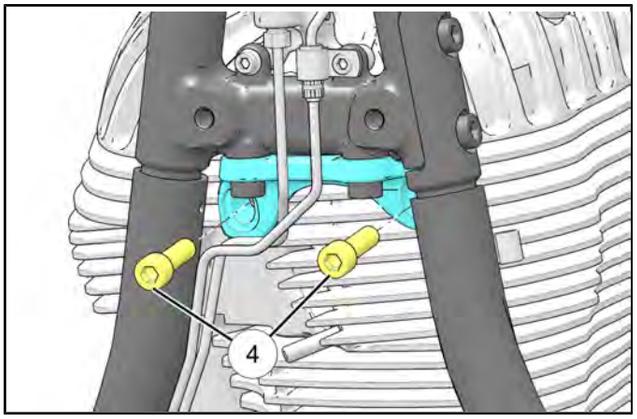
2. Install left hand cradle and hand tighten its fasteners ②.



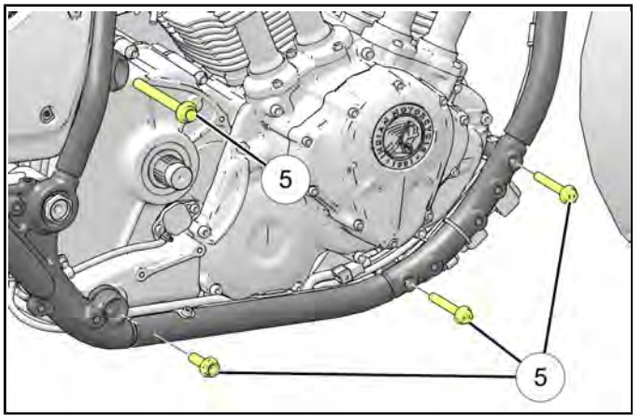
3. Install and hand tighten engine mount fasteners ③.



4. Install and hand tighten cylinder head mount fasteners ④.



5. Install and hand tighten engine mount fasteners ⑤.



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6. Torque engine mount fasteners to specification.

TORQUE
Engine Mount Fastener (Hex M10): **44 ft-lbs (60 N·m)**

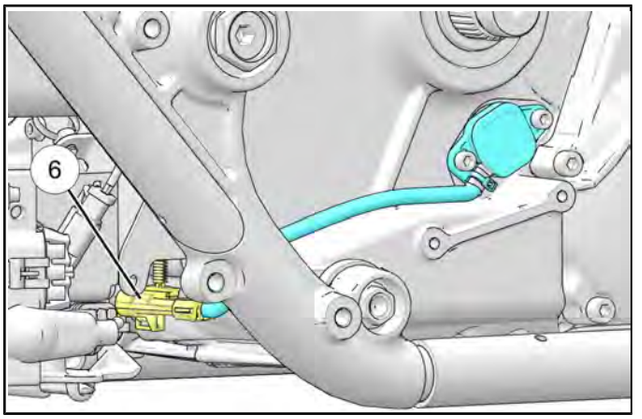
TORQUE
Engine Mount Fastener (Allen M8): **18 ft-lbs (25 N·m)**

TORQUE
Lower Engine Mount Fastener (Allen M10): **44 ft-lbs (60 N·m)**

TORQUE
Rear Engine Mount Fastener (Hex M12): **74 ft-lbs (100 N·m)**

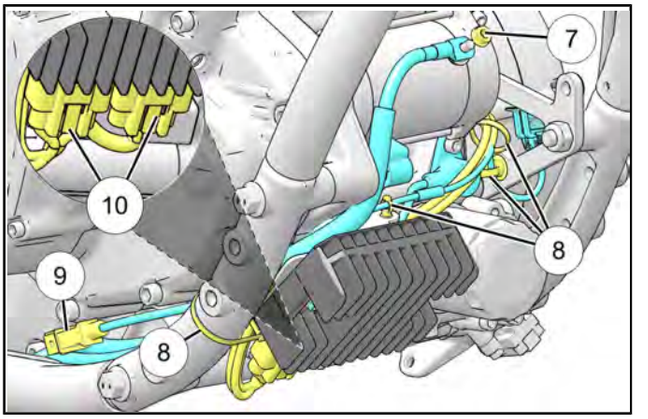
TORQUE
Frame Cradle Fastener: **44 ft-lbs (60 N·m)**

7. Connect gear position sensor electrical connection ⑥.



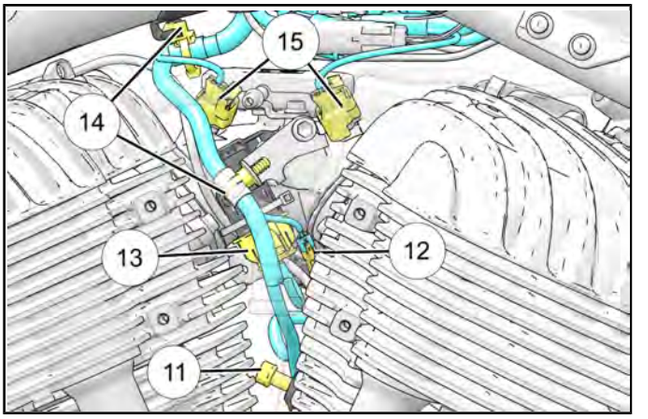
8. Connect starter cable nut ⑦.

TORQUE
Starter Cable Nut: **88 in-lbs (10 N·m)**



9. Retain harness with new panduit straps (PN 7080138) in locations shown ⑧.
10. Connect crank position sensor electrical connection ⑨.
11. Connect voltage regulator electrical connections ⑩.
12. Install detonation sensor and its fastener ⑪.

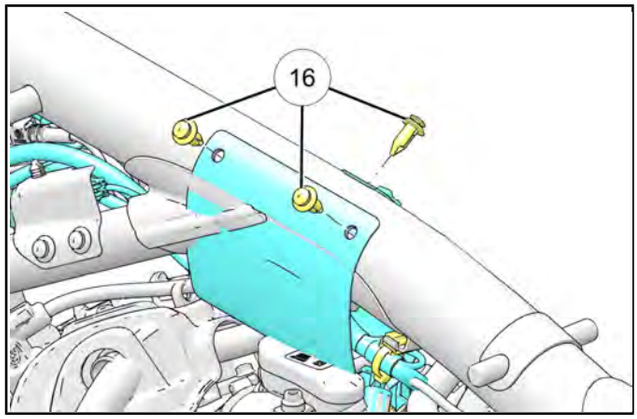
TORQUE
Detonation Sensor Fastener: **15 ft-lbs (20 N·m)**



13. Connect the CHTS electrical connector ⑫.
14. Connect the TMAP electrical connector ⑬.
15. Retain harness with new panduit straps (PN 7080138) in locations show ⑭.

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16. Connect the fuel injector electrical connectors ⑮. Slide red CPA lock into latched position.
17. Install harness retainer and retain with push pins ⑯.



18. Install intake manifold. See **Intake Manifold Removal / Installation page 4.13.**
19. Install clutch cable. See **Clutch Cable Removal / Installation page 5.5**.
20. Install side-stand. See **Side-stand Removal / Installation page 7.3**.
21. Install horn. See **Horn Removal / Installation page 10.79**.
22. Install ABS bracket. See **ABS Bracket Removal / Installation page 9.35**.
23. Install drive belt. See **Drive Belt Removal / Installation page 8.76**.
24. Install head pipe assembly . See **Head Pipe Removal / Installation page 3.105**.
25. Install fuel tank. See **Fuel Tank Installation page 4.24**.
26. Install left driver foot peg. See **Driver Foot Peg Removal / Installation page 7.25**.
27. Install battery . See **Battery Removal / Installation page 10.13**.

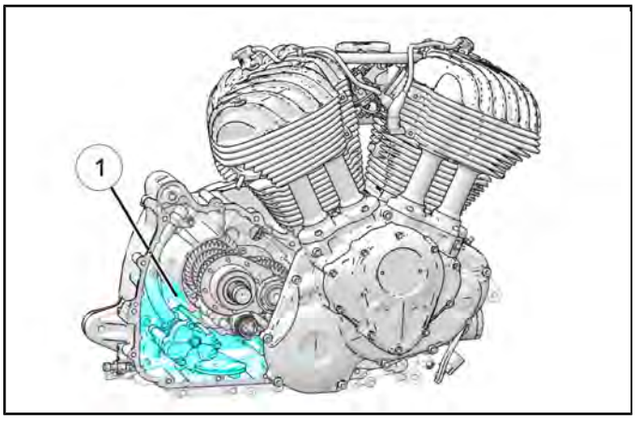
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LUBRICATION / COOLING

GENERAL INFORMATION

SERVICE NOTES – LUBRICATION / COOLING

The Thunderstroke 111 and 116 use 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.

To access the oil pump, the engine must be removed from the frame and disassembled. Before disassembly, review the troubleshooting charts located in this chapter.

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 - LUBRICATION / COOLING

TOOL DESCRIPTION	PART NUMBER
Oil Pressure Gauge	**PV-43531**

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SERVICE SPECIFICATIONS - LUBRICATION / COOLING

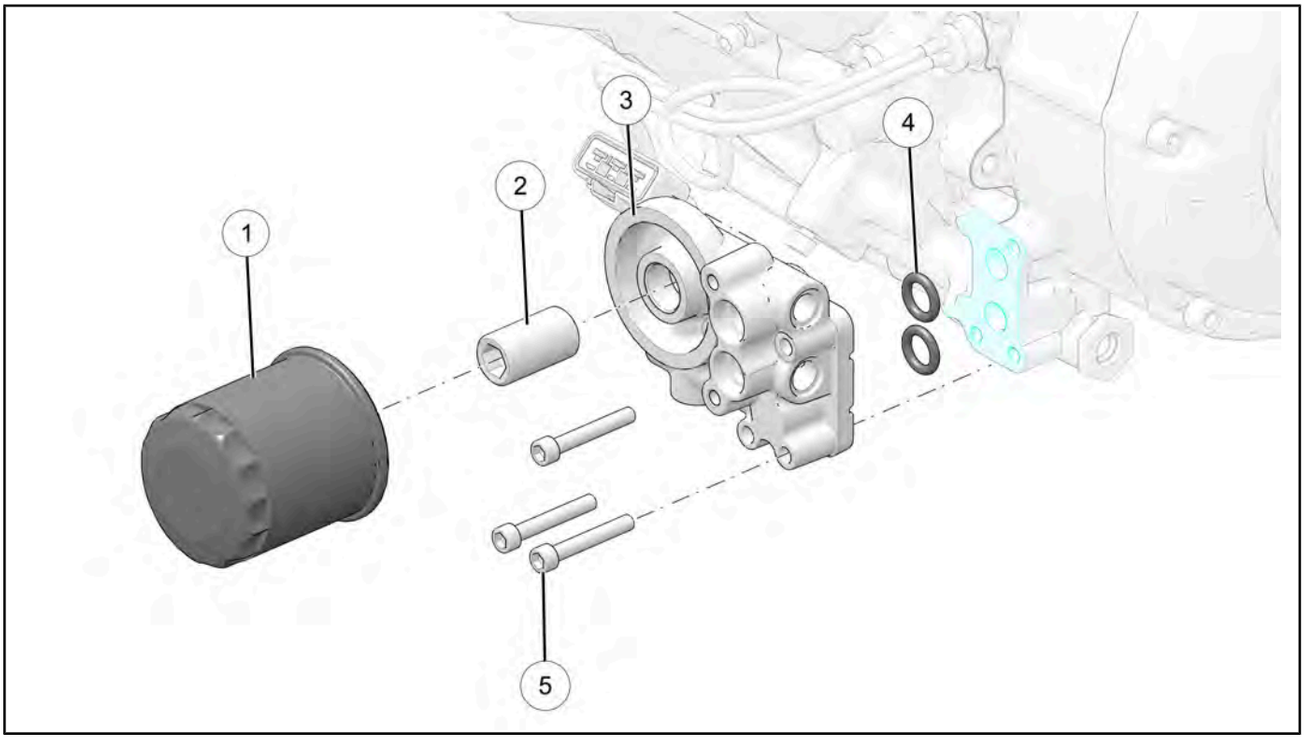
IMPORTANT
Always follow the engine oil level check procedure for accurate readings of the engine oil. **DO NOT OVERFILL!**

ITEM	STANDARD	LIMIT
Engine Oil Capacity (After Disassembly)	5.8 U.S. qts (5.5 Liters)	Not Applicable
Engine Oil Capacity (At Change with Filter) Follow the oil change procedure outlined in the Maintenance chapter.	6.0 U.S. qts (5.7 Liters)	Not Applicable
Engine Oil Capacity (At Change without Filter) Follow the oil change procedure outlined in the Maintenance chapter.	5.9 U.S. qts (5.6 Liters)	Not Applicable
Recommended Engine Oil if Indian Motorcycle 20W/40 is not available, use motorcycle oil with same specifications.	Indian Motorcycle Semi-Synthetic 20W/40	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)
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)

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ASSEMBLY VIEWS

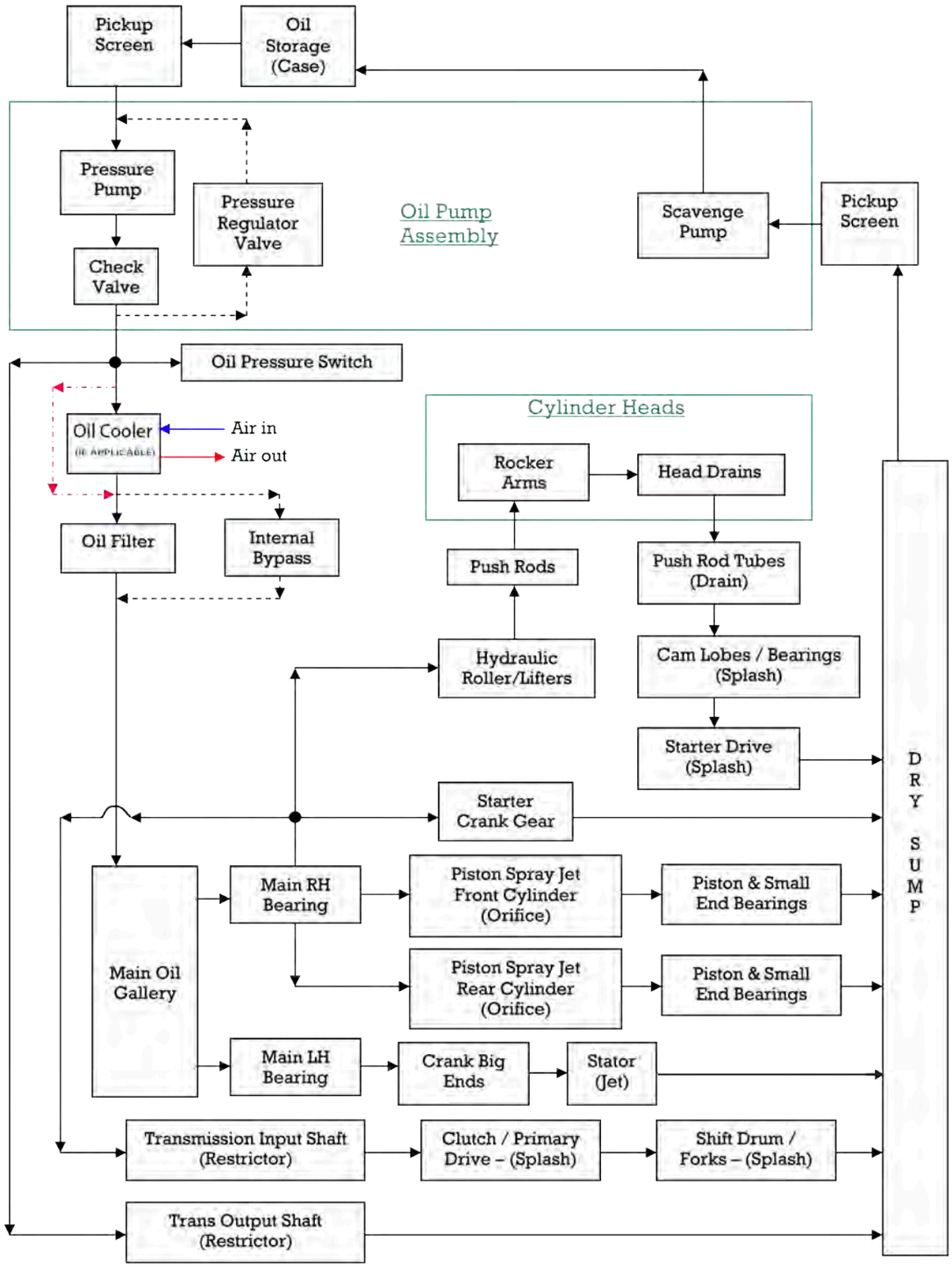
FILTER ADAPTER



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

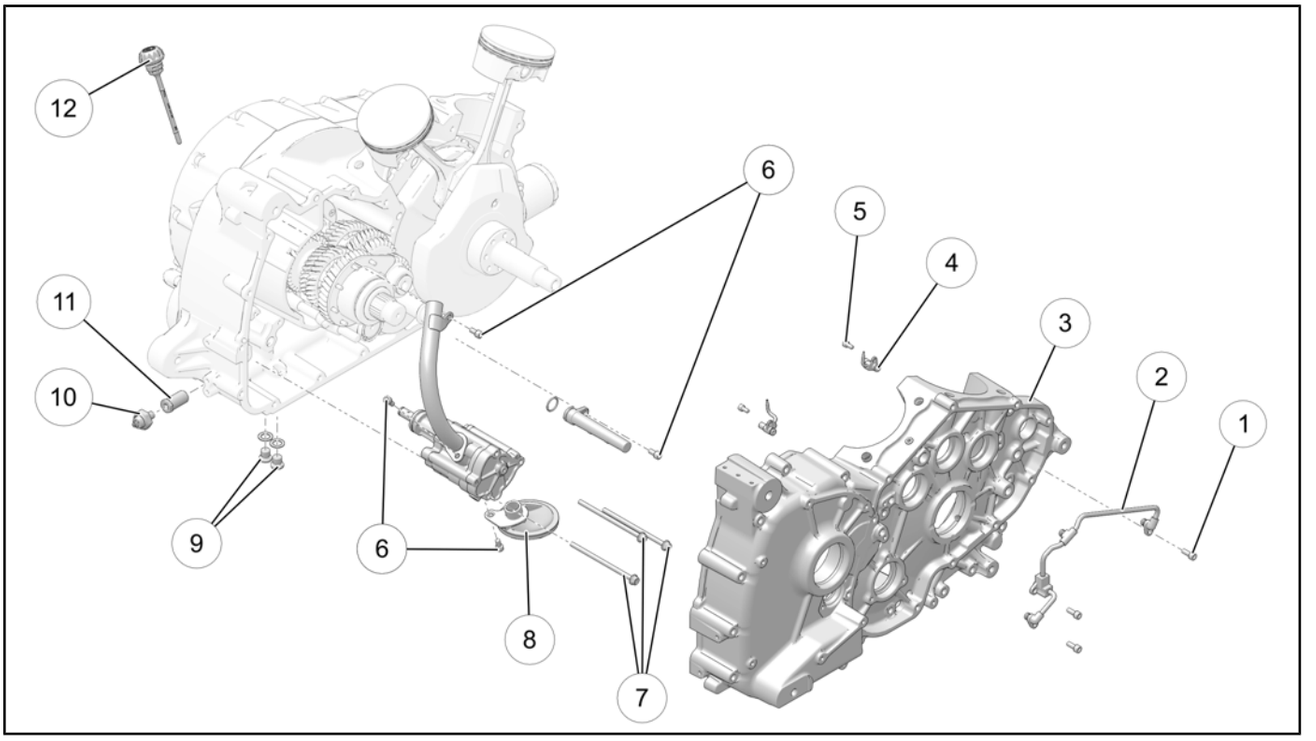
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OIL FLOW DIAGRAM



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LUBRICATION SYSTEM



ITEM	DESCRIPTION	TORQUE
①	Fastener, Oil Feed Pipe - M6 x 1.0 x 15 (QTY.3)	**88 in-lbs (10 N·m)**
②	Oil Feed Pipe	–
③	Engine Case (RH)	–
④	Oil Jet, Piston Cooling	–
⑤	Fastener, Oil Jet - M5 x 0.8 x 10 (QTY.2)	**62 in-lbs (7 N·m)**
⑥	Fastener - M6 x 1.0 x 12 (QTY.3)	**88 in-lbs (10 N·m)**
⑦	Fastener, Oil Pump - M6 x 1.0 x 115 (QTY.3)	**88 in-lbs (10 N·m)**
⑧	Pickup Screen, Oil Pump	–
⑨	Oil Drain Plugs, Scavenge and Oil Tank - M12 x 1.5 (QTY.2)	**15 ft-lbs (20 N·m)**
⑩	Oil Pressure Switch	**115 in-lbs (13 N·m)**
⑪	Adapter, Oil Pressure Switch	**15 ft-lbs (20 N·m)**
⑫	Dipstick, Oil	–

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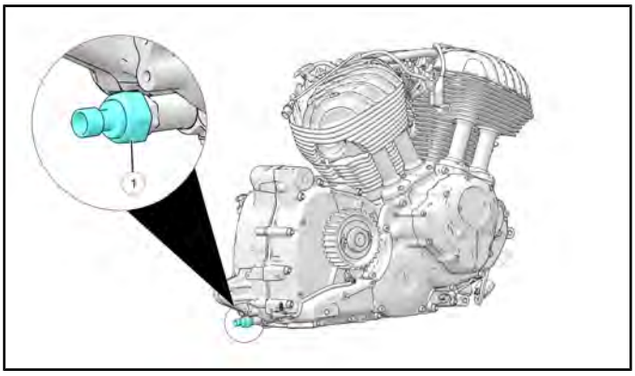
OIL PRESSURE INSPECTION

OIL PRESSURE

⚠ CAUTION
Use caution when working around hot engine oil.

NOTICE
Oil pressure switch is normally open. Switch point is on falling pressure from 3–8 PSI.

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



4. Install oil pressure gauge.
5. Use the dipstick to check the engine oil level and add recommended oil, if necessary.
6. Start engine and check oil pressure at 3000 rpm.
7. Compare reading to oil system specifications.
8. If oil pressure is outside of specification, refer to the **troubleshooting section page 3.18**.
9. Once testing is completed, clean threads with Loctite® Primer N, and apply thread sealant to the oil pressure switch threads and torque to specification.

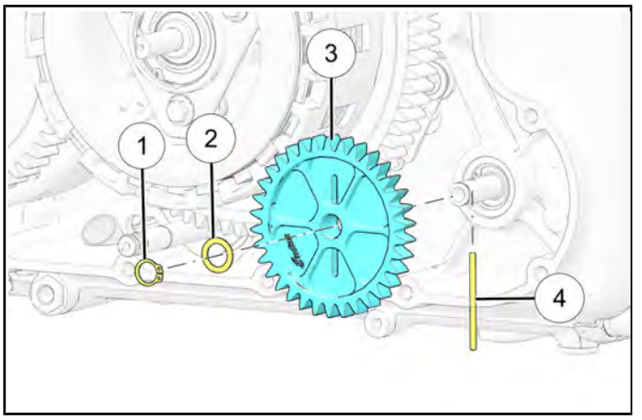
TORQUE
Oil Pressure Switch: **115 in-lbs (13 N·m)**

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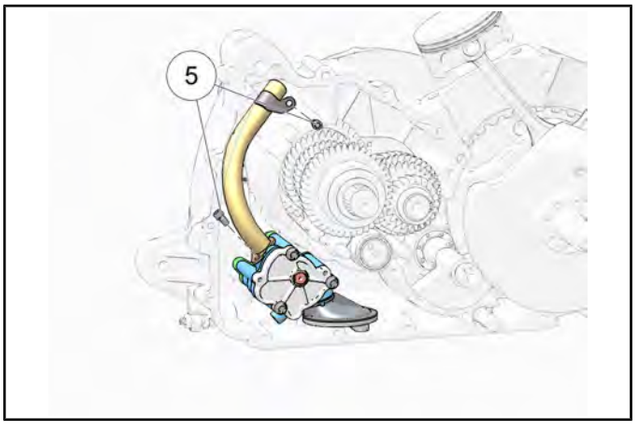
OIL PUMP SERVICE

OIL PUMP REMOVAL

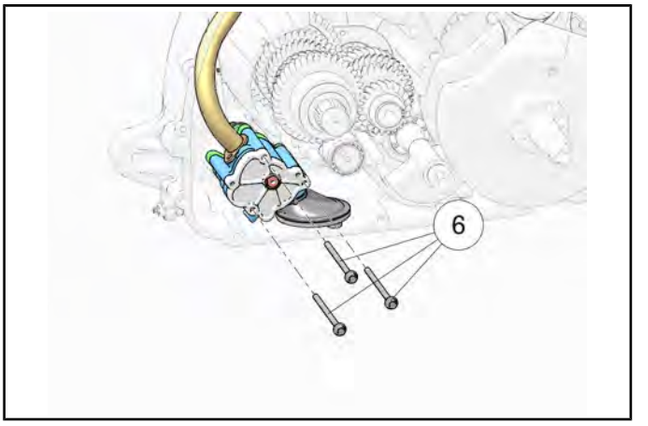
1. Remove engine from frame. See **Removing Engine From Frame page 3.13**.
2. Separate engine cases. See **Crankcase Separation page 6.25**.
3. Remove external snap-ring ①, flat washer ②, oil pump drive gear ③, and drive pin ④ from oil pump input shaft.



4. Remove the oil pump snorkel tube fasteners ⑤.



5. Remove the three fasteners ⑥ from the oil pump assembly.

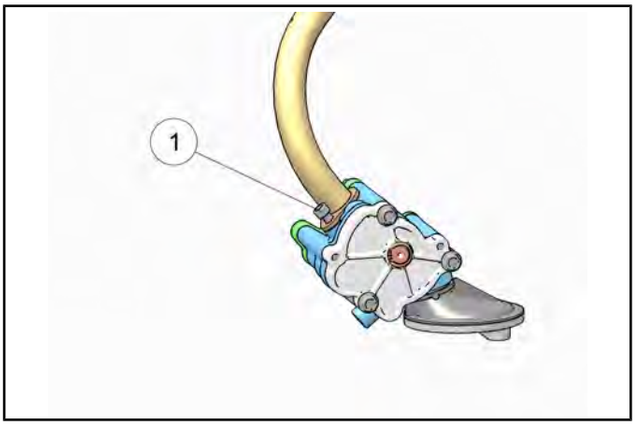


6. Remove the oil pump / snorkel tube assembly from the LH crankcase.

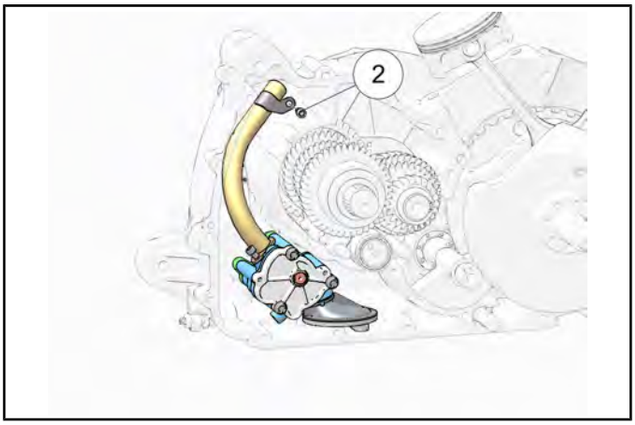
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OIL PUMP INSTALLATION

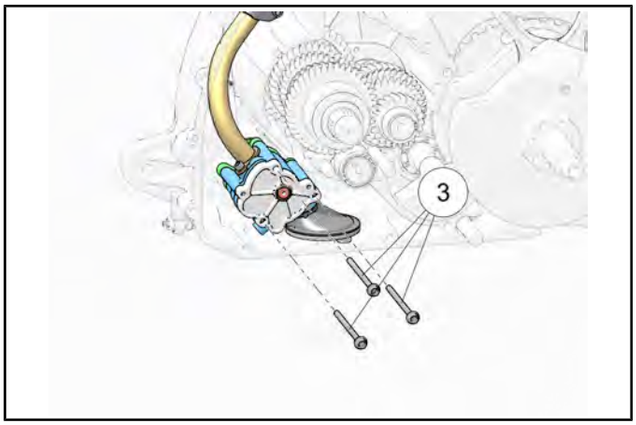
1. Clean oil pipe and dry with compressed air.
2. Loosely install the snorkel tube and fastener ① to the pump body.



3. Install the oil pump / snorkel tube assembly into the crankcase and loosely install fastener ② securing the snorkel tube to the left-hand crankcase.



4. Align fastener holes and install oil pump fasteners ③ and torque to specification.



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

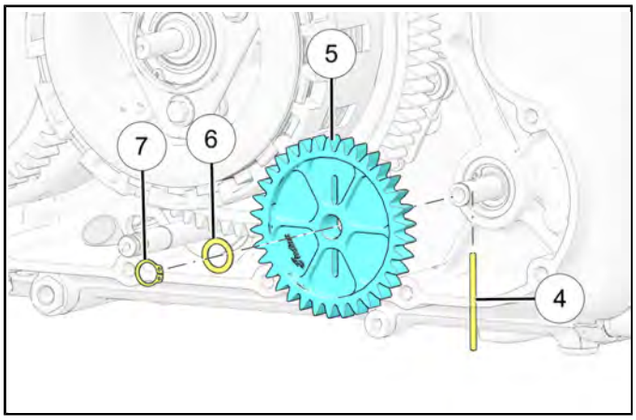
5. Torque snorkel tube fasteners to specification.

TORQUE
Snorkel Tube Fasteners: **88 in-lbs (10 N·m)**

6. Rotate the oil pump drive shaft by hand a few revolutions to verify smooth operation.

NOTICE
Pump should rotate by hand with little resistance. If it is difficult to rotate, loosen then re-torque oil pump fasteners and check again.

7. Install oil pump drive pin ④, sprocket ⑤, washer ⑥ and external snap-ring ⑦.



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8. Assemble engine crankcase. See **Crankcase Assembly page 6.41**.
9. Install engine in frame. See **Engine Installation page 3.15**.
10. Verify engine oil pressure after assembly. See **Oil Pressure page 3.23**.

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CYLINDER HEAD / VALVES

GENERAL INFORMATION

The Thunderstroke 111 / 116 engines use a single cam chain system to drive a centrally located camshaft (intake). The central camshaft uses a gear drive to turn two outer camshafts (exhaust). Each cylinder is equipped with two valves that are opened and closed via self-adjusting hydraulic lifters and pushrods.

SERVICE NOTES

- 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 20W/40 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

TOOL DESCRIPTION	PART NUMBER
Valve Spring Compressor	PV-1253
Crankshaft Locking Tool	PF-51235
Crankshaft Rotation Tool	PF-51239
Seal and Bearing Driver Set	PV-43558
Camshaft Service Tool	PF-51455
Camshaft Holding Tool	PF-52544

*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/

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SERVICE SPECIFICATIONS

CAMSHAFT DATA

DESCRIPTION		SPECIFICATION	
		111 c.i.	**116 c.i.**
CAMSHAFT DATA	Valve Train	Over Head Valve / 2 valves per cyl 1 Intake Valve / 1 Exhaust Valve	
	Intake Valve Opens At 1 mm Lift	2.0° BTDC	4° BTDC
	Intake Valve Closes At 1 mm Lift	43.0° ABDC	44° ABDC
	Exhaust Valve Opens At 1 mm Lift	44° BBDC	48° BBDC
	Exhaust Valve Closes At 1 mm Lift	4° ATDC	10° ATDC
	Max Lobe Lift INTAKE EXHAUST	 (7.20 mm) (7.20 mm)	 (7.55 mm) (8.40 mm)
	Max Valve Lift INTAKE EXHAUST	 (12.8 mm) (12.8 mm)	 (13.32 mm) (14.8 mm)

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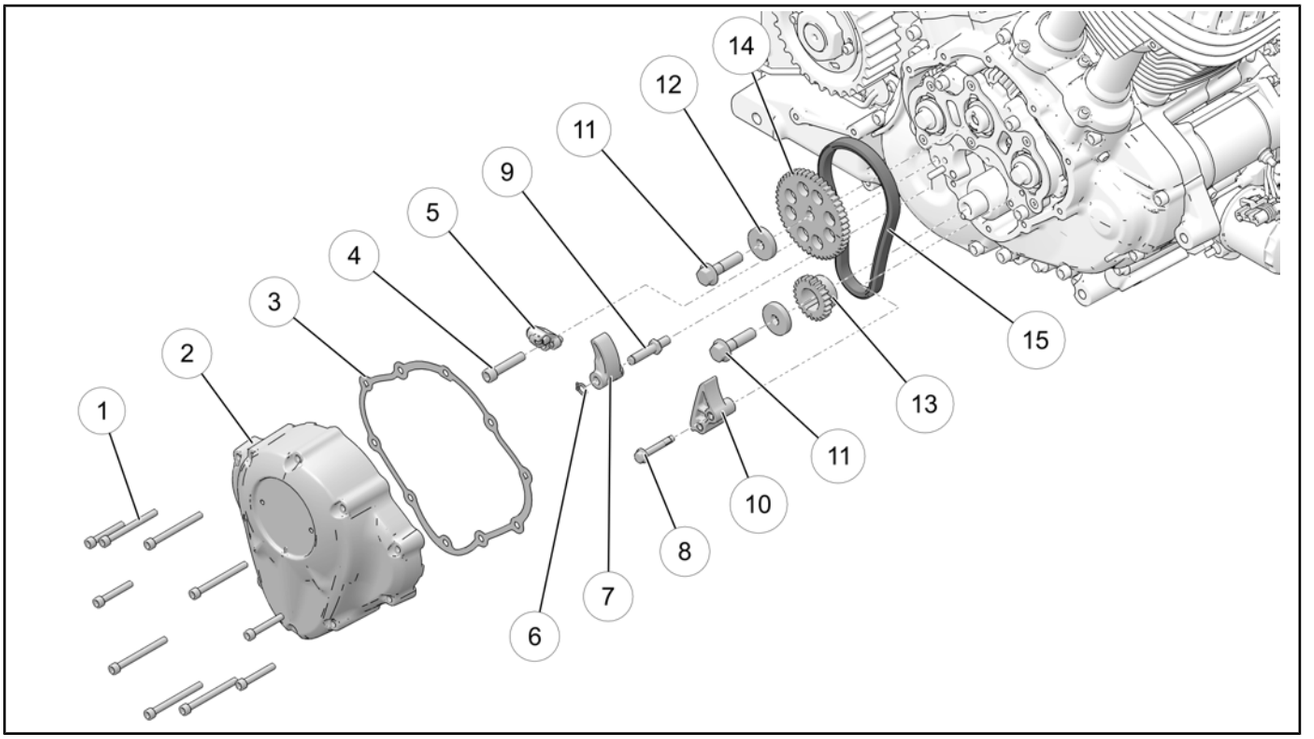
CYLINDER HEAD & VALVE TRAIN DATA

ITEM		STANDARD	SERVICE LIMIT
Cam Chain Tensioner	Ratchet / Spring	-	-
Cam Shaft	Lobe Height INTAKE EXHAUST	 1.6299" (41.401 mm) 1.5827" (40.202 mm)	 1.6260" (41.301 mm) 1.5788" (40.102 mm)
	Journal O.D. (Exhaust)	.9835 - .9840" (24.979 - 24.993 mm)	.9832" (24.973 mm)
	Journal O.D. (Intake)	.9835 - .9840" (24.979 - 24.993 mm)	.9832" (24.973 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	0.69 — 0.72" (17.7 — 18.3 mm)	-
	Valve Stem O.D. INTAKE EXHAUST	 .3131 — .3138" (7.953 – 7.973 mm) .3131 — .3138" (7.953 – 7.973 mm)	 .3128" (7.945 mm) .3128" (7.945 mm)
	Valve Stem Deflection (INTAKE & EXHAUST)	-	.005" (.13 mm)
	Valve Seat Width INTAKE EXHAUST	 .047" (1.2 mm) .053" (1.35 mm)	 - -
	Valve Stem Runout	-	.0005" (.013 mm)
	Valve Head Radial Runout	-	.002" (.05 mm)
	Valve Installed Height INTAKE EXHAUST	 2.184 - 2.224" (55.49 - 56.49mm) 2.184 - 2.224" (55.49 - 56.49mm)	 - -
Valve Spring	Intake Valve Maximum Lift	**111 c.i.** =0.504" (12.8 mm) **116 c.i.** =0.524" (13.32 mm)	-
	Exhaust Valve Maximum Lift	**111 c.i.** =0.504" (12.8 mm) **116 c.i.** =0.583" (14.8 mm)	-
	Spring Installed Height	1.929 - 2.007" (49.00 - 51.00 mm)	-

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ASSEMBLY VIEWS

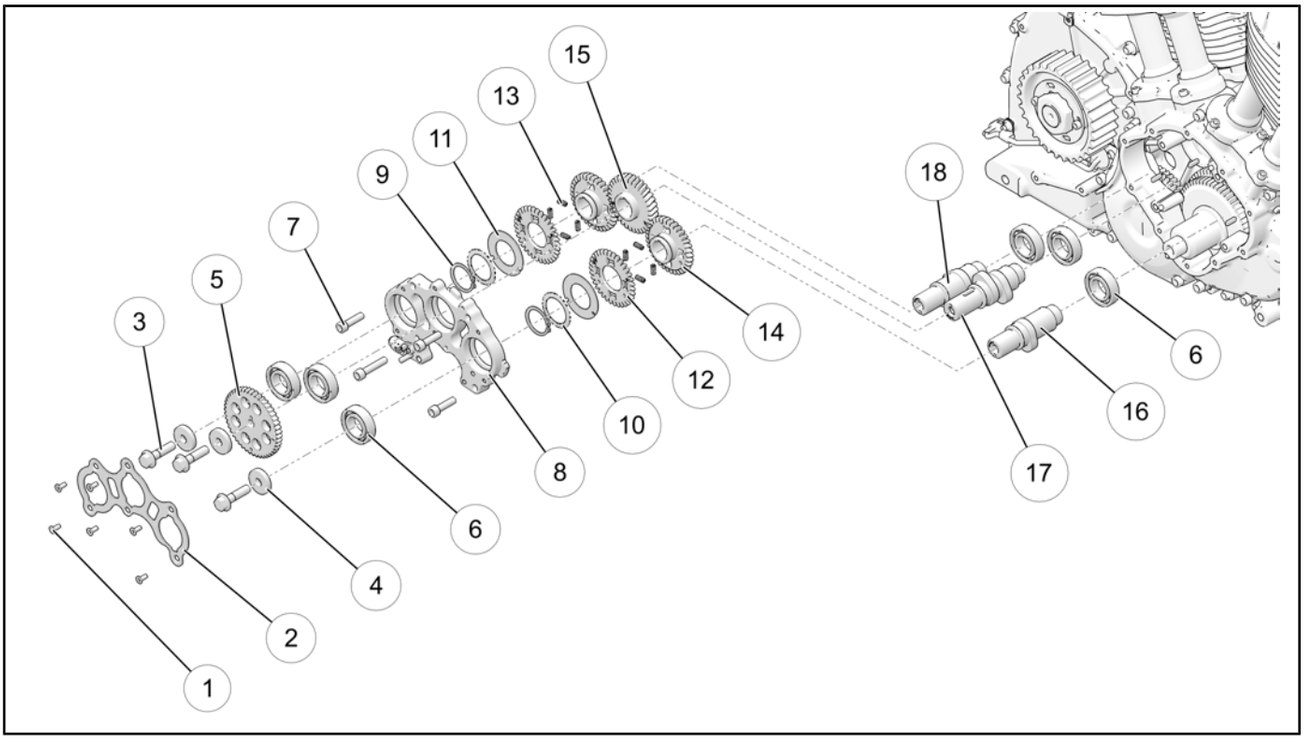
CAM CHAIN



ITEM	DESCRIPTION	TORQUE
①	Cam Cover Fastener	**10 ft-lbs (13 N·m)**
②	Cam Cover	—
③	Cam Cover Gasket	—
④	Timing Chain Tensioner Fastener	**15 ft-lbs (20 N·m)**
⑤	Timing Chain Tensioner	—
⑥	Snap Ring, Tensioner Arm	—
⑦	Tensioner Arm, Timing Chain	—
⑧	Timing Chain Guide Fastener	**71 in-lbs (8 N·m)**
⑨	Pivot, Tensioner Arm	**15 ft-lbs (20 N·m)**
⑩	Guide, Timing Chain	—
⑪	Timing Gear Fastener	**52 ft-lbs (70 N·m)**
⑫	Washer, Timing Gear	—
⑬	Timing Gear, Crankshaft	—
⑭	Timing Gear, Camshaft (Intake)	—
⑮	Timing Chain	—

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CAMSHAFTS



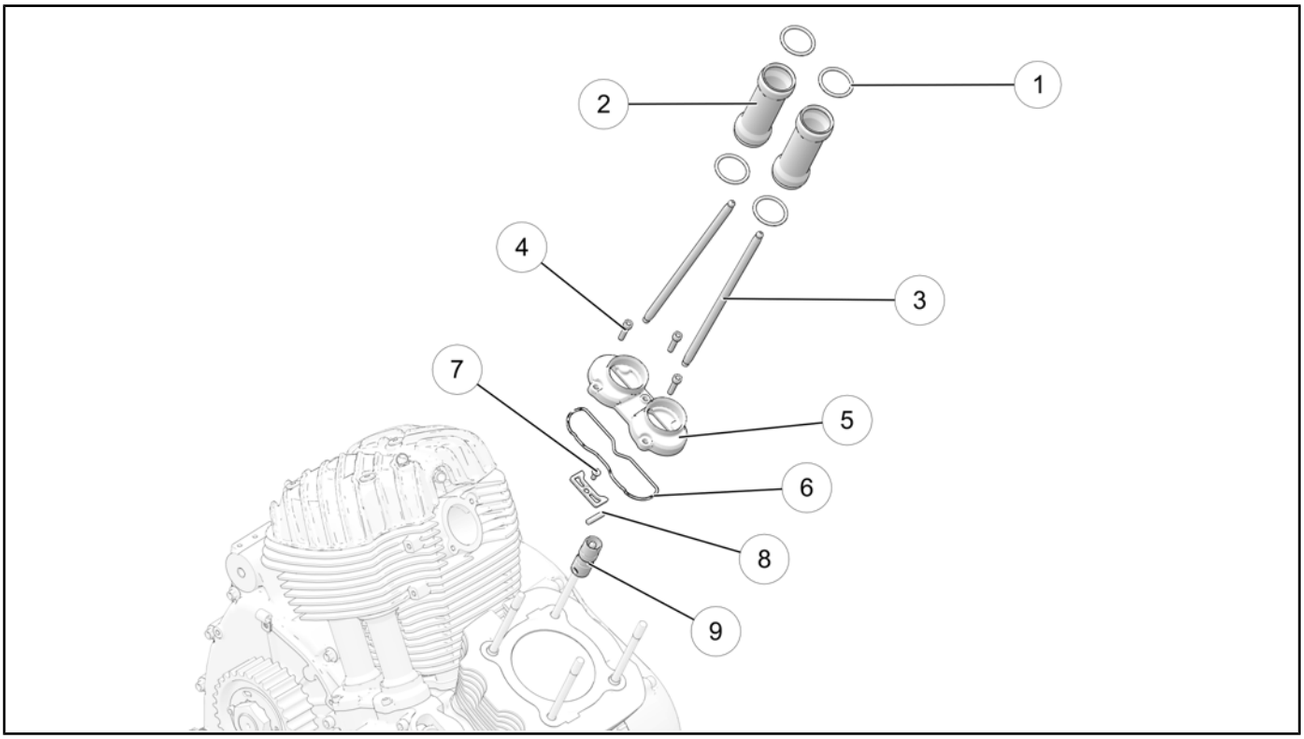
ITEM	DESCRIPTION	TORQUE
①	Fastener, Bearing Retainer Plate - M5 x 0.8 x 12 (QTY.6)	**62 in-lbs (7 N·m)**
②	Retaining Plate, Cam Bearings	-
③	Fastener, Timing Gear - M10 x 1.5 x 40 (QTY.2) (Exhaust Camshafts)	**52 ft-lbs (70 N·m)**
④	Washer, Timing Gear (QTY.3)	-
⑤	Timing Gear, Camshaft (Intake)	-
⑥	Bearings, Camshaft (Outer)	-
⑦	Fastener - M8 x 1.25 x 30 (QTY.3) / M8 x 1.25 x 40 (QTY.1)	**15 ft-lbs (20 N·m)**
⑧	Bearing Carrier, Camshaft (QTY.6)	-
⑨	External Snapring	-
⑩	Washer, Belleville	-
⑪	Retainer, Camshaft Gear (Split)	-
⑫	Camshaft Gear, Split (Exhaust)	-
⑬	Spring, Camshaft Gear (Split)	-
⑭	Camshaft Gear, Split (Exhaust) NOT SERVICEABLE	-
⑮	Camshaft Gear (Intake) SERVICEABLE AS ASSEMBLY ONLY	-
⑯	Camshaft, Exhaust (Front)	-

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ITEM	DESCRIPTION	TORQUE
⑰	Camshaft, Intake (Center)	-
⑱	Camshaft, Exhaust (Rear)	-

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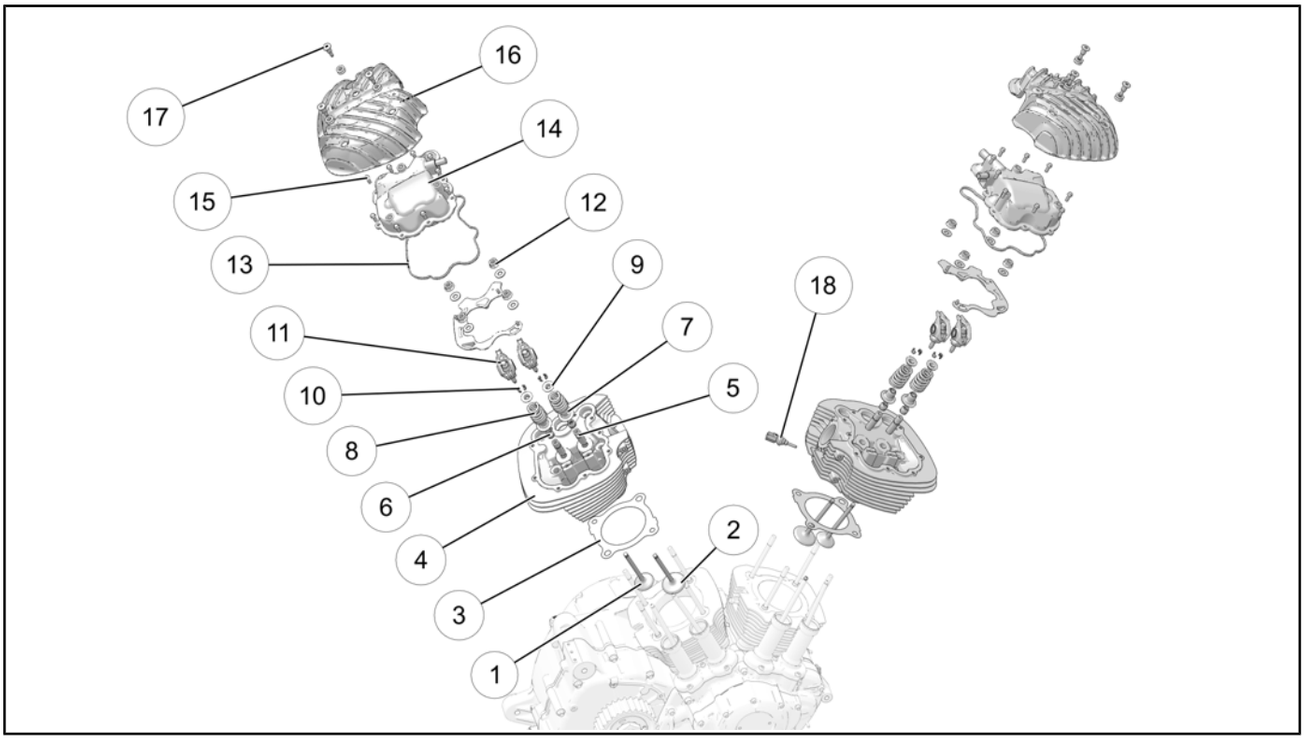
LIFTERS / PUSHRODS



ITEM	DESCRIPTION	TORQUE
①	O-ring, Pushrod Tube	—
②	Pushrod Tube	—
③	Pushrod	—
④	Fastener, Lifter Block - M6 x 1.0 x 25 (QTY.3 per cylinder)	**88 in-lbs (10 N·m)**
⑤	Lifter Block	—
⑥	Gasket, Lifter Block	—
⑦	Fastener, Retaining Plate - M5 x 0.8 x 12 (QTY.1 per cylinder)	**62 in-lbs (7 N·m)**
⑧	Dowel, Lifter Guide	—
⑨	Lifter	—

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CYLINDER HEAD



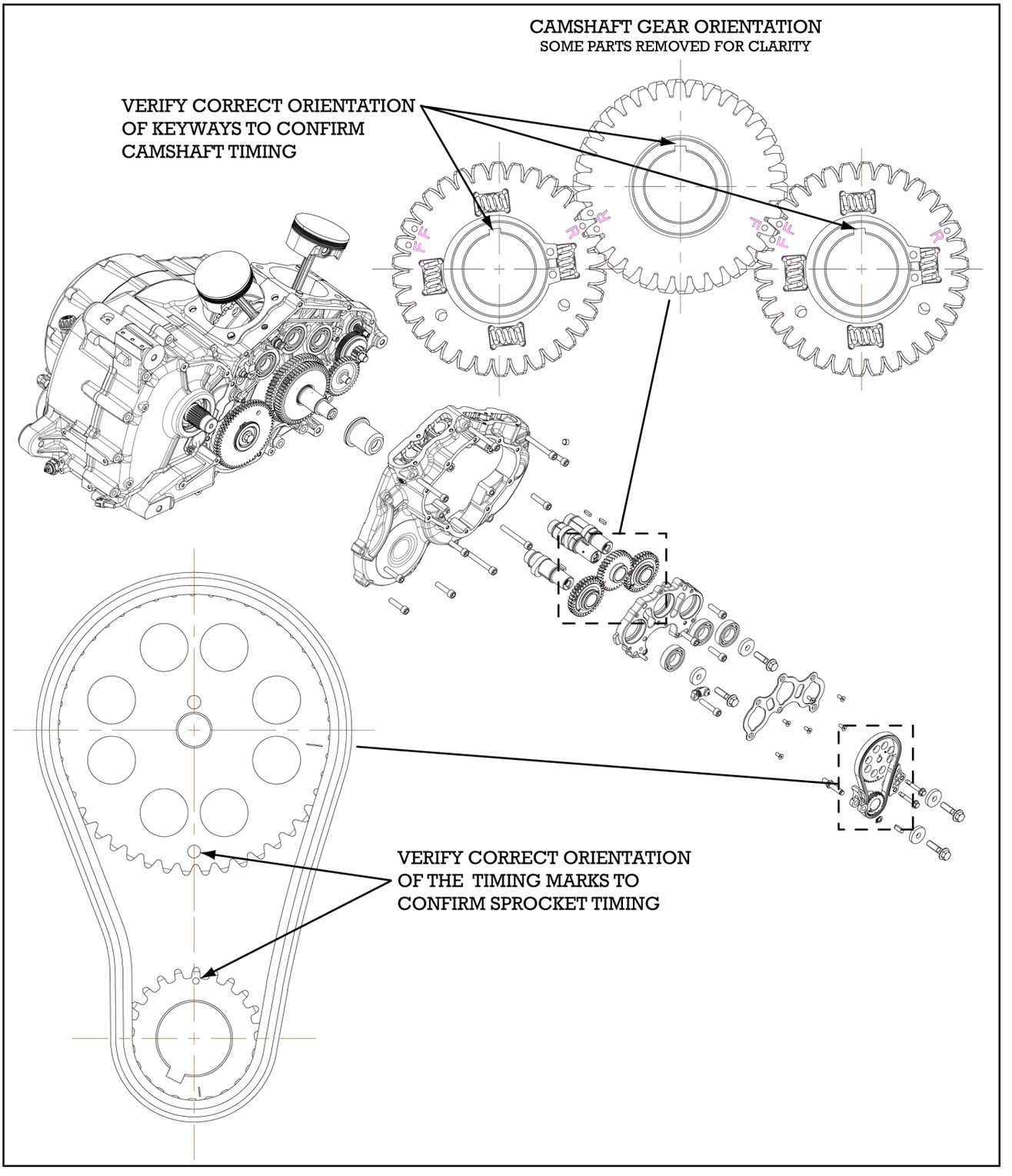
ITEM	DESCRIPTION	TORQUE
①	Valve, Exhaust	—
②	Valve, Intake	—
③	Gasket, Cylinder Base	—
④	Cylinder Head	—
⑤	Valve Guide	—
⑥	Spring Seat / Valve Stem Seal Asm	—
⑦	Spring Seat / Valve Stem Seal Asm	—
⑧	Valve Spring	—
⑨	Retainer, Valve Spring	—
⑩	Keepers, Valve Spring	—
⑪	Rocker Arm Assembly / Rocker Arm Nut	**22 ft-lbs (30 N·m)**
⑫	Nut, Cylinder Head - M10 x 1.50 (QTY.4 per cylinder)	Refer to procedure
⑬	Gasket, Valve Cover	—
⑭	Inner Valve Cover	—
⑮	Fastener, Inner Valve Cover - M6 x 1.0 x 20 (QTY.9)	**88 in-lbs (10 N·m)**
⑯	Outer Valve Cover	—

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ITEM	DESCRIPTION	TORQUE
⑰	Fastener, Outer Valve Cover - M6 x 12 x 15 (QTY.3)	**88 in-lbs (10 N·m)**
⑱	Cylinder Head Temperature Sensor (CHT)	**71 in-lbs (8 N·m)**

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CAMSHAFT TIMING



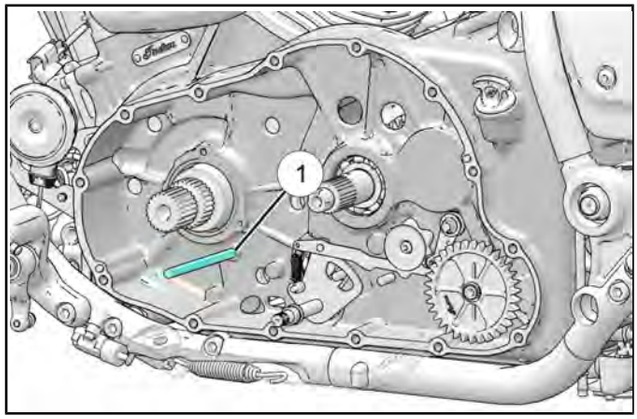
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CAM CHAIN SERVICE

LOCKING THE CRANKSHAFT FOR SERVICE

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

1. Remove the spark plugs. See **Spark Plug Removal page 3.5**.
2. Remove the stator. See **Stator Removal / Installation page 10.36**.
3. Using special service tool PF–51239, rotate the crankshaft counterclockwise (primary side) until the front piston is at TDC. See **Camshaft Timing page 3.36**.
4. Lock the crankshaft by inserting a 5/16" pin punch (or equivalent) into the locking hole ①.



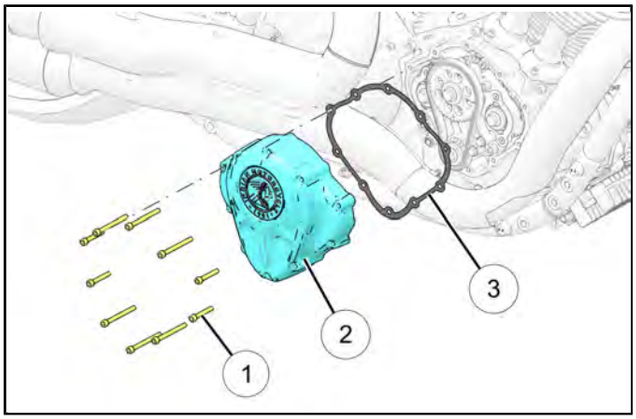
NOTICE
It may be necessary to rotate the crankshaft slight forward or back to properly align holes.

CAM CHAIN COVER REMOVAL / INSTALLATION

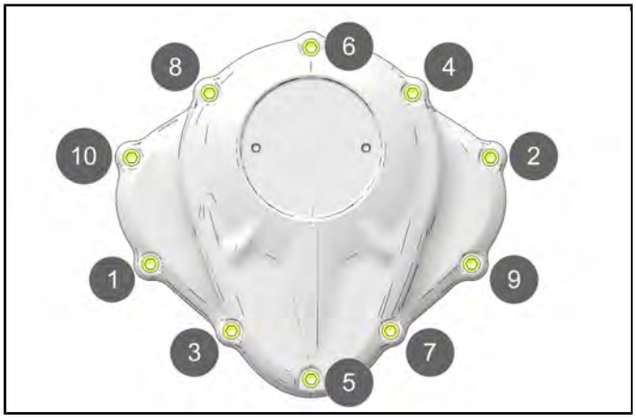
1. Remove the right-hand floorboard / master cylinder assembly and move out of the way. See **Driver Foot Peg Removal / Installation page 7.25**.

NOTICE
The right-hand 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 the ten fasteners ① securing the cam chain cover to the inner timing cover.



3. Remove the cam chain cover ② and gasket ③.
4. **INSTALLATION is performed by reversing the removal procedure.**
5. Clean gasket mating surfaces and install cam chain cover using a new gasket.
6. Torque cam chain cover fasteners following the specified torque sequence.



TORQUE
Cam Chain Cover Fasteners: **10 ft-lbs (13 N·m)**

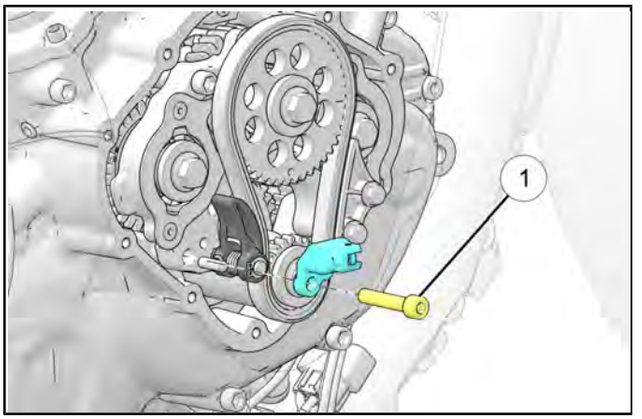
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CAM CHAIN TENSIONER REMOVAL

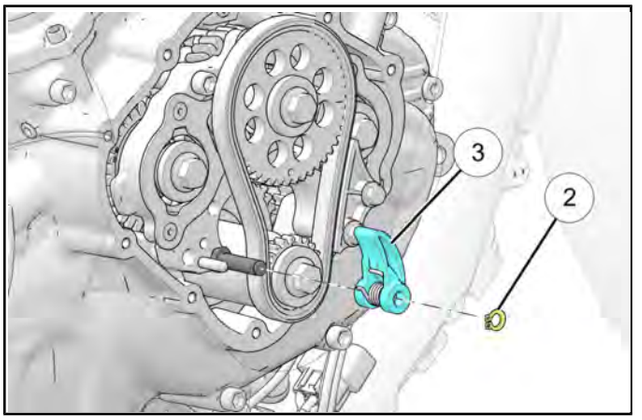
⚠ CAUTION

Do not rotate engine with tensioner(s) removed.

1. Remove the cam chain cover. See **Cam Chain Cover Removal / Installation page 3.37**.
2. Remove cam chain tensioner fastener ① and remove the cam chain tensioner.

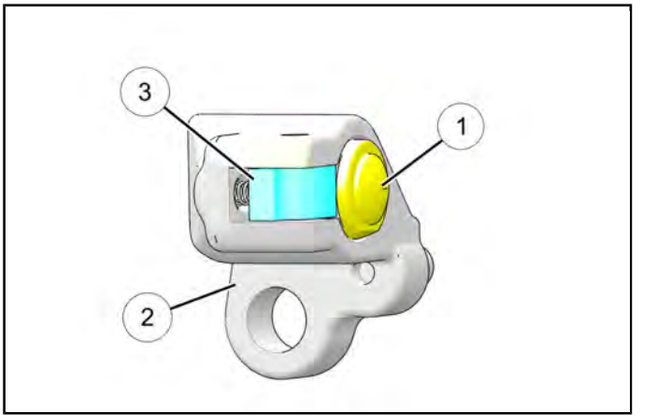


3. Remove the external snap ring ② from the tensioner arm and remove arm and spring as an assembly ③.



CAM CHAIN TENSIONER INSPECTION

1. Visually inspect ratchet plunger ① for damage, scoring, or burrs.
2. Lubricate ratchet plunger with engine oil. Depress the release pawl and move plunger in and out of housing ② to check for smooth movement without binding.
3. Inspect the ratchet pawl mechanism ③ and verify proper spring operation.
4. Replace tensioner assembly if plunger doesn't fully extend when released from a compressed state.



5. Inspect tensioner arm for excessive wear marks from timing chain, cracks or fatigue.
6. Inspect the tensioner arm spring for cracks or fatigue.

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CAM CHAIN TENSIONER INSTALLATION

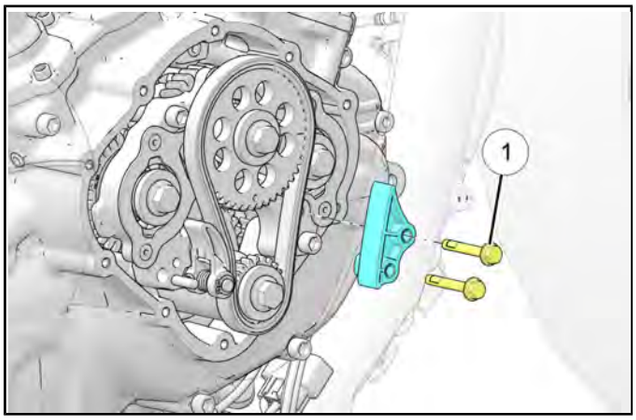
1. Verify that the engine is at TDC and the timing marks are properly aligned. See **Camshaft Timing page 3.36**.
2. Slide the tensioner arm and spring over the pivot pin and, using a needle nose pliers or similar tool, loop the tensioner arm spring over the retainer pin and slide down until fully seated.
3. Install the tensioner arm snap ring.
4. Compress the tensioner assembly and slide into position over the alignment dowel.
5. Install tensioner fastener and torque to specification.

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

6. With a new gasket and both mating surfaces clean, install the cam chain cover. See **Cam Chain Cover Removal / Installation page 3.37**.

CAM CHAIN GUIDE REMOVAL

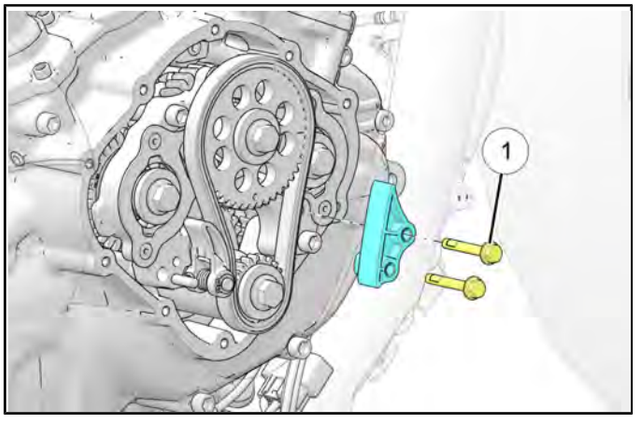
1. Remove the cam chain cover. See **Cam Chain Cover Removal / Installation page 3.37**.
2. Remove the two fasteners ① securing the cam chain guide to the engine and remove the guide and spacers.



CAM CHAIN GUIDE INSTALLATION

1. If removed, install the cam chain. See **Cam Chain Installation page 3.41**.
2. Install cam chain guide ① and fasteners ② . Torque to specification.

TORQUE
Cam Chain Guide: **71 in-lbs (8 N·m)**

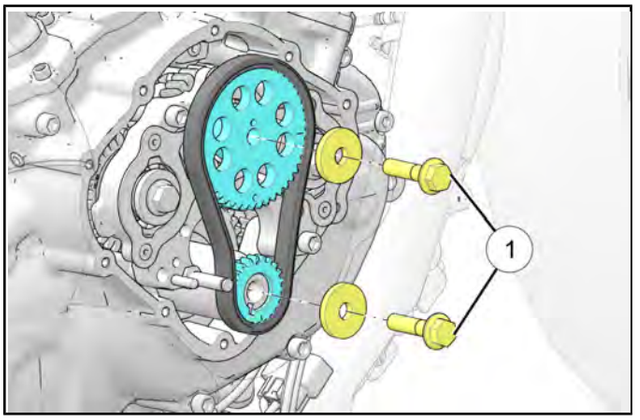


3. Install the cam cover. See **Cam Chain Cover Removal / Installation page 3.37**.

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CAM CHAIN REMOVAL

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Drain the engine oil. See **Engine Oil & Filter Change** in the Maintenance Chapter.
3. Remove spark plugs. See **Spark Plug Removal page 3.5**.
4. Place an oil drain pan beneath the engine to catch any residual oil when primary and cam chain covers are removed.
5. Remove the cam chain cover. See **Cam Chain Cover Removal / Installation page 3.37**.
6. Perform the crankshaft locking procedure. See **Locking the Crankshaft for Service page 3.37**.
7. Remove the cam chain tensioner and tensioner arm assemblies. See **Cam Chain Tensioner Removal page 3.38**.
8. Remove the cam chain guide. See **Cam Chain Removal page 3.40**
9. Remove the camshaft and crankshaft sprocket fasteners ① .



10. Pull the camshaft sprocket, crankshaft sprocket and cam chain off as an assembly.
11. Collect the woodruff key from the crankshaft.

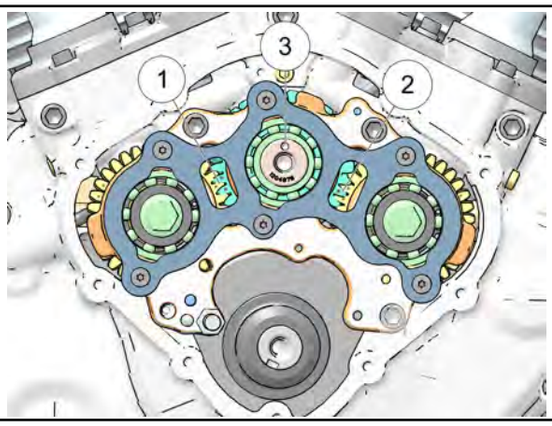
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CAM CHAIN INSTALLATION

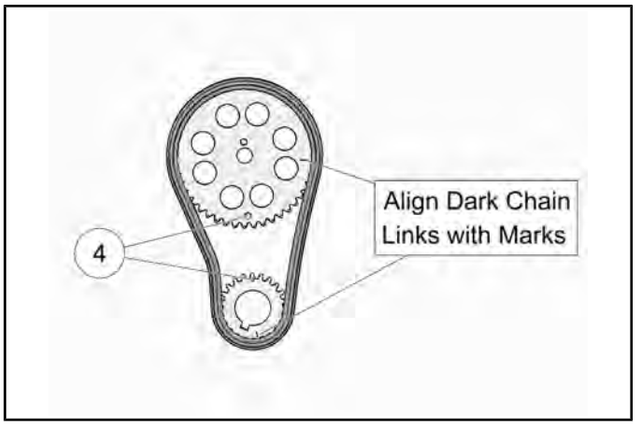
⚠ CAUTION

The Thunderstroke 111 / 116 is an INTERFERENCE ENGINE. If the camshafts and crankshaft must be turned independently of each other to set valve timing, the camshafts must be set to TDC prior to rotating the crankshaft. Failure to do this may cause the pistons to contact the valves resulting in engine damage.

1. Verify that the camshafts are set to TDC. Camshaft timing marks ① & ② should be aligned as shown. The camshaft sprocket alignment dowel ③ should be at 12 o'clock.



2. Perform **METHOD 1** of the crankshaft locking procedure. This will ensure the crankshaft is locked in the TDC position. See Locking the Crankshaft for Service page 3.37.
3. Place the woodruff key in the end of the crankshaft.
4. Working on a flat surface, assemble the timing chain onto the crankshaft and camshaft sprockets as shown.
   - Align timing marks ④ .
   - Position the chain on the sprockets so that the dark chain links line up with sprocket hashmarks.



5. Slide the chain and sprockets onto the crankshaft and center camshaft as an assembly.
6. Verify that the crankshaft woodruff key is still in place and that the timing marks are still aligned.
7. Install crankshaft and camshaft sprocket fasteners and washers and torque to specification.

TORQUE
Camshaft / Crankshaft Sprocket Fasteners: **52 ft-lbs (70 N·m)**

8. Install the cam chain guide. See **Cam Chain Guide Installation page 3.39**
9. Install the cam chain tensioner and tensioner arm assemblies. See **Cam Chain Tensioner Installation page 3.39**
10. Install the cam chain cover. See **Cam Chain Cover Removal / Installation page 3.37**
11. Remove the crankshaft locking pin installed during the crankshaft locking procedure in step 2.
12. Install stator. See **Stator Removal / Installation page 10.36**.
13. Install clutch assembly and clutch rack. See **Clutch Installation page 5.33**.
14. Install primary cover. See **Primary Cover Installation (2022) page 5.24**

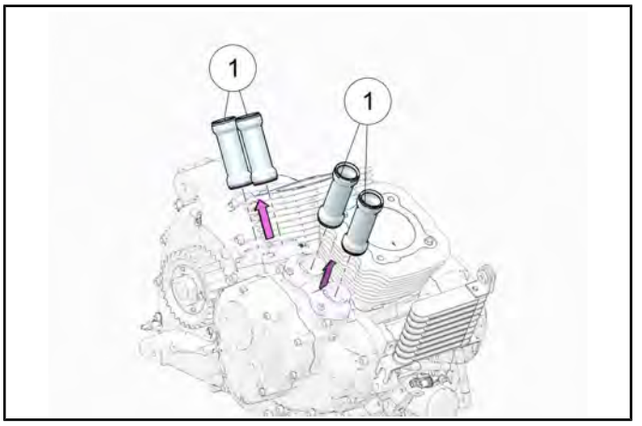
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CAMSHAFT / LIFTER SERVICE - ENGINE OUT

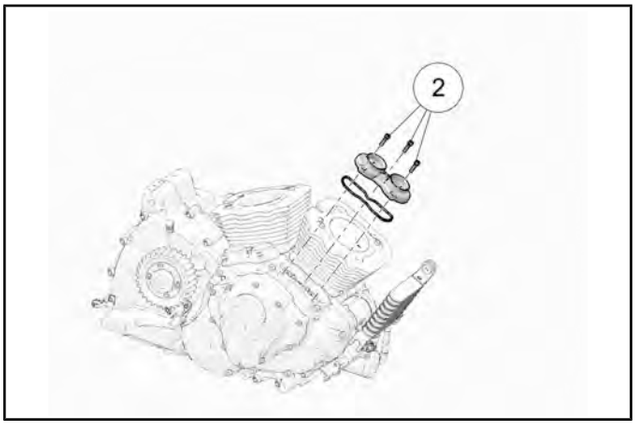
LIFTER REMOVAL

IMPORTANT
Keep mated parts together for assembly. It is important to put lifters and lifter blocks back in the same location.

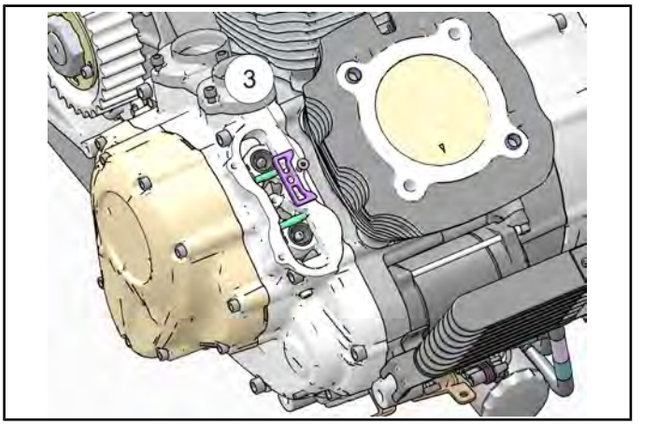
1. Remove Cylinder Heads. See **Cylinder Head Removal page 3.78** .
2. Remove push rod tubes ① by pulling out of the lifter blocks to release the o-rings.



3. Starting with the front lifter block, remove the three fasteners ② and the lifter block.



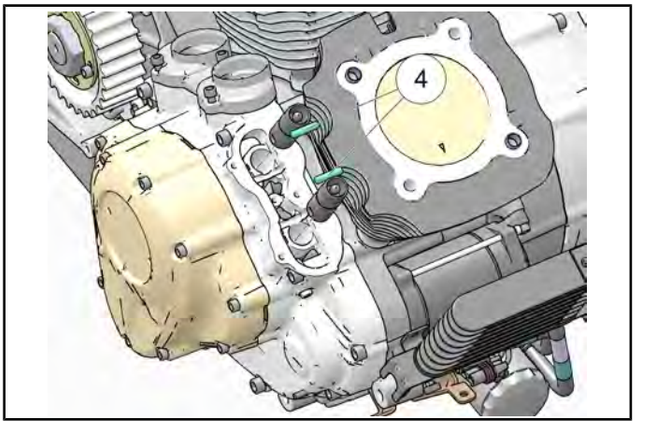
4. Using a T25 Torx, remove the fastener ③ securing the lifter retaining plate to the inner cam chain cover and remove plate.



5.

IMPORTANT
When removing the lifter guides, be careful not to drop them into the inner cam chain cover.

Remove lifter guides ④ and pull lifters out of bore.

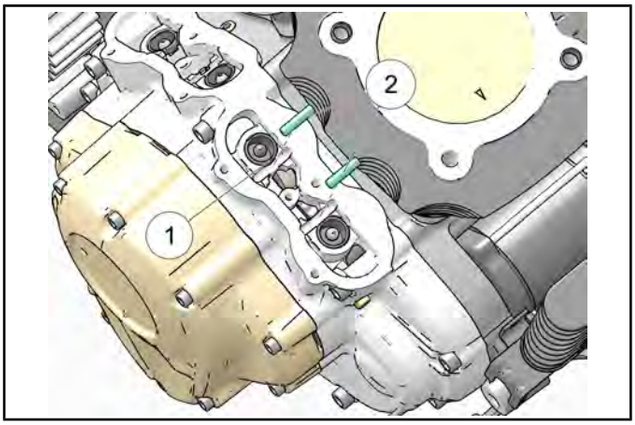


6. Repeat steps 3–5 to remove the rear lifters.

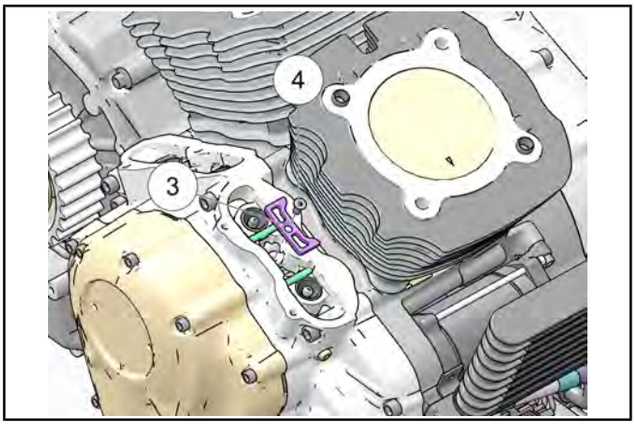
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LIFTER INSTALLATION

1. Apply a light coat of engine oil to each lifter and slide into bore in the same position from which it was removed.
2. Rotate each lifter so that the flat surface ① is parallel with the lifter guide slot.
3. Starting at the front cylinder, install lifter guides ② .



4. Install lifter retaining plate ③ with bevelled fastener relief facing up.
5. Install retaining plate fastener ④ and torque to specification.

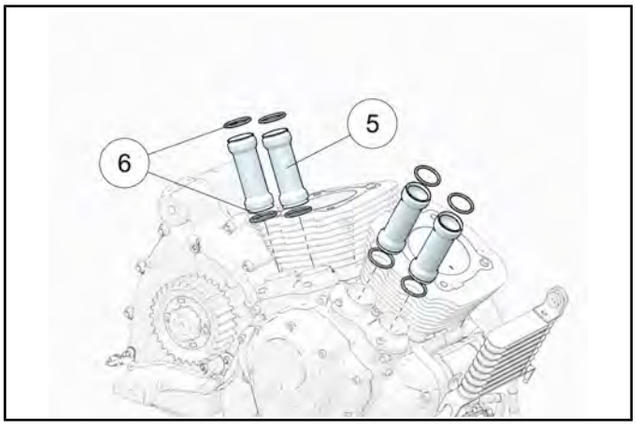


TORQUE
Lifter Retaining Plate Fastener: **62 in-lbs (7 N·m)**

6. Repeat steps 3–5 for the rear cylinder lifters.
7. Install new gaskets into lifter blocks and install lifter blocks and fasteners finger tight.
8. Torque lifter block fasteners to specification.

TORQUE
Lifter Block Fasteners: **88 in-lbs (10 N·m)**

9. Install push rod tubes ⑤ with new o-rings ⑥.



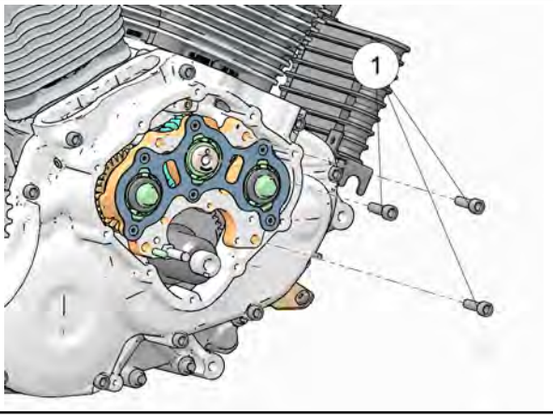
10. Install cylinder heads. See **Cylinder Head Installation page 3.84**.
11. Install inner and outer valve cover gaskets. See **Valve Cover Installation page 3.77**.

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CAMSHAFT CARRIER REMOVAL

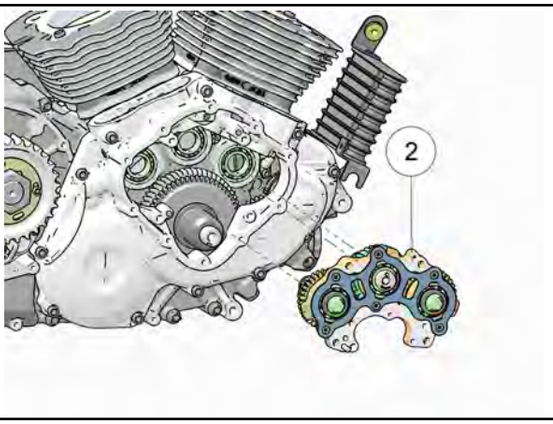
NOTICE
Base and head gasket seal is released when removing camshaft carrier. Replacement of both head and base gasket is recommended to prevent oil leaks. Keep mated parts together.

1. Remove the engine from the frame and place on an engine stand. See **Removing Engine From Frame page 3.13**.
2. Remove lifters. See **Lifter Removal page 3.42**.
3. Remove cam chain, cam chain tensioner and guide. See **Cam Chain Removal page 3.40**.
4. Remove the three remaining camshaft carrier fasteners ① .



5. Grasp the camshaft carrier ② and pull straight out to remove the three camshafts, outer bearings and carrier as an assembly.

NOTICE
The camshaft ends are slip-fit to the inner bearings and should come out by hand.



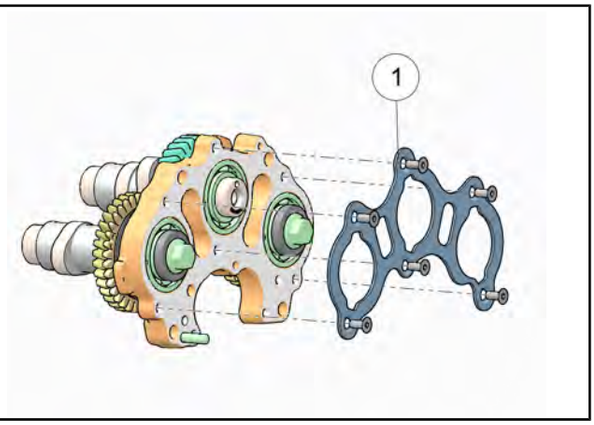
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CAMSHAFT CARRIER DISASSEMBLY

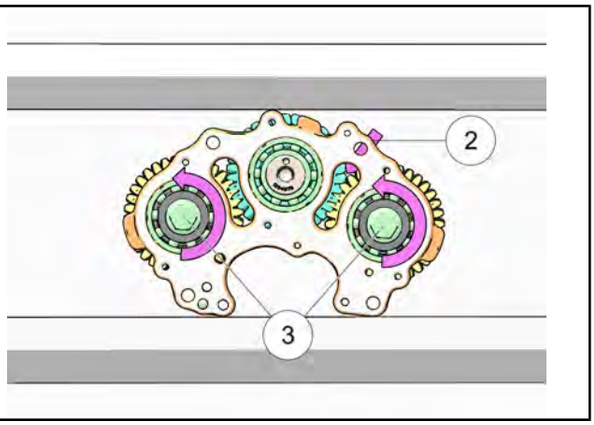
IMPORTANT

Camshafts are slip-fit to carrier bearings. Once the carrier assembly has been removed from the engine, the intake (center) camshaft will be held in place by gear preload only. Use caution while working on the carrier assembly so that camshafts do not fall from carrier and become damaged.

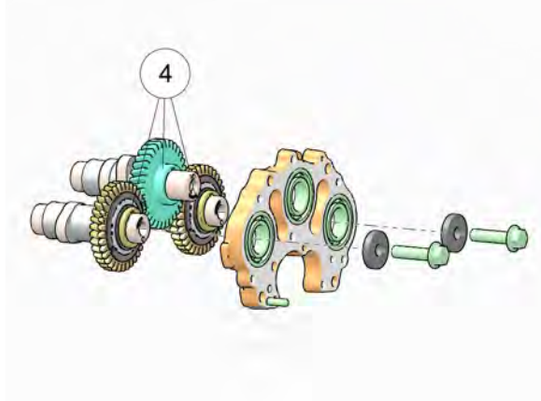
1. Remove the camshaft carrier assembly. See **Camshaft Carrier Removal page 3.44**.
2. Remove the six fasteners and the bearing retainer plate ① from the carrier assembly.



3. Place the camshaft carrier in a soft-jawed vise and use nylon strapping or rope ② to create an interference between the camshaft gear teeth, thus locking the camshafts.
4. Loosen, do not remove, the exhaust camshaft fasteners ③ .



5. Remove the camshaft carrier assembly from the vise and remove camshaft fasteners. Care should be taken so camshafts don't fall out of the carrier during this process.
6. Noting position in the carrier for reassembly, remove the camshafts and sprockets ④ from the carrier bearings.



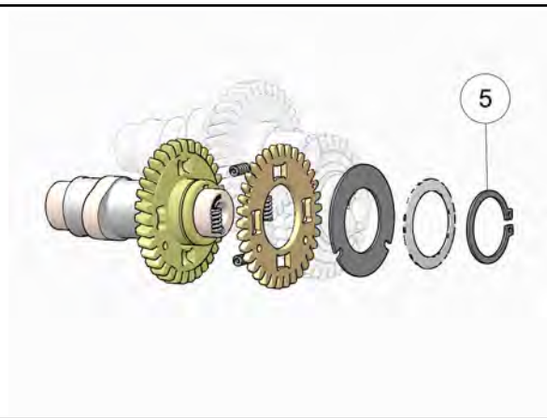
7. Camshaft carrier bearings can be removed using a suitable press or bearing driver. Pressure must be applied from the backside of the carrier plate and bearings pressed through the front.
8.

NOTICE

The following procedure is to INSPECT split gear springs only. If the split gears are damaged they MUST be replaced as an assembly as parts are not individually serviceable.

To separate split gears, wrap a shop rag around the teeth of the gear so springs are contained and remove external snap-ring ⑤ .

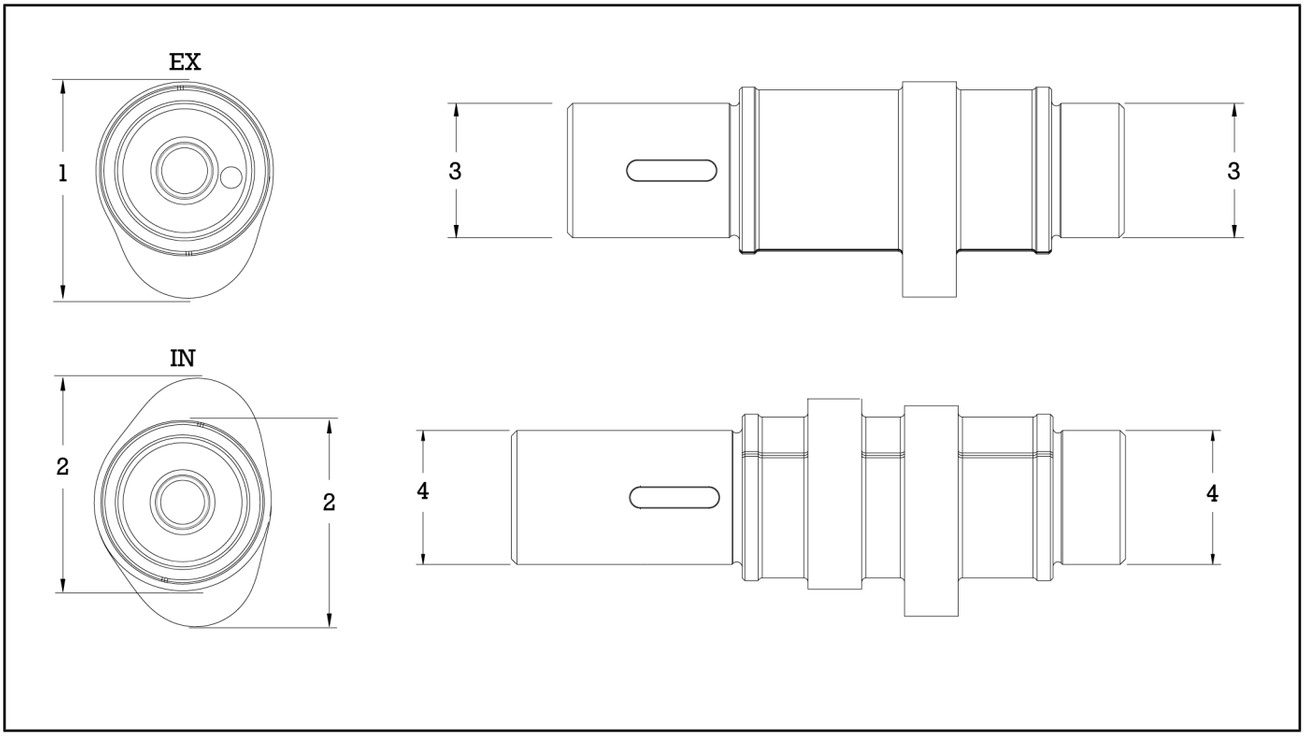
9. Separate components of gear as shown.



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CAMSHAFT INSPECTION

For the following camshaft inspection procedure, refer to the camshaft service specifications section. See Service Specifications page 3.28.



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 lobes ① and intake cam lobes ②.
3. Measure O.D. of each camshaft journal. Exhaust journals ③ and Intake journals ④ .

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CAMSHAFT CARRIER ASSEMBLY

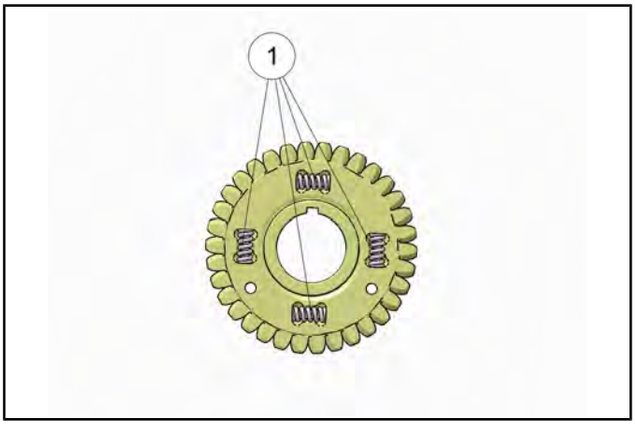
⚠ CAUTION

Wear eye protection while assembling split camshaft gears.

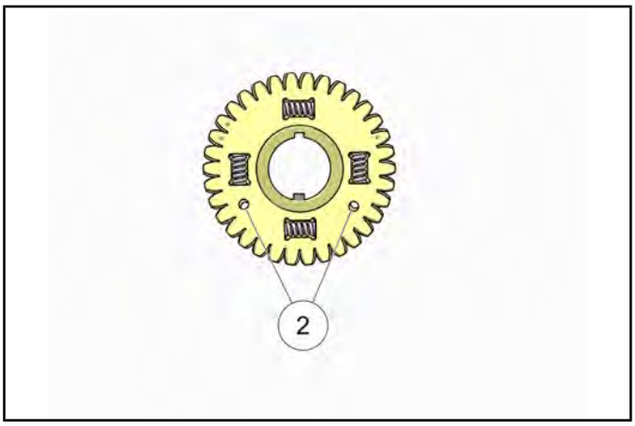
IMPORTANT

The following procedure details split gear assembly following inspection. If the split gears are damaged they MUST be replaced as an assembly as parts are not individually serviceable.

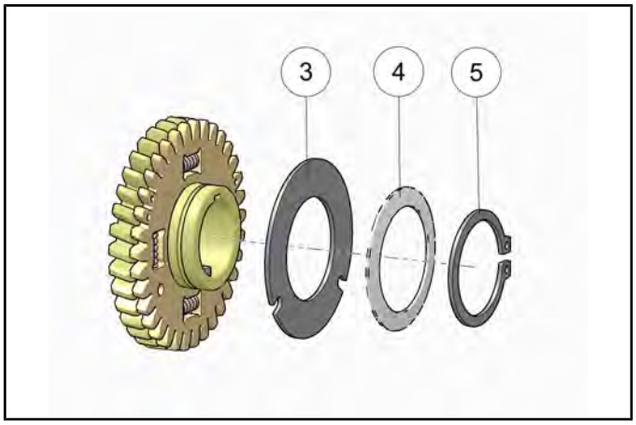
1. Load springs ① into the inner cam gear spring pockets.



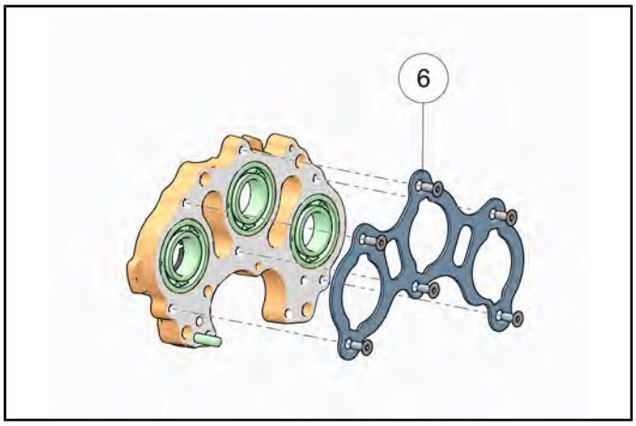
2. Install the outer cam gear onto the inner cam gear making sure the alignment holes ② are positioned as shown.



3. Install the spring retainer ③, Belleville washer ④, and the snap-ring ⑤ to complete split gear assembly.



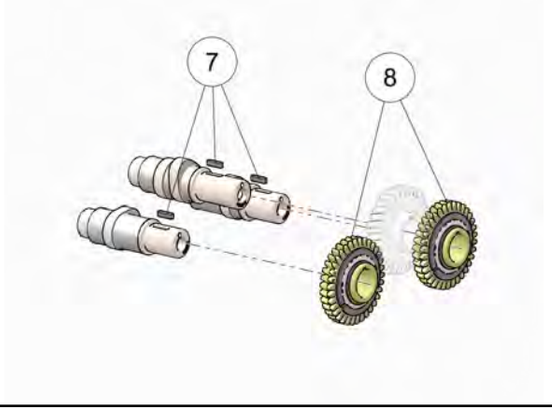
4. If replacing camshaft carrier bearings, press or drive new bearings into the carrier from the front side until seated against shoulder.
5. Install the bearing retainer plate ⑥ with the countersunk fastener holes facing out.
6. Install fasteners and torque to specification.



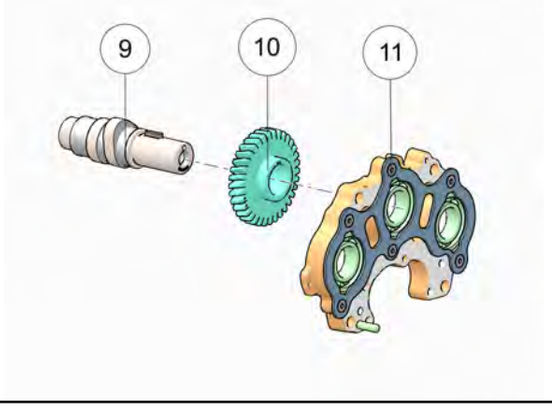
TORQUE
Bearing Retainer Plate Fasteners: **62 in-lbs (7 N·m)**

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7. Install woodruff keys ⑦ and split gear assemblies ⑧ onto the exhaust camshafts and set aside.



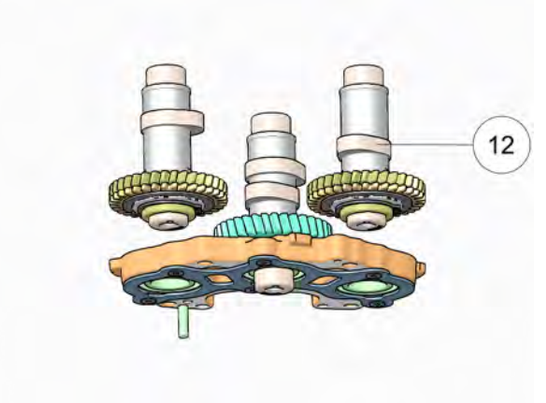
8. Install intake camshaft ⑨ into helical gear ⑩ and slide into the center carrier bearing ⑪. **Woodruff key should be positioned at 12 o'clock.**



9.

IMPORTANT

Care must be taken when installing the exhaust camshafts into the carrier bearings to ensure they are in the correct location. The lobe of the RH exhaust camshaft ⑫ should be *closer* to the bearing carrier than the LH exhaust camshaft lobe.

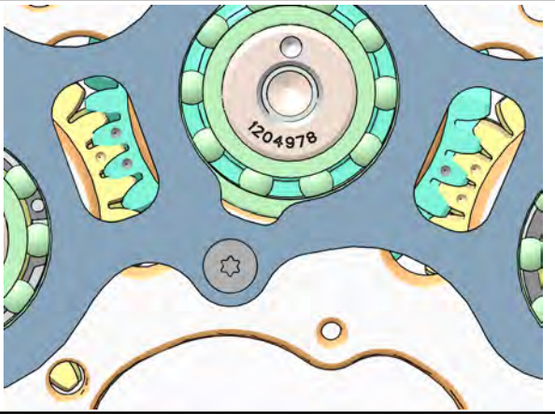


10.

NOTICE

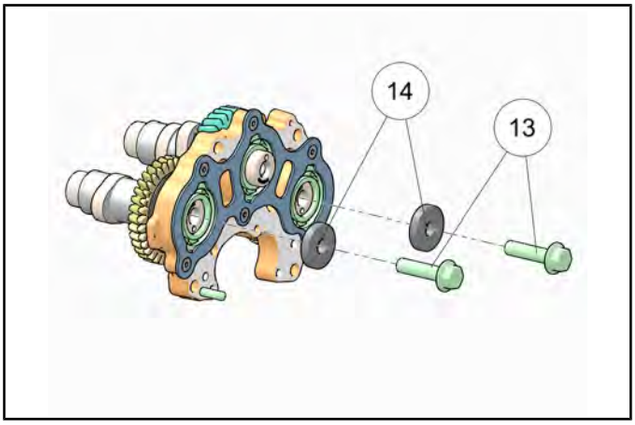
It may be necessary to use a flat screwdriver or similar tool to release the preload on the split gear teeth when engaging the helical gear.

Install the LH and RH exhaust camshafts so the timing marks line up as shown.

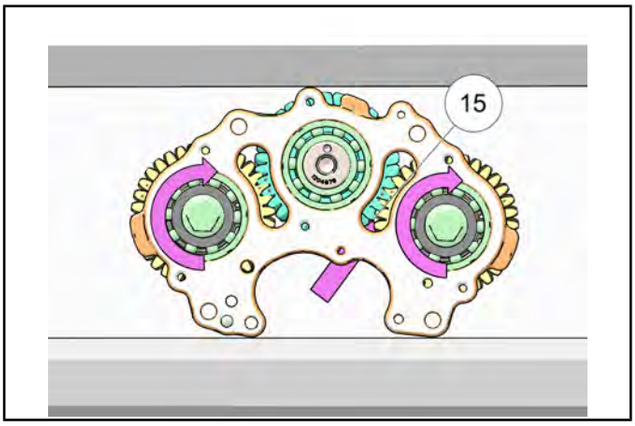


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11. Install exhaust camshaft fasteners ⑬ and washers ⑭ into carrier assembly so they are finger tight.



12. Place the camshaft carrier in a soft-jawed vise and use nylon strapping or rope ⑮ to create an interference between the camshaft gear teeth, thus locking the camshafts.



13. Torque exhaust camshaft fasteners to specification.

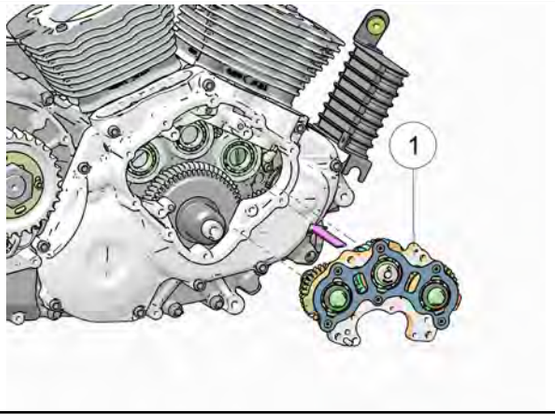
TORQUE
Exhaust Camshaft Fasteners: **52 ft-lbs (70 N·m)**

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CAMSHAFT CARRIER INSTALLATION

NOTICE
Base and head gasket seal is released when removing camshaft carrier. Replacement of both head and base gasket is recommended to prevent oil leaks.

1. Lift the camshaft carrier assembly ① into position so that each of the camshaft ends fits into the inner bearings.

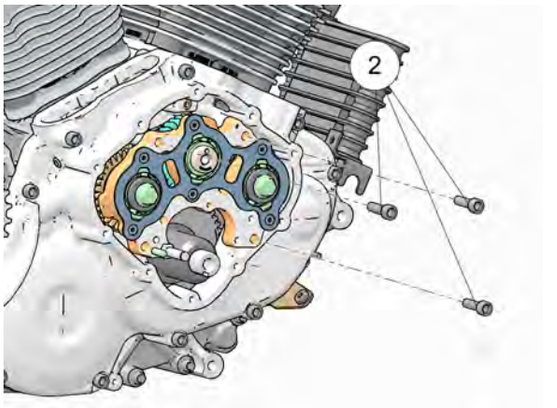


2.

NOTICE
The camshaft ends are slip-fit to the inner bearings and should slide in by hand.

Press the camshaft carrier assembly into the inner bearings until carrier is fully seated on the inner cam chain cover.

3. Install the three fasteners ② and torque to specification.



TORQUE
Camshaft Carrier Fasteners: **15 ft-lbs (20 N·m)**

4. Install cam chain, cam chain tensioner and guide. See **Cam Chain Installation page 3.41**.
5. Install lifters. See **Lifter Installation page 3.43**.
6. Install engine in frame. See **Engine Installation page 3.15**.

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CAMSHAFT SERVICE - IN BIKE

CAMSHAFT REMOVAL

IMPORTANT

Camshaft removal with the engine installed in the frame requires:

- **Special Service Tools:**
  - Crankshaft Locking Pin PF-52135 **or** 5/16" pin punch
  - Crankshaft Rotation Tool PF–51239
  - Camshaft Holding Tool PF-52544 **or** PF-51455-A (Combination Kit)

NOTICE

Secure the woodruff keys or place a shop towel under camshaft drive gears to ensure keys don't fall into the engine.

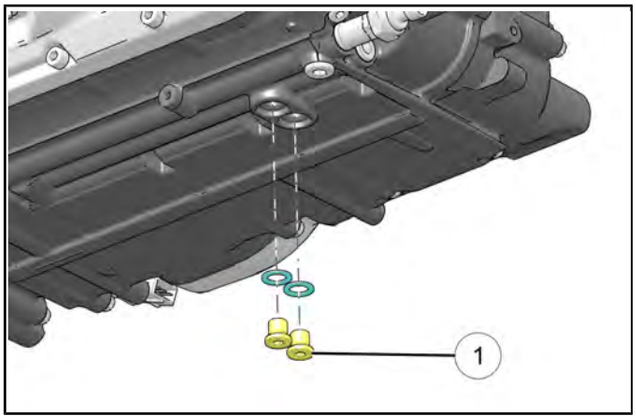
PREPARATION

IMPORTANT

Protect all finished surfaces during these operations. Take careful notes of wire routing and cable tie locations during disassembly to ensure proper reinstallation.

Special care should be taken on higher mileage bikes during disassembly. Especially when removing fasteners threaded into engine block and cylinder heads (For example: Exhaust manifold bolts, Primary cover bolts, etc.) Thread repair kit may be necessary if threads become damaged.

1. Turn key or ignition switch to **OFF** position and remove key. If equipped with keyless fob, remove fob from proximity of vehicle.
2. Ensure motorcycle is parked on a flat surface, kickstand is fully extended, and vehicle is stable prior to installation.
3. Support motorcycle securely in an upright position. Clamp front tire securely in a wheel vise.
4. Drain engine oil.
   - Clean the area around the drain plugs ①. Place a drain pan under both drain plugs.



   - Remove the drain plugs. Allow the oil to drain completely.
5. Remove and retain upper and lower side covers and saddlebags.

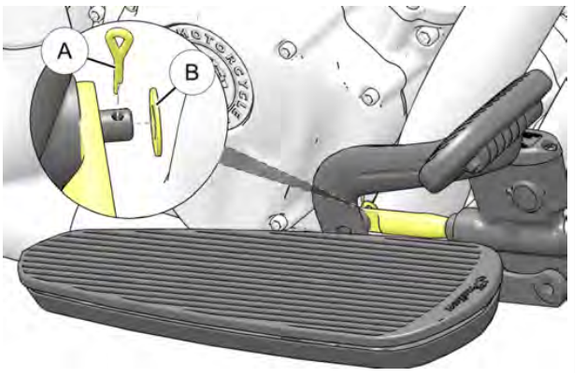
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RIGHT FLOORBOARD REMOVAL

1.

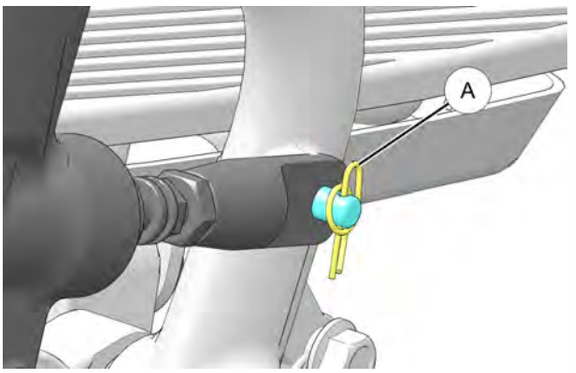
2022

Remove cotter pin Ⓐ and washer Ⓑ from brake master cylinder pushrod.



2023+

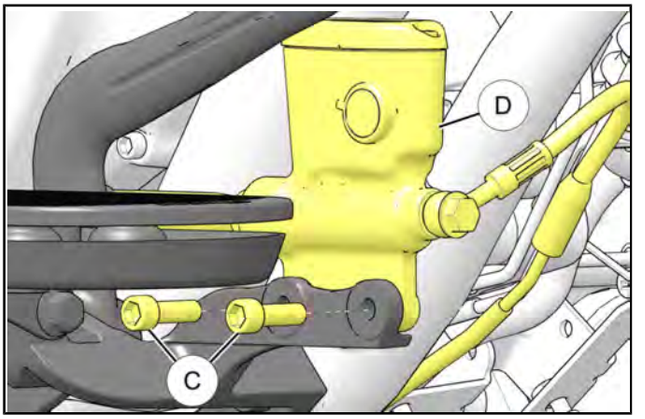
Remove rue pin Ⓐ from brake master cylinder pushrod.



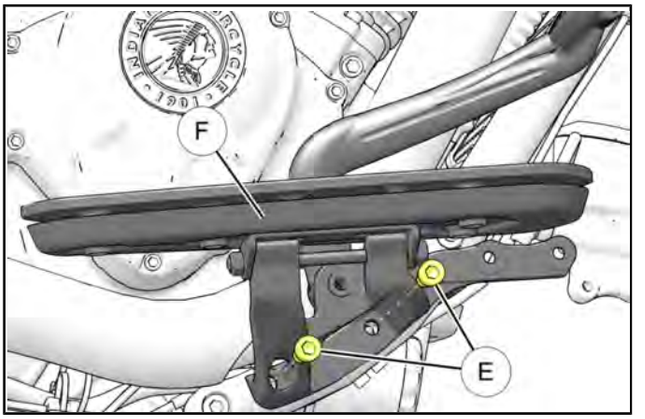
2. Remove and keep two screws Ⓒ from brake master cylinder Ⓓ, disengage pushrod from brake pedal assembly, and remove brake master cylinder Ⓓ from RH floorboard assembly and move out of the way.

IMPORTANT

Do not bend or kink flexible brake line during floorboard removal. Master cylinder assembly should be kept in an upright position and properly supported at all times.



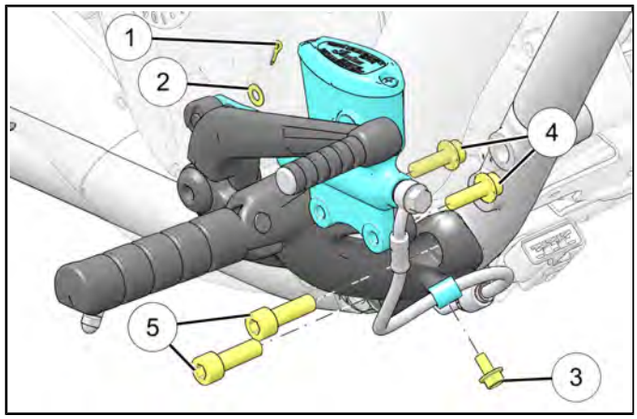
3. Remove and keep two bolts Ⓔ and remove RH floorboard assembly Ⓕ from frame.



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RIGHT FOOT PEG REMOVAL

1. Remove cotter pin ① and washer ②.

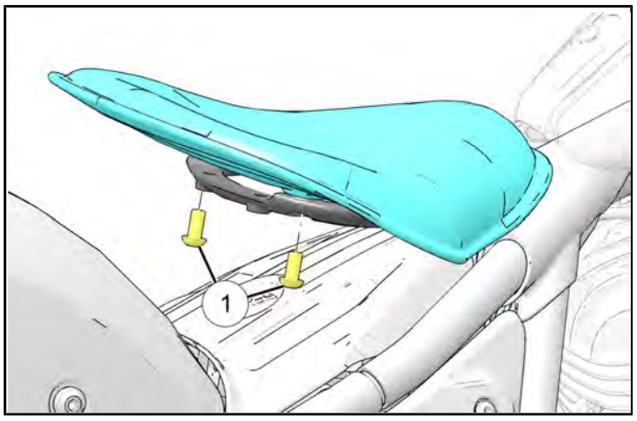


2. Remove brake line retention fastener ③.
3. Remove master cylinder fasteners ④.
4. Remove foot peg bracket fasteners ⑤.

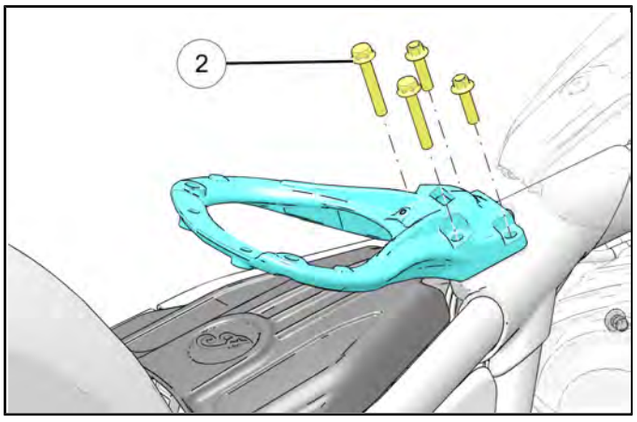
SEAT REMOVAL

BOBBER SEAT

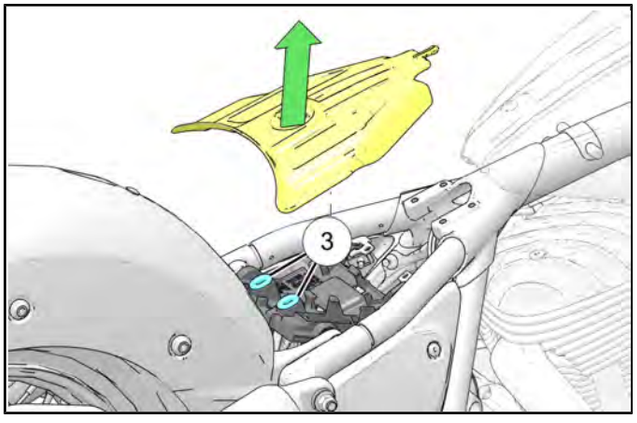
1. Remove seat fasteners ①.



2. Lift seat upward to remove.
3. Remove seat base fasteners ②.



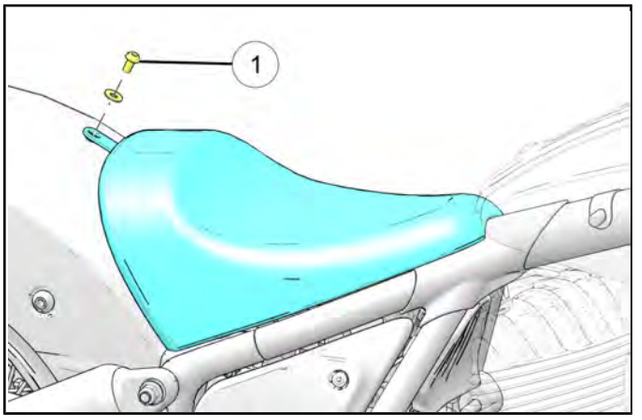
4. Remove seat base.
5. Lift seat closeout upward to disconnect from its grommets ③.



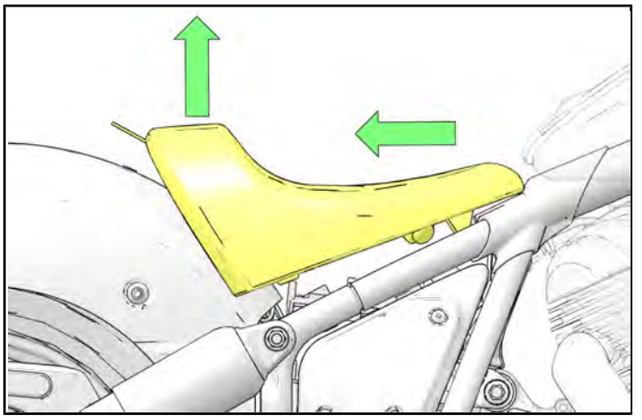
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SOLO SEAT

1. Remove seat faster ①.

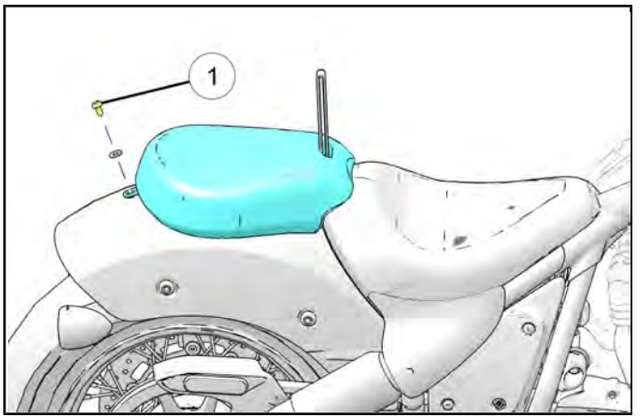


2. Lift the rear of the seat upward and slide back to remove.

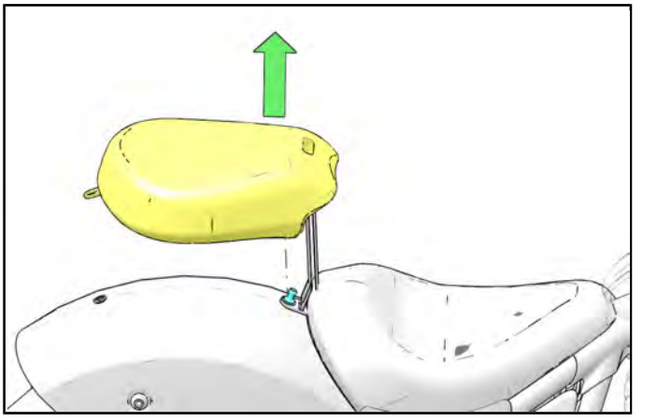


BAGGER SEAT

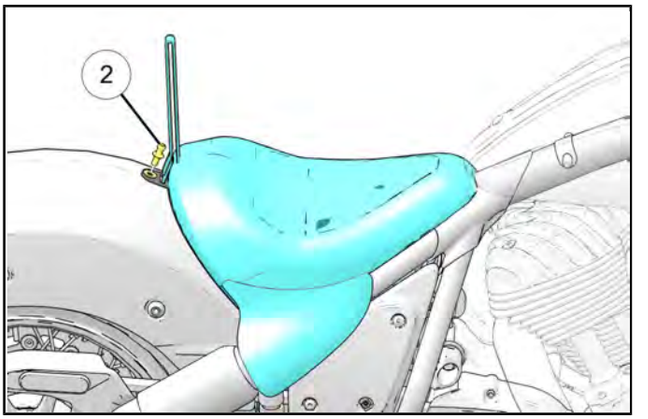
1. Remove pillion seat fastener ①.



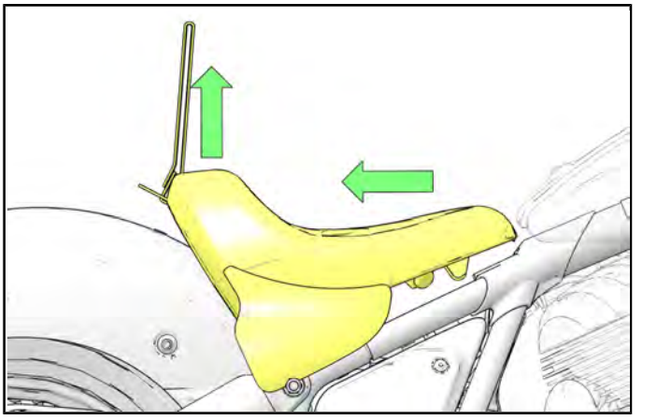
2. Pull pillion seat upward off of seat stud to remove.



3. Remove pillion seat stud ②.



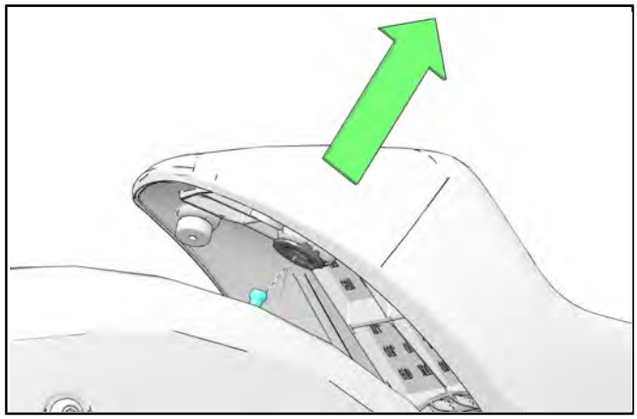
4. Lift the rear of the seat upward and slide back to remove.



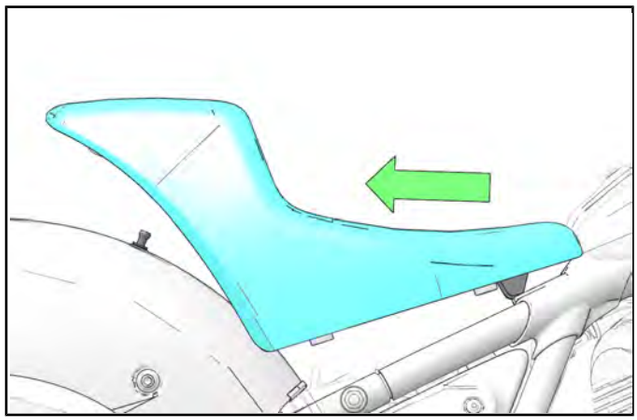
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SPORT SEAT

1. Lift the rear of the seat upward to disconnect the seat from the pillion fastener.

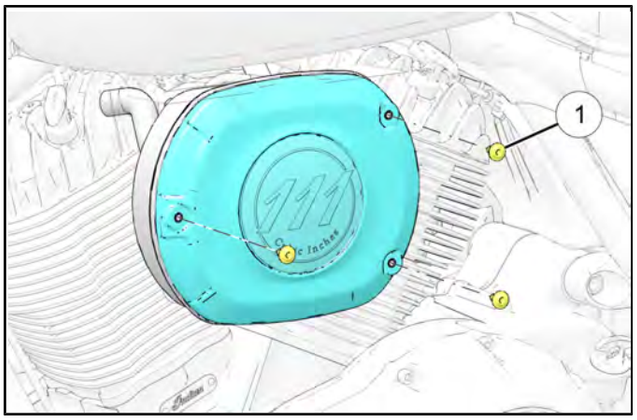


2. Move the seat rearward to disconnect the front retention feature and remove seat.

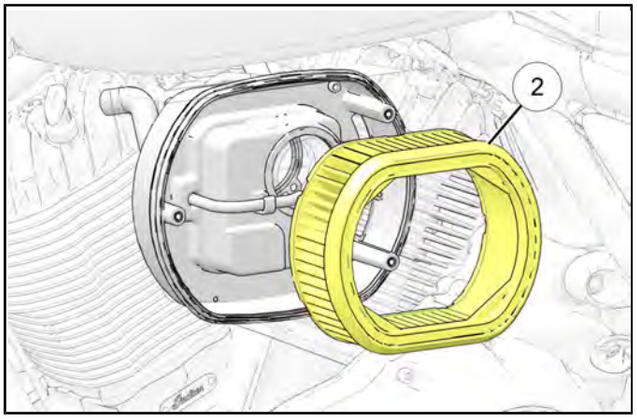


INTAKE REMOVAL

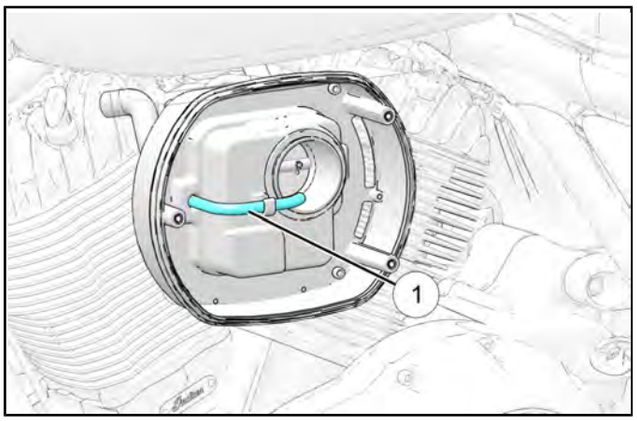
1. Remove air box cover fasteners ① and air box cover .



2. Remove air filter element ②.

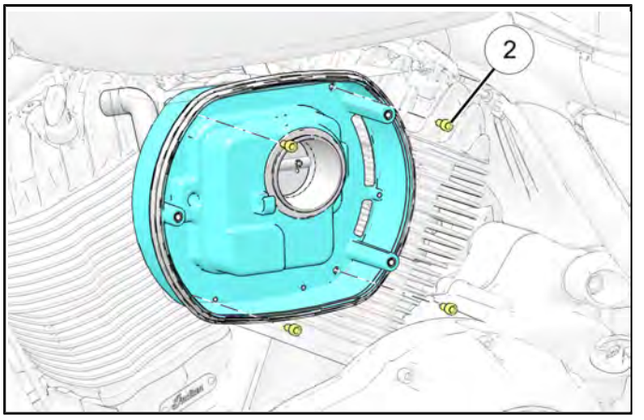


3. Remove vent hose ①.

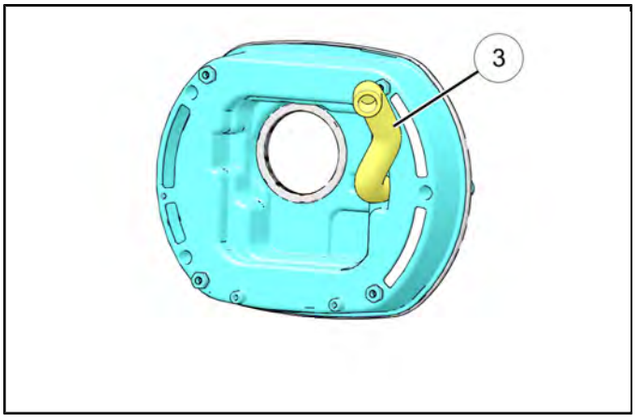


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4. Remove air box by removing its fasteners ②.



5. While removing the air box, disconnect the breather hose ③ from the back side of the air box.

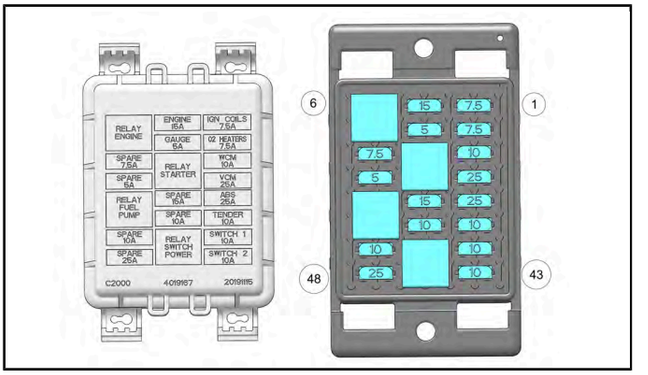


DEPRESSURIZE THE FUEL SYSTEM

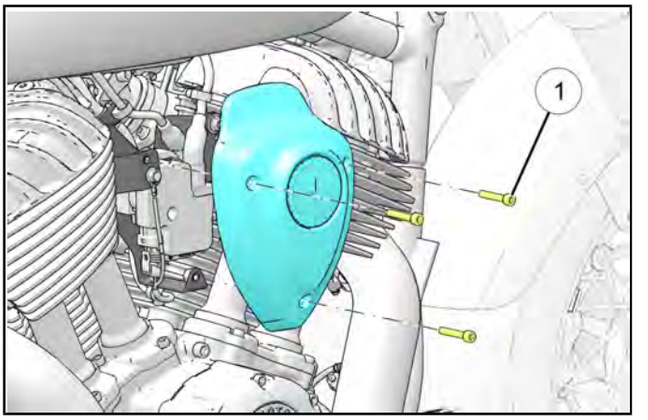
⚠ WARNING

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

1. Locate the fuel pump relay.



2. Pull the fuel pump relay and crank the engine over for 5 seconds to release fuel pressure.
3. Remove ignition cover by removing its fasteners ①.



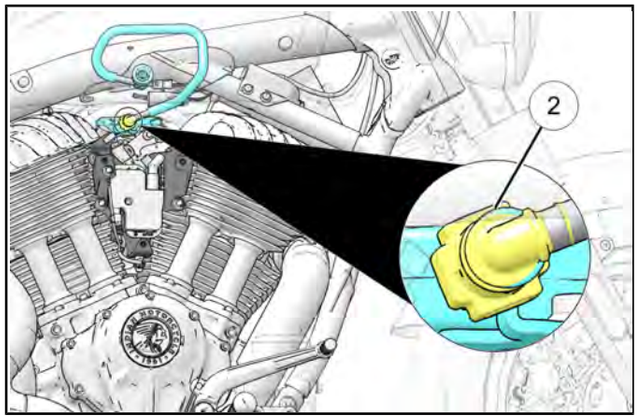
4. Wrap a clean shop towel around fuel line fitting ②.

⚠ CAUTION

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

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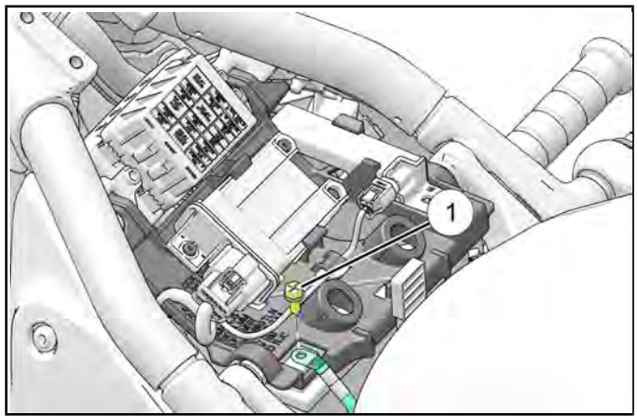
5. Squeeze both release buttons (one on each side of fitting) and hold. Gently slide fitting straight off fuel rail.



6. Cover fuel fittings to keep debris out.

DISCONNECT THE BATTERY

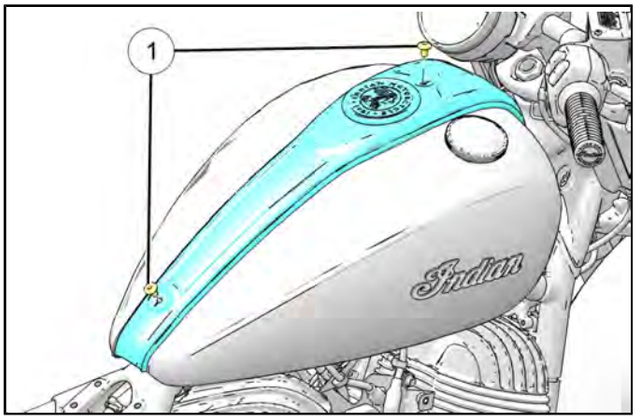
Disconnect the negative (-) battery cable ① from the battery terminal. Position the cable well clear of the terminal.



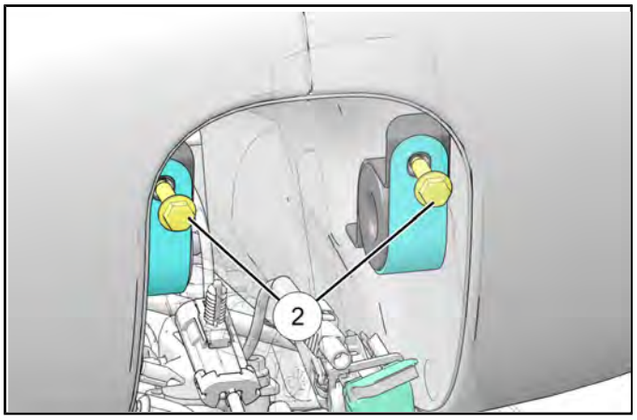
FUEL TANK REMOVAL

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.

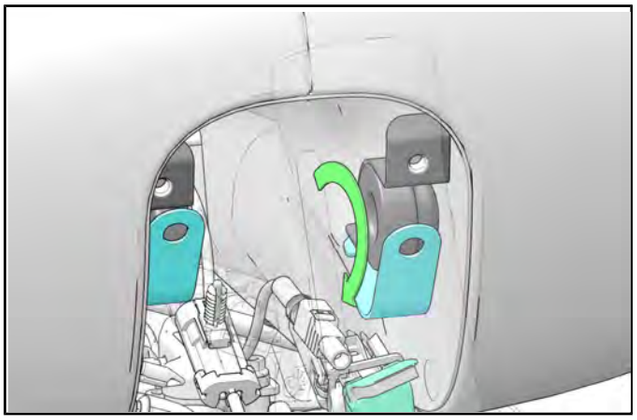
1. Remove fuel tank console removing its fasteners ① and set aside.



2. Remove fuel tank bracket fasteners ②.

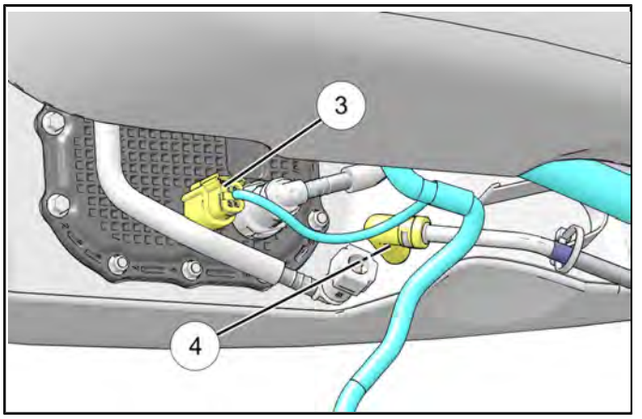


3. Rotate the fuel tank brackets downward to disconnect the mount from the isolator.



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4. Slowly pull the fuel tank up and disconnect the fuel pump electrical connector ③ and fuel vent line ④.



5. Lifting at the front and rear of the tank at the same time, slide the tank upward and rearward to remove from unit.

SPARK PLUG REMOVAL

⚠ CAUTION

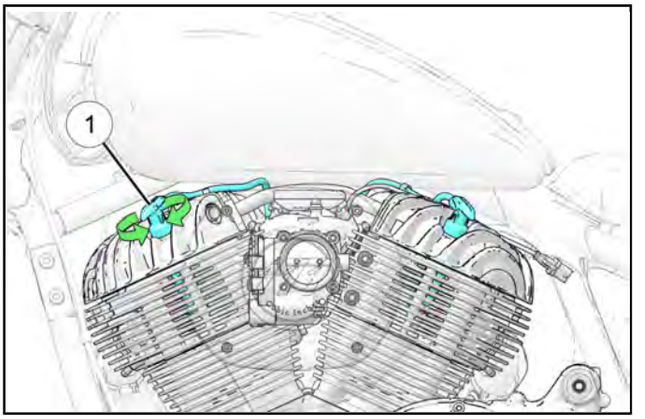
HOT COMPONENTS

Wear insulated gloves and/or allow engine and exhaust to cool before handling these parts.

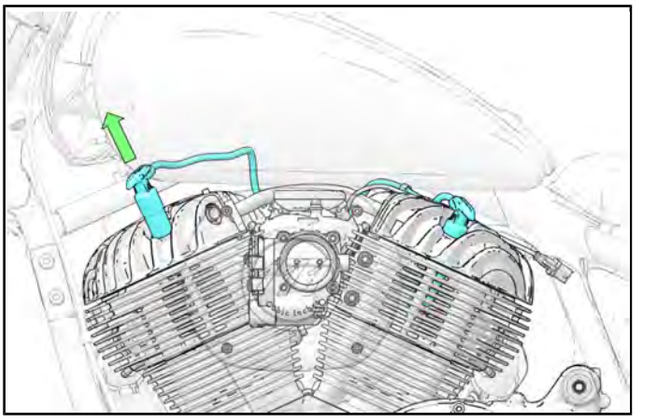
NOTICE

The front spark plug can be removed without having to remove the fuel tank by using a 3" extension and standard 5/8" spark plug socket.

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.

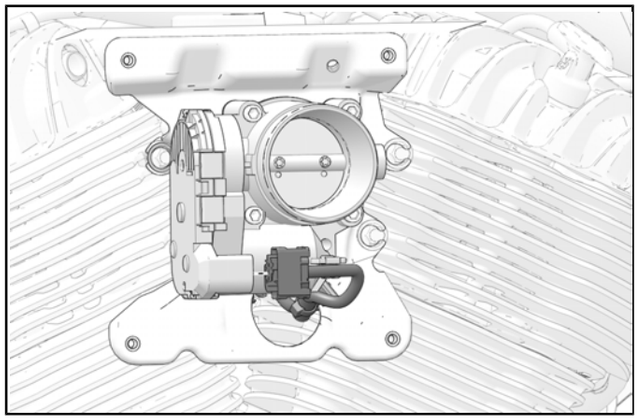


3. Clean out spark plug wells with compressed air to remove any loose dirt or debris.
4. Using a 3" extension and a 5/8" spark plug socket, remove spark plugs.

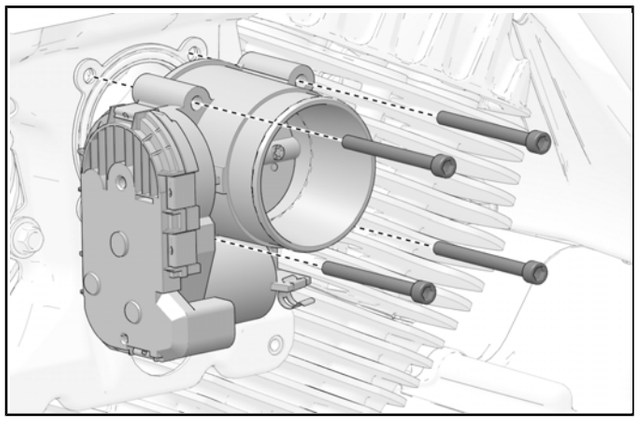
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THROTTLE BODY REMOVAL

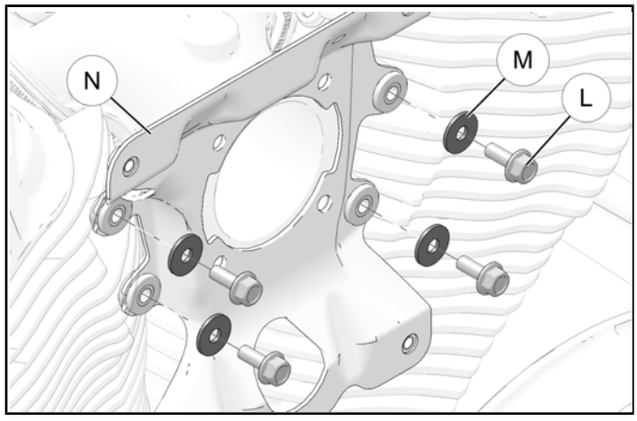
1. Disconnect throttle body electrical connector and remove the throttle body wiring from the holder.



2. Remove four throttle body screws and throttle body .



3. Remove and keep four screws Ⓛ and four washers Ⓜ from airbox support bracket Ⓝ. Remove support bracket.

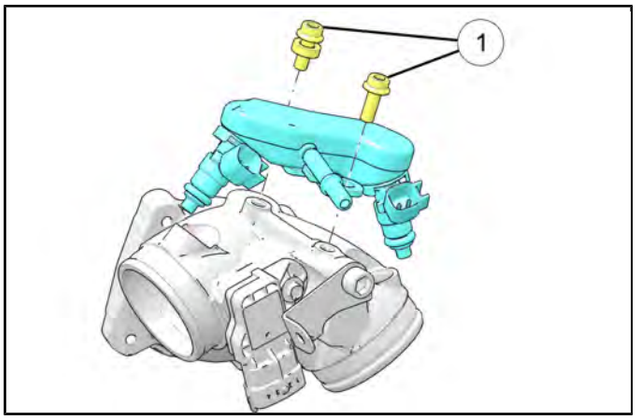


REMOVE FUEL INJECTORS

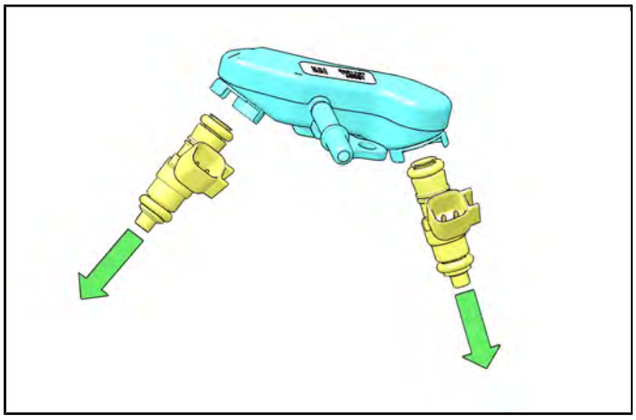
1. Disconnect fuel injector electrical connectors.

IMPORTANT
Disengage Red CPA connection lock before disconnecting injector.

2. Remove the fuel rail by removing its fasteners ①.



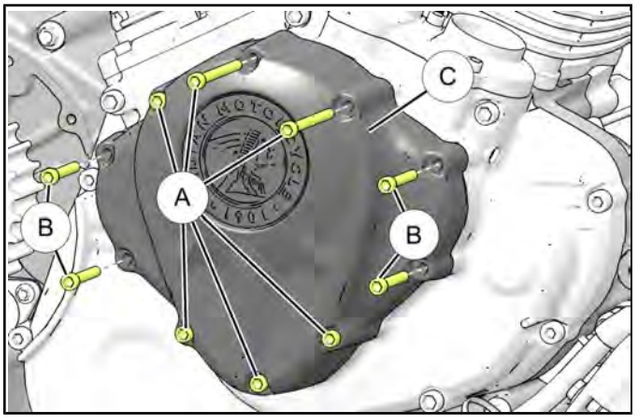
3. Remove fuel injectors from fuel rail.



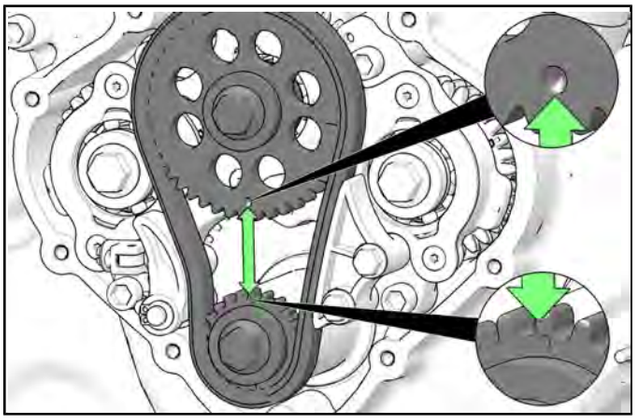
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REMOVE CAMSHAFTS

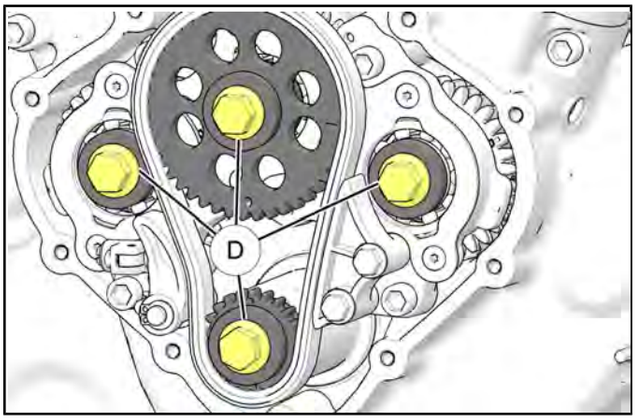
1. Remove and retain ten fasteners Ⓐ and Ⓑ, make note of different sizes and locations. Remove cam chain cover Ⓒ and gasket.



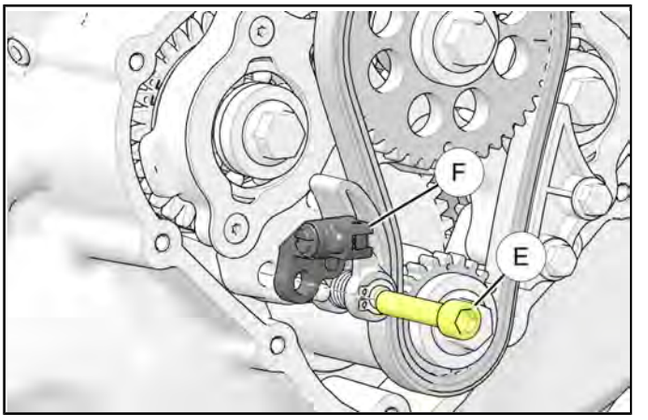
2. Ensure indents on gear faces align with each other as shown. If they do not, repeat crankshaft locking procedure and align them.



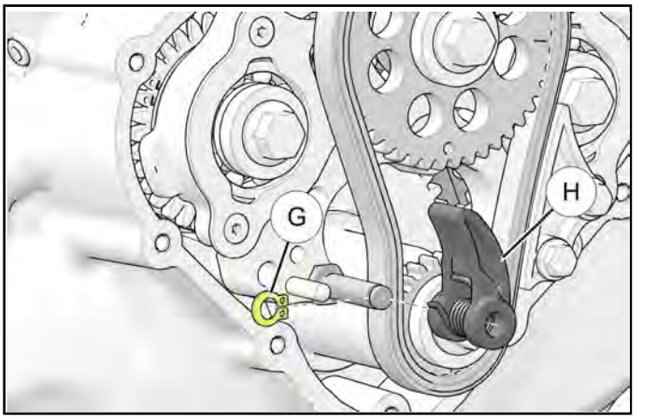
3. Loosen, but **DO NOT REMOVE** four screws Ⓓ.



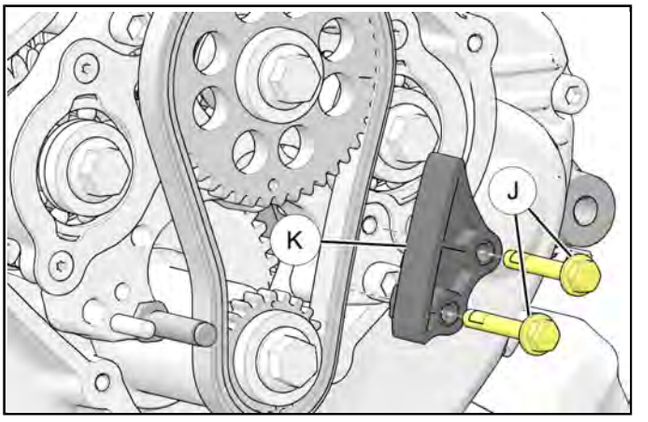
4. Remove and retain chain tensioner fastener Ⓔ and chain tensioner Ⓕ.



5. Remove and retain external snap ring Ⓖ and chain tensioner arm and spring assembly Ⓗ.

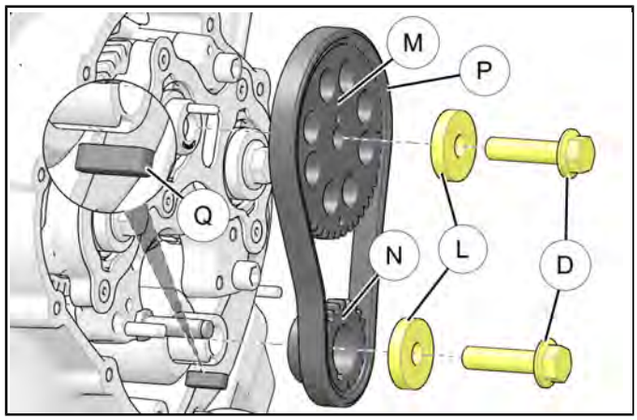


6. Remove and retain two fasteners Ⓙ and Camshaft Chain Guide Ⓚ.



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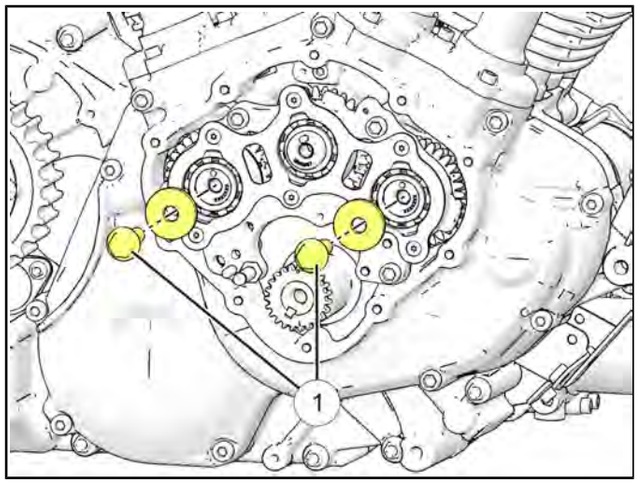
7. Remove screws Ⓓ and washers Ⓛ from crankshaft and camshaft. Pull camshaft sprocket Ⓜ, crankshaft sprocket Ⓝ and cam chain Ⓟ off as an assembly and set aside. Collect woodruff key Ⓠ from crankshaft and set aside.



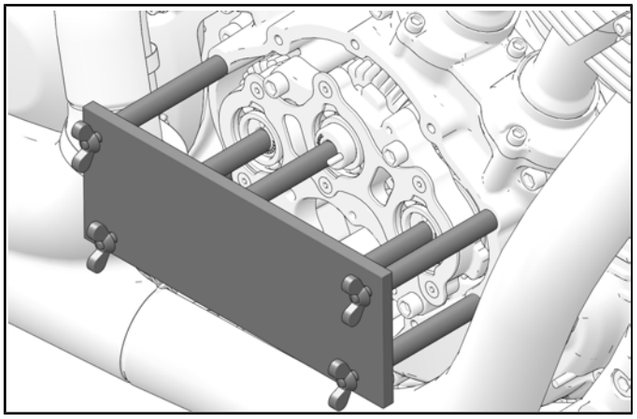
NOTICE

Secure the woodruff keys or place a shop towel under camshaft drive gears to ensure keys don't fall into the engine.

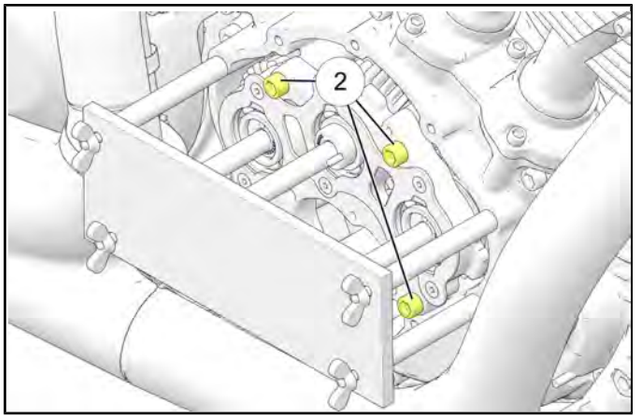
8. Remove the exhaust camshaft fasteners ①.



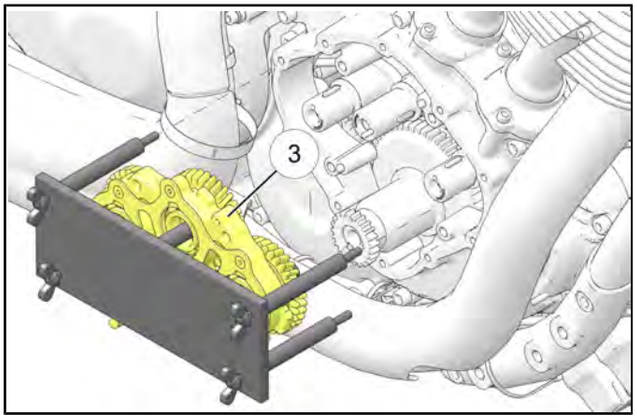
9. Install Special Tool PF-52544 as shown.



10. Remove the remaining camshaft carrier fasteners ②.

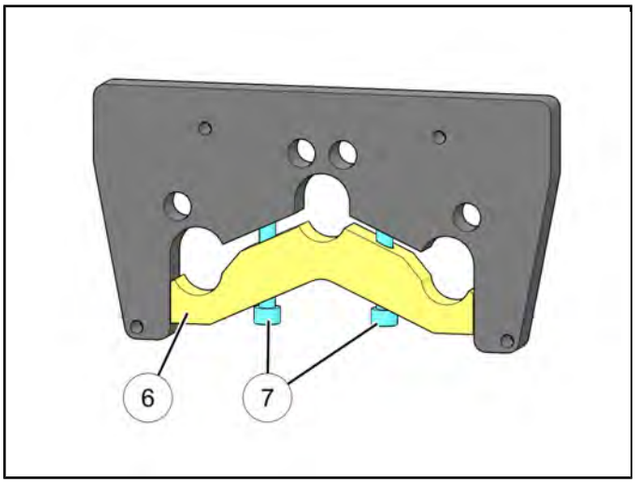


11. Remove the camshaft bearing carrier assembly ③.



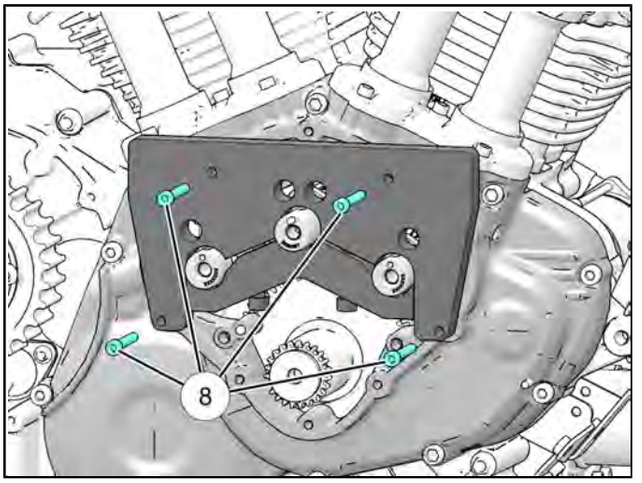
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12. On Special Tool PF-51455, loosely assemble the lower camshaft retainer plate ⑥ to the main plate using two fasteners ⑦.



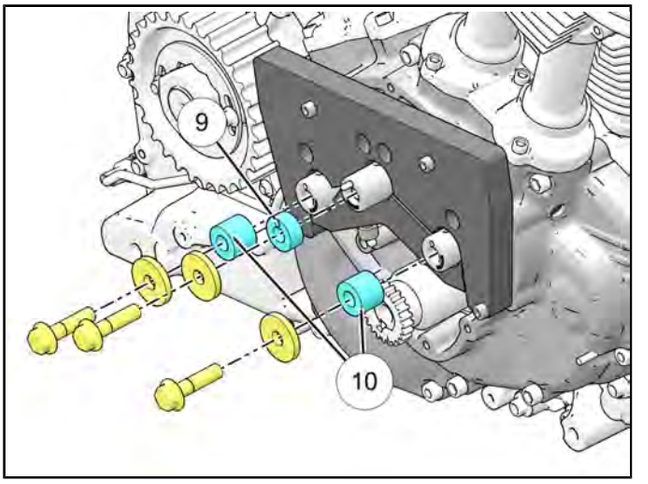
13. Install the camshaft special tool assembly onto the camshafts and tighten fasteners ⑧ until they are hand-tight.

NOTICE
The lower camshaft retainer plate should be tight enough to support the outboard camshaft bearing journal.



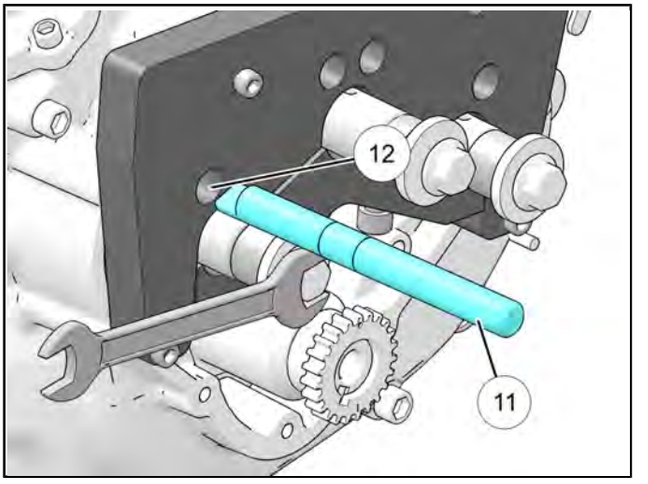
14. Install special tool spacer ⑨ (has dowel hole) onto the intake camshaft and spacers ⑩ onto the exhaust camshafts.

15. Install camshaft gear washers and fasteners until they are hand-tight.



16. With the flat side of the retaining pin ⑪ aligned perpendicular to the rear exhaust camshaft push-rod tube, slide the pin in hole marked “B” ⑫ until it stops.

NOTICE
It will be necessary to rotate the camshaft (clockwise) with a wrench to seat the pin.

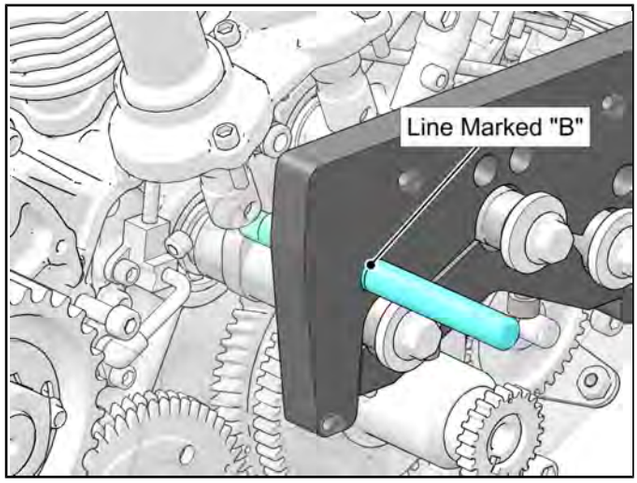


17. Rotate the camshaft using a suitable wrench while pressing on the retaining pin until it seats.

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18. Use the second etched line (marked “B”) to determine when the shaft is fully seated in the hole marked “B”. The lifter is now held in place by the retaining pin.

NOTICE
The crankcase has been removed in this picture to show the correct retaining pin position.



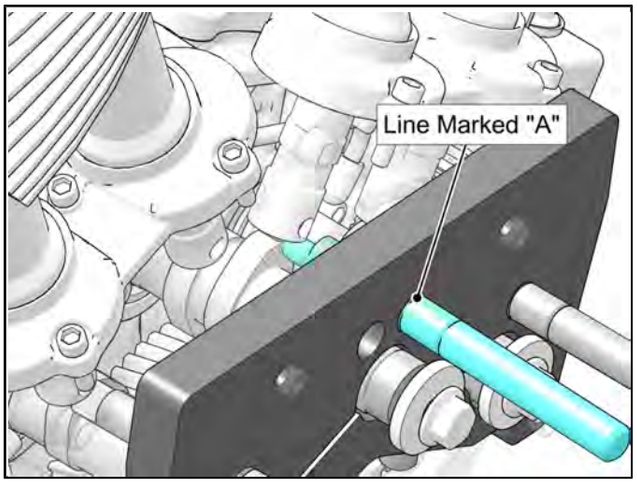
19. Repeat steps 10-12 for the forward exhaust camshaft.

NOTICE
For the front exhaust camshaft you will use the hole marked “A” and the line marked “A”.

20. Slide the third retaining pin into the front cylinder intake camshaft position (hole marked “A”) until it stops.

NOTICE
It will be necessary to rotate the camshaft (clockwise) with a wrench to seat the pin.

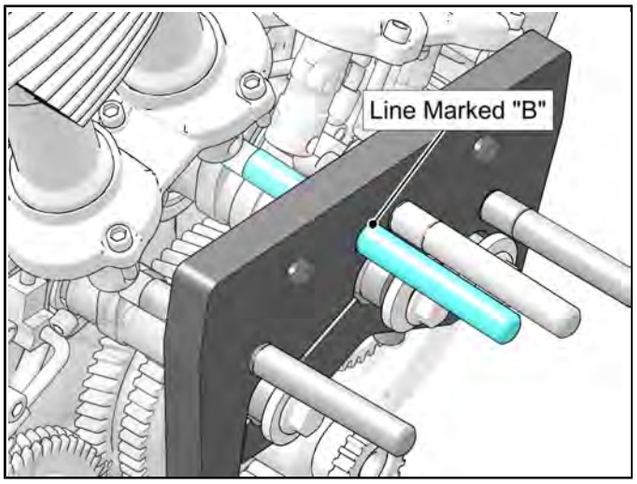
21. Rotate the camshaft using a suitable wrench while pressing on the retaining pin until it seats at the line marked “A”.



22. Slide the fourth retaining pin into the rear cylinder intake camshaft position (hole marked “B”) until it stops.

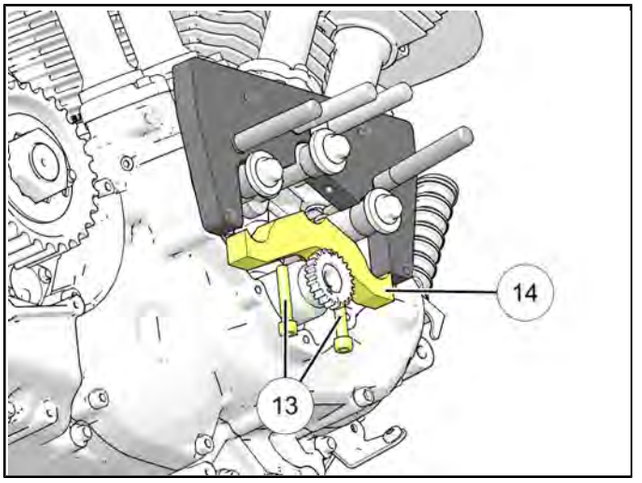
NOTICE
It will be necessary to rotate the camshaft (clockwise) with a wrench to seat the pin.

23. Rotate the camshaft using a suitable wrench while pressing on the retaining pin until it seats at the line marked “B”.



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24. Remove fasteners ⑬ and lower camshaft retaining plate ⑭.



25. Carefully pull each of the camshafts out from its respective bore.

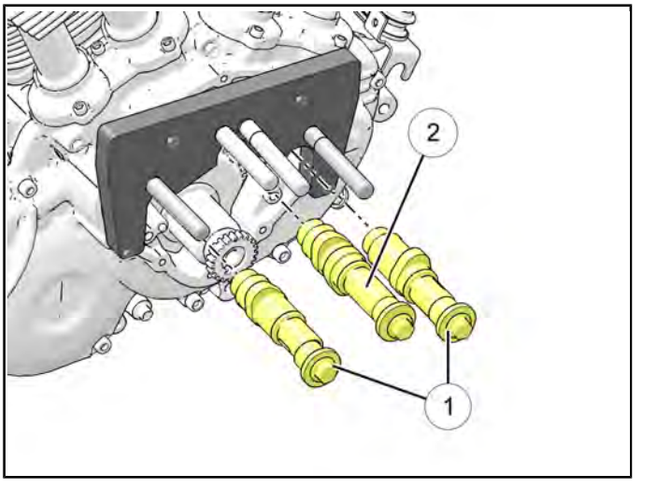
NOTICE
It may be necessary to rotate the camshaft by hand during removal so the camshaft lobes can clear the retaining plate.

CAMSHAFT INSTALLATION

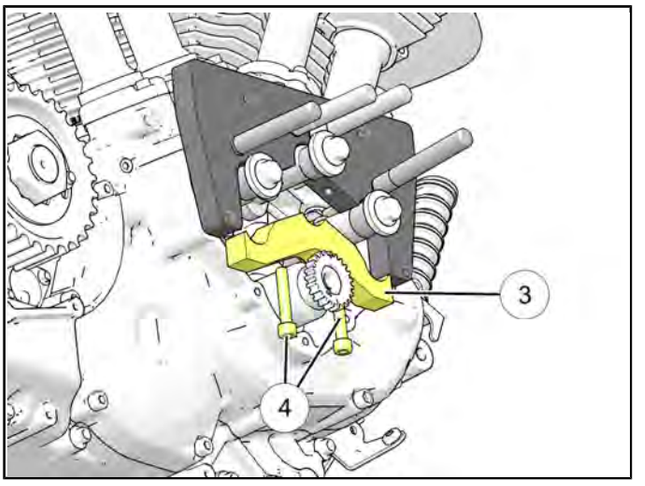
INSTALL CAMSHAFTS

1. With the retaining plate and pins installed and the lifters held in place, install the two exhaust camshafts ① and intake camshaft ②.

NOTICE
It may be necessary to rotate the camshaft by hand during installation so the camshaft lobes can clear the retaining plate.

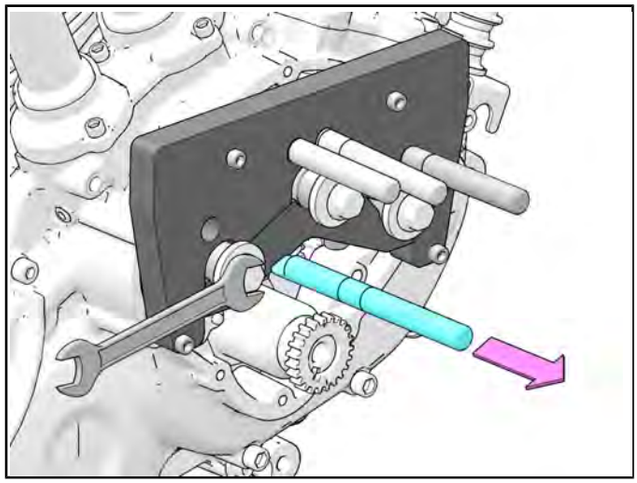


2. Assemble the lower camshaft retaining plate ③ to the main plate and tighten fasteners ④ until the are hand-tight.



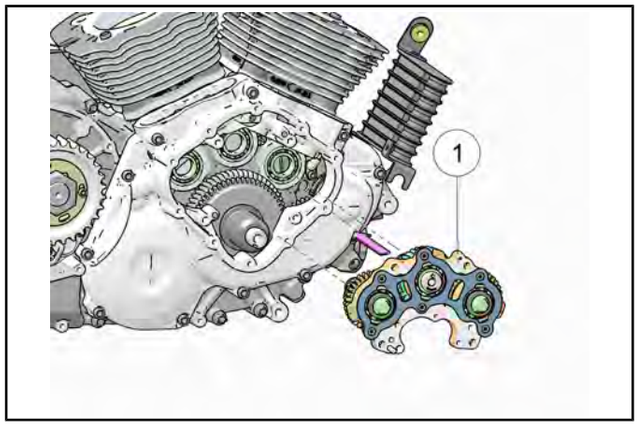
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3. Using a suitable wrench, rotate each camshaft while pulling the respective retaining pin out of the plate bore to release the lifters.



4. Remove the retaining plate assembly.

5. Lift the camshaft carrier assembly ① into position so that each of the camshaft ends fits into the inner bearings.

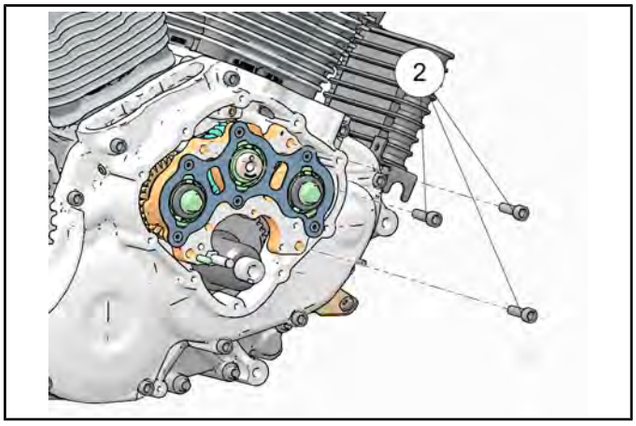


6.

NOTICE
The camshaft ends are slip-fit to the inner bearings and should slide in by hand.

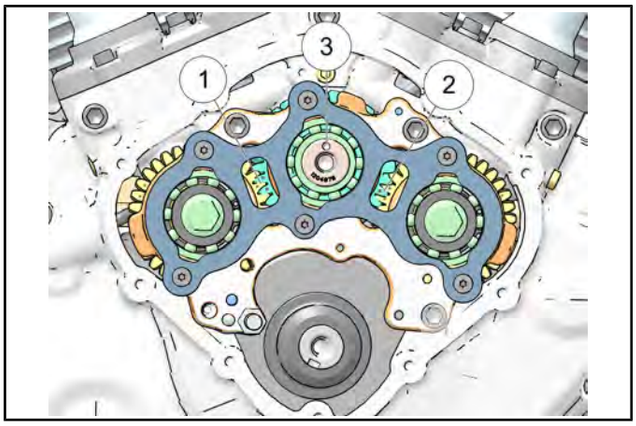
Press the camshaft carrier assembly into the inner bearings until carrier is fully seated on the inner cam chain cover.

7. Install the three fasteners ② and torque to specification.



TORQUE
Camshaft Carrier Fasteners: **15 ft-lbs (20 N·m)**

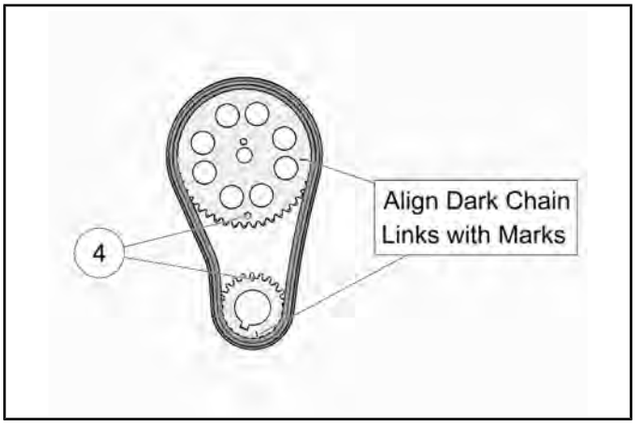
8. Verify that the camshafts are set to TDC. Camshaft timing marks ① & ② should be aligned as shown. The camshaft sprocket alignment dowel ③ should be at 12 o'clock.



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CAM GEAR AND CHAIN INSTALLATION

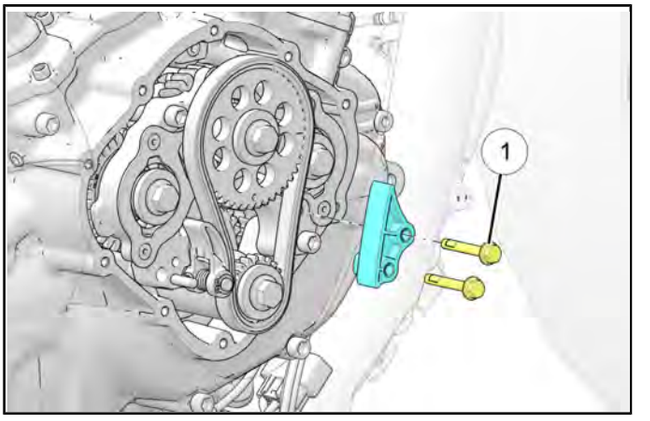
1. Place the woodruff key in the end of the crankshaft.
2. Working on a flat surface, assemble the timing chain onto the crankshaft and camshaft sprockets as shown.
   - Align timing marks ④ .
   - Position the chain on the sprockets so that the dark chain links line up with sprocket hashmarks.



3. Slide the chain and sprockets onto the crankshaft and center camshaft as an assembly.
4. Verify that the crankshaft woodruff key is still in place and that the timing marks are still aligned.
5. Install crankshaft and camshaft sprocket fasteners and washers and torque to specification.

TORQUE
Camshaft / Crankshaft Sprocket Fasteners: **52 ft-lbs (70 N·m)**

6. Install cam chain guide and fasteners ① . Torque to specification.



TORQUE
Cam Chain Guide: **71 in-lbs (8 N·m)**

IMPORTANT
Verify that the engine is at TDC and the timing marks are properly aligned.

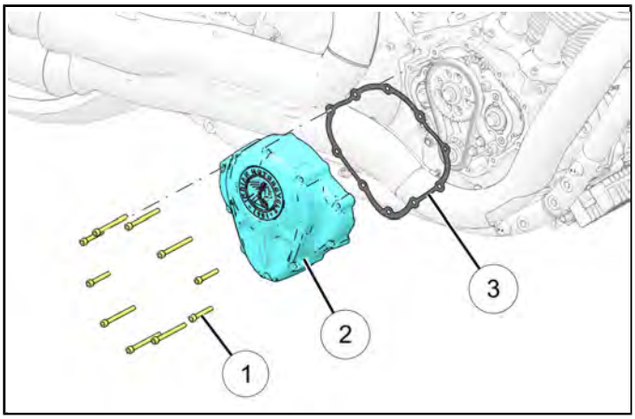
7. Slide the tensioner arm and spring over the pivot pin and, using a needle nose pliers or similar tool, loop the tensioner arm spring over the retainer pin and slide down until fully seated.
8. Install the tensioner arm snap ring.
9. Compress the tensioner assembly and slide into position over the alignment dowel.
10. Install tensioner fastener and torque to specification.

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

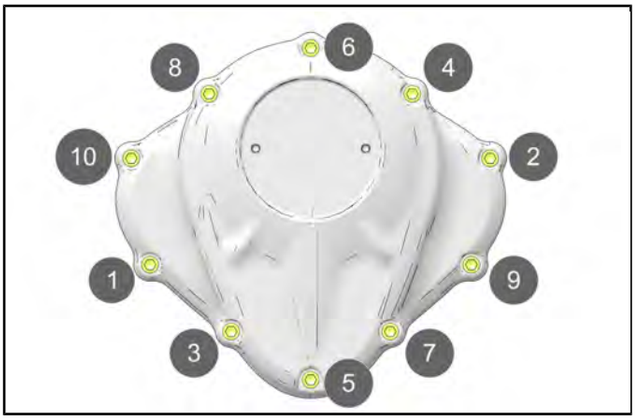
11. Clean gasket mating surfaces and install cam chain cover using a new gasket.

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12. Install the ten fasteners ① securing the cam chain cover to the inner timing cover.



13. Torque cam chain cover fasteners following the specified torque sequence.

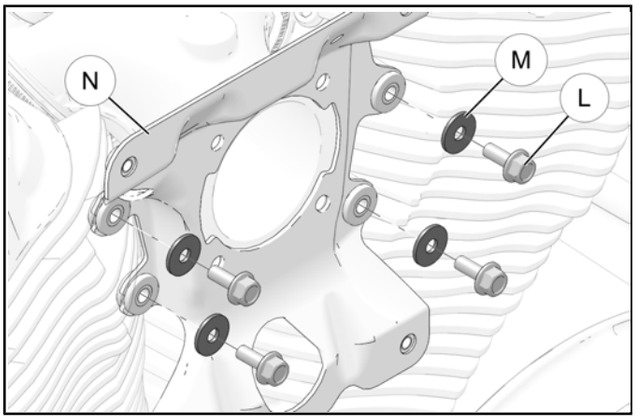


TORQUE
Cam Chain Cover Fasteners: **10 ft-lbs (13 N·m)**

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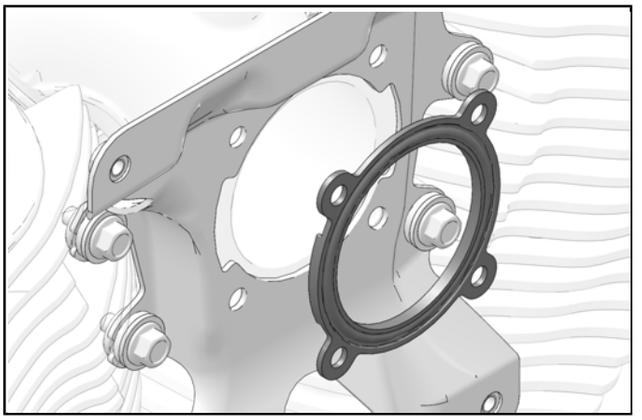
THROTTLE BODY INSTALLATION

1. Install four screws Ⓛ and four washers Ⓜ to the airbox support bracket Ⓝ. Torque fasteners to specification.

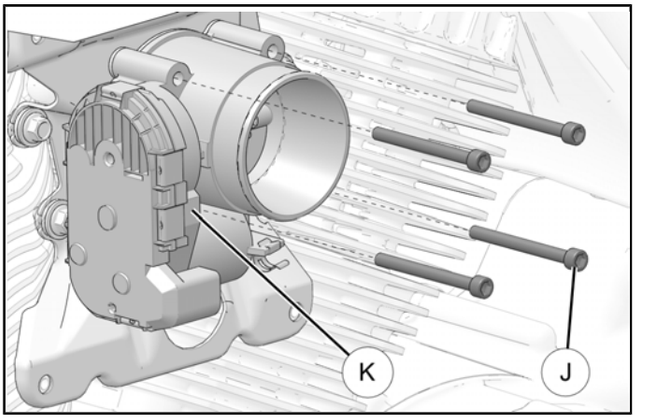


TORQUE
Air Box Support Fastener: **88 in-lbs (10 N·m)**

2. Install throttle body gasket aligned into the notches of the bracket as shown.

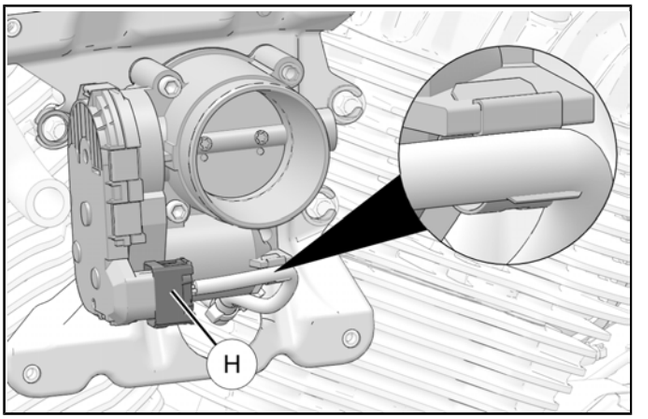


3. Install the NEW throttle body Ⓚ and throttle body screws Ⓙ. Torque fasteners to specification.



TORQUE
Throttle Body Fasteners: **88 in-lbs (10 N·m)**

4. Connect throttle body electrical connector Ⓗ and route the throttle body wiring to the holder.



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FUEL INJECTOR INSTALLATION

1. Always lubricate injector O-rings with clean, silicone-free motor oil.

⚠ CAUTION

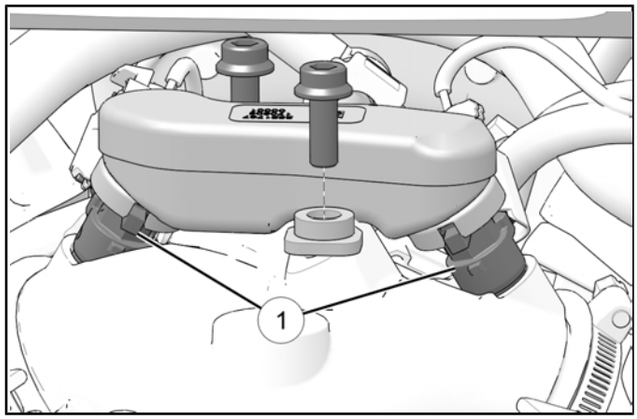
Apply oil sparingly and avoid contaminating the pintle valve / jet surface and upper inlet port.

2. Install NEW fuel injectors to the fuel rail.

IMPORTANT

Make sure injectors tabs align with fuel rail for proper installation.

3. Install fuel injectors ① by carefully pressing into manifold.

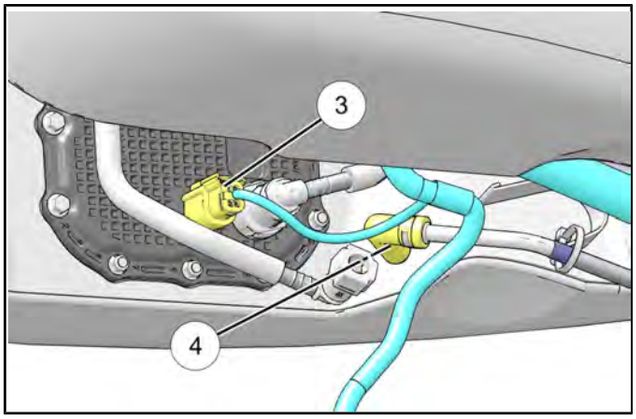


4. Install fuel rail screws and torque to specification.

TORQUE
Fuel Rail Screws: **88 in-lbs (10 N·m)**

FUEL TANK INSTALLATION

1. Apply alcohol, soapy water solution, or rubber lubricant to the isolators and carefully lower the fuel tank onto the frame.
2. Engage the rear isolators first and then rotate the tank downward onto the front isolator.
3. Connect fuel tank vent line ④ and fuel pump electrical connector ③.

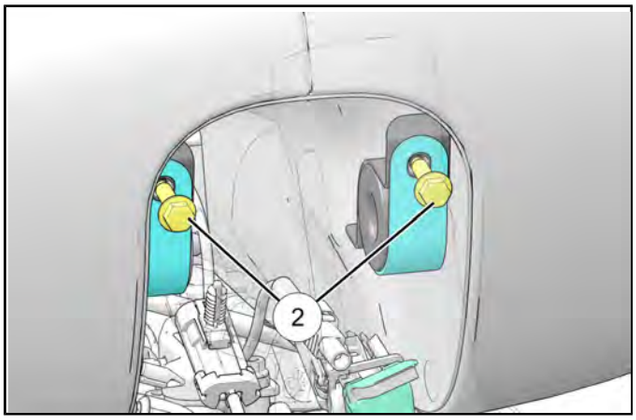


IMPORTANT

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.

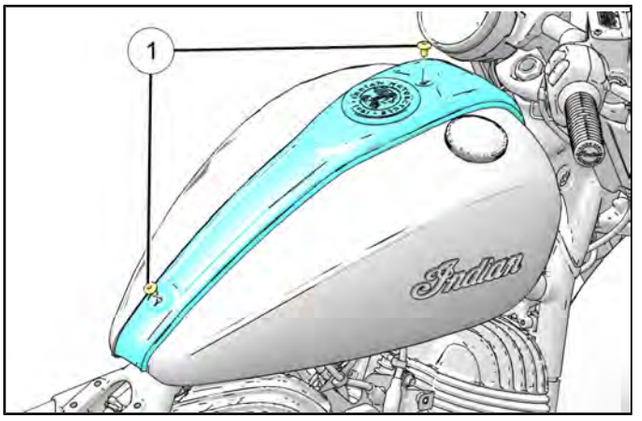
4. Continue lowering the fuel tank until it is fully seated on the isolators.
5. Install fuel tank bracket fasteners ②.

TORQUE
Fuel Tank Mount Fastener: **88 in-lbs (10 N·m)**



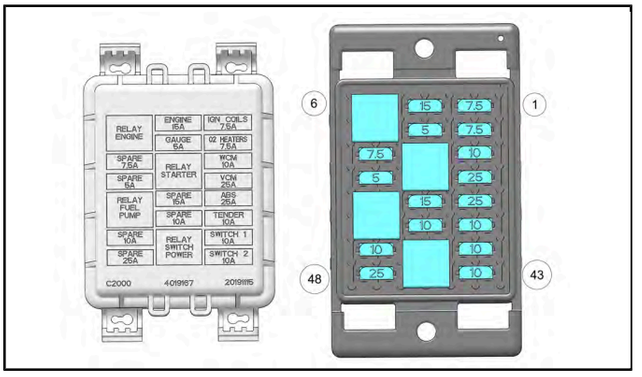
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6. Install fuel tank console and secure it with fasteners ①. Torque fasteners to specification.



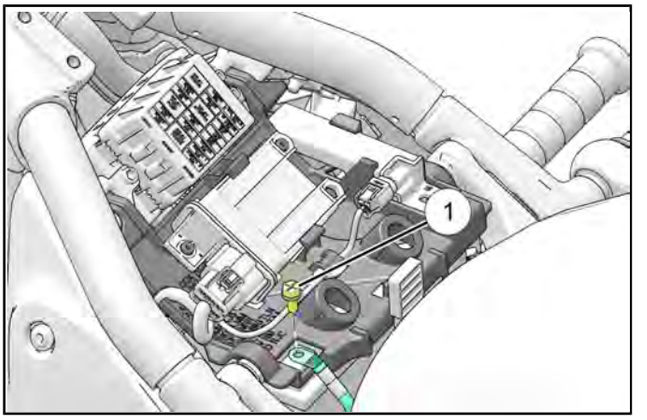
TORQUE
Fuel Tank Console Fastener: **88 in-lbs (10 N·m)**

7. Install the fuel pump relay.



CONNECT THE BATTERY

Connect the negative (-) battery cable ① to the battery terminal. Torque fastener to specification.

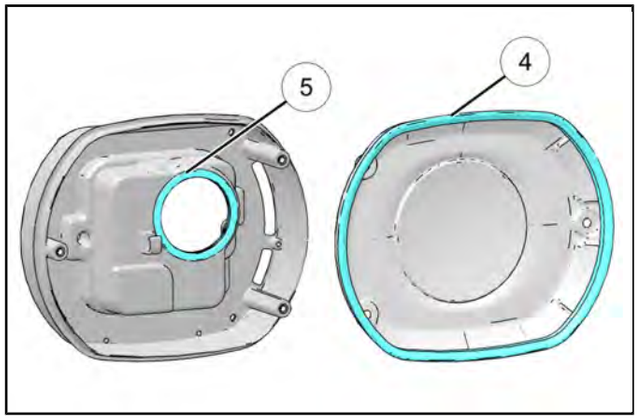


TORQUE
Battery Terminal Fastener: **48 in-lbs (5.4 N·m)**

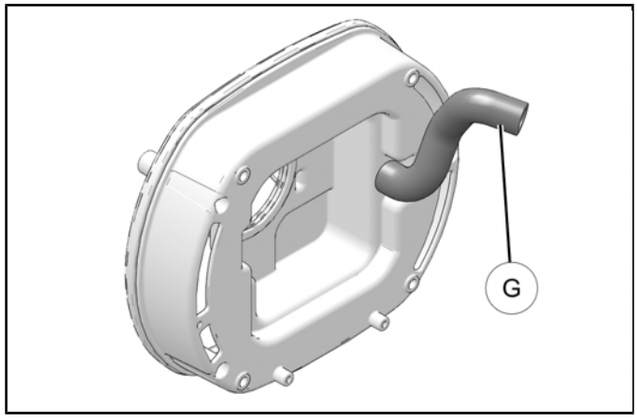
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INSTALL INTAKE

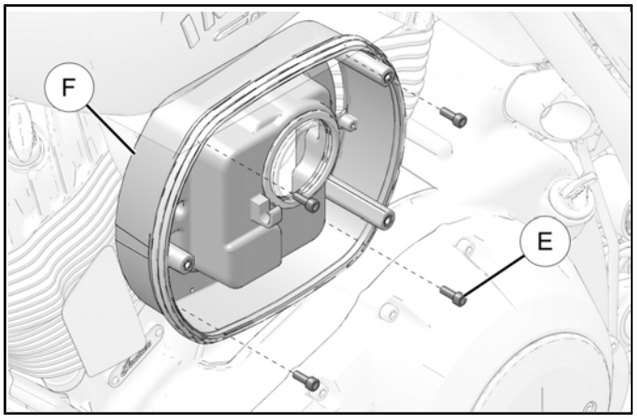
1. Inspect the air box seal ④ and the filter retainer plate seal ⑤. Replace if needed.



2. Connect the breather hose Ⓖ to the breather fitting on the engine.

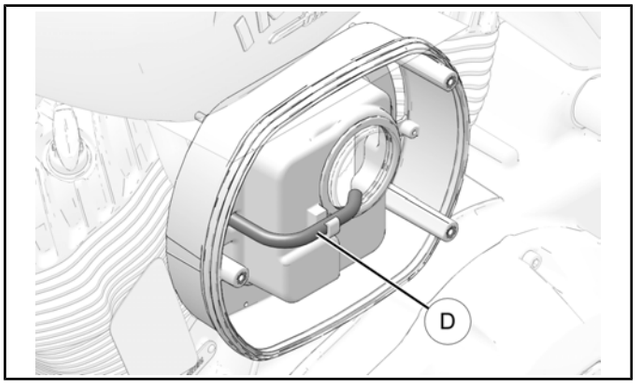


3. Install airbox Ⓕ and airbox screws Ⓔ. Torque fasteners to specification.

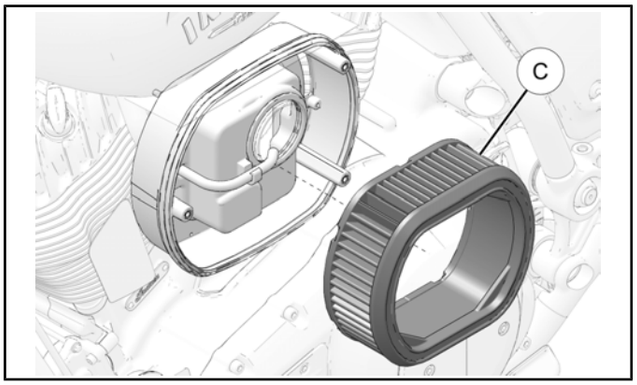


TORQUE
Air Box Base Fasteners: **88 in-lbs (10 N·m)**

4. Route vent hose Ⓓ as shown.



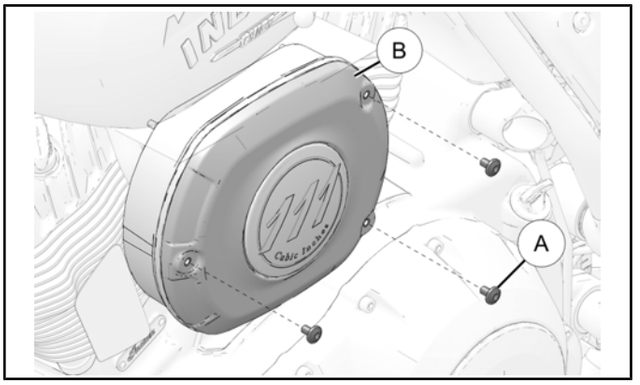
5. Install air filter element Ⓒ.



IMPORTANT
Always use OEM Polaris air filters.

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6. Install airbox cover Ⓑ and secure with airbox cover screws Ⓐ. Torque fasteners to specification

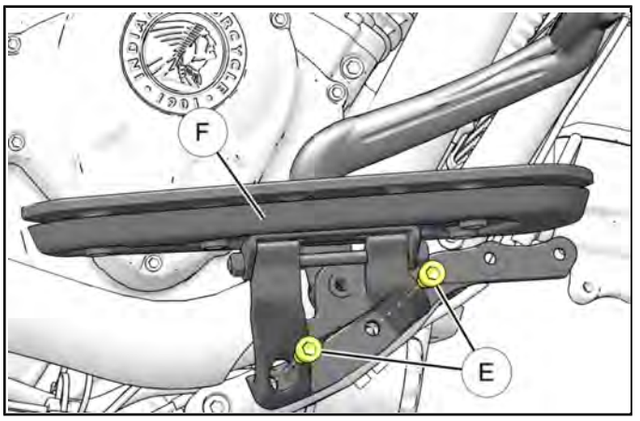


TORQUE
Air Box Cover Fasteners: **88 in-lbs (10 N·m)**

RIGHT FLOORBOARD INSTALLATION

1. Install floorboard assembly Ⓕ and attach with two retained screws Ⓔ. Torque screws to specification.

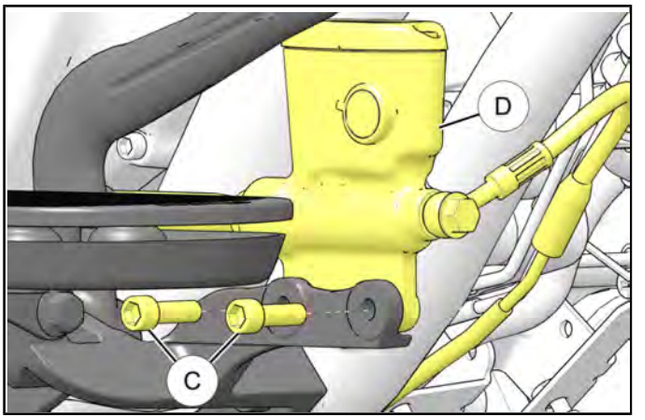
TORQUE
Floorboard assembly screws Ⓔ: **18 ft-lbs (25 N·m)**



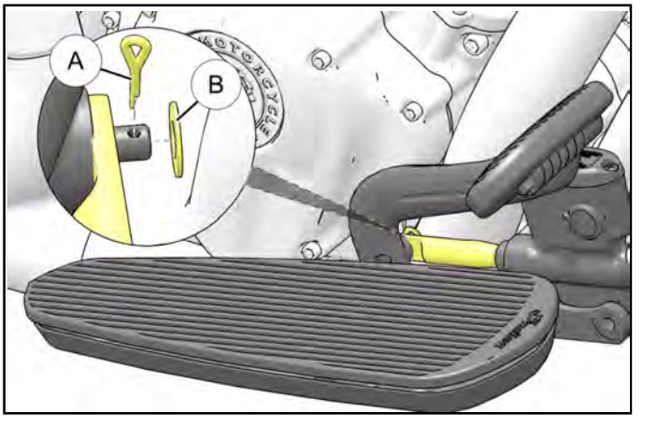
2. Lower brake master cylinder Ⓓ in place, engaging pushrod onto brake pedal assembly and attach with two retained screws Ⓒ. Torque screws to specification.

IMPORTANT
Master cylinder assembly should be kept in an upright position and properly supported at all times. If master cylinder is not kept upright, brake system must be bled of air.

TORQUE
Brake Master Cylinder Mounting Screws Ⓒ: **18 ft-lbs (25 N·m)**



3. **2022 Models:** Apply a thin coat of grease to pushrod pivot pin and install retained washer Ⓑ and cotter pin Ⓐ onto brake master cylinder pushrod.



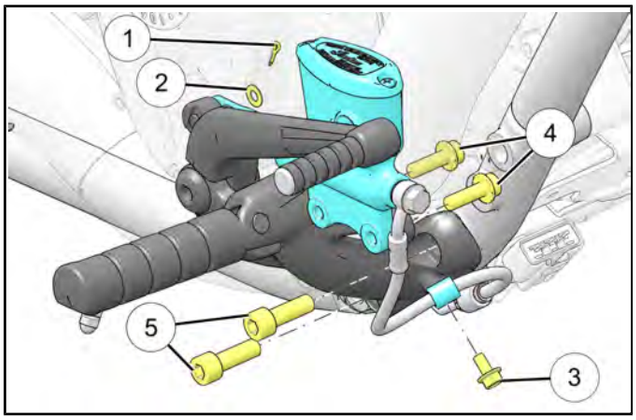
NOTICE
2023+ models: Install the rue pin instead of cotter pin Ⓐ.

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4. Test foot brake and verify pedal feels firm and no air has entered hydraulic circuit. Bleed brakes if necessary.

RIGHT FOOT PEG INSTALLATION

1. Install foot peg bracket fasteners ⑤.



2. Install and torque master cylinder fasteners ④.

TORQUE
Master Cylinder Mounting Fasteners (rear): **18 ft-lbs (25 N·m)**

3. Install and torque brake line retention fastener ③.

TORQUE
Brake Line Retention Fastener: **80 in-lbs (9 N·m)**

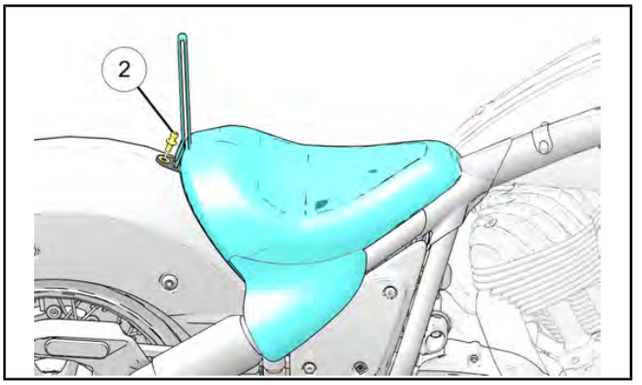
4. Install washer ② and cotter pin ① (2022 models) or rue pin (2023 models).
5. Torque driver foot peg fasteners to specification.

TORQUE
Foot Peg Fasteners (driver): **35 ft-lbs (47 N·m)**

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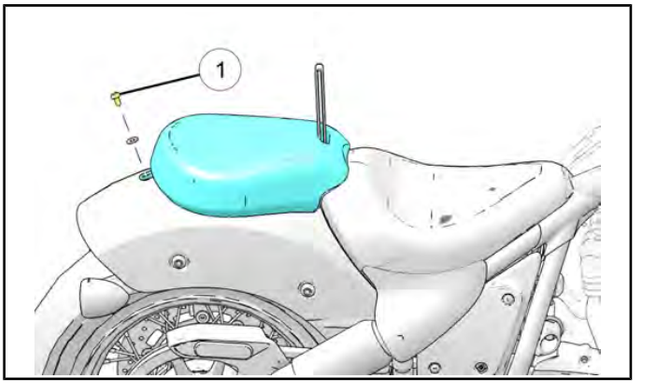
SEAT INSTALLATION

1. Position the seat by inserting the seat mounting tabs from rear to front into the frame.
2. Rotate the rear of the seat downward and position the rear mount seat bracket onto the fender.
3. Thread the seat mount bolt through the seat mount bracket and into the fender. Torque the seat bolt ② to specification.



TORQUE
Pillion Seat Stud (Bagger): **13 ft-lbs (18 N·m)**

4. Position the passenger seat near the fender, and push the grab strap through the seat bottom (if equipped).
5. Lower the passenger seat onto the seat post, and push downward to engage the seat grommet to the seat post.
6. Gently raise the rear bracket and reinstall the nylon grommet.
7. Thread the rear bracket bolt and washer through the bracket and nylon grommet. Torque the bolt ① to specification.



TORQUE
Pillion Seat Fastener (Bagger): **13 ft-lbs (18 N·m)**

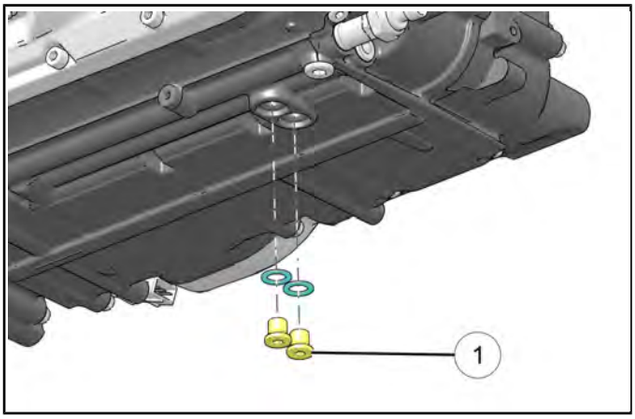
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OIL FILL AND LEVEL CHECK

1. Install new sealing washers on the drain plugs. The sealing surfaces on drain plugs and engine should be clean and free of burrs, nicks or scratches.

IMPORTANT
Start the reinstallation of the drain plugs carefully by hand. Excessive torquing and incorrect alignment can easily cause the drain plugs to become cross-threaded.

2. Reinstall the drain plugs. Torque to specifications.



TORQUE
Drain Plugs: **15 ft-lbs (20 N·m)**

3. 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.
4. Install the new filter and rotate it clockwise by hand until the filter gasket contacts the sealing surface, then turn it an additional 3/4 to one full turn.
5. Remove the dipstick. Add only 4.5 qts. (4.25 l) of the recommended oil at this step. *Do not overfill.*
6. Reinstall the dipstick securely.
7. With the motorcycle in an upright, centered position, start the engine and idle for 30 seconds.
8. Stop the engine and check the oil level before adding any additional oil.

IMPORTANT
Add oil in 0.5 qts (0.47 l) increments, checking oil level after each fill, until oil is between ADD and FULL.

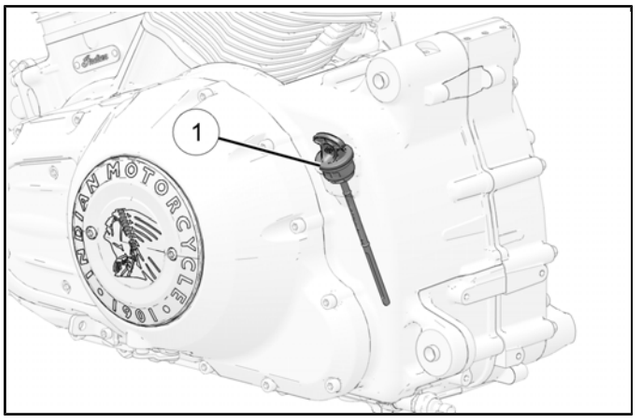
IMPORTANT
Total fill with oil filter change will be approximately 5.5 - 6.0 US quarts. The total amount required for the oil and filter change shall not exceed 6.0 US quarts.

9. 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 motorcycle. Always use the recommended oil.

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



d. Thread the dipstick until fully seated.

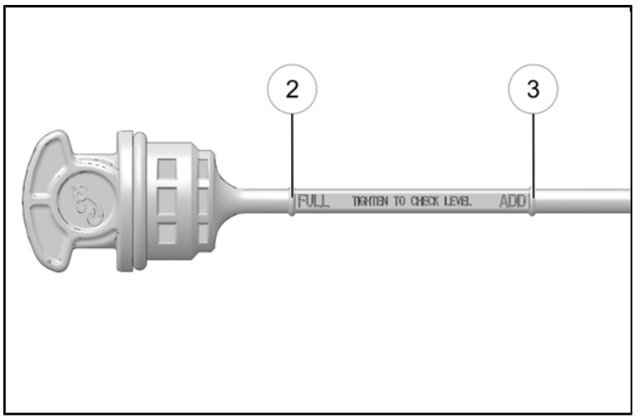
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e. Remove the dipstick and view the oil level.

NOTICE
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.

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



g. Reinstall the dipstick securely.

⚠ CAUTION
Oil level will NOT be accurate if checked on a cold engine. DO NOT ADD oil to bring to FULL mark on a cold engine, as this can result in overfilling. 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.

10. Dispose of used filter and oil properly.

11. Check for leaks around drain plug and oil filter.

NOTICE
Recycle used oil and oil filter in accordance with local regulations.

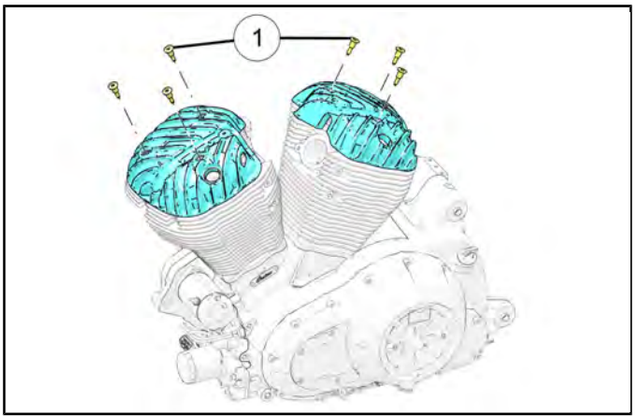
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CYLINDER HEAD SERVICE

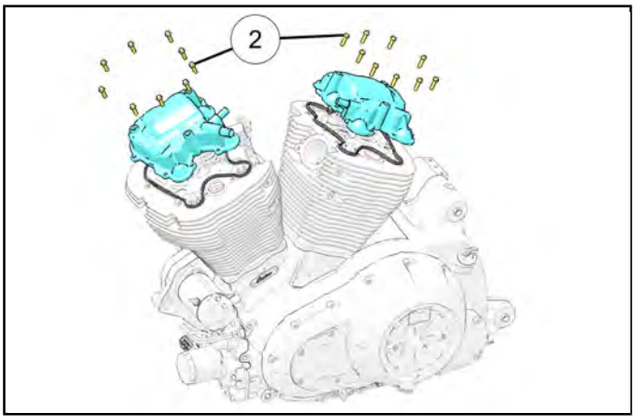
VALVE COVER REMOVAL

IMPORTANT
Due to the proximity of the valve cover in the frame, the engine must be lowered down for valve cover removal. To lower the engine down, reference **Removing Engine From Frame page 3.13**

1. Remove the three fasteners ① from each of the outer valve covers and remove covers.

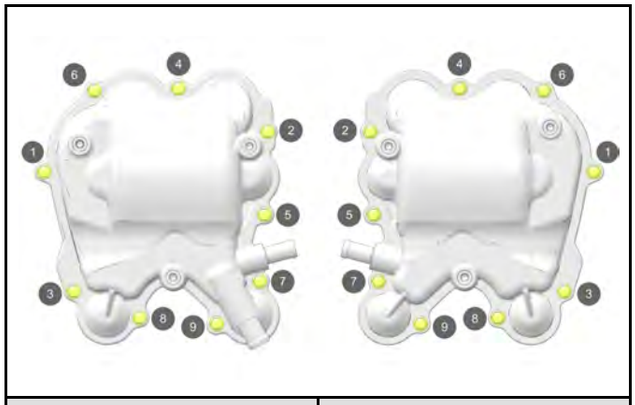


2. Remove the fasteners ② securing the inner valve covers to the cylinder head.



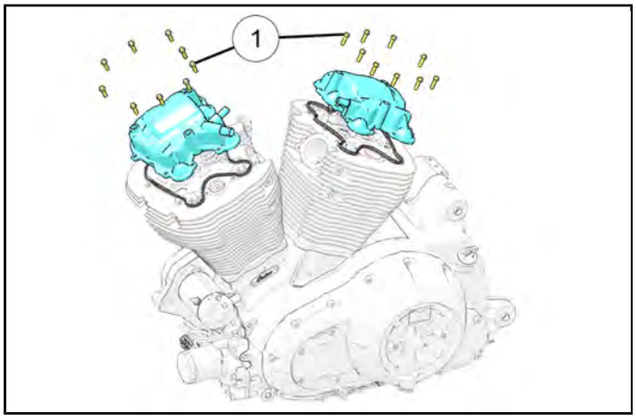
3. Remove inner valve covers and gaskets.

VALVE COVER INSTALLATION



Front Valve Cover, Inner Torque Sequence	Rear Valve Cover, Inner Torque Sequence

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
Inner Valve Cover Fasteners: **88 in-lbs (10 N·m)**

3. Install the outer valve covers and torque fasteners to specification.

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

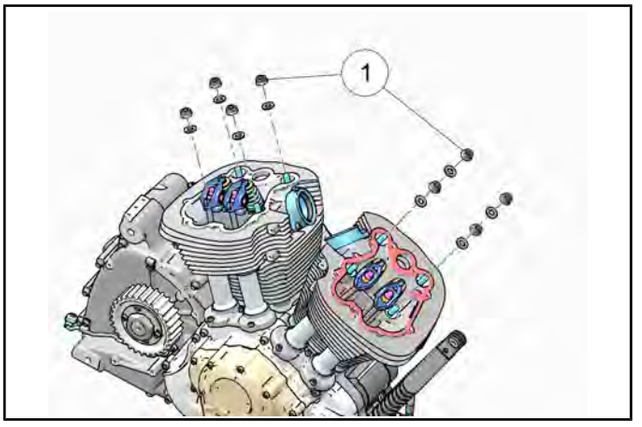
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CYLINDER HEAD REMOVAL

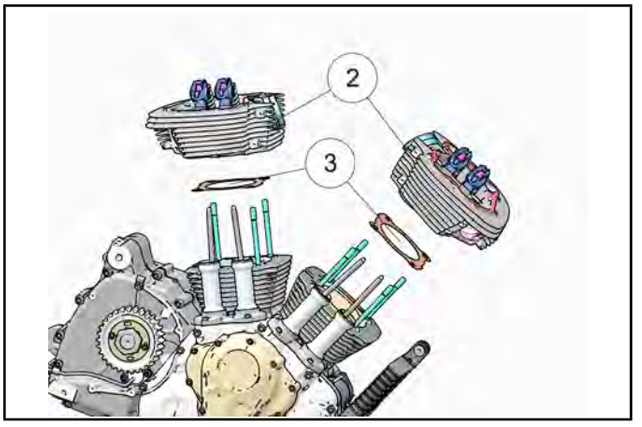
⚠ CAUTION

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

1. Remove engine from frame and place on an engine stand. See **Removing Engine From Frame page 3.13**.
2. Remove inner and outer valve covers. See **Valve Cover Removal page 3.77**.
3. Alternately loosen cylinder head nuts ① to relieve valve spring pressure. Remove nuts and washers.

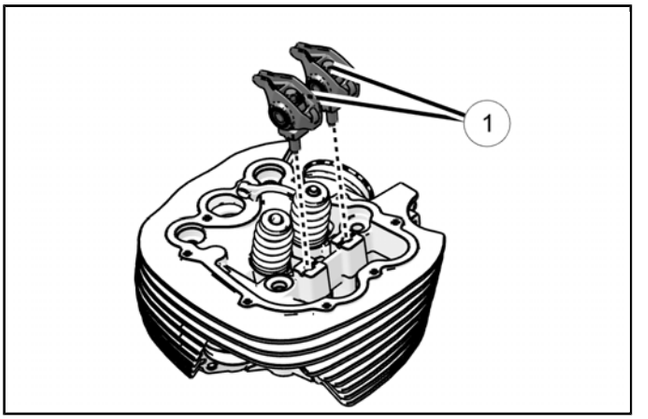


4. Remove cylinder heads ② and head gaskets ③ .



ROCKER ARM REMOVAL

1. Remove rocker arm fasteners ① and remove rocker arms as an assembly.



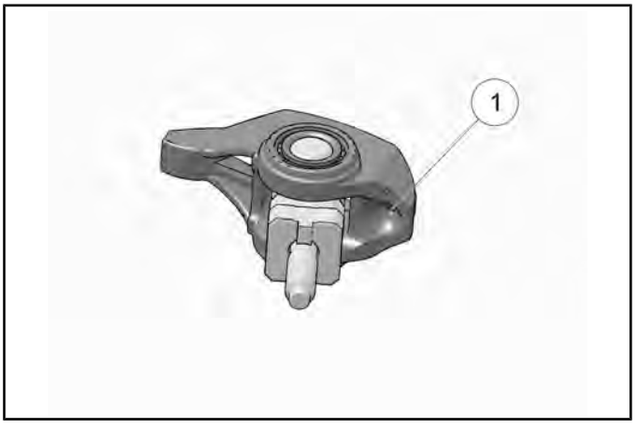
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ROCKER ARM INSPECTION

NOTICE

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

1. Visually inspect rocker arms and needle bearings for scoring or damage.
2. Inspect oil passage ① at the push rod cup and clean thoroughly. Use only clean solvent.



3. Rotate rocker arm. Rocker arm should move smoothly without excessive play or binding. Check for excessive radial movement.
4. Replace rocker arm assembly if pad or push rod cup show signs of wear, cracks, nicks or burrs.

CYLINDER HEAD DISASSEMBLY

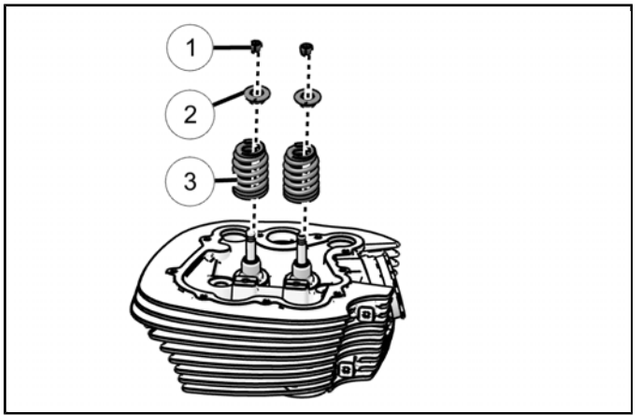
⚠ CAUTION

Wear eye protection while removing valve springs.

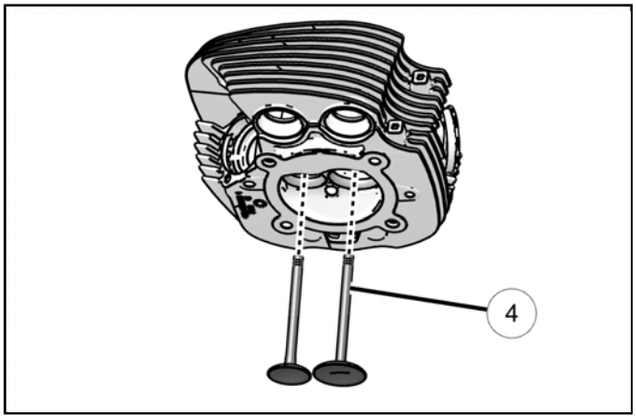
NOTICE

Keep mated parts together for assembly.

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 .

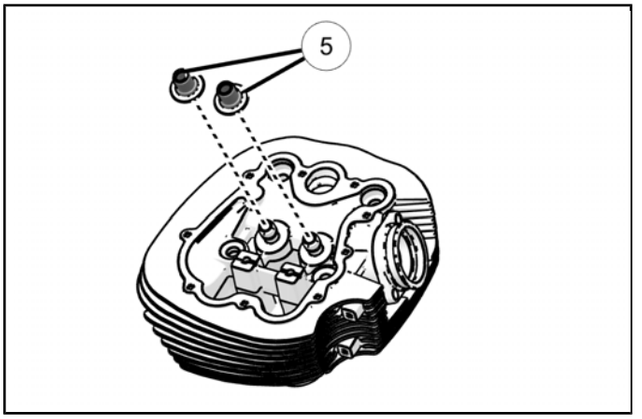


3. Remove the valves ④ .



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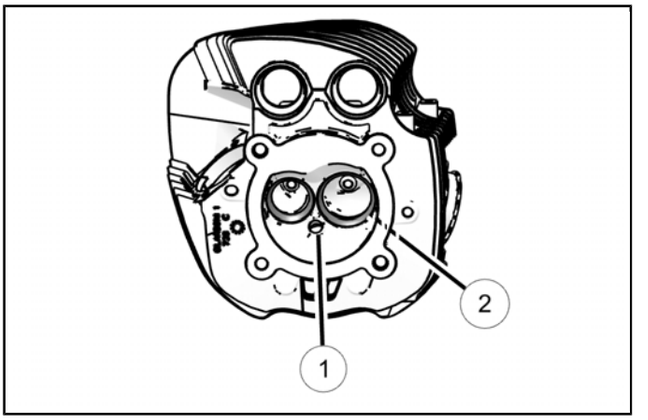
4. Remove and discard the spring seat / valve stem seal assemblies ⑤ .



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 .



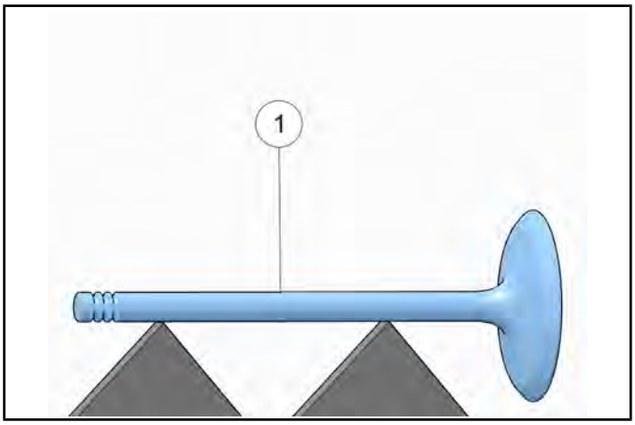
2. Inspect cylinder head for distortion with a straight edge and feeler gauge. Check in different directions and locations on the cylinder head. For cylinder head service limits, see **Service Specifications - Cylinder Head / Valves**.

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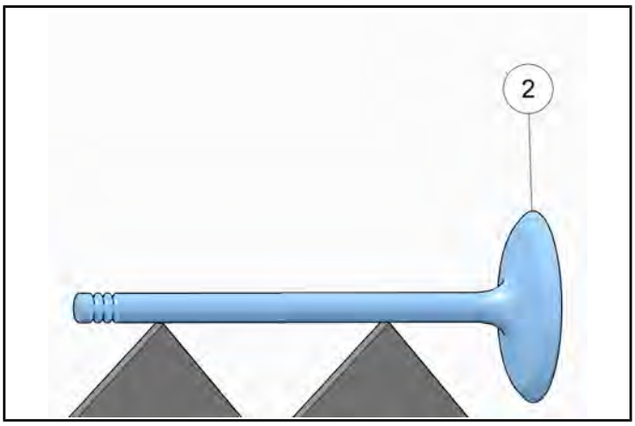
VALVE INSPECTION

NOTICE
Valve service specifications can be found at the beginning of this chapter. See **Service Specifications - Cylinder Head / Valves**.

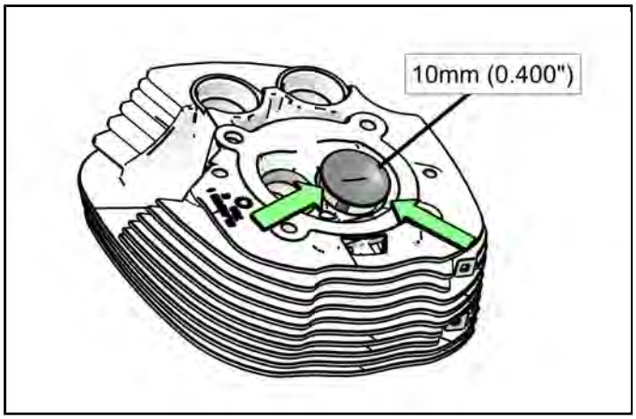
1. Place valves on V-blocks as shown and measure valve stem runout ① using a runout gauge or similar tool..



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.

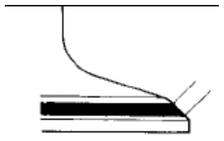
B. Position dial indicator as shown. Measure deflection in two directions perpendicular to each other (X & Y axis).

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.

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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

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VALVE GUIDE REMOVAL / INSTALLATION

⚠ 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:
17.7–18.3 mm

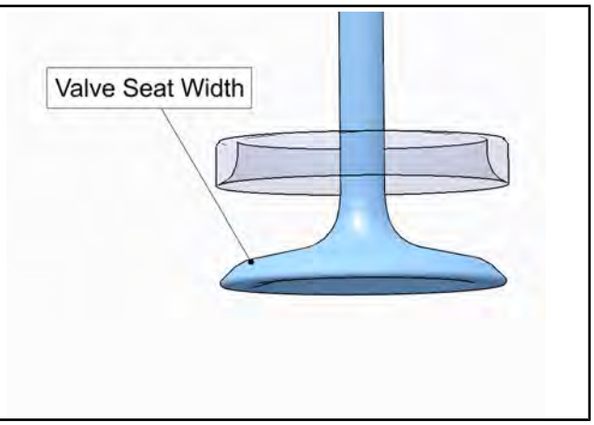
6. Ream new valve guides to size to obtain specified stem-to-guide clearance. Ream from combustion chamber side of head.
7. Clean cylinder head thoroughly with clean solvent.
8. Inspect and recondition valve seats.

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 / Valves**.



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.

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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 3.97**.
Rocker arms must be removed from cylinder head prior to installation.

1. If previously removed, lubricate push rod tube o-rings with a small amount of engine oil and press them into the lifter blocks until fully seated.
2. Verify that locating dowels ① are in position on the cylinder deck.
3. Thoroughly clean cylinder and cylinder head mating surfaces.

NOTICE

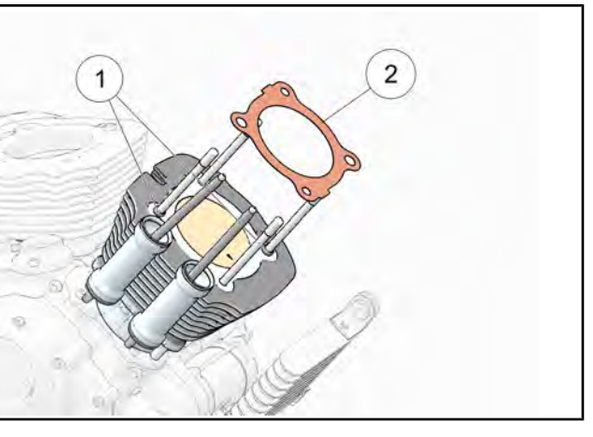
Gaskets and gasket sealing surfaces must be free of oil and grease during assembly.

4. Slide push rods through push rod tubes until seated in lifters.

NOTICE

All push rods and rocker arms are identical, although an effort should be made to put parts back into the same location from which they were removed.

5. Install a new head gasket ② .



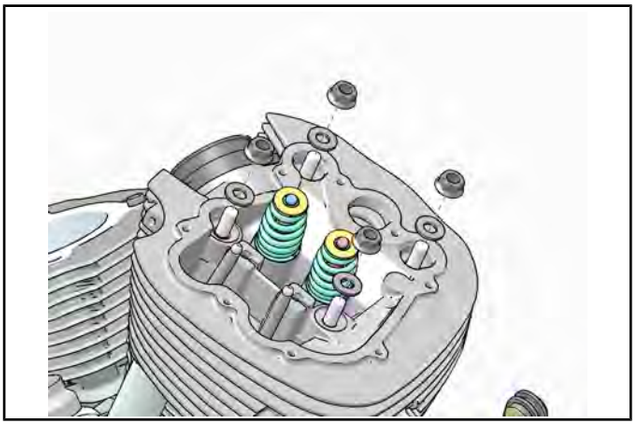
NOTICE

Use care not to damage, tear or displace push rod tube o-rings when fitting the cylinder head to the cylinder.

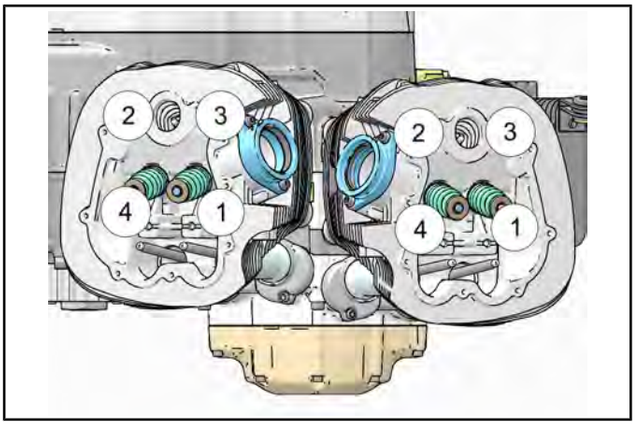
6. Set cylinder head in place on cylinder and press down over the push rod tubes until fully seated.
7. Apply assembly lube to the tops of the valve stems.

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8. Install washers and nuts on cylinder studs. Tighten finger tight.



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



TORQUE
Cylinder Head Nuts: **Step 1: 26 ft-lbs (35 N·m)Step 2: Turn additional 50°Step 3: Turn additional 90°**

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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

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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	-	Refer to Fuel Delivery / EFI chapter
	Fuel Injection Problem	-	Refer to Fuel Delivery / EFI chapter
	Ignition Problem	-	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
	Ignition / Fuel Injection System	—	Refer to Fuel Delivery / EFI or Electrical chapter
	Oiling Problem	Oil Overfilled	Correct Engine Oil Level

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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

TOOL DESCRIPTION	PART NUMBER
Piston Ring Compressor	PV-43570-A
Clutch Shaft Holding Tool	PF-51232
Cylinder Bore Gauge	PV-3017
Crankshaft Rotation Tool	PF-51239
Crankshaft Locking Pin	PF-52135
Engine Case Splitting Tool	PF-51234
Straightedge, Feeler Gauge	Commercially Available
Protective Sleeves For Pistons / Studs	Commercially Available

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

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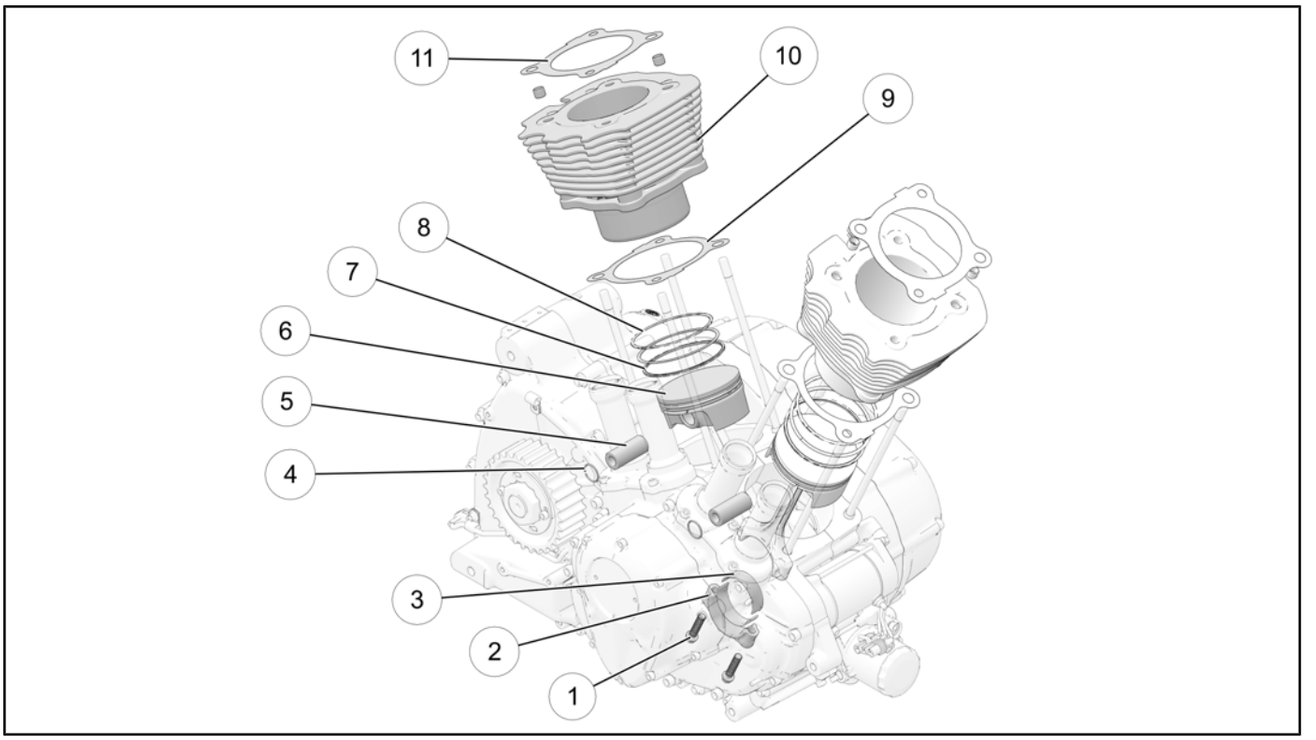
SERVICE SPECIFICATIONS – CYLINDER / PISTON

ITEM		STANDARD		SERVICE LIMIT
Cylinder		**111 c.i.**	**116 c.i.**	
	I.D.	100.987 - 101.013 (3.9759" - 3.9769")	103.187 - 103.213 (4.0625" - 4.0635")	Check taper and out-of-round
	Out of Round	Measure 66 mm up from base gasket surface		0.05 mm (0.002")
	Taper			0.05 mm (0.002")
	Gasket Surface Warpage	-		0.1 mm max. (0.0039")
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 12 mm up from bottom of skirt, 90 degrees to pin) 100.932 - 100.946 mm (3.9737 - 3.9743")	(Measured 21 mm up from bottom of skirt, 90 degrees to pin) 103.132 - 103.146 mm (4.0603 - 4.0609")	Replace if piston-to-cylinder clearance is excessive with good cylinder
	Piston Pin Hole I.D.	22.006 - 22.012 mm (0.8664 - 0.8666")	22.004-22.010 mm (0.8663 - 0.8665")	22.047 mm (0.8680")
	Piston Pin O.D.	21.995 - 22.000 mm (0.8659 - 0.8661")		21.96 mm (0.864")
	Piston to Cylinder	0.041 - 0.081 mm (0.0016 - 0.0032")		0.15 mm (0.006")
	Piston to Piston Pin	0.006 - 0.017 mm (0.0002 - 0.0007")	0.004 - 0.015 mm (0.0002 - 0.0006")	0.035 mm (0.0014")
Piston Ring Clearances	Ring End Gap - Top (Installed) Ring End Gap - 2nd (Installed)Ring End Gap - 3rd (Oil Control Rails) (Installed)	0.15 - 0.40 mm (0.006 - 0.016") 0.33 - 0.53 mm (0.013 - 0.021") 0.15 - 0.35 mm (0.006 - 0.014")		.80 mm (0.031") 1.11 mm (0.043") 0.80 mm (0.031")
	Piston Ring Marks	-		"CTOP" mark must face UP on all rings.
Piston Ring to Ring Land	Top Ring (1.2mm ring thickness)	0.02 - 0.060 mm (0.0008 - 0.0024")		0.11 mm (0.0043")
	2nd Ring (1.2 mm ring thickness)	0.02 - 0.060 mm (0.0008 - 0.0024")		0.11 mm (0.0043")
	Oil Control Ring	0.03 - 0.17 mm (0.001 - 0.0067")		0.26 mm (0.010")

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ASSEMBLY VIEWS

CYLINDER / PISTON

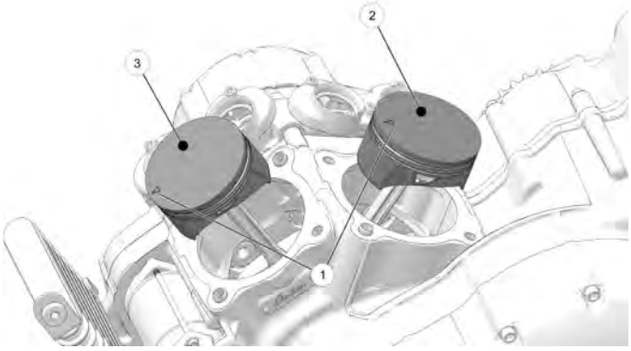


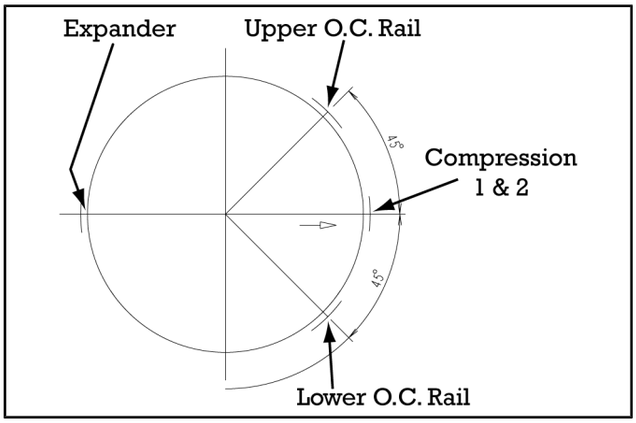
ITEM	DESCRIPTION	TORQUE
①	Fastener, Connecting Rod Bearing Cap	**22 ft-lbs (30 N·m) + 90°**
②	Bearing Cap, Connecting Rod	-
③	Bearing, Connecting Rod (52 mm)	-
④	Circlip, Wristpin	-
⑤	Wristpin	-
⑥	Piston (101 mm)	-
⑦	Ring, Oil Control	-
⑧	Ring, Compression (top 2 rings)	-
⑨	Gasket, Cylinder Base	-
⑩	Cylinder	-
⑪	Gasket, Cylinder Head	-

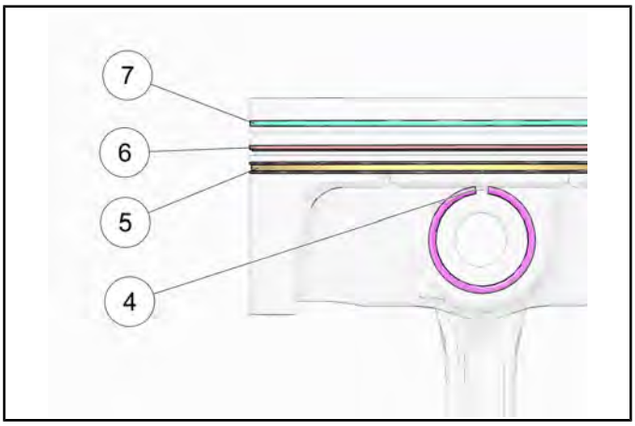
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CYLINDER / PISTON SERVICE

PISTON RING PROFILE AND ORIENTATION







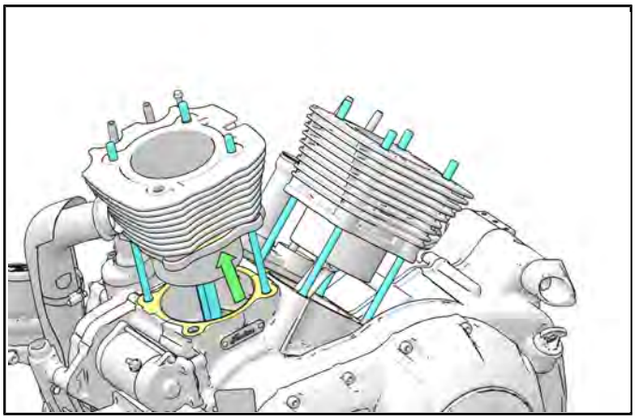
NOTICE
Compression rings 1 & 2 should not be aligned in the same orientation during installation.

ITEM	DESCRIPTION
①	Arrows on piston crown indicating installation direction. Both arrows point toward the front of the engine.
②	Rear piston is installed closest to the primary drive side of the engine.
③	Front piston is installed closest to the camshaft side of the engine.
④	Wrist pin circlip. Install the circlip with the gap positioned at 12 o'clock.
⑤	Oil Control Ring
⑥	Compression Ring No. 2
⑦	Compression Ring No. 1

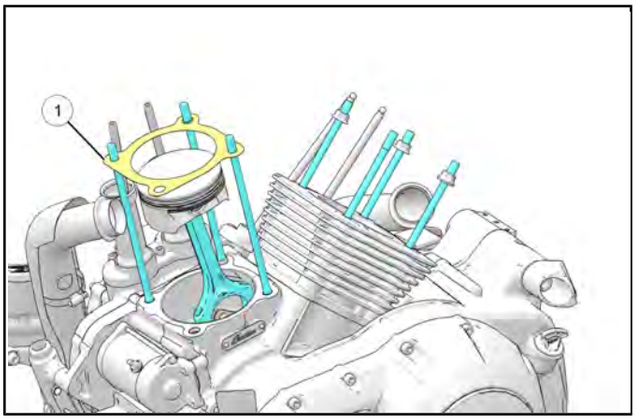
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CYLINDER REMOVAL

1. Remove cylinder head(s). See **Cylinder Head Removal page 3.78**.
2. Remove cylinder(s). 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 ① .



4. Clean gasket surfaces of cylinders thoroughly.

⚠ CAUTION

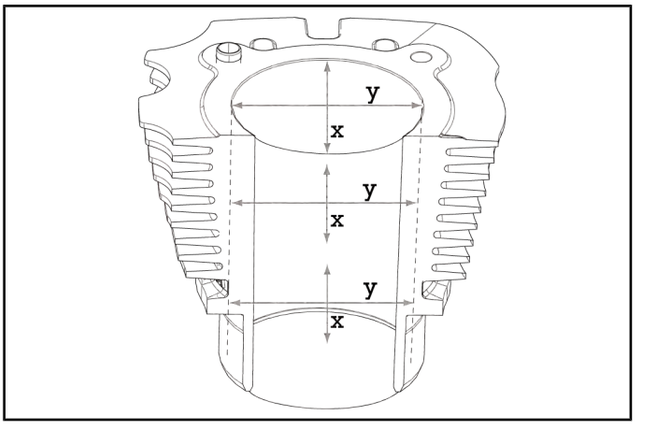
Careless handling of cylinder, pistons or rings may cause irreparable damage. Do not damage gasket surfaces during cleaning.

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.

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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.

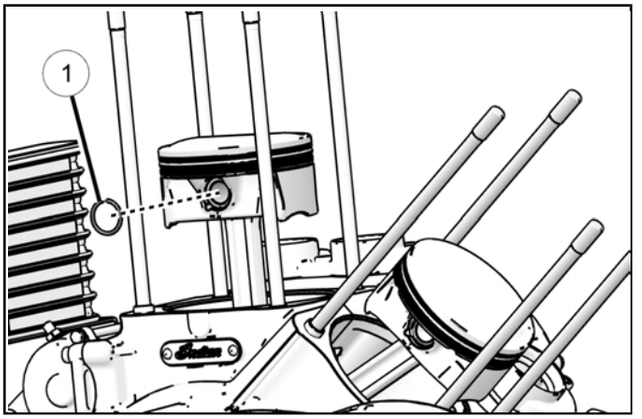
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CYLINDER WARPAGE MEASUREMENT

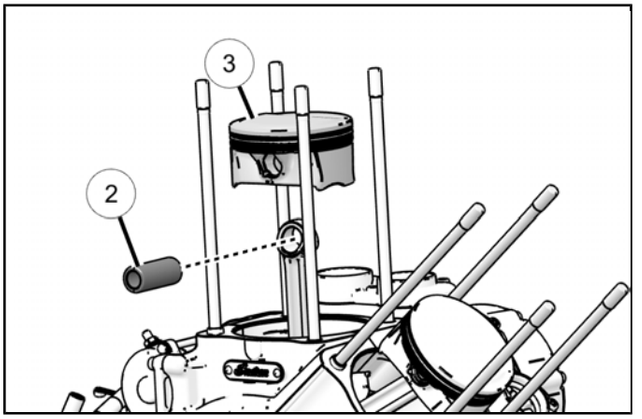
1. Inspect cylinder for warpage at cylinder head surface and base gasket surface.
2. Place a straight edge diagonally across cylinder mating surfaces in several positions. Attempt to slide a .05mm (.002") feeler gauge under the straight edge in each position.
3. Replace cylinder if warped beyond the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



3. Push piston pin ② out to left side of engine and remove the piston ③ .

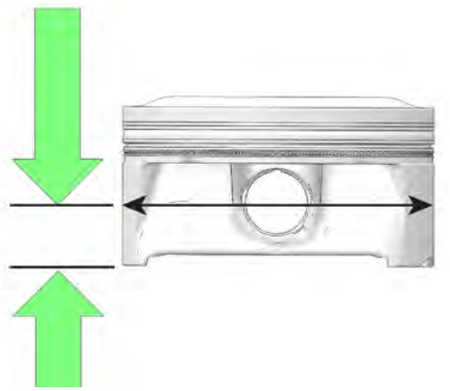


4. Rotate rings in piston grooves. Rings should rotate freely in grooves.
5. Clean carbon deposits from piston.
6. Spread rings only wide enough to remove them from piston. Spreading rings too wide will damage them.
7. Clean piston ring grooves. Break or cut a piston ring in half. File or grind one edge 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. Visually inspect piston for cracks, excessive wear, scoring, etc.
2. Measure piston skirt O.D. (see table below). Replace piston if worn beyond the service limit. See **Service Specifications - Cylinder / Piston page 3.89**.



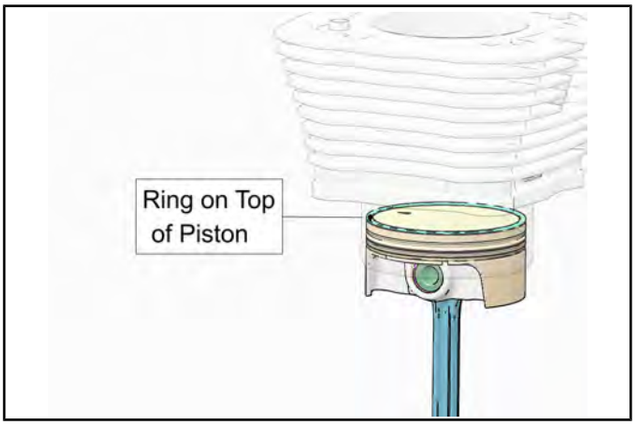
111 C.I.	116 C.I.
90° to pin and **12 mm** from bottom of piston skirt	90° to pin and **21 mm** from bottom of piston skirt

3. Calculate Piston to Cylinder Clearance. Subtract piston O.D. from cylinder bore I.D. and compare to specifications. See **Service Specifications - Cylinder / Piston page 3.89**
4. Replace parts that do not meet specification.

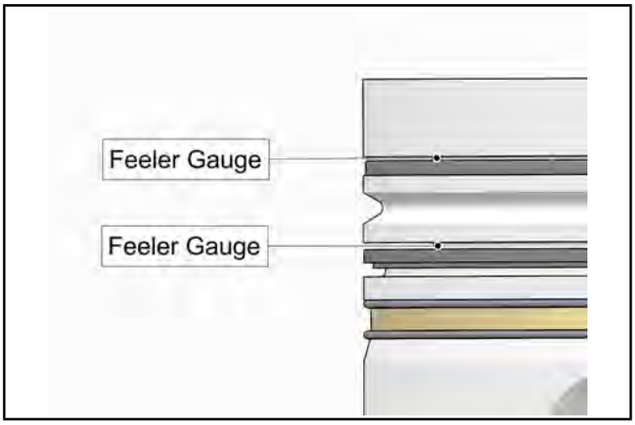
NOTICE
If piston-to-cylinder clearance exceeds service limit, *measure a new piston and re-calculate clearance*. If piston-to-cylinder clearance exceeds service limits with a new piston, cylinder must be replaced.

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



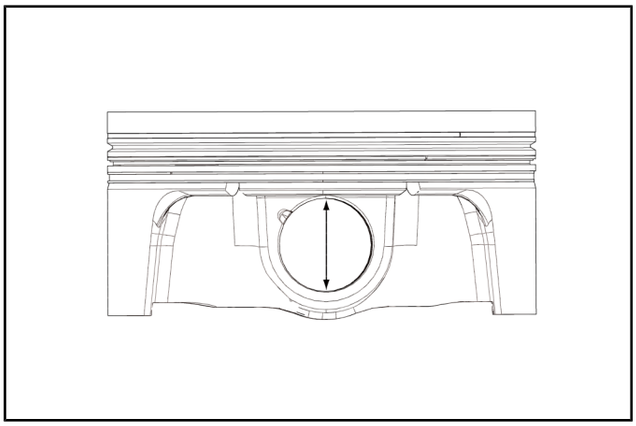
6. Measure installed ring end gap with a feeler gauge and compare to specifications. See **Service Specifications - Cylinder / Piston page 3.89**
7. Install rings onto a clean piston. Push rings in until they are flush with piston. Using a feeler gauge, measure side clearances for the 1st & 2nd rings.



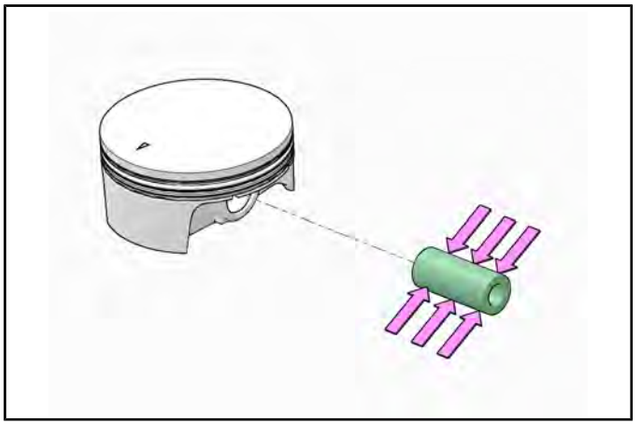
8. Replace parts that exceed service limit.

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.



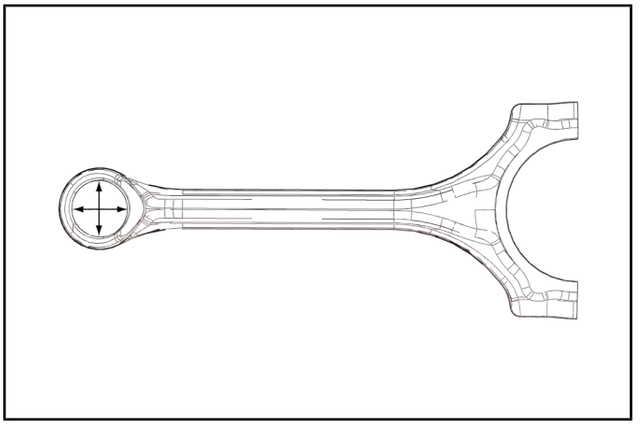
2. Measure piston pin O.D. at three locations. Record largest measurement.



3. Calculate piston pin-to-piston clearance. Subtract pin O.D. from pin hole I.D.

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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

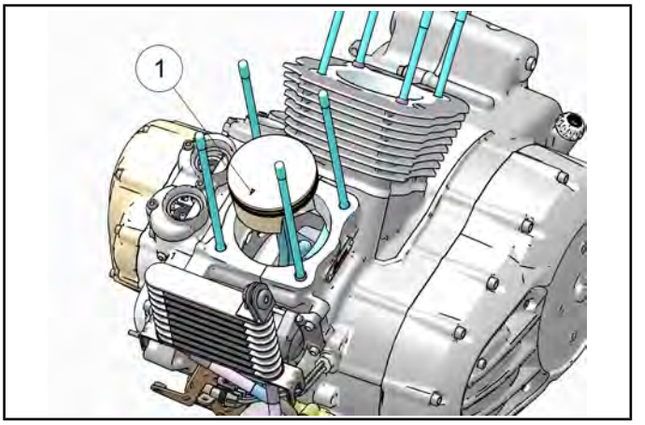
⚠ CAUTION

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. See Piston Ring Profile And Orientation page 3.91.
3. Install top and bottom rails with end gap located as shown. See Piston Ring Profile And Orientation page 3.91
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. See Piston Ring Profile And Orientation page 3.91.

PISTON INSTALLATION

The pistons are marked with an arrow on the crown. Install pistons on connecting rods with arrow ① facing the FRONT of the engine.

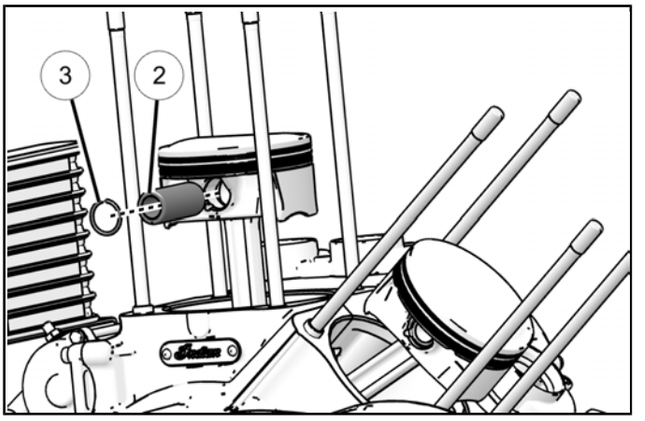


1. Place a clean shop towel over crankcase to prevent foreign material from entering crankcase.
2. Install a new circlip on one side of the piston with end gap facing UP (12:00 position).

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 ② through rod and piston pin hole until it is stopped by circlip.
6. Install remaining circlip ③ with end gap facing up (12:00 position.)

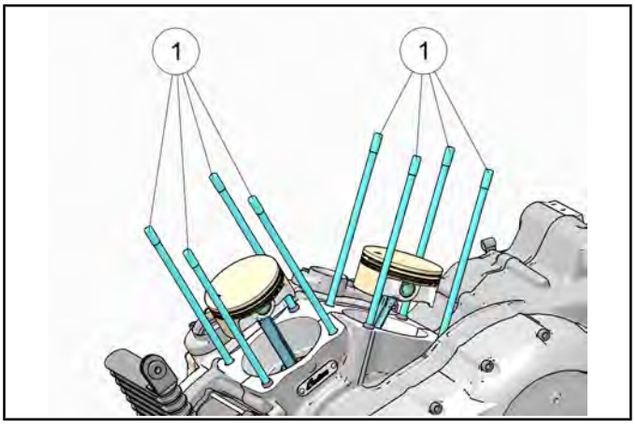


7. Make sure both piston circlips are seated properly in the groove.

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CYLINDER STUD REPLACEMENT

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



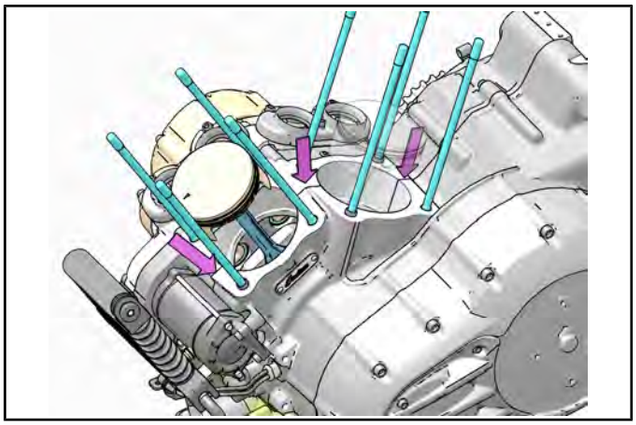
2. Clean threads in cases thoroughly.
3. Apply engine oil to stud threads.
4. Install studs and torque them to specification.

TORQUE
Cylinder Studs: **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.

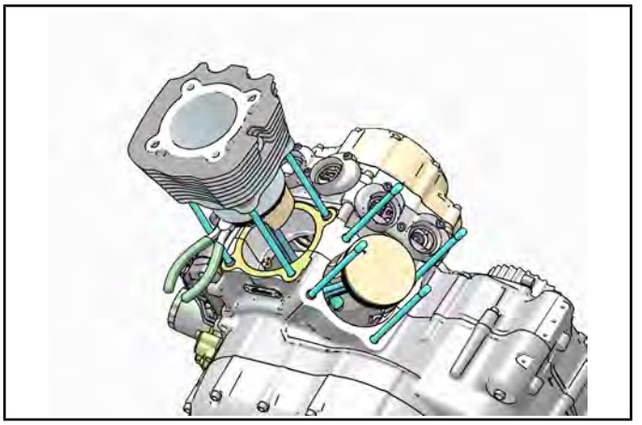
⚠ CAUTION
Be sure compressor band end gap does not align with any ring end gap when compressing the rings.

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

9. Remove protective covering from crankcase.

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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 3.84**.

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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

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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	-	Refer to Fuel Delivery / EFI chapter
	Fuel Injection Problem	-	Refer to Fuel Delivery / EFI chapter
	Ignition Problem	-	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	—	Refer to Fuel Delivery / EFI or Electrical chapter
	Oiling Problem	Oil Overfilled	Correct Engine Oil Level

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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.

TIP
With the aid of a second person and the bike in gear, firmly apply the rear break to prevent the drive sprocket from being able to move.

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: **30%**

7. For any cylinder leakage above 30%, 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.

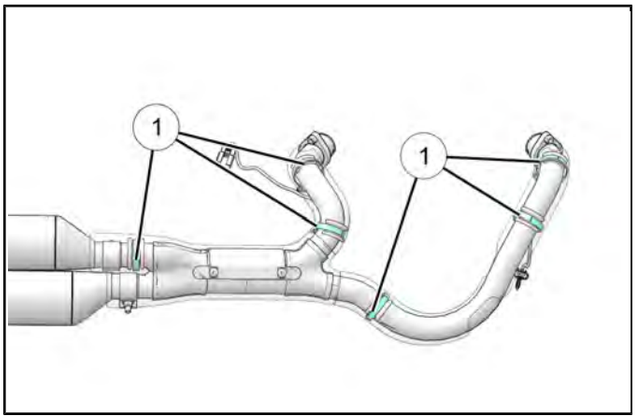
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EXHAUST

EXHAUST MAINTENANCE

EXHAUST HEAT SHIELD

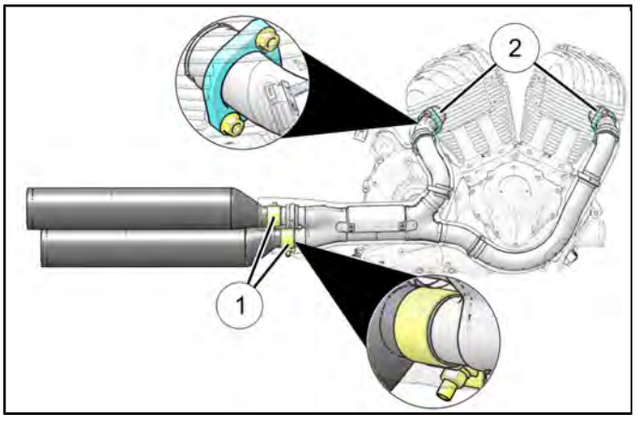
After 500 Miles (805 km) of riding, check orientation and re-torque all clamps ①.



TORQUE
Exhaust Heat Shield Clamp **31 in-lbs (3.5 N·m)**

EXHAUST JOINTS

Check and re-torque all sealed exhaust joints.

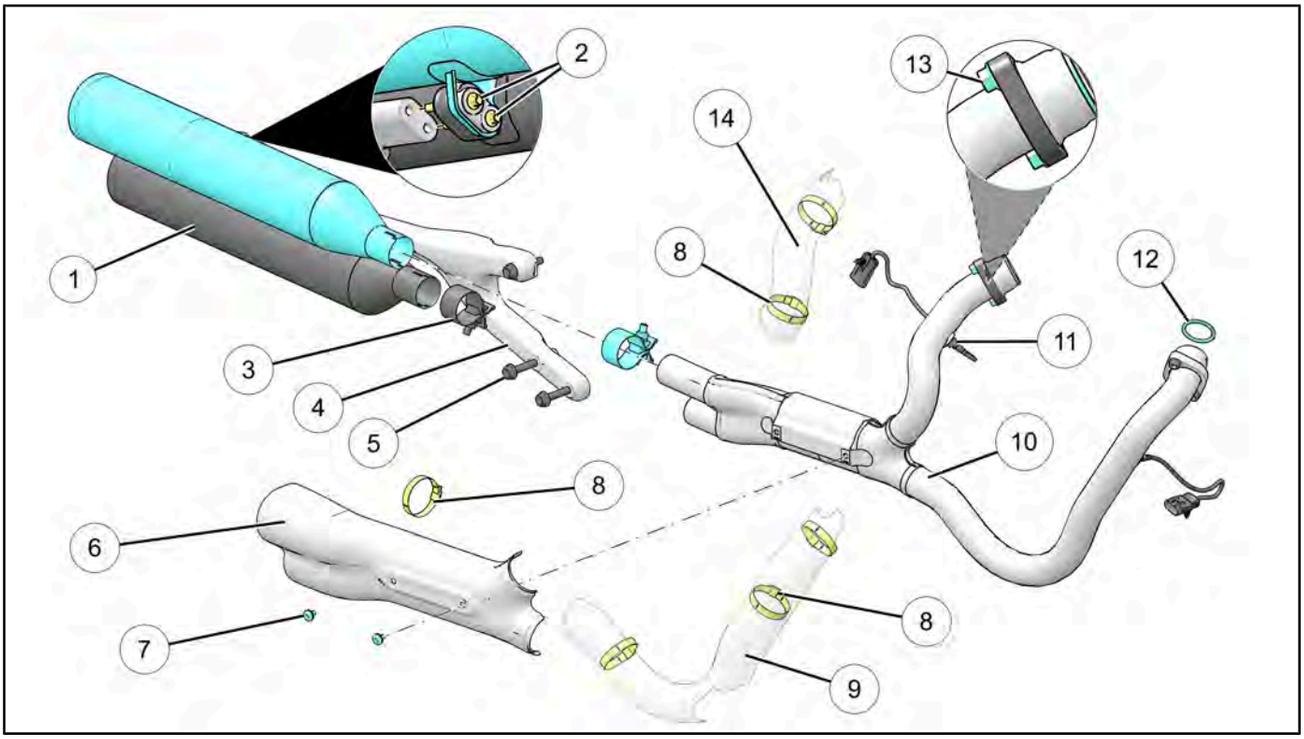


REF	DESCRIPTION	TORQUE
①	Exhaust Clamp	**41 ft-lbs (55 N·m)**
②	Head Pipe Nut	Reference Head Pipe Removal / Installation procedure

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ASSEMBLY VIEWS

EXHAUST SYSTEM



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Muffler	—	⑧	Heat Shield Clamp	**31 in-lbs (3.5 N·m)**
②	Muffler Fastener	**18 ft-lbs (25 N·m)**	⑨	Front Cylinder Heat Shield	—
③	Exhaust Clamp Fastener	**41 ft-lbs (55 N·m)**	⑩	Head Pipe	—
④	Exhaust Mount	—	⑪	Oxygen Sensor	**13 ft-lbs (18 N·m)**
⑤	Exhaust Mount Fastener	**37 ft-lbs (50 N·m)**	⑫	Exhaust Gasket	—
⑥	Crossover Heat Shield	—	⑬	Head Pipe Nut	Reference Head Pipe Removal / Installation procedure
⑦	Crossover Heat Shield Fastener	**88 in-lbs (10 N·m)**	⑭	Rear Cylinder Heat Shield	—

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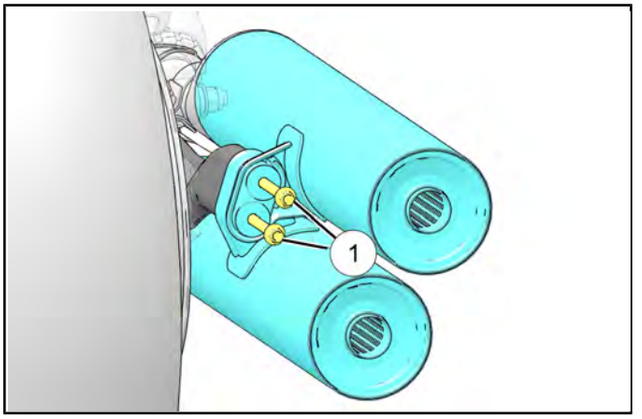
EXHAUST SERVICE

MUFFLER REMOVAL / INSTALLATION

⚠ 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.

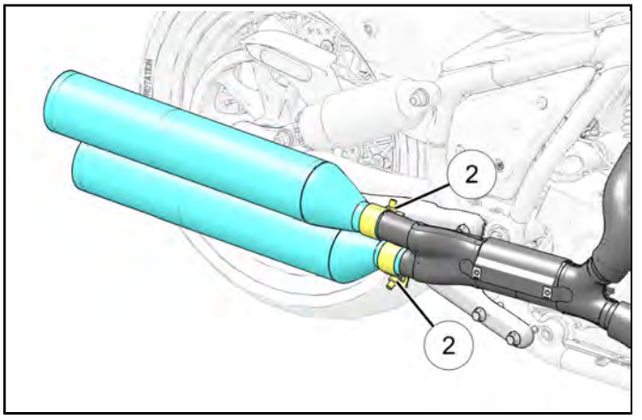
1. Viewing from the rear of the unit, remove the muffler fasteners ①.



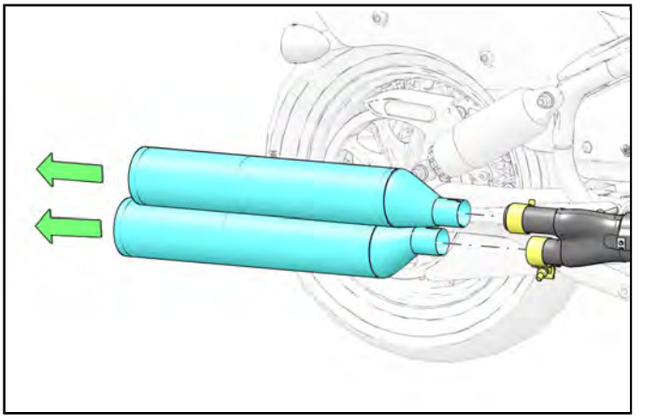
2. Loosen exhaust clamps ②.

IMPORTANT

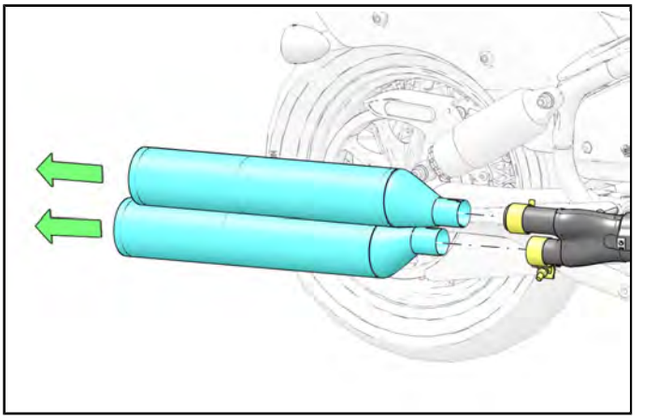
Note clamp orientation for reassembly.



3. Pull mufflers rearward to remove.



1. Install mufflers.

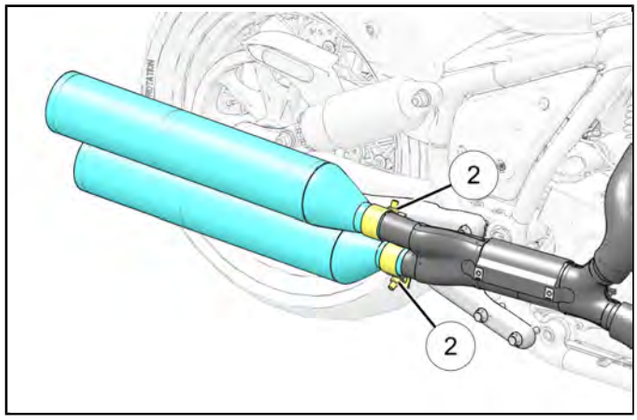


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2. Torque exhaust clamps ② to specification.

IMPORTANT

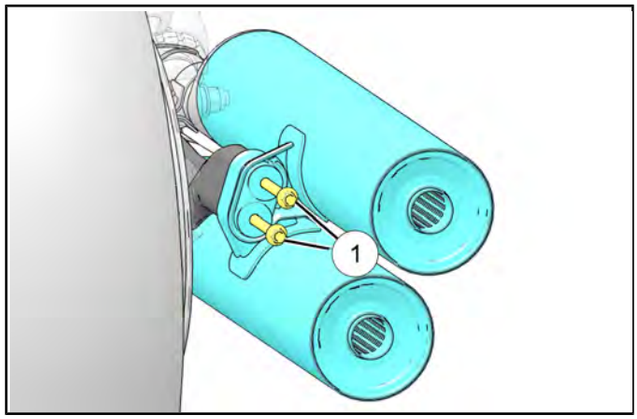
Make sure clamps are in the orientation noted from disassembly.



TORQUE

Exhaust Clamp:
41 ft-lbs (55 N·m)

3. Viewing from the rear of the unit, Install the muffler fasteners ①. Torque to specification.



4. **Installation is performed by reversing the removal procedure.**

TORQUE

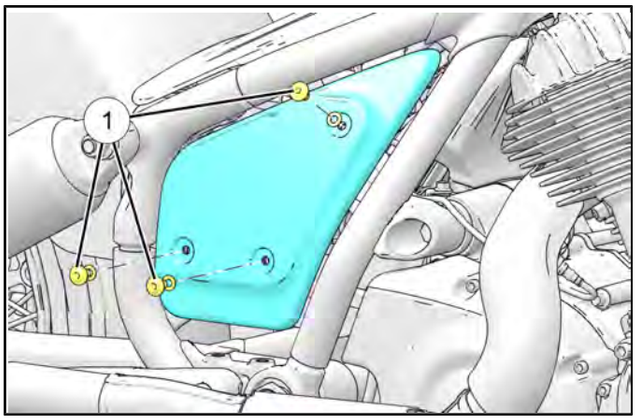
Muffler Fastener:
18 ft-lbs (25 N·m)

HEAD PIPE REMOVAL / INSTALLATION

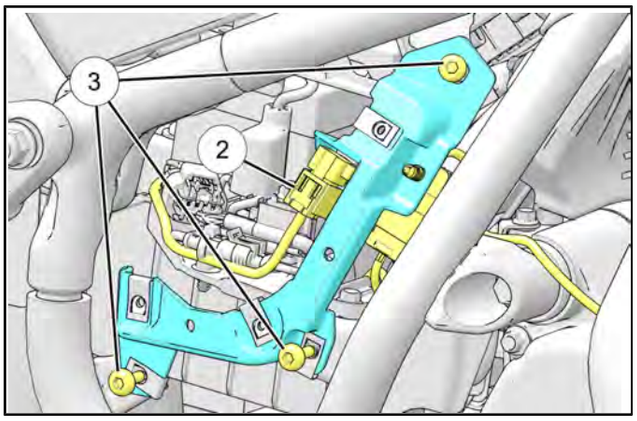
⚠ WARNING

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.

1. Remove Mufflers. See **Muffler Removal / Installation page 3.104**.
2. Remove right driver footpedal. See **Driver Foot Peg Removal / Installation page 7.25**.
3. Remove right side cover by removing its fasteners ①.



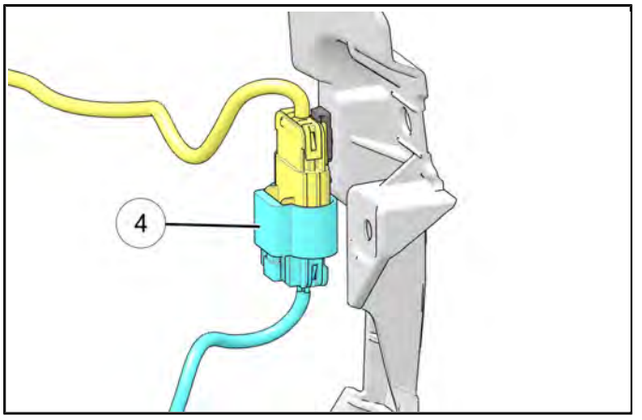
4. Disconnect diagnostic connector ② from side cover bracket.



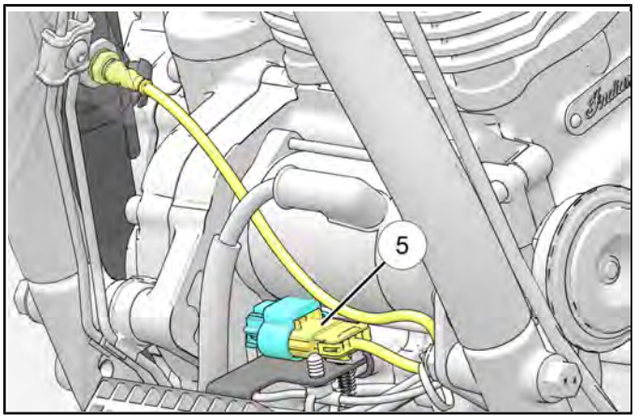
5. Remove side cover bracket by removing its fasteners ③.

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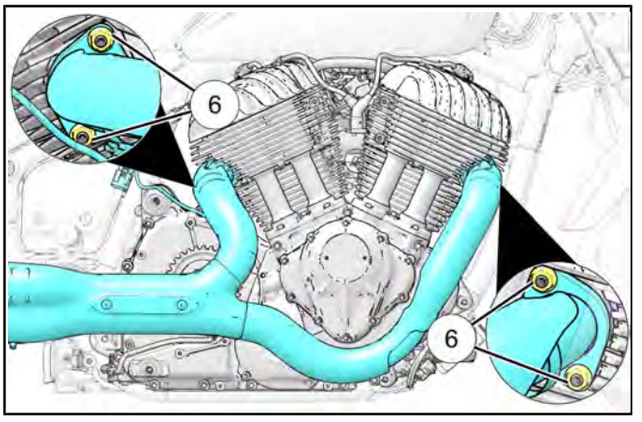
6. Disconnect oxygen sensor electrical connector ④.



7. Disconnect the oxygen sensor connector from the side cover bracket.
8. From the front of the engine, disconnect the front cylinder oxygen sensor electrical connector ⑤ and disconnect it from the voltage regulator bracket.



9. Remove head pipe nuts ⑥.



10. Remove head pipe.

1. **Installation is performed by reversing the removal procedure.**
2. Inspect exhaust gasket prior to head pipe assembly.

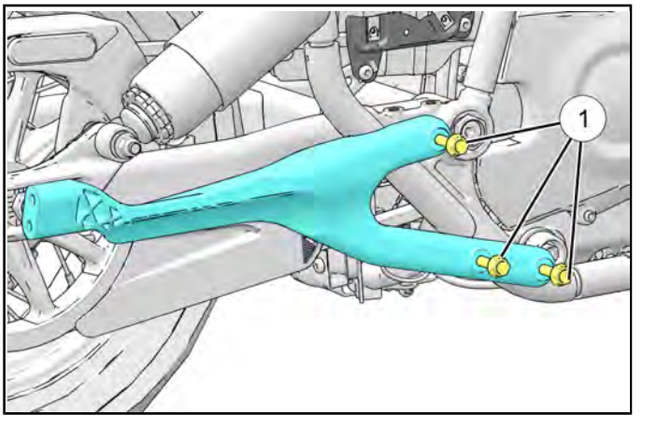
TORQUE
Head Pipe Nut: **Step 1: Start all four nuts.Step 2: Torque front upper nut to 88 in-lbs (10 N·m) and back off nut 2 revolutionsStep 3: Torque front lower nut to 88 in-lbs (10 N·m).Step 4: Torque rear upper nut to 88 in-lbs (10 N·m) and back off nut 2 revolutions.Step 5: Torque rear lower nut to 88 in-lbs (10 N·m).Step 6: Final Torque 15 ft-lbs (21 N·m) in sequence : Front upper, front lower, rear upper, rear lower.**

TORQUE
Side Cover Bracket Fastener: **35 in-lbs (4 N·m)**

TORQUE
Side Cover Fastener: **35 in-lbs (4 N·m)**

EXHAUST MOUNT REMOVAL / INSTALLATION

1. Remove head pipe. See **Head Pipe Removal / Installation page 3.105**.
2. Remove muffler mount by removing its fasteners ①.



3. **Installation is performed by reversing the removal procedure.**

TORQUE
Exhaust Mount Fastener: **37 ft-lbs (50 N·m)**

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CHAPTER 4
FUEL DELIVERY / EFI

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GENERAL INFORMATION

SERVICE NOTES - FUEL DELIVERY / EFI

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.

Pull 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 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.

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SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Electrical Tester Kit	PV-43536
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: 1-800-345-2233 or https://polaris.service-solutions.com/

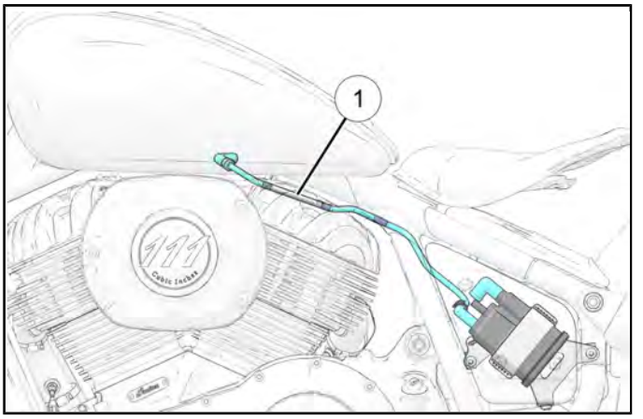
SERVICE SPECIFICATIONS – FUEL DELIVERY / EFI

ITEM	SPECIFICATIONS
Fuel Pump Pressure	4.0 BAR (400 kPa) (58 psi)
Idle Speed	950 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

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

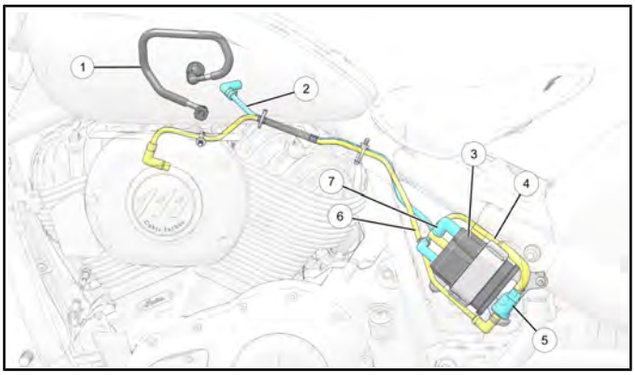


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EVAPORATIVE EMISSION CONTROL SYSTEM

NOTICE

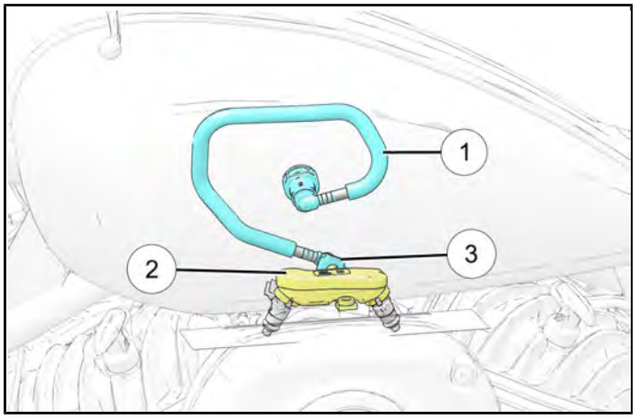
The fuel tank vent line is routed to a carbon canister where the fuel vapor is stored until specific operating parameters are met and the ECM opens the purge valve. Fuel vapor is then routed out of the carbon canister, through the purge valve and into the throttle body for combustion. Inspect all EVAP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



REF	DESCRIPTION
①	Fuel Line
②	Fuel Tank to Carbon Canister Line
③	Carbon Canister
④	Carbon Canister to Purge Valve Line
⑤	Purge Valve
⑥	Purge Valve to Throttle Body Hose
⑦	Carbon Canister Vent Filter

FUEL LINE / FUEL RAIL INSPECTION

1. The fuel line and fuel rail are located behind the engine cover on the RH 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 rail 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.

4

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SERVICE PRECAUTIONS

EFI SYSTEM PRECAUTIONS

⚠ CAUTION

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

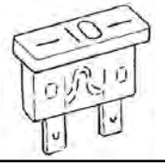
It is not advisable to "jump start" the machine with another battery. Although problems are unlikely to occur if everything is done carefully, the electrical component could be damaged.

Never disconnect the battery while the engine is running.

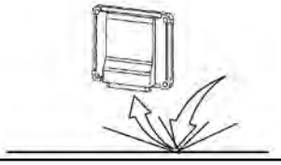
When connecting and disconnecting the battery cables refer to Electrical Chapter for complete battery connection and charging information. See **Battery Removal / Installation page 10.13**.

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 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

⚠ CAUTION

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.

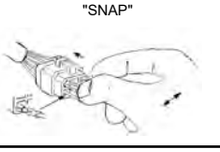
Always use the proper adapter from the Connector Test Adapter Kit when probing the terminals. Most of the connectors are sealed and cannot be back probed. Be extremely careful not damage the connectors by forcing meter probes into the connectors.



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.



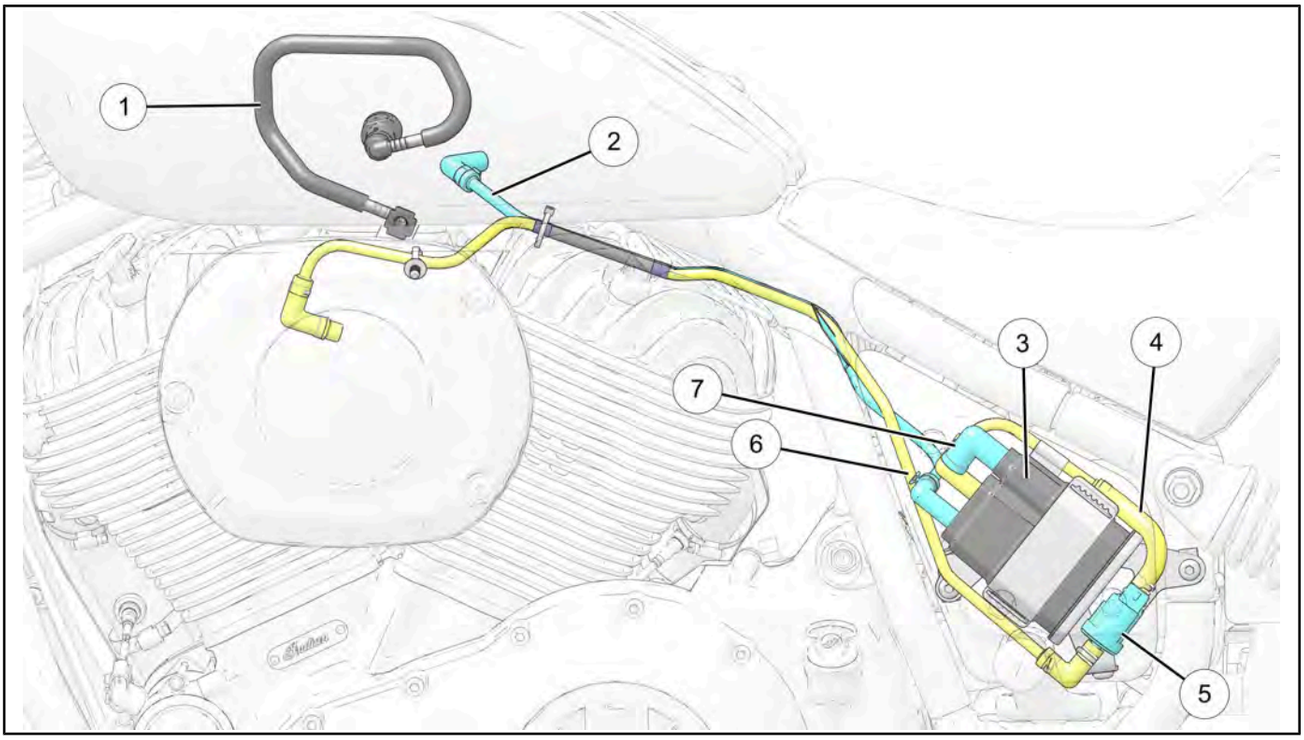
Carefully inspect the connections of the failed circuit before doing any other troubleshooting steps. Wire terminals should be corrosion free and fully seated into the connectors. Connector should snap together and lock.

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ASSEMBLY VIEWS

FUEL LINE ROUTING

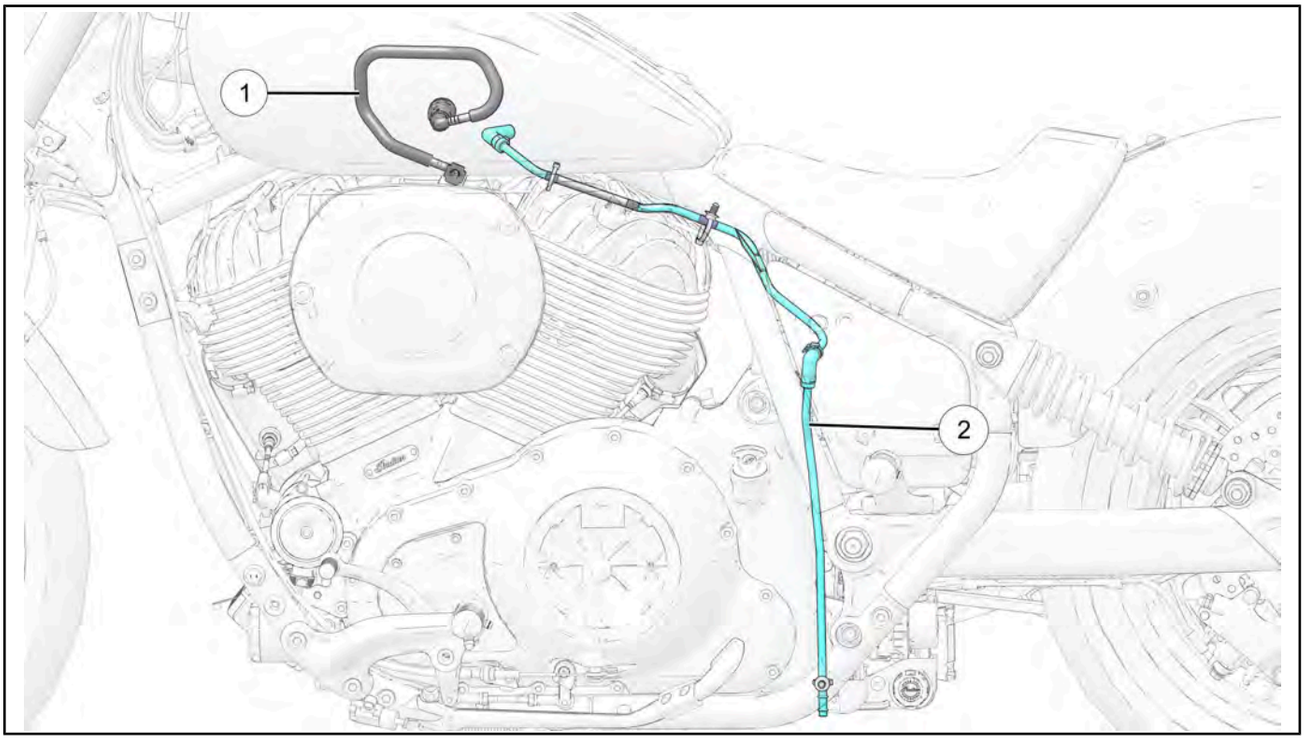
50 STATE



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

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49 STATE

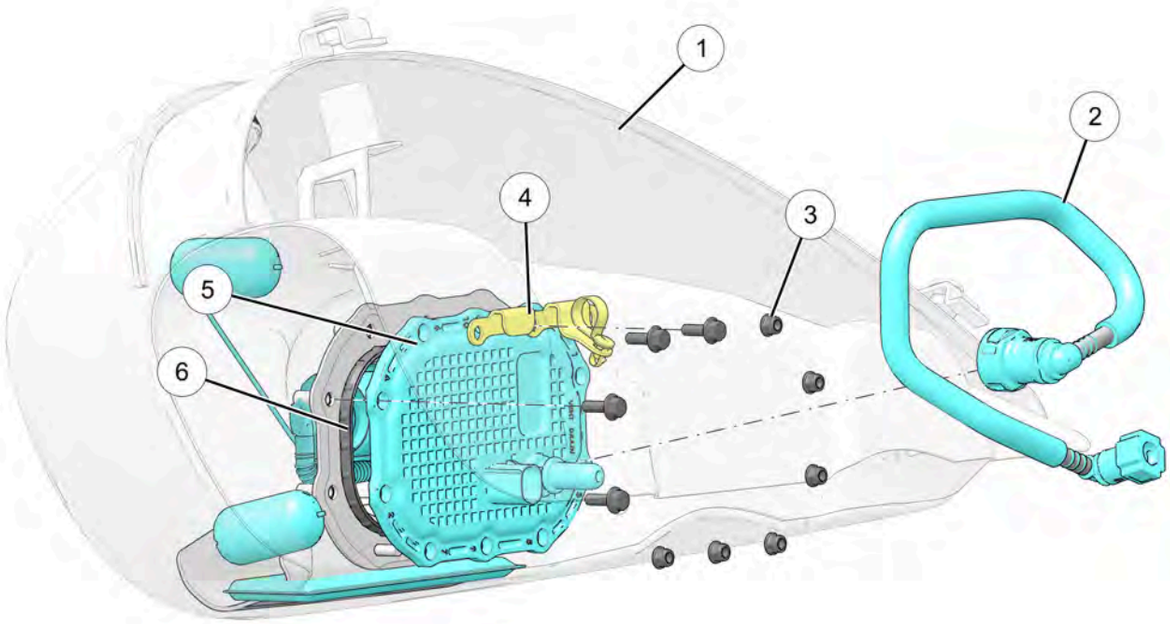


ITEM	DESCRIPTION
①	Fuel Line
②	Fuel Vent Line

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FUEL SYSTEM COMPONENTS

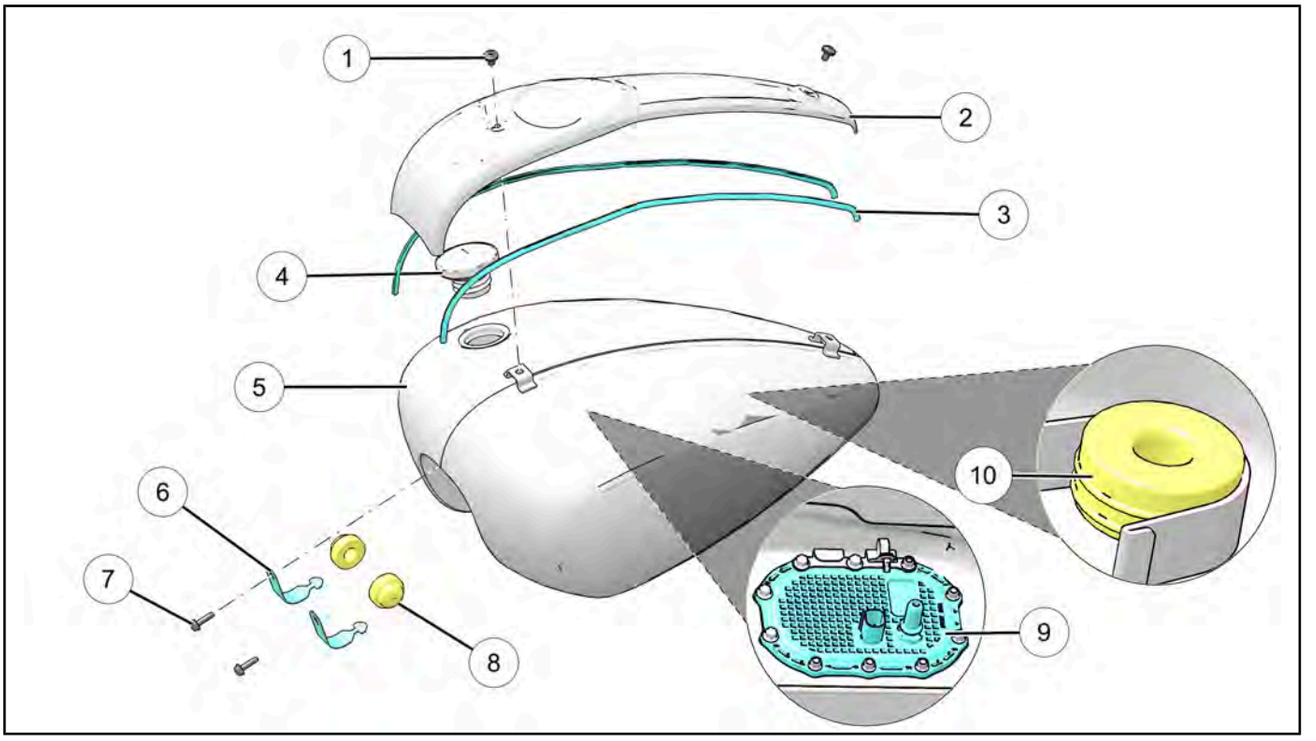
NOTICE
Left side of fuel tank is hidden for viewing purposes.



ITEM	DESCRIPTION	TORQUE
①	Fuel Tank	—
②	Fuel Line	—
③	Fuel Pump Fastener / Nut	**44 in-lbs (5 N·m)**
④	Fuel Line Retention Bracket	—
⑤	Fuel Pump	—
⑥	Fuel Pump Seal	—

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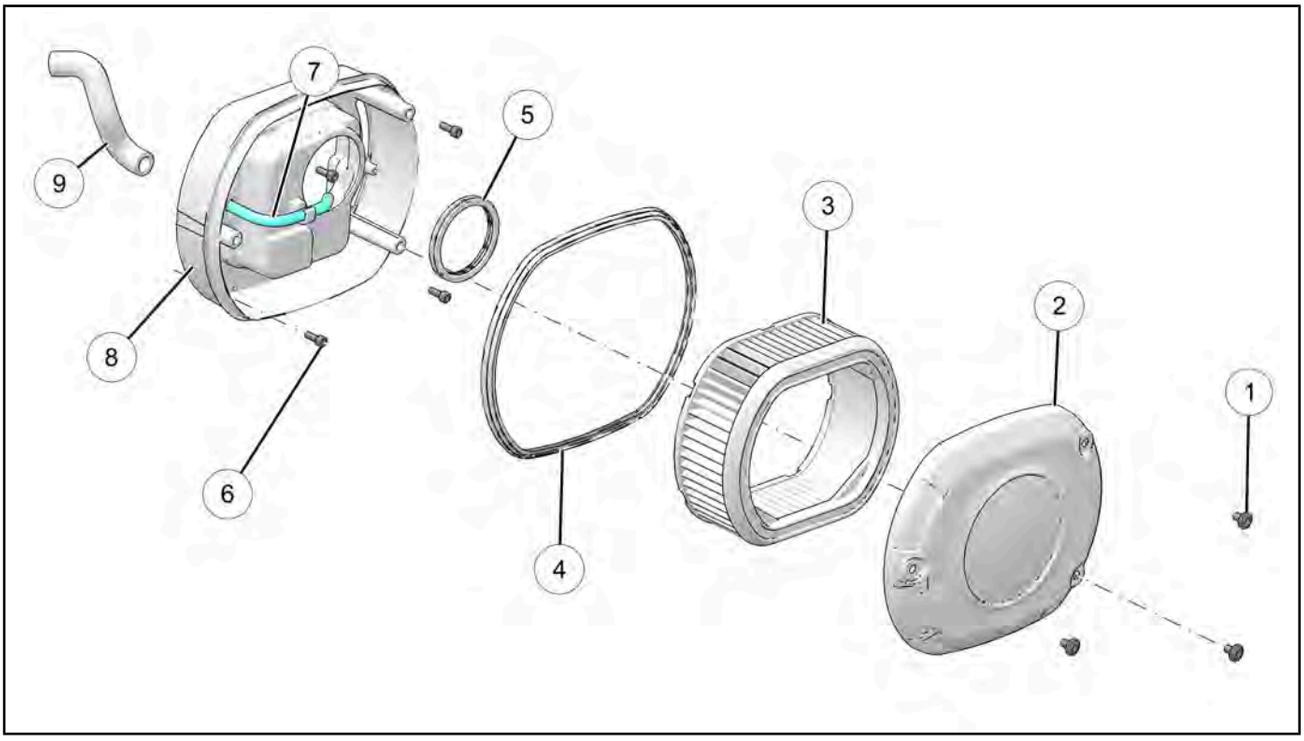
FUEL TANK COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Fuel Tank Console Fastener	**88 in-lbs (10 N·m)**
②	Fuel Tank Console	—
③	Fuel Tank Console Trim	—
④	Fuel Cap	—
⑤	Fuel Tank	—
⑥	Fuel Tank Mount (Front)	—
⑦	Fuel Tank Mount Fastener	**88 in-lbs (10 N·m)**
⑧	Front Fuel Tank Isolator	—
⑨	Fuel Pump	—
⑩	Rear Fuel Tank Isolator	—

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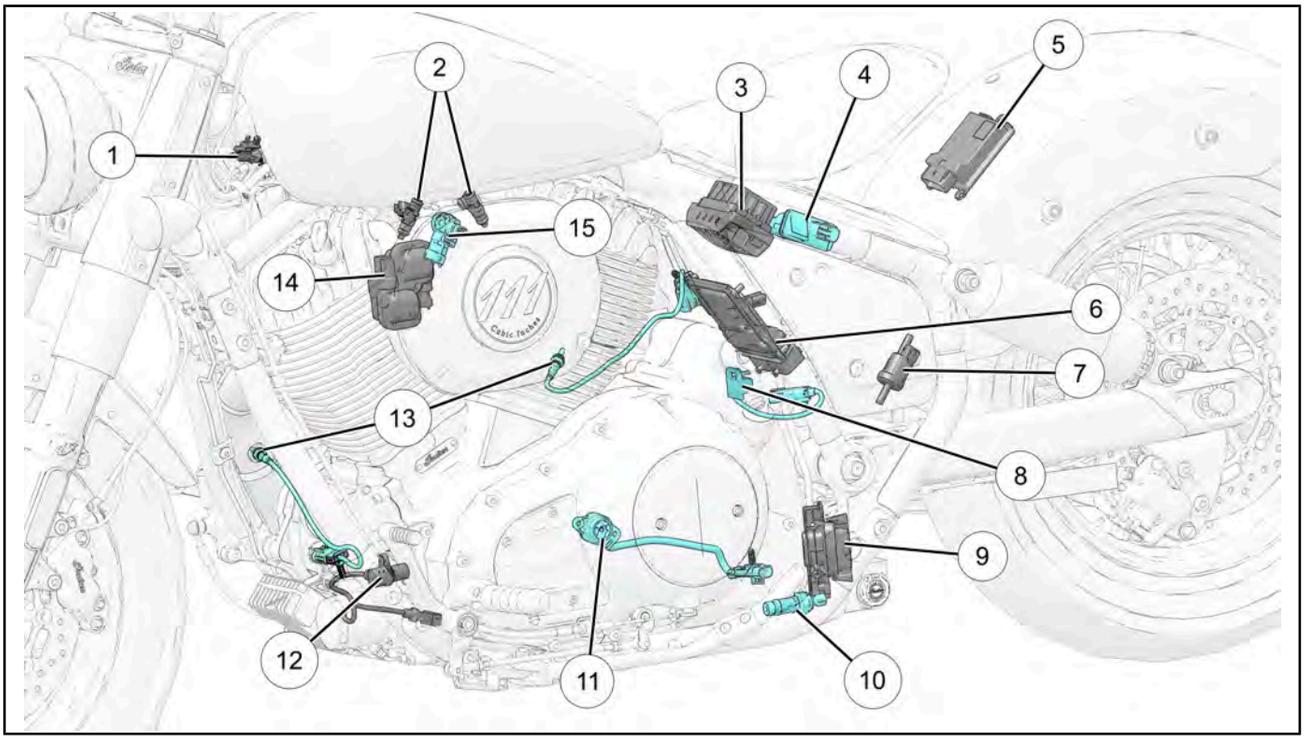
AIR BOX COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Air Filter Cover Fastener	**88 in-lbs (10 N·m)**
②	Air Filter Cover	—
③	Air Filter	—
④	Air Box Seal	—
⑤	Air Filter Retainer Plate	—
⑥	Air Box Base Fastener	**57 in-lbs (6.5 N·m)**
⑦	Vent Hose	—
⑧	Air Box Base	—
⑨	Breather Hose	—

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SENSORS - POWERTRAIN MANAGEMENT COMPONENTS



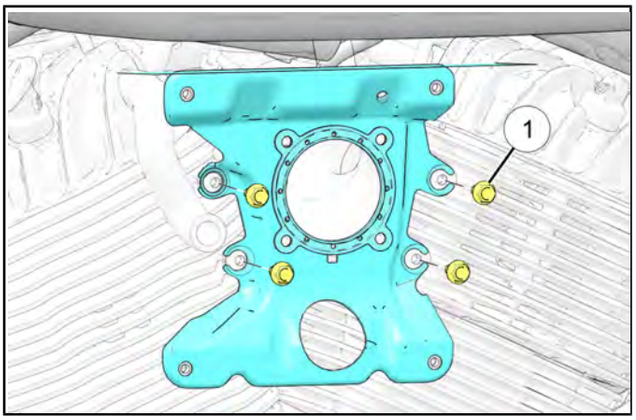
ITEM	DESCRIPTION	ITEM	DESCRIPTION
①	Air Temperature Sensor	⑨	J-Case Fuse Box
②	Fuel Injector	⑩	Oil Pressure Sensor
③	Fuse Box	⑪	Gear Position Sensor
④	WCM	⑫	Crankshaft Position Sensor
⑤	VCM	⑬	Oxygen Sensor
⑥	ECM	⑭	Ignition Coil
⑦	Purge Valve	⑮	TMAP
⑧	Tip Over Sensor		

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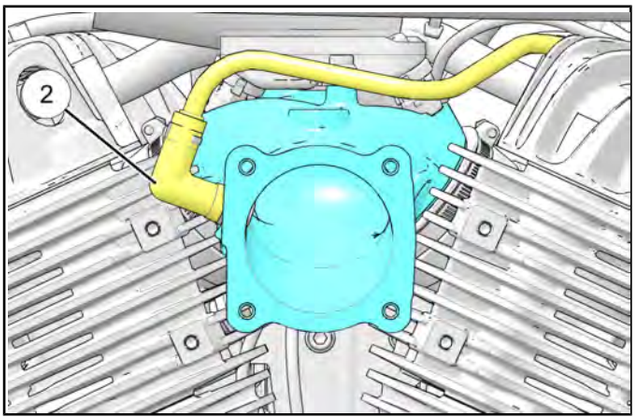
FUEL DELIVERY SERVICE

INTAKE MANIFOLD REMOVAL / INSTALLATION

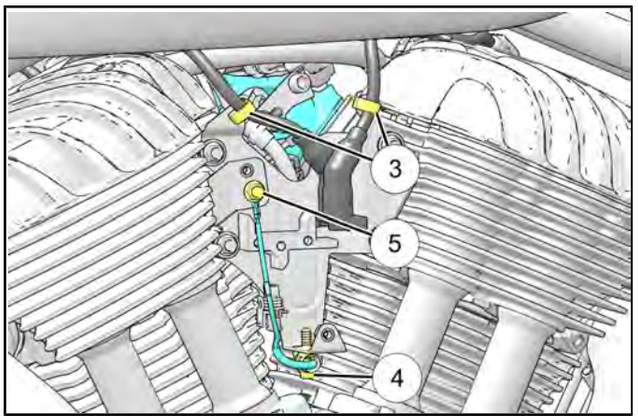
1. Remove throttle body. See **Throttle Body (ETC) Removal / Installation page 4.53**.
2. Disconnect harness retention points from the air box support.
3. Remove air box support bracket by removing its fasteners ①.



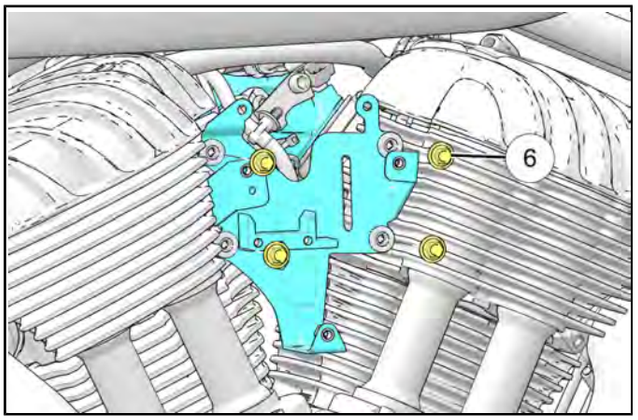
4. Remove gasket and discard.
5. If equipped, disconnect purge line ② from intake manifold.



6. Remove ignition coil. See **Ignition Coil Removal / Installation page 10.46**.
7. Disconnect spark plug wire retention features ③.



8. Cut panduit strap ④ retaining harness ignition bracket.
9. Remove harness ground fastener ⑤.
10. Remove ignition bracket by removing its fasteners ⑥.



11. Disconnect TMAP sensor electrical connection.
12. Disconnect fuel injector electrical connectors.

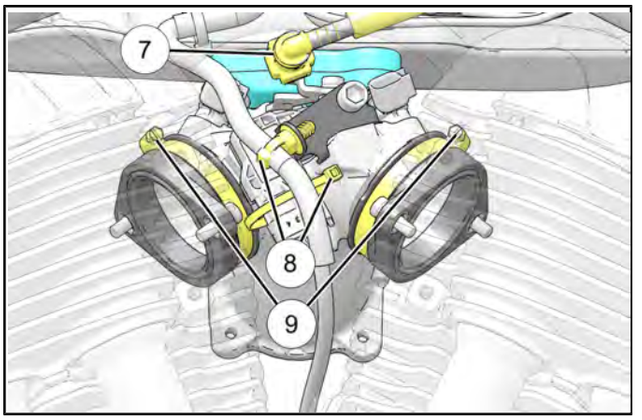
IMPORTANT
Disengage Red CPA connection lock before disconnecting injector.

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13. Remove supply line by squeezing both release buttons (one on each side of quick connection) and hold. Gently slide fitting ⑦ straight off fuel rail.

⚠ CAUTION

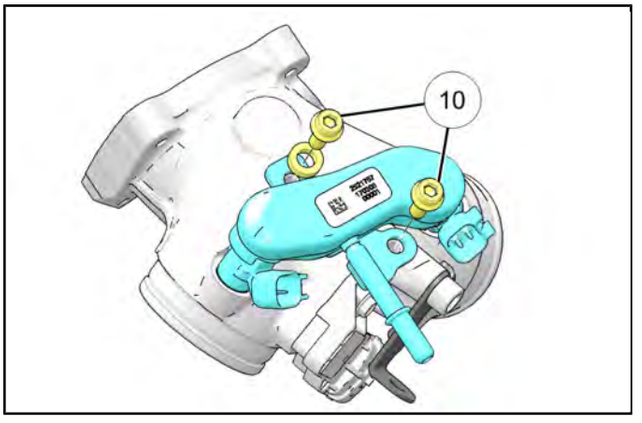
Do not use anything other than fingers to remove the quick connection. The use of tools can damage the connection.



14. Remove harness retention features ⑧.
15. Loosen intake manifold clamps ⑨.
16. Remove the intake manifold from the left side of the unit.
17. Remove the fuel rail by removing its retaining fasteners ⑩.

IMPORTANT

Ensure that the fuel injector O-rings come out with the injectors and are not left in the intake manifold.



18. **Installation is performed by reversing the removal procedure.**

IMPORTANT

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.

TORQUE

Fuel Rail Fastener:
88 in-lbs (10 N·m)

TORQUE

Intake Manifold Clamp:
11 in-lbs (1.3 N·m)

TORQUE

Ignition Bracket Fastener:
88 in-lbs (10 N·m)

TORQUE

Air Box Support Fastener:
88 in-lbs (10 N·m)

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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 4.16**.
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
3.8 BAR (380 kPa) (55 psi)

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

IMPORTANT

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.

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 * Plugged fuel pickup filter (located in fuel tank) * Pressure regulator malfunction (located on pump) * Fuel pump malfunction (Pump should run for about 2-3 seconds the instant that the key switch and Engine Stop switch are turned ON. * Fuel pickup not fully installed into fuel tank baffle.	* Plugged fuel return (in tank on pressure regulator) * Pressure regulator malfunction (located on pump).

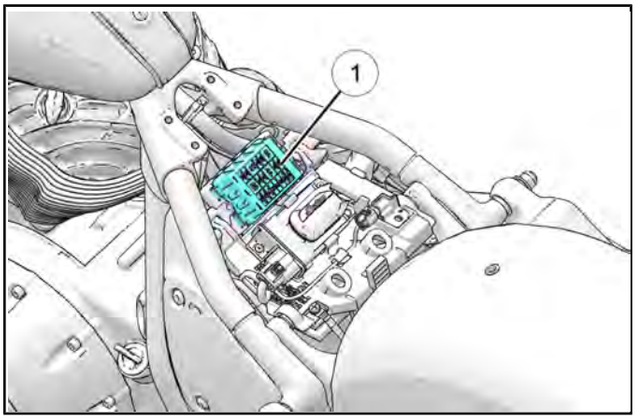
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FUEL SYSTEM DEPRESSURIZATION

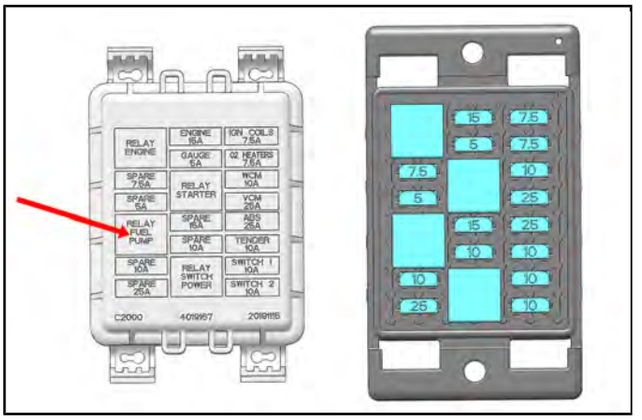
⚠ WARNING

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

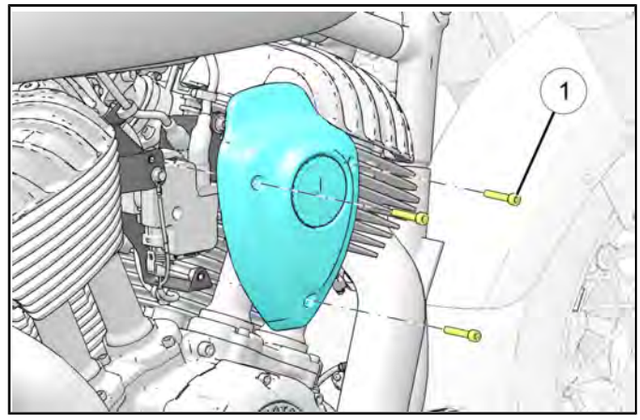
1. Remove Seat. See **Frame / Body > Body / Frame Service > Seat Removal**.
2. Locate the fuse box ① and remove its cover.



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.
5. Remove ignition cover by removing its fasteners ①.



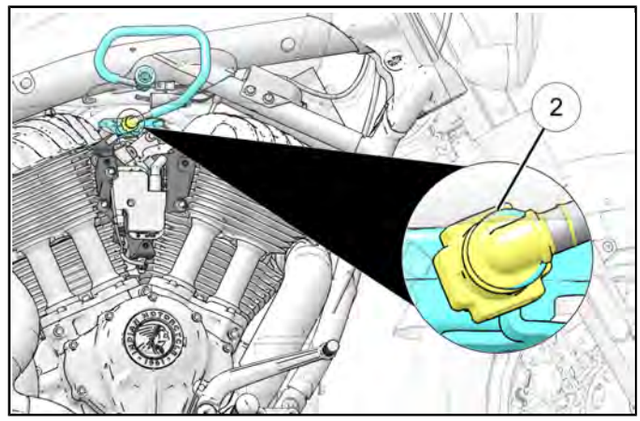
6. Wrap a clean shop rag around fuel line fitting ②.
7. Squeeze both release buttons (one on each side of fitting) and hold. Gently slide fitting straight off fuel rail.

STOP!

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.



8. Cover fuel fittings to keep debris out.

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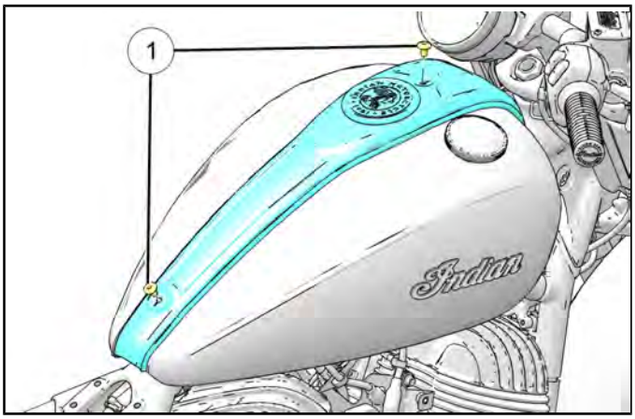
FUEL TANK REMOVAL

⚠ WARNING

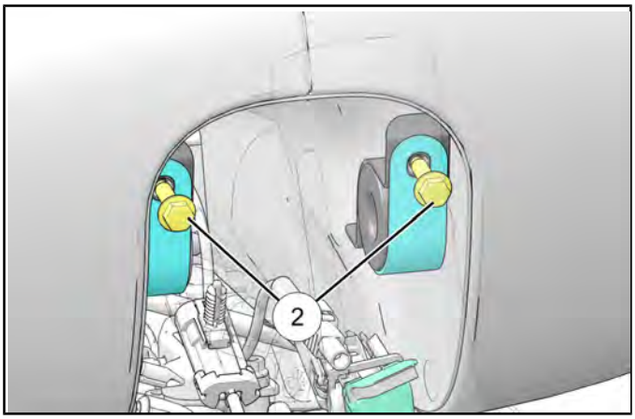
Allow engine and exhaust to cool completely before disconnecting fuel line or removing tank. Protect fuel tank finish when removing, storing, and installing tank.

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.

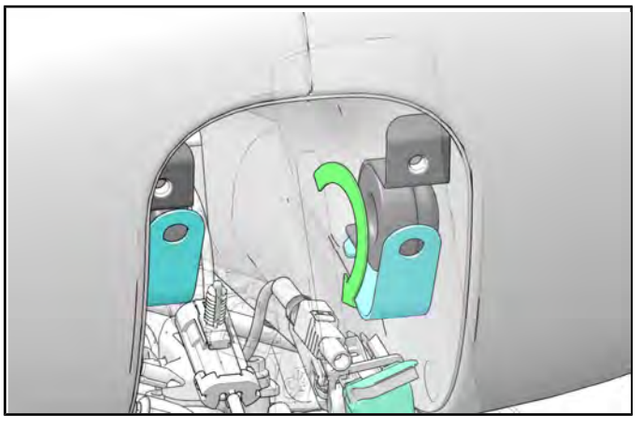
1. Depressurize fuel system. See **Fuel System Depressurization page 4.16**.
2. Drain the fuel system:
   a. Drain fuel from tank using a clean vacuum or siphon pump designed for fuel systems.
   b. Retain drained fuel in a clean container safe for fuel and reuse later.
3. Remove fuel tank console by removing its fasteners ① and set aside.



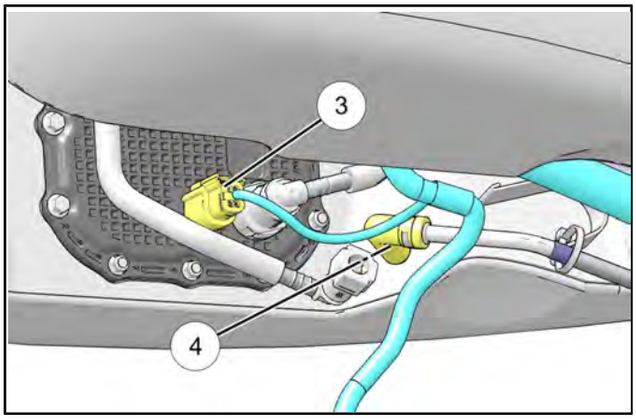
4. Remove fuel tank bracket fasteners ②.



5. Rotate the fuel tank brackets downward to disconnect the mount from the isolator.



6. Slowly pull the fuel tank up and disconnect the fuel pump electrical connector ③ and fuel vent line ④.



STOP!

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

7. Lifting at the front and rear of the tank at the same time, slide the tank upward and rearward to remove from unit.

IMPORTANT

Carry the fuel tank flat to avoid any fuel spills.

8. Set the fuel tank on absorbent mats to avoid damage to the tank.

IMPORTANT

Cover the vent line with a clean rag to prevent a fuel spill.

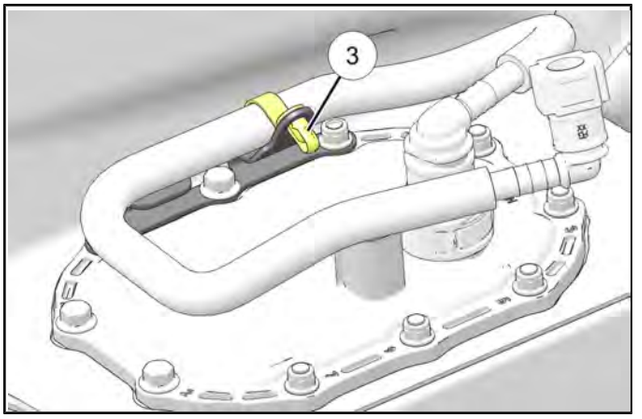
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FUEL PUMP REMOVAL

⚠ CAUTION

Be careful when performing this procedure to avoid damaging the fuel pump, electrical wiring, or hoses. Always inspect wires and hoses closely for damage after removing the fuel pump.

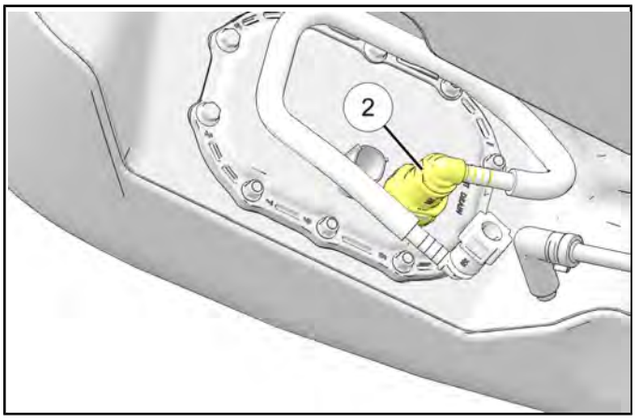
1. Tilt the fuel tank and siphon out any remaining fuel, if necessary.
2. Remove fuel line retainer push pin ③ and save.



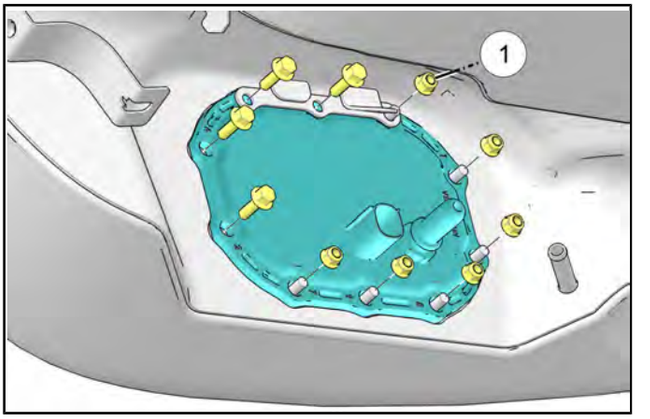
3. Disconnect fuel line ② from the fuel pump.

STOP!

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



4. Remove fuel pump fasteners ①.



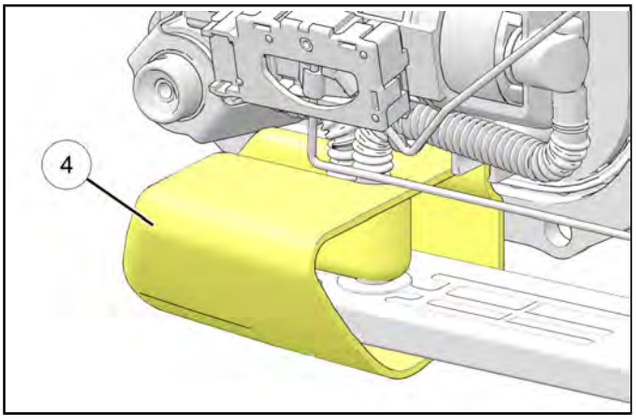
NOTICE

Working with the fuel tank upside down may be helpful. Make sure the gas cap is installed and place the tank on a soft surface to remove the fuel pump fasteners.

5. Starting at the rear, lift the fuel pump assembly and carefully remove from fuel tank.

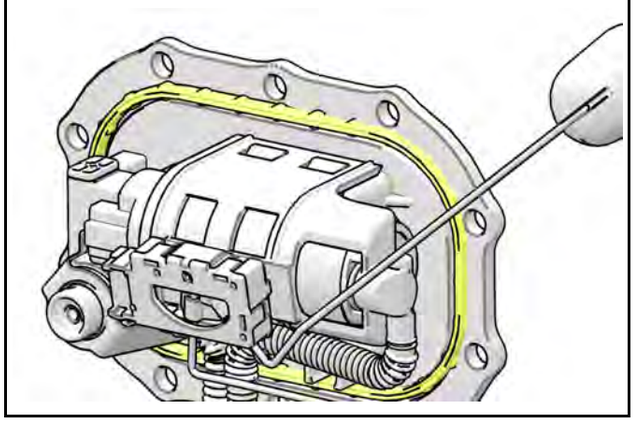
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6. If replacing the fuel pump, remove cable tie and remove the pickup baffle ④ and save for installation.



STOP!

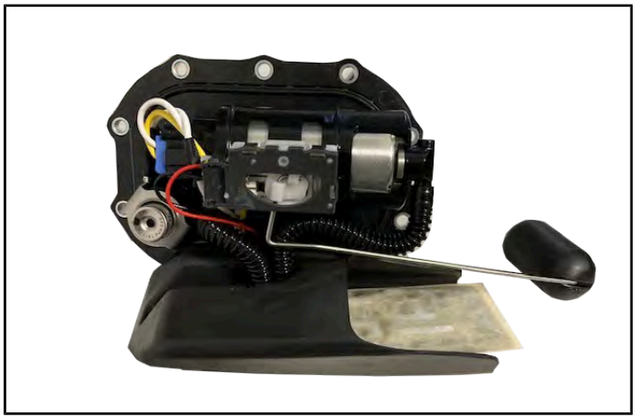
Remove the fuel pump seal, CUT and DISCARD along with fuel pump.

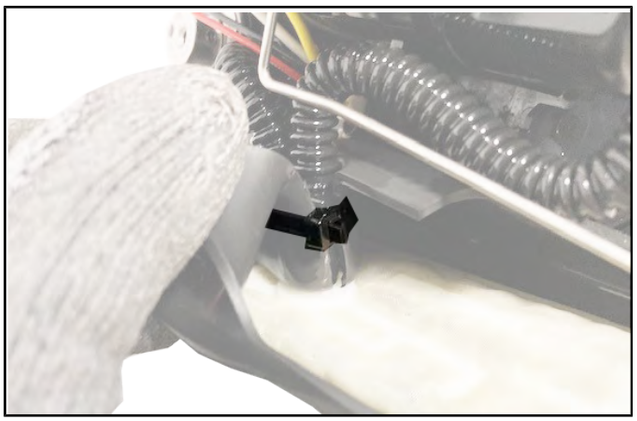


FUEL FILTER REPLACEMENT

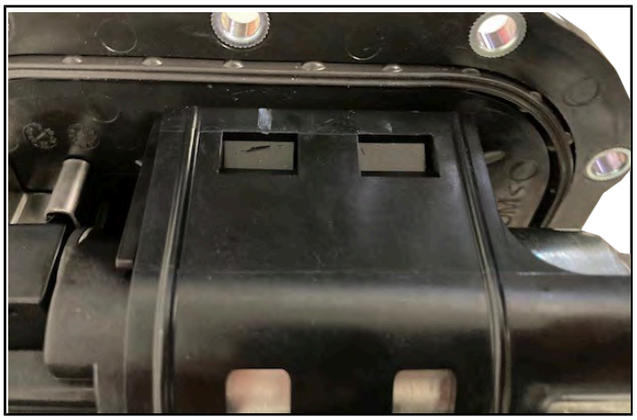
REMOVAL

1. Remove fuel pump from the fuel tank. See **Fuel Pump Removal page 4.18**.
2. Remove fuel baffle from fuel pump by removing its cable tie.





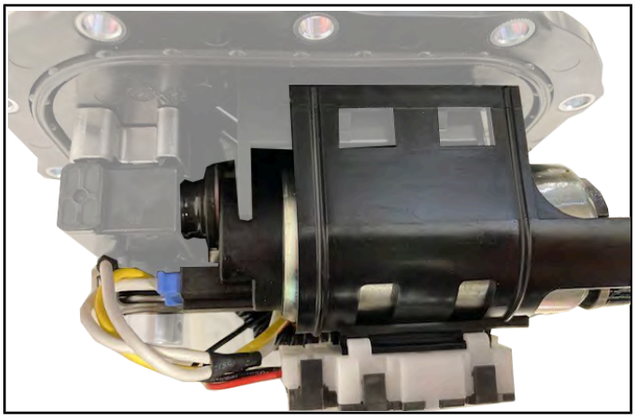
3. Insert a small screwdriver and gently pry the retaining tabs to release it from the snap detent on both sides of the pump cage.

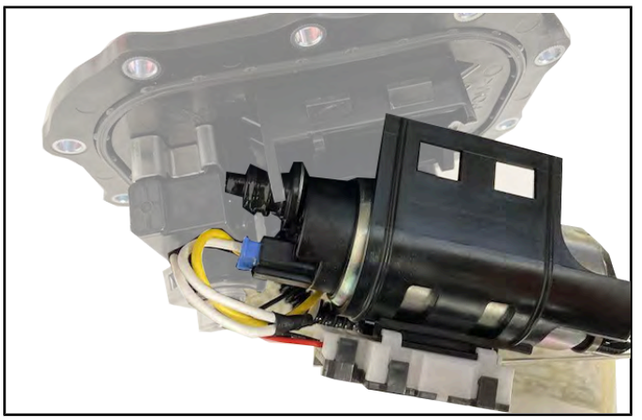


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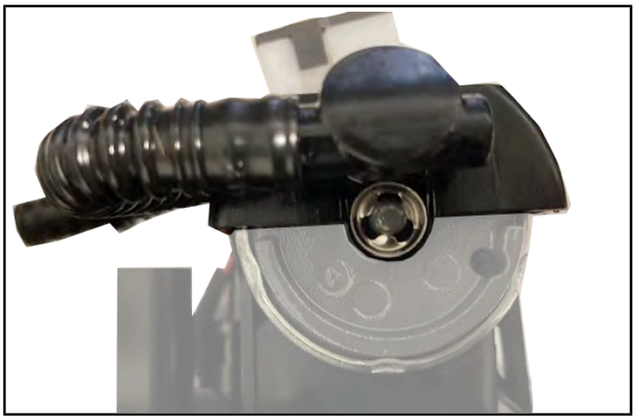
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4. Remove cable tie holding suction line and return line together.
5. Slide the pump and filter assembly rearward to release it from the flange assembly.

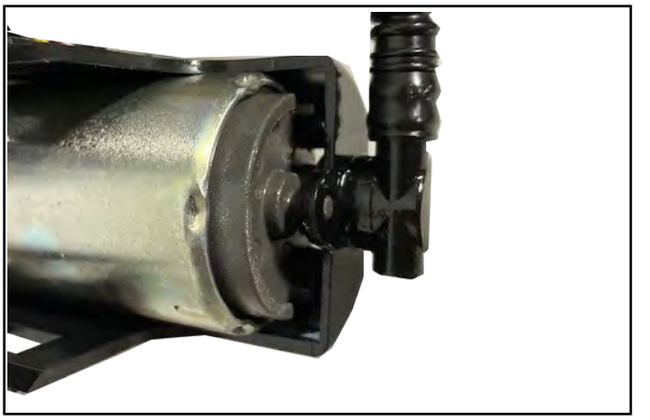




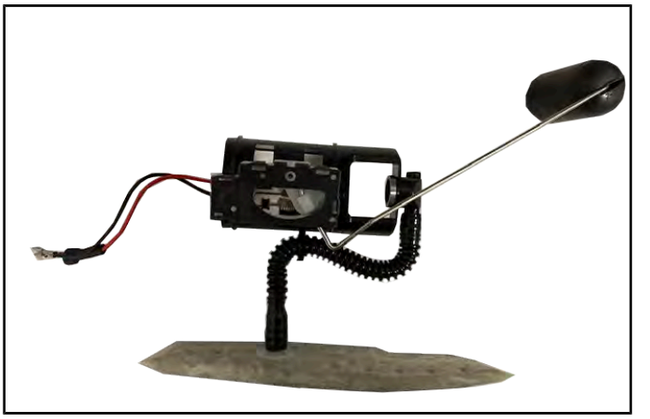
6. Disconnect the fuel pump electrical connector.
7. Remove the filter element retaining ring.



8. Insert a large flat blade screwdriver and pry near the filter tee fitting to separate the filter element assembly from the pump motor. Use caution not to break or permanently deform the plastic.



9. Disconnect fuel sender electrical connector.
10. Remove the filter assembly. Remove motor from remaining assembly.



11. Remove fuel level sender from pump cage by inserting a small screwdriver to release the locking tab and slide the sender forward off of the pump cage.



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INSTALLATION

1. Reinstall the level sender assembly by gently sliding forward on the filter assembly until securely locked in place.
2. Install pump onto filter assembly by gently pressing filter tee fitting onto pump inlet until fully seated.

NOTICE
This step requires some force to fully seat.

3. Install new retaining ring and seat with a small deep well socket.
4. Install the pump cage onto the flange assembly. Be careful not to severely bend or kink wire exiting the level sender assembly.
5. Connect the fuel pump electrical connector.
6. Connect fuel sender electrical connectors.
7. Reinstall pickup baffle onto new filter assembly and secure with cable tie.
8. Install the pump assembly into the fuel tank. See **Fuel Pump Installation page 4.22**.

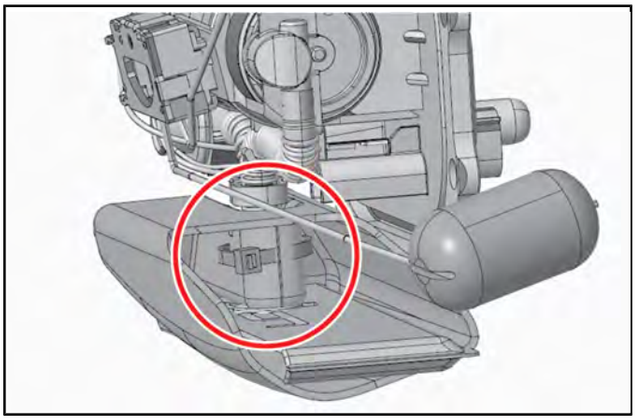
FUEL TANK VENT INSPECTION

1. Refer to Maintenance Chapter for tank vent inspection and hose routing information. See **Fuel Tank Vent Inspection page 4.4**.

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FUEL PUMP INSTALLATION

1. If installing a NEW fuel pump:
   a. Install pickup baffle to NEW pump. Secure with cable tie supplied in the kit.



⚠ WARNING

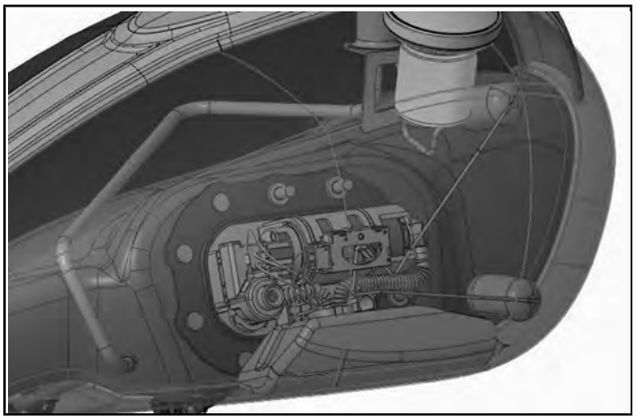
Do NOT use alternative cable tie. ONLY use the 7080138 cable tie supplied. Failure to use proper cable tie may result in the cable tie dissolving in the fuel.

   b. Install NEW fuel pump seal.

⚠ WARNING

Ensure a NEW seal is used. Failure to use a new seal may result in a fuel leak.

2. Install the fuel pump assembly into the bottom of the fuel tank:
   a. Insert fuel filter and level sender arm first before guiding the rest of the fuel pump into the fuel tank.
   b. Verify the filter is positioned correctly in the fuel tank before installing fasteners.



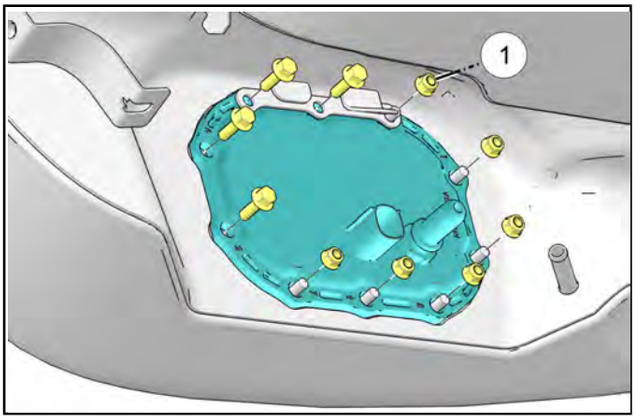
   c. Once installed, ensure the pump moves freely. Verify by slightly moving the pump in each direction to make sure is does not feel "bound" on the fuel tank.

IMPORTANT

Ensure the fuel sender arm and assembly is not damaged upon installation.

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3. Install fuel pump fasteners ① and tighten to specification following the torque sequence shown.



NOTICE

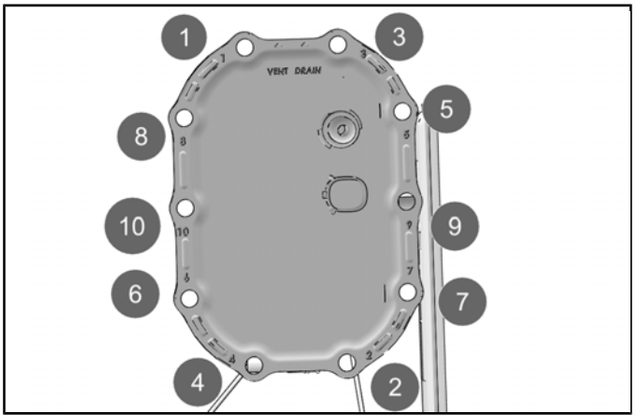
Make sure the fuel line routing retention bracket has the proper orientation as shown.

NOTICE

Working with the fuel tank upside down may be helpful. Make sure the gas cap is installed and place the tank on a soft surface to install the fuel pump fasteners.

NOTICE

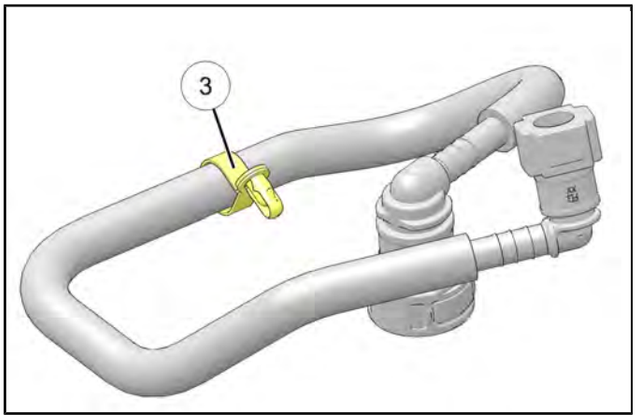
Make sure the fuel pump seal is not rolled or missing



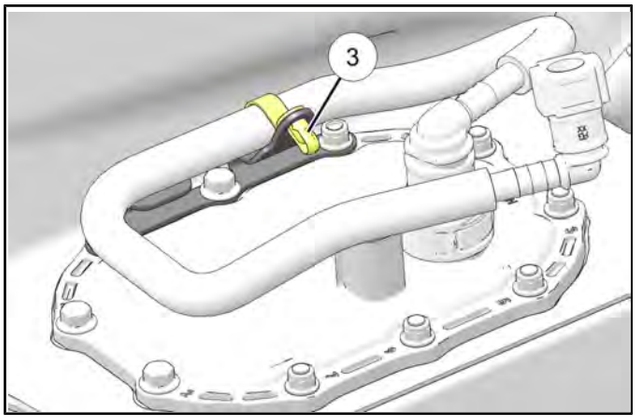
TORQUE

Fuel Pump Fastener / Nut:
44 in-lbs (5 N·m)

4. Attach the push pin retaining strap ③ to the fuel line.



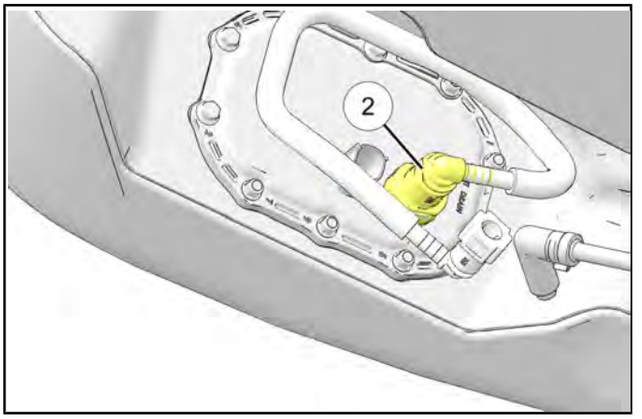
5. Install the fuel line push pin retaining strap ③ onto the pump bracket as shown.



4

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6. Connect fuel line ② to the fuel pump.

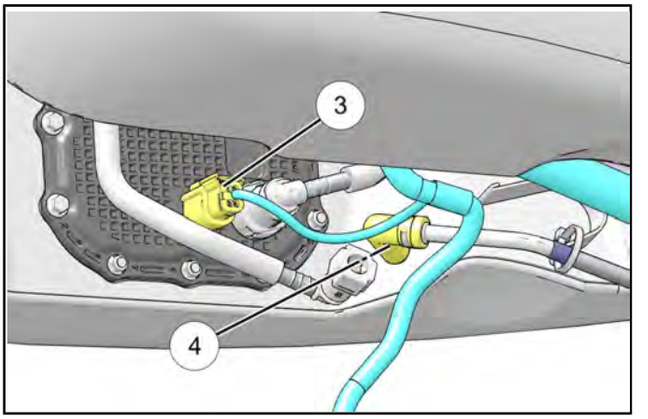


IMPORTANT

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

FUEL TANK INSTALLATION

1. Secure the handlebars in the straight ahead position.
2. Apply a soapy water solution to the isolators and carefully lower the fuel tank onto the frame.
3. Engage the rear isolators first and then rotate the tank downward onto the front isolators.
4. Connect fuel tank vent line ④ and fuel pump electrical connector ③.



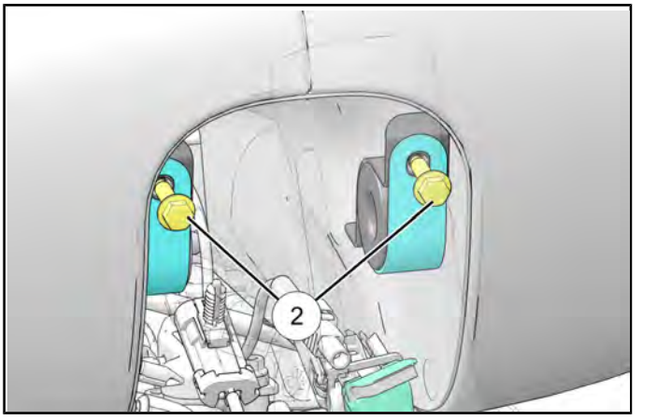
⚠ WARNING

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.

5. Continue lowering the fuel tank until it is fully seated on the isolators.
6. Install fuel tank bracket fasteners ②.

TORQUE

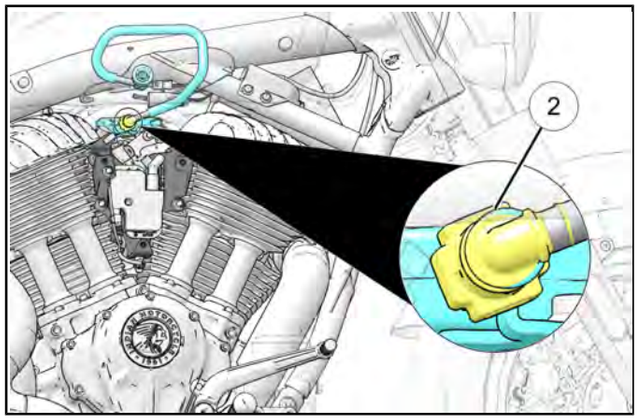
Fuel Tank Mount Fastener:
88 in-lbs (10 N·m)



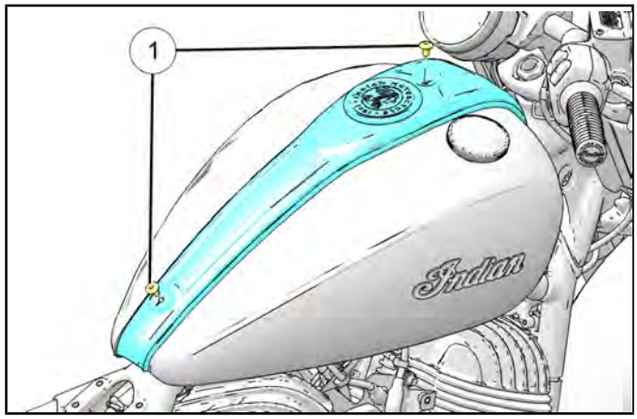
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7. Connect the fuel line to the fuel rail.

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



8. Install fuel tank console and secure it with fasteners ①. Torque fasteners to specification.

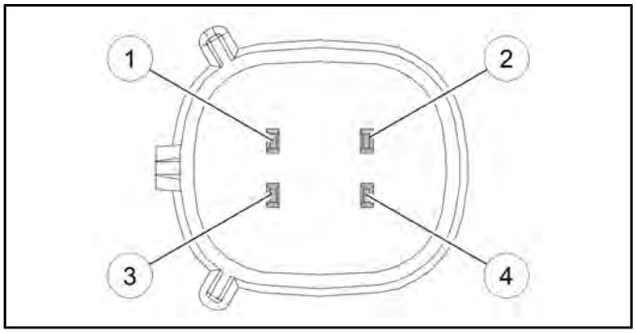


TORQUE
Fuel Tank Console Fastener: **88 in-lbs (10 N·m)**

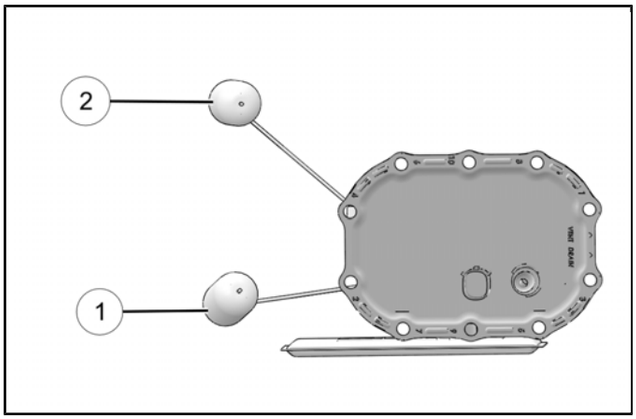
FUEL LEVEL SENSOR RESIGTANCE TEST

If fuel level readings are inaccurate when the motorcycle is powered up, 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 4.18**.
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 the sensor and compare to the table.



ITEM	COLOR	ASSIGNMENT
①	White	Fuel Pump (-)
②	Yellow	Fuel Pump (+)
③	Black	Thermistor (-)
④	Red	Thermistor (+)



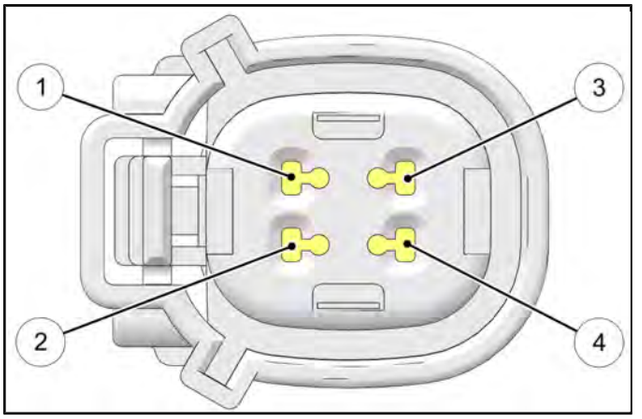
FLOAT POSITION	APPROXIMATE RESISTANCE LIMITS
① EMPTY	450 ± 10% Ω
② FULL	100 ± 10% Ω

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FUEL PUMP SUPPLY VOLTAGE TEST

Before performing this test, verify that battery is fully charged and in good operating condition.

1. Remove the fuel tank assembly. See **Fuel Pump Removal page 4.18**.
2. Disconnect the fuel pump / level sensor electrical connector.
3. Connect meter across terminals 2 & 4 on the *wire harness* side of connector.



ITEM	WIRE COLOR	FUNCTION
①	BK/BU	Fuel Level Sensor Signal Return
②	BK	Fuel Pump Ground
③	BK/DG	Fuel Sender Output
④	VT/YE	Fuel Pump Power

4. Turn the ignition switch to the "ON" position to power up the motorcycle electrical system.
5. 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.
6. If low or no voltage is delivered to the fuel pump, verify ground wire (Pin 2, BK/DG) has good continuity to battery (-) post.
7. If ground is OK, check Gray wire from fuel pump relay terminal B4 to ECM Pin #142 . 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.
8. Trace both power and ground circuits to determine fault if battery voltage is not present for 2-3 seconds after ignition switch and STOP / RUN switch are turned on.
9. When a CPS signal is received by the ECM (engine is cranking or running) the ECM maintains the ground on Pin # 142 (Gray wire), keeping the pump powered.

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FUEL PUMP CURRENT DRAW TEST

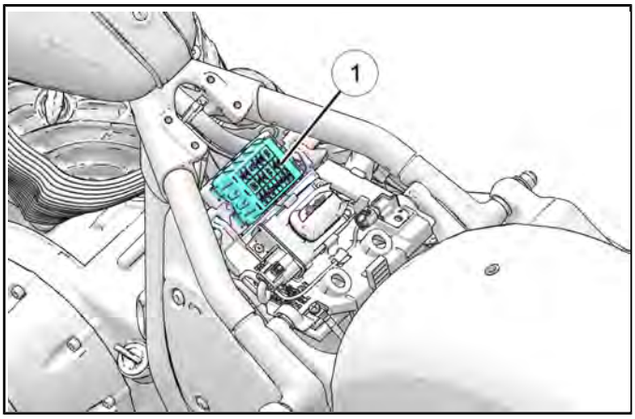
NOTICE

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).

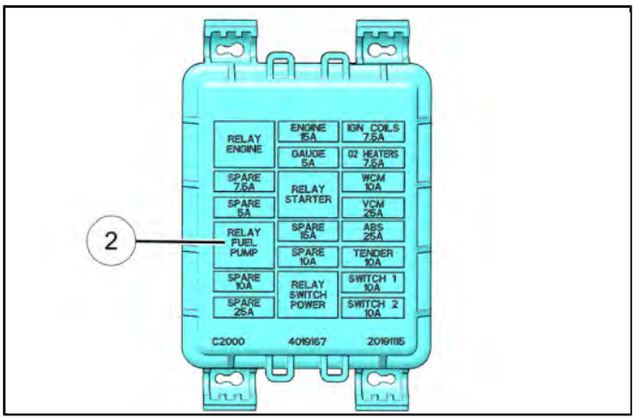
IMPORTANT

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 seat. See **Seat Removal / Installation page 7.27**.
2. Remove fuse box cover ①.



3. Remove Fuel Pump Relay ② by pulling straight upward.



4. Set meter to DC Amps. Be sure red meter lead is in the 10A jack, and black meter lead is in common (-) jack.
5. Insert leads in the appropriate sockets for the fuel pump relay. Reference **Fuse Application Chart page 10.68**.
6. Read fuel pump current draw on meter and compare to specification.
7. Inspect fuel pump circuit wiring or replace fuel pump if current draw exceeds specification.

SPECIFICATION: Fuel Pump Current Draw
Maximum: 6 DC Amps

4

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PRIMING THE FUEL SYSTEM

Prime procedure should be performed:

- If a new fuel pump is installed or if tank is run completely dry.
- Whenever fuel system is serviced (fuel line is disconnected).
- Whenever battery disconnected.

1. Power on the motorcycle, **DO NOT START**, verify the low fuel light comes on, this may take up to 5 minutes.
2. Fill the fuel tank.

IMPORTANT
Make sure the fuel tank is full.

3. Turn Engine Stop switch OFF.
4. Turn the ignition switch to ON.
5. Turn stop switch to RUN.
6. Allow switch to remain in RUN position until pump stops running (about 2-3 seconds).

NOTE
First time the pump is used/cycled it may run up to 20 seconds.

NOTICE
You should hear the fuel pump running to cycle fuel. If you don't, check the electrical connection to the fuel pump.

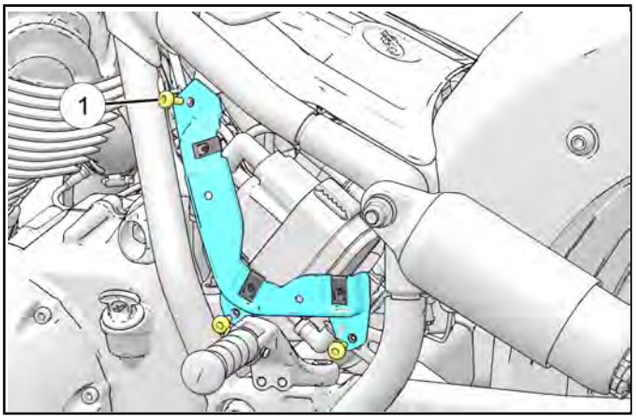
7. Turn stop switch OFF.
8. Turn the ignition switch to OFF.
9. *WAIT* approximately 10 seconds.
10. Repeat Steps 4-8 four times to complete the priming procedure.

STOP!
a. Start the motorcycle.
b. Verify no fuel leaks are present around the fuel line connectors or fuel pump seal area.
c. Verify proper fuel level function.

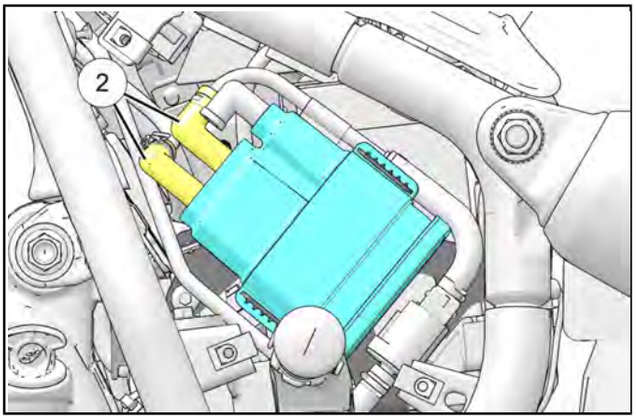
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CARBON CANISTER REMOVAL / INSTALLATION

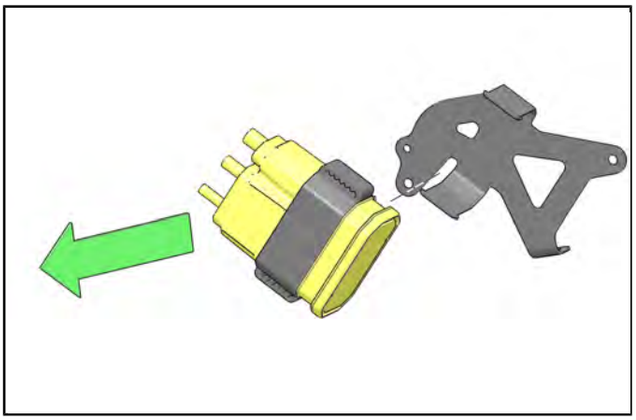
1. Remove left side cover. See **Side Cover Removal / Installation page 7.29**.
2. Remove side cover bracket by removing its fasteners ①.



3. Disconnect vent lines going to carbon canister ②.



4. Remove carbon canister from its bracket.



5. **Installation is performed by reversing the removal procedure.**

TORQUE
Side Cover Fastener: **35 in-lbs (4 N·m)**

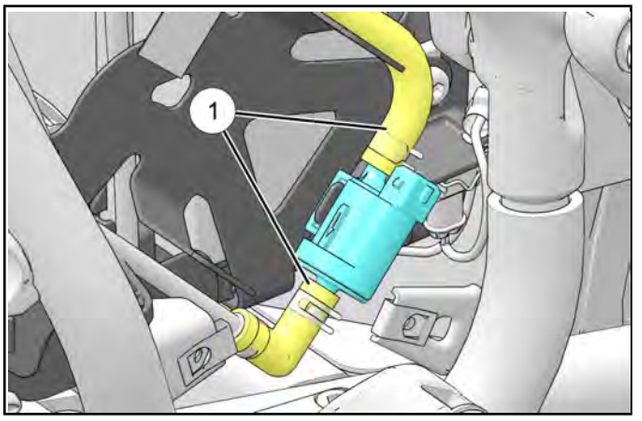
TORQUE
Side Cover Bracket Fastener: **35 in-lbs (4 N·m)**

4

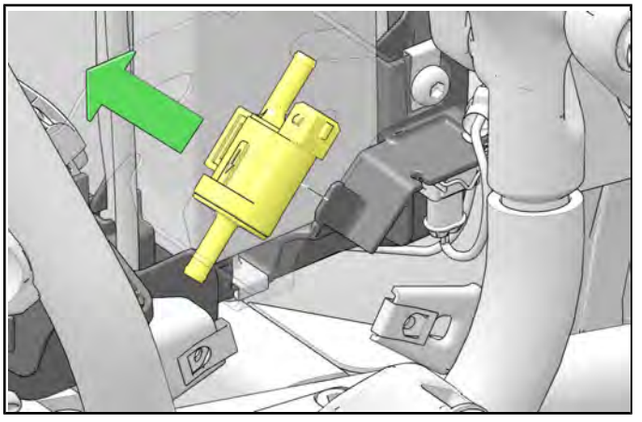
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PURGE VALVE REMOVAL / INSTALLATION

1. Remove carbon canister. See **Carbon Canister Removal / Installation page 4.29**.
2. Disconnect purge valve electrical connector.
3. Disconnect the lines ① going into the purge valve.



4. Remove purge valve from battery box retention feature.



5. **Installation is performed by reversing the removal procedure.**

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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 adjacent to 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 Temperature Manifold Absolute Pressure (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 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 head pipe provides feedback to the ECM and the injection time will be adjusted for each cylinder to achieve the target AFR.

The locations of sensors and other EFI system related components are outlined in this chapter. See **Sensors - Powertrain Management Components page 4.12**.

ECM CONNECTOR MAP

See **ECM Connector Map page 10.48**.

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DIAGNOSTIC TROUBLE CODES

SPN	FMI	COMPONENT	CONDITION	CODE
29	4	Accelerator Pedal 2 Position	Voltage Below Normal, Or Shorted To Low Source	P1227
	3	Accelerator Pedal 2 Position	Voltage Above Normal, Or Shorted To High Source	P1228
51	2	Engine Throttle Valve 1 Position 1	Data Erratic, Intermittent Or Incorrect	P0121
	4	Engine Throttle Valve 1 Position 1	Voltage Below Normal, Or Shorted To Low Source	P0122
	3	Engine Throttle Valve 1 Position 1	Voltage Above Normal, Or Shorted To High Source	P0123
84	2	Wheel-Based Vehicle Speed	Data Erratic, Intermittent Or Incorrect	P0503
	19	Wheel-Based Vehicle Speed	Received Network Data In Error	P106B
	9	Wheel-Based Vehicle Speed	Abnormal Update Rate	P160A
91	4	Accelerator Pedal Position 1	Voltage Below Normal, Or Shorted To Low Source	P0227
	3	Accelerator Pedal Position 1	Voltage Above Normal, Or Shorted To High Source	P0228
96	2	Fuel Level 1	Data Erratic, Intermittent Or Incorrect	P0461
	4	Fuel Level 1	Voltage Below Normal, Or Shorted To Low Source	P0462
	3	Fuel Level 1	Voltage Above Normal, Or Shorted To High Source	P0463
	16	Fuel Level 1	Data Valid But Above Normal Operating Range - Moderately Severe Level	P1462
	18	Fuel Level 1	Data Valid But Below Normal Operating Range - Moderately Severe Level	P1463
102	31	Engine Intake Manifold #1 Pressure	Condition Exists	P0105
	2	Engine Intake Manifold #1 Pressure	Data Erratic, Intermittent Or Incorrect	P0106

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	4	Engine Intake Manifold #1 Pressure	Voltage Below Normal, Or Shorted To Low Source	P0107
	3	Engine Intake Manifold #1 Pressure	Voltage Above Normal, Or Shorted To High Source	P0108
105	2	Engine Intake Manifold 1 Temperature	Data Erratic, Intermittent Or Incorrect	P0111
	4	Engine Intake Manifold 1 Temperature	Voltage Below Normal, Or Shorted To Low Source	P0112
	3	Engine Intake Manifold 1 Temperature	Voltage Above Normal, Or Shorted To High Source	P0113
	10	Engine Intake Manifold 1 Temperature	Abnormal Rate Of Change	P0114
108	2	Barometric Pressure	Data Erratic, Intermittent Or Incorrect	P2227
	4	Barometric Pressure	Voltage Below Normal, Or Shorted To Low Source	P2228
	3	Barometric Pressure	Voltage Above Normal, Or Shorted To High Source	P2229
168	4	Battery Potential / Power Input 1	Voltage Below Normal, Or Shorted To Low Source	P0562
	3	Battery Potential / Power Input 1	Voltage Above Normal, Or Shorted To High Source	P0563
171	2	Ambient Air Temperature	Data Erratic, Intermittent Or Incorrect	P0071
	4	Ambient Air Temperature	Voltage Below Normal, Or Shorted To Low Source	P0072
	3	Ambient Air Temperature	Voltage Above Normal, Or Shorted To High Source	P0073
190	31	Engine Speed	Condition Exists	P121C
523	2	Transmission Current Gear	Data Erratic, Intermittent Or Incorrect	P0914
	11	Transmission Current Gear	Root Cause Not Known	P0915
	4	Transmission Current Gear	Voltage Below Normal, Or Shorted To Low Source	P0916
	3	Transmission Current Gear	Voltage Above Normal, Or Shorted To High Source	P0917

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527	9	Cruise Control States	Abnormal Update Rate	U0104
	23	Cruise Control States	Checksum Error	U0405
	22	Cruise Control States	Counter Error	U1405
598	2	Clutch Switch	Data Erratic, Intermittent Or Incorrect	P0704
	22	Clutch Switch	Counter Error	U0256
	23	Clutch Switch	Checksum Error	U0557
	9	Clutch Switch	Abnormal Update Rate	U1FFF
628	12	ECU Memory	Bad Intelligent Device Or Component	P1602
636	8	Crankshaft Position Sensor	Abnormal Frequency Or Pulse Width Or Period	P0335
	2	Crankshaft Position Sensor	Data Erratic, Intermittent Or Incorrect	P0339
651	5	Injector 1 (Front) (MAG) (SDI Port Injector)	Current Below Normal Or Open Circuit	P0201
	4	Injector 1 (Front) (MAG) (SDI Port Injector)	Voltage Below Normal, Or Shorted To Low Source	P0261
	3	Injector 1 (Front) (MAG) (SDI Port Injector)	Voltage Above Normal, Or Shorted To High Source	P0262
652	5	Injector 2 (Rear) (PTO) (SDI Port Injector)	Current Below Normal Or Open Circuit	P0202
	4	Injector 2 (Rear) (PTO) (SDI Port Injector)	Voltage Below Normal, Or Shorted To Low Source	P0264
	3	Injector 2 (Rear) (PTO) (SDI Port Injector)	Voltage Above Normal, Or Shorted To High Source	P0265
677	5	Starter Solenoid Driver Circuit	Current Below Normal Or Open Circuit	P0615
	4	Starter Solenoid Driver Circuit	Voltage Below Normal, Or Shorted To Low Source	P0616
	3	Starter Solenoid Driver Circuit	Voltage Above Normal, Or Shorted To High Source	P0617
731	2	Knock Sensor 1	Data Erratic, Intermittent Or Incorrect	P0326

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1268	4	Ignition Coil Primary Driver 1 (Front) (MAG)	Voltage Below Normal, Or Shorted To Low Source	P2300
	3	Ignition Coil Primary Driver 1 (Front) (MAG)	Voltage Above Normal, Or Shorted To High Source	P2301
1269	4	Ignition Coil Primary Driver 2 (Rear) (PTO)	Voltage Below Normal, Or Shorted To Low Source	P2303
	3	Ignition Coil Primary Driver 2 (Rear) (PTO)	Voltage Above Normal, Or Shorted To High Source	P2304
1321	5	Starter Enable Circuit	Current Below Normal Or Open Circuit	P1615
	4	Starter Enable Circuit	Voltage Below Normal, Or Shorted To Low Source	P1616
	3	Starter Enable Circuit	Voltage Above Normal, Or Shorted To High Source	P1617
1347	5	Fuel Pump Driver Circuit	Current Below Normal Or Open Circuit	P0230
	4	Fuel Pump Driver Circuit	Voltage Below Normal, Or Shorted To Low Source	P0231
	3	Fuel Pump Driver Circuit	Voltage Above Normal, Or Shorted To High Source	P0232
3056	5	Oxygen Sensor Bank 1 Sensor 1	Current Below Normal Or Open Circuit	P0130
	4	Oxygen Sensor Bank 1 Sensor 1	Voltage Below Normal, Or Shorted To Low Source	P0131
	3	Oxygen Sensor Bank 1 Sensor 1	Voltage Above Normal, Or Shorted To High Source	P0132
	12	Oxygen Sensor Bank 1 Sensor 1	Bad Intelligent Device Or Component	P0133
	17	Oxygen Sensor Bank 1 Sensor 1	Data Valid But Below Normal Operating Range - Least Severe Level	P2195
	15	Oxygen Sensor Bank 1 Sensor 1	Data Valid But Above Normal Operating Range - Least Severe Level	P2196
	2	Oxygen Sensor Bank 1 Sensor 1	Data Erratic, Intermittent Or Incorrect	P2231

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3057	5	Oxygen Sensor Bank 2 Sensor 1	Current Below Normal Or Open Circuit	P0150
	4	Oxygen Sensor Bank 2 Sensor 1	Voltage Below Normal, Or Shorted To Low Source	P0151
	3	Oxygen Sensor Bank 2 Sensor 1	Voltage Above Normal, Or Shorted To High Source	P0152
	12	Oxygen Sensor Bank 2 Sensor 1	Bad Intelligent Device Or Component	P0153
	17	Oxygen Sensor Bank 2 Sensor 1	Data Valid But Below Normal Operating Range - Least Severe Level	P2197
	15	Oxygen Sensor Bank 2 Sensor 1	Data Valid But Above Normal Operating Range - Least Severe Level	P2198
	2	Oxygen Sensor Bank 2 Sensor 1	Data Erratic, Intermittent Or Incorrect	P2234
3597	16	ECU Power Output Supply Voltage #1	Data Valid But Above Normal Operating Range - Moderately Severe Level	P16A5
	18	ECU Power Output Supply Voltage #1	Data Valid But Below Normal Operating Range - Moderately Severe Level	P16A7
3598	16	ECU Power Output Supply Voltage #2	Data Valid But Above Normal Operating Range - Moderately Severe Level	P16AB
	18	ECU Power Output Supply Voltage #2	Data Valid But Below Normal Operating Range - Moderately Severe Level	P16AD
5582	9	Static Roll Angle	Abnormal Update Rate	P1062
	2	Static Roll Angle	Data Erratic, Intermittent Or Incorrect	U0431
65557	9	Torque Request CAN Message	Abnormal Update Rate	U015A
	23	Torque Request CAN Message	Checksum Error	U1FFB
	22	Torque Request CAN Message	Counter Error	U2200
65590	31	Cylinder Misfire	Condition Exists	P0363

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65591	7	Cylinder 1 Misfire	Mechanical System Not Responding Or Out Of Adjustment	P0301
65592	7	Cylinder 2 Misfire	Mechanical System Not Responding Or Out Of Adjustment	P0302
65613	2	ETC Accelerator Position Sensor Outputs 1 & 2 Correlation	Data Erratic, Intermittent Or Incorrect	P1135
	7	Powertrain Relay Driver Circuit	Mechanical System Not Responding Or Out Of Adjustment	P1784
516125	2	CAN 1	Data Erratic, Intermittent Or Incorrect	U0019
520142	9	Wheel Speed Information	Abnormal Update Rate	U0121
520171	4	Trunk Tail Lamp	Voltage Below Normal, Or Shorted To Low Source	P1585
	3	Trunk Tail Lamp	Voltage Above Normal, Or Shorted To High Source	P1586
520172	4	Trunk Brake Lamp	Voltage Below Normal, Or Shorted To Low Source	P1587
	3	Trunk Brake Lamp	Voltage Above Normal, Or Shorted To High Source	P1588
520198	2	Throttle Position Sensor 2	Data Erratic, Intermittent Or Incorrect	P0221
	4	Throttle Position Sensor 2	Voltage Below Normal, Or Shorted To Low Source	P0222
	3	Throttle Position Sensor 2	Voltage Above Normal, Or Shorted To High Source	P0223
520200	2	Rollover Sensor (Tipover)	Data Erratic, Intermittent Or Incorrect	P1501
	4	Rollover Sensor (Tipover)	Voltage Below Normal, Or Shorted To Low Source	P1502
	3	Rollover Sensor (Tipover)	Voltage Above Normal, Or Shorted To High Source	P1503
	14	Rollover Sensor (Tipover)	Special Instructions	P1504
520202	3	Canister Purge Valve	Voltage Above Normal, Or Shorted To High Source	P0443

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	5	Canister Purge Valve	Current Below Normal Or Open Circuit	P0444
	4	Canister Purge Valve	Voltage Below Normal, Or Shorted To Low Source	P0445
520204	17	Fuel Correction Front	Data Valid But Below Normal Operating Range - Least Severe Level	P0171
	15	Fuel Correction Front	Data Valid But Above Normal Operating Range - Least Severe Level	P0172
520205	17	Fuel Correction Rear	Data Valid But Below Normal Operating Range - Least Severe Level	P0174
	15	Fuel Correction Rear	Data Valid But Above Normal Operating Range - Least Severe Level	P0175
520209	5	Oxygen Sensor Heater Bank 1 Sensor 1	Current Below Normal Or Open Circuit	P0030
	4	Oxygen Sensor Heater Bank 1 Sensor 1	Voltage Below Normal, Or Shorted To Low Source	P0031
	3	Oxygen Sensor Heater Bank 1 Sensor 1	Voltage Above Normal, Or Shorted To High Source	P0032
	2	Oxygen Sensor Heater Bank 1 Sensor 1	Data Erratic, Intermittent Or Incorrect	P0135
520210	5	Oxygen Sensor Heater Bank 2 Sensor 1	Current Below Normal Or Open Circuit	P0050
	4	Oxygen Sensor Heater Bank 2 Sensor 1	Voltage Below Normal, Or Shorted To Low Source	P0051
	3	Oxygen Sensor Heater Bank 2 Sensor 1	Voltage Above Normal, Or Shorted To High Source	P0052
	2	Oxygen Sensor Heater Bank 2 Sensor 1	Data Erratic, Intermittent Or Incorrect	P0155
520211	14	Idle Speed	Special Instructions	P1514
	31	Idle Speed	Condition Exists	P1516
520248	31	FCCU Hardware Module	Condition Exists	P1547
520249	31	Function Monitoring MoFAir Group	Condition Exists	P1548
520267	31	Kickstand Switch	Condition Exists	P181C

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520277	3	Throttle Body Control - Power Stage	Voltage Above Normal, Or Shorted To High Source	P150D
	4	Throttle Body Control - Power Stage	Voltage Below Normal, Or Shorted To Low Source	P150E
	2	Throttle Body Control - Power Stage	Data Erratic, Intermittent Or Incorrect	P151A
	8	Throttle Body Control - Power Stage	Abnormal Frequency Or Pulse Width Or Period	P151B
520278	31	Throttle Body Control - Return Spring Check Failed	Condition Exists	P151C
520279	31	Throttle Body Control - Adaption Aborted	Condition Exists	P151D
520280	31	Throttle Body Control - Limp Home Position Check Failed	Condition Exists	P151E
520281	31	Throttle Body Control - Mechanical Stop Adaptation Failure	Condition Exists	P152A
520282	31	Throttle Body Control - Repeated Adaptation Failed	Condition Exists	P152B
520283	31	Throttle Body Control	Condition Exists	P161C
520284	31	Throttle Body Control - Position Deviation Fault	Condition Exists	P152E
520287	31	ECU Monitoring Error (Level 3)	Condition Exists	P1541
520288	31	ECU Monitoring of Injection Cut Off (Level 1)	Condition Exists	P1542
520289	31	ECU Monitoring of Injection Cut Off (Level 2)	Condition Exists	P1543
520306	31	ECU ADC Fault - No Load	Condition Exists	P1531
520307	31	ECU ADC Fault - Voltage	Condition Exists	P1532
520308	31	Accelerator Sensor Sync Fault - Sensor Diff Exceeds Limit	Condition Exists	P1533
520320	5	Brake Light	Current Below Normal Or Open Circuit	P1593

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	3	Brake Light	Voltage Above Normal, Or Shorted To High Source	P1594
	4	Brake Light	Voltage Below Normal, Or Shorted To Low Source	P1595
520321	5	Tail Light	Current Below Normal Or Open Circuit	P1596
520321	3	Tail Light	Voltage Above Normal, Or Shorted To High Source	P1597
520321	4	Tail Light	Voltage Below Normal, Or Shorted To Low Source	P1598
520322	3	Front Brake Switch	Voltage Above Normal, Or Shorted To High Source	P1599
	23	Front Brake Switch	Checksum Error	U0418
	19	Front Brake Switch	Received Network Data In Error	U1FF7
	22	Front Brake Switch	Counter Error	U1FF8
520323	3	Rear Brake Switch	Voltage Above Normal, Or Shorted To High Source	P159C
520329	9	pOperator Switch Status (pOSS1)	Abnormal Update Rate	P1063
520331	3	Knock Sensor Positive Line	Voltage Above Normal, Or Shorted To High Source	P1327
	4	Knock Sensor Positive Line	Voltage Below Normal, Or Shorted To Low Source	P1328
520332	3	Knock Sensor Negative Line	Voltage Above Normal, Or Shorted To High Source	P132A
	4	Knock Sensor Negative Line	Voltage Below Normal, Or Shorted To Low Source	P132B
520338	31	Gross Air Leak	Condition Exists	P2279
520342	17	Idle Fuel Correction Bank 1	Data Valid But Below Normal Operating Range - Least Severe Level	P2187
	15	Idle Fuel Correction Bank 1	Data Valid But Above Normal Operating Range - Least Severe Level	P2188
520343	17	Idle Fuel Correction Bank 2	Data Valid But Below Normal Operating Range - Least Severe Level	P2189

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	15	Idle Fuel Correction Bank 2	Data Valid But Above Normal Operating Range - Least Severe Level	P2190
520344	17	Adaptive Fuel Correction Bank 1	Data Valid But Below Normal Operating Range - Least Severe Level	P2177
	15	Adaptive Fuel Correction Bank 1	Data Valid But Above Normal Operating Range - Least Severe Level	P2178
520345	17	Adaptive Fuel Correction Bank 2	Data Valid But Below Normal Operating Range - Least Severe Level	P2179
	15	Adaptive Fuel Correction Bank 2	Data Valid But Above Normal Operating Range - Least Severe Level	P2180
520382	31	RBA Monitoring Keep Alive	Condition Exists	P154A
520383	31	RBA Monitoring Memory	Condition Exists	P154B
520384	31	RBA Monitoring T15	Condition Exists	P154C
520385	31	Function Monitoring MoFTrq	Condition Exists	P154E
520386	31	ICO Request MoCSOP Module	Condition Exists	P154F
520387	31	Function Monitoring Post Build	Condition Exists	P1551
520388	31	Function Monitoring MoFIACo	Condition Exists	P1557
520389	31	Function Monitoring Brake	Condition Exists	P1558
520390	31	Function Monitoring Starter Release	Condition Exists	P155A
520391	9	CAN APPL / PT	Abnormal Update Rate	P155B
520545	3	Front Left Turn Driver Circuit	Voltage Above Normal, Or Shorted To High Source	P17A0
	4	Front Left Turn Driver Circuit	Voltage Below Normal, Or Shorted To Low Source	P17A1
	5	Front Left Turn Driver Circuit	Current Below Normal Or Open Circuit	P17A2
520546	3	Front Right Turn Driver Circuit	Voltage Above Normal, Or Shorted To High Source	P17A3
	4	Front Right Turn Driver Circuit	Voltage Below Normal, Or Shorted To Low Source	P17A4

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	5	Front Right Turn Driver Circuit	Current Below Normal Or Open Circuit	P17A5
520547	3	Rear Left Turn Driver Circuit	Voltage Above Normal, Or Shorted To High Source	P17A6
	4	Rear Left Turn Driver Circuit	Voltage Below Normal, Or Shorted To Low Source	P17A7
	5	Rear Left Turn Driver Circuit	Current Below Normal Or Open Circuit	P17A8
520548	3	Rear Right Turn Driver Circuit	Voltage Above Normal, Or Shorted To High Source	P1803
	4	Rear Right Turn Driver Circuit	Voltage Below Normal, Or Shorted To Low Source	P1804
	5	Rear Right Turn Driver Circuit	Current Below Normal Or Open Circuit	P1805
521092	2	Powertrain CAN Bus	Data Erratic, Intermittent Or Incorrect	U0001
523995	3	DRL Right	Voltage Above Normal, Or Shorted To High Source	C1100
	4	DRL Right	Voltage Below Normal, Or Shorted To Low Source	C1101
	5	DRL Right	Current Below Normal Or Open Circuit	C1102
523996	3	DRL Left	Voltage Above Normal, Or Shorted To High Source	C1103
	4	DRL Left	Voltage Below Normal, Or Shorted To Low Source	C1104
	5	DRL Left	Current Below Normal Or Open Circuit	C1105
524040	2	Run/Stop Switch	Data Erratic, Intermittent Or Incorrect	P05BD
	9	Run/Stop Switch	Abnormal Update Rate	U1FF9
	19	Run/Stop Switch	Received Network Data In Error	U1FFE
524067	9	pDrive Mode Requested	Abnormal Update Rate	U0257

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ABS Trouble Codes

SPN	FMI	COMPONENT	CONDITION	ABS LAMP ON (YES / NO)	TRACTION CONTROL LAMP ON (YES / NO)	CODE	SERVICE ACTION
520140	12	ABS ECU	Bad Intelligent Device	Yes	Yes	C2437	Replace Module
520131	12	ABS Valve Relay	Condition Exists	Yes	Yes	C2420	Replace Module
520254	31	ABS Solenoid (Front In)	Condition Exists	Yes	Yes	C1326	Replace Module
520255	31	ABS Solenoid (Front Out)	Condition Exists	Yes	Yes	C1327	Replace Module
520252	31	ABS Solenoid (Rear In)	Condition Exists	Yes	Yes	C1330	Replace Module
520253	31	ABS Solenoid (Rear Out)	Condition Exists	Yes	Yes	C1332	Replace Module
520262	0	ABS Controller Source Voltage	Data valid but above normal operational range	Yes	Yes	C2422	Check Battery Voltage
	1		Data valid but above below operational range	Yes	Yes	2421	
	3		Voltage above normal	No	Yes	1039	
	4		Voltage below normal	No	Yes	1038	
520132	31	ABS Pressure Sensor	ABS internal pressure sensor supply voltage faulty	Yes	Yes	C2423	Replace ABS Module
520133	12	ABS Internal Pressure Sensor	Bad Intelligent Device	Yes	Yes	C2424	Replace ABS Module
	2		Data Erratic, intermittent, or incorrect	Yes	Yes	C2439	Cycle Key 3–4 times. Replace module if unsuccessful
520260	12	ABS Motor	Bad Intelligent Device	Yes	Yes	C101C	Replace ABS Module
520134	31	ABS Motor Supply Failure	Condition Exists	Yes	Yes	C2425	Check Motor Supply Voltage. Check Fuses
904	2	Front Wheel Speed Sensor	Data Erratic, Intermittent, or Incorrect	Yes	Yes	C1031	Check Tone Ring for any abnormalities , Check for Bad Airgap and wheel vibrations
	3		Voltage Above Normal	Yes	Yes	C2426	Check Signal Line Voltage
	4		Voltage Below Normal	Yes	Yes	C2427	Check Supply/ Signal Line Voltage
907	2	Rear Wheel Speed Sensor	Data Erratic, Intermittent, or Incorrect	Yes	Yes	C103D	Check Tone Ring for any abnormalities , Check for Bad Airgap and wheel vibrations
	3		Voltage Above Normal	Yes	Yes	C113D	Check Signal Line Voltage

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SPN	FMI	COMPONENT	CONDITION	ABS LAMP ON (YES / NO)	TRACTION CONTROL LAMP ON (YES / NO)	CODE	SERVICE ACTION
	4		Voltage Below Normal	Yes	Yes	C123D	Check Supply/ Signal Line Voltage
520135	31	Wheel Speed Sensor	Wheel Speed Sensor Signal Error	Yes	Yes	C2430	Check Tone Wheel Alignment /Airgap.
65559	31	CAN1 Bus Hardware	CAN Controller Failure	Yes	Yes	C1130	Replace the ABS Module if multiple key cycles do not recover module.
520141	31	CAN1 Bus Wiring	CAN Wiring Issue	Yes	Yes	C2438	Check the CAN wiring going into the module
520136	7	IMU (Inertial Measurement Unit)	Mechanical System Failure or Out of Adjustment	No	No	C2431	Verify IMU Installation and Connections for abnormalities.
	2		Data Erratic or Incorrect or Intermittent	No	No	C2432	Verify IMU Installation and Connections for abnormalities.
	9		Abnormal Update Rate	No	No	U0132	Verify IMU Installation and Connections for abnormalities.
	22		Counter Fault	No	No	U0133	Verify IMU Installation and Connections for abnormalities.
	23		Checksum Fault	No	No	U0134	Verify IMU Installation and Connections for abnormalities.
520137	31	ABS Manually Disabled	Condition Exists	Yes	No	C2433	No Service Action Required
520138	31	TC Manually Disabled	Condition Exists	No	Yes	C2434	No Service Action Required
520265	7	ABS Module	Un-Filled Component	Yes (Flashing)	Yes	C1042	—
524077	2	pDrive Mode Commanded	Data Invalid or Intermittent or Incorrect	No	No	C2435	Check Wiring and Connection to ECM and ABS
	9		Abnormal Update Rate	No	No	U0135	
520139	9	pTSCF1	Abnormal Update Rate	No	Yes	U0136	Check wiring and connection to ECM and ABS
	22		Counter Fault	No	Yes	U0137	
	23		Checksum Fault	No	Yes	U0138	
513118	9	65314 Timing	Abnormal Update Rate	No	Yes	U1109	Check wiring and connection to ECM and ABS
516121	9	61445 Timing Gear Position	Abnormal Update Rate	No	Yes	U1111	Check wiring and connection to ECM and ABS

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SPN	FMI	COMPONENT	CONDITION	ABS LAMP ON (YES / NO)	TRACTION CONTROL LAMP ON (YES / NO)	CODE	SERVICE ACTION
516136	31	PGN 61441 Missing EBC1–Lamp Info	Condition Exists	No	No	U1112	Check wiring and connection to Gauge and ABS
516120	9	PGN 65265 Missing CCVS - Clutch Status	Abnormal Update Rate	No	Yes	U1106	Check wiring and connections for Hand Controls and ABS
520319	31	Variant Invalid	Condition Exists	Yes	Yes	C1082	Follow Variant Write Procedure within DW.
	14		Data not Read Properly	Yes	Yes	C2436	Verify the ABS Variant Procedure was successful

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.

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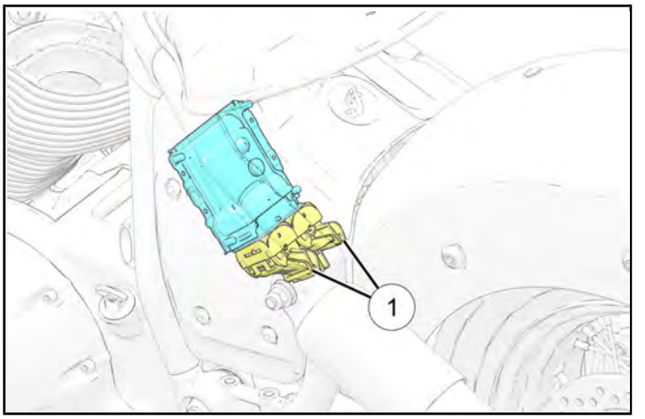
ECM PINOUT TESTING

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 as 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 CONNECTOR REMOVAL

1. To disconnect the two 56-pin ECM connectors:
   - Locate the ECM connectors ①.

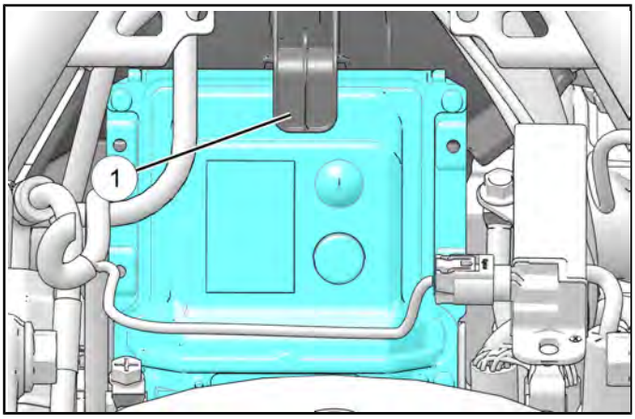


   - Remove the panduit strap securing the connector lock lever (if equipped).
   - Slide the lock lever toward the rear of the vehicle until connector is disengaged from the ECM.
   - Lift the connector straight off of the ECM.
2. Carefully align the ECM connector *straight* with the flange on the ECM. (Do not tip or rotate the connector into the ECM).
3. Gently apply straight inward pressure on the connector while sliding the lock lever back toward the connector until the lever stops and the connector is fully seated.
4. Secure a new panduit strap around the ECM rear connector lock lever and harness.

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ECM REMOVAL / INSTALLATION

1. Remove Seat. See **Seat Removal / Installation page 7.27**.
2. Remove battery. See **Battery Removal / Installation page 10.13**.
3. Remove the ECM from the retaining tab ① on the closeout panel.



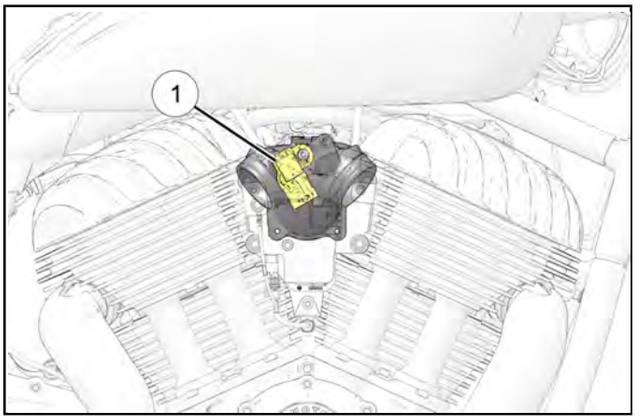
4. Disconnect the ECM connectors . See **ECM Connector Removal page 4.46**.
5. **Installation is performed by reversing the removal procedure.**

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TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP) REPLACEMENT

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.

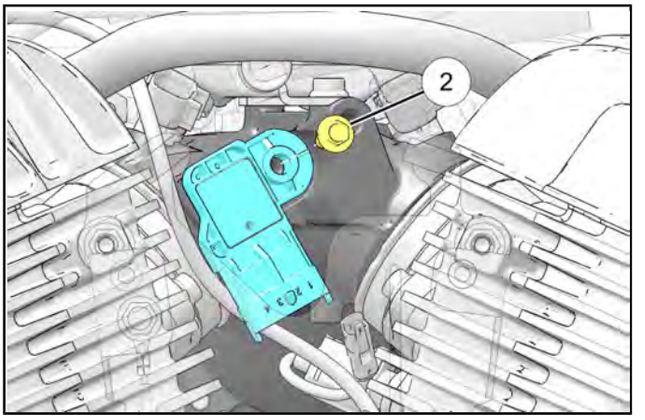
TMAP Sensor Test

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 the ignition coil assembly and associated bracket. See **Ignition Coil Removal / Installation page 10.46**.
2. Disconnect vehicle harness from TMAP sensor.
3. Cut tie retaining securing CHT lead to the TMAP.
4. Remove TMAP sensor screw ② and remove sensor from the intake manifold.

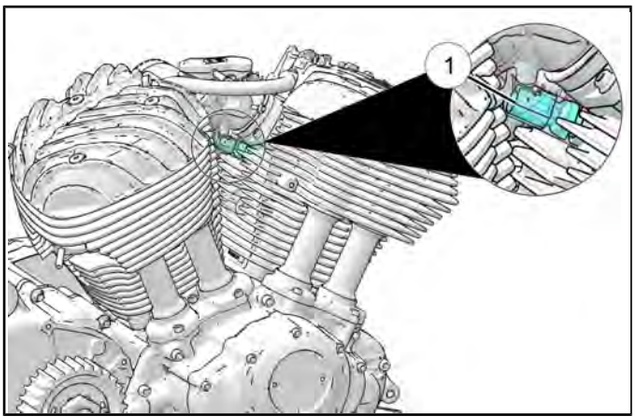


5. **INSTALLATION is performed by reversing the removal procedure.**
6. Torque TMAP sensor screw to specification.

TORQUE
TMAP Sensor Fastener: **18 in-lbs (2 N·m)**

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CYLINDER HEAD TEMPERATURE SENSOR, TEST / REPLACE



CHT TEST OVERVIEW		
INDICATES	INSPECT	LOCATION
Voltage received at ECM from CHTS 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 CHTS sensor resistance.	Under front cylinder intake port.

1. Disconnect ECM #2 connector. See **ECM Connector Removal page 4.46**.
2. Attach test lead adapters to meter leads.
3. Set multimeter to measure resistance.
4. Measure resistance between pin 143 and pin 233 of the ECM #2 connector and compare to specification. See **ECM Connector Map page 10.48**.
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 # 143 to # 233	30. K Ohms +/- 11% @ 25° C (77° F)

TORQUE
Cylinder Head Temperature Sensor: **71 in-lbs (8 N·m)**

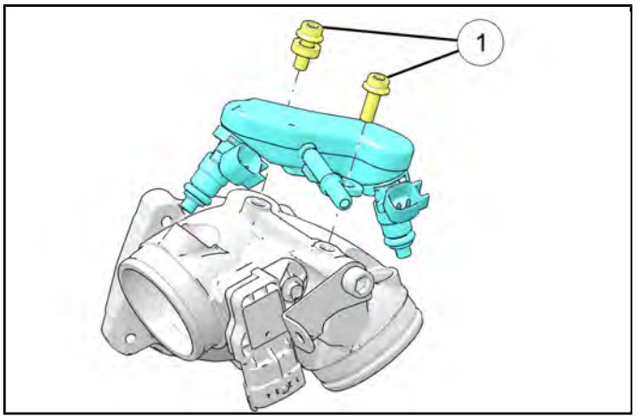
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FUEL INJECTOR REMOVAL / INSTALLATION

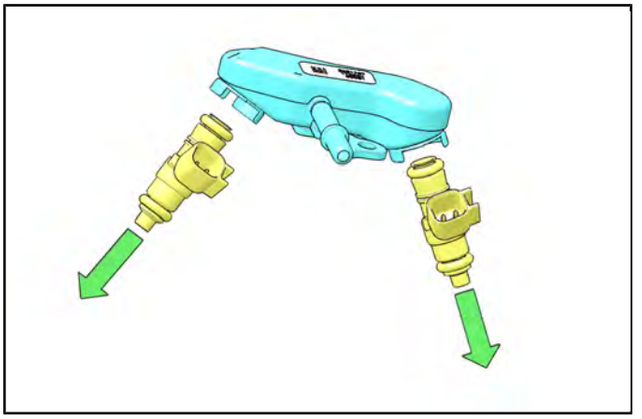
1. Remove fuel tank. See **Fuel Tank Removal page 4.17**.
2. Disconnect fuel injector electrical connectors.

IMPORTANT
Disengage Red CPA connection lock before disconnecting injector.

3. Remove the fuel rail by removing its fasteners ①.



4. Remove fuel injectors from fuel rail.



5. **Installation is performed by reversing the removal procedure.**

IMPORTANT
Make sure injectors tabs align with fuel rail for proper installation.

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

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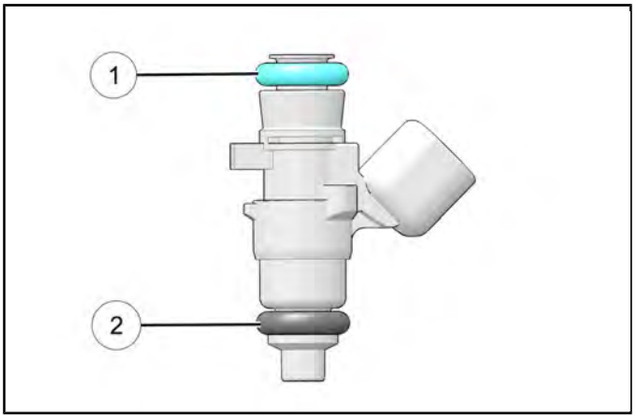
FUEL INJECTOR O-RINGS

1. Any time an injector is removed, you must replace the upper and lower O-rings.
2. Always lubricate NEW injector O-rings with clean, silicone-free motor oil.

⚠ CAUTION

Apply oil sparingly and avoid contaminating the pintle valve / jet surface and upper inlet port.

3. Install NEW O-rings onto top and bottom of injector



ITEM	PART NUMBER	COLOR	POSITION
①	5412891	Blue	TOP OF INJECTOR
②	1500198	Brown	BOTTOM OF INJECTOR

IMPORTANT

Always install NEW O-rings when removing the fuel rail or injectors.

IMPORTANT

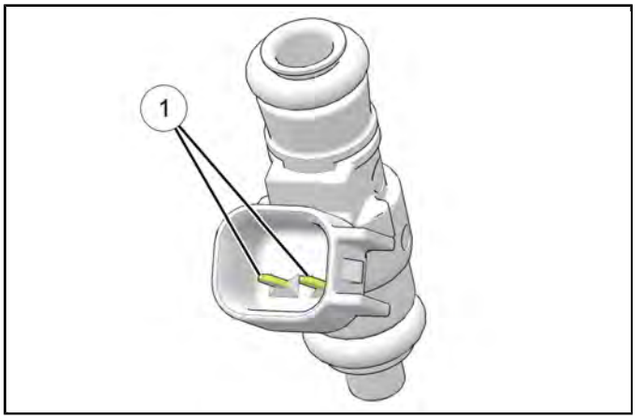
Verify that the new top and bottom O-rings are installed in the correct position and are lubricated with clean, silicone-free oil.

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:
11.5 Ω - 12.5 Ω

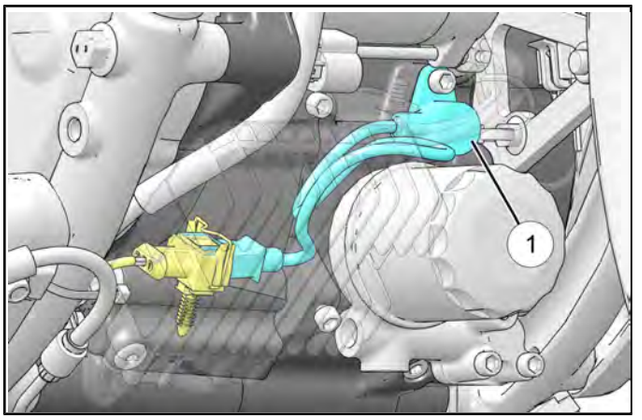
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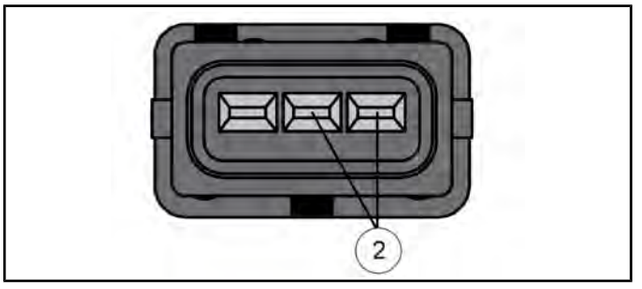
CRANKSHAFT POSITION SENSOR, TEST / REPLACE

Crankshaft Position Sensor CPS Test

1. Locate the CPS ① by the oil filter. Follow the wiring to the electrical connector and disconnect.



2. Connect an ohmmeter between the pin terminals ② and compare resistance readings to specification below.

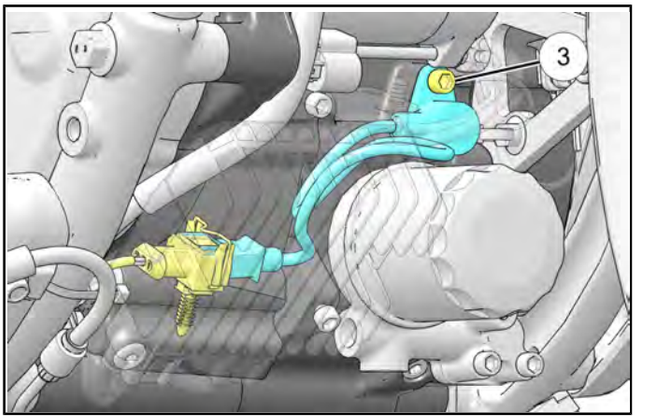


3. If resistance is correct, check to see that the sensor is mounted properly and that the tone wheel has not been damaged and is securely mounted to the crankshaft assembly.

Crankshaft Position Sensor: **1050 Ohms @ 20°C (68° F)**

CPS Replacement

1. Disconnect the CPS sensor from the vehicle harness and release flying lead from plastic darts and cable ties.
2. Remove the screw ③ securing the CPS sensor to the engine case and remove sensor.



3. **Installation is performed by reversing the removal procedure.**

IMPORTANT
Apply rubber lubricant to the CPS sensor o-ring to ease installation.

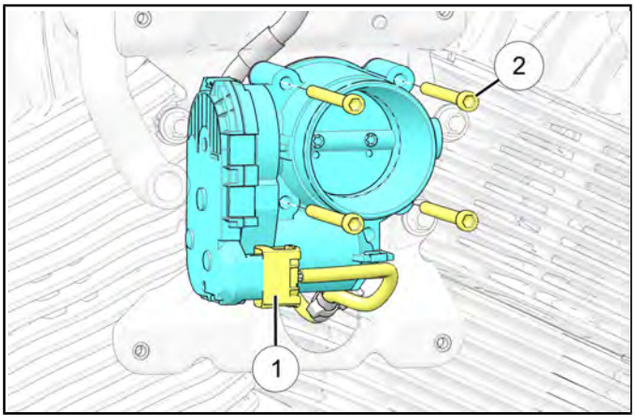
4. Torque the CPS retaining fastener to specification.

TORQUE
Crank Position Sensor (CPS) Retaining Fastener: **88 in-lbs (10 N·m)**

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THROTTLE BODY (ETC) REMOVAL / INSTALLATION

1. Remove Air Box. See **Air Box Removal / Installation page 3.8**.
2. Disconnect throttle body electrical connector ①.



3. Remove throttle body by removing its fasteners ②.
4. Remove and discard throttle body gasket.
5. **Installation is performed by reversing the removal process.**

TORQUE
Throttle Body Fasteners: **88 in-lbs (10 N·m)**

NOTICE

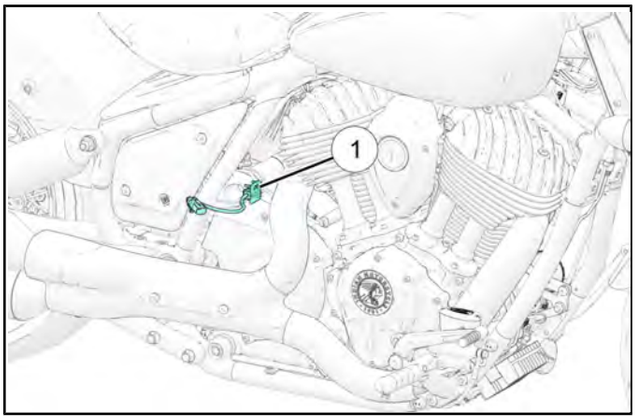
Throttle Position Sensor (TPS) has two different voltage sensors and the sum of the two sensors should equal the same value regardless of the throttle position. As the voltage goes down for sensor 1 it should go up for sensor 2 by the same value. Example voltages listed at idle are 2.83 and 0.50 (2.83 + 0.50 = 3.33) the same is true with the values at full throttle (2.75 + 0.58 = 3.33). Indian Motorcycles uses two different voltage scales depending on the bike model 3.33 or 4.98 volts. Primarily Heavy Weight Air Cooled (HWAC) models operate at 3.33 volts. MY22 and newer Chief and Heavy Weight Liquid Cooled (HWLC) models operate at 4.98 volts.

NOTICE

Accelerator Position Sensor (APS) has two different voltage sensors and sensor 1 should always be twice the value of sensor. As the voltage goes up for sensor 1 it should also go up for sensor 2 but at ½ of the value. The two sensors in the TPS and the two sensors in the APS are designed to create redundancy in the communication to the ECU. If any of the four values go out of specification a fault code will be generated and in many cases the engine will go into "Limp Mode" (reduced power).

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TIP OVER SENSOR



The Tip Over Sensor ① adds load to standard high-current hand control switches for terminal cleaning and to provide ECM interface signal integrity. The Tip Over Sensor interrupts the ignition/fuel supply which prevents engine operation after a tip over event.

See Electrical Chapter (Chassis Electrical) for additional information.

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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.

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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 Air restriction in IAC Fuel Pump Fuel injector / Fuel Rail obstructed or leaking Air Filter Wrong Fuel / Old Fuel Crank Position Sensor	Inspect IAC system Inspect IAC hoses and fittings Inspect fuel pressure Replace Replace Inspect / Replace Inspect / Replace
Poor Running in Higher RPM Range	Air intake restriction Oil Overfilled Ignition problems Low 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

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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 Replace 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 / Cooling / Exhaust Chapter (Cylinder Head / Valves)	
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 lines 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 Charge/Replace 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 Chapters See Electrical Chapter (Ignition System) 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 line Low battery voltage ECM	Repair / Replace Replace Repair Test / Replace Test / Replace Test / Replace Test / Replace Clear Test batt./Charging system
	Throttle Pedal Fault		Digital Wrench diagnostic

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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 CTS 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

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NOTES

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CHAPTER 5
CLUTCH / PRIMARY / SHIFT

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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.
- 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
Engine Lock Tool - Transmission	PF-51612
Engine Lock Tool - Crankshaft	PF-51235-A
Engine Stand Adapter	PF-51609
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 — (2022)	82.5 lbf @ Installed Height
		Coil Type, QTY 3 — (2023+)	74.4 lbf @ Installed Height
	Clutch Lever Free Play (Cable)		.50-1.50 mm (.020-.060")

5

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CLUTCH / PRIMARY / SHIFT MAINTENANCE

CLUTCH CABLE INSPECTION / LUBRICATION

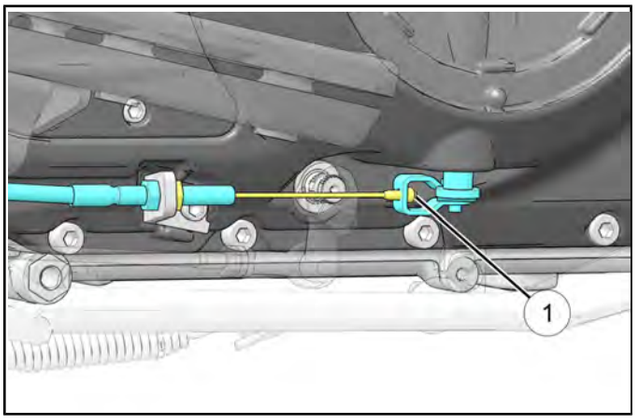
NOTICE

Control 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 **Periodic Maintenance Interval Table page 2.4**.

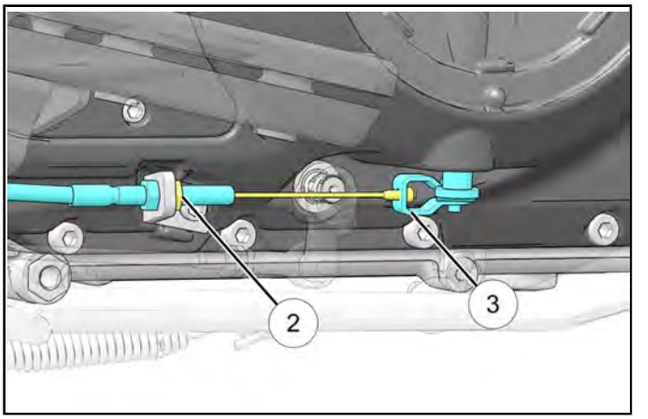
⚠ CAUTION

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 Remove cable from clevis guide ③.



IMPORTANT

Protect finish of clutch shaft arm with a shop towel or tape.

4. Apply a thin coating of all purpose grease to the clutch perch cable end and the clevis joint.
5. Reverse steps 3–4 to reinstall clutch cable.
6. Adjust cable free play. See **Clutch Lever Free Play page 5.6**
7. Tighten the lower cable guide fastener to specification.

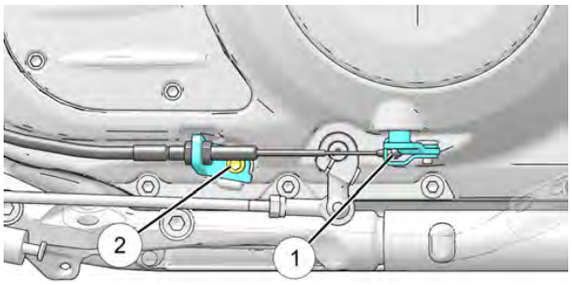
TORQUE
Clutch Cable Jam Nut: **48 in-lbs (5 N·m)**

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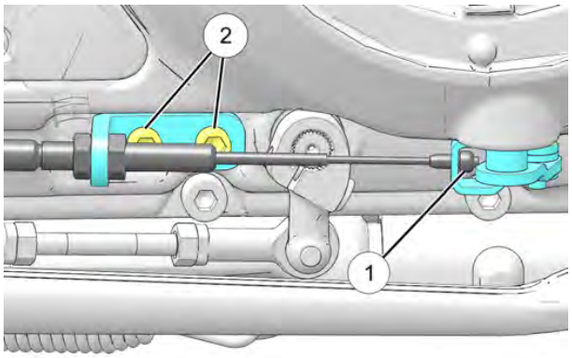
CLUTCH CABLE REMOVAL / INSTALLATION

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Disconnect clutch cable ① from clutch pinion arm.

2022



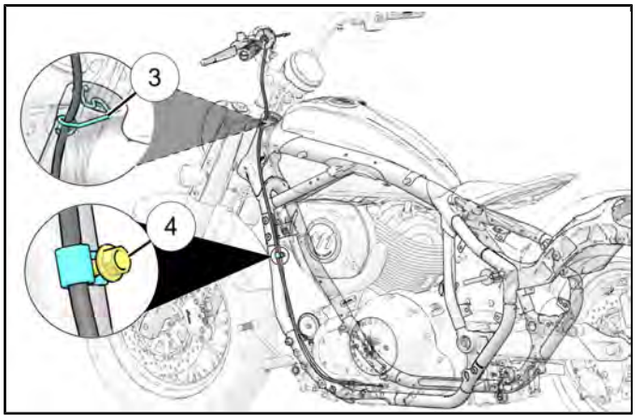
2023+



NOTICE

Note pinion shaft orientation for reassembly.

3. Loosen and remove the adjuster jam nut so the cable can be pulled through and out of the bracket.
4. At the handlebar, pull the clutch cable casing straight out until clear of lever perch and rotate cable outward to align inner cable wire with slot in lever.
5. Pull lever slightly until slotted opening in lever is clear of perch and slide cable barrel end down and out of lever.
6. Disconnect the clutch cable from the wire guide ③.



7. Remove clutch cable p-clamp fastener ④.
8. Remove the cable from the unit. Note the routing for reinstallation.
9. **Installation is performed by reversing the removal procedure.**

⚠ CAUTION

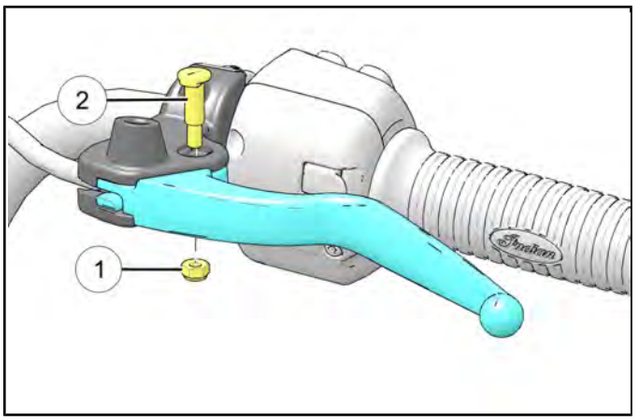
Do not kink, bend, or twist the inner cable or outer cable casing during installation

10. Route clutch cable in the same manner as removed.
11. Apply multi-purpose grease to the lever end of the cable and install it in the clutch lever at the handlebar.
12. Install the casing in the lever perch at the handlebar.
13. Install cable in the mount located on the primary cover.
14. At the clutch pinion arm end of the cable, pull the inner cable until fully extended. Be sure the upper end of the cable casing is seated in the lever perch at handlebar end.
15. Apply multi-purpose grease to the lower barrel end of the cable and at the clutch pinion arm joint.
16. Rotate the clutch pinion arm inward (as in STEP 2) until cable can be installed in the clutch pinion arm.
17. Adjust clutch cable free play. See **Clutch Lever Free Play page 5.6**.

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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 the nut ① and push pivot bolt ② upward to remove.



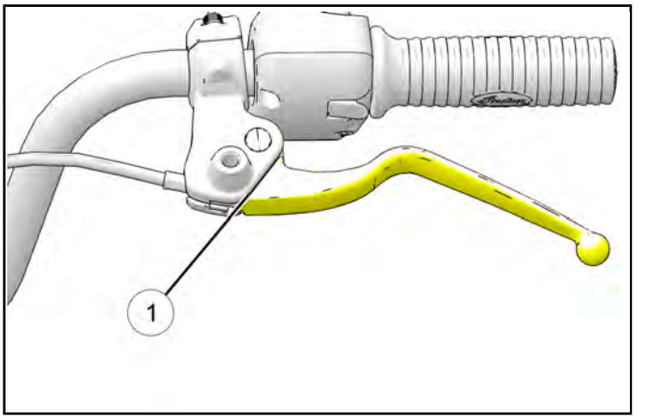
4. Inspect both ends of inner cable for frayed strands. Clean parts and apply moly paste to pivot bolt and both cable ends.
5. Assemble lever.
6. Install cable to lever. Rotate cable back through slot in perch, and push outer casing back into perch recess.
7. Install the pivot bolt and torque the nut to specification.

TORQUE
Clutch Lever Pivot Nut: **53 in-lbs (6 N·m)**

8. Lubricate and attach lower end of cable to clutch pinion arm on primary cover.
9. Adjust clutch lever free play. See **Clutch Lever Free Play page 5.6**.

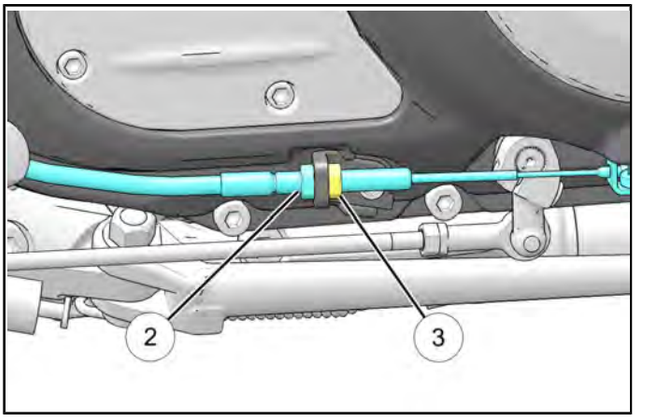
CLUTCH LEVER FREE PLAY

1. With handlebars pointing straight ahead, measure the clutch lever free play at point shown ① between lever and perch.



MEASUREMENT
Clutch Lever Free Play: **.019–.059" (0.5–1.5 mm)**

2. Compare measurement to specification. If adjustment is required, proceed to Step 3.
3. Locate the clutch cable adjuster ② .



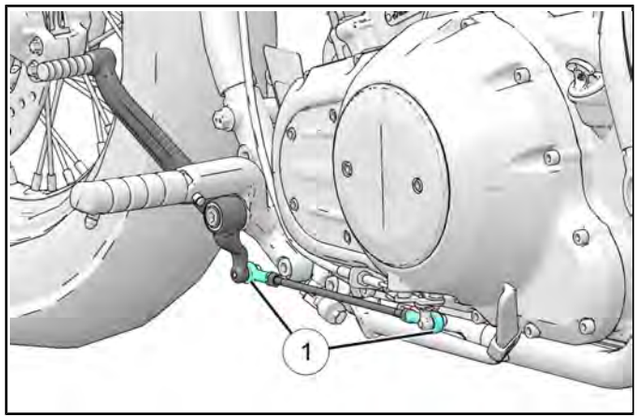
4. Hold cable and loosen the adjuster jam nut ③.
5. Turn cable adjuster nut in or out until clutch free play is correct.
6. Tighten adjuster jam nut to specification.

TORQUE
Clutch Cable Adjuster Jam Nut: **48 in-lbs (5 N·m)**

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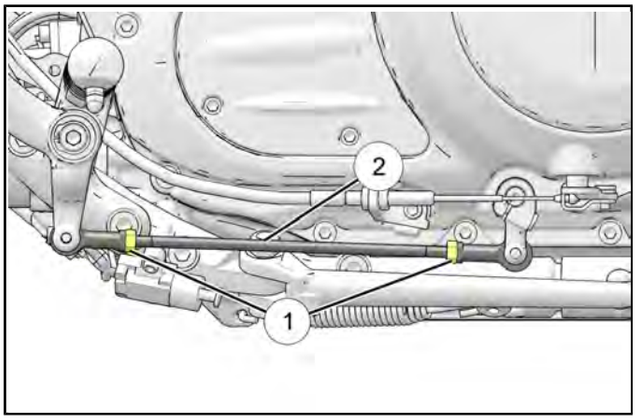
SHIFT PEDAL INSPECTION / LUBRICATION

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 ① with all-purpose lubricant.



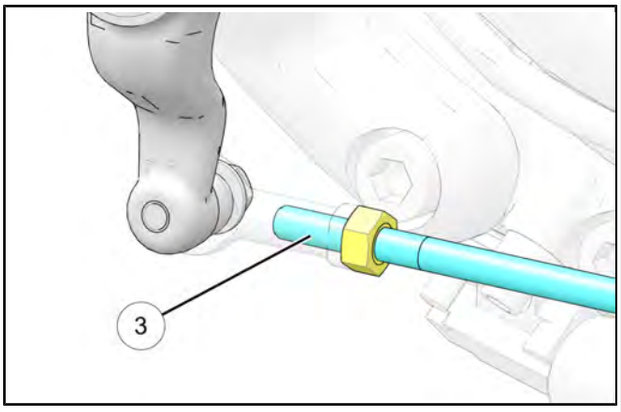
SHIFT PEDAL ADJUSTMENT

1. Loosen jam nuts ①.
2. Rotate linkage rod ② until pedal angle is correct.



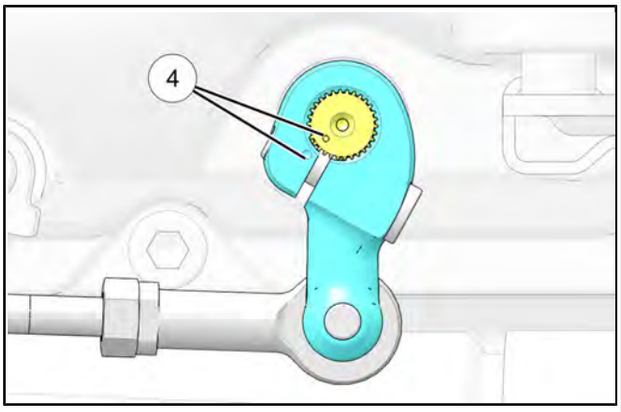
IMPORTANT

The shift linkage rod ③ must be threaded into each pivot end a minimum of seven complete turns.



IMPORTANT

Make sure Dots ④ are properly aligned.



5

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- Tighten jam nuts ① to specification.

TORQUE
Shift Rod Jam Nuts: **88 in-lbs (10 N·m)**

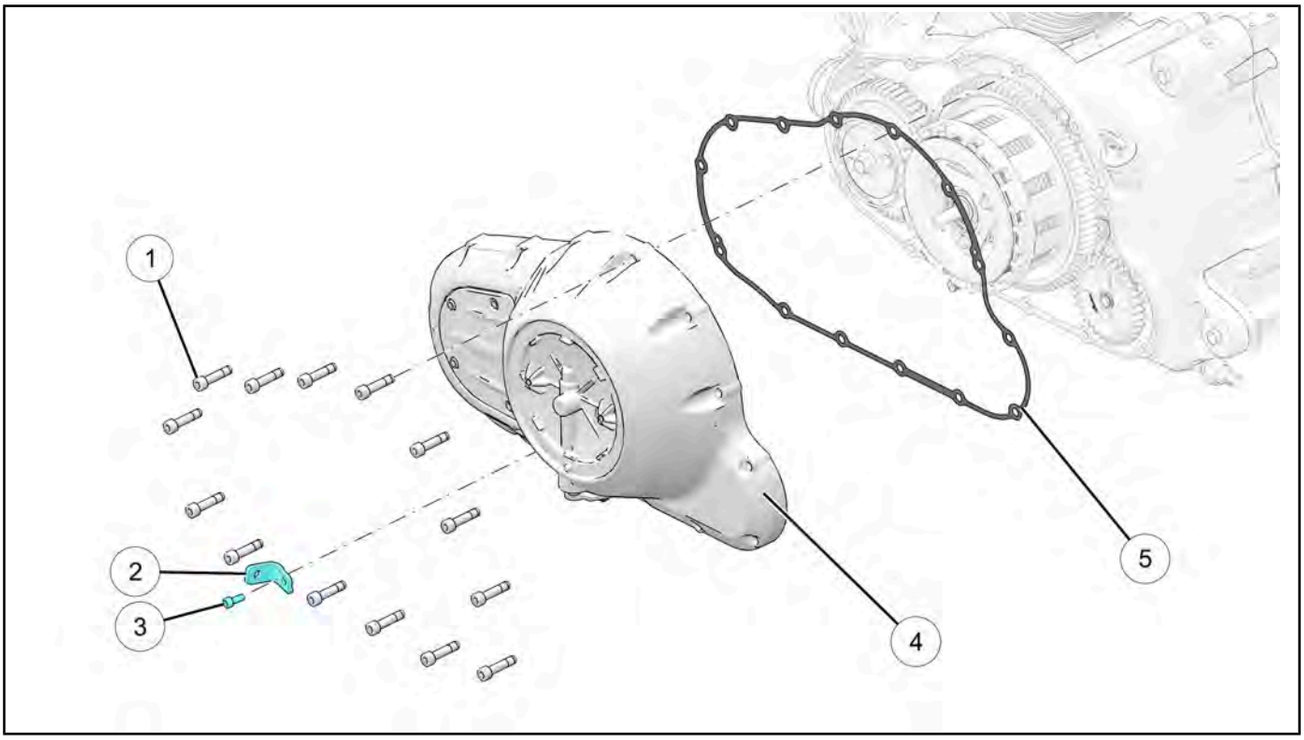
⚠ CAUTION

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.

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ASSEMBLY VIEWS

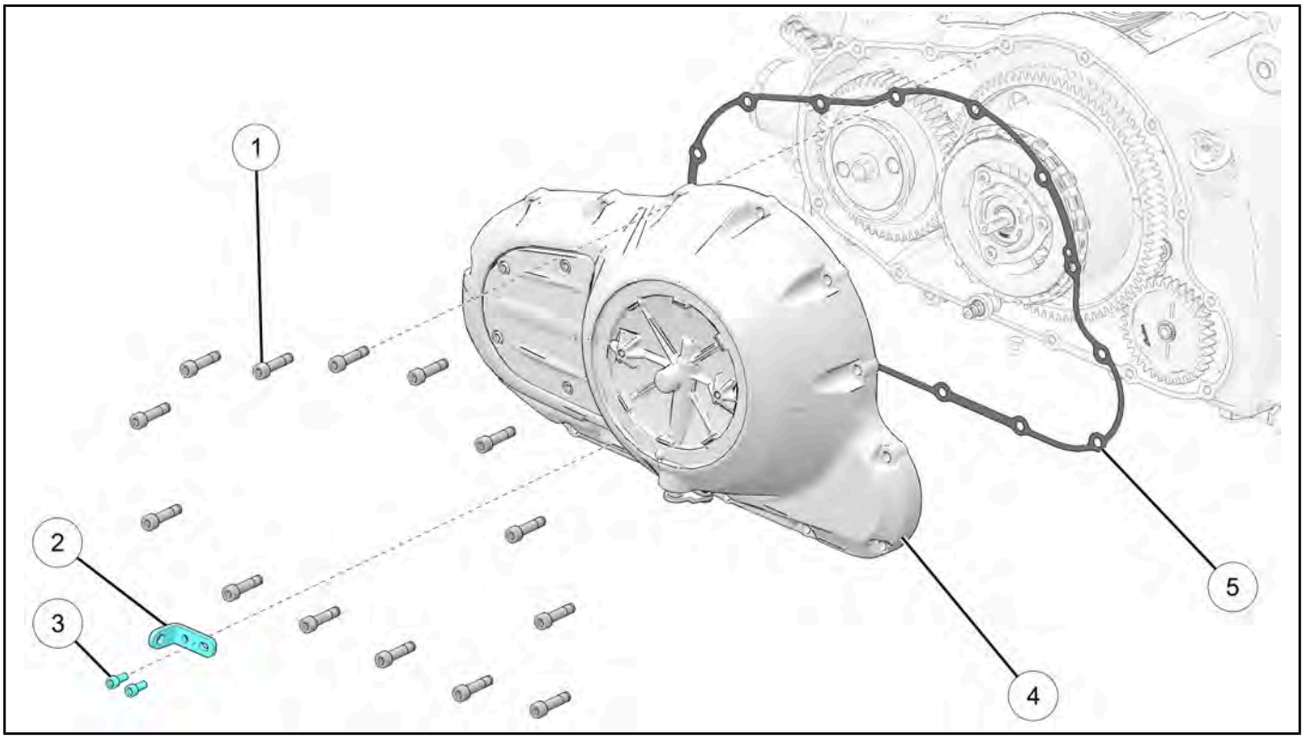
PRIMARY COVER (2022)



ITEM	DESCRIPTION	TORQUE
1	Primary Cover Fastener	**177 in-lbs (20 N·m)**
2	Cable Mount Bracket	—
3	Cable Mount Bracket Fastener	**88 in-lbs (10 N·m)**
4	Primary Cover	—
5	Primary Cover Gasket	—

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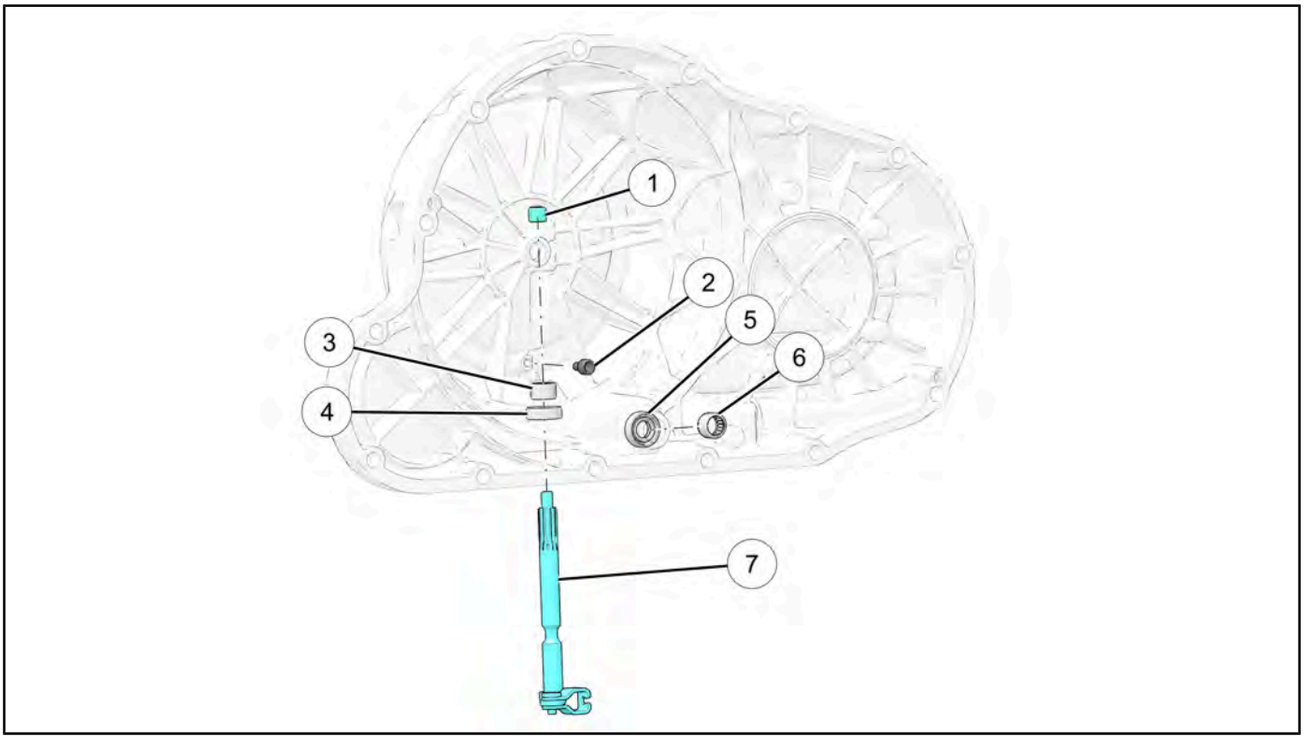
PRIMARY COVER (2023)



ITEM	DESCRIPTION	TORQUE
1	Primary Cover Fastener	**177 in-lbs (20 N·m)**
2	Cable Mount Bracket	—
3	Cable Mount Bracket Fastener	**88 in-lbs (10 N·m)**
4	Primary Cover	—
5	Primary Cover Gasket	—

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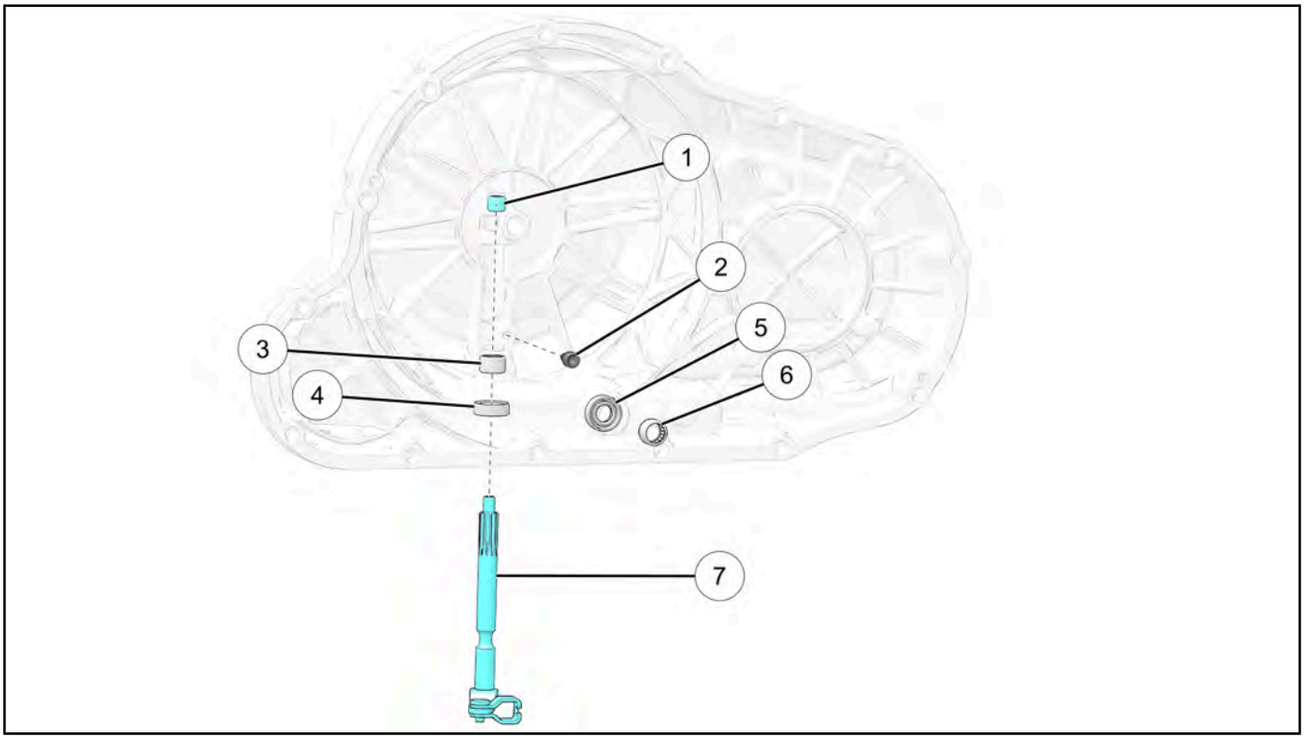
CLUTCH PINION SHAFT (2022)



ITEM	DESCRIPTION	TORQUE
①	Pinion Shaft Bearing (M7 x 11 x 9)	—
②	Clutch Pinion Shaft Fastener	**62 in-lbs (7 N·m)**
③	Pinion Shaft Bearing (M12 x 16 x 10)	—
④	Pinion Shaft Seal	—
⑤	Shift Shaft Seal	—
⑥	Shift Shaft Bearing (M12 x 16 x 10)	—
⑦	Clutch Pinion Shaft	—

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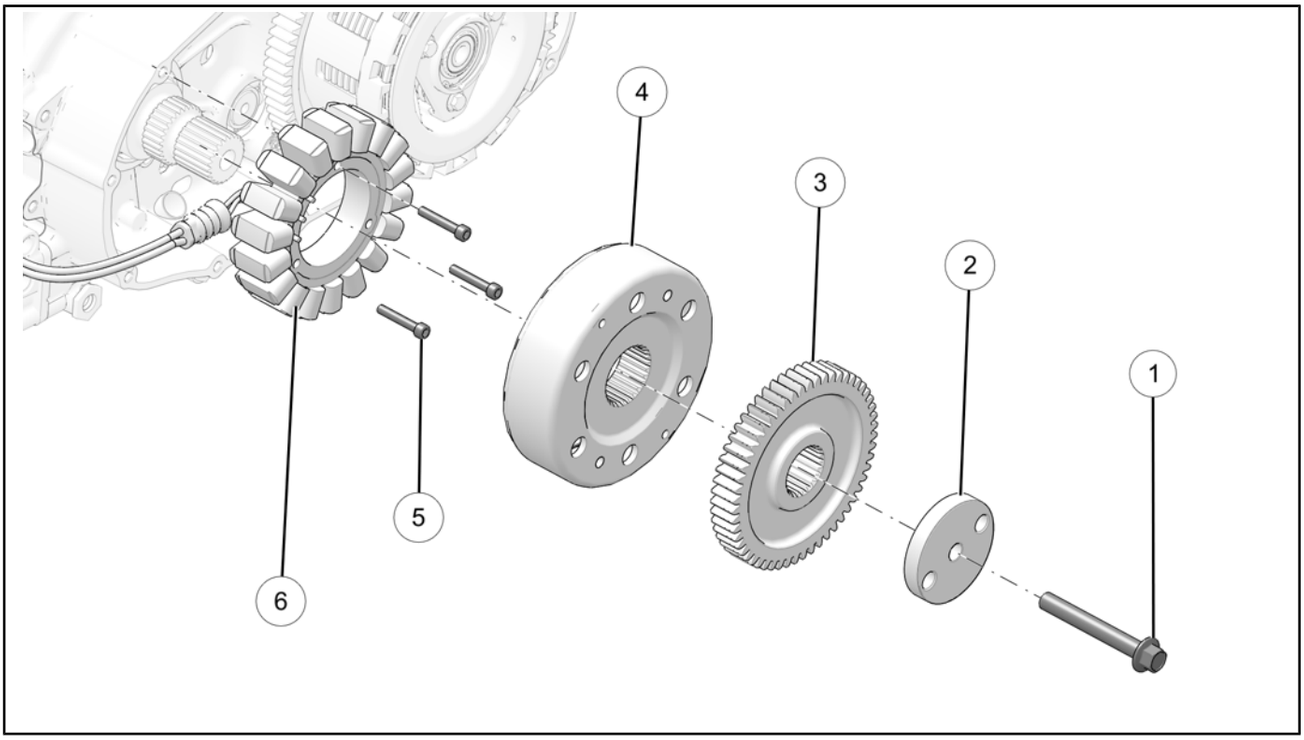
CLUTCH PINION SHAFT (2023)



ITEM	DESCRIPTION	TORQUE
①	Pinion Shaft Bearing M7 x 11 x 9	—
②	Clutch Pinion Shaft Fastener	**62 in-lbs (7 N·m)**
③	Pinion Shaft Bearing M12 x 16 x 10	—
④	Pinion Shaft Seal	—
⑤	Shift Shaft Seal	—
⑥	Shift Shaft Bearing M12 x 16 x 10	—
⑦	Clutch Pinion Shaft	—

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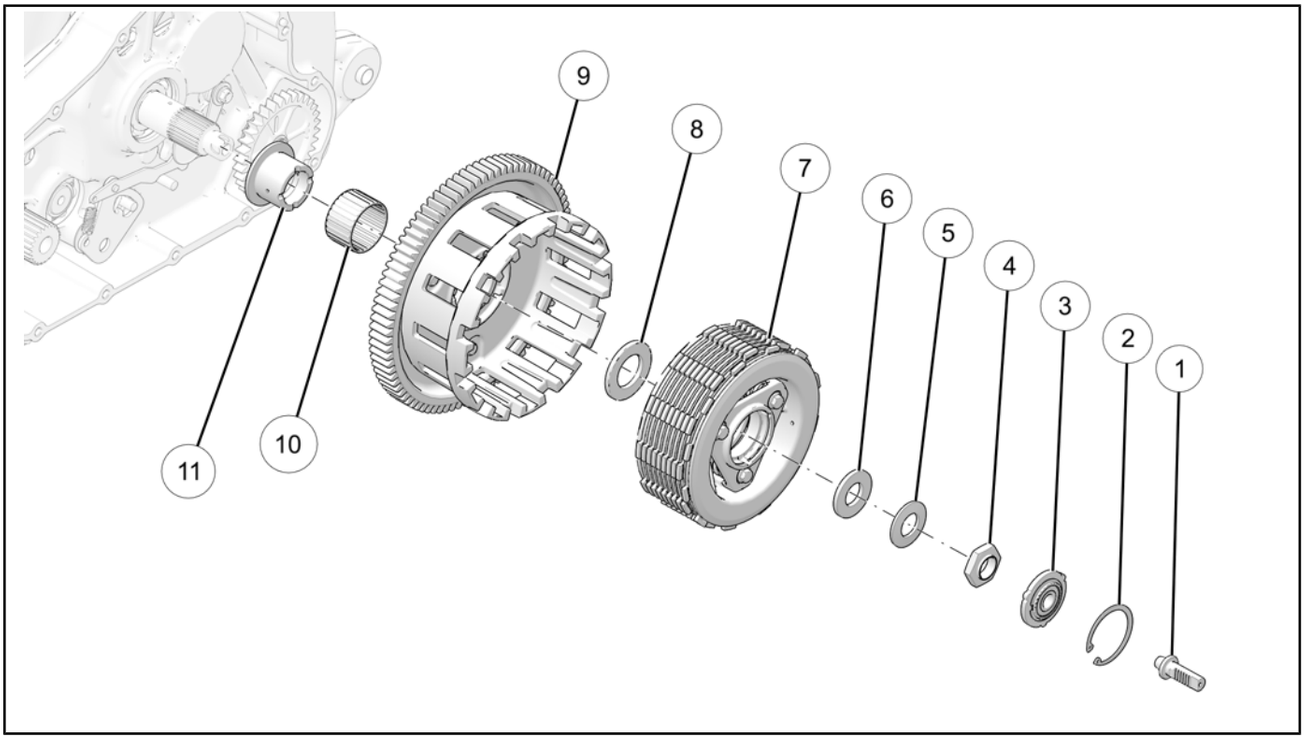
PRIMARY DRIVE GEAR



ITEM	DESCRIPTION	TORQUE
①	Primary Drive Gear Fastener (2022)	**50 ft-lbs (68 N·m) + 38°**
	Primary Drive Gear Fastener (2023+)	**83 ft-lbs (112 N·m)**
②	Cold Test Adapter	—
③	Primary Drive Gear	—
④	Stator Rotor	—
⑤	Stator Fastener	**88 in-lbs (10 N·m)**
⑥	Stator	—

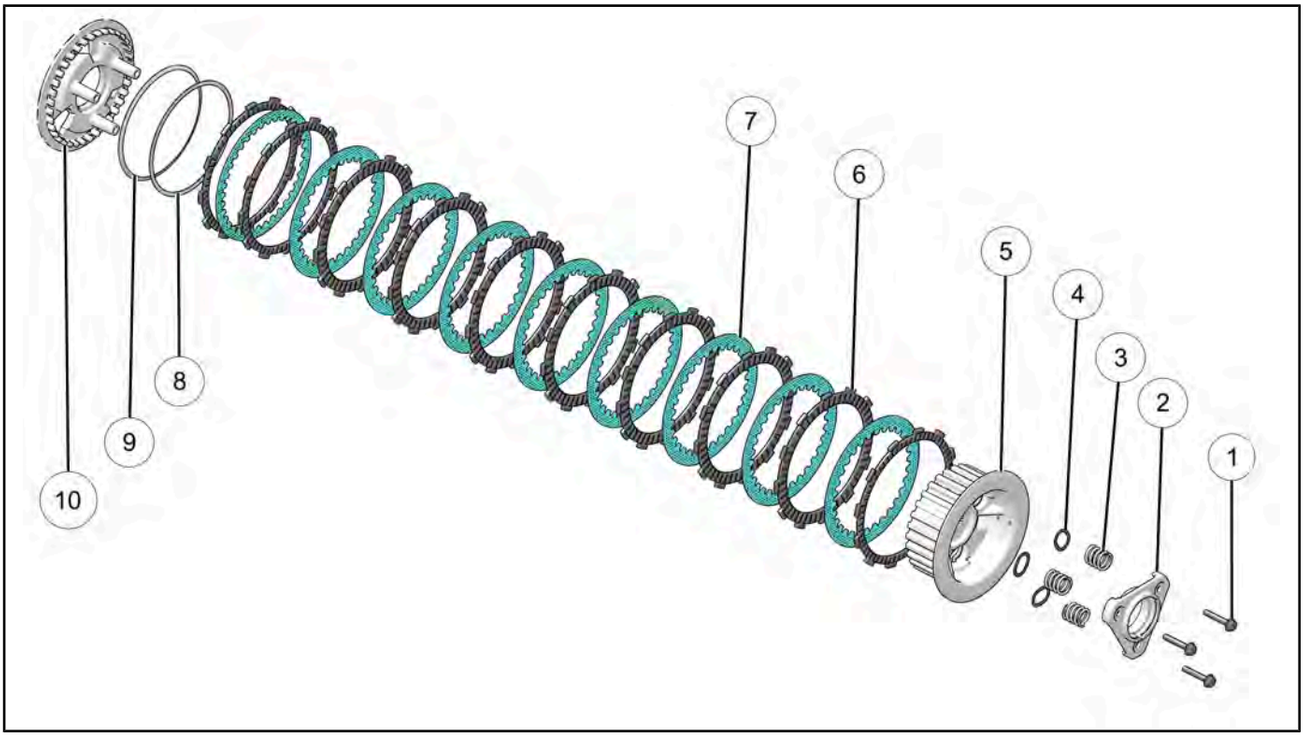
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CLUTCH (2022)



ITEM	DESCRIPTION	TORQUE
①	Clutch Rack	—
②	Retaining Ring	—
③	Clutch Lifter	—
④	Clutch Stake Nut	**125 ft-lbs (170 N·m)**
⑤	Spring Disc	—
⑥	Flat Washer	—
⑦	Clutch Disc Assembly	—
⑧	Flat Washer	—
⑨	Clutch Basket	—
⑩	Needle Bearing	—
⑪	Bearing Collar	—

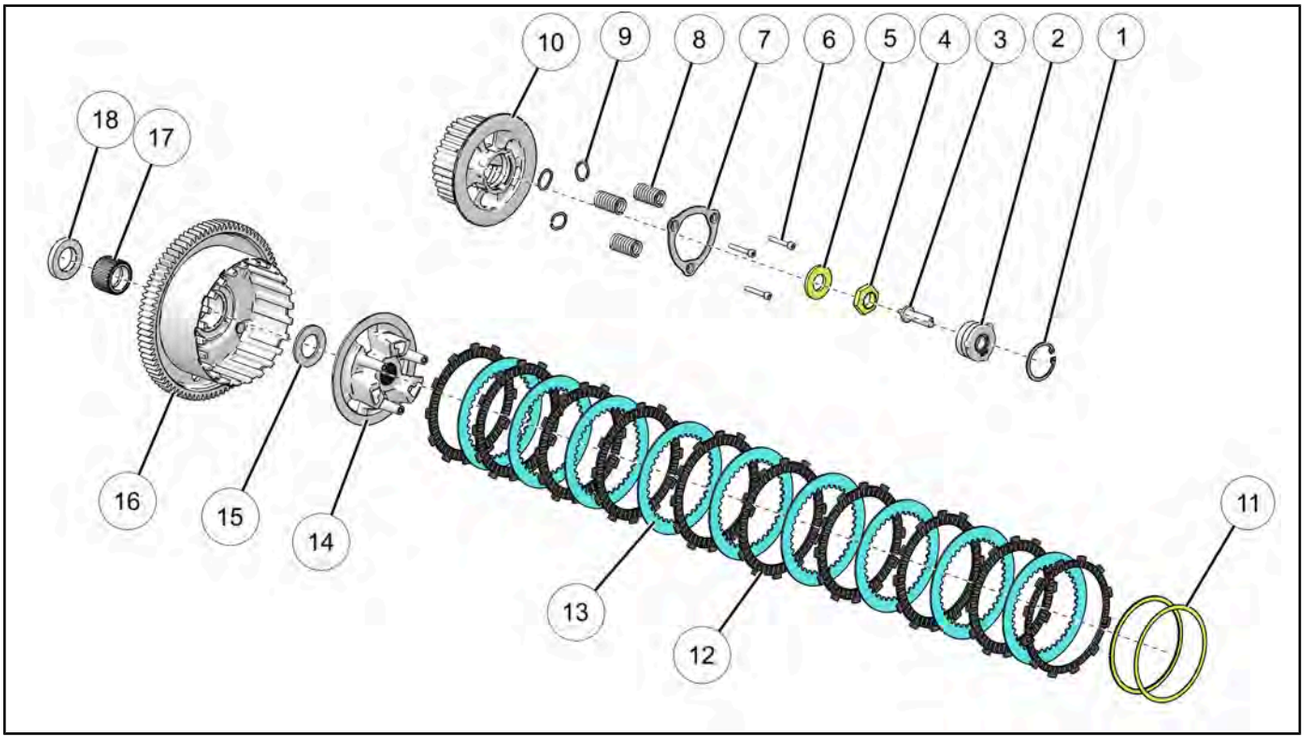
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ITEM	DESCRIPTION	TORQUE
①	Stopper Plate Fastener	**62 in-lbs (7 N·m)**
②	Stopper Plate	—
③	Clutch Spring	—
④	Clutch Seat Spring	—
⑤	Inner Clutch Hub	—
⑥	Clutch Friction Disc	—
⑦	Clutch Steel Disc	—
⑧	Judder Spring	—
⑨	Judder Spring Seat	—
⑩	Pressure Plate	—

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CLUTCH (2023)



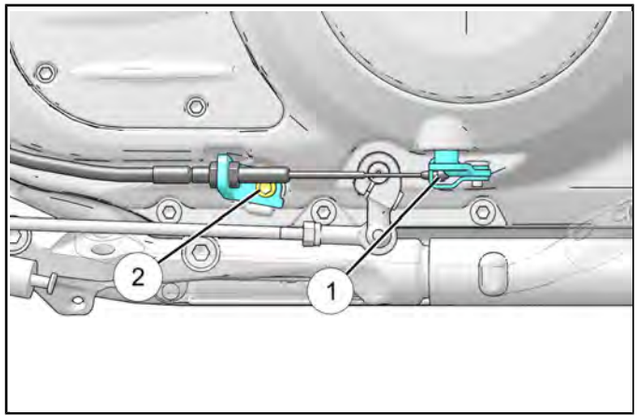
ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Lift Rack	—	⑩	Pressure Plate	—
②	Internal Retaining Ring	—	⑪	Judder Spring	—
③	Clutch Lifter	—	⑫	Friction Plate	—
④	Stake Nut, Clutch	**125 ft-lbs (170 N·m)**	⑬	Separator Plate	—
⑤	Washer	—	⑭	Inner Clutch Hub	—
⑥	Stopper Plate Fastener	**62 in-lbs (7 N·m)**	⑮	Washer	—
⑦	Stopper Plate	—	⑯	Outer Basket Assembly	—
⑧	Clutch Spring	—	⑰	Needle Bearing	—
⑨	Clutch Seat Spring	—	⑱	Clutch Spacer	—

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SERVICE PROCEDURES

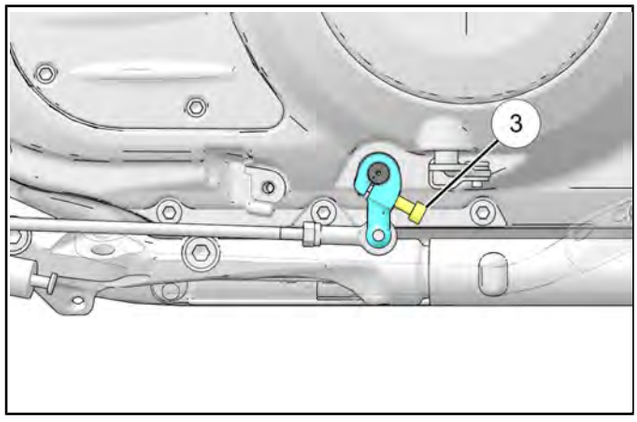
PRIMARY COVER REMOVAL (2022)

1. Remove Left Foot peg. Reference **Driver Foot Peg Removal / Installation page 7.25**.
2. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
3. Drain the engine oil. See **Engine Oil & Filter Change page 2.7**.
4. Disconnect clutch cable ① from pinion arm.

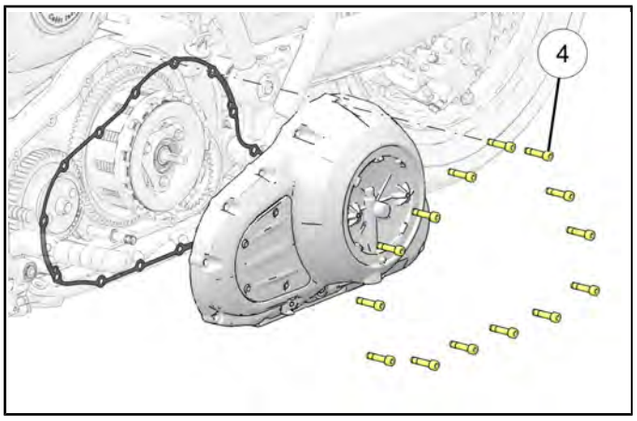


NOTICE
Note pinion shaft orientation for reassembly.

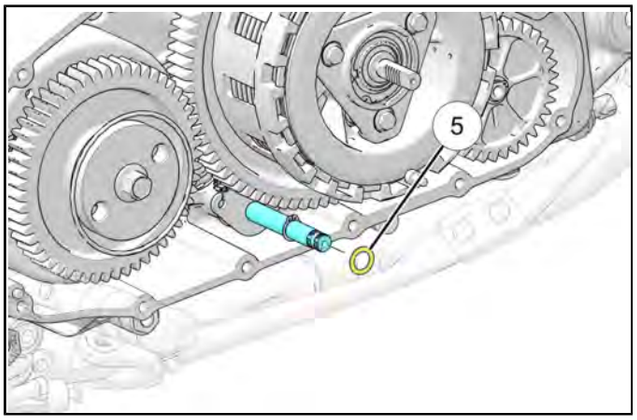
5. Remove cable bracket fastener ②.
6. Remove shift linkage by removing its fastener ③.



7. Remove primary cover fasteners. ④



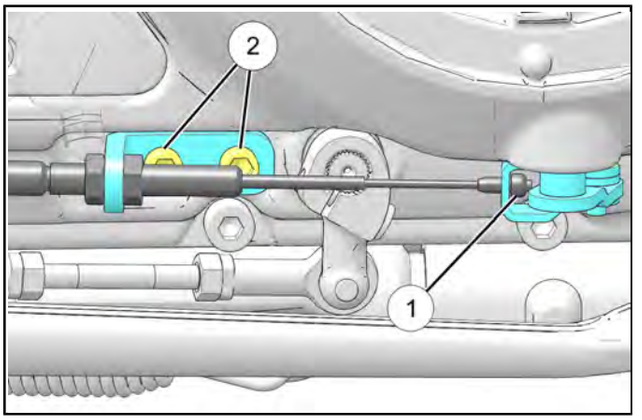
8. Tap cover with a soft face mallet to loosen.
9. Remove the shim ⑤ from the end of the shift shaft noting position for reassembly.



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PRIMARY COVER REMOVAL (2023)

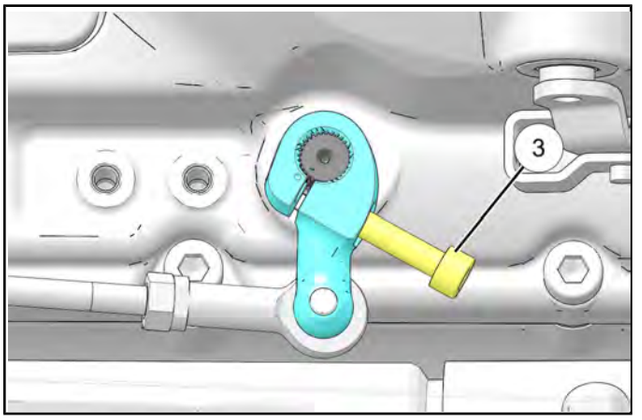
1. Remove Left Foot peg. Reference **Driver Foot Peg Removal / Installation page 7.25**.
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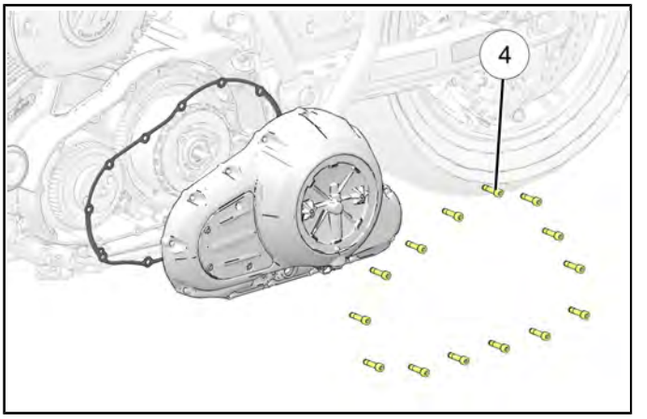
NOTICE

Note pinion shaft orientation for reassembly.

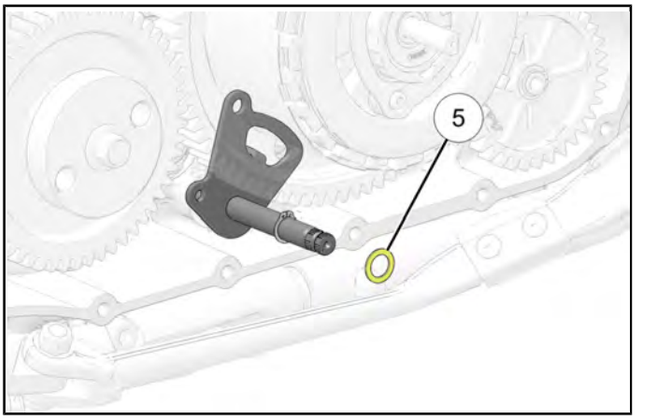
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6. Remove shift linkage by removing its fastener ③.



7. Remove primary cover fasteners. ④



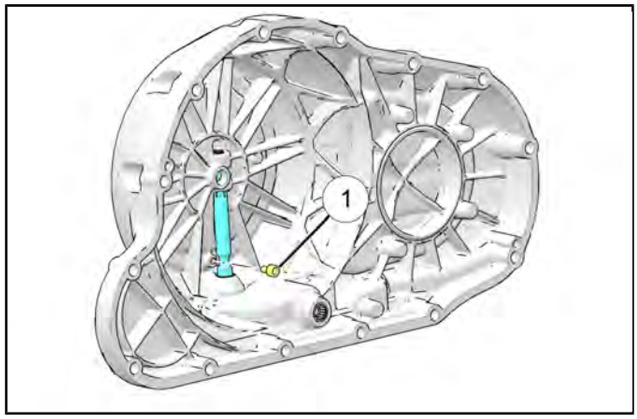
8. Tap cover with a soft face mallet to loosen.
9. Remove the shim ⑤ from the end of the shift shaft noting position for reassembly.



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CLUTCH PINION SHAFT REMOVAL

1. Remove the Primary Cover. See **Primary Cover Removal (2022) page 5.17**.
2. Remove pinion shaft fastener ①.



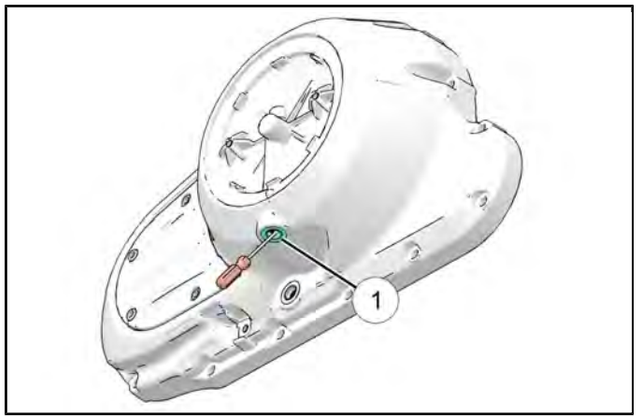
3. Slide the pinion shaft out through the bottom of the primary cover.

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.

CLUTCH PINION SHAFT SEAL REMOVAL & INSTALLATION

1. Remove clutch pinion shaft. See **Clutch Pinion Shaft Removal page 5.19**.
2. Carefully pry seal ① out of primary cover.

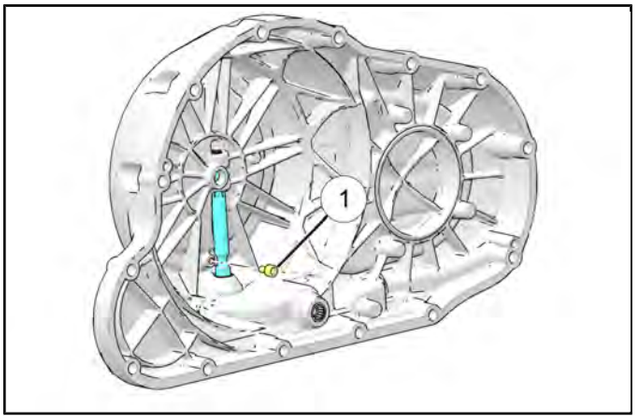


3. Lubricate outer edge of new seal with engine oil and sealing lip with grease.
4. Drive seal into place with a suitable driver.

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CLUTCH PINION SHAFT INSTALLATION

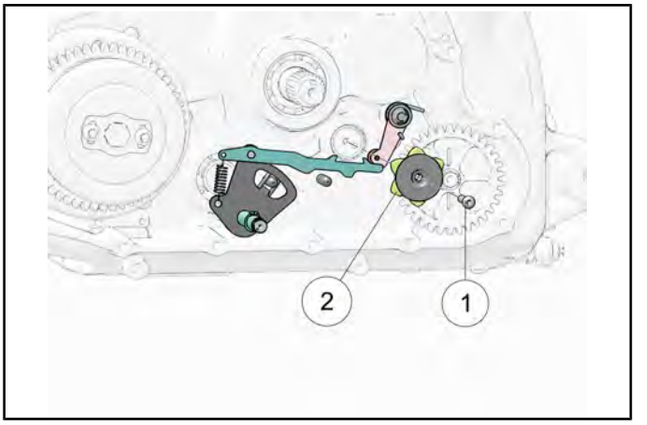
1. Lubricate and install clutch pinion shaft until fully seated in bearings.
2. Install pinion shaft fastener ①.



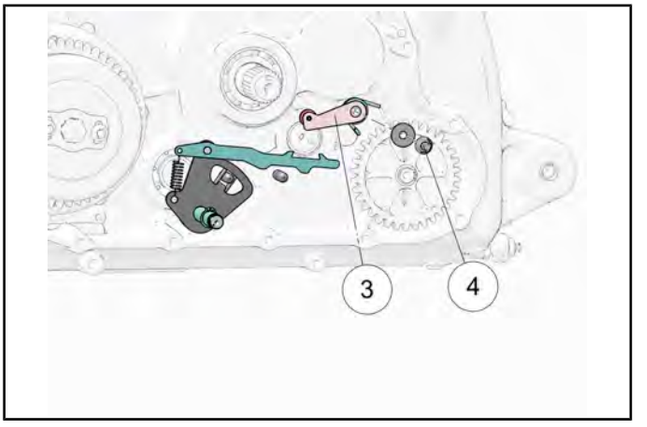
TORQUE
Pinion Shaft Fastener: **62 in-lbs (7 N·m)**

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 (2022) page 5.17**.
4. Remove clutch assembly. See **Clutch Removal page 5.29**.
5. Using a 4 mm hex wrench, remove the fastener ① securing the shift star ② to the shift drum and remove shift star.

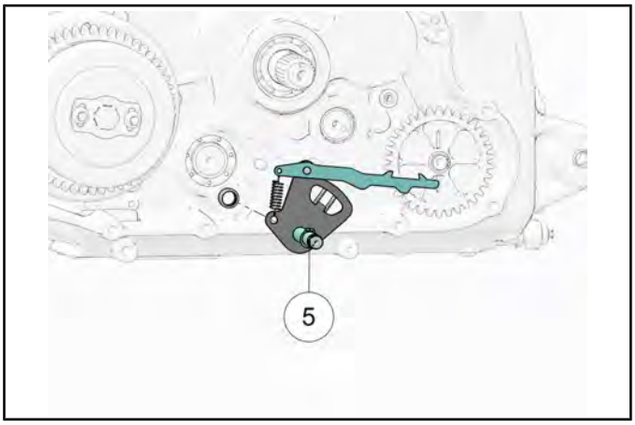


6. Rotate the detent lever ③ so the spring is relaxed. Using a 10 mm socket, remove the fastener ④ securing the detent lever to the engine case and remove lever.

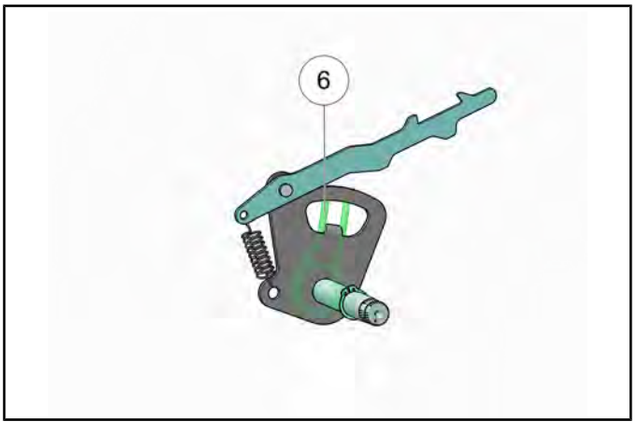


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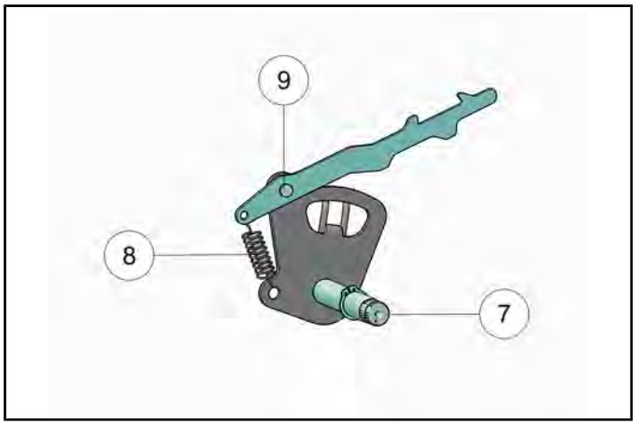
7. Pull the shift lever and spring assembly ⑤ out of the bore.



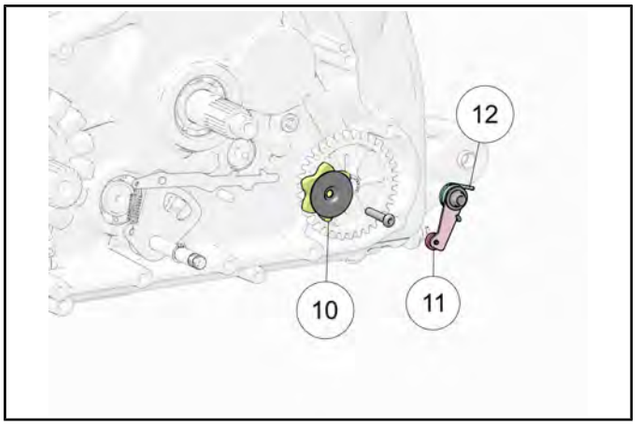
8. Inspect shift shaft return spring ⑥ for cracks or loss of tension. The spring should have enough tension to keep the shift shaft centered.



9. Inspect shift shaft ⑦ for wear or damage.
10. Inspect coil spring ⑧ for tension. The spring should apply enough tension on the shift ratchet mechanism to keep it engaged with the shift star.
11. Inspect fit of rivet ⑨ on shift ratchet assembly. It should allow for free movement, but not be excessively loose.



12. Inspect shift star ⑩ .
13. Inspect detent roller arm ⑪ for wear or damage.
14. Inspect spring ⑫ for cracks or fatigue.

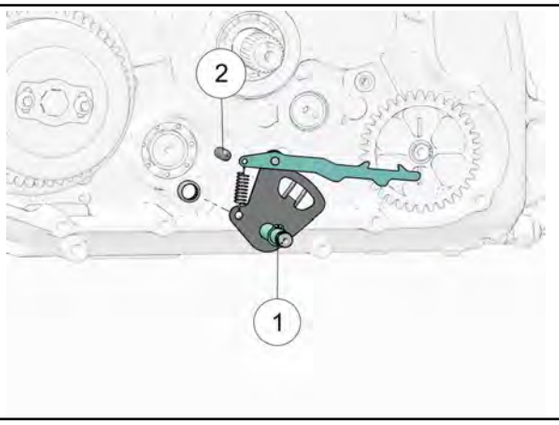


5

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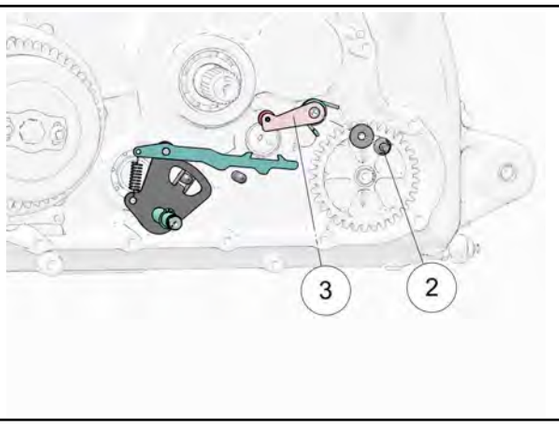
SHIFT RATCHET INSTALLATION

1. Lubricate shift shaft assembly ① with engine oil and slide into bearing until fully seated. Make sure that the spring pin ② is located between the return spring arms.



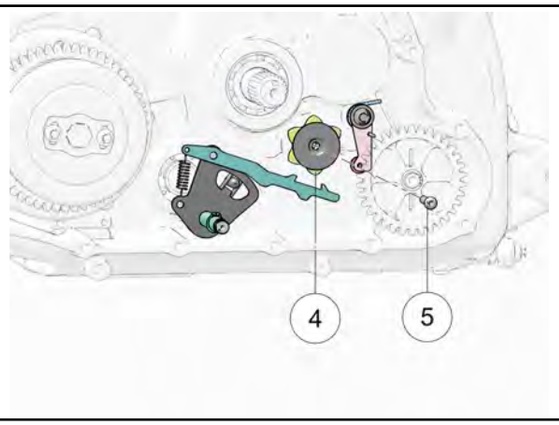
NOTICE
Be sure the washer is in place between the shift ratchet and the crankcase upon installation.

2. Apply Loctite 242 (Blue) to clean threads of detent roller fastener ②. Install detent roller arm ③ with spring. Torque fastener to specification.



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

3. Rotate the detent arm and ratchet arm out of the way and install the shift star ④ and shift star fastener ⑤. Torque fastener to specification.



4. Install clutch assembly. See **Clutch Installation page 5.33**.

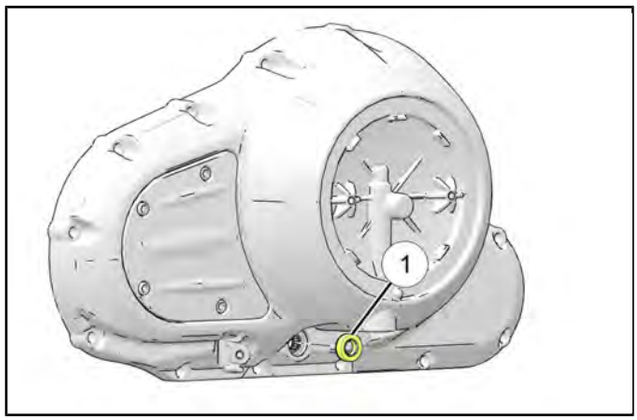
TORQUE
Shift Star Fastener: **88 in-lbs (10 N·m)**

5. Install the primary cover. See **Primary Cover Installation (2022) page 5.24**.

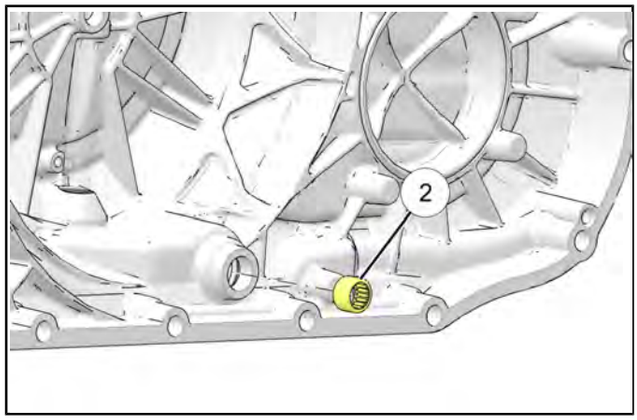
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SHIFT SHAFT BEARING & SEAL REPLACEMENT

1. Remove primary cover. See **Primary Cover Removal (2022) page 5.17**.
2. Carefully pry shift shaft seal ① from cover.



3. Using a suitable arbor and arbor press, press bearing ② from outside of cover to inside.



4. Apply assembly lube 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 (2022) page 5.24**.
9. After installing primary cover, be sure shift shaft returns freely to the centered position after rotating up or down.

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PRIMARY COVER INSTALLATION (2022)

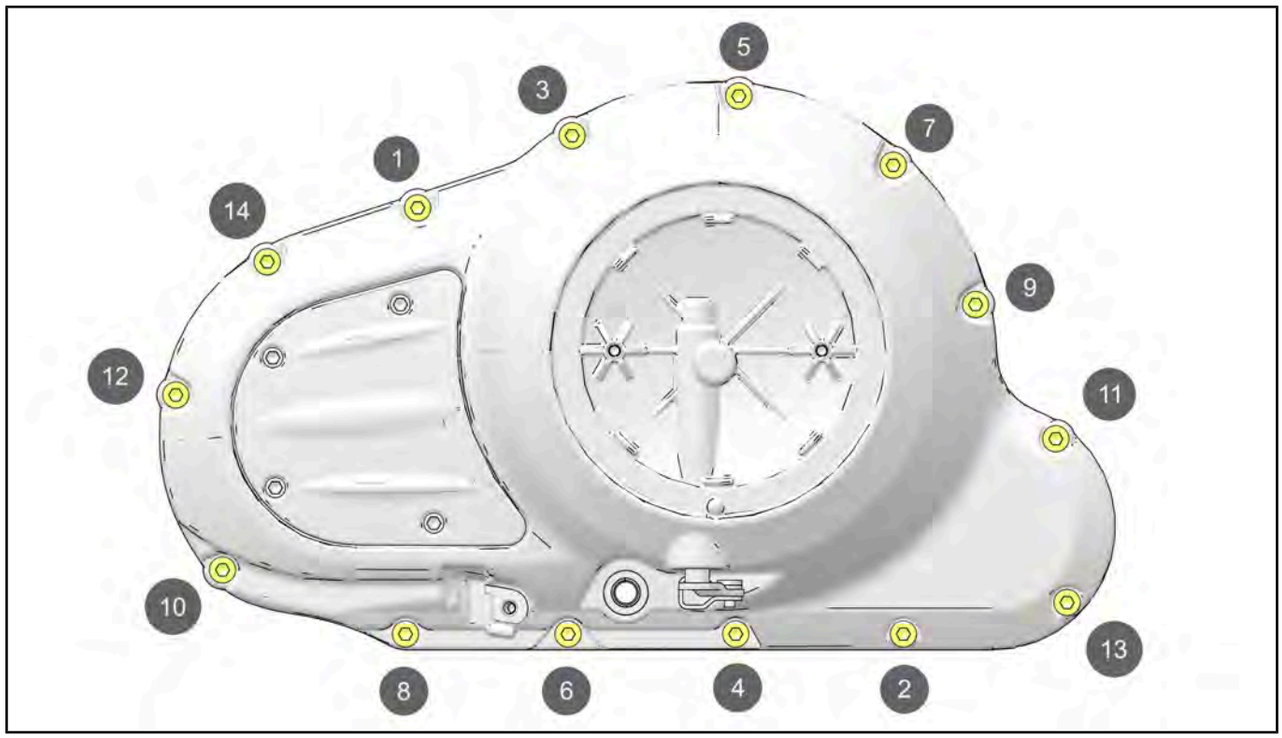
1. Clean gasket surfaces of crankcase and cover.
2. Install the thrust washer onto the shift shaft so it rests on snap ring .
3. Install a new primary cover gasket.
4. Apply a thin layer of grease to the shift shaft seal.
5. Install the primary cover so the clutch arm is angled correctly and install primary cover fasteners so they are finger tight.

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6. Torque the primary cover fasteners to specification following the torque sequence.

TORQUE
Primary Cover Fasteners: **177 in-lbs (20 N·m)**

Primary Cover Torque Sequence



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PRIMARY COVER INSTALLATION (2023)

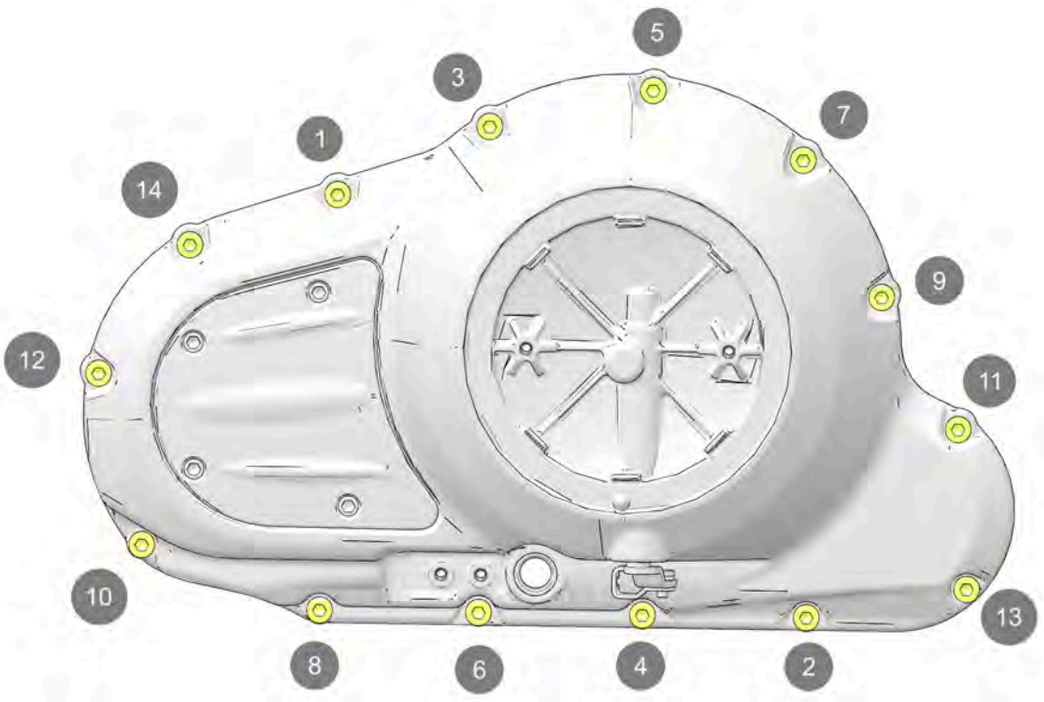
1. Clean gasket surfaces of crankcase and cover.
2. Install the thrust washer onto the shift shaft so it rests on snap ring .
3. Install a new primary cover gasket.
4. Apply a thin layer of grease to the shift shaft seal.
5. Install the primary cover so the clutch arm is angled correctly and install primary cover fasteners so they are finger tight.

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6. Torque the primary cover fasteners to specification following the torque sequence.

TORQUE
Primary Cover Fasteners: **177 in-lbs (20 N·m)**

Primary Cover Torque Sequence

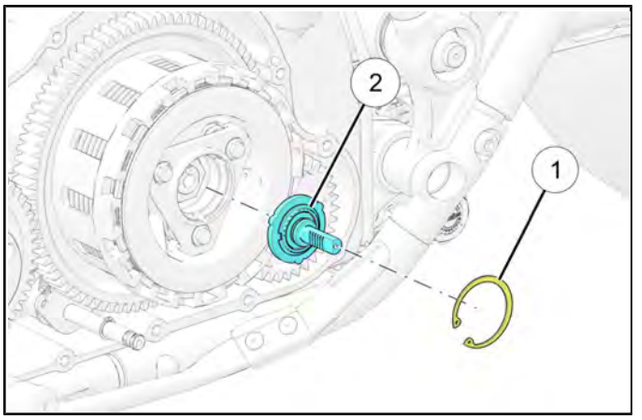


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CLUTCH SERVICE (2022)

CLUTCH RACK, REMOVAL / INSTALLATION

1. Using an internal snap ring pliers, remove snap ring ① and clutch rack ②.

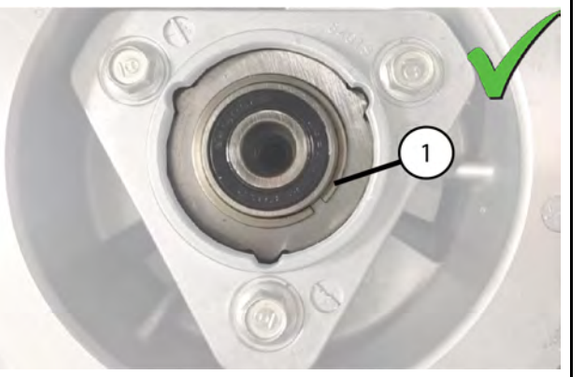


2. **INSTALLATION:** Reverse the removal procedure to install.

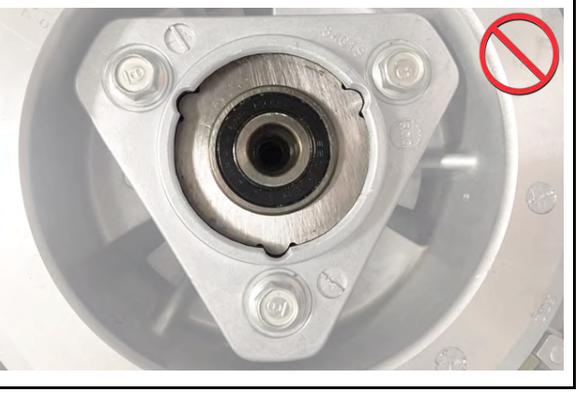
⚠ CAUTION

The clutch rack is to be installed with the snap ring facing outward only. Failure to correctly install the clutch rack will cause improper operation.

CORRECT
Snap ring ① is facing outward.



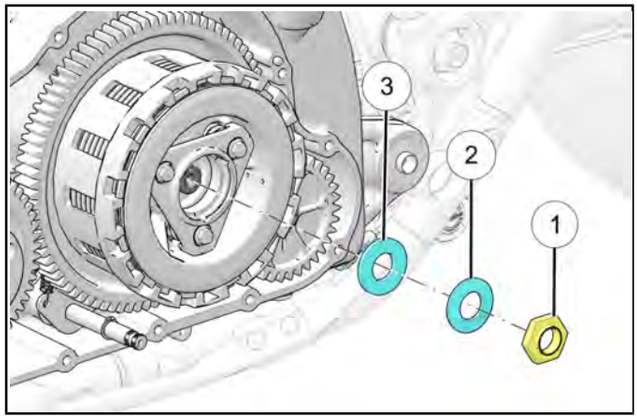
INCORRECT
Snap ring is facing inward.



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CLUTCH REMOVAL

1. Remove primary cover. See **Primary Cover Removal (2022) page 5.17**.
2. Remove clutch rack. See **Clutch Rack, Removal / Installation page 5.28**.
3. Remove clutch nut ① , Belleville washer ② , and flat washer ③. Discard the clutch nut.



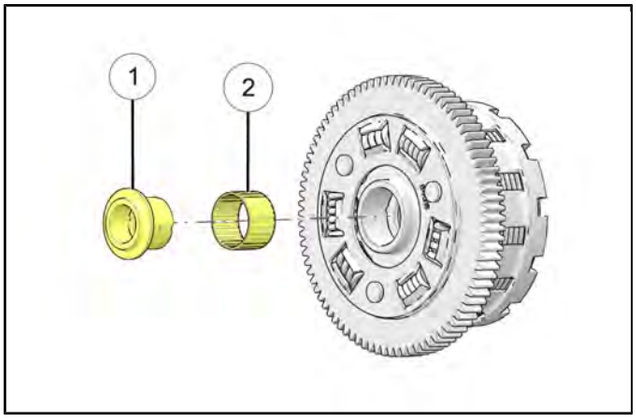
4. Remove clutch assembly from clutch shaft.
5. A new clutch nut must be installed upon assembly.

CLUTCH DISASSEMBLY

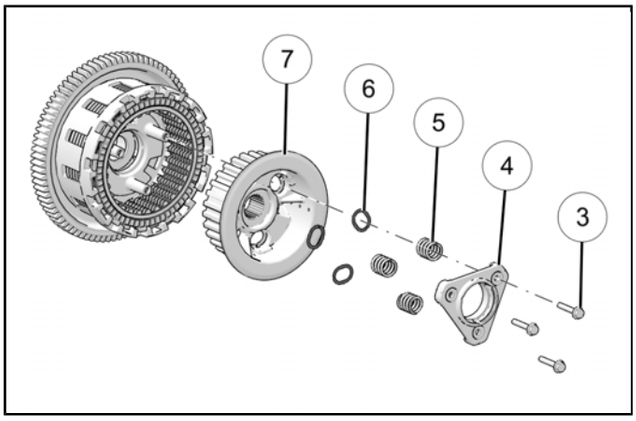
⚠ CAUTION

Clutch is under spring pressure. WEAR EYE PROTECTION.

1. Remove the clutch. See **Clutch Removal page 5.29**.
2. Remove the sleeve ① and needle bearing ② from the back side of the clutch assembly.



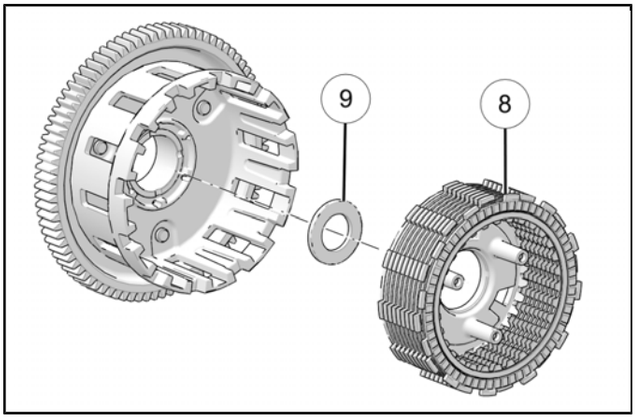
3. With the clutch assembly resting on a clean, flat work surface, alternately loosen the pressure plate fasteners ③ evenly until spring tension has relaxed.



4. Remove stopper plate ④.
5. Remove springs ⑤ and clutch seat springs ⑥.
6. Remove clutch hub ⑦.

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7. Lift clutch assembly ⑧ out of basket and set aside



8. Remove washer ⑨.
9. Remove the friction and steel discs from the clutch assembly as well as the judder springs.

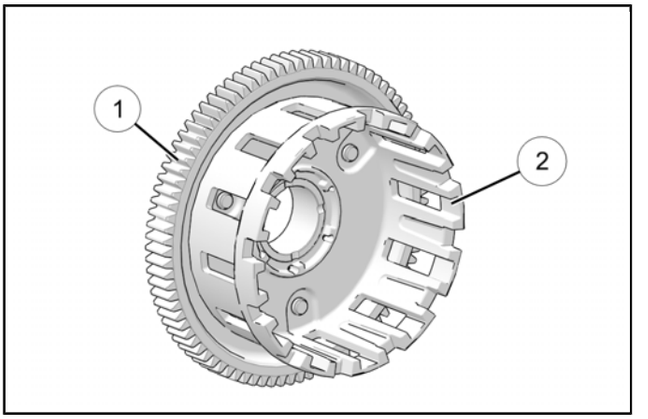
IMPORTANT
Keep friction and steel disc organized for reinstallation.

CLUTCH INSPECTION

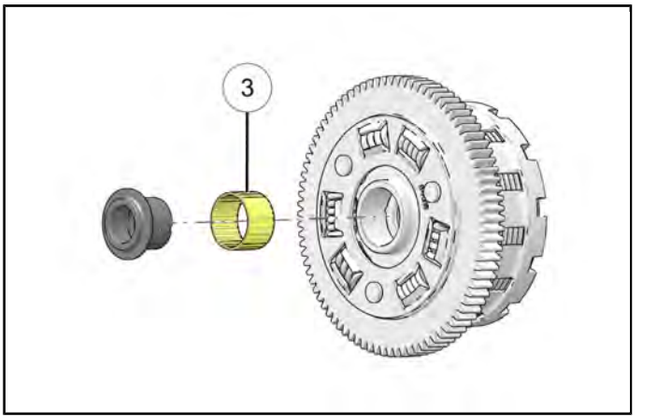
1. Clean clutch plates, inner hub, and outer basket.

Clutch Basket

2. 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.
6. Lubricate bearing ③ with engine oil.

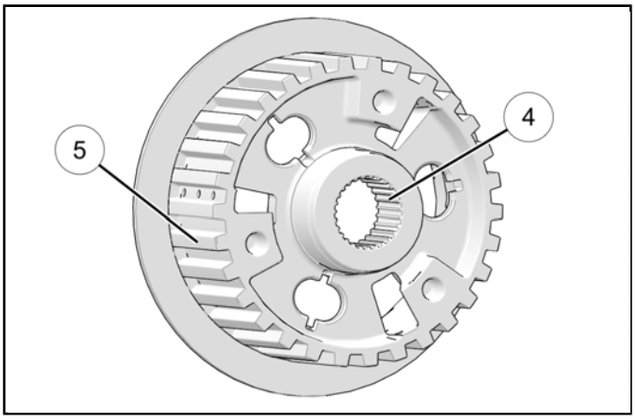


Clutch Hub

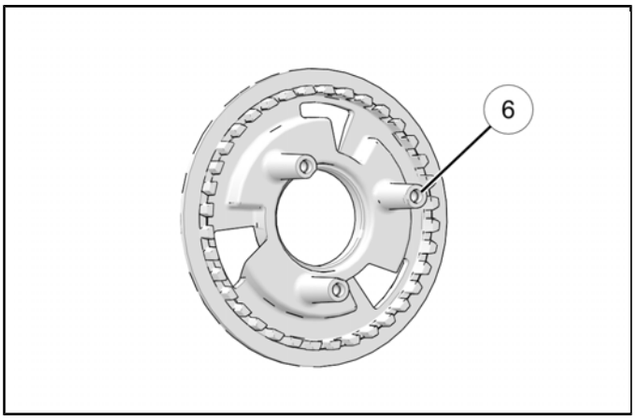
7. Inspect spline teeth ④ for wear, cracks or damage.

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8. Inspect surface of steel plate guides ⑤ on outer edge of hub for wear, grooves, or damage.



9. Check all posts ⑥ of stopper plate for cracks or damage.



10. Inspect ramps on both inner and outer hubs for damage.
11. 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.
12. 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)**

13. 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)** **Clutch Pressure Plate**

14. Inspect pressure plate for cracks, scoring, or wear on friction surface.

Clutch Springs

15. Inspect clutch springs for cracks or distortion.

Clutch Release Rack and Bearing

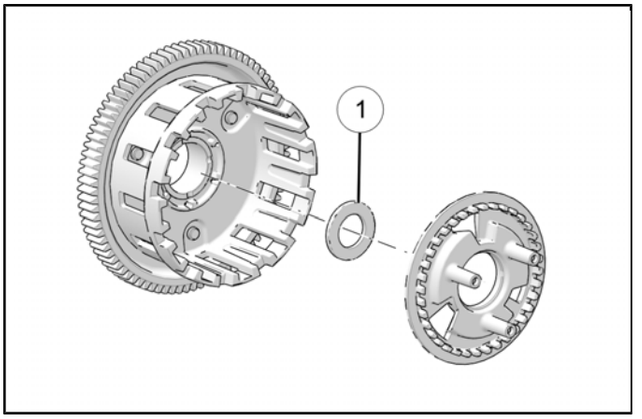
NOTICE
Clutch rack is serviceable as an assembly only.

16. Inspect clutch rack for broken or damaged teeth.
17. 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.
18. Replace clutch rack assembly if necessary.

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CLUTCH ASSEMBLY

1. Install the thrust washer ① and the pressure plate into the clutch basket.



2.

NOTICE

Refer to the Clutch Assembly View outlined in this chapter for clutch plate and judder spring orientation. See Clutch (2022) page 5.14.

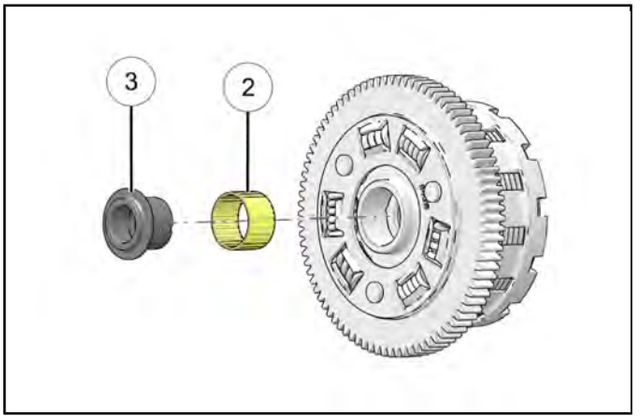
NOTICE

Judder spring must be installed with concave side facing UP (toward outside of clutch). The tallest edge of spring will be outermost.

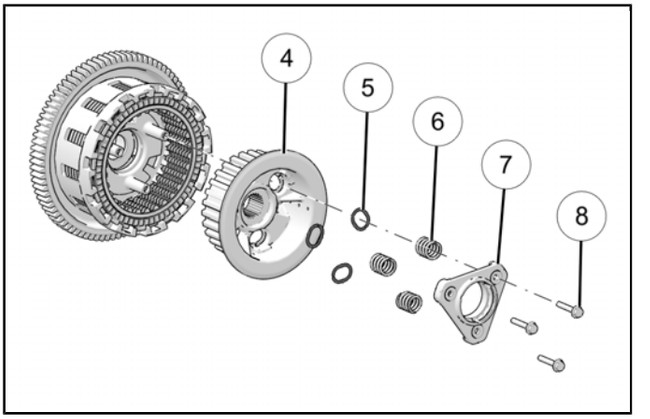
NOTICE

If friction plates are new, soak them in clean engine oil for a few minutes before installing.

3. Install the hub bearing ② and sleeve ③ into the clutch assembly.



4. Install clutch hub ④.



5. Install clutch spring seats ⑤ and springs ⑥.
6. Install stopper plate ⑦ and fasteners ⑧. Alternately tighten stopper plate fasteners until fully seated.

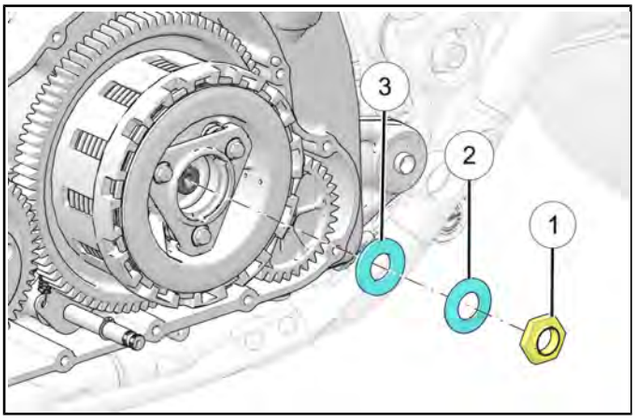
TORQUE
Stopper Plate Fastener: **62 in-lbs (7 N·m)**

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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. Install washer ③ , **a new spring washer ② and a new stake nut ① .**



2. Lock the crankshaft. See **Locking the Crankshaft for Service page 3.37**
3. Torque the stake nut to specification.

TORQUE
Clutch Stake Nut: **125 ft-lbs (170 N·m)**

4. Install clutch rack assembly. See **Clutch Rack, Removal / Installation page 5.28**.
5. Install primary cover. See **Primary Cover Installation (2022) page 5.24**.
6. Check engine oil and fill to proper level.

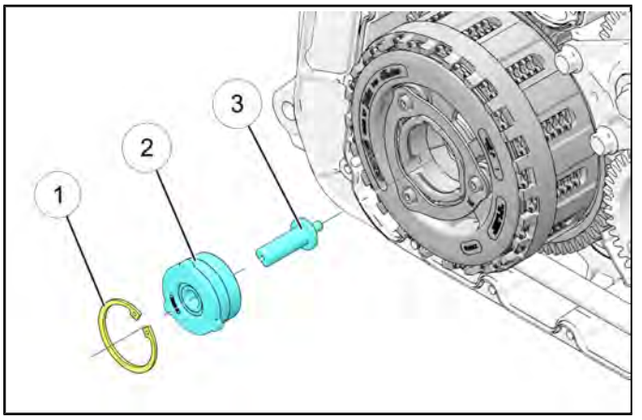
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CLUTCH SERVICE (2023)

CLUTCH RACK, REMOVAL / INSTALLATION (2023)

REMOVAL

1. Remove primary cover. See **Primary Cover Removal (2023) page 5.18**.
2. Using an internal snap ring pliers, remove snap ring ①, clutch rack ②, and lift rack ③.



INSTALLATION

1. Install the clutch rack and lift rack.

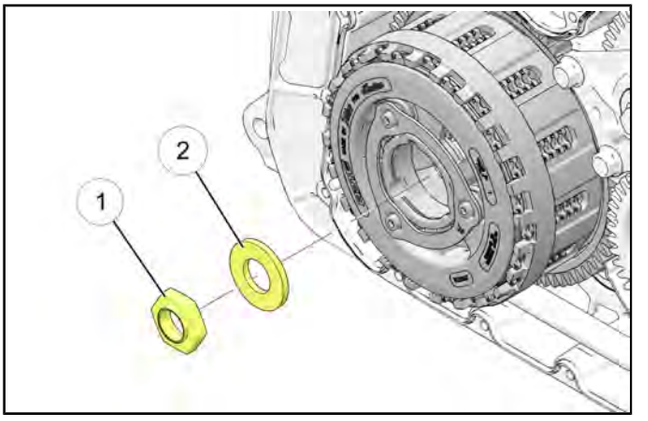
⚠ CAUTION

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 to retain clutch rack.

CLUTCH REMOVAL

1. Remove primary cover. See **Primary Cover Removal (2023) page 5.18**.
2. Remove clutch rack. See **Clutch Rack, Removal / Installation (2023) page 5.34**.
3. Perform the crankshaft locking procedure. See **Locking the Crankshaft for Service page 3.37**.
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.

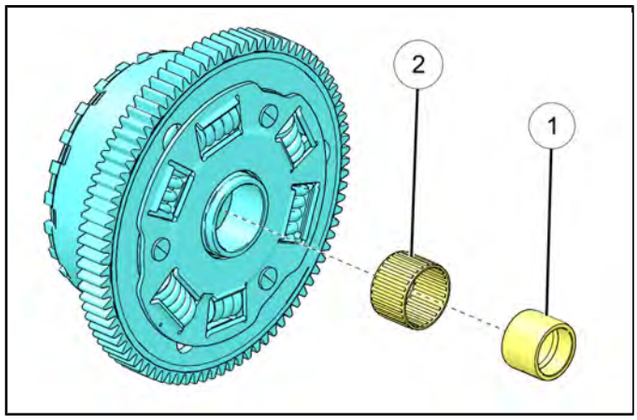
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CLUTCH DISASSEMBLY

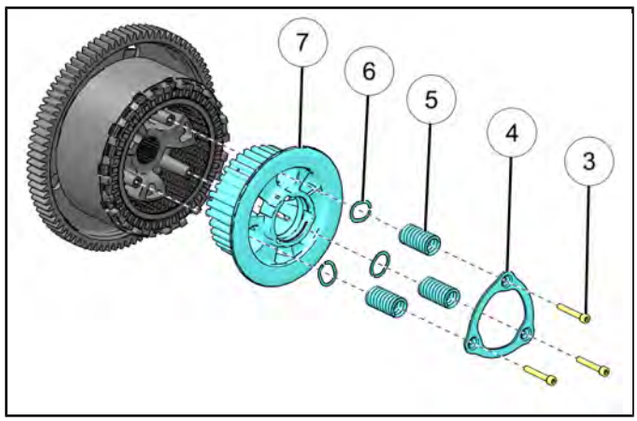
⚠ CAUTION

Clutch is under spring pressure. WEAR EYE PROTECTION.

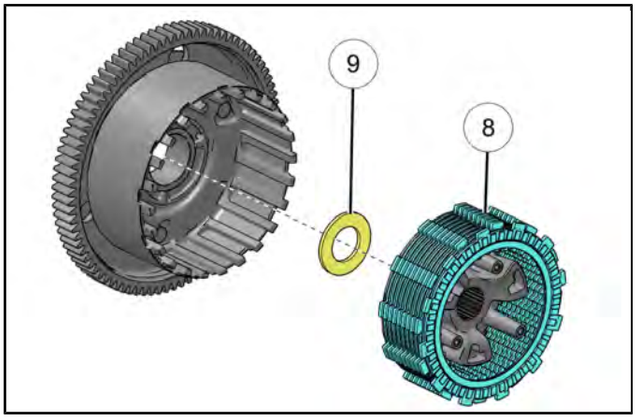
1. Remove the clutch. See **Clutch Removal page 5.34**.
2. Remove the sleeve ① and needle bearing ② from the back side of the clutch assembly.



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.



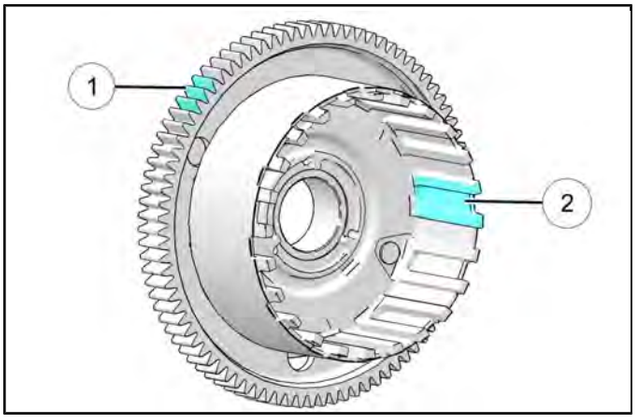
8. Remove thrust washer ⑨.

5

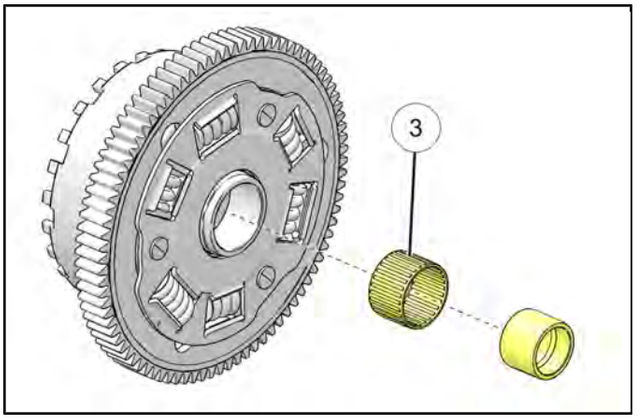
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CLUTCH INSPECTION

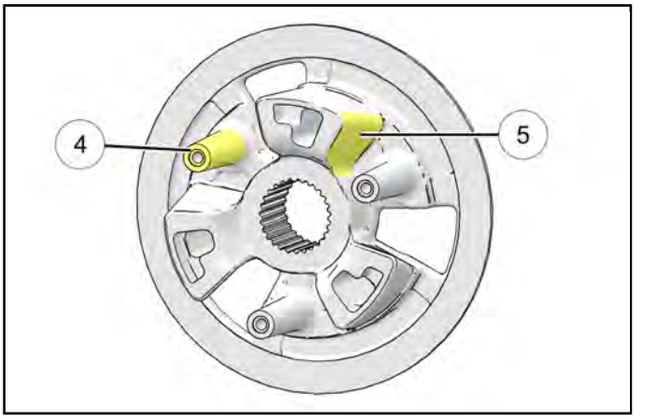
1. Clean clutch plates, inner hub, and outer basket.
2. **Clutch Basket** Inspect clutch gear teeth ① for wear, cracks or damage.
3. Inspect inside surfaces ② of basket for cracks or wear (grooves) from clutch plates.



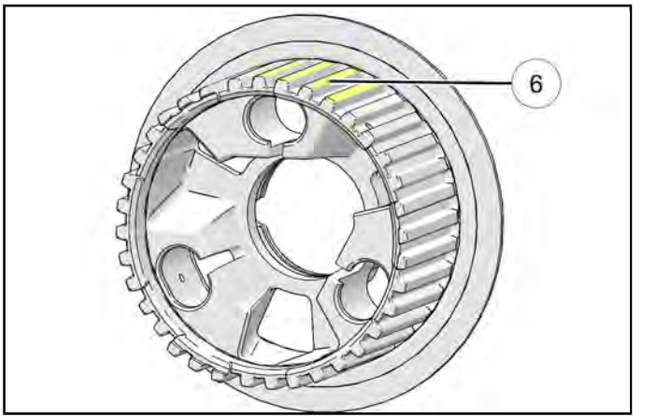
4. Replace parts that fail inspection
5. Rotate hub bearing. Check for smooth rotation. Inner race should have no detectable radial movement.
6. Lubricate bearing ③ with engine oil.



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)**

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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

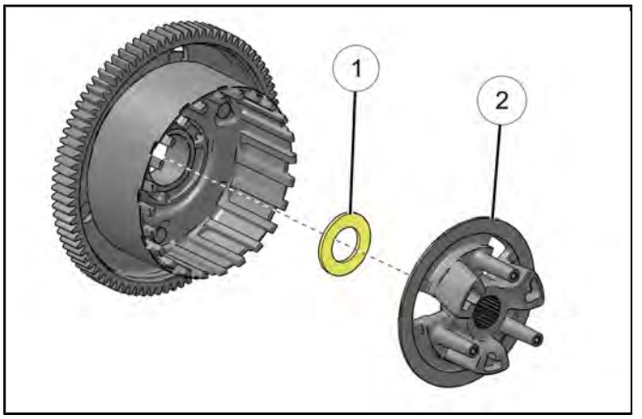
NOTICE
Clutch rack is serviceable as an assembly only.

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.

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CLUTCH ASSEMBLY

1. Install the thrust washer ① and the clutch hub ② into the clutch basket.

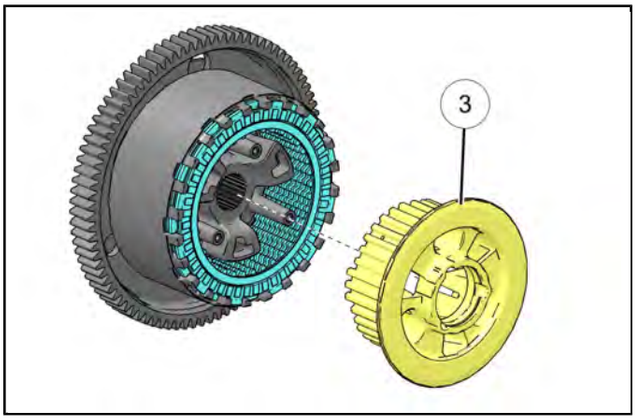


Refer to the Clutch Assembly View outlined in this chapter for clutch plate orientation. See Clutch (2023) page 5.16 .

NOTICE

If friction plates are new, soak them in clean engine oil for a few minutes before installing.

2. Install pressure plate ③.

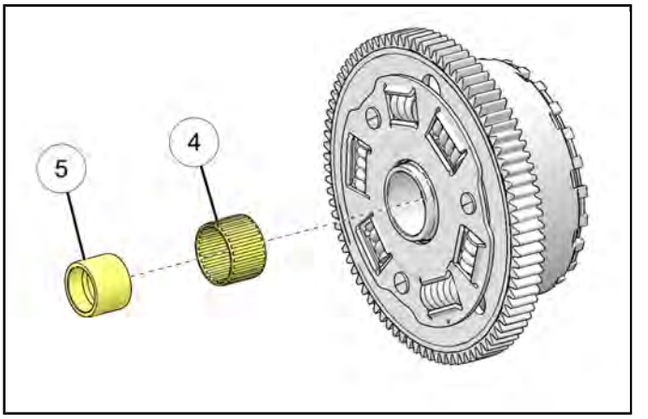


NOTICE

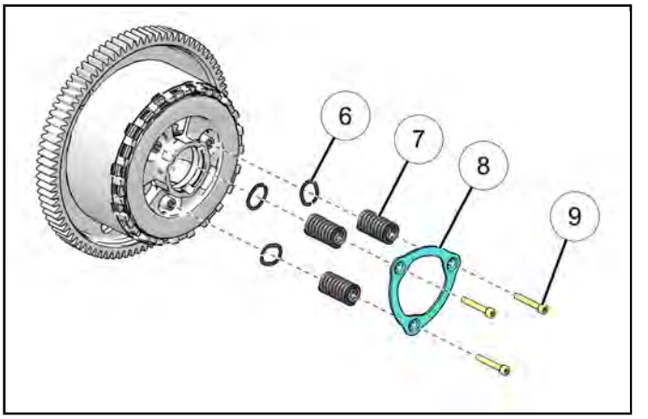
Use care while installing to prevent damage to friction plates and separator plates

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)

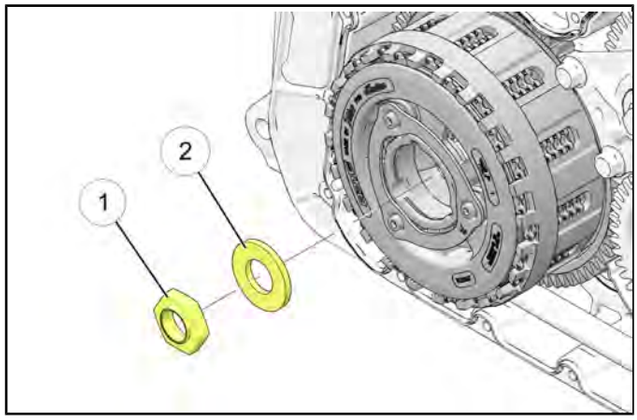
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CLUTCH INSTALLATION

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)**



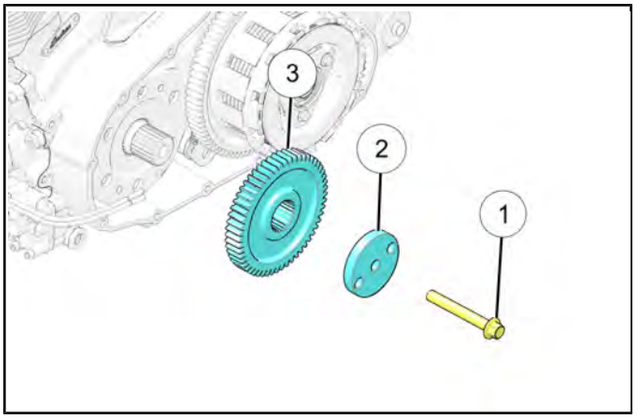
3. Stake the nut.
4. Install clutch rack. See **Clutch Rack, Removal / Installation (2023) page 5.34**.
5. Install primary cover. See **Primary Cover Installation (2023) page 5.26**.

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PRIMARY DRIVE GEAR SERVICE

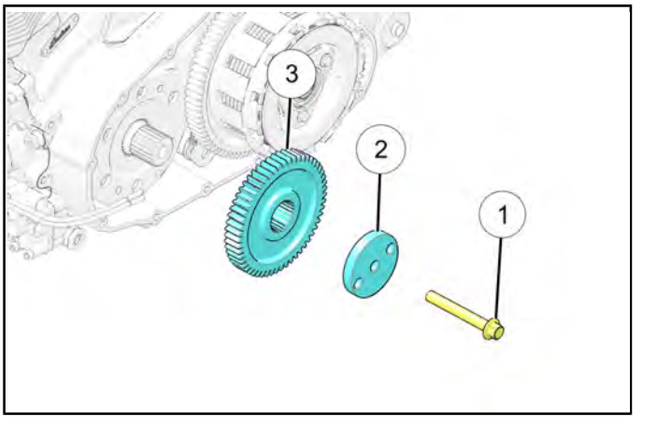
PRIMARY DRIVE GEAR REMOVAL

1. Remove primary cover. See **Primary Cover Removal (2022) page 5.17**.
2. Remove the primary drive gear fastener ① , cold test adapter ② , and primary drive gear ③ from the crankshaft.

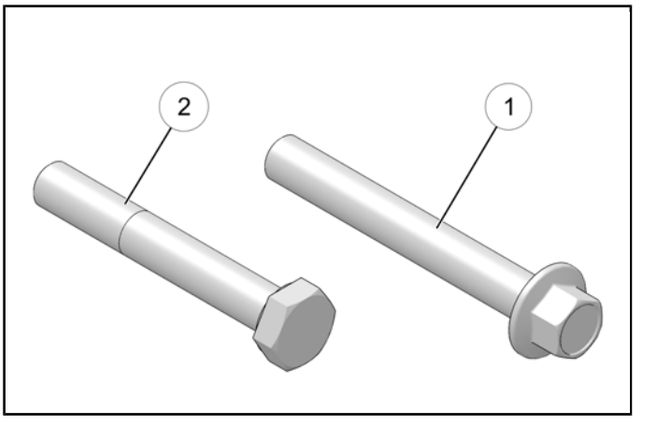


PRIMARY DRIVE GEAR INSTALLATION

1. Apply engine oil to shaft splines before installation.
2. Install the primary drive gear ③ to the crankshaft.



3. Install cold test adapter ②.
4. Apply Loctite 262 to primary drive gear fastener and torque to specification.



TORQUE
① Primary Drive Gear Fastener (2022): **50 ft-lbs (68 N·m) + 38°**

TORQUE
② Primary Drive Gear Fastener (2023+): **83 ft-lbs (112 N·m)**

5. Install primary cover. See **Primary Cover Installation (2022) page 5.24**.
6. Fill engine oil to proper level.

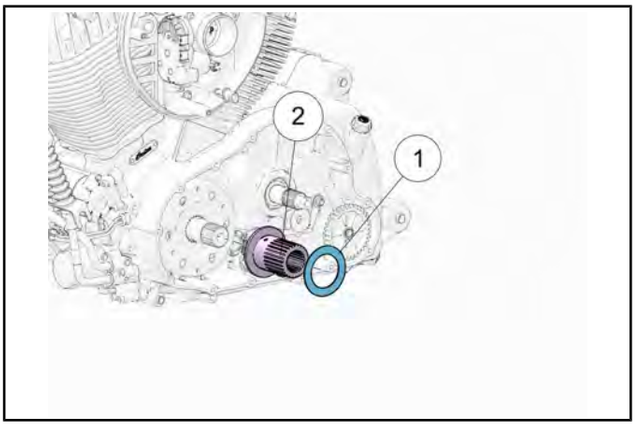
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FLYWHEEL REMOVAL

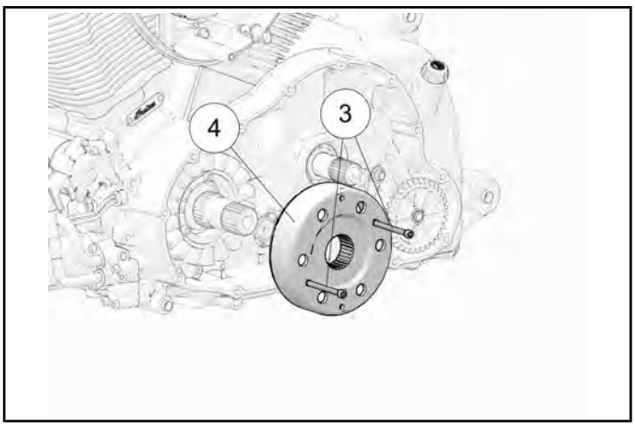
⚠ WARNING

The flywheel contains powerful magnets. Use caution when lifting flywheel off of stator to avoid personal injury.

1. Remove primary cover. See **Primary Cover Removal (2022) page 5.17Primary Cover Removal (2023) page 5.18**.
2. Remove clutch assembly. See **Clutch Removal page 5.29**.
3. Remove Primary Drive Gear. See **Primary Drive Gear Removal page 5.40**.
4. Remove thrust washer ① and compensator sleeve ② (2017 models).



5. Thread two primary cover fasteners ③ into threaded holes on flywheel ④.



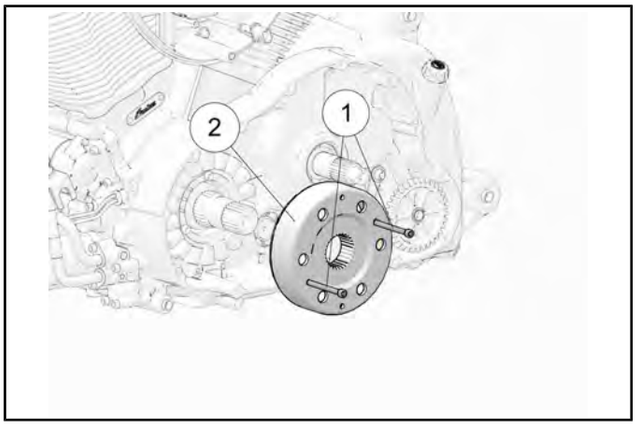
6. Grasp the two fasteners and lift the flywheel off of the stator.

FLYWHEEL INSTALLATION

⚠ CAUTION

The flywheel contains powerful magnets. Use caution when installing flywheel onto crankshaft to avoid personal injury.

1. Clean rotor and crankshaft thoroughly.
2. Thread two primary cover fasteners ① into the flywheel ② and install onto crankshaft.



3. Install Primary Drive Gear. See **Primary Drive Gear Installation page 5.40**.
4. Install clutch assembly. See **Clutch Installation page 5.39**.
5. Install primary cover. See **Primary Cover Installation (2022) page 5.24 Primary Cover Installation (2023) page 5.26**.
6. Check engine oil and add as necessary. See **Engine Oil Level Check page 2.9**

5

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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 binding	Clutch cable / clutch cable bracket	Inspect / Adjust / Lubricate
Clutch Slips	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
	Incorrect clutch cable adjustment	clutch cable / Clutch	Adjust clutch cable freeplay
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
	Incorrect clutch cable adjustment	Clutch	Adjust

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PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Transmission Will Not Shift	Broken shift drum	Shift drum	Replace shift drum
	Bent shift forks	Shift fork	Replace shift forks
	Worn shift drum	Shift drum	Replace shift drum
	Broken gears	Transmission gears	Replace broken gear(s)
	Damaged/broken bearings	Transmission, shift cam bearings	Replace bearings that fail inspection
	Worn gear shift pawl ratchet mechanism	Shift pawl mechanism	Replace parts that fail inspection
	Broken or dislodged shift shaft return spring	Shift shaft return spring	Repair or replace
	Roller detent arm stuck	Roller detent arm	Repair or replace parts
	Bent shift shaft (internal)	Shift shaft	Repair or replace
	External shift linkagebinding or damaged	External shift linkage	Repair or replace
	Bent or distorted shift forks	Shift fork	Replace
	Bent or distorted shift fork rails	Shift fork rail	Replace
	Broken transmission components	Transmission components	Repair or replace
Transmission Hard to Shift	Improper clutch operation	Clutch	Inspect, repair
	Incorrect oil viscosity	Oil quality	Replace engine oil
	Incorrect clutch cable adjustment	-	Adjust
	Shift shaft damaged	Shift shaft components	Repair or replace
	Sticking pivot point, bent external shift linkage	External shift linkage	Repair or replace
	Bent or distorted shift forks	Shift forks	Replace
	Damaged shift drum grooves	Shift drum	Repair or replace
	Shift detent plunger stuck	Shift detent plunger	Repair or replace
	Bent/binding shift fork rails	Shift fork rails	Repair or replace
Transmission Jumps Out of Gear	Broken / loose stop pin	Shift stop pin	Replace
	Worn shift drum or shift drum ratchet	Shift drum or shift linkage	Replace
	Broken shift return spring	Shift return spring	Replace
	Damaged shift drum grooves	Shift drum	Replace
	Bent or worn shift forks	Shift forks	Replace
	Bent/binding shift fork rails	Shift fork rails	Replace
	Worn engagement dogs on transmission gears	Transmission gears	Replace
Transmission Noise	Drive belt tension incorrect	Drive belt	Adjust or replace
	Clutch plates bind or drag when clutch is disengaged	Clutch plates / hubs	Adjust / repair / replace
	Gear/bearing wear/damage	Transmission components	Inspect / replace

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NOTES

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CHAPTER 6
TRANSMISSION / CRANKSHAFT

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GENERAL INFORMATION

SERVICE NOTES

- Remove engine from frame to service internal transmission and/or crankshaft components. See ENGINE REMOVAL / INSTALLATION.
- The crankcase must be separated to access internal transmission components and crankshaft.
- Label and store parts neatly to speed the assembly process and ensure that matched parts like connecting rods, camshafts and bearings and pushrods can be installed in their original location
- Crankshaft main bearing replacement requires line boring. This procedure requires full machine shop capabilities and specialized knowledge. It is recommended that a qualified machine shop perform this procedure if it becomes necessary or replace the crankcase assembly
- Crankshafts and connecting rods are color coded for manufacturing tolerances with a white or red paint mark (or stamped “R” or W”).
- All torque specifications are "dry" unless specified for oil or locking agent. Refer to exploded views
- When locking agents are required, use Loctite® Primer N to clean fastener before applying locking agent Primer N reduces cure time of thread locking agent in addition to preparing the surfaces

SPECIAL TOOLS - TRANSMISSION / CRANKSHAFT

TOOL DESCRIPTION	PART NUMBER
Case Splitting / Assembly Tool	PF-51234
Clutch Shaft Holding Tool	PF-51232
Crankshaft Locking Pin	PF-52135
Crankshaft Rotation Socket	PF-51239
Drive Sprocket Seal Installer	PF-51243
Engine Stand Adapter	PF-51240

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

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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	.22 - .42 mm (.0087 - .0165")	.65 mm (.025")
	Connecting Rod Bearing to Crankshaft Oil Clearance	.0254 - .0635 mm (.001 - .0025")	.11 mm (.0043")
	Connecting Rod Small End I.D.	22.01 - 22.02 mm (.8665 - .8670")	22.09 mm (.8694")
	Connecting Rod Width	21.01 - 21.11 mm (.8271 - .8310")	20.76 mm (.8173")
	Connecting Rod Big End I.D. (White)	54.992 - 55.000 mm (2.1650 - 2.1653")	55.030 mm (2.1665")
	Connecting Rod Big End I.D. (Red)	55.000 - 55.008 mm (2.1653 - 2.1656")	55.038 mm (2.1668")
Crankshaft Main Bearing / Rod Journals	Connecting Rod Journal Width	42.42 - 42.50 mm (1.670 - 1.673")	43.46 mm (1.711")
	Crankshaft Rod Journal O.D. (White)	51.9920 - 51.9999 mm (2.0469 - 2.0472")	51.9620 mm (2.0457")
	Crankshaft Rod Journal O.D. (Red)	52.0000 - 52.0080 mm (2.0472 - 2.0475")	51.970 mm (2.0460")
	Main Bearing Oil Clearance	Left .013 - .060 mm (.0005 - .0023") Right .014 - .061mm (.0005 - .0024")	.10 mm (.004")
	Left Main Bearing Journal O.D.	59.9523 - 59.9703 mm (2.3603 - 2.3610")	59.9323 mm (2.3595")
	Right Main Bearing Journal O.D.	64.9523 - 64.9703 mm (2.5571 - 2.5578")	64.9273 mm (2.5561")
	Crankshaft End Play	0.080–0.450 mm (0.003–0.018")	
Balance Shaft	Journal O.D., Left (Primary Side) / Journal O.D., Right (Cam Side)	24.980 - 24.992 mm / 24.969 - 24.979 mm	-

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TRANSMISSION SPECIFICATIONS

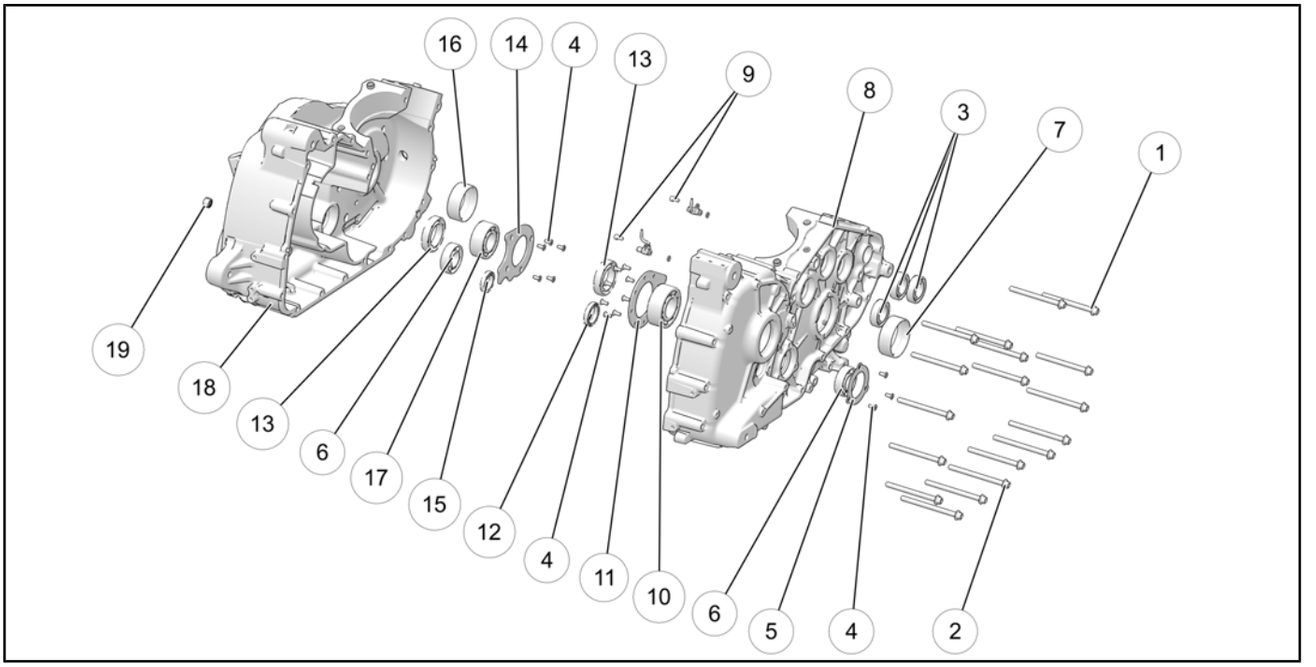
ITEM	PART SPECIFIC	STANDARD	SERVICE LIMIT
Shift Fork	Shift Fork I.D. (Rail)	12.00 - 12.026 mm (.4725 - .4732")	12.05 mm (.4744")
	Shift Fork Pin O.D.	6.036 - 6.136 mm (.2376 - .2416")	6.02 mm (.2370")
Shift Fork Rail	Shift Fork Rail O.D.	11.948 - 11.972 mm (.4704 - .4713")	11.92 mm (.4693")
	Shift Fork 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	2.2: 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	0.94: 1
	Gear Ratio: 6th Gear (Overdrive)	0.81: 1

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ASSEMBLY VIEWS

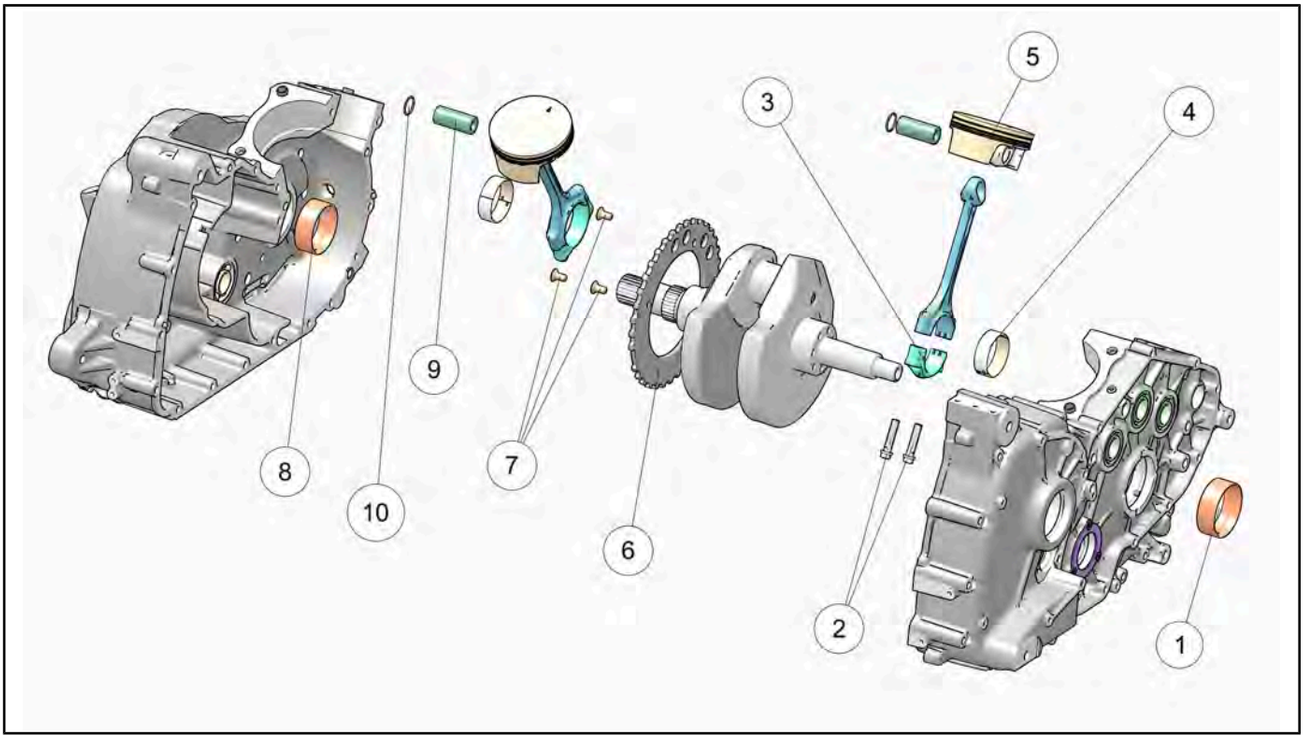
CRANKCASE



ITEM	DESCRIPTION	TORQUE
①	Fastener, Crankcase — M8 x 1.25 x 100	**22 ft-lbs (30 N·m)**
②	Fastener, Crankcase — M8 x 1.25 x 110	**22 ft-lbs (30 N·m)**
③	Bearing, Camshaft	—
④	Fastener, Bearing Retainer – M5 x 0.8 x 12	**65 in-lbs (7.3 N·m)**
⑤	Retainer Plate, Bearing	—
⑥	Bearing, Balance Shaft	—
⑦	Bearing, Crankshaft (Camshaft Side) — Non-Serviceable	—
⑧	Crankcase, RH	—
⑨	Fastener, Piston Cooling Jet — M5 x 0.8 x 10	**62 in-lbs (7 N·m)**
⑩	Bearing, Transmission Output Shaft	—
⑪	Retainer Plate, Bearing	—
⑫	Bearing, Shift Drum	—
⑬	Bearing, Transmission Input Shaft	—
⑭	Retainer Plate, Bearing	—
⑮	Bearing, Shift Drum	—
⑯	Bearing, Crankshaft (Primary Side) — Non-Serviceable	—
⑰	Bearing, Transmission Input Shaft	—
⑱	Crankcase, LH	—
⑲	Bearing, Shift Shaft	—

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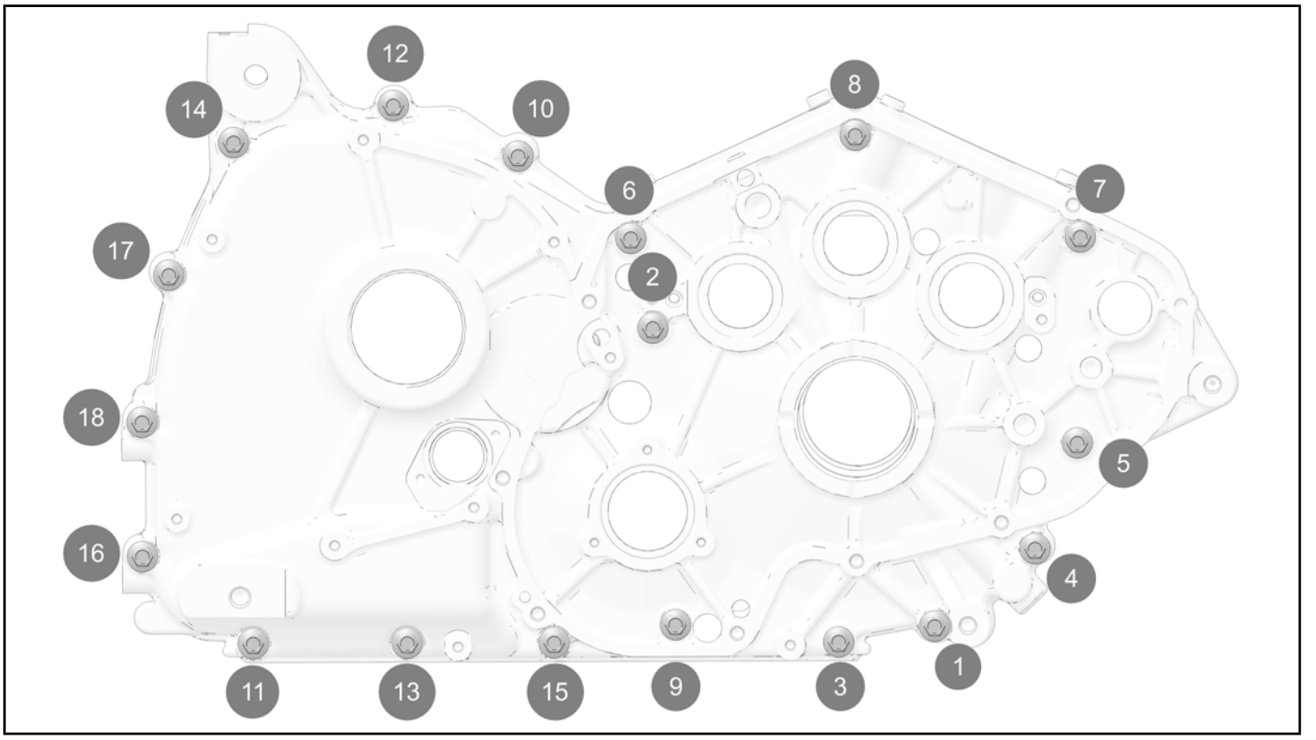
CRANKSHAFT



ITEM	DESCRIPTION	TORQUE
①	Bearing, Crankshaft Main (RH) — Non-Serviceable	—
②	Fastener, Connecting Rod Bearing Cap (QTY.4)	**22 ft-lbs (30 N·m) + 90°**
③	Bearing Caps, Connecting Rod	—
④	Bearings, Connecting Rod (big end)	—
⑤	Piston	—
⑥	Tone Ring, Crankshaft Position Sensor — Non-Serviceable	—
⑦	Fastener, Tone Ring - M8 x 1.25 x 16 (QTY.3)	—
⑧	Bearing, Crankshaft Main (LH) — Non-Serviceable	—
⑨	Wrist Pin, Piston	—
⑩	Circlip, Wrist Pin	—

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CRANKCASE FASTENER LENGTH AND TORQUE PATTERN



NOTICE
Items 1, 3, 4, 11, 13 & 15 use Long fasteners. All other items use Short fasteners.

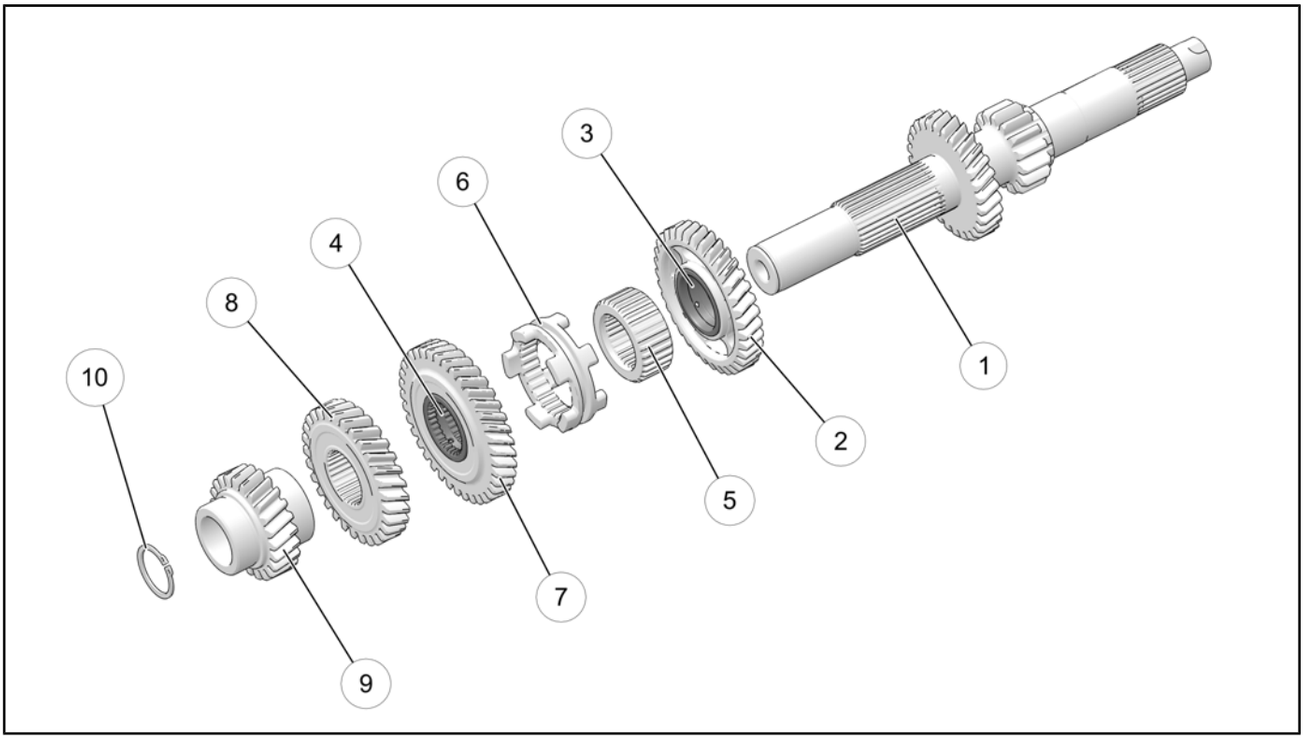
Torque case fasteners to specification following the torque sequence.

TORQUE
Crankcase Fasteners: **22 ft-lbs (30 N·m)**

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TRANSMISSION

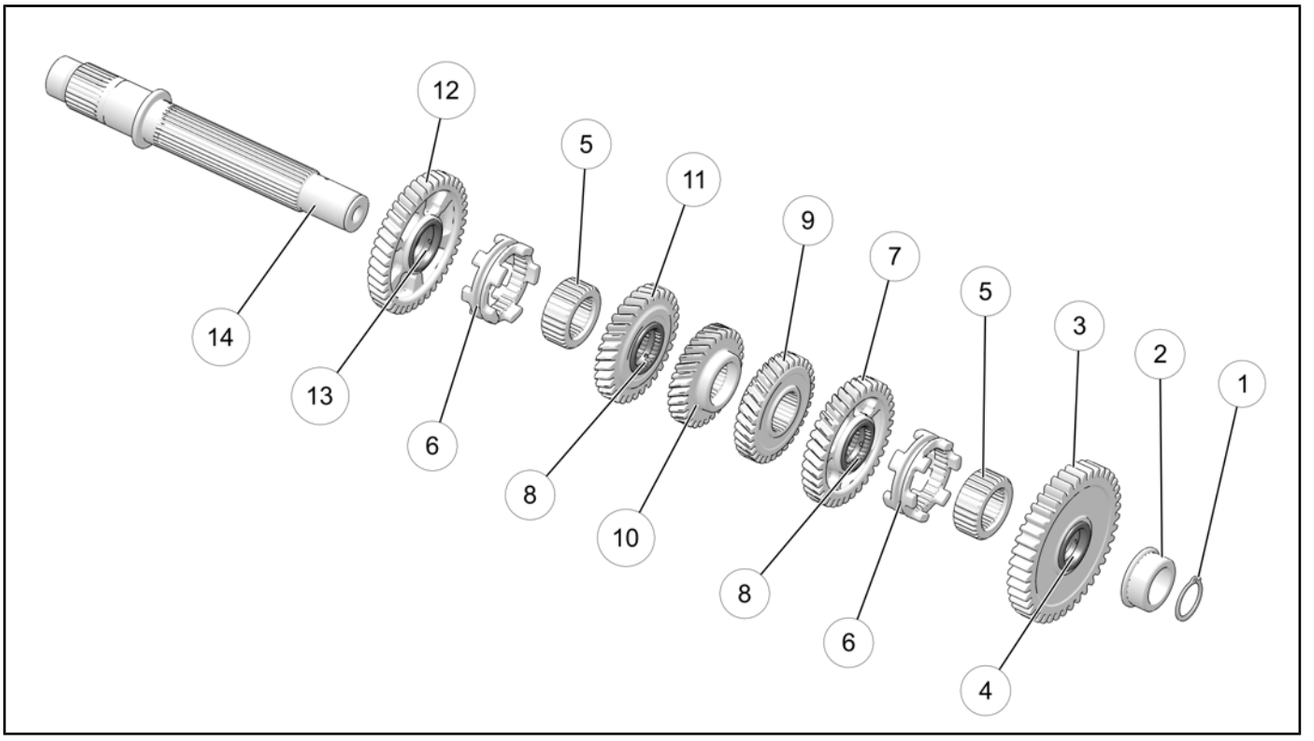
INPUT SHAFT



ITEM	DESCRIPTION
①	Input Shaft, Transmission
②	Gear, 5th — Drive
③	Bearing, 5th Gear
④	Bearing, 6th Gear
⑤	Slider, Gear Dog
⑥	Gear Dog, 5th & 6th
⑦	Gear, 6th — Drive
⑧	Gear, 4th — Drive
⑨	Gear, 2nd — Drive
⑩	Snap Ring

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OUTPUT SHAFT

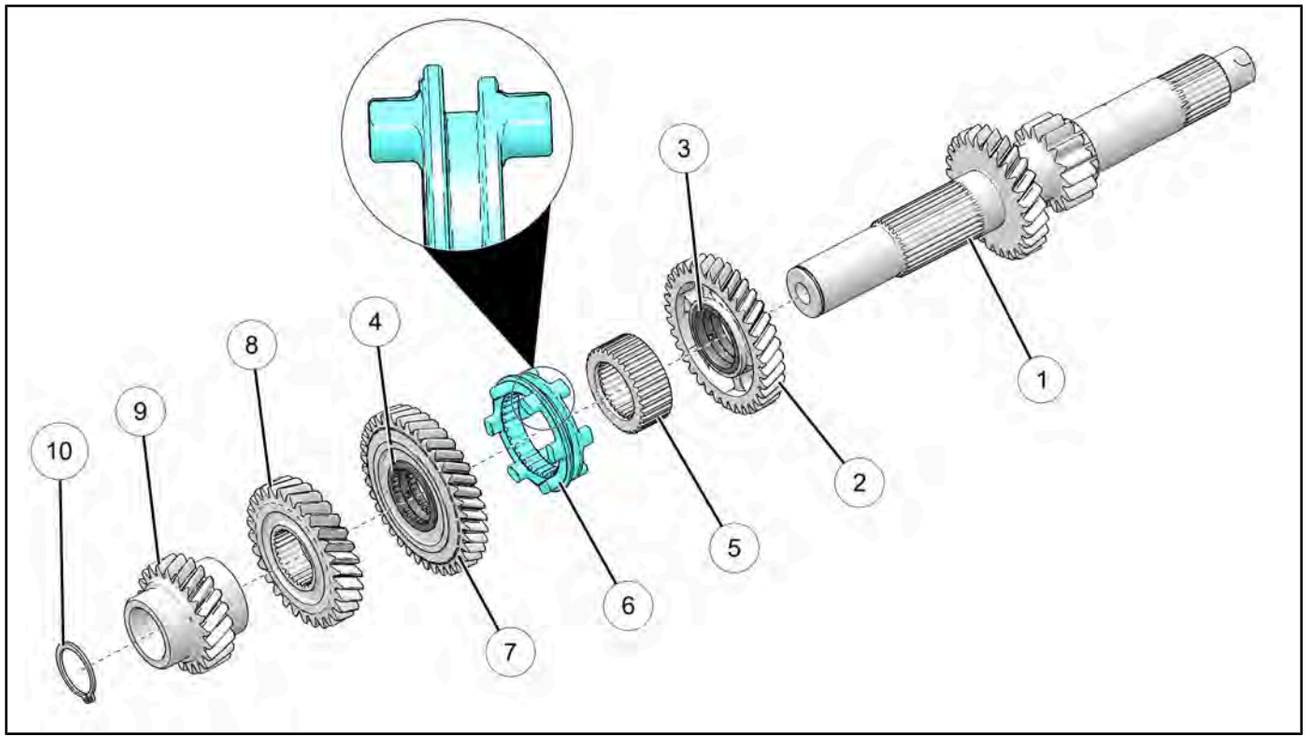


ITEM	DESCRIPTION
①	Snap Ring
②	Spacer
③	Gear, 1st — Driven
④	Bearing, 1st Gear
⑤	Slider, Gear Dog
⑥	Gear Dog
⑦	Gear, 3rd — Driven
⑧	Bearing
⑨	Gear, 5th — Driven
⑩	Gear, 6th — Driven
⑪	Gear, 4th — Driven
⑫	Gear, 2nd — Driven
⑬	Bearing, 2nd Gear
⑭	Output Shaft, Transmission

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TRANSMISSION (2023+)

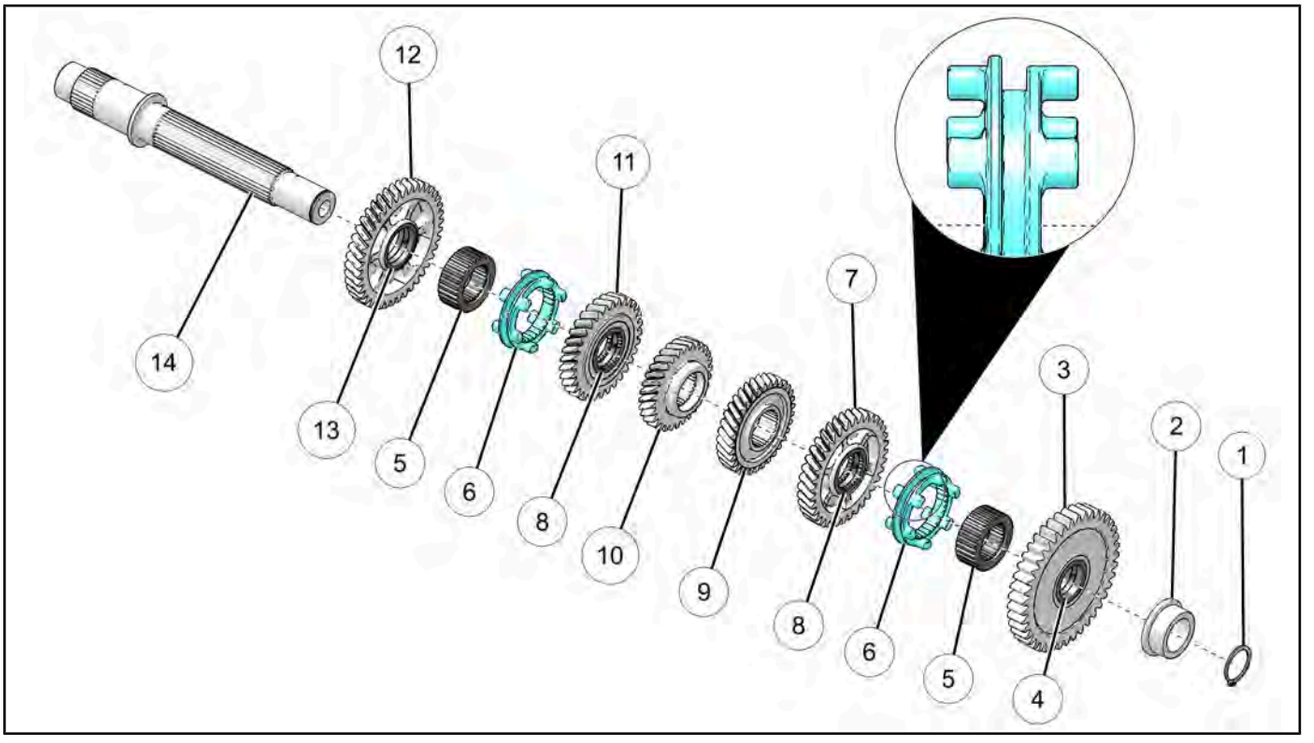
Input Shaft



ITEM	DESCRIPTION
①	Input Shaft, Transmission
②	Gear, 5th — Drive
③	Bearing, 5th Gear
④	Bearing, 6th Gear
⑤	Slider, Gear Dog
⑥	Gear Dog, 5th & 6th
⑦	Gear, 6th — Drive
⑧	Gear, 4th — Drive
⑨	Gear, 2nd — Drive
⑩	Snap Ring (not used on 2019-2020 engines)

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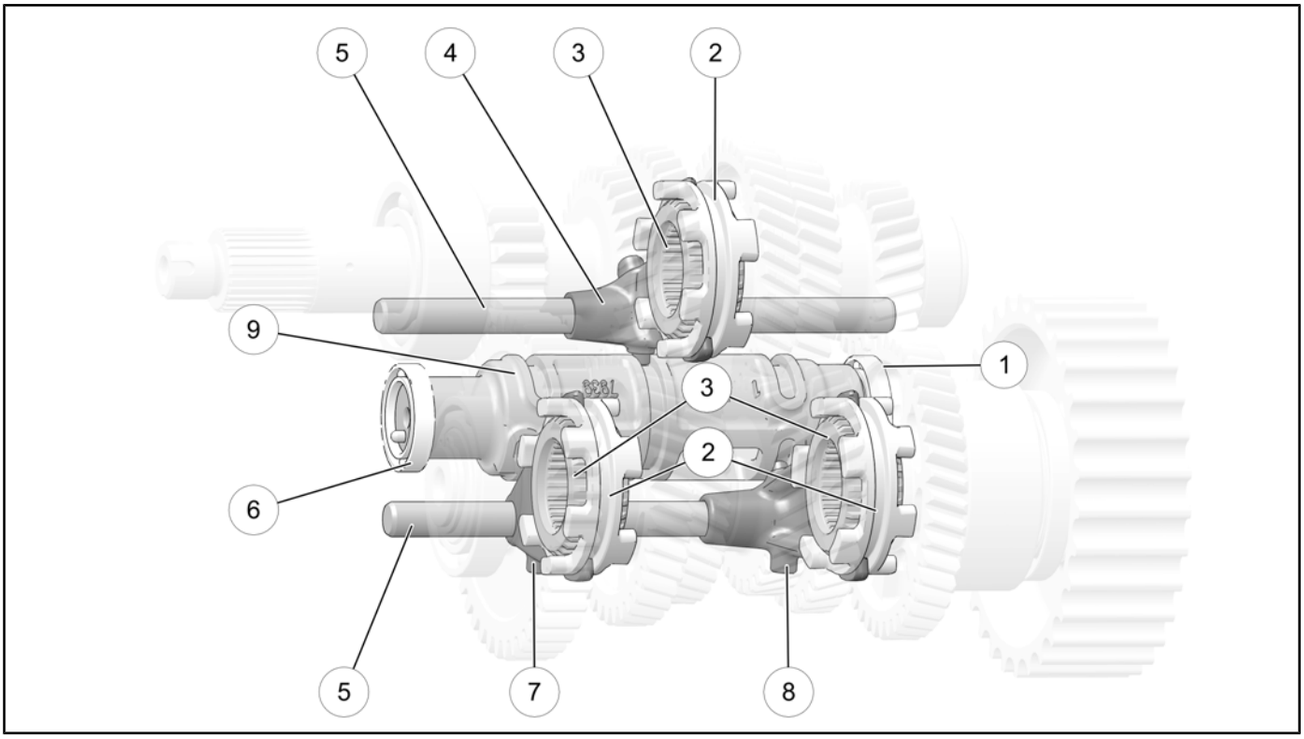
Output Shaft



ITEM	DESCRIPTION
①	Snap Ring
②	Spacer
③	Gear, 1st — Driven
④	Bearing, 1st Gear
⑤	Slider, Gear Dog
⑥	Gear Dog
⑦	Gear, 3rd — Driven
⑧	Bearing
⑨	Gear, 5th — Driven
⑩	Gear, 6th — Driven
⑪	Gear, 4th — Driven
⑫	Gear, 2nd — Driven
⑬	Bearing, 2nd Gear
⑭	Output Shaft, Transmission

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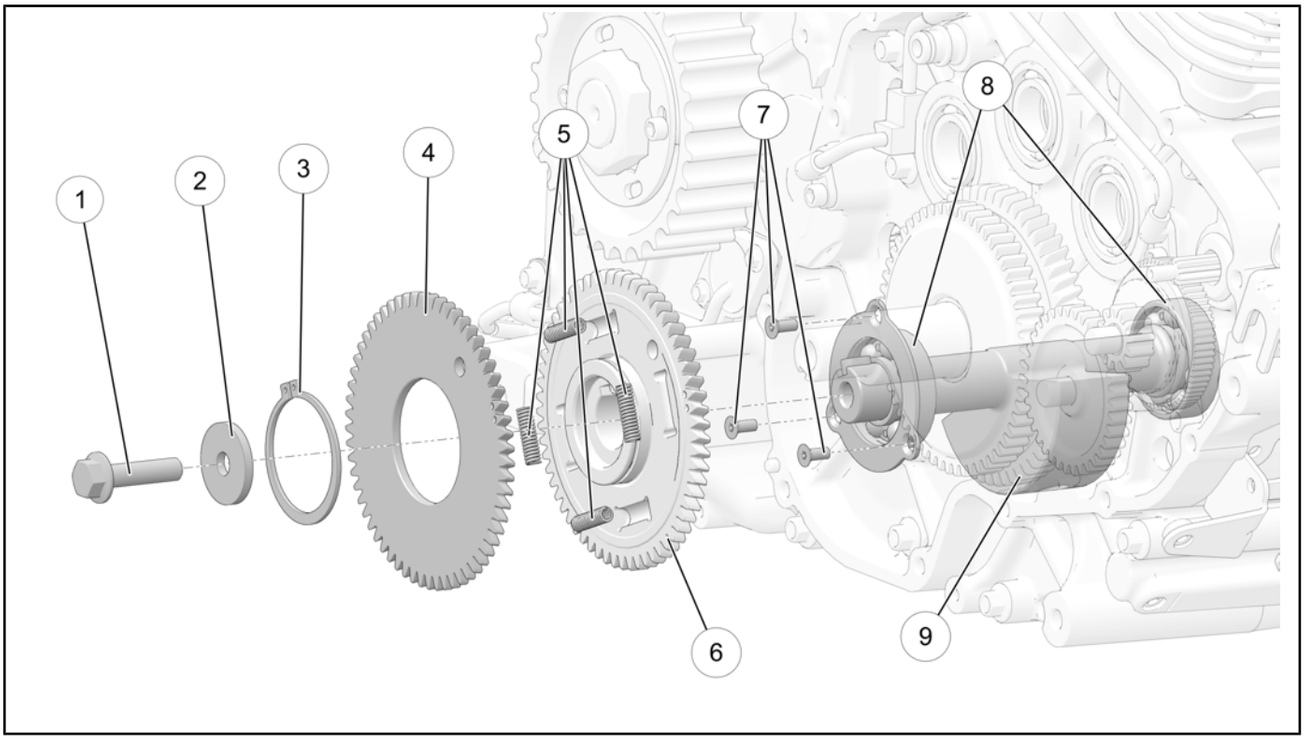
SHIFT DRUM / SHIFT FORK



ITEM	DESCRIPTION
①	Bearing, Shift Drum — Drive Sprocket Side
②	Gear Dog
③	Slider, Gear Dog
④	Shift Fork, 5th & 6th
⑤	Shift Rail
⑥	Bearing, Shift Drum — Primary Side
⑦	Shift Fork, 1st & 3rd
⑧	Shift Fork, 2nd & 4th
⑨	Shift Drum

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BALANCE SHAFT

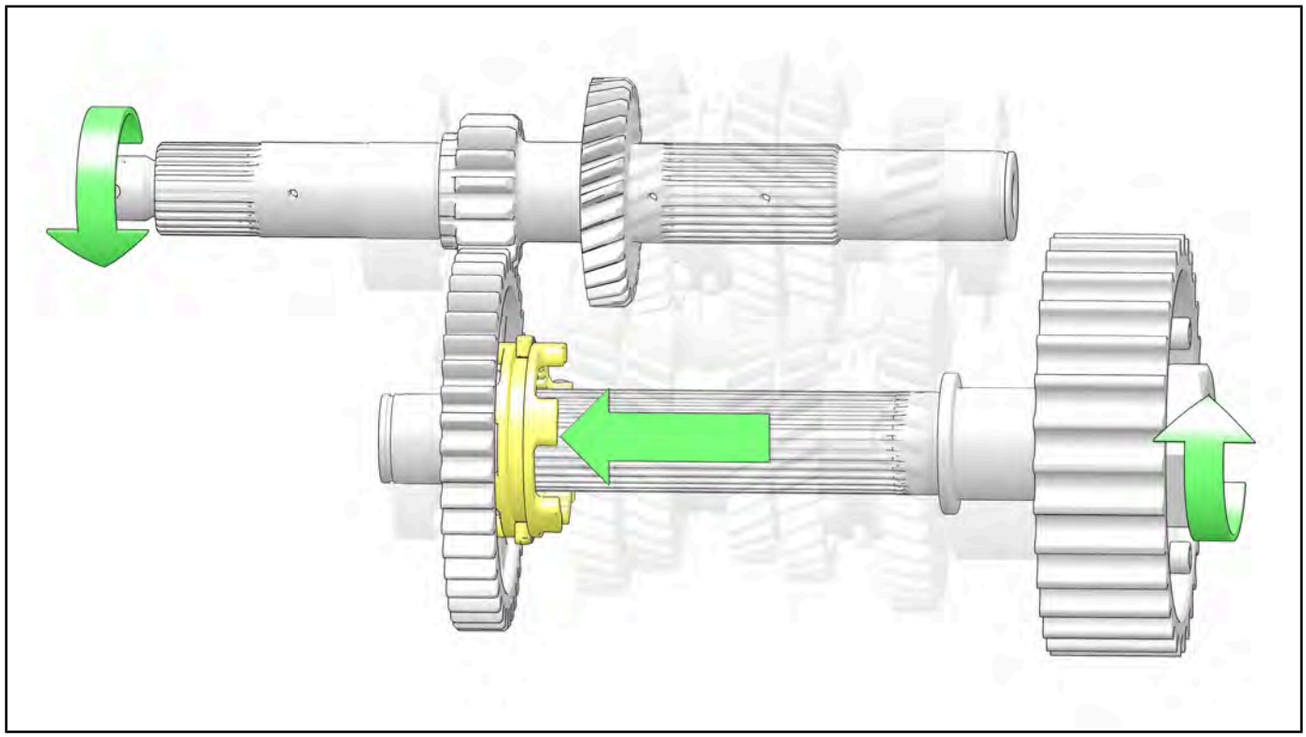


ITEM	DESCRIPTION	TORQUE
①	Fastener, Balance Shaft Gear — M10 x 1.5 x 40 (QTY.1)	**59 ft-lbs (80 N·m)**
②	Washer	—
③	Snap-Ring, Balance Shaft Split Gear	—
④	Gear, Balance Shaft (Outer) — Non-Serviceable	—
⑤	Springs, Pre-Load — Non-Serviceable	—
⑥	Gear, Balance shaft (Inner) — Non-Serviceable	—
⑦	Fastener, Bearing Retainer Plate — M5 x 0.8 x 12 (QTY.3)	**65 in-lbs (7.3 N·m)**
⑧	Bearings, Balance Shaft	—
⑨	Balance Shaft	—

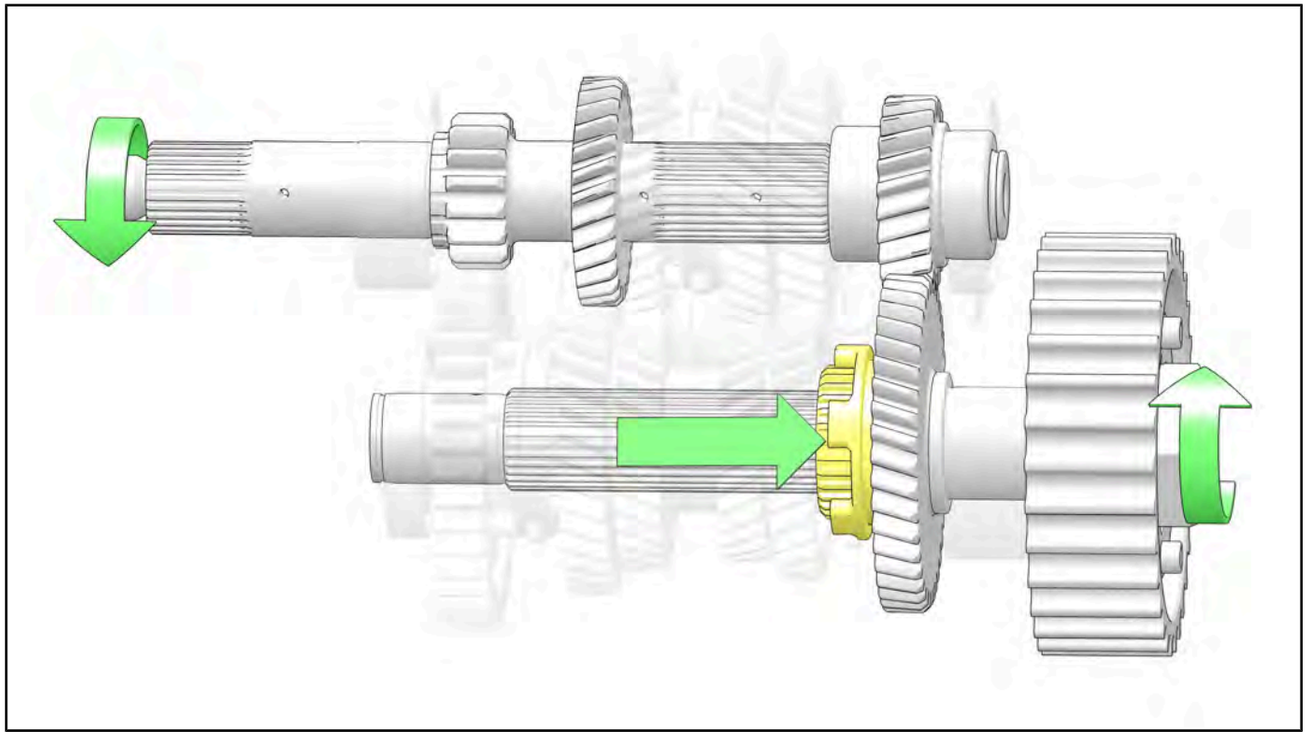
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GEAR TRAIN

1st Gear

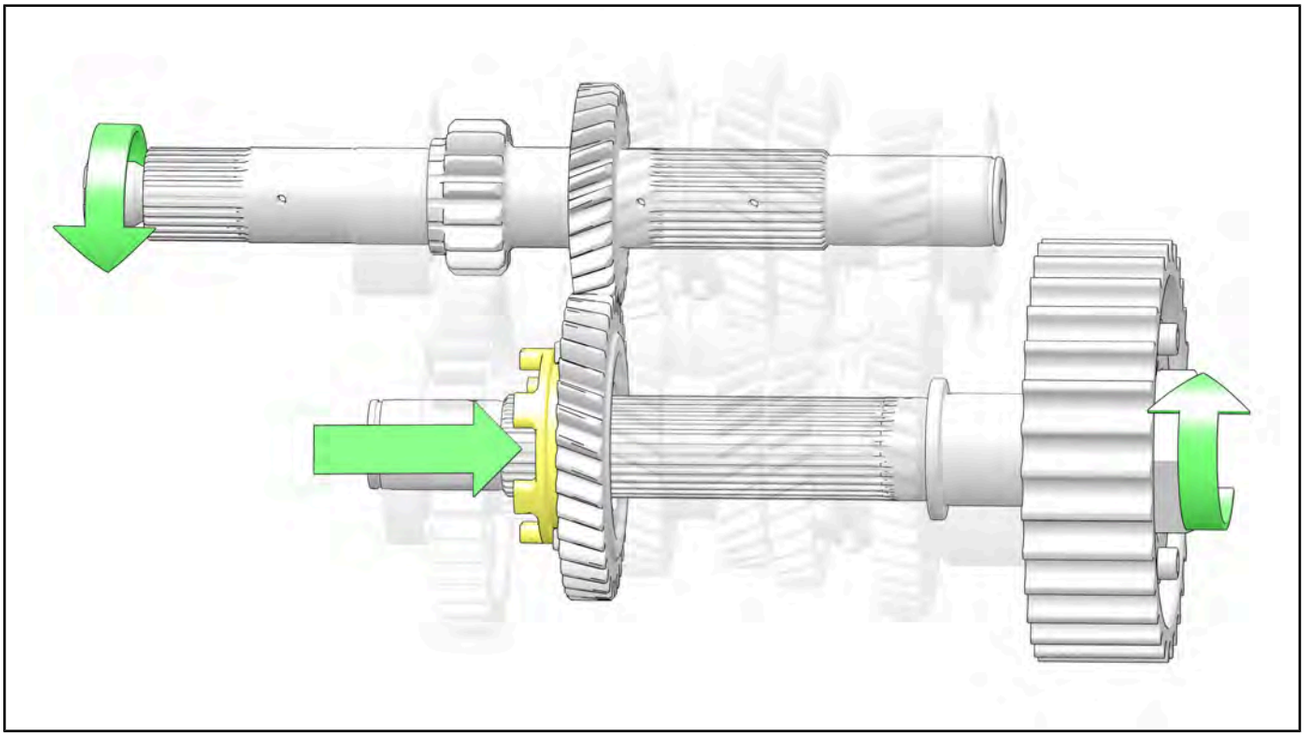


2nd Gear

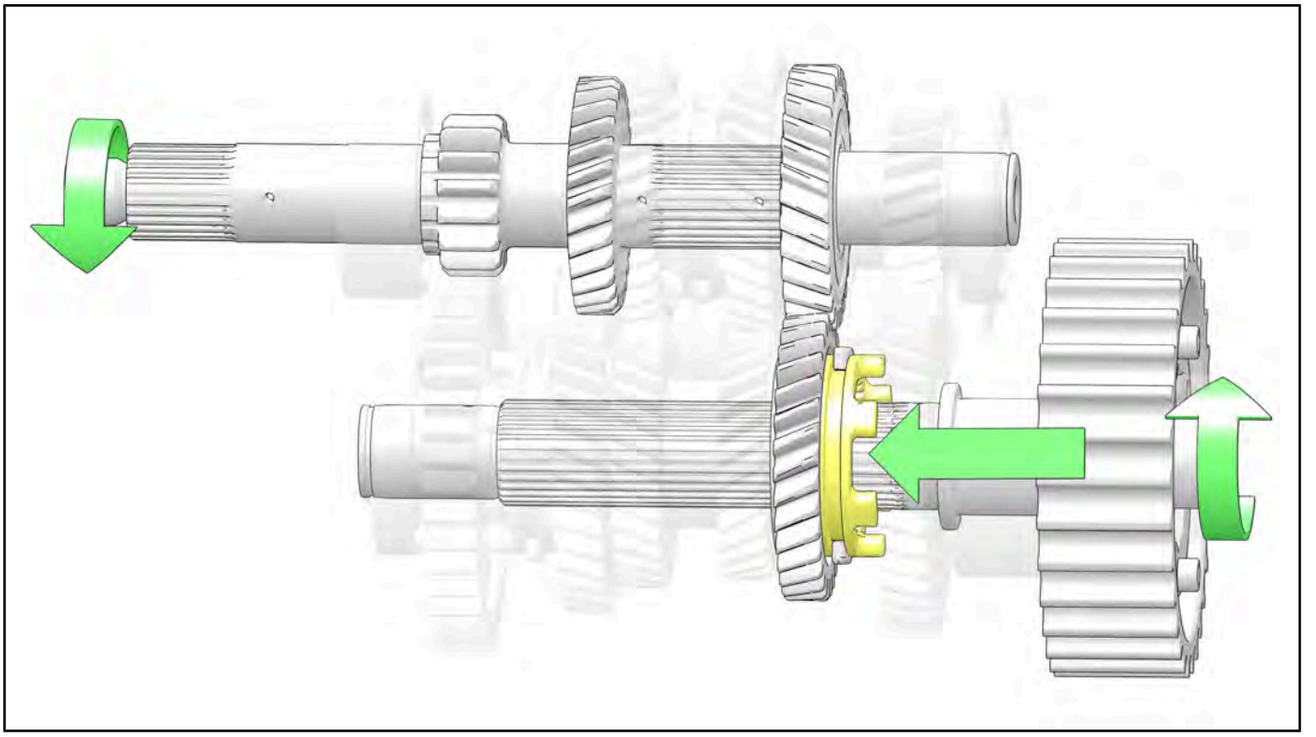


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3rd Gear

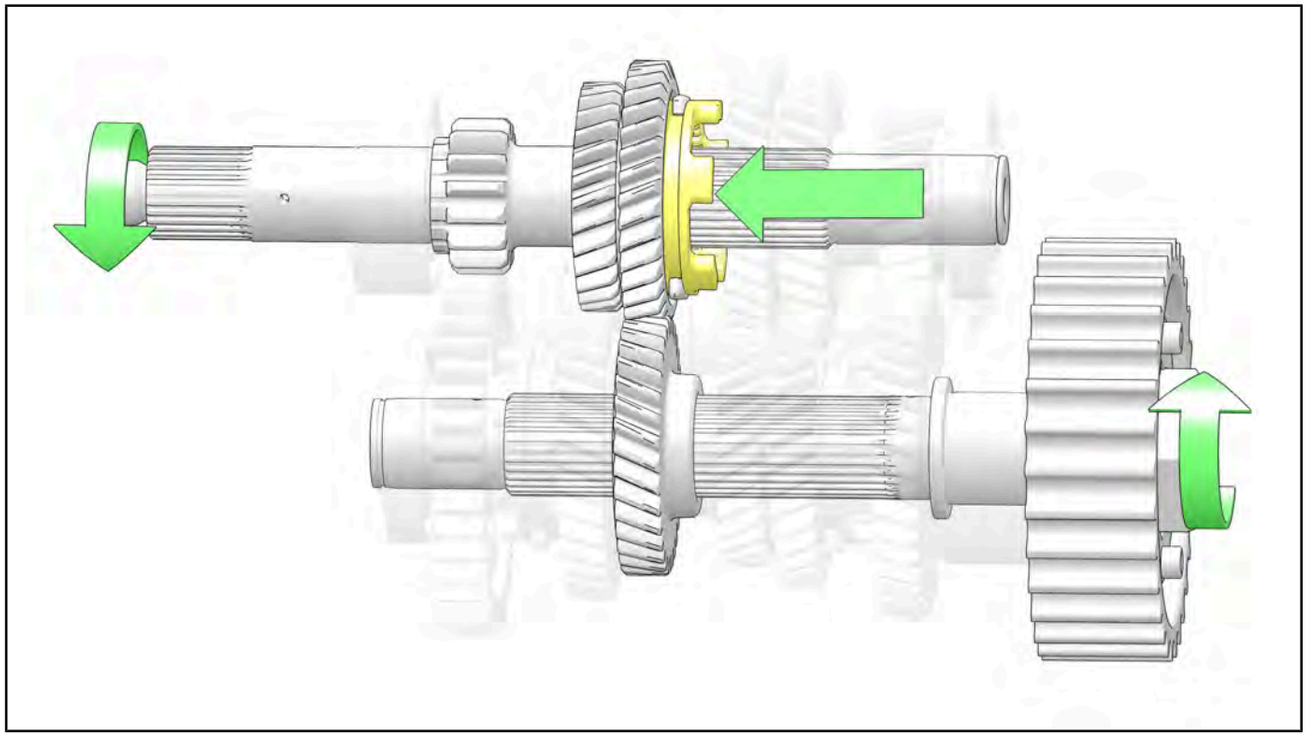


4th Gear

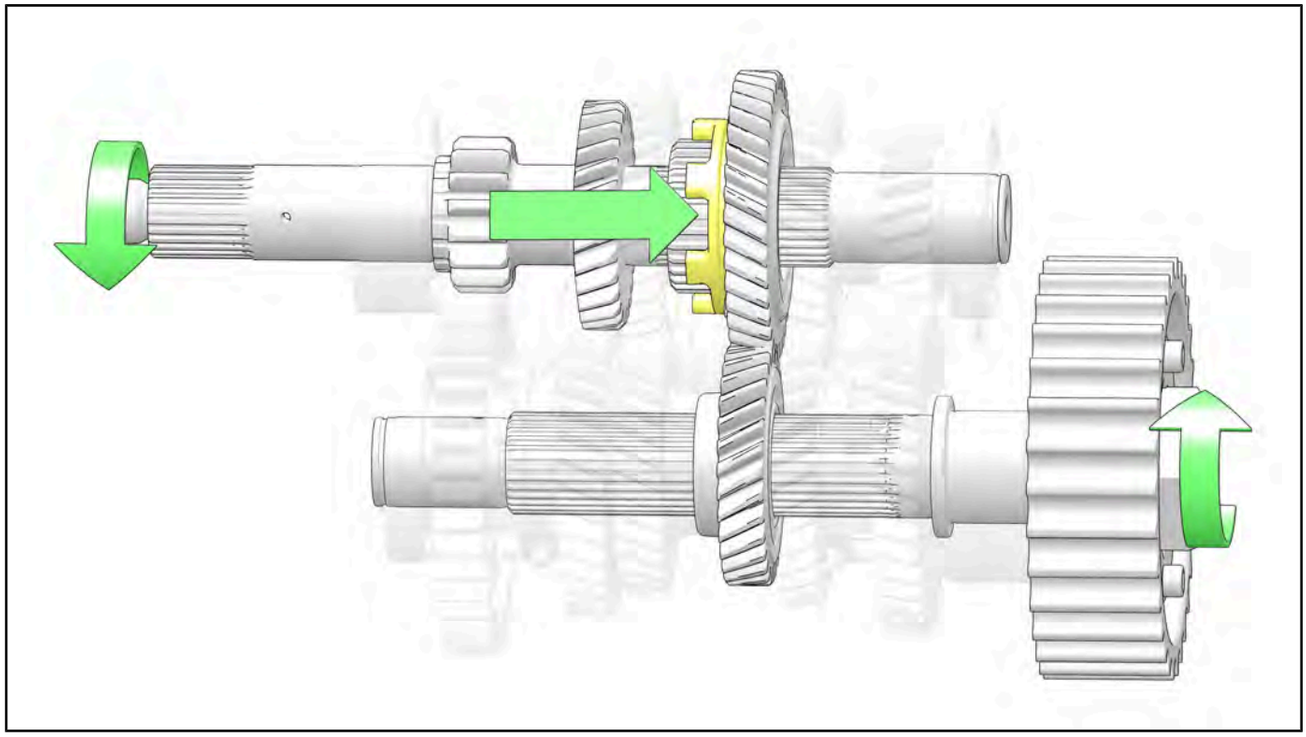


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5th Gear



6th Gear

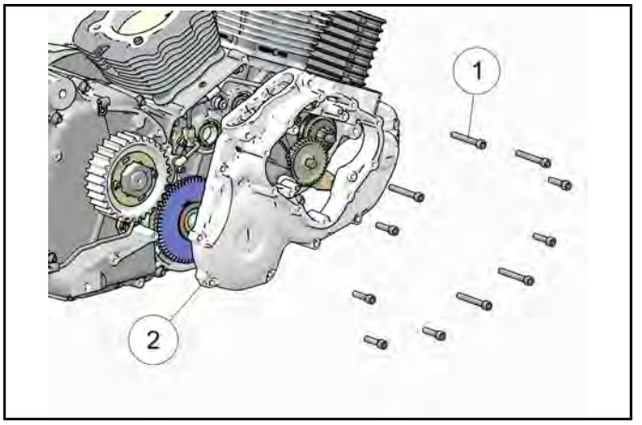


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BALANCE SHAFT SERVICE

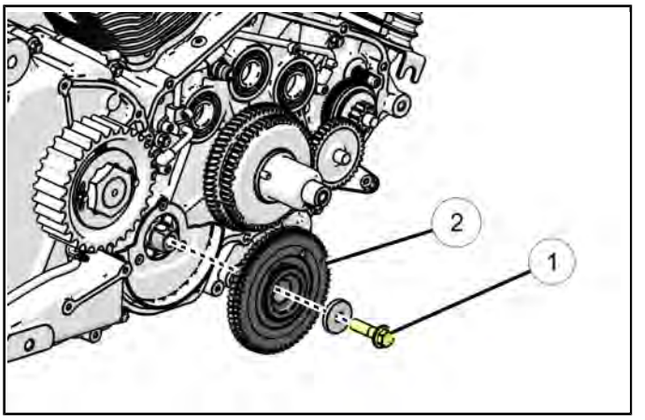
INNER CAM CHAIN COVER REMOVAL

1. Remove the camshaft carrier assembly. See **Camshaft Carrier Removal page 3.44**.
2. Remove inner cam chain cover fasteners ① and inner cam chain cover ②.



BALANCE SHAFT REMOVAL

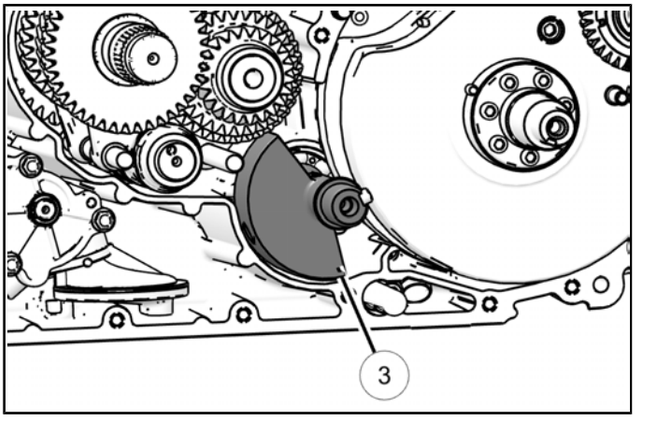
1. Remove the inner cam cover. See **Inner Cam Chain Cover Removal page 6.18**.
2. Remove the fastener ① and balance shaft gear ② .



IMPORTANT

Be sure to collect the woodruff key from the end of the balance shaft once the gear has been removed.

3. Separate the engine cases. See **Crankcase Separation page 6.25**.
4. Rotate balance shaft ③ until counterweights are clear of crankshaft. Grasp balance shaft and remove it from case.

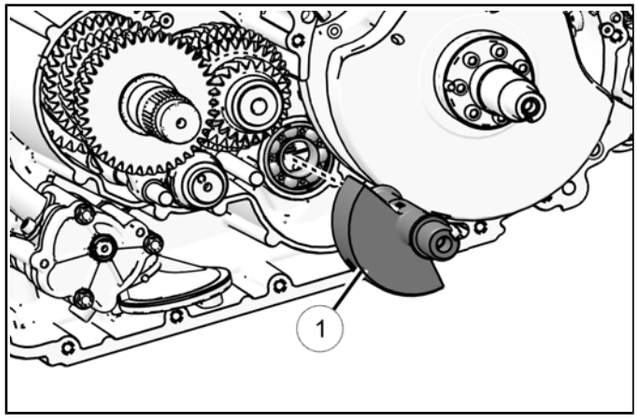


5. Check shaft for runout, or twisting.
6. Rotate right and left balance shaft bearings by hand while observing bearing rotation. Bearings should run smooth and quiet and shaft should be a snug fit in bearing.
7. Visually inspect bearings for damage.

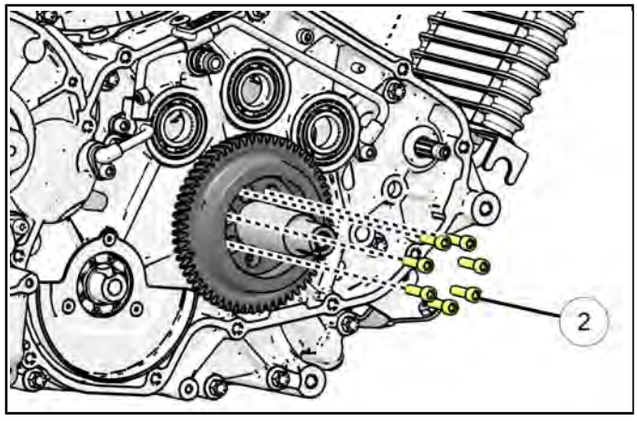
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BALANCE SHAFT INSTALLATION

1. Lubricate balance shaft bearings with engine oil.
2. Insert the balance shaft ① into the primary side bearing until fully seated. Woodruff key slot should be facing the cam side of the engine.

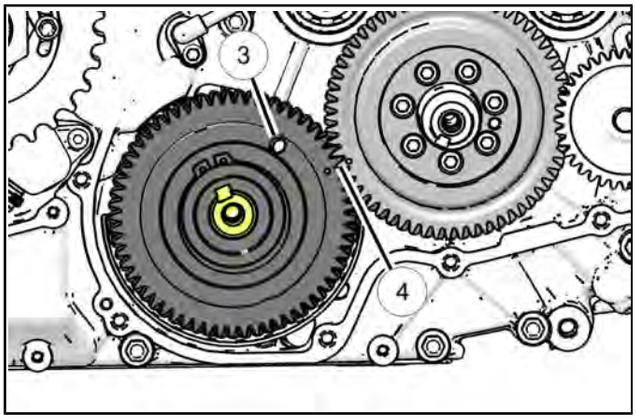


3. Assemble the engine cases. See **Crankcase Assembly page 6.41**.
4. Lock the crankshaft for service using **Method 1.** See **Locking the Crankshaft for Service page 3.37**.
5. Install the balance shaft drive gear and torque fasteners ② to specification.

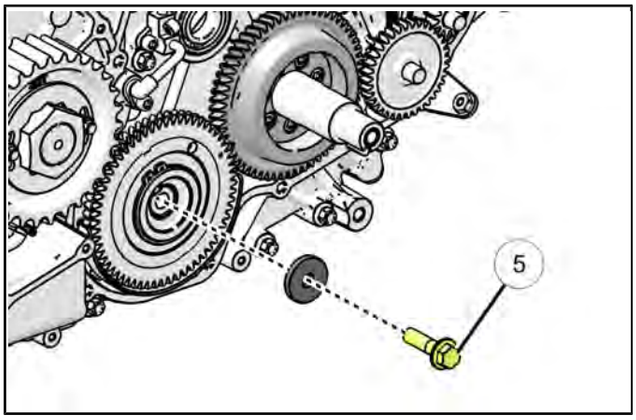


TORQUE
Balance Shaft Drive Gear: **10 ft-lbs (14 N·m)**

6. Place the woodruff key into the end of the balance shaft.
7. Place a pin punch, or other suitable tool, through hole ③ and preload split gear teeth so they are aligned.
8. Fit the driven balance shaft gear to the end of the balance shaft so the timing marks ④ are aligned as shown.



9. Thread the driven balance shaft gear fastener ⑤ in until seated.



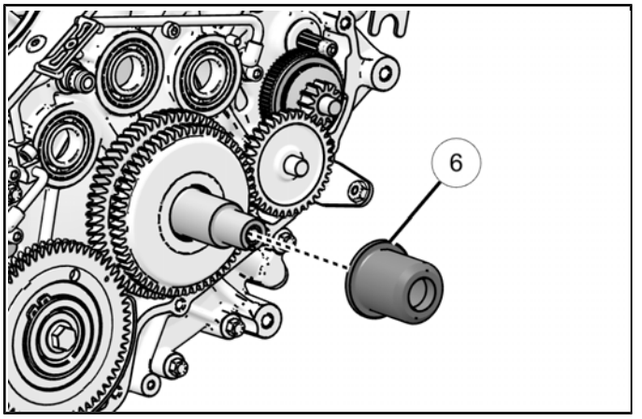
10. Torque the driven balance shaft gear fastener to specification.

TORQUE
Balance Shaft Driven Gear: **59 ft-lbs (80 N·m)**

11. Install the starter drive. See **Starter Drive Installation page 6.23**.

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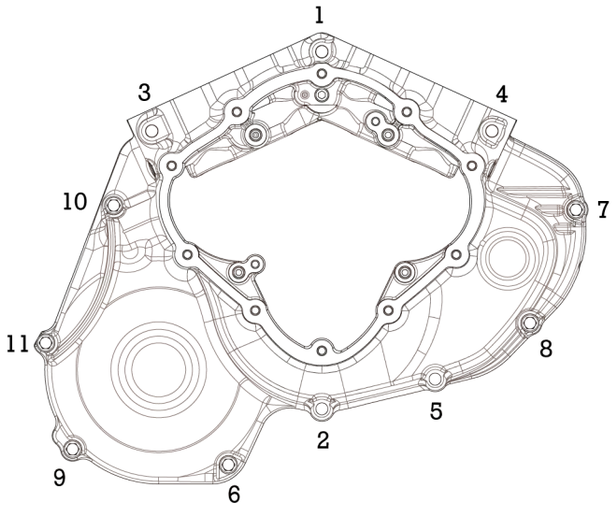
12. Install the spacer ⑥ onto the crankshaft.



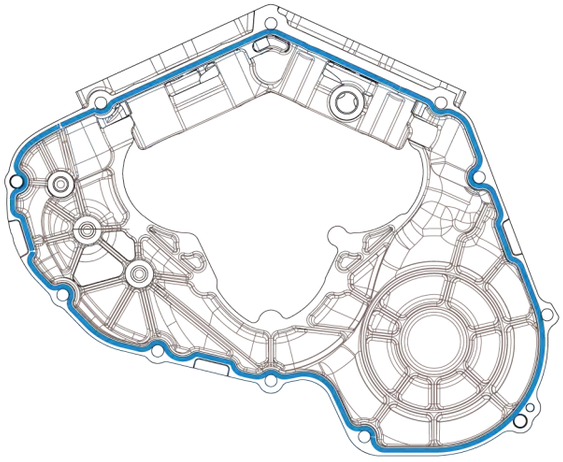
13. Install the inner cam cover. See **Inner Cam Chain Cover Installation page 6.21**.

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INNER CAM CHAIN COVER INSTALLATION



Inner Cam Chain Cover
Torque Sequence



Inner Cam Chain Cover
Sealant Path

6

1. Clean inner cam chain cover and crankcase mating surfaces with a residue-free degreaser.
2. Apply Loctite 598 flange sealant to cover and assemble to crankcase.
3. Thread inner cam chain cover fasteners into crankcase so they are finger tight.
4. Tighten inner cam chain cover fasteners following the specified torque sequence.

TORQUE
Inner Cam Chain Cover Fasteners: **15 ft-lbs (20 N·m)**

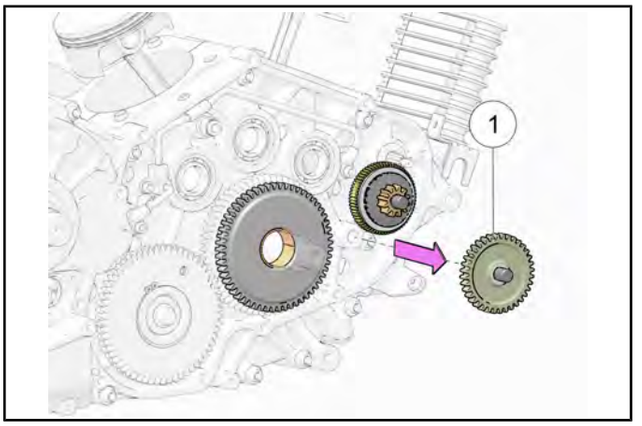
5. Install the camshaft carrier assembly. See **Camshaft Carrier Installation page 3.50**.

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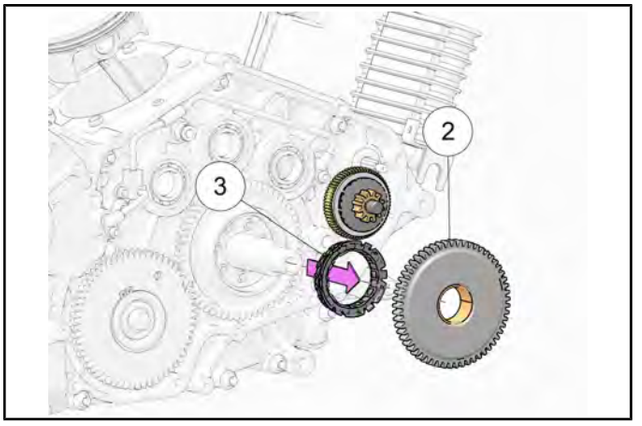
STARTER DRIVE SERVICE

STARTER DRIVE REMOVAL

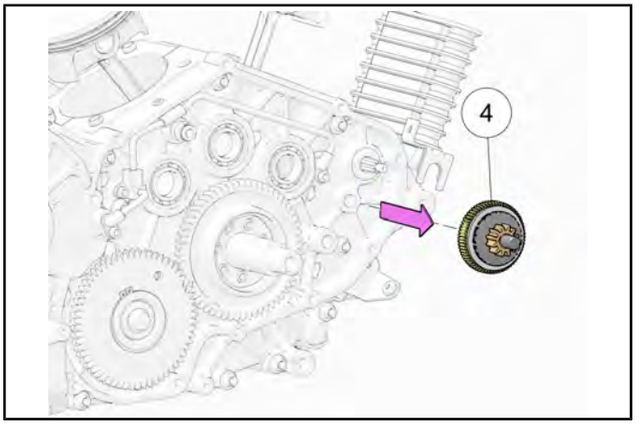
1. Remove the inner cam cover. See **Inner Cam Chain Cover Removal page 6.18**.
2. Remove the starter drive reduction gear ① by lifting the shaft and gear out as an assembly.



3. Lift the sprag gear ② and one-way clutch ③ off of the crankshaft as an assembly.

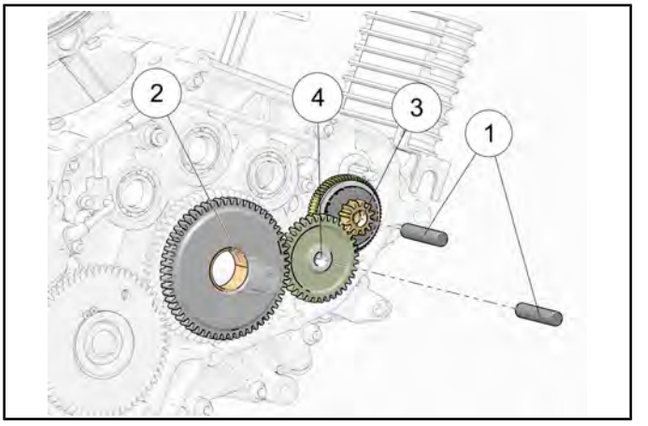


4. Remove the torque limiter clutch ④ and shaft as an assembly.

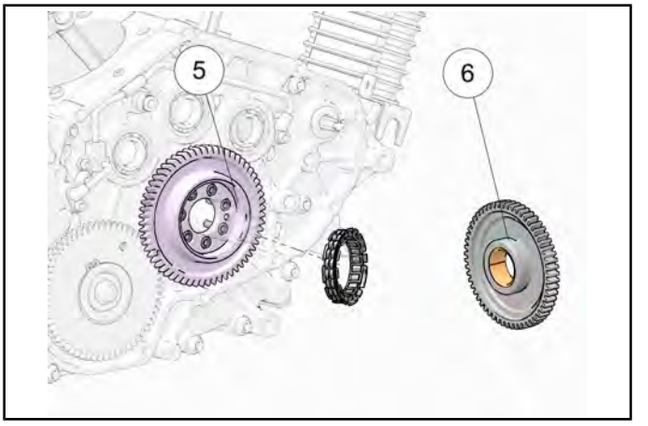


STARTER DRIVE INSPECTION

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. Inspect one-way clutch hub surfaces ⑤ ⑥ for wear, scoring or damage.
4. Measure the I.D of the balance shaft gear bearing surface ⑤ and the O.D. of the flywheel bearing surface ⑥ and compare to specification.



One-Way Clutch Hub I.D. (Balance Shaft Gear):
68.38 mm ±.013 mm

One-Way Clutch Hub O.D. (Flywheel):
51.71 mm ±.007 mm

5. Replace gear if wear or damage is evident.

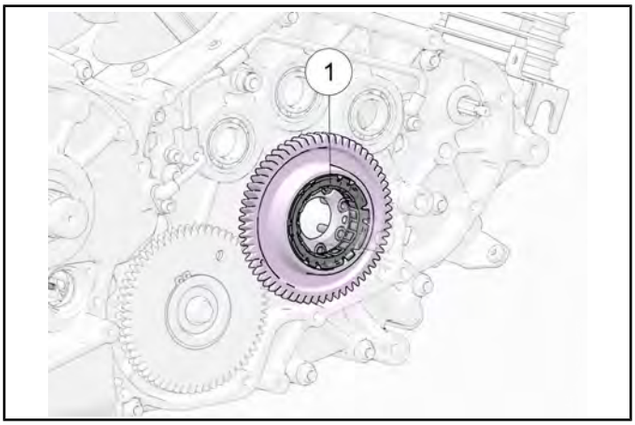
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STARTER DRIVE INSTALLATION

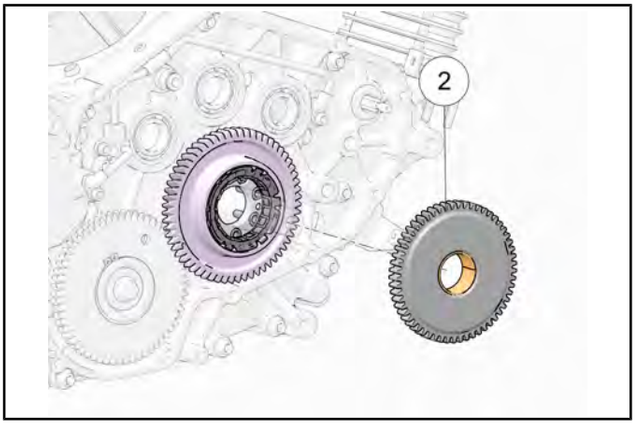
1.

NOTICE
Install starter clutch so the arrow is facing out.

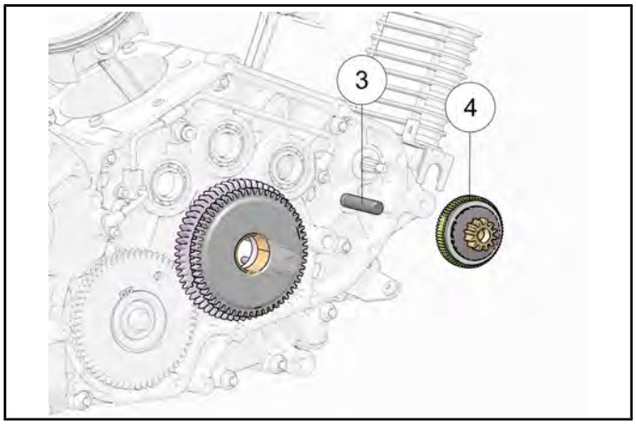
Install one-way starter clutch bearing ① into the balance shaft gear hub.



2. Install flywheel ② over crankshaft and into the one-way clutch bearing until fully seated.



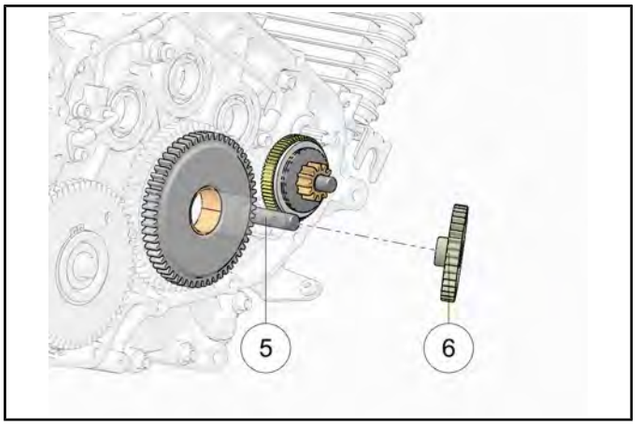
3. Install the torque limiter shaft ③ into the crankcase bore followed by the limiter clutch assembly ④.



4.

NOTICE
If previously removed, install starter motor at this time.

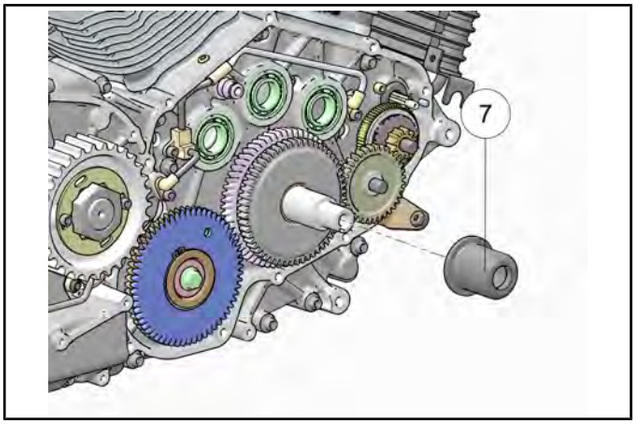
Install the starter reduction gear shaft ⑤ into crankcase bore followed by the reduction gear ⑥. **The raised shoulder on the reduction gear should face the crankcase.**



6

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5. Install spacer ⑦ onto the crankshaft.



6. Install inner cam chain cover. See **Inner Cam Chain Cover Installation page 6.21**.
7. Check engine oil and fill to proper level.

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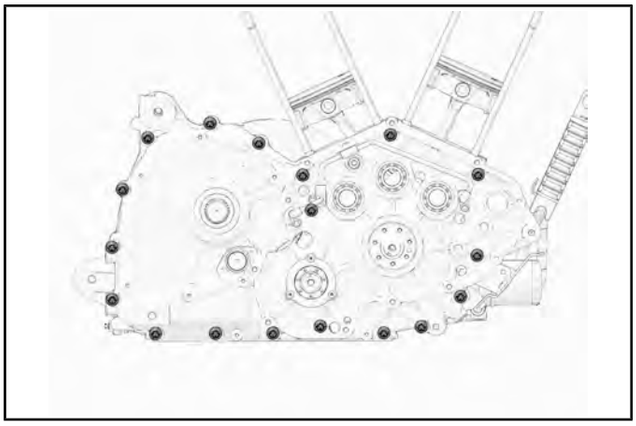
CRANKSHAFT SERVICE

CRANKCASE SEPARATION

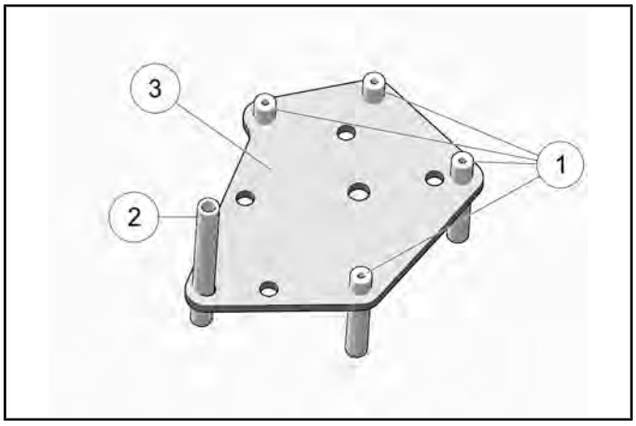
1. Drain the engine oil. See **Engine Oil & Filter Change** in the Maintenance Chapter.
2. Remove engine from frame. See **Removing Engine From Frame page 3.13**.
3. Mount engine securely on an engine stand using Engine Stand Adapter tool **PF-51240**.
4. Remove cylinder heads. See **Cylinder Head Removal page 3.78**.
5. Remove cylinders. See **Cylinder Removal page 3.92**.
6. Remove lifters. See **Lifter Removal page 3.42**.
7. Remove primary cover. See **Primary Cover Removal (2022) page 5.17**.
8. Remove clutch assembly. See **Clutch Removal page 5.29**.
9. Remove stator. See **Stator Removal / Installation page 10.36**.
10. Remove flywheel. See **Flywheel Removal page 5.41**.
11. Remove the cam chain. See **Cam Chain Removal page 3.40**.
12. Remove camshaft carrier assembly. See **Camshaft Carrier Removal page 3.44**.
13. Remove the inner cam chain cover. See **Inner Cam Chain Cover Removal page 6.18**.
14. Remove the starter drive. See **Starter Drive Removal page 6.22**.
15. Remove the balance shaft driven gear and drive gear. See **Balance Shaft Removal page 6.18**.
16. Remove the drive sprocket. See **Drive Sprocket Removal / Installation page 8.78**.
17. Remove the gear position switch. See **Gear Position Sensor Removal / Replacement page 10.29**.

NOTICE
If applicable, collect the two switch contact pins and springs from the end of the shift drum so they do not get lost.

18. Remove engine case fasteners.



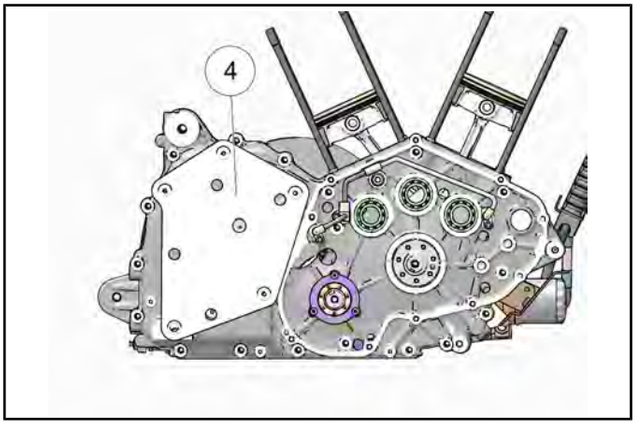
19. Place the Engine Case Splitting / Assembly tool **PF-51234** on a flat surface and assemble the M6 threaded spacers ① and M12 threaded spacer ② into the main plate ③ as shown. **Use only holes marked with the letter A.**



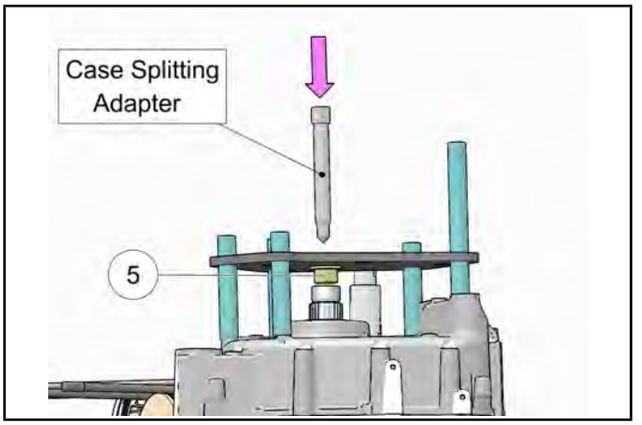
20. Rotate the engine stand so the engine is lying flat with the output shaft pointing UP.

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21. Position the main plate assembly ④ onto the engine case as shown. The threaded spacers should line up with the corresponding engine case fastener holes.



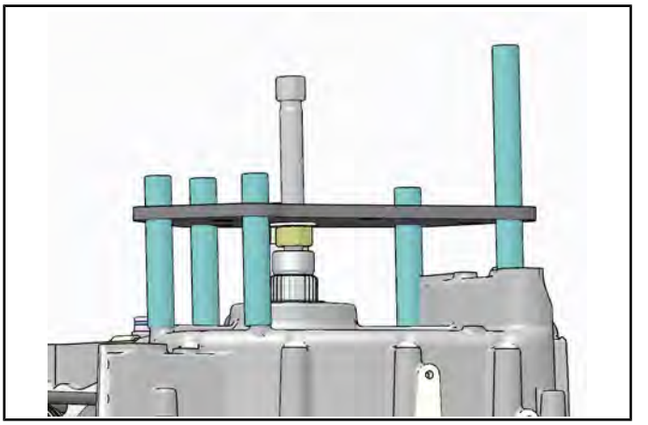
22. Install the case splitting adapter through the center hole in the main plate and thread into nut and washer ⑤ until 1–2 threads are exposed on the other side.



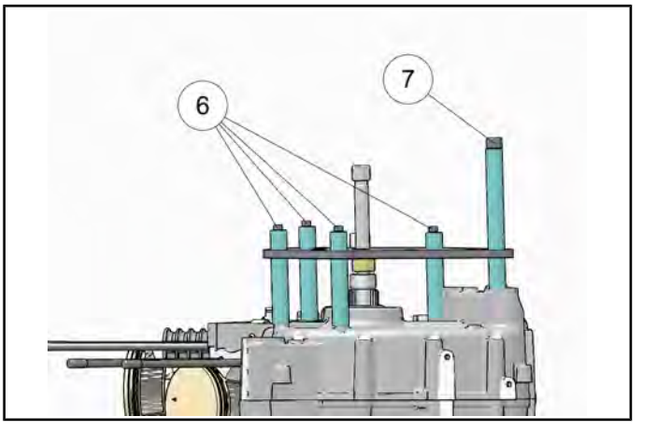
23. **Main plate adjustment: Turn threaded spacers in or out to raise, lower and level the main plate.**

IMPORTANT

- Plate surface should be parallel to the surface of the engine crankcase.
- Plate height is correct when the plate is resting on the washer and the case splitting adapter contacts the transmission output shaft.
- All threaded spacers must be in contact with engine case prior to fastening on the plate assembly.



24. Install M6 fasteners ⑥ and M12 fastener ⑦ into threaded spacers and torque to specification.

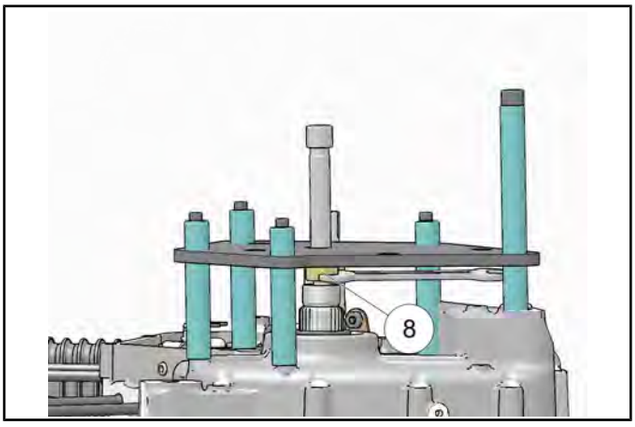


TORQUE

Main Plate Mounting Fasteners (All):
88 in-lbs (10 N·m)

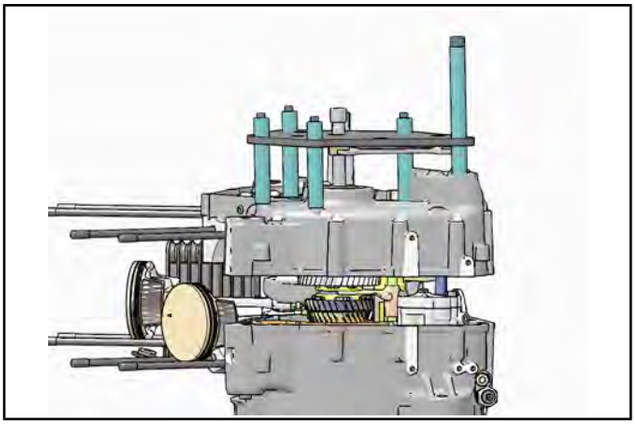
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25. Holding nut ⑧ stationary with an open ended wrench, turn the case splitting adapter clockwise until the engine cases begin to part. **STOP.**



26. Using a soft-faced mallet, work around the seam of the engine cases tapping lightly to release the sealed bond.

27. Alternately turn the case splitting tool in until resistance is felt, then work around the upper case with a mallet until the cases are completely apart.



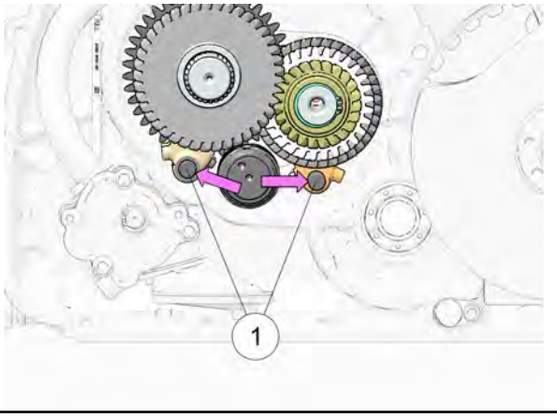
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TRANSMISSION REMOVAL

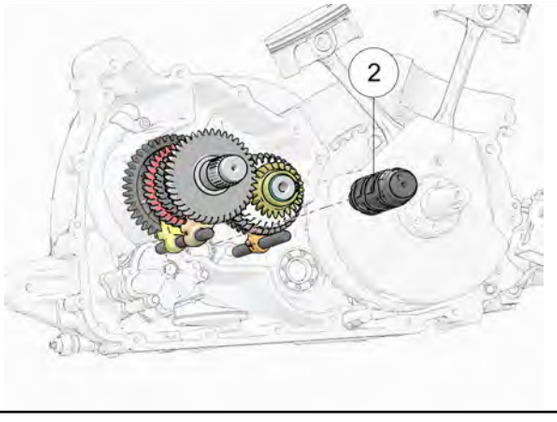
⚠ CAUTION

Gloves should be worn at all times while working on the transmission assembly to avoid personal injury.

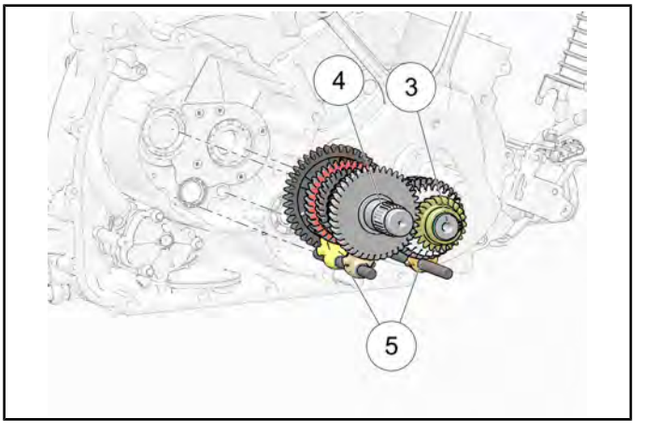
1. Remove the shift ratchet assembly. See **Shift Ratchet Removal & Inspection page 5.20**.
2. Remove the balance shaft. See **Balance Shaft Removal page 6.18**.
3. Lift both of the shift fork rails ① out of the crankcase just enough so the ends clear the crankcase bores. Rotate rails and forks away from the shift drum.



4. Lift the shift drum ② out of the bearing.



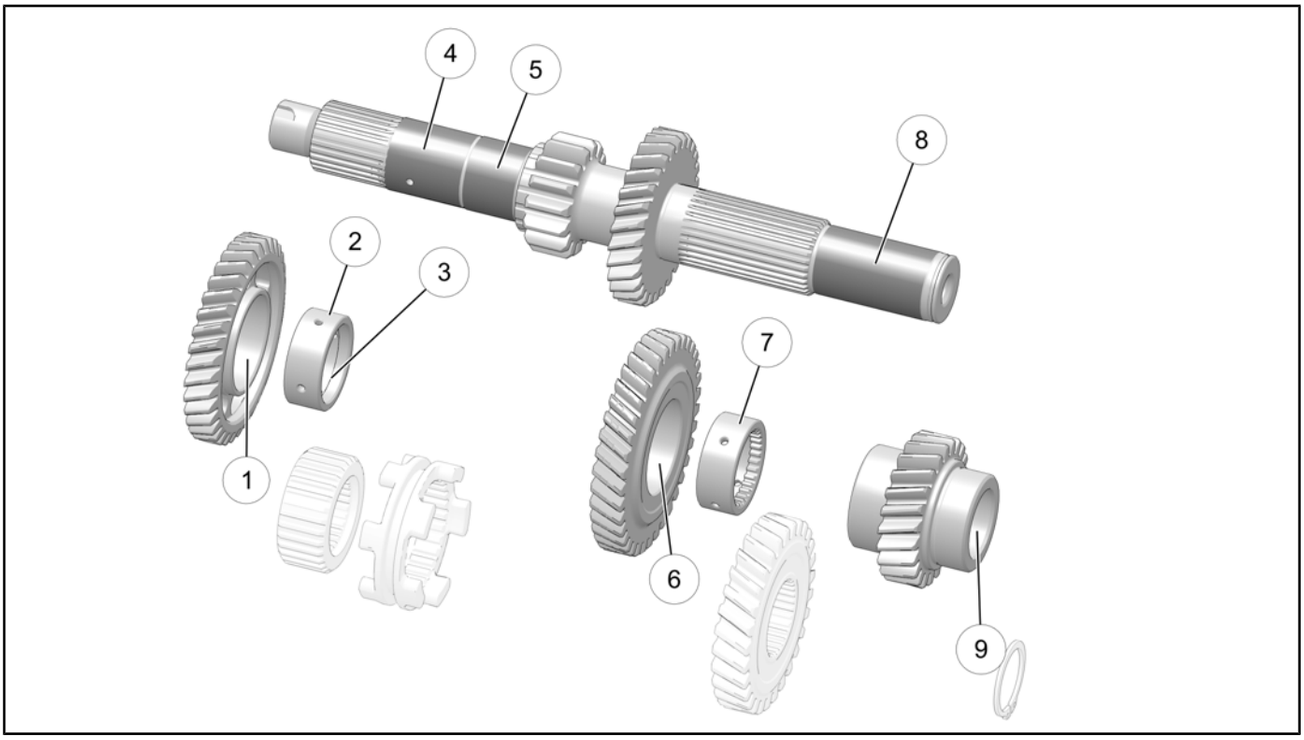
5. **As an assembly**, lift the input shaft ③ , output shaft ④ , shift forks and shift fork rails ⑤ out of the engine case.



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TRANSMISSION INSPECTION (ALL MODEL YEARS)

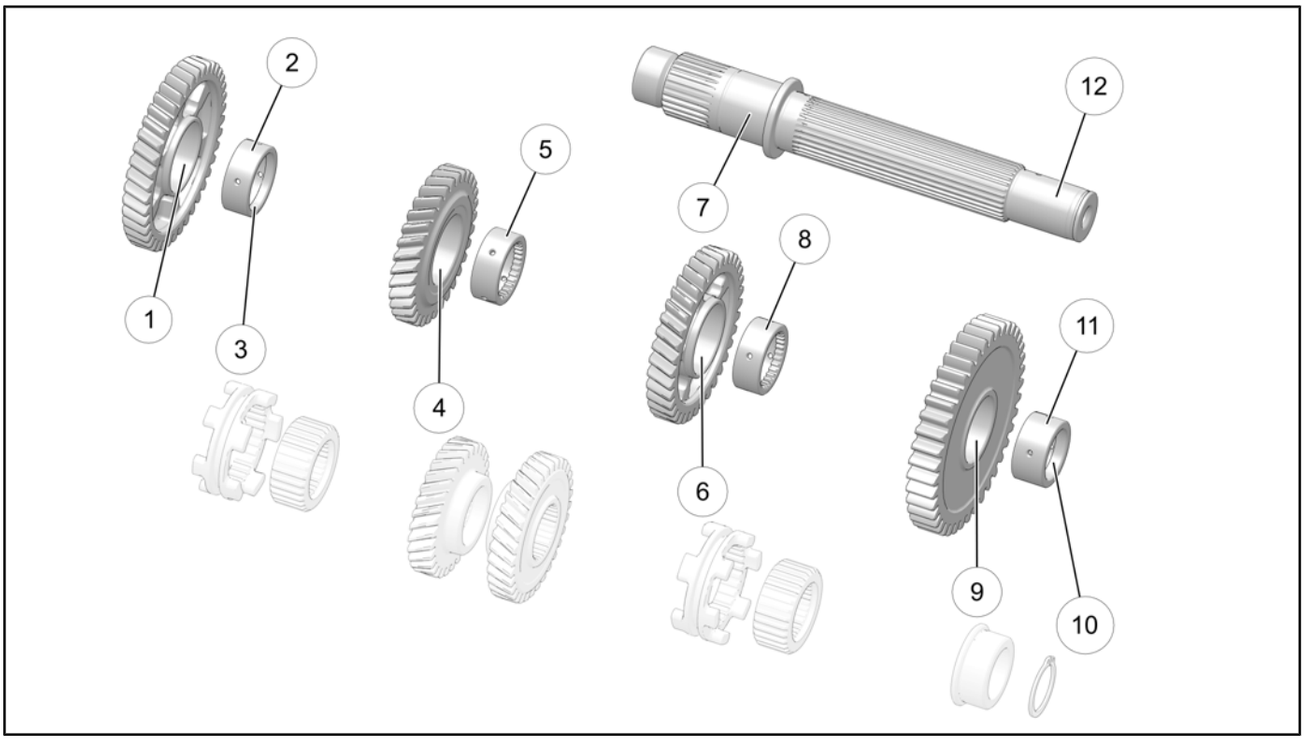
Input Shaft



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

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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 page 6.6.
Refer to the Service Specifications section in this chapter for complete transmission specifications. See Service Specifications - Transmission / Crankshaft page 6.4.

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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. Visually inspect:
   - Gear internal splines
   - Gear teeth
   - Gear dogs for rounding, cracks, chips
   - Gear dog slots for rounding
   - Bearing surfaces
   - Shift fork grooves

   Check each gear for damage, cracks, wear (rounding of dogs or surfaces), or discoloration.

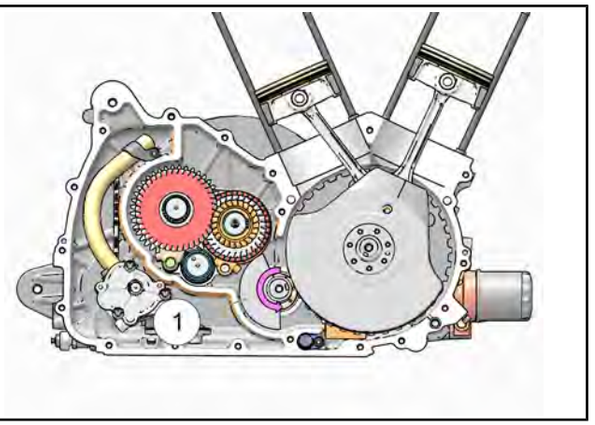
   Shift Forks, Shift Fork Rails
3. Inspect all contact surfaces of each shift fork. Replace a shift fork if any part is discolored (overheated), unusually scored, warped, or worn beyond service limit.
4. Inspect each shift fork pin for wear or damage and compare to specifications.
5. Inspect shift fork rails for wear, scoring, or runout.
6. 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.
7. Slide rails into crankcase holes and check for a good snug fit.
8. 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.
9. Temporarily install shift drum into bearing and rotate, checking for smooth bearing operation.

   Shift Drum
10. Inspect shift drum grooves for wear. Pay close attention to corners of grooves where forks change direction.
11. Inspect surface of shift drum star for excessive wear or damage.
12. Inspect right side shift drum bearing.
13. Temporarily install shift drum in right hand case bearing and inspect fit. Spin drum to check for smooth bearing operation.

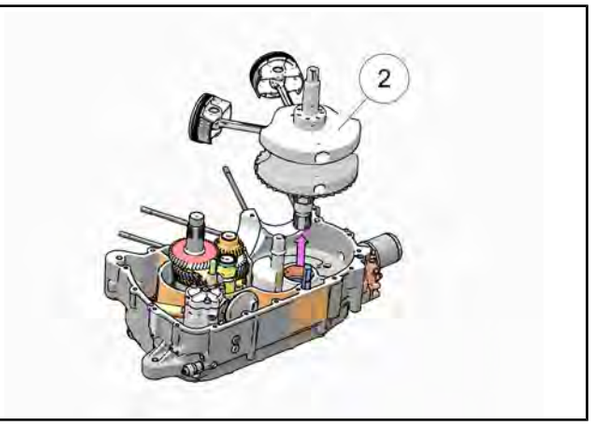
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CRANKSHAFT REMOVAL

1. Separate RH crankcase from LH case. See **Crankcase Separation page 6.25**.
2. Rotate balance shaft ① until counterweights are clear of crankshaft.



3. Lift crankshaft assembly ② straight up until clear of case.

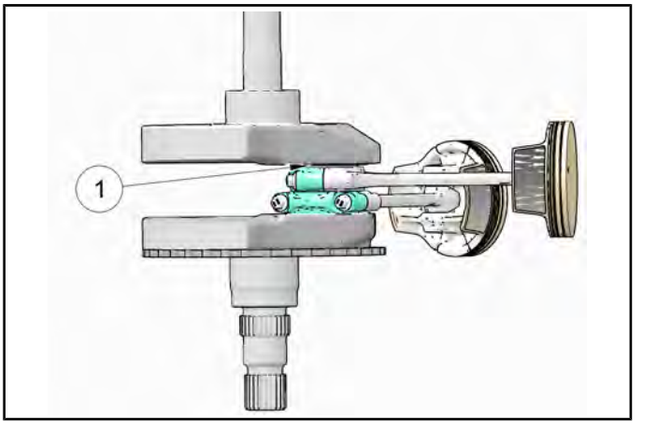


NOTICE

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 6.4**.



2. If clearance recorded exceeds service limit, the crankshaft, connecting rod or both must be inspected and worn parts replaced. See **Crankshaft Inspection page 6.36**.

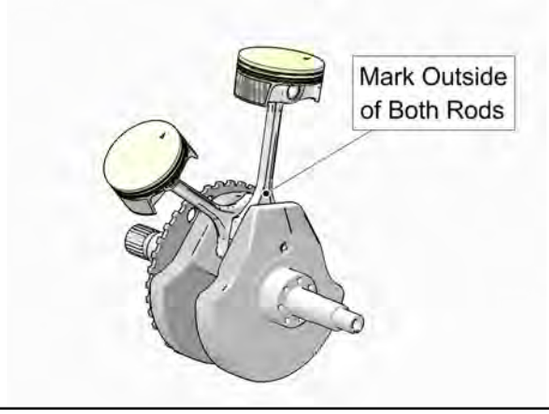
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CONNECTING ROD REMOVAL / IDENTIFICATION

NOTICE

The connecting rod caps are marked with paint from the factory, however it is recommended that an additional reference mark be added for clarity. **Caps are matched to rods and MUST be installed with the proper orientation left to right and front to back.** DO NOT strike or stamp the connecting rod.

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.

⚠ CAUTION

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:

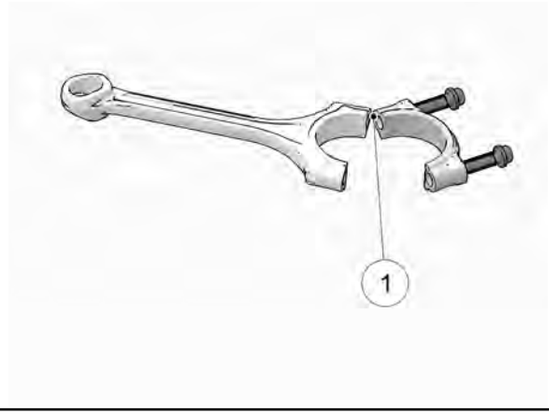
- 1st Torque: Manufacturer installation of connecting rod fasteners.
- 2nd Torque: Torque for inspection per this procedure.
- 3rd Torque: Reinstallation following inspection. **Discard fasteners the next time they are removed.**

1. Refer to **Piston Pin / Pin Bore Inspection page 3.95** for connecting rod small end inspection.

⚠ 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.

2. Remove bearings and install caps on connecting rods. Be sure mating surfaces ① of rod and cap are clean.
3. Apply engine oil to threads of rod fasteners. Torque fasteners to specification.

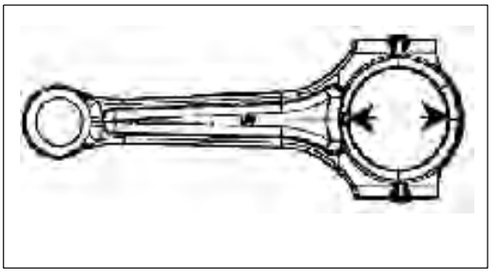


TORQUE

Connecting Rod Fasteners:
22 ft-lbs (30 N·m) + 90°

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4. Measure I.D. of connecting rod big end for size and out of round and compare to specification. See **Service Specifications - Transmission / Crankshaft page 6.4**.



5. Visually inspect connecting rod upper and lower ends for scoring, damage, or excessive wear.

CONNECTING ROD BEARING INSPECTION

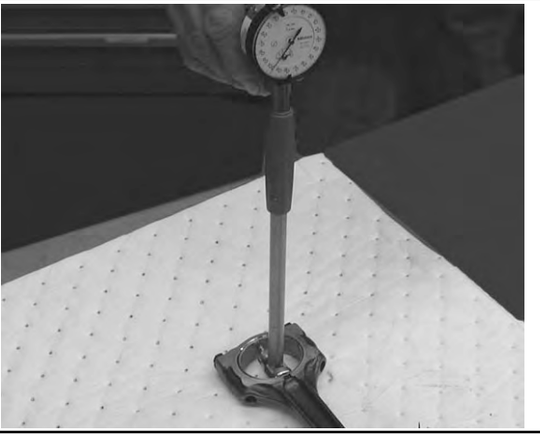
1. Inspect bearing inserts for unusual wear, peeling, scoring, damage etc. Replace as a set if damage is noted. Inspect bearing clearance and refer to Bearing Selection Chart. See **Connecting Rod Bearing Selection page** .

CONNECTING ROD BEARING CLEARANCE INSPECTION

1. Assemble the connecting rod cap with bearings and torque to specification.

TORQUE
Connecting Rod Fasteners: **22 ft-lbs (30 N·m) + 90°**

2. Measure the connecting rod big end bearing I.D. with a dial bore gauge and record.

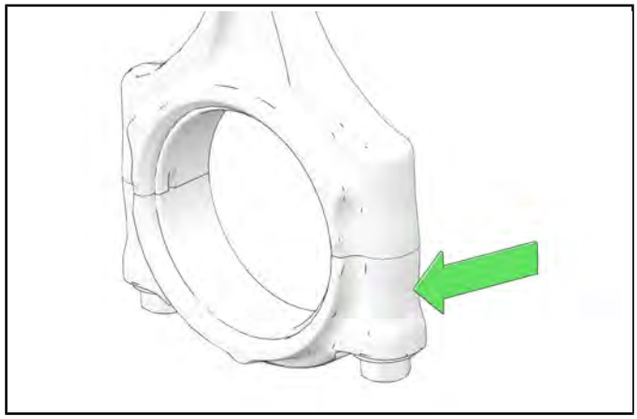


3. Measure the connecting rod journal on crankshaft and record.
4. Subtract the journal diameter from the connecting rod bearing diameter to calculate oil clearance and compare to specification. See **Service Specifications - Transmission / Crankshaft page 6.4**.
5. If service limits are exceeded, install new rod bearings and recheck oil clearance.
6. If service limits are still exceeded, determine if crankshaft or connecting rods need to be replaced.

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CONNECTING ROD BEARING SELECTION

1. There are 3 sizes of connecting rod bearings available: Black, Orange and Blue (see chart below).
2. To determine which bearing to use, look at the color code on right-hand end of crankshaft. “R” for Red and “W” for White. The letter will be stamped onto the counterweight.



3. The color code on the connecting rod appears in the form of a painted mark on the large end of the connecting rod.
4. Refer to the chart below to select the proper bearing insert.

FOR EXAMPLE: If the CONNECTING ROD paint mark is RED and the CRANKSHAFT stamp is W (white) (or not stamped), use BLUE bearing inserts.

CONNECTING ROD BEARING SELECTION CHART

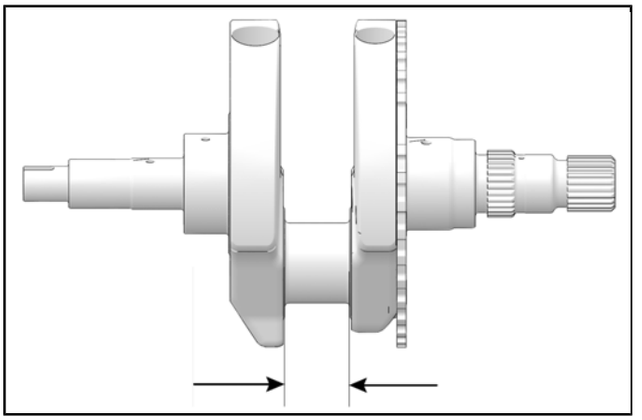
Connecting Rod Color	**Crankshaft Color**	**Bearing Color** (P/N 3515097-**xxx**)	**Bearing Thickness**
WHITE Paint Mark	RED (“R” Stamp)	Black (**- 067**)	1.474 — 1.479 mm
WHITE Paint Mark	WHITE (“W” Stamp or not marked)	Orange (**- 159**)	1.478 — 1.483 mm
RED Paint Mark	RED (“R” Stamp)	Orange (**- 159**)	
RED Paint Mark	WHITE (“W” Stamp or not marked)	Blue (**- 027**)	1.482 — 1.488 mm

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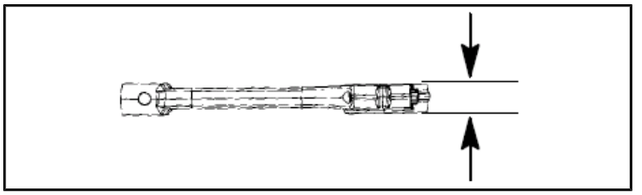
CRANKSHAFT INSPECTION

Record all measurements and compare to specifications. Replace crankshaft if any measurement is worn beyond the service limit. See **Service Specifications - Transmission / Crankshaft page 6.4.**

1. Measure the width of the rod bearing journal.

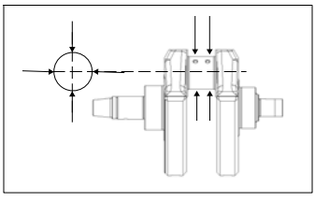


2. Measure width of connecting rods at big end.

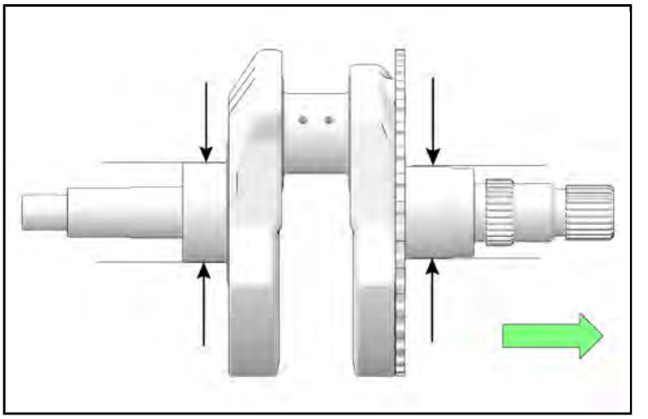


3. Visually inspect all bearing journals for scoring, damage or excessive wear.
4. Crankshaft and connecting rods are identified by color. Be sure to compare measurements to specifications for the proper color (or non-marked) connecting rod or crankshaft.

   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. Make sure proper bearing clearance is achieved by using the correct colored bearing insert for a given color combination of connecting rod and crankshaft.
2. Clean all oil off connecting rod, connecting rod cap and bearing inserts.
3. Install bearing inserts into connecting rods and caps. First, install bearing tab into groove, then press the rest of the bearing into place.

NOTICE
Procedure during disassembly called for marking of connecting rods and caps. Ensure that each part is installed in original location including rod cap fasteners.

4. Apply assembly lube to connecting rod bearings and crank pin.
5. 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.
6. Tighten rod cap fasteners:

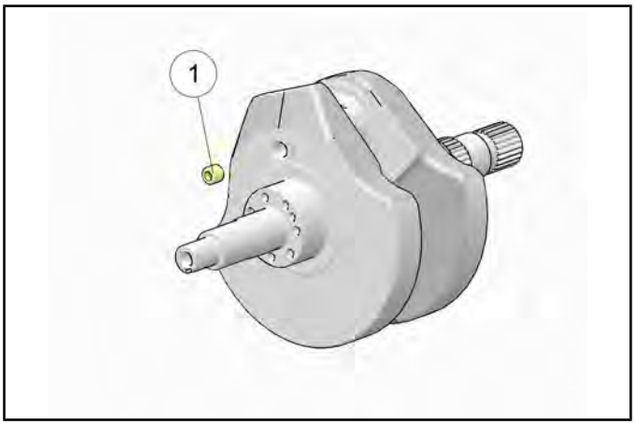
TORQUE
Connecting Rod Fasteners: **22 ft-lbs (30 N·m) + 90°**

7. Check that the connecting rods rotate smoothly and freely on crankshaft journal.

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CRANKSHAFT CLEANING

1. Remove blind plug ① from crankshaft to ensure that passages are clear.

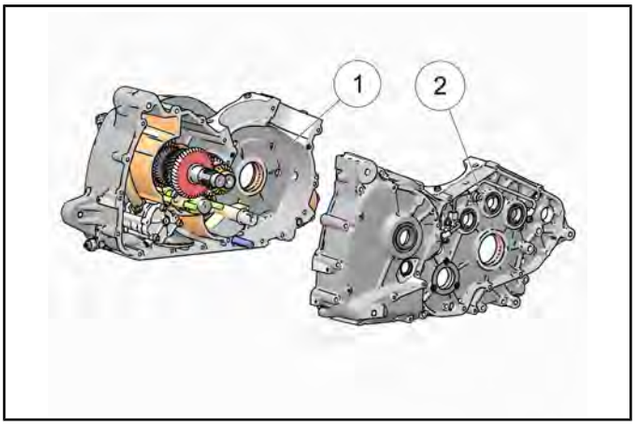


2. After cleaning passages, install blind plug and torque to specification. Plug should be flush with surface of crankshaft.

TORQUE
Blind Plug: **15 ft-lbs (20 N·m)**

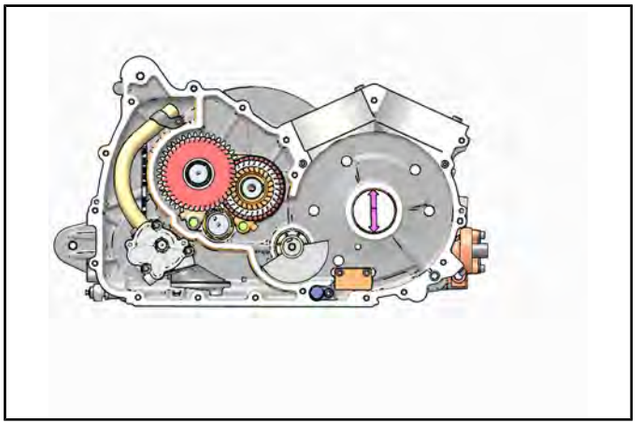
MAIN BEARING INSPECTION

1. Inspect crankcase main bearing surfaces ① & ② 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 6.4**.



2. If crankshaft dimensions are within tolerances and oil clearances are incorrect, the crankcase set must be replaced or new main bearings installed and line-honed by a competent machinist.

NOTICE
Replace crankcase halves as a set.

6

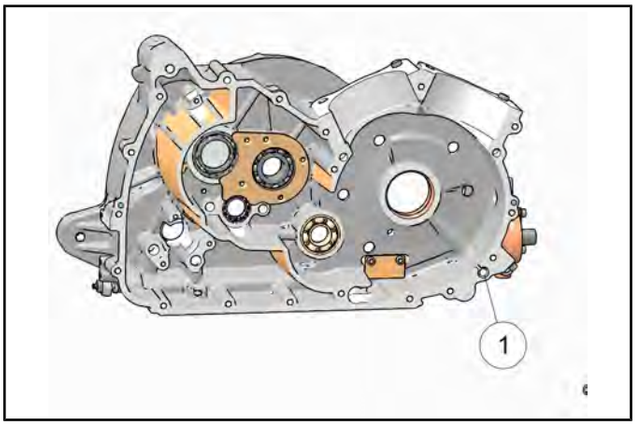
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LEFT CRANKCASE ASSEMBLY

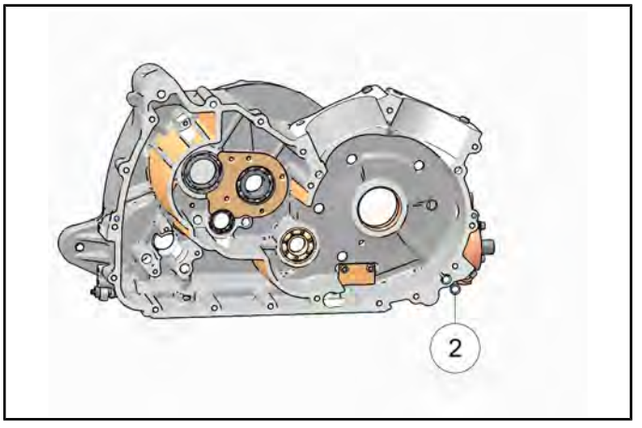
Prepare LEFT crankcase for assembly:

Refer to crankcase assembly view for locations and torque values. See **Crankcase page 6.6**.

1. Clean crankcase and oil passage ① thoroughly. Rinse and dry with compressed air.



2. Install new ball bearings in crankcase as required.
   - 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
3. Install bearing retainers as required and torque to specification.
4. Install scavenge filter screen assembly. See **Lubrication System page 3.22**.
5. Install new oil passage o-ring ② .

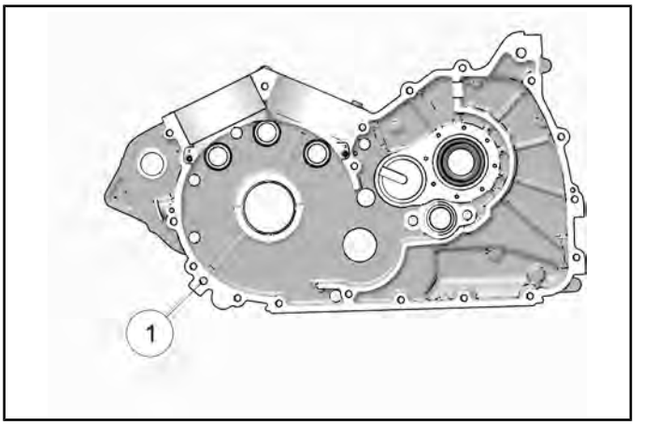


RIGHT CRANKCASE ASSEMBLY

Prepare RIGHT crankcase for assembly:

Refer to crankcase assembly view for locations and torque specification. See **Crankcase page 6.6**.

1. Clean crankcase oil passages ① thoroughly. Rinse and dry with compressed air.



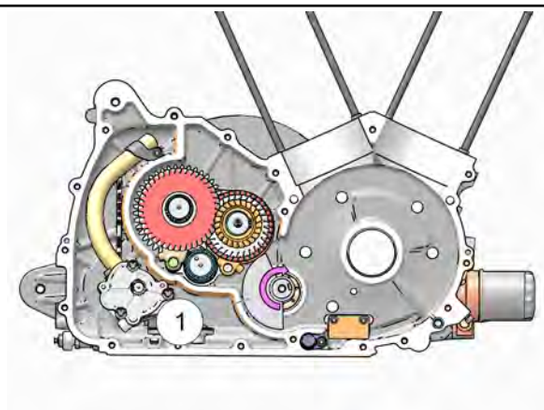
2. Install new bearings in crankcase as required.
   - Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
   - Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
   - DO NOT press on inner race of ball bearings.
3. Install bearing retainers as required and torque to specification.

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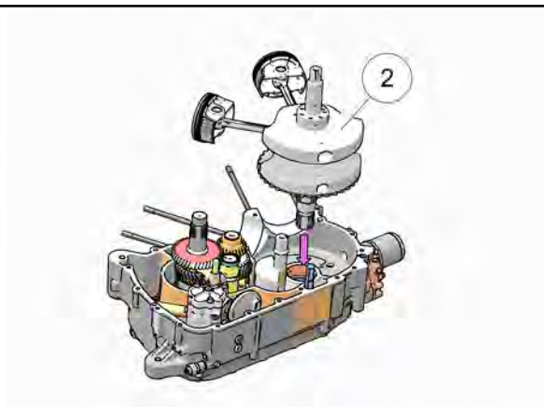
CRANKSHAFT INSTALLATION

NOTICE
Install left engine case onto an engine stand.

1. If balance shaft is already in place, rotate the balance shaft counter weight ① out of the way prior to crankshaft installation.



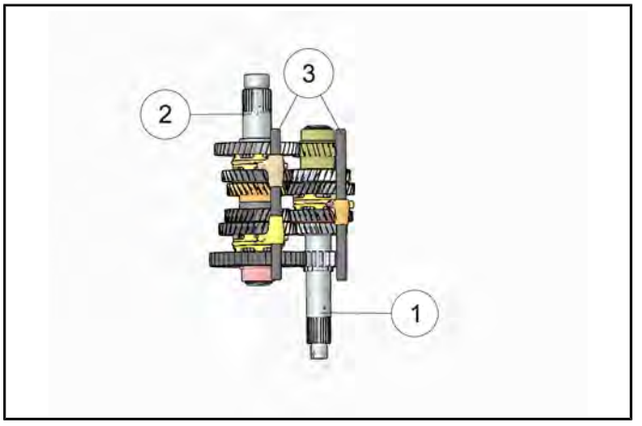
2. Apply assembly paste to main bearings.
3. Hold crankshaft over left crankcase and position rods so that left side rod is in cutout for rear cylinder and right side rod is in cutout for the front cylinder.
4. Place crankshaft ② into left crankcase half.



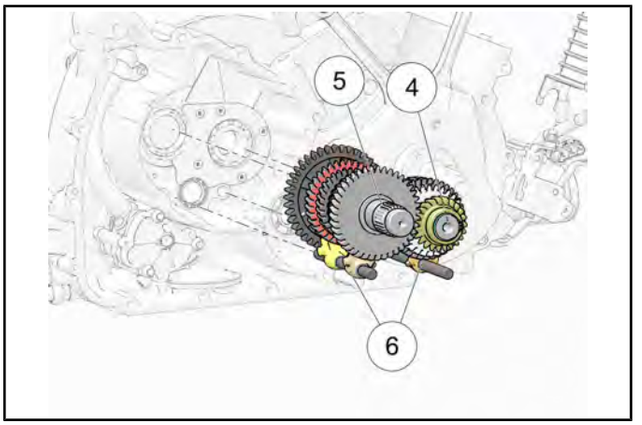
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TRANSMISSION INSTALLATION

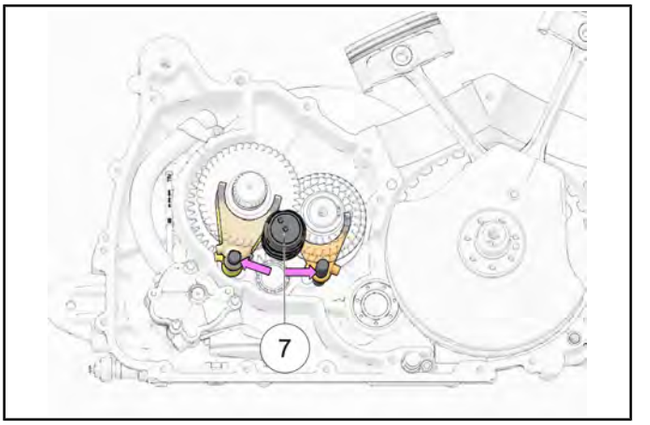
1. If transmission shaft bearings were replaced, be sure all bearing retainer plate fasteners are installed and tightened to specification. See **Crankcase page 6.6**.
2. Working on a flat surface, assemble the input shaft ① and output shaft ② so the gears are properly meshed.
3. Install shift rails ③ into shift forks and assemble to input and output shafts.



4. into shift forks and assemble to input and output shafts.
5. Install input shaft ④ and output shaft ⑤, shift forks and rails ⑥ into the left crankcase. Make certain both shafts are fully seated and rotate freely.



6. Rotate shift rails away from shift drum bore and install shift drum ⑦ .

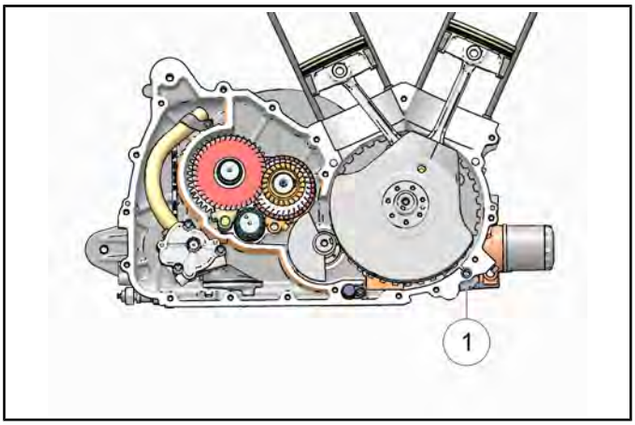


7. Rotate shift drum to align proper grooves with forks.
8. Move shift fork pins into drum grooves and seat rails.
9. Install balance shaft. See **Balance Shaft Installation page 6.19**.
10. Instal oil pump assembly. See **Oil Pump Installation page 3.25**.
11. Install crankshaft. See **Crankshaft Installation page 6.39**.
12. Assemble crankcase. See **Crankcase Assembly page 6.41**.

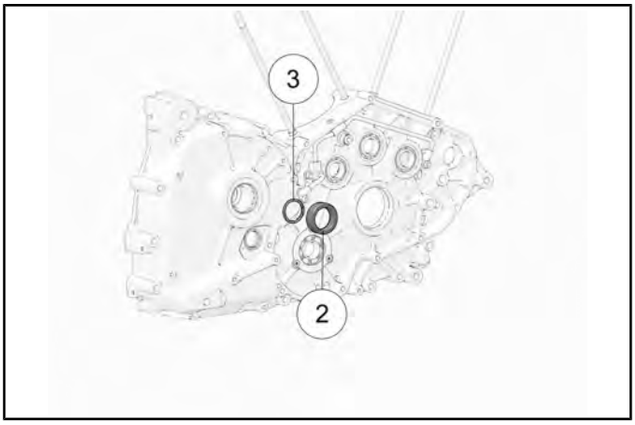
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CRANKCASE ASSEMBLY

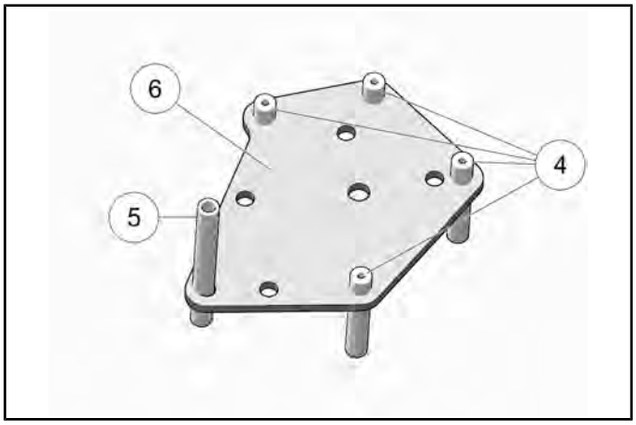
1. Clean crankcase mating surfaces to remove all grease, oil, and old sealant.
2. Check to be sure all shafts are seated properly (crankshaft, balance shaft, shift drum, shift forks, input shaft, output shaft).
3. Check to be sure that a new oil passage o-ring ① , alignment dowel pins and oil pipes, etc. are in place.



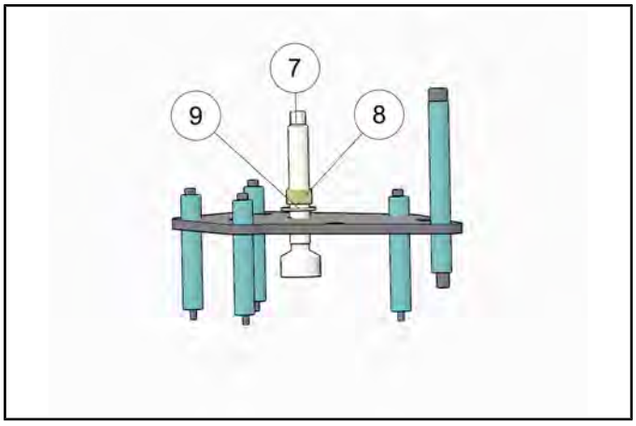
4. Remove the drive sprocket spacer ② and o-ring ③ from the right-hand crankcase prior to installation.



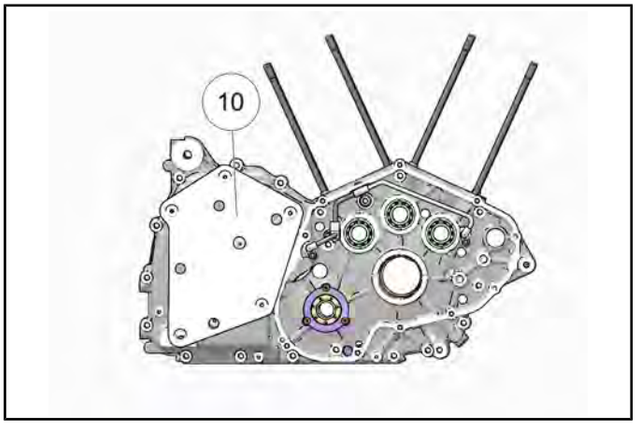
5. Place the Engine Case Splitting / Assembly tool **PF-51234** on a flat surface and assemble the M6 threaded spacers ④ and M12 threaded spacer ⑤ into the main plate ⑥ as shown. **Use only holes marked with the letter A.**



6. Install case assembly adapter ⑦ , nut ⑧ and washer ⑨ onto main plate.



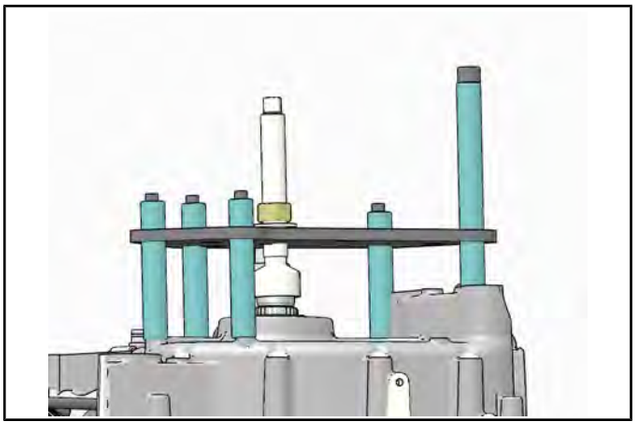
7. Install the main plate assembly ⑩ to the right-hand crankcase and torque fasteners to specification.



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IMPORTANT

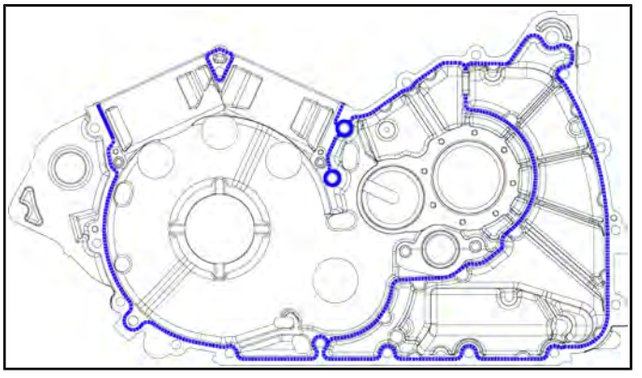
- Plate surface should be parallel to the surface of the engine crankcase.
- All threaded spacers must be in contact with engine case prior to fastening on the plate assembly.



TORQUE

Main Plate Mounting Fasteners (All):
88 in-lbs (10 N·m)

8. Apply a light even bead of Loctite™ Ultra Black 598 to entire case sealing surface.



9. Spread sealant into a thin even layer on entire case mating surface. Be sure all areas are covered. DO NOT ALLOW SEALANT TO DRY. CONTINUE ASSEMBLY UNTIL CASES ARE SEALED AND ALL FASTENERS ARE TIGHT.
10. Lower the right-hand case onto the left-hand case and install the case installation adapter onto the transmission output shaft.
11. 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.

12. Remove the tool.
13. Install crankcase fasteners and torque to specification. See **Crankcase Fastener Length And Torque Pattern page 6.8**.
14. Install a new output seal in right-hand crankcase using seal installer **PF-51243**.
15. Install the o-ring and drive sprocket spacer removed in STEP 4 with tapered edge toward the o-ring.
16. Install the gear position switch. See **Gear Position Sensor Removal / Replacement page 10.29**.
17. Install the drive sprocket. See **Drive Sprocket Removal / Installation page 8.78**.
18. Install the balance shaft driven gear and drive gear. See **Balance Shaft Installation page 6.19**.
19. Install the starter drive. See **Starter Drive Installation page 6.23**.
20. Install the inner cam chain cover. See **Inner Cam Chain Cover Installation page 6.21**.
21. Install the camshaft carrier assembly. See **Camshaft Carrier Installation page 3.50**.
22. Install the cam chain. See **Cam Chain Installation page 3.41**.
23. Install the stator. See **Stator Removal / Installation page 10.36**.
24. Install Flywheel. See **Flywheel Installation page 5.41**
25. Install the clutch assembly. See **Clutch Installation page 5.33**.
26. Install the primary cover. See **Primary Cover Installation (2022) page 5.24**.
27. Install lifters. See **Lifter Installation page 3.43**.
28. Install cylinders. See **Cylinder Installation page 3.97**.
29. Install cylinder heads. See **Cylinder Head Installation page 3.84**.
30. Install engine in frame. See **Engine Installation page 3.15**.

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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.

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 as shown below using round side of punch. Do not crack or tear staking lip. Do not use a sharp chisel to stake the nut.

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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
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
Transmission Hard to Shift	Improper Clutch Operation	Clutch	Refer to Clutch / Primary / Shift chapter

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PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
	Incorrect Oil Viscosity	Engine oil and filter	Refer to Engine / Cooling / Exhaust chapter
	Incorrect Clutch Adjustment	Clutch Adjustment	Refer to Clutch / Primary / Shift 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
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

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NOTES

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CHAPTER 7
FRAME / BODY

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GENERAL INFORMATION

SERVICE NOTES

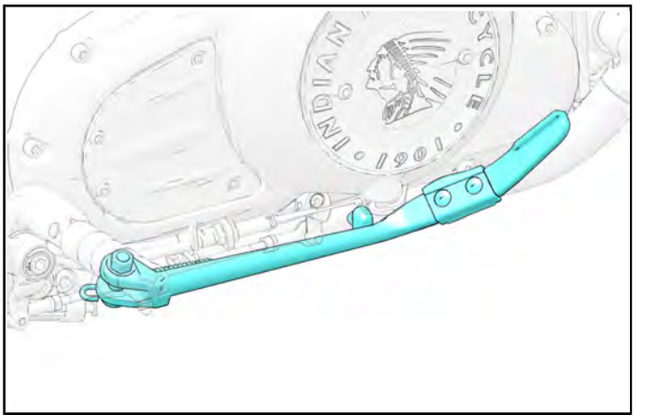
This section covers the removal and installation of frame and body components, assemblies and systems. Pay close attention to assembly procedures and torque specifications.

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.

FRAME / BODY MAINTENANCE

SIDE-STAND INSPECTION

1. Support the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Inspect side-stand spring for damage or loss of tension. Verify the side-stand returns to fully retracted position.



3. Inspect side-stand for smooth movement.
4. Inspect side-stand pivot fastener nut for proper torque.

TORQUE
Side-stand Pivot Fastener: **37 ft-lbs (50 N·m)**

5. Replace side-stand if it is bent. Do not attempt to straighten side-stand.

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SIDE-STAND REMOVAL / INSTALLATION

SIDE-STAND REMOVAL

⚠ WARNING

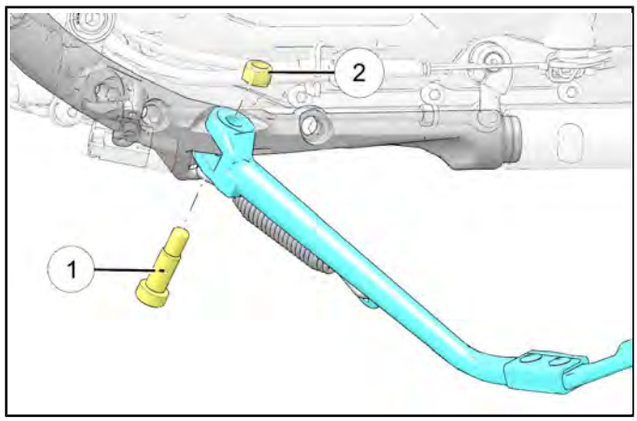
Side-stand is under spring tension, wear eye protection.

1. Park the motorcycle on it's center, secure the motorcycle, and make sure it is stable

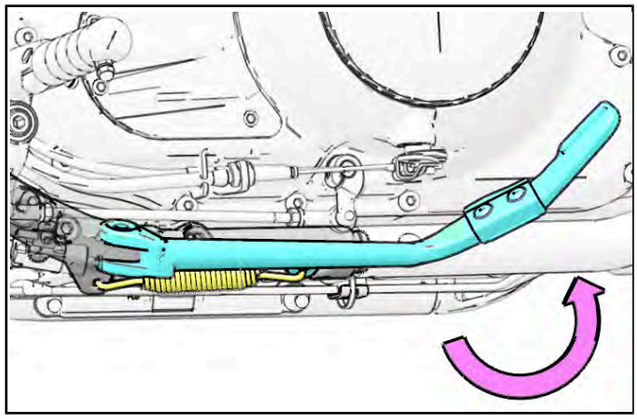
⚠ CAUTION

Side-stand will be moved between the UP (retracted) and DOWN (extended) position during removal and installation. Be sure vehicle is properly secured.

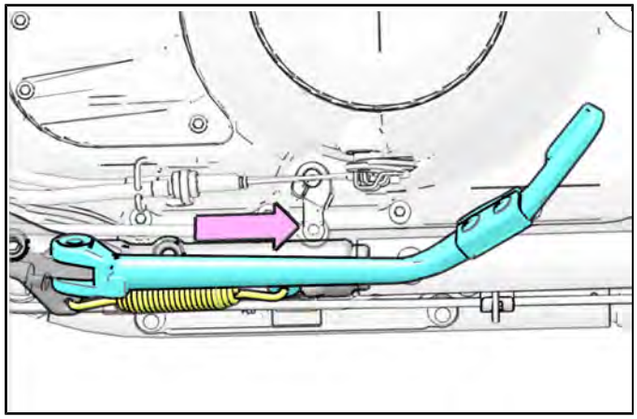
2. Turn key to OFF position and remove key.
3. Ensure side-stand is in the DOWN position Remove side-stand pivot bolt ① using a 6 mm hex wrench while holding the nut ② with a 15 mm wrench.



4. Grasp side-stand firmly and move it to the UP position.



5. Grasp side-stand firmly. Pull side-stand rearward against spring tension until mounting flange on side-stand is clear of the mounting boss on the frame.



6. Relax tension and remove spring.

7

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SIDE-STAND INSTALLATION

⚠ WARNING

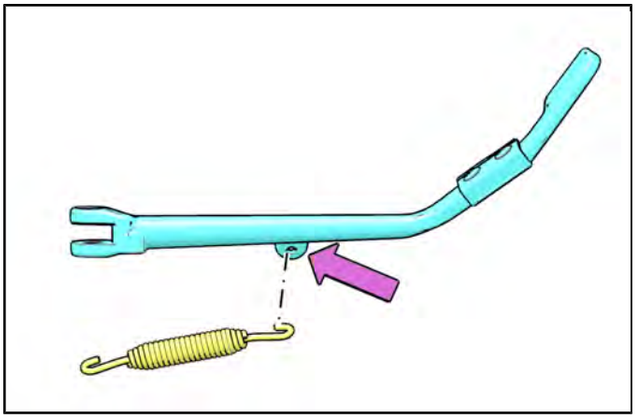
Side-stand is under spring tension, wear eye protection.

1. Using ID Red or similar de-greaser, clean the pivot bolt and side-stand mounting boss on frame.

IMPORTANT

Failure to do so will result in poor performance of the side-stand.

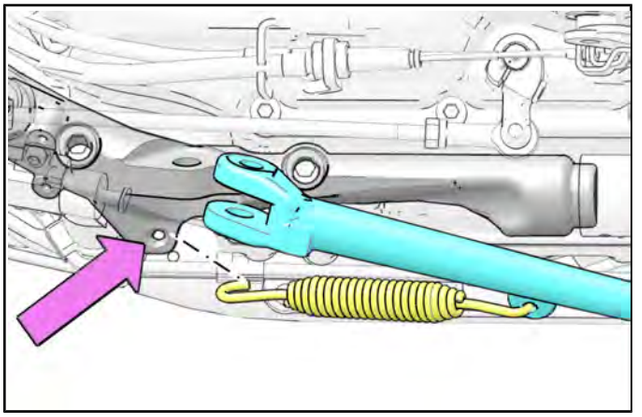
2. Lightly grease side-stand mounting boss on frame and the shouldered portion of the pivot bolt.
3. Attach spring to side-stand.



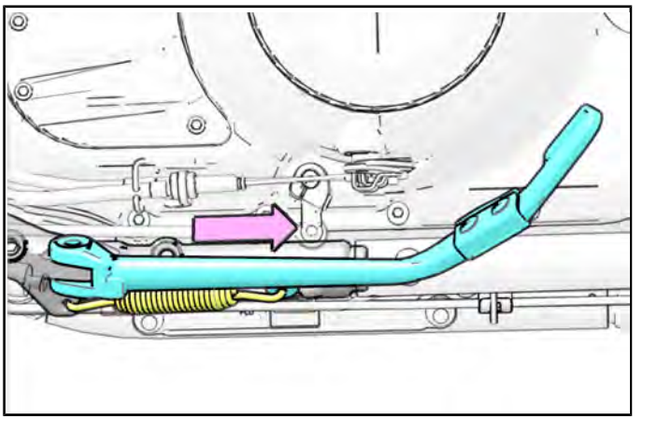
IMPORTANT

Ensure the loops of the side-stand spring face towards the center of motorcycle. Failure to have proper orientation may result in a spring failure.

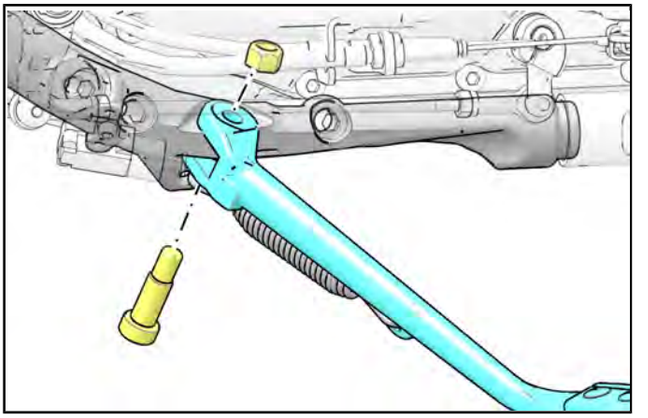
4. Place loose end of spring through hole in frame rail.



5. With side-stand in the retracted position (up) grasp side-stand firmly and, pull stand rearward against spring tension until the mounting flange on the side-stand drops onto the mounting boss on the frame.



6. Swing side-stand to the extended position to align bolt hole and install bolt and nut.



7. Torque to specification and wipe off any excess grease.

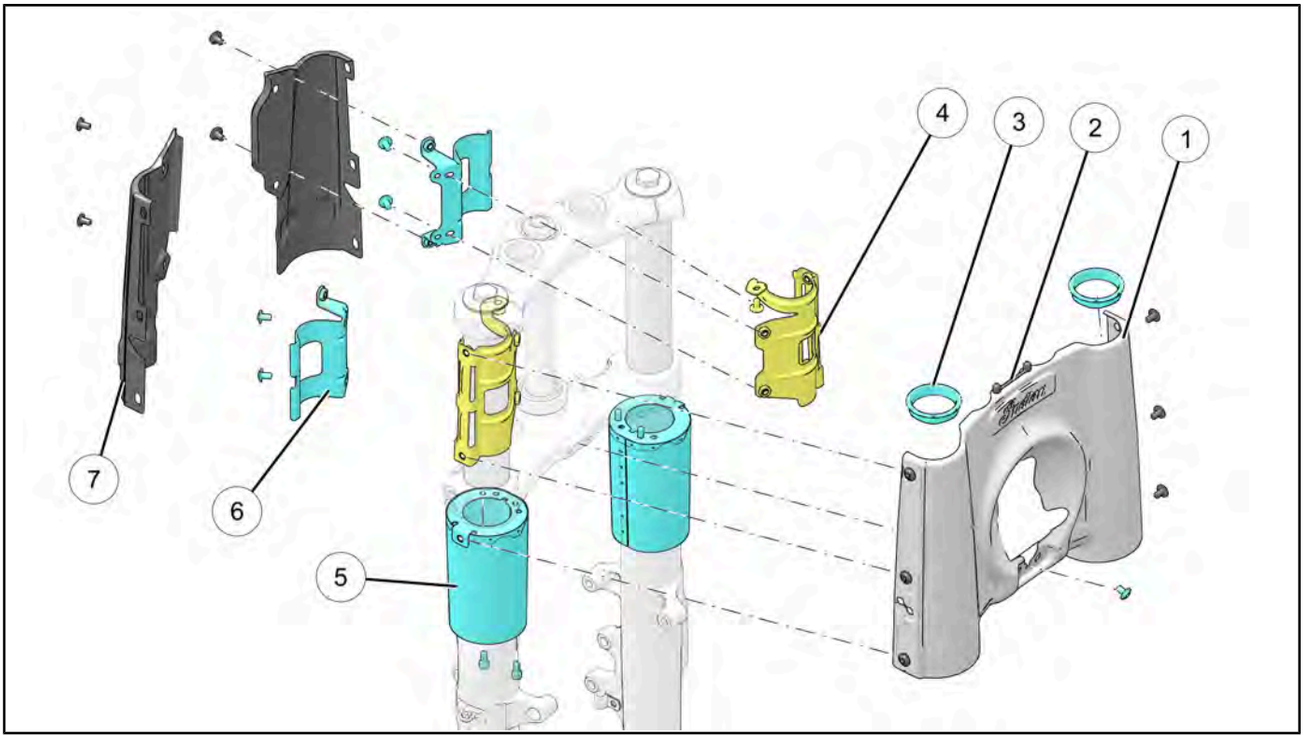
TORQUE
Side-stand Pivot Bolt: **37 ft-lbs (50 N·m)**

8. Cycle the side-stand to be sure it moves freely, and returns to the fully retracted position.

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ASSEMBLY VIEWS

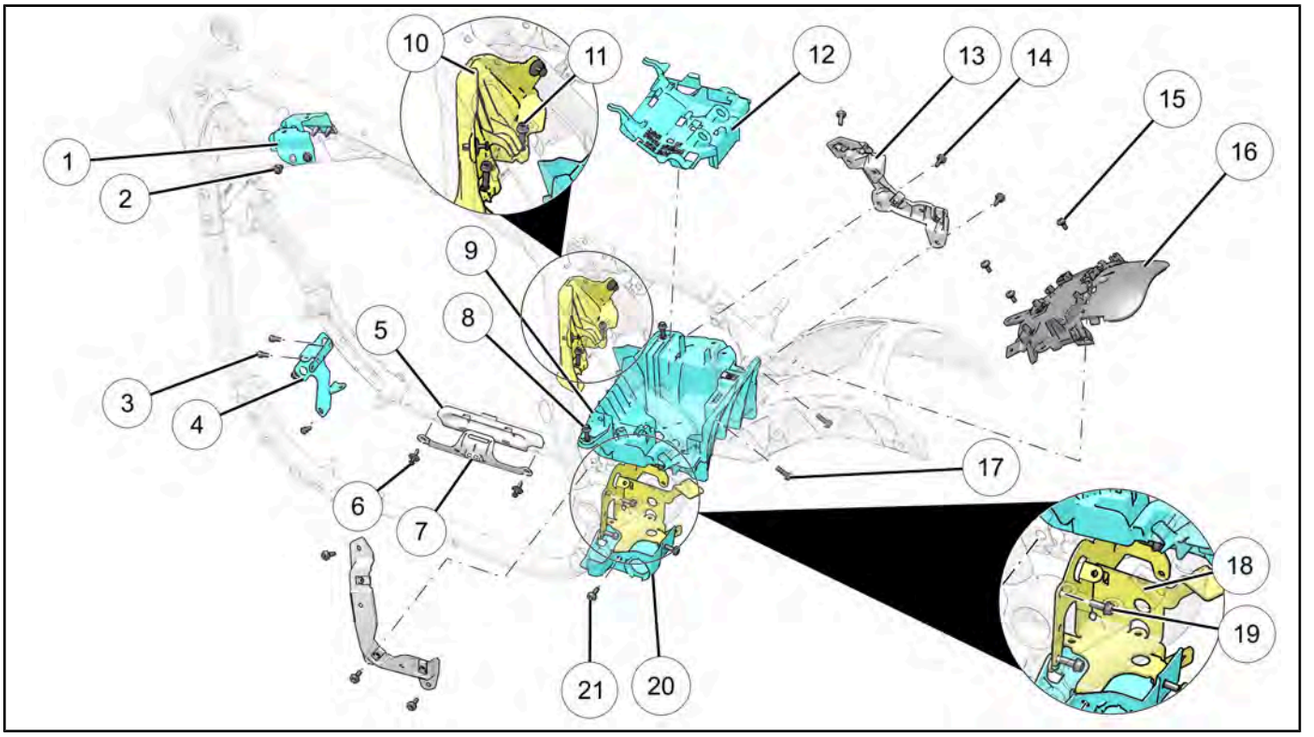
BODYWORK COMPONENTS



NOTICE
All front bodywork fasteners are to be torqued to **88 in-lbs (10 N·m)**. Fasteners are not interchangeable.

ITEM	DESCRIPTION
①	Front Cover
②	Nacelle Pin Grommet
③	Fork Tube Grommet
④	Nacelle Mount
⑤	Fork Cover
⑥	Rear Clamp Mount
⑦	Rear Nacelle Cover

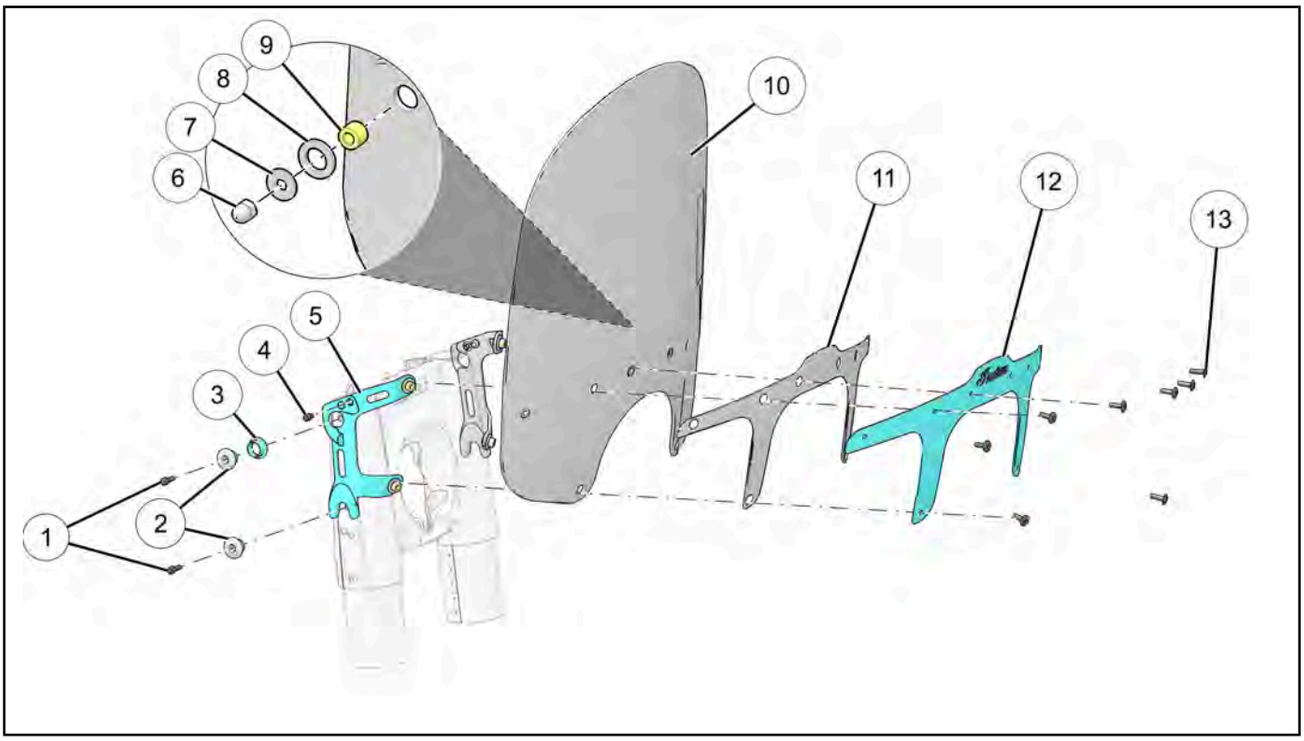
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ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Harness Tray	—	⑫	Upper Battery Tray	—
②	Push Rivet	—	⑬	Side Cover Bracket RH	—
③	Voltage Regulator Bracket Fastener	**88 in-lbs (10 N·m)**	⑭	Side Cover Bracket Fastener	**35 in-lbs (4 N·m)**
④	Voltage Regulator Bracket	—	⑮	Fender Tray Fastener	**88 in-lbs (10 N·m)**
⑤	Retention Cradle	—	⑯	Fender Tray	—
⑥	Push Rivet	—	⑰	Battery Box Rear Fastener	**115 in-lbs (13 N·m)**
⑦	Retention Cradle Strap	—	⑱	ABS Bracket	—
⑧	Battery Box Fastener M6	**35 in-lbs (4 N·m)**	⑲	ABS Bracket Fastener	**88 in-lbs (10 N·m)**
⑨	Battery Box	—	⑳	ABS Tray	—
⑩	Closeout Panel	—	㉑	ABS Tray Fastener	**35 in-lbs (4 N·m)**
⑪	Closeout Panel Fastener	**88 in-lbs (10 N·m)**			

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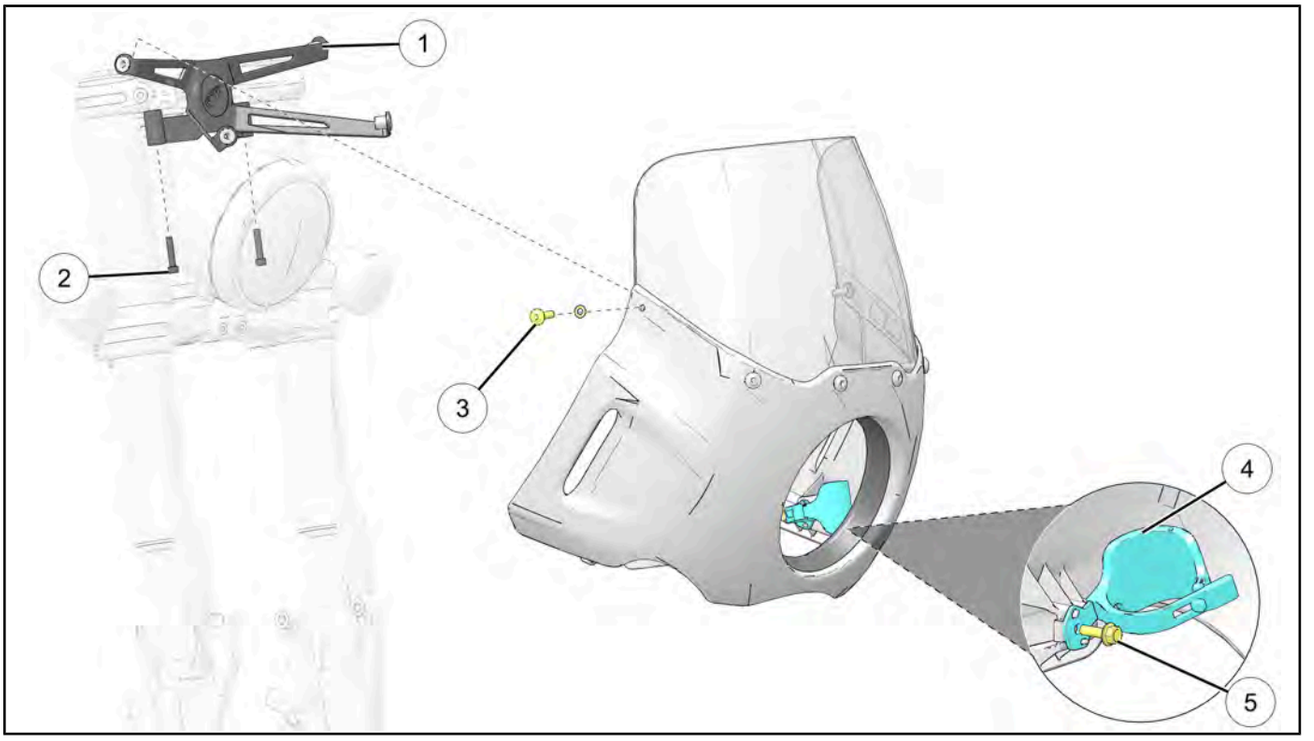
WINDSHIELD



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Windshield Spool Fastener	**88 in-lbs (10 N·m)**	⑧	Rubber Washer	—
②	Windshield Spool	—	⑨	Windshield Bushing	—
③	Windshield Bushing	—	⑩	Windshield	—
④	Windshield Lock Fastener	**88 in-lbs (10 N·m)**	⑪	Windshield Rubber Pad	—
⑤	Windshield Mount Bracket	—	⑫	Windshield Outer Bracket	—
⑥	Windshield Nut	**88 in-lbs (10 N·m)**	⑬	Windshield Fastener	**88 in-lbs (10 N·m)**
⑦	M6 Metal Washer	—			

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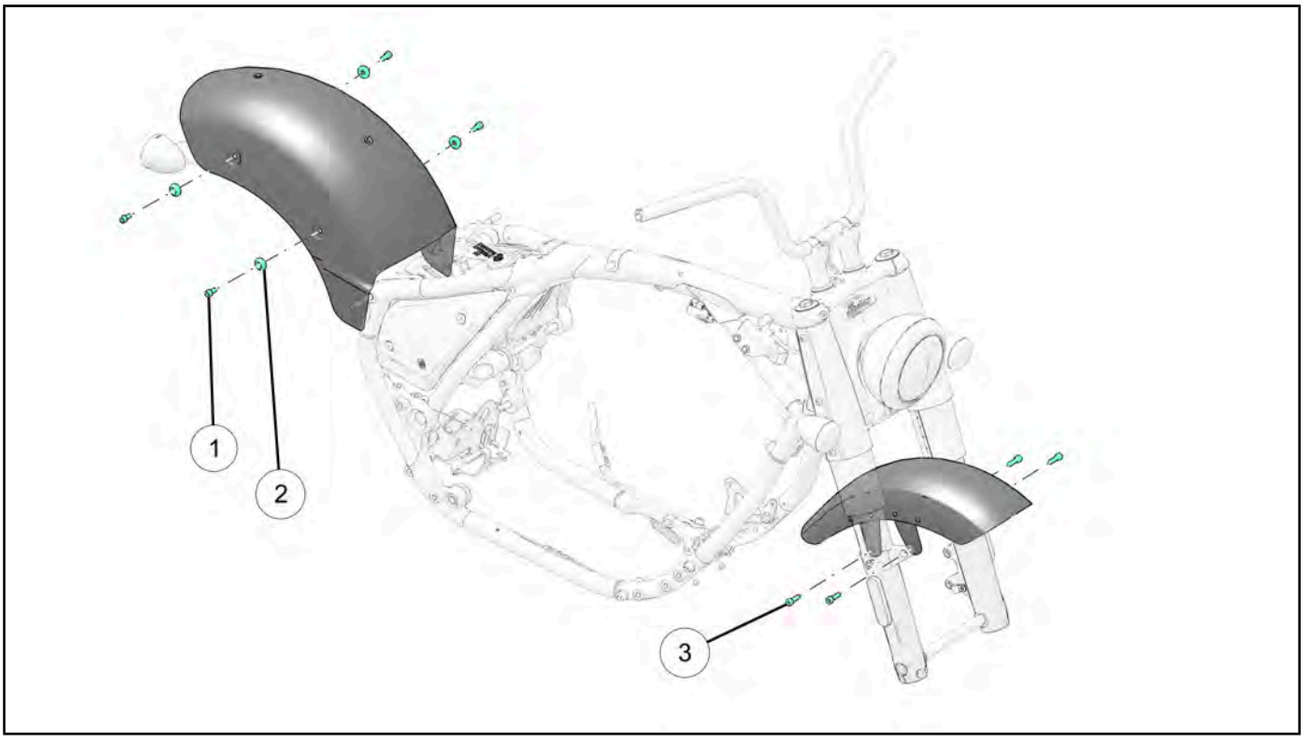
FAIRING



ITEM	DESCRIPTION	TORQUE
①	Cowl Mount (Upper)	—
②	Cowl Mount Fastener (Upper)	**88 in-lbs (10 N·m)**
③	Windshield Fastener	**9 in-lbs (1 N·m)**
④	Cowl Mount (Lower)	—
⑤	Cowl Mount Fastener (Lower)	**35 in-lbs (4 N·m)**

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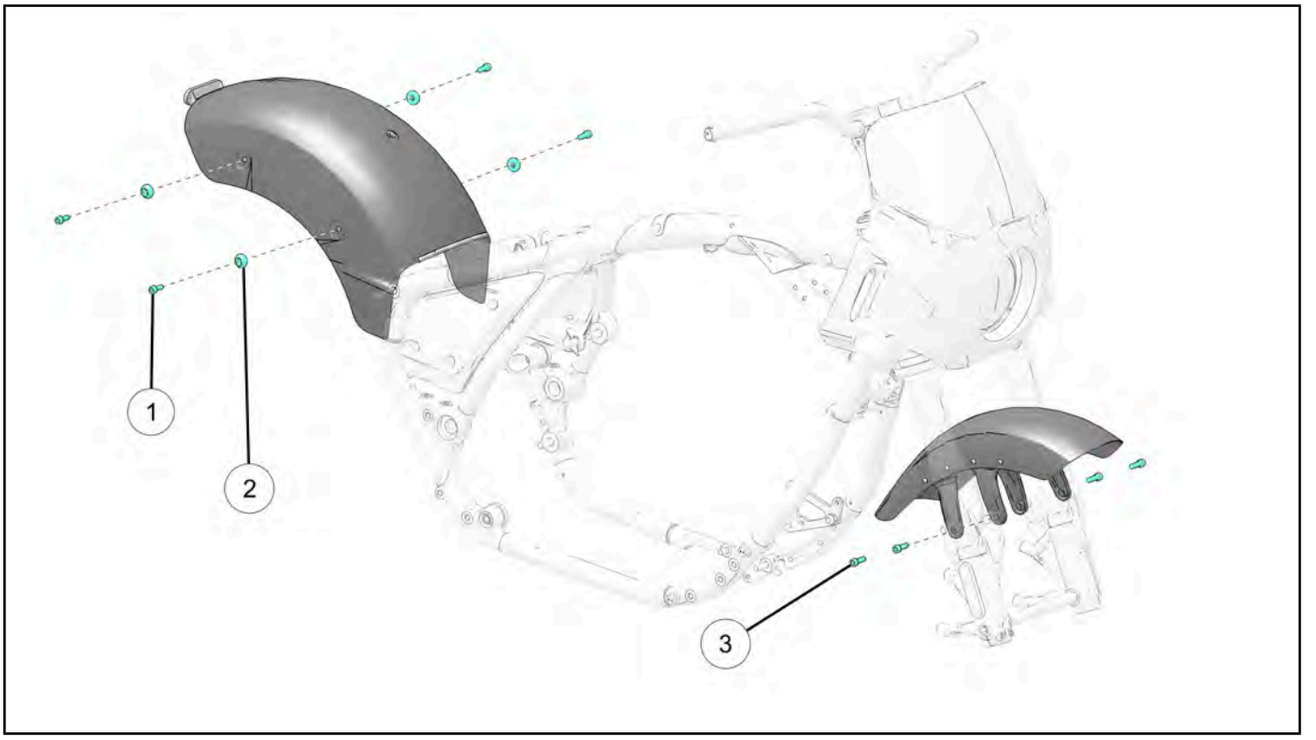
FENDER COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Rear Fender Fastener	**18 ft-lbs (25 N·m)**
②	Rear Fender Washer	—
③	Front Fender Fastener	**17 ft-lbs (24 N·m)**

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FENDER COMPONENTS (SPORT CHIEF)

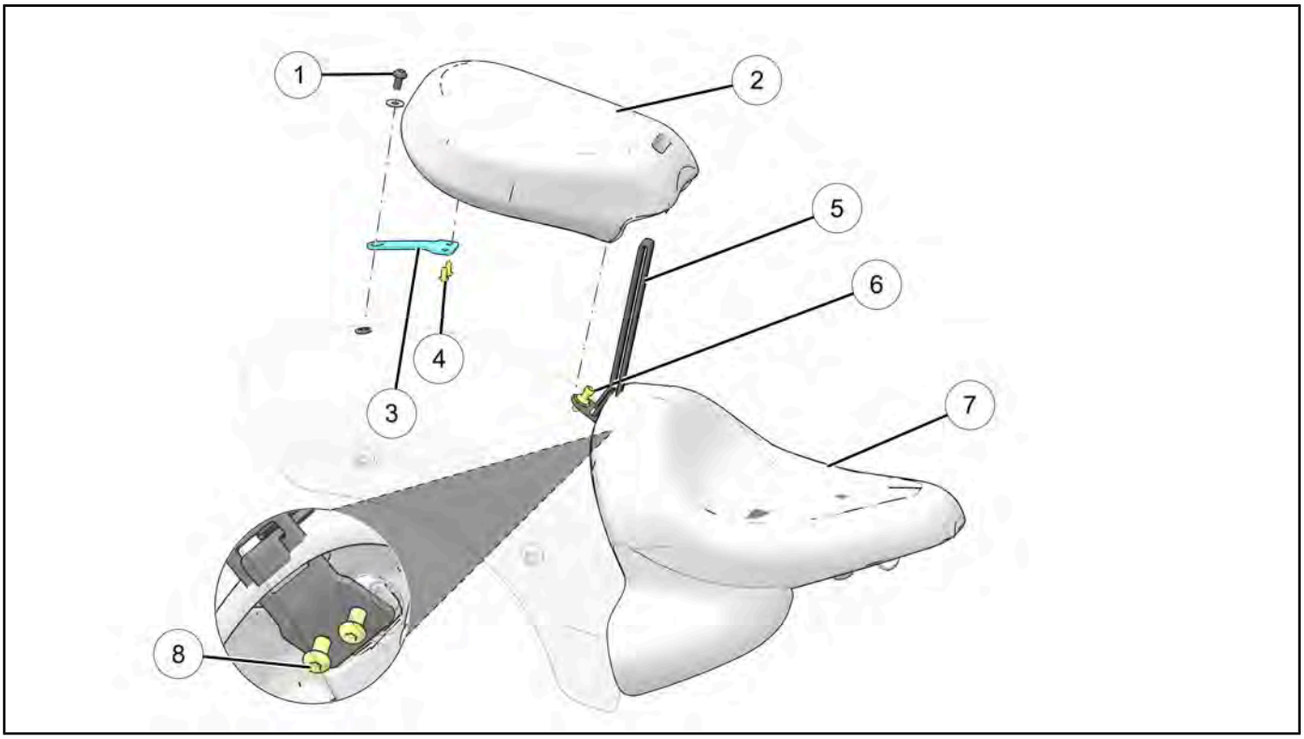


ITEM	DESCRIPTION	TORQUE
①	Rear Fender Fastener	**18 ft-lbs (25 N·m)**
②	Rear Fender Washer	—
③	Front Fender Fastener	**17 ft-lbs (24 N·m)**

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SEAT

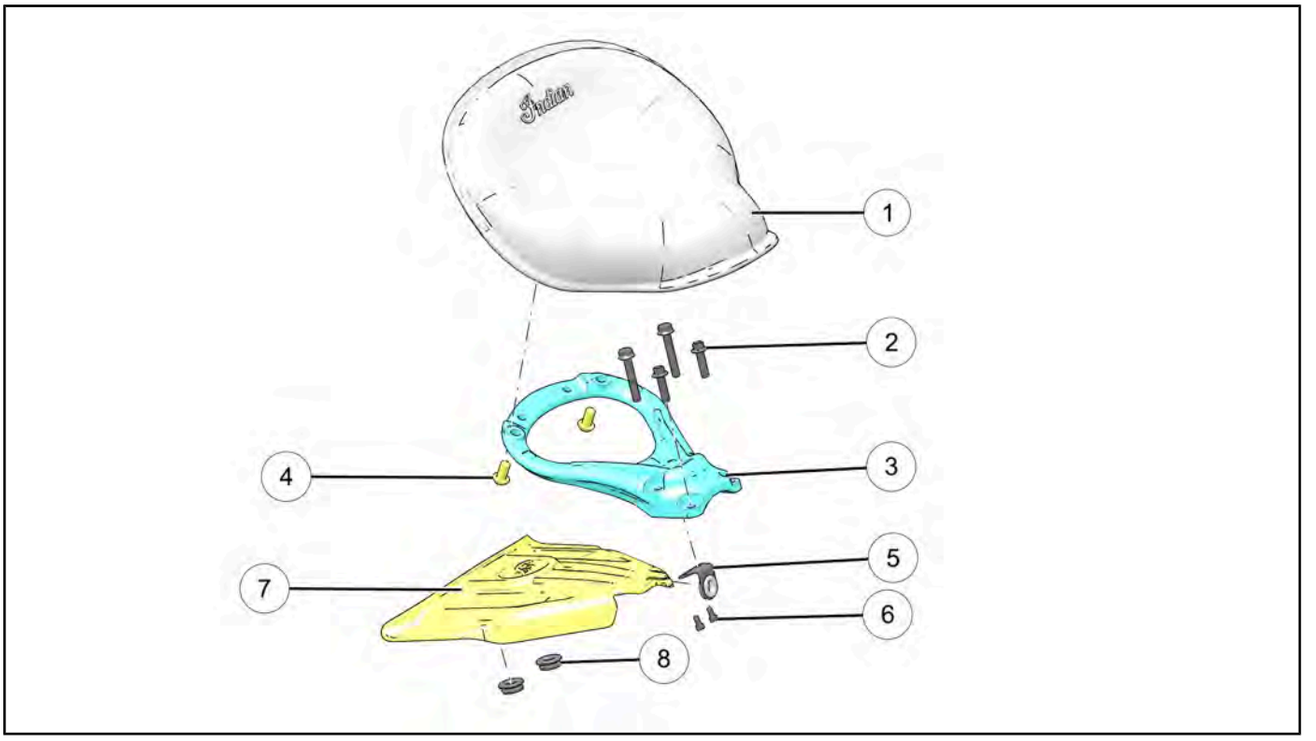
BAGGER SEAT



ITEM	DESCRIPTION	TORQUE
①	Pillion Seat Fastener	**13 ft-lbs (18 N·m)**
②	Pillion Seat	—
③	Pillion Seat Bracket	—
④	Pillion Seat Bracket Fastener	**53 in-lbs (6 N·m)**
⑤	Pillion Strap Assembly	—
⑥	Pillion Seat Stud	**13 ft-lbs (18 N·m)**
⑦	Bagger Seat	—
⑧	Pillion Strap Assembly Fastener	**53 in-lbs (6 N·m)**

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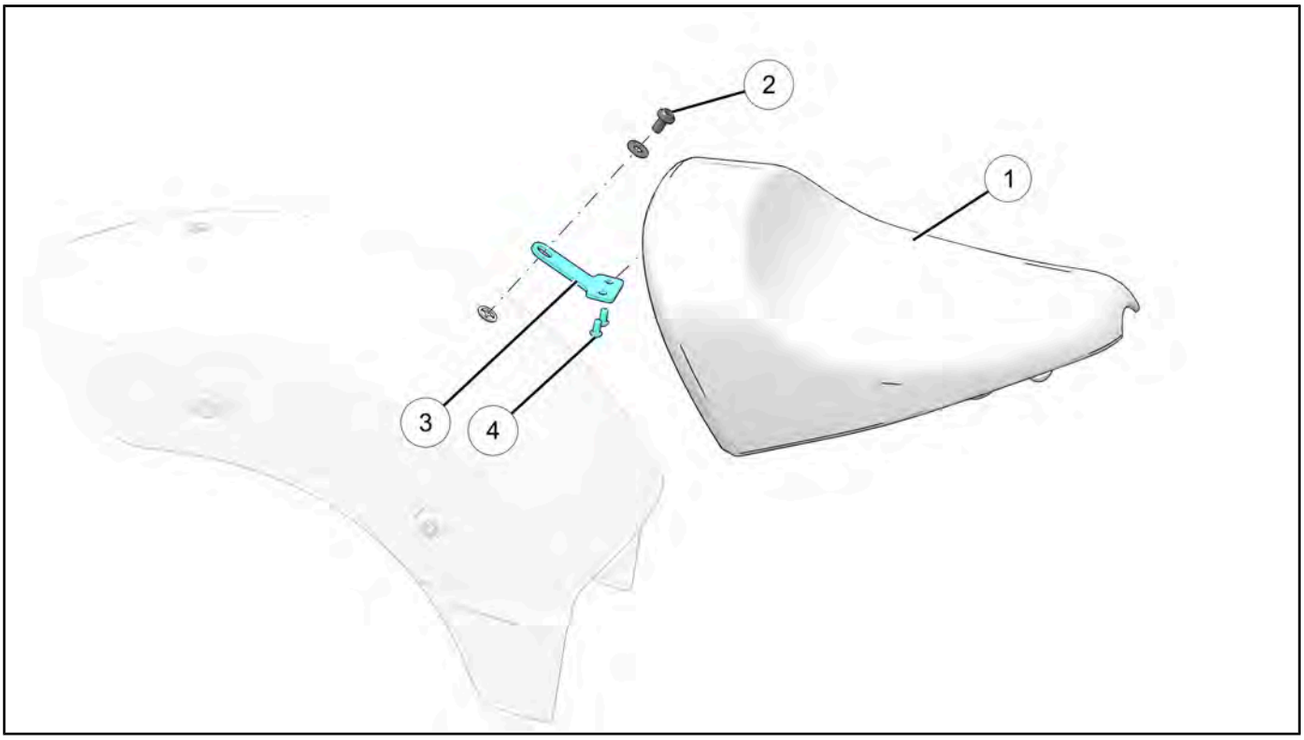
FLOATING SEAT



ITEM	DESCRIPTION	TORQUE
①	Floating Seat	—
②	Seat Mount Fastener	**18 ft-lbs (25 N·m)**
③	Seat Mount	—
④	Floating Seat Fastener	**18 ft-lbs (25 N·m)**
⑤	Closeout Bracket	—
⑥	Closeout Bracket Fastener	**35 in-lbs (4 N·m)**
⑦	Seat Closeout	—
⑧	Seat Closeout Grommet	—

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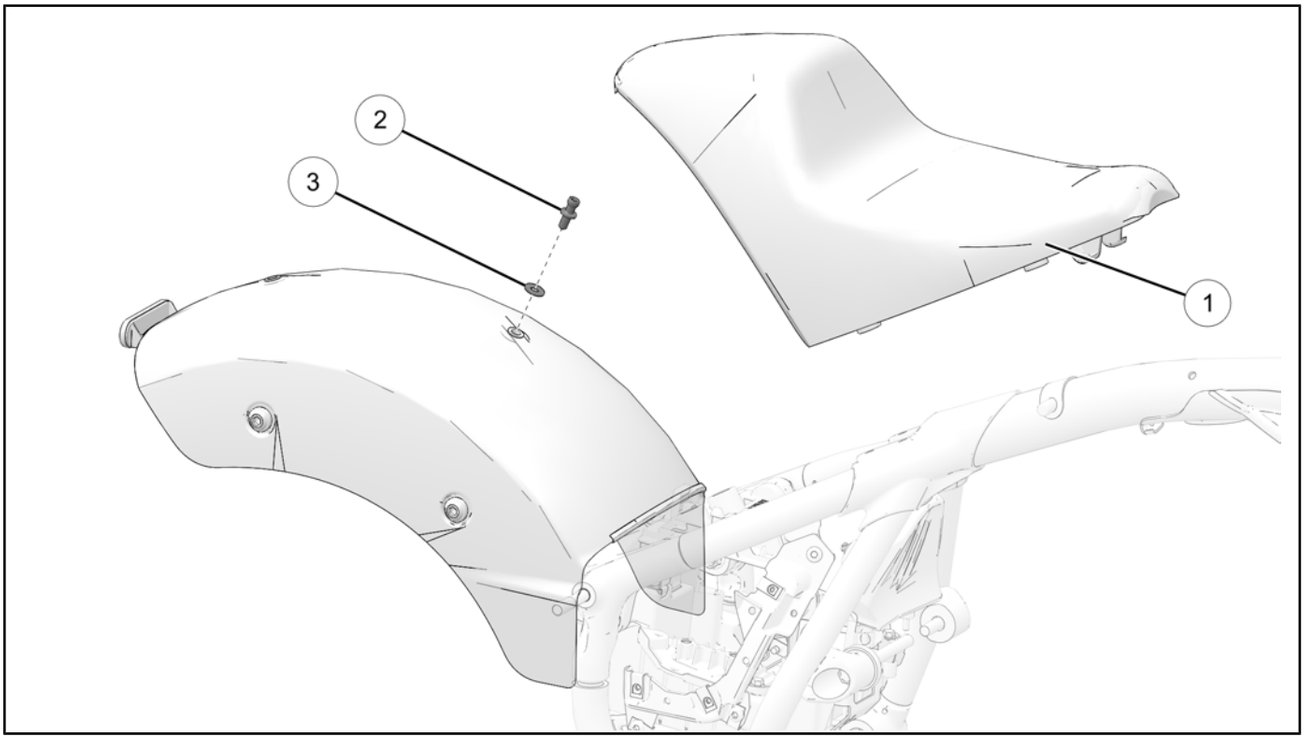
SOLO SEAT



ITEM	DESCRIPTION	TORQUE
①	Solo Seat	—
②	Solo Seat Fastener	**13 ft-lbs (18 N·m)**
③	Solo Seat Bracket	
④	Solo Seat Bracket Fastener	**53 in-lbs (6 N·m)**

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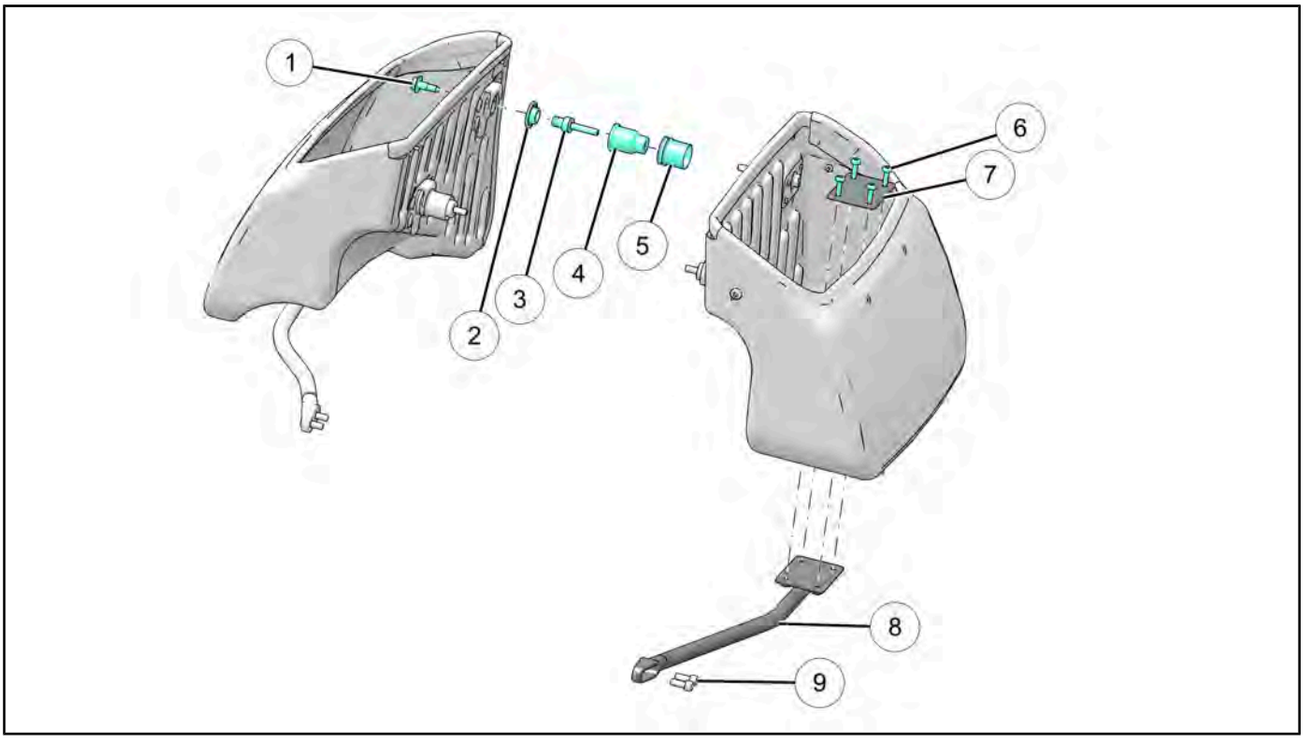
SEAT (SPORT CHIEF)



ITEM	DESCRIPTION	TORQUE
①	Sport Seat	—
②	Sport Seat Fastener	**13 ft-lbs (18 N·m)**
③	Washer	—

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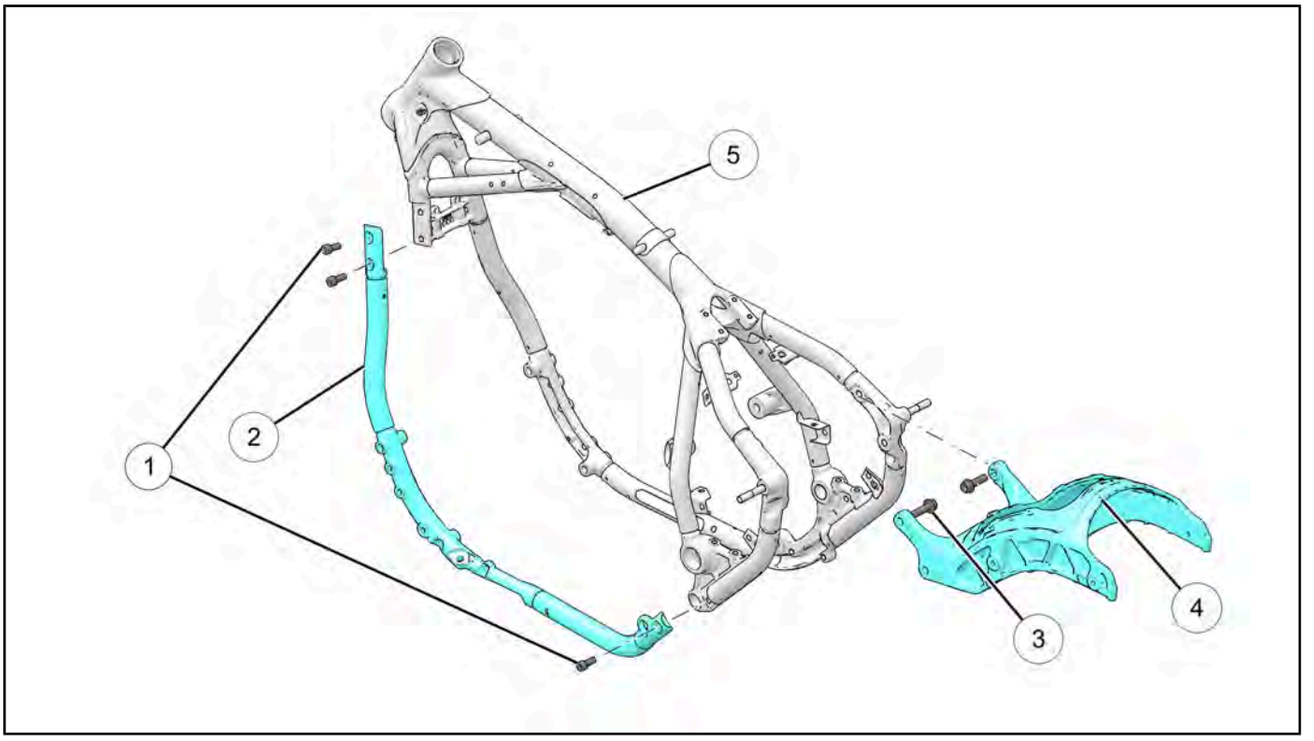
SADDLE BAG COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Saddle Bag Fastener	**13 ft-lbs (18 N·m)**
②	Rubber Flange Bushing	—
③	Saddle Bag Spool Fastener	**18 ft-lbs (25 N·m)**
④	Saddlebag Spool	—
⑤	Trunk Spool	—
⑥	Saddle Bag Support to Saddle Bag Fastener	**88 in-lbs (10 N·m)**
⑦	Saddle Bag Backer	—
⑧	Saddle Bag Support	—
⑨	Saddle Bag Support to Frame Fastener	**18 ft-lbs (25 N·m)**

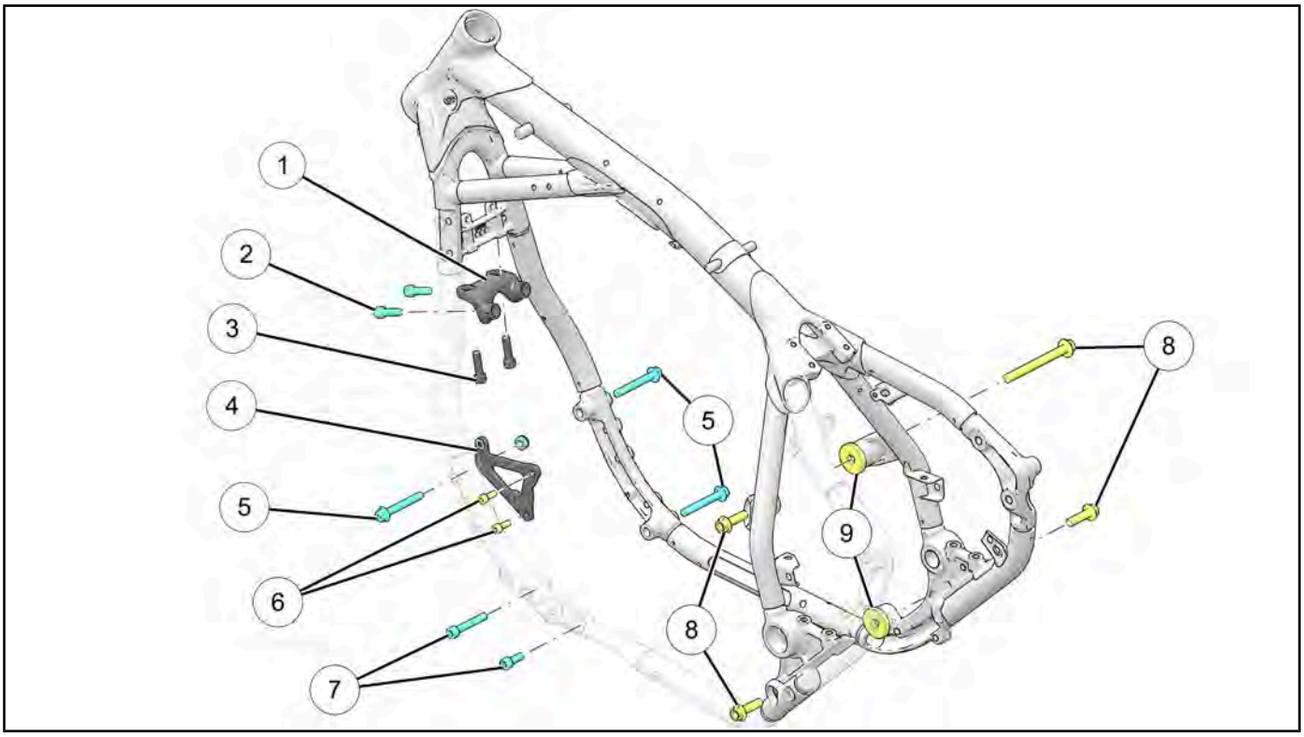
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FRAME COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Frame Cradle Fastener	**44 ft-lbs (60 N·m)**
②	Frame Cradle	—
③	Subframe Fastener	**74 ft-lbs (100 N·m)**
④	Subframe	—
⑤	Main Frame	—

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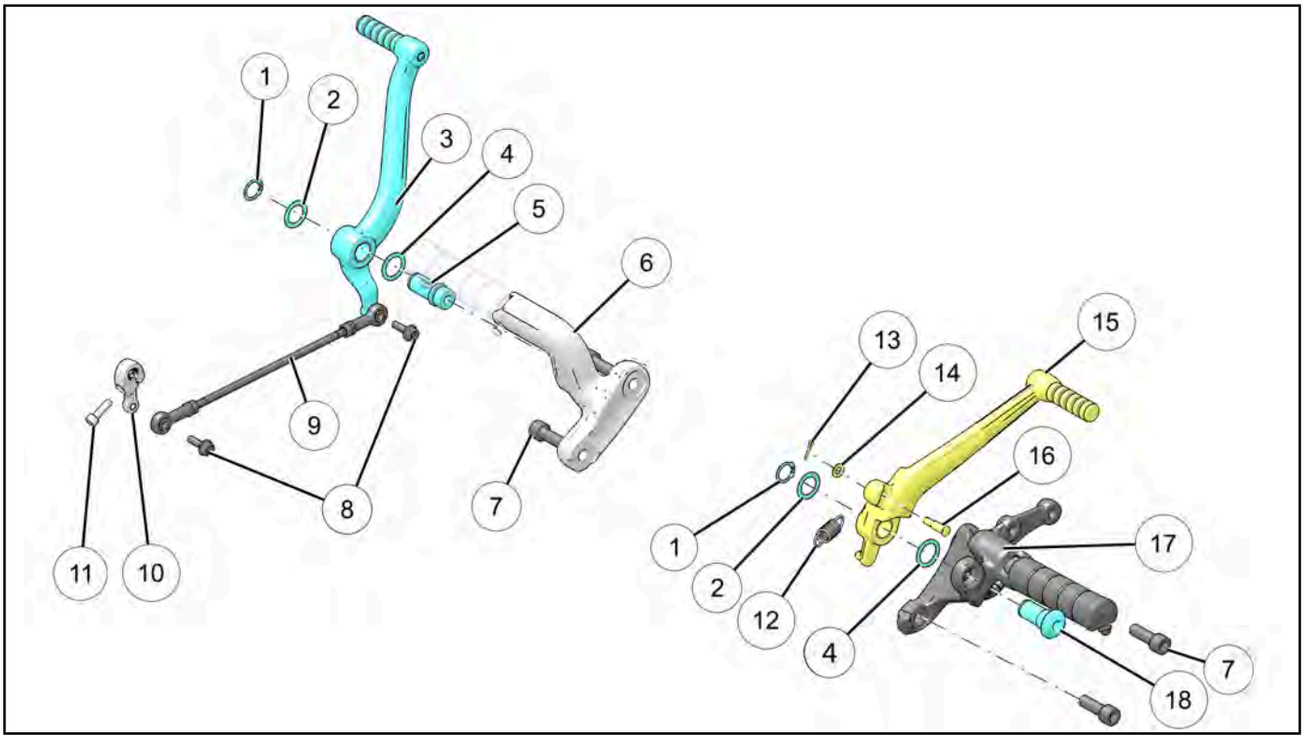


ITEM	DESCRIPTION	TORQUE
①	Cylinder Head Mount Bracket	—
②	Cylinder Head Mount Bracket Faster (to frame)	**33 ft-lbs (45 N·m)**
③	Cylinder Head Mount Bracket Faster (to engine)	
④	Engine Bracket	—
⑤	Engine Mount Fastener (Hex M10)	**44 ft-lbs (60 N·m)**
⑥	Engine Mount Fastener (Allen M8)	**18 ft-lbs (25 N·m)**
⑦	Lower Engine Mount Fastener (Allen M10)	**44 ft-lbs (60 N·m)**
⑧	Rear Engine Mount Fastener (Hex M12)	**74 ft-lbs (100 N·m)**
⑨	Frame Spacer 7.6mm	—

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FOOT PEG COMPONENTS

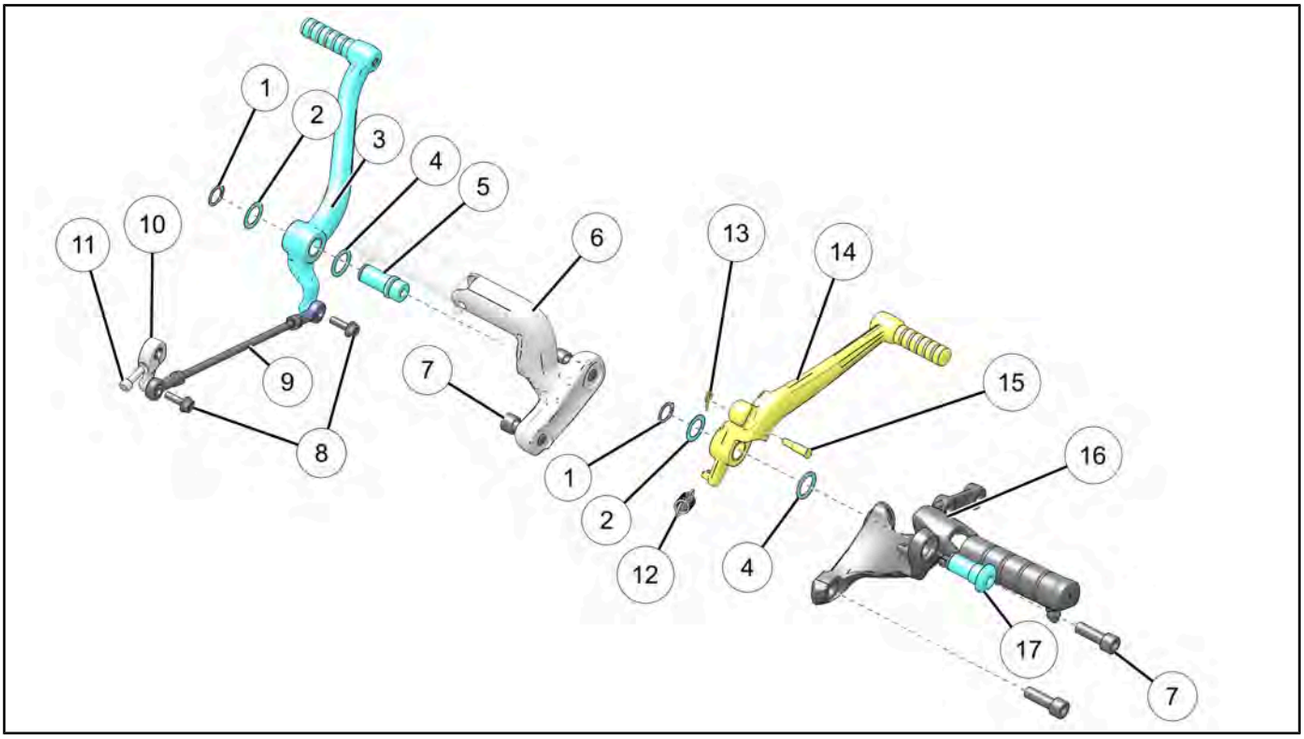
FORWARD CONTROLS (2022)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Snap Ring	—	⑩	Shift Lever	—
②	Washer	—	⑪	Shifter Lever Fastener	**88 in-lbs (10 N·m)**
③	Shift Pedal	—	⑫	Brake Return Spring	—
④	Wave Washer	—	⑬	Cotter Pin	—
⑤	Shift Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**	⑭	Washer	—
⑥	Left Foot Peg Mount	—	⑮	Brake Pedal	—
⑦	Foot Control Fastener	**35 ft-lbs (47 N·m)**	⑯	Clevis Pin	—
⑧	Shift Rod Fastener	**88 in-lbs (10 N·m)**	⑰	Right Foot Peg Mount	—
⑨	Shift Rod	—	⑱	Brake Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**

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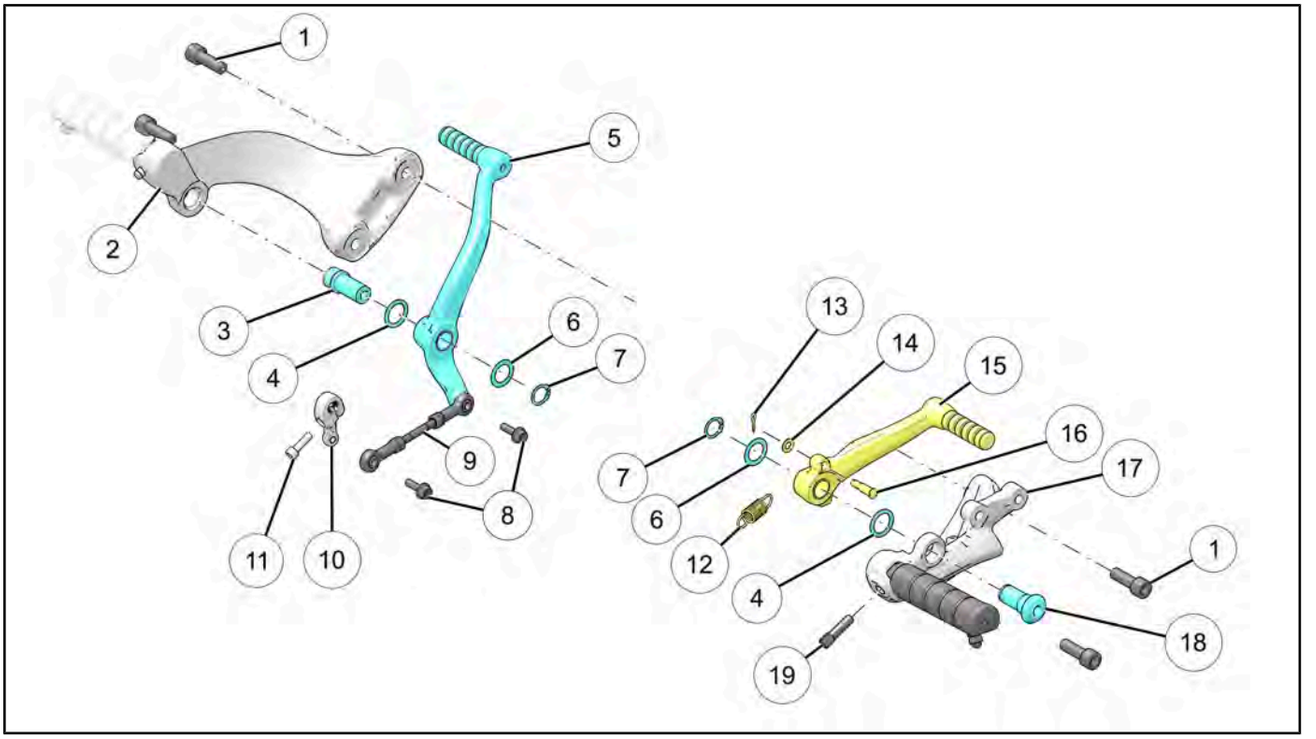
FORWARD CONTROLS (2023+)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Snap Ring	—	⑩	Shift Lever	—
②	Washer	—	⑪	Shifter Lever Fastener	**88 in-lbs (10 N·m)**
③	Shift Pedal	—	⑫	Brake Return Spring	—
④	Wave Washer	—	⑬	Rue Pin	—
⑤	Shift Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**	⑭	Brake Pedal	—
⑥	Left Foot Peg Mount	—	⑮	Clevis Pin	—
⑦	Foot Control Fastener	**35 ft-lbs (47 N·m)**	⑯	Right Foot Peg Mount	—
⑧	Shift Rod Fastener	**88 in-lbs (10 N·m)**	⑰	Brake Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**
⑨	Shift Rod	—			

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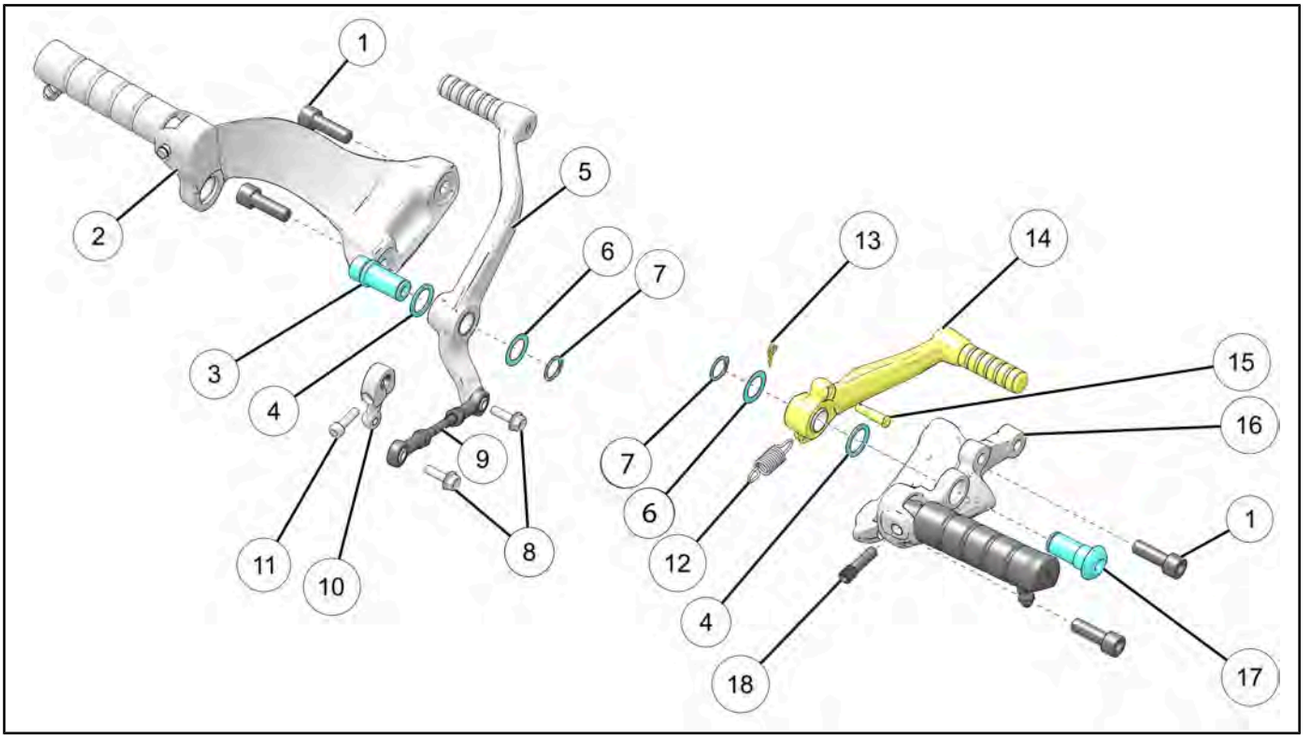
MID CONTROLS (2022)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Foot Control Fastener	**35 ft-lbs (47 N·m)**	⑪	Shifter Lever Fastener	**88 in-lbs (10 N·m)**
②	Left Foot Peg Mount	—	⑫	Brake Return Spring	—
③	Shift Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**	⑬	Cotter Pin	—
④	Wave Washer	—	⑭	Washer	—
⑤	Shift Pedal	—	⑮	Brake Pedal	—
⑥	Washer	—	⑯	Clevis Pin	—
⑦	Snap Ring	—	⑰	Right Foot Peg Mount	—
⑧	Shift Rod Fastener	**88 in-lbs (10 N·m)**	⑱	Brake Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**
⑨	Shift Rod	—	⑲	Foot Peg Pivot Fastener (Mid Control)	**10 ft-lbs (13 N·m)**
⑩	Shift Lever	—			

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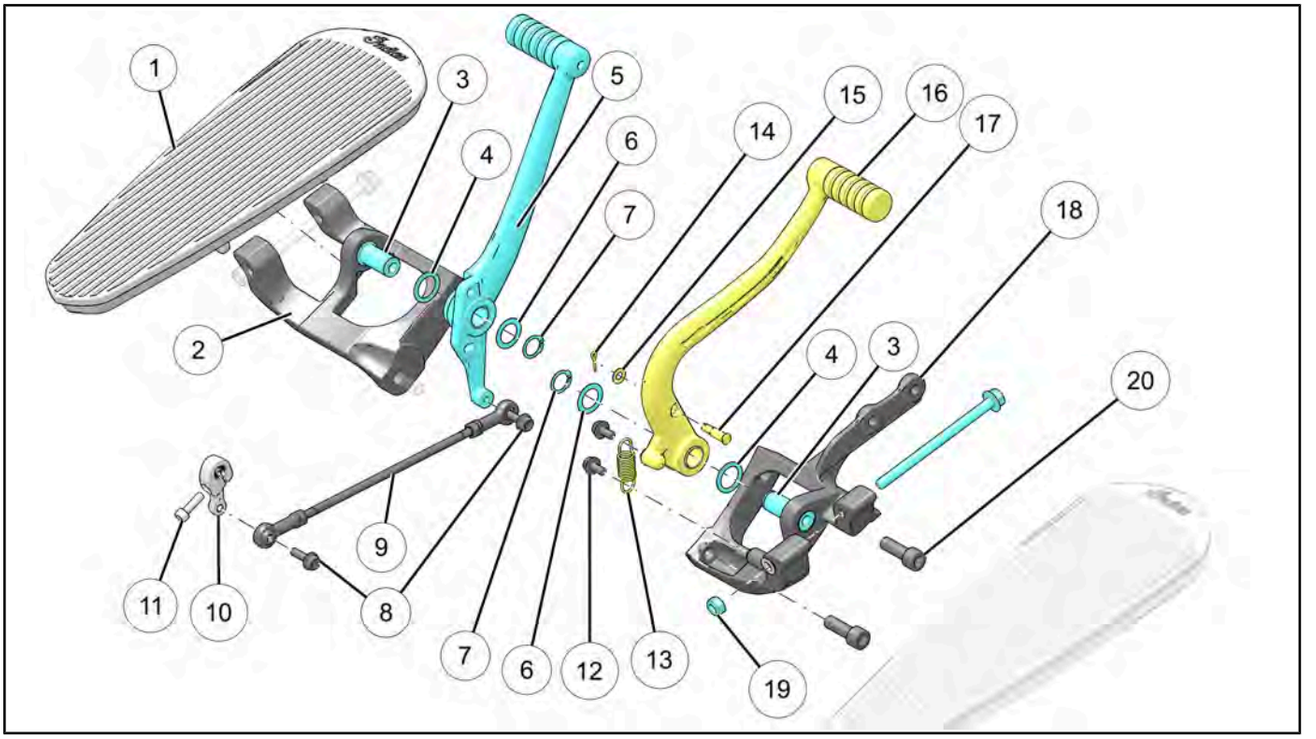
MID CONTROLS (2023+)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Foot Control Fastener	**35 ft-lbs (47 N·m)**	⑩	Shift Lever	—
②	Left Foot Peg Mount	—	⑪	Shifter Lever Fastener	**88 in-lbs (10 N·m)**
③	Shift Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**	⑫	Brake Return Spring	—
④	Wave Washer	—	⑬	Rue Pin	—
⑤	Shift Pedal	—	⑭	Brake Pedal	—
⑥	Washer	—	⑮	Clevis Pin	—
⑦	Snap Ring	—	⑯	Right Foot Peg Mount	—
⑧	Shift Rod Fastener	**88 in-lbs (10 N·m)**	⑰	Brake Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**
⑨	Shift Rod	—	⑱	Foot Peg Pivot Fastener (Mid Control)	**10 ft-lbs (13 N·m)**

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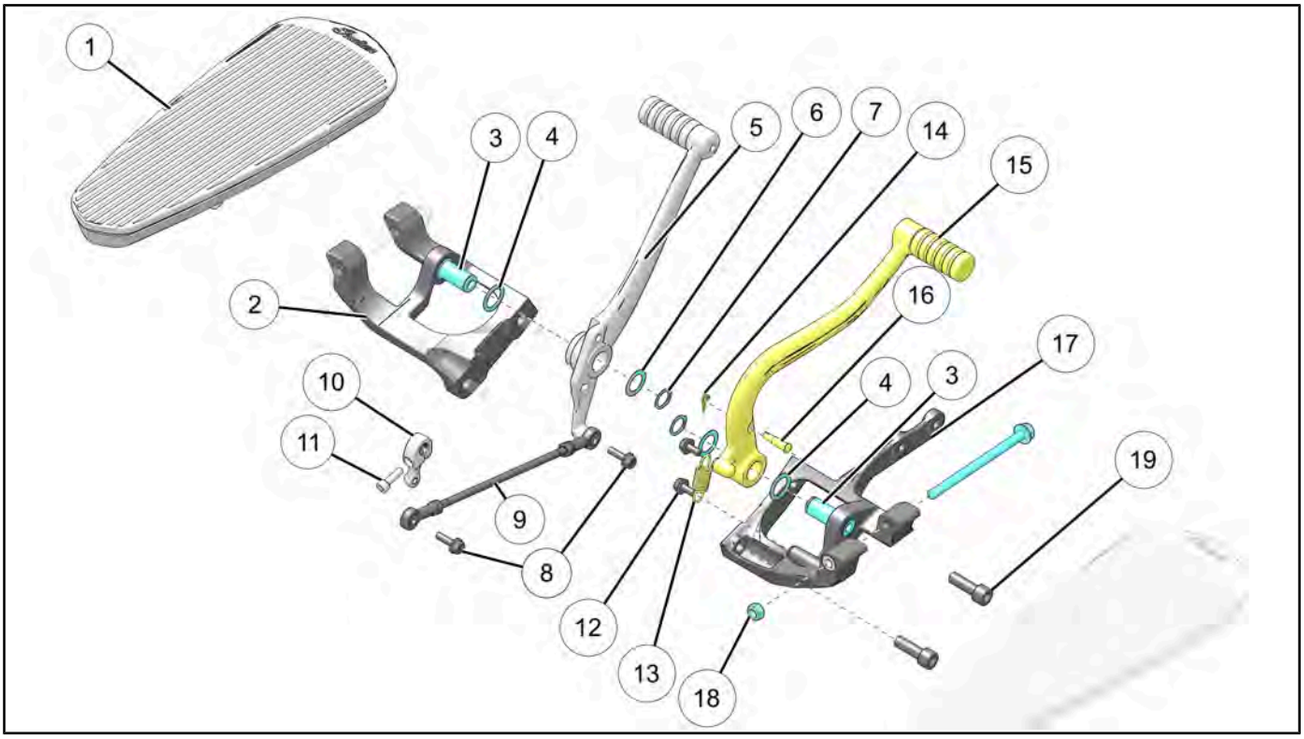
FLOOR BOARD CONTROLS (2022)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Floorboard assembly	—	⑪	Shifter Lever Fastener	**88 in-lbs (10 N·m)**
②	Floorboard Support (LH)	—	⑫	Brake Return Spring Fastener	**88 in-lbs (10 N·m)**
③	Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**	⑬	Brake Return Spring	—
④	Wave Washer	—	⑭	Cotter Pin	—
⑤	Shift Pedal	—	⑮	Washer	—
⑥	Washer	—	⑯	Brake Pedal	—
⑦	Snap Ring	—	⑰	Clevis Pin	—
⑧	Shift Rod Fastener	**88 in-lbs (10 N·m)**	⑱	Floorboard Support (RH)	—
⑨	Shift Rod	—	⑲	Floorboard Fastener	**18 ft-lbs (25 N·m)**
⑩	Shift Lever	—	⑳	Foot Control Fastener	**35 ft-lbs (47 N·m)**

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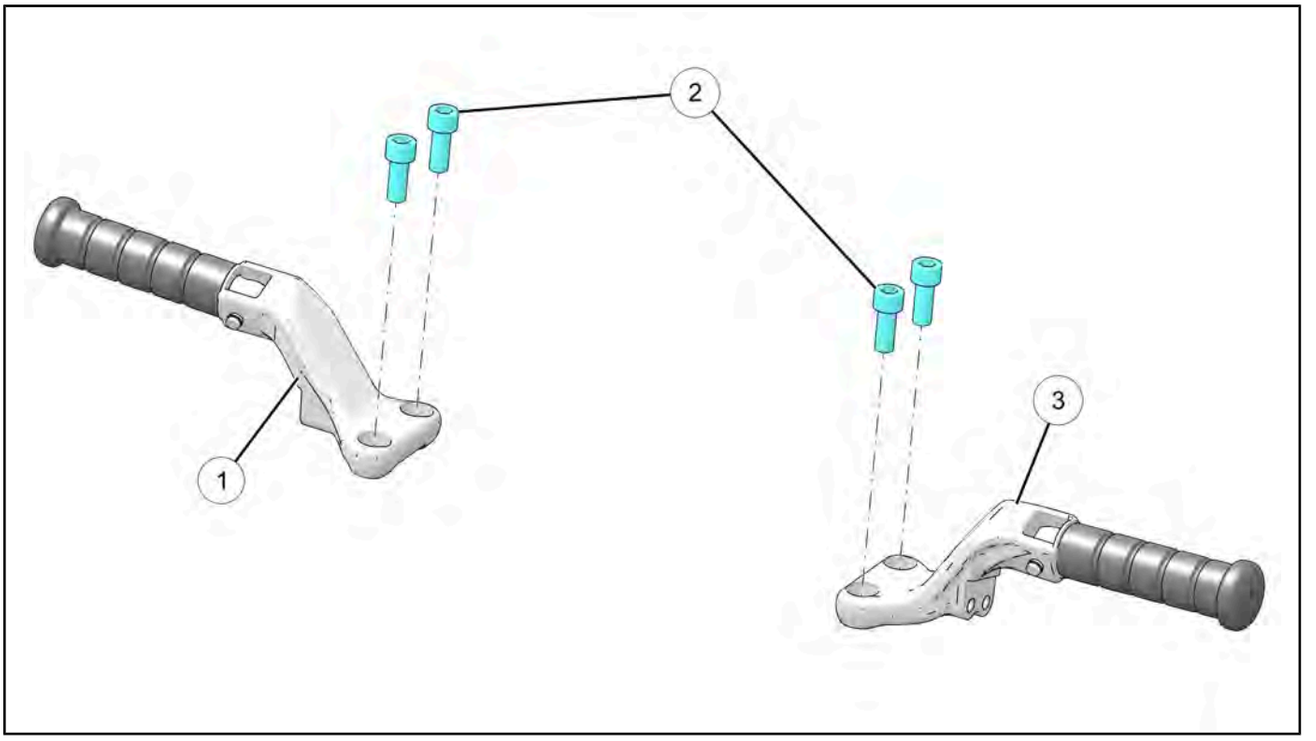
FLOOR BOARD CONTROLS (2023+)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Floorboard assembly	—	⑪	Shifter Lever Fastener	**88 in-lbs (10 N·m)**
②	Floorboard Support (LH)	—	⑫	Brake Return Spring Fastener	**88 in-lbs (10 N·m)**
③	Pedal Pivot Shaft	**50 ft-lbs (68 N·m)**	⑬	Brake Return Spring	—
④	Wave Washer	—	⑭	Rue Pin	—
⑤	Shift Pedal	—	⑮	Brake Pedal	—
⑥	Washer	—	⑯	Clevis Pin	—
⑦	Snap Ring	—	⑰	Floorboard Support (RH)	—
⑧	Shift Rod Fastener	**88 in-lbs (10 N·m)**	⑱	Floorboard Fastener	**18 ft-lbs (25 N·m)**
⑨	Shift Rod	—	⑲	Foot Control Fastener	**35 ft-lbs (47 N·m)**
⑩	Shift Lever	—			

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PASSENGER FOOT PEGS



ITEM	DESCRIPTION	TORQUE
①	Passenger Foot Peg LH	—
②	Passenger Foot Peg Fastener	**35 ft-lbs (47 N·m)**
③	Passenger Foot Peg RH	—

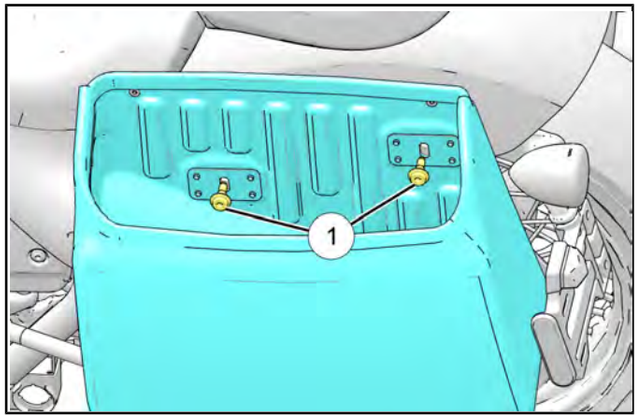
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BODY / FRAME SERVICE

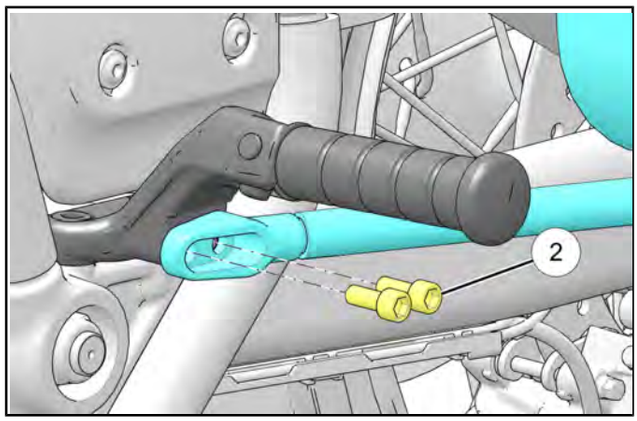
SADDLE BAG REMOVAL / INSTALLATION

REMOVAL

1. Open Saddle Bag.
2. Remove saddle bag fastener ①.



3. Remove saddle bag support to frame fasteners ②.



4. Lift saddle bag up and remove.

INSTALLATION

1. Place saddlebags onto spools and loosely install all fasteners.
2. Torque saddle bag support to frame fasteners.

TORQUE
Saddle Bag Support to Frame Fastener: **18 ft-lbs (25 N·m)**

3. Torque saddle bag fasteners.

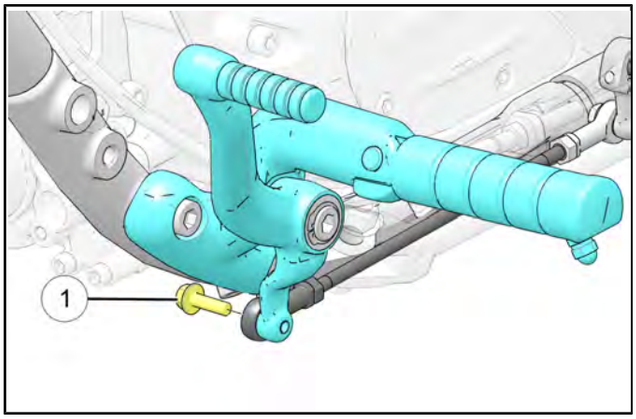
TORQUE
Saddle Bag Fastener: **13 ft-lbs (18 N·m)**

DRIVER FOOT PEG REMOVAL / INSTALLATION

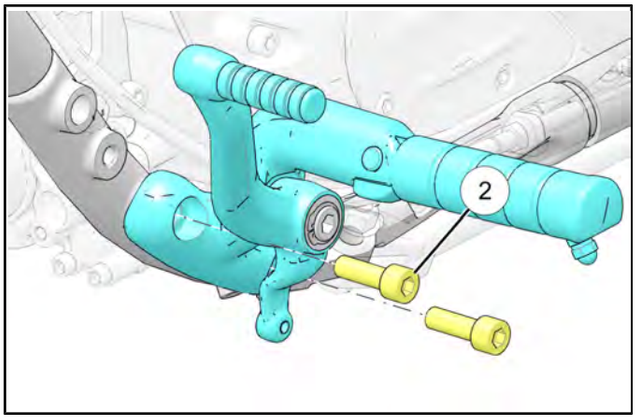
LEFT FOOT PEG

NOTICE
Forward controls shown, similar procedure applies to mid and floorboard controls

1. Remove Shift Rod Bolt ① from shift rod.



2. Remove fasteners ② securing foot peg bracket to frame.



3. **INSTALLATION is performed by reversing the removal procedure.**

7

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4. Torque driver foot peg bracket bolts to specification.

TORQUE
Foot Control Fastener: **35 ft-lbs (47 N·m)**

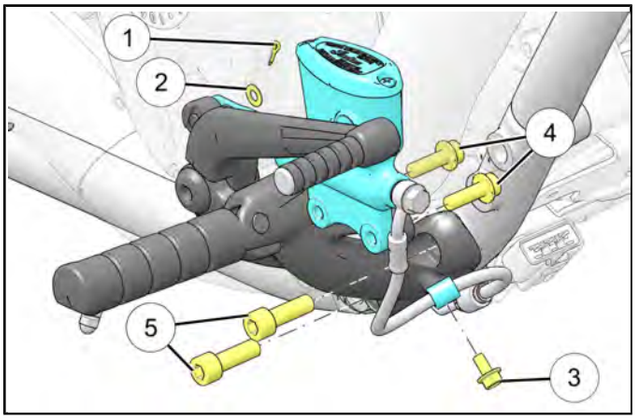
TORQUE
Shift Rod Fastener: **88 in-lbs (10 N·m)**

RIGHT FOOT PEG

NOTICE
Forward controls shown, similar procedure applies to mid and floorboard controls.

1. Remove pin ① and washer ② (If equipped).

NOTICE
2023+ units will have a rue pin.



2. Remove brake line retention fastener ③.
3. Remove master cylinder fasteners ④.
4. Remove foot peg bracket fasteners ⑤.

IMPORTANT
Keep the master cylinder in an upright position to avoid air from getting into the system.

5. **INSTALLATION is performed by reversing the removal procedure.**

6. Torque driver foot peg bolts to specification.

TORQUE
Foot Control Fastener: **35 ft-lbs (47 N·m)**

TORQUE
Master Cylinder Mounting Fasteners (rear): **18 ft-lbs (25 N·m)**

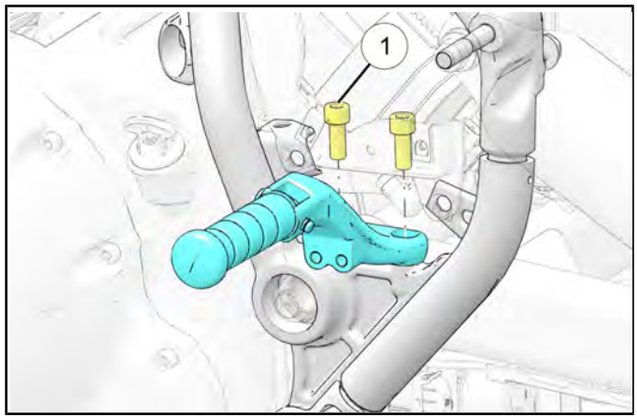
TORQUE
Brake Line Retention Fastener: **80 in-lbs (9 N·m)**

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FOOT PEGS PASSENGER REMOVAL / INSTALLATION

NOTICE
Left side shown. Procedure for right side is identical.

1. Remove side cover. See **Side Cover Removal / Installation page 7.29**.
2. Remove foot peg bracket fasteners ①.



3. **INSTALLATION is performed by reversing the removal procedure.**

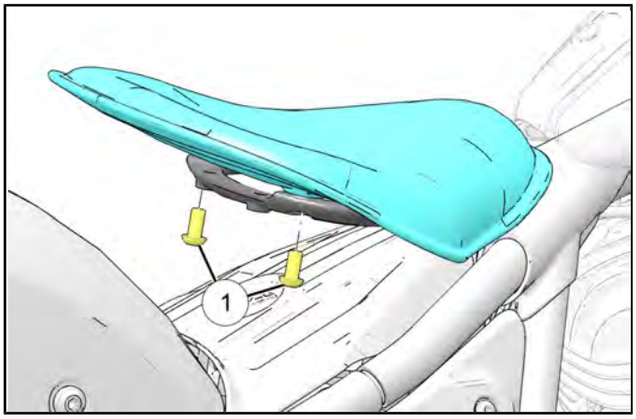
TORQUE
Foot Peg Fastener (Passenger): **35 ft-lbs (47 N·m)**

TORQUE
Side Cover Fastener: **35 in-lbs (4 N·m)**

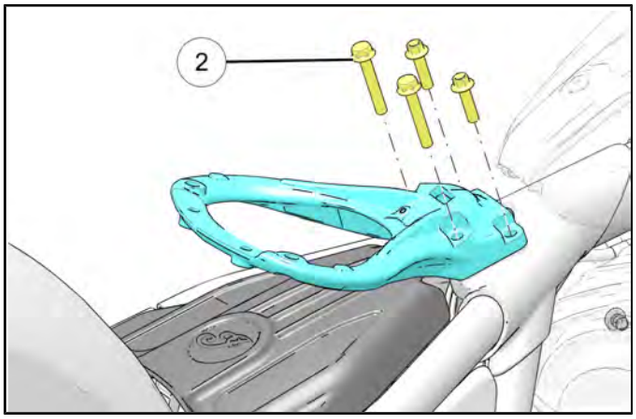
SEAT REMOVAL / INSTALLATION

FLOATING SEAT

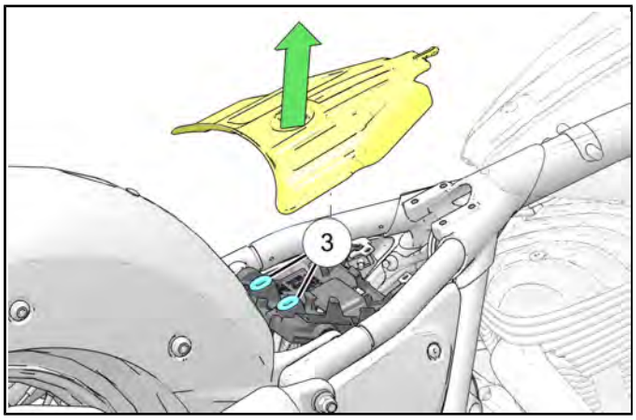
1. Remove seat fasteners ①.



2. Lift seat upward to remove.
3. Remove seat base fasteners ②.



4. Remove seat base.
5. Lift seat closeout upward to disconnect from its grommets ③.



7

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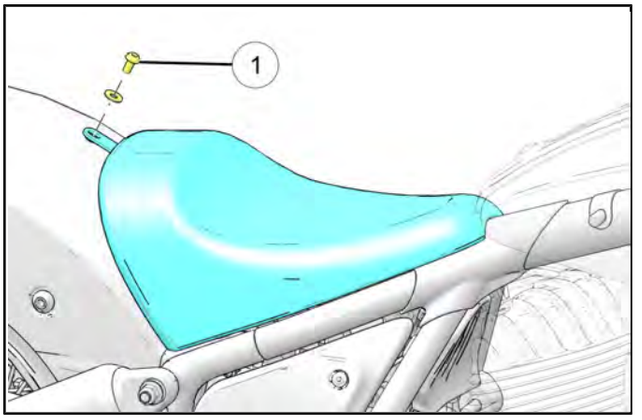
6. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Seat Fastener (Floating): **18 ft-lbs (25 N·m)**

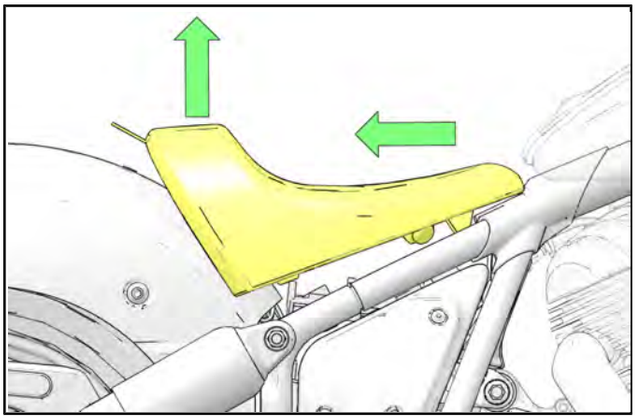
TORQUE
Seat Mount Fastener (Floating): **18 ft-lbs (25 N·m)**

SOLO SEAT

1. Remove seat faster ①.



2. Lift the rear of the seat upward and slide back to remove.

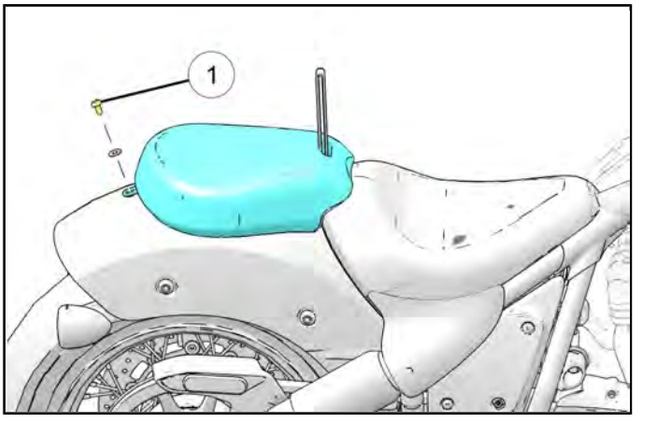


3. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

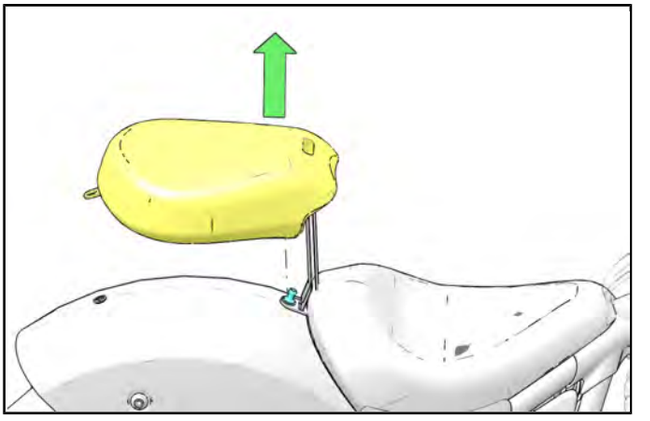
TORQUE
Seat Fastener (Solo): **13 ft-lbs (18 N·m)**

BAGGER SEAT

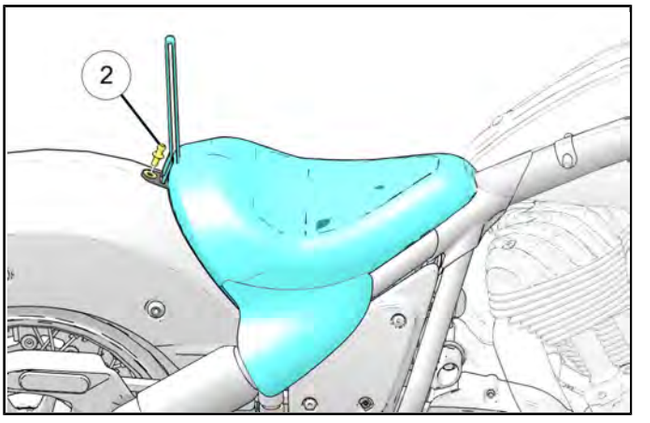
1. Remove pillion seat fastener ①.



2. Pull pillion seat upward off of seat stud to remove.

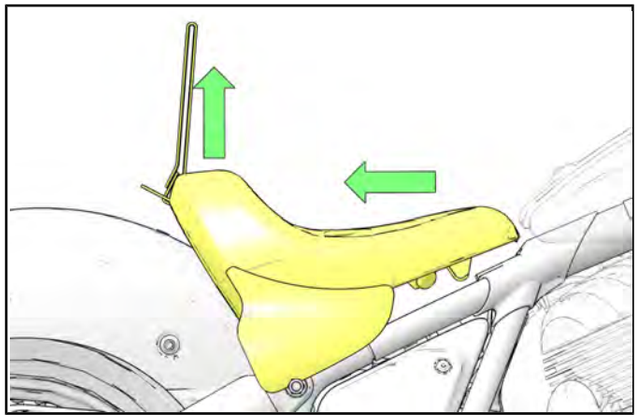


3. Remove pillion seat stud ②.



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4. Lift the rear of the seat upward and slide back to remove.



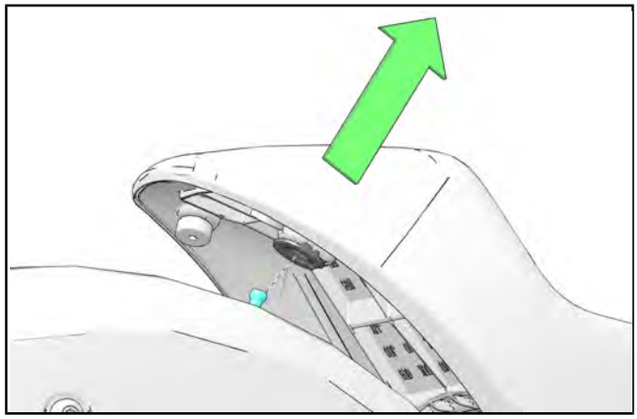
5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Pillion Seat Stud (Bagger): **13 ft-lbs (18 N·m)**

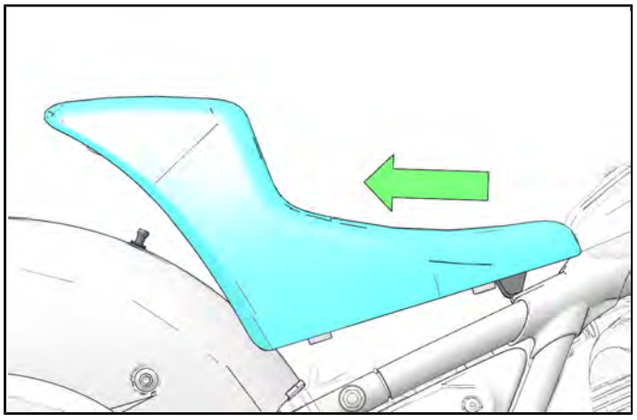
TORQUE
Pillion Seat Fastener (Bagger): **13 ft-lbs (18 N·m)**

SEAT REMOVAL / INSTALLATION (SPORT CHIEF)

1. Lift the rear of the seat upward to disconnect the seat from the pillion fastener.



2. Move the seat rearward to disconnect the front retention feature and remove seat.

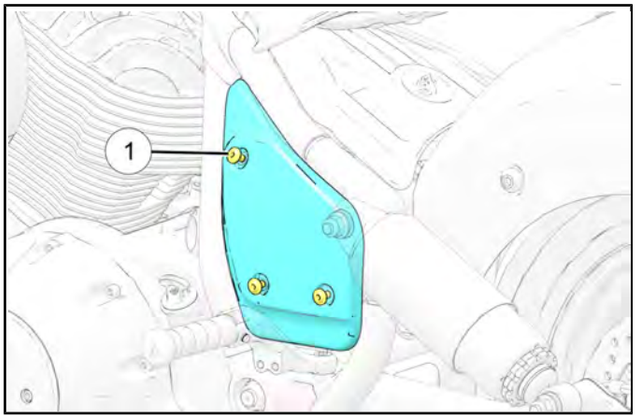


3. **Installation is performed by reversing the removal procedure.**

SIDE COVER REMOVAL / INSTALLATION

NOTICE
Left side cover show. Procedure for right side cover is identical.

1. Remove the left side cover by removing its fasteners ①.



2. **INSTALLATION is performed by reversing the removal procedure.**

TORQUE
Side Cover Fastener: **35 in-lbs (4 N·m)**

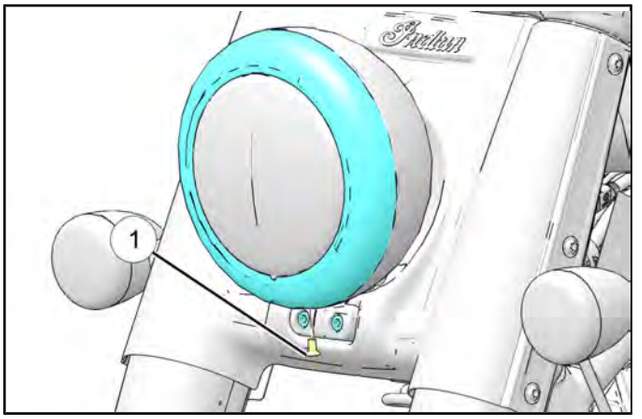
7

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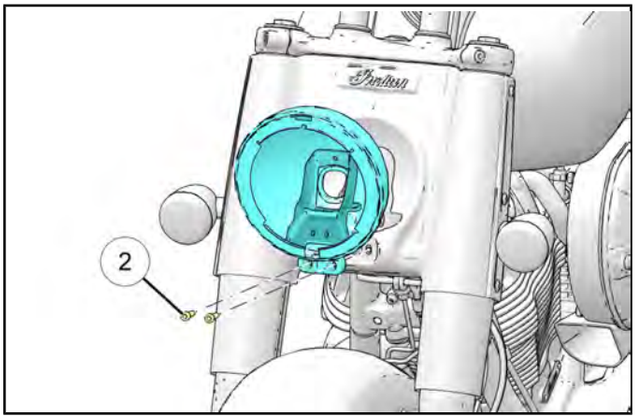
FRONT BODY COMPONENTS REMOVAL / INSTALLATION

FRONT BODY COMPONENTS REMOVAL

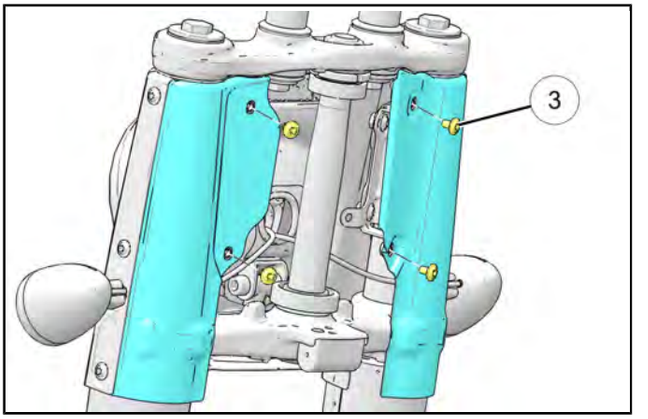
1. Remove head light bezel by removing its fastener ①.



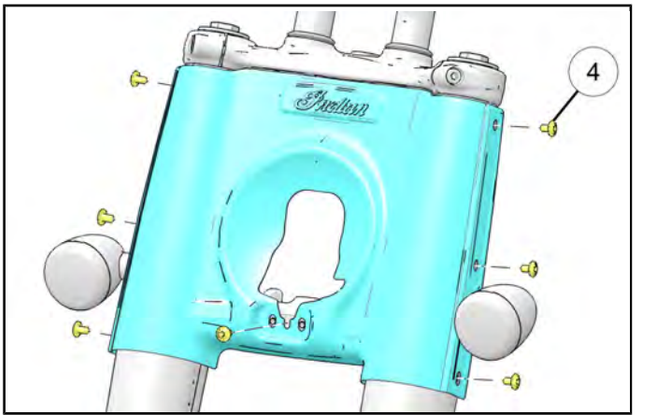
2. Pull the head light out and disconnect the turn signals and head light electrical connectors.
3. If equipped, disconnect harness retention feature from the head light bucket.
4. Remove head light bucket by removing its fasteners ②.



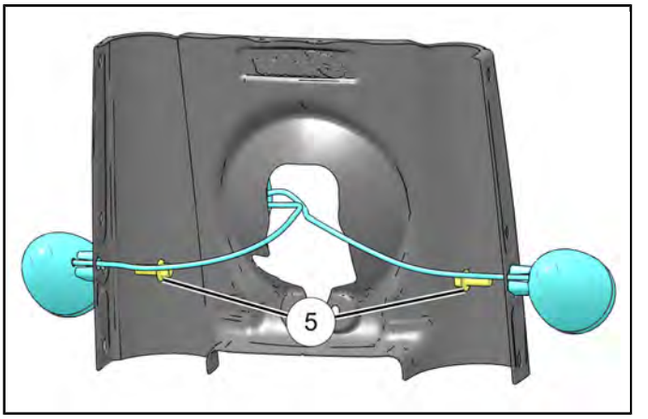
5. Remove rear cover fasteners ③.



6. Remove the front cover fasteners ④ to remove the front and rear covers.

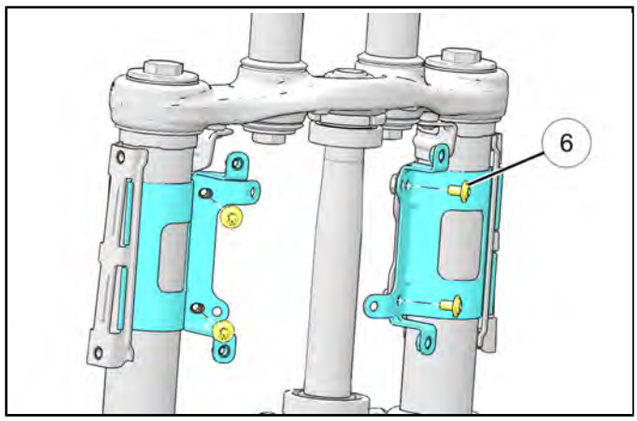


7. Remove the turn signals from the front cover by removing the fastener ⑤.

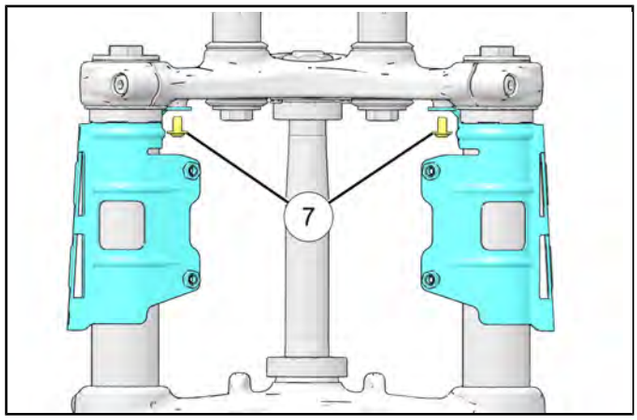


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8. Remove the rear clamp mounts by removing its fasteners ⑥.



9. Remove the front nacelle mounts by removing its fasteners ⑦.

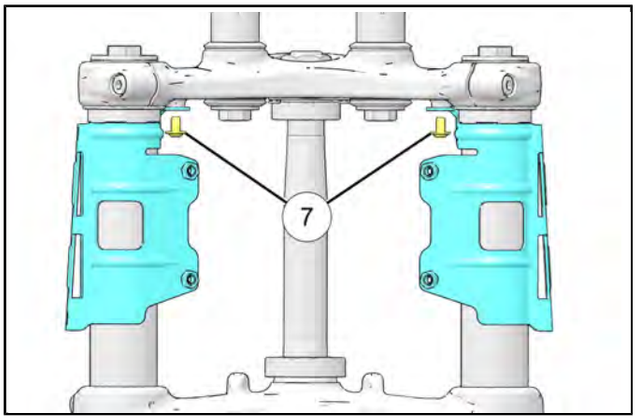


FRONT BODY COMPONENTS INSTALLATION

IMPORTANT

During reassembly, push the front cover upward to close the gap to the upper triple clamps before securing with fasteners.

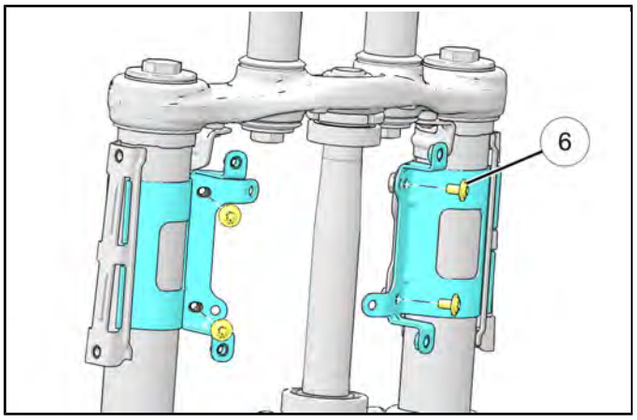
1. Install the front nacelle mounts and its fasteners ⑦. Torque fasteners to specification.



TORQUE

Front Bodywork Fastener:
88 in-lbs (10 N·m)

2. Install the rear clamp mounts and its fasteners ⑥. Torque fasteners to specification.

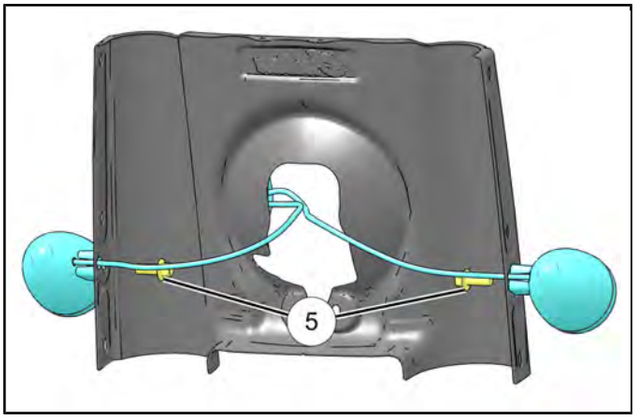


TORQUE

Front Bodywork Fastener:
88 in-lbs (10 N·m)

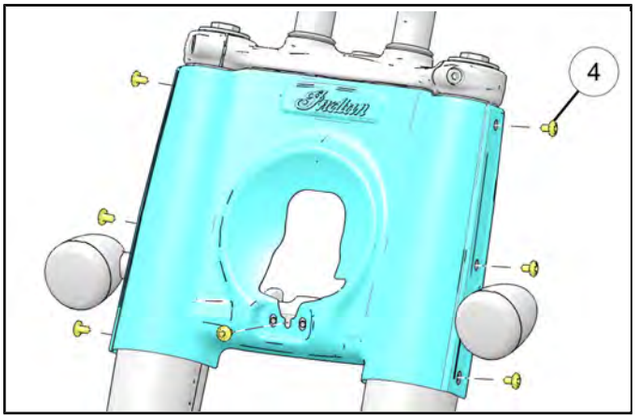
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3. Install the turn signals to the front cover and the fasteners ⑤. Torque fasteners to specification.



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

4. Install the front cover and its fasteners ④.

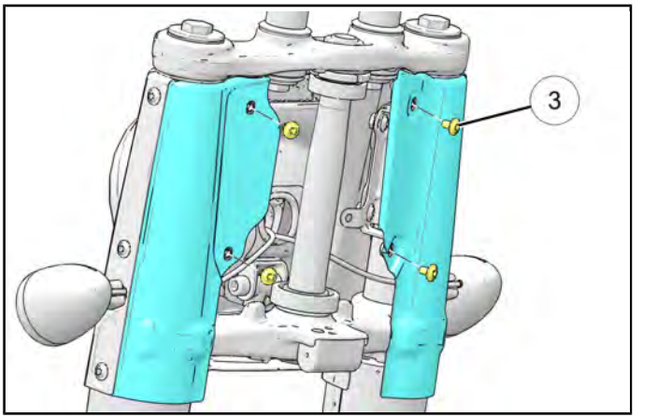


5. Align the covers to 6.6 mm +/- 1 mm (0.26 in. +/- 0.04 in.). Torque fasteners to specification.



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

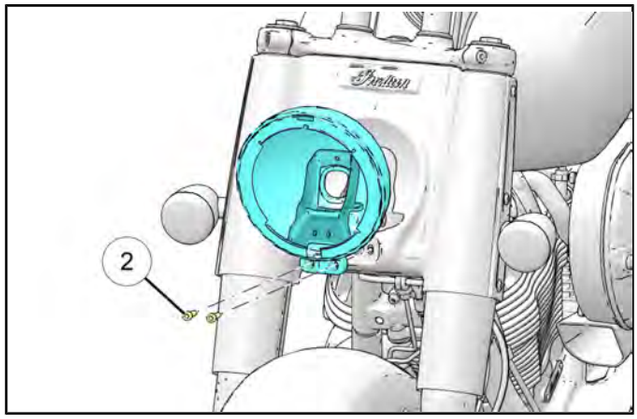
6. Install the rear cover and its fasteners ③. Torque fasteners to specification.



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

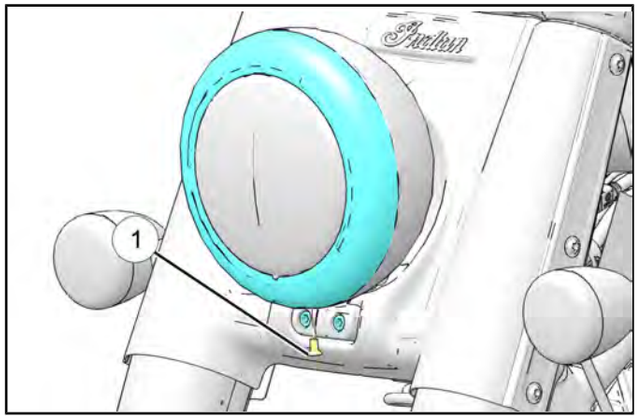
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7. Install head light bucket and its fasteners ②. Torque fasteners to specification.



TORQUE
Head Light Mount Fastener: **88 in-lbs (10 N·m)**

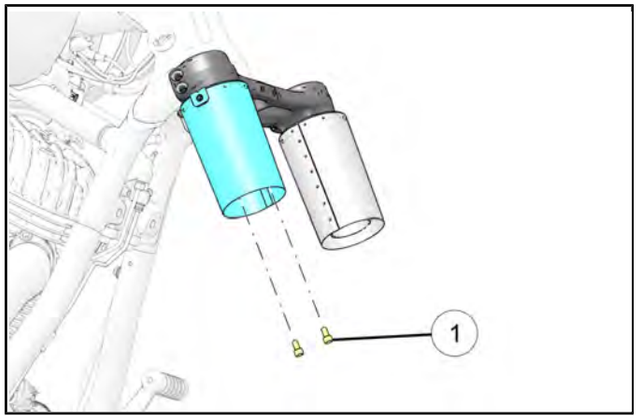
8. If equipped, connect harness retention feature to the head light bucket.
9. Install the head light and connect the turn signals and head light electrical connectors.
10. Install head light bezel and its fastener ①. Torque fastener to specification



TORQUE
Head Light Bezel Fastener: **27 in-lbs (3 N·m)**

FORK COVER REMOVAL / INSTALLATION

1. Remove Fork. See **Front Fork Removal page 8.35**.
2. Remove fasteners ① securing fork cover.



3. **Installation is performed by reversing the removal procedure.**

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

7

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FORK COVER ALIGNMENT

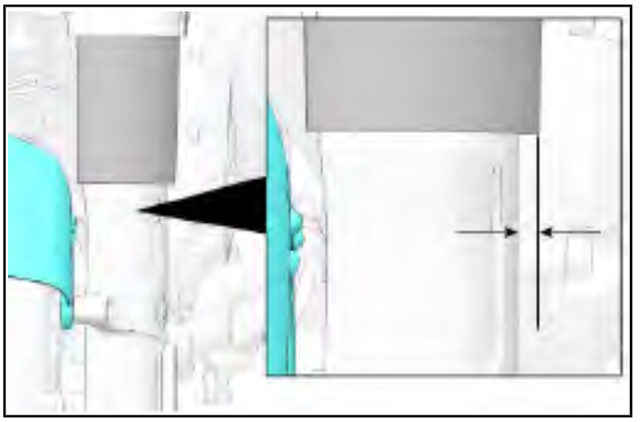
1. Using a vernier/dial/digital caliper, measure the lateral distance between the fork cover and fork body.

⚠ CAUTION

Use care not to scratch or damage painted surfaces during measurement process.

MEASUREMENT
Gap Specification: **6.6 mm +/- 1 mm (0.26 in. +/- 0.04 in.)**

Front View



Lateral Distance Measurement



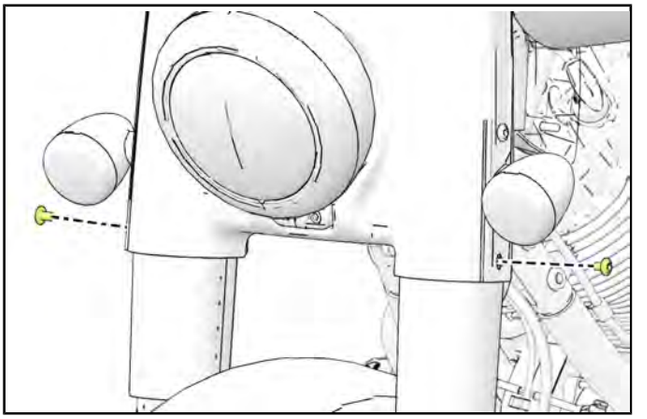
STOP!
If the fork covers are out of alignment, proceed to the next step. If the fork covers are aligned on both sides proceed to step 6.

2. Loosen the fork cover fasteners, and align the covers to 6.6 mm +/- 1 mm (0.26 in. +/- 0.04 in.). Torque fasteners to specification.

⚠ CAUTION

Use care not to scratch or damage painted surfaces during alignment process.

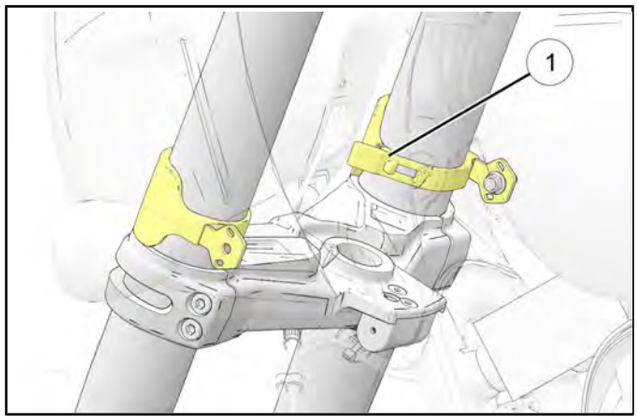
TORQUE
Fork Cover Fasteners: **88 in-lbs (10 N·m)**



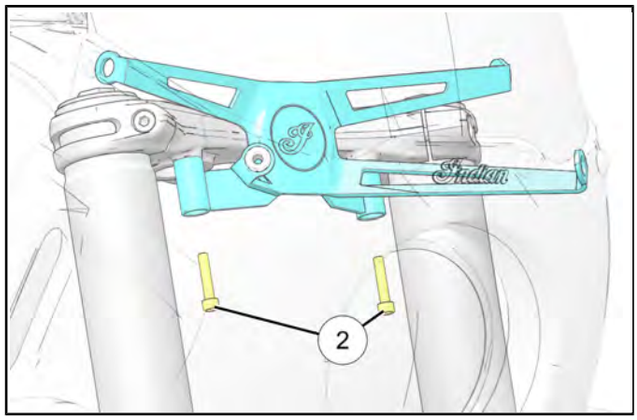
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FAIRING REMOVAL / INSTALLATION

1. Unhook cowl rubber straps ①.



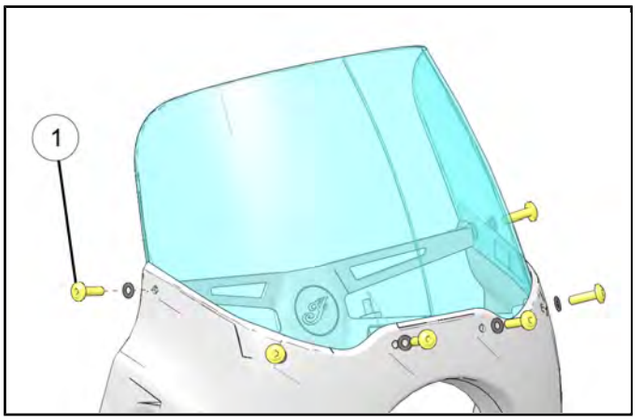
2. Remove upper cowl bracket fasteners ②.



3. Remove cowl assembly from unit.
4. **Installation is performed by reversing the removal procedure.**

WINDSCREEN REMOVAL / INSTALLATION

1. Remove fasteners securing windscreen ①.



2. Remove windscreen from unit.
3. **Installation is performed by reversing the removal procedure.**

TORQUE
Windscreen Fastener **9 in-lbs (1 N·m)**

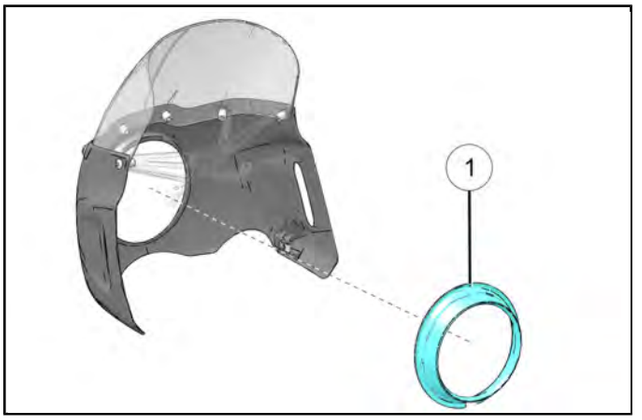
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FAIRING RING GROMMET REMOVAL / INSTALLATION (SPORT CHIEF)

REMOVAL

1. Remove fairing. See **Fairing Removal / Installation page 7.35**.
2. Gently remove grommet ① from the fairing.

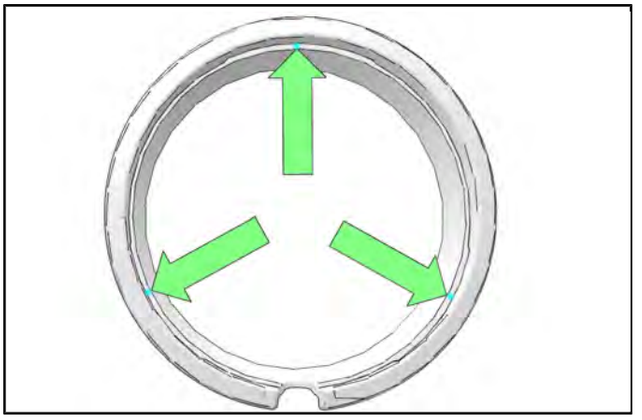


3. Clean off any existing glue from the grommet and fairing.
4. Inspect the grommet for damage and replace if necessary.

INSTALLATION

1. Add three small dot of Loctite 454 to the grommet as shown.

IMPORTANT
The glue will start to harden within the first minute of it being applied.



2. Install the grommet to the fairing and apply pressure for five seconds.
3. Install fairing. See **Fairing Removal / Installation page 7.35**

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FRONT FENDER REMOVAL / INSTALLATION

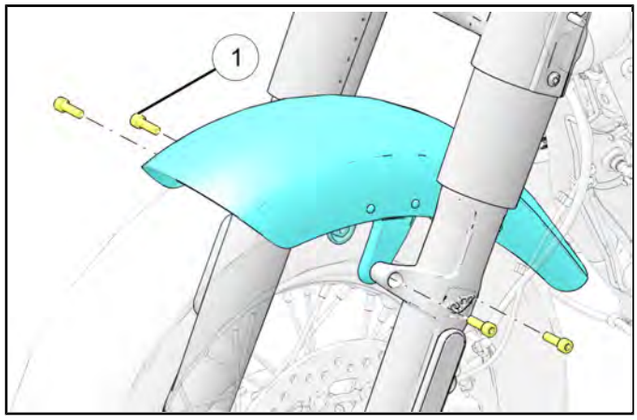
Motorcycle should be parked on a level surface resting on the side stand.

⚠ CAUTION

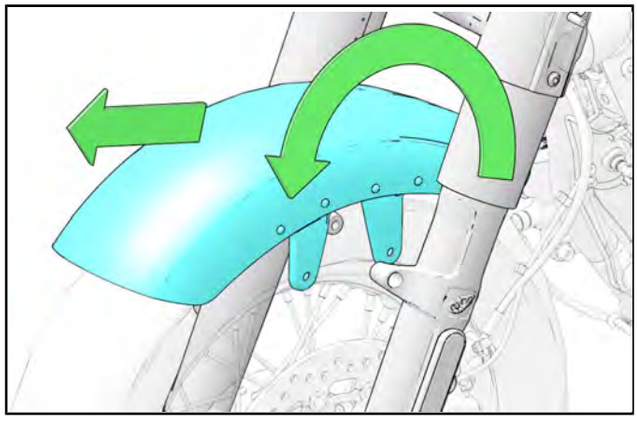
Use care not to scratch or damage painted surfaces during fender removal and / or installation.

FRONT FENDER REMOVAL

1. Remove fender mount fasteners ①.



2. Stand in front of the motorcycle facing the front fender and squeeze the sides together while "rolling" the fender out from between the fork legs.



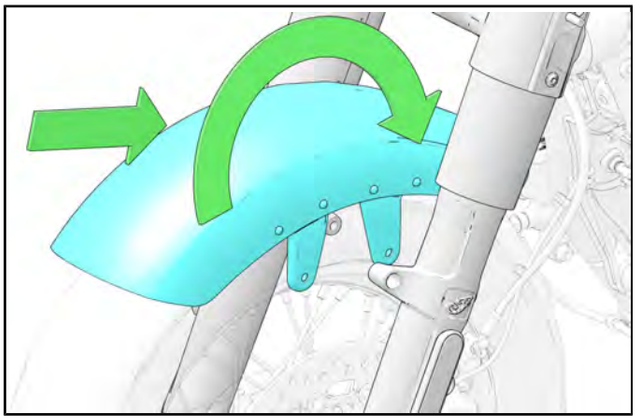
Once fender has been removed from the motorcycle, make sure the fender is stored safely until it is reinstalled.

FRONT FENDER INSTALLATION

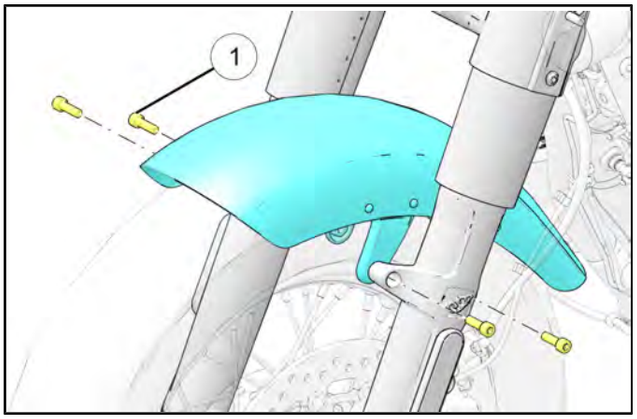
⚠ CAUTION

Use care not to scratch or damage painted surfaces during fender installation.

- Stand in front of the motorcycle facing the front fender and squeeze the sides together while "rolling" the fender in between the fork legs.



- Install fender mount fasteners ①. Torque fasteners to specification.



TORQUE
Front Fender Fastener: **17 ft-lbs (24 N·m)**

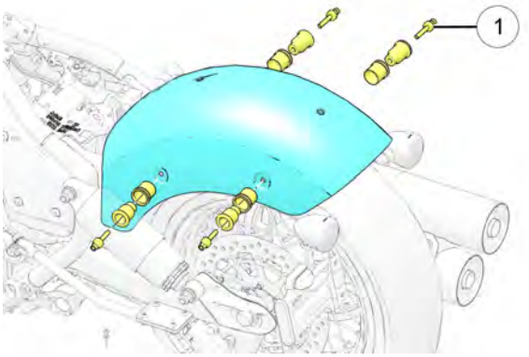
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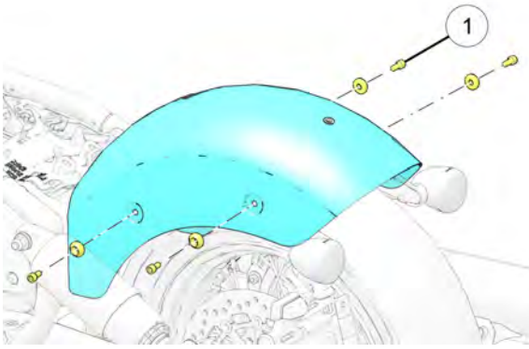
REAR FENDER REMOVAL / INSTALLATION

1. If equipped, remove saddle bags. Reference **Saddle Bag Removal / Installation page 7.25**.
2. Remove seat. See **Seat Removal / Installation page 7.27**.
3. Remove rear fender fasteners ①.

Saddle Bag Equipped Units



Non-Saddle Bag Units



4. Lift the fender off of the motorcycle.

⚠ CAUTION
Be careful not to damage painted surfaces.

5. **Installation is performed by reversing the removal procedure.**

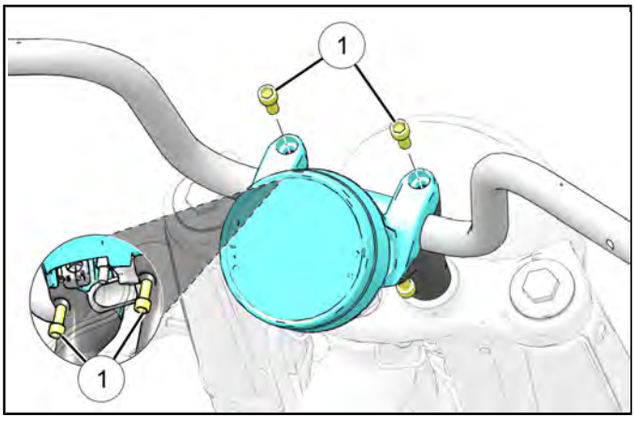
TORQUE
Rear Fender Fastener: **18 ft-lbs (25 N·m)**

TORQUE
Saddle Bag Spool Fastener: **18 ft-lbs (25 N·m)**

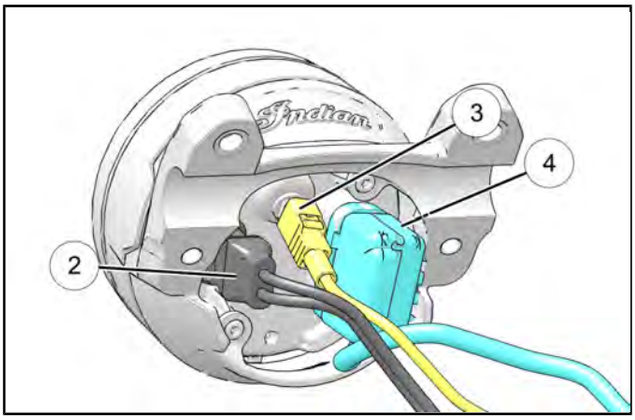
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INSTRUMENT CLUSTER REMOVAL / INSTALLATION

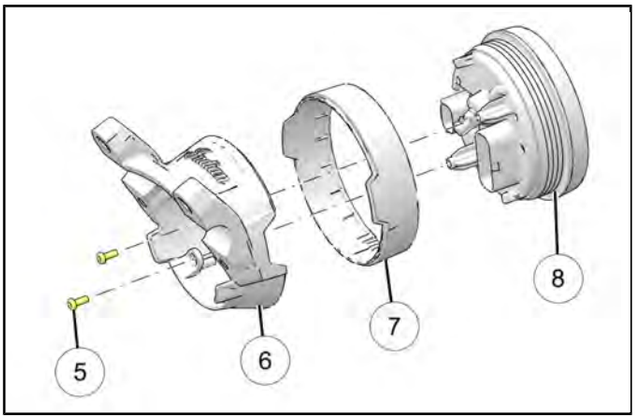
1. Remove riser cap fasteners ①.



2. Lift the cluster assembly upward and disconnect cell USB, ②, Antenna GPS ③, and chassis harness ④.



3. Remove instrument cluster fasteners ⑤.



4. Separate riser cap ⑥, housing ⑦ and cluster ⑧.

NOTICE
If replacing cluster ⑧, remove cluster rubber grommet for reuse as necessary.

5. **Installation is performed by reversing the removal procedure.**

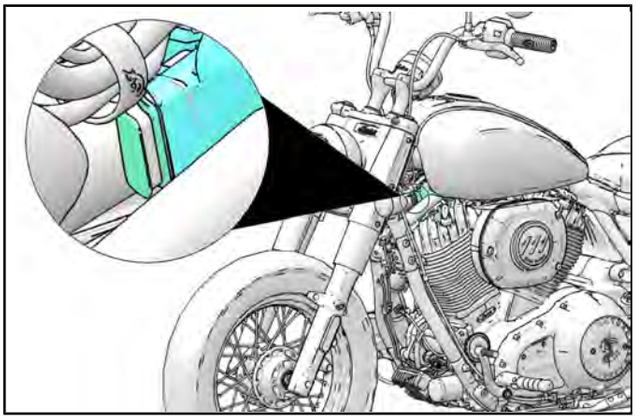
TORQUE
Riser Cap Fastener: **18 ft-lbs (25 N·m) Torque front fasteners, then rear**

TORQUE
Instrument Cluster fastener: **17 in-lbs (2 N·m)**

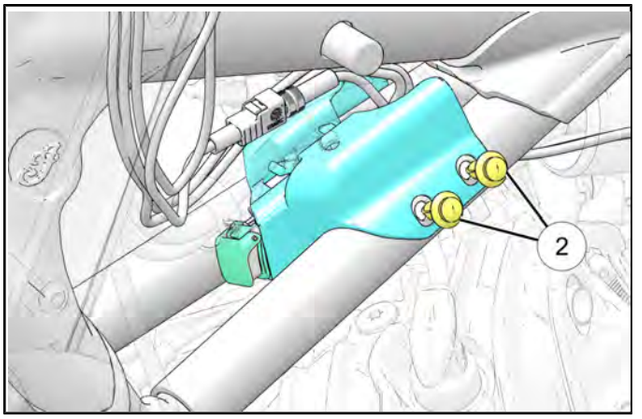
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USB CHARGE PORT REPLACEMENT

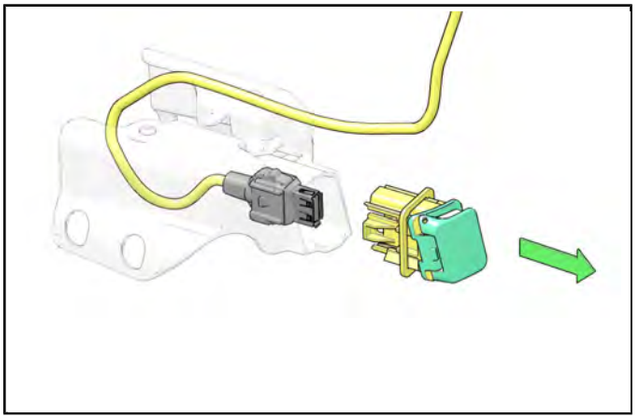
1. Locate the USB charge point.



2. Remove fuel tank. See **Fuel Tank Removal page 4.17**.
3. Remove push pins ② securing frame harness tray.



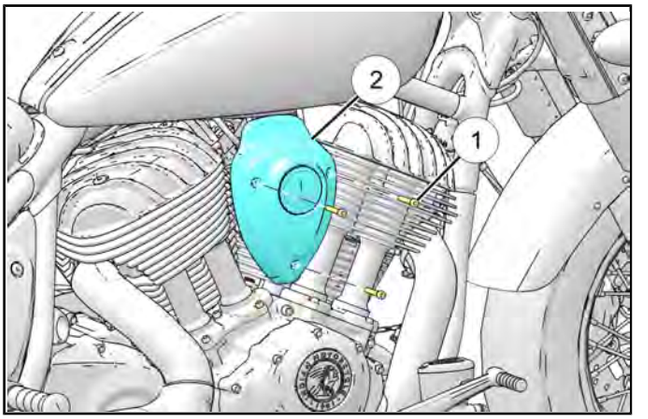
4. Disconnect the USB charger electrical connector and remove from the frame harness tray.



5. **Installation is performed by reversing the removal procedure.**

IGNITION COVER REMOVAL / INSTALLATION

1. Remove ignition side cover fasteners ①.



2. Remove ignition side cover ②.
3. **Installation is performed by reversing the removal procedure.**

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

FRAME REMOVAL / 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.

1. Remove Engine. See **Removing Engine From Frame page 3.13**.
2. Remove Battery box. See **Battery Box Removal / Installation page**
3. Remove Triple clamp. See **Triple Clamp Removal page 8.43**.
4. Remove swingarm. See **Swingarm Removal page 8.87**.
5. Remove harness. See **Harness Removal / Installation page 10.92**.

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CHAPTER 8
STEERING / SUSPENSION

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FRONT WHEEL & SUSPENSION

GENERAL INFORMATION

SERVICE NOTES

⚠ 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.

- Refer to Maintenance Chapter for **MAINTENANCE** of front end components.
- Refer to Steering / Suspension Chapter for **TIRE REMOVAL, REPAIR, & BALANCING**
- Refer to Brakes Chapter for **BRAKE SYSTEM** service and repairs.

SPECIAL TOOLS- FRONT WHEEL / SUSPENSION

TOOL DESCRIPTION	PART NUMBER
Fork Spring Compressor	PV-49463
Fork Spring Compressor Adapter (Inverted Forks)	PV-49464
Fork Spring Compressor Adapter / Cartridge Tool	PF-51664–2
Cartridge Shaft Tool (Inverted Forks)	PV-49452
Fork Oil Seal Driver	PF-51610
Fork Seal Guide (43mm) (Inverted Forks)	PV-47037
Fork Seal Driver (Inverted Forks)	PV-49494
Fork Seal Installation Tool	PF-51611
Wheel / Stem Bearing Removal / Installation Kit	PF-51324
Spanner Socket (Steering Stem)	PV-43508
Cartridge Shaft Tool	PF-53122

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SERVICE SPECIFICATIONS- FRONT WHEEL / SUSPENSION

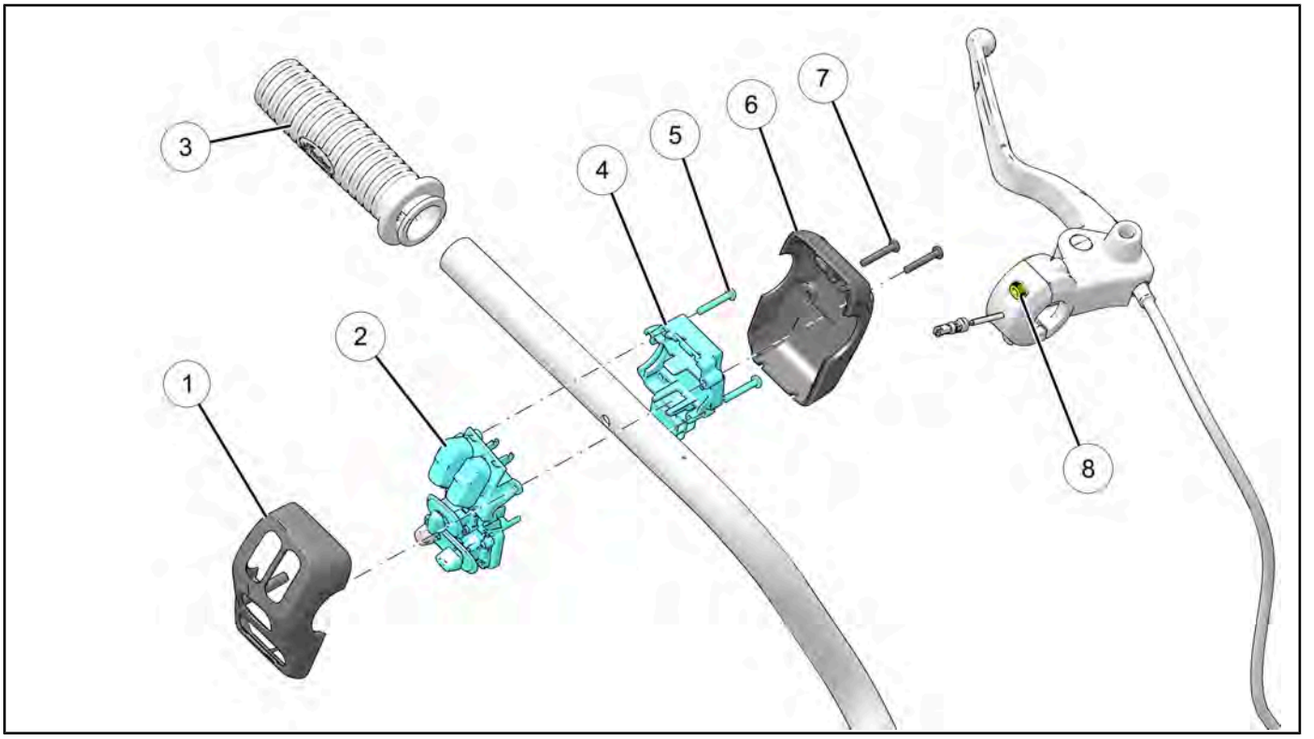
ITEM		STANDARD	SERVICE
Axle Runout		-	.20 mm (.008 in.)
Front Wheel Runout (Spoked) 3.0" x 16"	Axial	.50 mm (.020 in.)	2.0 mm (.080 in.)
	Radial	.50 mm (.020 in.)	2.0 mm (.080 in.)
Front Wheel Runout (Cast) 3.5" x 19"	Axial	.50 mm (.020 in.)	2.0 mm (.080 in.)
	Radial	.50 mm (.020 in.)	2.0 mm (.080 in.)
Fork Tube Diameter		45.9 mm (1.81 in.)	Not Applicable
Fork Tube Diameter (Inverted Forks)		43 mm (1.69 in.)	Not Applicable
Fork Tube Runout		-	.20 mm (.008 in.)
Fork Oil Type		Indian Motorcycle Fork Oil (2208093)	
		Fuchs Titan SAF 5113	
Fork Spring Rate		10 N/mm (57 lb/in)	Not Applicable
Fork Spring Free Length		400 mm (15.75 in.)	-
Fork Oil Capacity (per leg, dry) Oil level must be measured and adjusted to specification.		**550 cc**	Set Level (115 mm from top of fork tube fully collapsed and without spring)
Fork Oil Capacity (per leg, dry) (Inverted Forks) Oil level must be measured and adjusted to specification.		**582 cc**	Set Level (67 mm from top of fork tube fully collapsed and without spring, washer, and spacer)

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ASSEMBLY VIEWS

CONTROLS

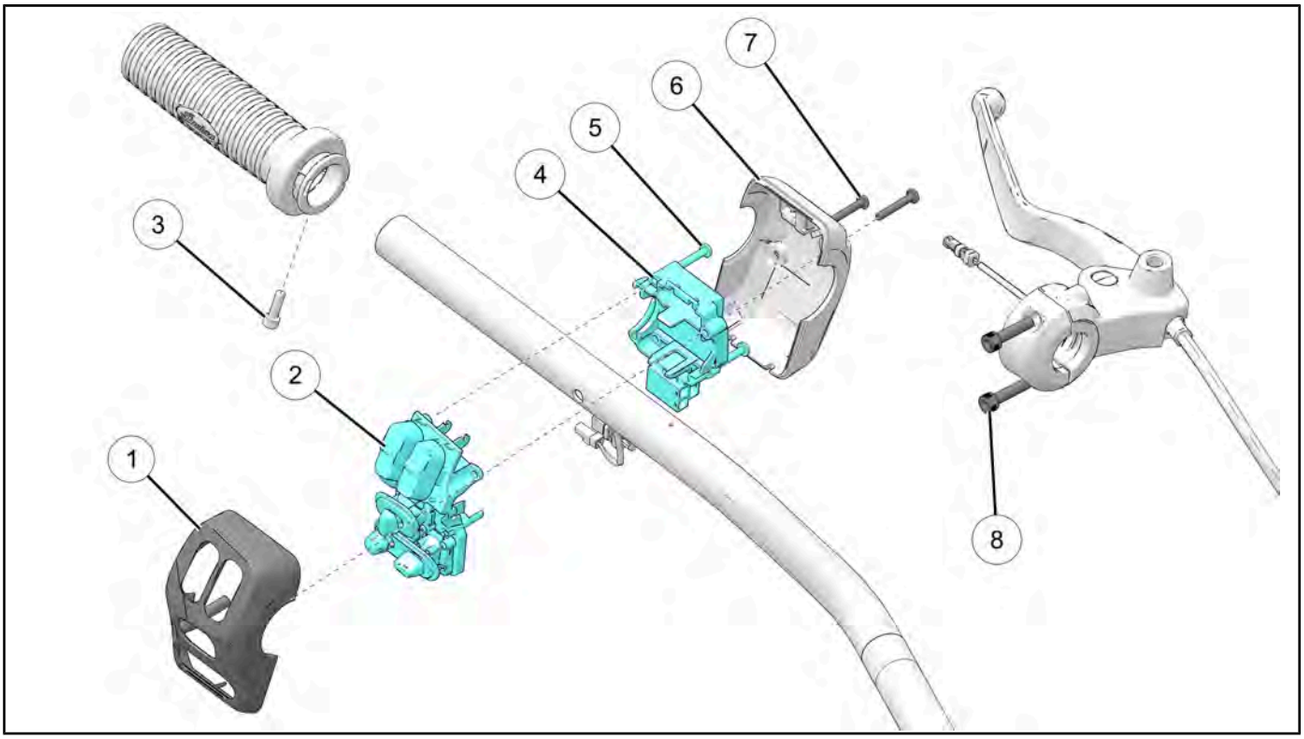
LEFT (2022)



ITEM	DESCRIPTION	TORQUE
①	Front Switch Cover	—
②	Switch Cube Front	—
③	Grip	—
④	Switch Cube Rear	—
⑤	Switch Cube Fastener	**9 in-lbs (1 N·m)**
⑥	Rear Switch Cover	—
⑦	Switch Cube Cover Fastener	**9 in-lbs (1 N·m)**
⑧	Clutch Perch Fastener	**88 in-lbs (10 N·m) Torque upper fastener then lower.**

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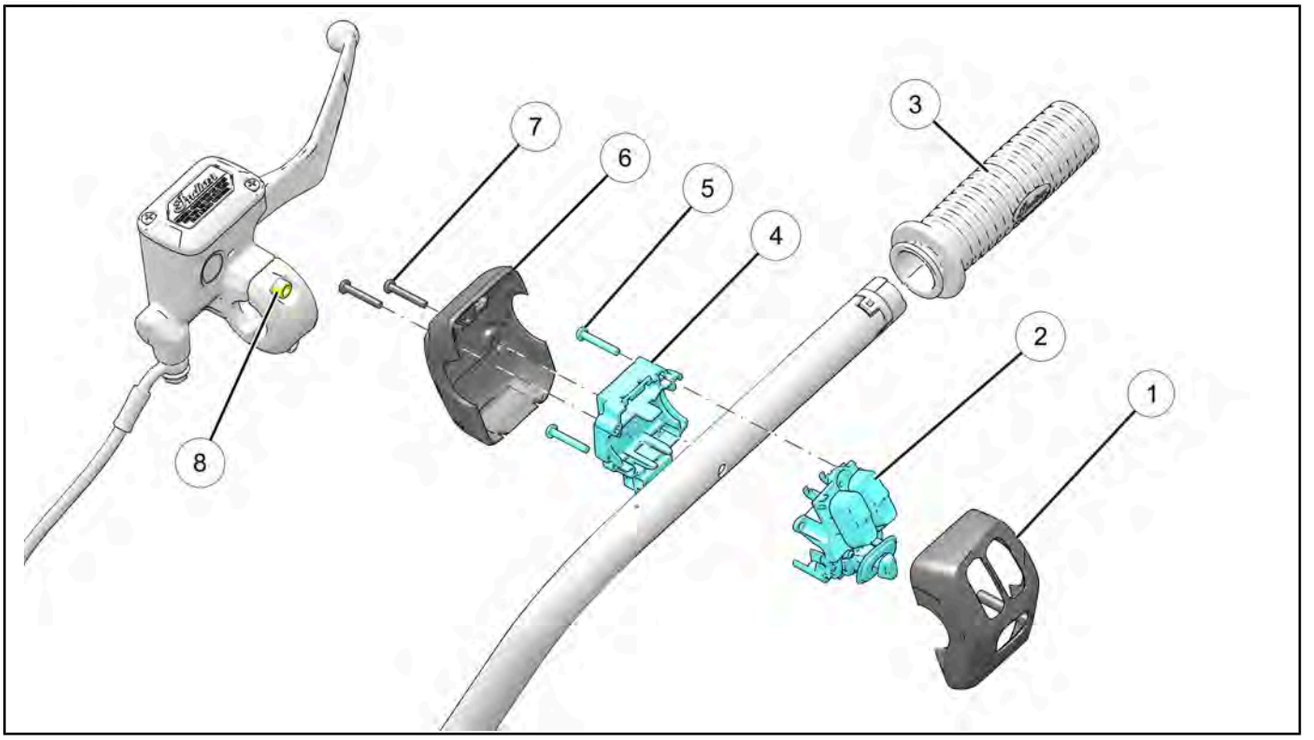
LEFT (2023+)



ITEM	DESCRIPTION	TORQUE
①	Front Switch Cover	—
②	Switch Cube Front	—
③	Grip Fastener	**53 in-lbs (6 N·m)**
④	Switch Cube Rear	—
⑤	Switch Cube Fastener	**9 in-lbs (1 N·m)**
⑥	Rear Switch Cover	—
⑦	Switch Cube Cover Fastener	**9 in-lbs (1 N·m)**
⑧	Clutch Perch Fastener	**88 in-lbs (10 N·m) Torque upper fastener then lower.**

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RIGHT

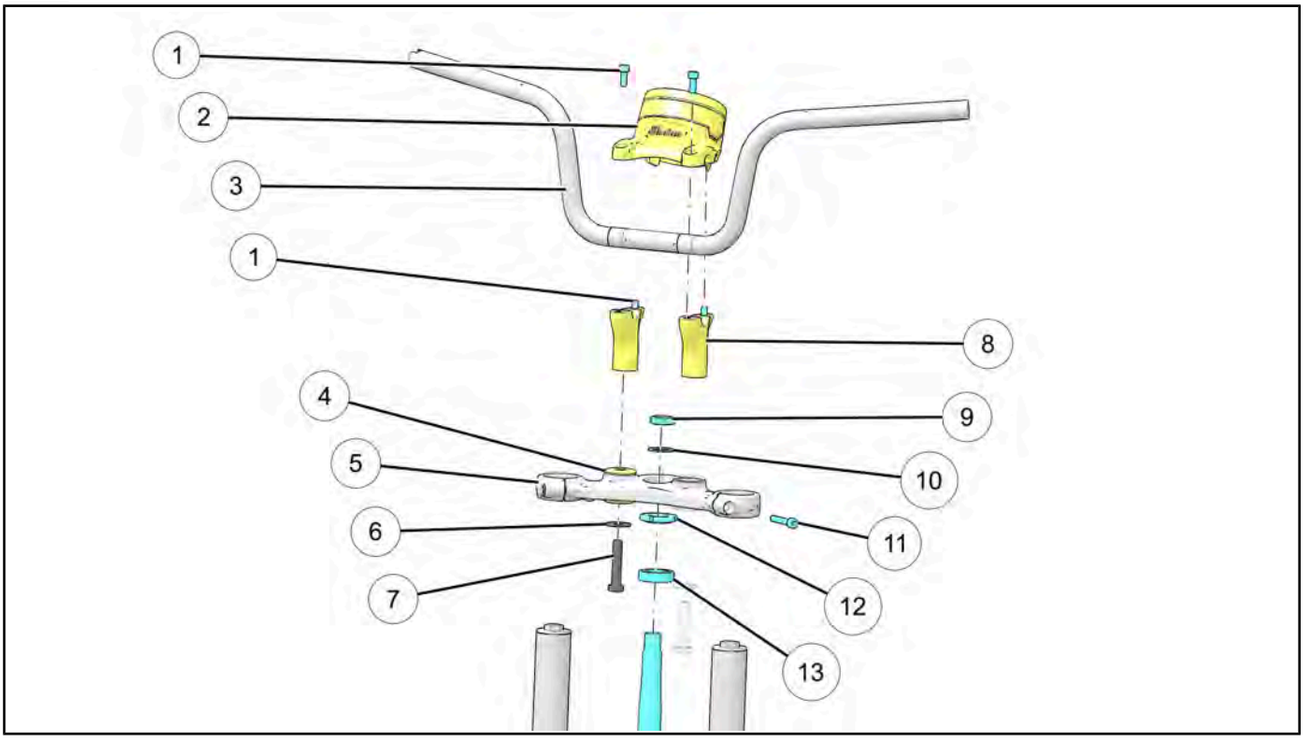


ITEM	DESCRIPTION	TORQUE
①	Front Switch Cover	—
②	Switch Cube Front	—
③	Throttle Grip	—
④	Switch Cube Rear	—
⑤	Switch Cube Fastener	**9 in-lbs (1 N·m)**
⑥	Rear Switch Cover	—
⑦	Switch Cube Cover Fastener	**9 in-lbs (1 N·m)**
⑧	Master Cylinder Fastener	**88 in-lbs (10 N·m) Torque upper fastener, then lower**

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HANDLEBAR COMPONENTS

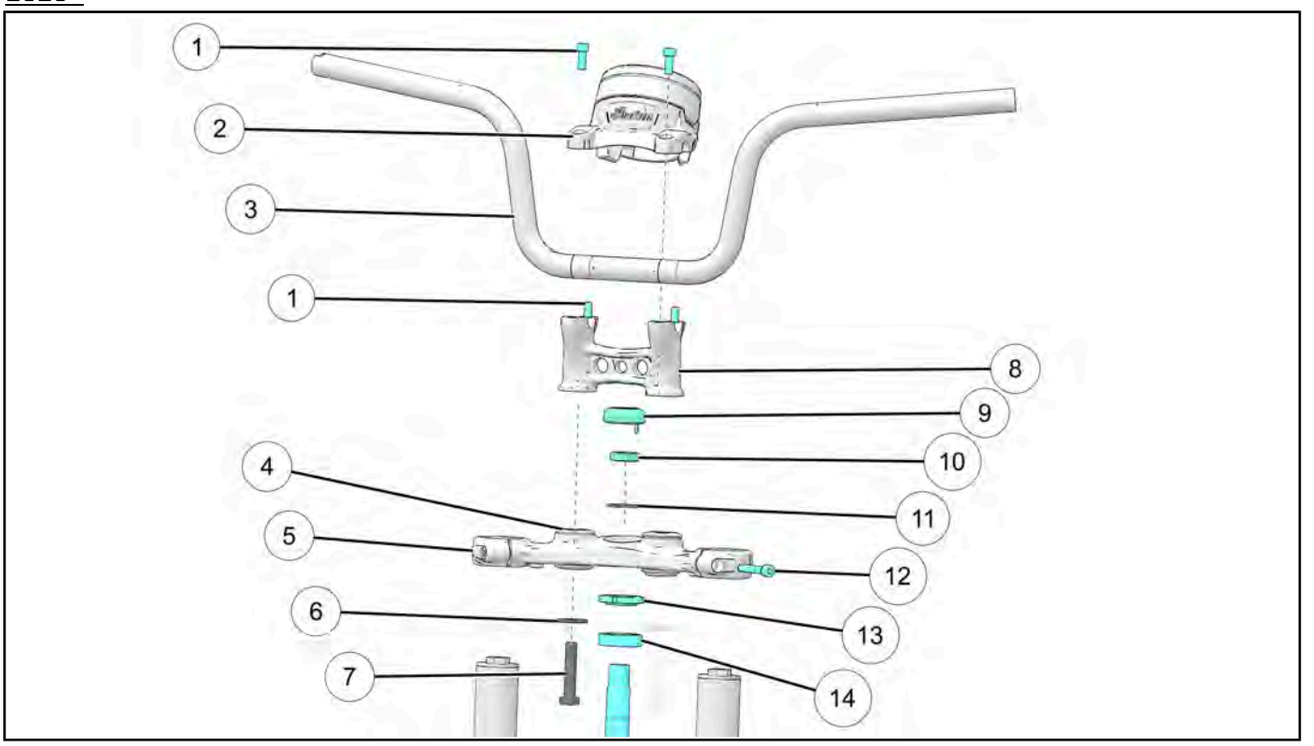
2022



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Riser Cap Fastener	**18 ft-lbs (25 N·m) Torque front fasteners, then rear**	⑧	Riser Bottom	—
②	Riser Cap	—	⑨	Triple Clamp Top Nut	**72 ft-lbs (98 N·m)**
③	Handlebar	—	⑩	Washer	—
④	Isolator	—	⑪	Triple Clamp Pinch Fastener	**17 ft-lbs (24 N·m)**
⑤	Upper Triple Clamp	—	⑫	Steering Head Nut	**29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**
⑥	Washer	—	⑬	Ball Bearing	—
⑦	Riser Bottom Fastener	**59 ft-lbs (80 N·m)**			

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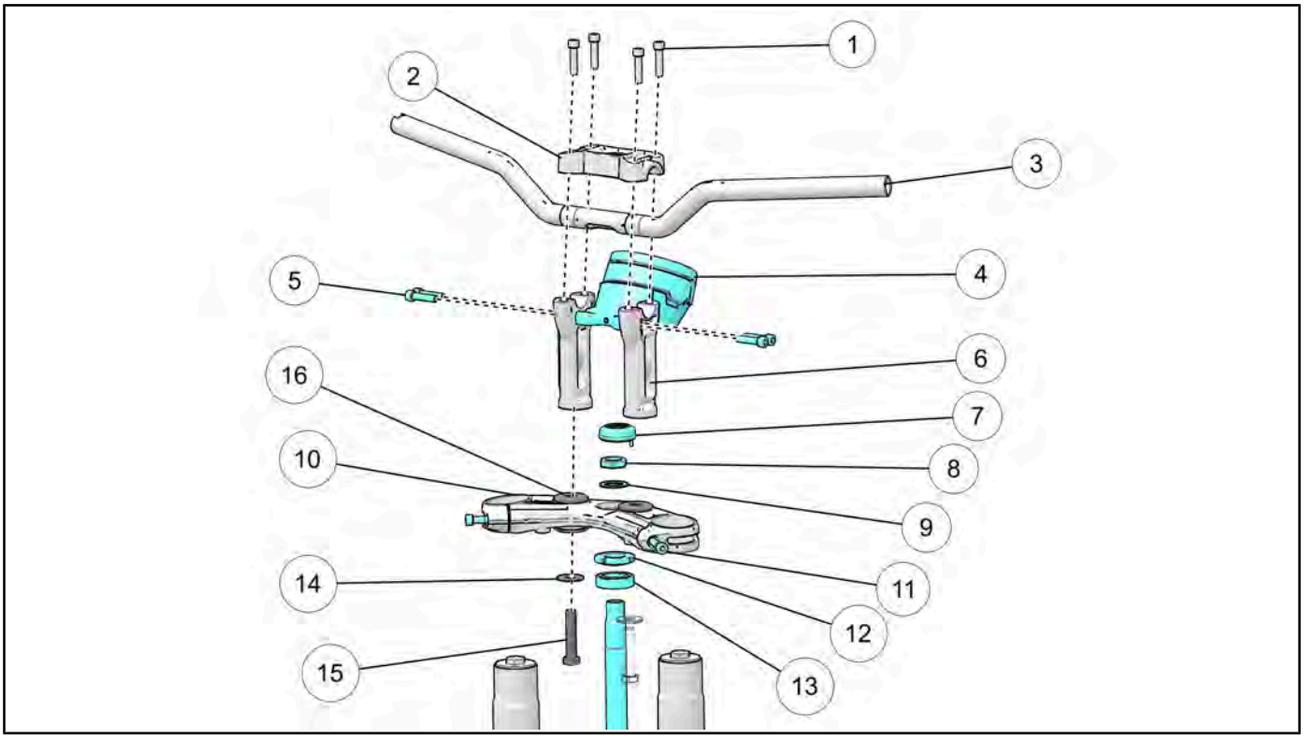
2023+



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Riser Cap Fastener	**18 ft-lbs (25 N·m) Torque front fasteners, then rear**	⑧	Riser Bottom	—
②	Riser Cap	—	⑨	Triple Clamp Cap	—
③	Handlebar	—	⑩	Triple Clamp Top Nut	**72 ft-lbs (98 N·m)**
④	Isolator	—	⑪	Washer	—
⑤	Upper Triple Clamp	—	⑫	Triple Clamp Pinch Fastener	**17 ft-lbs (24 N·m)**
⑥	Washer	—	⑬	Steering Head Nut	**29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**
⑦	Riser Bottom Fastener	**59 ft-lbs (80 N·m)**	⑭	Ball Bearing	—

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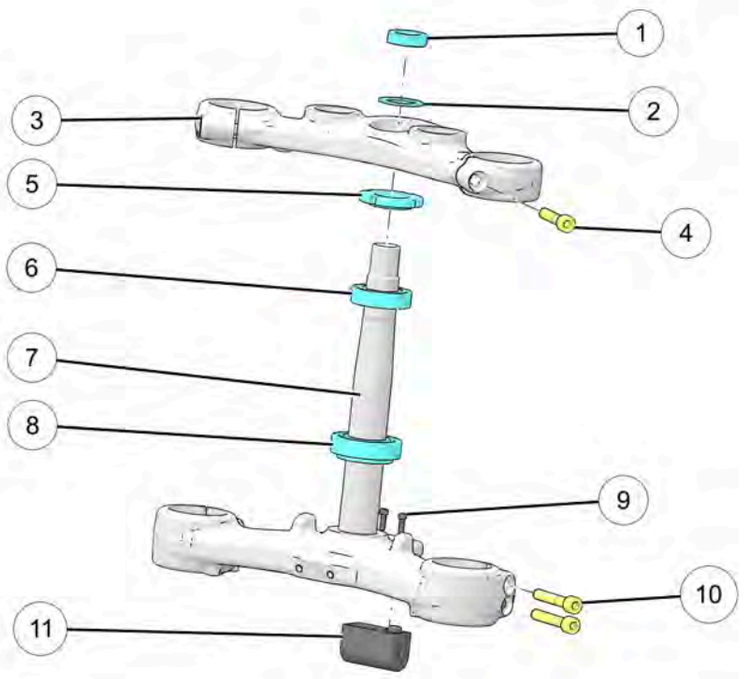
HANDLEBAR COMPONENTS (SPORT CHIEF)



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Riser Cap Fastener	**18 ft-lbs (25 N·m) Torque front fasteners, then rear**	⑨	Washer	—
②	Riser Cap	—	⑩	Triple Clamp	—
③	Handlebar	—	⑪	Triple Clamp Pinch Fastener	**17 ft-lbs (24 N·m)**
④	Gauge Mount	—	⑫	Steering Head Nut	**29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**
⑤	Gauge Mount Fastener	**18 ft-lbs (25 N·m)**	⑬	Ball Bearing	—
⑥	Riser	—	⑭	Washer	—
⑦	Triple Clamp Cap	—	⑮	Riser Bottom Fastener	**59 ft-lbs (80 N·m)**
⑧	Triple Clamp Top Nut	**72 ft-lbs (98 N·m)**	⑯	Isolator	—

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TRIPLE CLAMP COMPONENTS



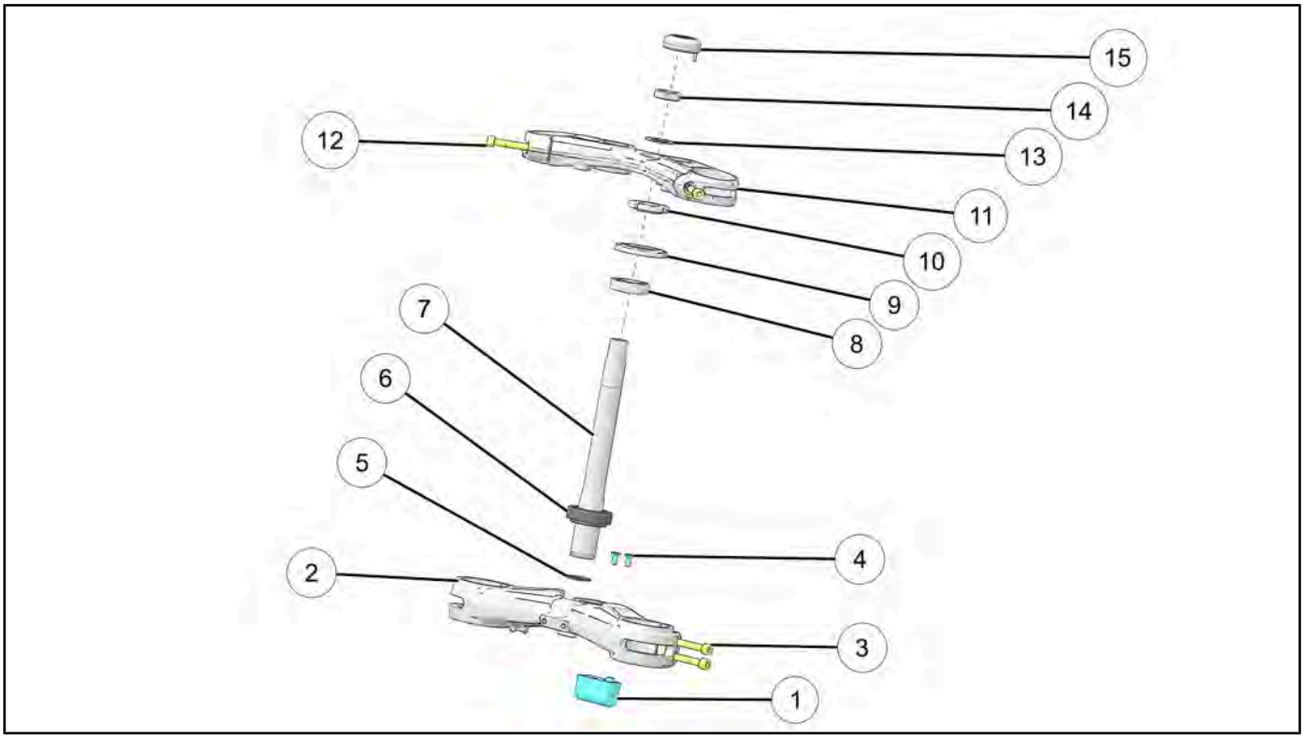
ITEM	DESCRIPTION	TORQUE
①	Triple Tree Top Nut	**72 ft-lbs (98 N·m)**
②	Washer	—
③	Upper Triple Clamp	—
④	Triple Clamp Pinch Fastener	**17 ft-lbs (24 N·m)**
⑤	Steering Head Nut	**29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**
⑥	Ball Bearing	—
⑦	Lower Triple Clamp Assembly	—
⑧	Sealed Tapered Roller Bearing	—
⑨	Fork Lock Fastener	**80 in-lbs (9 N·m)**

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ITEM	DESCRIPTION	TORQUE
⑩	Lower Triple Clamp Pinch Fastener	**Step 1: Tighten bearing lock by following its tightening procedure.** **Step 2: Tighten bottom bolts on lower triple clamp.** **Step 3: Tighten top bolts on lower triple clamp.** **Step 4: repeat step 2.** **Step 5: Repeat step 3.** **Step 6: Tighten top nut by following its tightening procedure.** **Step 7: Final Torque Pinch fasteners to 17 ft-lbs (24 N·m)**
⑪	Fork Lock	—

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TRIPLE CLAMP COMPONENTS (SPORT CHIEF)



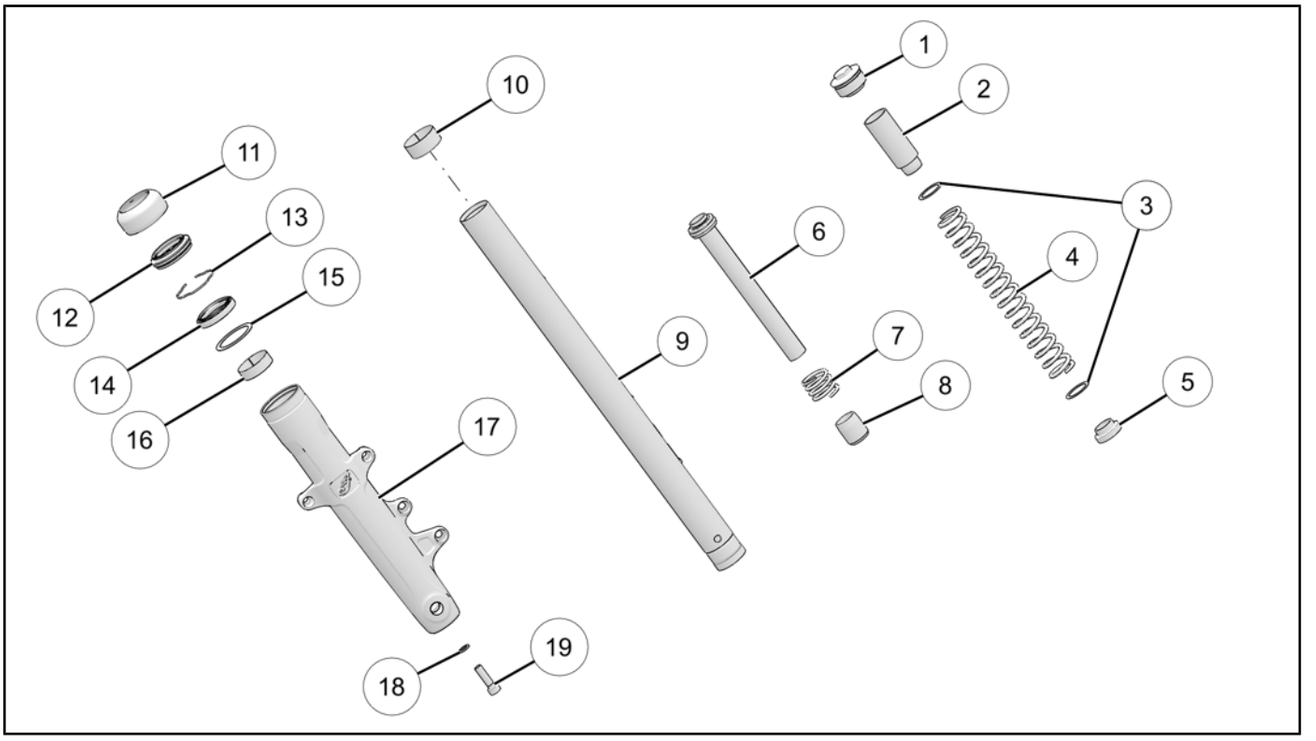
ITEM	DESCRIPTION	TORQUE
①	Steering Lock	—
②	Lower Triple Clamp	—
③	Lower Fork Clamp Fastener	**Step 1: Tighten bearing lock by following its tightening procedure.** **Step 2: Tighten bottom bolts on lower triple clamp.** **Step 3: Tighten top bolts on lower triple clamp.** **Step 4: repeat step 2.** **Step 5: Repeat step 3.** **Step 6: Tighten top nut by following its tightening procedure.** **Step 7: Final Torque Pinch fasteners to 17 ft-lbs (24 N·m)**
④	Steering Lock Fastener	**17 ft-lbs (24 N·m)**
⑤	Steering Post Clip	—
⑥	Sealed Bearing	—
⑦	Steering Stem	—
⑧	Ball Bearing	—
⑨	Bearing Stem Cover	—
⑩	Steering Lock Fastener	**17 ft-lbs (24 N·m)**
⑪	Upper Triple Clamp	—
⑫	Upper Fork Clamp Fastener	**17 ft-lbs (24 N·m)**

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ITEM	DESCRIPTION	TORQUE
⑬	Washer	—
⑭	Top Triple Clamp Nut	**72 ft-lbs (98 N·m)**
⑮	Triple Clamp Nut Cap	—

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FRONT FORK COMPONENTS

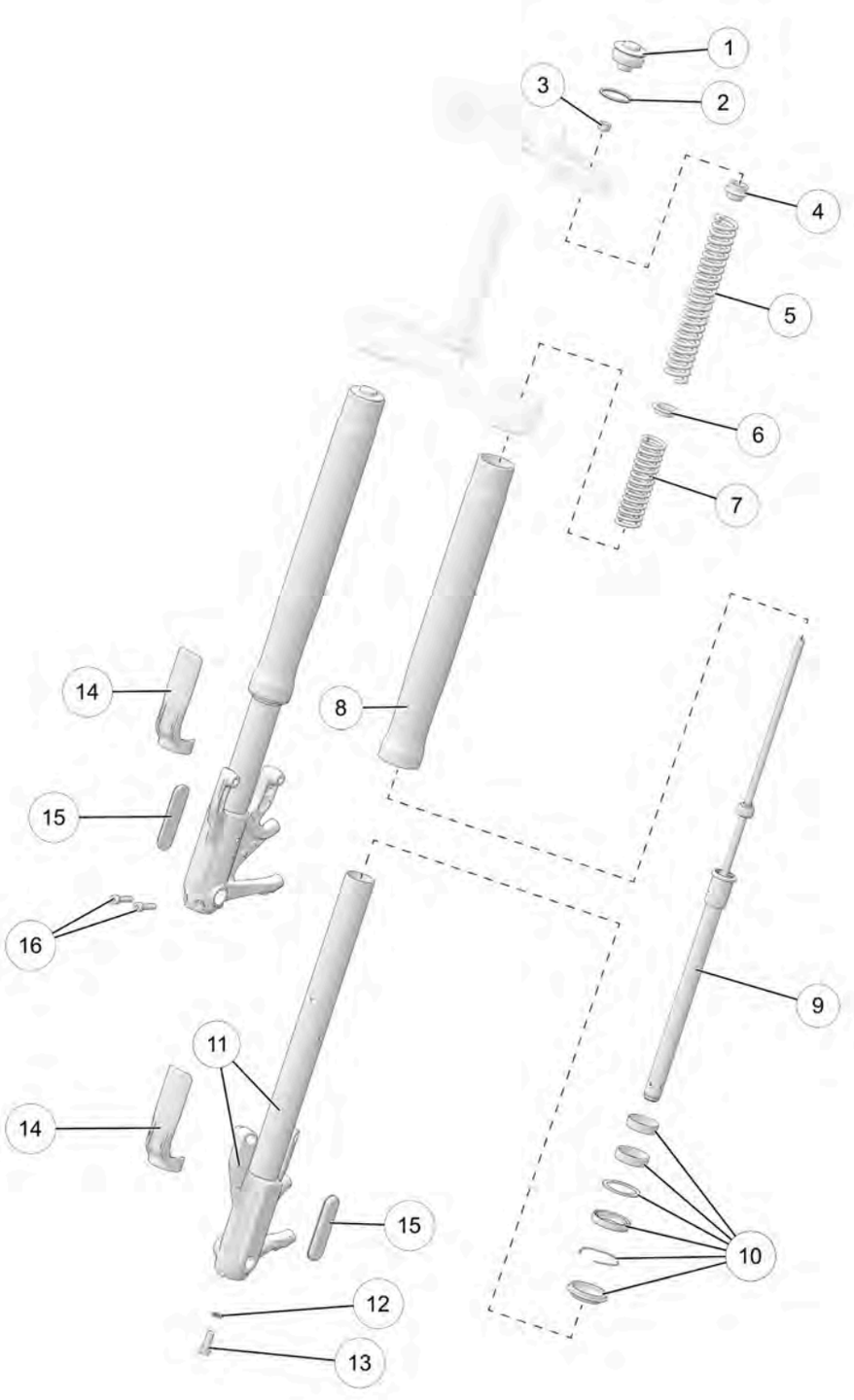


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ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Fork Cap	**15 ft-lbs (20 N·m)**	⑪	Seal Cover	—
②	Spring Spacer	—	⑫	Seal Wiper	—
③	Spring Seat	—	⑬	Snap Ring	—
④	Main Spring	—	⑭	Main Seal	—
⑤	Spring Mount	—	⑮	Washer	—
⑥	Damper Tube	—	⑯	Upper Bushing	—
⑦	Top Out Spring	—	⑰	Fork Outer Leg	—
⑧	Hydraulic Lock	—	⑱	Washer	—
⑨	Fork Inner Tube	—	⑲	Fork Cartridge Fastener	**22 ft-lbs (30 N·m)**
⑩	Lower Bushing	—			

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FRONT FORK COMPONENTS (SPORT CHIEF)



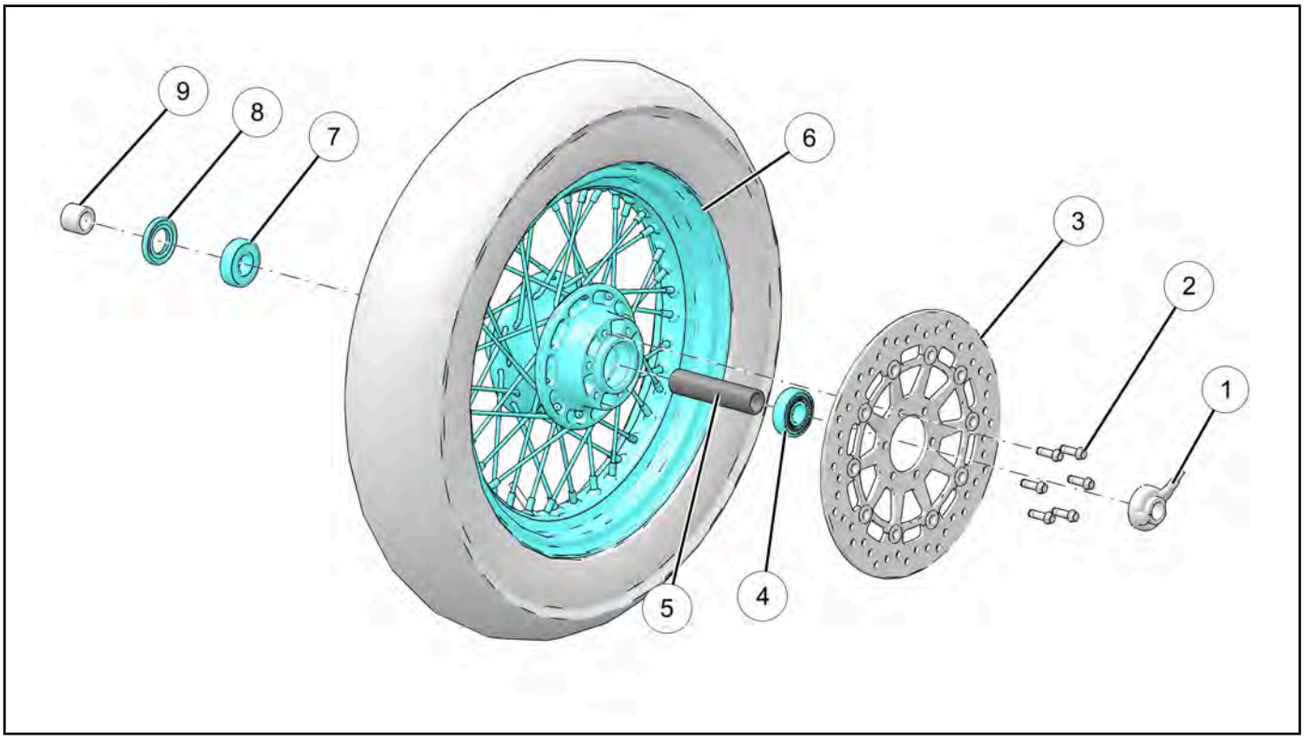
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ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Fork Cap	**17 ft-lbs (23 N·m)**	⑪	Cylinder Comp.	—
②	O-Ring	—	⑫	Kit, Seals	—
③	Fork Cap Nut	**12 ft-lbs (16 N·m)**	⑬	Tube Comp. Inner	—
④	Spring Guide, Upper	—	⑭	Sealing Washer	—
⑤	Spring, Upper	—	⑮	Cartridge Screw	**17 ft-lbs (23 N·m)**
⑥	Spring Guide, Lower	—	⑯	Guard, Fork	—
⑦	Spring, Lower	—	⑰	Reflector	—
⑧	Comp. Tube, Outer	—	⑱	Front Axle Pinch Fastener	**19 ft-lbs (26 N·m)**
⑨	Cylinder Comp.	—	⑲	Caps, Pinch Bolt INTL ONLY (not shown)	—
⑩	Seals & Bushings	—			

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FRONT WHEEL COMPONENTS

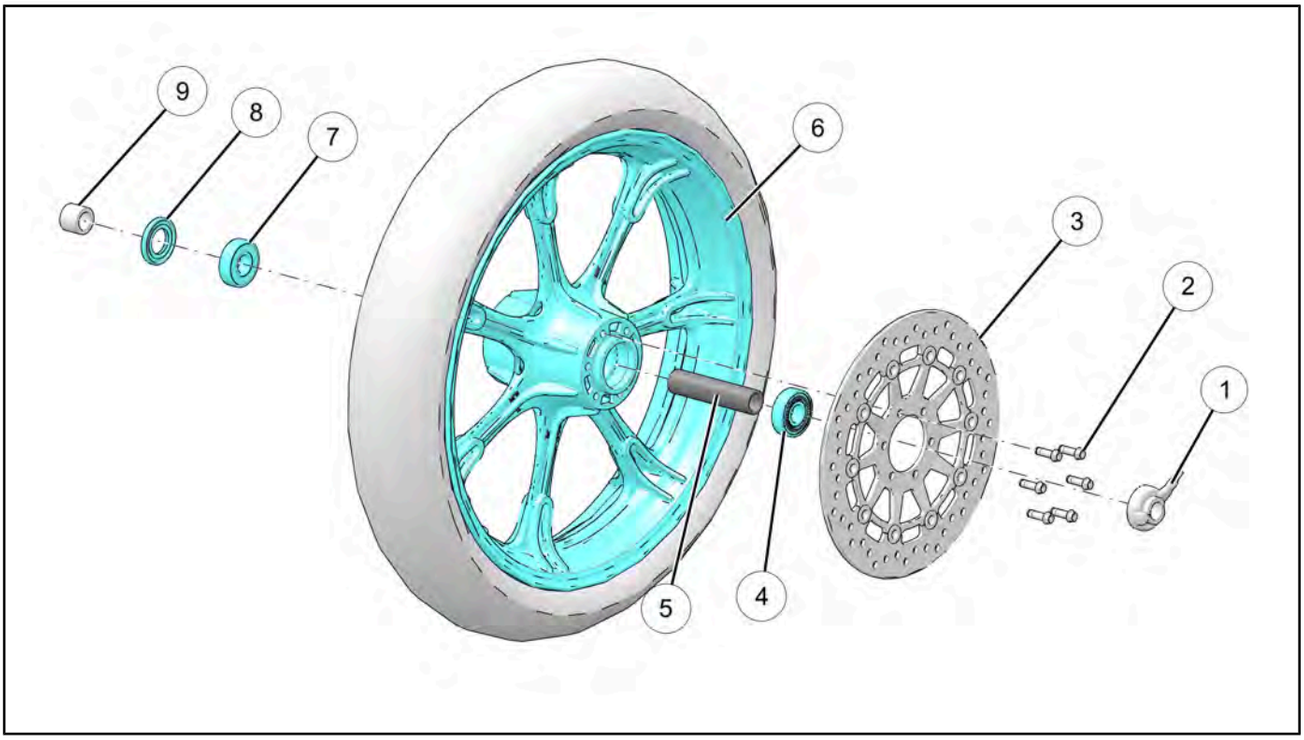
SPOKE WHEEL



ITEM	DESCRIPTION	TORQUE
①	Wheel Speed Sensor	—
②	Brake Disc Fastener	**22 ft-lbs (30 N·m)**
③	Brake Disc	—
④	Wheel Bearing LH	—
⑤	Wheel Bearing Spacer	—
⑥	Spoked Wheel	—
⑦	Wheel Bearing RH	—
⑧	Wheel Bearing Seal	—
⑨	Wheel Spacer	—

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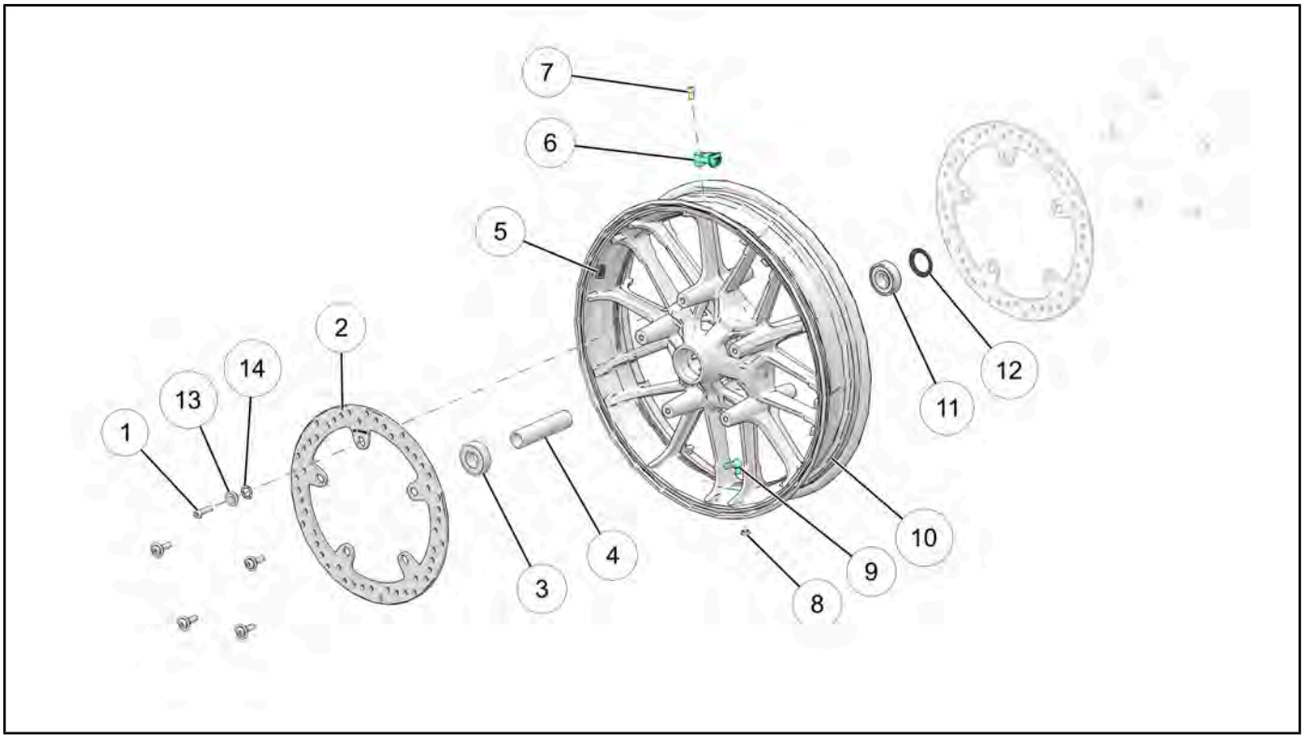
CAST WHEEL



ITEM	DESCRIPTION	TORQUE
①	Wheel Speed Sensor	—
②	Brake Disc Fastener	**22 ft-lbs (30 N·m)**
③	Brake Disc	—
④	Wheel Bearing LH	—
⑤	Wheel Bearing Spacer	—
⑥	Cast Wheel	—
⑦	Wheel Bearing RH	—
⑧	Wheel Bearing Seal	—
⑨	Wheel Spacer	—

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FRONT WHEEL COMPONENTS (SPORT CHIEF)



ITEM	DESCRIPTION	TORQUE
①	Rotor Screw	**22 ft-lbs (30 N·m)**
②	Brake Rotor	—
③	Wheel Bearing	—
④	Bearing Spacer	—
⑤	Wheel Weight	—
⑥	Tire Pressure Sensor	—
⑦	Tire Pressure Sensor Fastener	**72 in-lbs (8 N·m)**
⑧	Valve Stem Nut	**44 in-lbs (5 N·m)**
⑨	Valve Stem	—
⑩	Front Wheel 19 x 3.5	—
⑪	Ball Bearing	—
⑫	Seal	—
⑬	Bushing	—
⑭	Wave Washer	—

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SERVICE PROCEDURES

HANDLEBAR REMOVAL / INSTALLATION

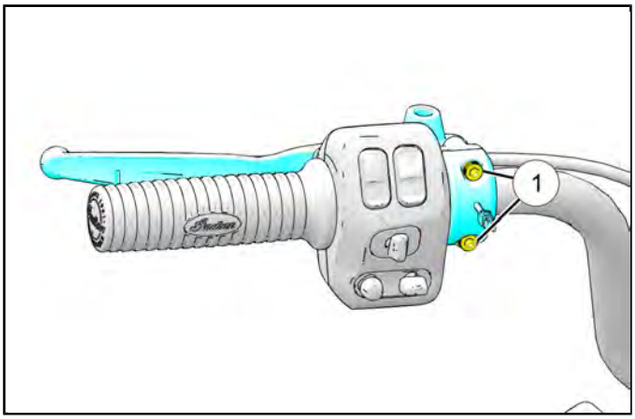
⚠ WARNING

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.
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.

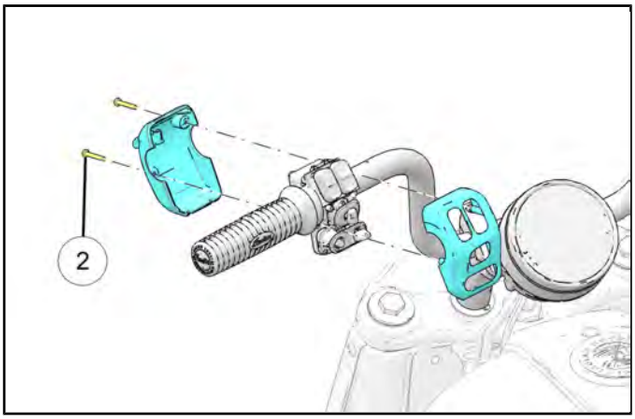
1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise
2. Remove clutch perch fasteners ①.

IMPORTANT

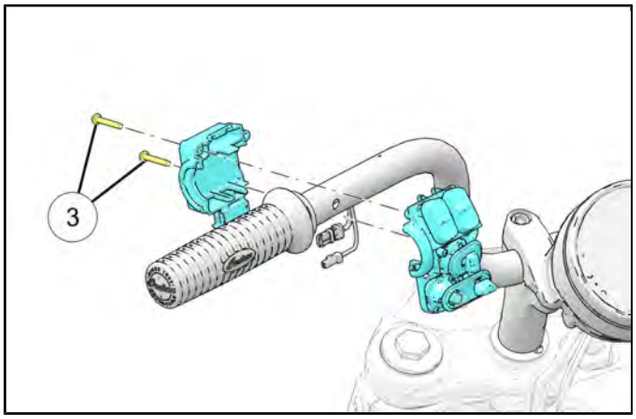
Do not allow the clutch perch to hang from its electrical connection to the switch cube.



3. Remove switch cube cover fasteners ②.



4. Disconnect switch cube electrical connectors.
5. Remove switch cube fasteners ③ and remove.



6. Remove the left hand grip from the unit.

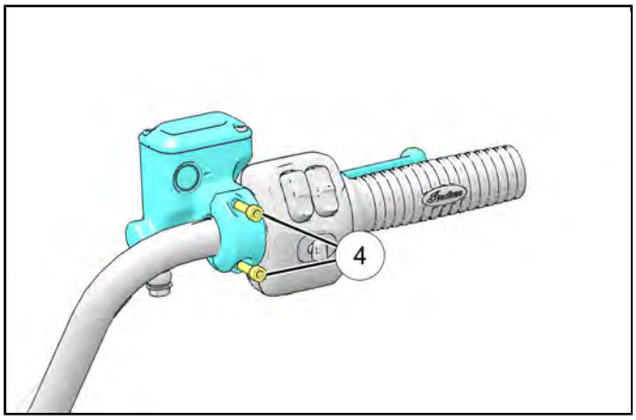
IMPORTANT

2022 units will have the left grip glued to the handlebar. 2023 and newer units have a fastener retaining the left grip.

7. Remove master cylinder perch fasteners ④.

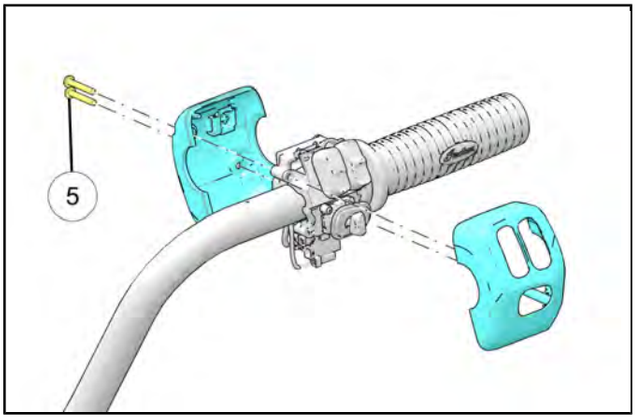
IMPORTANT

Keep the master cylinder upright or the brake system may need to be bled after reassembly.



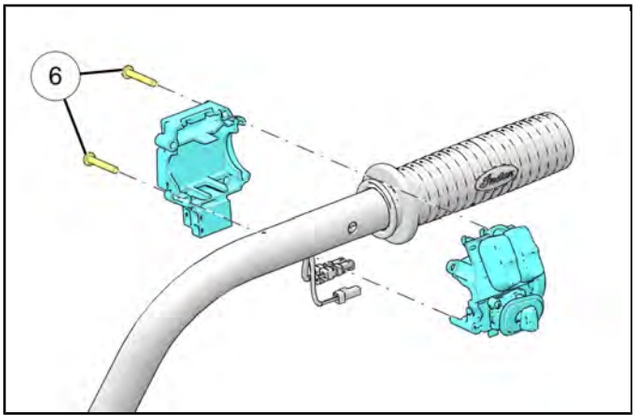
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8. Remove switch cube cover fasteners ⑤.

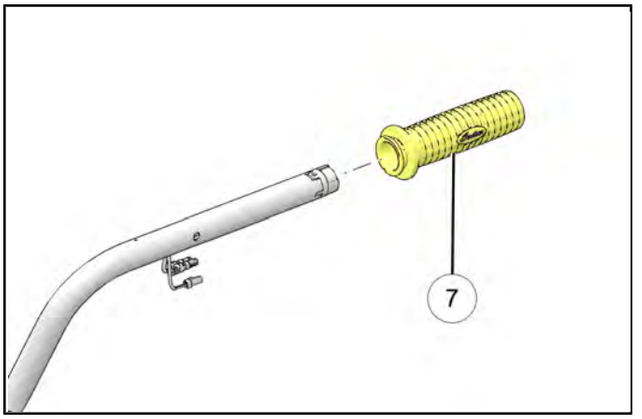


9. Disconnect switch cube electrical connections.

10. Remove switch cube fasteners ⑥.



11. Remove right hand grip and in-bar ETC.



12. Remove fuel tank. See **Fuel Tank Removal page 4.17**.

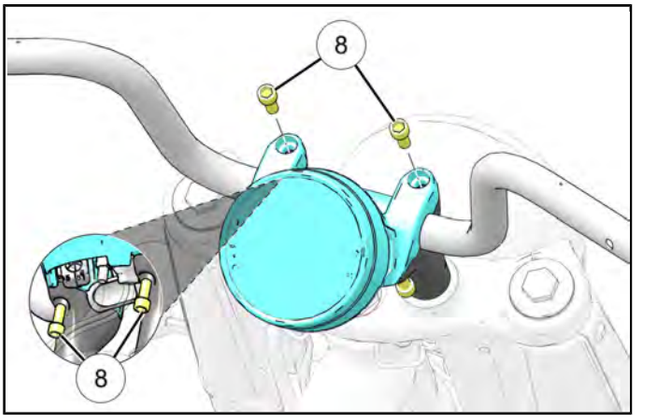
13. Follow the handlebar harness and disconnect electrical connectors.

NOTICE

Tape a cord or braided wire sleeve with cord to harness before removing from the handlebars.



14. Remove riser cap fasteners ⑧.



15. Remove handlebar.

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16. **Installation is performed by reversing the removal procedure.**

NOTICE
Thread harness into braided wire sleeve with cord that was fed through the handlebar on disassembly. Tape the end of the sleeve to the harness. Gentle pull the cord on the sleeve and guide the harness through the handlebars.

TORQUE
Riser Cap Fastener: **18 ft-lbs (25 N·m) Torque front fasteners, then rear**

TORQUE
Grip Fastener (2023): **53 in-lbs (6 N·m)**

TORQUE
Master Cylinder Perch Fastener: **88 in-lbs (10 N·m) Torque upper fastener, then lower**

TORQUE
Switch Cube Fastener: **9 in-lbs (1 N·m)**

TORQUE
Switch Cube Cover Fastener: **9 in-lbs (1 N·m)**

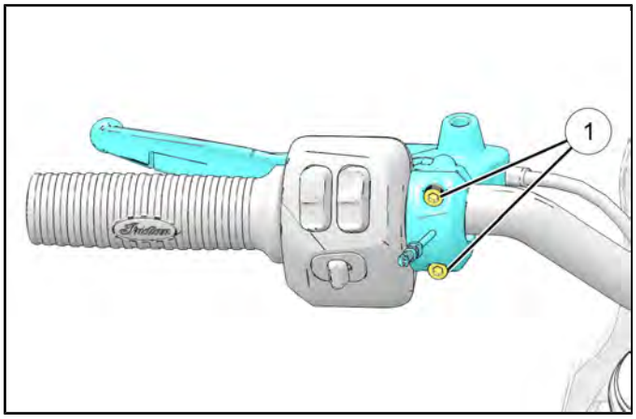
TORQUE
Clutch Perch Fastener: **88 in-lbs (10 N·m) Torque upper fastener then lower.**

HANDLEBAR REMOVAL / INSTALLATION (SPORT CHIEF)

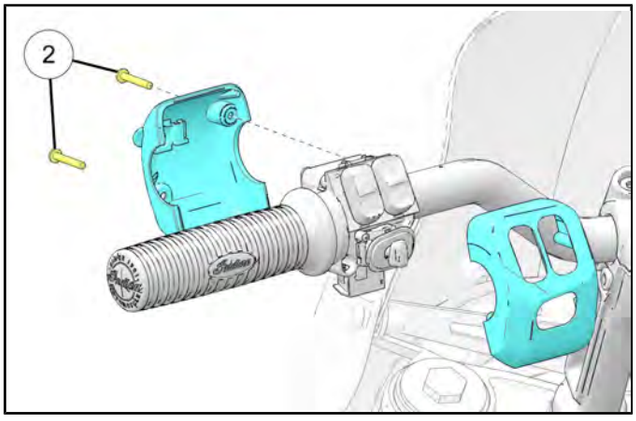
⚠ WARNING
Clutch cable must be routed, installed, and adjusted correctly to function properly. Note how cable is routed and secured before removing the cable. Permanent cable damage may result if the inner cable is bent or twisted during installation. If the cable is incorrectly routed, installed, or adjusted, serious injury or death may occur. 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.

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise
2. Remove clutch perch fasteners ①.

IMPORTANT
Do not allow the clutch perch to hang from its electrical connection to the switch cube.



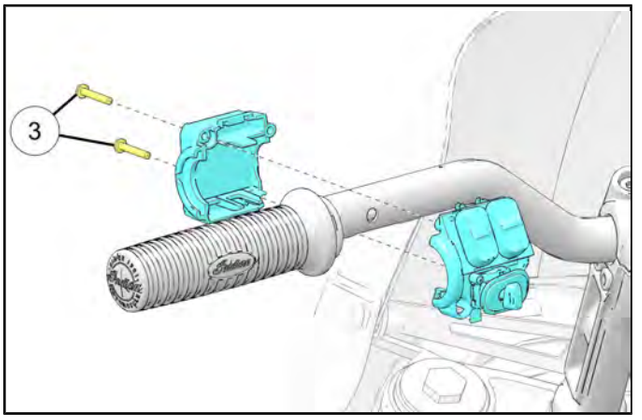
3. Remove switch cube cover fasteners ②.



8

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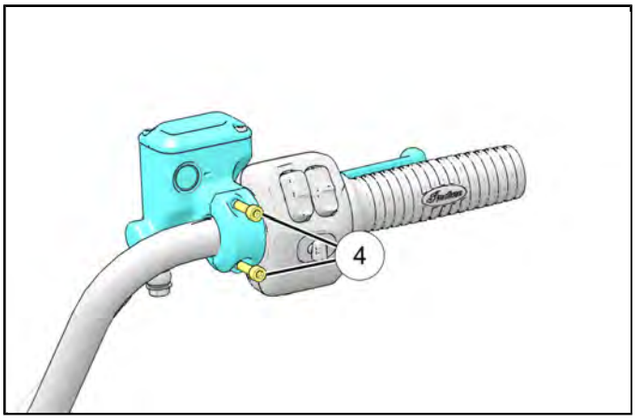
4. Disconnect switch cube electrical connectors.
5. Remove switch cube fasteners ③ and remove.



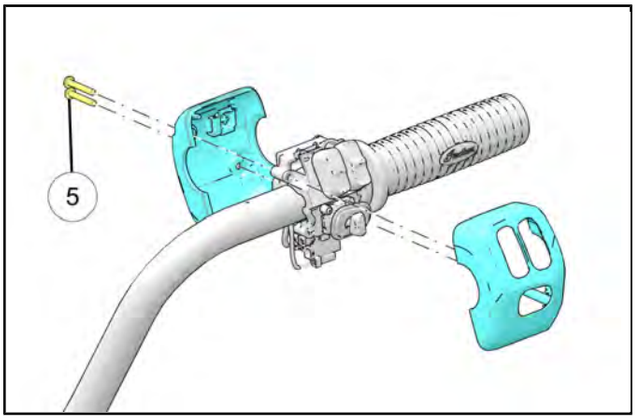
6. To remove left hand grip, remove its fastener.
7. Remove master cylinder perch fasteners ④.

IMPORTANT

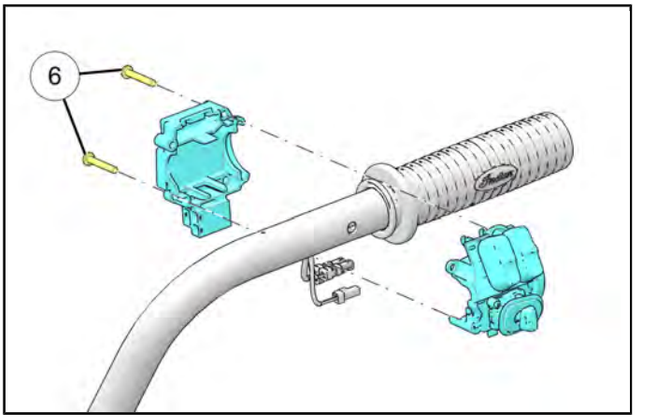
Keep the master cylinder upright or the brake system may need to be bled after reassembly.



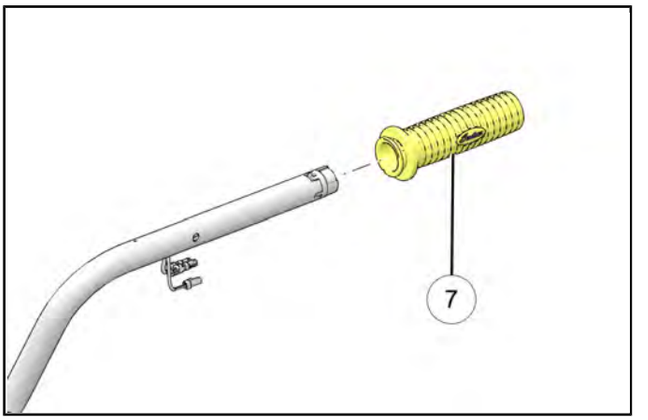
8. Remove switch cube cover fasteners ⑤.



9. Disconnect switch cube electrical connections.
10. Remove switch cube fasteners ⑥.



11. Remove right hand grip and in-bar ETC.



12. Remove fuel tank. See **Fuel Tank Removal page 4.17**.
13. Follow the handlebar harness and disconnect electrical connectors.

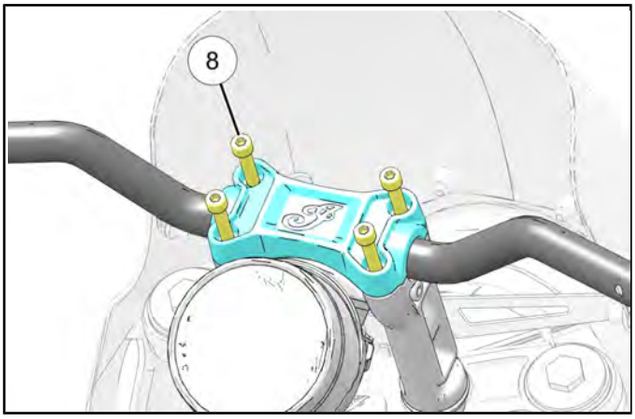
NOTICE

Tape a cord or braided wire sleeve with cord to harness before removing from the handlebars.



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14. Remove riser cap fasteners ⑧.



15. Remove handlebar.

16. **Installation is performed by reversing the removal procedure.**

TORQUE
Riser Cap Fastener: **18 ft-lbs (25 N·m) Torque front fasteners, then rear**

TORQUE
Grip Fastener (2023): **53 in-lbs (6 N·m)**

TORQUE
Master Cylinder Perch Fastener: **88 in-lbs (10 N·m) Torque upper fastener, then lower**

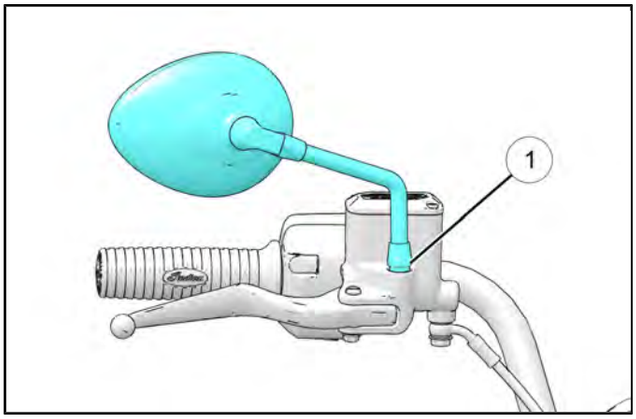
TORQUE
Switch Cube Fastener: **9 in-lbs (1 N·m)**

TORQUE
Switch Cube Cover Fastener: **9 in-lbs (1 N·m)**

TORQUE
Clutch Perch Fastener: **88 in-lbs (10 N·m) Torque upper fastener then lower.**

MIRROR REMOVAL / INSTALLATION

1. Loosen the mirror ① from the perch assembly.



NOTICE
INTL models have an additional adapter between the mirror and perch assembly.

2. **Installation is performed by reversing the removal procedure.**

TORQUE
Mirror: **17 ft-lbs (24 N·m)**

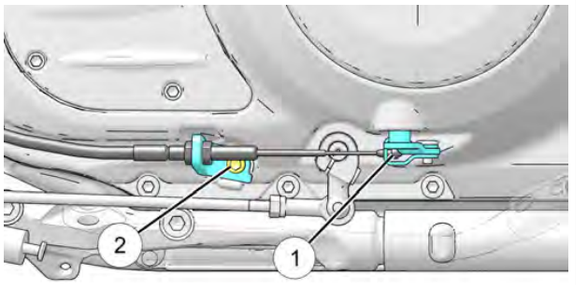
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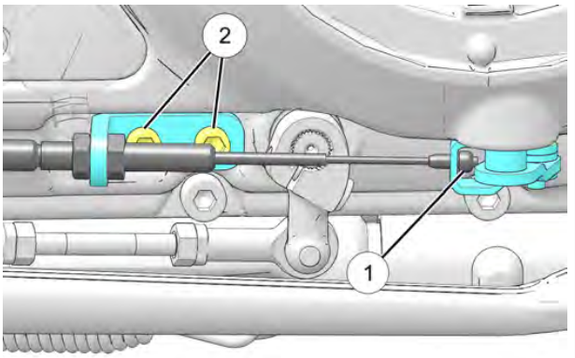
CLUTCH CABLE REMOVAL / INSTALLATION

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Disconnect clutch cable ① from clutch pinion arm.

2022



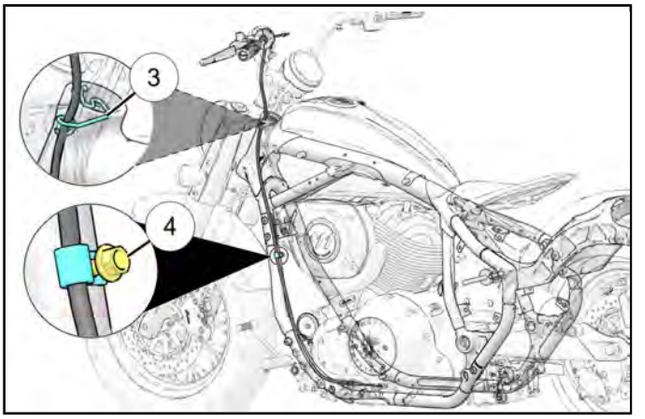
2023+



NOTICE

Note pinion shaft orientation for reassembly.

3. Loosen and remove the adjuster jam nut so the cable can be pulled through and out of the bracket.
4. At the handlebar, pull the clutch cable casing straight out until clear of lever perch and rotate cable outward to align inner cable wire with slot in lever.
5. Pull lever slightly until slotted opening in lever is clear of perch and slide cable barrel end down and out of lever.
6. Disconnect the clutch cable from the wire guide ③.



7. Remove clutch cable p-clamp fastener ④.
8. Remove the cable from the unit. Note the routing for reinstallation.
9. **Installation is performed by reversing the removal procedure.**

⚠ CAUTION

Do not kink, bend, or twist the inner cable or outer cable casing during installation

10. Route clutch cable in the same manner as removed.
11. Apply multi-purpose grease to the lever end of the cable and install it in the clutch lever at the handlebar.
12. Install the casing in the lever perch at the handlebar.
13. Install cable in the mount located on the primary cover.
14. At the clutch pinion arm end of the cable, pull the inner cable until fully extended. Be sure the upper end of the cable casing is seated in the lever perch at handlebar end.
15. Apply multi-purpose grease to the lower barrel end of the cable and at the clutch pinion arm joint.
16. Rotate the clutch pinion arm inward (as in STEP 2) until cable can be installed in the clutch pinion arm.
17. Adjust clutch cable free play. See **Clutch Lever Free Play page 5.6**.

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FRONT WHEEL REMOVAL / 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.

⚠ 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.

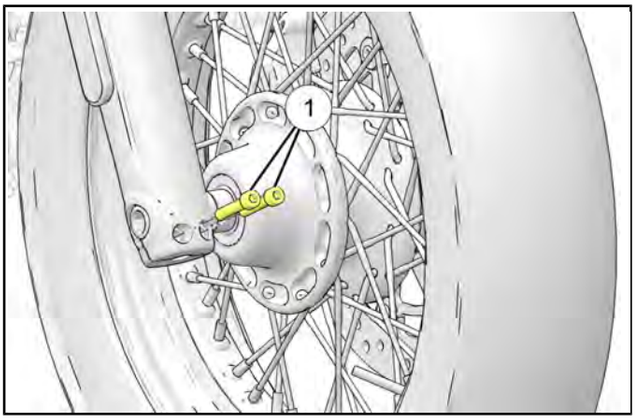
FRONT WHEEL REMOVAL

1. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

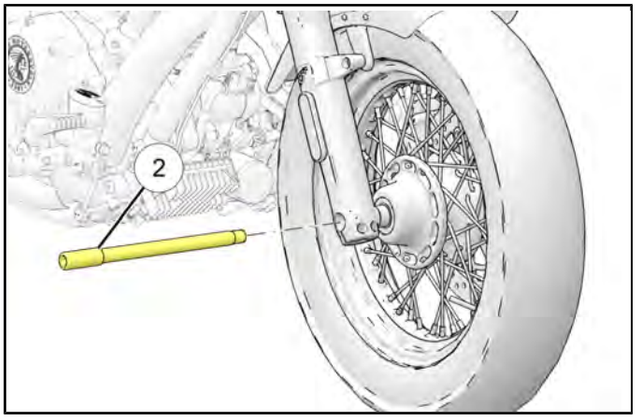
IMPORTANT

Do not operate the front brake lever with the calipers or wheel removed.

2. Loosen axle pinch bolts ① on lower right fork leg.



3. Support wheel and remove axle ②.



4. Remove wheel speed sensor from brake side.
5. Remove wheel spacer from non-brake side.

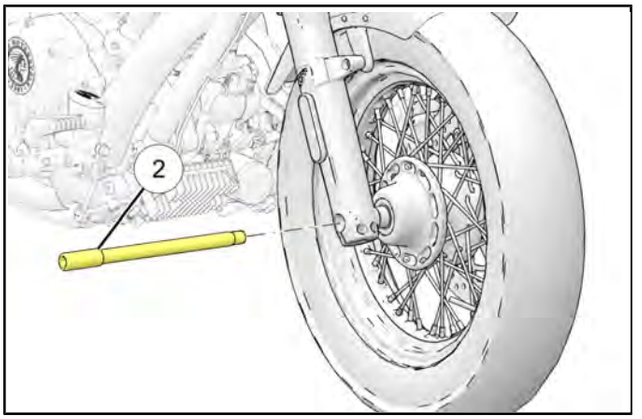
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FRONT WHEEL INSTALLATION

- Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

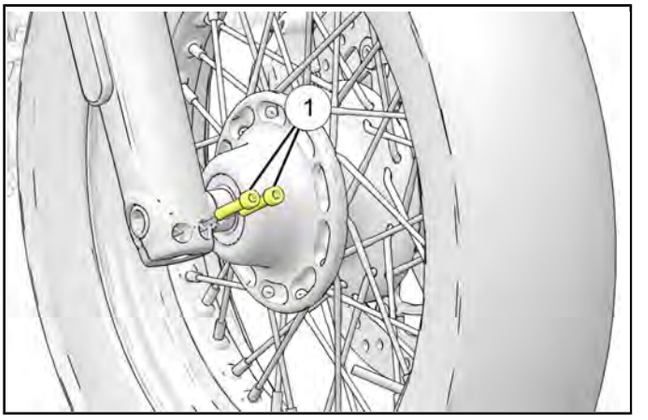
IMPORTANT
Do not operate the front brake lever with the calipers or wheel removed.

- Install wheel spacer to non-brake side.
- Install wheel speed sensor to brake side.
- Install wheel and install axle ②. Torque axle to specification.



TORQUE
Axle (front fork): **52 ft-lbs (70 N·m)**

- Install axle pinch bolts ① on lower right fork leg.



- Cycle the front suspension. Tighten axle pinch bolts to specification.

TORQUE
Axle Pinch Fasteners: **18 ft-lbs (25 N·m)Tighten each screw once after initial torque**

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FRONT WHEEL REMOVAL / INSTALLATION (SPORT CHIEF)

⚠ 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.

Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

NOTICE

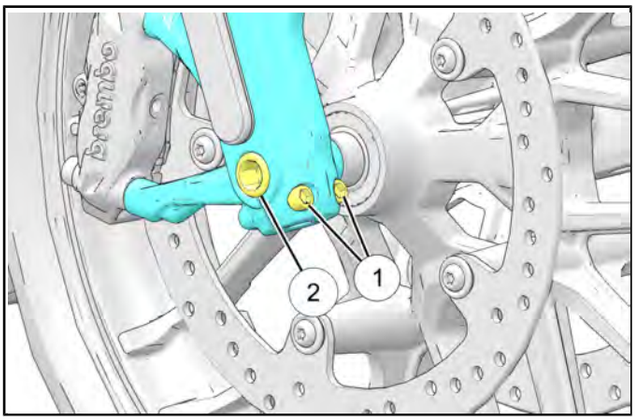
Do not operate the front brake lever with the calipers or wheel removed.

REMOVAL

1. Remove brake calipers. See **Front Caliper Service (Sport Chief) page 9.49**.
2. Loosen axle pinch fasteners ① on lower right fork leg.

IMPORTANT

Remove plastic cap if equipped.



3. Support wheel and remove axle ②. Be prepared to catch spacer and wheel speed sensor.

INSTALLATION

1. Install front wheel and spacers into fork.
2. Make sure wheel speed sensor is properly installed in the hub before installing the axle nut.
3. Install the axle and torque to specification.

TORQUE
Front Axle: **52 ft-lbs (70 N·m)**

4. Install pinch fasteners. Torque to specification.

TORQUE
Front Axle Pinch Fastener: **18 ft-lbs (25 N·m)**

5. Install brake calipers. See **Front Caliper Installation (Sport Chief) page 9.50**.

8

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FRONT AXLE INSPECTION

1. Place axle in V-blocks and inspect runout. Compare to specifications in this chapter. See **Service Specifications - Front Wheel / Suspension**.



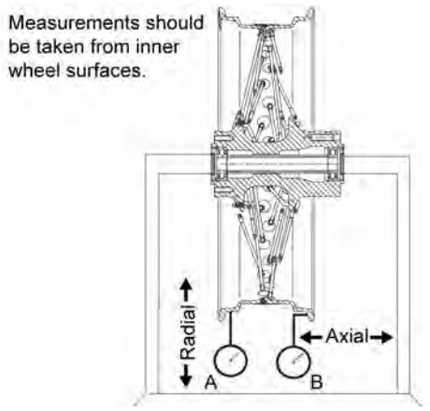
2. Replace axle if it fails inspection. Do not attempt to straighten a bent axle.

FRONT WHEEL INSPECTION

1. Install front wheel in truing stand.

IMPORTANT
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. See **Service Specifications - Front Wheel / Suspension**.
3. Position dial indicator to measure axial runout (side to side) (B) and compare to specifications. See **Service Specifications - Front Wheel / Suspension**.

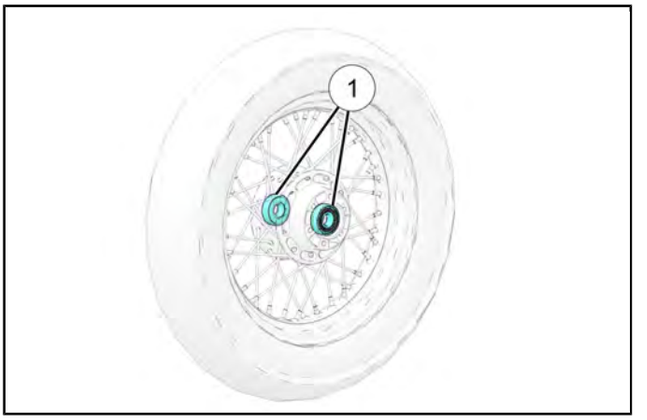


4. Visually inspect wheel for cracks.
5. Replace wheel if it fails visual or measured inspection. Do not attempt to straighten cast or wheels.

FRONT WHEEL BEARING INSPECTION

IMPORTANT
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 seals ① on each side for wear or damage.



NOTICE
The tone ring is built into the bearing.

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.

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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.

IMPORTANT

This procedure requires the Wheel Bearing Removal / Installation Kit **(PF-51324)**. Refer to special tool manufacturer instructions for proper use of tool.

REMOVAL

1. Remove front wheel. See **Front Wheel Removal / Installation page 8.29**.
2. Remove brake discs. See **Brake Disc Removal / Installation page 9.44**.
3. Carefully remove the external seal on the non-braking side 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 LH side of hub.
5. Remove bearing.
6. Remove spacer.
7. Extract or drive bearing from RH side of hub.

INSTALLATION

1. Use the Wheel Bearing Removal / Installation Kit **PF-51324)** to install new wheel bearings. Refer to special tool manufacturer instructions for proper use of tool.
2. Press the brake rotor side bearing with a flat ground tool that supports the bearing inner and outer race equally until it seats.

IMPORTANT

The tone ring must face outward and not be damaged or deformed.

NOTICE

Drawing a straight line across the bearing races and the seal containing the tone ring with a black marker can aid in wheel speed diagnostic procedures at a later date.

3. Install the center bearing spacer.
4. Continue to support the rotor side bearing inner and outer race while the right side bearing is installed.
5. Install the right side bearing with a flat ground tool that support the bearing inner and outer race equally until the inner race seats on the spacer.

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6. Install *new* seal on the non-brake side.
7. Install the brake disc. See **Brake Disc Removal / Installation page 9.44**.
8. Install the front wheel. See **Front Wheel Removal / Installation page 8.29**.

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FORK SERVICE

FRONT FORK REMOVAL

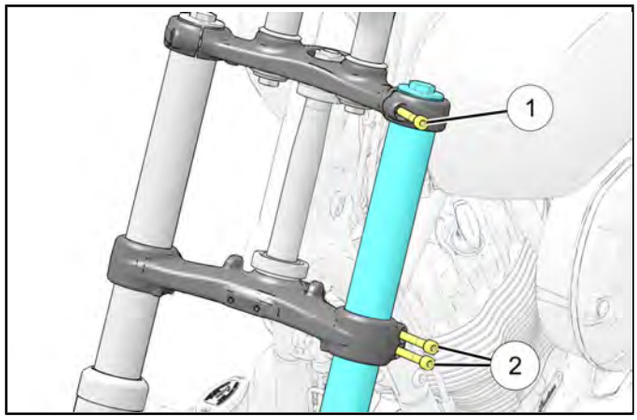
⚠ WARNING

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.

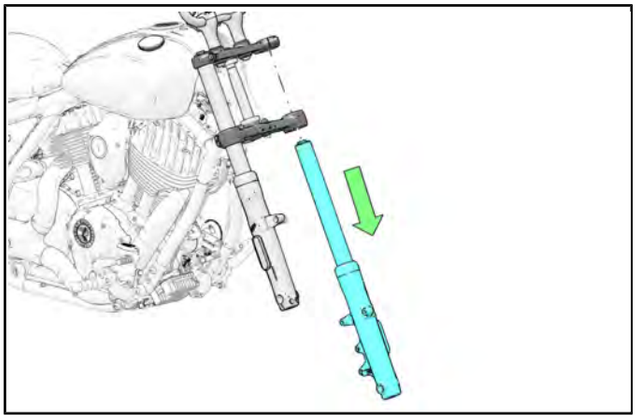
⚠ CAUTION

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 / Installation page 7.37**.
2. Remove front wheel. See **Front Wheel Removal / Installation page 8.29**.
3. Remove front body work. See **Front Body Components Removal / Installation page 7.30**.
4. Loosen top triple clamp pinch bolt ①.



5. Loosen lower triple clamp pinch bolts ②.
6. Slide fork leg down and remove.



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FRONT FORK DISASSEMBLY

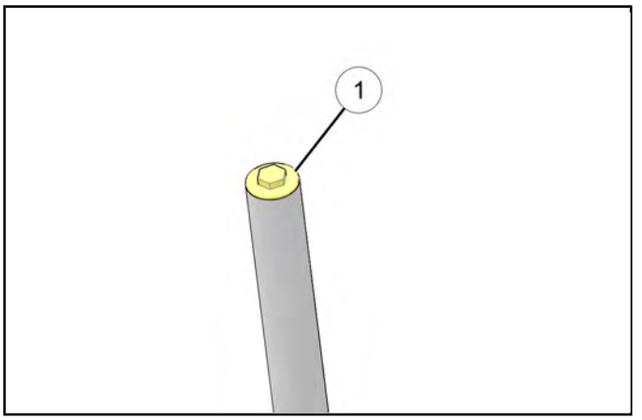
IMPORTANT

The following procedure requires the use of dampener Tool (PF-53122).

NOTICE

Refer to Front Fork Assembly View. See **Front Fork Components page 8.16**. Clean fork tubes before disassembly.

1. Loosen the fork cap ①. Do not remove it at this time.



2. Loosen cartridge bolt. Do not remove it at this time.

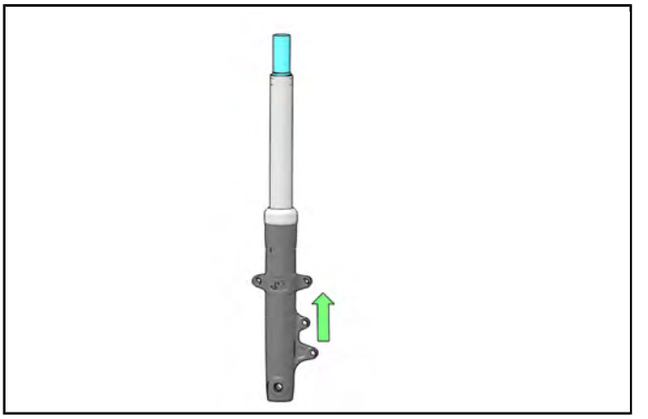


3. Finish removing fork cap.

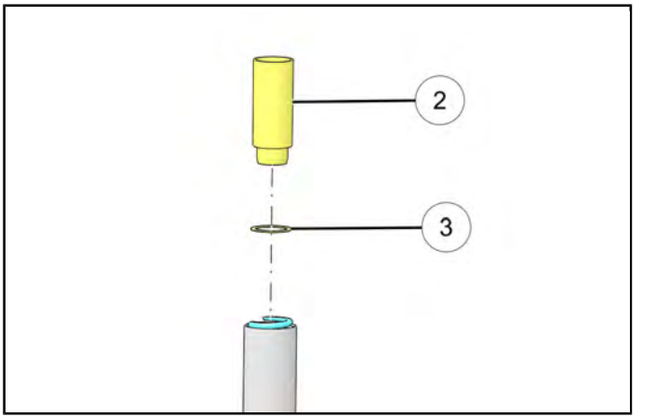
NOTICE

The top cap is under pressure but not enough to require compression.

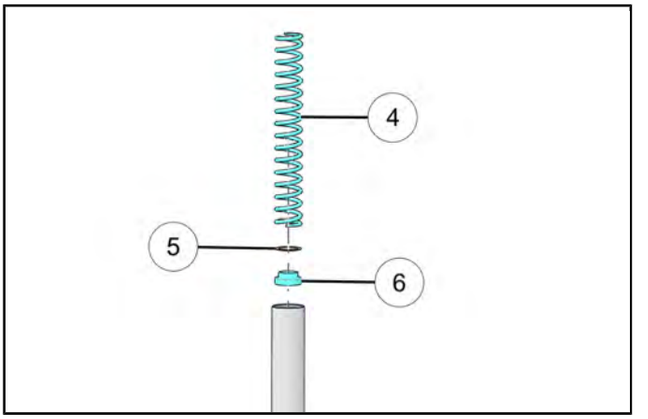
4. Compress the fork to expose the spring spacer.



5. Remove spring spacer ② and spring seat ③.



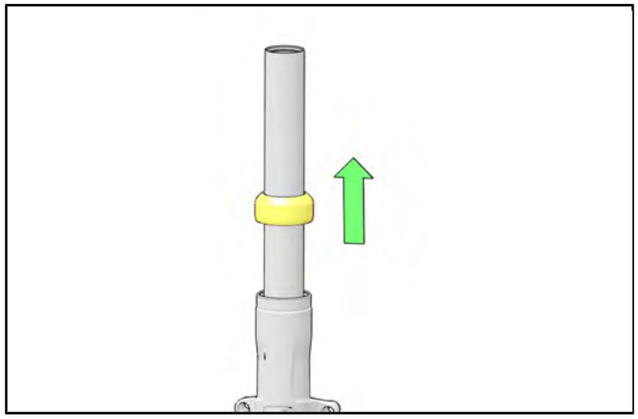
6. Remove main spring ④.



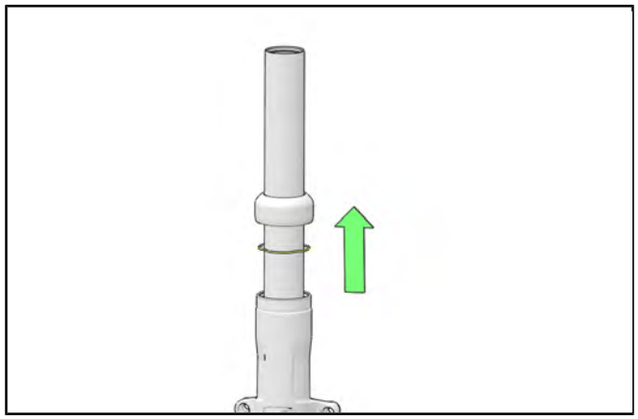
7. Remove spring seat ⑤ and spring mount ⑥.
8. Drain the oil from the fork in an appropriate receptacle.

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9. Gently pry dust seal upward.

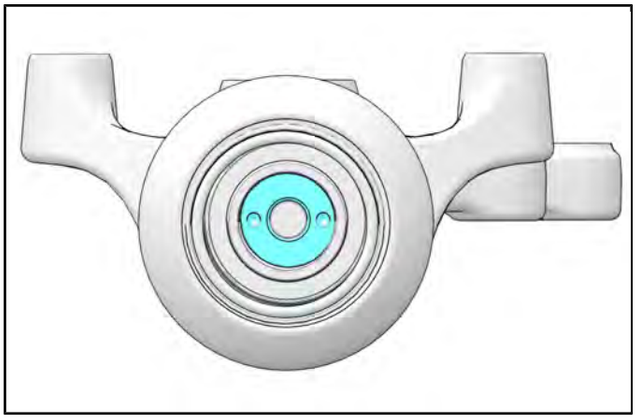


10. Gently pry out clip.



11. Compress the fork.

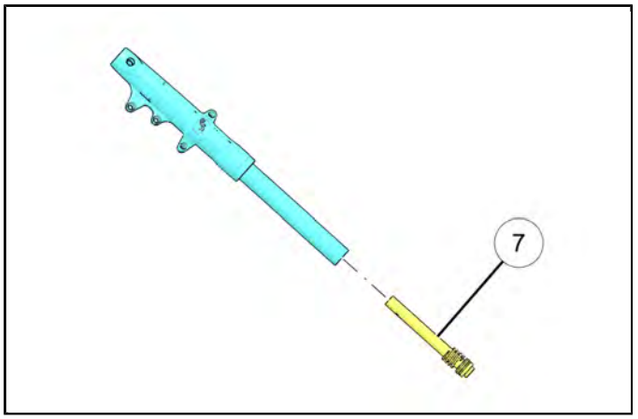
12. Looking down from the top of the fork, insert special tool **PF-53122** to hold the damper tube.





13. Finish removing bottom cartridge bolt and washer from step 2.

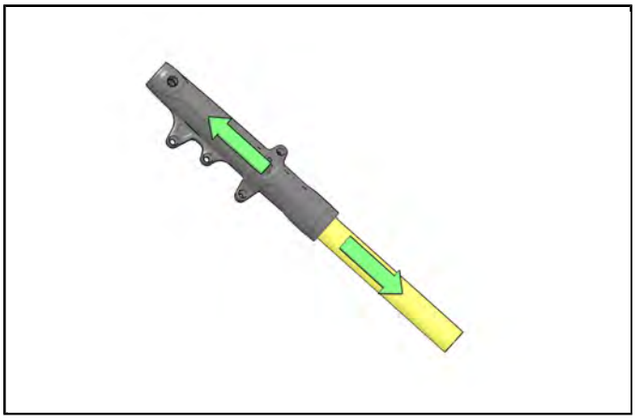
14. Tilt the tube down and remove the damper tube ⑦.



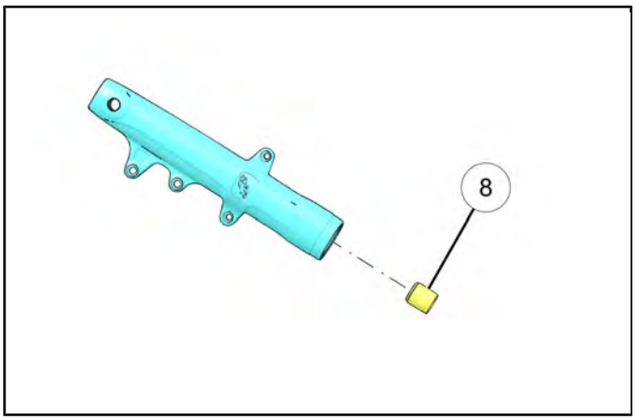
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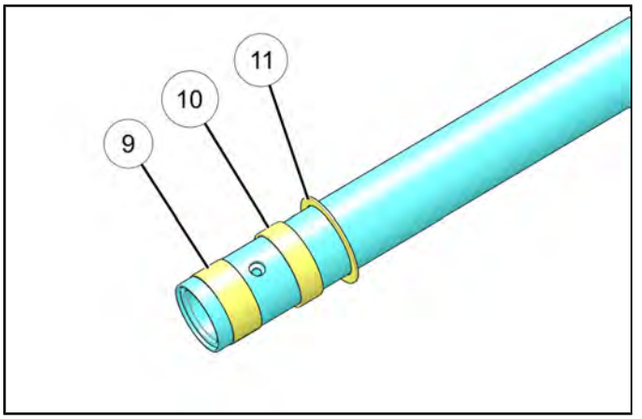
15. Using a slide hammer action, separate the inner fork tube from the outer leg.



16. Remove hydraulic lock ⑧ from the outer leg.

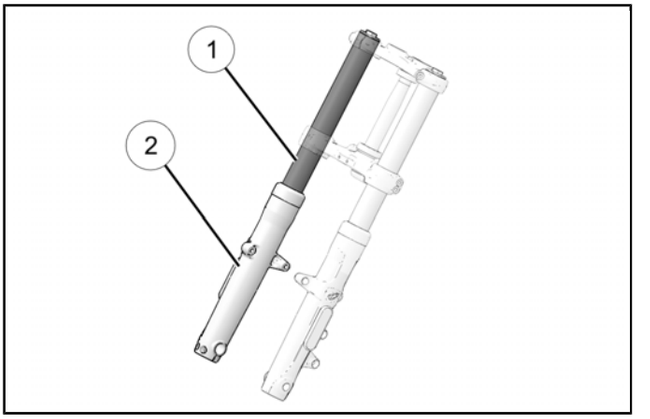


17. Remove lower bushing ⑨, Upper bushing ⑩, and washer ⑪ from inner fork tube.

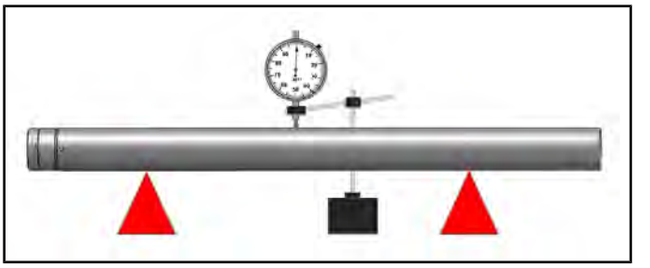


FRONT FORK INSPECTION

1. Measure fork spring free length, refer to **Service Specifications - Front Wheel / Suspension**.
2. Inspect inner and outer tube ① for scoring, heavy scratches, dents due to rocks or other road debris, or excessive wear. Replace tube(s) if deep scratches, pitting, or dents are found.
3. Inspect outer tube ② for dents or other indentations due to rocks or other road debris or damage. If damage is found on exterior of outer tube, insert inner tube into outer tube and move the tube through the complete travel range. Check for resistance or binding in the damaged area. If binding or resistance is evident, replace the outer tube.



4. Place fork tube in V-blocks and measure runout. Replace the tube if runout exceeds service limit listed at **Service Specifications - Front Wheel / Suspension**.



⚠ WARNING

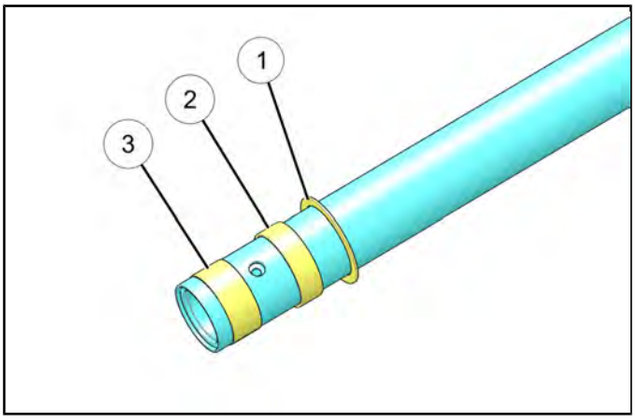
Do not attempt to straighten bent fork tubes. Doing so will weaken the tube and make the motorcycle unsafe to operate.

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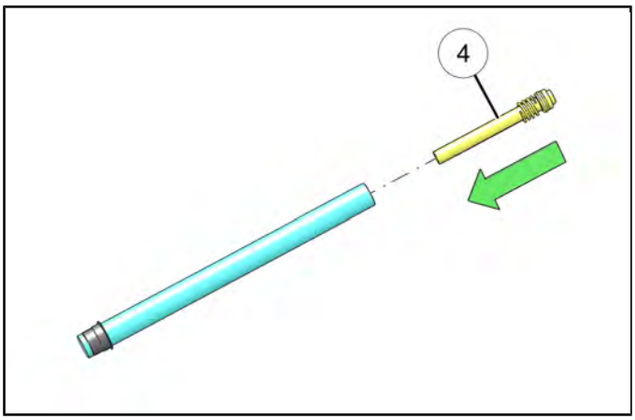
FRONT FORK ASSEMBLY

NOTICE
Clean all parts prior to assembly.

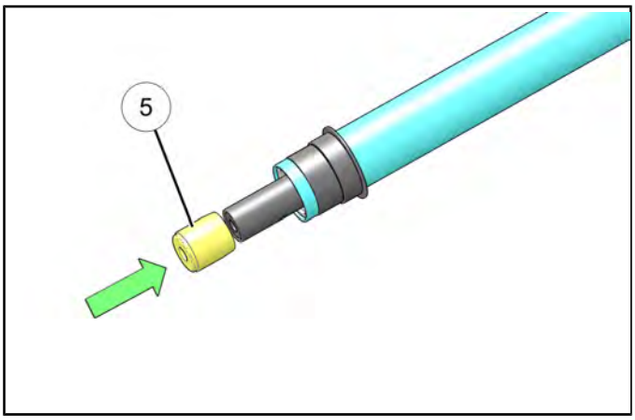
1. Install washer ①, upper bushing ②, and lower bushing ③ onto inner fork tube.



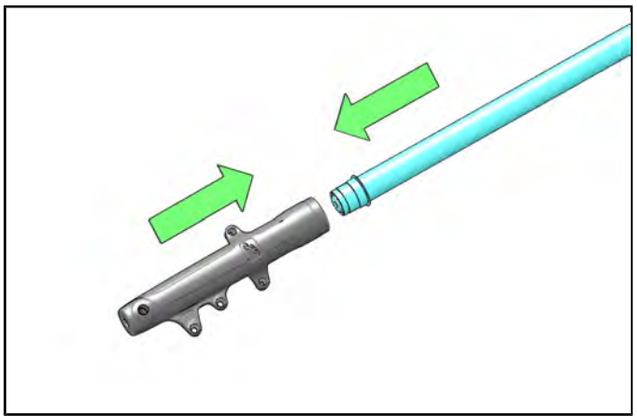
2. Install the damper tube ④ into the inner fork tube.



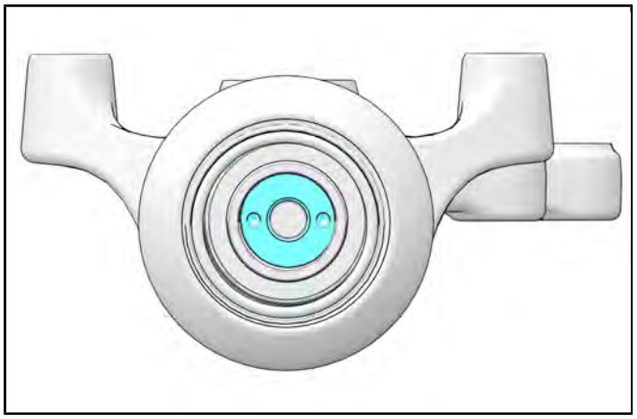
3. With the damper tube sticking out of the bottom of the inner fork tube, install the hydraulic lock ⑤.



4. Install the inner fork tube assembly into the lower tube.



5. Looking down from the top of the fork, insert special tool **PF-53122** to hold the damper tube.





8

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6. Install cartridge bolt and torque to specification.

TORQUE
Fork Cartridge Fastener **22 ft-lbs (30 N·m)**



7. To properly seat the busing and washer, use fork seal installer (**PV-49494**) to seat the bushing and washer.

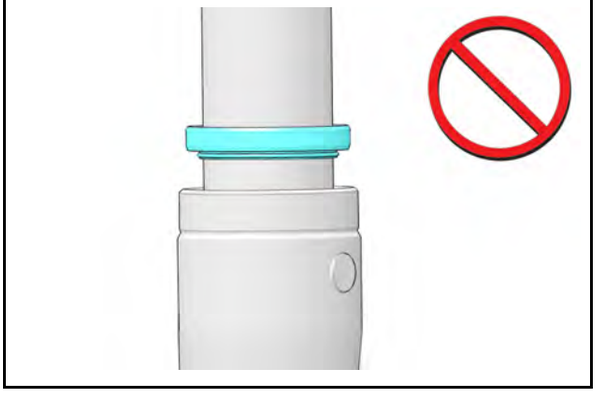
8. Using the smaller diameter of fork seal installer (**PV-49494**), drive in the *new* main seal.

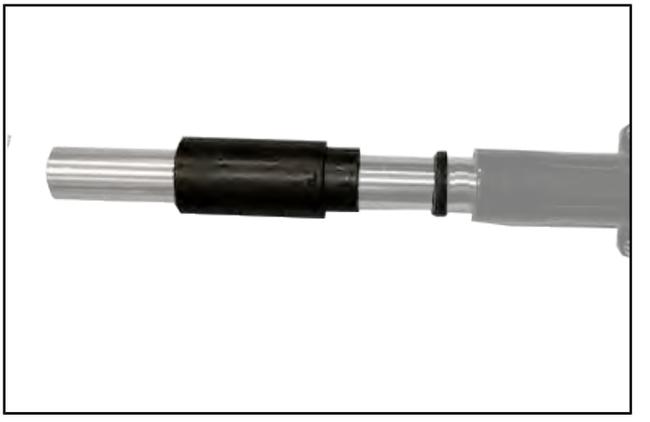
IMPORTANT
Note orientation of seal during installation.

Correct



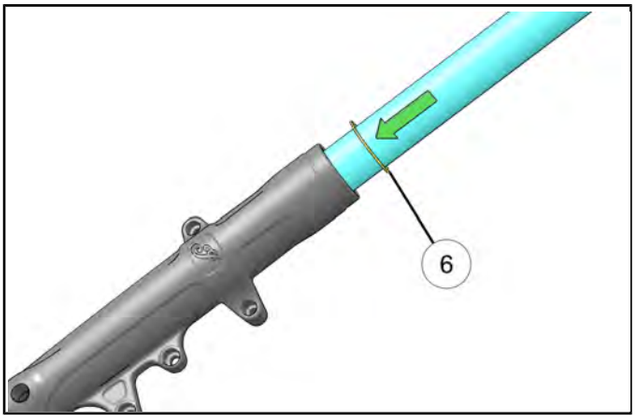
Incorrect



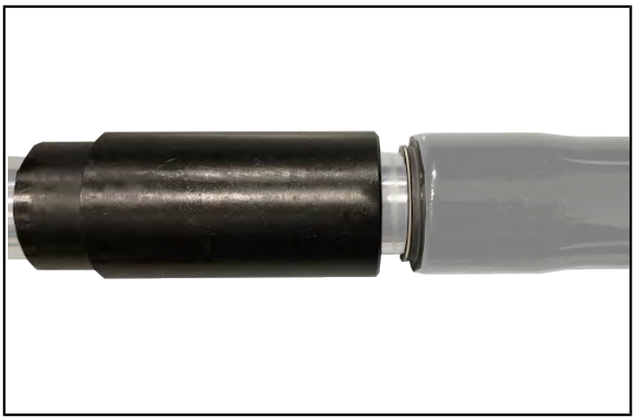


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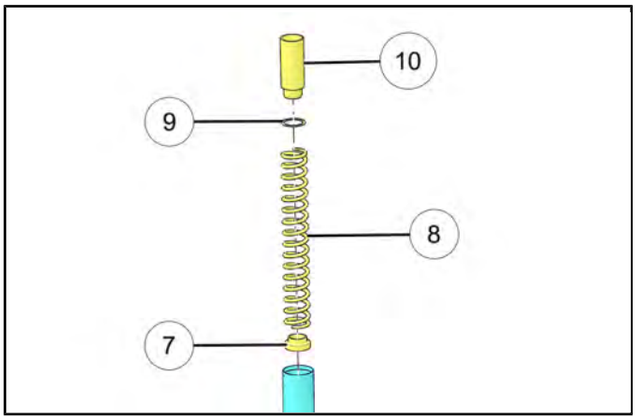
9. Install spring clip ⑥



10. Using the larger diameter end of (**PV-49494**), install the *new* seal wiper.

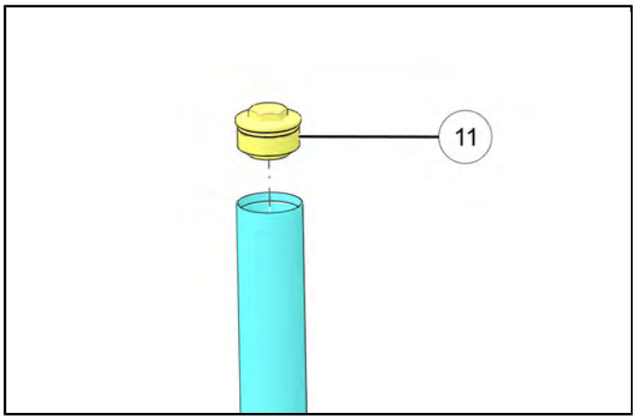


11. Compress the inner fork into the outer leg and stand the assembly upright.
12. Pour fork oil (PN: 2208093 or Fuchs SAF 5113) into the inner fork and cycle to purge out any air.
13. With the fork compressed, the oil level should be **4.53 inches (115 mm)** from the top of the inner fork opening. Use special tool **PV-59000A** for an accurate measurement.
14. Install spring mount ⑦, main spring ⑧, spring seat ⑨, and spring seat ⑩.



15. Install fork cap ⑪.

TORQUE
Fork Cap: **15 ft-lbs (20 N·m)**



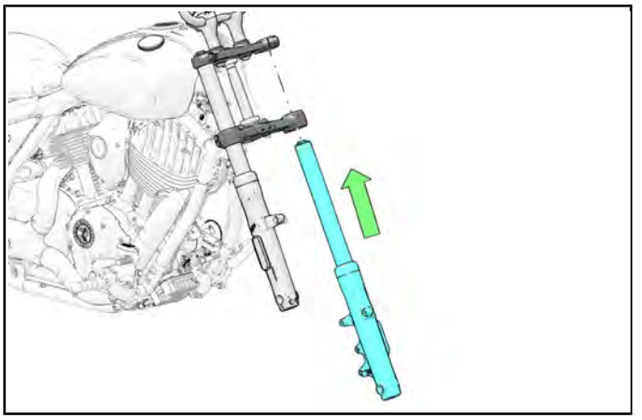
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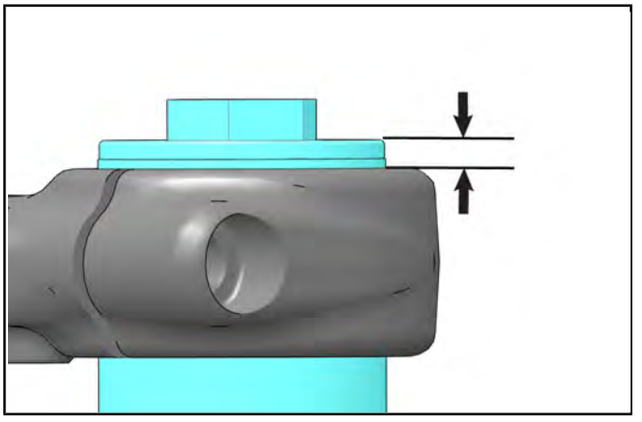
FRONT FORK INSTALLATION

IMPORTANT
Clean the fork tubes and the clamping surfaces of the triple clamps to remove any oil or grease prior to installation.

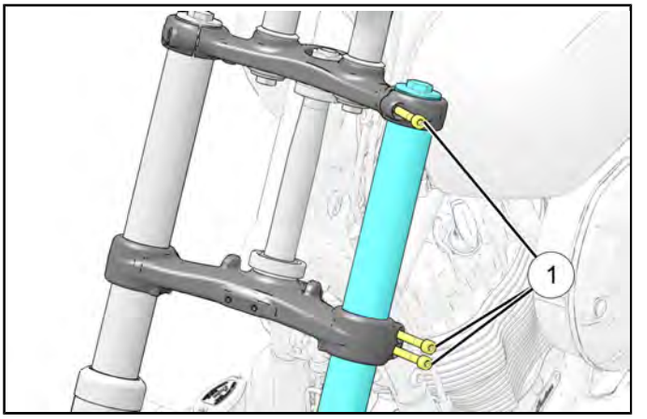
1. Install one fork tube assembly into lower triple clamp.



2. Continue to slide tube through lower triple clamp and into upper triple clamp. Stop when the top of the fork cap is protruding 0.098 inches (2.5 mm) with the top of the upper triple clamp.



3. Install and hand tighten the triple clamp pinch fasteners. ①.



4. Torque fasteners to specification.

TORQUE
Triple Clamp Pinch Fastener (Lower): **Step 1: Tighten bearing lock by following its tightening procedure.Step 2: Tighten bottom bolts on lower triple clamp.Step 3: Tighten top bolts on lower triple clamp.Step 4: repeat step 2.Step 5: Repeat step 3.Step 6: Tighten top nut by following its tightening procedure.Step 7: Final Torque Pinch fasteners to 17 ft-lbs (24 N·m)**

TORQUE
Fork Triple Clamp Fasteners (Upper): **17 ft-lbs (24 N·m)**

5. Repeat steps for remaining fork tube.
6. Install front body work components. See **Front Body Components Removal / Installation page 7.30**
7. Install front wheel. See **Front Wheel Removal / Installation page 8.29**.
8. Install front fender. See **Front Fender Removal / Installation page 7.37**.
9. Inspect all bolts for proper torque. Inspect hoses and wiring for proper routing.
10. Lower front end of motorcycle to the ground and test front suspension / fork operation.

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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

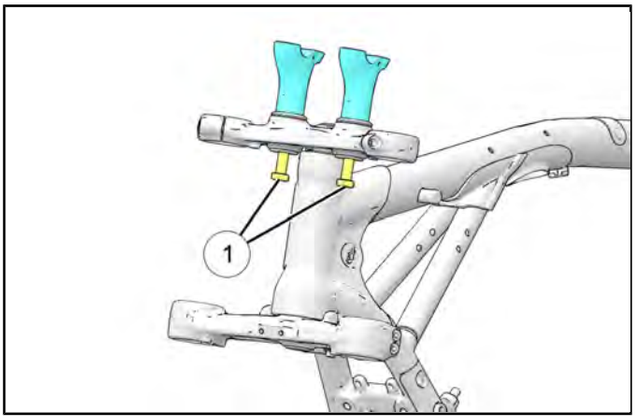
Do not twist the brake hose or brake line. Do not allow calipers to hang from the brake hose. Secure calipers in such a way to avoid hose damage.

1. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

IMPORTANT

Do not operate the front brake lever with the calipers or wheel removed.

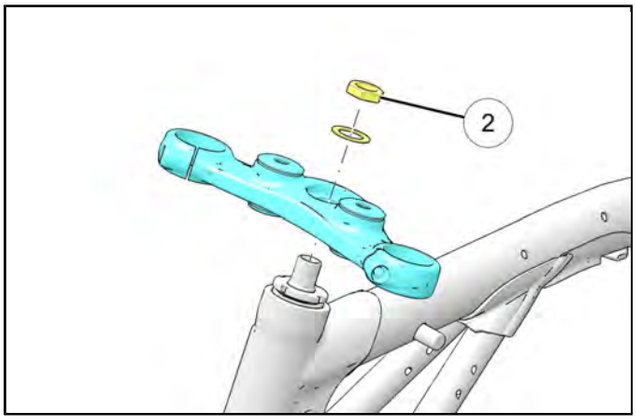
2. Remove the front fender. See **Front Fender Removal / Installation page 7.37**.
3. Remove front wheel. See **Front Wheel Removal / Installation page 8.29**.
4. Remove handlebar. See **Handlebar Removal / Installation page 8.23**.
5. Remove front body components. See **Front Body Components Removal / Installation page 7.30**.
6. Remove Forks. See **Front Fork Removal page 8.35**.
7. Remove riser bottom by removing its fastener ①.



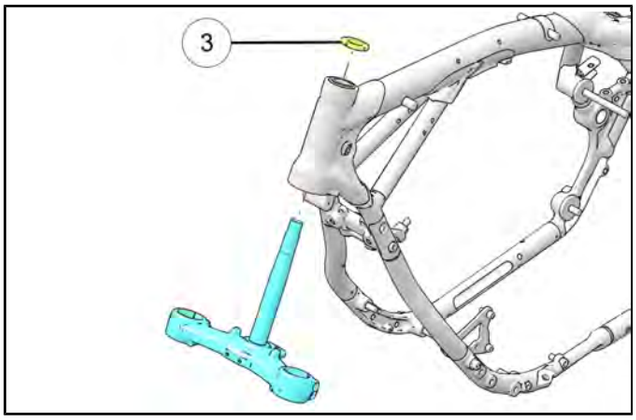
NOTICE

2023+ models are manufactured with a one bridged riser.

8. Remove brake line and wire harness guides from upper and lower triple clamp.
9. Remove center nut ② and washer on upper triple clamp.



10. Slide upper triple clamp off steering stem.
11. Remove stem adjuster nut ③ with a suitable spanner socket.



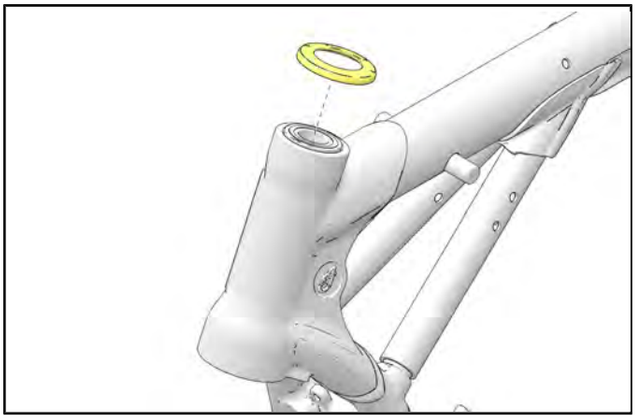
NOTICE

Support lower triple clamp while removing the adjuster nut.

8

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12. If equipped, remove bearing cover.



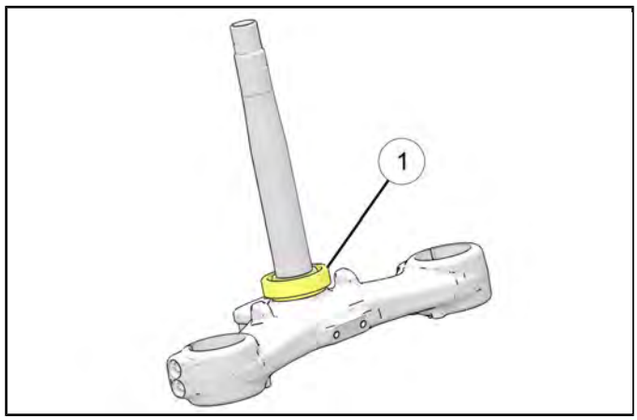
NOTICE
Note Orientation for installation.

13. Remove lower triple clamp, with steering stem, and lower bearing (outer race will remain in head tube).
14. Inspect bearings and bearing races.

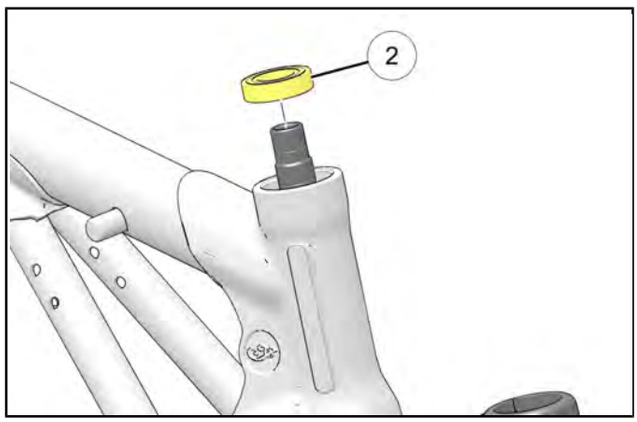
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TRIPLE CLAMP INSTALLATION / STEERING HEAD BEARING ADJUSTMENT

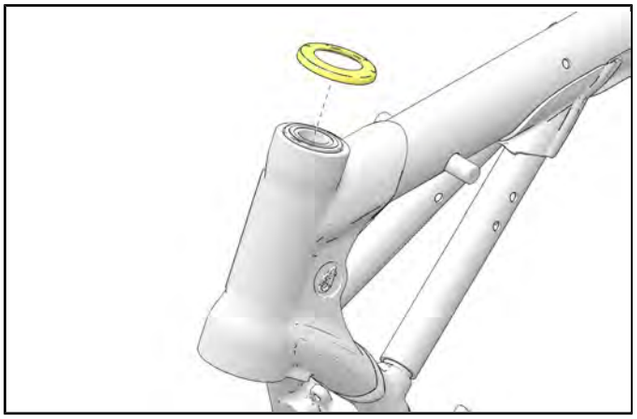
1. Inspect both top and bottom bearing races for pitting, dents, or worn surface. Replace bearings and races as a set if they are worn or damaged.
2. Be sure lower stem bearing ① is seated against step on lower triple clamp. Apply all purpose grease to bearing and install lower triple clamp / stem to frame.



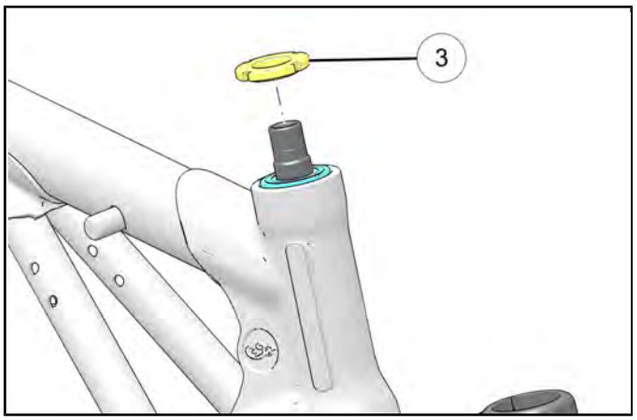
3. Grease and install upper bearing ② onto stem and push it down until seated in upper bearing race.



4. If previously removed, reinstall bearing cover.



5. Screw adjuster nut ③ (shoulder side down) onto the steering stem until it is finger tight.



6. Turn triple clamp assembly fully to the right.
7. Torque steering head nut to specification using suitable spanner wrench.

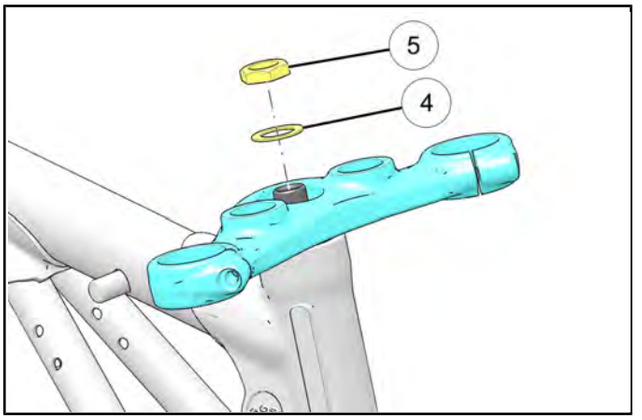
IMPORTANT
Use a anti-rotation fixture when torquing these nuts. The steering stops are on the upper triple clamp & without the upper triple in place the lower triple clamp can hit the frame or become jammed.

TORQUE
Steering Head Nut: **29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**

8. Place a mark on the frame in alignment with one of the slots on the adjuster nut.
9. Turn lower triple clamp from lock to lock five times and *return to full right* position.

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10. Loosen adjuster nut 90 degrees (1/4 turn) so the reference mark on frame is aligned with the next one of the four slots on the stem nut.
11. 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.

12. Install fork tubes. See **Front Fork Installation page 8.42**.
13. Tighten top triple clamp pinch bolt enough to hold tubes in place. Leave lower triple clamp pinch bolts *loose*.
14. Torque the triple clamp top cut to specification.

TORQUE
Triple Clamp Top Nut): **72 ft-lbs (98 N·m)**

IMPORTANT
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 10. Tighten steering stem adjuster nut an additional 5 degrees, and reassemble following. Repeat this procedure until no play can be felt.

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FORK SERVICE (SPORT CHIEF)

FRONT FORK REMOVAL (SPORT CHIEF)

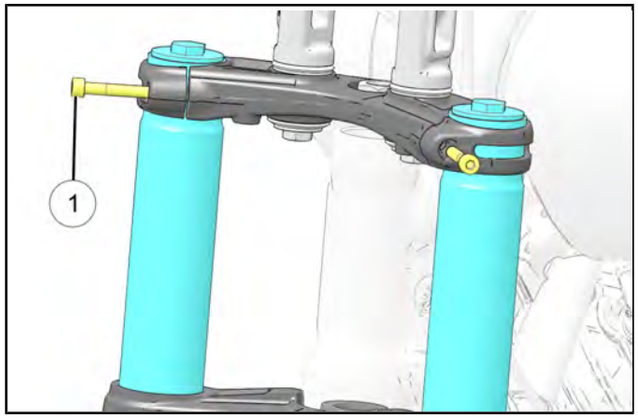
⚠ WARNING

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.

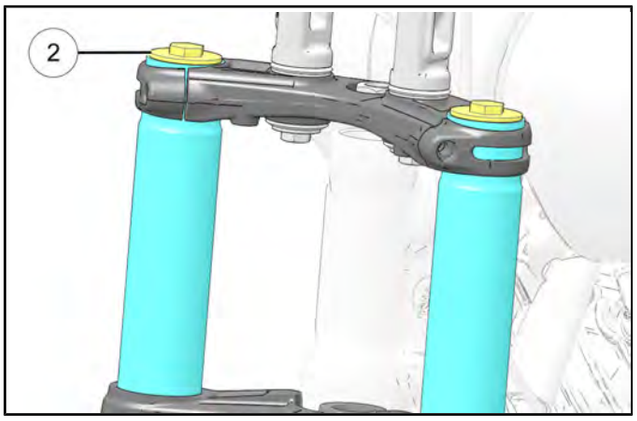
⚠ CAUTION

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.

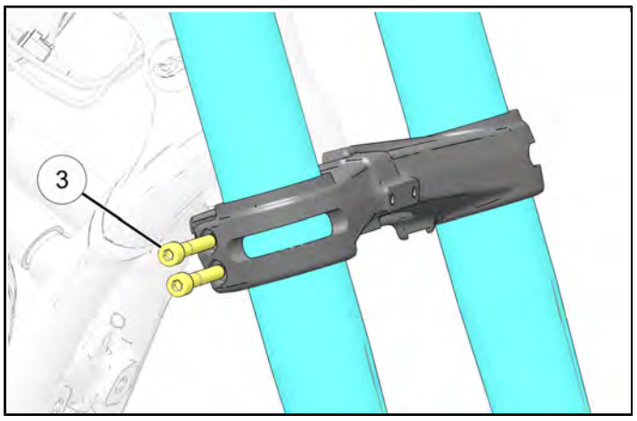
1. Remove front fender. See **Front Fender Removal / Installation page 7.37**.
2. Remove front brake calipers and support them so they do not hang by brake hoses. See **Front Brake Pad Replacement (Sport Chief) page 9.47**.
3. Remove front wheel. See **Front Wheel Removal / Installation (Sport Chief) page 8.31**.
4. Remove fairing. See **Fairing Removal / Installation page 7.35**.
5. Loosen upper triple clamp pinch fastener ① for each fork tube.



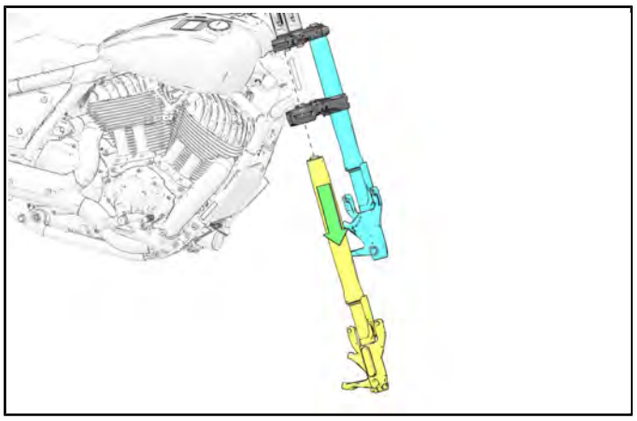
6. If disassembling the fork tube(s), loosen the fork cap(s) ② prior to loosening the lower triple clamp fasteners.



7. Loosen lower triple clamp pinch fasteners ③ for each fork tube.



8. Slide fork legs down and remove.



9. Repeat steps for remaining side.

8

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FRONT FORK DISASSEMBLY

NOTICE

The following procedure requires the use of Fork Spring Compressor (PV-49463).

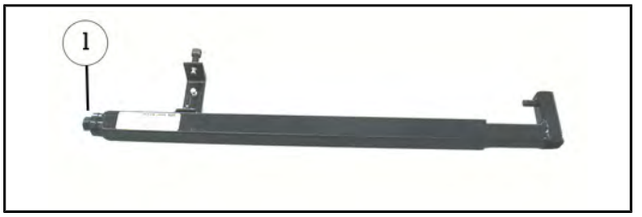
NOTICE

Refer to appropriate Front Fork Exploded View.

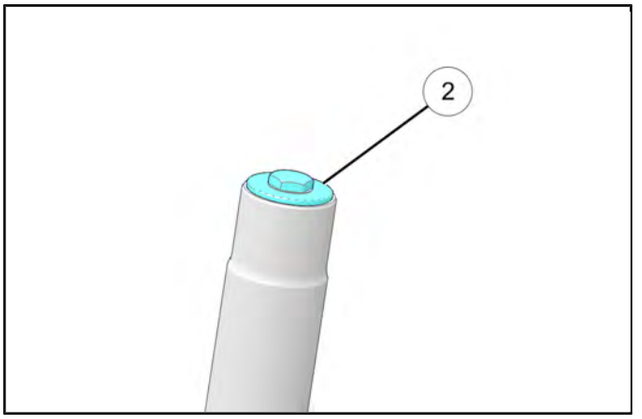
IMPORTANT

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.



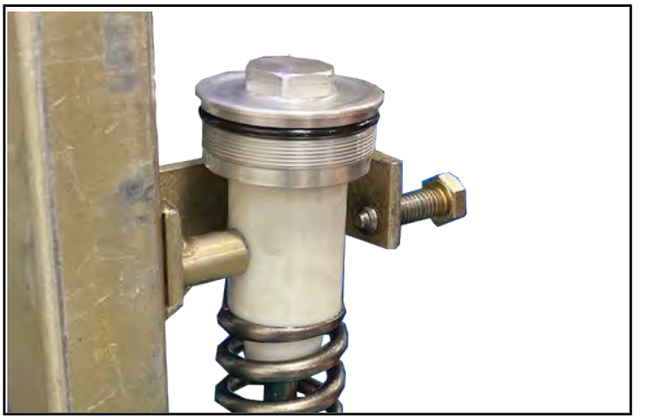
⚠ WARNING

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.

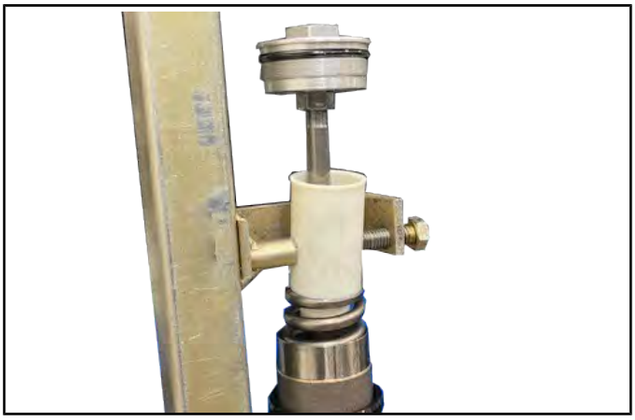


6. Tighten thumb screw in remaining hole.



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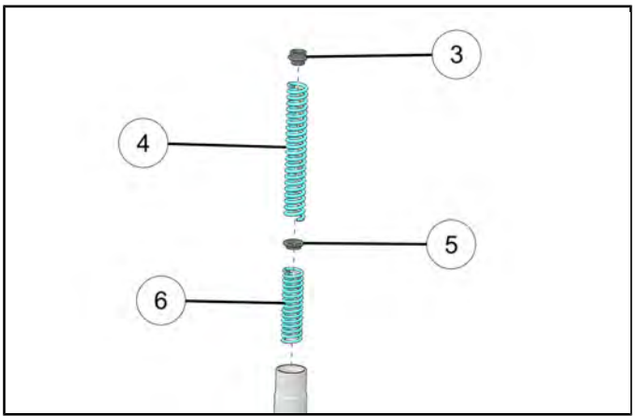
7. Compress spring until jam nut is shown.



8. Break loose jam nut and remove top cap.

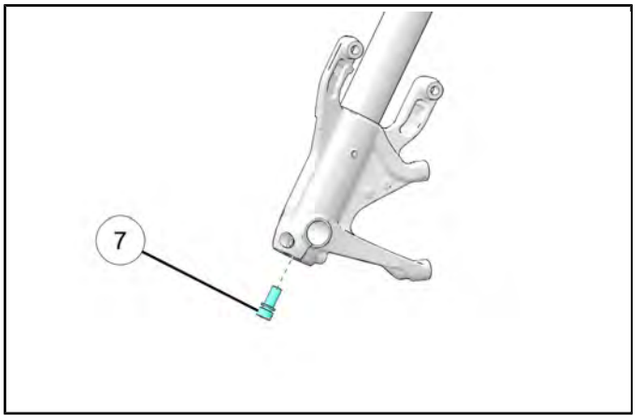


9. Remove tension off the spring compressor.
10. Remove the fork assembly from the spring compressor.
11. Remove upper spring guide ③, upper spring ④, lower spring guide ⑤, and lower spring ⑥.

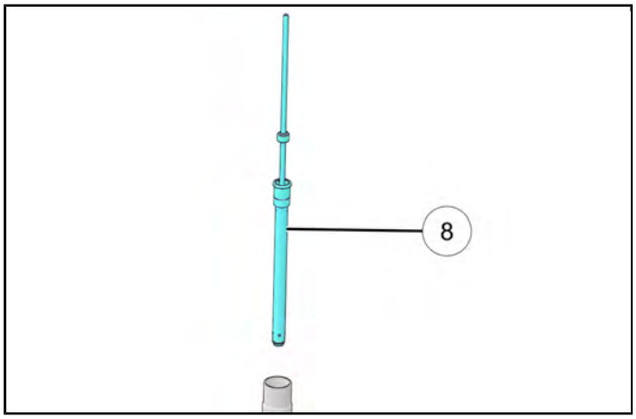


12. Install cartridge holder **PV-49452**.

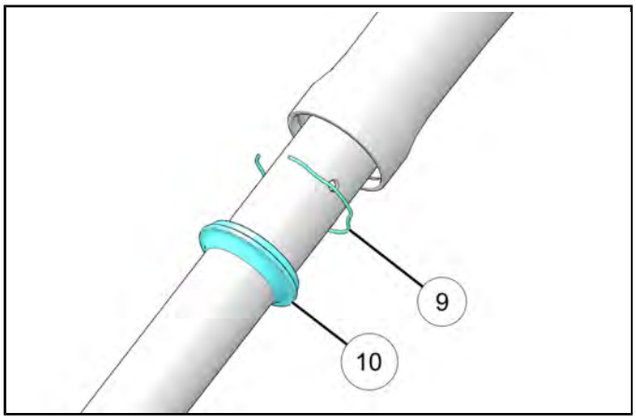
13. Remove cartridge bolt ⑦.



14. Remove cartridge ⑧.



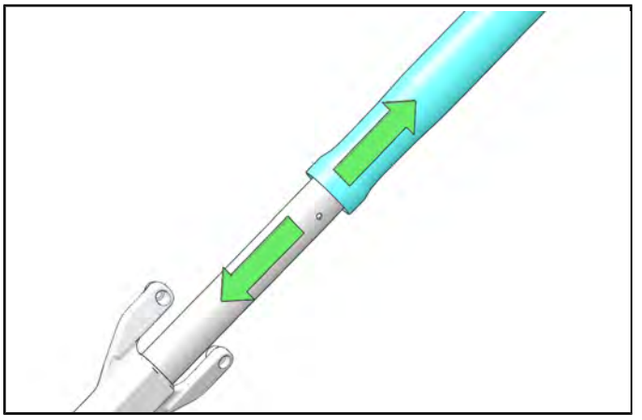
15. Cycle damper rod on the cartridge to remove oil.
16. Remove dust cap ⑩.



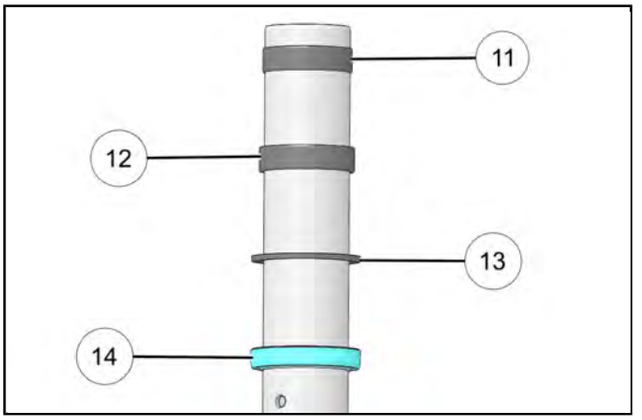
17. Remove snap ring ⑨.

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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.

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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**

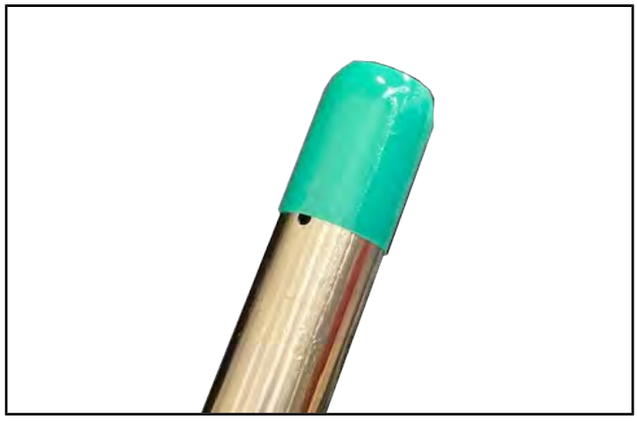
⚠ WARNING

DO NOT disassemble the inner fork tube. If damaged or worn, the inner fork tube / lower casting must be replaced as an assembly.

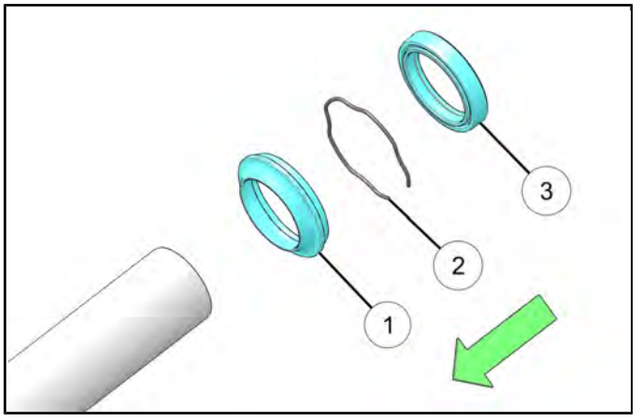
4. Inspect outer tube for dents or other damage. Look for cracks in the tube, especially in the clamping zone. Assemble inner and outer fork tube and move inner tube through complete travel range. Check for resistance or binding in suspect area of outer tube. Replace outer tube if binding or resistance 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

1. Install seal saver **PV-47037**.



2. Lubricate dust cap inside lip.
3. Install dust cap ①.

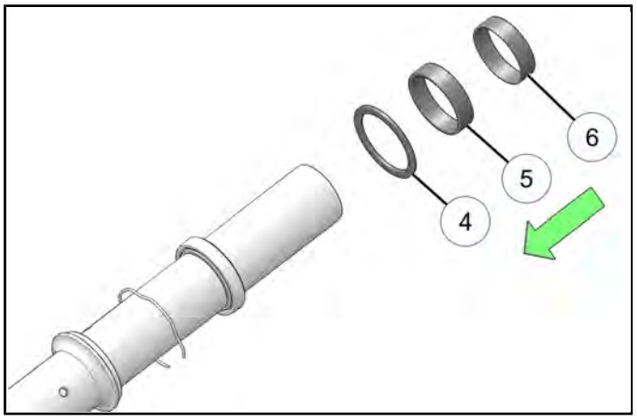


4. Install snap ring ②.
5. Install oil seal ③.

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.

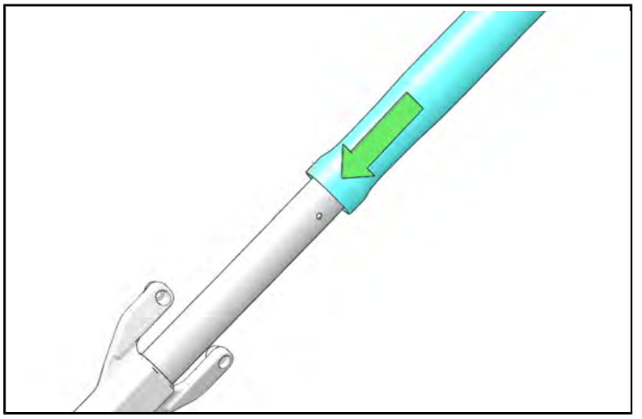


8. Install lower bushing ⑤.
9. Install upper tube bushing ⑥.

8

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10. Slide outer fork tube over inner fork tube.



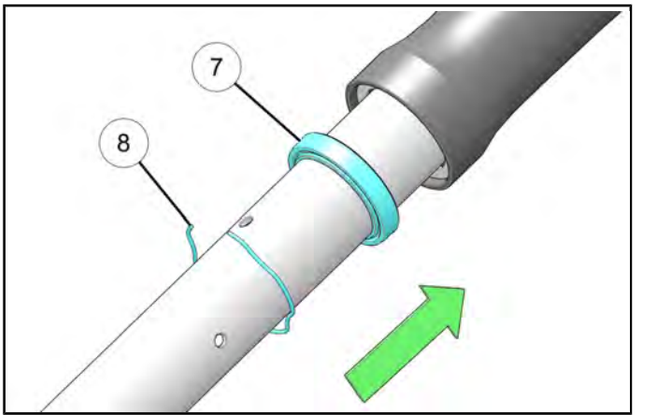
11. Lightly install lower tube busing and washer into outer fork tube.

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.

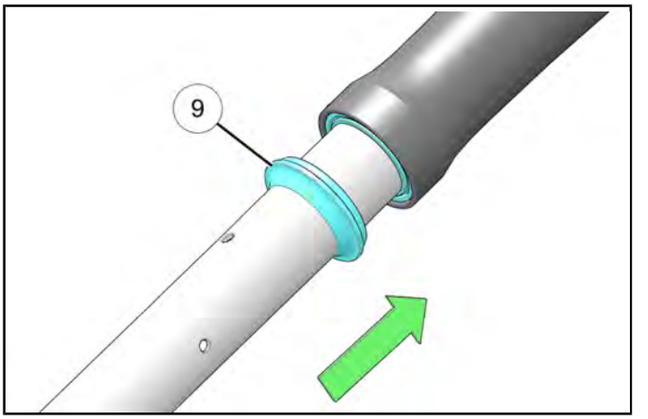
13. Install oil seal into outer tube and use seal driver to seat.



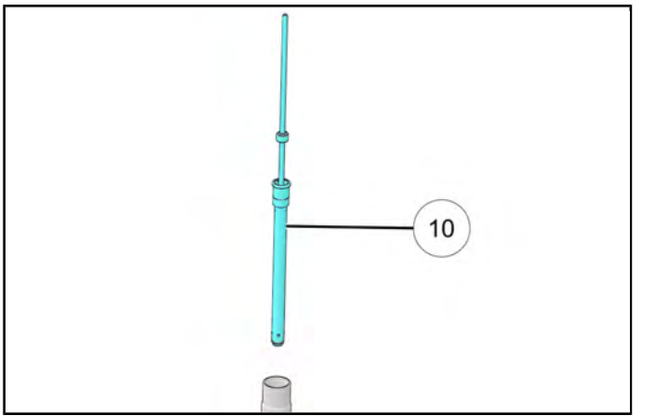
14. Install snap ring ⑧.

IMPORTANT
Make sure snap ring is full retained.

15. Install dust cap ⑨.

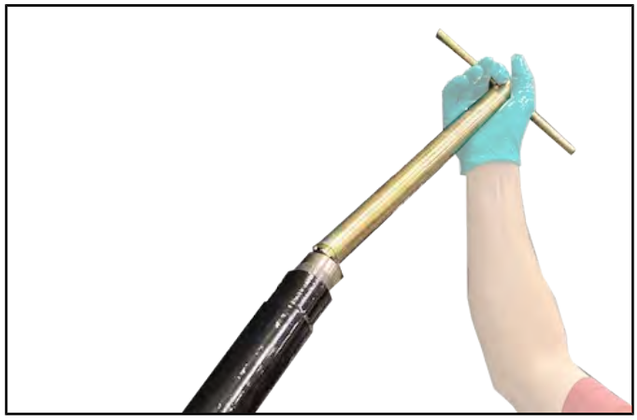


16. Install cartridge ⑩.

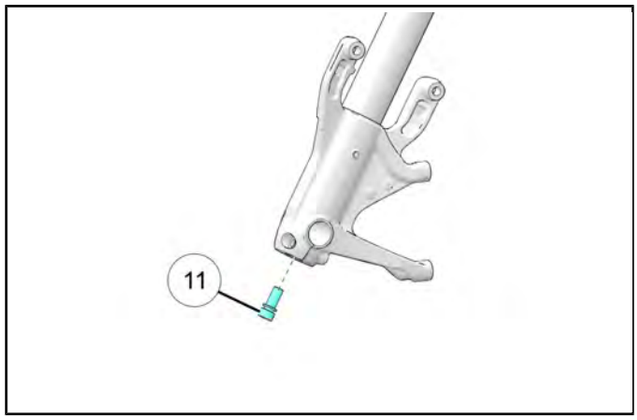


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17. Install cartridge holder tool **PV-49452**.



18. Install cartridge bolt ⑪ and *new* sealing washer.



TORQUE
Cartridge Bolt: **17 ft-lbs (23 N·m)**

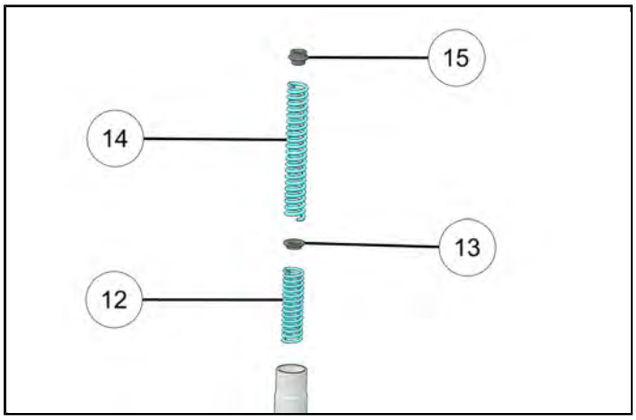
19. Secure the fork assembly in the vertical position.
20. Add approximately 500 ml of fork fluid.
21. Cycle damper rod to bleed air bubbles.
22. With the fork compressed, cup your hand over the top of the outer tube to create a vacuum and pull up.
23. With the fork extended, cup your hand over the top 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 Steering suspension > Front Wheel / Suspension > service specifications – Front Wheel / Suspension.



26. Install lower spring ⑫, lower spring guide ⑬, upper spring ⑭, and upper spring guide ⑮.



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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)**

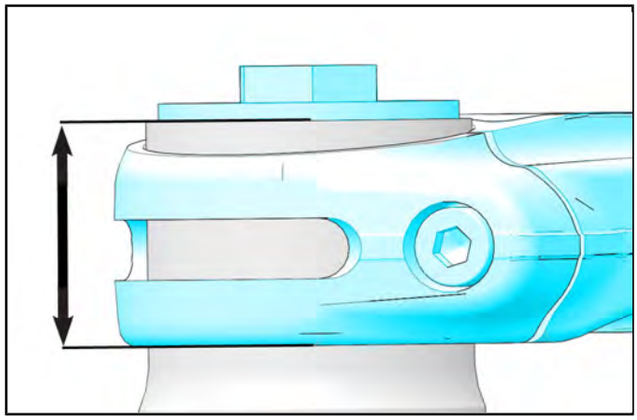
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FRONT FORK INSTALLATION (SPORT CHIEF)

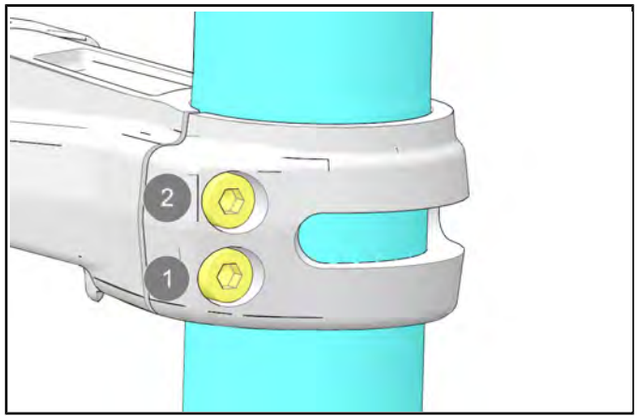
IMPORTANT

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 bottom of the clamp should measure **1.45 in (37 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 fasteners to specification.

TORQUE

Fork Triple Clamp Fasteners (Lower):
Step 1: Tighten bearing lock by following its tightening procedure.Step 2: Tighten bottom bolts on lower triple clamp.Step 3: Tighten top bolts on lower triple clamp.Step 4: repeat step 2.Step 5: Repeat step 3.Step 6: Tighten top nut by following its tightening procedure.Step 7: Final Torque Pinch fasteners to 17 ft-lbs (24 N·m)

TORQUE

Fork Triple Clamp Fasteners (Upper):
17 ft-lbs (24 N·m)

6. Repeat steps for remaining fork tube.
7. Install front body work components. See **Fairing Removal / Installation page 7.35**
8. Install front wheel. See **Front Wheel Removal / Installation (Sport Chief) page 8.31**.
9. Install front fender. See **Front Fender Removal / Installation page 7.37**.
10. Inspect all bolts for proper torque. Inspect hoses and wiring for proper routing.
11. Lower front end of motorcycle to the ground and test front suspension / fork operation.

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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

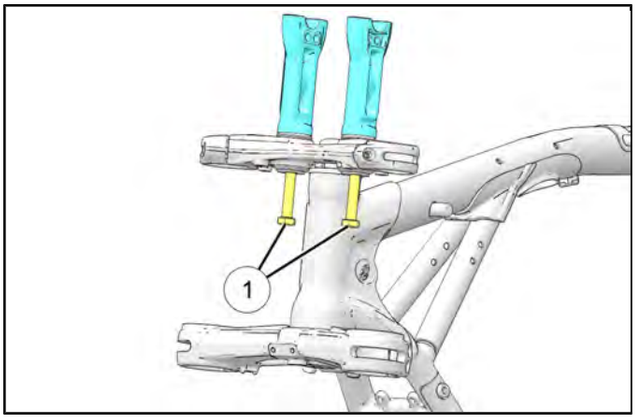
Do not twist the brake hose or brake line. Do not allow calipers to hang from the brake hose. Secure calipers in such a way to avoid hose damage.

1. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

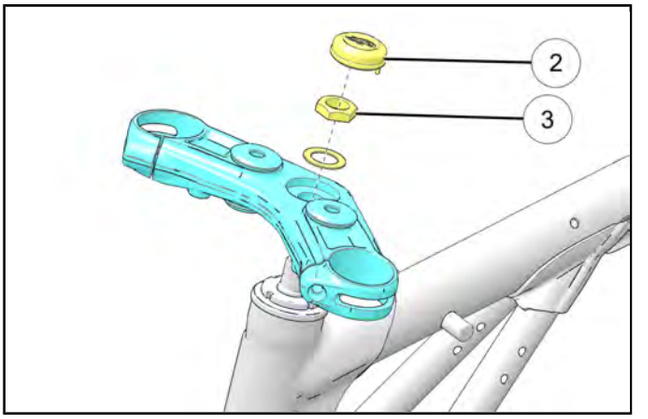
IMPORTANT

Do not operate the front brake lever with the calipers or wheel removed.

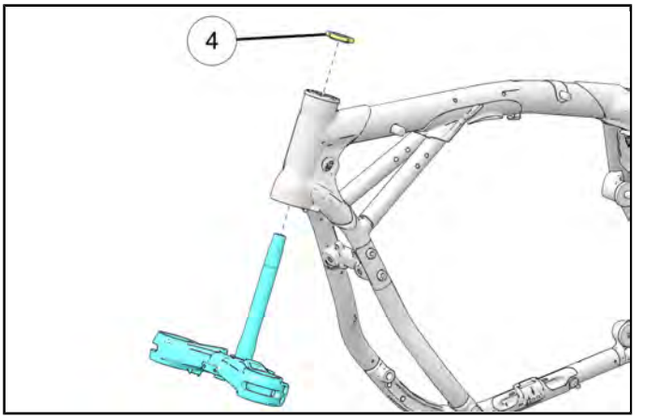
2. Remove the front fender. See **Front Fender Removal / Installation page 7.37**.
3. Remove front wheel. See **Front Wheel Removal / Installation (Sport Chief) page 8.31**.
4. Remove handlebar. See **Handlebar Removal / Installation page 8.23**.
5. Remove fairing. See **Fairing Removal / Installation page 7.35**.
6. Remove Forks. See **Front Fork Removal (Sport Chief) page 8.47**.
7. Remove riser bottom by removing its fastener ①.



8. Remove brake line and wire harness guides from upper and lower triple clamp.
9. Remove cap ②, center nut ③, and washer on upper triple clamp.



10. Slide upper triple clamp off steering stem.
11. Remove stem adjuster nut ④ with a suitable spanner socket.

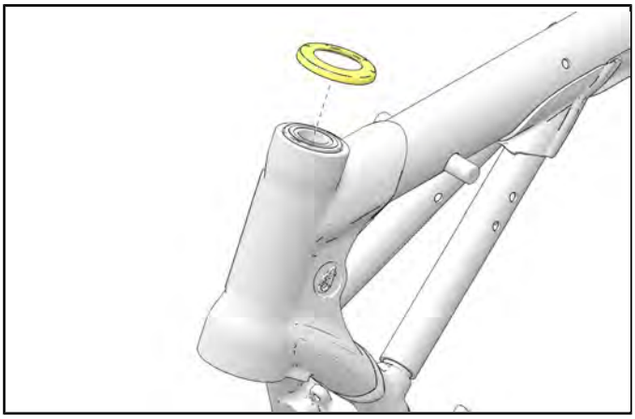


NOTICE

Support lower triple clamp while removing the adjuster nut.

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12. If equipped, remove bearing cover.

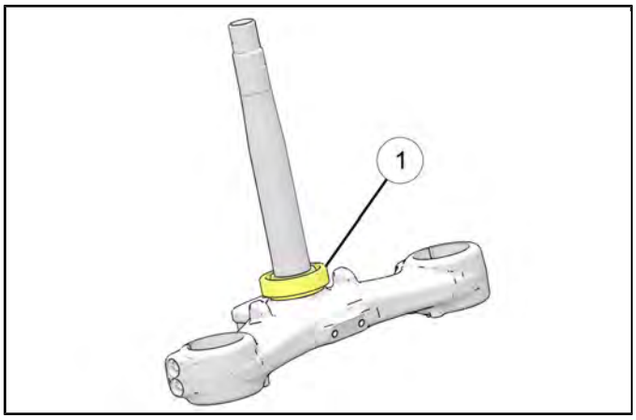


NOTICE
Note Orientation for installation.

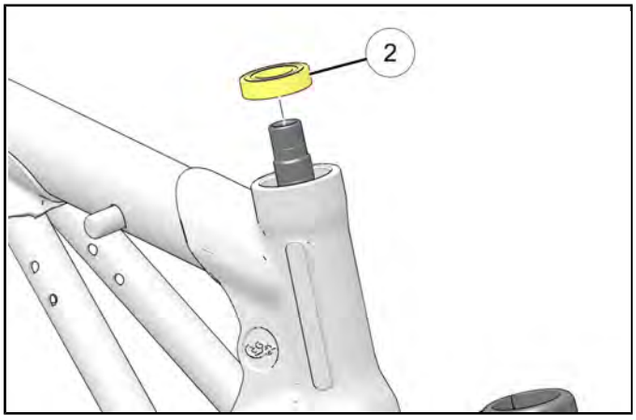
13. Remove lower triple clamp, with steering stem, and lower bearing (outer race will remain in head tube).
14. Inspect bearings and bearing races.

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.



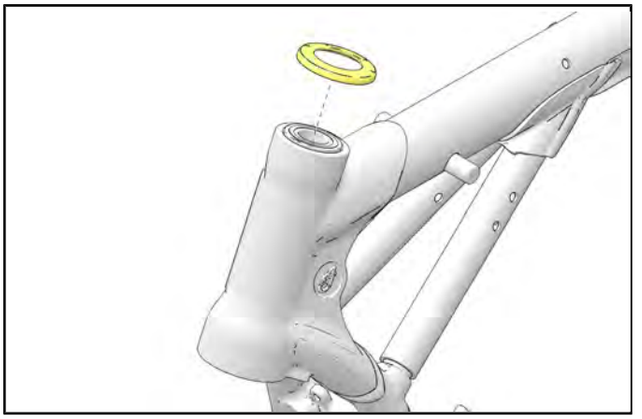
3. Grease and install upper bearing ② onto stem and push it down until seated in upper bearing race.



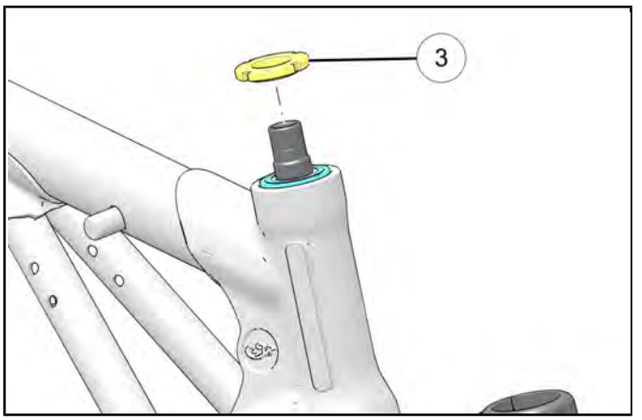
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4. If previously removed, reinstall bearing cover.



5. Screw adjuster nut ③ (shoulder side down) onto the steering stem until it is finger tight.

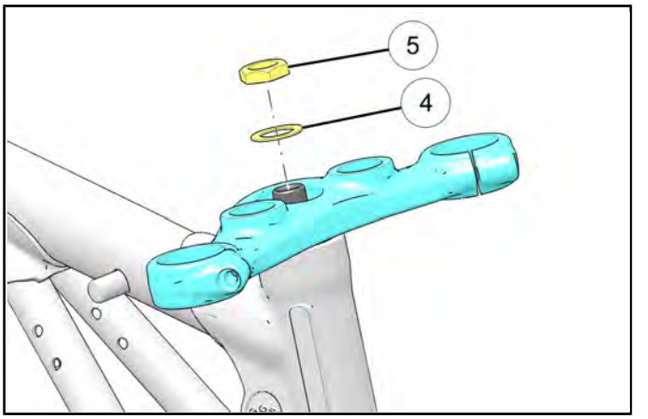


6. Turn triple clamp assembly fully to the right.
7. Torque steering head nut to specification using suitable spanner wrench.

IMPORTANT
Use a anti-rotation fixture when torquing these nuts. The steering stops are on the upper triple clamp & without the upper triple in place the lower triple clamp can hit the frame or become jammed.

TORQUE
Steering Head Nut: **29 ft-lbs (39 N·m) Loosen 90°. Tighten Top Nut**

8. Place a mark on the frame in alignment with one of the slots on the adjuster nut.
9. Turn lower triple clamp from lock to lock five times and *return to full right* position.
10. Loosen adjuster nut 90 degrees (1/4 turn) so the reference mark on frame is aligned with the next one of the four slots on the stem nut.
11. 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.

12. Install fork tubes. See **Front Fork Installation page 8.42**.
13. Tighten top triple clamp pinch bolt enough to hold tubes in place. Leave lower triple clamp pinch bolts *loose*.
14. Torque the top steering stem nut to specification.

TORQUE
Steering Stem Nut (top): **72 ft-lbs (98 N·m)**

IMPORTANT
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 10. Tighten steering stem adjuster nut an additional 5 degrees, and reassemble following. Repeat this procedure until no play can be felt.

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TROUBLESHOOTING FRONT WHEEL / SUSPENSION

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 Swingarm Bearings	Replace
	Loose Swingarm 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
Front Wheel Oscillates (Wobbles)	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

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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.

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.

- 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
Shock Spanner Wrench	PV-2884811
Shock Spanner Wrench	2890086
Bearing Removal / Installation Kit	PU-51324
Platform Jack	Commercially Available

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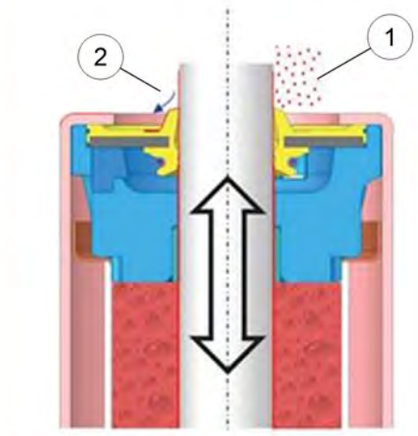
SERVICE SPECIFICATIONS - REAR WHEEL / SUSPENSION

ITEM		STANDARD	SERVICE LIMIT
Axle Runout		-	.20 mm (.008")
Rear Wheel Runout	Axial / Radial	.80 mm (.030 inch)	2.0 mm (.080")
Rear Wheel Size / Type		16" x 5.0" Cast	–
		16" x 5.0" Spoke	–
Rear Wheel Travel		3.0" (76.2 mm)	–
Shock Spring Free Length		9.92" (252 mm)	–
Shock Spring Installed Length (Standard)		Perform Ride Height Adjustment	–
Suspension Ride Height		Refer to Maintenance Chapter for Ride Height Measurement procedure	–
Spring Rate		1st Rate: 257 lbs/in (45 N/mm) 2nd Rate: 428 lbs/in (75 N/mm)	–
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	–

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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 ensure 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
	

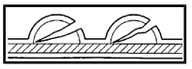
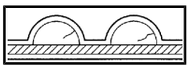
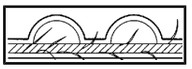
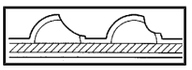
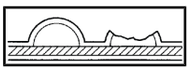
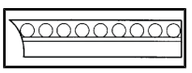
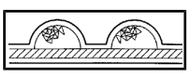
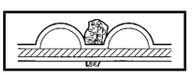
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STEERING / SUSPENSION MAINTENANCE

DRIVE BELT INSPECTION

NOTICE

Inspect drive belt in accordance with Periodic Maintenance Interval Chart and replace at specified intervals regardless of belt condition. See **Periodic Maintenance Interval Table 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.

IMPORTANT

Adjust drive belt tension at intervals in accordance with the Periodic Maintenance Interval Chart. See **Periodic Maintenance Interval Table page 2.4**.

DRIVE BELT SPECIFICATIONS

DRIVE BELT DEFLECTION DATA

IMPORTANT

DEFLECTION AT 10 LBS FORCE	FREQUENCY
.433“ (11 mm)	40 Hz

DRIVE BELT FREQUENCY TENSION DATA

NOTICE

40 Hz with Sonic Tension Meter

SPECIFICATIONS: DRIVE BELT

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	646.98 mm
Belt Width	22 mm
Belt Mass Constant	8.4 g/mm
Tension	40 Hz (± 2 Hz)

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DRIVE BELT TENSION

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

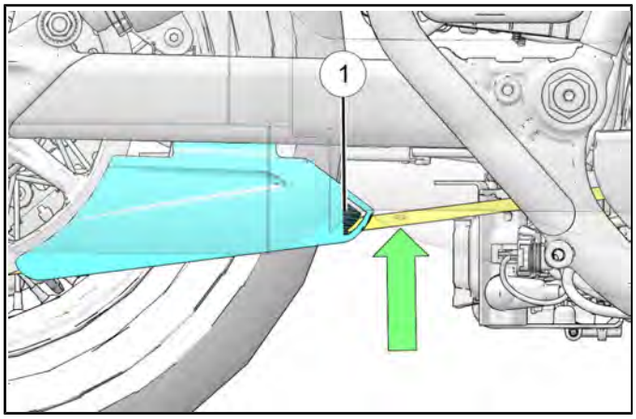
A drive belt that is not properly tensioned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

⚠ WARNING

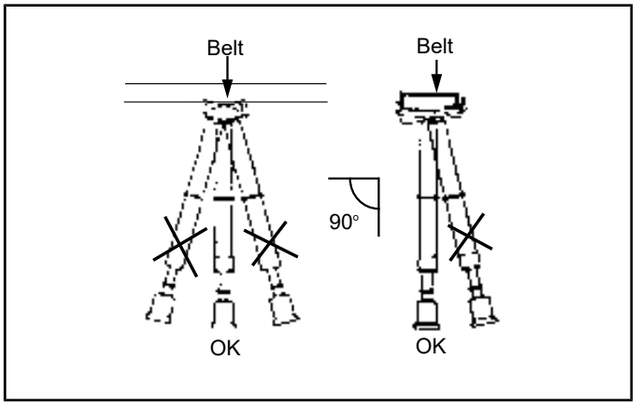
Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

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 COUNTER-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 (COUNTER-CLOCKWISE) 1-2 revolutions until your reference mark (the tightest point) is lined up with the tension setting window ① in the lower belt guard.



   - 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 Specifications page 8.64** for drive belt deflection specifications.

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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 8.66**.

IMPORTANT
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).

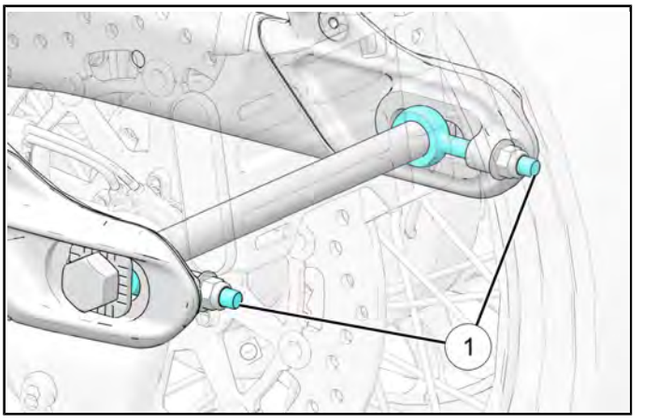
DRIVE BELT ADJUSTMENT

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 rear axle not in alignment can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

IMPORTANT
When adjusting the drive belt, use the exposed length or number of threads of the adjuster bolts ①.



1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Raise the rear of the motorcycle so the rear tire can be freely rotated.
3. Loosen axle nut and retighten to the **ADJUSTMENT SPECIFICATION** during the adjustment procedure.

TORQUE
Rear Axle Nut **(ADJUSTMENT SPECIFICATION) 15 ft-lbs (20 Nm)**

4. Turn the RIGHT SIDE adjuster nut to achieve the proper tension. Refer to **Drive Belt Tension page 8.65**
5. Turn the LEFT SIDE adjuster nut to achieve proper alignment.

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6. When belt tension is correct, check and adjust final belt alignment as follows.

Belt Alignment

⚠ WARNING

Drive belt misalignment can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

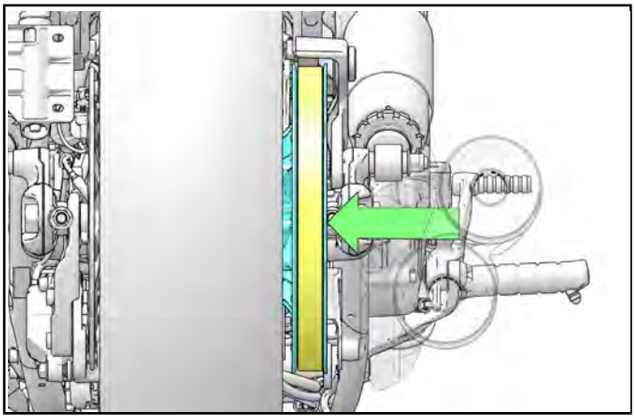
IMPORTANT

To minimize change in belt tension, use LEFT SIDE adjuster only to make final adjustments to belt alignment. Be sure to keep axle seated forward against axle adjusters during this procedure.

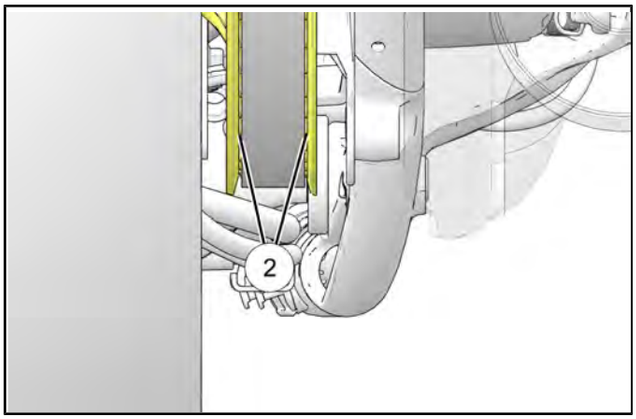
7. Rotate the wheel BACKWARD. Tighten LEFT rear axle adjuster until belt comes off inside sprocket flange during backward wheel rotation.

IMPORTANT

The belt should track to the center of the sprocket tooth surface when properly aligned. Sprocket teeth should be visible on both sides of the drive belt.



8. Rotate the wheel in FORWARD direction and verify that sprocket teeth ② are visible on both sides of the drive belt.



9. If necessary, loosen the axle nut and LEFT SIDE adjuster until belt moves off the left flange and begins to track down the center of the driven sprocket flange during forward wheel rotation.

IMPORTANT

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.

10. 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.
11. Verify that drive belt tension is still within specification. Refer to **Drive Belt Tension page 8.65**.
12. Tighten rear axle nut to **FINAL Specification**

TORQUE
Rear Axle Nut **(FINAL TIGHTENING) 65 ft-lbs (88 N·m)**

13. Pump rear brake pedal several times to reset brake pad distance.
14. Verify wheel rotates smoothly and freely without drag when brake pedal is released.

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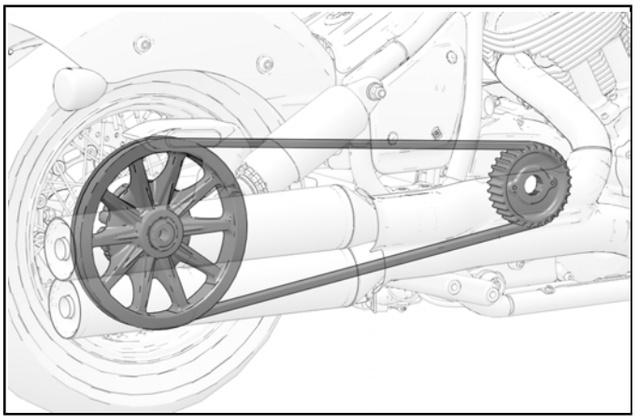
SPROCKET INSPECTION

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

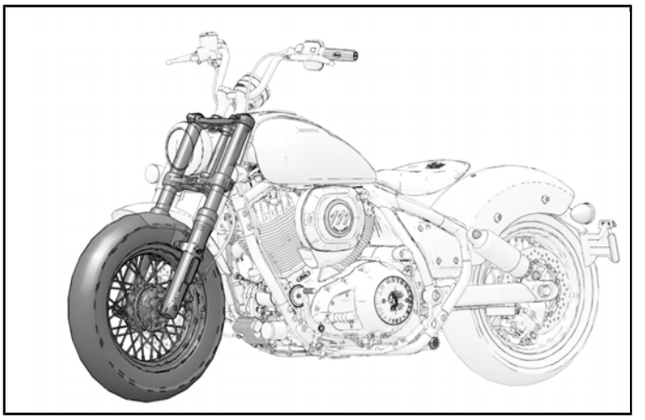
⚠ WARNING

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.

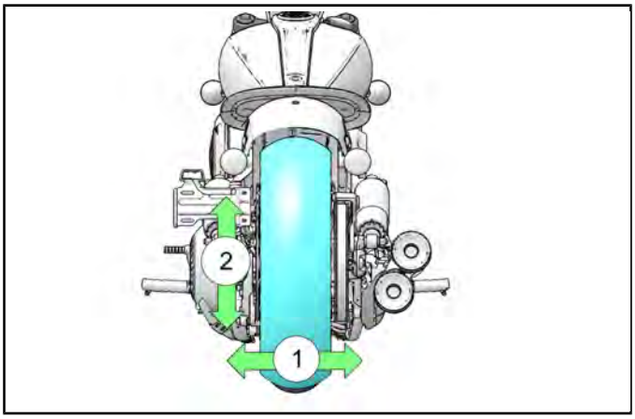
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SWINGARM INSPECTION

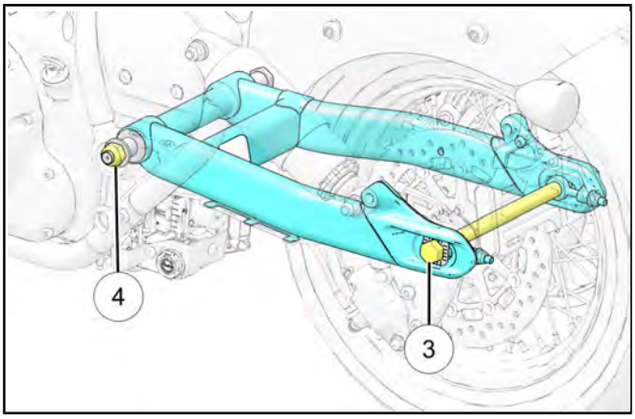
⚠ WARNING

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. 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 . Inspect for worn bearings and linkages by moving the wheel side-to-side ②.



4. If movement is detected, determine if movement is at axle area ③ or swing arm pivot area ④. Refer to 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. Replace any worn or damaged parts.
9. Verify axle nut is tight.

TORQUE
Rear Axle Nut: **65 ft-lbs (88 N·m)**

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REAR SHOCK

REAR SHOCK PRELOAD INSPECTION

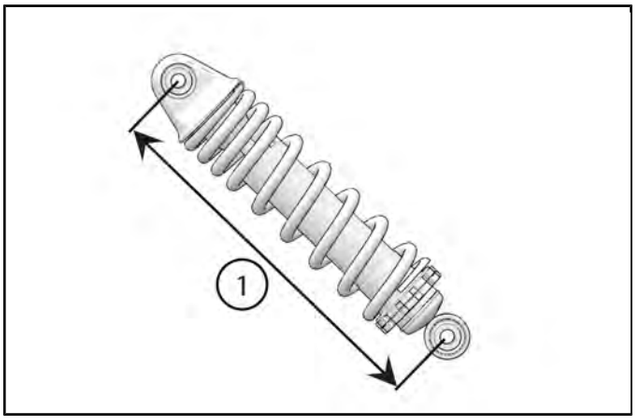
Periodically inspect rear shock preload. For the most comfortable ride and proper ground clearance, adjust preload if ride height is out of specification.

1. Verify that tire pressure is at specification. See **Tire Pressure / Specifications**.
2. Load the motorcycle with all intended cargo. Wearing your riding gear, bring the motorcycle to the upright position and sit on the operator's seat. If you plan to carry a passenger, have the passenger (with riding gear) sit on the passenger seat.

⚠ WARNING

Do not carry a passenger unless the motorcycle is equipped with passenger seat and passenger footrests.

3. Measure shock preload from upper mount bolt center to lower mount bolt center (eye-to-eye) ①. Perform this measurement on both shocks.
4. Adjust preload as needed to achieve suspension sag indicated in the table below. See (Rear Shock Preload Adjustment) for adjustment procedure.



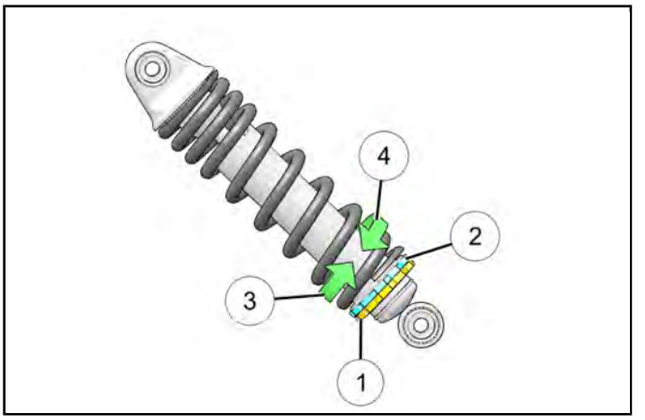
SHOCK PRELOAD LENGTH	
①	300 mm (11.8 inches)(from shock mount bolts center-to-center)

REAR SHOCK PRELOAD ADJUSTMENT

1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise..
2. Using shock spanner wrench **PV-2884811** loosen the lock nut ① by turning it counter-clockwise (as viewed from the top of the shock).
3. Ensure threads are clear of all dirt and debris before loosening the lock nut①. Loosen the lock nut by turning it clockwise (as viewed from the top of shock) with the spanner wrench. The upper spanner nut is the adjuster nut ②.

⚠ WARNING

Ensure threads on shock body are clean and clear of debris before adjusting the spanner nuts. Before attempting to adjust downward, spin the spanner nuts one full revolution upward and then adjust in the downward position.



4. Spray a light lubricant on the adjuster nut where it contacts the spring. DO NOT allow spray to contact the drive belt or brakes.
5. Adjust shock preload by rotating the adjuster nut clockwise (as viewed from the bottom of shock) to INCREASE preload ③ (firm) or counter-clockwise to DECREASE preload ④ (softer).
6. Recheck the preload measurement after adjusting.
7. Tighten the lock nut securely against the adjuster nut.

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REAR SHOCK (SPORT CHIEF)

REAR SHOCK PRELOAD INSPECTION (SPORT CHIEF)

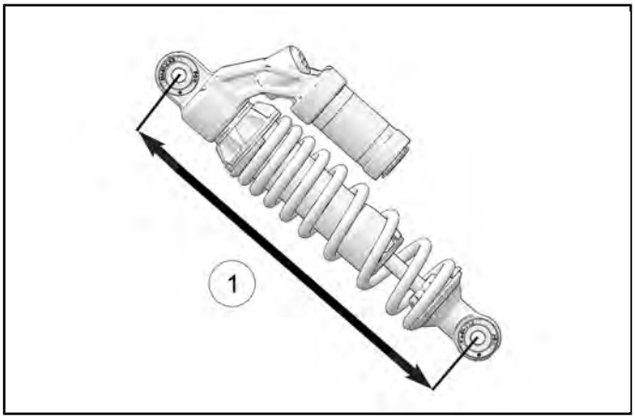
Periodically inspect rear shock preload. For the most comfortable ride and proper ground clearance, adjust preload if ride height is out of specification.

1. Verify that tire pressure is at specification. See **Tire Pressure / Specifications**.
2. Load the motorcycle with all intended cargo. Wearing your riding gear, bring the motorcycle to the upright position and sit on the operator's seat. If you plan to carry a passenger, have the passenger (with riding gear) sit on the passenger seat.

⚠ WARNING

Do not carry a passenger unless the motorcycle is equipped with passenger seat and passenger footrests.

3. Measure shock preload from upper mount bolt center to lower mount bolt center (eye-to-eye) ①. Perform this measurement on both shocks.
4. Adjust preload as needed to achieve suspension sag indicated in the table below. See (Rear Shock Preload Adjustment) for adjustment procedure.



SHOCK PRELOAD LENGTH	
①	310 mm (12.2 inches)(from shock mount bolts center-to-center)

REAR SHOCK PRELOAD ADJUSTMENT (SPORT CHIEF)

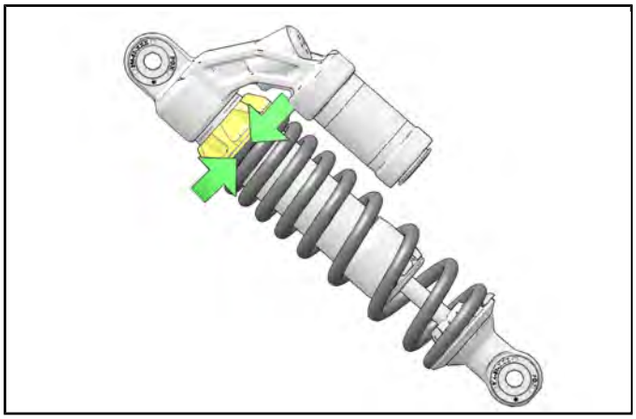
1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Using shock spanner wrench **2890086** to adjust the preload.



3. Ensure threads are clear of all dirt and debris before adjusting.

⚠ WARNING

Ensure threads on shock body are clean and clear of debris before adjusting the spanner nuts. Before attempting to adjust downward, spin the spanner nuts one full revolution upward and then adjust in the downward position.



4. Recheck the preload measurement after adjusting.

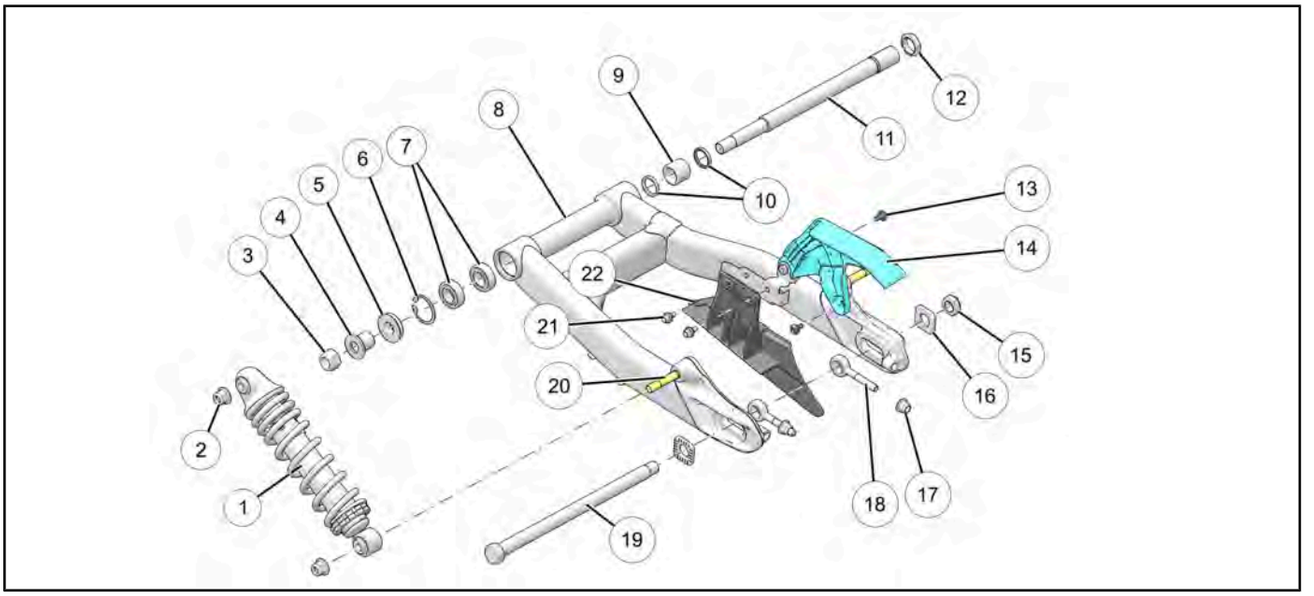
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ASSEMBLY VIEWS

REAR SUSPENSION COMPONENTS

IMPORTANT
Both the swingarm pivot nut ③ and swingarm pivot jam nut ⑫ are single use fasteners and must be replaced.

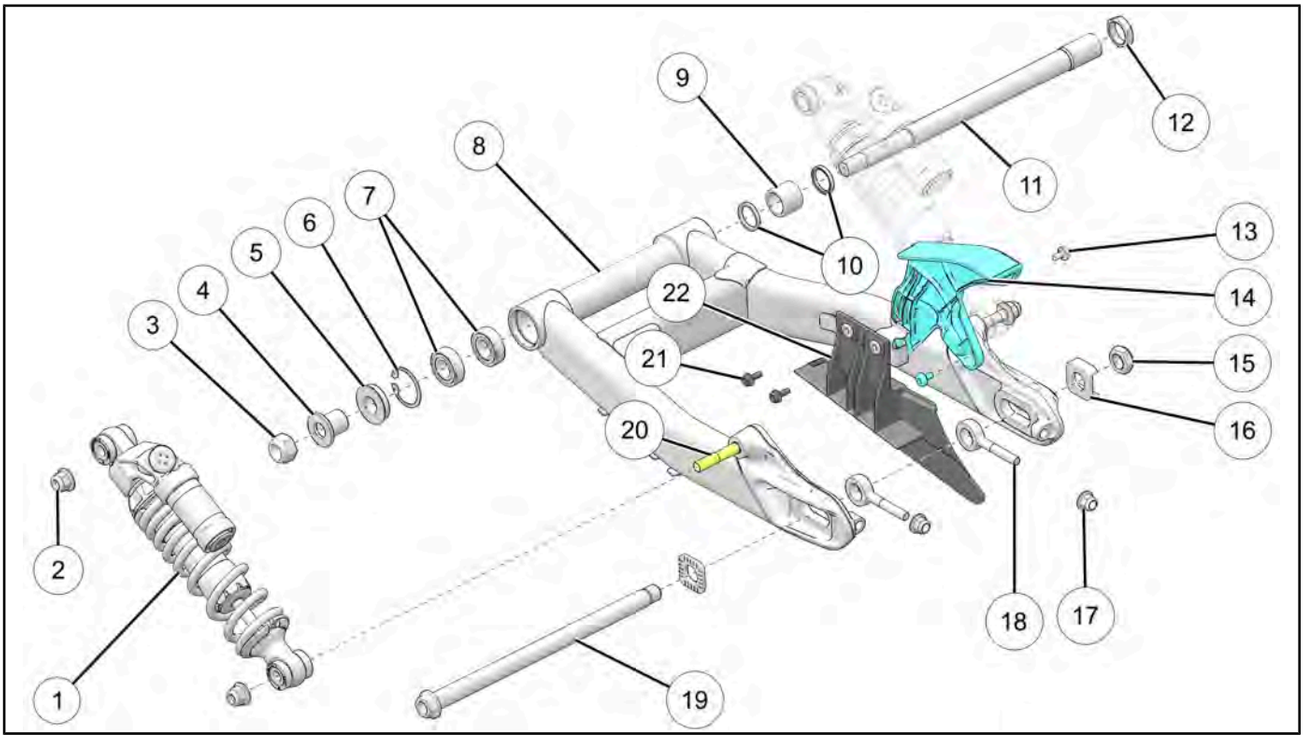


ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Shock	—	⑫	Swingarm pivot Jam Nut	**74 ft-lbs (100 N·m)**
②	Shock Nut	**84 ft-lbs (114 N·m)**	⑬	Upper Belt Guard Fastener	**80 in-lbs (9 N·m)**
③	Swingarm Pivot Nut	**65 ft-lbs (88 N·m)**	⑭	Upper Belt Guard	—
④	Pivot Spacer (Outer)	—	⑮	Rear Axle Fujilok Nut	**65 ft-lbs (88 N·m)**
⑤	Pivot Spacer (Inner)	—	⑯	Adjustment Indicator Plate	—
⑥	Retention Ring	—	⑰	Axle Adjuster Nut	—
⑦	Bearing	—	⑱	Axle Adjuster	—
⑧	Swingarm	—	⑲	Rear Axle	—
⑨	Needle Roller Bearing	—	⑳	Shock Stud	—
⑩	Seal	—	㉑	Lower Belt Guard Fastener	**80 in-lbs (9 N·m)**
⑪	Swingarm Pivot	—	㉒	Lower Belt Guard	—

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REAR SUSPENSION COMPONENTS (SPORT CHIEF)

IMPORTANT
Both the swingarm pivot nut ③ and swingarm pivot jam nut ⑫ are single use fasteners and must be replaced.

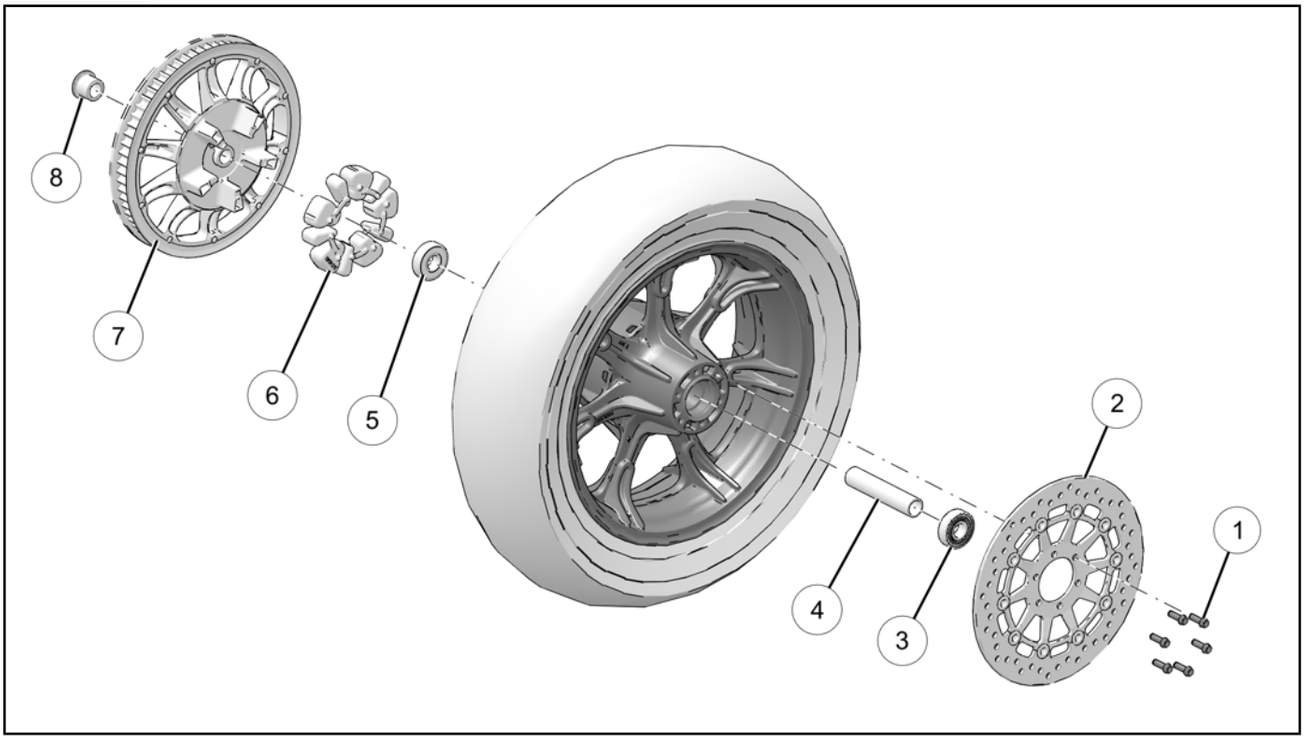


ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Shock	—	⑫	Swingarm pivot Jam Nut	**74 ft-lbs (100 N·m)**
②	Shock Nut	**84 ft-lbs (114 N·m)**	⑬	Upper Belt Guard Fastener	**80 in-lbs (9 N·m)**
③	Swingarm Pivot Nut	**65 ft-lbs (88 N·m)**	⑭	Upper Belt Guard	—
④	Pivot Spacer (Outer)	—	⑮	Rear Axle Fujilok Nut	**65 ft-lbs (88 N·m)**
⑤	Pivot Spacer (Inner)	—	⑯	Adjustment Indicator Plate	—
⑥	Retention Ring	—	⑰	Axle Adjuster Nut	—
⑦	Bearing	—	⑱	Axle Adjuster	—
⑧	Swingarm	—	⑲	Rear Axle	—
⑨	Needle Roller Bearing	—	⑳	Shock Stud	—
⑩	Seal	—	㉑	Lower Belt Guard Fastener	**80 in-lbs (9 N·m)**
⑪	Swingarm Pivot	—	㉒	Lower Belt Guard	—

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REAR WHEEL COMPONENTS

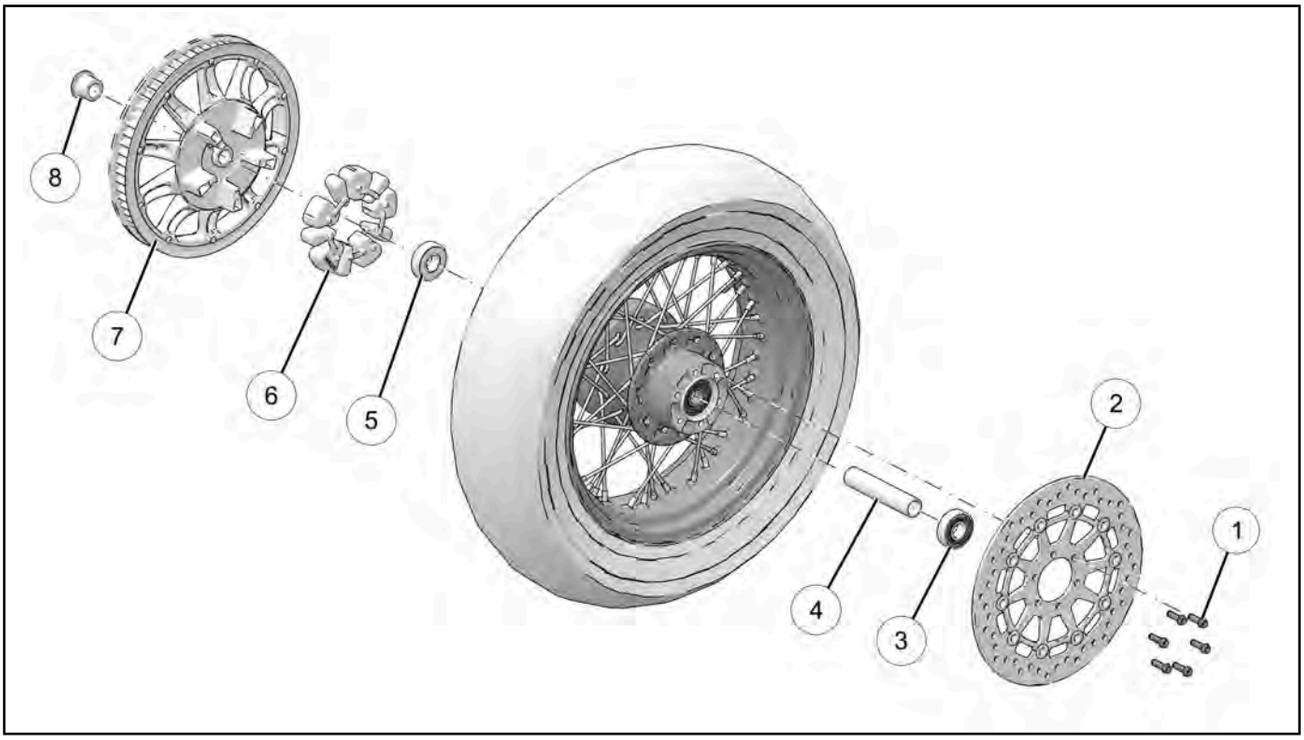
CAST WHEEL



ITEM	DESCRIPTION	TORQUE
①	Brake Disc Fastener	**22 ft-lbs (30 N·m)**
②	Brake Disc	—
③	Wheel Bearing *NOTICE* The tone ring is built into the bearing	—
④	Bearing Spacer	—
⑤	Ball Bearing	—
⑥	Damper	—
⑦	Sprocket	—
⑧	Spacer	—

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SPOKED WHEEL



ITEM	DESCRIPTION	TORQUE
①	Brake Disc Fastener	**22 ft-lbs (30 N·m)**
②	Brake Disc	—
③	Wheel Bearing *NOTICE* The tone ring is built into the bearing	—
④	Bearing Spacer	—
⑤	Ball Bearing	—
⑥	Damper	—
⑦	Sprocket	—
⑧	Spacer	—

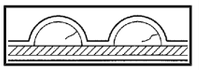
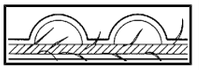
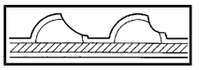
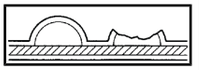
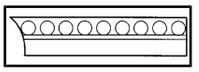
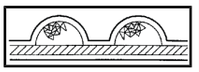
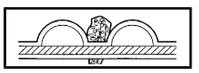
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DRIVE BELT SERVICE

DRIVE BELT INSPECTION

NOTICE

Inspect drive belt in accordance with Periodic Maintenance Interval Chart and replace at specified intervals regardless of belt condition. See **Periodic Maintenance Interval Table 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 **Periodic Maintenance Interval Table page 2.4**.

DRIVE BELT REMOVAL / INSTALLATION

IMPORTANT

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 mis-aligned 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.

REMOVAL

1. Loosen rear axle and axle adjusters. See **Rear Wheel Removal / Installation page 8.82**.
2. Remove drive sprocket cover. See **Drive Sprocket Cover Removal / Installation page 8.77**.
3. Remove belt from drive sprocket.

INSTALLATION

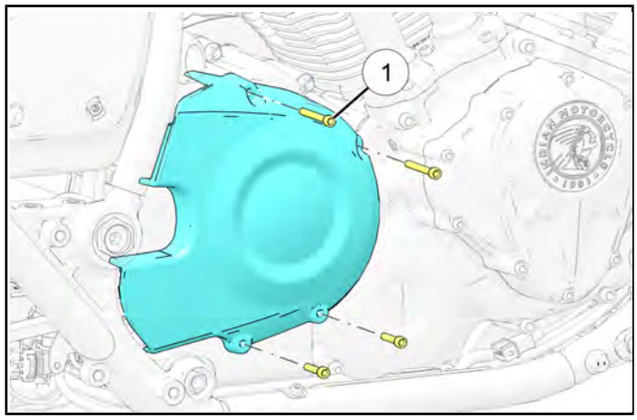
1. Inspect sprockets and verify sprocket fasteners are tight.
2. Install drive belt with Indian Motorcycle script situated so that it reads correctly when viewed from the Right hand side of the unit.
3. **Installation is performed by reversing the removal procedure.**
4. Set drive belt alignment and tension. See **Drive Belt Tension page 8.65**.

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DRIVE SPROCKET SERVICE

DRIVE SPROCKET COVER REMOVAL / INSTALLATION

1. Remove Headpipe. See **Head Pipe Removal / Installation page 3.105**.
2. Remove drive sprocket cover fasteners ①.



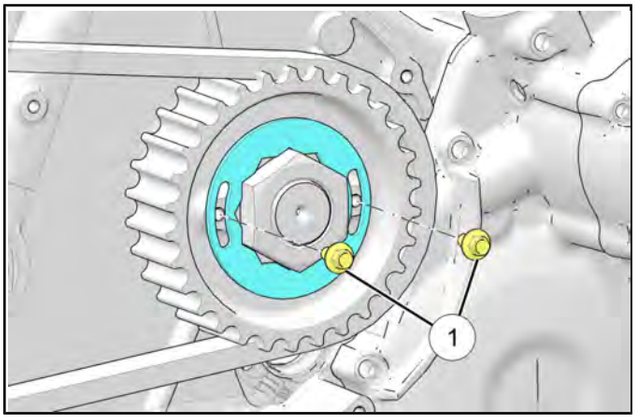
3. **Installation is performed by reversing the removal process.**

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

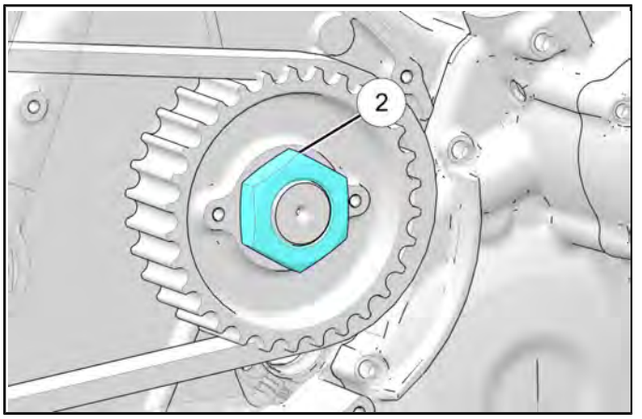
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DRIVE SPROCKET REMOVAL / INSTALLATION

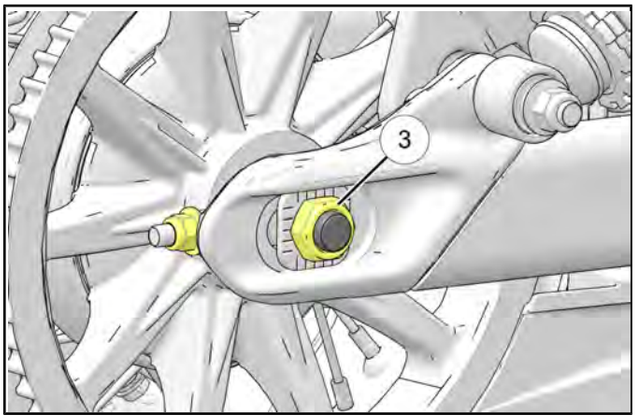
1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove drive sprocket cover. See **Drive Sprocket Cover Removal / Installation page 8.77**.
3. Remove drive sprocket locking plate fasteners ①.



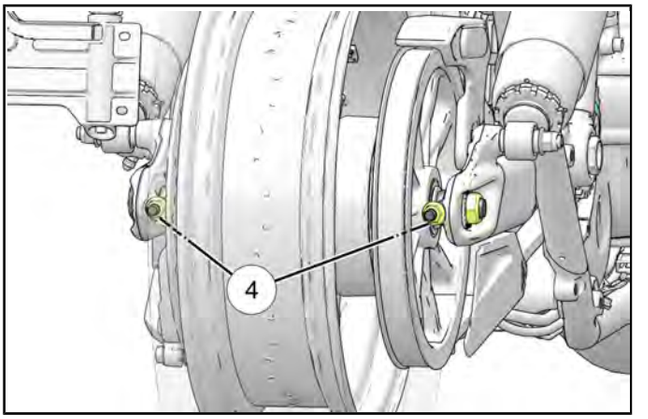
4. Loosen drive sprocket nut ②. Do not remove at this time.



5. Loosen rear axle nut ③ so the wheel assembly can be moved forward.



6. Loosen both axle adjuster nuts ④ evenly to move the wheel forward until belt is loose.



7. Remove belt from drive sprocket.
8. Finish removing drive sprocket nut and remove the drive sprocket.
9. Remove spacer and O-ring.
10. **Installation is performed by reversing the removal procedure.**

TORQUE
Drive Sprocket Nut: **180 ft-lbs (244 N·m)**

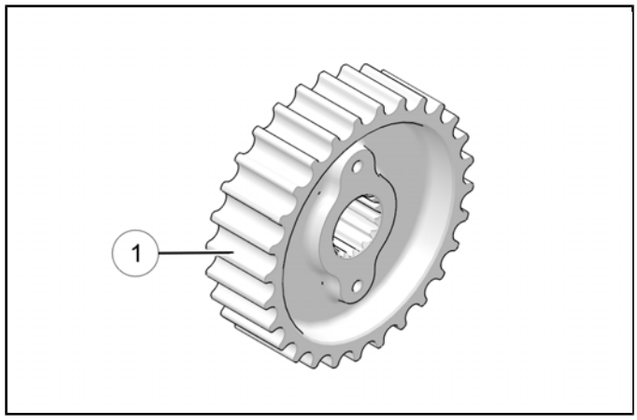
TORQUE
Drive Sprocket Lock Plate Fastener: **88 in-lbs (10 N·m)**

TORQUE
Rear Axle Fuji Lock Nut **65 ft-lbs (88 N·m)**

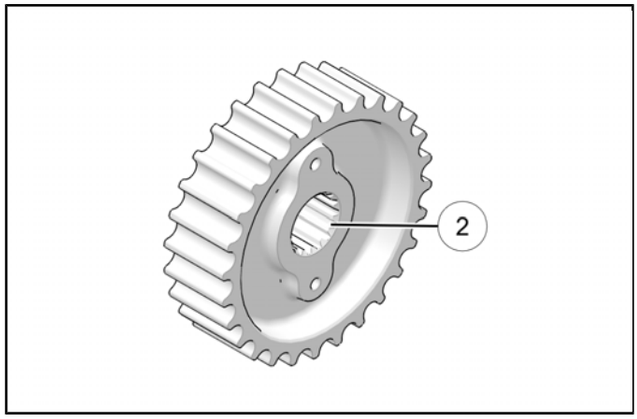
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DRIVE SPROCKET INSPECTION

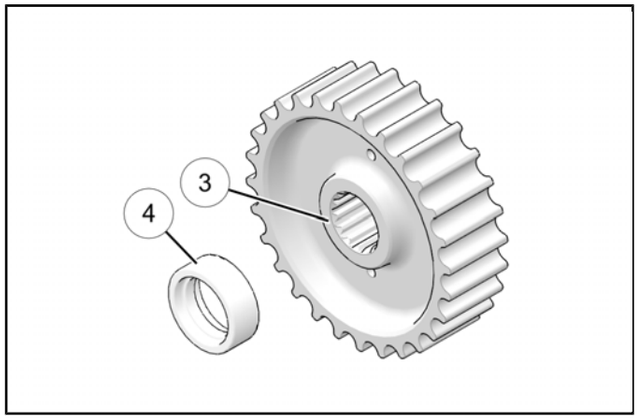
1. Visually inspect sprocket teeth ① for excessive wear and damage.



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.



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.

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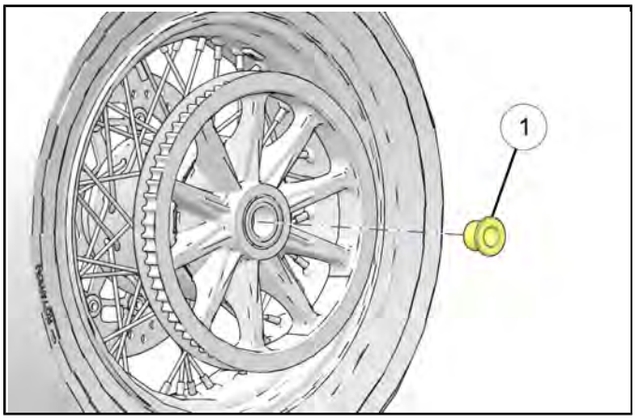
DRIVEN SPROCKET SERVICE

DRIVEN SPROCKET REMOVAL

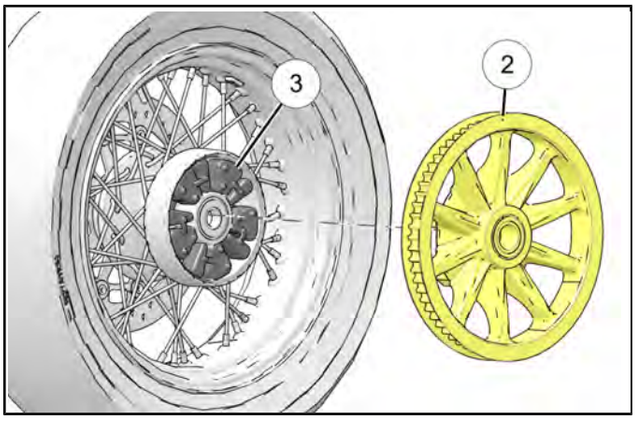
⚠ CAUTION

Protect brake disc surface while working on wheel.

1. Remove rear wheel. See **Rear Wheel Removal / Installation page 8.82**.
2. Remove the RH wheel spacer ① from the driven sprocket roller bearing.

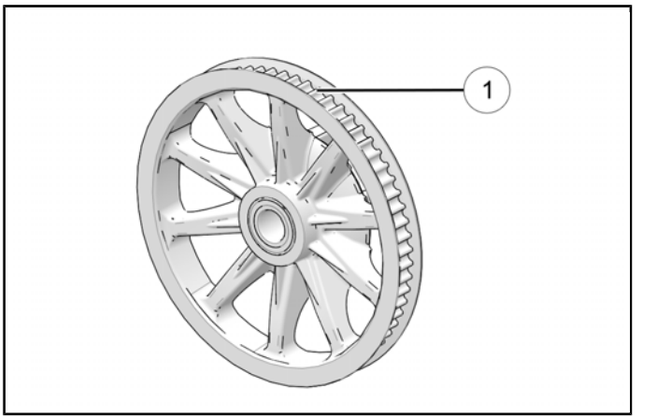


3. Lift the driven sprocket assembly ② off of the drive damper ③.

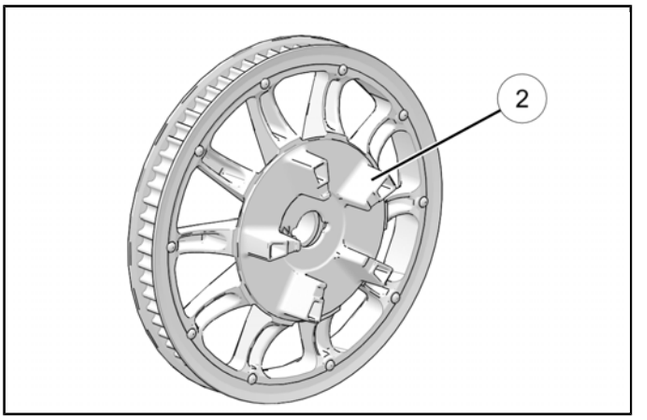


DRIVEN SPROCKET INSPECTION

1. Visually inspect sprocket teeth ① for excessive wear and damage from foreign material or road debris.



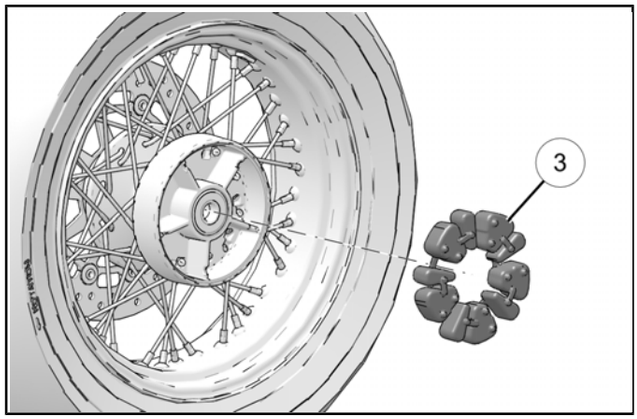
2. Inspect the back side of the sprocket where it engages the damper ② for wear, galling or roughness. Surface must be smooth, with no burrs or surface irregularities.



3. Inspect the driven sprocket bearing by rotating by hand and feeling for any roughness or excessive play. If any roughness or excessive play is found, the drive sprocket assembly must be replaced.

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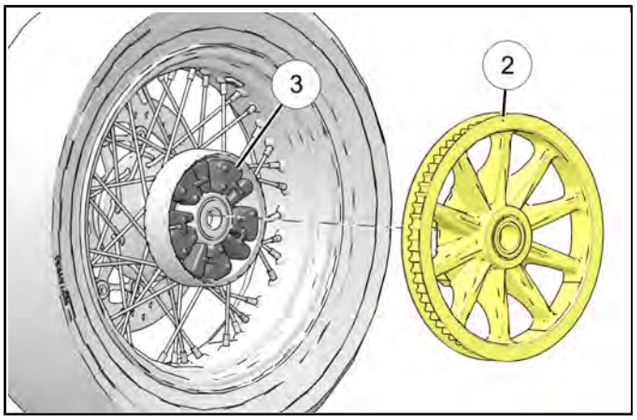
4. Visually inspect the cushion drive damper ③ for cracks or deformation. Replace damper if damage is found.



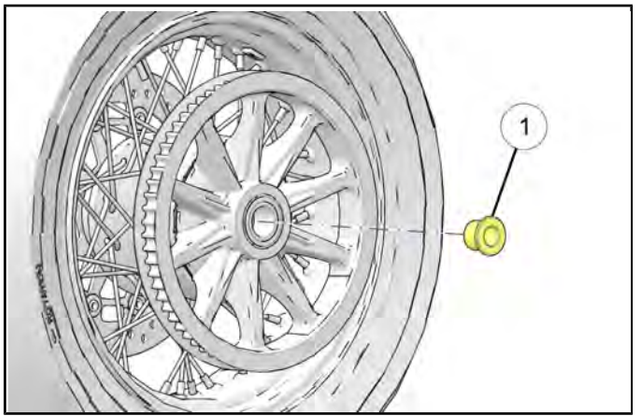
DRIVEN SPROCKET INSTALLATION

1. Install cushion damper ③ into wheel hub.
2. Install sprocket assembly ② onto wheel hub making sure the cushion damper is properly engaged.

NOTICE
Soapy water can be used as lubricant to aid in installation.



3. Install the LH wheel spacer ① into the sprocket roller bearing.



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REAR WHEEL SERVICE

REAR WHEEL REMOVAL / INSTALLATION

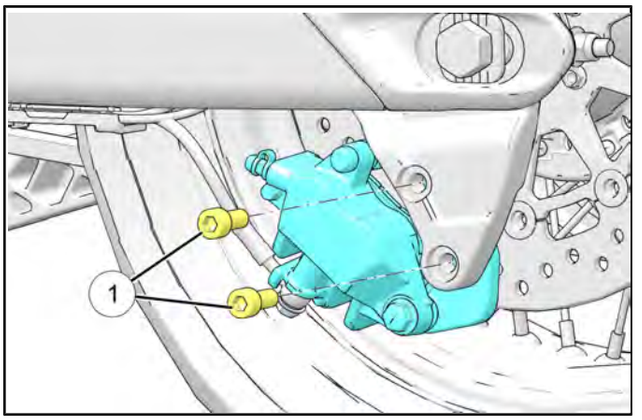
⚠ WARNING

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.

⚠ 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. Remove saddlebags, if equipped.
3. Position a platform jack beneath the engine cases and raise until the rear tire is barely in contact with the ground
4. Remove Mufflers. See **Muffler Removal / Installation page 3.104**.
5. Remove two caliper mounting bolts ① and remove caliper.



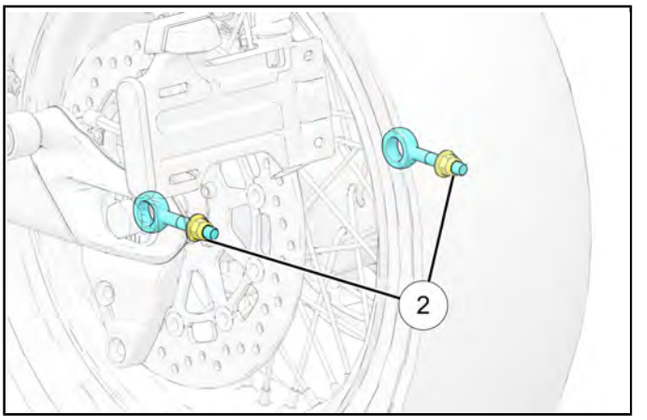
⚠ CAUTION

Do not hang rear brake caliper from the brake line. Do not twist the brake line or damage may result.

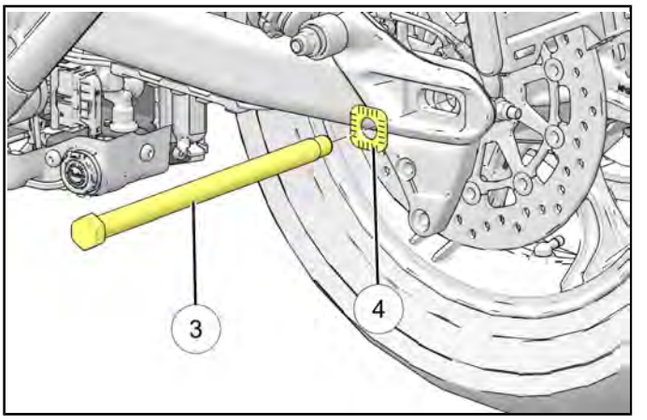
IMPORTANT

Do not apply rear brake pedal after the brake caliper has been removed.

6. Loosen right and left axle adjusters ② two full turns.



7. Remove axle ③ and adjustment indicator plate ④.



8. Pull the wheel speed sensor assembly upward to avoid damage.
9. Push wheel forward and slide drive belt to the right side off of the rear sprocket.
10. Remove rear wheel assembly by sliding it to the rear of the motorcycle.
11. **Installation is performed by reversing the removal procedure.**
12. Torque fasteners to specification.

TORQUE
Axle Nut: **65 ft-lbs (88 N·m)**

TORQUE
Caliper Mounting Fasteners (rear): **29 ft-lbs (40 N·m)**

Set drive belt tension and alignment. See **Drive Belt Tension page 8.65**.

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REAR AXLE INSPECTION

1. Install rear axle in V-blocks and measure runout and compare to service limit. See **Service Specifications - Rear Wheel / Suspension page 8.62**.

REAR WHEEL INSPECTION

IMPORTANT
Wheel bearings must be in good condition.

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 8.101**.
2. Visually inspect wheel for cracks or other damage.
3. Replace wheel if it fails visual or measured inspection.

REAR WHEEL BEARING INSPECTION

IMPORTANT
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.

IMPORTANT
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.

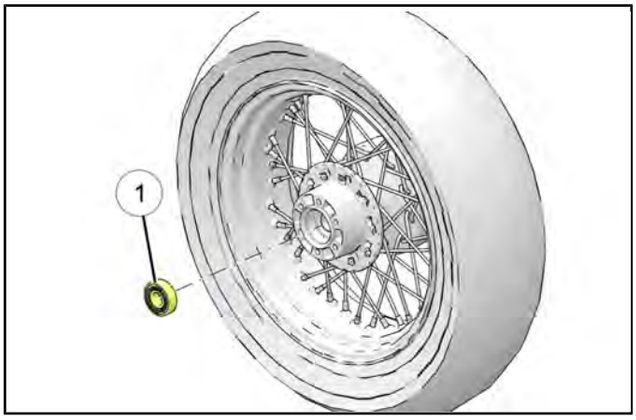
WHEEL BEARING REPLACEMENT

⚠ CAUTION
Do not reuse bearings that have been removed.

IMPORTANT
This procedure requires the Wheel Bearing Removal / Installation Kit **(PF-51324)**. Refer to special tool manufacturer instructions for proper use of tool.

REMOVAL

1. Remove rear wheel. See **Rear Wheel Removal / Installation page 8.82** .
2. Remove driven sprocket. See **Driven Sprocket Removal page 8.80**.
3. Remove brake disc. See **Brake Disc Removal / Installation page 8.84**.
4. Refer to special tool manufacturer instructions to remove bearing from brake disc side of hub.



5. Remove bearing.
6. Extract or drive bearing from sprocket side.

INSTALLATION

1. Use the Wheel Bearing Removal / Installation Kit **PF-51324)** to install new wheel bearings. Refer to special tool manufacturer instructions for proper use of tool.

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2. Press the brake rotor side bearing with a flat ground tool that supports the bearing inner and outer race equally until it seats.

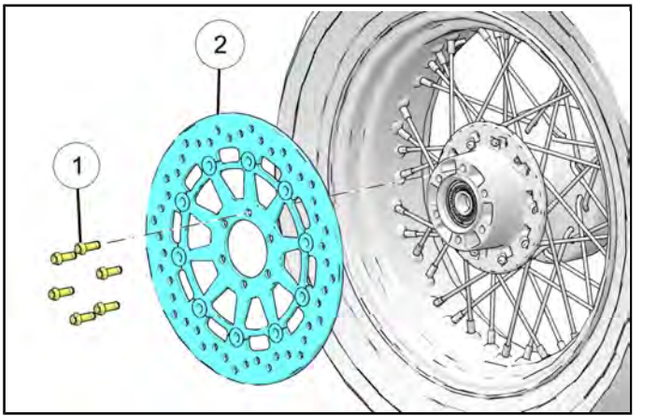
IMPORTANT
The tone ring must face outward and not be damaged or deformed.

NOTICE
Drawing a straight line across the bearing races and the seal containing the tone ring with a black marker can aid in wheel speed diagnostic procedures at a later date.

3. Install the center bearing spacer.
4. Continue to support the rotor side bearing inner and outer race while the right side bearing is installed.
5. Install the right side bearing with a flat ground tool that support the bearing inner and outer race equally until the inner race seats on the spacer.
6. Install *new* seal on the non tone right side and existing outer bearing spacers into each side of the wheel hub.
7. Install the brake disc. See **Brake Disc Removal / Installation page 8.84**.
8. Install driven sprocket. See **Driven Sprocket Installation page 8.81**.
9. Install the rear wheel. See **Rear Wheel Removal / Installation page 8.82**.

BRAKE DISC REMOVAL / INSTALLATION

1. Remove the rear wheel. See **Rear Wheel Removal / Installation page 8.82**.
2. Remove the driven sprocket and cushion damper. See **Driven Sprocket Removal page 8.80**.
3. Position wheel with brake disc facing up.
4. Remove brake disc fasteners① and brake disc ②.



5. **Installation is performed by reversing the removal procedure.**
6. Torque *new* brake disc fasteners to specification in a star pattern. Ensure rotation arrows on rotor are noted and followed.

TORQUE
Brake Disc Fasteners: **22 ft-lbs (30 N·m)**

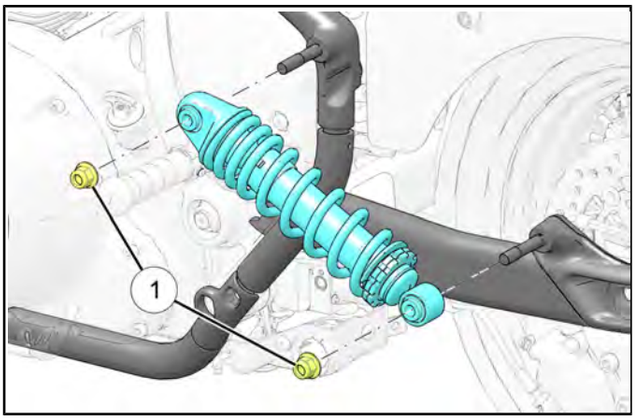
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SHOCK ABSORBER REMOVAL / INSTALLATION

⚠ 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. With the rear wheel properly supported, remove the shock fasteners ① and remove shock absorber.

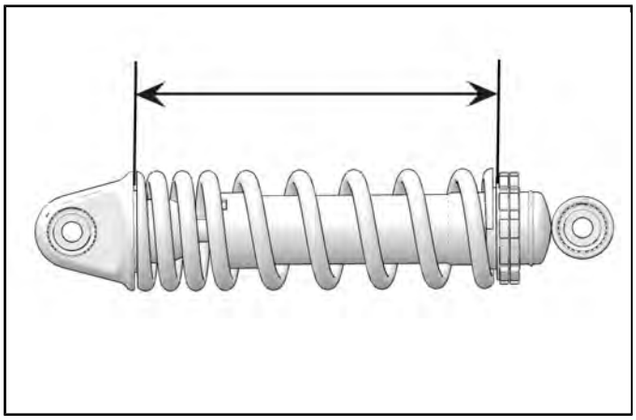


2. **Installation is performed by reversing the removal procedure.**

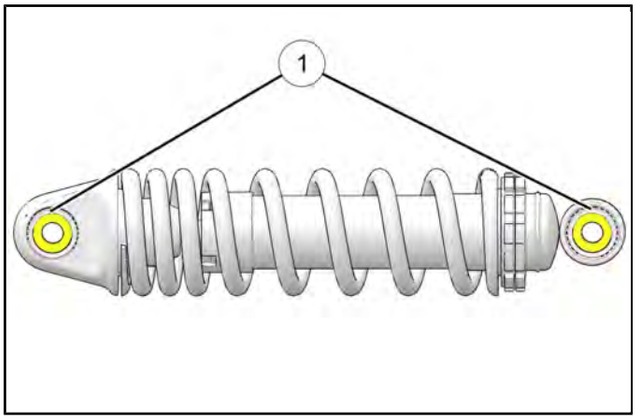
TORQUE
Shock Absorber Nut: **84 ft-lbs (114 N·m)**

SHOCK ABSORBER INSPECTION

1. Measure spring installed height and record so ride height adjustment can be returned to rider's preference.



2. Rotate spring to remove through the slot in the spring seat.
3. Thoroughly clean the shock spring.
4. Inspect eyelets ② and 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 8.62**.
7. Install spring onto shock body.

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SHOCK ABSORBER STUD REMOVAL / INSTALLATION

1. Remove battery box. See **Battery Box Removal / Installation page 10.15**.
2. Remove rear wheel. See **Rear Wheel Removal / Installation page 8.82**.
3. Remove Shocks. See **Shock Absorber Removal / Installation page 8.85**.
4. If replacing the stud on the right side of the swing arm, remove the mufflers. See **Muffler Removal / Installation page 3.104**.
5. Thread the shock nuts on so the nut is flush with the threads of the shock stud.
6. Using a commercially available ball joint kit, Press out the stud from the frame.



IMPORTANT
If a shock stud is removed, it must be discarded and replaced with a new one.

7. Apply a multi-purpose grease to the splines and threads of the *new* shock stud.
8. Install the shock stud into the frame.
9. Install a stack up of washers or spacers onto the stud.
10. Install the nut onto the stud and tighten to draw the stud into the frame.

IMPORTANT
Draw the stud into the frame until the back is flush with the frame.

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SWINGARM SERVICE

SWINGARM REMOVAL

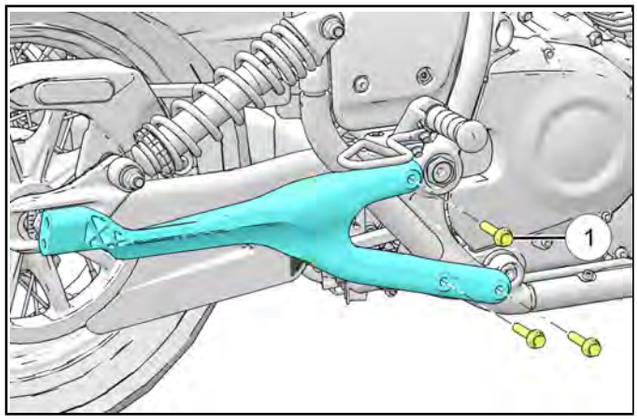
⚠ WARNING

Swingarm 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.

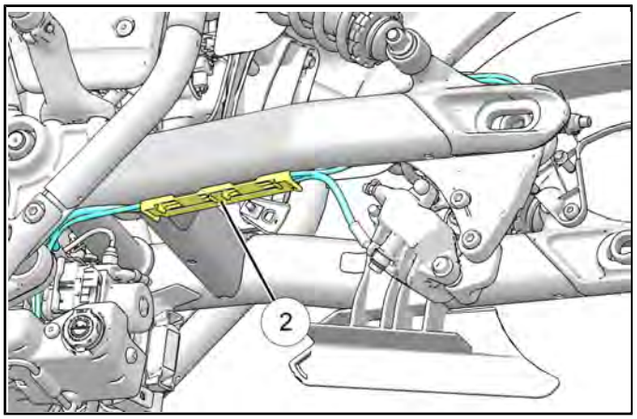
⚠ WARNING

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.

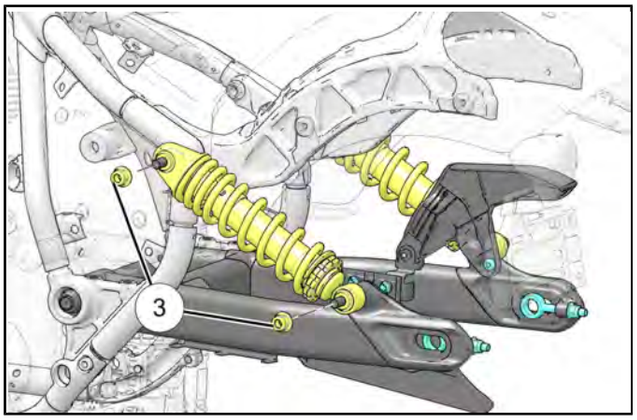
1. Remove Headpipe. See **Head Pipe Removal / Installation page 3.105**.
2. Remove exhaust mount by removing its fasteners ①.



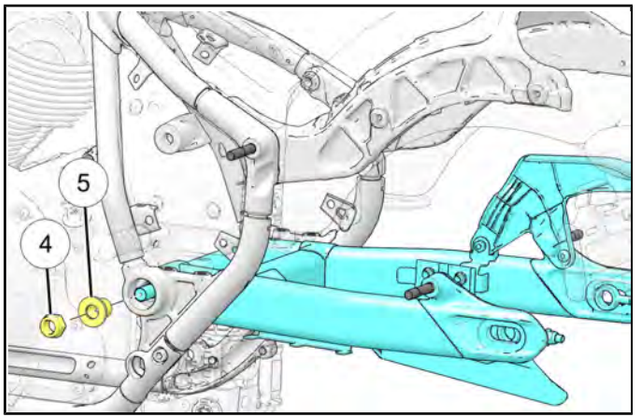
3. Remove rear wheel. See **Rear Wheel Removal / Installation page 8.82**.
4. Disconnect the Rear Brake Line Retention Clip ② from the swingarm so the brake line and wheel speed sensor wires can be removed.



5. Remove the shock by removing its fasteners ③. Repeat step for opposite side.



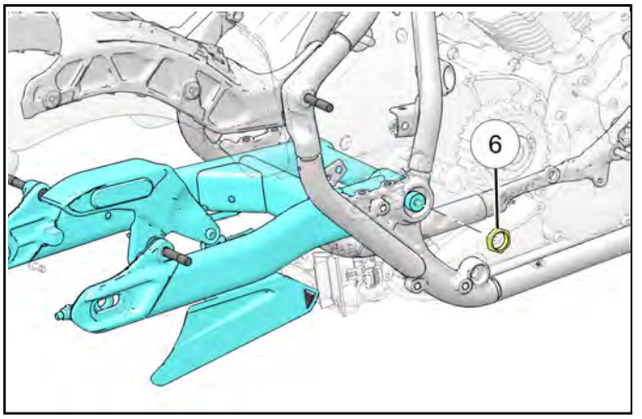
6. While holding opposite side, remove swingarm pivot nut ④ and outer pivot spacer ⑤.



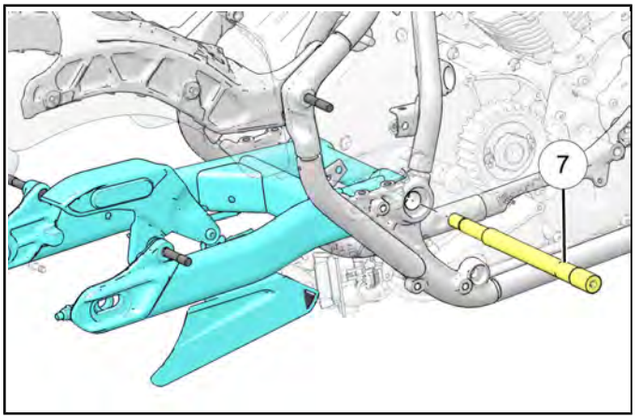
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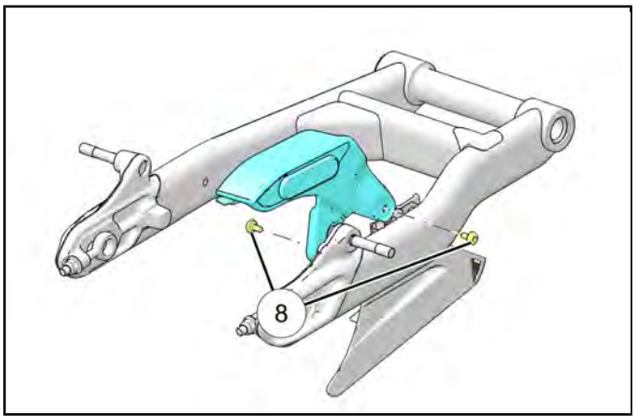
7. Remove swingarm pivot jam nut ⑥.



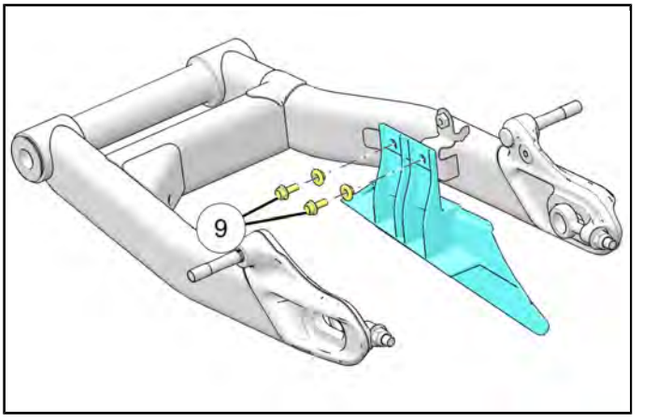
8. Remove swingarm pivot ⑦.



9. Remove the swingarm assembly.
10. Remove upper belt guard by removing its fasteners ⑧.



11. Remove lower belt guard by removing its fasteners ⑨.

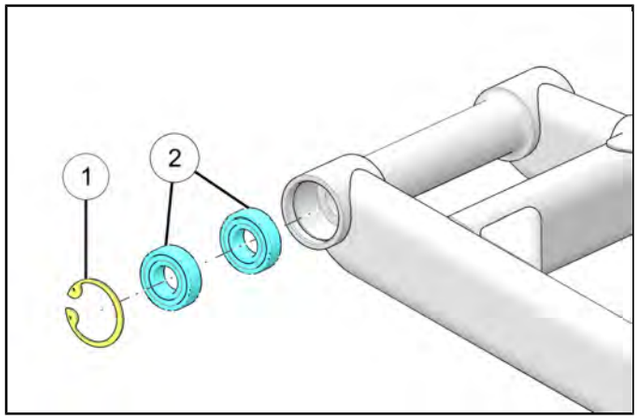


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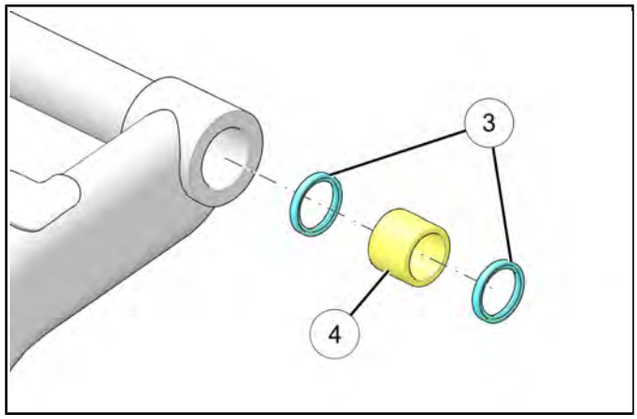
SWINGARM BUSHING / BEARING REPLACEMENT

REMOVAL

1. Remove swingarm assembly from motorcycle. See **Swingarm Removal page 8.87**.
2. Remove the internal snap-ring ① followed by the bearings ② from the LH side of the swingarm.



3. Working from the RH side of the swingarm, gently pry the seals ③ out of the bearing bore.



4. Remove needle roller bearing ④.
5. Inspect bearing bores for any galling or damage.

INSTALLATION

1. Working on the LH side of the swingarm, press or drive *new* bearings ② into the bearing bore using a suitable bearing driver.
2. Install internal snap-ring ①.
3. Using the bearing driver, install a new *inner* seal and needle bearing ④ into the RH side of the swingarm until fully seated.
4. Press new *outer* seal ③ into the bearing bore until seated.
5. Install swingarm assembly. See **Swingarm Installation page 8.90**.

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SWINGARM INSTALLATION

Drive belt must be installed on the drive sprocket prior to installing the swingarm.

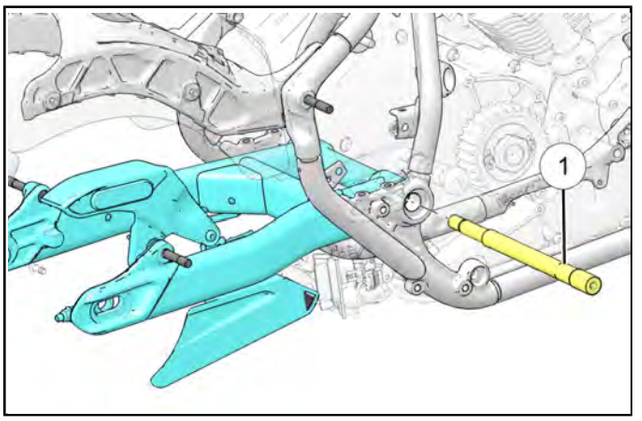
IMPORTANT
Both the swing arm lock nut and pivot nut are single use nuts and MUST be replaced.

1. If removed, install upper and lower belt guards.

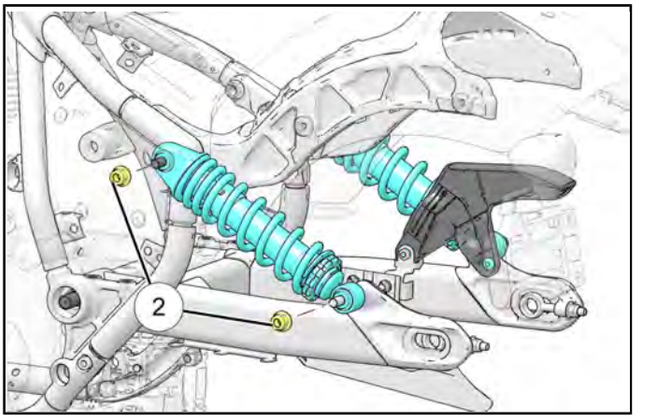
TORQUE
Upper Belt Guard Fastener: **80 in-lbs (9 N·m)**

TORQUE
Lower Belt Guard Fastener: **80 in-lbs (9 N·m)**

2. Clean inside of the swingarm shaft bores in both sides of the frame.
3. Grease swingarm pivot shaft.
4. Lift the swingarm into position in the frame.
5. Install the swingarm pivot shaft ①.



6. Install shocks and hand tighten fasteners ②.



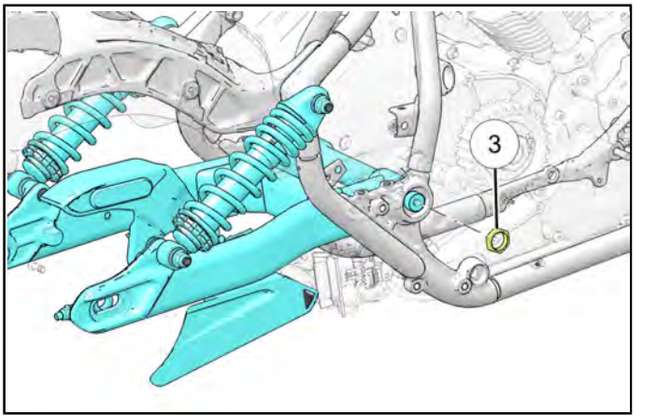
7. Tighten Pivot shaft.

TORQUE
Pivot Shaft: **8 ft-lbs (11 Nm)**

8. Tighten shock fasteners.

TORQUE
Shock Nut: **84 ft-lbs (114 N·m)**

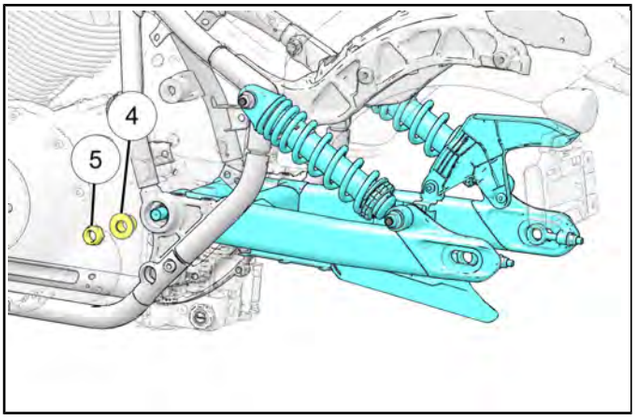
9. Install *new* swingarm pivot jam nut ③.



TORQUE
Swingarm pivot Jam Nut: **74 ft-lbs (100 N·m)**

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10. Install outer pivot spacer ④ and *new* swingarm pivot nut ⑤.



TORQUE
Swingarm pivot Nut: **65 ft-lbs (88 N·m)**

11. Install the rear wheel. See **Rear Wheel Removal / Installation page 8.82**.
12. Install exhaust mount.

TORQUE
Exhaust Mount Fastener: **37 ft-lbs (50 N·m)**

13. Install the exhaust headpipe. See **Head Pipe Removal / Installation page 3.105**.
14. Make sure that the following applies:
    - The rear wheel turns freely, without any interference between the belt guard, the tire, and the swingarm.
    - 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 swingarm and exhaust mufflers and mounting.
    - The swingarm 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.
15. Adjust ride height as required. See **Rear Shock Preload Adjustment page 8.70**
16. Test ride motorcycle to be sure rear suspension operates smoothly without binding or abnormal noises.

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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
	Shock bushing failure	Replace shock bushings
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 shock bushings	Replace shock bushings
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

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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

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TIRES

GENERAL INFORMATION

SERVICE NOTES - TIRES

⚠ WARNING

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. Tires other than OEM may or may not adversely affect the handling characteristics of the motorcycle or may not have adequate tire clearance. 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.
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.
When a tire reaches the minimum tread depth, replace the tire immediately.

⚠ CAUTION

Overloading and under-inflation lead to premature tire wear. Do not deviate from the specifications for loading or inflation.

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SERVICE SPECIFICATIONS- TIRES

Refer to Steering / Suspension Chapter (Front Wheel and Suspension) for front wheel specifications.

Refer to Steering / Suspension Chapter (Rear Wheel and Suspension) for rear wheel specifications.

	Location:	**Type:**	**Size:**	**PSI:**	**Minimum Thread Depth:**
Chief Sport Chief	FRONT	Pirelli Night Dragon	130/60B19 61H	36 PSI (248 kPa)	1/16 in (1.6 mm)
		(China Models): Bridgestone Battle Cruise H50	130/90B16 73H		
	REAR	Pirelli Night Dragon	180/65B16 81H	40 PSI (276 kPa)	1/16 in (1.6 mm)
		(China Models): Bridgestone Battle Cruise H50	180/95B16 81H		
	Location:	**Type:**	**Size:**	**PSI:**	**Minimum Thread Depth:**
Chief Bobber Super Chief	FRONT	Pirelli Night Dragon	130/90B16 67H	36 PSI (248 kPa)	1/16 in (1.6 mm)
		(China Models): Bridgestone Battle Cruise H50	130/90B16 73H		
	REAR	Pirelli Night Dragon	180/65B16 81H	40 PSI (276 kPa)	1/16 in (1.6 mm)
		(China Models): Bridgestone Battle Cruise H50	180/95B16 81H		

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TIRE INSPECTION

TIRE WEAR PATTERNS

TIRE WEAR PATTERNS

SYMPTOM	POSSIBLE CAUSE
Wear on Left Side	Riding on Crowned Roads
Edges Worn	Under-inflation or Excessive Loads
Excess Wear in the Middle of Tire	Over-inflation or Tire Abuse
Cracks in Tread Grooves	Under-inflation, 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.

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TIRE SERVICE

TIRE CHANGING

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.

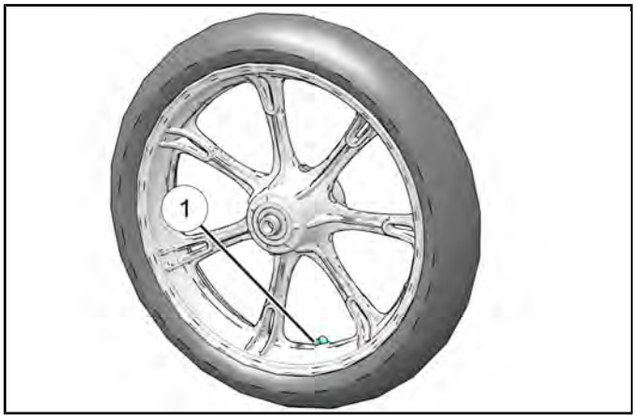
Manual manipulation is the least preferred method since it will generally not deliver the same efficiency as the other methods and greater care needs to be taken when performed. Care must be taken when using tire irons to not damage or stress the tire bead, Also, the opposite bead needs to be in drop center of wheel during mounting and dismounting of the tire.

Be very careful not to damage the rim, tire, inner tube, brake disk, or sprocket regardless of which method is used.

TIRE REMOVAL

IMPORTANT
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 **Steering / Suspension Chapter for front wheel removal** and **rear wheel removal**.
2. Remove valve core ① 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 and continue around the circumference of the rim as necessary.
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.

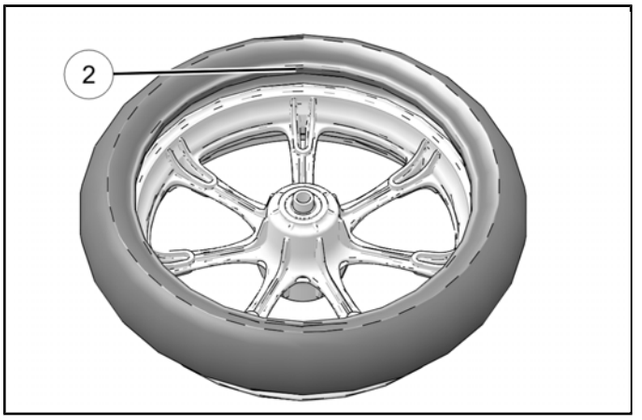
NOTICE
Refer to manufacturer's instructions for proper tire changer operation.

Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

8

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6. Carefully work around the circumference of the upper bead ② with the tire lever until it is completely off of the rim.



7. Lift the lower tire bead up until the tire lever can be positioned and the tire completely removed.
8. Work around the circumference of the rim until the tire can be lifted free of the rim.

TIRE INSTALLATION

IMPORTANT

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

⚠ CAUTION

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.

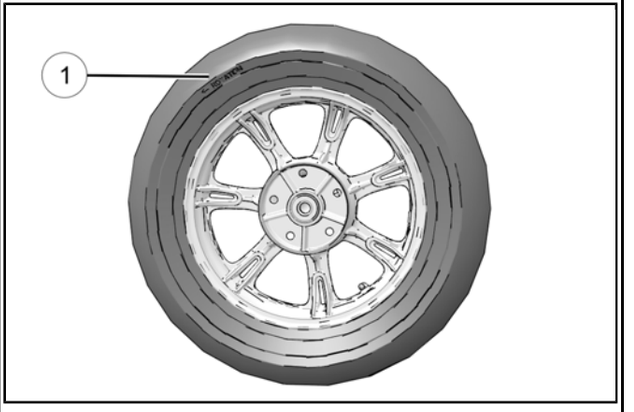
IMPORTANT

Balance Dots

Tire balance dots denote the lightest part of the tire and should be lined up with the valve step upon tire installation. Aligning the balancing dots and valve stem will reduce the amount of weight needed to balance the assembly.

Directional Arrows

Tires ① 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.

⚠ WARNING

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.

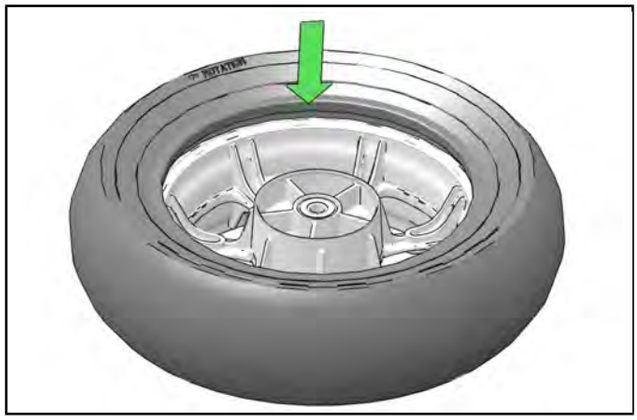
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2.

NOTICE
Refer to manufacturer's instructions for proper tire changer operation.

Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

3. Orient tire correctly as to the 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.



IMPORTANT
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 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.

IMPORTANT
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".

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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.

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.

IMPORTANT

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 1521682

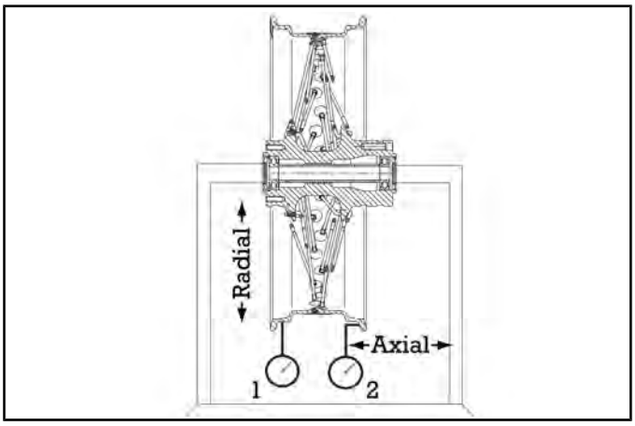
8. Install wheel / tire assembly onto motorcycle. See **Steering / Suspension Chapter for front wheel installation** and **rear wheel installation**.

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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.



IMPORTANT

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 - Rear Wheel / Suspension**, **Service Specifications - Front Wheel / Suspension**. 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

Do not attempt to repair tires.
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.
When a tire reaches the minimum tread depth, replace the tire immediately.

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VALVE STEM

VALVE STEM INSPECTION

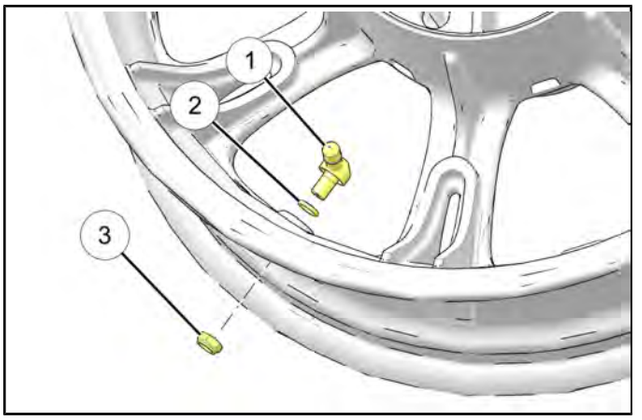
1. Remove the valve stem cap and spray the valve stem down with a mild soap and water solution.
2. Observe the area around the base of the valve stem and valve core area. If any bubbles form over a 1–2 minute period, the valve stem or inner tube should be replaced.
3. Inspect valve stem for cracks or visible damage and replace if necessary.

IMPORTANT
Valve stem replacement is recommended when tire is being replaced.

VALVE STEM INSTALLATION

IMPORTANT
Pay close attention to markings to ensure proper tire and valve stem orientation.

1. Remove tire from wheel. See **Tire Removal page 8.97**.
2. Remove valve stem nut ③, valve stem ①, o-ring ②.



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 in the same position as removed.
5. Hold stem and tighten nut to specification.

TORQUE
Valve Stem Nut: **44 in-lbs (5 N·m)**

6. Install tire. See **Tire Installation page 8.98**.

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TROUBLESHOOTING TIRES

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Worn or damaged swingarm 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 swingarm, 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

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NOTES

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CHAPTER 9
BRAKES

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GENERAL INFORMATION

SERVICE NOTES

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.

NOTE

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.

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SPECIAL TOOLS - BRAKES

TOOL DESCRIPTION	PART NUMBER
ABS Tool (Lever Reserve)	PV-50104
Vacuum Brake Bleeder	Commercially Available

SERVICE SPECIFICATIONS - BRAKES

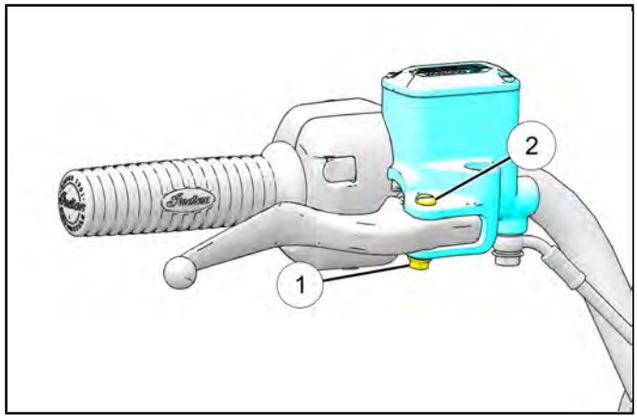
ITEM	STANDARD	SERVICE LIMIT
Specified Brake Fluid	DOT 4	Replace every 24 months or 10,000 miles (16,000 km)
Brake Disc Thickness, Front	5 mm	4.5 mm (.177") (Min)
Brake Disc Thickness, Rear	5mm	4.5 mm (.177") (Min)
Brake Disc Runout	-	.30 mm (.012") (Max)
Brake Pad Wear Limit (Front & Rear)	-	When wear limit groove is no longer visible
Brake Pedal Free Play (Pedal Clearance)	No Adjustment	-
Brake Lever Freeplay (Front)	No Adjustment	-

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BRAKES MAINTENANCE

FRONT BRAKE LEVER LUBRICATION

1. Remove the nut ① and pivot fastener②.



2. Clean pivot bolt, lever and lever perch.
3. Remove brake lever and apply grease to pivot fastener ②, lever bushing, and pushrod contact surface of lever.
4. Assemble brake lever.
5. Torque brake lever pivot fastener and nut to specification.

TORQUE
Brake Lever Pivot Fastener: **9 in-lbs (1 N·m)**

TORQUE
Brake Lever Pivot Nut: **48 in-lbs (6 N·m)**

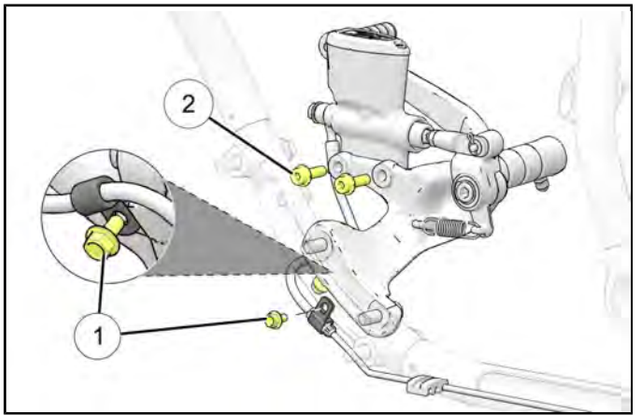
BRAKE PEDAL INSPECTION

1. Press and release the 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 Bleeding.

BRAKE PEDAL LUBRICATION

Lubricate brake pedal at intervals listed on periodic maintenance table. See **Periodic Maintenance Interval Table 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 brake line p clamp bolt ① and master cylinder fasteners ②. Move foot peg mount/master cylinder assembly so the brake pedal pivot shoulder bolt can be accessed.



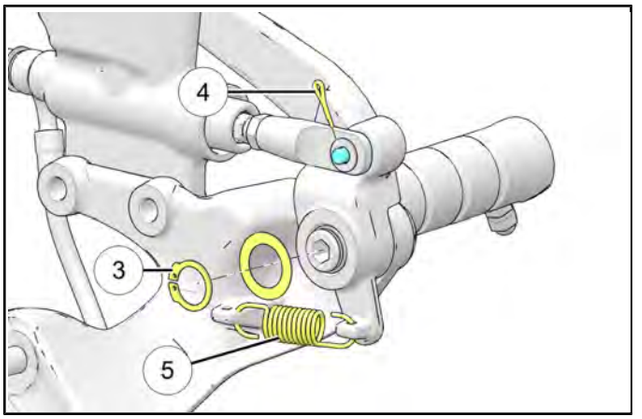
IMPORTANT
It is not necessary to disconnect the brake line from the master cylinder to perform this procedure.

IMPORTANT
Keep the master cylinder assembly in an upright position at all times to ensure air does not enter the brake system.

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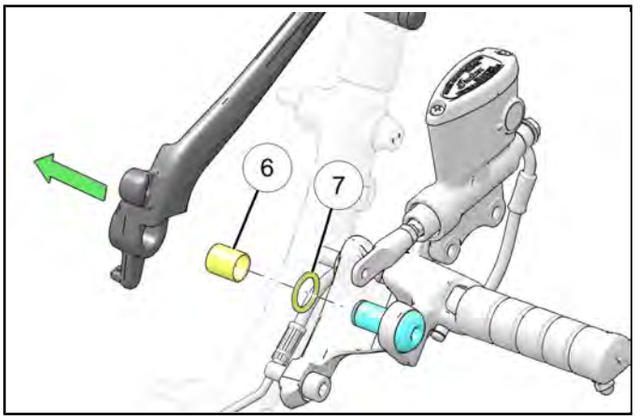
3. Remove the brake pedal pivot c-clip ③ and flat washer. Remove the pushrod cotter pin ④ and washer.



NOTICE

2023+ models have a rue pin in place of the cotter pin.

4. Remove brake pedal return spring ⑤.
5. Remove brake pedal bushing ⑥ and washer ⑦.



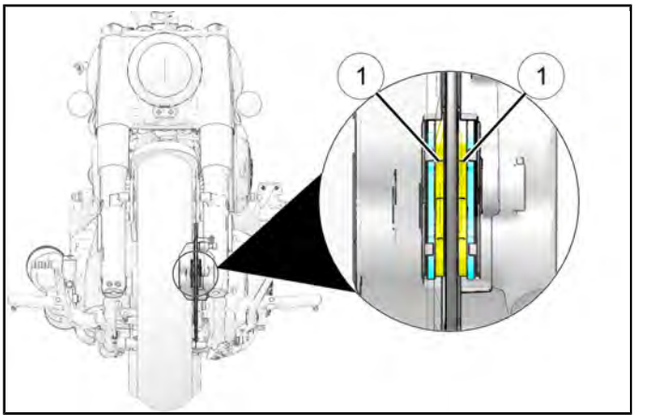
6. Clean off old lubricant and dirt from all parts.
7. Apply all-purpose grease to bushing and washer.
8. **Installation is performed by reversing the removal procedure. Reference Driver Foot Peg Removal / Installation page 7.25.**
9. Depress brake pedal to verify proper operation and pedal feel. Bleed brakes if necessary. See "Brake System Bleeding" in the Brakes Chapter.

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 9.43**.

1. Viewing the front brake pads from the rear of the caliper, locate the wear indicator grooves ①.
2. Wear indicator grooves should be visible on both inboard and outboard brake pads.



⚠ 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, the front caliper should receive a new pad set. Failure to replace both front brake pads together may cause reduced braking performance or brake failure, resulting in a vehicle crash.

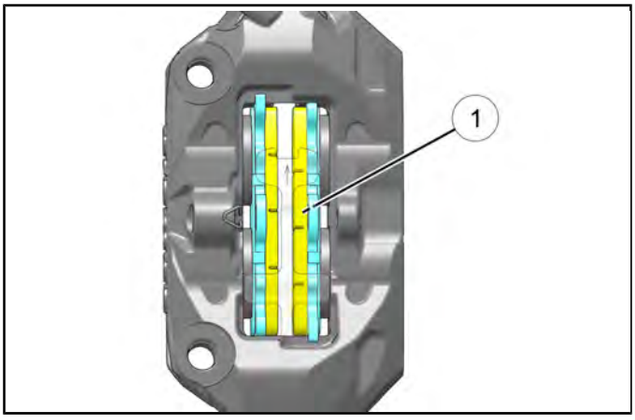
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FRONT BRAKE PAD INSPECTION (SPORT CHIEF)

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.

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

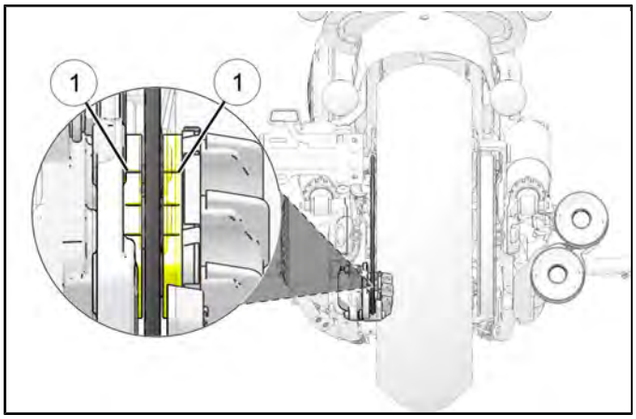
Front brake pads should always be replaced as a complete set. If it is determined that an individual brake pad has worn past the wear indicator groove, both front calipers should receive new pad sets. Failure to replace both sets of front brake pads together may cause reduced braking performance or brake failure, resulting in a vehicle crash.

REAR BRAKE PAD INSPECTION

IMPORTANT

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.
Replace pads if worn to bottom of grooves. See **Rear Brake Pad Replacement page 9.51**.

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, locate the wear indicator grooves ①.



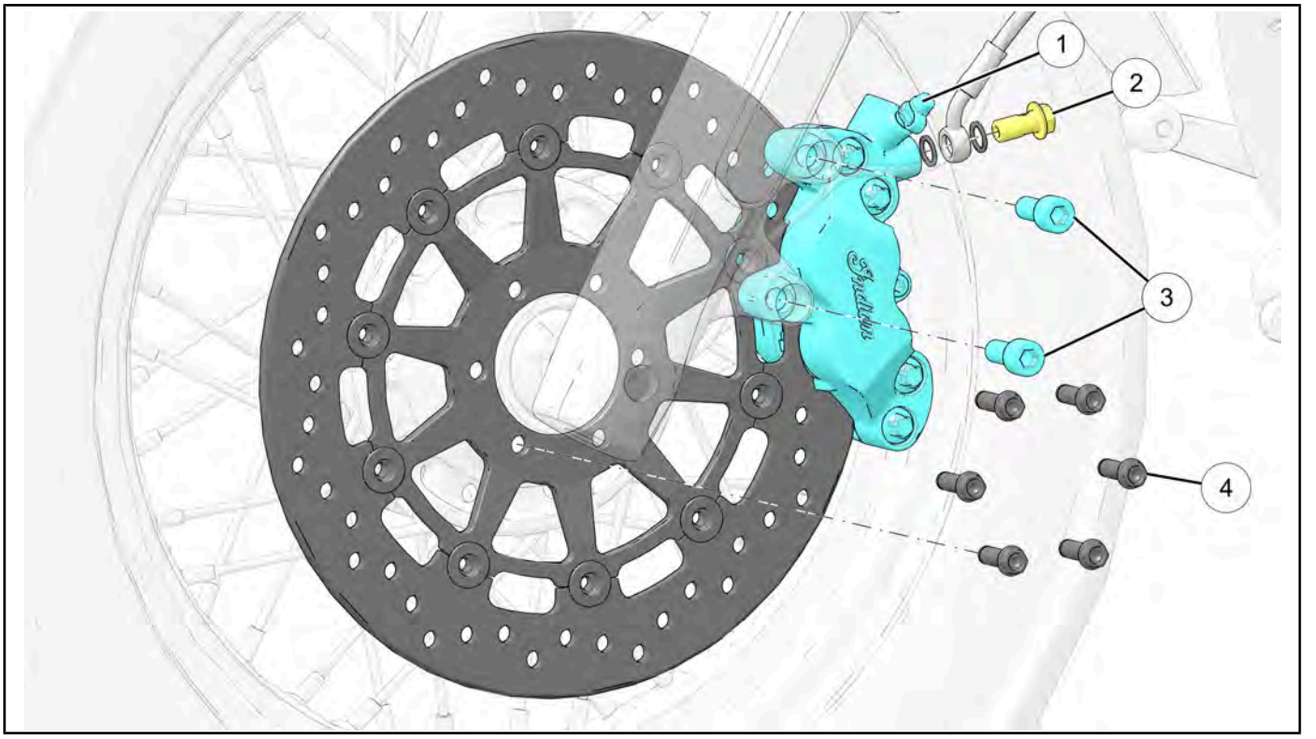
3. Wear indicator grooves should be visible on both inboard and outboard brake pads.

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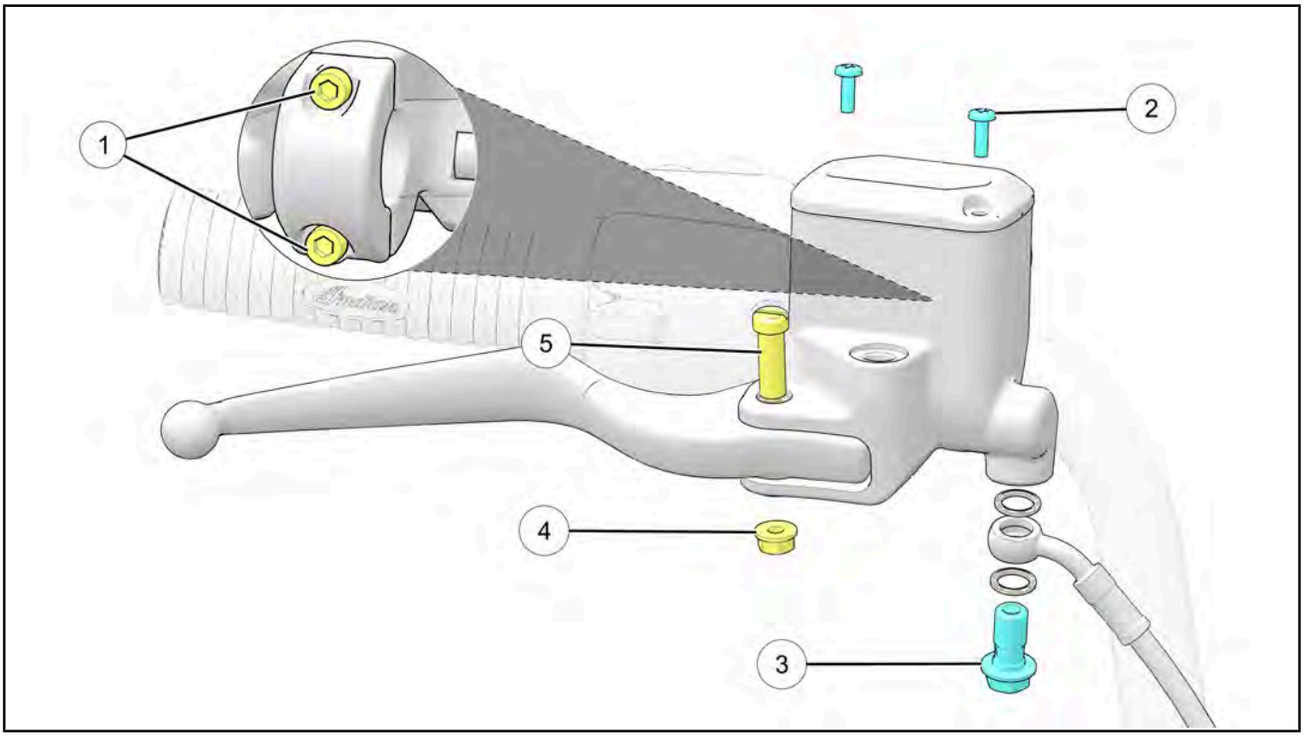
ASSEMBLY VIEWS

FRONT BRAKE SYSTEM COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Caliper Bleeder Screw	**53 in-lbs (6 N·m)**
②	Banjo Bolt	**18 ft-lbs (25 N·m)**
③	Front Brake Caliper Fasteners	**29 ft-lbs (40 N·m)**
④	Front Brake Disc Fastener	**22 ft-lbs (30 N·m)**

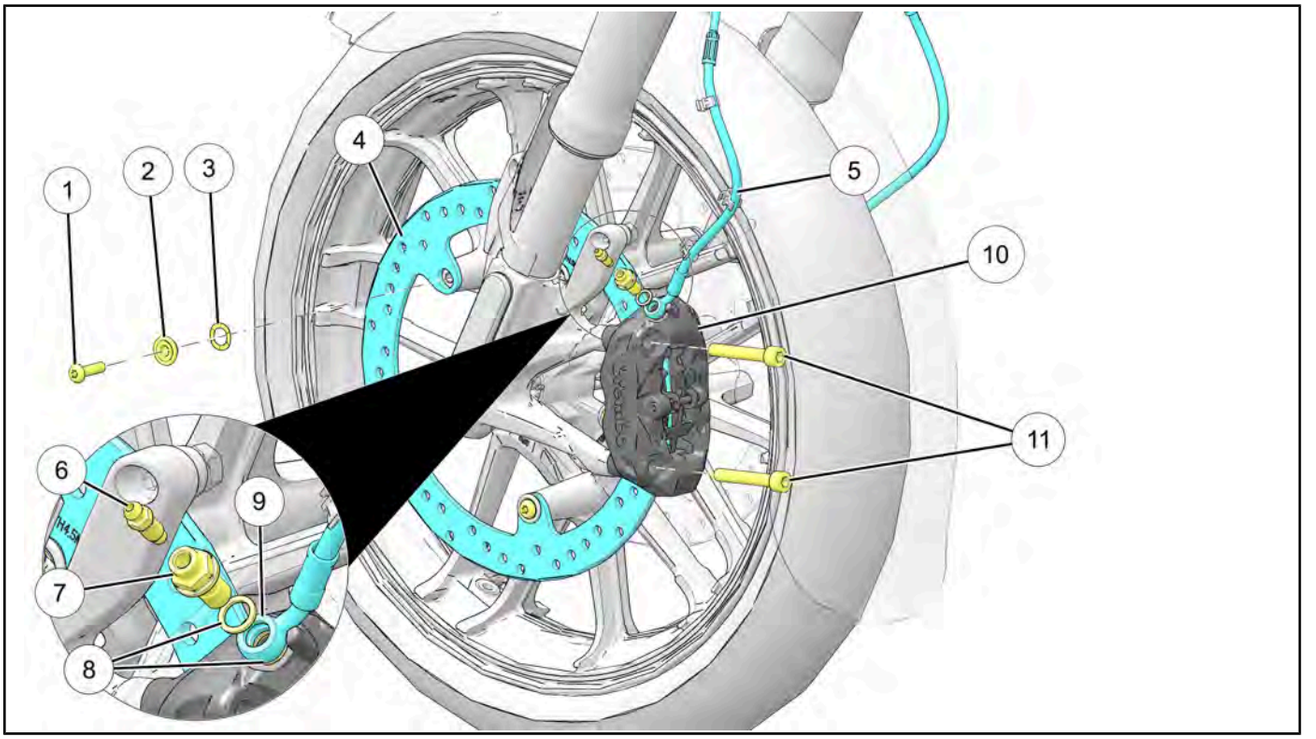
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ITEM	DESCRIPTION	TORQUE
①	Front Master Cylinder Fastener	**88 in-lbs (10 N·m) Torque upper fastener then lower**
②	Master Cylinder Cover Fastener	**13 in-lbs (1.5 N·m)**
③	Banjo Bolt	**18 ft-lbs (25 N·m)**
④	Brake Lever Pivot Nut	**48 in-lbs (6 N·m)**
⑤	Brake Lever Pivot Fastener	**9 in-lbs (1 N·m)**

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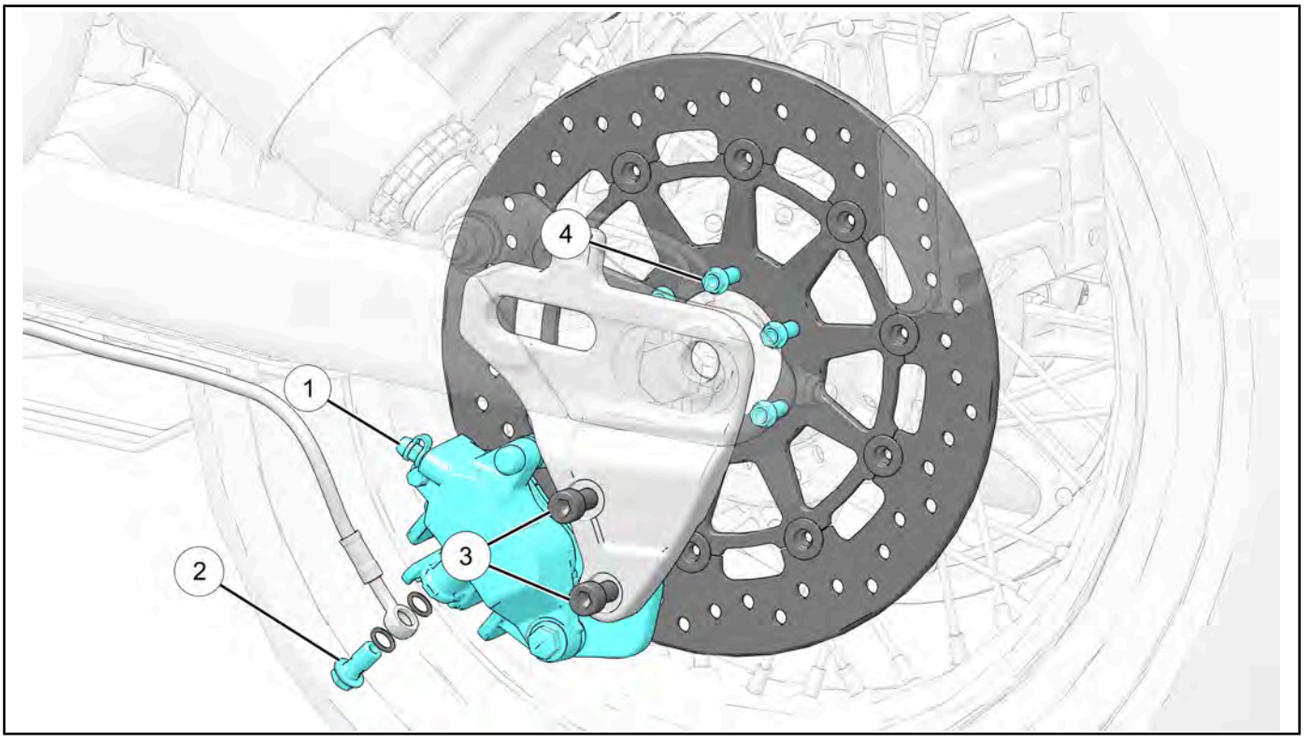
FRONT BRAKE SYSTEM COMPONENTS (SPORT CHIEF)



ITEM	DESCRIPTION	TORQUE
①	Rotor Screw	**22 ft-lbs (30 N·m)**
②	Rotor Bushing	—
③	Rotor Spring	—
④	Brake Rotor	—
⑤	Brake Line	—
⑥	Bleed Screw	**80 in-lbs (9 N·m)**
⑦	Banjo Bolt	**18 ft-lbs (25 N·m)**
⑧	Copper Washer	—
⑨	Banjo Fitting	—
⑩	Brake Caliper	—
⑪	Brake Caliper Fastener (Front)	**36 ft-lbs (48 N·m)**

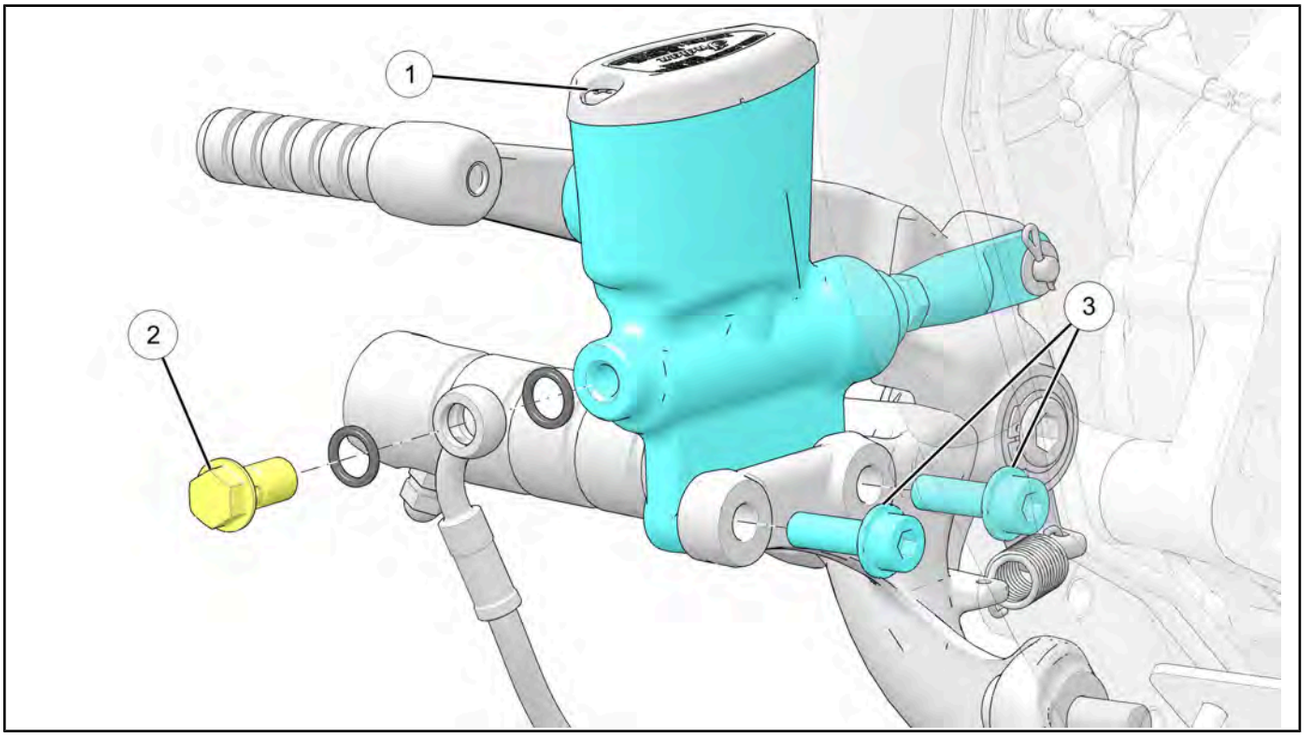
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REAR BRAKE SYSTEM COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Caliper Bleeder Screw	**53 in-lbs (6 N·m)**
②	Banjo Bolt	**18 ft-lbs (25 N·m)**
③	Rear Brake Caliper Fastener	**29 ft-lbs (40 N·m)**
④	Rear Brake Disc Fastener	**22 ft-lbs (30 N·m)**

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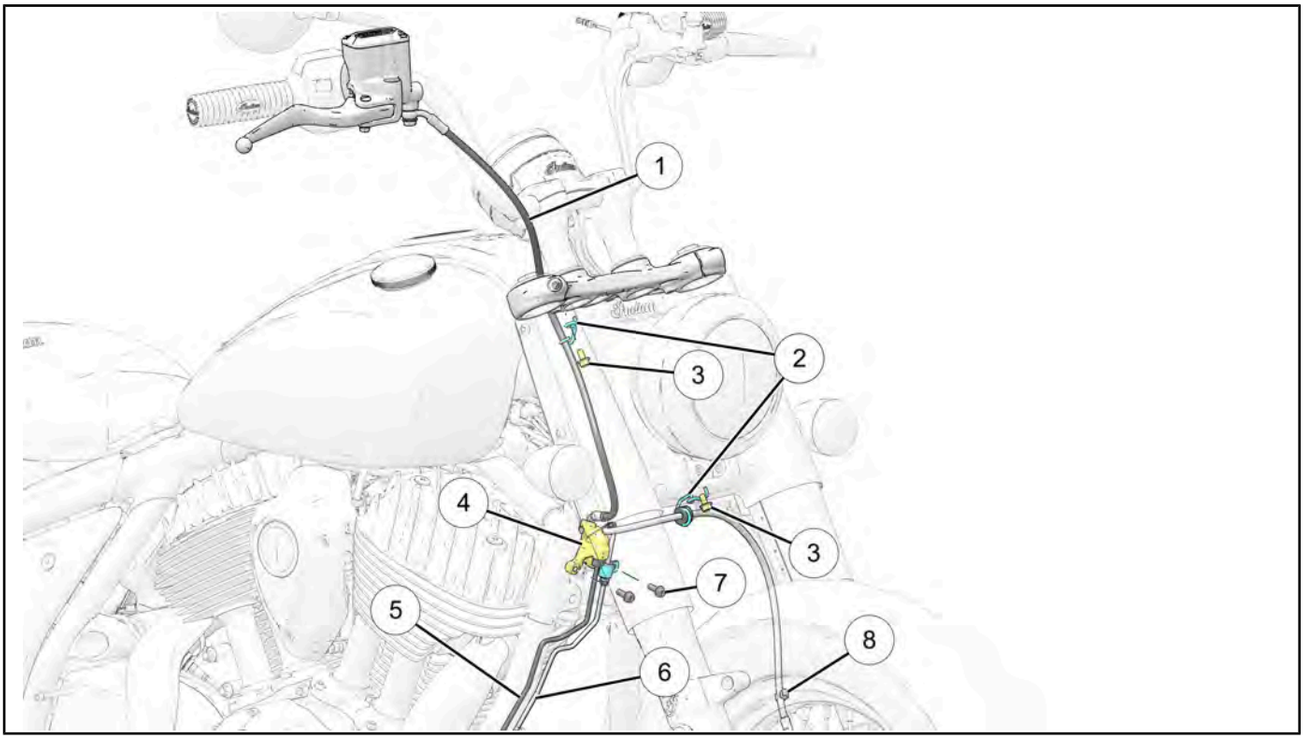


ITEM	DESCRIPTION	TORQUE
①	Master Cylinder Cover Fastener	**13 in-lbs (1.5 N·m)**
②	Banjo Bolt	**18 ft-lbs (25 N·m)**
③	Rear Master Cylinder Fastener	**18 ft-lbs (25 N·m)**

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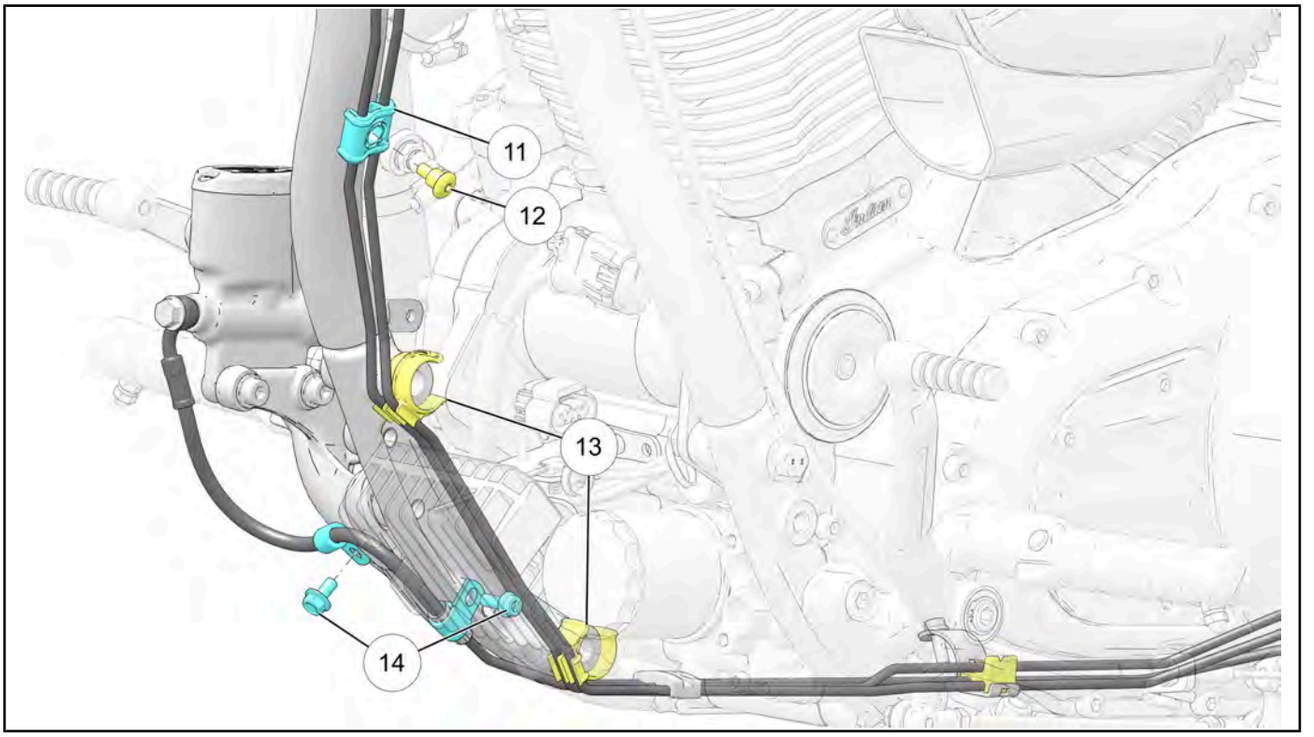
BRAKE LINE ROUTING

ABS



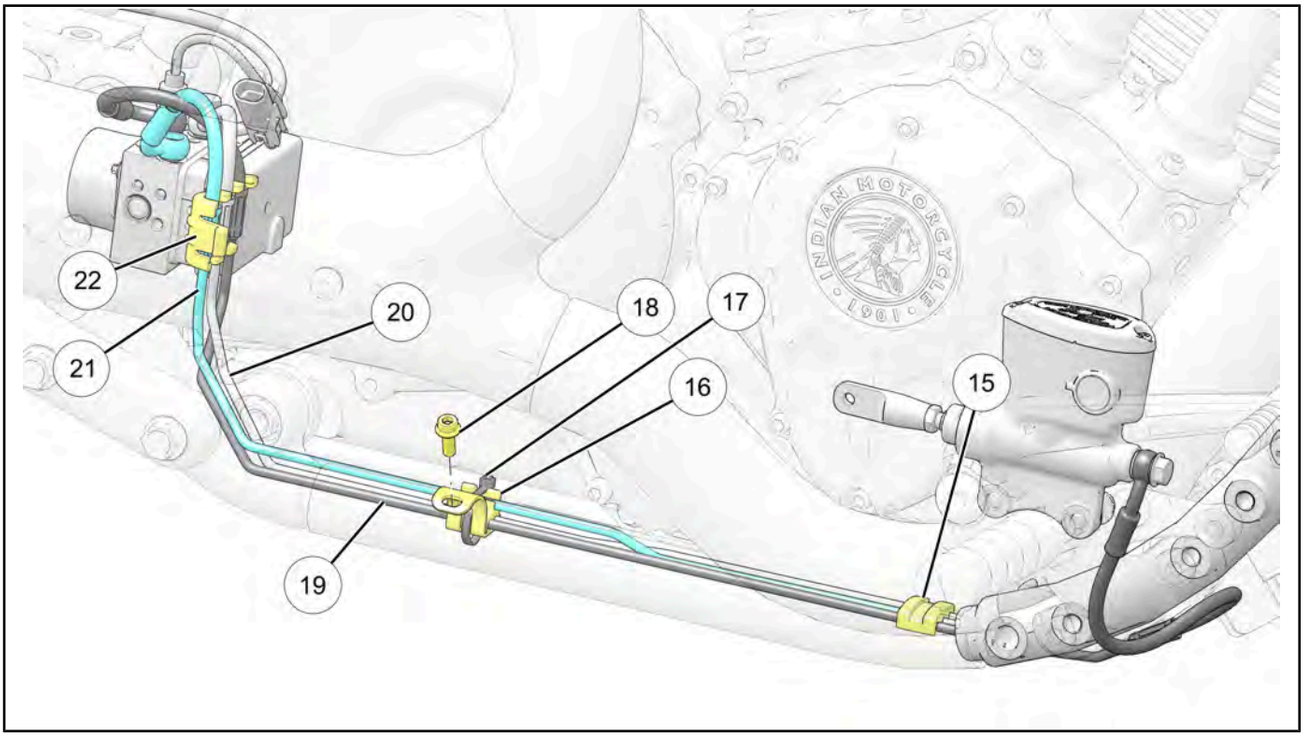
ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Master Cylinder to Brake Manifold Line	—	⑤	Brake Manifold to ABS Module Line	—
②	Wire Form Guide	—	⑥	ABS Module to Front Brake Caliper Line	—
③	Wire Form Guide Fastener	**80 in-lbs (9 N·m)**	⑦	Brake Manifold Fastener	**80 in-lbs (9 N·m)**
④	Brake Manifold	—	⑧	Guide Clip	—

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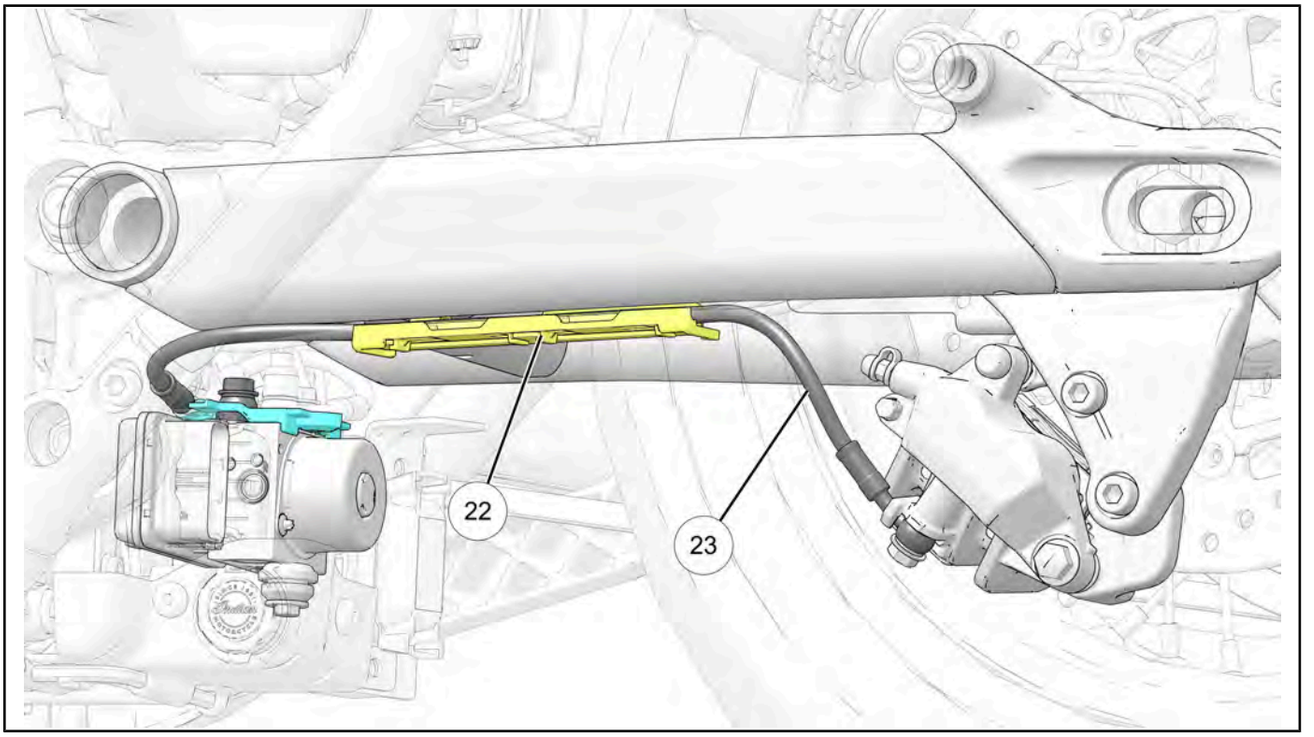
ITEM	DESCRIPTION	TORQUE
⑪	Brake Line Retainer	—
⑫	Brake Line Retainer Fastener	**80 in-lbs (9 N·m)**
⑬	Brake Line Boss Retainer	—
⑭	P-Clip Fastener	**80 in-lbs (9 N·m)**

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ITEM	DESCRIPTION	TORQUE
⑮	Retention Clip	—
⑯	Rear Retainer Clip	—
⑰	Panduit Strap	—
⑱	Rear Retainer Clip Fastener	**80 in-lbs (9 N·m)**
⑲	Rear Master Cylinder to ABS Module Line	—
⑳	Brake Manifold to ABS Module Line	—
㉑	Front Brake Caliper to ABS Module Line	—
㉒	ABS Brake Line Retainer	—

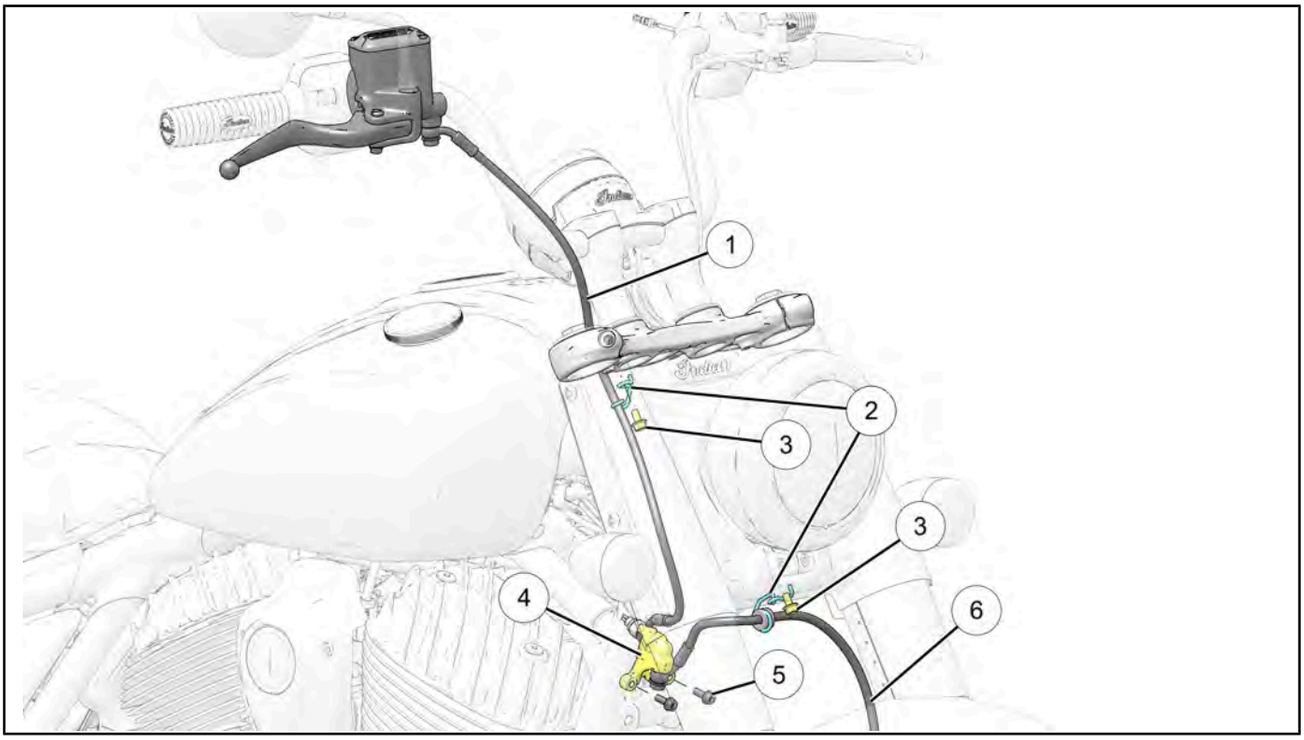
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ITEM	DESCRIPTION	TORQUE
㉒	Rear Brake Line Retention Clip	—
㉓	ABS Module to Rear Brake Caliper Line	—

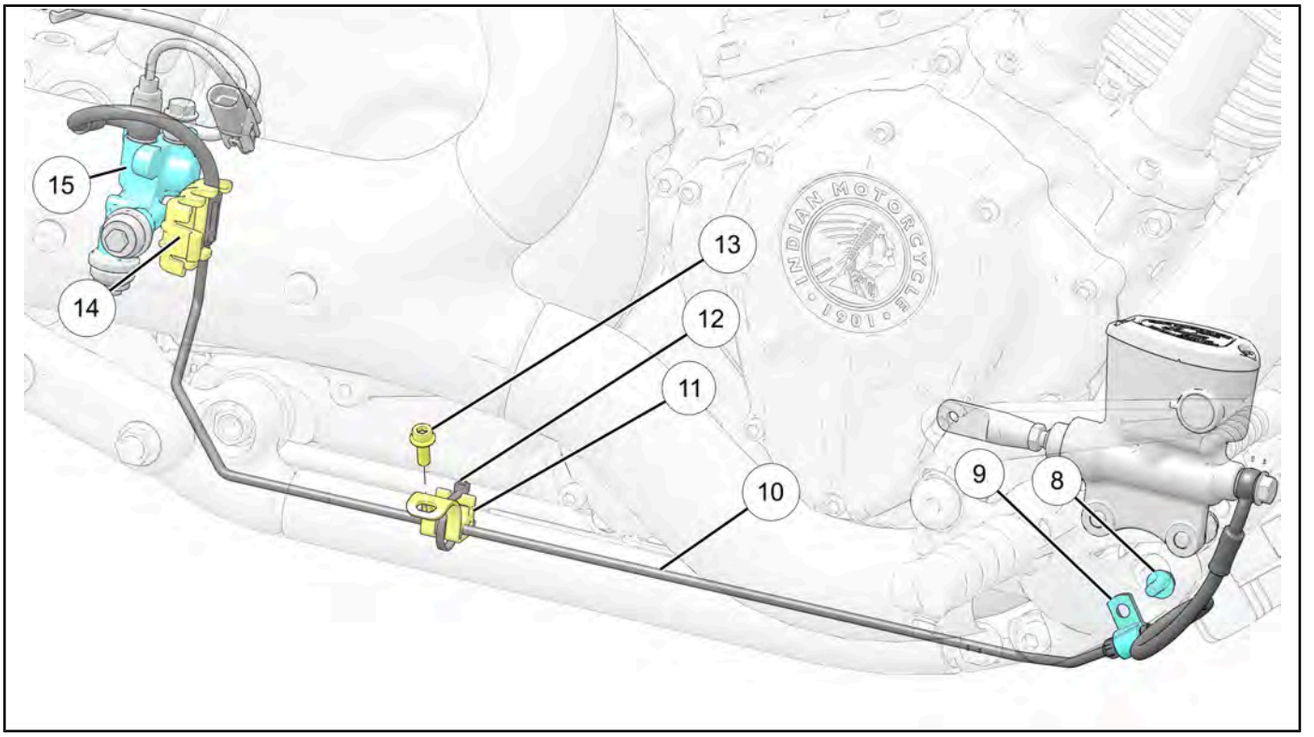
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NON-ABS



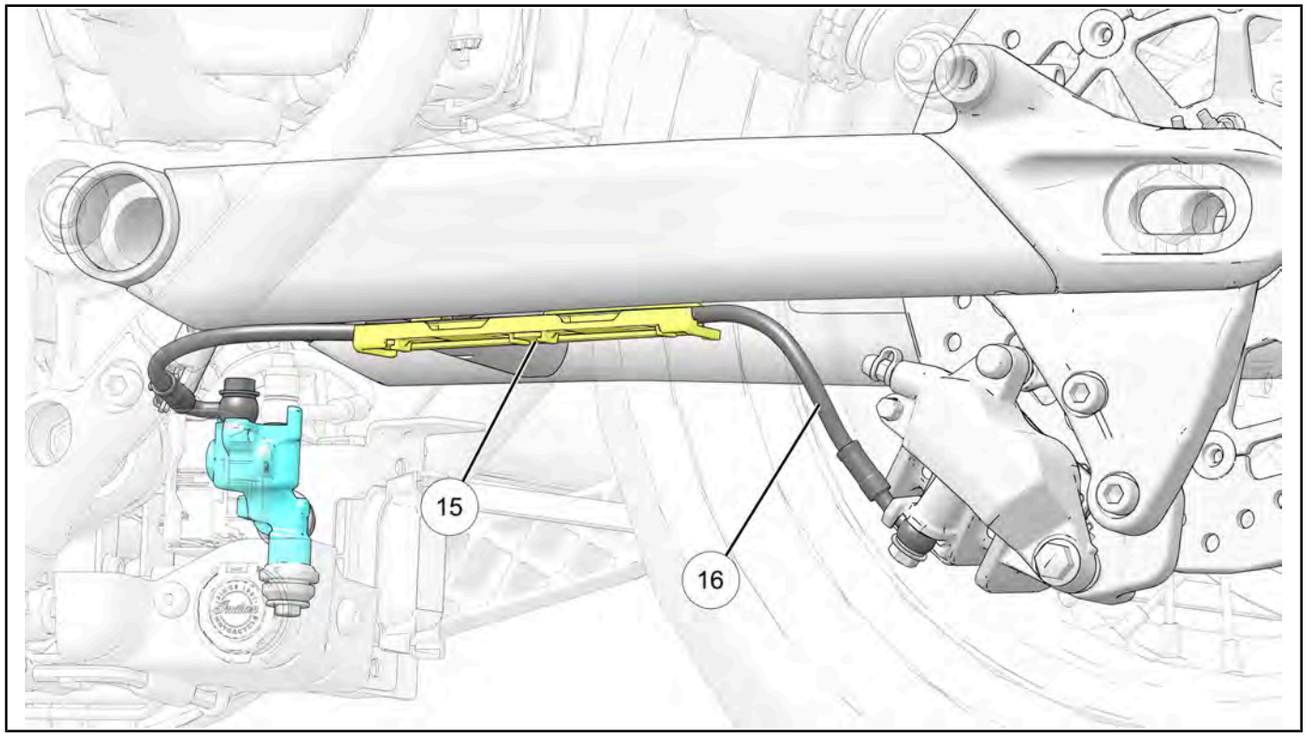
ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Master Cylinder to Brake Manifold Line	—	④	Brake Manifold	—
②	Wire Form Guide	—	⑤	Brake Manifold Fastener	**80 in-lbs (9 N·m)**
③	Wire Form Guide Fastener	**80 in-lbs (9 N·m)**	⑥	Brake Manifold to Front Brake Caliper	—

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ITEM	DESCRIPTION	TORQUE
⑧	P-Clamp Fastener	**80 in-lbs (9 N·m)**
⑨	P-Clamp	—
⑩	Rear Master Cylinder to Rear Brake Manifold	—
⑪	Rear Retainer Clip	—
⑫	Panduit Strap	—
⑬	Rear Retainer Clip Fastener	**80 in-lbs (9 N·m)**
⑭	Brake Line Retainer	—
⑮	Rear Brake Manifold	—

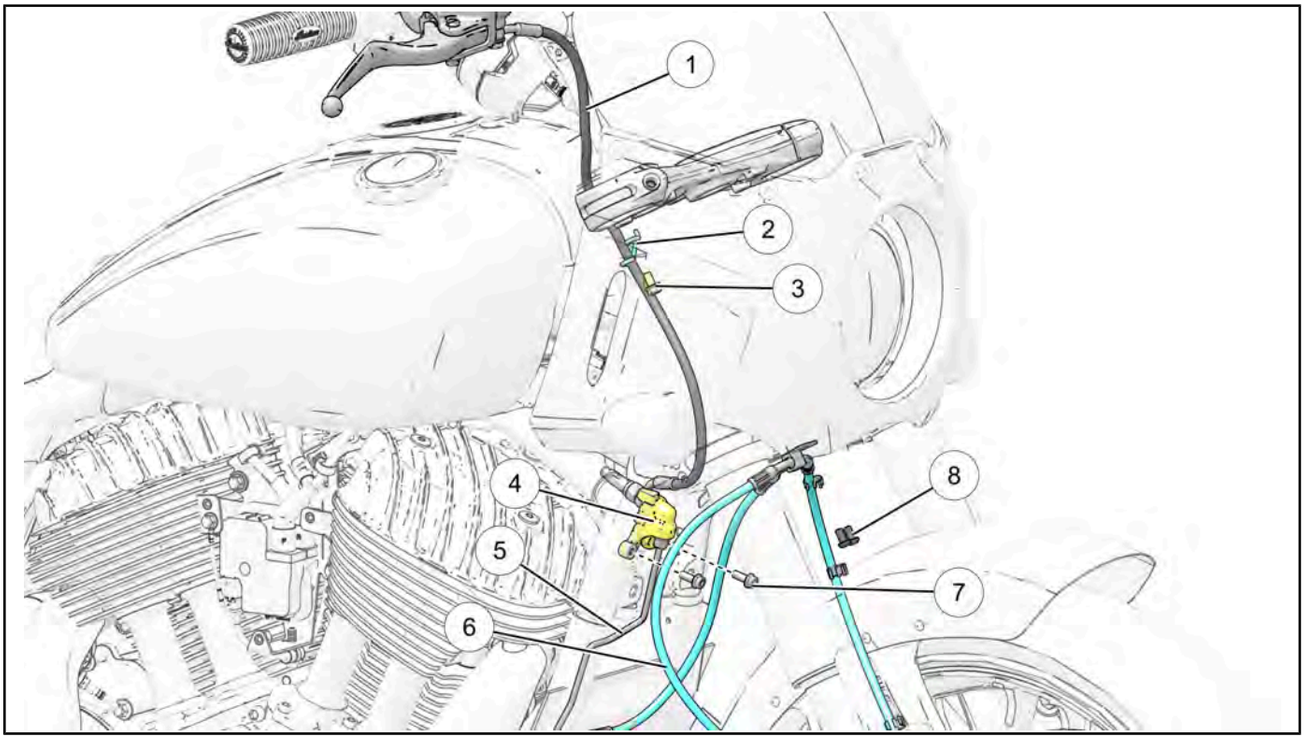
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ITEM	DESCRIPTION	TORQUE
⑮	Rear Brake Line Retention Clip	—
⑯	Brake Manifold to Rear Brake Caliper Line	—

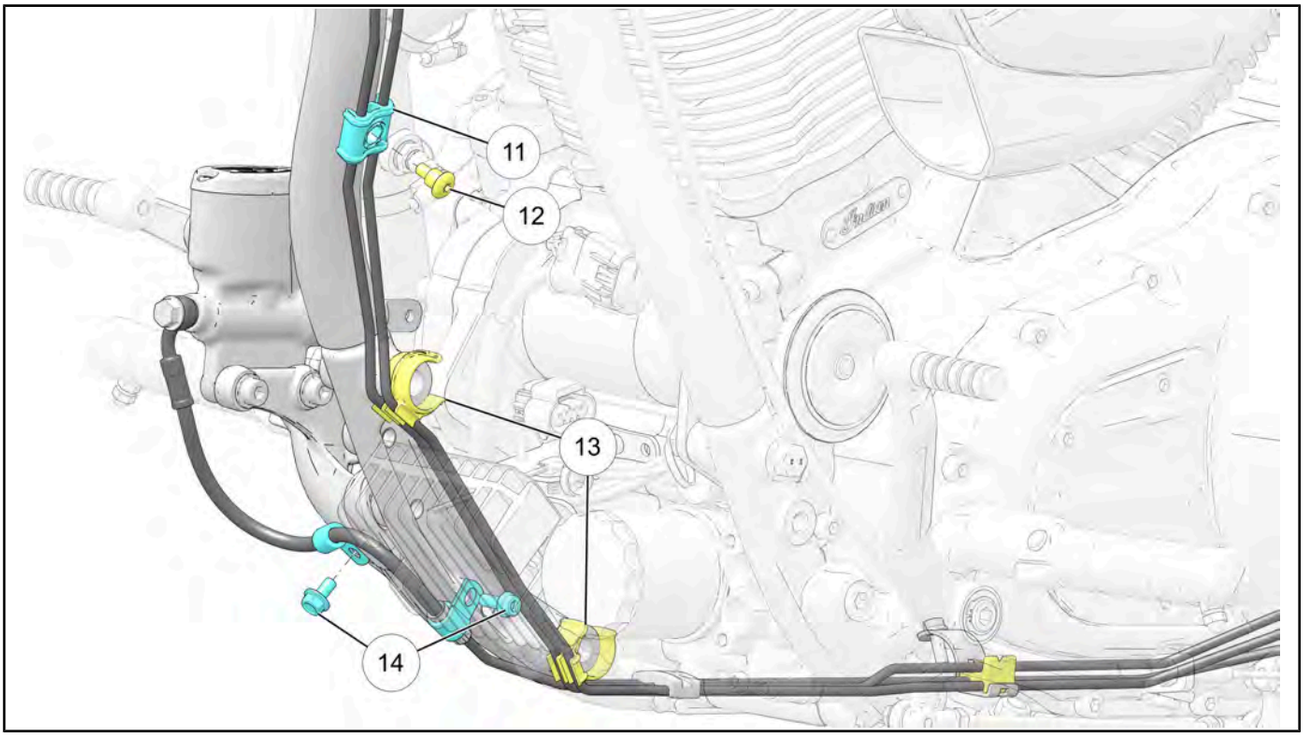
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BRAKE LINE ROUTING (SPORT CHIEF)



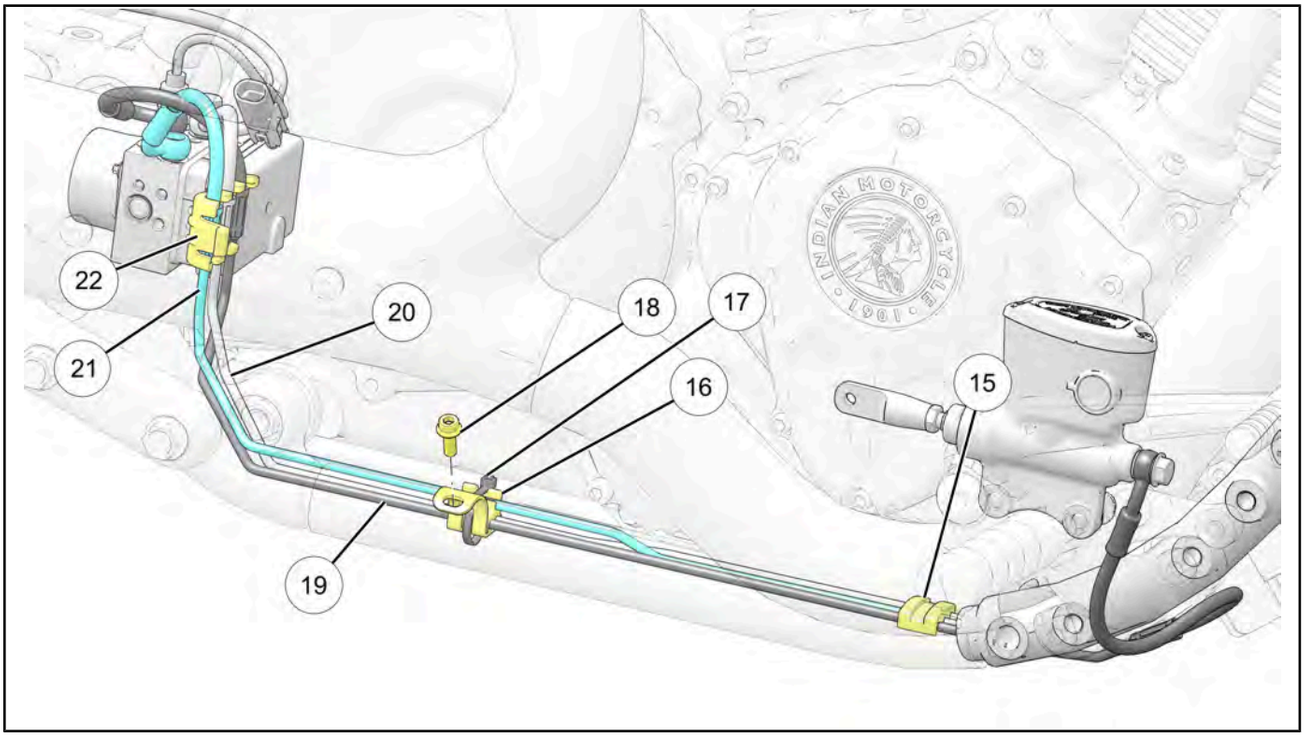
ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Master Cylinder to Brake Manifold Line	—	⑤	Brake Manifold to ABS Module Line	—
②	Wire Form Guide	—	⑥	ABS Module to Front Brake Caliper Line	—
③	Wire Form Guide Fastener	**80 in-lbs (9 N·m)**	⑦	Brake Manifold Fastener	**80 in-lbs (9 N·m)**
④	Brake Manifold	—	⑧	Brake Line Retainer Fastener	**80 in-lbs (9 N·m)**

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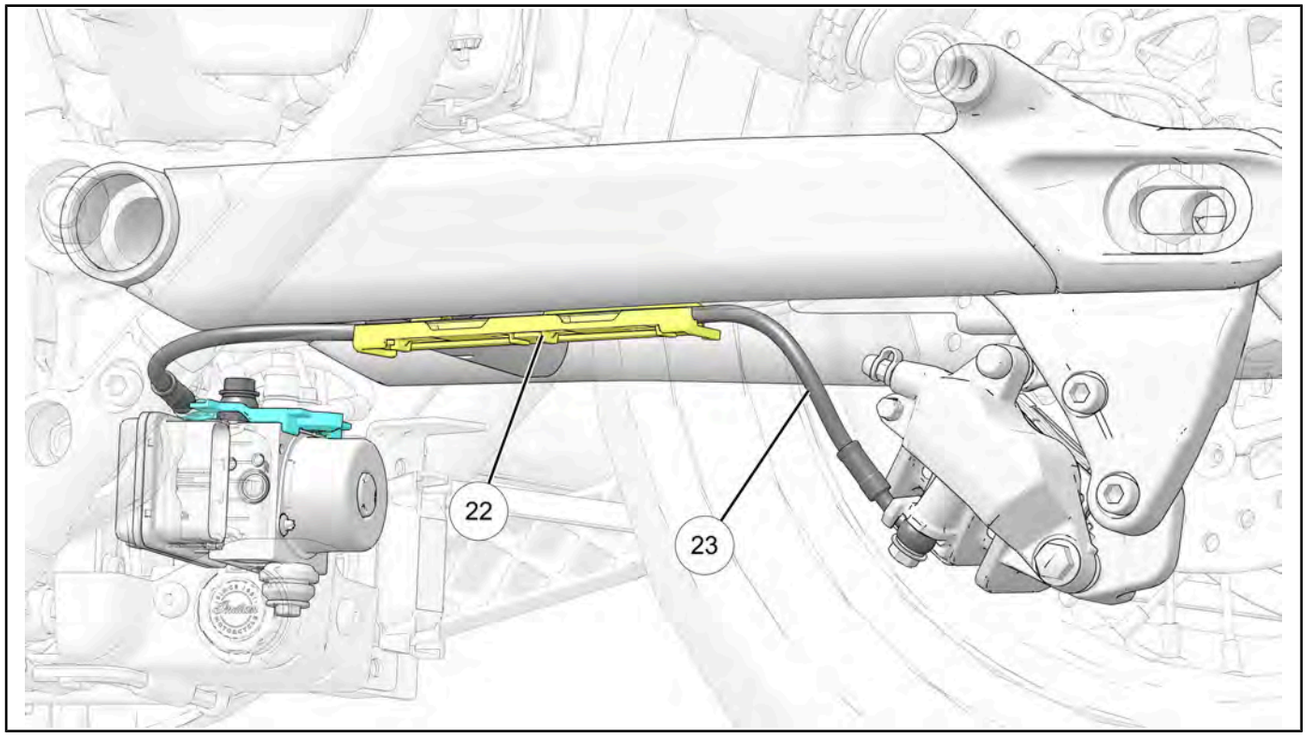
ITEM	DESCRIPTION	TORQUE
⑪	Brake Line Retainer	—
⑫	Brake Line Retainer Fastener	**80 in-lbs (9 N·m)**
⑬	Brake Line Boss Retainer	—
⑭	P-Clip Fastener	**80 in-lbs (9 N·m)**

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ITEM	DESCRIPTION	TORQUE
⑮	Retention Clip	—
⑯	Rear Retainer Clip	—
⑰	Panduit Strap	—
⑱	Rear Retainer Clip Fastener	**80 in-lbs (9 N·m)**
⑲	Rear Master Cylinder to ABS Module Line	—
⑳	Brake Manifold to ABS Module Line	—
㉑	Front Brake Caliper to ABS Module Line	—
㉒	ABS Brake Line Retainer	—

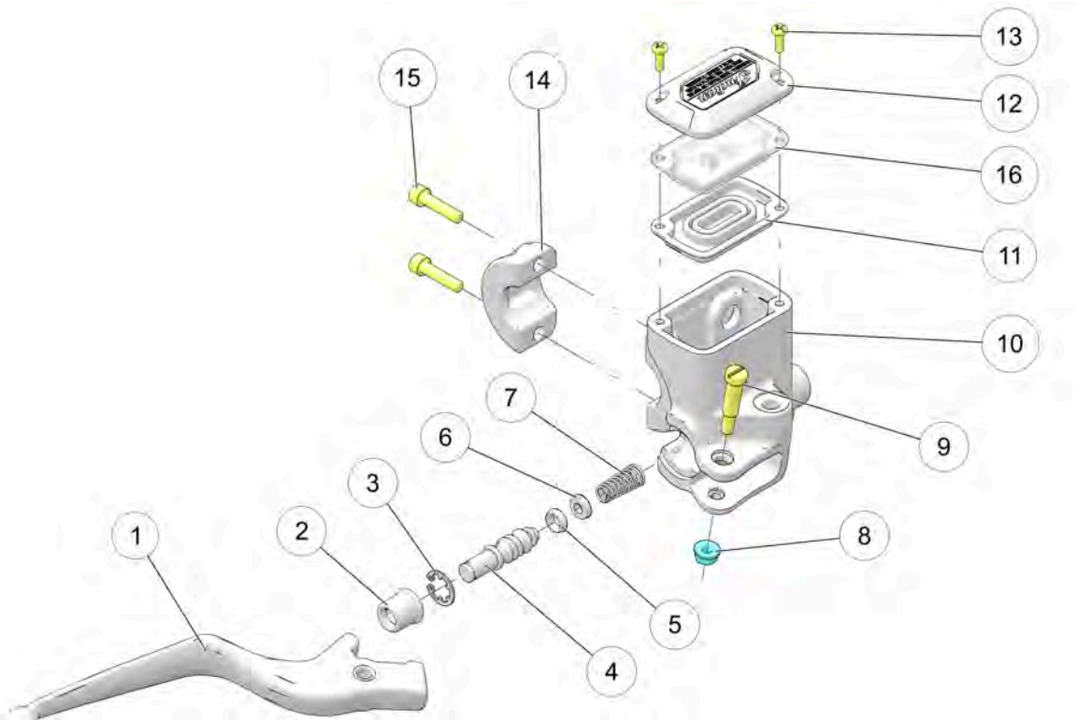
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ITEM	DESCRIPTION	TORQUE
㉒	Rear Brake Line Retention Clip	—
㉓	ABS Module to Rear Brake Caliper Line	—

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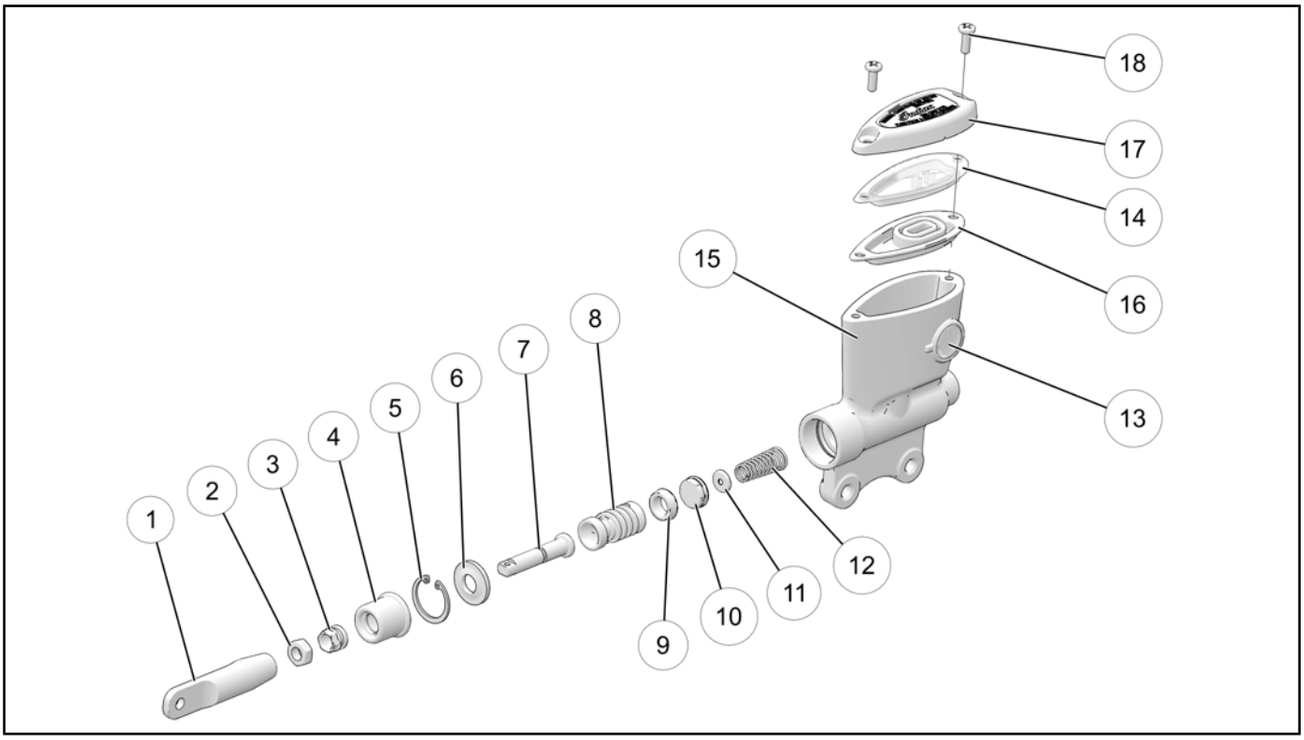
FRONT MASTER CYLINDER COMPONENTS



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Brake Lever	—	⑨	Brake Lever Pivot Fastener	**9 in-lbs (1 N·m)**
②	Dust Boot	—	⑩	Master Cylinder Body	—
③	Circlip	—	⑪	Diaphragm	—
④	Piston	—	⑫	Master Cylinder Cover	—
⑤	Secondary Cup	—	⑬	Master Cylinder Cover Fastener	**13 in-lbs (1.5 N·m)**
⑥	Primary Cup	—	⑭	Master Cylinder Perch Clamp	—
⑦	Spring	—	⑮	Master Cylinder Perch Clamp Fasteners	**88 in-lbs (10 N·m) Torque upper fastener, then lower**
⑧	Brake Lever Pivot Nut	**48 in-lbs (6 N·m)**	⑯	Diaphragm Plate	—

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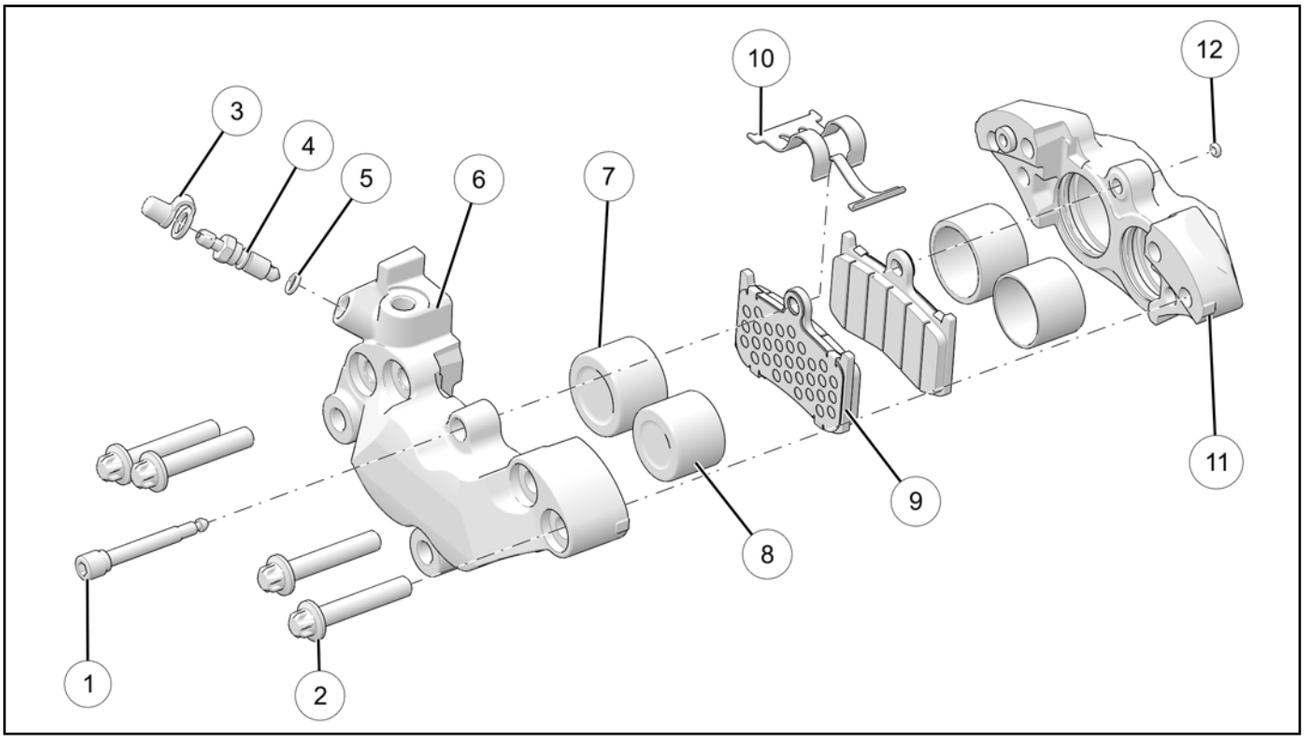
REAR MASTER CYLINDER COMPONENTS



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Clevis	—	⑩	Primary Cup	—
②	Master Cylinder Clevis Nut (rear)	**12 ft-lbs (17 N·m)**	⑪	Spring Cup	—
③	Pushrod Nut	—	⑫	Spring	—
④	Boot	—	⑬	Sight Glass	—
⑤	Circlip	—	⑭	Master Cylinder Diaphragm Plate	—
⑥	Stop Plate	—	⑮	Master Cylinder Body	—
⑦	Pushrod	—	⑯	Diaphragm	—
⑧	Piston	—	⑰	Master Cylinder Cover	—
⑨	Secondary Cup	—	⑱	Master Cylinder Cover Fastener	**13 in-lbs (1.5 N·m)**
			⑲	Sight Glass O-Ring (not shown)	—

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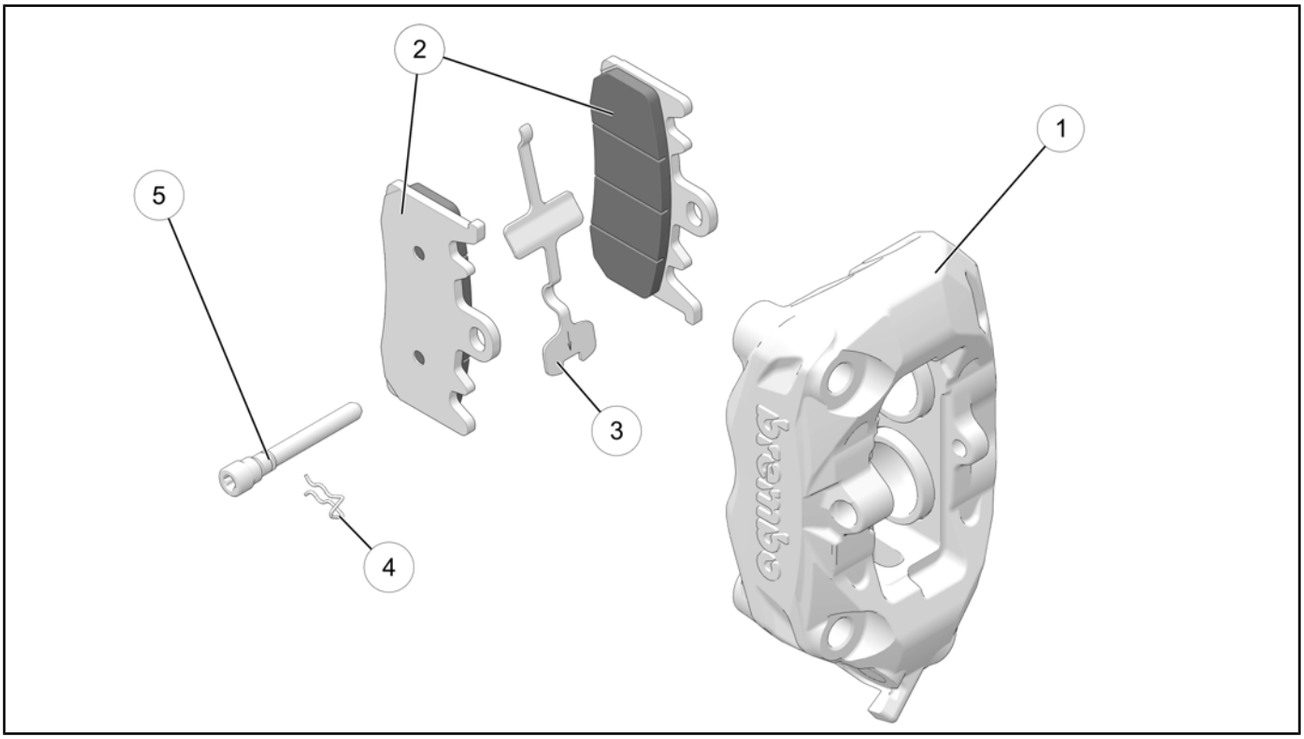
FRONT BRAKE CALIPER COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Caliper Pin	**12 ft-lbs (17 N·m)**
②	Caliper Body Fastener	**20 ft-lbs (27 N·m)**
③	Bleeder Screw Cap	—
④	Bleeder Screw	**53 in-lbs (6 N·m)**
⑤	Bleeder Screw O-ring	—
⑥	Outboard Caliper Body	—
⑦	Caliper Piston	—
⑧	Caliper Piston	—
⑨	Brake Pad	—
⑩	Pad Spring	—
⑪	Inboard Caliper Body	—
⑫	Stopper Ring	—

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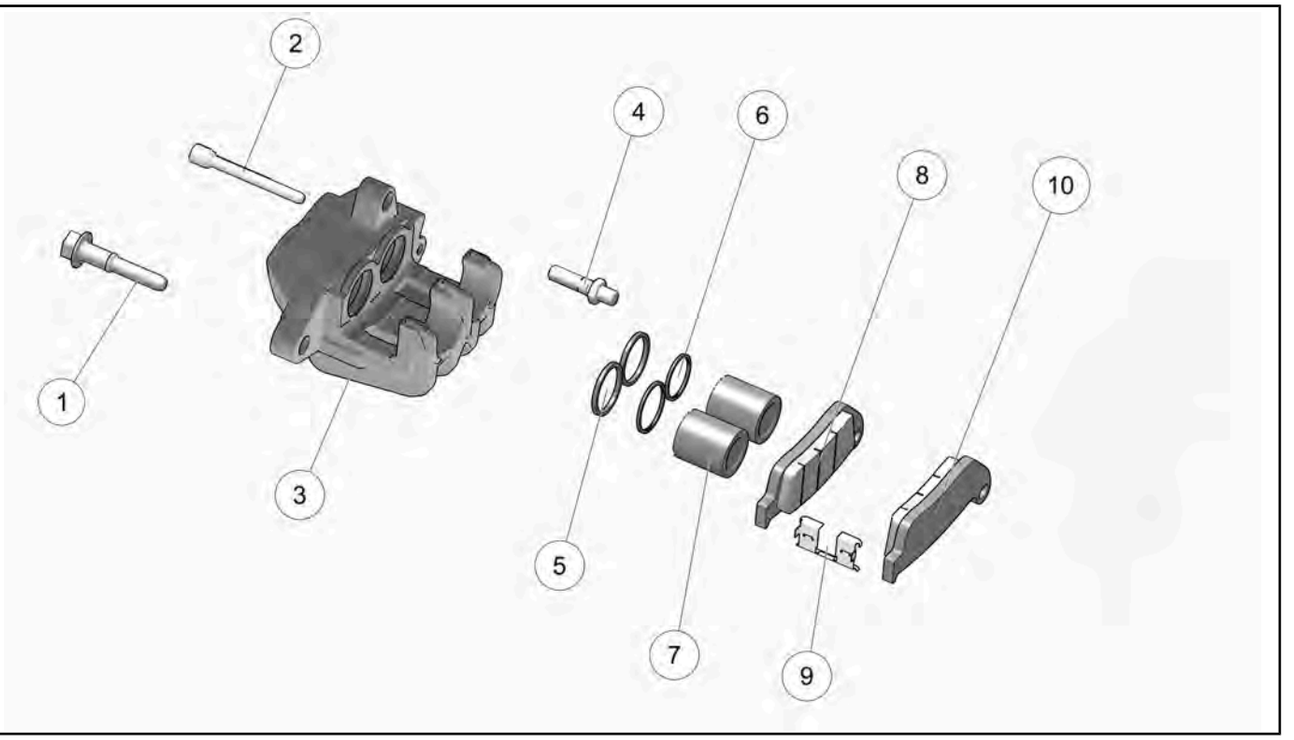
FRONT BRAKE CALIPER COMPONENTS (SPORT CHIEF)



ITEM	DESCRIPTION	TORQUE
①	Caliper Body	—
②	Brake Pads (shims not shown)	—
③	Pad Spring	—
④	Pin Clip	—
⑤	Brake Pad Retaining Pin	**53 in-lbs (6 N·m)**

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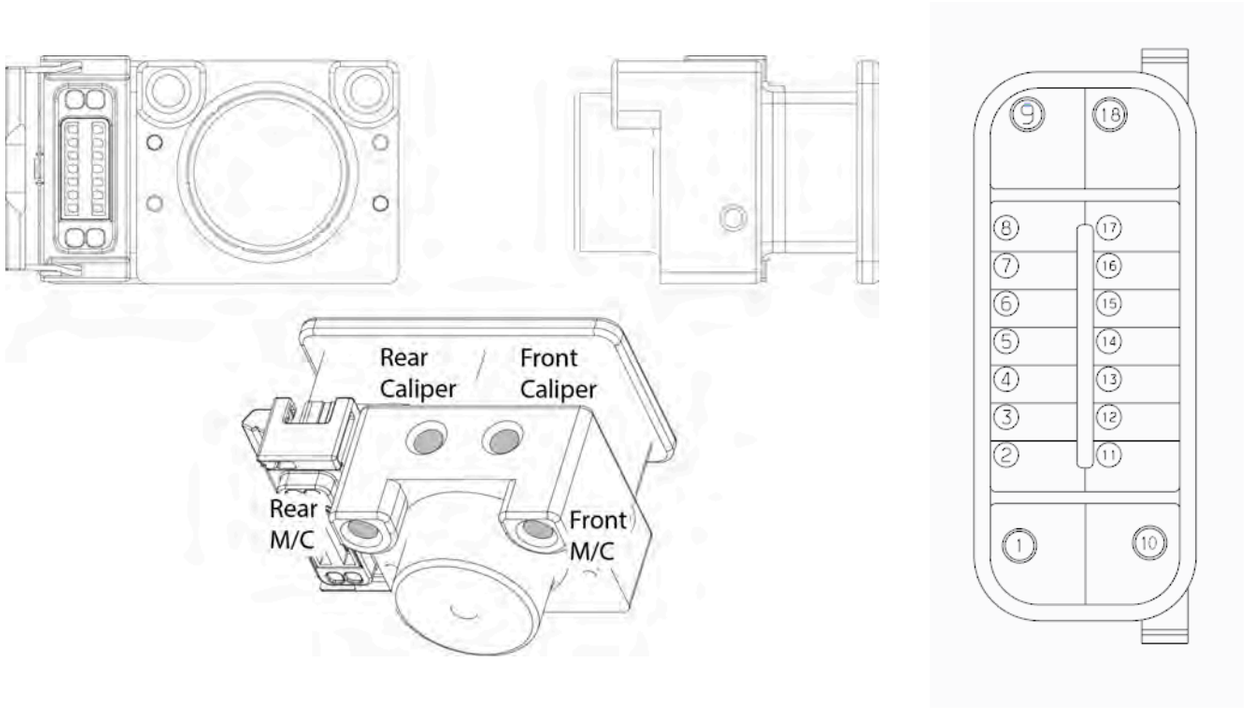
REAR BRAKE CALIPER COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Caliper Retainer Fastener	**20 ft-lbs (27 N·m)**
②	Pad Retaining Pin	**12 ft-lbs (17 N·m)**
③	Caliper Body	—
④	Guide Pin	**115 in-lbs (13 N·m)**
⑤	Piston Seal	—
⑥	Dust Seal	—
⑦	Piston	—
⑧	Outboard Brake Pad	—
⑨	Pad Spring	—
⑩	Inboard Brake Pad	—

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ABS MODULE



PIN	DESCRIPTION	PIN	DESCRIPTION
1	Ground for ECU	10	Ground for Mount
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

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ANTILOCK BRAKE SYSTEM (ABS) INFORMATION

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 test described in this manual 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 OEM tires specified for the vehicle.
- Always maintain the recommended tire pressure.
- Indian Motorcycle DOT 4 Brake Fluid is recommended. 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) always illuminates when the key is in the ON position and remains on until the anti-lock system activates, which occurs when vehicle speed exceeds 6 mph (10 kph).
- If the lamp is not illuminated when the key is ON, connect Digital Wrench and perform an ABS System inspection to determine the cause.
- When the ABS lamp is illuminated, the anti-lock brakes will not activate, but the conventional brake system will continue to operate normally.
- If the lamp continues to illuminate after the vehicle speed exceeds 6 mph (10 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 air gap is non-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 fuse is open or removed, the ABS light will remain ON after 6 mph (10 kph). ABS will not be active. Normal (conventional) braking will be available provided the system components (master cylinder, lines, calipers, etc.) are in working order.

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ABS SYSTEM COMPONENTS

The following parts *function* in the same manner as the same component in a non-ABS system, although parts are not necessarily interchangeable. Always refer to the appropriate ABS parts information when replacing a component or component parts.

- Front Brake Calipers
- Rear Brake Caliper
- Front Master Cylinder
- Rear Master Cylinder
- Brake Light Switch
- Brake Lines

In addition to the brake system components listed above, the following are exclusive to ABS equipped vehicles:

- Wheel speed sensors utilize pulse rings that are mounted to the front and rear wheels.
- The tone rings are integrated to the wheel bearings.
- The rear wheel speed sensor is located between the rear wheel and the caliper bracket.
- ABS Module Assembly
- ABS Related Wiring
- ABS Indicator Lamp

ABS OVERVIEW OF OPERATION

The ABS system is active and available when vehicle speed exceeds 6 mph (10 kph).

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 ECM turns on the ABS indicator lamp (via the CAN BUS) and leaves it on even after vehicle speed exceeds 6 mph (10 kph) activation speed.

If a system fault occurs, the light will remain on (and ABS will not be active) 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.

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ABS SYSTEM SERVICE

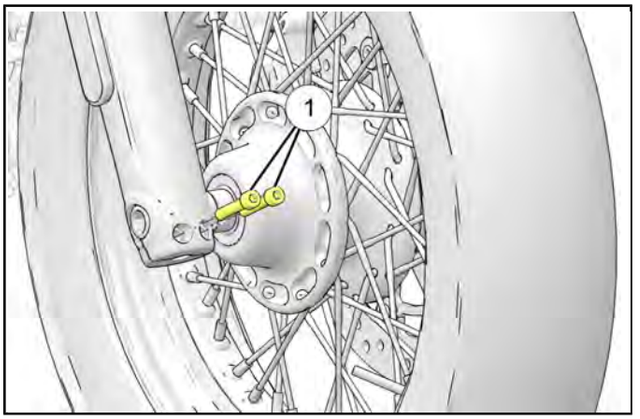
WHEEL SPEED SENSOR REPLACEMENT

FRONT WHEEL SPEED SENSOR

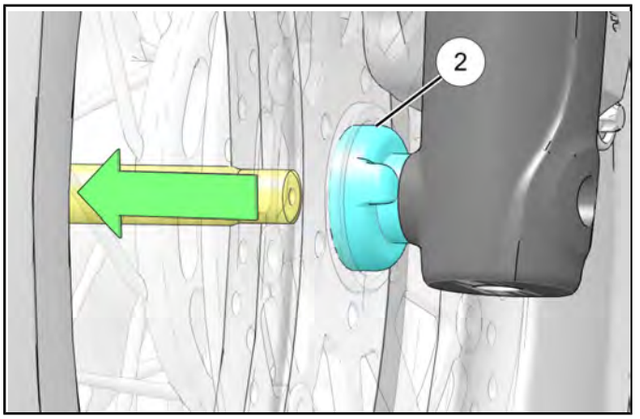
⚠ WARNING

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.

1. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.
2. Loosen axle pinch bolts ① on lower right fork leg.



3. Remove the axle and wheel speed sensor ②.



4. Disconnect the wheel speed sensor electrical connector.

NOTICE

With the wheel speed sensor removed, draw a straight line across the bearing races and seal/tone ring with a black marker. This can be used for the wheel speed sensor diagnostics at a later date to see if the tone ring is moving without the outer race turning at the same rate.

5. **Installation is performed by reversing the removal procedure.**

TORQUE
Axle (front fork): **52 ft-lbs (70 N·m)**

TORQUE
Axle Pinch Fasteners: **18 ft-lbs (25 N·m)Tighten each screw once after initial torque**

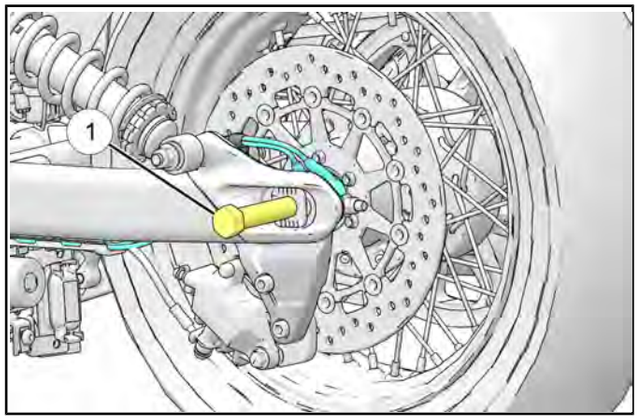
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REAR WHEEL SPEED SENSOR

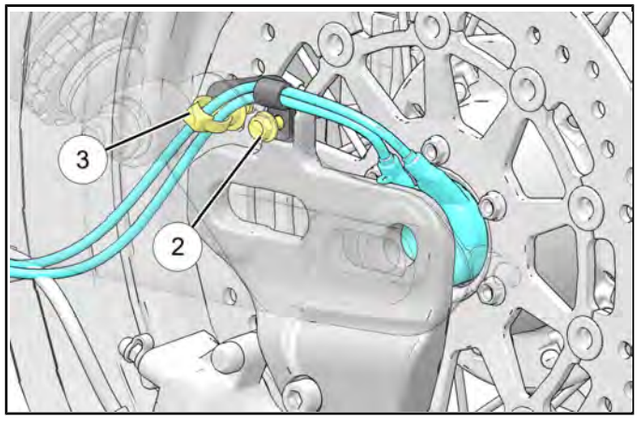
⚠ WARNING

This procedure requires raising and supporting the motorcycle so that the rear 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.

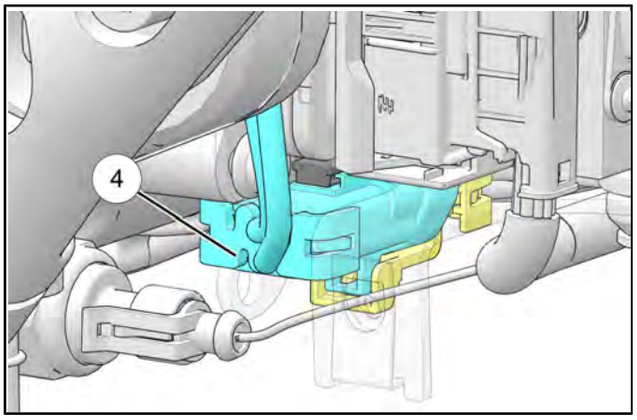
1. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.
2. Loosen right and left axle adjusters.
3. Remove rear axle ①.



4. Remove the wheel speed sensor p-clamp fastener ②.



5. Disconnect routing clip ③.
6. Disconnect the wheel speed sensor electrical connector ④ and remove.



7. **Installation is performed by reversing the removal procedure.**

TORQUE
P-Clamp Fastener: **80 in-lbs (9 N·m)**

TORQUE
Rear Axle Nut: **65 ft-lbs (88 N·m)**

8. Adjust the drive belt. See **Drive Belt Adjustment page 8.66**.
9.

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ABS MODULE REPLACEMENT

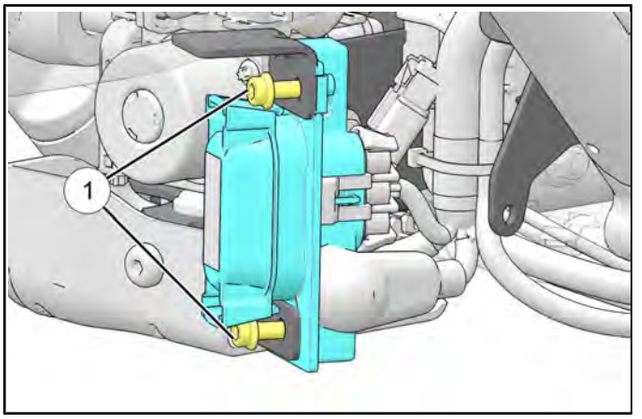
IMPORTANT

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.

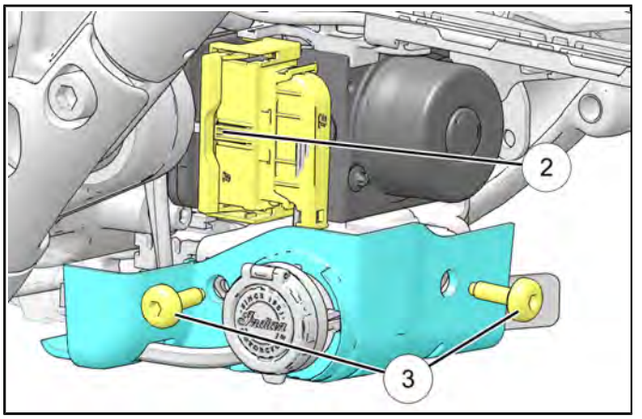
⚠ WARNING

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.

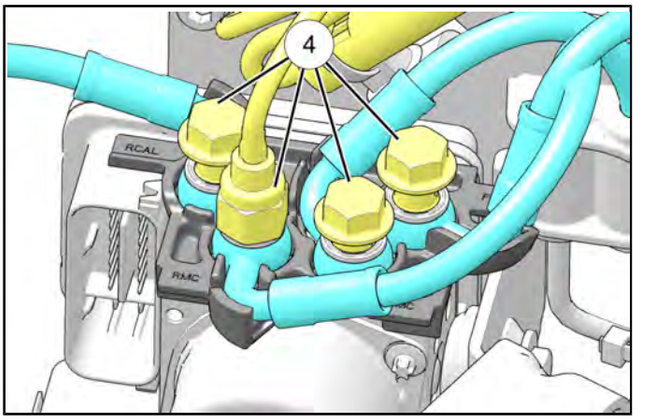
1. Disconnect the negative battery cable.
2. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
3. Remove J-case mounting fasteners ①.



4. Allow the J-case to hang off the harness away from the ABS module and bracket.
5. Remove ABS tray fasteners ③.
6. Disconnect ABS electrical connector ② by depressing lock release and swinging the latch rearward. The connector will then lift and release.



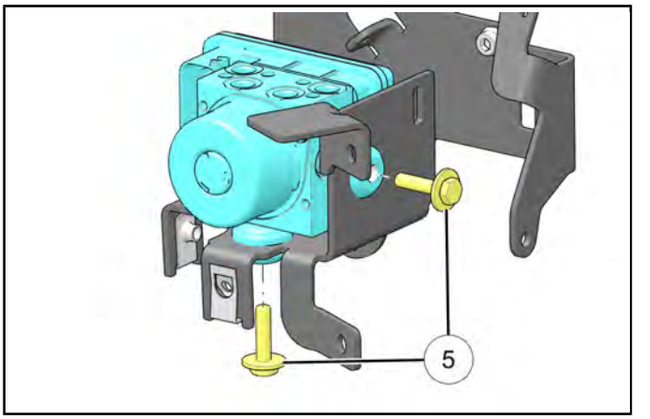
7. Remove Brake Line banjo bolts ④.



IMPORTANT

Note location of each line and port. Lines must be returned to the correct port they were removed from. See **ABS Module page 9.29**

8. Remove ABS module fasteners ⑤ and remove module.



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9. **Installation is performed by reversing the removal procedure.**

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

TORQUE
Banjo Bolt: **18 ft-lbs (25 N·m)**

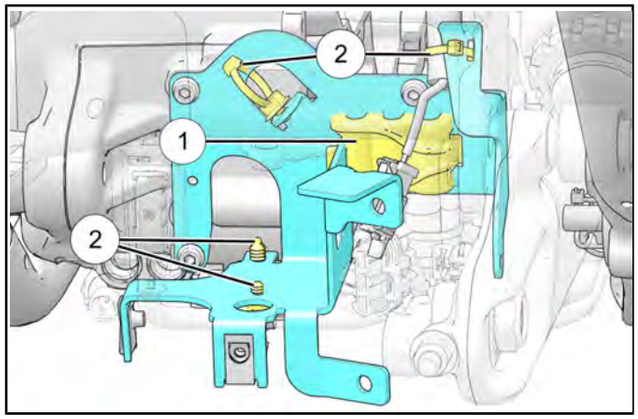
TORQUE
ABS Tray Fastener: **35 in-lbs (4 N·m)**

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

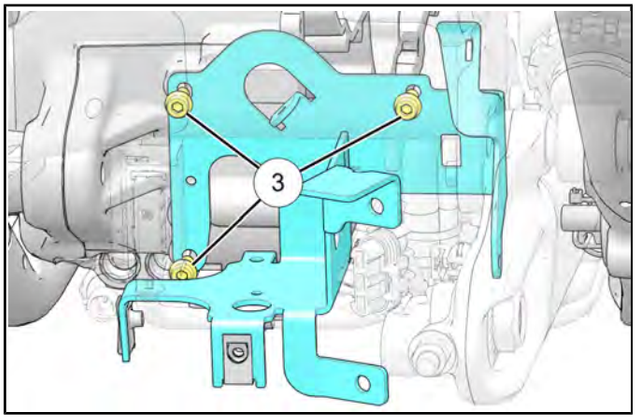
10. Bleed Brake system. See **Brake Fluid Replacement / Bleeding Precautions page 9.37**.

ABS BRACKET REMOVAL / INSTALLATION

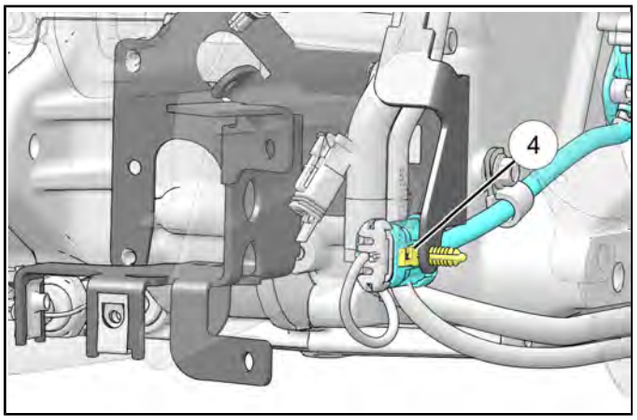
1. Remove ABS module. See **ABS Module Replacement page 9.34**.
2. Disconnect Brake line retainer ①.



3. Remove harness retention features ②.
4. Remove ABS bracket fasteners ③.



5. Disconnect gear position sensor electrical connector ④ from the bracket.



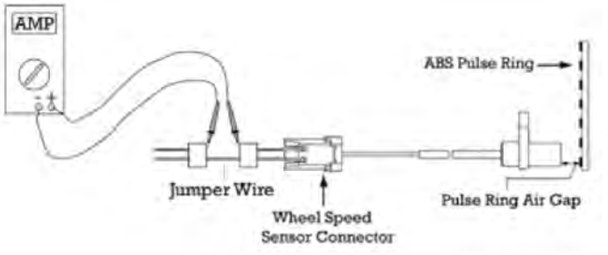
6. **Installation is performed by reversing the removal procedure.**

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

9

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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 4 - 10 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.

Disconnect the harness from the ABS modules and complete the following tests:

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)?

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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.
- Always torque banjo bolts 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.



9

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ABS FLUID CHANGE

Review Brake Fluid Replacement and Bleeding Precautions before working with brake fluid.

IMPORTANT

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.

IMPORTANT

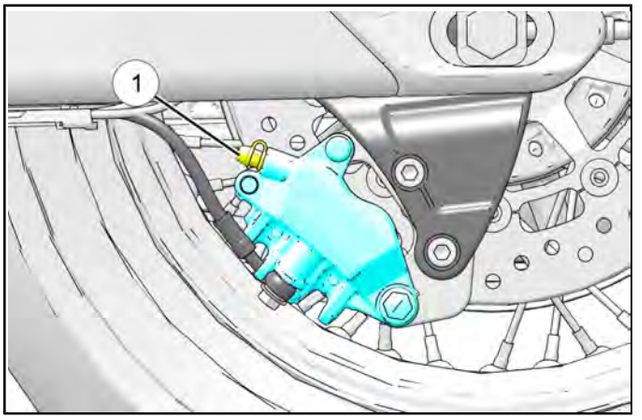
EMPTY LINES - If system is dry or very low on fluid due to parts replacement or disassembly, fill reservoir and pump lever or pedal slowly through stroke range until air bubbles no longer rise through the fluid into the reservoir.
FLUSHING THE SYSTEM - Brake systems should be flushed every 2 years or 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

IMPORTANT

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 8mm box end wrench on the screw.



2. Clean and remove reservoir cap on the master cylinder.
3. Fill rear brake fluid reservoir and leave cover off so fluid can be added as it is drawn through the system.
4. Attach a tight-fitting clear hose from the vacuum bleeder to the bleed screw and apply vacuum.
5. Open bleed screw about 1/4 turn.
6. Vacuum bleed approximately four reservoirs worth of fluid through the system.

IMPORTANT

Vacuum bleed until the level in the reservoir has been lowered to the LOW level then refill reservoir.

⚠ WARNING

Do not allow reservoir level to fall below the LOW level or complete system bleeding will be required.

7. Close bleeder screw and fill the brake fluid reservoir appropriately per the level indications on the sight glass.
8. Torque bleed screw to specification and install the rubber cap.

TORQUE

Rear Caliper Bleeder Screw:
53 in-lbs (6 N·m)

9. Clean the reservoir cover, diaphragm, diaphragm plate, and reservoir sealing surface. If diaphragm is extended, return it to normal (flat) position. Install diaphragm, diaphragm plate, and cover.



TORQUE

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

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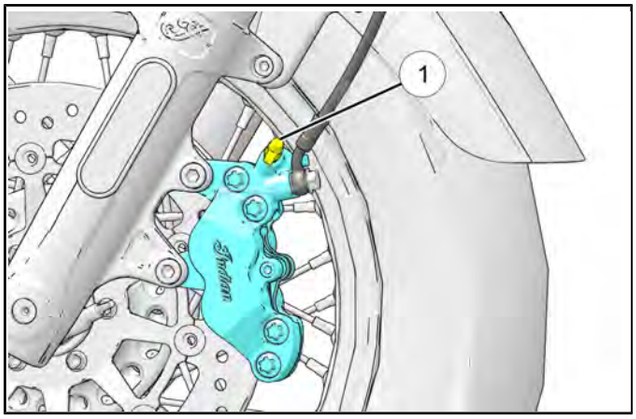
10. If pedal is not firm, repeat bleeding procedure and inspect brake system.
11. If unable to obtain a firm pedal feel after brake system bleeding, contact Technical Service at **1-800-330-9407**

ABS FRONT BRAKE BLEEDING

IMPORTANT

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 bleeder screw ① on front caliper and place 8mm box end wrench on the screw.



2. Clean and remove reservoir cap on the master cylinder.
3. Fill front brake fluid reservoir and leave cover off so fluid can be added as it is drawn through the system.
4. Attach tight fitting clear hose from vacuum bleeder to bleed screw and apply vacuum.
5. Open bleed screw about 1/4 turn.
6. Vacuum bleed approximately four reservoirs worth of fluid through the system.

IMPORTANT

Vacuum bleed until the level in the reservoir has been lowered to the LOW level then refill reservoir.

⚠ WARNING

Do not allow reservoir level to fall below the LOW level or complete system bleeding will be required.

7. Close bleeder screw and fill the brake fluid reservoir appropriately per the level indications on the sight glass.
8. Repeat procedure until lever feels firm.

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9. Torque bleed screw to specification and install the rubber cap.

TORQUE
Caliper Bleeder Screws: **53 in-lbs (6 N·m)**

10. Clean the reservoir cover, diaphragm, diaphragm plate, and reservoir sealing surface. If diaphragm is extended, return it to normal (flat) position. Install diaphragm, diaphragm plate, and cover.



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

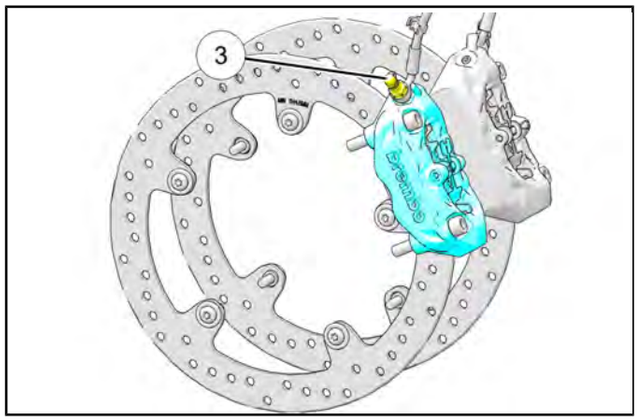
11. Perform brake lever reserve inspection. See **Brake Lever Reserve Inspection page 9.41**.

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ABS FRONT BRAKE BLEEDING (SPORT CHIEF)

NOTICE
Bleed left front caliper first then right caliper. Repeat the bleeding procedure at least once.

1. Remove front brake fluid reservoir cover and leave it off so fluid can be added as it is drawn through the system.
2. Remove rubber cap from bleeder screw ③ on *front left* caliper and place a box end wrench on the screw.



3. Attach tight fitting clear hose from vacuum bleeder to bleed screw and apply vacuum.
4. Hold lever to handlebar or hold firm pressure on lever, then open bleed screw about 1/4 turn.
5. 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.
6. Close bleeder screw and fill the brake fluid reservoir.
7. Proceed to Step 8 to bleed the right front brake caliper.
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 and install diaphragm, diaphragm plate, and cover. Torque cover fasteners to specification.

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

15. Perform Brake Lever Reserve Inspection. See **Brake Lever Reserve Inspection (Sport Chief) page 9.42**.

NOTICE
If air is stuck in front calipers and the above procedure doesn't flush it out, an additional method can be used. Squeeze the lever several times to pump up the brake system. Squeeze and hold the lever, and open the bleeder screw a 1/4 turn. While still holding the lever, push the caliper pistons back into the caliper to push air and fluid within the caliper out through the bleed screw. Close the bleed screw, and repeat these steps as necessary.

BRAKE LEVER RESERVE INSPECTION

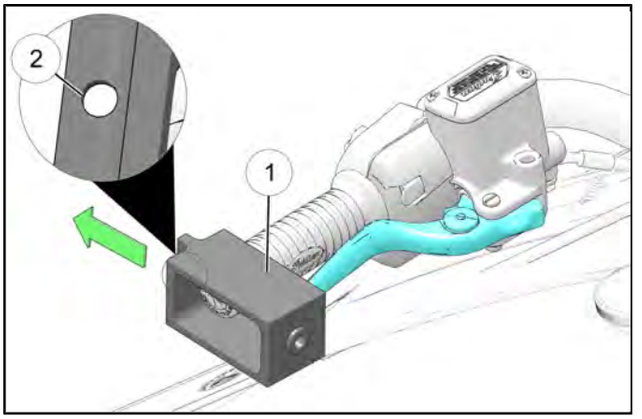
NOTICE
This procedure requires use of the Brake Lever Reserve Tool **(PV-50104)**.

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 9.5**.
3. Place grommet of brake handle pressure tester **PV-50104** ① on ball end of front brake lever.

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4. Connect a scale (commercially available) with a minimum of 25 kg / 50 lb capacity to end of tool ②.



5. Keep tool centered so it does not touch hand grip. Pull on scale connected to tool eyelet.

Brake Lever Reserve Force: **43 lbs (19.5 kg)**

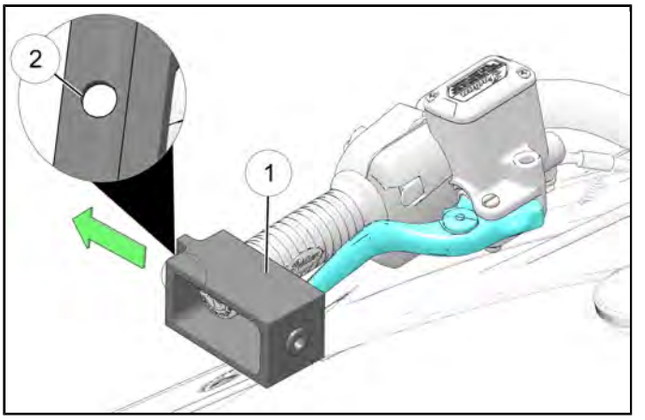
6. Safely elevate the front wheel. Verify wheel rotates freely without drag or binding when lever is released.
7. Have an assistant verify brake lever *does not* contact hand grip. Clearance must exist at specified pull force.
8. If the minimum brake lever reserve force is not met before the lever makes contact with the hand grip, the brake system will need to be bled. See **ABS Front Brake Bleeding page 9.39**.

BRAKE LEVER RESERVE INSPECTION (SPORT CHIEF)

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 9.5**.
3. Place grommet of brake handle pressure tester **PV-50104** ① on ball end of front brake lever.
4. Connect a scale (commercially available) with a minimum of 25 kg / 50 lb capacity to end of tool ②.



5. Keep tool centered so it does not touch hand grip. Pull on scale connected to tool eyelet.

Brake Lever Reserve Force: **36 lbs (16 kg)**

6. Safely elevate the front wheel. Verify wheel rotates freely without drag or binding when lever is released.
7. Have an assistant verify brake lever *does not* contact hand grip. Clearance must exist at specified pull force.
8. 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 (Sport Chief) page 9.41**.

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BRAKE SYSTEM SERVICE

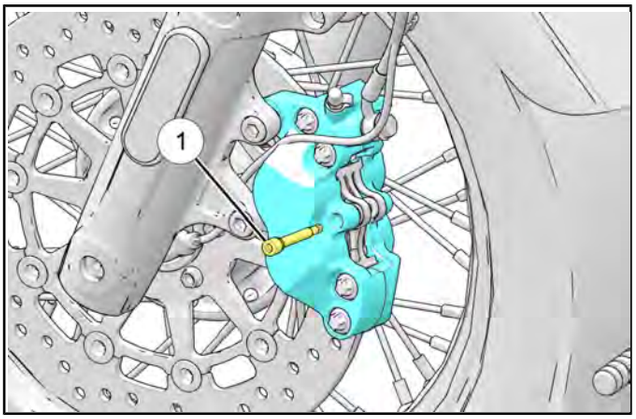
CHIEF FRONT BRAKE SERVICE

FRONT BRAKE PAD REPLACEMENT

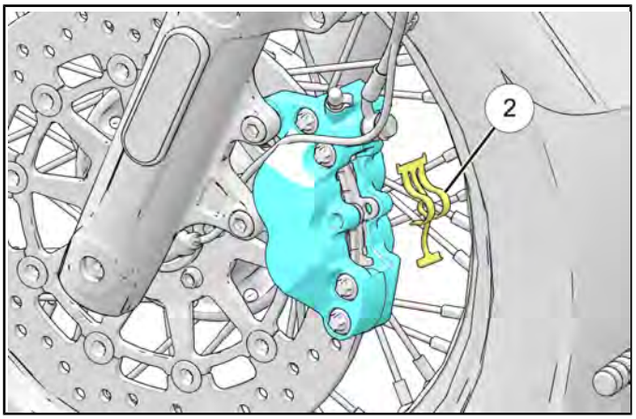
IMPORTANT

Always replace brake pads as a set and always replace pads at the same time.

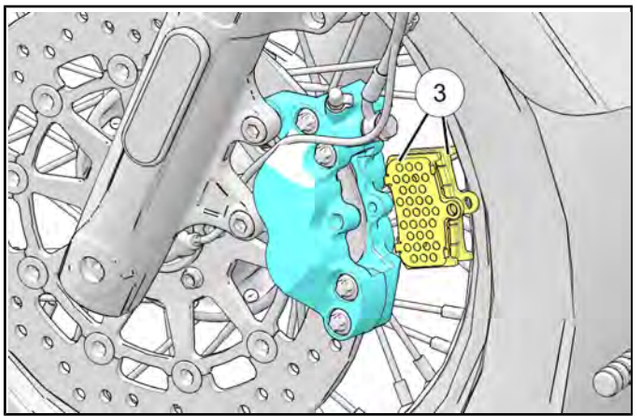
1. Remove pin ①.



2. Remove pad spring ②.



3. Remove brake pads ③.



4. Compress the caliper pistons.
5. **Installation is performed by reversing the removal procedure**

NOTICE

Insulators and shims must be reinstalled on each pad prior to assembly.

TORQUE

Caliper Pin:
12 ft-lbs (17 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.

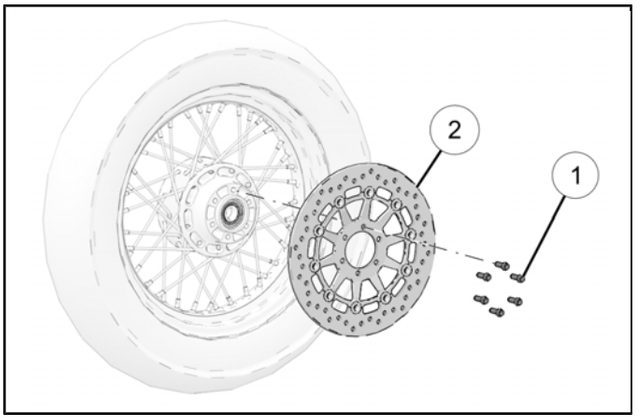
⚠ WARNING

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.

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BRAKE DISC REMOVAL / INSTALLATION

1. Remove front wheel. See **Front Wheel Removal / Installation page 8.29**.
2. Remove and discard brake disc fasteners ①.



3. Remove brake disc ② from wheel.
4. **Installation is performed by reversing the removal procedure.**
5. Torque *new* brake disc fasteners to specification in a star pattern.

TORQUE
Brake Disc Fasteners: **22 ft-lbs (30 N·m)**

FRONT CALIPER SERVICE

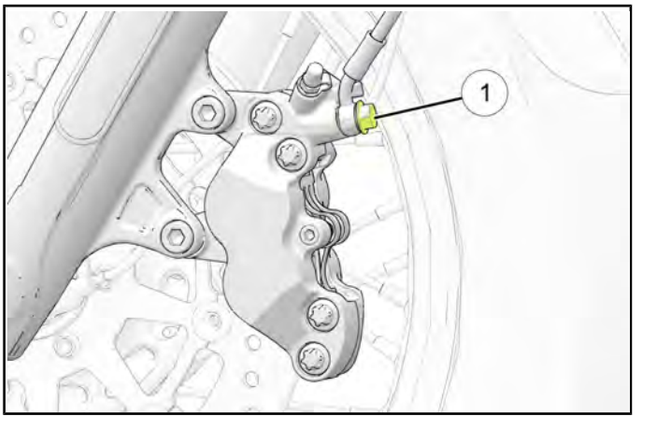
⚠ CAUTION

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.

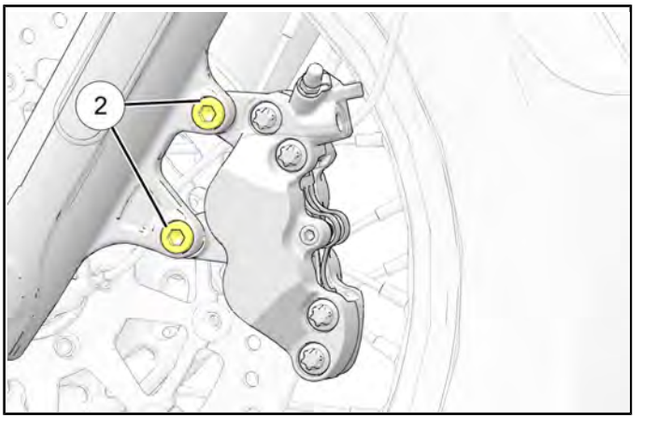
IMPORTANT

Replace all rubber parts upon assembly. Keep parts in order for assembly. *The top and bottom pistons in the caliper are NOT the same size*.

1. Remove banjo fastener ①, sealing washers, and brake hose from caliper assembly and allow it to drain into a container. Cover the end of brake line to prevent debris from entering.

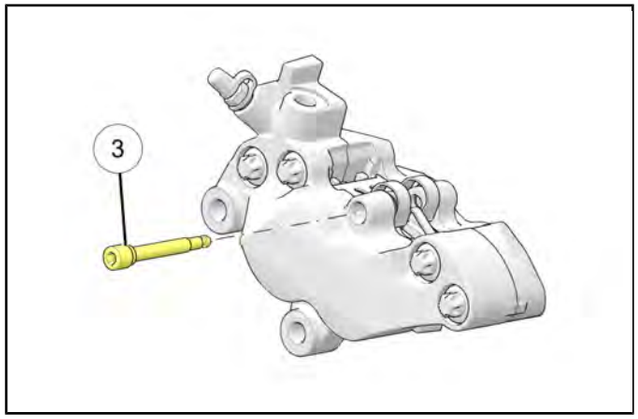


2. Remove front caliper mounting fasteners ② and remove the caliper.

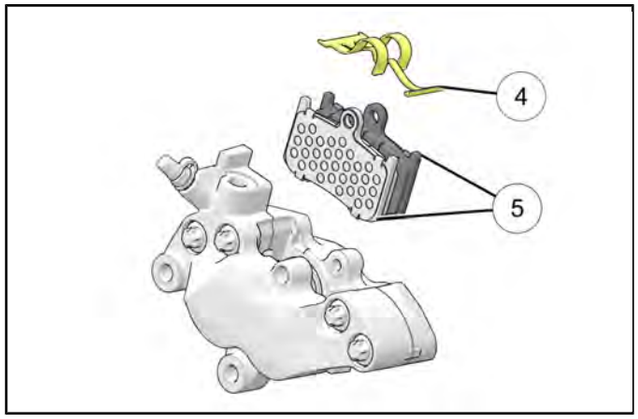


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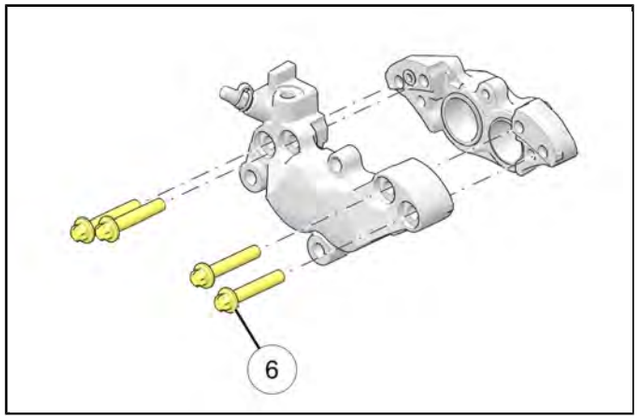
3. Cover the brake hose connection on the caliper and clean the outer surfaces of caliper assembly with brake cleaner (commercially available) or isopropyl alcohol. Dry with compressed air.
4. Remove the caliper pin ③.



5. Remove spring clip ④ and brake pads ⑤.



6. Remove caliper body fasteners ⑥ and separate the caliper.



7. Keep parts in order for assembly in the same bore.
8. Remove each piston with a caliper piston pliers. If a caliper piston pliers is not available, wrap the caliper in a shop towel and apply short bursts of compressed air through the brake line hole and through the transfer passage to force the pistons out of the bore.
9. Remove dust seals and piston seals. Use care not to damage the seal bores.
10. Clean all parts thoroughly with isopropyl alcohol. Be sure the seal bores are clean, removing all traces of dirt or dried brake fluid.
11. Clean piston seal and dust seal bores to remove residue that could cause the pistons to stick, resulting in brake drag.
12. Inspect each piston bore for corrosion, scratches, scoring, or pitting. Replace caliper if any of these conditions are evident.

IMPORTANT
Install all new rubber parts during assembly. Do not reuse old seals or boots.

13. Apply special lubricant from service kit to new piston seals and dust seals. If special lubricant is not available use clean DOT4 brake fluid.
14. Apply clean DOT4 brake fluid to outer surface of all pistons.
15. Install piston seals and dust seals in caliper body.
16. Install pistons in their respective bores.
17. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Caliper Pin **12 ft-lbs (17 N·m)**

TORQUE
Caliper Body Fasteners **20 ft-lbs (27 N·m)**

TORQUE
Bleeder Screw **53 in-lbs (6 N·m)**

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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
Caliper Mounting Fasteners (front): **29 ft-lbs (40 N·m)**

5. Connect brake hose to caliper with banjo bolt and new sealing washers. Torque to specification.

TORQUE
Banjo Bolt (Brake Line): **18 ft-lbs (25 N·m)**

6. Fill and bleed the front brake hydraulic system. See **ABS Front Brake Bleeding page 9.39**.

⚠ 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.

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SPORT CHIEF FRONT BRAKE SERVICE

FRONT BRAKE PAD REPLACEMENT (SPORT CHIEF)

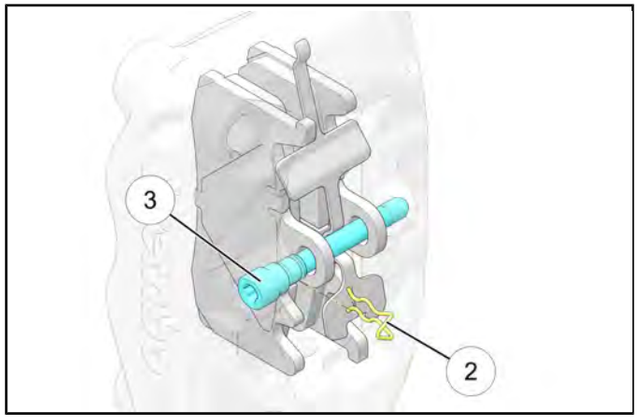
IMPORTANT
Always replace brake pads as a set and always replace pads in both front calipers at the same time.

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

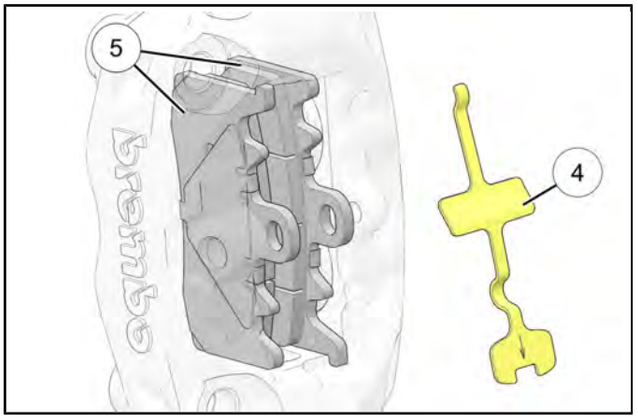
https://vimeo.com/354240031/843e9a9251

REMOVAL

1. Remove the pin clip ② and brake pad retaining pin ③.



2. Pull out pad spring ④ from the body.



3. Push each pad back by hand to gain clearance for new pads.

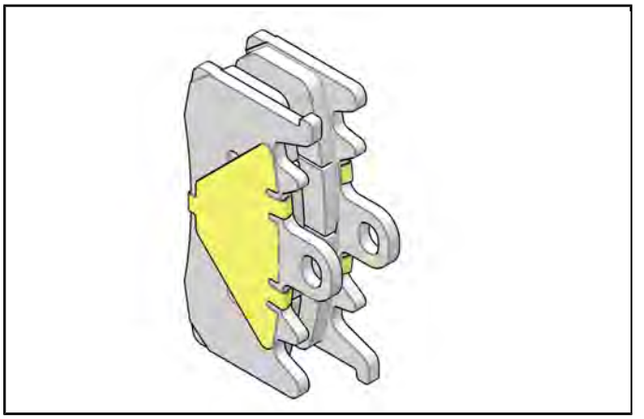
NOTICE
Brake fluid will be forced back into the reservoir when pads are pushed back. Remove reservoir cover and monitor fluid level while pushing the pads and pistons back.

4. Remove each pad ⑤.

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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 shims onto brake pads as shown. Be sure shim does not protrude from the brake backing plate.



5. Install new brake pads with friction material toward disc.

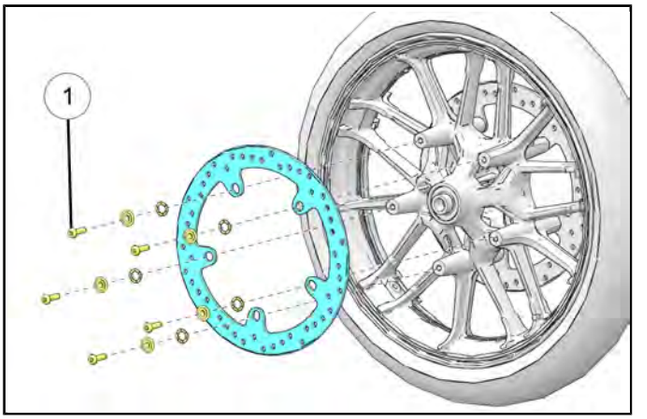
TORQUE
Brake Pad Retaining Pin (Front): **53 in-lbs (6 N·m)**

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.

BRAKE DISC REMOVAL / INSTALLATION (SPORT CHIEF)

1. Remove front wheel. See **Front Wheel Removal / Installation (Sport Chief) page 8.31**.
2. Remove brake disc fasteners ①.



3. Remove brake disc from wheel.
4. **Installation is performed by reversing the removal procedure.**
5. Torque brake disc fasteners to specification in a star pattern.

TORQUE
Brake Disc Fasteners: **22 ft-lbs (30 N·m)**

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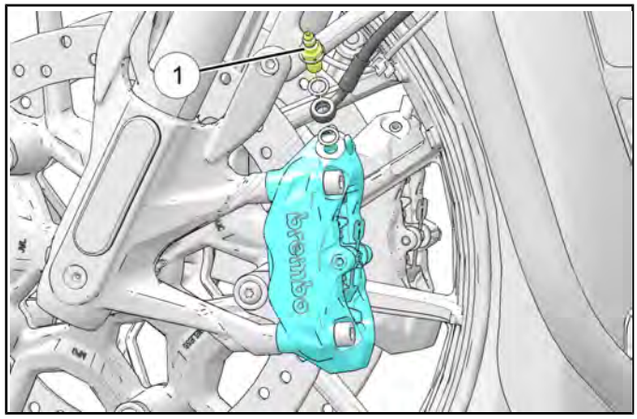
FRONT CALIPER SERVICE (SPORT CHIEF)

⚠ CAUTION

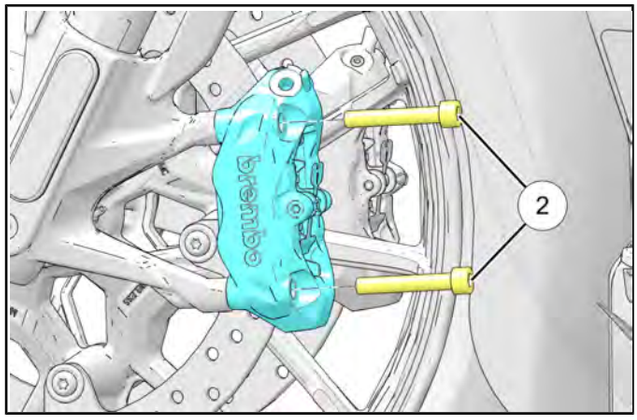
Brake fluid and brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake 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. *The top and bottom pistons in the caliper are the same size*.

1. Remove banjo fastener ① , sealing washers, and brake hose from caliper assembly and allow it to drain into a container.



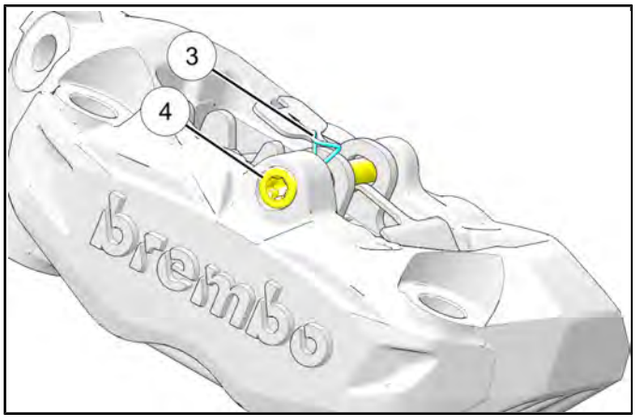
2. Remove front caliper mounting studs ② and remove the caliper.



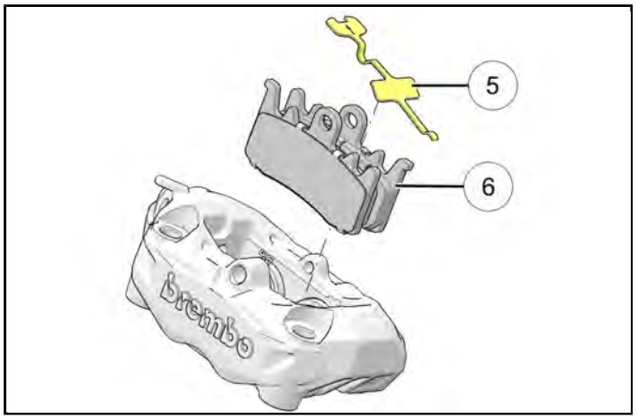
3. Cover the end of brake line(s) to prevent debris from entering.

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

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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 ft-lbs (25 N·m)**

FRONT CALIPER INSTALLATION (SPORT CHIEF)

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 studs 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 ft-lbs (25 N·m)**

6. Fill and bleed the front brake hydraulic system. See **ABS Front Brake Bleeding (Sport Chief) 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.

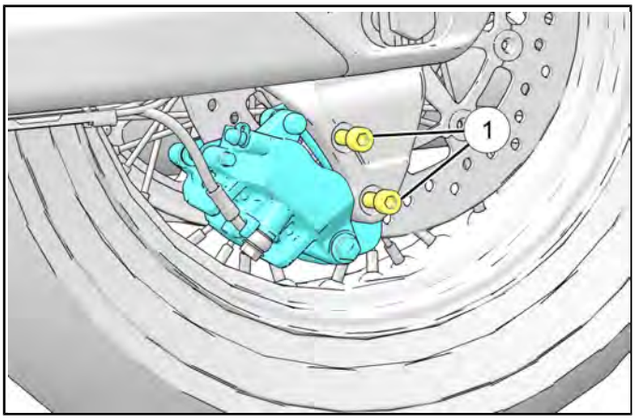
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REAR BRAKE PAD REPLACEMENT

IMPORTANT

Always replace brake pads as a set.

1. Remove the rear brake caliper from the bracket by removing the two fasteners ①.



2. Push each pad back by hand to gain clearance for new pads.

NOTICE

Brake fluid will be forced back into the reservoir when pads are pushed back. Remove reservoir cover and monitor fluid level, or attach a hose to the brake bleeder fastener and open the bleed fastener while pushing the pads and pistons back.

3. Remove the pad retaining pin.
4. Remove the old pads and pad spring from the caliper.
5. Apply grease to primary and secondary pin bolt on the main caliper and bracket.
6. Install new pads with the friction material of the pads against each other. Slide the pads into the caliper until the tab is seated in the wear clip. Insert the pad retaining pin through the caliper and the hole in both brake pads. Torque fasteners to specification.

NOTICE

Make sure that the shim and insulators are installed on the inboard pad.

TORQUE

Pad Retaining Pin:
12 ft-lbs (17 N·m)

7. Install the caliper onto the bracket, ensuring one pad is on each side of the disc. Torque fasteners to specification.

TORQUE

Caliper Mounting Fasteners (rear):
29 ft-lbs (40 N·m)

8. Inspect fluid level in the reservoir and adjust as necessary.
9. Pump brake pedal slowly several times to set new pads against disc, until pedal is firm and pressure can be felt.
10. Inspect fluid level in the reservoir and adjust as necessary.
11. Bleed brake system if necessary.

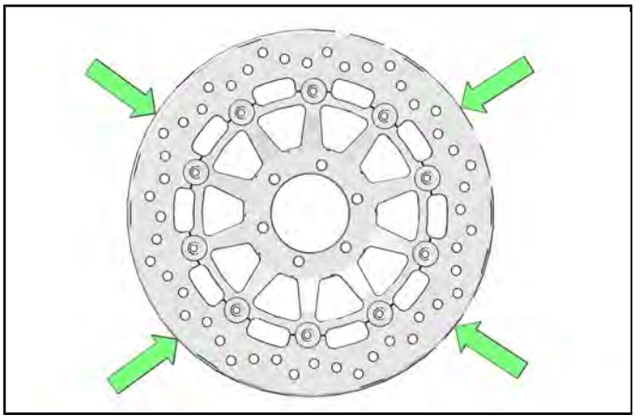
⚠ WARNING

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.

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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**



IMPORTANT
Replace the brake disc if any measurement is worn beyond the service limit.

3. With the disc mounted to the wheel, inspect for brake disc runout / warpage with a dial indicator and compare to specifications. See **Service Specifications - Brakes page 9.4**

IMPORTANT
Runout should be measured 2-4 mm 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.

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FRONT MASTER CYLINDER SERVICE

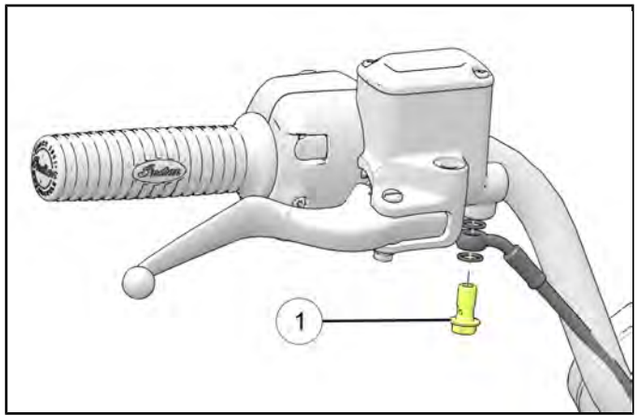
⚠ CAUTION

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.

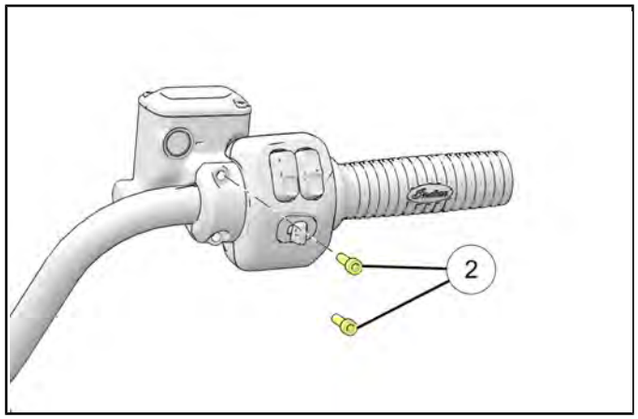
IMPORTANT

Replace all rubber parts upon assembly.

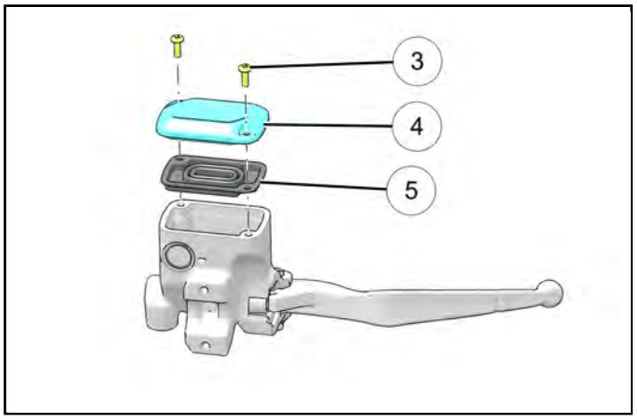
1. Clean the master cylinder. Attach a drain hose to caliper bleed screw and place the end in a suitable container. Drain brake fluid from the front brake system by slowly pumping brake lever.
2. Remove the RH side mirror from the lever perch.
3. Remove banjo bolt ① and brake line from master cylinder.



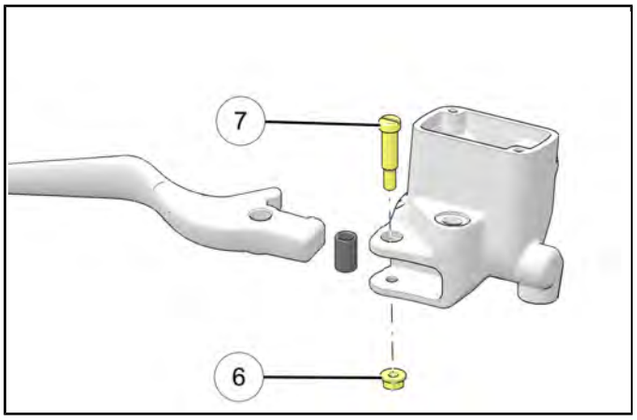
4. Remove screws ②, clamp, and master cylinder from the handlebar.



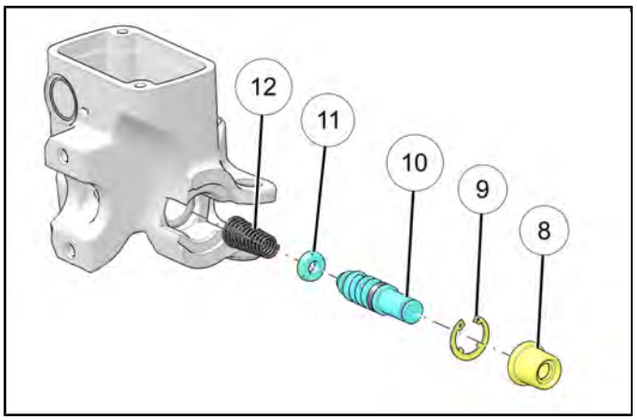
5. Remove reservoir cover fasteners ③, cover ④, diaphragm ⑤ and diaphragm plate.



6. Remove the nut ⑥ and pivot pin ⑦ and pull lever assembly out of master cylinder.



7. Remove dust boot ⑧ ,snap ring ⑨ , and piston ⑩ out of master cylinder.



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8. Remove primary cup ⑪ and spring ⑫.

IMPORTANT
Note spring orientation for assembly of new spring (new parts)

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.
14. Carefully install spring / piston assembly into master cylinder bore. Work the primary 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 secondary 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 the new boot, seating the outer edge fully in the bore and engage outer lip of boot in piston groove.
19. Apply non-petroleum grease from kit to brake lever contact surface.
20. Install brake lever. Torque to specification.

TORQUE
Brake Lever Pivot Fastener: **9 in-lbs (1 N·m)**

TORQUE
Brake Lever Pivot Nut: **48 in-lbs (6 N·m)**

21. Install master cylinder on handlebar. Torque clamp fasteners to specification.

TORQUE
Brake Lever Perch Fasteners: **88 in-lbs (10 N·m) Torque upper fastener, then lower**

22. Connect the banjo bolt securing the brake line to the front master cylinder. Make sure to use *new* sealing washers.

TORQUE
Banjo Fastener: **18 ft-lbs (25 N·m)**

23. Inspect brake fluid in reservoir and set to proper level.
24. 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.
25. Install diaphragm, diaphragm plate, and reservoir cover and torque to specification.

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

26. 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.

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REAR MASTER CYLINDER SERVICE

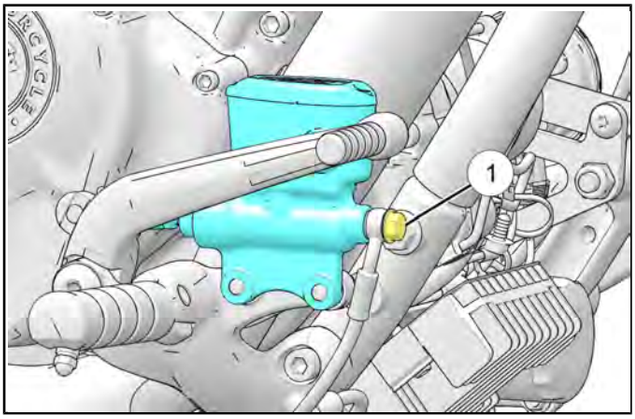
⚠ CAUTION

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.

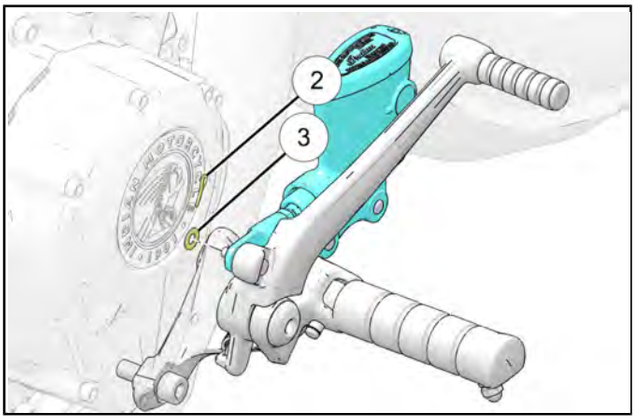
NOTICE

Replace all rubber parts upon assembly.

1. Remove brake line banjo bolt ①, sealing washers, and brake line. Allow fluid to drain into a container.



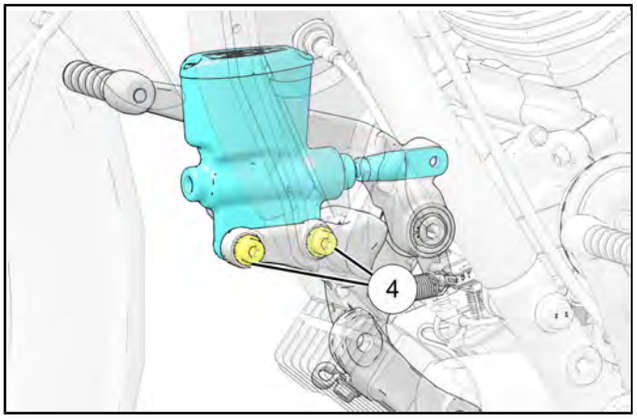
2. Remove pin ② and washer ③.



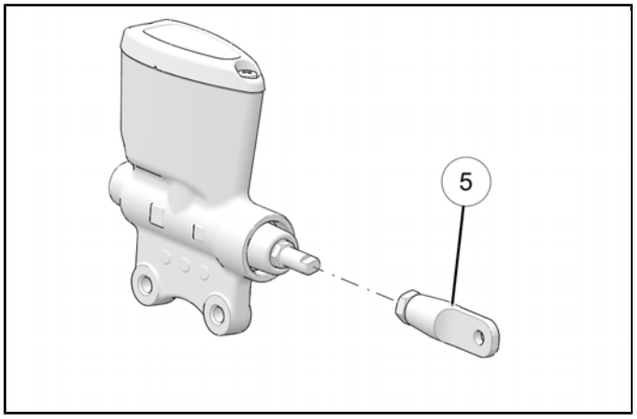
NOTICE

2022 Units will have a cotter pin and a washer.
2023+ units will have a rue pin.

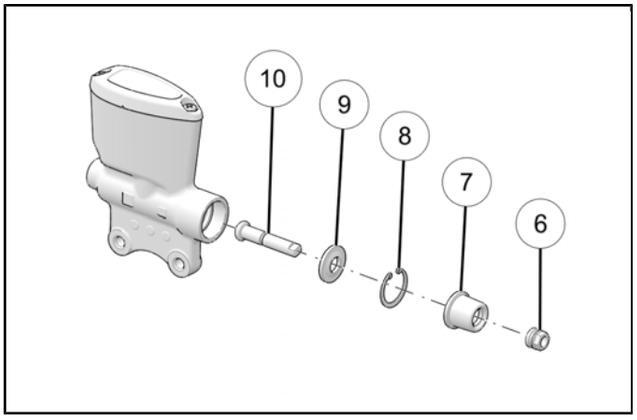
3. Remove master cylinder fasteners ④.



4. Remove clevis ⑤.



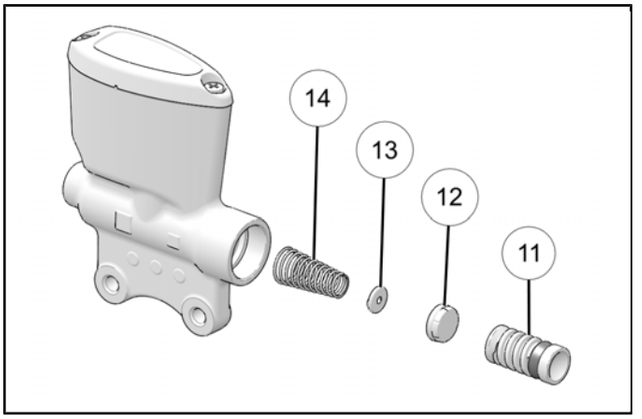
5. Remove pushrod nut ⑥, dust boot ⑦, circlip ⑧, stop plate ⑨, and pushrod ⑩.



9

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6. Remove piston ⑪, primary cup ⑫, spring cup ⑬, and spring ⑭.

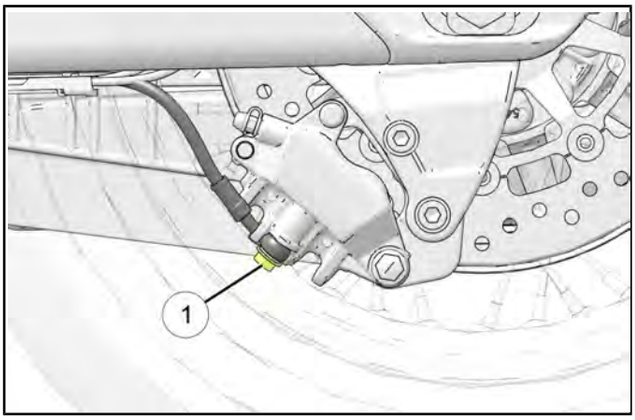


7. Inspect cylinder bore and chamfer on the front of the bore for corrosion, scratches, scoring, or pitting. Replace master cylinder if any of these conditions are evident.
8. Clean compensating port and supply port with compressed air to be sure they are clean and unobstructed.
9. Clean all parts with isopropyl alcohol.
10. Replace ALL RUBBER PARTS with new rubber components and lubricate them with lubricant from the service kit.
11. Carefully assemble and install the internal master cylinder components in order.

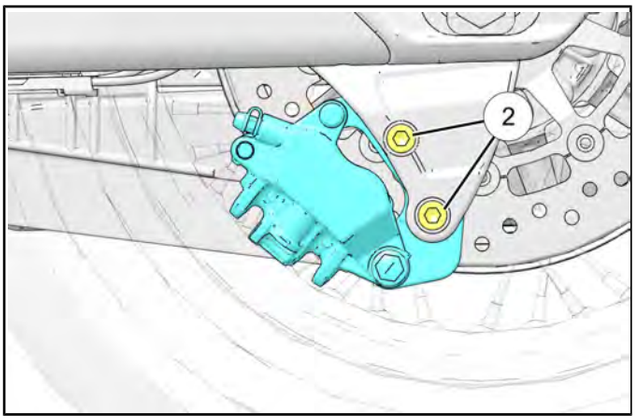
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REAR CALIPER SERVICE

1. Remove banjo fastener ① and sealing washers from rear caliper and allow fluid to drain into a container.



2. Remove caliper fasteners ② and lower caliper off of mounting bracket.



3. Remove the rear brake pads. Refer to **Rear Brake Pad Replacement page 9.51**.
4. Slide caliper bracket off pins and remove spring clip.
5. Remove each piston with a caliper piston pliers. If a caliper piston pliers is not available, wrap the caliper in a shop towel and apply short bursts of compressed air through the brake line hole to force the pistons out of the bore.
6. Remove dust seals and piston seals. Use care not to damage the seal bores.
7. 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.
8. Inspect bore and surface of piston for corrosion, scratches, scoring, or pitting. Replace caliper assembly if any of these conditions are evident.
9. 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. If special lubricant is not available, use clean DOT4 brake fluid.
10. Apply clean DOT4 brake fluid to outer surface of all pistons.
11. Install piston seals and dust seals in caliper body.
12. Install piston in bore.
13. Replace caliper pin boot on bracket and on caliper. Apply all purpose silicon grease to boots and both pins.
14. Assemble bracket to caliper. Remove excess lubricant. Ensure both boots are engaged on the clips.
15. Install spring clip and outer brake pad. Start pad pin through outer pad.
16. Install inner pad.
17. Install rear caliper and retain with fasteners.

TORQUE
Rear Brake Caliper Fastener: **29 ft-lbs (40 N·m)**

18. Reinstall brake line and secure with banjo bolt and new sealing washers.

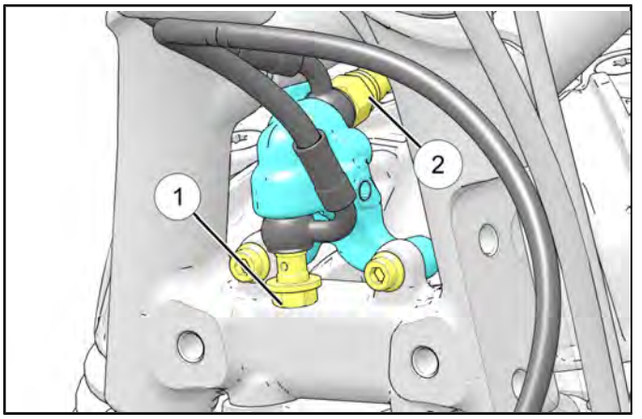
TORQUE
Banjo Bolt: **18 ft-lbs (25 N·m)**

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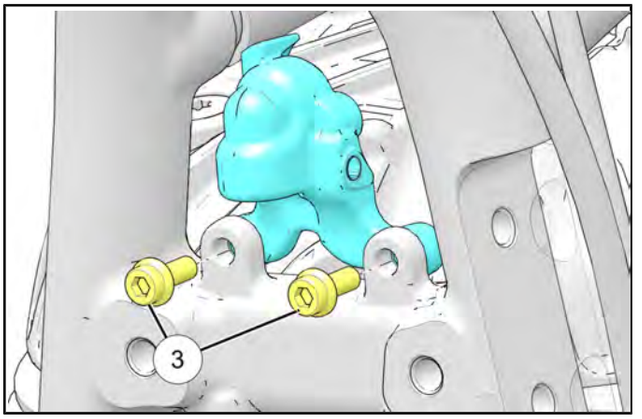
BRAKE MANIFOLD REMOVAL / INSTALLATION

FRONT

1. Remove Banjo bolt ① and brake pressure sensor ②.



2. Remove brake manifold by removing its fasteners ③.



3. **Installation is performed by reversing the removal procedure.**

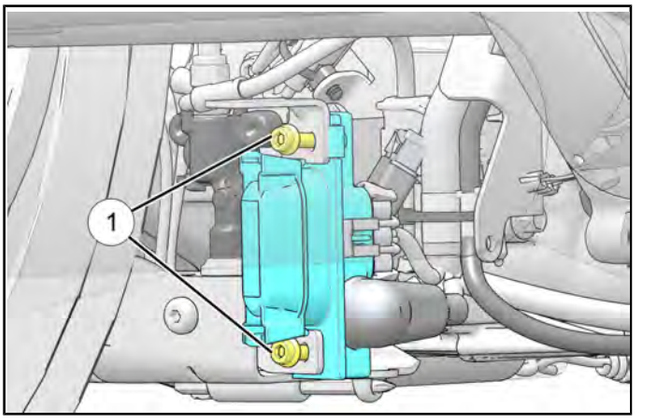
TORQUE
Brake Manifold Fastener: **80 in-lbs (9 N·m)**

TORQUE
Banjo Bolt: **18 ft-lbs (25 N·m)**

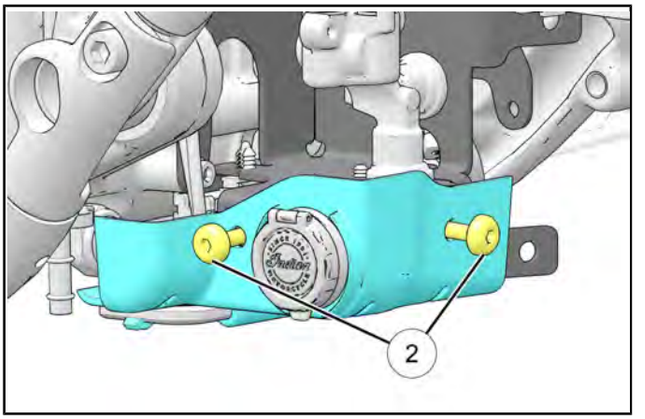
REAR

NOTICE
Non-ABS units only.

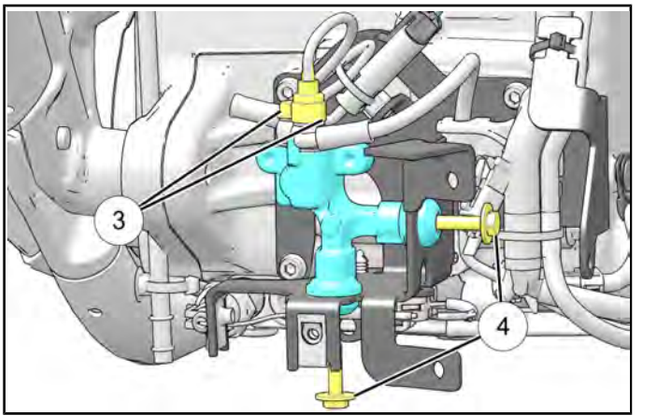
1. Remove J-case mouting fasteners ①.



2. Remove ABS tray fasteners ②.



3. Remove banjo bolt and brake pressure sensor ③.



4. Remove brake manifold fasteners ④.

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5. **Installation is performed by reversing the removal procedure.**

TORQUE
Brake Manifold Fastener: **80 in-lbs (9 N·m)**

TORQUE
Banjo Bolt: **18 ft-lbs (25 N·m)**

TORQUE
ABS Tray Fastener: **35 in-lbs (4 N·m)**

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

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TROUBLESHOOTING

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 Screws. 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; 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

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NOTES

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ELECTRICAL

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STARTING / CHARGING

GENERAL INFORMATION

SERVICE NOTES

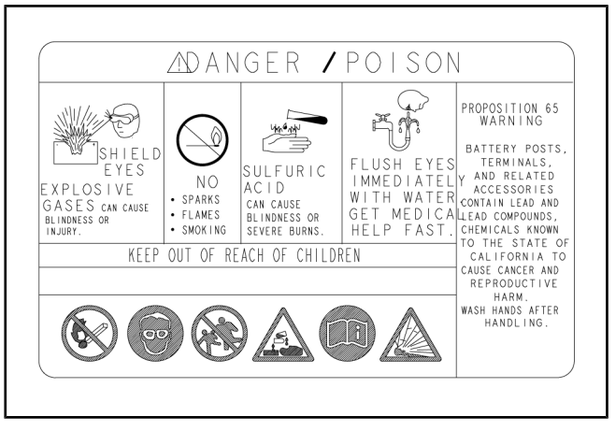
All electrical system and component service can be performed with the engine in the frame.

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



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⚠ 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. 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, excessive loads will quickly drop the battery voltage and eventually cause the battery to “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(es), 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 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 (Fuel Injection) and Electrical Chapter (Ignition System), very carefully when working on electronic components. Failure to follow instructions may cause irreparable damage to the part being inspected.

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BATTERY

This motorcycle is equipped with a maintenance free battery. DO NOT remove cell caps or add distilled water to the battery. If the battery discharges, refer to Electrical Chapter for diagnostic information.

⚠ 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.

SPECIAL TOOLS - ELECTRICAL

TOOL DESCRIPTION	PART NUMBER
Battery Tester	PU-50296
Electrical Tester Kit	PV-43526
Relay Bypass	PU-49466
Smartlink Module Kit	PU-47471
USB to Serial Adapter	PU-50621

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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
Alternator No Load AC Output @ 800–1000 RPM (Engine cool)		17-26.5 VAC @ Idle
Alternator 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
Alternator Output (Amps / Watts)		56 A / 710 W @ 2000 RPM
Battery	Type	Yuasa: YTX20HL
	Voltage	12 Volts DC
	Nominal Capacity @ 10 Hr Rate	18 AH
	Recommended Battery Charging Current	STD: 1.85 A for 5 to 10 hrs
	CCA Rating	310

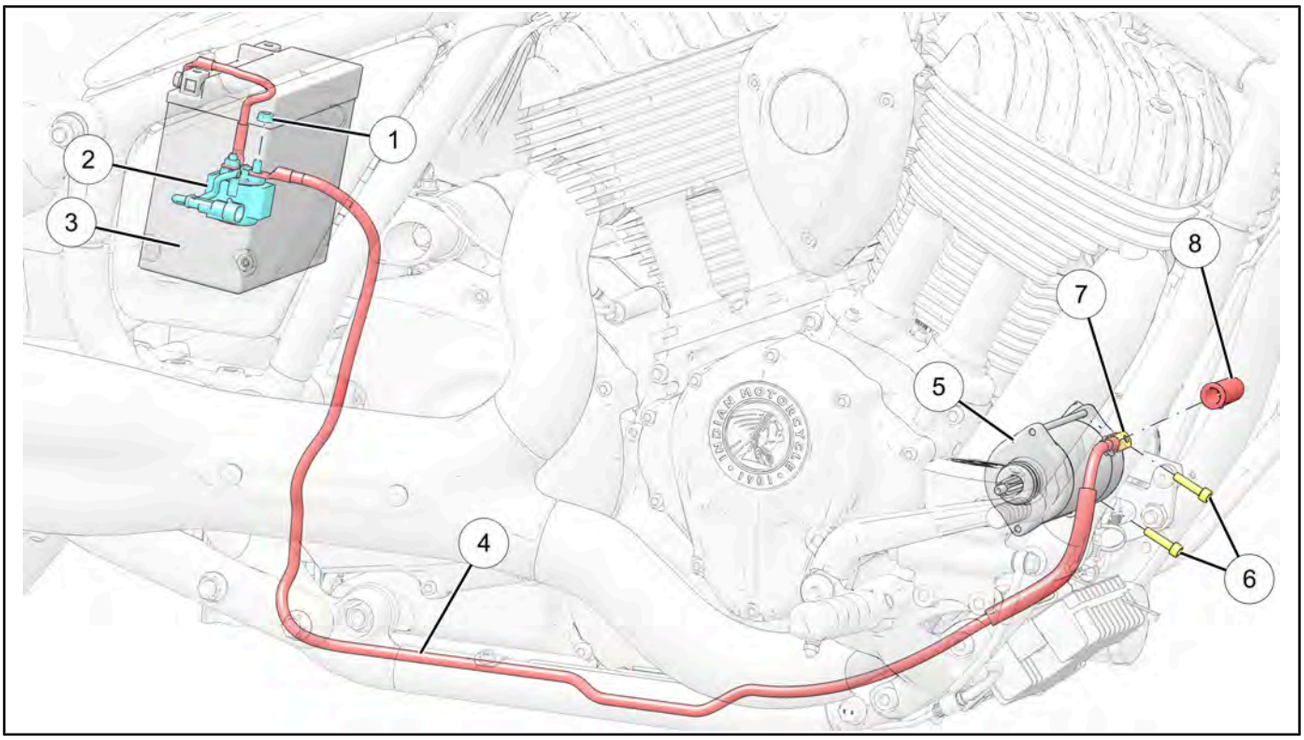
STARTING SYSTEM SPECIFICATIONS

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

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ASSEMBLY VIEWS

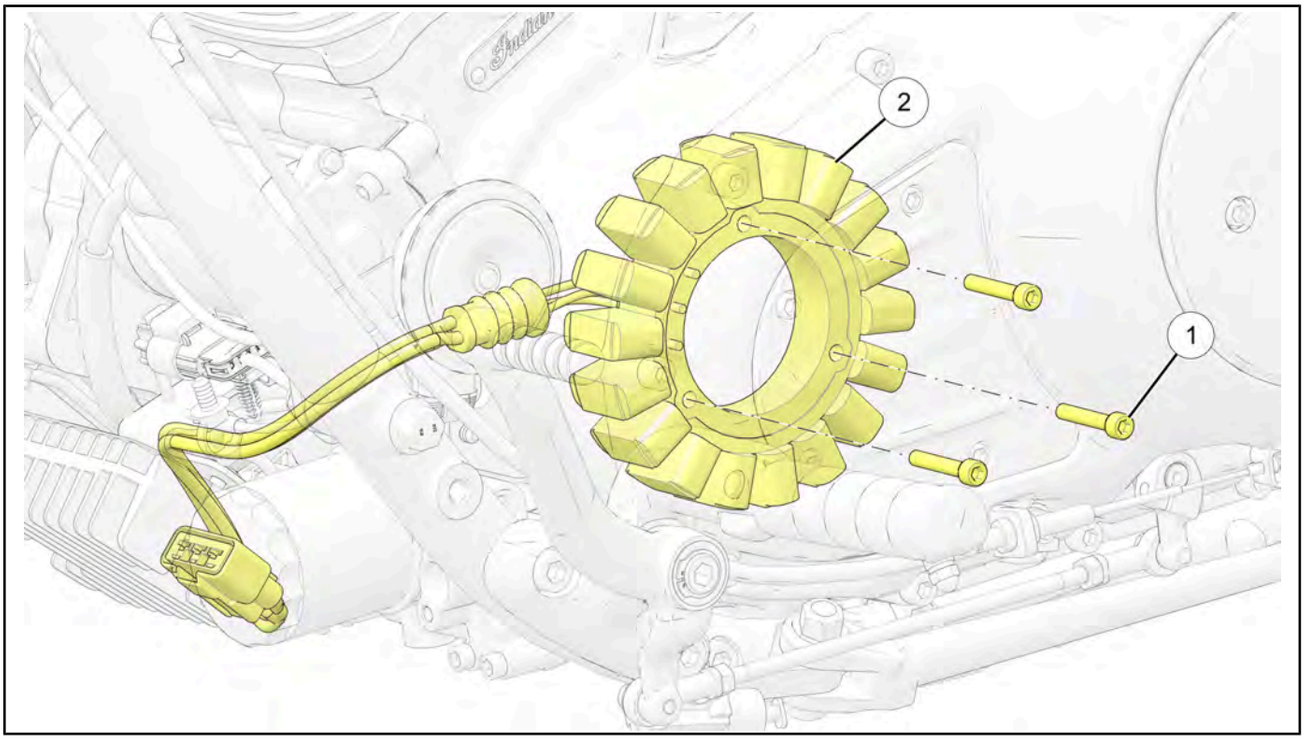
STARTER MOTOR / SOLENOID COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Starter Solenoid Nut	**44 in-lbs (5 N·m)**
②	Starter Solenoid	—
③	Battery	—
④	Solenoid to Starter Motor Cable (B+)	—
⑤	Starter Motor	—
⑥	Starter Motor Fastener	**88 in-lbs (10 N·m)**
⑦	Starter Cable Nut	**88 in-lbs (10 N·m)**
⑧	Terminal Cover	—

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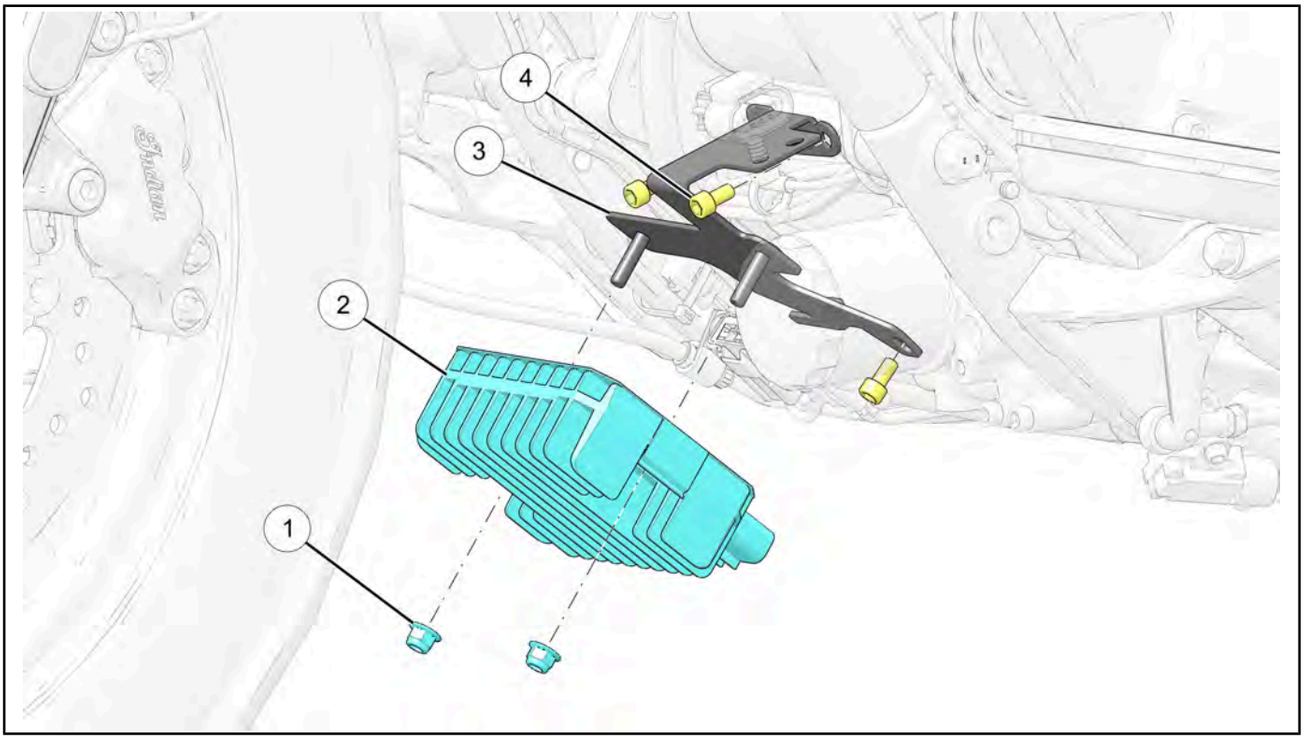
STATOR COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Stator Fastener	**88 in-lbs (10 N·m)**
②	Stator	—

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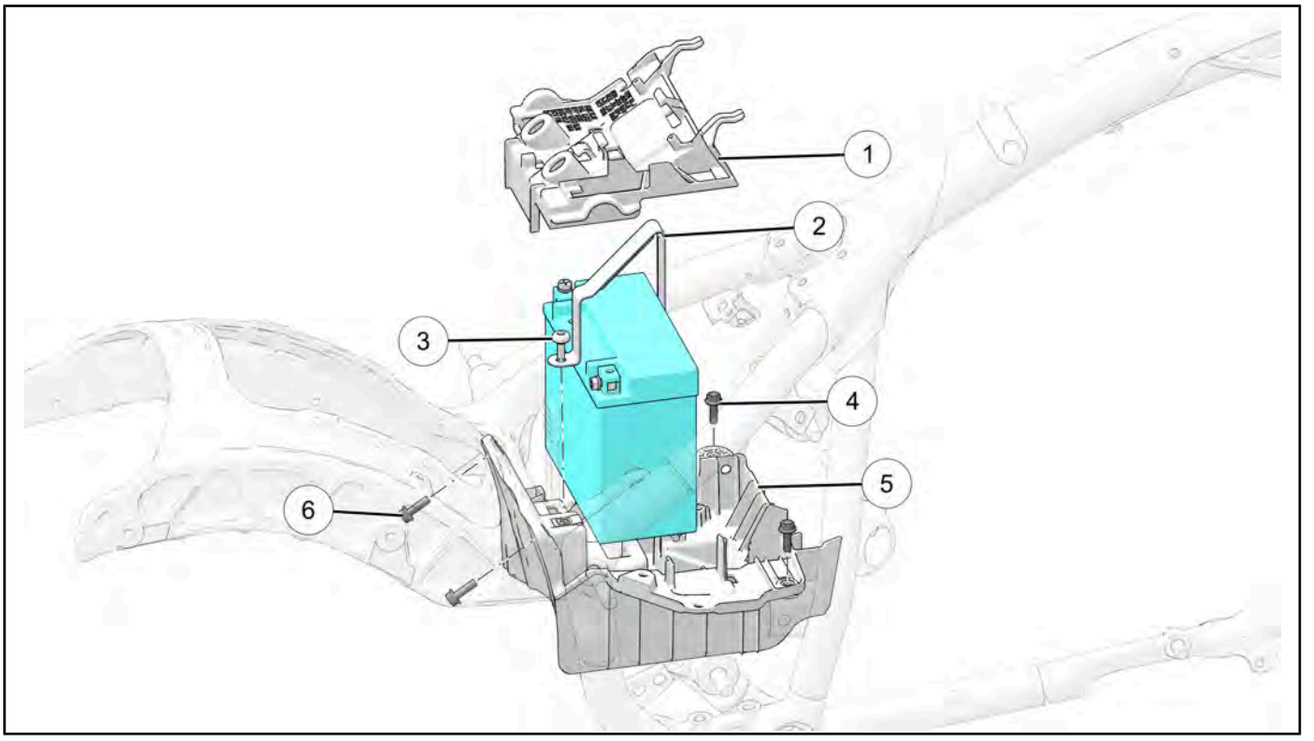
REGULATOR / RECTIFIER COMPONENTS



ITEM	DESCRIPTION	TORQUE
①	Voltage Regulator Nuts	**62 in-lbs (7 N·m)**
②	Voltage Regulator	—
③	Voltage Regular Bracket	—
④	Voltage Regulator Bracket Fastener	**88 in-lbs (10 N·m)**

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BATTERY BOX COMPONENTS



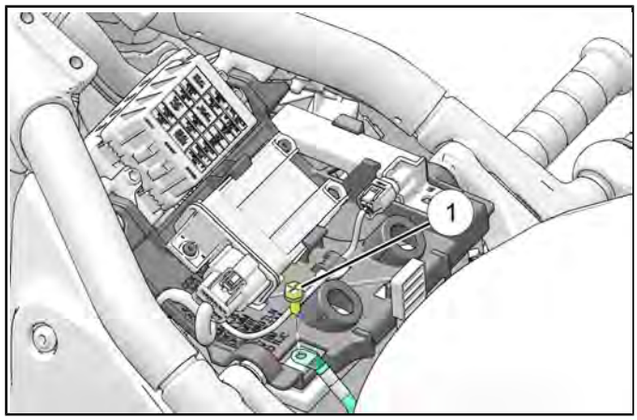
ITEM	DESCRIPTION	TORQUE
①	Upper Battery Tray	—
②	Battery Strap	—
③	Battery Strap Fastener	**35 in-lbs (4 N·m)**
④	Battery Box Fastener M6	**35 in-lbs (4 N·m)**
⑤	Battery Box	—
⑥	Battery Box Rear Fastener	**115 in-lbs (13 N·m)**

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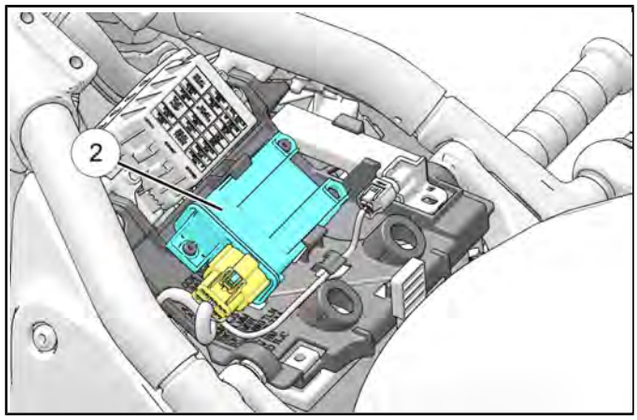
BATTERY SERVICE

BATTERY REMOVAL / INSTALLATION

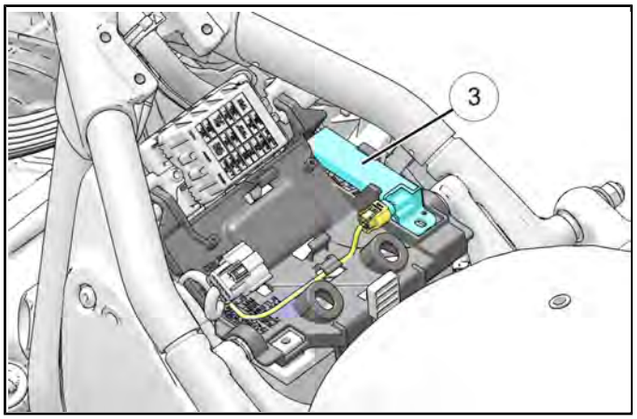
1. Remove the seat. See **Seat Removal / Installation page 7.27**.
2. Remove negative battery cable terminal ①.



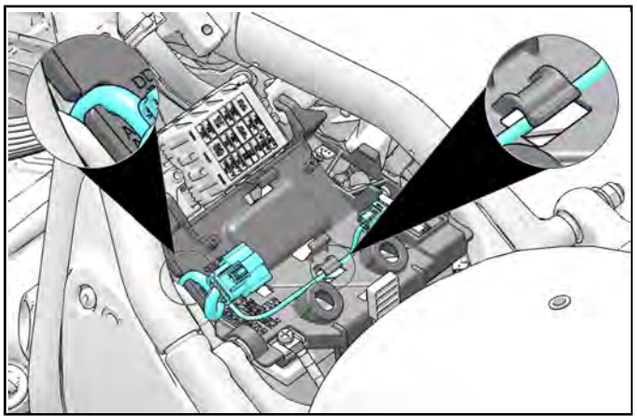
3.
4. Remove the WCM ② by disconnecting its electrical connector and removing it from the upper battery tray.



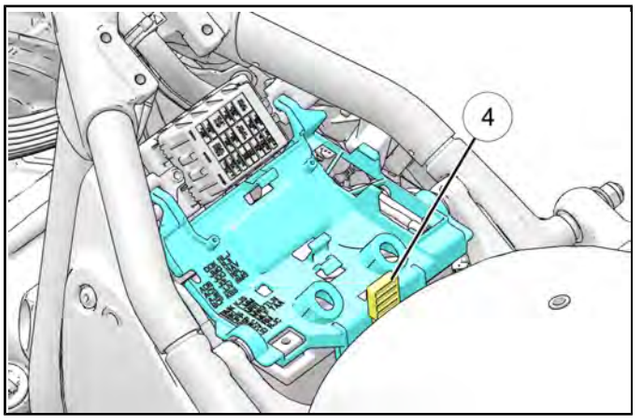
5. Remove the antenna ③ by disconnecting its electrical connector and removing it from the upper battery tray.



6. Disconnect the wiring harness from the upper battery tray by removing it from the two retention areas and move it off to the left side of the unit.



7. Disconnect the strap upper battery tray strap ④.

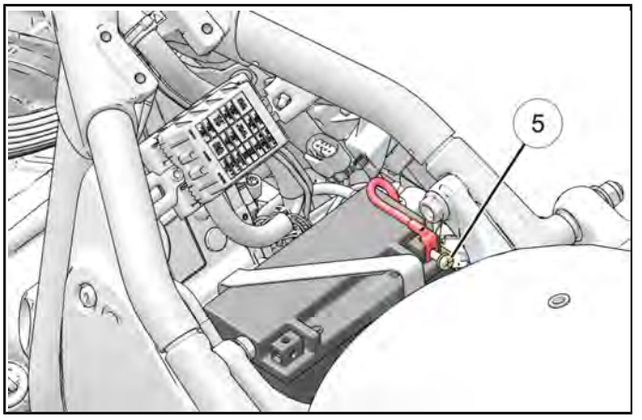


8. Lift the rear of the upper battery tray upward and pull it toward the rear of the unit to remove.

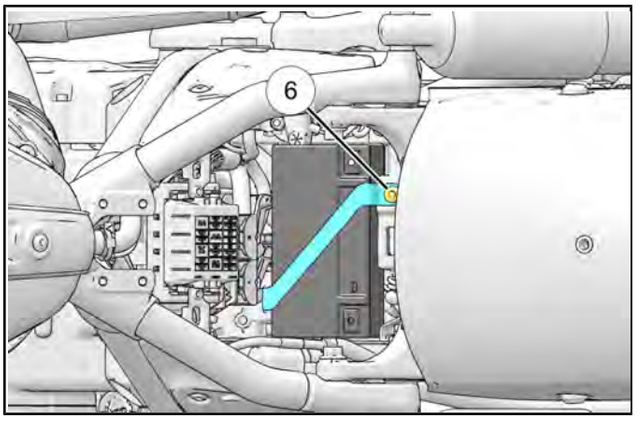
10

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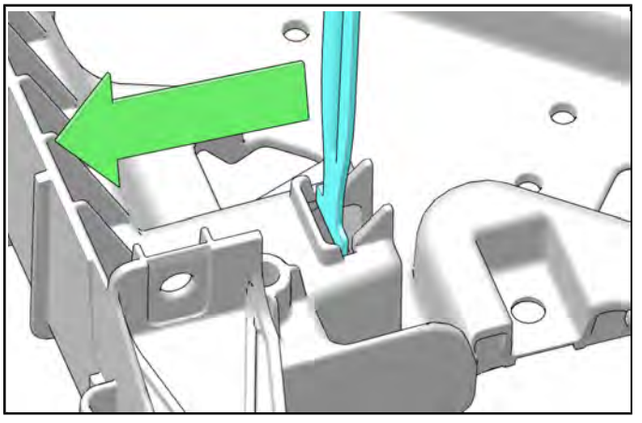
9. Remove the positive terminal fastener ⑤.



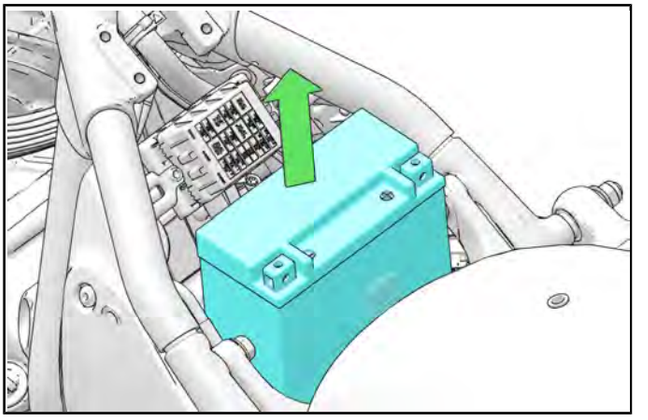
10. Remove the battery strap fastener ⑥.



11. Remove the battery strap by moving the front of the strap forward out of the retention feature of the battery box.



12. Lift the battery from the battery box.



13. **Installation is performed by the reversing the removal procedure.**

TORQUE
Battery Strap Fastener: **35 in-lbs (4 N·m)**

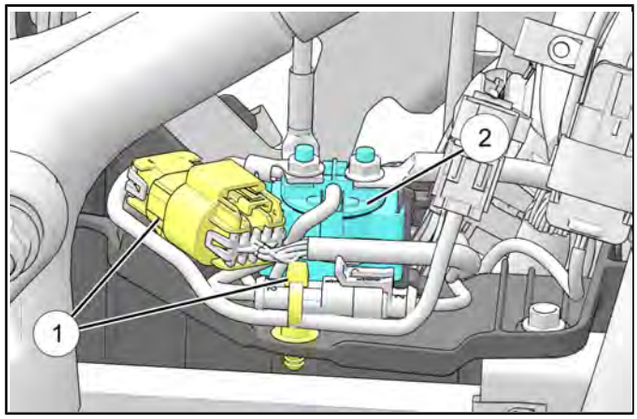
TORQUE
Battery Terminal Fastener: **48 in-lbs (5.4 N·m)**

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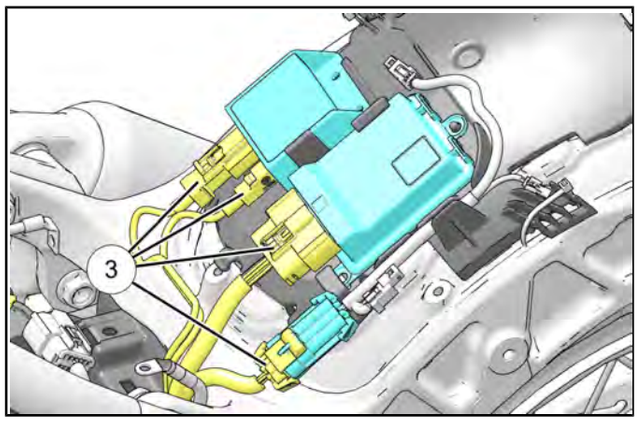
BATTERY BOX REMOVAL / INSTALLATION

2022

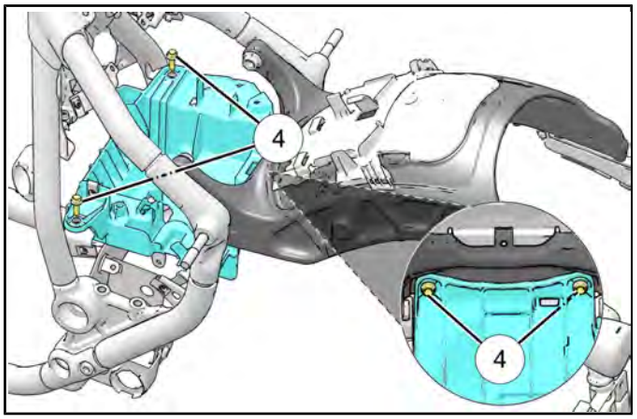
1. Remove battery. See **Battery Removal / Installation page 10.13**.
2. Remove ECM. See **ECM Removal / Installation page 4.47**.
3. If applicable, remove carbon canister. See **Carbon Canister Removal / Installation page 4.29**.
4. If applicable, remove purge valve. See **Purge Valve Removal / Installation page 4.30**.
5. Remove side covers and side cover brackets. Reference **Side Cover Removal / Installation page 7.29**.
6. Remove rear fender. See **Rear Fender Removal / Installation page 7.38**.
7. On the right side of the batter box, Disconnect diagnostic connector from sealed cap and disconnect the retention feature ① connected to the battery box.



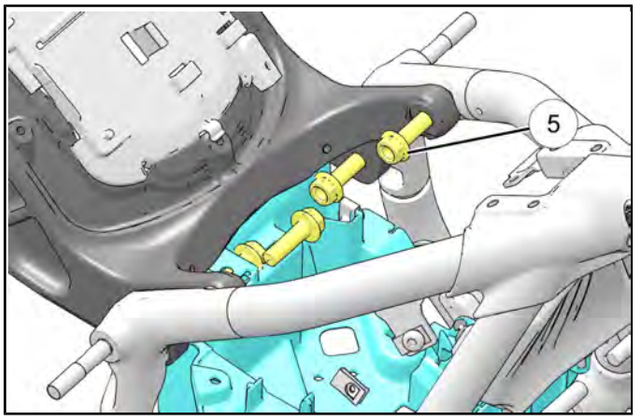
8. Lift the starter solenoid ② up from its retention feature in the battery box.
9. On the rear subframe, disconnect the electrical connectors ③.



10. Disconnect and remove and harness retention features connected to the battery box.
11. Remove battery box fasteners ④.



12. Remove the subframe by removing its fasteners ⑤.



13. With the subframe removed, the batter box can be removed from the unit.
14. **Installation is performed by reversing the removal procedure.**

TORQUE
Subframe Fastener: **74 ft-lbs (100 N·m)**

TORQUE
Battery Box Fastener: **35 in-lbs (4 N·m)**

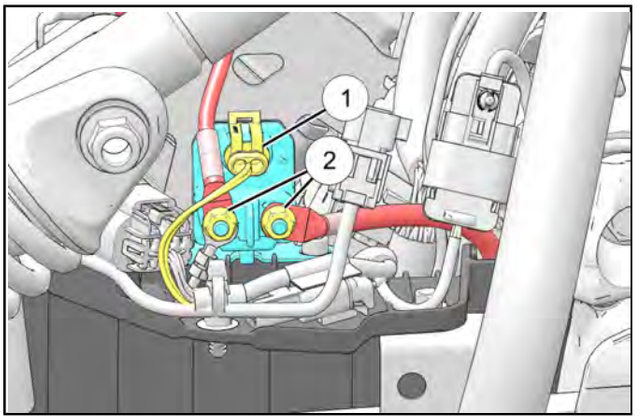
TORQUE
Battery Box Rear Fastener: **115 in-lbs (13 N·m)**

10

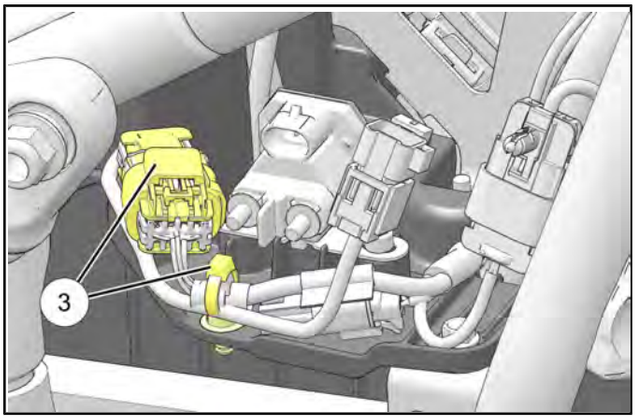
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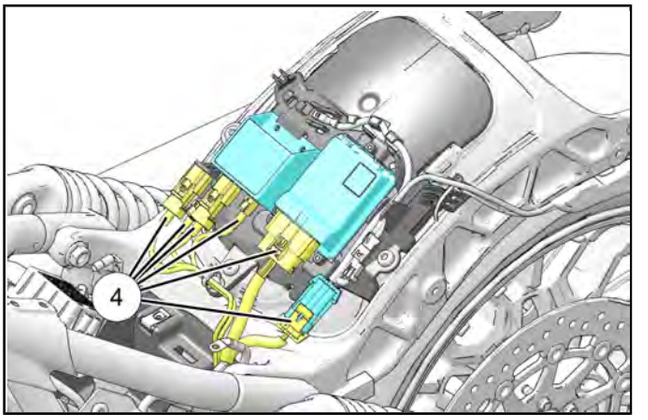
1. Remove battery. See **Battery Removal / Installation page 10.13**.
2. Remove ECM. See **ECM Removal / Installation page 4.47**.
3. If applicable, remove carbon canister. See **Carbon Canister Removal / Installation page 4.29**.
4. If applicable, remove purge valve. See **Purge Valve Removal / Installation page 4.30**.
5. Remove side covers and side cover brackets. Reference **Side Cover Removal / Installation page 7.29**.
6. Remove rear fender. See **Rear Fender Removal / Installation page 7.38**.
7. On the right side of the batter box, Disconnect starter solenoid electrical connector ①.



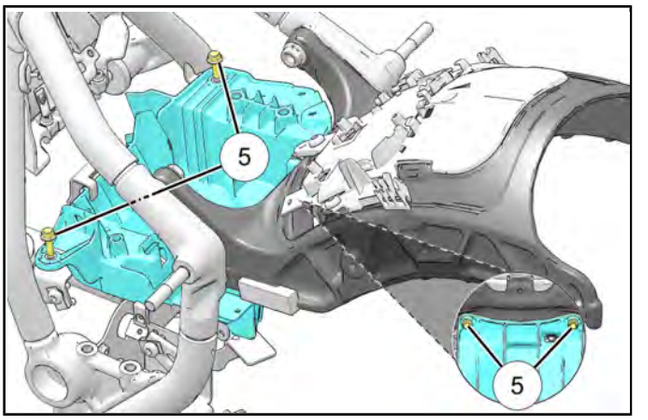
8. Remove starter solenoid terminal nuts ② and cables.
9. Disconnect diagnostic connector from sealed cap and disconnect the retention feature ③ connected to the battery box.



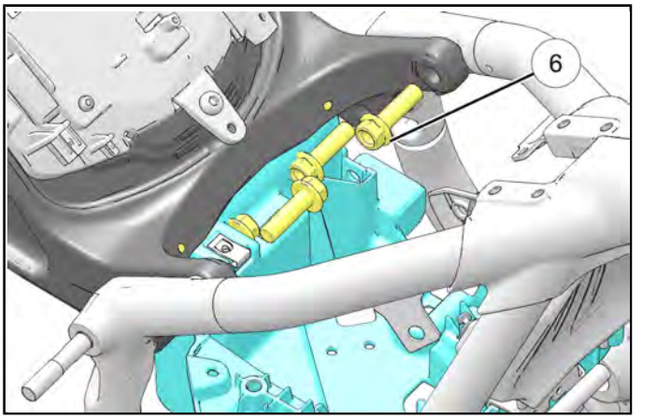
10. On the rear subframe, disconnect the electrical connectors ④



11. Remove battery box fasteners ⑤



12. Remove the subframe by removing its fasteners ⑥.



13. With the subframe removed, the batter box can be removed from the unit.

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14. **Installation is performed by reversing the removal procedure.**

TORQUE
Subframe Fastener: **74 ft-lbs (100 N·m)**

TORQUE
Battery Box Fastener: **35 in-lbs (4 N·m)**

TORQUE
Battery Box Rear Fastener: **115 in-lbs (13 N·m)**

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 **AGM Battery Charging Recommendations – Deeply Discharged (below 3 volts)** 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.

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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

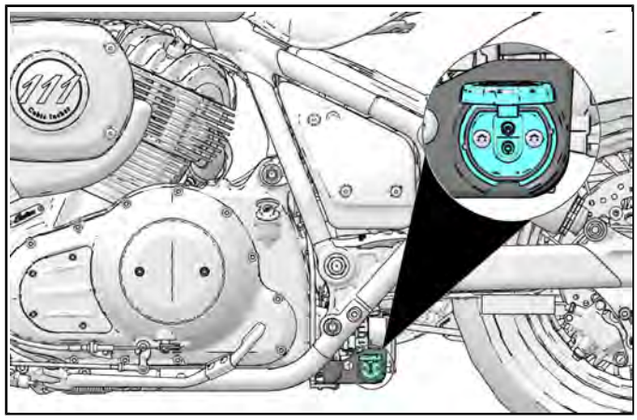
Always check to ensure the positive cables are connected to the positive terminals before powering the charger on. Reversing polarity when charging can damage electrical components and risk personal injury. Be careful not to let battery cable clamps touch each other.

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.

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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. Chief / Chief Bobber / Super Chief units are conveniently equipped with a SAE bullet style connector for quick access to charging the battery. The recommended BatteryMINDer® 2012 charger comes with the mating connector for easy plug and play maintenance. The connector is located on the left side of the unit and a maintenance charger can be connected to it for extended periods (e.g. winter storage).



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BATTERY INSPECTION

1. Remove battery. See **Battery Removal / Installation page 10.13**.
2. Visually inspect the exterior of the battery. Replace battery if housing is damaged, case is deformed, or if electrolyte is leaking
3. 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.
4. Test using the Indian Motorcycle recommended AGM battery testing procedure. See **BATTERY CHARGING AND MAINTENANCE page 10.17**.
5. Install battery. See **Battery Removal / Installation page 10.13**.

BATTERY TESTING

The recommended battery tester for all Indian Motorcycle batteries is special tool **PU-50296.** See **Special Tools - Electrical page 10.7**.

Conductance describes the ability of a battery to conduct current. A conductance tester functions by sending a low frequency AC signal through the battery and a portion of the current response is captured, from this output a conductance measurement is calculated. Conductance testing is more accurate than voltage, specific gravity, or load testing.

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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. Turn ignition key on 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 CIRCUIT DIAGRAM

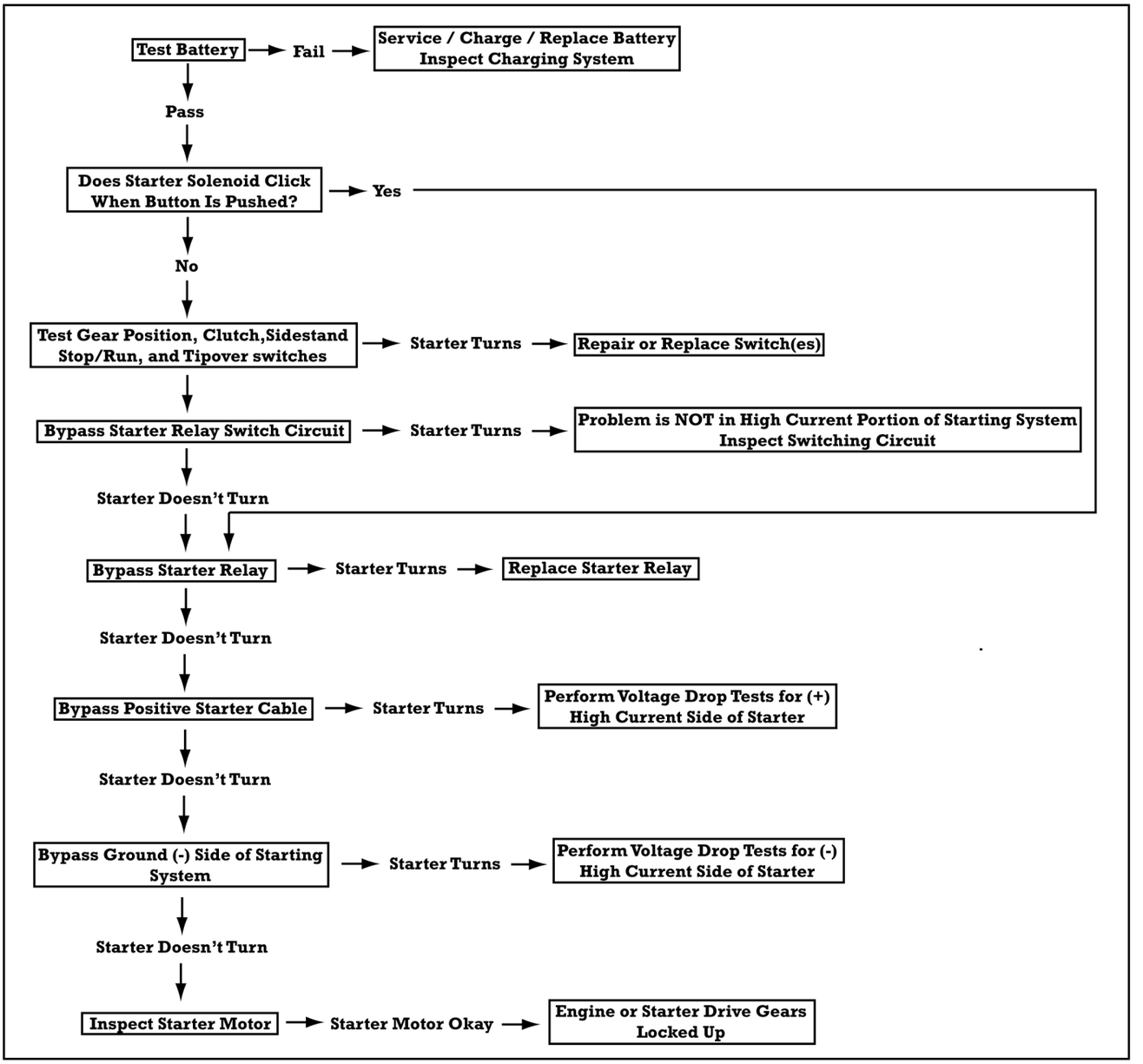
Reference the **WIRING DIAGRAMS** located at the end of the manual.

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. *NOTICE* Unit will not start if side-stand is down, even with the clutch pulled in.	Clutch Switch or Side-Stand switch circuit malfunction.	Test Switches.
Starter motor will not turn.	Low battery voltage. Poor cable connections. Main ground loose. Blown horn/starter fuse	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

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TROUBLESHOOTING FLOW CHART 1

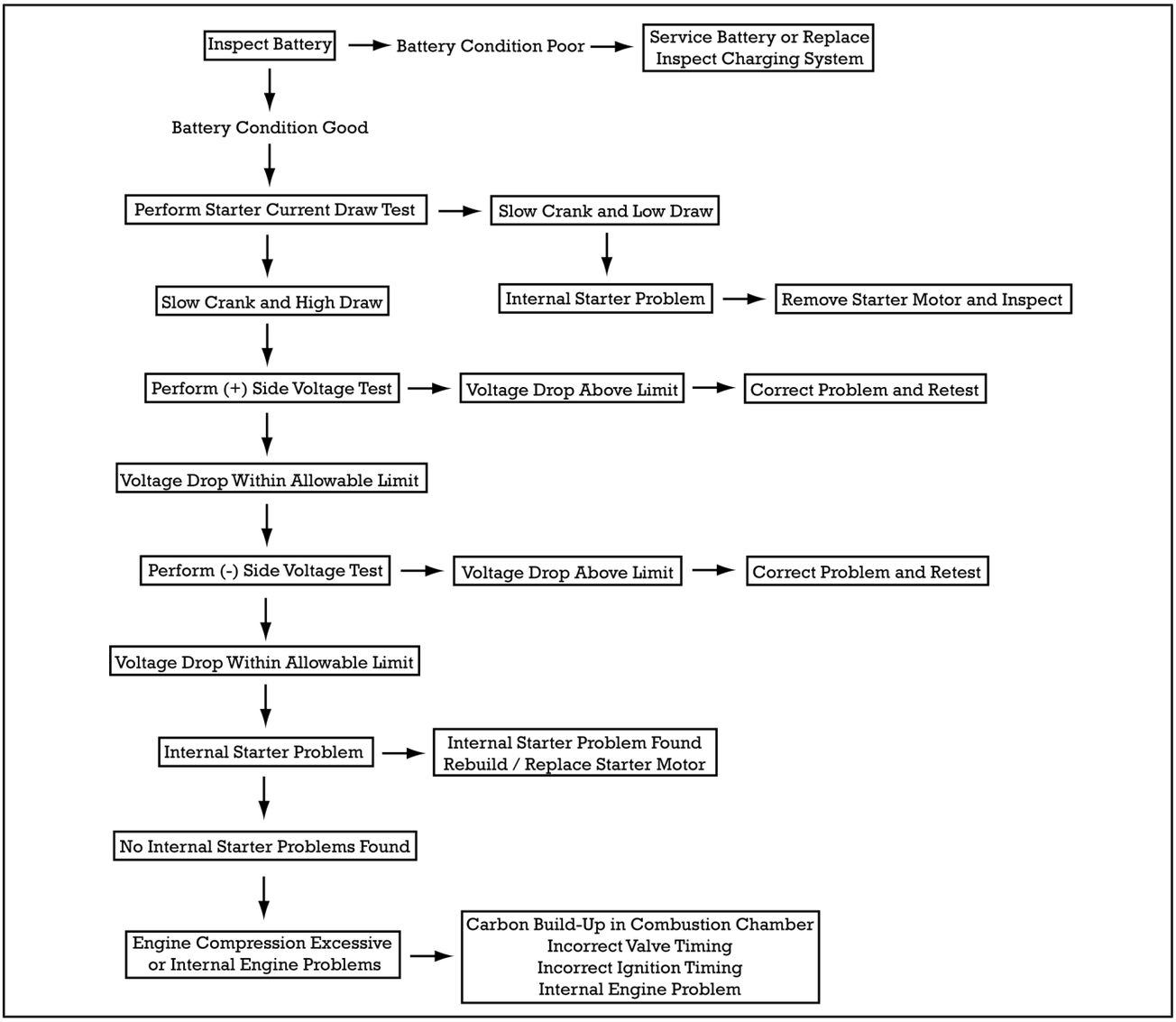


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TROUBLESHOOTING FLOW CHART 2

NOTE

These procedures require a Digital Multi Meter (DMM) and high a high current shunt, or an inductive ammeter clamp and a DMM.



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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.

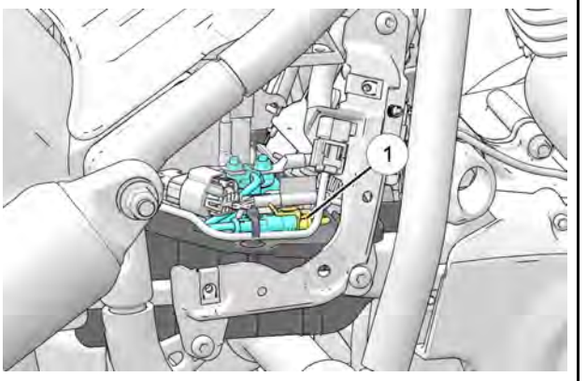
STARTER SOLENOID GROUND CIRCUIT TEST

⚠ WARNING

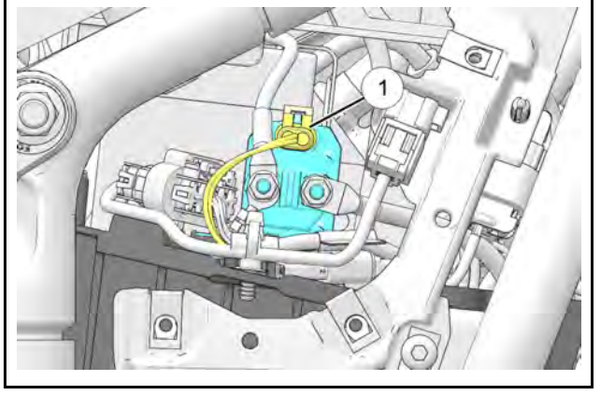
Ensure that the motorcycle is secure and that the transmission is in neutral for the following test.

1. Remove right side cover. See **Side Cover Removal / Installation page 7.29**.
2. Locate the starter solenoid and disconnect the start solenoid connector ①.

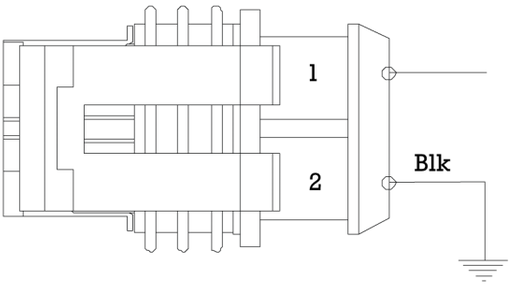
2022



2023+



3. Set the multi-meter to read resistance and insert meter leads into the appropriate jacks.
4. Working on the vehicle side of the harness, test continuity between terminal 2 (black wire) and chassis ground.



Resistance should be ≤ 0.5 Ω

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GEAR POSITION SENSOR TEST

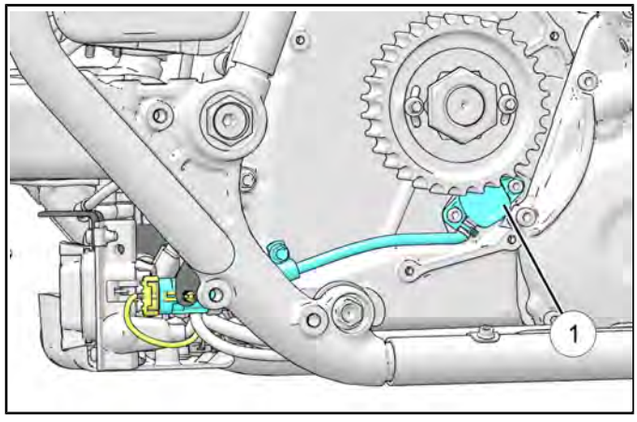
Symptoms of a faulty gear position sensor may include:

- Starter motor does not operate when transmission is in neutral,

BUT

- Starter motor does operate when clutch is pulled in.

1. Remove sprocket cover. See **Drive Sprocket Cover Removal / Installation page 8.77**
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 in 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 it is in neutral.
   - Locate gear position sensor ① and trace the wires to the connector..



7. Backprobe the connector and compare the value with the table below.

Terminal	Wire Color	Function
A	Red	VCC
B	Black	Ground
C	Blue	Gear

Gear	Voltage (V)
1	0.59–0.71
N	0.98–1.10
2	1.38–1.49
3	2.17–2.28
4	2.96–3.04
5	3.70–3.80
6	4.44–4.55

8. If the reading is not within specified parameters, replace or repair wiring as necessary.

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CLUTCH SWITCH CIRCUIT TEST

The symptom of a faulty clutch switch circuit is:

- Starter motor will not operate with transmission in gear and clutch lever pulled in. Starter *operates* with transmission in neutral. Use an ohmmeter to determine if continuity is present when the switch is closed (lever pulled in).

1. Transmission can be in neutral or in any gear.
2. Disconnect the clutch switch connectors.
3. Set multimeter to measure resistance and insert meter leads into appropriate jacks.
4. Connect red (+) lead of multi meter to either of the clutch switch terminals and the black meter lead to the other clutch switch terminal.
5. Operate clutch lever while observing meter display.
6. Pull clutch lever to the handlebar. Meter should display continuity or very low resistance (less than 1 ohm) when the clutch switch closes.
7. Release clutch lever, meter should display OL (open line).
8. If clutch switch does not test as described inspect clutch switch, clutch switch wiring or mounting of switch to clutch lever for fault.
9. If switch is mounted correctly and physically operates but does not open and close electrically, replace switch.

STARTER SOLENOID POSITIVE CIRCUIT TEST

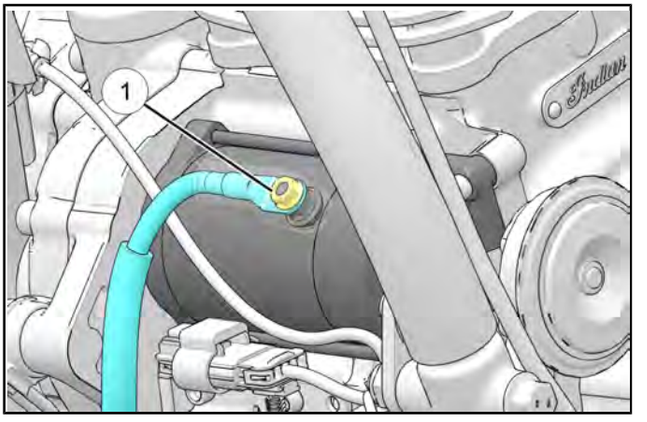
⚠ WARNING

Secure motorcycle on the side stand and place transmission in neutral for the following test.

1. Place the transmission in neutral.
2. Disconnect positive cable ① from starter motor.

⚠ CAUTION

Hold the lower terminal nut with an open ended wrench while tightening the upper nut to avoid damage.



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. Place key switch in RUN position 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.

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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

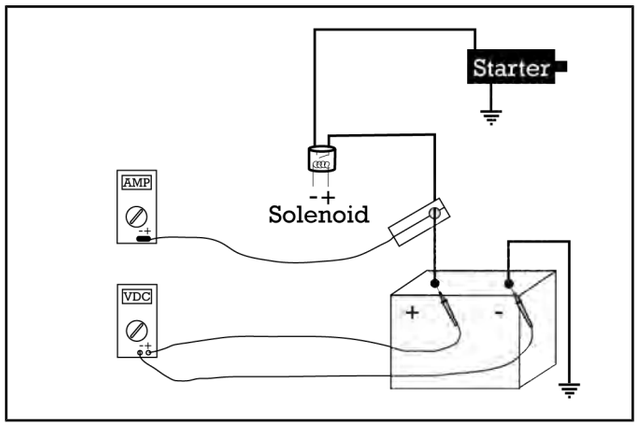
Do not allow any part of the jumper cable clamp to touch the chassis or any other ground.

⚠ CAUTION

Disable the ignition system so that the engine will not start during this test.

- Remove ignition coils and spark plugs.
- Install test spark plugs into plug caps.
- Ground spark plugs against engine.

1. Remove seat. See **Seat Removal / Installation page 7.27**.
2. Inspect the battery. Charge or replace battery as necessary before proceeding.
3. Place transmission in neutral.
4. Position an inductive ammeter clamp on battery positive cable.
5. Set the multi meter to **Volts DC** scale and connect red lead of meter to positive post of battery.
6. Connect black lead of meter to negative post of battery.



7. Turn the ignition switch ON to power up the electrical system and observe ammeter. It should register negative amps. If it does not, turn the ammeter probe around.
8. Place 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.
9. Press starter switch and crank starter for about 5 seconds and observe both meters and the tachometer.
10. The battery voltage should remain above 9.6 volts.
11. The amperage draw of the starter should not exceed 160 amps.

Starter current draw @ 77°F (25°C): ≤**160 Amps**

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STARTER MOTOR SERVICE

SAFETY INFORMATION

⚠ WARNING

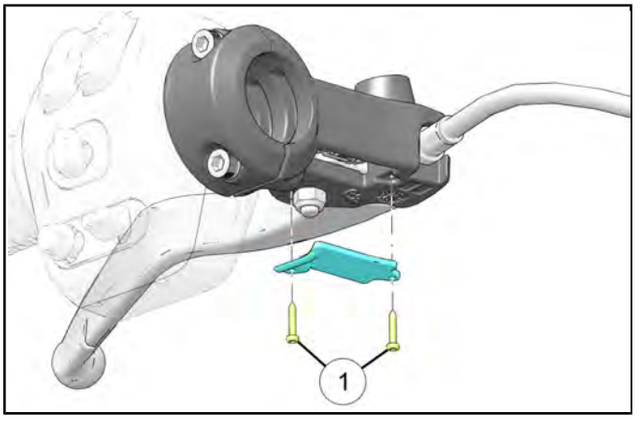
Always disconnect the battery (negative terminal first) before servicing the starter motor.

- Inspect the condition of the battery before troubleshooting the starter system. Also inspect main engine ground and battery cable connections.

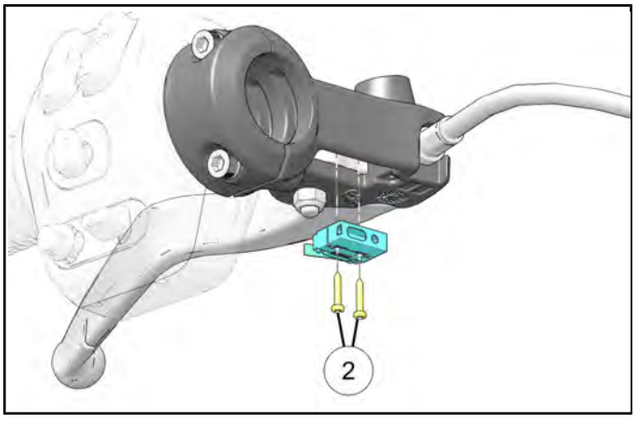
CLUTCH SWITCH REMOVAL / INSTALLATION

REMOVAL

1. Remove clutch switch cover fasteners ① and 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.

INSTALLATION

1. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**
2. Torque clutch switch and cover fasteners to specification.

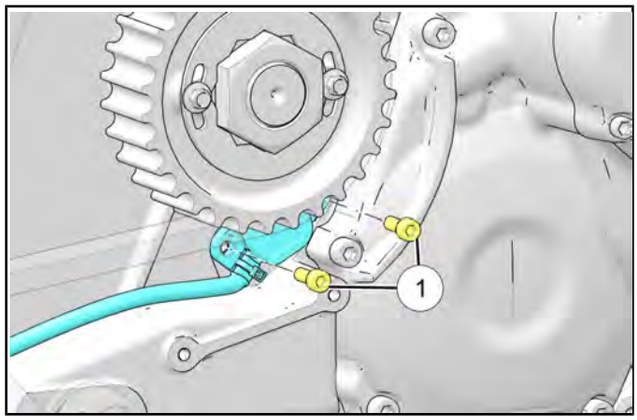
TORQUE
Clutch Switch Fastener: **4.4 in-lbs (0.5 N·m)**

TORQUE
Clutch Switch Cover Fasteners: **4.4 in-lbs (0.5 N·m)**

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GEAR POSITION SENSOR REMOVAL / REPLACEMENT

1. Remove sprocket cover. See **Drive Sprocket Cover Removal / Installation page 8.77**
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. Disconnect gear position sensor electrical connector.
5. Remove gear position sensor fasteners ①.



STARTER MOTOR, REMOVAL / INSTALLATION

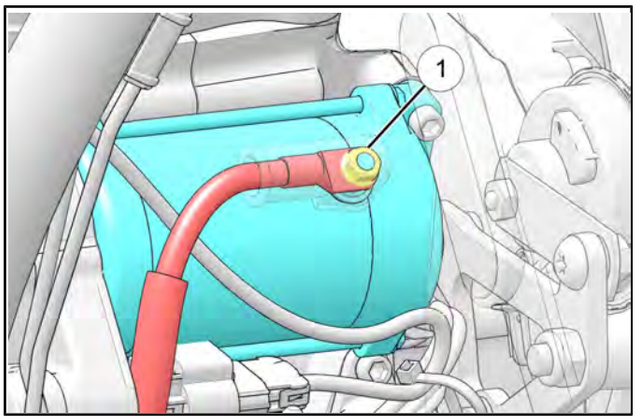
⚠ WARNING

Ensure that the ignition switch is turned off. Remove the negative cable at the battery before removing the starter motor.

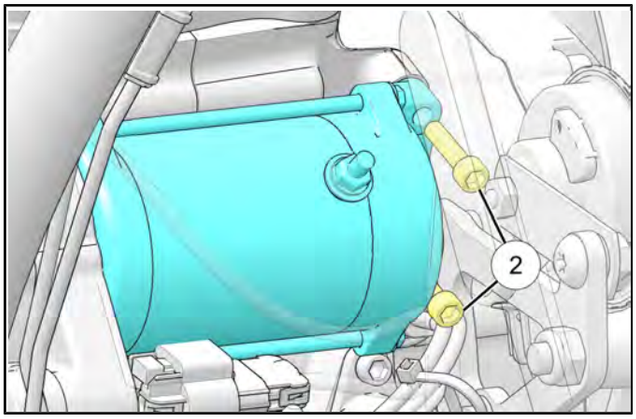
1. Disconnect negative battery cable. See **Battery Removal / Installation page 10.13**.
2. Disconnect positive terminal ① from the starter motor.

⚠ CAUTION

Hold the lower terminal nut with an open ended wrench while tightening or loosening the upper nut to avoid damage.



3. Remove starter motor by removing its fasteners ②. Slide starter to the RH side of the motorcycle to release from engine case.



4. Remove starter motor.

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5. **Installation is performed by reversing the removal procedure.**

TORQUE
Starter Motor Fasteners: **88 in-lbs (10 N·m)**

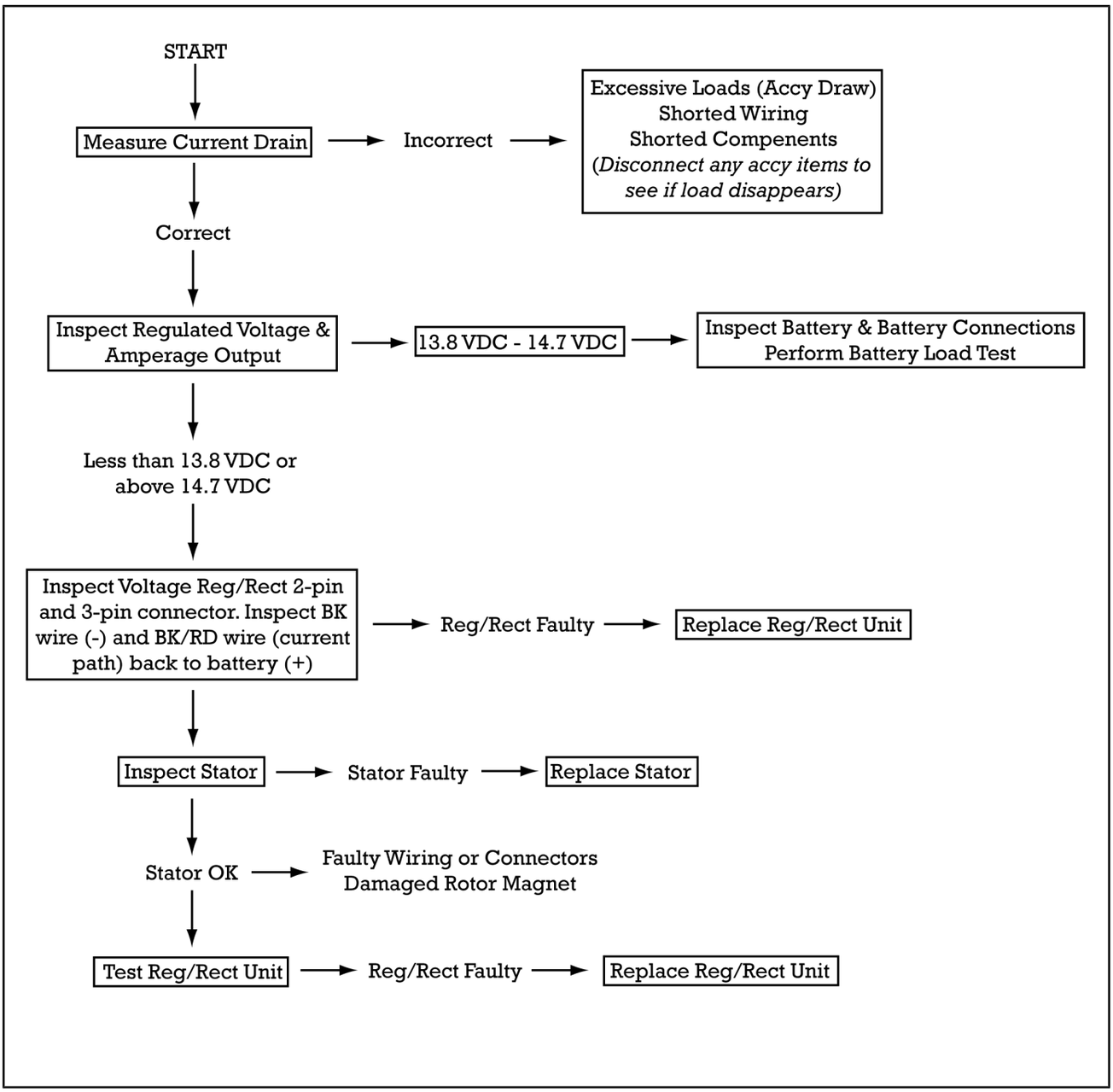
TORQUE
Battery Cable to Starter Motor Nut: **88 in-lbs (10 N·m)**

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CHARGING SYSTEM SERVICE

TROUBLESHOOTING, CHARGING SYSTEM

NOTE
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.



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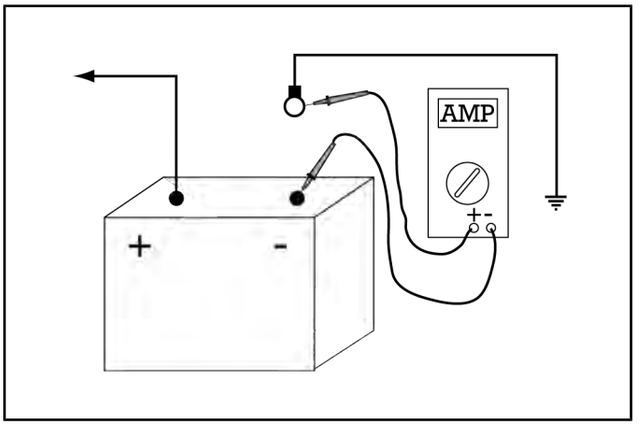
CURRENT DRAIN INSPECTION

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. Remove seat. See **Seat Removal / Installation page 7.27**.
2. 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.

3. Run the unit briefly and shut it off after idle stabilizes.

NOTE

Do not disturb or disconnect the meter leads.

4. With ignition switch off, **and after 12 minutes have passed**, read current drain.
5. 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.

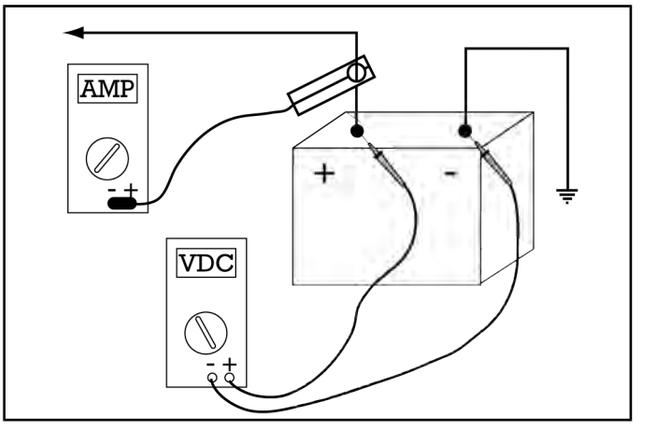
6. Locate the faulty component or wiring by disconnecting accessories, wiring connections, and fuses one-at-a-time while observing current drain. When current drain falls within specifications, focus efforts on the last circuit or component that was disconnected.

REGULATED VOLTAGE / AMPERAGE OUTPUT INSPECTION

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. Remove seat. See **Seat Removal / Installation page 7.27**.
2. Place the inductive ammeter over the positive (+) battery cable.
3. Set multi meter to V DC scale.
4. Connect voltmeter red (+) lead to battery red (+) lead and black (-) voltmeter lead to battery black (-) lead.



5. Start engine and warm to operating temperature.

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6. At 1000 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

7. Increase engine RPM to 2500. The ammeter should rise a slight amount, then stabilize. Volt meter should read above 14 V DC.
8. 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.
9. Turn ignition key off.
10. Remove inductive ammeter clamp.
11. Install seat. See **Seat Removal / Installation page 7.27**.

STATOR AC VOLTAGE OUTPUT TEST

IMPORTANT

Set multimeter 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.

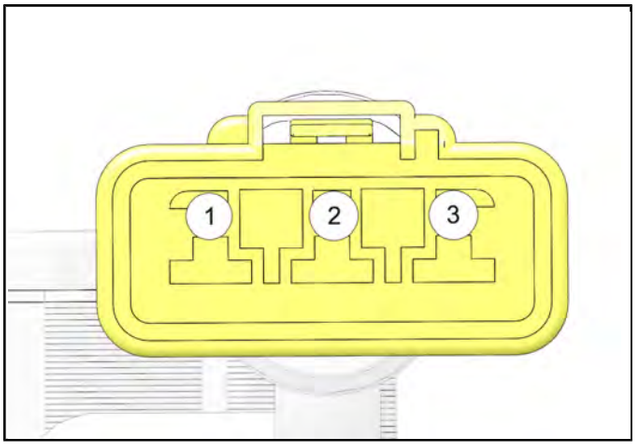
⚠ CAUTION

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.

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3. Connect one lead of the multi meter to pin A ① and one lead to pin B ② 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 a minimum reading of 24 VAC at idle.
6. Repeat test for pins A ① & C ③.
7. Repeat test for pins B ② & C ③.

No load AC Volts @ 800 RPM: Approx 24 VAC

NOTICE

The test results in Steps 6, 7, and 8 can read more than 24 VAC, but it is **important that the reading for each pair of wires is approximately equal.**

8. Increase RPM to 2000. Repeat Steps 4-8.
9. At 2000 RPM the reading should be at least 34 VAC.

NOTICE

The test results obtained in step 10 can read more than 34 VAC, but it is important that they are all approximately equal.

No load AC Volts @ 2000 RPM: Approx 34 VAC

STATOR RESISTANCE TEST

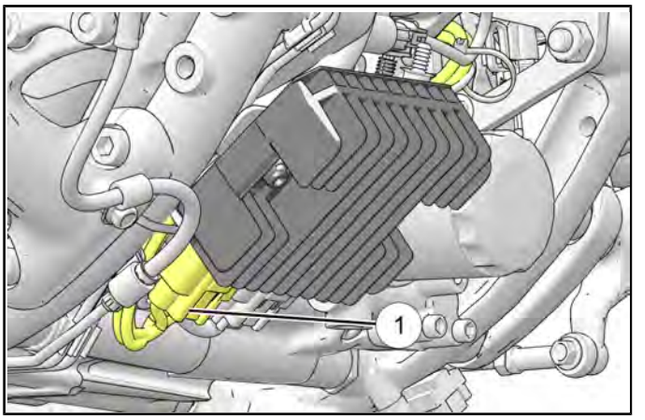
⚠ CAUTION

The *engine must not be running* while performing the following resistance test.

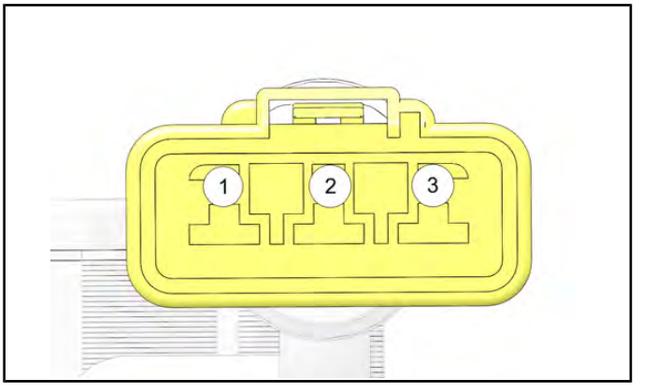
IMPORTANT

Set multimeter to measure resistance. Engine OFF and cold. Regulator Rectifier 3-pin connector unplugged.

1. Disconnect the three pin connector ① from stator.



2. Set the multi meter to measure resistance (Ω) and insert the meter leads in to the appropriate jacks.
3. Connect one meter lead to pin A ① and the other lead to pin B ② on the stator connector. Note resistance value.



Stator Resistance: Less than 1 Ohm

4. Repeat test for pins A ① & C ③.
5. Repeat test for pins B ② & C ③.
6. If resistance values do not match specification, inspect stator and replace as necessary.

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STATOR WINDINGS TO GROUND INSPECTION

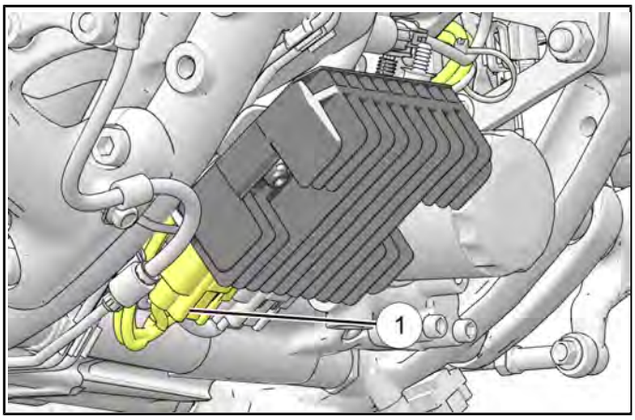
⚠ CAUTION

The *engine must not be running* while performing the following resistance test.

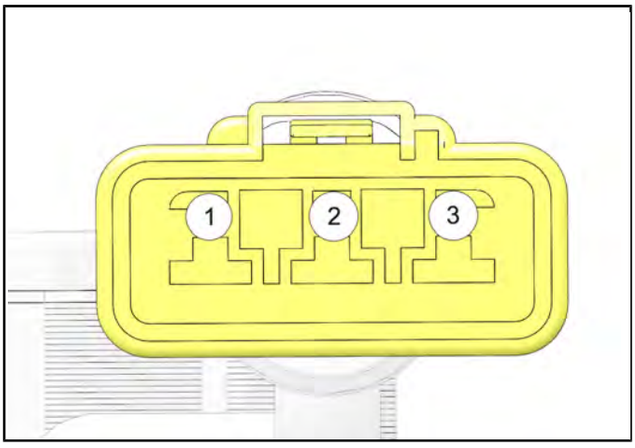
IMPORTANT

Set multimeter to measure resistance. Engine OFF and cold. Regulator Rectifier 3-pin connector unplugged.

1. Disconnect the three pin connector ① from stator.



2. Connect one multi meter lead to pin A ① 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)

3. Repeat test for other two stator leads (② & ③) to ground.

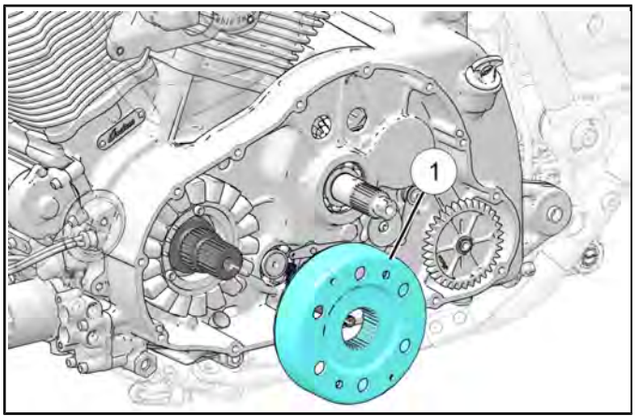
4. There should be no connection from stator windings to ground.

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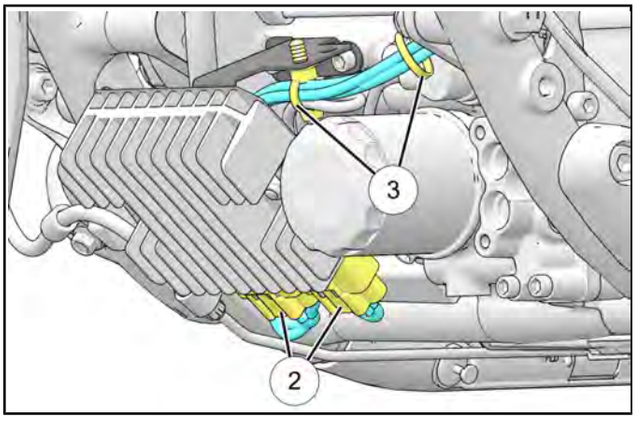
STATOR REMOVAL / INSTALLATION

REMOVAL

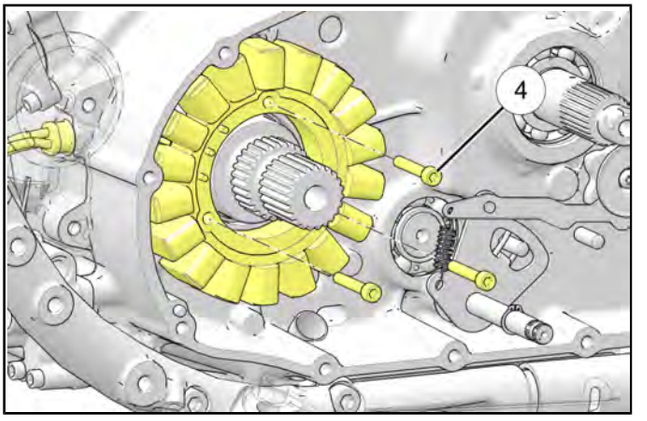
1. Remove primary cover. See **Primary Cover Removal (2022) page 5.17**.
2. Remove primary drive gear. See **Primary Drive Gear Removal page 5.40**.
3. Remove Clutch assembly. See **Clutch Removal page 5.29**.
4. Remove stator rotor ①.



5. Disconnect stator electrical connections ②.



6. Disconnect retention points ③.
7. Using a flat head screwdriver or similar tool, remove the terminal retainer from the back of the stator connector.
8. Using a terminal tool or pick tool, remove the three electrical terminals from the stator connector.
9. Remove stator fastener ④.



10. Push the rubber harness seal through to the inside of the primary case and remove stator assembly.

INSTALLATION

1. The electrical connector must be removed from the stator assembly before it can be installed.
2. Feed the stator wires through the hole in the LH engine case and push the rubber harness seal through until fully seated.
3. Place stator in position over the crankshaft and install fasteners.

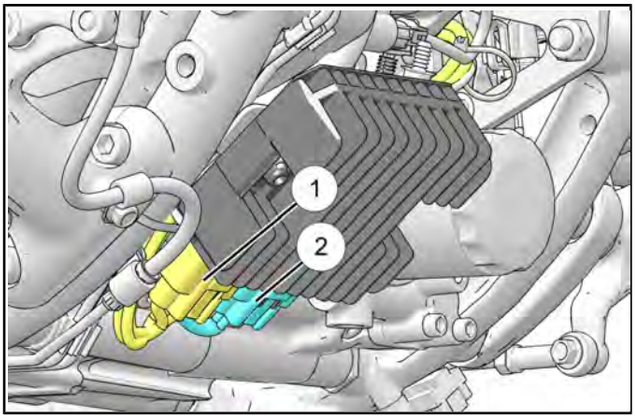
TORQUE
Stator Fasteners: **88 in-lbs (10 N·m)**

4. Press the three wire terminals into the connector housing until there is an audible “click” and the wires cannot be backed out.
5. Install the silicone plugs into each of the connector cavities and snap the terminal retaining clip into place.
6. Plug the stator connector into the regulator / rectifier connector.
7. Install the stator rotor.
8. Install clutch. See **Clutch Installation page 5.33**.
9. Install Primary Drive Gear. See **Primary Drive Gear Installation page 5.40**.
10. Install Primary Cover. See **Primary Cover Installation (2022) page 5.24**.

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RECTIFIER / REGULATOR CONNECTOR INSPECTION

1. Disconnect both 3-pin ① and 2-pin ② connectors.

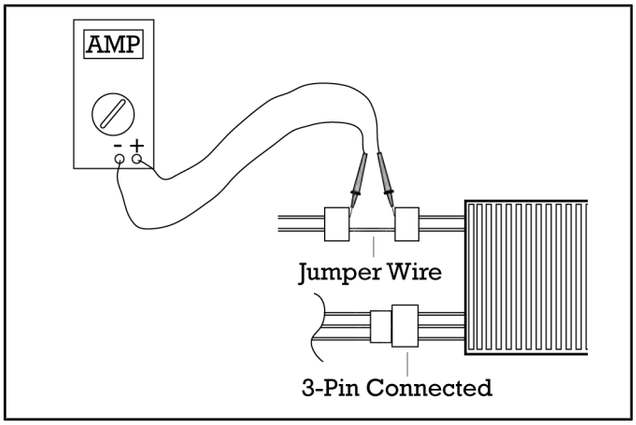


2. Inspect pins in the 3-pin and 2-pin connectors carefully. Check for corrosion, loose pins, poor connections, or evidence of overheating or other damage.
3. If the wiring and connectors are undamaged and appear to be clean and tight, inspect the battery, stator, and related wiring. Test the regulator / 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

DIAGNOSTICS, CHARGING SYSTEM BATTERY CHECK

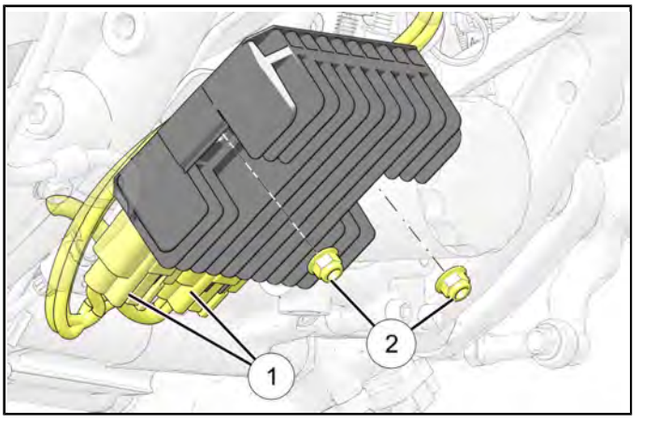
1. Electrical connections: Check bolted joints at battery + and – terminals, making sure all cables are tight. Also check voltage regulator connections (input from stator and output to battery).
   a. If any connection was loose, the battery must be fully charged, and the system re-evaluated.

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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 the + 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. Disconnect the electrical connectors from the regulator / rectifier ①.



2. Remove the two nuts ② securing the regulator / rectifier to the bracket.
3. **INSTALLATION is performed by reversing the removal procedure.**
4. Torque the regulator / rectifier nuts to specification.

TORQUE
Voltage Regulator Nuts: **62 in-lbs (7 N·m)**

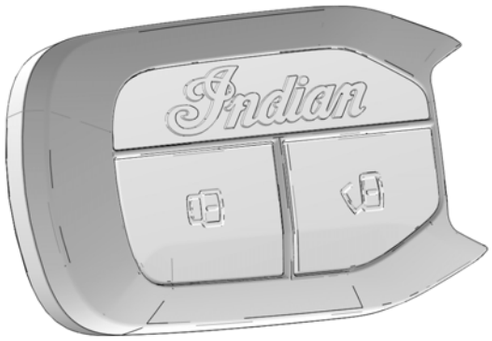
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KEY FOB

KEY FOB OVERVIEW

Indian Chief / Chief Bobber / Super Chief 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.

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 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. Turn the power switch on. Do NOT start the engine. The security light and/or power switch will turn on briefly until the key fob is detected or until the valid, current PIN is entered.
2. Push or hold the turn signal CANCEL switch for 10 seconds until the security light and/or power switch turn on.

NOTICE

On models with Infotainment Display, a pop-up window will appear during this procedure stating that the key fob is out of range.

3. Enter either the master PIN or your current 4-digit rider PIN within 20 seconds. If the PIN is successfully entered, the security light and/or power switch will remain on and the horn will sound briefly.

IMPORTANT

If the valid PIN is not entered within 20 seconds, the security light and/or power switch will flash for 10 seconds, then the system will shut down. Return to step 1 to try again.

4. Enter a new 4-digit security PIN of your own choosing. If the PIN is successfully entered, the security light and/or power switch will remain on and the horn will sound briefly. Proceed to step 5.

IMPORTANT

If the 4-digit PIN is NOT successfully entered within 20 seconds, the security light and/or power switch will flash for 10 seconds, then the system exits the procedure. Return to step 1 to try again.

5. Re-enter the new 4-digit PIN. If this entry matches the first entry, the security light and/or power switch will turn off and the horn will sound briefly. The new rider PIN has been saved. *Record your new rider PIN.*

IMPORTANT

If the second entry is not entered within 20 seconds or does not match the first entry, the security light and/or power switch will flash for 10 seconds, then the system exits the procedure. The new PIN was NOT saved. Continue to use your former valid PIN. Return to step 1 to try again.

Driving Key Fob Operation:

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- 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. 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.
- If the key fob is not detected when shifting into gear:

– The engine will turn off. The security light and/or power switch will flash.
– The electrical system will then automatically shut down.

Saddlebag Key Fob Operation:

- If equipped with electric saddlebag locks, the locks can be controlled by either the key fob or the lock switch on the console.
- When using the console lock switch, the key fob must be within range.
- If the key fob is not detected:
  – The power switch will flash.
  – The system will not perform the lock or unlock procedure.

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 1.25**

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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 **3 feet** of motorcycle)
3. Key Fob battery must have sufficient voltage (LOW Key Fob battery will illuminate the Security Light and the Battery Indicator on the instrument cluster)
4. Key Fob PIN is properly paired with motorcycle WCM (Digital Wrench)

Authentication Tell Tales

SUCCESSFUL:

- Security Light turns OFF
- Neutral Indicator illuminates (verify motorcycle is in Neutral by rolling back and forth)
- Motorcycle Starts / Runs

UNSUCCESSFUL:

- Electrical system shuts down after 20 seconds
- Security Light flashes 2x's per second for 10 seconds
- Horn honks every 5 seconds after startup
- Motorcycle DOES NOT Start / Run

Reference **Key Fob Troubleshooting page 10.41**.

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. **No-Button Fob** – Remove screw and carefully pry fob apart to access button. Press button and verify that LED illuminates.
   c. Measure fob battery voltage with DVOM. If voltage measures less than 3.0VDC, replace battery. Does LED illuminate?

      YES — Proceed to STEP 2

      NO — Replace Key Fob
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 1.25**

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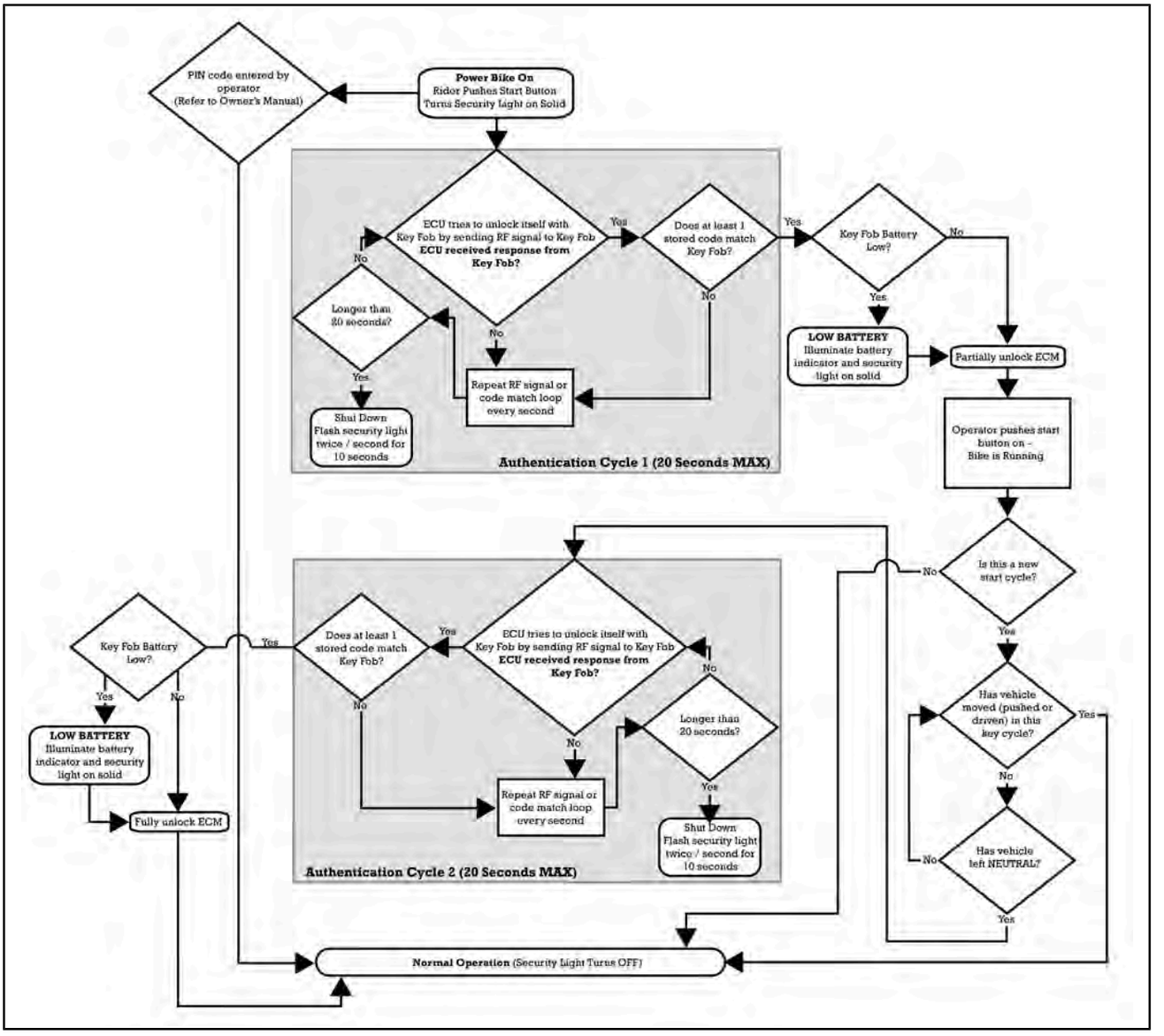
4. Test VCM Receiver Antenna.
   a. Inspect the 21 kHz 2-wire antenna (near the WCM) using a DVOM. Pin 7 is Antenna OUT B; Pin 18 is Antenna OUT A.

SPECIFICATION
Capacitance: 3.4 nF (± 2 %)

   b. Check 433 MHz antenna (located at Signal Connector 2 – PIN 5). Verify that connector is properly seated in multiplug and connection to VCM is secure.
   c. Does antenna test within specification?

      YES — Replace VCM

      NO — Contact Indian Motorcycle Technical Service.



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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.



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5. Install the battery cover back on to the key fob.
6. If applicable, verify the key fob lock and unlock functions work correctly.

ALARM SYSTEM OVERVIEW

Chief / Chief Bobber / Super Chief models have incorporated an Alarm / Immobilizer feature which can be activated using the multi-function (two button) key fob. This feature can be used if the multi-function key fob is purchased and paired with the WCM.

Alarm System Operation

To Activate the Alarm:

- Press the LOCK button on the Key Fob 2 times.
- The horn will sound briefly to confirm that the alarm is activated.

To Deactivate the Alarm (Key Fob must be within range):

- Press the UNLOCK button on the Key Fob. ***OR***
- Press the power button on the console panel. ***OR***
- Press the starter button. ***OR***
- Press the LOCK / UNLOCK switch on the center console. ***OR***
- Move the motorcycle to the fully upright position from leaning on the sidestand. (The horn will sound repeatedly if the Key Fob is not detected within 5 seconds.)

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IGNITION SYSTEM

GENERAL INFORMATION

SERVICE NOTES

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

SERVICE SPECIFICATIONS - IGNITION SYSTEM

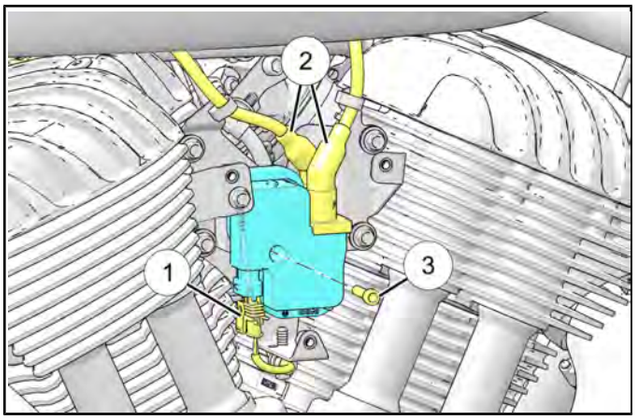
ITEM		SPECIFICATIONS
Spark Plug		NGK DCPR8E
Spark Plug Gap		0.034 in (0.90 mm)
Ignition Switch/ Cables Resistance Values	Primary	0.6 - 0.8 Ohms ± 20%
	Secondary	N/A
Crank Position Sensor Resistance		1050 Ohms ± 10% @ 68°F (20°C)
* Spark plug end caps are not removable		

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IGNITION SYSTEM SERVICE

IGNITION COIL REMOVAL / INSTALLATION

1. Place the IGNITION and RUN / STOP switch in the OFF/STOP position.
2. Remove ignition cover. See **Ignition Cover Removal / Installation page 7.40**.
3. Disconnect ignition coil electrical connector ①.



4. Remove spark plug wires ②.
5. Remove ignition coil fastener ③.
6. **Installation is performed by reversing the removal procedure.**

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

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

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TROUBLESHOOTING

IGNITION SYSTEM 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 (mounted on right side of the battery box).

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 coils 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

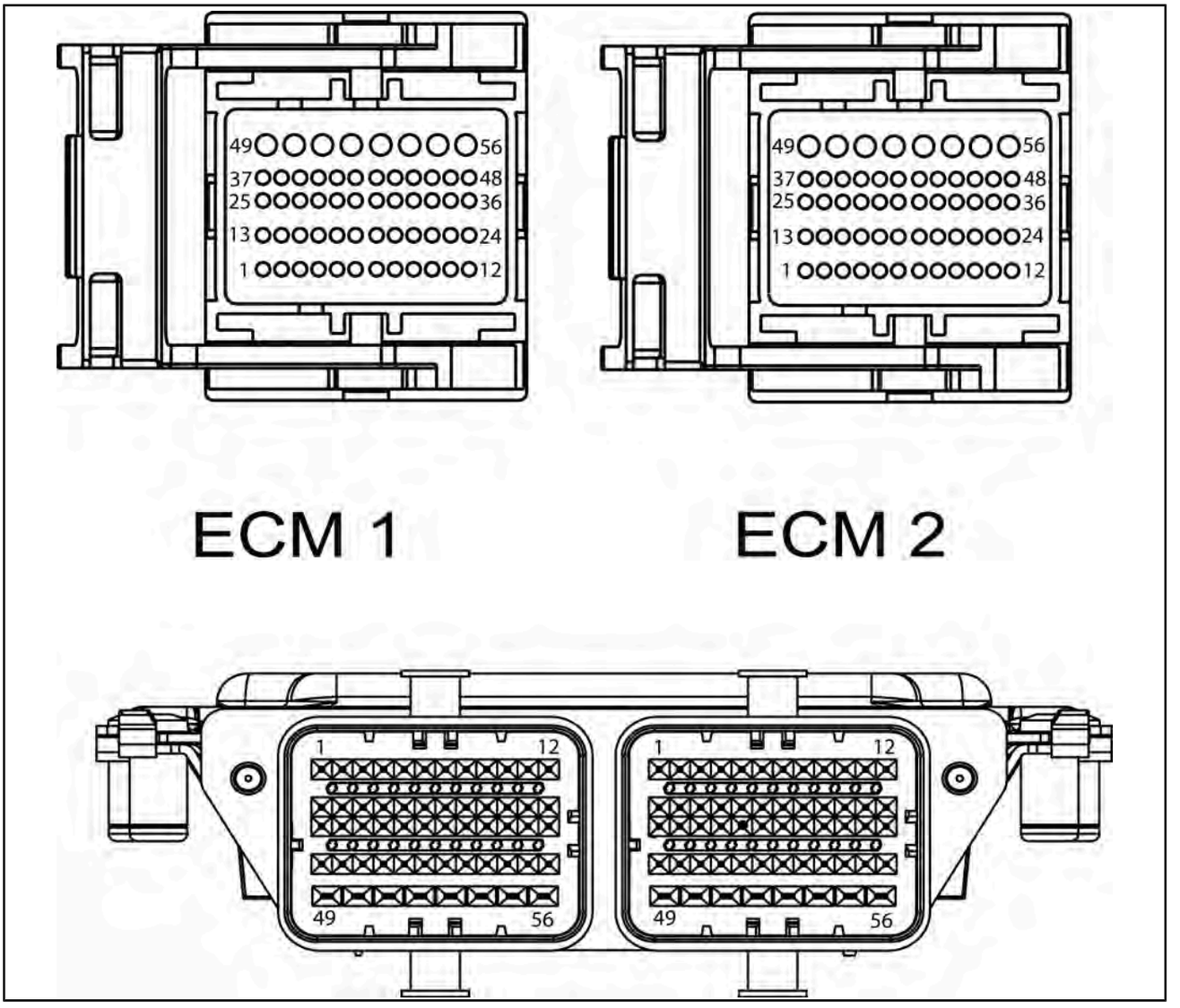


⚠ CAUTION

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.

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ECM CONNECTOR MAP



PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
1	—	–	1	GY / WH	Rear heated Oxygen Sensor Control
2	BN / PK	TMAP Power	2	YE / BK	Gear Position
3	–	–	3	–	–
4	–	–	4	–	–
5	–	–	5	BN / YE	Rear Wheel Signal
6	–	–	6	–	–
7	–	–	7	–	–
8	–	–	8	–	–
9	RD	Knock Sensor A	9	PK	K15
10	BK	Knock Sensor B	10	BN / DB	TPS +5V
11	PK / DB	Brake Light Power	11	RD / BU	Gear Select Sensor +5V

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PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
12	DG / YE	Tail Light Power	12	PK / RD	ETC Motor (+)
13	–	–	13	WH	CPS Positive Signal
14	–	–	14	BK	CPS Negative Signal
15	–	–	15	OG / DG	Intake Air Temperature Sensor Output
16	–	–	16	OG / BN	Manifold Absolute Pressure Sensor Output
17	–	–	17	–	–
18	–	–	18	–	–
19	DB / PK	Run Stop Switch	19	–	–
20	BG / BK	Sidestand Switch Signal	20	GY	Fuel Pump Relay Control
21	–	–	21	OG / BN	Starter Relay Control
22	–	–	22	WG/ RD	PPS 1 +5V Reference
23	DB	Left Front TS Lamp Output	23	YE / RD	PPS 2+5V Reference
24	DB / RD	Right Front TS Lamp Output	24	YE	ETC Motor (–)
25	–	–	25	BG	Rear heated Oxygen Sensor Return
26	–	–	26	BN / WH	TPS Return
27	–	–	27	YE / BK	PPS 2 Return
28	–	–	28	GY / RD	Rear Heated Oxygen Sensor Output
29	–	–	29	YE	250K CAN HIGH
30	–	–	30	DG	256K CAN LOW
31	GY / DB	Front heated Oxygen Sensor Output	31	WH / RD	Rear Brake Switch Output
32	BG / WH	Front heated Oxygen Sensor Return	32	YE / GN	PPS 2 Output
33	–	–	33	OG / DB	Cylinder Head Temperature Sensor Output
34	–	–	34	GY / BK	Engine Relay Control
35	DB	Left Rear TS Lamp Output	35	WH / GN	PPS 1 Output
36	DB / RD	Right Rear TS Lamp Output	36	BK / DG	Fuel Level Sensor Output
37	DG	CANB LOW	37	BN / GN	MAP Sensor Return
38	YE	CANB HIGH	38	WH / BK	PPS1 Return
39	–	–	39	–	–
40	–	–	40	DB / BK	Canister Purge Valve
41	PK / BK	STARTER HSD	41	WH / GY	Rear Fuel Injector Driver
42	–	–	42	WH / DB	Front Fuel Injector Driver
43	OG / BN	CHT RETURN	43	YE / VT	Rear Brake Switch output
44	BK / BU	FUEL SENDER GROUND	44	–	–
45	–	–	45	VT / RD	TPS 2 Signal
46	–	–	46	–	–
47	–	–	47	OG / DB	Ambient Air Signal
48	–	–	48	OG / YE	Throttle Position Sensor 1 Output
49	–	–	49	VT / PK	Engine Relay power Output
50	–	–	50	VT / PK	Engine Relay Power Output
51	–	–	51	BK / WH	ECM Ground
52	BK / DG	ECM GROUND	52	BK / WH	ECM Ground
53	–	–	53	WH	Front Coil Signal

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PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
54	BK / WH	ECM GROUND	54	BK	Rear Coil Signal
55	GY / WH	FRONT HEATED OXYGEN SENSOR CONTROL	55	–	–
56	–	–	56	–	–

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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 1.25**

ECM REPROGRAMMING

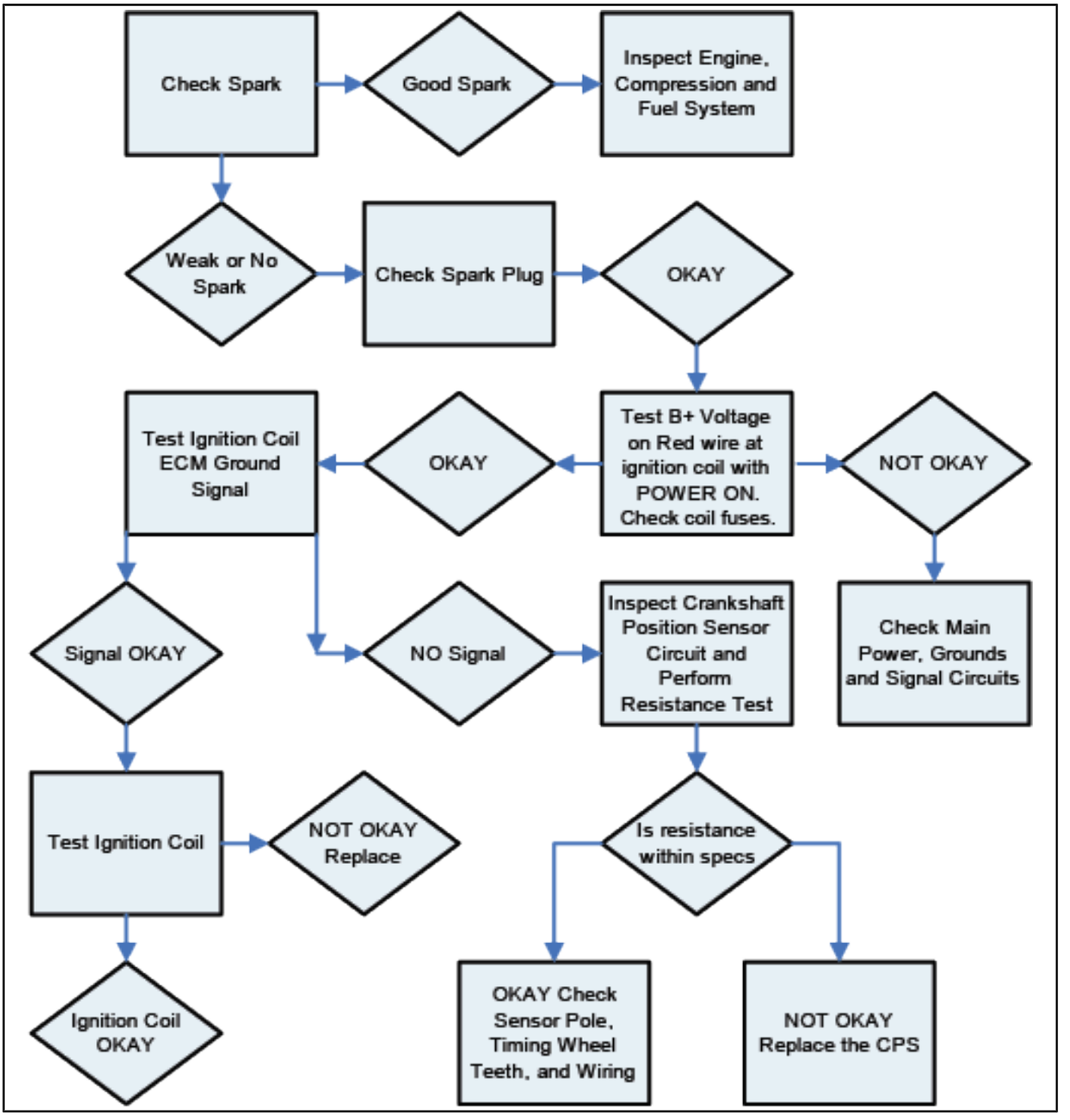
This procedure will require Digital Wrench® II

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 1.25**

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IGNITION SYSTEM TEST FLOWCHART



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BATTERY VOLTAGE INSPECTION TEST 1

1. Remove the seat. See **Seat Removal / Installation page 7.27**.
2. Set multimeter 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. Remove ignition coil. See **Ignition Coil Removal / Installation page 10.46**.
2. Install secondary ignition cable test adapter (commercially available) between coil(s) and spark plug(s).
3. Connect timing light to secondary ignition cable test adapter.
4. Turn ignition key ON to power up the motorcycle and place the STOP/RUN switch in the RUN position.
5. Shift transmission into neutral and pull in clutch lever.
6. Depress starter button and observe timing light.
7. Determine if timing light flashes without interruption for both cylinders.
8. 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 circuit or poor connection is one example of an open secondary.
9. Replace spark plugs, connect plug wires and re-test.
10. If timing light does not flash consistently for one or both cylinders, test ignition coil (Test 3).

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IGNITION COIL POWER / GROUND SIGNAL TEST 3

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 / Installation page 10.46**.
2. Set the multimeter 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 terminal 1 of the ignition coil primary connector and the red meter lead to the test adapter.
5. Turn ignition key ON to power up the motorcycle electrical system and place the STOP/RUN switch in the RUN position.
6. Battery voltage should appear on terminal 1 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 terminal 3 of the ignition coil primary harness connector. The signal will appear as a pulse on the meter between Ground (-) and Open (OL).
8. Set the multimeter to measure resistance (Ω).
9. Place a small thin test adapter into terminal 3 of the ignition coil connector (the WH wire) and connect one meter lead to the test adapter..
10. Ground the other lead to the engine.
11. Place transmission in Neutral.
12. Turn the ignition key ON to power up the motorcycle electrical system and place the STOP/RUN switch in the RUN position.
13. 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.
14. Repeat the test on the other outside wire in the connector.

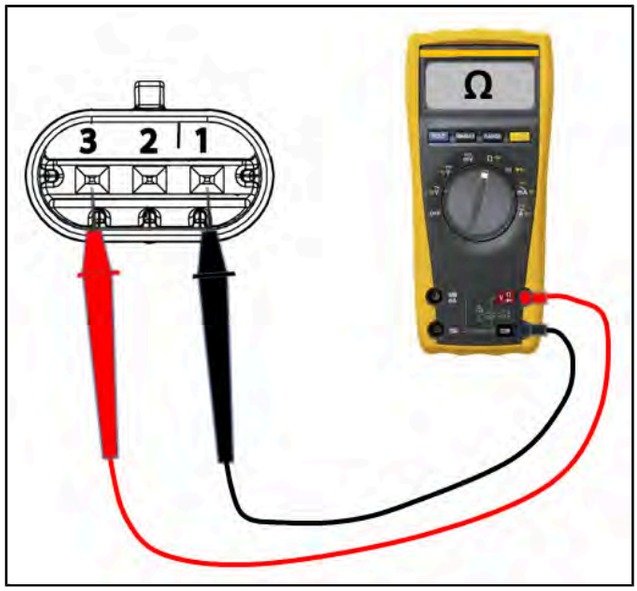
- If no pulse is present, test the Crankshaft Position Sensor.
- If the signal is present on one wire and not the other, test related wiring and connections.
- If both signals are present and there was battery voltage on the RD wire (center terminal) but still no spark, test the ignition coil windings. (Test 5).

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IGNITION COIL RESISTANCE TEST 4

Ignition Coil Primary Winding

1. Remove ignition coil. See **Ignition Coil Removal / Installation page 10.46**.
2. Set the multi meter to measure resistance (Ω) and insert the meter leads into the appropriate jacks.
3. Measure resistance between terminal ① and terminal ③ on the coil. Compare to specification.



Primary Coil Resistance: 0.6 - 0.8 Ω

CRANKSHAFT POSITION SENSOR (CPS) RESISTANCE INSPECTION:

See **Crankshaft Position Sensor, Test / Replace page 4.52**.

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CHASSIS ELECTRICAL

GENERAL INFORMATION

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 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. 10 A jack for current readings). Refer to the Owner's Manual included with your meter for more information.
- Pay attention to the prefix on the multi-meter 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.

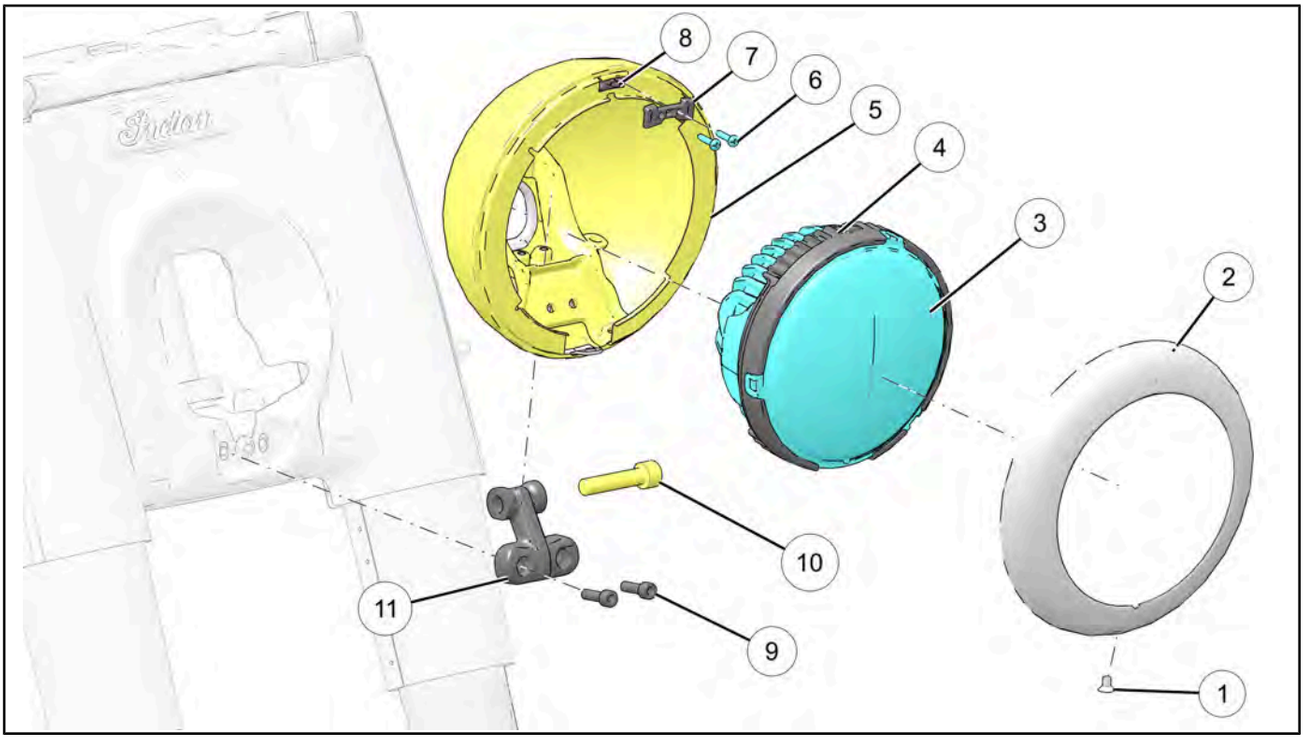
SPECIAL TOOLS - CHASSIS ELECTRICAL

TOOL DESCRIPTION	PART NUMBER
Battery Tester	PV-50296
Electrical Tester Kit	PV-43526
Smartlink Module Kit	PU-47471
USB to Serial Adapter	PU-50621

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ASSEMBLY VIEWS

HEAD LIGHT COMPONENTS

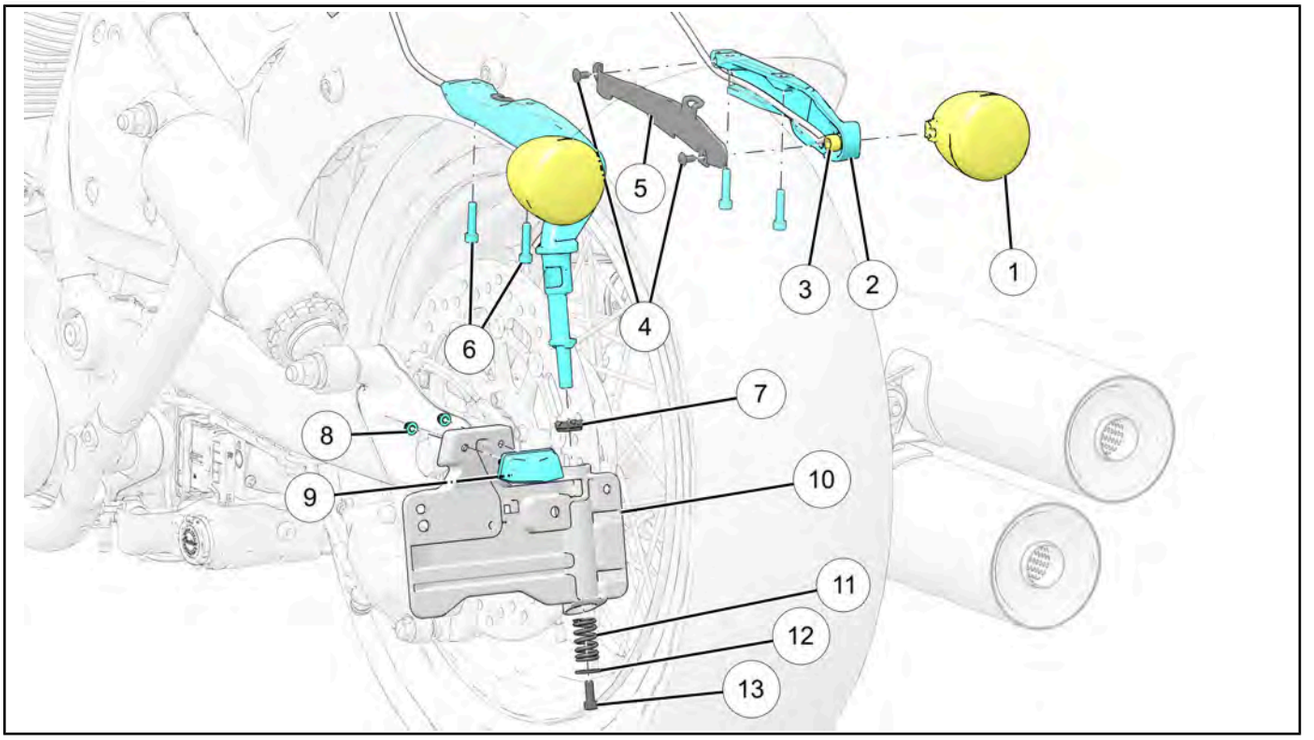


ITEM	DESCRIPTION	TORQUE
①	Head Light Bezel Fastener	**27 in-lbs (3 N·m)**
②	Head Light Bezel	—
③	Head Light	—
④	Head Light Coupler	—
⑤	Head Light Bucket	—
⑥	Head Light Stop Fastener	**12.4 in-lbs (1.4 N·m)**
⑦	Head Light Stop Front	—
⑧	Head Light Stop Rear	—
⑨	Head Light Mount Fastener	**88 in-lbs (10 N·m)**
⑩	Head Light Pivot Fastener	**30 ft-lbs (40 N·m)**
⑪	Head Light Mount	—

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TAIL LIGHT / LICENSE PLATE LIGHT COMPONENTS

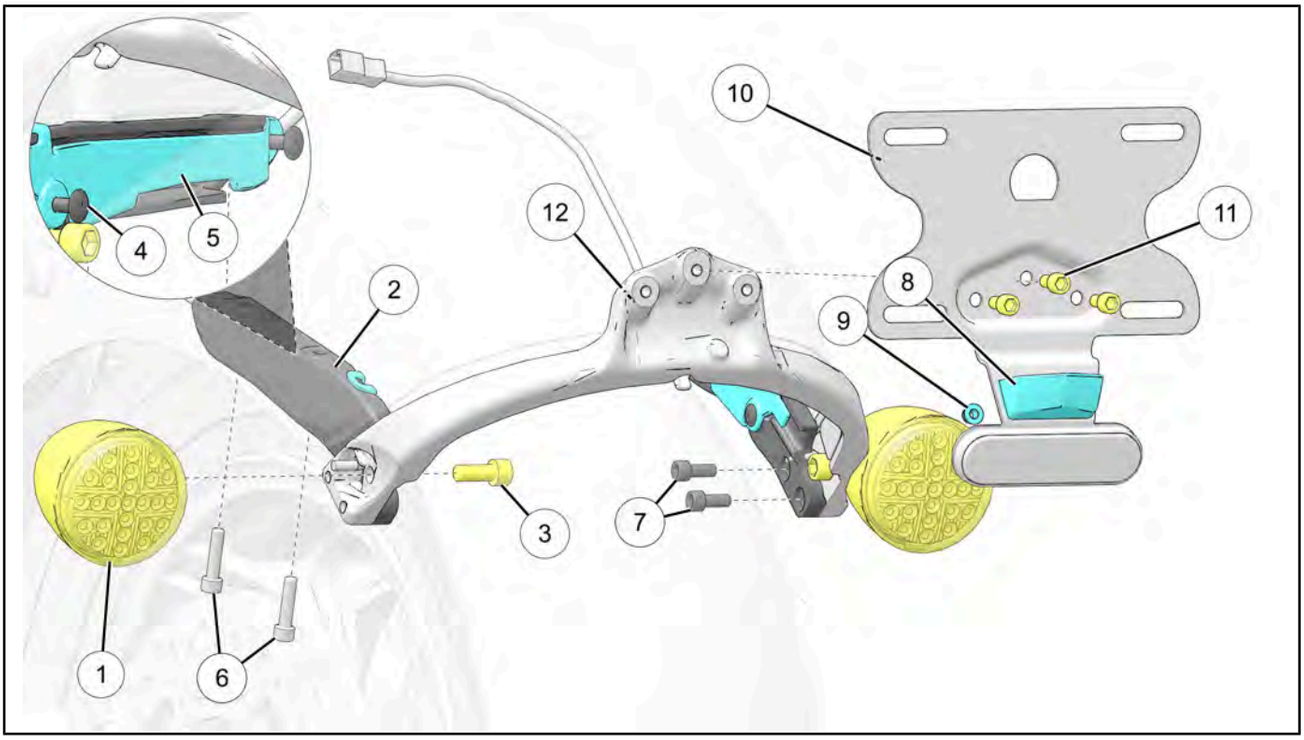
SIDE MOUNT



ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Turn Signal	—	⑧	License Plate Light Fastener	**17 in-lbs (2 N·m)**
②	Rear Light Mount (RH)	—	⑨	License Plate Light	—
③	Turn Signal Fastener	**18 ft-lbs (25 N·m)**	⑩	License Plate Bracket	—
④	Push Dart	—	⑪	Spring	—
⑤	Side Mount Harness Retainer	—	⑫	Washer	—
⑥	Rear Light Mount Fastener	**115 in-lbs (13 N·m)**	⑬	License Plate Bracket Fastener	**88 in-lbs (10 N·m)**
⑦	Cam Pad	—			

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CENTER MOUNT

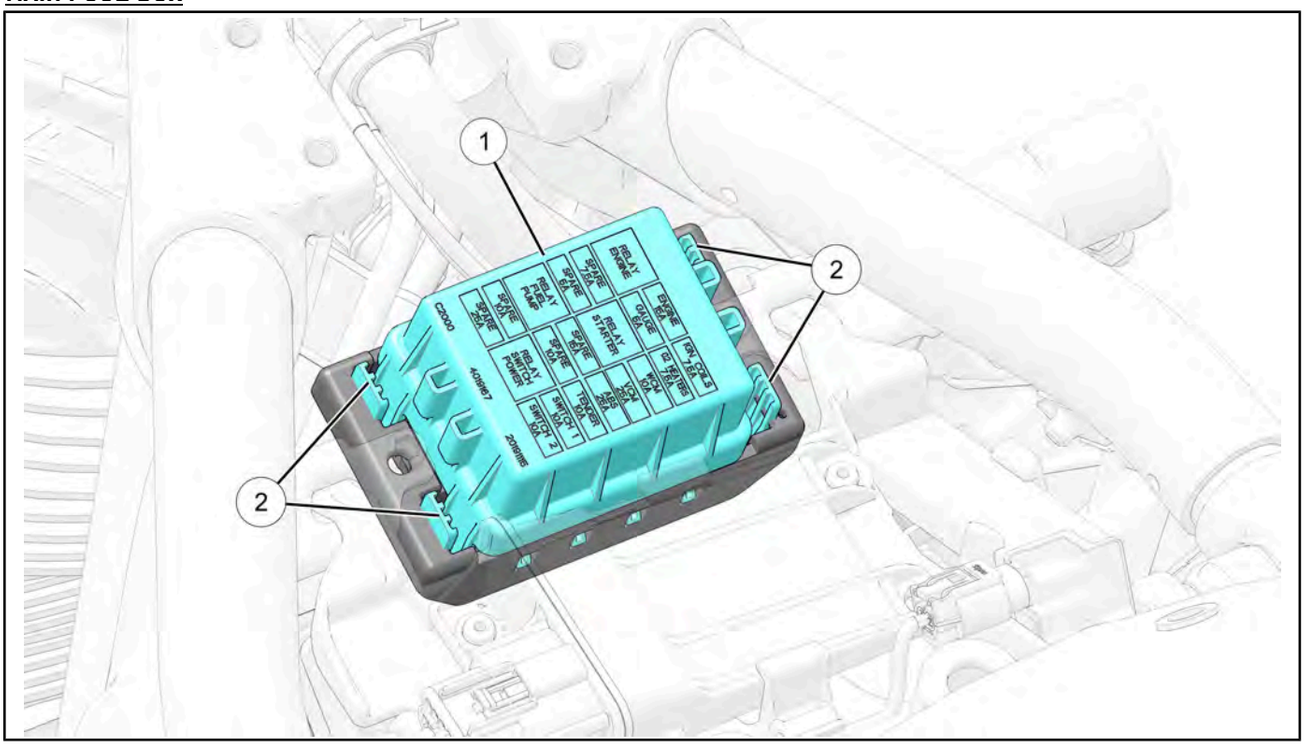


ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
①	Turn Signal	—	⑦	Center Light Mount Fastener	**18 ft-lbs (25 N·m)**
②	Rear Light Mount (RH)	—	⑧	License Plate Light	
③	Turn Signal Fastener	**18 ft-lbs (25 N·m)**	⑨	License Plate Light Fastener	**17 in-lbs (2 N·m)**
④	Push Dart	—	⑩	License Plate Bracket	—
⑤	Side Mount Harness Retainer	—	⑪	License Plate Bracket Fastener	**88 in-lbs (10 N·m)**
⑥	Rear Light Mount Fastener	**115 in-lbs (13 N·m)**	⑫	Center Light Mount	—

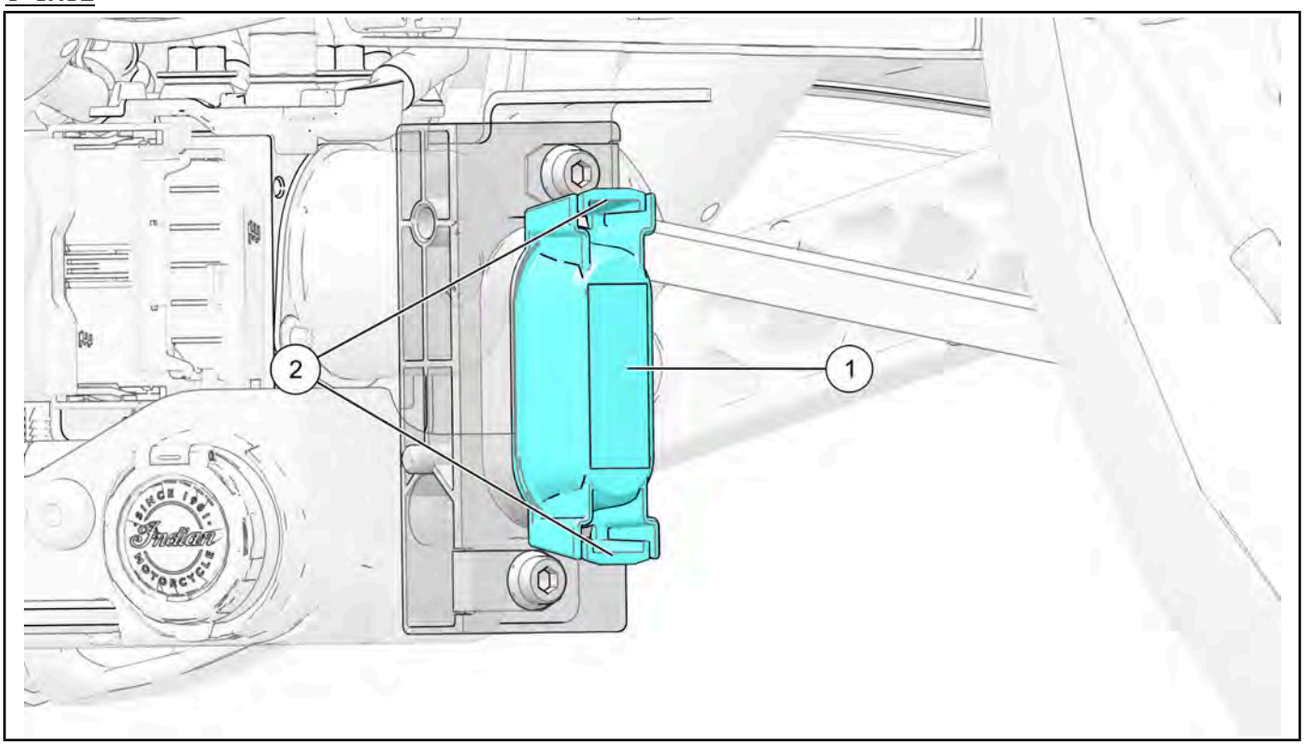
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FUSE BOX

MAIN FUSE BOX



J-CASE

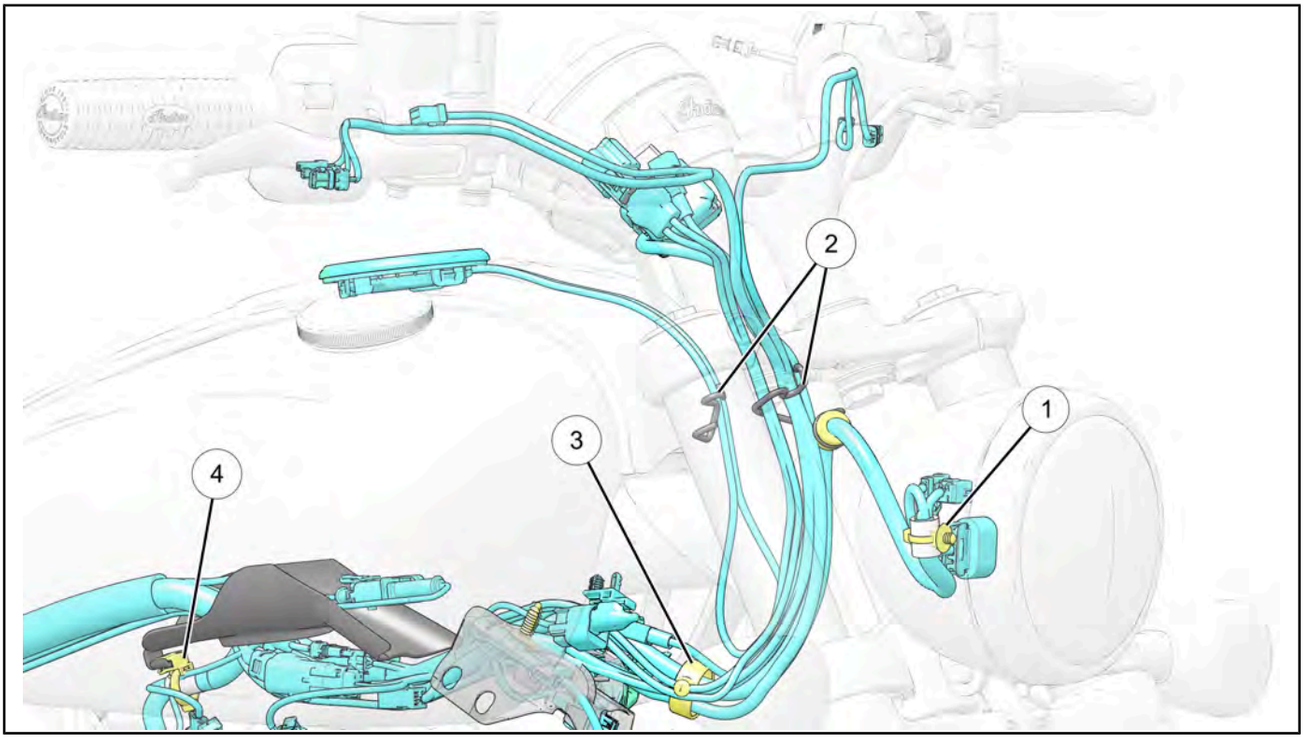


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ITEM	DESCRIPTION
①	Fuse Box Cover
②	Fuse Box Latch

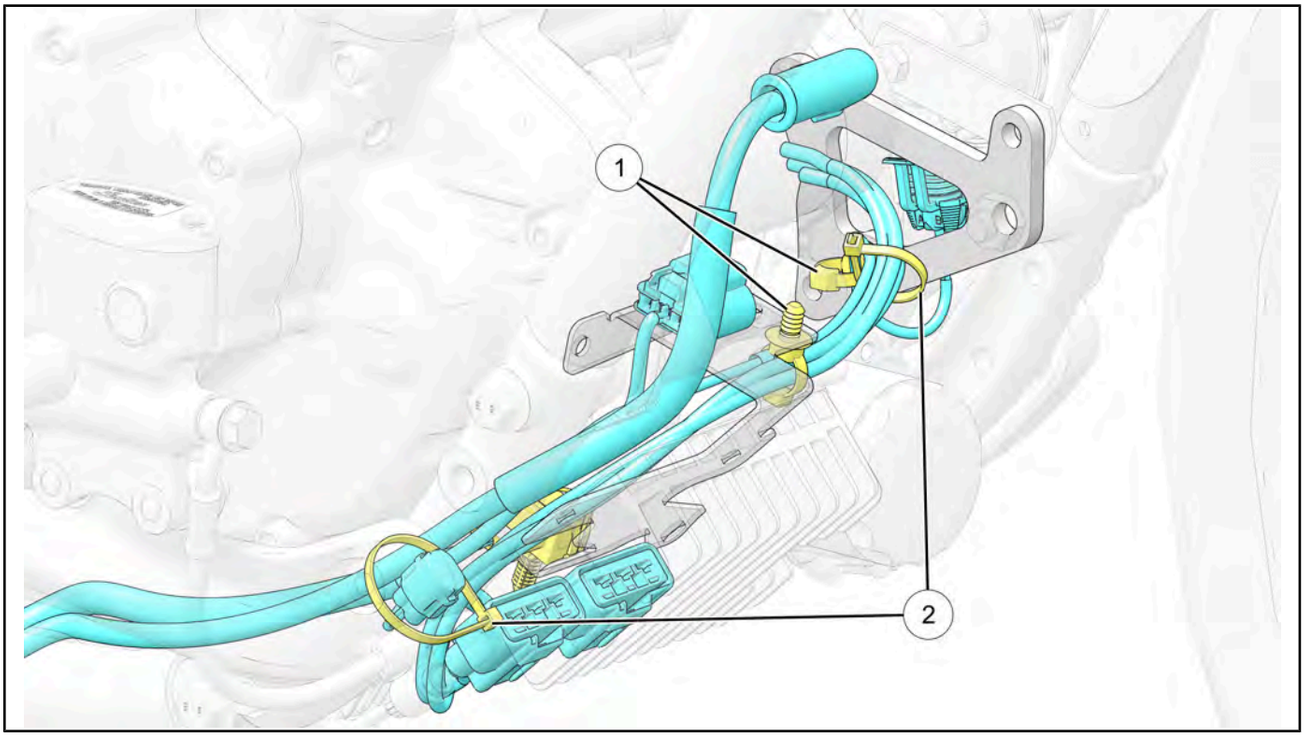
HARNESS ROUTING / RETENTION

NOTICE
2022 Model Shown



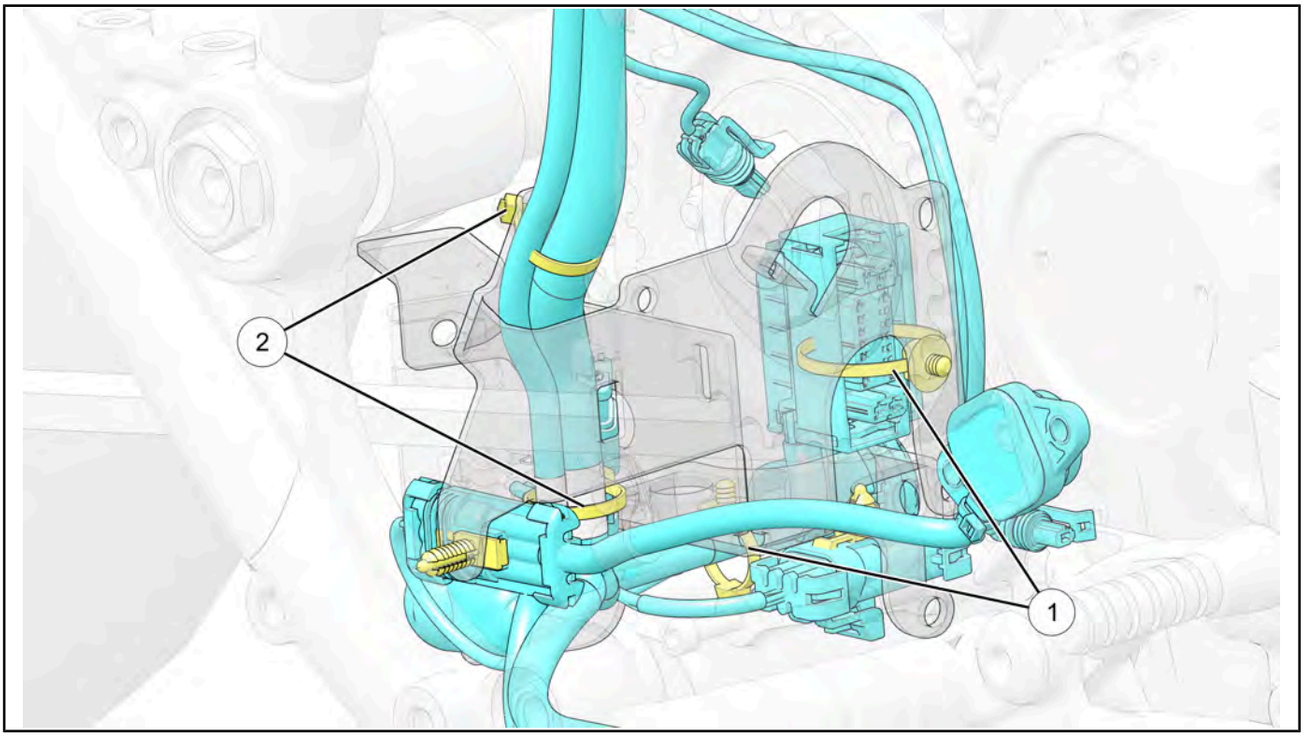
ITEM	DESCRIPTION
①	Routing Clip
②	Wire Form Guide
③	Rubber Strap
④	Edge Clip

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ITEM	DESCRIPTION
①	Cable Tie
②	Routing Clip

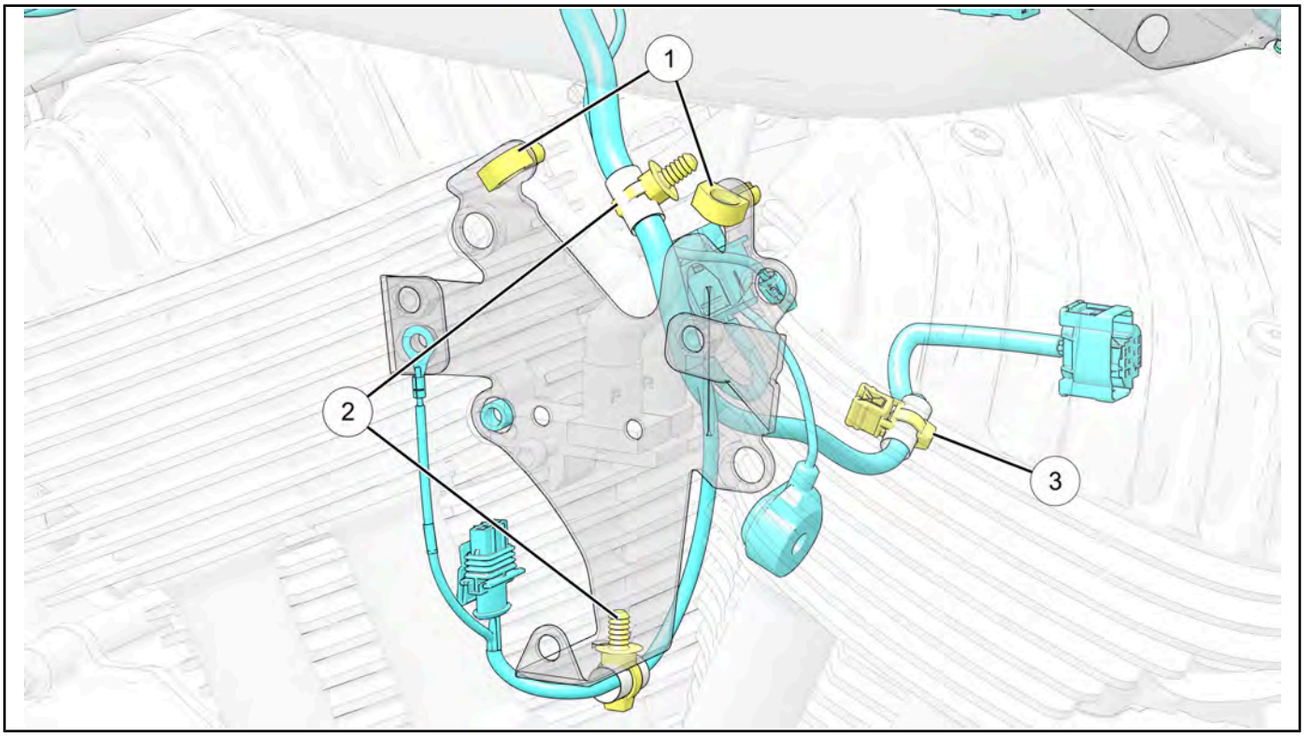
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NOTICE
ABS equipped harness shown.

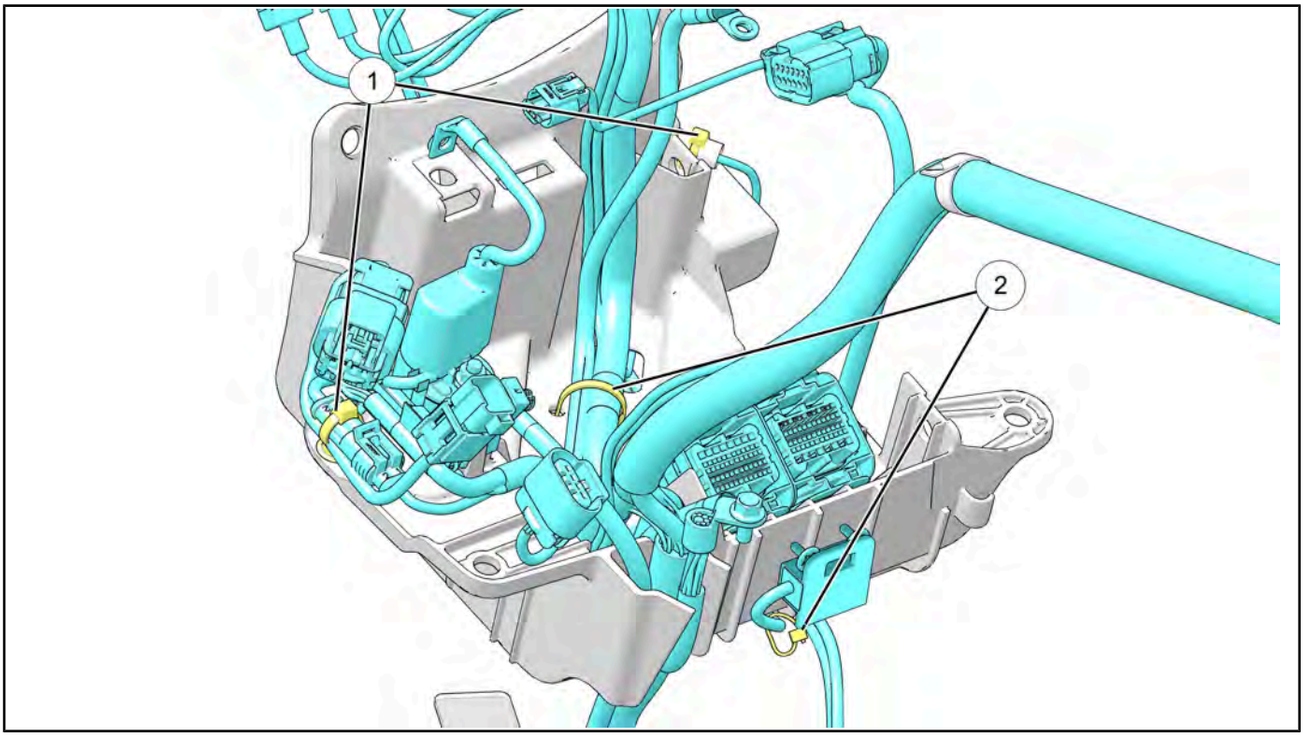
ITEM	DESCRIPTION
①	Cable Tie
②	Routing Clip

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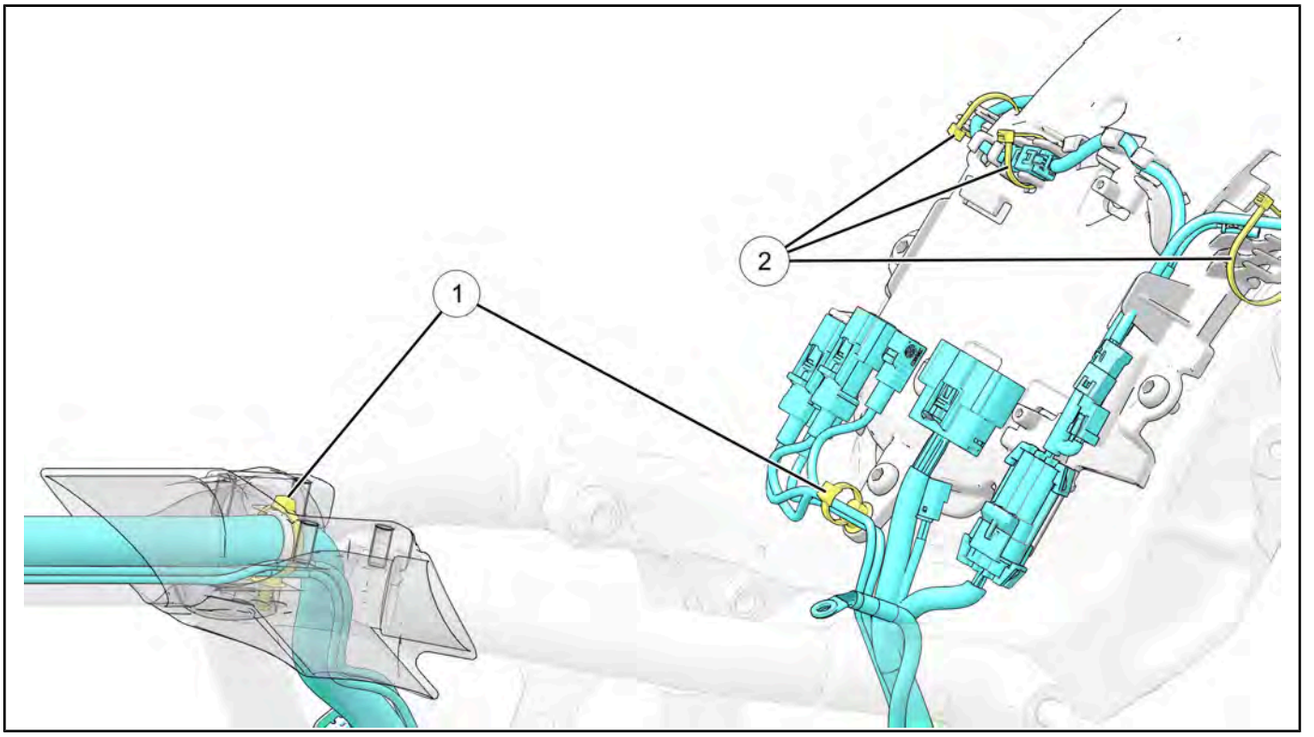
ITEM	DESCRIPTION
①	Silencer Clip
②	Routing Clip
③	Edge Clip

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ITEM	DESCRIPTION
①	Cable Tie
②	Routing Clip

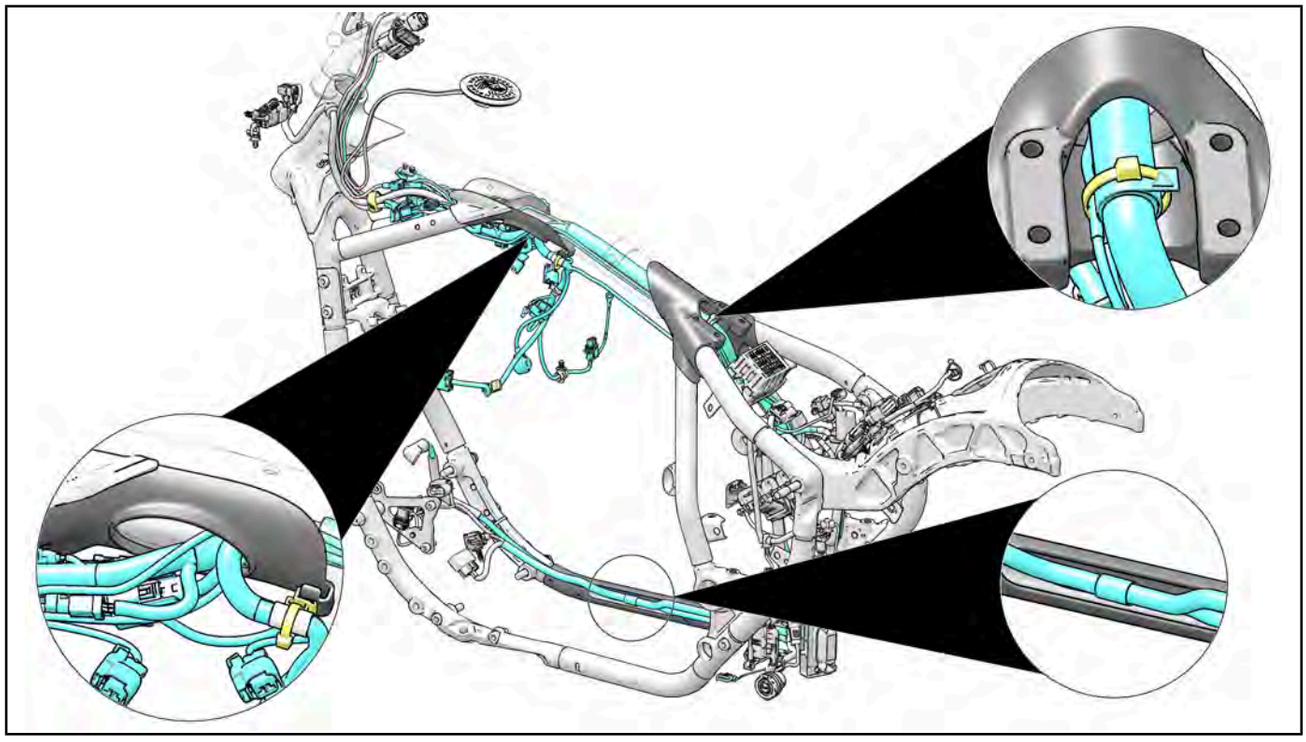
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ITEM	DESCRIPTION
①	Cable Tie
②	Routing Clip

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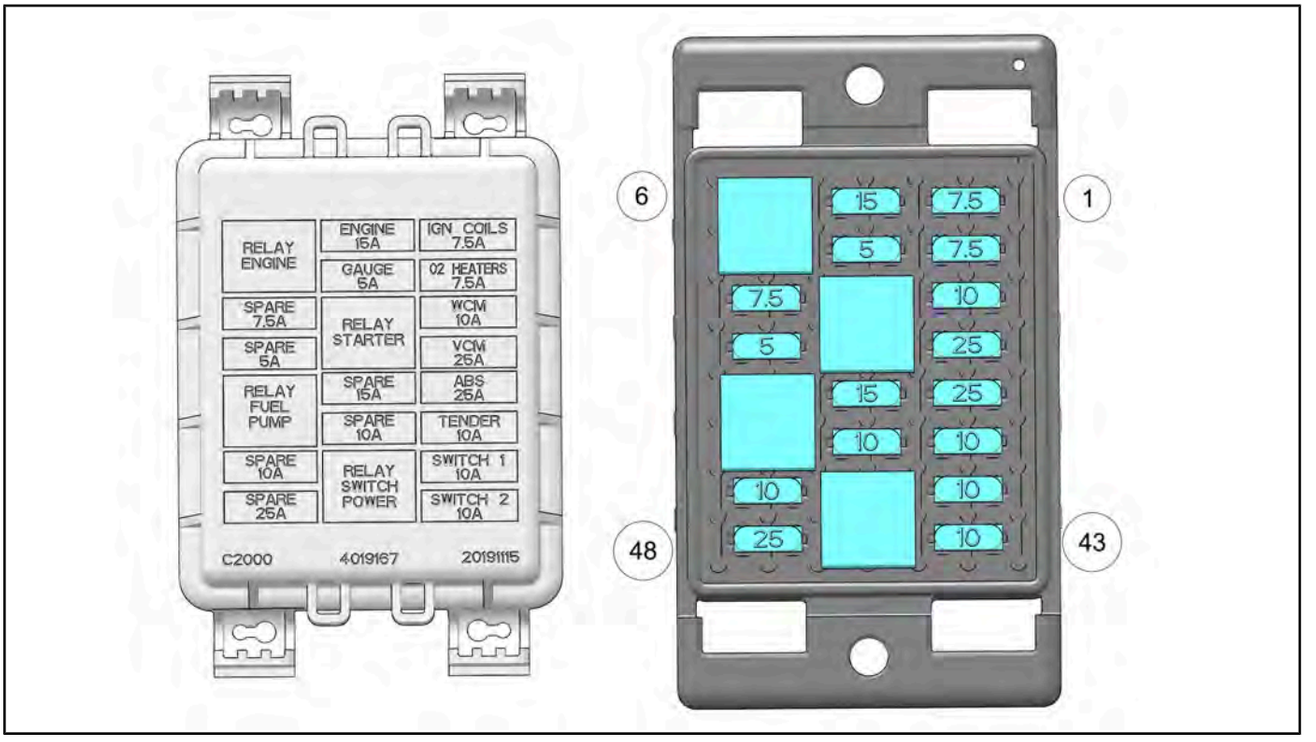
The electrical harness routes through the frame backbone and exits near the seat base. There is a recess on the right hand cradle where the harness routes into.

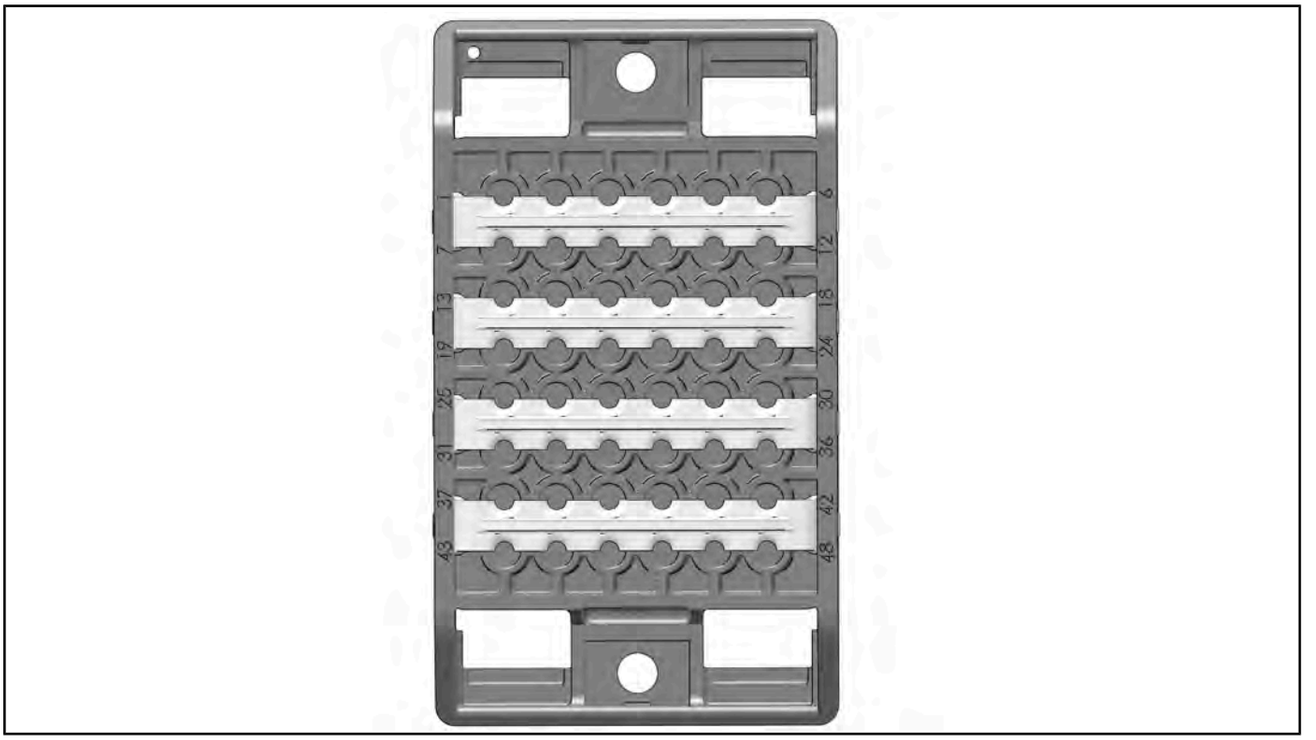


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FUSE BOX

FUSE APPLICATION CHART





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MAIN FUSE BLOCK

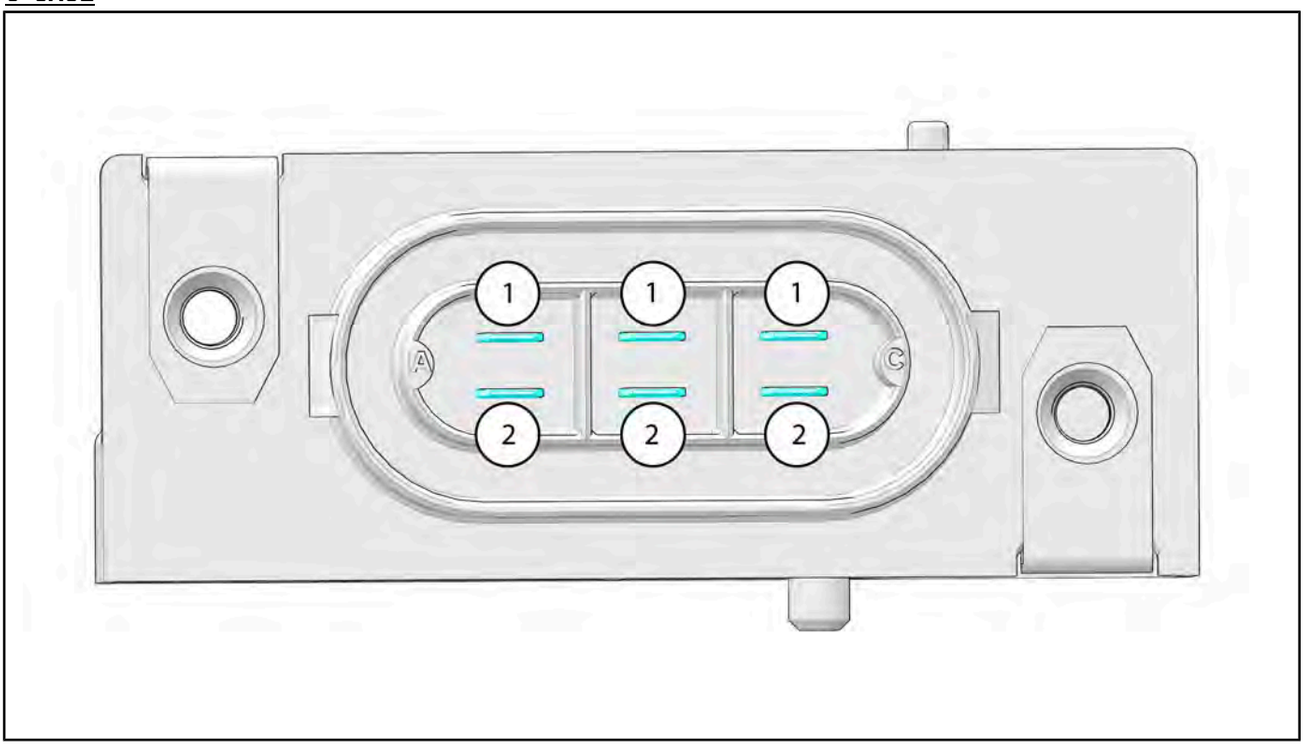
CIRCUIT	PIN	WIRE COLOR	FUNCTION
Ignition Coil Fuse 7.5A	1	RD	Ignition Coil Feed
	2	RD/DB	Engine Breaker Output
Engine Fuse	3	RD/DB	Run / Stop Switch Power
	4	VT/PK	Engine Relay Power Output
Engine Relay	5	RD	Main Fuse Output
	6	RD	Main Fuse Output
	11	GY/BK	Engine Relay Control
	12	RD/DB	Engine Breaker output
O2 Heater Fuse 7.5A	7	DB/PK	Aux Engine Relay Power Output
	8	RD/DB	Engine Breaker Output
Gauge Fuse 5A	9	OG	Instrumentation Fuse Output
	10	RD	Main 2 Fuse Output
WCM Fuse 10A	13	RD/YE	VCM Control Power
	14	RD	Main Fuse Output
Starter Relay	15	VT/PK	Engine Relay Power Output
	16	PK/BK	Starter HSD
	21	OG/BN	Starter Relay Control
	22	DGWJ	Starter Solenoid Control
Spare Fuse 7.5A	17	—	—
	18	—	—
VCM Fuse 25A	19	RD	Main 2 Fuse Output
	20	RD	VCM Power
Spare Fuse 5A	23	—	—
	24	—	—
ABS Fuse 25A	25	RD	Main 2 Fuse Output
	26	RD/BK	ABS 20A Fuse
Spare Fuse 15A	27	—	—
	28	—	—
Fuel Pump Relay	29	VT/PK	Engine Relay Power Output
	30	VT/PK	Engine Relay Power Output

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	35	GY	Fuel Pump Relay Control
	36	VT/YE	Fuel Pump Power
Tender Fuse 10A	31	RD	Main 2 Fuse Output
	32	GY/RD	Accessory Constant Fuse Output
Spare Fuse 10A	33	—	—
	34	—	—
Switch 1 Fuse 10A	37	RD/BU	Switched Power Relay Load
	38	PK/GN	VCM Accessory Power Out
Relay Switch Power	39	RD	Main Fuse Output
	40	OG/YE	Switched Power Control
	45	BK	Ground
	46	RD/BU	Switched Power Relay Load
Spare Fuse 10A	41	—	—
	42	—	—
Switch 2 Fuse 10A	43	RD/BU	Switched Power Relay Load
	44	GY/WH	Accessory Switched Output
Spare Fuse 25A	47	—	—
	48	—	—

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J-CASE



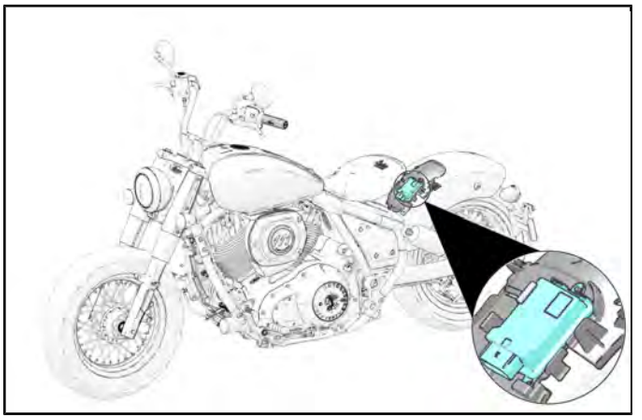
CIRCUIT	PIN	WIRE COLOR	FUNCTION
ABS 40A	A1	RD	ABS Main Fuse Output
	A2	RD	ABS Main Fuse Input
Primary 40A	B1	RD	Primary Fuse Output
	B2	RD	Primary Fuse Input
Secondary 40A	C1	RD	Secondary Fuse Output
	C2	RD	Secondary Fuse Input

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VEHICLE CONTROL MODULE (VCM)

VEHICLE CONTROL MODULE (VCM) OVERVIEW

The VCM is located under the rear fender on the fender tray..



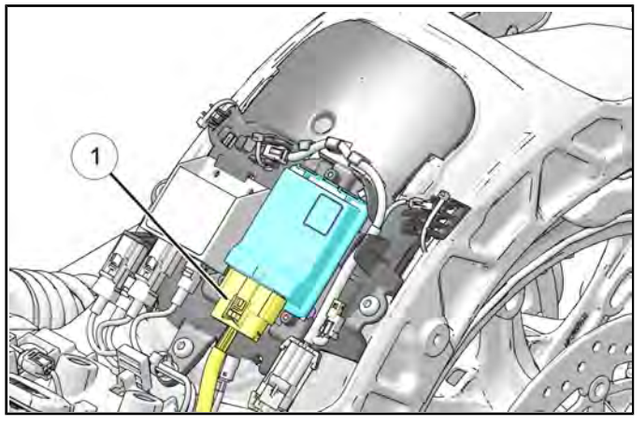
IMPORTANT
Replacement of the Vehicle Control Module (VCM) should only be performed by a qualified dealer. Vehicle Control Module (VCM) setup and initialization requires the use of Digital Wrench.

VCM Functions
Heated Grips
Saddle Bag Locks
Horn
Headlights (low and high)
Heated Grip Switch
Heated Grip Indicator Light

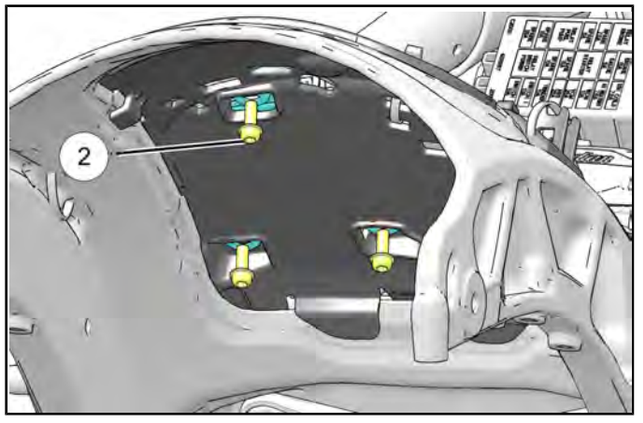
VEHICLE CONTROL MODULE (VCM), REMOVAL / INSTALLATION

⚠ 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.

1. Remove rear fender. See **Rear Fender Removal / Installation page 7.38**.
2. Disconnect negative battery cable.
3. Disconnect VCM electrical connection ①.



4. Remove VCM by removing its fasteners ② on the underside of the fender tray.

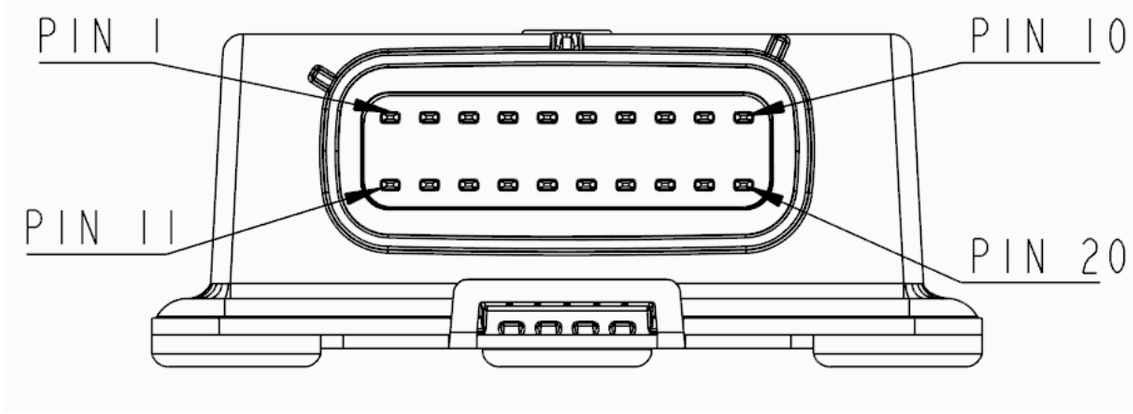


5. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
VCM Fastener: **17 in-lbs (2 N·m)**

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VCM PINOUT



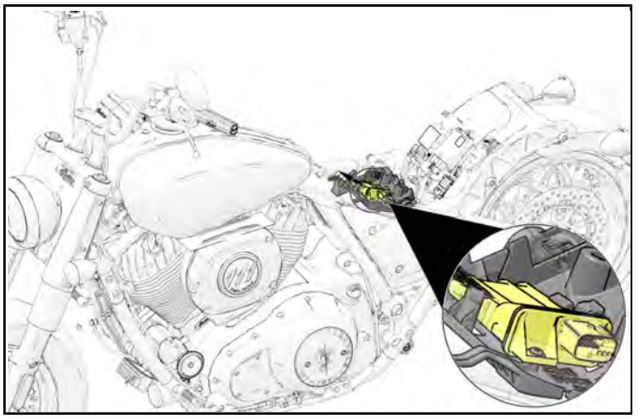
PIN	FUNCTION
1	Power
2	500K CAN High
3	LH Heated Grips Output
4	Aux Light Switch Indicator Light
5	Low Beam
6	Aux Light Switch Output
7	Horn Power
8	Heat Grip Switch Decrease
9	—
10	VCM Accessory Power Out
11	500K CAN LOW
12	Heated Grips Output
13	Heat Grip Light Feed
14	VCM Ground
15	—
16	High Beam Output
17	—
18	LH AUX Light Feed
19	—
20	Power

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WIRELESS CONTROL MODULE (WCM)

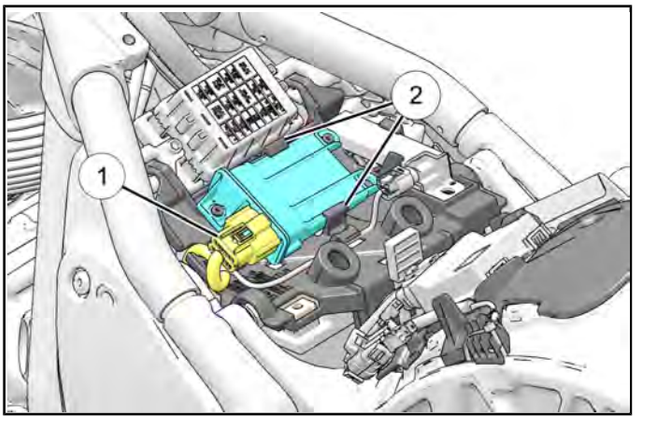
WCM OVERVIEW

The Wireless Control Module (WCM) controls main power module, lock switch, key fob authentication, and the TPMS receiver. The WCM is located under the seat as shown.



WCM REMOVAL / INSTALLATION

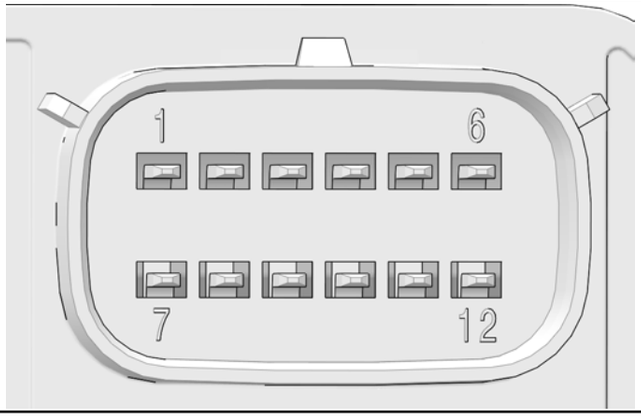
1. Remove seat. See **Seat Removal / Installation page 7.27**.
2. Disconnect the negative battery cable. Reference **Battery Removal / Installation page 10.13**.
3. Disconnect WCM electrical connector ①.



4. Move retention tabs ② and remove WCM.
5. **Installation is performed by reversing the removal procedure.**

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WCM PINOUT



PIN	FUNCTION
1	Power
2	500K CAN High
3	—
4	500K CAN LOW
5	—
6	Ignition Switch Signal
7	K15 Signal
8	Switched Power Control
9	Security LED Feed
10	21 kHz B
11	21 kHz A
12	Ground

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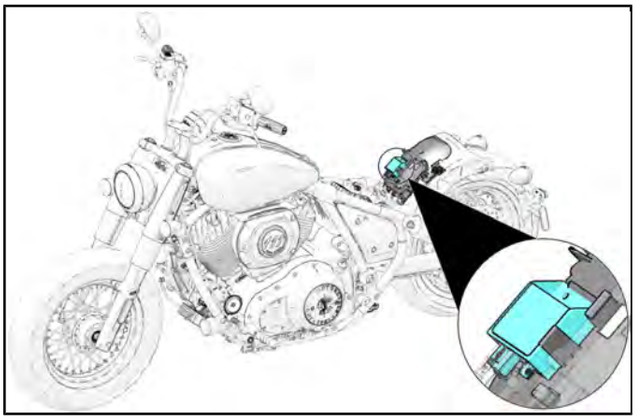
CELL MODEM

CELL MODEM OVERVIEW

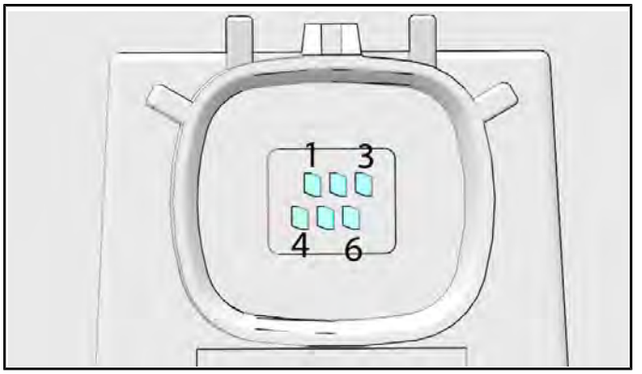
OPERATION OVERVIEW

The cell modem controls the Ride Command and phone functions on the display.

The cell modem is located under the rear fender on the fender tray.



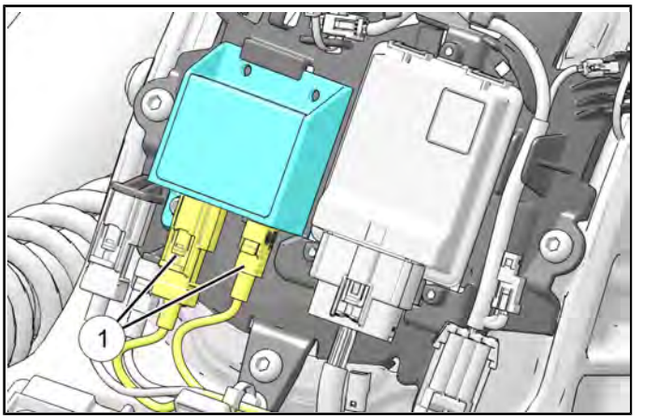
PINOUT



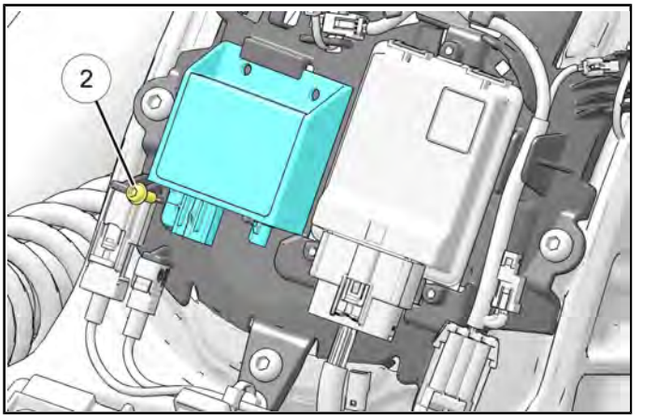
PIN	FUNCTION
1	—
2	Data +
3	Data –
4	+5V DC
5	USB Drain
6	Ground

CELL MODEM REPLACEMENT

1. Remove rear fender. See **Rear Fender Removal / Installation page 7.38**.
2. Disconnect negative battery cable.
3. Disconnect Cell modem electrical connectors ①.



4. Remove cell modem fastener ② and remove cell modem.



5. **Installation is performed by reversing removal procedure.**

TORQUE
Cell Modem Fastener: **17 in-lbs (2 N·m)**

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PERFORM DIGITAL WRENCH CELL MODEM ACTIVATION (USA AND CANADA ONLY)

This procedure can only be done by the dealer and must be done using Digital Wrench® II.

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

CELL MODEM TROUBLESHOOTING

CELL MODEM TROUBLESHOOTING (IF APPLICABLE)

Ensure the following BEFORE beginning:

- Reliable internet connection.
- Latest version of Digital Wrench is installed on computer. Log into Polaris Dealer Website, select "**Service and Warranty**" menu, then "**Digital Wrench Updates**".

1. Connect Digital Wrench to diagnostic port on motorcycle and power on motorcycle.
2. Enter vehicle information as required.
3. Select "Procedures" menu.
4. Select "Modem Service Procedures" menu.
5. Select "Cell Modem Diagnostics".
6. After selecting option from step 5, follow Digital Wrench screen prompts until Digital Wrench provides a result.
7. Verify the functionality of the cell modem.
8. If the cell modem is still not functional, call Indian Motorcycle for Ride Command Support.

CELL MODEM TROUBLESHOOTING (IF APPLICABLE)

This procedure can only be done by the dealer and must be done using Digital Wrench® II.

NOTE
After initializing cell modem activation bike may need to be rode to get in a location with strong response from cell tower.

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

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

*Not currently available for model year 2020

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.

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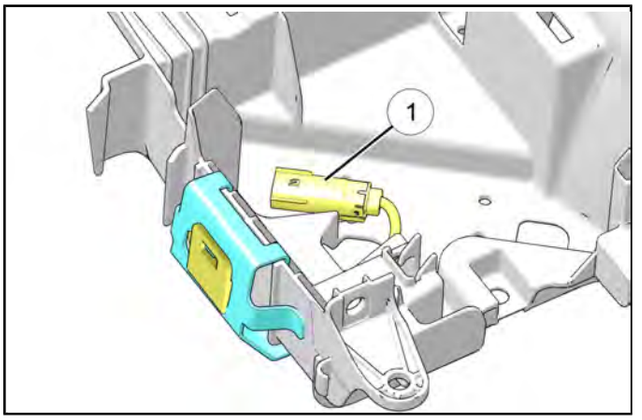
TIPOVER MODULE

TIP OVER MODULE CONNECTOR MAP

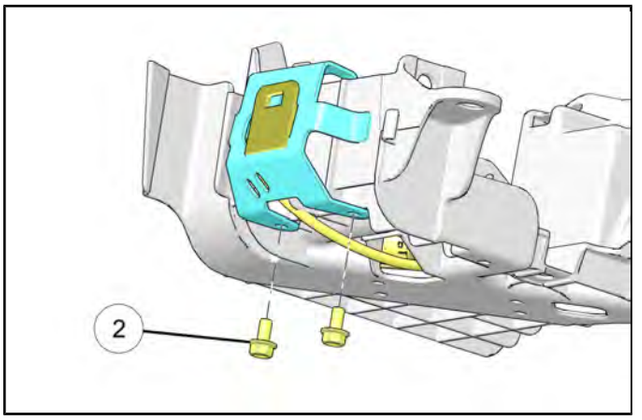
Connector Pinout	Function	Wire Color
1	+5V	Red
2	Signal Out	White
3	Ground	Black

LOAD TIP OVER MODULE REMOVAL AND INSTALLATION

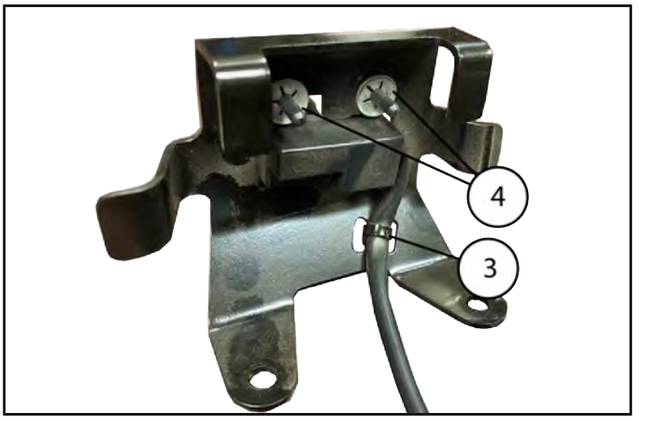
1. Remove Battery Box. See **Battery Box Removal / Installation page 10.15**.
2. Disconnect electrical connection ① from battery box.



3. Remove two fasteners ② securing tip over bracket to battery box.



4. Cut cable tie ③ securing harness to tip over bracket.



5. Remove retention rings ④ securing tip over sensor to its bracket.
6. **Installation is performed by reversing the removal procedure.**

TORQUE
Tip Over Bracket Fastener: **88 in-lbs (10 N·m)**

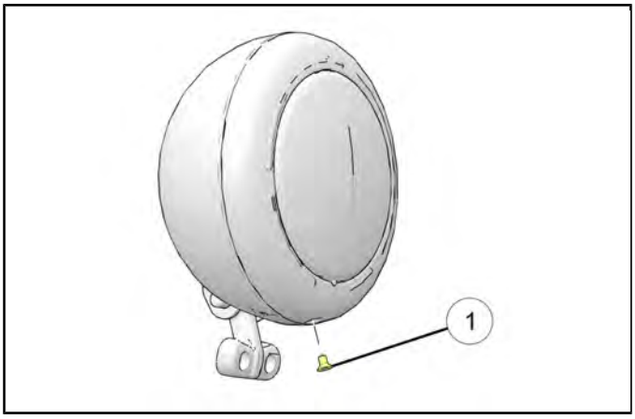
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HEADLIGHT SERVICE

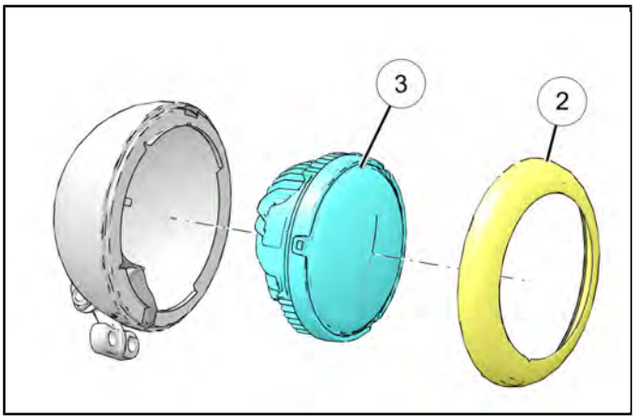
HEAD LIGHT REPLACEMENT

IMPORTANT
The head light is comprised of an LED and must be replaced as an assembly.

1. Remove head light bezel fastener ①.



2. Remove head light bezel ②.



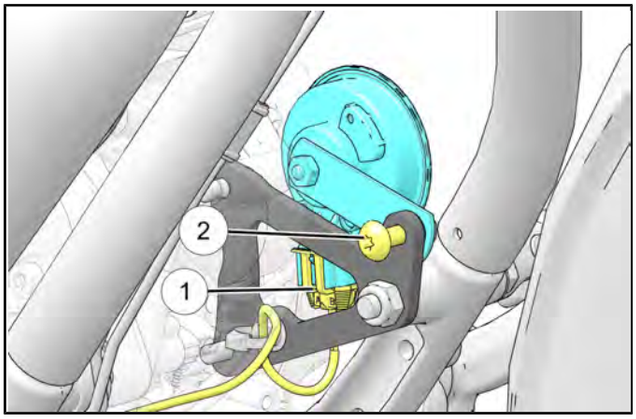
3. Disconnect head light connector, and remove head light ③.
4. **Installation is performed by reversing the removal procedure.**

TORQUE
Head Light Bezel Fastener **27 in-lbs (3 N·m)**

HORN SERVICE

HORN REMOVAL / INSTALLATION

1. Disconnect horn electrical connector ①.



2. Remove horn fastener ②.
3. Remove the horn.
4. **INSTALLATION IS PERFORMED BY REVERSING THE REMOVAL PROCEDURE.**

TORQUE
Horn to Frame Bracket Fastener: **97 in-lbs (11 N·m)**

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TAIL LAMP 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.

NOTICE
Scout Bobber doesn't have a tail lamp, it's combined with the rear turn signals.

Tail / Brake Light Power Supply:

When the motorcycle is powered ON, battery voltage is delivered to the TAIL / BRAKE LEDs on the BN / PINK wire from the Headlight Relay. Current through each TAIL LED (WHITE wire) is limited (inside tail lamp unit) to approximately 250 mA.

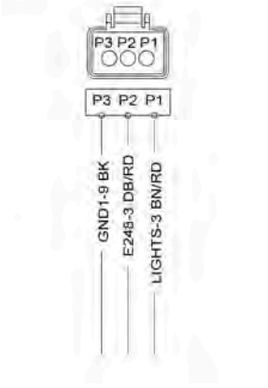
Tail / Brake Light Ground Signal:

The front and rear brake light switches provide a path to ground through the Load / Over Module to the ECM via BLACK / YELLOW wire (rear brake switch) and YELLOW / VIOLET wire (front 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.

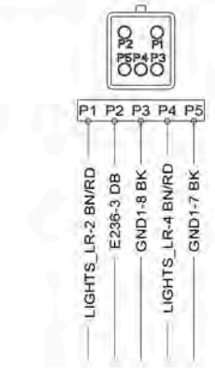
US
RR_TRN_TL_STP

PIN	FUNCTION
P1	TAIL LIGHT POWER
P2	RIGHT REAR STOP/TURN
P3	GROUND



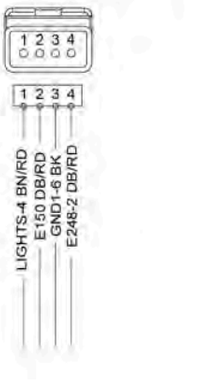
US
LR_TRN_TAIL_STOP

PIN	FUNCTION
P1	LEFT REAR TAIL POWER NA
P2	LEFT REAR STOP/TURN
P3	GROUND
P4	LP LAMP POWER NA
P5	LP LAMP GROUND



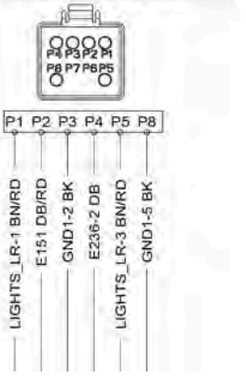
INTL
RR_TRN/TL/STP

PIN	FUNCTION
1	TAIL LIGHT POWER
2	REAR RIGHT STOP
3	GROUND
4	REAR RIGHT TURN



INTL
LR_TRN_TAIL_STOP

PIN	FUNCTION
P1	LEFT REAR TAIL POWER INTL
P2	REAR LEFT STOP
P3	GROUND
P4	REAR LEFT TURN
P5	LP LAMP POWER INTL
P8	LP LAMP GROUND

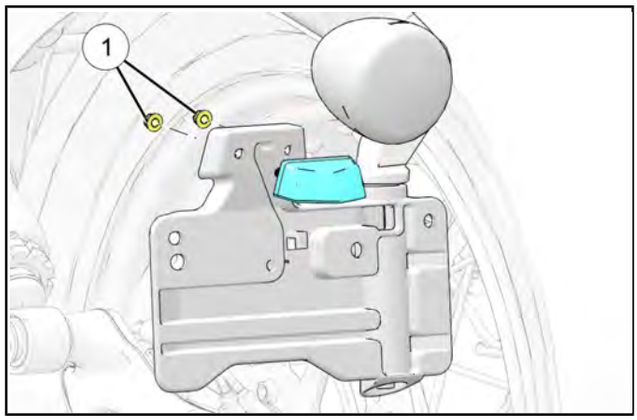


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LICENSE PLATE LIGHT REMOVAL / INSTALLATION

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.

1. Remove license plate light fasteners ①.



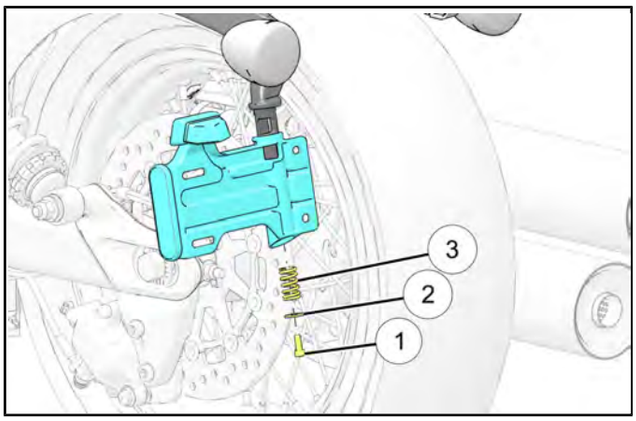
2. Disconnect license plate light electrical connector and remove assembly.
3. **Installation is performed by reversing the removal procedure.**

TORQUE
License Plate Light Fastener: **17 in-lbs (2 N·m)**

LICENSE PLATE BRACKET REMOVAL / INSTALLATION

SIDE MOUNT

1. Remove license plate bracket fastener ①.

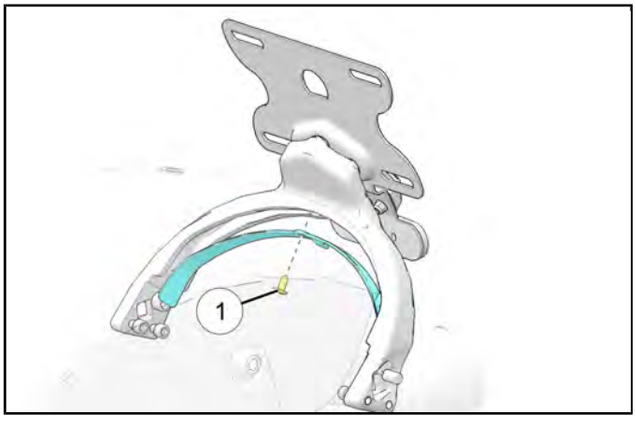


2. Remove washer ② and spring ③.
3. **Installation is performed by reversing the removal procedure.**

TORQUE
License Plate Bracket Fastener: **88 in-lbs (10 N·m)**

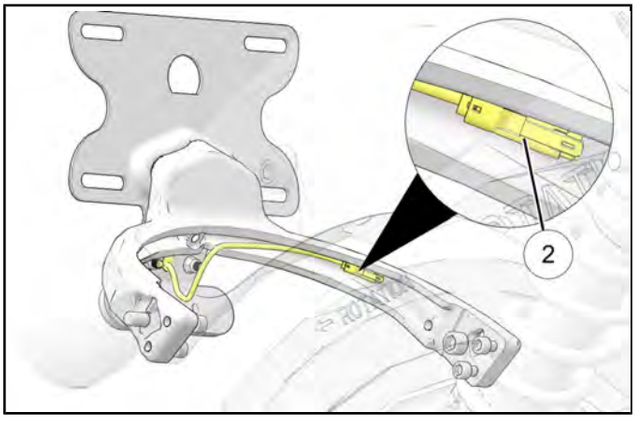
CENTER MOUNT

1. Remove push pin ① retaining harness retainer. Pull inward on the part ends to release the tabs that are engaged with the bracket.

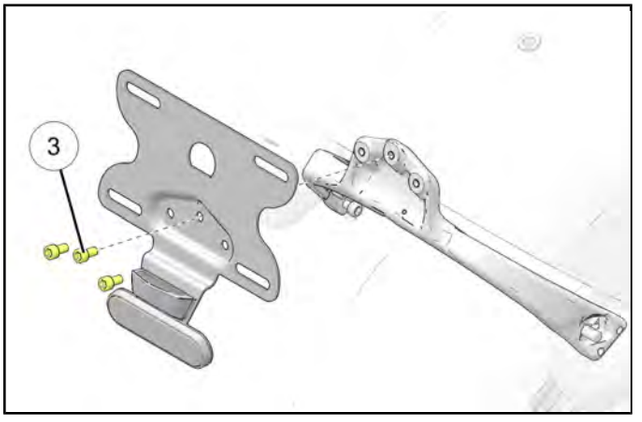


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2. Disconnect electrical connector ②.



3. Remove license plate bracket by removing its fasteners ③.



4. **Installation is performed by reversing the removal procedure.**

TORQUE
License Plate Bracket Fastener: **88 in-lbs (10 N·m)**

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TURN SIGNAL / HAZARD SYSTEM SERVICE

TURN SIGNAL OPERATION

Turn Signal Auto Cancel Functionality

Verify function of the following components for correct turn signal operation.

- Turn Signal Switch
- Hazard Flasher Switch
- Vehicle Speed Sensor

NOTICE
Scout Bobber has LED front turns and combination stop/tail/turn in the rear.

The Auto Cancel Turn Signal Modes

1. NORMAL MODE - Vehicle speed above 14.9 mph (24 kmh) the auto cancel software records vehicle when turn signal is activated and equates speed with a preset distance. After the preset distance is traveled the turn signal is cancelled.
2. CONTINUOUS MODE - Vehicle speed below 14.9 mph (24 kmh) the turn signals operate indefinitely until manually cancelled. This mode overrides any previous auto cancel mode.
3. 90 - DEGREE TURN MODE - Vehicle speed below 14.9 mph (24 kmh) the turn signals operate indefinitely until speed exceeds 14.9 mph (24 kmh). If vehicle speed remains above 14.9 mph (24 kmh) for approximately two complete ON-OFF flash cycles, the turn signal cancels.
4. LANE CHANGE MODE - Vehicle speed above 14.9 mph (24 kmh) by pressing and holding the turn signal switch in the desired direction for more than one ON-OFF flash cycle the turn signals will cancel immediately once the switch is released.
5. HAZARD FLASHER MODE - At any vehicle speed the hazard flashers operate indefinitely and must be manually cancelled. This mode overrides any previous auto cancel mode.

The turn signal / hazard light system does not utilize a conventional “flasher module”, but instead receives a grounding signal from the ECM. Power to the turn signals is provided via the IGNITION CIRCUIT BREAKER located in the main fuse box. Turn Signal INPUTS & OUTPUTS can be located in the ECM Connector Map and Fuse Application Chart.

See **ECM Connector Map page 10.48**.

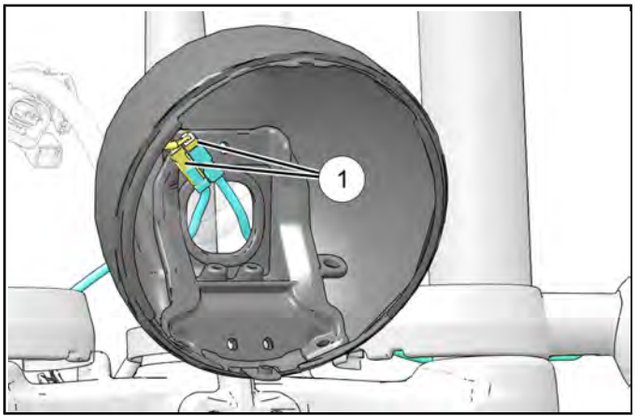
See **Fuse Application Chart page 10.68**.

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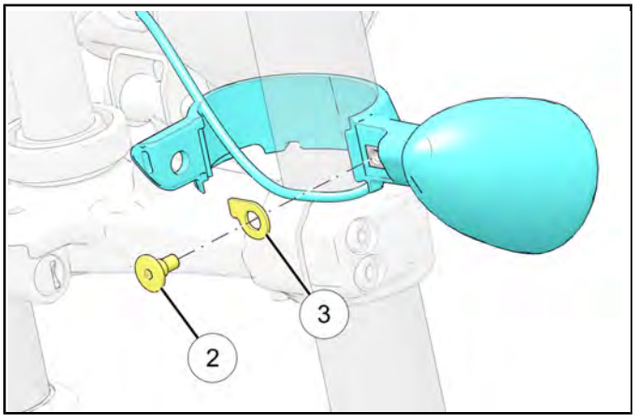
FRONT TURN SIGNAL REMOVAL / INSTALLATION

CHIEF

1. Remove head light. See **Head Light Replacement page 10.79**.
2. Disconnect turn signal electrical connectors ①.



3. Remove turn signal fastener ② and signal bracket ③.

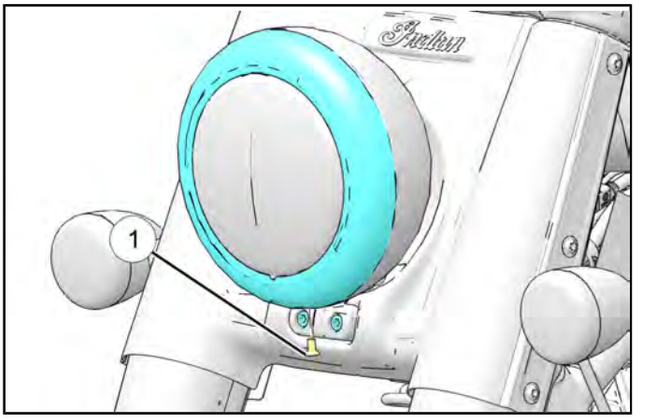


4. **Installation is performed by revering the removal procedure.**

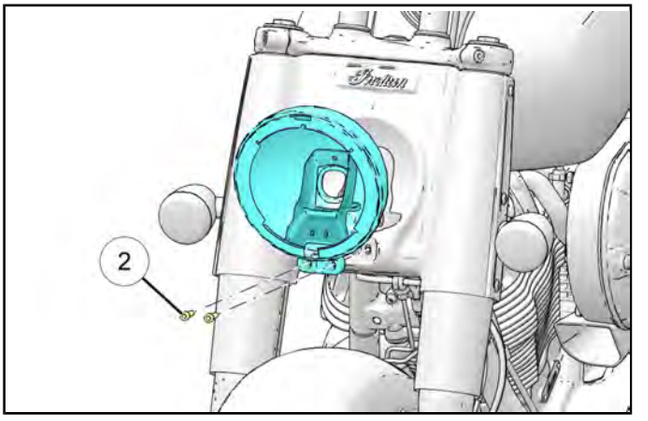
TORQUE
Turn Signal Fastener (Chief Front): **35 in-lbs (4 N·m)**

CHIEF BOBBER / SUPER CHIEF

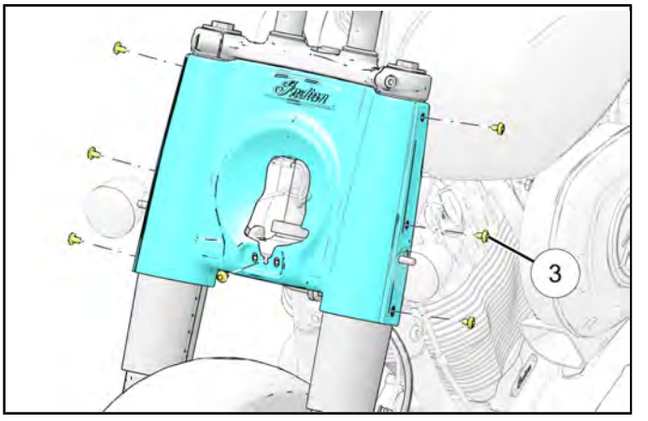
1. Remove head light bezel by removing its fastener ①.



2. Pull the head light out and disconnect the turn signal and head light electrical connectors.
3. If equipped, disconnect harness retention feature from the head light bucket.
4. Remove head light bucket by removing its fasteners ②.

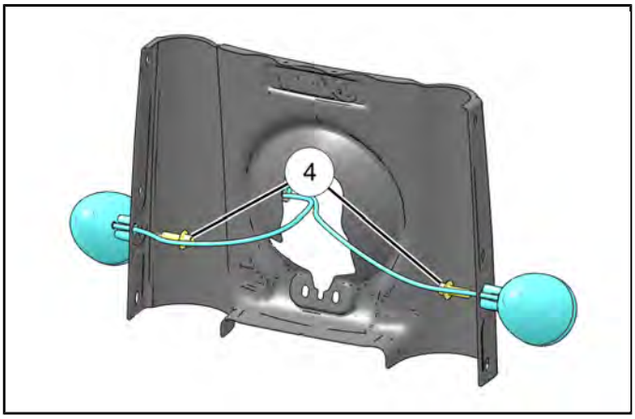


5. Remove the fasteners ③ retaining the Front Cover.



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6. Remove the turn signals from the front cover by removing the fastener ④.



7. **Installation is performed by reversing the removal procedure.**

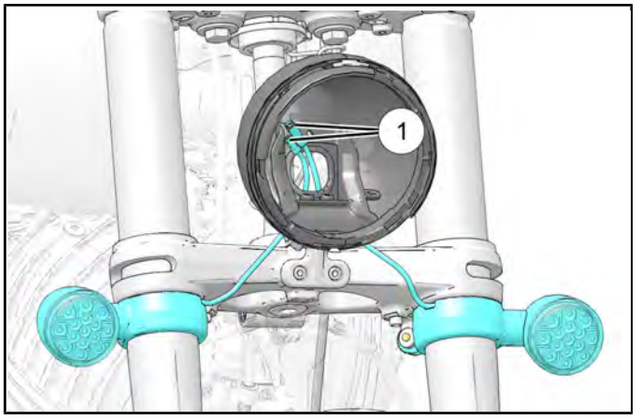
TORQUE
Front Bodywork Fastener: **88 in-lbs (10 N·m)**

TORQUE
Turn Signal Fastener (Chief Bobber / Super Chief Front): **88 in-lbs (10 N·m)**

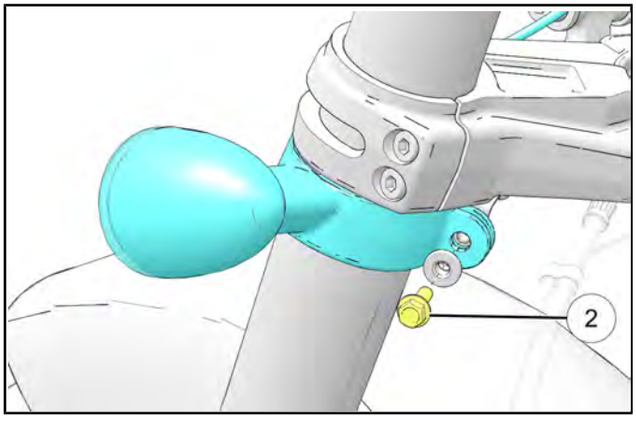
TORQUE
Head Light Mount Fastener: **88 in-lbs (10 N·m)**

FRONT TURN SIGNAL REMOVAL / INSTALLATION (SPORT CHIEF)

1. Remove front fairing. See **Fairing Removal / Installation page 7.35**.
2. Remove head light. See **Head Light Replacement page 10.79**.
3. Disconnect turn signal electrical connectors ①.



4. Remove turn signal fastener ②.



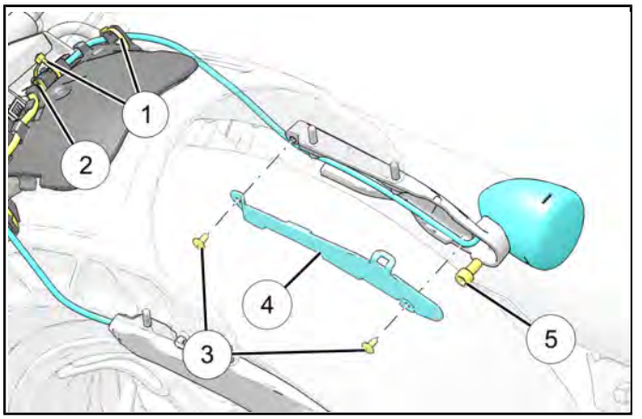
5. **Installation is performed by revering the removal procedure.**

TORQUE
Turn Signal Fastener: **35 in-lbs (4 N·m)**

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REAR TURN SIGNAL REMOVAL / INSTALLATION

1. Remove rear fender. See **Rear Fender Removal / Installation page 7.38**.
2. Remove the turn signal harness retention features ①.



3. Disconnect turn signal electrical connector ②.
4. Remove push darts ③ to remove side mount harness retainer ④.
5. Remove turn signal fastener ⑤.
6. Remove turn signal.
7. **Installation is performed by reversing the removal procedure.**

TORQUE
Turn Signal Fastener (Rear): **18 ft-lbs (25 N·m)**

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INSTRUMENTATION

INDICATOR LAMPS

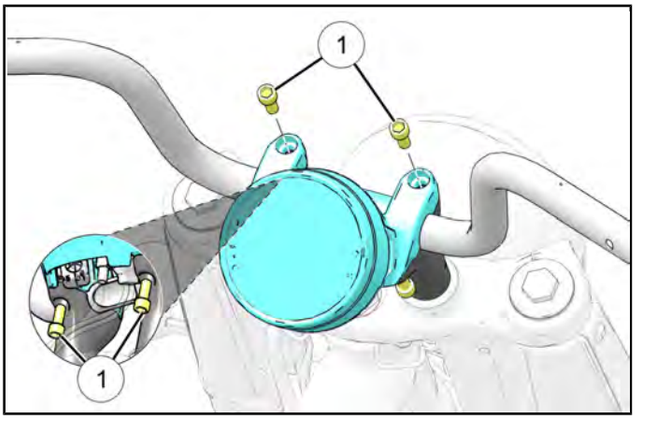
LAMP	INDICATES	CONDITION
	Cruise Control Status	*Amber Lamp:* Cruise control is enabled, but not set. When flashing, a cruise control related fault exists. *Green Lamp:* Cruise control is set to the desired speed. *Read the safety and operation procedures before using cruise control.*
	Turn Signals	One arrow flashes when the corresponding turn signal is activated. Both arrows flash when the hazard signal is activated. *If there is a problem in the signal system, the lamps will flash at twice the normal rate.*
MPH	Vehicle Speed	When standard mode is selected, speed displays in miles per hour.
km/h		When metric mode is selected, speed displays in kilometers per hour.
	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.
N	Neutral	The transmission is in neutral and the power switch is ON.
	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.
	Sidestand Light	The sidestand light will turn on anytime the sidestand is down.
	Chassis Fault	The alert symbol illuminates if a chassis fault occurs.
	Tire Pressure Monitoring System (TPMS)	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.
	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. *If the oil level is correct and the lamp remains on after the engine is restarted, turn the engine off immediately. See your dealer.*
	Low Battery Voltage	This lamp illuminates when battery voltage is low. Turn non-essential accessories off to conserve power. Make sure the charging system is operating properly. This lamp

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LAMP	INDICATES	CONDITION
		also illuminates with the security light and/or power switch when the key fob battery is low, and with the TPMS lamp when the TPMS sensor battery is low.
	ABS Not Activated	The indicator remains on until the anti-lock system activates, which occurs when vehicle speed exceeds 6 MPH (10 km/h). When the lamp is illuminated, the anti-lock brakes will not activate, but the conventional brake system will continue to operate normally.
	Check Engine	This lamp illuminates briefly when the power switch is turned ON. This indicates proper function. *If this lamp illuminates while the engine is running, see an authorized 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.
	Security	The security indicator illuminates when the security system is activated.

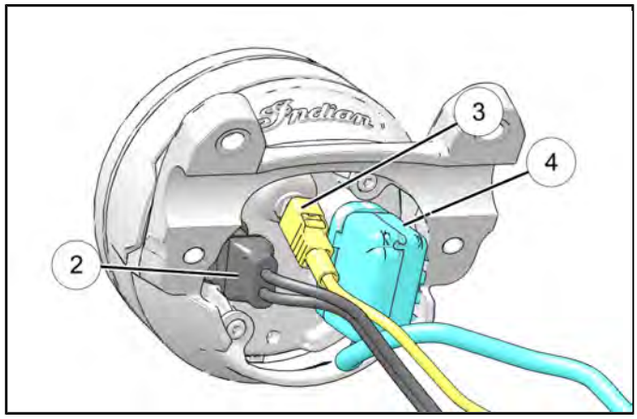
INSTRUMENT CLUSTER REMOVAL / INSTALLATION

1. Remove riser cap fasteners ①.

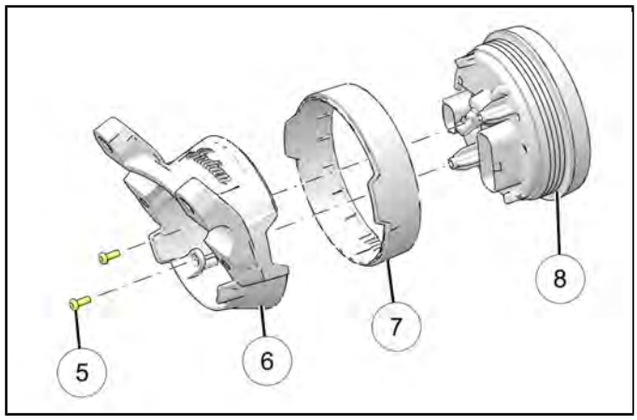


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2. Lift the cluster assembly upward and disconnect cell USB, ②, Antenna GPS ③, and chassis harness ④.



3. Remove instrument cluster fasteners ⑤.



4. Separate riser cap ⑥, housing ⑦ and cluster ⑧.

NOTICE
If replacing cluster ⑧, remove cluster rubber grommet for reuse as necessary.

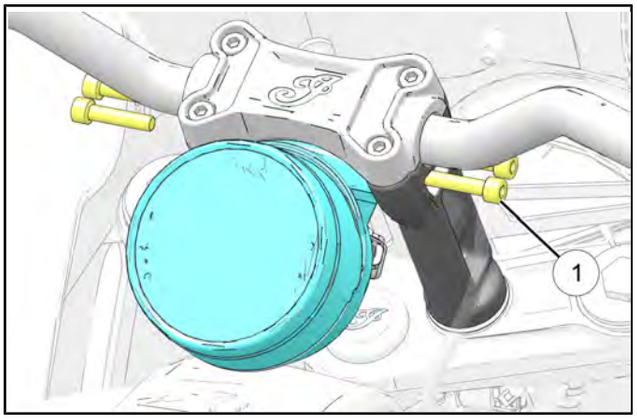
5. **Installation is performed by reversing the removal procedure.**

TORQUE
Riser Cap Fastener: **18 ft-lbs (25 N·m) Torque front fasteners, then rear**

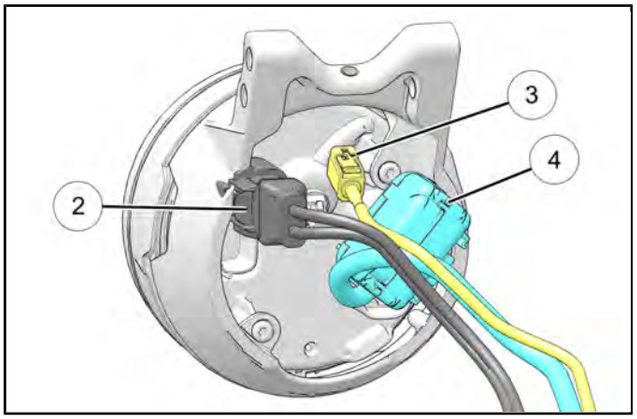
TORQUE
Instrument Cluster fastener: **17 in-lbs (2 N·m)**

INSTRUMENT CLUSTER REMOVAL / INSTALLATION (SPORT CHIEF)

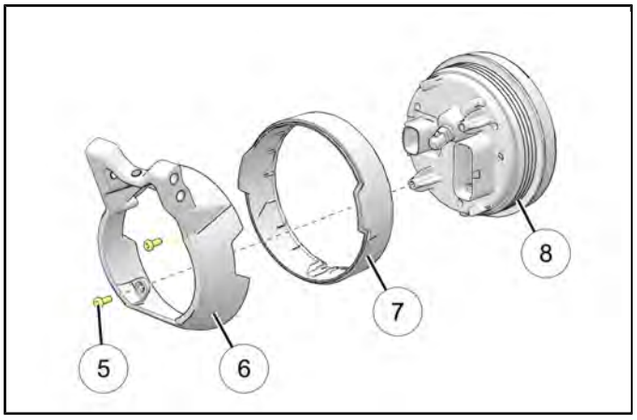
1. Loosen riser cap fasteners.
2. Remove instrument cluster fasteners ①.



3. Shift the cluster assembly rearward and disconnect cell USB, ②, Antenna GPS ③, and chassis harness ④.



4. Remove instrument cluster fasteners ⑤.



10

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5. Separate gage mount ⑥, housing ⑦ and cluster ⑧.

NOTICE
If replacing cluster ⑧, remove cluster rubber grommet for reuse as necessary.

6. **Installation is performed by reversing the removal procedure.**

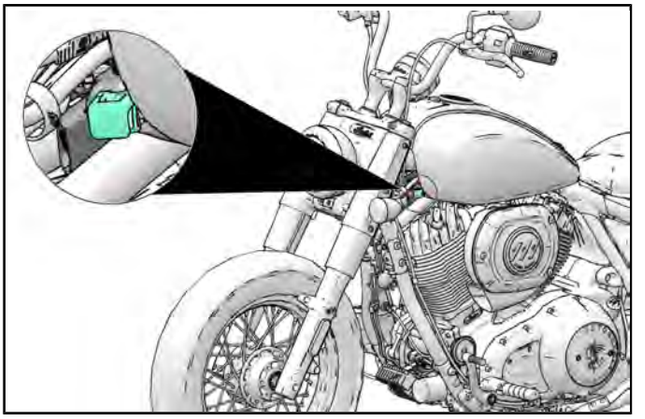
TORQUE
Gauge Mount Fastener: **18 ft-lbs (25 N·m)**

TORQUE
Instrument Cluster fastener: **17 in-lbs (2 N·m)**

TORQUE
Riser Cap Fastener: **18 ft-lbs (25 N·m) Torque front fasteners, then rear**

USB CHARGE PORT OVERVIEW

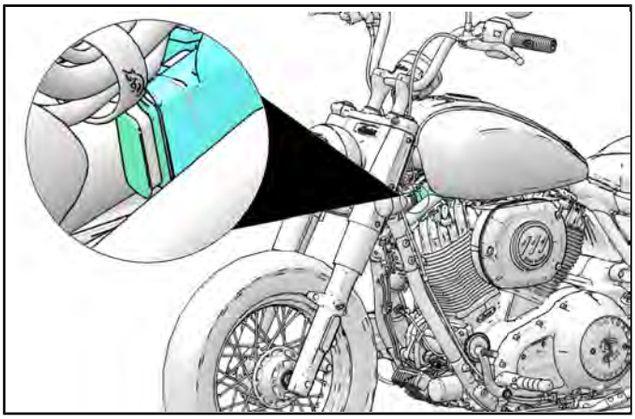
The USB charge port is located on the left side of the unit beneath the gas tank as shown. The USB port can be used to charge any of your mobile devices. Power is only available when the key is in the ON or ACC position.



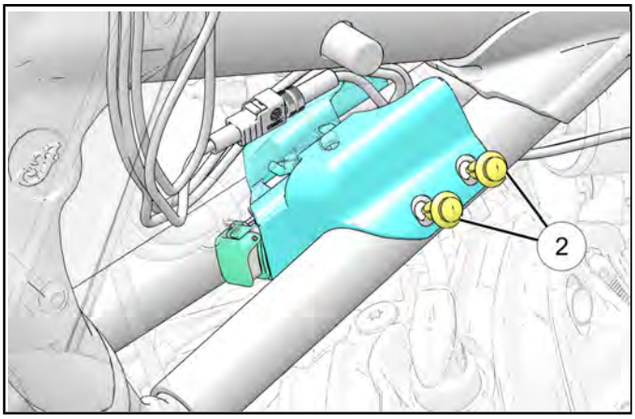
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USB CHARGE PORT REPLACEMENT

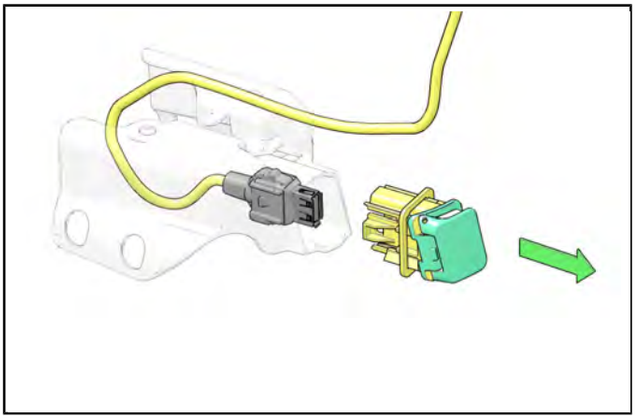
1. Locate the USB charge point.



2. Remove fuel tank. See **Fuel Tank Removal page 4.17**.
3. Remove push pins ② securing frame harness tray.



4. Disconnect the USB charger electrical connector and remove from the frame harness tray.



5. **Installation is performed by reversing the removal procedure.**

USB CHARGE PORT TESTING

1. Remove USB charge port, reference **USB Charge Port Replacement page 10.91**.
2. With the ignition in the ON or ACC position, check the voltage at the electrical connection.

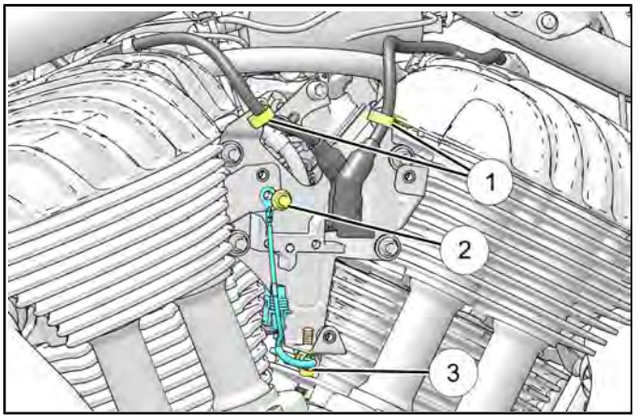
WIRE COLOR	FUNCTION
BN / PK	Power
BK / WH	Ground

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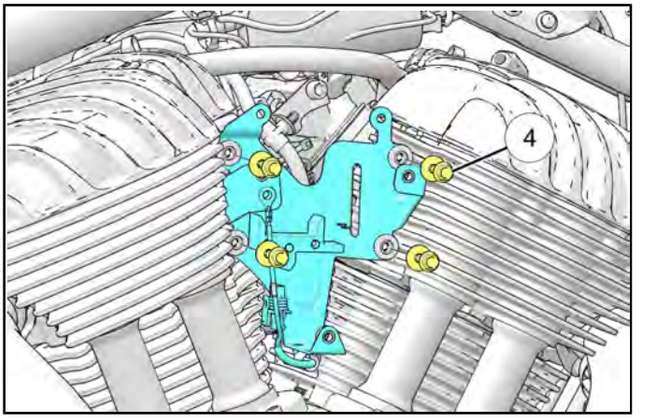
CHASSIS HARNESS

HARNESS REMOVAL / INSTALLATION

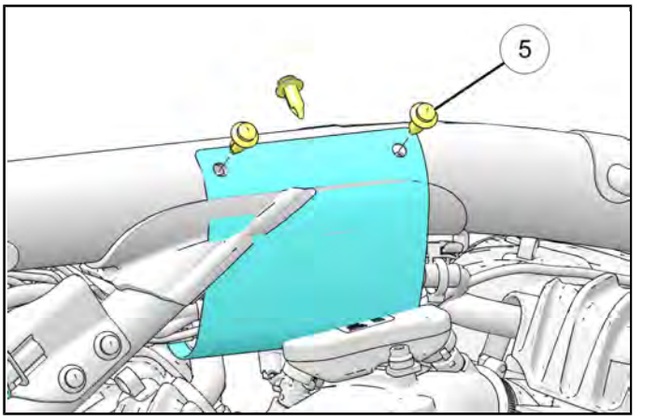
1. Remove Battery. See **Battery Removal / Installation page 10.13**.
2. Remove ECM. See **ECM Removal / Installation page 4.47**.
3. Remove Battery Box. See **Battery Box Removal / Installation page 10.15**.
4. Remove Fuel Tank. See **Fuel Tank Removal page 4.17**.
5. Remove Instrument Cluster. See **Instrument Cluster Removal / Installation page 10.88**.
6. Remove Headlight. See **Head Light Replacement page 10.79**.
7. Remove Air box. See **Air Box Removal / Installation page 3.8**.
8. Remove Ignition Coil. See **Ignition Coil Removal / Installation page 10.46**.
9. Disconnect spark plug wire retention features ①.



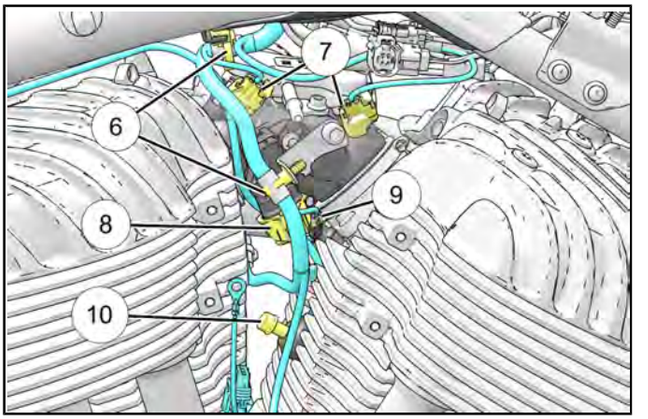
10. Remove ground fastener ②.
11. Remove harness retention feature ③ from the ignition bracket.
12. Remove ignition bracket by removing its fasteners ④.



13. Remove harness retainer by removing its push pins ⑤.



14. Disconnect harness retention features ⑥.

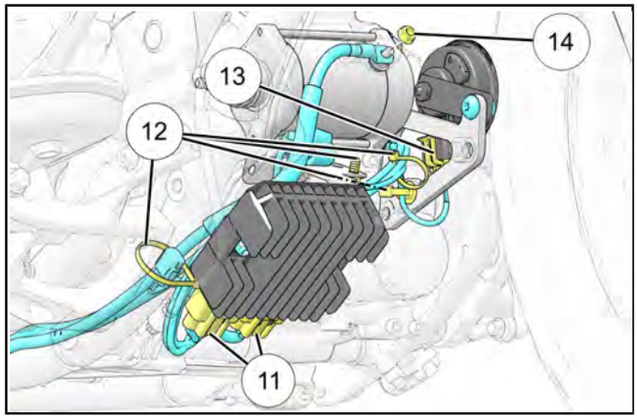


15. Disconnect the fuel injector electrical connectors ⑦.
16. Disconnect the TMAP electrical connector ⑧.
17. Disconnect the CHTS electrical connector ⑨.

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18. Remove detonation sensor by removing its fastener ⑩.

19. at the front of the engine, disconnect voltage regulator electrical connectors ⑪.



20. Disconnect harness retention features ⑫.

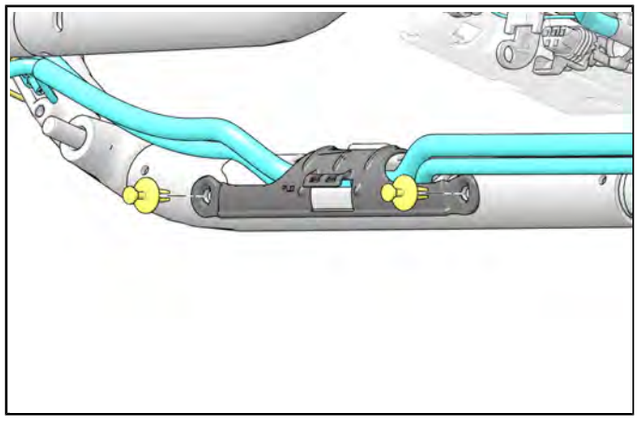
21. Disconnect horn electrical connector ⑬.

22. Remove starter terminal nut ⑭.

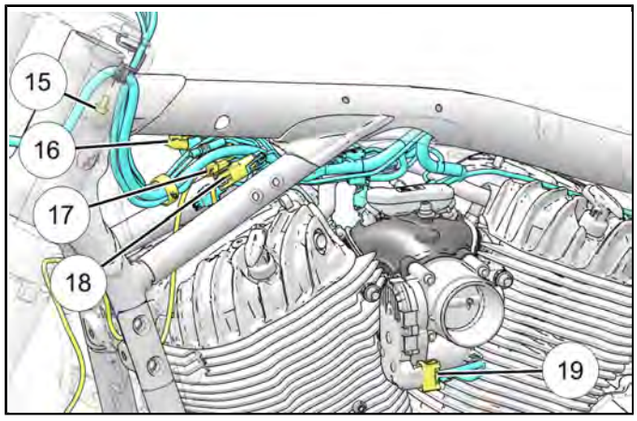
⚠ CAUTION

Hold the lower terminal nut with an open ended wrench while tightening or loosening the upper nut to avoid damage.

23. Following the harness routing to the right side of the frame, remove push pins retaining frame retention strap.



24. On the left side of the unit, remove the wire form guide fastener ⑮.



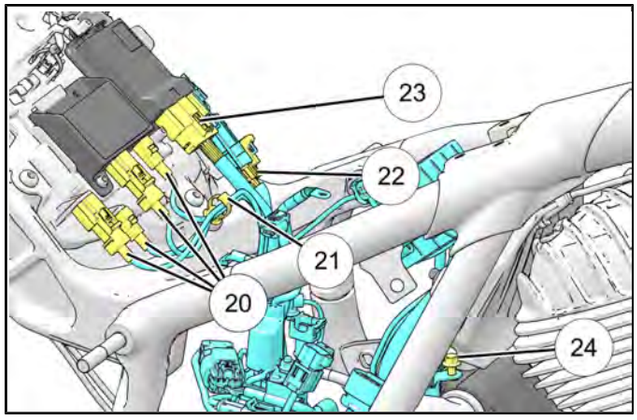
25. Disconnect air temperature sensor electrical connector ⑯.

26. Disconnect front wheel speed sensor electrical connector ⑰.

27. Disconnect front brake pressure sensor electrical connector ⑱.

28. Disconnect throttle body electrical connector ⑲ and edge clip.

29. On the rear of the unit, disconnect cell modem electrical connectors ⑳.



30. Remove harness retention feature ㉑.

31. Disconnect rear harness electrical connector ㉒.

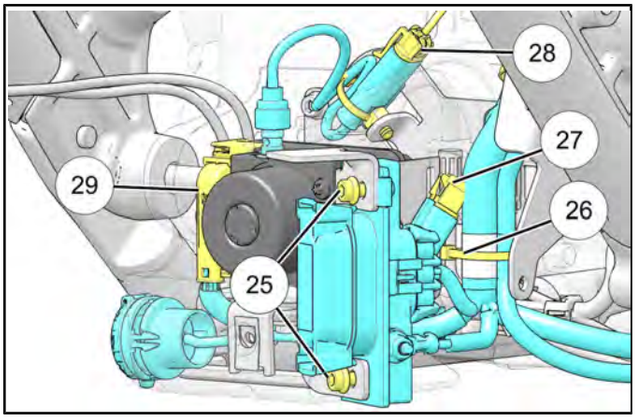
32. Disconnect VCM electrical connector ㉓.

33. Remove harness ground fastener ㉔.

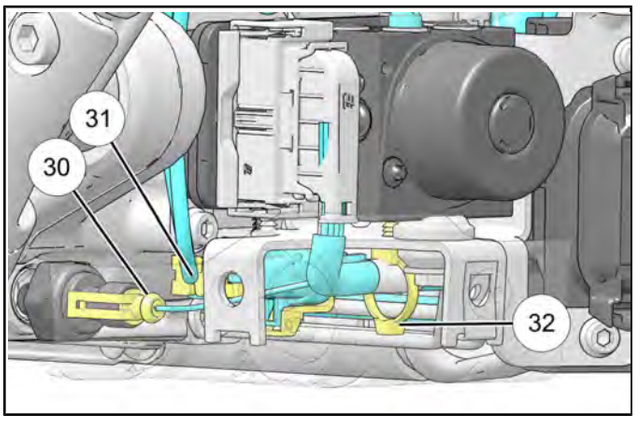
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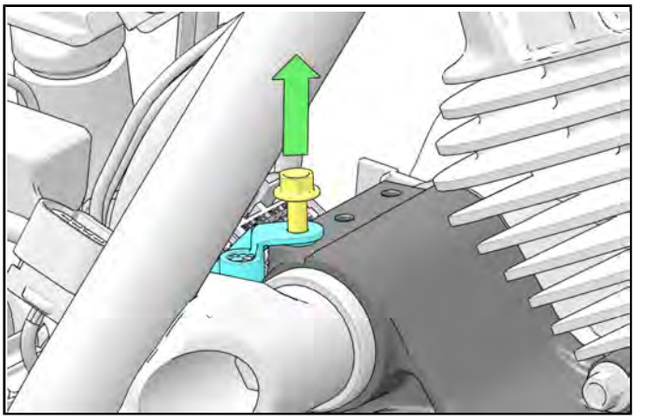
34. Remove J-case fasteners ㉕.



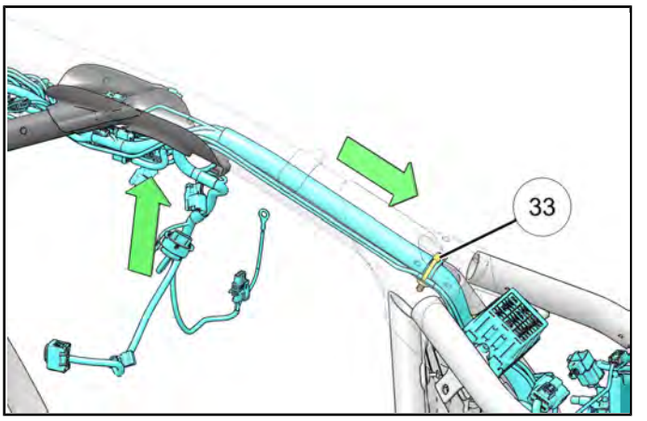
35. Remove harness retention feature ㉖.
36. Disconnect charge port electrical connector ㉗.
37. Disconnect rear brake pressure switch electrical connector ㉘.
38. Disconnect ABS module electrical connector ㉙.
39. Disconnect Oil pressure sensor electrical connector ㉚.



40. Disconnect rear wheel speed sensor electrical connector ㉛.
41. Disconnect harness retention feature from ABS bracket ㉜.
42. Remove fastener securing ground cable to rear of engine.



43. Remove harness retention feature from frame ㉝.



44. Carefully route the harness through the backbone toward the rear of the unit.
45. Make sure all connections are disconnect and remove the harness from the unit.
46. **Installation is performed by reversing the removal procedure.**
47. Replace all removed retention features.
48. Reference harness routing / retention for installation. See **Harness Routing / Retention page 10.61**.

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

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HARNESS PINOUT

WIRE COLOR	FROM	PORT	TO	PORT	FUNCTION
VT / YE	WCM	6	Handlebar	2	Ignition Switch Signal
DG / BK	Fog Lights	P3	VCM	6	AUX Light Switch Output
YE/ BK	Speedo	8	Oil Pressure Switch	1	Oil Pressure Switch
OG / YE	WCM	8	Splice	2	Switch Power Control
OG / YE	Fusebox	40	Splice	1	Switch Power Control
OG / YE	Speedo	3	Splice	2	Switch Power Control
GY / RD	VCM	4	Fog Lights	P4	AUX Light Switch Indicator Light
BU / RD	VCM	13	Heated Grips Switch	P4	Heated Grip Light Feed
BU / BK	VCM	8	Heated Grips Switch	P2	Heated Grip Switch Decrease
RD	ECM 1	109	Knock Sensor	1	Knock Sensor A
BN	ABS	14	RWSS	D	Rear Wheel Speed Signal (–)
BN / RD	ABS	13	RWSS	E	Rear Wheel Speed Signal (+)
DG / WH	Fusebox	22	Start Solenoid	1	Starter Solenoid Control
OG	Fusebox	9	Speedo	4	Instrumentation Fuse Output
VT / YE	Fusebox	36	Fuel Pump	4	Fuel Pump Power
PK / RD	ECM 2	212	ETC Motor	4	ETC Motor (+)
YE	ECM 2	224	ETC Motor	1	ETC Motor (–)
GY / WH	Fusebox	44	Splice	1	Accessory Switched Output
GY / WH	USB Charger	1	Splice	2	Accessory Switched Output
GY / WH	Splice	2	Rear 12V Switched	A	Accessory Switched Output
BK	Chassis Ground	1	Splice	2	Ground
BK	Diag	D	Splice	1	Ground
BK	Rear Brake Switch	B	Splice	2	Ground

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BK	Rear Wheel Speed Sensor	B	Splice	2	Ground
BK	Start Solenoid	2	Splice	2	Ground
BK	Start Solenoid	2	Splice	2	Ground
BK	Rear Lighting	E	Splice	1	Ground
BK	Rear 12V Switched	B	Splice	1	Ground
BK	Splice	1	Fusebox	45	Ground
RD	J-Case	A	ABS	18	ABS Main Fuse Output
WH / BK	ECM 2	238	Handlebar 2	3	PPS 1 Return
WH / GY	ECM 2	241	Front Injector	1	Front Fuel Injector Driver
WH / DB	ECM 2	242	Rear Injector	1	Rear Fuel Injector Driver
BK	Splice	2	Coil Shield Ground	1	Coil Shield Ground
SHLD	CPS	3	Splice 0063A	1	Crank Position Sensor Shield
SHLD	Splice 0063B	1	Splice 0063A	2	Coil Shield
PK	Handlebar 1	2	VCM	12	Heated Grips Ouput
OG / BN	ECM 2	216	TMAP	4	Manifold Absolute Pressure (MAP) Sensor Output
BK	Chassis Ground 1	1	Splice 0067	1	ABS Ground
BK	ABS	1	Splice 0067	2	ABS Ground
BK	ABS	10	Splice 0067	2	ABS Ground
RD	J-Case	B	Splice 0070	2	Primary Fuse Output
RD	Splice 0070	2	Fusebox	6	Main Fuse Output
RD	Fusebox	5	Splice 0070	1	Main Fuse Output
RD	Fusebox	14	Splice 0070	1	Main Fuse Output
RD	Fusebox	39	Splice 0070	1	Main Fuse Output
PK / GN	Fusebox	38	Splice 0071	2	VCM Accessory Power Out
PK / GN	Fog Lights	P1	Splice 0071	1	VCM Accessory Power Out

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PK / GN	Headlight	C	Splice 0071	1	VCM Accessory Power Out
PK / GN	ABS	4	Splice 0071	2	VCM Accessory Power Out
PK / GN	Handlebar 2	4	Splice 0071	2	VCM Accessory Power Out
PK / GN	VCM	10	Splice 0071	2	VCM Accessory Power Out
PK / GN	Heated Grips Switch	P3	Splice 0071	1	VCM Accessory Power Out
VT / RD	ECM 2	245	ETC Motor	5	TPS 2 Signal
BK	Chassis Ground 1	1	Splice 0080	1	Ground
BK	Handlebar 1	2	Splice 0080	1	Ground
BK	Speedo	5	Splice 0080	2	Ground
YE / BK	GSS	C	ECM 2	202	Gear Position
RD / YE	WCM	1	Fusebox	13	VCM Control Power
VT / PK	Fusebox	4	Splice 0085	2	Engine Relay Power Output
VT / PK	Splice 0085	2	Fusebox	15	Engine Relay Power Output
VT / PK	Splice 0085	1	Front Injector	2	Engine Relay Power Output
VT / PK	Splice 0085	1	Rear Injector	2	Engine Relay Power Output
VT / PK	Fusebox	30	Splice 0085	2	Engine Relay Power Output
VT / PK	ECM 2	249	Splice 0085	1	Engine Relay Power Output
VT / PK	ECM 2	250	Splice 0085	1	Engine Relay Power Output
VT / PK	Fusebox	29	Splice 0085	2	Engine Relay Power Output
GY / WH	ECM 2	201	Rear O2	B	Rear Heated Oxygen Sensor Control
BK	Charge Port	2	Chassis Ground	1	Ground
DB / RD	ECM 1	124	Front RH Turn	1	Right Front TS Lamp Output
BK	Headlight	A	Chassis Ground 1	1	Headlight Ground
YE	VCM	16	Headlight	D	High Beam Output

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DG	VCM	5	Headlight	B	Low Beam
YE / BK	ECM 2	227	Handlebar 2	7	PPS 2 Return
BN / GN	ECM 2	237	TMAP	1	MAP Sensor
BN / WH	ECM 2	226	ETC Motor	2	TPS Return
DG / RD	Fog Lights	P2	VCM	18	LH Aux Light Feed
YE / GN	ECM 2	232	Handlebar 2	6	PPS 2 Output
BK / DG	ECM 2	236	Fuel Pump	3	Fuel Level Sensor Output
BN / WH	WCM	9	Speedometer	6	Security LED Feed
GY / BK	ECM 2	234	Fusebox	11	Engine Relay Control
PK	ECM 2	209	WCM	7	K15
BK	VCM	14	Chassis Ground	1	VCM Ground
BK	WCM	12	Chassis Ground	1	VCM Ground
BK	ECM 1	110	Knock Sensor	2	Knock Sensor B
WH / GN	ECM 2	235	Handlebar 2	2	PPS 1 Output
DB / PK	ECM 1	119	Handlebar 3	1	Run Stop Switch
WH / RD	ECM 2	231	Front Brake Switch	A	Rear Brake Switch Output
YE / RD	ECM 2	223	Handlebar 2	5	PPS 2 +5V Reference
RD / DB	Fusebox	12	Splice 0127	2	Engine Breaker Output
RD / DB	Fusebox	3	Splice 0127	2	Run / Stop Switch power
RD / DB	Fusebox	8	Splice 0127	1	Engine Breaker Output
RD / DB	Fusebox	2	Splice 0127	1	Engine Breaker Output
GY / YE	ECM 1	155	Front O2	B	Front Heated Oxygen Sensor
YE	ECM 2	229	Splice 0132A	1	250K CAN HIGH
YE	VCM	2	Splice 0132A	2	250K CAN HIGH
YE	Splice 0132A	2	Splice 0132B	2	250K CAN HIGH
YE	Diag	H	Splice 0132B	1	250K CAN HIGH
YE	Splice 0132B	2	Splice 0132C	2	250K CAN HIGH
YE	WCM	2	Splice 0132C	2	250K CAN HIGH
YE	Splice 0132C	1	Splice 0132D	1	250K CAN HIGH

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YE	Handlebar 1	3	Splice 0132D	1	250K CAN HIGH
YE	Splice 0132E	2	Splice 0132D	2	250K CAN HIGH
YE	Handlebar 1	1	Splice 0132E	1	250K CAN HIGH
YE	Speedo	1	Splice 0132E	2	250K CAN HIGH
YE	ECM1	138	Splice 0133A	1	CANB HIGH
YE	Diag	E	Splice 0133A	2	CANB HIGH
YE	Splice 0133A	2	Splice 0133B	2	CANB HIGH
YE	ABS	2	Splice 0133B	1	CANB HIGH
YE	ABS CAN	1	Splice 0133B	22	CANB HIGH
BN / DB	ECM 2	210	ETC Motor	3	TPS +5V
OG / BN	ECM 2	221	Fusebox	21	Starter Relay Control
GY	ECM 2	220	Fusebox	35	Fuel Pump Relay Control
DG	ECM 2	230	Splice 0144A	1	256K CAN LOW
DG	VCM	11	Splice 0144A	2	256K CAN LOW
DG	Splice 0144A	2	Splice 0144B	2	256K CAN LOW
DG	Splice 0144B	1	Diag	G	256K CAN LOW
DG	Splice 0144B	2	Splice 0144C	2	256K CAN LOW
DG	WCM	4	Splice 0144C	2	256K CAN LOW
DG	Splice 0144C	1	Splice 0144D	1	256K CAN LOW
DG	Handlebar 1	6	Splice 0144D	1	256K CAN LOW
DG	Splice 0144E	2	Splice 0144D	2	256K CAN LOW
DG	Handlebar 1	4	Splice 0144E	1	256K CAN LOW
DG	Speedo	2	Splice 0144E	2	256K CAN LOW
DG	ECM 1	137	Splice 0145A	1	CANB Low
DG	Diag	F	Splice 0145A	2	CANB Low
DG	Splice 0145A	2	Splice 0145B	2	CANB Low
DG	ABS	11	Splice 0145B	1	CANB Low
DG	ABS CAN	2	Splice 0145B	2	CANB Low
BG / BK	ECM 1	120	Side Stand Switch	P1	Side Stand Switch Signal
PK / DB	Rear Lighting	B	ECM 1	111	Brake Light Power
DG / YE	Rear Lighting	A	ECM 1	112	Tail Light Power
GY / RD	Fusebox	32	Splice 0153	2	Accessory Constant Fuse Output

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GY / RD	Splice 0153	1	Charge Port	1	Accessory Constant Fuse Output
GY / RD	Diag	A	Splice 0153	2	Accessory Constant Fuse Output
WH / RD	ECM 2	222	Handlebar 2	1	PPS 1 +5V Reference
BN / PK	ECM 1	102	TMAP	3	TMAP Power
BK	Horn	B	Chassis Ground 1	1	Horn Ground
WH	VCM	7	Horn	A	Horn Power
GY / RD	ECM 2	228	Rear O2	C	Rear heated Oxygen Sensor Output
GY / BK	ABS	3	ABS Front Wheel Speed Sensor	B	Front Wheel Speed Signal
WH	LF Antenna	1	WCM	11	125 kHz A
BK	LF Antenna	2	WCM	10	135 kHz B
DB / BK	ECM 2	240	Purge	2	Canister Purge Valve
DB	ECM 1	135	Rear Lighting	D	Left Rear TS Lamp Output
Bk	Fuel Pump	2	Chassis Ground 1	1	Fuel Pump Ground
RD	Fusebox	20	Splice 0174	1	VCM Power
RD	VCM	1	Splice 0174	2	VCM Power
RD	VCM	20	Splice 0174	2	VCM Power
WH	ECM 2	253	Coil	1	Front Coil Signal
BK	Chassis Ground 1	1	Splice 0178	2	Ground
BK	Handlebar 2	8	Splice 0178	1	Ground
BK	Front Brake Switch	B	Splice 0178	1	Ground
BK	Front Right Turn	2	Splice 0178	1	Ground
BK	Front Left Turn	2	Splice 0178	1	Ground
BK	Heated Grips Switch	P1	Splice 0178	1	Ground
BK	Fog Lights	P5	Splice 0178	2	Ground
BK	USB Charger	2	Splice 0178	2	Ground
BK / WH	Chassis Ground	1	Splice 0179	2	Ground

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BK / WH	Side Stand Switch	P2	Splice 0179	1	ECM Ground
BK / WH	ECM 2	251	Splice 0179	2	ECM Ground
BK / WH	ECM 1	154	Splice 0179	1	ECM Ground
BK / WH	ECM 2	252	Splice 0179	1	ECM Ground
BK / WH	Splice 0179	2	Ambient Air Temp	B	ECM Ground
GY / RD	ABS	12	ABS Front Wheel Speed Sensor	A	Front Wheel Speed Signal +
OG / DG	ECM 2	215	TMAP	2	Intake Air Temperature Sensor Output
BK	Chassis Ground 1	1	Slice 0063A	1	ECM Shield Ground
BK / RD	Voltage Regulator	P3	J-Case Stud	1	Voltage Regulator Output Power
BK	Voltage Regulator	P1	Chassis Ground 1	1	Voltage Regulator Ground
BK	ECM 2	254	Coil	3	Rear Coil Signal
DB / PK	Fusebox	7	Splice 0194	1	AUX Engine Relay Power Output
DB / PK	Splice 0194	1	Front O2	A	AUX Engine Relay Power Output
DB / PK	Splice 0194	1	Rear O2	A	AUX Engine Relay Output
DB / PK	Splice 0194	1	Purge	1	Purge Valve Power
DB / PK	Rear Wheel Speed Sensor	A	Splice 0194	2	AUX Engine Relay Power Output
DB / PK	Diag	B	Splice 0194	2	AUX Engine Relay Power Output
DB / PK	Rear Lighting	F	Splice 0194	2	AUX Engine Relay Power Output
DB / PK	ECM 1	136	Rear Lighting	C	Right Rear TS Lamp Output
BK	ECM 2	214	CPS	2	CPS Negative Signal

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GY / DB	ECM 1	131	Front O2	C	Front Heated Oxygen Sensor Output
OG / YE	ECM 2	248	ETC Motor	6	Throttle Position sensor 1 output
BG WJ	ECM 1	132	Front O2	D	Front heated sensor return
BK / BU	ECM 1	144	Fuel Pump	1	Fuel Sender Ground
BG	ECM 2	225	Rear O2	D	Rear heated Oxygen Sensor Return
OG / BN	ECM 1	143	Cylinder Head Temperature Sensor	P2	CHT Return
DB	ECM 1	123	Front LH Turn	1	Left Front TS Lamp Output
WH	ECM 2	213	CPS	1	CPS Positive Signal
OG / DB	ECM 2	233	Cylinder Head Temperature Sensor	P1	Cylinder Head Temperature Sensor Output
OG / DB	ECM 2	247	Ambient Air Temp	A	Ambient Air Signal
YE / VT	ECM 2	243	Rear Brake Switch	A	Rear Brake Switch Output
RD	Fusebox	1	Coil	2	Ignition Coil Feed
BK / DG	GSS	B	ECM 1	152	ECM Ground
RD / BU	GSS	A	ECM 2	211	Gear Select Sensor +5V
RD / BK	ABS	9	Fusebox	26	ABS 20A Fuse
PK / BK	ECM 1	141	Fusebox	16	Starter HSD
RD / BU	Splice 0261	1	Fusebox	46	Switched Power Relay Load
RD / BU	Fusebox	37	Splice 0261	2	Switched Power Relay Load
RD / BU	Fusebox	43	Splice 0261	2	Switched Power Relay Load
BN / YE	ECM 2	205	RWSS	C	Rear Wheel Signal
RD	Splice 0272	2	J-Case	C	Secondary Fuse Output
RD	Splice 0272	2	Fusebox	19	Main 2 Fuse Output

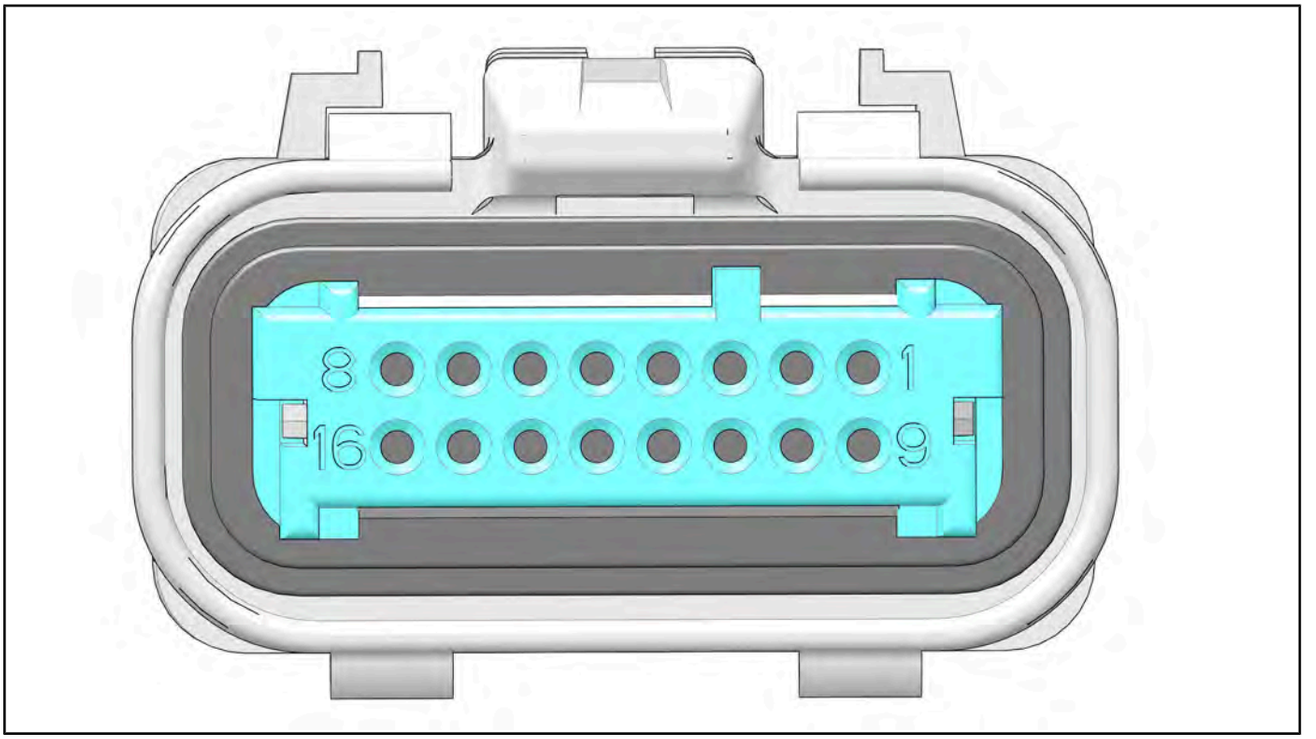
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RD	Fusebox	25	Splice 0272	2	Main 2 Fuse Output
RD	Fusebox	10	Splice 0272	1	Main 2 Fuse Output
RD	Fusebox	31	Splice 0272	1	Main 2 Fuse Output
RD	J-Case Stud	1	Starter Solenoid	1	Battery Unfused
BG	VCM	3	Handlebar 3	3	Left Heated Grips Output

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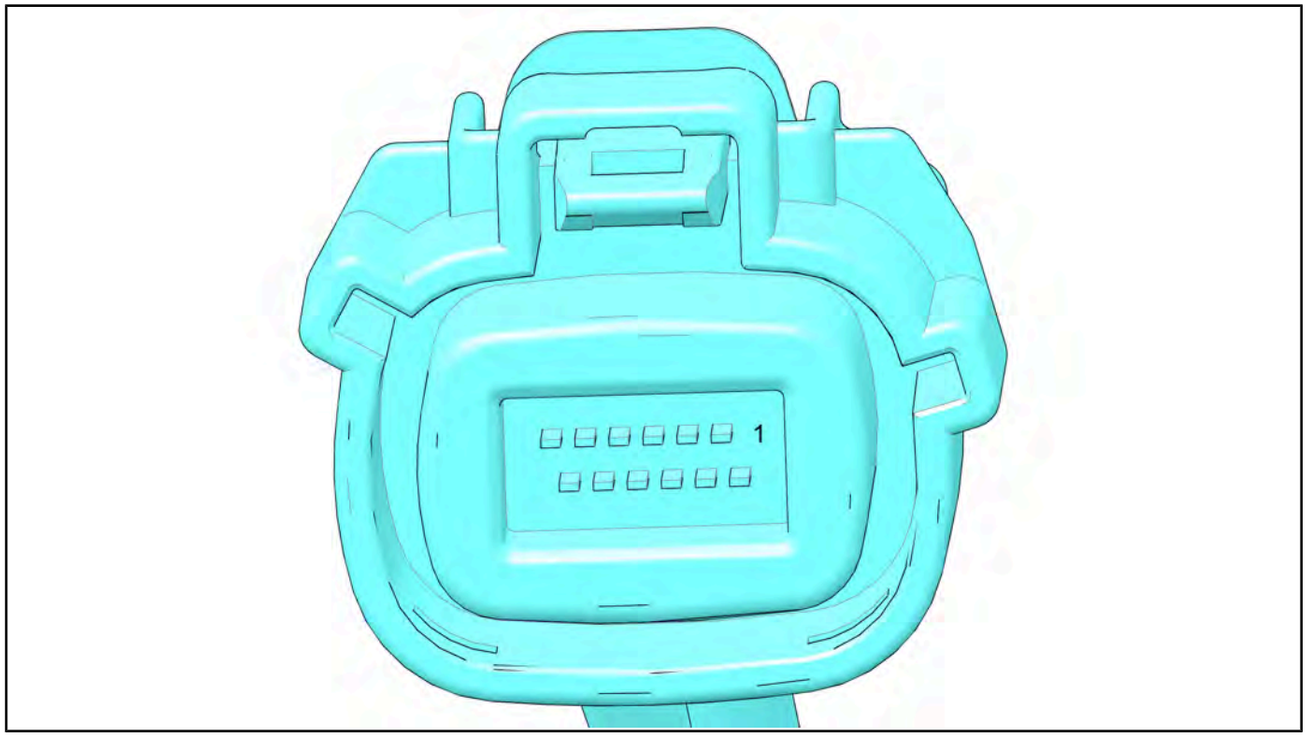
RIDE COMMAND DISPLAY

DISPLAY CONNECTOR PINOUT



PIN	WIRE COLOR	FUNCTION	PIN	WIRE COLOR	FUNCTION
1	YE	250K CAN HIGH	9	—	—
2	DG	256K CAN LOW	10	—	—
3	OG / YE	Switched Power Control	11	—	—
4	OG	Instrumenta-tion Fuse Output	12	—	—
5	BK	Ground	13	—	—
6	BN / WH	Security LED Feed	14	—	—
7	—	—	15	—	—
8	YE / BK	Oil Pressure Switch	16	—	—

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PIN	WIRE COLOR	FUNCTION	PIN	WIRE COLOR	FUNCTION
1	Red	VBUS	7	Red	VBUS
2	–	–	8	–	–
3	White	D –	9	White	D –
4	Green	D +	10	Green	D +
5	–	–	11	–	–
6	Black	Ground	12	Black	Ground

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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 Application Chart page 10.68**. ***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

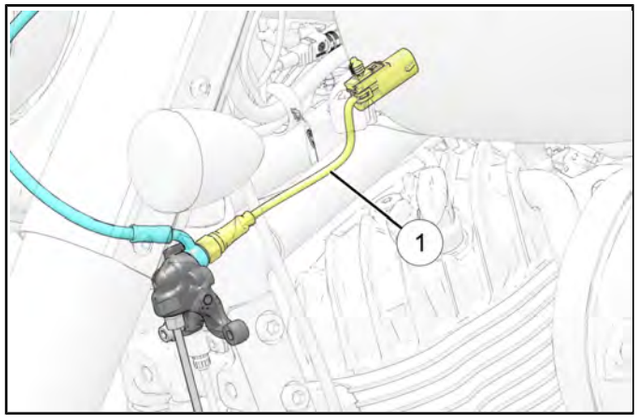
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SWITCH TESTING

BRAKE PRESSURE SWITCH TEST

FRONT

1. Locate the front brake pressure switch ① located on the front brake manifold.

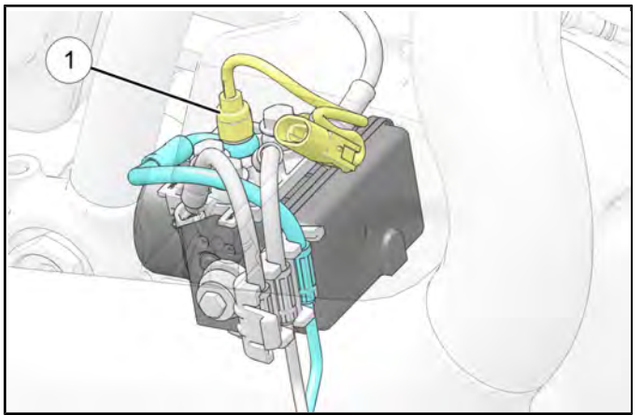


2. Follow the switch and disconnect the electrical connection.
3. Use a multi-meter to read resistance and insert leads into the appropriate jacks.
4. Check the resistance of the switch with the front brake UN-applied.

Un-applied Brake Pedal Resistance:
2000 Ohms

REAR

1. Located the rear brake pressure switch ① on the ABS module.



2. Follow the switch and disconnect the electrical connection.
3. Use a multi-meter to read resistance and insert leads into the appropriate jacks.
4. Check the resistance of the switch with the rear brake UN-applied.

Un-applied Brake Pedal Resistance:
2000 Ohms

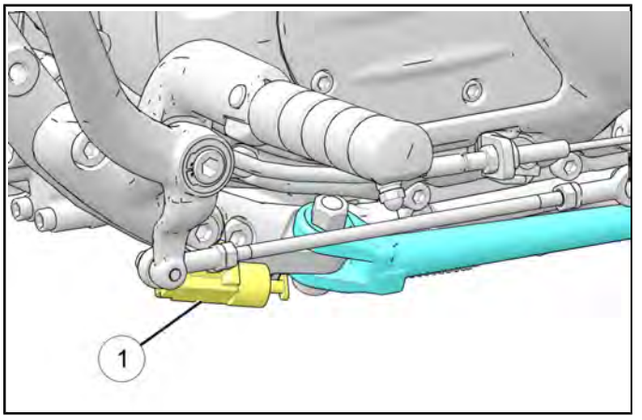
CLUTCH SWITCH TEST

1. Access the clutch switch. Reference **Clutch Switch Removal / Installation page 10.28**.
2. Measure the resistance of the switch with lever pulled to handlebar (less than 1 Ohm resistance) and with lever released (OL).

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SIDE STAND SWITCH TEST

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. Locate the side stand switch ①.



3. Locate the side stand switch electrical connector.
4. Set multi meter to measure resistance and insert meter leads into appropriate jacks.
5. Place one meter lead onto each of the side stand switch terminal pins.
6. 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)**

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BREAKOUT WIRING DIAGRAMS

BREAKOUT DIAGRAMS

Physical copies of the breakout diagrams can be located in the last few pages of the service manual.

If viewing on a computer, the breakout diagrams links can be found on **Wiring Diagram page** .

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.

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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 10.112**
- All associated circuits have no shorts to ground. **Testing For A Short To Ground page 10.113**
- All associated circuits have no shorts to voltage. **Testing For A Short To Voltage page 10.114**

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 10.115**. 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 10.32**.
- 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 10.116**

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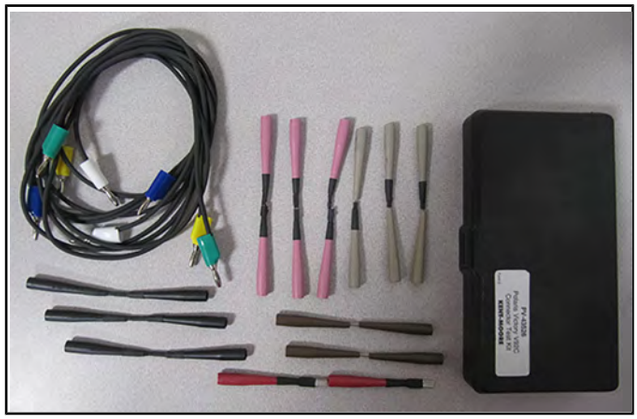
CONNECTOR PROBING GUIDELINES

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 it's design limits, causing no tension. If there is no tension, you will have 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. You can either replace that 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, as 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), ensure it is done only on connectors that are large enough to accommodate the probe. Ensure back probing is done gently and carefully. Ensure 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.

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TESTING CONTINUITY / RESISTANCE

Testing using the Ohmmeter function of your DMM is one of the first things you will do 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 quickly give you a good idea if you simply need to replace a part, or if there might be another circuit issue.

Using the following points in conjunction with your DMM owner's manual will ensure your resistance testing is always accurate:

- Only measure resistance on an isolated part of the circuit. This means if you are testing internal resistance of a component, it cannot be connected to the harness. If you are measuring a wire (typically from the ECU to a sensor) both the sensor and ECU would need to be unplugged. Most Ohmmeters provides a precise amount of current to determine resistance. Any other sources will make your reading inaccurate.
- Ensure you are making good contact by using the proper terminal adapters. Connector Probing Guidelines page 10.111
- If you are not using a self ranging meter, double check your range setting.
- If your continuity is under 1 ohm, leave the harness disconnected and move on to Testing For A Short To Ground page 10.113 and Testing For A Short To Voltage page 10.114.

For a video demonstration, scan the QR code below, or right click it and select "open in new tab."

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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. Ensure you are able to duplicate the concern before testing so that your results point you in the right direction.Testing for Intermittent Conditions page 10.114

TESTING PROCEDURE

1. Consult the wiring diagram. Determine which circuit you will be testing.
2. Ensure 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 10.112
4. Ensure 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. Ensure you are using the correct adapter.Connector Probing Guidelines page 10.111
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 10.114

For a video demonstration, scan the QR code below, or right click it and select "open in new tab".



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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. Ensure 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 10.112
4. Ensure you have checked for a short to ground. Testing For A Short To Ground page 10.113
5. Ensure 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. Ensure you are using the correct adapter.Connector Probing Guidelines page 10.111
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.

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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 10.111.

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.

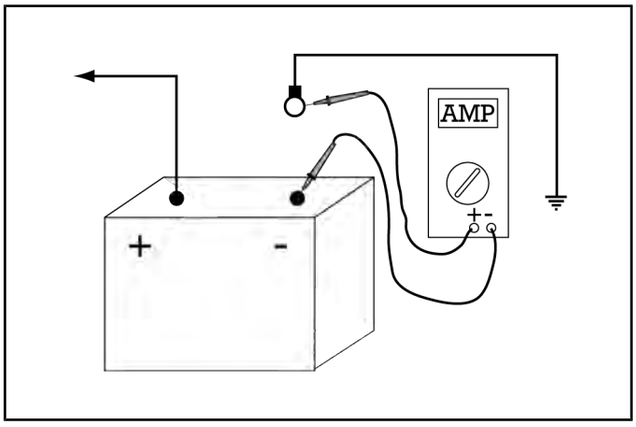
TESTING PARASITIC DRAW

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. Remove seat. See **Seat Removal / Installation page 7.27**.
2. 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.

3. Run the unit briefly and shut it off after idle stabilizes.

NOTE

Do not disturb or disconnect the meter leads.

4. With ignition switch off, **and after 12 minutes have passed**, read current drain.

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5. 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.

6. 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.

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 10.111.

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”.

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APPENDIX A WIRING DIAGRAMS

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