



2017 Indian Motorcycle (Full-Size) Service Manual

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'.

Consumers, please provide your feedback in writing to: Indian Motorcycle Company ATTN: Service Publications Department, 2100 Hwy 55, Medina, MN 55340.

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SAFETY WARNINGS

Throughout this manual, important information is brought to your attention by the following symbols:

⚠ WARNING

SAFETY ALERT WARNING indicates a potential hazard that may result in severe injury or death to the operator, bystander or person(s) inspecting or servicing the vehicle.

⚠ CAUTION

SAFETY ALERT CAUTION indicates a potential hazard that may result in minor personal injury or damage to the vehicle.

CAUTION

CAUTION indicates special precautions that must be taken to avoid vehicle damage or property damage.

NOTE

NOTE 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 MENTIONED IN THIS MANUAL:

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

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

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

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

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

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

REVISION INDEX

REV	DATE	CHANGES
R01	8/1/2016	Initial release
R02	1/20/2017	Add Roadmaster Classic models
R03	4/2/2017	Add Chieftain Limited and Elite models

2017 Indian Motorcycle (Full-Size)

Service Manual

Chapter Summary

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CHAPTER 1

GENERAL / SPECIFICATIONS

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GENERAL / SPECIFICATIONS

VEHICLE INFORMATION MODEL NUMBER DESIGNATION

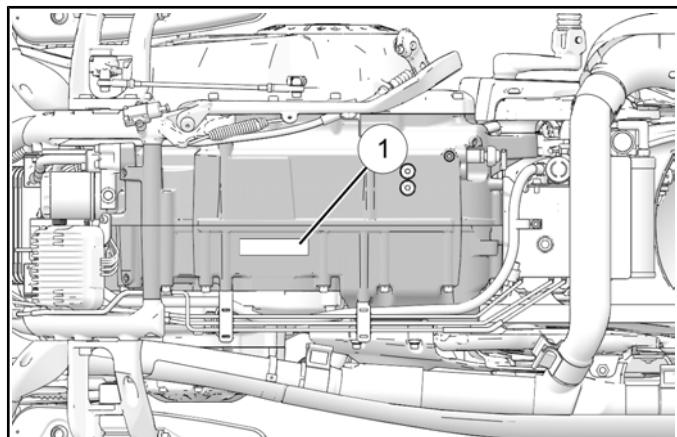
Example: N17CCDAAAH

GRP	MY	TYPE	MODEL	LINE	DISP	NET BRAKE HP	MARKET CONFIG	COLOR
1st digit	2nd/ 3rd digit	4th digit*	5th digit*	6th digit*	7th digit*	8th digit	9th digit**	10th digit
N= Indian Motor- cycle	17 = 2017	C= Cruiser M = Midsize T = Touring	C = Chief V = Chief Vintage C= Chieftain H = Springfield R = Roadmaster B = Roadmaster Classic	A = Standard ABS B = Standard Non-ABS C = Classic ABS D = Dark Horse ABS V = Vintage ABS	A = 1811cc (111ci) V-Twin	A = Full-size	A = 49 State (49S) B = 50 State (50S) C = Canadian (CAN) E = EU (WVTA) J = Japan (SVA) K = Braxil CKD (BRZ) X = China (XNA)	A = Thunder Black B = Springfield Blue C = Ivory Cream D = Indian Red / Thunder Black E = Indian Red / Cream F = Springfield Blue / Cream G = Willow Green / Cream H = Black Smoke R = Indian Red S = Black Hills Silver T = Vogue Silver w/ Blk Graphic V = Matte Sunset Red / Matte Black Z = Unpainted

* = digits that would transfer to 17 digit VIN and are used in digits 4–8 respectively.
 ** = 9th digit will be used on color / featured versions of models (not including base).
 First 3 digits and 9th digit are used in model number only. They are not used with the 17 digit VIN.

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.



VEHICLE IDENTIFICATION NUMBER (VIN) DESIGNATION

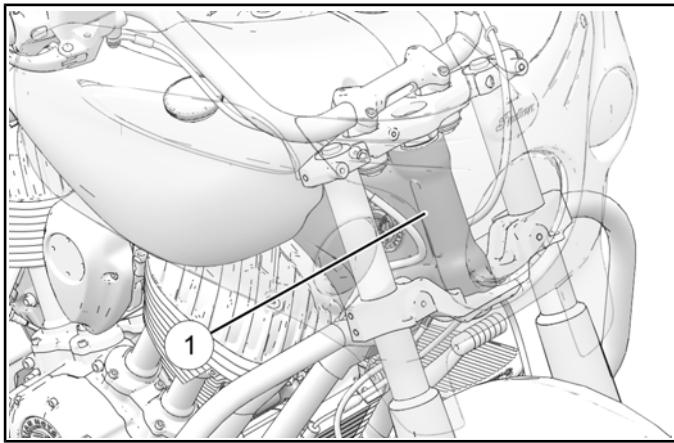
Example: 56KTCAAAOE3000024

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

* Model Year: H = 2017

VIN LOCATION

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

**MANUFACTURER LABEL**

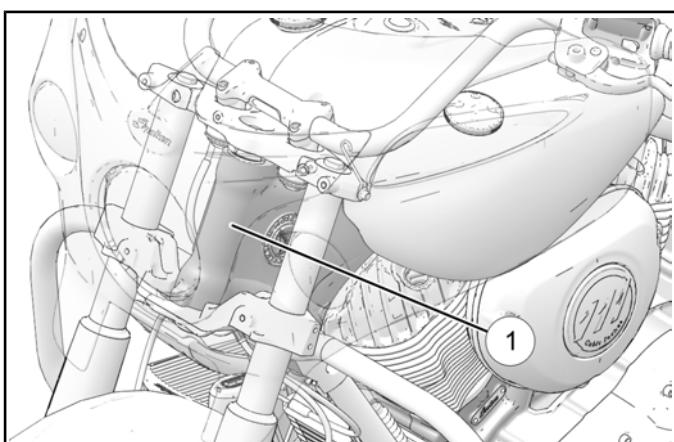
The manufacturer label ① located on the left side of the steering head contains the following information:

Vehicle Identification Number (VIN)

Gross Vehicle Weight Rating (GVWR)

Gross Axle Weight Rating (GAWR)

Tire Type and Load Information.

**TIRE INFORMATION LABEL**

See Manufacturer Label, page 1.3 for tire information.

GENERAL / SPECIFICATIONS

GENERAL SPECIFICATIONS 2017 CHIEF CLASSIC

Model Numbers

2017	
N17CCCAAAD	N17CCCAACK
N17CCCAAAK	N17CCCAACZ
N17CCCAAAZ	N17CCCAAED
N17CCCAABD	N17CCCAAEK
N17CCCAABK	N17CCCAAKD
N17CCCAABZ	N17CCCAAKK
N17CCCAACD	



Chassis

CATEGORY	SPECIFICATION
Dry Weight	751 lbs (341 kg)
Wet Weight	783 lbs (356 kg)
Gross Vehicle Weight Rating	1260 lbs (572 kg)
Gross Axle Weight Rating, Front	485 lbs (220 kg)
Gross Axle Weight Rating, Rear	775 lbs (352 kg)
Maximum Load	477 lbs (216 kg)
Overall Length	103.5 in (2630 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	46.3 in (1176 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.5 in (139.8 mm)
Total Storage Capacity	NA
Passenger Capacity	0
Wheelbase	68.1 in (1730 mm)
Rake / Trail	29° / 6.1 in (155.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205441
Engine Type	Thunder Stroke 111
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Speed	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V (Accessory)

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up

Transmission Gear Ratios:

1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.68 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Gas with Adjustable Preload
Rear Swingarm Type	Cast Aluminum
Rear Travel	3.7 in (9.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3 – 130/90B16
Front Wheel Type / Size	Cast - 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop American Elite – 180/65B16
Rear Wheel	Cast - 16 in X 5 in
Rear Tire Air Pressure	40 PSI (276 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for standard Indian Chief Classic models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

GENERAL / SPECIFICATIONS

2017 CHIEF DARK HORSE

Model Numbers

2017
N17CCDAAAH
N17CCDAABH
N17CCDAACH
N17CCDAAEH



Chassis

CATEGORY	SPECIFICATION
Dry Weight	751 lbs (341 kg)
Wet Weight	783 lbs (356 kg)
Gross Vehicle Weight Rating	1260 lbs (572 kg)
Gross Axle Weight Rating, Front	485 lbs (220 kg)
Gross Axle Weight Rating, Rear	775 lbs (352 kg)
Maximum Load	477 lbs (216 kg)
Overall Length	103.5 in (2630 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	46.3 in (1176 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.5 in (139.8 mm)
Total Storage Capacity	NA
Passenger Capacity	0
Wheelbase	68.1 in (1730 mm)
Rake / Trail	29° / 6.1 in (155.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205442
Engine Type	Thunder Stroke 111
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	610W @ 3500 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V (Accessory)

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up

Transmission Gear Ratios:

1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.68 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Gas with Adjustable Preload
Rear Swingarm Type	Cast Aluminum
Rear Travel	3.7 in (9.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3- 130/90B16
Front Wheel Type / Size	Cast / 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop American Elite – 180/65B16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	40 PSI (276 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for standard Indian Dark Horse models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

GENERAL / SPECIFICATIONS

2017 CHIEF VINTAGE

Model Numbers

2017	
N17CCVAAAA	N17CCVAACE
N17CCVAAAE	N17CCVAACF
N17CCVAAAF	N17CCVAACG
N17CCVAAAG	N17CCVAACZ
N17CCVAAAZ	N17CCVAAEA
N17CCVAABA	N17CCVAAEE
N17CCVAABE	N17CCVAAEF
N17CCVAABF	N17CCVAAEG
N17CCVAABG	N17CCVAAKA
N17CCVAAHZ	N17CCVAAKE
N17CCVAAACA	



Chassis

CATEGORY	SPECIFICATION
Dry Weight	824 lbs (374 kg)
Wet Weight	856 lbs (388 kg)
Gross Vehicle Weight Rating	1260 lbs (572 kg)
Gross Axle Weight Rating, Front	485 lbs (220 kg)
Gross Axle Weight Rating, Rear	775 lbs (352 kg)
Maximum Load	404 lbs (183 kg)
Overall Length	103.7 in (2634 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	58.7 in (1490 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.5 in (140 mm)
Total Storage Capacity	15 lbs (6.8 kg)
Passenger Capacity	1
Wheelbase	68.1 in (1730 mm)
Rake / Trail	29° / 6.1 in (155.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205441
Engine Type	Thunder Stroke 111
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up
Transmission Gear Ratios:	
1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.68 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Gas with Adjustable Preload
Rear Swingarm Type	Cast Aluminum
Rear Travel	3.7 in (9.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop American Elite – 130/90B16
Front Wheel Type / Size	Spoked / 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop American Elite – 180/65B16
Rear Wheel	Spoked / 16 in X 5 in
Rear Tire Air Pressure	40 PSI (276 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for standard Indian Chief Vintage models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

GENERAL / SPECIFICATIONS

2017 SPRINGFIELD

Model Numbers

2017	
N17THAAAAAA	N17THAAACL
N17THAAAAL	N17THAAACM
N17THAAAAM	N17THAAACR
N17THAAAAR	N17THAAACZ
N17THAAAAZ	N17THAAAEA
N17THAAABA	N17THAAAEEL
N17THAAABL	N17THAAEEM
N17THAAABM	N17THAAEER
N17THAAABR	N17THAAAKA
N17THAAABZ	N17THAAAKL
N17THAAACA	



Chassis

CATEGORY	SPECIFICATION
Dry Weight	830 lbs (376 kg)
Wet Weight	862 lbs (391 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (401 kg)
Maximum Load	523 lbs (237 kg)
Overall Length	101.7 in (2583 mm)
Overall Width	39.0 in (990 mm)
Overall Height	56.8 in (1442 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.6 in (142 mm)
Total Storage Capacity	22 lbs (10.0 kg)
Passenger Capacity	1
Wheelbase	67 in (1701 mm)
Rake / Trail	25° / 5.2 in (133.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205441
Engine Type	Thunder Stroke 111 V-Twin
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
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Transmission Gear Ratios:	
1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.7 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Air Adjustable Shock
Rear Swingarm Type	Cast Aluminum
Rear Travel	4.5 in (11.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3- 130/90B16
Front Wheel Type / Size	Cast / 16 in X 3.5 in
Front Tire Air Pressure	46 PSI (317 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop Elite 3 – 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (283 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for standard Indian Springfield models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

GENERAL / SPECIFICATIONS

2017 CHIEFTAIN

Model Numbers

2017	
N17TCAAA1	N17TCAAAC1
N17TCAAA6	N17TCAAAC6
N17TCAAAAP	N17TCAAACP
N17TCAAAAS	N17TCAAACS
N17TCAAAAT	N17TCAAACCT
N17TCAAAAZ	N17TCAAACZ
N17TCAAAB1	N17TCAAEE1
N17TCAAAB6	N17TCAAEE6
N17TCAAABP	N17TCAAEP
N17TCAAABS	N17TAAAES
N17TCAAABT	N17TCAAET
N17TCAAABZ	N17TCAAKS



Chassis

CATEGORY	SPECIFICATION
Dry Weight	828 lbs (376 kg)
Wet Weight	860 lbs (391 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (402 kg)
Maximum Load	525 lbs (238 kg)
Overall Length	101.2 in (2571 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	54.6 in (1388 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.6 in (142 mm)
Total Storage Capacity	45 lbs (20 kg)
Passenger Capacity	1
Wheelbase	65.7 in (1668 mm)
Rake / Trail	25° / 5.9 in (150.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205440
Engine Type	Thunder Stroke 111 V-Twin
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up
Transmission Gear Ratios:	
1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.7 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Air Adjustable Shock
Rear Swingarm Type	Cast Aluminum
Rear Travel	4.5 in (11.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3- 130/90B16
Front Wheel Type / Size	Cast / 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop Elite 3- 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (282 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for standard Indian Chieftain models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

GENERAL / SPECIFICATIONS

2017 CHIEFTAIN DARK HORSE

Model Numbers

2017
N17TCDAAAH
N17TCDAABH
N17TCDAACH
N17TCDAAEH



Chassis

CATEGORY	SPECIFICATION
Dry Weight	799 lbs (362 kg)
Wet Weight	831 lbs (377 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (401 kg)
Maximum Load	554 lbs (251 kg)
Overall Length	101.2 in (2571 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	54.6 in (1388 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.6 in (142 mm)
Total Storage Capacity	22 lbs (10.0 kg)
Passenger Capacity	1
Wheelbase	65.7 in (1668 mm)
Rake / Trail	25° / 5.9 in (150.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205534
Engine Type	Thunder Stroke 111 V-Twin
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up
Transmission Gear Ratios:	
1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.7 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Air Adjustable Shock
Rear Swingarm Type	Cast Aluminum
Rear Travel	4.5 in (11.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3- 130/90B16
Front Wheel Type / Size	Cast / 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop Elite 3- 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (282 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

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GENERAL / SPECIFICATIONS

2017 CHIEFTAIN LIMITED

Model Numbers

2017	
N17TCNAAAAA	N17TCNAAAT
N17TCNAAAP	N17TCNAABT
N17TCNAABP	N17TCNAACT
N17TCNAAACP	N17TCNAAET
N17TCNAAEP	N17TCNAAAS
N17TCNAAA6	N17TCNAABS
N17TCNAAAB6	N17TCNAAACS
N17TCNAAAC6	N17TCNAAES
N17TCNAAE6	



Chassis

CATEGORY	SPECIFICATION
Dry Weight	817 lbs (371 kg)
Wet Weight	849 lbs (385 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (402 kg)
Maximum Load	536 lbs (243 kg)
Overall Length	98.7 in (2506 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	54.6 in (1388 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.6 in (142 mm)
Total Storage Capacity	45 lbs (20 kg)
Passenger Capacity	1
Wheelbase	65.7 in (1668 mm)
Rake / Trail	25° / 5.9 in (150.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205440
Engine Type	Thunder Stroke 111 V-Twin
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up
Transmission Gear Ratios:	
1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.7 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Air Adjustable Shock
Rear Swingarm Type	Cast Aluminum
Rear Travel	4.5 in (11.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop American Elite – 130/60B19
Front Wheel Type / Size	Cast / 19 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire Type / Size	Dunlop Elite 3– 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (282 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

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GENERAL / SPECIFICATIONS

2017 CHIEFTAIN ELITE



Model Numbers

2017
N17TCEAAA4

Chassis

CATEGORY	SPECIFICATION
Dry Weight	831 lbs (377 kg)
Wet Weight	863 lbs (392 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (402 kg)
Maximum Load	522 lbs (237 kg)
Overall Length	98.7 in (2506 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	57.0 in (1448 mm)
Seat Height	26.0 in (660 mm)
Ground Clearance	5.6 in (142 mm)
Total Storage Capacity	45 lbs (20 kg)
Passenger Capacity	1
Wheelbase	65.7 in (1668 mm)
Rake / Trail	25° / 5.9 in (150.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205440
Engine Type	Thunder Stroke 111 V-Twin
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	LED (non-serviceable) H4 12V 60/55W Long Life (INT'L)
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up
Transmission Gear Ratios:	
1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.7 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Air Adjustable Shock
Rear Swingarm Type	Cast Aluminum
Rear Travel	4.5 in (11.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop American Elite – 130/60B19
Front Wheel Type / Size	Cast / 19 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire Type / Size	Dunlop Elite 3– 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (282 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

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GENERAL / SPECIFICATIONS

2017 ROADMASTER

Model Numbers

2017	
N17TRAAGAA	N17TRAACB
N17TRAAGAB	N17TRAACG
N17TRAAGAG	N17TRAACV
N17TRAAGAV	N17TRAACX
N17TRAAGAX	N17TRAACZ
N17TRAAGAZ	N17TRAAEA
N17TRAABA	N17TRAAEB
N17TRAABB	N17TRAAEG
N17TRAABG	N17TRAAEV
N17TRAABV	N17TRAAEX
N17TRAABX	N17TRAAKA
N17TRAABZ	N17TRAAKD
N17TRAACA	



Chassis

CATEGORY	SPECIFICATION
Dry Weight	912 lbs (414 kg)
Wet Weight	944 lbs (428 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (401 kg)
Maximum Load	441 lbs (200 kg)
Overall Length	104.6 in (2656 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	58.7 in (1491 mm)
Seat Height	26.5 in (673.1 mm)
Ground Clearance	5.5 in (140 mm)
Total Storage Capacity	85 lbs (36 kg)
Passenger Capacity	1
Wheelbase	65.7 in (1668 mm)
Rake / Trail	25° / 5.9 in (150.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205440
Engine Type	Thunder Stroke 111
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V (Accessory)

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up

Transmission Gear Ratios:

1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.68 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Gas with Adjustable Preload
Rear Swingarm Type	Cast Aluminum
Rear Travel	3.7 in (9.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3- 130/90B16
Front Wheel Type / Size	Cast / 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop Elite 3- 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (283 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for standard Indian Roadmaster models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

GENERAL / SPECIFICATIONS

2017 ROADMASTER CLASSIC

Model Numbers

2017	
N17TRLAAGA	N17TRLAABA
N17TRLAACB	N17TRLAAEA
N17TRLAAGC	N17TRLAABG
N17TRLAACD	N17TRLAAEG
N17TRLAAE	N17TRLAABE
N17TRLAAEC	N17TRLAAEE



Chassis

CATEGORY	SPECIFICATION
Dry Weight	864 lbs (392 kg)
Wet Weight	896 lbs (406 kg)
Gross Vehicle Weight Rating	1385 lbs (628 kg)
Gross Axle Weight Rating, Front	500 lbs (227 kg)
Gross Axle Weight Rating, Rear	885 lbs (401 kg)
Maximum Load	489 lbs (222 kg)
Overall Length	103.5 in (2630 mm)
Overall Width	39.4 in (1000 mm)
Overall Height	58.7 in (1491 mm)
Seat Height	26.5 in (673.1 mm)
Ground Clearance	5.5 in (140 mm)
Total Storage Capacity	56 lbs (25 kg)
Passenger Capacity	1
Wheelbase	65.7 in (1668 mm)
Rake / Trail	25° / 5.9 in (150.0 mm)

Engine

CATEGORY	SPECIFICATION
Engine Number	1205440
Engine Type	Thunder Stroke 111
Engine Configuration	49° OHV Pushrod V-Twin
Engine Wet Weight	297 lbs (134.7 kg)
Engine Displacement	111 cid (1811 cc)
Engine Cooling System	Air / Oil
Compression Ratio	9.5:1
Compression Pressure	90–110 psi (620–758 kPa)
Valve Train	2 Valves per cylinder / Hydraulic Lifters
Bore x Stroke	101 mm x 113 mm
Idle Speed / Fast Idle Spd	800 RPM ± 50 RPM (warm)
Oil Capacity	5.5 qts (5.2 L)
Oil Type	SAE 20W40 (recommended)
Lubrication System	Semi-Dry Sump
Spark Plug Type / Gap	DCPR8E / 0.034 in (0.9 mm)
Exhaust System	Two O2 Sensors (one in each pipe) / Single three-way catalyst

Fuel System

CATEGORY	SPECIFICATION
Fuel System Type	Electronic Fuel Injection (ME17)
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 psi (400 kPa)
Throttle Body Bore Size	2.125 in (54 mm)
Fuel Capacity	5.5 gal (20.8 L)
Fuel Reserve Capacity	1.0 gal (3.8 L)
Fuel Type	91 Octane recommended ((R+M/2) method)

GENERAL / SPECIFICATIONS

Electrical

CATEGORY	SPECIFICATION
Stator Rated Output	710W @ 2000 RPM
Battery	12V / 18 AH / 310 CCA, Sealed Glass Mat
Headlights	H4 12V 60/55W Long Life
Auxiliary Lights	H8 35W
Tail / Brake	LED (non-serviceable)
Turn Signals	LED (non-serviceable)
Starting System	Electric Start
Ignition System	Bosch ME-17 (ECM Controlled)
Instrument Type	Multifunction Instrument Cluster
DC Outlet	Standard 12V (Accessory)

Drivetrain

CATEGORY	SPECIFICATION
Transmission Type	6 Speed Overdrive, Constant Mesh
Clutch Type	Wet, Multi-Plate, Coil Spring
Primary Drive Type	Wet, Gear Drive w/Torque Compensator
Primary Reduction Ratio	1.56:1
Final Drive Type / Ratio	Belt / 2.2:1
Belt Type / Belt Width	24 mm Carbon Fiber Reinforced Belt
Gear Shift Pattern	1 Down, 5 Up

Transmission Gear Ratios:

1st	2.73:1
2nd	1.86:1
3rd	1.38:1
4th	1.10:1
5th	.94:1
6th	.81:1

Suspension

CATEGORY	SPECIFICATION
Front Suspension Type	Conventional Telescopic Fork
Front Travel	4.68 in (11.9 cm)
Front Tube Diameter	46 mm
Rear Shock Type	Single, Monotube Gas with Adjustable Preload
Rear Swingarm Type	Cast Aluminum
Rear Travel	3.7 in (9.4 cm)

Wheels / Brakes

CATEGORY	SPECIFICATION
Front Tire Type / Size	Dunlop Elite 3- 130/90B16
Front Wheel Type / Size	Cast / 16 in X 3.5 in
Front Tire Air Pressure	36 PSI (248 kPa)
Front Brake, Type	Dual Floating Disc / 4 Piston Calipers
Rear Tire	Dunlop Elite 3- 180/60R16
Rear Wheel	Cast / 16 in X 5 in
Rear Tire Air Pressure	41 PSI (283 kPa)
Rear Brake, Type	Single Floating Disc / 2 Piston Caliper
Brake Fluid Type	DOT 4

All specifications are for Indian Roadmaster Classic models. Specifications may change with the addition of custom order options and / or accessories. Indian Motorcycle Company reserves the right without prior notice to discontinue at any time at its discretion any of the items herein or change specifications or designs without incurring any obligation to the customer.

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 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

GENERAL / SPECIFICATIONS

PUBLICATIONS & TECHNICAL LITERATURE

PUBLICATIONS PART NUMBERS

Some Indian Motorcycle publications, such as Owner's Manuals and Parts Books may be available on-line at the Indian Motorcycle website; <http://www.indianmotorcycle.com/>

Service Manuals and Owner's Manuals can be purchased through any authorized Indian motorcycle dealer. The part numbers are listed in the following table.

MODEL YEAR / MARKET	MODEL	SERVICE MANUAL PART NUMBERS	OWNER'S MANUAL PART NUMBERS	PARTS BOOK PART NUMBERS
2017 Indian Motorcycle (U.S.)	Classic	9927618	9927464	9927429
	Vintage			9927430
	Chief Darkhorse			9927431
	Chieftain			9927690
	Chieftain Darkhorse			9927431
	Roadmaster			9927432
	Springfield			
2017 Indian Motorcycle (CAN)	Classic	9927618	9927466	9927429
	Vintage			9927430
	Chief Darkhorse			9925931
	Chieftain / Limited / Elite			9927690
	Chieftain Darkhorse			9927431
	Roadmaster			9927432
	Springfield			
2017 Indian Motorcycle (INT'L)	Classic	9927618	9927468	9927429
	Vintage			9927430
	Chief Darkhorse			9927431
	Chieftain / Limited / Elite			9927690
	Chieftain Darkhorse			9927431
	Roadmaster			9927432
	Springfield			

REFINISHING
PAINT COLORS BY MODEL

2017 CHIEF CLASSIC		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17CCCAA AK N17CCCA BK N17CCCA CK N17CCCA EK N17CCCA KK	Pearl White	P-566
N17CCCAA AD N17CCCA BD N17CCCA CD N17CCCA ED N17CCCA KD	Burgundy Metallic / Thunder Black	P-629 P-266
N17CCCAA AZ N17CCCA BZ N17CCCA CZ	Unpainted	NA

2017 CHIEF DARK HORSE		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17CCDAA AH N17CCDA ABH N17CCDA AC N17CCDAA EH	Thunder Black Smoke	P-463

2017 CHIEF VINTAGE		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17CCVAAA A N17CCVA AB N17CCVA AC N17CCVAA EA N17CCVAA KA	Thunder Black	P-266
N17CCVAAA E N17CCVA AB N17CCVA AC N17CCVAA EE N17CCVAA KE	Indian Red / Ivory Cream	P-639 / P-646
N17CCVAAA G N17CCVA AB N17CCVA AC N17CCVAA EG	Willow Green / Ivory Cream	P-670 / P-646
N17CCVAAA F N17CCVA AB N17CCVA AC N17CCVAA EF	Springfield Blue / Ivory Cream	P-640 / P-646
N17CCVAAA Z N17CCVA AB N17CCVA AC	Unpainted	NA

2017 CHIEFTAIN		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17TCAAA A1 N17TCAA B1 N17TCAA C1 N17TCAA E1	Thunder Black Pearl	P-666
N17TCAAA A6 N17TCAA B6 N17TCAA C6 N17TCAA E6	White Smoke	P-675
N17TCAAA AS N17TCAA BS N17TCAA CS N17TCAA ES N17TCAA KS	Silver Smoke	P-581
N17TCAAA AT N17TCAA BT N17TCAA CT N17TCAA ET	Star Silver / Thunder Black	P-354 / P-266
N17TCAAA AP N17TCAA BP N17TCAA CP N17TCAA EP	Wildfire Red / Thunder Black	P-676 / P-266
N17TCAAA AZ N17TCAA BZ N17TCAA CZ	Unpainted	NA

2017 CHIEFTAIN DARK HORSE		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17TCDA AAH N17TCDA ABH N17TCDA AC N17TCDA AEH	Thunder Black Smoke	P-463

2017 CHIEFTAIN LIMITED		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17TCNAAA A	Thunder Black	P-266
N17TCNAAA AP N17TCNAA BP N17TCNAA CP N17TCNAA EP	Wildfire Red / Thunder Black	P-676 / P-266
N17TCNAAA A6 N17TCNAA B6 N17TCNAA C6 N17TCNAA E6	White Smoke	P-675

GENERAL / SPECIFICATIONS

2017 CHIEFTAIN LIMITED			2017 ROADMASTER CLASSIC		
MODEL NUMBER	PAINT COLOR	PAINT CODE	MODEL NUMBER	PAINT COLOR	PAINT CODE
N17TCNAAAT N17TCNAABT N17TCNAACT N17TCNAAET	Star Silver / Thunder Black	P-354 / P-266	N17TRLAAAA N17TRLAABA N17TRLAACCA N17TRLAAEA	Thunder Black	P-266
N17TCNAAAS N17TCNAABS N17TCNAACS N17TCNAAES	Silver Smoke	P-581	N17TRLAAAG N17TRLAABG N17TRLAACG N17TRLAAEG	Willow Green / Ivory Cream	P-670 / P-646
2017 CHIEFTAIN ELITE			2017 ROADMASTER		
MODEL NUMBER	PAINT COLOR	PAINT CODE	MODEL NUMBER	PAINT COLOR	PAINT CODE
N17TCEAAA4	Red Candy / Thunder Black	P-1627	N17TRAAAAA N17TRAAABA N17TRAAACCA N17TRAAAEAA N17TRAAAKA	Thunder Black	P-266
N17TRAAAAG N17TRAAABG N17TRAAACG N17TRAAAEAG	Willow Green / Ivory Cream	P-670 / P-646	N17TRAAAAG N17TRAAABV N17TRAAACV N17TRAAAEV	Burgundy Metallic	P-629
N17TRAAAAX N17TRAAABX N17TRAAACX N17TRAAAEAX	Thunder Black / Ivory Cream	P-266 / P-646	N17TRAAAAB N17TRAAABB N17TRAAACB N17TRAAAEAB N17TRAAAKB	Steel Gray / Thunder Black	P-266 / P-692 /
N17TRAAAАЗ N17TRAAABZ N17TRAAACZ	Unpainted	NA			

2017 SPRINGFIELD		
MODEL NUMBER	PAINT COLOR	PAINT CODE
N17THAAAAAA N17THAAABA N17THAAACA N17THAAAEA N17THAAAKA	Thunder Black	P-266
N17THAAAAR N17THAAABR N17THAAACR N17THAAAER	Indian Red	P-639
N17THAAAAL N17THAAABL N17THAAACL N17THAAAEL N17THAAAKL	Steel Gray/ Burgundy Metallic	P-692 / P-629
N17THAAAAM N17THAAABM N17THAAACM N17THAAAEM	Blue Sapphire / Silver Star	P-598 / P-354
N17THAAAАЗ N17THAAABZ N17THAAACZ	Unpainted	NA

GENERAL / SPECIFICATIONS

EMMISIONS INFORMATION

EMISSION CONTROL SYSTEMS

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

EMISSION SOURCES

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

EXHAUST EMISSION CONTROL

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

NOISE EMISSION CONTROL

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

1. The removal or rendering inoperative by any person other than for purposes of maintenance, repair or replacement, any device or element of design incorporated into the motorcycle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or
2. The use of the motorcycle after such device or element of design has been removed or rendered inoperative.
Among those acts presumed to constitute tampering are the acts listed below:
3. Removal of, or puncturing the muffler, baffles, header pipes or any other component which conducts exhaust gases.
4. Removal or puncturing of any part of the intake system.
5. Lack of proper maintenance.

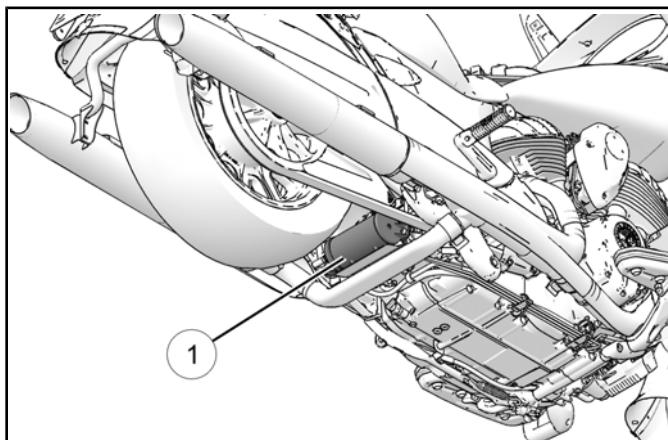
6. Replacing any moving part of the motorcycle or parts of the exhaust / intake system with parts other than those specified by the manufacturer.

CRANKCASE EMISSION CONTROL

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

EVAPORATIVE EMISSION CONTROL (CALIFORNIA AND INTERNATIONAL MODELS)

California and International models are equipped with 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.



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.

GENERAL / SPECIFICATIONS

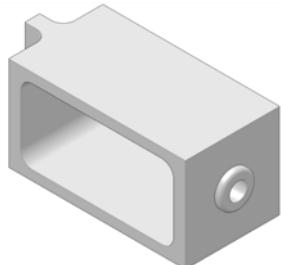
TOOL ORDERING INFORMATION

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

The screenshot shows the Polaris Computer Check (DIS) interface. At the top, there are links for Home, Ask Polaris, Site Map, and Log Out. The main menu includes Dealer Cases, Intranet, Change Dealer, Marketing, Finished Goods, Pure Polaris, Service and Warranty, Accounting and Finance, and Dealer Management. A search bar is present. On the left, there's a 'Follow-up' section with a message about 5 new leads and a 'News, Forms & Links' section with a search bar and a list of links. The right side features a 'Special Alerts' section with 'Action Required' and 'XP SALES E' notices. Below that is a 'Press Releases' section with news about the 2013 Sno Pro debut, the legendary 'Indy' Na, and the MY2013 Polaris SnowCheck Select. There's also a 'FOR WEBINAR' section and a 'Polaris Snowmobile Lineup' link.

SPECIAL TOOLS INDEX

ABS Tool (Brake Lever Reserve)
PV-50104



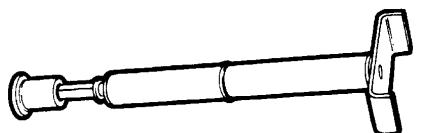
Battery Tester
PU-50296



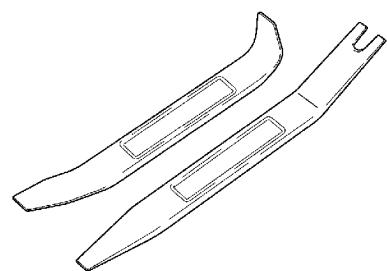
Bearing Removal Kit
PF-51324



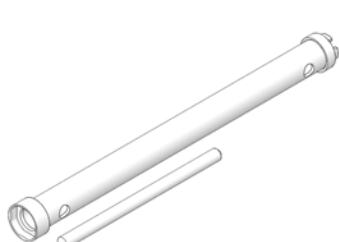
Belt Tension Meter
PV-43532



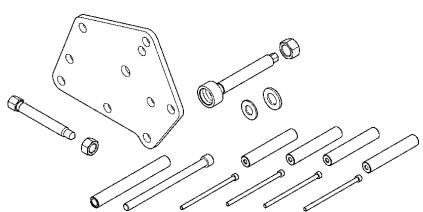
Body Panel Tool Kit
PV-49955



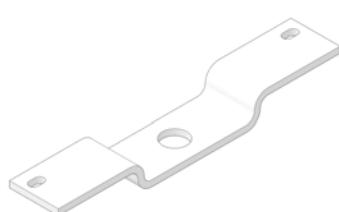
Cartridge Shaft Tool
PV-49452



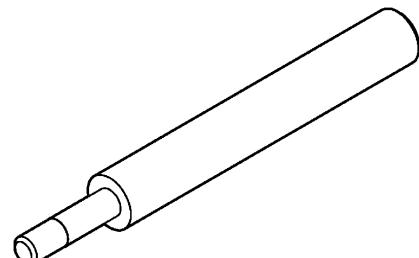
Crankcase Tool
PF-51234



Clutch Shaft Holding Tool
PF-51232



Crankshaft Locking Pin
PF-52135



Crankshaft Rotation Tool
PF-51239



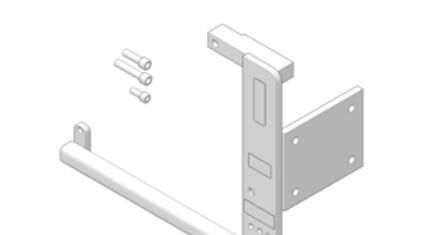
Damper Rod Holder
PV-49453



Electrical Tester Kit
PV-43526



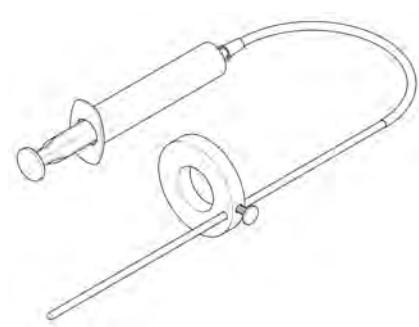
Engine Stand Adapter
PF-51240



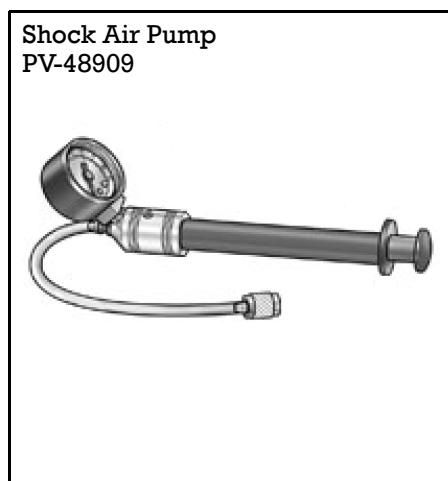
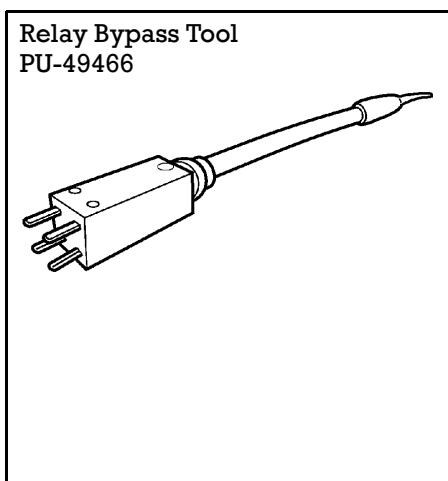
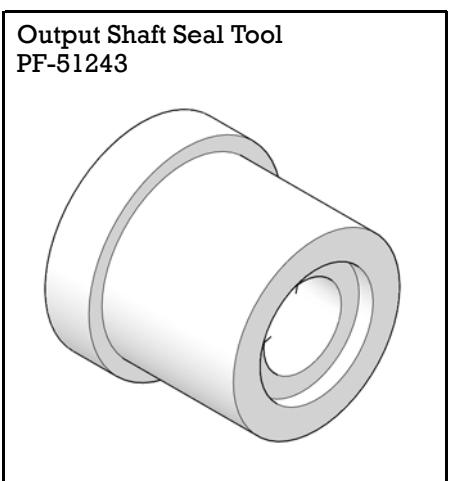
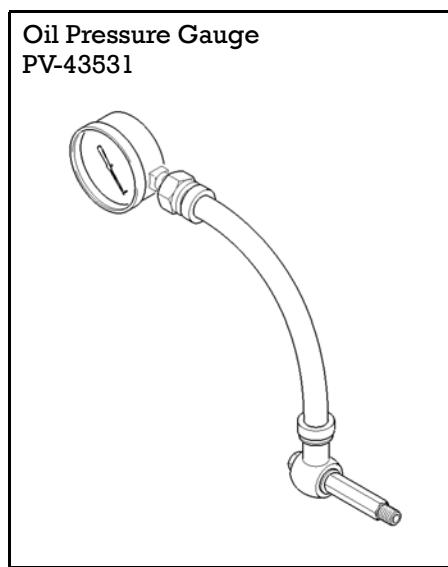
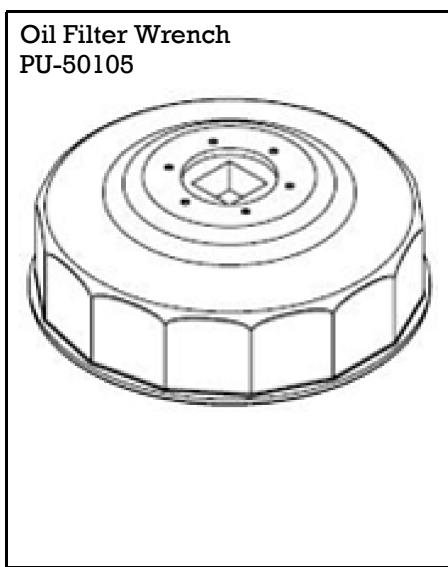
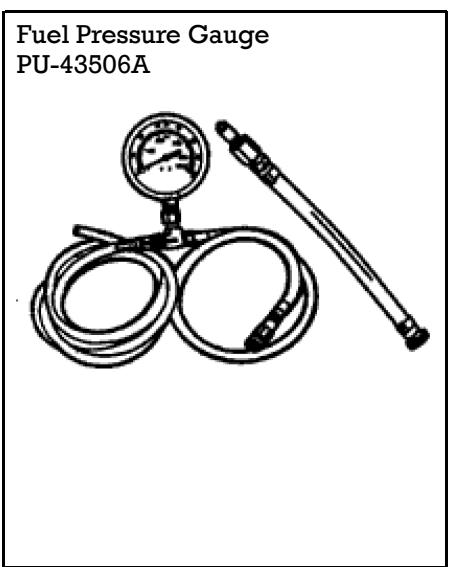
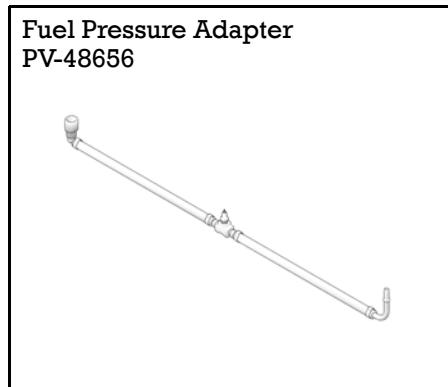
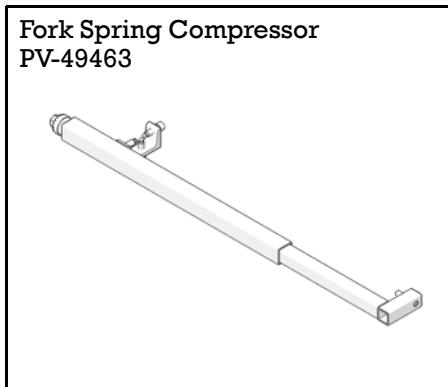
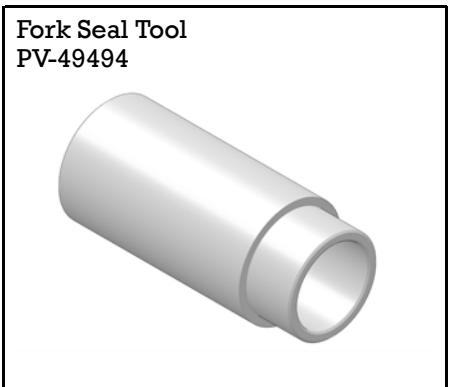
Fork Spring Compressor Adapter
PV-49464



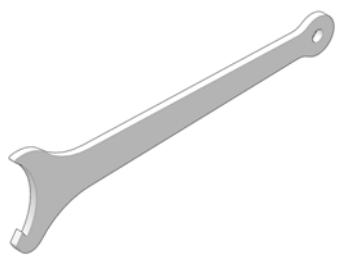
Fork Oil Level Tool
PV-59000A



GENERAL / SPECIFICATIONS



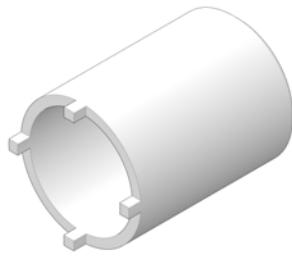
Shock Spanner Wrench
PV-46993



Smartlink Module Kit
PU-47471



Spanner Socket (Stem)
PV-43508



Swingarm Bushing Tool
PF-51237



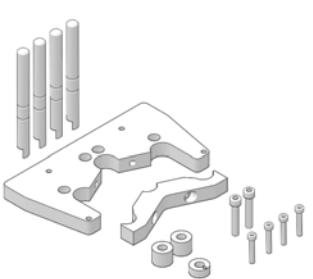
TPMS Activation Tool
PF-51288



USB to Serial Adapter
PU-50621



Cam Installation Tool
PF-51455



GENERAL / SPECIFICATIONS

REFERENCE MASTER TORQUE TABLE

ITEM		TORQUE
ABS Module Bracket fasteners		84 in-lbs (10 Nm)
ABS Pulse Ring / Brake Disc fasteners		22 ft-lbs (30 Nm)
Air Box	Bracket fasteners	88 in-lbs (10 Nm)
	Cover fasteners	84 in-lbs (10 Nm)
	Retainer fastener	86 in-lbs (10 Nm)
Air Filter	Filter fasteners	62 in-lbs (7 Nm)
	Adapter Plate fasteners	31 in-lbs (4 Nm)
Auxiliary Light Bar Bracket fasteners		18 ft-lbs (24 Nm)
Baffle Plate fasteners		31 in-lbs (4 Nm)
Balance Shaft	Drive Gear fasteners	10 ft-lbs (14 Nm)
	Driven Gear fastener	59 ft-lbs (80 Nm)
Battery	Box fasteners	84 in-lbs (10 Nm)
	Battery to Starter Motor Nut	63 in-lbs (7 Nm)
	Terminal Fasteners	40 in-lbs (5 Nm)
Bezel fasteners		36 in-lbs (4 Nm)
Bezel fasteners (Vintage/Springfield)		12 in-lbs (1 Nm)
Blind Plug		15 ft-lbs (20 Nm)
Brake Bleeder fasteners		48 in-lbs (5 Nm)
Brake Caliper Cover Acorn Nut		18 in-lbs (2 Nm)
Brake Disc fasteners		22 ft-lbs (30 Nm)
Brake Lever Cap fastener		70 in-lbs (8 Nm)
Brake Line	Banjo fasteners	18 ft-lbs (24 Nm)
	Mounting fasteners	84 in-lbs (10 Nm)
Brake Pad Retaining Pin		120 in-lbs (14 Nm)
Brake Pedal Pad fasteners		84 in-lbs (10 Nm)
Brake Pressure Switches		18 ft-lbs (24 Nm)
Camshaft Carrier	Bearing Retainer Plate fasteners	62 in-lbs (7 Nm)
	Carrier fasteners	15 ft-lbs (20 Nm)
	Carrier Bearing fasteners	52 ft-lbs (70 Nm)
Cam Chain Tensioner	Chain Cover fasteners	15 ft-lbs (20 Nm)

ITEM		TORQUE
	Chain Guide fasteners	71 in-lbs (8 Nm)
	Tensioner fastener	15 ft-lbs (20 Nm)
Camshaft Sprocket fasteners	52 ft-lbs (70 Nm)	
Clutch	Cable Adjuster Jam Nut	48 in-lbs (5 Nm)
	Cable Guide fastener	84 in-lbs (10 Nm)
	Lever Cap fastener	70 in-lbs (8 Nm)
	Pinion Shaft Lever fastener	88 in-lbs (10 Nm)
	Spring fasteners	89 in-lbs (10 Nm)
	Stake Nut	125 ft-lbs (170 Nm)
	Switch Cover fasteners	6 in-lbs (1 Nm)
	Switch fastener	6 in-lbs (1 Nm)
Connecting Rod Bearing Cap fastener	22 ft-lbs (30 Nm)	
Console Bracket fasteners	43 in-lbs (5 Nm)	
Console Panel fasteners	84 in-lbs (10 Nm)	
Crankcase fasteners	22 ft-lbs (30 Nm)	
Crankshaft Position Sensor	89 in-lbs (10 Nm)	
Crankshaft Sprocket fastener	52 ft-lbs (70 Nm)	
Cylinder Head	Cylinder Head Nuts	Step 1: 22 ft-lbs (30 Nm)
		Step 2: Back nuts off completely.
		Step 3: 40 ft-lbs (54 Nm)
	Cylinder Studs	25 ft-lbs (34 Nm)
	Cylinder Head Temperature Sensor	71 in-lbs (8 Nm)
Display Bracket fasteners (top)	36 in-lbs (4 Nm)	
Display Bracket fasteners (bottom)	84 in-lbs (10 Nm)	
Detent Roller fastener	89 in-lbs (10 Nm)	
Down Tube fasteners	45 ft-lbs (60 Nm)	
Drive Motor Hinge fasteners	84 in-lbs (10 Nm)	
Drive Sprocket	Cover fasteners	84 in-lbs (10 Nm)
	Sprocket Nut	180 ft-lbs (244 Nm)
	Sprocket Nut Retainer Plate	88 in-lbs (10 Nm)

GENERAL / SPECIFICATIONS

ITEM		TORQUE
ECM fasteners		36 in-lbs (4 Nm)
Engine Mounts	Front	18 ft-lbs (24 Nm)
	Rear	75 ft-lbs (102 Nm)
Evaporative Emissions Canister fasteners		84 in-lbs (10 Nm)
Exhaust Clamps		31 ft-lbs (42 Nm)
Fairing	Clamp fasteners	36 in-lbs (4 Nm)
	Inner Mounting Nuts	12 ft-lbs (16 Nm)
	Outer Mounting Nuts	36 in-lbs (4 Nm)
Fender fasteners		84 in-lbs (10 Nm)
Floorboard	Pivot fasteners	18 ft-lbs (24 Nm)
	Support fasteners	35 ft-lbs (48 Nm)
Foot Peg	Blank fastener	35 ft-lbs (48 Nm)
	Mounting fasteners	35 ft-lbs (48 Nm)
Fork Cartridge fastener		17 ft-lbs (23 Nm)
Fork Clamp fasteners		18 ft-lbs (24 Nm)
Fork Cap to Jam Nut		11 ft-lbs (15 Nm)
Fork Cap to Outer Tube		16 ft-lbs (22 Nm)
Frame Down Tube fasteners		45 ft-lbs (60 Nm)
Front Axle		52 ft-lbs (71 Nm)
Front Axle Pinch fasteners		18 ft-lbs (24 Nm)
Front Caliper Body fasteners		20 ft-lbs (27 Nm)
Front Caliper Stud		35 ft-lbs (48 Nm)
Front Fender fasteners		18 ft-lbs (24 Nm)
Front Master Cylinder		70 in-lbs (8 Nm)
Front Master Cylinder Cover fasteners		14 in-lbs (2 Nm)
Fuel Injector Retaining fasteners		89 in-lbs (10 Nm)
Fuel Pump Nut		24 in-lbs (3 Nm)
Fuel Tank Mounting fasteners		18 ft-lbs (25 Nm)
Fuse Box fastener		63 in-lbs (7 Nm)
Gear Position Switch		43 in-lbs (5 Nm)
Grip Retaining fastener		35 in-lbs (4 Nm)
Ground Wire fastener		84 in-lbs (10 Nm)
Gusset Plate		55 ft-lbs (75 Nm)
Head Pipe Nuts		15 ft-lbs (20 Nm)
Head Pipe Trim Cover fasteners		84 in-lbs (10 Nm)
Headlight	Bracket fastener	12 in-lbs (1 Nm)
	Carrier fasteners	75 in-lbs (8 Nm)

ITEM		TORQUE
Heat Shield Clamps		31 in-lbs (4 Nm)
Highway Bar	Lower fasteners	35 ft-lbs (48 Nm)
	Upper fasteners	18 ft-lbs (24 Nm)
Hinge fasteners		45 in-lbs (5 Nm)
Horn to Bracket Nut		84 in-lbs (10 Nm)
Ignition Coil		84 in-lbs (10 Nm)
Ignition Cover fasteners		84 in-lbs (10 Nm)
Intake Manifold Boots		89 in-lbs (10 Nm)
Intake Manifold Clamps		20 in-lbs (2 Nm)
Knock Sensor		15 ft-lbs (20 Nm)
Latch Assembly fasteners		65 in-lbs (7 Nm)
Latch Striker fasteners		36 in-lbs (4 Nm)
LED Trunk Light fasteners		36 in-lbs (4 Nm)
Left Hand Lower Side Cover fastener		84 in-lbs (10 Nm)
License Plate Bracket fasteners		84 in-lbs (10 Nm)
License Plate Light fasteners		15 in-lbs (2 Nm)
Lift Arm fasteners		84 in-lbs (10 Nm)
Lifter Block fasteners		89 in-lbs (10 Nm)
Lifter Retaining Plate fasteners		62 in-lbs (7 Nm)
Lock Actuator fasteners		13 ft-lbs (18 Nm)
Lower Belt Guard		96 in-lbs (11 Nm)
Luggage Rack fasteners		12 in-lbs (1 Nm)
Master Cylinder Jam Nut		35 ft-lbs (48 Nm)
Main Plate Mounting fasteners		88 in-lbs (10 Nm)
Midcast fasteners	Lower	75 ft-lbs (102 Nm)
	Upper	35 ft-lbs (48 Nm)
Muffler Hanger fasteners		18 ft-lbs (24 Nm)
Oil Cooler	Mounting fastener	84 in-lbs (10 Nm)
	Supply/Return Line fasteners	84 in-lbs (10 Nm)
Oil Filter	Adapter fasteners	88 in-lbs (10 Nm)
	Filter Fitting	22 ft-lbs (30 Nm)
Oil Jet fasteners		62 in-lbs (7 Nm)
Oil Pan	Drain Plug	15 ft-lbs (20 Nm)
	Inlet Screen	88 in-lbs (10 Nm)
	Scavenge Tube Mounting fasteners	88 in-lbs (10 Nm)
	Assembly fasteners	88 in-lbs (10 Nm)
Oil Pump	Pickup fasteners	88 in-lbs (10 Nm)

GENERAL / SPECIFICATIONS

ITEM	TORQUE
Oil Pressure Sensor	88 in-lbs (10 Nm)
Oil Pressure Sensor Adapter	15 ft-lbs (20 Nm)
Oxygen Sensors	14 ft-lbs (19 Nm)
P-Clamp fasteners (Brake Line / W. S.S.)	84 in-lbs (10 Nm)
Passenger to Driver Seat fasteners (Except Darkhorse)	84 in-lbs (10 Nm)
Pressure Plate fasteners	88 in-lbs (10 Nm)
Primary Cover fasteners	15 ft-lbs (20 Nm)
Rear Axle Nut	Step 1: 15 ft-lbs (20 Nm) Step 2: 65 ft-lbs (88 Nm)
Rear Caliper Mounting fasteners	31 ft-lbs (42 Nm)
Rear Caliper Slide fasteners	20 ft-lbs (27 Nm)
Rear Head Pipe Hanger fasteners	18 ft-lbs (24 Nm)
Rear Lower Subframe fasteners	18 ft-lbs (24 Nm)
Rear Master Cylinder Cover fasteners	7 in-lbs (1 Nm)
Rear Nacelle Cover fasteners	36 in-lbs (4 Nm)
Rear Subframe fasteners	35 ft-lbs (48 Nm)
Rectifier	Bracket fasteners 84 in-lbs (10 Nm)
	Crankcase fasteners 89 ft-lbs (10 Nm)
Ride Command Display Fasteners	36 in-lbs (4 Nm)
Right Hand Sprocket Cover fastener	84 in-lbs (10 Nm)
Riser fasteners	60 ft-lbs (81 Nm)
Riser Clamp fasteners	18 ft-lbs (24 Nm) Tighten Front fasteners First, Then Rear
Rocker Arm fastener	22 ft-lbs (30 Nm)
Saddlebag Mounting Cylinder fasteners	25 in-lbs (34 Nm)
Saddlebag fasteners	84 in-lbs (10 Nm)
Seat Fasteners	18 ft-lbs (24 Nm)
Seat Fasteners (Except Darkhorse)	84 in-lbs (10 Nm)
Seat fasteners	14 in-lbs (2 Nm)
Shift Rod Jam Nuts	84 in-lbs (10 Nm)
Shifter Toe Pedal	18 ft-lbs (24 Nm)
Shock Absorber fasteners	55 ft-lbs (75 Nm)
Shock Air Line Jam Nut	20 ft-lbs (27 Nm)
Side Stand	Bumper fastener 84 in-lbs (10 Nm)
	Pivot fastener 37 ft-lbs (50 Nm)
	Switch fasteners 43 in-lbs (5 Nm)

ITEM	TORQUE
Solenoid Terminal (B+) Nut	60 in-lbs (7 Nm)
Spark Plug	13 ft-lbs (17 Nm)
Speedometer Bracket fasteners	15 in-lbs (2 Nm)
Spool fasteners	25 ft-lbs (34 Nm)
Starter Motor fasteners	89 in-lbs (10 Nm)
Starter Solenoid Mounting fasteners	84 in-lbs (10 Nm)
Starter Terminal (B+) Nut	60 in-lbs (7 Nm)
Stator fasteners	88 in-lbs (10 Nm)
Steering Lock fasteners	18 ft-lbs (24 Nm)
Steering Stem Adjuster Nut	29 ft-lbs (39 Nm)
Strap fasteners	8 ft-lbs (11 Nm)
Strut Cover fasteners	84 in-lbs (10 Nm)
Swing-arm Nut	65 ft-lbs (88 Nm)
Swing-arm Shaft (Initial Torque)	8 ft-lbs (11 Nm)
Swing-arm Shaft Jam Nut	75 ft-lbs (102 Nm)
Switch Cubes	31 in-lbs (4 Nm)
Switch Cubes (2018 models)	7 in-lbs (1 Nm)
Tail Light fastener	84 in-lbs (10 Nm)
Throttle Body fasteners	89 in-lbs (10 Nm)
TMAP Sensor fastener	62 in-lbs (7 Nm)
Tone Ring fasteners	18 ft-lbs (24 Nm)
Torque Compensator fastener	83 ft-lbs (112 Nm)
Torque Compensator Locking Plate fastener	88 in-lbs (10 Nm)
TPMS Sensor fastener	44 in-lbs (5 Nm)
Triple Clamp Nut, Top	72 ft-lbs (98 Nm)
Triple Clamp Pinch fasteners	18 ft-lbs (24 Nm)
Trunk	Back fasteners 12 in-lbs (1 Nm)
	Base fasteners 13 ft-lbs (18 Nm)
Turn Signal fastener	18 ft-lbs (24 Nm)
Turn Signal fastener, Front	36 in-lbs (4 Nm)
Upper Pushrod fastener	55 ft-lbs (75 Nm)
Valve Cover fasteners	89 in-lbs (10 Nm)
Valve Stem Lock Nut	13 in-lbs (2 Nm)
Valve Stem Nut	44 in-lbs (5 Nm)
VCM Mounting Plate fastener	84 in-lbs (10 Nm)
Wheel Speed Sensor	96 in-lbs (11 Nm)
Wheel Spoke	69 in-lbs (8 Nm)
Windshield	Mounting fasteners 36 in-lbs (4 Nm)
	Motor Nuts 36 in-lbs (4 Nm)

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 EQUIVALENT	NEAREST FRACTION
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

GENERAL / SPECIFICATIONS

DECIMAL EQUIVALENTS

1/64 in = .0156 in	47/64 in = .7344 in [19 mm = .7480 in]
1/32 in = .0312 in [1 mm = .0394 in]	3/4 in = .75 in
3/64 in = .0469 in	49/64 in = .7656 in
1/16 in = .0625 in	25/32 in = .7813 in [20 mm = .7874 in]
5/64 in = .0781 in [2 mm = .0787 in]	51/64 in = .7969 in
3/32 in = .0938 in	13/16 in = .8125 in [21 mm = .8268 in]
7/64 in = .1094 in [3 mm = .1181 in]	53/64 in = .8281 in
1/8 in = .1250 in	27/32 in = .8438 in
9/64 in = .1406 in	55/64 in = .8594 in [22 mm = .8661 in]
5/32 in = .1563 in [4 mm = .1575 in]	7/8 in = .875 in
11/64 in = .1719 in	57/64 in = .8906 in [23 mm = .9055 in]
3/16 in = .1875 in [5 mm = .1969 in]	29/32 in = .9063 in
13/64 in = .2031 in	59/64 in = .9219 in
7/32 in = .2188 in	15/16 in = .9375 in [24 mm = .9449 in]
15/64 in = .2344 in [6 mm = .2362 in]	61/64 in = .9531 in
1/4 in = .25 in	31/32 in = .9688 in [25 mm = .9843 in]
17/64 in = .2656 in [7 mm = .2756 in]	63/64 in = .9844 in
9/32 in = .2813 in	1 in = 1.0 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	

FAHRENHEIT TO CELSIUS $^{\circ}\text{C} \text{ to } ^{\circ}\text{F}: 9 (^{\circ}\text{C} + 40), 5 - 40 = ^{\circ}\text{F}$ $^{\circ}\text{F} \text{ to } ^{\circ}\text{C}: 5 (^{\circ}\text{F} + 40), 9 - 40 = ^{\circ}\text{C}$

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

GENERAL / SPECIFICATIONS

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

CHAPTER 2

MAINTENANCE

2

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MAINTENANCE QUICK REFERENCE GUIDE

SPECIFICATIONS - MAINTENANCE

General Specifications

ITEM	STANDARD	SERVICE LIMIT
Battery Type / CCA	12 Volt / 18 AH / 310 CCA	—
Brake Pad Thickness, Front	.16 in (4.0 mm)	.04 in (1.0 mm)
Brake Disc Thickness, Front	.20 in (5.0 mm)	.18 in (4.5 mm)
Brake Pad Thickness, Rear	.25 in (6.5 mm)	.04 in (1.0 mm) Minimum
Brake Disc Thickness, Rear	.28 in (7 mm)	.26 in (6.5 mm)
Clutch Lever Freeplay	.019-.059" (0.5–1.5 mm)	—
Compression Pressure (Cylinder)	90-110 psi (620-758 kPa)	Below 80 psi (552 kPa)
Drive Belt Deflection (with 10 lbs force)	Classic / Vintage / Dark Horse: 1.1" (28 mm) or 8 notches up on belt guard. Chieftain / Roadmaster / Springfield: 1.3" (34 mm) or 11 notches up on belt guard.	—
Fuel Pressure (KOEO)	58 psi (400 kPa)	51 psi (350 kPa)
Idle Speed / Fast Idle Speed	800 RPM	±50 RPM
Oil Pressure, Lubrication @ 3000 rpm	60 PSI (414 kPa) ± 15% Engine at operating temperature.	30 PSI (207 kPa)
Ride Height (Rear Spring Pre-Load)	See adjustment procedure outlined in this chapter	—
Spark Plug Type / Gap	NGK DCPR8E / GAP — .034 in (0.9 mm)	—
Tire Pressure	FRONT: All Models (EXCEPT Springfield): 36 PSI (248 kPa) Springfield: 46 PSI (317 kPa)	—
	REAR: Chief Classic / Chief Vintage / Chief Dark Horse: 40 PSI (276 kPa) Springfield / Chieftain Dark Horse / Chieftain / Roadmaster : 41 PSI (282 kPa)	—
Tire Tread Depth (Minimum)	—	.063 in (1.6 mm)
Valve Lash (Int. / Ex.)	NOT ADJUSTABLE (Lash is self-adjusting via hydraulic lifters)	—

MAINTENANCE

Torque Specifications

DESCRIPTION	TORQUE SPECIFICATIONS
Air Filter Cover Fastener — M6 x 1.0 x 10 (QTY.3)	84 in-lbs (10 Nm)
Battery Terminal Nuts	40 in-lbs (5 Nm)
Battery Cable to Starter Motor	63 in-lbs (7.1 Nm) 63 in-lbs (7 Nm)
Brake Bleeder Fasteners (Caliper)	48 in-lbs (5 Nm)
Drive Sprocket Nut	180 ft-lbs (244 Nm)
Drive Sprocket Nut Retainer Plate	88 in-lbs (10 Nm)
Fuel Tank Mounting Fasteners	18 ft-lbs (25 Nm)
Master Cylinder Cover Fasteners (Front)	14 in-lbs (2 Nm)
Oil Drain Plugs (2)	15 ft-lbs (20 Nm)
Oil Filter	Approximately 3/4 turn after sealing ring has contacted the filter adapter.
Seat Fasteners	18 ft-lbs (24 Nm)
Spark Plugs	13 ft-lbs (17 Nm)

Fluid Specifications

DESCRIPTION	FLUID TYPE	CAPACITY
Brake Hydraulic Fluid	DOT 4	—
Engine / Transmission Oil	Semi-Synthetic 20W40 Engine Oil	5.5 Qts (5.2 L)
Fork Oil (Classic / Vintage / Dark Horse)	Indian Motorcycle Fork Oil	20.3 oz (599 cc) per leg
Fork Oil (Chieftain / Roadmaster / Springfield)	Indian Motorcycle Fork Oil	18.8 oz (557 cc) per leg
Fuel	91 Octane (Recommended)	5.5 gal (20.8 L) / Reserve 1.0 gal (3.8 L)

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	2880015
Starter Grease	2 oz	2871460
Oil Change Kit (Thunder Stroke 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 (Thunder Stroke Engines)	quart	2880012
	55 gal drum	2880013
Synthetic Transmission oil	quart	2880014

MAINTENANCE

PERIODIC MAINTENANCE INTERVAL TABLE

ENGINE	MILES (KILOMETERS)																				
	500 (800)	2,500 (4,000)	5,000 (8,000)		10,000 (16,000)		15,000 (24,000)		20,000 (32,000)		25,000 (40,000)		30,000 (48,000)		35,000 (52,000)		40,000 (64,000)		45,000 (72,000)		50,000 (80,000)
Air Filter	I	I	I		I		R		I		I		R		I		I		R		I
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				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
Exhaust System	I	I	I		I		I		I		I		I		I		I		I		I
Fuel Filter Replacement Applies only to fuel pumps built before 11/10/2015. Fuel pumps built after 11/11/2015 do not have a replaceable fuel filter.																				R	
Fuel System	I	I	I		I		I		I		I		I		I		I		I		I
Key Fob Battery**																					
Oil Lines / Oil System Inspection	I	I	I		I		I		I		I		I		I		I		I		I
Spark Plugs	I						I					R						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

CHASSIS	MILES (KILOMETERS)															
	500 (800)	2,500 (4,000)	5,000 (8,000)	10,000 (16,000)	15,000 (24,000)	20,000 (32,000)	25,000 (40,000)	30,000 (48,000)	35,000 (52,000)	40,000 (64,000)	45,000 (72,000)	50,000 (80,000)				
Battery	I	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				R
Brake Pads	I	I	I	I	I	I	I	I	I	I	I	I				I
Clutch Lever	L	I	L	L	I	L	I	L	I	L	I	L				L
Clutch Cable Freeplay	I	I	I	I	I	I	I	I	I	I	I	I				I
Control Cable Ends	I		I	L	I	L	I	L	I	L	I	L				L
Fasteners	I	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				L
Front Fork Oil**	I		I	I	R	I	I	R	I	I	R	I				I
Front Forks and Front Axle	I	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				I
Head Light	I	I		I		I		I		I		I				I
Rear Brake Pedal	I	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	I				R
Rear Wheel Alignment	I	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				P
Sidestand	L	I	I	L	I	L	I	L	I	L	I	L				L
Steering Bearings	I	I	I	I	I	I	I	I	I	I	I	I				I
Suspension Linkage, Rear	I	I	I	I	I	I	I	I	I	I	I	I				I
Swing Arm and Rear Axle	I	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				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

MAINTENANCE

GENERAL INFORMATION

SERVICE NOTES

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.

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.

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Brake Lever Reserve Tool	PV-50104
Battery Tester	PU-50296
Belt Tension Meter	PV-43532
Oil Filter Wrench	PU-50105
Shock Air Pump	PV-48909
Shock Spanner Wrench	PV-46993

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

Observe the following precautions during the break-in period:

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

Break-In Guidelines

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

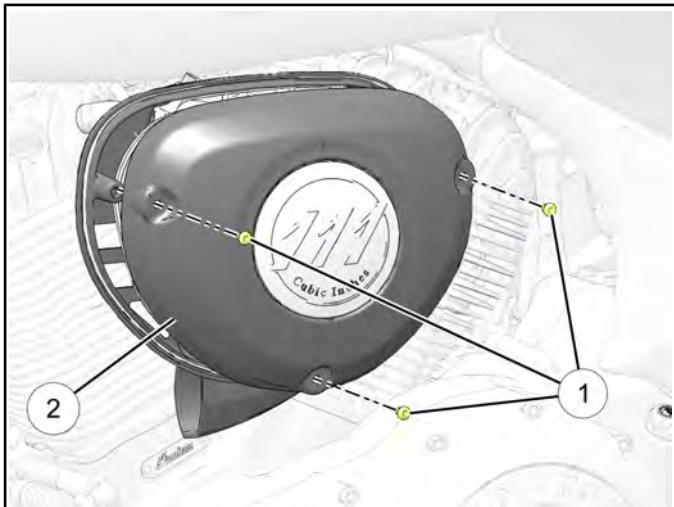
MAINTENANCE PROCEDURES

AIR FILTER REPLACEMENT

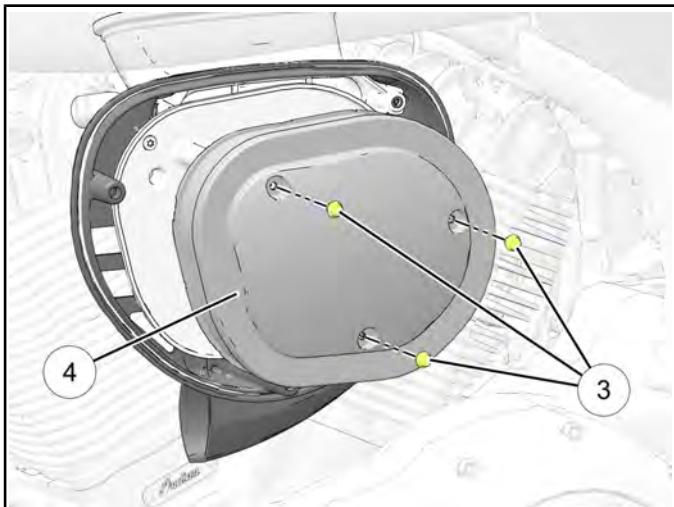
NOTE

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.



2. Remove three fasteners ③ securing air filter element ④ to air box backing plate and remove filter.



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

TORQUE

Air Filter Fasteners ③ : 62 in-lbs (7 Nm)

Air Box Cover Fasteners ① : 84 in-lbs (10 Nm)

ENGINE OIL & FILTER CHANGE

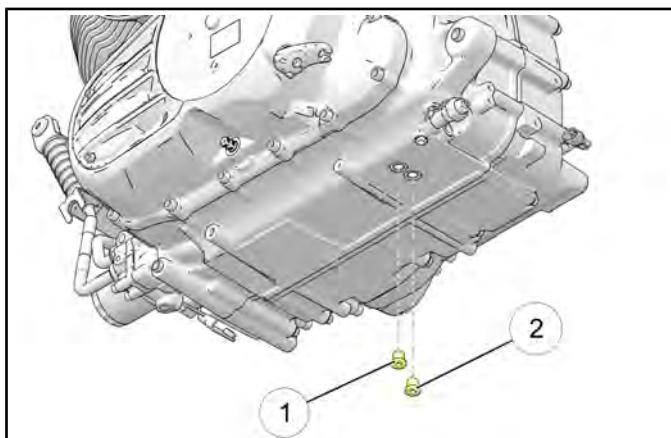
Engine MUST BE WARM while performing the following procedure.

⚠ WARNING

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

2

1. Start and run the engine until it reaches normal operating temperature. Stop the engine.
2. Securely support the motorcycle in an upright (vertical) position.
3. Place an oil drain pan under both the SCAVENGE ① and STORAGE ② drain plugs.



4. Remove both drain plugs and sealing washers.
5. Allow oil to drain completely.
6. Remove oil filter, drain and dispose of oil and filter properly.
7. Clean the oil filter sealing surface and surrounding area.
8. Place a small amount of oil on the seal of the new filter and spin on until the filter seal contacts the sealing surface. Tighten oil filter to specification.

TORQUE

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

9. Use new sealing washers and reinstall both drain plugs. Torque to specification.

TORQUE

Scavenger and Storage Drain Plugs: 15 ft-lbs (20 Nm)

MAINTENANCE

10. Remove dipstick / filler cap and wipe clean, then using a funnel, install 4.5 US quarts of Indian Motorcycle 20W40 engine oil.

NOTE

4.5 US quarts is an acceptable amount of oil to run the engine for the initial check.

11. With the motorcycle in an upright, centered position, start engine and run at varied speeds to 2500 RPM for approximately 3 minutes.
12. Shut engine OFF and add approximately 1.0 US quarts of Indian Motorcycle 20W40 engine oil. **DO NOT OVERFILL!**

IMPORTANT

Total fill with oil filter change will be approximately 5.5 US quarts.

13. Refer to the Checking Engine Oil, page 2.10 section in this chapter for setting proper oil level.

CAUTION

If the low oil pressure indicator remains illuminated longer than usual after an oil change, do not increase RPM above idle until indicator lamp goes out or engine may be damaged.

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

NOTE

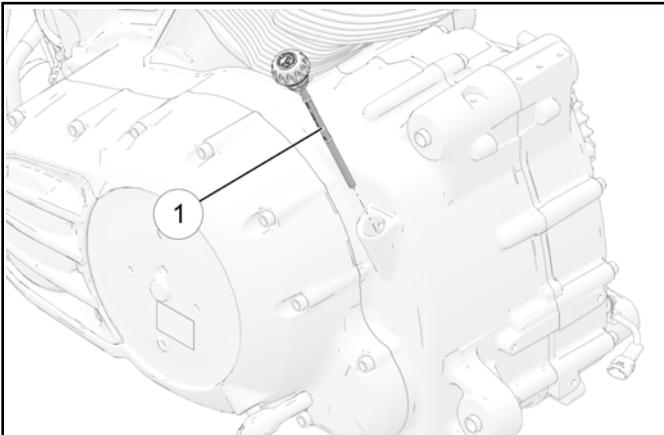
Recycle used oil and oil filter in accordance with local regulations.

ENGINE OIL LEVEL

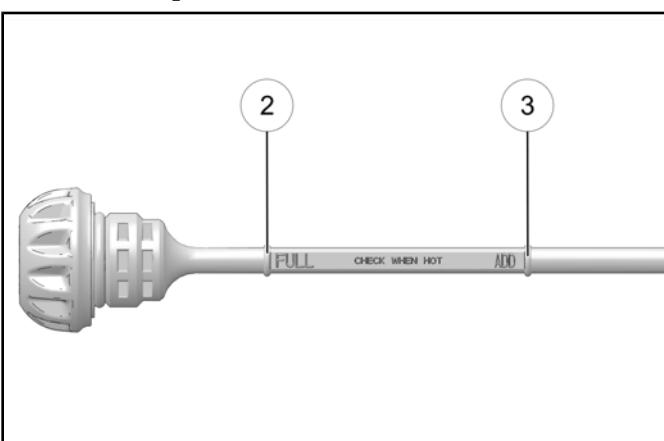
Engine MUST BE AT FULL OPERATING TEMPERATURE when checking oil level.

1. With the motorcycle in an upright (vertical) position, run the engine for several minutes until operating temperature is reached.
2. Stop engine and wait for 1-2 minutes.
3. Place the machine on a level area and hold it in an upright (centered) position.

4. Remove and clean the oil off of the dipstick ①.



5. Screw the dipstick in until seated.
6. Remove dipstick and view oil level.



7. Oil level should be between ADD ③ and FULL ② lines on dipstick. If oil level is low, add Indian Motorcycle 20W-40 engine oil and repeat steps 1-6 until the reading is within the safe operation range.

Be careful not to overfill! Approximate volume from ADD to FULL is 1 qt (.95 L).

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.

IDLE SPEED / FAST IDLE SPEED

NOTE

Idle speed is continuously monitored and adjusted by the ECM.

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.

Minimum Tread Depth (ALL MODELS)

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

Tire Pressure Table (Cold)**NOTE**

Also refer to Manufacturing Information label.

CHIEF CLASSIC

FRONT: Dunlop American Elite (130/90 B16)	36 PSI(248 kPa)
REAR: Dunlop American Elite (180/65 B16)	40 PSI (276 kPa)

CHIEF VINTAGE

FRONT: Dunlop American Elite (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop American Elite (180/65 B16)	40 PSI (276 kPa)

CHIEF DARK HORSE

FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop American Elite (180/65 B16)	40 PSI (276 kPa)

SPRINGFIELD

FRONT: Dunlop Elite 3 (130/90 B16)	46 PSI (317 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)

CHIEFTAIN DARK HORSE

FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)

CHIEFTAIN

FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)

CHIEFTAIN LIMITED / ELITE

FRONT: Dunlop American Elite - 130/60B19	36 PSI (248 kPa)
REAR: Dunlop Elite 3 - 180/60R16	41 PSI (283 kPa)

ROADMASTER

FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)

MAINTENANCE

ROADMASTER CLASSIC	
FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)

CLUTCH CABLE INSPECTION / LUBRICATION

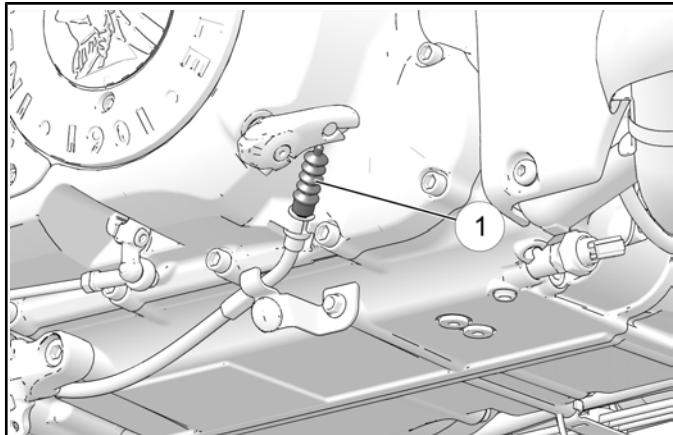
NOTE

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 2.6.

CAUTION

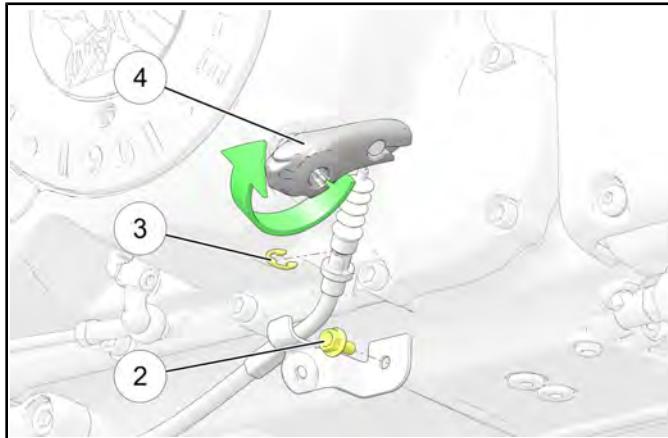
Inspect inner cable for fraying. Do not kink, bend or twist inner cable or cable casing during removal or installation.

1. Inspect the clutch cable for proper routing, smooth movement, and damage to the external casing.



2. Push the rubber boot ① up to expose the lower cable end and inspect for damage or frayed wires.

3. Remove lower cable guide fastener ② and E-clip ③. Using an adjustable wrench, rotate the clutch shaft arm ④ to release the cable housing from the mounting boss.



IMPORTANT

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

4. Apply a thin coating of all purpose grease to both cable ends.
5. Reverse steps 3–4 to reinstall clutch cable.
6. Tighten the lower cable guide fastener to specification..

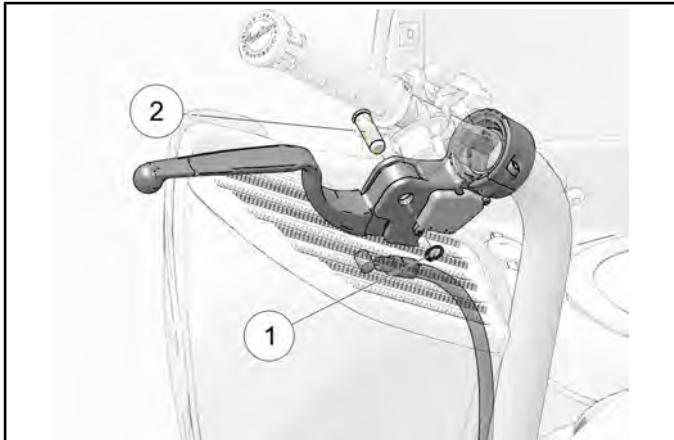
TORQUE

Cable Guide Fastener: 84 in-lbs (10 Nm)

7. Adjust cable free play.

CLUTCH LEVER LUBRICATION

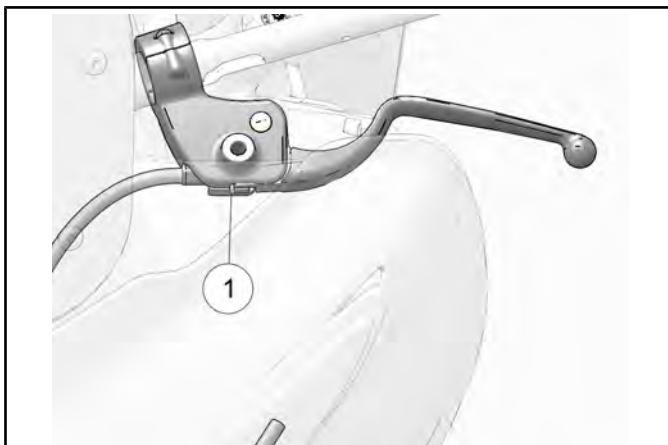
1. Disconnect clutch cable at primary cover. See Clutch Cable Inspection / Lubrication, page 2.12.
2. Pull cable housing out of lever perch and remove barrel from clutch lever. Do not kink cable.
3. Remove snap ring ① and push pivot pin ② upward to remove.



4. Inspect both ends of inner cable for frayed strands. Clean parts and apply moly paste to pivot fastener and 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. Lubricate and attach lower end of cable to clutch arm on primary cover.
8. Adjust clutch lever free play. See Clutch Lever Free Play, page 2.13.

CLUTCH LEVER FREE PLAY

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

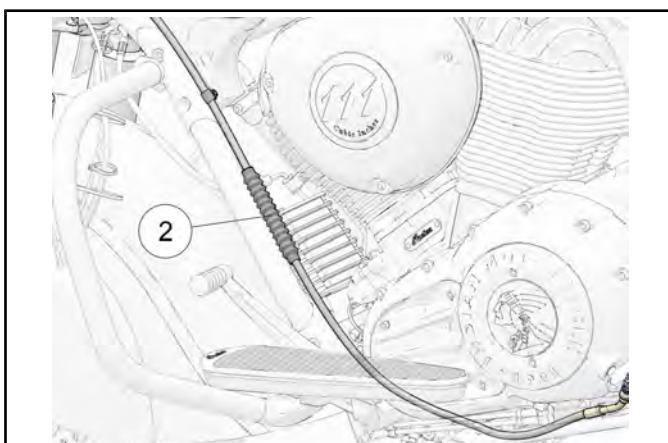


2

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 boot ② and pull it back to expose the jam nut and barrel adjuster.



4. Hold cable and loosen the adjuster jam nut.
5. Turn cable adjuster 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 Nm)

7. Slide adjuster boot back over adjuster assembly.

MAINTENANCE

FRONT BRAKE LEVER INSPECTION

1. 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 2.14.
2. Measure brake lever free play ①. You should feel a firm resistance in the lever within the specified length of lever travel. If brake lever travels too far before beginning to apply the brake, inspect for brake fluid leaks and bleed air from the system. See Brake Fluid Replacement & Bleeding Precautions, page 9.22.



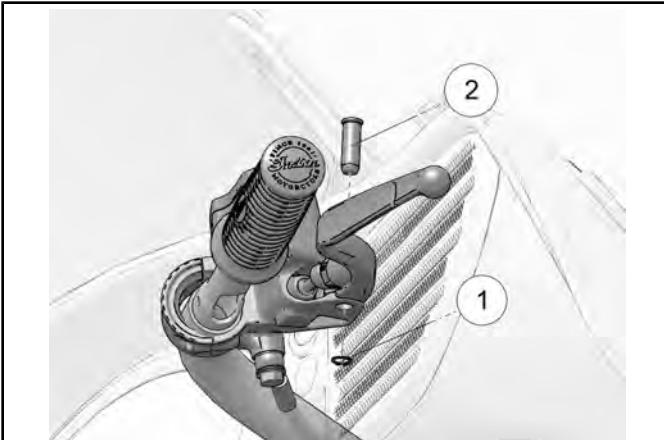
MEASUREMENT

Brake Lever Free Play: .75-1.0" (19.1-25.4 mm)

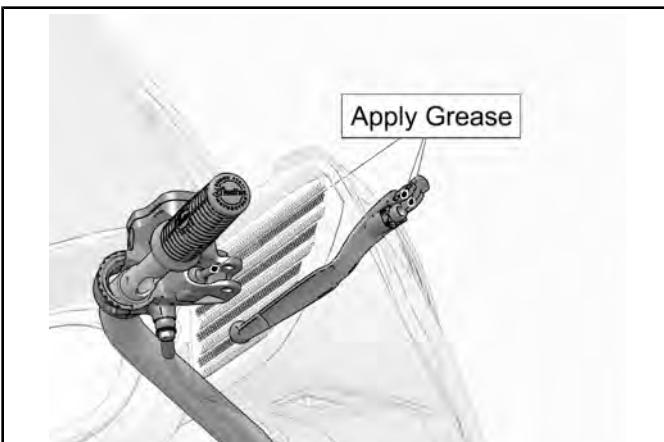
3. Safely elevate the front wheel. Verify wheel rotates freely without drag or binding when lever is released.

FRONT BRAKE LEVER LUBRICATION

1. Remove snap ring ① and pivot pin ②.



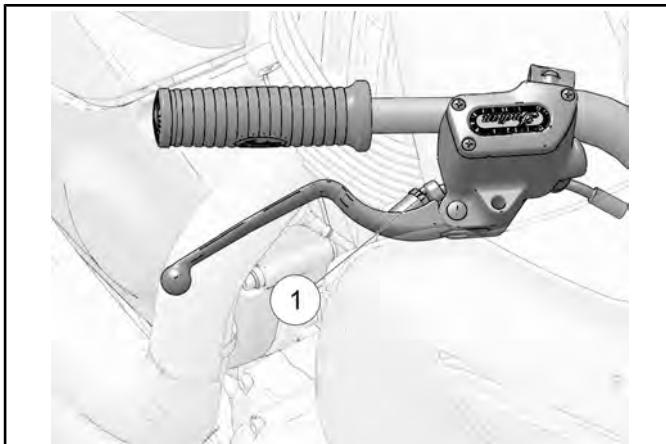
2. Clean pivot pin, lever and lever perch.
3. Remove brake lever and apply grease to pivot pin ②, lever bushing, and contact surface of pushrod as shown.



4. Assemble brake lever.

FRONT BRAKE LEVER REACH

1. Lever reach (distance to hand grip) is adjustable:
 - Pull lever forward (away from hand grip) and *hold*.
 - TO ADJUST reach distance, turn dial ① on the lever.



2. The adjustment pin will seat at different depths in the dial at each setting. Stop once the proper brake lever reach is achieved.

IMPORTANT

Make sure the adjustment pin is not resting between pockets on the dial. Once the reach is set, pull the brake lever 2–3 times to verify proper operation.

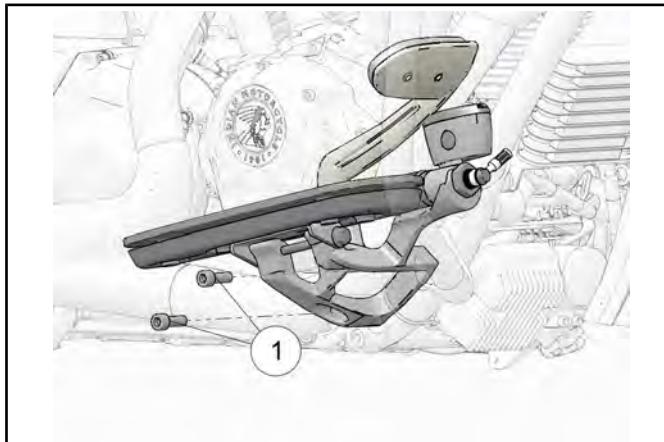
BRAKE PEDAL INSPECTION

1. Press and release brake pedal. It should move freely and smoothly and return to the rest position quickly when released.
2. Press brake pedal and check for firm resistance. If pedal feels spongy or travels too far without resistance, inspect system for leaks and bleed brakes. See Brake Fluid Replacement & Bleeding Precautions, page 9.22.

BRAKE PEDAL LUBRICATION

Lubricate brake pedal at intervals listed on periodic maintenance table. See Periodic Maintenance Interval Table, page 2.6.

1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Working on the RH side of the motorcycle, remove floorboard support fasteners ① and move floorboard / master cylinder assembly so the brake pedal pivot pin can be accessed.

**NOTE**

It is not necessary to disconnect the brake line from the master cylinder to perform this procedure.

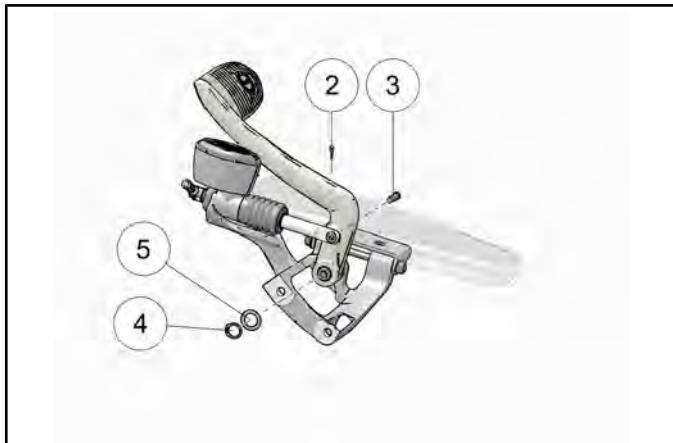
IMPORTANT

Keep the floorboard / master cylinder assembly in an upright position at all times to ensure air does not enter the brake system.

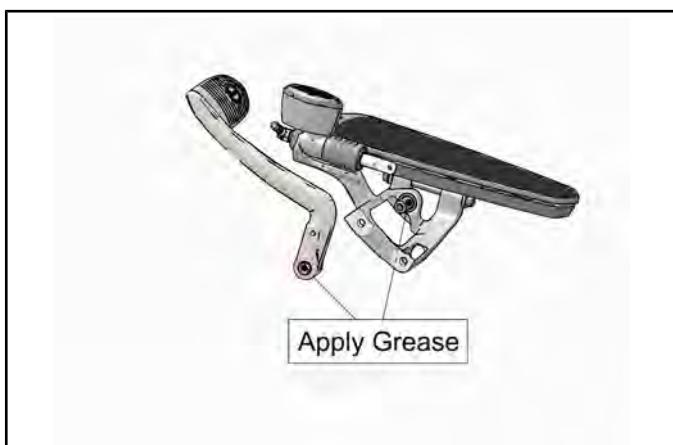
3. Remove cotter pin and flat washer ② and pushrod pivot pin ③. Release the pushrod from the brake pedal.

MAINTENANCE

4. Remove snap ring ④ and washer ⑤. Remove pedal and inner wave washer from post.



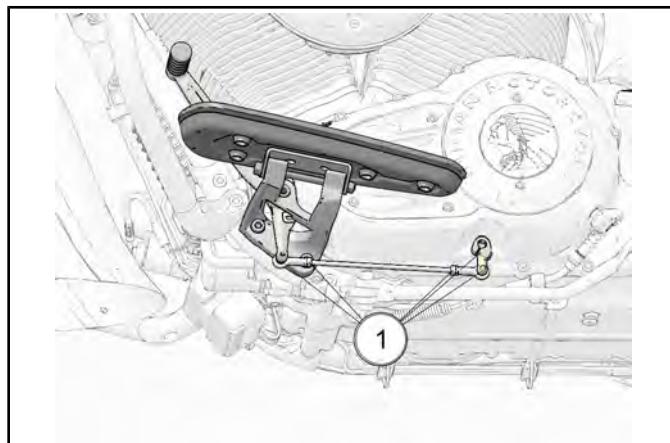
5. Clean off old lubricant and dirt from all parts.
6. Apply all-purpose grease to post and pedal bushing as shown.



7. Install wave washer, pedal, flat washer ⑤ and snap ring ④. Be sure snap ring is fully seated in the groove.
8. Install pushrod pivot pin ③ and flat washer and cotter pin ②.
9. Assemble floorboard support to frame. Torque mounting fasteners ① to specification. See Floorboard (Driver), Installation, page 7.19.
10. Depress brake pedal to verify proper operation and pedal feel. Bleed brakes if necessary. See Brake Fluid Replacement & Bleeding Precautions, page 9.22.

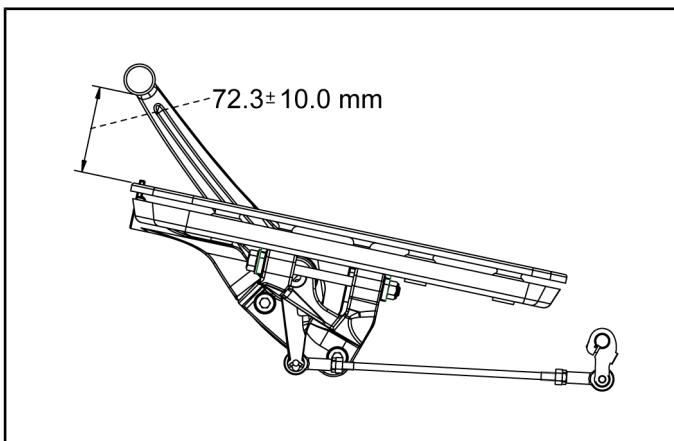
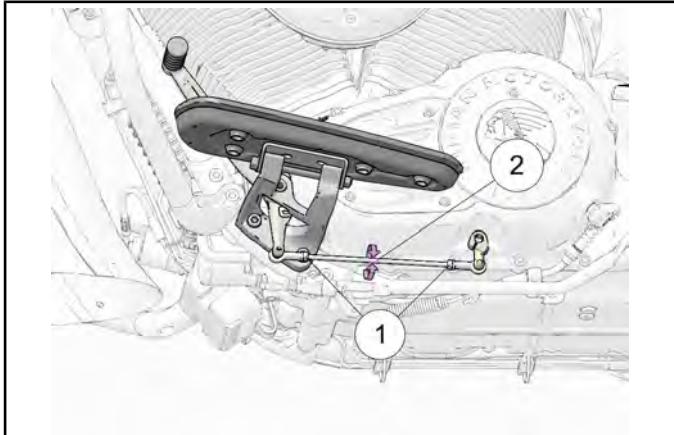
SHIFT PEDAL INSPECTION / LUBRICATION

1. Check all shift pedal and linkage fasteners to be sure they are tight. Torque fasteners to specification. See Shift Pedal Adjustment, page 2.17.
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.



3. Tighten jam nuts ① to specification.

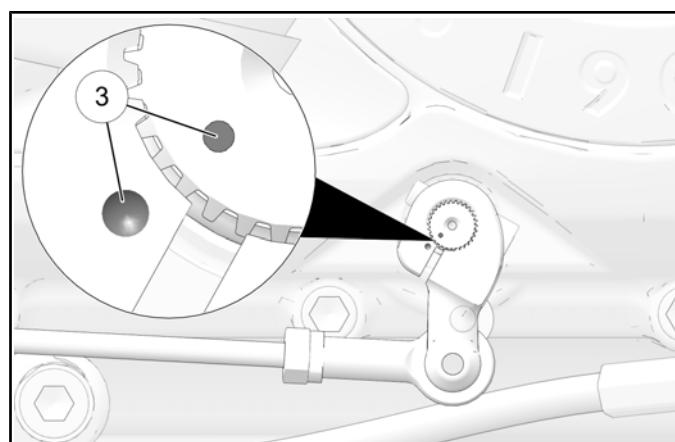
TORQUE

Shift Rod Jam Nuts: **84 in-lbs (10 Nm)**

2

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.



MAINTENANCE

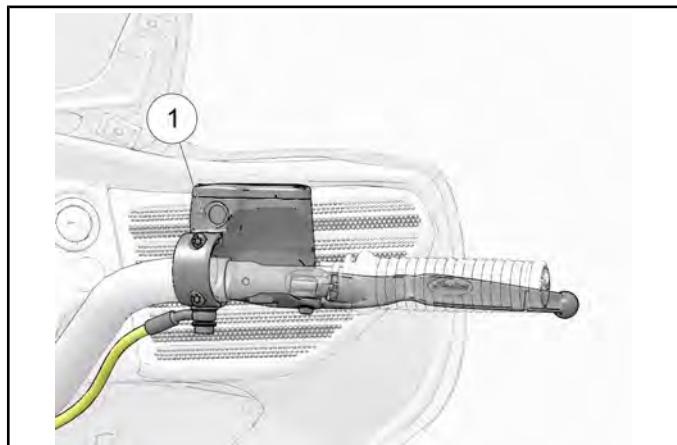
BRAKE FLUID LEVEL INSPECTION

IMPORTANT

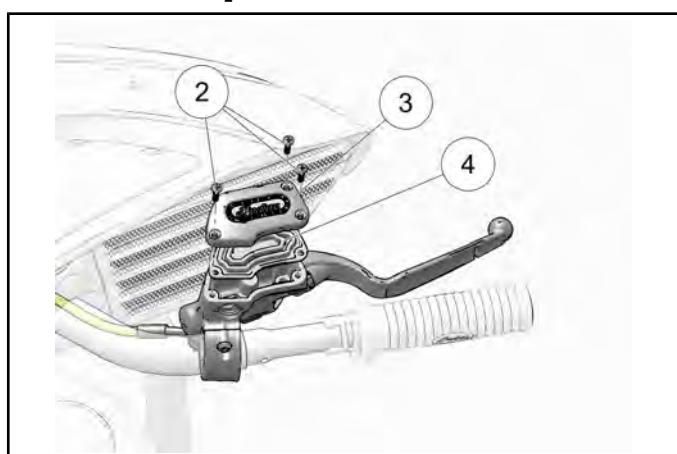
The brake fluid level in the reservoir will go down as brake pads wear. If you notice a constant or sudden lowering of the brake fluid level, inspect brake pads for wear and brake system for leaks.

Front Brake Fluid Inspection

1. 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 or above the LOW level mark ①.



3. Wipe area around reservoir cover with a clean cloth.
4. Wipe brake fluid container with a clean cloth.
5. Remove fasteners ②, reservoir cover ③ and diaphragm ④. If diaphragm is extended, return it to the neutral position.



6. Carefully add enough DOT 4 brake fluid to bring level to the upper edge of the sight glass.

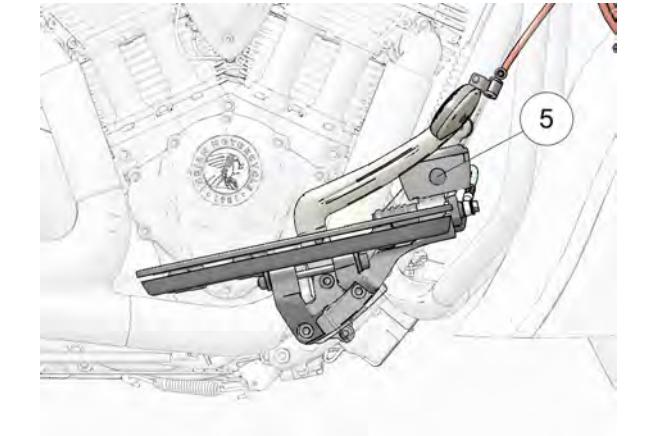
7. Reinstall reservoir diaphragm and cover and torque fasteners to specification.

TORQUE

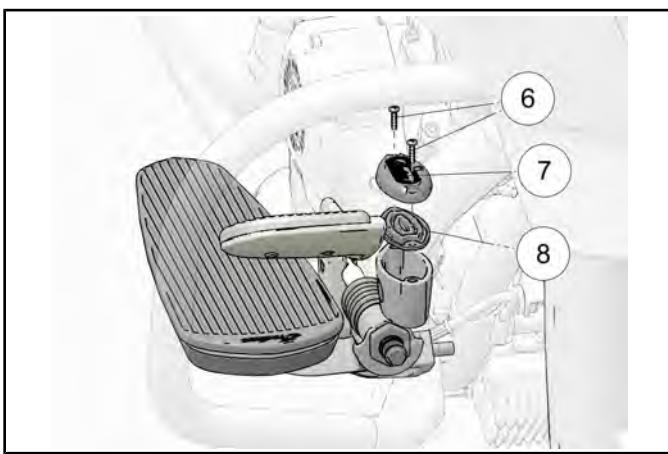
Front Master Cylinder Cover Fasteners: **14 in-lbs (2 Nm)**

Rear Brake Fluid Inspection

8. Fluid level is checked at the rear brake master cylinder reservoir.
9. View fluid level through reservoir sight glass ⑤. The fluid should be clear and at a level between UPPER and LOWER level marks.



10. Wipe area around reservoir cover with a clean cloth.
11. Wipe brake fluid container with a clean cloth.
12. Remove fasteners ⑥, reservoir cover ⑦, and diaphragm ⑧. If diaphragm is extended, return it to the neutral position.



13. Carefully add enough DOT 4 brake fluid to bring level to the upper edge of the sight glass.

14. Install diaphragm and cover. Tighten cover fasteners to specification.

TORQUE

Rear Master Cylinder Cover Fasteners: **7 in-lbs (1 Nm)**

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.

FRONT BRAKE PAD INSPECTION

NOTE

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.

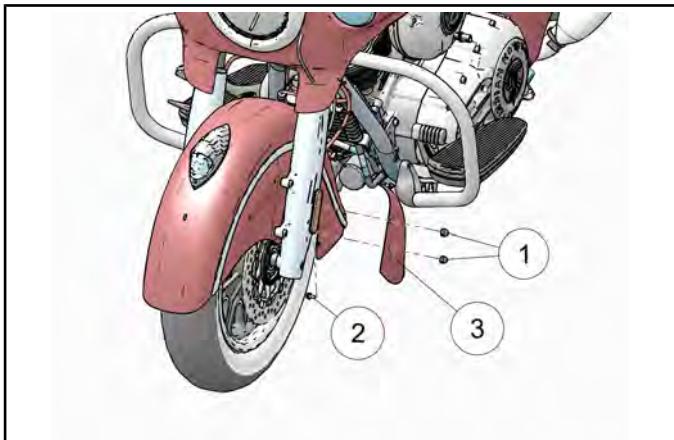
Replace pads if worn to bottom of grooves. See Front Brake Pad Replacement, page 9.26

4. Install caliper cover. Torque to specification.

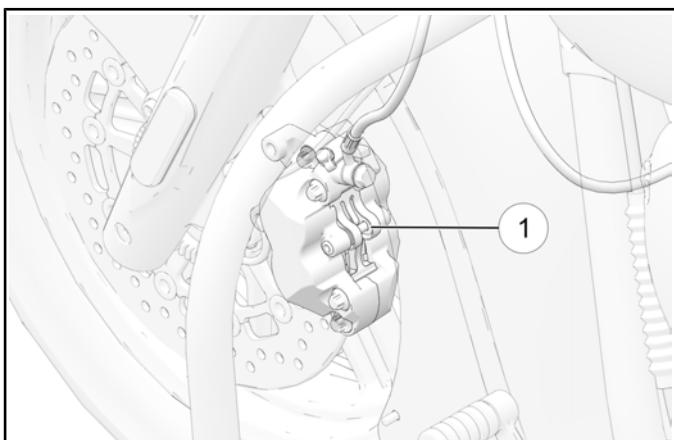
TORQUE

Caliper Cover Acorn Nuts:
18 in-lbs (2 Nm)

1. Remove two acorn nuts ① and fastener ② from each side of the motorcycle and remove the caliper covers ③.



2. Viewing the front brake pads from the rear of the calipers, locate the wear indicator grooves ①.



3. Wear indicator grooves should be visible on both inboard and outboard brake pads of both calipers.

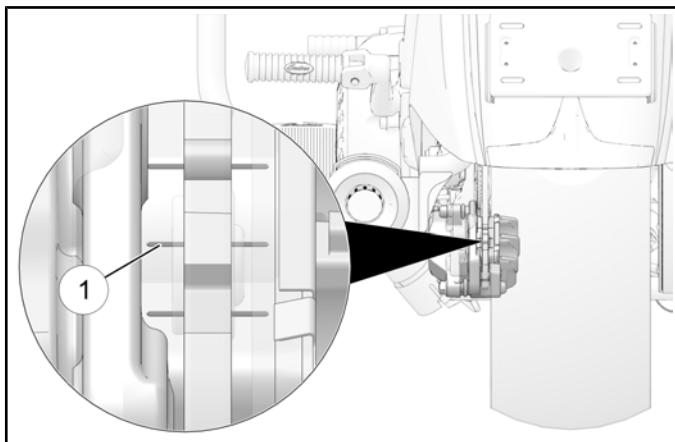
MAINTENANCE

REAR BRAKE PAD INSPECTION

NOTE

Wear indicator grooves are provided on each rear brake pad to allow for a visual inspection without pad removal. Inspect pads by viewing from the rear of the motorcycle, directly behind the LH tailpipe. Replace pads if worn to bottom of grooves. See Rear Brake Pad Replacement, page 9.27.

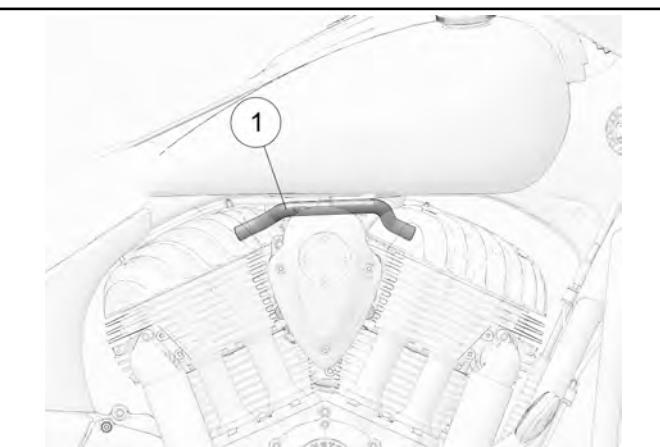
1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Viewing the rear brake pads from behind the motorcycle and below the lip of the rear fender, locate the wear indicator grooves ①.



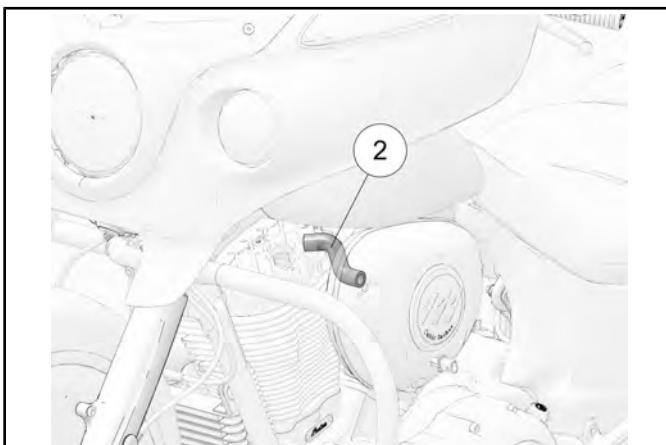
3. Wear indicator grooves should be visible on both inboard and outboard brake pads.

CRANKCASE VENTILATION SYSTEM

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



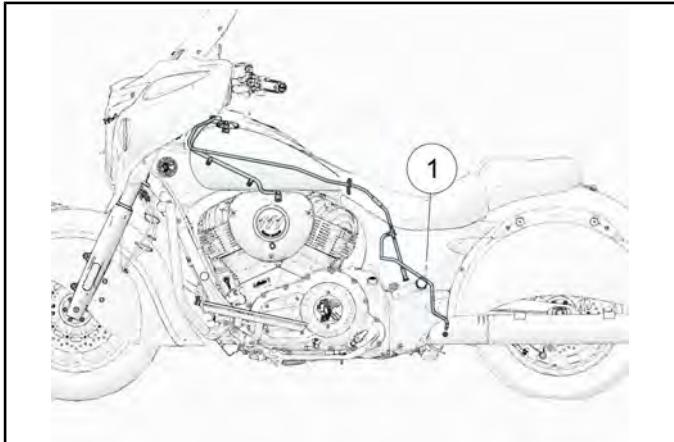
2. Inspect condition of ventilation hose ② along its length and at both ends.



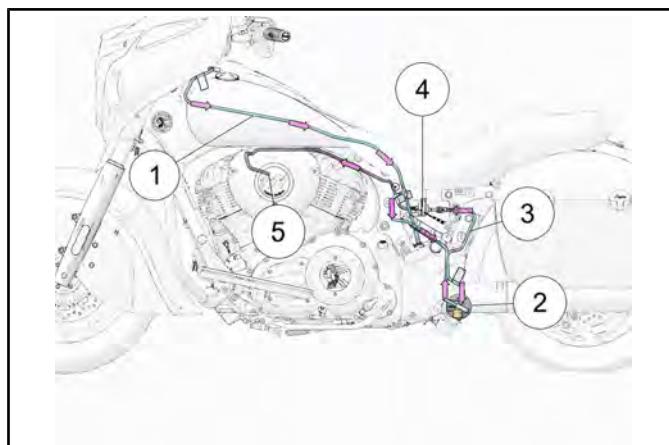
3. Be sure hoses are not restricted, kinked, or cracked.
4. Replace hose if worn or damaged.

FUEL TANK VENT INSPECTION (49 STATE)

- 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.

**EVAPORATIVE EMISSION CONTROL SYSTEM (CALIFORNIA AND INTERNATIONAL MODELS)****NOTE**

The fuel tank vent line is routed to a vapor 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 vapor 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.

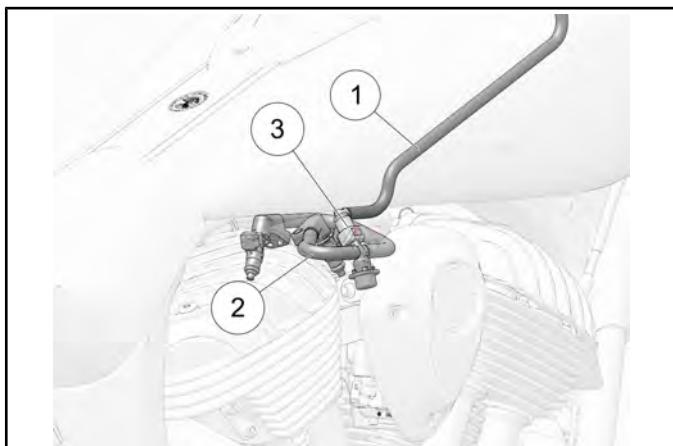


NUMBER	PART DESCRIPTION
①	Fuel Tank Vent Hose
②	Evaporative Emissions Vapor Canister
③	Purge Hose (Canister to Purge Valve)
④	Canister Purge Valve
⑤	Purge Hose (Purge Valve to Throttle Body)

MAINTENANCE

FUEL SUPPLY HOSE (FUEL RAIL) INSPECTION

1. The fuel supply hose (fuel rail) can be found behind the horn cover on the RH side of the motorcycle.
2. Inspect fuel supply line ① and fuel rail ② for deterioration, damage, leakage, or kinked areas. Inspect fuel supply 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.

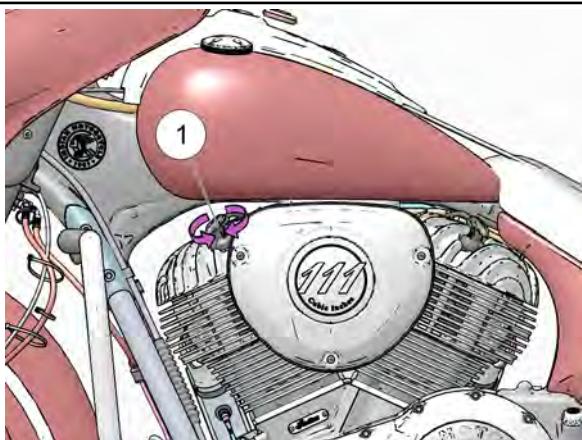
SPARK PLUG REMOVAL**CAUTION****HOT COMPONENTS**

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

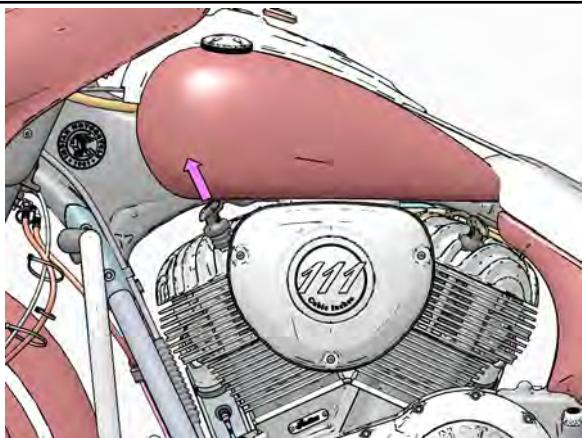
NOTE

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.

- 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.



- Grabbing only the base of the spark plug boot, pull straight out of spark plug well.



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

SPARK PLUG INSPECTION / GAP**CAUTION**

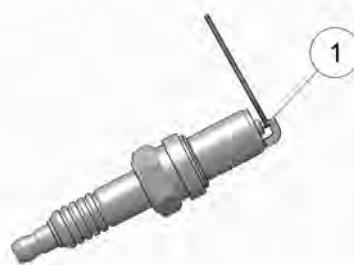
A hot engine can cause serious burns. Allow engine to cool or wear protective gloves when removing the spark plugs.

- Remove spark plugs. See Spark Plug Removal, page 2.23.
- Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.
- 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.

- 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)

MAINTENANCE

SPARK PLUG INSTALLATION

- 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)**

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

TORQUE

Spark Plug: **13 ft-lbs (17 Nm)**

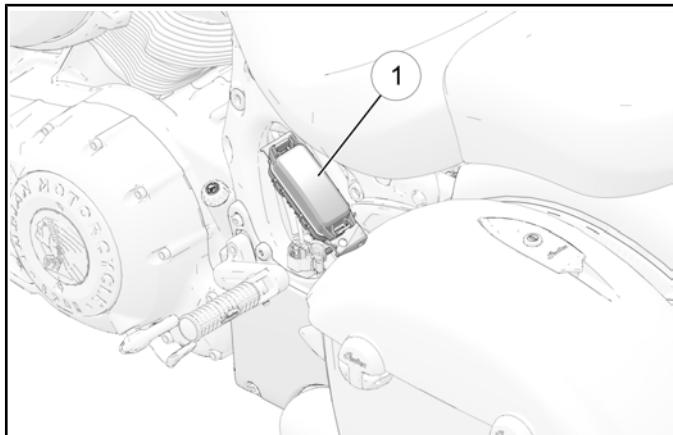
CAUTION

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

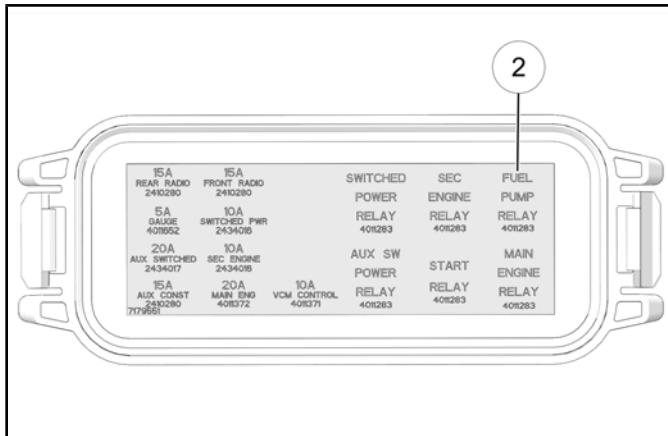
- Install spark plug wire boots securely over the plugs.

ENGINE COMPRESSION TEST

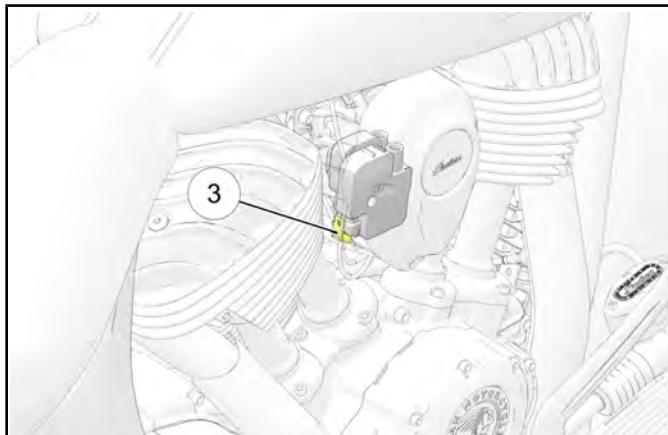
- Warm engine to operating temperature.
- Shift transmission into neutral and stop engine.
- Remove the LH upper side cover to access the fuse box ①. See Side Cover (Upper), Removal / Installation, page 7.17.



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



- Disconnect the ignition coil ③ to disable ignition system.



- Disconnect ignition cables from both spark plugs.
- Remove spark plug from cylinder to be tested. See Spark Plug Removal, page 2.23.
- Install compression tester in the spark plug hole following manufacturers instructions.
- Open throttle and crank engine until needle on compression gauge stops rising (about 5 seconds).
- Repeat procedure for other cylinder.

Specification - Thunder Stroke 111: All Models

STD: 90-110 psi (620-758 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)

If a cylinder leakage tester is not available, perform a wet cylinder compression test.

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 2.24.
2. If compression increases substantially, inspect cylinder, piston, and rings.
3. If compression does not increase, inspect valves and valve seats.

BATTERY

This motorcycle is equipped with a maintenance free battery which is located under the seat. 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).

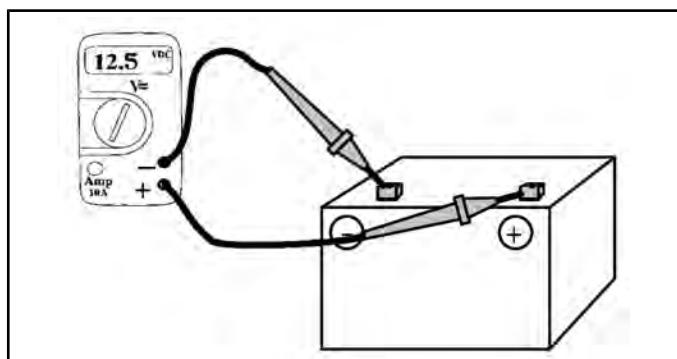
Take great care NOT to reverse the battery leads when installing the battery.

MAINTENANCE

BATTERY INSPECTION

Battery terminals and connections should be kept free of corrosion. If cleaning is necessary, remove the corrosion with a stiff wire brush. Wash with a solution of one tablespoon baking soda to one cup water. Rinse well with tap water and dry off with clean rags. Coat terminals with dielectric grease.

1. Visually inspect the exterior of the battery. Replace battery if housing is damaged, case is deformed, or if electrolyte is leaking.
2. To remove corrosion, remove battery from motorcycle and wash terminals with water and baking soda solution. Clean terminals, fasteners, and cable ends with a brass wire brush and apply a thin film of dielectric grease.
3. Measure battery voltage.



Specification: 12.5V DC minimum

4. If battery voltage is below 12.5V DC, charge it thoroughly. See Battery Charging - In Service, page 10.16.
5. Replace battery if it will not accept a charge.

BATTERY CHARGING

See Battery Charging - New Battery, page 10.15 or Battery Charging - In Service, page 10.16.

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 monthly using a 12 volt battery charger with a maximum charge rate of 1.8 amp-hr.

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.

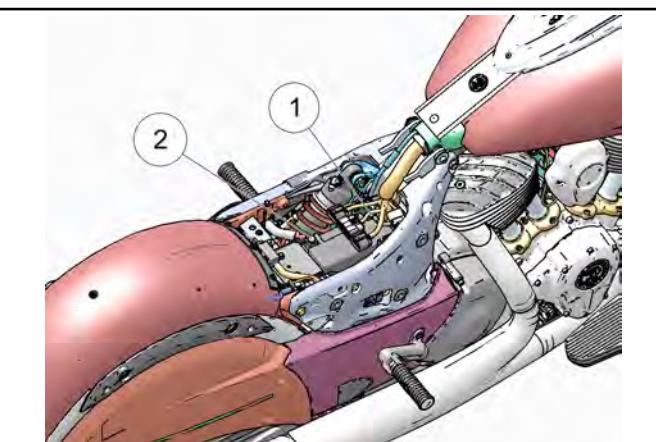
Batteries contain acid that is caustic. Wear protective clothing and a face shield or protective eyewear when working with the battery. KEEP OUT OF REACH OF CHILDREN.

BATTERY REMOVAL

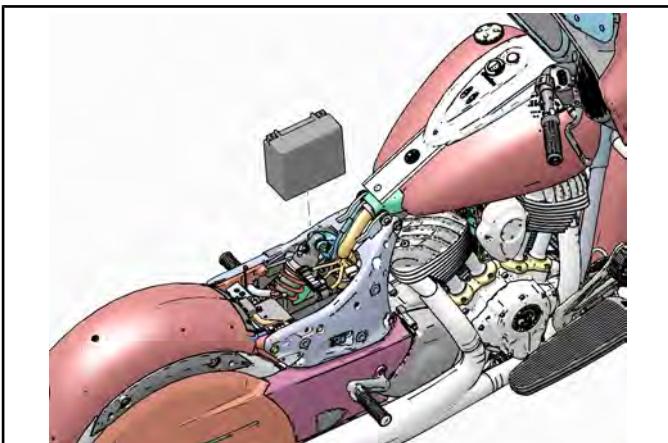
IMPORTANT

It is not necessary to disconnect the VCM from the electrical harness during battery removal. If the VCM must be disconnected for any reason, the negative battery cable must be disconnected first.

1. Remove the upper side covers. See Side Cover (Upper), Removal / Installation, page 7.17.
2. Remove the seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
3. Remove the fastener securing the Vehicle Control Module (VCM) mounting plate to the top of the battery box and move the VCM out of the way. **Do not disconnect VCM.** See Vehicle Control Module (VCM), Removal / Installation, page 10.48.
4. Remove negative (-) battery terminal fastener and cable first ①.
5. Remove positive (+) battery terminal fastener and cable last ②.



6. Lift battery straight up and out of the battery box.



NOTE

It may be necessary to push the VCM harness away from the battery, into the RH side of the frame in order to remove the battery.

BATTERY INSTALLATION

- See Battery Installation, page 10.13.

DRIVE BELT INSPECTION

NOTE		
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 2.6.		

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

- Periodically inspect drive belt for cuts, excessive wear, foreign substance (oil, grit), missing teeth, or any other damage.
- If any damage is found, belt should be replaced.

NOTE
Adjust drive belt tension at intervals in accordance with the Periodic Maintenance Interval Chart. See Periodic Maintenance Interval Table, page 2.6.

- If the drive belt or sprocket is being replaced due to damage, replace belt and both sprockets as a set if drive system has more than 5000 miles (8000 Km) of use.

MAINTENANCE

DRIVE BELT SPECIFICATIONS

DRIVE BELT DEFLECTION DATA

MODEL	DEFLECTION AT 10 LBS FORCE
Chief Classic	
Chief Vintage	1.1" (28 mm) or 8 notches up on belt guard. See Drive Belt Tension, page 2.29.
Chief Dark Horse	
Spring- field	
Chief- tain Dark Horse	
Chief- tain	1.3" (34 mm) or 11 notches up on belt guard. See Drive Belt Tension, page 2.29.
Road- master	
Road- master Classic	

DRIVE BELT FREQUENCY TENSION DATA

NOTE

Due to the low frequency levels produced by Indian Motorcycle drive belts, it is recommended to use a commercially available CLAVIS optical sensor or equivalent to achieve the most accurate tension measurement.

DRIVE BELT TENSION MEASUREMENTSpecial Tool: **Belt Tension Gauge PV-43532****IMPORTANT**

Do not adjust the belt when wet, or immediately after riding. Belt must be dry and the drive system must be at ambient temperature (60-80° F). This is extremely important for accuracy.

IMPORTANT

Perform this procedure to achieve proper belt tension and alignment. Belt tension should be set before performing the alignment procedure.

WARNING

A drive belt that is not properly tensioned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

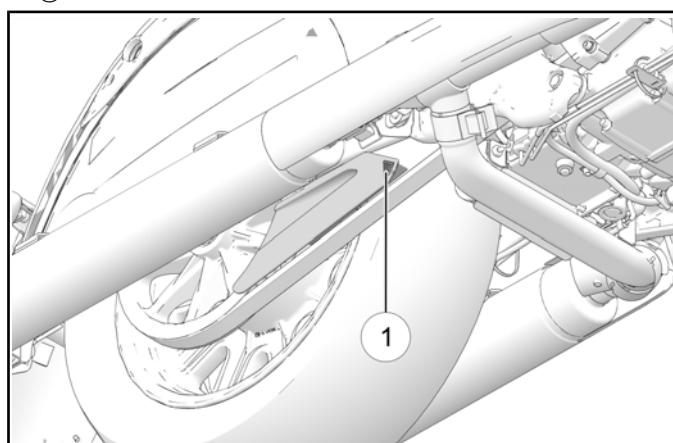
1. Secure motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Shift transmission into NEUTRAL.
3. ELEVATE rear wheel off the ground when checking deflection or adjusting the belt.

Find Tight Spot In Belt

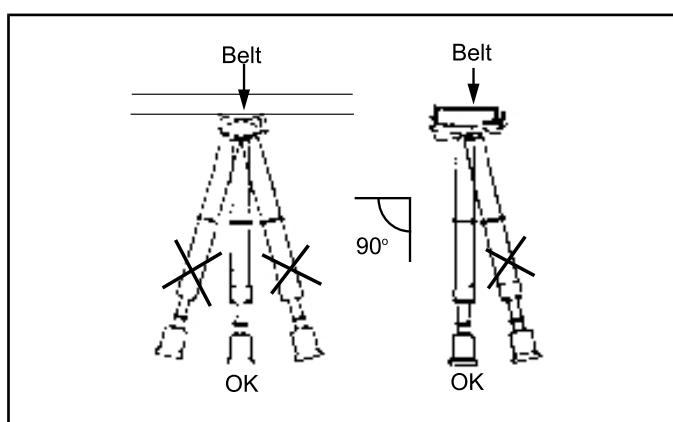
4. Use the tire valve stem as a reference and perform the following Steps:

- Check / record belt deflection at 4 different points, 90 degrees apart. Rotate wheel in a **CLOCKWISE** rotation as viewed from belt side of motorcycle.
- Place a mark on rear wheel at the tightest point (least deflection) to use as a reference.
- Continue to rotate the wheel in normal drive direction (**CLOCKWISE**) 1-2 revolutions until your reference mark (the tightest point) is lined up with the tension setting window in the lower belt guard

①.



- Adjust belt deflection with wheel in this position.
- 5. Place tape measure or ruler next to drive belt or use the graduations on lower belt guard for reference.
- 6. Slide O-ring on belt tension gauge to the 10 lb. mark.
- Place belt tension gauge squarely against belt at center and keep it at a 90° angle to the belt surface.



7. Push up on gauge until O-ring just touches tool body. See Drive Belt Specifications, page 2.28 for drive belt deflection specifications.

MAINTENANCE

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 2.31.

NOTE

New drive systems (new vehicle or when belt and sprockets are replaced) should be set to the tight side of the specification and inspected after the first 500 miles (800 km).

DRIVE BELT TENSION - SPECIFICATIONS

Specifications: Drive Belt

BELT DEFLECTION	
Model	Deflection @ 10 lbs force
Chief / Chief Darkhorse / Vintage	1.1" (28 mm)
Springfield / Chieftain / Chieftain Darkhorse / Roadmaster	1.3" (34 mm)
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	719.10mm
Belt Width	24mm
Belt Mass Constant	8.4 g/mm
Tension Chief / Chief Darkhorse / Vintage	23 Hz (\pm 1 Hz)
Tension Springfield / Chieftain / Chieftain Darkhorse / Roadmaster	18 Hz (\pm 1 Hz)

DRIVE BELT ADJUSTMENT**IMPORTANT**

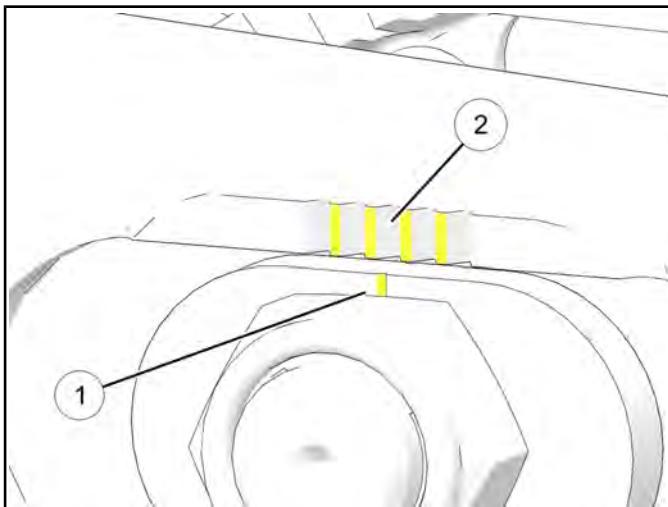
Perform this procedure to achieve proper belt tension and alignment. Belt tension should be set before performing the alignment procedure.

Belt Tension**WARNING**

A drive belt that is not properly tensioned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

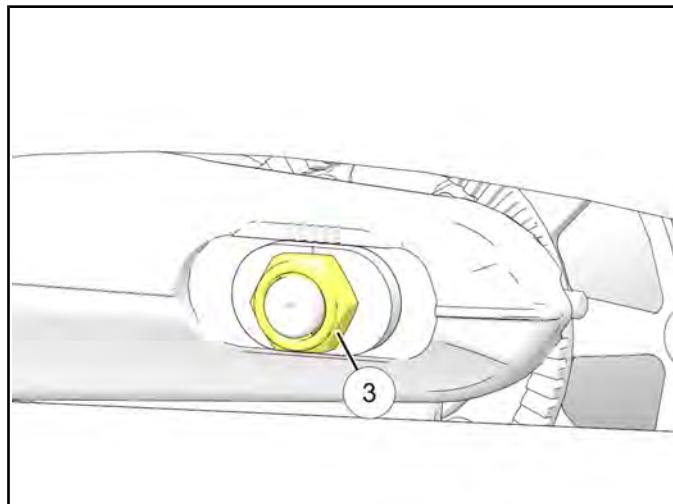
NOTE

Marks ① and ② are used as a reference for initial wheel alignment. Marks should be in roughly the same position on both left and right sides of wheel.



1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Make note of adjuster locations ① and ②.
3. Raise the rear of the motorcycle so the rear tire can be freely rotated.

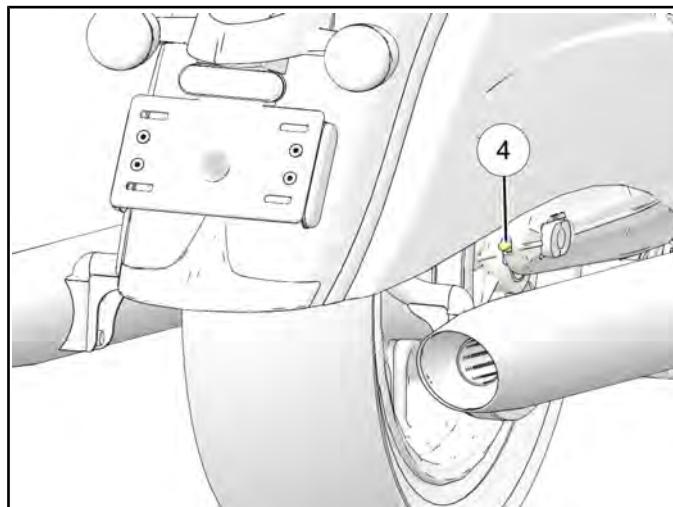
4. Loosen axle nut ③ and retighten to the **ADJUSTMENT SPECIFICATION** during the adjustment procedure.

**TORQUE****Axle Nut Torque (ADJUSTMENT SPECIFICATION):**

Step 1: 15 ft-lbs (20 Nm)

Step 2: 65 ft-lbs (88 Nm)

5. Turn the RIGHT SIDE adjuster nut ④ to achieve proper belt tension. See Drive Belt Tension Measurement, page 2.29.



6. When belt tension is correct, check and adjust final wheel alignment as follows:

Belt Alignment

MAINTENANCE

⚠ WARNING

A drive belt that is not properly aligned can cause drive line noise and damage the drive belt, causing possible belt failure and loss of control of the motorcycle.

NOTE

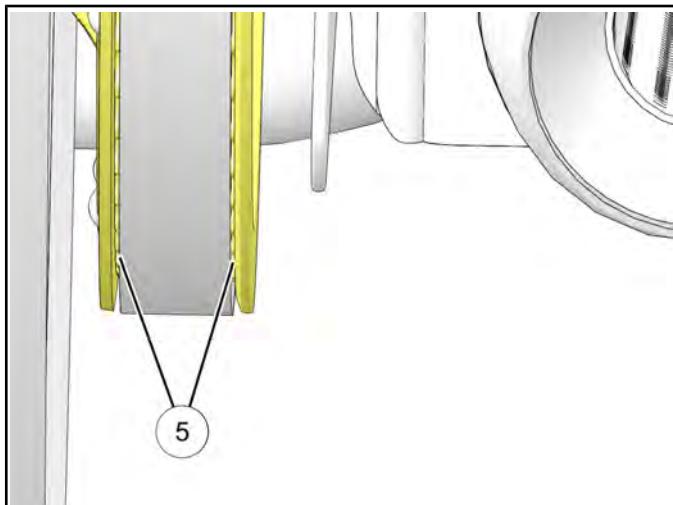
To minimize change in belt tension, use LEFT SIDE adjuster only to make final adjustments to belt alignment.

7. Rotate the wheel BACKWARD. Tighten LEFT SIDE adjuster until belt comes off inside sprocket flange during backward wheel rotation.

IMPORTANT

The belt should track to the center of the sprocket tooth surface when properly aligned ⑤. Sprocket teeth should be visible on both sides of the drive belt.

8. Rotate the wheel in the FORWARD direction and verify that sprocket teeth are still visible on both sides of the drive belt ⑤.



9. If necessary, loosen the axle nut and LEFT SIDE adjuster until belt just moves off the right flange and begins to track down the center of the driven sprocket flange during forward wheel rotation.

NOTE

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. See Drive Belt Tension Measurement, page 2.29.

12. Tighten rear axle nut to FINAL specification.

TORQUE

Axle Nut Torque (FINAL TIGHTENING):

Step 1: 15 ft-lbs (20 Nm)

Step 2: 65 ft-lbs (88 Nm)

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.

SPROCKET INSPECTION

NOTE

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

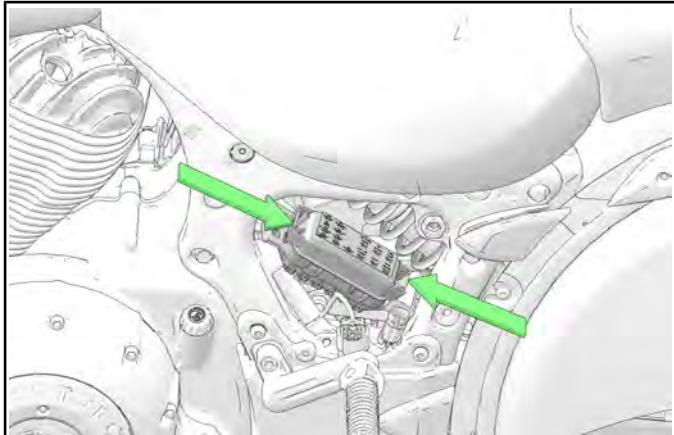
1. Clean the drive belt and front and rear sprockets with a mild mixture of dish soap and warm water. Rinse and dry thoroughly.
2. Inspect front and rear sprocket teeth for wear or damage from foreign material.
3. Closely inspect drive belt condition.

FUSE REPLACEMENT

Fuses and relays are located in the fuse box under the LH upper side cover.

1. Remove LH upper side cover. See Side Cover (Upper), Removal / Installation, page 7.17.

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



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

CAUTION

Do not use fuses of a higher amperage rating than what is specified.

If the correctly rated fuse continues to blow, something is wrong and needs to be corrected. Substituting a higher amperage fuse can lead to extensive electrical system and vehicle damage.

15A REAR RADIO 240280	15A FRONT RADIO 240280	SWITCHED POWER	SEC ENGINE	FUEL PUMP
5A WIRING 401952	10A SWITCHED PWR 243406	RELAY 401263	RELAY 401263	RELAY 401263
20A AUX SWITCHED 243407	10A SEC ENGINE 243408	AUX SW POWER	START MAIN ENGINE	
15A AUX CONST 240280 217955	20A MAIN ENG 401972	RELAY 401263	RELAY 401263	RELAY 401263
	10A VCM CONTROL 401371			

MAINTENANCE

HEADLIGHT AIM INSPECTION

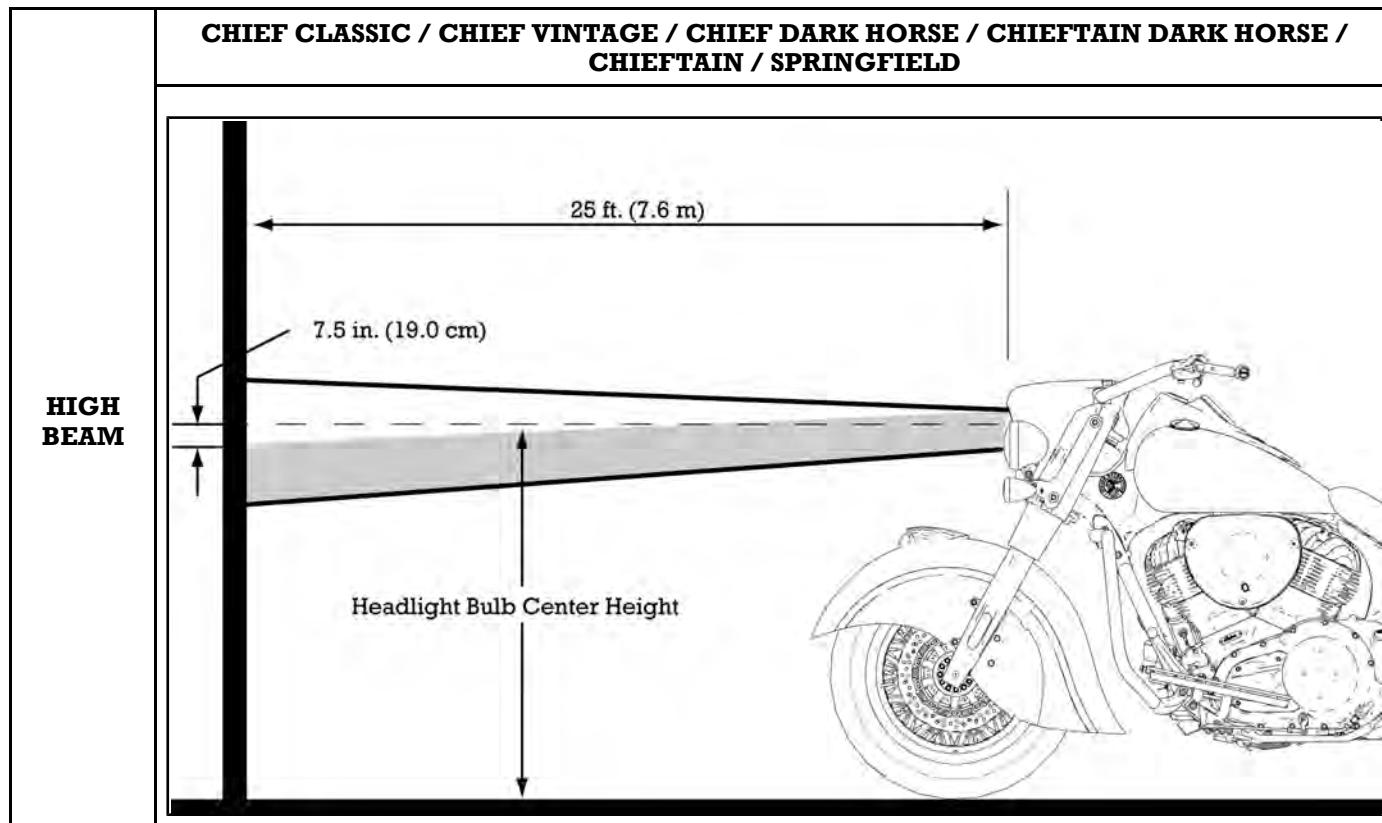
Adjust headlight aim when there is a change in load (rider, cargo, accessories, etc.) or after suspension adjustment.

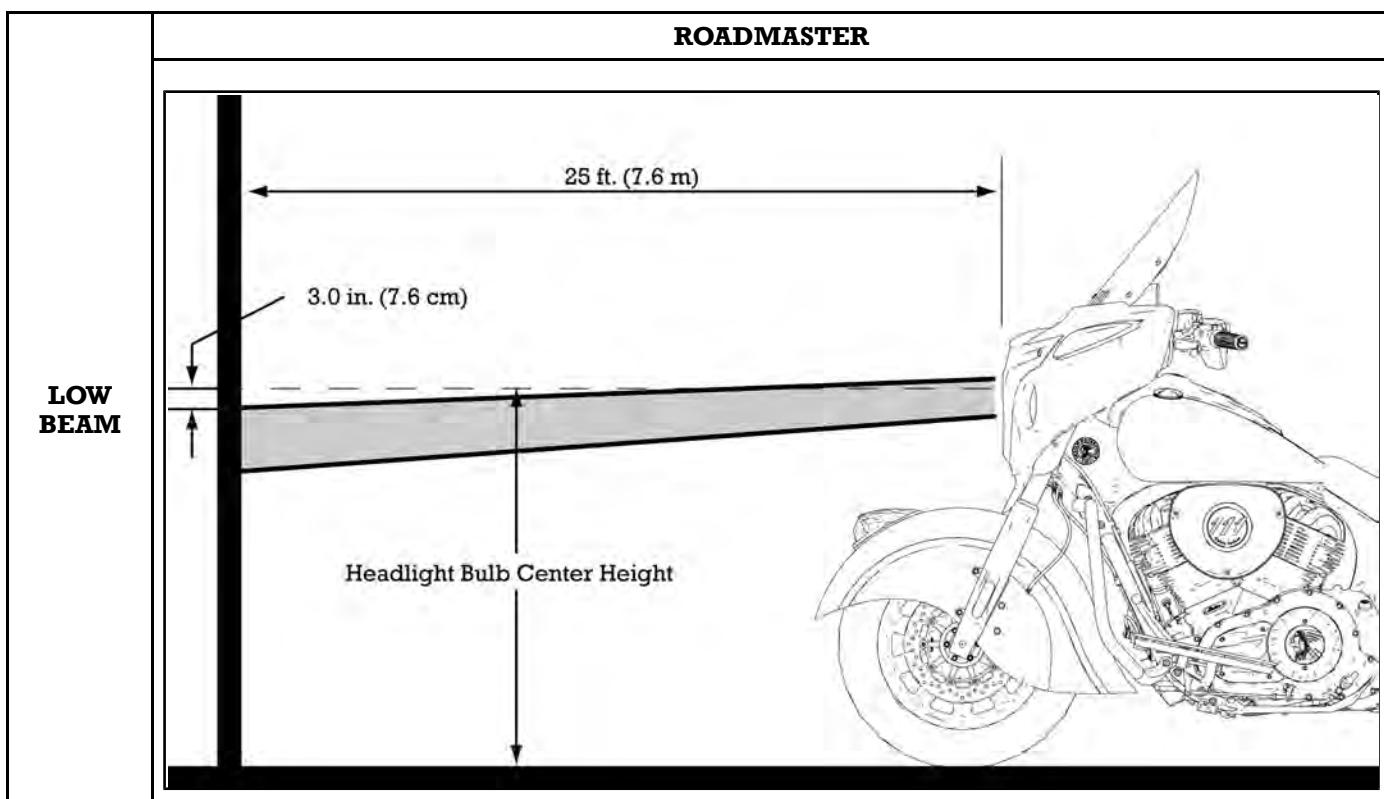
CHIEF CLASSIC / CHIEF VINTAGE / CHIEF DARK HORSE / CHIEFTAIN DARK HORSE / CHIEFTAIN / SPRINGFIELD: With the headlight switched to HIGH beam, the center of highest intensity (appears as a diamond shape) should be 7.5 in (19 cm) below the height of the headlight bulb when centered straight ahead at 25 feet (7.62 m).

ROADMASTER / ROADMASTER CLASSIC: With the headlight switched to LOW beam, the top of the highest intensity (appears as a diamond shape) should be 3.0 in (7.6 cm) below the height of the headlight bulb when centered straight ahead at 25 feet (7.62 m).

Follow all steps below to ensure accurate aim inspection.

1. Check and adjust the tire pressure. See Tire Pressure / Specifications, page 2.11.
2. Verify suspension ride height is set correctly. See Rear Shock Preload Inspection, page 2.37.
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 25 ft. (7.6 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. Turn ignition switch ON.
6. Set headlight to HIGH beam and LOW beam for models listed below.
7. Compare the position of headlight beam on the wall to the illustration below and adjust if necessary.





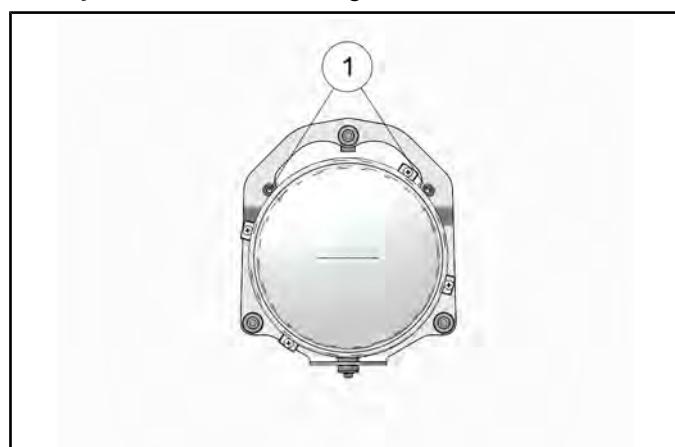
HEADLIGHT AIM ADJUSTMENT

NOTE

Chieftain / Roadmaster models: Access headlight adjustment fasteners by removing the headlight bezel. See Headlight Bulb Replacement - All Models, page 10.52.

Classic / Vintage / Dark Horse / Springfield models: Headlight adjustment fasteners can be accessed directly through the headlight nacelle. It is not necessary to remove the nacelle for adjustment.

- To adjust the headlight horizontally, turn the left adjustment fastener out (counter-clockwise) to adjust the beam to the left. Turn the right adjustment fastener out (counter-clockwise) to adjust the beam to the right.



- To adjust the headlight vertically, both adjustment fasteners ① must be turned in or out equally. Turn fasteners in (clockwise) to lower the beam. Turn fasteners out (counter-clockwise) to raise the beam.

MAINTENANCE

SIDESTAND INSPECTION

1. Support the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Inspect sidestand spring for damage or loss of tension. Be sure stand returns to fully retracted position.
3. Inspect side stand for smooth movement.
4. Inspect sidestand pivot fastener nut for proper torque.

TORQUE

Sidestand Pivot Fastener: 37 ft-lbs (50 Nm)

5. Replace sidestand if it is bent. Do not attempt to straighten sidestand.

SIDESTAND REMOVAL / INSTALLATION

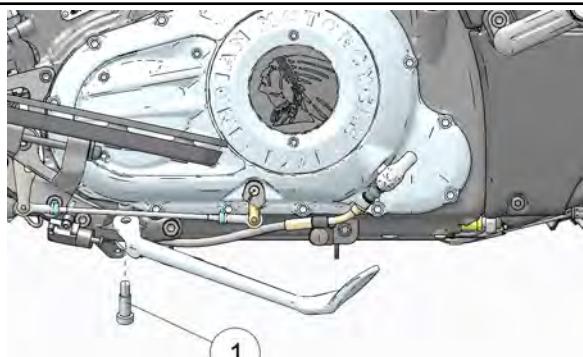
⚠ WARNING

The sidestand spring is under tension. Wear eye and face protection when removing and installing the spring and sidestand. Be sure the vehicle is properly secured before you begin.

IMPORTANT

Sidestand fasteners must be replaced any time the sidestand is removed. The nut is a crushed lock and therefore it can not be reused.

1. Sidestand will be moved between the UP (retracted) and DOWN (extended) position during removal and installation. Be sure vehicle is properly secured.
2. Remove sidestand pivot fastener ① using a 6mm hex wrench while holding the nut with a 15 mm wrench.



3. Grasp sidestand firmly and move it to the UP position.

4. Pull sidestand rearward against spring tension until mounting flange on sidestand is clear of the mounting boss on the frame.
5. Relax tension and remove spring.
6. *Installation:* Attach spring to sidestand.
7. Lightly grease sidestand mounting boss on frame and the shouldered portion of the pivot fastener.
8. Place loose end of spring through hole in frame rail.
9. With sidestand in the retracted position (up), pull stand rearward against spring tension until the mounting flange on the sidestand drops onto the mounting boss on the frame.
10. Swing sidestand to the extended position to align fastener hole and install NEW fastener and nut.
11. Torque to specification and wipe off any excess grease.

TORQUE

Sidestand Pivot Fastener: 37 ft-lbs (50 Nm)

12. Cycle the sidestand to be sure it moves freely, and returns to the fully retracted position.

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.

NOTE

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. See
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.

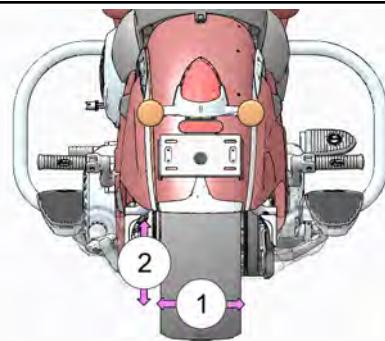
- Turn handle bars full right or left and hold against the fork stop. Attempt to move front wheel side-to-side. If movement is observed, inspect front axle, wheel, and bearings. See Steering / Suspension chapter.

SWINGARM INSPECTION

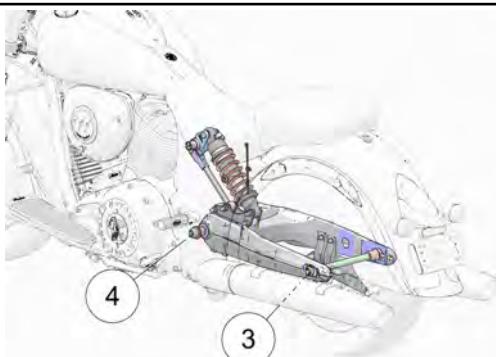
WARNING

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.

- Sit astride the motorcycle. Compress the rear suspension several times and check for smooth and quiet operation ②.
- Secure motorcycle with rear wheel elevated.
- Inspect for worn swing arm bearings by grasping the rear wheel and attempting to move wheel side-to-side ①.



- If movement is detected, determine if movement is at axle area ③ or swingarm pivot area ④. Refer to Steering / Suspension chapter for wheel bearing and swingarm bearing replacement.

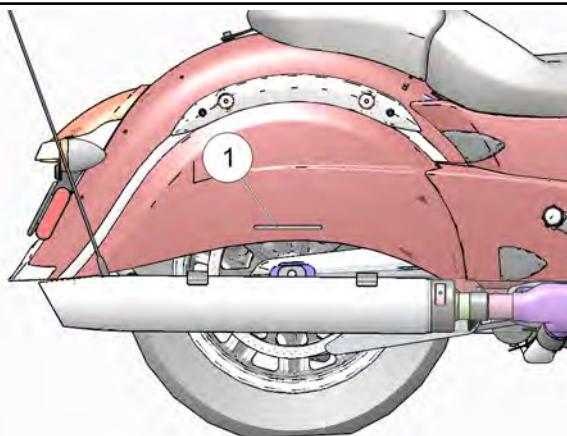


- Rotate rear wheel and inspect for smooth rotation of rear wheel bearings. If roughness or unusual sounds are detected, inspect rear wheel bearings, belt tension and alignment, and brake pads.
- Inspect rear shock for leakage and all rear suspension components for damage or loose fasteners.
- Inspect 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.
- Verify axle nut is tight.
- Replace any worn or damaged parts.

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.

- Verify that tire pressure is at specification. See Tire Pressure / Specifications, page 2.11.
- Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
- Remove saddlebags, if equipped.
- Apply a strip of removable tape ① to the rear fender directly over the center of the rear axle.



- 5.

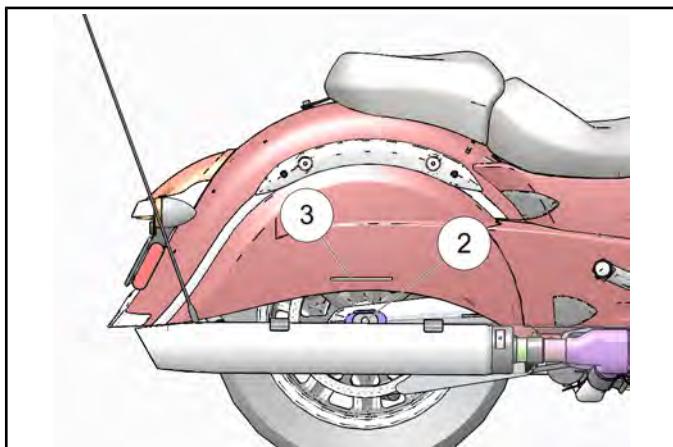
CAUTION

For CALIFORNIA and INTERNATIONAL motorcycles, the Evaporative Canister must be removed prior to raising the motorcycle. If the canister is not removed and the motorcycle is raised, the fittings will contact the swingarm and become damaged.

Using a scissor jack or similar tool, raise the motorcycle until the rear shock is completely extended.

MAINTENANCE

- Measure the distance (in millimeters) from the center of the rear axle ② to the bottom of the tape ③. Record the results as measurement M1.



- Lower the motorcycle and remove the scissor jack.
- Load the motorcycle with all intended cargo. Wearing riding gear, sit on the motorcycle in the normal riding position.

IMPORTANT

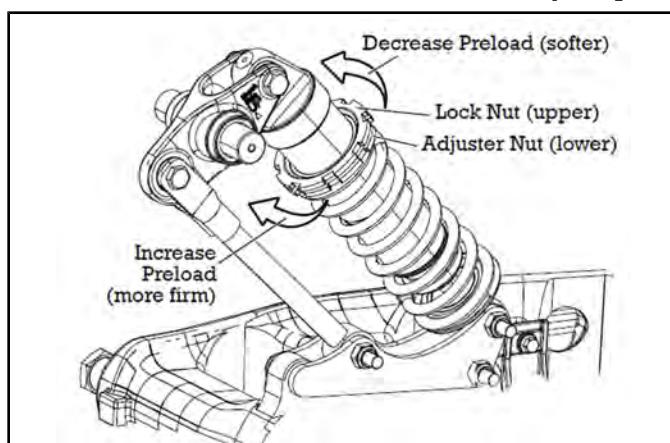
Have an assistant stabilize the motorcycle in a vertical position so rider can sit in a normal riding position with feet on floorboards.

- Have an assistant measure the same location. Record the results as measurement M2.
- Subtract measurement M2 from M1. The result is the measured rider sag. ($M1 - M2 = \text{Sag}$)
- Adjust preload as needed to achieve suspension sag indicated in the table below. See Rear Shock Preload Adjustment - Chief Models, page 2.38 or Rear Shock Preload Adjustment - Springfield / Chieftain / Roadmaster, page 2.39 for adjustment procedure.

RECOMMENDED SUSPENSION SAG	
Chief Classic / Chief Vintage / Chief Dark Horse	35 mm
Springfield / Chieftain Dark Horse / Chieftain / Roadmaster	45 mm

REAR SHOCK PRELOAD ADJUSTMENT - CHIEF MODELS

- Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
- Remove the seat as outlined in Frame / Body chapter.
- Using shock spanner wrench (PV-46993) loosen the lock nut by turning it counter-clockwise (as viewed from the top of the shock).
- Spray a light lubricant on the adjuster nut where it contacts the spring.
- Adjust shock preload by rotating the adjuster nut clockwise (as viewed from the top of the shock) to **INCREASE** preload (firm) or counter-clockwise to **DECREASE** preload (softer).
- Recheck the preload measurement after adjusting.
- Tighten the lock nut securely against the adjuster nut.
- Install the seat as outlined in Frame / Body chapter.



REAR SHOCK PRELOAD ADJUSTMENT - SPRINGFIELD / CHIEFTAIN / ROADMASTER

Refer to the label located on the inside of the left side cover. The label shows recommended pressures based on potential load weights. Always inspect and adjust shock preload (ride height) based on your actual load weight.

TOTAL CARGO & OCCUPANT WEIGHT (LB)	AIR PRESSURE (PSI)			MAX PRESSURE: 150 PSI
	NO TRUNK	LEATHER TRUNK	PAINTED TRUNK	
	0	0	0	
150	0	0	0	
175	0	0	10	
200	0	10	23	
225	10	23	30	
250	23	30	38	
275	30	38	48	
300	38	48	60	
325	48	60	71	
350	60	71	85	
375	71	85	100	
400	85	100	122	
425	100	122	134	
450	122	134	145	
475	134	145	NA	
500	145	NA	NA	

SELECT PRESSURE CORRESPONDING TO TOTAL CARGO AND OCCUPANT WEIGHT. REMOVE ALL PASSENGERS AND CARGO BEFORE SETTING / CHECKING SHOCK PRESSURE. SET PRESSURE WITH BIKE ON SIDE STAND.

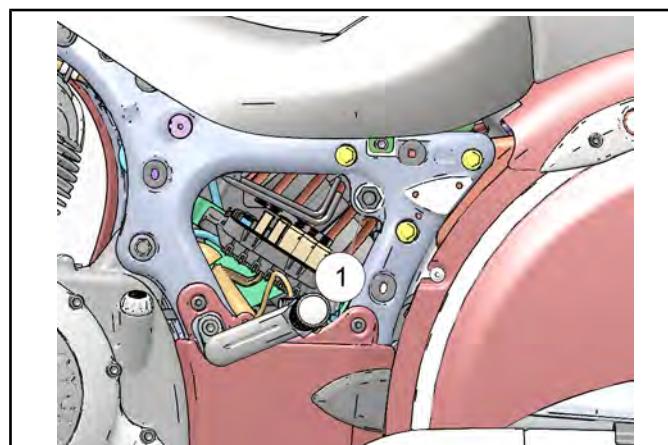
IMPORTANT

Follow these guidelines when adjusting:

- Park motorcycle with the sidestand down on a firm, level surface.
- Remove all riders and cargo.
- **DO NOT exceed 150 psi (1034 kPa) in the shock.**
- Use shock air pump (PV-48909) to complete adjustment procedure.

1. Remove the LH upper side cover. See Side Cover (Upper), Removal / Installation, page 7.17.

2. Remove the cap from the air fitting ①.



3. Refer to the label on the inside of the LH side cover to determine the recommended shock air pressure.
4. Install the hose fitting the shock air pump onto the fitting and read the gauge.
5. To reduce air pressure, push the bleed button on the gauge. Release air until the desired pressure reading is obtained.

MAINTENANCE

6. To increase pressure, pump the handle until pressure increases to the desired level.
7. Remove the hose from the air fitting and reinstall the cap.
8. Repeat the preload inspection to verify proper preload. See Rear Shock Preload Inspection, page 2.37.

MAINTENANCE - CHECK WHEEL SPOKES

If your motorcycle is equipped with spoked wheels, inspect both wheels for loose, bent, broken or missing spokes. To identify loose spokes, grasp each spoke and try to move it side to side or up and down. All spokes should be equally tight and have the same amount of flex. Tighten loose spokes or replace bent, broken or missing spokes.

Inspect spokes after first 500 miles, then again every 5,000 miles.

CHAPTER 3

ENGINE / COOLING / EXHAUST

3

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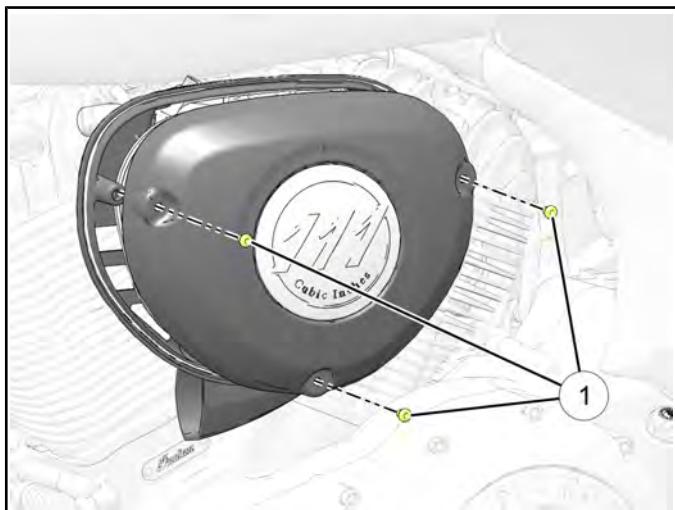
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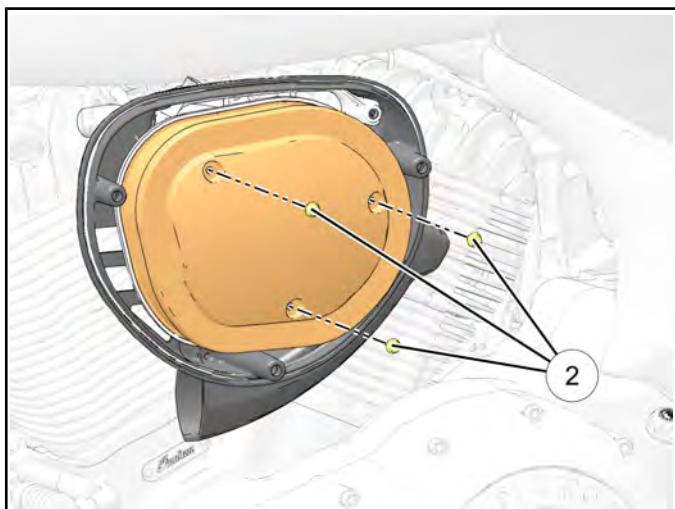
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AIR CLEANER SERVICE**AIR BOX REMOVAL**

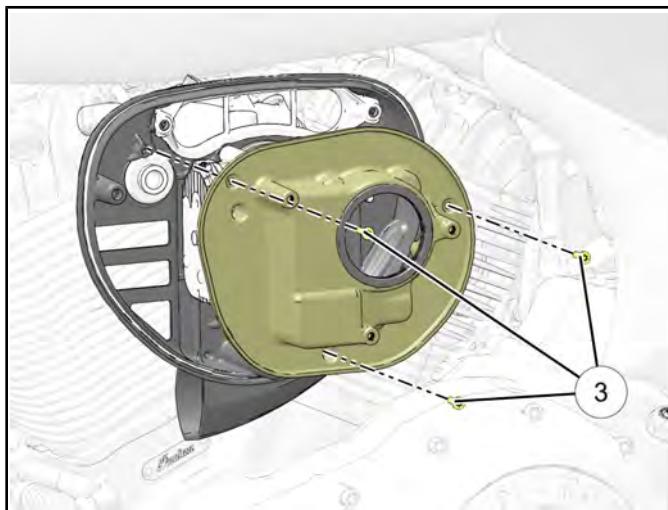
1. Using a 4mm hex wrench, remove the three fasteners ① securing the air cleaner cover to the air box.



2. Using an 8mm socket, remove the three fasteners ② securing the air filter element to the adapter plate and remove element.

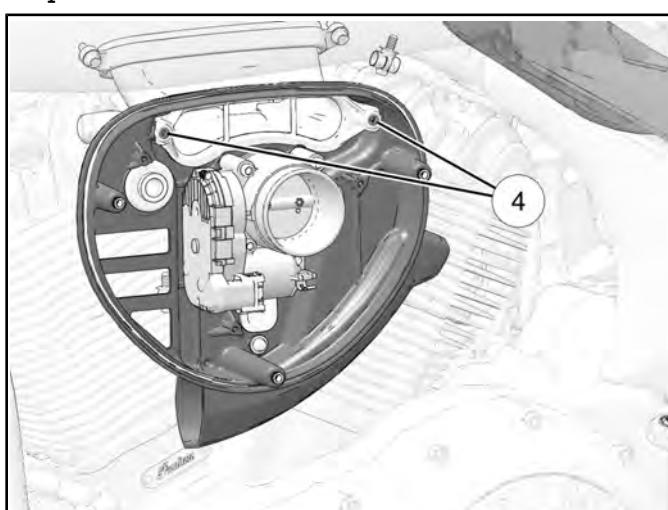


3. Using a T30 Torx wrench, remove the three fasteners ③ securing the air filter adapter plate to the air box assembly and remove adapter plate.

**NOTE**

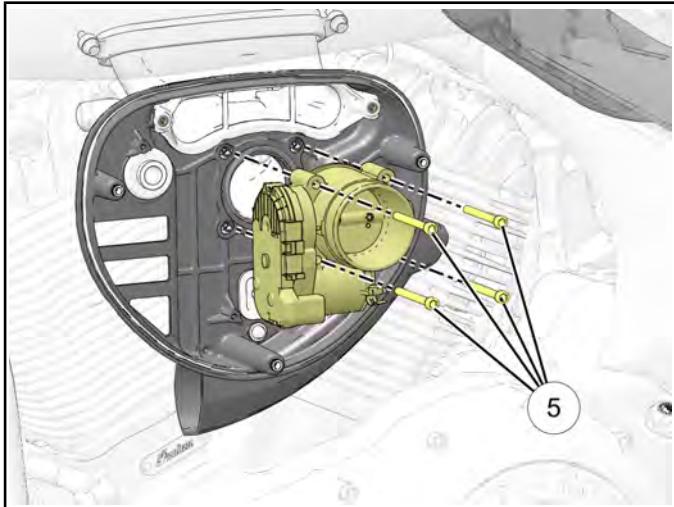
When removing the adapter plate, start by applying more pressure to the forward (LH) edge and pull outward to release the valve cover vent hose from the back side of the adapter plate.

4. Remove the two fasteners ④ securing the baffle plate to the intake air boot.

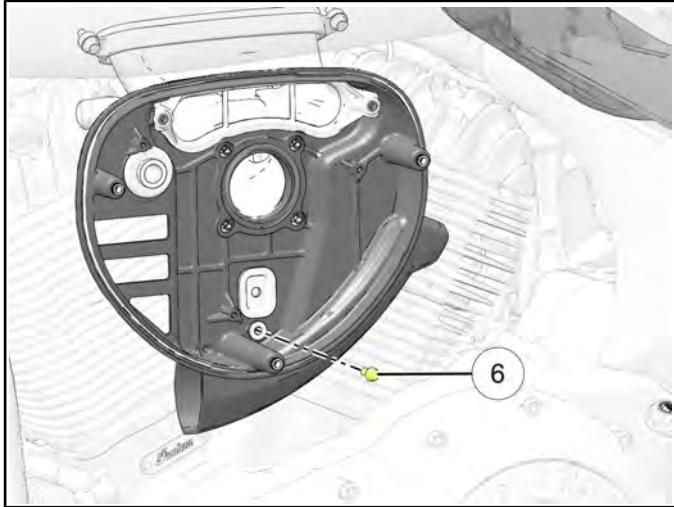


5. Disconnect the multi-plug from the throttle body.

- Using a 5 mm hex wrench, remove the four fasteners ⑤ securing the throttle body to the mounting plate and remove throttle body assembly.



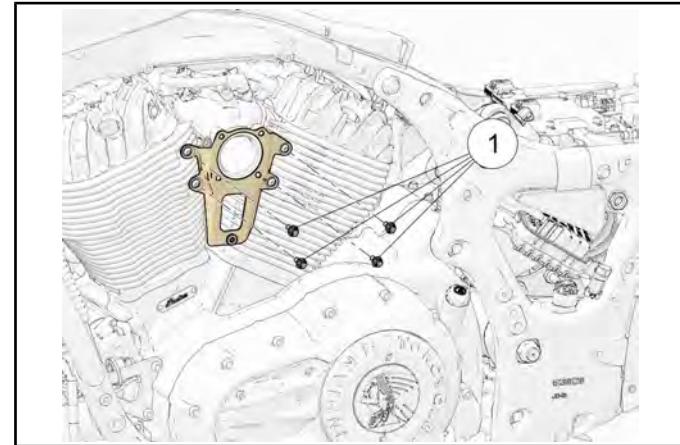
- Using an 8 mm socket, remove the lower fastener ⑥ securing the air box to the mounting plate.



- Push the rubber harness seal through to the back side of the air box and remove the air box from the motorcycle.

AIR BOX INSTALLATION

- Install the four fasteners ① securing the air box mounting bracket to the engine and torque to specification.



3

TORQUE

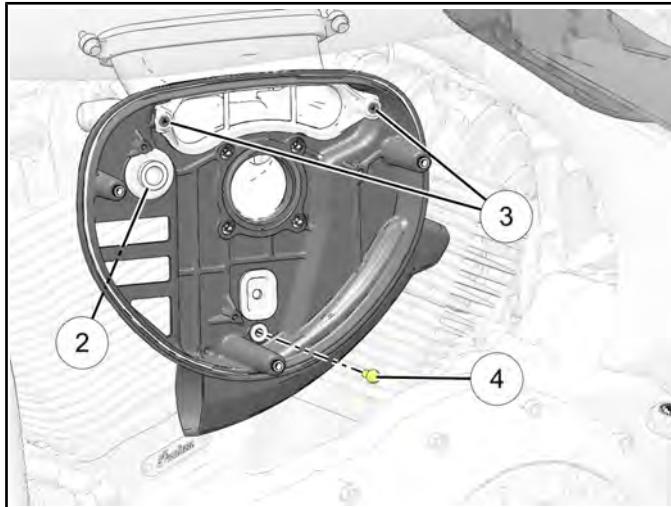
Air Box Bracket Fasteners: 88 in-lbs (10 Nm)

- Feed the throttle body electrical connector through the hole in the air box and install the rubber harness seal in the rectangular cutout.

NOTE

Make sure that the harness seal is fully seated in the air box cutout.

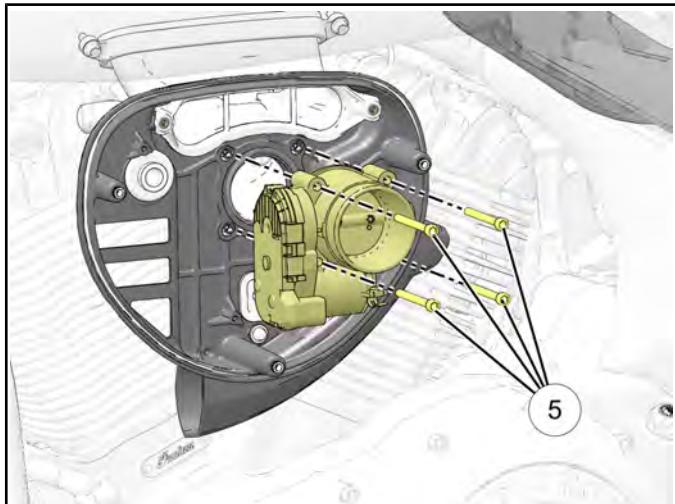
- Fit the air box to the mounting bracket and press breather hose ② through the rubber grommet until the air box sits flat against the bracket.
- Install the intake air boot and baffle plate. Torque baffle plate fasteners ③ to specification.
- Install air box retainer fastener ④ and torque to specification.



TORQUE

Baffle Plate Fasteners: 31 in-lbs (4 Nm)
Air Box Retainer Fastener: 86 in-lbs (10 Nm)

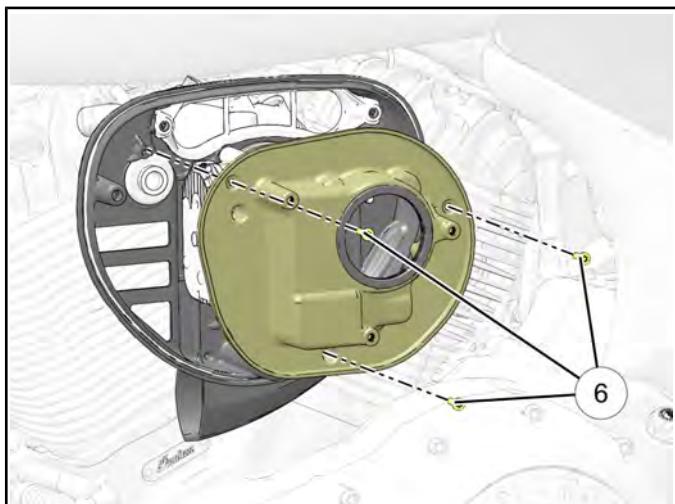
6. Install throttle body o-ring and throttle body. Torque throttle body fasteners ⑤ to specification.



TORQUE

Throttle Body Fasteners: 89 in-lbs (10 Nm)

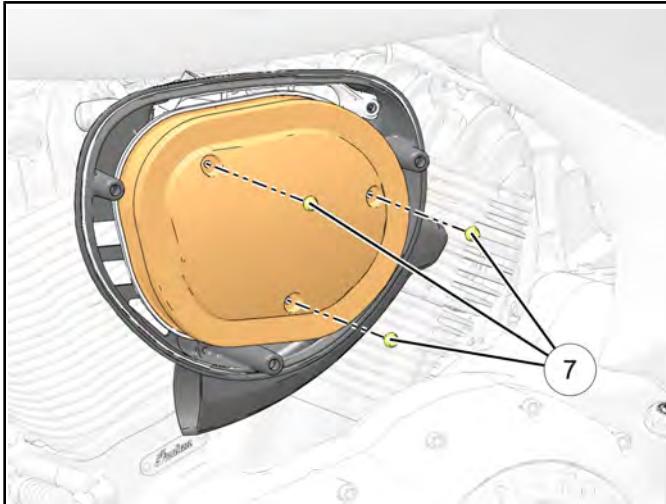
7. Connect throttle body electrical connector.
8. Install the air filter adapter plate and seal into the airbox. Press the hose fitting on the adapter plate into the breather hose until the plate is fully seated.
9. Install the three air filter adapter plate fasteners ⑥ and torque to specification.



TORQUE

Air Filter Adapter Plate Fasteners: 31 in-lbs (4 Nm)

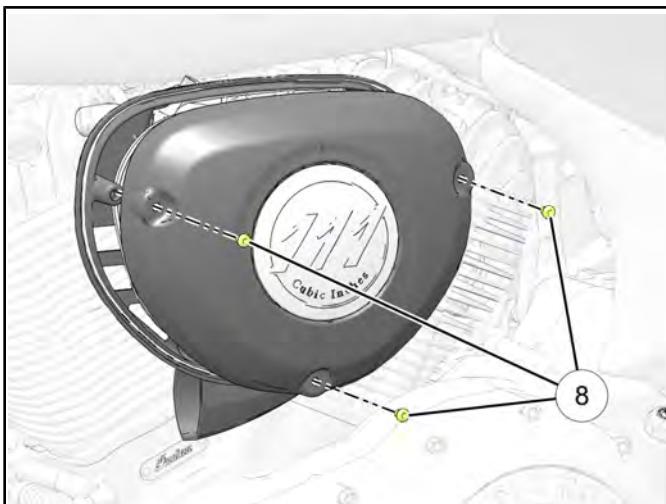
10. Install the air filter element and torque fasteners ⑦ to specification.



TORQUE

Air Filter Fasteners: 62 in-lbs (7 Nm)

11. Install air box gasket and cover. Torque fasteners ⑧ to specification.



TORQUE

Air Box Cover Fasteners: 84 in-lbs (10 Nm)

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)

TORQUE SPECIFICATIONS

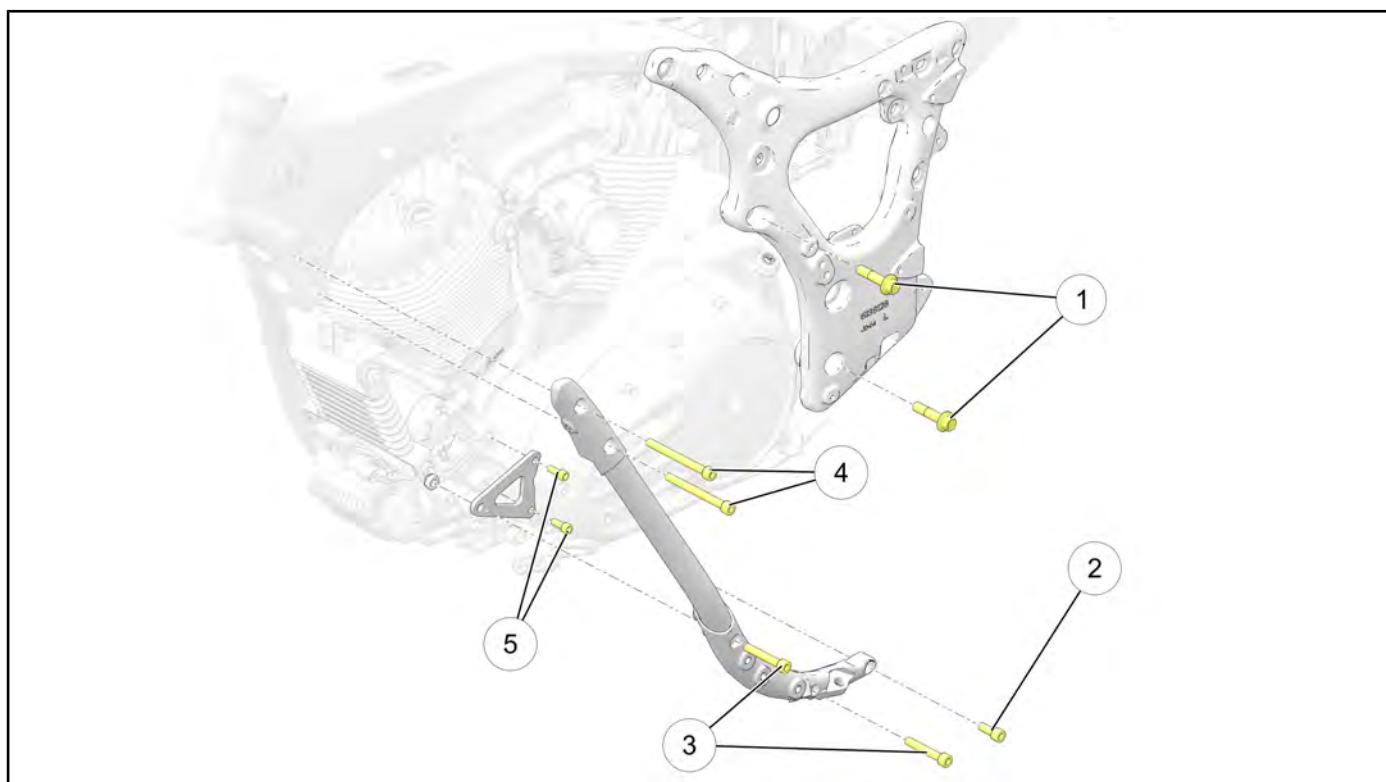
PART DESCRIPTION	TORQUE SPECIFICATION
ABS Module Bracket — M6 x 1.0 x 12 (QTY.4)	84 in-lbs (10 Nm)
Battery Box — M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)
Brake Line Routing Tabs — M6 x 1.0 x 12 (QTY.4)	84 in-lbs (10 Nm)
Down Tube, Lower (Both Sides) — M10 x 1.5 x 60 (QTY.4)	45 ft-lbs (60 Nm)
Down Tube, Lower LH — M10 x 1.5 x 25 (QTY.1)	45 ft-lbs (60 Nm)
Down Tube, Upper LH — M10 x 1.5 x 100 (QTY.2)	45 ft-lbs (60 Nm)
Engine Mounts, Front — M8 x 1.25 x 20 (QTY.2)	18 ft-lbs (24 Nm)
Engine Mounts, Rear — M12 x 1.75 x 50 (QTY.4)	75 ft-lbs (102 Nm)
Ground Wire — M6 x 1.0 x 12 (QTY.1)	84 in-lbs (10 Nm)
Side Stand Bumper — M6 x 1.0 x 12 (QTY.1)	84 in-lbs (10 Nm)
Side Stand Switch — M5 x 0.8 x 16 (QTY.2)	43 in-lbs (5 Nm)
Starter Solenoid — M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)

ENGINE / COOLING / EXHAUST

SPECIAL TOOLS

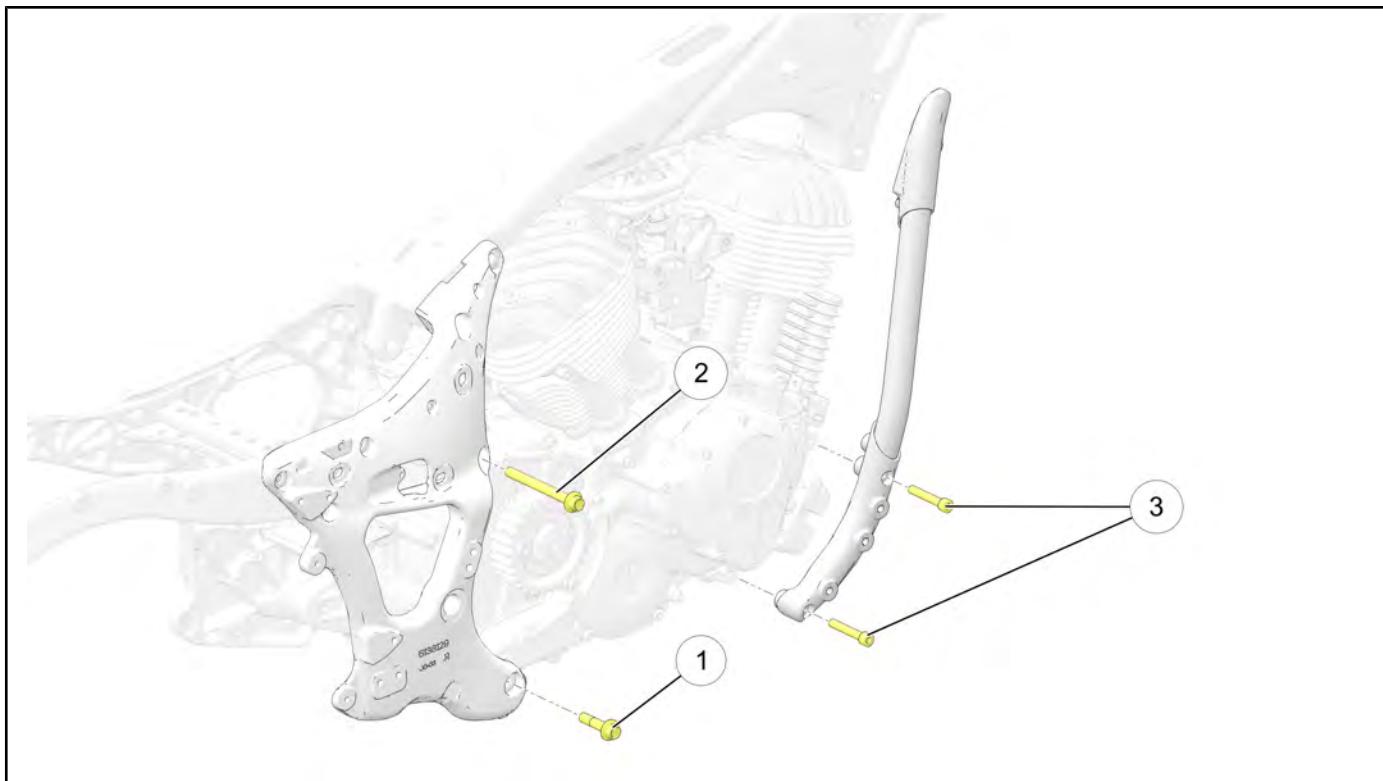
TOOL DESCRIPTION	PART NUMBER
Engine Stand Adapter	PF-51240
Motorcycle Table Lift / Wheel Vise	Commercially Available
12"x12" Platform Jack	Commercially Available
Engine Hoist (Cherry Picker)	Commercially Available
Engine Stand	Commercially Available

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

ASSEMBLY VIEWS**ENGINE BRACKETS / FASTENERS****LEFT SIDE BRACKETS / FASTENERS**

3

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Engine Mount — M12 x 1.75 x 50 (QTY.2)	75 ft-lbs (102 Nm)
②	Fastener, Engine Mount — M10 x 1.5 x 25 (QTY.1)	45 ft-lbs (60 Nm)
③	Fastener, Engine Mount — M10 x 1.5 x 60 (QTY.2)	45 ft-lbs (60 Nm)
④	Fastener, Frame Down Tube — M10 x 1.5 x 100 (QTY.2)	45 ft-lbs (60 Nm)
⑤	Fastener, Front Engine Mount — M8 x 1.25 x 20 (QTY.2)	18 ft-lbs (25 Nm)

RIGHT SIDE BRACKETS / FASTENERS

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Engine Mount — M12 x 1.75 x 50 (QTY.1)	75 ft-lbs (102 Nm)
②	Fastener, Engine Mount — M12 x 1.75 x 120 (QTY.1)	75 ft-lbs (102 Nm)
③	Fastener, Engine Mount — M10 x 1.5 x 60 (QTY.2)	45 ft-lbs (60 Nm)

ENGINE REMOVAL

PREPARATION FOR ENGINE REMOVAL

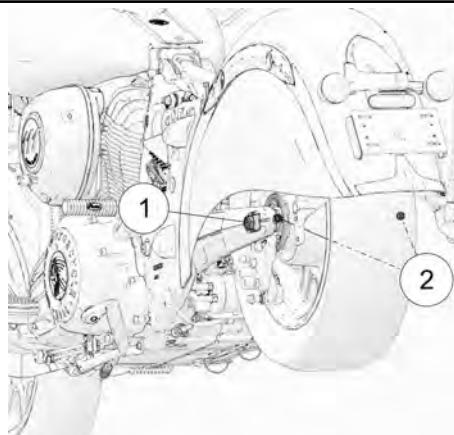
Remove the front fender with the motorcycle resting on its side stand, prior to placing the front tire in a wheel vise.

NOTE

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.

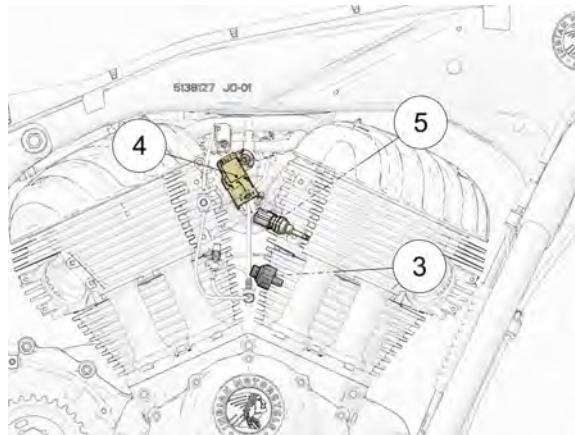
- With the motorcycle resting on its side stand, remove the front fender. See Front Fender Removal, page 7.26.
- Support motorcycle securely in an upright position. Clamp front tire securely in a wheel vise.
- Remove upper side covers. See Side Cover (Upper), Removal / Installation, page 7.17.
- Remove lower side covers. See Side Cover (Lower), Removal / Installation, page 7.17.
- Remove the seat. See Seat, Removal / Installation - Classic / Vintage / Chieftain, page 7.21.
- Remove the battery. See Battery Removal, page 2.26.
- Remove the fuel tank. See Fuel Tank Removal, page 4.15.
- Remove the complete exhaust system. See EXHAUST SERVICE.
- Remove the sprocket cover. See Drive Sprocket Cover, Removal / Installation, page 8.48.
- Remove the ignition coil assembly. See Ignition Coil Removal / Installation, page 10.40.
- Remove the RH and LH floorboard assemblies. See Floorboard (Driver), Removal, page 7.18.
- Remove highway bars, if equipped. See Highway Bar Removal, page 7.24.

- Loosen axle nut ① and loosen belt tension adjustment nuts ② and remove belt from drive sprocket.

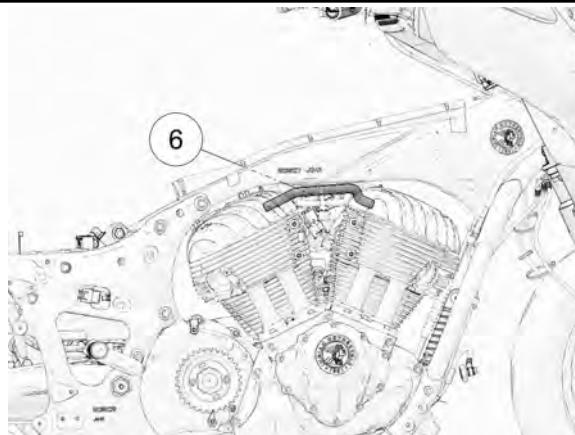


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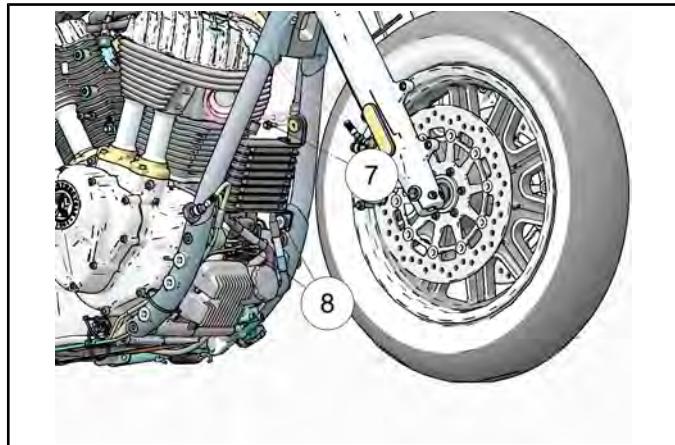
- Remove air box. See Air Box Removal, page 3.4.
- Remove the knock sensor ③.
- Disconnect the TMAP sensor ④.
- Disconnect the CHT sensor ⑤.



- Remove both ends of the breather hose ⑥ from the valve covers.



19. Disconnect electrical connectors from both fuel injectors and feed the electrical harness and all plugs up through the fuel rail (distribution line) and move out of the way.
20. Using a 10 mm socket, remove the top oil cooler fastener ⑦ and release the oil cooler from the lower mounting tabs ⑧.



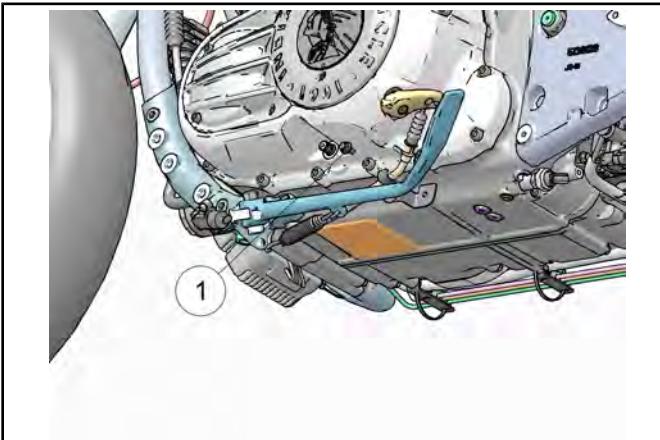
21. Disconnect the oil pressure switch. See Sensors — Powertrain Management, page 4.12.
22. Disconnect the gear position switch. See Sensors — Powertrain Management, page 4.12.
23. Using a 4 mm hex wrench, remove the two fasteners securing the sidestand switch and move switch out of the way. See Sensors — Powertrain Management, page 4.12.

REMOVING ENGINE FROM FRAME

1. Perform the preliminary engine removal steps outlined in this chapter. See Preparation For Engine Removal, page 3.11.
2. Place a platform jack beneath the engine and raise enough to support crankcase (Jack should just be touching the crankcase).

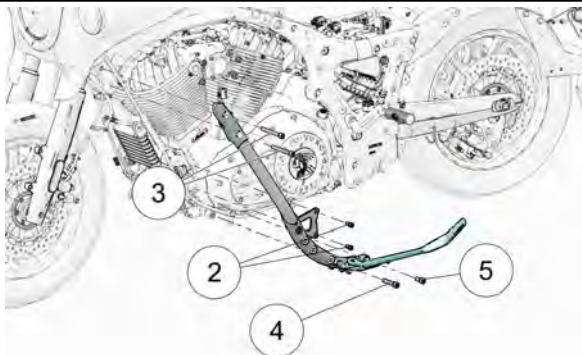


3. Using a 5 mm hex wrench, remove the fastener ① securing the clutch cable clip to the bottom of the LH engine case.



4. Remove the E-clip from the end of the clutch cable, rotate the clutch arm by hand and release the clutch cable end from the arm.
5. Using a 6 mm hex wrench, remove the two front motor mount fasteners ② from the engine case.
6. Using an 8 mm hex wrench, remove the 4 fasteners ③ ④ ⑤ securing the LH front down tube to the frame top tube and lower engine boss.

7. Remove the LH frame down tube and side stand as an assembly.



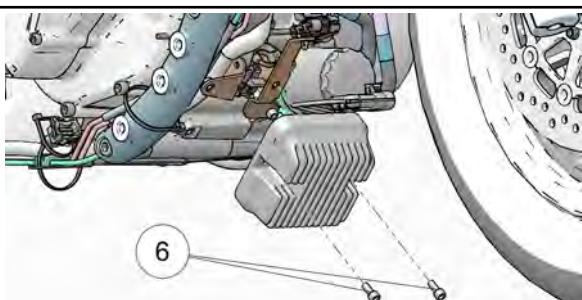
8. Disconnect the stator from the regulator.

9.

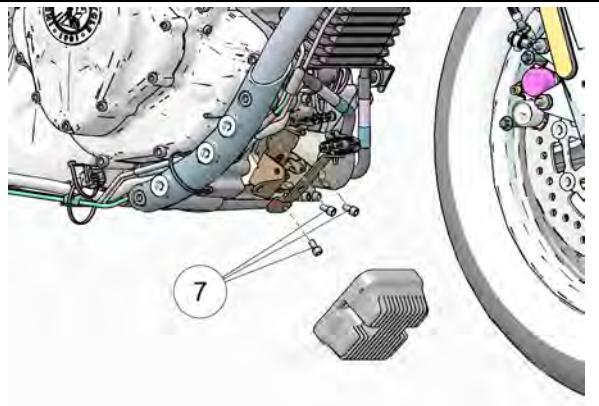
NOTE

It is not necessary to clip the cable ties securing the stator / regulator harness to the mounting bracket as they can be moved out of the way as an assembly.

Using a 5 mm hex wrench, remove the two fasteners ⑥ securing the voltage regulator to the mounting bracket and move the regulator enough to access the mounting bracket fasteners.



10. Remove the three regulator mounting bracket fasteners ⑦ securing the regulator bracket to the engine case and move bracket out of the way.

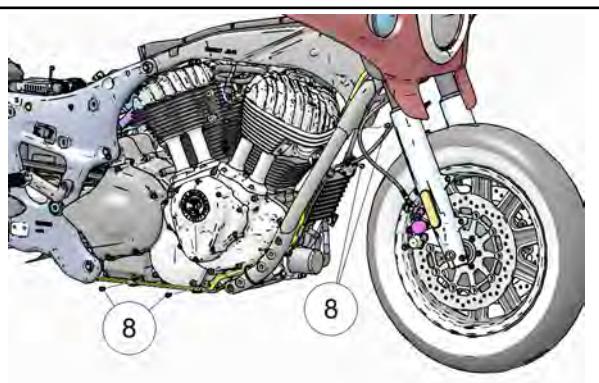


3

11. Remove the starter motor. See Starter Motor, Removal / Installation, page 10.25.

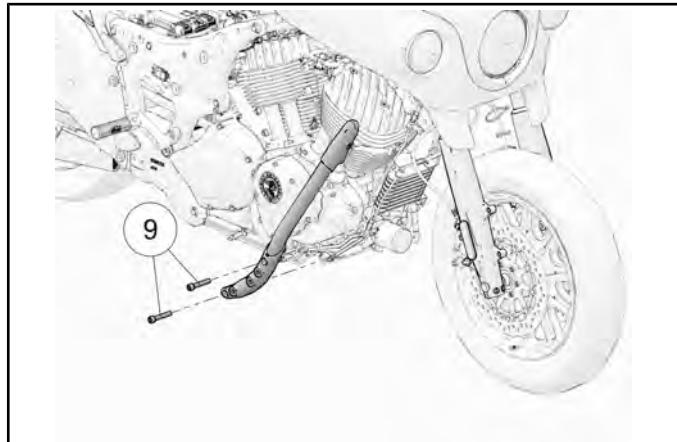
12. Remove CPS. See Sensors — Powertrain Management, page 4.12.

13. Using a 5 mm hex wrench, remove the four fasteners ⑧ securing the hard hydraulic lines to the RH frame down tube and engine case.



ENGINE / COOLING / EXHAUST

14. Using an 8 mm hex wrench, remove the remaining two fasteners ⑨ from the RH frame down tube and remove.

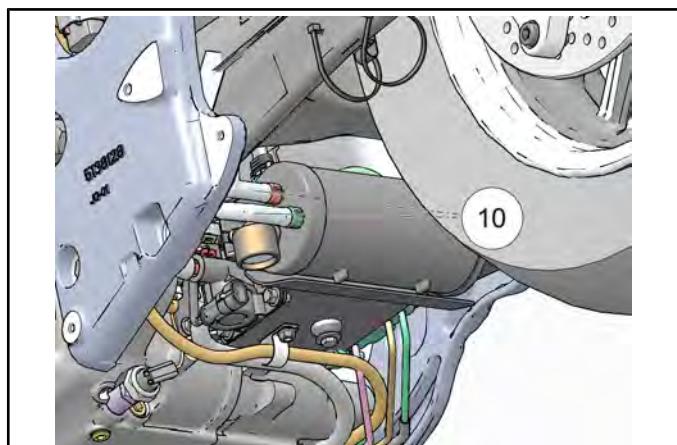


15.

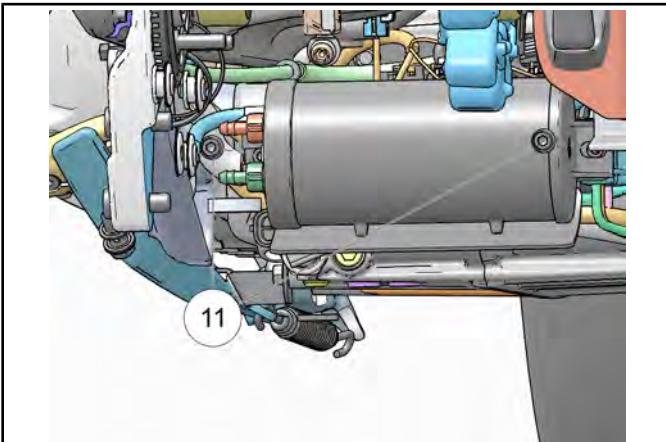
NOTE

STEPS 15–17 APPLICABLE TO CA AND INTERNATIONAL MODELS ONLY.

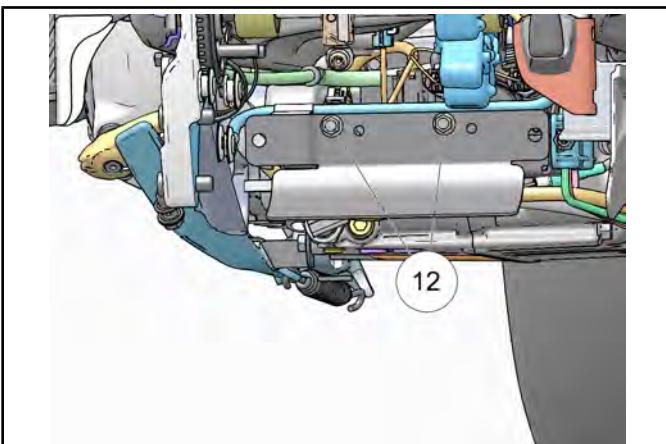
Noting position, disconnect hoses ⑩ from the charcoal canister.



16. Using a 5 mm hex wrench, remove the two fasteners ⑪ securing the charcoal canister to the bracket. Remove canister.



17. Remove the two fasteners ⑫ securing the charcoal canister mounting bracket to the ABS bracket.



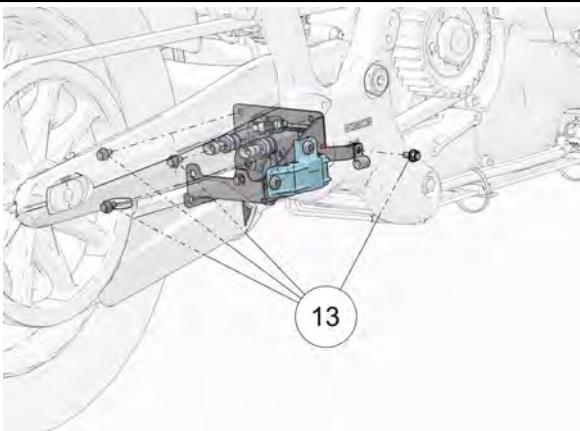
18. Disconnect the main ABS electrical connector and two brake switch connectors from the ABS Module.

19.

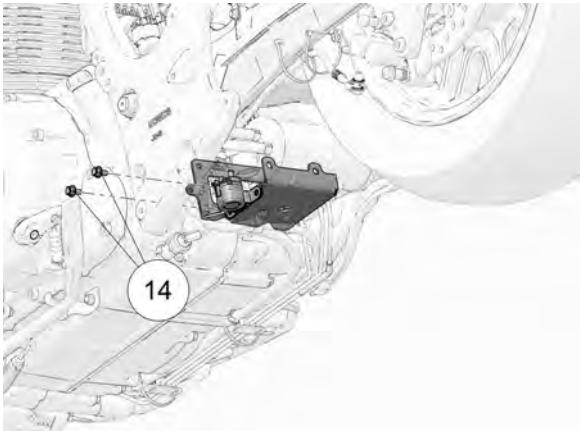
NOTE

It is not necessary to remove the hydraulic lines from the ABS module during engine removal.

Remove the four fasteners ⑬ from the ABS bracket.

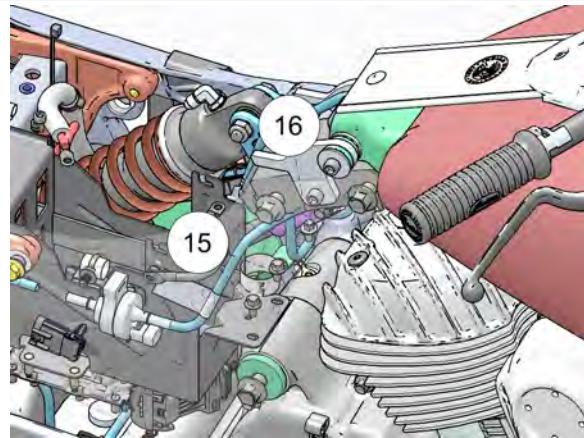


20. Remove the two fasteners ⑭ securing the starter solenoid to the ABS bracket.



21. Move the ABS Module / bracket and hydraulic brake lines far enough away from the RH side of the engine so that the engine can be lowered slightly.

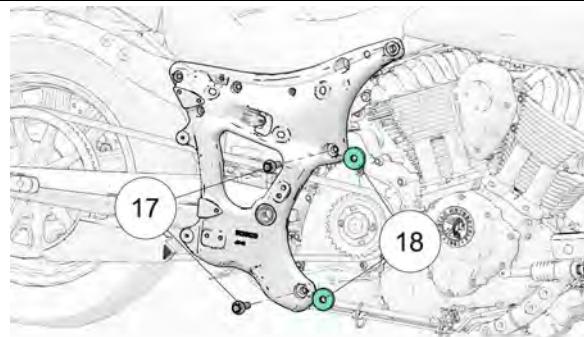
22. Remove the two fasteners ⑮ securing the battery tray to the engine and the grounding fastener ⑯ from the engine case.



3

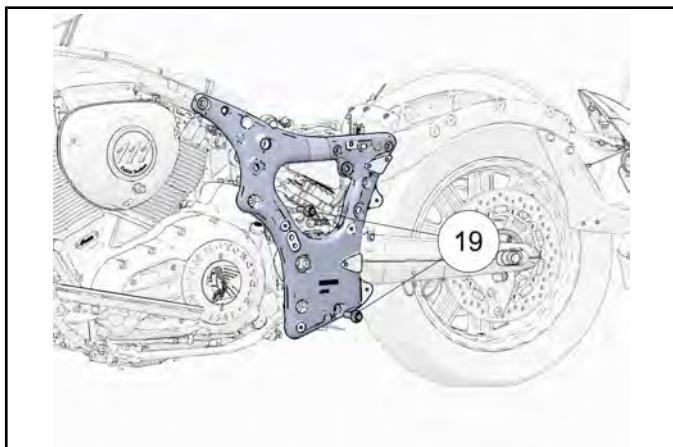
23. Working from the RH side, using a 16 mm socket, remove the two fasteners ⑰ securing the rear of the motor to the frame side panel.

24. Using a pick tool, remove the two spacers ⑱ from the RH side of the engine between the frame panel and engine mounts.



ENGINE / COOLING / EXHAUST

25. Working from the LH side of the motorcycle, remove the two fasteners ⑯ securing the rear of the engine to the LH frame panel.



26. Push engine slightly to the RH side to free up from alignment dowels. With an assistant, lower the engine from the frame and remove from vehicle.

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 Engine Brackets / Fasteners, page 3.9 in this chapter for torque values and assembly views.

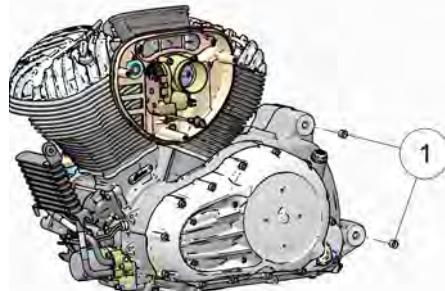
CAUTION

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.

IMPORTANT

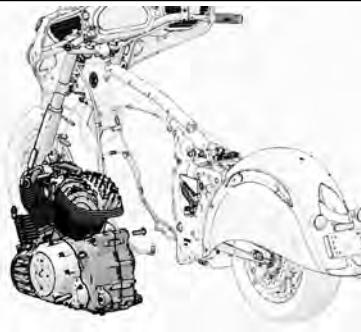
Be sure alignment dowels are in place in the LH rear engine mounts prior to installation.

- Clean mating surfaces of frame and engine crankcase. Install alignment dowels ①.



- Place motorcycle in an upright position with the front wheel clamped in a wheel vise.

- Position the engine on a platform jack to the left of the motorcycle and slide into position so the engine is orientated correctly front to back.



- Slide the engine back until the rear mounting ears are aligned with the mounting holes in the frame side panels. Adjust height of engine as needed to align rear mounts and dowel pins.
- Slide the engine towards the LH frame panel until the dowel pins are fully seated.



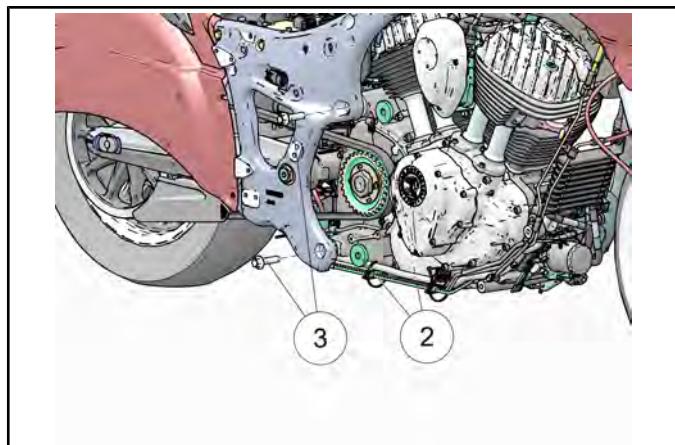
- Be sure all wiring and hoses are properly routed before installing rear spacers and mounting fasteners.
- Install the two engine mounting fasteners into the LH frame panel and tighten until the engine is fully drawn into the frame panel. **Do not torque fasteners at this time.**

CAUTION

Be sure engine is aligned at the proper height and angle with the dowel pins. DO NOT force engine alignment using the mounting fasteners, or the dowel pins may be damaged! Adjust engine height and angle continuously as required while drawing up the fasteners.

ENGINE / COOLING / EXHAUST

8. Working on the RH side of the engine, slide the spacers ② into position between the RH frame panel and the engine crankcase.
9. Install the two engine mounting fasteners ③ into the RH frame panel, through the spacers and torque to specification. See Engine Brackets / Fasteners, page 3.9.

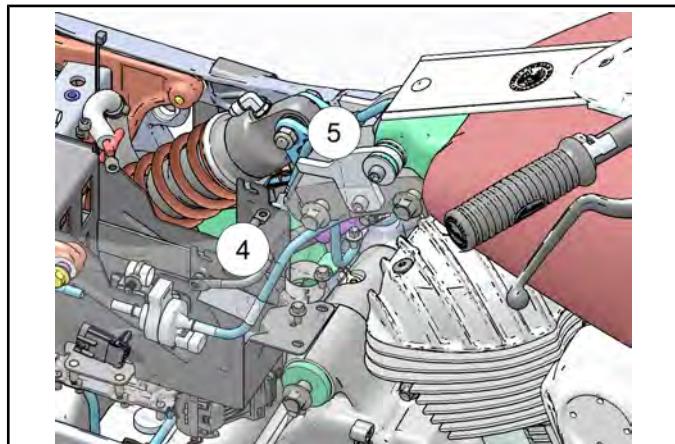


10. Torque the left hand rear engine mounting fasteners to specification.

TORQUE

Rear Engine Mounting Fasteners: **75 ft-lbs (102 Nm)**

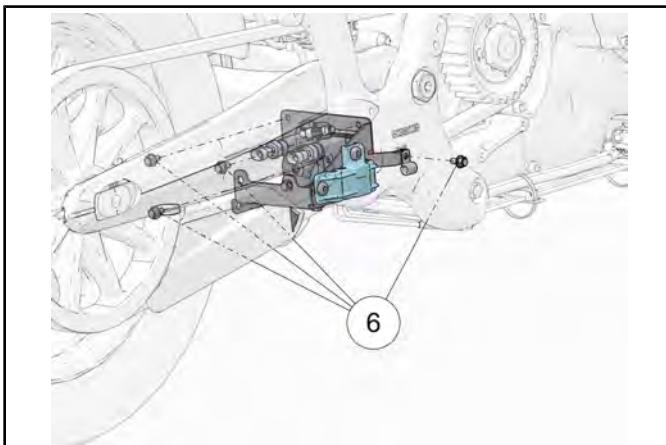
11. Install the two fasteners ④ securing the battery box to the engine and the grounding wire fastener ⑤ and torque to specification.



TORQUE

Battery Box Fasteners: **84 in-lbs (10 Nm)**
Grounding Wire Fastener: **84 in-lbs (10 Nm)**

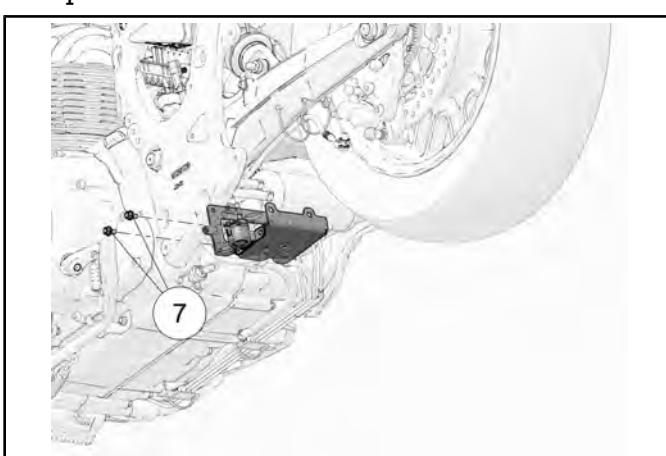
12. Install the four fasteners ⑥ securing the ABS module bracket to the rear of the engine and torque to specification.



TORQUE

ABS Module Bracket Fasteners: **84 in-lbs (10 Nm)**

13. Reconnect the main connector and brake switch connectors to the ABS module.
14. Install the two fasteners ⑦ securing the starter solenoid to the ABS bracket and torque to specification.



TORQUE

Starter Solenoid Mounting Fasteners: **84 in-lbs (10 Nm)**

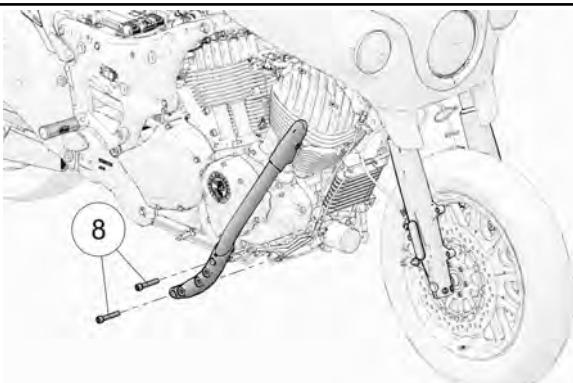
15. If applicable, install the mounting bracket and charcoal canister to the back of the ABS module bracket and reconnect vapor hoses.

16.

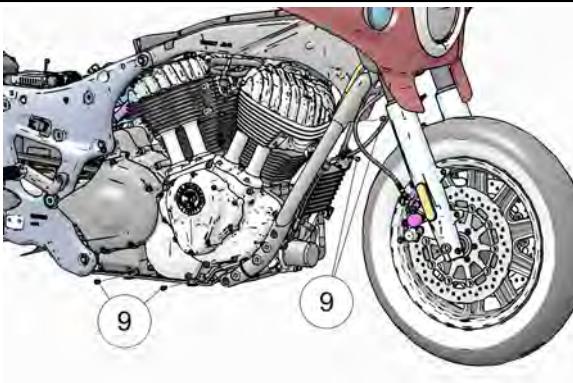
NOTE

Pay attention to brake line routing while installing the RH down tube. The brake line with a 90° bend above the oil cooler should run forward of the down tube while the brake line running up toward the head tube runs to the rear of the down tube.

Place the RH frame down tube in position and install the lower two fasteners ⑧ to the engine case and torque to specification. See Engine Brackets / Fasteners, page 3.9.



17. Using a 5 mm hex wrench, install the four fasteners ⑨ securing the hard hydraulic brake lines to the engine case and RH down tube and torque to specification.

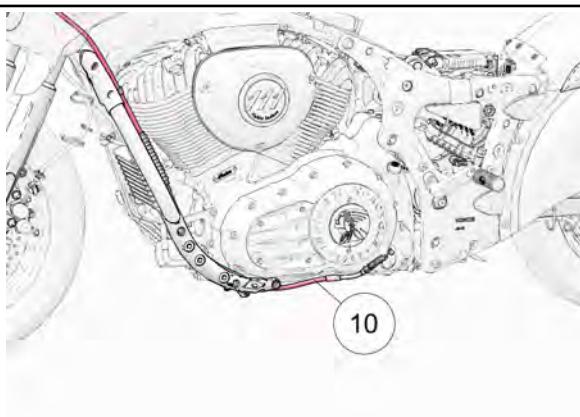
**TORQUE**

Brake Line Mounting Fasteners: 84 in-lbs (10 Nm)

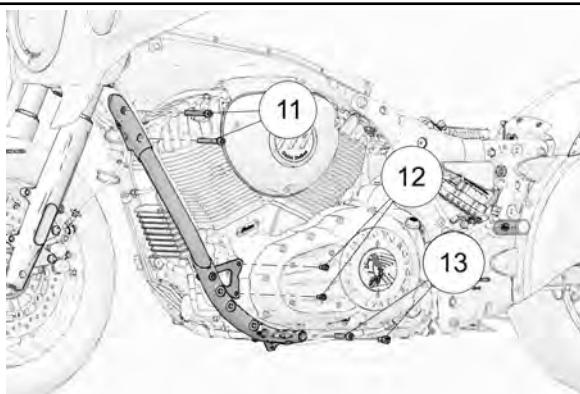
18. Install the starter motor. See Starter Motor, Removal / Installation, page 10.25.

19. Install the regulator / rectifier mounting bracket and the regulator / rectifier. See Rectifier / Regulator Replacement, page 10.33

20. Place the LH frame down tube in position on the motorcycle with the clutch cable ⑩ properly routed.

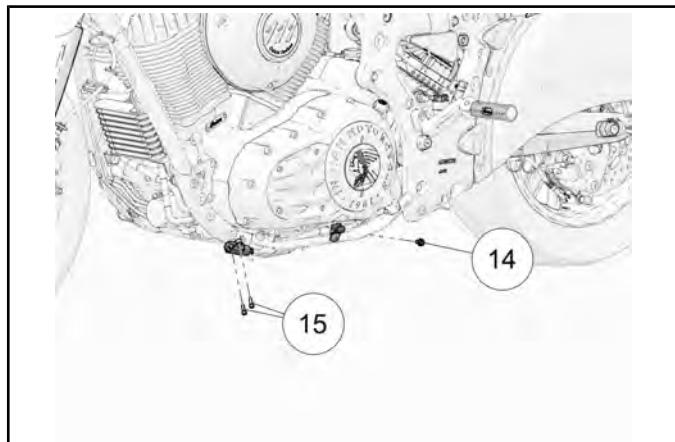


21. Install the two fasteners ⑪, two fasteners ⑫ and two fasteners ⑬ securing the LH down tube to the motorcycle and torque to specification. See Engine Brackets / Fasteners, page 3.9.



ENGINE / COOLING / EXHAUST

22. Install side stand bumper fastener **⑯** and side stand switch fasteners **⑯** and torque to specification.



TORQUE

Side Stand Bumper Fastener: **84 in-lbs (10 Nm)**
Side Stand Switch Fasteners: **43 in-lbs (5 Nm)**

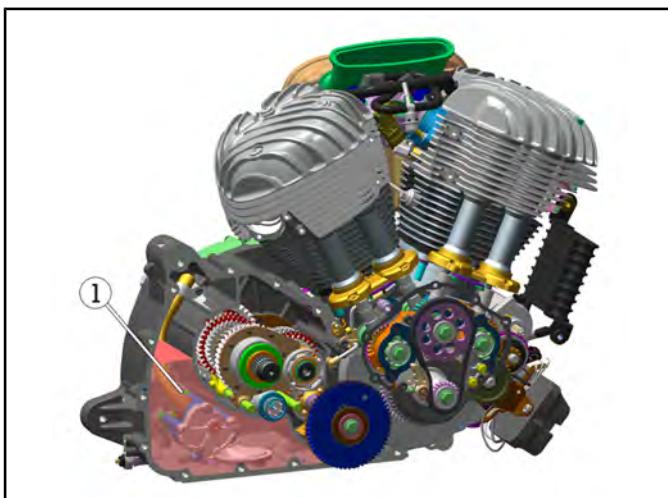
23. Connect the gear position switch, side stand switch and oil pressure switch. See Sensors — Powertrain Management, page 4.12.
24. Install the oil cooler to the frame. See Oil Cooler Installation, page 3.31.
25. Working on the RH side of the motorcycle, route the fuel injector harness down through the fuel distribution line (fuel rail) and reconnect the fuel injectors, TMAP sensor, CHT sensor and knock sensor. See Sensors — Powertrain Management, page 4.12.
26. Install the air cleaner assembly and throttle body. See Air Box Installation, page 3.5.
27. Fit the drive belt over the drive sprocket and set belt tension / wheel alignment. See Drive Belt Adjustment, page 2.31.
- 28. Remove motorcycle from wheel vise and place on side stand for remainder of engine installation procedure.**
29. If equipped, install the highway bar. See Highway Bar Installation, page 7.24.
30. Install front fender. See Front Fender Installation, page 7.27.
31. Install the LH and RH floorboard assemblies. See Floorboard (Driver), Installation, page 7.19.
32. Install ignition coil and cover. See Ignition Coil Removal / Installation, page 10.40.
33. Install the sprocket cover. See Drive Sprocket Cover, Removal / Installation, page 8.48.
34. Install the complete exhaust system. See EXHAUST SERVICE.
35. Install the lower side covers. See Side Cover (Lower), Removal / Installation, page 7.17.
36. Install the battery. See Battery Installation, page 10.13.
37. Install the fuel tank. See Fuel Tank Installation, page 4.19.
38. Install the seat. See Seat, Removal / Installation - Classic / Vintage / Chieftain, page 7.21.
39. Install the upper side covers. See Side Cover (Upper), Removal / Installation, page 7.17.
40. Install new oil filter and fill engine to proper level with Indian Motorcycle engine oil.
41. Check operation of all cables and controls and adjust as necessary.
42. Add fuel to fuel tank and prime fuel system.
43. Start engine and set oil to proper level.
44. Pump front brake lever and rear brake pedal to seat pads against disc. Test brakes to be sure operation and pedal pressure are normal. Bleed brake system if necessary.
45. Test ride motorcycle and check all systems for proper operation.
46. When test ride is completed, check entire vehicle and engine for fluid leaks and be sure all fasteners have been properly torqued.
47. Inspect oil level and adjust if necessary.

LUBRICATION / COOLING

GENERAL INFORMATION

SERVICE NOTES

The Thunderstroke 111 uses a semi-dry sump lubrication system. The engine oil is housed in a separate chamber within the engine cases ① as shown in the image below.



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

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

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Oil Pressure Gauge	PV-43531

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

ENGINE / COOLING / EXHAUST

TORQUE SPECIFICATIONS

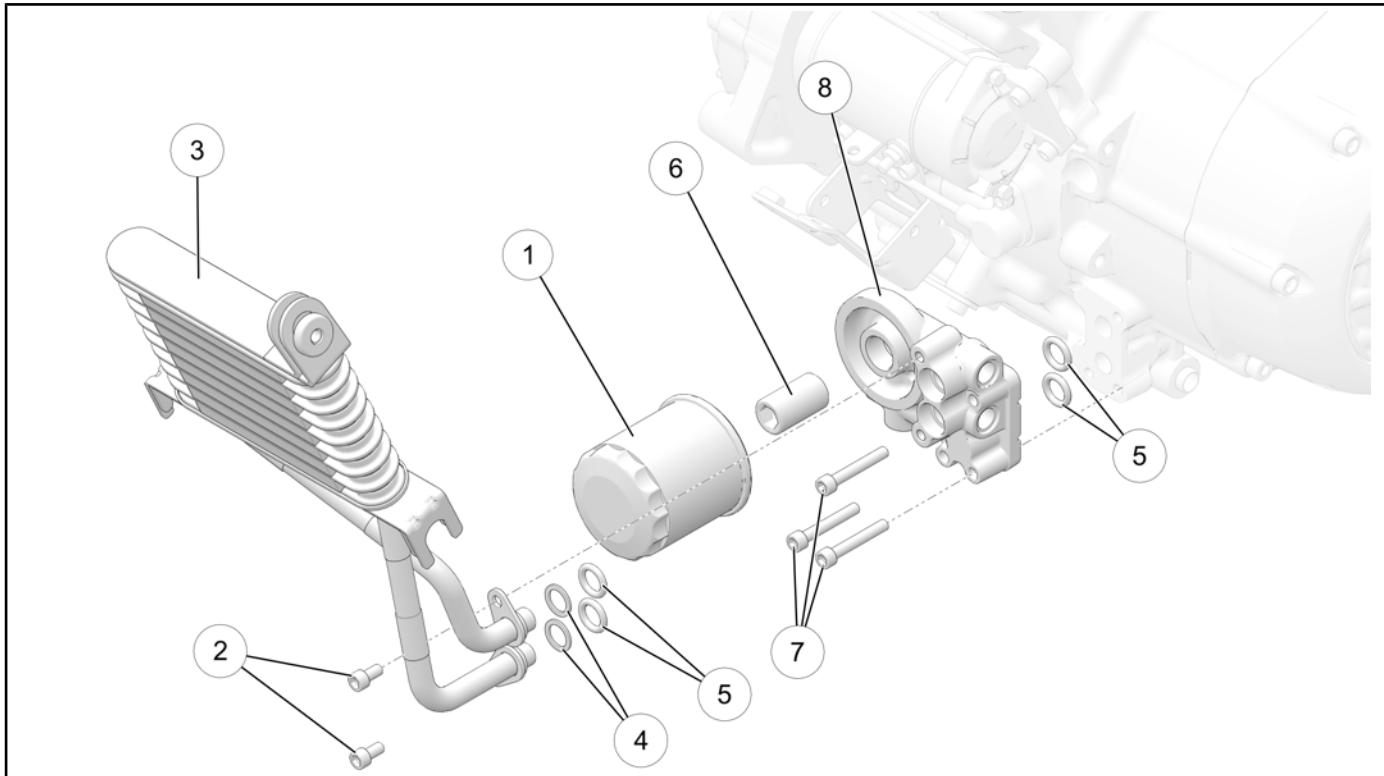
PART DESCRIPTION	TORQUE SPECIFICATION
Cylinder Head Temperature Sensor (CHT) - (Install new if removed)	71 in-lbs (8 Nm)
Oil Cooler Line Flange Fittings - Supply and Return	84 in-lbs (10 Nm)
Oil Drain Plugs - Scavenge and Oil Tank	15 ft-lbs (20 Nm)
Oil Filter (Apply oil to filter seal)	Approximately 3/4 turn after sealing ring has contacted the filter adapter.
Oil Filter Fitting to Oil Filter Adapter	22 ft-lbs (30 Nm)
Oil Filter Adapter to Crankcase	88 in-lbs (10 Nm)
Oil Pickup Screen to Oil Pump	88 in-lbs (10 Nm)
Oil Pressure Sensor	88 in-lbs (10 Nm)
Oil Pressure Sensor Adapter	15 ft-lbs (20 Nm)
Oil Pump to Crankcase	88 in-lbs (10 Nm)
Oil Scavenge Inlet Screen	88 in-lbs (10 Nm)
Oil Scavenge Tube to Oil Pump and Engine Case	88 in-lbs (10 Nm)

SERVICE SPECIFICATIONS

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.	5.5 U.S. qts (5.2 Liters)	Not Applicable
Engine Oil Capacity (At Change without Filter) Follow the oil change procedure outlined in the Maintenance chapter.	5.4 U.S. qts (5.1 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)

ASSEMBLY VIEWS

OIL COOLER

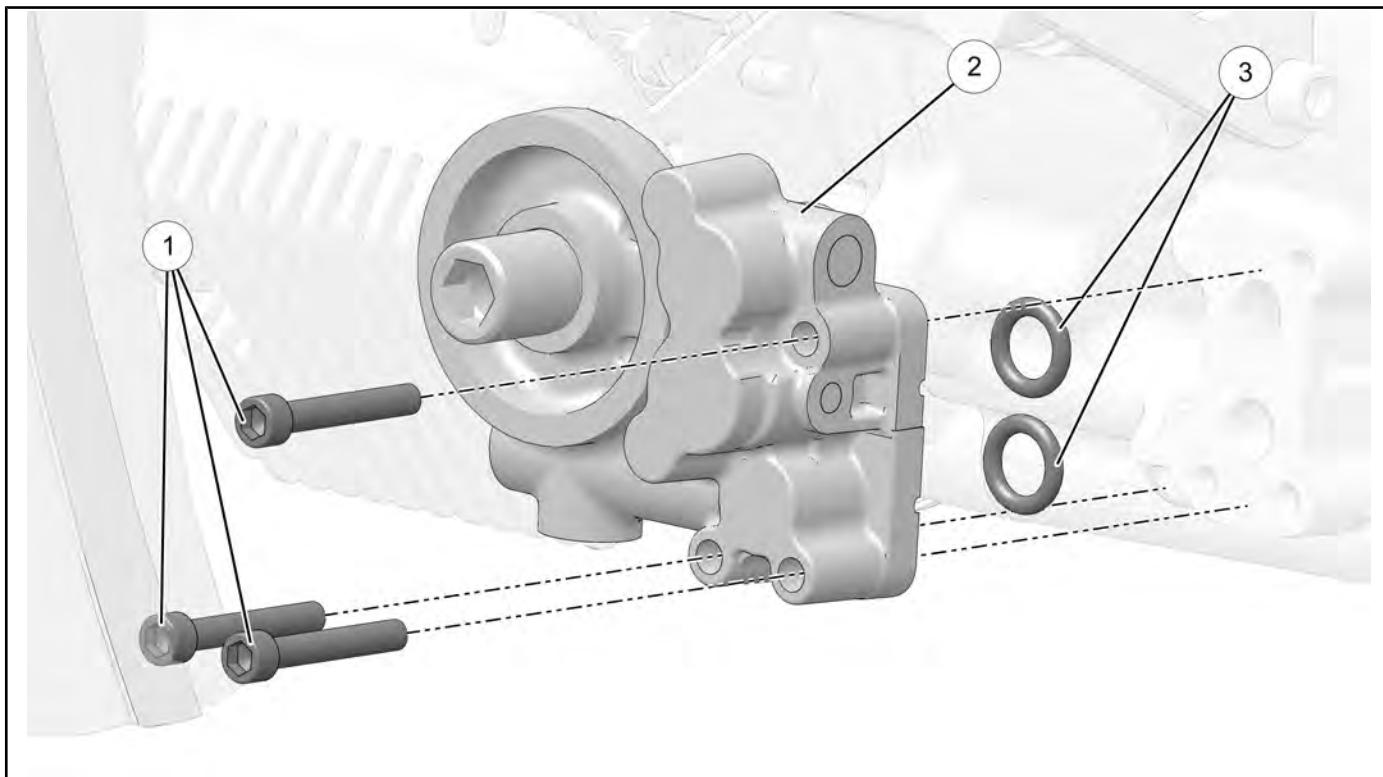


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NOTE

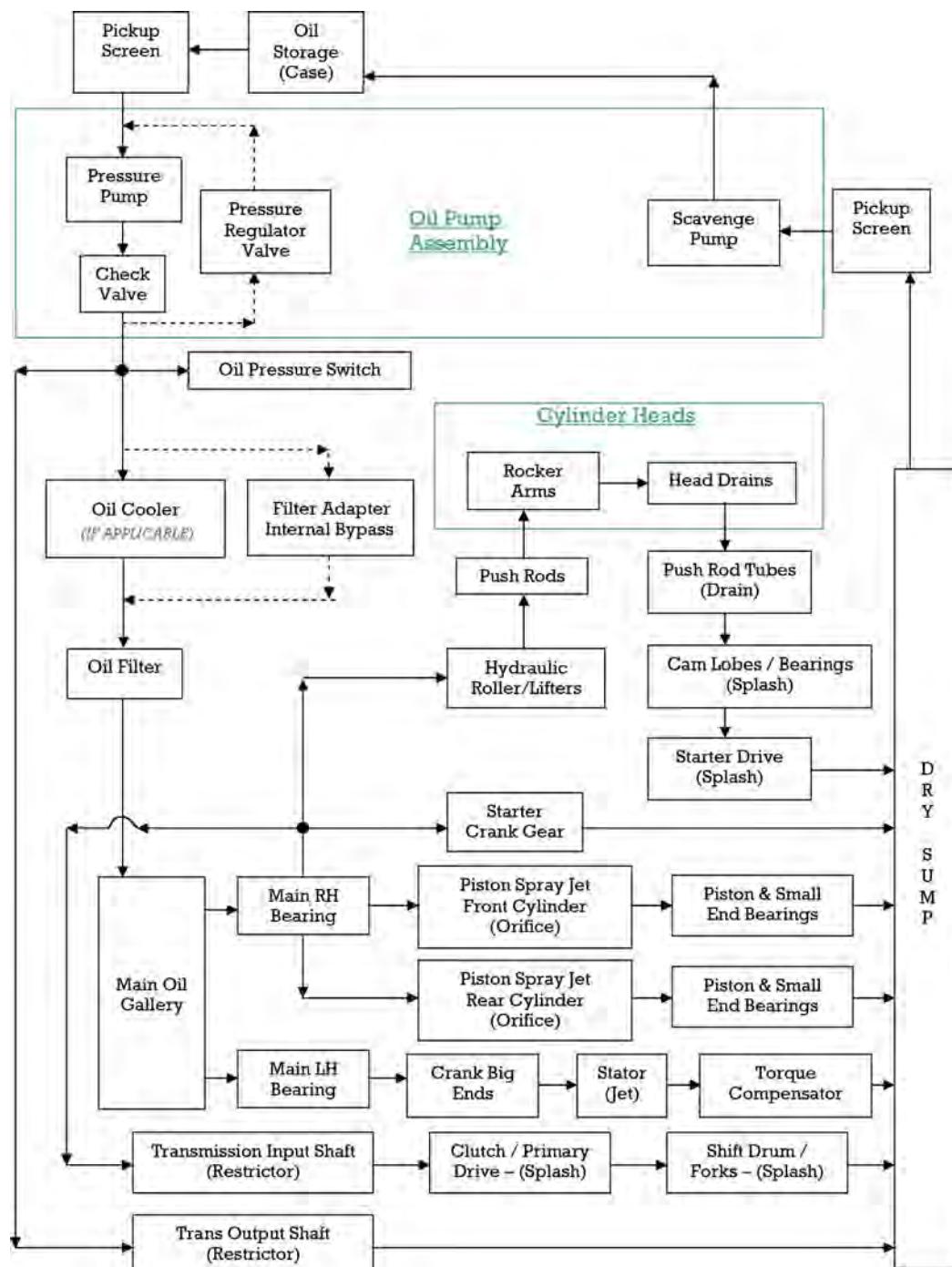
This system only applies to certain models. See Oil Flow Diagram, page 3.25 for list of affected models.

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Oil Filter (Apply oil to filter seal)	Approximately 3/4 turn after sealing ring has contacted the filter adapter.
②	Fastener, Oil Cooler Pipes - M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)
③	Oil Cooler Assembly	-
④	Backing Ring, O-ring	-
⑤	O-ring, Oil Cooler	-
⑥	Fitting, Oil Filter	22 ft-lbs (30 Nm)
⑦	Fastener, Oil Filter Adapter - M6 x 1.0 x 40 (QTY.3)	88 in-lbs (10 Nm)
⑧	Oil Filter Adapter Assembly	-

FILTER ADAPTER

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Oil Filter Adapter - M6 x 1.0 x 40 (QTY.3)	88 in-lbs (10 Nm)
②	Oil Filter Adapter Assembly	—
③	O-ring, Oil Cooler	—

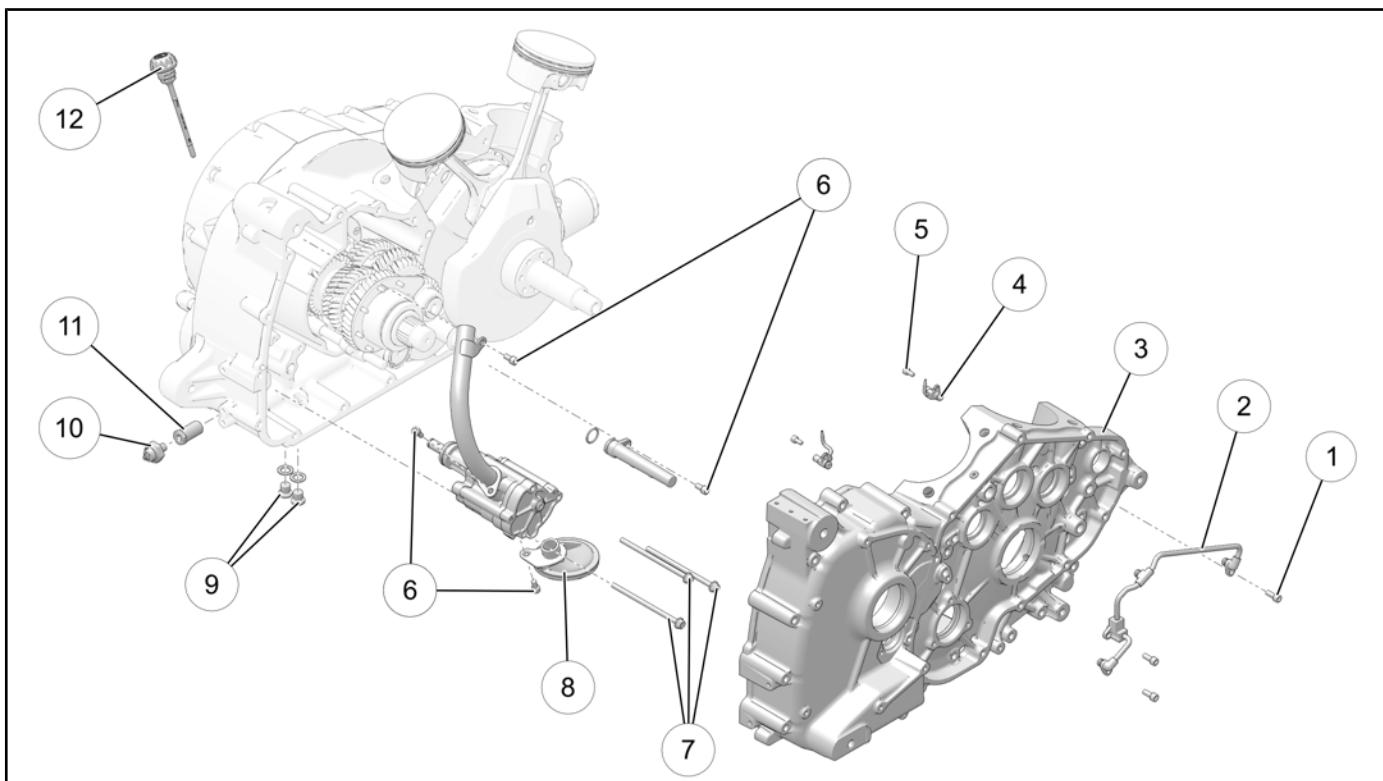
OIL FLOW DIAGRAM



OIL COOLER	FILTER ADAPTER INTERNAL BYPASS
<ul style="list-style-type: none"> • Chieftain Dark Horse • Chieftain • Roadmaster 	<ul style="list-style-type: none"> • Chief Classic • Chief Vintage • Chief Dark Horse • Springfield

ENGINE / COOLING / EXHAUST

LUBRICATION SYSTEM



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Oil Feed Pipe - M6 x 1.0 x 15 (QTY.3)	84 in-lbs (10 Nm)
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 Nm)
⑥	Fastener - M6 x 1.0 x 12 (QTY.3)	88 in-lbs (10 Nm)
⑦	Fastener, Oil Pump - M6 x 1.0 x 115 (QTY.3)	88 in-lbs (10 Nm)
⑧	Pickup Screen, Oil Pump	—
⑨	Oil Drain Plugs, Scavenge and Oil Tank - M12 x 1.5 (QTY.2)	15 ft-lbs (20 Nm)
⑩	Oil Pressure Sensor	88 in-lbs (10 Nm)
⑪	Adapter, Oil Pressure Sensor	15 ft-lbs (20 Nm)
⑫	Dipstick, Oil	—

OIL PRESSURE INSPECTION

OIL PRESSURE

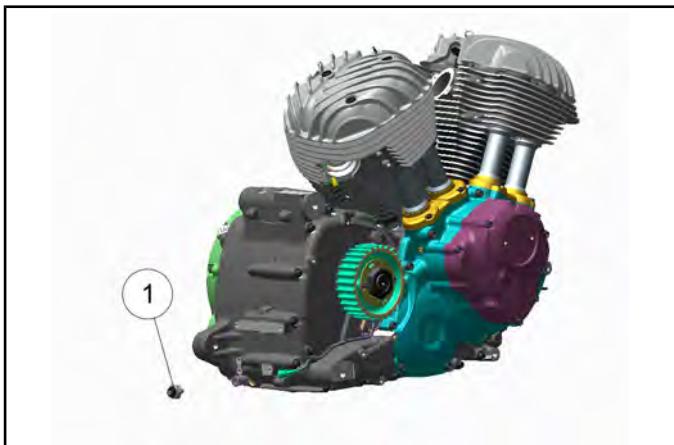
CAUTION

Use caution when working around hot engine oil.

NOTE

Oil pressure switch activates at 3 psi \pm 1 psi.

1. Start the engine and run until operating temperature is reached.
2. Turn the engine OFF.
3. Remove oil pressure sensor 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 3.21.
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.

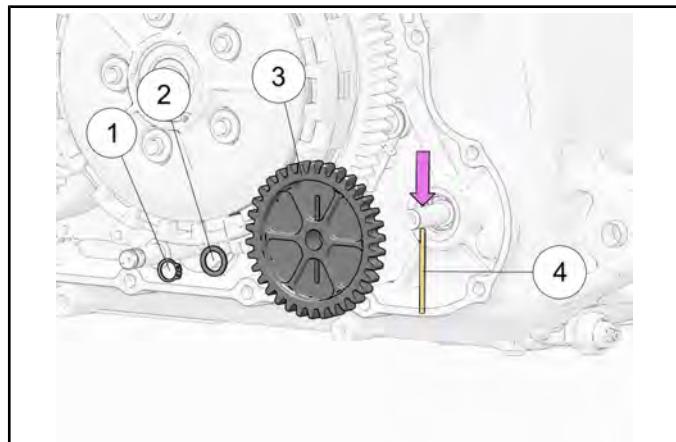
TORQUE

Oil Pressure Switch: **88 in-lbs (10 Nm)**

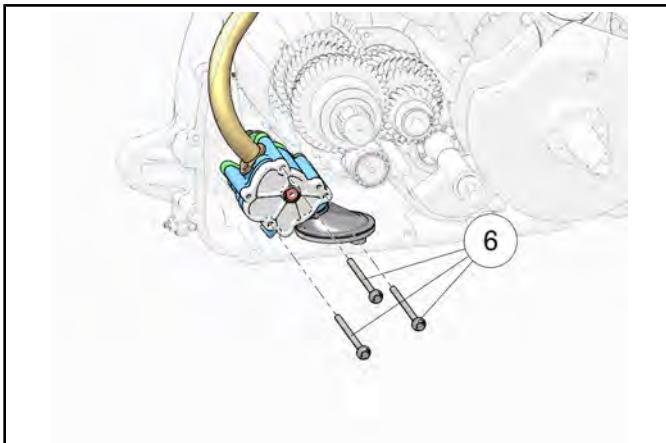
OIL PUMP SERVICE

OIL PUMP REMOVAL

1. Remove engine from frame. See Removing Engine From Frame, page 3.12.
2. Separate engine cases. See Crankcase Separation, page 6.23.
3. Remove external snap-ring ①, flat washer ②, oil pump drive gear ③, and drive pin ④ from oil pump input shaft.

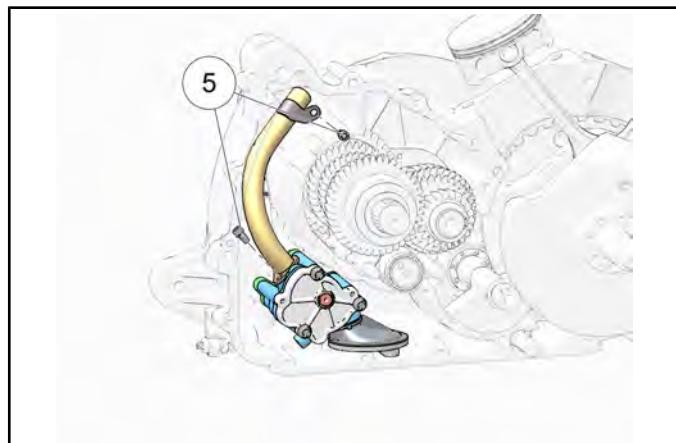


5. Remove the three fasteners ⑥ from the oil pump assembly.



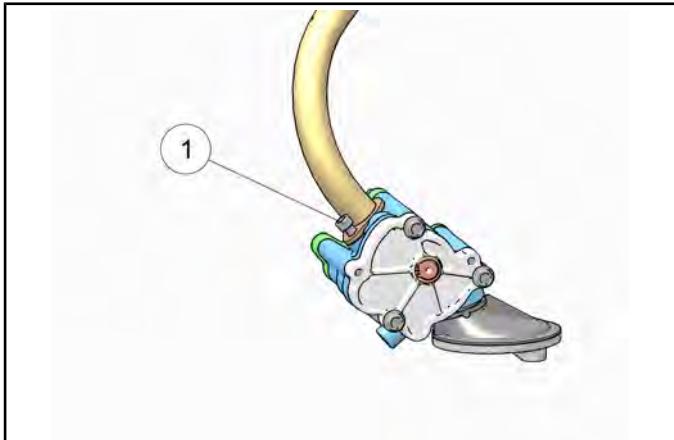
6. Remove the oil pump / snorkel tube assembly from the LH crankcase.

4. Remove the oil pump snorkel tube fasteners ⑤.

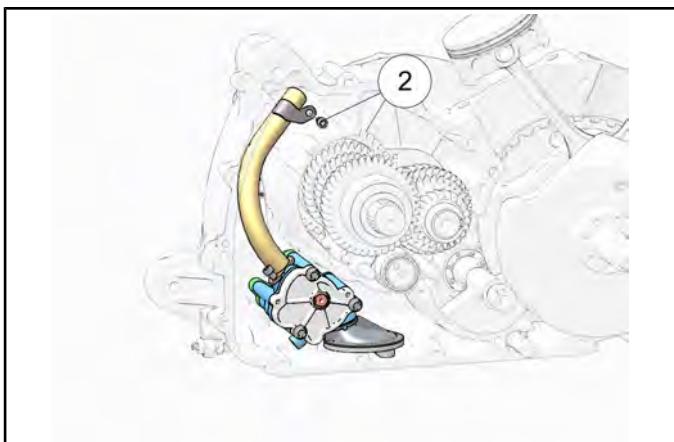


OIL PUMP INSTALLATION

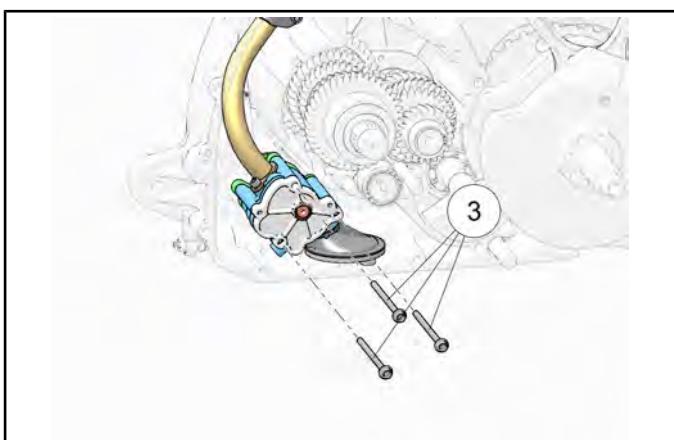
1. Clean oil pipe and dry with compressed air.
2. Loosely install the snorkel tube and fastener ① to the pump body.



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



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

**TORQUE**

Oil Pump Fasteners: 88 in-lbs (10 Nm)

5. Torque snorkel tube fasteners to specification.

TORQUE

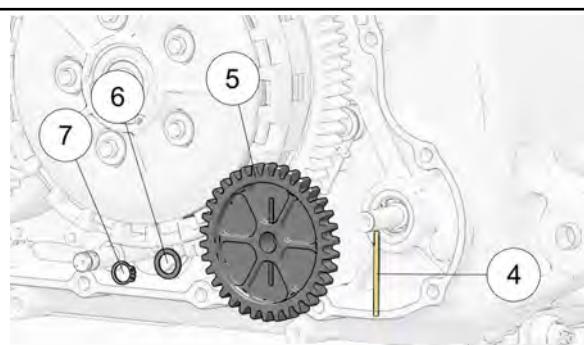
Snorkel Tube Fasteners: 88 in-lbs (10 Nm)

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

NOTE

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.

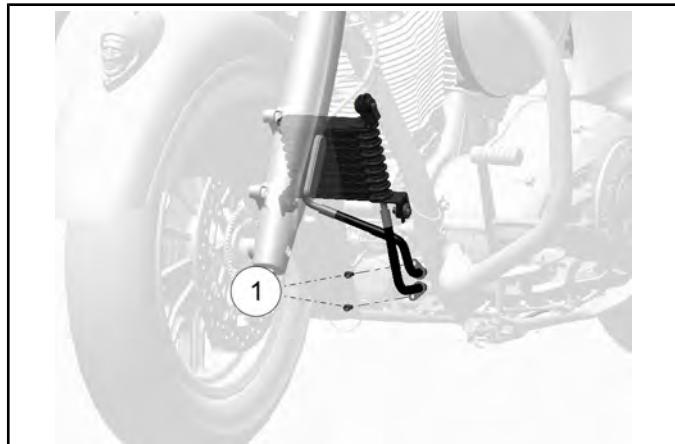


8. Assemble engine crankcase. See Crankcase Assembly, page 6.39.
9. Install engine in frame. See Engine Installation, page 3.17.
10. Verify engine oil pressure after assembly. See Oil Pressure, page 3.27.

OIL COOLER SERVICE

OIL COOLER REMOVAL

1. Place an oil pan beneath the oil filter adapter to catch any oil that drains out of the cooler assembly upon removal.
2. Remove the two fasteners ① securing the oil cooler lines to the oil filter adapter.

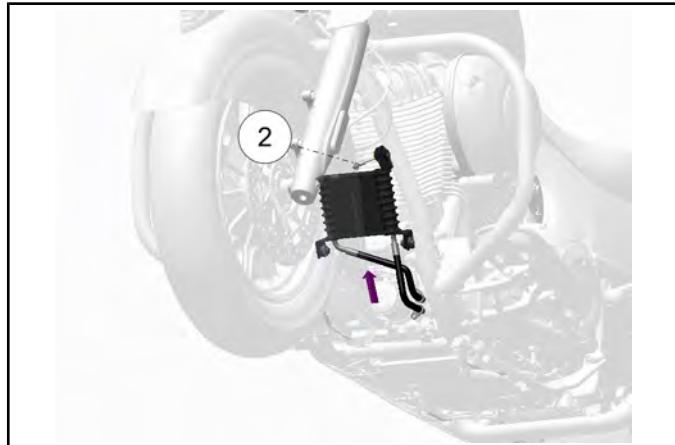


3. Pull the oil cooler lines out of the filter adapter.

NOTE

It may be necessary to gently pry between the oil cooler line flange and filter adapter using a plastic body tool to assist with removal.

4. Remove the upper oil cooler fastener ② and lift the lower cooler mounts off of the rubber isolators.



5. Remove the oil cooler assembly from the vehicle.

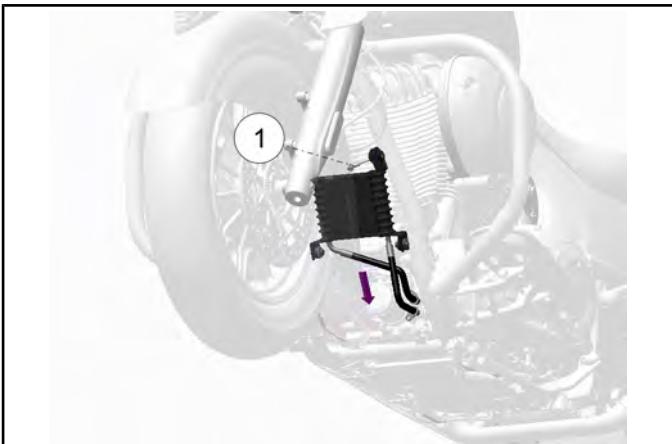
OIL COOLER INSPECTION

1. Inspect cooler, lines and all connection for leaks.
2. Inspect lines for proper routing. Replace if there is any sign of abrasion or damage.
3. Inspect cooler surface for obstructions or debris.
4. Rinse from back side to front with low pressure water.
5. Inspect oil cooler fins for deformation. Fins can be straightened if not severely deformed and no oil leaks are present.
6. Inspect cooler mounting fastener for proper torque.
7. Inspect mounting bracket and rubber grommets for cracks or damage.
8. Replace any damaged components.

OIL COOLER INSTALLATION

Inspect the o-rings and backup washers on both oil cooler lines for damage and replace if necessary.

1. Fit the lower oil cooler mounts into the rubber isolators located on the frame down tubes.
2. Install the upper oil cooler mounting fastener ① and torque to specification.

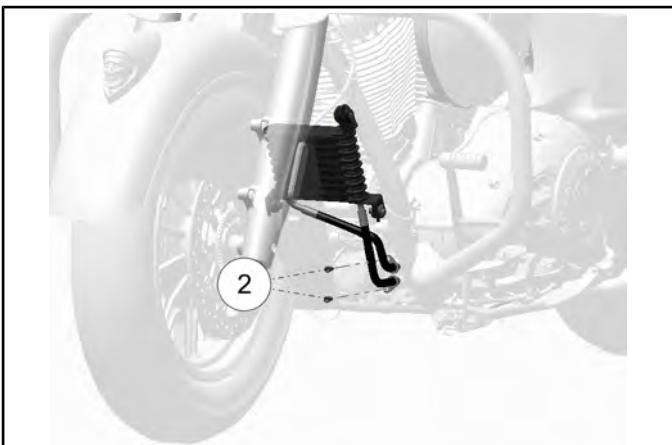


3

TORQUE

Oil Cooler Mounting Fastener: **84 in-lbs (10 Nm)**

3. Install the oil cooler lines into the oil filter adapter and torque flange fasteners ② to specification.

**TORQUE**

Oil Cooler Line Fasteners: **84 in-lbs (10 Nm)**

4. Run the engine to cycle oil through the oil cooler and check oil level. Top off if necessary.

CYLINDER HEAD / VALVES

GENERAL INFORMATION

The Thunder Stroke 111 uses 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

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

TORQUE SPECIFICATIONS

PART DESCRIPTION	TORQUE SPECIFICATION
Cam Chain Cover Fasteners — M6 x 1.0 x 40 (QTY.4) / M6 x 1.0 x 65 (QTY.6)	15 ft-lbs (20 Nm)
Camshaft Carrier Bearing Retainer Plate Fasteners — M5 x 0.8 x 12 (QTY.6)	62 in-lbs (7 Nm)
Camshaft Carrier Fasteners — M8 x 1.25 x 30 (QTY.3)	15 ft-lbs (20 Nm)
Camshaft to Carrier Bearing Fasteners, Exhaust — M10 x 1.5 x 40 (QTY.2)	52 ft-lbs (70 Nm)
Cam Chain Guide Fasteners — M6 x 1.0 x 40 (QTY.2)	71 in-lbs (8 Nm)
Cam Chain Tensioner Fastener — M8 x 1.25 x 40 (QTY.1)	15 ft-lbs (20 Nm)
Camshaft Sprocket Fastener, Intake (Timing Gear) — M10 x 1.5 x 40 (QTY.1)	52 ft-lbs (70 Nm)
Crankshaft Sprocket Fastener (Timing Gear) — M10 x 1.5 x 40 (QTY.1)	52 ft-lbs (70 Nm)
Cylinder Head Nut — M8 x 1.5 (QTY.8)	Step 1: 22 ft-lbs (30 Nm) Step 2: Back nuts off completely. Step 3: 40 ft-lbs (54 Nm)
Lifter Block Fasteners — M6 x 1.0 x 25 (QTY.6)	89 in-lbs (10 Nm)
Lifter Retaining Plate Fastener — M5 x 0.8 x 12 (QTY.2)	62 in-lbs (7 Nm)
Rocker Arm Fastener	22 ft-lbs (30 Nm)
Spark Plug	13 ft-lbs (17 Nm)
Valve Cover Fasteners, Inner — M6 x 1.0 x 20 (QTY.18)	89 in-lbs (10 Nm)
Valve Cover Fasteners, Outer — M6 x 12 x 14 (QTY.6)	89 in-lbs (10 Nm)

SERVICE SPECIFICATIONS**Camshaft Data**

	DESCRIPTION	SPECIFICATION
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
	Intake Valve Closes At 1 mm Lift	43.0° ABDC
	Exhaust Valve Opens At 1 mm Lift	44° BBDC
	Exhaust Valve Closes At 1 mm Lift	4° ATDC
	Max Lobe Lift INTAKE EXHAUST	(7.20 mm) (7.20 mm)

ENGINE / COOLING / EXHAUST

	DESCRIPTION	SPECIFICATION
	Max Valve Lift INTAKE EXHAUST	(12.8 mm) (12.8 mm)

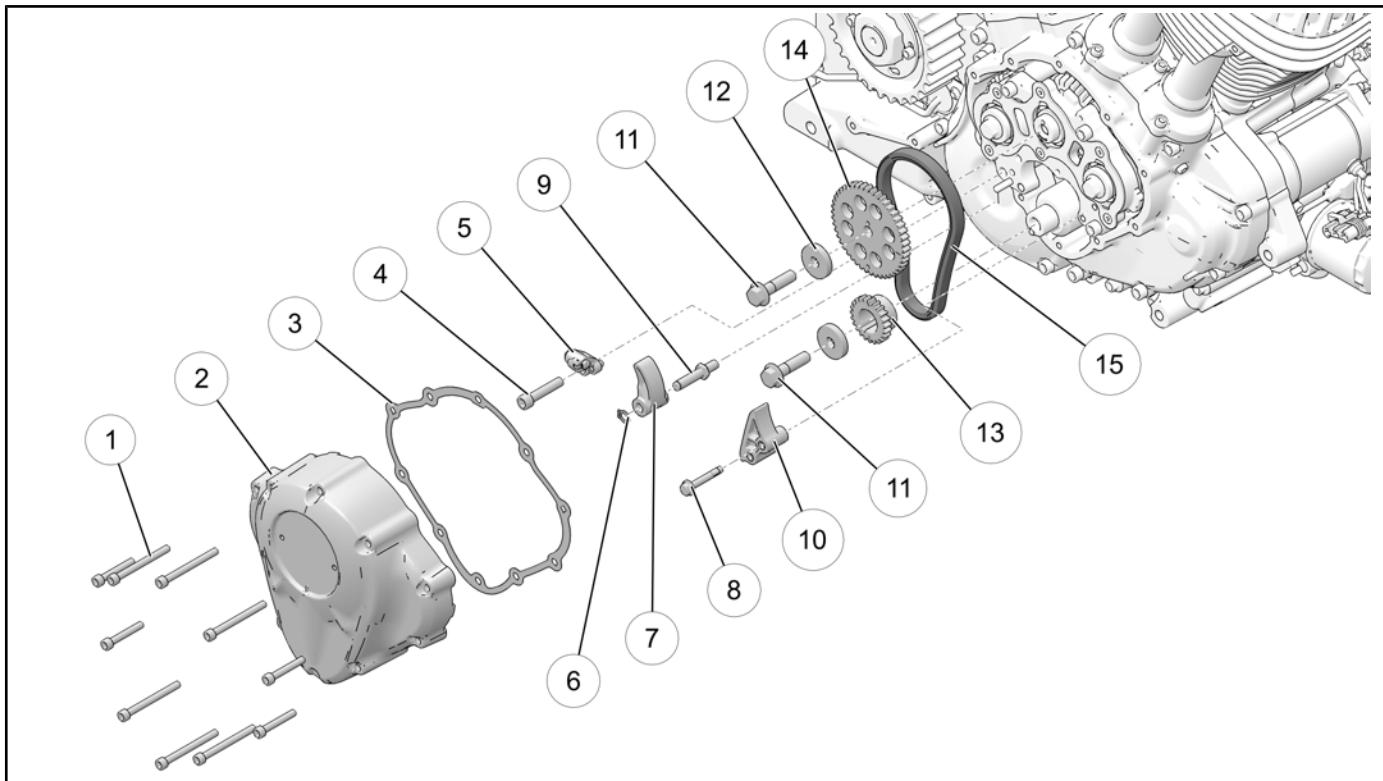
Cylinder Head & Valve Train Data

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	Free Length (INTAKE & EXHAUST)	2.20" (56.00 mm)	2.169" (55.10 mm)
	Intake Valve Maximum Lift	.504" (12.8 mm)	-
	Exhaust Valve Maximum Lift	.504" (12.8 mm)	-

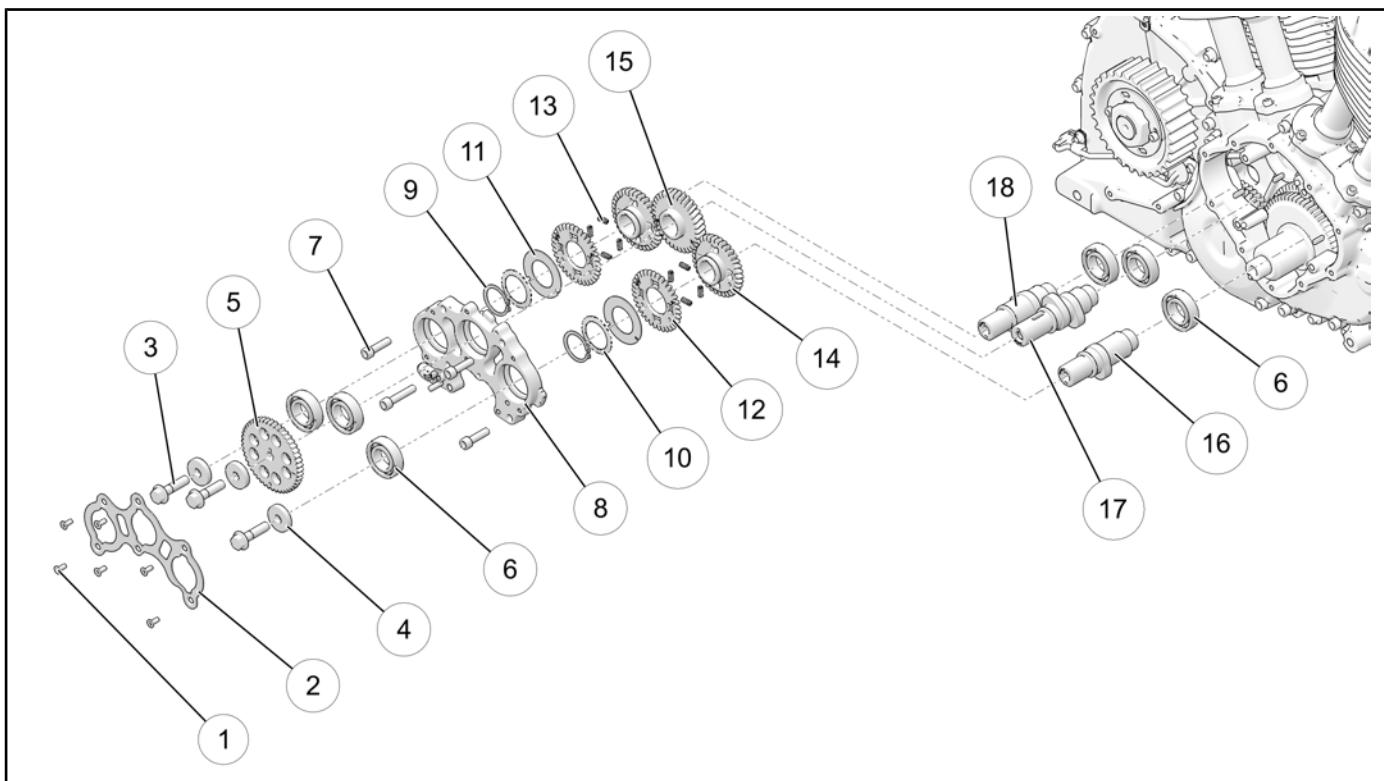
ENGINE / COOLING / EXHAUST

ITEM	STANDARD	SERVICE LIMIT
Spring Installed Height	1.929 - 2.007" (49.00 - 51.00 mm)	-

3

ASSEMBLY VIEWS**CAM CHAIN**

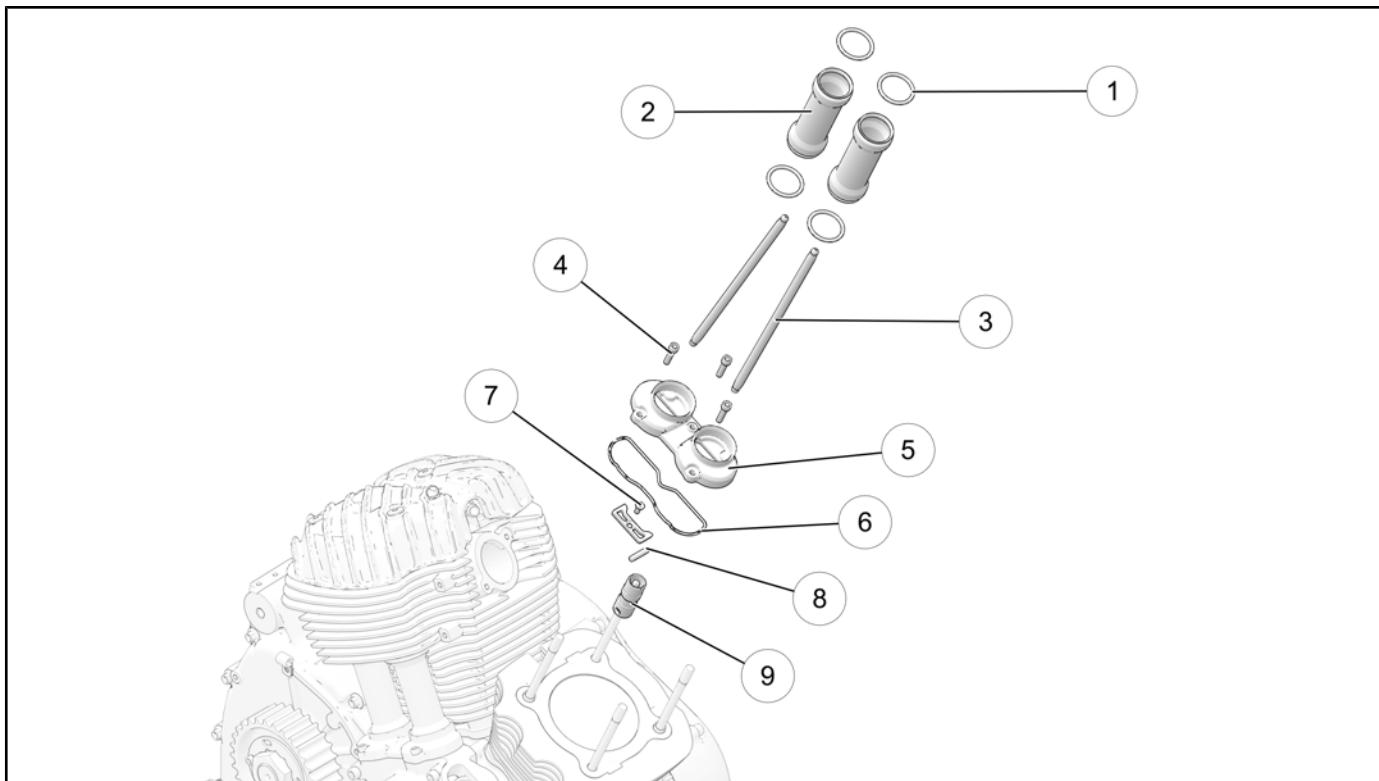
NUMBER	PART DESCRIPTION	TORQUE SPECIFICATIONS (IF APPLICABLE)
①	Fastener - M6 x 1.0 x 65 (QTY.6) / Fastener - M6 x 1.0 x 40 (QTY.4)	15 ft-lbs (20 Nm)
②	Cam Cover	-
③	Cam Cover Gasket	-
④	Fastener, Timing Chain Tensioner - M8 x 1.25 x 40 (QTY.1)	15 ft-lbs (20 Nm)
⑤	Tensioner, Timing Chain	-
⑥	Snap Ring, Tensioner Arm	-
⑦	Tensioner Arm, Timing Chain	-
⑧	Fastener, Timing Chain Guide - M6 x 1.0 x 40 (QTY.2)	71 in-lbs (8 Nm)
⑨	Pivot, Tensioner Arm	15 ft-lbs (20 Nm)
⑩	Guide, Timing Chain	-
⑪	Fastener, Timing Gear - M10 x 1.5 x 40 (QTY.2)	52 ft-lbs (70 Nm)
⑫	Washer, Timing Gear	-
⑬	Timing Gear, Crankshaft	-
⑭	Timing Gear, Camshaft (Intake)	-
⑮	Timing Chain	-

CAMSHAFTS

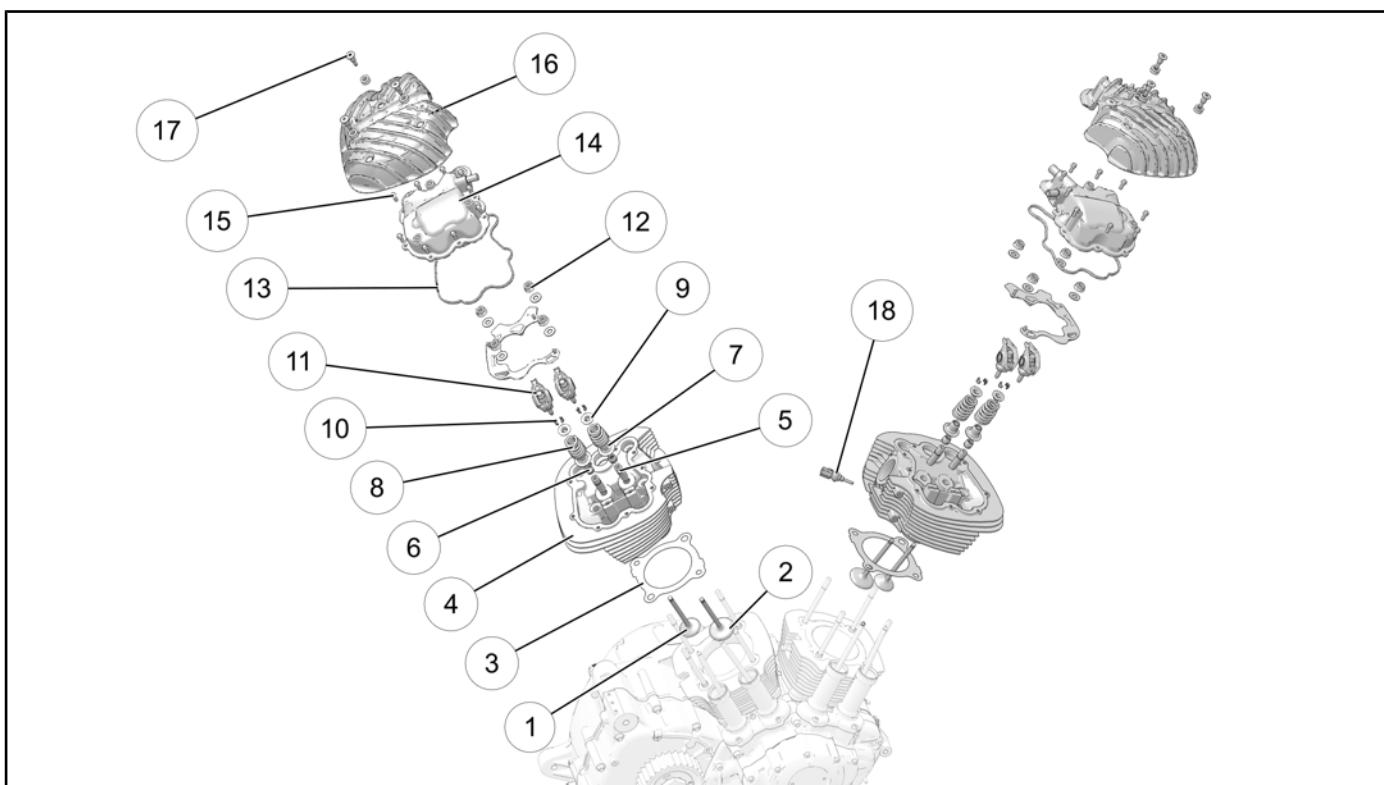
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NUMBER	PART DESCRIPTION	TORQUE SPECIFICATIONS (IF APPLICABLE)
①	Fastener, Bearing Retainer Plate - M5 x 0.8 x 12 (QTY.6)	62 in-lbs (7 Nm)
②	Retaining Plate, Cam Bearings	-
③	Fastener, Timing Gear - M10 x 1.5 x 40 (QTY.2) (Exhaust Camshafts)	52 ft-lbs (70 Nm)
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 Nm)
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)	-
⑰	Camshaft, Intake (Center)	-
⑱	Camshaft, Exhaust (Rear)	-

LIFTERS / PUSHRODS



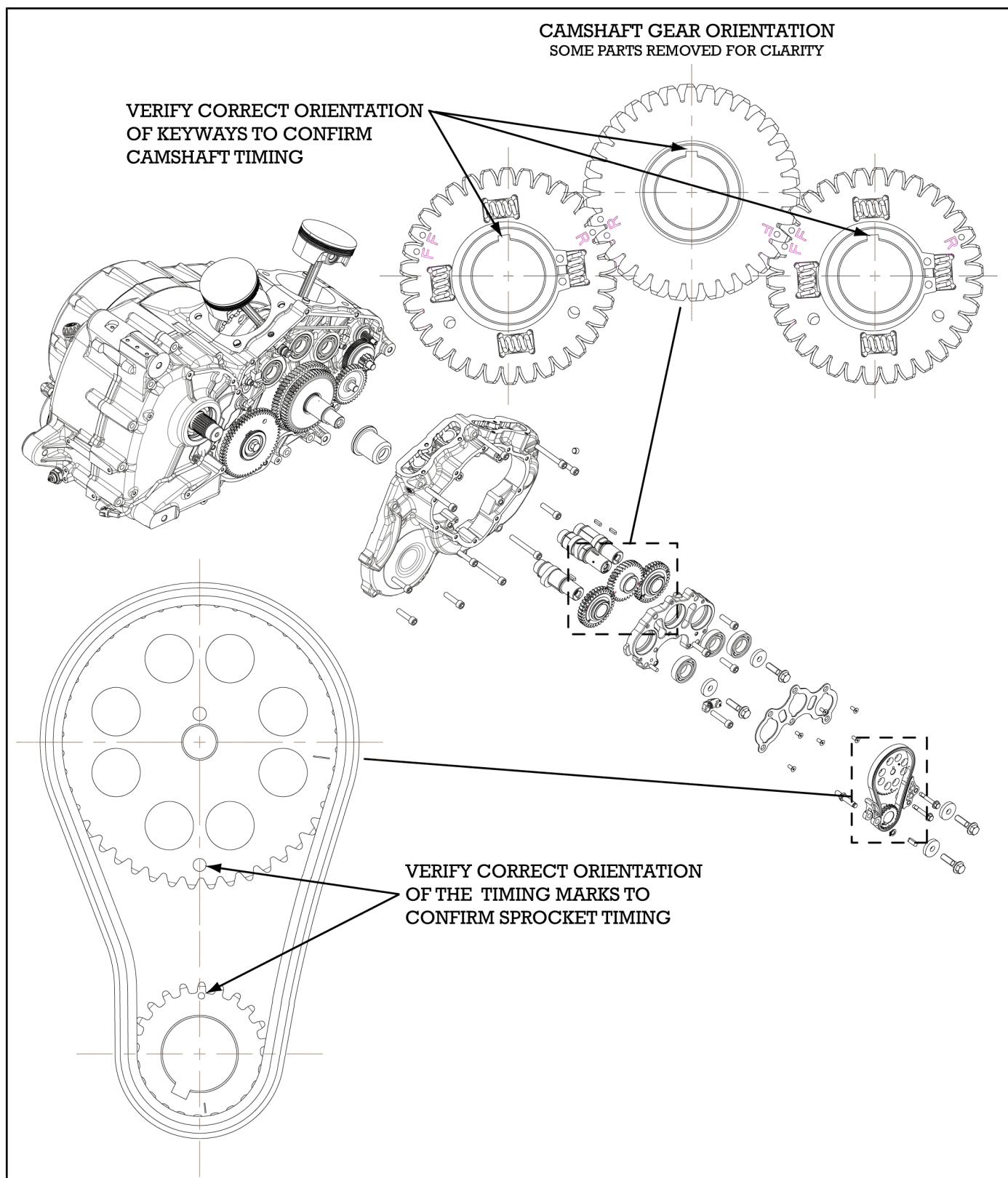
NUMBER	PART DESCRIPTION	TORQUE SPECIFICATIONS (IF APPLICABLE)
①	O-ring, Pushrod Tube	-
②	Pushrod Tube	-
③	Pushrod	-
④	Fastener, Lifter Block - M6 x 1.0 x 25 (QTY.3 per cylinder)	89 in-lbs (10 Nm)
⑤	Lifter Block	-
⑥	Gasket, Lifter Block	-
⑦	Fastener, Retaining Plate - M5 x 0.8 x 12 (QTY.1 per cylinder)	62 in-lbs (7 Nm)
⑧	Dowel, Lifter Guide	-
⑨	Lifter	-

CYLINDER HEAD

3

NUMBER	PART DESCRIPTION	TORQUE SPECIFICATIONS (IF APPLICABLE)
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 Nm)
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)	89 in-lbs (10 Nm)
⑯	Outer Valve Cover	-
⑰	Fastener, Outer Valve Cover - M6 x 12 x 15 (QTY.3)	89 in-lbs (10 Nm)
⑱	Cylinder Head Temperature Sensor (CHT)	71 in-lbs (8 Nm)

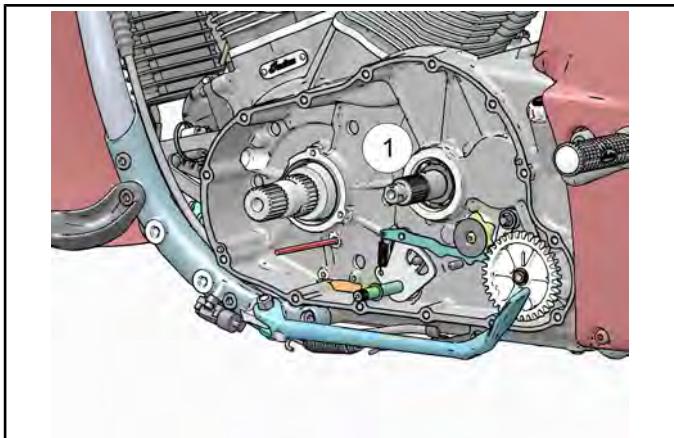
CAMSHAFT TIMING



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 2.23.
2. Remove the stator. See Stator Removal, page 10.30.
3. Using special service tool PF- 51239, rotate the crankshaft counterclockwise (primary side) until the front piston is at TDC. See Cylinder Head, page 3.39.
4. Lock the crankshaft by inserting a 5/16" pin punch (or equivalent) into the locking hole ①.

**NOTE**

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

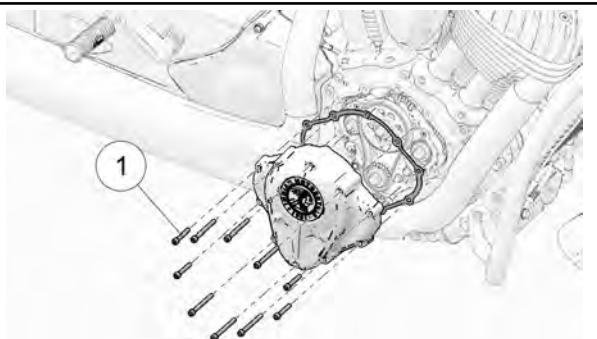
CAM CHAIN COVER REMOVAL / INSTALLATION

1. Remove the RH floorboard / master cylinder assembly and move out of the way. See Floorboard (Driver), Removal, page 7.18

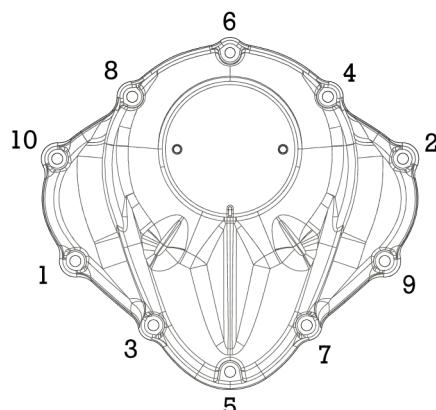
NOTE

The RH floorboard and rear brake master cylinder can be removed as an assembly. It is not necessary to disconnect the brake line from the master cylinder while performing this procedure.

2. Remove the ten fasteners ① securing the cam chain cover to the inner timing cover.



3. Remove the cam chain cover and gasket.
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.

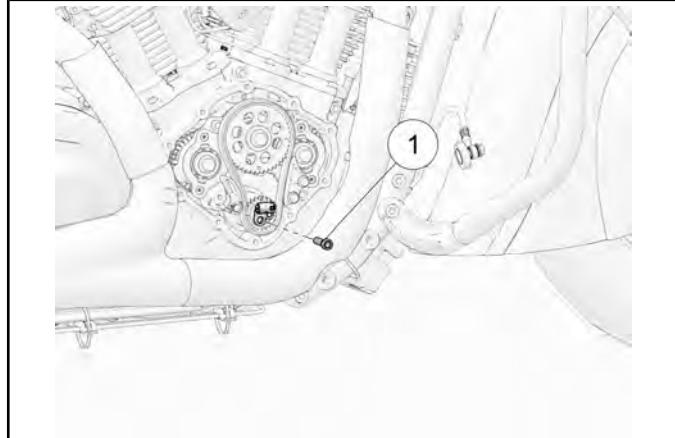
**TORQUE**

Cam Chain Cover Fasteners: 15 ft-lbs (20 Nm)

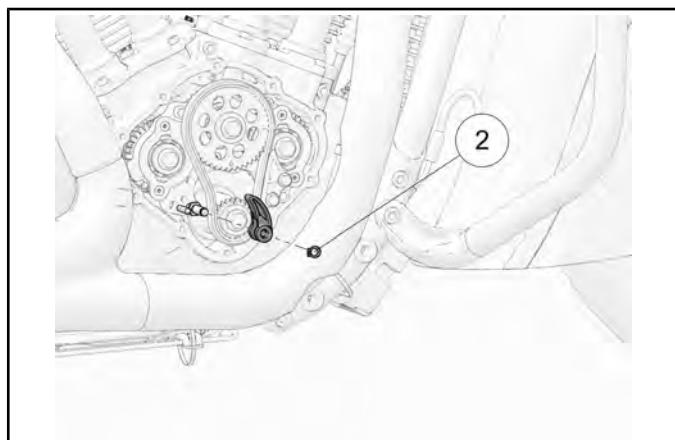
CAM CHAIN TENSIONER REMOVAL**CAUTION**

Do not rotate engine with tensioner(s) removed.

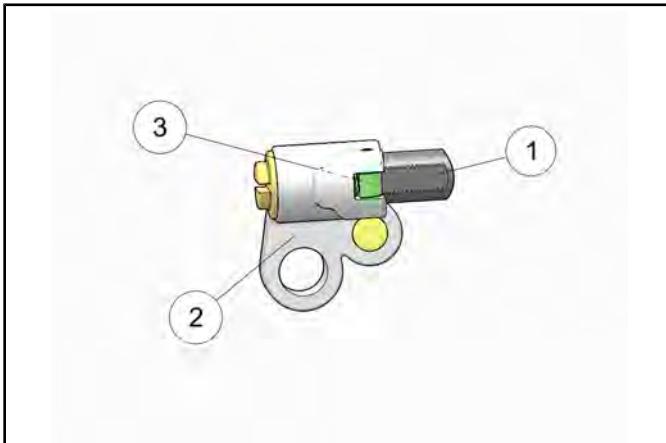
1. Remove the cam chain cover. See Cam Chain Cover, Removal / Installation, page 3.41.
2. Remove cam chain tensioner fastener ① and remove the cam chain tensioner.



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

**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.

CAM CHAIN TENSIONER INSTALLATION

1. Verify that the engine is at TDC and the timing marks are properly aligned. See Cylinder Head, page 3.39.
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.

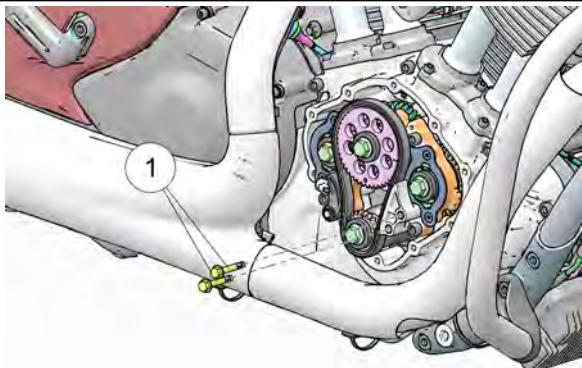
TORQUE

Tensioner Fastener: 15 ft-lbs (20 Nm)

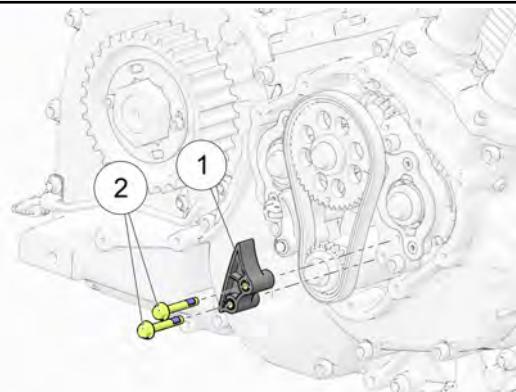
6. With a new gasket and both mating surfaces clean, install the cam chain cover. See Cam Chain Cover, Removal / Installation, page 3.41.

CAM CHAIN GUIDE REMOVAL

1. Remove the cam chain cover. See Cam Chain Cover, Removal / Installation, page 3.41
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 3.44.
2. Install cam chain guide ① and fasteners ②. Torque to specification.

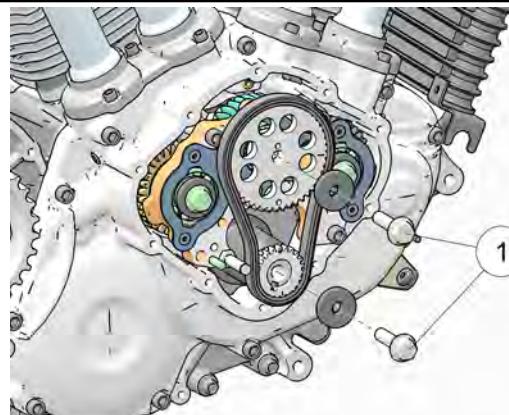
**TORQUE**

Cam Chain Guide: 71 in-lbs (8 Nm)

3. Install the cam cover. See Cam Chain Cover, Removal / Installation, page 3.41.

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, page 2.9.
3. Remove spark plugs. See Spark Plug Removal, page 2.23.
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 3.41.
6. Perform the crankshaft locking procedure. See Locking the Crankshaft for Service, page 3.41.
7. Remove the cam chain tensioner and tensioner arm assemblies. See Cam Chain Tensioner Removal, page 3.42.
8. Remove the cam chain guide. See Cam Chain Guide Removal, page 3.43
9. Remove the camshaft and crankshaft sprocket fasteners ①.

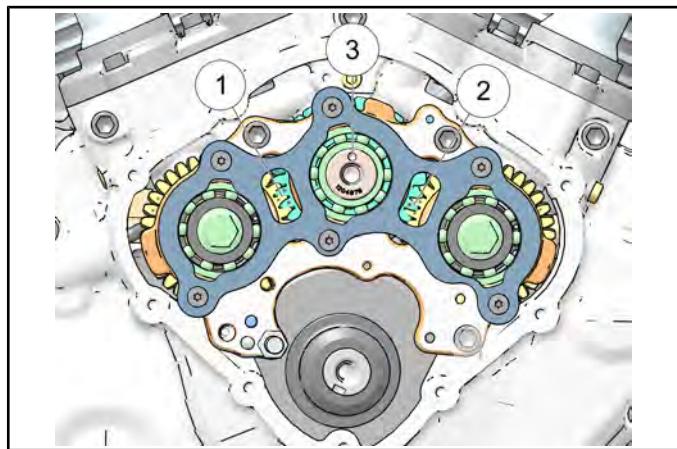


10. Pull the camshaft sprocket, crankshaft sprocket and cam chain off as an assembly.
11. Collect the woodruff key from the crankshaft.

CAM CHAIN INSTALLATION**CAUTION**

The Thunder Stroke 111 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.

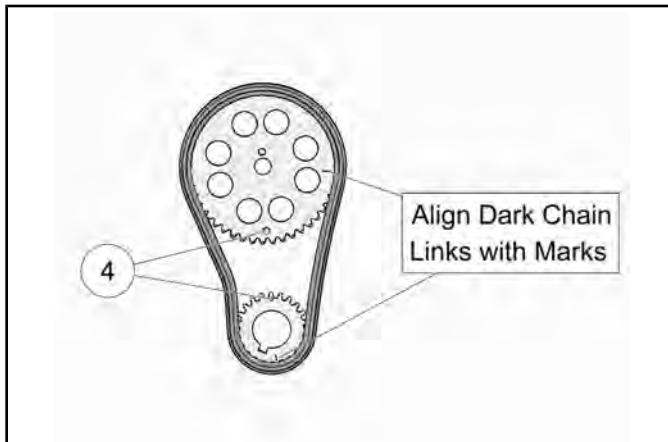
1. Verify that the camshafts are set to TDC. Camshaft timing marks ① & ② should be aligned as shown. The camshaft sprocket alignment dowel ③ should be at 12 o'clock.



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 3.41.
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.

1. Align timing marks ④.
2. 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 Nm)**

8. Install the cam chain guide. See Cam Chain Guide Installation, page 3.43.
9. Install the cam chain tensioner and tensioner arm assemblies. See Cam Chain Tensioner Installation, page 3.42.
10. Install the cam chain cover. See Cam Chain Cover, Removal / Installation, page 3.41.
11. Remove the crankshaft locking pin installed during the crankshaft locking procedure in step 2.
12. Install stator. Stator Installation, page 10.31.
13. Install flywheel. See Flywheel Installation, page 5.22.
14. Install clutch assembly and clutch rack. See Clutch Installation, page 5.19.
15. Install torque compensator. See Torque Compensator Installation, page 5.21.
16. Install primary cover. See Primary Cover Installation, page 5.12.

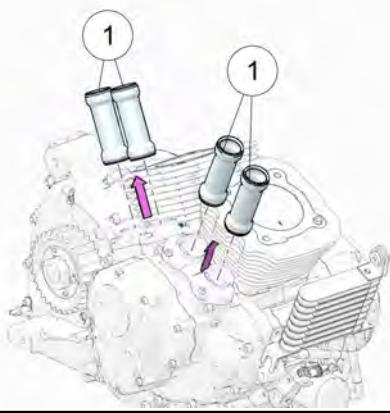
CAMSHAFT / LIFTER SERVICE - ENGINE OUT

LIFTER REMOVAL

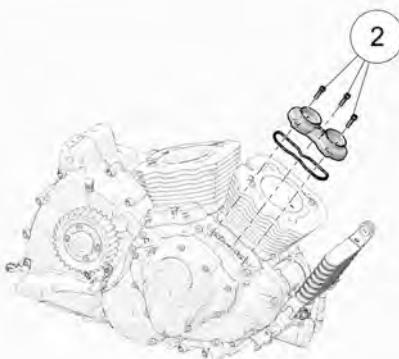
IMPORTANT

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

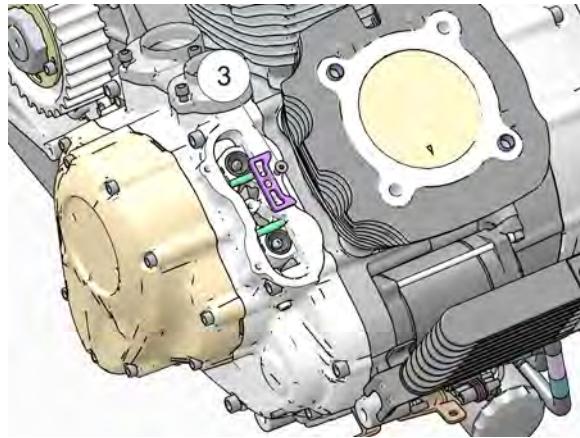
1. Remove cylinder heads and push rods from engine. See Cylinder Head Removal, page 3.61.
2. Remove push rod tubes ① by pulling out of the lifter blocks to release the o-rings.



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.

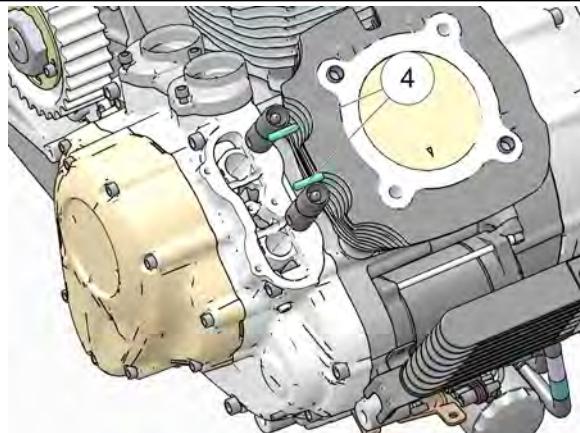


5.

IMPORTANT

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

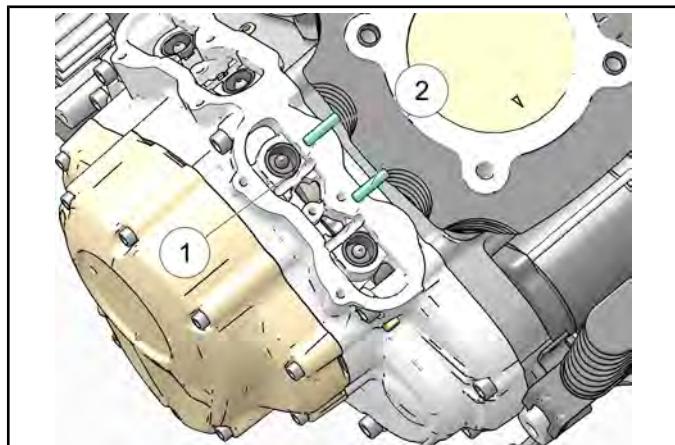
Remove lifter guides ④ and pull lifters out of bore.



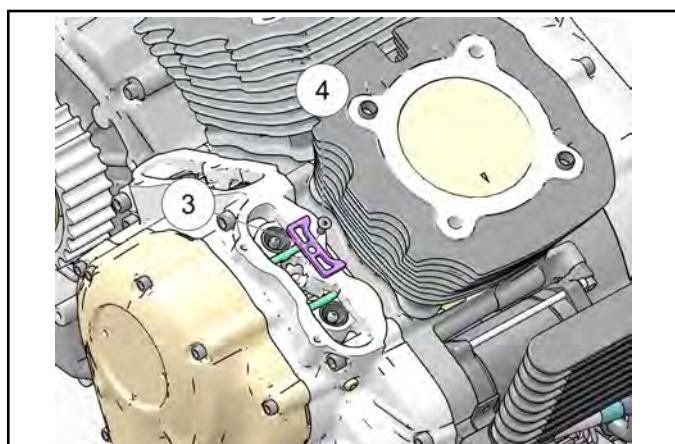
6. Repeat steps 3–5 to remove the rear lifters.

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

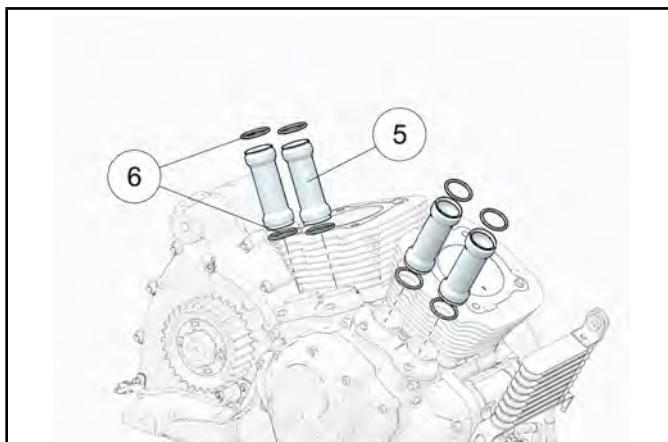
Lifter Retaining Plate Fastener: **62 in-lbs (7 Nm)**

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: **89 in-lbs (10 Nm)**

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

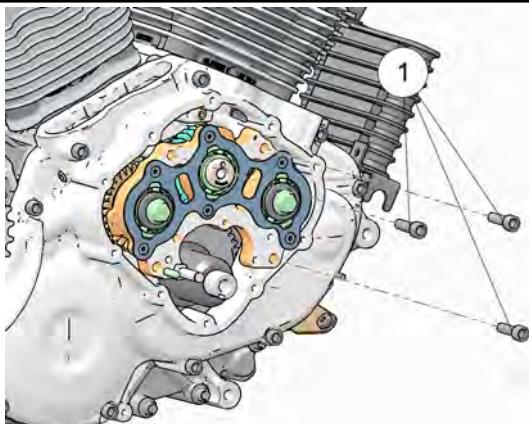


10. Install cylinder heads. See Cylinder Head Installation, page 3.67.
11. Install inner and outer valve cover gaskets. See Valve Cover Installation, page 3.60.

CAMSHAFT CARRIER REMOVAL**NOTE**

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.

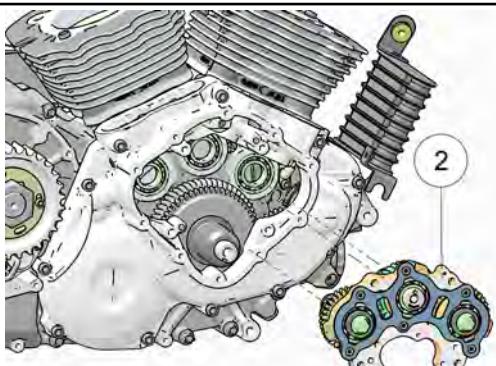
1. Remove the engine from the frame and place on an engine stand. See Removing Engine From Frame, page 3.12.
2. Remove lifters. See Lifter Removal, page 3.45.
3. Remove cam chain, cam chain tensioner and guide. See Cam Chain Removal, page 3.43.
4. Remove the three remaining camshaft carrier fasteners ①.



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

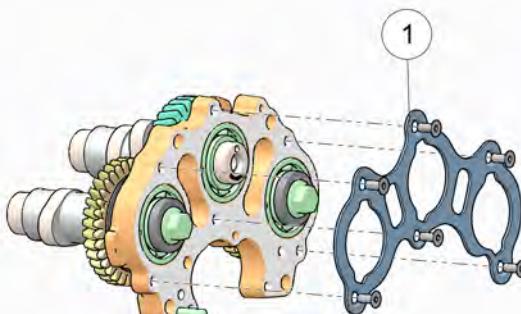
NOTE

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

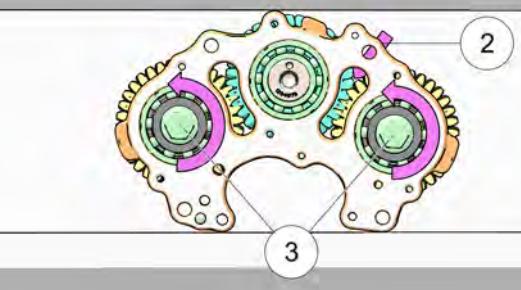
**CAMSHAFT CARRIER DISASSEMBLY****IMPORTANT**

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 3.47.
2. Remove the six fasteners and the bearing retainer plate ① from the carrier assembly.



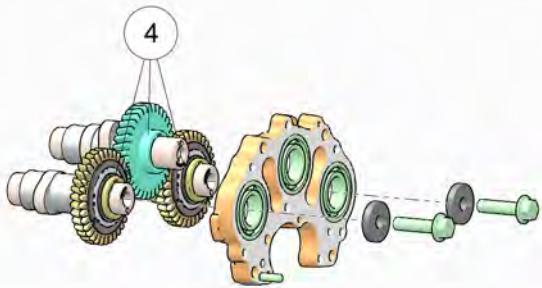
3. Place the camshaft carrier in a soft-jawed vise and use nylon strapping or rope ② to create an interference between the camshaft gear teeth, thus locking the camshafts.
4. Loosen, do not remove, the exhaust camshaft fasteners ③.



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.

ENGINE / COOLING / EXHAUST

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.

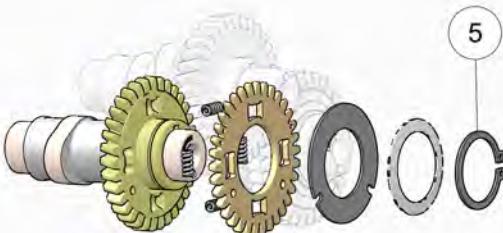
- 8.

NOTE

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.

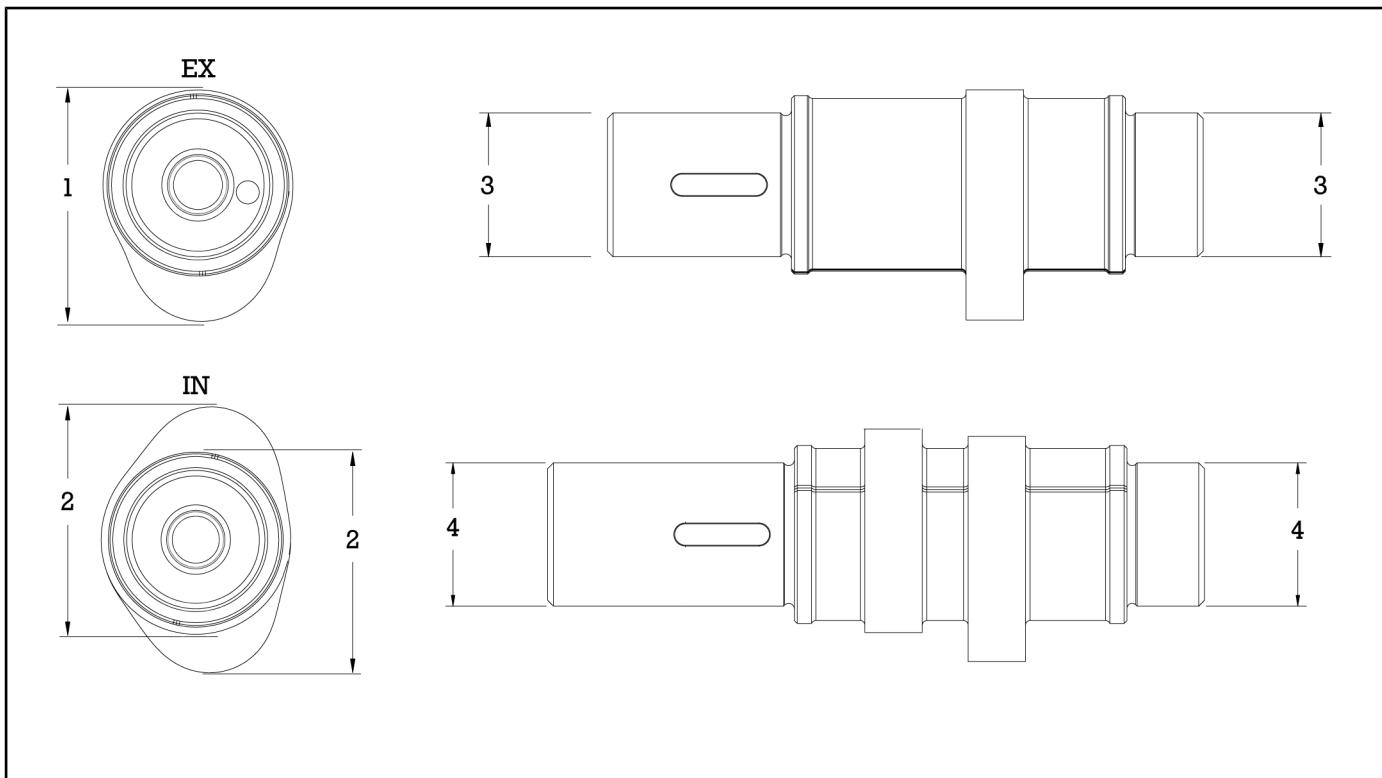
To separate split gears, wrap a shop rag around the teeth of the gear so springs are contained and remove external snap-ring ⑤.

9. Separate components of gear as shown.



CAMSHAFT INSPECTION

For the following camshaft inspection procedure, refer to the camshaft service specifications section. See Service Specifications, page 3.33.



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.

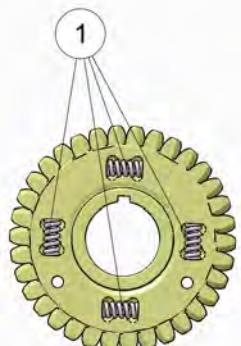
CAMSHAFT CARRIER ASSEMBLY**CAUTION**

Wear eye protection while assembling split camshaft gears.

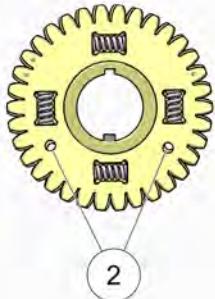
IMPORTANT

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.

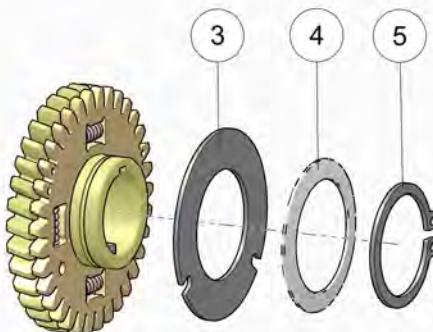
1. Load springs ① into the inner cam gear spring pockets.



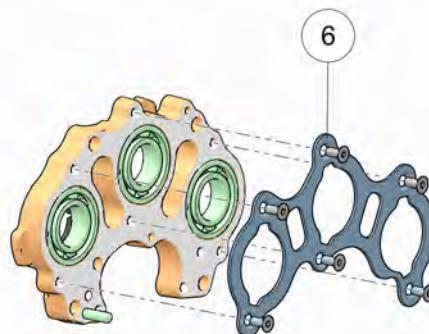
2. Install the outer cam gear onto the inner cam gear making sure the alignment holes ② are positioned as shown.



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

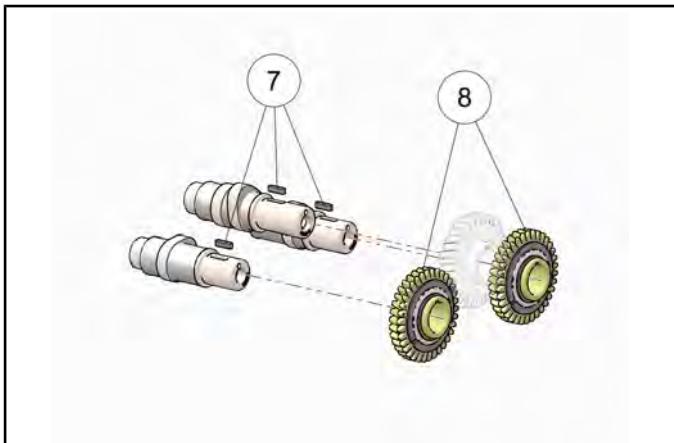


4. If replacing camshaft carrier bearings, press or drive new bearings into the carrier from the front side until seated against shoulder.
5. Install the bearing retainer plate ⑥ with the countersunk fastener holes facing out.
6. Install fasteners and torque to specification.

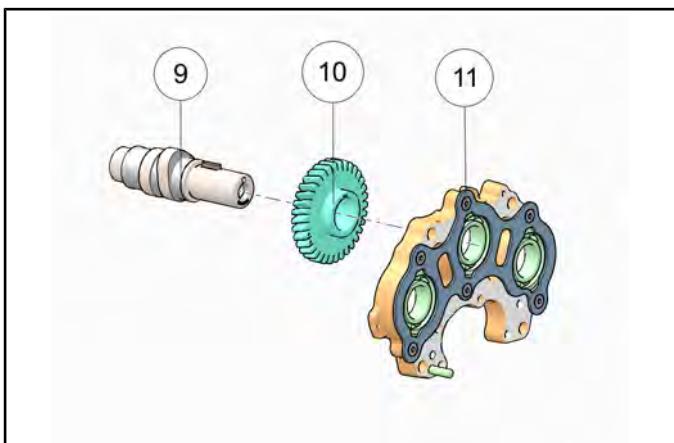
**TORQUE**

Bearing Retainer Plate Fasteners: 62 in-lbs (7 Nm)

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



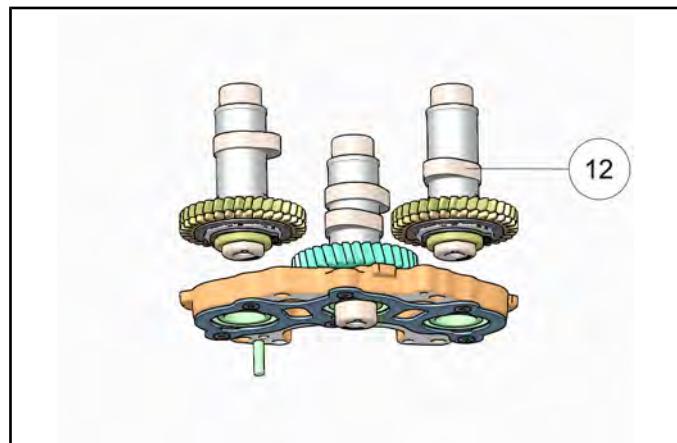
8. Install intake camshaft ⑨ into helical gear ⑩ and slide into the center carrier bearing ⑪. **Woodruff key should be positioned at 12 o'clock.**



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.

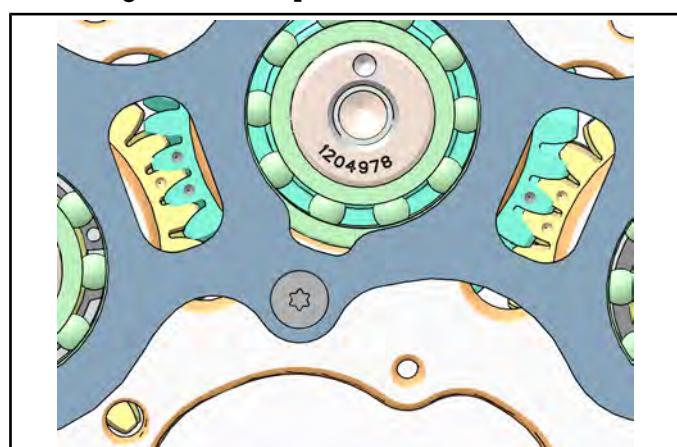


10.

NOTE

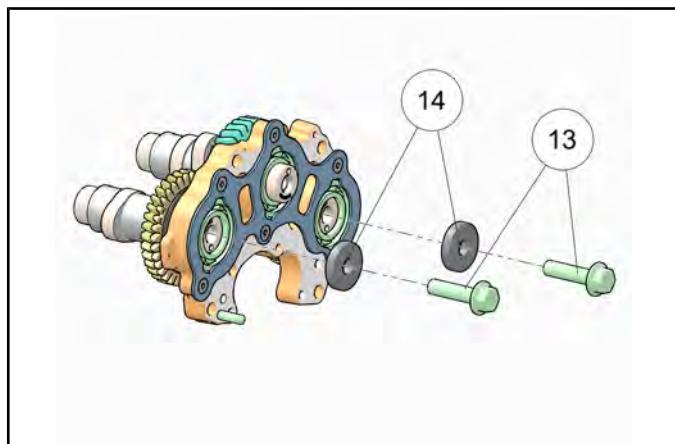
It may be necessary to use a flat fastenerdriver or similar tool to release the preload on the split gear teeth when engaging the helical gear.

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

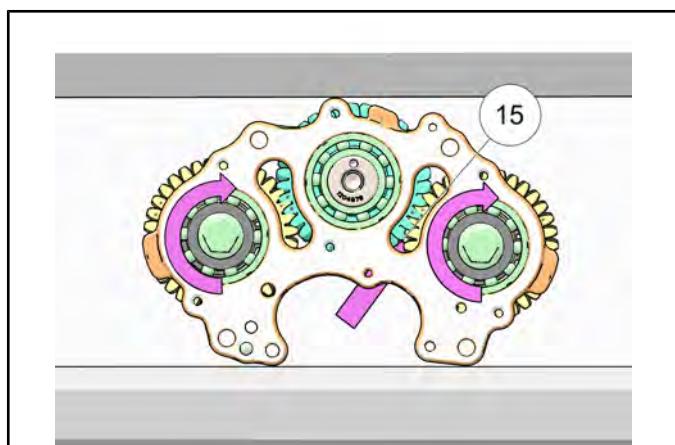


ENGINE / COOLING / EXHAUST

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

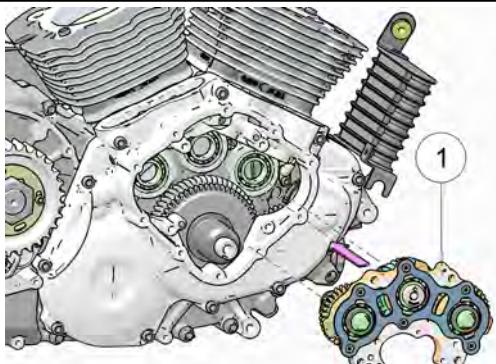
Exhaust Camshaft Fasteners: **52 ft-lbs (70 Nm)**

CAMSHAFT CARRIER INSTALLATION**NOTE**

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

4. Install cam chain, cam chain tensioner and guide. See Cam Chain Installation, page 3.44.
5. Install lifters. See Lifter Installation, page 3.46.
6. Install engine in frame. See Engine Installation, page 3.17.

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



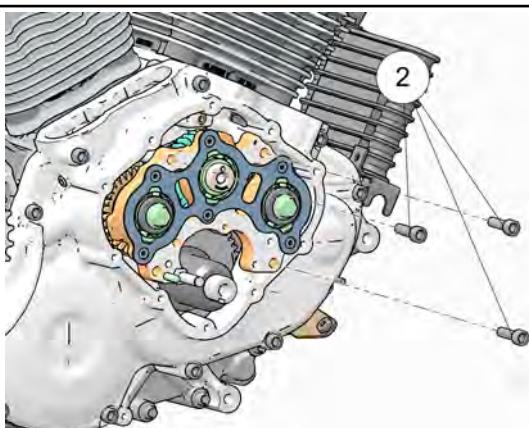
- 2.

NOTE

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 Nm)

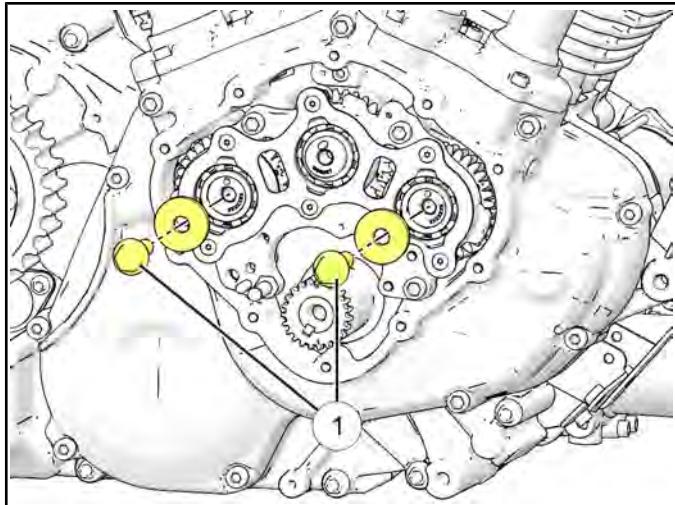
CAMSHAFT SERVICE - IN BIKE**CAMSHAFT REMOVAL****IMPORTANT**

Camshaft removal with the engine installed in the frame requires Special Tool #: PF-51455.

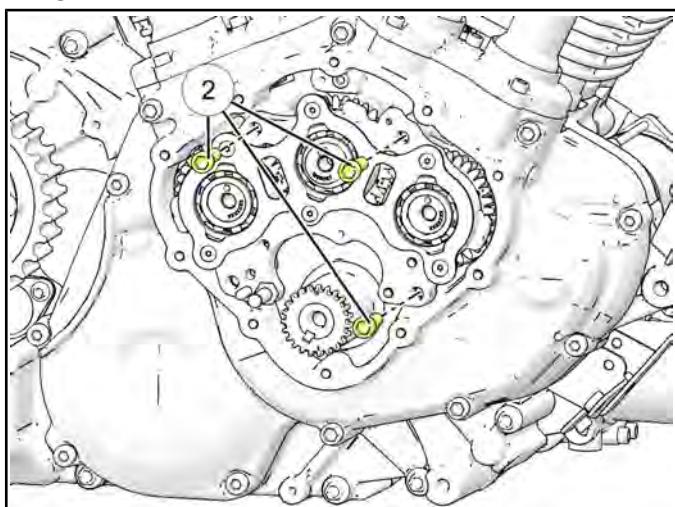
NOTE

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

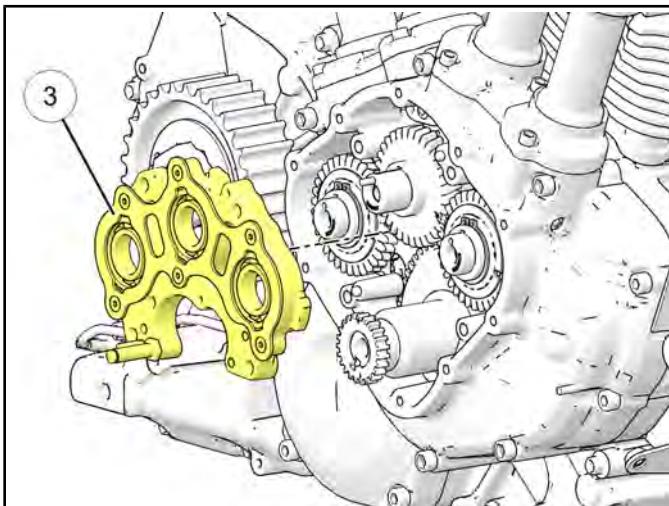
1. Remove the cam chain, guide and tensioner assemblies. See Cam Chain Cover Removal / Installation, page 3.41.
2. Remove the exhaust camshaft fasteners ①.



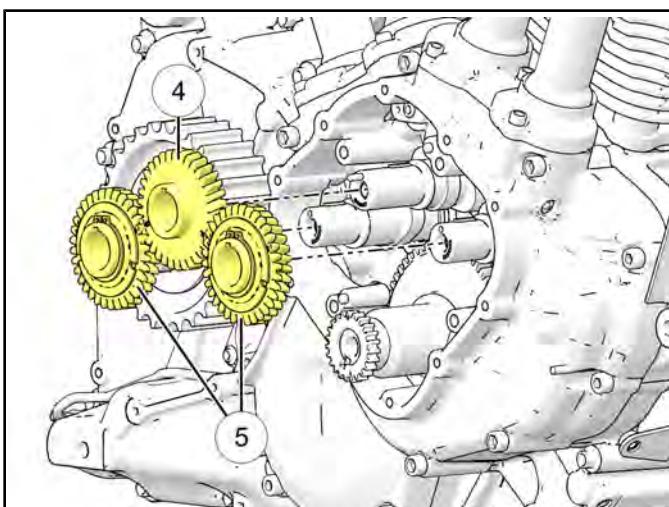
3. Remove the remaining camshaft carrier fasteners ②.



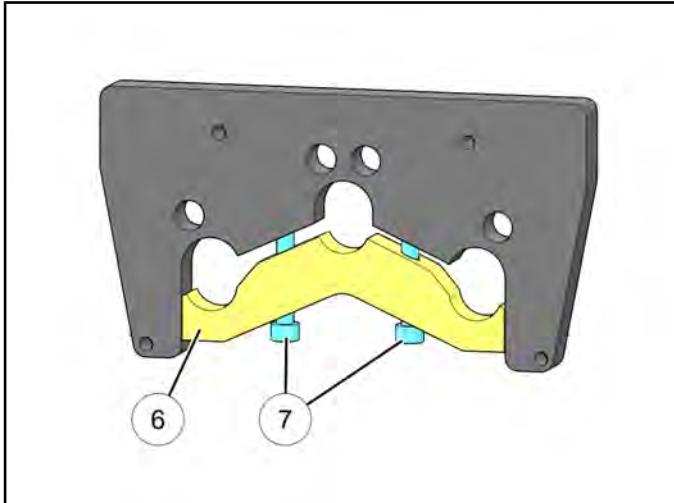
4. Leaving the camshafts in position in the crankcase bearing bores, remove the camshaft bearing carrier ③.



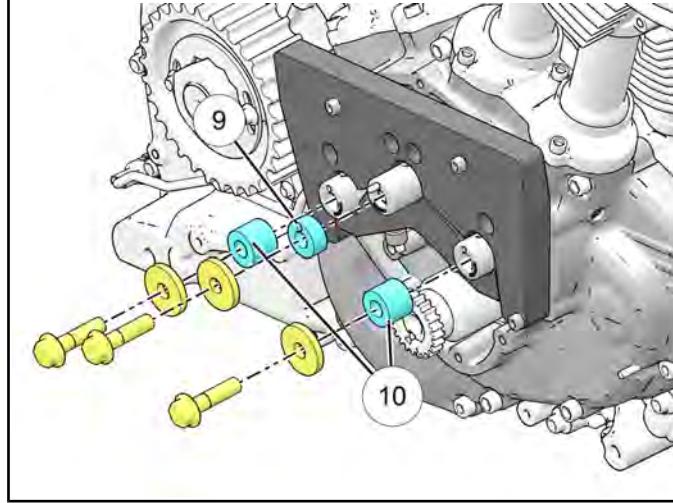
5. Remove the intake ④ and exhaust ⑤ camshaft drive gears.



6. Loosely assemble the lower camshaft retainer plate ⑥ to the main plate using two fasteners ⑦.



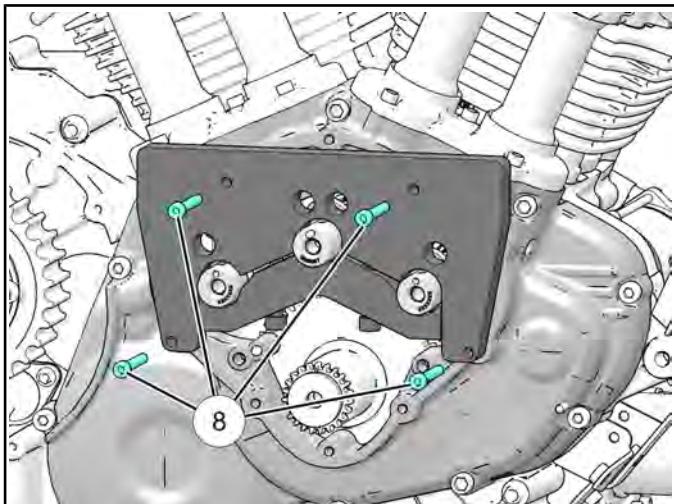
9. Install camshaft gear washers and fasteners until they are hand-tight.



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

NOTE

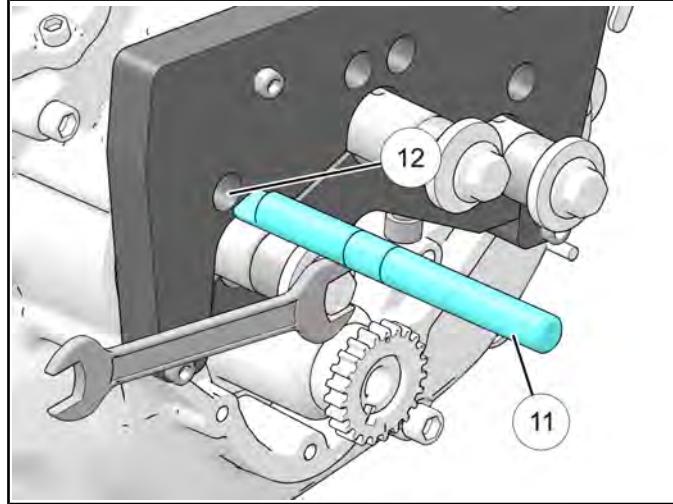
The lower camshaft retainer plate should be tight enough to support the outboard camshaft bearing journal.



10. With the flat side of the retaining pin ⑪ aligned perpendicular to the rear exhaust camshaft pushrod tube, slide the pin in hole marked "B" ⑫ until it stops.

NOTE

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



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

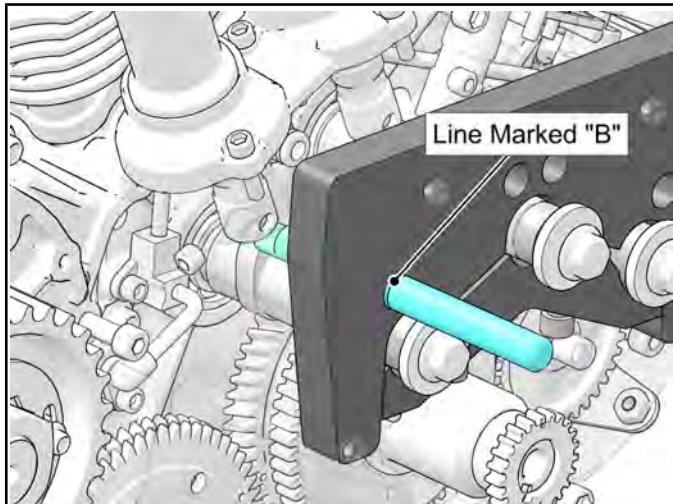
11. Rotate the camshaft using a suitable wrench while pressing on the retaining pin until it seats.

ENGINE / COOLING / EXHAUST

12. 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.

NOTE

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



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

NOTE

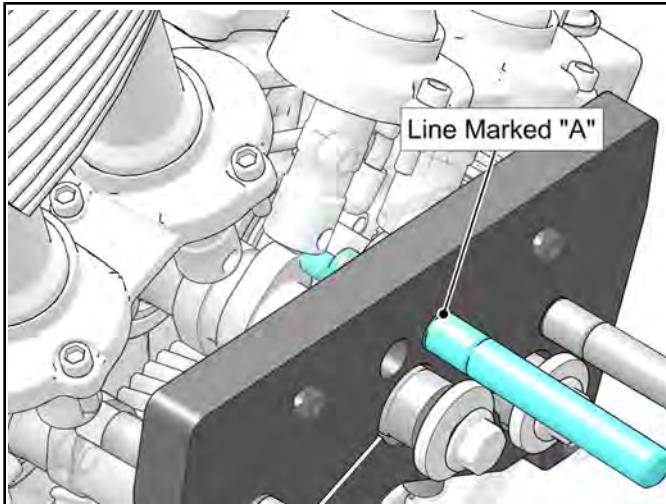
For the forward exhaust camshaft you will use the hole marked "A" and the line marked "A".

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

NOTE

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

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

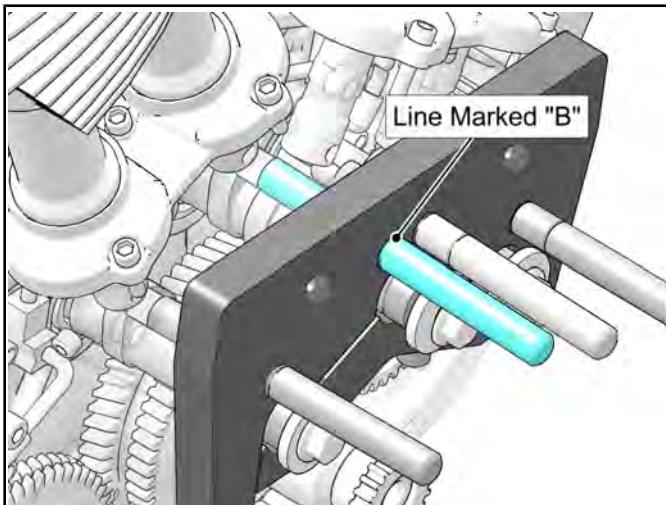


16. Slide the fourth retaining pin into the rear cylinder intake camshaft position (hole marked "B") until it stops.

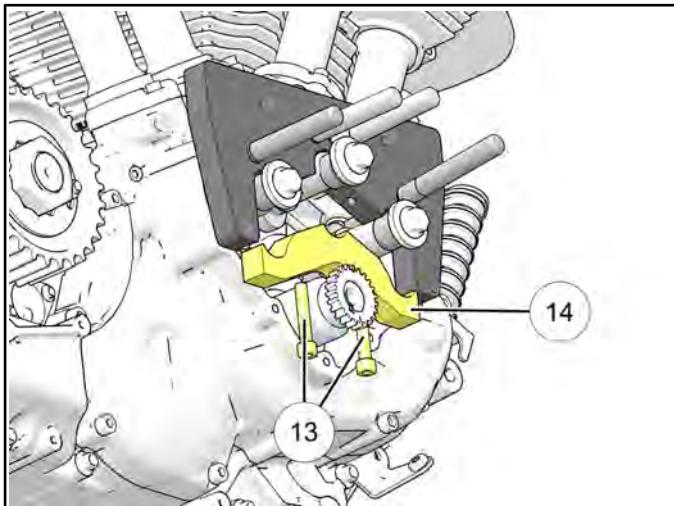
NOTE

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 at the line marked "B".



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



3

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

NOTE

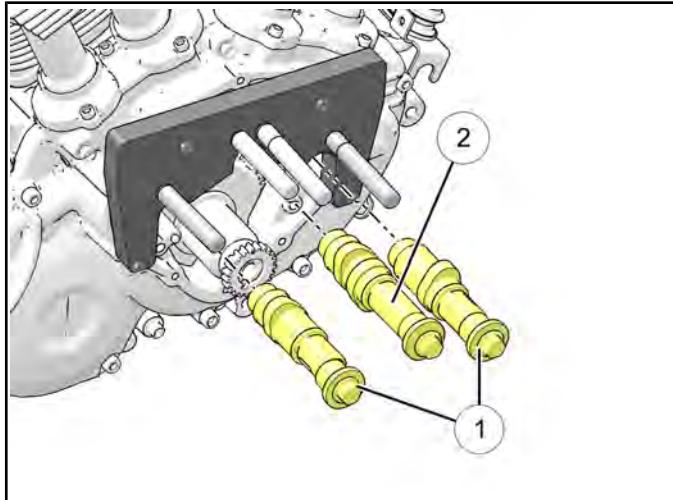
It may be necessary to rotate the camshaft by hand during removal so the camshaft lobes can clear the retaining plate.

CAMSHAFT INSTALLATION

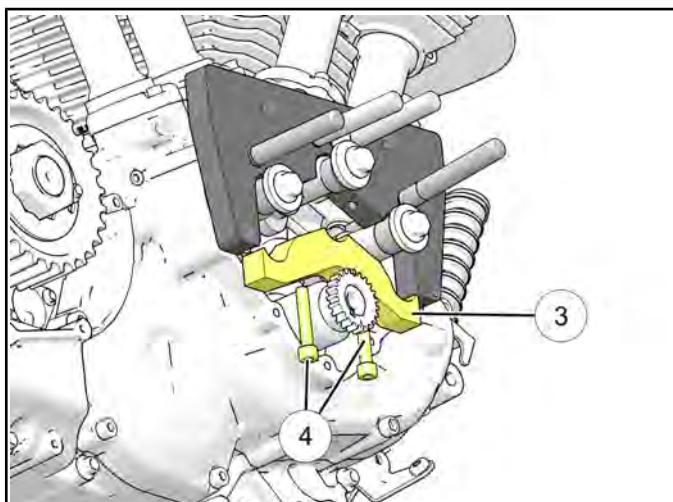
- With the retaining plate and pins installed and the lifters held in place, install the two exhaust camshafts ① and intake camshaft ②.

NOTE

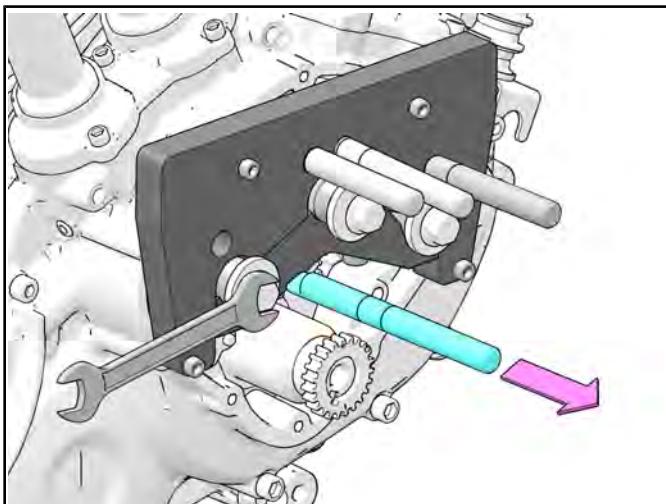
It may be necessary to rotate the camshaft by hand during installation so the camshaft lobes can clear the retaining plate.



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



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

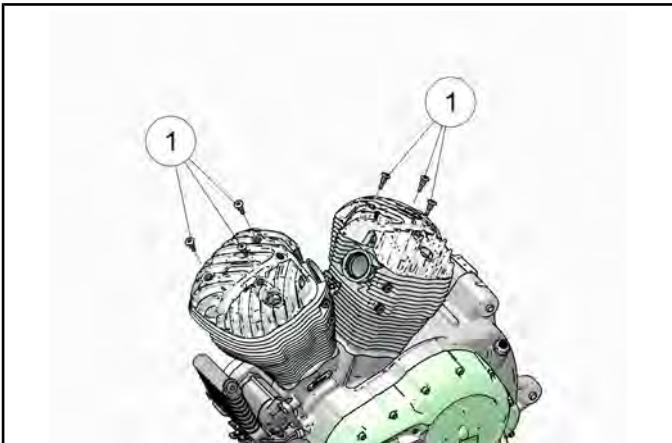


- Remove the retaining plate assembly.
- Install the camshaft carrier, timing components and timing chain cover as outlined in this chapter.

CYLINDER HEAD SERVICE

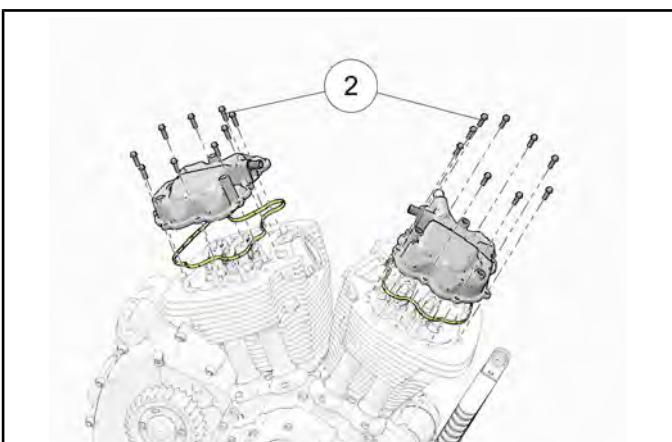
VALVE COVER REMOVAL

1. Remove engine from frame and place on an engine stand. See Removing Engine From Frame, page 3.12.
2. Using a T40 Torx, remove the three fasteners ① from each of the outer valve covers and remove covers.



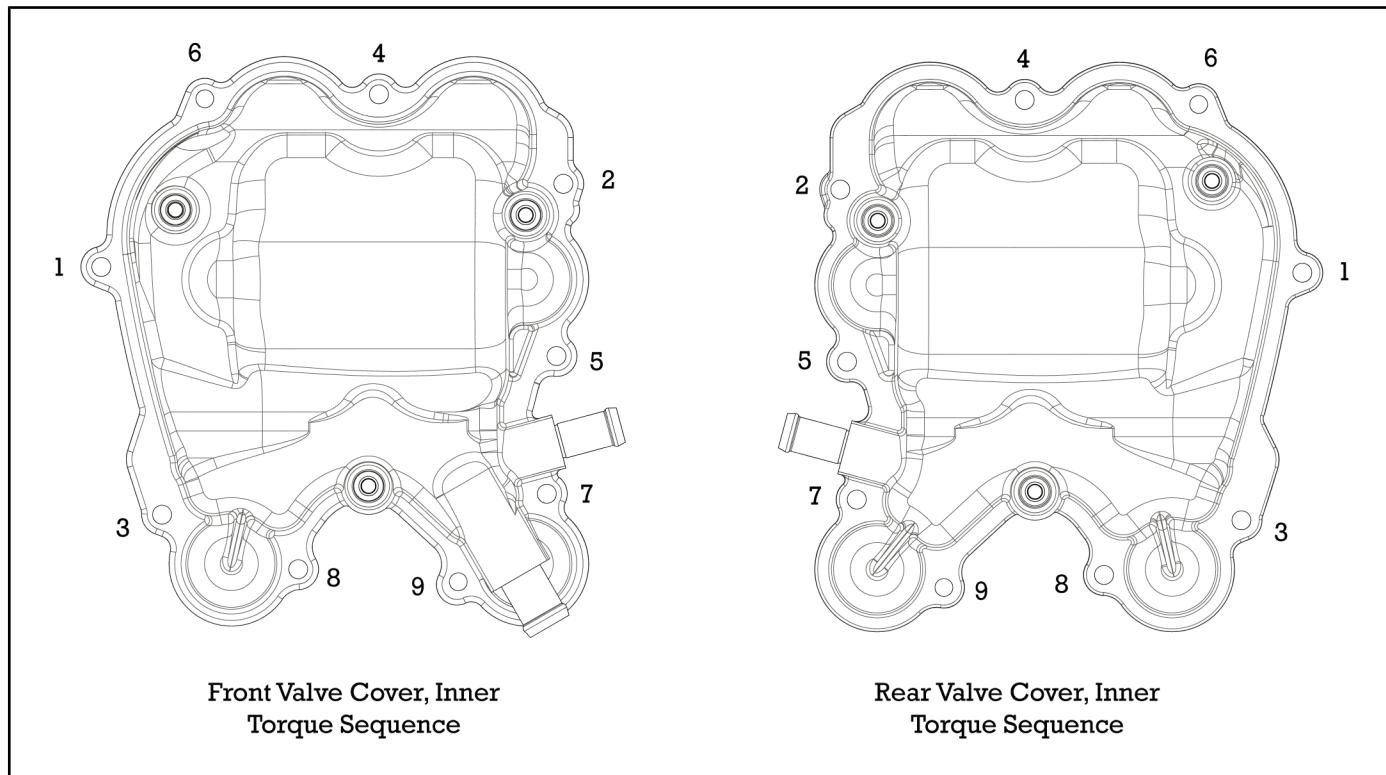
3

3. Using an 8mm socket, remove the fasteners ② securing the inner valve covers to the cylinder head.

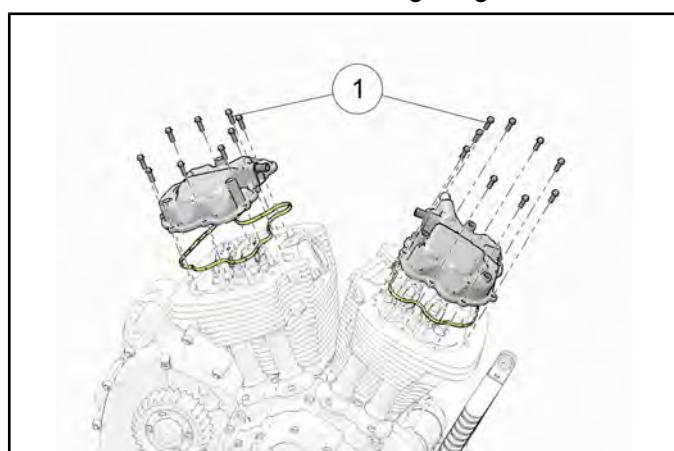


4. Remove inner valve covers and gaskets.

VALVE COVER INSTALLATION



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



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

TORQUE

Inner Valve Cover Fasteners: **89 in-lbs (10 Nm)**

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

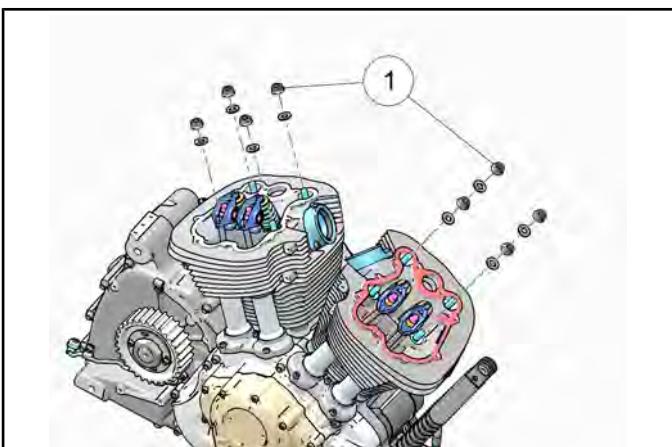
TORQUE

Outer Valve Cover Fasteners: **89 in-lbs (10 Nm)**

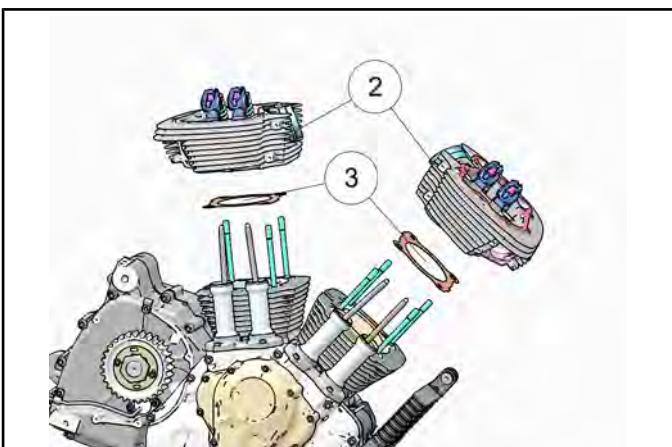
CYLINDER HEAD REMOVAL**CAUTION**

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

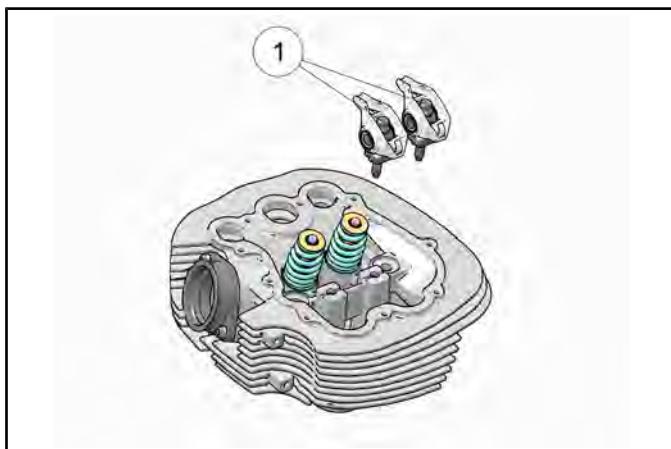
1. Remove engine from frame and place on an engine stand. See Removing Engine From Frame, page 3.12.
2. Remove inner and outer valve covers. See Valve Cover Removal, page 3.59.
3. Alternately loosen cylinder head nuts ① to relieve valve spring pressure. Remove nuts and washers.



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.

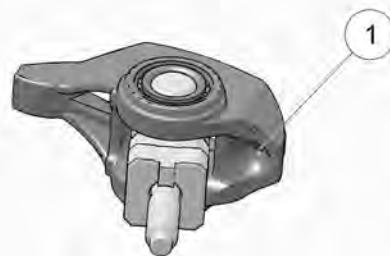


3

ROCKER ARM INSPECTION**NOTE**

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..

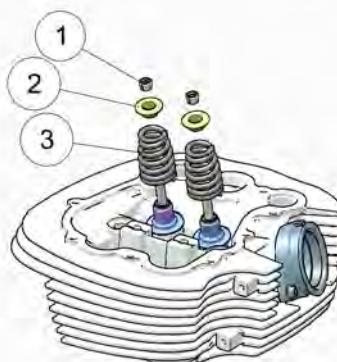
CYLINDER HEAD DISASSEMBLY**CAUTION**

Wear eye protection while removing valve springs.

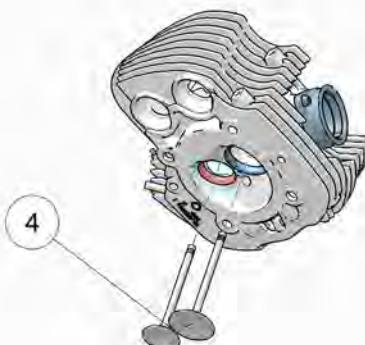
NOTE

Keep mated parts together for assembly.

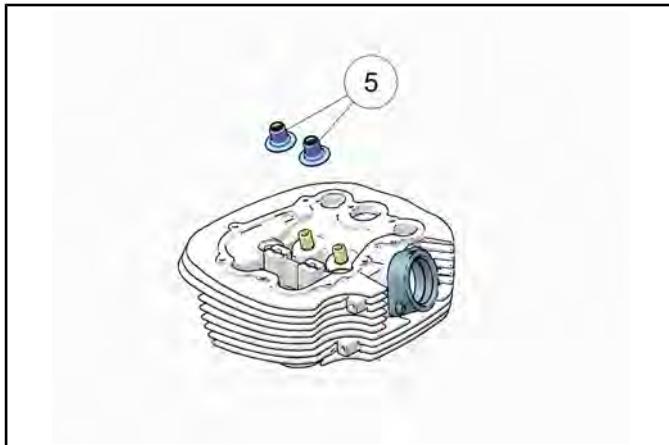
1. Remove the valve keepers ① using a valve spring compressor tool PV-1253. Use a small magnet to remove valve keepers.
2. Remove upper valve spring retainers ② and springs ③ .



3. Remove the valves ④ .



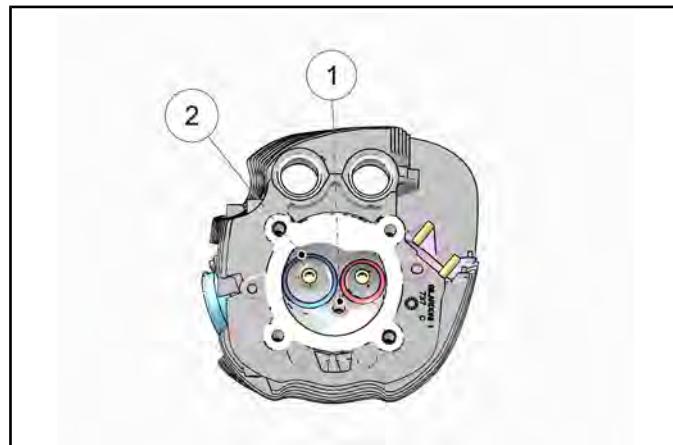
4. Remove and discard the spring seat / valve stem seal assemblies ⑤ .



5. Clean carbon deposits from combustion chamber.
6. Clean gasket surfaces.

CYLINDER HEAD INSPECTION

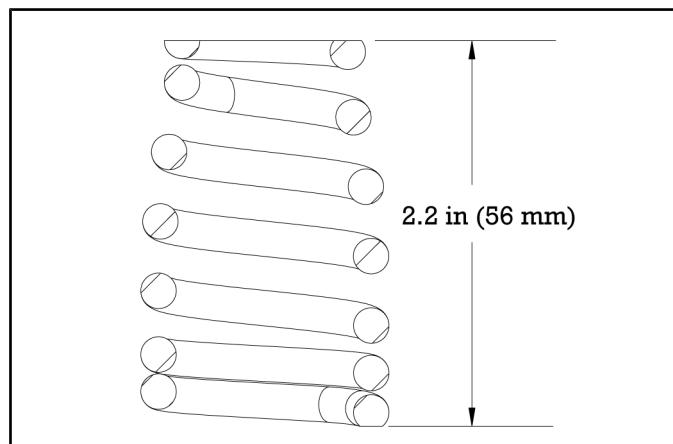
1. Visually inspect cylinder head for cracks or damage. Pay close attention to the areas around spark plug ① and valve seats ② .



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, page 3.33.

VALVE SPRING FREE LENGTH INSPECTION

1. Measure free length of valve springs. Replace springs that do not meet specification. See Service Specifications, page 3.33.



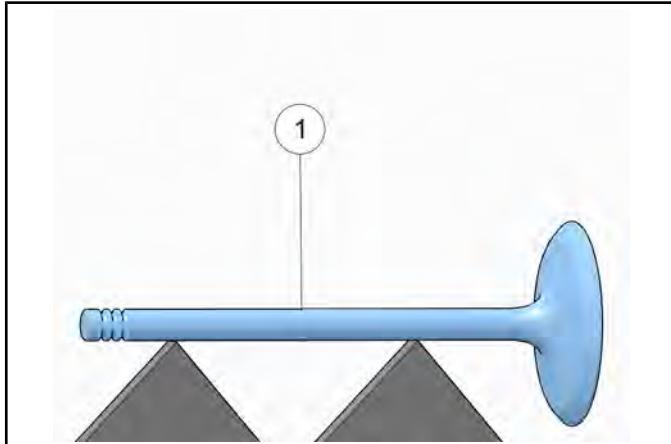
NOTE

Intake and exhaust springs are identical.

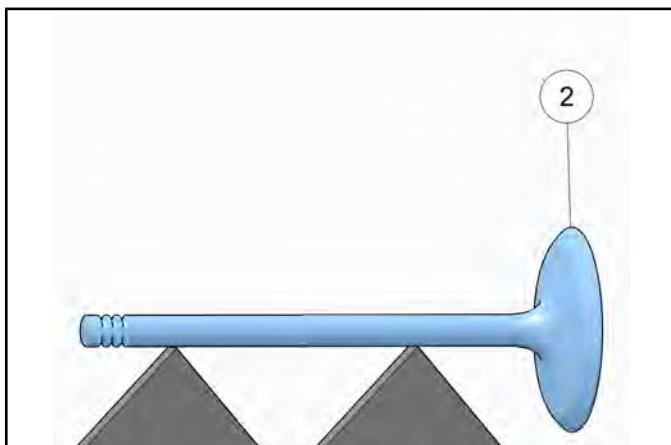
VALVE INSPECTION**NOTE**

Valve service specifications can be found at the beginning of this chapter. See Service Specifications, page 3.33.

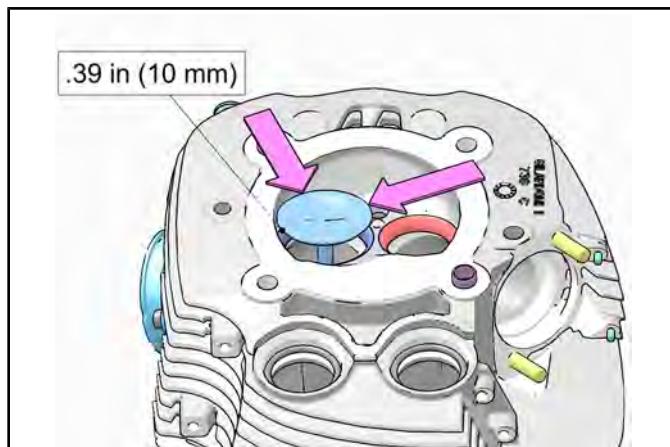
1. Place valves on V-blocks as shown and measure valve stem runout ① using a runout gauge or similar tool..



2. Inspect the valve face for damage from burning, pitting or uneven contact.
3. Place valves on V-block as shown and inspect valve head radial runout ② .

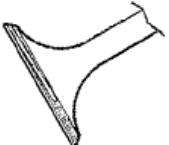
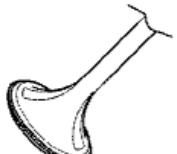
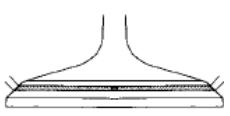
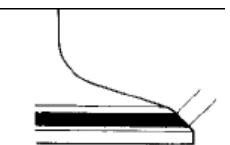


4. Insert valves into their original locations in cylinder head.
5. Inspect that each valve moves up and down smoothly without binding in guide.
6. Measure valve stem deflection for each valve to determine if valve or valve guide requires replacement.



- A. Raise valve 10mm (0.400") off of seat.
- B. Position dial indicator as shown. Measure deflection in two directions perpendicular to each other (X & Y axis).
- C. If valve deflection exceeds service limit measure valve stem diameter.
7. Replace valve and repeat step 6 if valve stem O.D. measures outside standard range. If valve stem deflection exceeds service limits with a new valve installed, valve guide must be replaced.
8. Installation of new valve guides and/or new valves requires valve seat reconditioning. This work should be performed by an experienced technician properly equipped to perform cylinder head reconditioning.

VALVE INSPECTION

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

VALVE GUIDE 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:

MEASUREMENT

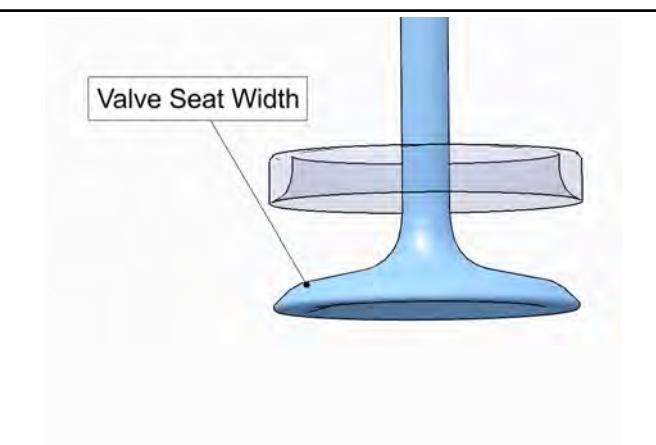
Valve Guide Installed Height: **17.7–18.3 mm**

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**NOTE**

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, page 3.33.



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

VALVE SEAT RECONDITIONING**NOTE**

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

CYLINDER HEAD ASSEMBLY**CAUTION**

Wear eye protection during assembly.

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

CAUTION

Do not compress valve springs more than necessary to install keepers.

Support cylinder head so valves will not be damaged.

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

CYLINDER HEAD INSTALLATION**NOTE**

The base gasket seal is broken when the cylinder head is removed and must be replaced. See Cylinder Installation, page 3.82.
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.

NOTE

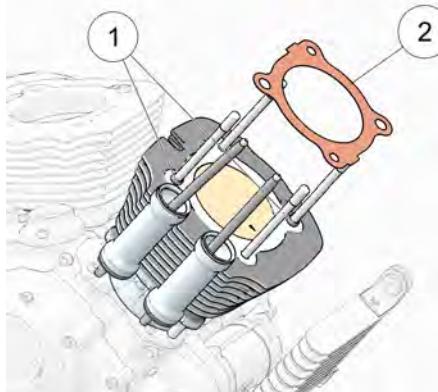
Gaskets and gasket sealing surfaces must be free of oil and grease during assembly.

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

NOTE

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.



6.

NOTE

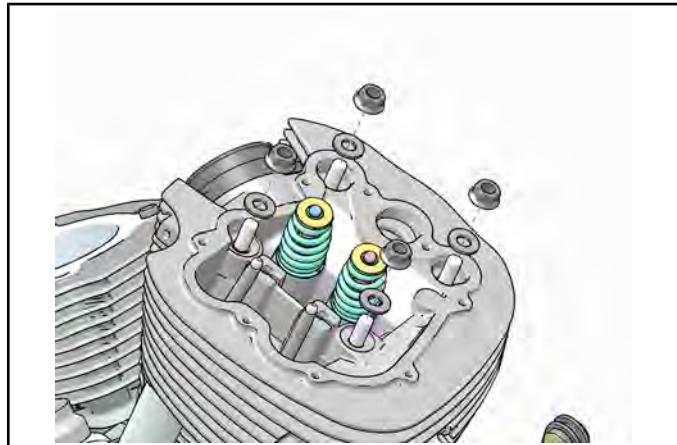
Use care not to damage, tear or displace push rod tube o-rings when fitting the cylinder head to the cylinder.

Set cylinder head in place on cylinder and press down over the push rod tubes until fully seated.

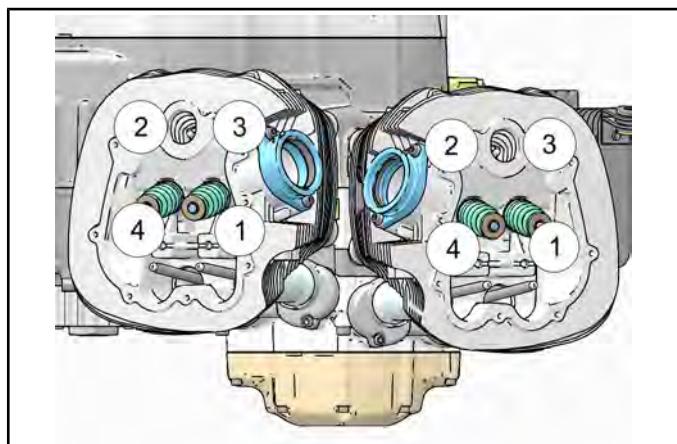
ENGINE / COOLING / EXHAUST

7. Apply assembly lube to the tops of the valve stems.
8. Install washers and nuts on cylinder studs. Tighten finger tight.

Torque



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



TROUBLESHOOTING, CYLINDER HEAD AND VALVE TRAIN**NOTE**

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
Electric Starter Straining to Turn Engine Over	High Compression	Ignition Problem	Refer to Electrical chapter
		Fuel Problem	Refer to Fuel Delivery / EFI chapter
		Excessive carbon build-up in combustion chamber	De-carbon Combustion Chamber
Poor Idle Quality (Engine Related)	Low Compression	Compression Release Mechanism Failure	Inspect/Repair/Replace Compression Release Mechanism
		Excessive Starter Load	Determine Cause of Seizure or Binding
		Collapsed Hydraulic Lifter(s)	Bleed Air from Lifter(s) / Run at high idle for 10 minutes
Poor Idle Quality (Engine Related)	Excessive Oil in Combustion Chamber	Poor Seating of Valve(s)	Repair or Replace
		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

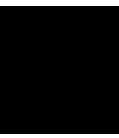
ENGINE / COOLING / EXHAUST

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Poor High-Speed Running	Camshaft Area	Broken or Weak Valve Spring(s)	Replace
		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
Lack of Power in all RPM Ranges	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
	Low Compression	Worn Piston, Rings, Cylinder, Poor Valve Seating	Repair / Replace

ENGINE / COOLING / EXHAUST

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
	Oiling Problem	Oil Overfilled	Correct Engine Oil Level

3



CYLINDER / PISTON

GENERAL INFORMATION

SERVICE NOTES

NOTE

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.

TOOL DESCRIPTION	PART NUMBER
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/>

TORQUE SPECIFICATIONS

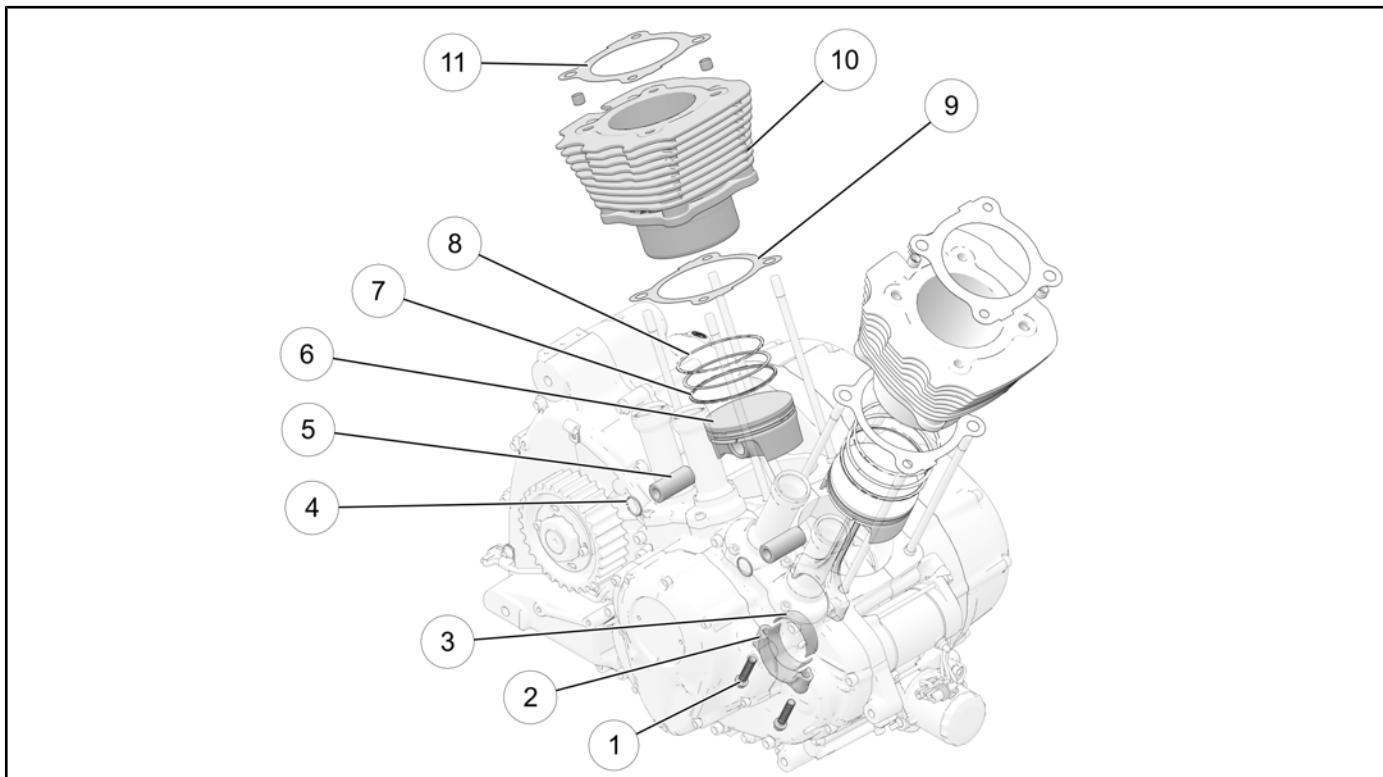
DESCRIPTION	TORQUE SPECIFICATION
Connecting Rod Bearing Cap	22 ft-lbs (30 Nm)
Cylinder Studs	25 ft-lbs (34 Nm)

SPECIAL TOOLS

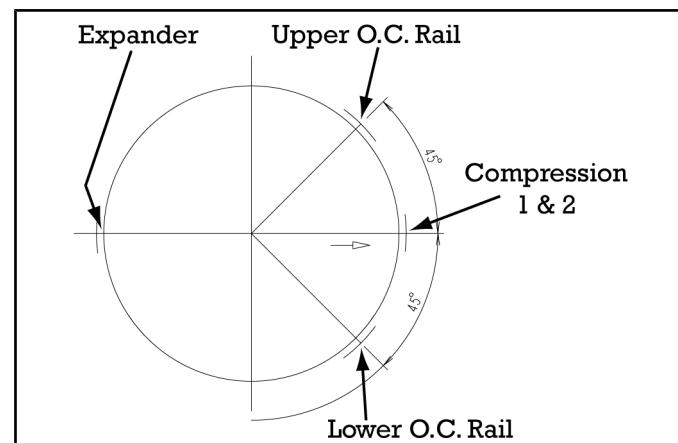
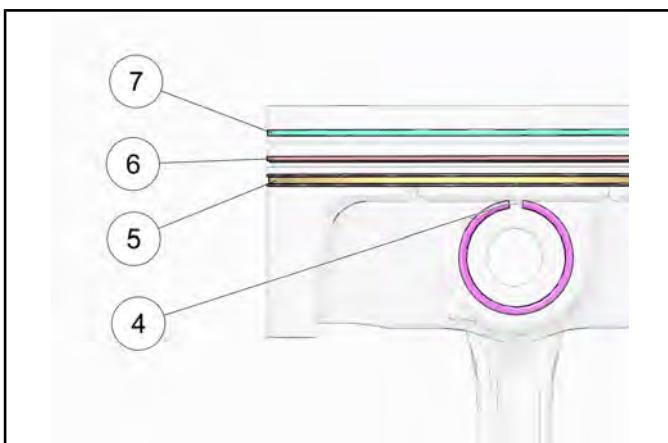
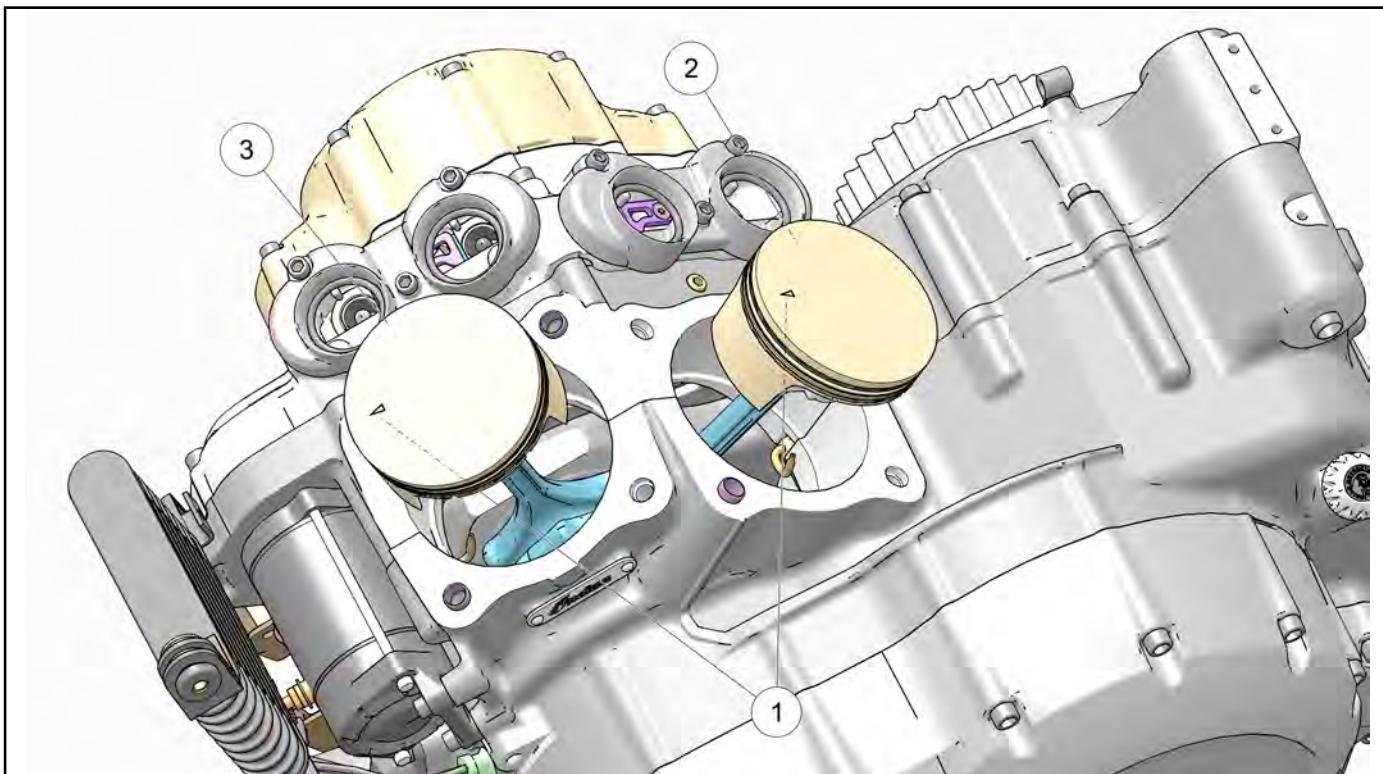
TOOL DESCRIPTION	PART NUMBER
Piston Ring Compressor	PV-43570-A
Clutch Shaft Holding Tool	PF-51232
Cylinder Bore Gauge	PV-3017
Crankshaft Rotation Tool	PF-51239
Crankshaft Locking Pin	PF-52135
Engine Case Splitting Tool	PF-51234

SERVICE SPECIFICATIONS

ITEM		STANDARD	SERVICE LIMIT
Cylinder	I.D.	100.987 - 101.013 (3.9759" - 3.9769")	Check taper and out-of-round
	Out of Round	Measure 66mm up from base gasket surface	0.05 mm (.002")
	Taper		0.05 mm (.002")
Gasket Surface Warpage		-	.1mm max. (.0039")
Piston	Piston Mark Direction	Piston orientation is determined by arrow on piston crown. Position BOTH pistons so arrows point to front of engine.	
	Piston O.D. (Nominal) (Measured 12 mm up from bottom of skirt, 90 degrees to pin)	100.966 - 101.004mm (3.975 - 3.976")	Replace if piston-to-cylinder clearance is excessive with good cylinder
	Piston Pin Hole I.D.	22.006 - 22.012 mm (.8664 - .8666")	22.047 mm (.8680")
	Piston Pin O.D.	21.995 - 22.000 mm (.8659 - .8661")	21.96 mm (.864")
	Piston to Cylinder	.023 - .067 mm (.0009 - .0026")	.15 mm (.006")
Piston to Piston Pin		.006 - .017 mm (.0002 - .0007")	.035 mm (.0014")
Piston Ring Clearances	Ring End Gap - Top (Installed)	.15 - .40 mm (.006 - .016")	.80 mm (.031")
	Ring End Gap - 2nd (Installed)	.33 - .53 mm (.013 - .021")	1.11 mm (.043")
Piston Ring to Ring Land	Ring End Gap - 3rd (Oil Control Rails) (Installed)	.15 - .35 mm (.006 - .014")	.80 mm (.031")
	Piston Ring Marks	-	"CTOP" mark must face UP on all rings.
	Top Ring (1.2mm ring thickness)	.02 - .060 mm (.0008 - .0024")	.11 mm (.0043")
	2nd Ring (1.2mm ring thickness)	.02 - .060 mm (.0008 - .0024")	.11 mm (.0043")
	Oil Control Ring	.03 - .17 mm (.001 - .0067")	.26 mm (.010")

ASSEMBLY VIEWS
CYLINDER / PISTON


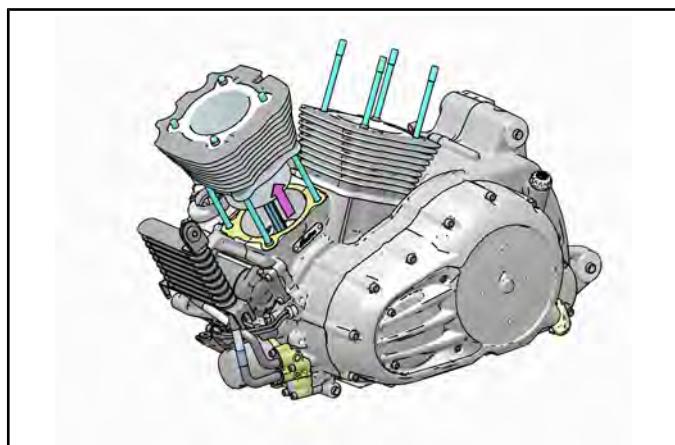
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Connecting Rod Bearing Cap	22 ft-lbs (30 Nm)
②	Bearing Cap, Connecting Rod	-
③	Bearing, Connecting Rod (52 mm)	-
④	Circlip, Wristpin	-
⑤	Wristpin	-
⑥	Piston (101 mm)	-
⑦	Ring, Oil Control	-
⑧	Ring, Compression (top 2 rings)	-
⑨	Gasket, Cylinder Base	-
⑩	Cylinder	-
⑪	Gasket, Cylinder Head	-

CYLINDER / PISTON SERVICE**PISTON RING PROFILE AND ORIENTATION**

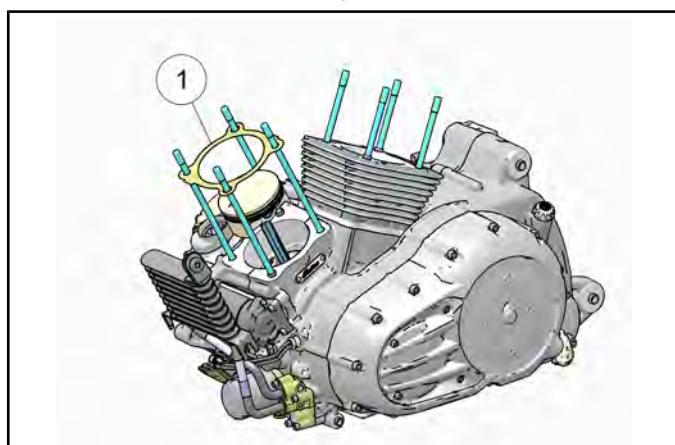
NUMBER	DESCRIPTION
①	Arrows on piston crown indicating installation direction. Both arrows point toward the front of the engine.
②	Rear piston is installed closest to the primary drive side of the engine.
③	Front piston is installed closest to the camshaft side of the engine.
④	Wrist pin circlip. Install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

CYLINDER REMOVAL

1. Remove cylinder head (s). See Cylinder Head Removal, page 3.61.
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

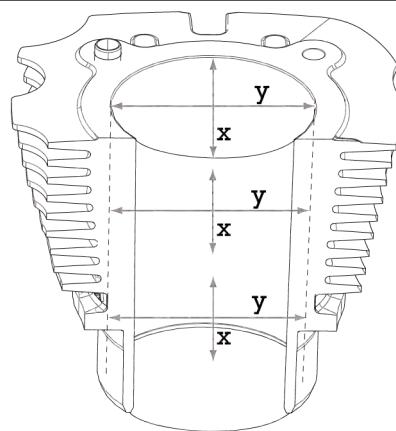
Careless handling of cylinder, pistons or rings may cause irreparable damage. Do not damage gasket surfaces during cleaning.

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:



NOTE

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

- Cylinder Bore Inside Diameter
 - Cylinder Taper
 - Out of Round
2. Use maximum measurement to determine wear.
 3. Use the worksheet provided to record measurements and calculate the clearance.

PISTON TO CYLINDER CLEARANCE WORKSHEET

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

3

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.

NOTE

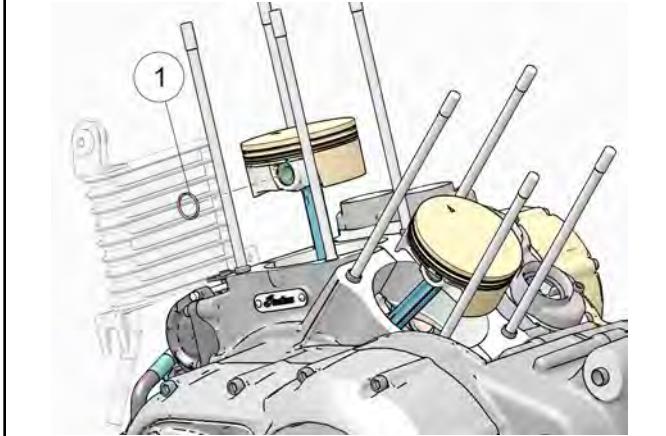
- The cylinders are Ni-SiC plated and cannot be reconditioned by boring or honing. If excessive surface damage, taper or out-of-round exists, the cylinder must be replaced.
- If the piston-to-cylinder clearance exceeds the service limit, measure a new piston and re-calculate the clearance. If the piston-to-cylinder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

CYLINDER WARPAGE MEASUREMENT

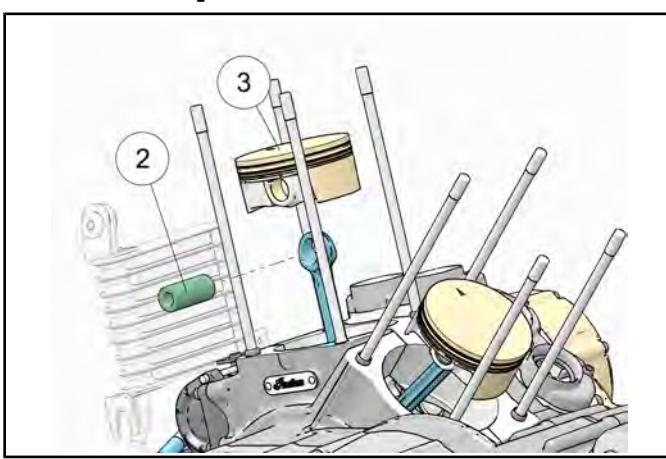
1. Inspect cylinder for warpage at cylinder head surface and base gasket surface.
2. Place a straight edge diagonally across cylinder mating surfaces in several positions. Attempt to slide a .05mm (.002") feeler gauge under the straight edge in each position.
3. Replace cylinder if warped beyond the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

PISTON & PISTON RING REMOVAL

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



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



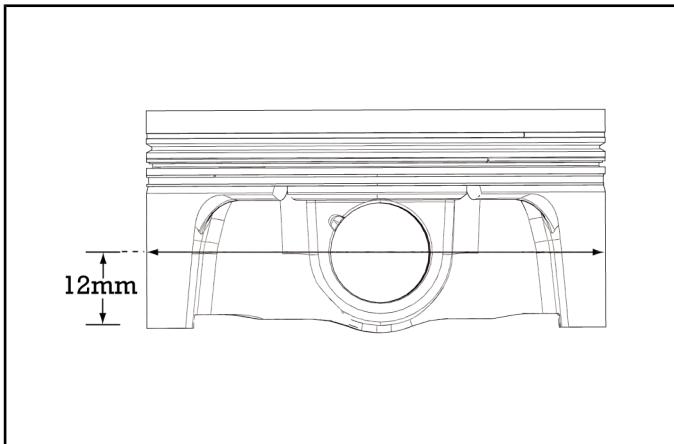
4. Rotate rings in piston grooves. Rings should rotate freely in grooves.
5. Clean carbon deposits from piston.
6. Spread rings only wide enough to remove them from piston. Spreading rings too wide will damage them.
7. Clean piston ring grooves. Break or cut a piston ring in half. File or grind one edge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

NOTE

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. (90° to pin and 12 mm from bottom of piston skirt). Replace piston if worn beyond the service limit. See Service Specifications, page 3.73.

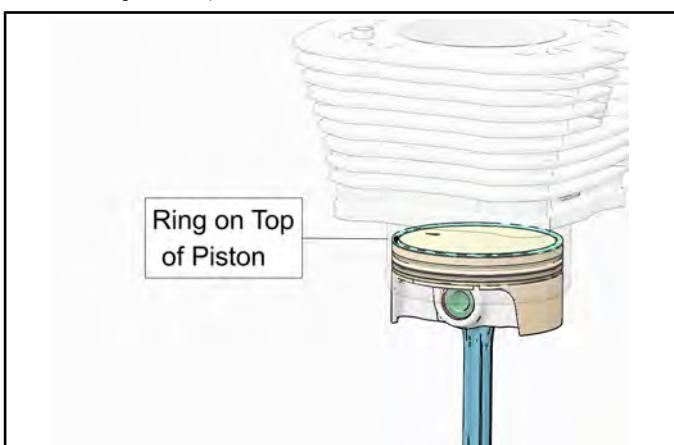


3. Calculate Piston to Cylinder Clearance. Subtract piston O.D. from cylinder bore I.D. and compare to specifications. See Service Specifications, page 3.73.
4. Replace parts that do not meet specification.

NOTE

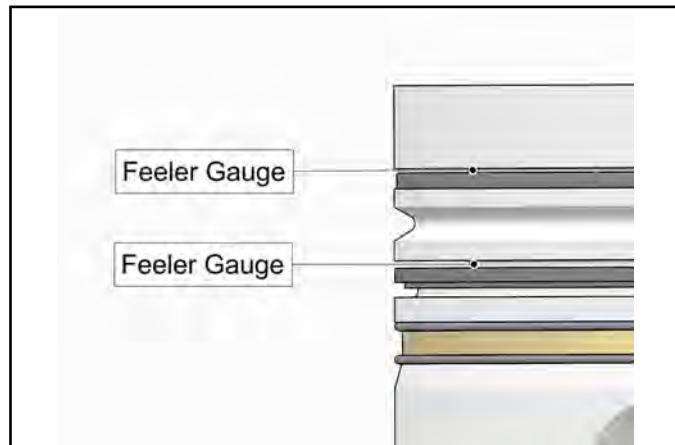
If piston-to-cylinder clearance exceeds service limit, measure a new piston and re-calculate clearance. If piston-to-cylinder clearance exceeds service limits with a new piston, cylinder must be replaced.

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, page 3.73.

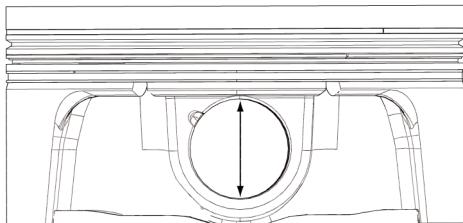
7. Install rings onto a clean piston. Push rings in until they are flush with piston. Using a feeler gauge, measure side clearances for the 1st & 2nd rings.



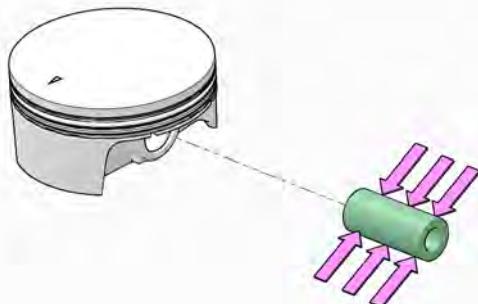
8. Replace parts that exceed service limit.

PISTON PIN / PIN BORE INSPECTION

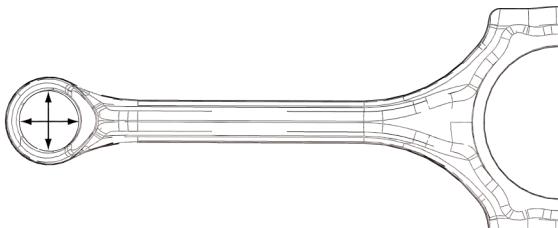
- Measure piston pin hole I. D. top to bottom (as shown) and as close to the circlip groove as possible with a telescoping gauge. Record the smallest measurement.



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



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



- Calculate connecting rod-to-piston pin clearance by subtracting pin O.D. from rod hole I.D.
- Compare measurements to specifications and replace any worn parts. See Service Specifications, page 3.73.

PISTON RING INSTALLATION

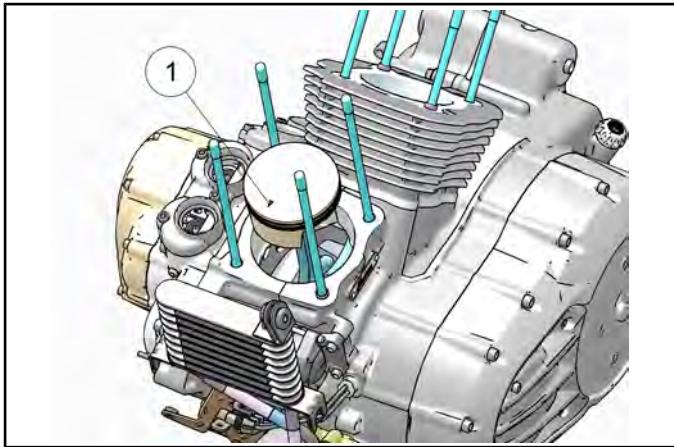
CAUTION

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

- Lubricate all rings with engine oil.
- Carefully install oil control ring expander with end gap located as shown. See Piston Ring Profile And Orientation, page 3.75.
- Install top and bottom rails with end gap located as shown. See Piston Ring Profile And Orientation, page 3.75
- Install top ring (marked "C") and second ring (marked "CTOP") with markings facing UP.
- Compress each ring by hand and rotate to be sure they rotate freely in grooves.
- Locate ring end gaps as shown below in relation to arrow on piston crown. See Piston Ring Profile And Orientation, page 3.75.

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.

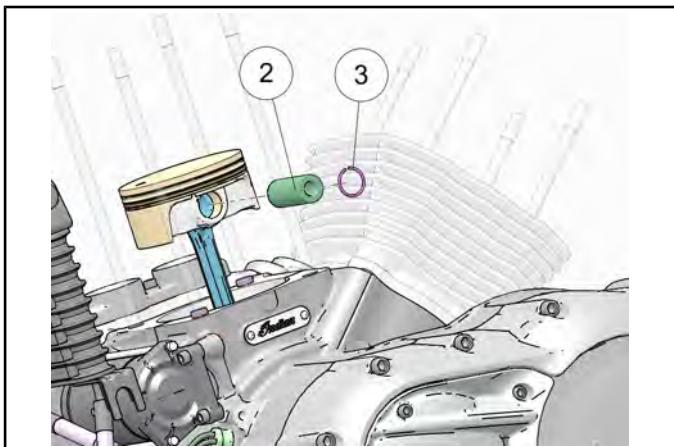


1. Place a clean shop towel over crankcase to prevent foreign material from entering crankcase.
2. Install a new circlip on one side of the piston with end gap facing UP (12:00 position).

IMPORTANT

Never reuse piston pin circlips.

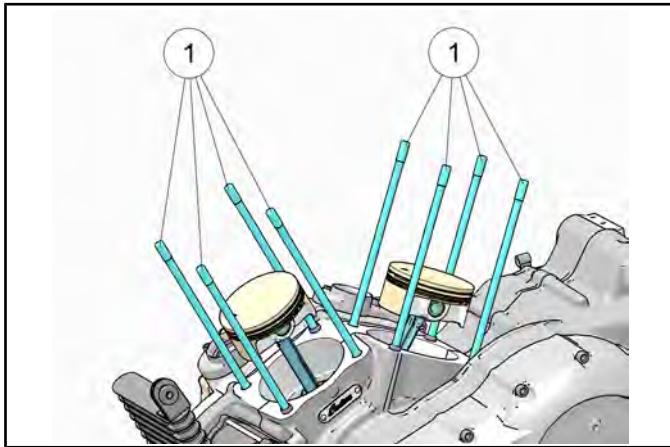
3. Lubricate piston pin and I. D. of connecting rod small end with engine oil or moly lube.
4. Install piston over connecting rod with arrow on piston crown facing FRONT of engine.
5. Push piston pin ② through rod and piston pin hole until it is stopped by circlip.
6. Install remaining circlip ③ with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



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

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.

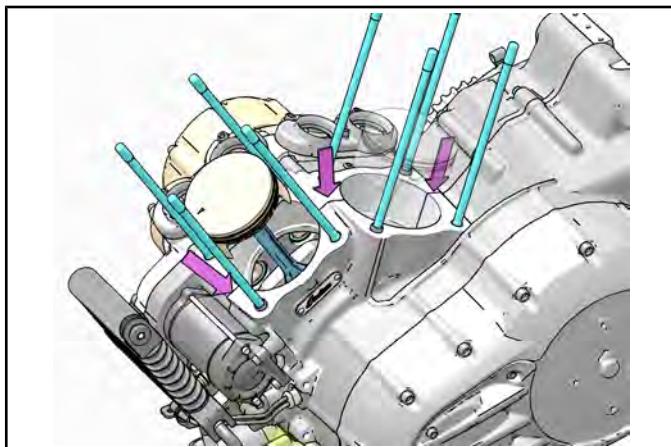
TORQUE

Cylinder Studs: 25 ft-lbs (34 Nm)

CYLINDER INSTALLATION**NOTE**

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.

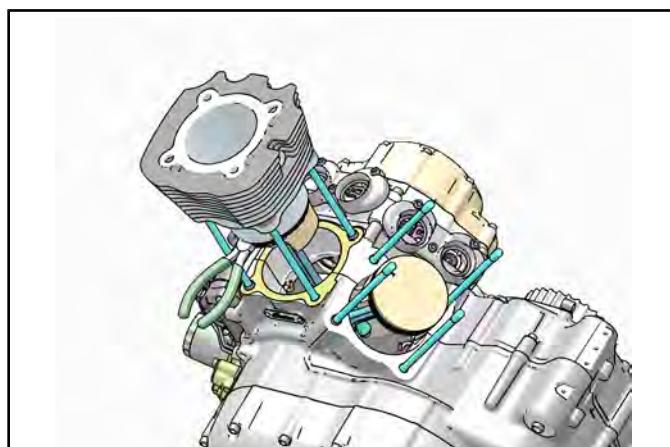
CAUTION

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

NOTE

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

9. Remove protective covering from crankcase.
10. Carefully install cylinder (s) over piston/ring assembly. Do not force cylinder over piston. Monitor rings carefully. If a piston ring becomes dislodged from the ring compressor; remove cylinder, inspect ring carefully for damage.



11. Remove piston ring compressor when rings are fully captive in cylinder.
12. Slide cylinder down over piston until seated to base gasket and crankcase surface.
13. Repeat for other cylinder.
14. Install cylinder head (s). See Cylinder Head Installation, page 3.67.

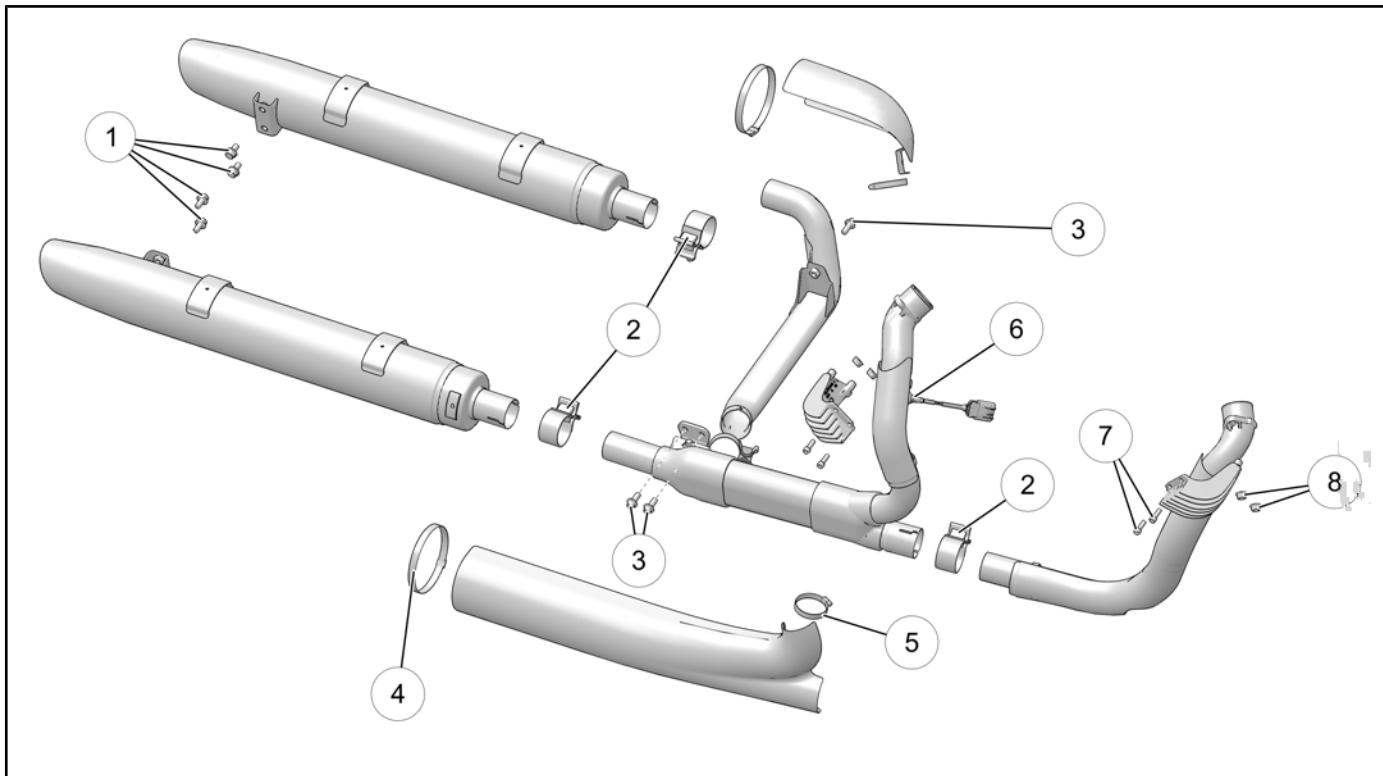
TROUBLESHOOTING, CYLINDER / PISTON

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
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

ENGINE / COOLING / EXHAUST

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Poor High-Speed Running		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
Lack of Power in all RPM Ranges	Transmission Area	Bearings	Refer to Transmission / Crankshaft chapter
	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
	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

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
	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

**EXHAUST
ASSEMBLY VIEWS****EXHAUST SYSTEM**

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Muffler Hanger — M8 x 1.25 x 16 (QTY.4)	18 ft-lbs (24 Nm)
②	Clamp, Exhaust (QTY.4)	31 ft-lbs (42 Nm)
③	Fastener, Rear Head Pipe Hanger — M8 x 1.25 x 20 (QTY.4)	18 ft-lbs (24 Nm)
④	Clamp, Worm Drive	31 in-lbs (4 Nm)
⑤	Clamp, Worm Drive	31 in-lbs (4 Nm)
⑥	Oxygen Sensor (QTY.2)	14 ft-lbs (19 Nm)
⑦	Fastener, Head Pipe Trim Cover — M6 x 1.0 x 20 (QTY.4)	84 in-lbs (10 Nm)
⑧	Nut, Head Pipe — M8 x 1.25 (QTY.4)	15 ft-lbs (20 Nm)

EXHAUST SERVICE

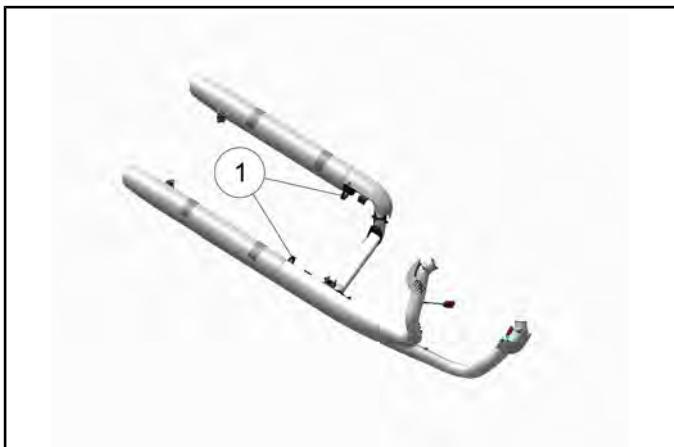
MUFFLER REMOVAL

⚠ WARNING

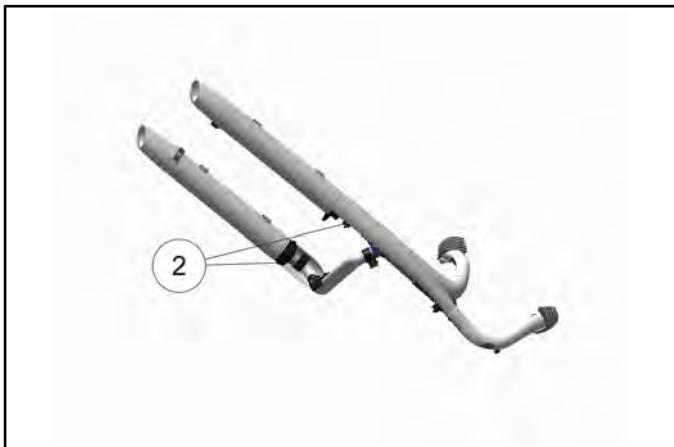
Engine and exhaust components get hot and remain hot for a period of time after the engine is stopped.

Wear insulated protective clothing or wait for components to cool sufficiently before working on the machine.

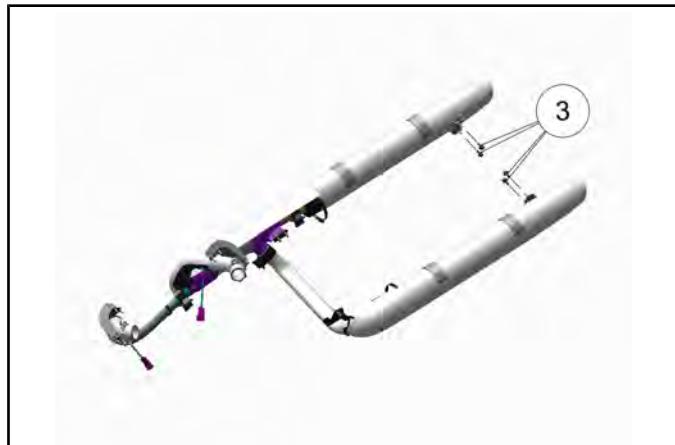
- Using a flat head screwdriver, loosen (do not remove) the rear heat shield clamps ①.



- Loosen the forward muffler clamps ② between the head pipe / cross over pipe and muffler.



- Remove the four fasteners ③ securing each muffler to the rear hanger.



- Slide the muffler assemblies rearward to remove from the head pipe and cross over pipe.

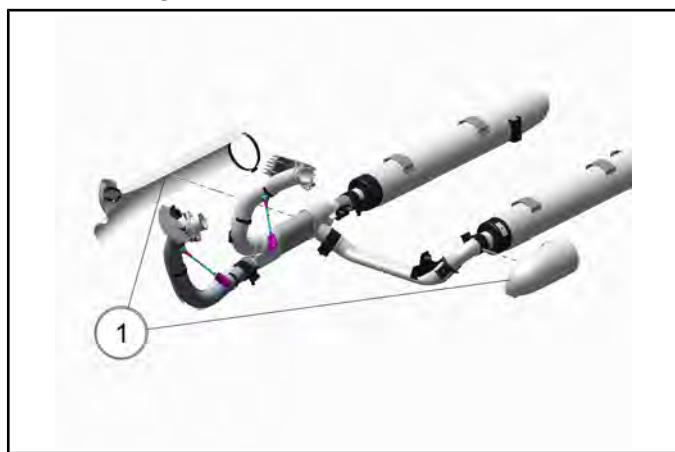


CROSS OVER PIPE REMOVAL

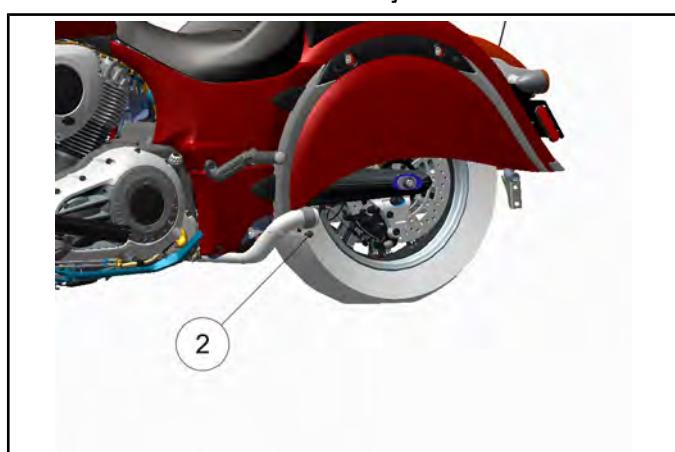
WARNING

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

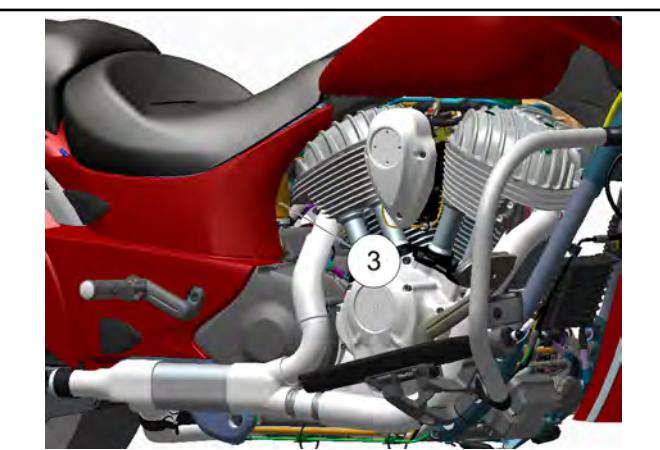
1. Remove saddlebags, if equipped.
2. Using a flat head screwdriver, loosen the heat shield clamps on both sides of the motorcycle until the ends can be opened up. Remove the heat shields ①.



3. Remove left and right muffler assemblies, page 3.87.
4. Remove cross over pipe support fastener ② from left hand side of the motorcycle.

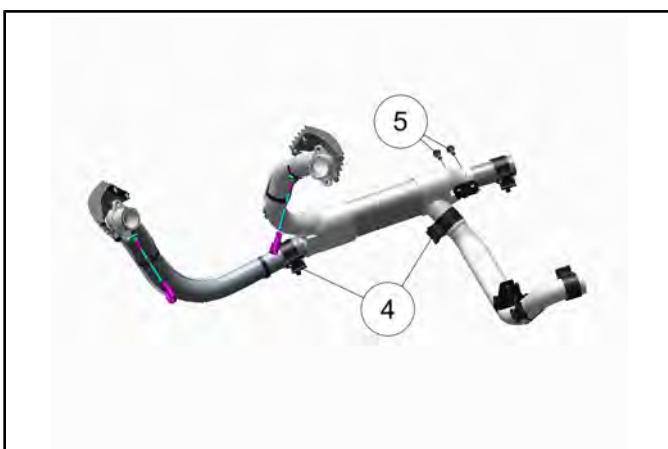


5. Disconnect the rear oxygen sensor connector ③.



Connector is tucked into the RH side frame panel.

6. Loosen rear head pipe and cross over pipe exhaust clamps ④ and remove rear head pipe support fasteners ⑤.

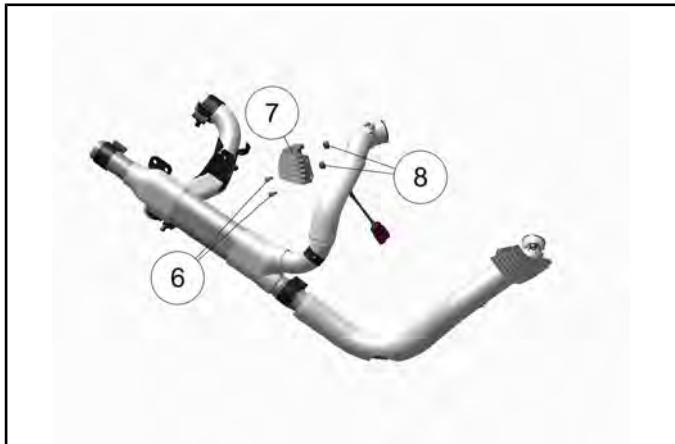


- 7.

⚠ WARNING

Heat sink edges are extremely sharp and could cause personal injury. Wear gloves while removing from the cylinder head assembly.

Remove the two fasteners ⑥ and the heat sink trim cover ⑦ to access the head pipe flange nuts ⑧. Remove flange nuts.



8. Slide the rear head pipe and cross over pipe assembly back to remove from the front head pipe.
9. Remove the cross over pipe from the rear head pipe.

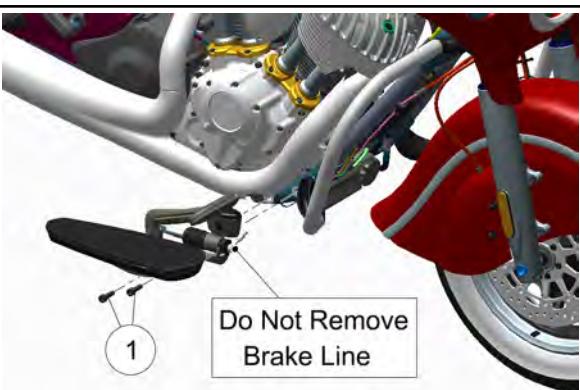
3

HEAD PIPE REMOVAL

WARNING

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

1. Remove cross over pipe / rear head pipe assembly., page 3.88
2. Remove the two fasteners ① securing the RH floorboard to the frame. Keeping the master cylinder reservoir in an upright position, move the floorboard and master cylinder out of the way.



WARNING

Heat sink edges are extremely sharp and could cause personal injury. Wear gloves while removing from the cylinder head assembly.

- Remove the fasteners ③ securing the heat sink trim cover to the cylinder head and remove cover.
5. Remove the flange nuts ④ from the head pipe and remove head pipe from motorcycle..



NOTE

It is not necessary to remove the hydraulic line from the master cylinder during this operation.

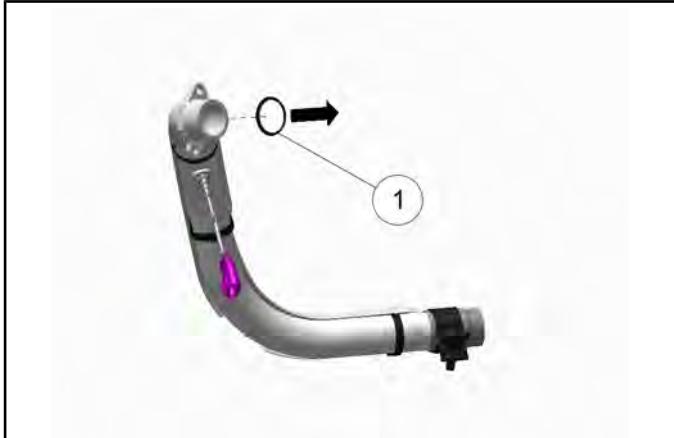
3. Locate the front oxygen sensor connector ②, at the front motor mount, and disconnect.



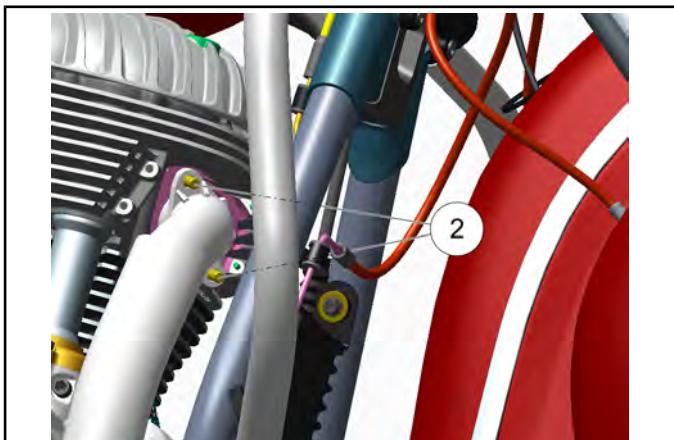
4.

HEAD PIPE INSTALLATION

- Verify that the old head pipe gasket has been removed from the front cylinder head exhaust port and install a new gasket ①.



- With the new gasket in position, slide the front head pipe into position over the flange studs ② and tighten nuts finger tight.

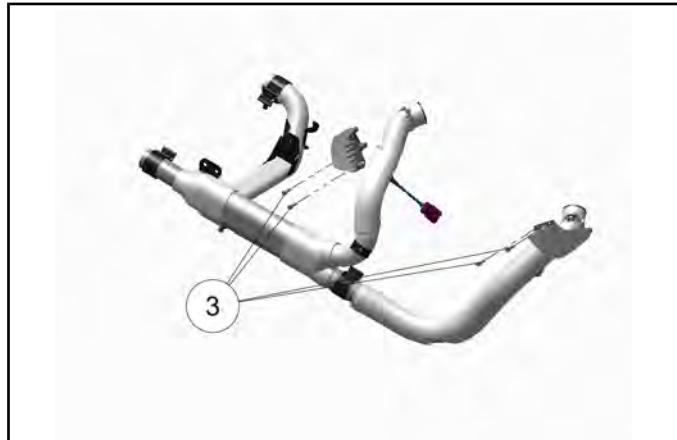


- Install the cross over pipe / rear head pipe, page 3.92 assembly.
- Tighten front and rear head pipe flange nuts to specification.

TORQUE

Head Pipe Flange Nuts: 15 ft-lbs (20 Nm)

- Install front and rear heat sink trim covers and torque fasteners ③ to specification.

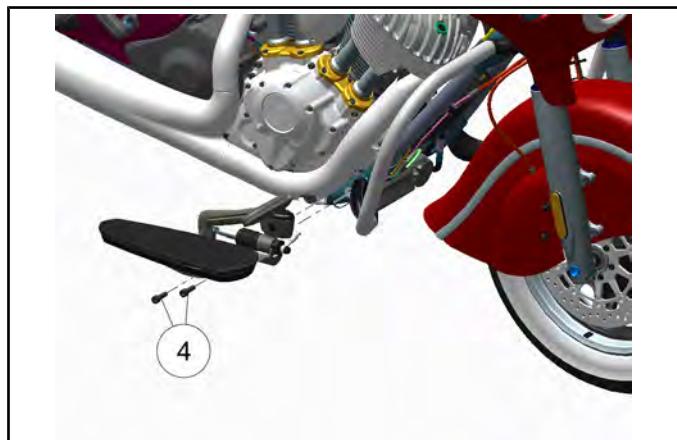


3

TORQUE

Heat Sink Trim Cover Fasteners: 84 in-lbs (10 Nm)

- Reconnect front and rear oxygen sensors and secure wires with cable ties.
- Move RH floorboard into position and torque the two support fasteners ④ to specification.

**TORQUE**

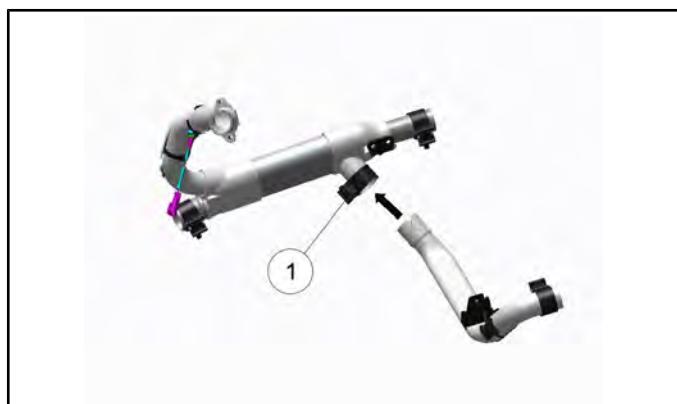
Floorboard Support Fasteners: 35 ft-lbs (48 Nm)

ENGINE / COOLING / EXHAUST

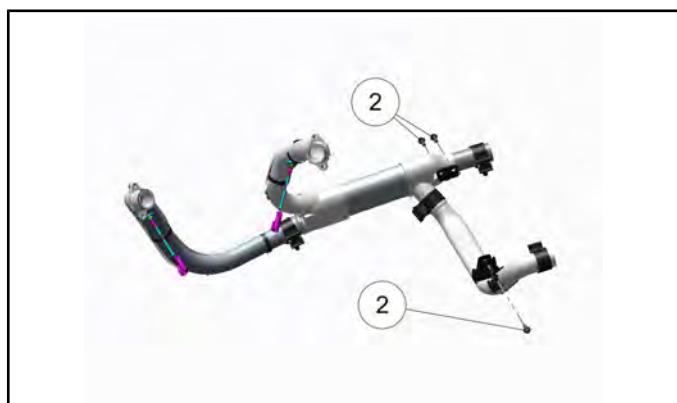
CROSS OVER PIPE INSTALLATION

Front head pipe must be installed before cross over pipe / rear head pipe assembly can be installed.

1. Slide cross over pipe onto rear head pipe. Do not tighten clamp ① at this time.



2. Slide the cross over pipe / rear head pipe assembly into position on motorcycle and install head pipe flange nuts finger tight.
3. Rotate the cross over pipe into position and install the cross over pipe support fastener ② and rear head pipe support fasteners ② finger tight.



4. Tighten head pipe flange nuts to specification.

TORQUE

Head Pipe Flange Nuts: 15 ft-lbs (20 Nm)

5. Install heat sink trim covers and torque fasteners to specification.

TORQUE

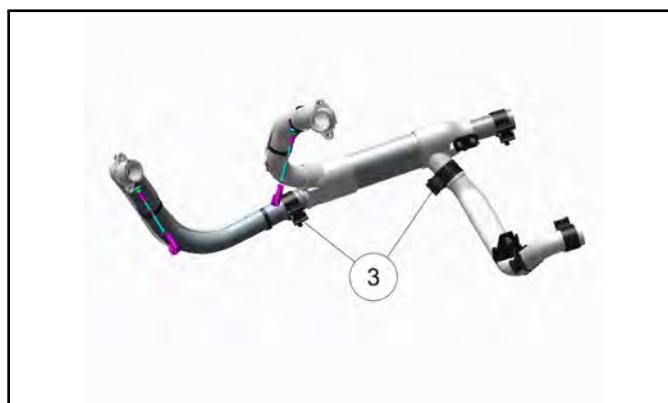
Heat Sink Trim Cover Fasteners: 84 in-lbs (10 Nm)

6. Tighten cross over pipe support fastener ② and rear head pipe support fasteners ② to specification.

TORQUE

Cross Over / Head Pipe Support Fasteners: 18 ft-lbs (24 Nm)

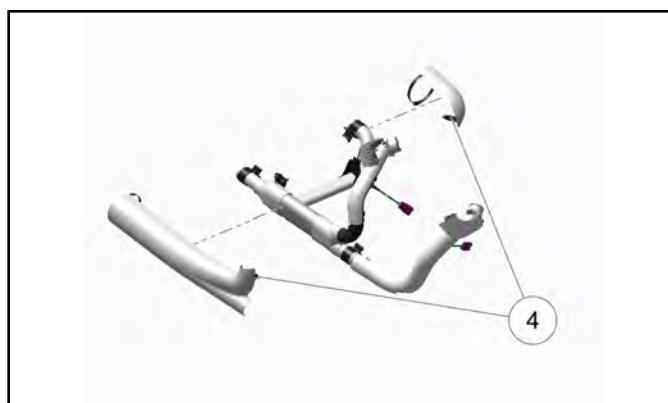
7. Tighten head pipe and cross over pipe exhaust clamps ③ to specification.



TORQUE

Exhaust Clamps: 31 ft-lbs (42 Nm)

8. Reconnect rear oxygen sensor.
9. Install left and right heat shields ④ and torque front clamps to specification.



NOTE

Rear heat shield clamps should not be tightened until the mufflers have been installed.

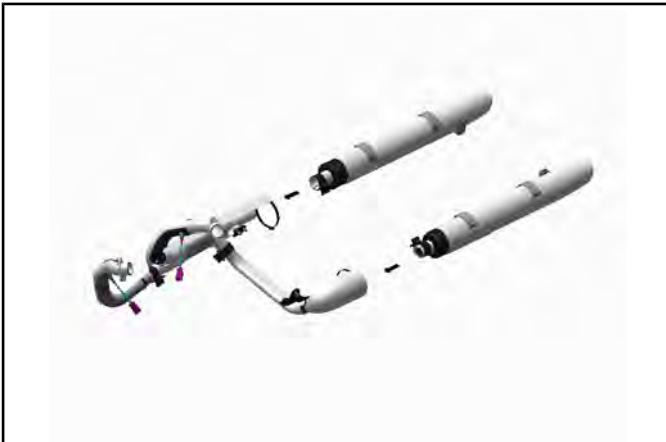
TORQUE

Heat Shield Clamps: 31 in-lbs (4 Nm)

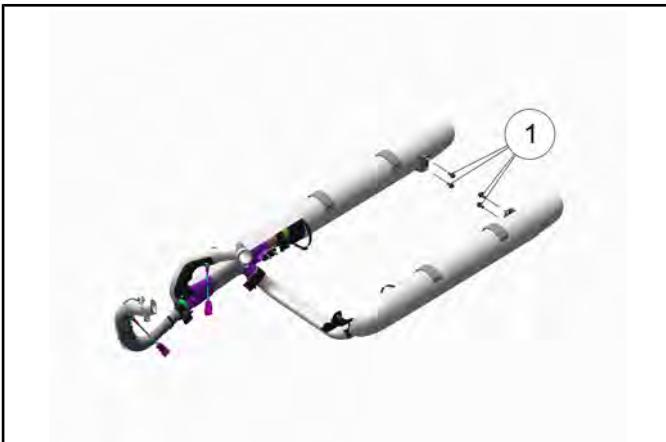
10. Install left and right muffler assemblies, page 3.93.

MUFFLER INSTALLATION

- Slide the left and right mufflers into position so the rear support fasteners can be installed.



- Install rear muffler support fasteners ① into left and right muffler assemblies finger tight.



- Tighten left and right muffler clamps ② to specification.



- Torque rear muffler support fasteners ① to specification.

TORQUE

Muffler Support Fasteners: 18 ft-lbs (24 Nm)

- Torque rear heat shield clamps ③ to specification.

**TORQUE**

Heat Shield Clamps: 31 in-lbs (4 Nm)

- Start engine and listen for exhaust leaks.

3

NOTES

CHAPTER 4

FUEL DELIVERY / EFI

4

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FUEL DELIVERY / EFI

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GENERAL INFORMATION

SERVICE NOTES

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

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

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

Disconnect the fuel pump electrical connector 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.

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Electrical Tester Kit	PV-43536
Fuel Line Plug Tool	2521832
Fuel Rail Fastener Torquing Tool	2564374
Fuel Pressure Adapter	PV-48656
Fuel Pressure Gauge	PU-43506-A
Relay Bypass	PU-49466
Smartlink Module Kit	PU-47471
USB to Serial Adapter	PU-50621

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

SERVICE SPECIFICATIONS

ITEM	SPECIFICATIONS
Fuel Pump Pressure (Normal Operation)	3.99 BAR (400 kPa) (58 psi)
Idle Speed	800 rpm ± 50 rpm
Fuel Pump Amp Draw (Normal Operation)	3–5 Amps
Recommended Octane	91 Octane Minimum
Injector Resistance	11.4 - 12.6 Ohms

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE SPECIFICATION
Air Box Cover	84 in-lbs (10 Nm)
Air Filter Element	62 in-lbs (7 Nm)
Air Filter Retainer Plate	31 in-lbs (4 Nm)
CHT	71 in-lbs (8 Nm)
Console Panel Fasteners	84 in-lbs (10 Nm)
CPS	89 in-lbs (10 Nm)
Evaporative Emissions Canister	84 in-lbs (10 Nm)
Exhaust Clamp	31 ft-lbs (42 Nm)
Fuel Pump Nut	24 in-lbs (3 Nm)
Fuel Tank Fastener	18 ft-lbs (25 Nm)
Gear position Switch	43 in-lbs (5 Nm)
Head Pipe Flange Nuts	15 ft-lbs (20 Nm)
Head Pipe Trim Covers	84 in-lbs (10 Nm)
Ignition Coil	84 in-lbs (10 Nm)
Knock Sensor	15 ft-lbs (20 Nm)
Muffler Hanger Fasteners	18 ft-lbs (24 Nm)
Oil Pressure Switch	88 in-lbs (10 Nm)
Oxygen Sensor	14 ft-lbs (19 Nm)
Rear Head Pipe Hanger	18 ft-lbs (24 Nm)
Side Stand Switch	43 in-lbs (5 Nm)
TMAP	62 in-lbs (7 Nm)
TPMS Sensor Fastener	44 in-lbs (5 Nm)
Wheel Speed Sensor	96 in-lbs (11 Nm)
Worm Drive Exhaust Clamps	31 in-lbs (4 Nm)

SERVICE PRECAUTIONS

EFI SYSTEM PRECAUTIONS

NOTE

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

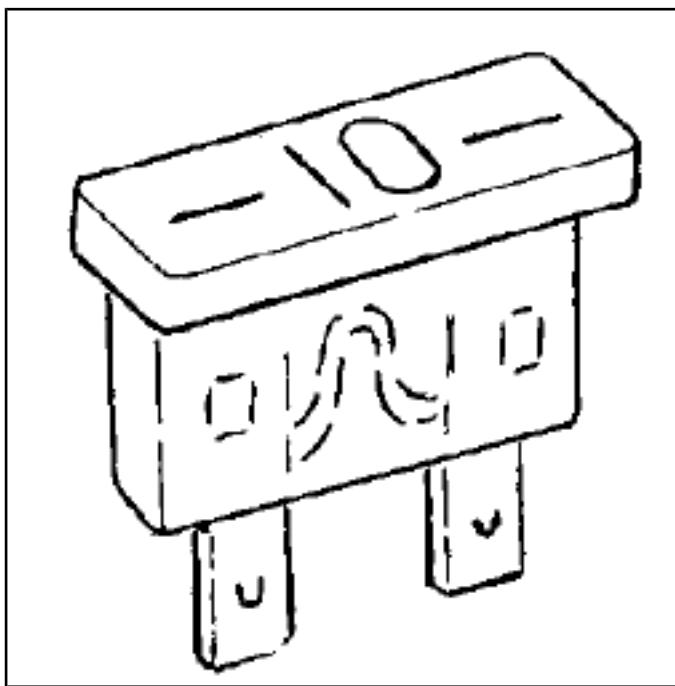
It is not advisable to "jump start" the machine with another battery. Although problems are unlikely to occur if everything is done carefully, the electrical component could be damaged.

Never disconnect the battery while the engine is running.

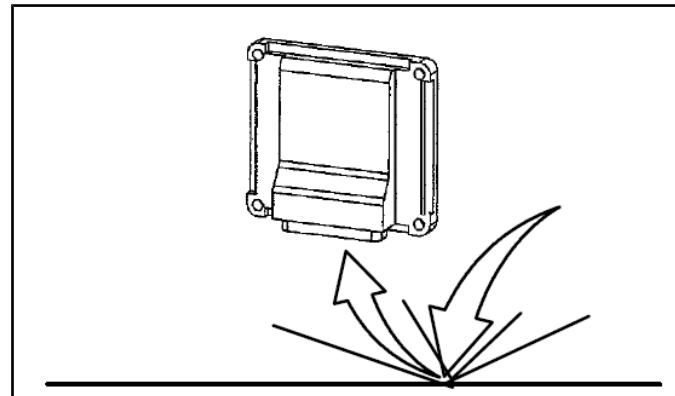
When connecting and disconnecting the battery cables refer to Electrical chapter for complete battery connection and charging information. See Battery Installation, page 10.13.

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



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

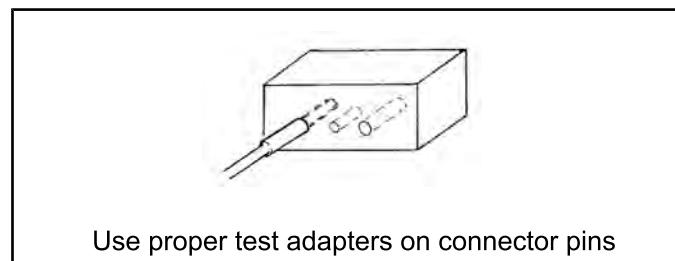


Do not touch ECM connector pins

Anti-static wrist strap PV-43541

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

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.



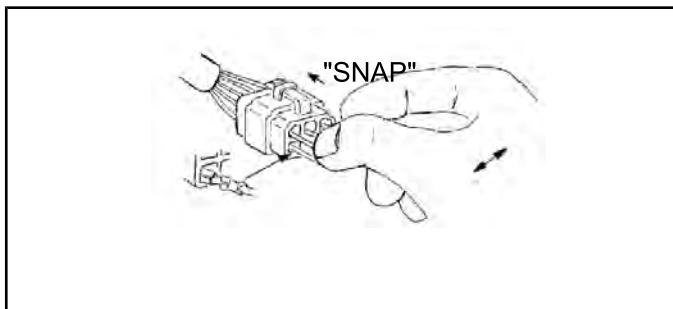
Use proper test adapters on connector pins

Connector test adapter kit PV-43526

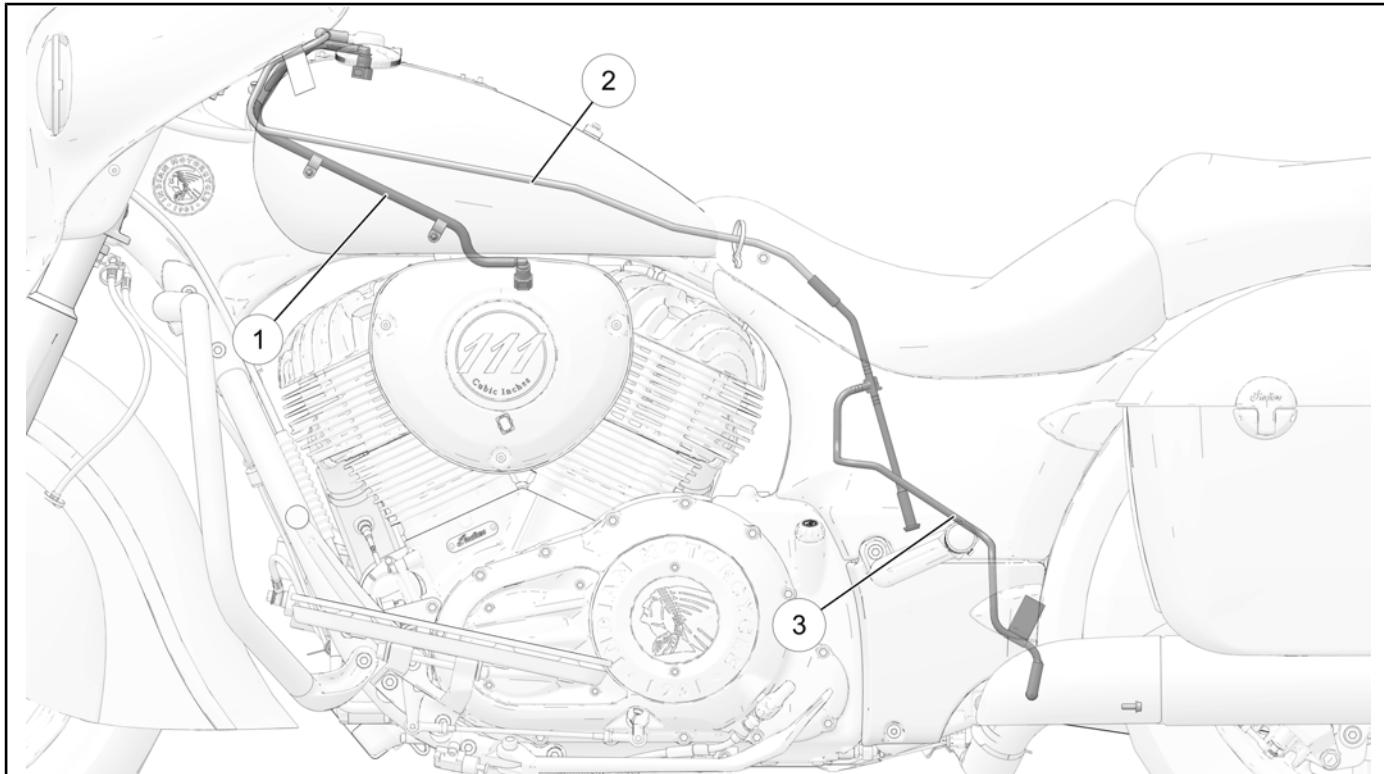
Poor connections are the most common cause of Electronic Fuel Injection malfunctions. Inspect

FUEL DELIVERY / EFI

connector and wiring connections carefully during troubleshooting.

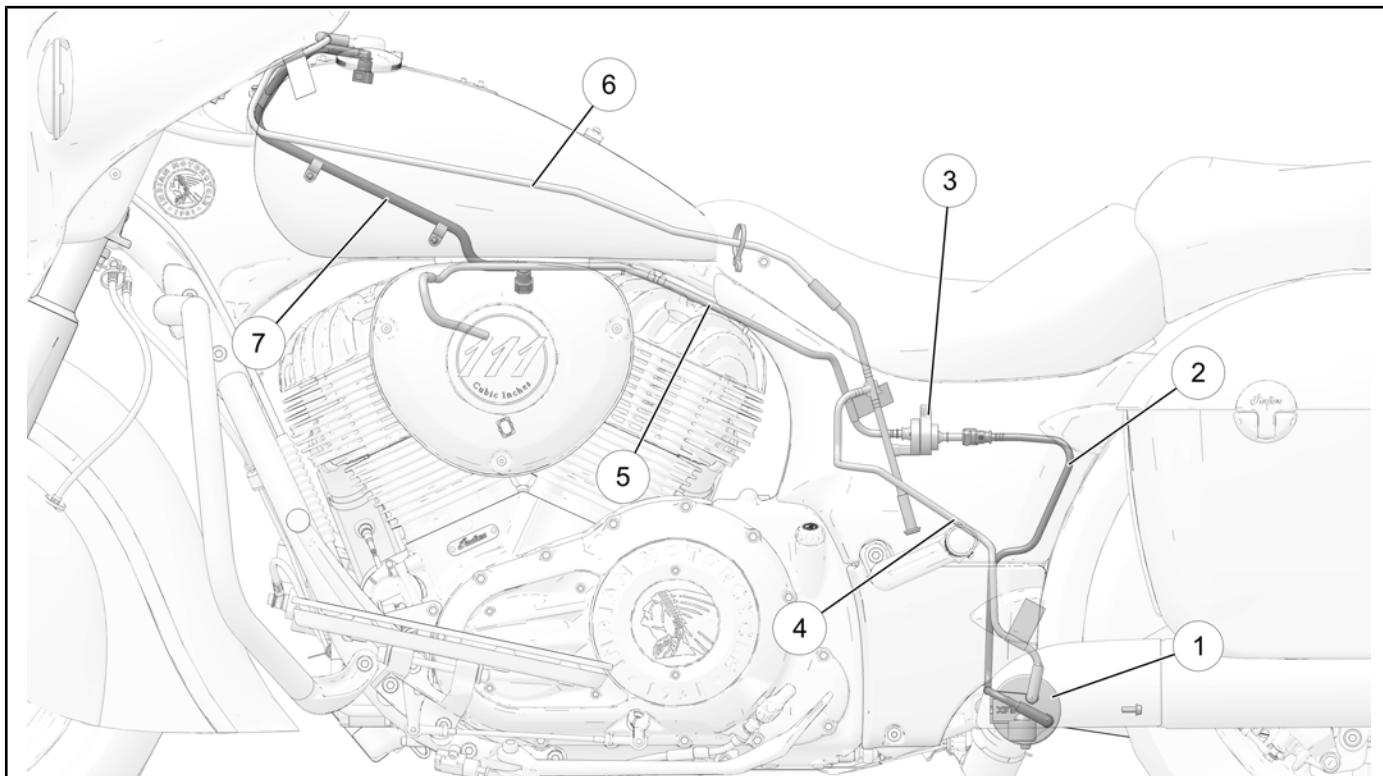


Carefully inspect the connections of the failed circuit before doing any other troubleshooting steps. Wire terminals should be corrosion free and fully seated into the connectors. Connector should snap together and lock.

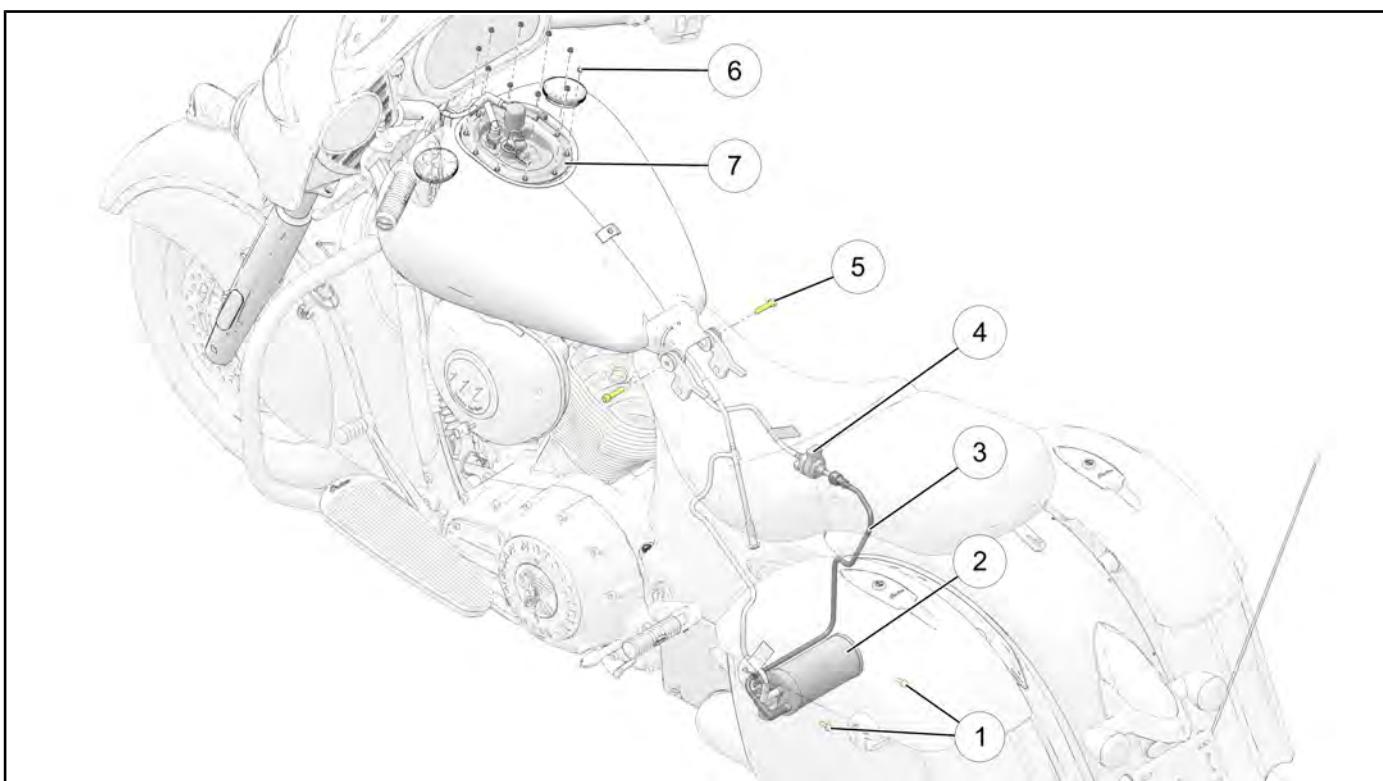
ASSEMBLY VIEWS
FUEL LINE ROUTING (49 STATE MODELS)

4

NUMBER	PART DESCRIPTION
①	Fuel Supply Line (Pump to Fuel Rail)
②	Vapor Vent Line, Upper (from tank)
③	Vapor Vent Line, Lower (to atmosphere)

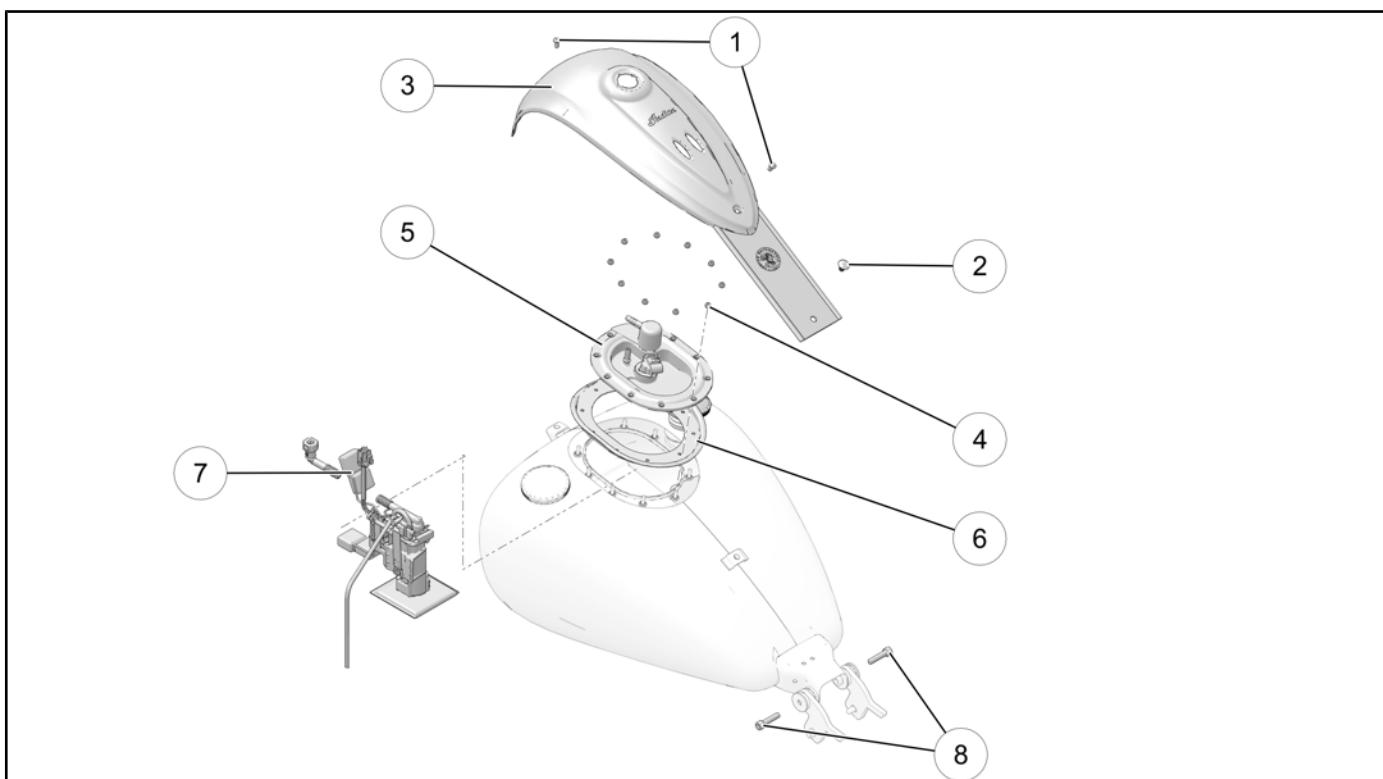
FUEL LINE ROUTING (CA & INTL)

NUMBER	PART DESCRIPTION
①	Evaporative Emissions Canister
②	Vapor Supply Line, Lower (from canister)
③	Canister Purge Valve
④	Vapor Vent Line, Lower (to canister)
⑤	Vapor Supply Line, Upper (to tank)
⑥	Vapor Vent Line, Upper (from tank)
⑦	Fuel Supply Line (Pump to Fuel Rail)

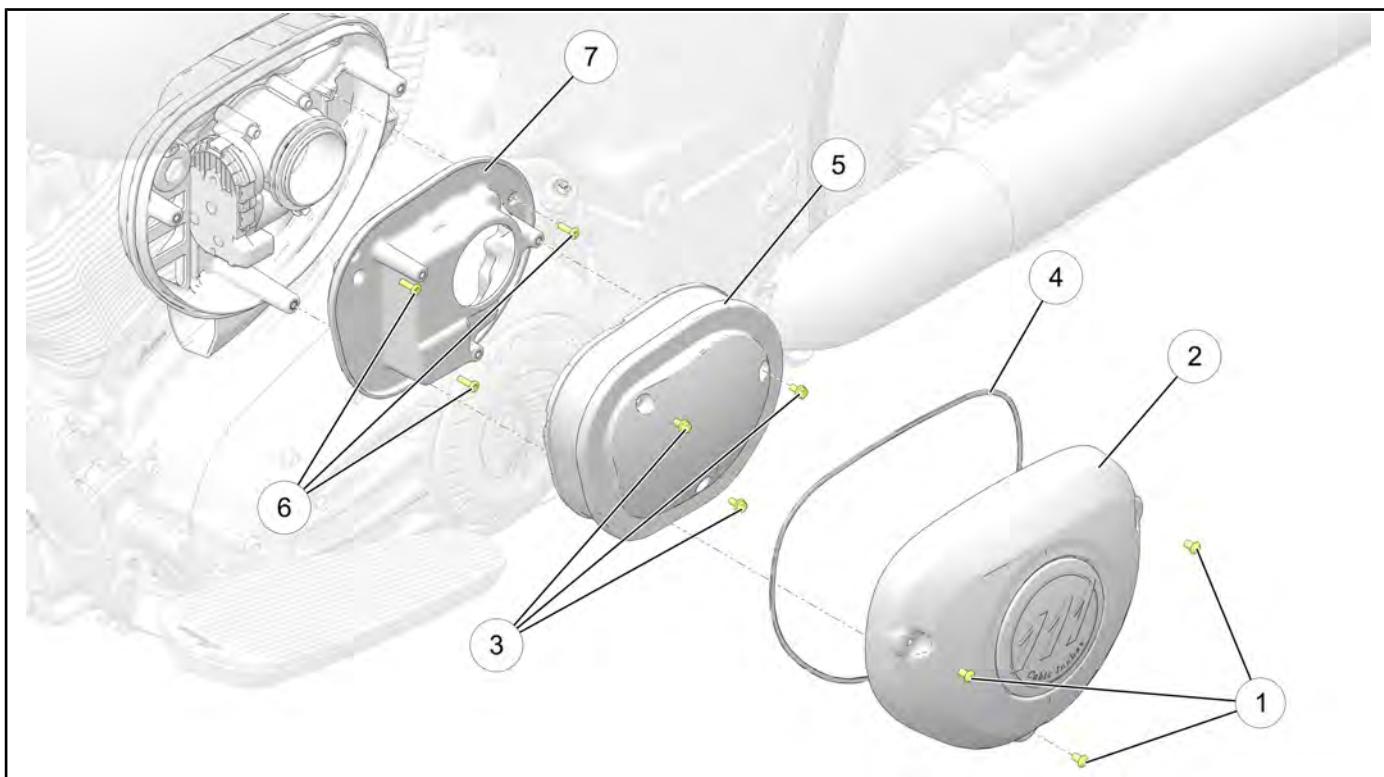
FUEL SYSTEM

4

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Evaporative Emissions Canister — M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)
②	Evaporative Emissions Canister (CA & INTL Models ONLY)	—
③	Purge Line (CA & INTL Models ONLY)	—
④	Purge Valve (CA & INTL Models ONLY)	—
⑤	Fastener, Fuel Tank — M8 x 1.25 x 35 (QTY.2)	18 ft-lbs (25 Nm)
⑥	Nut, Fuel Pump — M5 x 0.8 (QTY.10)	24 in-lbs (3 Nm)
⑦	Fuel Pump	—

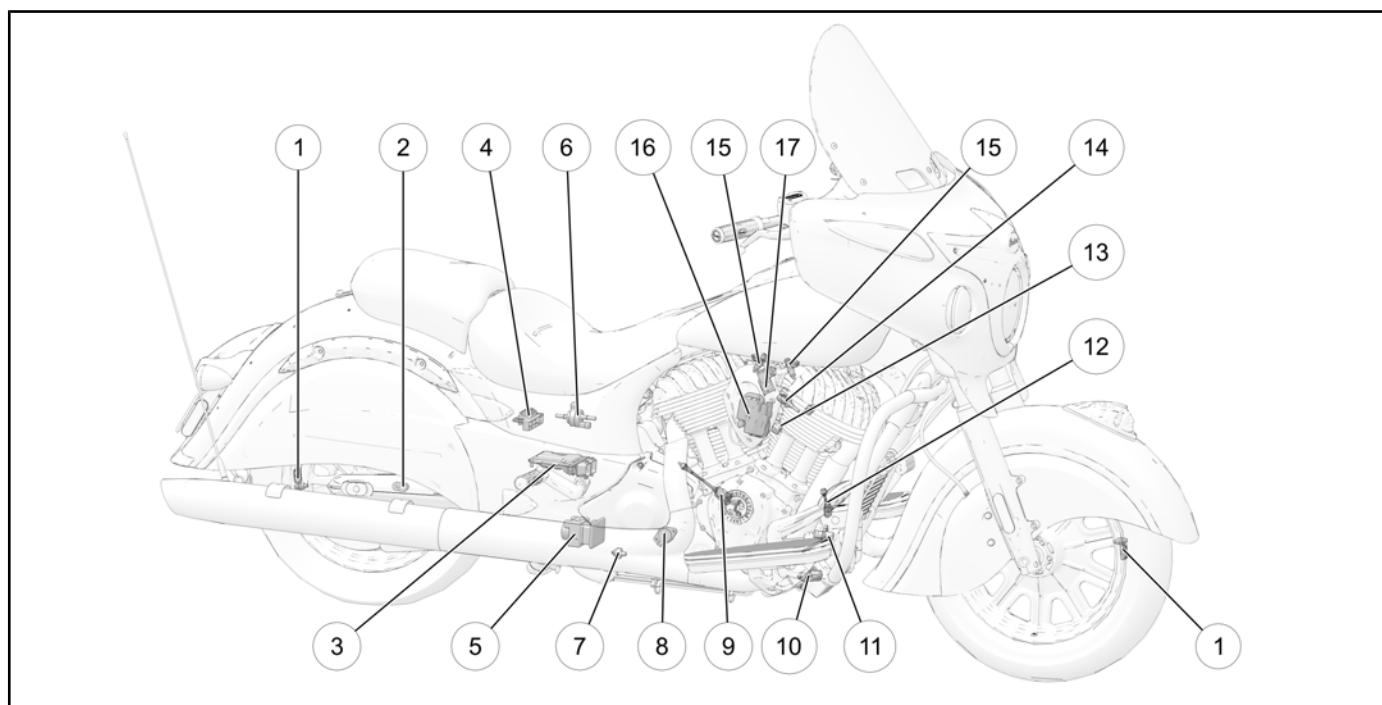
FUEL TANK

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Console Panel — M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)
②	Plastic Dart	—
③	Console Cover	—
④	Nut, Fuel Pump — M5 x 0.8 (QTY.10)	24 in-lbs (3 Nm)
⑤	Fuel Pump Access Panel	—
⑥	Gasket, Fuel Pump	—
⑦	Fuel Pump	—
⑧	Fastener, Fuel Tank — M8 x 1.25 x 35 (QTY.2)	18 ft-lbs (25 Nm)

AIR BOX

4

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Air Box Cover — M6 x 1.0 x 10 (QTY.3)	84 in-lbs (10 Nm)
②	Cover, Air Box	—
③	Fastener, Air Filter Element — M5 x 0.8 x 10 (QTY.3)	62 in-lbs (7 Nm)
④	Gasket, Air Box Cover	—
⑤	Air Filter Element	—
⑥	Fastener, Air Filter Retainer Plate — 10 x 5/8 (QTY.3)	31 in-lbs (4 Nm)
⑦	Retainer Plate, Air Filter	—

SENSORS – POWERTRAIN MANAGEMENT

NUMBER	SENSOR / LOCATION	TORQUE (IF APPLICABLE)
①	TPMS (Tire Pressure Monitoring System) — Sensor located 180° from valve stem	44 in-lbs (5 Nm)
②	Wheel Speed Sensor, Rear — Located at the rear caliper carrier	96 in-lbs (11 Nm)
③	ECM (Engine Control Module) — Located inside the lower RH side cover, behind the drive sprocket	—
④	Fuse Box — Located inside the LH upper side cover. NOTE: High current J-Case Fuse Box located behind battery box	—
⑤	ABS (Anti-Lock Brake) Module — Located in front of the rear tire	—
⑥	Canister Purge Valve (CA models only) — Located inside the RH upper side cover	—
⑦	Oil Pressure Switch — Located at the rear of the LH engine case	88 in-lbs (10 Nm)
⑧	Gear Position Switch — Located inside the drive sprocket cover, below the drive sprocket	43 in-lbs (5 Nm)
⑨	Oxygen Sensor, Rear — Located on the rear head pipe	14 ft-lbs (19 Nm)
⑩	Side Stand Switch — Located behind the side stand hinge	43 in-lbs (5 Nm)
⑪	CPS (Crank Position Sensor) — Located on the front of the engine by the oil filter	89 in-lbs (10 Nm)
⑫	Oxygen Sensor, Front — Located on the front head pipe	14 ft-lbs (19 Nm)
⑬	Detonation “Knock” Sensor — Located on the rear face of the front cylinder heat sink	15 ft-lbs (20 Nm)
⑭	CHT (Cylinder Head Temperature) Sensor — Located on the rear face of the front cylinder head	71 in-lbs (8 Nm)
⑮	Fuel Injectors — Located at the cylinder head intake ports	—
⑯	Ignition coil — Located behind the horn assembly on the RH side of the engine	84 in-lbs (10 Nm)
⑰	TMAP — (Temperature / Manifold Absolute Pressure) Sensor — Located on the back side of the intake manifold	62 in-lbs (7 Nm)

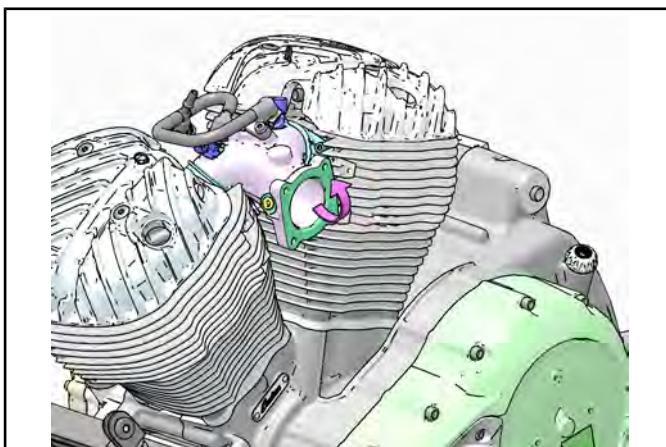
FUEL DELIVERY SERVICE

INTAKE MANIFOLD, REMOVAL / INSTALLATION

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove the fuel tank. See Fuel Tank Removal, page 4.15.
3. Remove the air box / throttle body assembly. See Air Box Removal, page 3.4.
4. Remove the fuel injectors. See Fuel Injector, Removal / Installation, page 4.42.
5. Loosen the two clamps ① securing the intake manifold to the rubber boots at the front and rear cylinders.



6. Remove the four fasteners securing the intake boots to the cylinder head.
7. Rotate the air box mounting flange up as shown and remove the intake manifold from the engine.



8. **INSTALLATION** is performed by reversing the removal procedure.

9. Torque the intake manifold clamps and boots to specification.

TORQUE

Intake Manifold Clamps: 20 in-lbs (2 Nm)

TORQUE

Intake Manifold Boots: 89 in-lbs (10 Nm)

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 4.14.
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 3.51 BAR (351 kPa) (51 psi)

4. Turn ignition switch off. Disconnect gauge adapter and re-connect fuel line (Fuel Tank Installation, page 4.19).

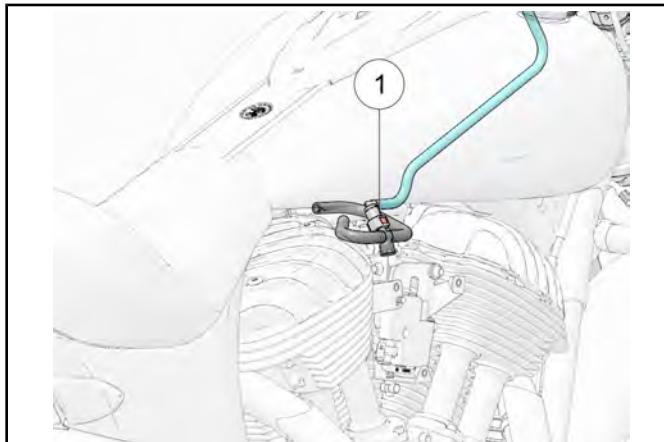
FUEL PRESSURE TROUBLESHOOTING	
FUEL PRESSURE TOO LOW: INSPECT	FUEL PRESSURE TOO HIGH: INSPECT
<ul style="list-style-type: none"> * Low fuel level (add fuel) * Pump not running (Fuel pump or circuit malfunction) * Restricted fitting, fuel supply line, or gauge adapter hose * Fuel line kinked or restricted (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 seconds the instant that the key switch and Engine Stop switch are turned ON. 	<ul style="list-style-type: none"> * Plugged fuel return (in tank or pressure regulator) * Pressure regulator malfunction (located on pump).

FUEL SYSTEM DEPRESSURIZATION

⚠ WARNING

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

1. Remove the horn. See Horn Removal / Installation, page 10.56.
2. Wrap a clean shop towel around fuel line fitting ①.
3. Squeeze both release buttons (one on each side of fitting) and hold. Gently slide fitting straight off fuel rail.



4. Cover fuel fittings to keep debris out.

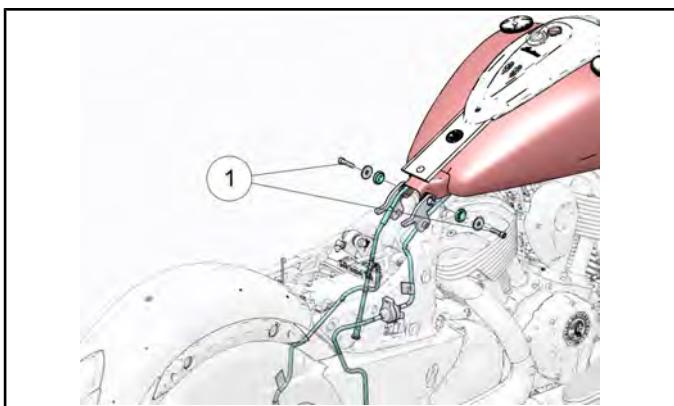
FUEL TANK REMOVAL

⚠ WARNING

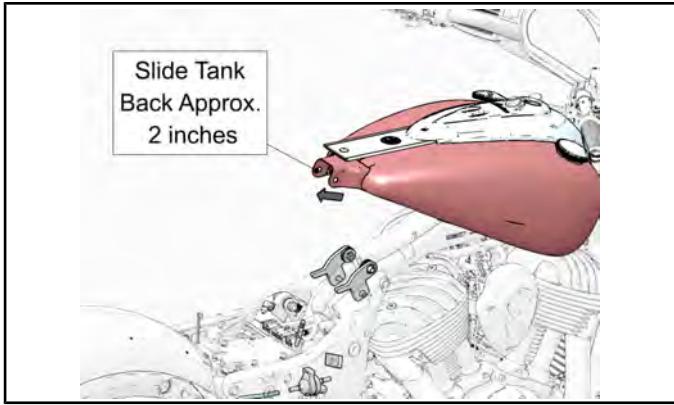
Allow engine and exhaust to cool completely before disconnecting fuel line or removing tank. Protect fuel tank finish when removing, storing, and installing tank.

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.

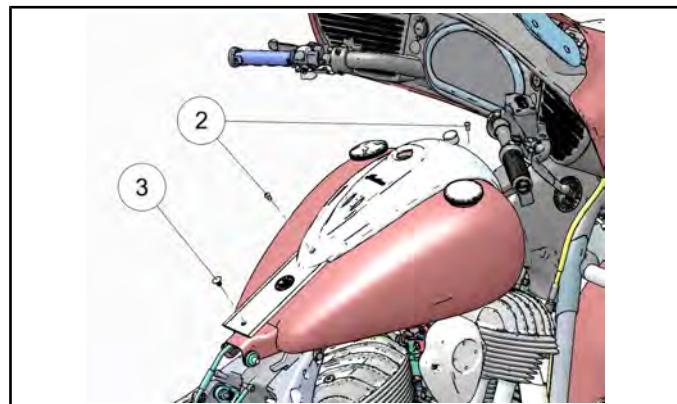
1. Remove seat. See Seat, Removal / Installation - Classic / Vintage / Chieftain, page 7.21
2. Remove the two fasteners ①, washer and rubber isolator at the rear of the fuel tank.



3. Lift the rear of the tank and slide back approximately 2" to expose the front console cover fastener.



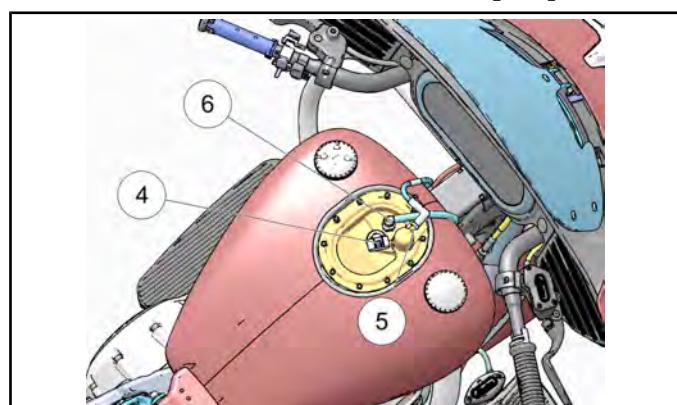
4. Remove console cover fasteners ② and the plastic dart ③.



- **Chieftain / Roadmaster**

For these models the front fastener does not have to be removed. Remove rear fastener and slide console forward to release it from the front mounting grommet.

5. Disconnect electrical connectors at the security light, central locking and system power buttons and remove console cover.
6. Disconnect the fuel pump electrical connector ④, and the evaporative vent line ⑤.
7. With a shop rag wrapped around the fuel fitting, remove the fuel line ⑥ from the fuel pump.

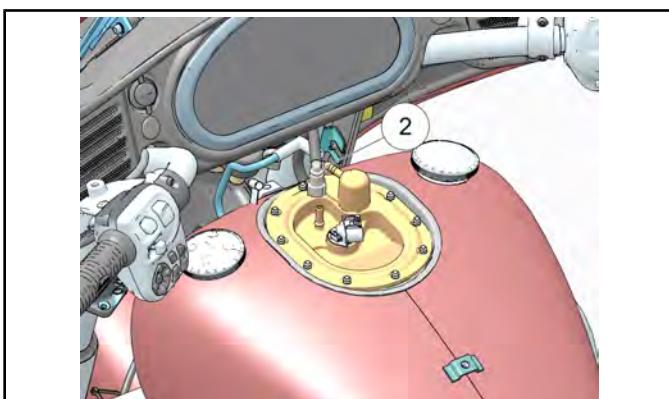


FUEL DELIVERY / EFI

- Lift the rear of the fuel tank and slide rearward to release from the front isolators.



- Wrap a shop rag around the fuel supply line connector ② and disconnect from fitting.



- Lift the tank off of the motorcycle and store safely.

FUEL PUMP REMOVAL

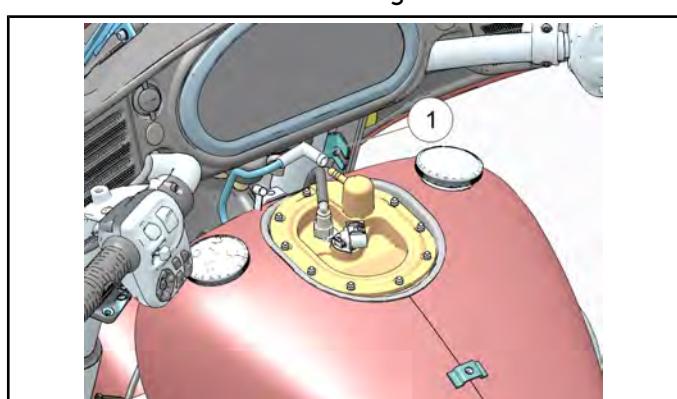
WARNING

Replace all mounting fasteners and pump seal O-ring any time pump is removed for service. Do not kink or bend fuel pickup hose upon removal. Review gasoline warnings outlined in the beginning of this chapter. See EFI System Precautions, page 4.5.

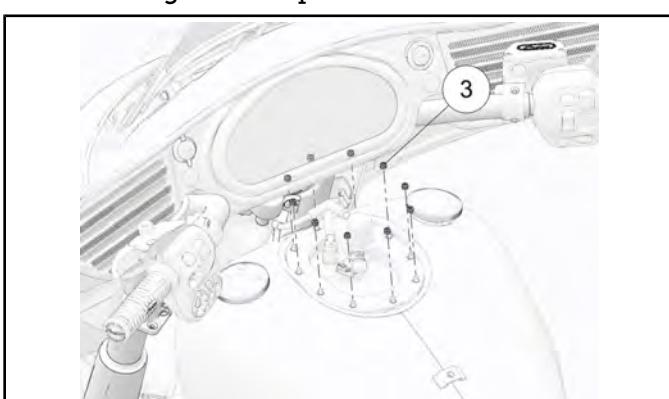
CAUTION

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

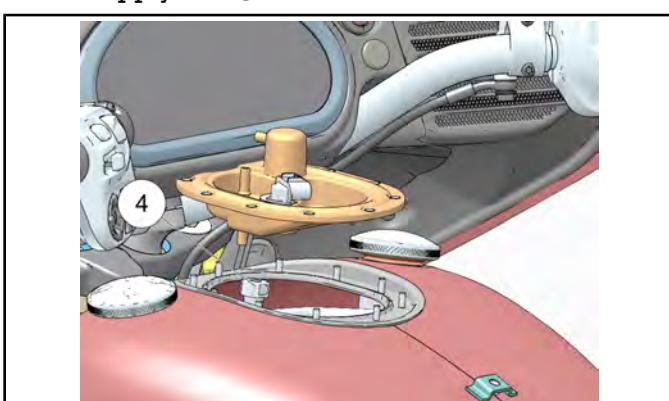
- Remove the console cover from the fuel tank. See STEPS 1–5 of Fuel Tank Removal, page 4.15.
- Disconnect the fuel pump electrical connector and move out of the way.
- Disconnect the fuel tank vent line ① by sliding the rubber elbow off of the fitting.



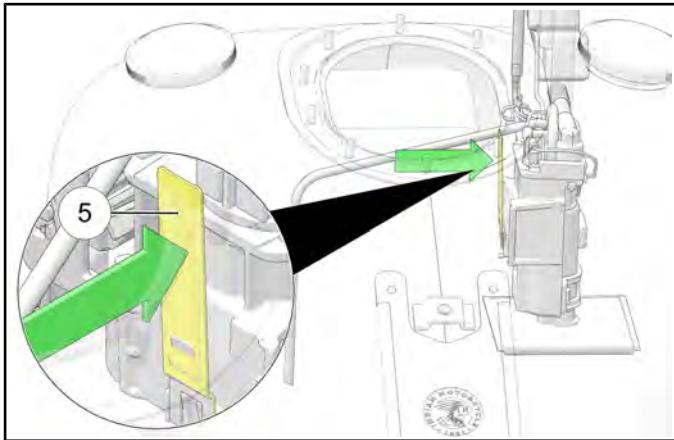
- Remove fuel pump access cover nuts ③ in an alternating or "star" pattern.



- Raise the fuel pump access cover enough to disconnect the fuel pump electrical connector and the supply line ④.



- Reach in through the fuel pump access cover and gently press the fuel pump retaining tab ⑤ toward the RH side of the fuel tank.



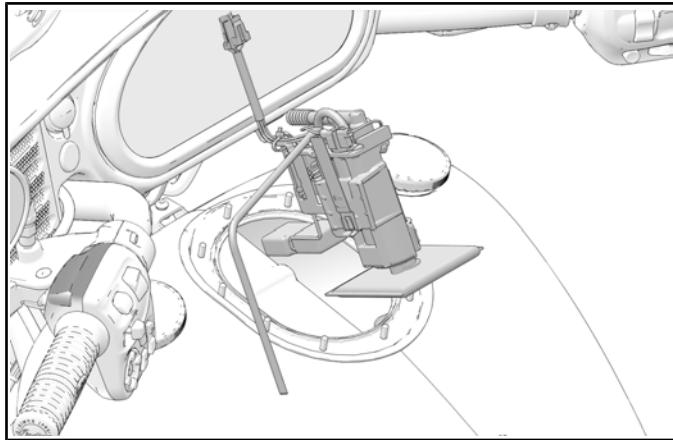
- Lift the fuel pump assembly out of the retaining bracket and carefully lift out of the fuel tank.

FUEL TANK VENT INSPECTION

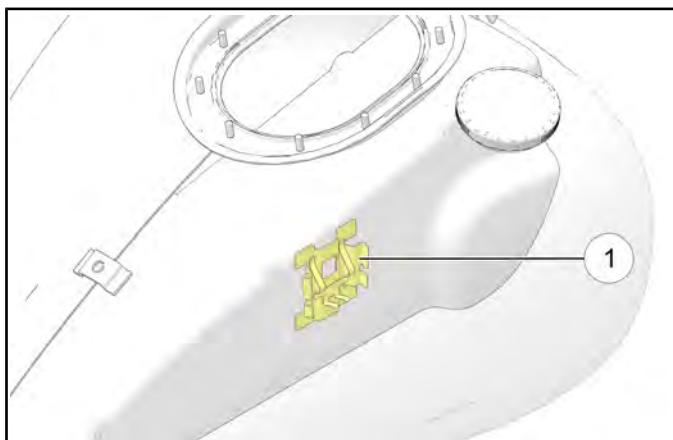
- Refer to Maintenance chapter for tank vent inspection and hose routing information. See Fuel Tank Vent Inspection (49 State), page 2.21.

FUEL PUMP INSTALLATION

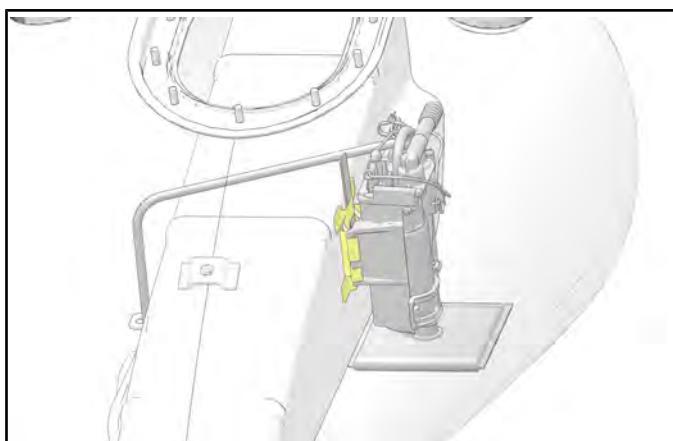
- Lower the fuel pump assembly into the access hole with the level arm facing forward and the jet pipe resting on the left side of the tunnel.



- Once the pump body is inside the tank, line up the guide rails and retaining tab with the bracket ①.



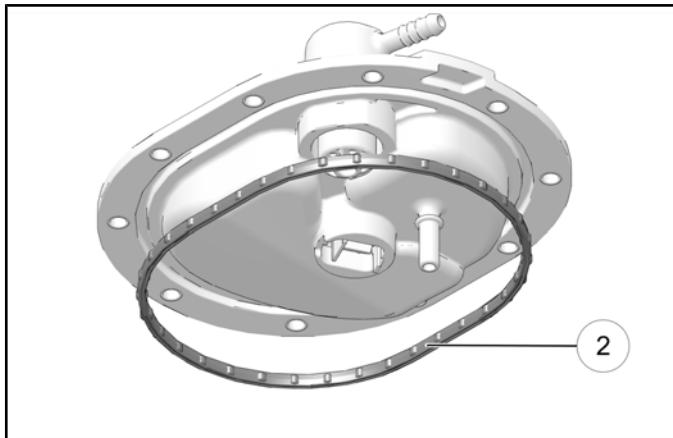
- Slide the pump into position until the retaining tab engages and the pump is locked in place.



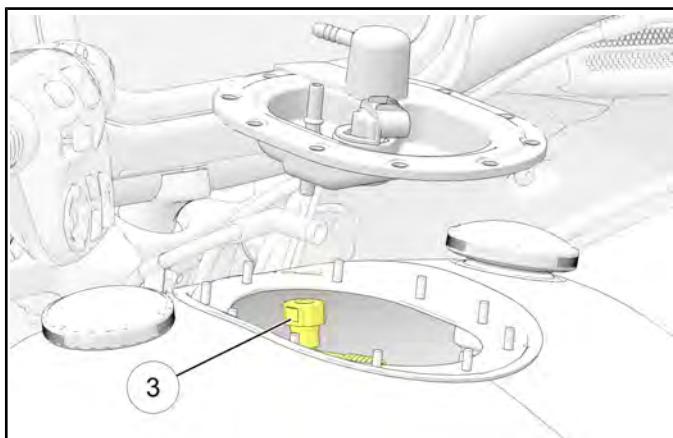
- Verify that the float arm moves freely through its full range of motion.

FUEL DELIVERY / EFI

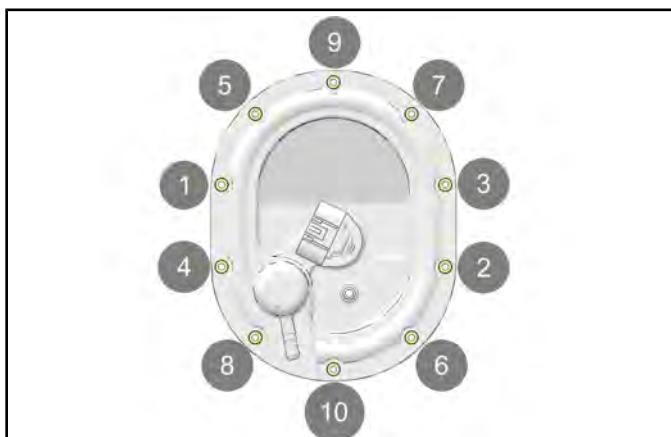
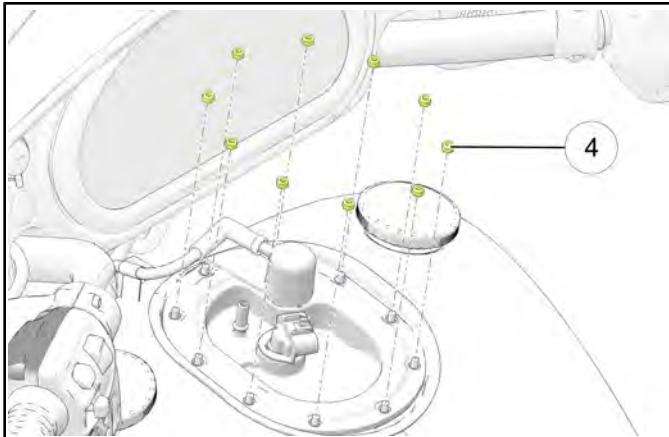
5. Press a new sealing gasket ② into the bottom of the fuel pump access cover.



6. Lower the fuel pump access cover into position and connect the electrical connector and supply line ③.



7. Install fuel pump access cover nuts ④ and tighten to specification following the torque sequence shown.



TORQUE

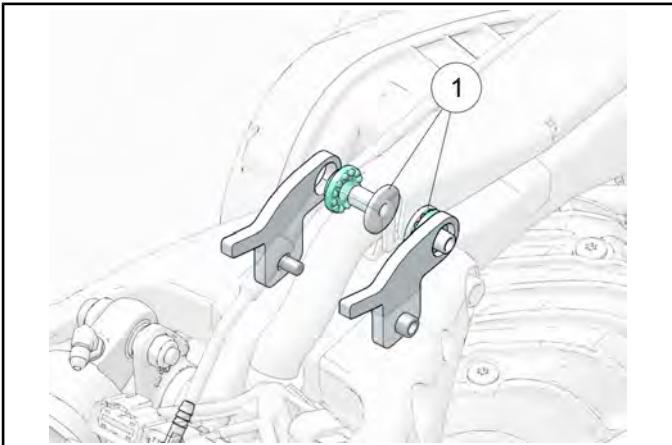
Fuel Pump Access Cover: 43 in-lbs (5 Nm)

8. Connect the fuel supply line, vent line and fuel pump electrical connector to the top of the access cover.
9. Install the console cover.
10. Prime the fuel system and verify fuel pump operation. See [Priming The Fuel System, page 4.22](#)

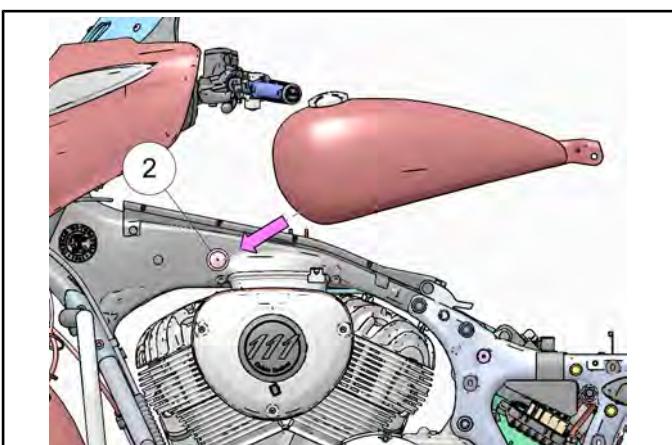
FUEL TANK INSTALLATION

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

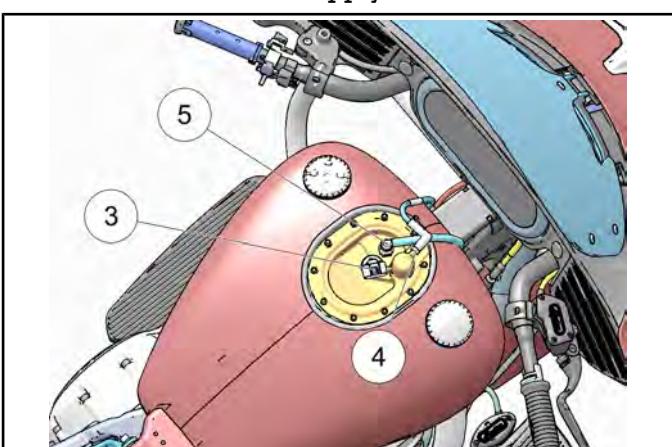
1. Install fuel cap assembly if removed.
2. Install the inner isolator / spacer assemblies ① to the rear fuel tank mounts as shown.



3. Verify that forward tank isolators ② are in position on the frame mounts and lower tank into position. DO NOT slide forward into position at this time.



4. Connect the fuel pump electrical connector ③, vent line ④ and fuel supply line ⑤.

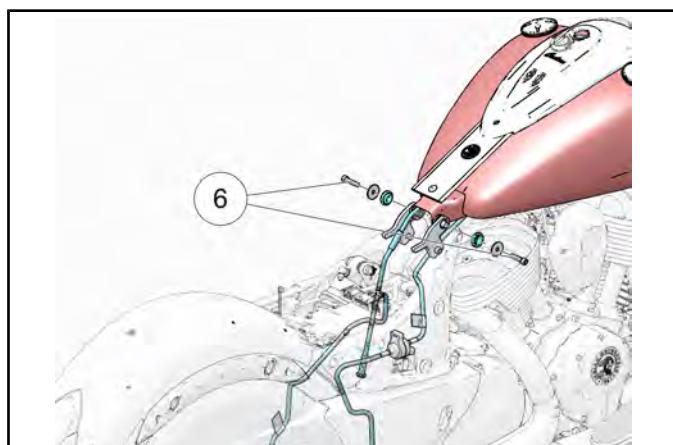


5. Install the console cover and torque fasteners to specification.

TORQUE

Console Cover Fasteners: 84 in-lbs (10 Nm)

6. Slide tank forward until fully seated on forward isolators.
7. Lower the rear of the tank into position over the rear mounting bracket.
8. Install the outer isolators and washers onto the rear tank mount and install mounting fasteners ⑥.



9. Verify that the fuel tank vent line is routed properly and torque the fuel tank mounting fasteners to specification.

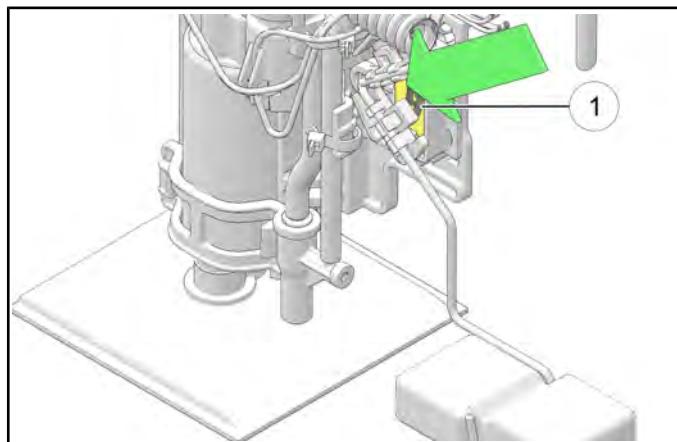
TORQUE

Fuel Tank Mounting Fasteners: 84 in-lbs (10 Nm)

10. Install seat and side covers.

FUEL LEVEL SENSOR RESISTANCE TEST

OVERVIEW OF OPERATION: Fuel level readings are measured by a variable resistance fuel level sensor ①. The fuel level sensor is located inside the fuel tank on the fuel pump.



If fuel level readings are inaccurate when the motorcycle is powered up, or if the fuel gauge isn't indicating fuel level at all, perform the following test and refer to resistance values located at the end of this procedure.

1. Remove the fuel pump. See Fuel Pump Removal, page 4.16.
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.

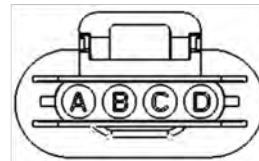
PIN OUT INFORMATION		
I.D.	COLOR	ASSIGNMENT
A	YE	LEVEL SENDER (+)
B	BL	FUEL PUMP (-)
C	BK	LEVEL SENDER (-)
D	RD	FUEL PUMP (+)

LEVEL SENSOR ARM POSITION	APPROXIMATE RESISTANCE LIMITS
Full (Top of Range)	97–103 Ω
Empty (Bottom of Range)	445–455 Ω

FUEL PUMP SUPPLY VOLTAGE TEST

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

1. Remove the console cover and disconnect the fuel pump / level sensor electrical connector. See Fuel Pump Removal, page 4.16 steps 1–5.
2. Connect meter across terminals A & B on the *wire harness* side of connector.



PIN OUT INFORMATION		
I.D.	COLOR	ASSIGNMENT
A	VT/YE	FUEL PUMP (+)
B	BK	FUEL PUMP (-)
C	BK/DG	LEVEL SENDER OUTPUT
D	BK/BL	LEVEL SENDER (-)

3. Press the POWER ON button to power up the motorcycle electrical system.
4. Turn Engine Stop switch to RUN and read DC voltage on meter when switch is first turned on. Voltage reading should be close to battery voltage for 2–3 seconds after switching Engine Stop switch to RUN.
5. If low or no voltage is delivered to the fuel pump, verify ground wire (Pin B, Black) has good continuity to battery (-) post.
6. If ground is OK, check Gray wire from fuel pump relay to ECM pin #42. The Gray wire receives a momentary ground from the ECM (for 2–3 seconds) and activates the fuel pump relay which supplies power to the pump on the VT/YE wire.
7. Trace both power and ground circuits to determine fault if battery voltage is not present for 2–3 seconds after power button and STOP / RUN switch are turned on.
8. When a CPS signal is received by the ECM (engine is cranking or running) the ECM maintains the ground on Pin 42 (Gray wire), keeping the pump powered.

FUEL PUMP CURRENT DRAW TEST

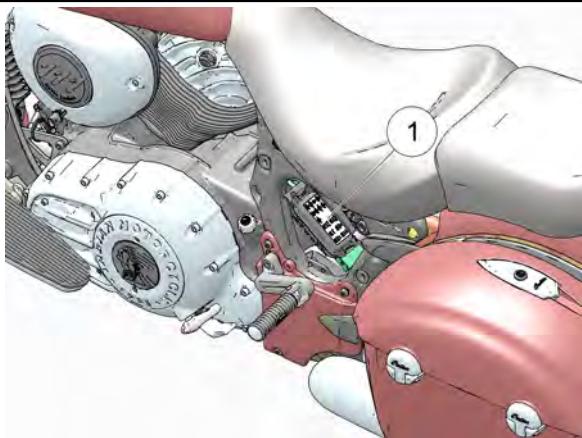
NOTE

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).

NOTE

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 the LH upper side cover and fuse box cover ①.

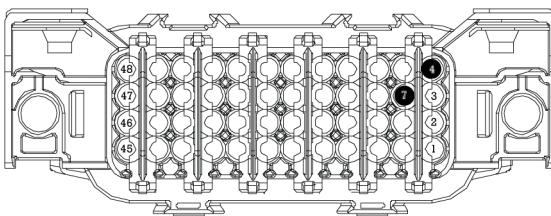


2. Remove fuel pump relay ② by pulling straight upward.



3. Set meter to DC Amps. Be sure red meter lead is in the 10A jack, and black meter lead is in common (-) jack.

4. Insert one meter lead in pin socket (4) and other meter lead in pin socket (7) of relay block.



5. Read fuel pump current draw on meter and compare to specification.
6. Inspect fuel pump circuit wiring or replace fuel pump if current draw exceeds specification.

SPECIFICATION: Fuel Pump Current Draw
Maximum: 6 DC Amps

PRIMING THE FUEL SYSTEM

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. Fill the fuel tank.
 2. Turn Engine Stop switch OFF.
 3. Press the power button to power up the motorcycle.
 4. Turn stop switch to RUN.
 5. Allow switch to remain in RUN position until pump stops running (about 2-3 seconds).
 6. Turn stop switch OFF.
 7. Press the power button to power down motorcycle.
 8. *WAIT* approximately 10 seconds.
 9. Repeat Steps 4-8 about 4 times to complete the priming procedure.

NOTE

Fuel level in tank must be high enough to submerge pickup screen on fuel pump.

EFI SERVICE

FUEL INJECTION SYSTEM - OVERVIEW OF OPERATION

The Electronic Fuel Injection (EFI) system functions to provide the engine with precisely metered fuel under varying loads and conditions.

The Engine Control Module or “ECM”, is located beneath the battery box. It is programmed to provide the correct fuel/air mixture and ignition timing based on several sensor input signals (engine load, temp, altitude, manifold pressure etc.). The ECM also provides grounds or voltage to other *EFI related* circuits of the electrical and fuel delivery systems.

An Electronic Throttle Control (ETC) system takes the place of a conventional, cable-operated throttle body. The ETC controls throttle blade angle and provides rate-of-change feedback to the ECM.

The ETC also serves as a plausibility check for the TMAP sensor. The MAP portion of the TMAP sensor is the primary air flow and load sensing device.

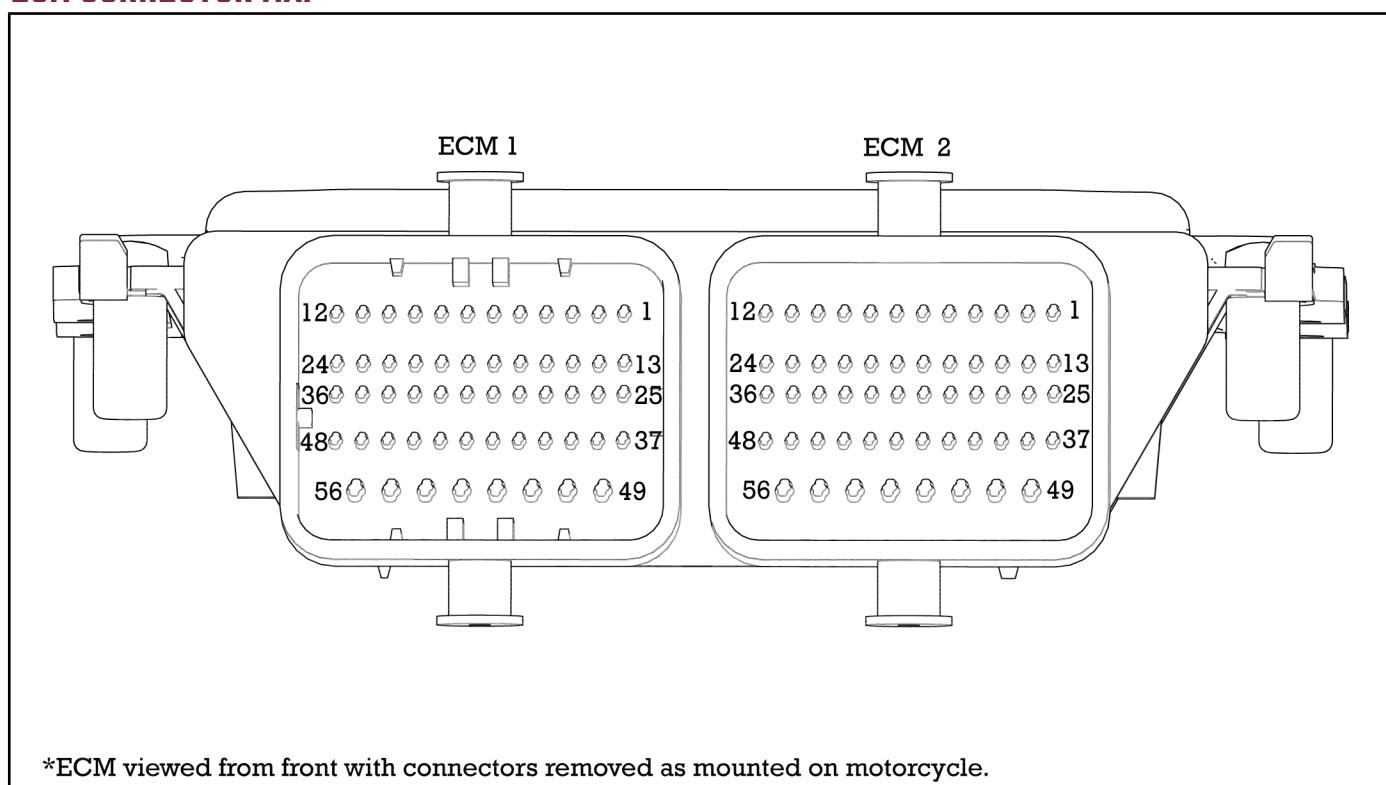
An electric fuel pump, mounted inside the fuel tank supplies fuel pressure to the injectors continuously when the engine is running or cranking. A pressure regulator incorporated on the pump keeps fuel pressure steady at approximately 3.51 Bar (350 kPa / 51 PSI). The fuel pump cycles “ON” for 2-3 seconds when the motorcycle is powered up and the Engine Stop switch is turned ON to pressurize the system for start-up.

The fuel injectors inject fuel when they are grounded by drivers inside the ECM. The duration of an injector pulse (length of time the injector circuit is grounded) is controlled by the ECM. Pulse duration determines the amount of fuel delivered to the engine (longer cycles = more fuel). The ECM selects the correct fuel injector pulse by calculating the airflow from the MAP sensor measurement and referencing a three dimensional “map” for the desired air-to-fuel ratio (AFR). The ECM calculates an injection time based on the measured airflow and desired AFR.

Although TMAP and engine RPM are the most influential inputs for selecting a map reference point, the ECM also evaluates feedback from minor sensors in the system, to obtain a more accurate “picture” of the fuel needs at any given moment.

The fuel control system is closed loop. When the engine is at a warm idle and typical cruising engine speeds and loads, the ECM will operate in “closed loop fuel control” mode. The oxygen sensors in each headpipe will provide feedback to the ECM and the injection time will be adjusted for each cylinder to achieve the target AFR.

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

ECM CONNECTOR MAP

PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
1	-	NOT USED	1	BK	CPS NEGATIVE SIGNAL
2	-	NOT USED	2	GY/DB	REAR O2 SNR OUTPUT
3	YE/BK	PPS 2 RETURN	3	OG/YE	TPS 1 OUTPUT
4	BN/GN	MAP SENSOR RETURN	4	BK	THERMISTOR RETURN
5	BN/WH	TPS RETURN	5	BG/WH	REAR O2 SNR RETURN
6	WH/BK	PPS 1 RETURN	6	BK/BU	FUEL SENDER GROUND
7	-	NOT USED	7	BG	FRONT O2 SNR RETURN
8	-	NOT USED	8	OG/BN	CHT RETURN
9	-	NOT USED	9	-	NOT USED
10	-	NOT USED	10	WH/RD	PPS 1 – 5 VOLT REF
11	YE/GN	PPS 2 OUTPUT	11	-	NOT USED
12	BK/DG	FUEL LEV SNR OUTPUT	12	DB	LEFT FRONT TS OUTPUT
13	WH/OG	NA	13	WH	CPS POSITIVE SIGNAL
14	-	NOT USED	14	-	NOT USED
15	GY/BK	ENGINE RELAY CNTL	15	OG/DB	CHT SENSOR OUTPUT
16	PK	K15	16	BN	RH WARMER THERMISTOR
17	-	NOT USED	17	YE/VT	REAR BRAKE SWT OUTPUT
18	-	NOT USED	18	OG/WH	TIPOVER SENSOR
19	DB/OG	CLUTCH SWT OUTPUT	19	OG/BN	MAP SENSOR OUTPUT
20	-	NOT USED	20	VT/RD	TPS 2 SIGNAL

PIN ECM 1	COLOR	FUNCTION	PIN ECM 2	COLOR	FUNCTION
21	WH/GN	PPS 1 OUTPUT	21	-	NOT USED
22	-	NOT USED	22	-	NOT USED
23	DB/PK	RUN / STOP SWITCH	23	BN/PK	TMAP POWER
24	WH/RD	RR BRK SWT OUTPUT	24	DB/RD	RIGHT FRONT TS OUTPUT
25	YE/RD	PPS 2 – 5 VOLT REF	25	-	NOT USED
26	RD/BU	TIPOVER SNR – 5 VOLT REF	26	WH/DG	LH WARMER THERMISTOR
27	-	NOT USED	27	OG/DG	IAT SENSOR OUTPUT
28	-	NOT USED	28	-	NOT USED
29	-	NOT USED	29	-	NOT USED
30	-	NOT USED	30	GY/RD	FRONT O2 SENSOR OUTPUT
31	-	NOT USED	31	-	NOT USED
32	YE	CAN HIGH	32	-	NOT USED
33	-	NOT USED	33	-	NOT USED
34	BN	CRUISE SFTY SWT OUTPUT	34	-	NOT USED
35	-	NOT USED	35	DB/BK	CANISTER PURGE VALVE
36	-	NOT USED	36	DB	LEFT REAR TS OUTPUT
37	-	NOT USED	37	RD	KNOCK SENSOR A
38	BN/DB	TPS – 5 VOLT REF	38	BK	KNOCK SENSOR B
39	-	NOT USED	39	GY/YE	REAR O2 SENSOR CONTROL
40	VT/DB	AUX RELAY CONTROL	40	-	NOT USED
41	OG/BN	STARTER RELAY CNTL	41	-	NOT USED
42	GY	FUEL PUMP RELAY CNTL	42	-	NOT USED
43	-	NOT USED	43	WH/GY	REAR FUEL INJECTOR DRIVER
44	DG	CAN LOW	44	WH/DB	FRONT FUEL INJECTOR DRIVER
45	-	NOT USED	45	-	NOT USED
46	-	NOT USED	46	GY/WH	FRONT O2 SENSOR CONTROL
47	BG/BK	SIDE STAND SWT SIGNAL	47	BK/WH	ECM GROUND
48	-	NOT USED	48	DB/RD	RIGHT REAR TS OUTPUT
49	-	NOT USED	49	-	NOT USED
50	YE/RD	TRUNK BRAKE LAMP	50	DB/WH	ECM GROUND
51	PK/DB	BRAKE LIGHT POWER	51	PK/RD	ETC MOTOR (+)
52	DG/YE	TAIL LIGHT POWER	52	YE	ETC MOTOR (-)
53	BK/WH	ECM GROUND	53	-	NOT USED
54	BK/WH	ECM GROUND	54	BK	REAR COIL SIGNAL
55	VT/PK	ENG RELAY PWR OUTPUT	55	-	NOT USED
56	VT-PK	ENG RELAY PWR OUTPUT	56	WH	FRONT COIL SIGNAL

TROUBLE CODES

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
29	3	Accelerator Position 2	Voltage Too High	ON	P1228
	4		Voltage Too Low	ON	P1227
	2		Not Plausible	ON	P1225
51	3	Throttle Position Sensor 1	Voltage Too High	ON	P0123
	4		Voltage Too Low	ON	P0122
	2		Signal Out of Range (Not Plausible)	ON	P0121
	0		Voltage Above Critical Level	ON	P1123
	1		Voltage Below Critical Level	ON	P1122
	10		Abnormal Rate of Change	ON	P0120
	13		Calibration / Adaption Failure	ON	P1120
84	0	Vehicle Speed Signal	Vehicle Speed Too High	ON	P0500
	1		Vehicle Speed Too Low	ON	C1057
	2		Data Erratic or Intermittent (or Missing)	ON	P0503
	8		Sensor Frequency Outside Normal Range	ON	P0501
	9		Abnormal Update Rate	ON	P160A
	19		Received Vehicle Speed has error	ON	C1069
				ON	P106B
91	3	Accelerator Position 1	Voltage Too High	ON	P0228
	4		Voltage Too Low	ON	P0227
	2		Not Plausible	ON	P0225
96	3	Fuel Level Signal	Voltage Too High	ON	P0463
	4		Voltage Too Low	ON	P0462
	16		Above Normal Operating Range	ON	P1462
	18		Below Normal Operating Range	ON	P1463
	2		Signal Fault	ON	P0461
98	3	Engine Oil Level Sensor Switch	Pressure Too High	ON	P1527
	4		Pressure Too Low	ON	P1526
	17		Oil Level Low	OFF	P250F
102	3	Manifold Absolute Pressure Sensor	Voltage Too High	ON	P0108
	4		Voltage Too Low	ON	P0107
	2		Signal Out of Range	ON	P0106
	10		Abnormal Rate of Change	ON	P0109
	7		Pneumatic Fault	ON	P1106
105	3	Intake Air Temperature Sensor	Voltage Too High	ON	P0113
	4		Voltage Too Low	ON	P0112

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
	10		Abnormal Rate of Change	ON	P0114
	2		Signal Out of Range	ON	P0111
110	3	Engine Temperature Sensor	Voltage Too High	ON	P0118
	4		Voltage Too Low	ON	P0117
	2		Signal Out of Range	ON	P0116
	10		Abnormal Rate of Change	ON	P0119
	16		Temperature Too High	OFF	P0217
	0		Engine Overheat Shutdown	OFF	P1217
	15		Temperature Above Normal Range	OFF	P1116
	17		Temperature Too Low	ON	P0128
	3		Voltage Too High	OFF	P0563
168	4	System Power (Battery Potential / Power Input)	Voltage Too Low	OFF	P0562
	0		Voltage Above Critical Level	ON	P1562
	16		Voltage Above Warning Level	ON	P1564
	1		Voltage Below Critical Level	ON	P1563
	18		Voltage Below Warning Level	OFF	P1565
	0	Engine Speed	Speed Exceeded Max Limit	ON	P0219
190	0		Engine Speed Too High	OFF	C1059
	1		Engine Speed Too Low	OFF	C1060
	2		Data Erratic or Intermittent (or Missing)	OFF	C1061
	7		CVT Threshold Exceeded	ON	P1219
	31		Error in Engine Speed Computation	ON	P121C
	19		Received Engine Speed has Error	OFF	C1066
523	3	Gear Sensor Signal	Voltage Too High	ON	P0917
	4		Voltage Too Low	ON	P0916
	9		Abnormal Update Rate	ON	P1914
	2		Signal Fault	ON	P0914
527	31	Cruise Control Panel Switches	Switch/Switches Stuck	ON	P153D
596	31	Cruise Control Enable Switch	Switch Stuck	ON	P1590
598	2	Clutch Switch Signal	Signal Fault	ON	P0704
599	31	Cruise Control Set/Decel Switch	Switch Stuck	ON	P1591
601	31	Cruise Control Resume/Accel Switch	Switch Stuck	ON	P1592
628	12	ECU Memory	EEPROM Read / Write Failure	ON	P1602
636	8	Crankshaft Position Sensor	Circuit Fault	ON	P0336
	2		Plausibility Fault	ON	P0335

FUEL DELIVERY / EFI

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
651	5	Injector 1	Driver Circuit Open/Grounded	ON	P0261
	3		Driver Circuit Short to B+	ON	P0262
	4		Driver Circuit Grounded	ON	P1262
652	5	Injector 2	Driver Circuit Open/Grounded	ON	P0264
	3		Driver Circuit Short to B+	ON	P0265
	4		Driver Circuit Grounded	ON	P1265
677	5	Starter Solenoid Driver Circuit	Driver Circuit Open/Grounded	ON	P0615
	3		Driver Circuit Short to B+	ON	P0617
	4		Driver Circuit Grounded	ON	P0616
731	4	Knock Sensor 1	Voltage Too Low	ON	P0327
904	5	Wheel Speed Sensor (Front)	Open / Short	ON	C1030
	2		Input Abnormal / Signal Failure	ON	C1031
907	2	Wheel Speed Sensor (Rear)	Plausibility Fault	ON	C103D
	3		Short to B+	ON	C113D
	4		Open/Short to GND	ON	C123D
	5		Open/Short	ON	C1036
	8		Abnormal Frequency	ON	C133D
	14		Incorrect Sensor / Improper Mounting	ON	C143D
1023	5	Trip Sudden Decelerations	Open / Short	ON	C1045
1071	5	Fan Relay Driver	Driver Circuit Open/Grounded	ON	P1481
	3		Driver Circuit Short to B+	ON	P1482
	4		Driver Circuit Grounded	ON	P1483
1268	5	Ignition Coil Primary Driver 1	Driver Circuit Open/Grounded	ON	P1351
	3		Driver Circuit Short to B+	ON	P1353
	4		Driver Circuit Grounded	ON	P1361
1269	5	Ignition Coil Primary Driver 2	Driver Circuit Open/Grounded	ON	P1352
	3		Driver Circuit Short to B+	ON	P1354
	4		Driver Circuit Grounded	ON	P1362
1347	5	Fuel Pump Driver Circuit	Driver Circuit Open/Grounded	ON	P0230
	3		Driver Circuit Short to B+	ON	P0232
	4		Driver Circuit Grounded	ON	P0231
2348	5	High Beam Lamp	Open Circuit / Short to B+	ON	C107E
	6		Grounded Circuit	ON	C107F
2350	5	Low Beam Lamp	Open Circuit / Short to B+	ON	C107B
	6		Grounded Circuit	ON	C107C
2367	5	Left Turn Indicator Driver Circuit	Driver Circuit Open/Grounded	OFF	P1714
	3		Driver Circuit Short to B+	OFF	P1715
	4		Driver Circuit Grounded	OFF	P1716

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
2369	5	Right Turn Indicator Driver Circuit	Driver Circuit Open/Grounded	OFF	P1710
	3		Driver Circuit Short to B+	OFF	P1711
	4		Driver Circuit Grounded	OFF	P1712
3056	2	Oxygen Sensor 1 (Front)	Signal Fault	ON	P0130
	12		Bad Component	ON	P113A
	3		Voltage High	ON	P0132
	4		Voltage Low	ON	P0131
3597	3	ECU Output Supply Voltage 1	Voltage Too High	ON	P16A2
	4		Voltage Too Low	ON	P16A1
	0		Voltage Above Critical Level	ON	P16A3
	16		Voltage Above Warning Level	ON	P16A5
	1		Voltage Below Critical Level	ON	P16A6
	18		Voltage Below Warning Level	ON	P16A7
3598	3	ECU Output Supply Voltage 2	Voltage Too High	ON	P16A9
	4		Voltage Too Low	ON	P16A8
	0		Voltage Above Critical Level	ON	P16AA
	16		Voltage Above Warning Level	ON	P16AB
	1		Voltage Below Critical Level	ON	P16AC
	18		Voltage Below Warning Level	ON	P16AD
3599	3	ECU Output Supply Voltage 3	Voltage Too High	ON	P17AA
	4		Voltage Too Low	ON	P17AB
	0		Voltage Above Critical Level	ON	P17AC
	16		Voltage Above Warning Level	ON	P17AD
	1		Voltage Below Critical Level	ON	P17AE
	18		Voltage Below Warning Level	ON	P17AF
5582	9	Static Roll Angle	Abnormal Update Rate	ON	P1062
65590	7	Cylinder Not Identified	Misfire Detected	ON	P0314
65591	7	Cylinder 1	Misfire Detected	ON	P0301
65592	7	Cylinder 2	Misfire Detected	ON	P0302
65613	2	ETC Accelerator Position Sensor Outputs 1 & 2 Correlation	Correlation Fault	ON	P1135
520198	3	Throttle Position Sensor 2	Voltage Too High	ON	P0223
	4		Voltage Too Low	ON	P0222
	0		Voltage Above Critical Level	ON	P1223
	1		Voltage Below Critical Level	ON	P1222
	2		Signal Out of Range (Not Plausible)	ON	P0221
	10		Abnormal Rate of Change	ON	P0220

FUEL DELIVERY / EFI

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
	13		Calibration / Adaption Failure	ON	P1220
520267	31	Kickstand Switch	Condition Exists (engine disabled due to extended kickstand)	ON	P181C
520200	2	Tipover Sensor	Signal Fault	ON	P1501
	3		Voltage High	ON	P1503
	4		Voltage Low	ON	P1502
	14		Condition Exists (tip over condition detected)	ON	P1504
520202	5	Canister Purge Valve	Driver Circuit Open/Grounded	ON	P0444
	3		Driver Circuit Short to B+	ON	P0443
	4		Driver Circuit Grounded	ON	P0445
520204	17	Fuel Correction	System Too Lean 1 (Front) (Pre)	ON	P0171
	15		System Too Rich 1 (Front) (Pre)	ON	P0172
520205	17	Fuel Correction	System Too Lean 2 (Rear) (Post)	ON	P0174
	15		System Too Rich 2 (Rear) (Post)	ON	P0175
520208	5	Chassis/Acc Relay	Driver Circuit Open/Grounded	ON	P1611
	3		Driver Circuit Short to B+	ON	P1614
	4		Driver Circuit Grounded	ON	P1613
520209	2	Oxygen Sensor Heater 1 (pre) (front)	Plausibility Fault	ON	P0135
	5		Driver Circuit Open/Grounded	ON	P0030
	3		Driver Circuit Short to B+	ON	P0032
	4		Driver Circuit Grounded	ON	P0031
520210	2	Oxygen Sensor Heater 2 (post) (rear)	Plausibility Fault	ON	P0141
	5		Driver Circuit Open/Grounded	ON	P0036
	3		Driver Circuit Short to B+	ON	P0038
	4		Driver Circuit Grounded	ON	P0037
520250	7	ABS Pulsar (front)	COG Chip	ON	C1022
520251	7	ABS Pulsar (rear)	COG Chip	ON	C1023
520252	5	ABS Solenoid (RRI)	Open / Short	ON	C1024
520253	5	ABS Solenoid (RRO)	Open / Short	ON	C1025
520254	5	ABS Solenoid (FFI)	Open/Short	ON	C1026
520255	5	ABS Solenoid (FFO)	Open/Short	ON	C1027
520256	5	ABS Solenoid (RFI)	Open/Short	ON	C1028
520257	5	ABS Solenoid (RFO)	Open/Short	ON	C1029
520258	11	ABS Actuator (front)	Wheel Lock (or VSS failure) ABS On	ON	C1032
520259	11	ABS Actuator (rear)	Wheel Lock (or VSS failure) ABS On	ON	C1033
520260	8	ABS Motor	Motor Lock	ON	C0020
	3		Off Stick	ON	C1020
	4		On Stick	ON	C1021

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
520261	7	ABS Fail Safe Relay	On/Off Stick	ON	C1034
520262	4	ABS Source Voltage	Drop	ON	C1038
	3		Raise	ON	C1039
520263	31	ABS Tire	Irregular Tire Size	ON	C1040
520264	12	ABS ECU	ECU Error	ON	C1041
520265	7	ABS Module	Incomplete Evacuation and Fill	ON	C1042
520275	31	Accelerator Position/Brake Position Interaction	Condition Exists	ON	P150A
520276	12	Throttle Position Sensor(1 or 2 Indeterminable)	Neither Position Sensor Passed Test	ON	P150B
	2		Position Sensor Correlation Fault (One okay, one failed)	ON	P150C
520277	3	Throttle Body Control - Power Stage	Maximum	ON	P150D
	4		Minimum	ON	P150E
	2		Not Plausible	ON	P151A
	8		Signal Error	ON	P151B
	31		Deactivated power stages due to 5V sensor supply error	ON	P153F
520278	31	Throttle Body Control - Return Spring Check Failed	Condition Exists	ON	P151C
520279	31	Throttle Body Control - Adaption Aborted	Condition Exists	ON	P151D
520280	31	Throttle Body Control - Limp Home Position Check Failed	Condition Exists	ON	P151E
520281	31	Throttle Body Control - Mechanical Stop Adaptation Failure	Condition Exists	ON	P15A
520282	31	Throttle Body Control	Condition Exists	ON	P152B
520283	3	Throttle Body Control	Maximum	ON	P152C
	4		Minimum	ON	P152D
	2		Outside of Pedal Range(Level 1)	ON	P152F
520284	31	Throttle Body Control - Position Deviation Fault	Condition Exists	ON	P152E
520285	2	Brake Switch (1 or 2 Indeterminable)	Brake Switch Correlation Fault	ON	P153E
520226	31	ECU Monitoring Error	Condition Exists	ON	P1540
520287	31	ECU Monitoring Error (Level 3)	Condition Exists	ON	P1541
520288	31	ECU Monitoring of Injection Cut Off(Level 1)	Condition Exists	ON	P1542
520289	31	ECU Monitoring of Injection Cut Off(Level 2)	Condition Exists	ON	P1543
520290	31	Controller Option Settings not Programmed	Condition Exists	ON	P1544
520291	5	Left Fog Lamp	Open Circuit / Short to B+	ON	C1075
	6		Grounded Circuit	ON	C1076
520292	5	Right Fog Lamp	Open Circuit / Short to B+	ON	C1078

FUEL DELIVERY / EFI

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
	6	Horn	Grounded Circuit	ON	C1079
520293	5		Open Circuit / Short to B+	ON	C122A
	6		Grounded Circuit	ON	C122B
520294	5	Windshield Motor Driver	Open Circuit / Short to B+	ON	C1222
	6		Grounded Circuit	ON	C1223
520295	2	Windshield Motor Switch	Both inputs are closed	ON	C1225
520296	12	Accelerometer	Bad Component	ON	C1125
520297	31	System On Button	Switch Stuck	ON	C1530
520298	5	Heated Grips	Open Circuit / Short to B+	ON	C1047
	6		Grounded Circuit	ON	C1048
520299	5	Power Lock Motor	Open Circuit / Short to B+	ON	C1226
	6		Grounded Circuit	ON	C1227
520300	12	Tire Pressure Sensor (Front)	Battery Voltage too Low (Replace)	OFF	C1083
	17		Pressure to Low	OFF	C1084
	9		Abnormal Update Rate	OFF	C1085
520302	12	Tire Pressure Sensor (Rear)	Battery Voltage too Low (Replace)	OFF	C1088
	17		Pressure to Low	OFF	C1089
	9		Abnormal Update Rate	OFF	C1090
520304	12	Key Fob	Battery Voltage too Low (Replace)	OFF	P1633
520305	31	Throttle Body Control - requested throttle angle not plausible	Condition Exists	ON	P1530
520311	31	ECU Fault – Hardware Disruption	Condition Exists	ON	P1537
520312	31	Power Lock Motor Switch	Switch Stuck	ON	C1229
520313	11	ABS Actuator (front)	Wheel Lock (or VSS failure) ABS Off	ON	C103A
520314	11	ABS Actuator (rear)	Wheel Lock (or VSS failure) ABS Off	ON	C103B
520320	5	Brake Light	Open Circuit	ON	P1593
	3		Shorted to Battery	ON	P1594
	4		Shorted to Ground	ON	P1595
520321	5	Tail Light	Open Circuit	ON	P1596
	3		Shorted to Battery	ON	P1597
	4		Shorted to Ground	ON	P1598
520322	3	Front Brake Switch	Voltage Too High	ON	P1599
	4		Voltage Too Low	ON	P159A
	2		Signal Fault	ON	P159B
520323	3	Rear Brake Switch	Voltage Too High	ON	P159C
	4		Voltage Too Low	ON	P159D
	2		Signal Fault	ON	P159E

SPN	FMI	COMPONENT	CONDITION	MIL	P-CODE
520329	9	Operator Switch Status (pOSS1)	Abnormal Update Rate	ON	P1063
520330	13	Immobilizer	Out of Calibration	ON	P1064
	9		Abnormal Update Rate	ON	P106A
520331	3	Knock Sensor Positive Line	Voltage Too High	ON	P1327
	4		Voltage Too Low	ON	P1328
520332	3	Knock Sensor Negative Line	Voltage Too High	ON	P132A
	4		Voltage Too Low	ON	P132B
520333	2	Oxygen Sensor (Pre) (BANK 2)	Signal Fault	ON	P1136
	12		Bad Component	ON	P1139
	3		Voltage High	ON	P1137
	4		Voltage Low	ON	P1138
520336	31	ECU Monitoring (Pedal Map Mismatch)	Condition Exists	ON	P1545
524046	31	Start Button	Switch Stuck	ON	C1512
524079	31	Cruise Control Input Checksum	Checksum does not match	ON	U0405
524080	31	Cruise Control Input Message Counter	Counter not incremented	ON	U1405
524083	5	Secondary Air Control Valve	Open Circuit	ON	P1075
	3		Shorted to Battery	ON	P1076
	4		Shorted to Ground	ON	P1077

SENSOR DIAGNOSTICS

If a sensor fails or reads outside a “normal” range, a “pre-programmed” (default) value is substituted by the ECM until sensor reading returns to normal.

Sensor values can be viewed in Digital Wrench® on the “Sensor Data Grid Or Graphs” screen. Since the sensor reading may either be actual feedback from the sensor OR a default value set by the ECM in the event of a fault in the sensor or wiring, it is important to verify the condition of the sensor.

The Malfunction Indicator Light (MIL) may or may not illuminate to alert the rider of a possible problem, depending on which system fault has occurred. The first step following illumination of the MIL is to perform a visual inspection to see if a cause can be determined.

Connect Digital Wrench® to see what codes are present in memory, and focus your diagnostics on that sensor and the related wiring for that circuit. Refer to wiring diagrams and system break-out diagrams to narrow a problem search.

If multiple codes are set, refer to the wiring diagram and focus your efforts on wiring and connections common to each of the sensors, such as a power supply or common ground. Multiple sensor failure is extremely unlikely.

Many sensor tests described in this section are performed at the ECM wire connector. This method ensures that the data from a sensor is reaching the ECM. Sensor tests can be performed at the sensor if easily accessible, but the wiring between the sensor and the two 56-pin ECM connectors should always be closely examined and the path between the sensor and ECM verified if the sensor itself passes the test.

Poor or corroded connections are the most common cause of system faults. Always check the integrity of the male pins and female receptacles of the connectors in the affected circuit. These may include the sensor connector, the ECM connector, and any wiring between the two, such as jumper harnesses where applicable.

ECM PINOUT TESTING

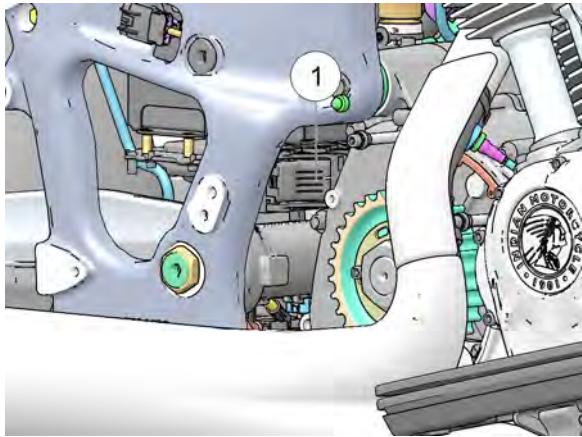
NOTE

Tests in this section may require reading resistance and voltages at ECM connector. Once ECM connector has been removed from the ECM:

- Do not touch pins on ECM. Static electricity from your body can damage the ECM.
- Do not attempt to perform tests on the ECM unit.
- Always use the appropriate test connector from the Electrical Connector Test Adapter Kit (PV-43526) or an appropriate test probe that will not damage (expand) the connector pin socket.
- DO NOT attempt to use standard meter probes or other devices to probe connector pin sockets. This could expand a terminal socket or damage the connector, create a problem where none existed before, and complicate the diagnostic process.
- Sensor tests on the following pages can often be performed at the sensor connector itself or at the ECM connector based on accessibility of the connector or wiring.
- If a sensor tests within the specified range (OK), then test the circuit wiring. This usually originates at the ECM connectors, but may include other connections.

ECM CONNECTOR REMOVAL

1. Remove the RH upper side cover. See Side Cover (Upper), Removal / Installation, page 7.17.
2. Remove the RH lower side cover. See Side Cover (Lower), Removal / Installation, page 7.17.
3. To disconnect the two 56-pin ECM connectors:
 - Locate the ECM connectors ①.



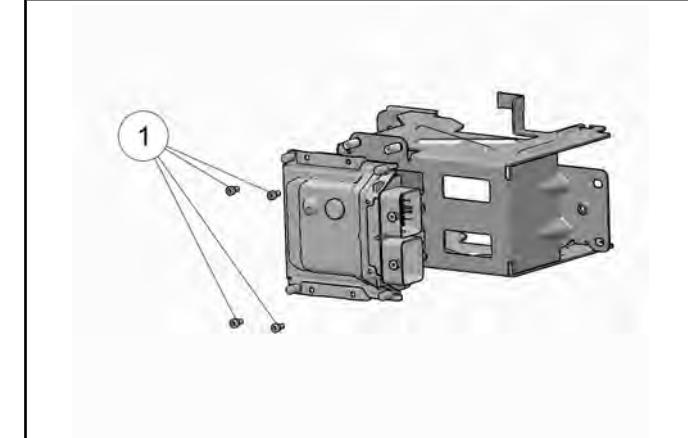
- Slide the lock lever toward the front of the vehicle until connector is disengaged from the ECM.
- Lift the connector straight off of the ECM.

ECM Connector Installation

4. Carefully align the ECM connector *straight* with the flange on the ECM. (Do not tip or rotate the connector into the ECM).
5. 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.
6. Install the upper and lower side covers.

ECM REMOVAL / INSTALLATION

1. Disconnect the ECM connectors. See ECM Connector Removal, page 4.35.
2. Remove the battery box. See Battery Box Removal, page 10.13.
3. Remove the four fasteners ① securing the ECM to the battery box.



4. Reverse the removal procedure to install.
5. Torque ECM fasteners to specification.

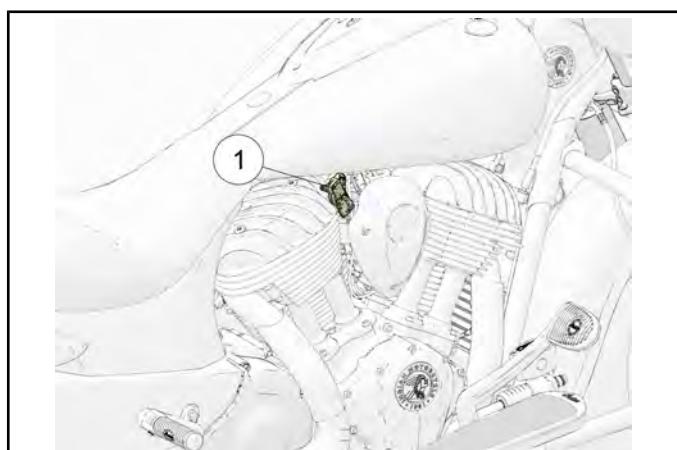
TORQUE

ECM Fasteners: **36 in-lbs (4 Nm)**

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

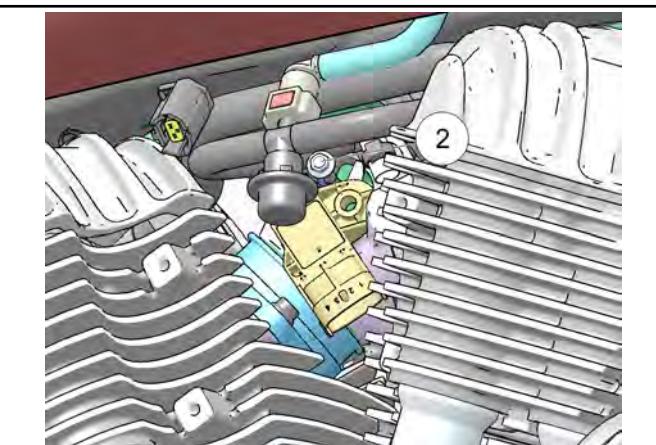
The TMAP sensor is a non-serviceable item. If it is faulty, it must be replaced

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 10.40.
2. Disconnect vehicle harness from TMAP sensor.
3. Remove TMAP sensor fastener ② and remove sensor from the intake manifold.



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

TORQUE

TMAP Sensor Fastener: 62 in-lbs (7 Nm)

CYLINDER HEAD TEMPERATURE SENSOR, TEST / REPLACE

CHT TEST OVERVIEW		
INDICATES	INSPECT	LOCATION
Voltage received at ECM from CHT sensor is outside of parameters.	Resistance readings through sensor and wiring at ECM #2 connector (ECM disconnected). This will inspect the wiring, connectors, and CHT sensor resistance.	Under front cylinder intake port.

1. Disconnect ECM #2 connector. See ECM Connector Removal, page 4.35.
2. Attach test lead adapters to meter leads.
3. Set multimeter to measure resistance.
4. Measure resistance between pin 8 and pin 15 of the ECM #2 connector and compare to specification. See ECM Connector MAP, page 4.24.
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.

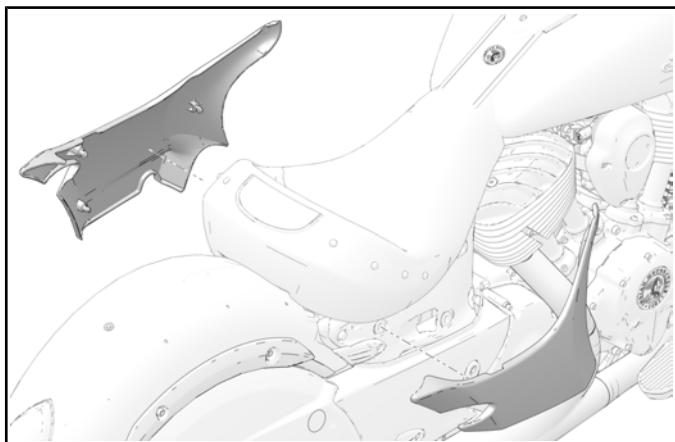
COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS ($\pm 10\%$)
CYLINDER HEAD TEMPERATURE SENSOR	OHMS	Pin #8 to #15	30.5 K Ohms +/- 13% @ 25° C (77° F)

FUEL RAIL REMOVAL

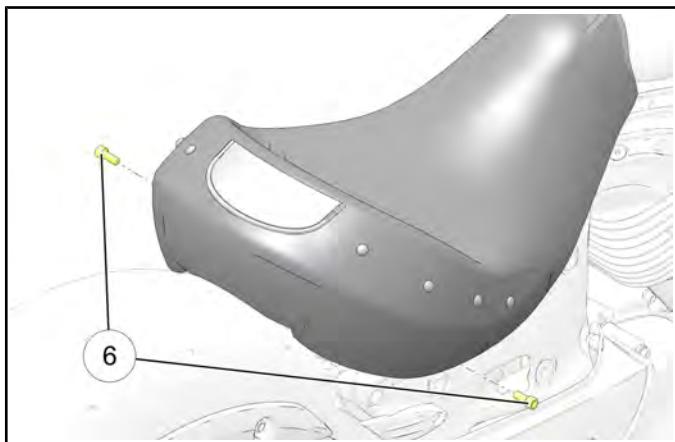
Remove Saddlebags (if equipped).

Remove Trunk (if equipped). See Trunk Removal, Roadmaster, page 7.29

1. Remove upper side covers.



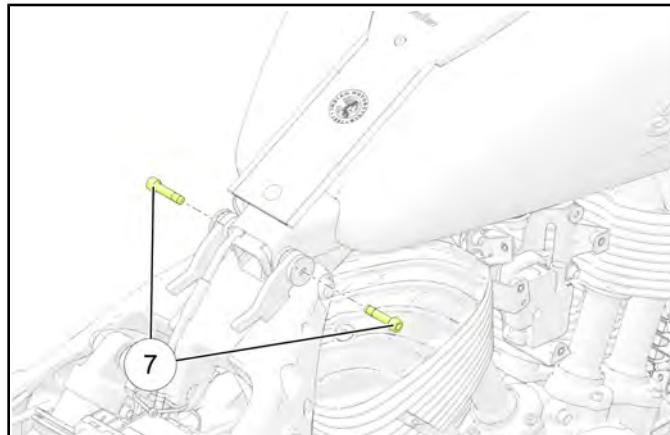
2. Remove the two fasteners ⑥ retaining the driver seat to the frame. Remove seat.



NOTE

For models with a passenger seat, remove passenger seat fastener.

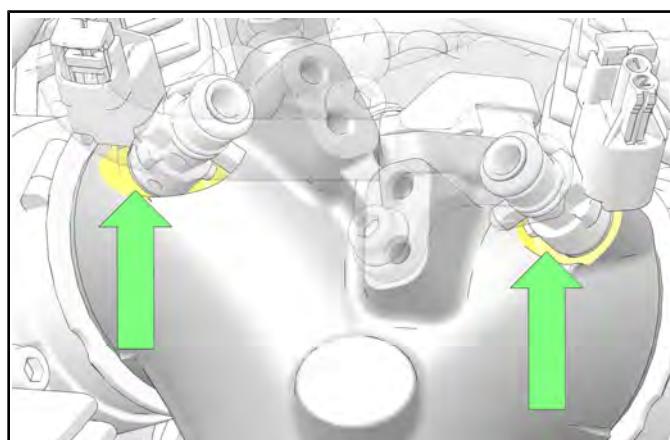
3. Remove fuel tank fasteners ⑦.



NOTE

To provide access to fuel rail, lift the rear of the fuel tank high enough to insert a small 2x4 piece of wood beneath the fuel tank rear mount.

4. Using compressed air, blow any debris away from base of fuel injectors.



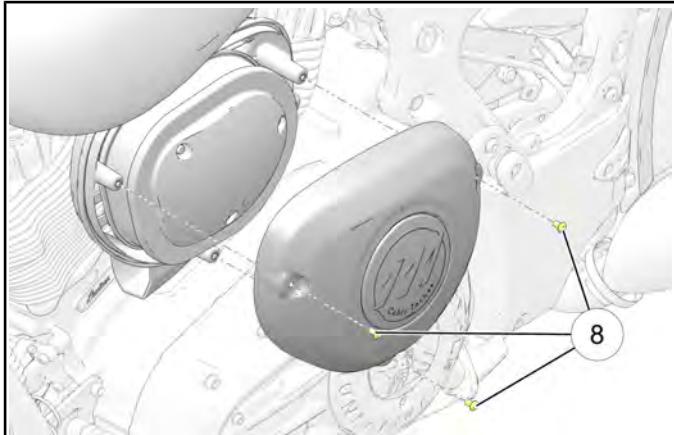
CAUTION

Always wear eye protection

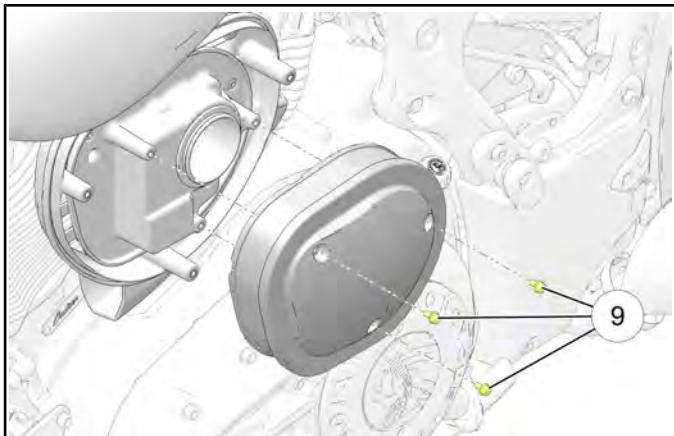
NOTE

Cleaning the area with compressed air prevents sand, grit, and dirt from entering the intake runner as the injector is removed.

5. Remove the three fasteners ⑧ securing the air cleaner cover to the air box.



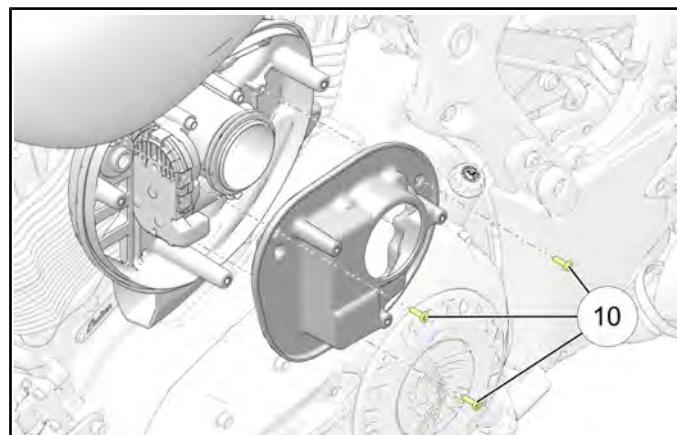
6. Remove the three fasteners ⑨ securing the air filter to the adapter plate and remove air filter.



NOTE

Accessory intakes may require a different removal process.

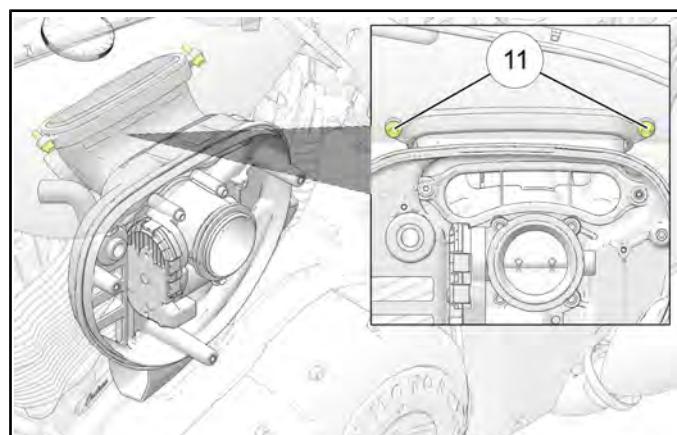
7. Remove the three fasteners ⑩ securing the air filter adapter plate to the air box assembly and remove adapter plate.



NOTE

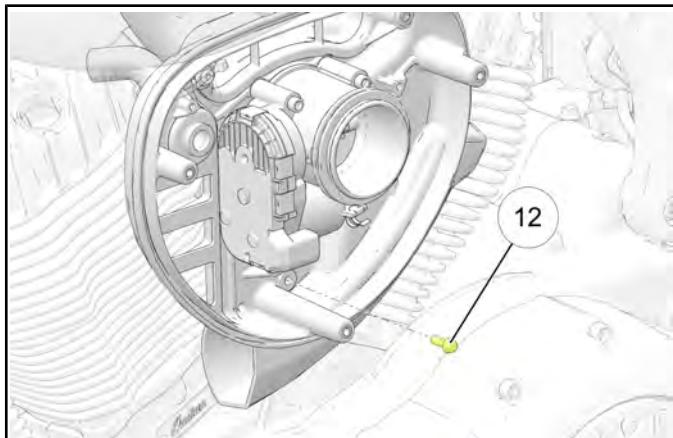
When removing the adapter plate, start by applying more pressure to the forward (left-hand) edge and pull outward to release the valve cover vent hose from the back side of the adapter plate.

8. Remove the upper two fasteners ⑪ securing the baffle plate to the intake.

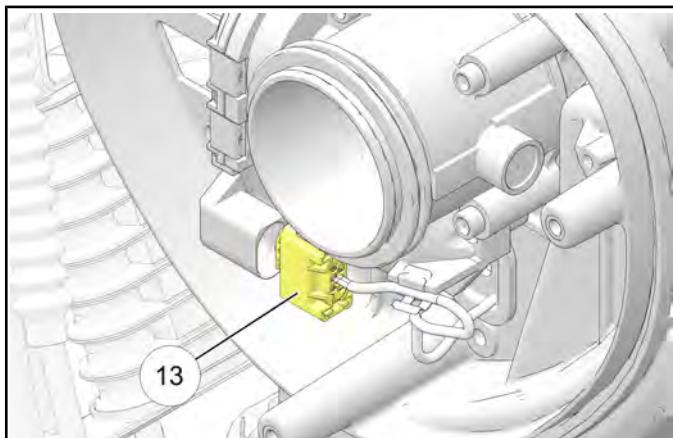


FUEL DELIVERY / EFI

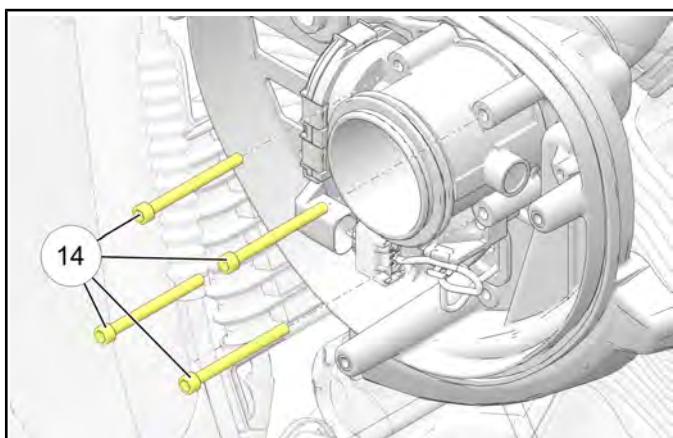
9. Remove the lower fastener **12** securing the air box housing to the mounting plate.



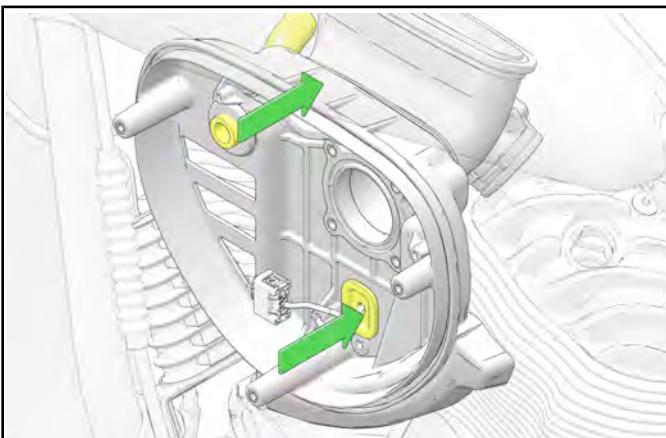
10. Disconnect the multi-plug **13** from the throttle body.



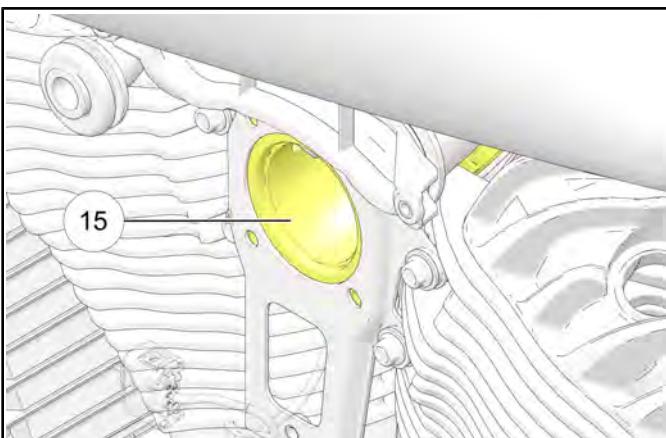
11. Remove four throttle body fasteners **14** and remove throttle body.



12. Push the rubber multi-plug seal through the back of the air box housing. Disconnect intake hose and remove air box housing.

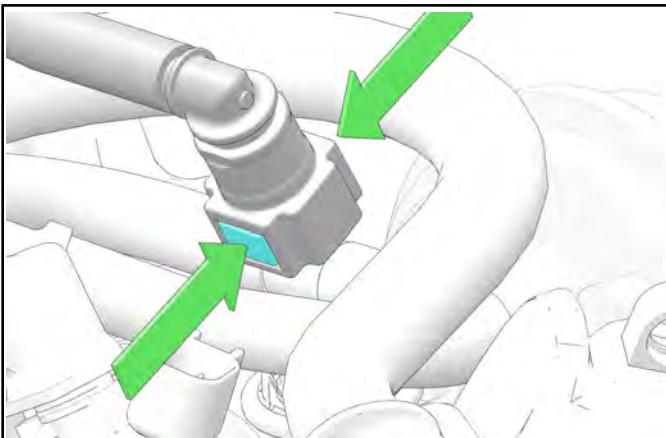


13. Cover intake **15** to prevent debris from entering the engine.



14. Wrap a clean shop towel around fuel line fitting.

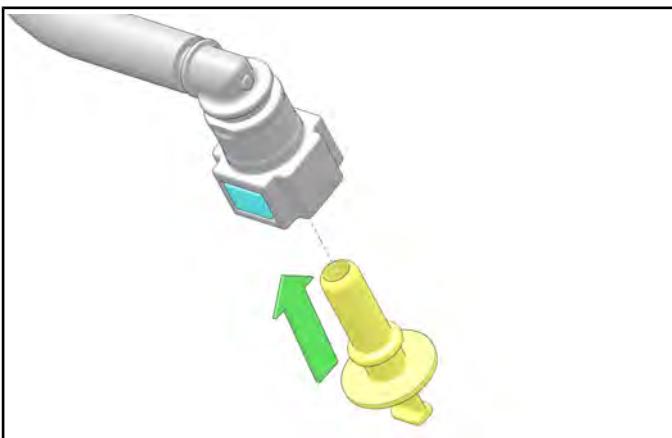
15. Squeeze the quick connect buttons (one on each side) and hold. Gently slide fitting straight off the fuel rail.



⚠ CAUTION

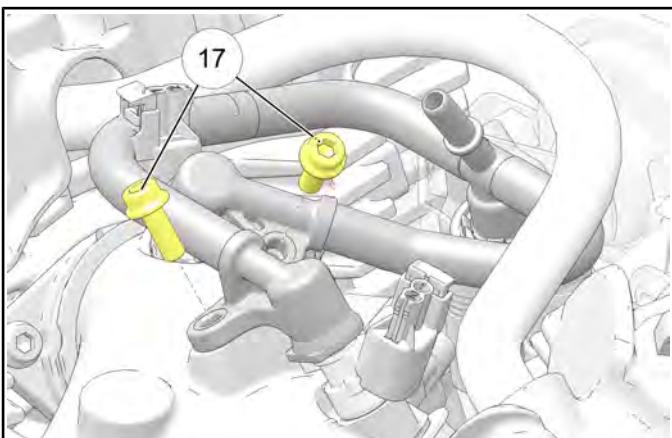
Always wear eye protection

16. Insert FUEL LINE PLUG TOOL (2521832) into fuel line to prevent fuel from leaking.

**NOTE**

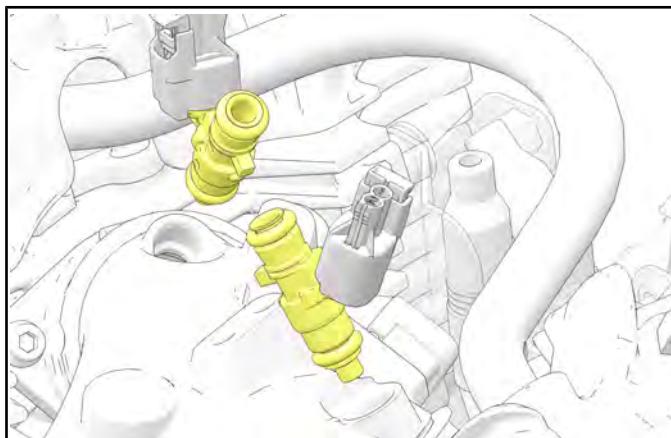
Listen for an audible “click” to confirm the Fuel Line Plug Tool is fully engaged.

17. Using a 'L' shaped allen wrench remove the two fasteners ⑯ securing the fuel rail to the intake manifold. Carefully remove fuel rail from the right-hand side of the motorcycle.

**NOTE**

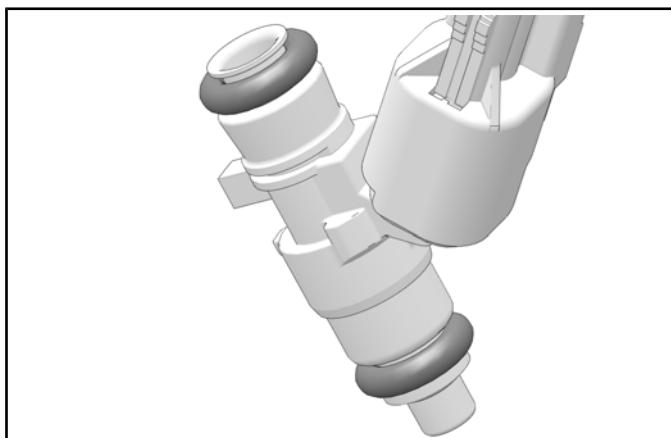
When removing fuel rail from injectors, wrap a rag around both ends of the fuel rail to collect fuel.

18. Leave electrical connector in place, remove fuel injectors from intake.



4

19. Remove o-rings from the top and bottom of the injectors and discard o-rings.



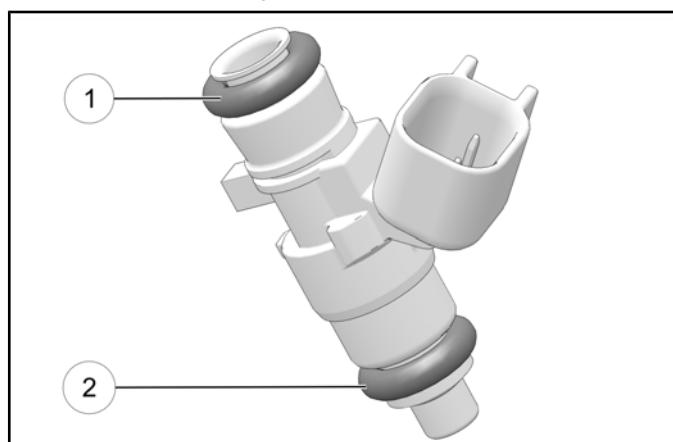
FUEL INJECTOR, REMOVAL / INSTALLATION

1. Remove fuel rail from injectors. See Fuel Rail Removal, page 4.38.
2. Disconnect electrical connector from fuel injector. Discard fuel injector AND injector o-rings.
3. Lubricate NEW injector o-rings with clean, silicone-free motor oil.

NOTE

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

4. Install NEW o-rings onto top and bottom of injector



ITEM	PART NUMBER	POSITION
①	1500198	TOP OF INJECTOR
②	5412891	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.

IMPORTANT

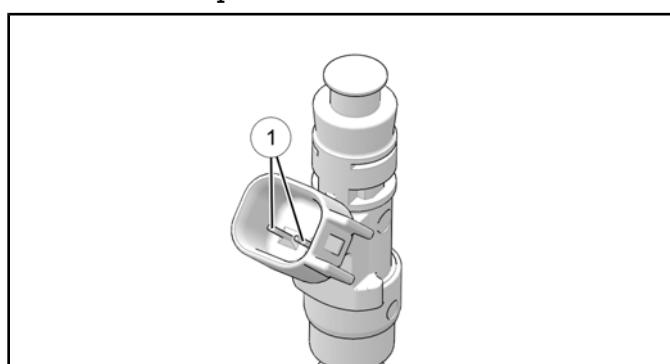
Verify that both of the new o-rings have been lubricated and installed correctly onto the injectors.

5. Install fuel injector. See Fuel Rail Installation, page 4.43

FUEL INJECTOR RESISTANCE TEST**IMPORTANT**

Take note of front and rear fuel injector harness connectors before disconnecting them.

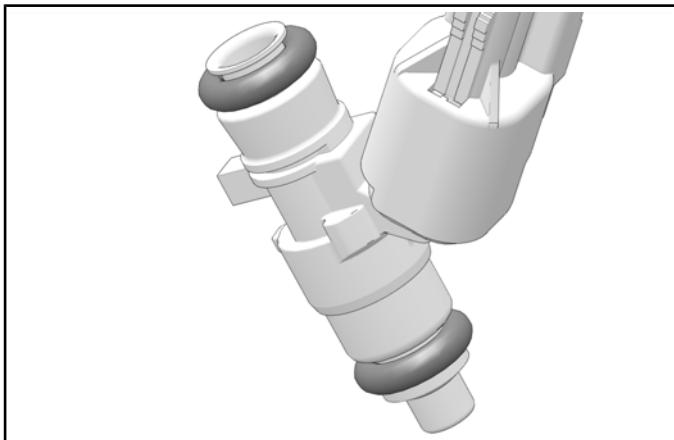
The fuel injectors are non-serviceable. If diagnosis indicates a problem with either injector, test the resistance of the fuel injector (s) by measuring between the two pin terminals ①.



Fuel Injector Resistance Specification:
11.4 Ω — 12.6 Ω

FUEL RAIL INSTALLATION

1. Lubricate NEW injector o-rings with clean, silicone-free motor oil.



NOTE

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

2. Install NEW o-rings onto top and bottom of injectors

PART NUMBER	POSITION
1500198	TOP OF INJECTOR
5412891	BOTTOM OF INJECTOR

IMPORTANT

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

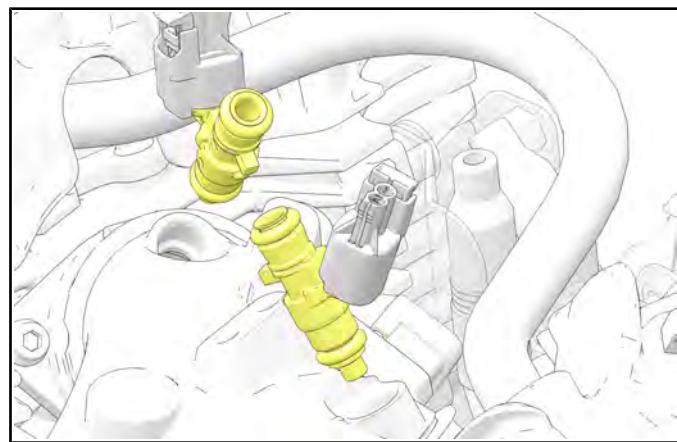
IMPORTANT

Verify that the new top and bottom o-rings are installed in the correct position.

IMPORTANT

Verify that both of the new o-rings have been lubricated and installed correctly onto the injectors.

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



CAUTION

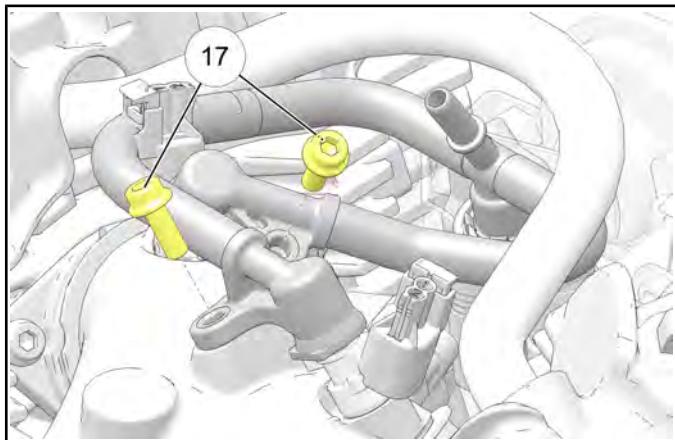
Use care not to fold or displace lower o-ring from seating surface.

4. Install replacement fuel rail from the right-hand side of motorcycle.

CAUTION

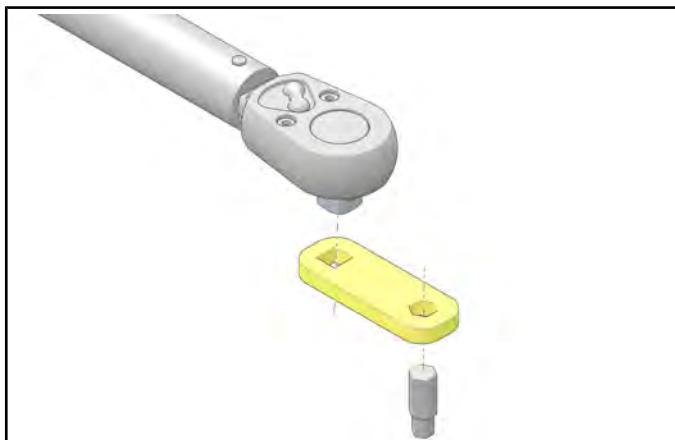
Use care not to fold or displace upper o-ring from seating surface.

- Install fuel rail fasteners ⑯ into the intake manifold until finger tight.

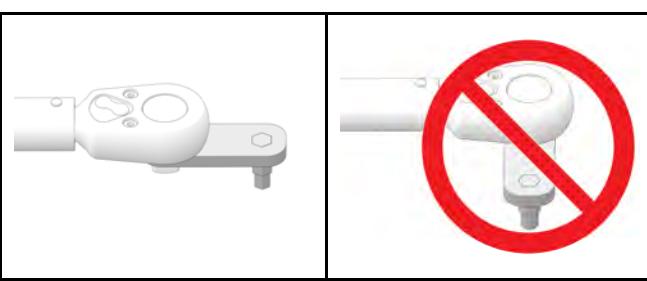
**NOTE**

For ease of installation, install the front cylinder fuel rail fastener first.

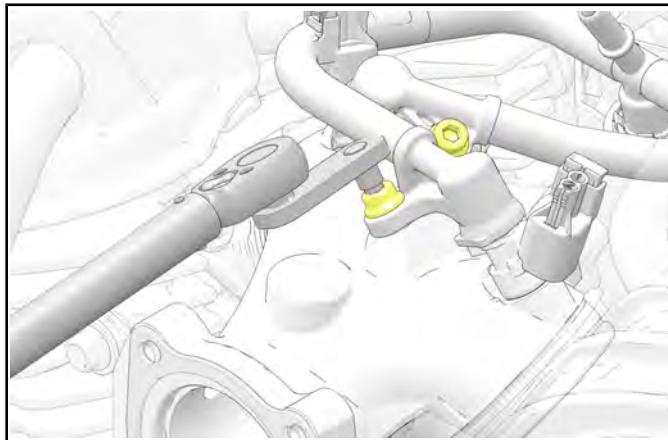
- Install the FUEL RAIL TORQUE TOOL (5264374) onto a $\frac{1}{4}$ in drive torque wrench. Install a 5 mm allen bit to the hex end of the torque tool as shown.

**IMPORTANT**

Alignment of the special tool is critical to achieve the correct torque. Make sure the FUEL RAIL TORQUE TOOL remains in-line with the torque wrench while torquing fasteners.



- Torque fuel rail fasteners to specification.

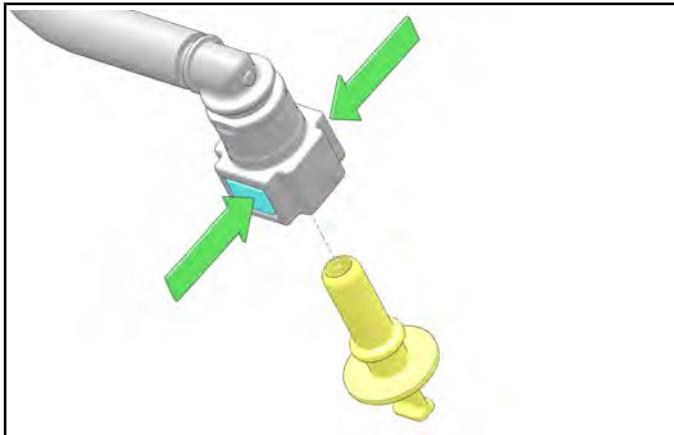
**IMPORTANT**

Make sure the FUEL RAIL TORQUE TOOL and the torque wrench remain in-line while torquing fasteners.

TORQUE

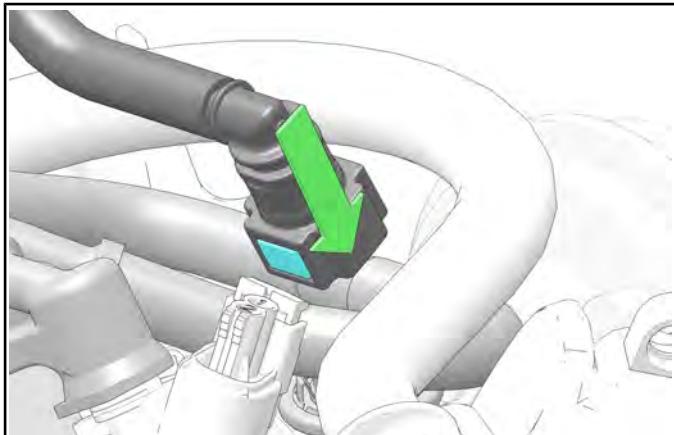
Fuel Rail Fasteners:
74 in-lbs (8 Nm)

8. Squeeze the quick connect buttons (one on each side) and hold. Remove special tool from fuel line.

**NOTE**

Use a rag to contain the small amount of fuel that may drain from the fuel line after the special tool is removed.

9. Connect fuel line to fuel rail.

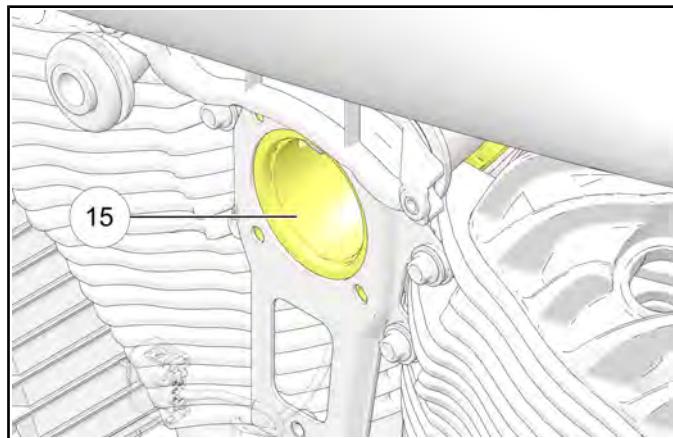
**NOTE**

Listen for an audible “click” to confirm the line is fully engaged.

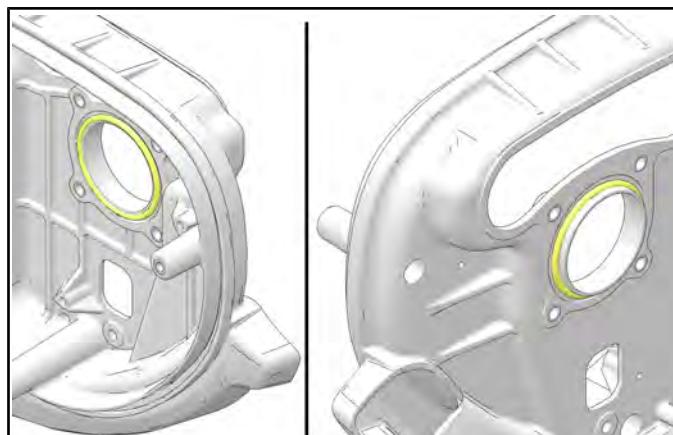
IMPORTANT

Pressurize the fuel system by powering up the bike and slide the STOP/RUN switch to the RUN position. Verify no leaks present with system under pressure.

10. Uncover the intake ⑯.

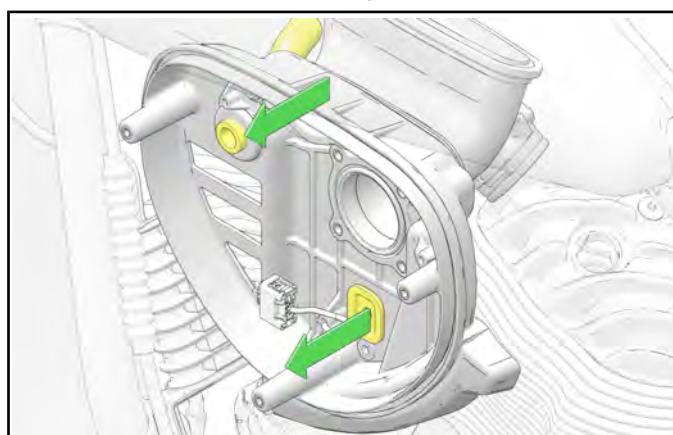


11.

**IMPORTANT**

Verify that BOTH air box o-ring seals are correctly in position before installing the throttle body.

12. Feed the throttle body multi-plug connector through the hole in the air box. Connect intake hose to the air box housing.



NOTE

Use a small amount of lubricant around the outside of the breather hose when installing to the air box housing.

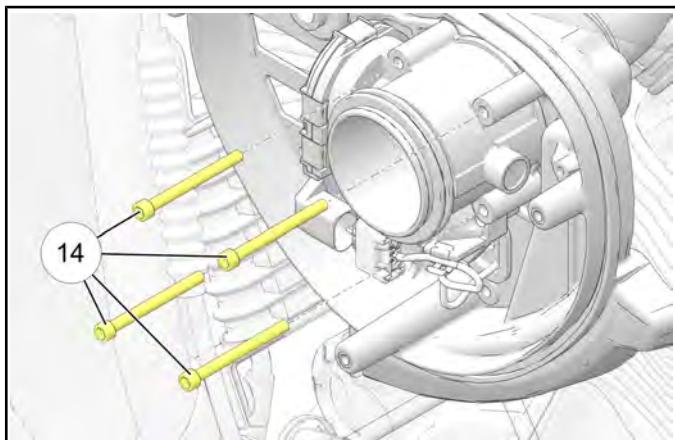
TORQUE

Throttle Body Fasteners:
84 in-lbs (10 Nm)

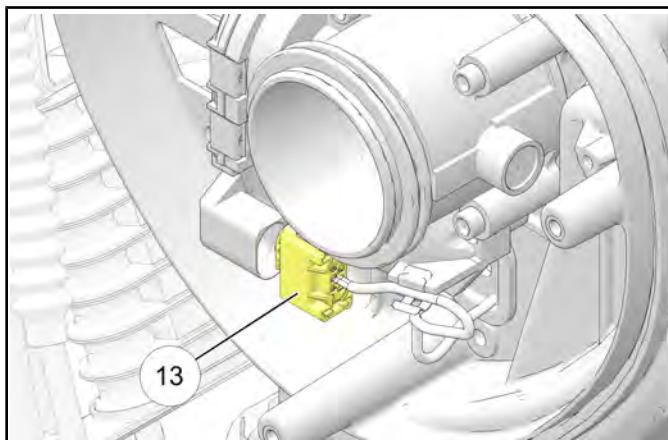
NOTE

Make sure that the harness seal is fully seated in the air box cutout.

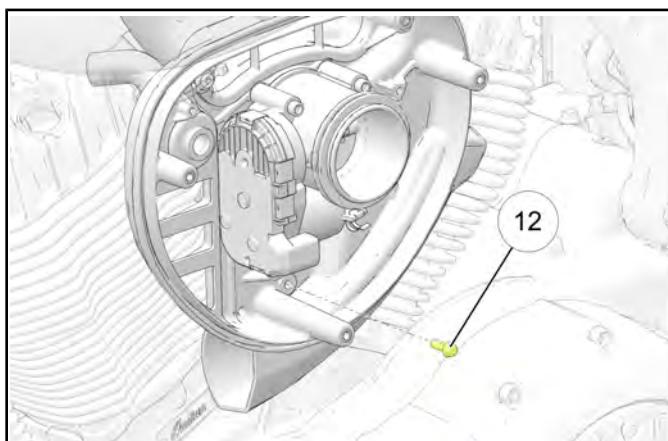
13. Install four throttle body fasteners **14**. Torque fasteners to specification.



14. Connect the multi-plug **⑧** to the throttle body.



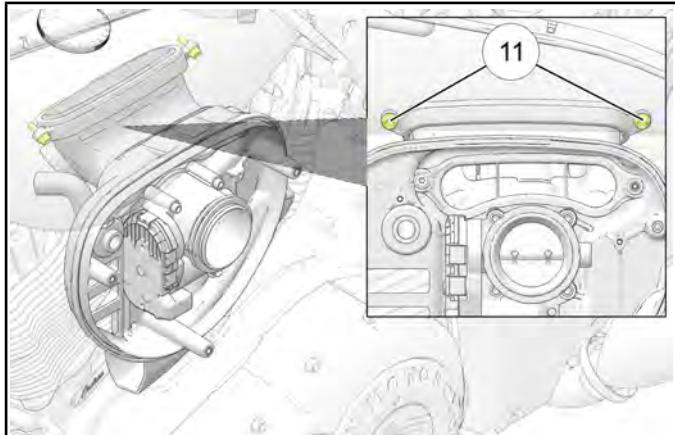
15. Install the lower fastener **⑫** securing the air box to the mounting plate. Torque fastener to specification.



TORQUE

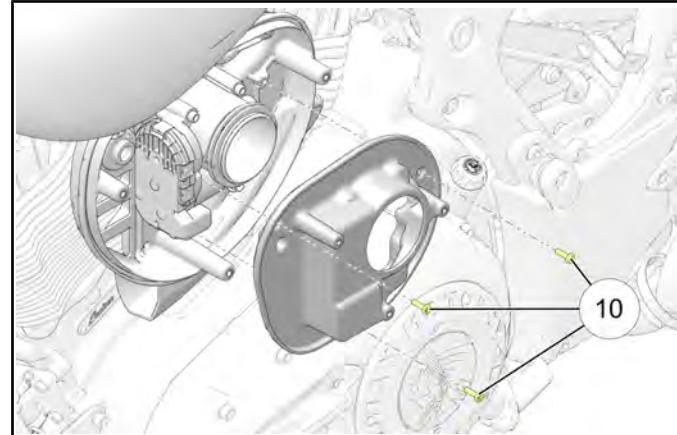
Air Box Fastener:
31 in-lbs (4 Nm)

16. Install the upper two fasteners ⑪ securing the baffle plate to the intake. Torque fasteners to specification.

**TORQUE**

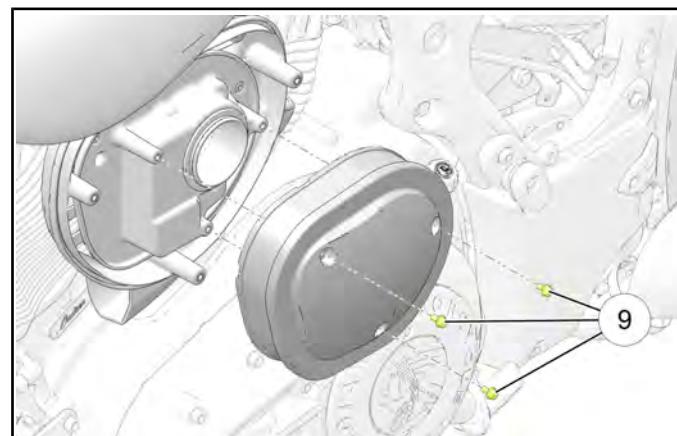
Upper Intake Fasteners:
84 in-lbs (10 Nm)

17. Install the three air filter adapter plate fasteners ⑩. Torque fasteners to specification.



4

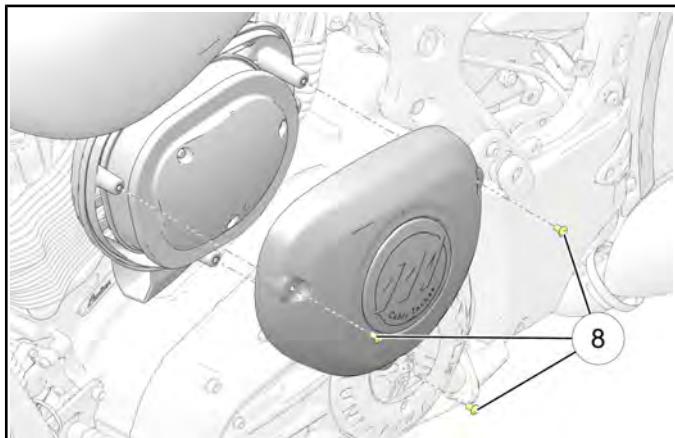
18. Install the three fasteners ⑨ securing the air filter to the adapter plate. Torque fasteners to specification.



TORQUE

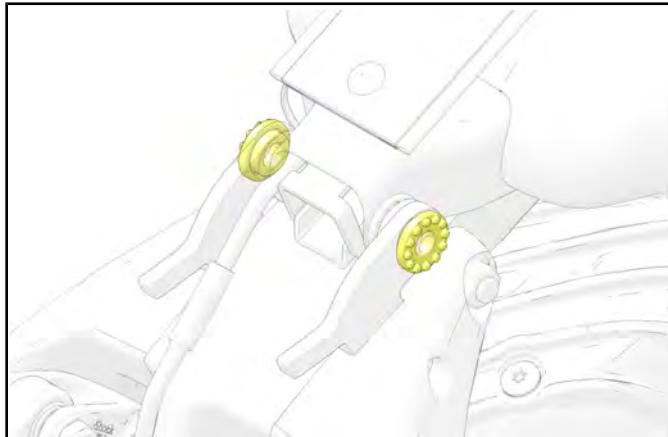
Air Filter Fasteners:
62 in-lbs (7 Nm)

19. Install the three fasteners ⑧ securing the air cleaner cover to the air box. Torque fasteners to specification.

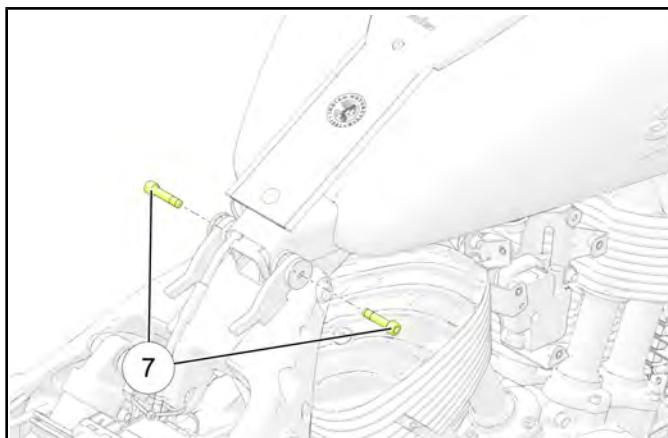
**TORQUE**

Air Box Cover Fasteners:
84 in-lbs (10 Nm)

20. Verify that both fuel tank isolators are assembled correctly as shown.



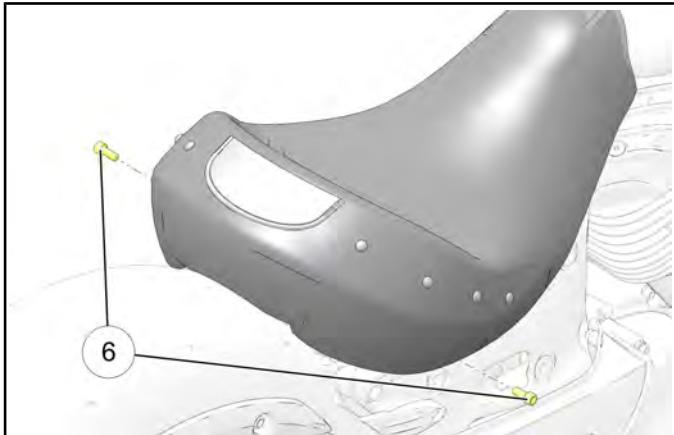
21. Remove the small 2x4 piece of wood beneath the fuel tank rear mount and lower fuel tank into position. Install fuel tank fasteners ⑦. Torque fasteners to specification.



TORQUE

Fuel Tank Fasteners:
84 in-lbs (10 Nm)

22. Slide front of seat into seat retaining bracket. Install the two fasteners ⑥ retaining the driver seat to the frame. Torque seat fasteners to specification

**TORQUE**

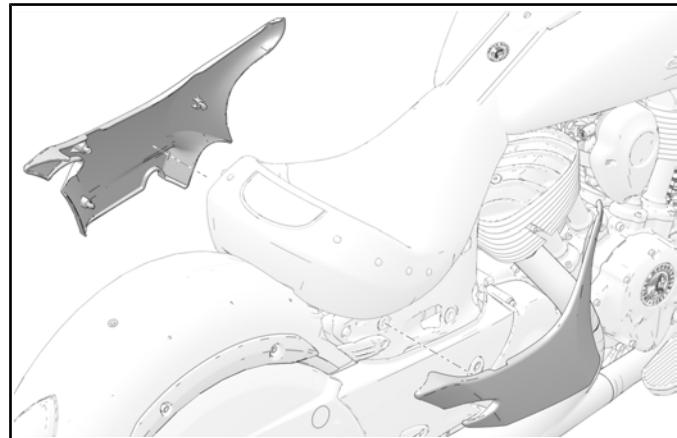
Seat Fasteners:
84 in-lbs (10 Nm)

NOTE

For models with a passenger seat, install and torque passenger seat fastener.

23. Connect the motorcycle to Digital Wrench. Verify no fail codes and no MIL lights are present. Field Test the motorcycle to verify proper operation.

24. Install the upper side covers.

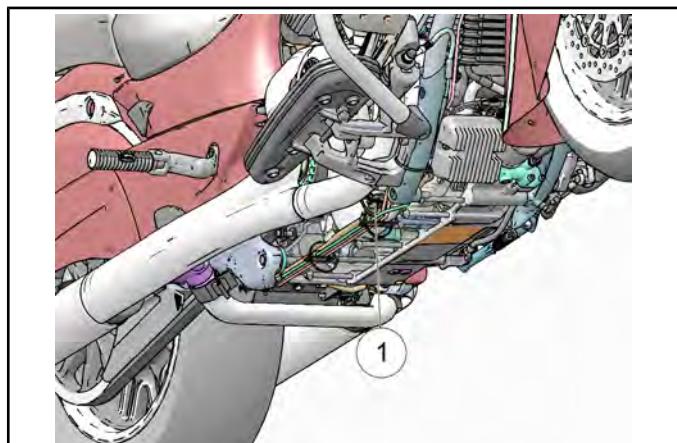


25. Install Trunk (if equipped). See Trunk Installation, Roadmaster, page 7.30

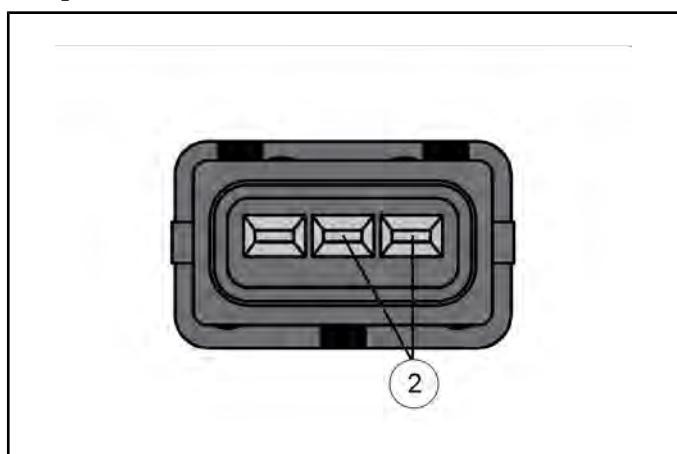
26. Install Saddlebags (if equipped).

CRANKSHAFT POSITION SENSOR, TEST / REPLACE**CPS Test**

1. Locate the CPS connector ① behind the RH front down tube, and disconnect.



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

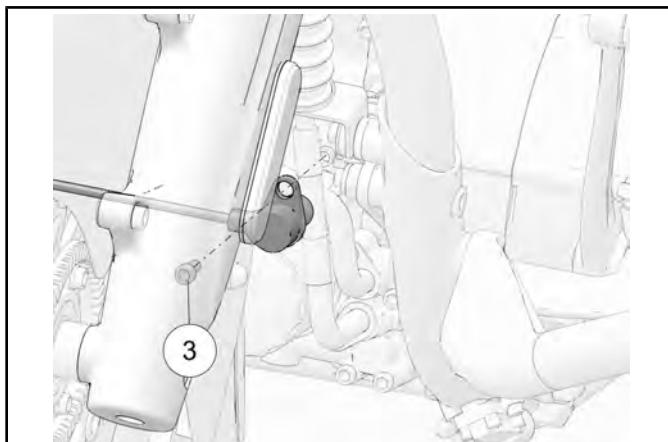


3. If resistance is correct, check to see that the sensor is mounted properly and that the tone wheel has not been damaged and is securely mounted to the crankshaft assembly.

Crankshaft Position Sensor: 860 Ohms @ 20°C (68°F)

CPS Replacement

1. Remove starter motor. See Starter Motor, Removal / Installation, page 10.25.
2. Remove regulator / rectifier assembly and bracket. See Rectifier / Regulator Replacement, page 10.33.
3. Disconnect the CPS sensor from the vehicle harness and release flying lead from plastic darts and cable ties.
4. Remove the fastener ③ securing the CPS sensor to the engine case and remove sensor.



5. Installation is performed by reversing the removal procedure.

NOTE

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

6. Torque the CPS retaining fastener to specification.

TORQUE

Crankshaft Position Sensor Retaining Fastener: **89 in-lbs (10 Nm)**

DETONATION SENSOR TEST / REPLACE

The detonation, or "Knock" sensor is a piezoelectric sensor that advances or retards ignition based on load.

CAUTION

The detonation sensor is torque sensitive and must be replaced if removed for any reason.

IMPORTANT

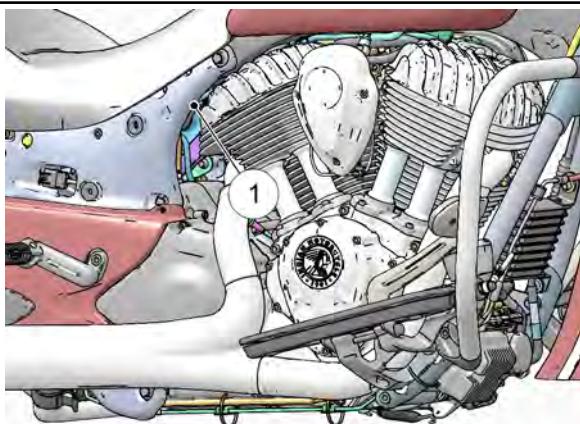
The detonation sensor must be torqued to specification or it will not perform correctly. Sensors that have been over-tightened or under-tightened may set a diagnostic trouble code and cause the MIL to illuminate. Use a properly calibrated torque wrench during installation.

Detonation Sensor Diagnostic Information

COMPONENT	LOCATION	P-CODE	SPN	FMI	DESCRIPTION
Detonation "Knock" Sensor	Rearward face of the front cylinder	P0327	731	4	Knock Sensor 1: Voltage too low
		P1327	520331	3	Positive Line: Voltage too high
		P1328		4	Positive Line: Voltage too low
		P132A	520332	3	Negative Line: Voltage too high
		P132B		4	Negative Line: Voltage too low

Test 1

1. Disconnect the negative battery cable. See Battery, Removal, page .
2. With the RH upper side cover removed, locate the detonation sensor connector ① just inside the RH midcasting and disconnect.



3. Inspect the sensor-side of the connector for moisture and / or corrosion. Make sure the terminal pins are securely seated in the plug.
4. Remove the ECM from the motorcycle to access ECM connector 2. See ECM Removal / Installation, page 4.35.
5. Set multi meter to measure resistance.

6. Measure the resistance through each wire from ECM connector to the sensor connector. Resistance should be less than 1 Ohm (good continuity). See ECM Connector MAP, page 4.24 for pin locations.

ECM2 Pin 37 to Detonation Sensor Connector Pin 1 should be less than 1Ω.
ECM2 Pin 38 to Detonation Sensor Connector Pin 2 should be less than 1Ω.

7. Measure the resistance across the detonation sensor pins 1 & 2.

Resistance across Detonation Sensor Connector Pin 1 & Pin 2: Continuity
Resistance should be between 4.5–5.0 MΩ

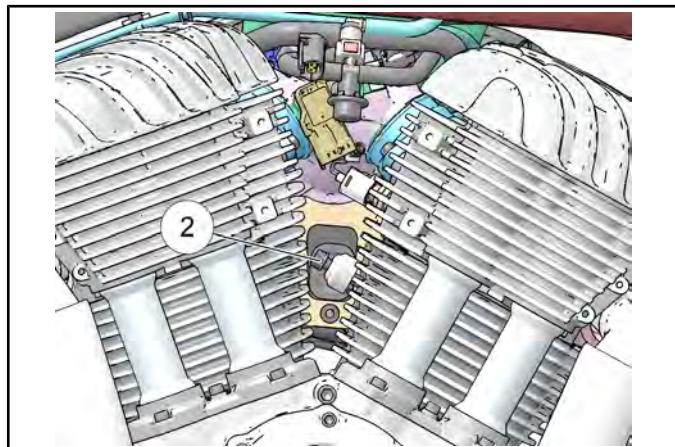
8. If the resistance does not match the specified value, replace the sensor.

Test 2

9. Using a multi meter with a low voltage AC frequency scale, connect the meter leads to the connector pins of the detonation sensor.
10. Allow the signal to stabilize to 0 Hz.
11. Lightly tap the front cylinder near the knock sensor with a rubber mallet or other non-metallic object.
12. Watch for frequency fluctuation.
13. If no frequency fluctuation is observed while tapping on the cylinder, replace the sensor.

Replace

14. Remove the ignition coil assembly and mounting bracket. See Ignition Coil Removal / Installation, page 10.40.
15. Remove the fuel tank. See Fuel Tank Removal, page 4.15.
16. Remove the fastener ② securing the detonation sensor to the forward cylinder.



17. Noting how the detonation sensor harness is routed, remove the sensor from the motorcycle.
18. **INSTALLATION is performed by reversing the removal procedure.**
19. Torque the detonation sensor fastener to specification.

TORQUE

Detonation Sensor Fastener: 15 ft-lbs (20 Nm)

THROTTLE BODY (ETC) REMOVAL

1. To remove the Electronic Throttle Control assembly, see Air Box Removal, page 3.4.

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.

NOTE

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.

CAN DIAGNOSTICS

CAN (CONTROLLER AREA NETWORK)

DIAGNOSTIC OVERVIEW

Overview

The speedometer and Engine Control Module (ECM) have integrated 120Ω termination resistors. With the speedometer unplugged, check resistance between the CAN terminals at the speedometer connector. The resistance should be 120Ω . With the speedometer connector plugged in, and the ECM connector unplugged the resistance will be 120Ω . With speedometer and ECM connectors plugged in, the resistance will be 60Ω .

Baseline CAN Resistance Values

Checking resistance between Yellow CAN High wire and Green CAN Low wire at the specified module connectors below (while unplugged):

- VCM = 60Ω
- ECM = 120Ω
- Speedometer = 120Ω
- ABS Module = 60Ω
- Diagnostic Connector = 60Ω

DIGITAL WRENCH

DIGITAL WRENCH DIAGNOSTIC SOFTWARE OVERVIEW

NOTE

Refer to Section 2, 3 and 4 in the Instruction Manual provided in the Digital Wrench Diagnostic Kit to install the Digital Wrench diagnostic software on your computer.

The Digital Wrench diagnostic software allows the technician to perform the following tests and observations:

- View or clear trouble codes
- Analyze real-time engine data
- Reflash ECU calibration files
- Perform guided diagnostic procedures
- Create customer service account records
- Perform output state control tests (some models)

DIAGNOSTIC SOFTWARE VERSION

Always use the most current version of the Digital Wrench software to ensure you have the latest updates or enhancements. New reprogramming files and guided diagnostic procedures are added to these updates as they become available. For information on how to determine if you have the latest update available, see Digital Wrench Version and Update ID, page 4.56.

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 ECU is transferred to the replacement ECU.

Refer to procedure and carefully follow all instructions provided in Digital Wrench.

GUIDED DIAGNOSTIC AVAILABLE

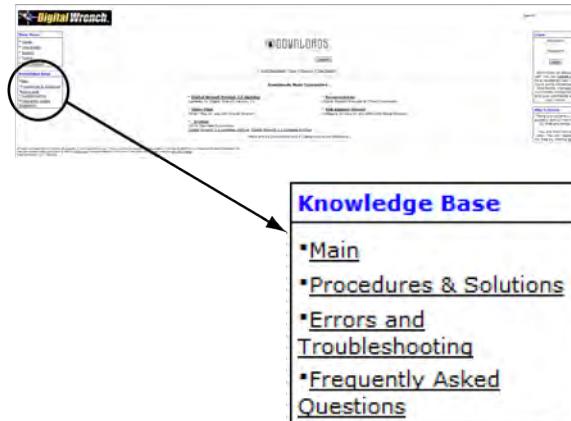
Guided diagnostics are available within Digital Wrench for most supported Diagnostic Trouble Codes (DTCs). That is, any fault that will turn on the 'Check Engine' indicator.

In addition, guided diagnostics are also available for many other electrical sub systems.

Diagnostic procedures are added to subsequent versions of Digital Wrench as they become available. Check your release version often and upgrade when available to be sure you are using the most current software available.

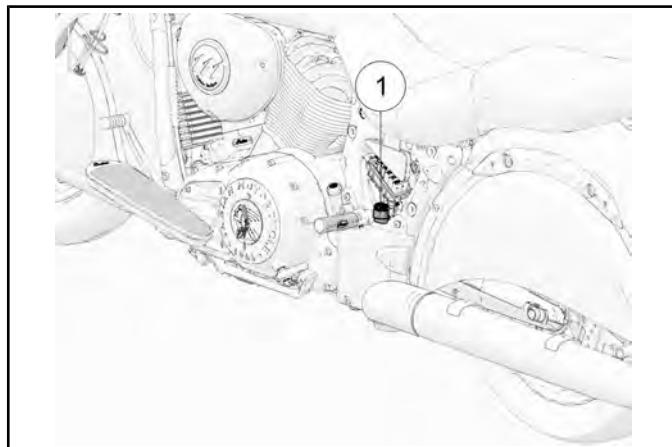
DIGITAL WRENCH COMMUNICATION ERRORS

If you experience problems connecting to a vehicle or any other Digital Wrench related problem, visit the Digital Wrench Knowledge Base for the most current troubleshooting information, FAQs, downloads and software updates at: <http://polaris.diagsys.com/>.



DIGITAL WRENCH DIAGNOSTIC CONNECTOR

The diagnostic connector ① is located under the LH upper side cover, below the fuse box.



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

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

DIGITAL WRENCH SERIAL NUMBER LOCATION

Open the configuration screen by clicking on the wrench icon. The serial number is located on the right side of the screen.



DIGITAL WRENCH VERSION AND UPDATE ID

Knowing what Digital Wrench version and update is installed will help determine which updates are required.

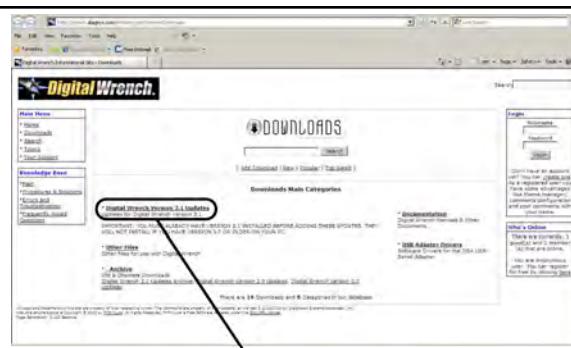
NOTE

Versions and updates are subject to change.

1. Open the Digital Wrench software. Locate the version ID shown on the lower right side of the Digital Wrench start-up screen.



2. Proceed to <http://polaris.diagsys.com> to see if a newer update is available.



Digital Wrench Update

3. If a newer update is available, it should be downloaded before using Digital Wrench.

NOTE

Always operate with the latest update.

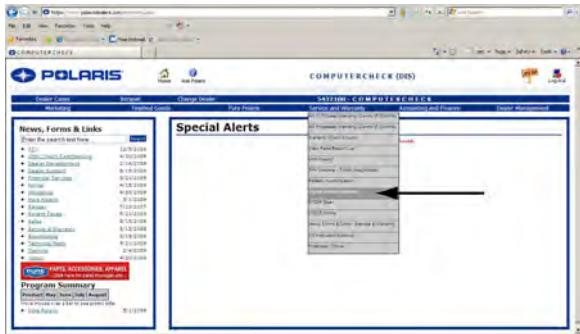
DIGITAL WRENCH UPDATES

Updates are released for Digital Wrench via the Internet at: <http://polaris.diagsys.com>. The Digital Wrench website can also be accessed through the dealer website at: www.polarisdealers.com.

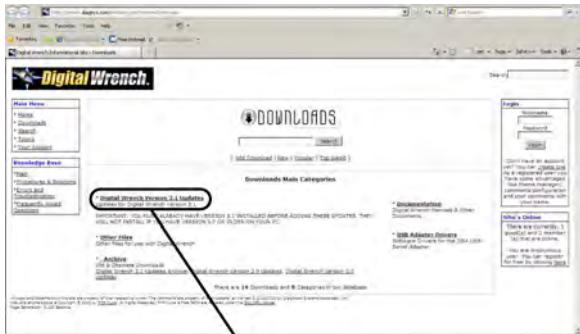
NOTE

Only authorized Indian Motorcycle dealers and distributors can access the dealer website.

1. Log on to www.polarisdealers.com.
2. Locate the **Service and Warranty** drop-down menu.
3. Click on **Digital Wrench Updates**.



4. The Digital Wrench portal website should appear in a new web browser.
5. Click on **Digital Wrench Version Updates**.



Digital Wrench Update

NOTE

You must already have the current version installed before adding an update. Updates will not install if you are using an older version loaded on your PC.

6. If the update file date listed is newer than your current version and update, download the file.



7. Click on the link shown above, save the file to your hard disk and then double-click the icon to start the update process.

NOTE

Do not "run" or "open" the file from where they are. Select "save" and download them to your PC before running the install.

8. When the update is complete, the version shown on the right side of the Digital Wrench start-up screen should match the update you just downloaded.

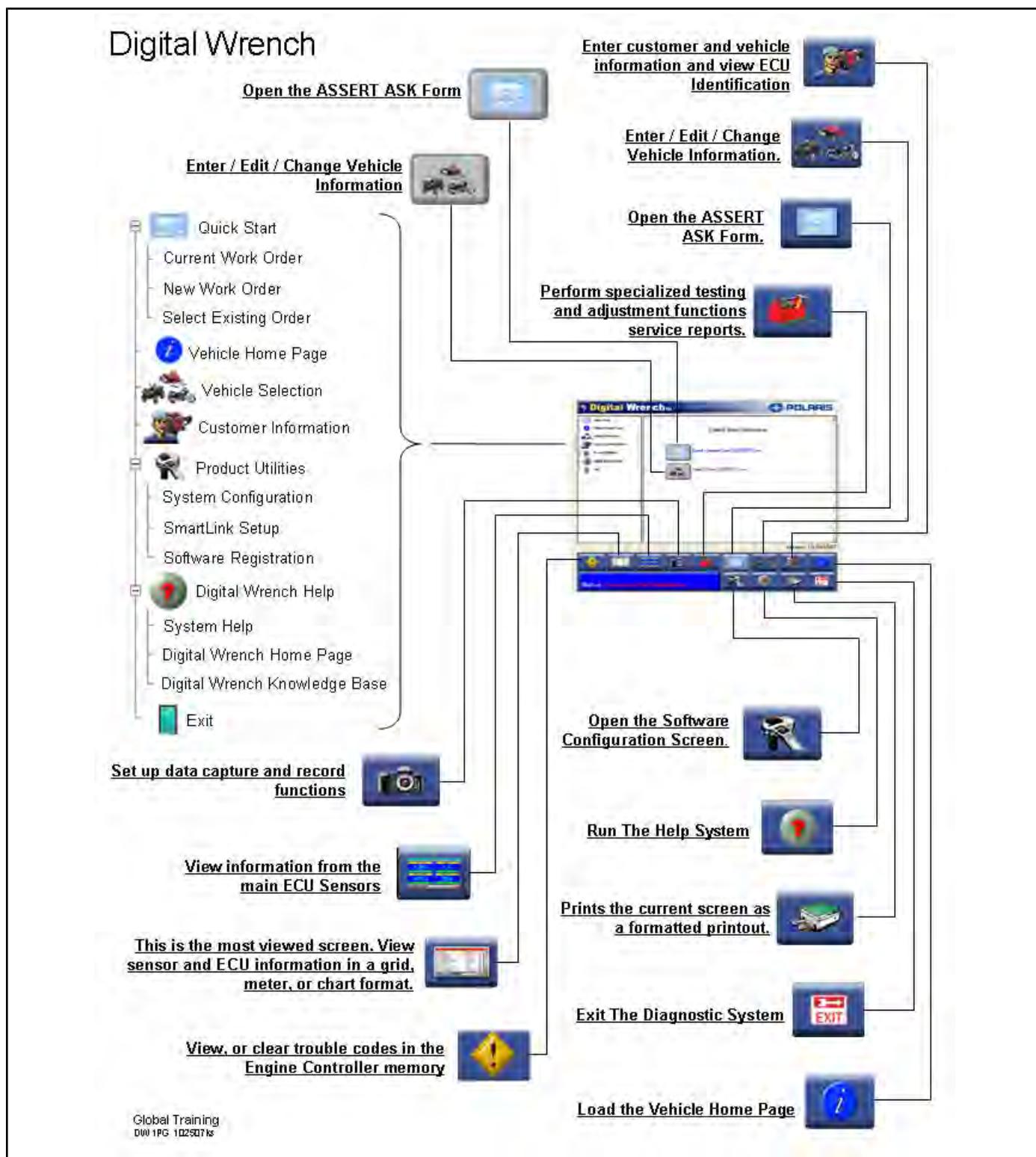


NOTE

Versions and updates are subject to change.

NOTE

You must already have the current version installed before adding an update. Updates will not install if you are using an older version loaded on your PC.

DIGITAL WRENCH FEATURE MAP

ENGINE CONTROLLER REPROGRAMMING (REFRESH)

Process Overview

The reprogramming feature is in the Special Tests menu on the Digital Wrench screen. Start Digital Wrench and click on the Special Tests menu icon (red tool box). A technician should be familiar with the process and with computer operation in general before attempting to reprogram an ECM.

The Digital Wrench Engine Controller Reprogramming (or "Reflash") feature allows reprogramming of the ECM fuel and ignition map. To successfully reprogram the ECM, an Authorization Key must be obtained by entering a Request Code in the box provided on the Reflash Authorization site. The Request Code is automatically generated by Digital Wrench during the reprogramming process. The Reflash Authorization site is located under the **Service and Warranty** drop down menu on the dealer website at: www.polarisdealers.com.

NOTE

Failure to follow the reprogramming instructions completely and correctly can result in an engine that does not run! Replacement ECMS are programmed as "no-start" and require a reflash for them to work.

Reprogramming (Reflash) Tips:

- **BATTERY VOLTAGE:** The majority of problems with reprogramming can be attributed to a low battery. Be sure the battery voltage (no load) is at least 13 volts and at least 12.5 volts with the key 'ON'. Connect a battery charger if necessary to bring voltage level above minimum. Fully charge the battery before you attempt to reprogram.
- **DEDICATED LAPTOP:** Best results are obtained using a laptop computer that is "dedicated to Digital Wrench". A laptop that is used by a variety of people and in several applications around the dealership is more likely to cause a reprogramming problem than one dedicated to Digital Wrench diagnostics only.
- **OBTAINING THE LATEST UPDATE:** Reprogramming updates are provided periodically and contain the most recent calibrations.
- **CLOSE NON-ESSENTIAL PROGRAMS:** It is recommended that you DO NOT install non-essential programs on a Service Department laptop. Camera detection software, Virus Scanners, Tool Bars, etc. may clog up memory if running in the background and make it harder for the diagnostic software to operate.

• **KNOW THE PROCESS:** If you are not familiar with the entire reprogramming process, review the HELP section of the diagnostic software before you attempt reprogramming. Click on the ? on the tool bar or press F11. The information in the on-line help is the most current and complete information available. This should be your first step until you are familiar with the process.

• **COMMUNICATION PROBLEMS:** If you have had problems communicating with a vehicle while performing diagnostic functions, do not attempt reprogramming until the cause has been identified and fixed. Check all connections, and be sure battery voltage is as specified.

• Proceed to <http://polaris.diagsys.com> for specific information and FAQs on how to troubleshoot communication problems.

• **DON'T DISTURB THE PC:** While reprogramming is in progress, don't move the mouse and don't touch the keyboard. The process only takes a few minutes, and is best left alone until complete.

Reprogramming (Reflash) Procedure:

If you are not familiar with the reprogramming process, review the "Reprogramming (Reflash) Tips" before you begin. Follow the on-screen instructions as you progress through the steps. If you encounter a problem, always check the On-Line help for current tips and information.

1. Verify the most current update has been downloaded and loaded into Digital Wrench.
2. Connect SmartLink Module cables to PC and vehicle.
3. Open the Digital Wrench program.
4. Select the model year, product line and vehicle description by selecting the "Change Vehicle Type" icon.
5. Select the "Special Tests" icon.
6. Select "Engine Controller Reprogramming".
7. Select the file you want to load into the ECU then click the "Continue" icon to proceed to the Integrity Check and obtain a Request Code.
8. Copy (CTRL +C) the Request Code that will be required on the dealer website in the next step. DO NOT CLOSE Digital Wrench or the Request Code will be invalid. **NOTE: All characters are letters; there are no numbers in a request code.**

NOTE

Request Codes and Authorization Keys must be entered EXACTLY as they appear on the screen.

FUEL DELIVERY / EFI

9. Go to www.polarisdealers.com and click on “ReFlash Authorization” from the “Service and Warranty” drop-down menu.
10. Enter or paste (CTRL+V) the Request Code into the box.
11. Select the same file type from the list that you selected previously while in Digital Wrench. Enter the VIN along with the customer's name and address. When completed, click the Authorize button once to proceed.
12. An “Authorization Key” will appear in the upper left corner of the screen. Copy (CTRL+C) this key exactly as it appears.
13. Enter or paste (CTRL+V) the Authorization Key in the box located on the Digital Wrench screen. Click the ‘Continue’ button and follow instructions provided on the screen to complete reprogramming procedure.
14. At this point the reflash process will begin. Do not touch the vehicle or PC during the process.
15. Once the ECU reprogramming procedure is complete, click the ‘Finish’ button on the screen. Verify the reflash was a success by starting the vehicle.

TROUBLESHOOTING

FUEL SYSTEM TROUBLESHOOTING, PART 1

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Engine turns over with electric starter, but won't start	Compression too low	See engine section	
	No spark at spark plugs	See ignition system	
	No fuel reaching intake tract	Out of fuel Blown Fuse Plugged fuel filters / lines Fuel pump not working Fuel pressure regulator Faulty fuel pump relay Open wiring / connector Faulty connection at ECM	Add Fuel Replace Clean/Replace Test / Replace Test / Replace Test / Replace Inspect / Repair Inspect / Repair
	Excessively rich or lean fuel mixture	Fuel pump Fuel pressure regulator Crank Position Sensor Low Battery TMAP sensor CHT sensor Fuel Injector	Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace
	Spark at wrong time or no spark. Fuel delivery timing incorrect.	Timing Wheel or CPS installed incorrectly, damaged, or dirty; faulty CPS	Install correctly, inspect for proper air gap (gap is preset but cover, sensor, and timing wheel must be clean and in good condition).
Poor idle	Excessively rich or lean fuel mixture	Air Leaks Fuel Pump Fuel injector or fuel rail obstructed or leaking Air Filter Wrong Fuel / Old Fuel Crank Position Sensor	Inspect throttle body and stepper motors Inspect fuel pressure Replace Replace Inspect / Replace Inspect / Replace
Poor Running in Higher RPM Range	Air intake restriction Oil Overfilled Ignition 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

FUEL SYSTEM TROUBLESHOOTING, PART 2

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Engine Stalls	Fuel Pump Problem	Low battery voltage Faulty fuel pump No signal from ECM Wiring problem	Battery/Charging system Check fuel pressure Repair Wiring Repair/Chk Pump Relay
	Excessive rich or lean fuel/air mixture	TMAP Sensor Plugged fuel filter Fuel pump (pressure) Fuel pressure regulator Vacuum leak Wiring problem Air Filter Low battery voltage	Repair / Replace Test / Replace Pump Assembly Test / Replace Test / Replace Pump Assembly Repair / Replace hoses Repair Replace Ck battery & charging system
	Control Circuit/ Sensors not functioning correctly	Fuel pressure regulator TPS Engine speed sensor Fuel pump relay Rotor Fuse ECM Relay Low battery voltage ECM	Test Pressure / Replace Test / Replace Test / Replace Test / Replace Inspect / Install correctly Replace Replace Inspect Charging system
	Valve train problems or Compression low	Refer to Engine chapter	
Backfiring	Low Battery Voltage Ignition Problem Air leaks Restricted air intake or throttle body	Battery, spark plug fouled, poor wire connection for ignition or fuel injection, loose pin in multi-pin connector for ECM or wiring harness Inlet and Exhaust Intake tract / Throttle body	Refer to battery section Replace plugs / diagnose Inspect wiring connections Disconnect and check pin connections Seal intake or exhaust leaks Clean air inlet tract and throttle body

FUEL SYSTEM TROUBLESHOOTING, PART 3

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Poor Running in upper rpm ranges	Control Circuit/ Sensors not functioning correctly	CPS ETC Air temperature sensor Manifold Absolute Pressure sensor Intermittent wiring /connector problem ECM	Test / Replace Test / Replace Test / Replace Test / Replace Repair/Replace Test / Replace
	Fuel delivery incorrect	Plugged or kinked fuel and/or vent hoses Fuel pump Fuel regulator Fuel filter Battery/Charging System Fuel Injector plugged Contaminated fuel (water, additives, etc.) Inadequate octane Defective ETC Low battery voltage	Repair/Replace Test / Replace Test Pressure / Replace Test / Replace Pump Assembly Charge/Replace (if applicable) Clean/Replace Clean/Replace Use correct fuel Test / Replace Charging system
	Air intake restriction	Dirty Air Cleaner Intake restriction	Clean Repair
	Air Leak	ETC gasket surfaces Intake manifold ETC	Repair/Replace Repair/Replace Repair/Replace
Engine lacks power	Engine component problems Ignition problems Overfilled with oil	See Engine / Cooling / Exhaust chapter See Electrical chapter See Maintenance chapter	
	Improper fuel delivery	Plugged fuel injector Dirty air cleaner Vacuum leaks Fuel pump Fuel pressure regulator Air temperature sensor TMAP sensor Plugged vent hose Low battery voltage ECM	Repair / Replace Replace Repair Test / Replace Test / Replace Test / Replace Test / Replace Clear Test batt./Charging system

FUEL SYSTEM TROUBLESHOOTING, PART 4

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(S)	REPAIR RECOMMENDED
Engine overheats	Internal Engine Parts Lubrication & Cooling system Low or incorrect oil Brakes dragging Drive belt too tight Ignition timing incorrect Spark plug(s) Low battery voltage	Cooling System Engine Oil Brake systems Drive Belt Ignition Coils Faulty ECM Charging System Faulty Battery Faulty Wiring	Refer to Engine / Cooling / Exhaust chapter Refer to Engine / Cooling / Exhaust chapter Refer to Brakes chapter Refer to Steering / Suspension chapter Refer to Electrical chapter Replace Test / Repair Replace Repair
	Lean Air/Fuel mixture	Fuel pressure regulator Air leak Fuel injector plugged CHT Vent hose plugged / kinked Air leak at throttle body to manifold seal	Repair / Replace Repair Clean / Replace Test / Replace Repair Test / Repair
Won't Accept New Calibration	Non-Current Calibration File Set Low Battery Voltage Attempting Re-Flash Without Proper VIN, Calibration I.D. number, or calibration authorization code		Go to Dealer website and download the most current Indian Motorcycle Calibration File Set Attach Battery Charger During Re-Flash, and Re-Charge Battery When Re-Flash Is Completed Enter Authorization Code Sent With Accessory Kit

CHAPTER 5

CLUTCH / PRIMARY / SHIFT

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GENERAL INFORMATION**SERVICE INFORMATION**

- 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 20W/40 motorcycle oil is recommended for all operating temperatures. If Indian Motorcycle 20W/40 oil is not available, a high quality 20W/40 motorcycle oil suitable for use in wet clutch transmissions can be used.
- Lubricate parts during assembly as described in the procedures.
- Corroded or sticking shift linkage pivot points can cause abnormal shifting. Replace any linkage components that are damaged or do not move freely, and lubricate at regular intervals.

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Case Splitting / Assembly Tool	PF-51234
Clutch Shaft Holder	PF-51232
Crankshaft Locking Pin	PF-52135
Crankshaft Rotation Socket	PF-51239
Engine Stand Adapter	PF-51240
Moly Assembly Paste	2871460

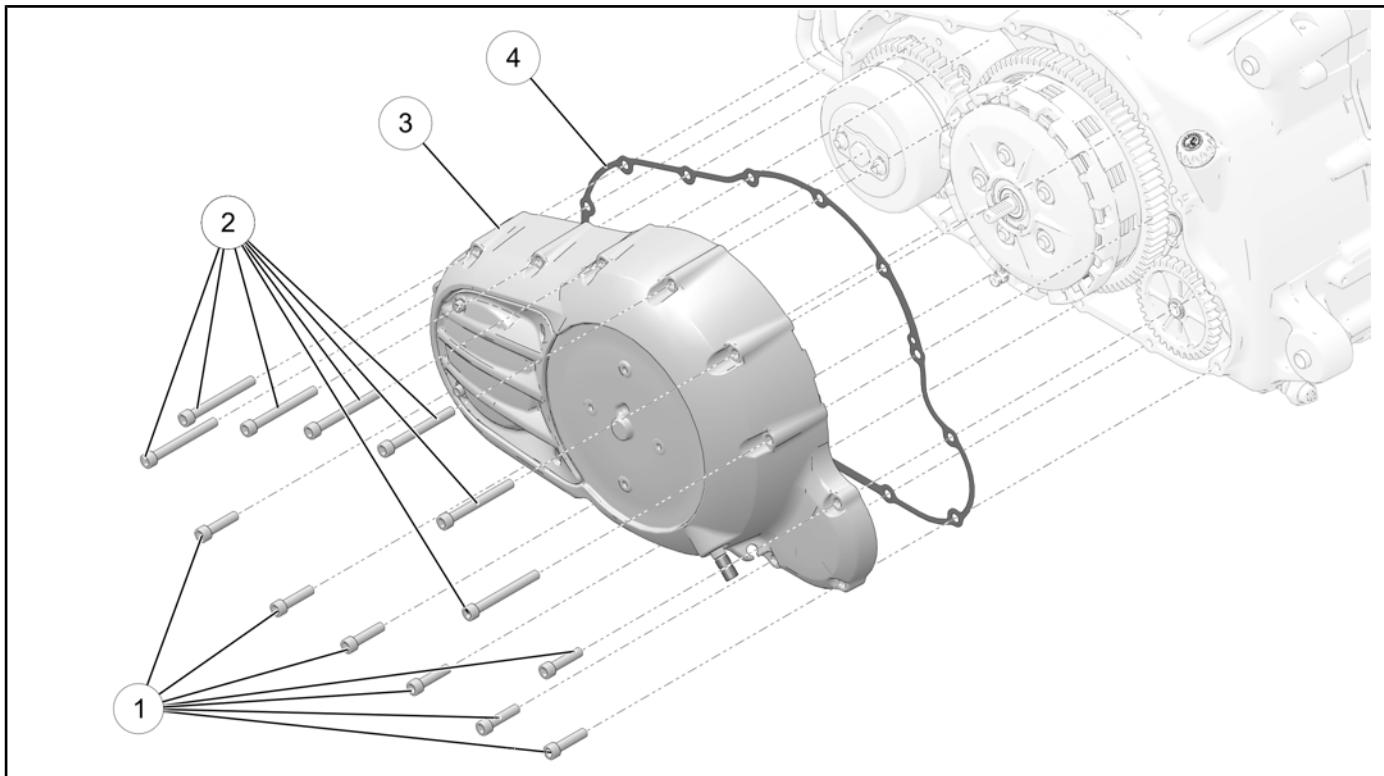
Bosch Automotive Service Solutions: 1- 800- 328-6657 or <https://polaris.service-solutions.com/>

TORQUE SPECIFICATIONS

PART DESCRIPTION	TORQUE SPECIFICATION
Clutch Pinion Shaft Lever Fastener	88 in-lbs (10 Nm)
Clutch Stake Nut	125 ft-lbs (170 Nm)
Pressure Plate Fasteners	88 in-lbs (10 Nm)
Primary Cover Fasteners	15 ft-lbs (20 Nm)
Stator Fasteners	88 in-lbs (10 Nm)
Torque Compensator Fastener	83 ft-lbs (112 Nm)
Torque Compensator Locking Plate Fastener	88 in-lbs (10 Nm)

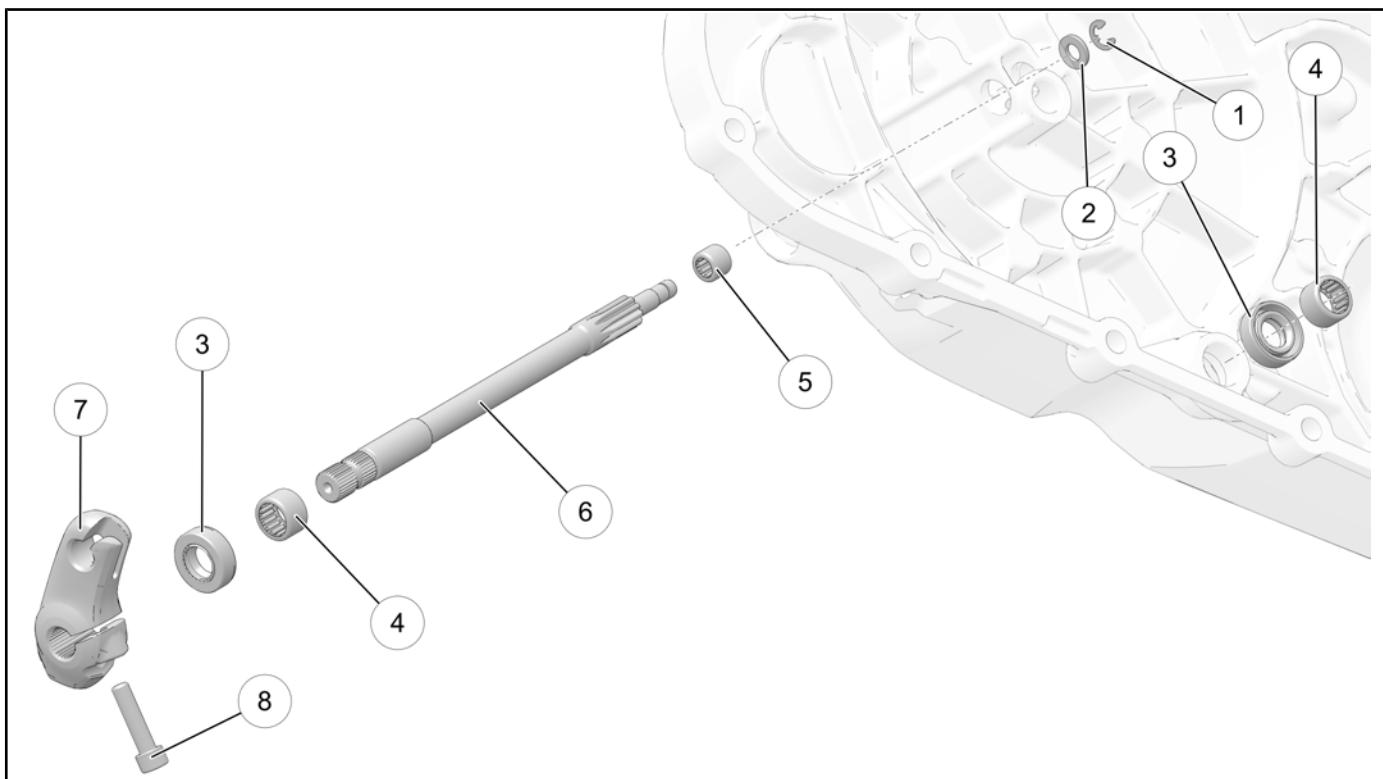
SERVICE SPECIFICATIONS

ITEM	SPECIFICATIONS
Clutch / Gear Shift / Linkage	Clutch Type
	Wet, Multi-Disk
	Clutch Operating Mechanism
	Manual / Cable Operated
	Torque Compensator
	Belleville Spring Loaded Cam Assembly
	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.5)	32.8 lbf @ Installed Height
Clutch Lever Free Play (Cable)	.50-.150 mm (.020-.060")

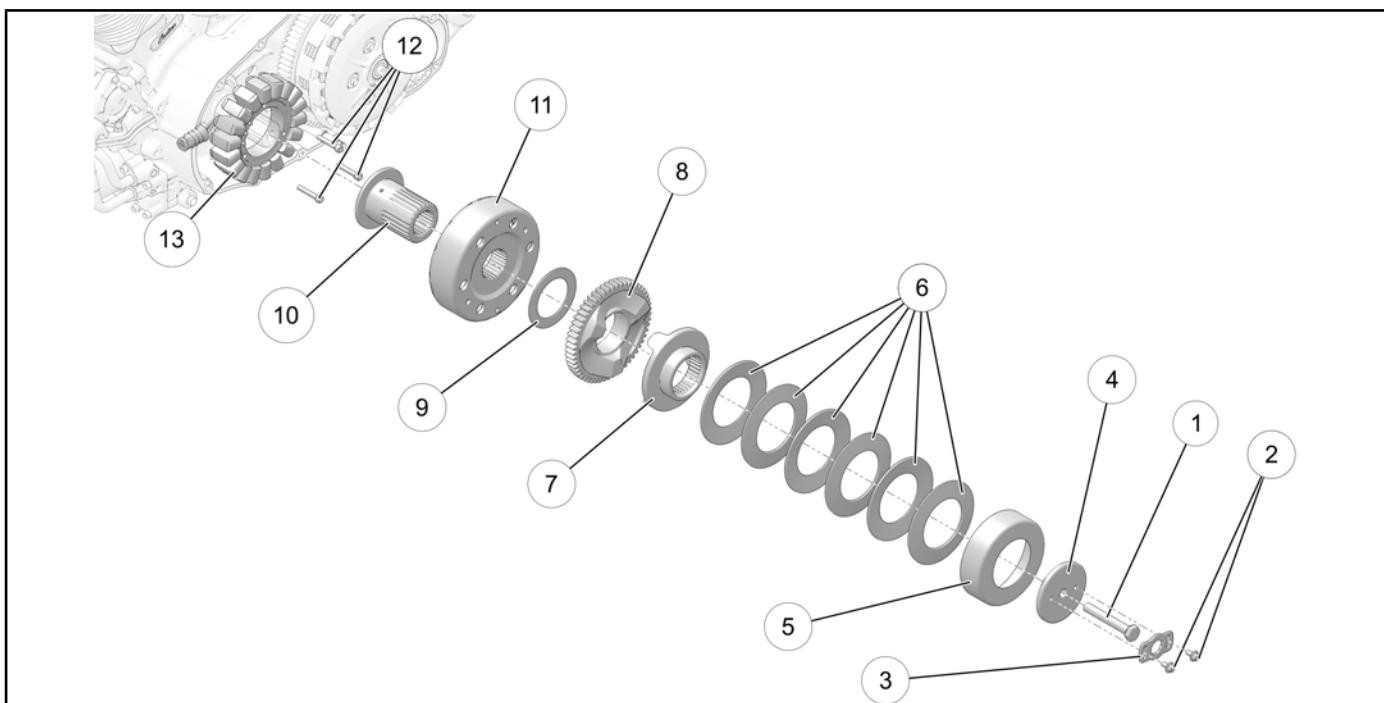
ASSEMBLY VIEWS
PRIMARY COVER


5

NUM-BER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Primary Cover - M8 x 1.25 x 35 (QTY.7)	15 ft-lbs (20 Nm)
②	Fastener, Primary Cover - M8 x 1.25 x 75 (QTY.7)	15 ft-lbs (20 Nm)
③	Primary Cover	-
④	Gasket, Primary Cover	-

CLUTCH PINION SHAFT

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	E-Clip, External	-
②	Washer	-
③	Seal, Shaft (Shift Shaft / Clutch Pinion Shaft)	-
④	Bearing, Shaft (Shift Shaft / Clutch Pinion Shaft)	-
⑤	End Bearing, Pinion Shaft	-
⑥	Pinion Shaft, Clutch	-
⑦	Lever, Clutch	-
⑧	Fastener, Clutch Lever - M6 x 1.0 x 25 (QTY.1)	88 in-lbs (10 Nm)

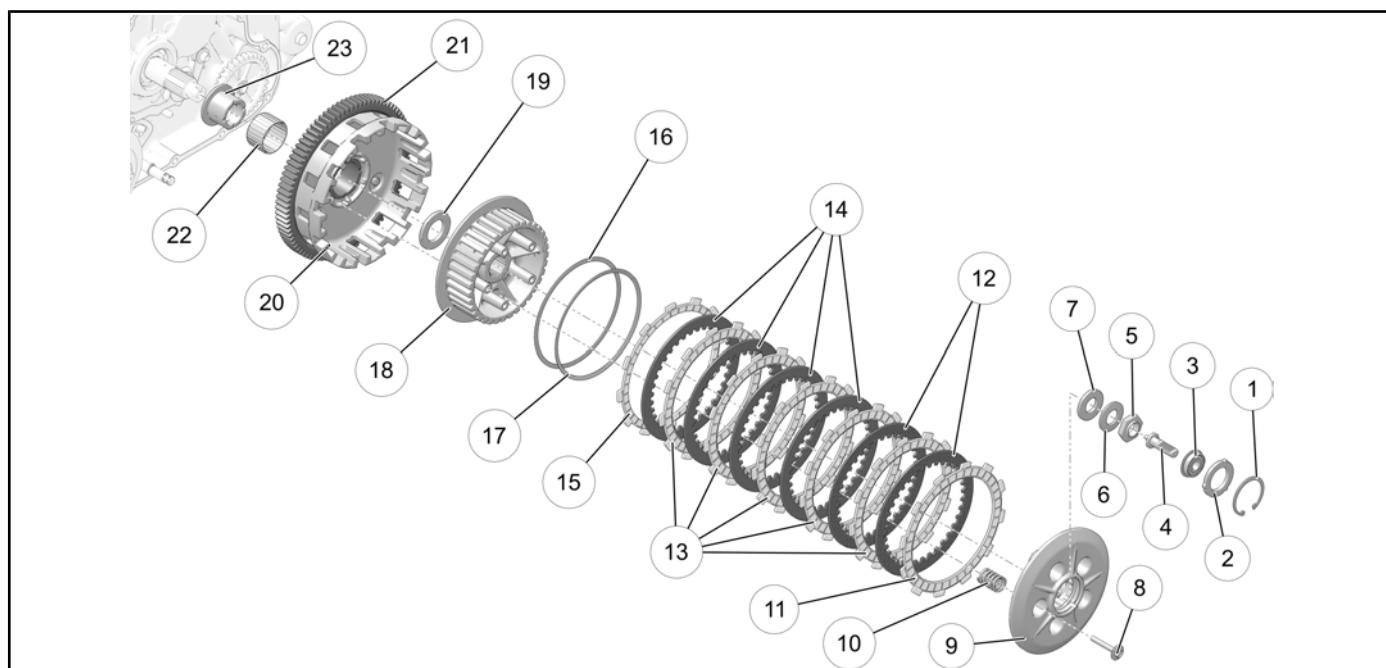
TORQUE COMPENSATOR

5

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Compensator — M12 x 80 (QTY.1)	83 ft-lbs (112 Nm)
②	Fastener, Locking Plate — M6 x 1.0 x 12 (QTY.2)	88 in-lbs (10 Nm)
③	Locking Plate	-
④	Spring Retainer, Compensator	-
⑤	Spring Cup, Compensator	-
⑥	Spring, Compensator	-
⑦	Slider, Compensator	-
⑧	Gear, Compensator	-
⑨	Washer	-
⑩	Sleeve, Compensator	-
⑪	Rotor, Stator	-
⑫	Fastener, Stator — M6 x 1.0 x 35 (QTY.3)	88 in-lbs (10 Nm)
⑬	Stator	-

CLUTCH / PRIMARY / SHIFT

CLUTCH

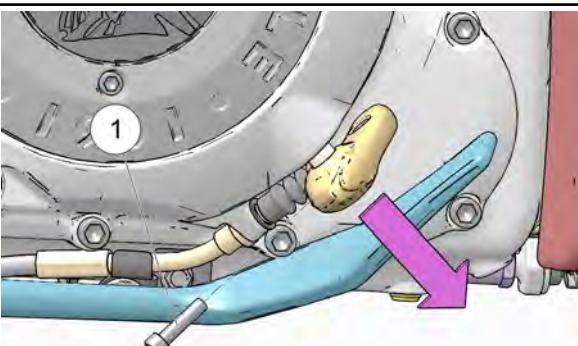


NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Retaining Ring, Clutch Rack	-
②	Plate, Clutch Lifter	-
③	Bearing, Clutch Rack	-
④	Clutch Rack	-
⑤	Stake Nut, Clutch - M20 x 1.5	125 ft-lbs (170 Nm)
⑥	Belleville Spring (QTY.1)	-
⑦	Washer, Flat (QTY.1)	-
⑧	Fastener, Pressure Plate - M6 x 1.0 x 45 (QTY.5)	88 in-lbs (10 Nm)
⑨	Pressure Plate, Clutch	-
⑩	Spring, Clutch (QTY.5)	-
⑪	Plate, Friction (A)	-
⑫	Plate, Separator (A)	-
⑬	Plate, Friction (B)	-
⑭	Plate, Separator (B)	-
⑮	Plate, Friction (C)	-
⑯	Seat, Judder Spring	-
⑰	Spring, Judder	-
⑱	Clutch Hub	-
⑲	Thrust Washer	-
⑳	Clutch Basket	-
㉑	Gear	-
㉒	Bearing, Needle	-
㉓	Collar, Clutch Bearing	-

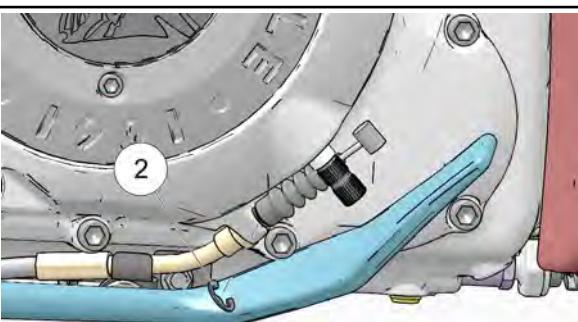
SERVICE PROCEDURES

PRIMARY COVER REMOVAL

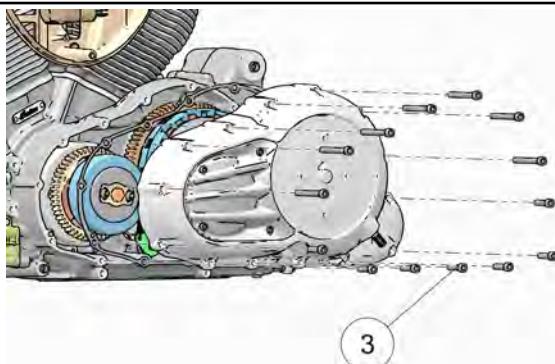
1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Drain oil from engine. See Engine Oil / Filter Change, page 2.9.
3. Remove LH floorboard and shift linkage as an assembly. See Floorboard (Driver), Removal, page 7.18
4. Remove clutch arm fastener ① and remove clutch arm from shaft.



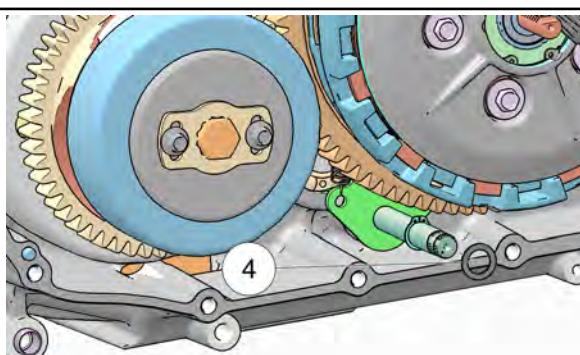
5. Release the clutch cable end from the clutch arm.
6. Remove the external snap ring ② from the clutch cable and withdraw from the mounting boss.



7. Remove primary cover fasteners ③ .



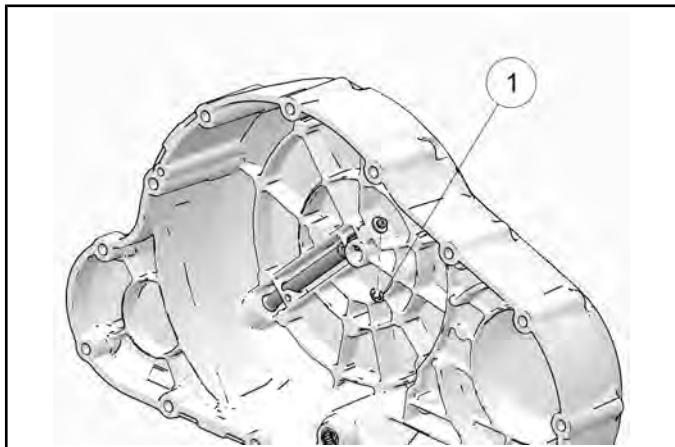
8. Tap cover with a soft face mallet to loosen.
9. Pull primary cover outward evenly at front and rear of cover to remove.
10. Remove the shim ④ from the end of the shift shaft noting position for reassembly.



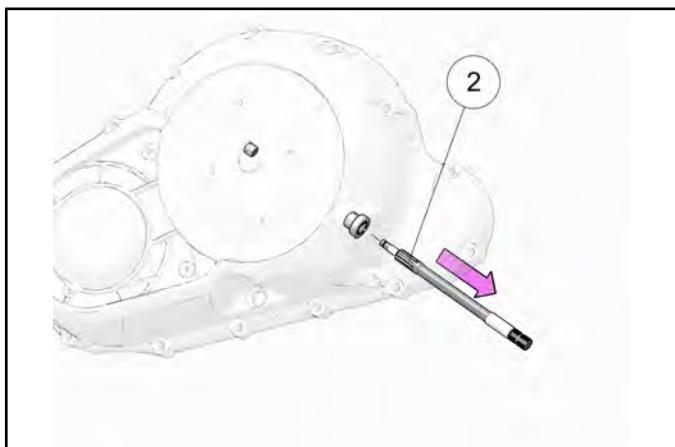
5

CLUTCH PINION SHAFT REMOVAL

1. Remove the Primary Cover. See Primary Cover Removal, page 5.7.
2. Remove the E-clip ① and washer from the end of the clutch pinion shaft as shown.

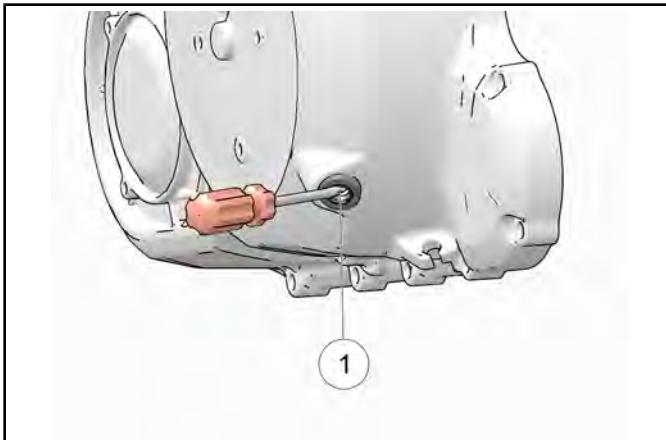


3. Slide the pinion shaft ② out through the bottom of the primary cover.



CLUTCH PINION SHAFT SEAL REMOVAL & INSTALLATION

1. Remove clutch pinion shaft. See Clutch Pinion Shaft Removal, page 5.8.
2. Carefully pry seal ① out of primary cover.



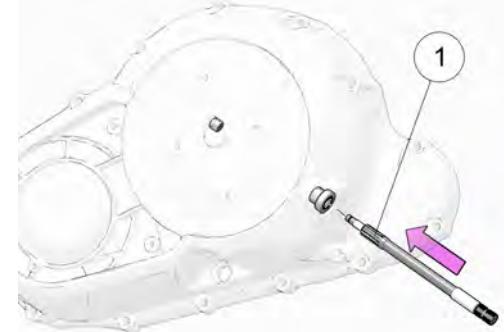
3. Lubricate outer edge of new seal with engine oil and sealing lip with grease.
4. Drive seal into place with a suitable driver.

CLUTCH PINION SHAFT BEARING INSPECTION

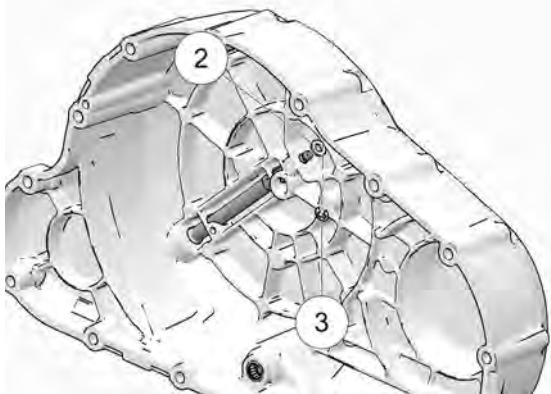
1. Apply engine oil to the bearings.
2. Temporarily install pinion shaft into primary cover.
3. Turn shaft by hand. Replace bearings that feel rough, notched, or loose.

CLUTCH PINION SHAFT INSTALLATION

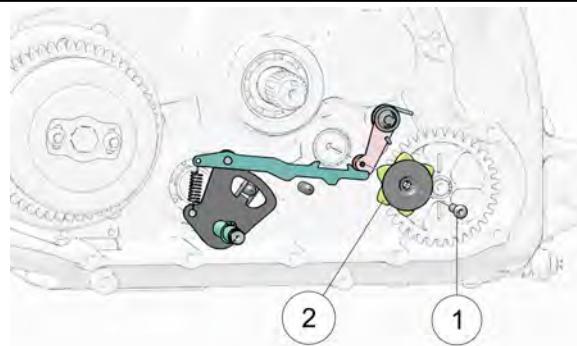
1. Lubricate and install clutch pinion shaft ① until fully seated in bearings.



2. Install washer ② and E-clip ③ .

**SHIFT RATCHET REMOVAL & INSPECTION**

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Shift transmission into neutral.
3. Remove primary cover. See Primary Cover Removal, page 5.7.
4. Remove clutch assembly. See Clutch Removal, page 5.14.
5. Using a 4 mm hex wrench, remove the fastener ① securing the shift star ② to the shift drum and remove shift star.



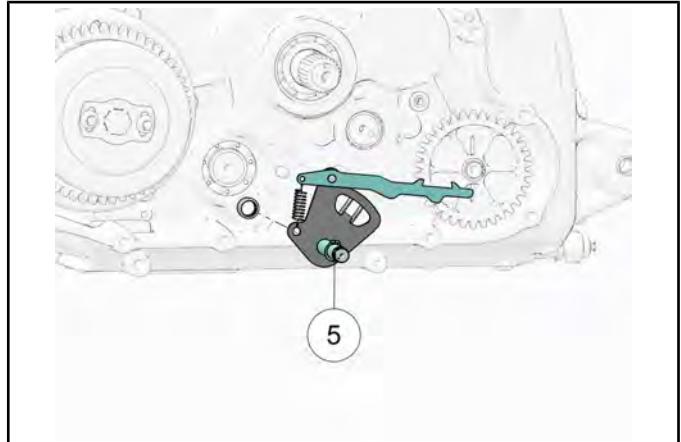
6. Rotate the detent lever ③ so the spring is relaxed. Using a 10 mm socket, remove the fastener ④ securing the detent lever to the engine case and remove lever.



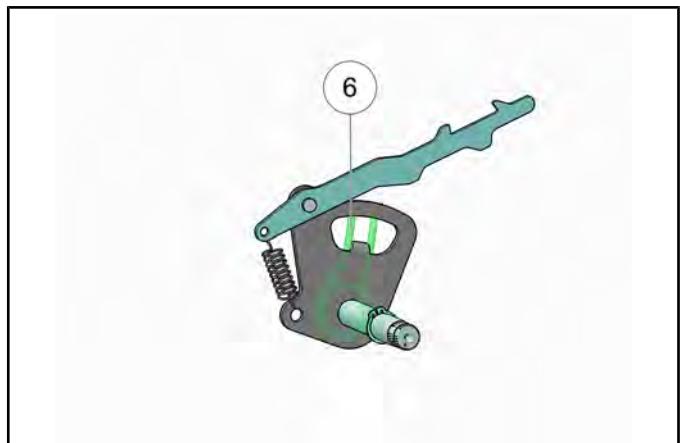
5

CLUTCH / PRIMARY / SHIFT

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



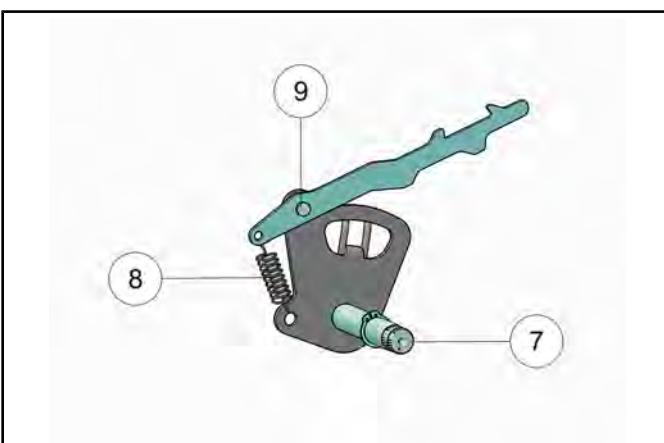
8. Inspect shift shaft return spring ⑥ for cracks or loss of tension. The spring should have enough tension to keep the shift shaft centered.



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.

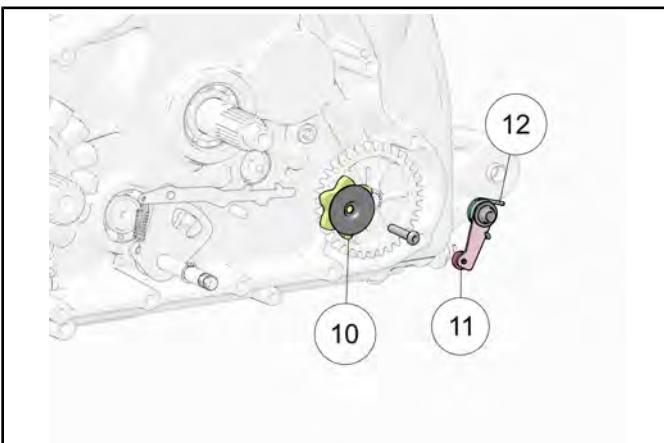
11. Inspect fit of rivet ⑨ on shift ratchet assembly. It should allow for free movement, but not be excessively loose.



12. Inspect shift star ⑩ .

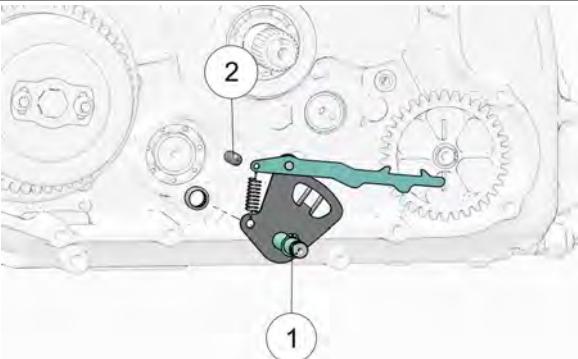
13. Inspect detent roller arm ⑪ for wear or damage.

14. Inspect spring ⑫ for cracks or fatigue.



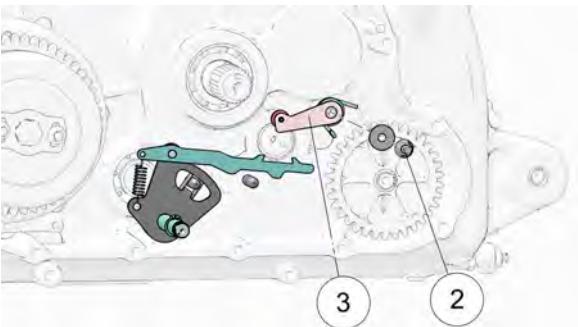
SHIFT RATCHET INSTALLATION

- 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.

**NOTE**

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

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

**TORQUE**

Shift Star Fastener: **88.5 in-lbs (10.0 Nm)**

- Install clutch assembly. See Clutch Installation, page 5.19.
- Install the primary cover. See Primary Cover Installation, page 5.12.

5

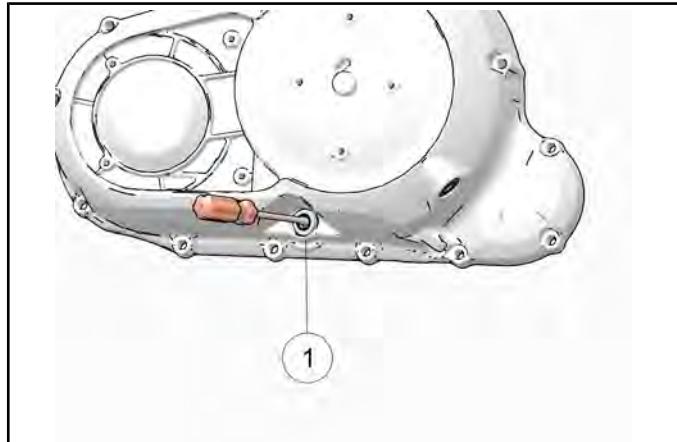
TORQUE

Detent Roller Fastener: **89 in-lbs (10 Nm)**

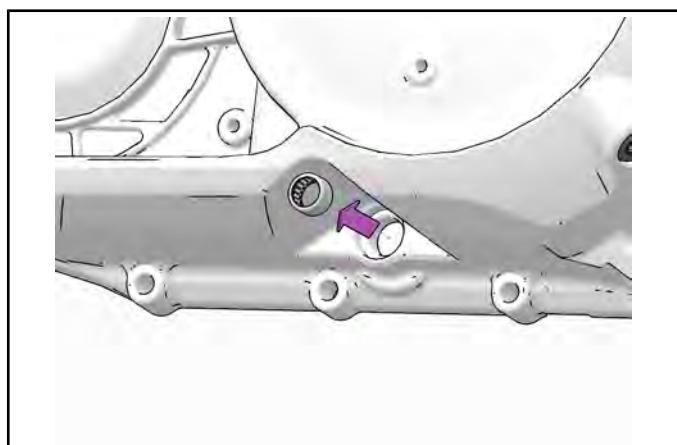
CLUTCH / PRIMARY / SHIFT

SHIFT SHAFT BEARING & SEAL REPLACEMENT

1. Remove primary cover. See Primary Cover Removal, page 5.7.
2. Carefully pry shift shaft seal ① from cover.



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



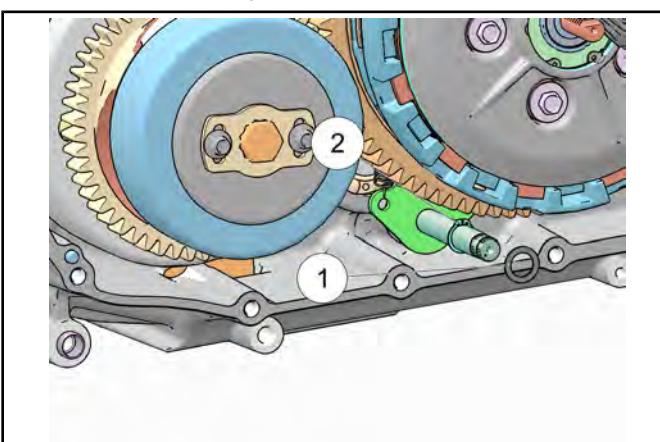
4. Apply assembly lube to inner & outer surfaces of new bearing.

Moly assembly paste PN: 2871460

5. Press bearing into place with numbered side out until fully seated.
6. Apply a small amount of grease to lip of seal and apply engine oil to outside of seal.
7. Drive seal into place with a seal driver slightly smaller than the O.D. of seal.
8. Install primary cover. See Primary Cover Installation, page 5.12.
9. After installing primary cover, be sure shift shaft returns freely to the centered position after rotating up or down.

PRIMARY COVER INSTALLATION

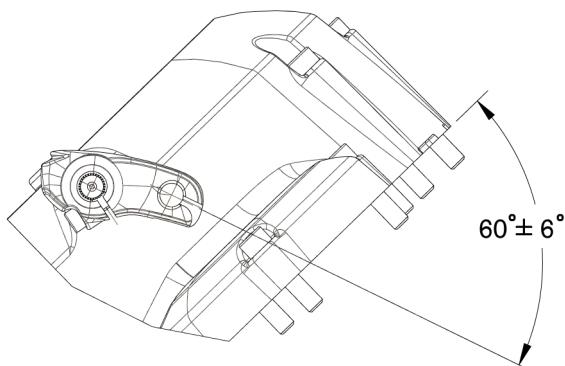
1. Clean gasket surfaces of crankcase and cover.
2. Install the thrust washer ① onto the shift shaft so it rests on snap ring ②.



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.

IMPORTANT

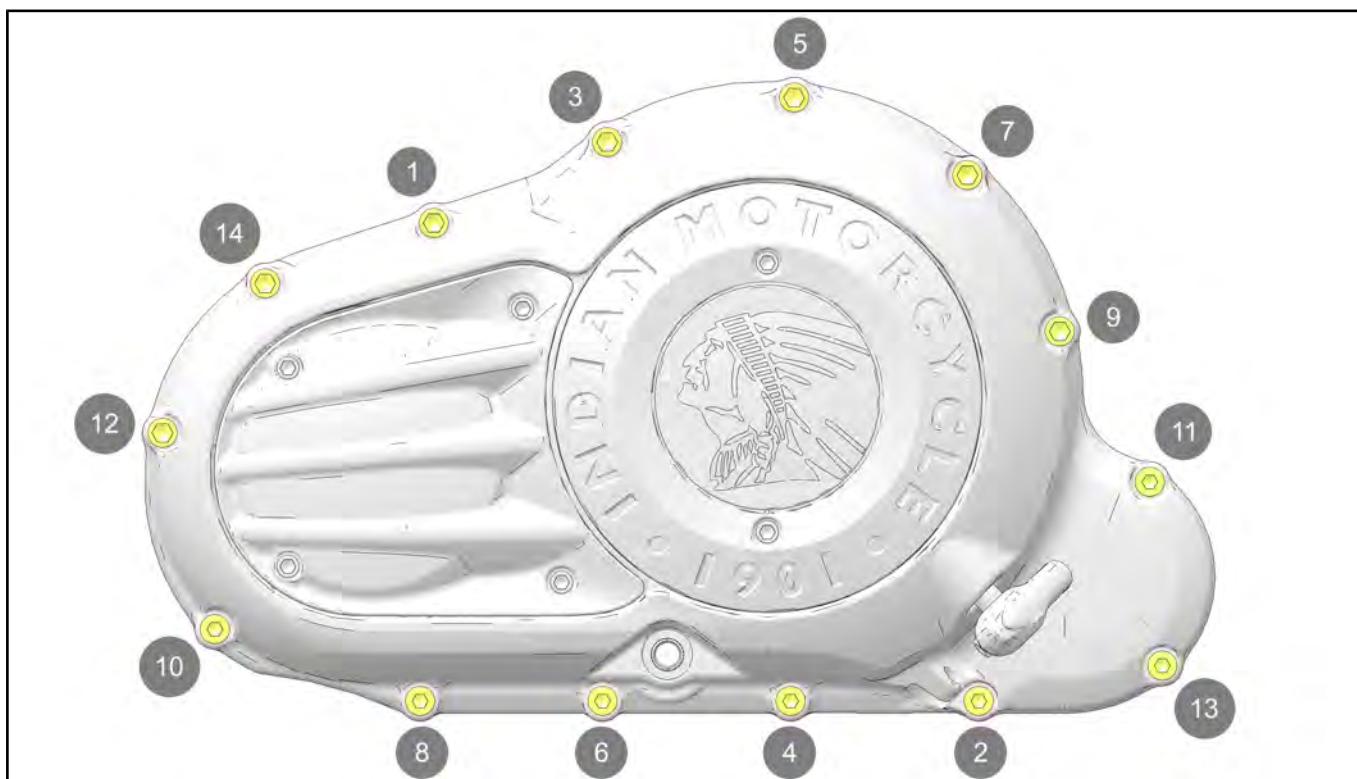
The clutch shaft must engage the clutch rack so that the clutch arm is angled approximately 60° off of the primary cover mating surface when fully seated.



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

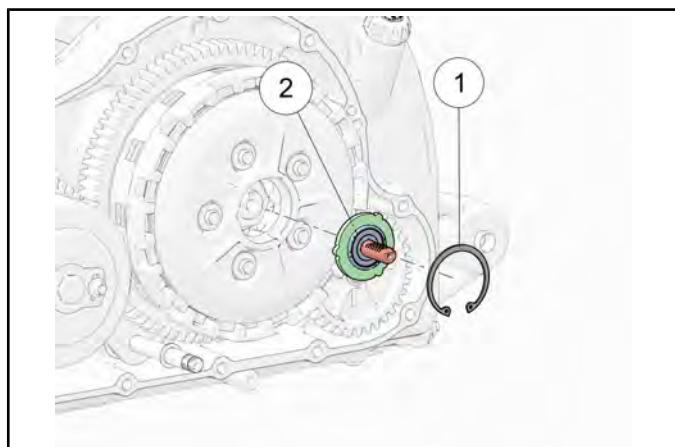
TORQUE

Primary Cover Fasteners: 15 ft-lbs (20 Nm)

Primary Cover Torque Sequence

CLUTCH SERVICE**CLUTCH RACK, REMOVAL / INSTALLATION**

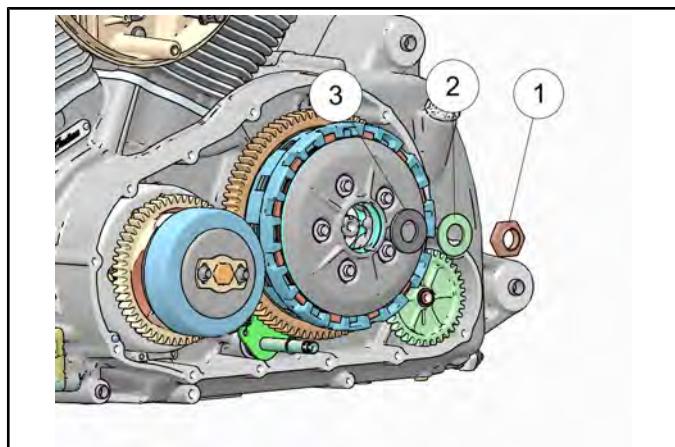
- Using an internal snap ring pliers, remove snap ring ① and clutch rack ②.



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

CLUTCH REMOVAL

- Remove primary cover. See Primary Cover Removal, page 5.7.
- Remove clutch rack. See Clutch Rack, Removal / Installation, page 5.14.
- Perform the crankshaft locking procedure **METHOD 2**. See Locking the Crankshaft for Service, page 3.41.
- Remove clutch nut ①, Belleville washer ②, and flat washer ③. Discard the stake nut.

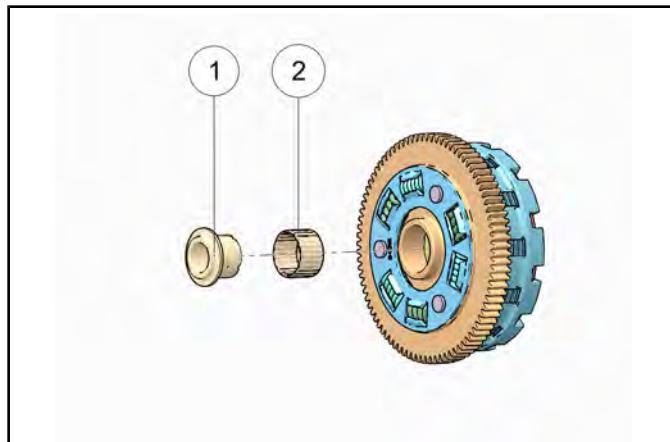


- Remove clutch assembly from clutch shaft.
- A new stake nut must be installed upon assembly.

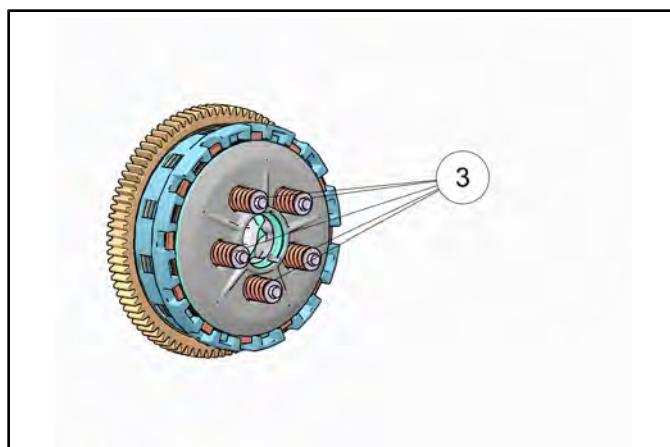
CLUTCH DISASSEMBLY**CAUTION**

Clutch is under spring pressure. WEAR EYE PROTECTION.

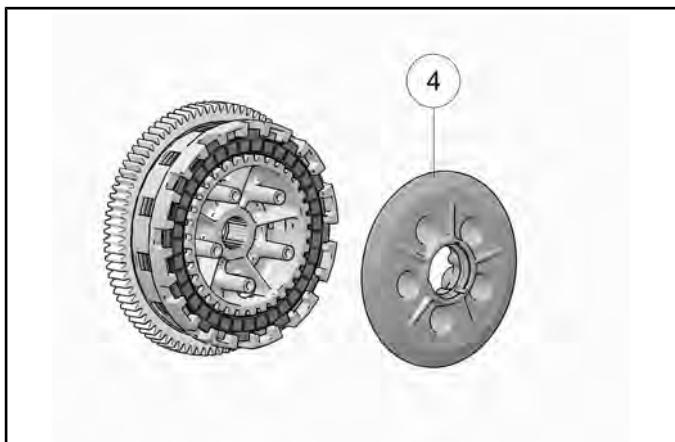
- Remove the clutch. See Clutch Removal, page 5.14.
- Remove the sleeve ① and needle bearing ② from the back side of the clutch assembly.



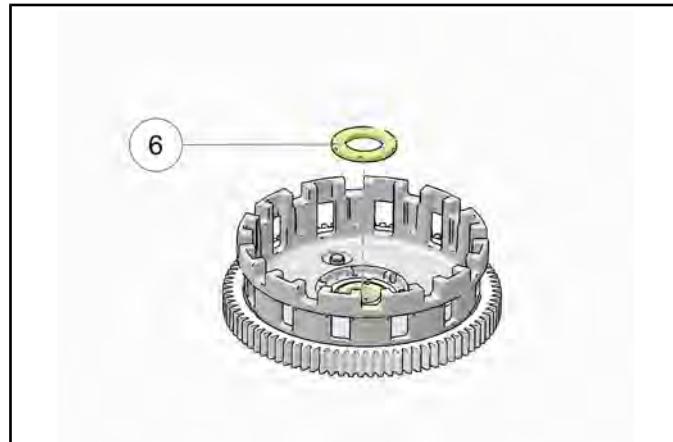
- With the clutch assembly resting on a clean, flat work surface, alternately loosen the five pressure plate fasteners ③ in a **star pattern** until spring tension has relaxed. Remove fasteners and springs.



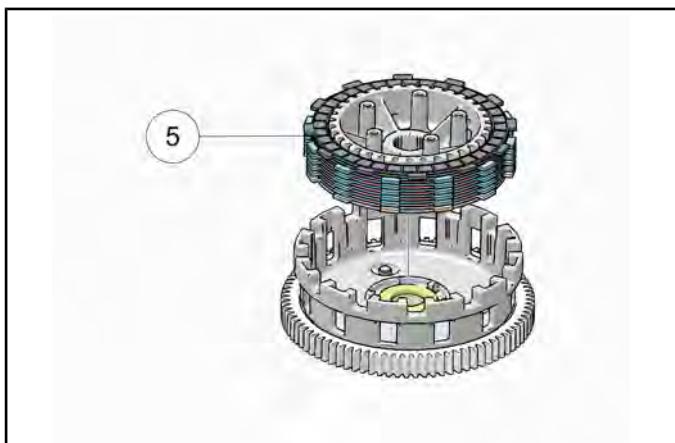
4. Remove pressure plate ④.



6. Remove thrust washer ⑥.



5. Lift the clutch assembly ⑤ out of the basket and set aside.



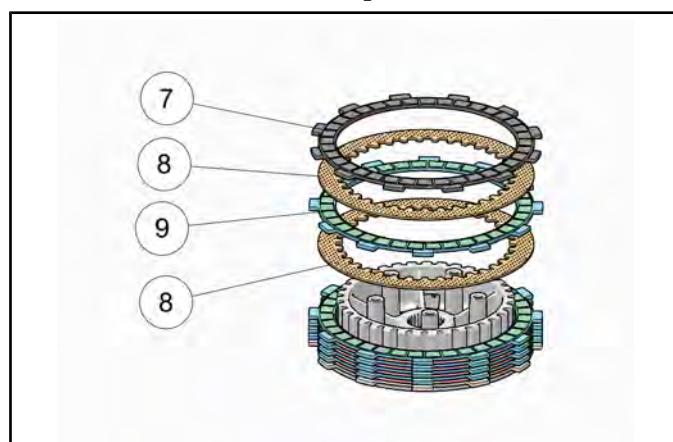
NOTE

The clutch assembly consists of three different types of friction plates and two different types of separator plates. See Clutch, page 5.6.

5

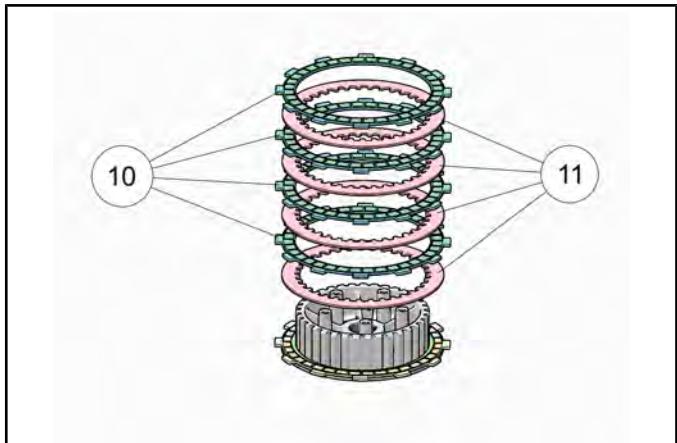
PART DESCRIPTION	QUANTITY
Friction Plate A (TOP)	1
Friction Plate B (MIDDLE)	5
Friction Plate C (BOTTOM)	1
Separator Plate A (TOP)	2
Separator Plate B (BOTTOM)	4
Spring, Judder Clutch	1
Seat, Judder Clutch	1

7. Remove Friction Plate A ⑦, Separator Plate A ⑧ , Friction Plate B ⑨ and Separator Plate A ⑧ .

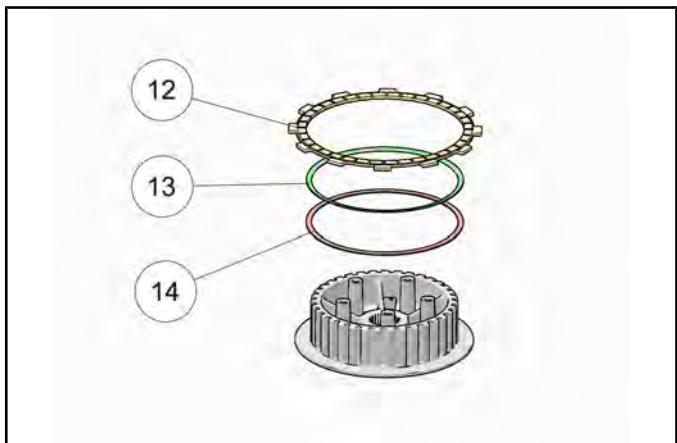


CLUTCH / PRIMARY / SHIFT

8. Alternately remove Friction Plates B ⑩ and Seperator Plates B ⑪ .

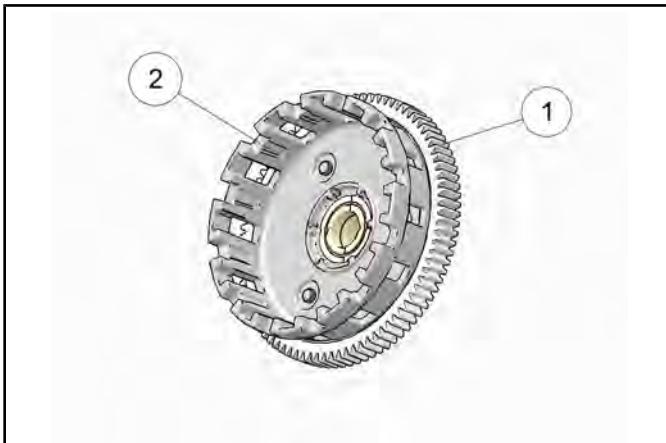


9. Remove Friction Plate C ⑫ , Judder Spring ⑬ and Judder Spring Seat ⑭ .

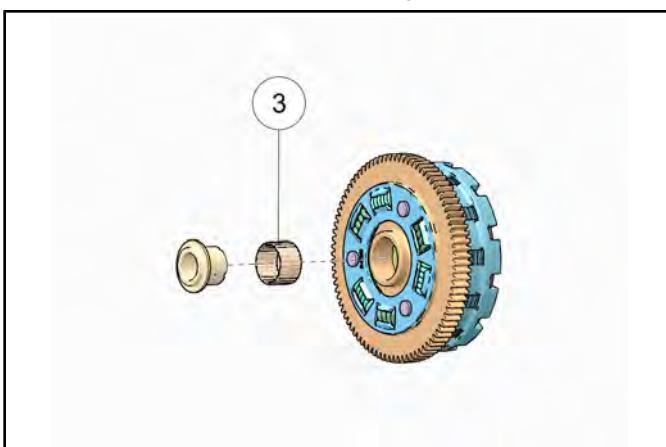


CLUTCH INSPECTION

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



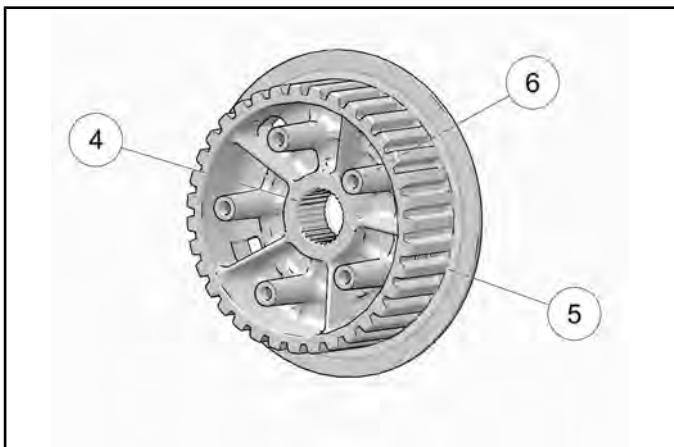
4. Replace parts that fail inspection
5. Rotate hub bearing. Check for smooth rotation. Inner race should have no detectable radial movement.
6. Lubricate bearing ③ with engine oil.



Clutch Hub

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

8. Inspect surface of steel plate guides ⑤ on outer edge of hub for wear, grooves, or damage. Check all posts ⑥ for cracks or damage.
16. Replace clutch rack assembly if necessary.



9. 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.
10. 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.

MEASUREMENT

Clutch Steel Plate Warp Service Limit: .008 in (.20 mm)

11. Measure thickness of friction plates in several places. Thickness should be the same at each place. Replace plates that fail inspection.

MEASUREMENT

Friction Plate Thickness (Minimum): .126 in (3.2 mm)

Clutch Pressure Plate

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

Clutch Springs

13. Inspect clutch springs for cracks or distortion.

Clutch Release Rack and Bearing

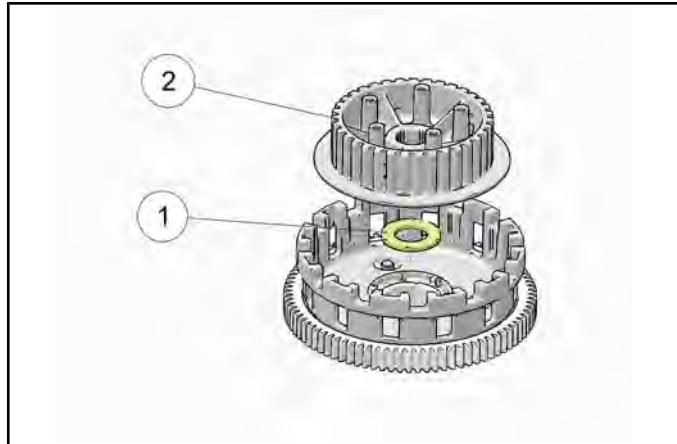
NOTE

Clutch rack is serviceable as an assembly only.

14. Inspect clutch rack for broken or damaged teeth.
15. 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.

CLUTCH ASSEMBLY

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



2. Apply engine oil to judder spring seat ③ and spring ④ .
3. Install judder spring seat (flat ring), then judder spring.

NOTE

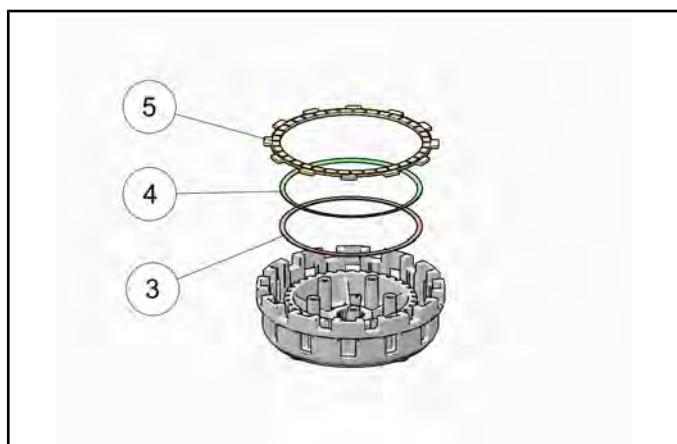
Judder spring must be installed with concave side facing UP (toward outside of clutch). The tallest edge of spring will be outermost.

- 4.

NOTE

Refer to the Clutch Assembly View outlined in this chapter for clutch plate orientation. See Clutch, page 5.6.

Apply engine oil to Friction Plate C ⑤ and install.

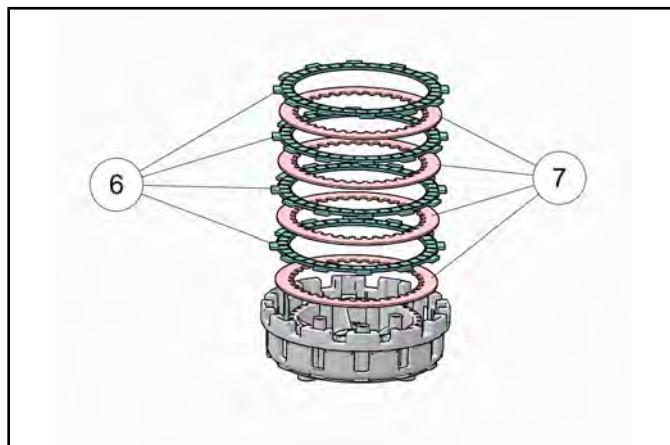


5. Place an oiled Seperator Plate B into clutch basket.

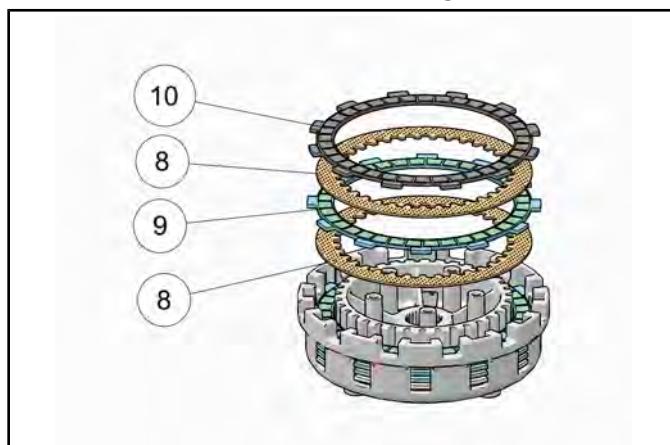
NOTE

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

6. Continue stacking oiled clutch plates into clutch basket alternating Friction Plate B ⑥ and Seperator Plate B ⑦ stopping at the fourth Friction Plate B. There should be one Friction Plate B remaining.

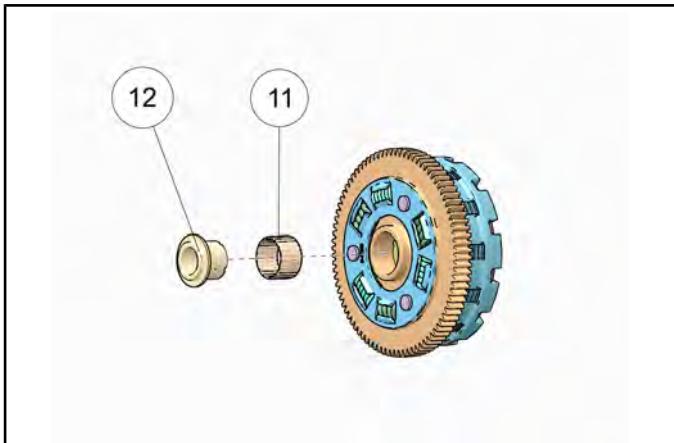


7. Install Seperator Plate A ⑧ followed by Friction Plate B ⑨ and Seperator Plate A ⑩ .
8. Install the final Friction Plate A ⑪ .

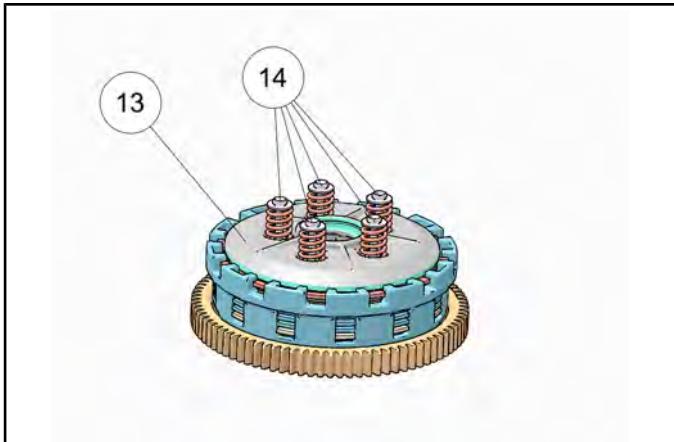


9. Apply engine oil to hub bearing ⑫ .

10. Install the hub bearing and sleeve ⑫ into the clutch assembly.



11. Install the pressure plate ⑬ and clutch springs and fasteners ⑭. **Alternately tighten the clutch spring fasteners in a star pattern until fully seated.**



12. Torque clutch spring fasteners to specification.

TORQUE

Clutch Spring Fasteners: **89 in-lbs (10 Nm)**

CLUTCH INSTALLATION

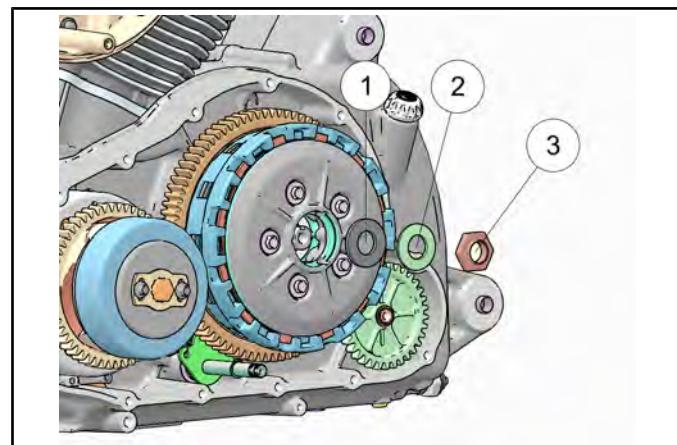
1.

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.

Slide the clutch assembly onto the transmission input shaft until fully seated.

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



3. Lock the crankshaft using **Method 2**. See Locking the Crankshaft for Service, page 3.41.
4. Torque the stake nut to specification.

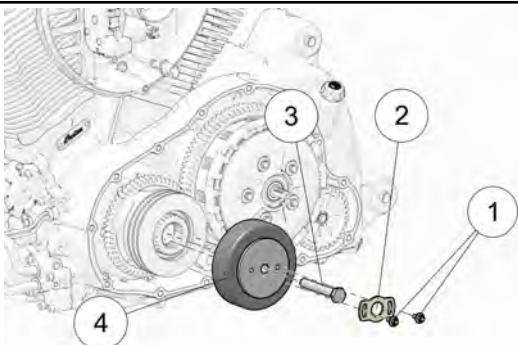
TORQUE

Clutch Stake Nut: **125 ft-lbs (170 Nm)**

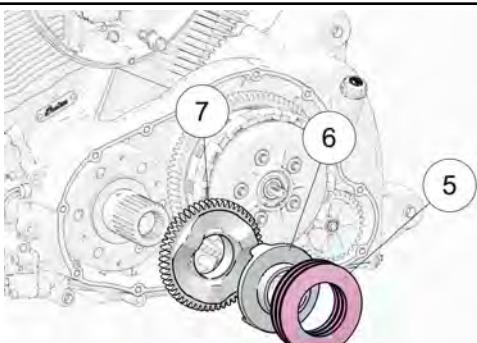
5. Install clutch rack assembly. See Clutch Rack, Removal / Installation, page 5.14.
6. Install primary cover. See Primary Cover Installation, page 5.12.
7. Check engine oil and fill to proper level.

TORQUE COMPENSATOR SERVICE**TORQUE COMPENSATOR REMOVAL**

1. Remove primary cover. See Primary Cover Removal, page 5.7.
2. Perform crankshaft locking procedure METHOD 2. See Locking the Crankshaft for Service, page 3.41.
3. Remove the two fasteners ①, locking plate ②, torque compensator fastener ③ and spring retainer assembly ④ from the crankshaft.



4. Remove the spring pack ⑤, upper torque compensator ramp ⑥ and torque compensator drive gear ⑦ from the crankshaft.

**TORQUE COMPENSATOR INSPECTION**

1. Inspect all parts for excessive galling or damage.

NOTE

Some polishing will be evident between the compensator gear and the compensator slider and is a normal condition. Replace assembly if ramps are worn.

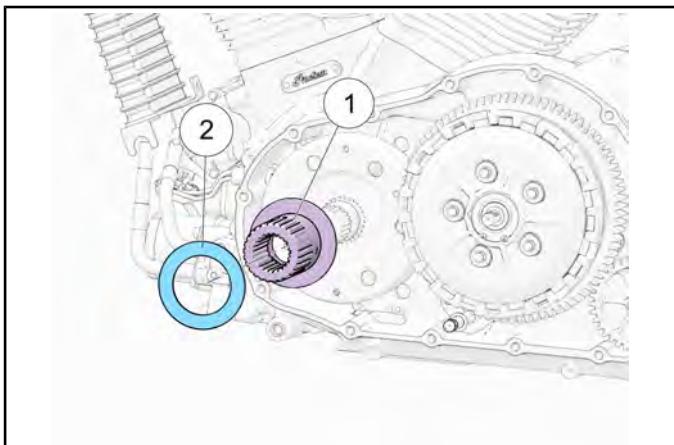
2. Measure free length of torque compensator spring stack.

**MEASUREMENT**

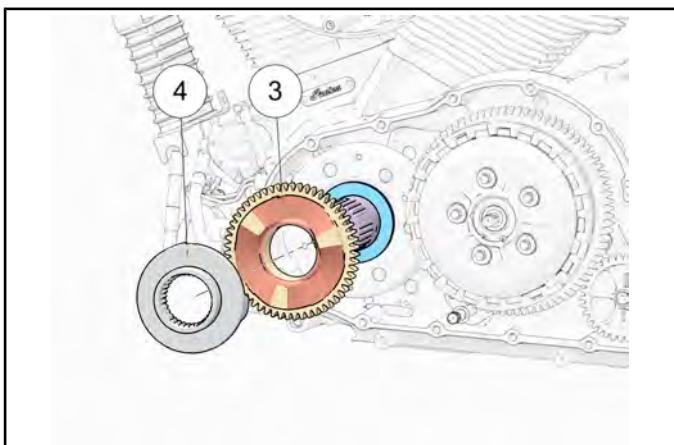
Compensator Spring Stack Height: 1.437–1.476 in
(36.5–37.5 mm)

TORQUE COMPENSATOR INSTALLATION

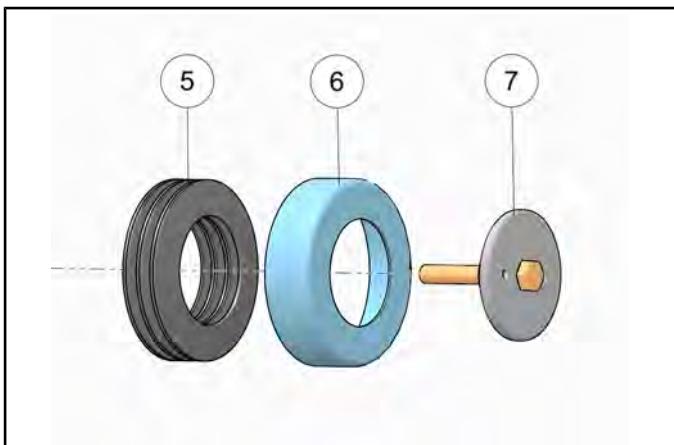
1. Apply engine oil to shaft splines, sleeve, washer, peaks, valleys and sliding ramps before installation.
2. Install the splined sleeve ① , flange side down, over the crankshaft followed by thrust washer ② .



3. Install the torque compensator gear ③ and upper ramp ④ .



4. Load the three Belleville spring packs ⑤ into the spring retainer cup ⑥ and fit the drive plate and fastener ⑦ into the spring retainer cup.

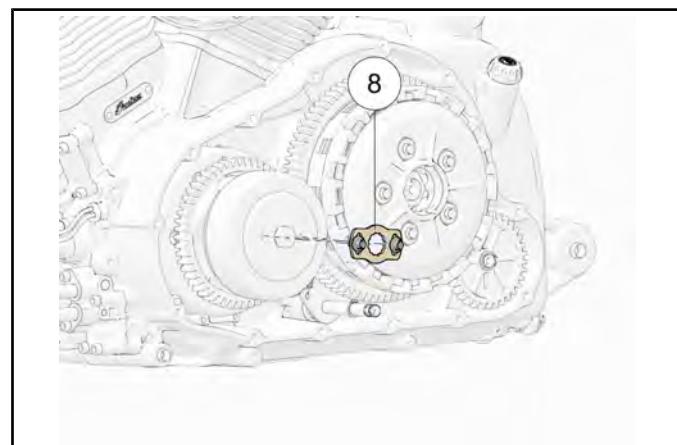


5. Slide the torque compensator spring assembly onto the crankshaft until the drive plate splines are fully seated.
6. Lock the crankshaft for service using **Method 2**. See Locking the Crankshaft for Service, page 3.41.
7. Apply Loctite 262 to compensator fastener and torque to specification.

TORQUE

Compensator Fastener: 83 ft-lbs (112 Nm)

8. Install compensator locking plate and fasteners ⑧ and torque to specification.



TORQUE

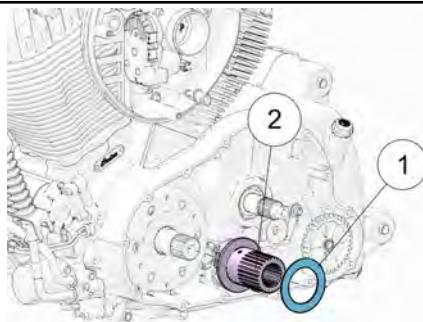
Compensator Fastener Locking Plate: 88 in-lbs (10 Nm)

9. Install primary cover. See Primary Cover Installation, page 5.12.
10. Fill engine oil to proper level.

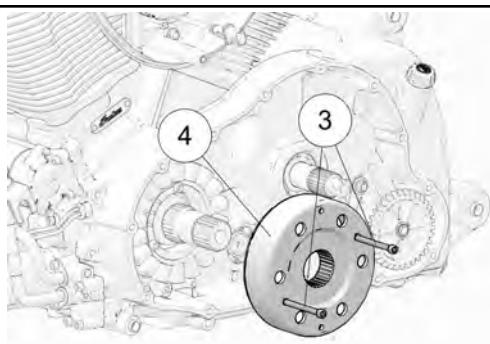
FLYWHEEL REMOVAL**WARNING**

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, page 5.7.
2. Remove clutch assembly. See Clutch Removal, page 5.14
3. Remove torque compensator assembly. See Torque Compensator Removal, page 5.20.
4. Remove thrust washer ① and compensator sleeve ②.



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

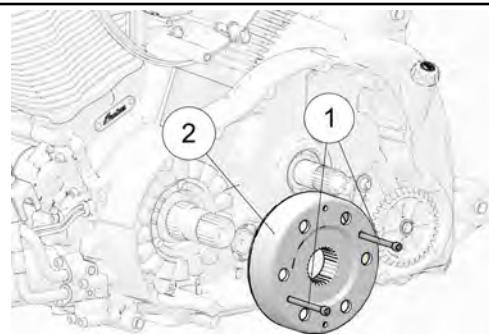


6. Grasp the two fasteners and lift the flywheel off of the stator.

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 torque compensator. See Torque Compensator Installation, page 5.21.
4. Install clutch assembly. See Clutch Installation, page 5.19.
5. Install primary cover. See Primary Cover Installation, page 5.12.
6. Check engine oil and add as necessary.

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 Slips	Clutch springs weak	Clutch springs	Replace
	Pressure plate worn or distorted	Pressure plate	Replace
	Clutch plates worn, warped or distorted	Clutch Friction / Seperator Plates	Replace plates as necessary
	Clutch rack mechanism sticking	Clutch rack mechanism	Replace
	Engine oil level low	Oil level	Correct oil level
	Oil additives present in oil or used previously	Oil quality	Replace oil & filter (clutch plates may need to be replaced)
Dragging clutch (doesn't disengage completely, creeping)	Clutch lever, pivot, cable, or lifter arm sticking	Lever, pivots, bushings, bearings, cable	Inspect
	Oil additives present in oil or used previously	Oil quality	Replace oil & filter (clutch plates may need to be replaced)
	Oil level too high	Oil level	Correct
	Oil viscosity too high	Oil quality	Replace oil & filter
	Pressure plate worn, warped or distorted	Pressure plate	Replace
	Clutch plate(s) worn, warped or distorted	Driven plates and / or drive plates	Replace
	Weak clutch springs	Clutch springs	Replace

CLUTCH / PRIMARY / SHIFT

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 linkage binding 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

CHAPTER 6

TRANSMISSION / CRANKSHAFT

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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.
- 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

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SPECIAL TOOLS

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/>

SERVICE SPECIFICATIONS**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 (1.627")
	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 (1.8888 - 1.8891")	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	.05 - .30 mm (.0019 - .0118")	-
Balance Shaft	Journal O.D., Left (Primary Side) / Journal O.D., Right (Cam Side)	24.980 - 24.992 mm / 24.969 - 24.979 mm	-

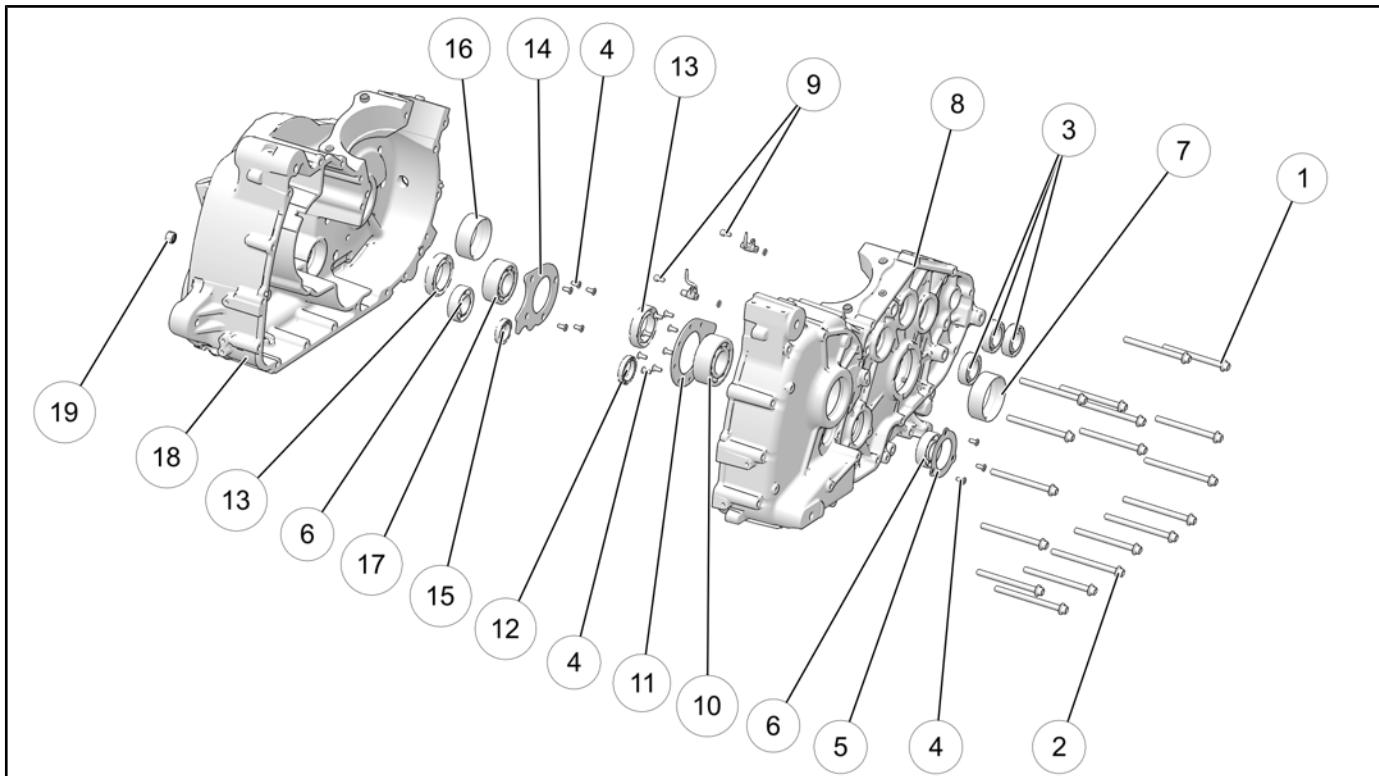
Transmission Specifications

ITEM	PART SPECIFIC	STANDARD	SERVICE LIMIT
Shift Fork	Shift Fork I.D. (Rail)	12.00 - 12.026 mm (.4725 - .4732")	12.05 mm (.4744")
	Shift Fork Pin O.D.	6.036 - 6.136 mm (.2376 - .2416")	6.02 mm (.2370")
Shift Fork Rail	Shift Fork Rail O.D.	11.948 - 11.972 mm (.4704 - .4713")	11.92 mm (.4693")
	Shift Fork Rail Runout	-	.025 mm (.001")
Shift Drum	Shift Drum Groove	-	Replace drum if any wear is evident

ITEM		SPECIFICATIONS
Drive Train (General)	Transmission	6 Speed (Overdrive)
	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	.94: 1
	Gear Ratio: 6th Gear (Overdrive)	0.81: 1

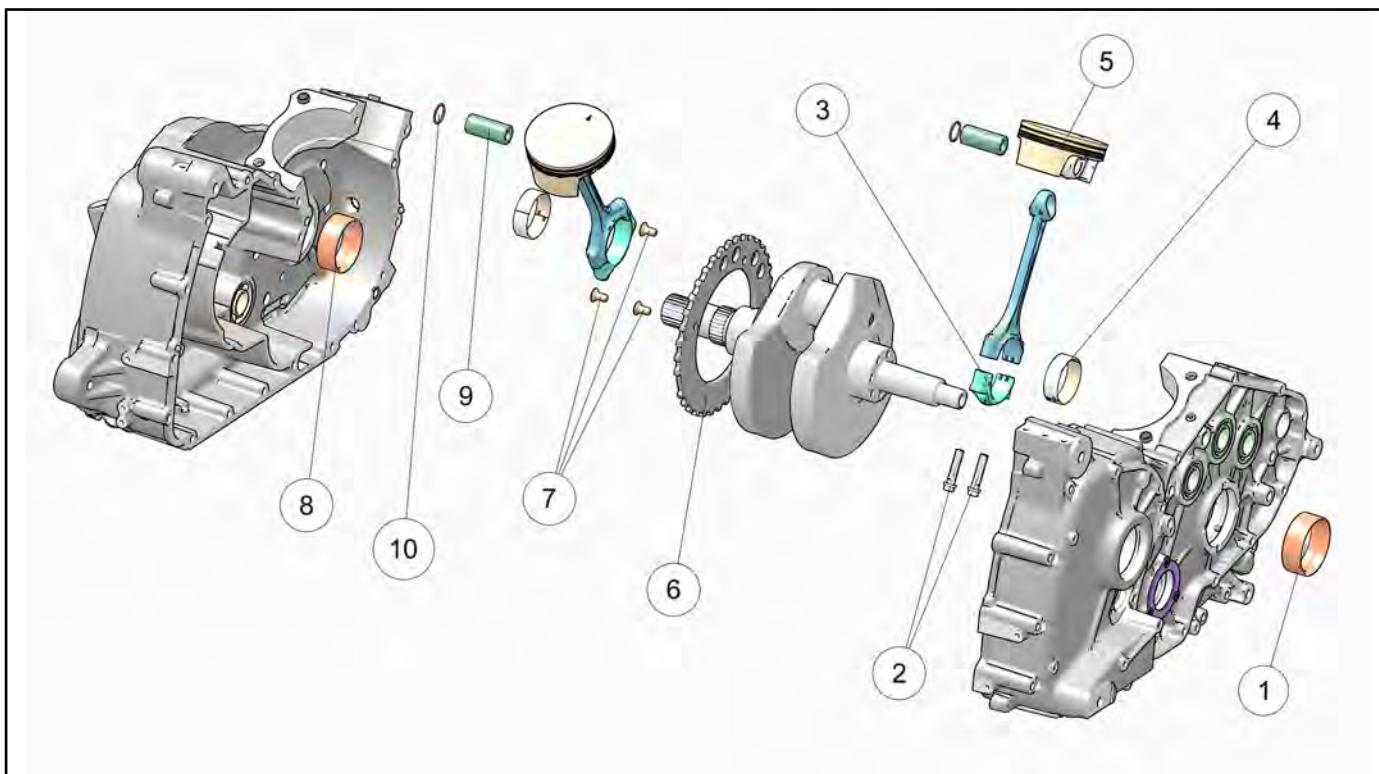
TRANSMISSION / CRANKSHAFT

ASSEMBLY VIEWS CRANKCASE



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Crankcase — M8 x 1.25 x 100 (QTY.12)	22 ft-lbs (30 Nm)
②	Fastener, Crankcase — M8 x 1.25 x 110 (QTY.6)	22 ft-lbs (30 Nm)
③	Bearing, Camshaft	—
④	Fastener, Bearing Retainer — M5 x 0.8 x 12 (QTY.16)	62 in-lbs (7 Nm)
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 (QTY.2)	62 in-lbs (7 Nm)
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	—

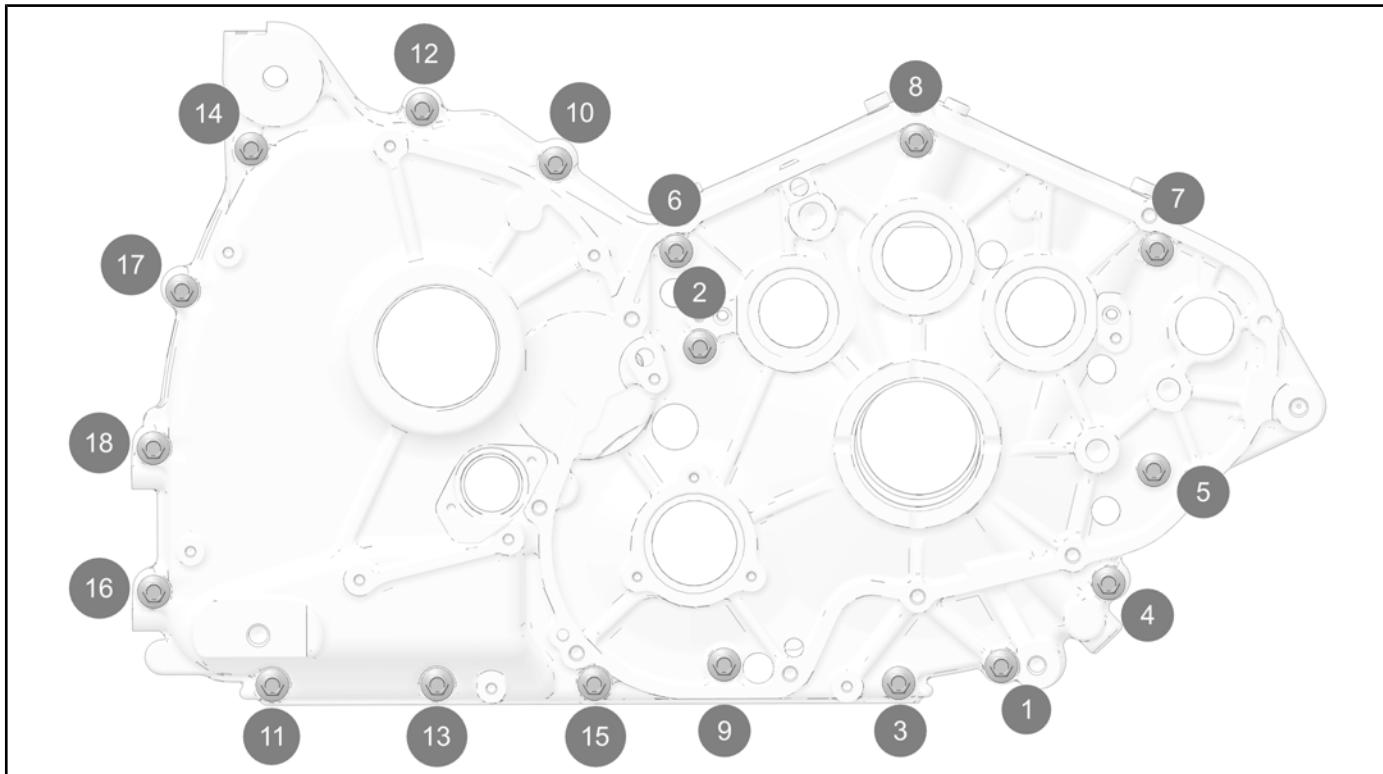
CRANKSHAFT



6

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Bearing, Crankshaft Main (RH) — Non-Serviceable	—
②	Fastener, Connecting Rod Bearing Cap (QTY.4)	22 ft-lbs (30 Nm)
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)	18 ft-lbs (24 Nm)
⑧	Bearing, Crankshaft Main (LH) — Non-Serviceable	—
⑨	Wrist Pin, Piston	—
⑩	Circlip, Wrist Pin	—

CRANKCASE FASTENER LENGTH AND TORQUE PATTERN



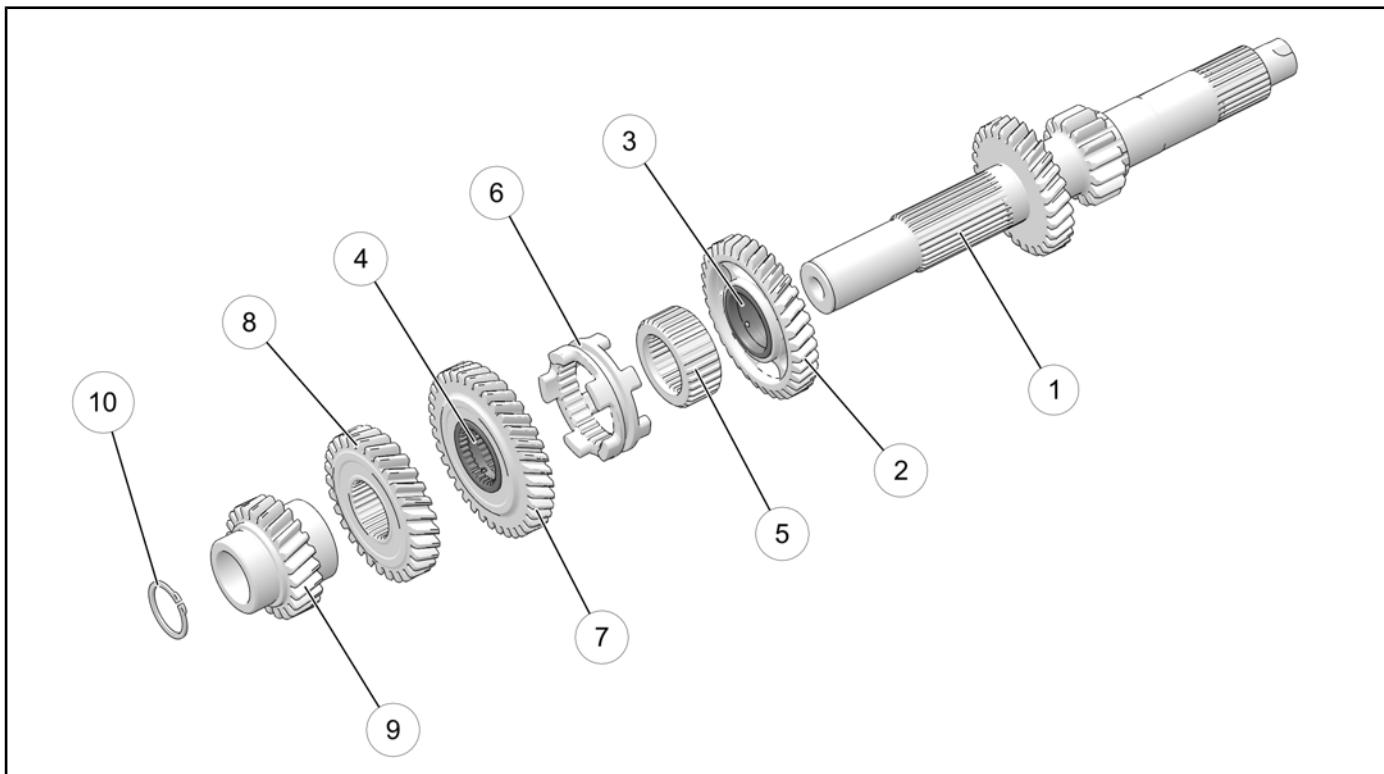
NOTE

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 Nm)**

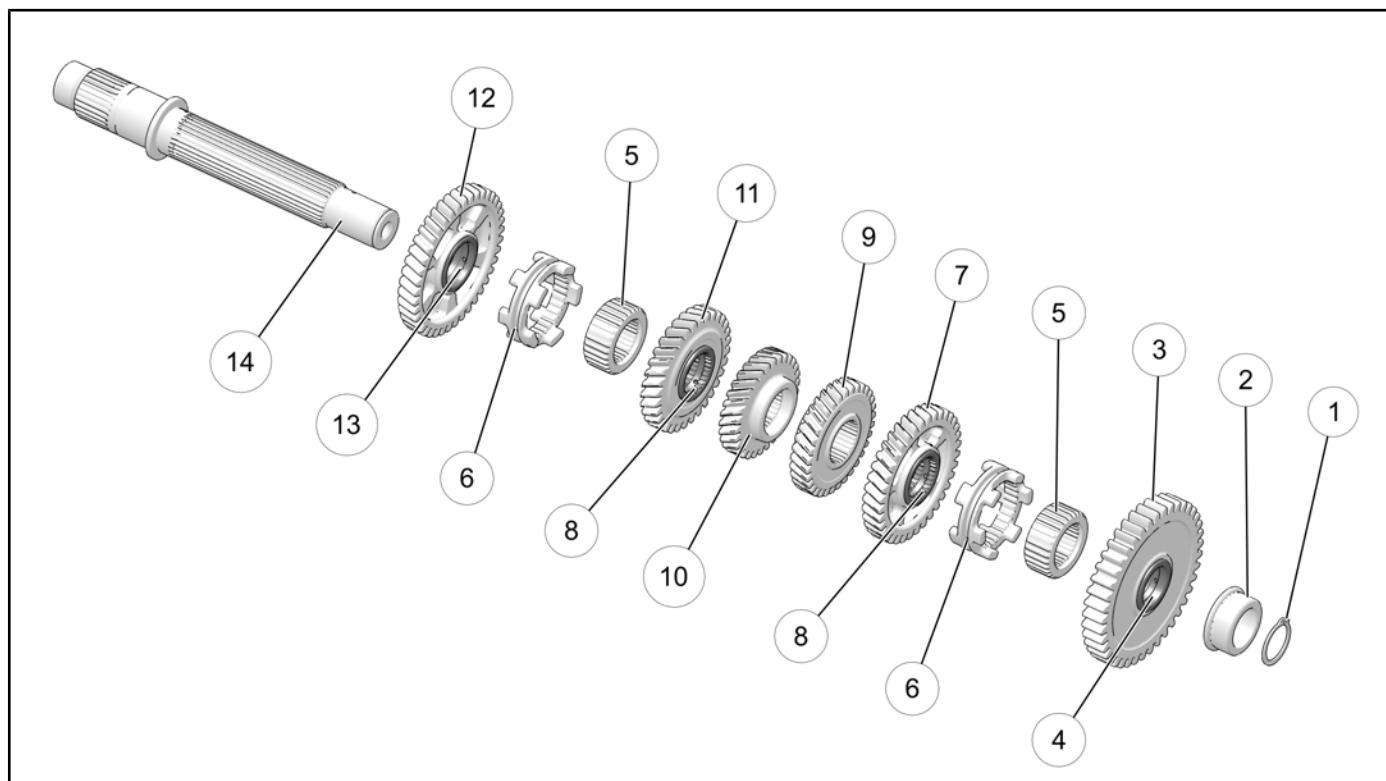
TRANSMISSION**Input Shaft**

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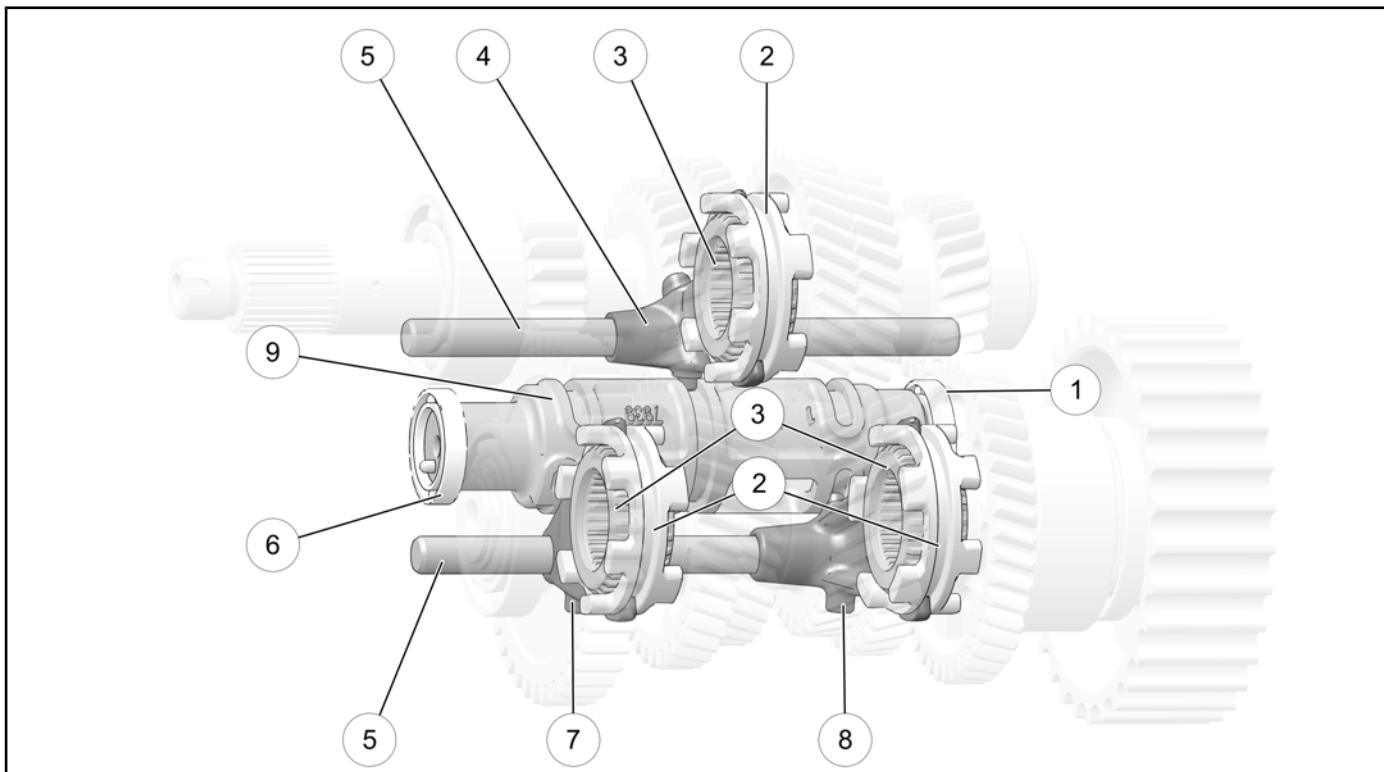
NUMBER	DESCRIPTION
①	Input Shaft, Transmission
②	Gear, 5th — Drive
③	Bearing, 5th Gear
④	Bearing, 6th Gear
⑤	Slider, Gear Dog
⑥	Gear Dog, 5th & 6th
⑦	Gear, 6th — Drive
⑧	Gear, 4th — Drive
⑨	Gear, 2nd — Drive
⑩	Snap Ring

TRANSMISSION / CRANKSHAFT

Output Shaft



NUMBER	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

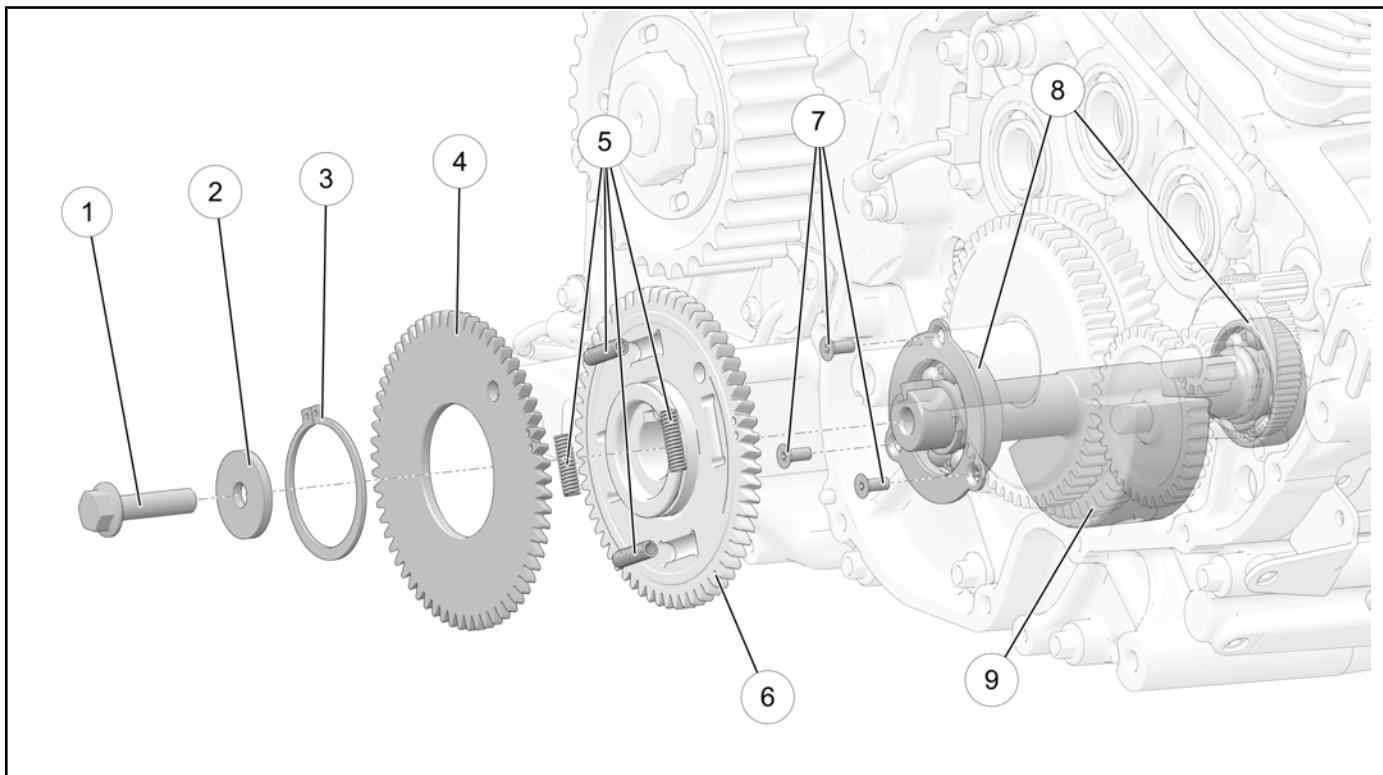
SHIFT DRUM / SHIFT FORK

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NUMBER	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

TRANSMISSION / CRANKSHAFT

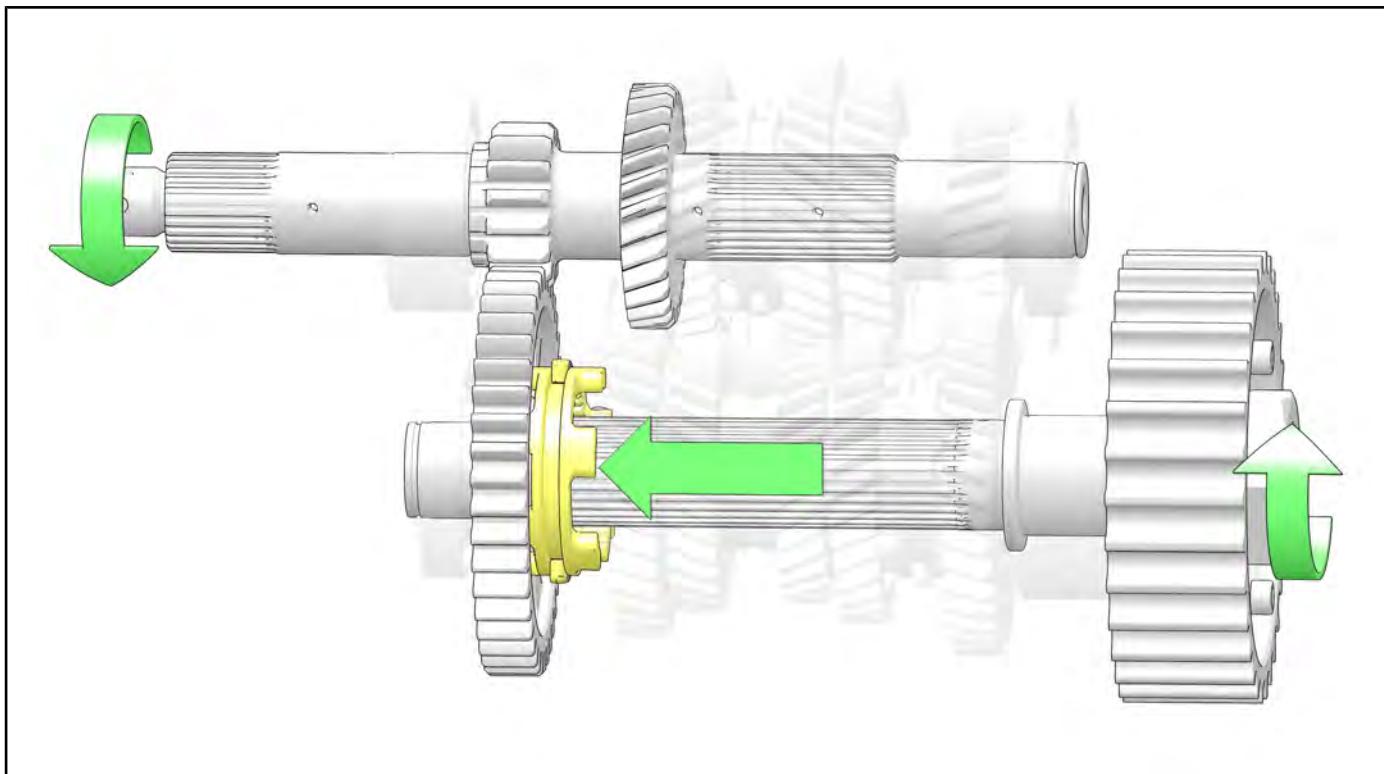
BALANCE SHAFT



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Balance Shaft Gear — M10 x 1.5 x 40 (QTY.1)	59 ft-lbs (80 Nm)
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)	62 in-lbs (7 Nm)
⑧	Bearings, Balance Shaft	-
⑨	Balance Shaft	-

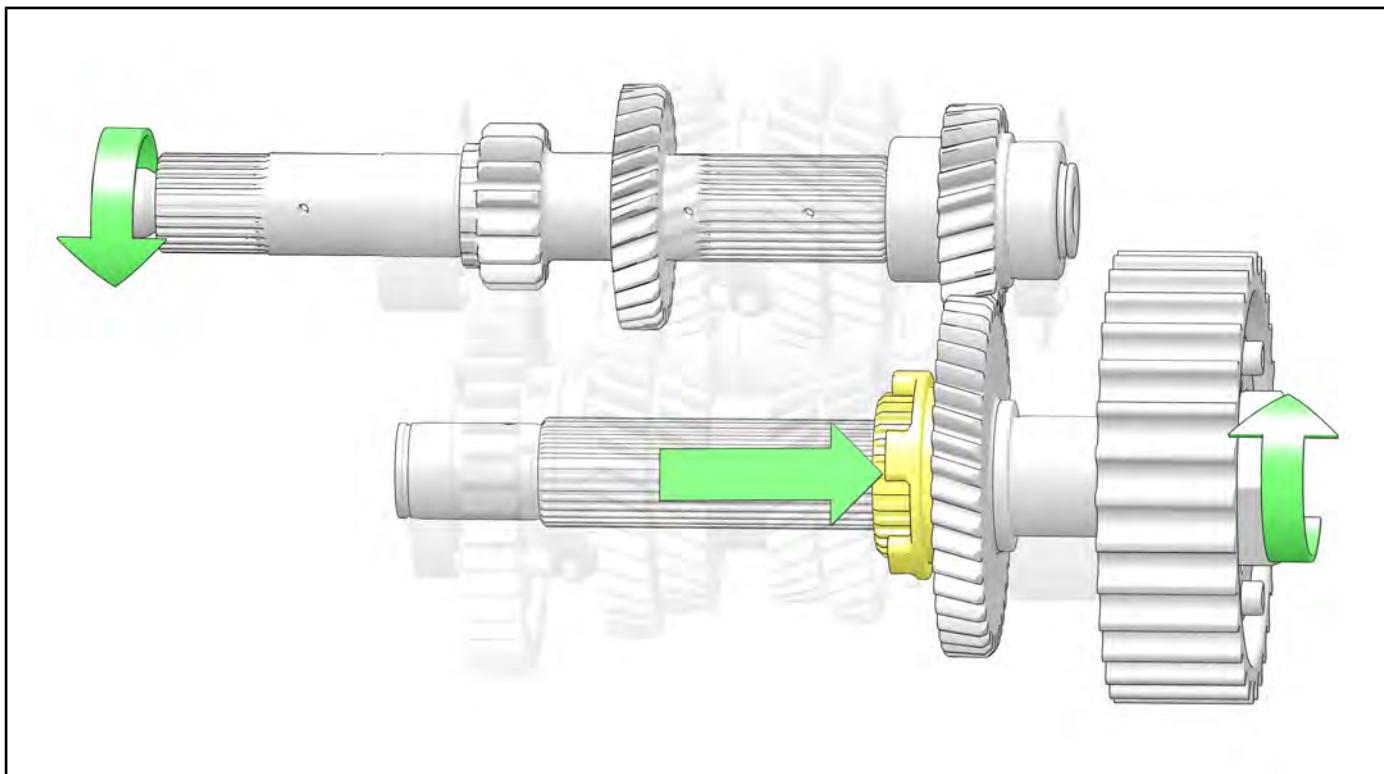
GEAR TRAIN

1st Gear



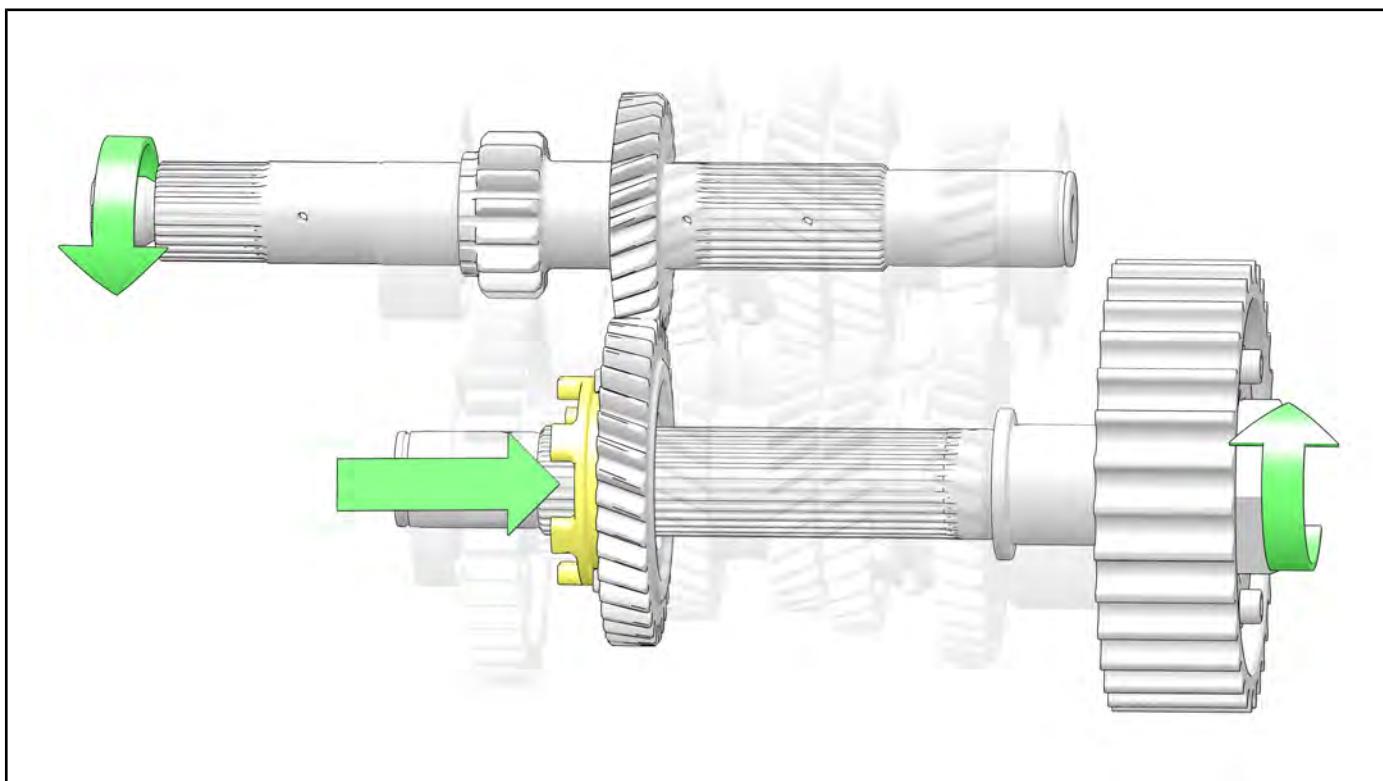
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2nd Gear

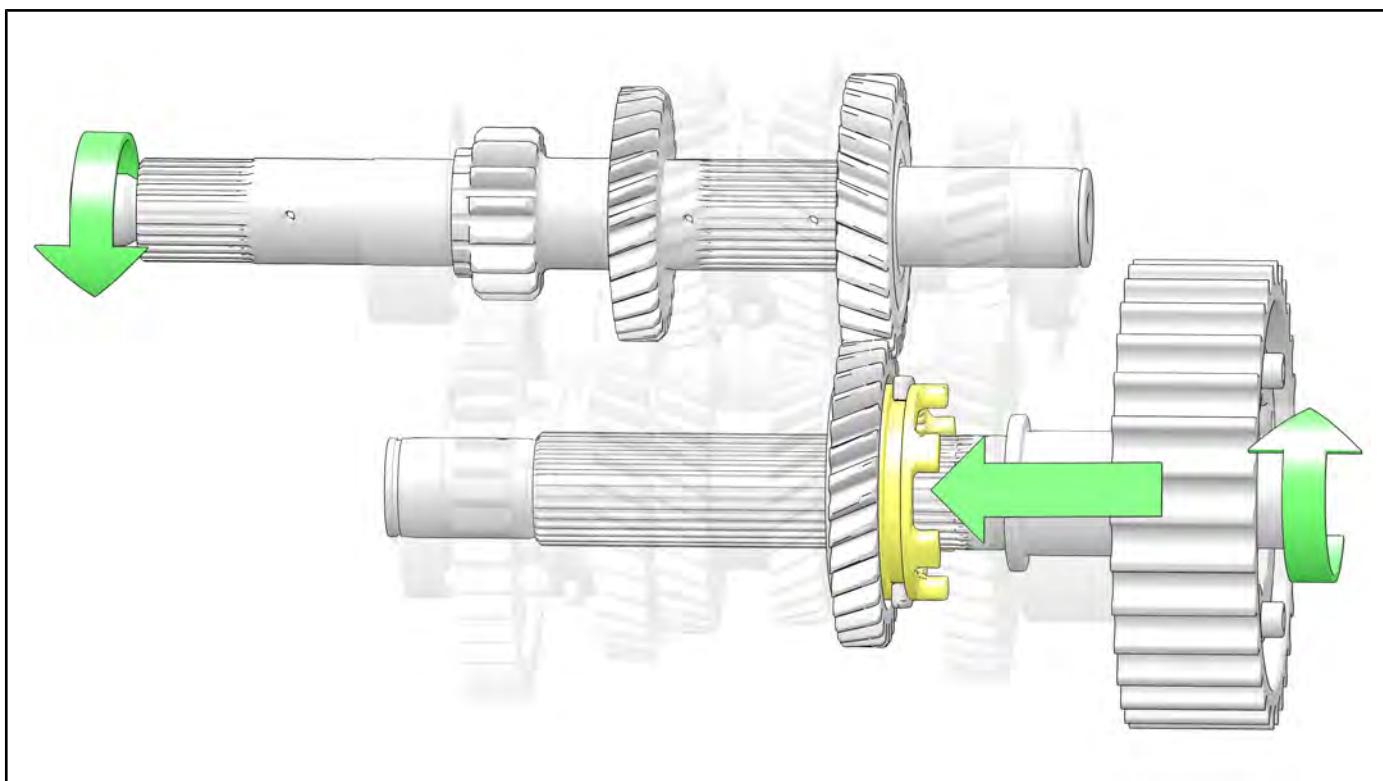


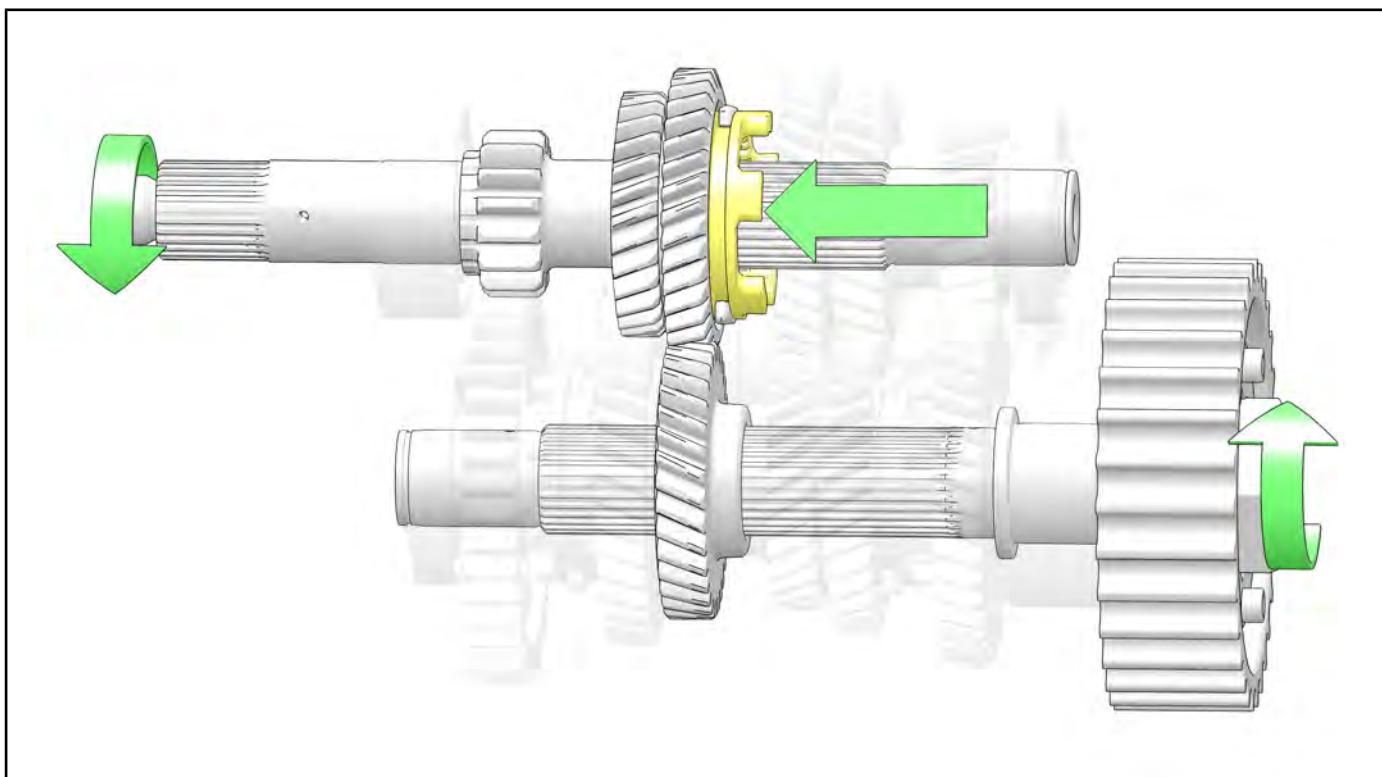
TRANSMISSION / CRANKSHAFT

3rd Gear

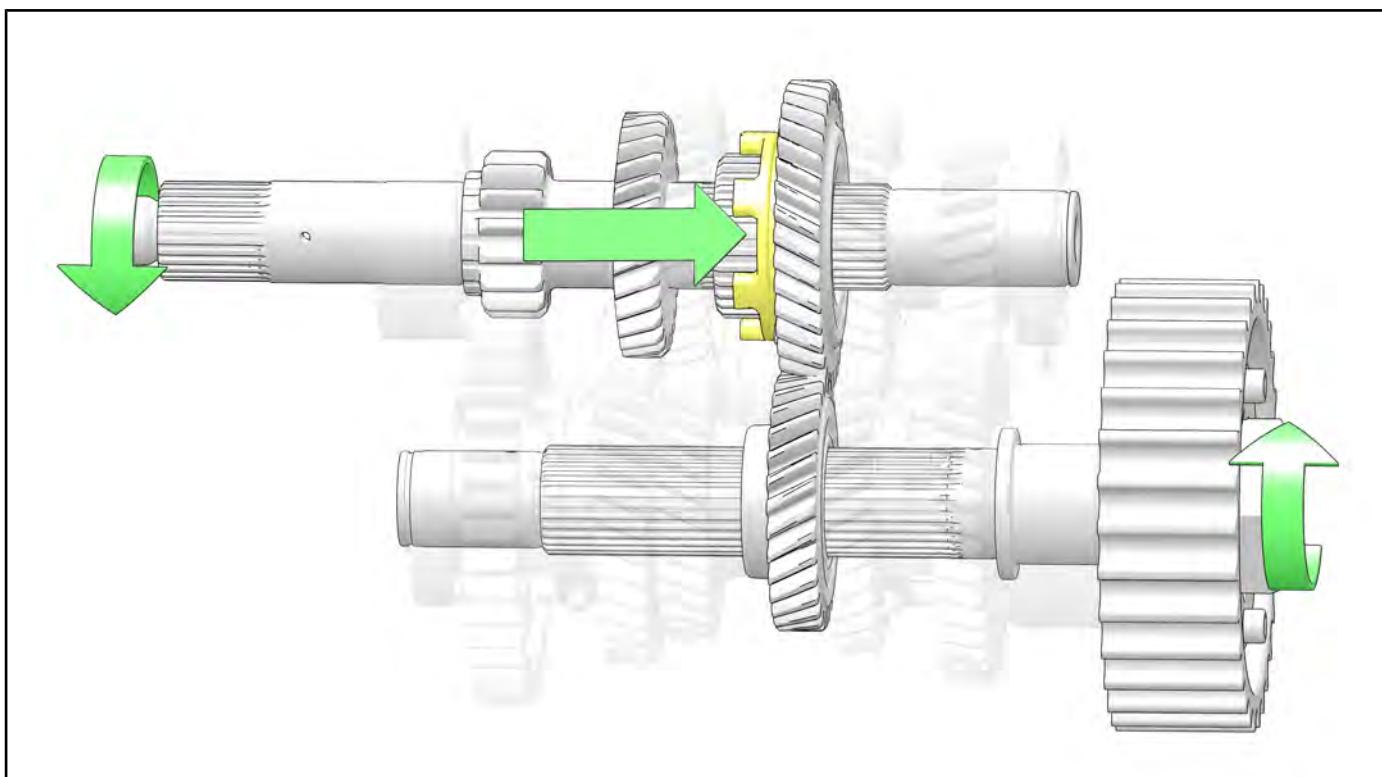


4th Gear



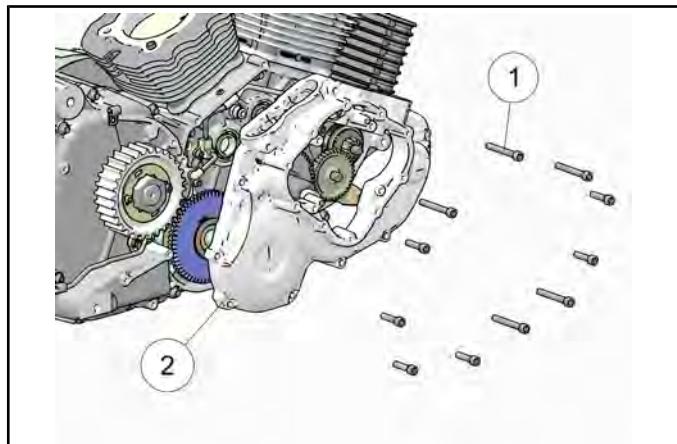
5th Gear

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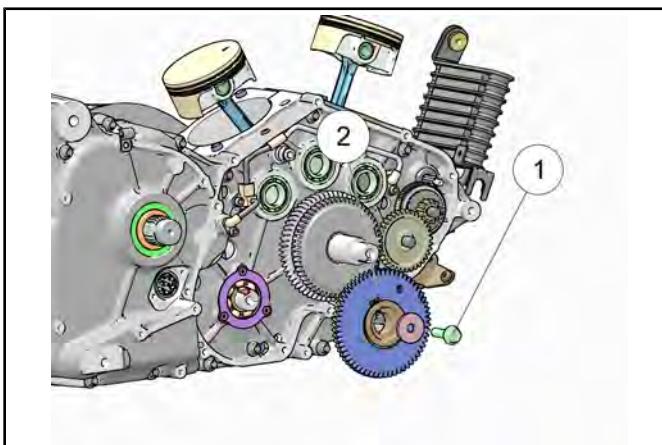
6th Gear

BALANCE SHAFT SERVICE**INNER CAM CHAIN COVER REMOVAL**

1. Remove the camshaft carrier assembly. See Camshaft Carrier Removal, page 3.47.
2. Remove inner cam chain cover fasteners ① and inner cam chain cover ②.

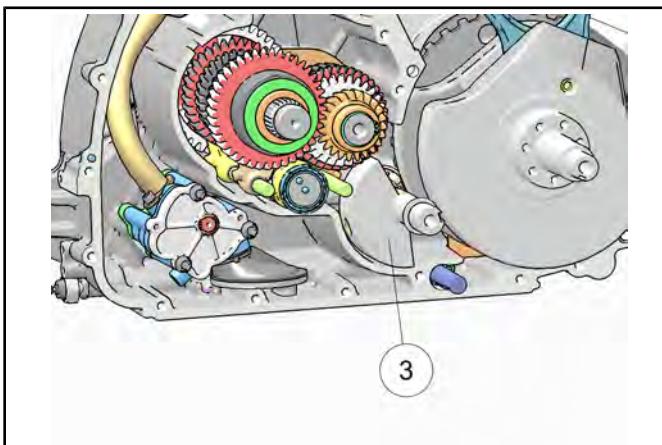
**BALANCE SHAFT REMOVAL**

1. Remove the inner cam cover. See Inner Cam Chain Cover Removal, page 6.16.
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.

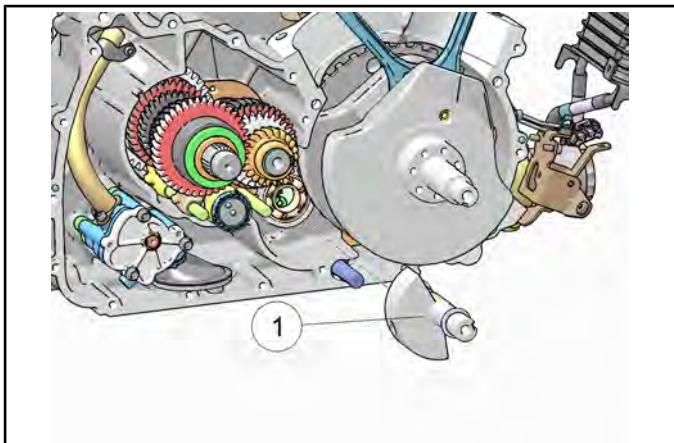
3. Separate the engine cases. See Crankcase Separation, page 6.23.
4. Rotate balance shaft ③ until counterweights are clear of crankshaft. Grasp balance shaft and remove it from case.



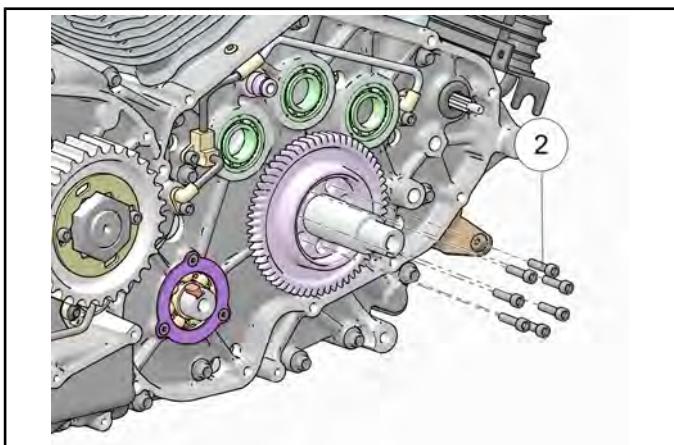
5. Inspect sprocket teeth for wear or damage.
6. Check shaft for runout, or twisting.
7. Rotate right and left balance shaft bearings by hand while observing bearing rotation. Bearings should run smooth and quiet and shaft should be a snug fit in bearing.
8. Visually inspect bearings for damage.

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.



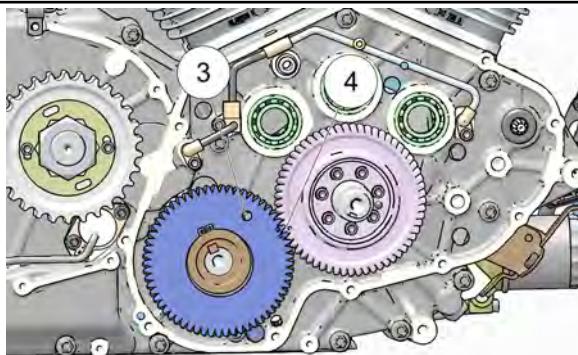
3. Assemble the engine cases. See Crankcase Assembly, page 6.39.
4. Lock the crankshaft for service using **Method 1**. See Locking the Crankshaft for Service, page 3.41.
5. Install the balance shaft drive gear and torque fasteners ② to specification.

**TORQUE**

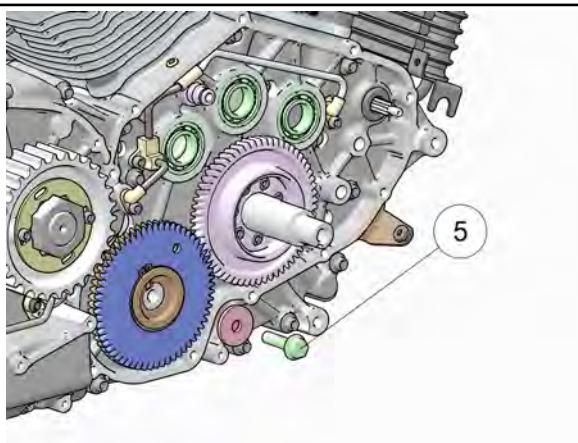
Balance Shaft Drive Gear: 10 ft-lbs (14 Nm)

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

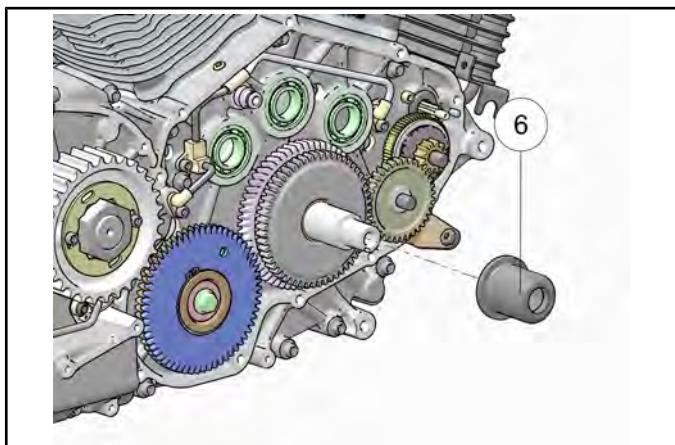
Balance Shaft Driven Gear: 59 ft-lbs (80 Nm)

11. Install the starter drive. See Starter Drive Installation, page 6.21.

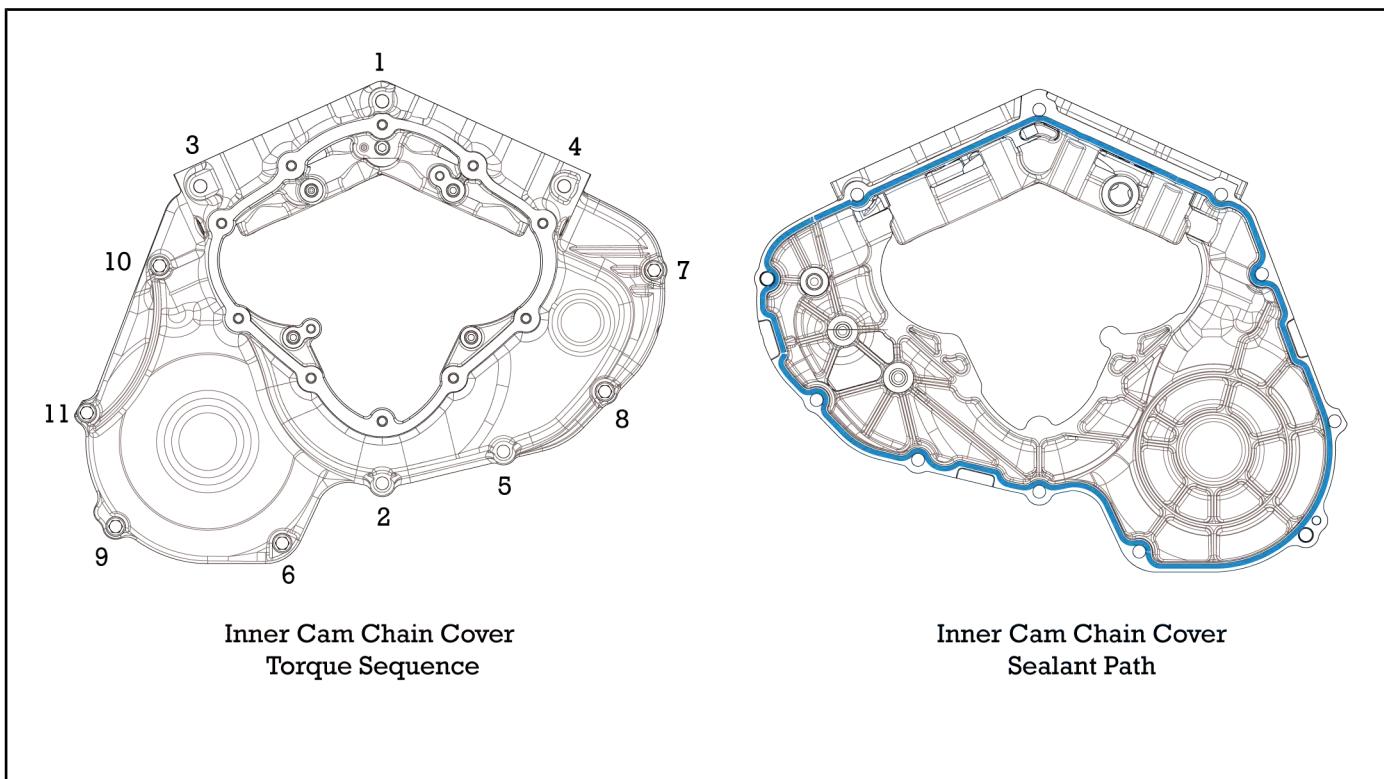
6

TRANSMISSION / CRANKSHAFT

12. Install the spacer ⑥ onto the crankshaft.



13. Install the inner cam cover. See Inner Cam Chain Cover Installation, page 6.19.

INNER CAM CHAIN COVER INSTALLATION

1. Clean inner cam chain cover and crankcase mating surfaces with a residue-free degreaser.
2. Apply Loctite flange sealant **PN: 8560070** 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.

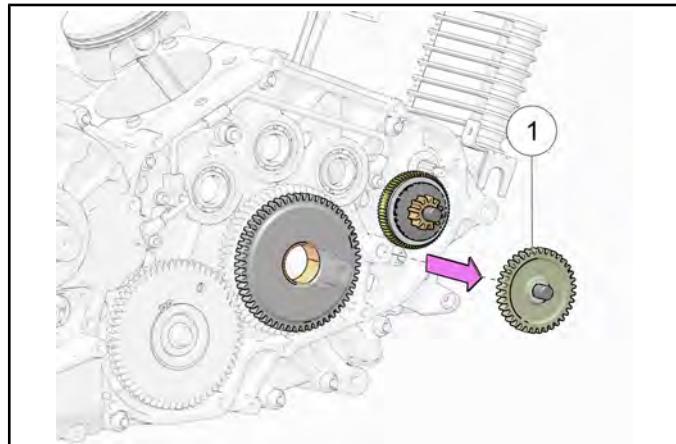
TORQUE

Inner Cam Chain Cover Fasteners: **15 ft-lbs (20 Nm)**

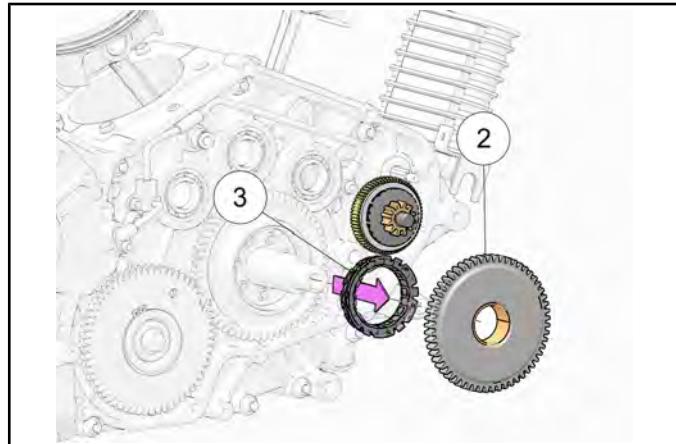
5. Install the camshaft carrier assembly. See Camshaft Carrier Installation, page 3.53.

STARTER DRIVE SERVICE**STARTER DRIVE REMOVAL**

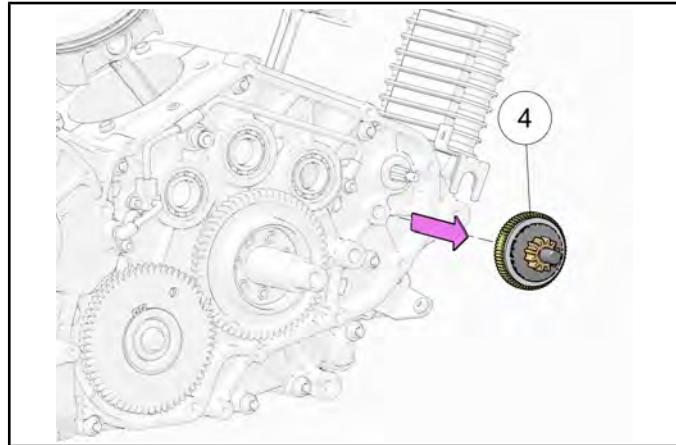
1. Remove the inner cam cover. See Inner Cam Chain Cover Removal, page 6.16.
2. Remove the starter drive reduction gear ① by lifting the shaft and gear out as an assembly.



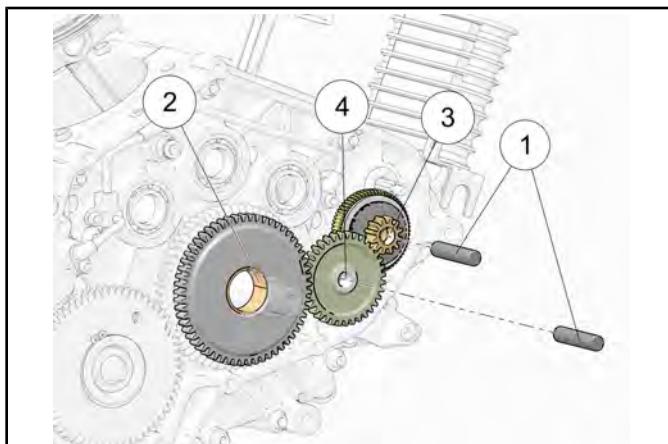
3. Lift the sprag gear (2) and one-way clutch (3) off of the crankshaft as an assembly.



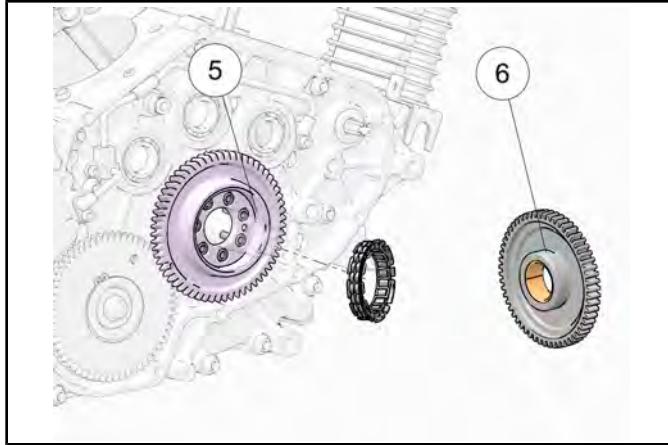
4. Remove the torque limiter clutch (4) and shaft as an assembly.

**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.

**MEASUREMENT**

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.

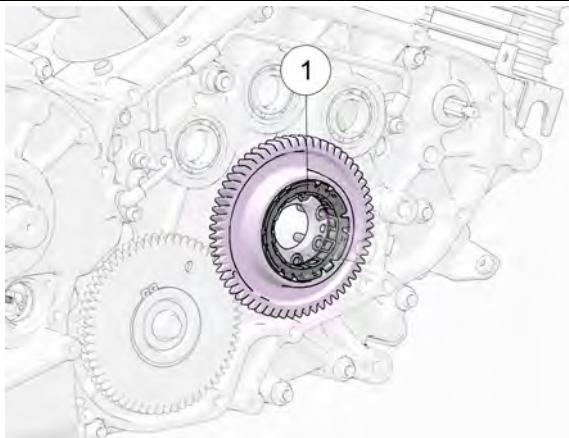
STARTER DRIVE INSTALLATION

1.

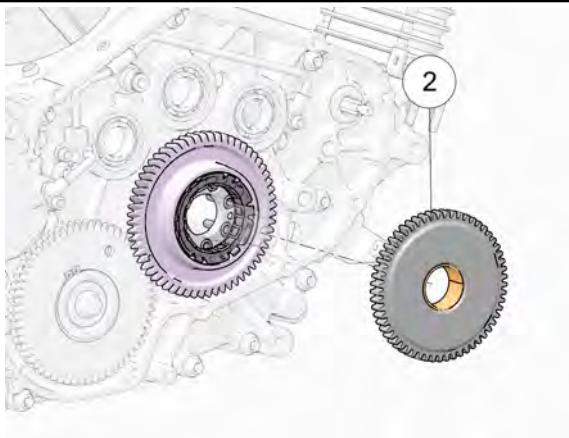
NOTE

Install starter clutch so the arrow is facing out.

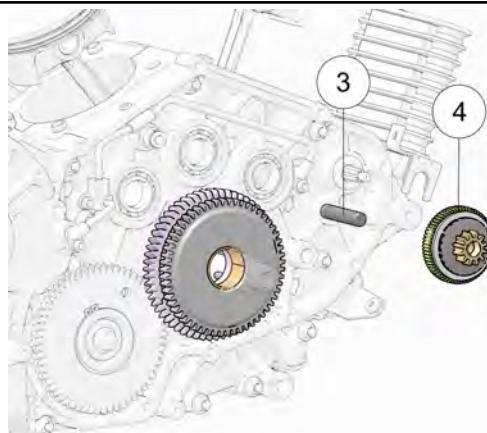
Install one-way starter clutch bearing ① into the balance shaft gear hub.



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.

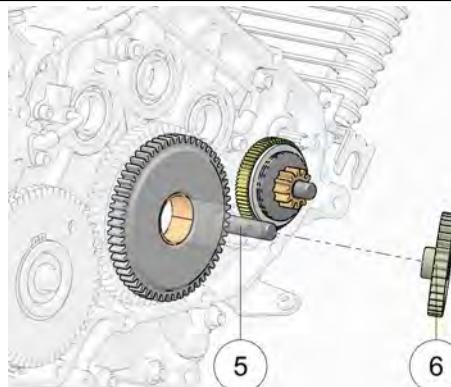


4.

NOTE

If previously removed, install starter motor at this time.

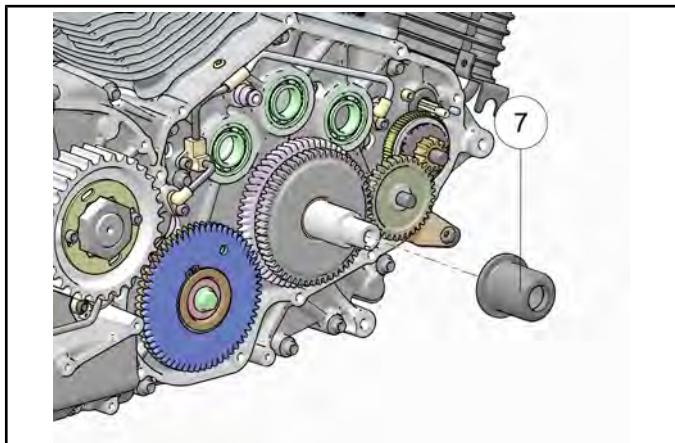
Install the starter reduction gear shaft ⑤ into crankcase bore followed by the reduction gear ⑥. **The raised shoulder on the reduction gear should face the crankcase.**



6

TRANSMISSION / CRANKSHAFT

5. Install spacer ⑦ onto the crankshaft.



6. Install inner cam chain cover. See Inner Cam Chain Cover Installation, page 6.19.
7. Check engine oil and fill to proper level.

CRANKSHAFT SERVICE

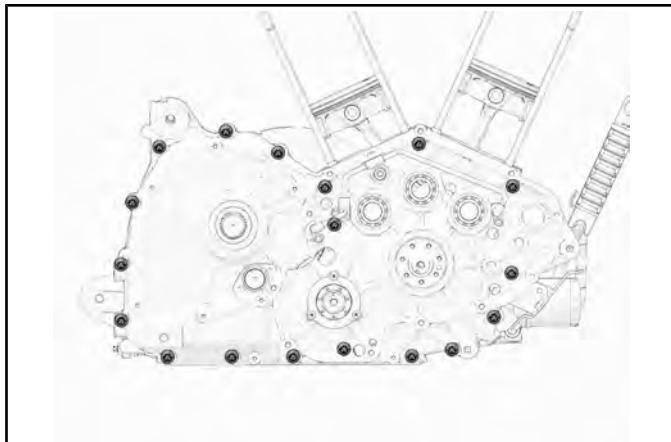
CRANKCASE SEPARATION

1. Drain engine oil. See Engine Oil / Filter Change, page 2.9.
2. Remove engine from frame. See ENGINE REMOVAL.
3. Mount engine securely on an engine stand using Engine Stand Adapter tool **PF-51240**.
4. Remove cylinder heads. See Cylinder Head Removal, page 3.61.
5. Remove cylinders. See Cylinder Removal, page 3.76.
6. Remove lifters. See Lifter Removal, page 3.45.
7. Remove primary cover. See Primary Cover Removal, page 5.7.
8. Remove torque compensator. See Torque Compensator Removal, page 5.20.
9. Remove clutch assembly. See Clutch Removal, page 5.14.
10. Remove flywheel. See Flywheel Removal, page 5.22.
11. Remove stator. See Stator Removal, page 10.30.
12. Remove the cam chain. See Cam Chain Removal, page 3.43.
13. Remove camshaft carrier assembly. See Camshaft Carrier Removal, page 3.47.
14. Remove the inner cam chain cover. See Inner Cam Chain Cover Removal, page 6.16.
15. Remove the starter drive. See Starter Drive Removal, page 6.20.
16. Remove the balance shaft driven gear and drive gear. See Balance Shaft Removal, page 6.16.
17. Remove the drive sprocket. See Drive Sprocket Removal, page 8.48.
18. Remove the gear position switch. See Sensors — Powertrain Management, page 4.12.

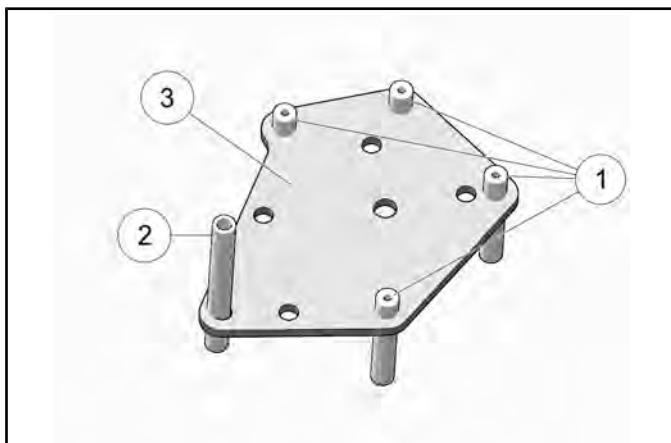
NOTE

Collect the two switch contact pins and springs from the end of the shift drum so they do not get lost.

19. Remove engine case fasteners.



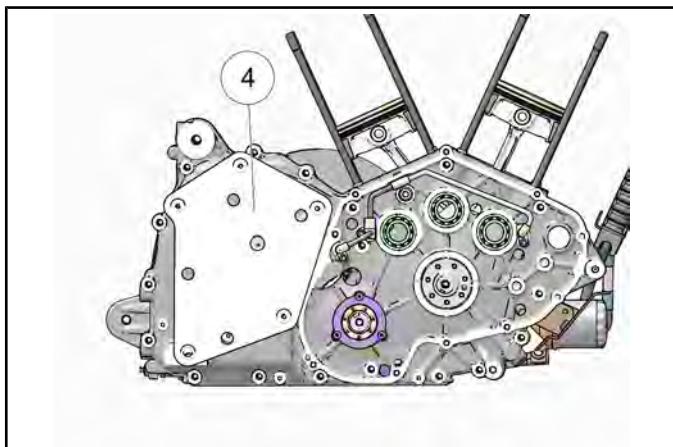
20. Place the Engine Case Splitting / Assembly tool **PF-51234** on a flat surface and assemble the M6 threaded spacers ① and M12 threaded spacer ② into the main plate ③ as shown. **Use only holes marked with the letter A.**



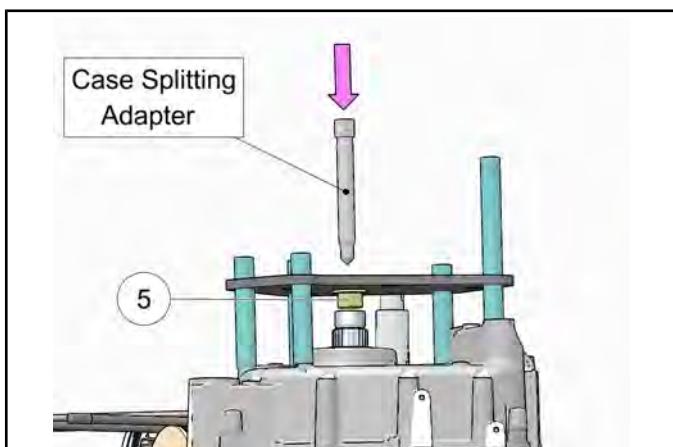
21. Rotate the engine stand so the engine is lying flat with the output shaft pointing UP.

TRANSMISSION / CRANKSHAFT

22. 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.



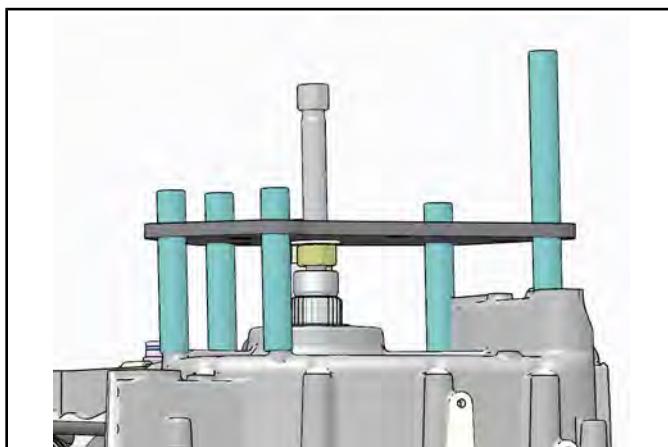
23. Install the case splitting adapter through the center hole in the main plate and thread into nut and washer ⑤ until 1–2 threads are exposed on the other side.



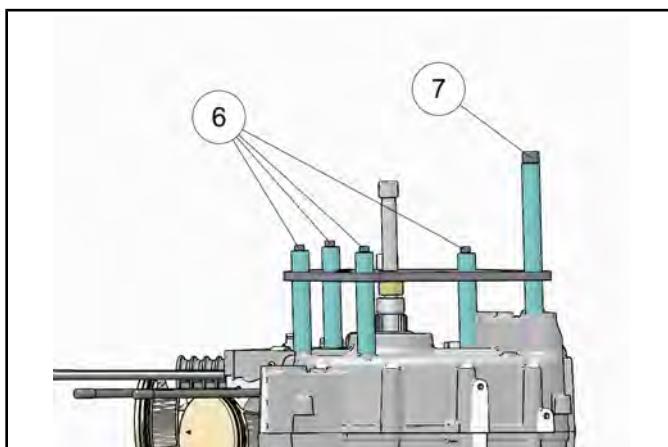
24. **Main plate adjustment:** Turn threaded spacers in or out to raise, lower and level the main plate.

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.



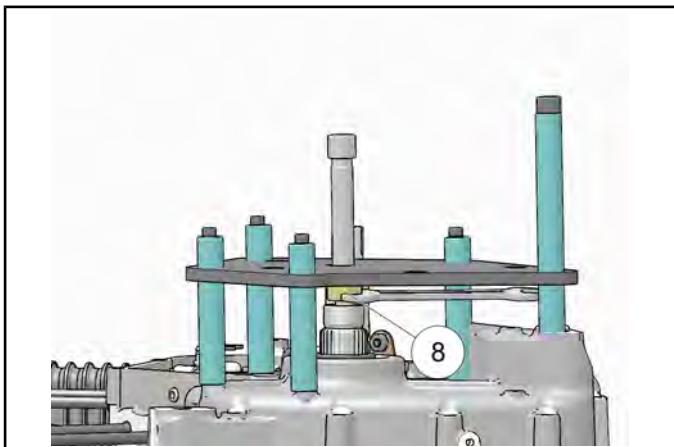
25. Install M6 fasteners ⑥ and M12 fastener ⑦ into threaded spacers and torque to specification.



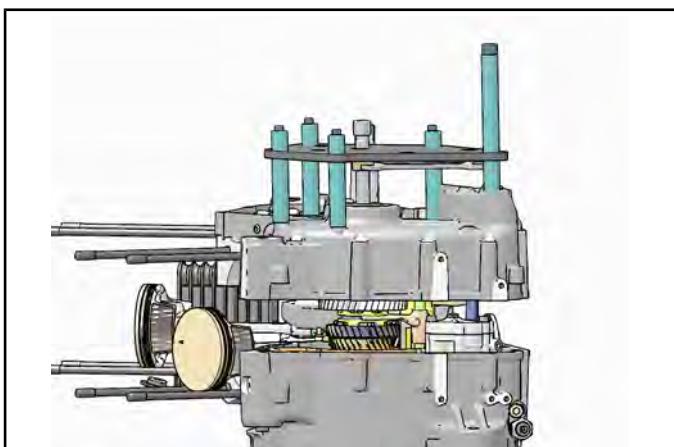
TORQUE

Main Plate Mounting Fasteners (All): 88 in-lbs (10 Nm)

26. Holding nut ⑧ stationary with an open ended wrench, turn the case splitting adapter clockwise until the engine cases begin to part. **STOP.**



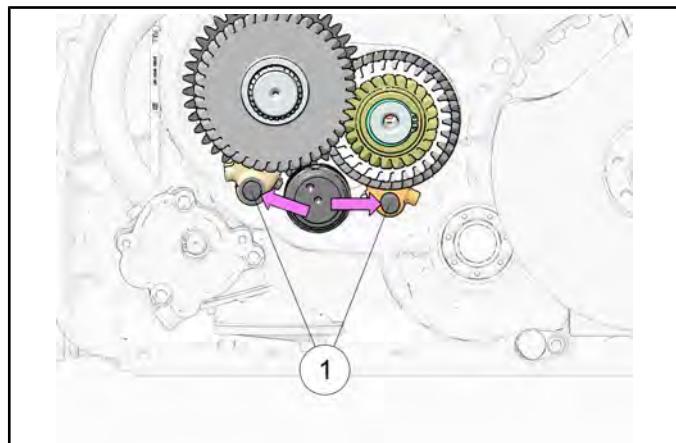
27. Using a soft-faced mallet, work around the seam of the engine cases tapping lightly to release the sealed bond.
28. Alternately turn the case splitting tool in until resistance is felt, then work around the upper case with a mallet until the cases are completely apart.



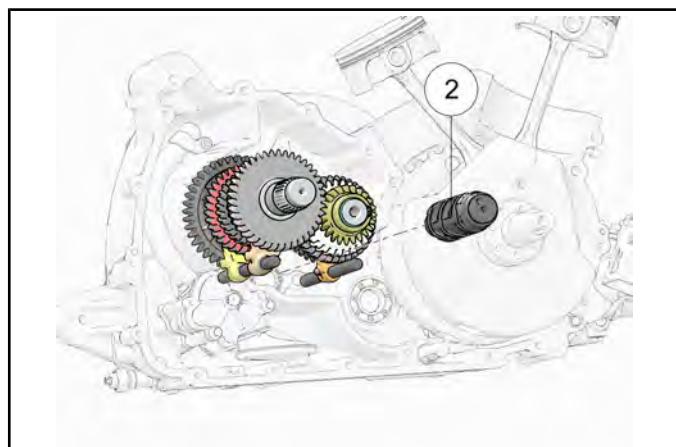
TRANSMISSION REMOVAL**CAUTION**

Gloves should be worn at all times while working on the transmission assembly to avoid personal injury.

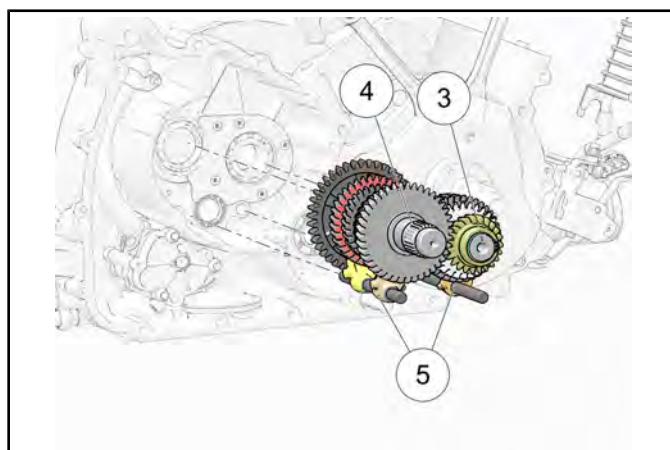
1. Remove the shift ratchet assembly. See Shift Ratchet Removal & Inspection, page 5.9.
2. Remove the balance shaft. See Balance Shaft Removal, page 6.16.
3. Lift both of the shift fork rails ① out of the crankcase just enough so the ends clear the crankcase bores. Rotate rails and forks away from the shift drum.

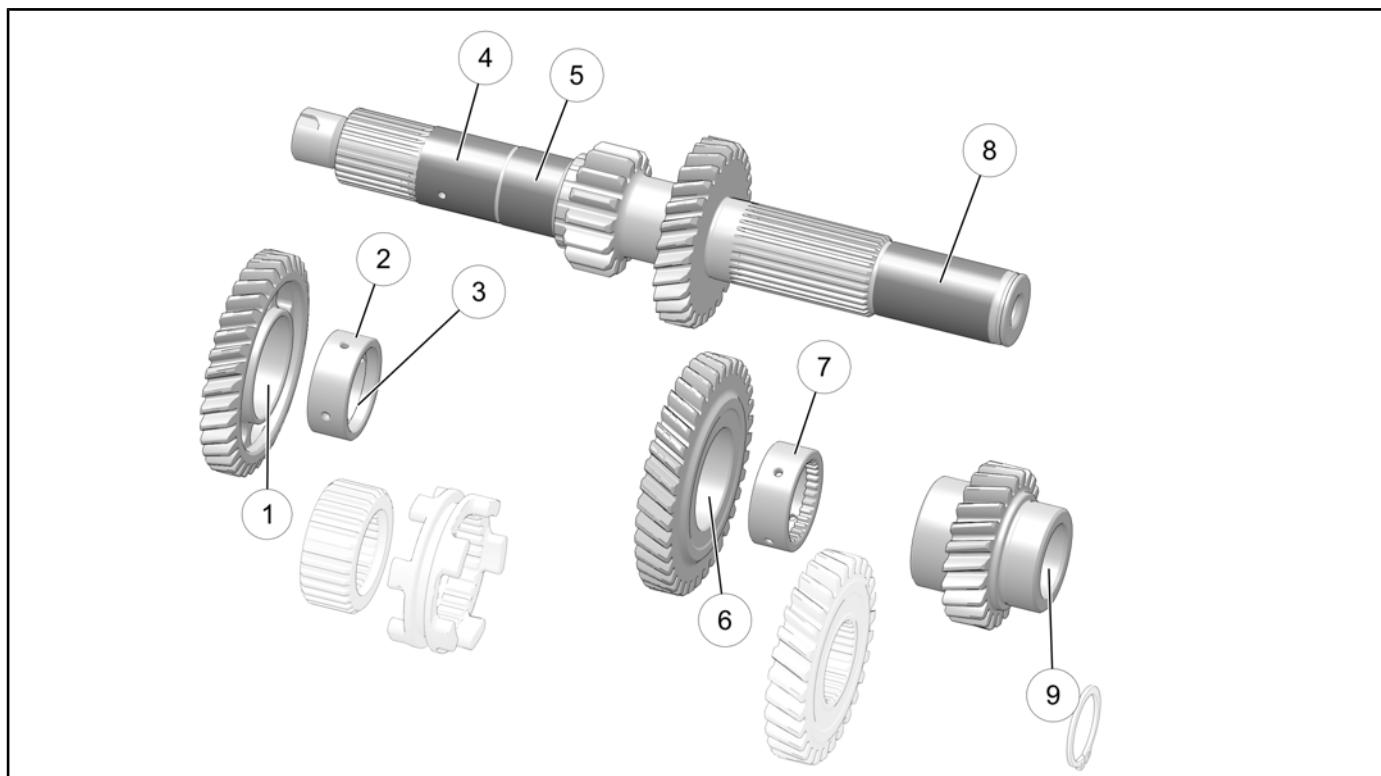


4. Lift the shift drum ② out of the bearing.



5. **As an assembly**, lift the input shaft ③ , output shaft ④ , shift forks and shift fork rails ⑤ out of the engine case.



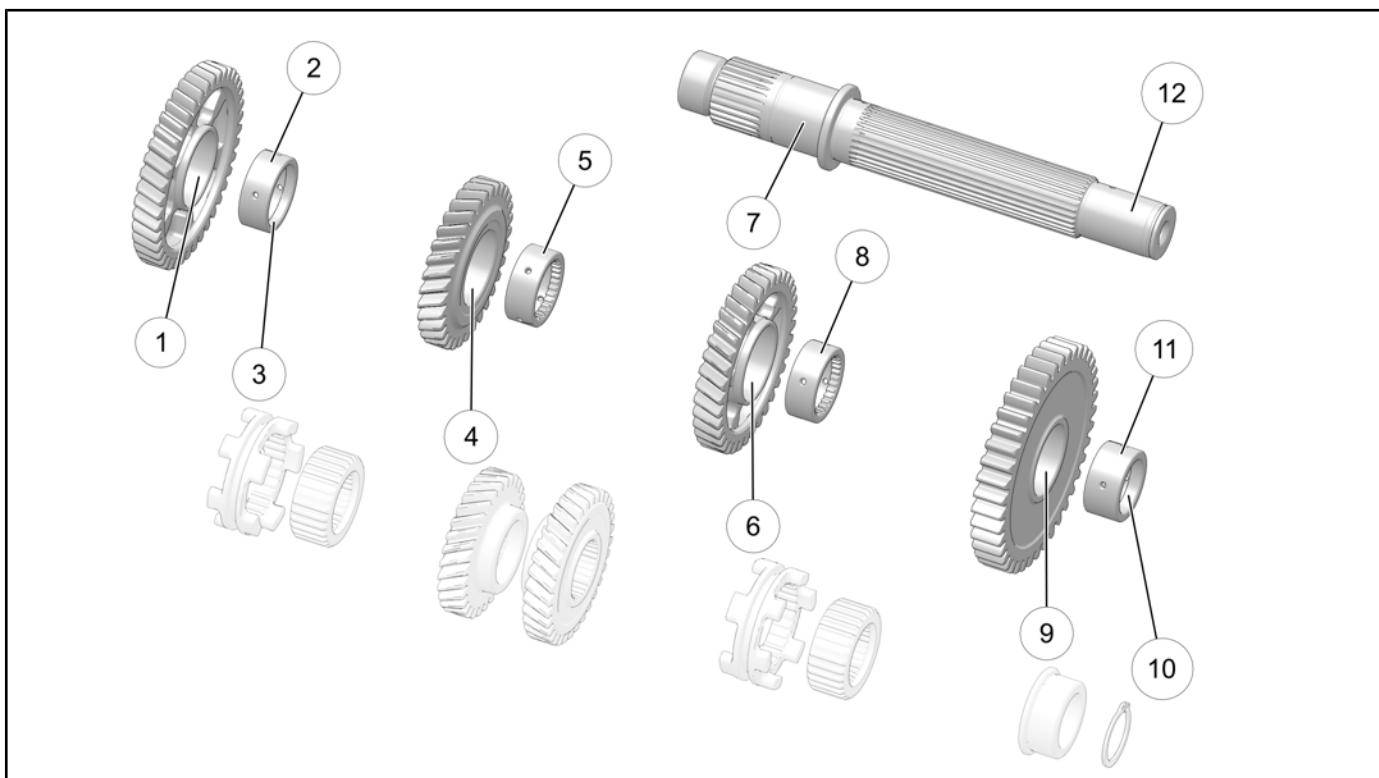
TRANSMISSION INSPECTION**Input Shaft**

6

NUMBER	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

TRANSMISSION / CRANKSHAFT

Output Shaft



NUMBER	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

NOTE

Refer to the Assembly View section in this chapter for component locations and exploded diagrams.

See Crankcase, page 6.6ASSEMBLY VIEWS, page .

Refer to the Service Specifications section in this chapter for complete transmission specifications.

See Service Specifications, page 6.4.

Shafts

- 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

Gears

- 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

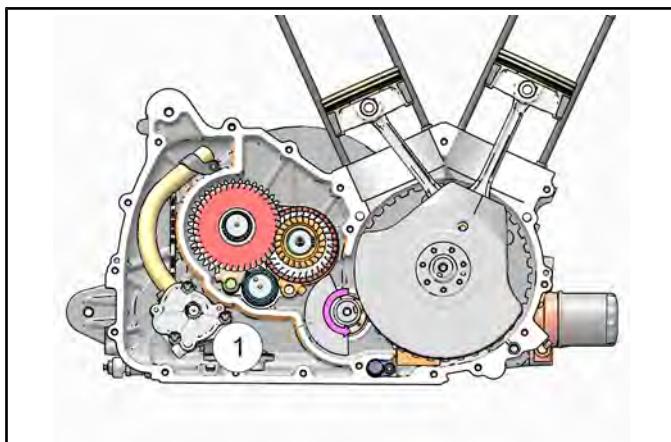
- Inspect all contact surfaces of each shift fork. Replace a shift fork if any part is discolored (overheated), unusually scored, warped, or worn beyond service limit.
- Inspect each shift fork pin for wear or damage and compare to specifications.
- Inspect shift fork rails for wear, scoring, or runout.
- 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.
- Slide rails into crankcase holes and check for a good snug fit.
- 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.
- Temporarily install shift drum into bearing and rotate, checking for smooth bearing operation.

Shift Drum

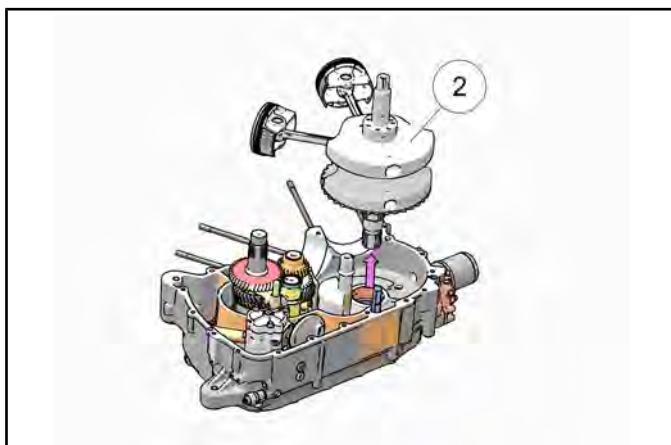
- Inspect shift drum grooves for wear. Pay close attention to corners of grooves where forks change direction.
- Inspect surface of shift drum star for excessive wear or damage.
- Inspect right side shift drum bearing.
- Temporarily install shift drum in right hand case bearing and inspect fit. Spin drum to check for smooth bearing operation.

CRANKSHAFT REMOVAL

- Separate RH crankcase from LH case. See Crankcase Separation, page 6.23.
- Rotate balance shaft ① until counterweights are clear of crankshaft.



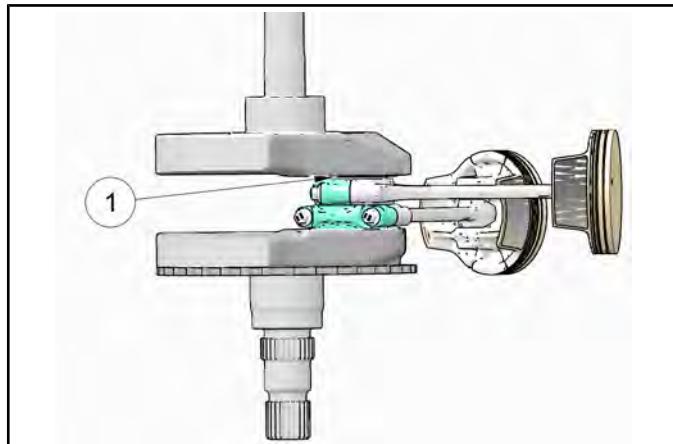
- Lift crankshaft assembly ② straight up until clear of case.

**NOTE**

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

- 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, page 6.4.



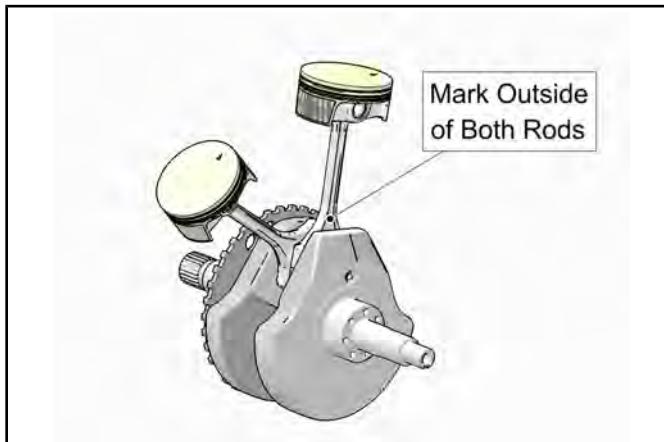
- If clearance recorded exceeds service limit, the crankshaft, connecting rod or both must be inspected and worn parts replaced. See Crankshaft Inspection, page 6.34.

CONNECTING ROD REMOVAL / IDENTIFICATION

NOTE

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.

- 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**.
- Mark the outside of both connecting rods prior to removal so they can be assembled in the same direction in relation to the crankshaft.



- Remove connecting rod fasteners and connecting rod bearing caps.

NOTE

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.

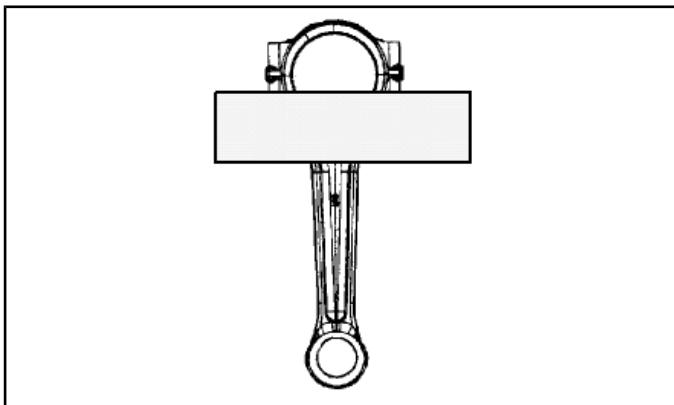
EXAMPLE:

- 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 3.80 for connecting rod small end inspection.

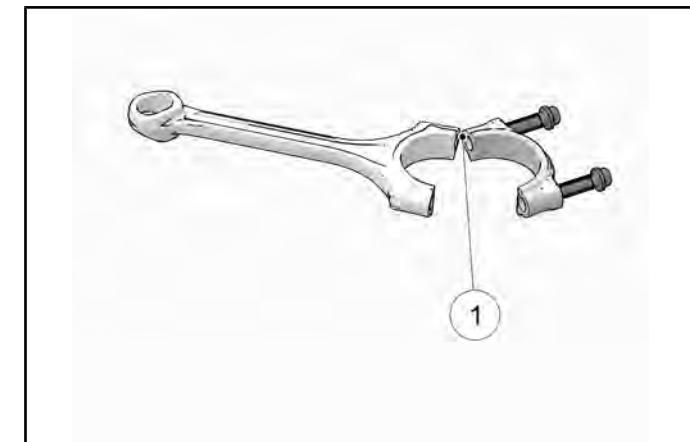
CAUTION

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.

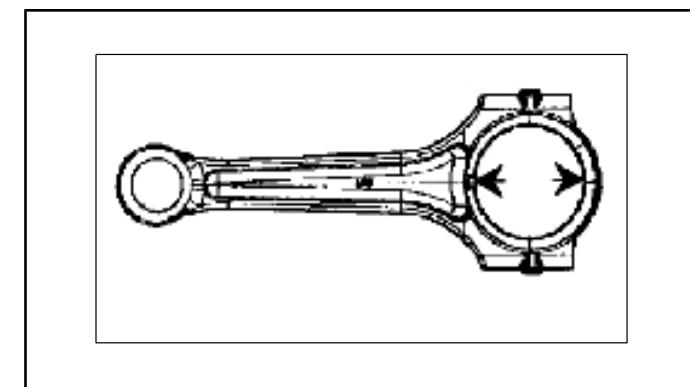
3. Apply engine oil to threads of rod fasteners. Torque fasteners to specification.



TORQUE

Connecting Rod Fasteners: 22 ft-lbs (30 Nm)

4. Measure I. D. of connecting rod big end for size and out of round and compare to specification. See Service Specifications, 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 6.33.

CONNECTING ROD BEARING CLEARANCE INSPECTION

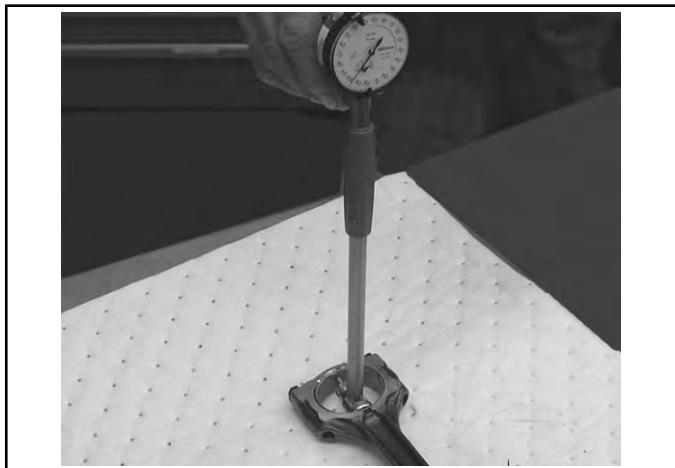
1. Assemble the connecting rod cap with bearings and torque to specification.

TORQUE

Connecting Rod Fasteners: 22 ft-lbs (30 Nm)

TRANSMISSION / CRANKSHAFT

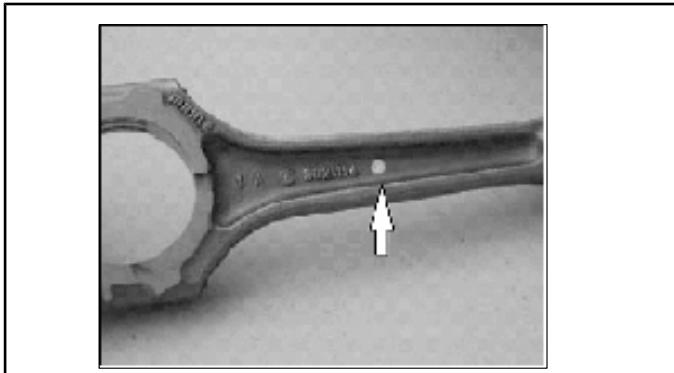
2. Measure the connecting rod big end bearing I.D. with a dial bore gauge and record.



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, 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.

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 RH 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 side facing away from the center of the crankshaft.



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.

6

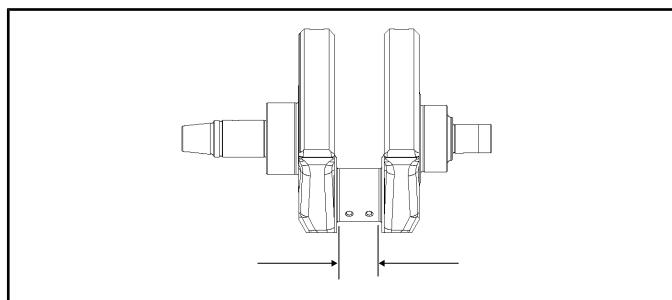
CONNECTING ROD BEARING SELECTION CHART

Connecting Rod Color	Crankshaft Color	Bearing Color (P/N 3514790-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

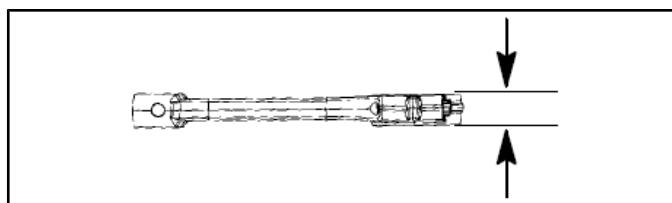
CRANKSHAFT INSPECTION

Record all measurements and compare to specifications. Replace crankshaft if any measurement is worn beyond the service limit. See Service Specifications, page 6.4.

1. Measure the width of the rod bearing journal.

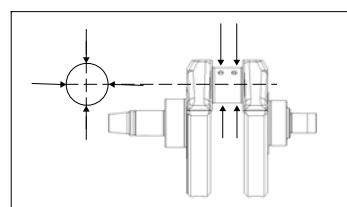


2. Measure width of connecting rods at big end.

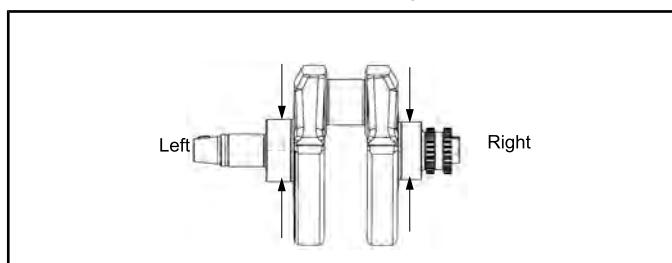


3. Visually inspect all bearing journals for scoring, damage or excessive wear.
4. Crankshaft and connecting rods are identified by color. Be sure to compare measurements to specifications for the proper color (or non-marked) connecting rod or crankshaft.

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.

NOTE

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:

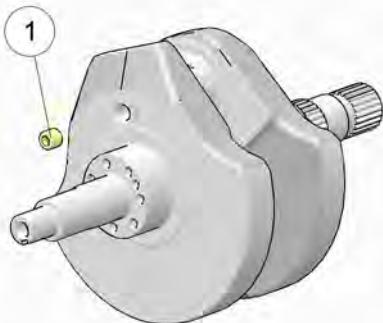
TORQUE

Connecting Rod Fasteners: 22 ft-lbs (30 Nm)

7. Check that the connecting rods rotate smoothly and freely on crankshaft journal.

CRANKSHAFT CLEANING

1. Remove blind plug ① from crankshaft to ensure that passages are clear.



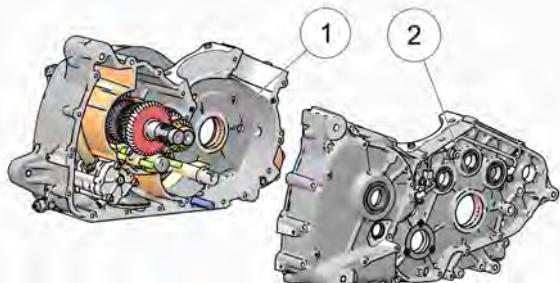
2. After cleaning passages, install blind plug and torque to specification. Plug should be flush with surface of crankshaft.

TORQUE

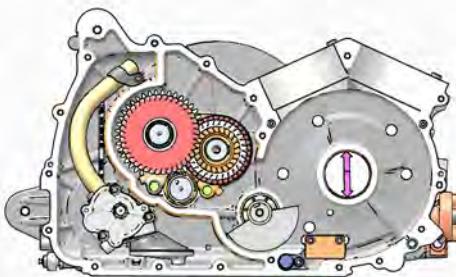
Blind Plug: 15 ft-lbs (20 Nm)

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, 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.

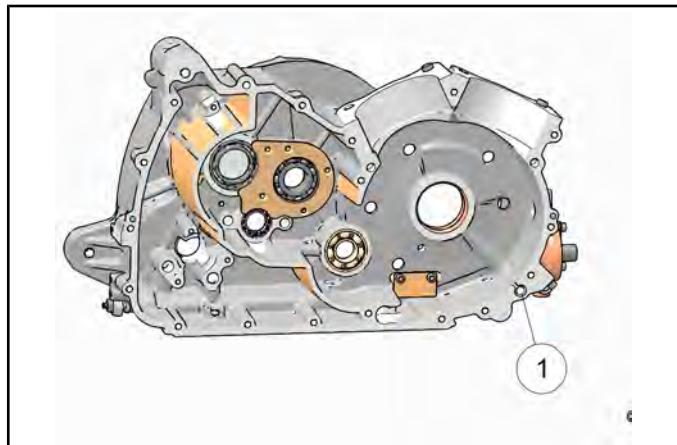
NOTE

Replace crankcase halves as a set.

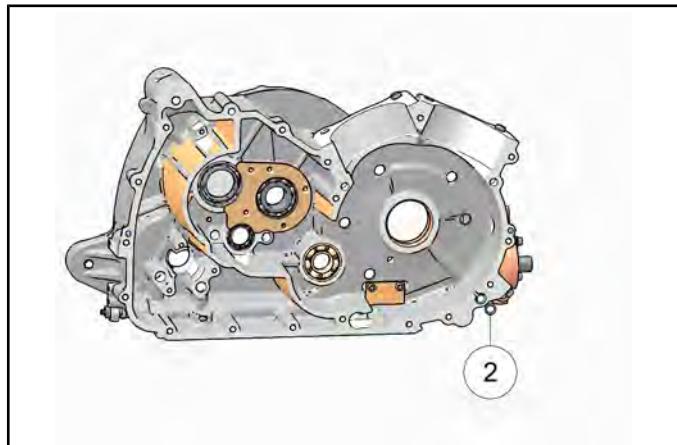
LEFT CRANKCASE ASSEMBLY**Prepare LEFT crankcase for assembly:**

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.

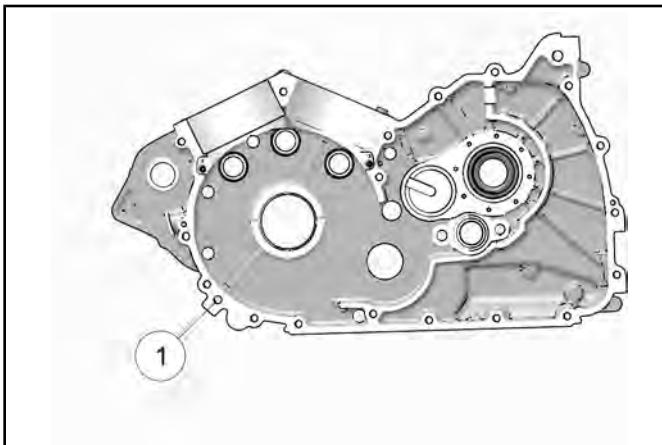


2. Install new ball bearings in crankcase as required.
 - Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
 - Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
 - DO NOT press 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 3.26.
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.



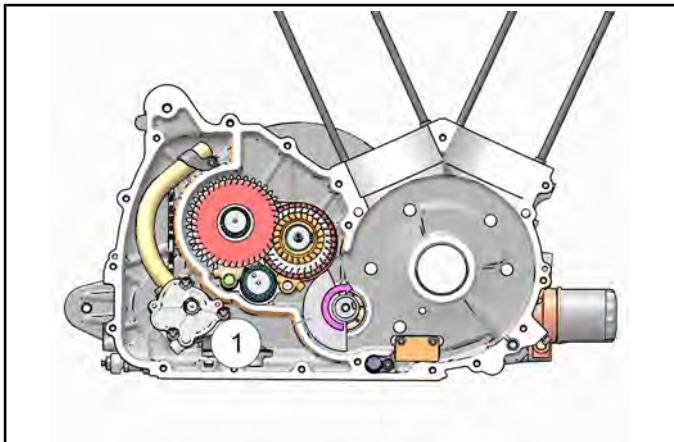
2. Install new bearings in crankcase as required.
 - Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
 - Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
 - DO NOT press on inner race of ball bearings.
3. Install bearing retainers as required and torque to specification.

CRANKSHAFT INSTALLATION

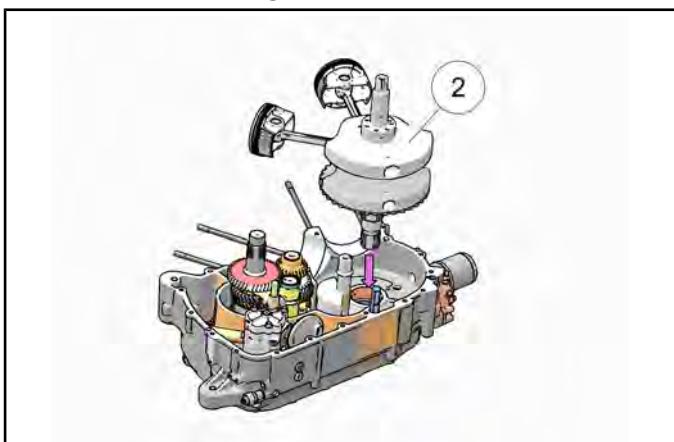
NOTE

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.



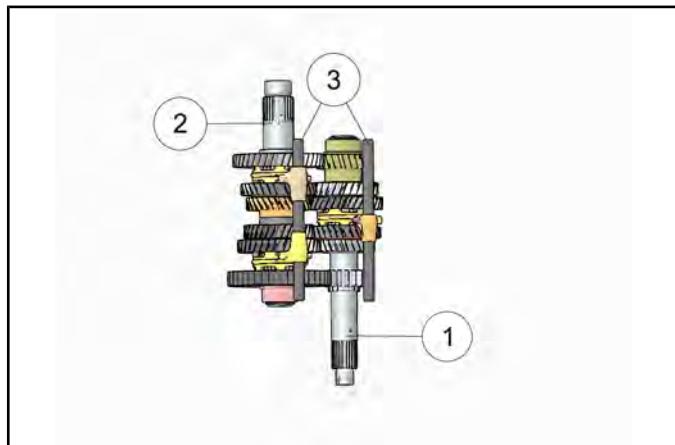
2. Apply assembly paste to main bearings.
3. Hold crankshaft over left crankcase and position rods so that left side rod is in cutout for rear cylinder and right side rod is in cutout for the front cylinder.
4. Place crankshaft ② into left crankcase half.



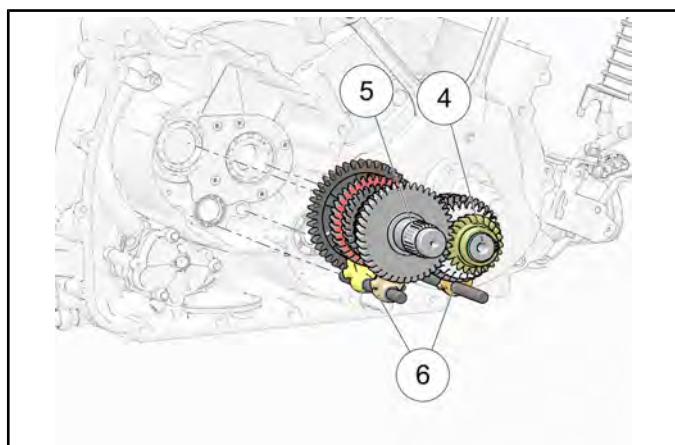
TRANSMISSION / CRANKSHAFT

TRANSMISSION INSTALLATION

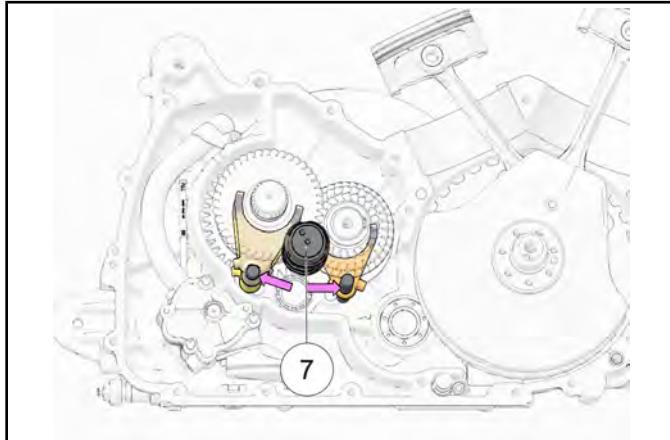
1. If transmission shaft bearings were replaced, be sure all bearing retainer plate fasteners are installed and tightened to specification. See Crankcase, page 6.6.
2. Working on a flat surface, assemble the input shaft ① and output shaft ② so the gears are properly meshed.
3. Install shift rails ③ into shift forks and assemble to input and output shafts.



4. Lubricate parts with engine oil. Apply assembly lube to ends of transmission 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.



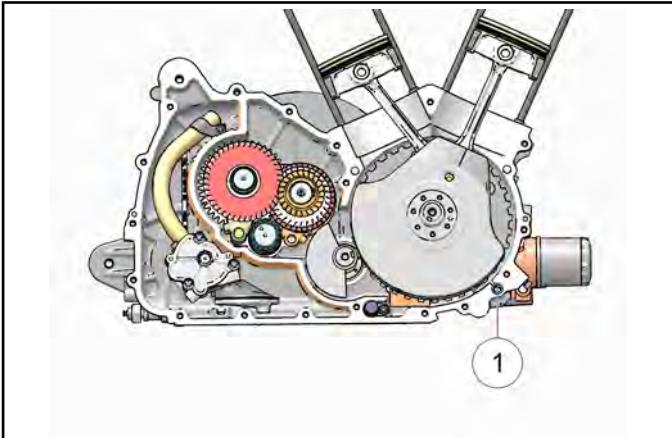
6. Rotate shift rails away from shift drum bore and install shift drum ⑦.



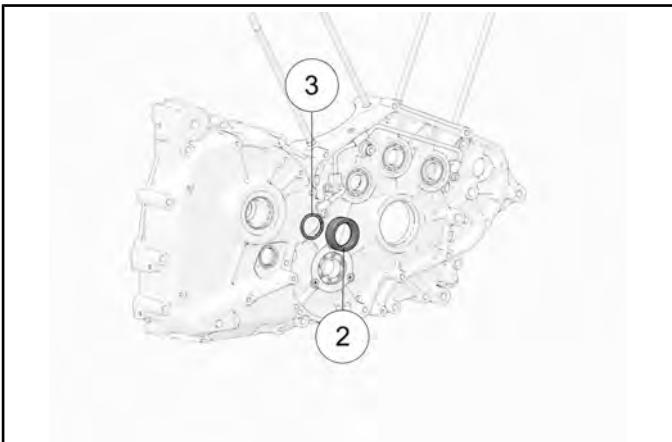
7. Rotate shift drum to align proper grooves with forks.
8. Move shift fork pins into drum grooves and seat rails.
9. Install balance shaft. See Balance Shaft Installation, page 6.17.
10. Install oil pump assembly. See Oil Pump Installation, page 3.29.
11. Install crankshaft. See Crankshaft Installation, page 6.37.
12. Assemble crankcase. See Crankcase Assembly, page 6.39.

CRANKCASE ASSEMBLY

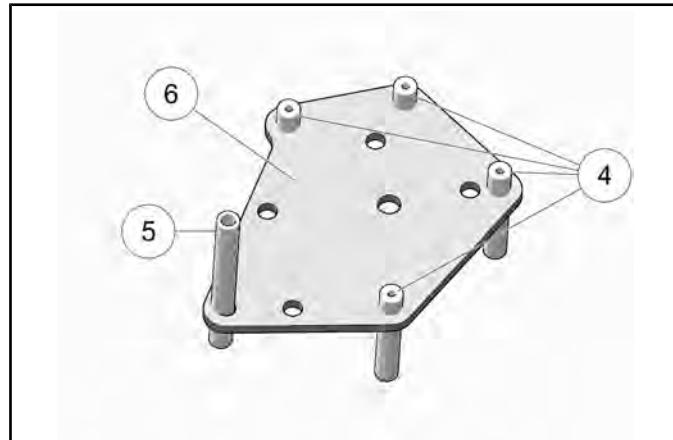
1. Clean crankcase mating surfaces to remove all grease, oil, and old sealant.
2. Check to be sure all shafts are seated properly (crankshaft, balance shaft, shift drum, shift forks, input shaft, output shaft).
3. Check to be sure that a new oil passage o-ring ①, alignment dowel pins and oil pipes, etc. are in place.



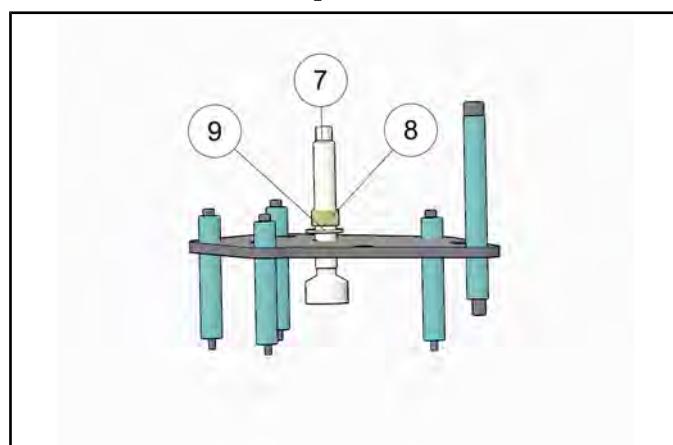
4. Remove the drive sprocket spacer ② and o-ring ③ from the RH crankcase prior to installation.



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.**



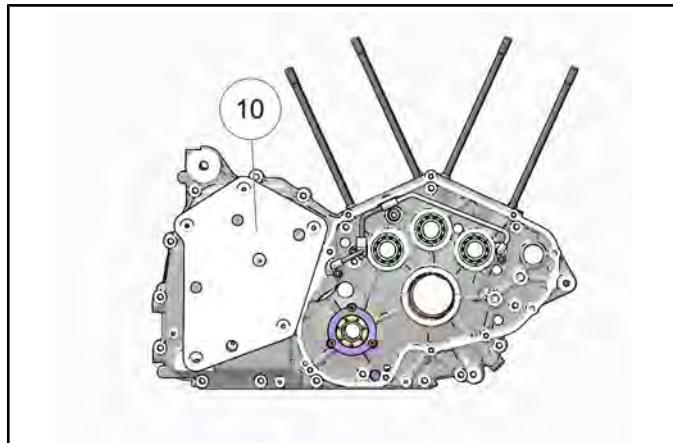
6. Install case assembly adapter ⑦, nut ⑧ and washer ⑨ onto main plate.



6

TRANSMISSION / CRANKSHAFT

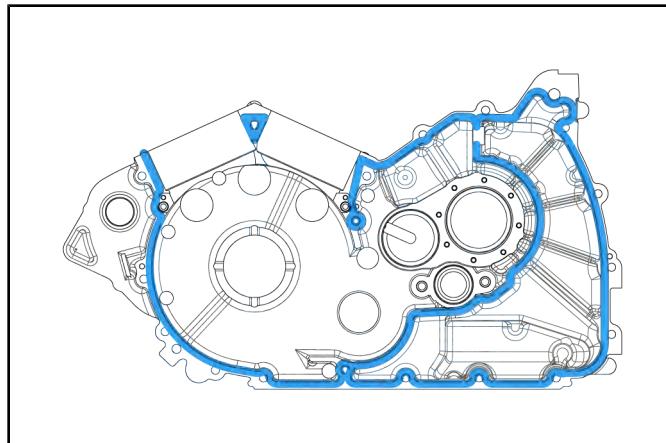
7. Install the main plate assembly **⑩** to the RH crankcase and torque fasteners to specification.



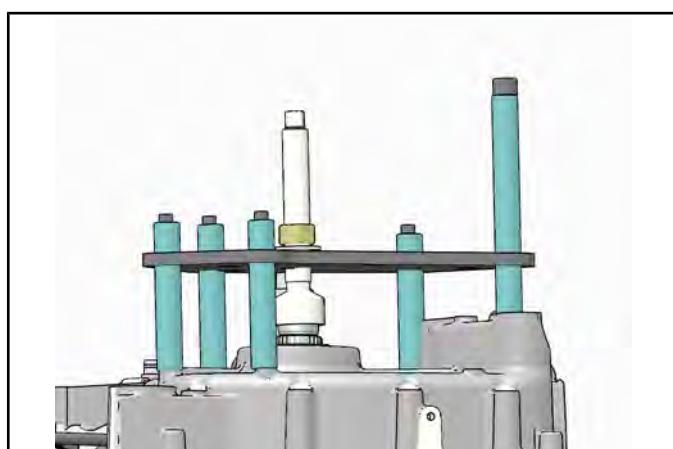
IMPORTANT

- 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.

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.



TORQUE

Main Plate Mounting Fasteners (All): **88 in-lbs (10 Nm)**

10. Lower the RH case onto the LH 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.

NOTE

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 Bolt Length And Torque Pattern, page 6.8.
14. Install a new output seal in RH 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 Sensors — Powertrain Management, page 4.12.
17. Install the drive sprocket. See Drive Sprocket Installation, page 8.51.
18. Install the balance shaft driven gear and drive gear. See Balance Shaft Installation, page 6.17.
19. Install the starter drive. See Starter Drive Installation, page 6.21.

20. Install the inner cam chain cover. See Inner Cam Chain Cover Installation, page 6.19.
21. Install the camshaft carrier assembly. See Camshaft Carrier Installation, page 3.53.
22. Install the cam chain. See Cam Chain Installation, page 3.44.
23. Install the stator. See Stator Installation, page 10.31.
24. Install the flywheel. See Flywheel Installation, page 5.22.
25. Install the clutch assembly. See Clutch Installation, page 5.19.
26. Install the torque compensator. See Torque Compensator Installation, page 5.21.
27. Install the primary cover. See Primary Cover Installation, page 5.12.
28. Install lifters. See Lifter Installation, page 3.46.
29. Install cylinders. See Cylinder Installation, page 3.82.
30. Install cylinder heads. See Cylinder Head Installation, page 3.67.
31. Install engine in frame. See Engine Installation, page 3.17.

TRANSMISSION / CRANKSHAFT

STAKE NUT INSTALLATION

- The Stake nut is located on the clutch side of the transmission input shaft.
- It is important that they are torqued and staked correctly for proper function

IMPORTANT

Do not reuse or reinstall any previously used stake nut. A new stake nut needs to be installed every time the nut is removed or loosened.

Use the following procedure to install the stake nuts correctly:

- Clean threads on shaft so there is no oil or contaminants.

Be sure staking lip does not tear/crack in staking area.
Stake nut with round side of punch.



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
Excessive Noise Related to Bottom End of Engine	Debris From Broken Parts Locking Transmission	Transmission Components	Repair as necessary
	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, Torque Compensator, 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

TRANSMISSION / CRANKSHAFT

PROBLEM	POSSIBLE CAUSE	PART(S) AFFECTED	REPAIR RECOMMENDED
Transmission Hard to Shift	Improper Clutch Operation	Clutch	Refer to Clutch / Primary / Shift chapter
	Incorrect Oil Viscosity	Engine oil and filter	Refer to Engine / Cooling / Exhaust chapter
	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

CHAPTER 7

FRAME / BODY

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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.

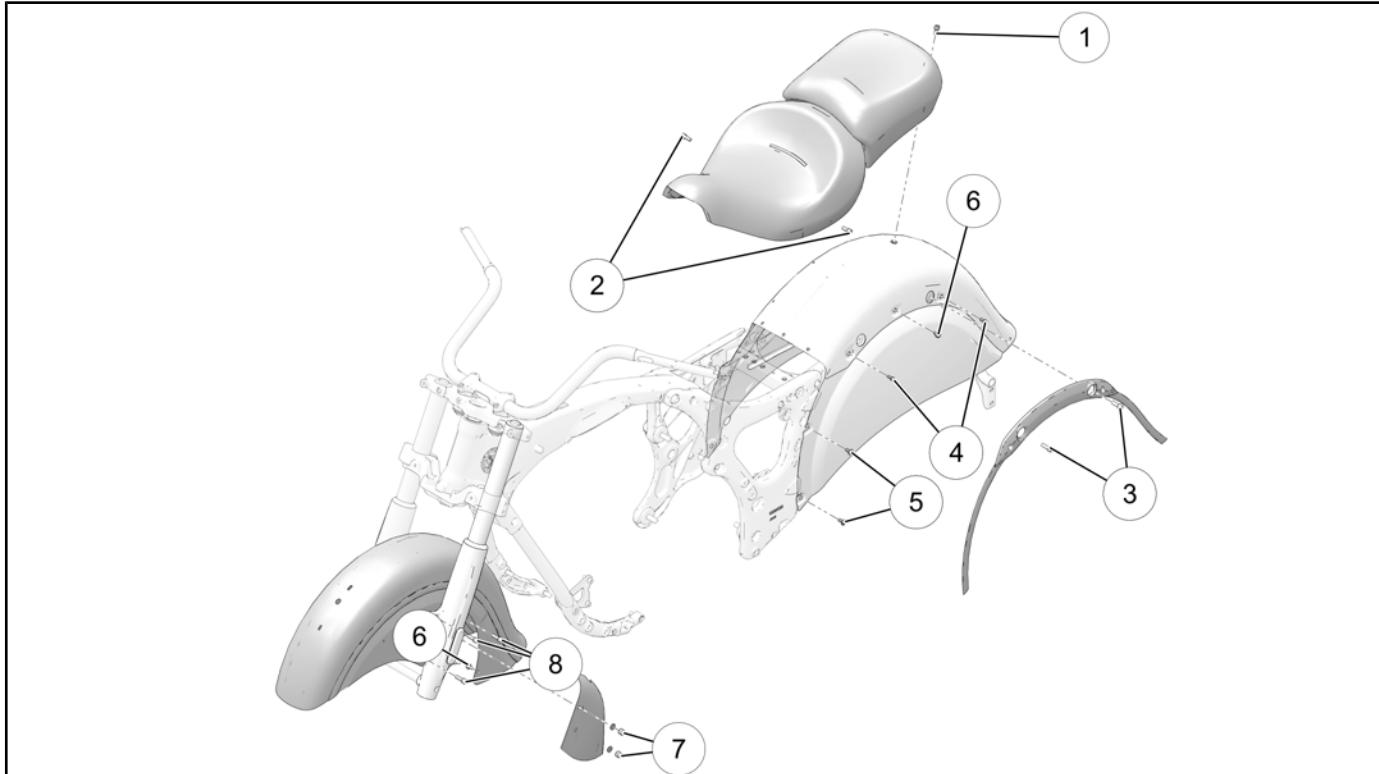
SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
PV-49955	Body Panel Tool Kit

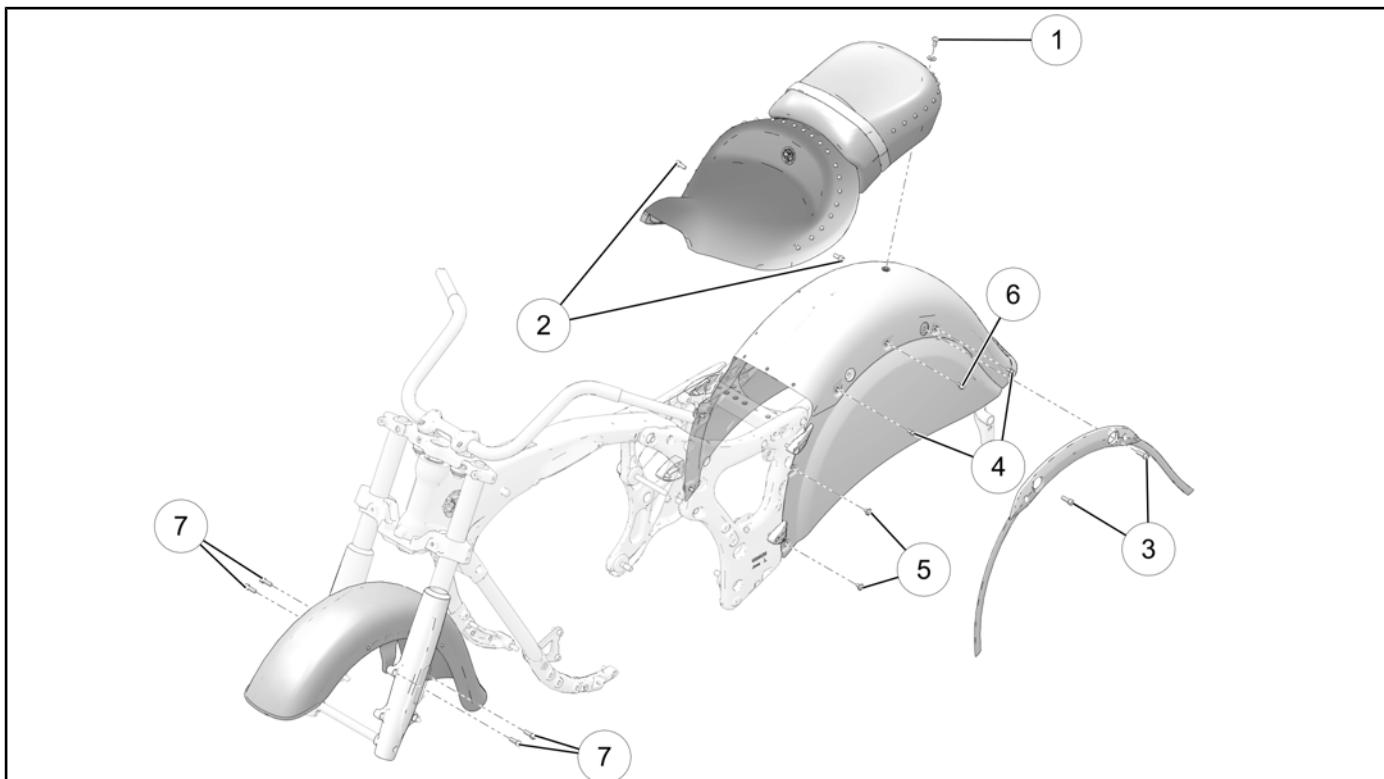
Bosch Automotive Service Solutions: 1-800-328-6657 or <https://polaris.service-solutions.com/>

FRAME / BODY

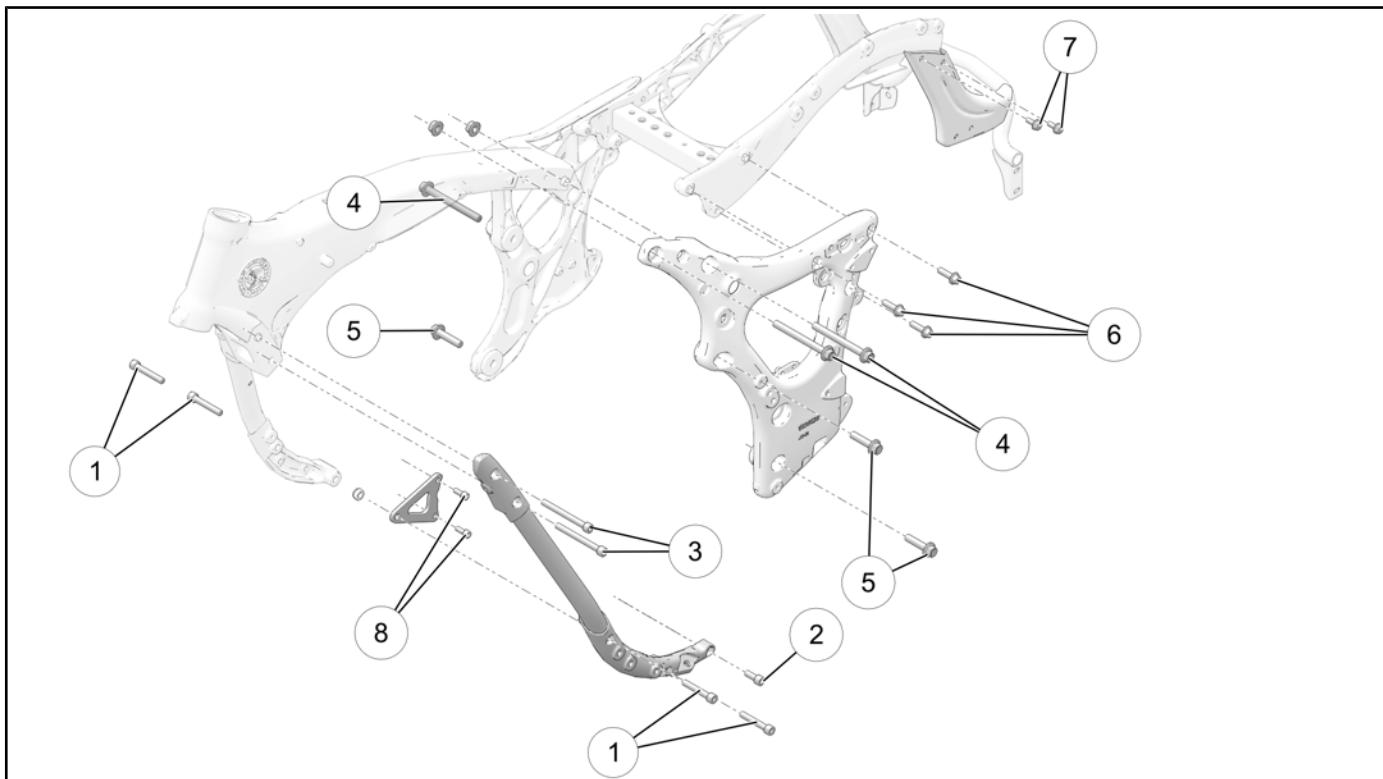
ASSEMBLY VIEWS FENDERS / SEAT



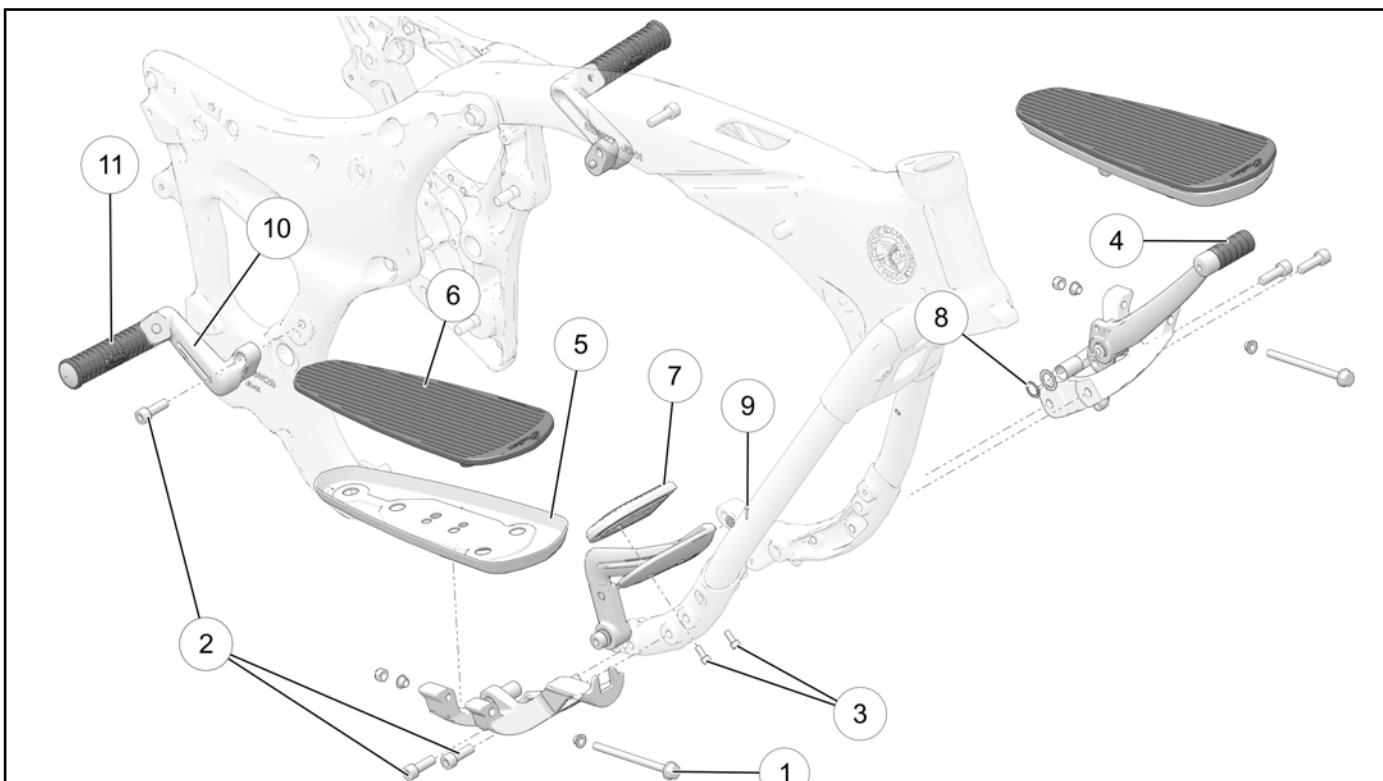
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Passenger Seat Fastener	18 ft-lbs (24 Nm)
②	Driver Seat Fastener	18 ft-lbs (24 Nm)
③	Strut Cover Fastener	84 in-lbs (10 Nm)
④	Rear Fender Upper Fastener	84 in-lbs (10 Nm)
⑤	Rear Fender Lower Stud / Ball	84 in-lbs (10 Nm)
⑥	Fender Fastener	84 in-lbs (10 Nm)
⑦	Caliper Cover Acorn Nut	18 in-lbs (2 Nm)
⑧	Front Fender Fastener	18 ft-lbs (24 Nm)

FENDERS / SEAT (OPEN STYLE FENDER)

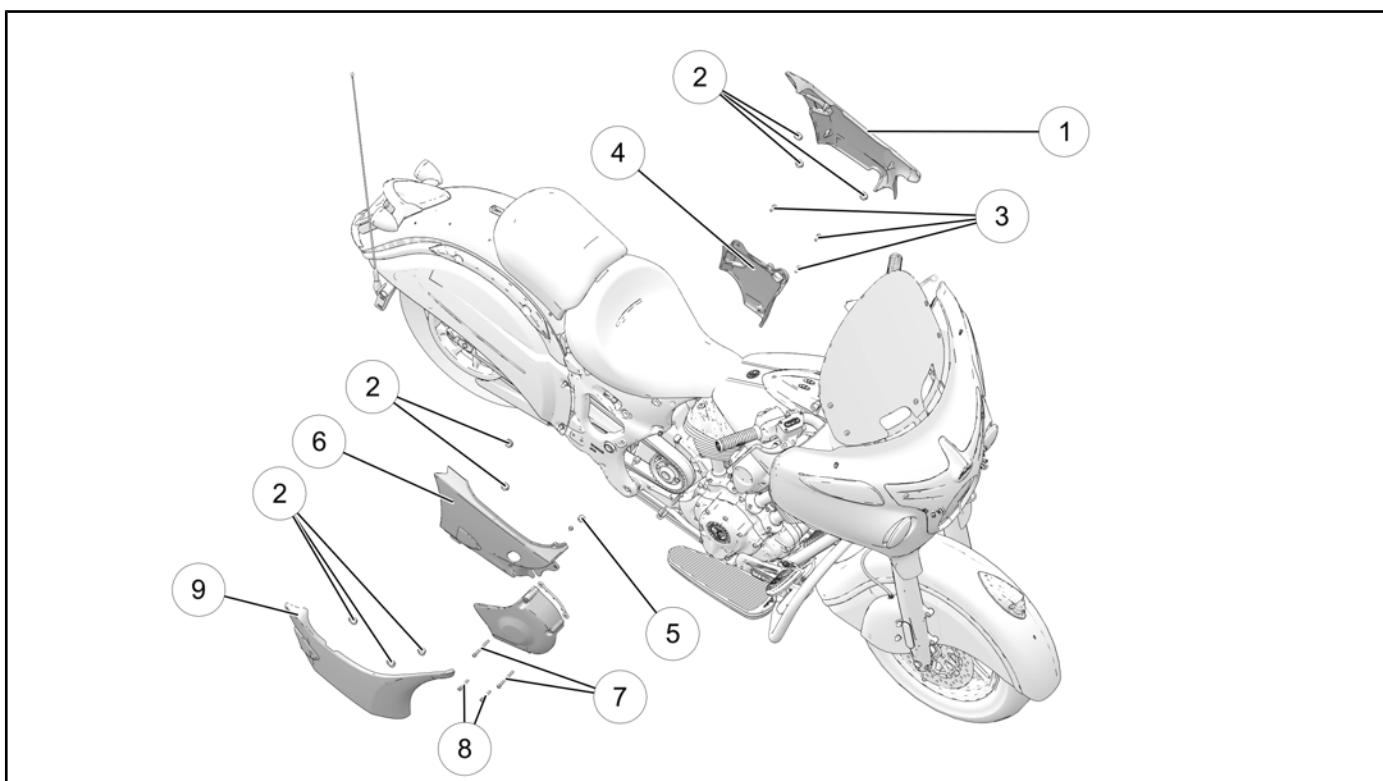
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Passenger Seat Fastener	18 ft-lbs (24 Nm)
②	Driver Seat Fastener	18 ft-lbs (24 Nm)
③	Strut Cover Fastener	84 in-lbs (10 Nm)
④	Rear Fender Upper Fastener	84 in-lbs (10 Nm)
⑤	Rear Fender Lower Stud / Ball	84 in-lbs (10 Nm)
⑥	Fender Fastener	84 in-lbs (10 Nm)
⑦	Front Fender Fastener	18 ft-lbs (24 Nm)

FRAME

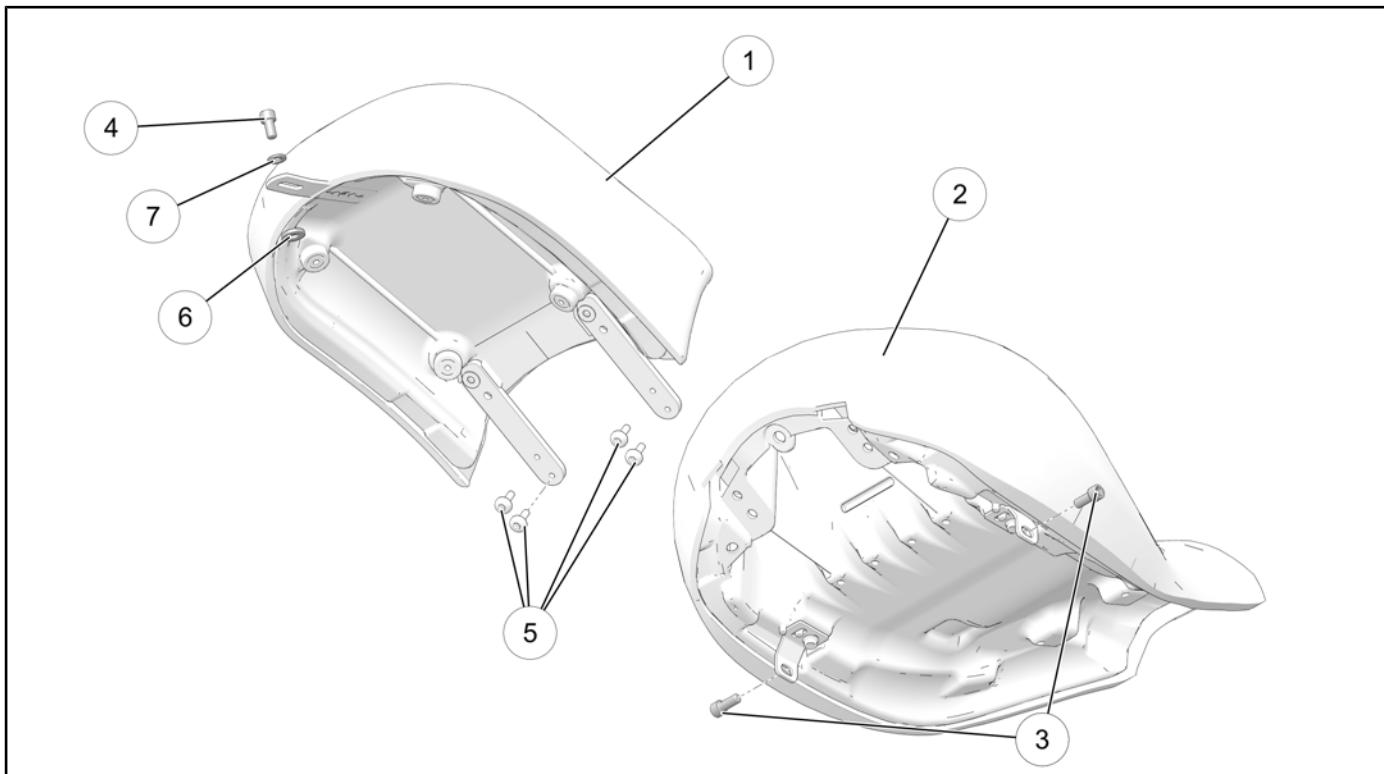
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Down Tube (Lower) — M10 x 1.5 x 60 (QTY.4)	45 ft-lbs (60 Nm)
②	Fastener, Down Tube (Lower LH) — M10 x 1.5 x 25 (QTY.1)	45 ft-lbs (60 Nm)
③	Fastener, Down Tube (Upper) — M10 x 1.5 x 100 (QTY.2)	45 ft-lbs (60 Nm)
④	Fastener — M12 x 1.75 x 120 (QTY.3)	75 ft-lbs (102 Nm)
⑤	Fastener, Midcast — M12 x 1.75 x 50 (QTY.3)	75 ft-lbs (102 Nm)
⑥	Fastener, Rear Subframe — M10 x 1.5 x 35 (QTY.6)	35 ft-lbs (48 Nm)
⑦	Fastener, Rear Lower Subframe — M8 x 1.25 x 20 (QTY.4)	18 ft-lbs (24 Nm)
⑧	Fastener, Engine Bracket — M8 x 1.25 x 20 (QTY.2)	18 ft-lbs (24 Nm)

FLOORBOARDS

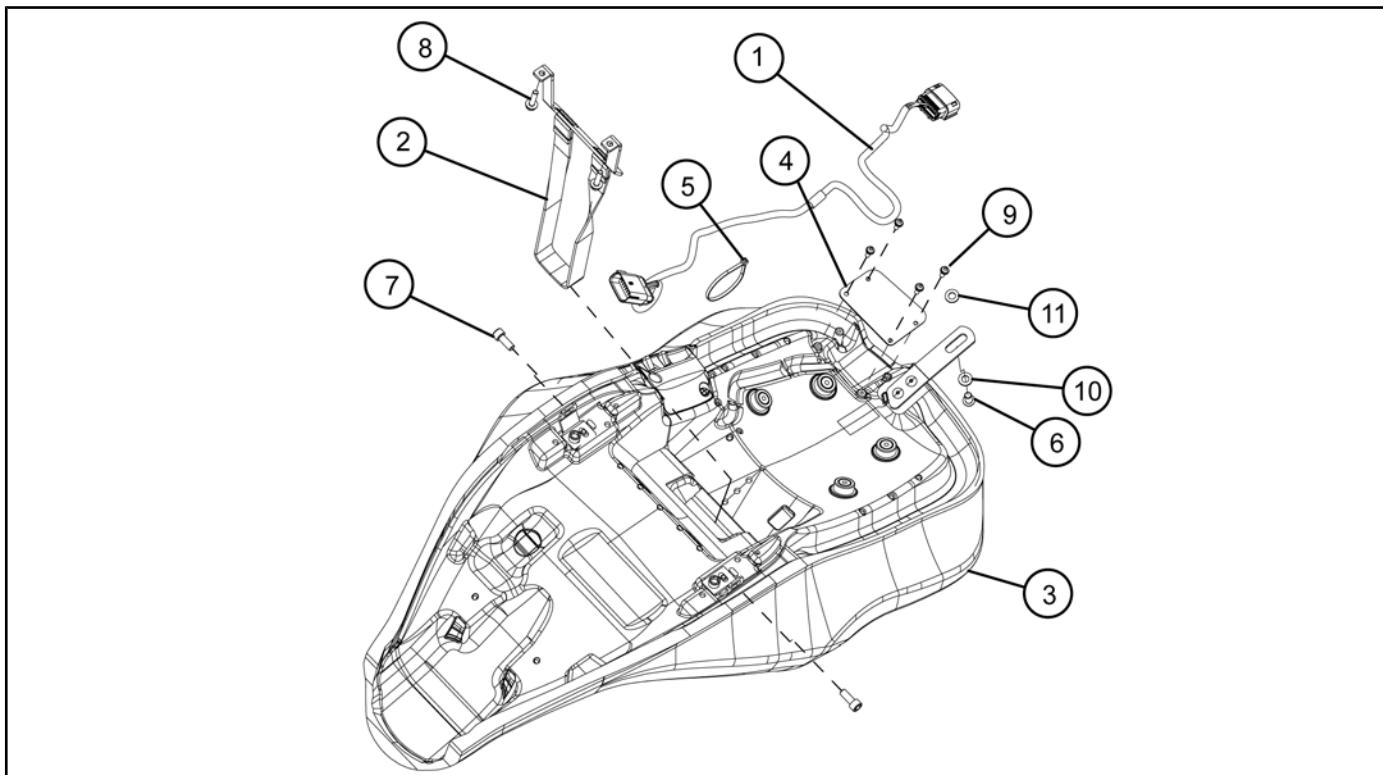
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Floorboard Pivot — M8 x 1.25 x 120 (QTY.2)	18 ft-lbs (24 Nm)
②	Fastener, Floorboard Support — M10 x 1.5 x 30 (QTY.4)	35 ft-lbs (48 Nm)
③	Fastener, Brake Pedal Pad — M6 x 1.0 x 15 (QTY.2)	84 in-lbs (10 Nm)
④	Shifter Toe Pedal	18 ft-lbs (24 Nm)
⑤	Floorboard Pan	-
⑥	Floorboard Pad	-
⑦	Brake Pedal Pad	-
⑧	External Snap Ring (Brake Pedal and Shifter)	-
⑨	Retaining Pin, Pushrod	-
⑩	Passenger Foot Peg Support Bracket	-
⑪	Passenger Foot Peg	-

SIDE PANELS

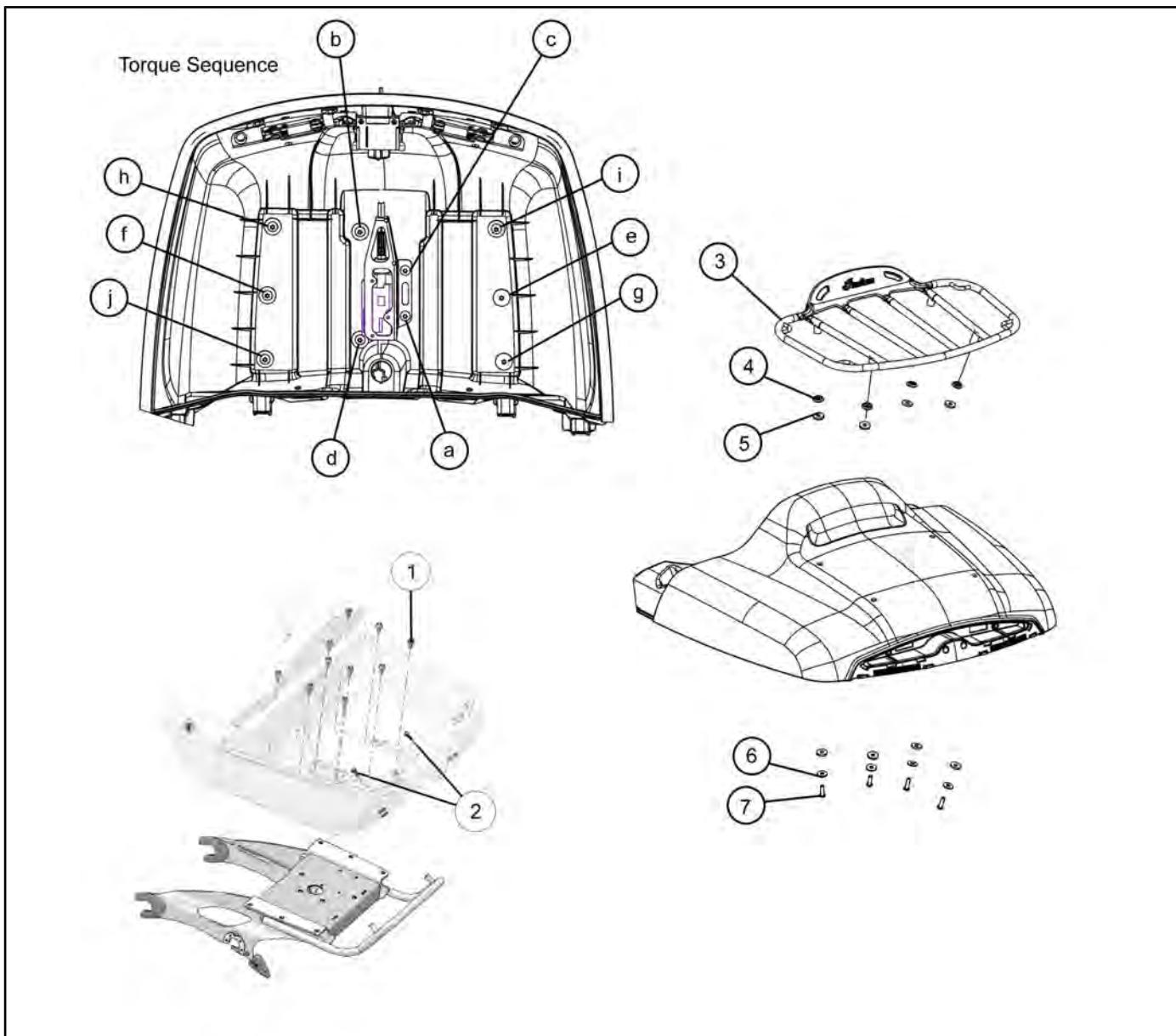
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Side Cover, Left Hand Upper	—
②	Rubber Grommet	—
③	Fastener, Left Hand Lower Side Cover — M6 x 1.0 x 15 (QTY.3)	84 in-lbs (10 Nm)
④	Side Cover, Left Hand Lower	—
⑤	Rubber Isolator	—
⑥	Side Cover, Right Hand Lower	—
⑦	Fastener, Right Hand Sprocket Cover — M6 x 1.0 x 70 (QTY.2)	84 in-lbs (10 Nm)
⑧	Fastener, Right Hand Sprocket Cover — M6 x 1.0 x 40 (QTY.2)	84 in-lbs (10 Nm)
⑨	Side Cover, Right Hand Upper	—

SEAT - ALL (EXCEPT ROADMASTER)

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Seat, Passenger (except Dark Horse)	-
②	Seat, Driver	-
③	Fastener, Seat - M8 x 1.25 x 20 (QTY.2)	18 ft-lbs (24 Nm)
④	Fastener, Seat - M8 x 1.25 x 16 (QTY.1) (except Dark Horse)	84 in-lbs (10 Nm)
⑤	Fastener, Passenger to Driver Seat - M x 1.0 x 15 (QTY.4) (except Dark Horse)	84 in-lbs (10 Nm)
⑥	Washer (QTY.1) (except Dark Horse)	-
⑦	Washer (QTY.1) (except Dark Horse)	-

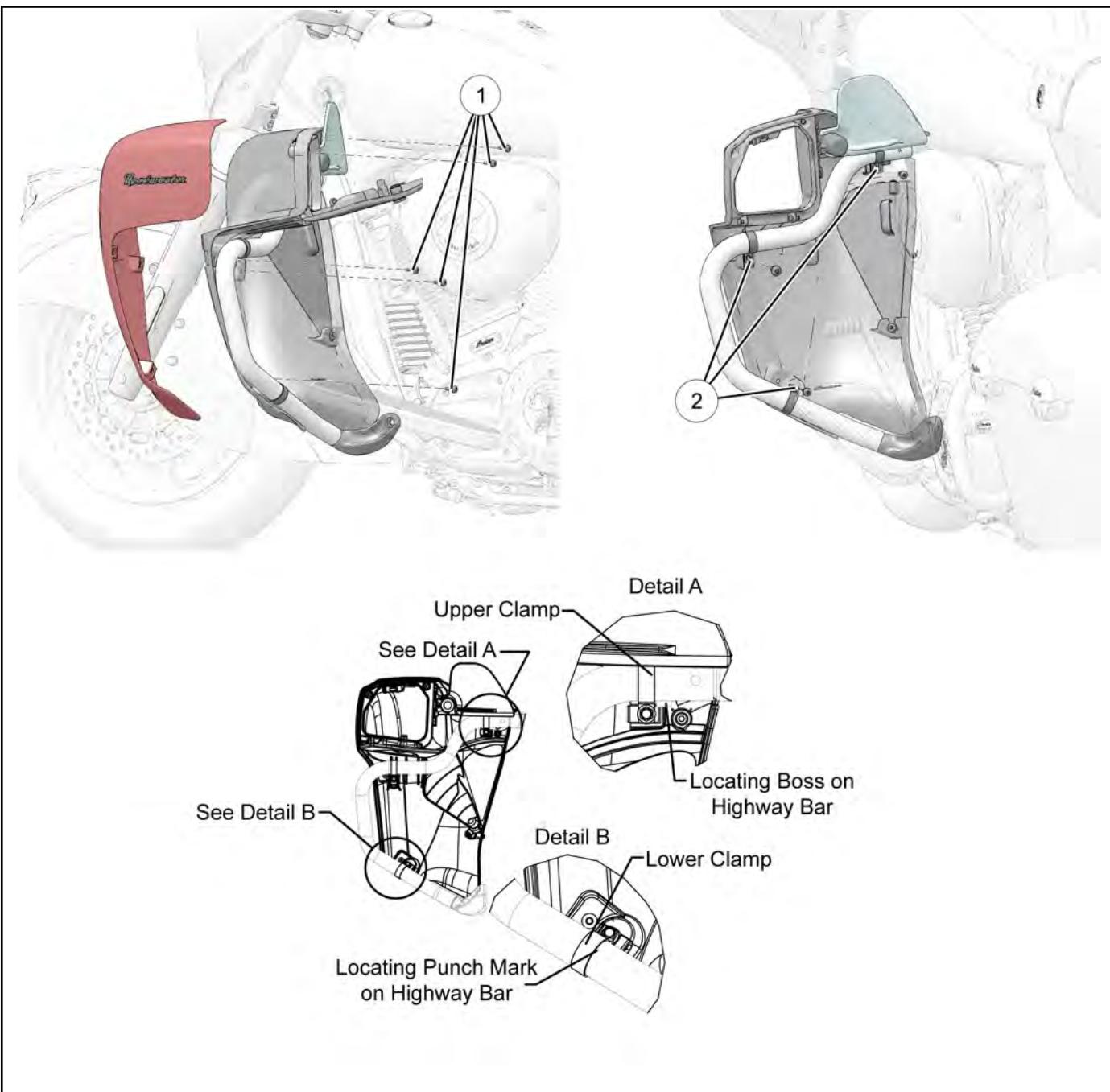
SEAT - ROADMASTER

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Harness, Trunk	-
②	Strap - Passenger Seat	-
③	Heated Seat Assembly	-
④	Wire Cover	-
⑤	Cable Tie	-
⑥	Fastener - M8 x 1.25x16 (QTY.1)	84 in-lbs (10 Nm)
⑦	Fastener, Seat - M8 x 1.25 x 20 (QTY.2)	18 ft-lbs (24 Nm)
⑧	Fastener, Strap - M6 x 1.0 x 25 (QTY.2)	8 ft-lbs (11 Nm)
⑨	Fastener (QTY.4)	14 in-lbs (2 Nm)
⑩	Washer (QTY.1)	-
⑪	Washer (QTY.1)	-

TRUNK, ROADMASTER

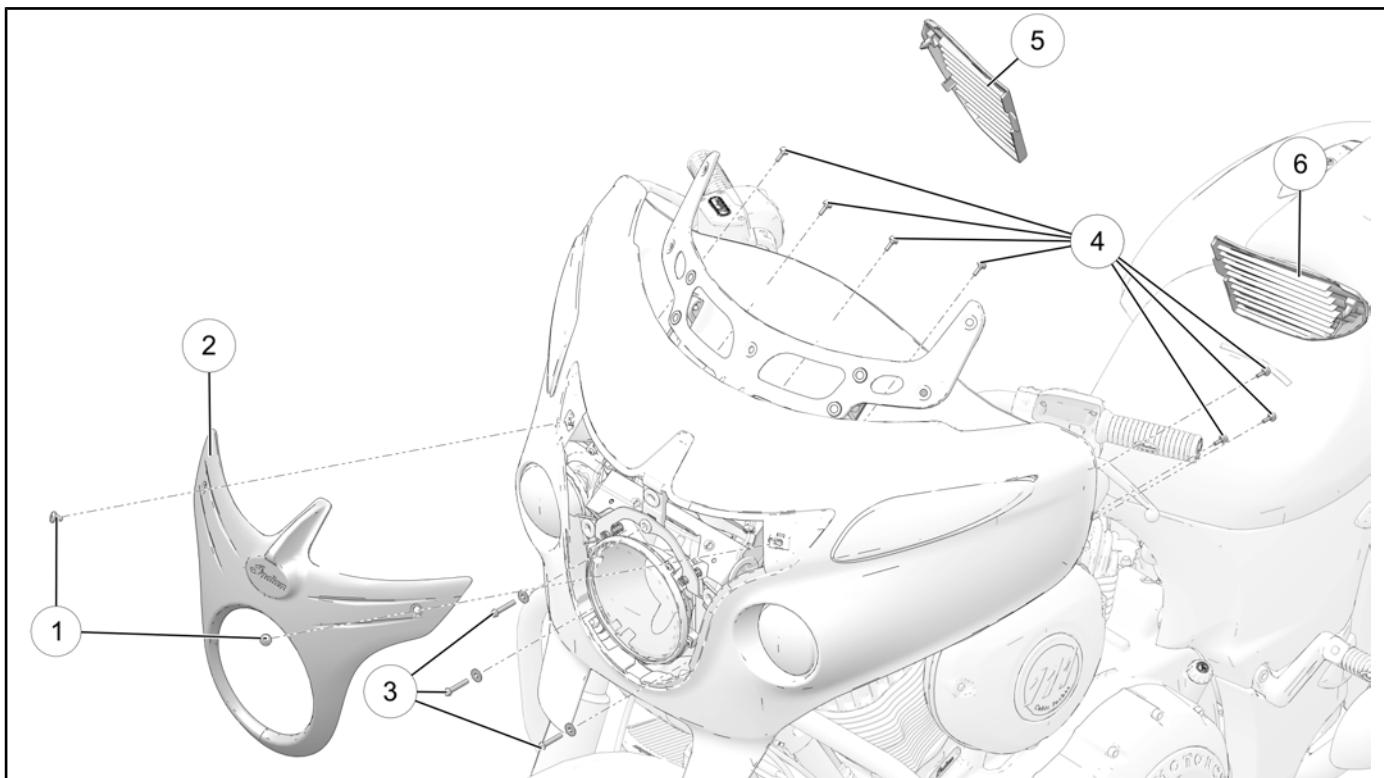
7

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Trunk Base - M8 x 1.25 x 20 (QTY.10)	13 ft-lbs (18 Nm)
②	Fastener, Trunk Back - M6 x 1.0 x 20 (QTY.2)	12 in-lbs (1 Nm)
③	Luggage Rack	-
④	Washer, Cup	-
⑤	Washer, Upper	-
⑥	Washer, Lower	-
⑦	Fastener, Luggage Rack - M6 x 1.0 x 20 (QTY.4)	12 in-lbs (1 Nm)

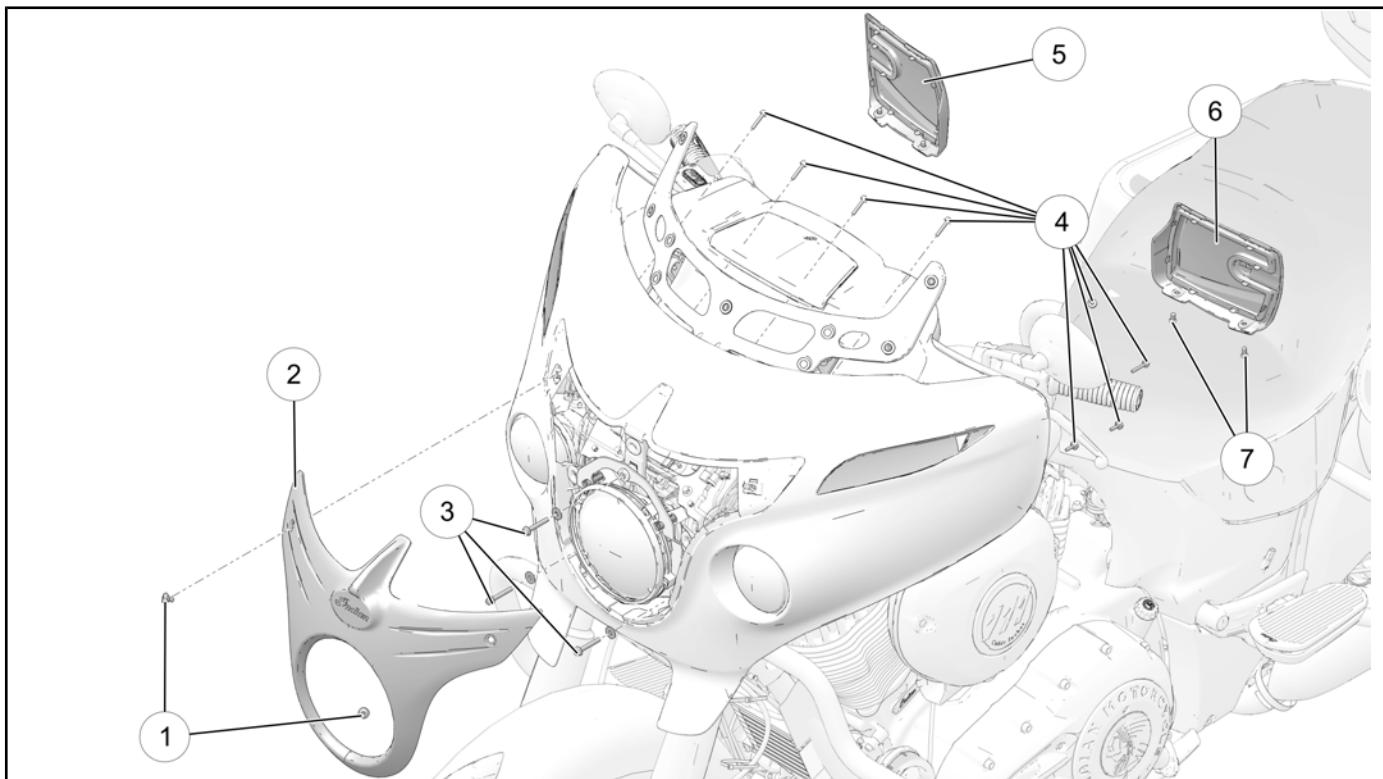
LOWER FAIRING, ROADMASTER

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Inner to Outer Fairing - (QTY.10)	36 in-lbs (4 Nm)
②	Fastener, Clamp - M6 x 1.0 x 16 - (QTY 6)	36 in-lbs (4 Nm)

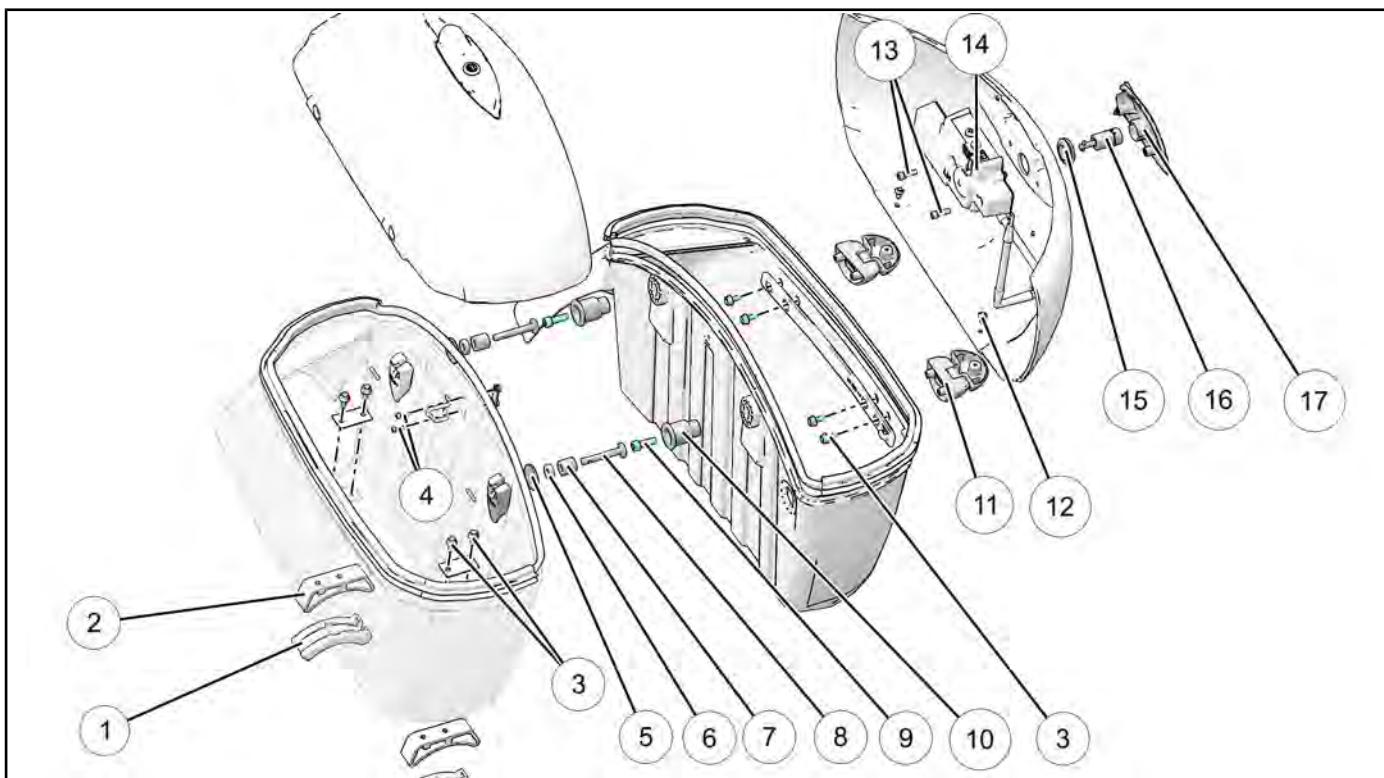
FAIRING, CHIEFTAIN DARK HORSE



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Bezel — M6 x 1.0 (QTY.2)	36 in-lbs (4 Nm)
②	Headlight Bezel	—
③	Fastener, Headlight Bracket — M6 x 1.0 x 40 (QTY.3)	NA
④	Fastener, Fairing — NOTE: Fasteners differ in size	See Fairing Installation (Frame / Body chapter)
⑤	Speaker Grill, RH	—
⑥	Speaker Grill, LH	—

FAIRING, CHIEFTAIN / ROADMASTER

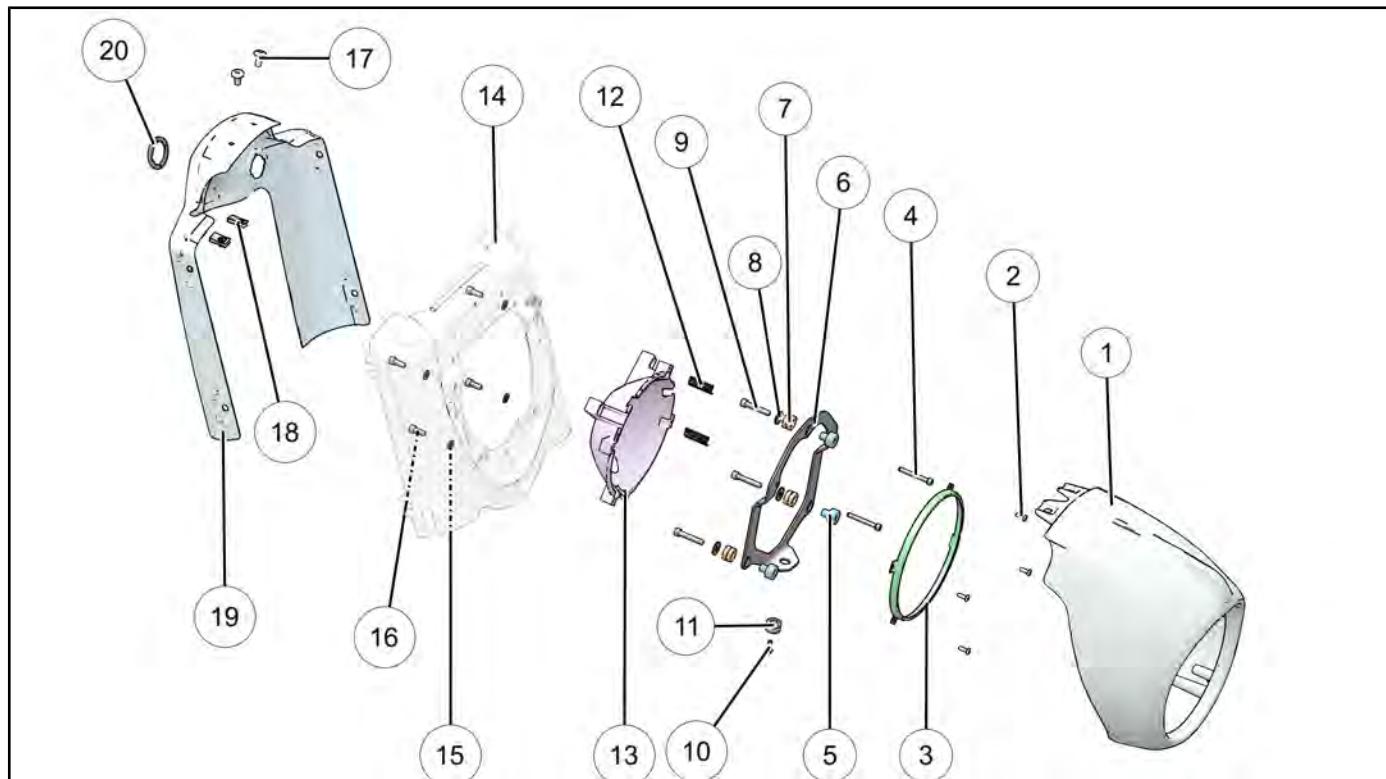
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Bezel — M6 x 1.0 (QTY.2)	36 in-lbs (4 Nm)
②	Headlight Bezel	—
③	Fastener, Headlight Bracket — M6 x 1.0 x 40 (QTY.3)	NA
④	Fastener, Fairing — NOTE: Fasteners differ in size	See Fairing Installation (Frame / Body chapter)
⑤	Speaker Grill, RH	—
⑥	Speaker Grill, LH	—
⑦	Fastener, Speaker	36 in-lbs (4 Nm)

SADDLEBAGS, CHIEFTAIN / ROADMASTER

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Pad, Saddle Bag Mount (QTY.4)	-
②	Bracket, Saddle Bag Mount (QTY.4)	-
③	Fastener - M6 x 1.0 x 16 (QTY.16)	84 in-lbs (10 Nm)
④	Fastener, Latch Striker - M4 x 0.7 x 16 (QTY.4)	36 in-lbs (4 Nm)
⑤	Washer, Rubber (QTY.4)	-
⑥	Spacer, Saddlebag Latch (QTY.4)	-
⑦	Bushing, Rubber (QTY.4)	-
⑧	Pin, Anchor (QTY.4)	-
⑨	Fastener, Spool - M8 x 1.25 x 25 (QTY.4)	25 ft-lbs (34 Nm)
⑩	Spool (QTY.4)	-
⑪	Hinge, Lid (QTY.4)	-
⑫	Fastener, Hinge - M5 x 0.8 x 12 (QTY.4)	45 in-lbs (5 Nm)
⑬	Fastener, Latch Asm. - M6 x 1.0 x 20 (QTY.4)	65 in-lbs (7 Nm)
⑭	Actuator, Lock (QTY.2)	-
⑮	Seal, Saddlebag Lock (QTY.2)	-
⑯	Lock Cylinder (QTY.2)	-
⑰	Handle, Latch (QTY.2)	-

FRAME / BODY

NACELLE, VINTAGE / SPRINGFIELD



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Cover, Front Headlight(QTY.1)	-
②	Fastener - #8-18 x .50" (QTY.4)	12 in-lbs (1 Nm)
③	Retaining Ring, Bulb (QTY.1)	-
④	Fastener, Headlight Adjuster (QTY.2)	-
⑤	Bushing, Headlight Flange (QTY.3)	-
⑥	Bracket, Headlight (QTY.1)	-
⑦	Isolator, Headlight (QTY.3)	-
⑧	Washer - 6.4 x 10 x 1.6 (QTY.3)	-
⑨	Fastener - M6 x 1.0 x 35 (QTY.3)	-
⑩	Fastener - 10-16 (QTY.1)	12 in-lbs (1 Nm)
⑪	Grommet (QTY.1)	-
⑫	Spring, Headlight Adjuster (QTY.2)	-
⑬	Carrier, Headlight (QTY.1)	-
⑭	Cover, Front Nacelle (QTY.1)	-
⑮	Washer, Flat (QTY.4)	-
⑯	Fastener - M6 x 1.0 x 15 (QTY.4)	75 in-lbs (8 Nm)
⑰	Fastener - M6 x 1.0 x 16 (QTY.2)	36 in-lbs (4 Nm)
⑱	Clip, Speed Nut (QTY.2)	-
⑲	Cover, Rear Nacelle (QTY.1)	-
⑳	Spacer, Nacelle Bezel (QTY.1)	-

BODY / FRAME SERVICE

SIDE COVER (UPPER), REMOVAL / INSTALLATION

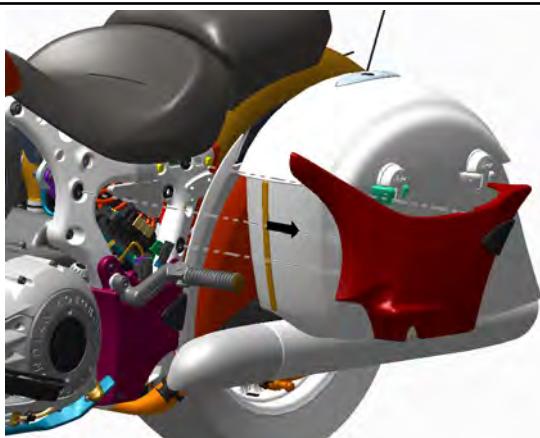
CAUTION

Use care not to scratch or damage painted surfaces during side cover removal and / or installation.

1. Working from the right side of the motorcycle, pull corners of the upper cover evenly straight outward to disengage each tab from rubber grommet in frame.



2. Working from the left hand side of the motorcycle, pull corners of the upper cover evenly straight outward to disengage each tab from rubber grommet in frame.



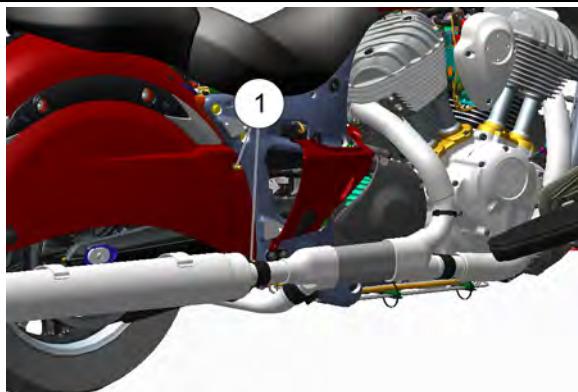
INSTALLATION is performed by reversing the removal procedure. Using a mild soapy water solution on the rubber grommets will make it easier to press the side covers into position.

SIDE COVER (LOWER), REMOVAL / INSTALLATION

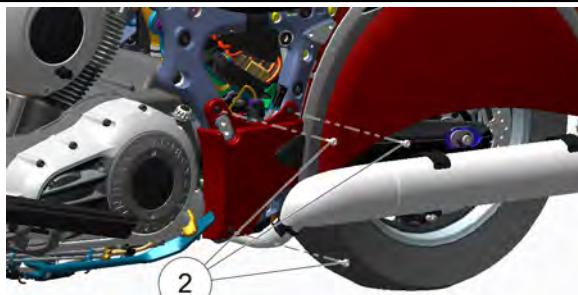
CAUTION

Use care not to scratch or damage painted surfaces during side cover removal and /or installation.

1. Remove the upper side covers, page 7.17 from both sides of the motorcycle.
2. If applicable, remove the passenger foot pegs, page 7.21 from both sides of the motorcycle.
3. Remove the Cross Over Pipe Removal, page 3.88.
4. Pull the rear edge of the RH lower side panel straight out to disengage the two rubber grommets ①.



5. Pull back slightly on the RH lower side panel to disengage from the front rubber grommet.
6. Working from the LH side of the motorcycle, use a 6 mm hex wrench to remove the 3 fasteners ② securing the panel to the frame. Remove panel.



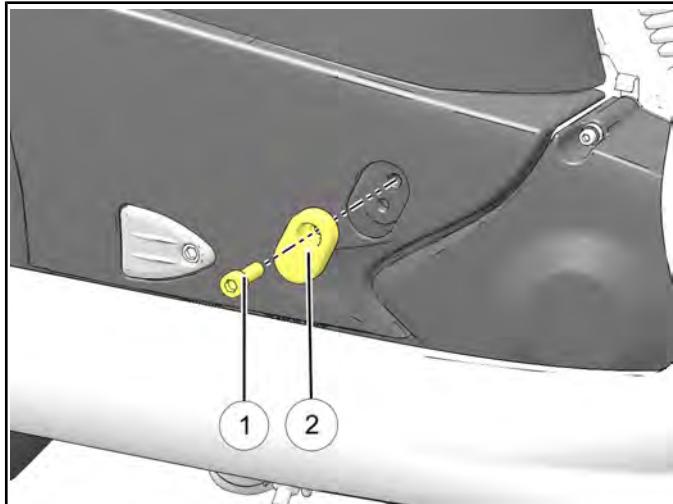
7. **INSTALLATION** is performed by reversing the removal procedure. Using a mild soapy water solution on the rubber grommets will make it easier to press the side covers into position.

TORQUE

LH Side Cover Fasteners: 84 in-lbs (10 Nm)

PASSENGER FOOT PEG BLANKS (DARK HORSE), REMOVAL / INSTALLATION

1. Remove fastener ① and passenger foot peg blank ②.



2. Installation is performed by reversing the removal procedure. Torque fasteners to specification.

TORQUE

Foot Peg Blank Fastener: 35 ft-lbs (48 Nm)

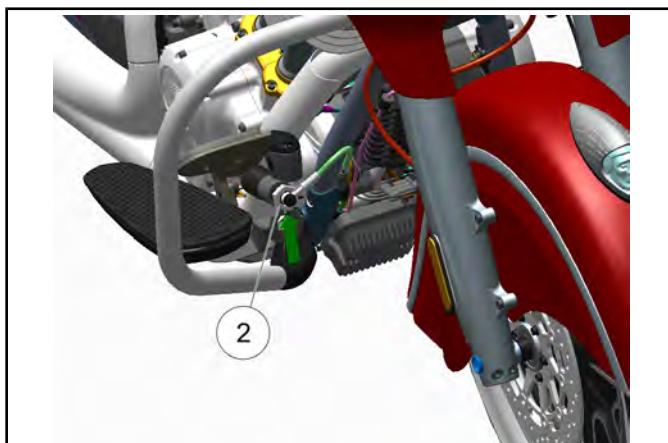
FLOORBOARD REMOVAL

Secure the motorcycle in an upright position. For detailed floorboard assembly / disassembly information, please see the FLOORBOARD ASSEMBLY VIEW, page 7.7 located in this chapter.

1. Remove cotter pin and washer ① from brake master cylinder pushrod. Disengage pushrod from the brake pedal assembly.



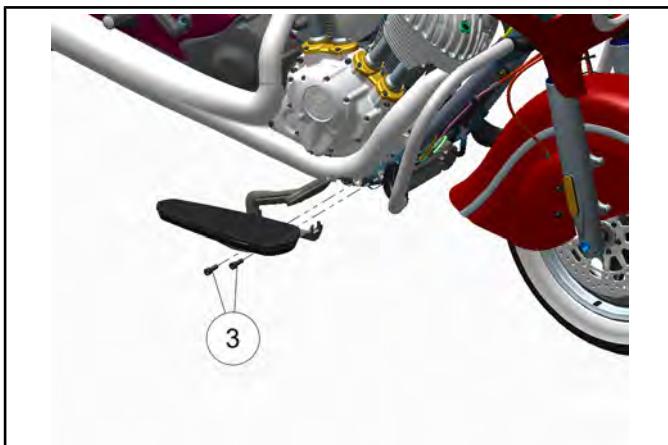
2. Loosen the jam nut ② and remove the brake master cylinder from the RH floorboard assembly and move out of the way.



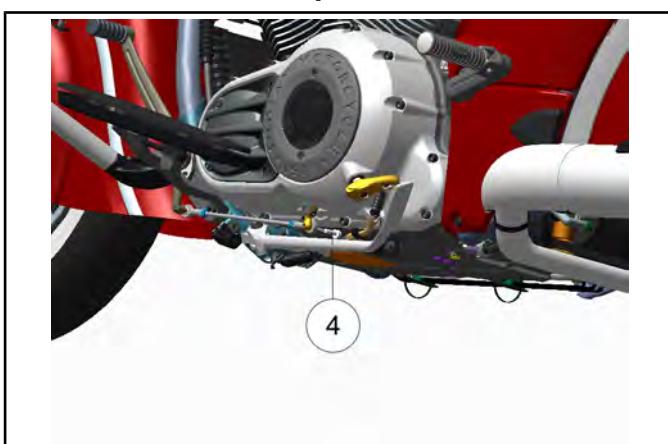
CAUTION

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.

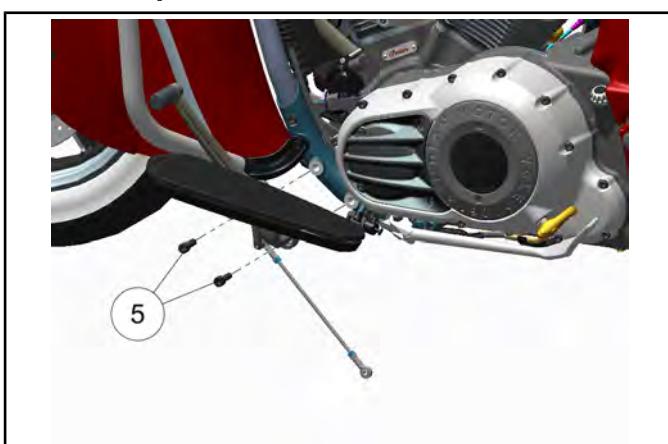
- Working on the RH side of the motorcycle, remove the two fasteners ③ securing the floorboard support bracket to the frame.



- Working from the left side of the motorcycle, remove the rear shift rod fastener ④ and move shift rod out of the way.



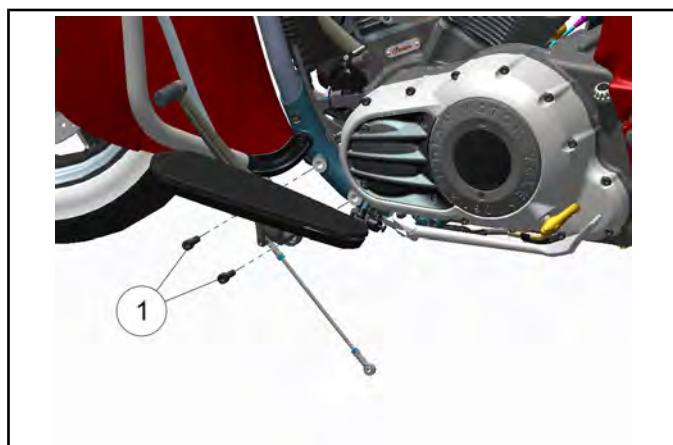
- Remove the two fasteners ⑤ securing the LH floorboard to the frame and remove floorboard assembly.



FLOORBOARD INSTALLATION

Secure the motorcycle in an upright position.

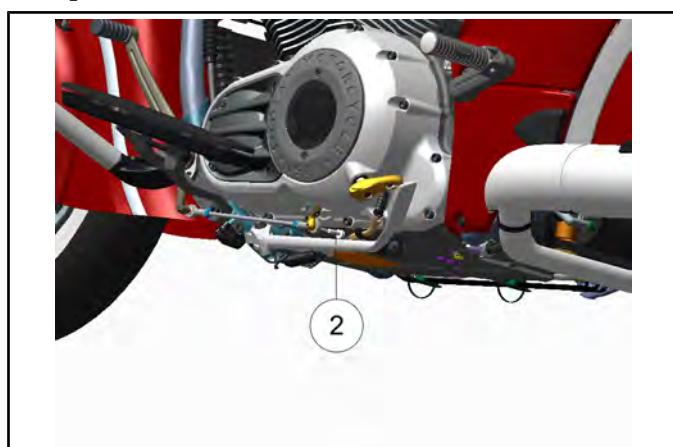
- Working from the LH side of the motorcycle, lift the floorboard assembly into position and torque the two fasteners ① to specification.



TORQUE

Floorboard Bracket Fasteners: **35 ft-lbs (48 Nm)**

- Lift the shift rod into position at the inside of the shift arm and torque shift rod fastener ② to specification.

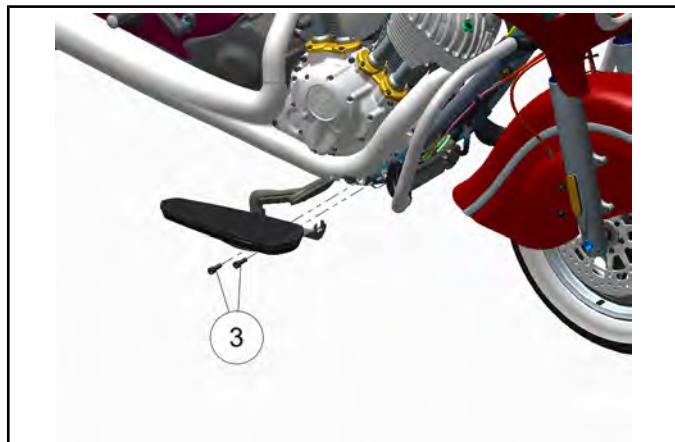


TORQUE

Shift Rod Fastener: **84 in-lbs (10 Nm)**

FRAME / BODY

3. Working on the RH side of the motorcycle, lift the floorboard assembly into position and torque the two fasteners ③ to specification.



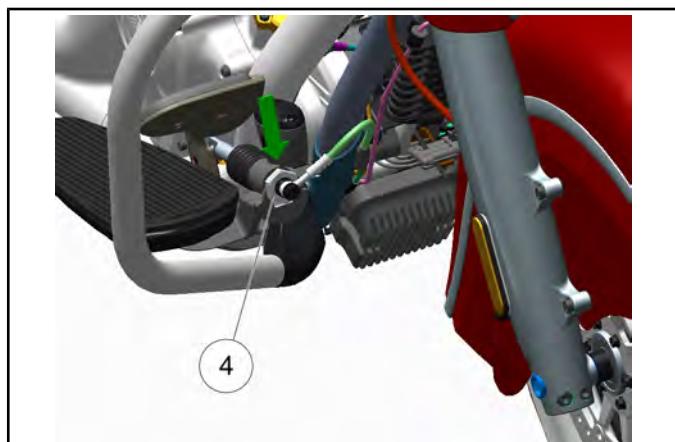
5. Apply a thin coat of grease to the pushrod pivot pin ⑤ and connect the pushrod to the foot pedal linkage.



TORQUE

Floorboard Bracket Fasteners: **35 ft-lbs (48 Nm)**

4. Lower the master cylinder assembly onto the floorboard bracket and torque the jam nut ④ to specification.



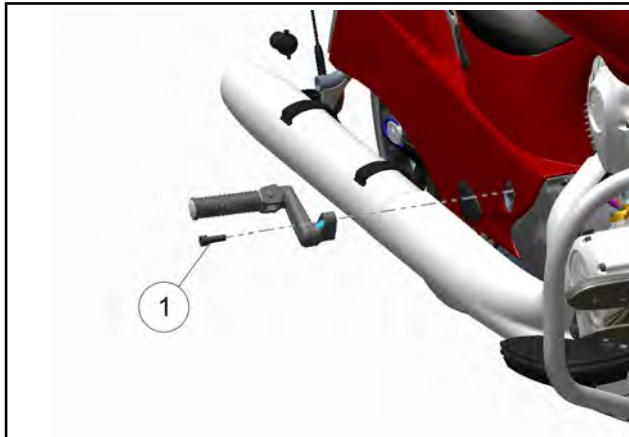
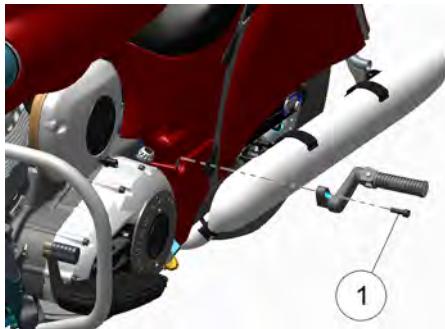
6. Test foot brake and verify that the pedal feels good and no air has entered the hydraulic circuit. Bleed brakes if necessary.

TORQUE

Master Cylinder Jam Nut: **35 ft-lbs (48 Nm)**

FOOT PEGS (PASSENGER), REMOVAL / INSTALLATION

1. Remove fasteners ① securing foot peg bracket to frame.
2. Remove foot peg / bracket as an assembly.



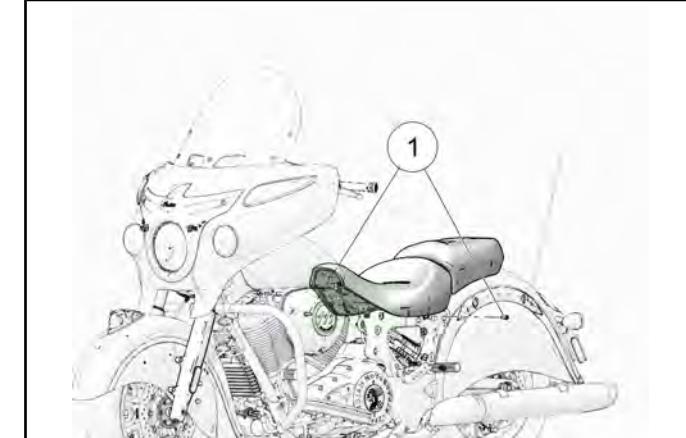
3. **INSTALLATION** is performed by reversing the removal procedure.
4. Torque passenger foot peg bracket fasteners ① to specification.

TORQUE

Passenger Foot Peg Fasteners: 35 ft-lbs (48 Nm)

SEAT REMOVAL / INSTALLATION - ALL (EXCEPT ROADMASTER)

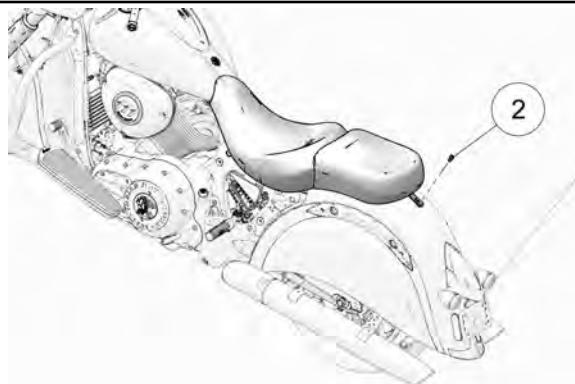
1. Remove left and right side covers., page 7.17
2. Using a 6 mm hex wrench, remove the two fasteners ① securing the driver's seat to the frame.



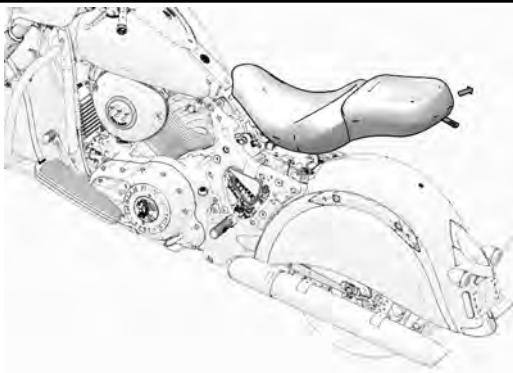
NOTE

It may be necessary to lift the seat skirt to access the side fasteners on some models.

3. Remove the passenger seat fastener ②.



- Lift the rear of the seat and pull rearward to disengage front retaining arms from the bracket behind the fuel tank.



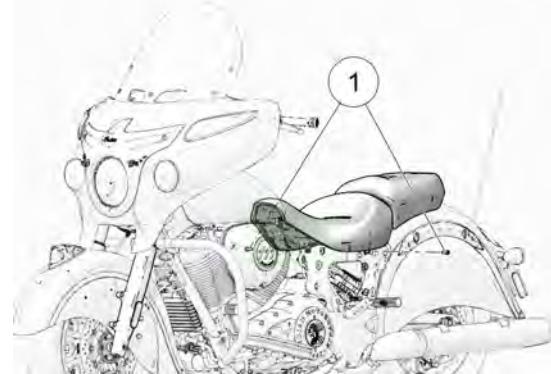
- INSTALLATION** is performed by reversing the removal procedure.
- Torque the seat fasteners to specification.

TORQUE

Seat Fasteners (All): **84 in-lbs (10 Nm)**

SEAT REMOVAL / INSTALLATION - (ROADMASTER)

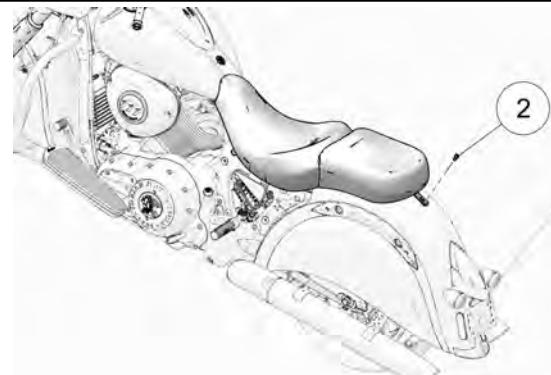
- Remove left and right side covers., page 7.17
- Remove trunk assembly. See Trunk Removal, Roadmaster, page 7.29.
- Using a 6 mm hex wrench, remove the two fasteners ① securing the driver's seat to the frame.



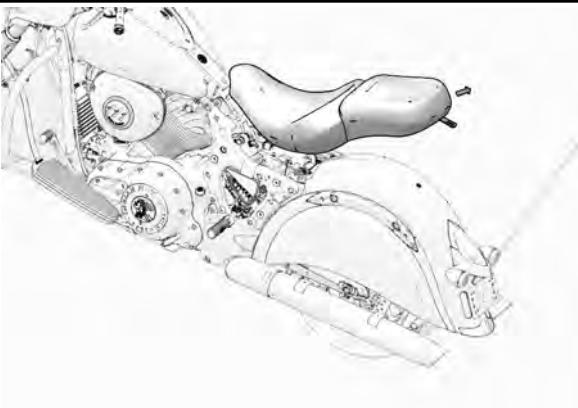
NOTE

It may be necessary to lift the seat skirt to access the side fasteners on some models.

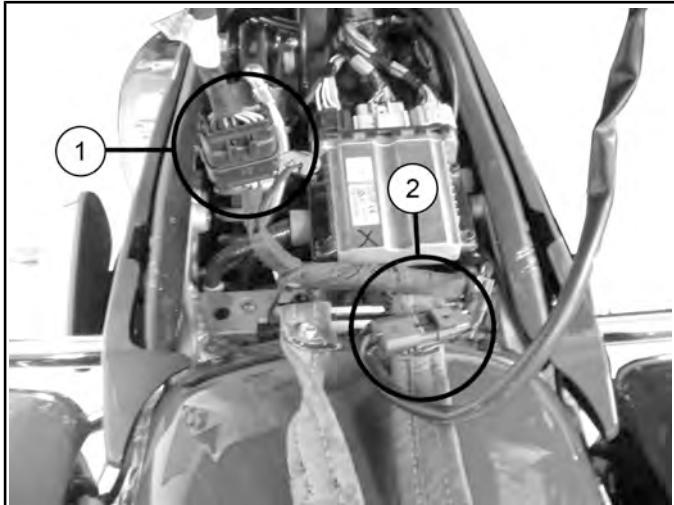
- Remove the passenger seat fastener ②.



- Lift the rear of the seat and pull rearward to disengage front retaining arms from the bracket behind the fuel tank.



- If applicable, disconnect the trunk harness ① and heated seat connector ②.



NOTE

Mark the vehicle side connectors with tape for reference during seat installation.

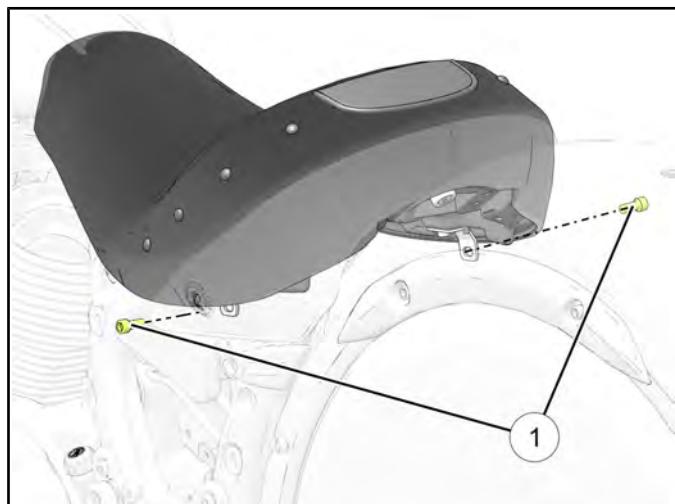
- Remove the seat assembly.
- INSTALLATION is performed by reversing the removal procedure.**
- Torque the seat fasteners to specification.

TORQUE

Seat Fasteners (All): 84 in-lbs (10 Nm)

SEAT REMOVAL / INSTALLATION - (DARK HORSE)

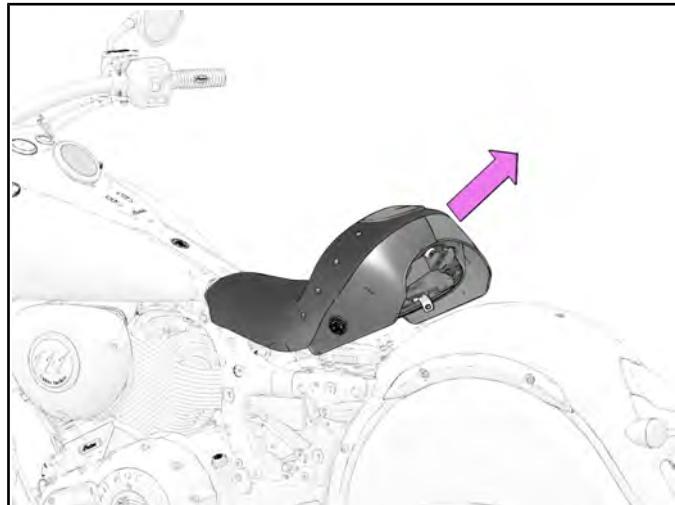
- Remove left and right side covers., page 7.17
- Using a 6 mm hex wrench, remove the two fasteners ① securing the driver's seat to the frame.



NOTE

It may be necessary to lift the seat skirt to access the side fasteners on some models.

- Lift the rear of the seat and pull rearward to disengage front retaining arms from the bracket behind the fuel tank.



- INSTALLATION is performed by reversing the removal procedure.**

TORQUE

Seat Fasteners (All): 84 in-lbs (10 Nm)

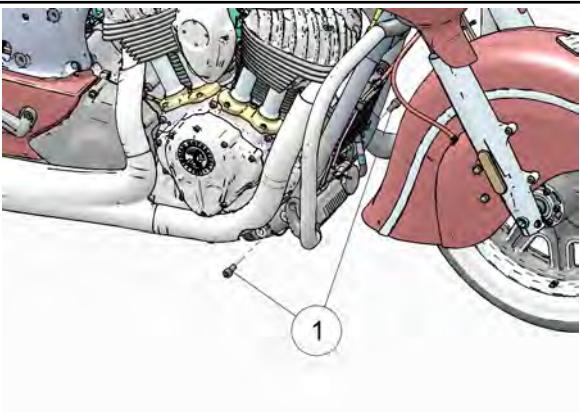
HIGHWAY BAR REMOVAL

Place the motorcycle on the side stand. Turn the handlebar all the way to the left.

CAUTION

Protect chrome and painted surfaces prior to removal, particularly the front fender.

- Using an 8 mm hex wrench, remove the lower two fasteners ① from the right and left side of the highway bar assembly.

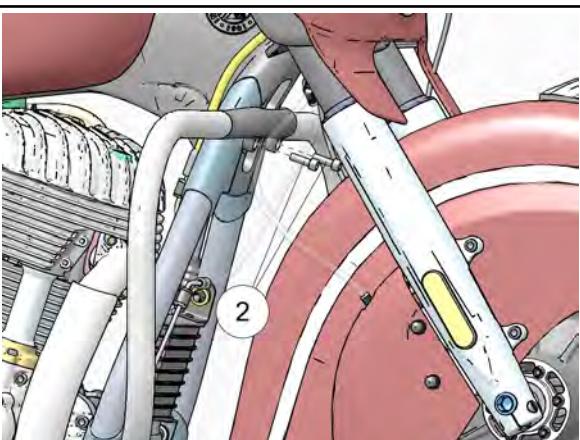


2.

CAUTION

Hold the highway bar assembly in place while removing the top fasteners so it doesn't swing down and damage the front fender.

Using a 6 mm hex wrench, remove the top two fasteners ② from the highway bar assembly.



- Carefully maneuver the highway bar out from the frame / fender area.

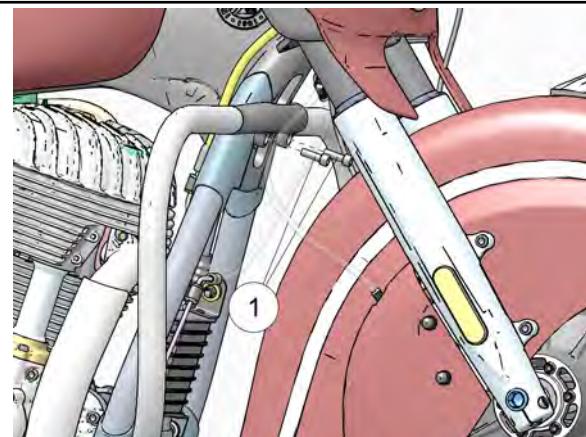
HIGHWAY BAR INSTALLATION

Place the motorcycle on the side stand. Turn the handlebar all the way to the left.

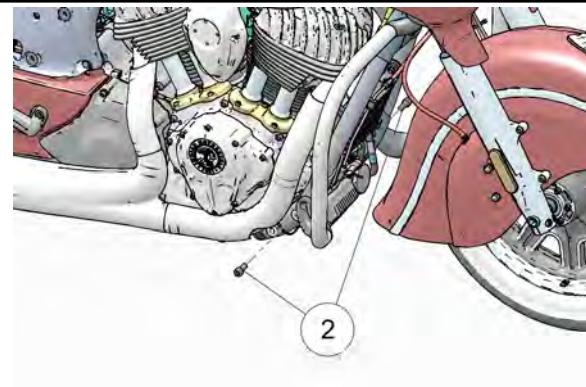
CAUTION

Protect chrome and painted surfaces prior to removal, particularly the front fender.

- Carefully maneuver the highway bar into position and thread the upper mounting fasteners ① in finger tight.



- Install the lower mounting fasteners ② and torque upper and lower fasteners to specification.

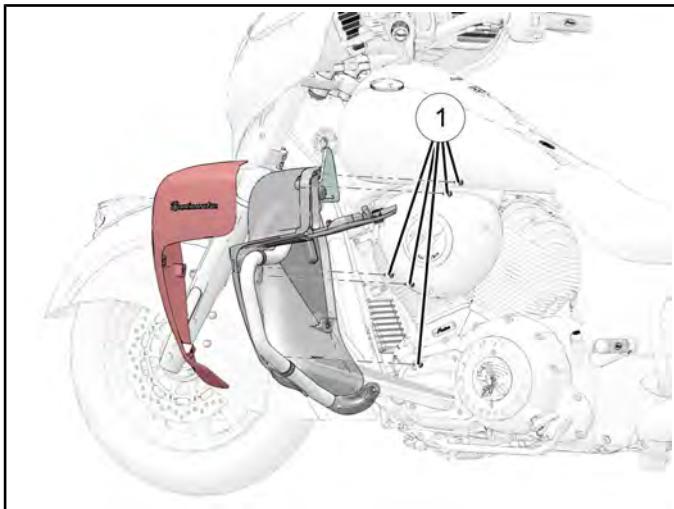
**TORQUE**

Upper Highway Bar Fasteners: 18 ft-lbs (24 Nm)
Lower Highway Bar Fasteners: 35 ft-lbs (48 Nm)

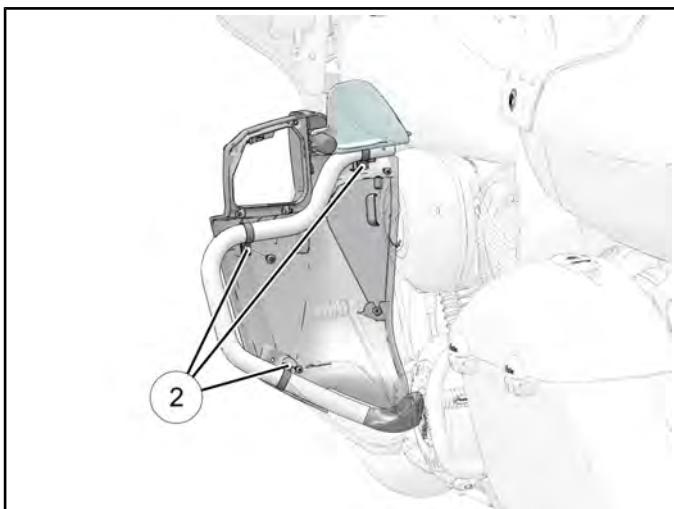
LOWER FAIRING REMOVAL - (ROADMASTER)**CAUTION**

Painted surfaces can be easily scratched or damaged during removal and installation. Be sure you have a safe location to store painted body components before they are removed.

1. Remove fasteners ① and carefully remove the outer fairing assembly.



2. Remove fasteners ② from clamps securing the inner fairing assembly to the highway bars.



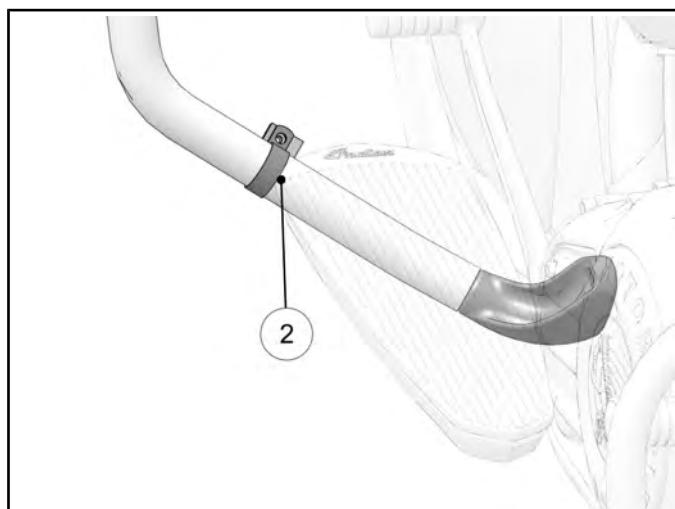
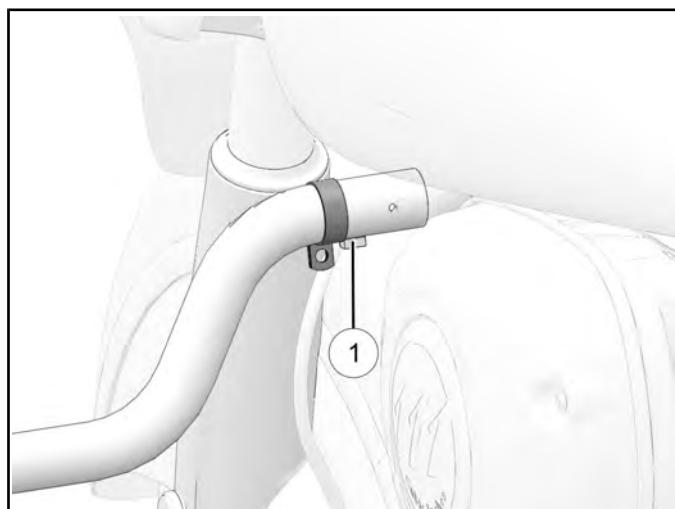
3. Remove the inner fairing assembly and associated clamps from the highway bars.

LOWER FAIRING INSTALLATION - (ROADMASTER)

1. Install the upper and lower fairing clamps onto the highway bars as shown.

NOTE

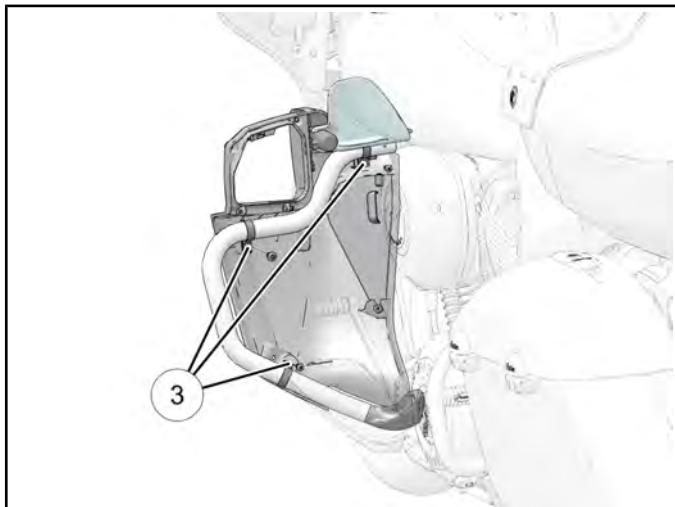
- The upper fairing clamp is positioned against the locating dowel ①.
- The lower fairing clamp is positioned to the outside of the locating mark ②.
- The center (outer) fairing clamp is attached last and does not have a locating mark.



2. Position the inner fairing assembly over the highway bar so the clamps line up with the fastener holes.
3. Install the upper and lower clamp fasteners finger tight.

FRAME / BODY

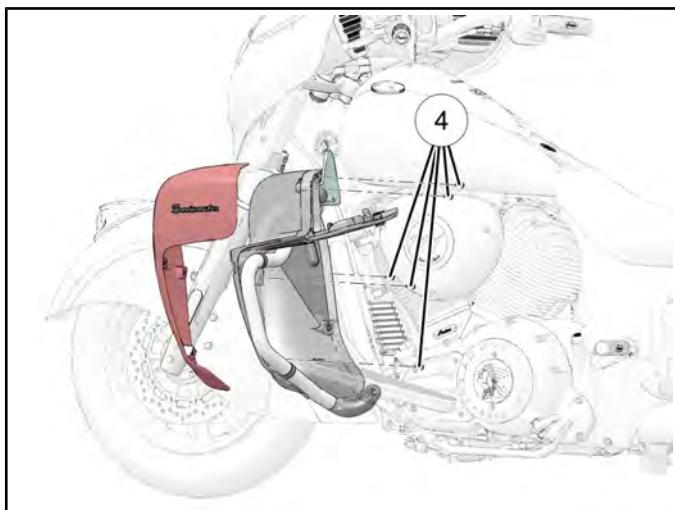
- Position the center (outer) fairing clamp onto the highway bar and line up with the fastener hole in the fairing.
- Starting with the upper clamp, followed by the lower and center clamps, torque all clamp fasteners ③ to specification.



TORQUE

Lower Fairing Clamp Fasteners: 36 in-lbs (4 Nm)

- Carefully position the outer fairing assembly over the inner and align the fastener holes.
- Install the five fasteners ④ securing the outer fairing to the inner fairing finger tight.



- Alternately tighten outer fairing fasteners to specified torque.

TORQUE

Inner to Outer Fairing Fasteners: 36 in-lbs (4 Nm)

FRONT FENDER REMOVAL

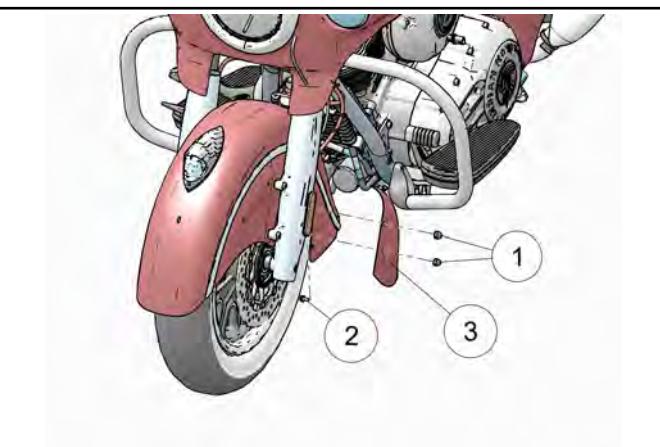
NOTE

Motorcycle should be parked on a level surface resting on the side stand.

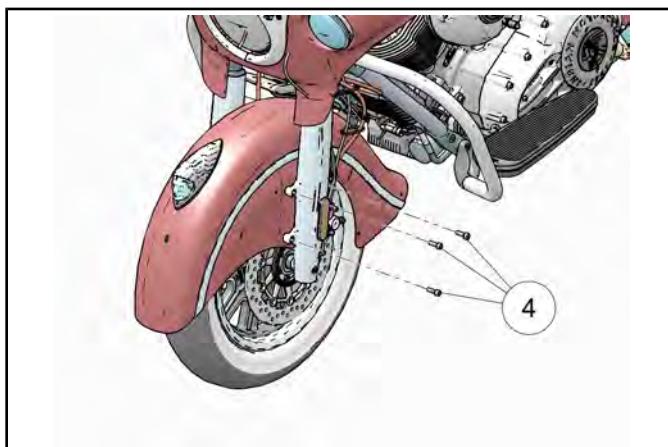
CAUTION

Use care not to scratch or damage painted surfaces during fender removal and / or installation.

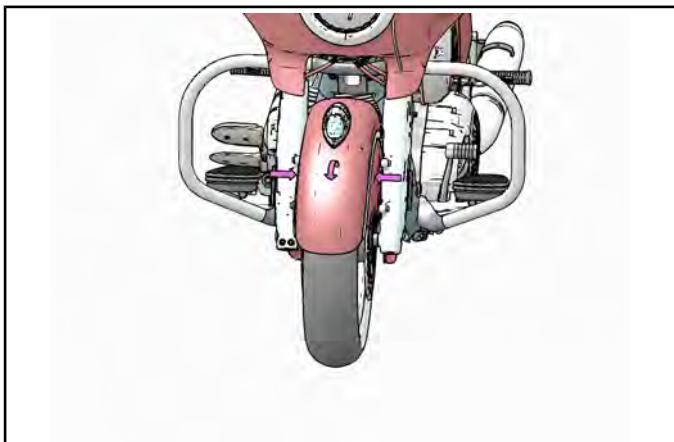
- Remove two acorn nuts ① and fastener ② from each side of the motorcycle and remove the caliper covers ③.



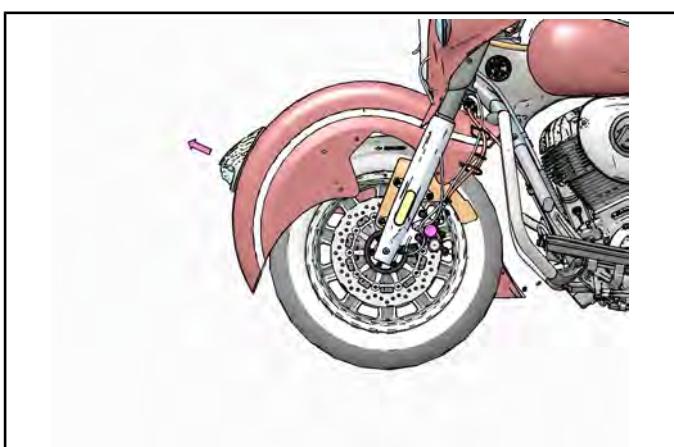
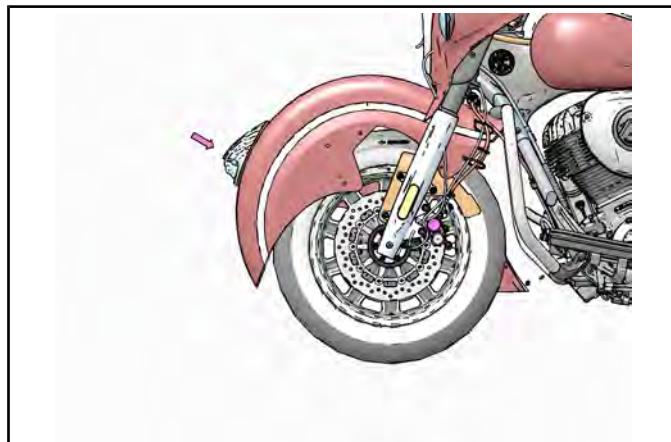
- Follow the fender light harness up into the fairing / nacelle, locate the connector and disconnect.
- Noting their position for reinstallation, cut the cable ties that are securing the fender light wire harness to the brake line.
- Remove the three fasteners ④ from each side of the fender.



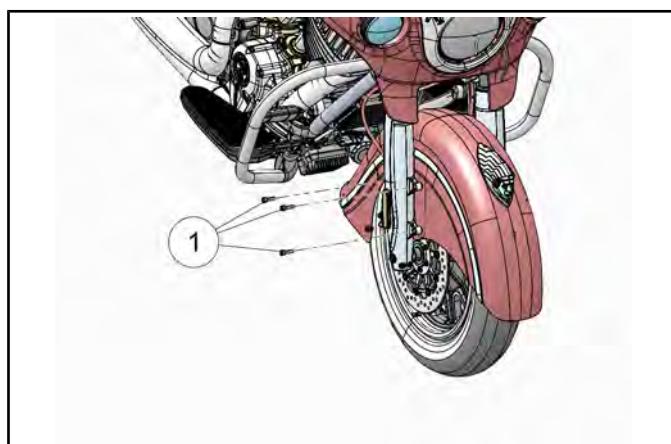
- Stand in front of the motorcycle facing the front fender and squeeze the sides together while "rolling" the fender out from the fork legs.



- Gently squeeze the sides of the front fender and "roll" the fender into position so the fastener holes line up.



- Install the three fasteners ① on each side of the fender and torque to specification.



IMPORTANT

Once fender has been removed from the motorcycle, make sure the fender is stored safely until it is reinstalled.

FRONT FENDER INSTALLATION

NOTE

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.

- Route the fender light wire harness into the fairing / nacelle and reconnect.

- Install cable ties to secure fender light harness away from moving parts.

- Install caliper cover. Torque to specification.

TORQUE

Front Fender Fasteners: 18 ft-lbs (24 Nm)

- Turn the handlebar all the way to the left and right to verify proper operation and freedom of movement.

Caliper Cover Acorn Nuts:
18 in-lbs (2 Nm)

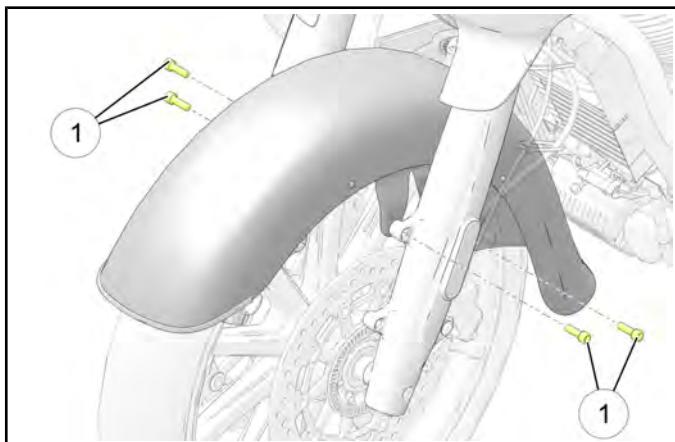
FRONT FENDER REMOVAL (OPEN STYLE FENDER)**NOTE**

Motorcycle should be parked on a level surface resting on the side stand.

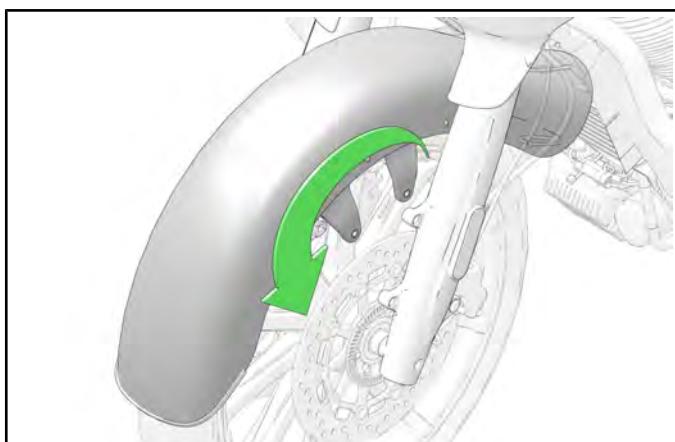
CAUTION

Use care not to scratch or damage painted surfaces during fender removal and / or installation.

1. Remove the two fasteners ① from each side of the fender.



2. Stand in front of the motorcycle facing the front fender and squeeze the sides together while "rolling" the fender out from the fork legs.

**IMPORTANT**

Once fender has been removed from the motorcycle, make sure the fender is stored safely until it is reinstalled.

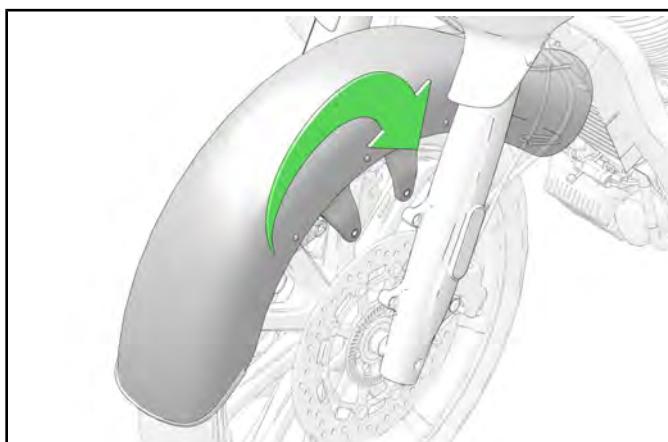
FRONT FENDER INSTALLATION (OPEN STYLE FENDER)**NOTE**

Motorcycle should be parked on a level surface resting on the side stand.

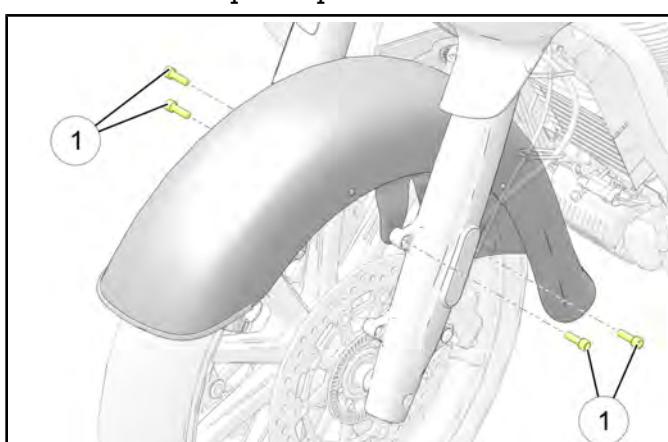
CAUTION

Use care not to scratch or damage painted surfaces during fender removal and / or installation.

1. Gently squeeze the sides of the front fender and "roll" the fender into position so the fastener holes line up.



2. Install the two fasteners ① on each side of the fender and torque to specification.

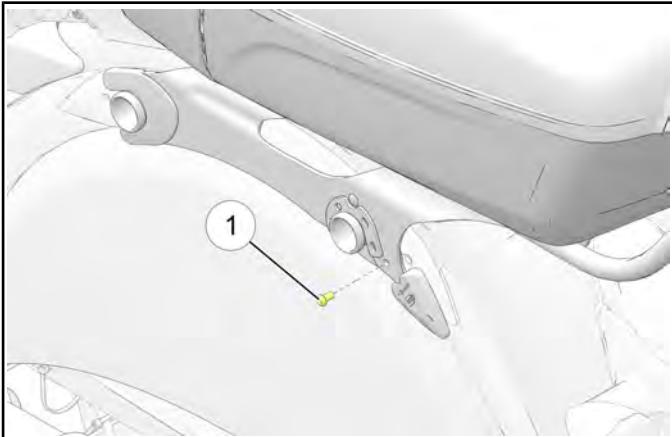
**TORQUE**

Front Fender Fasteners: 18 ft-lbs (24 Nm)

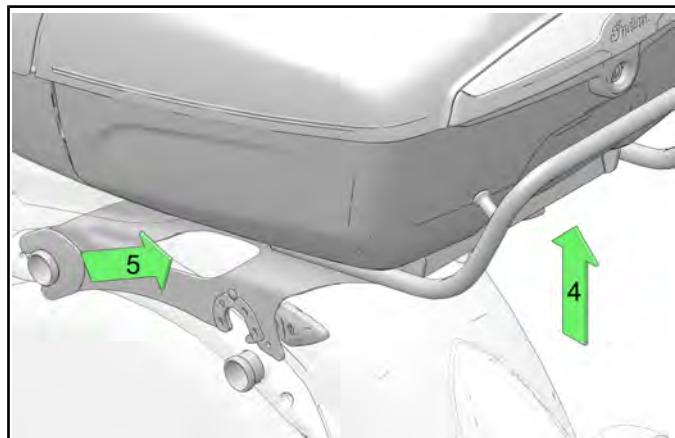
3. Turn the handlebar all the way to the left and right to verify proper operation and freedom of movement.

TRUNK REMOVAL, ROADMASTER

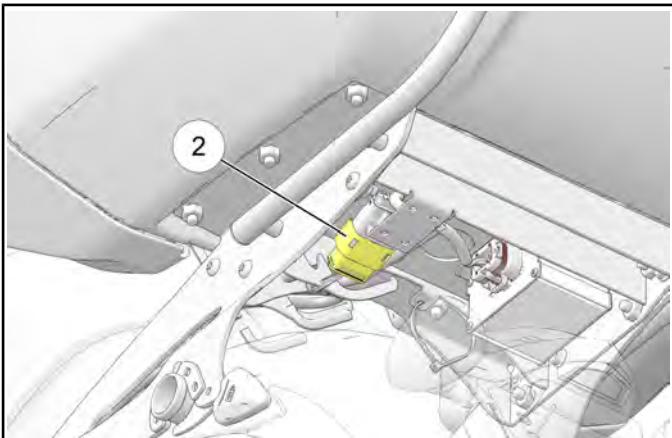
1. If applicable, remove the left and right saddlebags and remove the trunk lock fastener ① from each trunk latch.



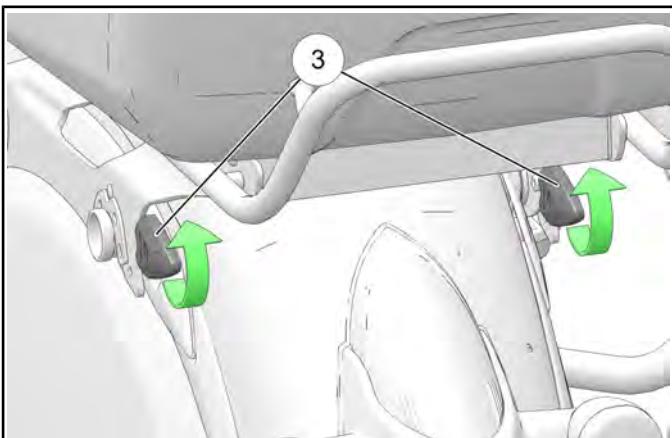
4. Lift up on the rear of the trunk ④ and slide rearward ⑤ to release the trunk from the motorcycle.



2. Disconnect the trunk harness multi-plug ②.



3. Lift the trunk latches ③ to unlock the trunk from the mount.



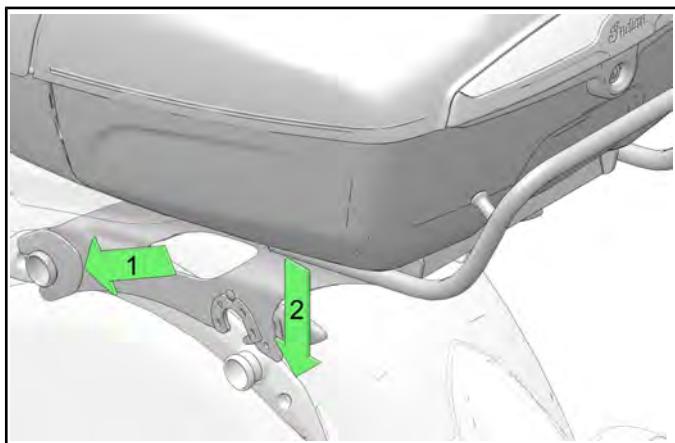
TRUNK INSTALLATION, ROADMASTER**CAUTION**

Use care when installing the trunk assembly so that no electrical wires / connectors get pinched.

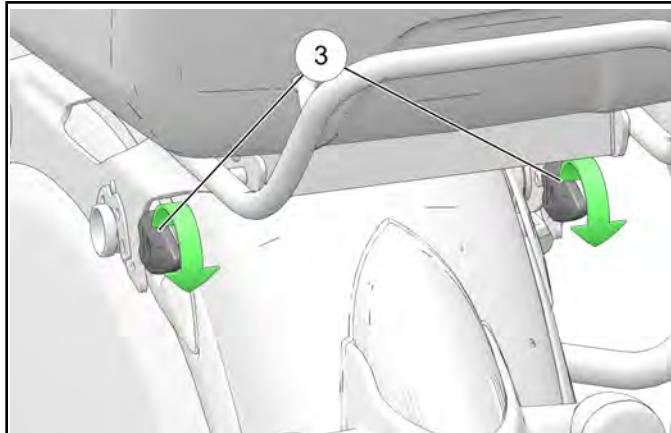
1. Lift the flap at the rear of the passenger seat pad to access the vehicle side of the trunk harness connector and lay harness on fender.



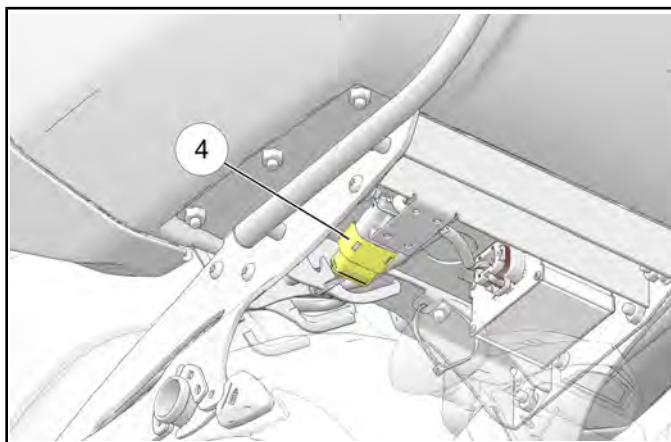
2. Slide the trunk forward ① onto the mounting bracket and lower ② the rear of the trunk until fully seated.



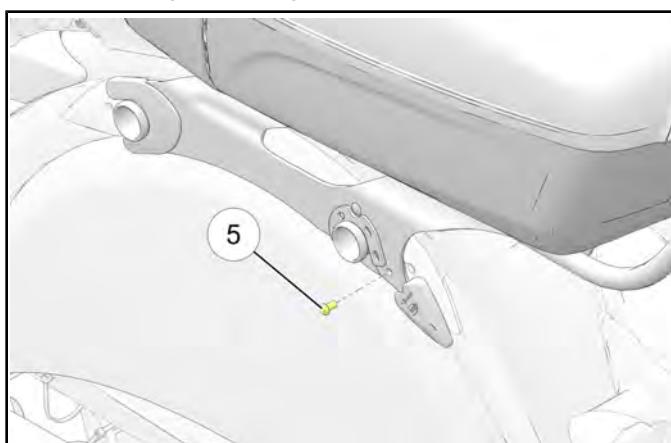
3. Push the trunk locking levers ③ down until fully seated and the trunk is held securely in place.



4. Reconnect the trunk harness connector ④.



5. If applicable, install the mounting fasteners ⑤ into left and right locking levers.



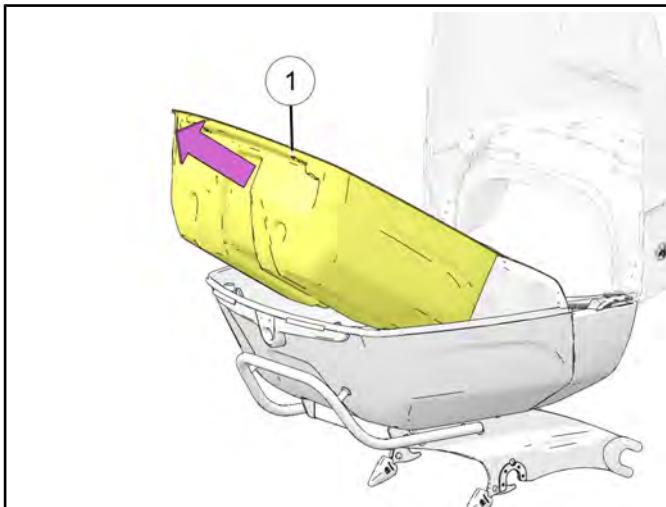
6. Install saddlebags, if equipped.

TRUNK LOCK REPLACEMENT - ROADMASTER**NOTE**

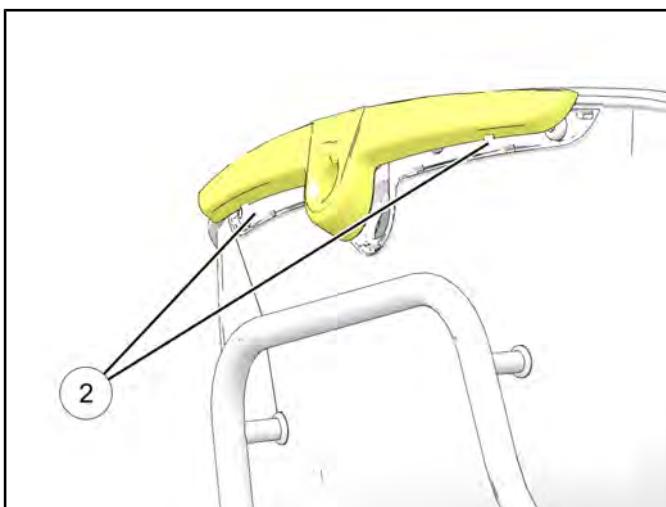
It is recommended that the trunk is removed from the motorcycle prior to disassembly. See TRUNK REMOVAL as outlined in this chapter.

REMOVAL

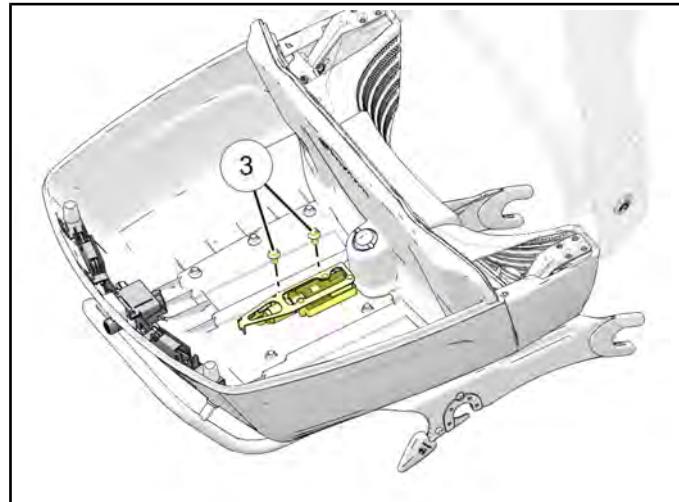
1. Remove the trunk from the motorcycle and place on flat work surface.
2. Open the trunk lid completely.
3. Lift the trunk liner ① up to remove from trunk base.



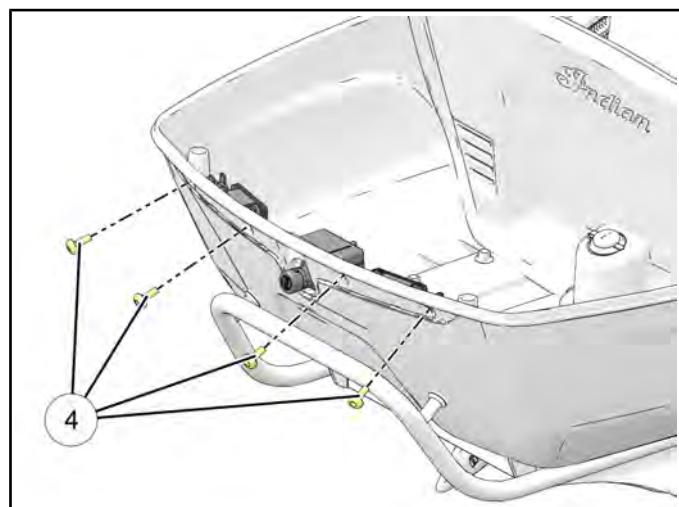
4. Insert body panel tool (PV-49955) or similar into the relief holes ② cut into the bezel and gently pry bezel off of the trunk base.



5. Remove the two fasteners ③ from the lock actuator bracket and disconnect electrical connector.



6. Remove the four fasteners ④ securing the lock assembly to the trunk.



7. Remove the latch and lock actuator together as an assembly.

8. If replacing individual components, disconnect the lock actuator cable from the latch assembly to separate the components.

INSTALLATION

9. Install the latch / lock actuator assembly and tighten fasteners finger-tight.
10. Torque latch fasteners to specification following the torque sequence.

NOTE

Bezel is held in place with pressure sensitive adhesive. It will be necessary to replace the adhesive with a suitable alternative (e.g. double sided tape) when the bezel is reinstalled.

TORQUE

Trunk Latch Fasteners: **36 in-lbs (4 Nm)**



11. Torque lock actuator fasteners to specification.

TORQUE

Lock Actuator Fasteners: **13 ft-lbs (18 Nm)**

12. If installing a new latch bezel:

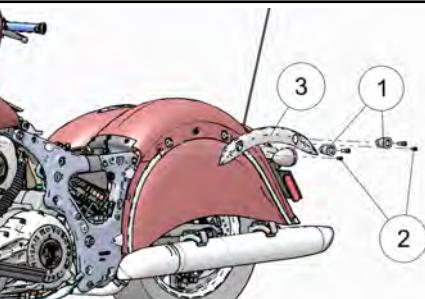
- Peel protective layer off of pressure sensitive adhesive
- Press bezel into place on the trunk bin with constant and even pressure and hold for 30 seconds.

13. Install trunk liner.

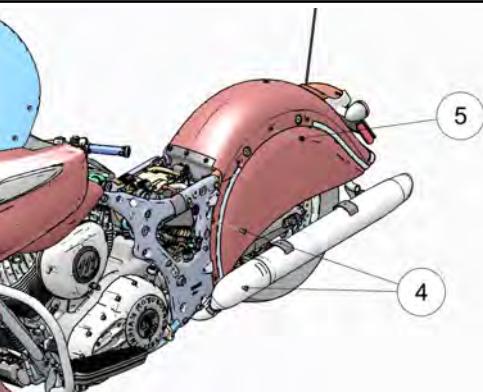
14. Operate lock and latch assembly to verify proper operation.

REAR FENDER REMOVAL

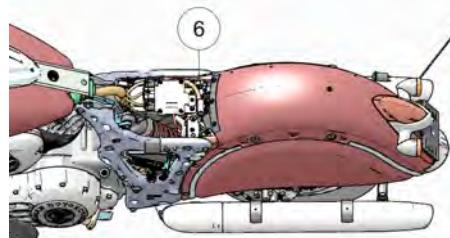
1. Disconnect the antenna cable from the mast.
2. Remove seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21
3. Remove upper side panels. See Side Cover (Upper), Removal / Installation, page 7.17.
4. Remove lower side panels. See Side Cover (Lower), Removal / Installation, page 7.17.
5. Remove saddlebags, if equipped.
6. Using a 6mm hex wrench, remove the saddlebag mounting cylinders ① from both sides of the fender, if equipped.
7. Remove the strut cover fasteners ② and the strut covers ③ from both sides of fender.



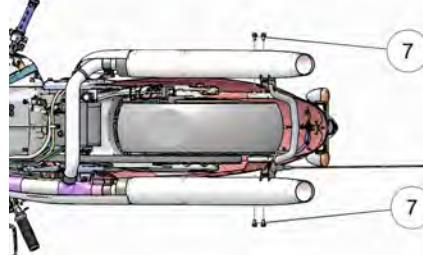
8. Remove fasteners ④ and ⑤ from both sides of the fender.



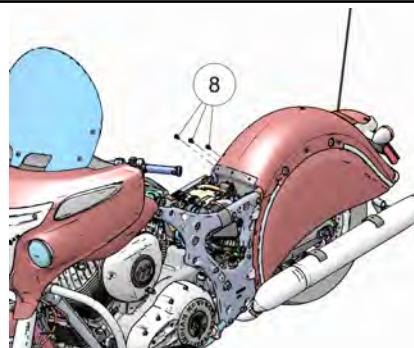
9. Locate the rear harness connector ⑥ and disconnect.



10. Loosen the four fasteners ⑦ on the underside of the fender.



11. Remove the three plastic darts ⑧ on the upper, forward lip of the fender.



12. Lift the fender off of the motorcycle.

NOTE

There is enough slack in the antenna wire to remove fender, turn it over and clip the cable ties.

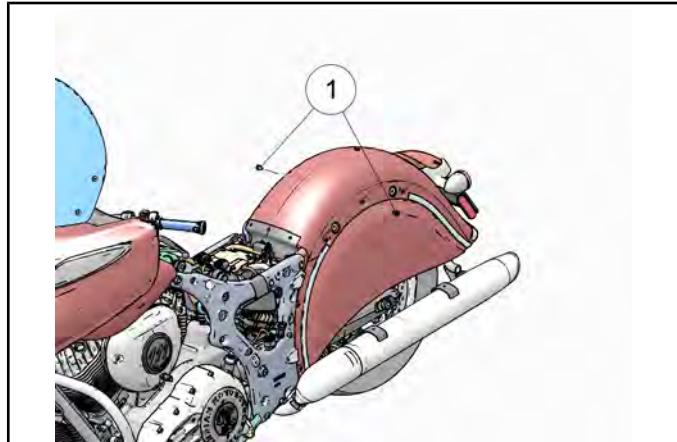
CAUTION

Be careful not to damage painted surfaces.

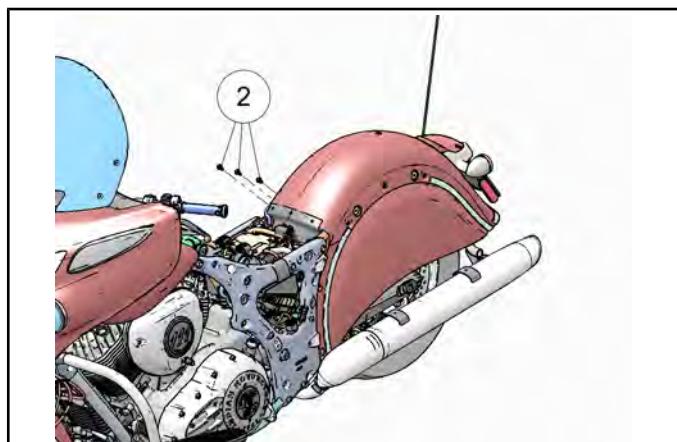
REAR FENDER INSTALLATION**CAUTION**

Use care not to scratch or damage painted surfaces during fender removal and / or installation.

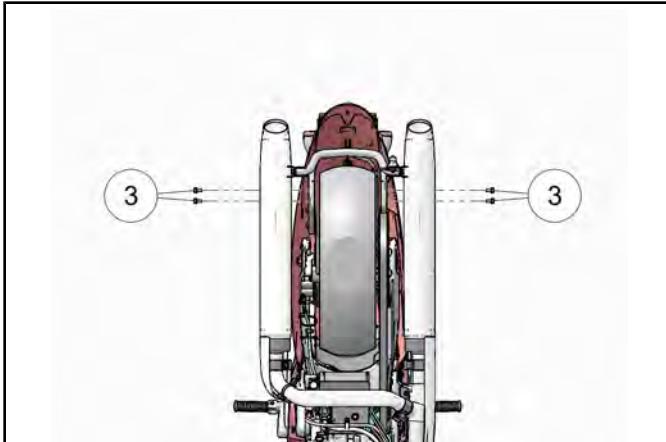
1. Route the rear harness and antenna cable along the rear fender and secure with cable ties.
2. Place the rear fender assembly onto the motorcycle so the top fastener holes line up and install fasteners ① so they are finger tight.



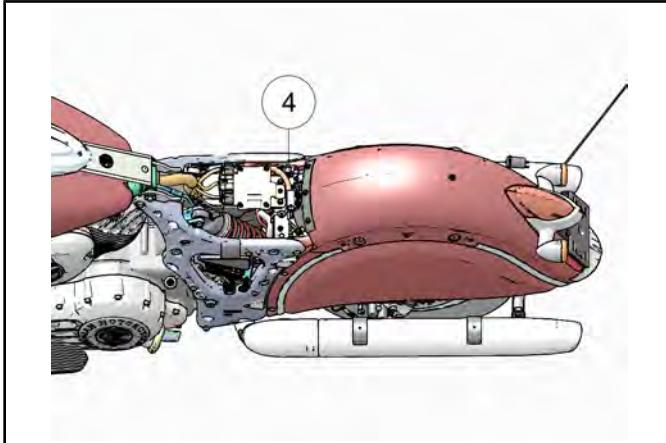
3. Line up the holes of the dust cover and install the three plastic darts ② as shown.



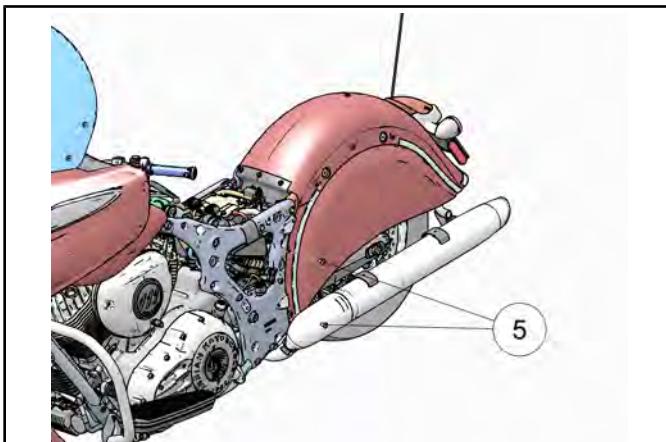
4. Install the four fasteners ③ on the inside of the fender so they are finger tight.



5. Plug the rear harness connector ④ into the chassis harness.



6. Install forward fender fasteners ⑤ on both sides of the fender and torque to specification.

**TORQUE**

Forward Fender Fasteners ⑤: **84 in-lbs (10 Nm)**

7. Torque top fender fasteners ① to specification.

TORQUE

Top Fender Fastener ①: 84 in-lbs (10 Nm)

8. Torque the lower inside fender fasteners ③ to specification.

TORQUE

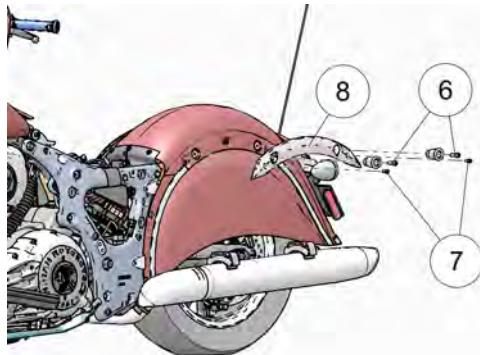
Inside Fender Fasteners ③: 84 in-lbs (10 Nm)

9. Install strut covers ⑧ and strut cover fasteners ⑦ and torque to specification.

TORQUE

Strut Cover Fasteners: 84 in-lbs (10 Nm)

10. Install saddlebag mounting cylinders and mounting cylinder fasteners ⑥, if equipped, and torque to specification.



TORQUE

Mounting Cylinder Fasteners: 25 in-lbs (34 Nm)

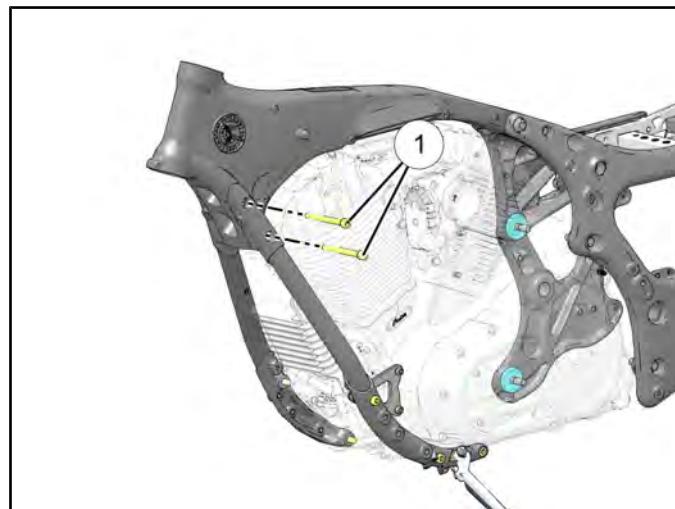
11. Install lower side panels. See Side Cover (Lower), Removal / Installation, page 7.17.
12. Install upper side panels. See Side Cover (Upper), Removal / Installation, page 7.17.
13. Install seat as outlined in this chapter.
14. Install saddlebags, if equipped.
15. Connect antenna cable to mast.

FRONT CASTING (MAIN FRAME), REMOVAL

WARNING

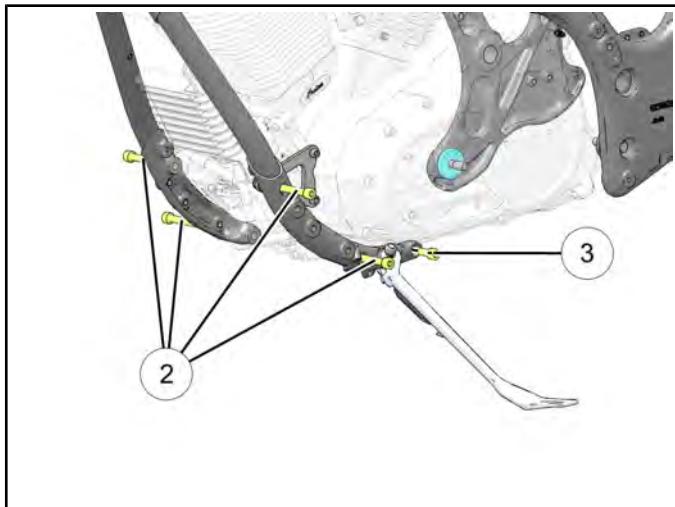
Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death could occur if the motorcycle tips or falls.

1. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove the fuel tank. See Fuel Tank Removal, page 4.15.
3. Disconnect the negative cable from the battery. See Battery Removal, page 2.26.
4. Remove the lower side covers. See Side Cover (Lower), Removal / Installation, page 7.17.
5. Remove the front triple clamps. See Triple Clamp Removal, page 8.33.
6. Remove the driver floorboard assemblies. See Floorboard Removal, page 7.18.
7. Remove the highway bar assembly. See Highway Bar Removal, page 7.24.
8. Remove the head pipes. See Head Pipe Removal, page 3.90.
9. If applicable, disconnect the oil cooler from the down tubes. See Oil Cooler Removal, page 3.30.
10. Unclip the harness conduit from the front casting.
11. Remove the upper fasteners ① from the left side down tube.

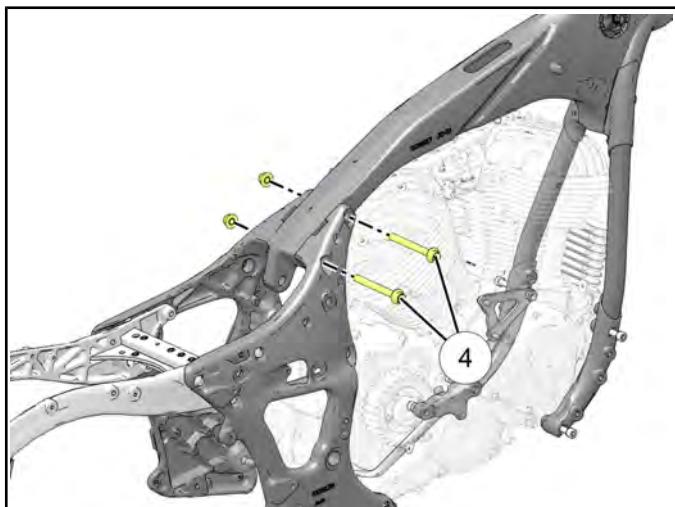


FRAME / BODY

12. Loosen lower fasteners ② and ③ enough so the dowels can be released from the front casting.



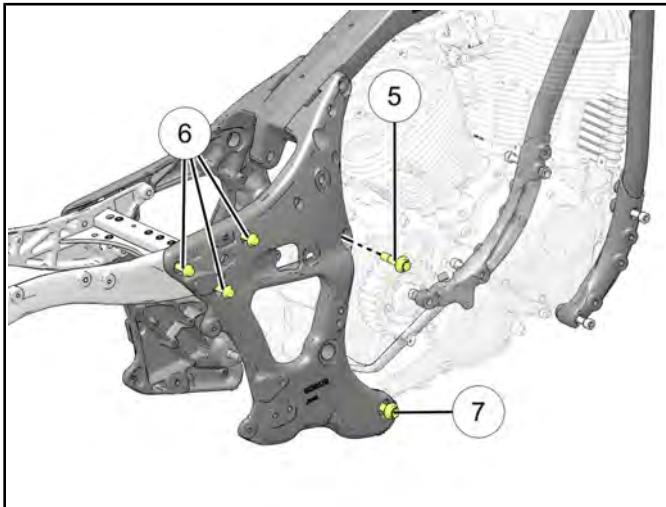
13. Remove fasteners ④ from the mid casting.



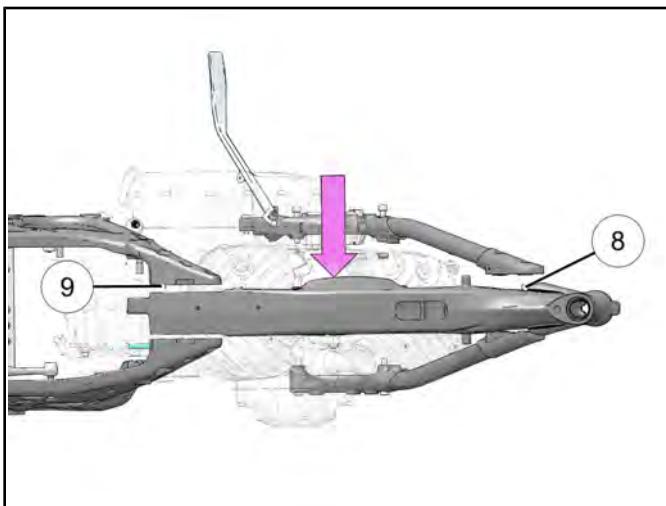
14. Remove fastener ⑤ and loosen fasteners ⑥ and ⑦ on the right side mid-casting.

NOTE

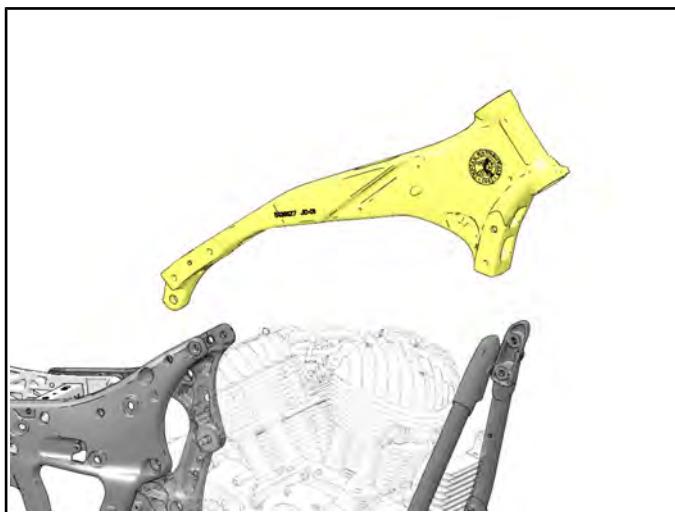
Remove the upper spacer from between the mid-casting and the engine.



15. Move the front casting toward the right hand side of the motorcycle to release dowels ⑧ and ⑨.

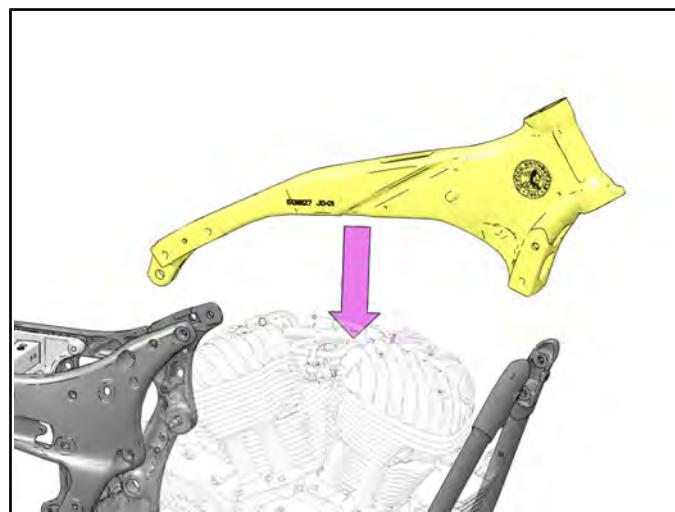


16. Remove the front casting from the motorcycle.

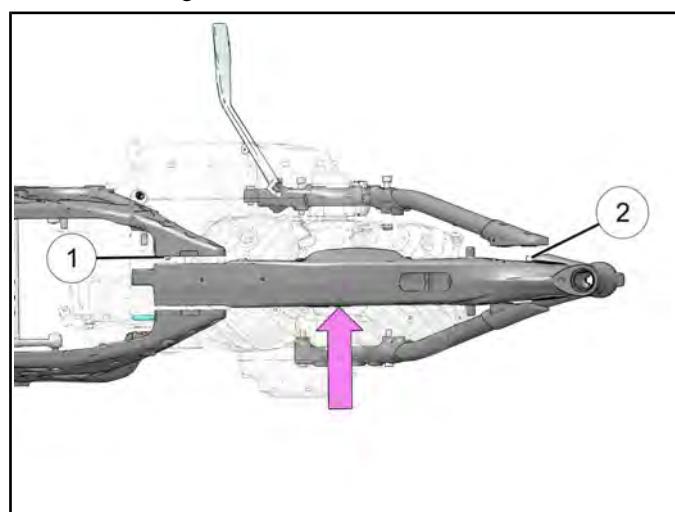


FRONT CASTING (MAIN FRAME), INSTALLATION

1. Lower the front casting into position over the engine.



2. Move the front casting to the left side of the motorcycle and engage the dowels ① and ② on the mid-casting and down tube.

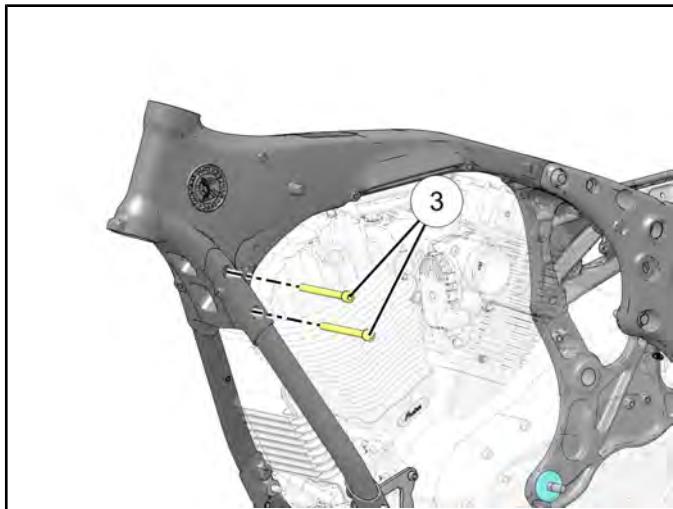


IMPORTANT

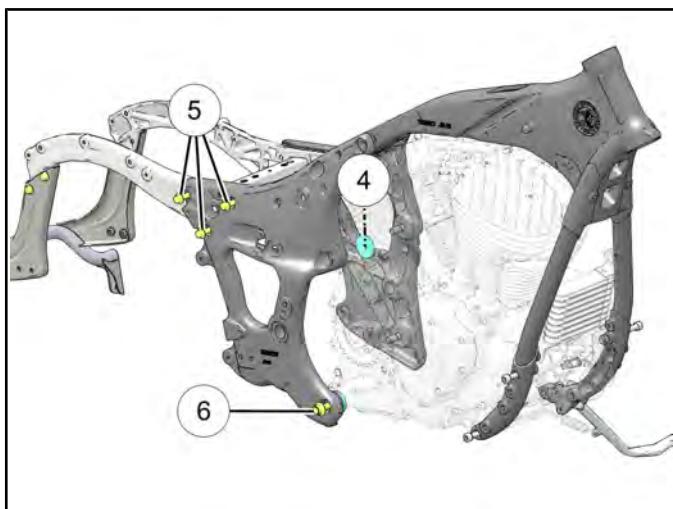
The upper engine spacer will *not* be installed during the initial torque and measurement stage of this procedure.

FRAME / BODY

3. Loosely install the upper down tube fasteners ③ through the front casting.



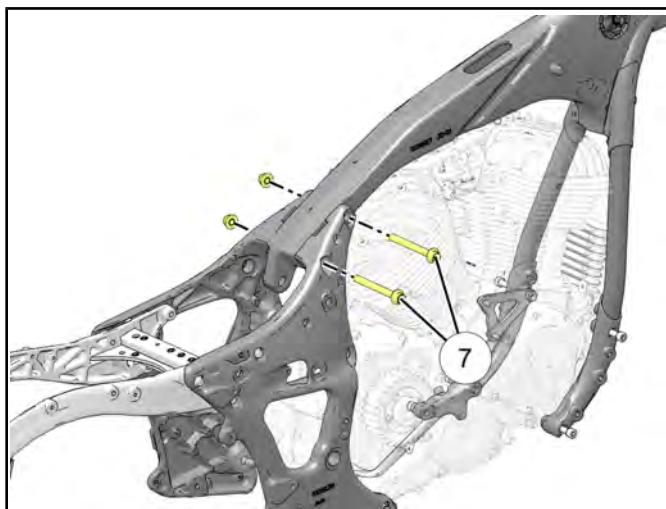
4. **DO NOT** install the upper engine spacer ④ at this time; Starting with the lower engine mount ⑥ torque mid-cast fasteners ⑤ and ⑥ to specification.



TORQUE

Upper Mid-Cast Fasteners ⑤: 35 ft-lbs (48 Nm)
Lower Mid-Cast Fastener ⑥: 75 ft-lbs (102 Nm)

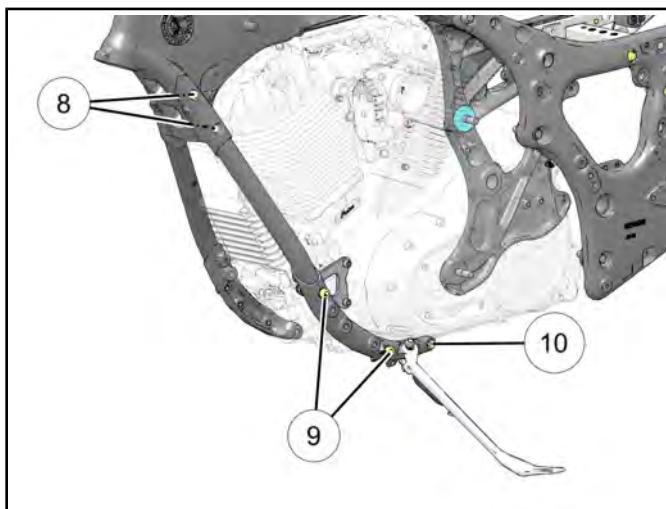
5. Torque front casting fasteners ⑦ to specification.



TORQUE

Front Cast to Mid-Cast Fasteners ⑦: 75 ft-lbs (102 Nm)

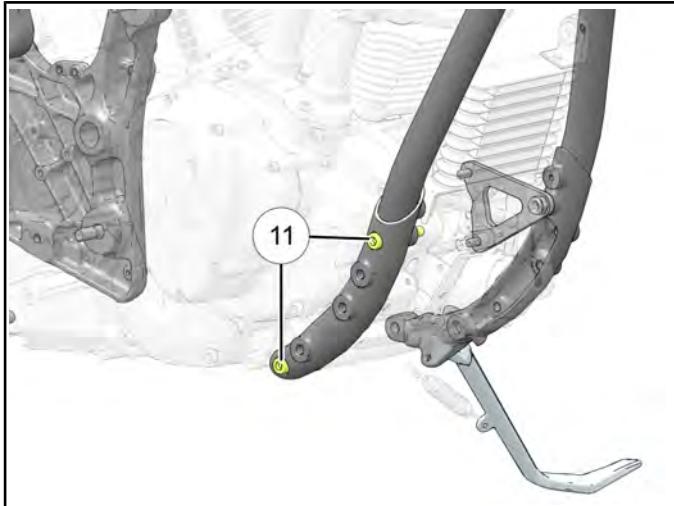
6. Torque left hand down tube fasteners ⑧, ⑨ and ⑩ to specification.



TORQUE

Upper, LH Down Tube Fasteners ⑧: 45 ft-lbs (60 Nm)
Lower, LH Down Tube Fasteners ⑨ & ⑩: 45 ft-lbs (60 Nm)

7. Torque lower right hand down tube fasteners ⑪ to specification.



10. If the gap is incorrect, repeat STEPS 4-8 until gap measurement is correct. Torque upper engine mount fastener to specification.

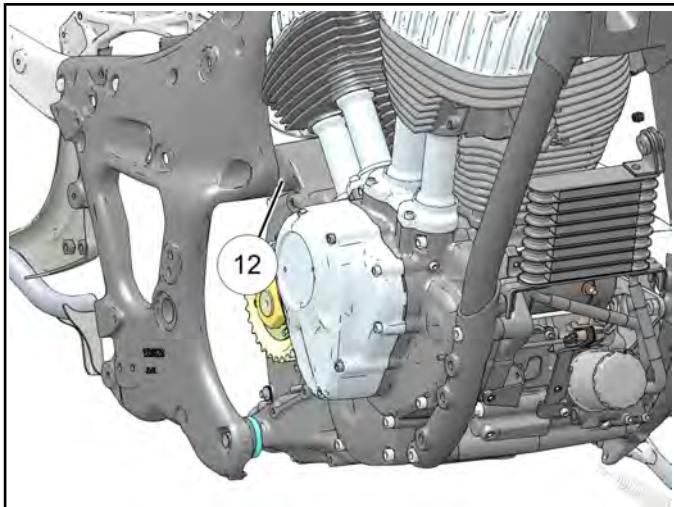
11. Reverse STEPS 2 - 10 from the removal procedure to complete installation.

TORQUE

Lower, RH Down Tube Fasteners ⑪: 45 ft-lbs (60 Nm)

8. Measure the gap ⑫ between the engine and mid-cast where the upper spacer should be.

Upper Engine Spacer Gap: 6.5 mm — 10.0 mm



9. If the gap is correct, the upper spacer can be installed and the upper fastener torqued to specification.

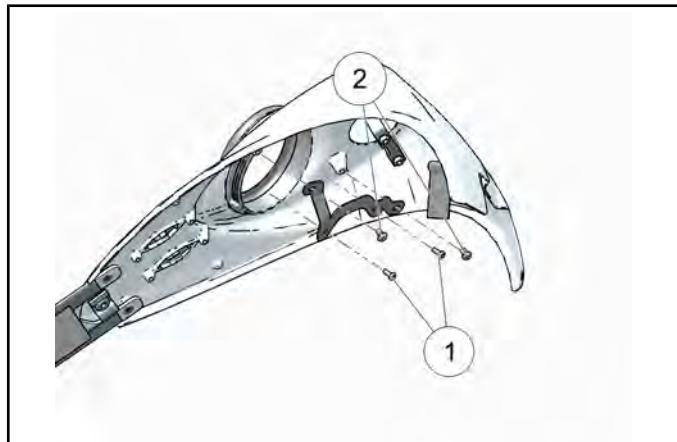
TORQUE

Upper Engine Mount Fastener: 45 ft-lbs (60 Nm)

CHIEF CLASSIC / CHIEF DARK HORSE / CHIEF VINTAGE / SPRINGFIELD

INSTRUMENT PANEL REMOVAL / INSTALLATION

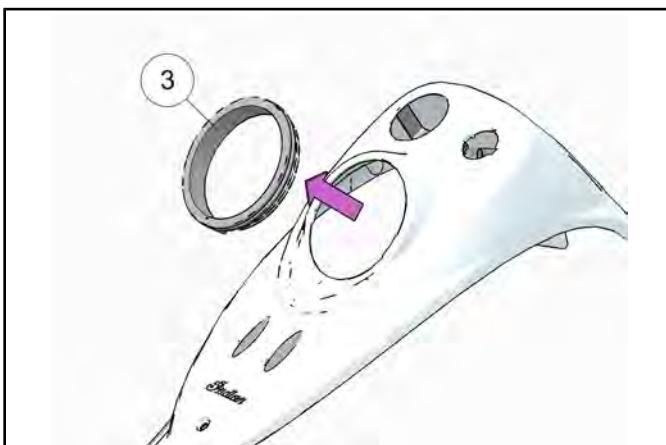
1. Position the motorcycle on it's side stand on a flat surface.
2. Remove the console cover. See STEPS 1–5 of Fuel Tank Removal, page 4.15.
3. Remove fasteners ① securing bracket to speedometer head and remove fasteners ② securing the speedometer bracket to the console cover.



4. Remove the bezel from the speedometer and lift the speedometer head out of the rubber grommet.



5. Remove the rubber grommet ③ from the console cover.



6. **INSTALLATION** is performed by reversing the removal procedure. Using a mild soapy water solution on the rubber seal will make it easier to press the instrument panel into position.
7. Torque speedometer bracket fasteners to specification.

TORQUE

Speedometer to Bracket Fasteners: 15 in-lbs (2 Nm)
Bracket to Console Cover Fasteners: 43 in-lbs (5 Nm)

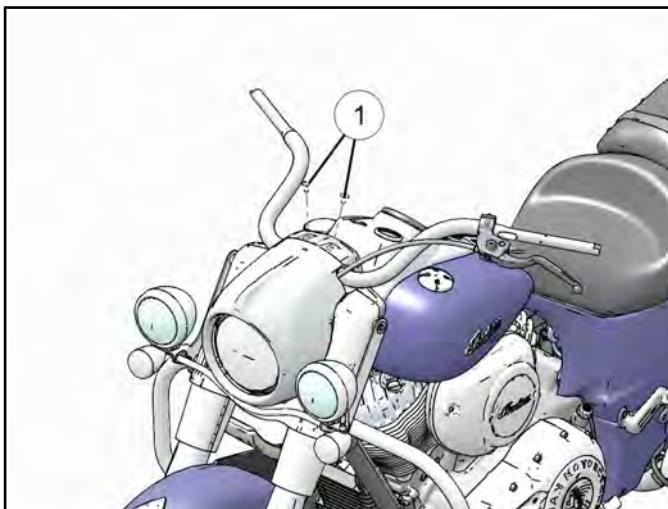
NACELLE REMOVAL**CAUTION**

Protect painted surfaces on the front fender and fuel tank prior to beginning the following procedure. Use care when removing the nacelle so the chrome does not get scratched.

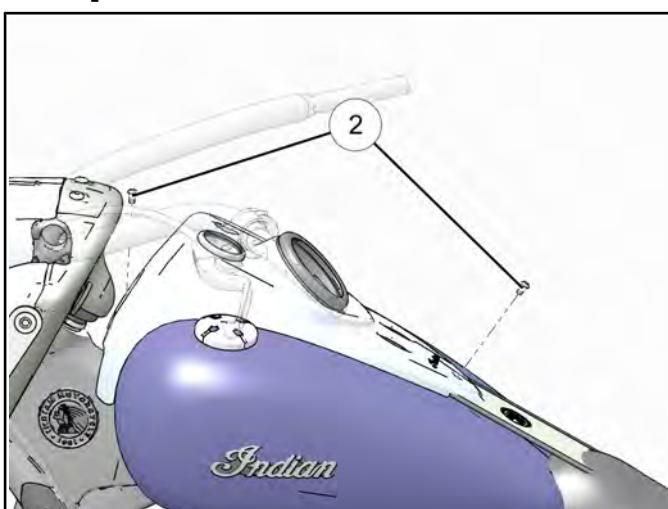
CAUTION

During disassembly, pay close attention to harness routing and connector orientation. Always route electrical wiring the same way as it was removed to avoid damaging wires and connectors.

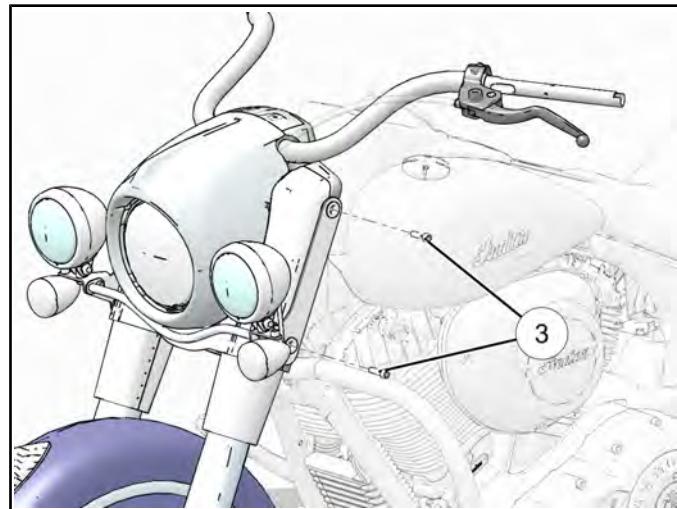
1. Remove windshield assembly, if equipped.
2. Remove two fasteners ① at the top of the nacelle assembly.



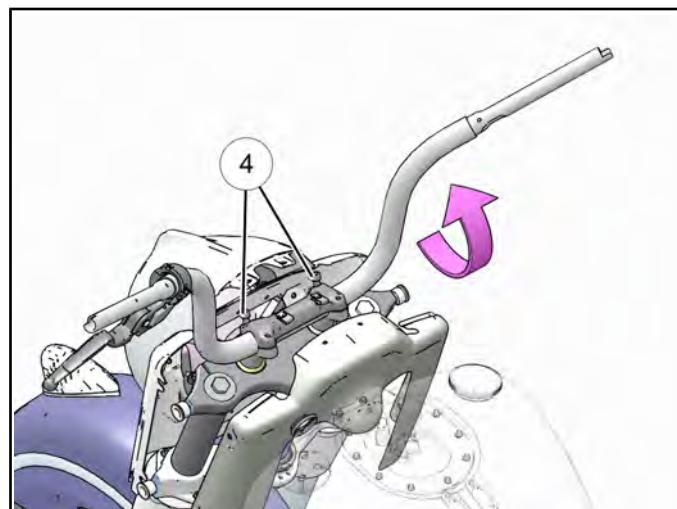
3. Remove two fasteners ② securing the console cover to the fuel tank and lift console back and set on protected fuel tank.



4. Remove two fasteners per side ③ securing the windshield mounting bracket assembly.

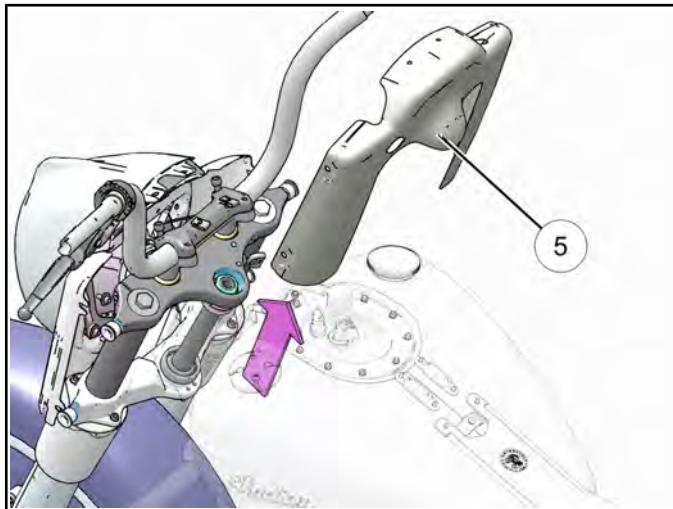


5. Rotate the auxiliary lamp assembly forward and lower out of the way.
6. Pull the rear portion of the nacelle assembly back toward the fuel tank to expose the handlebar risers.
7. Loosen the front handlebar clamp fasteners ④ and rotate the handlebar up so the rear portion of the nacelle can be removed.

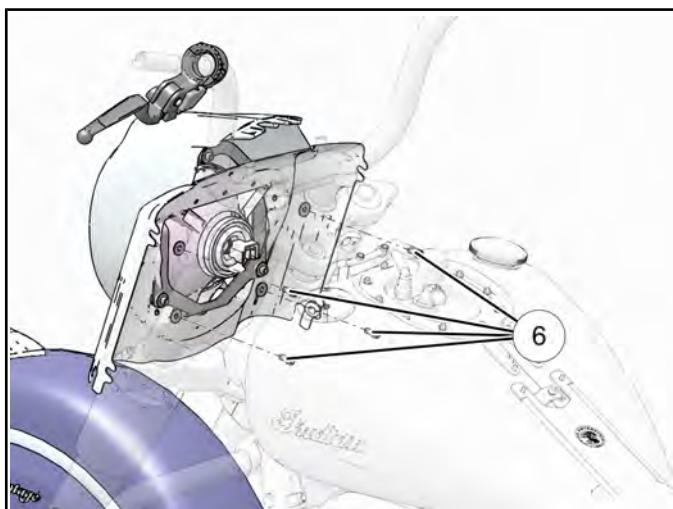


FRAME / BODY

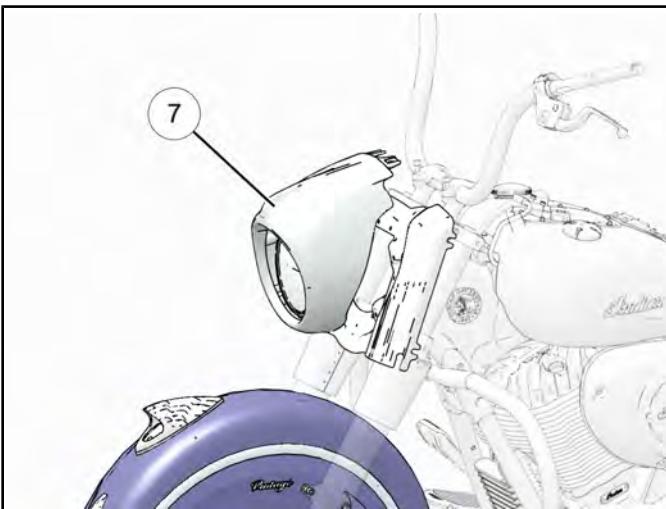
8. Disconnect the auxiliary light switch (if equipped) and remove the rear portion of the nacelle ⑤.



9. Pull the front portion of the nacelle out far enough to access the four fasteners ⑥ securing the headlamp bucket and remove.



10. Pull the headlamp bucket out far enough to disconnect the headlamp connector and remove the bucket assembly ⑦.



11. Using a side cutter, carefully clip the six cable ties securing the harness to the front portion of the nacelle assembly.

IMPORTANT

Use a marker or tape to index each multi-plug before disconnecting. Some of the connectors are unmarked and interchangeable.

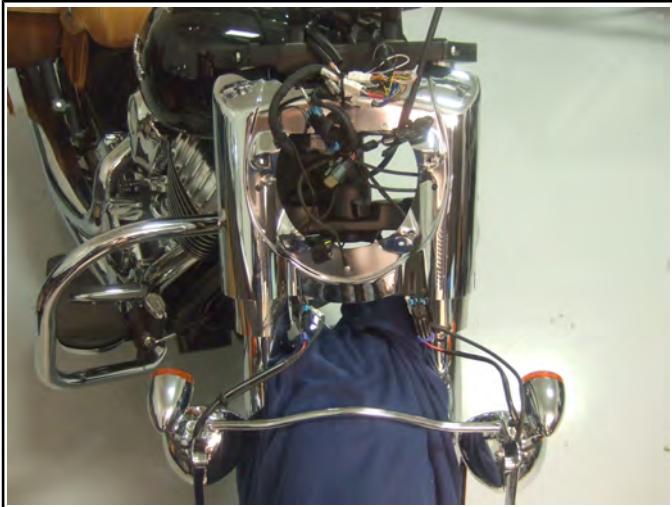
12. Disconnect all multi-plugs between the switch cube and chassis harness and route through the front portion of the nacelle.

13. Remove nacelle.

NACELLE INSTALLATION**CAUTION**

During installation of the nacelle assembly, pay close attention to harness routing and connector orientation. Always route electrical wiring the same way as it was removed to avoid damaging wires and connectors.

1. Move the front portion of the nacelle into position and feed the wire harness through the center hole as shown.



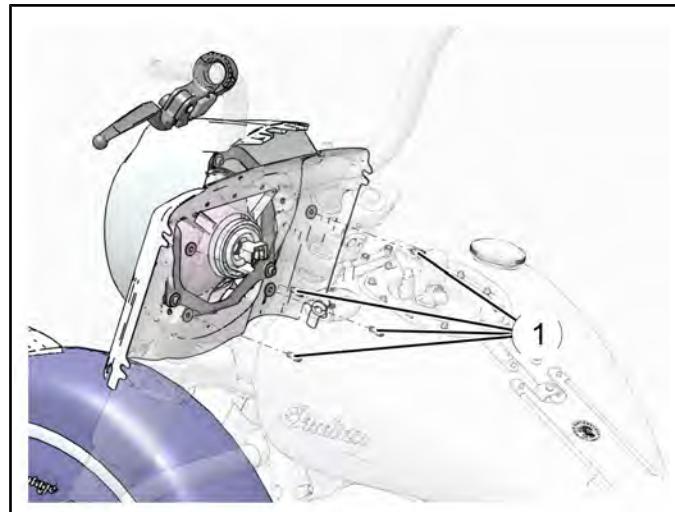
2. Install new cable ties into all six fir tree clips.
3. Paying attention to the natural form of the wiring harness, reconnect all of the multi-plugs between the chassis and switch cubes.

IMPORTANT

Pay attention to index marks placed on connectors during disassembly when reconnecting as some of them are interchangeable.

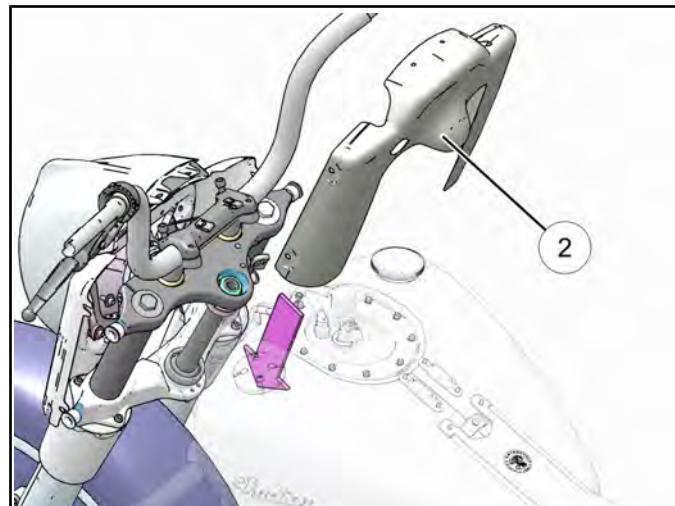
4. Secure harness to the front portion of the nacelle using the newly installed cable ties.
5. Position the headlamp bucket in front of the nacelle and reconnect the headlamp bulb.

6. Install the four headlamp bucket fasteners ① and torque to specification.

**TORQUE**

Headlamp Bucket Fasteners: 75 in-lbs (8 Nm)

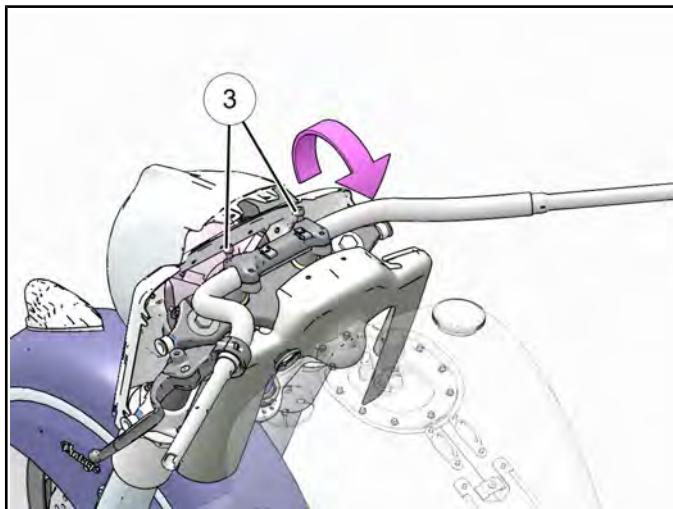
7. Lower the rear portion of the nacelle ② into position and reconnect the auxiliary light switch (if equipped).



7

FRAME / BODY

8. Rotate the handlebar into the desired position and torque the riser clamp fasteners **③** to specification.



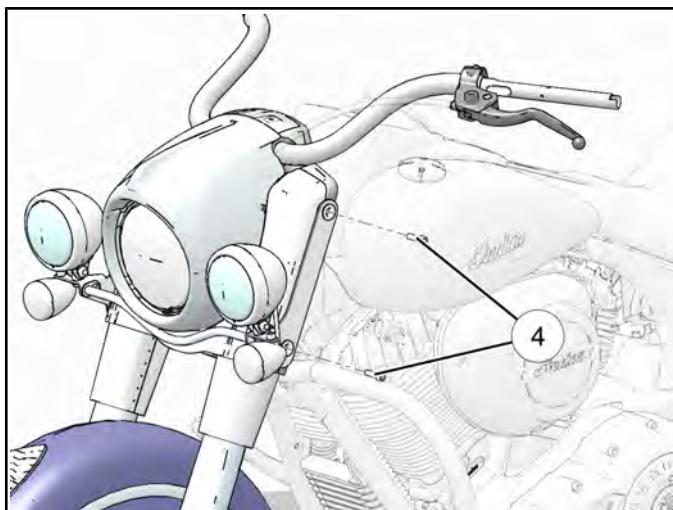
TORQUE

Riser Clamp Fasteners:

18 ft-lbs (24 Nm)

Tighten Front fasteners First, Then Rear

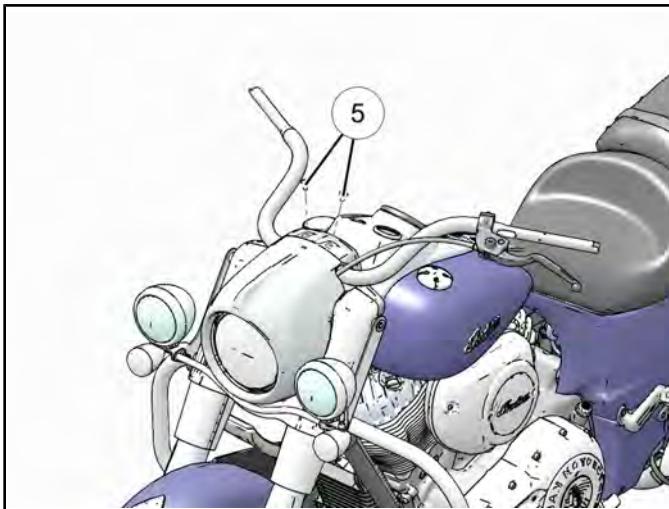
9. Push the front and rear portions of the nacelle together into position around the triple clamp.
10. Move the light bar / turn signal assembly into position and install the four fasteners **④** finger tight.



NOTE

Verify that the rubber grommets securing the auxiliary light / turn signal harness have been slid into place.

11. Install the two fasteners **⑤** located at the top of the nacelle and torque to specification.



TORQUE

Upper Nacelle Fasteners: **36 in-lbs (4 Nm)**

12. Torque the auxiliary light bar bracket fasteners **④** to specification.

TORQUE

Auxiliary Light Bar Bracket Fasteners: **18 ft-lbs (24 Nm)**

13. Move the console cover into position and torque fasteners to specification.

TORQUE

Console Cover Fasteners: **84 in-lbs (10 Nm)**

14. Install windshield assembly, if equipped.
15. Verify that all controls are operating correctly and the handlebar turns freely from lock to lock.

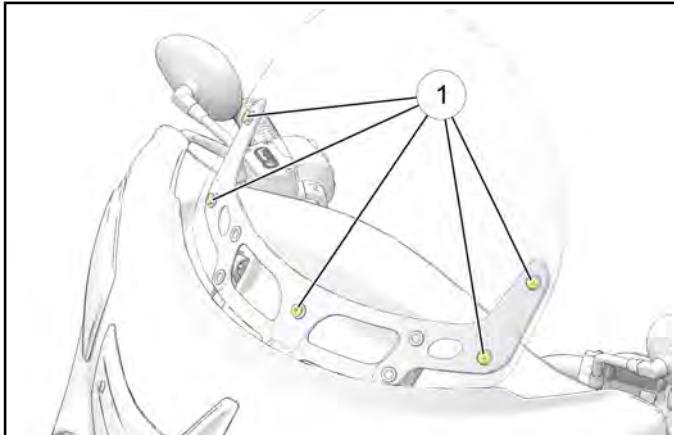
CHIEFTAIN DARK HORSE**OUTER FAIRING REMOVAL - (CHIEFTAIN DARK HORSE)****NOTE**

Place the power windshield in the FULL UP position prior to fairing removal.

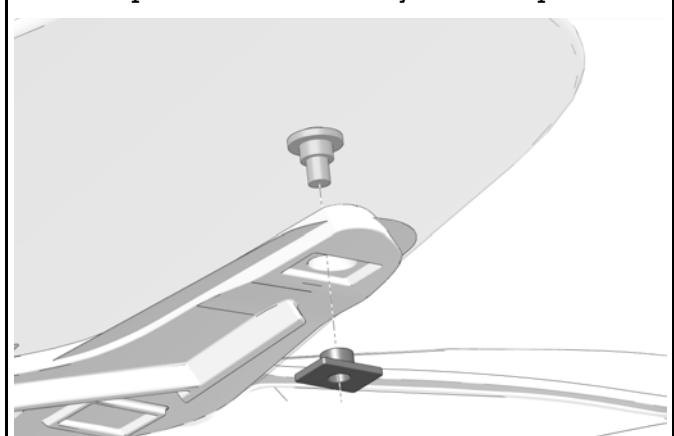
CAUTION

Fasteners removed in STEPS 3 & 5 are different lengths. It is imperative that the fasteners are reinstalled in the same positions they are removed from or damage to outer fairing may occur.

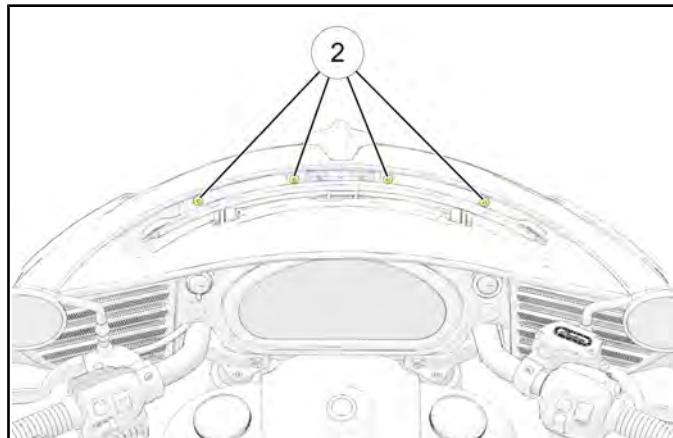
1. Place the motorcycle on a flat surface resting on its side stand.
2. Remove the five fasteners ① from the windshield and remove windshield.

**NOTE**

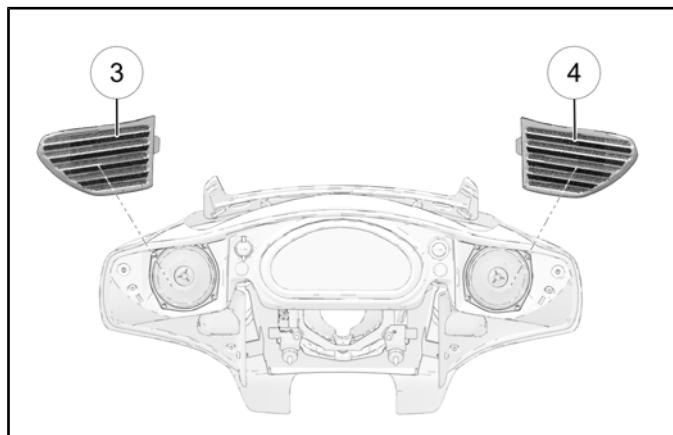
When removing the five windshield fasteners be sure to capture the T-nuts as they are not captive.



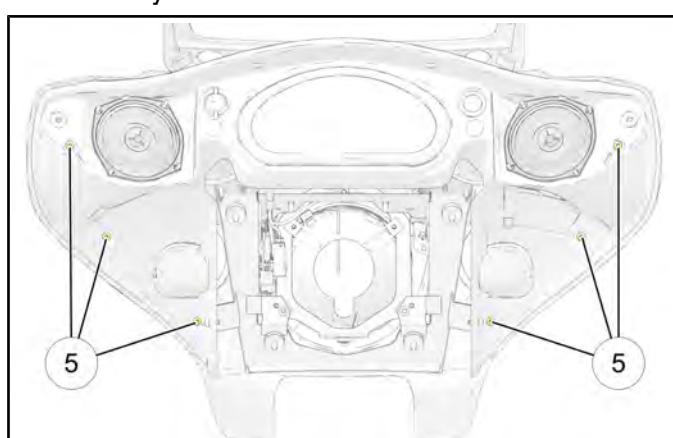
3. Remove the four LONG fasteners ② from the top of the fairing assembly.



4. Using the Body Panel tool (PV-49955), gently pry the LH ③ and RH ④ speaker grill out of the inner fairing assembly.



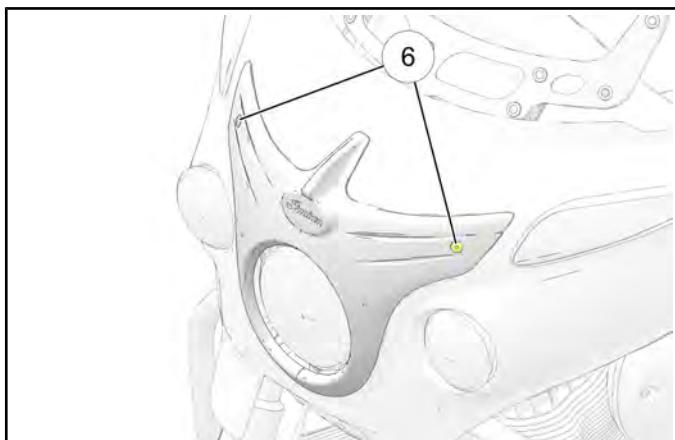
5. Remove six fasteners ⑤ from the inner fairing assembly.

**NOTE**

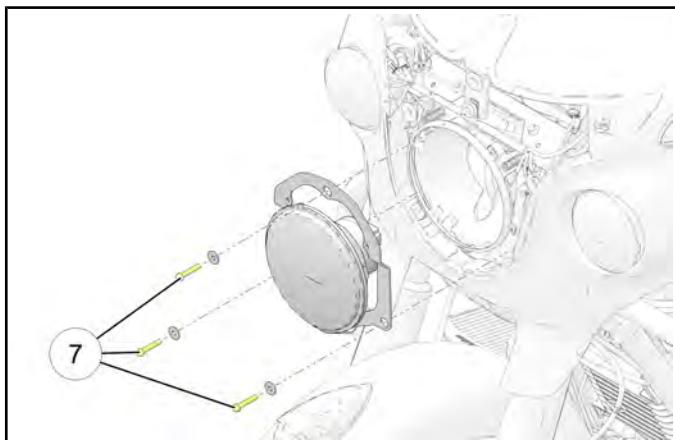
Some fasteners are longer than others, make sure to note placement of fasteners when removing.

FRAME / BODY

6. Remove two fasteners ⑥ and head light bezel.



7. Remove three fasteners ⑦ and withdraw the head light assembly far enough to disconnect electrical connector.



8. Remove fairing assembly.

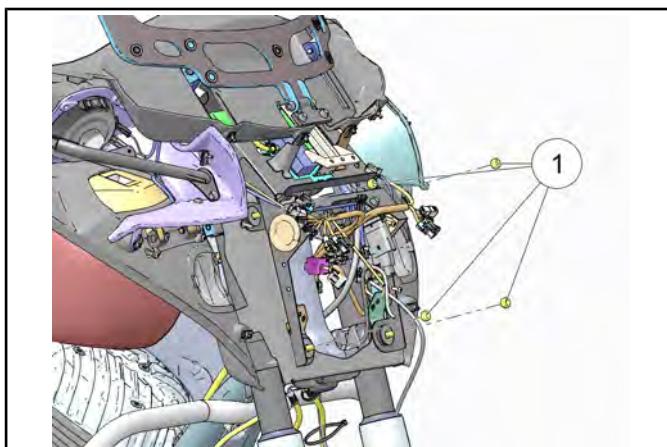
INNER FAIRING REMOVAL - (CHIEFTAIN DARK HORSE)**NOTE**

The inner fairing assembly can be removed with the radio module, power windshield actuator and speakers intact.

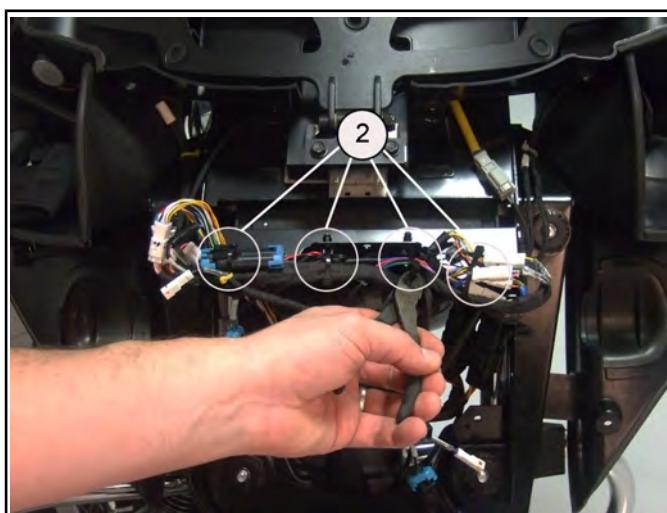
CAUTION

During disassembly, pay close attention to harness routing and connector orientation. Always route electrical wiring the same way as it was removed to avoid damaging wires and connectors.

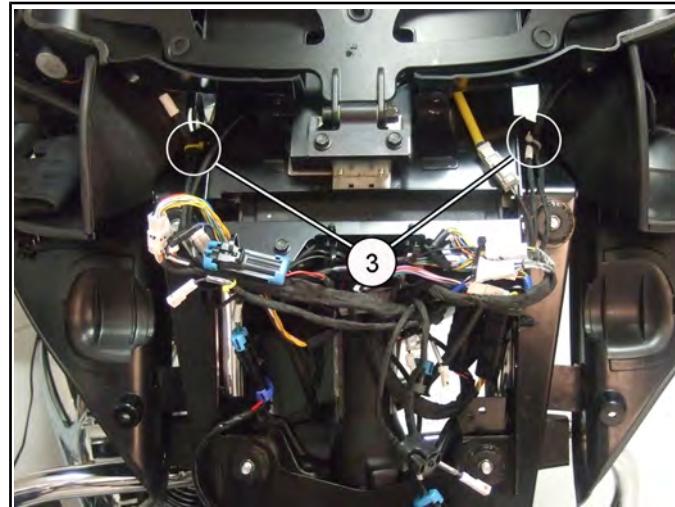
1. Remove the outer fairing. See Outer Fairing Removal - (Chieftain Dark Horse), page 7.45.
2. Remove the instrument cluster. See Instrument Panel Removal / Installation - (Chieftain Dark Horse), page 7.50.
3. Remove the four nuts and washers ① as shown.



4. Using a side-cutter, carefully clip the four cable ties ② securing the wiring harness to the inner fairing.

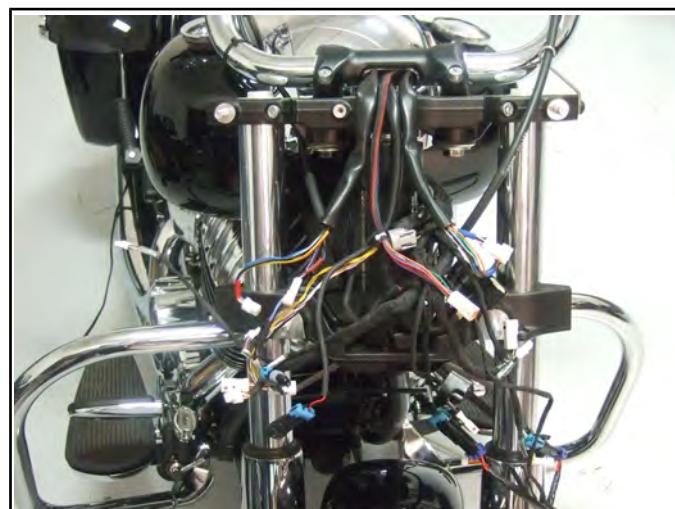


5. Using a side-cutter, carefully clip the outboard cable ties ③.

**IMPORTANT**

Use a marker or tape to index each multi-plug before disconnecting. Some of the connectors are unmarked and interchangeable.

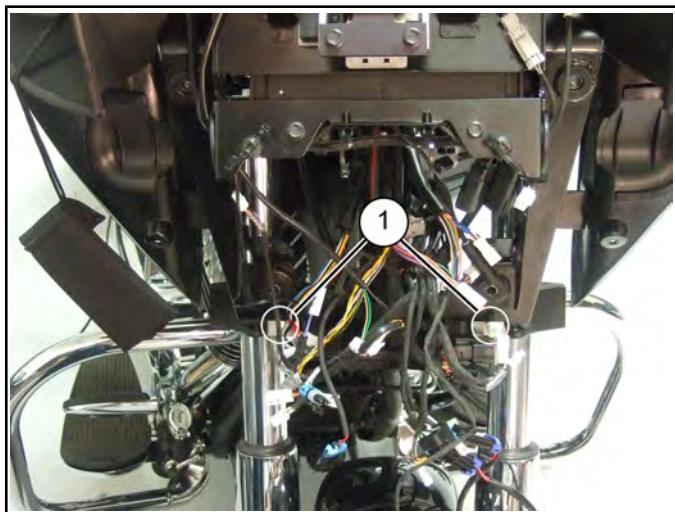
6. Disconnect all multi-plugs between the fairing and chassis harnesses.
7. Disconnect the 12V accessory socket connector and fog lamp button.
8. Lift the inner fairing assembly off of the triple clamp studs and route wire through the access hole.



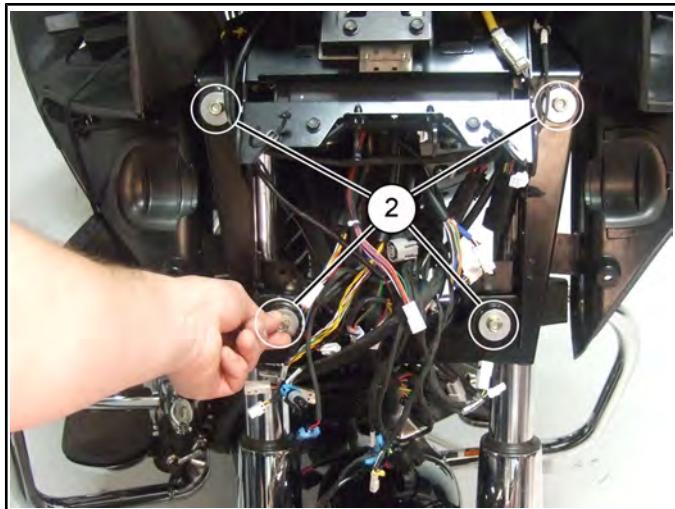
INNER FAIRING INSTALLATION - (CHIEFTAIN DARK HORSE)**CAUTION**

During installation of the inner fairing, pay close attention to harness routing and connector orientation. Always route electrical wiring the same way as it was removed to avoid damaging wires and connectors.

1. Rest the inner fairing assembly on the lower mounting studs ① and tilt forward.



2. Carefully route all loose wires through the access hole in the inner fairing mount.
3. Install the inner fairing assembly on the four triple clamp studs ② and install washers and nuts finger tight.

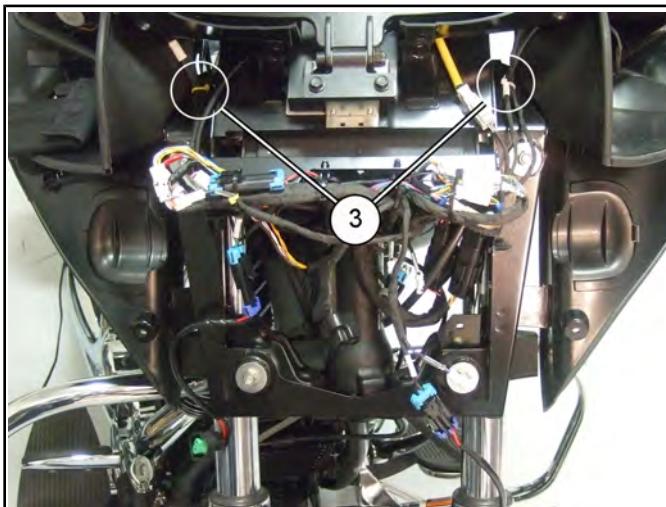


4. Verify that no wires or connectors have been pinched between the inner fairing and the triple clamp and torque mounting nuts to specifications.

TORQUE

Inner Fairing Mounting Nuts:
12 ft-lbs (16 Nm)

5. Route the fog lamp button and 12V accessory socket harnesses so they can be secured by their respective cable ties ③, and reconnect.



6. Paying attention to the natural form of the wiring harness, reconnect all of the multi-plugs between the chassis and inner fairing.

IMPORTANT

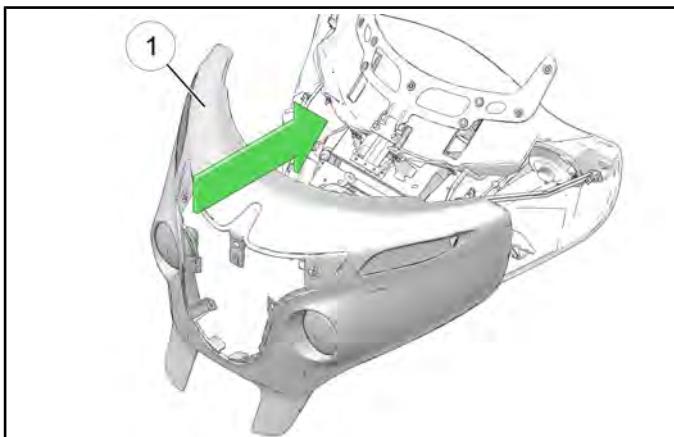
Pay attention to index marks placed on connectors during disassembly when reconnecting as some of them are interchangeable.

7. Connect the radio antenna and radio multi-plugs.
8. Remove the cut cable ties from the four fir tree clips and install new cable ties.
9. Position the wiring harness so it can be secured by the four cable ties.
10. Replace the cable ties securing the fog lamp button and 12V accessory socket to the inner fairing.
11. Install the outer fairing assembly. See Outer Fairing Installation - (Chieftain Dark Horse), page 7.49
12. Install the instrument cluster. See Instrument Panel Removal / Installation - (Chieftain Dark Horse), page 7.50

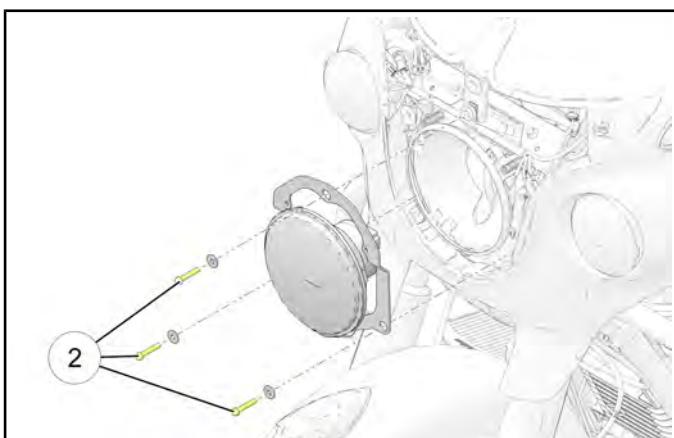
OUTER FAIRING INSTALLATION - (CHIEFTAIN DARK HORSE)**CAUTION**

Fasteners installed in STEPS 4 & 6 are different lengths. It is imperative that the fasteners are installed in the correct location or damage to outer fairing may occur. Reference the drawing below for proper fastener locations.

1. Install outer fairing assembly ① onto fairing subframe as shown.

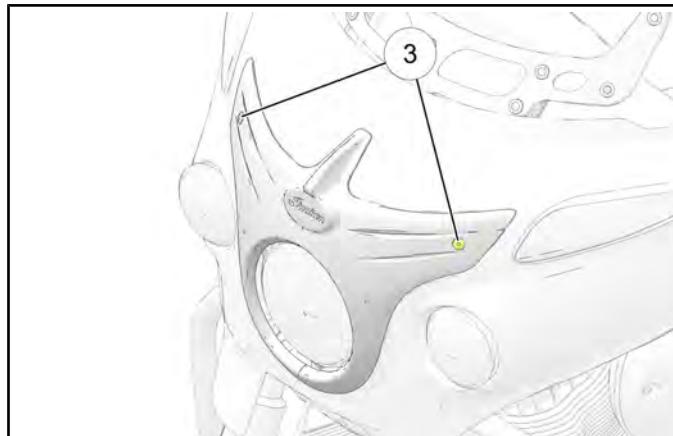


2. Install the head light assembly ② and torque fasteners to specification.

**TORQUE**

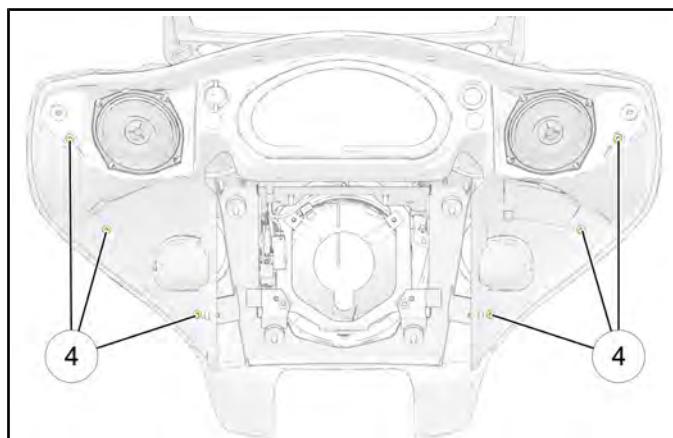
Head Light Bracket Fasteners:
75 in-lbs (8 Nm)

3. Install head light bezel and torque fasteners ③ to specification.

**TORQUE**

Head Light Bezel:
36 in-lbs (4 Nm)

4. Install the six fasteners ④ into the inner fairing assembly and torque to specification.

**NOTE**

Refer to the notes made when removing the fasteners. Some fasteners are longer than others, make sure the correct placement of fasteners when installing.

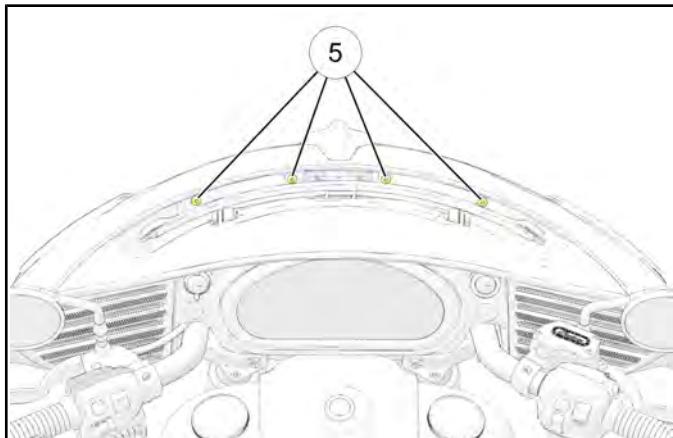
TORQUE

Inner Fairing Fasteners:
36 in-lbs (4 Nm)

5. Install the LH and RH speaker grills.

FRAME / BODY

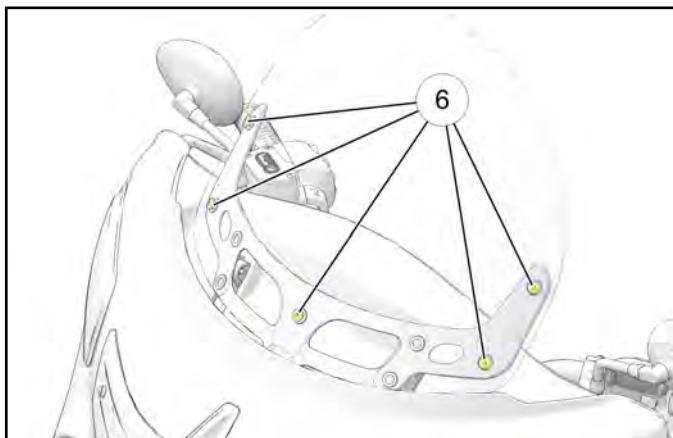
6. Install the four fasteners ⑤ into the top of the fairing assembly and torque to specification.



TORQUE

Upper Fairing Fasteners:
36 in-lbs (4 Nm)

7. Install the windshield and torque fasteners ⑥ to specification.

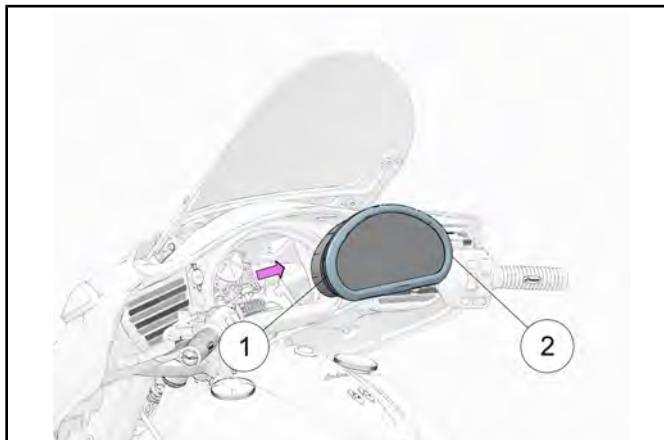


TORQUE

Windshield Fasteners:
36 in-lbs (4 Nm)

INSTRUMENT PANEL REMOVAL / INSTALLATION - (CHIEFTAIN DARK HORSE)

1. Position the motorcycle on it's side stand on a flat surface.
2. Using Body Panel tool (PV-49955) or a similar tool, alternately lift the LH side ① and RH side ② of the instrument panel until the rubber retainer is free.



3. Lift instrument panel out of the fairing mount and disconnect the single multi-plug.
4. **INSTALLATION is performed by reversing the removal procedure. Using a mild soapy water solution on the rubber seal will make it easier to press the instrument panel into position.**

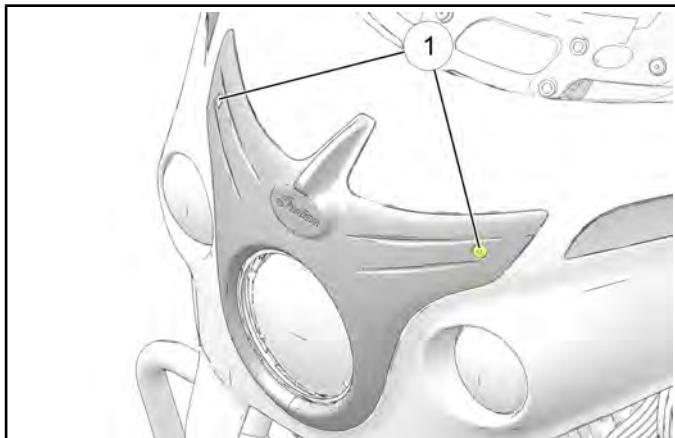
CAUTION

Do not use alcohol on seal for installation.

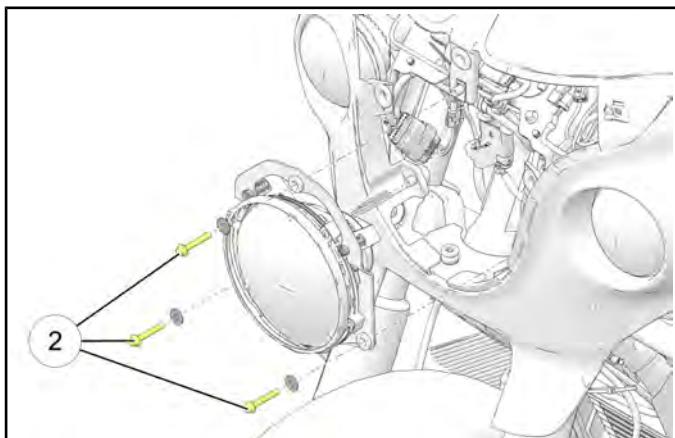
CHIEFTAIN / ROADMASTER**OUTER FAIRING REMOVAL - (CHIEFTAIN / ROADMASTER)****NOTE**

Place the power windshield in the FULL UP position prior to fairing removal.

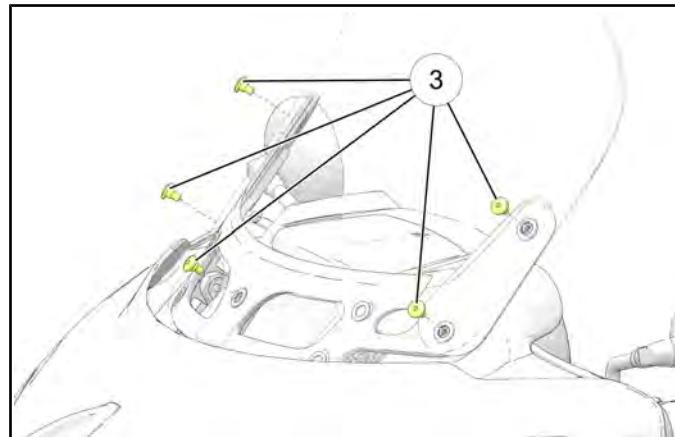
1. Place the motorcycle on a flat surface resting on it's side stand.
2. Remove two fasteners ① and head light bezel.



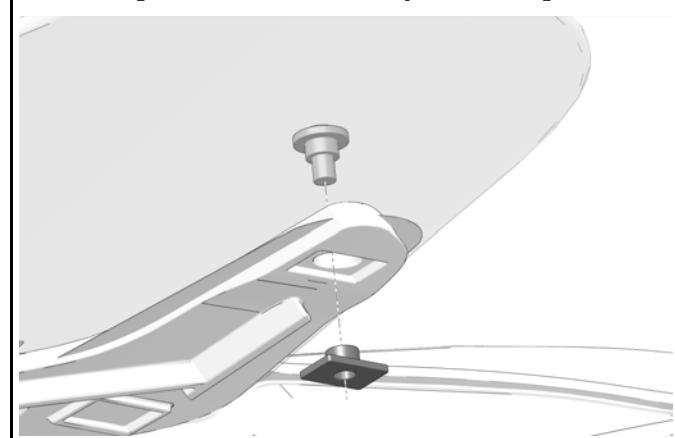
3. Remove three fasteners ② and withdraw the head light assembly far enough to disconnect electrical connector.



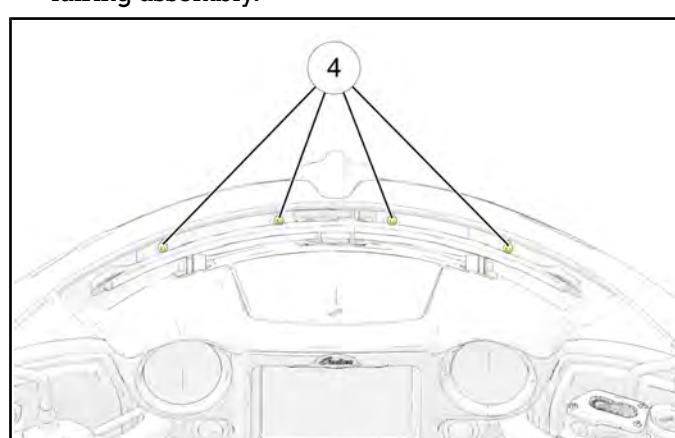
4. Remove the five fasteners ③ from the windshield and remove windshield.

**NOTE**

When removing the five windshield fasteners be sure to capture the T-nuts as they are not captive.

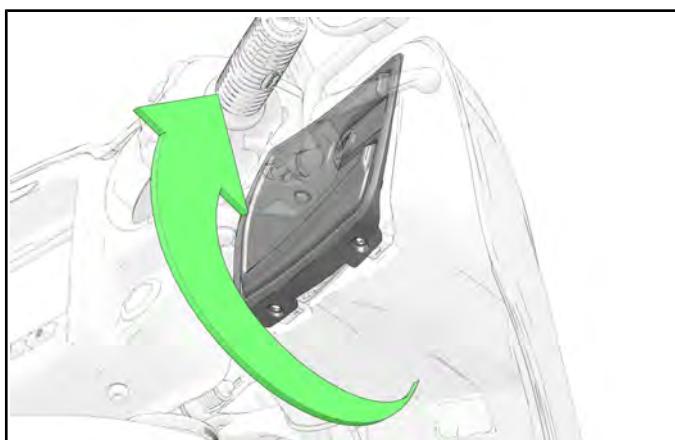


5. Remove the four fasteners ④ from the top of the fairing assembly.

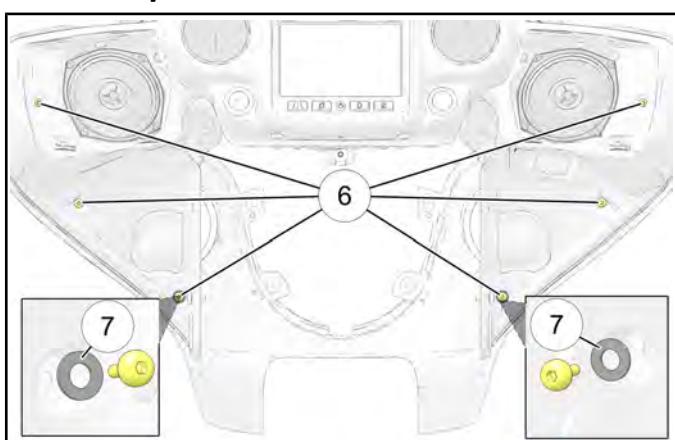


FRAME / BODY

6. Remove two fasteners from both the left and right side speaker grills ⑤. Pull speaker grills bottom out and then downward to remove.
8. Remove fairing assembly.



7. Remove two short fasteners, four longer fasteners ⑥ and two washers ⑦ from the inner fairing assembly.



NOTE

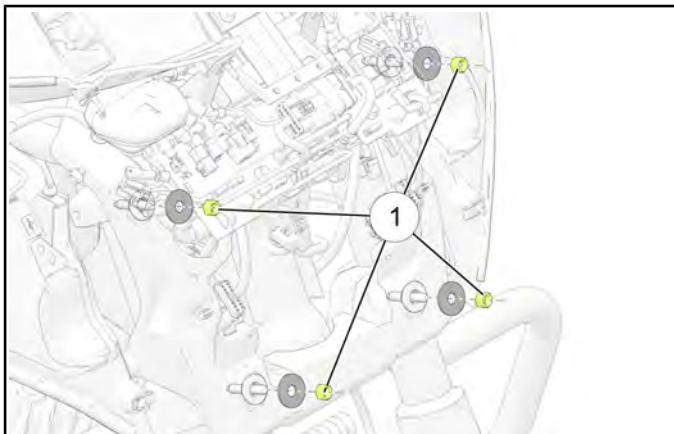
Some fasteners are longer than others, make sure to note placement of fasteners when removing.

INNER FAIRING REMOVAL - (CHIEFTAIN / ROADMASTER)

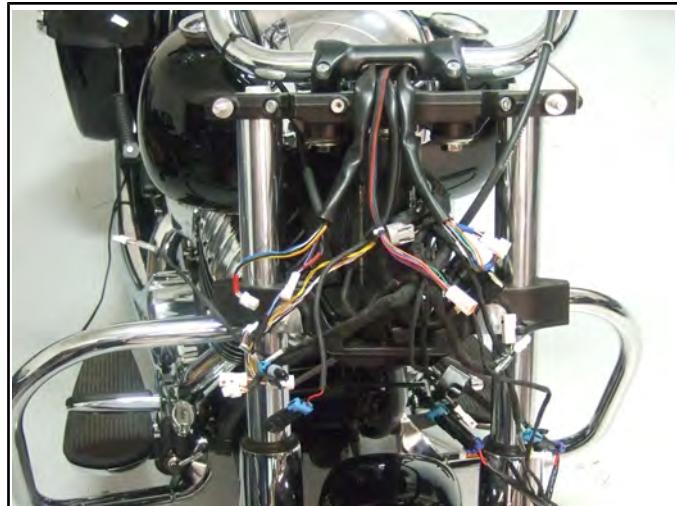
CAUTION

During disassembly, pay close attention to harness routing and connector orientation. Always route electrical wiring the same way as it was removed to avoid damaging wires and connectors.

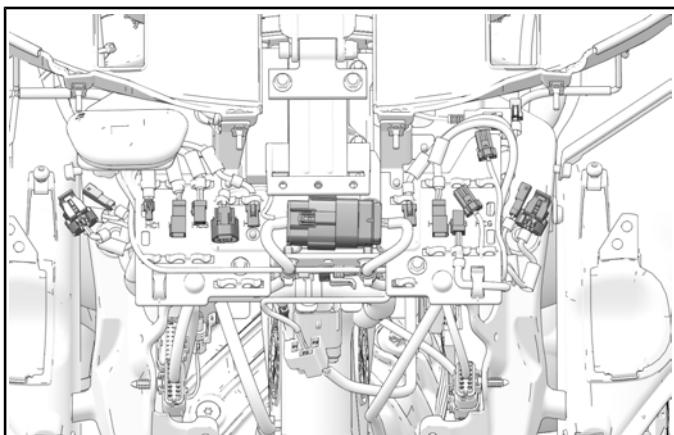
1. Remove the outer fairing. See Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51
2. Remove the instrument cluster. See Ride Command System Removal, page 7.57
3. Remove four nuts ① and washers securing the inner fairing support to the triple clamp assembly.



5. Lift the inner fairing assembly off of the triple clamp studs and route wire through the access hole.



4. Disconnect all multi plugs in harness holder bracket.



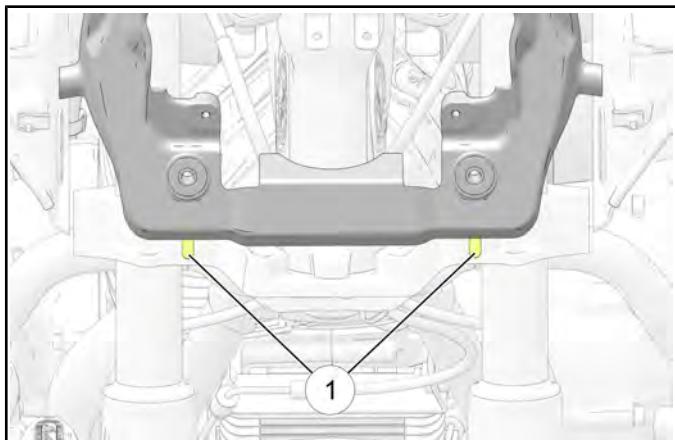
IMPORTANT

Use a marker or tape to index each multi-plug before disconnecting. Some of the connectors are unmarked and interchangeable.

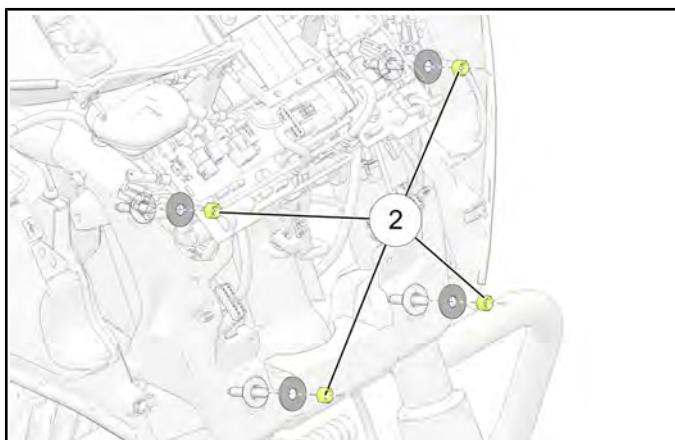
INNER FAIRING INSTALLATION - (CHIEFTAIN / ROADMASTER)**CAUTION**

During installation of the inner fairing, pay close attention to harness routing and connector orientation. Always route electrical wiring the same way as it was removed to avoid damaging wires and connectors.

1. Rest the inner fairing assembly on the lower mounting studs ① and tilt forward.



2. Carefully route all loose wires through the access hole in the inner fairing mount.
3. Install the inner fairing assembly on the four triple clamp studs ② and install washers and nuts finger tight.

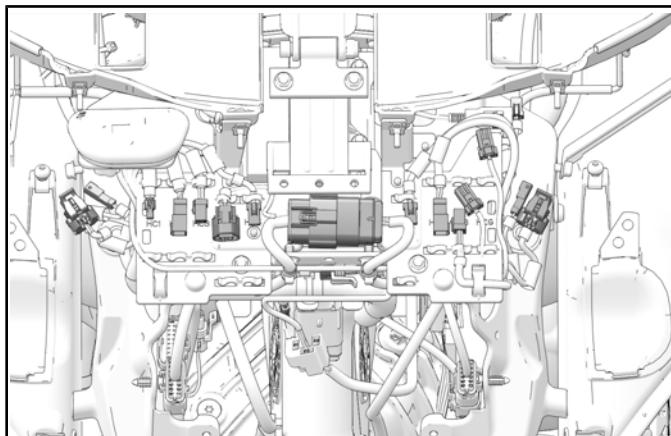


4. Verify that no wires or connectors have been pinched between the inner fairing and the triple clamp and torque mounting nuts to specifications.

TORQUE

Inner Fairing Mounting Nuts: **12 ft-lbs (16 Nm)**

5. Connect all multi plugs in harness holder bracket.



6. Paying attention to the natural form of the wiring harness, reconnect all of the multi-plugs between the chassis and inner fairing.

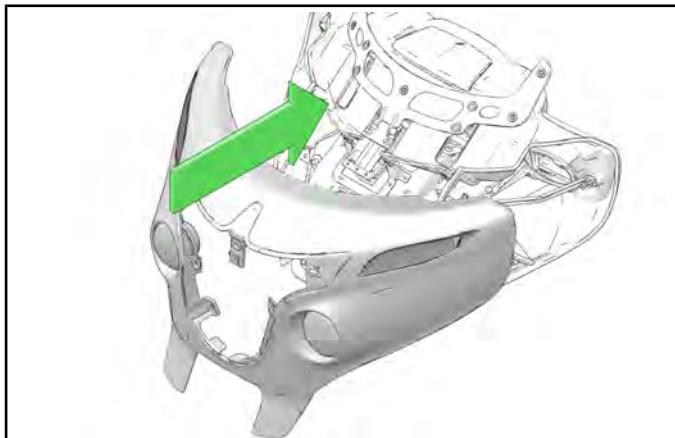
IMPORTANT

Pay attention to index marks placed on connectors during disassembly when reconnecting as some of them are interchangeable.

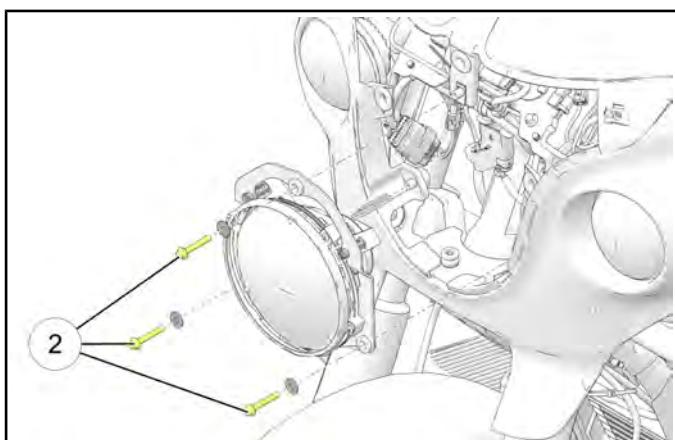
7. Install the outer fairing assembly. See Outer Fairing Installation - (Chieftain / Roadmaster), page 7.55
8. Install the instrument cluster. See Ride Command System Installation, page 7.58

OUTER FAIRING INSTALLATION - (CHIEFTAIN / ROADMASTER)

1. Install outer fairing assembly onto fairing subframe as shown.

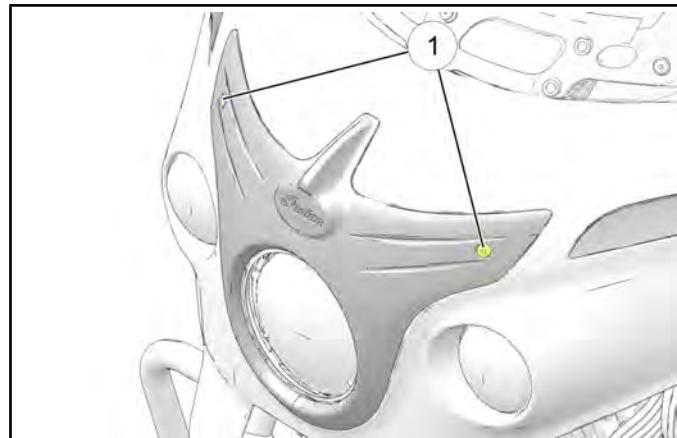


2. Install the head light assembly ② and torque fasteners to specification.

**TORQUE**

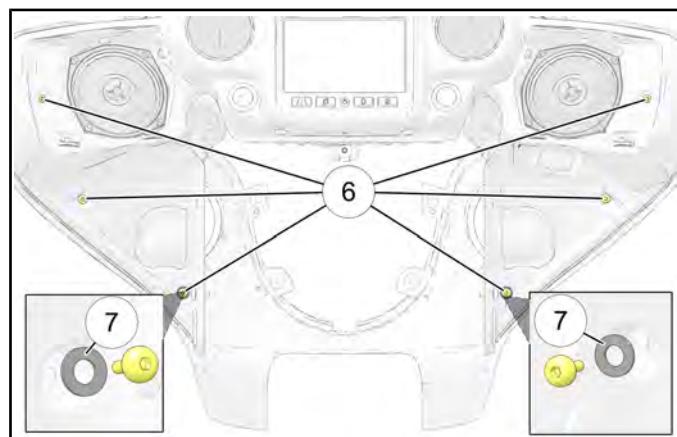
Head Light Bracket Fasteners:
75 in-lbs (8 Nm)

3. Install head light bezel and torque fasteners ① to specification.

**TORQUE**

Head Light Bezel:
36 in-lbs (4 Nm)

4. Install two short fasteners and four longer fasteners ⑥ into the inner fairing assembly. Install one washer ⑦ per side between the lower fasteners and the fairing. Torque fasteners to specification.



7

NOTE

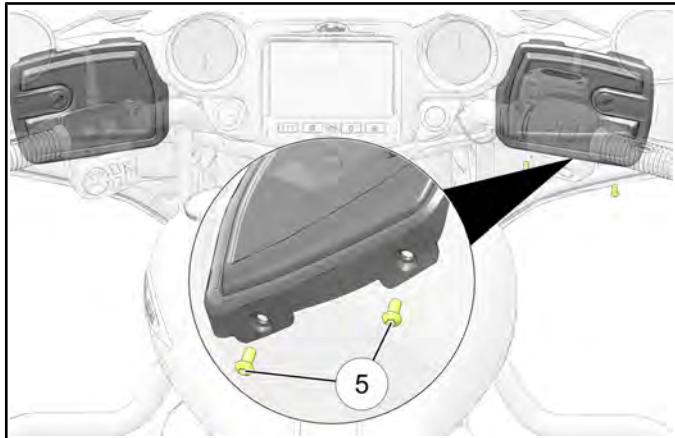
Some fasteners are longer than others, make sure to note placement of fasteners when removing.

TORQUE

Inner Fairing Fasteners:
36 in-lbs (4 Nm)

FRAME / BODY

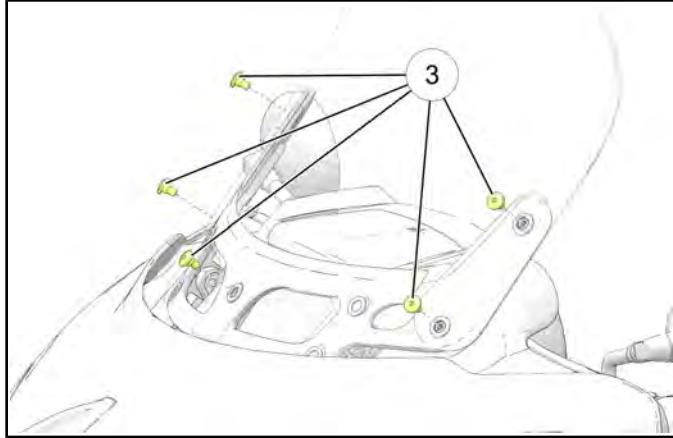
5. Install two fasteners into both the left and right side speaker grills ⑤. Torque to specification.



TORQUE

Speaker Fasteners:
36 in-lbs (4 Nm)

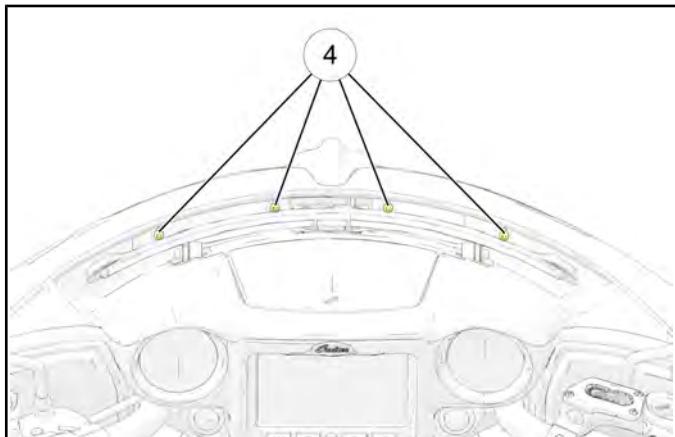
7. Install the windshield and torque fasteners ③ to specification.



TORQUE

Windshield Fasteners:
36 in-lbs (4 Nm)

6. Install the four fasteners ④ into the top of the fairing assembly and torque to specification.

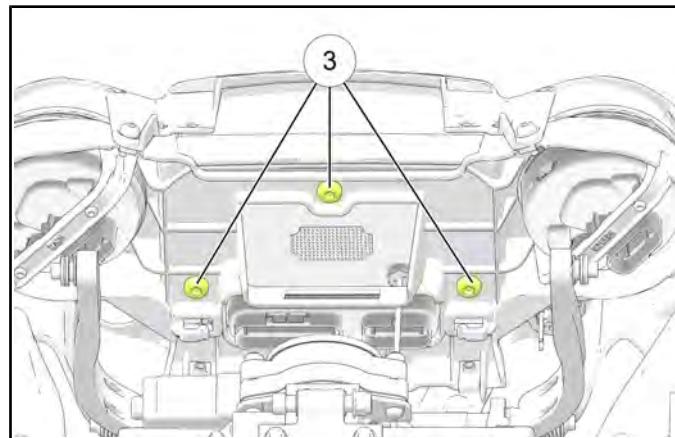
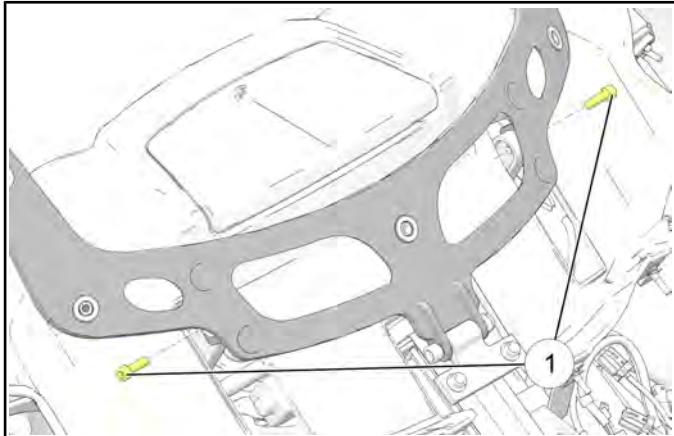


TORQUE

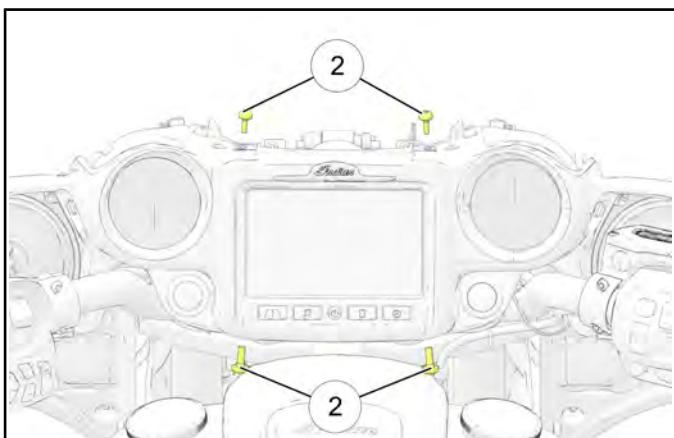
Upper Fairing Fasteners:
36 in-lbs (4 Nm)

RIDE COMMAND SYSTEM REMOVAL

1. Remove Outer Fairing, and Windshield. See Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51
2. Disconnect Windshield Linkage ①.



3. Tie back Windshield Linkages to ease in display removal.
4. Disconnect Power Button, Speedometer, Tach and Display harnesses.
5. Remove Display bracket hardware ② from top and bottom of display.

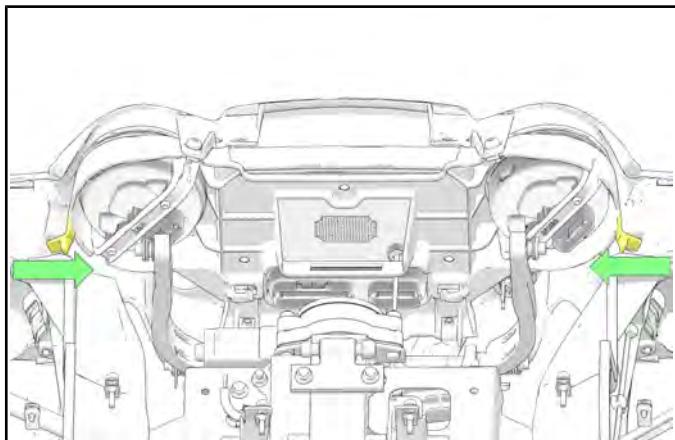


6. Remove Display hardware ③.

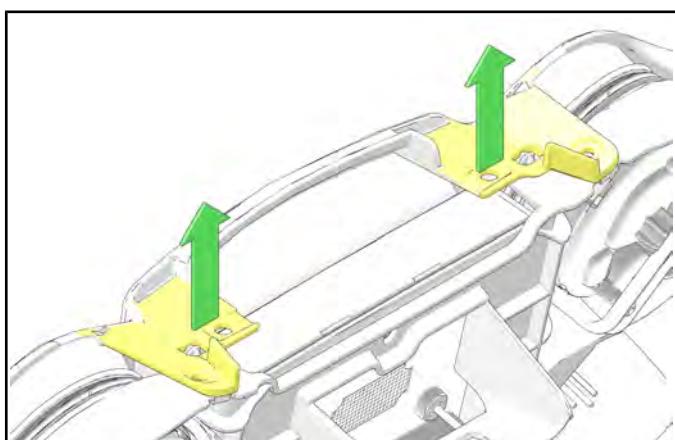
CAUTION

Failure to separate display from bracket prior to removal may cause damage during disassembly

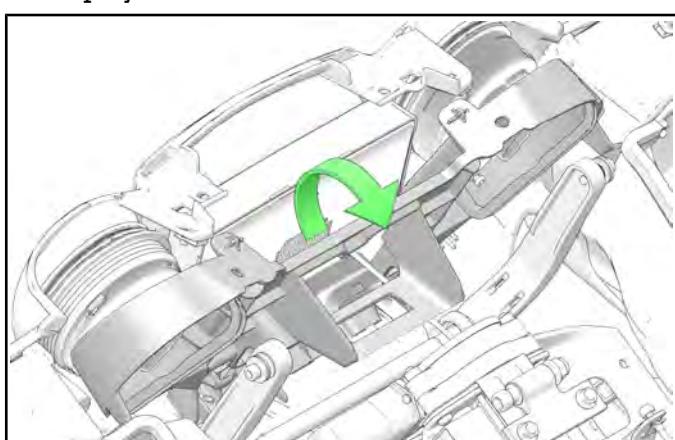
7. Disengage Display bracket locking tabs



8. Pull up on dash tabs to disengage display bracket pins



9. Pivot display bracket back and out to remove display.

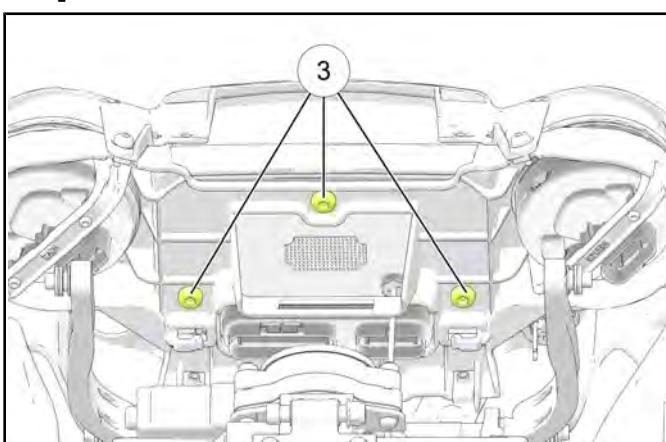
**RIDE COMMAND SYSTEM INSTALLATION**

1. Place display into dash.

NOTE

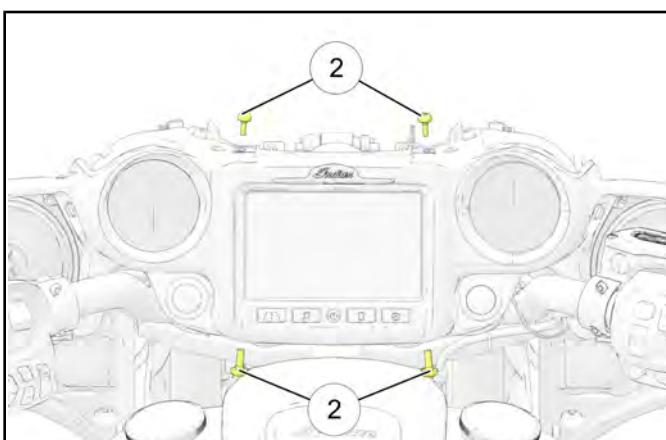
Temporarily secure display with a piece of tape to aid in step 3

2. Ensure Tach and Speedo bezels are clipped into dash.
3. Partially engage upper display bracket pins into dash holes and pivot bracket into place.
4. Engage display bracket side locking tabs.
5. Install display fasteners ③. Torque fasteners to specification.

**TORQUE**

Ride Command Display fasteners:
36 in-lbs (4 Nm)

6. Install display bracket fasteners ②. Torque fasteners to specification.



TORQUE

Display Bracket fasteners (top):
36 in-lbs (4 Nm)

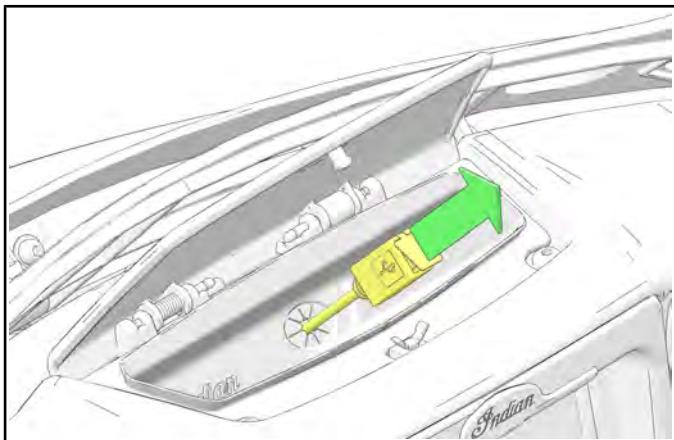
TORQUE

Lift Arm Fasteners:
84 in-lbs (10 Nm)

TORQUE

Display Bracket fasteners (bottom):
84 in-lbs (10 Nm)

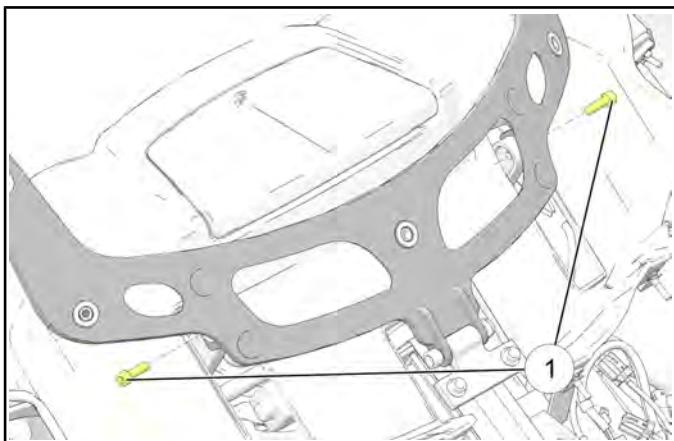
7. Connect Power Button, Speedometer, Tach and Display harnesses
8. Route USB wire thru storage box grommet and install storage box.

**NOTE**

Refer to image below to make sure the Lift Arm hardware stack is in the correct order.



9. Connect Windshield Lift Arm fasteners ①. Torque fasteners to specification.



10. Install Outer Fairing and Windshield. See Outer Fairing Installation - (Chieftain / Roadmaster), page 7.55.

NOTES

CHAPTER 8

STEERING / SUSPENSION

FRONT WHEEL / SUSPENSION	8.4
GENERAL INFORMATION	8.4
SERVICE NOTES	8.4
SPECIAL TOOLS	8.4
TORQUE SPECIFICATIONS	8.4
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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 front end components service.
- Refer to Steering / Suspension chapter for **TIRE REMOVAL, REPAIR, & BALANCING**
- Refer to Brakes chapter for **BRAKE SYSTEM** service and repairs.

SPECIAL TOOLS

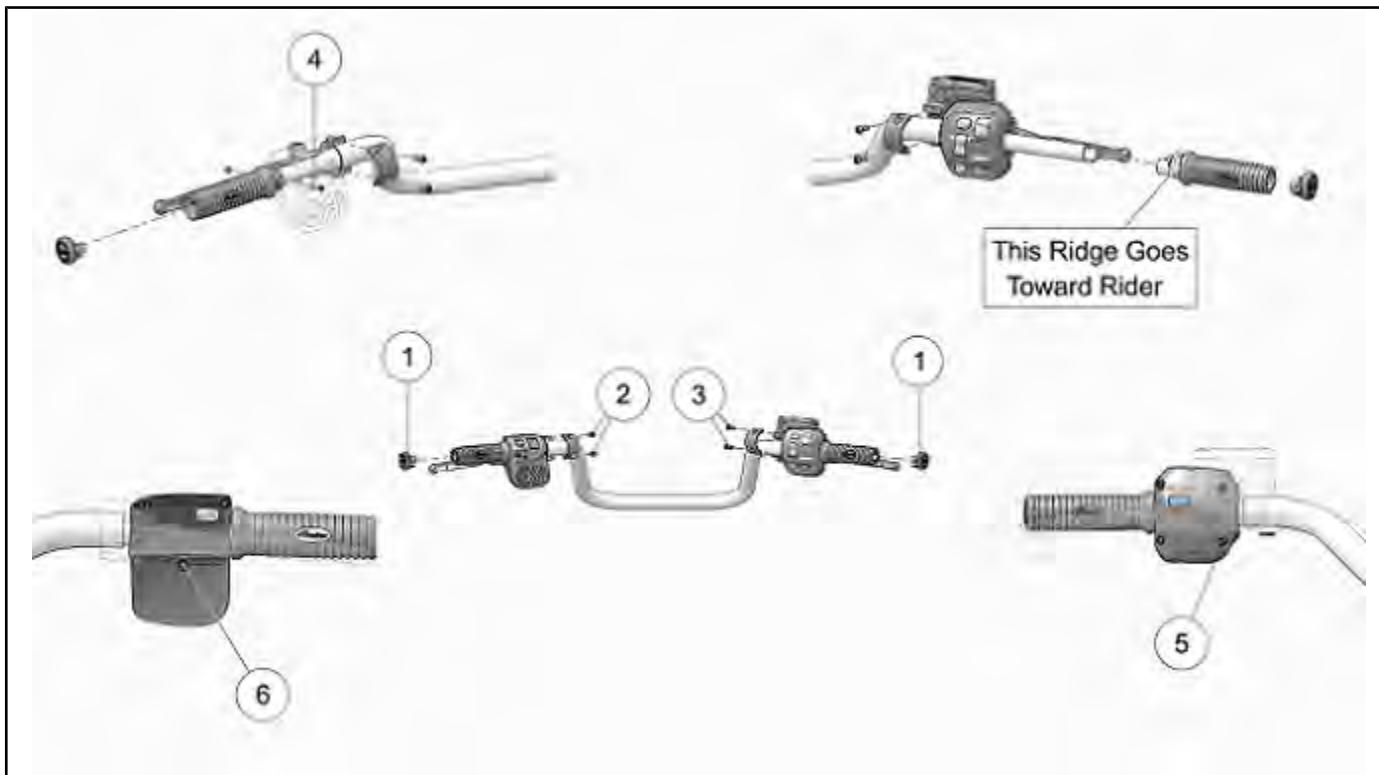
TOOL DESCRIPTION	PART NUMBER
Fork Spring Compressor	PV-49463
Fork Spring Compressor Adapter	PV-49464
Cartridge Shaft Tool	PV-49452
Damper Rod Holder	PV-49453
Fork Oil Level Tool	PV-59000-A
Fork Seal Driver	PV-49494
Wheel / Stem Bearing Removal / Installation Kit	PF-51324
Spanner Socket (Steering Stem)	PV-43508

TORQUE SPECIFICATIONS

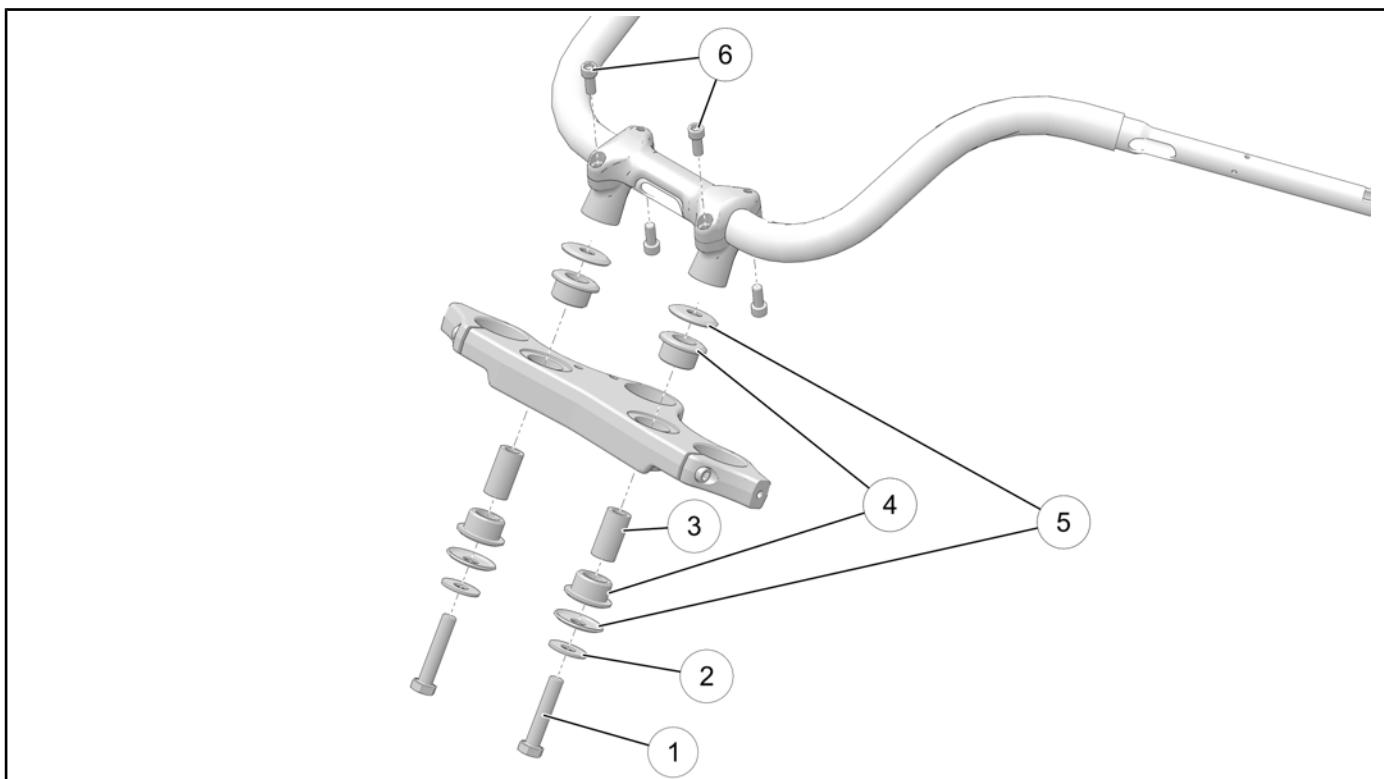
PART DESCRIPTION	TORQUE SPECIFICATION
ABS Pulse Ring / Brake Disc Fasteners	22 ft-lbs (30 Nm)
Cartridge Fastener, Fork	17 ft-lbs (23 Nm)
Clutch Lever Cap Fastener	70 in-lbs (8 Nm)
Fairing Support Nuts	12 ft-lbs (16 Nm)
Fork Cap to Jam Nut	11 ft-lbs (15 Nm)
Fork Cap to Outer Tube	16 ft-lbs (22 Nm)
Front Axle	52 ft-lbs (71 Nm)
Front Axle Pinch Fasteners	18 ft-lbs (24 Nm)
Front Master Cylinder	70 in-lbs (8 Nm)
Grip Retaining Fastener	35 in-lbs (4 Nm)
LH Switch Cube	31 in-lbs (4 Nm)
RH Switch Cube	31 in-lbs (4 Nm)
Riser Fasteners	60 ft-lbs (81 Nm)
Riser Cap Fasteners	18 ft-lbs (24 Nm)
Steering Lock Fasteners	18 ft-lbs (24 Nm)
Steering Stem Adjuster Nut	29 ft-lbs (39 Nm)
Triple Clamp Nut, Top	72 ft-lbs (98 Nm)
Triple Clamp Pinch Fasteners (All)	18 ft-lbs (24 Nm)

SERVICE SPECIFICATIONS

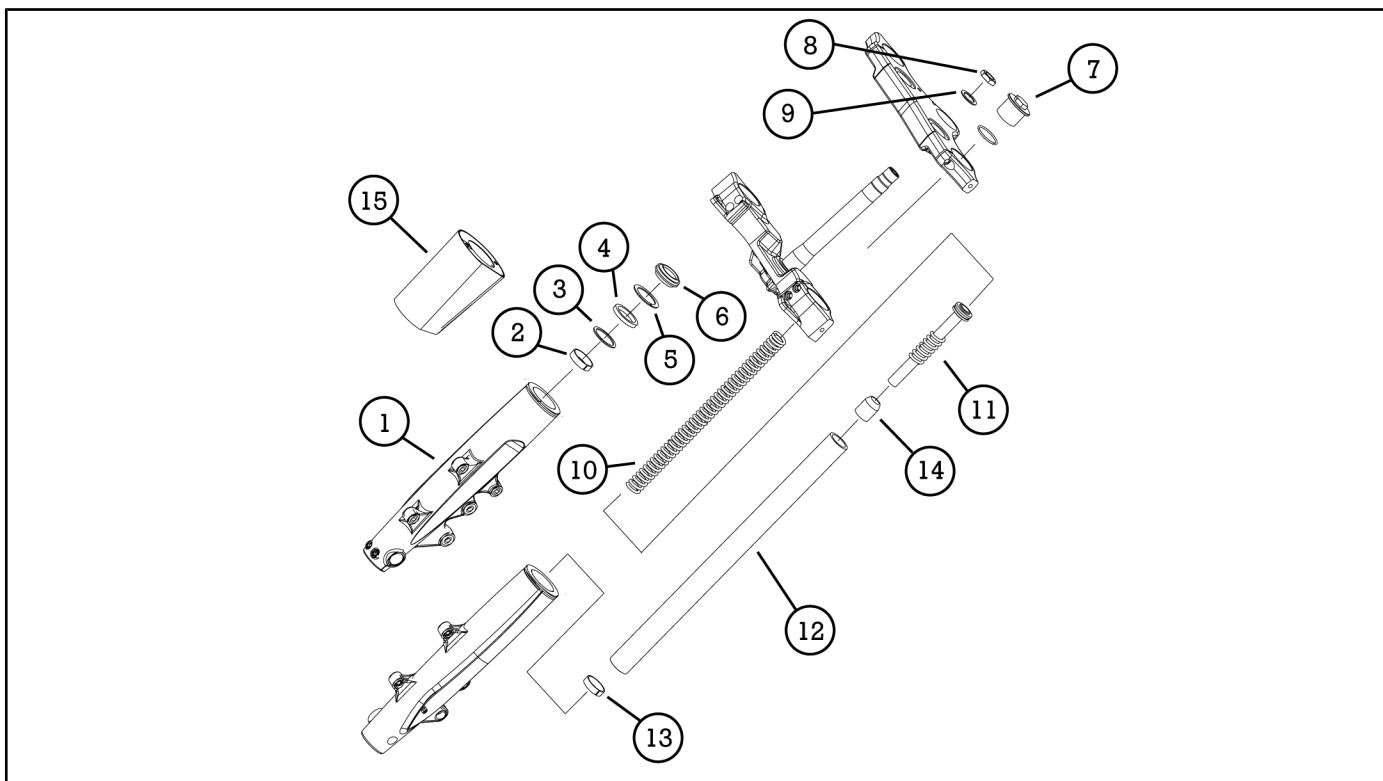
ITEM		STANDARD	SERVICE
Axe Runout		-	.20 mm (.008")
Front Wheel Runout (Cast and Spoked Type) 3.5" x 16" Cast 3.5" x 19"	Axial	.50 mm (.020")	2.0 mm (.080")
	Radial	.50 mm (.020")	2.0 mm (.080")
Fork Tube Diameter		46 mm	Not Applicable
Fork Tube Runout		-	.20 mm (.008")
Fork Oil Type		Indian Motorcycle Fork Oil (PN: 2880015)	
Fork Spring Pre-Load		1.3" (34.5 mm)	Not Applicable
Fork Spring Rate		56 - 114 lb/in (9.8 - 20.0 N/mm)	Not Applicable
Fork Spring Free Length		457.9 mm (18.02 in)	-
Fork Oil Level (From Top of Tube)	Measured with spring removed, inner tube fully compressed.	136 mm (5.35")	+1 mm (.039")
Fork Oil Capacity (per leg, dry)	Oil level must be measured and adjusted to specification.	550 cc (550 ml)	Set Level

ASSEMBLY VIEWS**HANDLEBAR CONTROLS**

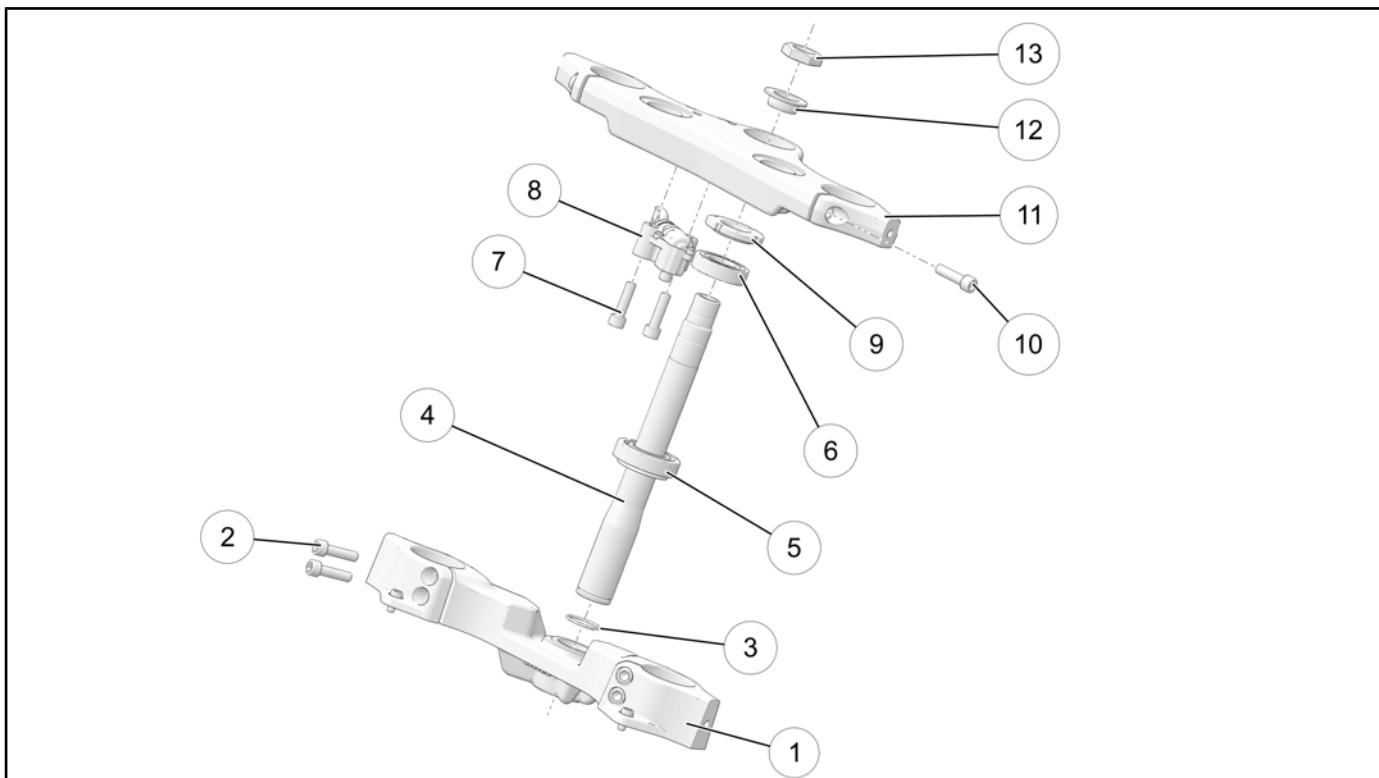
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Bar End Trim Cap	Push Evenly Until Fully Seated and Tabs Engage
②	Clutch Lever Cap Fastener	70 in-lbs (8 Nm)
③	Brake Lever Cap Fastener	70 in-lbs (8 Nm)
④	Grip Retainer Fastener	35 in-lbs (4 Nm)
⑤	RH Switch Cube Fastener	31 in-lbs (4 Nm)
⑥	LH Switch Cube Fastener	31 in-lbs (4 Nm)

HANDLEBAR

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Riser Fastener (QTY.2)	60 ft-lbs (81 Nm)
②	Washer	-
③	Spacer	-
④	Isolator	-
⑤	Washer	-
⑥	Riser Cap Fastener (QTY.4)	18 ft-lbs (24 Nm) Tighten Front fasteners First, Then Rear

FRONT FORK ASSEMBLY

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fork Leg Assembly	-
②	Metal Slide	-
③	Washer	-
④	Oil Seal	-
⑤	Snap Ring	-
⑥	Dust Seal	-
⑦	Cap Assembly	-
⑧	Top Triple Clamp Nut	72 ft-lbs (98 Nm)
⑨	Washer	-
⑩	Spring	-
⑪	Cylinder Assembly	-
⑫	Inner Fork Tube	-
⑬	Bushing	-
⑭	Oil Lock	-
⑮	Fork Cover	-

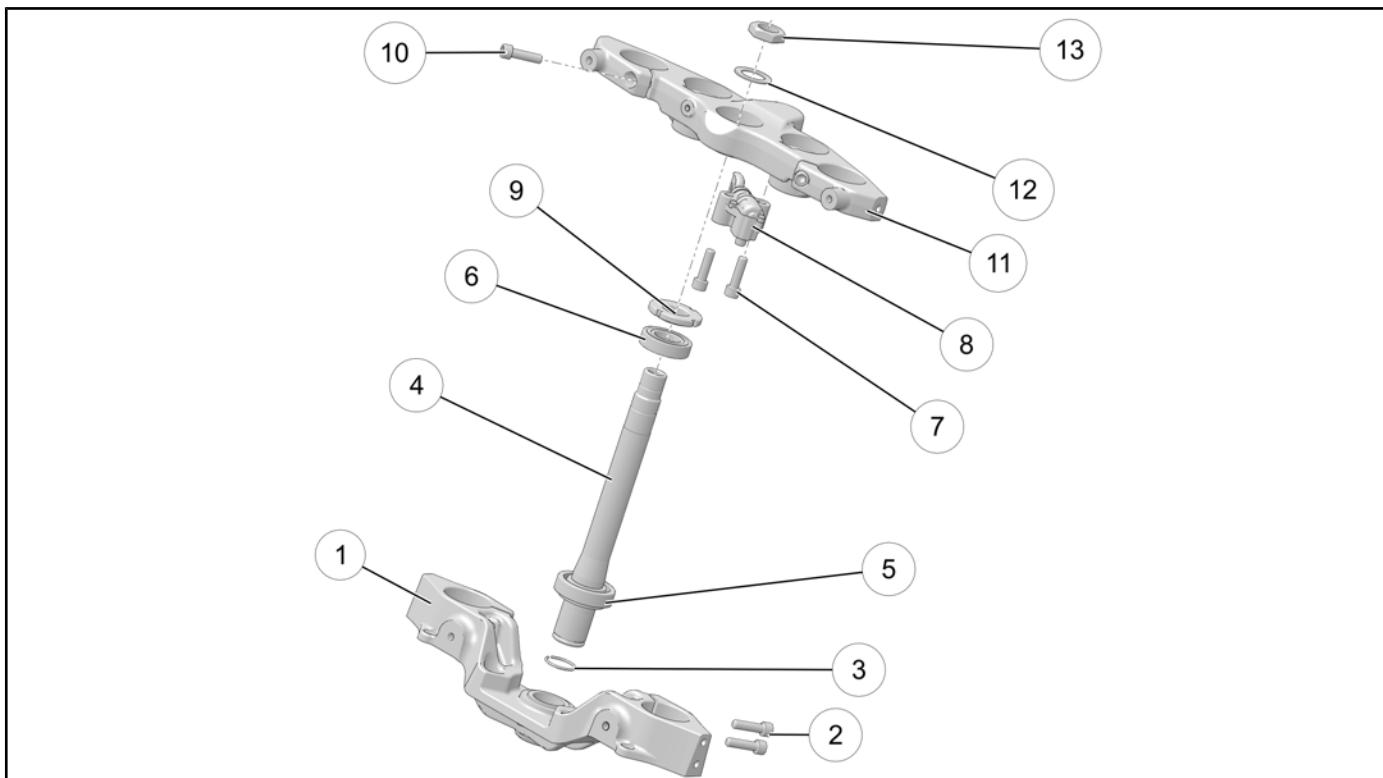
TRIPLE CLAMP (16 INCH)

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Lower Triple Clamp	-
②	Lower Fork Clamp Fastener (QTY.4)	18 ft-lbs (24 Nm)
③	Steering Post Clip	-
④	Steering Stem	-
⑤	Sealed Bearing – 22 x 55 x 17	-
⑥	Ball Bearing — 47 x 25 x 12	-
⑦	Steering Lock Fastener (QTY.2)	18 ft-lbs (24 Nm)
⑧	Steering Lock	-
⑨	Steering Head Nut	See Tightening Procedure Outlined in this Chapter
⑩	Upper Fork Clamp Fastener (QTY.2)	18 ft-lbs (24 Nm)
⑪	Upper Triple Clamp	-
⑫	Washer	-
⑬	Top Triple Clamp Nut	72 ft-lbs (98 Nm)

8

IMPORTANT

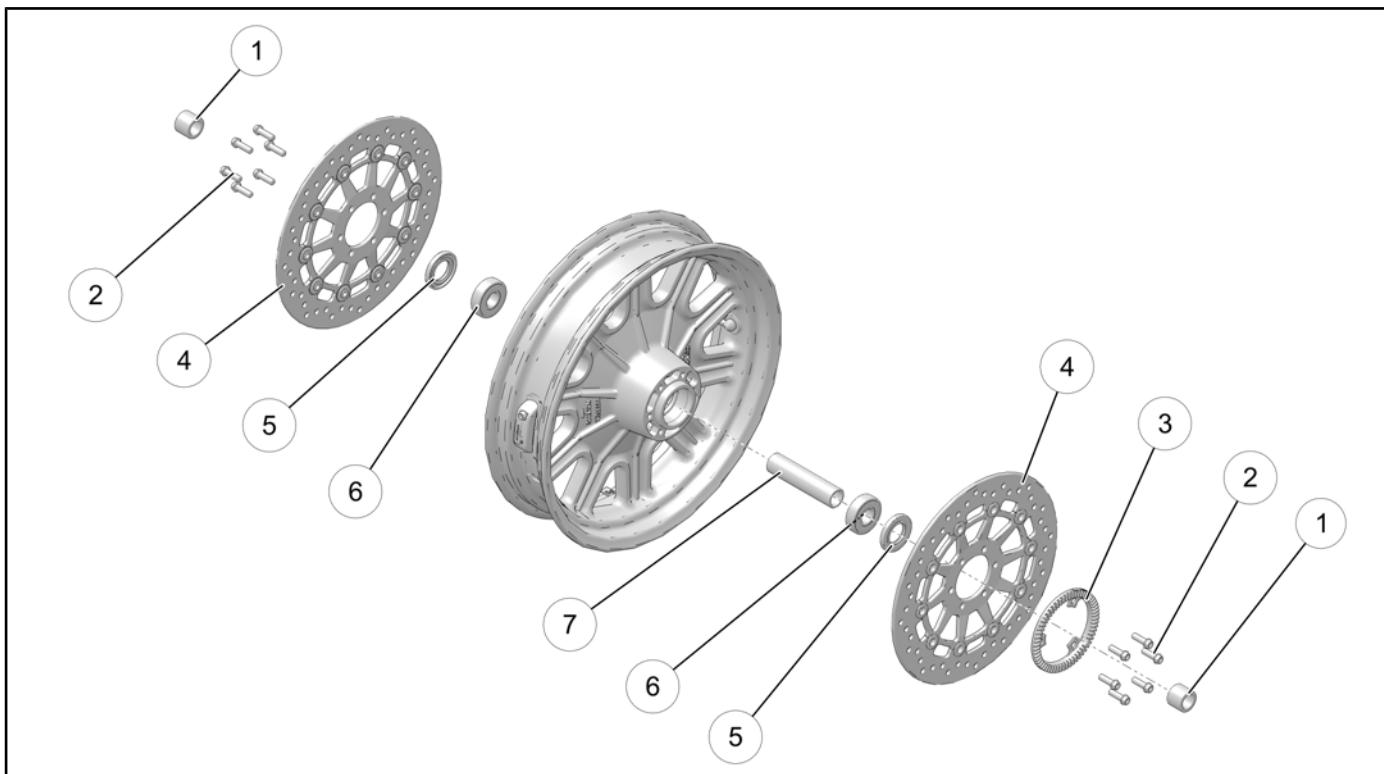
A Service Kit is required to upfit a 16" to 19" front wheel. The service kit will include all the triple clamp parts required for adequate clearance. See the polaris parts for specific kit details.

TRIPLE CLAMP (19 INCH)

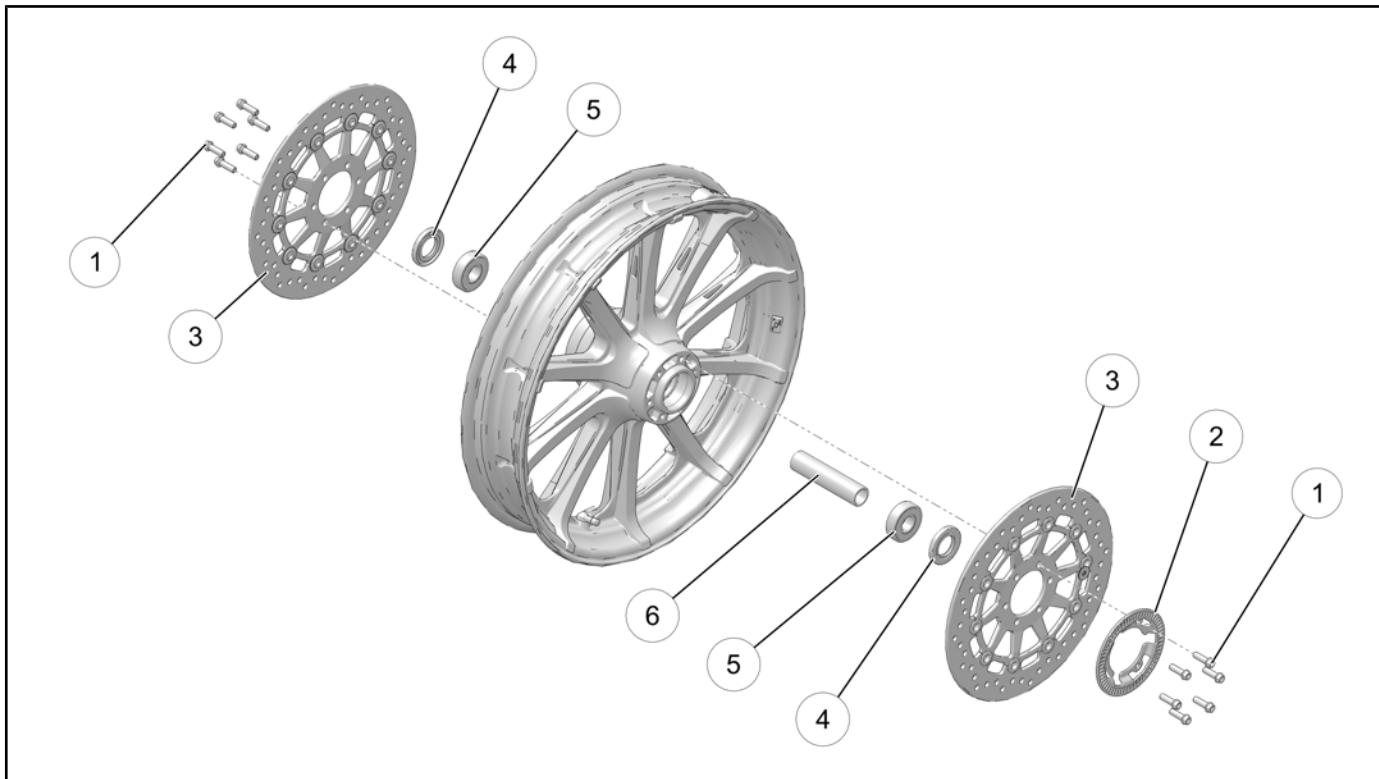
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Lower Triple Clamp	-
②	Lower Fork Clamp Fastener (QTY.4)	18 ft-lbs (24 Nm)
③	Steering Post Clip	-
④	Steering Stem	-
⑤	Sealed Bearing – 22 x 55 x 17	-
⑥	Ball Bearing — 47 x 25 x 12	-
⑦	Steering Lock Fastener (QTY.2)	18 ft-lbs (24 Nm)
⑧	Steering Lock	-
⑨	Steering Head Nut	See Tightening Procedure Outlined in this Chapter
⑩	Upper Fork Clamp Fastener (QTY.2)	18 ft-lbs (24 Nm)
⑪	Upper Triple Clamp	-
⑫	Washer	-
⑬	Top Triple Clamp Nut	72 ft-lbs (98 Nm)

IMPORTANT

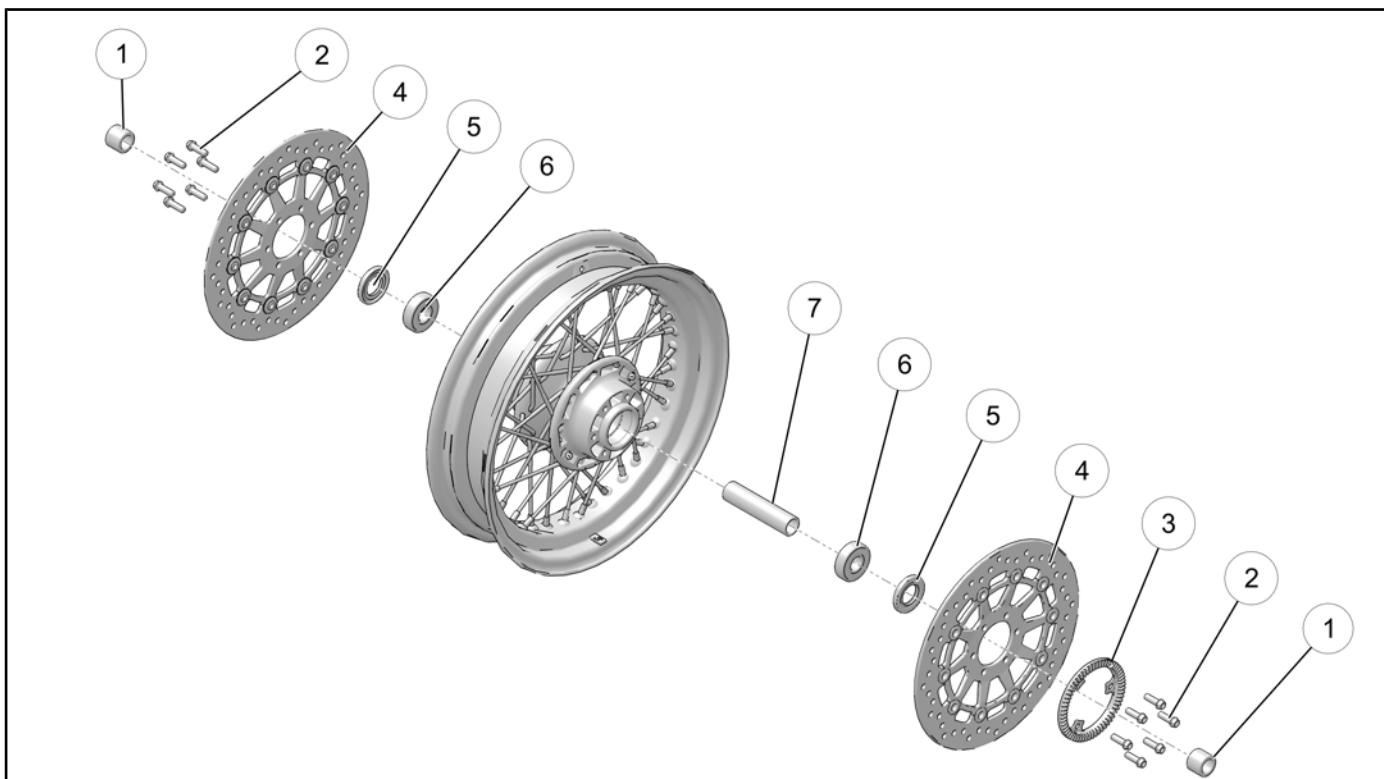
A Service Kit is required to upfit a 16" to 19" front wheel. The service kit will include all the triple clamp parts required for adequate clearance. See the polaris parts for specific kit details.

FRONT WHEEL - CAST (16 INCH)

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Outer Bearing Spacer	-
②	Pulse Wheel / Brake Disc Fastener (QTY.6 per disc)	22 ft-lbs (30 Nm)
③	ABS Pulse Wheel	-
④	Brake Disc	-
⑤	Seal	-
⑥	Wheel Bearing	-
⑦	Inner Bearing Spacer	-

FRONT WHEEL - CAST (19 INCH)

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Pulse Wheel / Brake Disc Fastener (QTY.6 per Disc)	22 ft-lbs (30 Nm)
②	ABS Pulse Wheel	-
③	Brake Disc	-
④	Seal	-
⑤	Wheel Bearing	-
⑥	Inner Bearing Spacer	-

FRONT WHEEL - SPOKED

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Outer Bearing Spacer	-
②	Pulse Wheel / Brake Disc Fastener (QTY.6)	22 ft-lbs (30 Nm)
③	ABS Pulse Wheel	-
④	Brake Disc	-
⑤	Seal	-
⑥	Wheel Bearing	-
⑦	Inner Bearing Spacer	-

SERVICE PROCEDURES**HANDLEBAR, REMOVAL / INSTALLATION
(ALL MODELS EXCEPT CHIEFTAIN / ROADMASTER)****WARNING**

Clutch cable must be routed, installed, and adjusted correctly to function properly. Note how cable is routed and secured before removing the cable. Permanent cable damage may result if the inner cable is bent or twisted during installation.

If the cable is incorrectly routed, installed, or adjusted, serious injury or death may occur.

CAUTION

Keep brake reservoir in an upright position to prevent air from entering the system. Bleeding is required if air enters the system.

CAUTION

Cover painted or chrome parts to prevent damage. Use care to protect fuel tank and front fender. Tank removal is recommended. Secure, set aside, or support parts as they are removed.

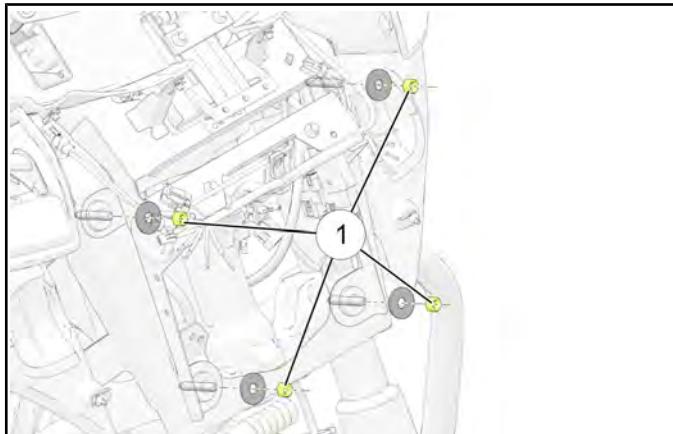
NOTE

Make an index mark on the handlebar along the parting line of the riser cap to ensure proper handlebar position upon reassembly.

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.

Chieftain Dark Horse:

2. Remove outer fairing. See Outer Fairing Removal - (Chieftain Dark Horse), page 7.45.
3. Remove instrument cluster. See Instrument Panel Removal / Installation - (Chieftain Dark Horse), page 7.50.
4. Remove four nuts ① and washers securing the inner fairing support to the triple clamp assembly.



5. Noting harness routing and connector locations, disconnect all fairing electrical connectors and remove inner fairing support.

Chief Classic / Chief Vintage / Chief Dark Horse / Springfield:

6. Remove headlight nacelle and headlight bucket assembly.

All Models (except Chieftain / Roadmaster):

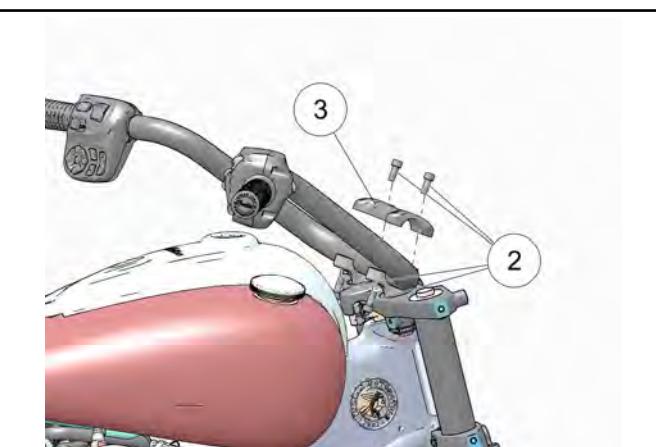
7. Remove front brake master cylinder assembly. See Front Master Cylinder Service, page 9.29.

8. Remove the clutch lever assembly. See Handlebar Controls, page 8.6.

9. Place a soft piece of cloth or padded material on the top of the fuel tank if tank has not been removed.

- 10.

11. Remove the riser cap ③.



12. Lift handlebars out of riser clamps (or the risers off of the upper triple clamp).

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

14. Line up the handlebar index mark made in STEP 10 and torque riser caps, starting with the front fasteners, to specification.

TORQUE

Riser Cap Fasteners:

18 ft-lbs (24 Nm)

Tighten Front fasteners First, Then Rear

15. If handlebar assembly was removed with risers intact, torque riser fasteners to specification.

TORQUE

Riser Fasteners:

60 ft-lbs (81 Nm)

Chieftain Dark Horse:

16. Install the inner fairing support and torque nuts ① to specification.

TORQUE

Inner Fairing Support:

12 ft-lbs (16 Nm)

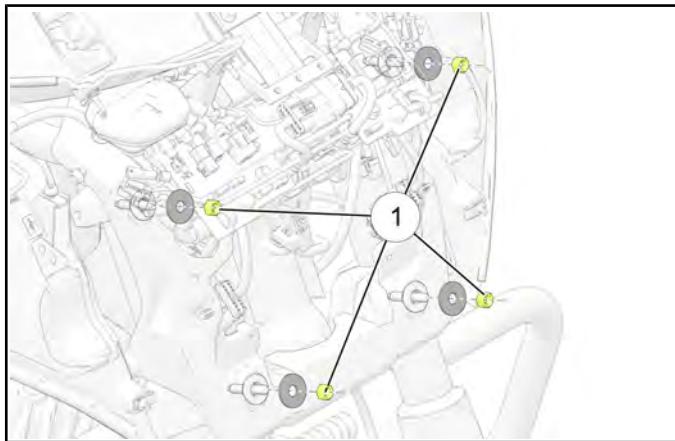
**HANDLEBAR REMOVAL / INSTALLATION
(CHIEFTAIN / ROADMASTER)****WARNING**

Clutch cable must be routed, installed, and adjusted correctly to function properly. Note how cable is routed and secured before removing the cable. Permanent cable damage may result if the inner cable is bent or twisted during installation. If the cable is incorrectly routed, installed, or adjusted, serious injury or death may occur.

CAUTION

Cover painted or chrome parts to prevent damage. Use care to protect fuel tank and front fender. Tank removal is recommended. Secure, set aside, or support parts as they are removed.

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove outer fairing. See Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51.
3. Remove four nuts ① and washers securing the inner fairing support to the triple clamp assembly.



4. Noting harness routing and connector locations, disconnect all fairing electrical connectors and remove inner fairing support.
5. Remove front brake master cylinder assembly. See Front Master Cylinder Service, page 9.29.

CAUTION

Keep brake reservoir in an upright position to prevent air from entering the system. Bleeding is required if air enters the system.

6. Remove the clutch lever assembly. See Handlebar Controls, page 8.6.

7. Place a soft piece of cloth or padded material on the top of the fuel tank if tank has not been removed.

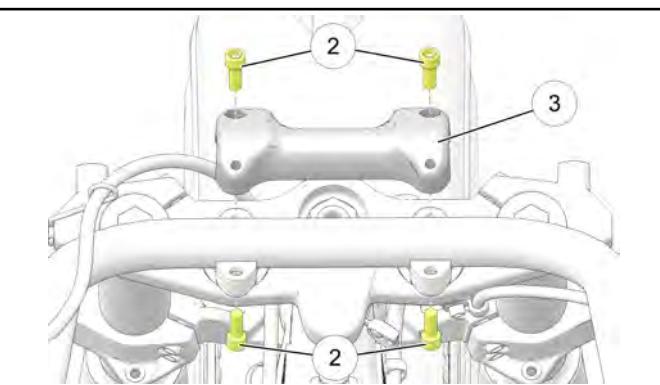
8.

NOTE

Make an index mark on the handlebar along the parting line of the riser cap to ensure proper handlebar position upon reassembly.

If risers will be removed, remove handlebars / risers as an assembly. If risers will not be removed, hold the handlebars in place and loosen the rear handlebar clamp fasteners ②, and then the front ②.

9. Remove the riser cap ③.



10. Lift handlebars out of riser clamps (or the risers off of the upper triple clamp).
11. Installation is performed by reversing the removal procedure.
12. Line up the handlebar index mark made in STEP 8 and torque riser caps, starting with the front fasteners, to specification.

TORQUE

Riser Cap Fasteners:

18 ft-lbs (24 Nm)

Tighten Front fasteners First, Then Rear

13. If handlebar assembly was removed with risers intact, torque riser fasteners to specification.

TORQUE

Riser Fasteners:

60 ft-lbs (81 Nm)

14. Install the inner fairing support and torque nuts ① to specification.

TORQUE

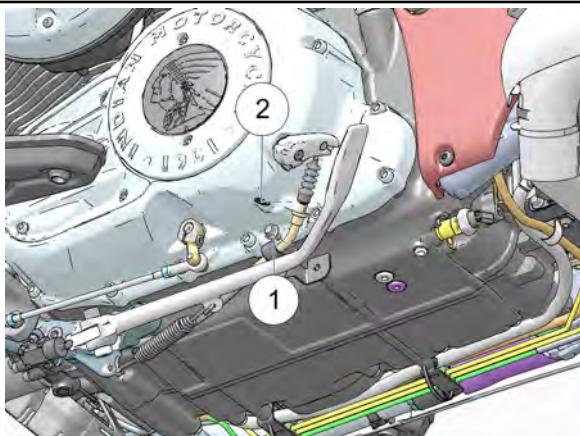
Inner Fairing Support:
12 ft-lbs (16 Nm)

CLUTCH CABLE, REMOVAL / INSTALLATION

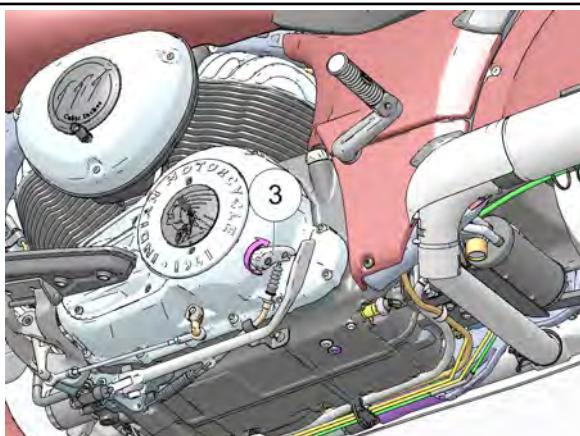
- Place motorcycle in an upright position with the front wheel clamped in a wheel vise.

Clutch Cable Removal

- Remove the side stand bumper fastener ① and the clutch cable E-clip ②.



- Protect the clutch release arm ③ with a shop towel. Using an adjustable wrench, rotate the release arm inward. Disconnect clutch cable from release arm.



- Withdraw the clutch cable from the mounting boss located on the primary cover.
- 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.
- Pull lever slightly until slotted opening in lever is clear of perch and slide cable barrel end down and out of lever.

- Note routing of clutch cable through frame.
- Loosen the fasteners securing the LH frame downtube to the engine and steering head.
- Remove the clutch cable.

Clutch Cable Installation**CAUTION**

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

- Route clutch cable in the same manner as removed.
- Torque the LH frame downtube fasteners to specification. See Engine Brackets / Fasteners, page 3.9.
- Apply multi-purpose grease to the lever end of the cable and install it in the clutch lever at the handlebar.
- Install the casing in the lever perch at the handlebar.
- Install cable in the mounting boss located on the primary cover.
- At the release 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.
- Apply multi-purpose grease to the lower barrel end of the cable.
- Rotate the release arm inward (as in STEP 3) until cable can be installed in release arm.
- Install the clutch cable E-clip at the mounting boss.
- Install the side stand bumper and fastener. Torque to specification.

TORQUE

Side Stand Bumper: **84 in-lbs (10 Nm)**

- Adjust clutch cable free play. See Clutch Lever Free Play, page 2.13.

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.

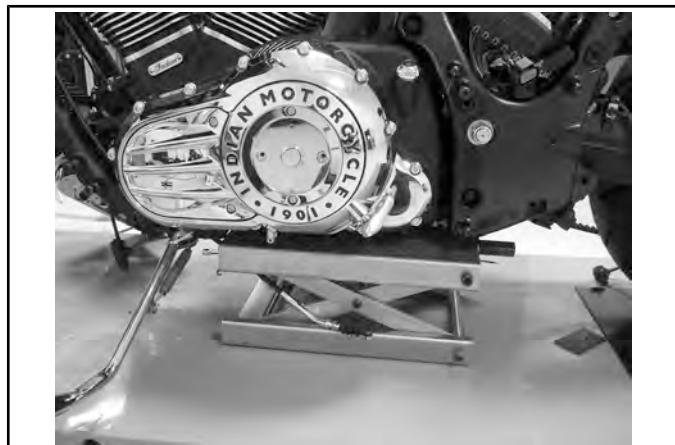
CAUTION

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.

CAUTION

CALIFORNIA MODELS: Remove the charcoal canister prior to raising motorcycle wheels off the ground. As the swingarm lowers it can contact the canister hose fittings and damage them.

- Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

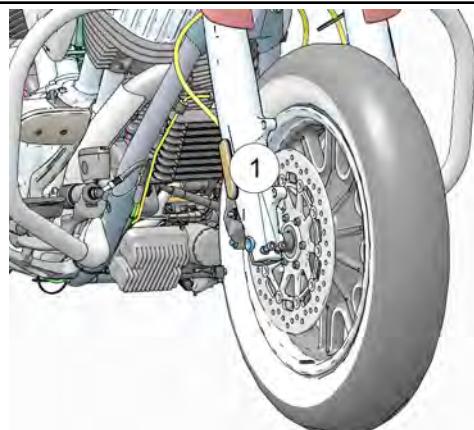
**NOTE**

Do not operate the front brake lever with the calipers or wheel removed.

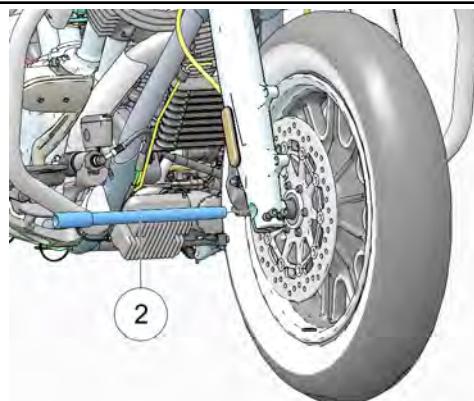
Removal

- Remove the front fender. See Front Fender Removal, page 7.26.

- Loosen axle pinch fasteners ① on lower right fork leg.



- Support wheel and remove axle ②. Be prepared to catch spacers on each side of the wheel and remove wheel.

**Installation**

- Install front wheel and spacers into fork.
- Install the axle and torque to specification.

TORQUE

Front Axle: 52 ft-lbs (71 Nm)

- Tighten axle pinch fasteners to specification.

TORQUE

Axle Pinch Fasteners: 18 ft-lbs (24 Nm)

- Install front fender. See Front Fender Installation, page 7.27.

FRONT AXLE INSPECTION

- Place axle in V-blocks and inspect runout. Compare to specifications in this chapter. See Service Specifications, page 8.5.



- Replace axle if it fails inspection. Do not attempt to straighten a bent axle.

FRONT WHEEL INSPECTION

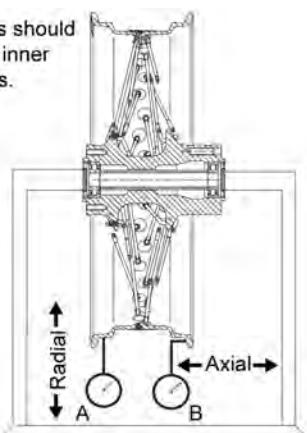
- Install front wheel in truing stand.

NOTE

Bearings must be in good condition to accurately measure runout.

- Set up a dial indicator to measure radial runout (up and down) (A) and compare to specifications. See Service Specifications, page 8.5.
- Position dial indicator to measure axial runout (side to side) (B) and compare to specifications. See Service Specifications, page 8.5.

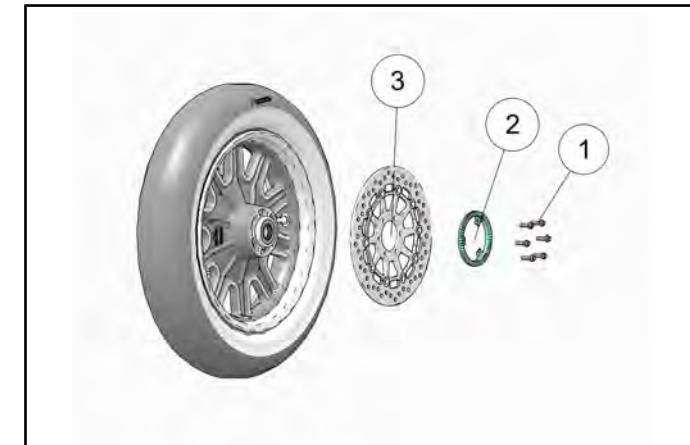
Measurements should be taken from inner wheel surfaces.



- Visually inspect wheel for cracks.
- Replace wheel if it fails visual or measured inspection. Do not attempt to straighten cast or wheels.

BRAKE DISC REMOVAL / INSTALLATION

- Remove front wheel. See Front Wheel, Removal / Installation, page 8.18.
- Position wheel with brake disc and ABS tone ring facing up (protect the other disc and wheel when removing opposite disc).
- Remove and discard brake disc / tone ring fasteners ①.
- Remove tone ring ② and brake disc ③ from wheel.



- Flip wheel over and repeat procedure to remove opposite side brake disc (no tone ring on RH side).
- Installation is performed by reversing the removal procedure. Use new brake disc fasteners for installation**
- Torque new brake disc fasteners to specification in a star pattern.

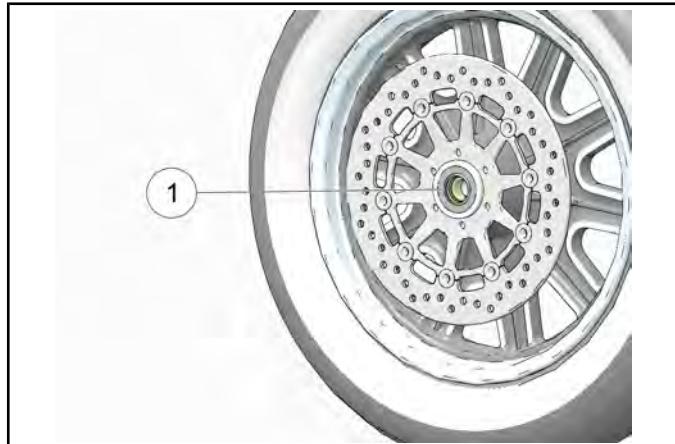
TORQUE

Brake Disc Fasteners: 22 ft-lbs (30 Nm)

FRONT WHEEL BEARING INSPECTION**NOTE**

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.



2. Check bearings by turning inner race by hand.
 - Look for signs of discoloration, scoring, galling, or contamination from moisture or dirt. Replace bearings if any of the above are present.
 - Turn the inner race of the bearings. The bearings should turn smoothly and quietly. The inner race should be firm with minimal side to side movement and no detectable up and down movement.
3. Discard bearings that fail any of the above inspections.

CAUTION

Do not reuse bearings after removing them from the wheel. Removal damages the bearings internally.

4. Inspect bearing fit into wheel hub. The outer race of the bearing must fit tightly into the bore. You should not be able to move it (or remove it) by hand. Replace the wheel if outer race of a new bearing does not fit tightly in the bore.

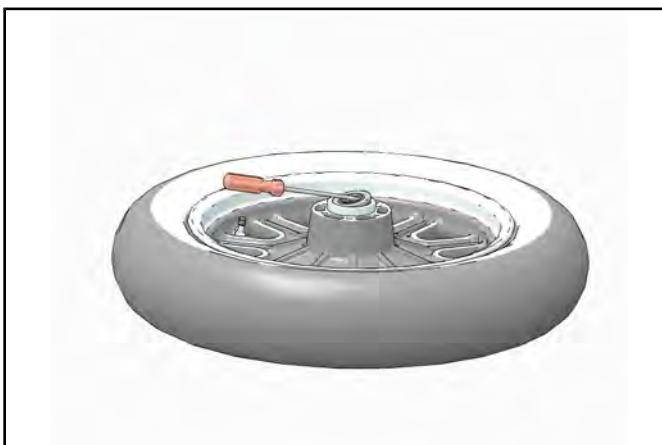
FRONT WHEEL BEARING REPLACEMENT**CAUTION**

Do not reuse bearings that have been removed.

NOTE

This procedure requires the Wheel Bearing Removal / Installation Kit (**PF-51324**). Refer to special tool manufacturer instructions for proper use of tool.

1. Remove front wheel. See Front Wheel, Removal / Installation, page 8.18.
2. Remove brake discs. See Brake Disc Removal / Installation, page 8.19.
3. Carefully remove both seals using a suitable seal removal tool and discard. Be careful not to scratch the seal bore.



4. Refer to special tool manufacturer instructions to remove bearing from LH side of hub.
5. Remove bearing.
6. Remove spacer.
7. Extract or drive bearing from RH side of hub.
8. **Installation:** 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.
9. Install new wheel bearing into the RH side of hub followed by the inner bearing spacer.
10. Install new wheel bearing into the LH side of hub.
11. Install new seals and existing outer bearing spacers into each side of the wheel hub.
12. Install the brake discs. See Brake Disc Removal / Installation, page 8.19.
13. Install the front wheel. See Front Wheel, Removal / Installation, page 8.18.

FRONT FORK REMOVAL (ALL MODELS)**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.

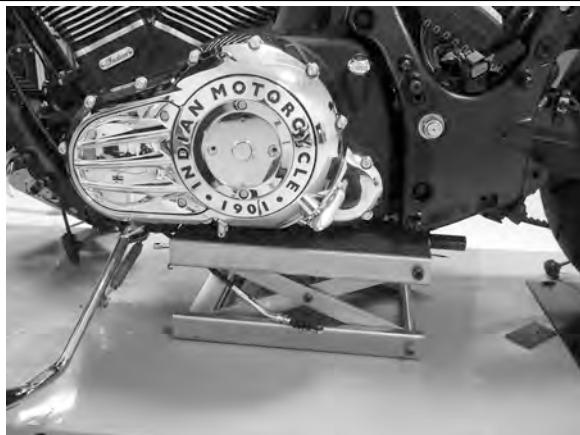
CAUTION

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.

CAUTION

CALIFORNIA & INTERNATIONAL MODELS: Remove the charcoal canister prior to raising motorcycle wheels off the ground. As the swingarm lowers, it can contact the canister hose fittings and damage them.

1. Remove front fender. See Front Fender Removal, page 7.26.
2. Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

**NOTE**

Do not operate the front brake lever with the calipers or wheel removed.

3. Remove front brake calipers and support them so they do not hang by brake hoses. See Front Caliper Service, page 9.31.
4. Remove front wheel. See Front Wheel, Removal / Installation, page 8.18.

Chieftain Dark Horse:

5. Remove fairing assembly. See Outer Fairing Removal - (Chieftain Dark Horse), page 7.45.

Chieftain / Roadmaster:

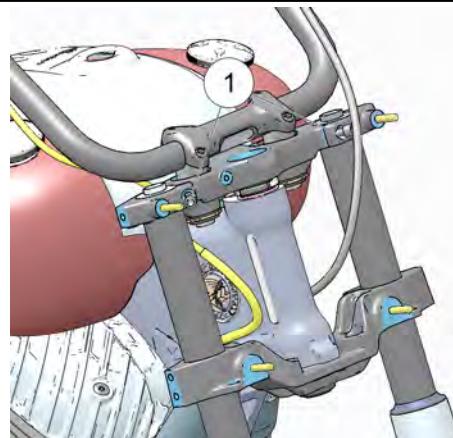
6. Remove fairing assembly. See Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51

Chief Classic / Chief Vintage / Chief Dark Horse / Springfield:

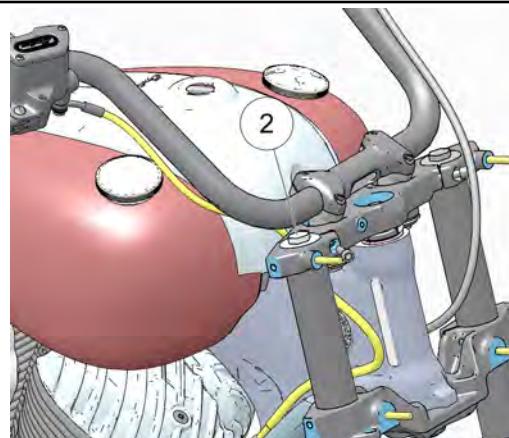
7. Remove nacelle and headlight bucket.

ALL Models

8. If triple clamp will be removed, remove front brake line guides from the upper and lower triple clamps.
9. Loosen upper triple clamp pinch fastener ① for each fork tube.

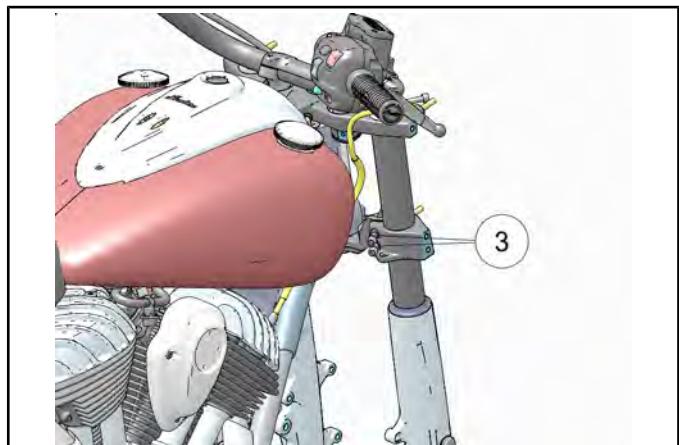


10. If disassembling the fork tube(s), loosen the fork cap(s) ② prior to loosening the lower triple clamp fasteners.

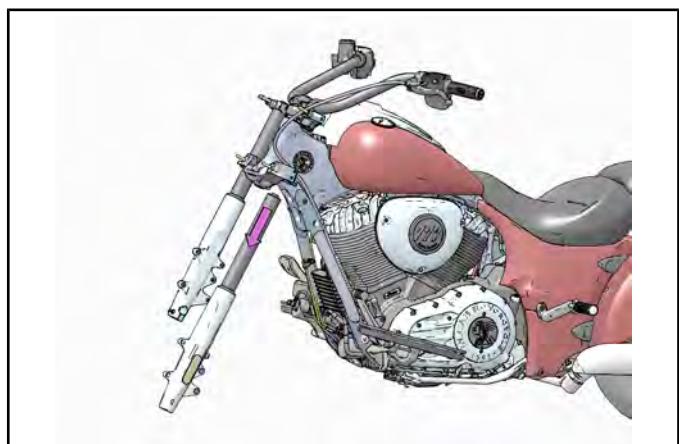


STEERING / SUSPENSION

11. Loosen lower triple clamp pinch fasteners ③ for each fork tube.



12. Slide fork legs down and remove.



FRONT FORK DISASSEMBLY

NOTE

The following procedure requires the use of Fork Spring Compressor (PV-49463) and Fork Spring Compressor Adapter (PV-49464).

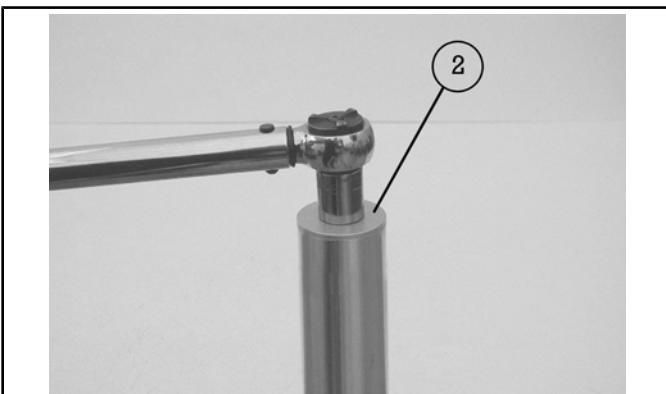
NOTE

Refer to appropriate Front Fork Exploded View.
Clean fork tubes before disassembly.

1. Secure Fork Spring Compressor (PV-49463) vertically in a vise with drive bolt ① UP.



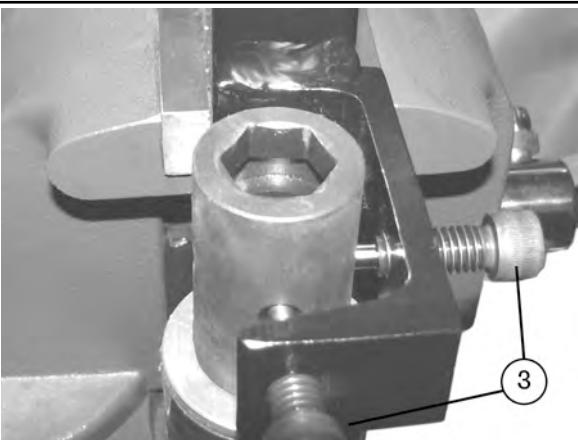
2. Loosen fork cap ② approximately 1 turn. Do not remove the cap.



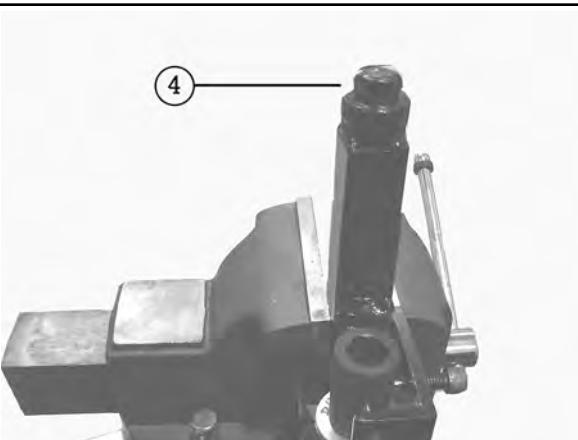
⚠ WARNING

Wear eye / face protection. Be sure spring is engaged properly with pegs of tool as you compress the spring in the following steps.

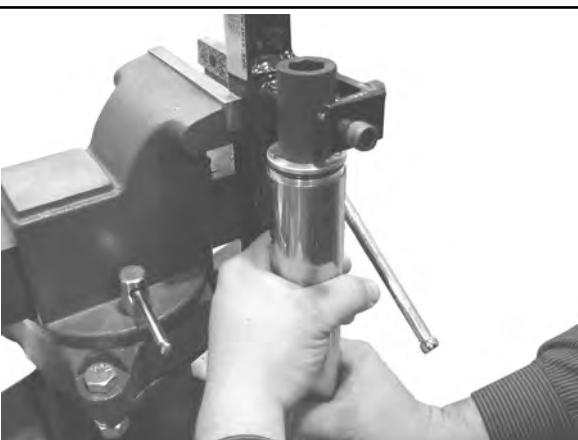
3. Mount special socket (**PV-49464**) in spring compressor. Center it in holding fixture with all thumb fasteners **③**.



4. Place fork tube in spring compressor tool with hole in bottom of fork slider over peg on bottom of tool.
5. Adjust length of spring compressor by turning drive bolt **④** as required until fork cap is captive in socket.

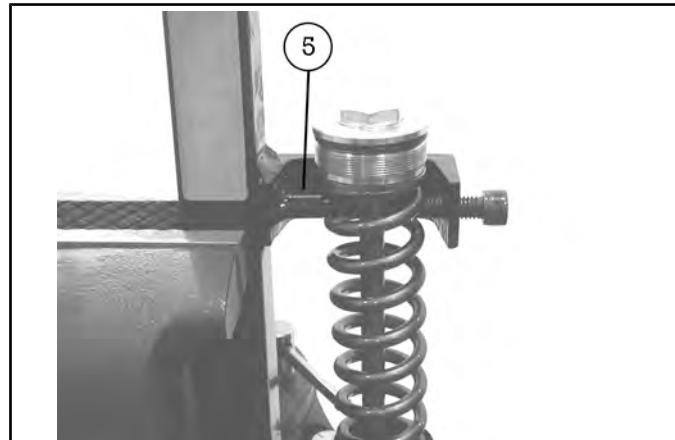


6. Rotate tube until cap is unscrewed completely from fork tube.



7. Back off spring compressor and remove special socket. Re-adjust length of tool so thumb fasteners are aligned with first or second coil at top of spring.

8. Hold fork in center and engage slot of stationary peg **⑤** with spring. Turn other fasteners in and engage spring in notch.

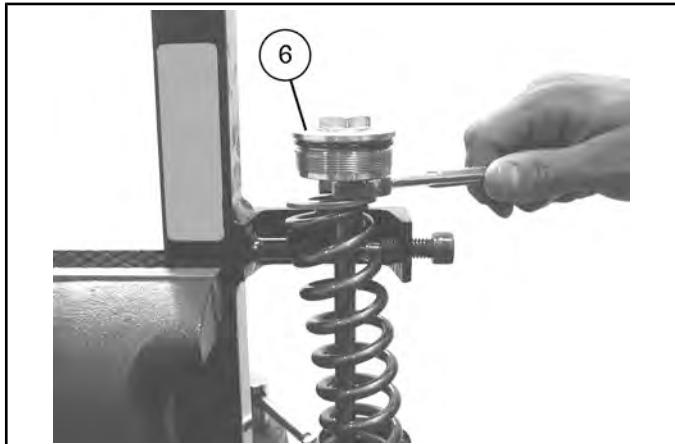


9. Slowly compress spring by turning drive bolt of compressor until cartridge rod nut is accessible. DO NOT use air or power tools to rotate drive bolt.



STEERING / SUSPENSION

10. Hold nut and remove fork cap ⑥ from cartridge shaft.



11. Remove washer ⑦ .



12. Remove spring from fork tube.

13. Pour fork oil out of tube assembly.

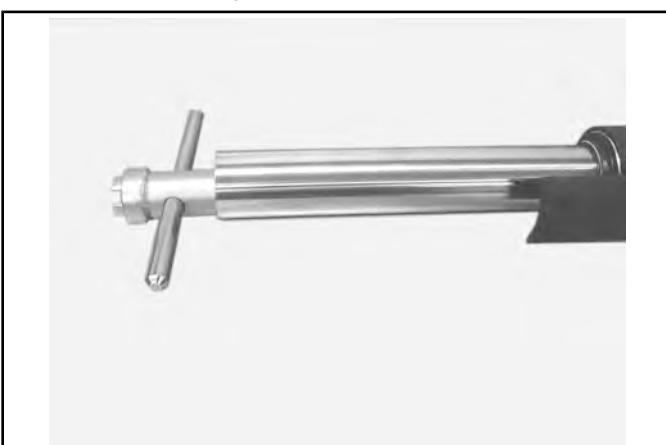
14. Move cartridge shaft through complete stroke several times to drain cartridge (until damping is gone).

NOTE

Fork seal replacement is recommended at oil change. If you do not intend to replace fork seals (fork oil change only) STOP HERE and proceed to Step 14 of Front Fork Assembly. Inner fork tube removal in the following steps will damage the oil seal and require seal replacement. For complete fork disassembly proceed to Cartridge Removal / Step 15.

Cartridge Removal

15. Hold cartridge through top of fork inner tube with octagonal end of Cartridge Shaft Tool (PV-49452). Loosen cartridge fastener.



16. Remove cartridge from inner tube.

WARNING

DO NOT disassemble the cartridge. If damaged or worn, it must be replaced as an assembly.

17. To clean cartridge when removed, submerge oil holes in clean cartridge fork oil and pump cartridge shaft.

18. Fully compress the fork tube. Carefully lift dust seal out of outer fork tube with a small flat screwdriver. KYB forks have access notch to remove dust seal.



19. Remove seal retaining ring. Use care not to scratch the surface of the inner fork tube.



24. Protect top surface of fork slider and pry out oil seal, using care not to scratch the seal bore.



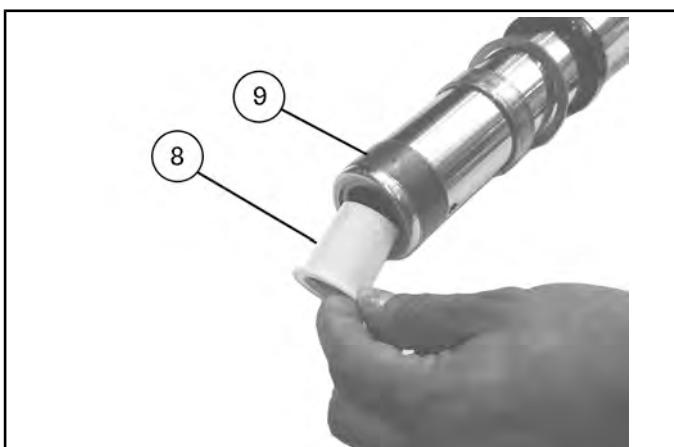
20. Push inner and outer tube together, then pull apart quickly to produce a slide hammer motion to remove the inner tube.

21. Separate the tubes.

22. If applicable, remove the lower bushing from the inner tube.



23. Remove oil lock valve ⑧ and bushing ⑨ from bottom of inner tube.



25. Remove oil seal and backing washer.



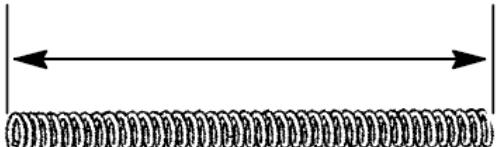
8

Upper Bushing Removal

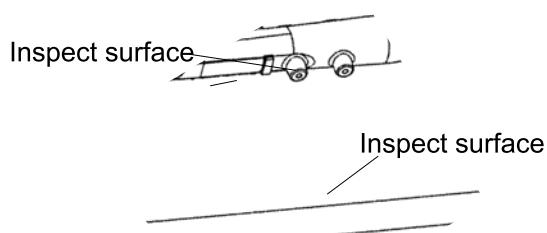
26. To remove upper bushing from fork slider, reinstall fork tube (with lower bushing attached) into fork slider, working the bushing carefully past the upper (slider) bushing.
27. Use a VERY LIGHT slide hammer motion to tap slider bushing out of the slider.
28. Clean tubes and drain completely. Cartridge removal is not required for seal and bushing replacement. Cartridge can be cleaned by adding clean fork oil to slider and pumping the cartridge rod in the clean oil bath. Discard fork oil used to flush the cartridge.

FRONT FORK INSPECTION

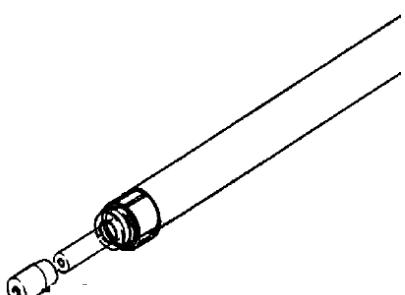
- Measure fork spring free length and compare to specifications on .



- Inspect fork stanchion tube 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.
- Inspect slider for dents or other indentations due to rocks or other road debris or damage. If damage is found on exterior of slider, insert fork tube into slider 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 slider.



- Inspect oil lock valve for scoring, excessive or abnormal wear.



- Visually inspect the damper rod piston ring. Replace ring if scoring, deep scratches and/or excessive wear is noted.



CAUTION

Ring is directional. Be sure to install it with stepped edge toward damper rod and top-out spring as shown.

- Place fork tube in V-blocks and measure runout. Replace the tube if runout exceeds service limit listed on .



WARNING

Do not attempt to straighten bent fork tubes. Doing so will weaken the tube and make the motorcycle unsafe to operate.

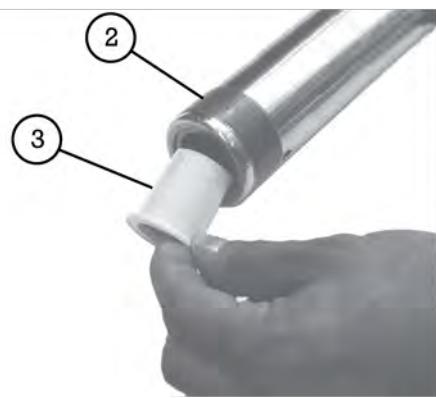
FRONT FORK ASSEMBLY**NOTE**

Clean all parts prior to assembly.

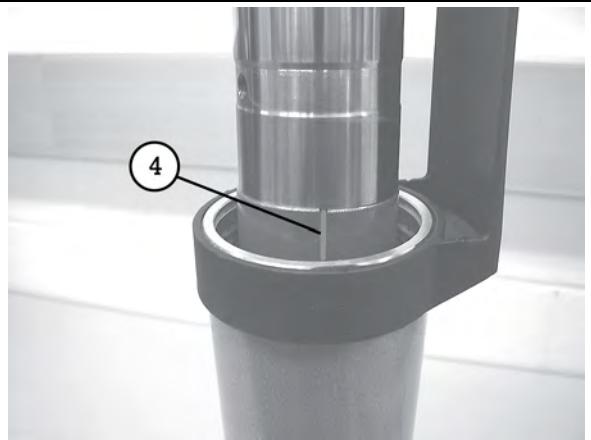
- Lubricate and install new upper bushing into fork slider. Position gap ① to left or right side of fork slider.



- Lubricate and install a new lower bushing ② on inner fork tube. Install oil lock valve ③ in bottom of fork tube (tapered side to the tube as shown).



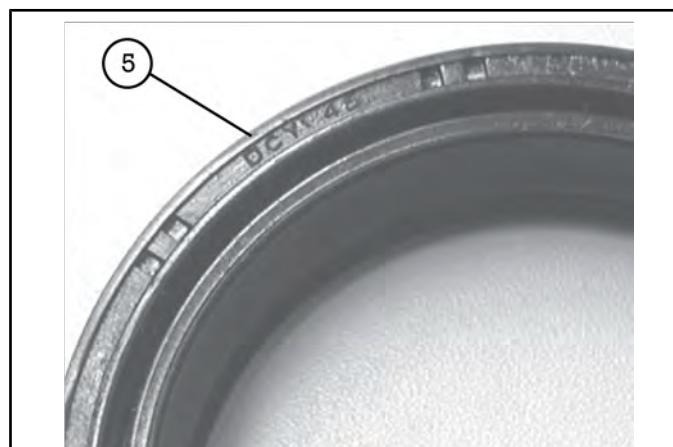
- Rotate bushing so gap ④ will be opposite the gap of slider bushing previously installed.



- Apply a light film of fork oil to outside edge and inside seal lips of new oil seal.

NOTE

Install oil seal with markings ⑤ facing UP (toward top of tube and retaining ring).

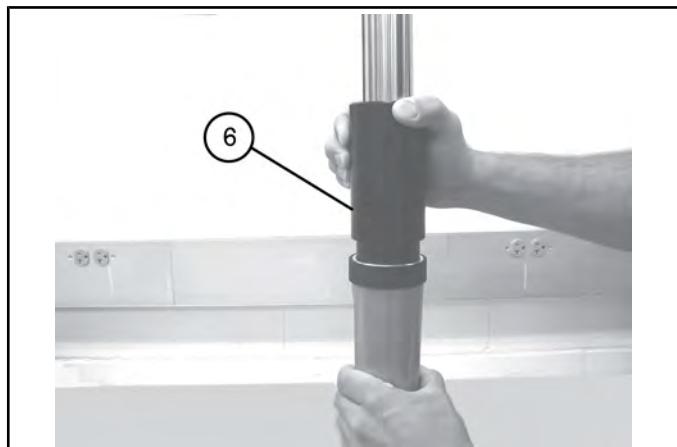


STEERING / SUSPENSION

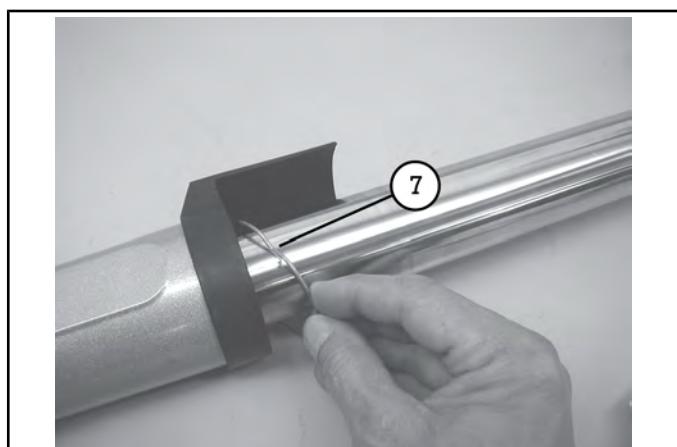
5. Lubricate the surface of the inner fork tube and slide backing washer and new oil seal down tube and into outer fork leg.



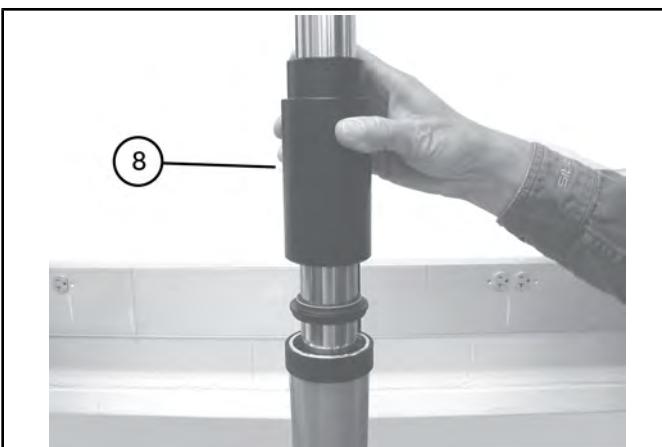
6. Use the Fork Seal Tool (PV-49494) (6) to install oil seal until seated. Be sure top edge of seal is past (below) retaining ring groove.



7. Install a new retaining ring (7) into groove of fork tube. Be sure it is completely seated around the entire circumference of the groove.

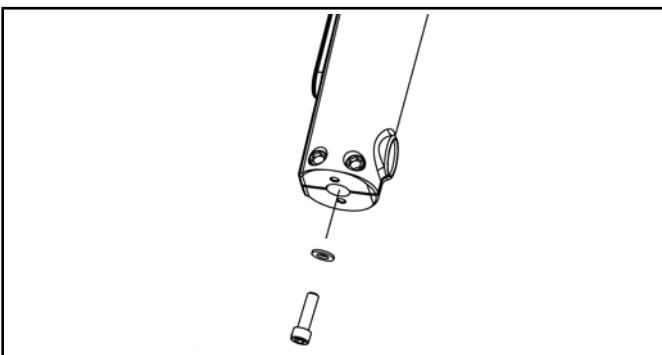


8. Wipe away any excess grease or oil. Install dust seal (use opposite end of Fork Seal Tool (PV-49494) (8) until fully seated in outer tube.



Cartridge Installation

9. Be sure fastener threads in bottom of cartridge are clean and not damaged.
10. Place cartridge assembly into fork slider, and carefully align bottom of cartridge with recess in bottom.
11. Install a new cartridge fastener and a new seal washer.



12. Hold cartridge with the Cartridge Shaft Tool (PV-49452).

13. Torque cartridge fastener to specification.



TORQUE

Cartridge Fastener: 17 ft-lbs (23 Nm)

Oil Filling / Cartridge Air Bleeding

14. Tip fork leg at an angle to reduce air bubbles. Slowly add about 350cc of Indian Motorcycle fork oil

15.

NOTE

The oil quantity slightly exceeds the capacity of the fork. Final fork oil level must be adjusted correctly as outlined later in this procedure.

Set fork leg upright.

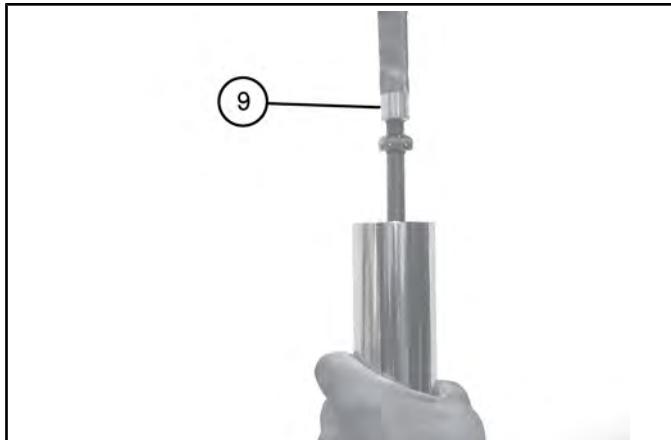
16. Lift outer tube up to top of travel range.
17. Seal top of tube with your hand and push downward against air pressure. Hold for 10–15 seconds. This will help force trapped air from cartridge and tube.



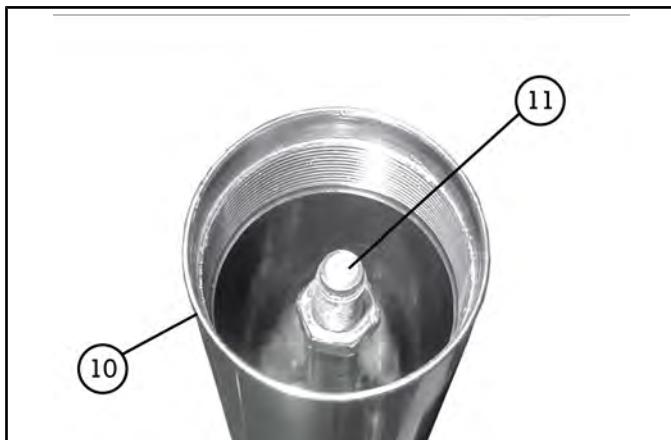
18. Mount fork assembly upright in a soft jawed vise by brake caliper mounts on slider.

19. Screw Damper Rod Holder (**PV-49453**) ⑨ onto cartridge rod.

20. Bleed cartridge by moving shaft up and down to purge air. Begin with small strokes, increasing stroke length until all air is removed and damping is smooth and consistent.



21. Slowly compress inner fork tube ⑩ and cartridge rod ⑪ until they stop (at bottom of travel) and remove damper rod holder.

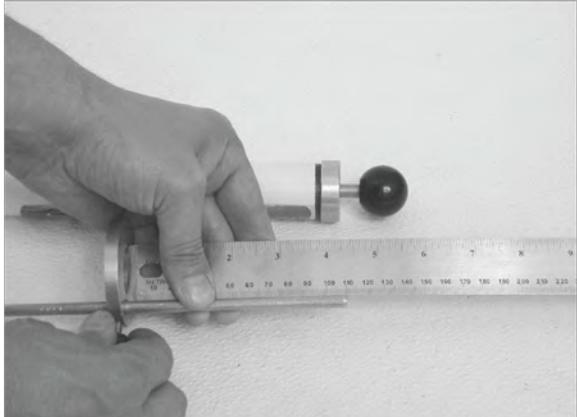


STEERING / SUSPENSION

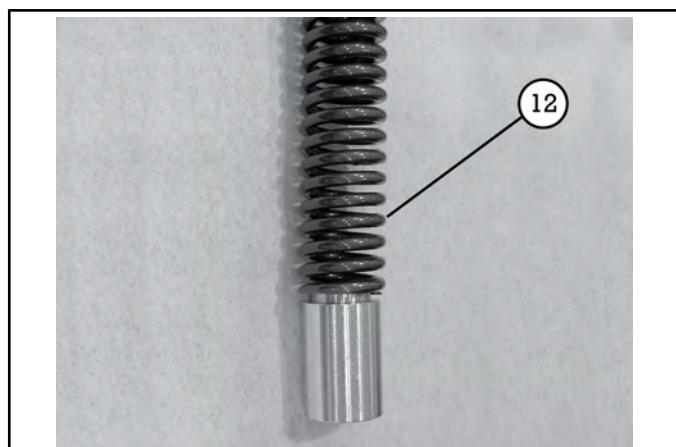
22. Loosen thumb fastener on Fork Oil Level Tool (**PV-59000A**) and slide stop plate to adjust tube to length of specified oil level.

MEASUREMENT

Fork Oil Level (from top of tube): **5.35 in (136 mm)**. Set level in tube with spring removed, and inner tube and damper rod (cartridge rod) fully compressed.



23. Insert fork oil level tool into fork. Be sure fork leg is standing upright and fork tube is fully compressed.
24. Draw excess oil out to the specified level.
25. Install spring with tightly wound coils **(12)** down.



26. Mount tube in spring compressor and adjust thumb fasteners to catch spring as outlined for disassembly.

WARNING

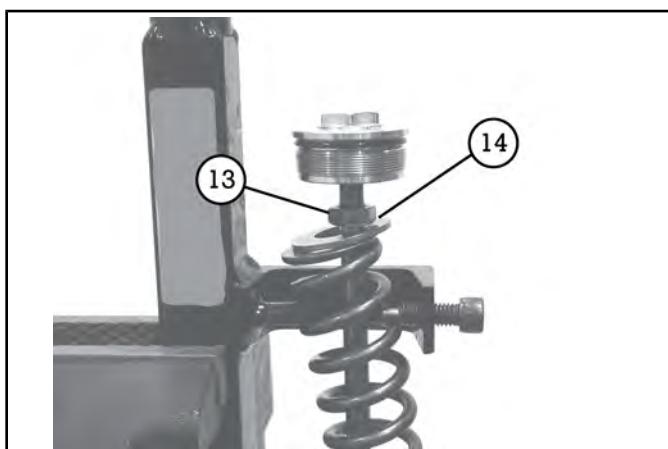
Wear eye / face protection. be sure spring is engaged properly with pegs of tool as you compress the spring in the following steps.

27. Attach damper rod holder and hold damper rod up.

28. Carefully compress spring until fork cap threads on top of damper rod are visible.

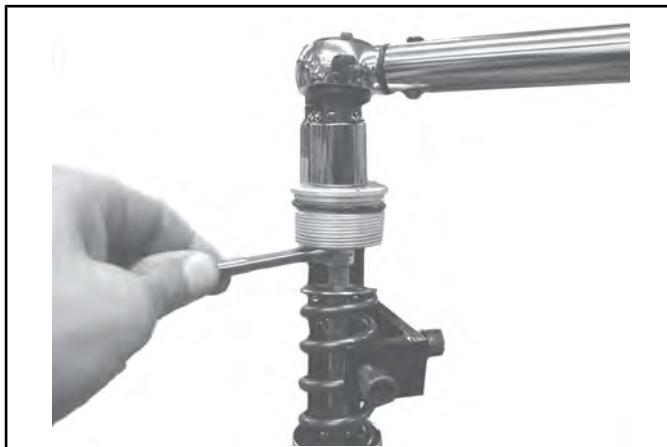


29. Remove extension tool and hold damper rod up, clear of spring.
30. Screw jamb nut **(13)** fully onto damper rod until bottomed.
31. Place backing washer **(14)** on top of spring.



32. Place a new o-ring on fork cap and screw cap FULLY onto damper rod for *maximum* thread engagement.
33. Hold cap and screw jamb nut up damper rod until it stops against cap.

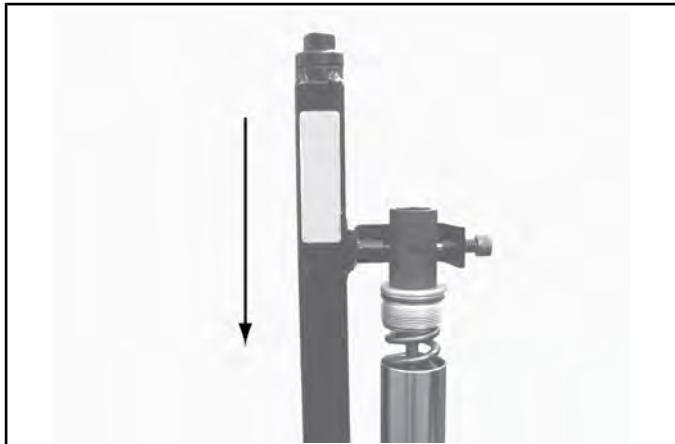
34. Hold jamb nut and torque fork cap to specification.



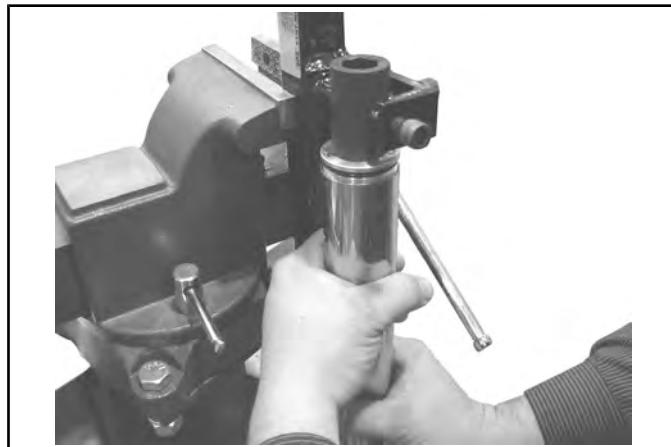
TORQUE

Fork Cap to Jamb Nut: 11 ft-lbs (15 Nm)

35. Slowly release spring pressure and remove fork leg from spring compressor.
 36. Install special socket in compressor as outlined for disassembly.
 37. Slowly compress fork tube assembly with drive nut until fork cap enters the outer tube, and threads start to make contact.



38. Rotate outer tube to start cap. Use care to avoid thread damage.



39. After cap thread is started, continue to turn tube and adjust spring compressor pressure as required until cap is fully seated against top of outer tube.

40. Tighten fork cap to outer tube. Torque to specification.

TORQUE

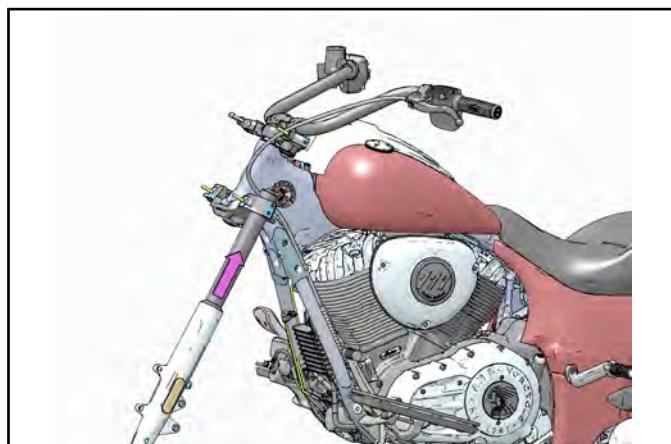
Fork Cap to Outer Tube: 16 ft-lbs (22 Nm)

FRONT FORK INSTALLATION (ALL MODELS)

NOTE

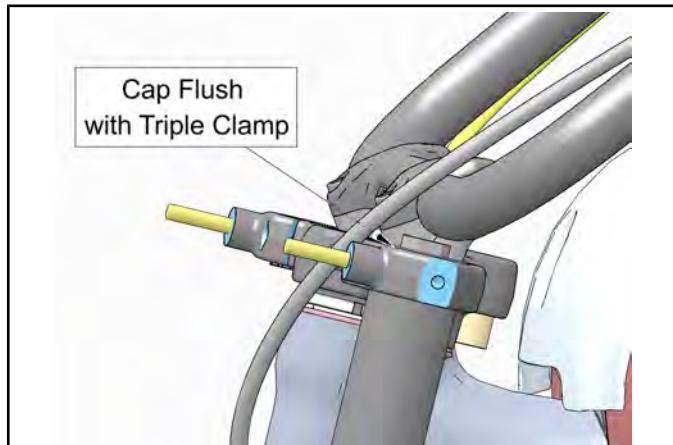
Clean the fork tubes and the clamping surfaces of the triple clamps to remove any oil or grease prior to installation.

1. Install one fork tube assembly into lower triple clamp.

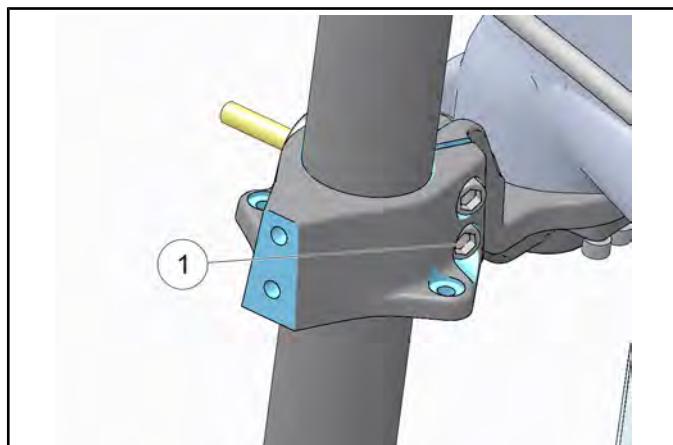


STEERING / SUSPENSION

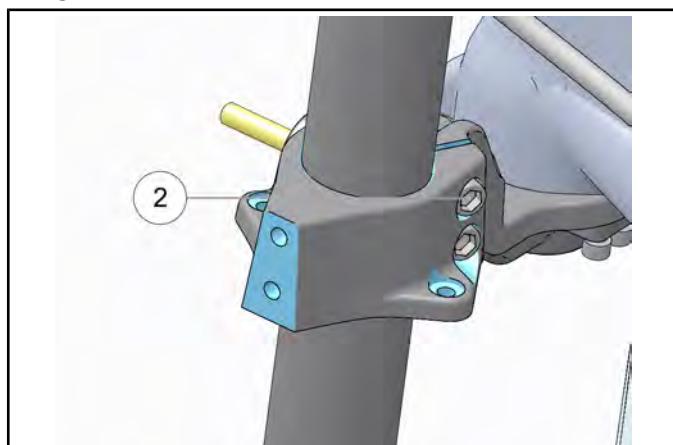
2. Continue to slide tube through lower triple clamp and into upper triple clamp. Stop when the top of the fork cap is flush with the top of the upper triple clamp.



3. Torque the bottom fastener on the lower triple clamp ① .

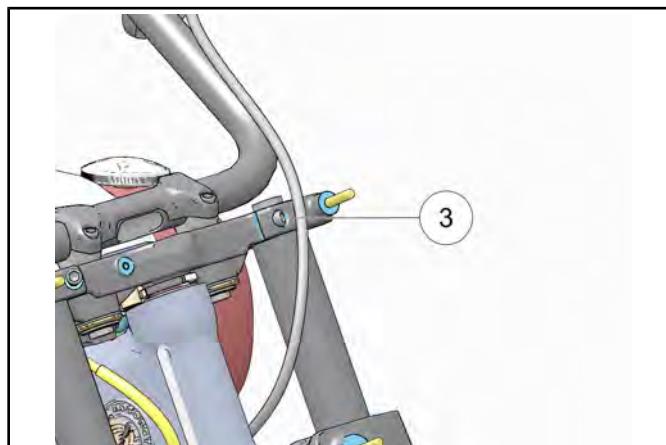


4. Torque the top fastener on the lower triple clamp ② .



5. REPEAT torque process in steps 3 & 4.

6. Torque the upper triple clamp fastener ③ .



TORQUE

Lower Triple Clamp Fasteners: 18 ft-lbs (24 Nm)
Upper Triple Clamp Fastener: 18 ft-lbs (24 Nm)

7. Repeat steps 1 through 6 for the other fork tube.
8. Install brake line guides (if removed).
9. Install front wheel. See Front Wheel, Removal / Installation, page 8.18.
10. Install brake calipers. See Front Caliper Service, page 9.31.
11. Install front fender. See Front Fender Installation, page 7.27.
12. Install fairing.
 - **Chieftain Dark Horse:** See Outer Fairing Installation - (Chieftain Dark Horse), page 7.49
 - **Chieftain / Roadmaster:** See Outer Fairing Installation - (Chieftain / Roadmaster), page 7.55
13. **Chief Classic / Chief Vintage / Chief Dark Horse / Springfield:**
 - Install headlight bucket and nacelle.
14. Inspect all fasteners for proper torque. Inspect hoses and wiring for proper routing.
15. Lower front end of motorcycle to the ground and test front suspension / fork operation.

TRIPLE CLAMP REMOVAL**⚠ WARNING**

This procedure requires raising and supporting the motorcycle so that the front wheel is off the ground. Precautions should be taken to ensure the motorcycle is properly stabilized at all times. Failure to properly support motorcycle may result in personal injury or damage to the motorcycle.

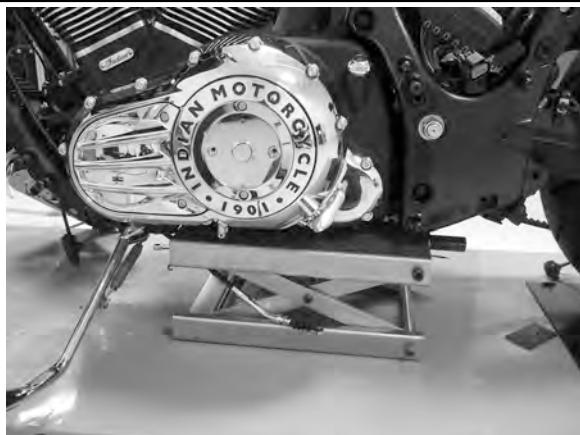
CAUTION

Do not twist the brake hose or brake line. Do not allow calipers to hang from the brake hose. Secure calipers in such a way to avoid hose damage.

CAUTION

CALIFORNIA & INTERNATIONAL MODELS: Remove the charcoal canister prior to raising motorcycle wheels off the ground. As the swingarm lowers it can contact the canister hose fittings and damage them.

- Secure the motorcycle in an upright position with tie-down straps and a platform jack positioned beneath the engine cases.

**NOTE**

Do not operate the front brake lever with the calipers or wheel removed.

- Remove the front fender. See Front Fender Removal, page 7.26.
- Remove front wheel. See Front Wheel, Removal / Installation, page 8.18.

Chieftain Dark Horse:

- Remove fairing assembly. See Outer Fairing Removal - (Chieftain Dark Horse), page 7.45.

Chieftain / Roadmaster:

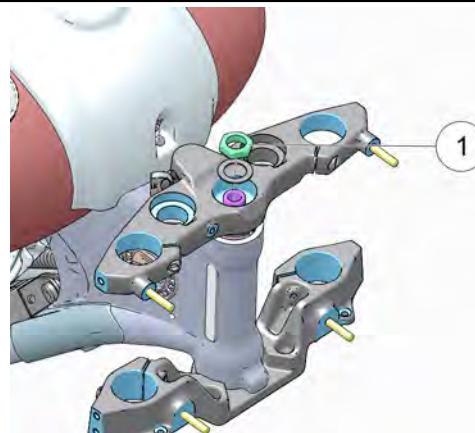
- Remove fairing assembly. See Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51

Chief Classic / Chief Vintage / Chief Dark Horse / Springfield:

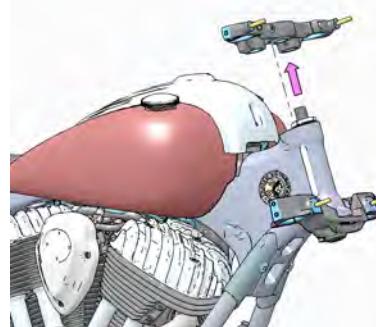
- Remove nacelle and headlight bucket.

ALL Models

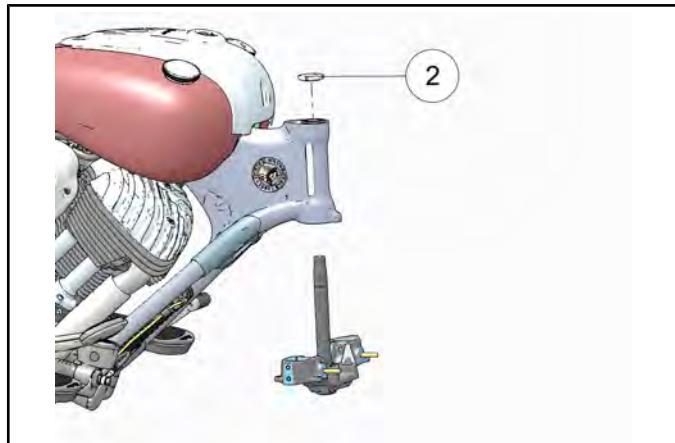
- Remove the handlebar / riser assembly. See Handlebar, Removal / Installation (All Models except Chieftain / Roadmaster), page 8.14 or Handlebar Removal / Installation (Chieftain / Roadmaster), page 8.16.
- Remove fork tubes. See Front Fork Removal (All Models), page 8.21.
- Remove brake line guides from upper and lower triple clamp.
- Remove center nut ① and washer on upper triple clamp.



- Slide upper triple clamp off steering stem.



12. Remove stem adjuster nut ② with a suitable spanner socket.



13. Remove lower triple clamp, with steering stem, and lower bearing (outer race will remain in head tube).

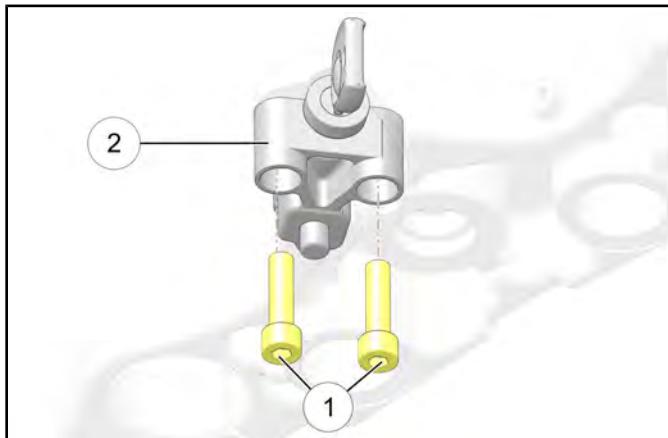
14. Inspect bearings and bearing races.

FRONT FORK LOCK REMOVAL / INSTALLATION

IMPORTANT

Fork lock fasteners must be replaced when fork lock is removed. Do not reuse fork lock fasteners.

1. Perform steps 1– 10 of **Triple Clamp Removal** procedure.
2. Remove two fork lock fasteners ① and remove fork lock ②.



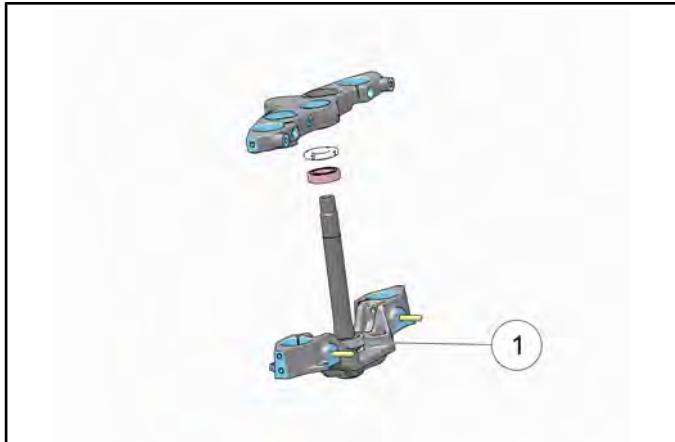
3. Install NEW fork lock ② and Install two NEW fasteners ①. Torque fasteners to specification.

TORQUE

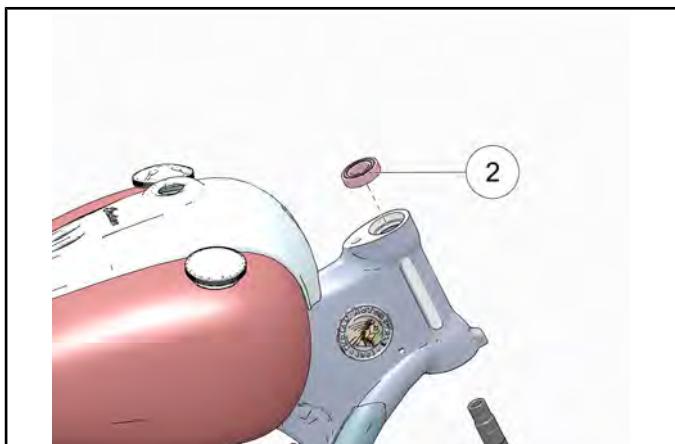
Fork Lock Fasteners:
18 ft-lbs (24 Nm)

TRIPLE CLAMP INSTALLATION / STEERING HEAD BEARING ADJUSTMENT

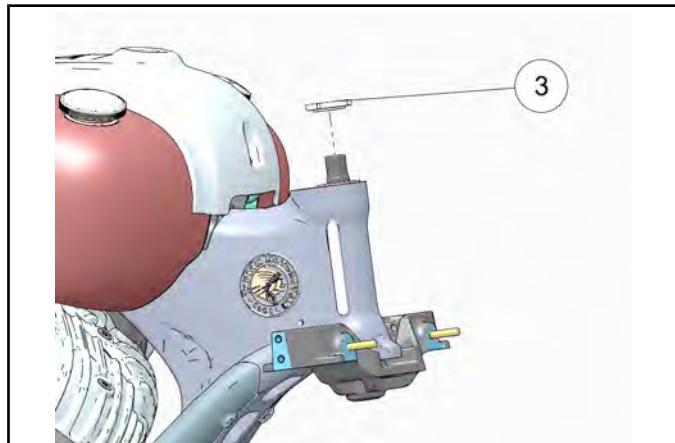
1. Inspect both top and bottom bearing races for pitting, dents, or worn surface. Replace bearings and races as a set if they are worn or damaged.
2. Be sure lower stem bearing ① is seated against step on lower triple clamp. Apply all purpose grease to bearing and install lower triple clamp / stem to frame.



3. Grease and install upper bearing ② onto stem and push it down until seated in upper bearing race.



4. Screw adjuster nut ③ (shoulder side down) onto the steering stem until it is finger tight.

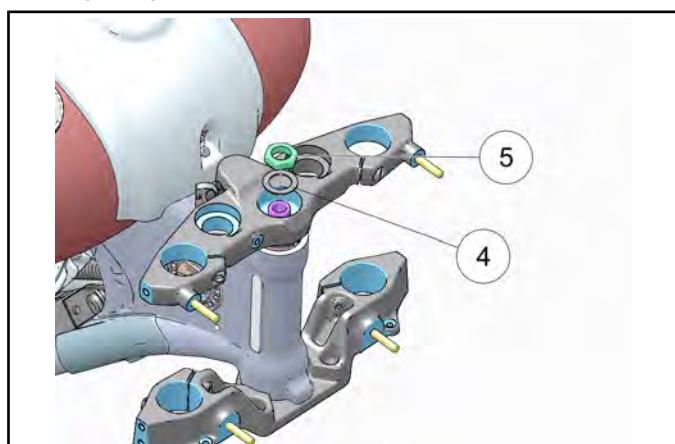


5. Turn triple clamp assembly fully to the right.
6. Torque adjuster nut to specification using suitable spanner wrench.

TORQUE

Steering Stem Bearing Adjuster Nut:
29 ft-lbs (39 Nm)

7. Place a mark on the frame in alignment with one of the slots on the adjuster nut.
8. Turn lower triple clamp from lock to lock five times and *return to full right position*.
9. 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.
10. Set upper triple clamp in place on stem. Install washer ④ and nut ⑤ and tighten top nut until it is finger tight.



NOTE

Nut will be torqued after fork tubes are installed.

STEERING / SUSPENSION

11. Slide fork tubes through lower triple clamp and into upper triple clamp. Align top edge of fork cap with top edge of upper triple clamp and hold in position.
12. Tighten top triple clamp pinch fastener enough to hold tubes in place. Leave lower triple clamp pinch fasteners loose.
13. Torque the top steering stem nut to specification.

TORQUE

Top Steering Stem Nut:
72 ft-lbs (98 Nm)

NOTE

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 STEPS 10–15. Repeat this procedure until no play can be felt.

14. Verify fork tube height in upper triple clamp. The top of the fork cap should be flush with the top of the upper triple clamp.
15. Torque the upper triple clamp pinch fasteners (both sides) to specification.

TORQUE

Upper Triple Clamp Pinch Fasteners:
18 ft-lbs (24 Nm)

16. Torque bottom fasteners on lower triple clamp to specification.
17. Torque top fasteners on lower triple clamp to specification.

TORQUE

Lower Triple Clamp Pinch Fasteners (ALL):
18 ft-lbs (24 Nm)

18. Repeat STEPS 15–17.
19. Install handlebar assembly. See Handlebar, Removal / Installation (All Models except Chieftain / Roadmaster), page 8.14 or Handlebar Removal / Installation (Chieftain / Roadmaster), page 8.16
20. Install front wheel. See Front Wheel, Removal / Installation, page 8.18
21. Verify all fasteners are installed and properly torqued.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Heavy Steering	Steering Stem Nut Over Tightened	Torque to specification
	Damaged Steering Stem Bearings or Races	Replace
	Bent Steering Stem	Replace
	Front Tire Damaged or Worn	Replace
	Low Tire Pressure	Inflate to specification
Pulls to One Side or Wanders	Damaged Steering Stem Bearings or Races	Replace
	Steering Stem Nut Over Tightened or Under Tightened	Torque to specification
	Low Tire Pressure	Inflate to specification
	Rear Wheel Not Aligned Correctly	Align
	Bent Front Axle	Replace
	Damaged or Excessively Worn Front Tire / Incorrect Tire	Replace
	Damaged Wheel Bearings	Replace
	Damaged Swing Arm Bearings	Replace

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
	Loose Swing Arm Pivot Nut	Torque to specification
	Bent Frame or Swingarm	Replace
Handlebars Oscillate (Wobble)	Bent Front Axle	Replace
	Wheel Has Excessive Runout	True (Spoked) / Replace (Cast)
	Tire Mounted Incorrectly	Check Mounting and Balance
	Damaged Tire / Worn Tire	Replace
	Loose Steering Stem Nut	Torque to specification
	Incorrect Tire	Replace
	Incorrect Tire Pressure	Correct
Noise Coming From Front Suspension	Worn Fork Bushings	Rebuild Forks
	Low Fork Fluid	Determine Cause / Replace Fork Oil
	Loose Fasteners	Torque to specification
	Loose Steering Stem Bearings	Determine Cause / Correct
Front Wheel Oscillates (Wobbles)	Bent Front Rim	Replace
	Damaged Front Wheel Bearings	Replace
	Damaged or Incorrect Tire	Replace
Front Wheel Oscillates (Wobbles)	Loose Axle	Torque to specification
	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

STEERING / SUSPENSION

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
	Damaged Sliders	Replace
	Forks Binding	Correct
Wheel Turns Hard	Damaged Wheel Bearings	Replace
	Front Axle Bent	Replace
	Brake Dragging (Hydraulic or Mechanical Problem)	Repair as Necessary
	Brake Dragging (Bent Disc)	Replace
	Improper Assembly After Repairs	Correct as Necessary

REAR WHEEL / SUSPENSION

GENERAL INFORMATION

SERVICE NOTES

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. Indian Motorcycle Chief Classic and Vintage models are equipped with spoked tube-type rims. Small imperfections in the alignment of these rims can be corrected using an approved wheel truing stand and spoke wrench (commercially available). Always use genuine Indian Motorcycle parts or equivalent so that quality is not compromised. The use of tire valves and valve cores other than original equipment replacement Indian Motorcycle parts could cause tire deflation which may lead to loss of control, resulting in injury or death. Do not allow any motorcycle to leave your service area without tire valve caps securely installed.

- The rear shock absorber is serviceable.
- Refer to Maintenance chapter for maintenance of rear wheel & suspension components, and suspension ride height adjustment.

SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Swing-arm Bushing Tool	PF-51237
Shock Spanner Wrench	PV-46993
Bearing Removal / Installation Kit	PF-51324
Platform Jack	Commercially Available

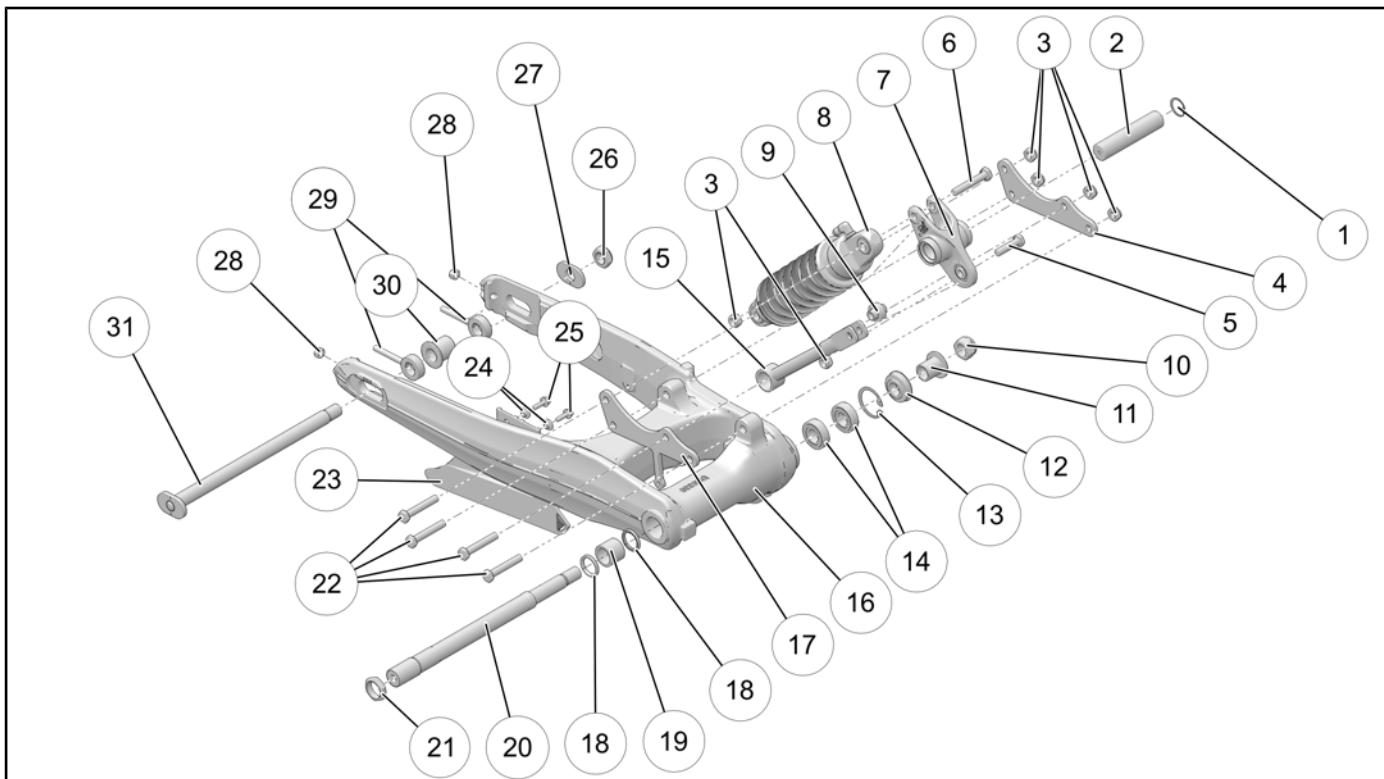
TORQUE SPECIFICATIONS - REAR WHEEL

PART / FASTENER	TORQUE SPECIFICATION
Belt Guard, Lower	96 in-lbs (11 Nm)
Brake Disc	22 ft-lbs (30 Nm)
Drive Sprocket Cover	84 in-lbs (10 Nm)
Drive Sprocket Lock Plate	88 in-lbs (10 Nm)
Drive Sprocket Nut	180 ft-lbs (244 Nm)
Gusset Plate	55 ft-lbs (75 Nm)
P-Clamp Fasteners (Brake Line / W.S.S.)	84 in-lbs (10 Nm)
Pushrod Fastener, Upper	55 ft-lbs (75 Nm)
Rear Axle Nut	Step 1: 15 ft-lbs (20 Nm) Step 2: 65 ft-lbs (88 Nm)
Rear Caliper Mounting Fasteners	31 ft-lbs (42 Nm)
Shock Absorber Fasteners (Upper & Lower)	55 ft-lbs (75 Nm)
Shock Air Line Jamb Nut (Air Shock)	20 ft-lbs (27 Nm)
Swingarm Nut (LH)	65 ft-lbs (88 Nm)
Swingarm Shaft, Initial Torque (Before Outer Nut Installation)	8 ft-lbs (11 Nm)
Swingarm Shaft, Jamb Nut	75 ft-lbs (102 Nm)
Wheel Speed Sensor	96 in-lbs (11 Nm)

STEERING / SUSPENSION

SERVICE SPECIFICATIONS

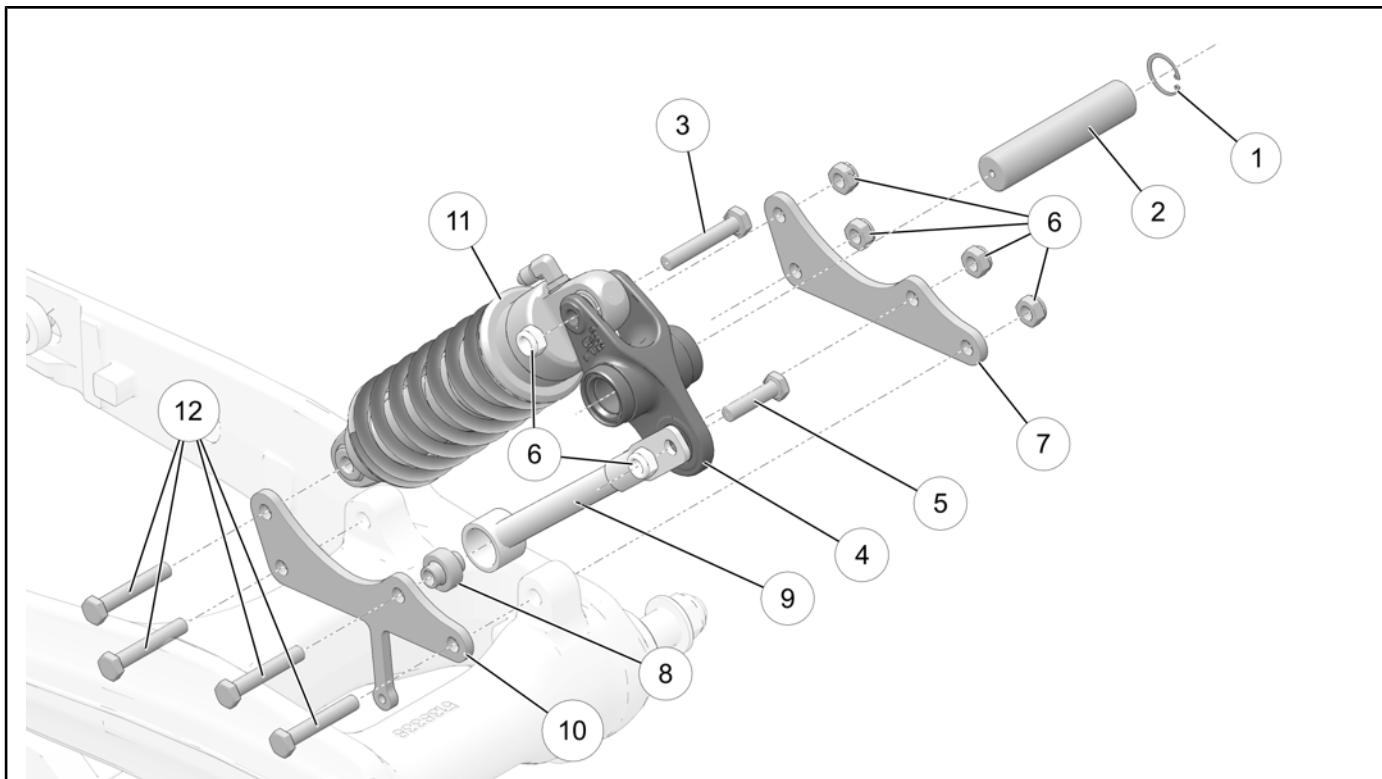
ITEM		STANDARD	SERVICE LIMIT
Axe Runout		-	.20 mm (.008")
Rear Wheel Runout	Axial	.80 mm (.030 inch)	2.0 mm (.080")
	Radial	.80 mm (.030 inch)	2.0 mm (.080")
Rear Wheel Size / Type	Classic / Vintage	16" x 5" Spoked	-
	Chieftain / Roadmaster / Dark Horse / Springfield	16" x 5" Cast	-
Rear Wheel Travel	Classic / Vintage / Dark Horse	3.7" (9.4 cm)	-
	Chieftain / Roadmaster / Springfield	4.5" (11.4 cm)	-
Shock Spring Free Length	Classic / Vintage / Dark Horse	8.0" (203.2 cm)	-
	Chieftain / Roadmaster / Springfield	8.0" (203.2 cm)	-
Shock Spring Installed Length (Standard)	Classic / Vintage / Dark Horse	Perform Ride Height Adjustment	-
	Chieftain / Roadmaster / Springfield		
Suspension Ride Height	All Models	Refer to Maintenance chapter for Ride Height Measurement procedure	-
Spring Rate	Classic / Vintage / Dark Horse	450 lbs / in	-
	Chieftain / Roadmaster / Springfield	400 lbs / in	-
Swing Arm Pivot Shaft Runout		Not Applicable	.20 mm (.008")
Swing Arm Pivot Shaft O.D.		LH Ball Bearing Journal: 19.965–19.99 mm / RH Needle Bearing Journal: 24.95–25.00 mm	-
Swing Arm Needle Bearing Bore O.D. (RH)		31.946–31.972 mm	-
Swing Arm Ball Bearing Bore O.D. (LH)		41.967–41.992 mm	-
Wheel bearing O.D. (approx)		51.987–52.00 mm	-
Wheel bearing I.D. (approx)		19.998–20.00 mm	-

ASSEMBLY VIEWS
REAR SUSPENSION

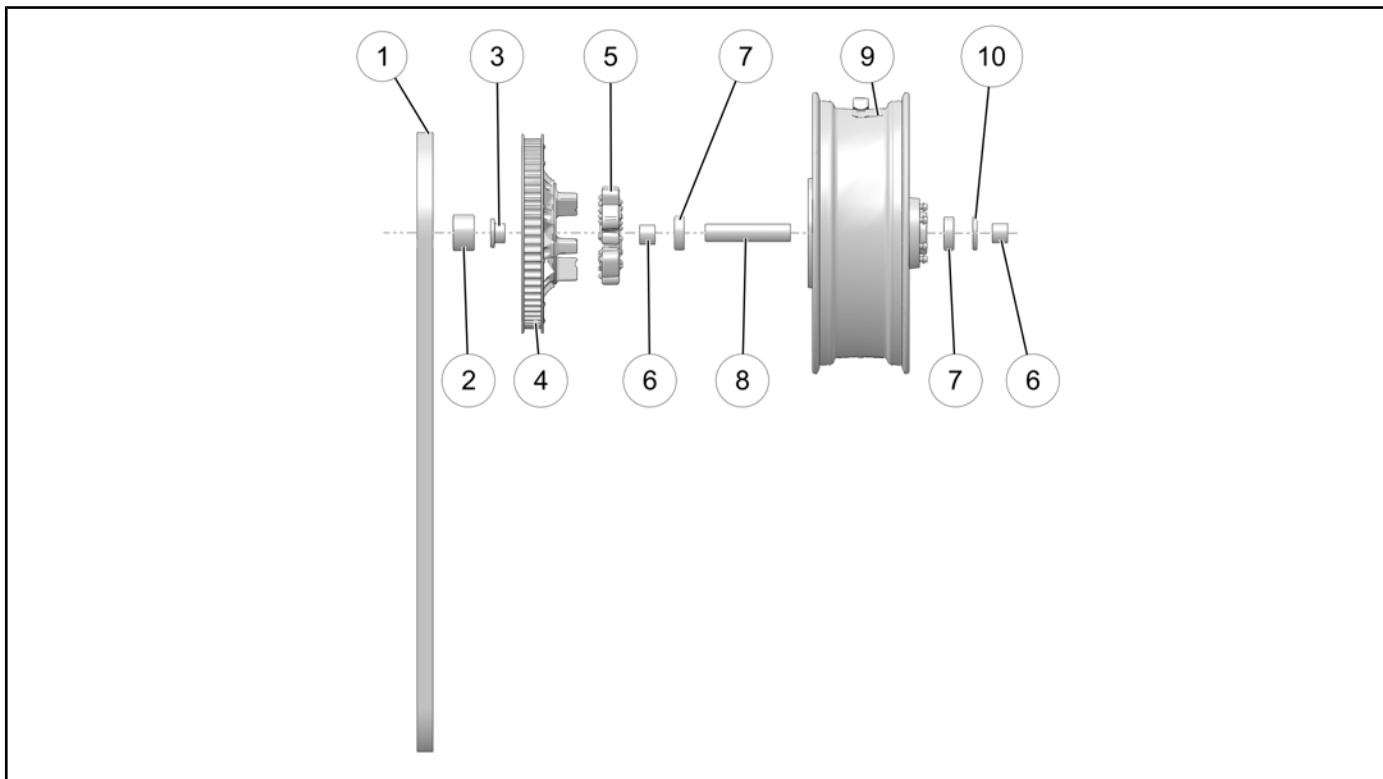
STEERING / SUSPENSION

NUMBER	PART DESCRIPTION	TORQUE SPECIFICATION (IF APPLICABLE)
①	Retaining Ring	-
②	Rocker Pivot Shaft	-
③	Nut, Gusset Plate — M10 x 1.5 (QTY.6)	-
④	Gusset Plate, Swingarm	-
⑤	Fastener, Pushrod — M10 x 1.5 x 40 (QTY.1)	55 ft-lbs (75 Nm)
⑥	Fastener, Shock — M10 x 60 (QTY.1)	55 ft-lbs (75 Nm)
⑦	Rocker Arm Assembly	-
⑧	Shock	-
⑨	Spherical Bearing	-
⑩	Nut, Swingarm — M18 x 1.5 (QTY.1)	65 ft-lbs (88 Nm)
⑪	Spacer, Pivot (LH Outer)	-
⑫	Spacer, Pivot (LH)	-
⑬	Retaining Ring	-
⑭	Ball Bearing — M42 x 20 x 12 (QTY.2)	-
⑮	Pushrod	-
⑯	Swingarm	-
⑰	Gusset Plate (RH), Swingarm	-
⑱	Seal	-
⑲	Bearing, Needle	-
⑳	Suspension Pivot	-
㉑	Nut, Jamb — M27 x 1.5 (QTY.1)	75 ft-lbs (102 Nm)
㉒	Fastener — M10 x 1.5 x 50 (QTY.4)	55 ft-lbs (75 Nm)
㉓	Belt Guard, Lower	-
㉔	Sleeve (QTY.2)	-
㉕	Fastener — M6 x 1.0 x 20 (QTY.2)	96 in-lbs (11 Nm)
㉖	Nut — M18 x 1.5 (QTY.1)	Step 1: 15 ft-lbs (20 Nm) Step 2: 65 ft-lbs (88 Nm)
㉗	Axle Adjuster (RH)	-
㉘	Nut — M8 x 1.25 (QTY.2)	-
㉙	Axle Adjuster (QTY.2)	-
㉚	Wheel Spacer (RH)	-
㉛	Axle, Rear	-

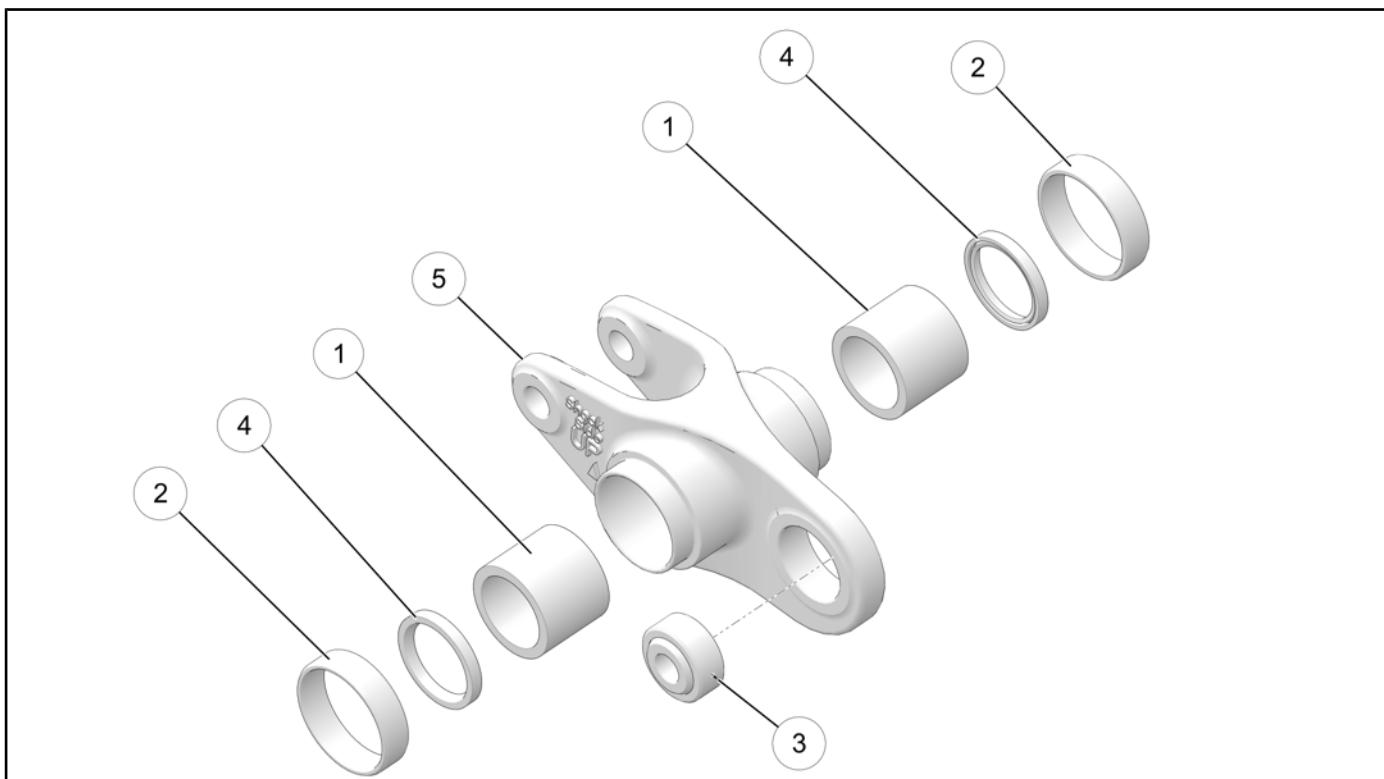
REAR SHOCK / PUSHROD



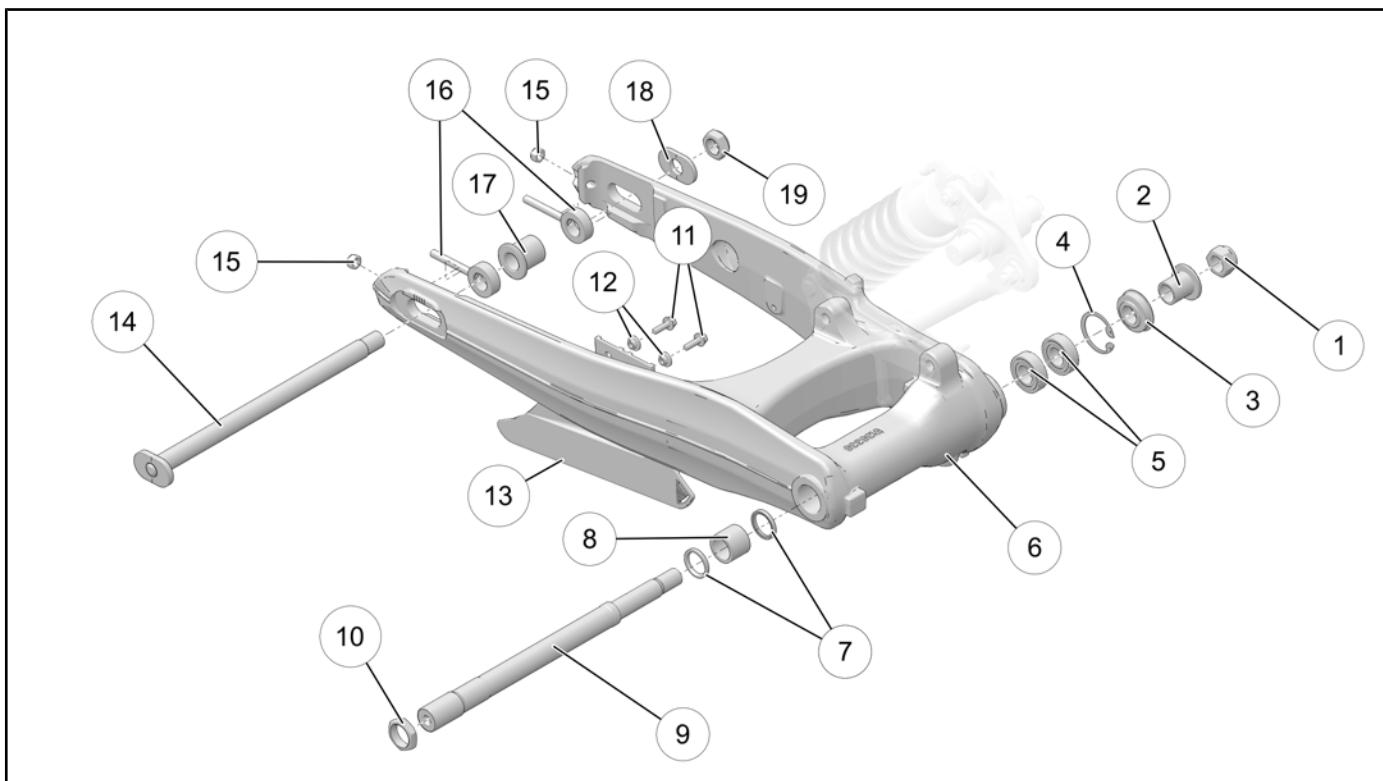
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Retaining Ring	-
②	Pivot Shaft, Rocker	-
③	Fastener, Shock — M10 x 60 (QTY.1)	55 ft-lbs (75 Nm)
④	Rocker Arm	-
⑤	Fastener, Pushrod — M10 x 1.5 x 40 (QTY.1)	55 ft-lbs (75 Nm)
⑥	Nut, Gusset Plate — M10 x 1.5 (QTY.6)	-
⑦	Gusset Plate, Swingarm	-
⑧	Spherical Bearing	-
⑨	Pushrod	-
⑩	Gusset Plate, Swingarm	-
⑪	Shock Assembly	-
⑫	Fastener — M10 x 1.5 x 50 (QTY.4)	55 ft-lbs (75 Nm)

REAR WHEEL

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Belt, Drive — 152T / 24 mm	-
②	Bearing, Cushion Drive	-
③	Spacer, Inner	-
④	Sprocket — 66T	-
⑤	Damper, Cushion Drive	-
⑥	Spacer, Wheel	-
⑦	Bearing, Wheel (RH) — 20 mm X 52 mm X 15 mm	-
⑧	Spacer, Bearing — 130 mm	-
⑨	Rim	-
⑩	Seal	-

ROCKER ASSEMBLY

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Bearing, Needle	-
②	Bearing, Thrust	-
③	Spherical Bearing	-
④	Seal	-
⑤	Rocker	-

SWINGARM

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Nut, Swingarm — M18 x 1.5 (QTY.1)	65 ft-lbs (88 Nm)
②	Spacer, Pivot (LH Outer)	-
③	Spacer, Pivot (LH)	-
④	Retaining Ring	-
⑤	Ball Bearing — M42 x 20 x 12 (QTY.2)	-
⑥	Swingarm	-
⑦	Seal	-
⑧	Bearing, Needle	-
⑨	Suspension Pivot	-
⑩	Nut, Jamb — M27 x 1.5 (QTY.1)	75 ft-lbs (102 Nm)
⑪	Fastener, Belt Guard — M6 x 1.0 x 20 (QTY.2)	96 in-lbs (11 Nm)
⑫	Sleeve	-
⑬	Guard, Lower Belt	-
⑭	Axle, Rear	-
⑮	Nut, Axle Adjuster	-
⑯	Axle Adjuster	-
⑰	Spacer, RH	-
⑱	Adjuster Plate, LH	-
⑲	Nut, Axle — M18 x 1.5 (QTY.1)	Step 1: 15 ft-lbs (20 Nm) Step 2: 65 ft-lbs (88 Nm)

DRIVE BELT SERVICE**DRIVE BELT INSPECTION**

1. Inspect belt tension and adjust if necessary. See Drive Belt Inspection, page 2.27.
2. If one or more component is damaged, replace belt and both sprockets as a set if the drive system has been in service for 5000 miles or more (8000 Km).

DRIVE BELT REMOVAL**NOTE**

If belt is to be reinstalled, mark direction of rotation on the outer surface of belt. Reinstall belt in same direction as it was removed.

⚠ WARNING

A misaligned rear axle can cause drive line noise and damage the drive belt, which could cause belt failure and loss of control of the motorcycle.

⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

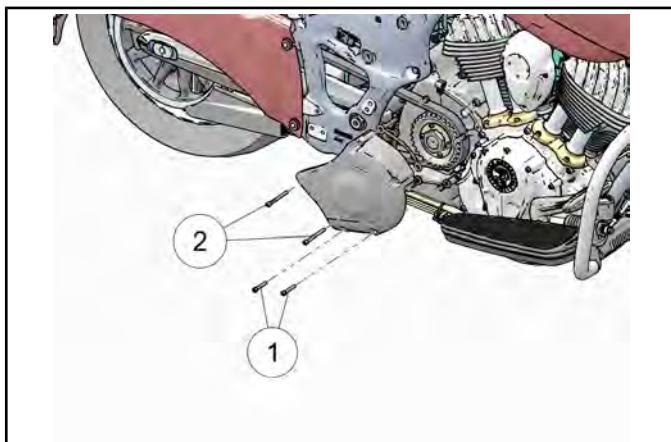
1. Remove rear wheel. See Rear Wheel Removal / Installation, page 8.56.
2. Remove swingarm assembly. See Swingarm Removal, page 8.63.
3. Remove exhaust assembly. See Muffler Removal, page 3.87.
4. Remove drive sprocket cover. See Drive Sprocket Cover, Removal / Installation, page 8.48.
5. Remove belt from drive sprocket.

DRIVE BELT INSTALLATION

1. Inspect sprockets and verify sprocket fasteners are tight.
2. Install drive belt with the Indian Motorcycle script situated so that it reads correctly when viewed from the RH side of the motorcycle.
3. Install the drive sprocket cover. See Drive Sprocket Cover, Removal / Installation, page 8.48.
4. Install the exhaust system. See Head Pipe Installation, page 3.91.
5. Install the swingarm assembly. See Swingarm Installation, page 8.67.
6. Install the rear wheel. See Rear Wheel Removal / Installation, page 8.56.
7. Set drive belt alignment and tension. See Drive Belt Adjustment, page 2.31.

DRIVE SPROCKET SERVICE**DRIVE SPROCKET COVER, REMOVAL /
INSTALLATION**

1. Remove the rear muffler and head pipe assembly. See Head Pipe Removal, page 3.90.
2. Using a 5mm hex wrench, remove the two short fasteners ① and two long fasteners ② securing the cover to the engine and remove cover.

**NOTE**

Note the position of the oxygen sensor harness for use during installation.

3. To install the drive sprocket cover, reverse the removal procedure.
4. Torque drive sprocket cover fasteners to specification.

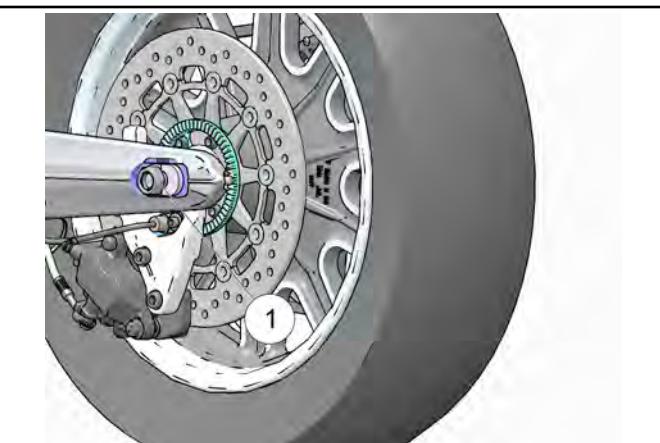
TORQUE

Drive Sprocket Cover Fasteners (All): 84 in-lbs (10 Nm)

DRIVE SPROCKET REMOVAL

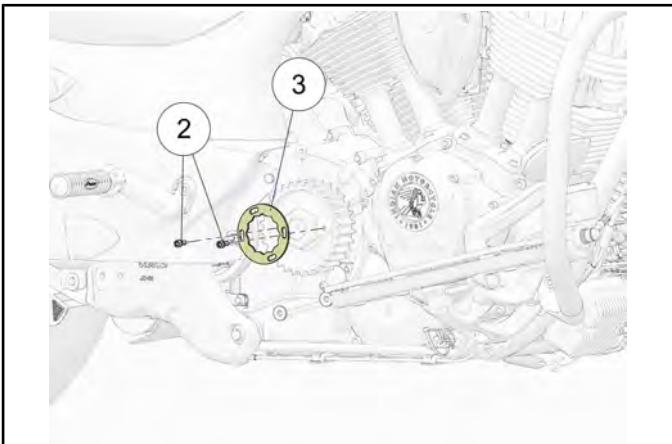
This procedure requires use of the Clutch Shaft Holding Tool (PF-51232).

1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove exhaust system. See Muffler Removal, page 3.87
3. Remove the drive sprocket cover. See Drive Sprocket Cover, Removal / Installation, page 8.48.
4. Drain engine oil. See Engine Oil / Filter Change, page 2.9.
5. Remove primary cover. See Primary Cover Removal, page 5.7.
6. Remove clutch assembly. See Clutch Removal, page 5.14.
7. Install the Clutch Shaft Holding Tool (PF-51232).
8. Loosen rear axle nut ① so that wheel assembly can be moved forward to slacken drive belt.

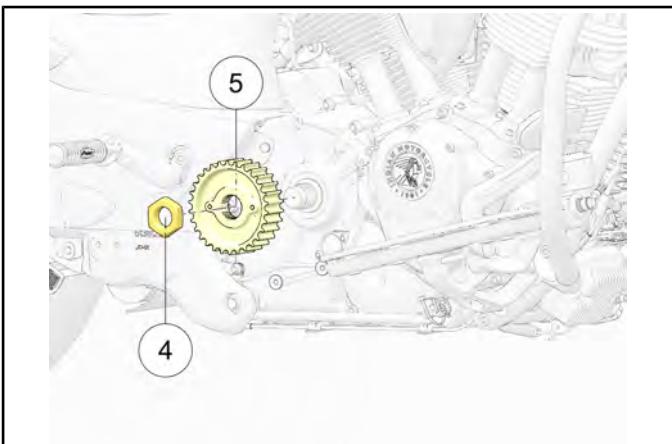


9. Loosen both axle adjuster nuts evenly to move wheel forward until belt is loose.
10. Pull belt off drive sprocket.

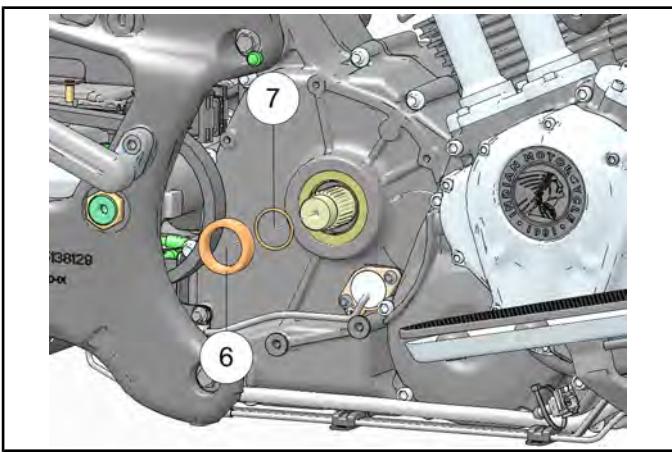
11. Remove two locking plate fasteners ② and locking plate ③.



12. Remove drive sprocket retaining nut ④ and drive sprocket ⑤.

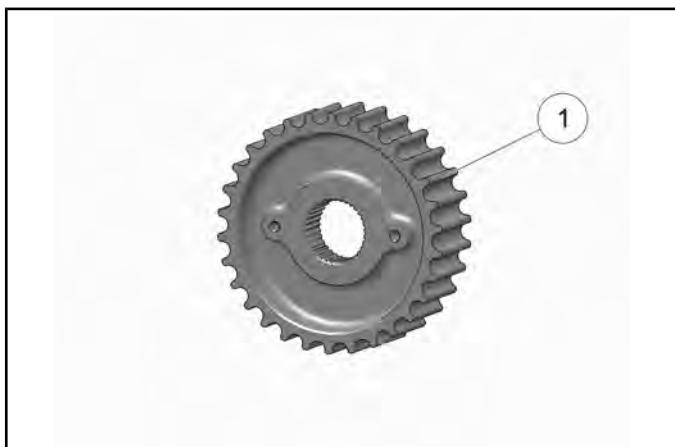


13. Remove spacer ⑥, and O-ring ⑦ from output shaft.

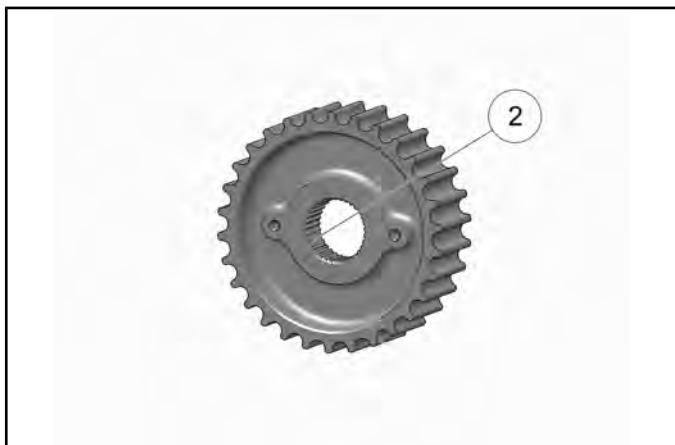


DRIVE SPROCKET INSPECTION

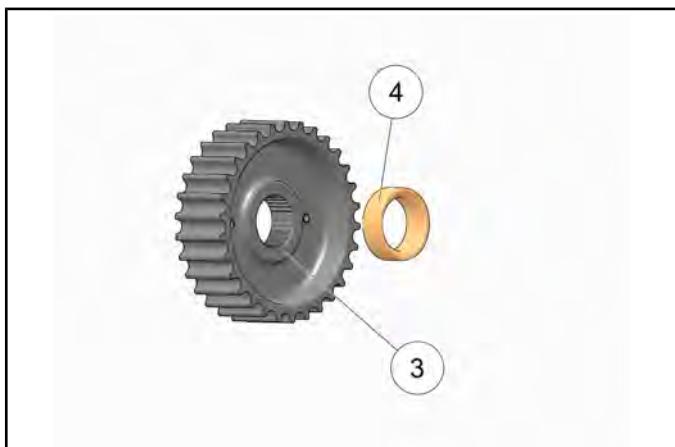
1. Visually inspect sprocket teeth ① for excessive wear and damage.



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.

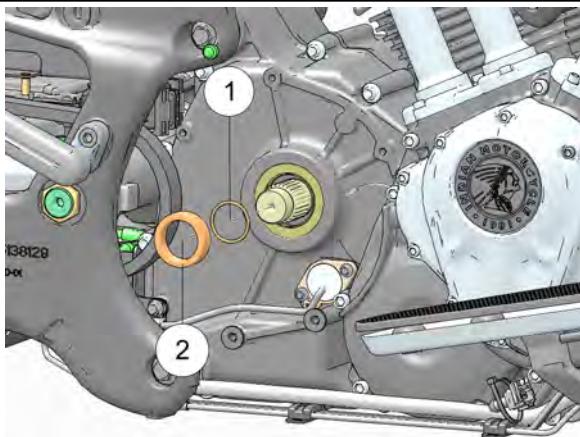


5. Sprockets and belt normally exhibit a polished appearance due to normal operation. Belt replacement is not required unless uncharacteristic damage is noted, or if the mileage service interval is reached. Belt or sprocket damage is usually due to debris trapped between belt and sprocket, or from improper maintenance and adjustment.

DRIVE SPROCKET INSTALLATION**NOTE**

If replacing the output shaft seal, it will be necessary to use the Output Shaft Seal Tool (**PF-51243**) for proper installation.

1. Place new output shaft seal over the output shaft and drive into position using the Output Shaft Seal Tool (**PF-51243**).
2. Apply grease to a new O-ring ① and install on output shaft.
3. Install seal sleeve ② with the chamfer on inside diameter of sleeve facing in, toward O-ring.



4. Clean shaft threads and sprocket nut to remove all previous thread locking agent.
5. Apply a light film of anti-seize compound to splines of shaft. Place belt onto front sprocket, place sprocket over splines of output shaft.
6. Apply Loctite™ 262 to threads of shaft and nut.
7. Install drive sprocket nut and torque to specification.

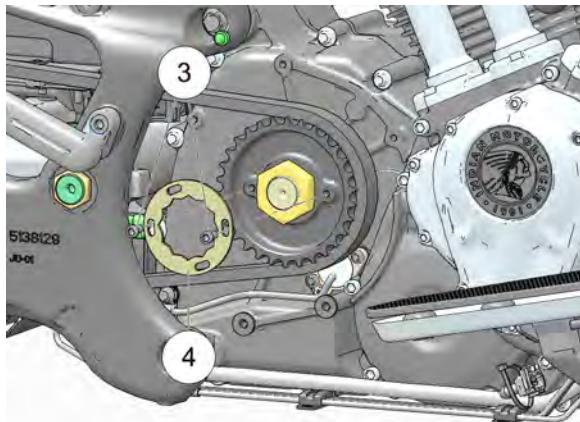
NOTE

Install Clutch Shaft Holding Tool (**PF-51232**) on clutch shaft prior to tightening sprocket nut.

TORQUE

Drive Sprocket Nut: **180 ft-lbs (244 Nm)**

8. Install lock plate ③ and tighten fasteners ④ until lightly seated on plate.

**NOTE**

The lock plate can be installed in many positions and either side of the plate can be used. If the plate still does not align, tighten sprocket nut slightly and try to fit the lock plate again.

9. Rotate the plate CLOCKWISE until it stops and hold it firmly against the nut.
10. Torque lock plate fasteners to specification.

TORQUE

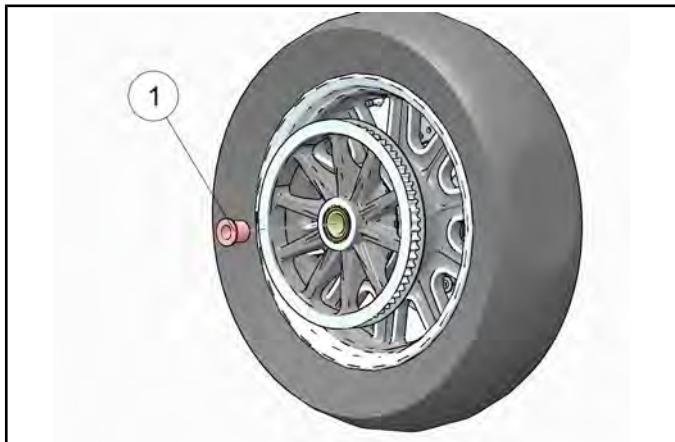
Lock Plate Fasteners: **88 in-lbs (10 Nm)**

11. Remove the clutch shaft holding tool and install the clutch assembly. See Clutch Installation, page 5.19.
12. Install the primary cover. See Primary Cover Installation, page 5.12.
13. Add engine oil to correct level. See Checking Engine Oil, page 2.10.
14. Install the drive sprocket cover. See Drive Sprocket Cover, Removal / Installation, page 8.48.
15. Install the exhaust system. See Head Pipe Installation, page 3.91.
16. Adjust belt tension and wheel alignment. See Drive Belt Adjustment, page 2.31.

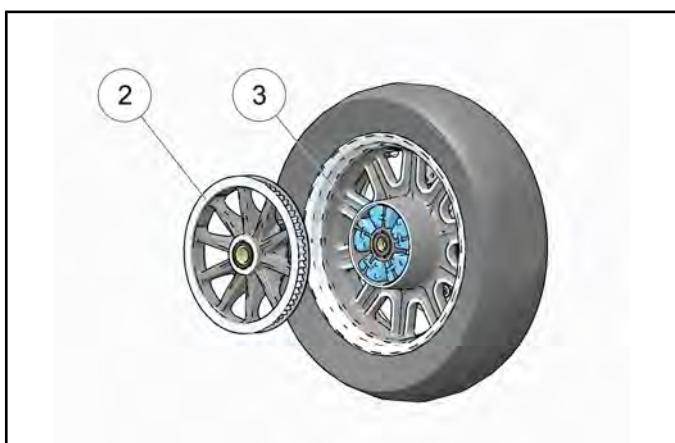
DRIVEN SPROCKET SERVICE**DRIVEN SPROCKET REMOVAL****CAUTION**

Protect brake disc surface while working on wheel.

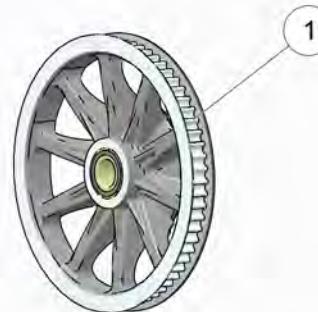
1. Remove rear wheel. See Rear Wheel Removal / Installation, page 8.56.
2. Remove the RH wheel spacer ① from the driven sprocket roller bearing.



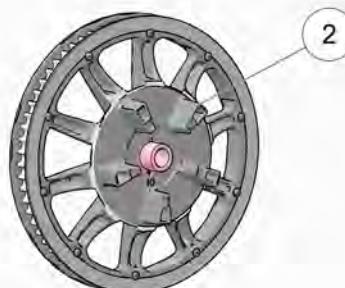
3. Lift the driven sprocket assembly ② off of the drive damper ③ .

**DRIVEN SPROCKET INSPECTION**

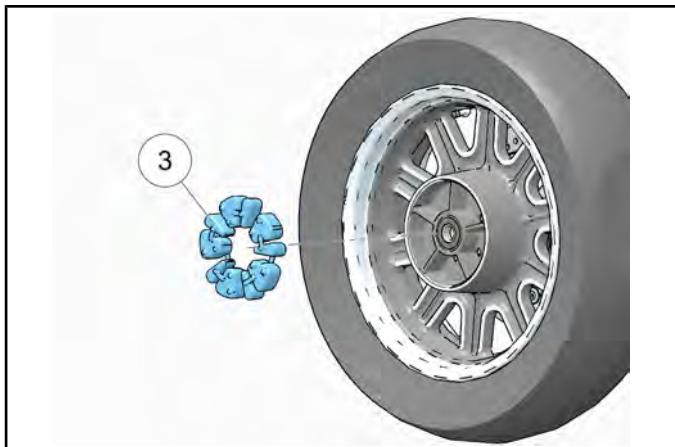
1. Visually inspect sprocket teeth ① for excessive wear and damage from foreign material or road debris.



2. Inspect the back side of the sprocket where it engages the damper ② for wear, galling or roughness. Surface must be smooth, with no burrs or surface irregularities.



3. Visually inspect the cushion drive damper ③ for cracks or deformation. Replace damper if damage is found.



NOTE

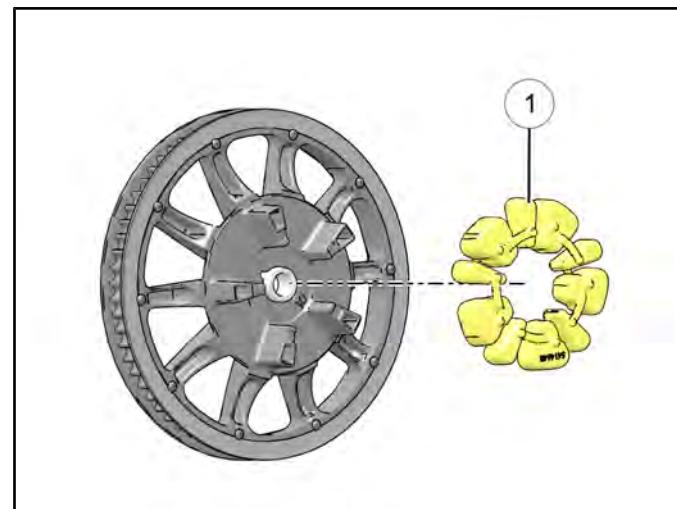
If the drive system has been in service for 5000 miles or more, replace both front and rear sprockets along with the belt if any one item is damaged or worn beyond a normal polished appearance.

DRIVEN SPROCKET BEARING - REPLACEMENT BEARING REMOVAL

1. Remove the driven sprocket. See Driven Sprocket Removal, page 8.52.
2. Remove the cushion drive damper ① from the driven sprocket and set aside.

NOTE

Mark the cushion drive damper and driven sprocket so the damper can be reinstalled in the same position from which it was removed.

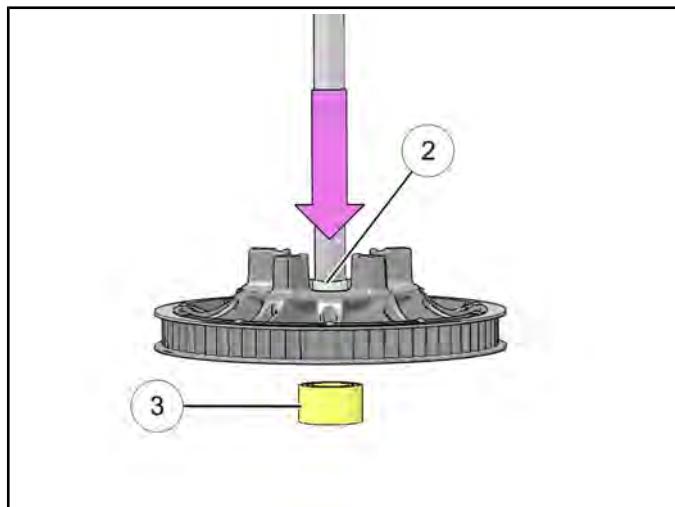


3. Place the driven sprocket face down on a suitable press leaving enough space for the bearing to be pressed through.

CAUTION

The painted surface of the driven sprocket should be resting on a protective surface such as wood or shop rags to ensure the finished surface is not damaged while pressing the bearing out.

4. Locate an arbor that is roughly the same size as the O. D. of the inner sprocket spacer ② and press straight down on the inner spacer to remove the bearing ③.



BEARING INSTALLATION

5. Turn the driven sprocket over on the press, so the face is pointing up toward the press arbor.

CAUTION

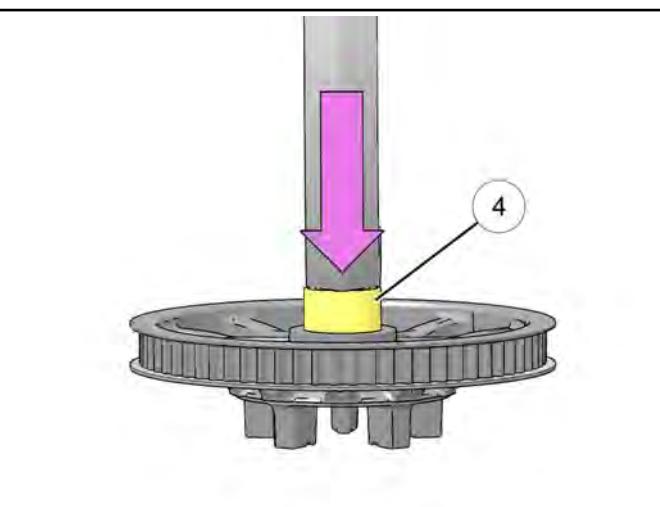
The cushion drive damper fingers should be resting on a solid, flat surface to prevent warping or damage as the new bearing is being pressed into the driven sprocket.

6. Verify that the inner spacer is in place in the driven sprocket prior to pressing in the new bearing.
7. Apply a thin coat of all-purpose grease to the outer race of the new driven sprocket bearing.
8. Place the new bearing into the bore on the driven sprocket so it is resting flat.

9. Locate an arbor that is roughly the same size as the O. D. of the outer bearing race and press the bearing ④ into position until fully seated.

NOTE

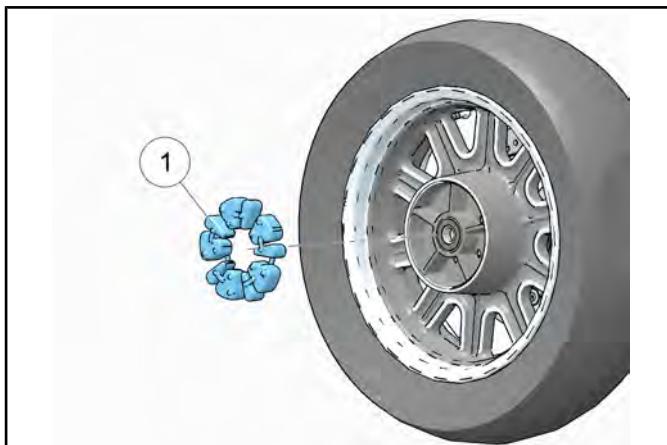
Once seated, the bearing will be approximately .019 in (0.5 mm) proud against the machined face of the driven sprocket.



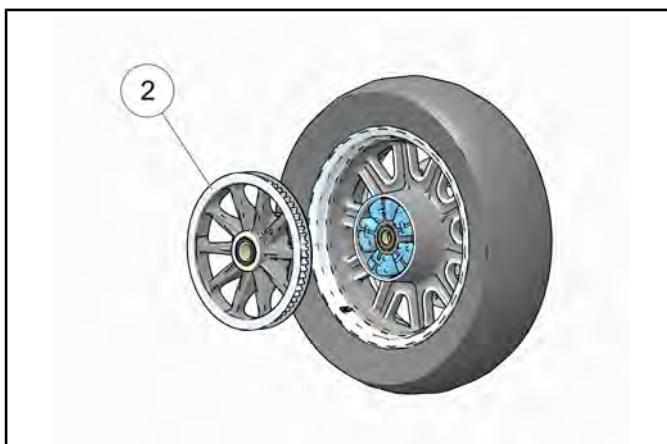
10. Verify that the inner race of the bearing rotates freely and does not bind.
11. Reinstall the cushion drive damper in the same position from which it was removed.
12. Install the driven sprocket assembly. See Driven Sprocket Installation (All Models), page 8.55.

DRIVEN SPROCKET INSTALLATION (ALL MODELS)

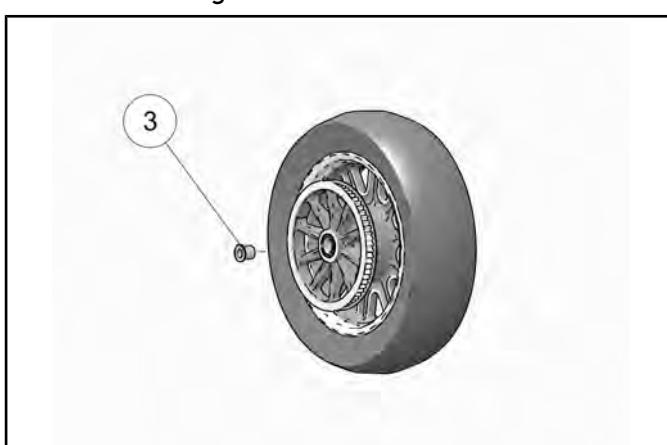
1. Install cushion damper ① into wheel hub.



2. Install sprocket assembly ② onto wheel hub making sure the cushion damper is properly engaged.



3. Install the RH wheel spacer ③ into the sprocket roller bearing.



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.

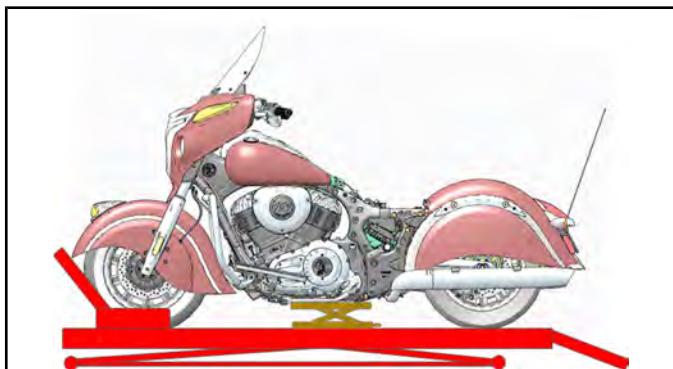
⚠ WARNING

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.

⚠ WARNING

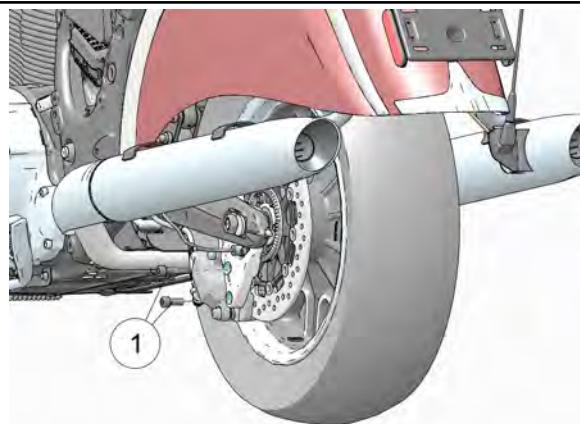
If working on a motorcycle equipped with a charcoal canister (EVAP), remove the canister prior to elevating the rear of the motorcycle to prevent damage to the canister hose fittings.

1. Place the motorcycle in an upright position on a lift table with the front wheel clamped in a wheel vise.



2. If equipped, remove the charcoal canister. See Evaporative Emission Control System (CA Models), page 2.21.
3. Remove saddlebags, if equipped.
4. Remove upper left side panel. See Side Cover (Upper), Removal / Installation, page 7.17.
5. Position a platform jack beneath the engine cases and raise until the rear tire is barely in contact with the ground.

6. Remove two caliper mounting fasteners ① and remove caliper.

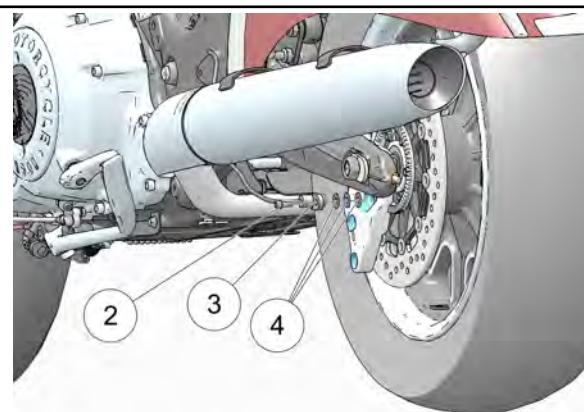
**CAUTION**

Do not hang rear brake caliper brake line or twist the brake line or damage may result.

NOTE

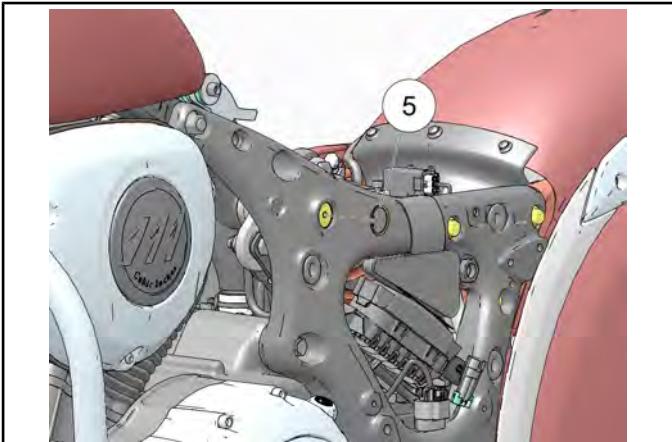
Do not apply rear brake pedal after the brake caliper has been removed.

7. Remove rear ABS wheel speed sensor mounting fastener ②, sensor ③, and shims ④, if applicable.

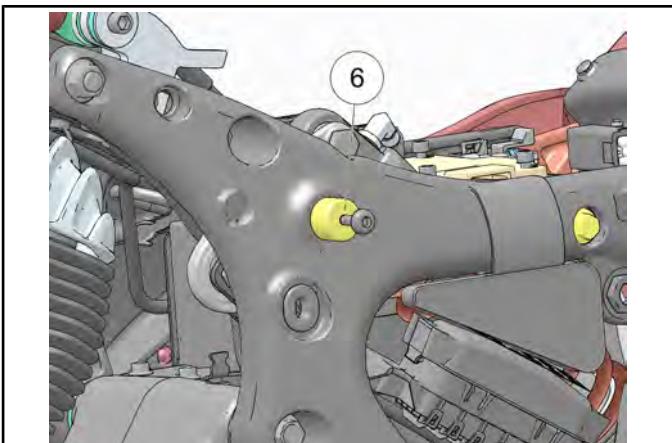
**NOTE**

Move sensor aside so that it is not damaged.

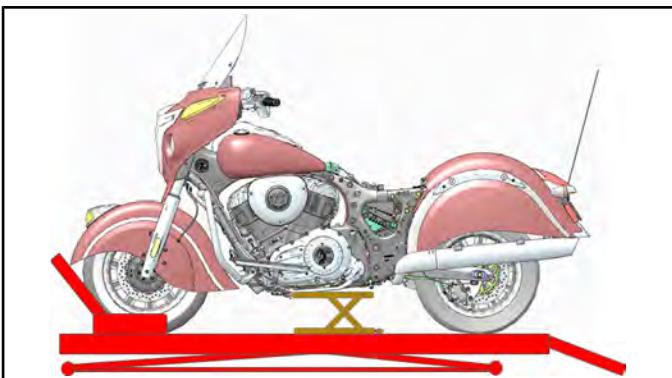
8. Remove the upper shock pivot pin retaining ring ⑤.



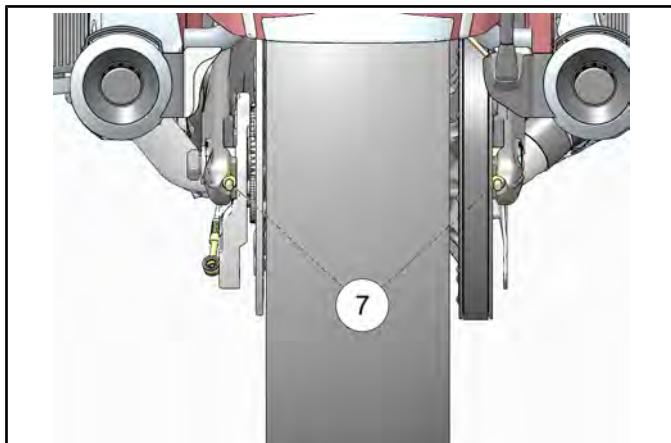
9. Thread a lower side panel fastener into the threaded opening on the pivot pin ⑥ and pull on exposed fastener to withdraw pin from bore.



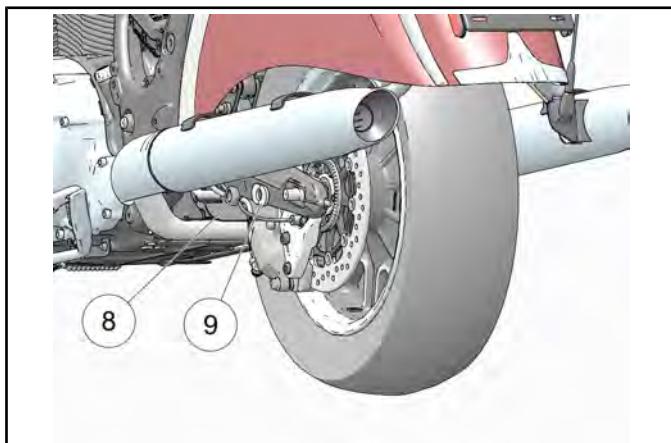
10. Raise the rear of the motorcycle until rear axle nut is accessible below the left muffler assembly.



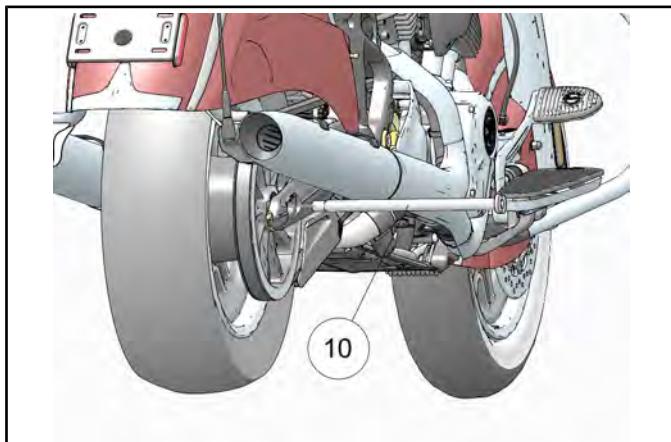
11. Loosen right and left axle adjusters ⑦.



12. Remove rear axle nut ⑧ and washer ⑨ from left side of swingarm.



13. Remove axle ⑩ from right side of swingarm.

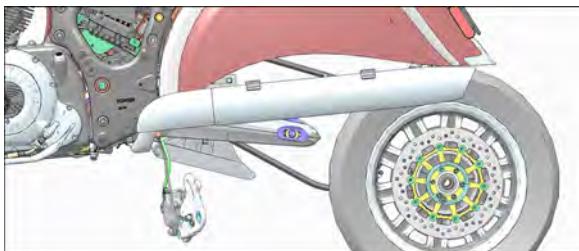


14. Push wheel forward and slide drive belt to the right side off of the rear sprocket.

8

STEERING / SUSPENSION

- Remove rear wheel assembly by sliding it to the rear of the motorcycle.



- Installation is performed by reversing the removal procedure.

- Torque fasteners to specification.

TORQUE

Axle Nut:

Step 1: 15 ft-lbs (20 Nm)

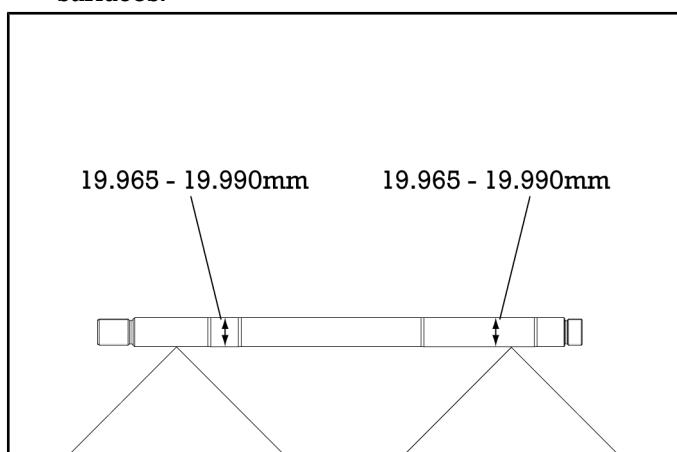
Step 2: 65 ft-lbs (88 Nm)

Wheel Speed Sensor Fastener: 96 in-lbs (11 Nm)
Rear Caliper Mounting Fasteners: 31 ft-lbs (42 Nm)

Set drive belt tension and alignment. See Drive Belt Tension, page 2.29 and Drive Belt Adjustment, page 2.31.

REAR AXLE INSPECTION

- Install rear axle in V-blocks and measure runout and compare to service limit. See Service Specifications, page 8.40.
- Axle diameter should be measured on bearing surfaces.



REAR WHEEL INSPECTION

NOTE

Wheel bearings must be in good condition.

- Set up a dial indicator to measure axial and radial runout of the wheel and compare to service limit. See Visual Inspection & Runout, page 8.88.
- Visually inspect wheel for cracks or other damage.
- Replace wheel if it fails visual or measured inspection.

REAR WHEEL BEARING INSPECTION

NOTE

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.

- Visually inspect integral bearing seal for damage.
- 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.
- Slide axle into wheel and check for smooth rotation and tight fit.

NOTE

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.

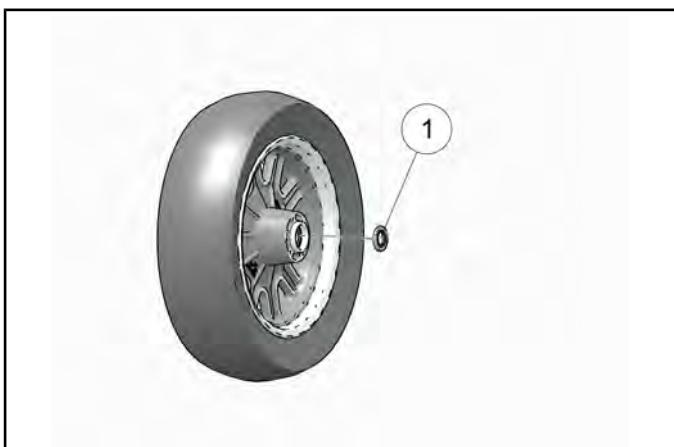
WHEEL BEARING REPLACEMENT**CAUTION**

Do not reuse bearings that have been removed.

NOTE

This procedure requires the Wheel Bearing Removal / Installation Kit (**PF-51324**). Refer to special tool manufacturer instructions for proper use of tool.

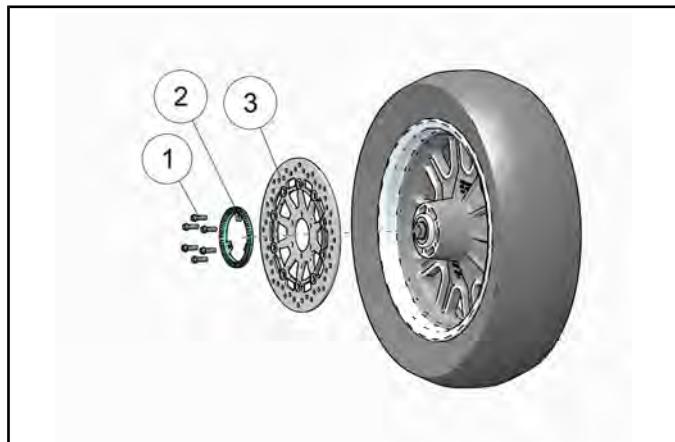
1. Remove rear wheel. See Rear Wheel Removal / Installation, page 8.56.
2. Remove driven sprocket. See Driven Sprocket Removal, page 8.52.
3. Remove brake disc. See Brake Disc Removal / Installation, page 8.59.
4. Carefully pry seal ① out of LH side of hub.



5. Refer to special tool manufacturer instructions to remove bearing from brake disc side of hub.
6. Remove bearing.
7. Remove spacer.
8. Extract or drive bearing from sprocket side.
9. **Installation:** 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.
10. Install new seal into the LH side of hub.
11. Install the brake disc. See Brake Disc Removal / Installation, page 8.59.
12. Install driven sprocket. See Driven Sprocket Installation, page 8.55.
13. Install the rear wheel. See Rear Wheel Removal / Installation, page 8.56.

BRAKE DISC REMOVAL / INSTALLATION

1. Remove the rear wheel. See Rear Wheel Removal / Installation, page 8.56.
2. Remove the driven sprocket and cushion damper. See Driven Sprocket Removal, page 8.52.
3. Position wheel with brake disc facing up.
4. Remove and discard ABS tone ring / brake disc fasteners ① .
5. Remove the ABS tone ring ② and brake disc ③ .



6. **Installation is performed by reversing the removal procedure.**
7. Torque brake disc fasteners to specification in a star pattern.

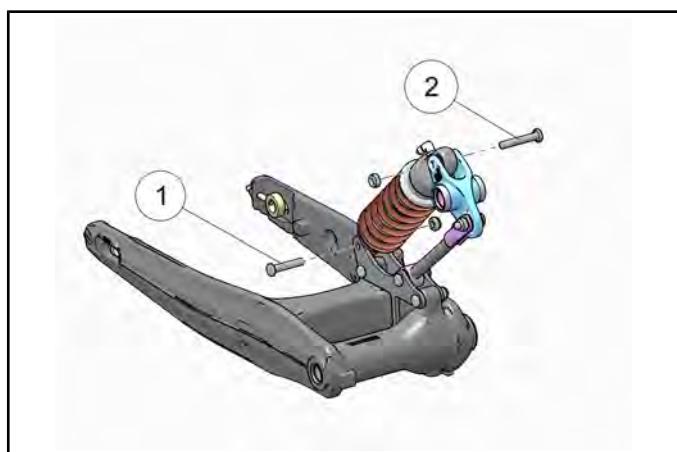
TORQUE

Brake Disc Fasteners: 22 ft-lbs (30 Nm)

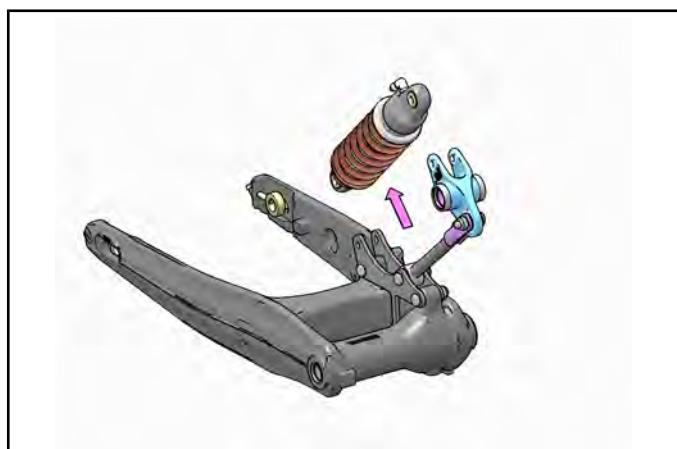
SHOCK ABSORBER REMOVAL**WARNING**

Shock absorber removal involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. Severe personal injury or death can occur if the motorcycle tips or falls.

1. Remove the swingarm / shock absorber assembly. See Swingarm Removal, page 8.63.
2. With the swingarm assembly resting on a sturdy work surface, remove the lower shock fastener ① and upper shock fastener ②.

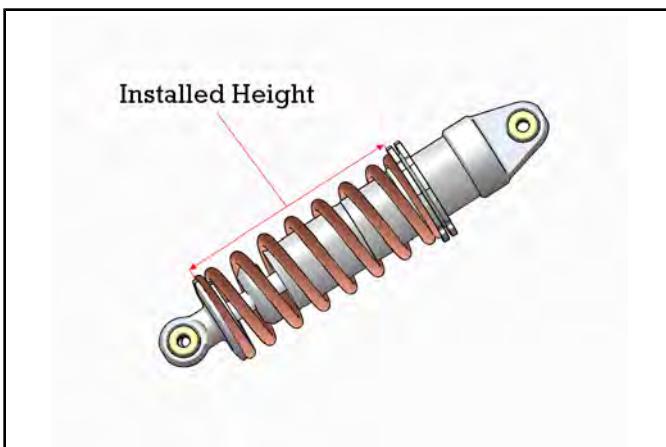


3. Remove shock absorber from swingarm assembly.

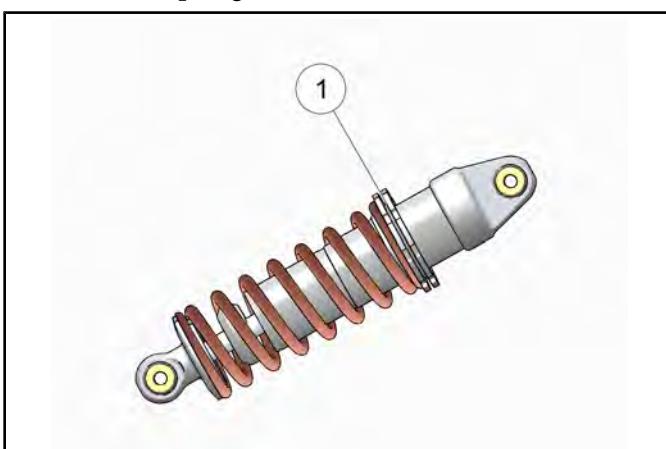
**SHOCK ABSORBER INSPECTION (ALL MODELS)**

Chief Classic / Chief Vintage / Chief Dark Horse

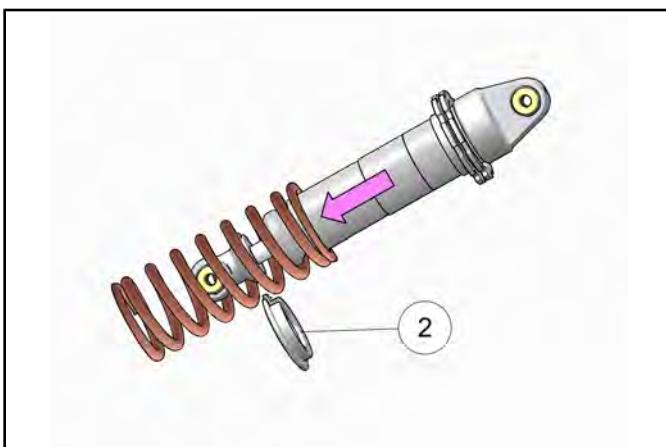
1. Measure spring installed height and record so ride height adjustment can be returned to rider's preference.



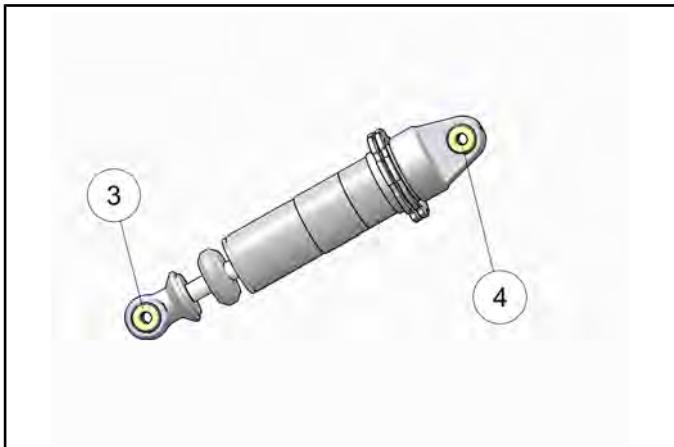
2. Lubricate spring collars ① and loosen completely to relieve spring tension.



3. Remove lower spring keeper ② and slide spring off of shock.



4. Thoroughly clean the shock spring.
5. Inspect shock for signs of oil seepage around the shaft seal. If leakage is suspected rebuild the shock absorber assembly.
6. Inspect eyelets ③ ④ for cracks, damage or loose fitting eyelet. Rebuild shock if either eyelet is cracked.

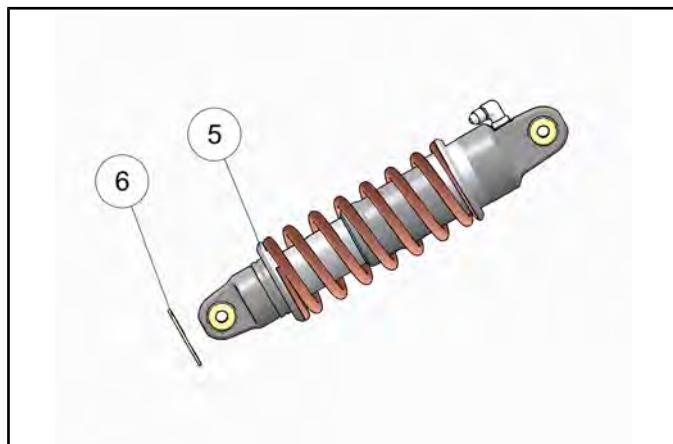


7. Inspect damper rod for corrosion, pitting, or damage. Rebuild shock if any of the above is evident.
8. With shock upright, move damper rod through entire travel range. Damper rod should move smoothly with consistent damping through the entire travel range, and return to the fully extended position when released. Rebuild shock if damping is inconsistent, or if gas leakage has occurred and the damper rod does not fully extend when released.
9. Inspect shock spring for cracks or distortion. Measure free length and compare to specification. See Service Specifications, page 8.40.

Chieftain / Chieftain Dark Horse / Roadmaster / Springfield

10. Install the shock / spring assembly in a suitable spring compressor.

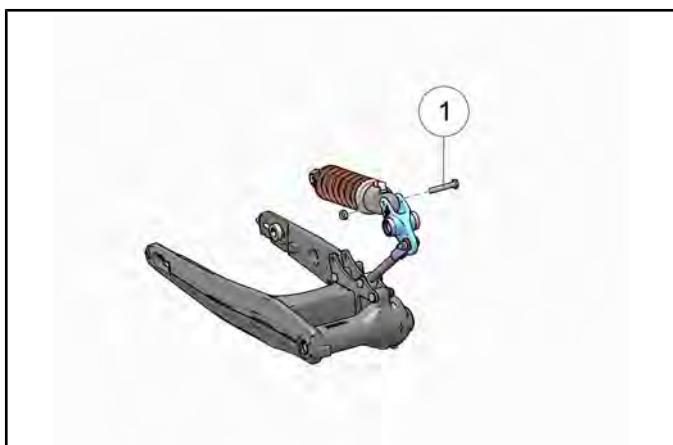
11. Compress spring enough to raise the lower keeper ⑤ and remove the circlip ⑥.



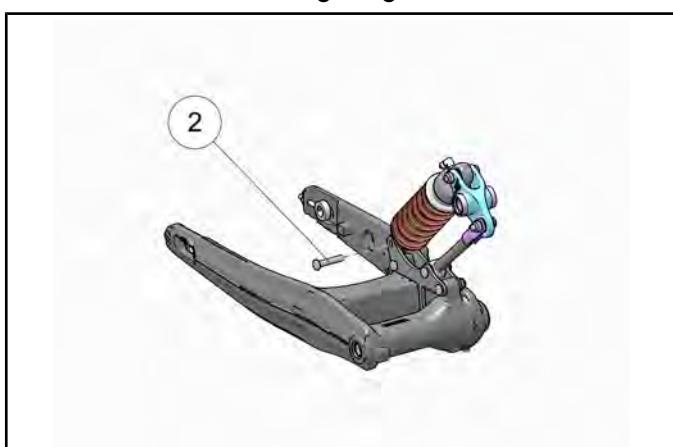
12. Remove the lower keeper and slide spring off of shock.
13. Thoroughly clean the shock spring.
14. Inspect shock for signs of oil seepage around the shaft seal. If leakage is suspected rebuild the shock absorber assembly.
15. Inspect eyelets for cracks or damage. Rebuild shock if either eyelet is cracked.
16. Inspect damper rod for corrosion, pitting, or damage. Rebuild shock if any of the above is evident.
17. Inspect shock spring for cracks or distortion. Measure free length and compare to specification. See Service Specifications, page 8.40.

SHOCK ABSORBER INSTALLATION

1. Grease all pivot points.
2. Lift shock into position and install top shock fastener ① from right to left, and install nut finger tight.



3. Install the lower shock fastener ② from right to left, and install nut finger tight.



4. Torque upper and lower shock fasteners to specification.

TORQUE

Shock Fasteners (All Models): **55 ft-lbs (75 Nm)**

5. Install the swingarm / shock absorber assembly. See Swingarm Installation, page 8.67.
6. Set suspension ride height / preload to accommodate rider / cargo weight. See Rear Shock Preload Inspection, page 2.37.

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.

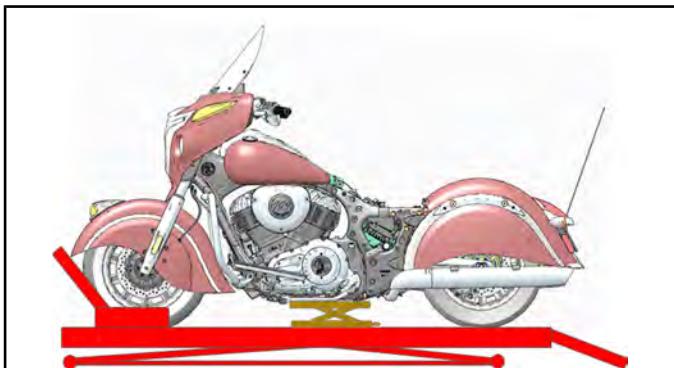
⚠ WARNING

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.

⚠ WARNING

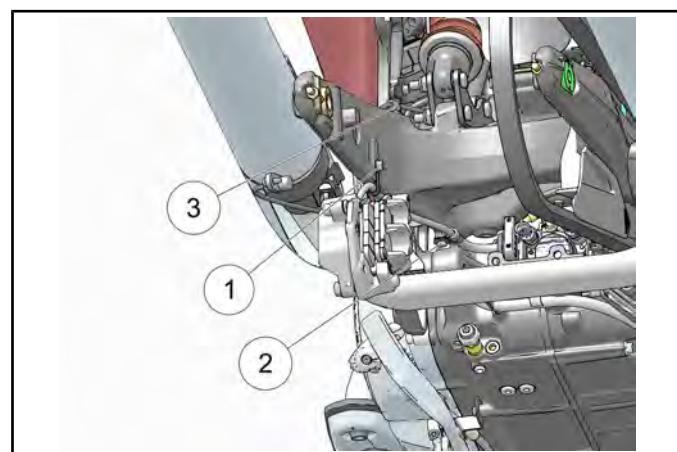
If working on a motorcycle equipped with a charcoal canister (EVAP), remove the canister prior to elevating the rear of the motorcycle to prevent damage to the canister hose fittings.

1. Place the motorcycle in an upright position on a lift table with the front wheel clamped in a wheel vise.
2. Position a platform jack beneath the engine cases and raise until it contacts the engine.

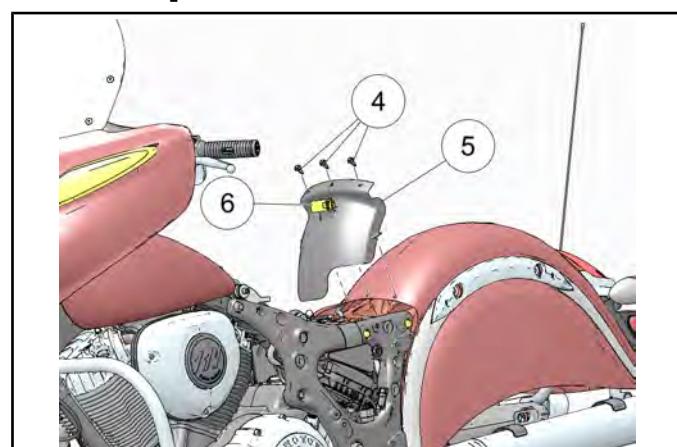


3. If equipped, remove the charcoal canister. See Evaporative Emission Control System (CA Models), page 2.21.
4. Remove saddlebags, if equipped. Refer to Owner's Manual.
5. Remove upper and lower side panels. See Side Cover (Upper), Removal / Installation, page 7.17 and Side Cover (Lower), Removal / Installation, page .
6. Remove the seat. See Seat, Removal / Installation - Classic / Vintage / Chieftain, page 7.21.
7. Remove rear wheel assembly. See Rear Wheel Removal / Installation, page 8.56.

8. Remove the rear brake hose rear p-clamp ① and front p-clamp ② fasteners located on the left inner surface of the swingarm.
9. Remove the rear ABS wheel speed sensor harness p-clamp fastener ③ from the front left side of the swingarm.

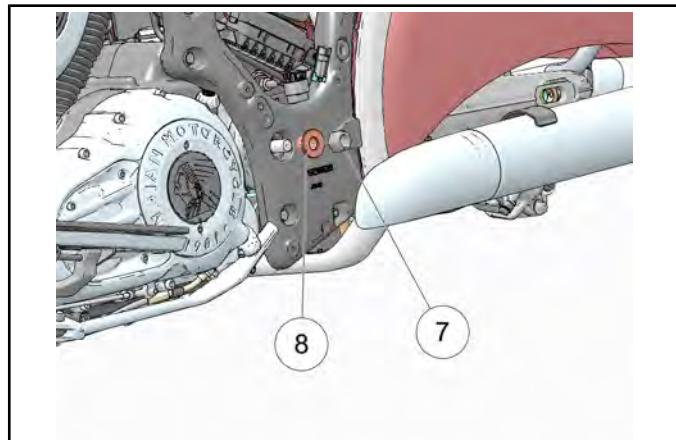


10. Disconnect the rear ABS wheel speed sensor connector located at the front of swingarm.
11. Remove the plastic darts ④ securing the rear wheel debris flap ⑤ to the forward upper edge of the rear fender.
12. Disconnect the tip over sensor connector ⑥ located on the rear wheel debris flap and remove debris flap ⑤ .

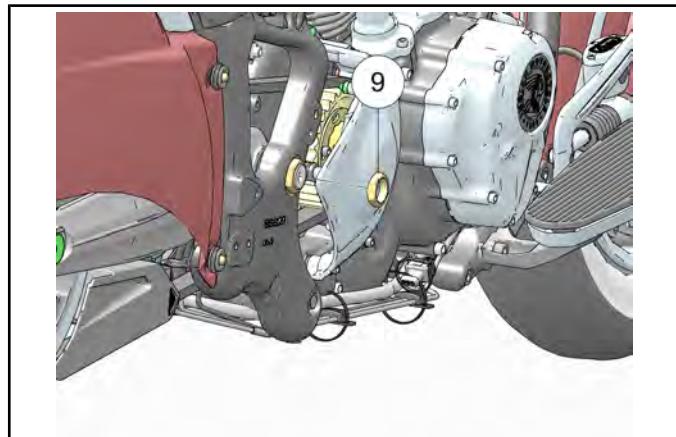


STEERING / SUSPENSION

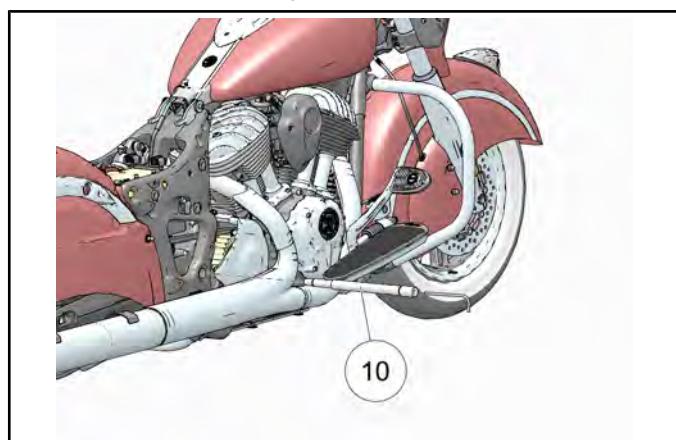
13. Remove swingarm nut ⑦ and outer pivot spacer ⑧ from the left side of the swingarm pivot shaft.



14. Remove the pivot jamb nut ⑨ located on the right side of the swingarm pivot shaft.

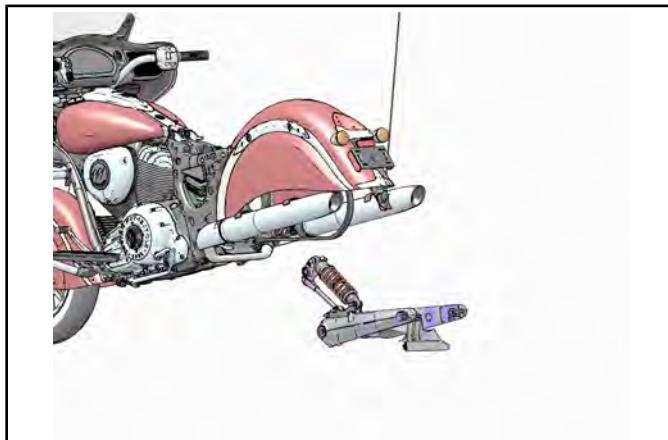


15. Use an 8 mm hex wrench to thread the swingarm shaft ⑩ out of the right side of the frame.



16. **CHIEFTAIN / CHIEFTAIN DARK HORSE / ROADMASTER / SPRINGFIELD ONLY:** Disconnect the shock absorber air line fitting from the left frame section.

17. Support and remove the swingarm assembly towards the rear of the motorcycle.

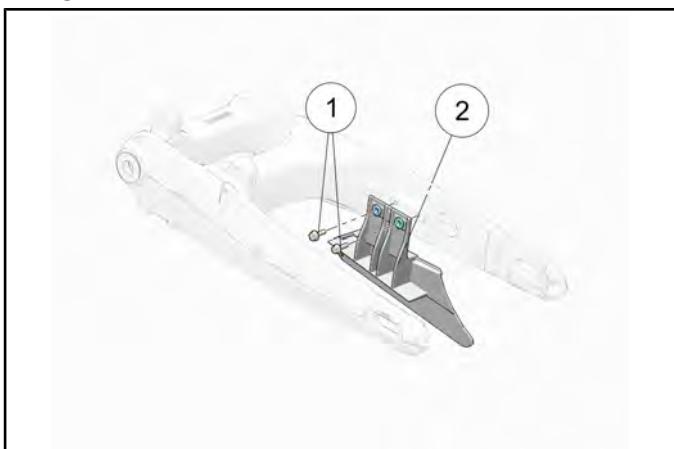


SWINGARM BUSHING / BEARING REPLACEMENT**NOTE**

Disassembly and assembly of the swingarm requires
Swingarm Bushing Tool (**PF-51237**).

REMOVAL

1. Remove swingarm assembly from motorcycle. See Swingarm Removal, page 8.63.
2. Remove shock absorber assembly from swingarm. See Shock Absorber Removal, page 8.60.
3. Remove the two fasteners ① and lower belt guard ②.



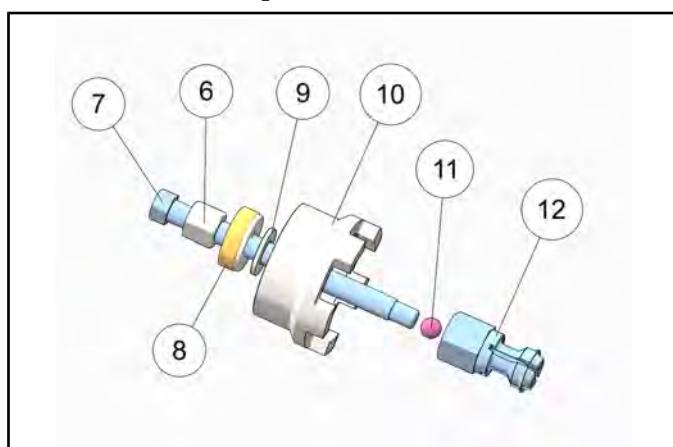
4. Remove the pivot spacer ③ from the LH side of the swingarm followed by internal snap-ring ④.



5. Working from the RH side of the swingarm, gently pry the seal ⑤ out of the bearing bore.

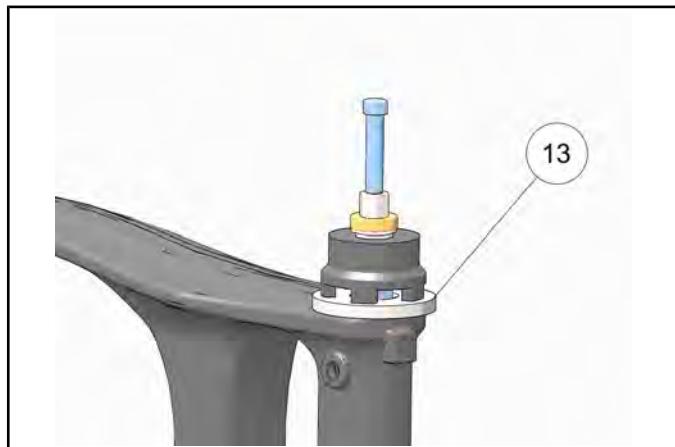


6. Assemble the Swingarm Bushing Tool (**PF-51237**):
 1. Thread nut ⑥ on to threaded rod ⑦ approximately 1/2 way.
 2. Slide bearing ⑧ on to threaded rod followed by washer ⑨ and arbor ⑩.
 3. Drop spreader ball ⑪ into adapter ⑫ and thread rod into adapter until the end lightly contacts the spreader ball.

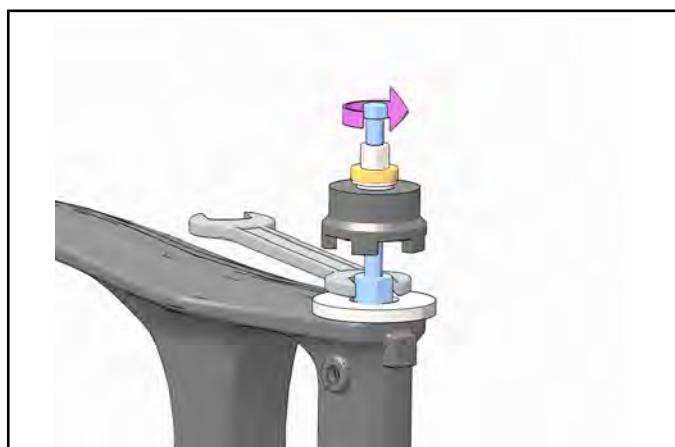


STEERING / SUSPENSION

7. Lay the press plate ⑬ over the needle bearing and install the Swingarm Bushing Tool (**PF-51237**) through the needle bearing as shown.

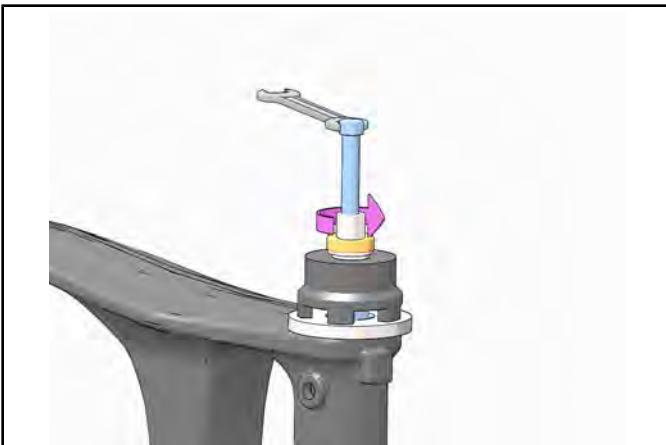


8. Raise the arbor up high enough to hold the adapter in place with an open ended wrench.
9. Turn the top of the threaded rod in until the adapter fingers are spread enough to grab the inner diameter of the needle bearing.

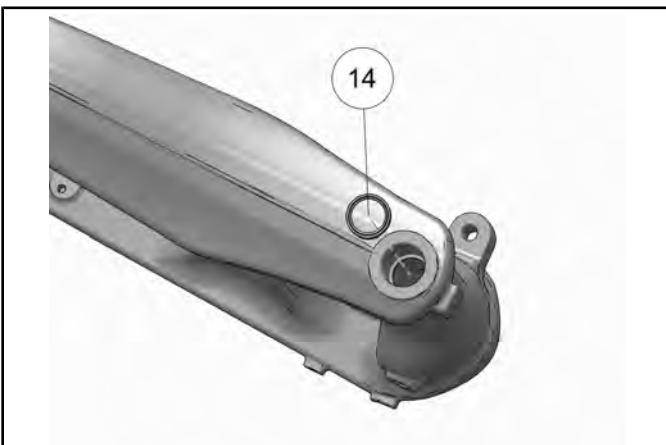


10. Lower the arbor until its seated on the press plate and thread the nut down onto the bearing.

11. Hold the threaded rod in place and turn the nut in until the needle bearing is drawn from the bore.



12. With the needle bearing removed, gently pry the inner seal ⑭ out of the needle bearing bore.



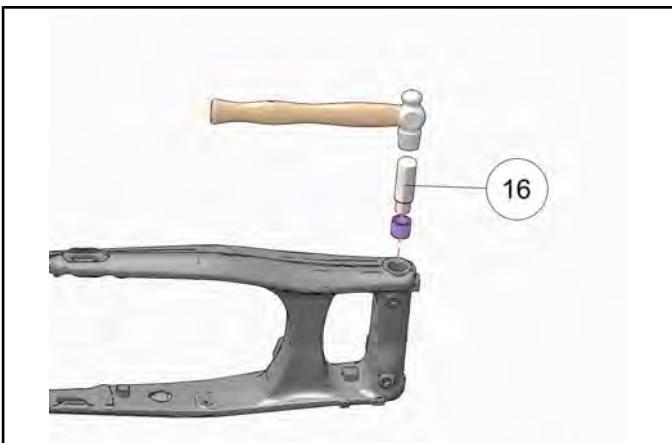
13. Insert a suitable bearing driver or drift through the RH side of the swingarm and drive the two bearings ⑮ out through the LH side.



14. Inspect bearing bores for any galling or damage.

INSTALLATION

15. Working on the LH side of the swingarm, press or drive new bearings into the bearing bore using a suitable bearing driver.
16. Install internal snap-ring and spacer removed in STEP 4 of this procedure.
17. Working on the RH side of the swingarm, press a new *inner* seal into the bearing bore until seated on the shoulder.
18. Using the bearing driver **16** provided in Swingarm Bushing Tool (**PF-51237**), drive a new needle bearing into the RH side of the swingarm until fully seated.



19. Press a new *outer* seal into the bearing bore until seated.
20. Install lower belt guard and torque fasteners to specification.

TORQUE

Lower Belt Guard Fasteners:
96 in-lbs (11 Nm)

21. Install shock absorber assembly. See Shock Absorber Installation, page 8.62.
22. Install swingarm assembly. See Swingarm Installation, page 8.67.

SWINGARM INSTALLATION

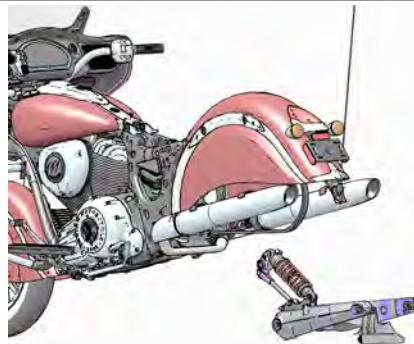
Drive belt must be installed on the drive sprocket prior to installing the swingarm.

1. Clean inside of the swingarm shaft bores in both sides of the frame midcastings.
2. Grease swingarm pivot shaft.
3. If previously removed, install the shock absorber and pushrod assembly. See Shock Absorber Installation, page 8.62.
4. Apply a thin film of grease to the LH swingarm spacer **①** and press into position in the LH bearing bore.

NOTE

Grease should be applied to the left side spacer so it stays in position when swingarm is installed.

5. Lift the swingarm / shock absorber assembly into position in the frame. Make sure the LH spacer stays in position.



6. **CHIEFTAIN / CHIEFTAIN DARK HORSE / ROADMASTER / SPRINGFIELD ONLY:**

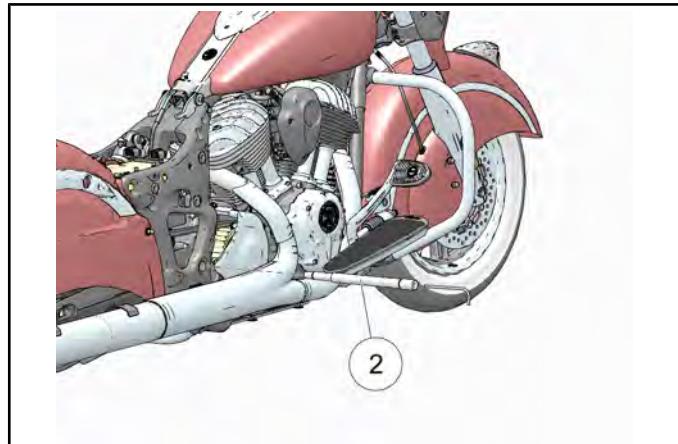
Install the shock absorber air line into the LH frame section and torque nut to specification.

TORQUE

Air Line Jamb Nut:
20 ft-lbs (27 Nm)

STEERING / SUSPENSION

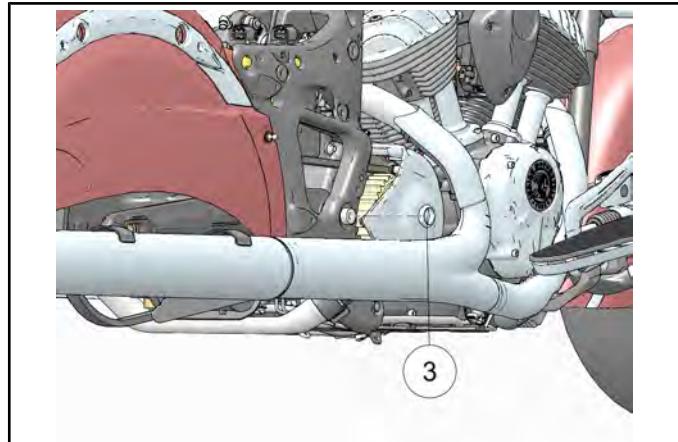
7. Use an 8 mm hex wrench to thread the swingarm shaft ② into the right side of the frame and torque to specification..



TORQUE

Swingarm Shaft:
8 ft-lbs (11 Nm)

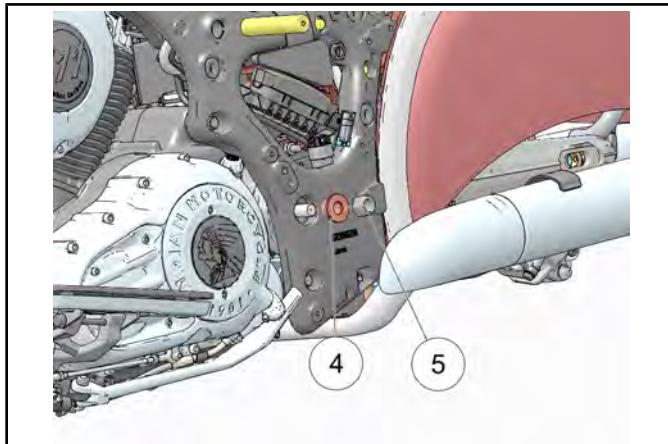
8. Install the swingarm shaft jamb nut ③ onto the end of the swingarm shaft on the RH side. Torque jamb nut to specification.



TORQUE

Swingarm Shaft Jam Nut:
89 in-lbs (10 Nm)

9. Working on the LH side of the motorcycle, install the outer pivot spacer ④ and swingarm nut ⑤ and torque to specification.



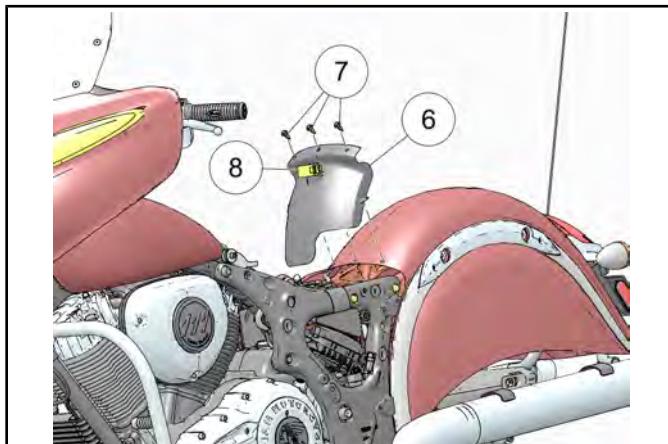
NOTE

The swingarm nut cannot be reused once removed from the swingarm shaft. Apply AP grease to the shoulder of the new nut prior to installation.

TORQUE

Swingarm Nut:
65 ft-lbs (88 Nm)

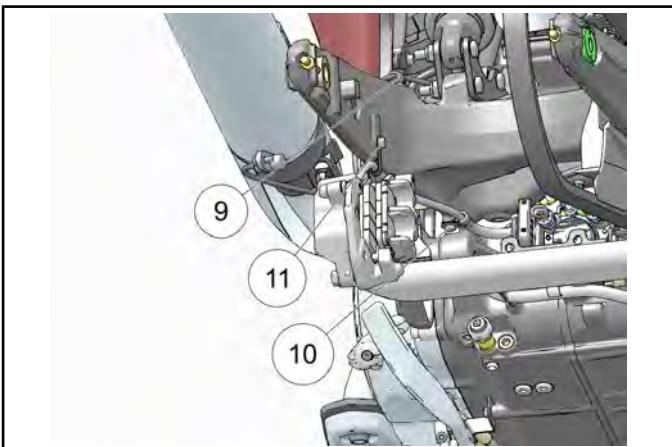
10. Install the debris flap ⑥ and three plastic dart clips ⑦ and reconnect the tip over sensor ⑧ .



11. Connect the ABS wheel speed sensor located at the front of the swingarm.

12. Route the ABS wheel speed sensor harness as shown and install the p-clamp fastener ⑨ . Torque to specification.

13. Route the rear brake line as shown and install the front p-clamp ⑩ and rear p-clamp ⑪ . Torque fasteners to specification.



TORQUE

P-Clamp Fasteners:
84 in-lbs (10 Nm)

14. Install the rear wheel. See Rear Wheel Removal / Installation, page 8.56.

15. 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.

16. Install the seat.

17. Install the upper and lower side panels. See Side Cover (Upper), Removal / Installation, page 7.17.

18. Install saddlebags, if equipped. Refer to Owner's Manual.

19. If equipped, install the charcoal canister. See Evaporative Emission Control System (CA Models), page 2.21.

20. Test ride motorcycle to be sure rear suspension operates smoothly without binding or abnormal noises.

21. Adjust ride height. See Rear Shock Preload Inspection, page 2.37.

TROUBLESHOOTING**TROUBLESHOOTING, REAR WHEEL / SUSPENSION**

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel Feels "Loose" or Wobbles	Loose fasteners	Torque to specification
	Distorted (bent) rear wheel	Replace wheel
	Worn or damaged wheel bearings	Replace wheel bearings
	Worn or damaged swing arm bushings.	Replace swing arm bushings
	Damaged or incorrect rear tire	Replace rear tire
	Unbalanced rear wheel assembly	Balance tire/wheel
	Low tire pressure	Inflate to specification
	Loose swing arm, axle or suspension fasteners	Torque to specification
	Pushrod or shock bearing failure	Replace pushrod or shock bearings
Rear Suspension Too Hard	Incorrect preload adjustment	Adjust to rider & load
	Damaged shock absorber	Replace / Rebuild shock
	Damaged or corroded suspension mount bushing	Correct as necessary
	Damaged or corroded swingarm bushings	Replace
	High tire pressure	Deflate to specification
	Drive belt adjustment too tight	Adjust drive belt tension
Rear Suspension Too Soft	Incorrect preload adjustment	Adjust to rider & load
	Damaged shock absorber	Rebuild or replace shock
	Weak shock spring	Replace shock spring
	Excessive load placed on motorcycle	Reduce load weight
	Low tire pressure	Inflate to specification
Rear Suspension Noisy	Loose fasteners	Torque to specification
	Worn wheel bearings	Replace
	Worn swing arm bushings	Replace
	Damaged shock absorber	Replace as necessary
	Worn pushrod or shock bearings	Replace pushrod or shock bearings
Wheel Drags (Turns Hard)	Incorrect drive belt adjustment	Adjust drive belt tension
	Brake problem	Diagnose and Service
	Loose fasteners	Torque to specification
	Bent rear axle	Replace
	Damaged wheel bearings	Replace
	Tire contact with object or chassis	Determine point of contact and correct

TROUBLESHOOTING, FINAL DRIVE

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Belt Shows Excessive Wear On One Side	Out-of-Alignment	Align rear wheel
Belt Squeal	Out-of-Alignment	Align rear wheel
Belt Whine / Noise	Out-of-Alignment Belt Damage Incorrect Belt Tension	Align rear wheel Inspect Belt Adjust Tension
Broken Sprocket Teeth	Foreign material damage / Loose drive belt or sprocket	Replace parts or repair as necessary
Broken or Torn Cogs on Belt	Foreign material damage / Loose drive belt or sprocket	Replace parts as necessary
Belt Jumps Sprocket Teeth	Worn, damaged or out of adjustment belt or sprockets	Replace parts as necessary
	Belt Loose	Adjust Belt
Excessive Wear, Binding Suspension	Belt Tight	Adjust Belt
Broken Belt	Belt weakened by foreign material damage. Belt run excessively tight or loose.	Replace Belt, Replace Sprockets

TIRES

GENERAL INFORMATION

SERVICE NOTES

⚠ WARNING

If a consumer wishes to replace the Original Equipment Manufacturer (OEM) tires with another brand of tire, Indian Motorcycle recommends contacting the tech-line department of the tire manufacturer being considered to ensure compatibility. Indian Motorcycle makes no other recommendation other than the OEM tires. Tires other than OEM may or may not adversely affect the handling characteristics of the motorcycle or may not have adequate clearance between tire and various parts of the motorcycle.

⚠ WARNING

Indian Motorcycles are produced using the designated tires listed as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability which can lead to a crash resulting in serious injury or death. Use only the recommended tires inflated to the recommended tire pressures. Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged rims.

⚠ WARNING

- Do not attempt to repair tires that have:
 - Punctures with a diameter of greater than 6mm (0.240").
 - Cuts with a length of greater than 6mm (0.240").
 - Any punctures or cuts on the sidewall of the tire.
 - Tread depth of less than 1.6mm (.063") for the front tire.
 - Tread depth of less than 1.6mm (.063") for the rear tire.
 - Ply separation.
 - Tread separation.
 - Severe tread cupping.
 - Cuts, gouges or scratches on the sealing surface of the bead.
 - Flat spots on the tread.
 - Bubbles, separation or any unusual damage to the inner liner of the tire.
 - Chemical sealants or balance additives added to the tire.

⚠ WARNING

All repairs must be made from inside the tire.

⚠ WARNING

No form of temporary repair should ever be attempted. Secondary damage caused by a penetrating object may not be detected and tire or tube deflation may occur at a later date.

⚠ WARNING

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

CAUTION

Two of the biggest factors contributing to premature tire wear are overloading and under-inflation. Do not deviate from the specifications for loading or inflation.

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
TPMS Activation Tool	PF-51288
Tire Changing Machine	Commercially Available

SERVICE SPECIFICATIONS

Refer to Steering / Suspension chapter for front and rear wheel specifications.

Tire Pressure Table (Cold)

NOTE	
Also refer to Manufacturing Information label.	
CHIEF CLASSIC	
FRONT: Dunlop American Elite (130/90 B16)	36 PSI(248 kPa)
REAR: Dunlop American Elite (180/65 B16)	40 PSI (276 kPa)
CHIEF VINTAGE	
FRONT: Dunlop American Elite (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop American Elite (180/65 B16)	40 PSI (276 kPa)
CHIEF DARK HORSE	
FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop American Elite (180/65 B16)	40 PSI (276 kPa)
SPRINGFIELD	
FRONT: Dunlop Elite 3 (130/90 B16)	46 PSI (317 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)
CHIEFTAIN DARK HORSE	
FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)
CHIEFTAIN	
FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)
CHIEFTAIN LIMITED / ELITE	
FRONT: Dunlop American Elite - 130/60B19	36 PSI (248 kPa)
REAR: Dunlop Elite 3 - 180/60R16	41 PSI (282 kPa)
ROADMASTER	
FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)
ROADMASTER CLASSIC	
FRONT: Dunlop Elite 3 (130/90 B16)	36 PSI (248 kPa)
REAR: Dunlop Elite 3 (180/60 R16)	41 PSI (283 kPa)

Minimum Tread Depth (ALL MODELS)

STEERING / SUSPENSION

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

TIRE INSPECTION**TIRE WEAR PATTERNS****Tire Wear Patterns**

SYMPTOM	CAUSE
Wear on Left Side	Riding on Crowned Roads
Edges Worn	Underinflation or Excessive Loads
Excess Wear in the Middle of Tire	Over-inflation or Tire Abuse
Cracks in Tread Grooves	Underinflation, Excessive Loads, Suspension Bottoming
Tread Block Cupping (Usually Front Tire -See Below)	Normal Braking Wear

OZONE CRACKING

Ozone cracking usually shows up on the sidewalls of tires and is caused by sunlight, electric motor emissions, smog, or other environmental factors. Ozone cracking does not pose a problem unless the cracks reach the cords. If this occurs, moisture may penetrate the carcass of the tire causing cord separation. Tires showing signs of severe ozone cracking (cords visible at the bottom of the cracks) must be replaced.

8

FRONT TIRE CUPPING

Front of tread block worn more than rear of tread block:

- The cupping of front tires is somewhat normal.
- Rear tires are subjected to forces in both directions. The forces of braking and acceleration result in even tire wear.
- Front tires are subjected only to the forces of braking. When the brakes are applied, tire deflection is increased and wear occurs in only one direction.
- Incorrect tire pressure is the number one cause of excessive tire cupping. Too little tire pressure causes the tire to over-deflect which increases the amount of scrubbing and causes more tire cupping.
- Binding or improperly assembled front forks can also contribute to excessive tire cupping. If the front forks do not react as they should the tire acts as the sole suspension component and tread deflection increases.

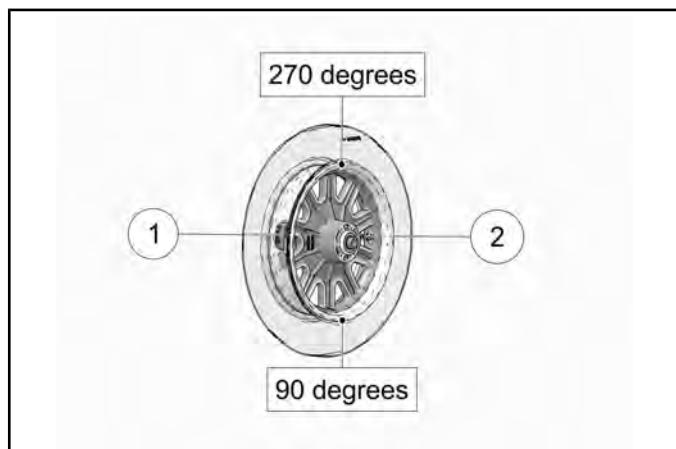
TIRE PRESSURE MONITORING SYSTEM (TPMS)

TPMS OVERVIEW

The Chieftain and Roadmaster models are equipped with an electronic tire pressure monitoring system (TPMS). The TPMS provides real-time tire pressure information to the operator of the vehicle and displays it via MFD and a low pressure warning light.

On models equipped with a TPMS, the sensors ① are located 180° from the valve stem ②. Use caution when servicing tires.

To avoid damaging a sensor, break the bead at the valve stem, then at 90° and 270° from the valve stem as required.



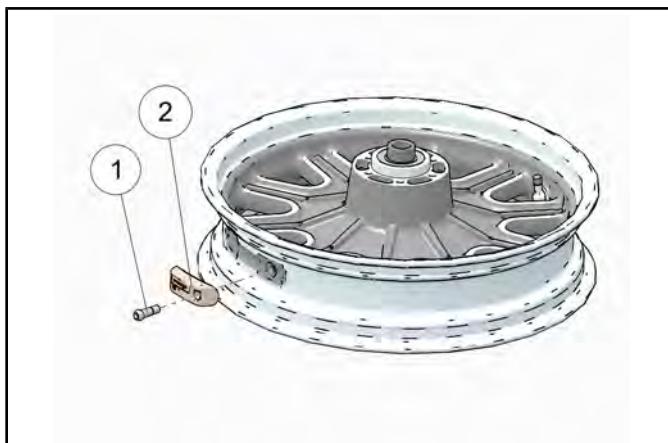
With TPMS, the pressure of each tire can be viewed in the MFD. If the display shows dashes (—) instead of a pressure value while traveling above 15 MPH (24 km/h), the system may not be functioning properly. See your dealer for service.

The TPMS warning indicator will illuminate if low tire pressure is detected. Always correct low tire pressure promptly. Always inspect tire pressure and condition before each ride.

The TPMS display may indicate an increase in tire pressure while riding, a normal occurrence as tires warm up. Riding into colder conditions may result in a drop in tire pressure as tires cool down. Regardless of conditions, low tire pressures should always be corrected promptly.

TPMS SENSOR REPLACEMENT

1. Remove tire from rim. See Tire Removal, Chieftain / Roadmaster, page 8.84.
2. Remove fastener ① and sensor ②.



3. Reverse the removal procedure for installation. Torque fastener to specification.

TORQUE

TPMS Sensor Fastener:
44 in-lbs (5 Nm)

4. Install tire. See Tire Installation - (Chieftain / Roadmaster), page 8.90.
5. Perform the **TPMS sensor activation** procedure.

TPMS ACTIVATION (SPRINGFIELD)

TPMS sensor activation is required any time the following occur:

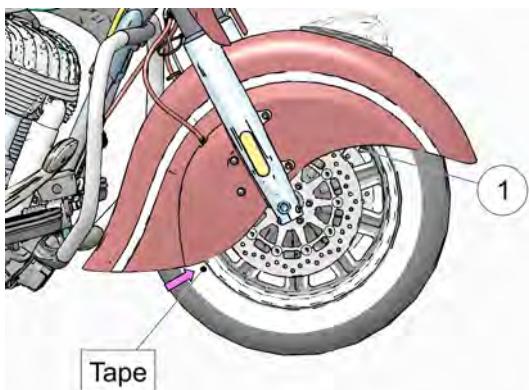
- TPMS sensor has been replaced.
- Vehicle Control Module (VCM) has been reflashed.
- Vehicle Control Module (VCM) has been replaced.

TPMS activation or "Wake Up" requires the use of the TPMS Activation tool (PF-51288).

NOTE

The TPMS sensor is located 180° from the valve stem

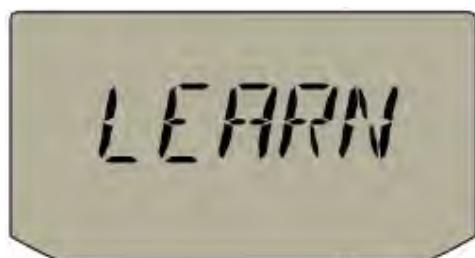
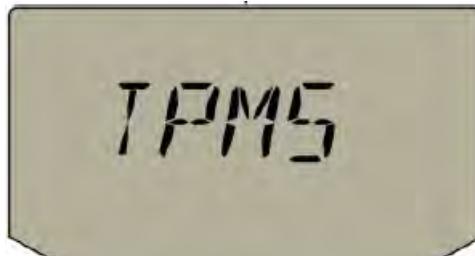
- ① Locate the position of the front and rear valve stems and place a piece of tape on the tire on the opposite side (180°). Both pieces of tape (front and rear tires) should be visible so the TPMS Activation tool can be held within 3 in (7.6 cm) of the tire where the sensor is located.

**NOTE**

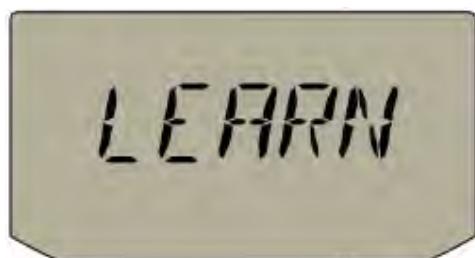
The TPMS Activation tool should be held close to the **sidewall of the tire** when activating the sensors. If the Activation tool is held over the aluminum rim, the sensor signal may not be received.

1. Press the power button to power up the motorcycle electrical system.

2. Press and hold RH and LH mode buttons simultaneously until the TMPS LEARN screens toggle on the screen.



3. Press the LH mode button to begin the activation process. The following screens should toggle.

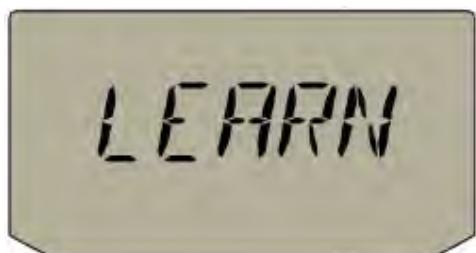


8

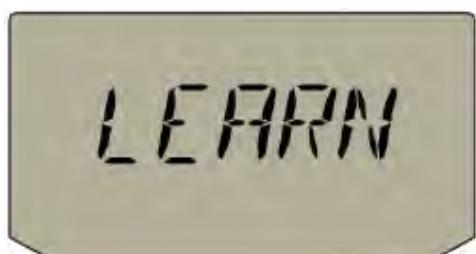
NOTE

Once TPMS setup has been initiated on the motorcycle, there is approximately 30 seconds to complete the activation procedure before the system times out and must be restarted. Make sure the TPMS Activation tool is close at hand and powered up before initiating setup.

4. With the Activation tool powered up and "Searching" for the TPMS sensor, hold the device no more than 3 in (7.6 cm) from the sidewall where the tape was placed on the front tire. You should hear a short audible "beep" acknowledging sensor activation. A value will appear on the screen indicating the successful reading of the front wheel. The display will switch to the rear wheel.



5. Move to the rear wheel and hold the Activation tool no more than 3 in (7.6 cm) from the sidewall where the tape was placed previously. You should hear a short audible "beep" acknowledging sensor activation. A value will appear on the screen indicating the successful reading of the rear wheel. The following screens will toggle indicating successful activation of both TPMS sensors.



TPMS ACTIVATION (CHIEFTAIN DARK HORSE)

TPMS sensor activation is required any time the following occur:

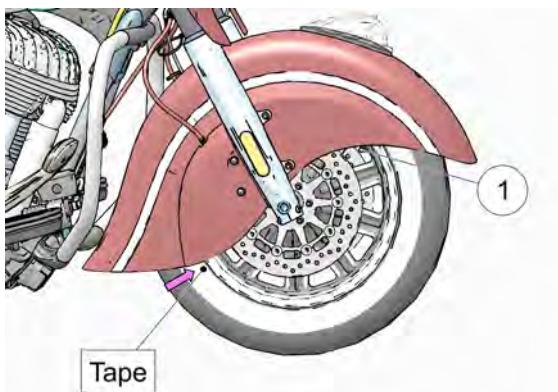
- TPMS sensor has been replaced.
- Vehicle Control Module (VCM) has been reflashed.
- Vehicle Control Module (VCM) has been replaced.

TPMS activation or "Wake Up" requires the use of the TPMS Activation tool (PF-51288).

NOTE

The TPMS sensor is located 180° from the valve stem

- ① Locate the position of the front and rear valve stems and place a piece of tape on the tire on the opposite side (180°). Both pieces of tape (front and rear tires) should be visible so the TPMS Activation tool can be held within 3 in (7.6 cm) of the tire where the sensor is located.

**NOTE**

The TPMS Activation tool should be held close to the **sidewall of the tire** when activating the sensors. If the Activation tool is held over the aluminum rim, the sensor signal may not be received.

1. Press the power button to power up the motorcycle electrical system.

2. Press and hold RH and LH mode buttons simultaneously until the SETUP screen is displayed on the MFD.

```

SETUP
SET CLOCK
SET UNITS
SET BOTTOM SCREEN
GAUGE INFORMATION
TPMS
SET BRIGHTNESS
EXIT

```

3. Press the RH mode button until TPMS is highlighted.

```

SETUP
SET CLOCK
SET UNITS
SET BOTTOM SCREEN
GAUGE INFORMATION
TPMS
SET BRIGHTNESS
EXIT

```

STEERING / SUSPENSION

4. Press the LH mode button to begin the activation process. The following screen should appear.

TPMS
START
TIRE PRESSURE
LEARNING
PROCEDURE

NOTE

Once TPMS setup has been initiated on the motorcycle, there is approximately 30 seconds to complete the activation procedure before the system times out and must be restarted. Make sure the TPMS Activation tool is close at hand and powered up before initiating setup.

5. After a few seconds the following screen will appear, indicating that the TPMS sensors are ready to be activated with the Activation tool.

TPMS
WAITING FOR
FRONT WHEEL

6. With the Activation tool powered up and "Searching" for the TPMS sensor, hold the device no more than 3 in (7.6 cm) from the sidewall where the tape was placed on the front tire. You should hear a short audible "beep" acknowledging sensor activation. The MFD will switch to the rear wheel.

TPMS
WAITING FOR
REAR WHEEL

7. Move to the rear wheel and hold the Activation tool no more than 3 in (7.6 cm) from the sidewall where the tape was placed previously. You should hear a short audible "beep" acknowledging sensor activation. The MFD will display the following screen indicating successful activation of both TPMS sensors.

TPMS
TIRE PRESSURE
SENSOR
LEARNING
COMPLETE

TPMS ACTIVATION (CHIEFTAIN / ROADMASTER)

TPMS sensor activation is required any time the following occur:

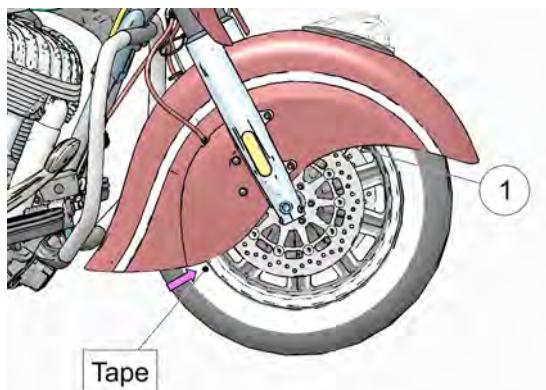
- TPMS sensor has been replaced.
- Vehicle Control Module (VCM) has been reflashed.
- Vehicle Control Module (VCM) has been replaced.

TPMS activation or "Wake Up" requires the use of the TPMS Activation tool (PF-51288).

NOTE

The TPMS sensor is located 180° from the valve stem

- ① Locate the position of the front and rear valve stems and place a piece of tape on the tire on the opposite side (180°). Both pieces of tape (front and rear tires) should be visible so the TPMS Activation tool can be held within 3 in (7.6 cm) of the tire where the sensor is located.

**NOTE**

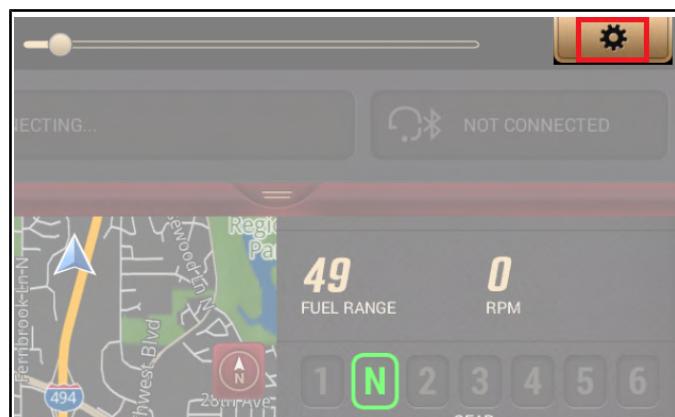
The TPMS Activation tool should be held close to the **sidewall of the tire** when activating the sensors. If the Activation tool is held over the aluminum rim, the sensor signal may not be received.

1. Press the power button to power up the motorcycle electrical system.

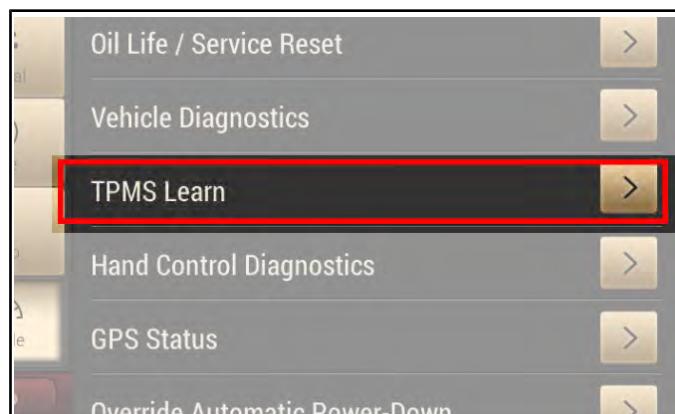
2. Press the middle dropdown button on top of screen to open the settings menu.



3. Press the "SETTINGS" icon in the upper right hand corner.



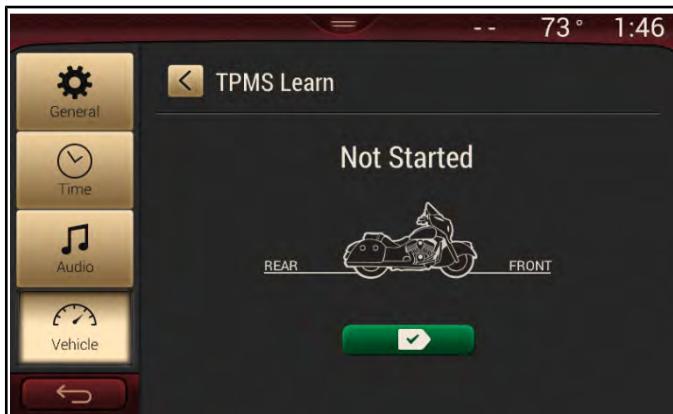
4. Press the "TPMS Learn" arrow button.

**NOTE**

Once TPMS setup has been initiated on the motorcycle, there is approximately 30 seconds to complete the activation procedure before the system times out and must be restarted. Make sure the TPMS Activation tool is close at hand and powered up before initiating setup.

STEERING / SUSPENSION

5. Press the “Vehicle” icon on the left hand side of screen. This screen indicates that the TPMS sensors are ready to be activated with the Activation tool. Press the green check to start the TPMS learn procedure.



6. With the Activation tool powered up and “Searching” for the TPMS sensor, hold the device no more than 3 in (7.6 cm) from the sidewall where the tape was placed on the front tire. You should hear a short audible “beep” acknowledging sensor activation. The display will switch to the rear wheel.



7. Move to the rear wheel and hold the Activation tool no more than 3 in (7.6 cm) from the sidewall where the tape was placed previously. You should hear a short audible “beep” acknowledging sensor activation. The screen will display a screen indicating successful activation of both TPMS sensors.

TIRE CHANGING, GENERAL INFORMATION

There are three generally acceptable methods to dismount and mount a motorcycle tire to its rim. For each of the three methods, there are countless variations.

The three general methods are:

- Pneumatic or electrically operated tire machine
- Manually operated tire machine
- Manual manipulation of tire irons

Indian Motorcycle permits and recommends all three of the general methods, but realizes that careless or improper work habits can damage both the tire and rim no matter which method is used. With any of the methods, care must still be taken to avoid damaging the rim, tire, inner tube (if applicable), brake disk, or sprocket.

The pneumatic or electrically operated tire machine is preferred because it is the most efficient method to dismount and mount tires.

The manually operated tire machine is the next preferred method. It can be just as efficient as a power assisted tire machine but with some of the machines it may be necessary to remove the belt driven sprocket in order to gain sufficient clearance for tire removal.

Manual manipulation is the least preferred method since it will generally not deliver the same efficiency as the other methods and greater care needs to be taken when performed. Care must be taken when using tire irons to not damage or stress the tire bead. Also, the opposite bead needs to be in drop center of wheel during mounting and dismounting of the tire.

Be very careful not to damage the rim, tire, inner tube, brake disk, TPMS sensor or sprocket regardless of which method is used.

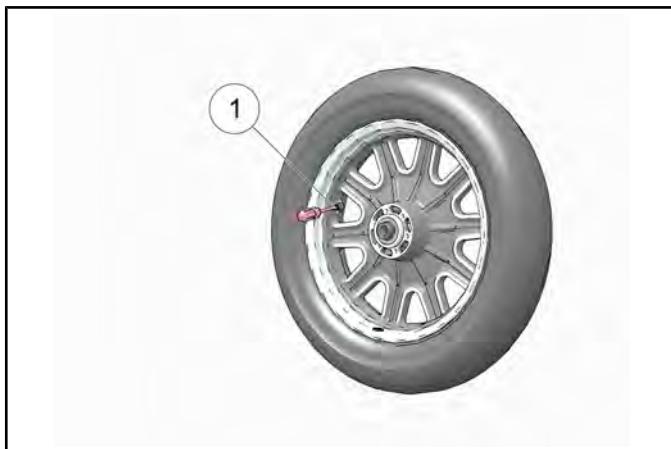
CAUTION

On models equipped with a Tire Pressure Monitoring System (TPMS) break beads at the valve stem, then at 90° and 270° from the valve stem as required. If the bead is broken 180° from the valve stem (sensor location) the TPMS sensor may be damaged and require replacement. See TPMS Overview, page 8.76.

TIRE REMOVAL**TIRE REMOVAL - (CHIEFTAIN / ROADMASTER)****NOTE**

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 and rear wheel removal procedures.
2. Remove valve core ① from valve stem and let all air escape.

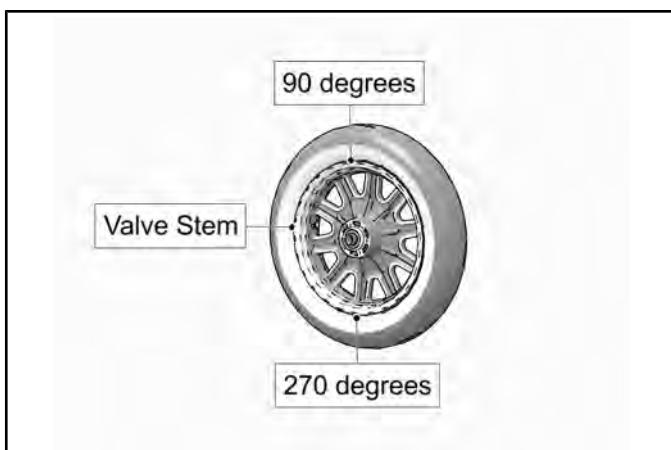


3.

CAUTION

The TPMS sensor is located 180° from the valve stem. If the bead is broken 180° from the valve stem the TPMS sensor may be damaged and require replacement.

Mount the wheel assembly onto a tire bead breaker and break the bead starting at the valve stem, then again at 90° and again at 270° from the valve stem as necessary.



4. Flip the wheel assembly over and repeat STEP 3 on the other side.

CAUTION

IMPORTANT: Take great care not to bend or otherwise damage the brake disc and/or belt driven sprocket. If the bead breaker being used interferes with either the brake disk and/or belt driven sprocket, remove the disc or sprocket as required.

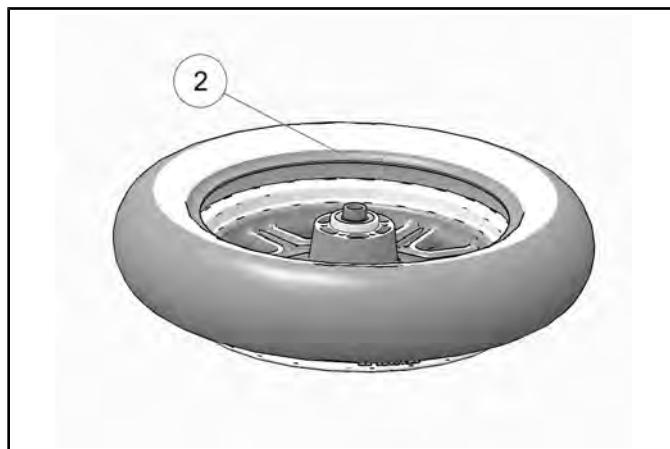
5. Push tire down and lubricate tire bead with tire lubricant on both sides of the tire.
- 6.

NOTE

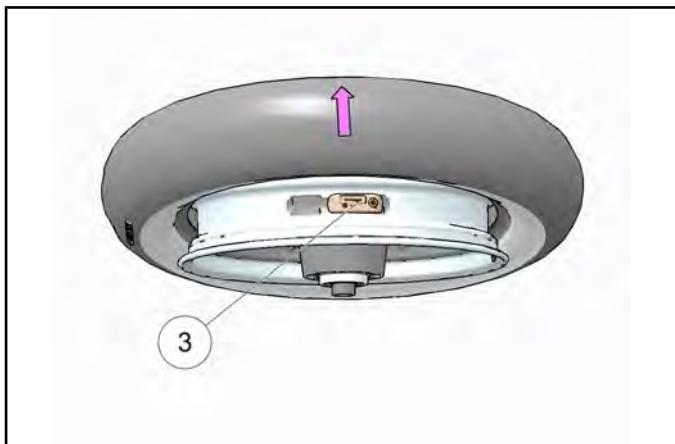
Refer to manufacturer's instructions for proper tire changer operation.

Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

7. Carefully work around the circumference of the upper bead ② with the tire lever until it is completely off of the rim.



8. Paying attention to the location of the TPMS sensor ③, lift the lower tire bead up until the tire lever can be positioned and the tire completely removed.



9. Work around the circumference of the rim until the tire can be lifted free of the rim.

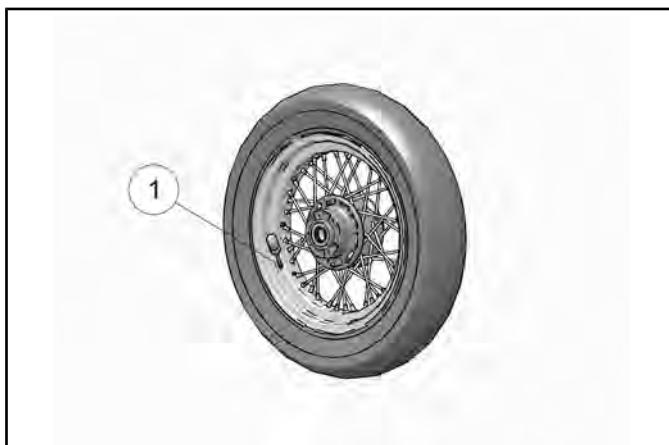


TIRE REMOVAL - (CLASSIC / VINTAGE)

NOTE

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 and rear wheel removal procedures.
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.

CAUTION

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.

NOTE

Refer to manufacturer's instructions for proper tire changer operation.

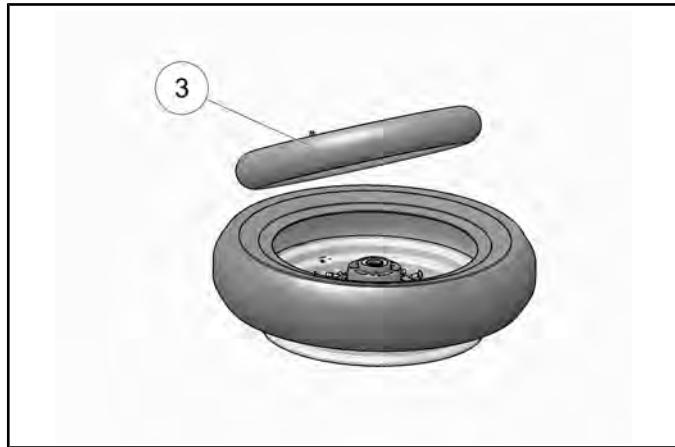
8

Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

- Carefully work around the circumference of the upper bead ② with the tire lever until it is completely off of the rim.



- Lift the lower tire bead up until the inner tube can be withdrawn from the tire. Remove inner tube ③.



- Lift the lower tire bead up until the tire lever can be positioned and the tire completely removed.
- Work around the circumference of the rim until the tire can be lifted free of the rim.

TIRE REMOVAL - (DARK HORSE)

NOTE

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

- Remove wheel / tire assembly from motorcycle. See Steering / Suspension chapter for front and rear wheel removal procedures.
- Remove valve core ① from valve stem and let all air escape.



- 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.
- Flip the wheel assembly over and repeat STEP 3 on the other side.

CAUTION

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.

-

NOTE

Refer to manufacturer's instructions for proper tire changer operation.

Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

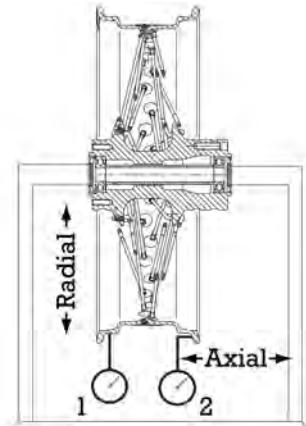
6. Carefully work around the circumference of the upper bead ② with the tire lever until it is completely off of the rim.



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.

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).

**TIRE REPAIR PRECAUTIONS****⚠ WARNING**

Only permanent plug-patch repairs of small tread area punctures from **inside** the dismounted tire are recommended. Never perform an exterior repair and never use an inner tube as a substitute for a proper repair. Speed should not exceed 50 MPH for the first 24 hours after repair and the repaired tire should never be used over 80 MPH. Inspect inflation pressure after tire cools for at least three hours following initial operation.

NOTE

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, page 8.40. 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.

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.

NOTE

Tubeless: Valve stem replacement is recommended when tire is being replaced.

Tube Type: Inner tube replacement is recommended when tire is being replaced.

VALVE STEM INSTALLATION - RUBBER

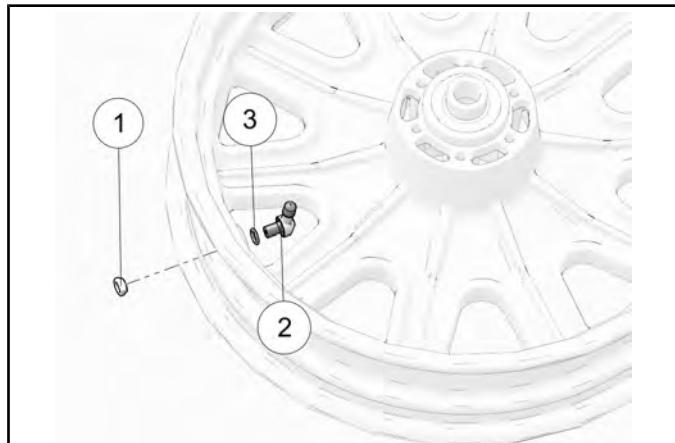
1. Remove tire from wheel and cut valve stem with a diagonal cutter to remove.
2. Clean tire valve hole and sealing area thoroughly.
3. Lubricate tire valve and hole with P-80 rubber lubricant or equivalent.
4. Place tire valve into hole and fastener a tire valve installation tool (commercially available) onto valve.
5. Place a small wood block against the rim to improve leverage point and keep the pulling angle as straight as possible. (Fig. 9)
6. Pull the valve until fully seated and remove tool.

VALVE STEM INSTALLATION - METAL**IMPORTANT**

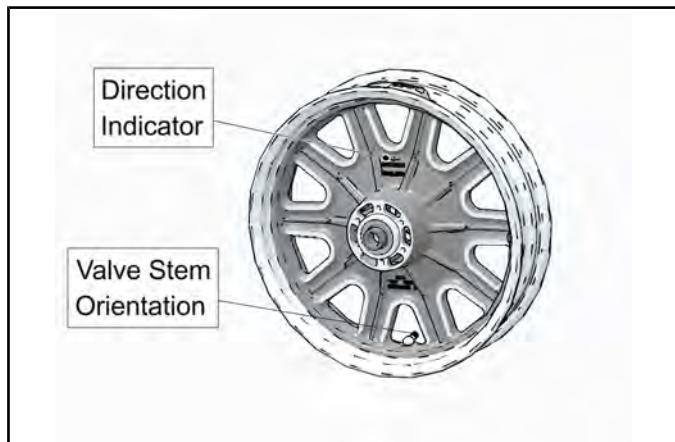
The Chieftain, Roadmaster and Dark Horse models use directional tires and wheels. Pay close attention to markings to ensure proper tire and valve stem orientation.

1. Remove tire from wheel as outlined in this chapter.

2. Remove valve stem nut ① , valve stem ② and o-ring ③ .



3. Clean gasket or o-ring sealing surface of rim.
4. Place new valve stem (with seal washer or O-ring installed) through hole in rim and position it so the stem is perpendicular from wheel center and, valve opening facing away from surface containing direction indicator.



5. Hold stem and tighten nut to specification.

TORQUE

Valve Stem Nut: **44 in-lbs (5 Nm)**

6. Install tire as outlined in this chapter.

TIRE INSTALLATION**TIRE INSTALLATION - (CHIEFTAIN / ROADMASTER)****NOTE**

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

NOTE**Balance Dots**

Dunlop tires have a yellow dot on the sidewall which corresponds to the lightest part of the tire. This dot is meant to line-up with the tire valve which often is the heaviest part of the rim (although this is not always the case).

Indian Motorcycle does not recommend the use of liquid balancer/sealers. These are a form of temporary repair which may adversely affect ply material and mask secondary damage caused by the penetrating object. Reliance upon sealants can result in sudden tire failure and accident.

Directional Arrows

Tires ① and rims ② 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.

2.

NOTE

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 balance dot and directional arrows.

4.

CAUTION

Use care not to damage the TPMS sensor while installing the tire bead over the edge of the rim.

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.

**NOTE**

Confirm tire is positioned correctly by observing directional arrows.

5. Lubricate the tire bead.
6. With your hands, push as much of the remaining tire bead as possible into the rim, pinching both upper and lower beads into the drop center.
7. When no more of tire can be installed by hand, press down on portion of tire in front of you with your knee to keep the top bead in the drop center.

8. Install the tire lever and work around the remaining circumference of the wheel until the bead is fully installed onto the rim.

NOTE

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 REPAIRED TIRES: Speed should not exceed 50 MPH for the first 24 hours after repair and repaired tire should never be used over 80 MPH. Inspect inflation pressure after tire cools for at least three hours following run-in.

FOR NEW TIRES: Replacement of OEM tires or replacement with differently constructed tires will not immediately produce improved reactions the same as the original tires when new. When new tires are installed, they should not be subjected to maximum power or hard cornering until a reasonable “scrub” period of approximately 100 miles has been covered. This will permit the rider to become accustomed to “feel” of new tires or tire combination, and achieve optimum road grip. Inspect and adjust tire inflation pressure after tire cools down for at least three hours following “run-in”.

TIRE INSTALLATION - (CLASSIC / VINTAGE)

NOTE

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

NOTE

Balance Dots

Dunlop tires have a yellow dot on the sidewall which corresponds to the lightest part of the tire. This dot is meant to line-up with the tire valve which often is the heaviest part of the rim (although this is not always the case).

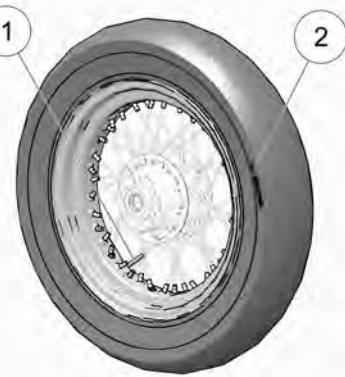
Indian Motorcycle does not recommend the use of liquid balancer/sealers. These are a form of temporary repair which may adversely affect ply material and mask secondary damage caused by the penetrating object. Reliance upon sealants can result in sudden tire failure and accident.

Directional Arrows

Tires and rims have directional indicators that must be observed when installing tires to rims.

Rims: The valve stem ① should exit the rim on the rider's RH side when installed on the motorcycle.

Tires: The tires ② have directional arrows located on the side wall.



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. Make sure that the edges of the rim, where the beads rest, are clean and free of debris.

2. Lubricate both tire beads with rubber lubricant.

CAUTION

Never apply grease, oil, gasoline, spray type lubricants or anything other than rubber lubricant or a neutral soap and water solution to the tire bead. Doing so can damage the tire.

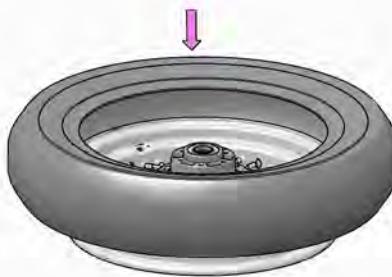
- 3.

NOTE

Refer to manufacturer's instructions for proper tire changer operation.

Mount the tire and wheel assembly on the tire machine per the manufacturers instructions.

4. Orient tire correctly as to the balance dot and directional indicators.
5. 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.

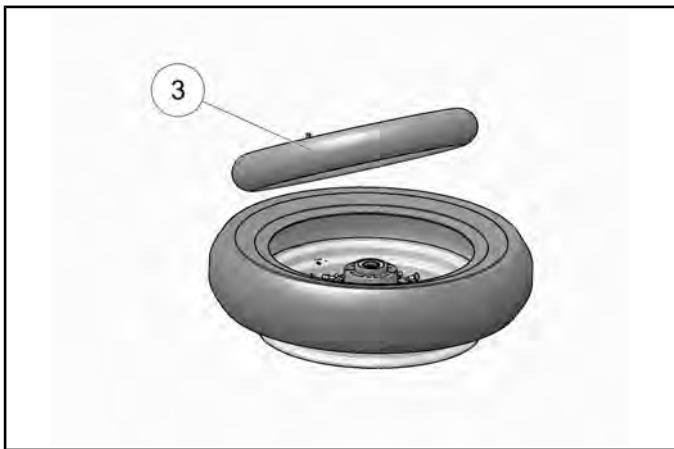


NOTE

Confirm tire is positioned correctly by observing directional arrow.

6. Thread valve stem base nut completely on to valve stem.
7. Apply baby powder to new (deflated) tube and install by inserting valve stem through the rim band and rim.

8. Install the tube ③ into the tire starting at the valve stem and working around until the entire tube is laying inside the tire in a natural position.



9. Arrange the tube, if necessary, to remove kinks or bends, making sure that the valve stem projects straight out and forms a 90 degree angle with the rim.
10. Thread the valve stem lock nut until it fully draws the valve stem through the rim and torque to specification.

TORQUE

Valve Stem Lock Nut: 13 in-lbs (2 Nm)

11. For tube type tires, also observe the following:

CAUTION

Make sure your tire irons are smooth and free of scratches or any sharp edges. Polish them if necessary. Do not slide the tire iron in any more than is necessary. When installing tube type tires, avoid lifting the tire iron past vertical to minimize the chance of pinching the tube.

12. Install valve core if it was removed.
13. Line up balance dot.
14. Confirm that the directional arrows are pointing in the correct direction.

15. 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.
16. 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.
17. If tire is not seated correctly, deflate and unseat the tire, lubricate the tire beads and repeat inflation procedure.
18. Install wheel assembly onto balance stand and spin. Observe the wheel assembly while it is spinning to make sure the tire is seated properly.
19. Adjust tire pressures to specifications.
20. Balance tire / wheel assembly.

WARNING

FOR REPAIRED TIRES: Speed should not exceed 50 MPH for the first 24 hours after repair and repaired tire should never be used over 80 MPH. Inspect inflation pressure after tire cools for at least three hours following run-in.

FOR NEW TIRES: Replacement of OEM tires or replacement with differently constructed tires will not immediately produce improved reactions the same as the original tires when new. When new tires are installed, they should not be subjected to maximum power or hard cornering until a reasonable "scrub" period of approximately 100 miles has been covered. This will permit the rider to become accustomed to "feel" of new tires or tire combination, and achieve optimum road grip. Inspect and adjust tire inflation pressure after tire cools down for at least three hours following "run-in".

TIRE INSTALLATION - (DARK HORSE)

NOTE

This procedure is written assuming that a pneumatic, electric, or manually operated rim-clamp type tire machine is being used.

NOTE**Balance Dots**

Dunlop tires have a yellow dot on the sidewall which corresponds to the lightest part of the tire. This dot is meant to line-up with the tire valve which often is the heaviest part of the rim (although this is not always the case).

Indian Motorcycle does not recommend the use of liquid balancer/sealers. These are a form of temporary repair which may adversely affect ply material and mask secondary damage caused by the penetrating object. Reliance upon sealants can result in sudden tire failure and accident.

Directional Arrows

Tires ① and rims ② 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.

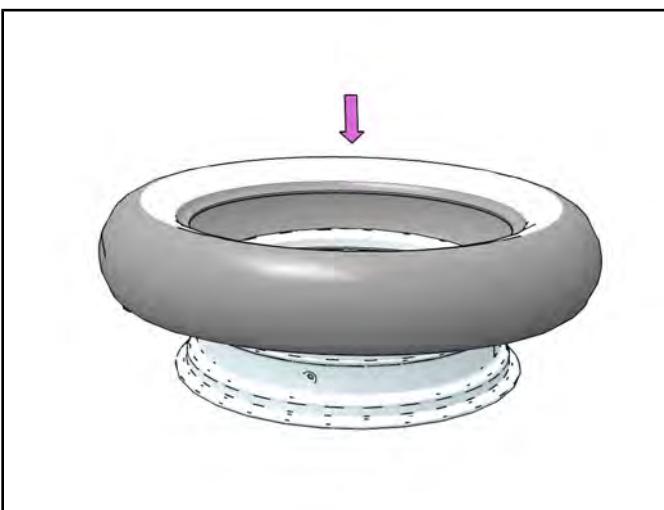
2.

NOTE

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 balance dot and directional arrows.
4. Push tire on to rim until one bead is installed. It shouldn't be necessary to use tire irons to put one side of the tire onto the rim. Remember to keep bead(s) in the drop center of the wheel whenever possible.

**NOTE**

Confirm tire is positioned correctly by observing directional arrows.

5. Lubricate the tire bead.
6. With your hands, push as much of the remaining tire bead as possible into the rim, pinching both upper and lower beads into the drop center.
7. When no more of tire can be installed by hand, press down on portion of tire in front of you with your knee to keep the top bead in the drop center.
8. Install the tire lever and work around the remaining circumference of the wheel until the bead is fully installed onto the rim.

NOTE

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.

IMPORTANT

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.

⚠ WARNING

FOR REPAIRED TIRES: Speed should not exceed 50 MPH for the first 24 hours after repair and repaired tire should never be used over 80 MPH. Inspect inflation pressure after tire cools for at least three hours following run-in.

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".

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.

TIRE BALANCING

⚠ WARNING

It is essential that the wheel assembly be balanced before use and rebalanced each time the tire is removed. Wheel balance affects stability, handling and overall safety of the motorcycle.

All Dunlop street tires should be installed with the yellow balance dot at the tire valve.

The use of liquid balancer/sealer is not recommended.

This procedure will outline balancing wheel assembly in a gravity balance stand. If a pendulum or spin type balancer is being used, reference the manufacturer's instructions that came with the equipment.

1. Mount wheel assembly in a commercially available balance stand.
2. Remove all balance weights. Clean tire and rim thoroughly.

NOTE

While it is possible to balance a wheel assembly with axle and grease-free wheel bearings as the pivot point, it is not recommended. Use an inspection stand that has knife edge bearings and its own axle.

3. Spin the wheel assembly. Allow it to stop on its own and mark the highest (lightest) part of the wheel.
4. Repeat the spinning process to verify the heaviest part of the wheel.
5. Place balance weights at the lightest portion of wheel in small increments.
6. After each addition of weight, spin the wheel assembly and allow it to stop by itself.
7. When correct amount of weight has been added to wheel, it will no longer stop in the same location and the wheel assembly is balanced.

CAUTION

Do not add more than 85 grams (3.0 oz.) of weight to the front or rear wheel.

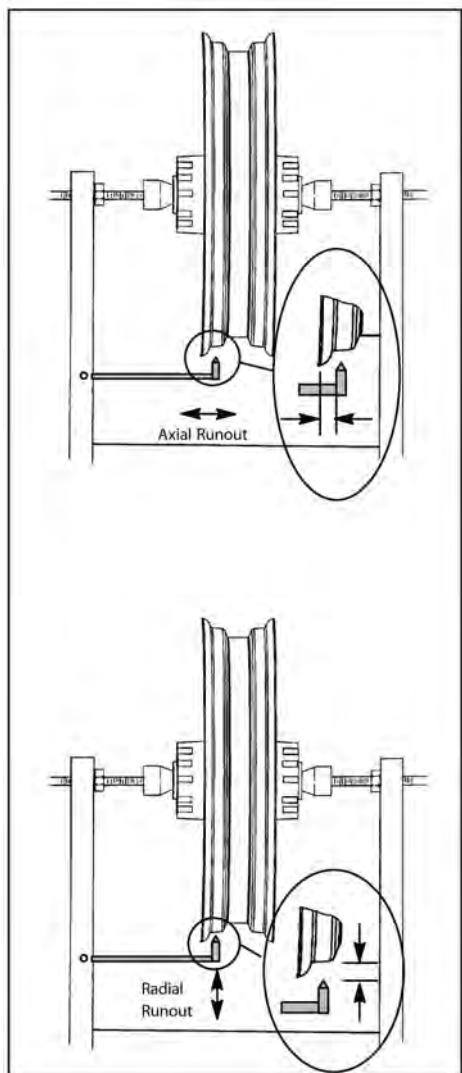
If more than the recommended weight is necessary to balance the wheel, dismount the tire and rotate it 90° without regard to the yellow balance dot, and re-balance the wheel / tire.

Adhesive Weight P/N 1520253

8. Install wheel / tire assembly onto motorcycle. See Steering / Suspension chapter for front and rear wheel installation procedures.

SPOKED WHEEL SERVICE**WHEEL TRUING**

- Measure axial and radial runout.



- Adjust axial runout.

NOTE

It's important to work slowly and make adjustments in small increments. Alternate between radial and axial adjustments until runout is within specification.

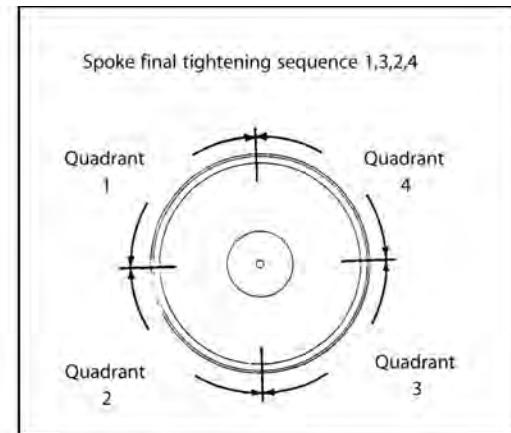
FINAL TIGHTENING

- Using tape, divide wheel into four quadrants to perform final spoke torque sequence. Tighten each spoke equally. (**Tightening Sequence 1,3,2,4**)

TORQUE

Final Spoke Torque: 69 in-lbs (8 Nm)

- Maintain proper runout adjustment during final tightening of spokes.

**NOTE**

Axial runout is side to side movement (wobble) of the rim. Radial runout is the up and down movement (hop) of the rim.

- First, adjust radial runout by loosening spokes around any high spots, rotate wheel 1/2 turn and tighten spokes directly opposite the high spot.

WHEEL LACING**NOTE**

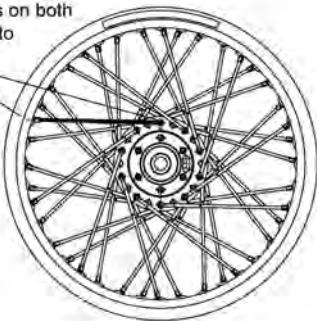
If an assembled wheel is available, it can be referenced for proper spoke pattern.

NOTE

Using tape or a grease pen, mark one side of the hub and rim for reference during reassembly. These parts **must** be assembled the same way they came apart.

1. Before disassembly, select a “starting spoke” and make index marks at its anchor points on the hub and rim. This will help ensure the spokes are installed and grouped correctly upon assembly.

Select a “starting spoke” and mark its anchor points on both the hub and rim prior to disassembly.



2. Organize 20 inside spokes and nipples on a clean work surface. Lubricate spoke threads and rim nipple-holes with a light oil.



3. Using the index marks from step one, insert all inside spokes skipping one hole between each.

**NOTE**

Install inside spokes on the opposite flange one hole to the right or left.

4. Lay rim in position around the hub assembly making sure the valve stem hole and spoke index marks are correctly located.



5. Thread the “starting spoke” into the corresponding nipple and continue to thread inside spokes until they are all finger tight.
6. Install outside spokes and screw on nipples. Work your way around the wheel, installing spokes on alternate sides of wheel. Continue until all spokes and nipples are installed. Tighten nipples equally by hand.
7. With all nipples installed, evenly snug all nipples using a spoke wrench. Equally tighten around the wheel until one thread shows above each nipple.
8. Place wheel assembly onto a truing stand for rim offset adjustment, final spoke tightening and wheel truing of wheel.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Worn or damaged swing arm bushings.	Replace as a set
	Damaged or incorrect tire	Replace rear tire
	Wheel assembly out-of-balance	Balance wheel
	Low tire pressure	Inflate to specification
	Loose swing arm, axle or suspension fasteners.	Torque to specification
Handlebars Oscillate (Wobble)	Bent front axle	Replace
	Worn or damaged wheel bearings	Replace as a set
	Tire mounted incorrectly	Inspect and re-mount tire
	Damaged tire	Replace
	Loose steering stem nut	Adjust to specification
	Incorrect tire	Replace
	Incorrect tire pressure	Inflate to specification
Front Wheel Oscillates (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Damaged or incorrect tire	Replace
	Loose axle or axle pinch fasteners	Torque to specification
	Right and left fork not installed at same height	Repair
	Fork oil level incorrect	Fill to specification
	Fork spring free length different between right & left	Replace spring that does not meet specification
	Wheel assembly out-of-balance	Balance wheel

NOTES

CHAPTER 9

BRAKES

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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.

NOTICE: Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Make sure the master cylinder reservoir being worked on is level and clean before removing the cap.

BRAKES

SPECIAL TOOLS

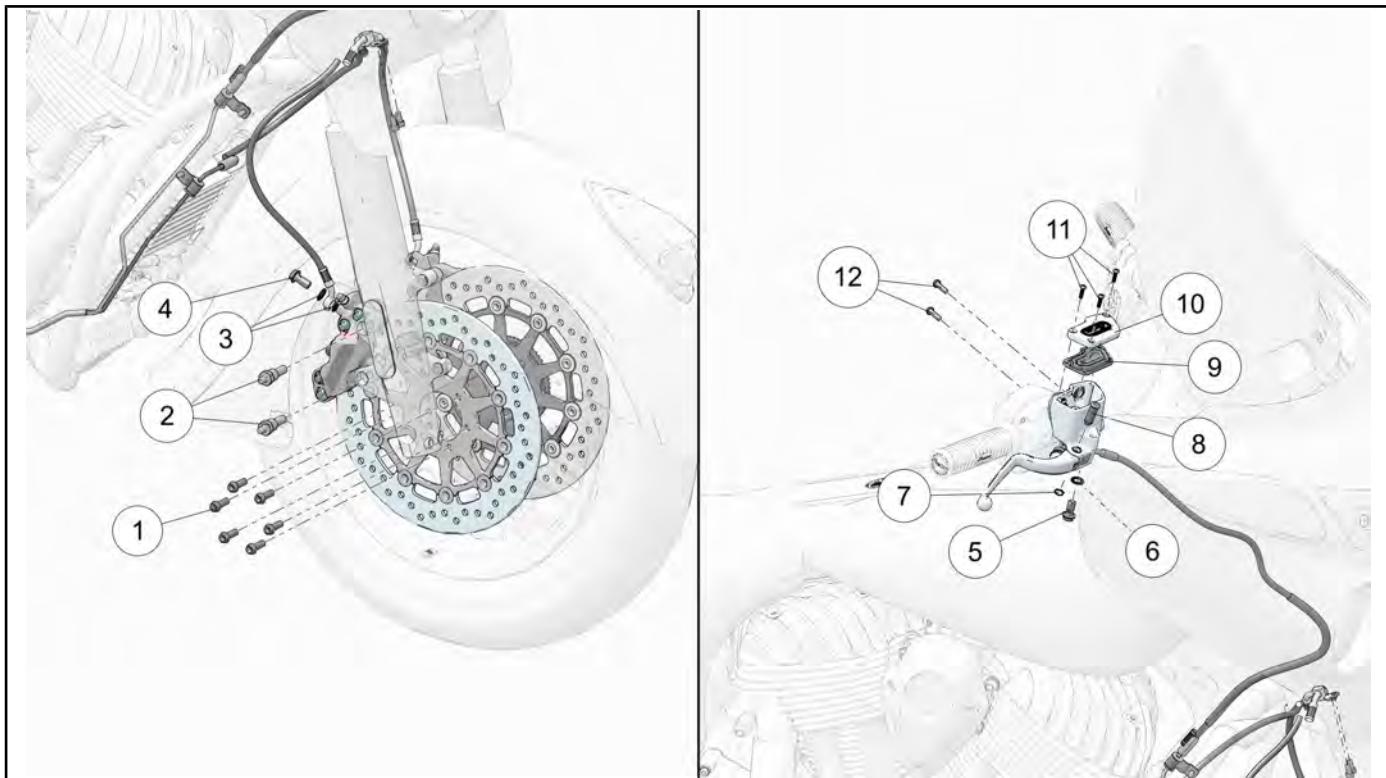
TOOL DESCRIPTION	PART NUMBER
ABS Tool (Lever Reserve)	PV-50104
Vacuum Brake Bleeder	Commercially Available

TORQUE SPECIFICATIONS

PART / FASTENER	TORQUE SPECIFICATION
Banjo Fastener, Front (Caliper, M/C)	18 ft-lbs (24 Nm)
Banjo Fastener, Rear (Caliper, M/C)	18 ft-lbs (24 Nm)
Bleeder Fastener (All)	48 in-lbs (5 Nm)
Brake Disc, Front	22 ft-lbs (30 Nm)
Brake Lever Clamp	70 in-lbs (8 Nm)
Brake Pressure Switches	18 ft-lbs (24 Nm)
Caliper Body, Front	20 ft-lbs (27 Nm)
Caliper Fastener, Rear	31 ft-lbs (42 Nm)
Caliper Slide Fastener, Rear	20 ft-lbs (27 Nm)
Caliper Stud, Front	35 ft-lbs (48 Nm)
Master Cylinder Cover, Front	14 in-lbs (2 Nm)
Master Cylinder Cover, Rear	7 in-lbs (1 Nm)
Master Cylinder Nut, Rear	35 ft-lbs (48 Nm)
Pad Retaining Pin (All)	120 in-lbs (14 Nm)
Wheel Speed Sensor (Both)	96 in-lbs (11 Nm)

SERVICE SPECIFICATIONS

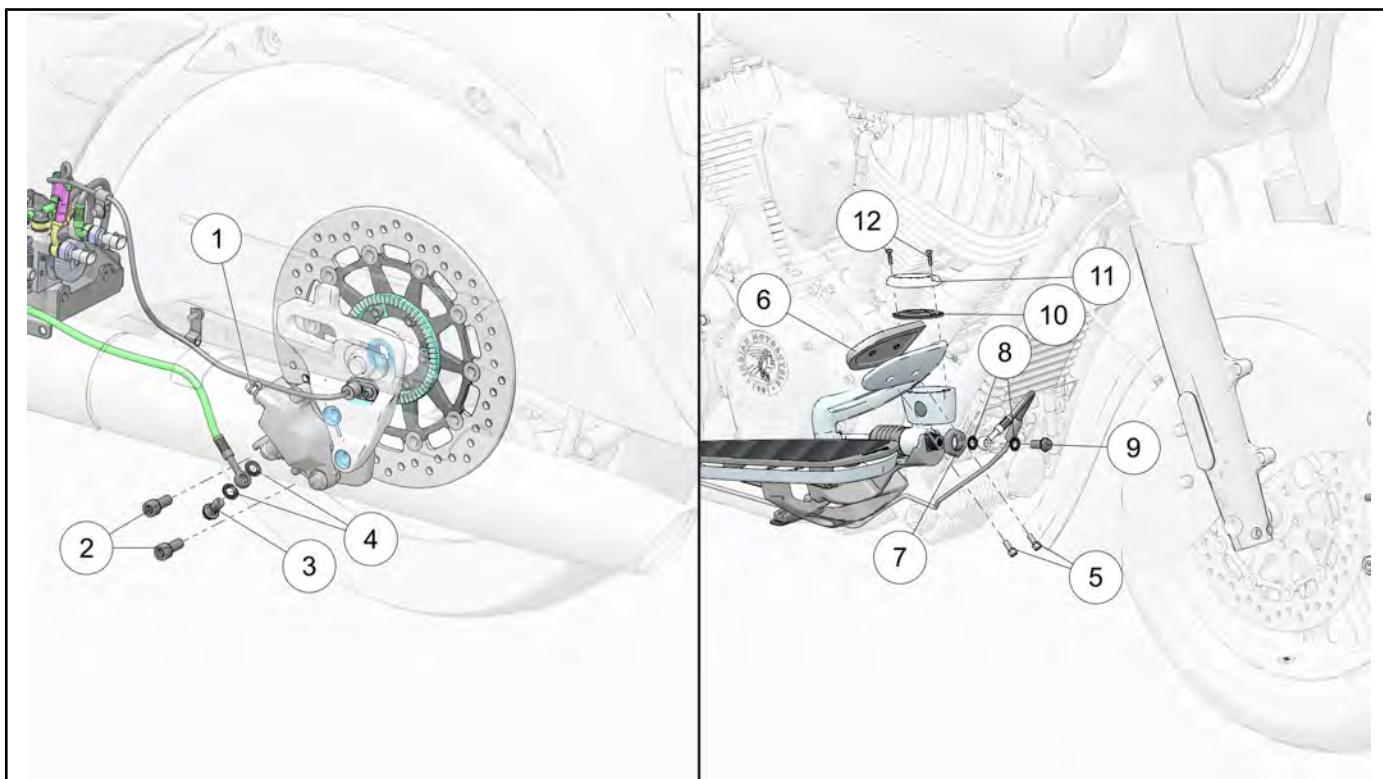
ITEM	STANDARD	SERVICE LIMIT
Specified Brake Fluid	DOT 4	Replace every 24 months or 10,000 miles (16,000 km)
Brake Disc Thickness, Front	5 mm	4.5 mm (.177") (Min)
Brake Disc Thickness, Rear	7 mm	6.5 mm (.256") (Min)
Brake Disc Runout	-	.30 mm (.012") (Max)
Brake Pad Wear Limit (Front & Rear)	-	When wear limit groove is no longer visible
Brake Pedal Free Play (Pedal Clearance)	No Adjustment	-
Brake Lever Freeplay (Front)	No Adjustment	-

ASSEMBLY VIEWS
FRONT BRAKE SYSTEM


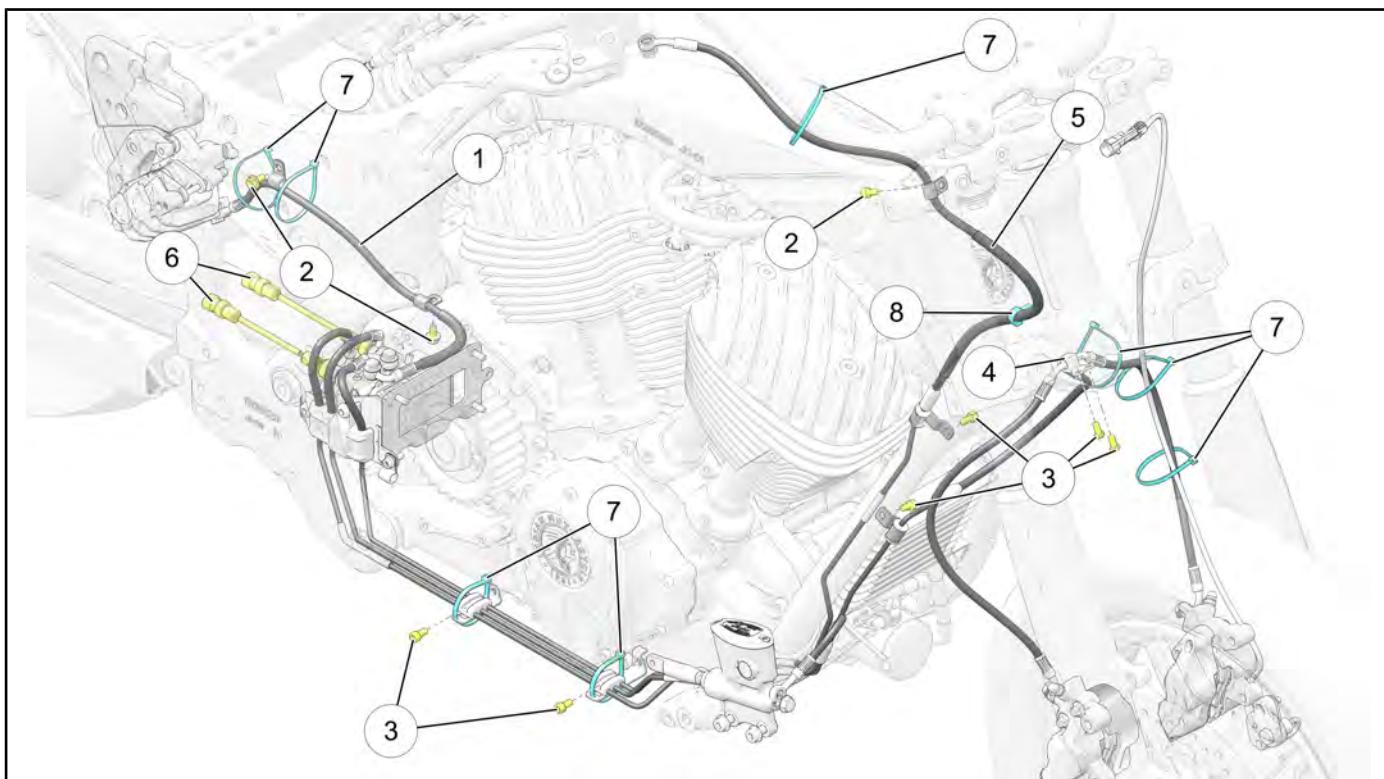
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Front Disc — M8 x 25 (QTY.12)	22 ft-lbs (30 Nm)
②	Stud, Front Caliper	35 ft-lbs (48 Nm)
③	Washer, Copper Sealing	-
④	Fastener, Banjo — 10 x 1.25	18 ft-lbs (24 Nm)
⑤	Fastener, Banjo — 10 x 1.25	18 ft-lbs (24 Nm)
⑥	Washer, Copper Sealing	-
⑦	Snap Ring, External	-
⑧	Pivot Pin, Brake Lever	-
⑨	Rubber Diaphragm	-
⑩	Cover, Front Master Cylinder	-
⑪	Fastener, Front Master Cylinder Cover	14 in-lbs (2 Nm)
⑫	Fastener, Brake Lever Clamp	70 in-lbs (8 Nm)

BRAKES

REAR BRAKE SYSTEM

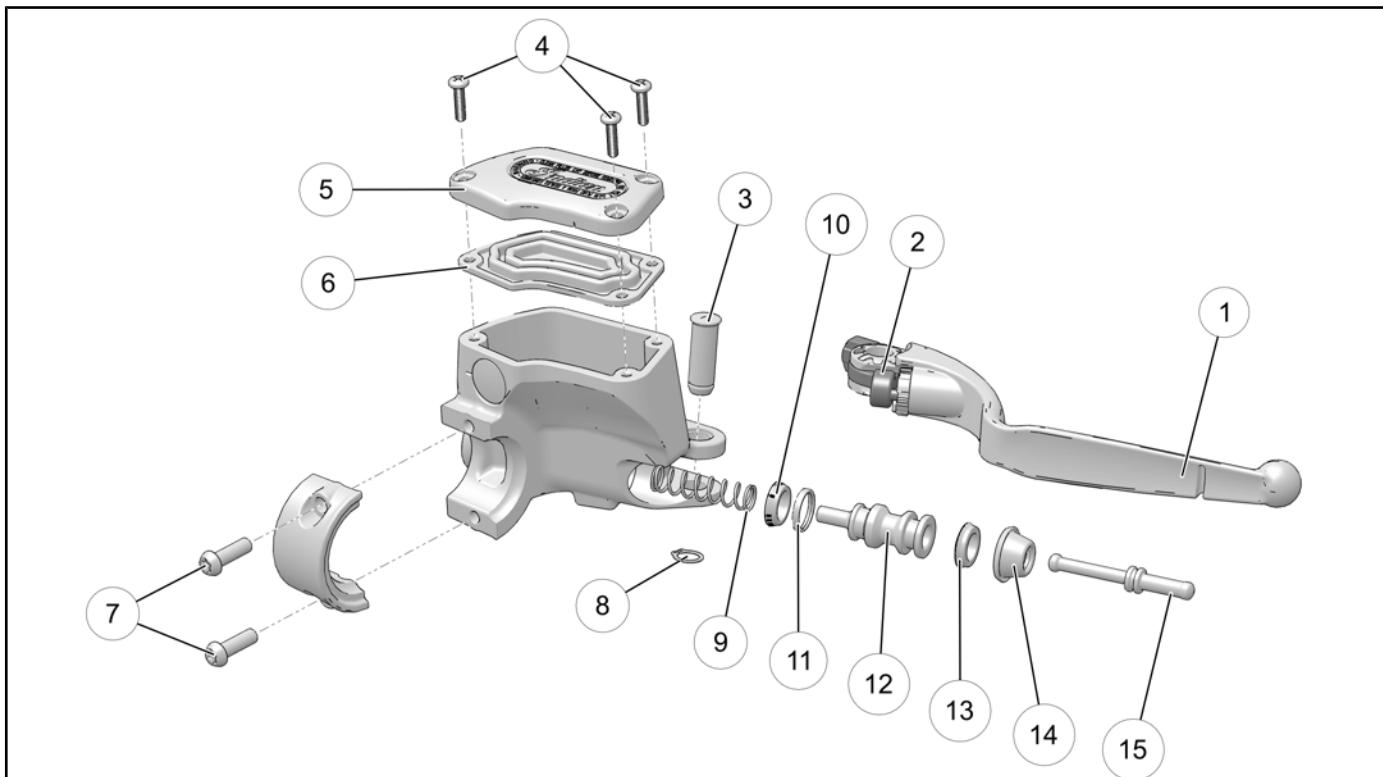


NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Valve, Bleeder	48 in-lbs (5 Nm)
②	Fastener, Caliper — 10 x 1.25 x 25 (QTY.2)	31 ft-lbs (42 Nm)
③	Fastener, Banjo — 10 x 1.25	18 ft-lbs (24 Nm)
④	Washer, Copper Sealing	-
⑤	Fastener, Pedal Pad —	-
⑥	Pedal Pad	-
⑦	Nut, Master Cylinder (QTY.1)	35 ft-lbs (48 Nm)
⑧	Washer, Copper Sealing	-
⑨	Fastener, Banjo — 10 x 1.25	18 ft-lbs (24 Nm)
⑩	Rubber Diaphragm	-
⑪	Cover, Rear Master Cylinder	-
⑫	Fastener, Rear Master Cylinder Cover	7 in-lbs (1 Nm)

BRAKE LINE ROUTING

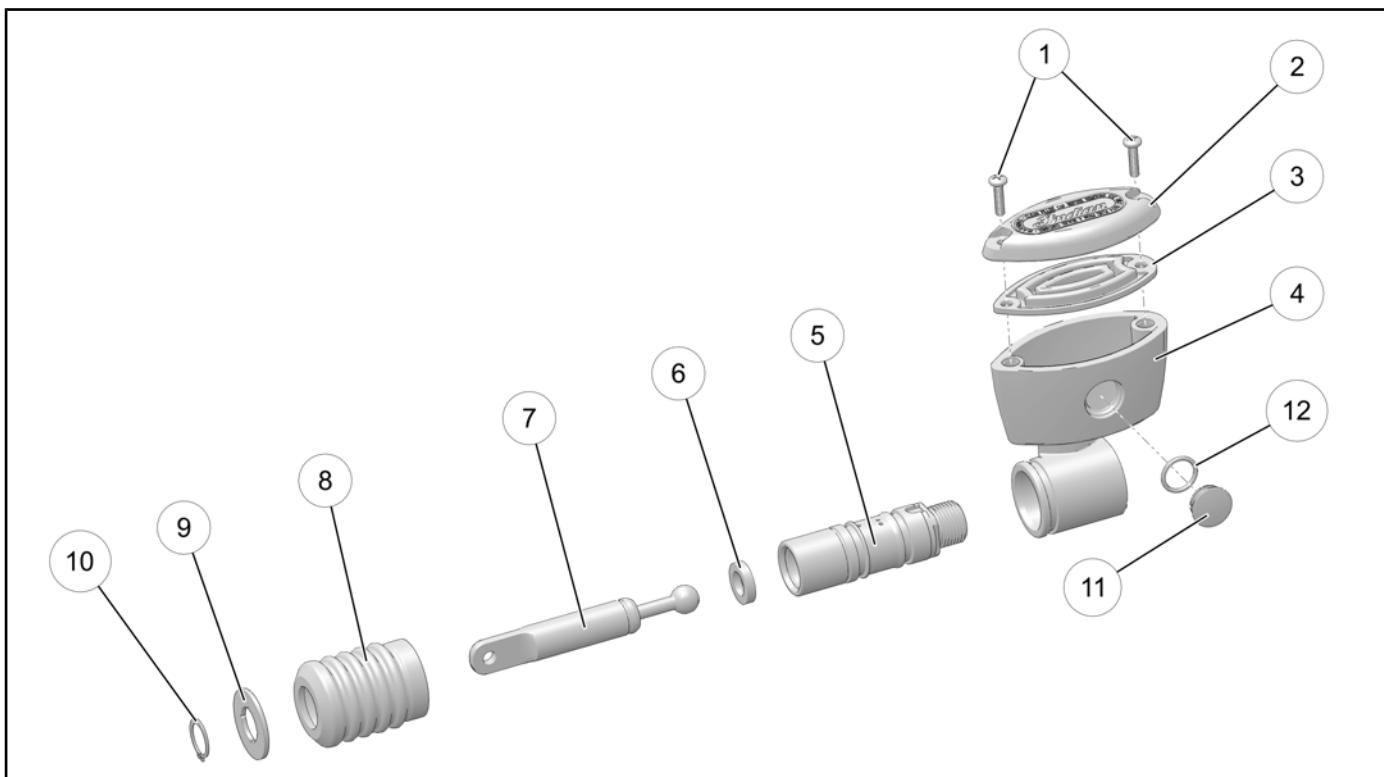
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Brake Line, Rear (Rear Caliper to ABS Module)	-
②	Fastener, P-Clamp — (QTY.3)	84 in-lbs (10 Nm)
③	Fastener, Bracket — (QTY.6)	84 in-lbs (10 Nm)
④	Brake Line, Front (ABS Module to Front Calipers)	-
⑤	Brake Line, Front (Front Master Cylinder to ABS Module)	-
⑥	Brake Pressure Switches	18 ft-lbs (24 Nm)
⑦	Retaining Strap	-
⑧	Routing Clip	-

FRONT MASTER CYLINDER



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Lever, Brake	-
②	Adjuster, Brake Lever	-
③	Pivot Pin, Brake Lever	-
④	Fastener, Front Master Cylinder Cover	14 in-lbs (2 Nm)
⑤	Cover, Front Master Cylinder	-
⑥	Rubber Diaphragm	-
⑦	Fastener, Brake Lever Clamp	70 in-lbs (8 Nm)
⑧	Snap Ring, External	-
⑨	Spring, Piston Return	-
⑩	Cup, Primary	-
⑪	Ring, Back Up	-
⑫	Piston	-
⑬	Cup, Secondary	-
⑭	Dust Boot	-
⑮	Pushrod	-

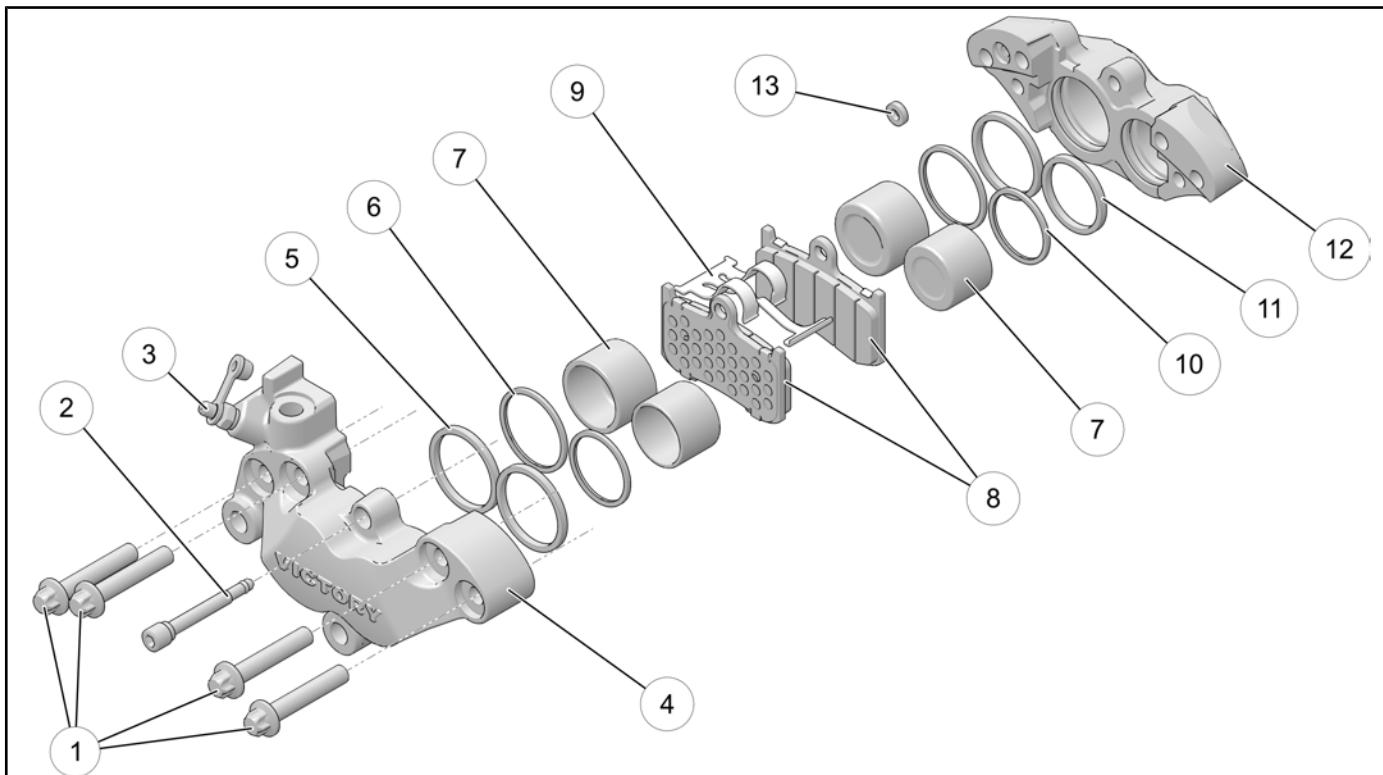
REAR MASTER CYLINDER



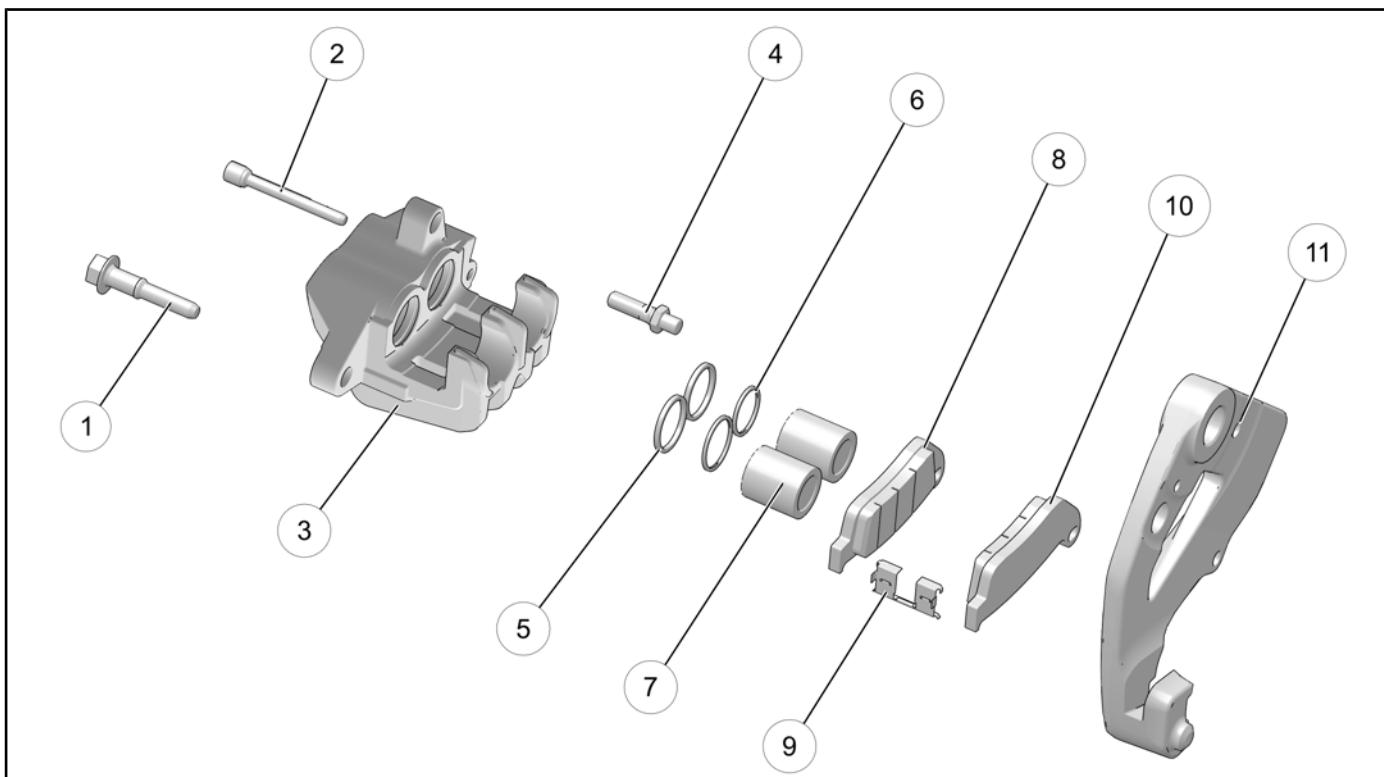
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Rear Master Cylinder Cover	7 in-lbs (1 Nm)
②	Cover, Rear Master Cylinder	-
③	Rubber Diaphragm	-
④	Reservoir, Rear Master Cylinder	-
⑤	Cartridge, Rear Master Cylinder	-
⑥	Push Cap	-
⑦	Pushrod	-
⑧	Dust Boot	-
⑨	Washer	-
⑩	Snap Ring, External	-
⑪	Sight Glass	-
⑫	O-Ring, Sight Glass	-

BRAKES

FRONT BRAKE CALIPER



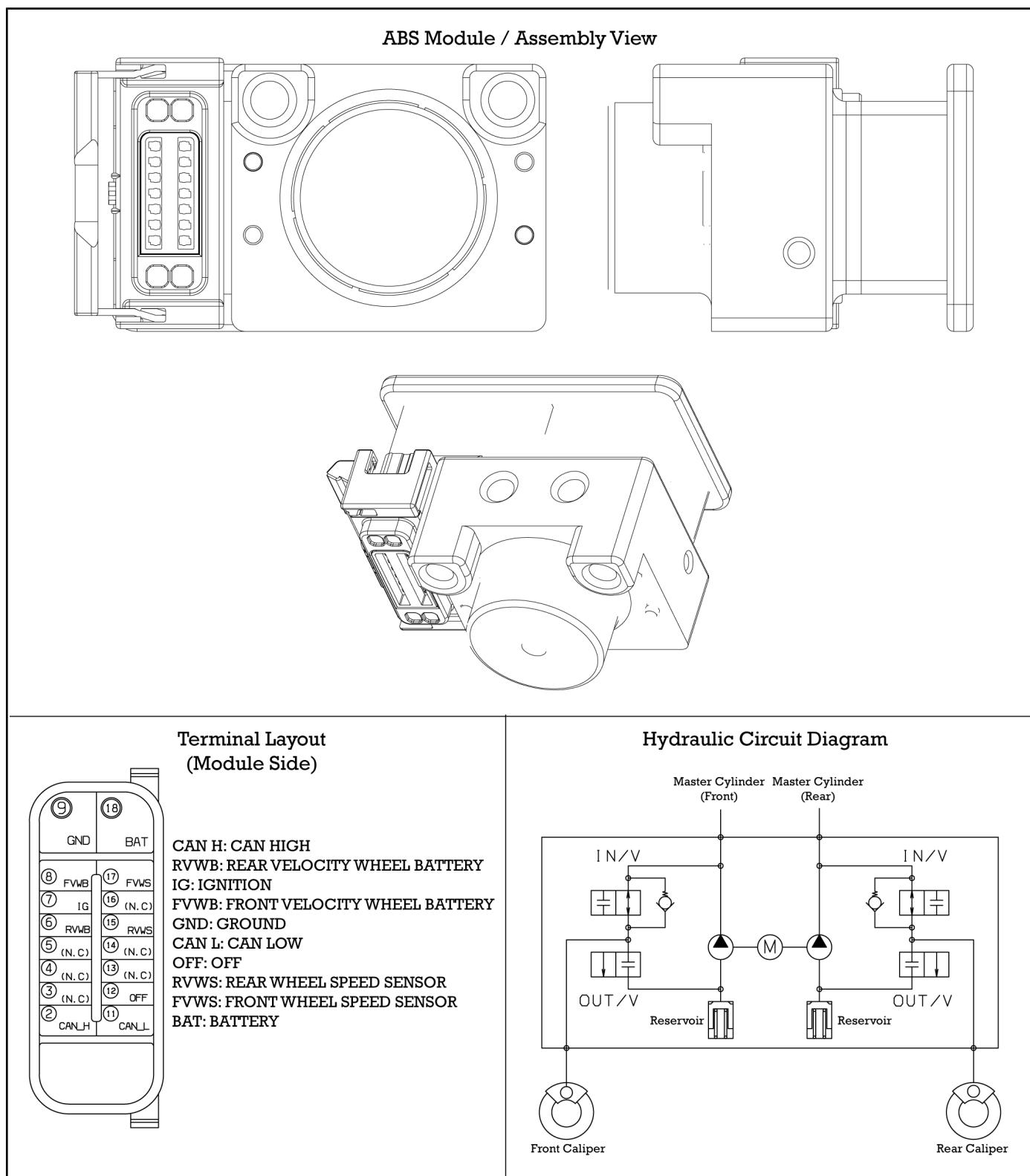
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Caliper Body	20 ft-lbs (27 Nm)
②	Pad Retaining Pin	120 in-lbs (14 Nm)
③	Screw, Bleeder	48 in-lbs (5 Nm)
④	Caliper Body, Outboard	-
⑤	Piston Seal	-
⑥	Dust Seal	-
⑦	Piston	-
⑧	Brake Pads	-
⑨	Pad Spring	-
⑩	Dust Seal	-
⑪	Piston Seal	-
⑫	Caliper Body, Inboard	-
⑬	O-Ring, Caliper Passage	-

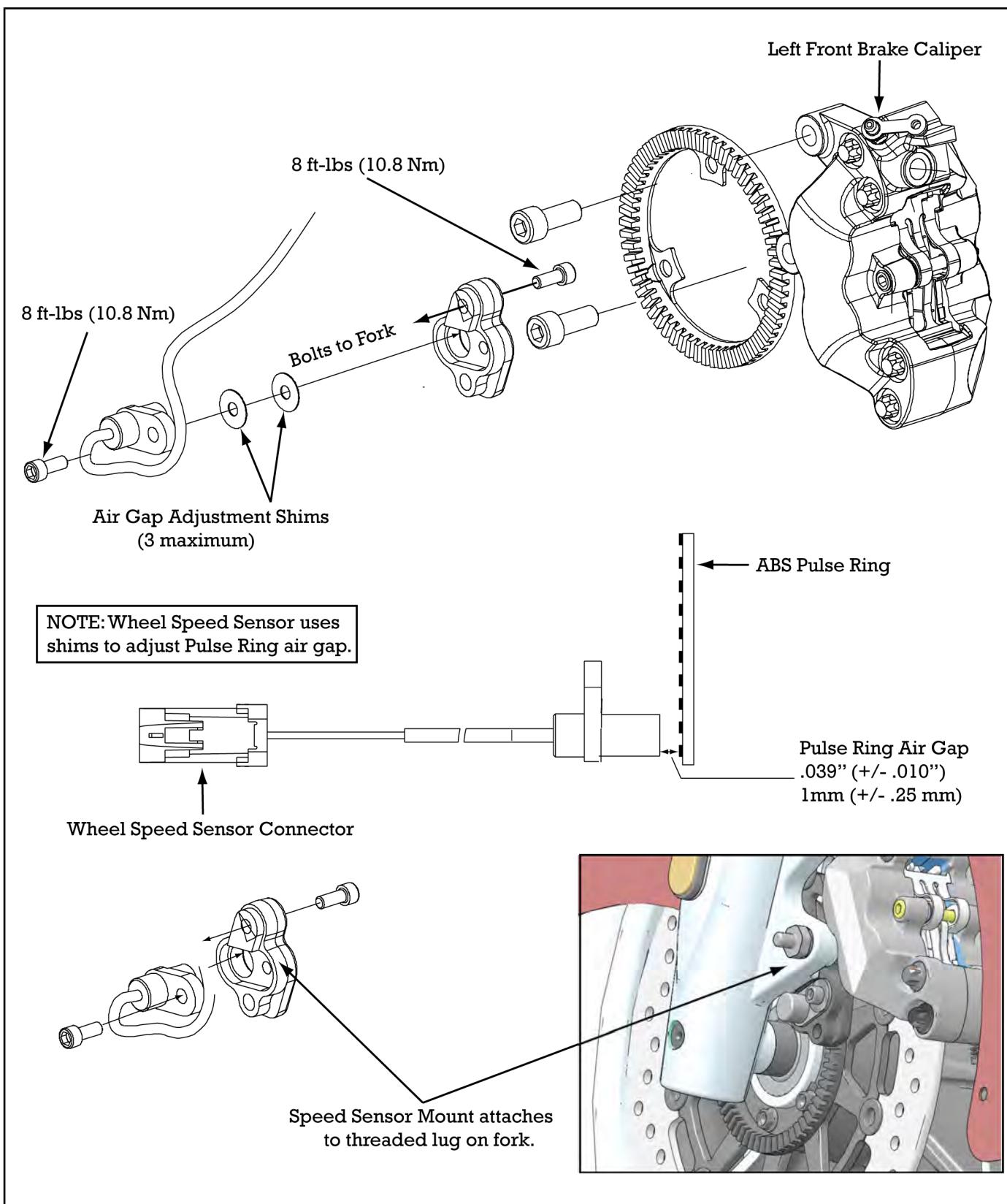
REAR BRAKE CALIPER

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Caliper Retainer	20 ft-lbs (27 Nm)
②	Pad Retaining Pin	120 in-lbs (14 Nm)
③	Caliper Body	-
④	Guide Pin	-
⑤	Piston Seal	-
⑥	Dust Seal	-
⑦	Piston	-
⑧	Brake Pad, Outboard	-
⑨	Pad Spring	-
⑩	Brake Pad, Inboard	-
⑪	Carrier, Caliper	-

BRAKES

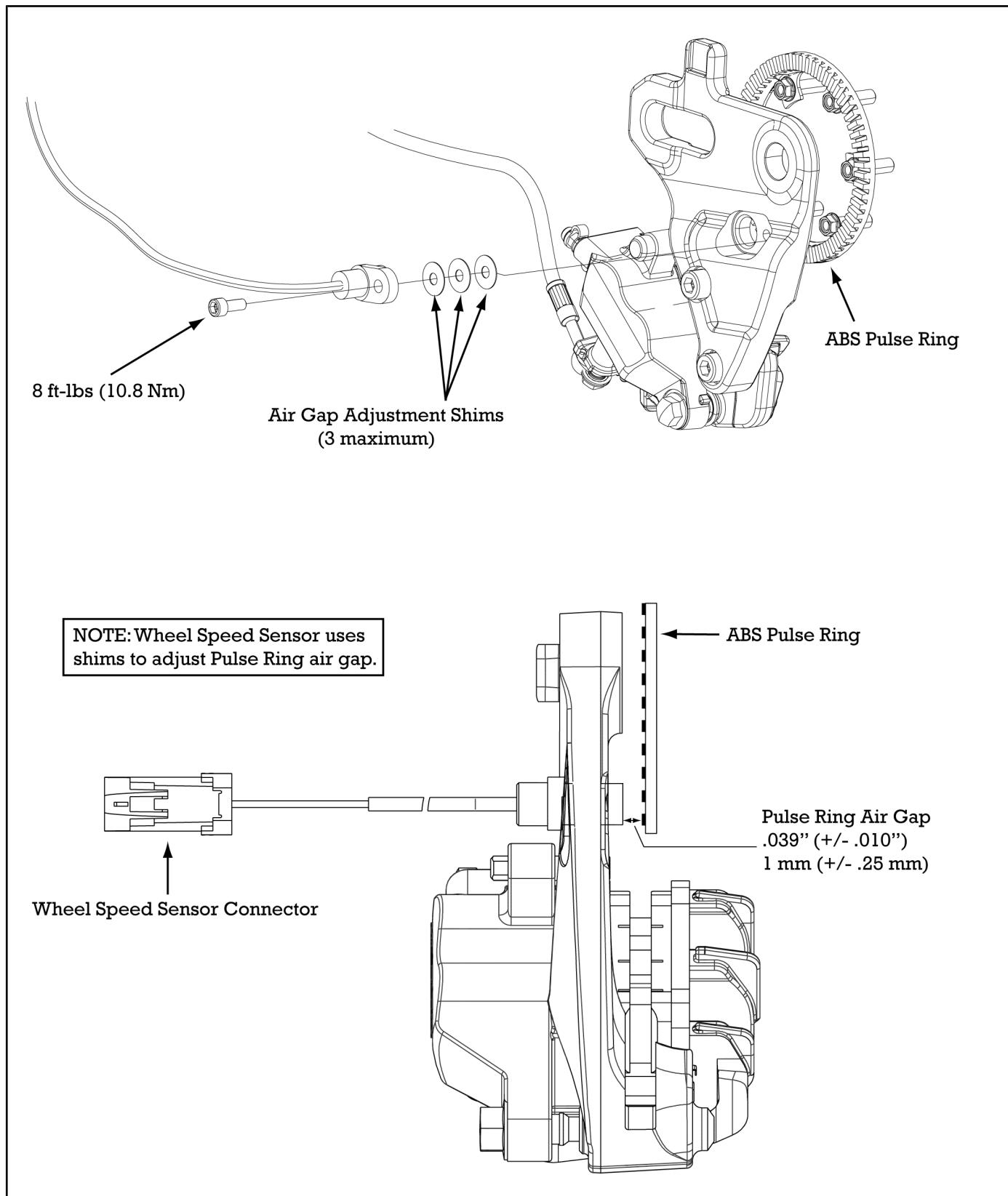
ABS MODULE



WHEEL SPEED SENSOR, FRONT

BRAKES

WHEEL SPEED SENSOR, REAR



ANTI-LOCK BRAKES SYSTEM (ABS) SERVICE

ABS SYSTEM SAFETY PRECAUTIONS

Before working on an Indian Motorcycle equipped with anti-lock brakes, review and understand all general brake system, brake fluid, and ABS specific precautions and system information. Do not attempt maintenance or repair of the anti-lock brake system without the proper tools.

WARNING

Proper brake system bleeding is extremely important to ensure adequate lever reserve in the system. Always perform the Brake Lever Reserve 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 size and type of 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-to-pulse ring air gap is adjustable. Shims can be added or removed to bring the air-gap into specification. See adjustment procedure outlined in this chapter.
- 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.

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 (Front located on front left fork leg; Rear mounted on rear caliper bracket)
- Wheel Speed Sensor Pulse Rings (Front and Rear mounted to wheel with 3 disc fasteners)
- 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 system uses two independent Hall-Effect *Wheel Speed Sensors*. One sensor is mounted to the front left fork leg and one is mounted to the rear brake caliper bracket. Two *Pulse Rings* are also used, one mounted to the left front brake disc hub and one to the rear brake disc hub, which rotate with the wheels. When the vehicle is in motion, the multiple reluctor segments on each pulse ring pass by the center pole of the respective wheel speed sensor, generating an electrical pulse signal in the sensor which is sent to the *ABS Module* which is located in front of the rear wheel.

The ABS Module interprets wheel speed signal pulses to determine speed, rate-of-change, and front / rear wheel speed differential to determine if wheel lock-up is about to occur. When wheel lock-up is imminent during a braking event, the ABS Module controls the operation of solenoids and a pressure pump (located inside the *ABS Module*) to regulate the amount of line pressure and cycles (length of time) applied to the caliper pistons and brake pads. This pressure / time modulation can often be felt at the brake lever or the brake pedal during an ABS braking event and is a normal condition. Note that the brake fluid is not diverted inside the module and does not "flow" in the system any more than occurs in a conventional (non-ABS) brake system.

If the surface coefficient changes (such as moving from wet pavement to dry pavement) the ABS system will recalculate (in a matter of milliseconds) and adjust pressure output to caliper(s) as required.

In the event of a system fault, the 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.

ABS TROUBLE CODES

C1022	520250	7	ABS Pulsar (front)	COG Chip	ON
C1023	520251	7	ABS Pulsar (rear)	COG Chip	ON
C1024	520252	5	ABS Solenoid (RRI)	Open / Short	ON
C1025	520253	5	ABS Solenoid (RRO)	Open / Short	ON
C1026	520254	5	ABS Solenoid (FFI)	Open/Short	ON
C1027	520255	5	ABS Solenoid (FFO)	Open/Short	ON
C1028	520256	5	ABS Solenoid (RFI)	Open/Short	ON
C1029	520257	5	ABS Solenoid (RFO)	Open/Short	ON
C1032	520258	11	ABS Actuator (front)	Wheel Lock (or VSS failure) ABS On	ON
C103A	520313	11	ABS Actuator (front)	Wheel Lock (or VSS failure) ABS Off	ON
C1033	520259	11	ABS Actuator (rear)	Wheel Lock (or VSS failure) ABS On	ON
C103B	520314	11	ABS Actuator (rear)	Wheel Lock (or VSS failure) ABS Off	ON
C0020	520260	8	ABS Motor	Motor Lock	ON
C1020		3		Off Stick	ON
C1021		4		On Stick	ON
C1034	520261	7	ABS Fail Safe Relay	On/Off Stick	ON
C1038	520262	4	ABS Source Voltage	Drop	ON
C1039		3		Raise	ON
C1040	520263	31	ABS Tire	Irregular Tire Size	ON
C1041	520264	12	ABS ECU	ECU Error	ON
C1042	520265	7	ABS Module	Incomplete Evacuation and Fill	ON

ABS AND LOW BATTERY VOLTAGE

When attempting to start an engine on a bike with a weak battery (less than 12.5 volts KOEO) it is possible that the 'Check Engine' light will illuminate and trouble code P106B will be stored in the ECM.

The P106B code indicates the engine is not getting a speed signal from the ABS module. This code DOES NOT indicate the presence of a single faulty wheel speed sensor.

9

Possible Causes:

- Low battery voltage - particularly while engine is cranking
- CAN bus communication error between the ABS module and the ECM
- Both front and rear wheel speed sensors are faulty
- Faulty connection at ABS module
- ABS module not programmed (partial ECUID present in Digital Wrench)

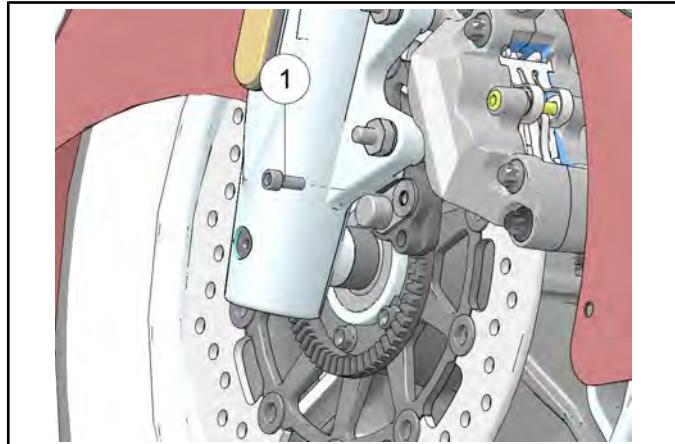
When diagnosing this code, make sure the battery is fully charged and passes a load test prior to clearing and retesting.

BRAKES

WHEEL SPEED SENSOR REPLACEMENT

Removal - Front

1. Remove fastener ① securing the Wheel Speed Sensor to bracket.



2. Withdraw speed sensor and remove any existing shims.
3. Noting their position, clip cable ties securing the harness to the motorcycle.
4. Locate connector and disconnect the wheel speed sensor.
 - Chief speed sensor connector is located in the headlight nacelle.
 - Chieftain / Roadmaster speed sensor connector is located in the fairing behind the headlight assembly.

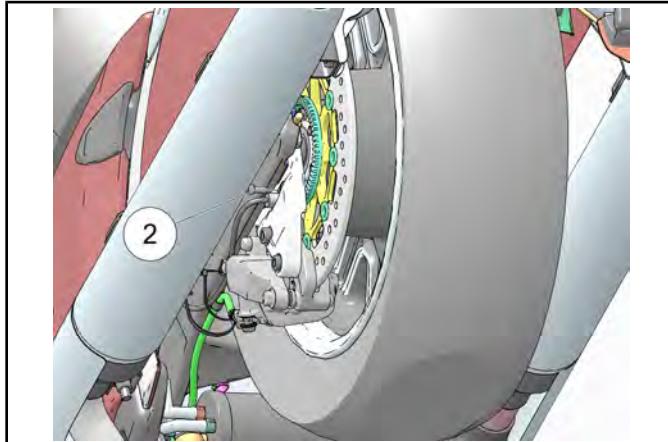
Installation - Front

5. Reverse procedure to install.
6. Verify speed sensor air gap is within specification. Perform adjustment procedure if necessary. See Wheel Speed Sensor Air Gap Adjustment, page 9.19.

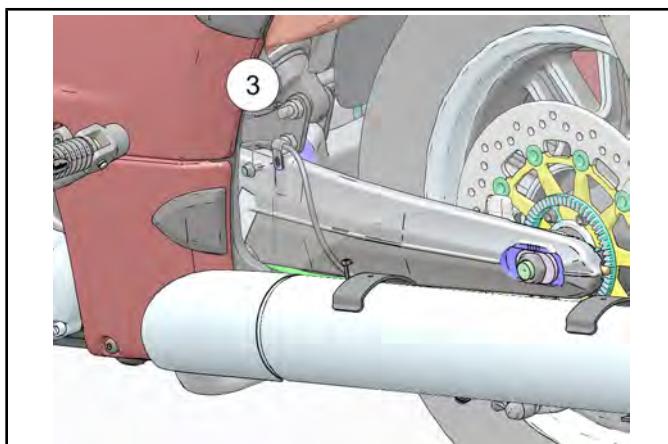
Removal - Rear

7. Remove left hand saddlebag. Refer to Owner's Manual.

8. Remove fastener ② securing the Wheel Speed Sensor to the bracket.



9. Withdraw speed sensor and remove any existing shims.
10. Noting their position, clip the cable ties securing the speed sensor harness to the rear brake line and remove P-clamp ③ from the left side of the swingarm.



NOTE

The P-clamp fastener can be accessed from beneath the motorcycle. Use a short 10 mm socket and ratchet between the swingarm and inner fender wall.

11. Remove the battery box / ECM assembly to access speed sensor plug, and disconnect. See Battery Box Removal, page 10.13.

Installation - Rear

12. Reverse procedure to install.
13. Verify speed sensor air gap is within specification. Perform adjustment procedure if necessary. See Wheel Speed Sensor Air Gap Adjustment, page 9.19.

WHEEL SPEED SENSOR AIR GAP ADJUSTMENT**MEASUREMENT**

Wheel Speed Sensor Air gap = .030" ± .010" (.75 mm ± .25 mm)

6. Reinstall Wheel Speed Sensor and torque to specification.

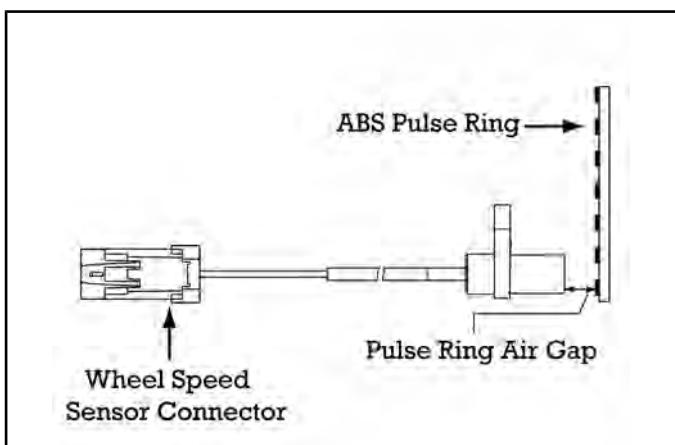
TORQUE

Wheel Speed Sensor: **96 in-lbs (11 Nm)**

NOTE

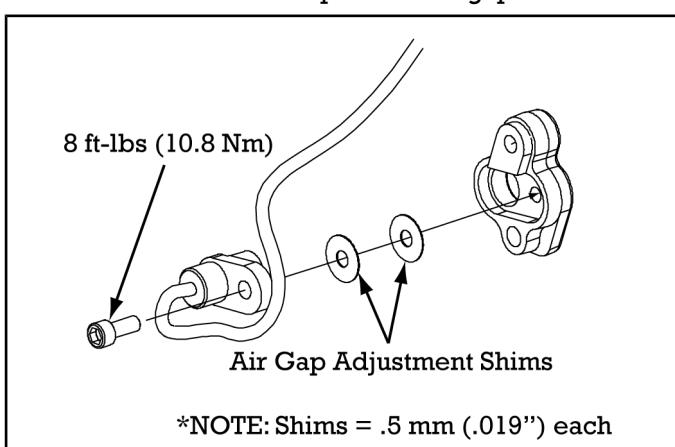
Wheel Speed Sensor air gap is adjusted by adding and removing shims. Shims are added to increase gap and removed to decrease gap. No more than 3 shims (per Wheel Speed Sensor) should be used at one time.

1. Using a suitable feeler gauge, measure the air gap between the ABS Pulse Ring and the Wheel Speed Sensor.



2. If the Wheel Speed Sensor air gap is out of specification, proceed to step 3.
3. Remove Wheel Speed Sensor from bracket.
4. Withdraw the speed sensor and remove any existing shims.
5. Based on air gap measurement, add or remove shims to achieve the specified air gap.

9



BRAKES

ABS MODULE REPLACEMENT

NOTE

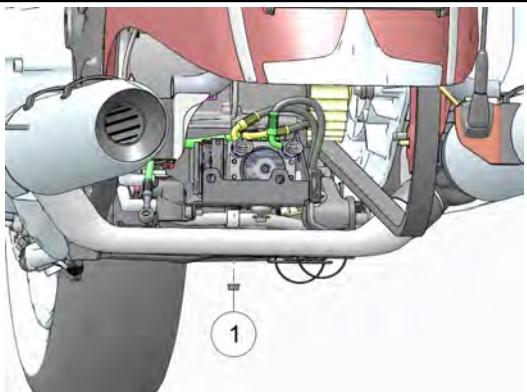
Do not disassemble the ABS module. The ABS module is serviceable only as a sealed (pre-bled) assembly. If ABS module has failed internally, replace complete assembly.

WARNING

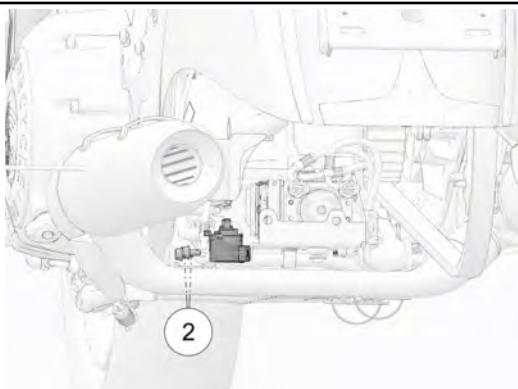
The hydraulic brake system MUST be completely bled following removal or replacement of the ABS module. Follow the brake bleeding procedure outlined in this chapter after ABS module service.

Removal

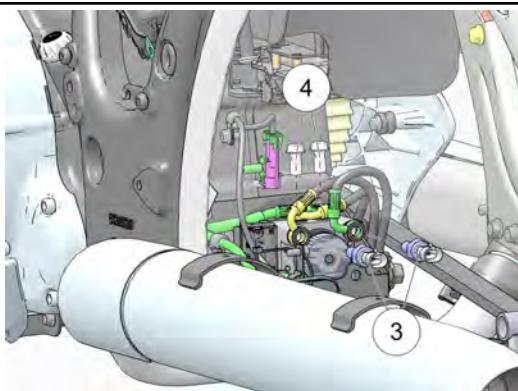
1. Disconnect the negative battery cable.
2. Position motorcycle in an upright position with the front wheel clamped in a wheel vise.
3. **California Models ONLY:** Remove the evaporative emissions charcoal canister, if equipped. See Evaporative Emission Control (California Models), page 1.48
4. Remove the swingarm assembly. See Swingarm Removal, page 8.63.
5. Remove nut ① securing P-clamp to bottom of ABS Module bracket.



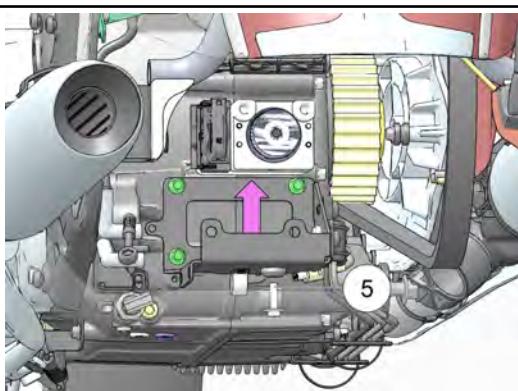
6. Remove two starter solenoid fasteners ②.



7. Disconnect three multi plugs from the ABS Module.
8. Disconnect hydraulic lines ③ ④ from ABS module and cap off lines to prevent contamination.



9. Remove fastener ⑤ securing ABS module to bracket.



10. Remove ABS module.

Installation

11. Reverse procedure to install.
12. Bleed brake system as outlined in this chapter.
13. Attach Digital Wrench and check for ABS trouble codes.

BRAKES

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 its performance.

⚠ WARNING

Brake fluid is poisonous. Keep brake fluid tightly sealed and out of reach of children.

⚠ WARNING

A soft, spongy feeling in the brake lever and/or brake pedal could indicate a hazardous condition in the brake system. Do not operate the motorcycle until the failure in the brake system is corrected.

⚠ WARNING

An unsafe condition exists when air is trapped in the hydraulic brake system. Air in the brake hydraulic system acts like a soft spring and absorbs a large percentage of the pressure developed by the master cylinder. Without this pressure, the braking system cannot develop full braking force to allow for safe, controlled stops. It is extremely important to bleed the brakes properly after any brake system work has been performed or when inspection reveals spongy brakes.

Keep these points in mind when bleeding hydraulic brakes:

- The master cylinder reservoirs have limited capacities. It is easy to empty them during the bleeding procedure. This introduces air into the system which you are trying to purge. Watch the reservoir closely and add fluid when necessary to keep the level above the LOW mark and prevent air from re-entering the system.
- Apply only light to moderate pressure to the lever or pedal when bleeding the brake system. Extreme pressure or rapid movement will cause a surge of fluid through the small orifices of the brake system when the bleeder screw is opened and could introduce air into the system by means of cavitation.
- Small amounts of air can become trapped in the banjo fastener fittings at the master cylinder(s) and junction points of brake lines. These fittings can be purged of air by following a standard bleeding procedure at these fittings (instead of the bleed screw on caliper) if necessary to speed the bleeding process. This is usually only needed if system was completely drained of fluid. Bleed each line connection, starting with the fitting closest to the master cylinder, working toward the caliper, and ending with the bleed screw.
- Always torque banjo fasteners and other brake system fasteners and components to specified torque.
- Always install NEW genuine Indian Motorcycle replacement parts and rubber parts upon assembly. Apply special lubricant where indicated (included in service kits).

ABS BRAKE VACUUM BLEEDER

A vacuum bleeder is recommended for ABS system bleeding and can also be used to bleed conventional (non-ABS) brake systems. One style of bleeder is shown below.



ABS FLUID CHANGE

Review Brake Fluid Replacement and Bleeding Precautions before working with brake fluid.

NOTE

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.

NOTE

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.

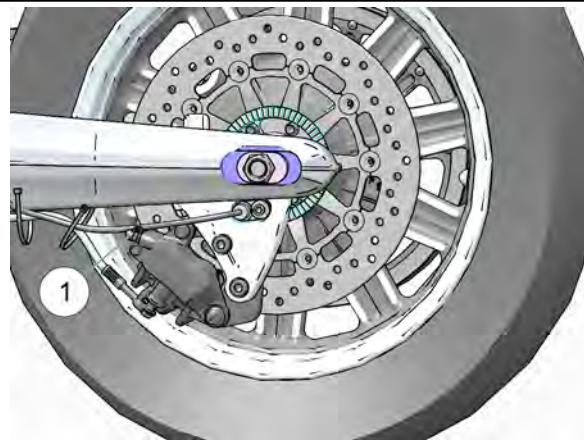
ABS REAR BRAKE BLEEDING

NOTE

The use of a vacuum bleeder is recommended. DO NOT allow fluid level in reservoir to drop below the LOW mark at any time during the bleeding procedure.

Repeat entire bleed procedure at least once.

1. Remove rubber cap from rear caliper bleed screw ① and place a box end wrench on the screw.
2. Attach a tight-fitting clear hose from the vacuum bleeder to the bleed screw and apply vacuum.



3. Fill rear brake fluid reservoir and leave cover off so fluid can be added as it is drawn through the system.
4. Open bleed screw about 1/4 turn.
5. Pump brake pedal repeatedly with smooth full strokes while adding brake fluid to the reservoir as required. For best results pump the pedal at a fairly rapid rate but avoid pumping too fast or fluid may become aerated. After about 2 cups of fluid have been run through the system, the bleeder hose should have clear, bubble-free fluid running through it.
6. Close bleeder screw and fill the brake fluid reservoir.
7. Repeat the entire bleeding process to be sure all air is purged from the system.
8. Torque all bleed screws to specification and install the rubber caps.

TORQUE

Caliper Bleeder Screws: 48 in-lbs (5 Nm)

9. After completing the bleeding procedure a second time, inspect brake fluid level and add if necessary.

BRAKES

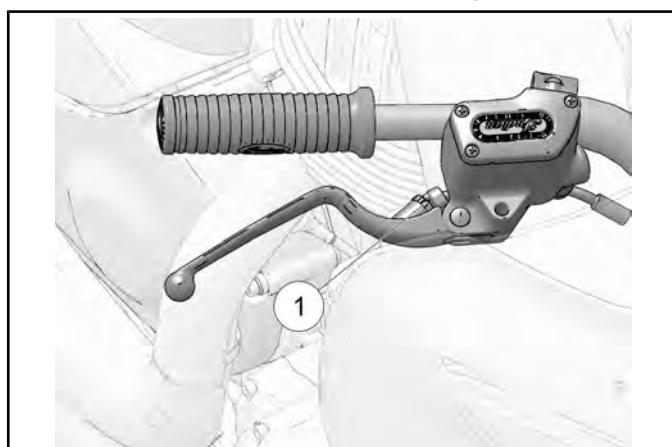
10. Clean the reservoir cover, diaphragm, and reservoir sealing surface. If diaphragm is extended, return it to normal (flat) position. Install diaphragm and cover.
11. If pedal is not firm, repeat bleeding procedure and inspect brake system.

ABS FRONT BRAKE BLEEDING

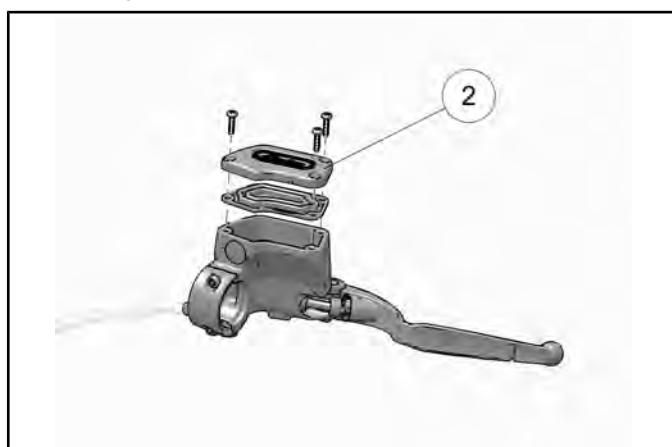
NOTE

Bleed left front caliper first then right caliper.
Repeat the bleeding procedure at least once.

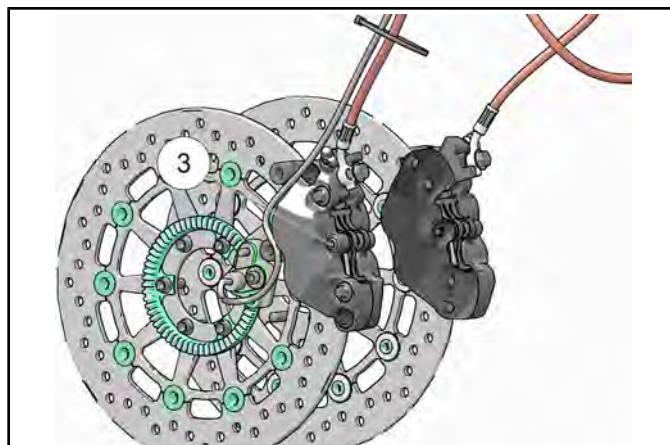
1. Pull brake lever forward and rotate reach adjustment dial ① to the longest reach setting to maximize lever stroke for bleeding.



2. Remove front brake fluid reservoir cover ② and leave it off so fluid can be added as it is drawn through the system.



3. Remove rubber cap from bleeder screw ③ on front left caliper and place a box end wrench on the screw.



4. Attach tight fitting clear hose from vacuum bleeder to bleed screw and apply vacuum.
5. Hold lever to handlebar or hold firm pressure on lever, then open bleed screw about 1/4 turn.
6. Pump brake lever repeatedly with smooth full strokes while adding brake fluid to the reservoir as required. For best results pump the lever at a fairly rapid rate but avoid pumping too fast or fluid may become aerated. After about 2 cups of fluid have been run through the system, the bleeder hose should have clear, bubble-free fluid running through it.
7. Close bleeder screw and fill the brake fluid reservoir.
8. Proceed to Step 9 to bleed the right front brake caliper.
9. Remove rubber cap from bleeder screw on front right caliper and place a box end wrench on the screw.
10. Connect vacuum bleeder hose to the bleed screw and start vacuum.
11. Hold lever to handlebar or hold firm pressure on lever, then open bleed screw about 1/4 turn.
12. 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.
13. Close bleed screw.

14. Once both front calipers have been bled, repeat procedure again on left caliper, then right to ensure all air has been purged.
15. Fill fluid reservoir and install diaphragm and cover. Torque cover fasteners to specification.

TORQUE

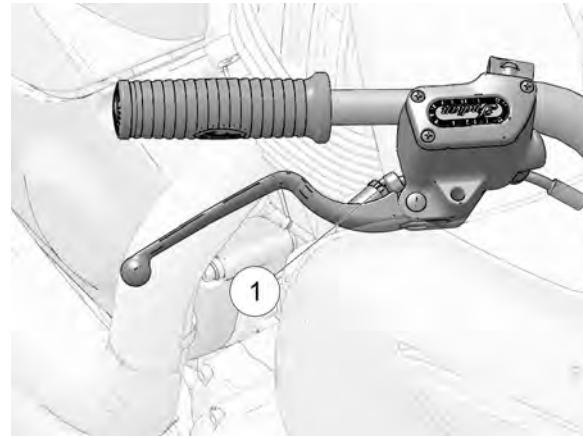
Front Master Cylinder Cover: 14 in-lbs (2 Nm)

16. Perform Brake Lever Reserve Inspection. See Brake Lever Reserve Inspection, page 9.25.

BRAKE LEVER RESERVE INSPECTION

This procedure requires use of the Brake Lever Reserve Tool (**PV-50104**).

1. Turn handlebars fully LEFT.
2. Set front brake lever reach adjustment ① so it is closest to handlebar.



3. Place grommet of Brake Lever Reserve Inspection Tool **PV-50104** 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.
5. Keep tool centered so it does not touch hand grip. Pull on scale to specified force.

Brake Lever Reserve Force: 37 lbs (16.8 kg)

6. Have an assistant verify brake lever *does not* contact hand grip. Clearance must exist at specified pull force as shown.
7. If lever makes contact with hand grip or bar end, bleed the front brake system.
8. See troubleshooting if bleeding problems persist.

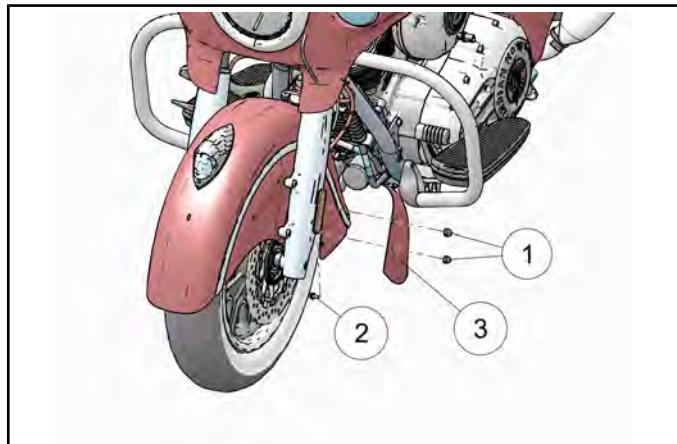
BRAKES

BRAKE SYSTEM SERVICE FRONT BRAKE PAD REPLACEMENT

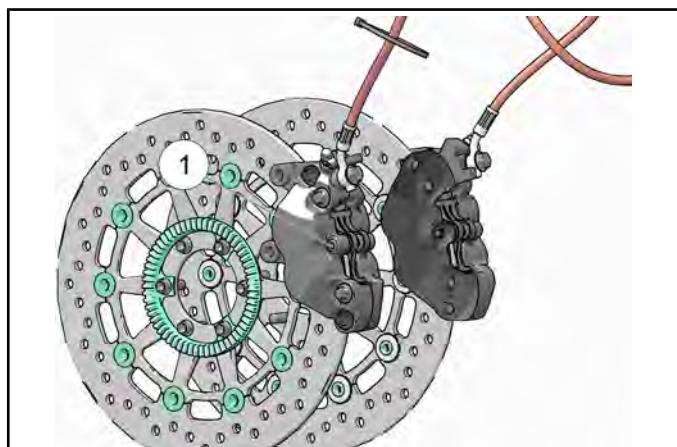
NOTE

Always replace brake pads as a set and always replace pads in both front calipers at the same time.

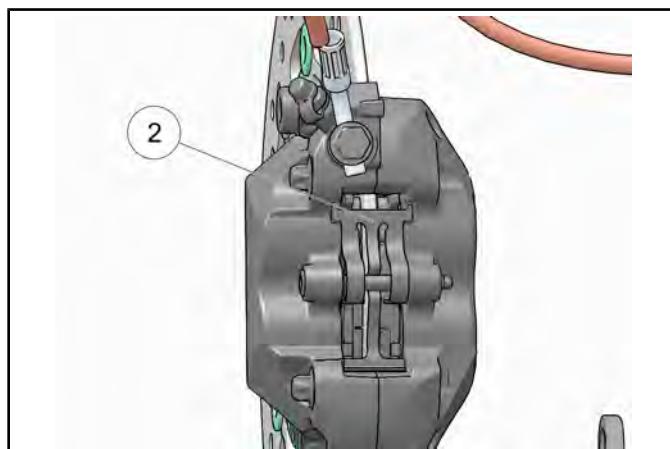
1. Remove two acorn nuts ① and fastener ② from each side of the motorcycle and remove the caliper covers ③.



2. Remove brake pad pin ①.



3. Remove pad spring ② ; note direction of plate (wide legs at top) for assembly.



4. Push each pad back by hand to gain clearance for new pads.

NOTE

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 screw and open the bleed screw while pushing the pads and pistons back.

5. Remove each pad.
6. Wipe brake disc clean with a shop towel sprayed with brake cleaner (commercially available).
7. Inspect caliper piston seals for any sign of fluid leakage.
8. Install isolator on new brake pads. Be sure isolator plate does not protrude from the brake backing plate.
9. Install new brake pads with friction material toward disc. Apply silicone grease to O-ring on pad retaining pin.
10. Insert pin through caliper and through outer pad. Lay spring in place over pads and press on center while sliding pin through spring and then through inner pad.
11. Torque pad retaining pin to specification.

TORQUE

Pad Retaining Pin: 120 in-lbs (14 Nm)

12. Inspect brake fluid in reservoir and set to proper level.

13. 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.
14. Install reservoir cover and torque to specification.

TORQUE

Master Cylinder Reservoir Cover: 14 in-lbs (2 Nm)

15. Operate brake lever several times until lever is firm and pressure can be felt.

WARNING

After pad installation or any brake system repair, safely elevate wheel, apply and release brake pedal or lever 2-3 times and release. Verify wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect vehicle to determine cause and then repair as necessary.

REAR BRAKE PAD REPLACEMENT

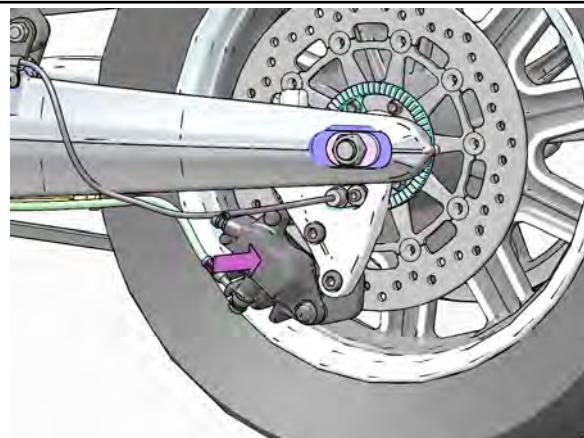
Always replace brake pads as a set. The rear pads can be changed with the caliper installed on the motorcycle.

Do not attempt to remove the caliper from the bracket with bracket installed.

NOTE

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 screw and open the bleed screw while pushing the pads and pistons back.

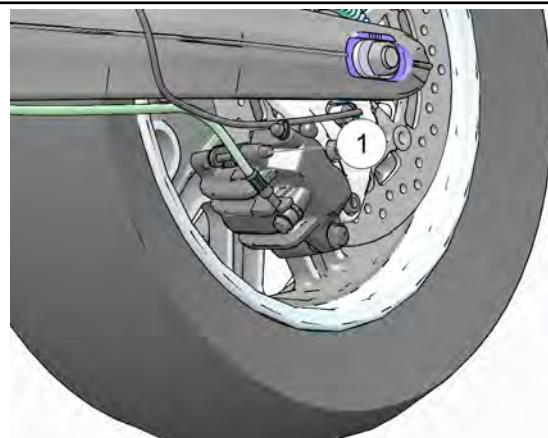
1. Push caliper toward wheel to push pad and pistons back and provide clearance for new pad installation.



NOTE

The caliper should move freely on the guide pins.

2. Slide retaining pin ① out until inner pad can be removed. Note orientation of spring plate.



BRAKES

3. Slide inner pad out front edge of rear caliper. Install new pad. Be sure backing plate is properly installed on new pad with insulator between brake pad and plate. Slide pad into place and engage tab in the back of the caliper.
4. Install new outer brake pad. Be sure tab is engaged with caliper as it is for the inner pad.
5. Apply silicone grease to O-ring on pad retaining pin.

TORQUE

Brake Pad Retaining Pin: 120 in-lbs (14 Nm)

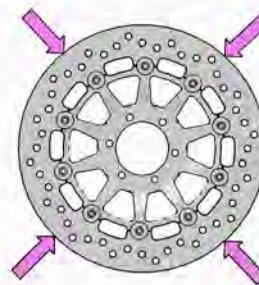
6. Inspect fluid level in the reservoir and adjust as necessary.
7. Pump brake pedal slowly several times to set new pads against disc, until lever is firm and pressure can be felt.
8. Bleed brake system if necessary.

⚠ WARNING

After pad installation or any brake system repair, safely elevate wheel, apply and release brake pedal or lever 2-3 times and release. Verify wheel turns freely without drag. If rear brake drag is evident, inspect pedal clearance. Do not operate the motorcycle if drag is still evident after clearance adjustment. Inspect vehicle to determine cause and repair as necessary.

BRAKE DISC INSPECTION

1. Visually inspect disc for cracks or damage.
2. Measure brake disc thickness in several locations around disc with a micrometer, and along wear surface and compare to specifications. See Service Specifications, page 9.4.



NOTE

Replace the brake disc if any measurement is worn beyond the service limit.

3. With disc mounted to wheel, inspect for brake disc runout / warpage with a dial indicator and compare to specifications. See Service Specifications, page 9.4.

NOTE

Runout should be measured 2-4mm in from outside edge of disc.

4. Replace brake disc if dial indicator reading displays excessive brake disc runout and other possible causes have been eliminated.

FRONT MASTER CYLINDER SERVICE

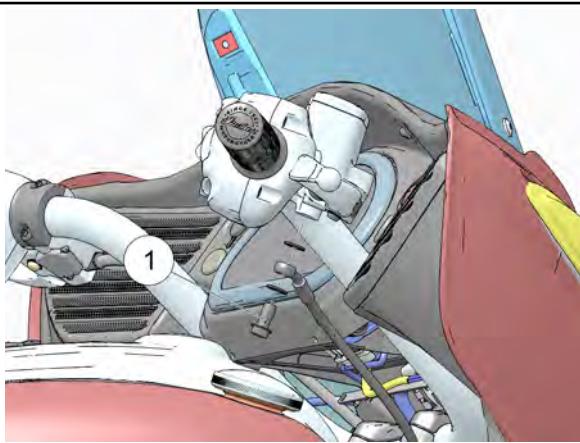
CAUTION

Brake fluid and brake cleaners could damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Be sure master cylinder reservoir is level before removing cover.

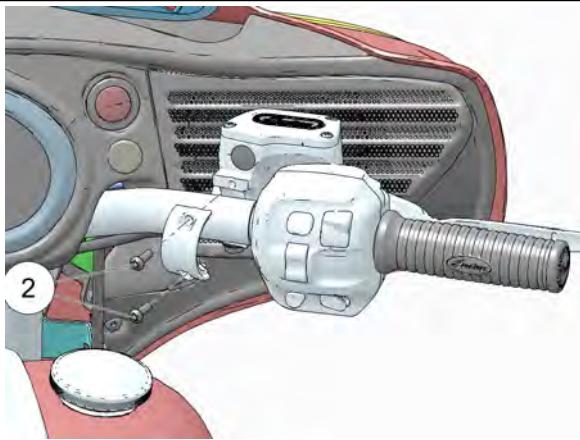
NOTE

Replace all rubber parts upon assembly.

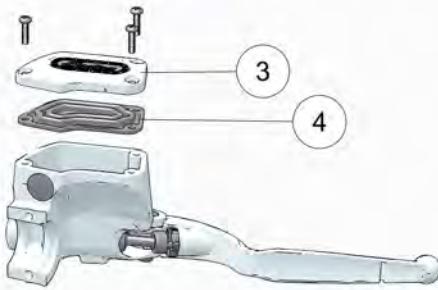
1. Clean the master cylinder. Attach a drain hose to caliper bleed screw and place the end in a suitable container. Drain brake fluid from the front brake system by slowly pumping brake lever.
2. Remove the RH side mirror from the lever perch.
3. Remove banjo fastener ① and brake line from master cylinder.



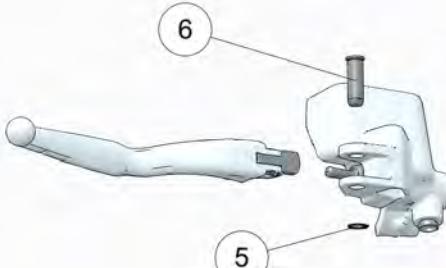
4. Remove fasteners ②, clamp, and master cylinder.



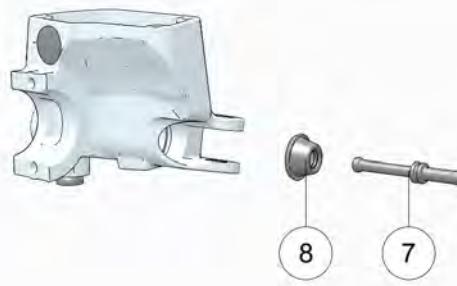
5. Remove reservoir cover ③ and diaphragm ④.



6. Remove the circlip ⑤ and pivot pin ⑥ and pull lever assembly out of master cylinder.



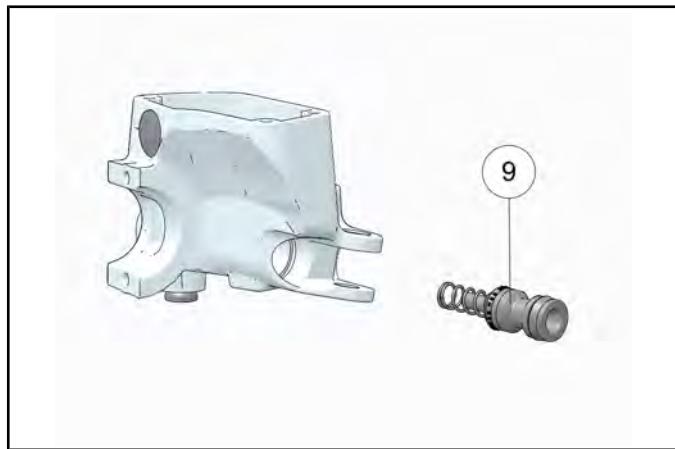
7. Pull push rod ⑦ and dust boot ⑧ out of master cylinder.



8. Remove snap ring.

BRAKES

- Slide piston ⑨ out with spring. Note spring orientation for assembly of new spring (new parts).



- 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.
- Inspect cylinder bore and chamfer of bore for corrosion, scratches, scoring, or pitting. Replace master cylinder if any of these conditions are evident.
- Measure the diameter of the bore. Replace master cylinder if worn beyond the service limit.

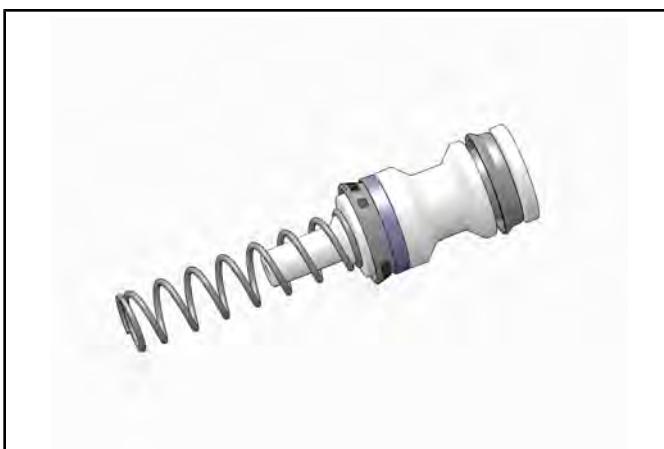
**Master Cylinder Bore Diameter Service Limit: .6886
in (17.49 mm)**

- Measure the diameter of the master cylinder piston. Replace piston if worn beyond the Service Limit.

**Master Cylinder Piston Diameter Service Limit: .6811
in (17.30 mm)**

- Clean the compensating port and supply port with compressed air to be sure they are clean and unobstructed.
- Apply a light film of special lubricant from piston kit to each piston seal cup.

- Assemble the piston / spring assembly as shown. Large diameter of beveled edge on piston cups face toward spring. Install a new retaining ring on end of piston with machined edge (sharpest of the two edges).



- Carefully install spring / piston assembly into master cylinder bore. Work the front piston seal carefully past the chamfer and into bore. Use care not to damage or fold the seal when working it past the chamfer.
- Continue to install the piston until the rear seal is past the chamfer. Push and hold the piston in far enough to allow the retaining ring to be installed.
- Be sure retaining ring is fully seated in the groove.
- 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.
- Install new boot, seating the outer edge fully in the bore and engage outer lip of boot in piston groove.
- Apply special lubricant from kit to brake lever contact surface.
- Install master cylinder on handlebar. Torque clamp fasteners to specification.

TORQUE

Master Cylinder Clamp Fasteners: 70 in-lbs (8 Nm)

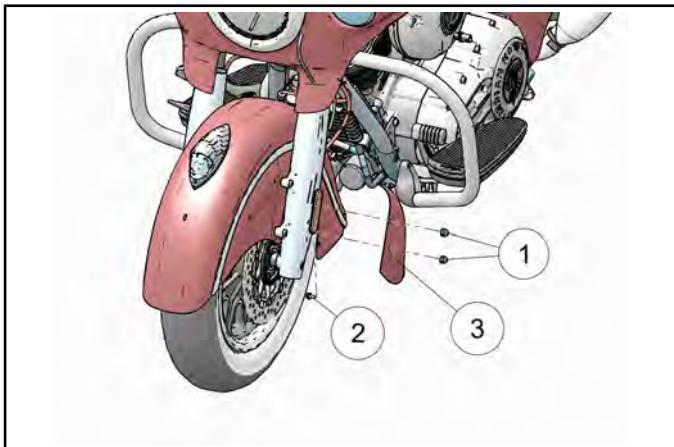
FRONT CALIPER SERVICE**CAUTION**

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.

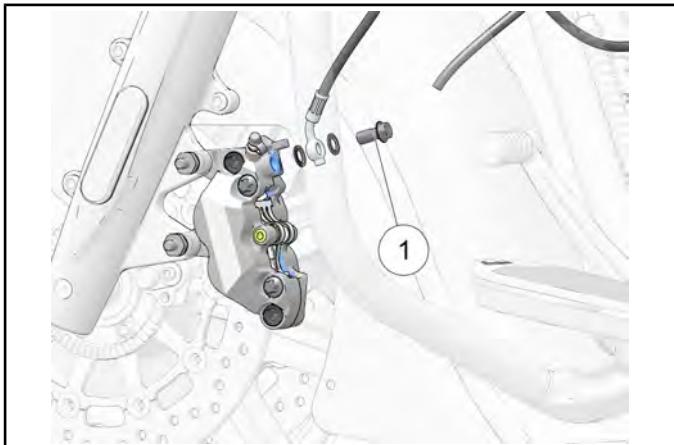
NOTE

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.*

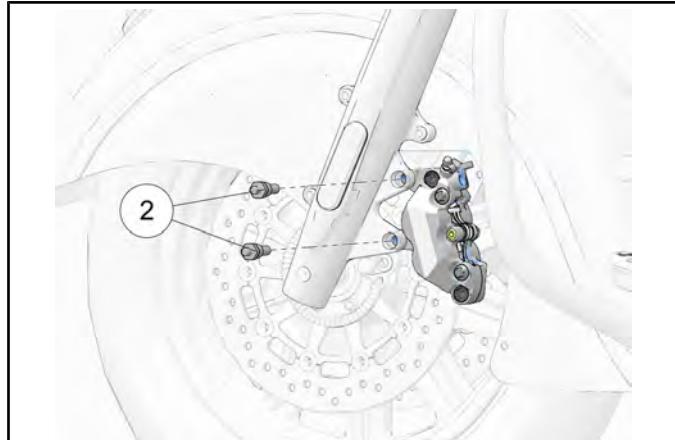
1. Remove two acorn nuts ① and fastener ② from each side of the motorcycle and remove the caliper covers ③.



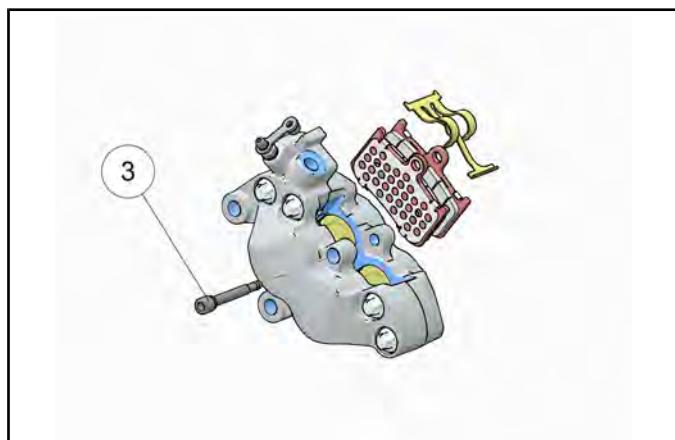
2. Remove banjo fastener ①, sealing washers, and brake hose from caliper assembly and allow it to drain into a container.



3. Remove front caliper mounting studs ② and remove the caliper.



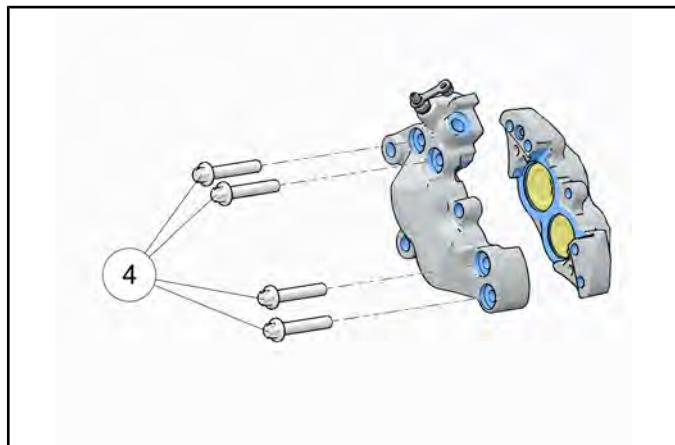
4. Cover the end of brake line(s) to prevent debris from entering.
5. Cover the brake hose connection on the caliper and clean the outer surfaces of caliper assembly with brake cleaner (commercially available) or isopropyl alcohol. Dry with compressed air.
6. Remove pad retaining pin ③ and brake pads.

**NOTE**

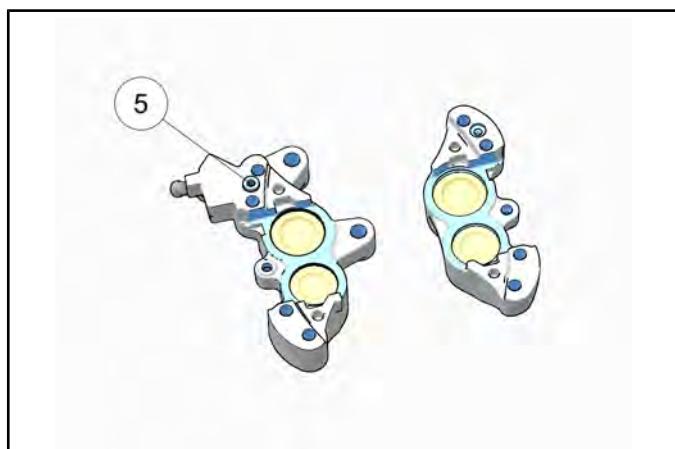
Pads contaminated with oil or grease must be replaced as a set.

BRAKES

7. Remove the four caliper fasteners ④ using an E12 reverse Torx socket.



8. Separate the halves. Note the O-ring ⑤ used to seal the fluid passage. This O-ring must be replaced along with all rubber parts during assembly.



9. Keep parts in order for assembly in the same bore. *Top and bottom pistons (in each caliper half) have different diameters.*
10. 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.
11. Remove dust seals and piston seals. Use care not to damage the seal bores.
12. Clean all parts thoroughly with isopropyl alcohol. Be sure the seal bores are clean, removing all traces of dirt or dried brake fluid.
13. Clean piston seal and dust seal bores to remove residue that could cause the pistons to stick, resulting in brake drag.

14. Inspect each piston bore for corrosion, scratches, scoring, or pitting. Replace caliper if any of these conditions are evident.

15. Measure the diameter of each caliper bore. Replace caliper if any is worn beyond the service limit.

Front Caliper Bore Diameter:

Standard = 30.23 mm | Limit = 30.31 mm (1.1933 in)

Standard = 33.96 mm | Limit = 34.04 mm (1.3401 in)

16. Measure the outside diameter of each piston in two spots 90° apart, 5mm from outer edge. Repeat measurement 5mm from inner edge. Replace piston if worn beyond service limit at any measuring point.

Front Caliper Piston Outside Diameter:

Standard = 30.15 mm | Limit = 30.09 mm (1.1846 in)

Standard = 33.91 mm | Limit = 33.85 mm (1.3327 in)

NOTE

Install all new rubber parts during assembly. Do not reuse old seals or boots.

17. Apply special lubricant from service kit to new piston seals and dust seals.
18. Apply special assembly oil (included in kit) to outer surface of all pistons.
19. Install piston seals and dust seals in caliper body.
20. Install pistons in their respective bores.
21. Clean threads of each caliper body fastener. Be sure threads are free from any oil, grease, or brake fluid. Apply a few drops of Loctite 242 (Blue) non permanent locking agent to the threads of each fastener.
22. Install a new O-ring on fluid transfer passage, assemble halves of caliper and start (4) fasteners while holding pressure on halves to keep O-ring in place.
23. Evenly tighten fasteners by hand until halves are secured.
24. Torque caliper body fasteners to specification.

TORQUE

Caliper Body Fasteners: **20 ft-lbs (27 Nm)**

25. Install brake pads. Torque retaining pin to specification.

TORQUE

Brake Pad Retaining Pin: **120 in-lbs (14 Nm)**

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 studs and torque to specification.

TORQUE

Caliper Mounting Studs: **35 ft-lbs (48 Nm)**

5. Connect brake hose to caliper with banjo fastener and new sealing washers. Torque to specification.

TORQUE

Banjo Fastener (Brake Line): **18 ft-lbs (24 Nm)**

6. Fill and bleed the front brake hydraulic system. See ABS Front Brake Bleeding, page 9.24.

⚠ 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.

BRAKES

REAR MASTER CYLINDER SERVICE

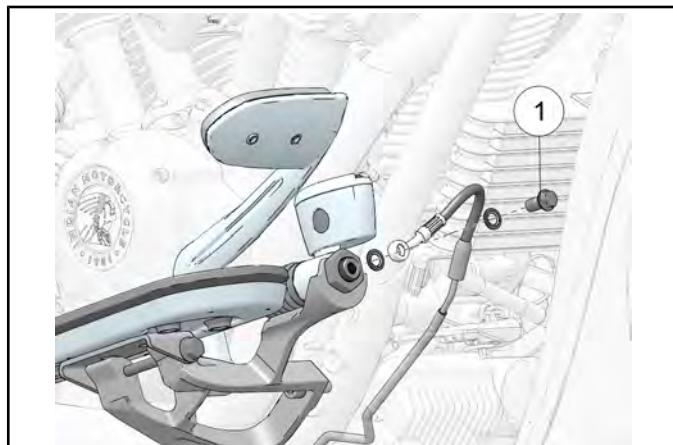
CAUTION

Brake fluid and brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed. Make sure the master cylinder reservoir being worked on is level before removing the cap. Replace all rubber parts upon assembly.

NOTE

Replace all rubber parts upon assembly.

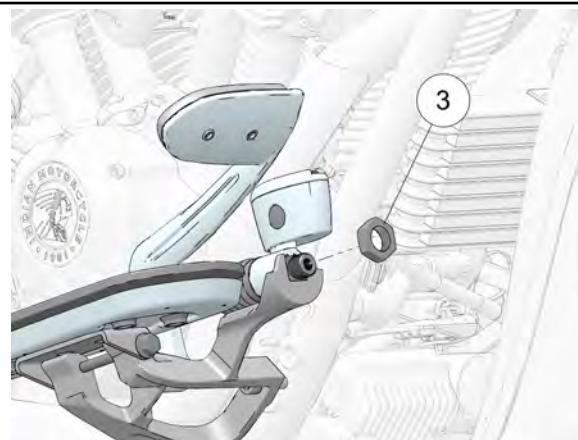
1. Remove brake line banjo fastener ① , sealing washers and brake line. Allow fluid to drain into a container.



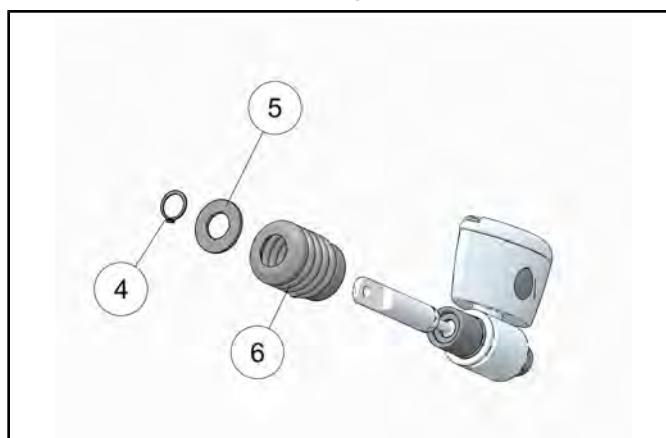
2. Remove cotter pin ② from push rod pin and remove washer.



3. Remove jamb nut ③ .



4. Remove master cylinder from floorboard support.
5. Remove external snap ring ④ , washer ⑤ and dust boot ⑥ and return spring (not shown).



6. Remove internal snap ring followed by piston and cups.
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. Measure the bore diameter. Replace if worn beyond the service limit. See Service Specifications, page 9.4.
9. Clean compensating port and supply port with compressed air to be sure they are clean and unobstructed.
10. Clean all parts with clean Indian Motorcycle DOT 4 brake fluid or isopropyl alcohol.
11. Replace ALL RUBBER PARTS with new.
12. Carefully assemble the piston and cups into the master cylinder bore.

13. Install the push rod, push rod retainer and internal snap ring.
14. Install the return spring, dust boot, washer and external snap ring.
15. Install the master cylinder and torque the jamb nut and brake line banjo fastener to specification.

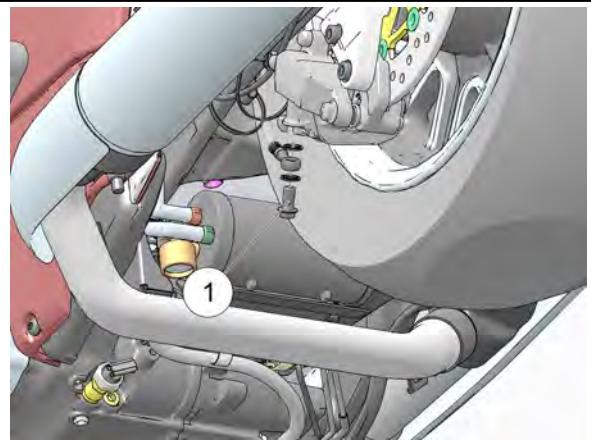
TORQUE

Brake Line Banjo Fastener: **18 ft-lbs (24 Nm)**
 Rear Master Cylinder Jamb Nut: **35 ft-lbs (48 Nm)**

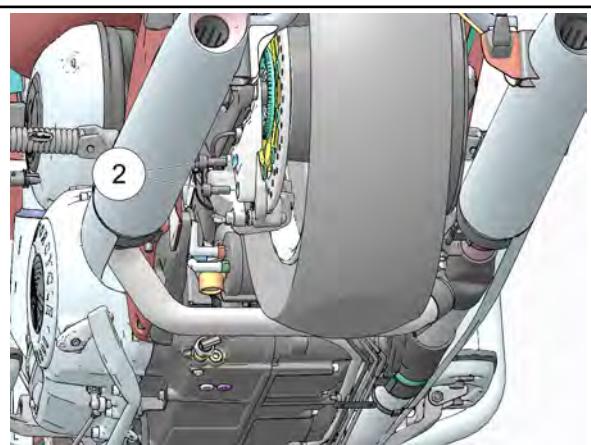
16. Install the push rod retaining pin, washer and cotter pin.

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 pin ③ and brake pads. Note orientation of spring plate for assembly.



4. Slide caliper bracket off pins and remove spring plate.

BRAKES

5. Remove caliper pistons. Keep pistons in order for installation in their respective bores.
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 each bore and surface of each piston for corrosion, scratches, scoring, or pitting. Replace caliper assembly if any of these conditions are evident.
9. Measure diameter of each bore and piston. Replace caliper assembly or parts if worn beyond service limit.

Caliper Piston Bore Diameter
Service Limit: 27.05 mm
(1.0649 in)

10. 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.
11. Apply special assembly oil to outer surface of all pistons.
12. Install piston seals and dust seals in caliper body.
13. Install pistons in their respective bore.
14. Replace caliper pin boot on bracket and on caliper. Apply special lubricant from service kit to boots and both pins.
15. Assemble bracket to caliper. Remove excess lubricant.
16. Install spring plate and outer brake pad. Start pad pin through outer pad.
17. Install inner pad with insulator and backing plate.
18. Torque brake pad retaining pin to specification.

TORQUE

Brake Pad Retaining Pin: 120 in-lbs (14 Nm)

19. Be sure end tabs of pads are both fully engaged in the heel plate on bracket.

20. Install caliper to bracket and torque caliper fasteners to specification.

TORQUE

Caliper Fasteners: 31 ft-lbs (42 Nm)

21. Install brake line with new sealing washers and torque banjo fastener to specification.

TORQUE

Banjo Fastener (Rear Caliper): 18 ft-lbs (24 Nm)

22. Bleed brake system. See ABS Rear Brake Bleeding, page 9.23.

REAR CALIPER INSTALLATION

1. Install caliper to rear mounting bracket and torque to specification.

TORQUE

Caliper Fasteners: **31 ft-lbs (42 Nm)**

2. Install brake hose, and banjo fastener with new sealing washers.

TORQUE

Banjo Fastener (Rear Caliper): **18 ft-lbs (24 Nm)**

3. Fill and bleed the rear hydraulic brake system. See ABS Rear Brake Bleeding, page 9.23.

⚠ 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.

BRAKES

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 Fasteners. Torque to Specification Replace Pads. Avoid Needless Heavy Braking for 100-200 miles (Burnish New Brake Pads).
Poor Brakes or No Brakes When First Applied. Brake Lever Pressure Present If Lever Is "Pumped".	Air In System Low Brake Fluid Level In Reservoir Brake Disc is Bent or Warped Caliper Misalignment External Leak Internal Leak (master cylinder) Faulty Brake Hose	Bleed Air From System Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Replace Brake Disc Determine Cause and Correct Repair or Replace Damaged Component Repair or Replace Master Cylinder Inspect for Bulges / Replace
Brake Pedal or Brake Lever Pulsates	Brake Disc Bent or Warped Mounting Surface of Brake Disc Uneven / Disc Loose Caliper Mount Surface Uneven Or Misaligned; Missing or Damaged Fasteners	Replace Brake Disc Repair or Replace as Necessary Repair or Replace as Necessary
Excessive Lever or Pedal Travel / Spongy Brake Feel.	Air in System Loose Mounting Hardware Low Brake Fluid Level In Reservoir Incorrect Brake Fluid Used See "Weak / Erratic Brakes" and Poor Brakes" possible causes above.	Bleed Air From System Repair as Necessary Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Flush System and Replace With Correct Fluid
Fluid Leakage	Loose Banjo Fittings Damaged Banjo Fitting Sealing Washers Cracked / Damaged Hose Worn Master Cylinder Piston, Caliper Piston(s) or Seals Diaphragm (master Cylinder reservoir) Leaking Fluid level too high (new brake pads installed without removing added fluid)	Tighten to Specified Torque Replace Replace Repair / Replace Master Cylinder or Wheel Caliper. Inspect / Replace Cover, Cap, Diaphragm or Reservoir as Required Correct fluid level

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; Measure Pedal Clearance / Adjust 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

BRAKES

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STARTING / CHARGING GENERAL INFORMATION

SERVICE NOTES

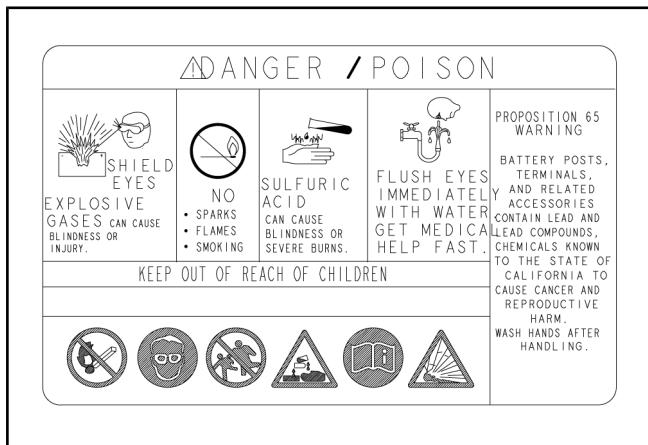
All electrical system and component service can be performed with the engine in the frame.

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



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, battery voltage can recover after charging, but under excessive loads the battery voltage will drop quickly and eventually "die". Often the charging system is suspect when it is not the cause of the problem. Always inspect for excessive loads if the battery continues to lose its charge. Items such as incorrect wattage bulbs, sticking brake light switch(s), continuous low rpm operation or leaving the lights on without the engine running for long periods of time can drain a battery even if the charging system is operating correctly.

ELECTRICAL

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 and Electrical chapter, very carefully when working on electronic components. Failure to follow instructions may cause irreparable damage to the part being inspected.

SPECIAL TOOLS

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

TORQUE SPECIFICATIONS

PART DESCRIPTION	TORQUE SPECIFICATION
Torque Compensator Fastener	83 ft-lbs (112 Nm)
Torque Compensator Locking Plate	88 in-lbs (10 Nm)
Primary Cover Fasteners	15 ft-lbs (20 Nm))
Regulator/Rectifier to Bracket	84 in-lbs (10 Nm)
Regulator/Rectifier Bracket to Crankcase	89 ft-lbs (10 Nm)
Stator Mounting Fasteners to Crankcase	88 in-lbs (10 Nm)

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
(All models except Chief Dark Horse)**

ITEM	SPECIFICATIONS
Alternator No Load AC Output @ 800-1000 RPM (Engine cool)	17-26.5 V AC @ 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
	Cold Cranking Amp Rating 310

**CHARGING SPECIFICATIONS
(Chief Dark Horse)**

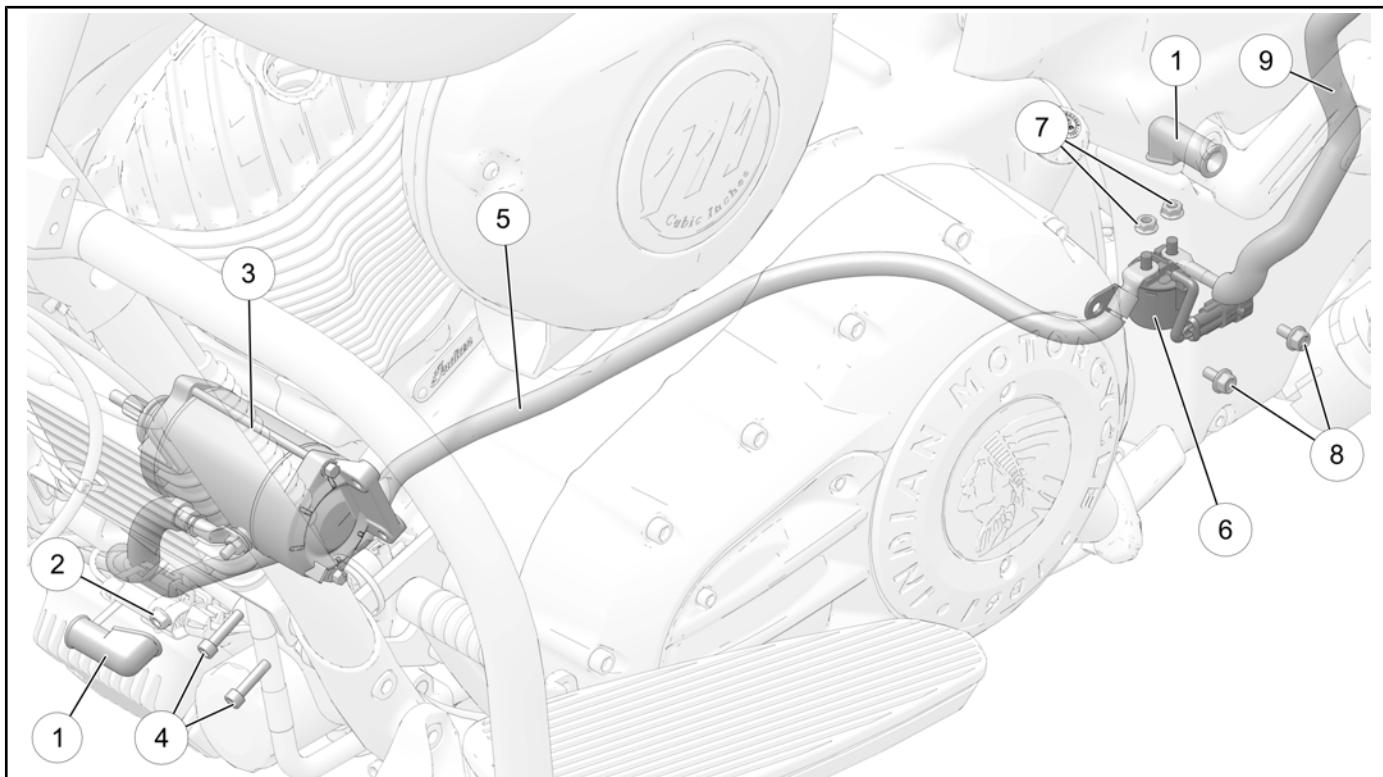
ITEM	SPECIFICATIONS
Alternator No Load AC Output @ 800-1000 RPM (Engine cool)	22 VAC ± 25%
Alternator No Load AC Output @ 2000 RPM (Engine cool)	40 VAC ± 25%
Stator Coil Resistance (@ 21°C / 70°F) (Black to each other black) (Disconnect regulator - see test.)	90.7 mΩ ± 20%
Stator Coil Resistance To Ground (Each black wire)	Infinity (no continuity)
Regulator/Rectifier Regulated Voltage	14.3 - 14.7 V DC
Alternator Output (Amps / Watts)	48 A / 610W @ 3500 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
	Cold Cranking Amp Rating 310

STARTING SYSTEM SPECIFICATIONS

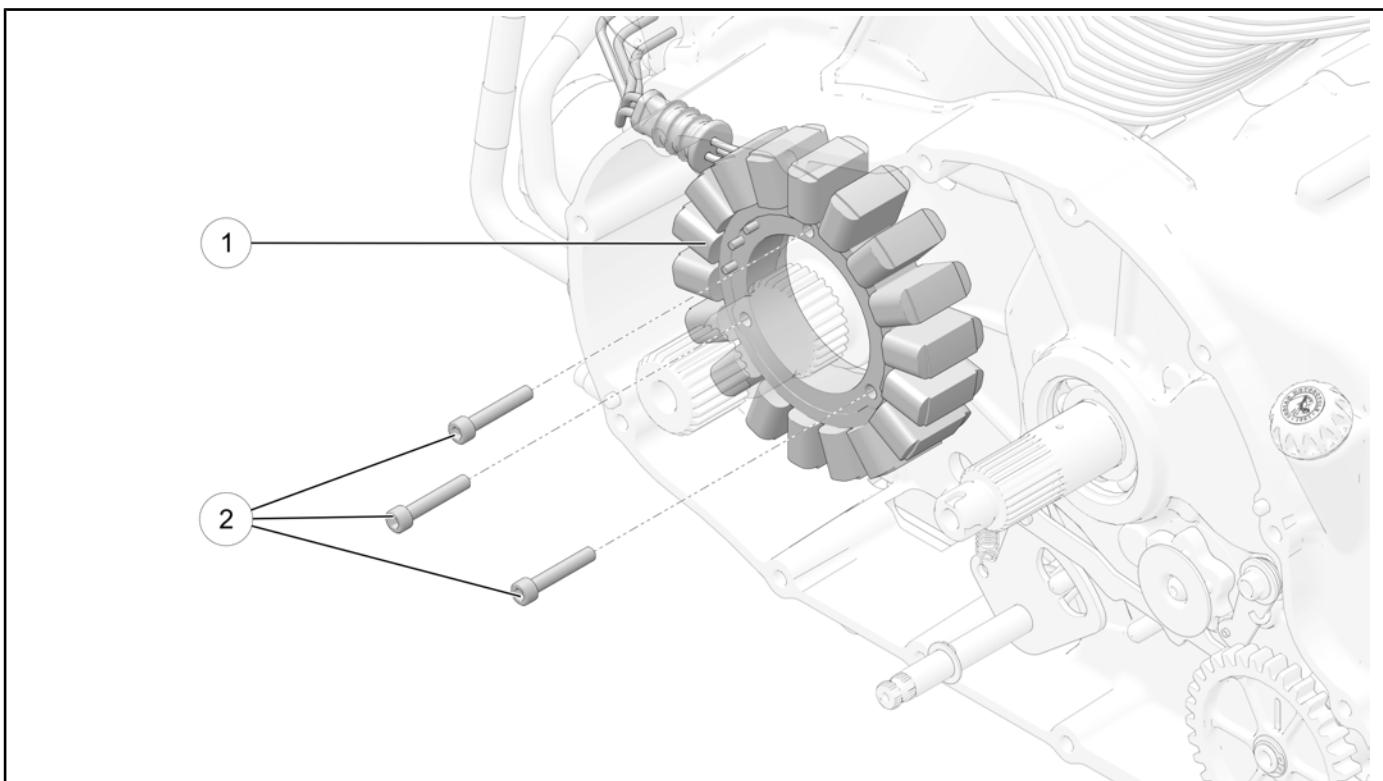
ITEM	SPECIFICATION
Battery Voltage, No Load	Above 12.5 V DC
Resistance: Between Any Two Commutator Bars	Continuity (0 Ohms)
Resistance: Commutator to Armature Shaft	Infinity (OL on Fluke™ 73)
Resistance: Battery Input Terminal to Insulated Brush	Continuity (0 Ohms)
Resistance: Bat. Input Terminal to 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

ELECTRICAL

ASSEMBLY VIEWS STARTER MOTOR / SOLENOID



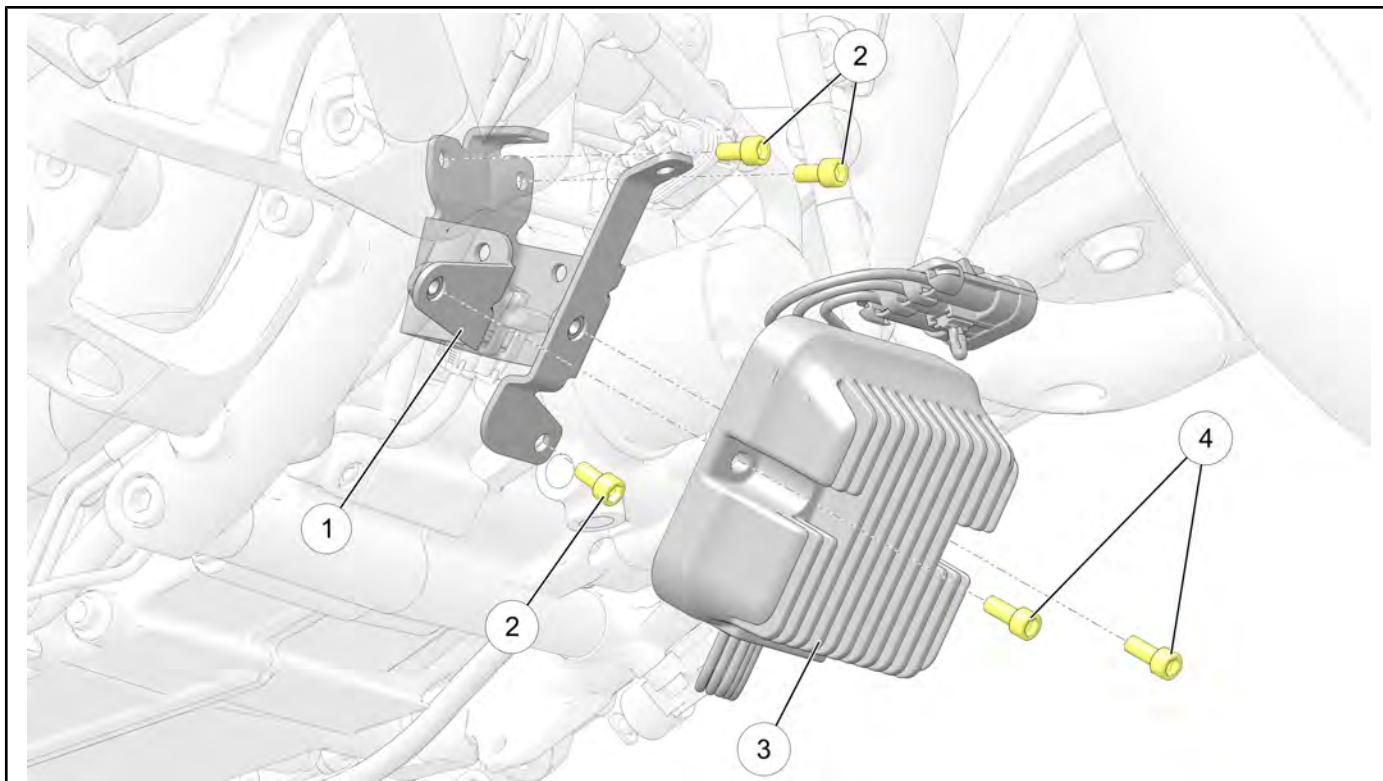
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Terminal Cover	-
②	Nut, Starter Terminal (B+) — M6 (QTY.1)	60 in-lbs (7 Nm)
③	Starter Motor	-
④	Fastener, Starter Motor — M6 x 1.0 x 25 (QTY.2)	89 in-lbs (10 Nm)
⑤	Cable, Solenoid to Starter Motor (B+)	-
⑥	Starter Solenoid	-
⑦	Nut, Solenoid Terminal (B+) — M6 (QTY.2)	60 in-lbs (7 Nm)
⑧	Fastener, Starter Solenoid — M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)
⑨	Cable, Battery to Solenoid (B+)	-

STATOR

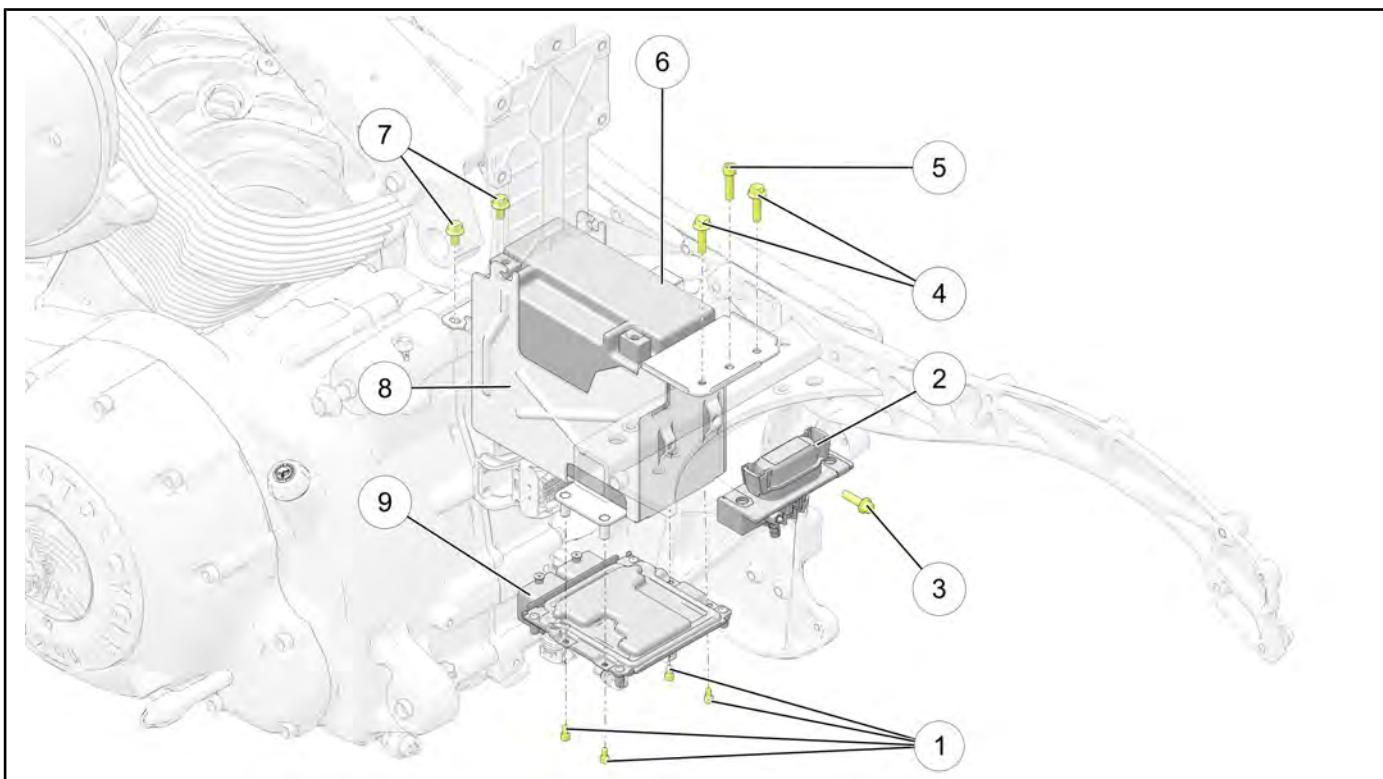
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Stator	-
②	Fastener, Stator — M6 x 1.0 x 35 (QTY.3)	88 in-lbs (10 Nm)

ELECTRICAL

REGULATOR / RECTIFIER



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Bracket, Regulator / Rectifier	-
②	Fastener, Regulator Bracket — M6 x 1.0 x 12 (QTY.3)	89 ft-lbs (10 Nm)
③	Regulator / Rectifier	-
④	Fastener, Regulator — M6 x 1.0 x 15 (QTY.2)	84 in-lbs (10 Nm)

BATTERY BOX

NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, ECM — M4 x 0.7 x 8 (QTY.4)	36 in-lbs (4 Nm)
②	Fuse Box, J-Case	-
③	Fastener, Fuse Box — M6 x 1.0 x 22 (QTY.1)	63 in-lbs (7 Nm)
④	Fastener, Battery Box — M6 x 1.0 x 12 (QTY.2)	84 in-lbs (10 Nm)
⑤	Fastener, VCM Mounting Plate — M6 x 1.0 x 25 (QTY.1)	84 in-lbs (10 Nm)
⑥	Battery	-
⑦	Fastener, Battery Box — M6 x 1.0 x 25 (QTY.2)	84 in-lbs (10 Nm)
⑧	Battery Box	-
⑨	ECM	-

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ELECTRICAL

BATTERY SERVICE

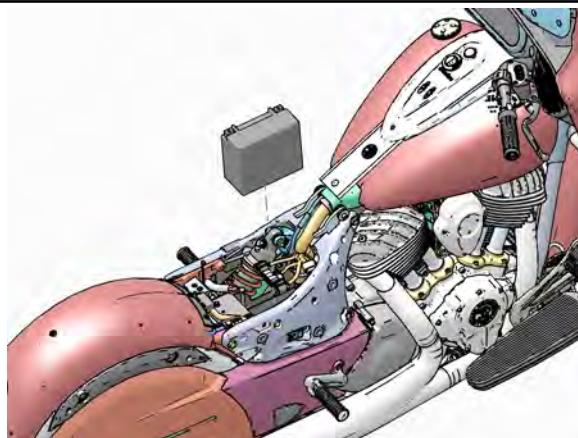
BATTERY REMOVAL

IMPORTANT

It is not necessary to disconnect the VCM from the electrical harness during battery removal. If the VCM must be disconnected for any reason, the negative battery cable must be disconnected first.

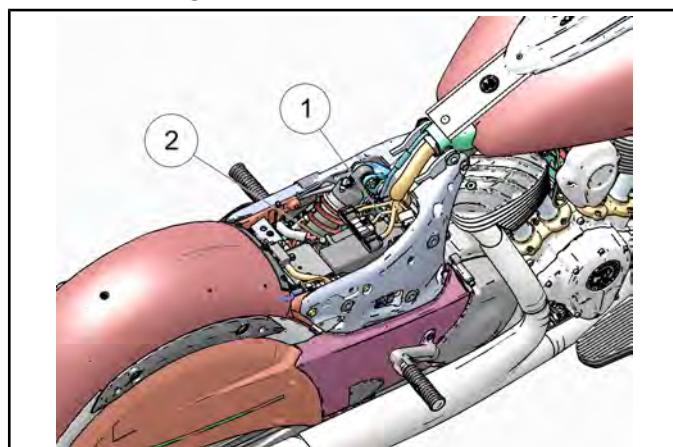
1. Remove the upper side covers. See Side Cover (Upper), Removal / Installation, page 7.17.
2. Remove the seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
3. Remove the fastener securing the Vehicle Control Module (VCM) mounting plate to the top of the battery box and move the VCM out of the way. **Do not disconnect VCM.** See Vehicle Control Module (VCM), Removal / Installation, page 10.48.
4. Remove negative (-) battery terminal fastener and cable first ① .
5. Remove positive (+) battery terminal fastener and cable last ② .

6. Lift battery straight up and out of the battery box.



NOTE

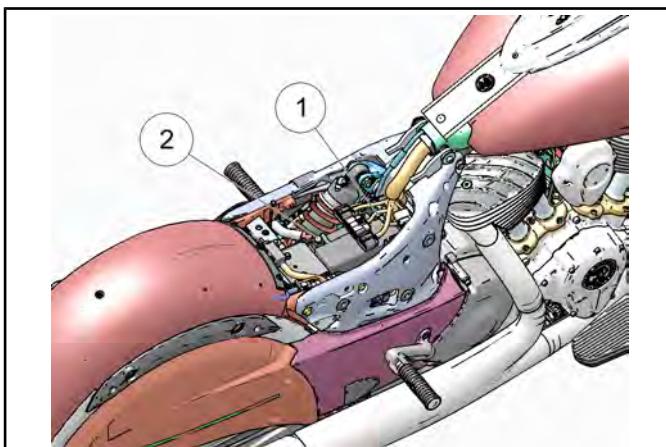
It may be necessary to push the VCM harness away from the battery, into the RH side of the frame in order to remove the battery.



BATTERY INSTALLATION**NOTE**

Be sure cable ends and battery terminals are clean. Apply a light film of di-electric grease to terminal fastener threads.

1. Carefully install battery with negative terminal toward front of vehicle.
2. Connect positive cable ② to the battery and torque to specification.
3. If previously removed, plug the three multi-plugs into the Vehicle Control Module (VCM).
4. Connect ground (negative) cable ① to battery and torque to specification.

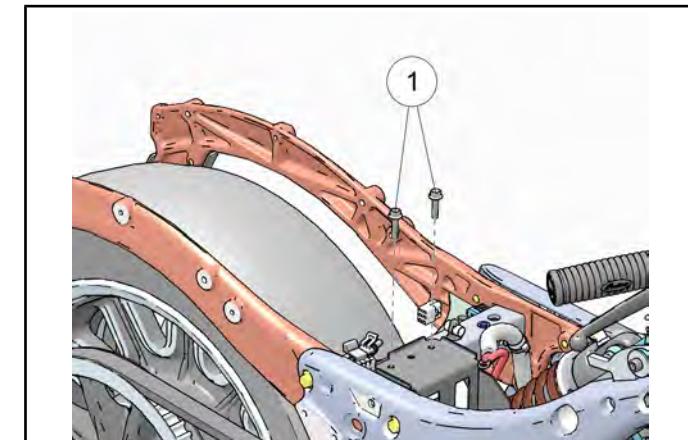
**TORQUE**

Battery Terminal Fasteners: 40 in-lbs (5 Nm)

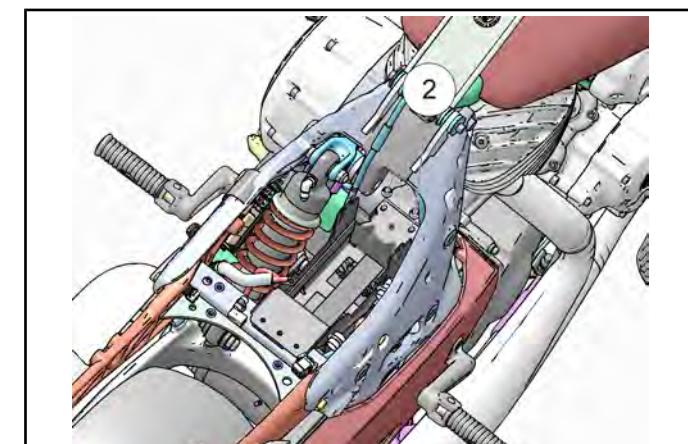
5. Apply dielectric grease over terminal areas for corrosion protection.
6. Install Vehicle Control Module (VCM). See Vehicle Control Module (VCM), Removal / Installation, page 10.48.
7. Install seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
8. Install upper side covers. See Side Cover (Upper), Removal / Installation, page 7.17.

BATTERY BOX REMOVAL

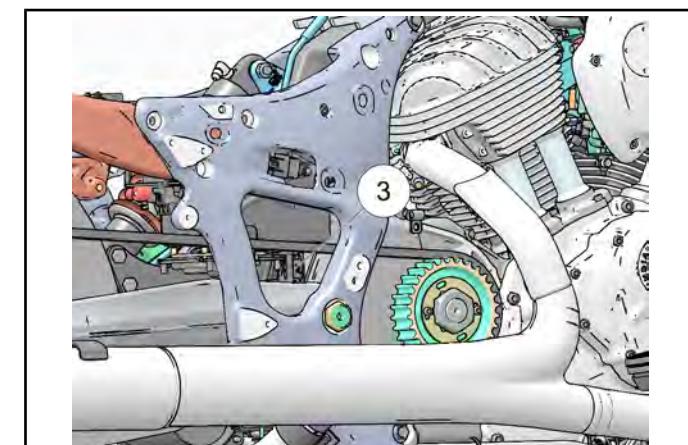
1. Place motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Remove the rear fender. See Rear Fender Removal, page 7.33
3. Remove battery. See Battery Removal, page 10.12.
4. Remove rear battery box fasteners ① .



5. Remove front battery box fasteners ② .



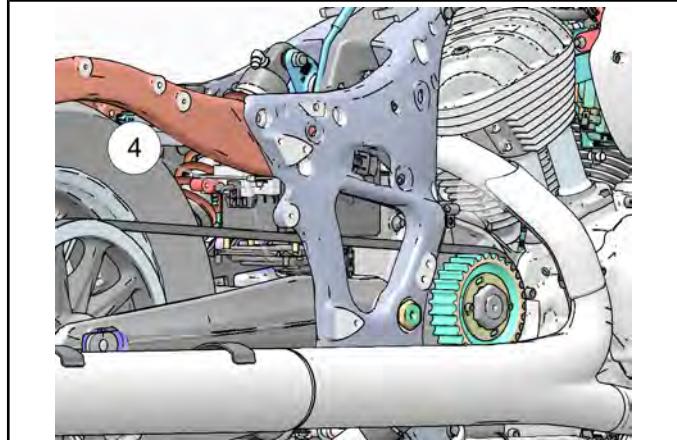
6. Disconnect the multi-plugs ③ from the ECM.



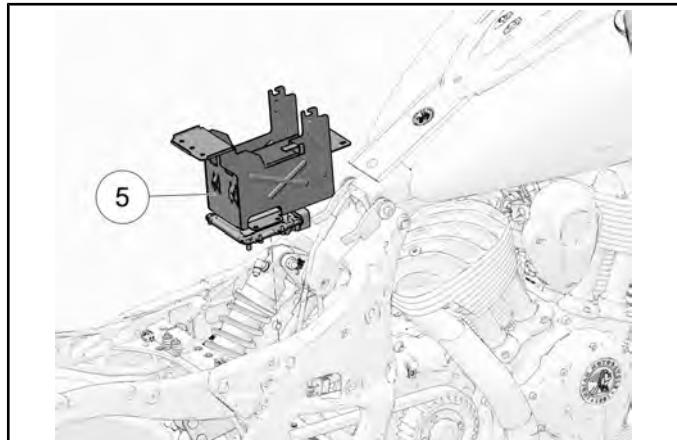
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ELECTRICAL

7. Remove the J-Case fuse box fastener ④ and move fuse box out of the way.

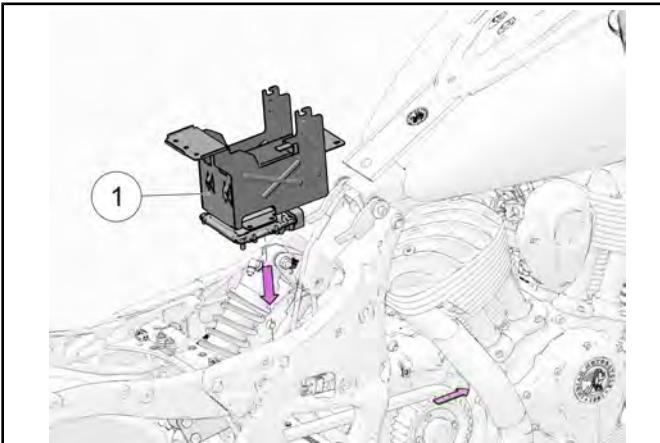


8. Remove the battery box / ECM assembly ⑤ .

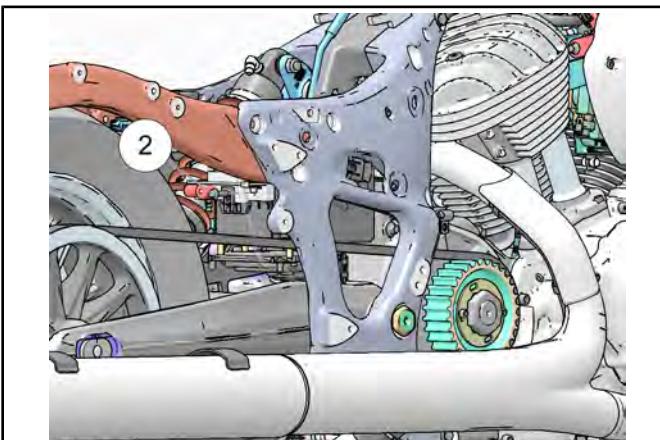


BATTERY BOX INSTALLATION

1. Lower the battery box / ECM assembly ① into position so the mounting tabs are resting in the frame and the fastener holes are lined up.



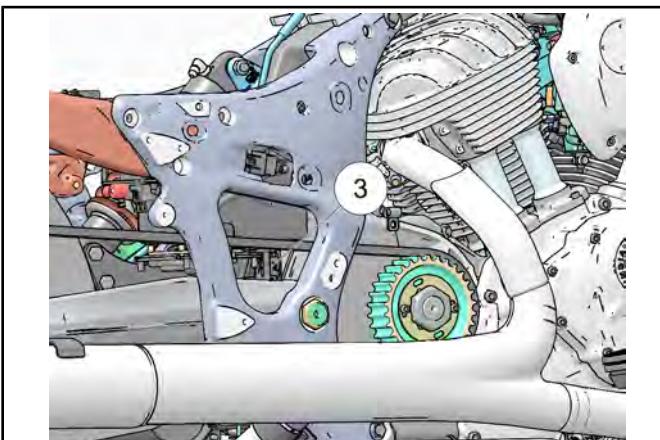
2. Move the J-Case fuse box into position and torque fastener ② to specification.



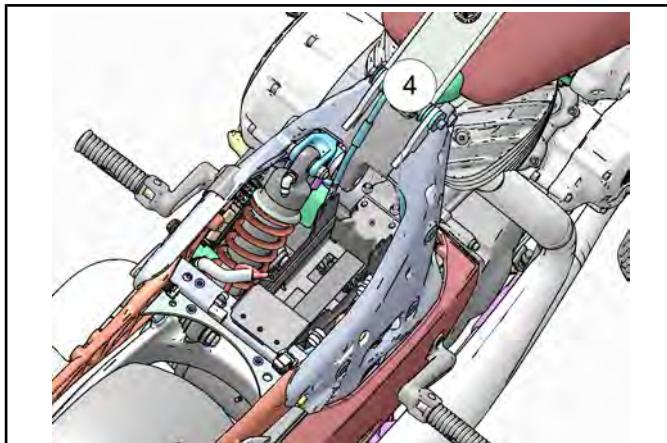
TORQUE

J-Case Fuse Box Fastener: 63 in-lbs (7 Nm)

3. Connect the ECM multi-plugs ③ .



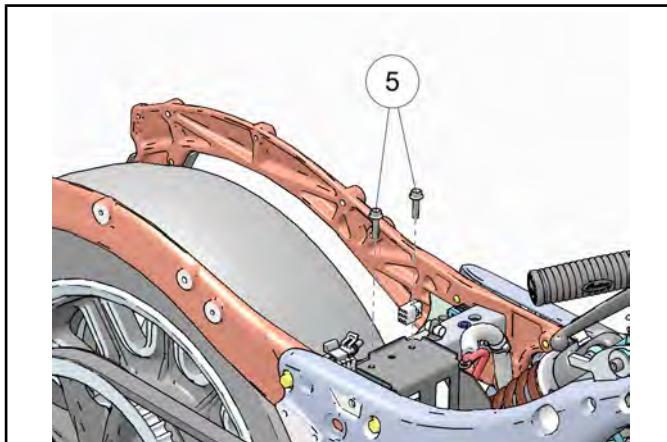
- Install the front battery box fasteners ④ and torque to specification.



TORQUE

Battery Box Fasteners, Front: **84 in-lbs (10 Nm)**

- Install rear battery box fasteners ⑤ and torque to specification.



TORQUE

Battery Box Fasteners, Rear: **84 in-lbs (10 Nm)**

- Install battery. See Battery Installation, page 10.13.
- Install rear fender. See Rear Fender Installation, page 7.34.

10

BATTERY CHARGING - NEW BATTERY

- Charge the battery at 1.8 amps for 5 to 10 hours. use a straight rate charger (not load sensing or battery tender type) for the initial charge of a new battery.

CAUTION

Do not attempt to quick charge the battery at any time.

- Remove battery from charger and let it sit for 30 minutes or longer.

NOTE

Measure voltage with a digital multimeter. If lower than 12.50 V DC, battery must be recharged again in accordance with step 1 and 2 above.

- After charging battery and letting it sit for 30 minutes or more, check battery voltage again. If battery voltage is still below 12.50 V DC, replace the battery.

ELECTRICAL

BATTERY CHARGING - IN SERVICE

1. Measure battery voltage with a digital multimeter. The reading should be above 12.50 V DC. If battery voltage is lower than 12.50 V DC battery must be charged according to the instructions given below.

CAUTION

Do not remove caps on battery while recharging. Do not attempt to inspect or add fluid to a maintenance free battery.

2. Charge battery at *1.8 amps for 5 to 10 hours.*

NOTE

Specification: 1.8 A for 5-10 hours

3. Remove battery from charger and let it sit for 30 minutes or longer.
4. Measure battery voltage with a digital multimeter. If battery voltage is lower than 12.50 V DC battery must be recharged again in accordance with step 1 and 2 above.
5. After charging battery and letting it sit for 30 minutes or more, check the battery voltage again. If battery voltage is still below 12.50 V DC, replace battery.

NOTE

When motorcycle is not used for one (1) month or more, remove battery and store it in a cool, dry area. Inspect voltage monthly and charge according to above instructions if necessary.

BATTERY INSPECTION

1. Remove battery. See Battery Removal, page 10.12.
2. Inspect battery tray and hold-down cover for damage. Be sure all foam strips are in place on battery box.
3. Inspect for cracked or broken battery case.

CAUTION

Do not remove the battery cap assembly in an attempt to inspect fluid level, specific gravity or attempt to add fluid to battery. After initial servicing, battery should remain sealed.

4. Inspect terminals for corrosion. If corrosion is found, remove battery and clean terminals with a solution of baking soda and water. Finish process by cleaning terminals (both battery and battery cables) with a wire brush.
5. Install battery. See Battery Installation, page 10.13.
6. Once connections are secured, apply a thin film of di-electric grease to terminals.
7. Install VCM / battery cover assembly. See Vehicle Control Module (VCM), Removal / Installation, page 10.48.
8. Install seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
9. Install upper side covers. See Side Cover (Upper), Removal / Installation, page 7.17.

BATTERY TESTING

The recommended battery tester for all Indian Motorcycle batteries is special tool **PU-50296**. See Special Tools Index, page 1.50.

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.

STARTER MOTOR SERVICE

SAFETY INFORMATION

 **WARNING**

Always disconnect the battery (negative terminal first) before servicing the starter motor.

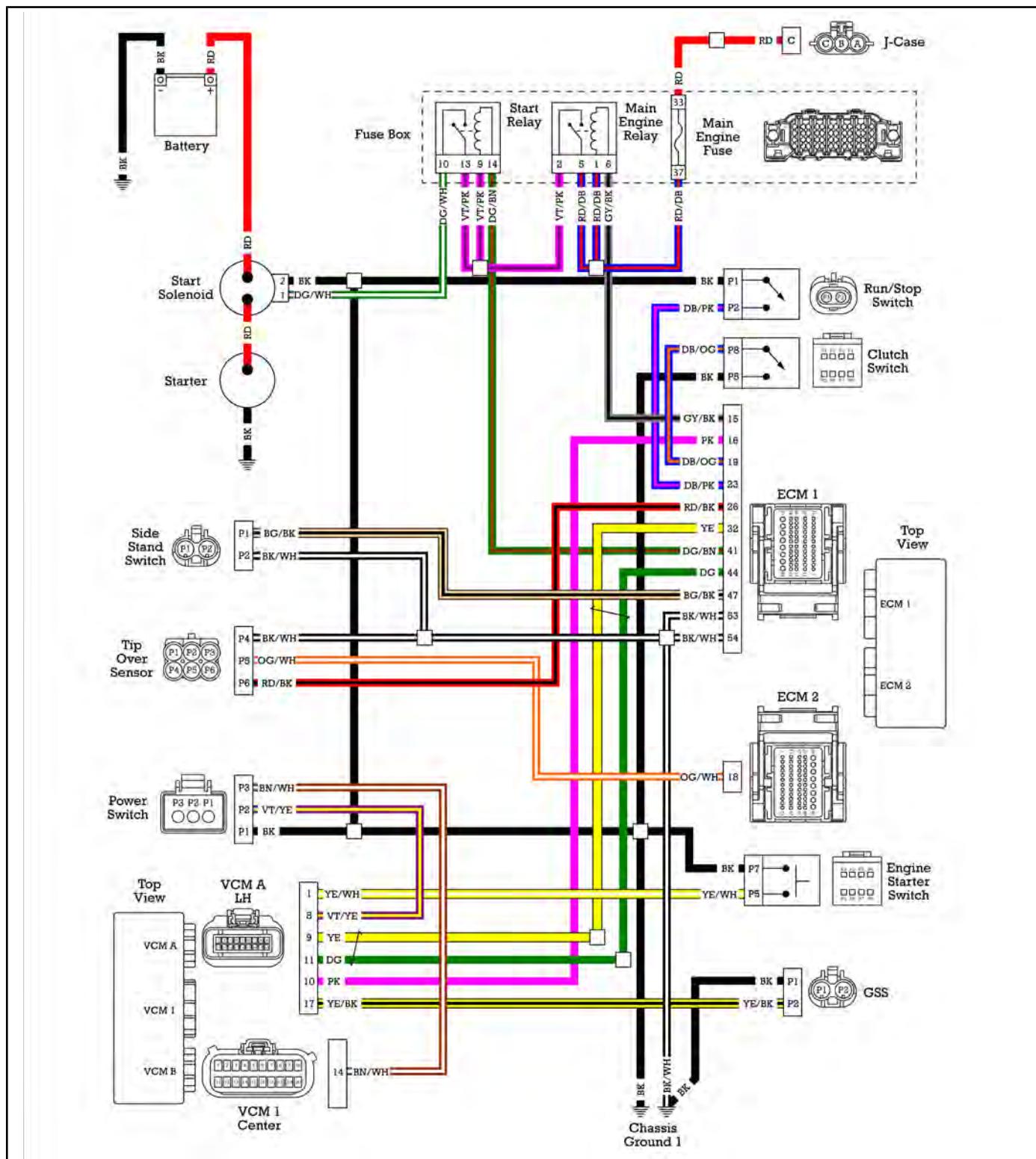
- Inspect the condition of the battery before troubleshooting the starter system. Also inspect main engine ground and battery cable connections.

STARTING SYSTEM DIAGNOSTIC TABLE

SYMPTOM	POSSIBLE CAUSE	RECOMMENDATION
Starter motor does not turn with transmission in neutral. Turns with clutch pulled in.	Gear Position Switch or circuit malfunction.	Test Gear Position Switch.
Starter motor does not turn with transmission in gear and clutch lever pulled in. Turns with transmission in neutral.	Clutch Switch or Side Stand switch circuit malfunction.	Test Switches.
Starter motor will not turn.	Low battery voltage. Poor cable connections. Main ground loose.	See Troubleshooting Flow Chart 1
Starter motor turns slowly. Engine may or may not start.	Low battery. Faulty starter motor or drive mechanism. Engine mechanical problem.	See Troubleshooting Flow Chart 2
Starter motor turns, but engine does not turn.	Starter torque limit clutch slipping.	See Troubleshooting Flow Chart 3
Starter motor turns at normal speed, but engine does not start.	Ignition Problem Engine Problem Fuel Delivery Problem	Electrical chapter Engine / Cooling / Exhaust chapter Fuel Delivery / EFI chapter

ELECTRICAL

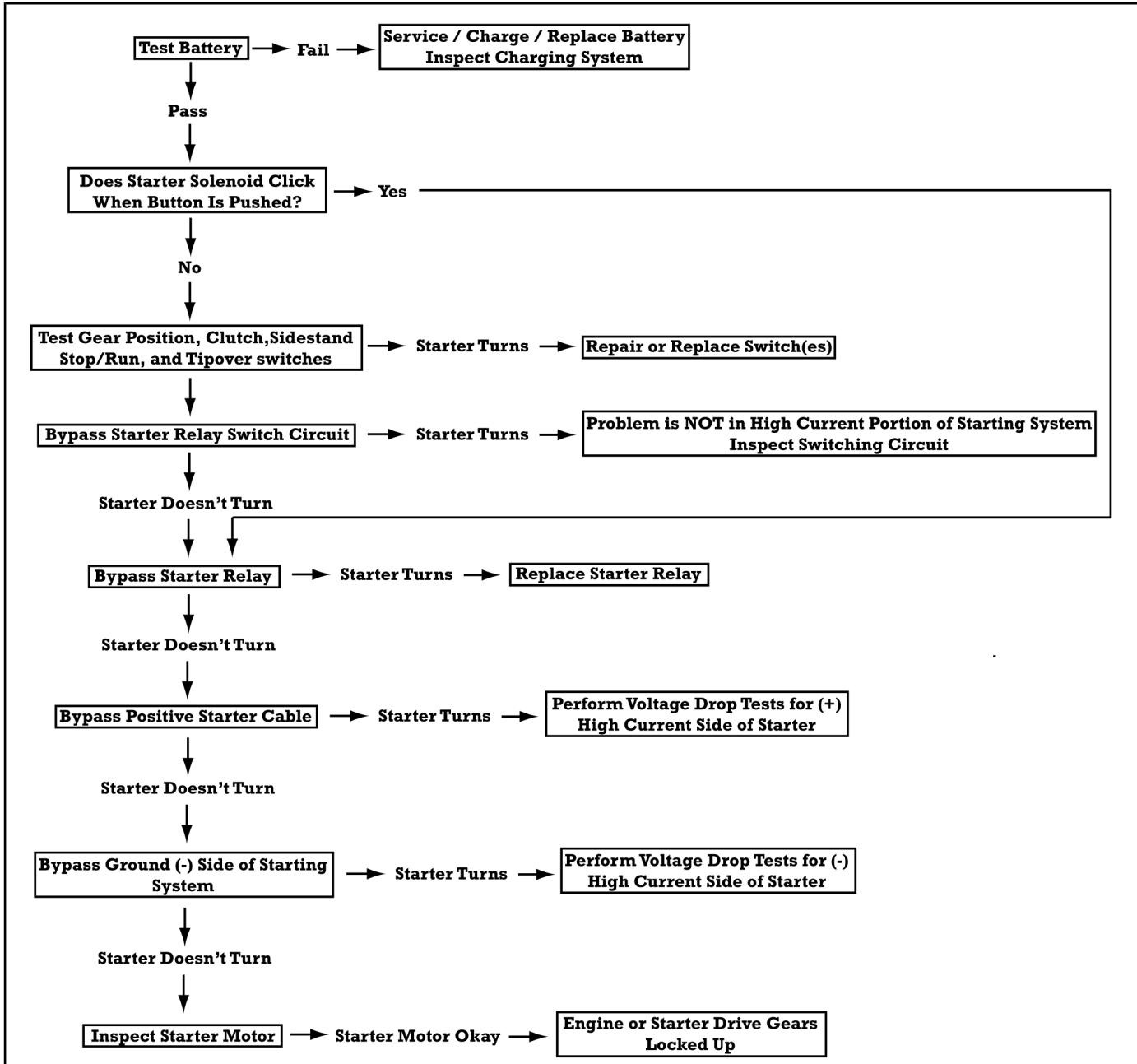
STARTER CIRCUIT DIAGRAM



TROUBLESHOOTING FLOW CHART 1

NOTE

Make sure the Key Fob authorization has occurred before performing troubleshooting.

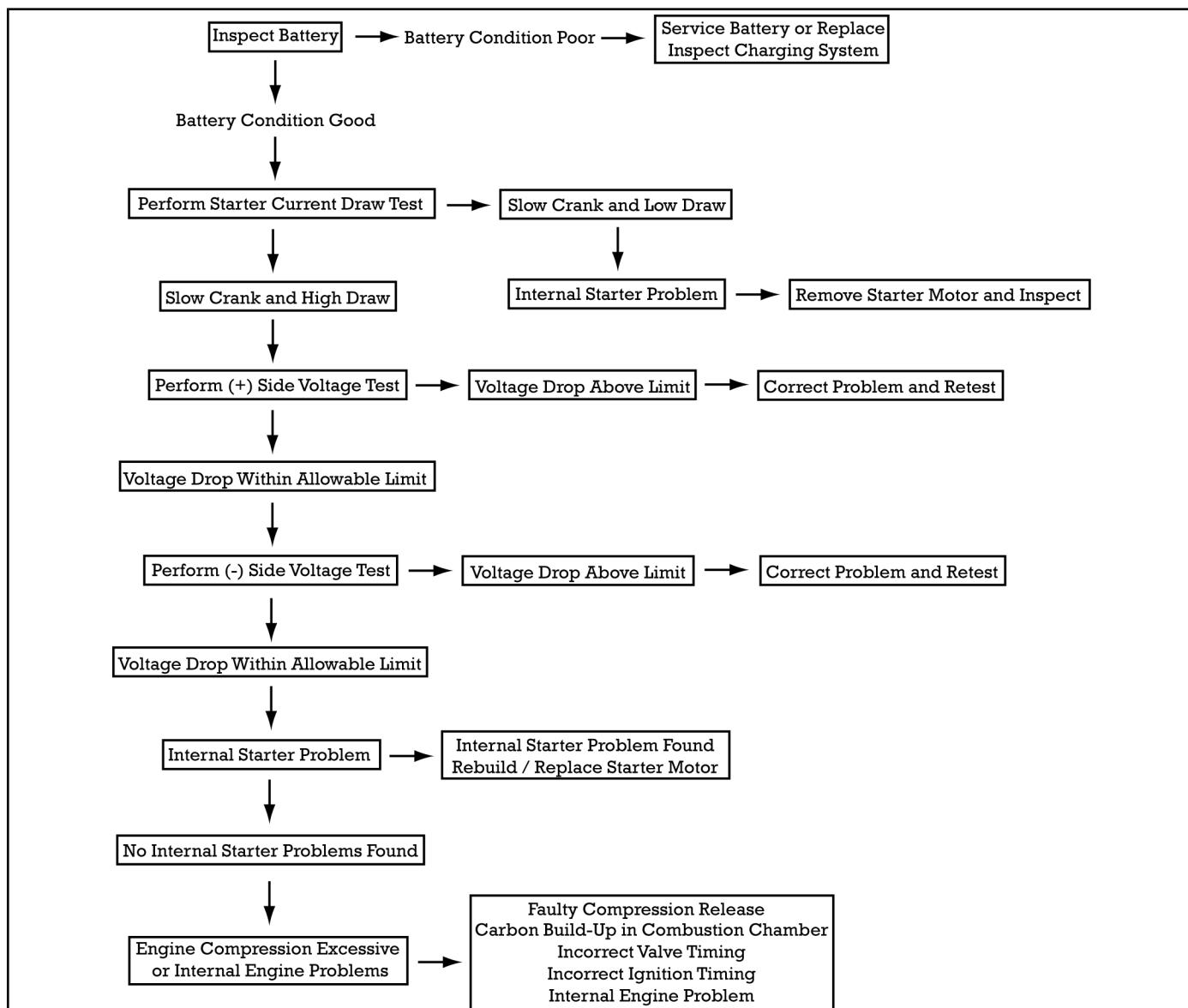


ELECTRICAL

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.



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.
Engine compression excessive or internal engine problems	Faulty Compression Release Carbon Build-Up in Combustion Chamber Incorrect Valve Timing Incorrect Ignition Timing Internal Engine Problem

STARTING SYSTEM TESTS

BATTERY LOAD TEST

- Load test battery using a commercially available battery load tester. Follow the battery load tester manufacturer instructions.

NOTE

Although not as conclusive, the following test can be used to direct troubleshooting efforts if a battery load tester is not readily available.

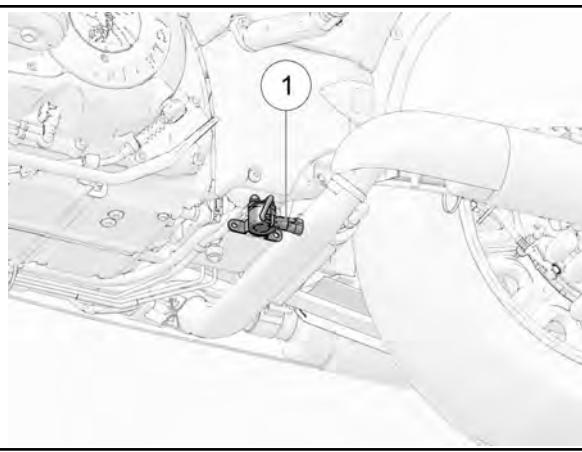
- Charge battery until open circuit voltage is above 12.5 Volts.
- Install battery and connect battery cables.
- Connect digital multimeter to battery and keep it connected for duration of test.
- Turn ignition key on and move head light high beam switch to High Beam for 1 minute (without the engine running).
- Measure battery voltage.
- If battery voltage has dropped below 10.5 V DC, re-charge and re-test battery or replace it.

STARTER SOLENOID GROUND CIRCUIT TEST

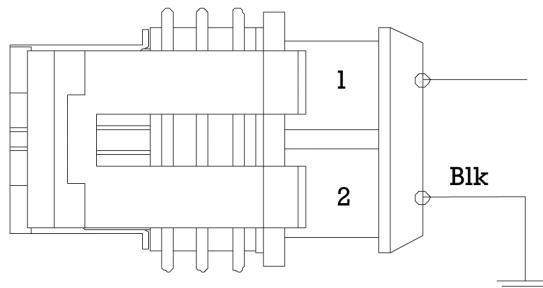
WARNING

Ensure that the motorcycle is secure and that the transmission is in neutral for the following test.

- Shift transmission to Neutral.
- Disconnect the start solenoid connector ① .



- Set the multi meter to read resistance and insert meter leads into the appropriate jacks.
- Working on the vehicle side of the harness, test continuity between terminal 2 (black wire) and chassis ground.



Resistance should be $\leq 0.5 \Omega$

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ELECTRICAL

GEAR POSITION SWITCH NEUTRAL INDICATOR TEST

Symptoms of a faulty Gear Position Switch may include:

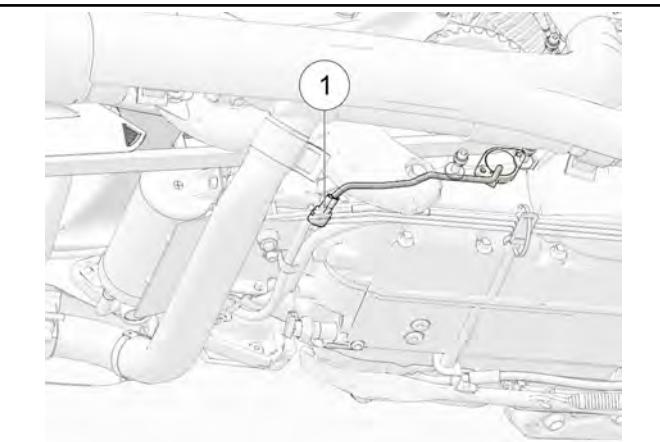
- Starter motor does not operate when transmission is in neutral,

but...

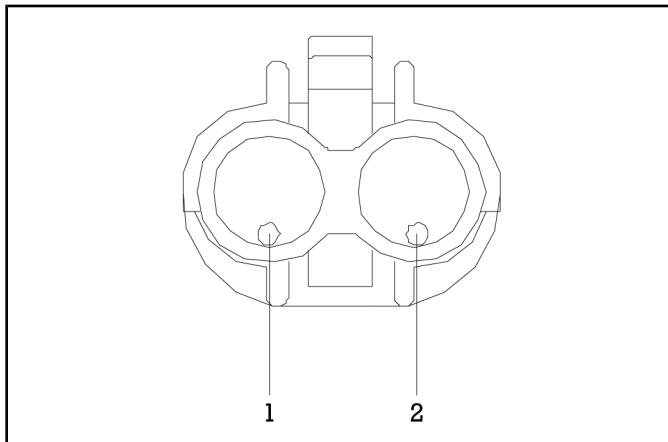
- Starter motor does operate when clutch is pulled in.
1. Press the POWER button to power up the electrical system.
 2. Place engine stop switch in the RUN position.
 3. Shift transmission into Neutral.
 4. Observe neutral indicator light.

5. If indicator is not lit with transmission in neutral:

- Place the RUN/STOP switch in the STOP position and turn motorcycle power off.
- Roll the motorcycle forward and back enough to verify that it is in neutral.
- Disconnect the gear position switch at connector ① located beneath the engine at the rear of the cases.



- Set the multi meter to test resistance and insert meter leads into the appropriate jacks.
- Test the gear position switch across terminals 1 & 2.



- Compare reading to the resistance specification.

Gear Position Switch Neutral Resistance
Specification: $42\ \Omega \pm 0.5\Omega$

6. If resistance reading is not within specified parameters, replace neutral switch or repair wiring as necessary.
7. If neutral indicator switch is working correctly and neutral indicator did not light with the transmission in neutral; inspect neutral lamp and circuit wiring for a open/short circuit.

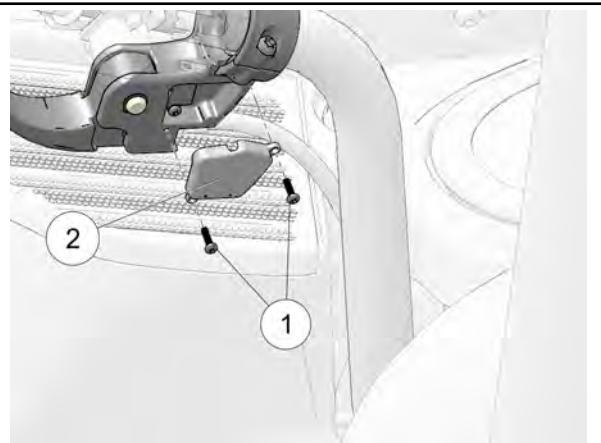
CLUTCH SWITCH CIRCUIT TEST

The symptom of a faulty clutch switch circuit is:

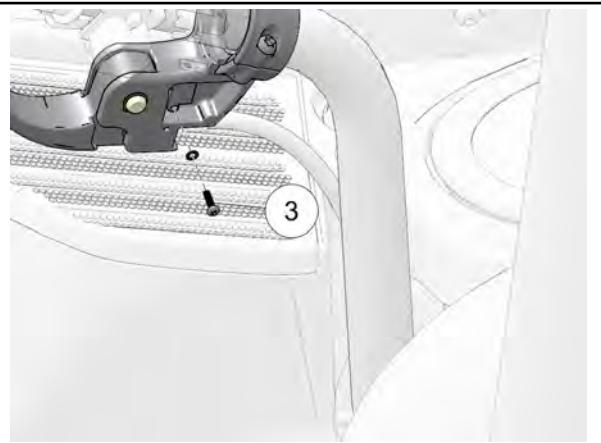
- Starter motor will not operate with transmission in gear and clutch lever pulled in. Starter operates with transmission in neutral. Use an ohmmeter to determine if continuity is present when the switch is closed (lever pulled in).
1. Transmission can be in neutral or in any gear.
 2. Disconnect ECM connector 1. See ECM Connector Removal, page 4.35.
 3. Set multi meter to measure resistance and insert meter leads into appropriate jacks.
 4. Connect red (+) lead of multi meter to PIN 19 in ECM connector 1 (harness side). See ECM Connector Map, page 4.24.
 5. Connect black meter lead to chassis ground.
 6. Operate clutch lever while observing meter display.
 7. Pull clutch lever to the handlebar. Meter should display continuity or very low resistance (less than 1 ohm) when the clutch switch closes.
 8. Release clutch lever, meter should display OL (open line).
 9. If clutch switch does not test as described inspect clutch switch, clutch switch wiring or mounting of switch to clutch lever for fault.
 10. If switch is mounted correctly and physically operates but does not open and close electrically, replace switch.

CLUTCH SWITCH REMOVAL / INSTALLATION

1. Remove clutch switch cover fasteners ① and clutch switch cover ②.



2. Remove clutch switch retaining fastener ③ and toothed washer.



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.

4. Installation is performed by reversing the removal procedure.
5. Torque clutch switch and cover fasteners to specification.

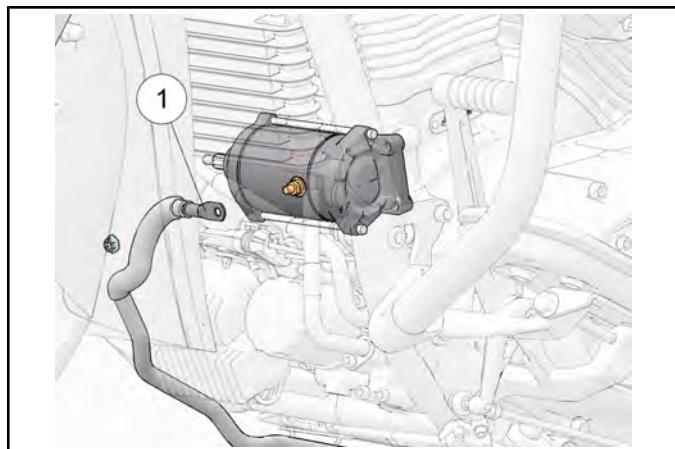
TORQUE

Clutch Switch Fastener: **6 in-lbs (1 Nm)**
 Clutch Switch Cover Fasteners: **6 in-lbs (1 Nm)**

STARTER SOLENOID POSITIVE CIRCUIT TEST**⚠ WARNING**

Secure motorcycle on the side stand and place transmission in neutral for the following test.

1. Place the transmission in neutral.
2. Remove the positive cable ① from starter motor.



3. Set multi meter to **DC Volts** and insert meter leads in the appropriate jacks.
4. Connect the red meter lead (+) to the positive starter cable eyelet and the black (-) meter lead to chassis ground.
5. Press the power button to power up the electrical system and place the STOP/RUN switch in the RUN position.
6. Press starter button. The meter should display battery voltage. If voltage is more than .2 volts below battery voltage, inspect the power supply circuit.

STARTER CURRENT DRAW TEST**NOTE**

This procedure requires the use of an inductive ammeter to read current draw and a volt meter to monitor battery voltage during the test.

⚠ WARNING

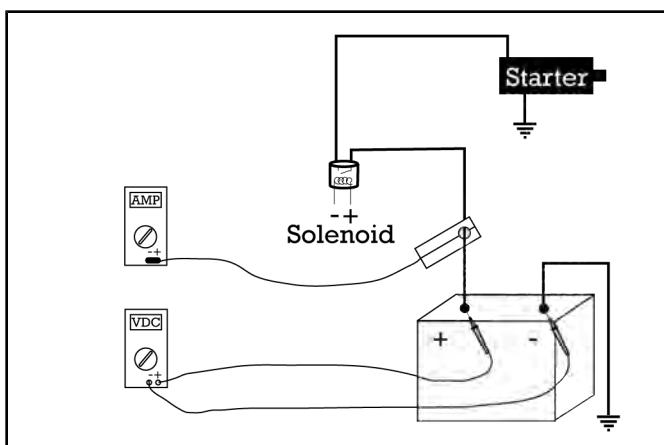
Do not allow any part of the jumper cable clamp to touch the chassis or any other ground.

CAUTION

Disable the ignition system so that the engine will not start during this test.

- Remove spark plug caps.
- Install test spark plugs into plug caps.
- Ground spark plugs against engine.

1. Remove seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
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. Press the power button to power up the electrical system and observe ammeter. It should register negative amps. If it does not, turn the ammeter probe around.
8. Place the engine STOP/RUN switch 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.

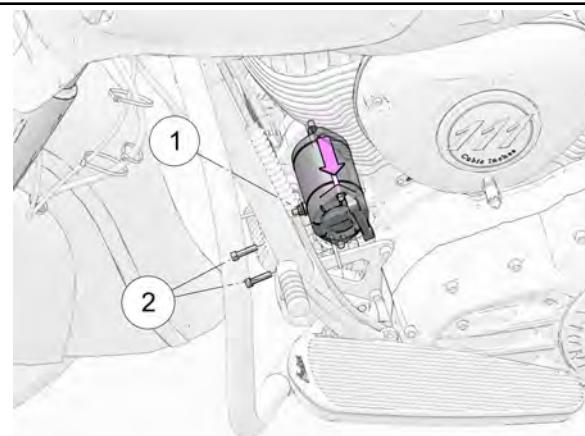
Starter current draw @ 77°F (25°C): ≤160 Amps

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 the negative battery cable. See Battery Removal, page 10.12.
2. Disconnect the positive terminal ① from the starter motor.
3. Remove the two fasteners ② from the rear of the starter motor and slide assembly to the LH side of the motorcycle to release from engine case.



4. Remove starter motor.
5. **To install the starter motor, reverse the removal procedure.**
6. Torque the starter mounting fasteners to specification.

TORQUE

Starter Mounting Fasteners: 89 in-lbs (10 Nm)

7.

NOTE

Hold the lower terminal nut with an open ended wrench while tightening the upper nut to avoid damage.

10

Torque the starter motor positive terminal nut to specification.

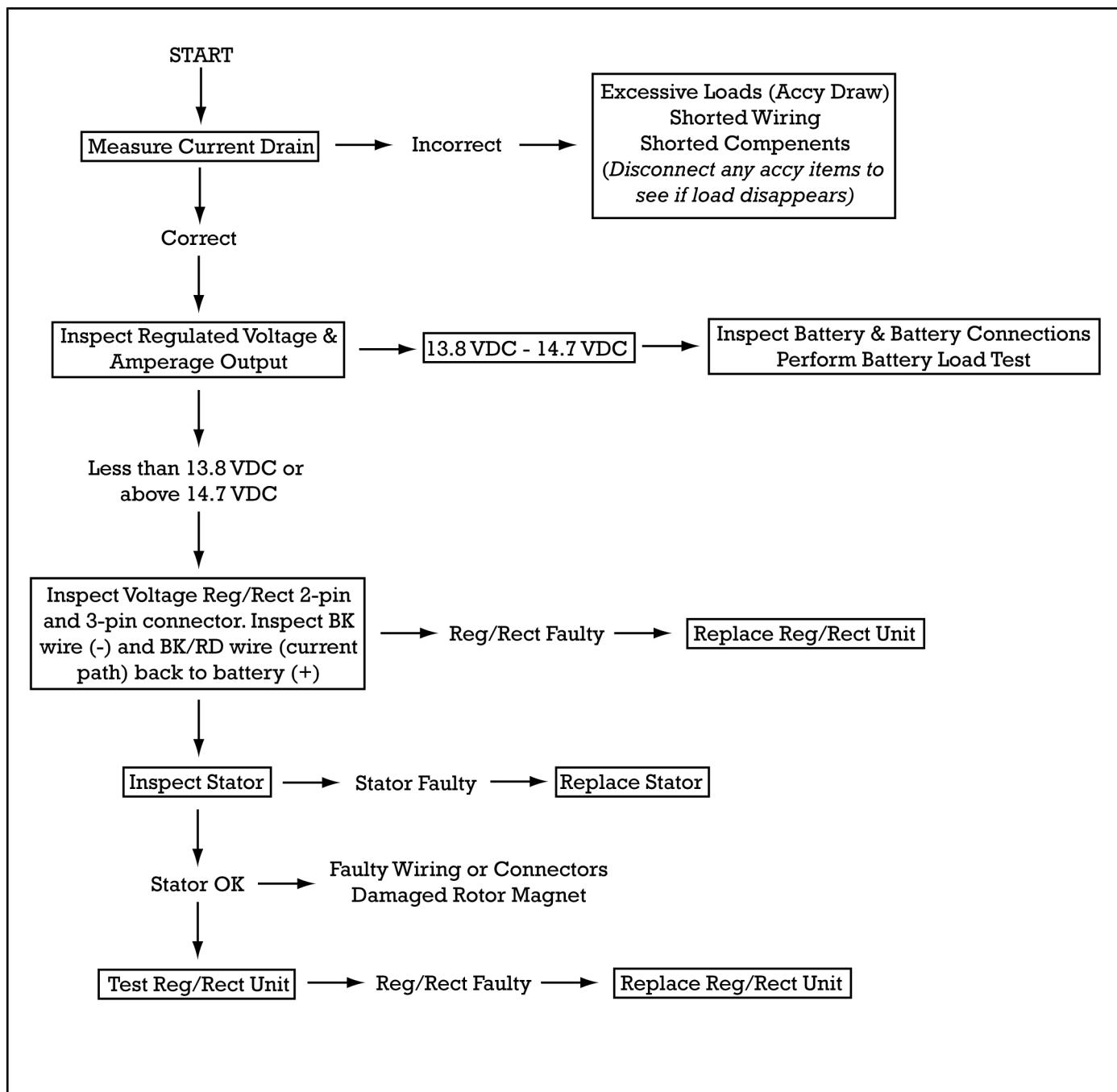
TORQUE

Starter Motor Positive Terminal Nut: 60 in-lbs (7 Nm)

CHARGING SYSTEM SERVICE

TROUBLESHOOTING, CHARGING SYSTEM

NOTICE: The battery must be fully charged and in good condition to obtain accurate readings. Battery charging current is automatically reduced by the regulator / rectifier if the regulator / rectifier unit reaches a critical temperature (overheated). The system should be cool when testing DC charging output or when testing the regulator / rectifier to ensure accurate readings. Refer to test procedure for individual charging system components for more information.

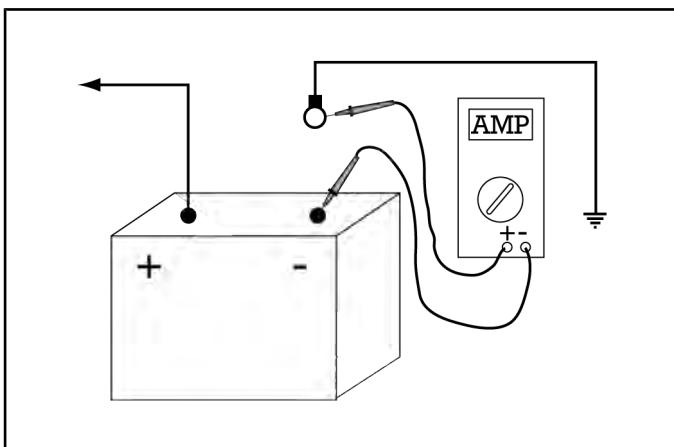


CURRENT DRAIN INSPECTION**IMPORTANT**

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 - All (except Roadmaster), page 7.21.
2. Disconnect ground cable (-) from battery.
3. Set multi meter to read milliamps (mA) and insert meter leads into appropriate jacks. Connect red meter lead to ground cable eyelet and connect black meter lead to battery negative (-) terminal.

**NOTE**

Do not operate electric starter or meter fuse will be damaged.

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.

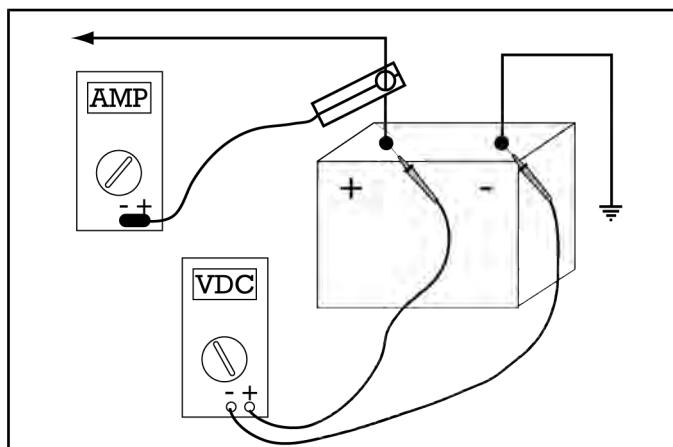
Parasitic Draw Specification (after 12 minutes with power OFF): 4.5 mA

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 (ALL MODELS)**NOTE**

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 - All (except Roadmaster), page 7.21.
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.
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 \pm 25%

7. Increase engine RPM to 2500. The ammeter should rise a slight amount, then stabilize. Volt meter should read above 14 VDC.

ELECTRICAL

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 $14.8 \pm V$ 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 - All (except Roadmaster), page 7.21.

STATOR AC VOLTAGE OUTPUT TEST

NOTE

Set multi meter to VAC (alternating current). Engine cold. Regulator / Rectifier disconnected (2-pin and 3-pin connector). Engine must be running. Be sure to heed the following Warnings and Cautions.

⚠ WARNING

HOT COMPONENTS:

The engine and exhaust system become very hot during operation and remain hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled sufficiently before working on the machine.

⚠ WARNING

CARBON MONOXIDE:

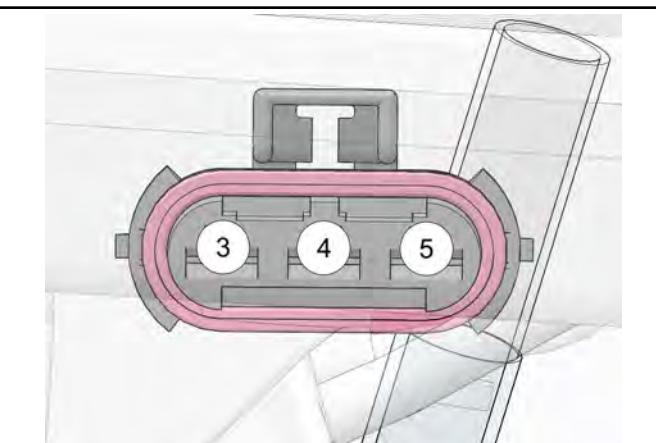
Never run an engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death. If you must run the engine to do some repairs, do so in an open area or with an exhaust evacuation system operating.

CAUTION

VOLTAGE / ARCING:

Use caution not to touch any of the connections or allow the exposed terminals to come close to any other part of the vehicle or other objects, as an arc may occur.

1. Disconnect the 3-pin stator connector.
2. Set multi meter to measure AC Volts.
3. Connect one lead of the multi meter to pin A ③ and one lead to pin B ④ on the 3-pin stator connector.



CAUTION**VOLTAGE / ARCING**

Use caution not to touch any of the connections or allow the exposed terminals to come close to any other part of the vehicle or other objects, as an arc may occur.

4. Start the engine and let it run at idle. Observe the multi meter reading.
5. The meter should indicate the following readings:

No load AC Volts @ 800 RPM:
All Models: **22 VAC ±25%**

6. Repeat test for pins A ③ & C ⑤.
7. Repeat test for pins B ④ & C ⑤.

NOTE

The test results in Steps 6, 7, and 8 can read more than the specified voltage, but it is important that the reading for each pair of wires is approximately equal.

8. Increase RPM to 2000. Repeat Steps 4-7.
9. At 2000 RPM the meter should indicate the following readings:

No Load AC Volts @ 2000 RPM: All Models: **40 VAC ± 25%**

NOTE

The test results obtained in step 10 can read more than the specified voltage, but it is important that they are all approximately equal.

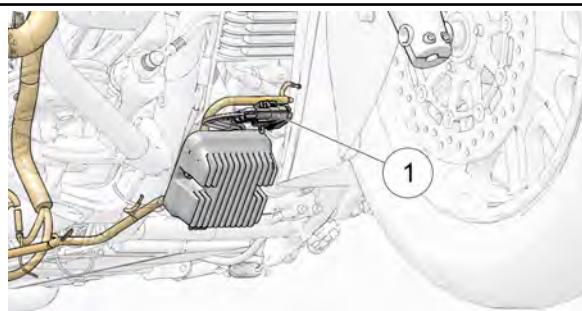
STATOR RESISTANCE TEST**CAUTION**

The engine must not be running while performing the following resistance test.

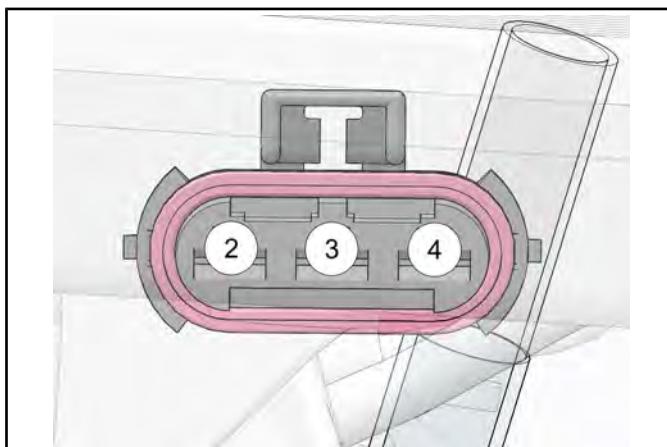
NOTE

Set multi meter to measure resistance. Engine OFF and cold. Regulator Rectifier 3-pin connector unplugged.

1. Disconnect the 3 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 into pin A ② and the other lead into pin B ③ on the stator connector and read resistance value.



Stator Resistance: Less than 1 Ohm

4. Repeat test for pins A ② & C ④.
5. Repeat test for pins B ③ & C ④.
6. If resistance values do not match specification, inspect stator and replace as necessary.

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ELECTRICAL

STATOR WINDINGS TO GROUND INSPECTION

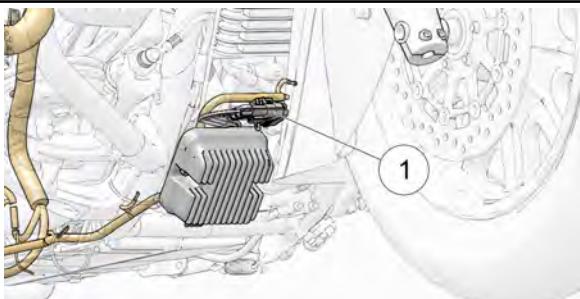
CAUTION

The engine must not be running while performing the following resistance test.

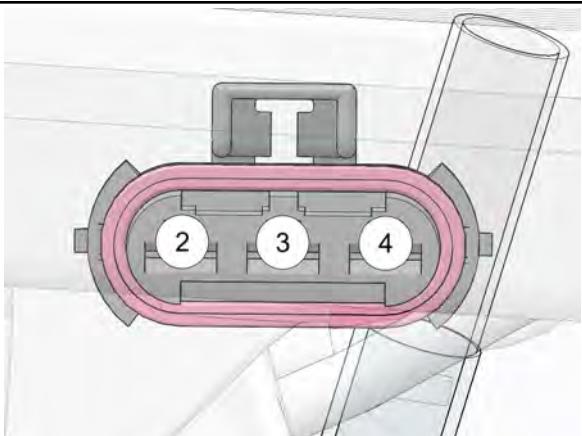
NOTE

Set multi meter to measure resistance. Engine OFF and cold. Regulator Rectifier 3-pin connector unplugged.

1. Disconnect the 3 pin connector ① from stator.



2. Connect one multi meter lead to pin A ② and place the other lead of the multi meter in contact with a good engine ground, observe resistance to ground reading.

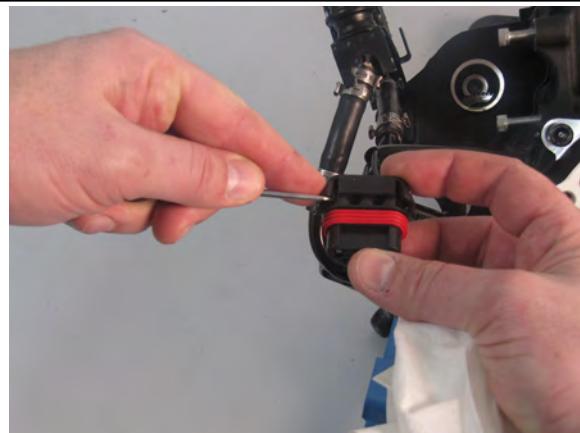


Stator to Ground (-) Continuity Specifications: Open Circuit (OL)

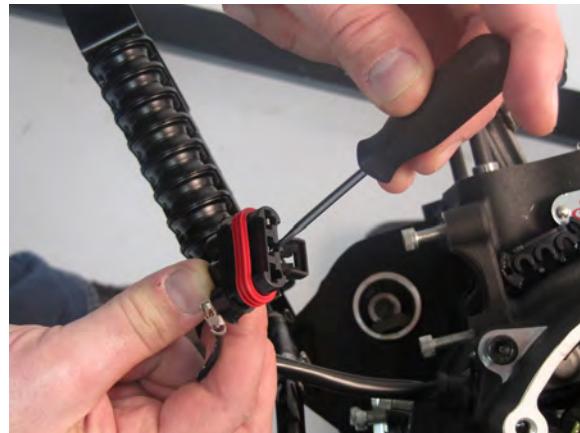
3. Repeat test for other two stator leads ③ & ④ to ground.
4. There should be no connection from stator windings to ground.

STATOR REMOVAL

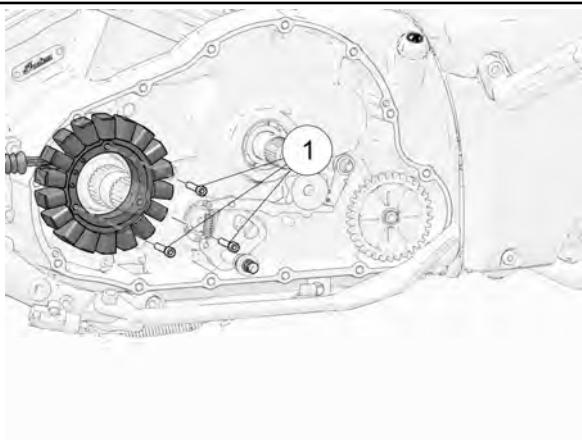
1. Remove primary cover. See Primary Cover Removal, page 5.7.
2. Remove the clutch assembly. See Clutch Removal, page 5.14
3. Remove the torque compensator assembly. See Torque Compensator Removal, page 5.20.
4. Remove the flywheel. See Flywheel Removal, page 5.22
5. Disconnect the stator from the regulator / rectifier.
6. Using a flat head screwdriver or similar tool, remove the terminal retainer from the back of the stator connector.



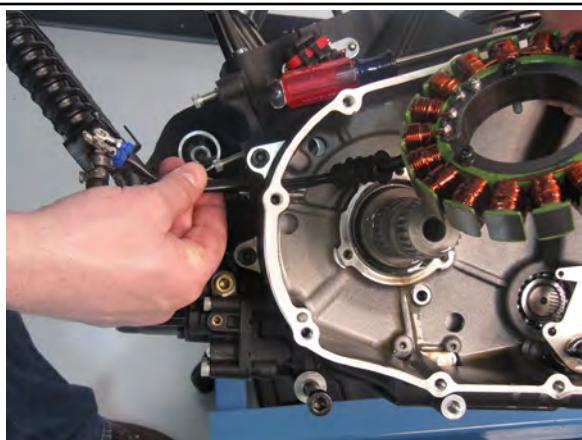
7. Using a terminal tool or pick tool, remove the three electrical terminals from the stator connector.



8. Remove the three fasteners ① from stator.



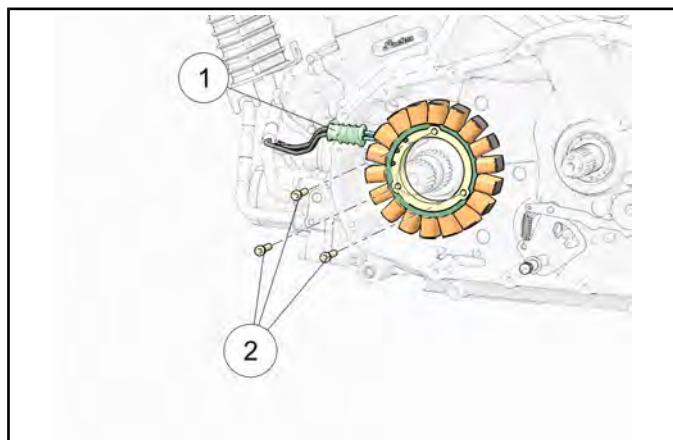
9. Push the rubber harness seal through to the inside of the primary case and remove stator assembly.



STATOR INSTALLATION

The electrical connector must be removed from the stator assembly before it can be installed in the motorcycle. See Stator Removal, page 10.30 for information on connector removal.

1. Feed the stator wires through the hole in the LH engine case and push the rubber harness seal ① through until fully seated.
2. Place stator in position over the crankshaft and install fasteners ②. Torque to specification.



TORQUE

Stator Fasteners: **88 in-lbs (10 Nm)**

3. Press the three wire terminals into the connector housing until there is an audible "click" and the wires cannot be backed out.

NOTE

Wires can be installed into any position on the electrical connector. Charging performance will not be affected.

4. Install the silicone plugs into each of the connector cavities and snap the terminal retaining clip into place.
5. Plug the stator connector into the regulator / rectifier connector.
6. Install the flywheel. See Flywheel Installation, page 5.22.
7. Install the torque compensator. See Torque Compensator Installation, page 5.21.
8. Install the clutch assembly and clutch rack. See Clutch Installation, page 5.19.
9. Install the primary cover. See Primary Cover Installation, page 5.12.

10

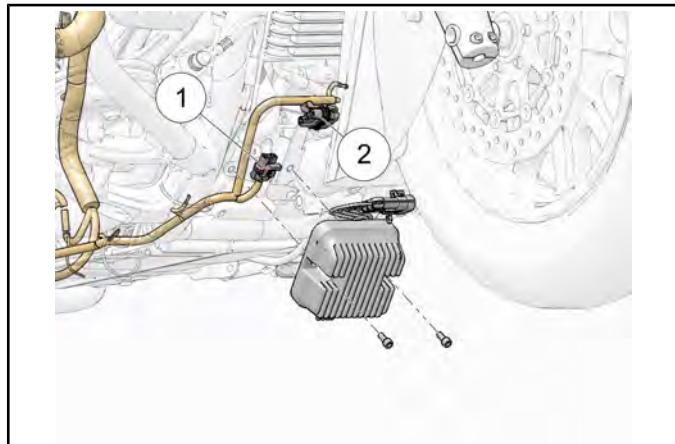
ELECTRICAL

FLYWHEEL REMOVAL

See Flywheel Removal, page 5.22.

RECTIFIER / REGULATOR CONNECTOR INSPECTION

1. Remove the regulator / rectifier assembly. See Rectifier / Regulator Replacement, page 10.33.
2. Disconnect both 2-pin ① and 3-pin connector ②.



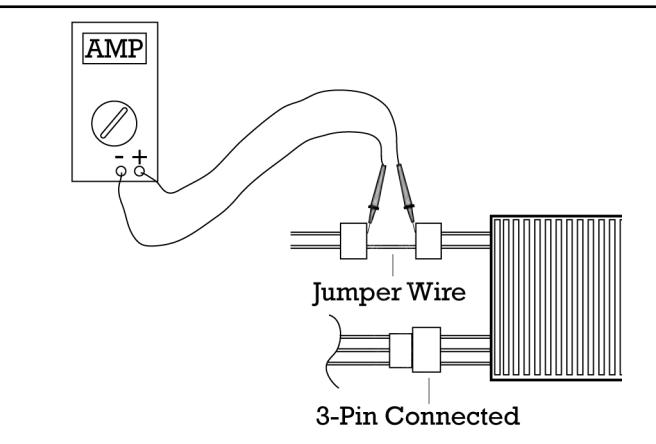
3. Inspect male and female pins in the 3-pin connector and the 2-pin connector carefully. Check for corrosion, loose pins, poor connections, or evidence of overheating or other damage.
4. If the wiring and connectors are undamaged and appear to be clean and tight, inspect the battery, stator, and related wiring. Test the regulator / rectifier for diode leakage.

DIODE LEAKAGE TEST

NOTE

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.



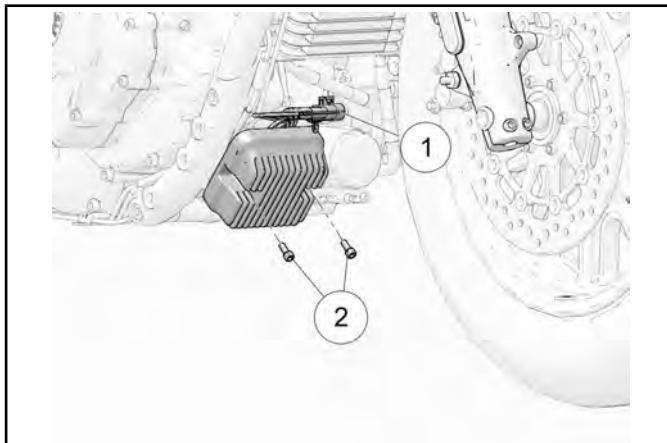
4. Compare leakage to specification below.

Specification:

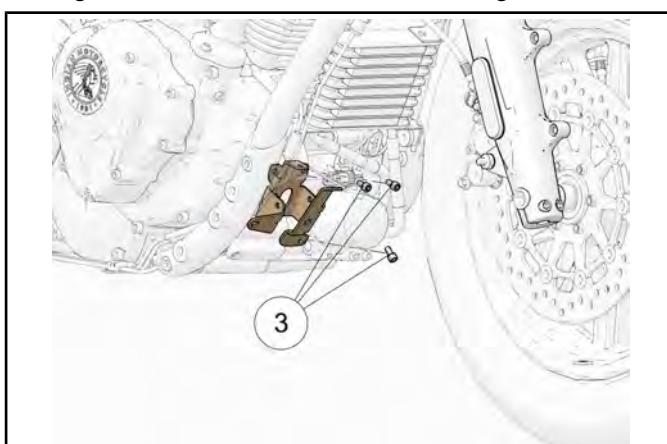
Leakage: Less than 1.0 mA

REGULATOR / RECTIFIER REPLACEMENT

1. Disconnect the stator ① from the regulator / rectifier.
2. Remove the two fasteners ② securing the regulator / rectifier to the bracket.



3. Remove the three fasteners ③ securing the regulator / rectifier bracket to the engine.



4. Noting their position for use during installation, remove the two plastic darts retaining the wiring harness to the regulator / rectifier bracket.
5. Disconnect the regulator / rectifier 2-pin connector from the vehicle harness and remove from vehicle.
6. Remove the regulator / rectifier bracket from vehicle.

10

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

SPECIAL TOOL	PART NUMBER
Electrical Tester Kit	PV-43526
Digital Multimeter	Commercially Available
Inductive Timing Light	Commercially Available

TORQUE SPECIFICATIONS

PART / FASTENER	TORQUE SPECIFICATION
Spark Plug	13 ft-lbs (17 Nm)
Ignition Coil to Bracket	84 in-lbs (10 Nm)

SERVICE SPECIFICATIONS

ITEM	SPECIFICATIONS	
Spark Plug	NGK DCPR8E	
Spark Plug Gap	.034 in (.9 mm)	
Ignition Coil / Cables Resistance Values	Primary	0.3 - 0.6 Ohms ± 20%
	Secondary	See coil test
	Plug Wire (with cap*)	1860 Ohms ± 20%
Crank Position Sensor Resistance	860 Ohms ± 10% @ 68° F (20°C)	

* Spark plug end caps are not removable

TROUBLESHOOTING

BASICS

Before troubleshooting the ignition system, ensure that the engine STOP/RUN switch is in the RUN position, the battery is fully charged, and system related fuses are not open (blown). Check visually for corroded, loose, or broken connections in critical areas (e. g. sensor connector). Check for loose wire pins in the individual sensor connectors and at the ECM (beneath the battery box).

Don't forget the spark plugs!

The Ignition System Troubleshooting flow chart (and the accompanying text) is designed to help you troubleshoot ignition system problems. It will not lead you to faulty or fouled spark plugs. Always inspect spark plug condition *first* (and replace if necessary) when troubleshooting ignition system problems.

Be sure that the spark plugs are the correct heat range and are the correct size specification.

WARNING

Extremely high voltage is present in the ignition system. Do not touch the ignition coil, wires or spark plugs during test procedures.

TEST LEAD ADAPTER KIT

1. Tests in this section may include the testing of voltage and / or resistance at the connectors for various sensor and system components. Use the appropriate test adapter lead when performing these tests at connector pin(s).
2. Forcing an incorrect or oversized probe into a connector may cause inaccurate test results (due to lack of a solid mechanical connection to the terminal). It can also damage the connector being probed or the connector housing, creating another problem which greatly complicates the diagnostic process. Extreme care must be taken not to introduce problems while probing a connector.

Electrical Tester Kit: PV-43526

CAUTION

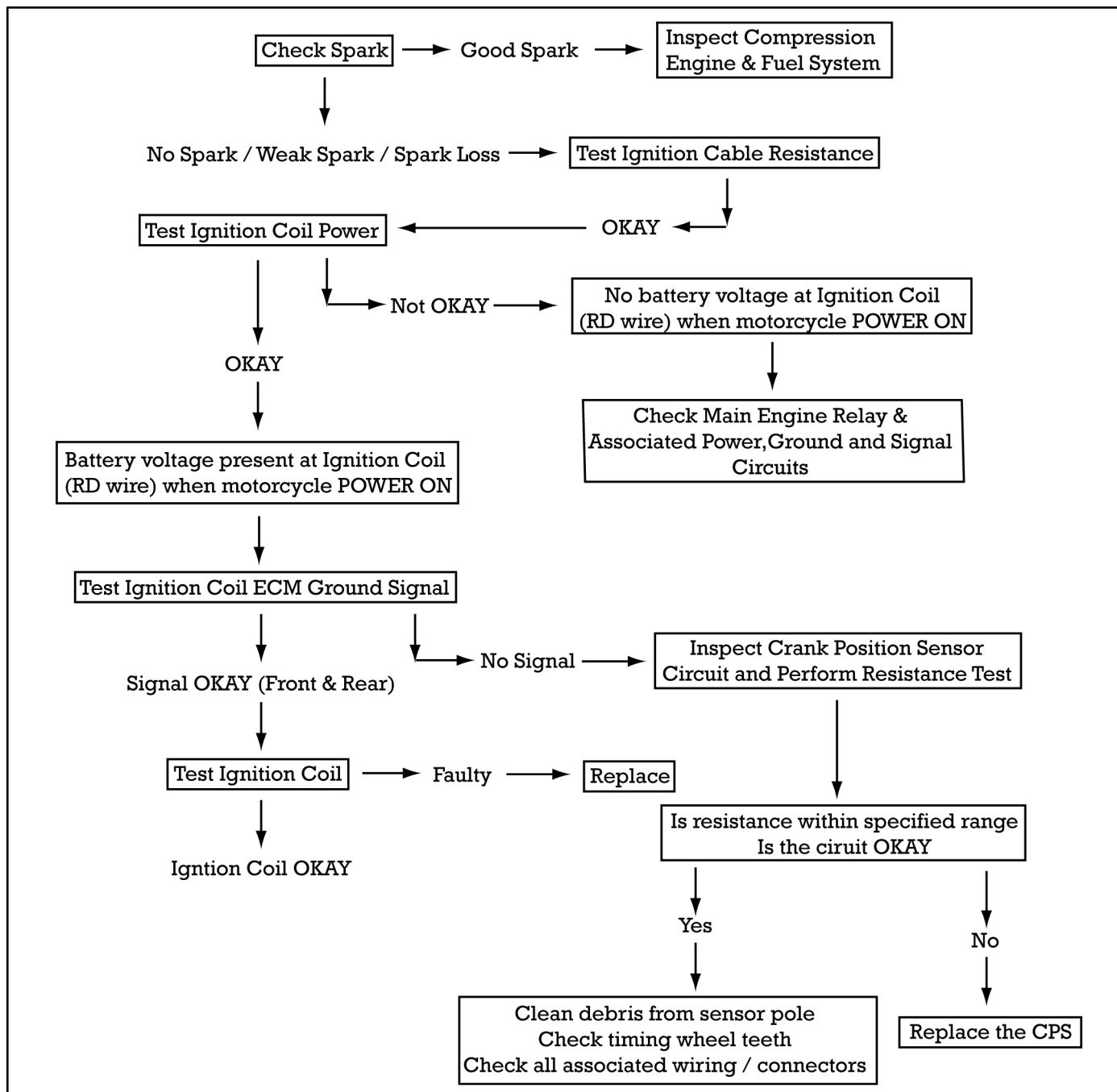
Once the ECM connector has been disconnected, do not touch the pins on the ECM. Static electricity from your body can damage the ECM. Do not attempt to perform tests on the ECM.

ELECTRICAL

ECM CONNECTOR MAP

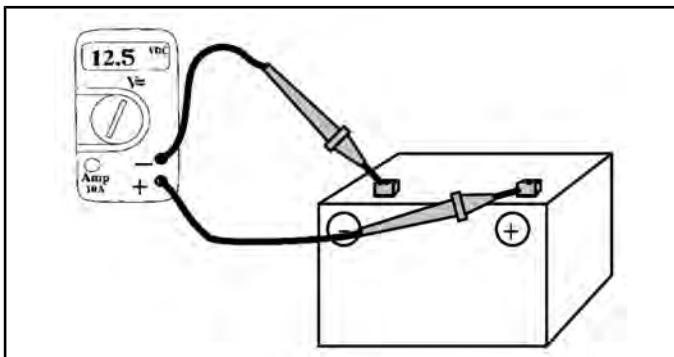
See ECM Connector Map, page 4.24.

IGNITION SYSTEM TEST FLOWCHART



BATTERY VOLTAGE INSPECTION: TEST 1

1. Remove the seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
2. Set multi meter to measure DC Volts.
3. Inspect battery voltage.



4. If the battery voltage is below 12.5 V DC charge or replace the battery with a fully charged battery.

NOTE

When operating the starter with a low battery, the voltage available for the ignition coils can drop below the minimum required to produce spark.

SPARK INSPECTION: TEST 2

1. Connect an inductive timing light to one spark plug wire.
2. Press ON to power up the motorcycle and place the STOP/RUN switch in the RUN position.
3. Shift transmission into neutral and pull in clutch lever.
4. Depress starter button and observe timing light.
5. Determine if timing light flashes without interruption for both cylinders.
6. Consistent flashes indicate that some secondary voltage is present. The likelihood of an ignition related problem is reduced but not eliminated. Keep the following points in mind:
 - There is a threshold voltage and amperage requirement for timing lights below which they will not trigger and therefore, not flash.
 - Fouled spark plugs may drop secondary voltage so low that a timing light will not trigger and therefore, not flash.
 - With no current flowing (open secondary side of the ignition coil) the timing light will not flash.
 - A faulty high tension lead (plug wire) or poor connection is one example of an open secondary.
7. Replace spark plugs, connect plug wires and re-test.

8. If timing light does not flash consistently for one or both cylinders, test high tension leads (Test 3).

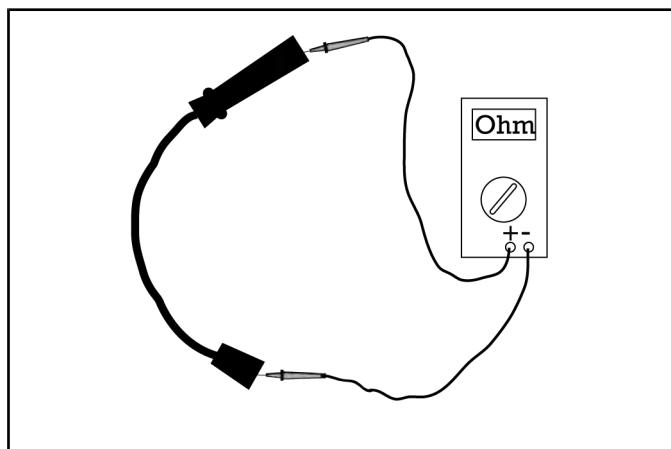
IGNITION CABLE RESISTANCE: TEST 3

1. Remove high tension leads by pulling firmly on the boots at the coil and spark plug. DO NOT pull on the wire or it may become permanently damaged.

NOTE

The plug caps or coil ends are NOT removable. Wire must be replaced as an assembly.

2. Test each high tension lead with an ohmmeter and compare to specification. Move wire to detect internal breaks or poor connections at terminal ends.



High Tension Lead Resistance: $1860\Omega \pm 20\%$

ELECTRICAL

IGNITION COIL POWER & GROUND SIGNAL TEST 4

Power To Ignition Coil

Battery voltage must be present at the ignition coil (Pin B) when the power button is switched on and the electrical system powered up.

1. Disconnect the electrical connector from the ignition coil. See Ignition Coil Removal / Installation, page 10.40.
2. Set the multi meter to measure VDC and insert the meter leads into the appropriate jacks.
3. Connect the black lead to ground (on the engine).
4. Connect a small thin test adapter lead to the center terminal of the ignition coil primary connector and the red meter lead to the test adapter.
5. Press the power button to power up the motorcycle electrical system and place the STOP/RUN switch in the RUN position.
6. Battery voltage should appear on the center terminal of the coil connector (RD wire).
7. With transmission in Neutral, crank the engine. Battery voltage should again be present on center wire.

Ignition Coil Ground Signal

The following steps will test the ECM (Ground) Signal To Ignition Coil

ECM ground signal must be present at each of the outer terminals of the ignition coil primary harness connector. The signal will appear as a pulse on the meter between Ground (-) and Open (OL).

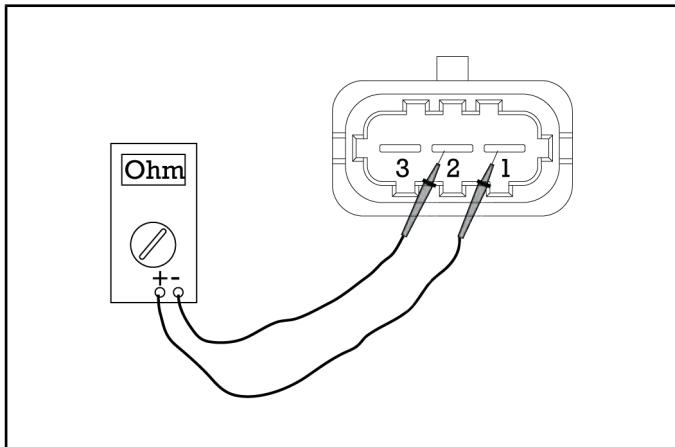
8. Set the multi meter to measure resistance (Ω).
9. Place a small thin test adapter into one of the outer terminals of the ignition coil connector (either the WH or BK wire) and connect one meter lead to the test adapter..
10. Ground the other lead to the engine.
11. Place transmission in Neutral.
12. Press the power button 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).

IGNITION COIL RESISTANCE: TEST 5**Ignition Coil Primary Winding**

1. Remove ignition coil. See Ignition Coil Removal / Installation, page 10.40.
2. Set the multi meter to measure resistance (Ω) and insert the meter leads into the appropriate jacks.
3. Measure resistance between terminal 3 and terminal 2 on the coil. Compare to specification.
4. Measure resistance between terminal 1 and terminal 2 on the coil. Compare to specification.

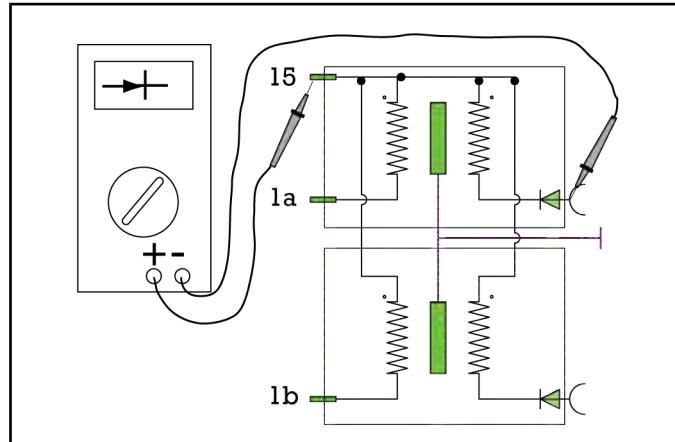


Primary Coil Resistance: 0.4–0.6 Ω

Ignition Coil Secondary Windings

5. Remove ignition coil. See Ignition Coil Removal / Installation, page 10.40.
6. Select DIODE CHECK function on the multi meter.
7. Place red meter lead on terminal 2 (center) of coil primary and black lead on secondary terminal and record.
8. Move black DMM lead to the other secondary terminal and record. (Reading should be the same for both secondary windings).

9. Repeat measurements on each secondary coil with meter leads reversed.

**NOTE**

Diode inside the secondary coil requires the Diode Check function of multi meter.

**Secondary Coil Resistance: 2.0–2.5 VDC
or
Open Line (OL) with leads reversed**

10. Compare readings to specification. Resistance should be low with leads one way and OL with leads reversed.

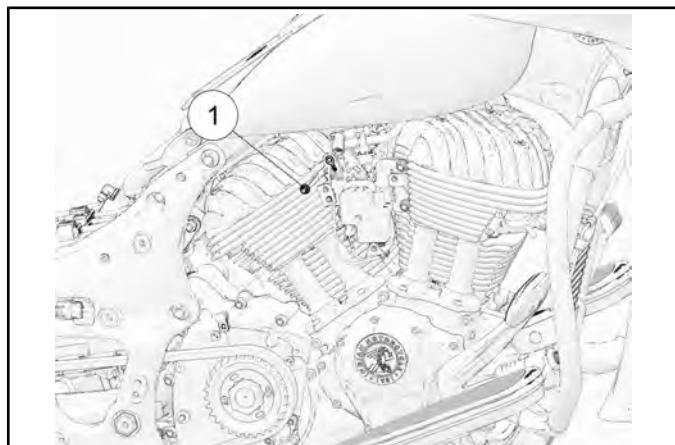
CRANKSHAFT POSITION SENSOR (CPS) RESISTANCE INSPECTION:

See Crankshaft Position Sensor, Test / Replace, page 4.50.

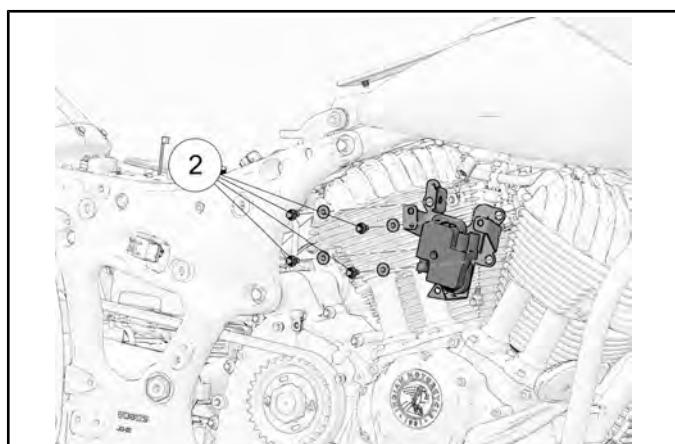
ELECTRICAL

IGNITION COIL REMOVAL / INSTALLATION

1. Verify that motorcycle is not powered up and the STOP / RUN switch is in the OFF position.
2. Remove the horn assembly. See Horn Removal / Installation, page 10.56.
3. Remove the ignition cables from the coil and disconnect the electrical connector from the coil.
4. Remove the ground wire ① from the coil bracket.



5. Release harness retainer from coil bracket.
6. Using a 10mm socket, remove the four fasteners ② securing the coil bracket to the engine and remove the coil assembly.



7. **INSTALLATION** of the ignition coil is performed by reversing the removal procedure. Torque fasteners to specification.

TORQUE

Coil Ground to Bracket: 84 in-lbs (10 Nm)
Ignition Coil to Bracket: 84 in-lbs (10 Nm)

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. 10A jack for current readings). Refer to the Owner's Manual included with your meter for more information.
- Pay attention to the prefix on the multimeter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate the component to be tested. Disconnect it from the wiring harness or power supply.

TORQUE SPECIFICATIONS

PART DESCRIPTION	TORQUE SPECIFICATION
Head Light Bezel (Chieftain / Roadmaster)	36 in-lbs (4 Nm)
Head Light Retaining Ring	12 in-lbs (1 Nm)
Horn to Bracket Nut	84 in-lbs (10 Nm)
Ignition Cover	84 in-lbs (10 Nm)
License Plate Bracket to Tail Light	84 in-lbs (10 Nm)
License Plate Light	15 in-lbs (2 Nm)
Tail Light Fastener	84 in-lbs (10 Nm)
Turn Signal Fastener	18 ft-lbs (24 Nm)
Turn Signal, Front (Chieftain / Roadmaster)	36 in-lbs (4 Nm)
VCM Mounting Plate	84 in-lbs (10 Nm)

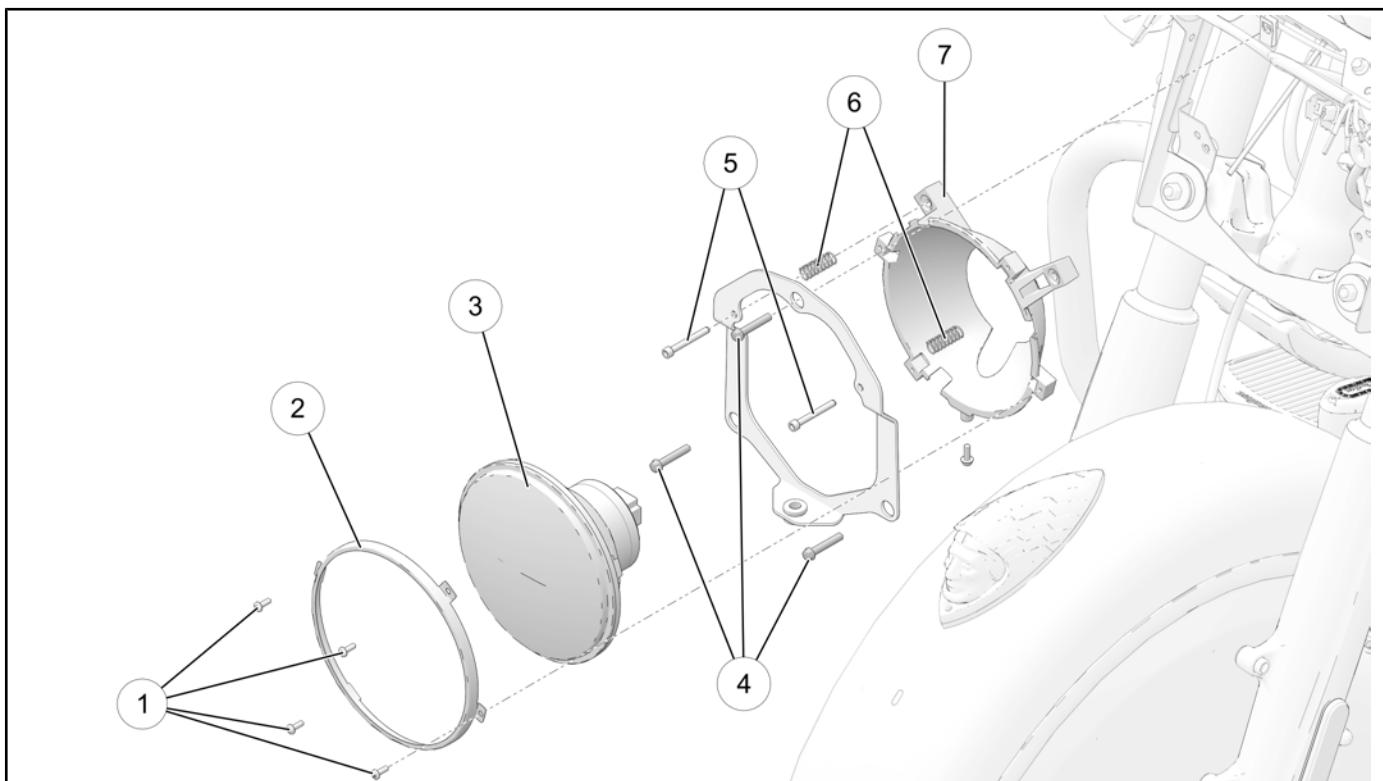
SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Battery Tester	PV-50296
Electrical Tester Kit	PV-43526
Smartlink Module Kit	PU-47471
TPMS Activation Tool	PF-51288
USB to Serial Adapter	PU-50621

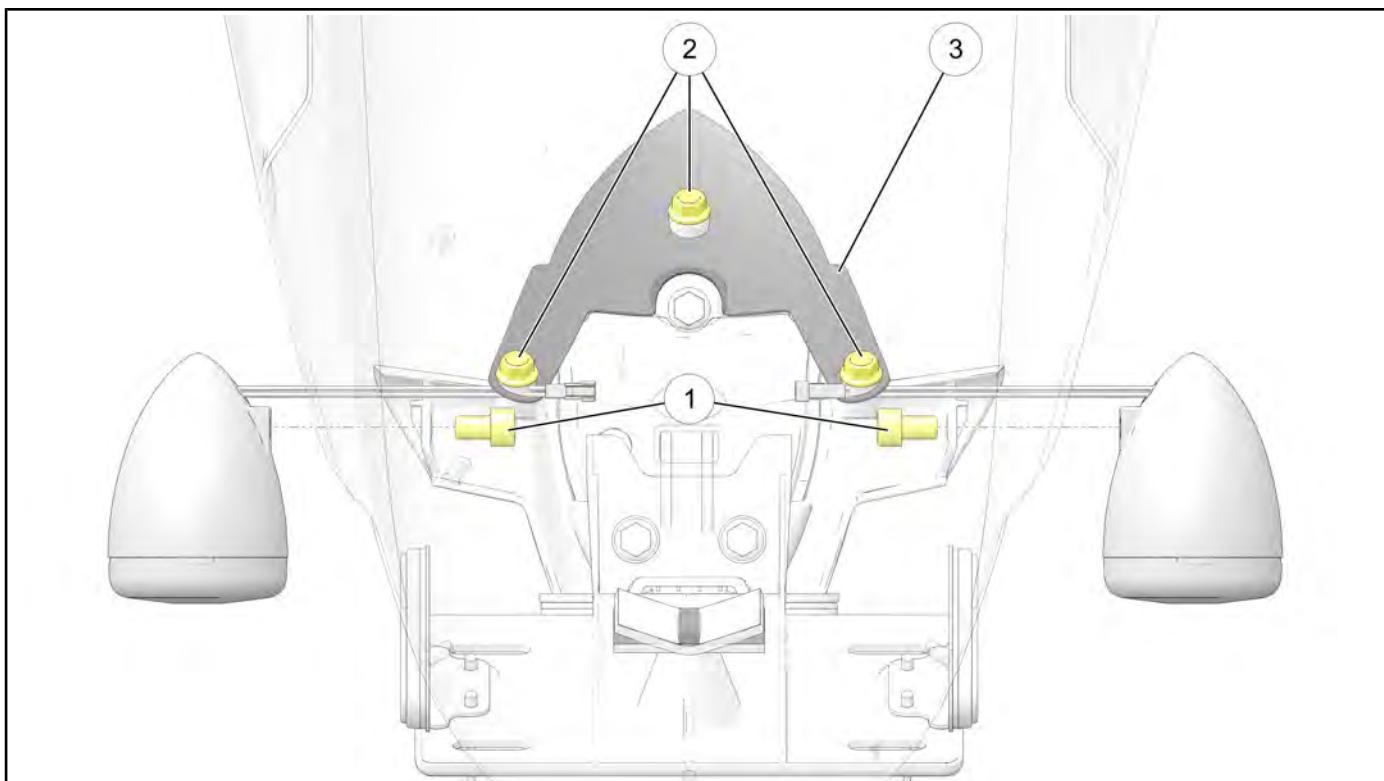
ELECTRICAL

ASSEMBLY VIEWS

HEAD LIGHT



NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Retaining Ring (QTY.4)	12 in-lbs (1 Nm)
②	Retaining Ring	-
③	Head Light Housing	-
④	Fastener, Head Light Mount	NA
⑤	Fastener, Adjuster	NA
⑥	Spring, Adjuster	-
⑦	Head Light Carrier	-

TAIL LIGHT / LICENSE PLATE LIGHT

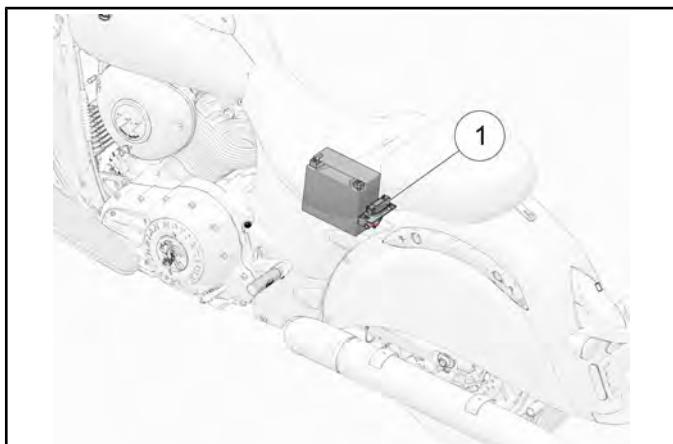
NUMBER	PART DESCRIPTION	TORQUE (IF APPLICABLE)
①	Fastener, Turn Signal — M8 x 1.25 x 12 (QTY.2)	18 ft-lbs (24 Nm)
②	Fastener, Tail Light Asm — M6 x 1.0 x 10 (QTY.3)	84 in-lbs (10 Nm)
③	Pad, Tail Light Bezel	-

FUSE BOX

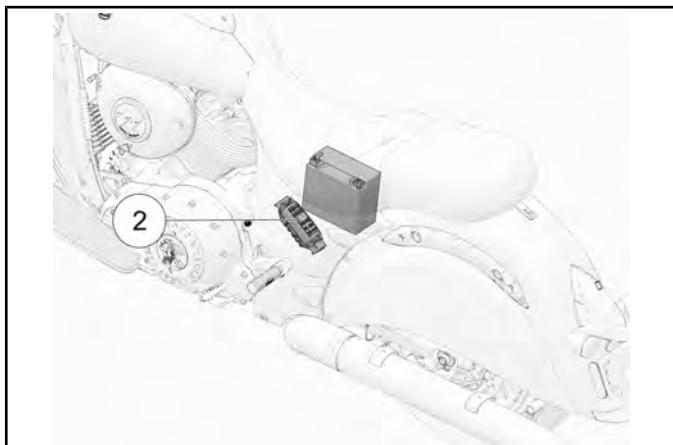
FUSE BOX LOCATION

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

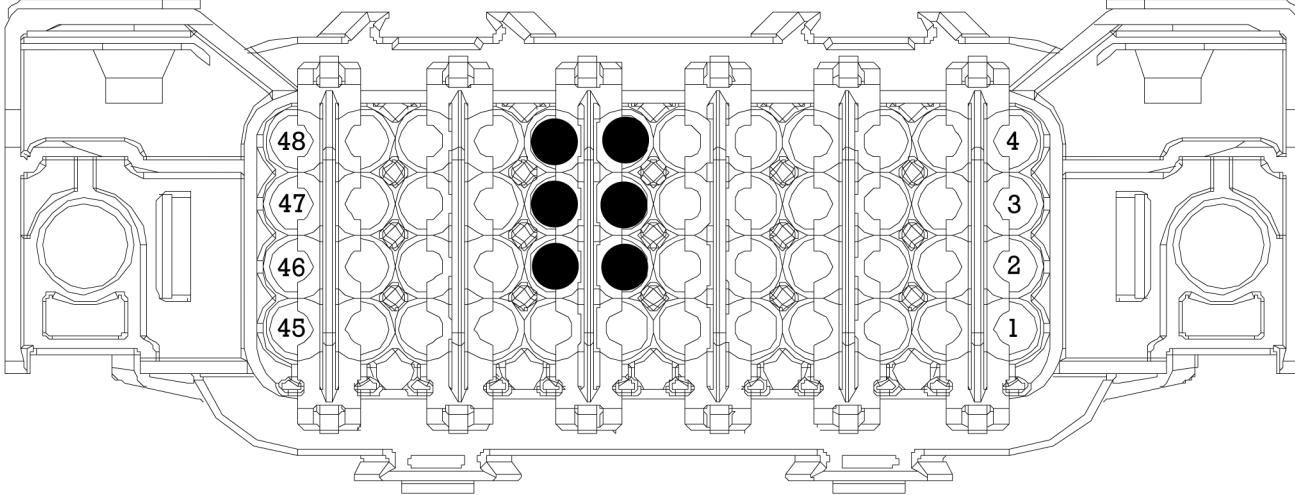
- The J-Case fuse box ① which is located on the rear of the battery box.



- The main fuse box ② which is located beneath the LH upper side cover.



FUSE APPLICATION CHART



15A Rr Radio	15A Fr Radio		Switched Power Relay	Sec Engine Relay	Fuel Pump Relay
5A Gauge	10A Swt'd Pwr				
20A Aux Swd	10A Sec Eng		Aux SW Power Relay	Start Relay	Main Engine Relay
15A Aux Const	20A Main Eng	10A VCM Ctrl			

PIN	CIRCUIT DESCRIPTION	FROM	TO
1	Engine Breaker Output	Fuse Box	Splice (ENGBRK)
2	Engine Relay Power Output	Fuse Box	Splice (ENGPWR)
3	Engine Relay Power Output	Fuse Box	Splice (ENGPWR)
4	Fuel Pump Power	Fuse Box	Fuel Pump
5	Engine Breaker Output	Fuse Box	Splice (ENGBRK)
6	Main Engine Relay Control	Fuse Box	Splice (E115)
7	Run / Stop Switch Power	Fuse Box	Splice (ENGBRK)
8	Fuel Pump Relay Control	ECM 1	Fuse Box
9	Engine Relay Power Output	Fuse Box	Splice (ENGPWR)
10	Starter Solenoid Control	Fuse Box	Starter Solenoid
11	Chassis Fuse Power Output	Fuse Box	Splice (CHPWR)
12	Auxiliary Engine Relay Power Output	Fuse Box	Splice (AUXENG)
13	Engine Relay Power Output	Splice (ENGPWR)	Fuse Box
14	Starter Relay Control	ECM 1	Fuse Box
15	Chassis Fuse Power Output	Fuse Box	Splice (CHPWR)
16	Main Engine Relay Control	Fuse Box	Splice (E115)
17	Auxiliary Engine Relay Power Output	Fuse Box	Splice (AUXENG)

ELECTRICAL

PIN	CIRCUIT DESCRIPTION	FROM	TO
18	Accessory Switched Output	Fuse Box	Splice (ACCSW)
19	Switched Power Control	VCM A	Fuse Box
20	Switched Power	Fuse Box	Fuse Box
21	Auxiliary Switched Fuse Output	Fuse Box	Fuse Box
22	Auxiliary Switched Relay Control	ECM 1	Fuse Box
23	VCM Accessory Power Output	Fuse Box	Splice (VCMACC)
24	Ground	Splice (GND2)	Fuse Box
25	Main Fuse Output	Splice (MPWR)	Fuse Box
26	Not Used	—	—
27	Not Used	—	—
28	Not Used	—	—
29	VCM Power Control	VCM B	Fuse Box
30	Not Used	—	—
31	Not Used	—	—
32	Not Used	—	—
33	Main Fuse Output	Fuse Box	Splice (MPWR)
34	Main Fuse Output	Fuse Box	Splice (MPWR)
35	Main Fuse Output	Fuse Box	Splice (MPWR)
36	Main Fuse Output	Fuse Box	Splice (MPWR)
37	Engine Breaker Output	Fuse Box	Splice (ENGBRK)
38	Chassis Fuse Output Power	Fuse Box	Splice (CHPWR)
39	Switched Power	Fuse Box	Fuse Box
40	Radio Fuse Output Power	Fuse Box	Fairing
41	Main Fuse Output	Splice (MPWR)	Fuse Box
42	Main Fuse Output	Splice (MPWR)	Fuse Box
43	Main Fuse Output	Fuse Box	Splice (MPWR)
44	Main Fuse Output	Fuse Box	Splice (MPWR)
45	Accessory Constant Fuse Output	Fuse Box	Splice (ACCCONST1)
46	Auxiliary Switched Fuse Output	Fuse Box	Fuse Box
47	Instrumentation Fuse Output	Fuse Box	Speedometer
48	Trunk Amp Power	Fuse Box	Trunk

VEHICLE CONTROL MODULE (VCM)

VEHICLE CONTROL MODULE (VCM) SERVICE NOTES

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.

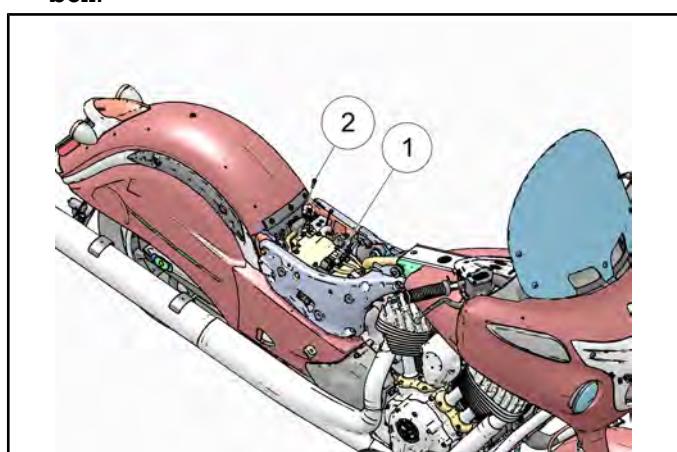
ELECTRICAL

VEHICLE CONTROL MODULE (VCM), REMOVAL / INSTALLATION

CAUTION

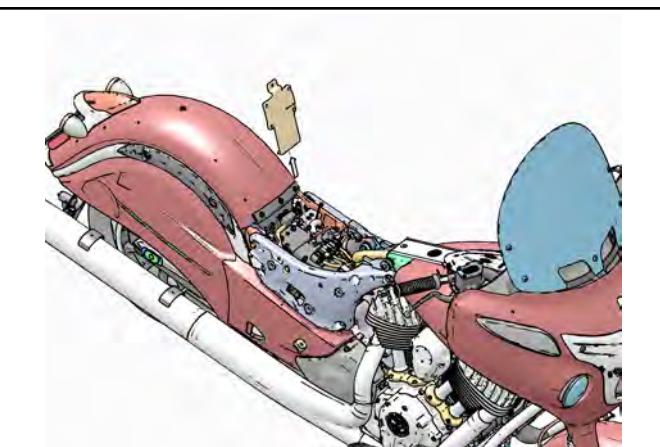
The negative battery cable MUST be disconnected before the VCM can be removed.
Electrical tape can be used to cover the negative battery terminal and cable end to prevent a short from occurring across the VCM during removal.

1. Connect to vehicle using Digital Wrench.
2. Using Digital Wrench, access and record the Key Fob number.
3. Record the 4 digit consumer PIN (as provided by the consumer).
4. Remove seat. See Seat Removal / Installation - All (except Roadmaster), page 7.21.
5. Using a 5mm hex wrench, remove the bolt ② securing the VCM mounting plate to the battery box.



6. Disconnect the negative battery cable.
7. Disconnect the three multi-plugs ① from the VCM.

8. Lift the VCM / mounting plate assembly from the rear and disengage hinge pins from the battery box to remove.

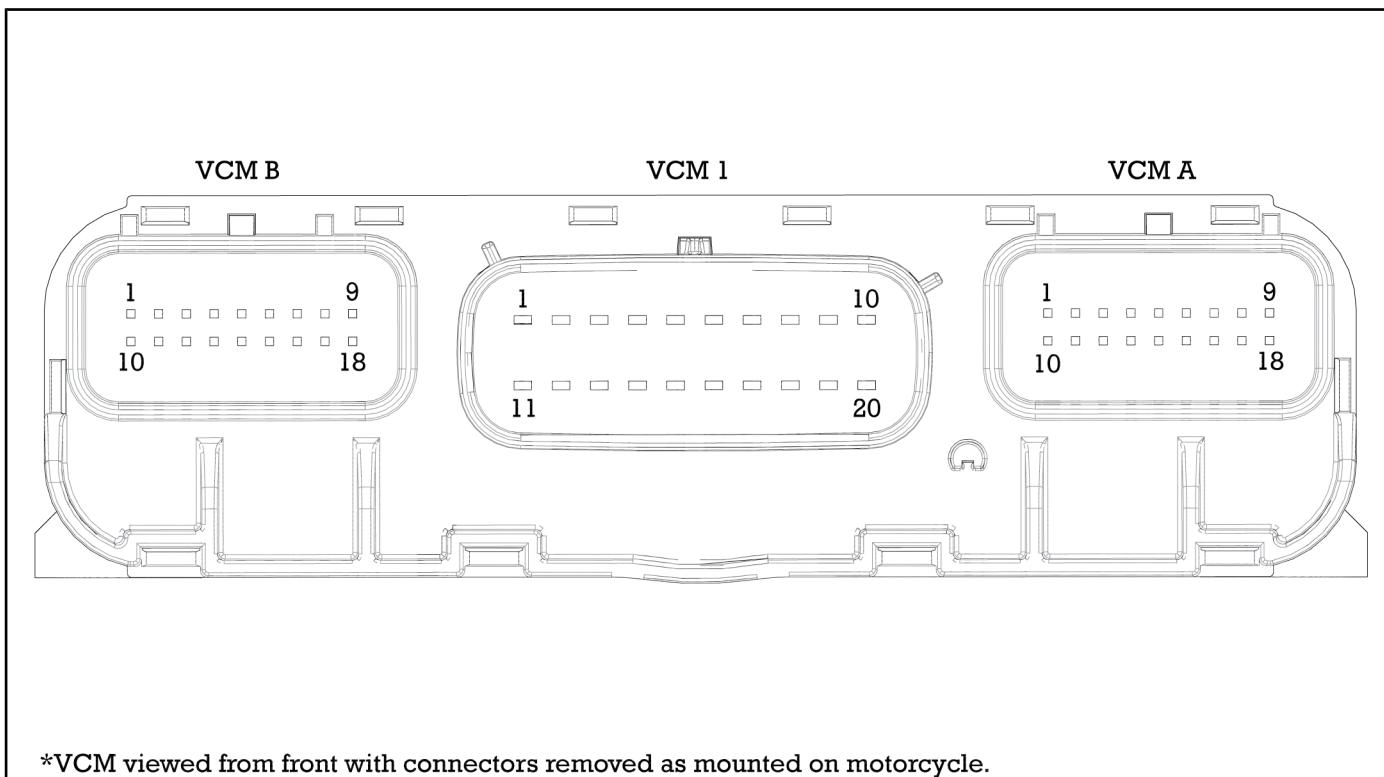


9. **INSTALLATION is performed by reversing the removal procedure.**
10. Torque the VCM mounting fastener to specification.

TORQUE

Vehicle Control Module Mounting Plate Fastener: **84 in-lbs (10 Nm)**

11. Reconnect to vehicle using Digital Wrench.
12. Using Digital Wrench, program the Key Fob number.
13. Set a new consumer PIN.
14. Record the new Master PIN by uploading a new Service Report.
15. **Chieftain / Roadmaster ONLY:** Initialize / reactivate the TPMS sensors.
16. Test ride the vehicle to verify all systems are operating correctly.

VCM CONNECTOR MAP**Connector: VCM A**

PIN NUMBER	WIRE COLOR	FUNCTION
1	YE/WH	START SWITCH OUTPUT
2	BU/WH	BAG UNLOCK
3	BU/DG	BAG LOCK
4	VT/YE	IGNITION SWITCH SIGNAL
5	WH	NOT USED
6	-	-
7	WH	NOT USED
8	YE	CAN HIGH
9	DG	CAN LOW
10	PK	NOT USED
11	OG/YE	SWITCHED POWER CONTROL
12	GY/RD	AUX LIGHT SWITCH INDICATOR LIGHT
13	BU/RD	HEATED GRIP SWITCH OUTPUT
14	-	-
15	-	-
16	-	-
17	YE/BK	TRANS GEAR POSITION SENSOR OUTPUT
18	BK	NOT USED

Connector: VCM 1

PIN NUMBER	WIRE COLOR	FUNCTION
1	YE	HIGH BEAM OUTPUT
2	DG	LOW BEAM OUTPUT
3	PK	HEATED GRIPS OUTPUT
4	WH	HORN POWER
5	RD	VCM POWER
6	GY/DB	WINDSHIELD MOTOR A
7	GY/DG	WINDSHIELD MOTOR B
8	OG/WH	LOCK B SIGNAL
9	RD/WH	LOCK A SIGNAL
10	-	-
11	RD	VCM POWER
12	DG/RD	LH AUX LIGHT POWER
13	DG/BN	RH AUX LIGHT POWER
14	BN/WH	NOT USED
15	-	-
16	-	-
17	BK	VCM GROUND
18	-	-
19	-	-
20	RD	VCM POWER

Connector: VCM B

PIN NUMBER	WIRE COLOR	FUNCTION
1	RD/YE	VCM CONTROL POWER
2	WH/BK	MODE SWITCH 1
3	GN	MODE SWITCH 2
4	GY	HORN SWITCH OUTPUT
5	DG/YE	HEADLIGHT CONTROL
6	DG/BK	AUX LIGHT SWITCH OUTPUT
7	DB/BK	HAZARD SWITCH OUTPUT
8	YE/BD	OIL PRESSURE SWITCH
9	BK	NOT USED
10	OG	CRUISE CONTROL ON/OFF SWITCH OUTPUT
11	WH	CRUISE CONTROL SET/ACCEL SWITCH
12	WH/DG	CRUISE CONTROL RESUME / DECEL SWITCH
13	BU/YE	HEATED GRIP SWITCH INCREASE
14	BU/BK	HEATED GRIP SWITCH DECREASE
15	YE/DG	LEFT TURN SIGNAL CONTROL
16	BN	RIGHT TURN SIGNAL CONTROL
17	BN/DB	WINDSHIELD SWITCH UP
18	DG/DB	WINDSHIELD SWITCH DOWN

HEADLIGHT SERVICE**HEADLIGHT BULB REPLACEMENT - ALL MODELS****IMPORTANT**

Avoid touching a halogen bulb with bare fingers. Oil from your skin leaves a residue, causing a hot spot that will shorten the life of the bulb. If a bulb is touched, clean it thoroughly with denatured alcohol.

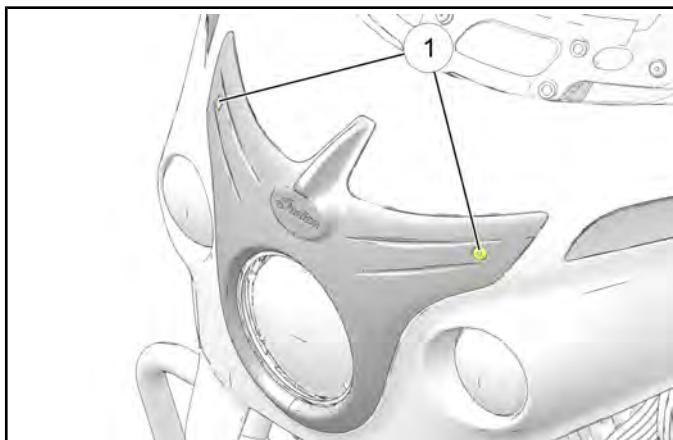
Chief Classic / Chief Vintage / Chief Dark Horse / Springfield**NOTE**

It is not necessary to remove the headlight nacelle to replace the headlight bulb on **Chief Classic / Chief Vintage / Chief Dark Horse / Springfield** models.

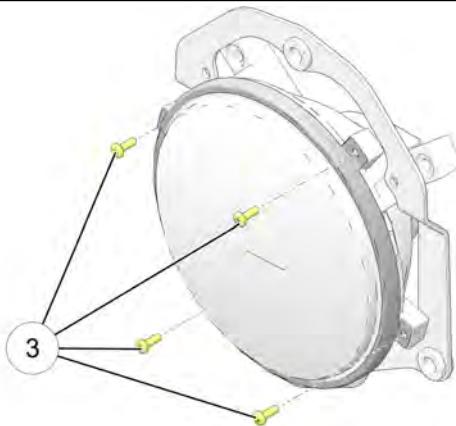
1. Turn handlebar all the way to the left.
2. Reach in the space between the head tube and nacelle to remove bulb and disconnect.
3. Using a clean, oil-free cloth, replace the headlight bulb.

Chieftain Dark Horse / Chieftain / Roadmaster

1. Remove two fasteners ① and head light bezel.



2. Remove fasteners ③ . Remove headlight retaining ring and withdraw the reflector assembly far enough to remove bulb.



3. Remove the headlight bulb from the reflector and unplug.
4. Using a clean, oil-free cloth, install the new headlight bulb.
5. **Reverse removal procedure to install.**
6. Torque all fasteners to specification upon reassembly.

TORQUE

Headlight Retaining Ring Fasteners: 12 in-lbs (1 Nm)
Bezel Fasteners: 36 in-lbs (4 Nm)

HEADLIGHT WARNING INDICATORS

Indian motorcycles are equipped with "tell tales" indicating when a fault occurs with the low or high beam headlight.

2014 models: If a fault occurs with the headlight bulb (low or high beam) the 'Check Engine' light will illuminate and fault codes will be stored. Once the bulb has been replaced and the issue corrected, the 'Check Engine' light will turn off however stored fault codes will need to be erased.



2015 and later models: If a fault occurs with the headlight bulb (low or high beam) the high beam indicator light will flash on the instrument cluster. Once the bulb has been replaced and the issue corrected, the high beam indicator will return to normal operation.



HORN SERVICE

GENERAL OVERVIEW

The horn uses a load-sensing circuit for diagnostic purposes. The VCM sends a 12V pull-up voltage to the horn through the WH wire.

- With the horn disconnected, you should see 12V at the horn connector when checked with a DVOM.
- When the horn is connected, the 12V pull-up goes away.
- The horn circuit is a Normally Open circuit, so depressing the horn provides the VCM a path to ground. The VCM responds by sending 12V to the horn making it sound.

LOAD SIDE TESTING

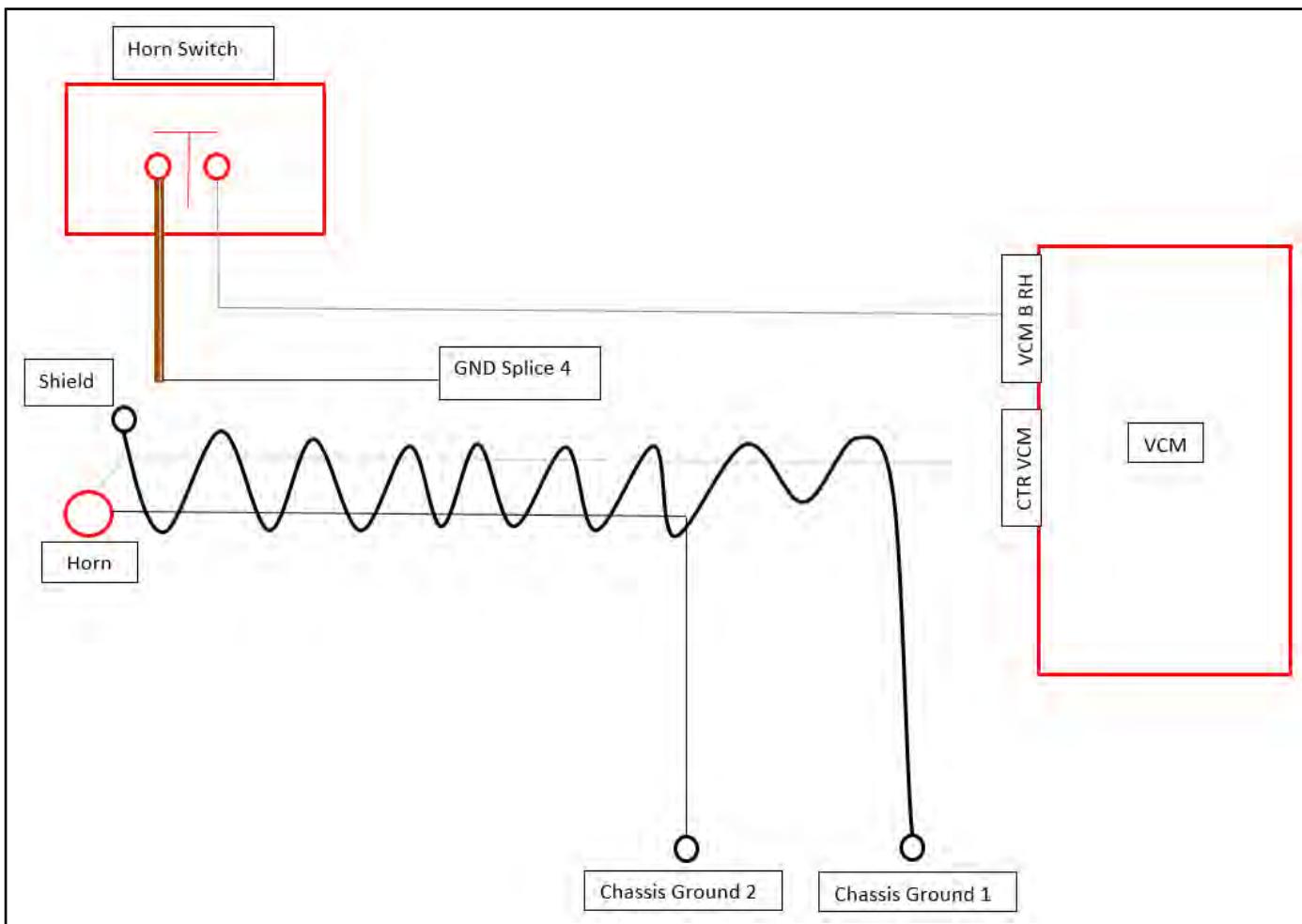
12 VDC is supplied to the WH wire.

- With the horn disconnected, Use a DVOM to probe the WH wire at the connector and chassis ground. Voltage reading should be 12V.
- Connect the horn and probe the WH wire at the connector and chassis ground. Voltage reading should be 0V.
- Resistance from the horn connector BK to GND should be 0.2 Ohms.
- Resistance from the WH wire to the VCM should be 0.2 Ohms.
- With the horn connected, probe the BK and WH wires. Depress the horn. Voltage reading should be 12V.

SWITCH SIDE TESTING

8 VDC is supplied on the Gray wire to the horn button.

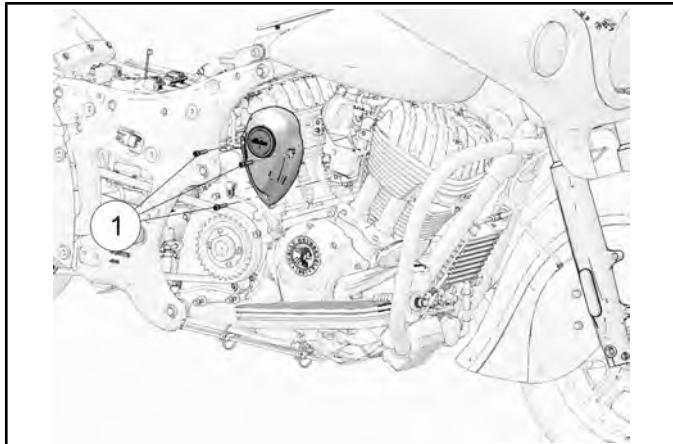
- Voltage should read 0.005 when the button is depressed.
- Digital Wrench can see button switch open and close.
- With the VCM connected, bypass the switch by providing the GY wire a direct path to ground. The horn should sound until the ground path is removed.

HORN BREAKOUT DIAGRAM

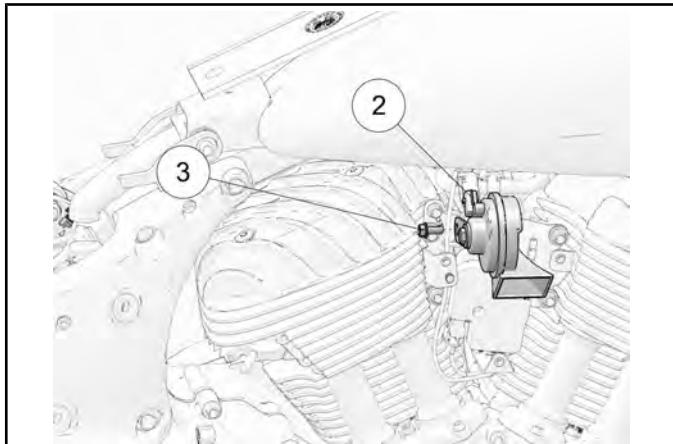
ELECTRICAL

HORN REMOVAL / INSTALLATION

1. Remove the three fasteners ① securing the horn cover to the bracket and remove cover.



2. Disconnect the horn electrical connector ②.
3. Using a 10mm wrench, remove the fastener ③ securing the horn to the ignition coil bracket. Remove the horn.



4. Installation is performed by reversing the removal procedure.
5. Torque fasteners to specification.

TORQUE

Horn to Bracket: **84 in-lbs (10 Nm)**

TORQUE

Ignition Coil Cover: **84 in-lbs (10 Nm)**

TAIL LIGHT SERVICE

LED TAIL / BRAKE LIGHT OPERATION

The multiple LED tail / brake lamp functions much like a conventional incandescent tail / brake lamp. LED lights require a regulated current supply to prevent damage, so a current regulation circuit is incorporated inside the tail lamp unit. Direct 12 volt battery power can be applied directly to the brake or tail lamp wire for testing purposes, but polarity MUST be observed or the LEDs will be permanently damaged.

Tail / Brake Light Power Supply:

When the motorcycle is powered ON, battery voltage is delivered to the TAIL / BRAKE LEDs on the DARK BLUE / PINK wire from the Secondary Engine Relay. Current through each TAIL LED (WHITE wire) is limited (inside tail lamp unit) to approximately 250 mA.

Tail / Brake Light Ground Signal:

The front and rear brake light switches provide a path to ground to the ECM via WHITE / RED wire (front brake switch) and YELLOW / VIOLET wire (rear brake switch). When the ECM receives a grounding signal from either of the brake switches, ground is provided to the tail / brake light LED, thus illuminating the light.

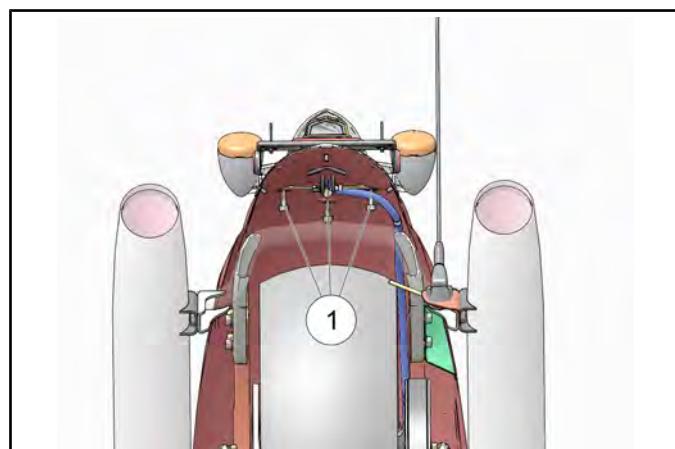
When the motorcycle is powered ON, the ECM provides a ground path to the tail light LED, thus illuminating the light.

TAIL / BRAKE / LICENSE PLATE LIGHT, REMOVAL / INSTALLATION

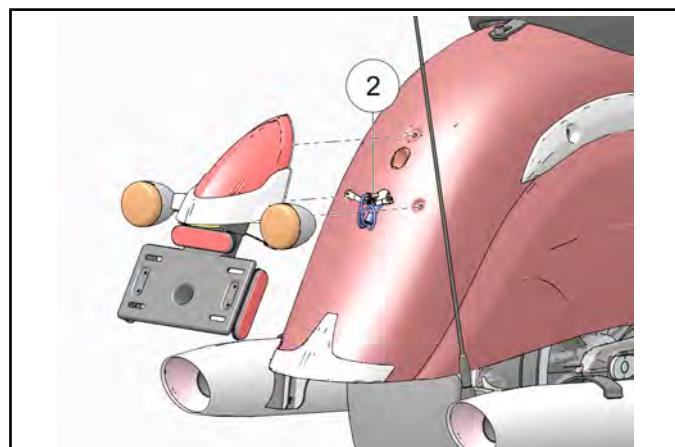
NOTE

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. Place the motorcycle in an upright position with the front wheel clamped in a wheel vise.
2. Working from beneath the rear fender, access the three tail light fasteners ① and remove.



3. Lift the tail light assembly off of the rear fender and disconnect the electrical connectors ② noting their position for reassembly.



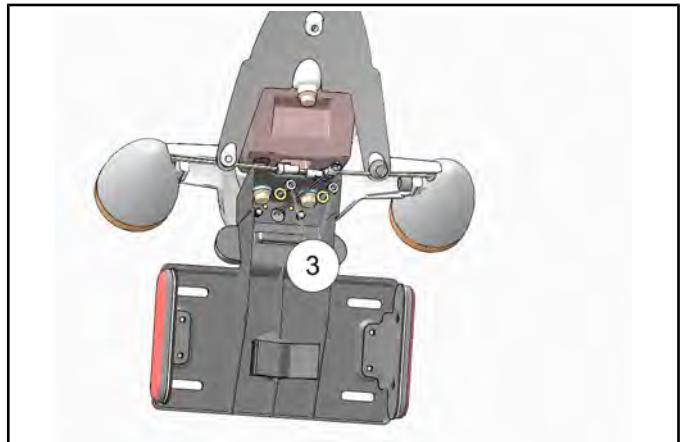
4. Remove the tail light assembly.

License Plate Light Removal

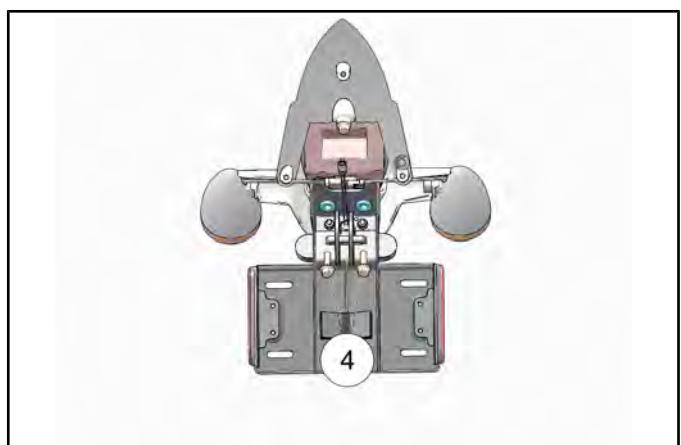
10

ELECTRICAL

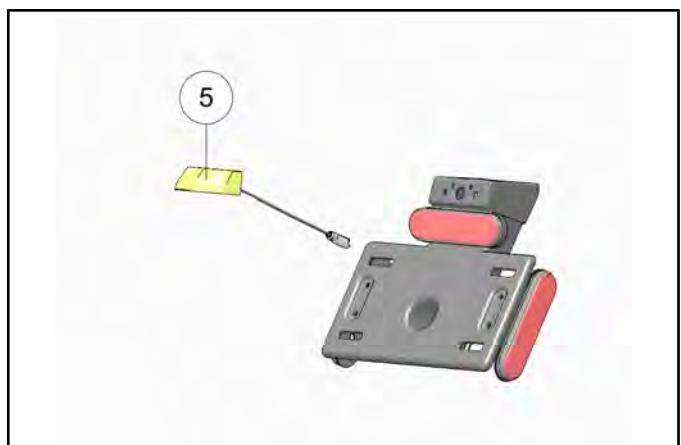
5. Remove nuts ③ and washers.



6. Remove the two fasteners ④ and separate the license plate bracket from the tail light assembly.

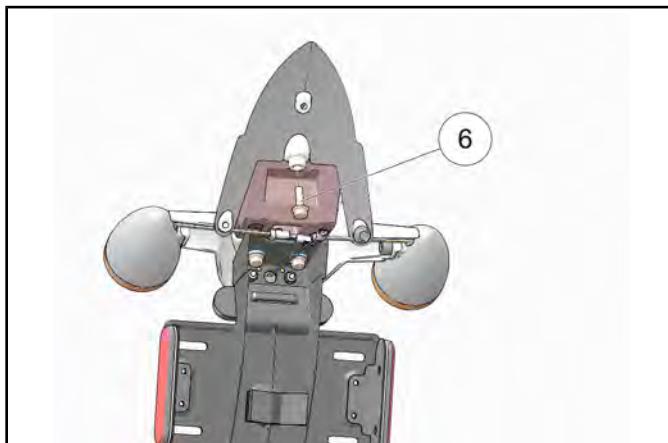


7. Remove the license plate light ⑤ from the license plate bracket.



Tail / Brake Light Removal

8. Remove fastener ⑥ and remove the tail light from the mount.



9. Installation is performed by reversing the removal procedure. Torque all fasteners to specification.

TORQUE

Tail Light to Mount: **84 in-lbs (10 Nm)**

TORQUE

License Plate Light to Mount: **15 in-lbs (2 Nm)**

TORQUE

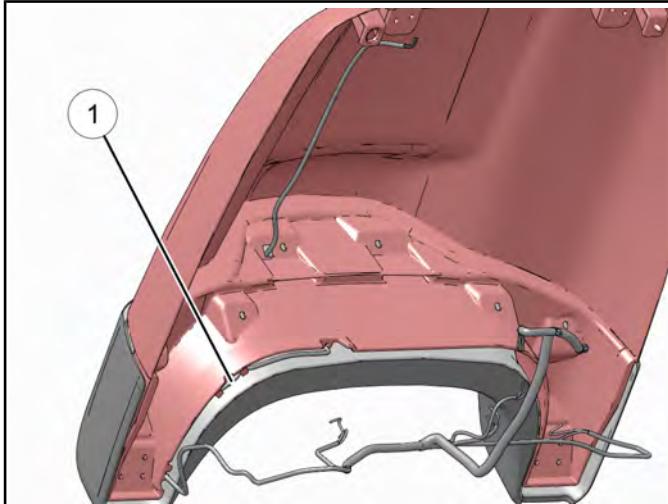
License Plate Bracket to Tail Light: **84 in-lbs (10 Nm)**

TORQUE

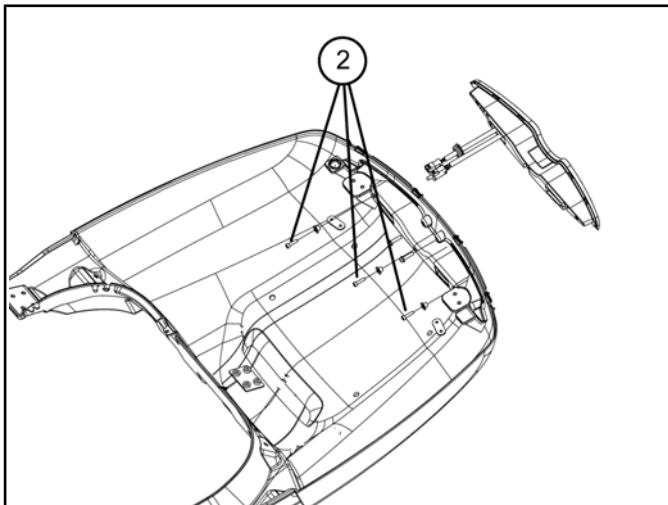
Tail Light Asm to Fender: **84 in-lbs (10 Nm)**

**TRUNK LED REPLACEMENT - BRAKE / INTERIOR
(ROADMASTER)**

1. Open trunk lid.
2. Disconnect the interior light electrical connector from the base of the switch plunger.
3. Locate the brake LED connector ① where it is tucked into the trunk lid and disconnect.



4. Remove the three fasteners ② securing the LED to the trunk lid using a 3mm hex wrench.



5. Feed the LED electrical connector through the conduit and remove the LED assembly.
6. **Installation is performed by reversing the removal procedure. Torque all fasteners to specification.**

TORQUE

LED Trunk Light Fasteners: 36 in-lbs (4 Nm)

10

ELECTRICAL

TURN SIGNAL / HAZARD SYSTEM SERVICE

TURN SIGNAL OPERATION

The turn signal / hazard light system does not utilize a conventional "flasher module", but instead receives a grounding signal from the ECM. Power to the LED turn signals is provided via the SEC ENGINE RELAY 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 4.24.

See Fuse Application Chart, page 10.45.

NOTE

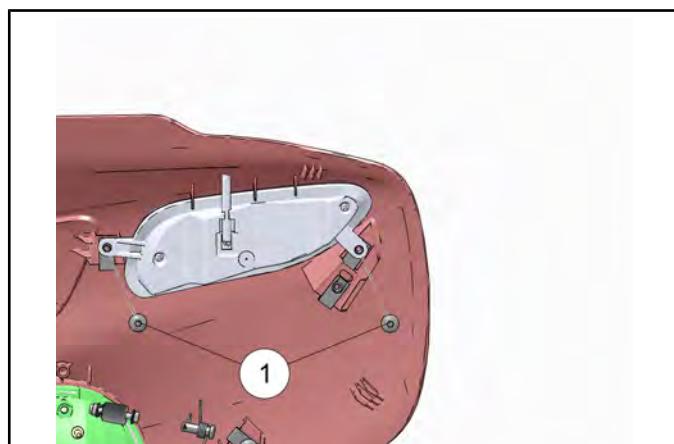
The turn signals use LED lights and must be replaced as an assembly. Bulbs cannot be replaced individually.

FRONT TURN SIGNAL REMOVAL / INSTALLATION (CHIEFTAIN / ROADMASTER)

NOTE

The turn signals are LED and must be replaced as an assembly. Bulbs cannot be replaced individually.

1. Remove the outer fairing. Depending on model see Outer Fairing Removal - (Chieftain Dark Horse), page 7.45 or Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51.
2. Remove two fasteners ① securing the turn signal light to the fairing.



3. Remove turn signal.
4. Installation is performed by reversing the removal procedure. Torque all fasteners to specification.

TORQUE

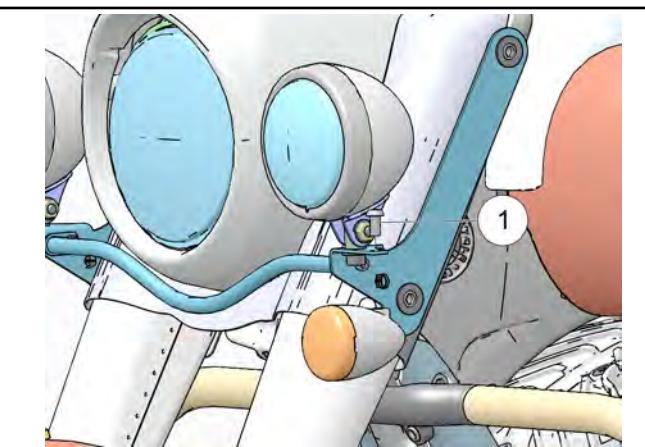
Turn Signal Fasteners: 36 in-lbs (4 Nm)

FRONT TURN SIGNAL, REMOVAL / INSTALLATION (CLASSIC / VINTAGE / DARK HORSE)

NOTE

Turn signals are LEDs and must be replaced as an assembly. Turn signal bulbs cannot be replaced independently.

1. Locate turn signal connectors inside the nacelle and disconnect.
2. Remove fastener ① and remove turn signal from bracket.



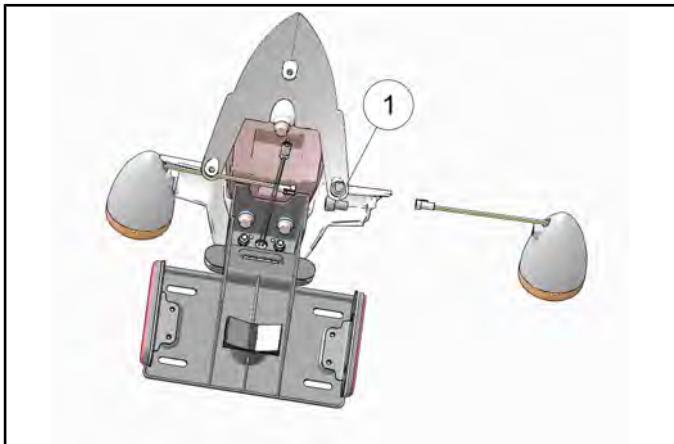
3. Installation is performed by reversing the removal procedure. Torque all fasteners to specification.

TORQUE

Turn Signal Fastener: 18 ft-lbs (24 Nm)

**REAR TURN SIGNAL, REMOVAL / INSTALLATION
(ALL MODELS)**

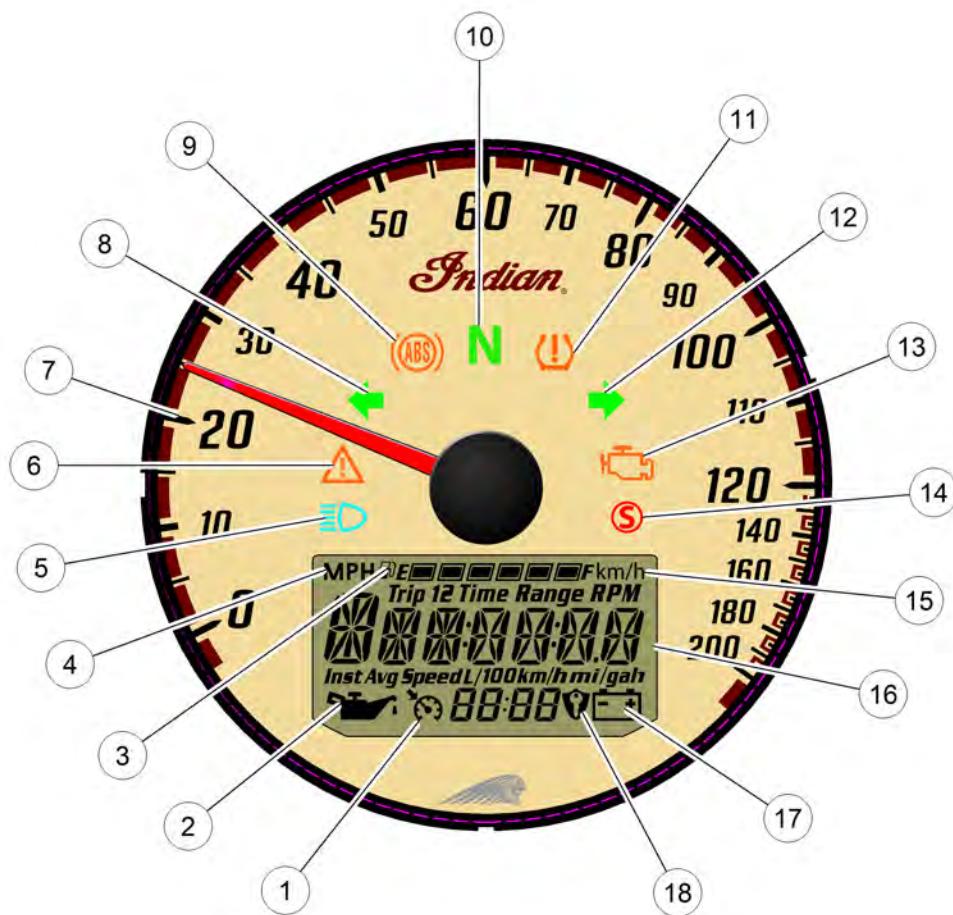
1. Remove the tail light assembly. See Tail Light / License Plate Light, page 10.43.
2. Remove fastener ① and withdraw the turn signal from the tail light assembly.



3. Installation is performed by reversing the removal procedure. Torque all fasteners to specification.

TORQUE

Turn Signal Fastener: 18 ft-lbs (24 Nm)

INSTRUMENTATION**INSTRUMENT CLUSTER (CHIEF CLASSIC / CHIEF VINTAGE /CHIEF DARK HORSE / SPRINGFIELD)**

For detailed information regarding MODE selection and Multi-Function Display operation refer to the Indian Motorcycle Owner's Manual.

The instrument cluster includes the speedometer, indicator lamps, Multi-Function Display (MFD) and fuel gauge (where applicable).

NUMBER	LIGHT	INDICATES	CONDITION
①		Cruise Control Status	Cruise control is enabled, but not set. Arrow appears in the upper left hand corner when cruise control is set to the desired speed.
②		Low Oil Pressure	This lamp illuminates when oil pressure drops below a safe operating pressure while the engine is running. If this lamp illuminates while the engine is running above idle speed, turn the engine off as soon as safely possible and check the oil level. <i>If the oil level is correct and the lamp remains on after the engine is restarted, turn the engine off immediately. See your dealer.</i>
③		Fuel Gauge	The segments of the fuel gauge show the level of fuel in the fuel tank. When the last segment clears, a low fuel warning is activated. All segments including the fuel icon will flash. Refuel promptly.

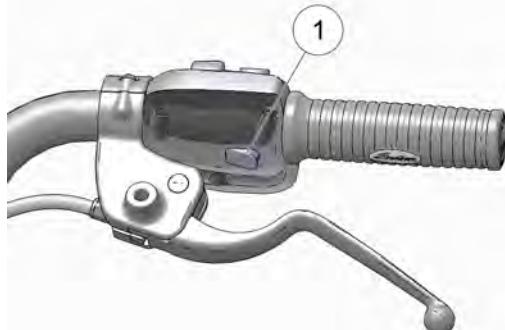
NUMBER	LIGHT	INDICATES	CONDITION
④	MPH	Vehicle speed	When standard mode is selected, speed displays in miles per hour.
⑤		High Beam	The headlight switch is set to high beam. This indicator will flash if there is a problem with the low or high beam light.
⑥		Chassis Fault	The alert symbol illuminates if a chassis fault occurs.
⑦	—	Vehicle Speed	Analog display of vehicle road speed in MPH or km/h.
⑧		Left Turn Signal	The turn signal indicator flashes when the left turn signal (hazard) is active. <i>If there is a problem in the signal system, the lamps will flash at twice the normal rate.</i>
⑨		Anti-Lock Brake System Status	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.
⑩		Neutral	The transmission is in neutral.
⑪		Tire Pressure Monitoring System (TPMS)	(If equipped) The TPMS indicator illuminates if low tire pressure is detected. It will also illuminate along with the Low Battery Voltage indicator when TPMS battery power is low, requiring service.
⑫		Right Turn Signal	The turn signal indicator flashes when the right turn signal (hazard) is active. <i>If there is a problem in the signal system, the lamps will flash at twice the normal rate.</i>
⑬		Check Engine	<i>If this lamp illuminates while the engine is running, see your dealer promptly.</i> The light will remain on if the tilt sensor shuts down the engine. If abnormal sensor or engine operation is detected the light will remain on as long as the fault condition exists. Retrieve the error codes for diagnosis.
⑭		Sidestand Indicator	Illuminates when the sidestand is in the down position.
⑮	Km/h	Vehicle Speed	When metric mode is selected, speed displays in kilometers per hour.
⑯	—	Multi-Function Display (MFD)	—

ELECTRICAL

NUMBER	LIGHT	INDICATES	CONDITION
⑯		Low Battery Voltage / Charge Status	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 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.
⑰		Security System Status	This indicator lamp illuminates while the security system is searching for the key fob signal and when the security system is locked. The lamp flashes if the key fob is not detected within range or if the fob is not programmed properly. It also illuminates with the low battery voltage indicator when the key fob battery is low.

Multi-Function Display (MFD)

The power switch must be ON to access the MFD. Use the mode switches to toggle through the modes of the MFD and to change settings in the display. The LH mode switch ① is located on the backside of the LH switch cube.

**MODES AVAILABLE**

Odometer	Engine Speed
Trip Odometer 1	Average Fuel Economy
Trip Odometer 2	DC Voltage
Clock	Ambient Air Temperature
Gear Indicator	Fuel Range

Odometer

The odometer displays total distance traveled.

Trip Odometers

The trip odometers (Trip 1 and Trip 2) display total distance traveled since being reset. To reset a trip odometer, toggle to the trip odometer, then press and hold the LEFT-TOGGLE switch until the trip odometer resets to zero.

Engine Speed

Engine Speed displays in revolution per minute (RPM).

DC Voltage

The volt meter displays battery voltage. If the engine is not running, approximate *battery* voltage displays. If the engine is running, approximate *charging* voltage displays. **10**

Gear Position

Gear position displays at all times while the engine is running, unless a fault occurs with the gear position sensor.

Temperature

The temperature area displays ambient air temperature.

Fuel Range

The fuel range displays the distance the motorcycle can travel on the remaining fuel in the fuel tank.

ELECTRICAL

INSTRUMENT CLUSTER (CHIEFTAIN DARK HORSE)

For detailed information regarding MODE selection and Multi-Function Display operation refer to the Indian Motorcycle Owner's Manual.



① Speedometer

④ Tachometer

② Multi-Function Display (MFD)

⑤ Fuel Gauge

③ Indicator Lights

Indicator Lights

LIGHT	INDICATES	CONDITION
	Neutral	The transmission is in neutral.
	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.
	Left Turn Signal	The turn signal indicator flashes when the left turn signal (hazard) is active. <i>If there is a problem in the signal system, the lamps will flash at twice the normal rate.</i>
	Right Turn Signal	The turn signal indicator flashes when the right turn signal (hazard) is active. <i>If there is a problem in the signal system, the lamps will flash at twice the normal rate.</i>
	Cruise Control Status	<i>Amber Lamp:</i> Cruise control is enabled, but not set. <i>Green Lamp:</i> Cruise control is set to the desired speed.

LIGHT	INDICATES	CONDITION
	Check Engine	If this lamp illuminates while the engine is running, see your dealer promptly. The light will remain on if the tilt sensor shuts down the engine. If abnormal sensor or engine operation is detected the light will remain on as long as the fault condition exists. Retrieve the error codes for diagnosis.
	Anti-Lock Brakes 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.
Km/h	Vehicle Speed Units	When metric mode is selected, speed displays in kilometers per hour.
MPH	Vehicle Speed Units	When standard mode is selected, speed displays in miles per hour.
	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. <i>If the oil level is correct and the lamp remains on after the engine is restarted, turn the engine off immediately. See your dealer.</i>
	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.
	Tire Pressure Warning	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 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 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.
	Security System Locked	This indicator lamp illuminates while the security system is searching for the key fob signal and when the security system is locked. The lamp flashes if the key fob is not detected within range or if the fob is not programmed properly. It also illuminates with the low battery voltage indicator when the key fob battery is low.

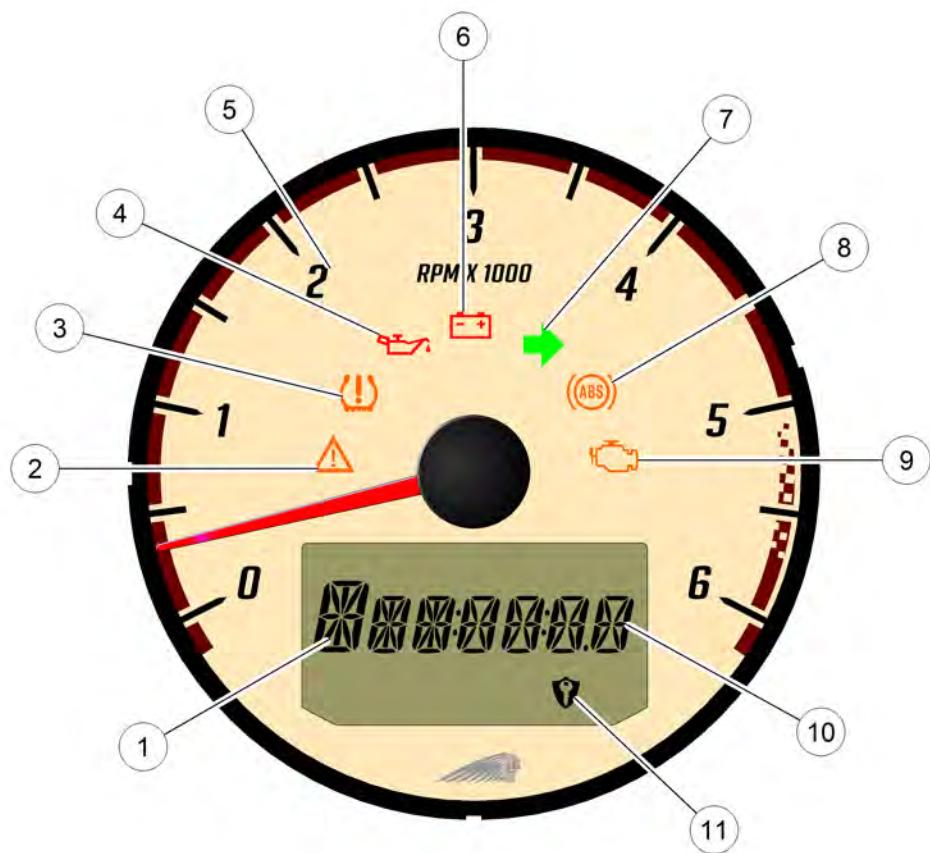
INSTRUMENT CLUSTER (CHIEFTAIN / ROADMASTER)
SPEEDOMETER DISPLAY



NUMBER	LIGHT	INDICATES	CONDITION
①	—	Fuel level / Range	Indicates how much fuel is remaining in the tank as well as the distance the motorcycle can travel on the remaining fuel in the fuel tank.
②	MPH	Vehicle speed	When standard mode is selected, speed displays in miles per hour.
③		Cruise Control Status	<i>Amber Lamp:</i> Cruise control is enabled, but not set. <i>Green Lamp:</i> Cruise control is set to the desired speed.
④		Left Turn Signal	The turn signal indicator flashes when the left turn signal (hazard) is active. <i>If there is a problem in the signal system, the lamps will flash at twice the normal rate.</i>
⑤	—	Vehicle Speed	Analog display of vehicle road speed in MPH or km/h.
⑥		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.
⑦		Neutral	The transmission is in neutral.
⑧		Low Fuel Indicator	This icon illuminates when approximately one gallon (3.8 L) 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.
⑨		Sidestand Indicator	Illuminates when the sidestand is in the down position.
⑩	Km/h	Vehicle Speed	When metric mode is selected, speed displays in kilometers per hour.

ELECTRICAL

TACHOMETER DISPLAY



NUMBER	LIGHT	INDICATES	CONDITION
①	—	Gear Selector	Indicates the current gear position.
②		Chassis Fault	The alert symbol illuminates if a chassis fault occurs.
③		Tire Pressure Monitoring System (TPMS)	(If equipped) The TPMS indicator illuminates if low tire pressure is detected. It will also illuminate along with the Low Battery Voltage indicator when TPMS battery power is low, requiring service.
④		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. <i>If the oil level is correct and the lamp remains on after the engine is restarted, turn the engine off immediately. See your dealer.</i>
⑤	—	Tachometer	Analog display of engine speed in revolutions per minute (RPM).
⑥		Low Battery Voltage / Charge Status	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 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.
⑦		Right Turn Signal	The turn signal indicator flashes when the right turn signal (hazard) is active. <i>If there is a problem in the signal system, the lamps will flash at twice the normal rate.</i>
⑧		Anti-Lock Brake System Status	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.
⑨		Check Engine	<i>If this lamp illuminates while the engine is running, see your dealer promptly.</i> 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.
⑩	—	Millage	Indicates the total amount of miles driven
⑪		Security System Status	This indicator lamp illuminates while the security system is searching for the key fob signal and when the security system is locked. The lamp flashes if the key fob is not detected within range or if the fob is not programmed properly. It also illuminates with the low battery voltage indicator when the key fob battery is low.

ELECTRICAL

RIDE COMMAND SYSTEM OVERVIEW

⚠ WARNING

Driving while distracted can result in loss of vehicle control, crash, and injury. We strongly recommend that you use extreme caution when using any device that may take your focus off the road. Your primary responsibility is the safe operating of your vehicle. We recommend against the use of any hand-held device while driving and encourage the use of voice-operated systems when possible. Make sure you are aware of all applicable local laws that may affect the use of electronic devices while driving.

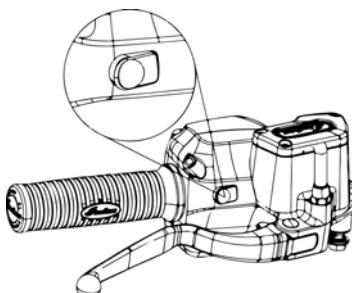


The most up-to-date information about your Ride Command™ display, visit www.my.indianmotorcycle.com

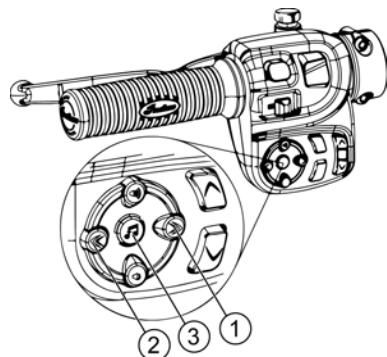
The RIDE COMMAND™ Display has 5 buttons:

- Rider Screen Button
- Audio Button
- Display On/Off Button
- Bluetooth Button
- Navigation Button

HAND CONTROLS TRIGGER CONTROLS



1. Use the left-hand trigger to decline selection, or switch Ride Command screens.
2. Use right-hand trigger to accept selection (shown above).

AUDIO CONTROLS

Use the controls on the left control block to affect audio features.

- ① Press the right button to advance. 
- ② Press the left button to go back. 
- ③ Press the center button to mute, play, or pause audio. 

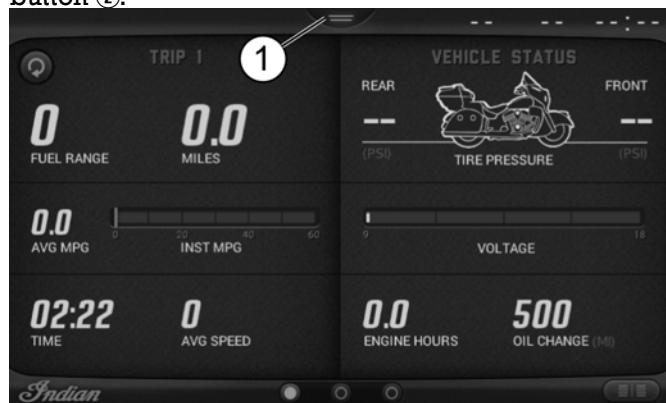
MAP CONTROLS

Press the up and down buttons on the left hand control block to zoom in and out of the map.

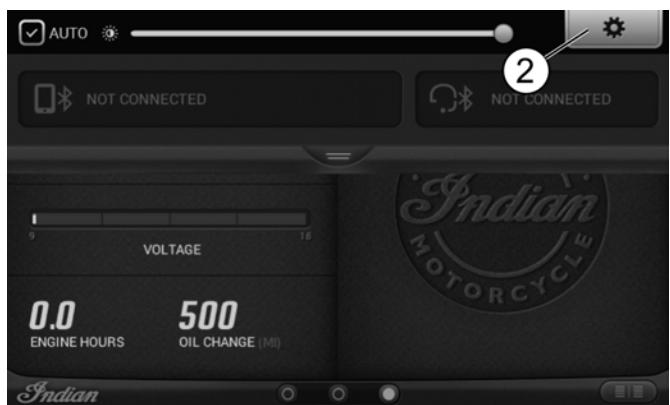
RIDE COMMAND™ SETTINGS

The Settings Menu is where you can personalize your Navigation System. You can configure settings, such as Language, Speed Units, Time Formats, as well as audio and vehicle settings.

To access the settings menu on your RIDE COMMAND™ display, press the button at the top of the touchscreen display ①, and then press the settings button ②.



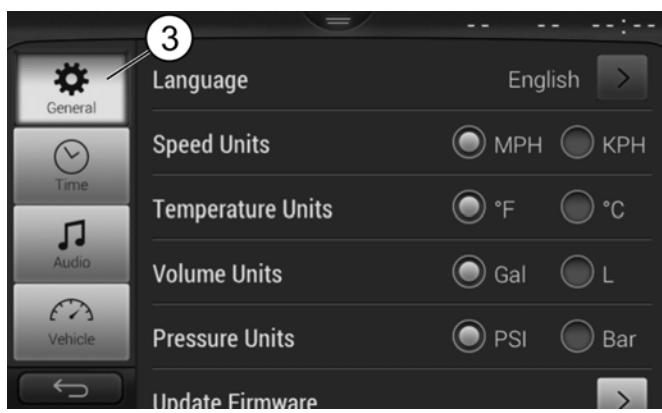
ELECTRICAL



The Settings Menu is composed of 4 categories that allow you to customize your screens; General, Time, Audio, and Vehicle.

GENERAL

Press the General button ③ to access the General Settings.

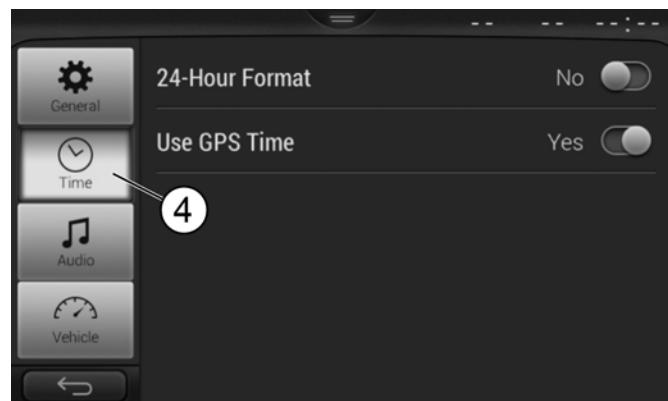


From the General settings menu you can do the following:

- Change the Language
- Set the Speed Units (MPH or KPH)
- Set the Temperature Units (F or C)
- Set the Volume Units (Gal or L)
- Set the Pressure Units (PSI or Bar)
- Update Software
- Update Maps

TIME

Press the Time button to access the Time Settings.



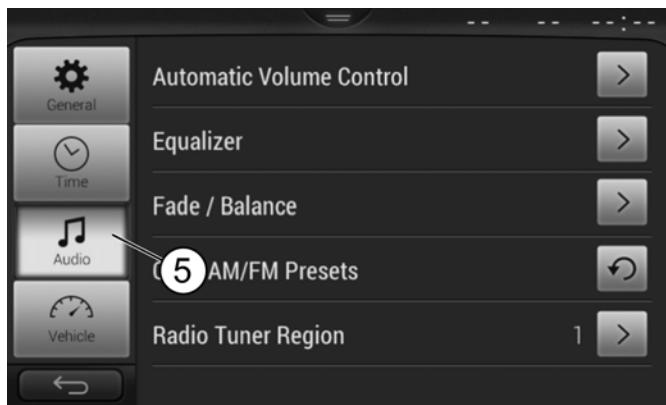
From the Time Settings you can do the following:

- Set the Time Format (12 hour or 24 hour)
- Enable GPS Time, which automatically sets the time to the time zone you are currently in
- Set the time
- Enable/Disable Daylight Saving Time

ELECTRICAL

AUDIO

Press the Audio button within the settings menu to access the Audio Settings.

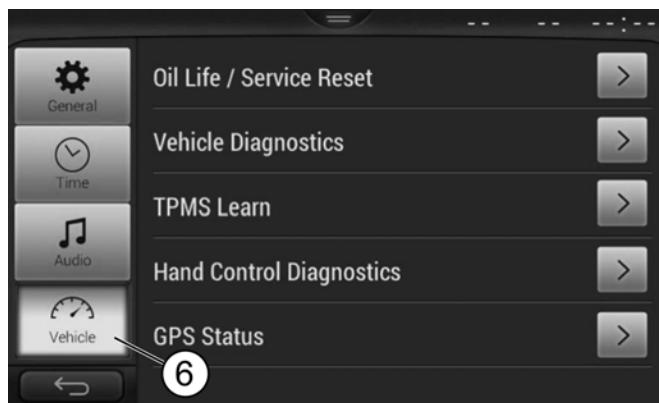


From the Audio Settings you can do the following:

- Enable Automatic Volume Control
- Set the Equalizer settings
- Adjust the Fade and Balance
- Clear AM/FM Presets
- Set the Radio Tuner Region

VEHICLE

Press the Vehicle button to access the Vehicle Settings.



From the Vehicle Settings you can do the following:

- Oil Life/ Service Reset
- Access Vehicle Diagnostics
- TPMS Learn
- Access Hand Control Diagnostics
- View GPS Status

DOWNLOAD NEW SOFTWARE

To download new software for RIDE COMMAND™, do the following:

ON YOUR PERSONAL COMPUTER

1. Go to www.my.indianmotorcycle.com
2. Log into your account, or create a new account.
3. Using the Vehicle Identification Number (VIN), add your new Indian Motorcycle to your Garage.
4. Locate and download the latest software to the USB flash drive (8 GB).

NOTE

File cannot be in a folder.

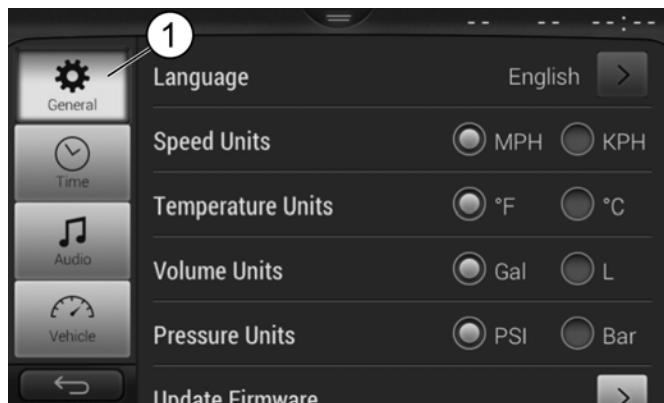
5. Properly eject USB flash drive from your personal computer.

ON YOUR MOTORCYCLE

1. Connect the USB flash drive to the USB cable located within the storage area above the display.
2. Power up your Indian Motorcycle.

ON YOUR RIDE COMMAND™ DISPLAY SCREEN

1. Navigate to the Settings Menu of your RIDE COMMAND™ display.
2. Select General Settings ①.



3. Select Update Software.
4. Select Continue.
5. Select the file you wish to load.

NOTE

Use the date listed in the file name to determine most recent file.

6. Select Yes to restart display.

NOTE

Restart is required for new software to become active.

ELECTRICAL

DOWNLOAD NEW MAPS

To download new maps for RIDE COMMAND™, do the following:

ON YOUR MOTORCYCLE

1. Connect the USB flash drive to the USB cable located within the storage area above the RIDE COMMAND™ display.

ON YOUR RIDE COMMAND™ DISPLAY SCREEN

1. Navigate to the Settings Menu of your RIDE COMMAND™ display.
2. Select General Settings.
3. Select Update Maps.
4. Select the Create Key button.
5. Once the key has finished loading, power down your motorcycle and remove the USB flash drive.

ON YOUR PERSONAL COMPUTER

1. Go to www.my.indianmotorcycle.com
2. Log into your account, or create a new account.
3. Using the Vehicle Identification Number (VIN), add your new Indian Motorcycle to your Garage.
4. Locate and download the latest maps to the USB flash drive.

NOTE

File cannot be in a folder.

5. Properly eject USB flash drive from your personal computer.

ON YOUR MOTORCYCLE

1. Connect the USB flash drive to the USB cable located within the storage area above the display.
2. Power up your Indian Motorcycle.

ON YOUR RIDE COMMAND™ DISPLAY SCREEN

1. Navigate to the Settings Menu of your RIDE COMMAND™ display.
2. Select General Settings.
3. Select Update Maps.
4. Select Continue.
5. Select Yes to restart display.

NOTE

Restart is required for new maps to become active.

NOTE

Your Ride Command display comes with a 3 year care map. This includes all of the original maps that came with your display, plus 2 additional years of free map updates.

RIDE COMMAND DIAGNOSTICS / TROUBLESHOOTING**Problem: Black Screen / Will Not Power On**

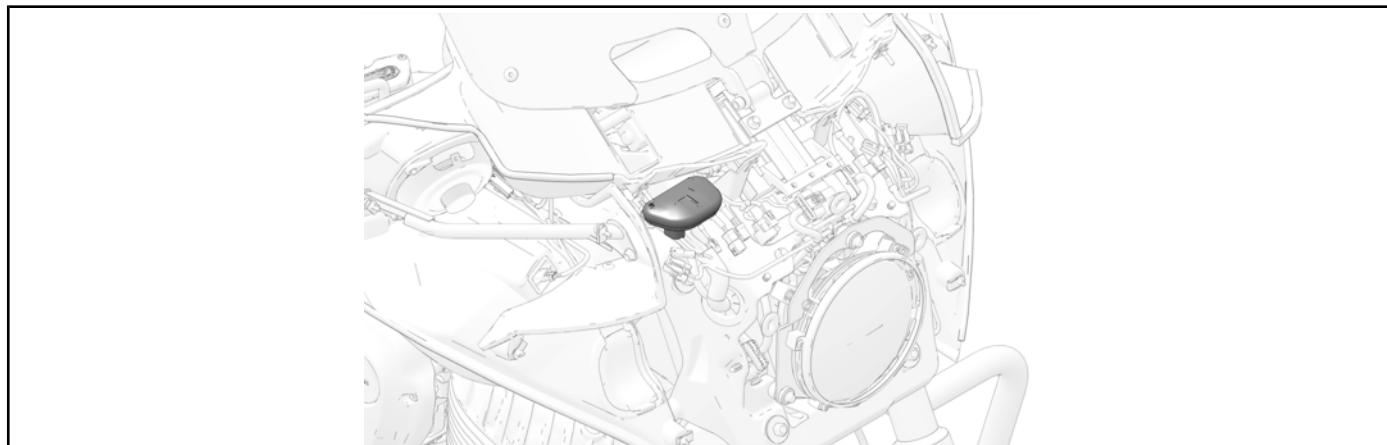
STEP	ACTION	YES	NO
1	Power cycle bike by switching ignition on and off with main power switch in fairing. Did you find and repair the condition?	Go to Step 8	Go to Step 2
2	Check the 5amp fuse labeled Gauge in the main fuse box under the left side upper panel. Refer to Fuse Box Location, page 10.44 Is 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. Check for battery voltage on pin 16 (Ground), 31 (Switched Power) and 32 (Battery Power) of display connector. Is there Battery Voltage at all pins?	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 pin 16, 31 and 32. Is there battery voltage at pin 16, 31 and 32?	Go to Step 8	Go to Step 1 and repeat diagnosis
8	Update display with newest software available. Refer to Download New Software, page 10.77 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

ELECTRICAL

Problem: Screen missing pixels, LCD screen flaw, software glitch or problem

STEP	ACTION	YES	NO
1	Power cycle bike by switching ignition on and off with main power switch in fairing. Did you find and repair the condition?	Go to Step 2	Go to Step 2
2	Update display with newest software available. Refer to Download New Software, page 10.77 for instructions on how to update/reflash software. Is display working properly?	Confirm display operation and continue use.	Go to Step 3
3	1. Remove and reinstall the 5amp fuse labeled <i>Gauge</i> in the main fuse box under the left side upper panel. Refer to Fuse Box Location, page 10.44 Did you find and repair the condition?	Go to Step 2	Go to Step 4
4	Replace display with known good display. Did you find and repair the condition?	Go to Step 2	Repeat Diagnosis

GPS Antenna Troubleshooting



1. Unplug connector from GPS antenna (Refer to: Outer Fairing Removal - (Chieftain Dark Horse), page 7.45 for location) and verify all contacts are securely seated in the connector.
2. Turn ignition on and make the following measurements on the antenna connector:

WIRING	CONNECTION TO MEASURE	VOLTAGE SPECIFICATION
Power	Between Pins 4 and 3	12Vdc (Battery Voltage)

3. If antenna connector has 0Vdc supplied, check harness for loose connection or breaks in wiring. Check for power at SW PWR fuse in fuse box.
4. If antenna connector shows proper voltage, check operation of GPS. If GPS still is not functioning, proceed to step 5.
5. Turn the ignition off and make the following measurements on the antenna connector:

6.

WIRING	CONNECTION TO MEASURE	RESISTANCE SPECIFICATION
CAN	Between Pins 1 and 2	60 Ohms

7. If resistance value is out of spec, check for breaks in yellow/green CAN wiring.
8. If all values are within specification, replace GPS antenna with new unit.

Headset Troubleshooting

If headset is not functioning properly with display:

1. Check volume level on Headset.
2. Ensure Headset has latest software. Visit Headset Manufacturer Website to verify and install most up to date software.
3. Clear all pairings from Headset and re-pair with display
4. Pair Headset with another Bluetooth enabled device and check for proper functionality

Android “OK Google” Issues

1. Ensure Headset and Android phone are paired to the motorcycle.
2. Turn phone screen ON and unlock phone.
3. Press and hold the center button (Mute, Play/Pause) on the handlebar control.
4. Display should initiate a Voice Command session with phone.
5. Ensure Google App is selected as the default app and that your phone always remembers this selection

Unclear Headset Sound

1. Unpair and repair headset from Ride Command in bluetooth menu.
2. If this does not resolve the issue, clear all previously paired headsets from Ride Command, and repair the headset.
3. If there is still unclear sound, pair different headset and see if sound quality improves.
4. If sound quality improves, previous headset was malfunctioning.

CRUISE CONTROL

CRUISE CONTROL OVERVIEW

The Indian Motorcycle cruise control system operates in conjunction with the Electronic Throttle Control (ETC) eliminating the need for a conventional actuator / cable assembly. The Engine Control Module (ECM) uses several inputs to determine the position of the ETC in order to maintain the desired vehicle speed. Momentary signals are sent to the Vehicle Control Module (VCM) from the right hand switch cube based on operator input. The VCM converts these operator inputs to CAN and relays the message to the Engine Control Module (ECM).

Cruise control only operates in gears 4 — 6.

Cruise Related Control Modules:

- Electronic Throttle Control (ETC)
- Engine Control Module (ECM)
- Vehicle Control Module (VCM)

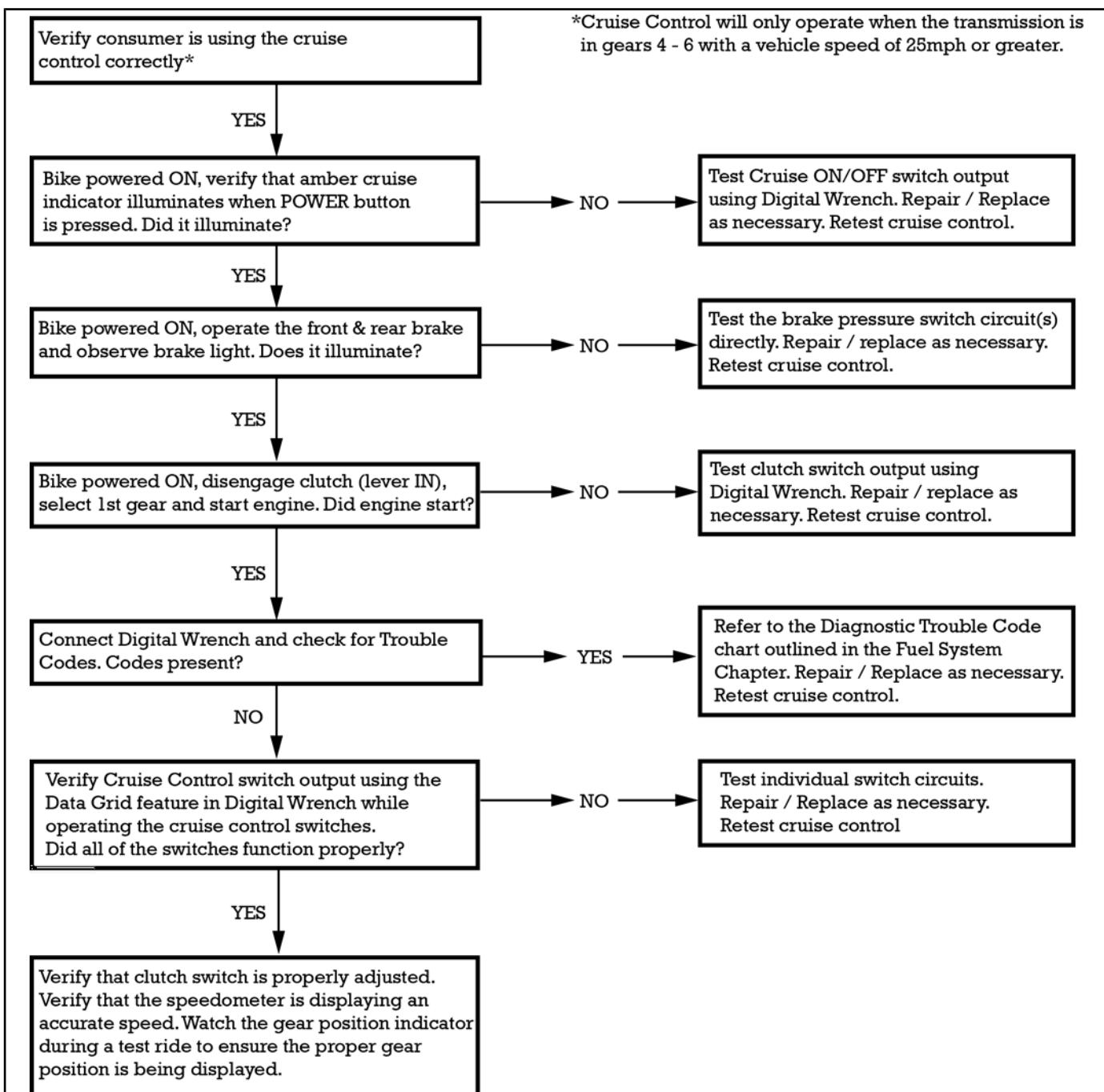
- Anti-Lock Brake Control Module

Cruise Related Inputs / Outputs (RH Switch Cube):

- CRUISE ON / OFF — Discrete input to the VCM then CAN message to ECM
- CRUISE RES / ACC — Discrete input to the VCM then CAN message to ECM
- CRUISE SET / DEC — Discrete input to the VCM then CAN message to ECM

Cruise Related Inputs / Outputs (other controls):

- Brake Pressure Switch (Front & Rear) — Discrete input to ECM
- Clutch Switch — Discrete input to the ECM
- Vehicle Speed (Wheel Speed Sensors) — Discrete inputs to ABS module and then CAN message to ECM

CRUISE CONTROL DIAGNOSTICS

10

ELECTRICAL

SECURITY ALARM

Overview

A 2-button key fob is required for use of the security alarm.

To activate the security alarm, double push the lock button on the key fob. The horn will sound briefly to confirm that the alarm is activated.

With the key fob within range, the following actions will deactivate the alarm.

NOTE

The security light and / or power switch will turn on briefly until the key fob is detected. If the key fob is not detected within 20 seconds, the horn (alarm) will sound repeatedly for 60 seconds.

- Press the unlock button on the key fob.
- Press the power switch on the center console.
- Press the starter button.
- Press the lock / unlock switch on the center console.
- Move the motorcycle to the fully upright position from leaning on sidestand. (The horn will sound repeatedly if the key fob is not detected within 5 seconds)

NOTE

Each time the alarm has been deactivated, a double press of the key fob lock button will reactivate.

GUIDED DIAGNOSTICS

NOTE

Things to consider prior to performing the following diagnostic tests:

- When was the last time the battery was disconnected?
- How many hours are on the vehicle (Fairing bikes only)?
- Has any servicing been done to the bike recently?
- Any other notable events occur before or during the start of this issue?

Bike Does Not Authenticate with Key Fob

A: Does the LED on the key fob blink when the bike is turned on?

B: Does the LED on the key fob blink when a key fob button is pressed?

C: Does the bike lock or unlock when the key fob button is pushed (Fairing bikes only)?

D: Does the Tire Pressure Monitoring System work when the PIN code is used?

A B C D

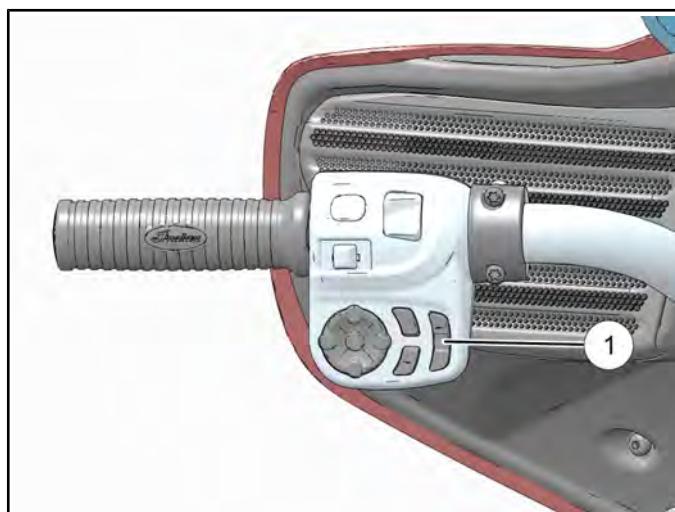
No	No	No	No	Look at VCM (1,2)
No	Yes	NA	NA	Antenna or serial number in key fob (2,3)
No	No	NA	NA	Bad key fob battery or key fob (1)
No	Yes	Yes	Yes	Look at 125 kHz antenna (3)
Yes	Yes	NA	NA	Connect to bike with Digital Wrench (2)
Yes				This means the 125 kHz antenna is working properly This means the correct serial number is stored in the VCM
	Yes			This means the correct serial number is stored in the VCM This means the key fob counter is working properly This means the 434 MHz receiver is working properly
			Yes	This means the 434 MHz receiver is working properly
		No	Yes	Look at key fob battery and serial number in Digital Wrench (2)
Yes	Yes	No	Yes	Connect to bike with Digital Wrench (2)

Troubleshooting

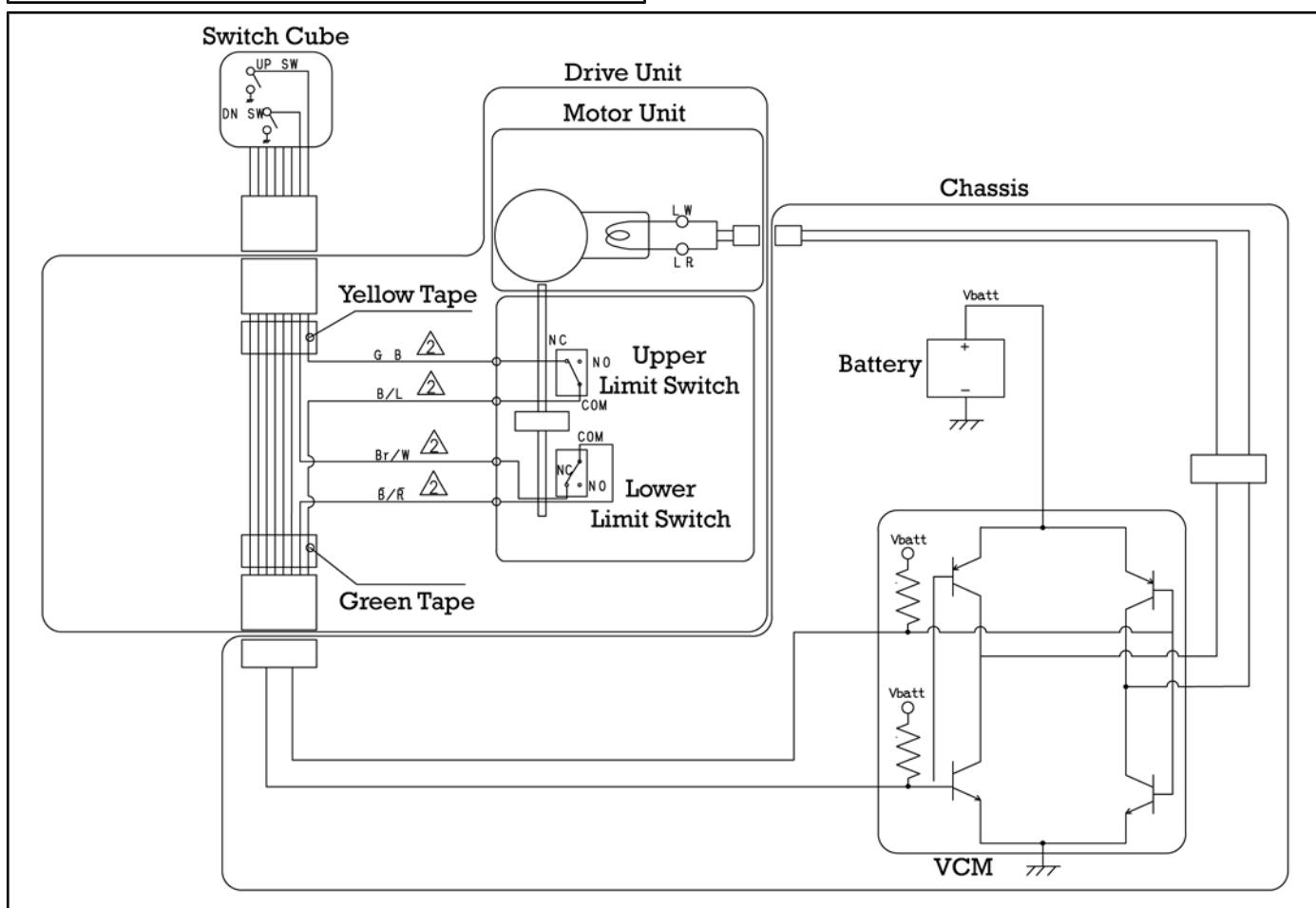
1. Remove the key fob battery and test voltage.
 - Is the battery voltage OK?
 - **YES:** Install battery and retest authentication.
 - **NO:** Proceed to next step.
2. Replace key fob battery with new cell.
 - Did this fix the issue?
 - **YES:** No further action required.
 - **NO:** Connect to Digital Wrench and write a new key fob serial number in Slot 2.
3. Connect to Digital Wrench and verify the correct VCM software is installed.
4. Verify that serial numbers match the key fob being used.
5. Inspect the 125 kHz antenna for broken wires.

POWER WINDSHIELD**POWER WINDSHIELD OPERATION**

The Chieftain and Roadmaster models are equipped with an electronically adjustable windshield which is controlled through a switch ① located on the LH switchcube.



When the windshield adjustment switch is moved to the up or down positions it is providing a path to ground, through the appropriate limit switch, to an H-bridge located in the VCM. The VCM then sends power and ground to the windshield adjustment motor based on switch position (switching action reverses polarity). Once the windshield reaches the upper or lower limits of travel, the normally closed (NC) limit switch will become open (O/C) thus breaking the ground path to the VCM and stopping power supply to the adjustment motor.

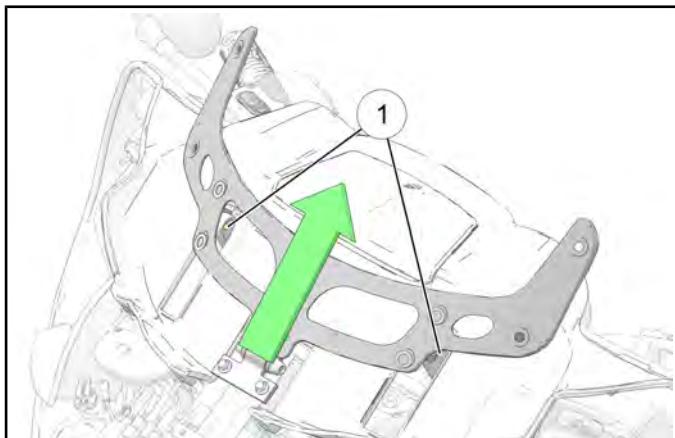


POWER WINDSHIELD MOTOR, REMOVAL

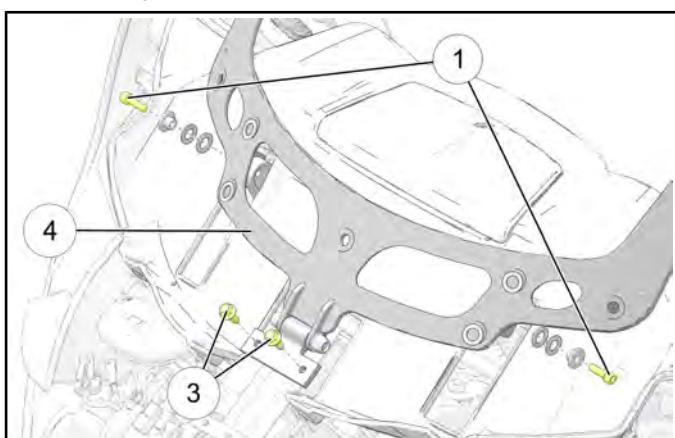
1. Remove the outer fairing and windshield.

 - **Chieftain Dark Horse:** See Outer Fairing Removal - (Chieftain Dark Horse), page 7.45
 - **Chieftain / Roadmaster:** See Outer Fairing Removal - (Chieftain / Roadmaster), page 7.51

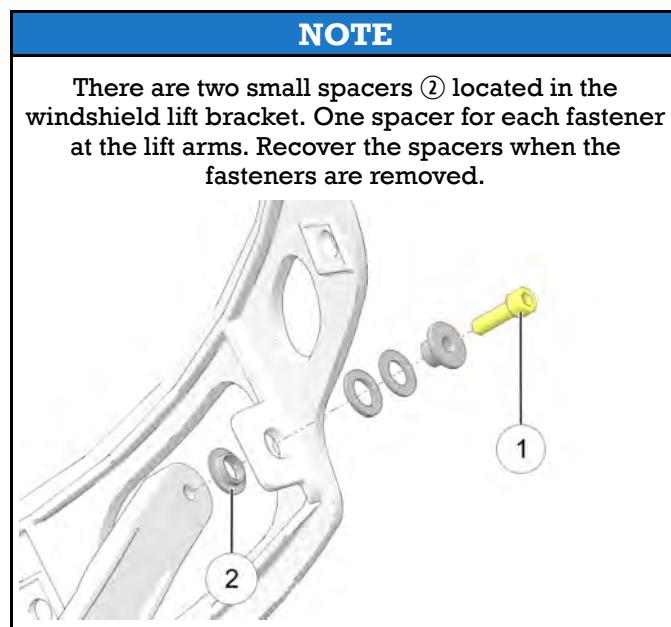
2. Raise the windshield to expose the hex-head fasteners ① on the lift arms.



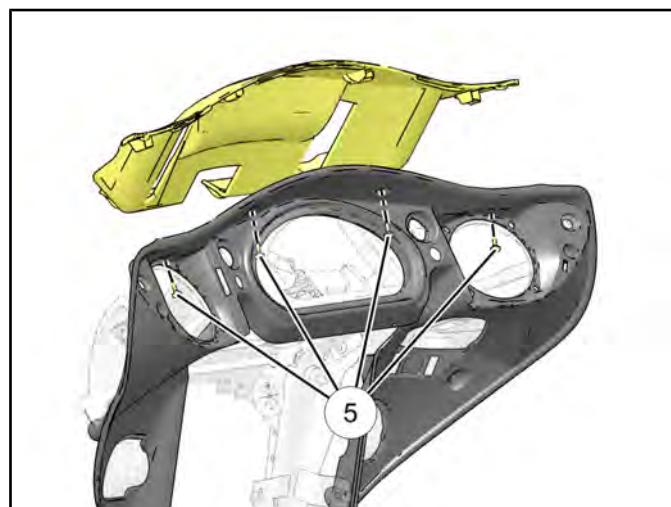
3. Remove the hex-head fasteners ① and fasteners ③ securing the windshield lift bracket to the motor.



4. Remove the windshield lift bracket ④.



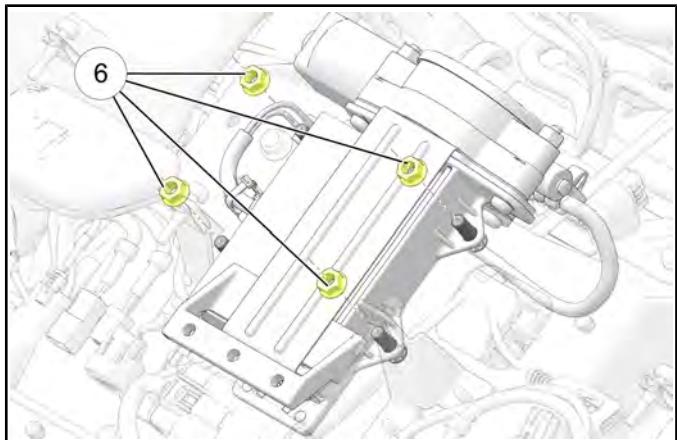
5. Remove the four fasteners ⑤ securing the windshield cowl panel to the inner fairing and remove cowl panel.



10

ELECTRICAL

6. Remove the four nuts ⑥ securing the windshield lift motor to the mounting bracket.



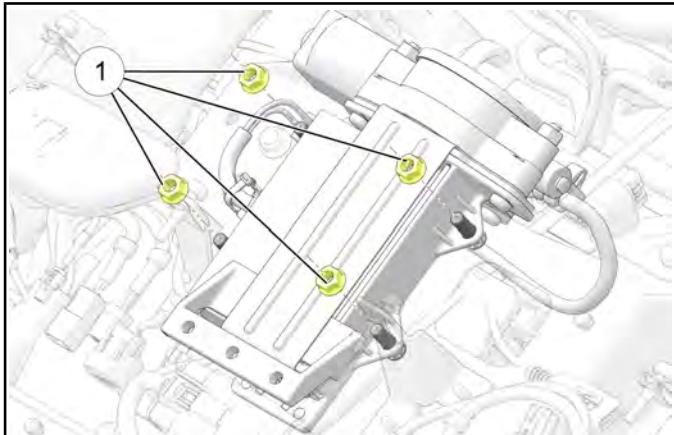
7. Disconnect the electrical connector(s) and remove motor assembly.

POWER WINDSHIELD MOTOR, INSTALLATION

- If the limiter switch is being replaced, attach the switch to the motor assembly at this time.
- Plug the electrical connector(s) into the windshield lift motor assembly and lower onto the mounting studs.
- Tighten nuts ① to specification.

TORQUE

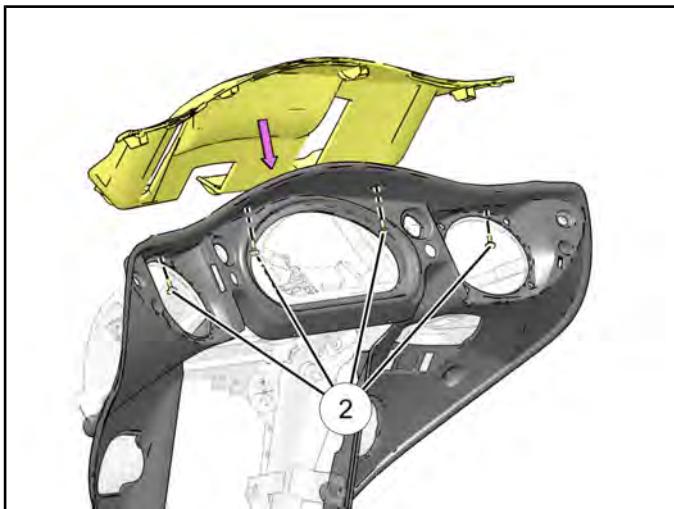
Windshield Motor Nuts: 36 in-lbs (4 Nm)



- Fit the windshield cowl panel into position and install the four fasteners ② securing the panel to the inner fairing. Torque fasteners to specification.

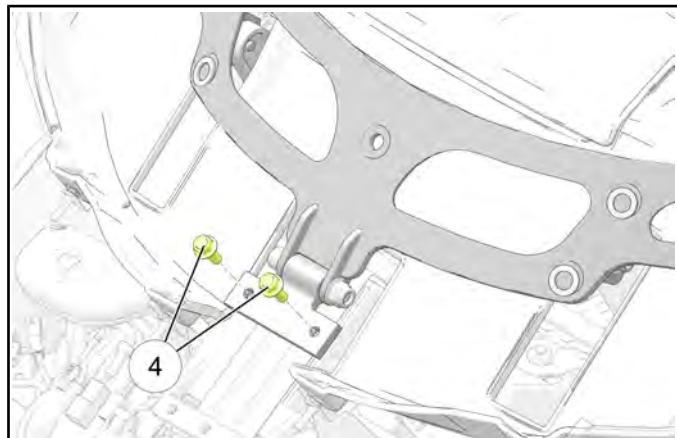
NOTE

It is necessary to move the windshield lift arms toward the front of the vehicle when fitting the cowl panel.

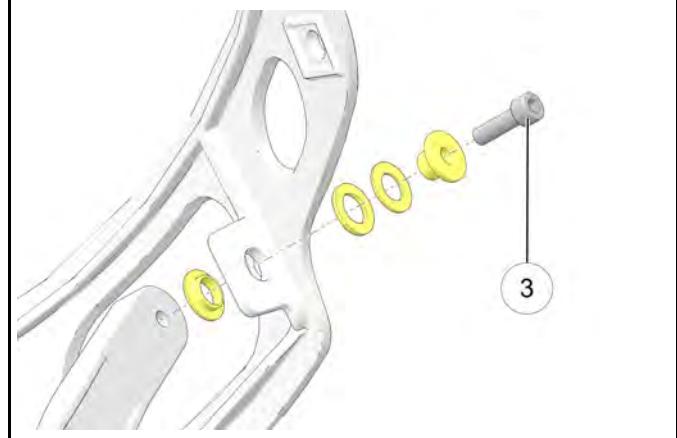
**TORQUE**

Windshield Cowl Panel Fasteners: 36 in-lbs (4 Nm)

- Install the two Lift Arm Fasteners ③ into the lift arms and Drive Motor Hinge Fastener ④ onto the drive motor. Torque all fasteners to specification.

**NOTE**

Refer to image below to make sure the Lift Arm hardware stack is in the correct order.

**TORQUE**

Lift Arm Fasteners: 84 in-lbs (10 Nm)

Drive Motor Hinge Fastener: 84 in-lbs (10 Nm)

10

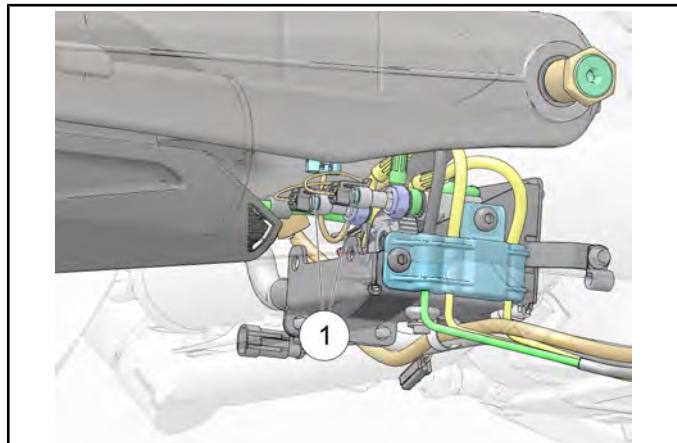
- Install the outer fairing and windshield.
 - Chieftain Dark Horse:** See Outer Fairing Installation - (Chieftain Dark Horse), page 7.49
 - Chieftain / Roadmaster:** See Outer Fairing Installation - (Chieftain / Roadmaster), page 7.55
- Verify the windshield moves up and down through the travel range.

ELECTRICAL

SWITCH TESTING

BRAKE LIGHT SWITCH TEST

1. Place the motorcycle in an upright position with front wheel clamped in a wheel vise.
2. Locate the brake light switch connectors ① on the ABS module and disconnect.

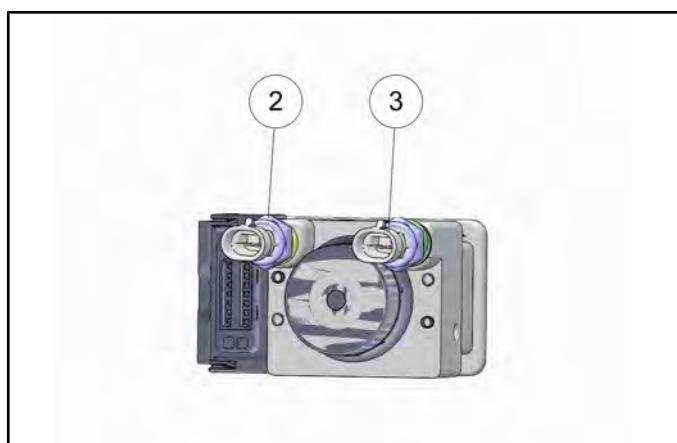


3. Set multi meter to measure resistance.
4. Connect meter leads to each terminal of the front brake switch ② .
5. Apply the front brake.

Resistance Specification: **Continuity with pedal / lever depressed**

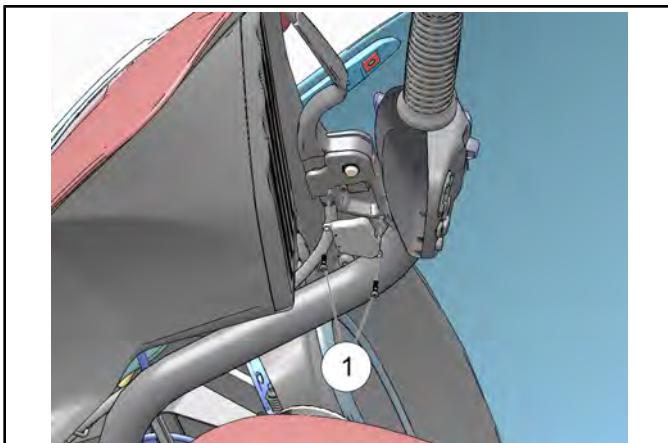
6. Connect meter leads to each terminal of the rear brake switch ③ .
7. Apply the rear brake.

Resistance Specification: **Continuity with pedal / lever depressed**



CLUTCH SWITCH TEST

1. Remove the clutch switch cover fasteners ① and clutch switch cover.



2. Disconnect clutch switch 2 pin connector. Measure the resistance of the switch with lever pulled to handlebar (less than 1 Ohm resistance) and with lever released (OL).

TIPOVER SENSOR (ANGLE SENSOR) OVERVIEW OF OPERATION

The Tipover Sensor (TOS) is used to disable the fuel pump, fuel injector, and ignition circuits in the event of a crash or tipover condition.

The ECM sends a 5VDC reference to the sensor and monitors the output voltage. From the output signal, the ECM can tell whether the TOS system is in normal operation, if the vehicle is tipped over, or if there is an open or short in the system wiring. Only a tipover voltage from the sensor will cause the ECM to disable the fuel pump and ignition circuits. If the TOS system wiring is disconnected (open / high) the ECM will set a fault code (and subsequent CHK ENG light) but will not disable the engine's operational circuits. The same is true for a TOS system short to ground (low).

Only in the event of an actual tipover condition is the voltage output within a range that will cause the ECM to disconnect the fuel and ignition circuits as well as the internal drivers that control them.

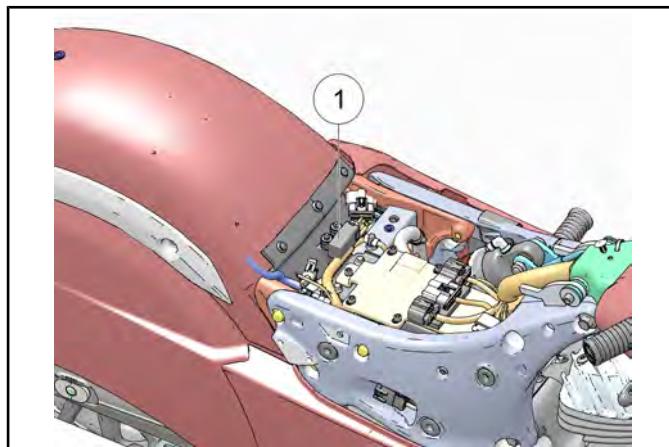
TIPOVER SENSOR RESET

After a Tipover Condition Has Occurred:

1. Return the motorcycle to the upright position and place it on the side stand.
2. Press the power button to power up the motorcycle electrical system.
3. Place the engine STOP / RUN switch in the RUN position.
4. The fuel pump should cycle and the system should return to normal operation.

SENSOR LOCATION

The tipover sensor ① is mounted on the rear inner fender debris flap behind the battery box. The sensor and wire connector can be accessed by removing the seat.

**DIAGNOSTICS**

5. If the tipover sensor was activated (vehicle was actually tipped over) reset the system as outlined above. If the system fault is still present, continue.
6. Remove the seat.
7. Visually inspect the sensor. Be sure it is securely mounted to the debris flap and the debris flap is secure in the chassis. The sensor should be level relative to the motorcycle.
8. Disconnect the sensor from the main wire harness and look at connector pins for signs of corrosion or misalignment that would cause a poor connection.
9. Connect Digital Wrench for further diagnosis of the tipover sensor circuit.

SIDE STAND SWITCH TESTING

1. Inspect side stand. Be sure that when the side stand is fully retracted (UP) that the switch plunger is extended and that when the side stand is extended (down) the plunger is depressed.
2. Remove the voltage regulator bracket to access the side stand switch connector and disconnect. See Regulator / Rectifier Replacement, page 10.33.
3. Set multi meter to measure resistance and insert meter leads into appropriate jacks.
4. Place one meter lead onto each of the side stand switch connector pins.
5. Read resistance with the side stand switch plunger depressed and extended.

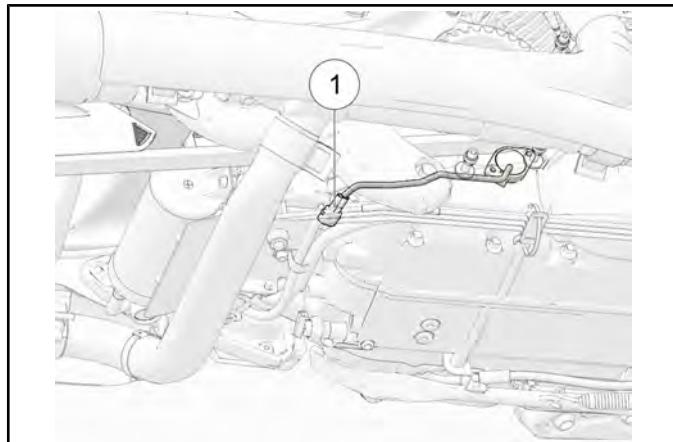
**Switch Depressed (Stand DOWN): No Continuity
(OL)**

**Switch Extended (Stand UP): Continuity (Less than
1Ω)**

ELECTRICAL

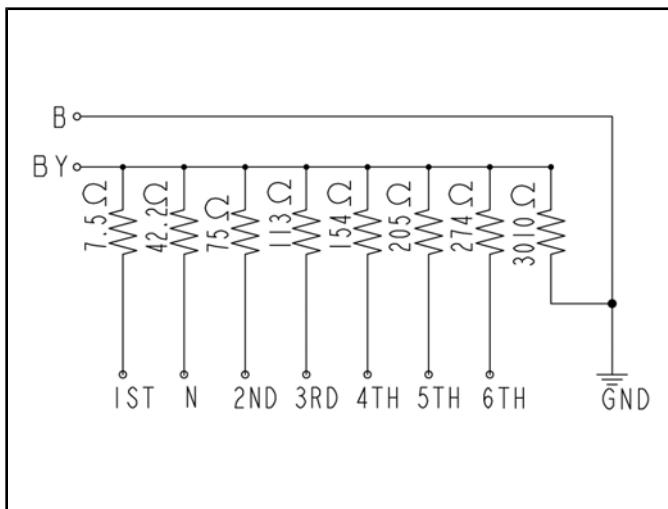
GEAR POSITION SWITCH TEST

- Disconnect the gear position switch 2-pin connector ① located at the rear of the engine below the ABS module.



- Set multi meter to measure resistance.

- Connect one meter lead to each of the pins on the switch connector.
- Watch the resistance readings as the transmission is shifted through each of the 6 gear positions including Neutral. The meter readings should match the resistance specifications given in the following diagram.

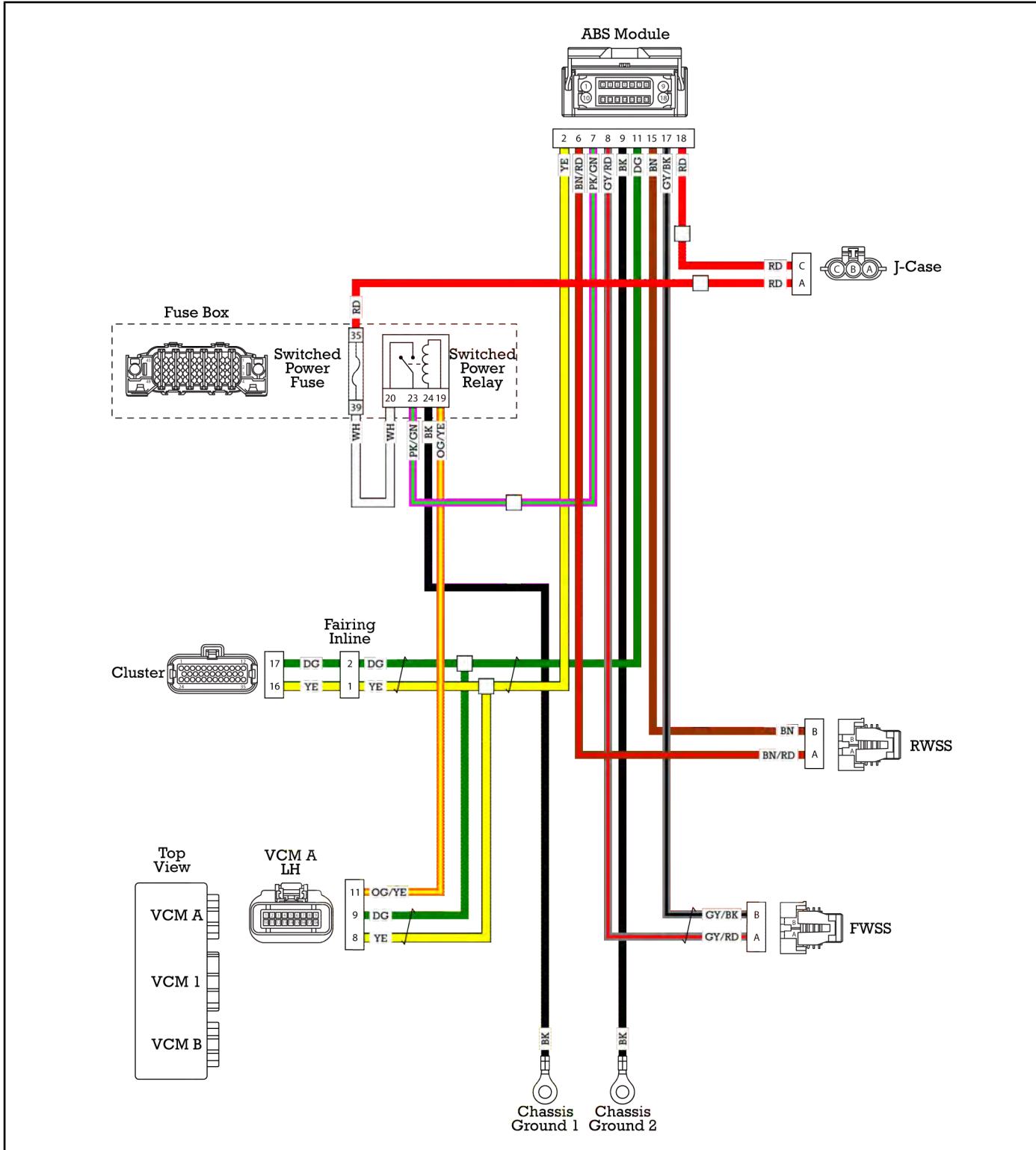


Gear Position Switch Voltage and Resistance Specifications

GEAR	RESISTANCE			VOLTAGE		
	NOMINAL	MIN	MAX	NOMINAL	MIN	MAX
1st	7.481359	7.107291	7.855427	0.149627	0.127931	0.172819
N	41.61654	39.53571	43.69737	0.832331	0.711643	0.961342
2nd	73.17666	69.51783	76.83549	1.463533	1.251321	1.690381
3rd	108.9113	103.4657	114.3569	2.178226	1.862383	2.515851
4th	146.5044	139.1792	153.8296	2.930088	2.505226	3.384252
5th	196.3043	186.4891	206.1196	3.926087	3.356804	4.53463
6th	261.1833	248.1241	274.2424	5.223665	4.466234	6.033333

BREAKOUT WIRING DIAGRAMS

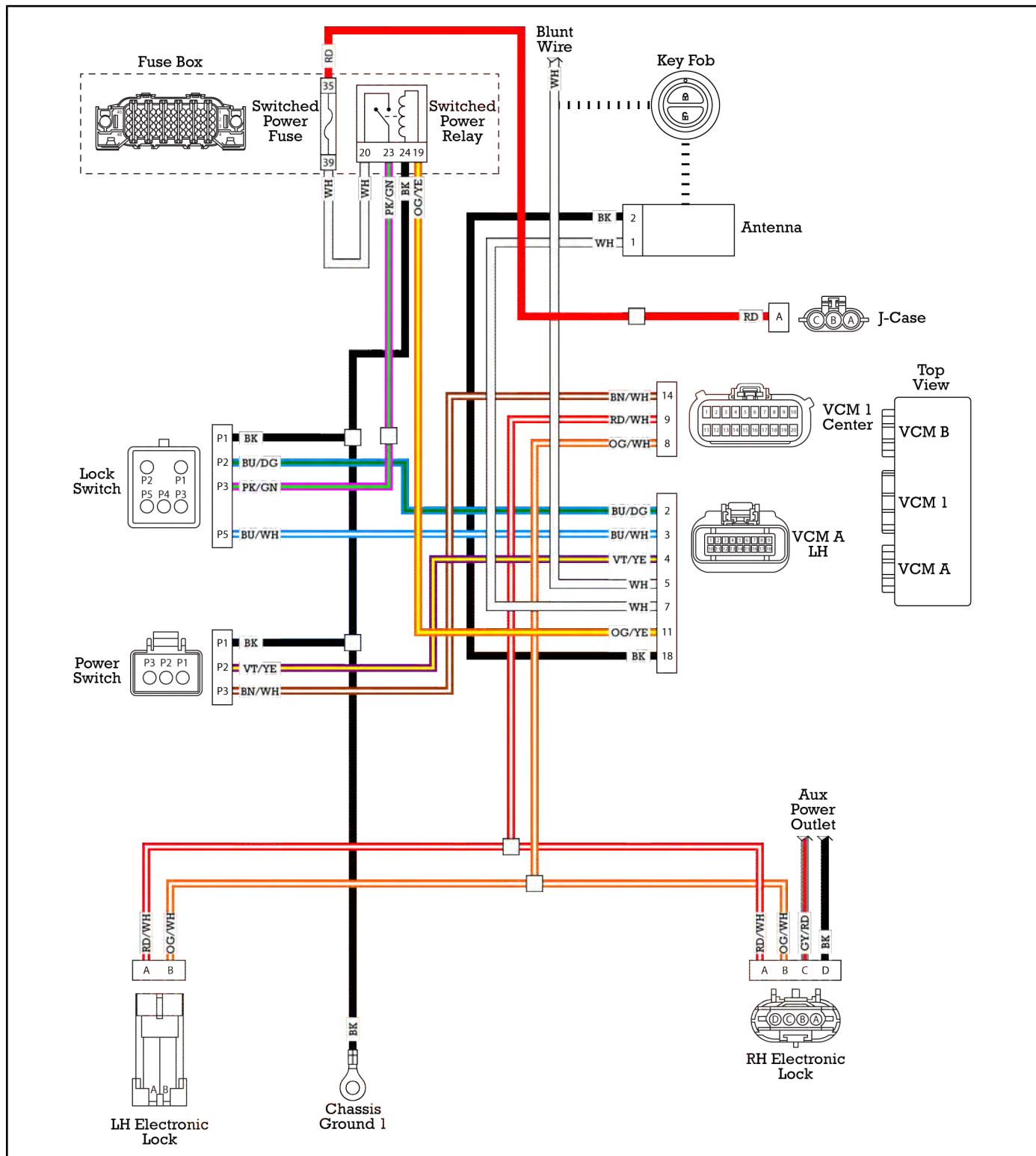
ANTI-LOCK BRAKE SYSTEM, WIRING DIAGRAM



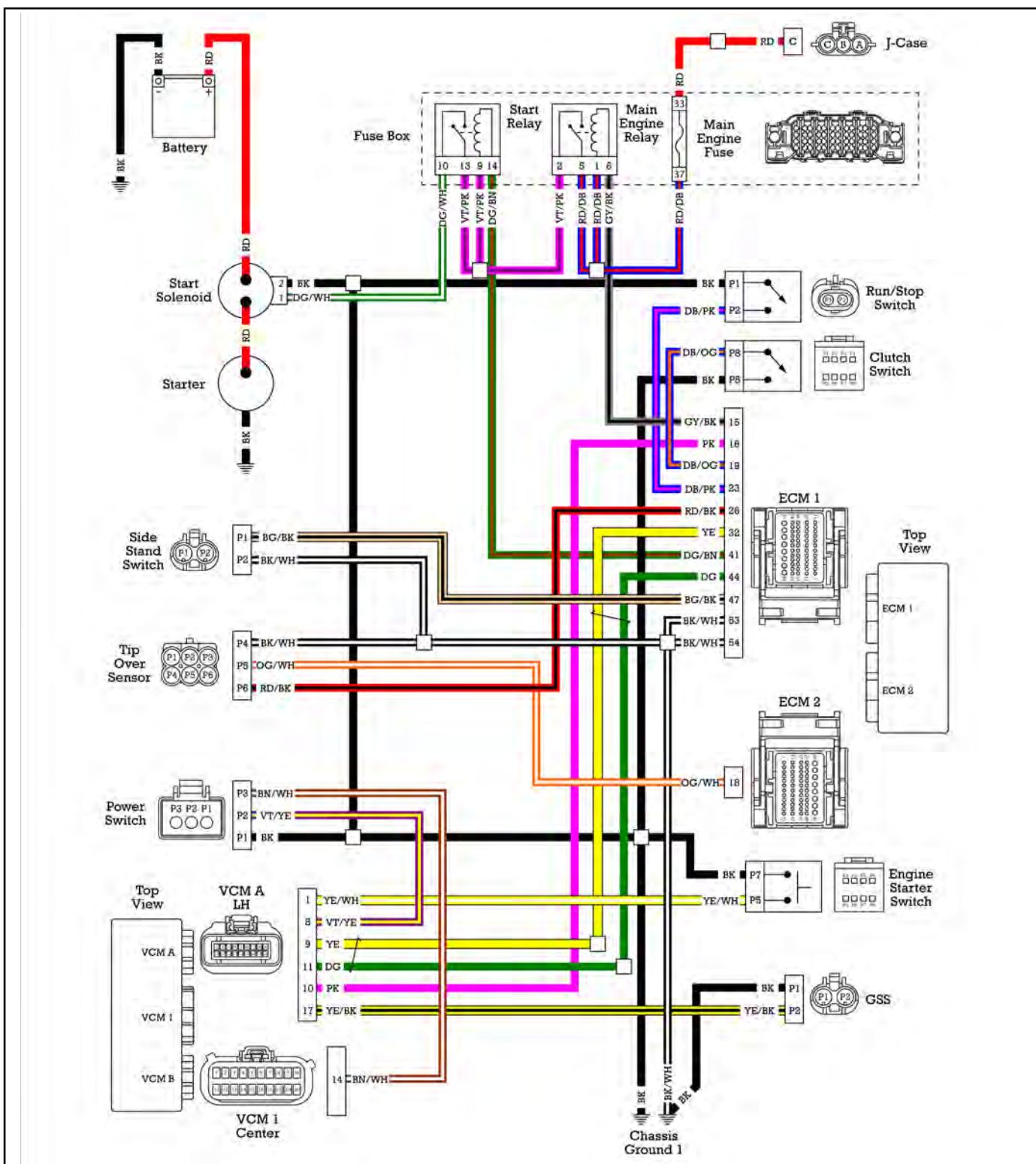
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CENTRAL LOCKING SYSTEM, WIRING DIAGRAM

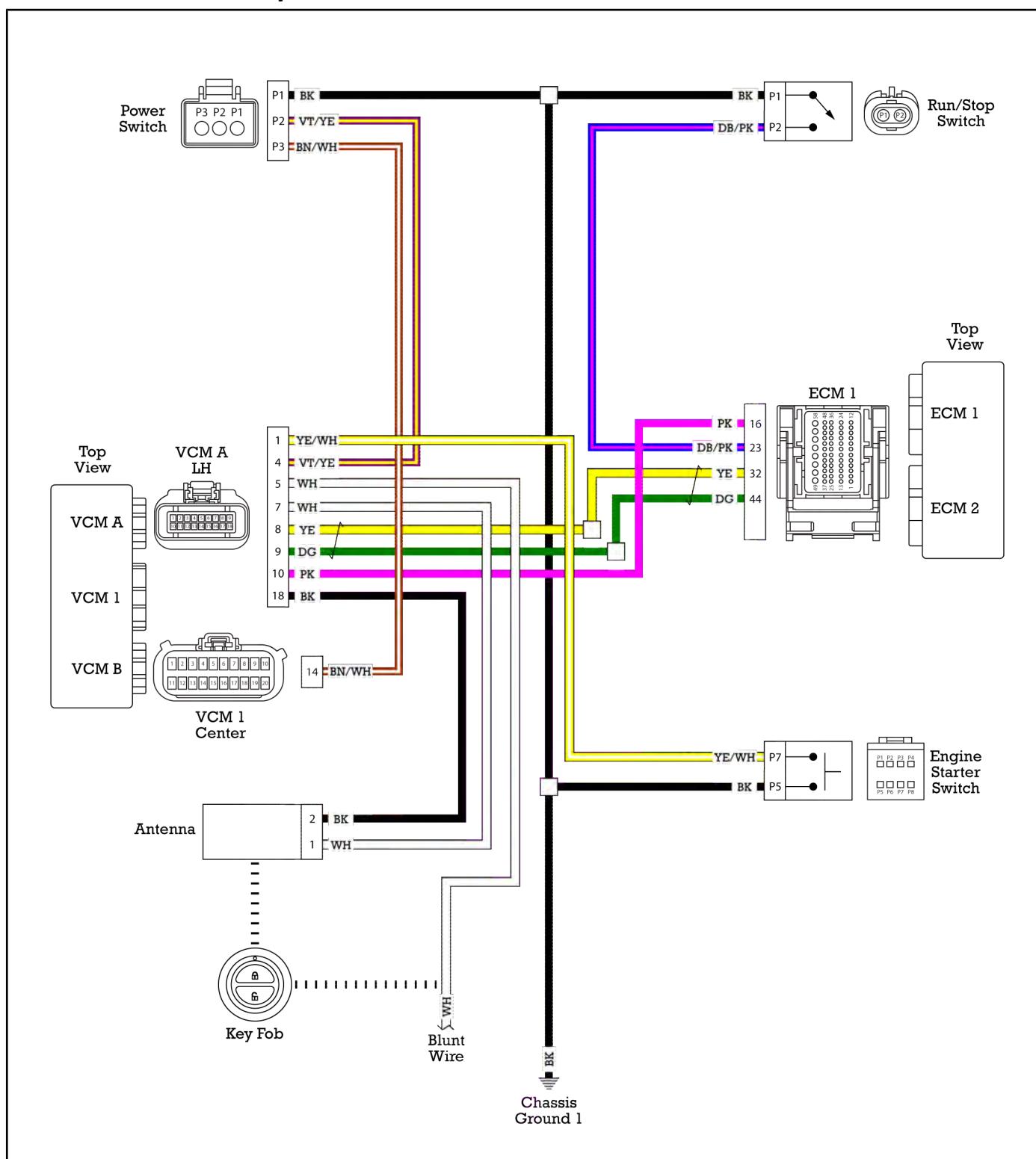


STARTING SYSTEM, WIRING DIAGRAM

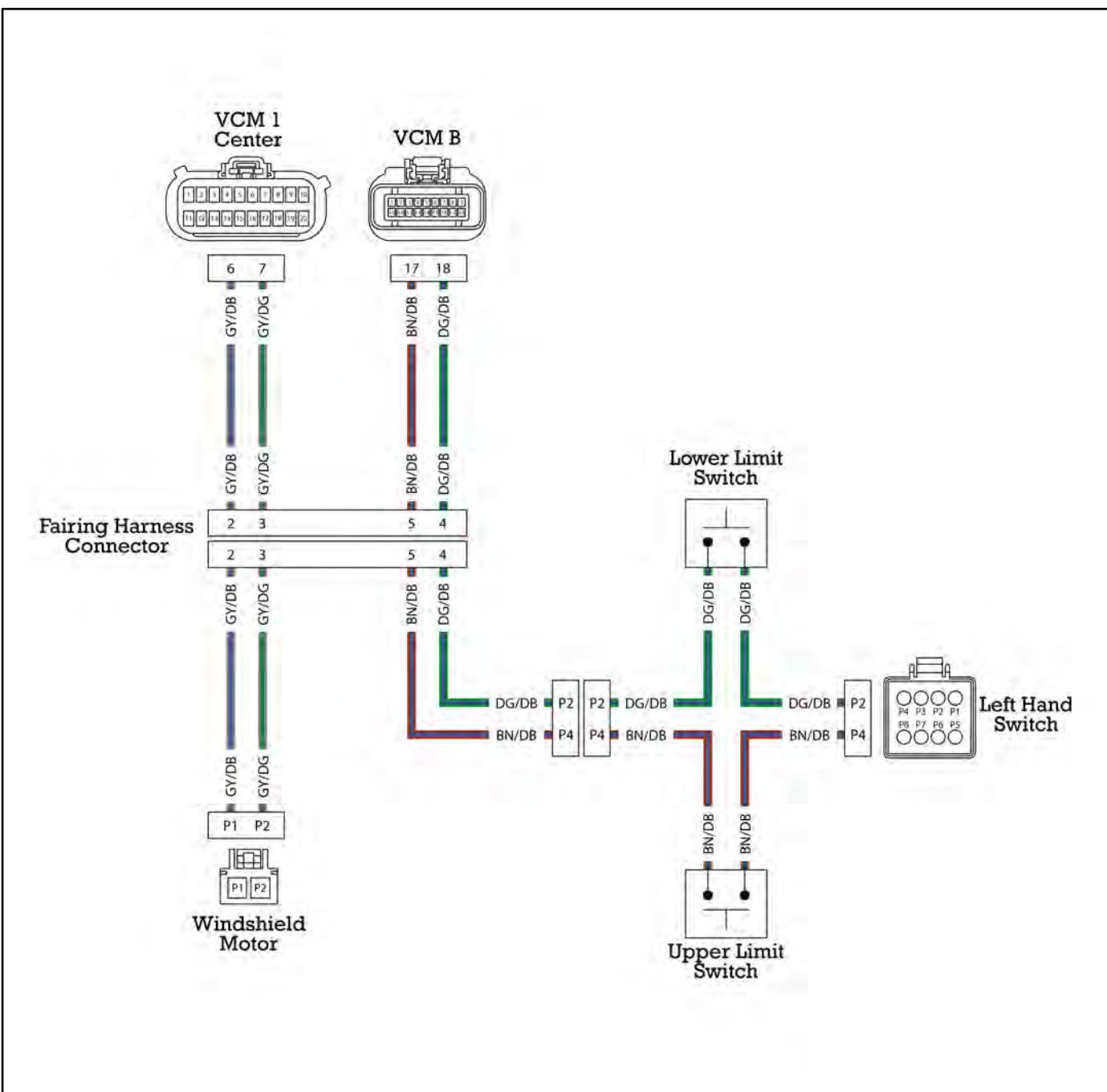


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KEYLESS IGNITION SYSTEM, WIRING DIAGRAM



POWER WINDSHIELD, WIRING DIAGRAM



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Chassis Schematic

2017 -
 Chief Classic / Chief Vintage / Chief Dark Horse
 Springfield / Chieftain / Roadmaster

E = ENGINE GROUND

C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

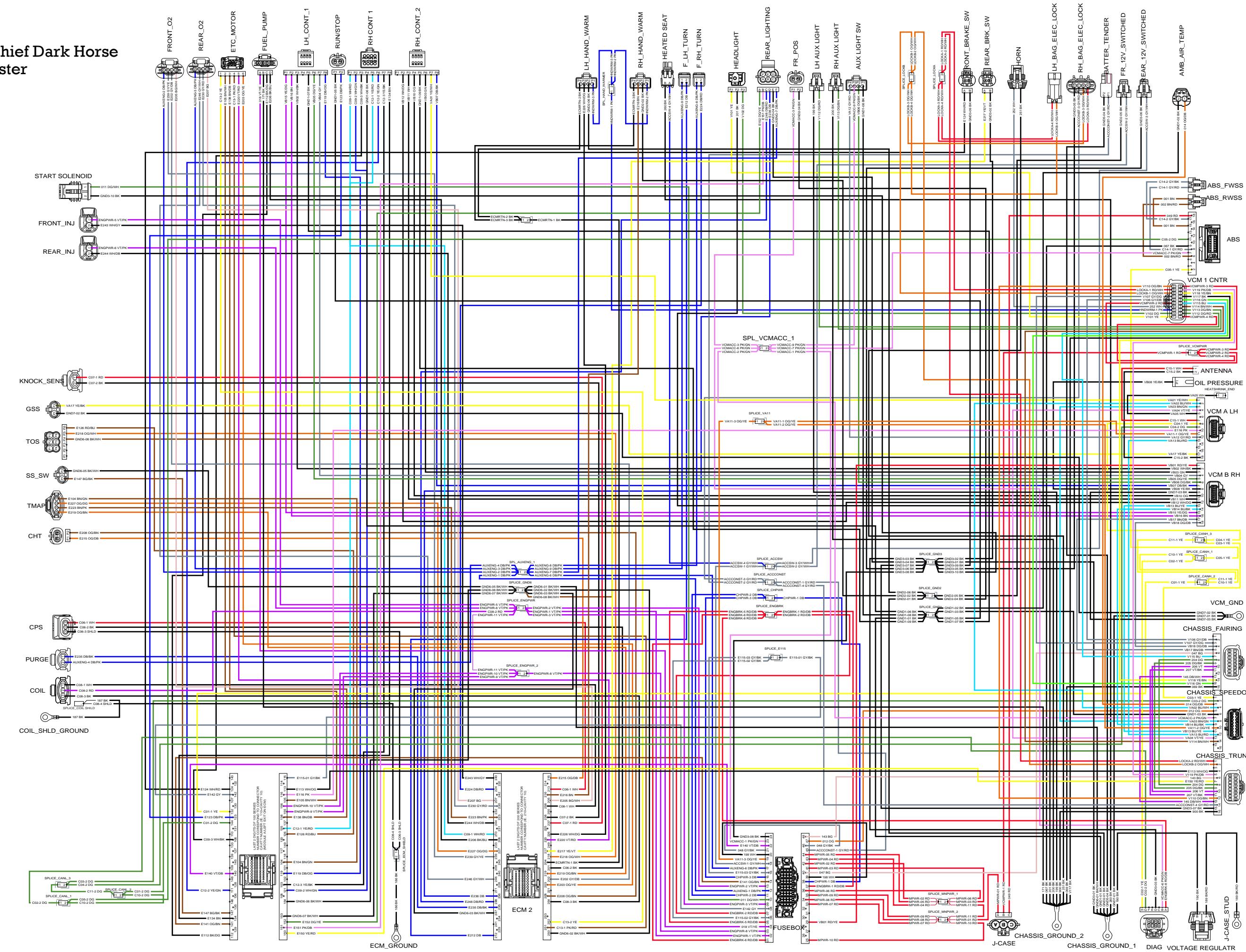
NO = SWITCH NORMALLY OPEN

HARNESS: 2413259-03

WIRE COLOR LEGEND

BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN
 WITH MAIN/TRACE COLORS.
 EXAMPLE: RD/YE = RED WITH
 YELLOW TRACE.



Taillight Harness Schematic

2017 -

Chief Classic / Chief Vintage / Chief Dark Horse

Springfield / Chieftain / Roadmaster

 = ENGINE GROUND

 = CHASSIS GROUND

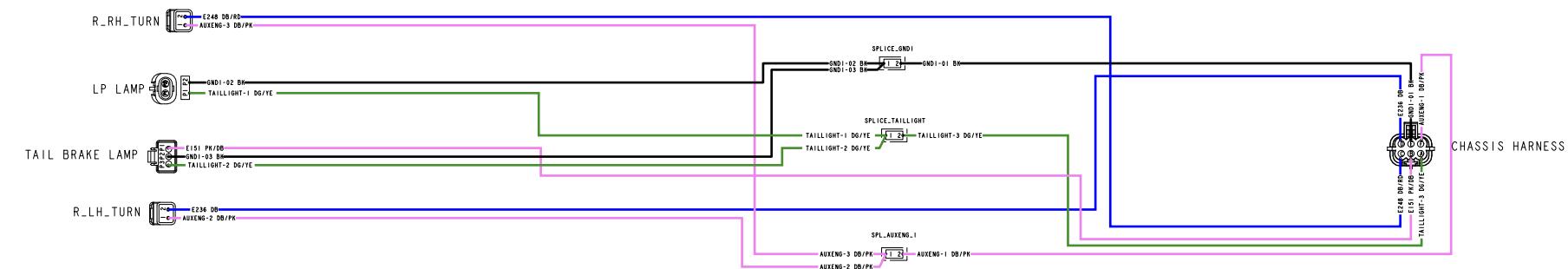
NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: IRON_D-03

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN
WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH
YELLOW TRACE.



Speedometer Schematic

2017 -

Chief Classic / Chief Vintage / Chief Dark Horse / Springfield

 E = ENGINE GROUND

 C = CHASSIS GROUND

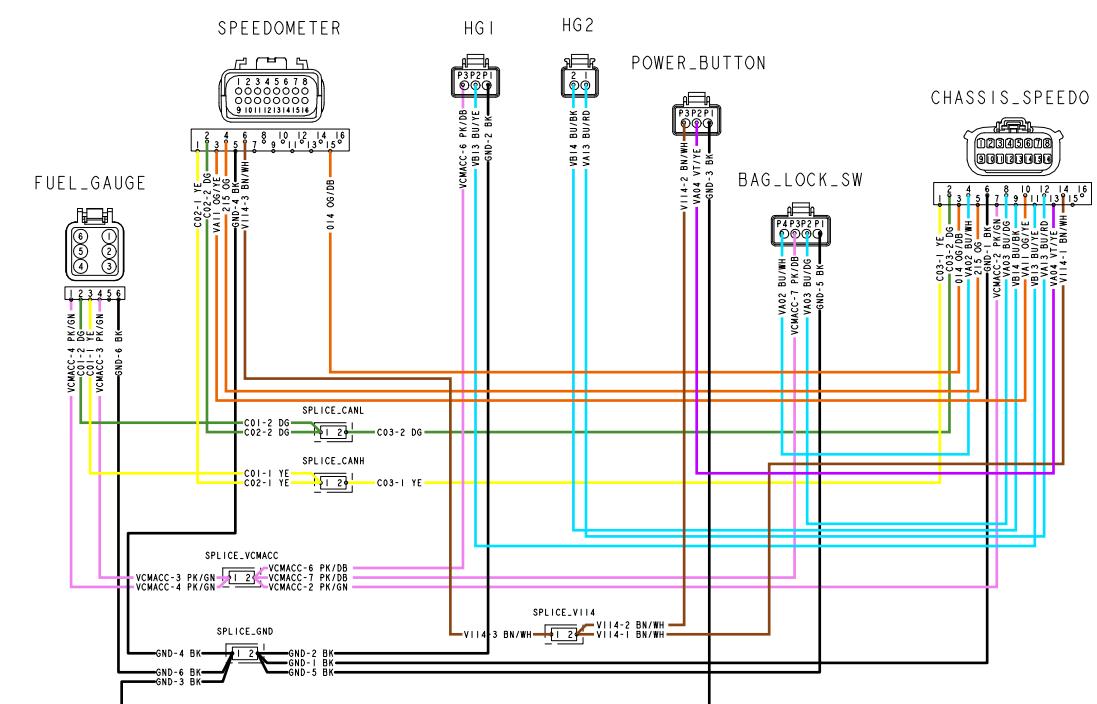
NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: 2413261 - *null*

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN
WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH
YELLOW TRACE.



Fairing Schematic

2017 -
Chieftain / Roadmaster

E = ENGINE GROUND

C = CHASSIS GROUND

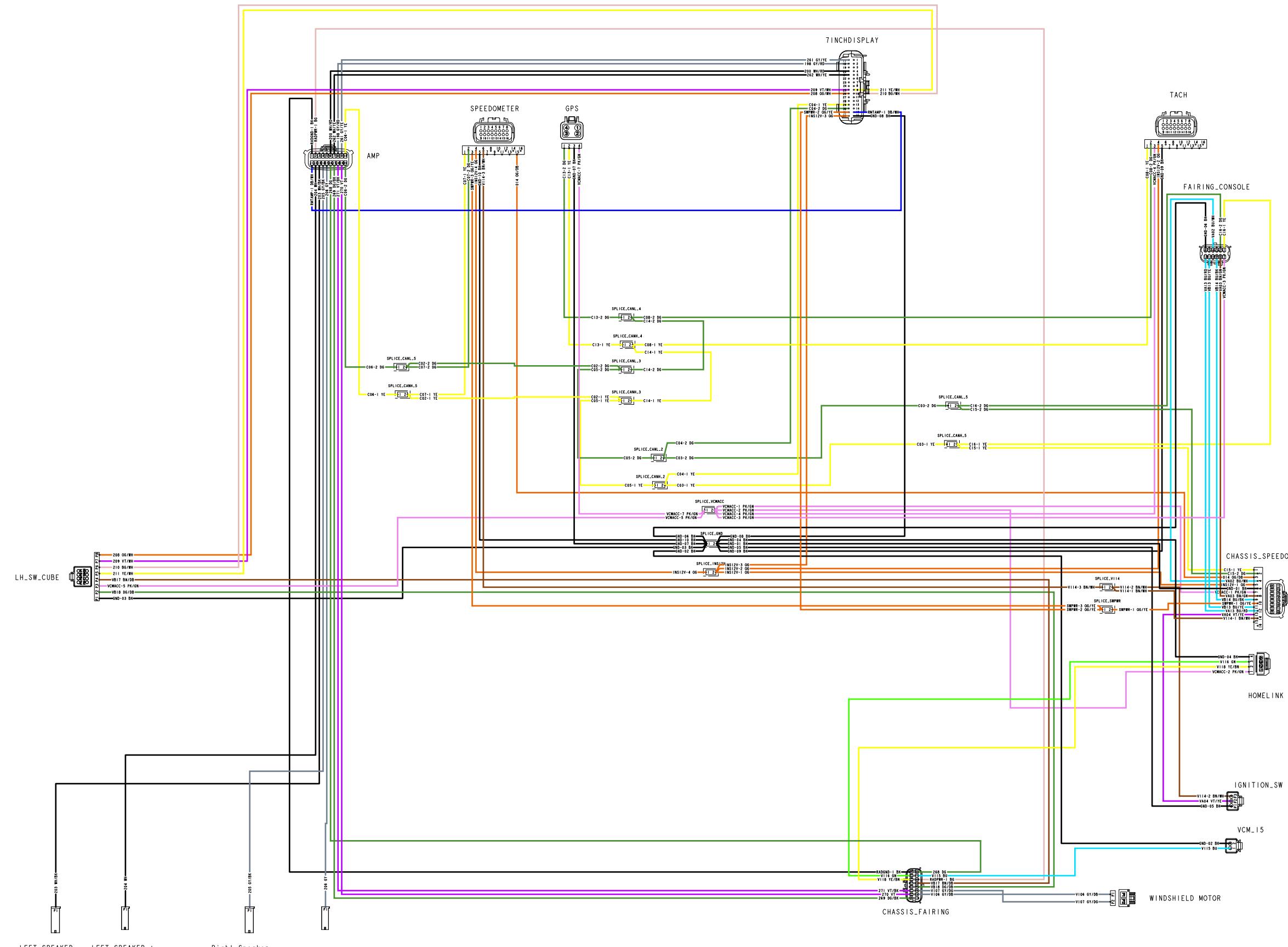
NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: 2413260-03

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH YELLOW TRACE.



Console Harness (Bags / Heated Grips) Schematic

2017 -

Chieftain / Roadmaster

 E = ENGINE GROUND

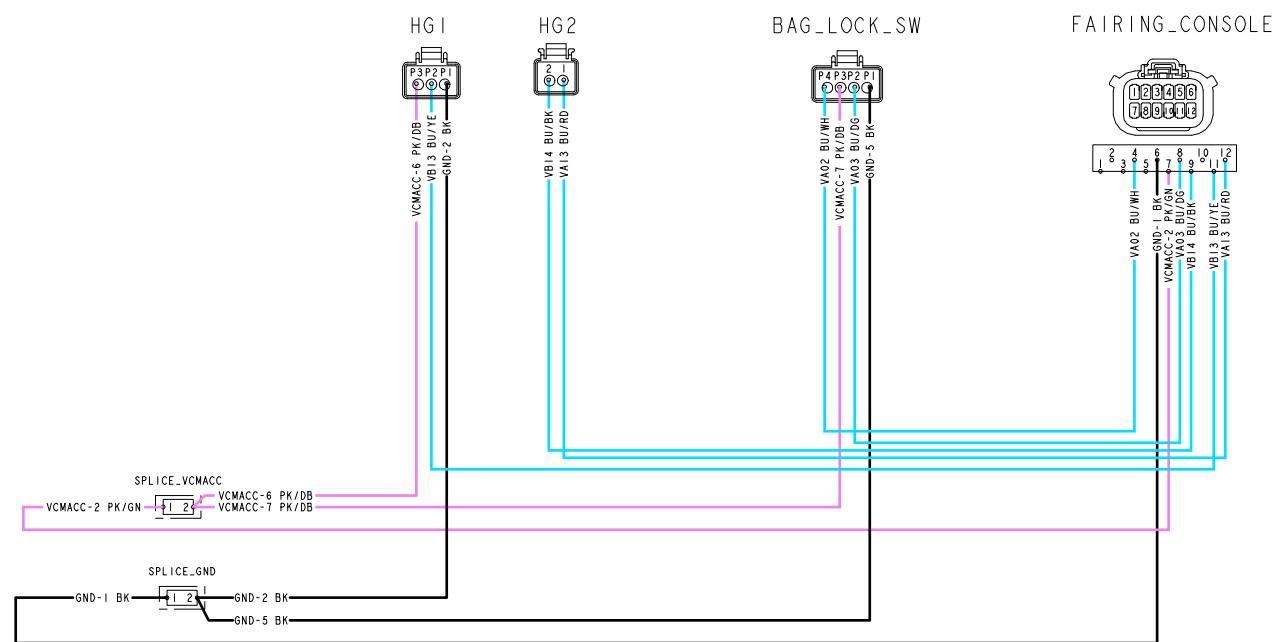
 C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: 2413580 - *null*

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR
TWO WIRE COLORS ARE SHOWN WITH MAIN/TRACE COLORS. EXAMPLE: RD/YE = RED WITH YELLOW TRACE.	



Saddlebag Speaker Schematic

2017 -

Chieftain

E = ENGINE GROUND

C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

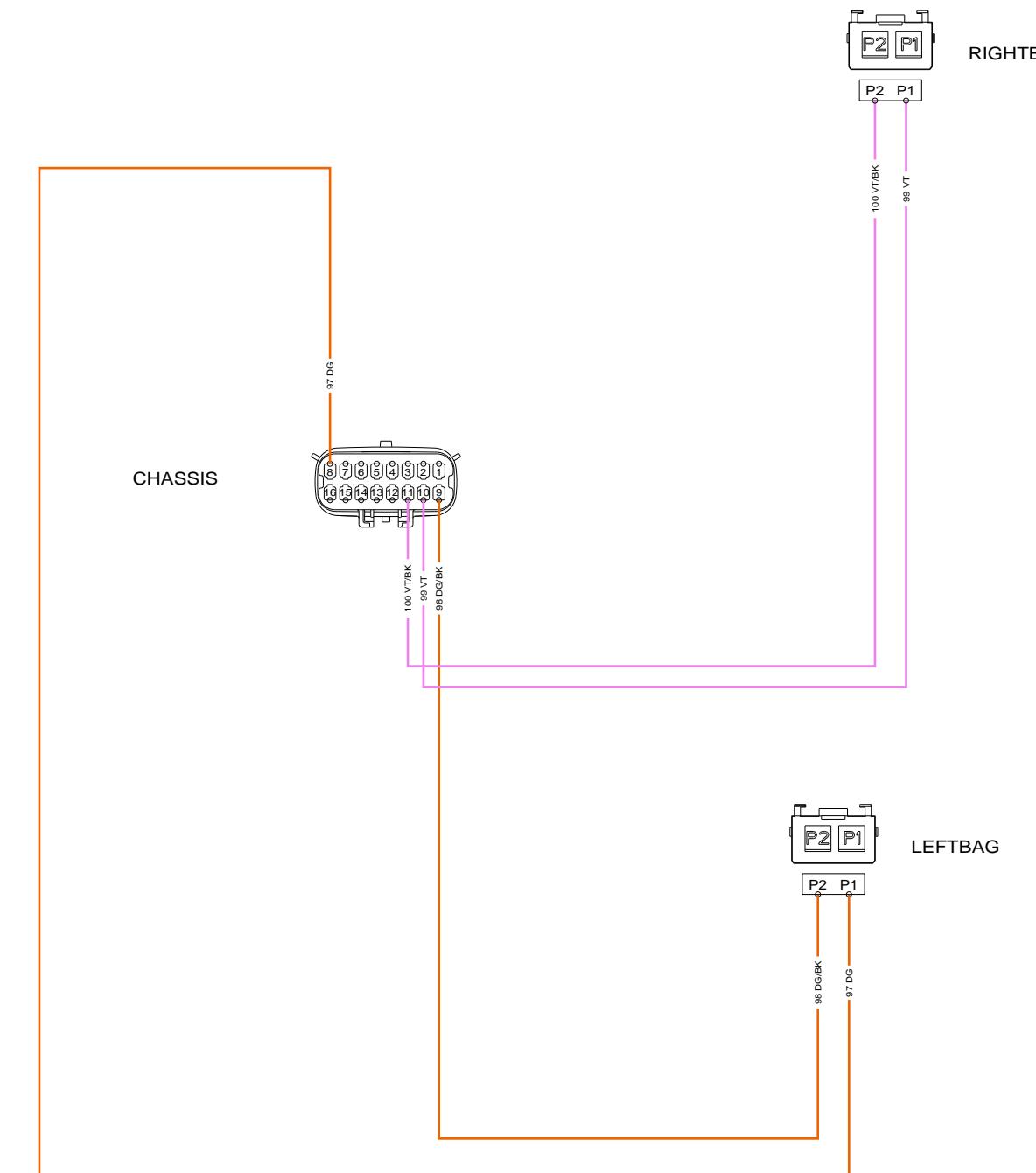
NO = SWITCH NORMALLY OPEN

HARNESS: 2413259-03

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN WITH MAIN/TRACE COLORS.

EXAMPLE: RD/YE = RED WITH YELLOW TRACE.



Trunk Schematic

2017 -
Roadmaster

 E = ENGINE GROUND

 C = CHASSIS GROUND

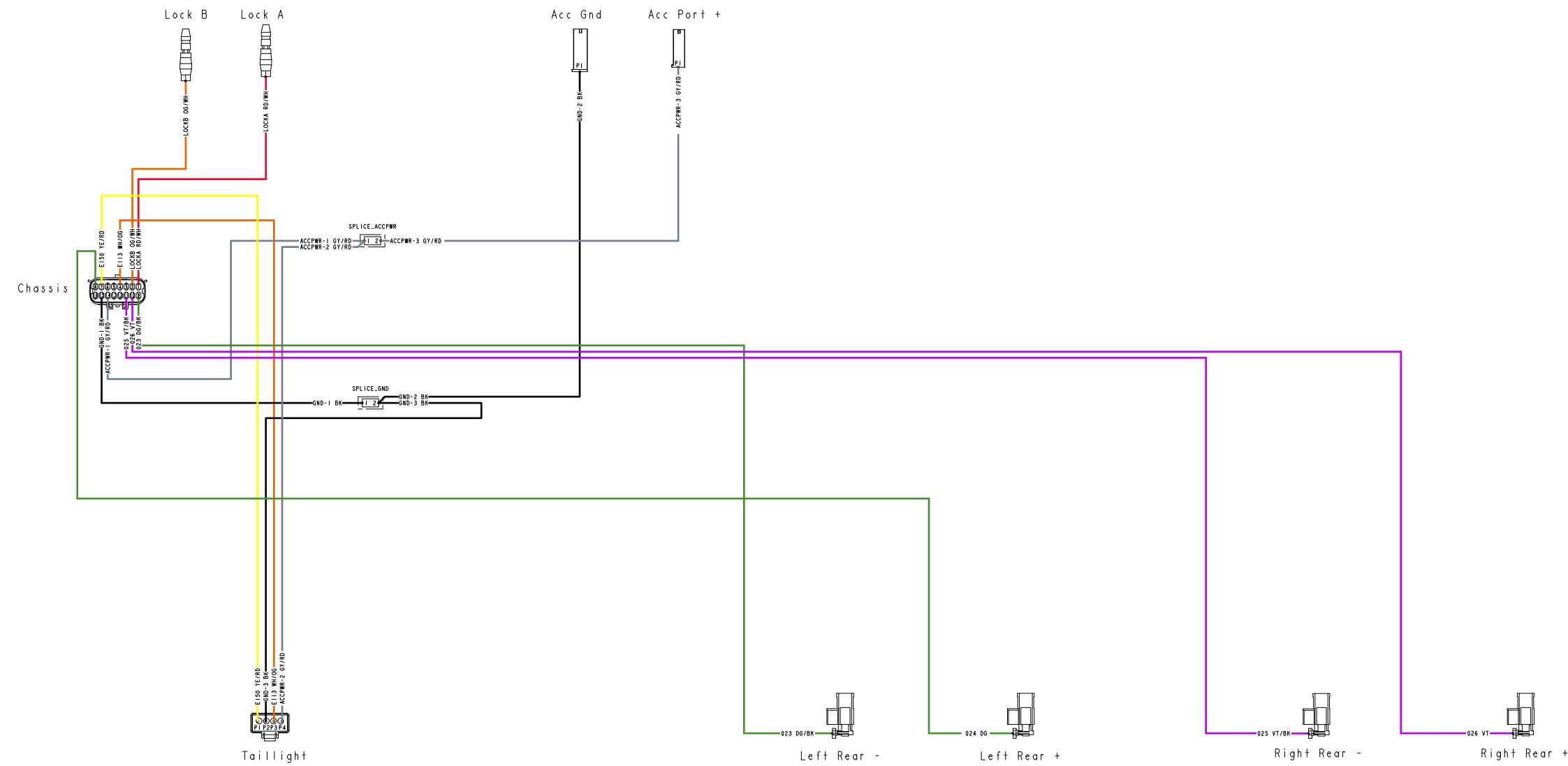
NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: IRON_D-2

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN
WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH
YELLOW TRACE.



Chassis Schematic

2017 -
Chieftain Dark Horse

E = ENGINE GROUND

C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

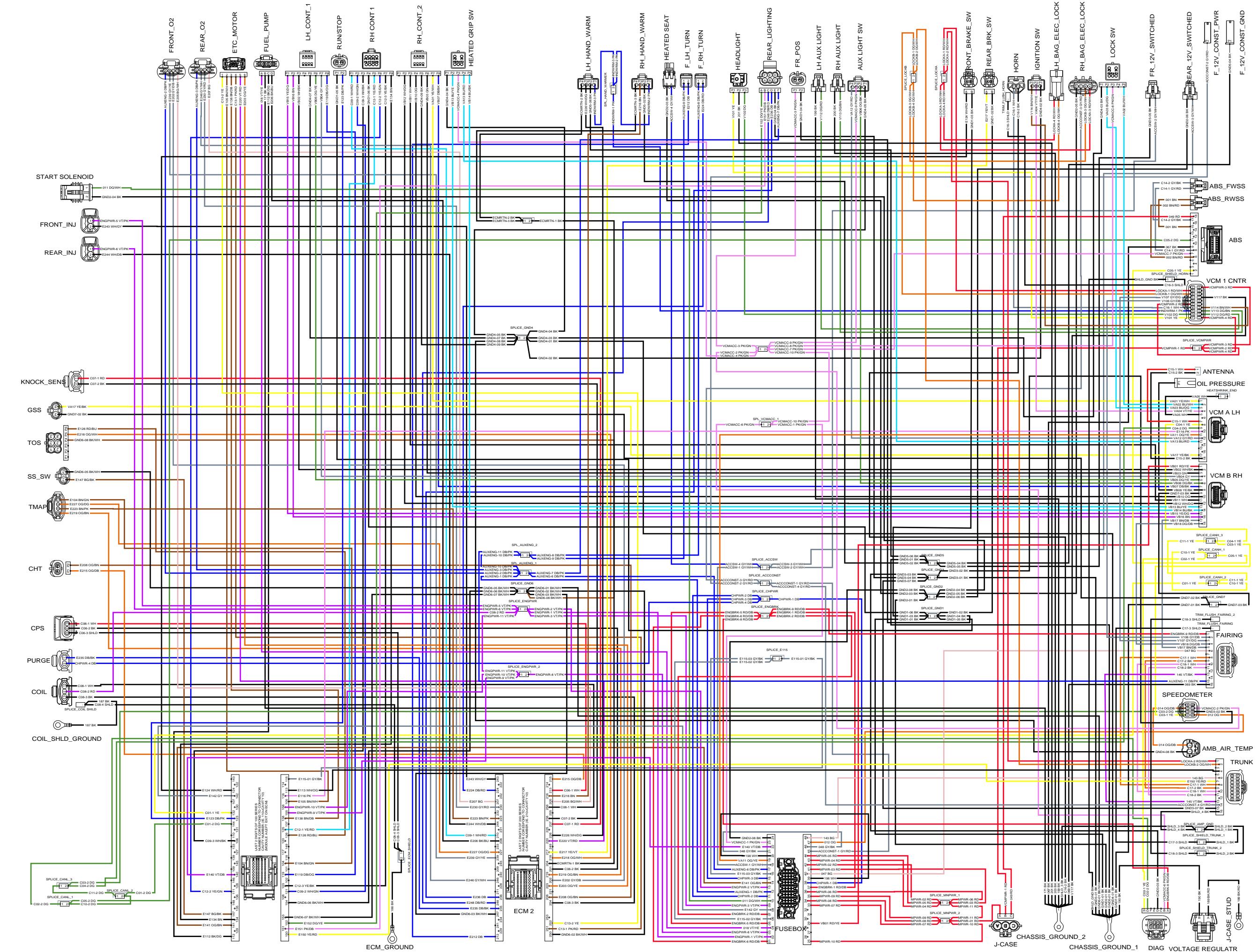
NO = SWITCH NORMALLY OPEN

HARNESS: 2412300-06

WIRE COLOR LEGEND

BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH YELLOW TRACE.



Rear Fender Harness Schematic

2017 -

Chieftain Dark Horse

 E = ENGINE GROUND

 C = CHASSIS GROUND

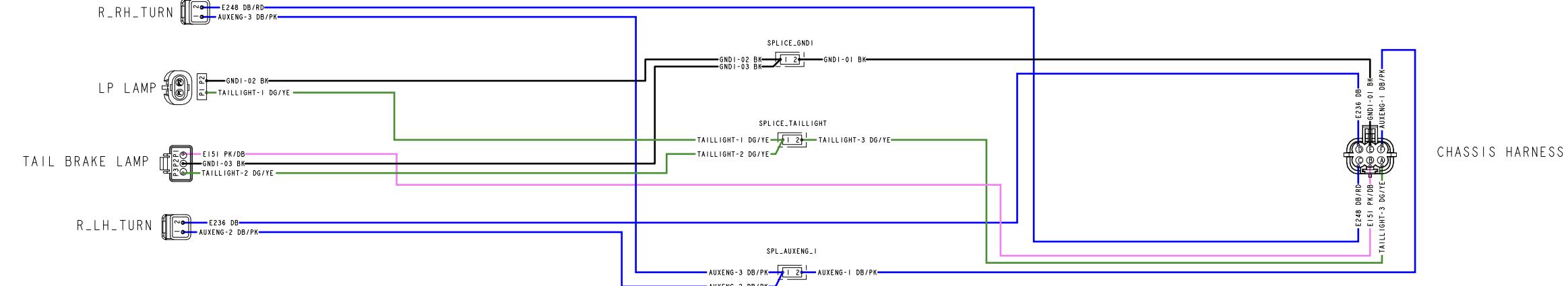
NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: IRON_D-3

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN
WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH
YELLOW TRACE.



Fairing Schematic

2017 -

Chieftain Dark Horse

 E = ENGINE GROUND

 C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

HARNESS: IRON_D-03

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GY	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN WITH MAIN/TRACE COLORS.
EXAMPLE: RD/YE = RED WITH YELLOW TRACE.

