



2013–2015 *RANGER* 800 4X4 / CREW / 6X6 FULLSIZE

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 Polaris 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: Polaris Industries Inc. ATTN: Service Publications Department, 2100 Hwy 55, Medina, MN 55340.

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UNDERSTANDING SAFETY LABELS AND DIRECTIONS

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



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.



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

POLARIS ACKNOWLEDGES THE FOLLOWING PRODUCT(S) MENTIONED IN THIS MANUAL:

Loctite, Registered Trademark of the Loctite Corporation

Nyogel, Trademark of Wm. F. Nye Co.

Fluke, Registered Trademark of John Fluke Mfg. Co.

Mity-Vac, Registered Trademark of Neward Enterprises, Inc.

Torx, Registered Trademark of Textron

Hilliard, Trademark of the Hilliard Corporation

Warn, Trademark of Warn Industries

FOX, Registered Trademark of FOX RACING SHOX

RydeFX, Registered Trademark of ArvinMeritor

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

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CHAPTER 1

GENERAL INFORMATION

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GENERAL INFORMATION

VEHICLE IDENTIFICATION

Model Number Designation

2014 Example: R14WH76AA

GROUP	MODEL YEAR		CHASSIS	DRIVE-LINE	ENGINE / MOTOR CODE		CATEGORY	OPTION	REGION
1st	2nd	3rd	4th*	5th*	6th*	7th*	8th*	9th**	10th
R	1	4	W	H	7	6	A	A	

* = 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 the base)
 First 3 digits and 9th digit are used in model number only. They are not used with the 17 digit VIN.
 Digits 1 through 8 determine Digital Wrench calibration.

2015 Example: A15SEA57AD

GROUP	MODEL YEAR		MAKE / CHASSIS CODE			ENGINE CODE		REGION	OPTION
1st	2nd	3rd	4th*	5th*	6th*	7th*	8th*	9th	10th**
A	1	5	S	E	A	5	7	A	D

* = digits that would transfer to 17 digit VIN and are used in digits 4-8 respectively
 ** = 10th digit will be used on color/featured versions of models (not including the base)
 First 3 digits and 10th digit are used in model number only. They are not used with the 17 digit VIN.
 Digits 1 through 8 determine Digital Wrench calibration.

Engine Designation Number

1204619 RGR800-13LK Twin Cylinder, Liquid Cooled, 4-Cycle OHV, Electric Start

Vehicle Identification Number (VIN) Designation

2014 Example: 4XAWH76A6E3000000

WORLD MFG. ID			VEHICLE DESCRIPTORS						VEHICLE IDENTIFIERS							
			CHASSIS	DRIVELINE	ENGINE SIZE	ENGINE MODIFIER	CATEGORY	CHECK DIGIT	MODEL YEAR *	MFG. LOCATION	INDIVIDUAL SERIAL NO.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	X	A	W	H	7	6	A	6	E	3	0	0	0	0	0	0
* Model Year: A = 2010; B = 2011; C = 2012; D = 2013; E = 2014																

GENERAL INFORMATION

2015 Example: 4XASEA570F3000000

WORLD MFG. ID			VEHICLE DESCRIPTORS						VEHICLE IDENTIFIERS							
			MAKE / CHASSIS		CATEGORY	ENGINE SIZE	ENGINE MODIFIER	CHECK DIGIT	MODEL YEAR *	MFG. LOCATION	INDIVIDUAL SERIAL NO.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	X	A	S	E	A	5	7	0	F	3	0	0	0	0	0	0
* Model Year: A = 2010; B = 2011; C = 2012; D = 2013; E = 2014; F = 2015																

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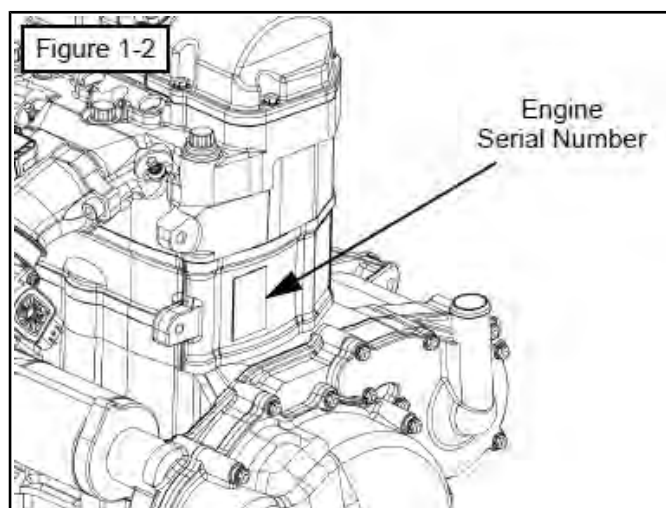
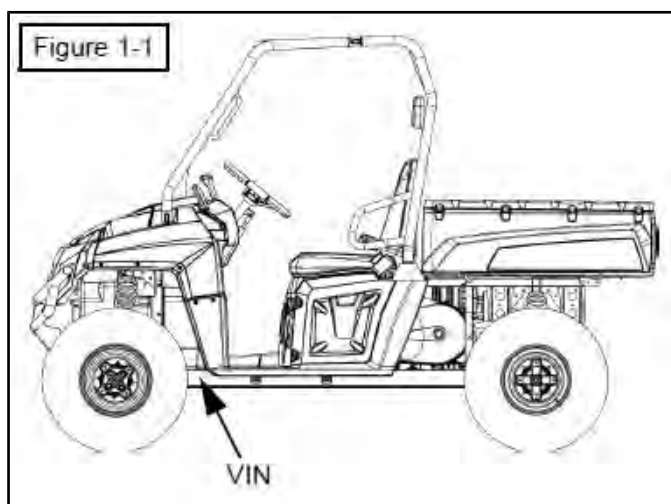
GENERAL INFORMATION

Vehicle and Engine Serial Number Locations

Whenever corresponding about a Polaris *RANGER* utility vehicle, be sure to refer to the vehicle identification number (VIN) and the engine model number and serial number.

The VIN can be found stamped on the lower frame rail on the front LH side of the vehicle (see Figure 1-1).

The engine model and serial number can be found on a decal applied to the side of the engine's cylinder (see Figure 1-2).



VEHICLE INFORMATION

Publication Numbers

MODEL	MODEL NO.	OWNER'S MANUAL	PARTS MANUAL
2013 <i>RANGER</i> 4X4 800 (CA)	R13TH76AG, AH, AK, AR, AZ (AGC, ARC, AZC)	9924160	9924097
2013 <i>RANGER</i> 4X4 800 EPS (CA)	R13TH7EAG, AK, AZ (AKC, AZC)	9924160	9924097
2013 <i>RANGER</i> CREW 800	R13WH76AG, AR	9924160	9924210
2013 <i>RANGER</i> CREW 800 EPS	R13WH7EAG, AI	9924160	9924210
2013 <i>RANGER</i> 6X6 800	R13HR76AG, AR	9924160	9924092
2014 <i>RANGER</i> 4X4 800 (CA)	R14TH76AA, AC, AR, AS	9924689	9924703
2014 <i>RANGER</i> 4X4 800 EPS (CA)	R14TH7EAK, AS	9924689	9924703
2014 <i>RANGER</i> CREW 800	R14WH76AA	9924689	9924720
2014 <i>RANGER</i> 6X6 800	R14HR76AA, AJ	9924689	9924690
2015 <i>RANGER</i> 6X6 800	R15HR76AA, AJ	9925367	9925368

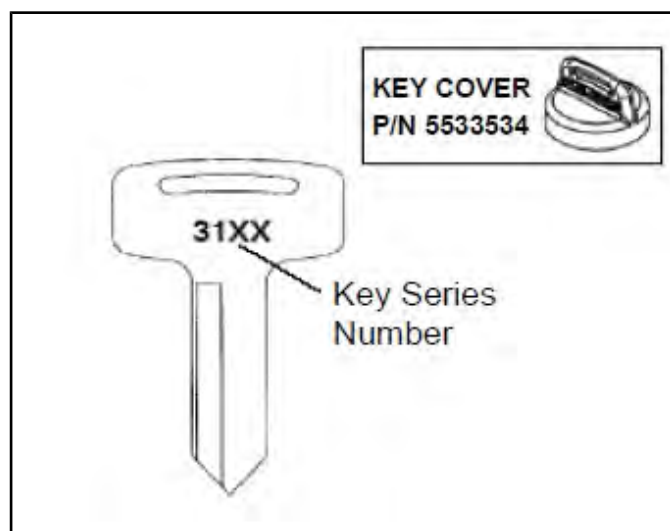
(CA): California 50-State Models

Polaris factory publications can be found at www.polarisindustries.com or purchased from www.purepolaris.com.

NOTE: When ordering service parts be sure to use the correct parts manual.

Replacement Keys

Replacement keys can be made from the original key. To identify which series the key is, take the first two digits on the original key and refer to the chart to the right for the proper part number.



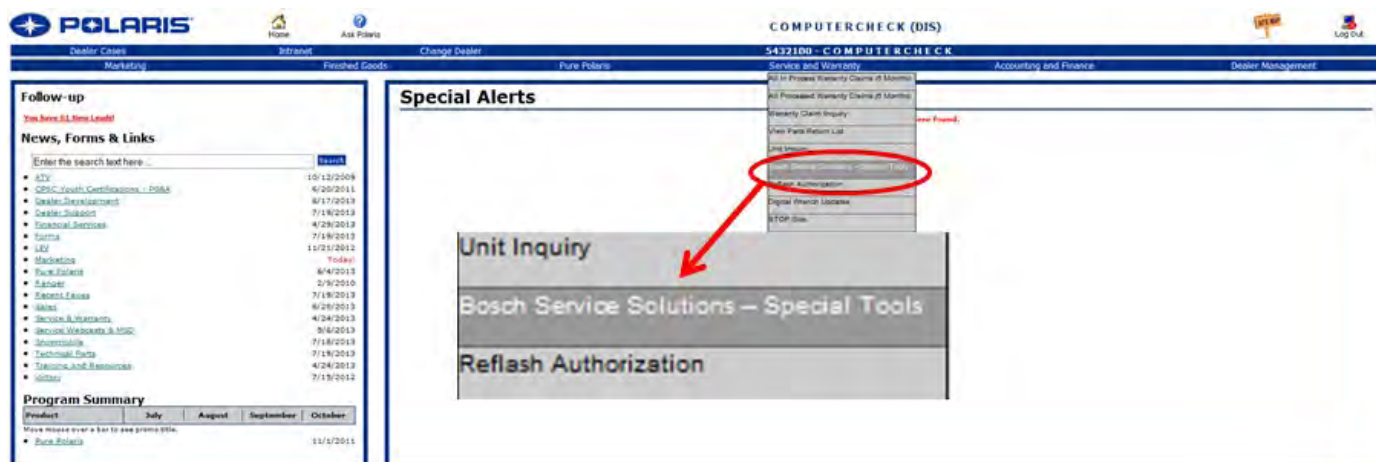
SERIES#	PART NUMBER
20	4010278
21	4010278
22	4010321
23	4010321
27	4010321
28	4010321
31	4110141
32	4110148
67	4010278
68	4010278

GENERAL INFORMATION

SPECIAL TOOLS

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. Polaris recommends the use of

Polaris Special Tools when servicing any Polaris product. Dealers may order special tools through Polaris' official tool supplier, Bosch Automotive Service Solutions, by phone at 1-800-328-6657 or on-line at <http://polaris.service-solutions.com/>.



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SPECIAL SERVICE TOOLS

KENT-MOORE

[NEW DEALER KIT](#)

Welcome to the Polaris & Victory Special Service Tools Site

SPX Corporation's Service Solutions business becomes Bosch Automotive Service Solutions

Click For More Info

Invented for life

This site offers an exclusive line of special service tools and diagnostic product designed specifically to reduce labor times and ensure a quality repair - maximizing your dealership ROI.

Take a moment to browse the site as we are continuously updating it with improved tool information. Also, be sure to watch for newly released tools appearing in the New Tools Section just to the right.

If you have any questions or need more information than provided on your Polaris & Victory on-line catalog, please call **1-800-345-2233**.

PRODUCT SEARCH

BY PART NUMBER ?

BY KEYWORD

ORDER ITEMS

0 ITEMS
\$0.00

[VIEW CART](#)

NEW TOOLS

[PORT RELIEF PRESSURE TOOL](#)
PU-51225

[SERVICE KIT FOR REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING MACHINE](#)
PU-51021-1

[REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING MACHINE](#)
PU-51021

[DRIVE CONTROL ADJUSTMENT WRENCH](#)
PU-51261

[SHOCK pre-LOAD WRENCH](#)
PV-43507-A

[MORE](#)

GENERAL INFORMATION

GENERAL SPECIFICATIONS

MODEL: 2013–2014 *RANGER* 4X4 800 / EPS

MODEL NUMBER: R13TH76AG, AGC, AH, AK, AR, ARC, AZ, AZC; R14TH76AA, AC, AR, AS

MODEL NUMBER: R13TH7EAG, AK, AKC, AZ, AZC; R14TH7EAK, AS, (EPS MODELS)

CATEGORY	DIMENSION / CAPACITY
Length	114 in. / 289.6 cm
Width (cargo box)	60 in. / 152.4 cm
Width (tires)	58 in. / 147.3 cm
Height	76 in. / 193 cm
Wheel Base	76 in. / 193 cm
Ground Clearance	11.5 in. / 30.5 cm
Turning Radius	158 in. / 401.3 cm
Dry Weight	<i>STD</i> : 1237 lbs. / 561 kg
	<i>EPS</i> : 1257 lbs. / 570 kg
Cargo Box Capacity	<i>49-State</i> : 1000 lbs. / 454 kg
	<i>50-State</i> : 600 lbs. / 272 kg
Cargo Box Dimensions (inside dimensions)	36.5 x 54 x 11.5 in. (93 x 137 x 29 cm)
Vehicle Payload (includes weight of operator, passenger, cargo and accessories)	<i>49-State</i> : 1500 lbs. / 681 kg
	<i>50-State</i> : 1100 lbs. / 499 kg
Hitch Towing Capacity	2000 lbs. / 907 kg
Hitch Tongue Capacity	150 lbs. / 68 kg



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GENERAL INFORMATION

MODEL: 2013–2014 *RANGER* 4X4 800 / EPS

4X4 800 MODELS: R13TH76AG,AGC,AH,AK,AR,ARC, AZ,AZC; R14TH76AA, AC, AR, AS

4X4 800 EPS MODELS: R13TH7EAG, AK, AKC, AZ, AZC; R14TH7EAK, AS

ENGINE	
Platform	High Output Domestic Twin Cyl, Liquid Cooled, 4-Stroke
Engine Number	1204397
Engine Displacement	760 cc H.O.
Number of Cylinders	2
Bore & Stroke (mm)	80 x 76.5 mm
Compression Ratio	9.78:1
Compression Pressure	165-185 psi
Engine Idle Speed	1250 ± 100 RPM
Engine Max Operating RPM	6500 RPM
Lubrication	Pressurized Wet Sump
Oil Requirements	PS-4 or Extreme Duty
Oil Capacity	2 qts. (1.9 L)
Coolant Capacity	3.25 qts. (3.1 L)
Overheat Warning	Instrument Cluster Indicator
Exhaust System	2 to 1 Canister Style
Fuel System	
Fuel System Type	Bosch M17 EFI
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 +/- 2 psi (400 +/- 14 kPa)
Fuel Capacity	9 gal. (34 L)
Fuel Requirement	87 Octane (minimum)
Electrical	
Alternator Rated Output	500 Watts @ 3000 RPM
Headlights	2 - Halogen: Low 55 W / High 60 W
Tail Lights	0.3 Watts / L.E.D. x 2
Brake Lights	3.1 Watts / L.E.D. x 2
Starting System	Electric Start
Ignition System	Bosch M17 (ECU Controlled)
Ignition Timing (Variable)	3° - 10° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC3 / .035 in. (0.9 mm)
Battery / Model / Amp Hr	Yuasa YB30L-B / 30 Amp Hr. / 12 Volt
Instrumentation	Multifunction Instrument Cluster
DC Outlets	(2) - Standard
Relays	Chassis / ECM / Fan / Fuel Pump EPS / Rear Diff

ENGINE	
Circuit Breaker	Fan Motor: 20 Amp
Fuses	Lights / ECM / Drive / Acc: 20 Amp Fuel Pump: 10 Amp EPS: 30 Amp

DRIVETRAIN	
Transmission Type	Polaris Automatic PVT
Shift Type	In Line Shift - H / L / N / R
Transmission Gear Ratio: High Low Reverse	Front: 3.60:1 / Rear: 11.18:1 Front: 7.70:1 / Rear: 23.91:1 Front: 7.00:1 / Rear: 21.74:1
Front Gearcase Lubricant Requirements	Demand Drive 9 oz. (265 ml)
Transmission Lubricant Requirements	AGL 33.8 oz. (1000 ml)
Clutch Type	Standard PVT
Drive Belt	3211133
Clutch Center Distance	10.05" (255 mm)
Steering / Suspension	
Toe Out	1/8 - 1/4 in. (3.2 - 6.35 mm)
Front Suspension	Dual A-arm
Front Travel	9.6 in. (24.4 cm)
Rear Suspension	Independent (IRS)
Rear Travel	9 in. (22.9 cm)
Shock Preload Adjustment	Cam Adjustment
Wheels / Brakes	
Front Wheel Type / Size	Steel / 12 x 6 Aluminum / 12 x 6
Rear Wheel Type / Size	Steel / 12 x 8 Aluminum / 12 x 8
Front Tire Make / Model / Size	Carlisle / AT489 / 25 x 10 R12 Carlisle / PXT / 26 x 9 R12
Rear Tire Make / Model / Size	Carlisle / AT489 / 25 x 11 R12 Carlisle / PXT / 26 x 11 R12
Tire Air Pressure	8-12 psi (69 kPa)
Brake System	4 Wheel Hydraulic Disc
Brake Fluid	DOT 4
Parking Brake	Hand Actuated (in dash)

CLUTCH CHART

ALTITUDE		SHIFT WEIGHT	DRIVE SPRING	DRIVEN SPRING
Me- ters (Fee- t)	0-1800 Meters (0-6000 Feet)	23-62 (5632337)	Black (7043594)	Blk / Almd (7043167)
	1800-3700 Meters (6000 - 12000 Feet)	23-58 (B) (1322911)	Black (7043594)	Blk / Almd (7043167)

(B) = Bushed Shift Weight

GENERAL INFORMATION

MODEL: 2013–2014 *RANGER CREW 800* / EPS

MODEL NUMBER: R13WH76AG, AR; R14WH76AA

MODEL NUMBER: R13WH7EAH, AI (EPS MODELS)

CATEGORY	DIMENSION / CAPACITY
Length	145 in. / 386 cm
Width (cargo box)	60 in. / 152.4 cm
Width (tires)	58 in. / 147.3 cm
Height	76 in. / 193 cm
Wheel Base	108 in. / 274 cm
Ground Clearance	11.5 in. / 29 cm
Turning Radius	255 in. / 648 cm
Dry Weight	STD: 1495 lbs. / 678 kg
	EPS: 1515 lbs. / 687 kg
Cargo Box Capacity	1000 lbs. / 454 kg
Cargo Box Dimensions (inside dimensions)	36.5 x 54 x 11.5 in. (93 x 137 x 29 cm)
Vehicle Payload (includes weight of operator, passengers, cargo and accessories)	1750 lbs. / 794 kg
Hitch Towing Capacity	2000 lbs. / 907 kg
Hitch Tongue Capacity	150 lbs. / 68 kg



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GENERAL INFORMATION

MODEL: 2013–2014 *RANGER* CREW 800 / EPS

CREW 800 MODEL: R13WH76AG, AR; R14WH76AA

CREW 800 EPS MODELS: R13WH7EAH, AI

ENGINE	
Platform	Domestic Twin Cylinder, Liquid Cooled, 4-Stroke
Engine Number	1204667
Engine Displacement	760 cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 76.5 mm
Compression Ratio	9.78:1
Compression Pressure	165-185 psi
Engine Idle Speed	1250 ± 100 RPM
Engine Max Operating RPM	6500 RPM
Lubrication	Pressurized Wet Sump
Oil Requirements	PS-4 or Extreme Duty
Oil Capacity	2 qts. (1.9 L)
Coolant Capacity	6.4 qts. (6 L)
Overheat Warning	Instrument Cluster Indicator
Exhaust System	2 to 1 Canister Style
Fuel System	
Fuel System Type	Bosch M17 EFI
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 +/- 2 psi (400 +/- 14 kPa)
Fuel Capacity	9 gal. (34 L)
Fuel Requirement	87 Octane (minimum)
Electrical	
Alternator Rated Output	500 Watts @ 3000 RPM
Headlights	2 - Halogen: Low 55 W / High 60 W
Tail Lights	0.3 Watts / L.E.D. x 2
Brake Lights	3.1 Watts / L.E.D. x 2
Starting System	Electric Start
Ignition System	Bosch M17 (ECU Controlled)
Ignition Timing (Variable)	3° - 10° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC3 / 0.035 in. (0.9 mm)
Battery / Model / Amp Hr	Yuasa YB30L-B / 30 Amp Hr. / 12 Volt
Instrumentation	Multifunction Instrument Cluster
DC Outlets	(2) - Front; (1) - Rear
Relays	Chassis / ECM / Fan / Fuel Pump EPS / Rear Diff
Circuit Breaker	Fan Motor: 20 Amp
Fuses	Lights / ECM / Drive / Acc: 20 Amp Fuel Pump: 10 Amp EPS: 30 Amp

DRIVETRAIN	
Transmission Type	Polaris Automatic PVT
Shift Type	In Line Shift - H / L / N / R

DRIVETRAIN	
Transmission Gear Ratio: High Low Reverse	Front: 4.63:1 / Rear: 14.37:1 Front: 7.70:1 / Rear: 23.91:1 Front: 7.00:1 / Rear: 21.74:1
Front Gearcase Lubricant Requirements	Demand Drive 9 oz. (265 ml)
Transmission Lubricant Requirements	AGL 33.8 oz. (1000 ml)
Clutch Type	Standard PVT
Drive Belt	3211133
Clutch Center Distance	10.05" (255 mm)
Steering / Suspension	
Toe Out	1/8 - 1/4 in. (3.2 - 6.35 mm)
Front Suspension	Dual A-arm
Front Travel	9.6 in. (24.4 cm)
Rear Suspension	Independent (IRS)
Rear Travel	9 in. (22.9 cm)
Shock Preload Adjustment	Cam Adjustment
Wheels / Brakes	
Front Wheel Type / Size	Steel / 12 x 6 Aluminum / 12 x 6
Rear Wheel Type / Size	Steel / 12 x 8 Aluminum / 12 x 8
Front Tire Make / Model / Size	Carlisle / PXT / 26 x 9 R12
Rear Tire Make / Model / Size	Carlisle / PXT / 26 x 11 R12
Tire Air Pressure	Front: 12 psi (83 kPa) Rear: 16 psi (110 kPa)
Brake System Type	4 Wheel Hydraulic Disc
Brake Fluid	DOT 4
Parking Brake	Hand Actuated (in dash)

CLUTCH CHART

ALTITUDE		SHIFT WEIGHT	DRIVE SPRING	DRIVEN SPRING
Me- ters (Feet)	0-1800 Meters (0-6000 Feet)	23-62 (5632337)	Black (7043594)	Blk / Almd (7043167)
	1800-3700 Meters (6000 - 12000 Feet)	23-58 (B) (1322911)	Black (7043594)	Blk / Almd (7043167)

(B) = Bushed Shift Weight

GENERAL INFORMATION

MODEL: 2013–2015 *RANGER* 6X6 800

MODEL NUMBER: R13HR76AG, AR; R14HR76AA, AJ; R15RAA76AA, AJ

CATEGORY	DIMENSION / CAPACITY
Length	137 in. / 348 cm
Width (cargo box)	60 in. / 152.4 cm
Width (tires)	58 in. / 147.3 cm
Height	76 in. / 193 cm
Wheel Base	105 in. / 267 cm
Ground Clearance	11.5 in. / 30.5 cm
Turning Radius	243 in. / 617 cm
Dry Weight	1551 lbs. / 703.5 kg
Gross Vehicle Weight	3701 lbs. / 1679 kg
Storage Box Capacity	250 lbs. / 113 kg
Cargo Box Capacity	1250 lbs. / 567 kg
Cargo Box Dimensions (inside dimensions)	42.5 x 54 x 11.5 in. (108 x 137 x 29 cm)
Vehicle Payload (includes weight of operator, passenger, cargo and accessories)	2000 lbs. / 907 kg
Hitch Towing Capacity	2000 lbs. / 907 kg
Hitch Tongue Capacity	150 lbs. / 68 kg



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GENERAL INFORMATION

MODEL: 2013–2015 RANGER 6X6 800

MODEL NUMBER: R13HR76AG, AR; R14HR76AA, AJ; R15HR76AA, AJ

ENGINE	
Platform	Domestic Twin Cylinder, Liquid Cooled, 4-Stroke
Engine Number	1204668
Engine Displacement	760 cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 76.5 mm
Compression Ratio	9.78:1
Compression Pressure	165-185 psi
Engine Idle Speed	1250 ± 100 RPM
Engine Max Operating RPM	6500 RPM
Lubrication	Pressurized Wet Sump
Oil Requirements	PS-4 or Extreme Duty
Oil Capacity	2 qts. (1.9 L)
Coolant Capacity	3.25 qts. (3.08 L)
Overheat Warning	Instrument Cluster Indicator
Exhaust System	2 to 1 Canister Style
Fuel System	
Fuel System Type	Bosch M17 EFI
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	58 +/- 2 psi (400 +/- 14 kPa)
Fuel Capacity	9 gal. (34 L)
Fuel Requirement	87 Octane (minimum)
Electrical	
Alternator Rated Output	500 Watts @ 3000 RPM
Headlights	2 - Halogen: Low 55 W / High 60 W
Tail Lights	0.3 Watts / L.E.D. x 2
Brake Lights	3.1 Watts / L.E.D. x 2
Starting System	Electric Start
Ignition System	Bosch M17 (ECU Controlled)
Ignition Timing (Variable)	3° - 10° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC3 / 0.035 in. (0.9 mm)
Battery / Model / Amp Hr	Yuasa YB30L-B / 30 Amp Hr. / 12 Volt
Instrumentation	Multifunction Instrument Cluster
DC Outlets	(2) - Standard
Relays	Chassis / ECM / Fan / Fuel Pump / Rear Diff
Circuit Breaker	Fan Motor: 20 Amp
Fuses	Lights / ECM / Drive / Acc: 20 Amp Fuel Pump: 10 Amp EPS: 30 Amp

DRIVETRAIN	
Transmission Type	Polaris Automatic PVT
Shift Type	In Line Shift - H / L / N / R
Transmission Gear Reduction:	
High	3.85:1
Low	8.71:1
Reverse	7.91:1
Drive Ratio - Front	3.818:1
Drive Ratio - Rear	3.70:1
Front Gearcase Lubricant Requirements	Demand Drive 9 oz. (265 ml)
Transmission Lubricant Requirements	AGL 43.6 oz. (1290 ml)
Mid Gearcase Lubricant Requirements	ATV Angle Drive Fluid 6.75 oz. (200 ml)
Rear Gearcase Lubricant Requirements	ATV Angle Drive Fluid 18 oz. (532 ml)
Clutch Type	Standard PVT
Drive Belt	3211133
Clutch Center Distance	10.05" (255 mm)
Steering / Suspension	
Toe Out	1/8 - 1/4 in. (3.2 - 6.35 mm)
Front Suspension	Dual A-arm
Front Travel	9.6 in. (24.4 cm)
Mid Suspension	Independent (IRS)
Mid Travel	9 in. (22.9 cm)
Rear Suspension	Independent (IRS)
Rear Travel	9 in. (22.9 cm)
Shock Preload Adjustment	Cam Adjustment
Wheels / Brakes	
Front Wheel Type / Size	Steel / 12 x 6
Rear Wheel Type / Size	Steel / 12 x 8
Front Tire Make / Model / Size	Carlisle / AT489 / 25 x 10 R12
Rear Tire Make / Model / Size	Carlisle / AT489 / 25 x 11 R12
Tire Air Pressure	8-12 psi (69 kPa)
Brake System Type	4 Wheel Hydraulic Disc
Brake Fluid	DOT 4
Parking Brake	Hand Actuated (in dash)

CLUTCH CHART

ALTITUDE		SHIFT WEIGHT	DRIVE SPRING	DRIVEN SPRING
Me- ters (Feet)	0-1800 Meters (0-6000 Feet)	23-62 (5632337)	Black (7043594)	Blk / Almd (7043167)
	1800-3700 Meters (6000 - 12000 Feet)	23-58 (B) (1322911)	Black (7043594)	Blk / Almd (7043167)

MISC. SPECIFICATIONS AND CHARTS**Conversion Table**

UNIT OF MEASURE	MULTIPLIED BY	CONVERTS TO
ft-lbs	x 12	= in-lbs
in-lbs	x 0.0833	= ft-lbs
ft-lbs	x 1.356	= Nm
in-lbs	x 0.0115	= kg-m
Nm	x 0.7376	= ft-lbs
kg-m	x 7.233	= ft-lbs
kg-m	x 86.796	= in-lbs
kg-m	x 10	= Nm
inch	x 25.4	= mm
mm	x 0.03937	= inch
inch	x 2.54	= cm
mile (mi)	x 1.6	= km
km	x 0.6214	= mile
ounces (oz)	x 28.35	= grams (g)
fluid ounces (fl oz)	x 29.57	= cubic centimeters (cc)
cubic centimeters (cc)	x .03381	= fluid ounces
grams (g)	x 0.035	= ounces
pounds (lb)	x 0.454	= kg
kilogram (kg)	x 2.2046	= lbs
cubic inches (cu in)	x 16.387	= cc
cubic centimeters (cc)	x 0.061	= cubic inches
US quarts	x 0.946	= liters (L)
liters (L)	x 1.057	= US quarts
US gallons	x 3.785	= liters (L)
liters (L)	x 0.264	= US gallons
PSI	x 6.895	= kilopascals (kPa)
kilopascals (kPa)	x 0.145	PSI
$\pi (3.14) \times \text{Radius}^2 \times \text{Height} =$		= cylinder volume
°C to °F:	$9/5 (°C + 32)$	= °F
°F to °C:	$5/9 (°F - 32)$	= °C

GENERAL INFORMATION

Standard Bolt Torque Specification

BOLT SIZE	GRADE 2 FT. LBS. (NM)	GRADE 5 FT. LBS. (NM)	GRADE 8 FT. LBS. (NM)
1/4-20	5 (7)	8 (11)	12 (16)
1/4-28	6 (8)	10 (14)	14 (19)
5/16-18	11 (15)	17 (23)	25 (35)
5/16-24	12 (16)	19 (26)	29 (40)
3/8-16	20 (27)	30 (40)	45 (62)
3/8-24	23 (32)	35 (48)	50 (69)
7/16-14	30 (40)	50 (69)	70 (97)
7/16-20	35 (48)	55 (76)	80 (110)
1/2-13	50 (69)	75 (104)	110 (152)
1/2-20	55 (76)	90 (124)	120 (166)

Metric Bolt Torque Specification

BOLT SIZE	GRADE				
	4.6	4.8	8.8 / 8.9	10.9	12.9
	FT.— LBS. (NM) DRY THREADS				
M3	0.3 (0.5)	0.5 (0.7)	1 (1.3)	1.5 (2)	1.5 (2)
M4	0.8 (1.1)	1 (1.5)	2 (3)	3 (4.5)	4 (5)
M5	1.5 (2.5)	2 (3)	4.5 (6)	6.5 (9)	7.5 (10)
M6	3 (4)	4 (5.5)	7.5 (10)	11 (15)	13 (18)
M8	7 (9.5)	10 (13)	18 (25)	26 (35)	33 (45)
M10	14 (19)	18 (25)	37 (50)	55 (75)	63 (85)
M12	26 (35)	33 (45)	63 (85)	97 (130)	11 (150)
M14	37 (50)	55 (75)	103 (140)	151 (205)	177 (240)
M16	59 (80)	85 (115)	159 (215)	232 (315)	273 (370)
M18	81 (110)	118 (160)	225 (305)	321 (435)	376 (510)

GENERAL INFORMATION

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	4.6 mm	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
3 x .50	#39	0.0995	3/32
3 x .60	3/32	0.0937	3/32
4 x .70	#30	0.1285	1/8
4 x .75	1/8	0.125	1/8
5 x .80	#19	0.166	11/64
5 x .90	#20	0.161	5/32
6 x 1.00	#9	0.196	13/64
7 x 1.00	16/64	0.234	15/64
8 x 1.00	J	0.277	9/32
8 x 1.25	17/64	0.265	17/64
9 x 1.00	5/16	0.3125	5/16
9 x 1.25	5/16	0.3125	5/16
10 x 1.25	11/32	0.3437	11/32
10 x 1.50	R	0.339	11/32
11 x 1.50	3/8	0.375	3/8
12 x 1.50	13/32	0.406	13/32
12 x 1.75	13/32	0.406	13/32

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GENERAL INFORMATION

Decimal Equivalents

FRACTION	DECIMAL	MM TO INCHES
1/64	0.0156"	
1/32	0.0312"	1 mm = 0.0394"
3/64	0.0469"	
1/16	0.0625"	
5/64	0.0781"	2 mm = 0.0787"
3/32	0.0938"	
7/64	0.1094"	3 mm = 0.1181"
1/8	0.1250"	
9/64	0.1406"	
5/32	0.1563"	4 mm = 0.1575"
11/64	0.1719"	
3/16	0.1875"	5 mm = 0.1969"
13/64	0.2031"	
7/32	0.2188"	
15/64	0.2344"	6 mm = 0.2362"
1/4	0.25"	
17/64	0.2656"	7 mm = 0.2756"
9/32	0.2813"	
19/64	0.2969"	
5/16	0.3125"	8 mm = 0.3150"
21/64	0.3281"	
11/32	0.3438"	9 mm = 0.3543"
23/64	0.3594"	
3/8	0.375"	
25/64	0.3906"	10 mm = 0.3937"
13/32	0.4063"	
27/64	0.4219"	11 mm = 0.4331"
7/16	0.4375"	
29/64	0.4531"	
15/32	0.4688"	12 mm = 0.4724"
31/64	0.4844"	
1/2	0.500"	13 mm = 0.5118"
33/64	0.5156"	
17/32	0.5313"	
35/64	0.5469"	14 mm = 0.5512"

FRACTION	DECIMAL	MM TO INCHES
9/16	0.5625"	
37/64	0.5781"	15 mm = 0.5906"
19/32	0.5938"	
39/64	0.6094"	
5/8	0.625"	16 mm = 0.6299"
41/64	0.6406"	
21/32	0.6563"	17 mm = 0.6693"
43/64	0.6719"	
11/16	0.6875"	
45/64	0.7031"	18 mm = 0.7087"
23/32	0.7188"	
47/64	0.7344"	19 mm = 0.7480"
3/4	0.750"	
49/64	0.7656"	
25/32	0.7813"	20 mm = 0.7874"
51/64	0.7969"	
13/16	0.8125"	21 mm = 0.8268"
53/64	0.8281"	
27/32	0.8438"	
55/64	0.8594"	22 mm = 0.8661"
7/8	0.875"	
57/64	0.8906"	23 mm = 0.9055"
29/32	0.9063"	
59/64	0.9219"	
15/16	0.9375"	24 mm = 0.9449"
61/64	0.9531"	
31/32	0.9688"	25 mm = 0.9843"
63/64	0.9844"	
1	1.000"	

CHAPTER 2

MAINTENANCE

2

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MAINTENANCE

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PERIODIC MAINTENANCE CHART

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 Polaris Engineered Parts Accessories & Apparel available from your Polaris dealer.

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

Maintenance intervals in the following chart are based upon average riding conditions and an average vehicle speed of approximately 10 miles per hour. Vehicles subjected to severe use must be inspected and serviced more frequently.

Severe Use Definition

- Frequent immersion in mud, water or sand
- Racing or race-style high RPM use
- Prolonged low speed, heavy load operation
- Extended idle
- Short trip cold weather operation

Pay special attention to the oil level. A rise in oil level during cold weather can indicate contaminants collecting in the oil sump or crankcase. Change oil immediately if the oil level begins to rise. Monitor the oil level, and if it continues to rise, discontinue use and determine the cause or see your dealer.

Break-In Period

The break-in period consists of the first 25 hours of operation, or the time it takes to use 14 gallons (53 liters) of fuel. Careful treatment of a new engine and drive components will result in more efficient performance and longer life for these components.

- Drive vehicle slowly at first while varying the throttle position. Do not operate at sustained idle.
- Pull only light loads.
- Perform regular checks on fluid levels and other areas outlined on the daily pre-ride inspection checklist.
- Change both the engine oil and filter after 25 hours or one month.
- See "Owner's Manual" for additional break-in information.

Maintenance Chart Key

The following symbols denote potential items to be aware of during maintenance:

■ = **CAUTION:** Due to the nature of these adjustments, it is recommended this service be performed by an authorized Polaris dealer.

► = **SEVERE USE ITEM:** See information provided above.

E = **Emission Control System Service (California).**

NOTE: Inspection may reveal the need for replacement parts. Always use genuine Polaris parts.



WARNING

Improperly performing the procedures marked ■ could result in component failure and lead to serious injury or death. Have an authorized Polaris dealer perform these services.

MAINTENANCE

Pre-Ride - 25 Hour Maintenance Interval

ITEM		MAINTENANCE INTERVAL (WHICHEVER COMES FIRST)			REMARKS
		HOURS	CALENDAR	MILES (KM)	
■	Steering	-	Pre-Ride	-	Make adjustments as needed. See Pre-Ride Checklist on Page 2.10.
▶	Front Suspension	-	Pre-Ride	-	
▶	Rear Suspension	-	Pre-Ride	-	
	Tires	-	Pre-Ride	-	
▶	Brake Fluid Level	-	Pre-Ride	-	
▶	Brake Pedal Travel	-	Pre-Ride	-	
	Brake Systems	-	Pre-Ride	-	
	Wheels / Fasteners	-	Pre-Ride	-	
	Frame Fasteners	-	Pre-Ride	-	
▶ E	Engine Oil Level	-	Pre-Ride	-	
▶ E	Air Filter / Pre-Filter	-	Daily	-	Inspect; clean often; replace as needed
▶ E	Air Box Sediment Tube	-	Daily	-	Drain deposits when visible
	Coolant Level	-	Daily	-	Check level daily, change coolant every 2 years
▶	Power Steering Unit (if equipped)	-	Daily	-	Inspect daily, clean often
	Head Lamp / Tail Lamp	-	Daily	-	Check operation; apply dielectric grease if replacing
▶ E	Air Filter, Main Element	-	Weekly	-	Inspect; replace as needed
▶ ■	Brake Pad Wear	10 H	Monthly	100 (160)	Inspect periodically
	Battery	20 H	Monthly	200 (320)	Check terminals; clean; test
	Fuel System	25 H	1 M	-	Inspect; cycle key to pressurize fuel pump; check lines and fittings for leaks and abrasion
▶ E	Engine Breather Filter (if equipped)	25 H	1 M	250 (400)	Inspect; replace if necessary
▶ E	Engine Oil Change (Break-In Period)	25 H	1 M	250 (400)	Perform a break-in oil change after the first 25 hours or one month of operation
▶	Front Gearcase Lubricant	25 H	1 M	250 (400)	Initial fluid level inspection; add if needed
▶	Mid Gearcase Lubricant (6X6)	25 H	1 M	250 (400)	Initial fluid level inspection; add if needed
▶	Rear Gearcase Lubricant (6X6)	25 H	1 M	250 (400)	Initial fluid level inspection; add if needed
▶	Transmission Lubricant	25 H	1 M	250 (400)	Initial fluid level inspection; add if needed
▶ ■	Parking Brake Cable Adjustment	25 H	-	-	Inspect; adjust tension after first 25 hours

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

E Emission Control System Service (California)

■ Have an authorized Polaris dealer perform these services.

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50 - 100 Hour Maintenance Interval

ITEM	MAINTENANCE INTERVAL (WHICHEVER COMES FIRST)			REMARKS
	HOU- RS	CALENDAR	MILES (KM)	
► General Lubrication	50 H	3 M	500 (800)	Lubricate all grease fittings, pivots, cables, etc.
Shift Linkage	50 H	6 M	500 (800)	Inspect, lubricate, adjust
■ Steering	50 H	6 M	500 (800)	Lubricate (if applicable)
► Front Suspension	50 H	6 M	500 (800)	Lubricate (if applicable)
► Mid Suspension (6X6)	50 H	6 M	500 (800)	Lubricate (if applicable)
► Rear Suspension	50 H	6 M	500 (800)	Lubricate (if applicable)
■ E Throttle Cable / Throttle Pedal	50 H	6 M	500 (800)	Inspect; adjust; lubricate; replace if necessary
E Throttle Body Air Intake Ducts / Flange	50 H	6 M	500 (800)	Inspect ducts for proper sealing/air leaks
Drive Belt	50 H	6 M	500 (800)	Inspect; adjust; replace as needed
Cooling System	50 H	6 M	500 (800)	Inspect coolant strength seasonally; pressure test system yearly
► Oil Lines, fasteners	50 H	6 M	500 (800)	Inspect for leaks and loose fittings
► ■ Parking Brake Cable Adjustment	100 H	6 M	1000 (1600)	Inspect; adjust tension as needed
► E Engine Oil Change	100 H	6 M	1000 (1600)	Perform a break-in oil change after the first 25 hours or one month of operation
► E Oil Filter Change	100 H	6 M	1000 (1600)	Replace with oil change
► Front Gearcase Lubricant	100 H	12 M	1000 (1600)	Change lubricant
► Mid Gearcase Lubricant (6X6)	100 H	12 M	1000 (1600)	Change lubricant
► Rear Gearcase Lubricant (6X6)	100 H	12 M	1000 (1600)	Change lubricant
► Transmission Lubricant	100 H	12 M	1000 (1600)	Change lubricant
■ E Fuel System	100 H	12 M	1000 (1600)	Cycle key to pressurize fuel pump; check for leaks at fill cap, fuel lines/rail and fuel pump; replace fuel lines every two years
► Radiator	100 H	12 M	1000 (1600)	Inspect; clean external surfaces
► Cooling Hoses	100 H	12 M	1000 (1600)	Inspect for leaks
► Engine Mounts	100 H	12 M	1000 (1600)	Inspect
Exhaust Silencer / Pipe	100 H	12 M	1000 (1600)	Inspect
■ E Spark Plug	100 H	12 M	1000 (1600)	Inspect; replace as needed
■ Ignition Timing	100 H	12 M	1000 (1600)	Inspect

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

E Emission Control System Service (California)

■ Have an authorized Polaris dealer perform these services.

MAINTENANCE

100 - 300 Hour Maintenance Interval

ITEM		MAINTENANCE INTERVAL (WHICHEVER COMES FIRST)			REMARKS
		HOU- RS	CALENDAR	MILES (KM)	
►	Wiring	100 H	12 M	1000 (1600)	Inspect for wear, routing, security; apply dielectric grease to connectors subjected to water, mud, etc.
■	Clutches (Drive and Driven)	100 H	12 M	1000 (1600)	Inspect; clean; replace worn parts
■	Front Wheel Bearings	100 H	12 M	1000 (1600)	Inspect; replace as needed
►	Shocks	100 H	-	-	Visually inspect shock seals
■	Brake Fluid	200 H	24 M	2000 (3200)	Change every two years (DOT 4)
	Spark Arrester	300 H	36 M	3000 (4800)	Clean out
■	Toe Adjustment	-			Inspect periodically; adjust when parts are replaced
	Headlight Aim	-			Adjust as needed

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

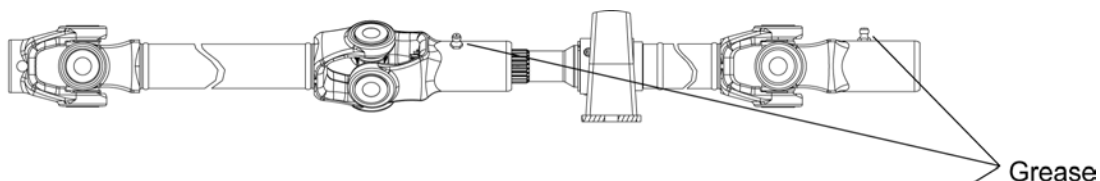
E Emission Control System Service (California)

■ Have an authorized Polaris dealer perform these services.

Grease Lubrication Points

ITEM	RECOMMENDED LUBE	METHOD	FREQUENCY
Front Propshaft Yoke	Polaris Premium U-Joint Grease	Grease fittings (3 pumps maximum)	Grease before long periods of storage, and after pressure washing or submerging the vehicle.

Front Propshafts
(CREW)



Front Propshaft
(4X4 / 6X6)



SERVICE PRODUCTS AND LUBRICANTS

Polaris Lubricants, Maintenance and Service Products

PART NO.	DESCRIPTION
Engine Lubricant	
2870791	Fogging Oil (12 oz. Aerosol)
2876244	PS-4 Synthetic 4-Cycle Engine Oil (Quart)
2876245	PS-4 Synthetic 4-Cycle Engine Oil (Gallon)
2878920	PS-4 Extreme Duty Synthetic 4-Cycle Engine Oil (Quart)
2878919	PS-4 Extreme Duty Synthetic 4-Cycle Engine Oil (Gallon)
2540086	Engine Oil Filter
2202166	Engine Oil Change Kit (Twin Cylinder)
Gearcase / Transmission Lubricants	
2877922	Demand Drive (Quart)
2877923	Demand Drive (2.5 Gallon)
2878068	AGL Gearcase Lubricant (1 Qt.) (12 Count)
2878069	AGL Gearcase Lubricant (1 Gal.) (4 Count)
2878070	AGL Gearcase Lubricant (2.5 Gal.) (2 Count)
2876160	ATV Angle Drive Fluid (Quart) (12 Count)
2872276	ATV Angle Drive Fluid (2.5 Gallon) (2 Count)
2870465	Oil Pump for 1 Gallon Jug
Grease / Specialized Lubricants	
2871322	Premium All Season Grease (3 oz. cartridge) (24 Count)
2871423	Premium All Season Grease (14 oz. cartridge) (10 Count)
2871460	Starter Drive Grease (12 Count)
2871515	Premium U-Joint Lube (3 oz.) (24 Count)
2871551	Premium U-Joint Lube (14 oz.) (10 Count)

PART NO.	DESCRIPTION
2871312	Grease Gun Kit
2871329	Dielectric Grease (Nyogel™)
Coolant	
2880514	Antifreeze 50/50 Premix (qt/.951)
2880513	Antifreeze 50/50 Premix (qt/3.81)

NOTE: Each item can be purchased separately at your local Polaris dealer.

PART NO.	DESCRIPTION
Additives / Sealants / Thread Locking Agents / Misc.	
2871950	Loctite™ Threadlock 242 (6 ml.) (12 Count)
2871326	Premium Carbon Clean (12 oz.) (12 Count)
2870652	Fuel Stabilizer (16 oz.) (12 Count)
2872189	DOT 4 Brake Fluid (12 Count)
2871557	Crankcase Sealant, 3-Bond 1215 (5 oz.)

NOTE: The number count indicated by each part number in the table above indicates the number of units that are shipped with each order.

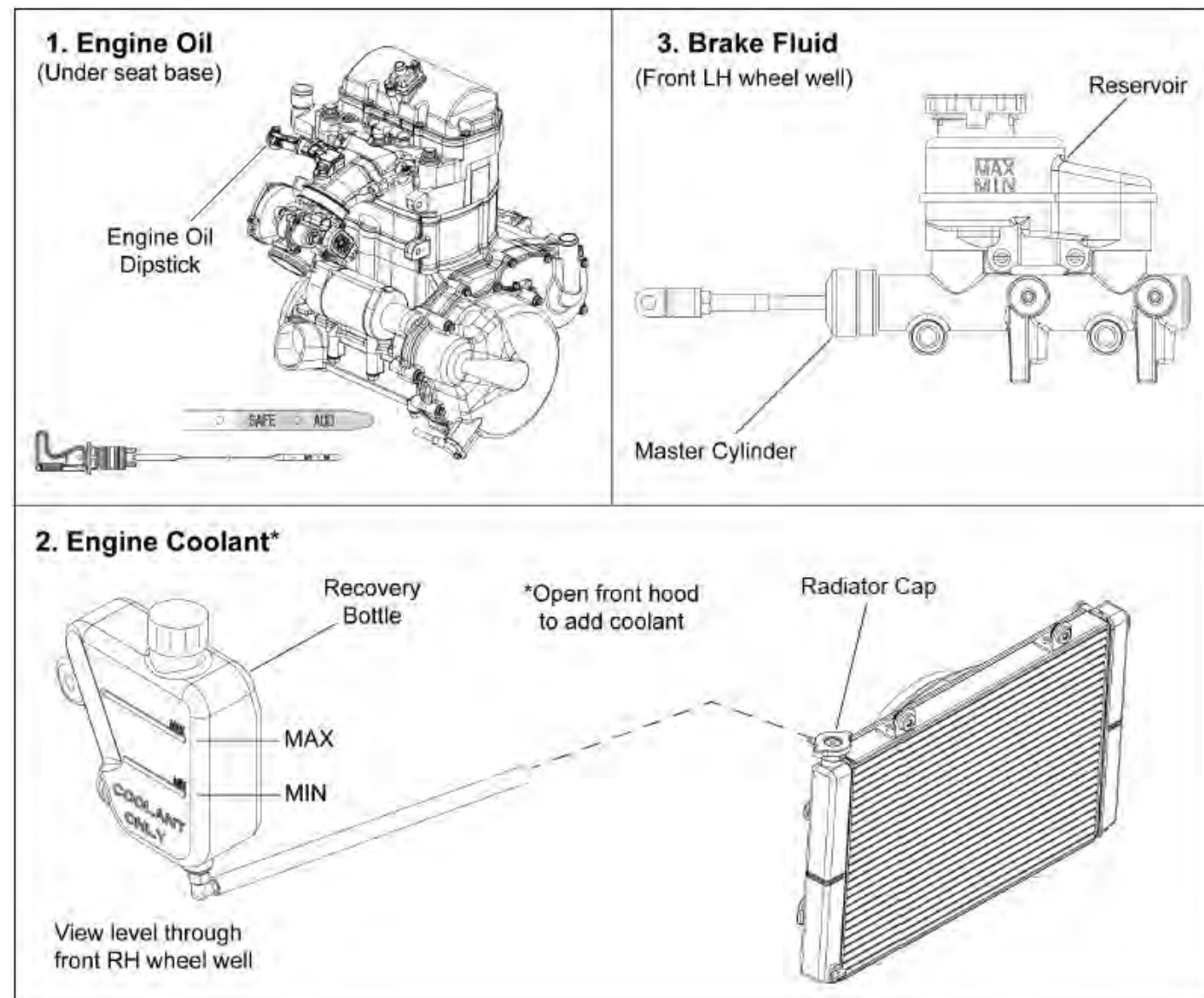
MAINTENANCE

FLUID MAINTENANCE REFERENCES

Component Quick Reference

III. #	ITEM	LUBE REC.	METHOD	FREQUENCY*
1	Engine Oil	Polaris PS-4 or Polaris PS-4 Extreme Duty 4-Cycle Engine Oil	Add oil to proper level on dipstick	Change after 1st month or first 25 hours of operation, 100 hours thereafter; Change more often (25 hours) in severe duty conditions or short trip cold weather operation
2	Engine Coolant	Polaris Antifreeze 50/50 Premix	Maintain coolant level in coolant reservoir bottle.	Check level daily, change coolant every two years
3	Brake Fluid	Polaris DOT 4 Brake Fluid	Maintain fluid level between "MAX" and "MIN" lines on the master cylinder reservoir	Check level during pre-ride inspection; change fluid every two years

* More often under severe use, such as operated in water or under severe loads.

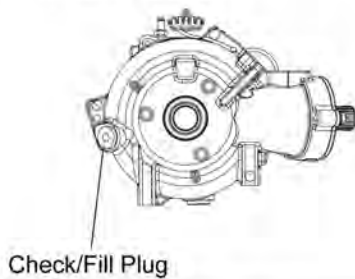


Component Quick Reference, Continued.....

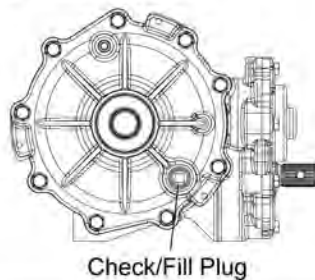
III. #	ITEM	LUBE REC.	METHOD	FREQUENCY*
4	Front Gearcase	Polaris Demand Drive	Add lubricant until it is visible at the fill hole threads	Initial level check at 25 hours; change according to intervals
5	Mid Gearcase	Polaris ATV Angle Drive Fluid (ADF)	Add lubricant until it is visible at the fill hole threads	Initial level check at 25 hours; change according to intervals
6	Rear Gearcase	Polaris ATV Angle Drive Fluid (ADF)	Add lubricant until it is visible at the fill hole threads	Initial level check at 25 hours; change according to intervals
7	Transmission	Polaris AGL Gearcase Lubricant	Add lubricant until it is visible at the check plug hole threads	Initial level check at 25 hours; change according to intervals

* More often under severe use, such as operated in water or under severe loads

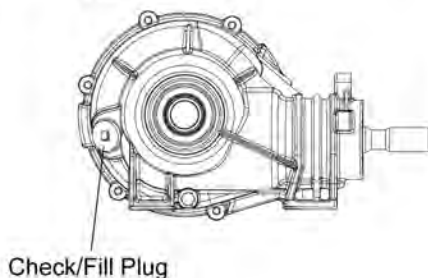
4. Front Gearcase (Front of vehicle)



5. Mid Gearcase (6x6) (LH side of vehicle)

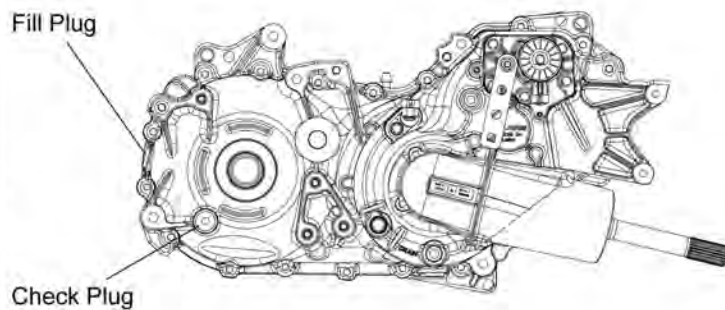


6. Rear Gearcase (6x6) (Rear of vehicle)

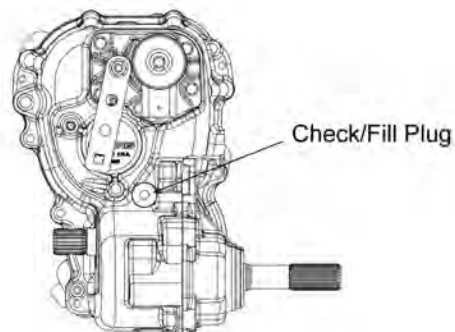


7. Transmission (Rear RH side of vehicle)

4X4 / CREW Models



6X6 Models



MAINTENANCE

GENERAL VEHICLE INSPECTION AND MAINTENANCE

Pre-Ride / Daily Inspection

Perform the following pre-ride inspection daily, and when servicing the vehicle at each scheduled maintenance.

- Tires - check condition and pressures
- Fuel tank - fill tank to proper level
- All brakes - check operation, fluid level and adjustment (includes parking brake)
- Throttle - check for free operation and closing
- Headlight/Taillight/Brakelight - check operation of all indicator lights, instrument cluster and switches
- Ignition switch - check for proper function
- Wheels - check for tightness of wheel nuts and axle nuts; check to be sure axle nuts are secured by cotter pins
- Air cleaner element - check for dirt; clean or replace
- Steering - check for free operation noting any unusual looseness in any area
- Loose parts - visually inspect vehicle for any damaged or loose nuts, bolts or fasteners
- Engine coolant - check for proper level at the recovery bottle
- Check all suspension components for wear or damage

Frame, Nuts, Bolts, and Fasteners

Periodically inspect the torque of all fasteners in accordance with the maintenance schedule. Check that all cotter pins are in place. Refer to specific fastener torques listed in each chapter.

Shift Cable Inspection

Shift cable adjustment is necessary when symptoms include:

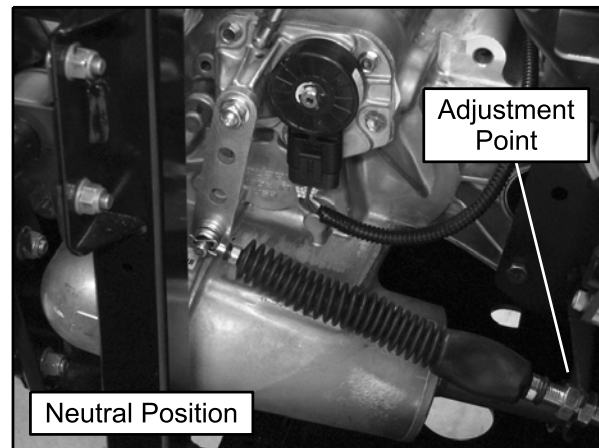
- Noise on deceleration
- Inability to engage a gear
- Excessive gear clash (noise)
- Gear selector is moving out of desired range

Inspect shift cable, clevis pins, and pivot bushings and replace if worn or damaged.

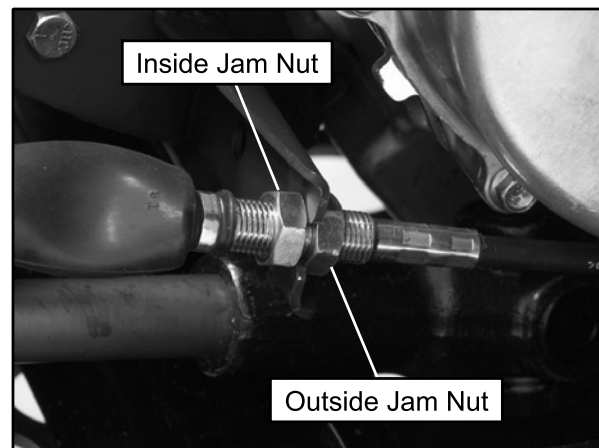
Shift Cable Adjustment (4X4 / CREW)

NOTE: The shift cable should be adjusted at the rear adjustment point located near the transmission. If adjustment is needed beyond that, remove the dash panel to access the shift cable adjustment point located underneath the shift lever.

1. Place gear selector in neutral. Make sure the transmission bell crank is engaged in the neutral position detents.



2. Locate the shift cable adjustment point at the engine-to-transmission mount bracket.
3. With two open-end wrenches, loosen the outside jam nut counterclockwise. Turn the outside jam nut 1 1/2 turns.



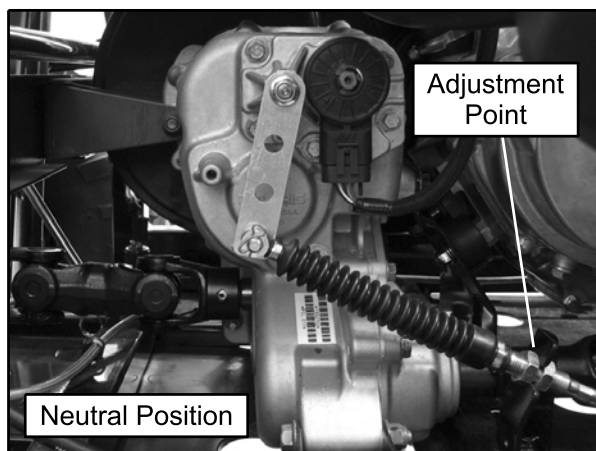
4. After turning the outside jam nut 1 1/2 turns, hold the outside jam nut with a wrench and tighten the inside jam nut clockwise until it is tight against the bracket.
5. Repeat Step 3 and Step 4 until the proper adjustment is made to the shift cable.

6. Use this procedure to loosen or tighten the shift linkage cable as needed.

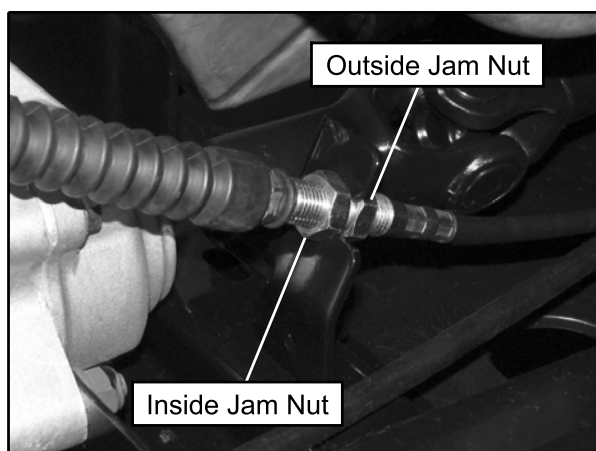
Shift Cable Adjustment (6X6)

NOTE: The shift cable should be adjusted at the rear adjustment point located near the transmission. If adjustment is needed beyond that, remove the dash panel to access the shift cable adjustment point located underneath the shift lever.

1. Place gear selector in neutral. Make sure the transmission bell crank is engaged in the neutral position detents.



2. Locate the shift cable adjustment point attached to the frame in front of the transmission.
3. With two open-end wrenches loosen the outside jam nut counterclockwise. Turn the outside jam nut 1 1/2 turns.



4. After turning the outside jam nut 1 1/2 turns, hold the outside jam nut with a wrench and tighten the inside jam nut clockwise until it is tight against the bracket.

MAINTENANCE

FUEL SYSTEM AND AIR INTAKE

Fuel System



WARNING

Gasoline is extremely flammable and explosive under certain conditions.

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

Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.

Do not overfill the tank. Do not fill the tank neck.

If you get gasoline in your eyes or if you swallow gasoline, seek medical attention immediately.

If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

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

Never drain the fuel when the engine is hot. Severe burns may result.

Fuel Lines

1. Check fuel lines for signs of wear, deterioration, damage or leakage. Replace if necessary.
2. Be sure fuel lines are routed properly and secured with cable ties. **CAUTION:** Make sure lines are not kinked or pinched.
3. Replace all fuel lines every two years.

Vent Lines

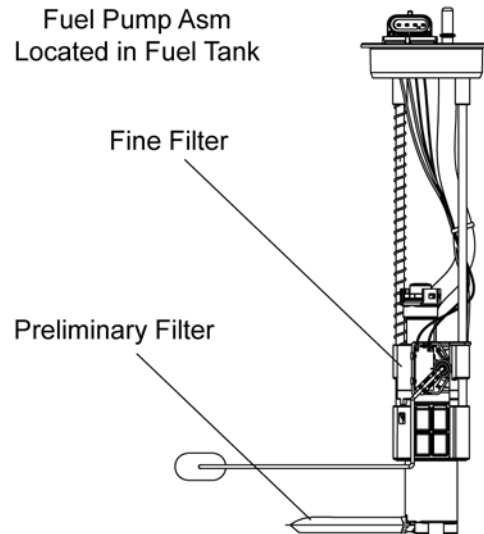
1. Check fuel tank vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.
2. Be sure vent lines are routed properly and secured with cable ties.

IMPORTANT: Ensure lines are not kinked or pinched.

Fuel Pump / Fuel Filters

The *RANGER* 800 EFI engine uses a serviceable, high-volume, high-pressure, fuel pump that includes a preliminary filter and an internal fine filter located before the pump regulator.

NOTE: Neither filter is serviceable individually. Must replace the fuel pump as an assembly.



NOTE: Refer to Chapter 4 for fuel pump replacement and all other information related to the EFI System.

Throttle Pedal Inspection

If the throttle pedal has excessive play due to cable stretch or cable misadjustment, it will cause a delay in throttle speed and the throttle may not open fully. If the throttle pedal has no play, it may be hard to control, and the idle speed may be erratic.

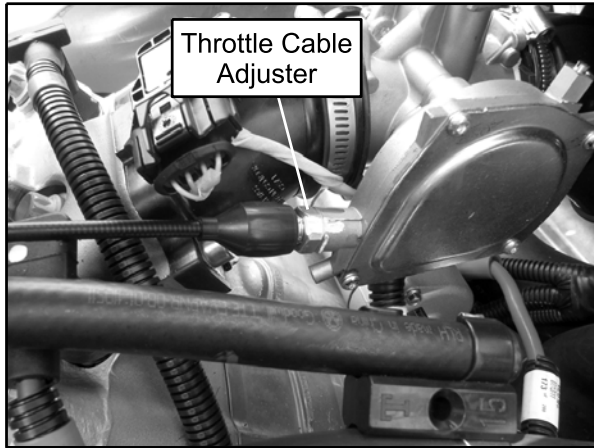
Check the throttle pedal play periodically in accordance with the Periodic Maintenance Chart and adjust the play if necessary.

Throttle Freeplay Adjustment Inspection

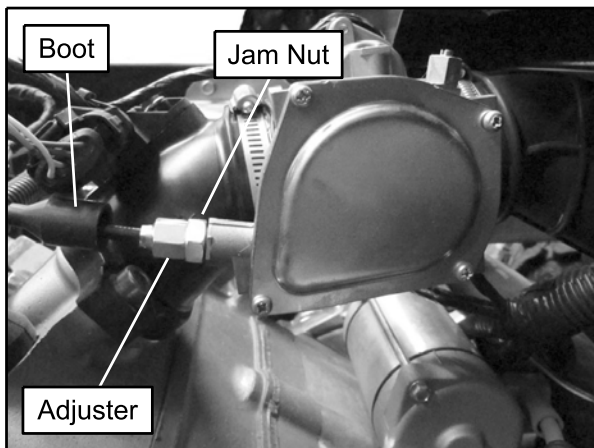
1. Apply the parking brake.
2. Put the gear shift lever in the N (Neutral) position.
3. Start the engine and warm it up thoroughly.
4. Measure the distance the throttle pedal moves before the engine begins to pick up speed. Free play should be 1/16" - 1/8" (1.5 - 3 mm).

Adjustment

1. Remove the lower seat base.
2. Locate the throttle cable adjustment at the throttle body.



3. Slide back the cable adjuster boot.
4. Using a 14 mm open-end wrench, loosen the adjustment jam nut. Using a 12 mm open-end wrench, move the cable adjuster until 1/16" - 1/8" (1.5 - 3 mm) of freeplay is achieved at the throttle pedal.



NOTE: While adjusting, lightly move the throttle pedal in and out.

5. Re-tighten the jam nut after final adjustment is made.
6. Apply a small amount of grease to the inside of the boot and slide it over the cable adjuster to its original position.
7. Reinstall the lower seat base.
8. Start the engine.

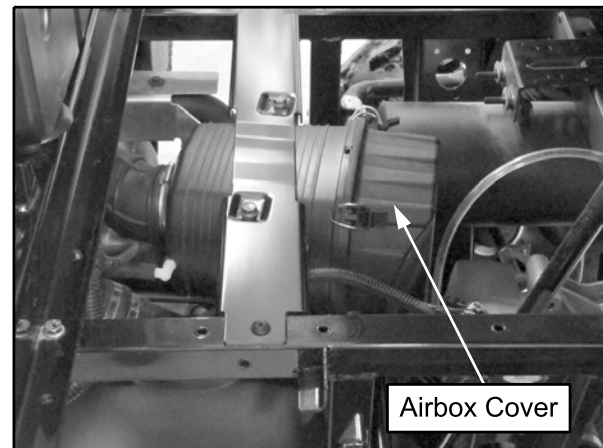
9. Disengage the parking brake and field test unit to ensure proper throttle operation.

Air Filter Service

It is recommended the air filter be replaced annually. When riding in extremely dusty or wet conditions, or at wide open throttle for extended periods, replacement is required more often. The filter should be inspected periodically (see "Periodic Maintenance Chart").

Removal

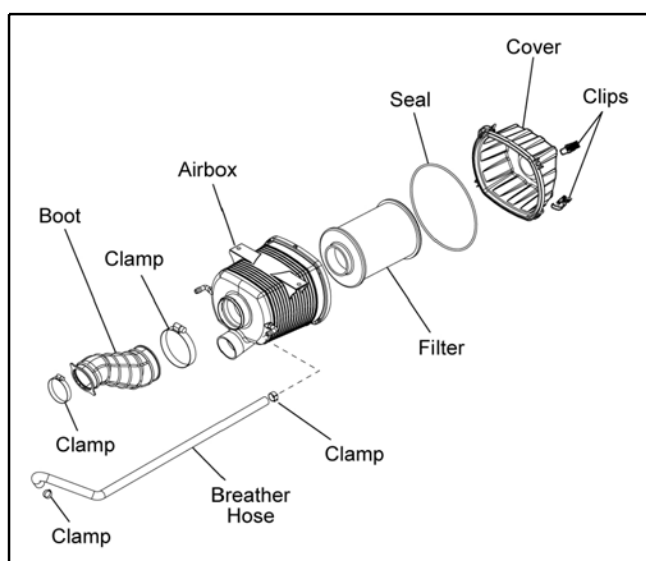
1. Lift the rear cargo box to access the airbox cover.



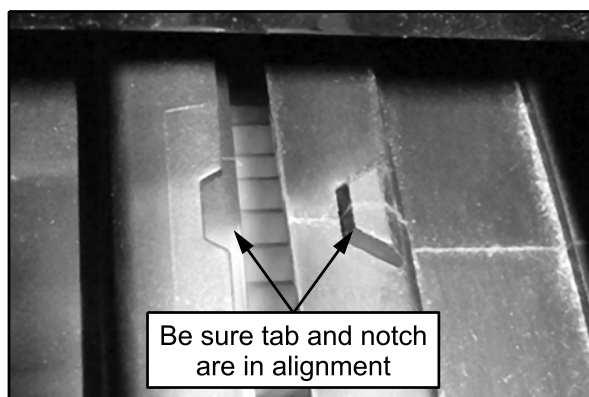
2. Unhook the (4) clips from airbox cover and remove cover. Inspect the cover seal. It should adhere tightly to the cover.
3. Remove air filter assembly by using a pulling/twisting motion. Be sure not to damage the filter element.
4. Inspect the air filter element and replace if necessary. Do not attempt to clean the air filter.

IMPORTANT: If the filter has been soaked with fuel or oil it must be replaced. Do not attempt to wash the air filter. If cleaning is required, replace the filter.

MAINTENANCE

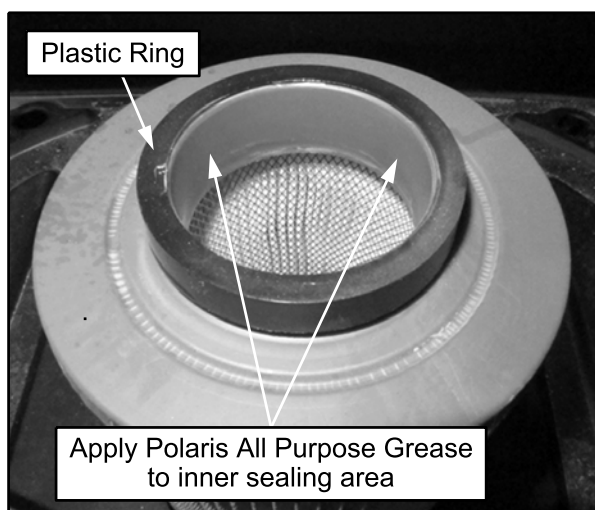


2. Reinstall the air filter cover into the airbox container. Align tab and notch for proper fit. Be sure the filter cover fits tightly to the air box and engage the (4) clips onto the airbox.



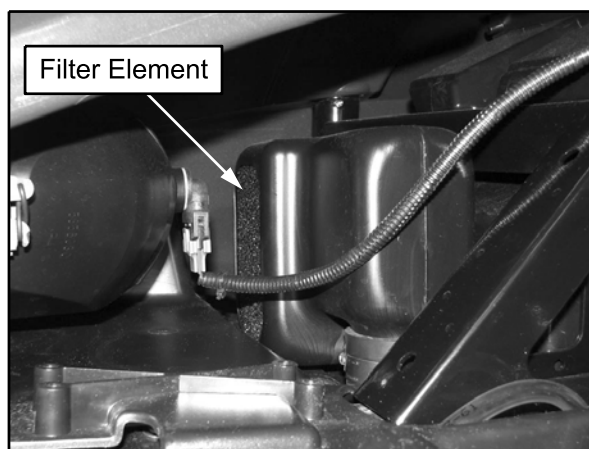
Installation

1. Clean airbox of any oil or water deposits and apply a small amount of grease to the sealing surfaces of the filter. Verify plastic sealing ring is installed on filter sealing area.



Engine Air Intake Inspection

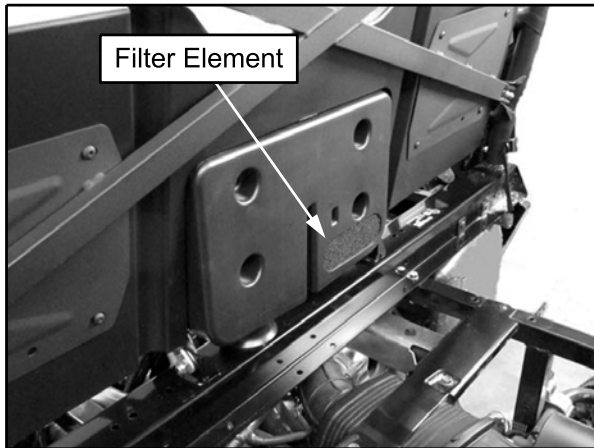
1. Open the hood to access the engine intake air baffle box.
2. Remove the filter element from the baffle box.



3. If the filter element is dirty, clean it with a high flash point solvent, followed by hot soapy water. Rinse and dry the filter element thoroughly. Inspect element for tears or damage. Replace if necessary.
4. Reinstall the filter element into the air baffle box.

PVT Air Intake Inspection

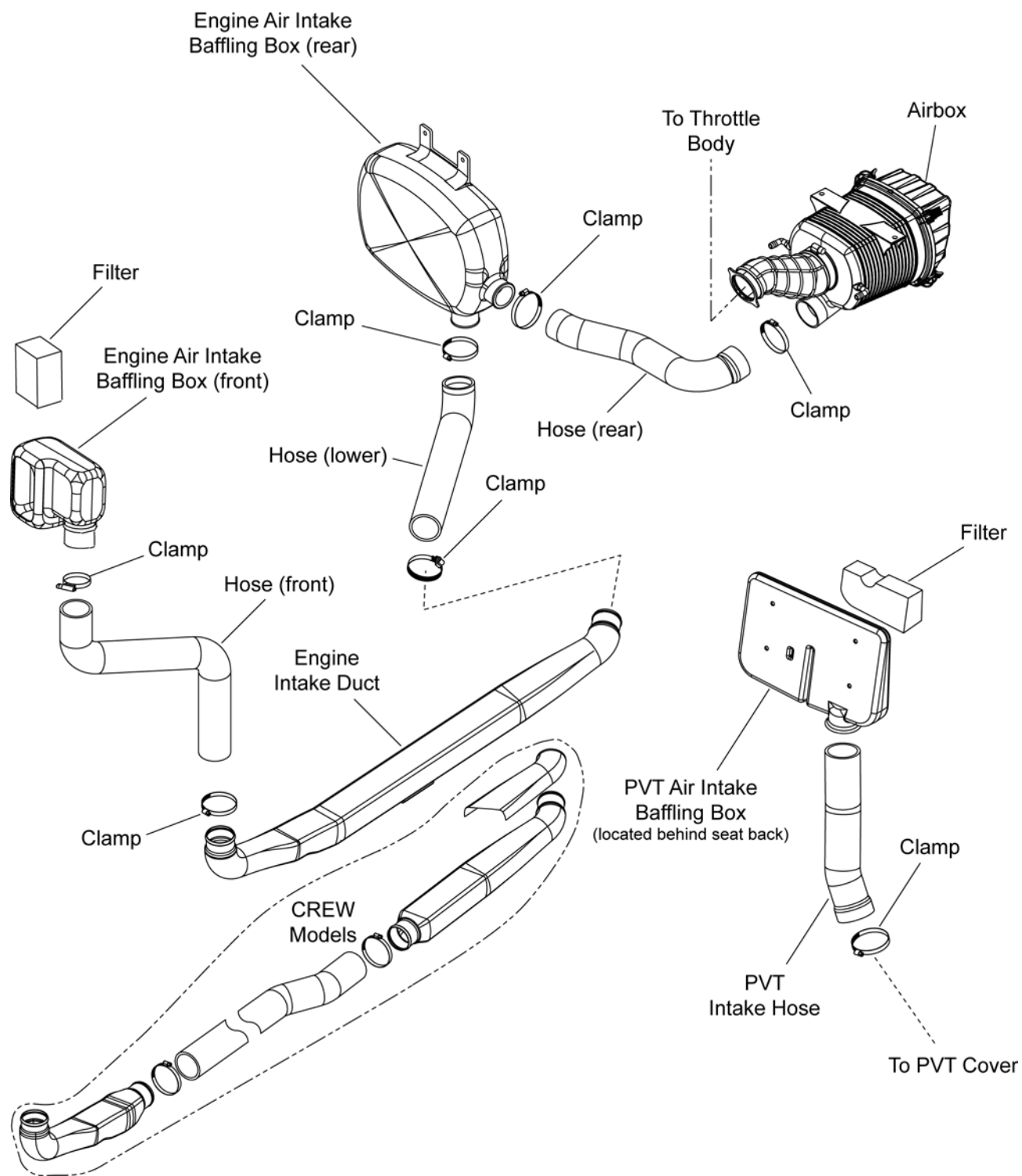
1. Lift the cargo box to access the PVT air intake baffle box.
2. Remove the filter element from the baffle box.



3. If the filter element is dirty, clean it with a high flash point solvent, followed by hot soapy water. Rinse and dry the filter element thoroughly. Inspect element for tears or damage. Replace if necessary.
4. Reinstall the filter element into the air baffle box.

MAINTENANCE

Air Intake Exploded View



ENGINE

Compression and Leakdown Test

NOTE: This engine does NOT have decompression components. Compression readings will vary in proportion to cranking speed during the test. Average compression (measured) is about 165-185 psi during a compression test.

A smooth idle generally indicates good compression. Low engine compression is rarely a factor in running condition problems above idle speed. Abnormally high compression can be caused by carbon deposits in the combustion chamber or worn, damaged exhaust cam lobes. Inspect camshaft and combustion chamber if compression is abnormally high.

A cylinder leakdown test is the best indication of engine condition. Follow manufacturer's instructions to perform a cylinder leakage test (never use high pressure leakage testers, as crankshaft seals may dislodge and leak).

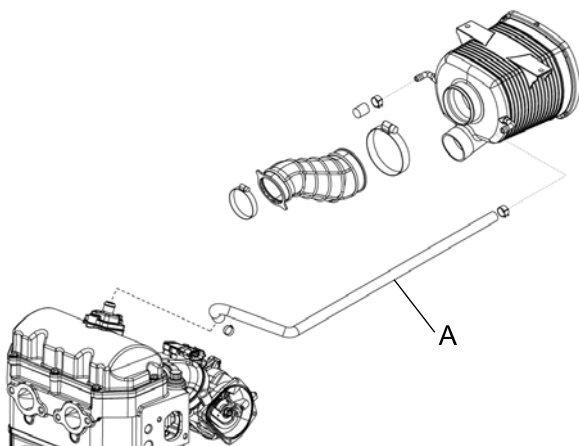
**Cylinder Compression
Standard: 165-185 PSI**

**Cylinder Leakdown
Service Limit 15%**

(Inspect for cause if test exceeds 15%)

Breather Hose Inspection

The engine is equipped with a breather hose (A). Inspect the breather hose for possible kinks or wear. The hose is formed for a proper fit. Follow the breather hose from the side of the airbox to the engine valve cover.



NOTE: Make sure line is not kinked or pinched.

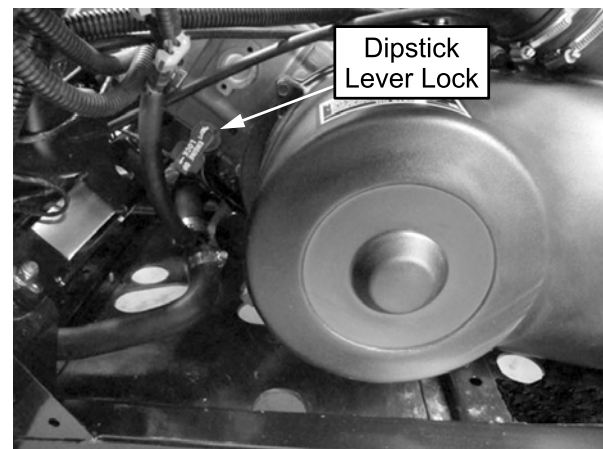
Engine Oil Level

The twin cylinder domestic engine is a wet-sump engine, meaning the oil is contained in the bottom of the crankcase. To check the oil level follow the procedure listed below:

1. Set machine on a level surface and set the parking brake.
2. Stop the engine and allow it to cool down before removing the dipstick.

IMPORTANT: Do not run the machine and then check the dipstick.

3. Remove the seat base and storage container.
4. Unlock the dipstick lever. Remove dipstick and wipe dry with a clean cloth.



5. Reinstall dipstick and push it into place. Do not lock the dipstick.

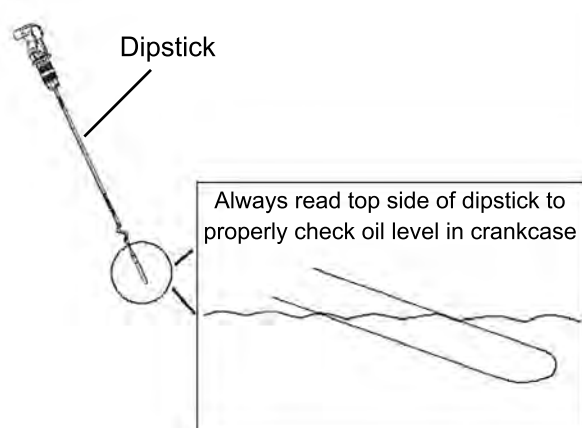
NOTE: Make certain the dipstick is inserted all the way into the filler tube to keep the angle and depth of dipstick consistent. When reinstalling the dipstick, make certain to seat the lever lock.

MAINTENANCE

6. Remove dipstick and check to see that the oil level is in the SAFE range. Add oil as indicated by the level on the dipstick. Do not overfill (see NOTE below).



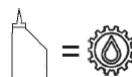
NOTE: Due to the dipstick entry angle into the crankcase, the oil level will read higher on the bottom side of the dipstick. Proper level indication is determined on the upper surface of the dipstick as it is being removed, regardless of the level marks being on top or on bottom (see the next illustration).



NOTE: A rising oil level between checks in cool weather driving can indicate contaminants such as gas or moisture collecting in the crankcase. If the oil level is over the full mark, change the oil immediately.

7. Reinstall the dipstick and lock the lever.

Engine Oil and Filter Change



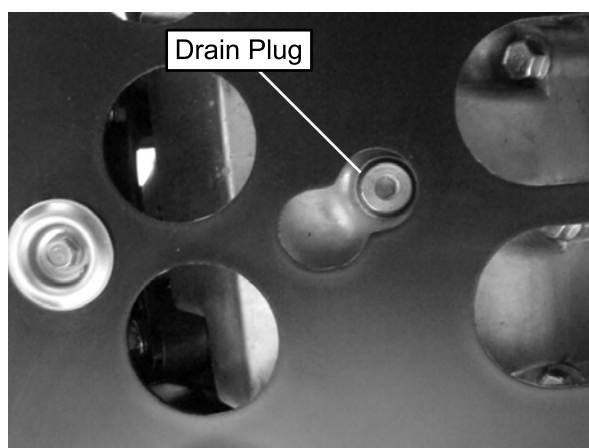
Recommended Engine Oil / Filter:

PS-4 Synthetic 4-Cycle Engine Oil
(PN 2876244) (Quart)

Engine Oil Filter (PN 2540086)

Capacity: 2 Quarts (1.9 L)

1. Place vehicle on a level surface and allow the engine to run for two to three minutes until warm. Stop engine.
2. Clean the area around the drain plug at the bottom of the crankcase. Drain plug is accessible through the skid plate.



WARNING

Personal injury can occur when handling used oil. Hot oil can cause burns or skin damage.

3. Place a drain pan beneath the crankcase and remove drain plug. **CAUTION:** Oil may be hot. Do not allow hot oil to come into contact with skin as serious burns may result.
4. Allow oil to drain completely.
5. Replace the sealing washer on the drain plug.

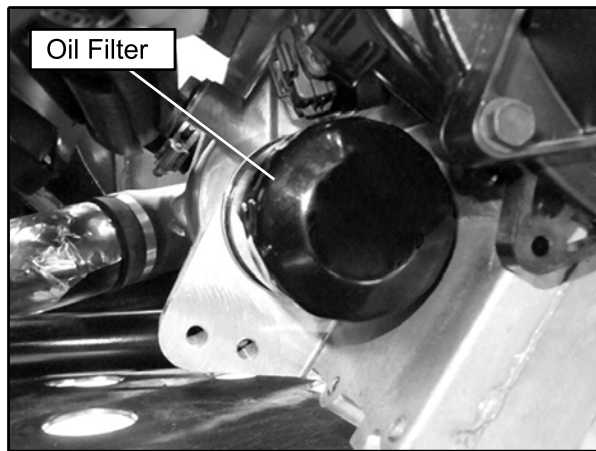
NOTE: The sealing surface on the drain plug should be clean and free of burrs, nicks or scratches.

- Reinstall drain plug and torque to specification.



Engine Crankcase Drain Plug:
16 ± 2 ft-lbs (21.7 ± 2.7 Nm)

- Remove the lower seat base.
- Remove the storage container located under the driver's side of the seat.
- Place shop towels beneath oil filter. Using Oil Filter Wrench (PU-50105), turn the filter counter-clockwise to remove it.



**Oil Filter Wrench:
PU-50105: 2.5" (64 mm)**

- Using a clean, dry cloth, clean filter sealing surface on crankcase.
- Lubricate O-ring on new oil filter with a film of fresh engine oil. Check to make sure the O-ring is in good condition.
- Install new filter to specification.



Oil Filter:
Turn by hand until filter gasket contacts sealing surface, then turn an additional 1/2 turn.

- Remove the dipstick and fill the sump with 2 quarts (1.9 L) of Polaris PS-4 Synthetic Engine Oil (PN 2876244).
- Place gear selector in neutral and set parking brake.

- Start the engine and let it idle for one to two minutes. Stop the engine and inspect for leaks.
- Re-check the oil level on the dipstick and add oil as necessary to bring the level to the upper mark on the dipstick.
- Dispose of used oil and oil filter properly.

Exhaust Pipe

WARNING

Do not perform clean out immediately after the engine has been run, as the exhaust system becomes very hot. Serious burns could result from contact with exhaust components.

To reduce fire hazard, make sure that there are no combustible materials in the area when purging the spark arrester.

Wear eye protection.

Do not stand behind or in front of the vehicle while purging the carbon from the spark arrester.

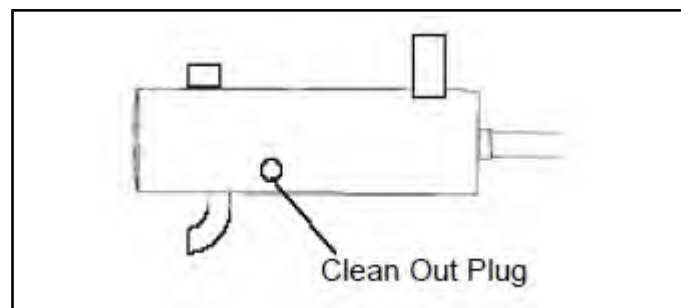
Never run the engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas.

Do not go under the machine while it is inclined. Set the hand brake and block the wheels to prevent roll back.

Failure to heed these warnings could result in serious personal injury or death.

The exhaust pipe must be periodically purged of accumulated carbon as follows:

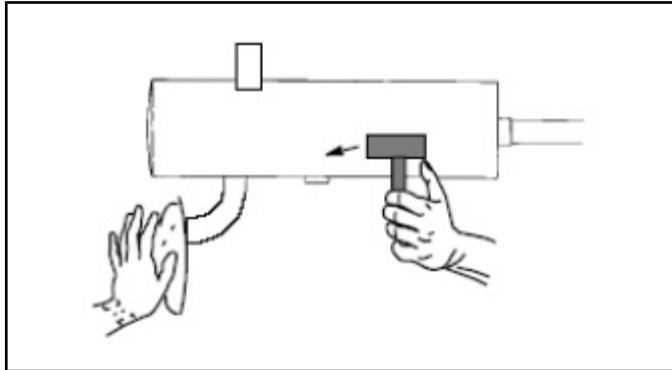
- Remove the clean out plug(s) located on the bottom of the muffler as shown below.



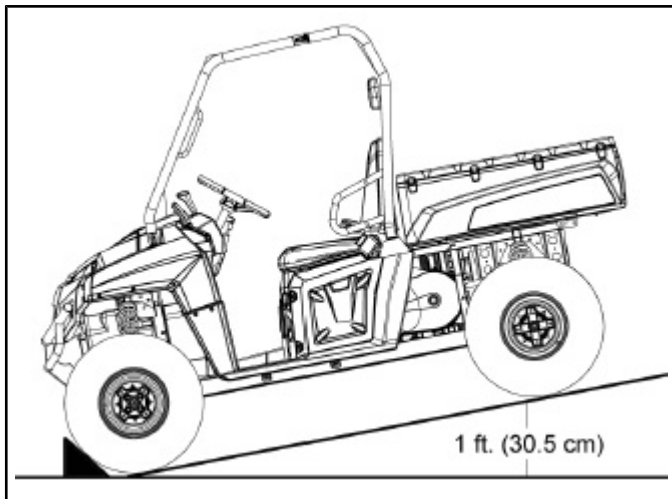
- Set the parking brake and start the engine. Purge accumulated carbon from the system by momentarily revving the engine several times.

MAINTENANCE

3. If some carbon is expelled, cover the exhaust outlet and lightly tap on the pipe around the clean out plugs with a rubber mallet while revving the engine several more times.



4. If particles are still suspected to be in the muffler, back the machine onto an incline so the **rear** of the machine is 1 ft. (30.5 cm) higher than the front. Set the parking brake, block the wheels and repeat Steps 2 and 3.



5. If particles are still suspected to be in the muffler, drive the machine onto the incline so the **front** of the machine is 1 ft. (30.5 cm) higher than the rear. Set the parking brake, block the wheels and repeat Steps 2 and 3.
6. Repeat steps 2 through 5 until no more particles are expelled when the engine is revved.
7. Stop the engine and allow the arrester to cool.
8. Reinstall the clean out plugs.

TRANSMISSION AND GEARCASES

Transmission Lubrication (4X4 / CREW)

NOTE: It is important to follow the transmission maintenance intervals described in the Periodic Maintenance Chart.

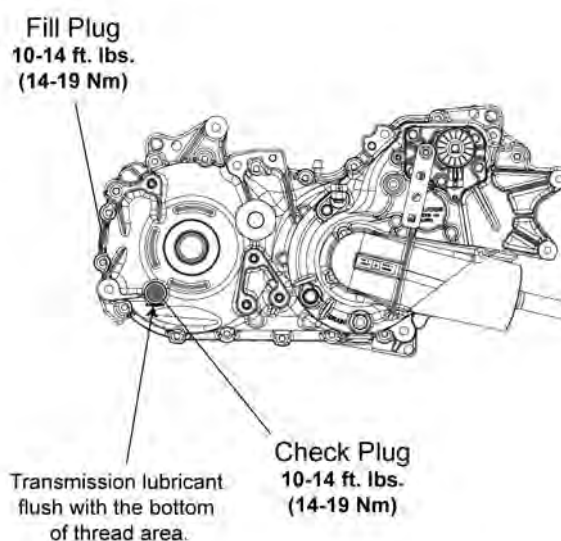
The transmission lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is positioned on a level surface when checking or changing the lubricant.
- Check vent hose to be sure it is routed properly and unobstructed.

Transmission Lubricant Level Check

The fill plug is located at the rear of the transmission. The check plug is located on the right side of the transmission. Maintain the fluid level even with the bottom threads of the check plug hole.

1. Position vehicle on a level surface.
2. Remove the check plug and check the lubricant level.



3. If lubricant level is not even with the bottom threads, remove the fill plug and add the recommended lubricant as needed. Do not overfill.
4. Reinstall the fill plug and check plug. Torque the plugs to specification.

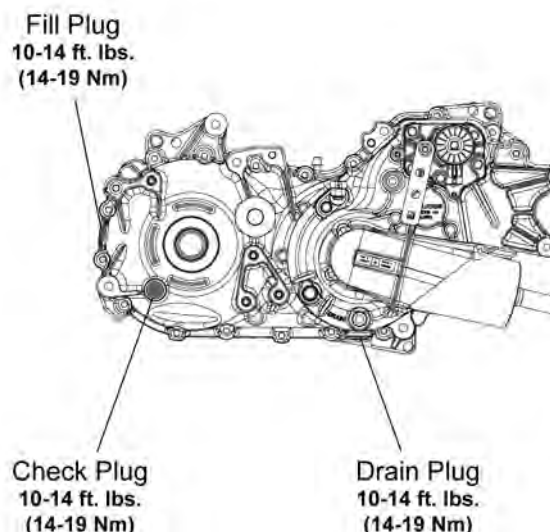


Fill / Check Plugs:
10-14 ft-lbs (14-19 Nm)

Transmission Lubricant Change

The drain plug is located on the bottom of the transmission. Access the drain plug through the skid plate.

1. Remove the fill plug.
2. Place a drain pan under the transmission drain plug.
3. Remove the drain plug and allow lubricant to drain completely.

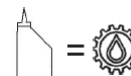


4. Clean the drain plug magnetic surface. Reinstall drain plug and torque to specification.



Drain Plug:
10-14 ft-lbs (14-19 Nm)

5. Remove the check plug.
6. Add the recommended amount of lubricant through the fill plug hole. Maintain the lubricant level at the bottom of the check plug hole when filling the transmission. Do not overfill (refer to "Transmission Lubricant Level Check").



Recommended Transmission Lubricant:
AGL (PN 2878068) (Quart)
Capacity: 33.8 oz. (1000 ml)

MAINTENANCE

7. Reinstall fill plug and check plug. Torque to specification.

 = T
Fill / Check Plugs: 10-14 ft-lbs (14-19 Nm)

8. Check for leaks. Dispose of used lubricant properly.

Transmission Lubrication (6X6)

NOTE: It is important to follow the transmission maintenance intervals described in the Periodic Maintenance Chart.

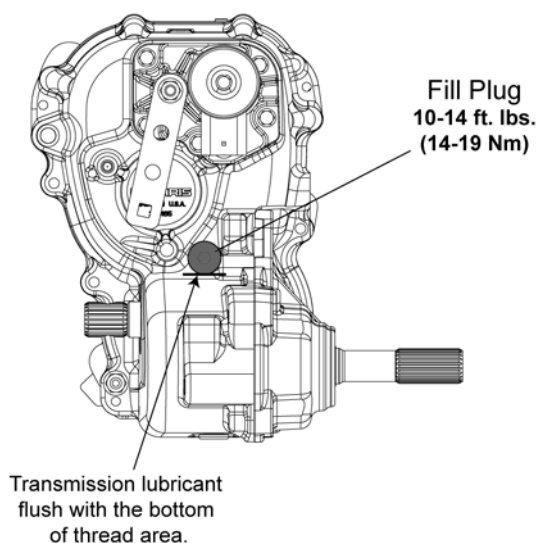
The transmission lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is positioned on a level surface when checking or changing the lubricant.
- Check vent hose to be sure it is routed properly and unobstructed.

Transmission Lubricant Level Check

The fill plug is located on the right-hand side of the transmission. Access the fill plug from the rear right-hand side of the vehicle. Maintain the fluid level even with the bottom threads of the fill plug hole.

1. Position vehicle on a level surface.
2. Remove the fill plug and check the lubricant level.



3. If lubricant level is not even with the bottom threads, add the recommended lubricant as needed. Do not overfill.

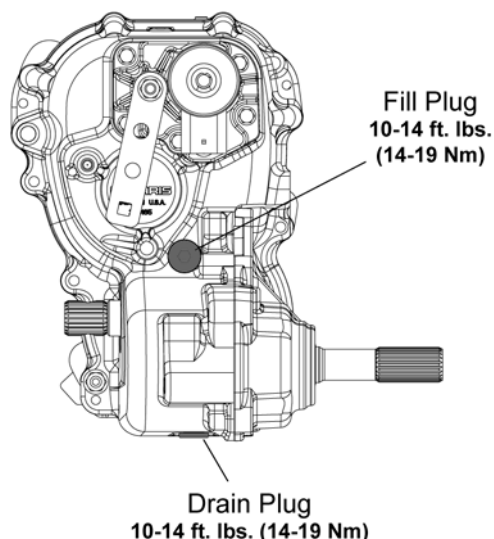
4. Reinstall the fill plug and torque to specification.

 = T
Fill Plug: 10-14 ft-lbs (14-19 Nm)

Transmission Lubricant Change

Access the drain plug on the right-hand side of the vehicle through the skid plate.

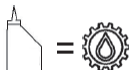
1. Remove the fill plug (refer to "Transmission Lubricant Level Check").
2. Place a drain pan under the transmission drain plug.
3. Remove the drain plug and allow lubricant to drain completely.



4. Clean the drain plug magnetic surface. Reinstall drain plug and torque to specification.

 = T
Drain Plug: 10-14 ft-lbs (14-19 Nm)

5. Add the recommended amount of lubricant through the fill plug hole. Maintain the lubricant level at the bottom of the fill plug hole when filling the transmission. Do not overfill.


Recommended Transmission Lubricant: AGL (PN 2878068) (Quart)
Capacity: 43.6 oz. (1290 ml)

6. Reinstall fill plug and torque to specification.

 = T
Fill Plug: 10-14 ft-lbs (14-19 Nm)

7. Check for leaks. Dispose of used lubricant properly.

Front Gearcase Lubrication

NOTE: It is important to follow the front gearcase maintenance intervals described in the Periodic Maintenance Chart.

The front gearcase fluid level should be checked and changed in accordance with the maintenance schedule.

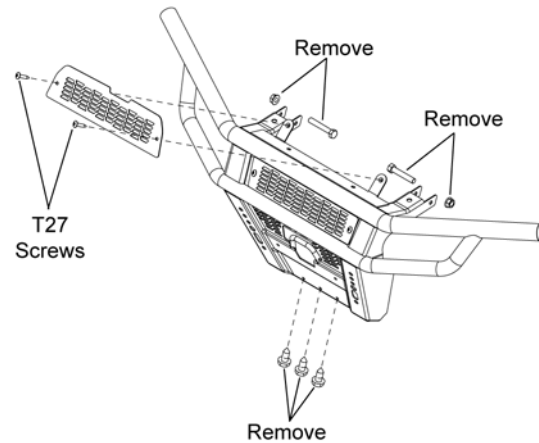
- Be sure vehicle is positioned on a level surface when checking or changing the fluid.
- Check vent hose to be sure it is routed properly and unobstructed.

Front Gearcase Fluid Level Check

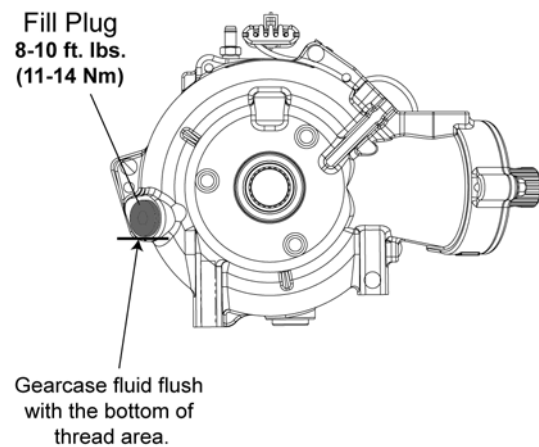
The fill plug is located on the front left side of the front gearcase. Access the fill plug from the front of the vehicle. Maintain the fluid level even with the bottom threads of the fill plug hole.

1. Position vehicle on a level surface.
2. Begin by removing the front bumper to gain access to the gearcase fill plug.

3. Remove the (2) T27 Torx-head screws retaining the fascia screen and remove the screen.



4. Remove the (3) bolts from the lower portion of the bumper.
5. Remove the fasteners from each side of the upper portion of the bumper.
6. Carefully remove the bumper from the vehicle
7. Remove the fill plug and check the fluid level.



8. If fluid level is not even with the bottom threads, add the recommended fluid as needed. Do not overfill.
9. Reinstall the fill plug and torque to specification.

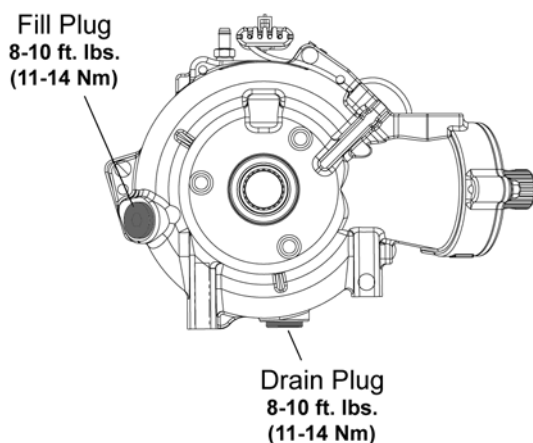
 = T
Fill Plug: 8-10 ft-lbs (11-14 Nm)

MAINTENANCE

Front Gearcase Fluid Change:

The drain plug is located on the bottom side of the front gearcase. Access the drain plug through the skid plate.

1. Remove the fill plug (refer to “Front Gearcase Fluid Level Check”).
2. Place a drain pan under the front gearcase drain plug.
3. Remove the drain plug and allow fluid to drain completely.

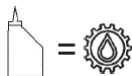


4. Clean the drain plug magnetic surface.
5. Reinstall drain plug and torque to specification.



Drain Plug:
10-14 ft-lbs (14-19 Nm)

6. Add the recommended amount of fluid through the fill hole. Maintain the fluid level even with the bottom threads of the fill plug hole.



Recommended Front Gearcase Fluid:
Polaris Demand Drive
(PN 2877922) (Quart)

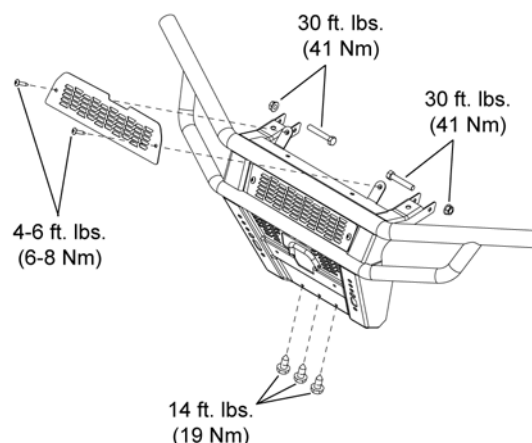
Capacity: 9 oz. (265 ml)

7. Reinstall fill plug and torque to specification.



Fill Plug:
8-10 ft-lbs (11-14 Nm)

8. Check for leaks. Dispose of used fluid properly.
9. Reinstall the front bumper.



10. Install the fasteners on each side of the upper portion of the bumper. Torque fasteners to specification.



Fasteners:
30 ft-lbs (41 Nm)

11. Install the (3) bolts in the lower portion of the bumper. Torque bolts to specification.



Bolts:
14 ft-lbs (19 Nm)

12. Install the (2) T27 Torx-head screws retaining the fascia screen. Torque screws to specification.



Screws:
4-6 ft-lbs (6-8 Nm)

Mid Gearcase Lubrication (6X6)

NOTE: It is important to follow the mid gearcase maintenance intervals described in the Periodic Maintenance Chart.

The gearcase lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is level with parking brake on before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.

Mid Gearcase Lubricant Level Check:

The fill plug is located on the left side of the mid gearcase. Maintain the lubricant level even with the bottom threads of the fill plug hole.

1. Position the vehicle on a level surface.
2. Remove the fill plug and check the lubricant level (see "Side View").
3. If lubricant level is not even with the bottom threads, add the recommended lubricant as needed. Do not overfill.
4. Reinstall fill plug and torque to specification.

 = T
Fill Plug: 14 ft-lbs (19 Nm)

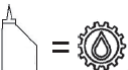
Mid Gearcase Lubricant Change:

The drain plug is located on the bottom right side of the mid gearcase. Access the drain plug through the skid plate.

1. Remove the fill plug (refer to "Mid Gearcase Lubricant Level Check").
2. Place a drain pan under the mid gearcase drain plug.
3. Remove the drain plug and allow the lubricant to drain completely (see "Bottom View").
4. Clean and reinstall drain plug. Torque to specification.

 = T
Drain / Fill Plug: 14 ft-lbs (19 Nm)

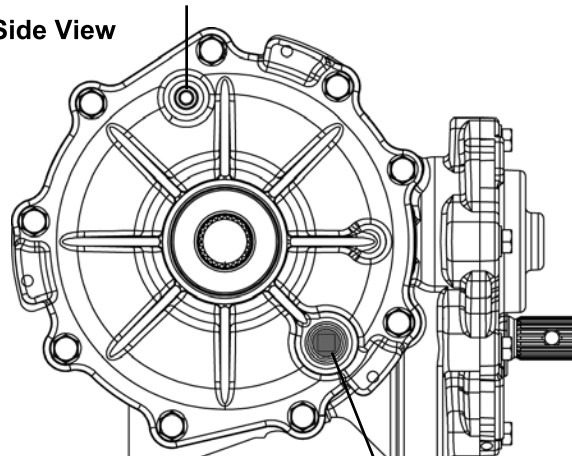
5. Add the recommended amount of lubricant through the fill hole. Maintain the lubricant level even with the bottom threads of the fill plug hole.

 = 
Recommended Mid Gearcase Lubricant: ATV Angle Drive Fluid (PN 2876160)
Capacity: 6.75 oz. (200 ml)

6. Reinstall fill plug and torque to specification.
7. Check for leaks. Dispose of used lubricant properly.

Make sure vent is unobstructed

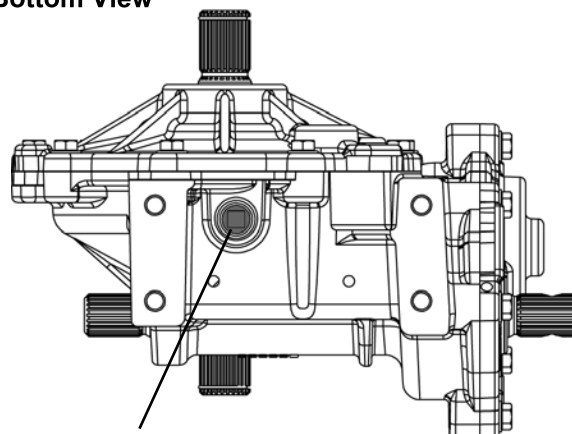
Side View



Fill to bottom of
fill plug hole
threads: 6.75 oz.

Fill Plug
14 ft-lbs (19 Nm)

Bottom View



Drain Plug
14 ft-lbs (19 Nm)

MAINTENANCE

Rear Gearcase Lubrication (6X6)

NOTE: It is important to follow the rear gearcase maintenance intervals described in the Periodic Maintenance Chart.

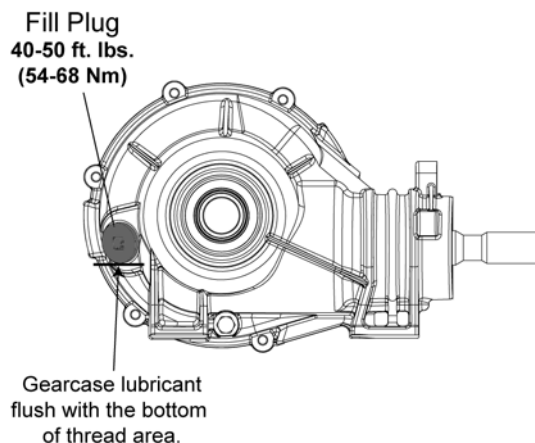
The rear gearcase lubricant level should be checked and changed in accordance with the maintenance schedule.

- Be sure vehicle is positioned on a level surface when checking or changing the lubricant.
- Check vent hose to be sure it is routed properly and unobstructed.

Rear Gearcase Lubricant Level Check:

The fill plug is located on the right side of the rear gearcase. Maintain the lubricant level even with the bottom threads of the fill plug hole.

1. Position the vehicle on a level surface.
2. Remove the fill plug and check the lubricant level.



3. If lubricant level is not even with the bottom threads, add the recommended lubricant as needed. Do not overfill.
4. Reinstall fill plug and torque to specification.

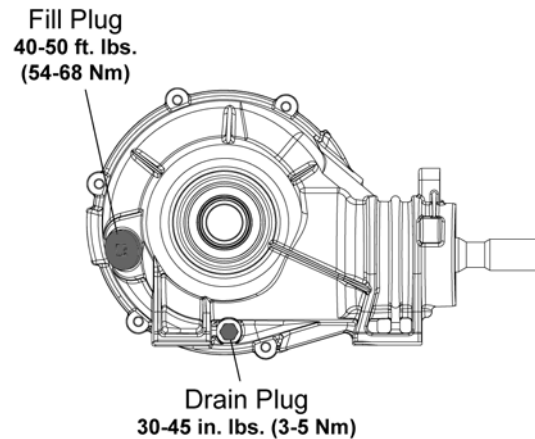
 = T
Fill Plug: 40-50 ft-lbs (54-68 Nm)

Rear Gearcase Lubricant Change:

The drain plug is located on the bottom right side of the

rear gearcase. Access the drain plug from the rear of the vehicle through the skid plate.

1. Remove the fill plug (refer to "Rear Gearcase Lubricant Level Check").
2. Place a drain pan under the rear gearcase drain plug.
3. Remove the drain plug and allow the lubricant to drain completely.



4. Clean the drain plug magnetic surface.
5. Reinstall drain plug and torque to specification.

 = T
Drain Plug: 30-45 in-lbs (3-5 Nm)

6. Add the recommended amount of lubricant through the fill hole. Maintain the lubricant level even with the bottom threads of the fill plug hole.

 = 
Recommended Rear Gearcase Lubricant: ATV Angle Drive Fluid (PN 2876160)
Capacity: 18 oz. (532 ml)

7. Reinstall fill plug and torque to specification.
8. Check for leaks. Dispose of used lubricant properly.

COOLING SYSTEM

Liquid Cooling System Overview

The engine coolant level is controlled or maintained by the recovery system. The recovery system components are the recovery bottle, radiator filler neck, radiator pressure cap and connecting hose.

As coolant operating temperature increases, the expanding (heated) excess coolant is forced out of the radiator past the pressure cap and into the recovery bottle. As engine coolant temperature decreases the contracting (cooled) coolant is drawn back up from the tank past the pressure cap and into the radiator.

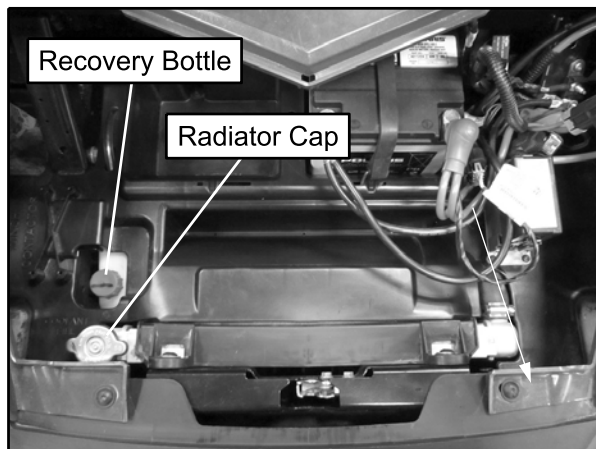
NOTE: Some coolant level drop on new machines is normal as the system is purging itself of trapped air. Observe coolant levels often during the break-in period.

IMPORTANT: Overheating of engine could occur if air is not fully purged from system.

Polaris Antifreeze 50/50 Premix is already premixed and ready to use. Do not dilute with water.

Coolant Level Inspection

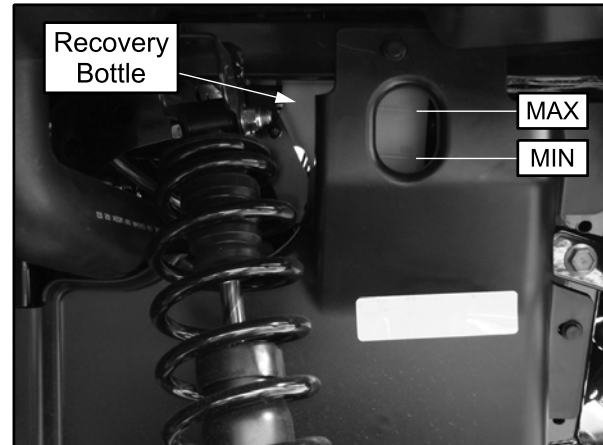
The recovery bottle and radiator pressure cap are located under the hood.



With the engine at operating temperature, the coolant level should be between the "MAX" and "MIN" marks on the recovery bottle. If not, perform the following:

1. Position the vehicle on a level surface.

2. Check the coolant level in the recovery bottle, located on the ride side of the machine. The coolant level must be maintained between the "MAX" and "MIN" levels indicated on the recovery bottle.



3. If the coolant level is below the "MIN" mark, open the hood to access the radiator pressure cap and recovery bottle cap.

NOTE: If overheating is evident, allow system to cool completely and check coolant level in the radiator and inspect for signs of trapped air in system.



WARNING

Never remove the pressure cap when the engine is warm or hot. Escaping steam can cause severe burns. The engine must be cool before removing the pressure cap.

4. Remove the pressure cap. Using a funnel, add coolant to the top of the radiator filler neck.
5. Reinstall the pressure cap.

NOTE: Use of a non-standard pressure cap will not allow the recovery system to function properly.

6. Remove the recovery bottle cap.
7. Fill the recovery bottle to the "MAX" mark with Polaris Antifreeze 50/50 Premix as required for freeze protection in your area.
8. Reinstall the recovery bottle cap.
9. If coolant was required, start engine and check for leaks. Make sure radiator fins are clean to prevent overheating.

MAINTENANCE

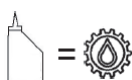
Coolant Strength / Type

Test coolant strength by using an antifreeze hydrometer.



Antifreeze Hydrometer

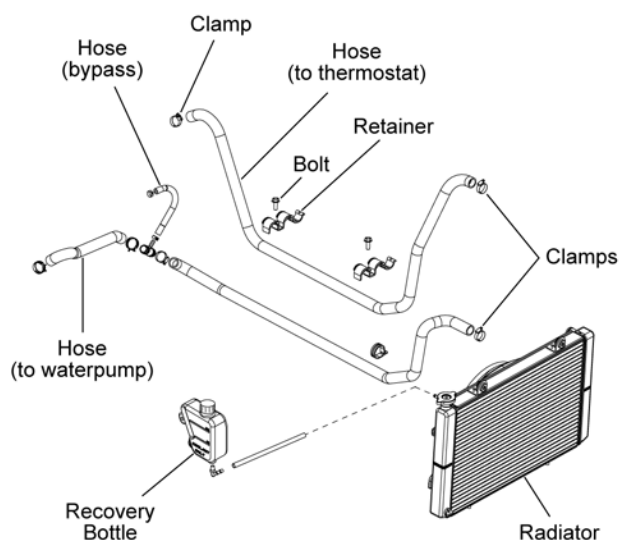
- A 50/50 mixture of antifreeze and distilled water will provide the optimum cooling, corrosion protection, and antifreeze protection.
- Do not use tap water, straight antifreeze, or straight water in the system. Tap water contains minerals and impurities which build up in the system. Straight water or antifreeze may cause the system to freeze, corrode, or overheat.



Recommended Anti-Freeze/Coolant:
Polaris Antifreeze 50/50 Premix
(PN 2880514) (Quart)

Cooling System Hoses

1. Inspect all hoses for cracks, deterioration, abrasion or leaks. Replace if necessary.



2. Check tightness of all hose clamps.

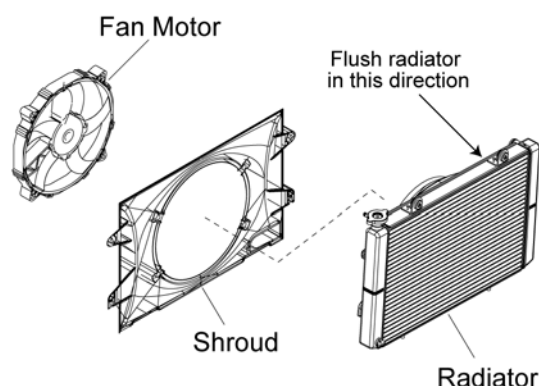


CAUTION

Do not over-tighten hose clamps at radiator or radiator fitting may distort.
Radiator hose clamp torque is **36 in-lbs (4 Nm)**.

Radiator Inspection / Cleaning

1. Check radiator air passages for restrictions or damage.



2. Carefully straighten any bent radiator fins.
3. Remove any obstructions with compressed air or low pressure water.



CAUTION

Washing the vehicle with a high-pressure washer could damage the radiator fins and impair the radiators effectiveness. Use of a high-pressure washer is not recommended.

Coolant Drain

1. Remove the push rivets and front LH wheel well panel to access the lower coolant hose at the radiator.
2. Place a suitable drain pan under the LH side of the radiator.

3. Allow the vehicle to cool down if recently operated.



WARNING

Never remove the pressure cap when the engine is warm or hot. Escaping steam can cause severe burns. The engine must be cool before removing the pressure cap.

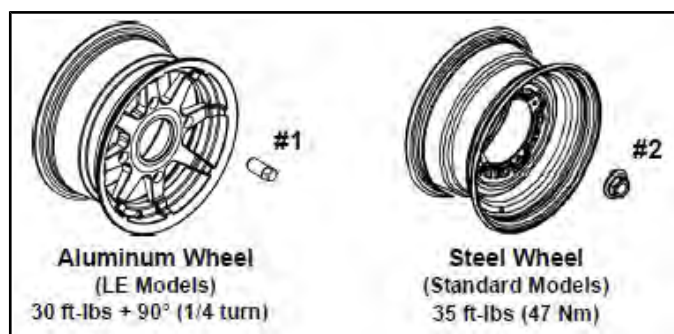
4. Open the hood and slowly open the radiator pressure cap to relieve system pressure.
5. Remove the lower coolant hose and drain the coolant from the radiator and hose. Allow the coolant to completely drain. Properly dispose of the used coolant.

MAINTENANCE

FINAL DRIVE / WHEEL AND TIRE

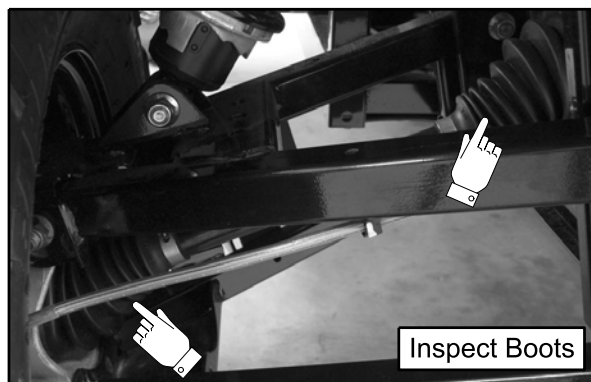
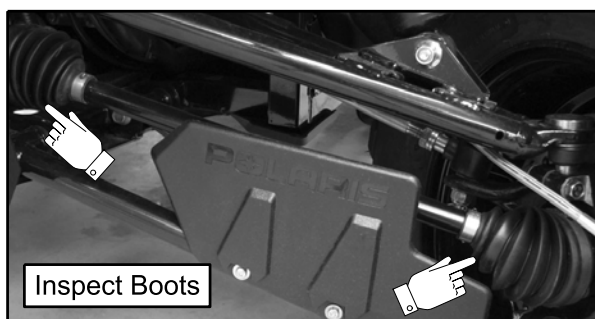
Wheel and Hub Torque Table

ITEM	NUT TYPE	SPECIFICATION
Aluminum Wheels (Cast)	Lug Nut #1	30 ft-lbs + 90° (1/4 turn)
Steel Wheels (Black / Camo)	Flange Nut #2	35 ft-lbs (47 Nm)
Front Hub Nut	-	80 ft-lbs (108 Nm)
Mid / Rear Hub Retaining Nut	-	110 ft-lbs (150 Nm)



CV Shaft Boot Inspection

Inspect the CV shaft boots in the front and rear of the *RANGER* for damage, tears, wear, or leaking grease. If the rubber boot exhibits any of these symptoms, replace the boot. Refer to Chapter 7 for CV boot replacement.



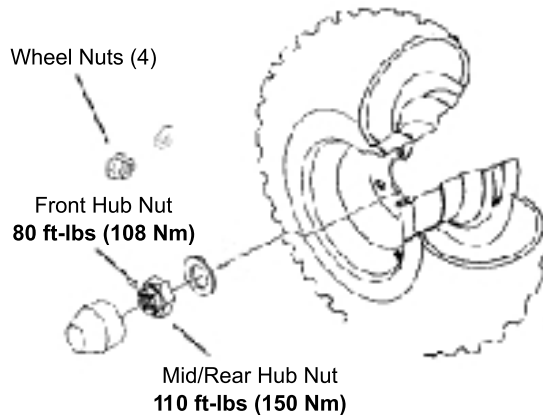
Wheel Removal

1. Stop the engine, place the transmission in gear and lock the parking brake.
2. Loosen the wheel nuts slightly.
3. Elevate the side of the vehicle by placing a suitable stand under the footrest frame.
4. Remove the wheel nuts and washers and remove the wheel.

Wheel Installation

1. With the transmission in gear and the parking brake locked, place the wheel in the correct position on the wheel hub. Be sure the valve stem is toward the outside and rotation arrows on the tire point toward forward rotation.
2. Install the washers (if applicable) and wheel nuts and finger tighten them.
3. Lower the vehicle to the ground.

- Securely tighten the wheel nuts to the proper torque listed in the torque table at the beginning of this section.



CAUTION

If wheels are improperly installed it could affect vehicle handling and tire wear. On vehicles with tapered rear wheel nuts, make sure tapered end of nut goes into taper on wheel.

WARNING

Operating a *RANGER* with worn tires will increase the possibility of the vehicle skidding easily with possible loss of control.

Worn tires can cause an accident.

Always replace tires when the tread depth measures 1/8" (3 mm) or less.

Tire Pressure

CAUTION

Maintain proper tire pressure. Refer to the warning tire pressure decal applied to the vehicle.

TIRE PRESSURE INSPECTION (PSI - COLD)

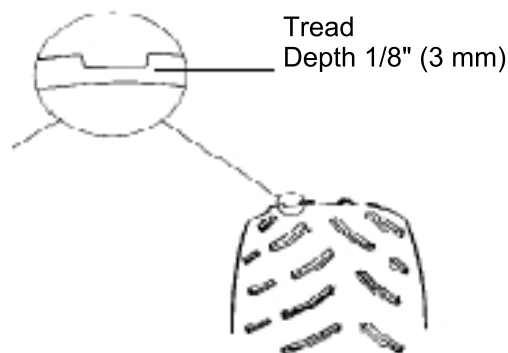
Model	Front / Rear
4X4 / 6X6	8-12 psi / 8-12 psi
CREW	12 psi / 16 psi

Tire Inspection

- Improper tire inflation may affect vehicle maneuverability.
- When replacing a tire always use original equipment size and type.
- The use of non-standard size or type tires may affect vehicle handling.

Tire Tread Depth

Replace tires when tread depth is worn to 1/8" (3 mm) or less.



MAINTENANCE

ELECTRICAL AND IGNITION SYSTEM

Battery Maintenance

Keep battery terminals and connections free of corrosion. If cleaning is necessary, remove the corrosion with a stiff wire brush. Wash with a solution of one tablespoon baking soda and one cup water. Rinse well with tap water and dry off with clean shop towels. Coat the terminals with dielectric grease or petroleum jelly.

Be careful not to allow cleaning solution or tap water into the battery.



WARNING

CALIFORNIA PROPOSITION 65 WARNING:
Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
WASH HANDS AFTER HANDLING.



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.

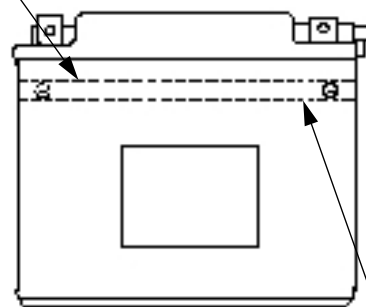
Batteries produce explosive gases.
Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries.
KEEP OUT OF REACH OF CHILDREN.

NOTE: Batteries must be fully charged before use or battery life will be reduced by 10-30% of full potential. Charge battery for 3-5 hours at a current equivalent of 1/10 of the battery's rated amp/hour capacity. Do not use the alternator to charge a new battery.

Battery Fluid Level (Conventional Battery)

A poorly maintained battery will deteriorate rapidly. Check the battery fluid level often. Maintain the fluid level between the upper and lower level marks.

Upper Level



Lower Level

Add only distilled water. Tap water contains minerals that are harmful to a battery.

Battery Removal

1. Remove the seat base.
2. Remove the under-seat storage container on the drivers side.



3. Disconnect the black (-, negative) battery cable.
4. Disconnect the red (+, positive) battery cable.
5. Remove the hold-down strap from the battery.

- Lift the battery out of the vehicle, being careful not to tip it sideways and spill any electrolyte (if applicable).



CAUTION

Improperly connecting or disconnecting battery cables can result in an explosion and cause serious injury or death. When removing the battery, always disconnect the negative (black) cable first. When reinstalling the battery, always connect the negative (black) cable last.

Battery Installation

NOTE: Using a new battery that has not been fully charged can damage the battery and result in a shorter life. It can also hinder vehicle performance. Follow the battery charging procedures before installing the battery.

- Verify that the battery is fully charged.
- Place the battery in the battery holder.
- Install battery hold down strap.
- Coat the terminals with dielectric grease or petroleum jelly.
- Connect and tighten the red (+, positive) cable first.
- Connect and tighten the black (-, negative) cable last.
- Verify that cables are properly routed and install the hold-down strap.
- Reinstall the under-seat storage container.
- Reinstall the seat base.

Use Polaris corrosion resistant Nyogel™ grease (PN 2871329) on battery terminals.



Battery Terminal Pinch Bolt:
40–60 lbs-in (5–7 Nm)

Battery Storage

Whenever the vehicle is not used for a period of three months or more, remove the battery from the vehicle, ensure that it's fully charged, and store it out of the sun in a cool, dry place. Check battery voltage each month during storage and recharge as needed to maintain a full charge.

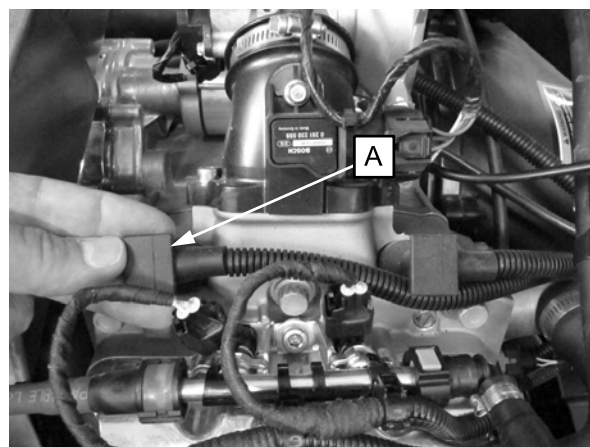
NOTE: Battery charge can be maintained by using a Polaris battery tender charger or by charging about once a month to make up for normal self-discharge. Battery tenders can be left connected during the storage period, and will automatically charge the battery if the voltage drops below a pre-determined point.

Battery Charging

- Remove the battery from the vehicle to prevent damage from leaking or spilled electrolyte during charging.
- Charge the battery with a charging output no larger than 1/10 of the battery's amp/hr rating. Charge as needed to raise the specific gravity to 1.270 or greater.
- Reinstall the battery.

Spark Plug Service

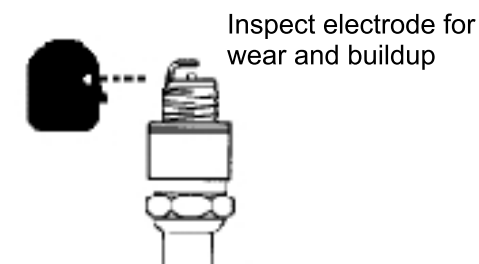
- Remove both spark plug high tension leads (A). Clean plug area so no dirt and debris can fall into engine when plug is removed.



- Remove spark plugs with proper socket.

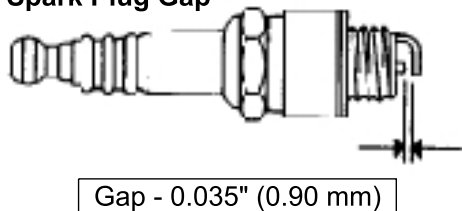
MAINTENANCE

3. Inspect electrodes for wear and carbon buildup. Outer edge should be sharp with no rounding or erosion of the electrodes.



4. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. **CAUTION:** A wire brush or coated abrasive should not be used.
5. Measure gap with a wire gauge. Refer to specifications in picture below for proper spark plug type and gap. Adjust gap if necessary by bending the side electrode carefully.

Spark Plug Gap



6. If necessary, replace spark plug with proper type. **CAUTION: Severe engine damage may occur if the incorrect spark plug is used.**
7. Apply a small amount of anti-seize compound to the spark plug threads.
8. Install spark plug and torque to specification.

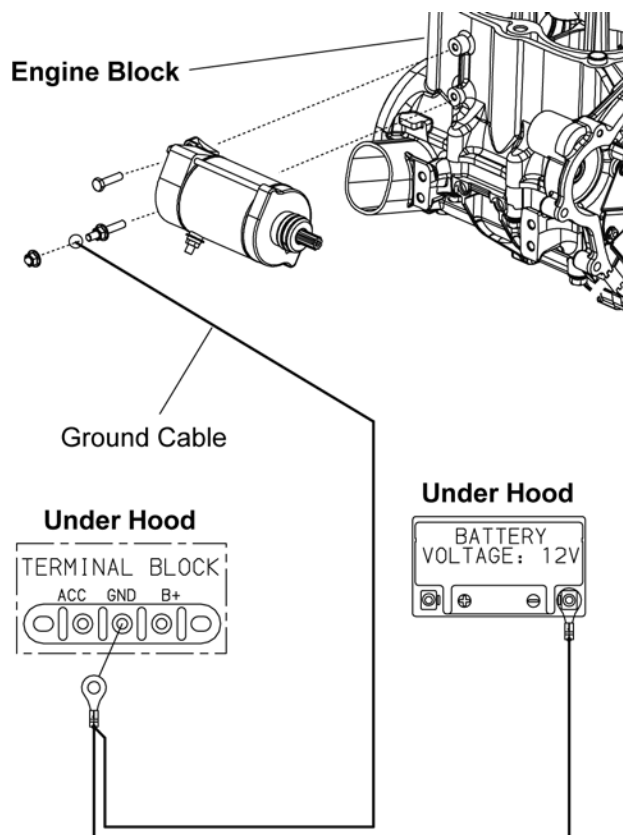
Recommended Spark Plug:
Champion RC7YC3



Spark Plug:
18 ft-lbs (24 Nm)

Engine To Frame Ground

Inspect engine ground cable connections. Be sure they are clean and tight. The ground cable runs from the engine to the terminal block located under the hood next to the battery.



STEERING

Steering Inspection

The steering components should be checked periodically for loose fasteners, worn tie rod ends, and damage. Also check to make sure all cotter pins are in place. If cotter pins are removed, they must not be re-used. Always use new cotter pins.

Replace any worn or damaged steering components. Steering should move freely through entire range of travel without binding. Check routing of all cables, hoses, and wiring to be sure the steering mechanism is not restricted or limited.

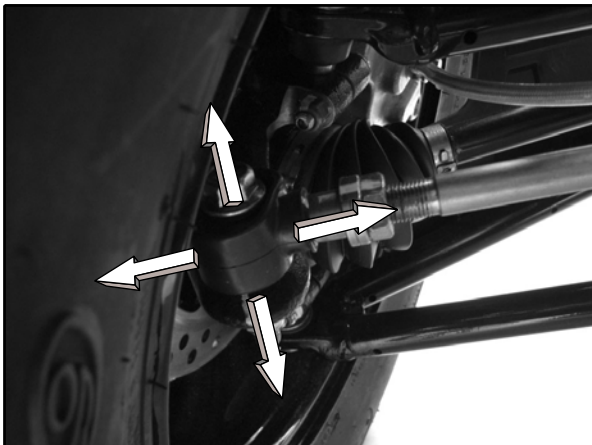
NOTE: Whenever steering components are replaced, check front end alignment. Use only genuine Polaris parts.

WARNING

Due to the critical nature of the procedures outlined in this chapter, Polaris recommends steering component repair and adjustment be performed by an authorized Polaris MSD-certified technician when replacing worn or damaged steering parts.
Use only genuine Polaris replacement parts.

Tie Rod End / Steering Inspection

- To check for play in the tie rod end, grasp the steering tie rod, pull in all directions feeling for movement.
- Replace any worn steering components. Steering should move freely through entire range of travel without binding.

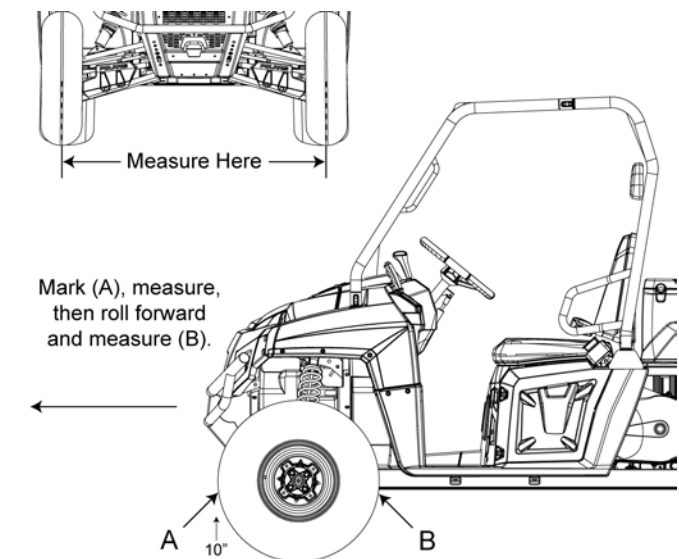


- Elevate front end of machine so front wheels are off the ground. Check for any looseness in front hub/wheel assembly by grasping the tire firmly at top and bottom first, and then at front and rear. Try to move the wheel and hub by pushing inward and pulling outward.
- If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause (loose wheel nuts or loose front hub nut).
- Refer to the Body/Steering or Final Drive chapter for more information.

2

Wheel Toe Alignment Inspection

1. Place machine on a smooth level surface and set steering wheel in a straight ahead position. Secure the steering wheel in this position.
2. Place a chalk mark on the center line of the front tires approximately 10" (25.4 cm) from the floor or as close to the hub/axle center line as possible.

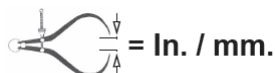


NOTE: It is important the height of both marks be equally positioned to get an accurate measurement.

3. Measure the distance between the marks and record the measurement. Call this measurement "A".
4. Rotate the tires 180° by moving the vehicle forward. Position chalk marks facing rearward, even with the hub/axle center line.

MAINTENANCE

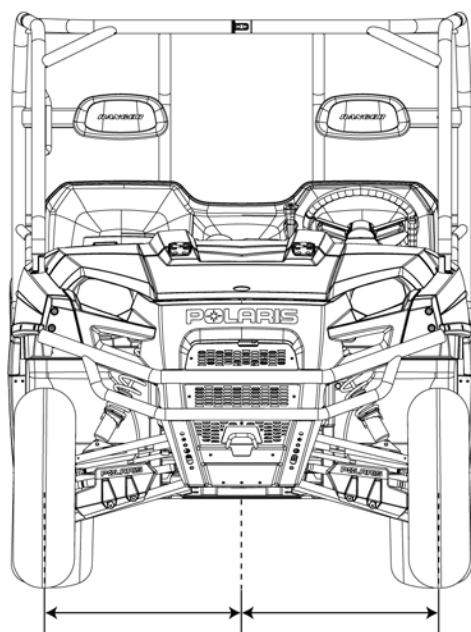
5. Again measure the distance between the marks and record. Call this measurement "B". Subtract measurement "B" from measurement "A". The difference between measurements "A" and "B" is the vehicle toe alignment. The recommended vehicle toe tolerance is 1/8" to 1/4" (0.3 to 0.6 cm) toe out. This means the measurement at the front of the tire (A) is 1/8" to 1/4" (0.3 to 0.6 cm) wider than the measurement at the rear (B).



Wheel Toe-Out:
(A) - (B) = 1/8 to 1/4" (0.3 to 0.6 cm)

Toe Adjustment

If toe alignment is incorrect, measure the distance between vehicle center and each wheel. This will tell you which tie rod needs adjusting.



Measure Distances
(measurements should be equal)

NOTE: Be sure steering wheel is straight ahead before determining which tie rod needs adjustment.



CAUTION

During tie rod adjustment, it is very important that the following precautions be taken when tightening tie rod end jam nuts.

If the rod end is positioned incorrectly it will not pivot, and may break.

To adjust toe alignment:

- Hold tie rod end to keep it from rotating.
- Loosen jam nuts at both end of the tie rod.
- Shorten or lengthen the tie rod until alignment is as required to achieve the proper toe setting as specified in "Wheel Toe Alignment".
- **IMPORTANT:** When tightening the tie rod end jam nuts, the rod ends must be held parallel to prevent rod end damage and premature wear. Damage may not be immediately apparent if done incorrectly.
- After alignment is complete, torque jam nuts to specification.



Tie Rod End Jam Nut:
12-14 ft-lbs (16-19 Nm)

SUSPENSION

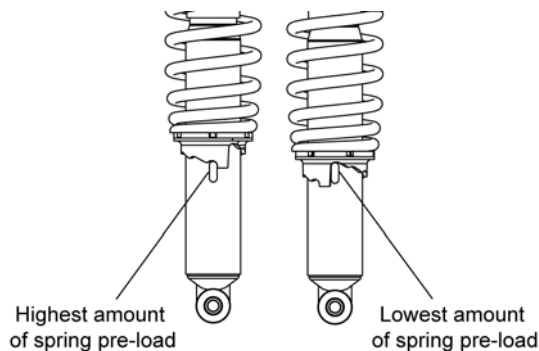
Suspension Inspection

Compress and release the suspension. Damping should be smooth throughout the range of travel.

- Check all suspension components and mounting fasteners for wear or damage.
- Inspect each shock body for leakage.

Spring Pre-Load Adjustment

The front and rear shock absorber springs are adjustable. Rotate the adjuster cam either direction to increase or decrease spring tension. Always adjust both left and right sides equally.



Shock Pre-Load Adjustment

Vehicle loads effect suspension spring pre-load requirements. Use Shock Spanner Wrench (PN 2871095) to adjust pre-load as necessary to avoid bottoming of the shocks.

**Shock Spanner Wrench:
PN 2871095**

Shock Position Adjustment

The front and rear shock position may be adjusted to provide a stiffer suspension if necessary.

1. Elevate the vehicle and safely support the main frame.

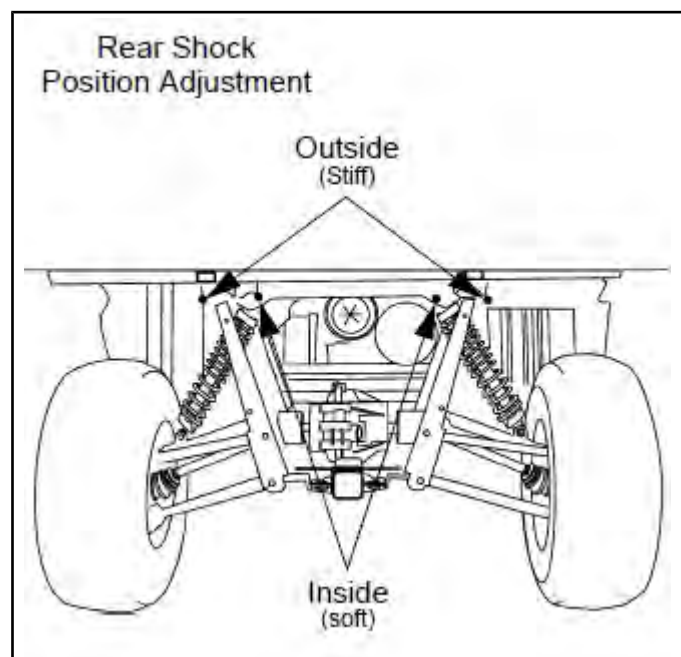
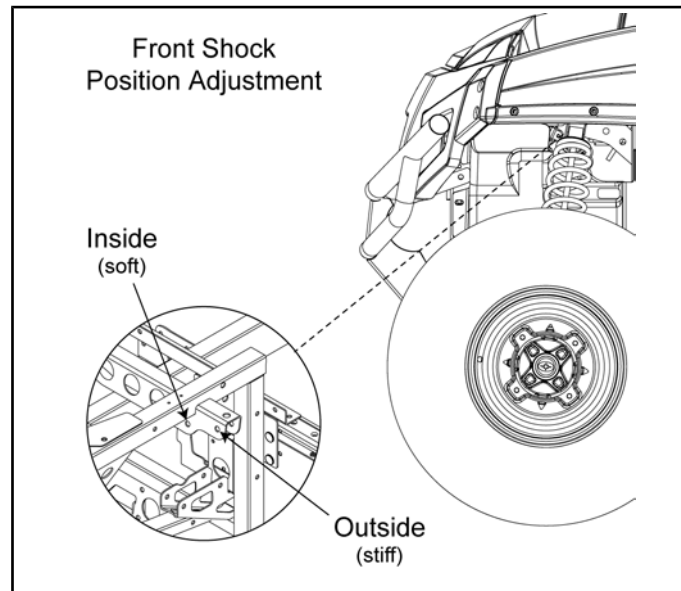


CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before adjusting.

2. Remove the top shock mounting bolts on each side.

3. Reposition the shocks to the outside mounting holes.



4. Reinstall the shock mounting bolts and torque to specification.



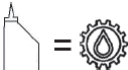
**Shock Mounting Bolts:
30 ft-lbs (41 Nm)**

MAINTENANCE

BRAKE SYSTEM

Brake Fluid Inspection

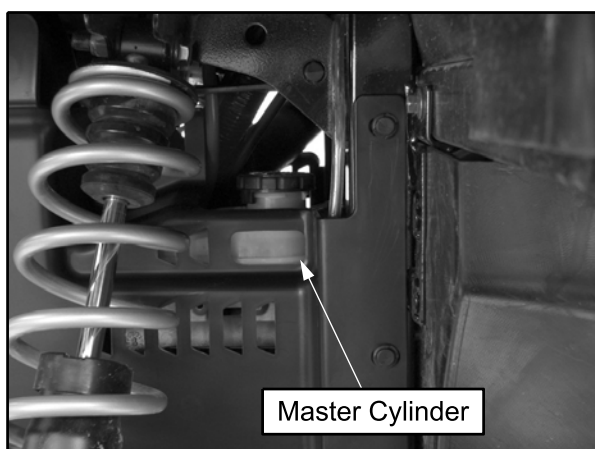
Always check the brake pedal travel and inspect the brake fluid reservoir level before each operation. If the fluid level is low, add DOT 4 brake fluid only.


Recommended Brake Fluid: DOT 4 Brake Fluid (PN 2872189)

Brake fluid should be changed every two years. The fluid should also be changed anytime the fluid becomes contaminated, the fluid level is below the minimum level, or if the type and brand of the fluid in the reservoir is unknown.

The brake master cylinder reservoir can be accessed through the front left wheel well.

1. Position the vehicle on a level surface.
2. Place the transmission in Neutral (N) and set the parking brake.
3. View the brake fluid level in the reservoir. The level should be between the MAX and MIN level lines.
4. If the fluid level is lower than the MIN level line, add brake fluid until it reaches the MAX level line.
5. Install the reservoir cap and apply the brake pedal forcefully for a few seconds and check for fluid leakage around the master cylinder fittings and the brake caliper fittings.



Brake Hose and Fitting Inspection

Check brake system hoses and fittings for cracks, deterioration, abrasion, and leaks. Tighten any loose fittings and replace any worn or damaged parts.

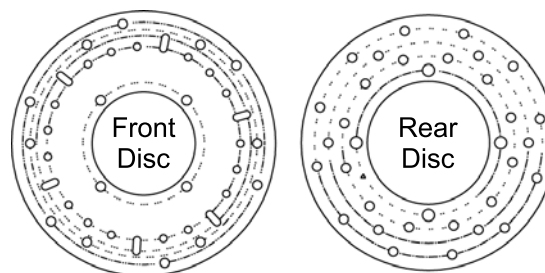
Brake Pad / Disc Inspection

1. Check the brake pads for wear, damage, or looseness.
2. Inspect the brake pad wear surface for excessive wear.
3. Pads should be changed when the friction material is worn to .030" (.762 mm).



4. Check surface condition of the brake discs.
5. Measure the thickness of the front and rear brake discs.
6. The disc(s) should be replaced if thickness is less than the specified service limit (see Chapter 9 for specifications).

Measure Brake Disc Thickness



Parking Brake Cable Adjustment

When the parking brake is fully engaged and the parking brake indicator is illuminated, engine speed is limited to 1300 RPM in all gears, including neutral. If throttle is applied, this limiting feature prevents operation, which protects the parking brake pads from excessive wear.

NOTE: Inspect the parking brake cable tension after the first 25 hours of operation and every 100 hours of operation afterwards to ensure proper cable tension.

Loss of tension in the parking brake cable will cause illumination of the parking brake indicator and activation of the limiting feature. If this occurs, inspect and adjust parking brake cable tension. If performing this service is difficult due to conditions or location, open the hood and temporarily disconnect the parking brake connector. Reconnect the connector as soon as practicable and adjust the parking brake cable to proper tension.

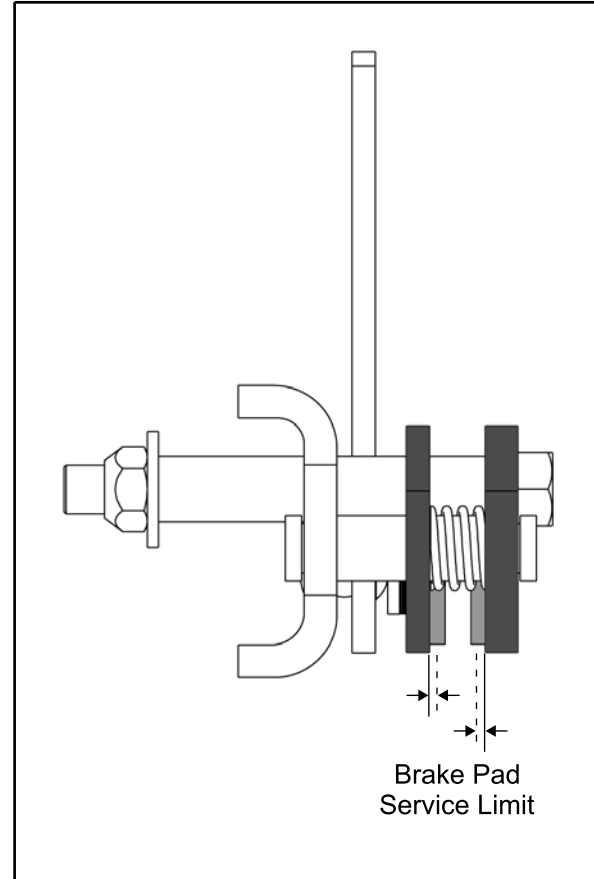
1. Pull back on the parking brake lever (located in the dash).
2. After 3 to 4 clicks "BRAKE" should display on the instrument cluster and the wheels of the vehicle should not rotate when turning by hand. After 8 full clicks of lever travel, the vehicle should not roll while parked.
3. If the vehicle moves, adjustment is necessary.
4. Adjust the parking brake cable where the cable attaches to the caliper mount bracket. The mount bracket is located on the left-hand side of the transmission behind the outer PVT cover (4X4) or on the rear gearcase (6X6).

Adjustment Procedure: Refer to Chapter 9 "Brakes" for complete adjustment procedure.

Parking Brake Pad Inspection

1. Inspect brake pads for excessive wear. Replace caliper assembly if required.

2. Measure the thickness of the brake pad material. Replace caliper assembly if pad material is worn past the service limit specification.



**Brake Pad Material
Service Limit: .030" (.762 mm)**

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CHAPTER 3

ENGINE

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ENGINE

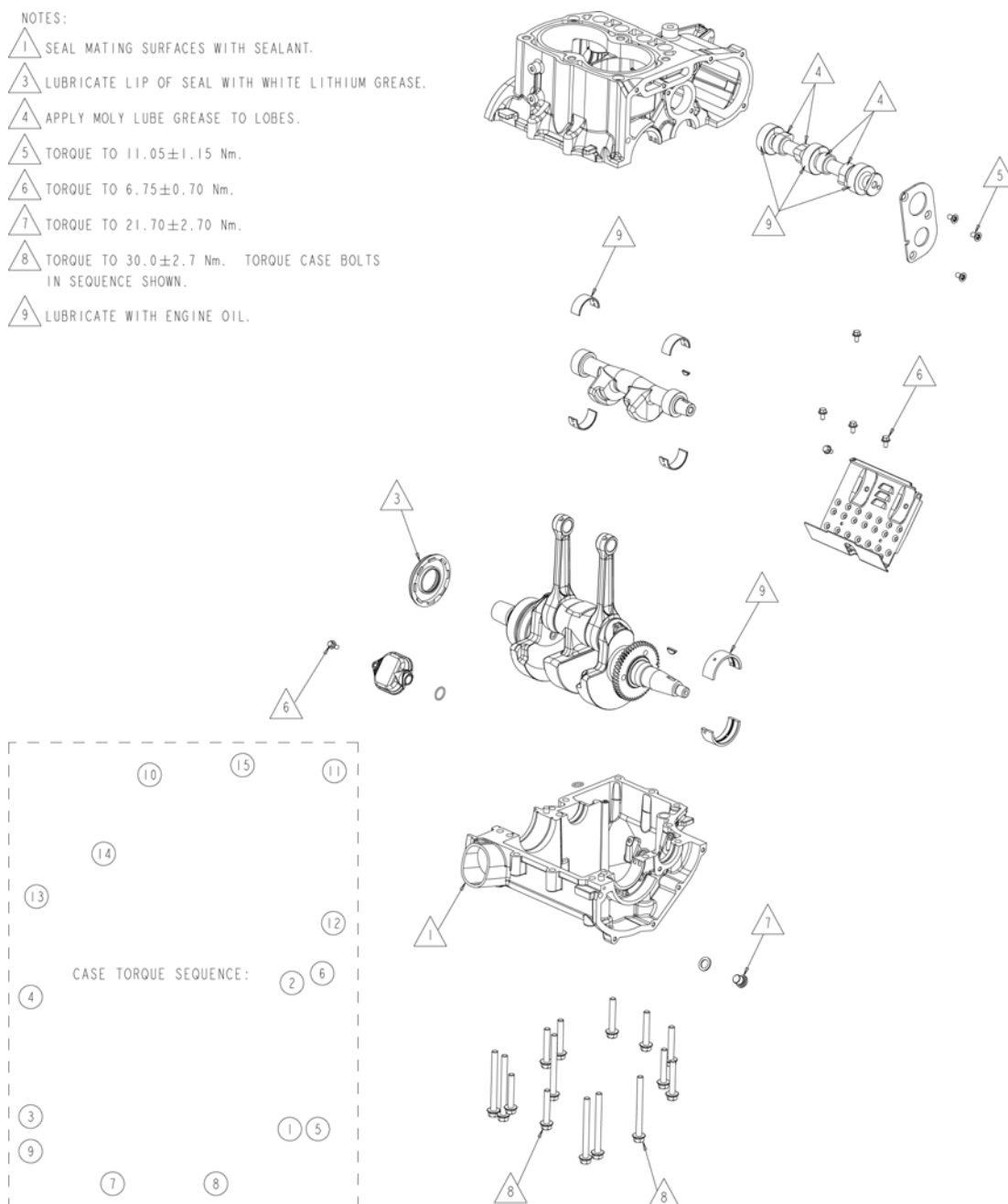
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ENGINE SPECIFICATIONS

Crankcase Exploded View

NOTES:

- 1 SEAL MATING SURFACES WITH SEALANT.
- 3 LUBRICATE LIP OF SEAL WITH WHITE LITHIUM GREASE.
- 4 APPLY MOLY LUBE GREASE TO LOBES.
- 5 TORQUE TO 11.05 ± 1.15 Nm.
- 6 TORQUE TO 6.75 ± 0.70 Nm.
- 7 TORQUE TO 21.70 ± 2.70 Nm.
- 8 TORQUE TO 30.0 ± 2.7 Nm. TORQUE CASE BOLTS IN SEQUENCE SHOWN.
- 9 LUBRICATE WITH ENGINE OIL.

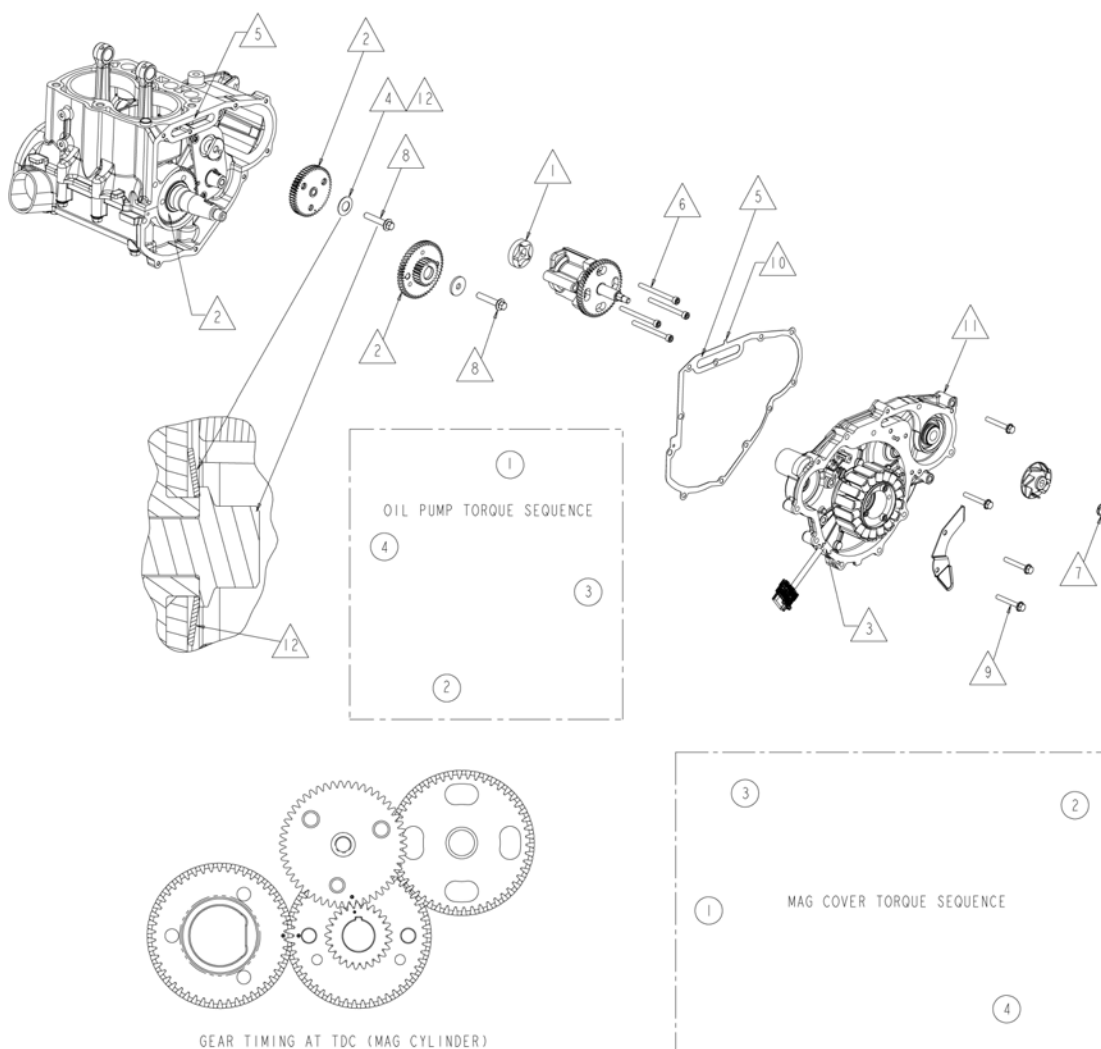


ENGINE

Oil Pump / Gears / Engine Cover Exploded View

NOTES:

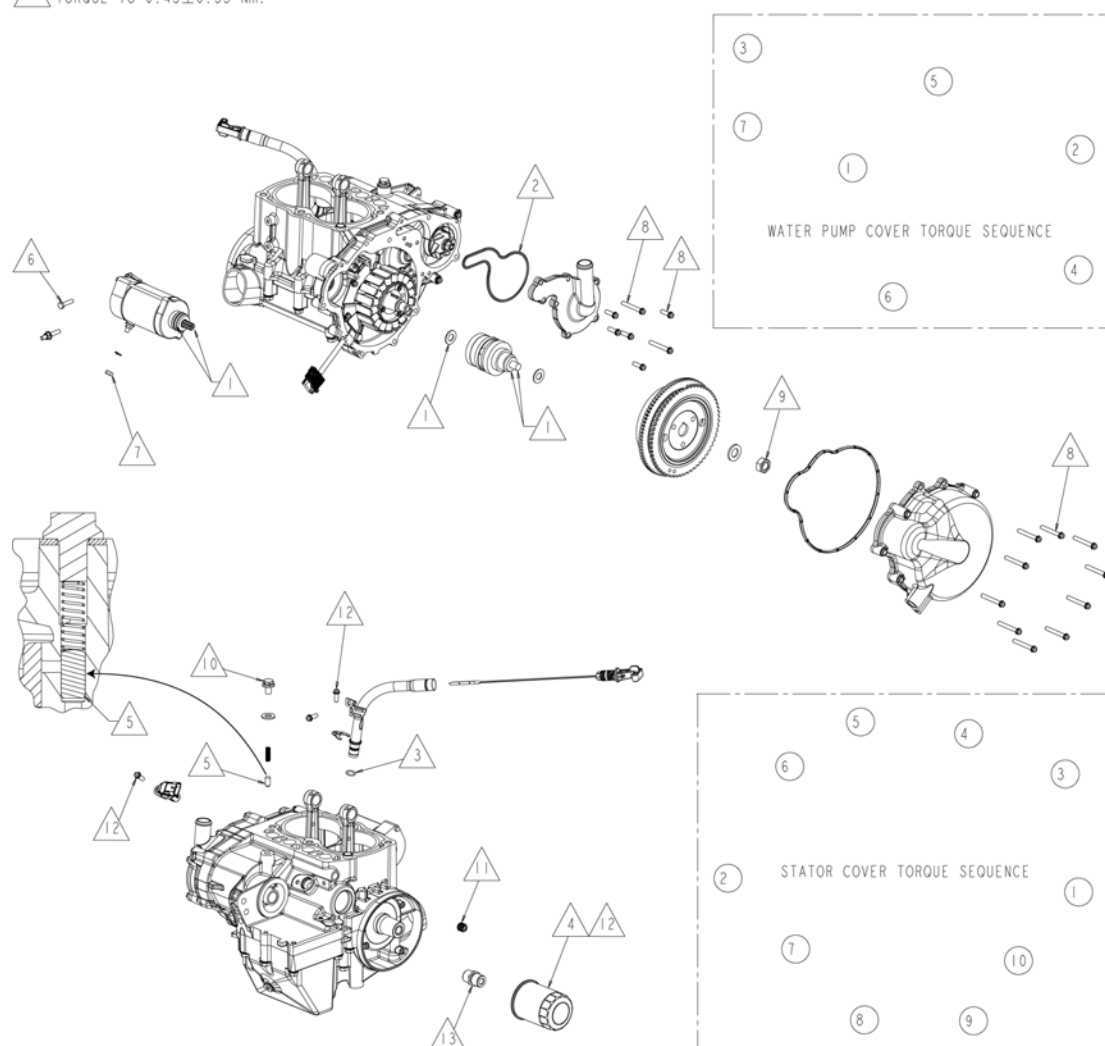
- 1 LUBRICATE WITH ENGINE OIL.
- 2 ALIGN GEARS TO GEAR TIMING VIEW BELOW.
- 3 APPLY CORROSION RESISTING GREASE TO STATOR GROMMET.
- 4 APPLY LITHIUM GREASE BETWEEN WASHER AND SPLIT GEAR.
- 5 NO GREASE AROUND WATER PORT.
- 6 TORQUE TO 9.50 ± 0.90 Nm. FOLLOW SEQUENCE FOR OIL PUMP.
- 7 TORQUE TO 12.20 ± 1.35 Nm.
- 8 TORQUE TO 30.0 ± 2.7 Nm.
- 9 TORQUE TO 10.85 ± 1.35 Nm. FOLLOW SEQUENCE FOR MAG COVER.
- 10 ENSURE TAB IS VISIBLE TO VERIFY ASSEMBLY.
- 11 LUBRICATE LIP OF CRANK SEAL AND OIL PUMP SEAL WITH ENGINE OIL.
- 12 ORIENTATE WASHER SO THAT THE CONCAVE SURFACE IS AGAINST GEAR.



Stator Cover / Starter / Water Pump / Lubrication System Exploded View

NOTES:

- 1 APPLY GREASE.
- 2 NO OIL OR GREASE ON O-RING.
- 3 LUBRICATE WITH ENGINE OIL.
- 4 LUBRICATE OIL FILTER GASKET WITH ENGINE OIL.
- 5 INSTALL PRESSURE RELIEF DOWEL WITH CHAMFER SIDE DOWN.
- 6 TORQUE TO 9.50 ± 0.90 Nm, UPPER BOLT FIRST ON STARTER, FOLLOWED BY LOWER BOLT.
- 7 TORQUE TO 6.45 ± 0.35 Nm.
- 8 TORQUE TO 10.85 ± 1.35 Nm. TORQUE WATER PUMP AND STATOR COVERS IN SEQUENCES SHOWN.
- 9 TORQUE TO 88.0 ± 9.5 Nm.
- 10 TORQUE TO 23.0 ± 2.7 Nm.
- 11 TORQUE TO 16.25 ± 1.35 Nm.
- 12 TORQUE TO 5.65 ± 0.55 Nm.
- 13 TORQUE TO 47.5 ± 5.4 Nm.

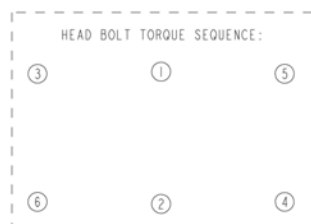


ENGINE

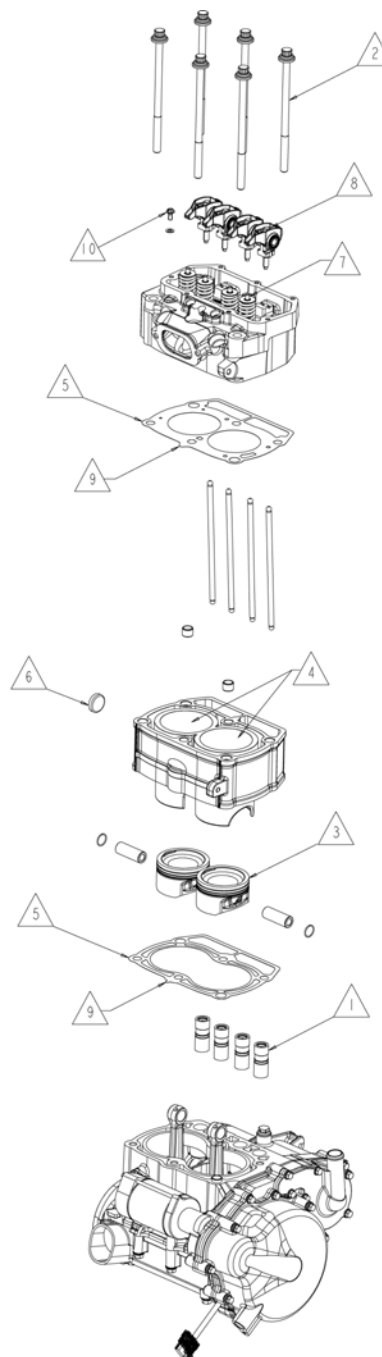
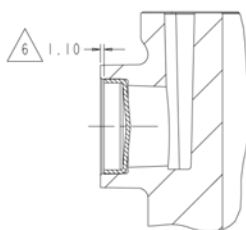
Cylinder / Cylinder Head / Piston Exploded View

NOTES:

- 1 LUBRICATE WITH ENGINE OIL.
- 2 LUBRICATE THREADS WITH ENGINE OIL.
TORQUE TO 20.5 ± 2.5 Nm, BACK-OFF 5 TURNS, THEN TORQUE TO 47.5 ± 5.4 Nm
IN SEQUENCE BELOW. FINALLY, TIGHTEN IN SEQUENCE TO 90° (1/4 TURN).
- 3 INSTALL CIRCLIP WITH OPEN END UP. CHECK
PREVIOUSLY INSTALLED CIRCLIP TO ENSURE THAT OPEN END IS UP.
- 4 APPLY THIN FILM OF ENGINE OIL TO 25-50 MM OF CYLINDER BORE.
- 5 GASKET SURFACE MUST BE FREE OF OIL.
- 6 INSTALL EXPANSION PLUG AS SHOWN.
LOCTITE 603 PERMISSIBLE.
- 7 APPLY MOLY LUBE GREASE TO ALL VALVE TIPS.
- 8 TORQUE TO 30.0 ± 2.7 Nm.
- 9 ENSURE TABS ARE VISIBLE TO VERIFY ASSEMBLY.
- 10 TORQUE TO 7.90 ± 1.15 Nm.



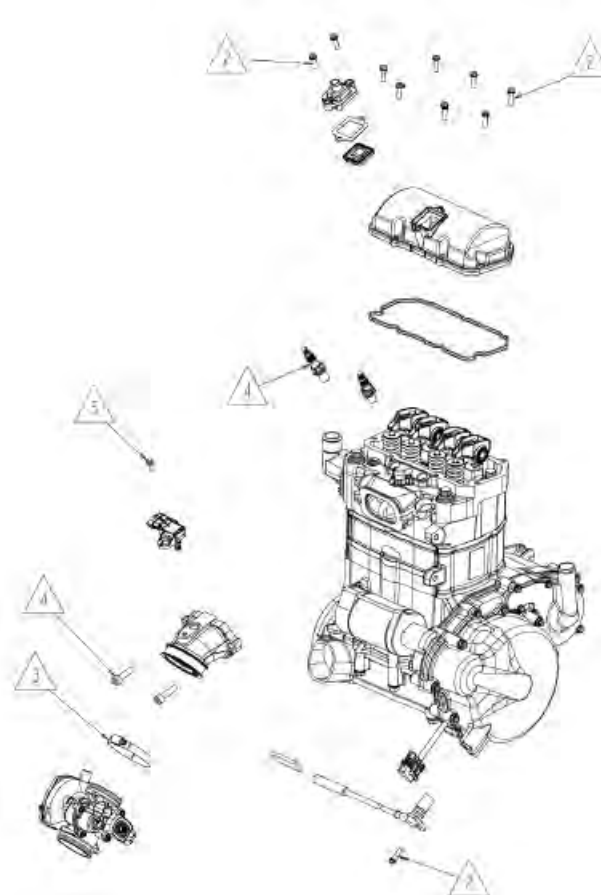
EXPANSION PLUG DETAIL



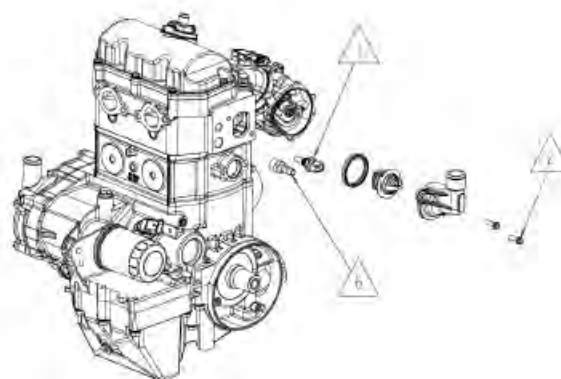
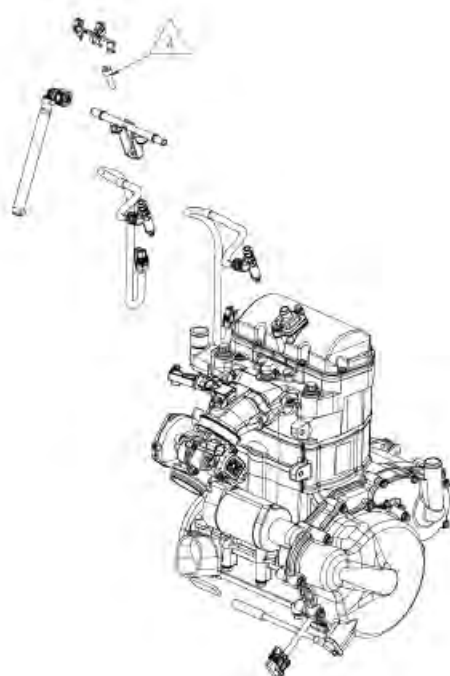
Engine EFI Sensors / Valve Cover / General Components Exploded View

NOTES:

- 1 TORQUE TO 25.60 ± 2.75 Nm.
- 2 TORQUE TO 9.50 ± 0.90 Nm. VALVE COVER TO BE TORQUED IN SEQUENCE SHOWN
- 3 TORQUE TO 2.25 ± 0.55 Nm
- 4 TORQUE TO 24.90 ± 2.70 Nm.
- 5 TORQUE TO 2.8 ± 0.3 Nm
- 6 TORQUE TO 13.0 ± 1.5 Nm



NOTE: See Chapter 4 for more information on the EFI System



ENGINE

Engine Torque Specifications

FASTENER	SIZE	IN-LBS (NM)	FT-LBS (NM)
Camshaft Gear	8 mm	-	22 ± 2 (30 ± 3)
Camshaft Phase Sensor Bolt	6 mm	50 ± 5 (5.65 ± 0.55)	-
Camshaft Thrust Plate	6 mm	115 ± 12 (13 ± 1.35)	9.5 ± 1 (13 ± 1.35)
Coolant Bleed Screw	6 mm	70 ± 10 (7.9 ± 1.15)	-
Coolant Bypass Hose Fitting	3/8 NPT	115 ± 11.5 (13 ± 1.3)	9.5 ± 1 (13 ± 1.35)
Counterbalance Gear	8 mm	-	22 ± 2 (30 ± 3)
Crankcase Bolts	8 mm	-	* 22 ± 2 (30 ± 3)
Crankcase Breather	5 mm	84 ± 8 (9.5 ± 0.9)	-
Cylinder Head Bolts	11 mm	-	* 35 ± 4 (47.5 ± 5.4)
Exhaust Manifold	8 mm	216 ± 24 (24.5 ± 2.70)	18 ± 2 (24.5 ± 2.7)
Flywheel	14 mm	-	65 ± 7 (88 ± 9.50)
Injector Rail	8 mm	216 ± 24 (24.5 ± 2.70)	18 ± 2 (24.5 ± 2.7)
Magneto Cover	6 mm	* 96 ± 12 (10.85 ± 1.35)	-
Oil Baffle Weldment	5 mm	60 ± 6 (6.8 ± 0.68)	-
Oil Drain Bolt (Crankcase)	12 mm	192 ± 24 (21.7 ± 2.7)	16 ± 2 (21.7 ± 2.7)
Oil Fill Tube Bolt	5 mm	50 ± 5 (5.64 ± 0.56)	-
Oil Filter Pipe Fitting	20 mm	-	35 ± 4 (47.5 ± 5.4)
Oil Pick Up	5 mm	60 ± 6 (6.8 ± 0.68)	-
Oil Pressure Relief Plug	10 mm	-	17 ± 2 (23 ± 2.7)
Oil Pump Housing Screw	6 mm	* 84 ± 8 (9.50 ± 0.90)	-
Rocker Arm	8 mm	-	* 22 ± 2 (30 ± 3)
Rocker Cover	6 mm	* 84 ± 8 (9.5 ± 0.9)	-
Spark Plug	14 mm	216 ± 24 (24.5 ± 2.7)	18 ± 2 (24.5 ± 2.7)
Starter Motor	6 mm	* 84 ± 8 (9.5 ± 0.9)	-
Stator Assembly	6 mm	84 ± 8 (9.5 ± 0.9)	-
Stator Housing	6 mm	* 96 ± 12 (10.85 ± 1.35)	-
Stator Wire Retainer Plate	5 mm	* 96 ± 12 (10.85 ± 1.35)	-
Thermistor Sensor	3/8 NPT	-	17 ± 2 (23 ± 2.7)
Thermostat Housing	6 mm	84 ± 8 (9.5 ± 0.9)	-
Throttle Body Adaptor Bolts	8 mm	216 ± 24 (24.5 ± 2.7)	18 ± 2 (24.5 ± 2.7)
T-MAP Sensor Bolt	5 mm	25 ± 3 (2.8 ± 0.3)	-
Water Pump Housing Cover	6 mm	* 96 ± 12 (10.85 ± 1.35)	-
Water Pump Impeller Nut	8 mm	108 ± 3 (12 ± 0.35)	-

NOTE: * See exploded views for notes or torque sequences.

3.8

800 EFI Engine Service Specifications

CYLINDER HEAD - ENGINE SPECIFICATIONS		
MAIN COMPONENT: CYLINDER HEAD		RGR800-13LK (1204619)
Camshaft	Cam Lobe Height - Intake	1.357" (34.477 mm)
	Cam Lobe Height - Exhaust	1.342" (34.096 mm)
	Camshaft Journal Outer Diameter - Mag	1.654" $\pm$ 0.00039" (42 $\pm$ 0.01 mm)
	Camshaft Journal Outer Diameter - Center	1.634" $\pm$ 0.00039" (41.50 $\pm$ 0.01 mm)
	Camshaft Journal Outer Diameter - PTO	1.614" $\pm$ 0.00039" (41 $\pm$ 0.01 mm)
	Camshaft Journal Bore Inner Diameter - Mag	1.656" $\pm$ 0.00039" (42.07 $\pm$ 0.01 mm)
	Camshaft Journal Bore Inner Diameter - Center	1.637" $\pm$ 0.00039" (41.58 $\pm$ 0.010mm)
	Camshaft Journal Bore Inner Diameter - PTO	1.617" $\pm$ 0.00039" (41.07 $\pm$ 0.01 mm)
	Camshaft Oil Clearance	0.00276" $\pm$ 0.00079" (0.07 $\pm$ 0.02 mm)
	Camshaft End Play	0.0167" $\pm$ 0.0098" (0.425 $\pm$ 0.25 mm)
Counter Balance	Counter Balance End Play	0.005" (0.127 mm)
Cylinder Head	Cylinder Head - Surface warp limit	0.00394" (0.1 mm)
	Cylinder Head - Standard height	3.478" (88.35 mm)
Valve Seat	Valve Seat - Contacting Width - Intake	0.0472" $\pm$ 0.00787" - 0.0039" (1.20 $\pm$ 0.20 - 0.10 mm)
	Valve Seat - Contacting Width - Exhaust	0.0591" $\pm$ 0.00787" - 0.0039" (1.50 $\pm$ 0.20 - 0.10 mm)
	Valve Seat Angle	45.5° $\pm$ 0.255°
Valve Guide	Valve Guide Inner diameter	0.2367" $\pm$ 0.00029" (6.012 $\pm$ 0.007 mm)
	Valve Guide Protrusion Above Head	0.807" $\pm$ 0.0039" (20.50 $\pm$ 0.01 mm)
Valve	Valve Stem Diameter - Intake	0.2356" $\pm$ 0.00039" (5.985 $\pm$ 0.01 mm)
	Valve Stem Diameter - Exhaust	0.2351" $\pm$ 0.00039" (5.972 $\pm$ 0.01 mm)
	Valve Stem Oil Clearance - Intake	0.00228" $\pm$ 0.00098" (0.058 $\pm$ 0.025 mm)
	Valve Stem Oil Clearance - Exhaust	0.00275" $\pm$ 0.00098" (0.0870 $\pm$ 0.025 mm)
	Valve Stem Overall Length - Intake	4.51" $\pm$ 0.01476" (114.5550 $\pm$ 0.375 mm)
	Valve Stem Overall Length - Exhaust	4.5453" $\pm$ 0.01496" (115.45 $\pm$ 0.38 mm)
Valve Spring	Valve Spring Overall Length - Free Length	1.735" (46.069 mm)
	Valve Spring Overall Length - Installed Height	Intake - 1.4638" (37.18 mm) Exhaust - 1.4736" (37.43 mm)

ENGINE

CYLINDER / PISTON - ENGINE SPECIFICATIONS		
MAIN COMPONENTS: CYLINDER / PISTON / CONNECTING ROD		RGR800-13LK (1204619)
Cylinder	Cylinder - Surface warp limit (mating with cylinder head)	0.004" (0.10 mm)
	Cylinder Bore - Standard	3.1495" (80 mm)
	Cylinder Taper Limit	0.00031" (0.008 mm)
	Cylinder Out of Round Limit	0.00030" (0.0075 mm)
	Cylinder to Piston Clearance	0.0015" $\pm$ 0.00059" (0.040 $\pm$ 0.015 mm)
Lifter	Lifter Outer Diameter Standard	0.84245" $\pm$ 0.00025" (21.39 8 $\pm$ 0.00635 mm)
	Lifter Block Bore	0.8438" $\pm$ 0.00062" (21.4322 $\pm$ 0.0157 mm)
Piston	Piston - Standard	3.14803" $\pm$ 0.00028" (79.960 $\pm$ 0.007 mm)
	Piston Standard Inner Diameter of Piston Pin Bore	0.70902" $\pm$ 0.00012" (18.009 $\pm$ 0.003 mm)
Piston Pin	Piston Pin Outer Diameter	0.70866" - 0.70846" (18 - 17.995 mm)
	Piston Pin - Standard Clearance - Piston Pin to Pin Bore	0.00047" $\pm$ 0.00024" (0.012 $\pm$ 0.006 mm)
	Piston Pin - Degree of Fit	Piston pin must be push fit (by hand) at 68° F (20° C)

PISTON / CONNECTING ROD / CRANKSHAFT - ENGINE SPECIFICATIONS			
MAIN COMPONENTS: PISTON / CONNECTING ROD			RGR800-13LK (1204619)
Piston Ring	Installed Gap	Top Ring - Standard	0.0059 - 0.0138" (0.15 - 0.35 mm)
		Top Ring - Limit	> 15% Leakdown
		Second Ring - Standard	0.0098 - 0.0197" (0.25 - 0.50 mm)
		Second Ring - Limit	> 15% Leakdown
		Oil Ring - Standard	0.0197 $\pm$ 0.0098" (0.50 $\pm$ 0.25 mm)
		Oil Ring - Limit	> 15% Leakdown
	Ring to Groove Clearance	Top Ring - Standard	0.00X24" $\pm$ 0.0008" (0.06 $\pm$ 0.02 mm)
		Top Ring - Limit	> 15% Leakdown
		Second Ring - Standard	0.0028" $\pm$ 0.0008" (0.07 $\pm$ 0.02 mm)
		Second Ring - Limit	> 15% Leakdown
Connecting Rod	Connecting Rod Small End I.D.		0.7096" - 0.70846" (18 - 17.995 mm)
	Connecting Rod Small End Radial Clearance		0.00098" $\pm$ 0.00039" (0.025 $\pm$ 0.01 mm)
	Connecting Rod Big End Side Clearance		0.01181" $\pm$ 0.00591" (0.30 $\pm$ 0.15 mm)
	Connecting Rod Big End Radial Clearance		0.0015" $\pm$ 0.0006" (0.038 $\pm$ 0.015 mm)
Crankshaft	Crankshaft Runout Limit		0.00236" (0.06 mm)

3.10

Special Tools

PART NUMBER	TOOL DESCRIPTION
PU-50105	OIL FILTER WRENCH
PU-45257	VALVE SPRING COMPRESSOR
PU-45652	VALVE PRESSURE HOSE
2871043	FLYWHEEL PULLER
2870390	PISTON SUPPORT BLOCK
PU-45497-1	CAM GEAR SPRING INSTALLATION KIT
PU-45497-2	CAM GEAR TOOTH ALIGNMENT TOOL
PU-45498	CAM SPANNER WRENCH
PU-45838	GEAR HOLDER
PA-44995	WATER PUMP MECHANICAL SEAL INSTALLER
PU-45543	UNIVERSAL DRIVER HANDLE
PA-45483	MAIN SEAL INSTALLER
PU-45658	CRANKSHAFT MAIN SEAL SAVER
PA-45401	WATER PUMP SEAL SAVER
2870975	MITY VAC™ PRESSURE TEST TOOL
PU-45778	OIL SYSTEM PRIMING TOOL

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

ENGINE

ENGINE COOLING SYSTEM

Cooling System Specifications

CONDITION	COOLANT TEMPERATURE °F (°C)	
Room Temperature	68° F (20° C)	
Thermostat Closed	175° F (79° C)	
Thermostat Open	180° F (82° C)	
Fan Off	194° F (90° C)	
Thermostat Full Open Lift	202° F (94° C)	
Fan On	205° F (96° C)	
Engine Temperature Overheat Indicator	Moving Vehicle:	235° F (113° C)
	Idle Vehicle:	241° F (116° C)
Engine Protection Ignition Misfire	Moving Vehicle:	239° F (115° C)
	Idle Vehicle:	244° F (118° C)
Engine Protection Shutdown	Moving Vehicle:	257° F (125° C)
	Idle Vehicle:	262° F (128° C)

ITEM	SPECIFICATION	
Cooling System Capacity	4X4 / 6X6	3.25 qts. (3.1 L)
	CREW	6.4 qts. (6 L)
Pressure Cap Relief	13 PSI	

Polaris Premium Antifreeze:
2871534 - Quart
2871323 - Gallon

Recommended Coolant

Use only Polaris Antifreeze 50/50 premix. This antifreeze is already premixed and ready to use.

IMPORTANT: Using tap water in the cooling system will lead to a buildup of deposits which may restrict coolant flow and reduce heat dissipation, resulting in possible engine damage.

Cooling System Pressure Test

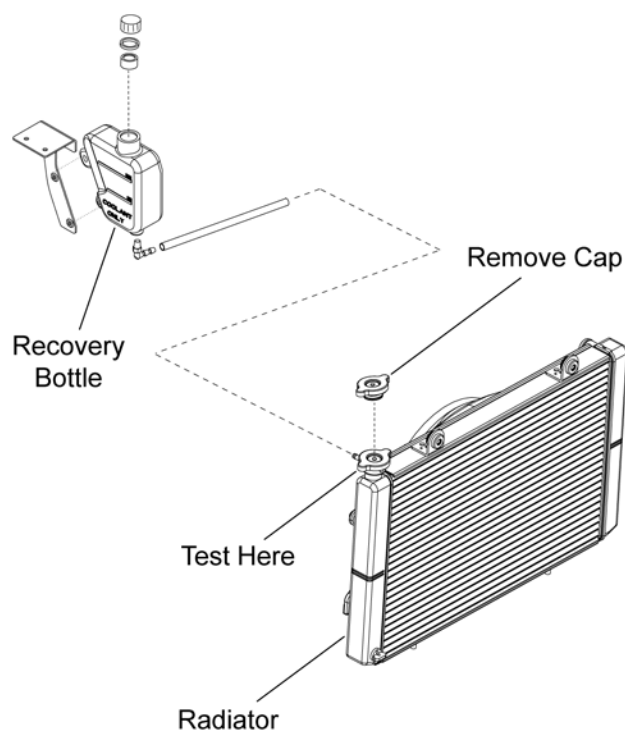
1. Open the front hood.



WARNING

Never remove radiator cap when engine is warm or hot. The cooling system is under pressure and serious burns may result. Allow the engine to cool before servicing.

2. Remove the pressure cap from the radiator and pressure test the cooling system using a commercially available tester.



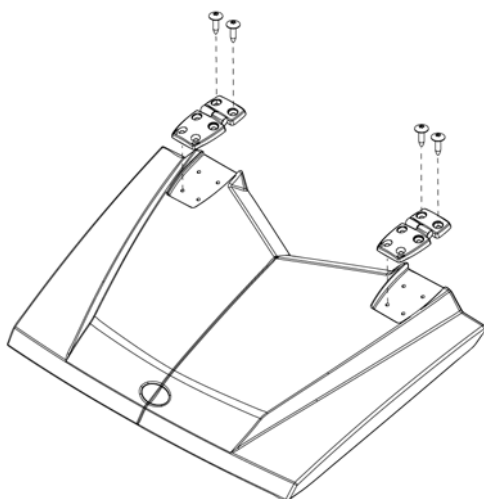
3. The system must maintain 10 psi for five minutes or longer. If pressure loss is evident within five minutes, check the radiator, all cooling system hoses, clamps and water pump seal for leakage.

Radiator Cap Pressure Test

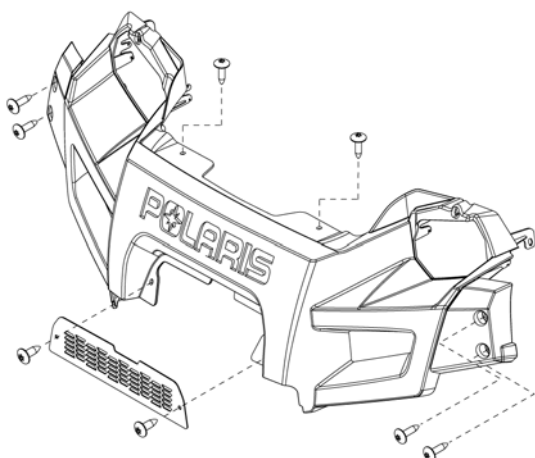
1. Open the front hood (see Warning under "Cooling System Pressure Test").
2. Remove radiator pressure cap and test using a pressure cap tester (commercially available).
3. The radiator cap relief pressure is 13 psi. Replace cap if it does not meet this specification.

Radiator Removal

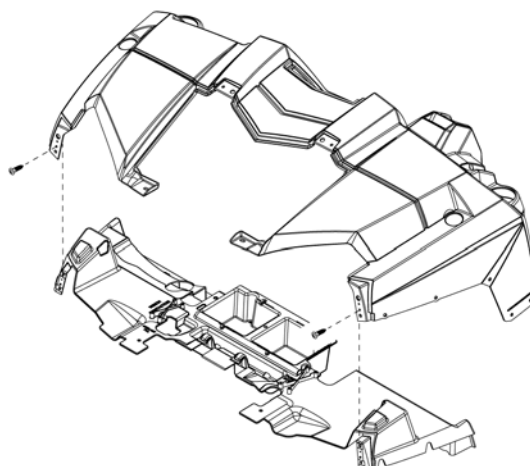
1. Open the hood and disconnect the headlights.
2. Remove the (4) upper screws that retain the hood to the frame.



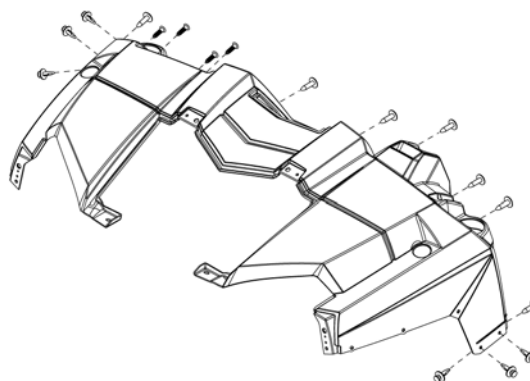
3. Remove the (8) fasteners retaining the front bumper assembly and remove the bumper from the vehicle.



4. Remove the (2) screws that retain the front cab assembly to the hood liner.



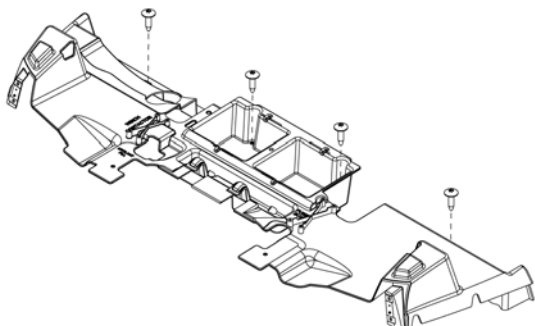
5. Remove the (11) remaining screws and (6) push rivets retaining the front cab.



6. Lift up on the front cab and slide it up the cab frame far enough to access the hood liner. Support the front cab to keep it from sliding down.
7. Disconnect and remove the battery from the vehicle.
8. Loosen the hose clamp and remove the engine air intake baffle box.

ENGINE

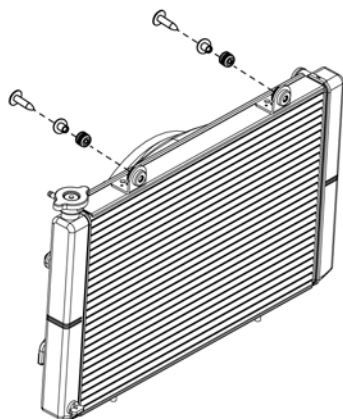
9. Remove the (4) screws that retain the hood liner to the frame.



10. Carefully lift up on the hood liner and lift it up far enough to allow radiator removal.

NOTE: Turn coolant pressure cap to allow the hood liner to clear the cap.

11. Remove the (2) screws retaining the upper portion of the radiator to the frame.



12. Remove the push rivets and front LH wheel well panel to access the lower coolant hose at the radiator.
13. Place a suitable drain pan under the LH side of the radiator.
14. Allow the vehicle to cool down if recently operated.

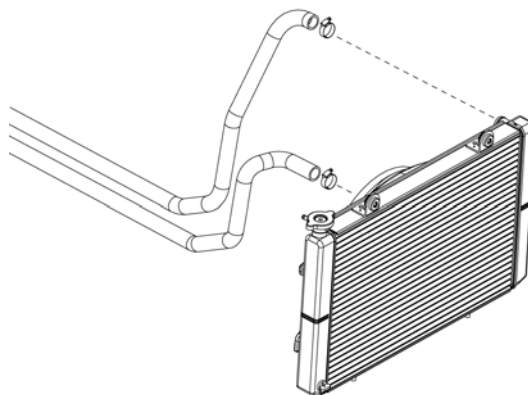


WARNING

Never remove the pressure cap when the engine is warm or hot. Escaping steam can cause severe burns. The engine must be cool before removing the pressure cap.

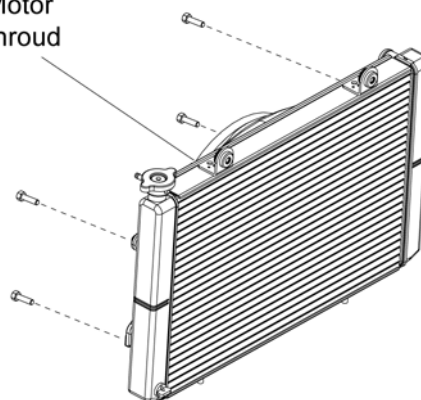
15. Slowly open the radiator pressure cap to relieve system pressure.

16. Remove the lower coolant hose and drain the coolant from the radiator and hose. Allow the coolant to completely drain. Properly dispose of the used coolant.



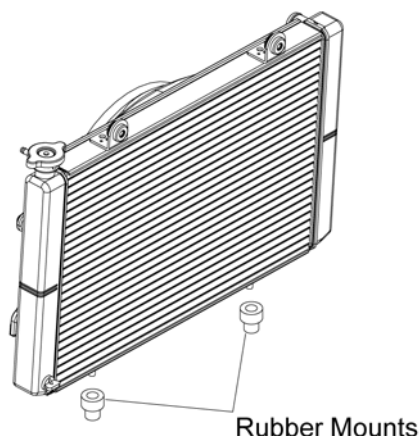
17. Remove the upper coolant hose.
18. Remove the recovery bottle return line from the radiator.
19. Disconnect the fan motor electrical connector.
20. Carefully lift the radiator/fan motor from the vehicle as an assembly. Take care not to damage the cooling fins.
21. Remove the (4) bolts that retain the fan motor assembly and service radiator or fan as needed.

Fan Motor and Shroud



22. Reverse this procedure for installation.

23. Upon installation, be sure the lower radiator mounts are placed properly in the frame support.



24. After the radiator is installed, be sure the mounts have remained in place.
25. After installation and reassembly, remove the pressure cap and fill the radiator and recovery bottle with coolant.
26. Refer to the "Cooling System Bleeding Procedure" in Chapter 3.

Cooling System Bleeding Procedure

WARNING

Always wear safety glasses and proper shop clothing when performing the procedures in this manual. Failing to do so may lead to possible injury or death.

CAUTION

Use caution when performing these procedures. Coolant may be hot and may cause severe injury or burns.

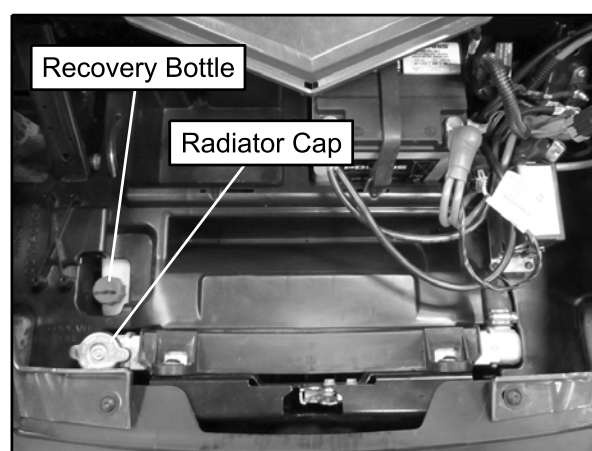
NOTE: Use this procedure when overheating occurs and no apparent leaks in the cooling system are found.

1. Place the vehicle in Neutral (N) and set the parking brake.

CAUTION

Be sure the engine has cooled and there is no pressure built up in the cooling system before removing the radiator cap. The coolant may be hot and could cause severe injury or burns.

2. Remove radiator cap and top off coolant.
3. Remove recovery bottle cap and fill to the "MAX" line.

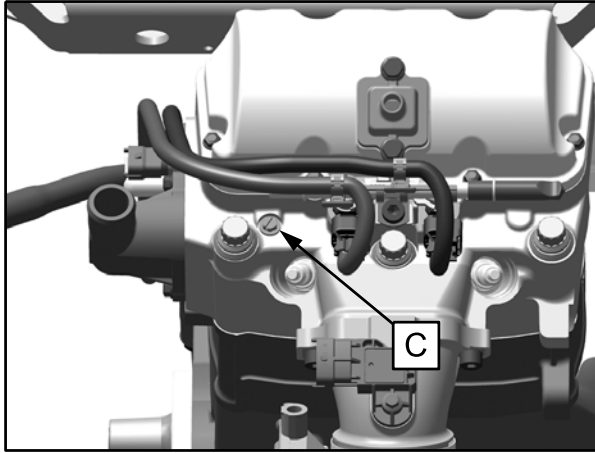


4. Start the engine and allow it to idle for 5-10 minutes or until the thermostat opens and allows coolant to flow through the system.
5. Squeeze coolant hoses by hand to help purge system of air.

NOTE: If the coolant level is LOW in the radiator, or if there are leaks in the system, the coolant system will not draw coolant from the recovery bottle.

ENGINE

6. Slightly loosen the bleed screw (C) on the cylinder head to let air escape. If no air is present, a steady stream of coolant will stream out. If air is present, the screw will bubble and sputter as the air escapes.



7. Tighten the bleed screw to specification and properly install the radiator pressure cap.



Coolant Bleed Screw:
70 ± 10 in-lbs (8 ± 1.13 Nm)

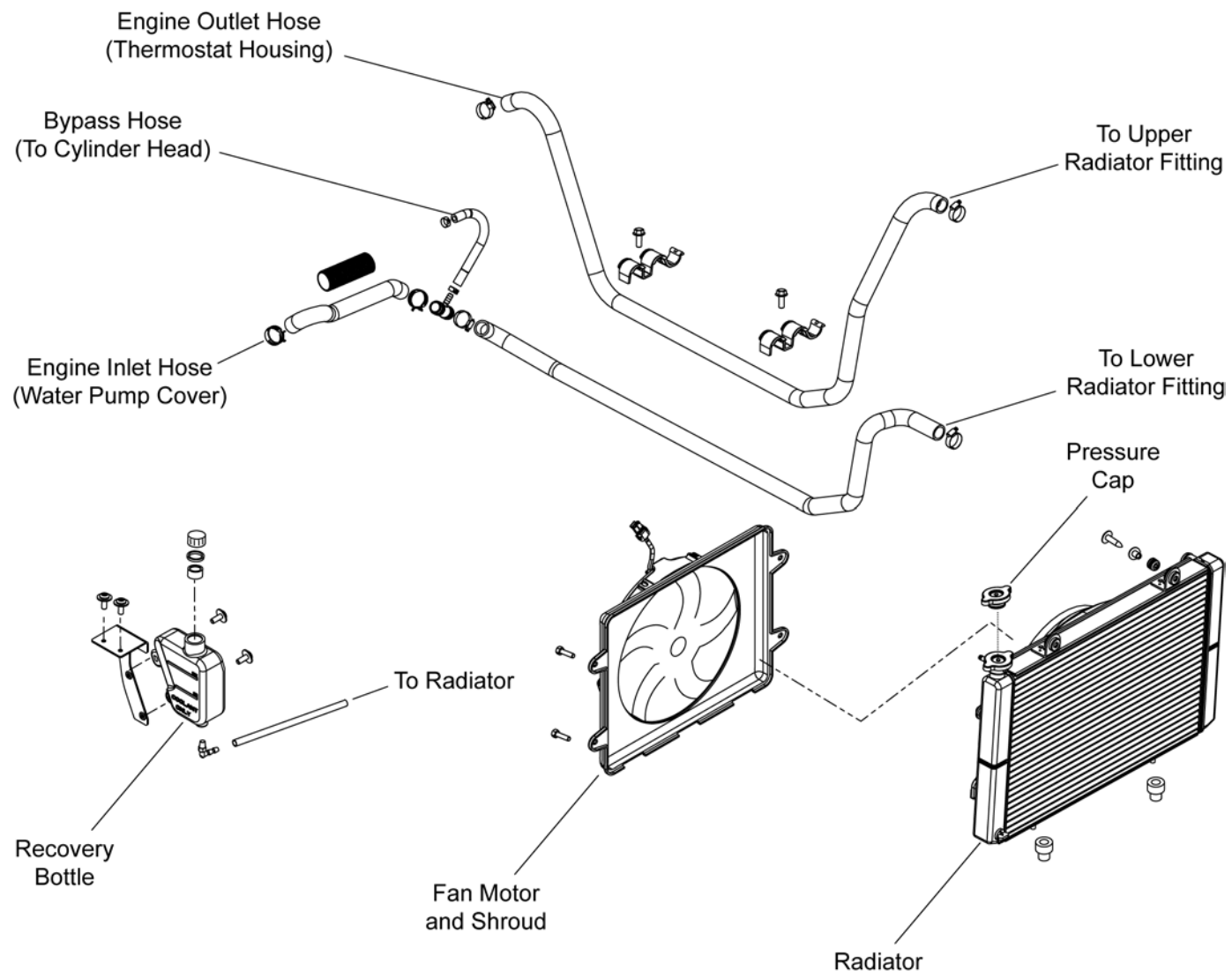
8. Add Polaris Premium Antifreeze to the radiator if the level goes down.



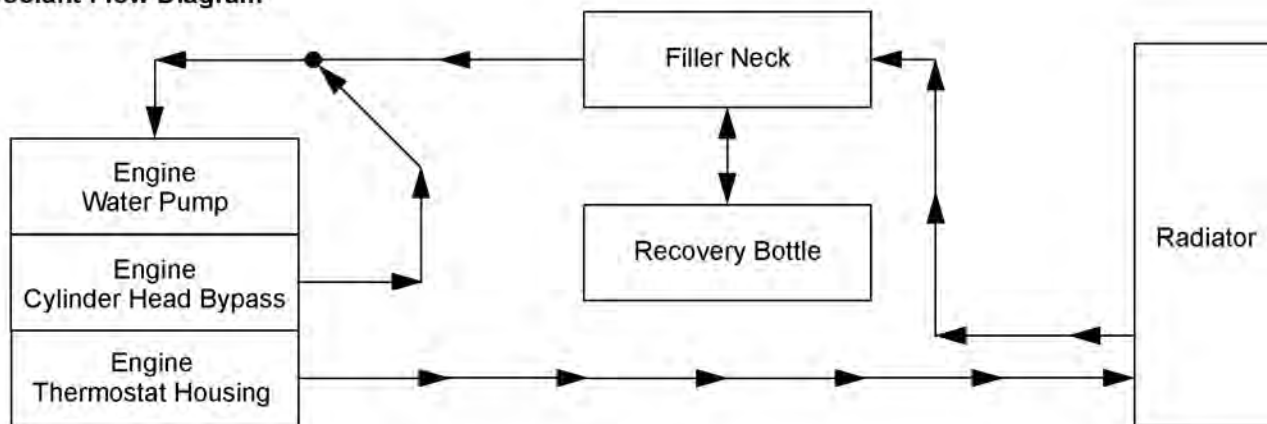
Be sure to install the pressure cap before shutting off the engine.
Coolant may spit out of the radiator.

9. Stop the engine and allow it to cool. Top off the radiator with coolant. If you hear or see a “glug” at the filler neck or the coolant level drops indicating that coolant has been pulled into the system, fill the radiator first before filling the recovery bottle.
10. Any air remaining in the system should continue to bleed out through the recovery bottle.
11. Repeat this procedure if you are still having difficulty bleeding the system.

Cooling System Exploded View



Coolant Flow Diagram

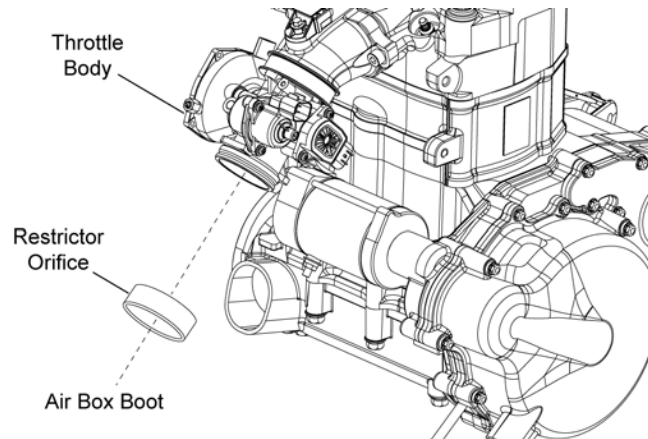


ENGINE

GENERAL ENGINE SERVICE

Engine Intake Restrictor Orifice

Some *RANGER* 800 models are equipped with an intake restrictor orifice in order to meet vehicle class regulations. This restrictor **MUST NOT** be removed for any reason.



IMPORTANT: Removal of the intake restrictor orifice will void the warranty of any *RANGER CREW* or 6x6 model.

Accessible Components

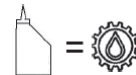
The following components can be serviced or removed with the engine installed:

- Flywheel
- Alternator (Stator)
- Starter Motor / Drive
- Cylinder Head
- Cylinder
- Piston / Rings
- Camshaft
- Rocker Arms
- Oil pump / Water Pump / Oil Pump Drive Gear
- Gear Train Components

The following components require engine removal for service:

- Counterbalance Shaft or Bearings
- Connecting Rod
- Crankshaft
- Crankshaft Main Bearings
- Crankcase

Engine Lubrication Specifications



Oil Capacity: Approximately 2 U.S. Quarts (1.9 l)

Oil Type: Polaris PS-4 (PN 2876244)
or PS-4 Extreme Duty (PN 2878920)

Oil Filter: PN 2540086

Filter Wrench: PU-50105 - 2.5" (64 mm)

- Oil Pressure Specification -
27-55 PSI @ 6000 RPM, PS-4 Synthetic
Engine at operating temperature

Oil Pressure Test

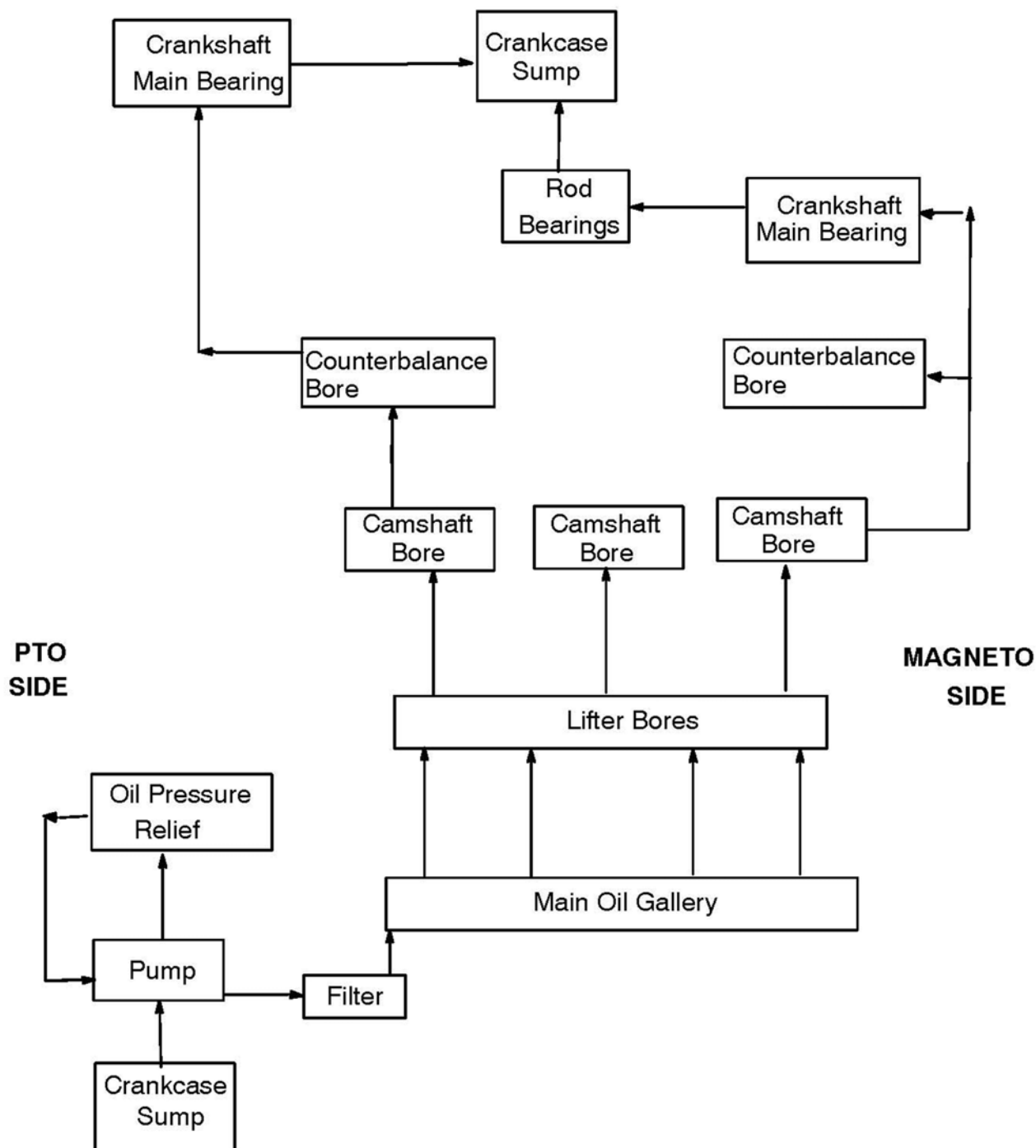
1. Remove blind plug/sender from left side of crankcase.
2. Insert a 1/4 NPTF oil pressure gauge adaptor into the crankcase and attach the gauge.
3. Start engine and allow it to reach operating temperature, while monitoring the gauge.

NOTE: Use only Polaris PS-4 or Extreme Duty Synthetic 4-Cycle Engine Oil.

Oil Pressure at 6000 RPM (Engine Hot):
Minimum: 27 PSI
Standard: 31 PSI
Maximum: 55 PSI

Oil Flow Chart

This chart describes the flow of oil through the 800 engine. Beginning in the crankcase sump, the oil is drawn through an oil galley to the feed side of the oil pump. The oil is then pumped through the oil filter. If the oil filter is obstructed, a bypass valve contained in the filter allows oil to bypass the filter element. At this point, the oil is supplied to the main oil galley through a crankcase passage. Oil is then diverted three ways from the main oil galley, with the first path entering the camshaft bores, onto the rear balance shaft journal and then draining back into the crankcase sump. The second oil path from the main oil galley feeds the lifter bores and then drains back into the crankcase sump. The third oil path flows through a crankcase galley to the MAG side crankshaft journal and also to the front balance shaft journal and onto the crankcase sump.



ENGINE

Engine Removal

IMPORTANT: Some engine repair procedures can be performed without removing the engine. Refer to “Accessible Components” for further information.

NOTE: Upon engine removal, use a mechanical lift or have an assistant help remove the engine from the vehicle to prevent personal injury or damage to vehicle components.



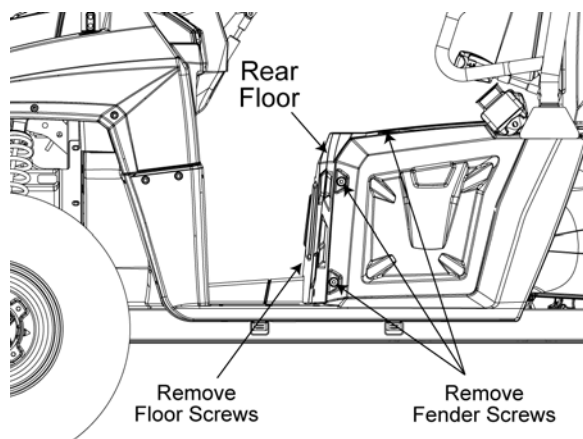
WARNING

Always wear safety glasses and proper shop clothing when performing the procedures in this manual. Failing to do so may lead to possible injury or death.

1. Clean your work area.
2. Thoroughly clean the engine and chassis.
3. Open the hood and disconnect battery negative (-) cable.
4. Drain the engine oil and engine coolant (see Chapter 2).

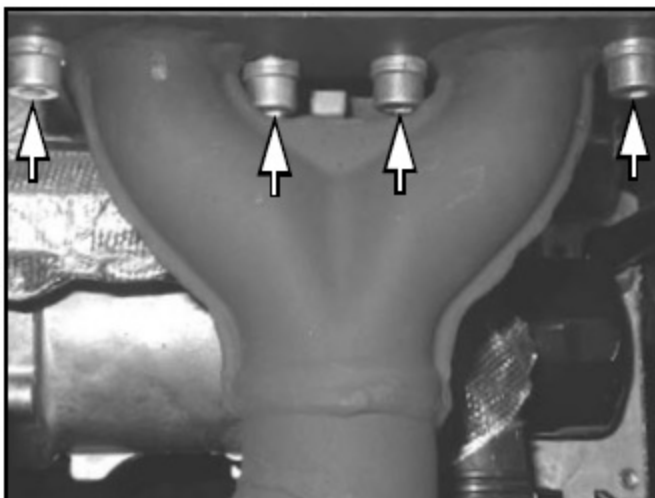
NOTE: Drain and dispose of the fluids properly.

5. Remove the lower seat base and storage container.
6. Remove the rear floor to better access the engine. The floor can be removed by removing (3) fender screws (3) rear floor screws as shown below.

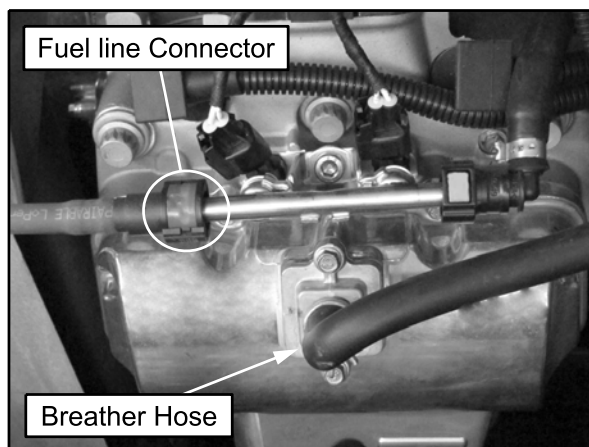


7. Disconnect the ECU harness to allow the floor to be removed from the vehicle.
8. Remove the springs from exhaust pipe.

9. Remove the (4) exhaust pipe bolts and remove the pipe.

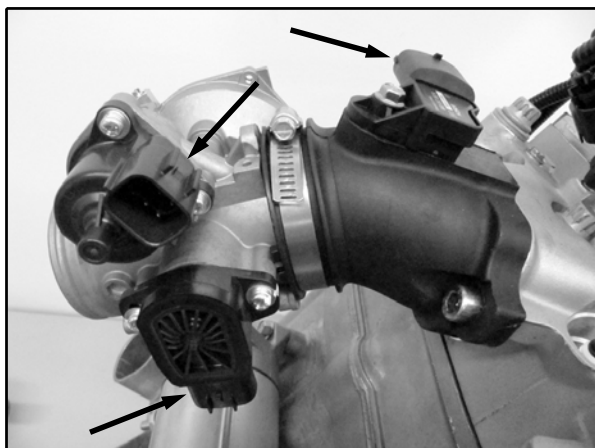


10. Place a small catch-container under the fuel rail and carefully disconnect the fuel line from the rail.

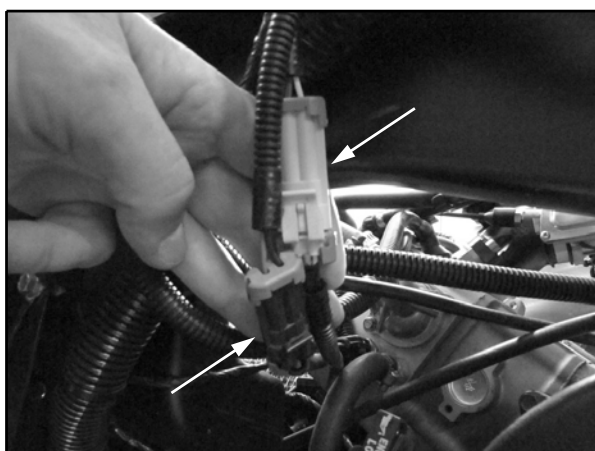


11. Remove the breather hose from the valve cover.

12. Disconnect the T-MAP, IAC and TPS sensor connectors from throttle body.

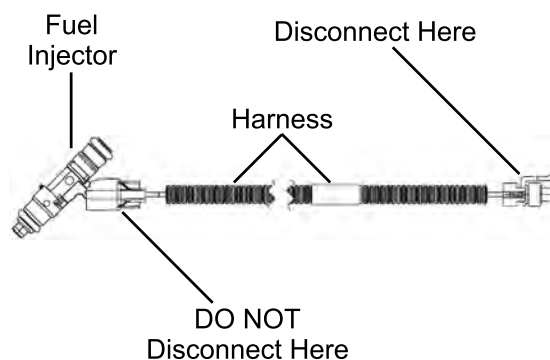


13. Loosen the clamps that secure the throttle body to the air intake track. Remove the throttle body and support it out of the way. Do not allow the throttle body to hang from the throttle cable.
14. Insert a shop towel into the engine intake to prevent dirt from entering the intake port.
15. Disconnect the fuel injectors at the wire harness connectors as shown below.



16. Mark the fuel injector harnesses to identify MAG and PTO harness connections to aid during reassembly. Disconnect the fuel injector harnesses.

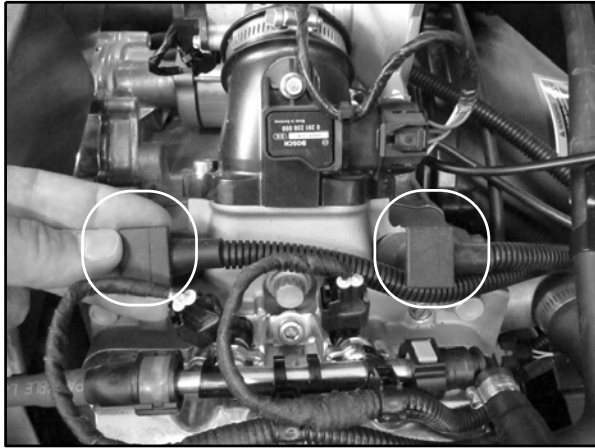
NOTE: The fuel injector harness connector and locking spring is bonded to the fuel injectors with an epoxy mix. **DO NOT** attempt to disconnect the connector from the fuel injectors. Damage will occur to the injector and/or harness if attempting to separate at that location. Separate the fuel injector from the vehicle by disconnecting at the end of the harness as shown.



IMPORTANT: Take note of PTO and MAG fuel injector harness connectors before disconnecting them. The harnesses are different and *can not* be connected incorrectly (PTO - Gray; MAG - Black).

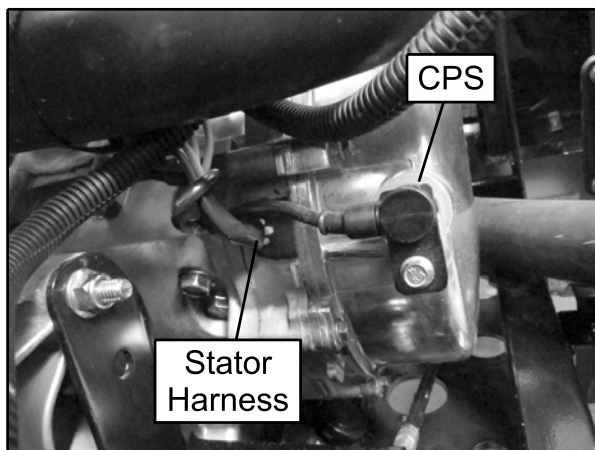
ENGINE

17. Remove the spark plug high tension leads.

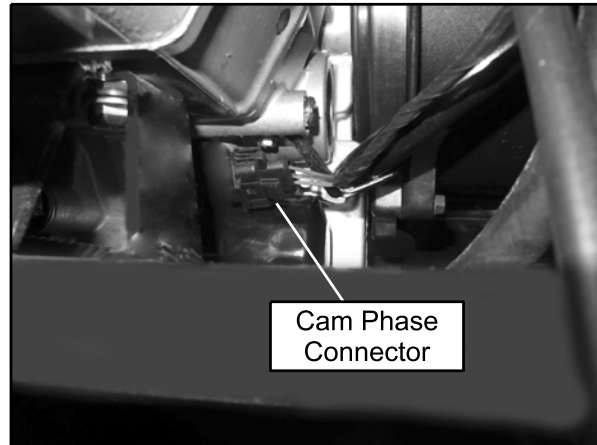


IMPORTANT: Mark or note which ignition coil wire goes to which cylinder and ignition coil post. The engine will misfire if the spark plug wires are installed incorrectly. The spark plug wires are marked with PTO and MAG from the factory and should be installed to the corresponding cylinder and ignition coil post.

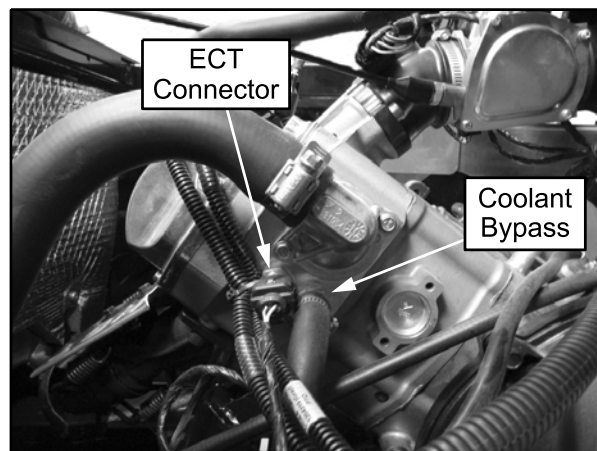
18. Disconnect the stator harness and crankshaft position sensor (CPS) harness or remove the (CPS) from the magneto cover.



19. Disconnect cam phase sensor (near oil filter).

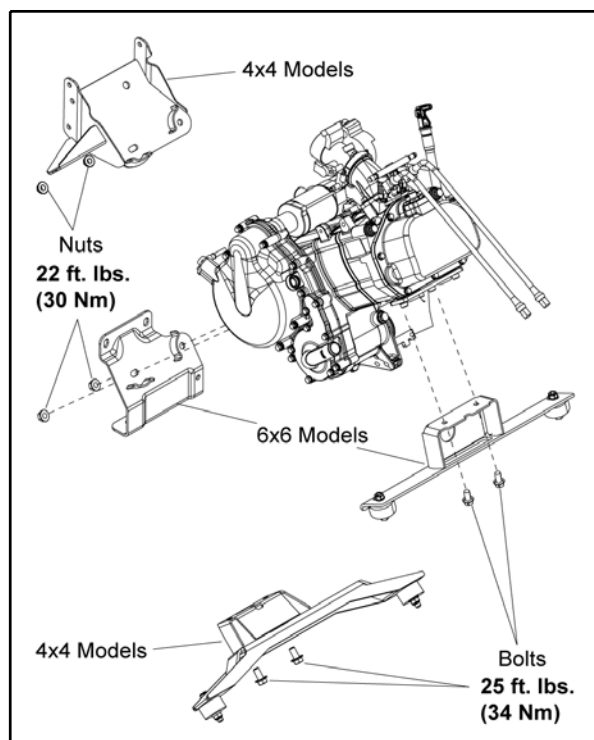


20. Remove the outer clutch cover with PVT outlet duct, drive belt, drive clutch, driven clutch and inner clutch cover (see Chapter 6 "Clutching").
21. Remove the rear PVT inlet hose from the engine crankcase.
22. Disconnect the engine coolant temperature (ECT) sensor harness and the bypass coolant hose from the left side of the cylinder head.



23. Remove the coolant hoses from the engine. Properly dispose of any coolant drained from the engine or hoses.
24. Remove the battery cables from the starter motor. When removing starter cables, note and mark ground cable and positive (+) cable mounting angle and locations.

25. Remove engine mount fasteners as shown below.



26. Carefully remove the engine through the top of the seat base frame. Lift the engine forward to free it from the rear mount and then lift the engine out from the vehicle.

NOTE: Rotating the engine to the left 90 degrees (valve cover facing left) may ease engine removal.

NOTE: Use caution when lifting the engine out of frame. Use an engine lift or other means, if the engine appears too heavy to be lifted manually.

Engine Installation Notes

After the engine is installed in the frame, review this checklist and perform all steps that apply:

General Items

1. Install previously removed components using new gaskets, seals, and fasteners where applicable.

NOTE: Properly route all electrical harnesses and re-attach any fasteners or protective tubing. Check for any possible rubbing points of electrical wires.

2. Perform regular checks on fluid levels, controls, and all other areas of the vehicle as outlined in the daily pre-ride inspection checklist (refer to Chapter 2 "Maintenance").

PVT System

1. Adjust clutch center distance, clutch offset and/or clutch alignment (see Chapter 6 "Clutching").
2. Clean clutch sheaves thoroughly and inspect inlet and outlet ducts for proper routing and sealing (see Chapter 6).

Transmission

1. Inspect transmission operation.
2. Adjust the shift cable if necessary. Refer to Chapter 2 and Chapter 8.

Exhaust

1. Replace exhaust gaskets. Seal connections with high temp silicone sealant.
2. Check to be sure all springs are in good condition.

Bleed Cooling System

NOTE: Follow coolant bleeding procedure outlined earlier in this chapter.

Engine Break-In Period

The break-in period for a Polaris *RANGER* engine is defined as the first 25 hours of operation, or the time it takes to use 2 full tanks of gasoline. No single action on your part is as important as a proper break-in period. Careful treatment of a new engine will result in more efficient performance and longer life for the engine. Perform the following procedures carefully:

CAUTION

Use only Polaris PS-4 or Extreme Duty Synthetic 4-Cycle engine oil or an equivalent. Never substitute or mix oil brands.

Serious engine damage and voiding of warranty can result.

Do not operate at full throttle or high speeds for extended periods during the first three hours of use. Excessive heat can build up and cause damage to close fitted engine parts.

1. Fill fuel tank with unleaded or leaded fuel which has a minimum pump octane number of 87 = (R+ M)/2.
2. Check oil level indicated on dipstick. Add oil if necessary (Refer to Chapter 2, "Engine Oil Level").
3. Drive slowly at first to gradually bring engine up to operating temperature.

ENGINE

4. Vary throttle positions. Do not operate at sustained idle or sustained high speed.
5. Perform regular checks on fluid levels, controls and all important bolt torques.
6. Pull only light loads during initial break-in.
7. Change oil and oil filter after break-in period at 25 hours.

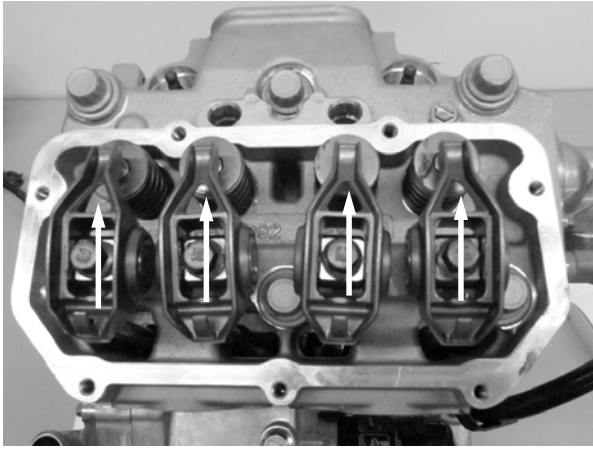
Cylinder Head Assembly Exploded View



ENGINE

Rocker Arms

1. Remove the valve cover.
2. Mark or tag rocker arms in order of disassembly to keep them in order for reassembly.



3. Inspect the wear pad at the valve end of the rocker arm for indications of scuffing or abnormal wear. If the pad is grooved, replace the rocker arm.

NOTE: Do not attempt to true this surface by grinding.

4. Check the rocker arm pad and fulcrum seat for excessive wear, cracks, nicks or burrs.

Push Rods

1. Clean push rods (A) in a suitable solvent. Blow dry push rods with compressed air.
2. Use compressed air to confirm the oil passage is clear in the center of the push rod.

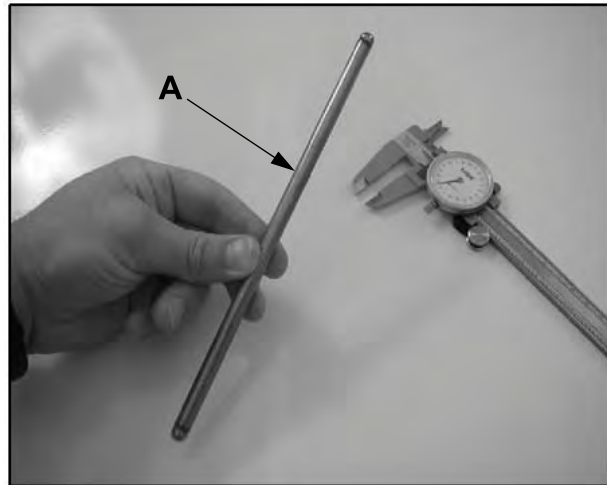


WARNING

Always wear safety glasses when working with compressed air to prevent personal injury.

3. Check the ends of the push rods (A) for nicks, grooves, roughness or excessive wear.
4. The push rods (A) can be visually checked for straightness while they are installed in the engine by rotating them with the valve closed. Push rods can also be checked with a dial indicator or rolled across a flat surface to check for straightness.

5. If the push rod (A) is visibly bent, it should be replaced.

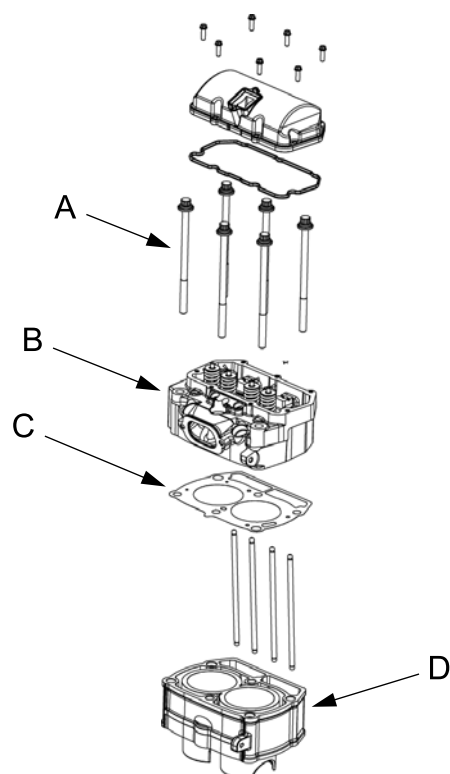


Cylinder Head Removal

NOTE: The cargo box assembly and the upper frame bolt-in brace must be removed to allow enough clearance to remove all the cylinder head bolts. Refer to Chapter 5 for removal procedures.

1. Loosen the six cylinder head bolts (A) evenly 1/8 turn each in a criss-cross pattern until loose.
2. Remove bolts (A) and tap cylinder head (B) lightly with a soft face hammer until loose. **CAUTION:** Tap only in reinforced areas or on thick parts of cylinder head casting to avoid damaging the head or cylinder.

3. Remove cylinder head (B) and head gasket (C) from the cylinder (D).



Cylinder Head Inspection

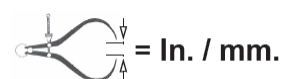
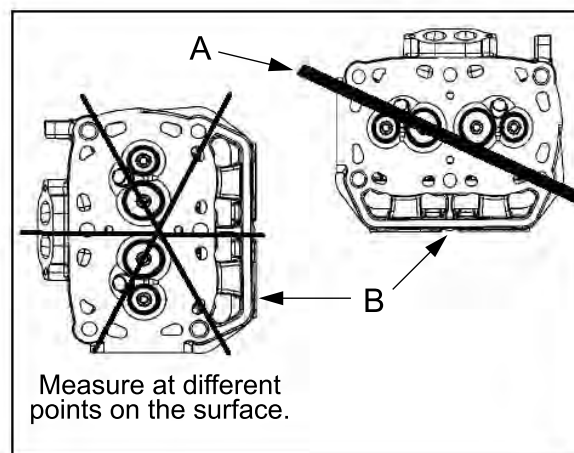
Thoroughly clean cylinder head surface to remove all traces of gasket material and carbon.

CAUTION

Use care not to damage sealing surface.

Cylinder Head Warp

1. Lay a straight edge (A) across the surface of the cylinder head (B) at several different points and measure warp by inserting a feeler gauge between the straight edge and the cylinder head surface. If warp exceeds the service limit, replace the cylinder head.



Cylinder Head Warp Limit:
.004" (.1016 mm) max

Valve Seal / Spring Service (On Engine)

NOTE: The following procedure is only for servicing the top end of the valve train when replacing valve springs or replacing valve seals.

In some cases the valve train can be serviced while the cylinder head is still on the engine. Keep all parts in order with respect to their location in the cylinder head.

WARNING

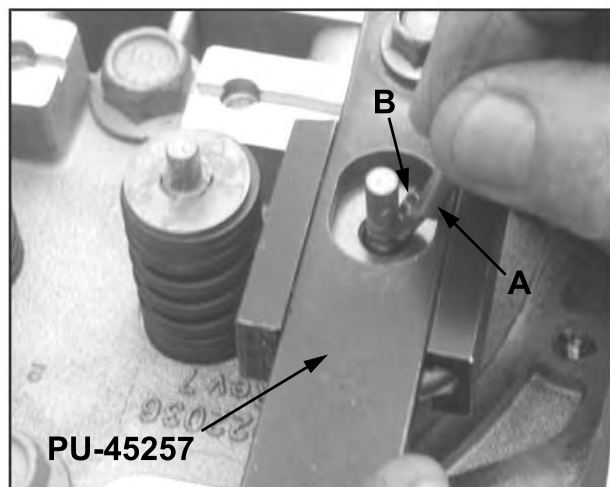
Wear eye protection or a face shield during cylinder head disassembly and reassembly.

1. Having already removed the valve cover, rocker arms and pushrods, align the cylinder to be worked on at top dead center (TDC). Install the Valve Pressure Hose (PU-45652) into the spark plug hole. Hook the hose to an air compressor and supply 50 to 100 psi to the hose. This will seat the valves during valve spring removal. Do not remove air supply until reassembly is completed.

ENGINE

- Using the Valve Spring Compressor (PU-45257), compress the valve spring and remove the valve keepers.

NOTE: A small parts magnet (A) can aid in the removal of the retainers (B).

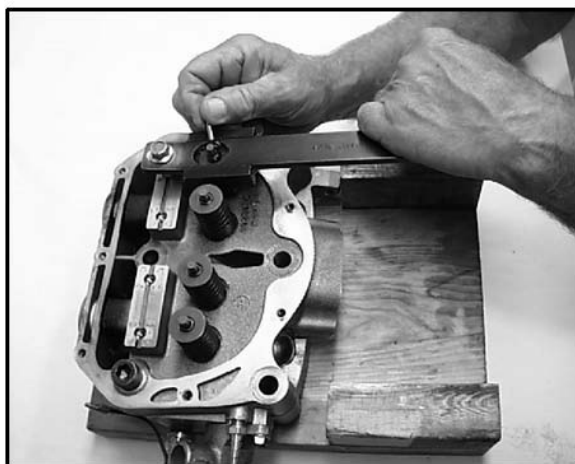


NOTE: To prevent damage to the valve seals, do not compress the valve spring more than is needed to remove the valve keepers.

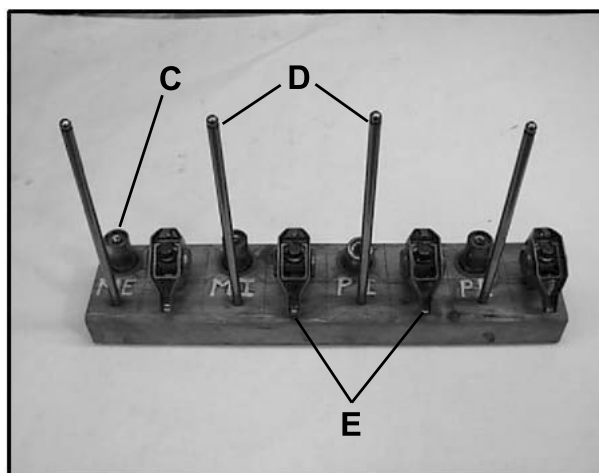
- Remove spring retainer and spring.
- The valve seals are now serviceable.

Cylinder Head Disassembly

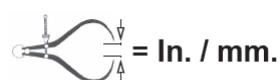
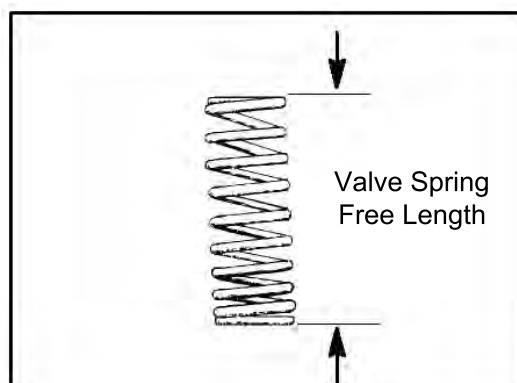
- Carefully remove the cylinder components.



- Place the hydraulic lifters (C), pushrods (D), and rocker arms (E) in a safe, clean area.



- Measure free length of spring with a Vernier caliper. Compare to specifications. Replace spring if measurement is out of specification.

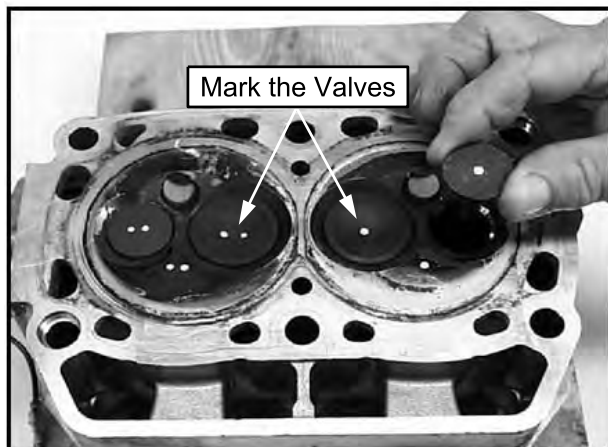


Valve Spring Free Length:
Std: 1.735" (44.069 mm)

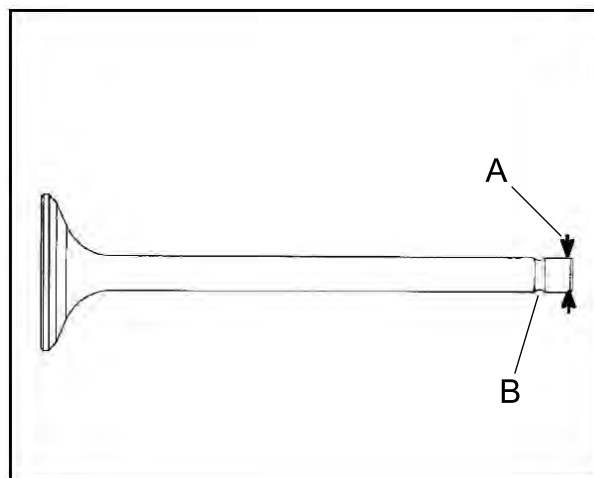
- Remove valve guide seals.

IMPORTANT: It is recommended to replace seals whenever the cylinder head is disassembled. Hardened, cracked or worn valve seals will cause excessive oil consumption and carbon buildup.

5. Mark the valves with a white pen. Remove the valves from the cylinder head. This will ensure that the valves are properly placed during engine reassembly.



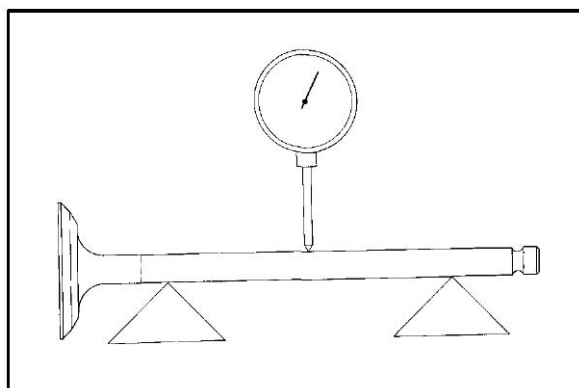
3. Check end of valve stem (A) for flaring, pitting, wear or damage. Inspect split keeper groove (B) for wear or flaring of the keeper seat area.



3

Valve Inspection

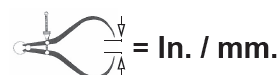
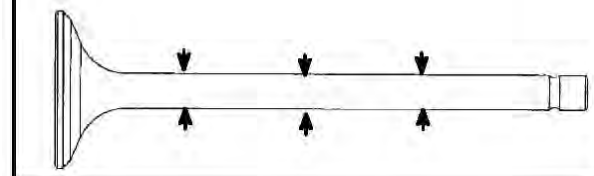
1. Remove all carbon from valves with a soft wire wheel or brush.
2. Check valve face for runout, pitting, and burnt spots. To check for bent valve stems, mount valve in a drill or use "V" blocks and a dial indicator.



NOTE: The valves can be re-faced or end ground, if necessary. They must be replaced if extensively worn, burnt, bent, or damaged.

4. Measure diameter of valve stem with a micrometer in three places, then rotate 90 degrees and measure again (six measurements total). Compare to specifications.

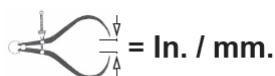
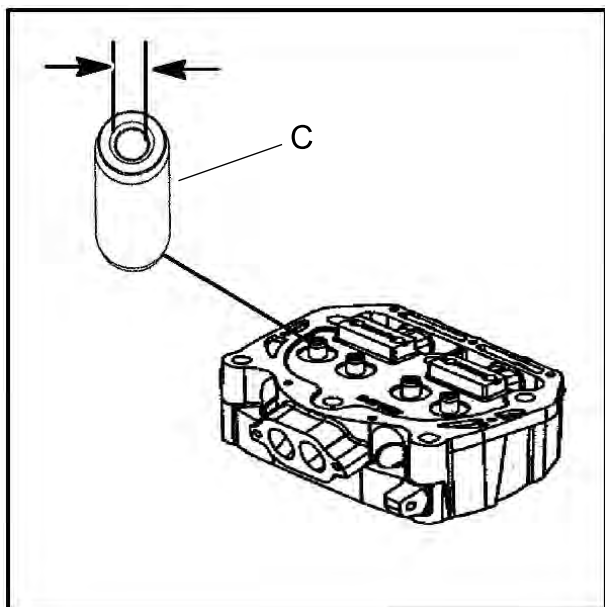
Measure valve stem in several places. Rotate the valve 90 degrees and measure for wear.



Valve Stem Diameter:
Intake: 0.2356" $\pm$ 0.00039"
(5.985 $\pm$ 0.01 mm)
Exhaust: 0.2351" $\pm$ 0.00039"
(5.972 $\pm$ 0.01 mm)

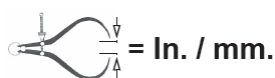
ENGINE

5. Measure valve guide (C) inside diameter at the top middle and end of the guide using a small hole gauge and a micrometer. Measure in two directions.



Valve Guide I.D.:
0.23672" $\pm$ 0.000295"
(6.0617 $\pm$ 0.0075 mm)

6. Subtract valve stem measurement from the valve guide measurement to obtain stem to guide clearance.



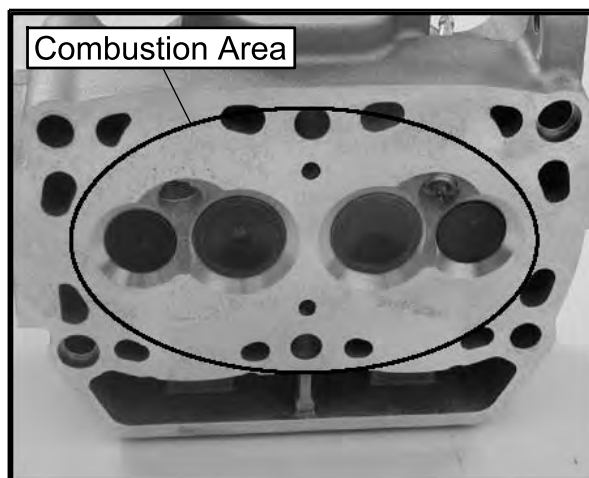
Valve Stem Oil Clearance:
Intake: 0.00228" $\pm$ 0.00098"
(0.058 $\pm$ 0.025 mm)
Exhaust: 0.00275" $\pm$ 0.00098"
(0.087 $\pm$ 0.025 mm)

NOTE: The valve guides cannot be replaced. Be sure to measure each guide and valve combination individually.

Combustion Chamber

1. Clean all accumulated carbon deposits from combustion chamber and valve seat area with carbon cleaner and a soft plastic scraper.

IMPORTANT: Do not use a wire brush, metal scraper, or abrasive cleaners to clean the bottom of the cylinder head. Extensive damage to the cylinder head may result. Wear safety glasses during cleaning.



Valve Seat Reconditioning

NOTE: Polaris recommends that the work be done by a local machine shop that specializes in this area.

NOTE: The cylinder head valve guides cannot be replaced.



WARNING

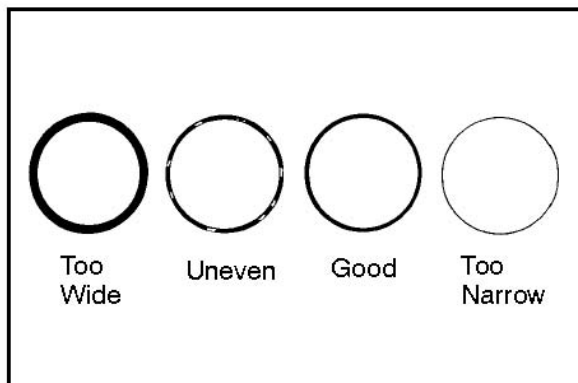
Wear eye protection or a face shield during cylinder head disassembly and reassembly.

Valve Seat Inspection

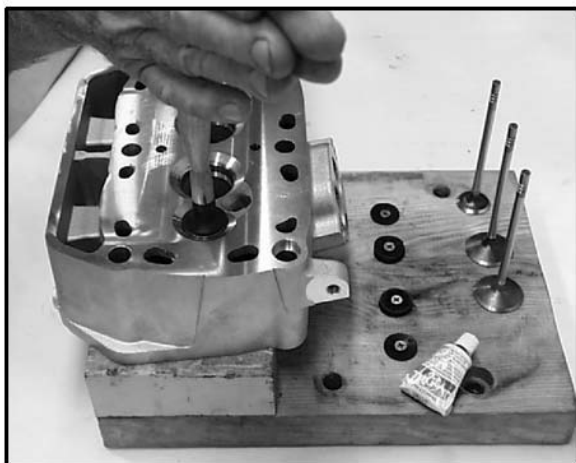
Inspect valve seat in cylinder head for pitting, burnt spots, roughness, and uneven surface. If any of the above conditions exist, the valve seat must be reconditioned. *If the valve seat is cracked, the cylinder head must be replaced.*

Follow the manufacturers instructions provided with the valve seat cutters in the commercially available cylinder head reconditioning kit. Abrasive stone seat reconditioning equipment can also be used. Keep all valves in order with their respective seat.

NOTE: Valve seat width and point of contact on the valve face is very important for proper sealing. The valve must contact the valve seat over the entire circumference of the seat, and the seat must be the proper width all the way around. If the seat is uneven, compression leakage will result. If the seat is too wide, seat pressure is reduced, causing carbon accumulation and possible compression loss. If the seat is too narrow, heat transfer from valve to seat is reduced. The valve may overheat and warp, resulting in burnt valves.



1. Install pilot into valve guide.
2. Apply cutting oil to valve seat and cutter.
3. Place 46° cutter on the pilot and make a light cut.



4. Inspect the cut area of the seat:

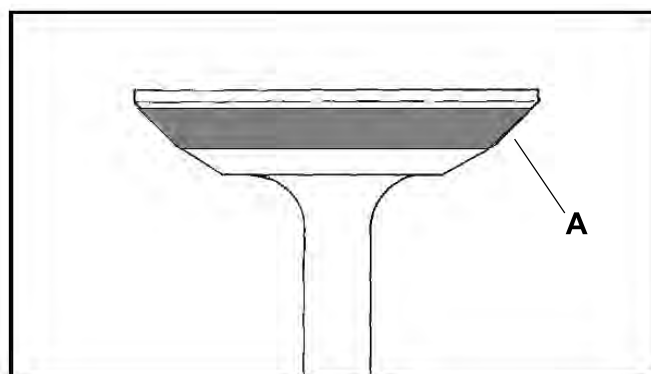
* If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.

* If the cutter now contacts the uncut portion of the seat, check the pilot. Look for burrs, nicks, or runout. If the pilot is bent it must be replaced.

* If the contact area of the cutter is in the same place, the valve guide is distorted from improper installation.

* If the contact area of the initial cut is greater than 75%, continue to cut the seat until all pits are removed and a new seat surface is evident. **NOTE: Remove only the amount of material necessary to repair the seat surface.**

5. To check the contact area of the seat on the valve face, apply a thin coating of Prussian Blue™ paste to the valve seat. If using an interference angle (46°) apply black permanent marker to the entire valve face (A).



6. Insert valve into guide and tap valve lightly into place a few times.

ENGINE

7. Remove valve and check where the Prussian Blue™ indicates seat contact on the valve face. The valve seat should contact the middle of the valve face or slightly above, and must be the proper width.

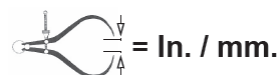
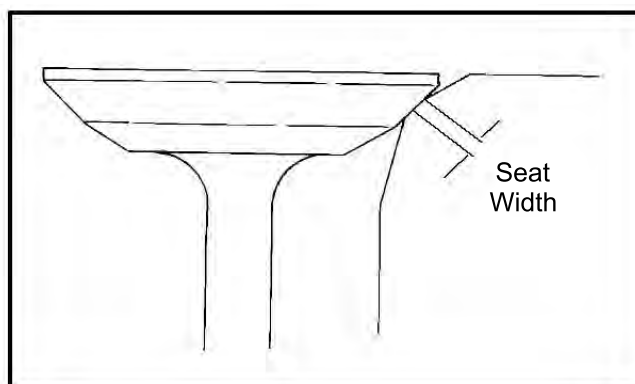
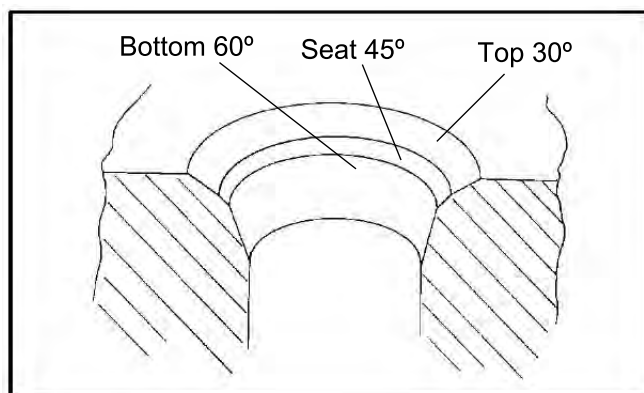
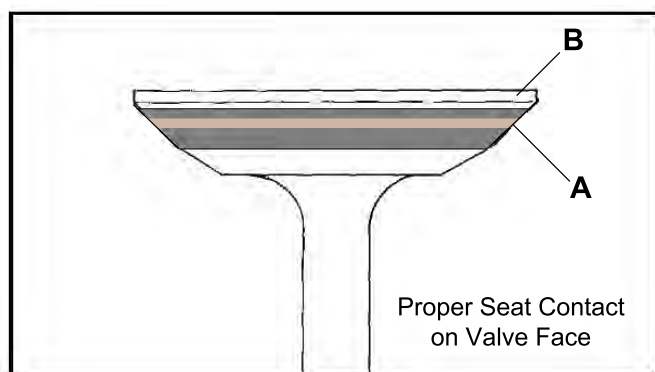
* If the indicated seat contact is at the top edge of the valve face and contacts the margin area (B) it is too high on the valve face. Use the 30° cutter to lower the valve seat.

* If too low, use the 60° cutter to raise the seat. When contact area is centered on the valve face, measure seat width.

* If the seat is too wide or uneven, use both top and bottom cutters to narrow the seat.

* If the seat is too narrow, widen using the 45° cutter and re-check contact point on the valve face and seat width after each cut.

NOTE: When using an interference angle, the seat contact point on the valve will be very narrow, and is a normal condition. Look for an even and continuous contact point all the way around the valve face (A).



Valve Seat Width:

Intake Std: 0.028" (0.7 mm)

Limit: 0.055" (1.4 mm)

Exhaust Std: 0.039" (1.0 mm)

Limit: 0.071" (1.8 mm)

8. Clean all filings from the area with hot soapy water. Rinse and dry with compressed air.
9. Lubricate the valve guides with clean engine oil, and apply oil or water based lapping compound to the face of the valve.

NOTE: Lapping is not required with an interference angle valve job.

10. Insert the valve into its respective guide and lap using a lapping tool or a section of fuel line connected to the valve stem.



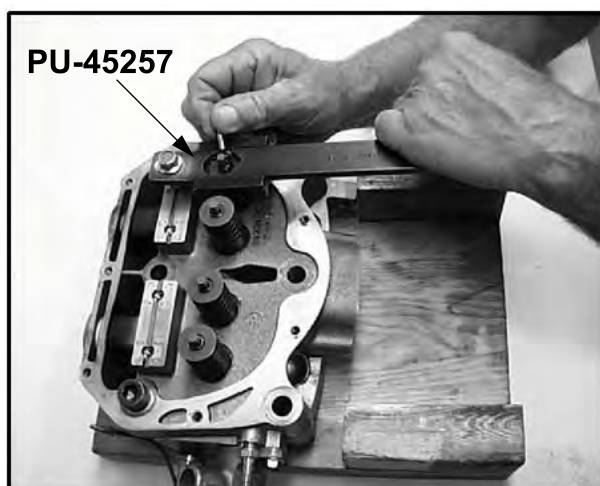
11. Rotate the valve rapidly back and forth until the cut sounds smooth. Lift the valve slightly off of the seat, rotate 1/4 turn, and repeat the lapping process. Do this four to five times until the valve is fully seated, and repeat process for the other valve(s).
12. Thoroughly clean cylinder head and valves.

Cylinder Head Reassembly

NOTE: Assemble the valves one at a time to maintain proper order.

1. Apply engine oil to valve guides and seats.
2. Coat valve stem with molybdenum disulfide grease or PS-4 Synthetic engine oil.
3. Install valve carefully with a rotating motion to avoid damaging valve seal.
4. Valve seals should be installed after the valves are in the head to avoid valve seal damage. Install new valve seals on valve guides.
5. Dip valve spring and retainer in clean engine oil and install.
6. Place retainer on spring and install Valve Spring Compressor (PU-45257). Install split keepers with the gap even on both sides.

NOTE: A small magnet can be used to aid in the installation of the keepers.

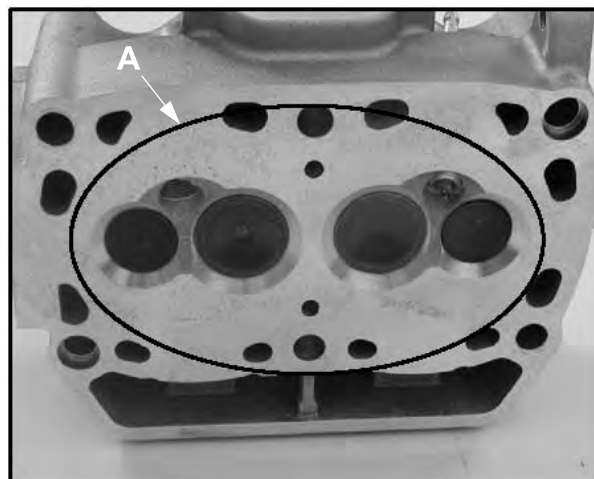


7. Repeat procedure for remaining valves. When all valves are installed, tap lightly with soft faced hammer on the end of the valves to seat the split keepers.

NOTE: To prevent damage to the valve seals, do not compress the valve spring more than necessary to install the keepers.

Valve Sealing Test

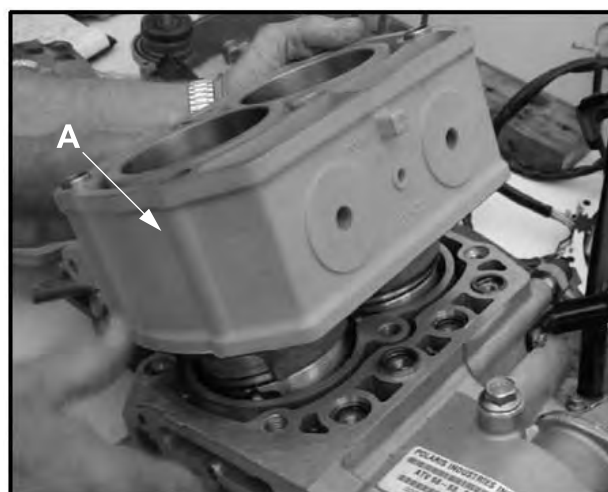
1. Clean and dry the combustion chamber area (A).



2. Pour a small amount of clean solvent onto the intake port and check for leakage around each intake valve. The valve seats should hold fluid with no seepage.
3. Repeat for exhaust valves by pouring fluid into exhaust port.

Cylinder Removal

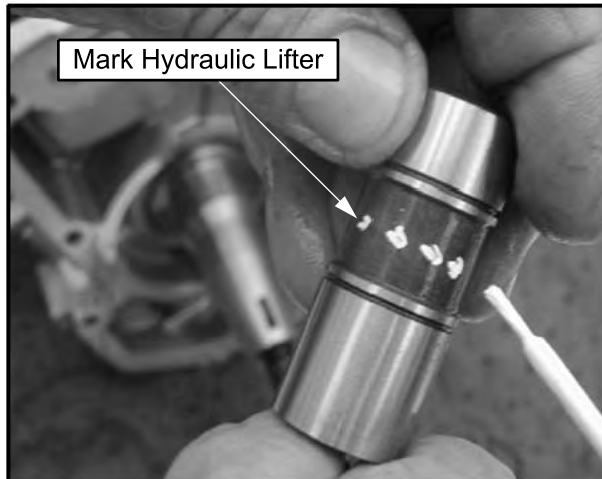
1. Follow engine disassembly procedures to remove rocker cover and cylinder head.
2. Tap cylinder (A) lightly with a rubber mallet in the reinforced areas only until loose.
3. Rock cylinder forward and backward while lifting it from the crankcase, supporting pistons and connecting rods. Support pistons with Piston Support Block (PN 2870390).



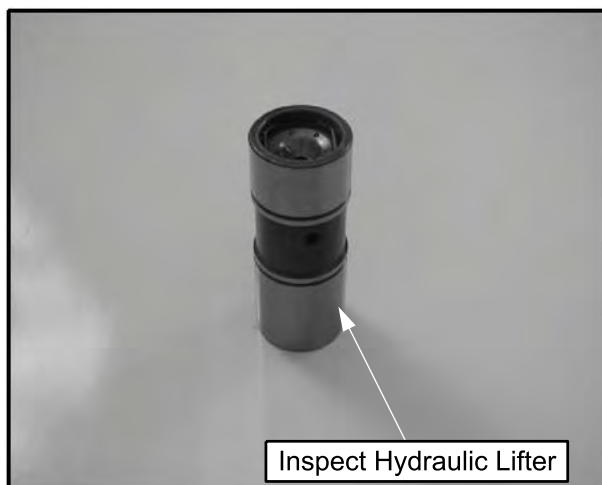
ENGINE

Valve Lifter Removal / Inspection

1. Remove the valve lifters by reaching into the crankcase and pushing the lifter up through the lifter bore by hand.
2. Thoroughly clean the lifters in cleaning solvent and wipe them with a clean, lint-free cloth.
3. Mark the lifters with a white pen if using the lifters for reassembly. This will ensure that the lifters are properly placed during engine reassembly.



4. Check the lifters for wear or scores.
5. Check the bottom end of lifter to make sure that it has a slight convex.
6. If the bottom surface has worn flat, it may be used with the original camshaft only.



NOTE: Lifters that are scored, worn, or if the bottom is not smooth should be replaced with new lifters and cam as an assembly. If replacing the lifters, the camshaft should also be replaced.

Piston Removal

1. Remove the circlip. Mark the piston with a white pen to ensure proper orientation (if reused) during assembly.



NOTE: If the pistons are to be reused, reassemble the pistons in the same cylinder and direction from which they were removed.

NOTE: New pistons are non-directional and can be placed in either cylinder.

2. Remove piston circlip and push piston pin out of piston. If necessary, heat the crown of the piston slightly with a propane torch. **CAUTION:** Do not apply heat to the piston rings. The ring may lose radial tension.
3. Remove top compression ring:

***Using a piston ring pliers:** Carefully expand ring and lift it off the piston. **CAUTION:** Do not expand the ring more than the amount necessary to remove it from the piston, or the ring may break.

***By hand:** Placing both thumbs as shown, spread the ring open and push up on the opposite side. Do not scratch the ring lands.

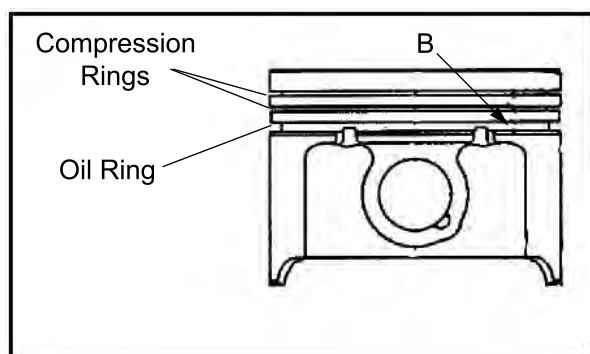


4. Repeat procedure for second ring.
5. Remove the oil control ring.

The oil control ring is a three piece design consisting of a top and bottom steel rail and a center expander section. The top rail has a locating tab on the end which fits into a notch (B) in the upper oil ring land of the piston.

To Remove:

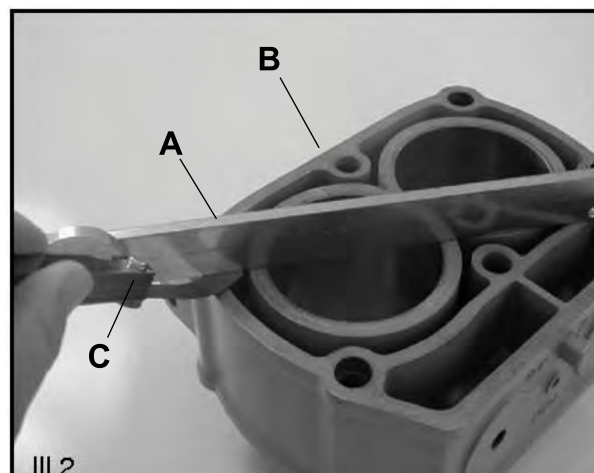
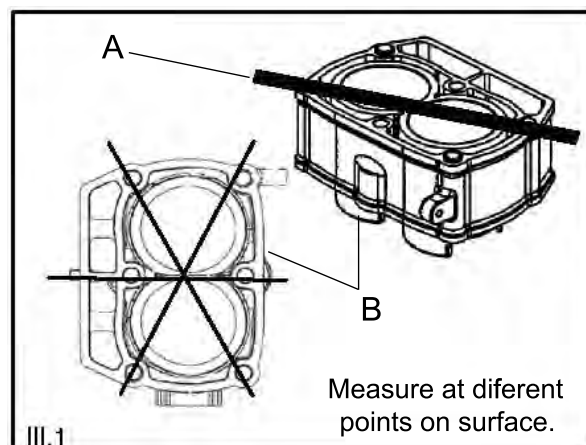
- A) Remove the top rail first followed by the bottom rail.
- B) Remove the expander.



Cylinder Inspection

1. Remove gasket material from cylinder sealing surfaces.

2. Inspect top of the cylinder (B) for warp using a straight edge (A) and feeler gauge (C). Refer to III. 1 and III. 2.

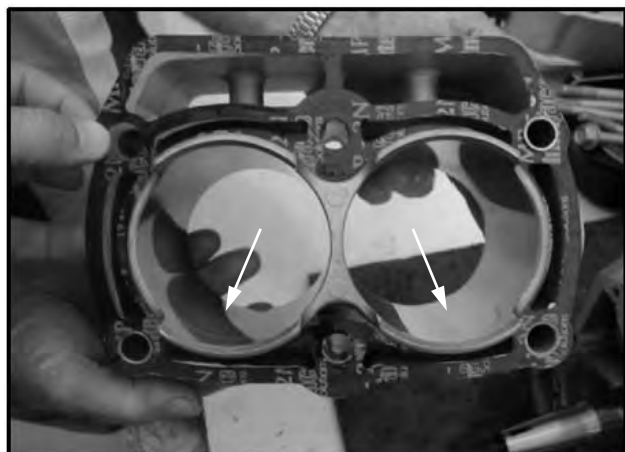


$$\text{In. / mm.}$$

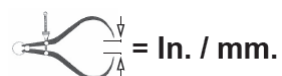
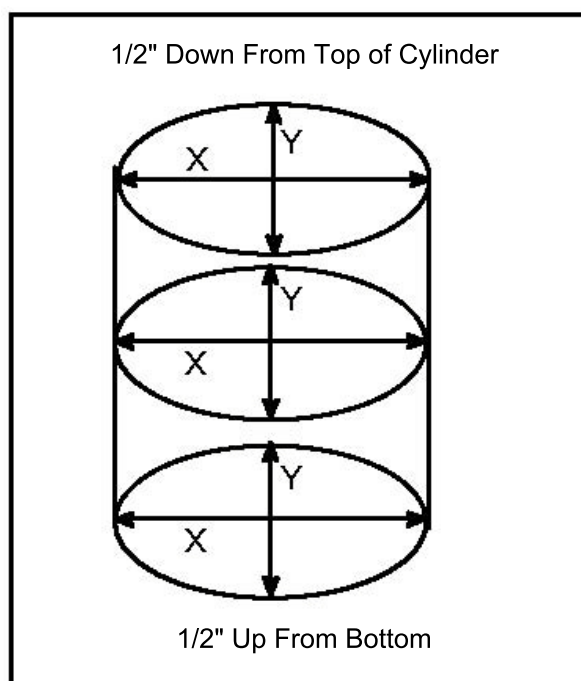
Cylinder Warp: 0.004" (0.1 mm) Max.

ENGINE

3. Inspect cylinder for wear, scratches, or damage.



4. Inspect cylinder for taper and out of round with a telescoping gauge or a dial bore gauge. Measure in two different directions, front to back and side to side, on three different levels (1/2" down from top, in the middle, and 1/2" up from bottom). Record measurements. If cylinder is tapered or out of round beyond 0.002" (0.05 mm), the cylinder must be replaced.



Cylinder Taper Limit:
0.002" (.05 mm) Max.

Cylinder Out of Round:
Limit: 0.002" (.05 mm) Max.

Standard Bore Size:
(Both Cylinders): 3.1496" (80 mm)

Cylinder Hone Selection and Honing Procedure

Cylinders may be wet or dry honed depending upon the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore.

CAUTION

A hone which will straighten as well as remove material from the cylinder is very important. Using a common spring loaded glaze breaker for honing is not advised for nicasil cylinders.

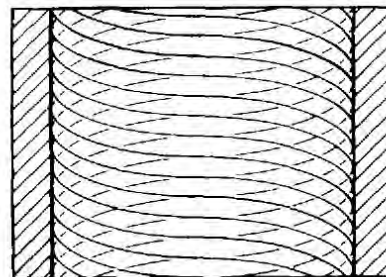
Polaris recommends using a rigid hone or arbor honing machine.

Honing To Deglaze

A finished cylinder should have a cross-hatch pattern to ensure piston ring seating and to aid in the retention of the fuel/oil mixture during initial break in. Hone cylinder according to hone manufacturer's instructions, or these guidelines:

- Honing should be done with a diamond hone. Cylinder could be damaged if the hone is not hard enough to scratch the nicasil lining.
- Use a motor speed of approximately 300-500 RPM, run the hone in and out of the cylinder rapidly until cutting tension decreases. Remember to keep the hone drive shaft centered (or cylinder centered on arbor) and to bring the stones approximately 1/2" (1.3 cm) above and below the bore at the end of each stroke.
- Release the hone at regular intervals and inspect the bore to determine if it has been sufficiently deglazed, and to check for correct cross-hatch.
NOTE: Do not allow cylinder to heat up during honing.
- After honing has been completed, inspect cylinder for thinning or peeling.

If cylinder wear or damage is excessive, it will be necessary to replace the cylinder. The cylinders are lined with a nicasil coating and are not repairable. Hone only enough to de-glaze the outer layer of the cylinder bore.



Example of Cross Hatch Pattern

IMPORTANT: Clean the cylinder after honing

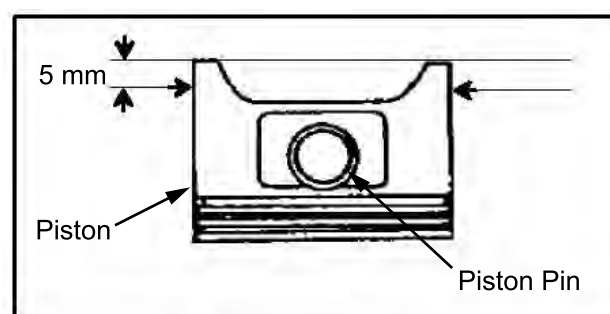
Cleaning the Cylinder After Honing

It is very important that the cylinder be thoroughly cleaned after honing to remove all grit material. Wash the cylinder in a solvent, then in hot, soapy water. Pay close attention to areas where the cylinder sleeve meets the aluminum casting (transfer port area). Use electrical contact cleaner if necessary to clean these areas. Rinse thoroughly, dry with compressed air, and oil the bore immediately with Polaris Lubricant.

Piston-to-Cylinder Clearance

Measure piston outside diameter at a point 5 mm up from the bottom of the piston at a right angle to the direction of the piston pin.

Subtract this measurement from the maximum cylinder bore measurement obtained during the "Cylinder Inspection" procedure.



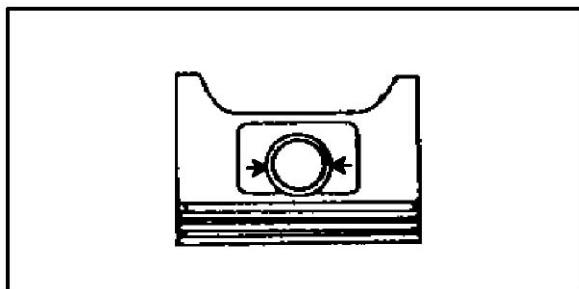
Piston to Cylinder Clearance:
See "800 EFI Engine Service Specifications", page 3.9

ENGINE

Piston O.D.:
See "800 EFI Engine Service Specifications", page 3.9

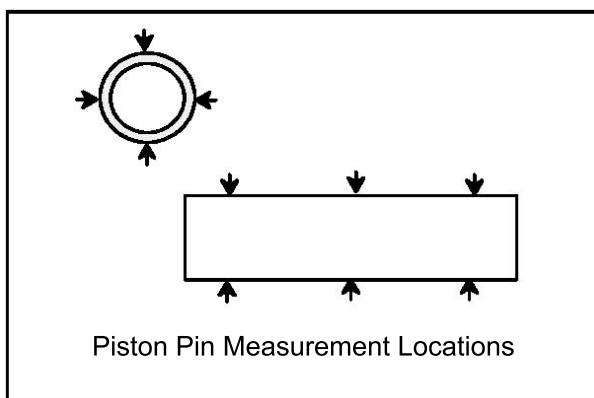
Piston / Rod Inspection

1. Measure piston pin bore.



Piston Pin Bore:
See "800 EFI Engine Service Specifications", page 3.9

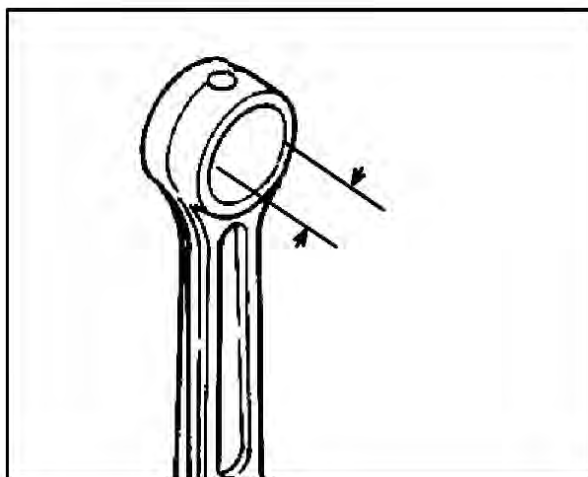
2. Measure piston pin O. D. Replace piston and/or piston pin if out of specification.



Piston Pin Measurement Locations

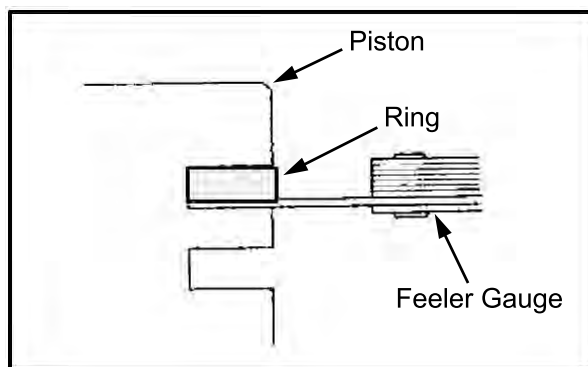
Piston Pin O.D.:
See "800 EFI Engine Service Specifications", page 3.9

3. Measure connecting rod small end I.D.



Connecting Rod Small End I.D.:
See "800 EFI Engine Service Specifications", page 3.9

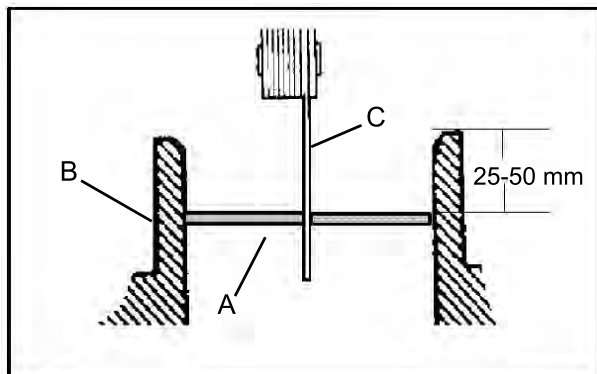
4. Measure piston ring to groove clearance by placing the ring in the ring land and measuring with a thickness gauge. Replace piston and rings if ring-to-groove clearance exceeds service limits.



See "800 EFI Engine Service Specifications", page 3.9

Piston Ring Installed Gap

1. Place each piston ring (A) inside cylinder (B) using a piston to push ring squarely into place as shown.



Piston Ring Installed Gap:
See "800 EFI Engine Service Specifications", page 3.9

NOTE: Ring should be installed with the mark facing upward.

2. Measure installed gap with a feeler gauge (C) at both the top and bottom of the cylinder.

IMPORTANT: A difference in end gap indicates cylinder taper. The cylinder should be measured for excessive taper and out of round.

3. If the bottom installed gap measurement exceeds the service limit, replace the rings. If ring gap is smaller than the specified limit, file ring ends until gap is within specified range.

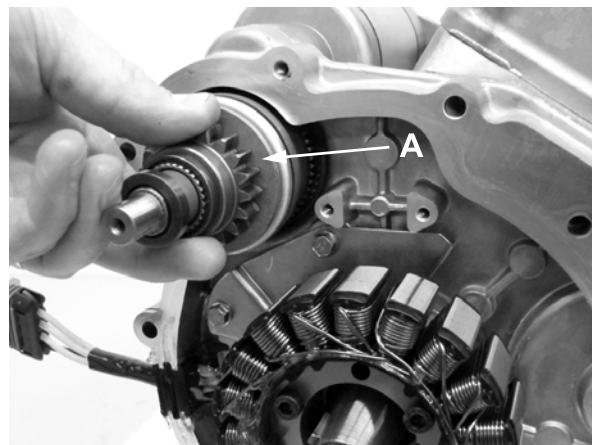
NOTE: Always check piston ring installed gap after re-boring a cylinder or when installing new rings. A re-bored cylinder should always be scrubbed thoroughly with hot soapy water, rinsed, and dried completely. Wipe cylinder bore with oil immediately to remove residue and prevent rust.

Starter Drive Bendix Removal / Inspection

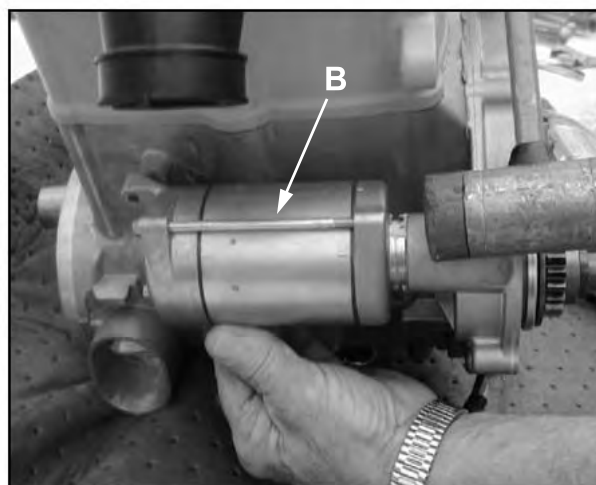
1. Remove stator housing bolts and remove housing.
2. Remove the flywheel nut and washer. Install Flywheel Puller (PN 2871043) and remove flywheel.

NOTE: Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.

3. Remove starter bendix assembly (A). Note the thrust washers located on both sides of the bendix.



4. Inspect the thrust washer for wear or damage and replace if necessary.
5. After bendix is removed, remove the two bolts retaining the starter. Tap on starter assembly (B) with a soft faced mallet to loosen starter from crankcase.



6. Inspect gear teeth on starter drive. Replace starter drive if gear teeth are cracked, worn, or broken.

ENGINE

7. Inspect the bendix bushing (C) in the mag cover for wear. Replace as needed.

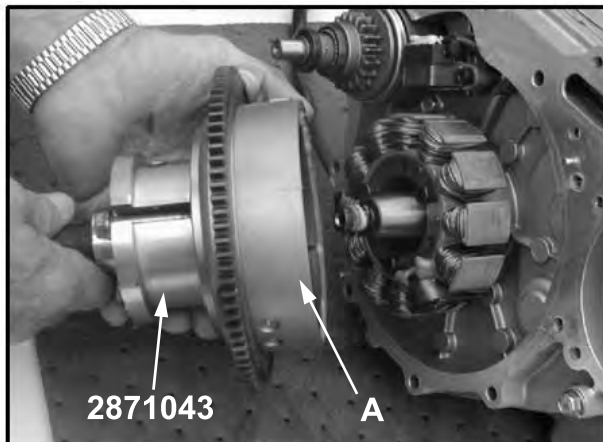


3. Install Flywheel Puller (PN 2871043) and remove flywheel (A).



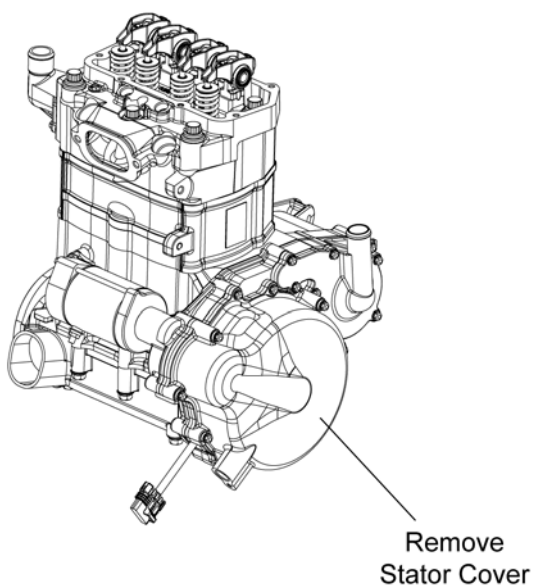
CAUTION

Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.



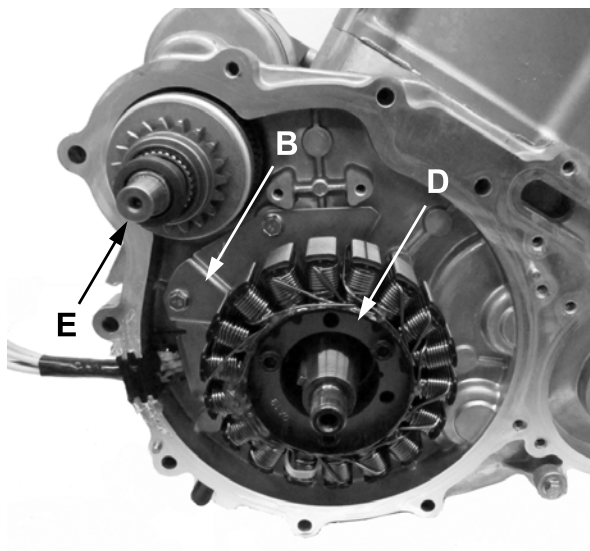
Flywheel / Stator Removal / Inspection

1. Remove stator cover bolts and remove the cover.



2. Remove flywheel nut and washer.

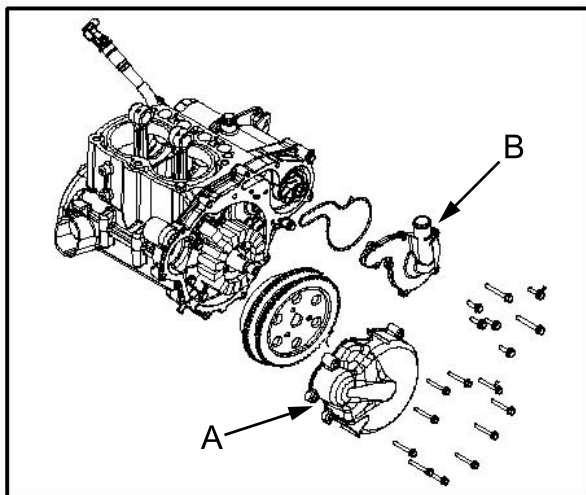
4. Use caution when removing the wire holddown (B) and the stator assembly (D). **Do not tap or bump the gear /stator housing cover or the stator.** This could cause the seal around the gear/stator housing cover and the crankcase to break, causing a leak.



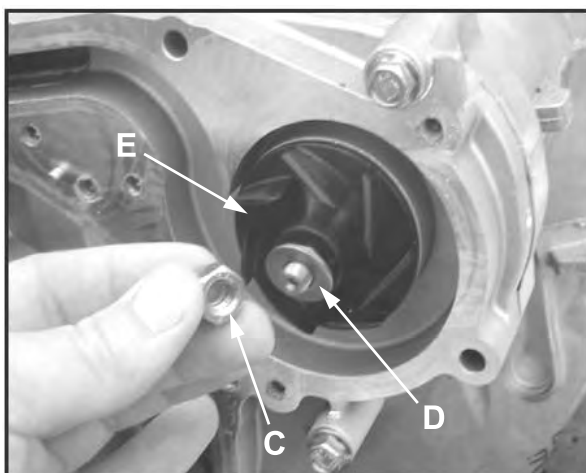
5. Remove the bendix (E) if necessary.

Engine Crankcase Disassembly / Inspection

1. Remove stator cover (A) and water pump cover (B).



2. Remove the nut (C), washer (D) and water pump impeller (E). Remove part of the water pump seal behind the impeller.



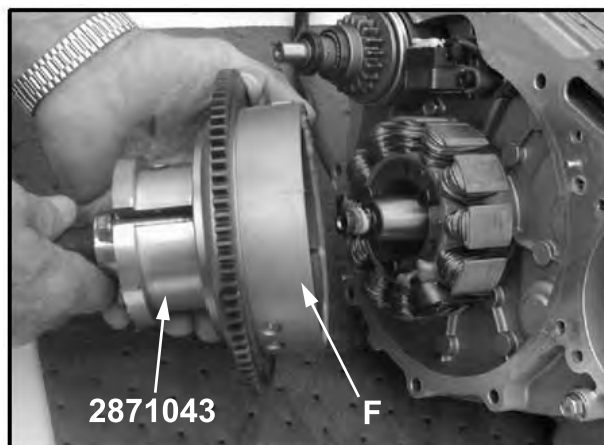
3. Remove flywheel nut and washer.

4. Install Flywheel Puller (PN 2871043) and remove flywheel (F).

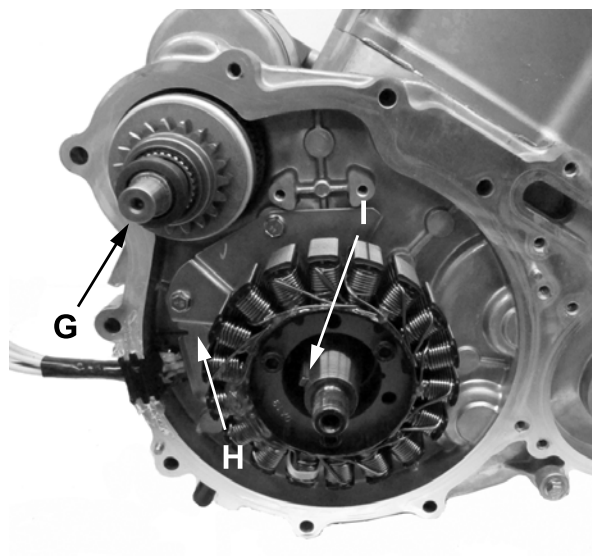


CAUTION

Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.

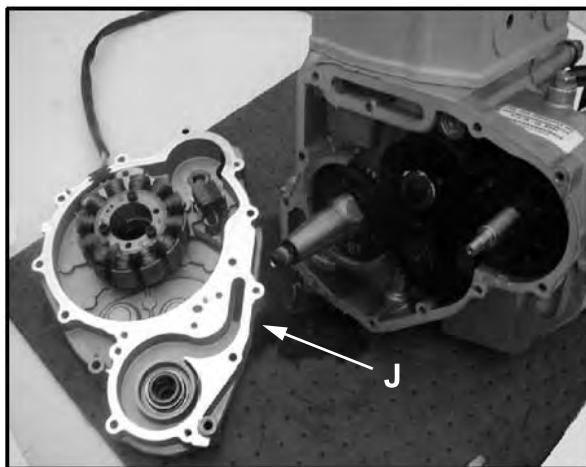


5. Remove the starter bendix (G), wire holddown plate (H), and the woodruff key (I) from the crankshaft. The stator does not have to be removed at this point.

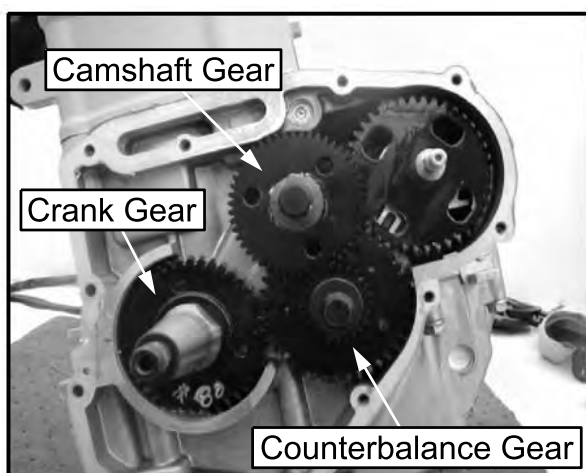


ENGINE

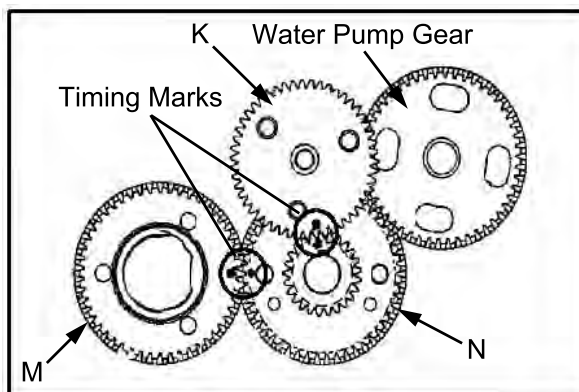
6. Remove the gear/stator housing bolts and remove the gear/stator housing cover (J) and gasket from the crankcase. Be sure to catch the excess oil from the crankcase.



7. Note the position of the gears in the photo.



8. Use a white pen to accent the timing marks on the following gears: camshaft gear (K), crankshaft gear (M) and counterbalance gear (N). This will ensure proper gear alignment and timing during reassembly of the gears.

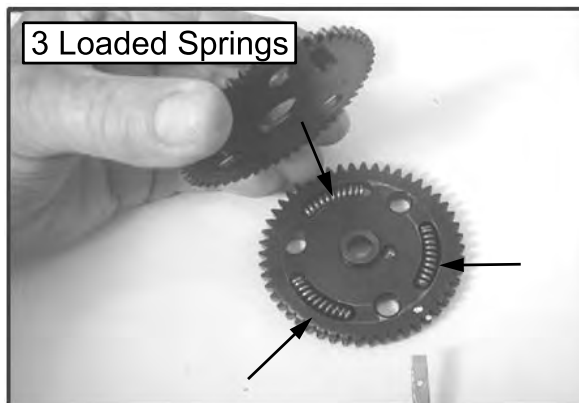


NOTE: If replacing one of the gears, it is recommended that all of the gears be replaced. A gear kit is available.

9. Use the Cam Gear Tooth Alignment Tool (PU-45497-2) to align and hold the cam split gear assembly. With the split gear aligned, remove the bolt and cam gear assembly.

NOTE: Install the Cam Gear Tooth Alignment Tool (PU-45497-2) into the assembly hole counter clockwise from the timing mark (see page 3.41).

10. Inspect the cam gear teeth and check to make sure there is spring tension offsetting the teeth between the two gears. If there is no tension, check the springs inside of the cam gear assembly.



11. The cam gear assembly contains three loaded springs. To open the cam gear assembly:

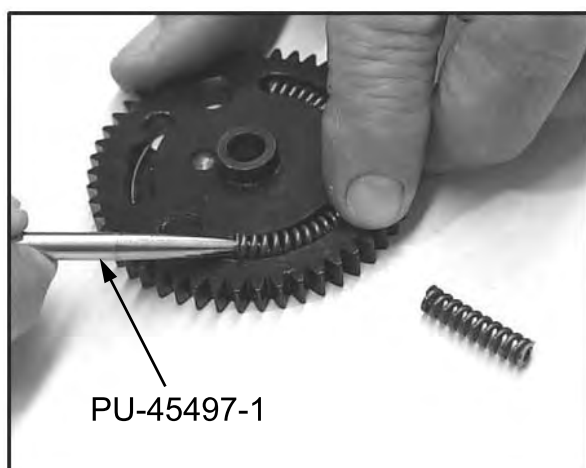
- Place the cam gear on a flat surface with the timing mark side facing up.
- While holding both gears together, lightly work a small flathead screwdriver between the two gears.
- Remove the top gear. The springs should stay in place.



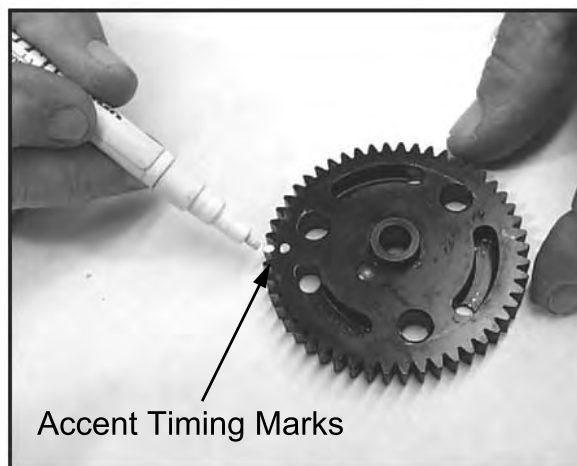
CAUTION

Wear safety glasses at all times. Use caution when working with the top gear. The springs could cause injury or become lost should they pop out.

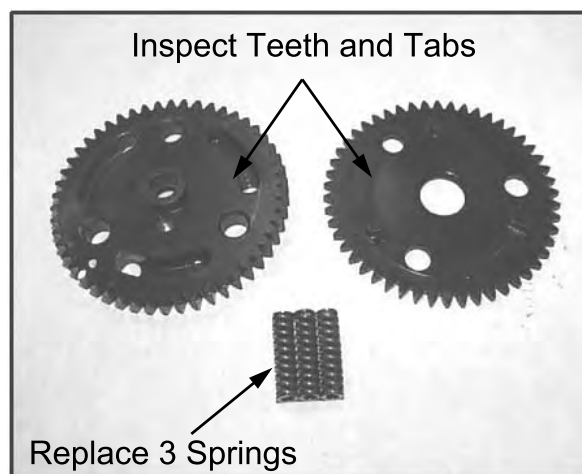
12. Remove all three springs using one of the tapered pins from (PU-45497-1).



13. With a white marking pen, accent the timing mark on the gear that contains the springs.

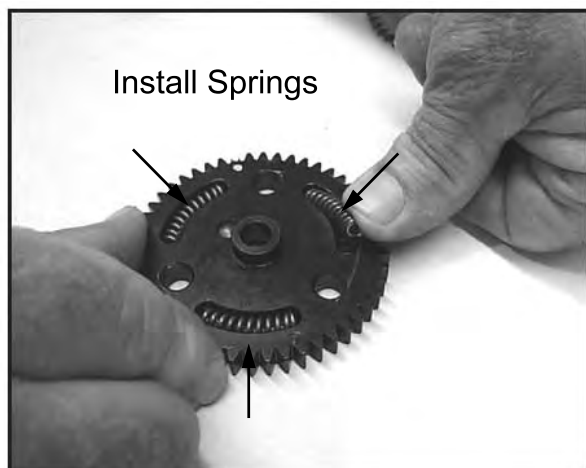


14. Inspect the gear teeth and the three tabs on the gears for wear.

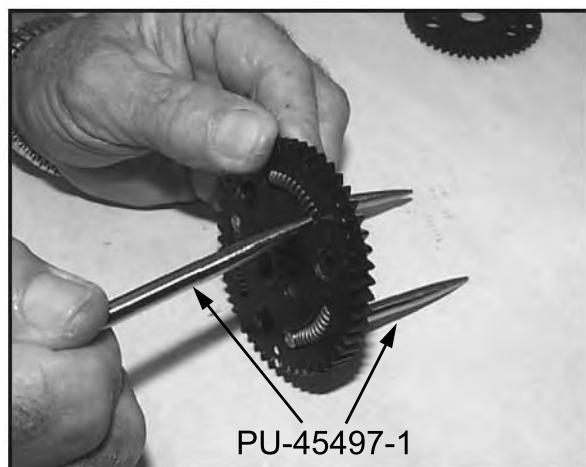


ENGINE

15. Install the new springs into the grooves of the cam gear.



16. Insert the pointed dowels from the Tapered Pins (PU-45497-1) into the cam gear.

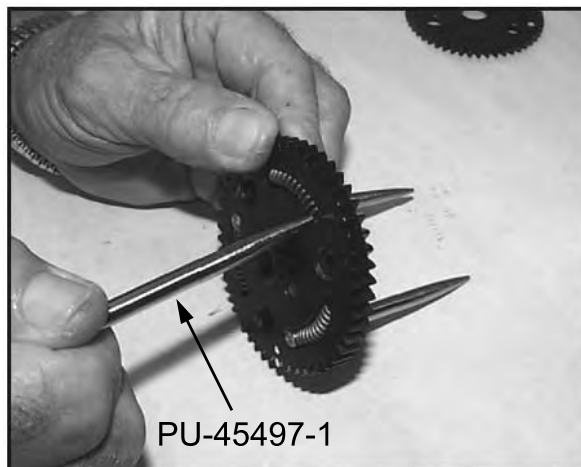


To Assemble:

- Hold the spring with one finger.
- Start pointed end of tapered pin into cam gear hole. Slowly push dowel through the hole until the end of the dowel is almost flush with the spring.
- Perform this procedure with all three tapered pins.
- Do not push the pins too far through or the springs will pop out.

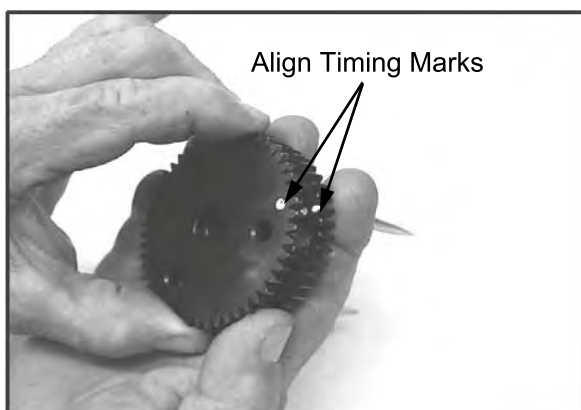
NOTE: Do not remove the tapered pins at this time.

17. Note in photograph that the Tapered Pins (PU-45497-1) are below flush with end of the springs. This helps to align the three gear tabs during the next step.



Cam Gear Spring Installation Tool Kit:
(PU-45497)
Tapered Pins:
(PU-45497-1)
Cam Gear Tooth Align Tool:
(PU-45497-2)

18. Line up the two gears using timing marks and three gear tabs that were referenced earlier. Push the gears back together, using both hands and hold securely.



19. Once the gears are pressed together, firmly hold the gears together with one hand. Carefully remove the Tapered Pins (PU-45497-1) by pulling them out one at a time with the other hand.



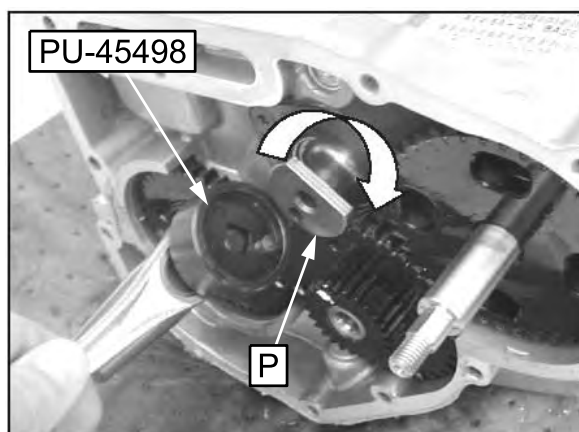
20. After the tapered pins are removed, be sure the cam gear assembly is held together tightly. Place the cam gear assembly on a flat surface. Use the Cam Gear Tooth Alignment Tool (PU-45497-2) to align the teeth of the cam gears, as shown in the picture.

NOTE: Install the Cam Gear Alignment Tool (PU-45497-2) into one assembly hole counter clockwise from the timing mark.



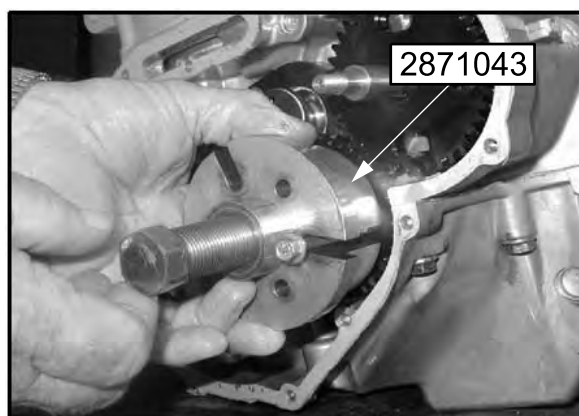
NOTE: For ease of installing the Cam Gear Alignment Tool (PU-45497-2), use a twisting motion when pushing down on the tool.

21. To remove the balance shaft gear, the flat side of the camshaft (P) must face the balance shaft gear. To rotate the camshaft, use the Cam Spanner Wrench (PU-45498) to rotate the camshaft so the flat side of the camshaft faces the balance shaft gear.



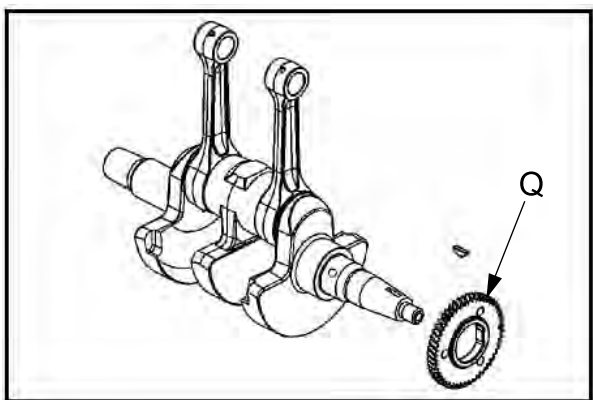
NOTE: This Cam Spanner Wrench (PU-45498) is only needed to rotate the camshaft when the entire valve train is assembled. If the rocker arms are removed, the cam-shaft can be turned by hand.

22. Remove the bolt and nut from the balance shaft gear. Try to remove the balance shaft gear. If the gear does not come off manually, use the Flywheel Puller (PN 2871043) to remove the balance shaft gear.

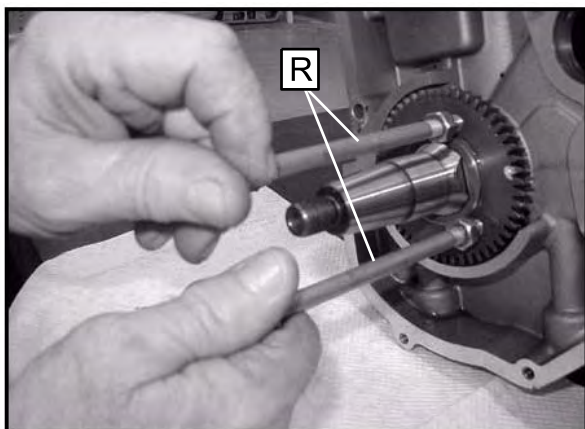


ENGINE

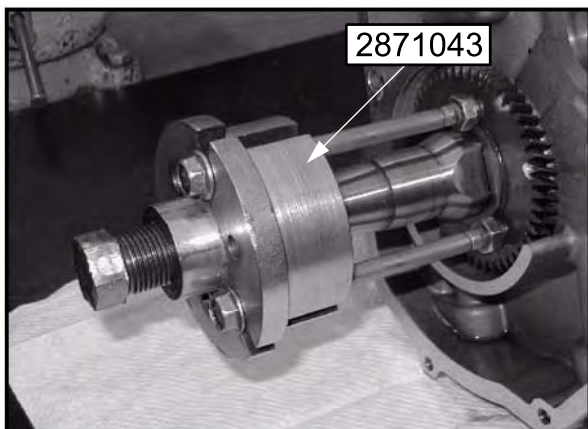
23. Inspect the crankshaft gear (Q) for broken or worn teeth. If the crankshaft gear does not need to be replaced, it does not need to be removed. If the crankshaft gear is damaged, remove the crankshaft gear with the Flywheel Puller (PN 2871043).



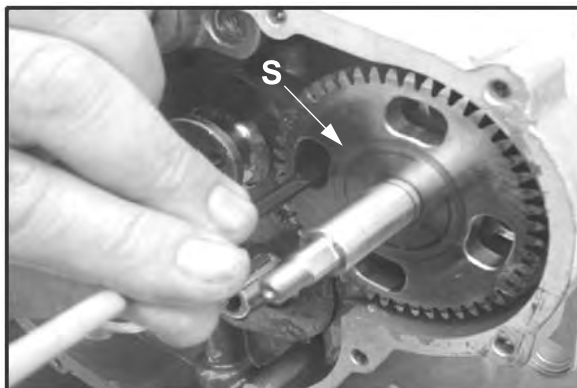
24. Install the two puller bolts (R). Tighten the puller bolts up so that the bolts are at equal length.



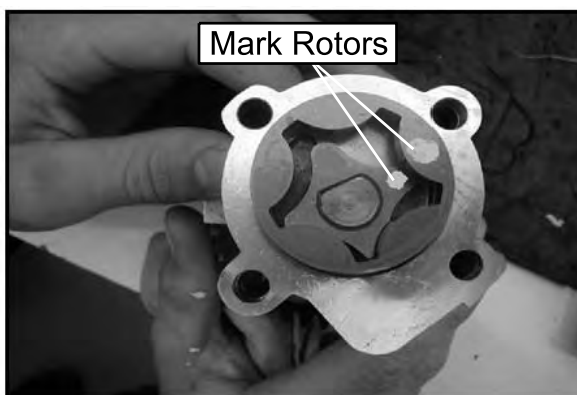
25. Install the Flywheel Puller (PN 2871043) and remove the crankshaft gear, if needed.



26. Rotate the water/oil pump gear (S), so that all four bolts are visible through the gear. Remove the four bolts with a hex wrench. Pull out the pump.

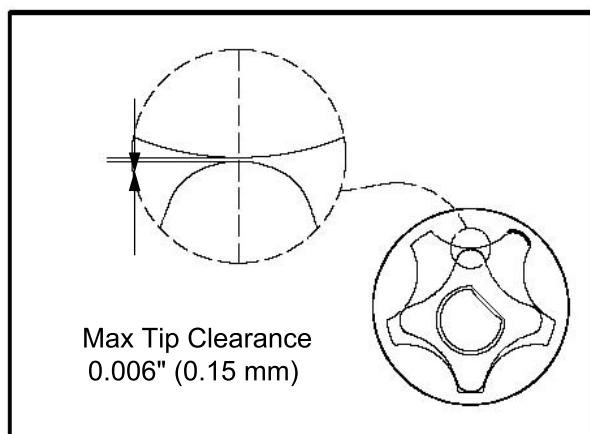


27. Inspect the oil pump rotors for wear. Mark the rotors with a white pen to ensure upon reassembly that the correct sides of the rotors are installed and mesh with the same edges as previously installed.



NOTE: If replacing the old rotors, new replacement rotors will fit into the original oil/water pump housing.

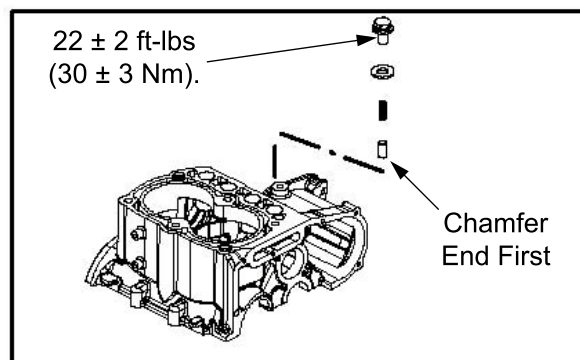
28. Use a feeler gauge to measure the clearance between the two rotors. Measure the gap between the two rotor tips as shown below. **The clearance should not exceed 0.006" (0.15 mm).**



29. Remove the oil pressure relief. The oil pressure relief consists of a bolt, washer, spring, and valve (dowel). Inspect the valve (dowel) for signs of possible obstructions. Use compressed air to blow out any debris.



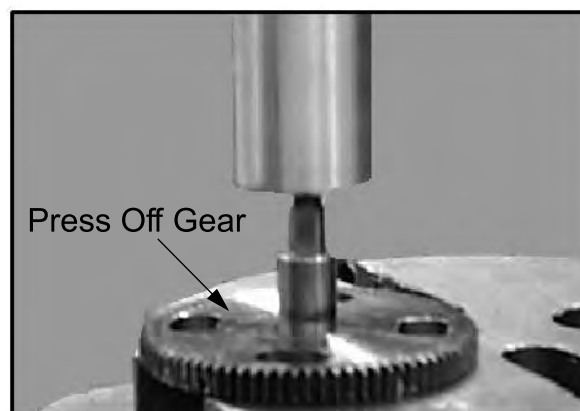
30. Reinstall the valve (dowel chamfered end first). Install the spring, washer, and bolt. Torque to specification.



Oil Pressure Relief Bolt:
22 ± 2 ft-lbs (30 ± 3 Nm)

NOTE: Be sure to place the tapered end of the valve (dowel) in first. If the valve is installed incorrectly, oil pressure and oil priming problems will occur.

31. Carefully press the gear off the assembly while supporting the housing assembly.

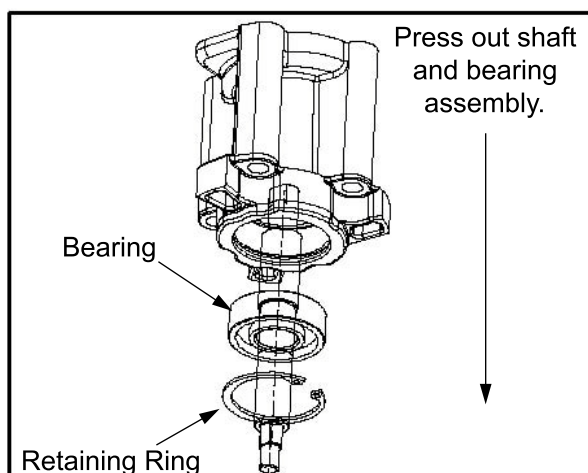


CAUTION

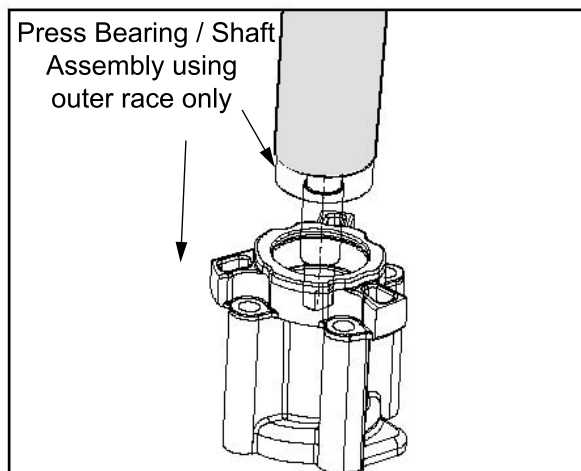
Wear appropriate safety gear during this procedure. Protective gloves, clothing and eye wear are required.

ENGINE

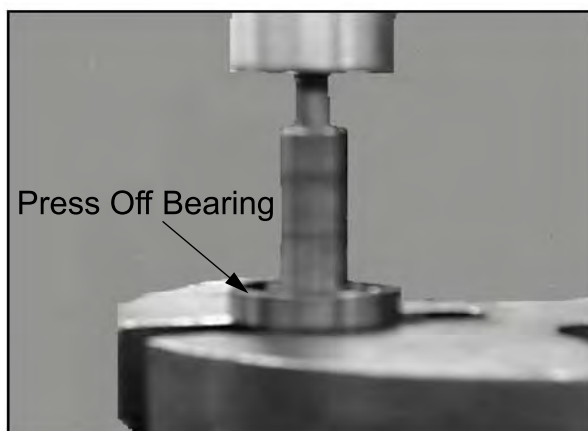
32. Remove snap ring from the assembly. Place housing in a support and press out the bearing/shaft assembly.



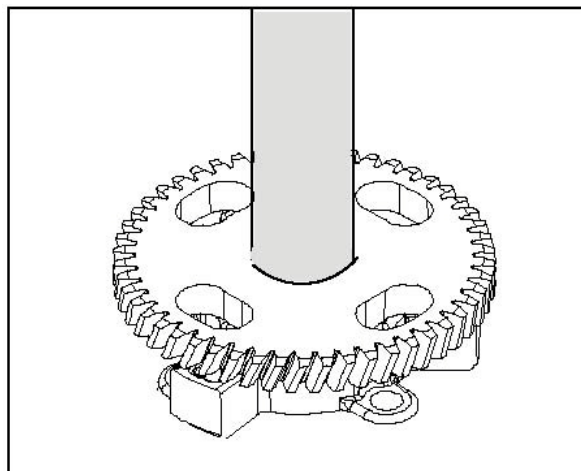
35. Press the bearing/shaft assembly using the bearing's outer race. Do not use the shaft to press the assembly into the housing, as bearing damage may result. Install retaining ring.



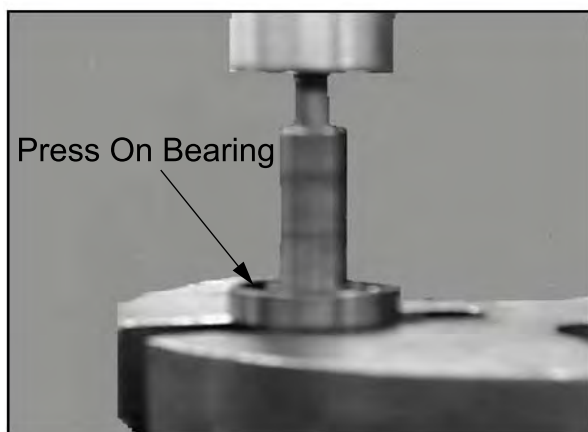
33. Place the shaft in a press to remove the bearing.



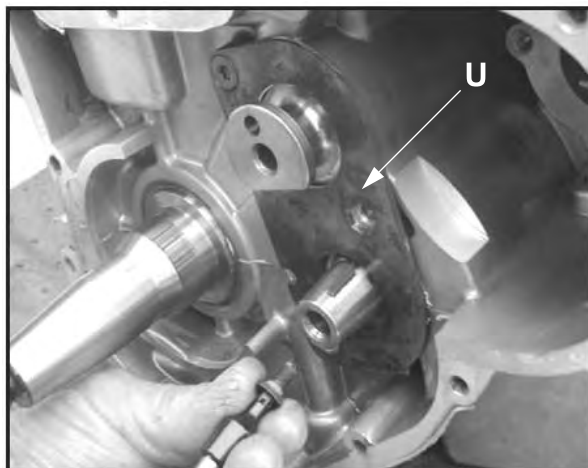
36. Press gear onto shaft while supporting the housing.



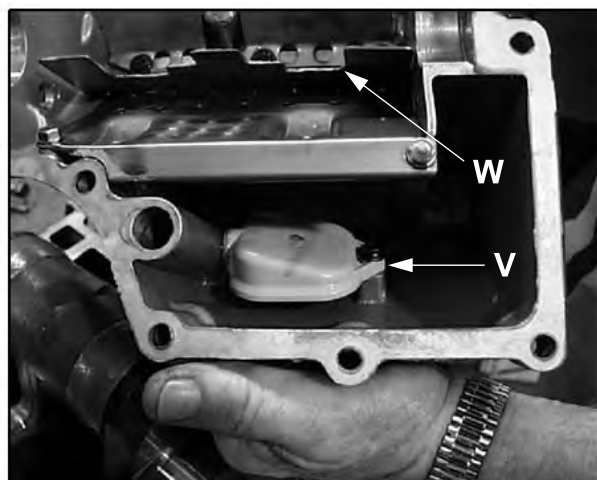
34. Press shaft into the new bearing.



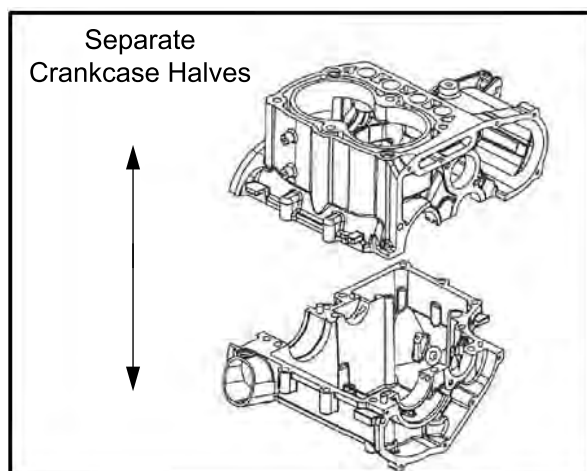
37. Remove thrust plate (U).



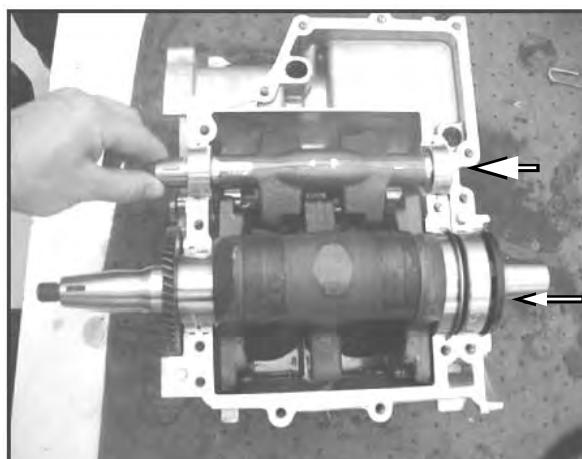
39. Remove and clean oil pick up (V) and oil baffle weldment (W).



38. Remove PTO end engine mount. Remove crankcase bolts. Tap on the reinforced areas on the cases using soft hammer. Carefully separate the two crankcase halves.



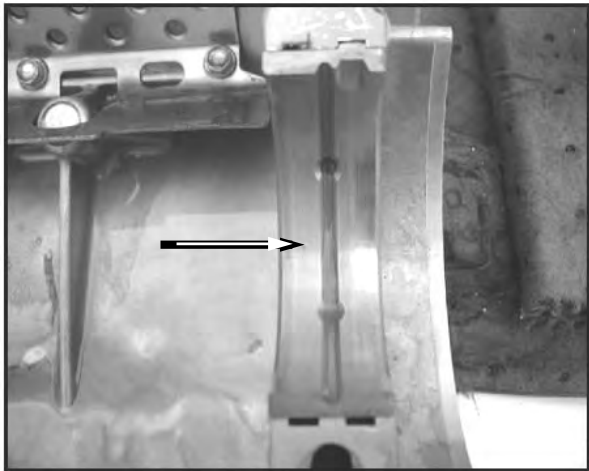
40. Remove balance shaft and crankshaft.



NOTE: Only remove the oil baffle if the baffle is damaged. When removing the oil baffle bolts, use a heat gun to heat the bolts and loosen the Loctite™. This will prevent any possible damage to the bolts or to the crankcase casting.

ENGINE

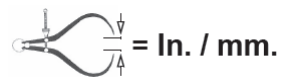
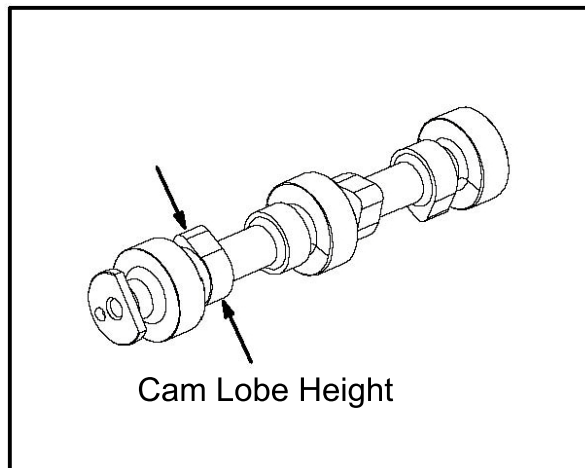
41. Remove and inspect crankshaft main journal bearings for abnormal wear. **It is recommended to replace the bearings anytime the engine is disassembled.**



Camshaft Inspection

1. Thoroughly clean the cam shaft.
2. Visually inspect each cam lobe for wear, chafing or damage.

3. Measure height of each cam lobe using a micrometer. Compare to specification.

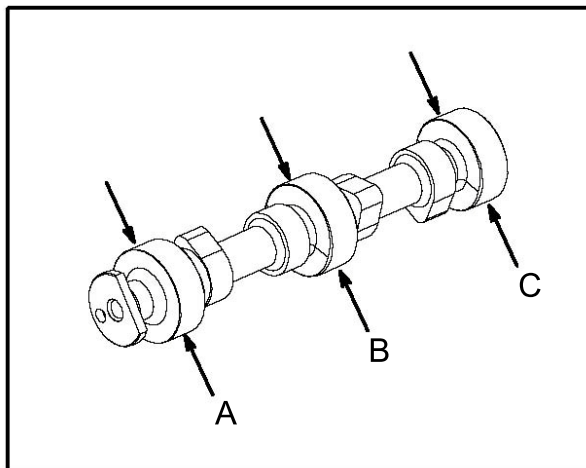


Cam Lobe Height

Intake (Std):
1.357" (34.477 mm)

Exhaust (Std.):
1.342" (34.096 mm)

4. Measure camshaft journal outside diameters (O.D.).



$$\text{Camshaft Journal O.D.} = \text{In. / mm.}$$

Camshaft Journal O.D.:
 A. (MAG) 1.654" $\pm$ 0.00039" (42 $\pm$ 0.01 mm)
 B. (CTR) 1.634" $\pm$ 0.00039" (41.5 $\pm$ 0.01 mm)
 C. (PTO) 1.614" $\pm$ 0.00039" (41 $\pm$ 0.01 mm)

5. Measure ID of camshaft journal bores.

$$\text{Camshaft Journal Bore I.D.} = \text{In. / mm.}$$

Camshaft Journal Bore I.D.:
 MAG: 1.656" $\pm$ 0.00039" (42.07 $\pm$ 0.01 mm)
 CTR: 1.637" $\pm$ 0.00039" (41.58 $\pm$ 0.01 mm)
 PTO: 1.617" $\pm$ 0.00039" (41.07 $\pm$ 0.01 mm)

6. Calculate oil clearance by subtracting journal O.D.s from journal bore I.D.s. Compare to specification.

$$\text{Oil Clearance} = \text{In. / mm.}$$

Calculated Camshaft Oil Clearance:
 Std: 0.0027" (.07 mm)
 Limit: 0.0039" (.10 mm)

NOTE: Replace camshaft if damaged or if any part is worn past the service limit.

NOTE: Replace the engine crankcase assembly if camshaft journal bores are damaged or worn excessively.

3

ENGINE

ENGINE REASSEMBLY

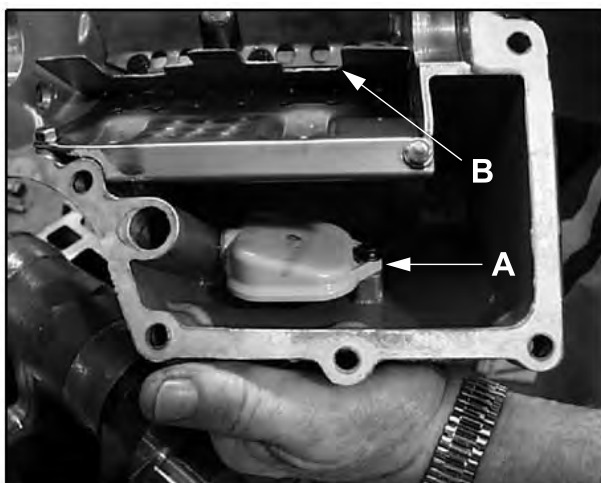
Crankcase Reassembly

CAUTION

After any reassembly or rebuild, the engine must be primed using the Oil Priming Adapter (PU-45778) and a 3/4-full oil filter before initial start-up (see "Oil Pump Priming").

NOTE: Before assembly, clean bolts and bolt holes with Loctite Primer N (commercially available). This will ensure proper sealing when installing bolts.

1. Install oil pick up (A). Torque bolt to specification.

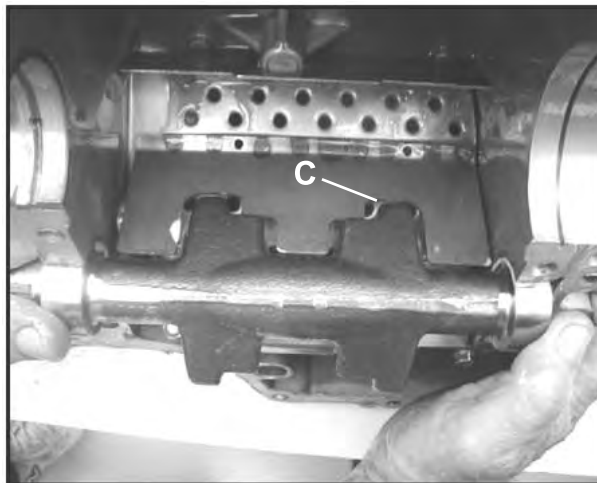


2. Install oil baffle weldment (B). Torque bolts to specification.



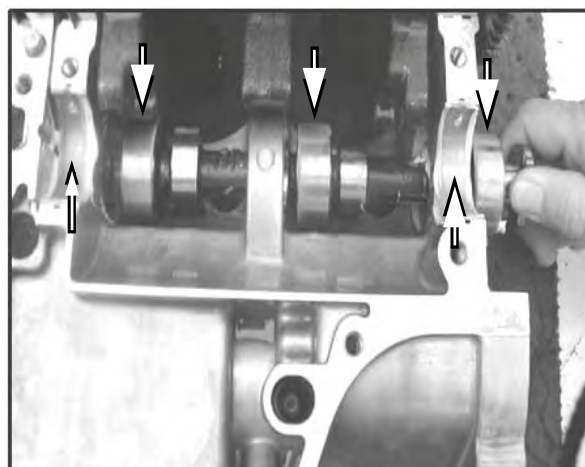
Oil Baffle Weldment and Oil Pick Up Bolts:
60 ± 6 in-lbs (6.8 ± 0.68 Nm)

3. Install balance shaft. Inspect balance shaft clearance (C) in both gearcase halves. Rotate balance shaft to ensure there is clearance between it and the oil baffle weldment.

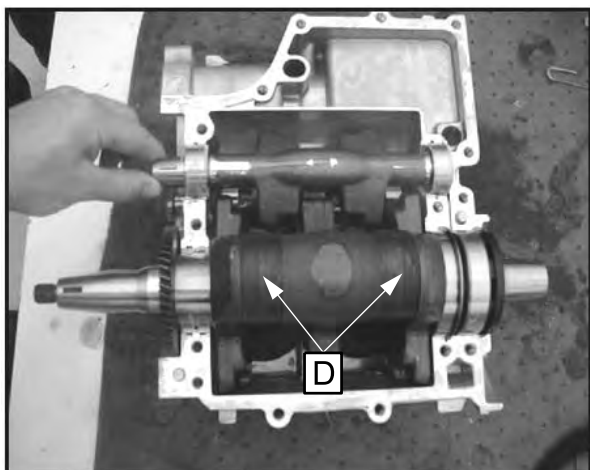


NOTE: Always install new balance shaft bearings.

4. Apply assembly lube to cam journals and balance shaft bearing surfaces of the MAG case half. Install camshaft and balance shaft.

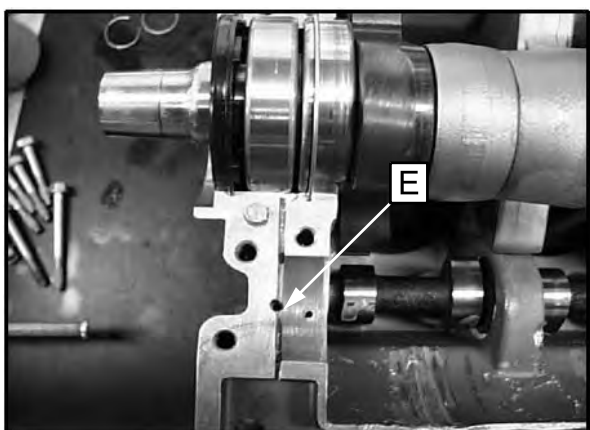


5. Install crankshaft assembly and apply engine oil to crank pins and rods (D). Apply assembly lube to the main journals and bearings.



6. Apply Crankcase Sealant (PN 2871557) to the top half of the crankcase.

NOTE: Do not apply sealant to cam relief hole (E).



7. Assemble the crankcase halves. Apply Loctite™ 242 (PN 2871949) to the threads and pipe sealant to the bolt flanges. Torque bolts to specification following torque pattern at beginning of this chapter.

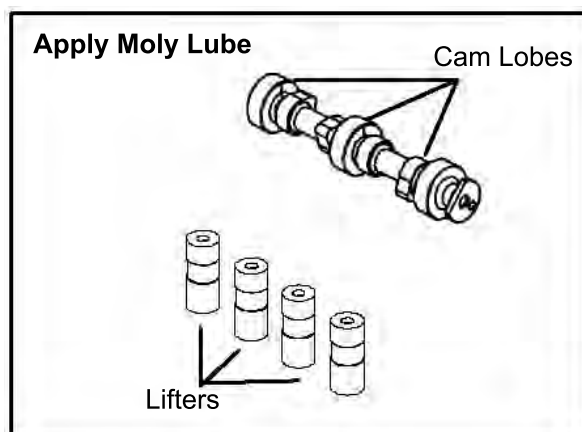


Crankcase Bolts:

22 ± 2 ft-lbs (30 ± 3 Nm)

Torque in sequence

8. Lubricate cam lobes and valve lifters with Moly Lube Grease.



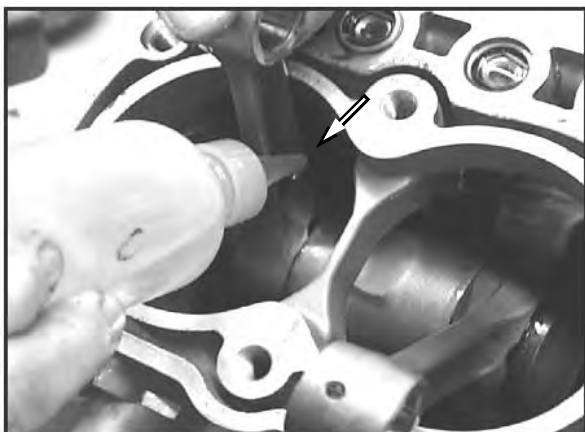
9. Lubricate lifters with engine oil and install in the original order as removed in disassembly. Apply Lubricant or Moly Lube to the ends of the lifters.

NOTE: Always replace the camshaft and lifters as a set.

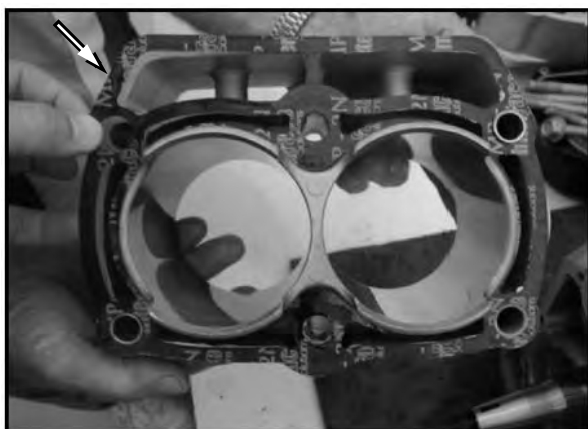


ENGINE

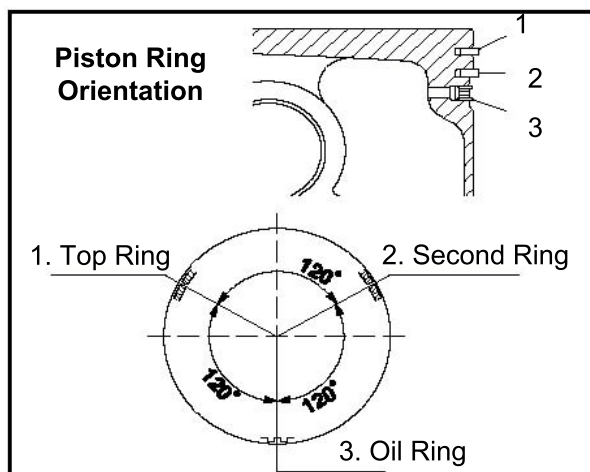
10. Lubricate connecting rods with PS-4 synthetic engine oil.



11. Install new cylinder gasket on crankcase. Align gasket on the dowel pins for proper gasket alignment.



12. Orientate the piston rings on the piston before installation into the cylinders. Set the gaps of the rings every 120° (see illustration below).

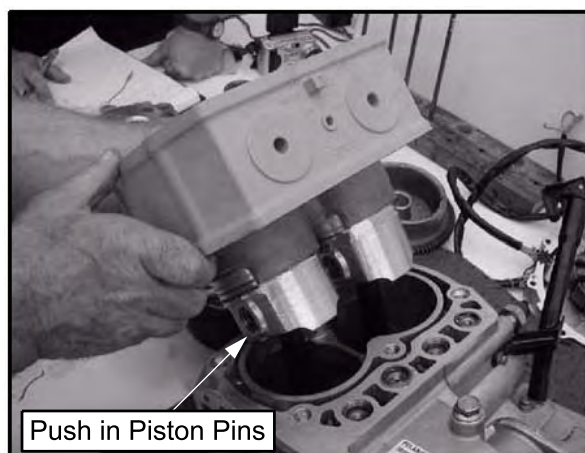


13. Install piston assemblies into cylinder aligning the piston pin holes, to ensure proper alignment of the pistons to the connecting rods upon assembly. Partially install the piston pins into the pistons.

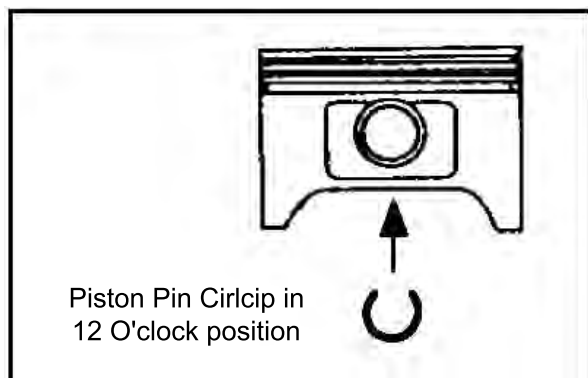


NOTE: To help align the pistons, slide a rod that is close to the same diameter as the wrist pin holes to properly align them in the cylinder.

14. Position cylinder and piston assemblies onto the connecting rods and push the piston pins through the piston and connecting rods.



15. Install the piston pin circlips. The circlip ends should be installed at the 12 O'clock position.

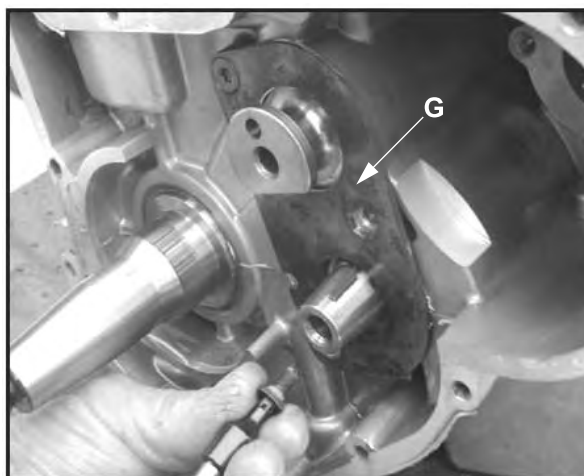


NOTE: While installing piston circlips, cover all engine passages. The clip could fall into the engine during installation.



16. Install camshaft thrust plate (G) with new bolts. Torque bolts to specification.

NOTE: New bolts have patch lock on the threads and do not require Loctite™.



Thrust Plate Screws:
115 ± 12 in-lbs (13 ± 1.35 Nm)

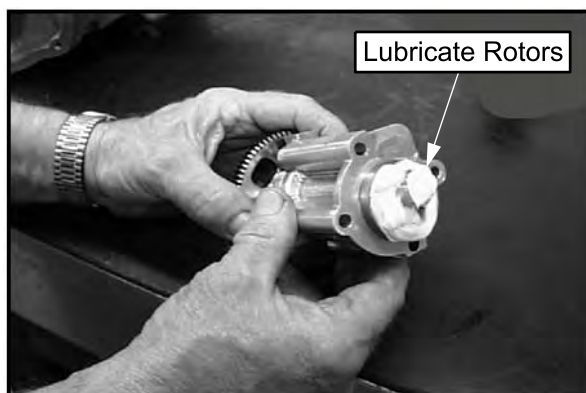
17. Assemble rotors as marked when disassembled. Use a cleaner to remove the marks previously made on the rotors.



ENGINE

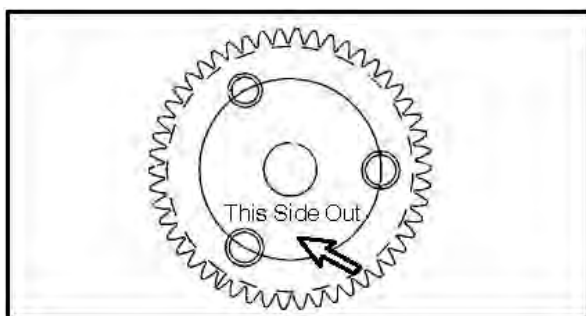
18. Apply assembly lube or oil to the rotors on the oil pump shaft.

NOTE: The application of lubrication aids in priming the oil pump during initial engine start up.



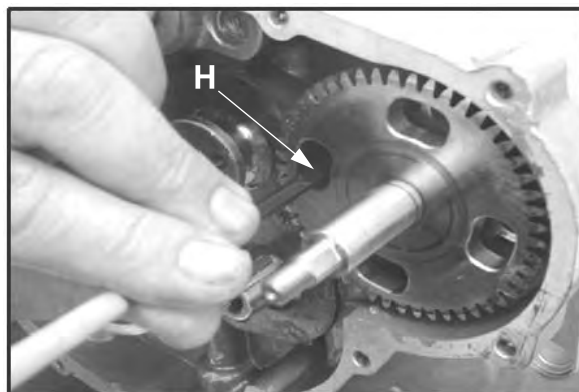
19. Align the bolt holes and install oil pump assembly into crankcase. Rotate the rotors in the housing during installation, as this checks for binding if new rotors are used.

NOTE: For assembly of the gears, the cam gear and the crankshaft gear are stamped with “This Side Out”. This indicates the side of the gear that faces outward or away from the case.



NOTE: Before assembly, clean the bolts and bolt holes with Loctite Primer N (commercially available) to remove any debris. This will ensure proper sealing when installing bolts and new Loctite™.

20. Install oil pump housing bolts (H). The new bolts contain patch lock, so Loctite™ is not needed on the new bolts. Torque bolts to specification and follow the torque sequence at beginning of the chapter.



NOTE: Occasionally spin the oil pump when installing bolts to check for binding of the rotors.

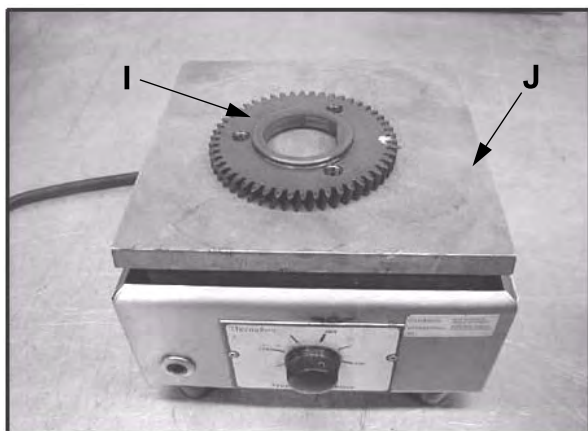


Oil Pump Bolts:
84 ± 8 in-lbs (9.50 ± 0.90 Nm)
Torque in Sequence

21. Apply Loctite™ 242 (PN 2871949) to the crankshaft.



22. Before installing the crankshaft gear (I), heat the crankshaft gear to 250° F (121°C) on a hot plate (J).

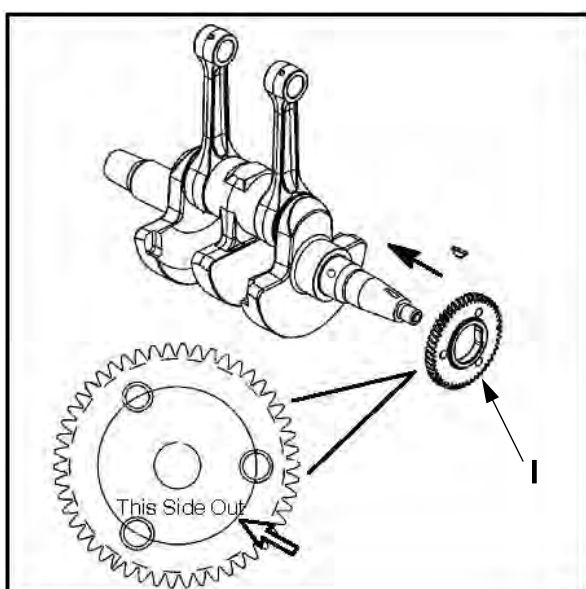


⚠ CAUTION

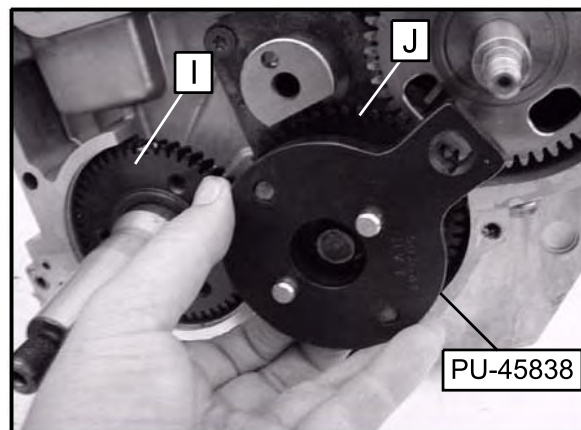
The crankshaft gear is extremely hot! Severe burns or injury can occur if the gear is not handled with extreme care and caution. Follow the procedure below to help ensure safety.

23. Use extreme caution when removing the crankshaft gear from the hot plate. Use a pair of pliers and leather gloves when handling the crankshaft gear.
24. Install the crankshaft gear (I) onto the crankshaft.

NOTE: For assembly of the gears, the cam gear and the crankshaft gear are stamped with “This Side Out”. This indicates the side of the gear that faces outward or away from the case.



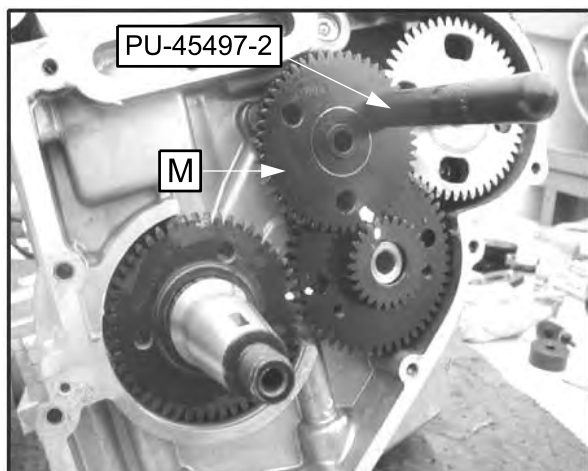
25. Install counter balance shaft gear (J) with new key, aligning timing marks with crankshaft gear (I). Install washer and bolt. Use the Gear Holder (PU-45838). Torque to specification.



Balance Shaft Gear Bolt:
22 ± 2 ft-lbs (30 ± 3 Nm)

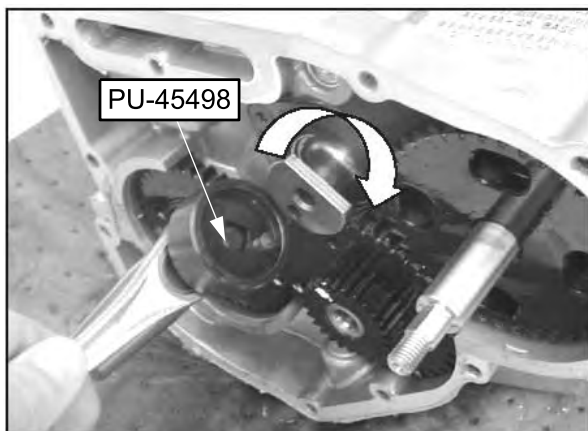
ENGINE

26. Use the Cam Gear Alignment Tool (PU-45497-2) to align the teeth of the cam gear (M). Install the cam gear (M) (with the Cam Gear Alignment Tool still in place) onto the camshaft. The timing marks on the camshaft gear should align with the keyway on the balance shaft gear.



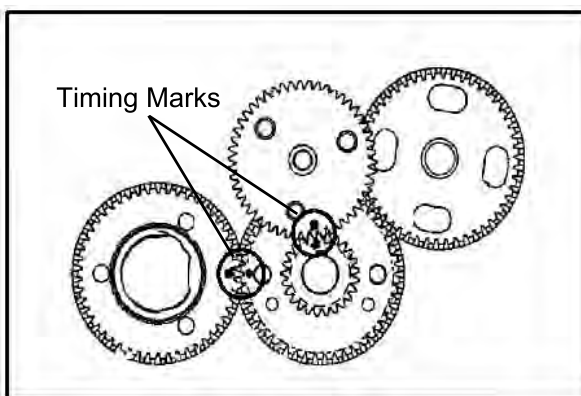
NOTE: If the timing mark on the camshaft gear does not align properly, remove the camshaft gear and tool. Use the Cam Spanner Wrench (PU-45498) to rotate the cam to the proper position.

NOTE: Cam Spanner Wrench (PU-45498) is only needed to rotate the camshaft when the entire valve train is assembled.



27. Reinstall camshaft gear so timing marks are aligned. Install the washer and bolt. Torque to specification.

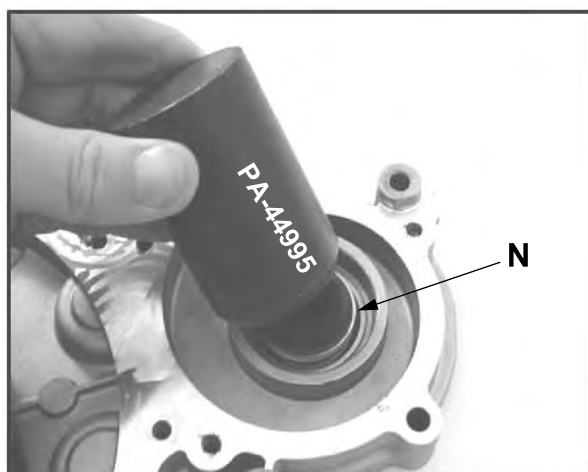
NOTE: Be sure all of the timing marks are properly aligned.



Counterbalance Gear and Camshaft Gear Bolt:

22 ± 2 ft-lbs (30 ± 3 Nm)

28. Before installing the gear / stator housing, replace the seals in the cover. Install a new water pump seal (N) into the gear / stator housing. Use the Water Pump Mechanical Seal Installer (PA-44995) to properly install the seal to the correct depth in the cover.

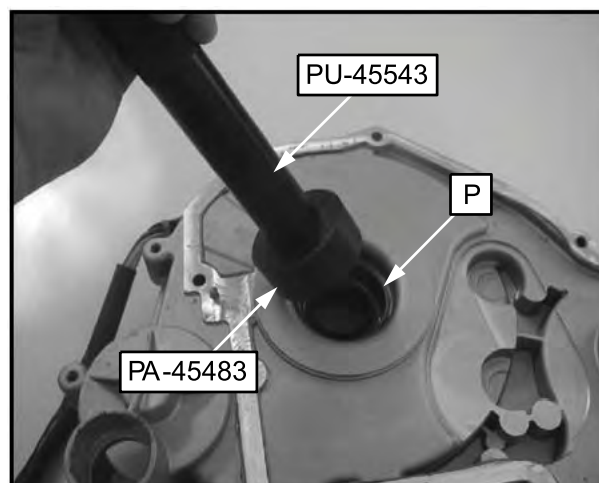


IMPORTANT: Due to seal design and construction, seals **MUST** be installed **DRY** (no lubricant) during assembly. Use of lubricants (oil, soapy water, etc.) will not allow the seal to wear-in and seal properly. Do not touch seal surface or allow seal surface to come in contact with contaminants during installation. Thoroughly clean parts, tools and hands before installation.

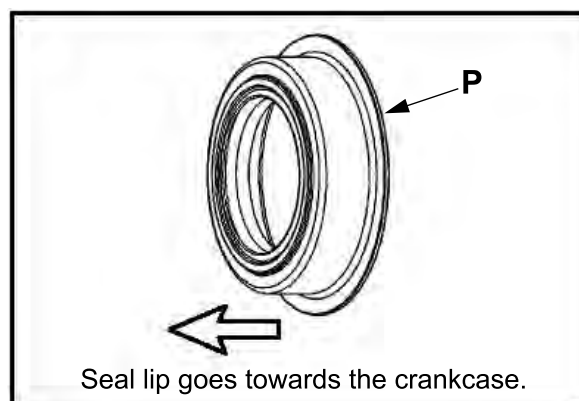
NOTE: To remove the water pump seal, the gear/stator housing must be removed. The water pump seal cannot be removed or installed with the gear/stator housing attached to the engine. Shaft damage will occur.

NOTE: Install the water pump seal (N) with the seal lip facing out (towards the crankcase). Use of a hydraulic press is recommended for this procedure.

29. Install a new crankshaft seal (P) into the gear/stator housing cover. Use the Universal Driver Handle (PU-45543) and the Main Seal Installer (PA-45483) to seat the crankshaft seal into place.

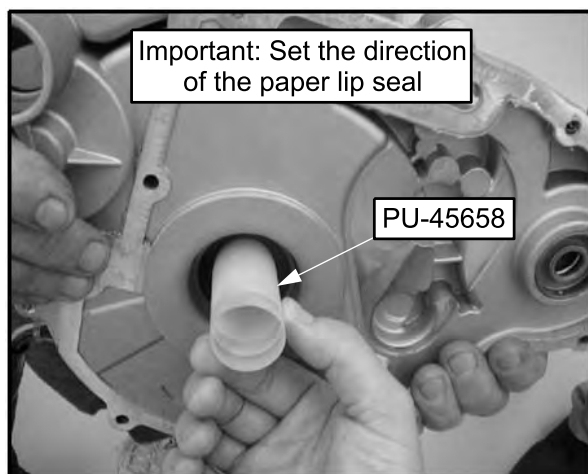


NOTE: Install the crankshaft seal (P) with the seal lip facing out (towards the crankcase).

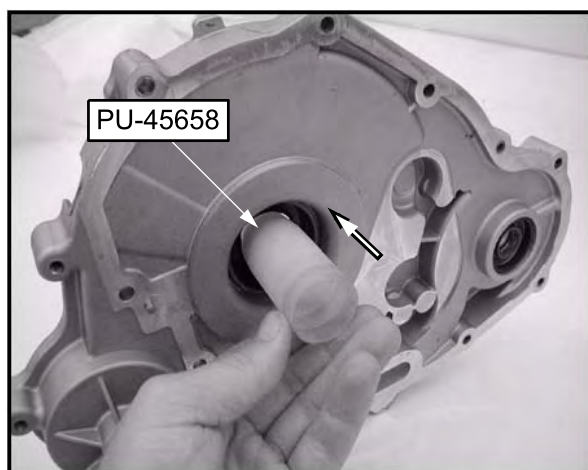


ENGINE

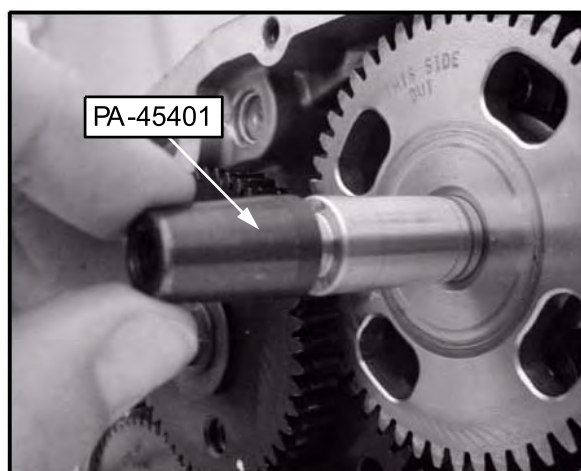
30. Once crankshaft seal is installed into the gear / stator housing cover, set the direction of the paper lip by sliding the Main Crankshaft Seal Saver (PA-45658) into the crankshaft seal from the rubber lipped side to the paper lip side (Back to Front). Remove the tool.



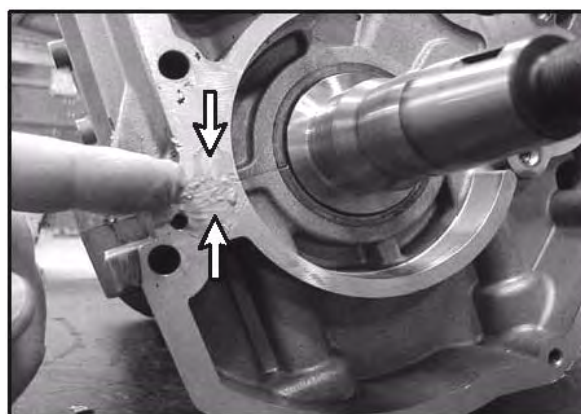
31. Carefully install tapered end of Crankshaft Seal Protection Tool (PA-45658) through paper side of crankshaft seal (back to front). Leave seal protector installed in crankshaft seal. Check the crankshaft seal lips to verify they have not been rolled or damaged.



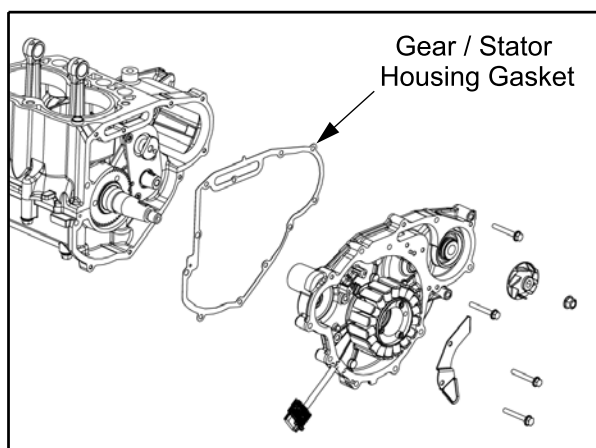
32. Before installing the gear/stator housing cover, install the Water Pump Seal Saver (PA-45401) onto the water pump shaft.



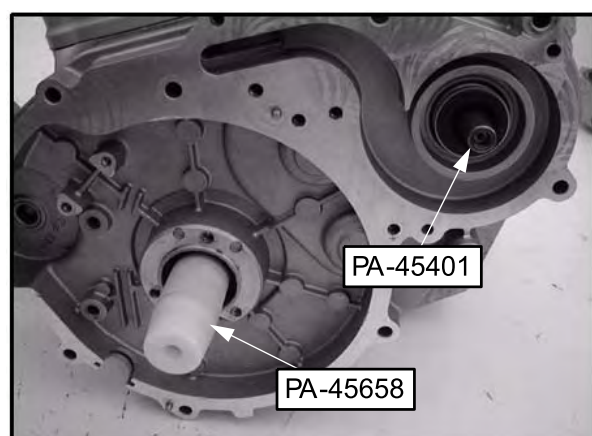
33. Apply Crankcase Sealant (PN 2871557) to the outside edges of the crankcase halves (see arrows), where the crankcases mate (see the following photos). This helps to prevent coolant leakage.



34. Install a new gear/stator housing gasket onto the crankcase.



35. With both seal savers installed, carefully place the gear / stator housing cover over the protection tools and onto the crankcase.



36. Secure the gear / stator housing cover to the crankcase with the cover bolts. Torque bolts in proper sequence to specification. Remove seal protectors from the shaft ends once the cover is secure.



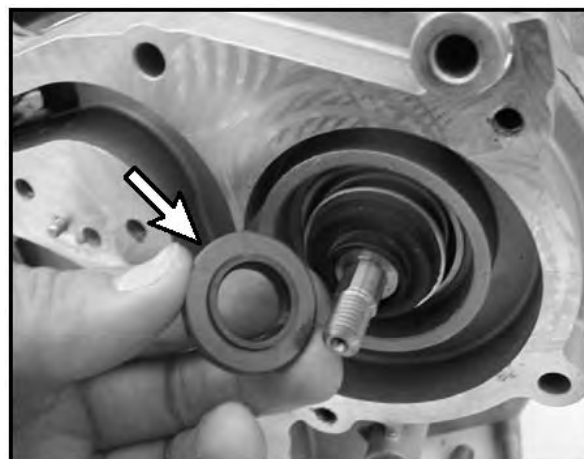
Gear / Stator Housing Bolt:

96 ± 12 in-lbs (10.85 ± 1.35 Nm)

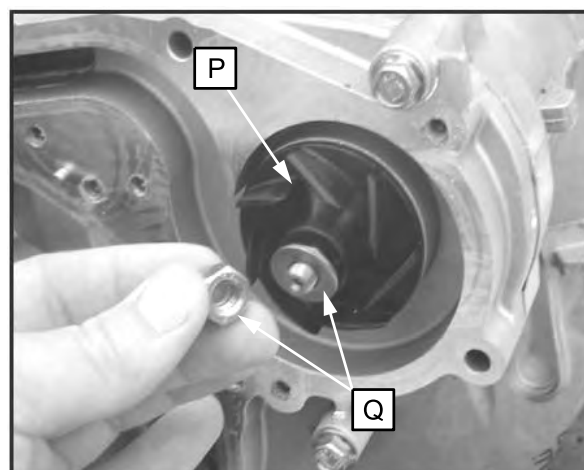
Torque in proper sequence

NOTE: Before assembly, clean the bolts and bolt holes with Loctite Primer N (commercially available) to remove any debris. This will ensure proper sealing when installing bolts.

37. Install shaft seal with ceramic surface facing inward.



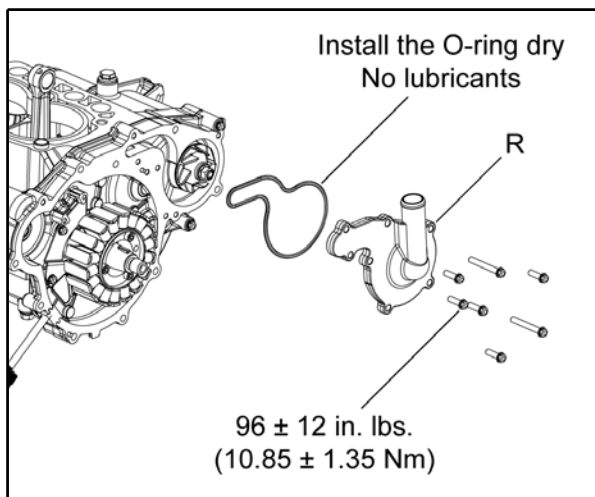
38. Install water pump impeller (P). **Secure the impeller with the washer and a new nut (Q).** Torque the nut to specification.



Water Pump Impeller Nut:
108 ± 6 in-lbs (6.8 ± 0.68 Nm)

ENGINE

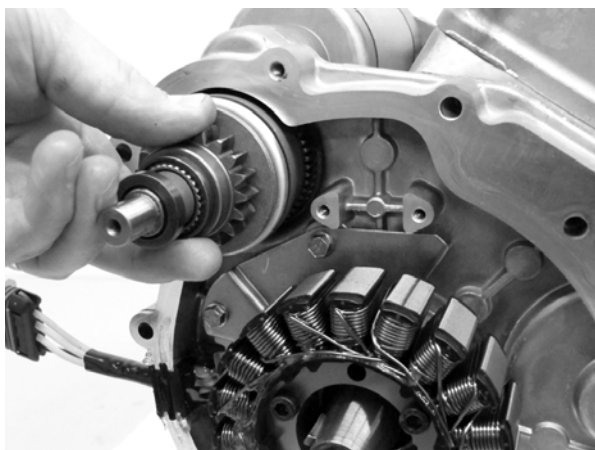
39. Install water pump cover (R) with new O-ring seal. Torque bolts to specification in proper sequence (see Page 3.4).



Water Pump Housing Bolt:
96 ± 12 in-lbs (10.85 ± 1.35 Nm)
Torque in proper sequence

40. Sparingly apply Starter Drive Grease (PN 2871423) to the starter drive. Install the starter bendix.

NOTE: There are thrust washers on both sides of starter drive.

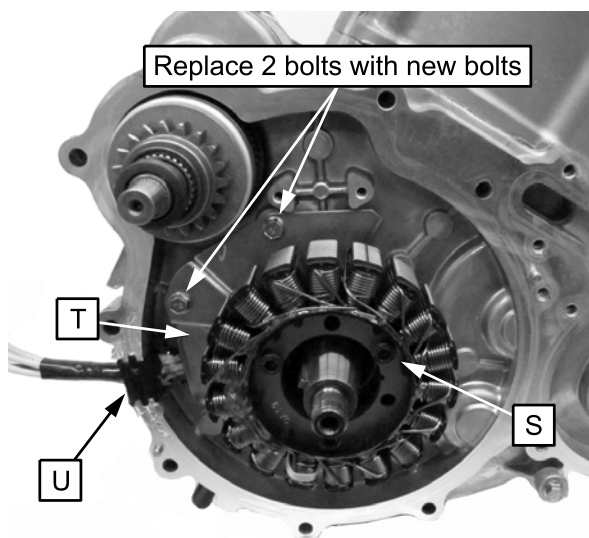


Flywheel / Stator Installation

NOTE: Before assembly, clean the bolts and bolt holes with Loctite Primer N (commercially available) to remove any debris. This will ensure proper sealing when installing bolts.

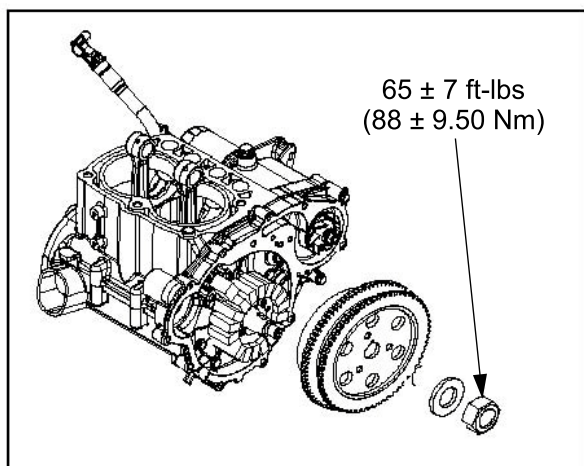
1. Install stator assembly (S) and bolts. Torque bolts to specification.
2. Install the wire hold down bracket (T). Install two new wire hold down bolts. New bolts contain patch-lock. Torque bolts to specification, following the proper bolt torque sequence. Coat the stator wire grommet (U) with Nyogelä Grease (PN 2871329).

NOTE: Verify stator wires are routed properly under the wire hold down bracket.



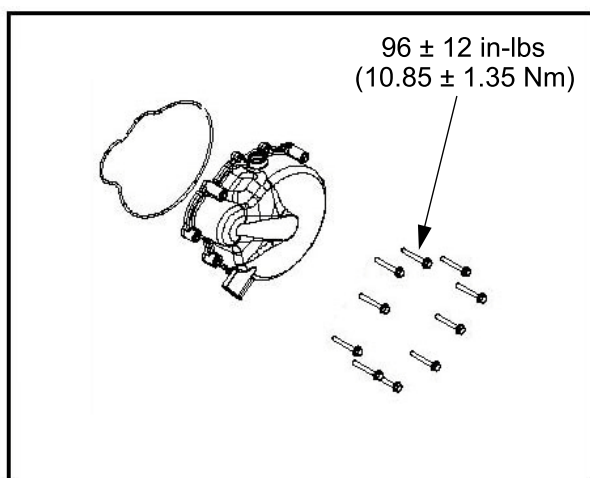
Stator Assembly Bolts:
84 ± 8 in-lbs (9.5 ± 0.9 Nm)

3. Install the flywheel, washer, nut, and key. Torque flywheel nut to specification.



Flywheel Nut:
65 ± 7 ft-lbs (88 ± 9.50 Nm)

4. Install stator housing with new O-ring. Torque the bolts to specification and follow proper bolt torque sequence at the beginning of this chapter.

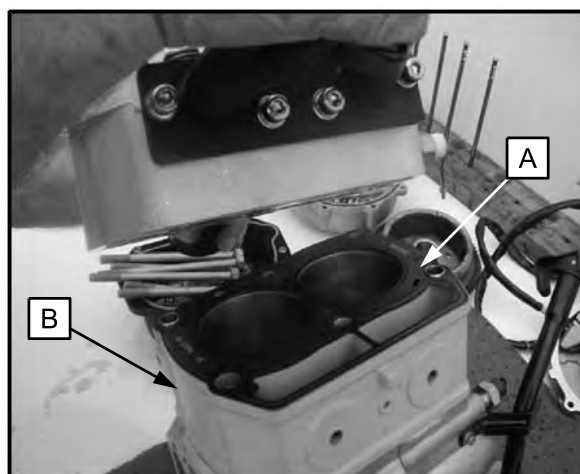


Stator Housing Bolts:
96 ± 12 in-lbs (10.85 ± 1.35 Nm)
Torque in Sequence

Cylinder Head Reassembly

NOTE: Before reassembly, clean the bolts and bolt holes with Loctite Primer N (commercially available) to remove any debris. This will ensure proper sealing when installing bolts.

1. Install the head gasket (A) on the cylinder (B).



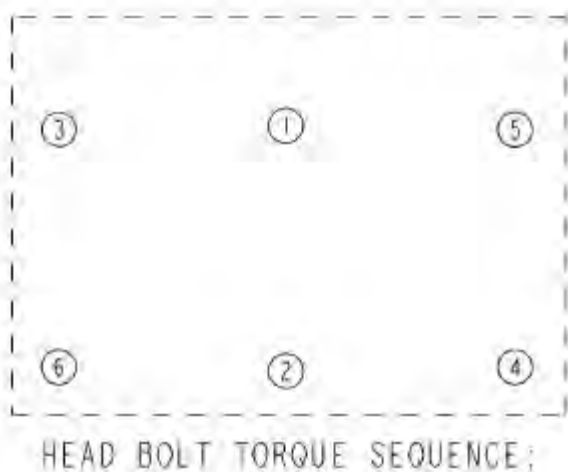
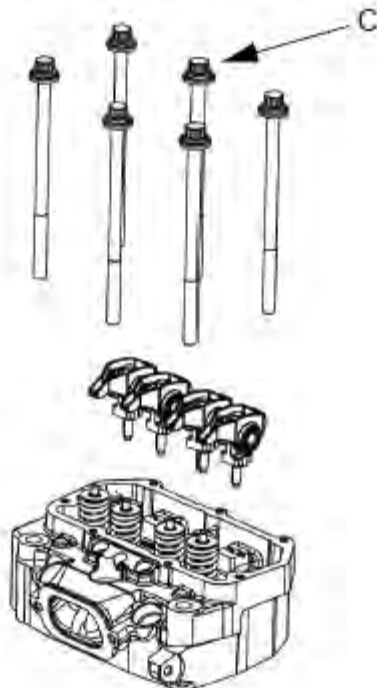
2. Install cylinder head on cylinder.

3

ENGINE

3. Lubricate threads, top of washers and underside of bolt head with engine oil. Install head bolts (C) and torque to specification in sequence.

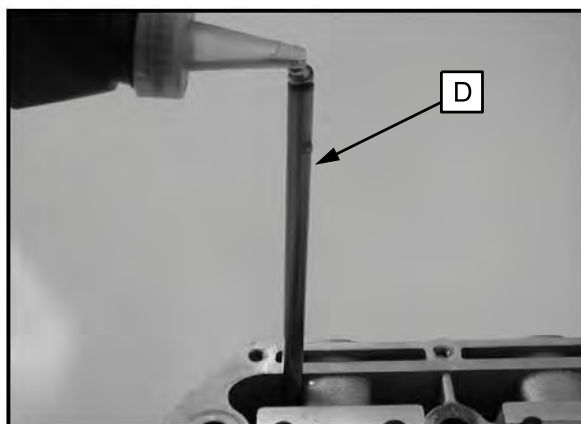
LUBRICATE THREADS WITH ENGINE OIL.
TORQUE TO 15 ± 1.5 FT-LBS. BACK-OFF 5 TURNS.
THEN TORQUE TO 35 ± 4 FT-LBS. IN SEQUENCE BELOW.
FINALLY, TIGHTEN IN SEQUENCE TO 90° (1/4 TURN).



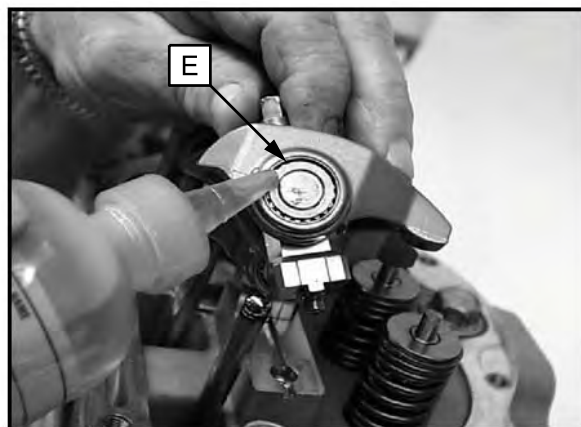
Cylinder Head Bolt Torque:

- 1) Torque to 15 ± 1.5 ft-lbs in sequence
- 2) Back off all head bolts 5 turns in sequence
- 3) Torque to 35 ± 4 ft-lbs in sequence
- 4) Tighten all head bolts in sequence another 90° or (1/4 turn).

4. Lubricate push rods (D) and install into lifters.

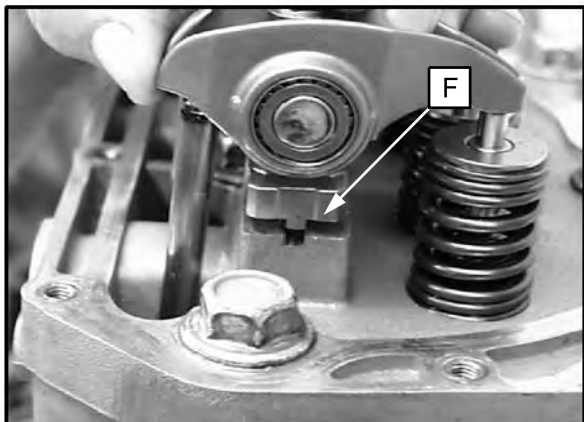


5. Lubricate rockers (E) with engine oil.



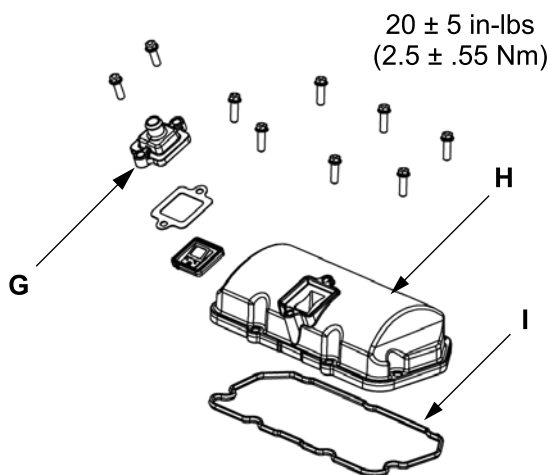
6. Verify pushrods are engaged in lifters.

7. Install rockers. Be sure that tab of fulcrum (F) is seated in head stand-off. Torque bolts to specification.



Rocker Arm Bolts:
 22 ± 2 ft-lbs (30 ± 3 Nm)

8. Install breather reed (G) into rocker cover (H). Lightly apply black RTV sealant to outer edges of breather reed. The reed has a tab and will assemble one-way only. Torque the breather bolts to specification.



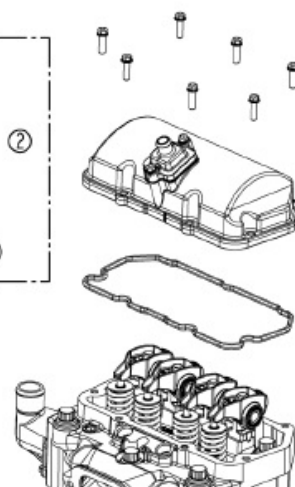
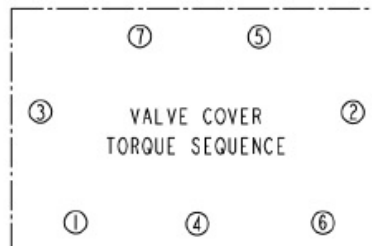
Breather Bolts:
 20 ± 5 in-lbs (2.5 ± 0.55 Nm)

NOTE: When applying RTV, do not get any RTV inside the reed assembly.

9. Place a new seal (I) into the bottom of the cover. Be sure the seal is seated into the cover properly.

IMPORTANT: Before assembly, clean bolts and bolt holes with Loctite Primer N (commercially available) to remove any debris.

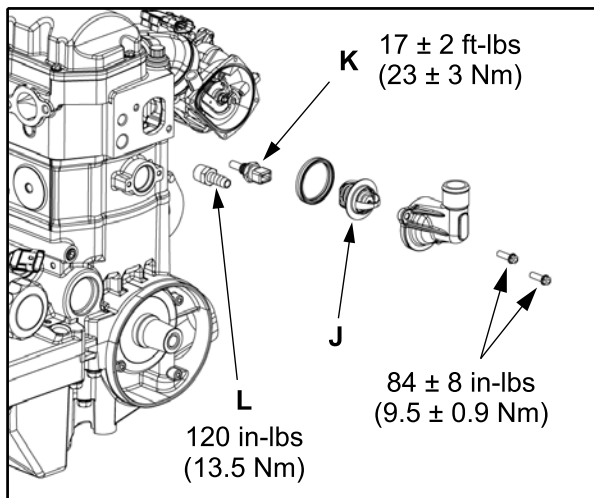
10. Install rocker cover. Torque bolts in sequence to specification.



Rocker Cover Bolts:
 84 ± 8 in-lbs (9.5 ± 0.9 Nm)

ENGINE

11. Install thermostat (J), new O-ring, and thermostat housing. Torque to specification.



= T

Thermostat Housing Bolt:
84 ± 8 in-lbs (9.5 ± 0.9 Nm)

12. Install 3/8" coolant hose fitting (L) and torque to specification.



= T

Engine Coolant Hose Fitting:
120 in-lbs (13.5 Nm)

13. Install coolant temperature sensor (K) and torque to specification.



= T

Engine Temperature Sensor:
17 ± 2 ft-lbs (23 ± 3 Nm)

Oil Pump Priming

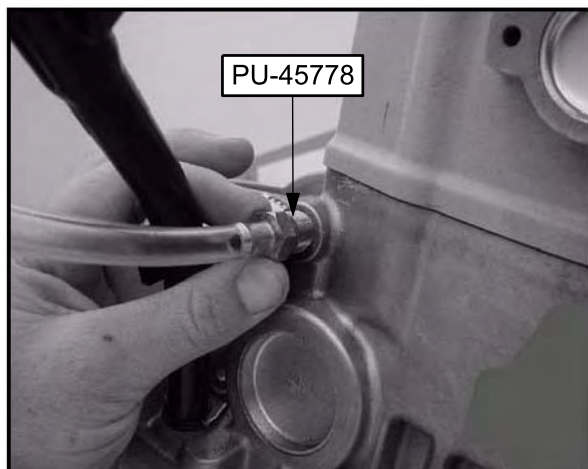
CAUTION

After any reassembly or rebuild, the engine must be primed using the Oil Priming Adapter (PU-45778) and a 3/4-full oil filter before initial start-up. Follow the steps in this section to properly prime the engine and aid proper engine break in. Failure to perform this procedure may cause internal engine damage on initial start-up.

1. After the engine is completely assembled and ready for installation, the engine must be properly primed with engine oil. Fill the oil filter 3/4 full with Polaris PS-4 or PS-4 Extreme Duty Synthetic Engine Oil. Let the oil soak into the filter for 8-10 minutes. Install the filter onto the engine.



2. Remove primer plug from the engine. Install Oil System Priming Adapter (PU-45778) into the oil plug hole. Push 3-5 oz. (approx.) of Polaris PS-4 or PS-4 Extreme Duty engine oil into the adapter or until resistance is felt. Remove the adapter. Apply sealant to the plug threads. Install the plug and torque to specification.



Primer Plug:
18 ± 2 ft-lbs (24.4 ± 2.71 Nm)

Engine Break-In

Refer to “Engine Break-In Period” under “Engine Installation Notes” listed earlier in this chapter.

TROUBLESHOOTING

Engine

Spark Plug Fouling

- Spark plug cap loose or faulty
- Incorrect spark plug heat range or gap
- PVT system calibrated incorrectly/ components worn or mis-adjusted
- Fuel quality poor (old) or octane too high
- Low compression
- Restricted exhaust
- Weak ignition (loose coil ground, faulty coil, or stator)
- Restricted air filter (main or pre-cleaner) or breather system
- Improperly assembled air intake system
- Restricted engine breather system
- Oil contaminated with fuel

Engine Turns Over But Fails To Start

- No fuel
- Dirt in fuel line or filter
- Fuel will not pass through fuel valve
- Fuel pump inoperative/restricted
- Tank vent plugged or pinched
- Engine flooded
- Low compression (high cylinder leakage)
- No spark (spark plug fouled) ignition component failure

Engine Does Not Turn Over

- Dead battery
- Starter motor does not turn
- Engine seized, rusted, or mechanical failure

Engine Runs But Will Not Idle

- Low compression
- Crankcase breather restricted

Engine Idles But Will Not Accelerate

- Spark plug fouled/weak spark
- Broken throttle cable
- Obstruction in air intake

ENGINE

- Air box removed (reinstall all intake components)
- Incorrect ignition timing
- Restricted exhaust system
- Cam worn excessively

Engine Has Low Power

- Spark plug fouled
- Cylinder, piston, ring, or valve wear or damage (check compression)
- PVT not operating properly
- Restricted exhaust muffler
- Cam worn excessively

Piston Failure - Scoring

- Lack of lubrication
- Dirt entering engine through cracks in air filter or ducts
- Engine oil dirty or contaminated

Excessive Smoke and Carbon Buildup

- Excessive piston-to-cylinder clearance
- Wet sumping
- Worn rings, piston, or cylinder
- Worn valve guides or seals
- Restricted breather
- Air filter dirty or contaminated

Piston Failure - Scoring

- Lack of lubrication
- Dirt entering engine through cracks in air filter or ducts
- Engine oil dirty or contaminated

Excessive Smoke and Carbon Buildup

- Excessive piston-to-cylinder clearance
- Wet sumping due to over-full crankcase
- Worn rings, piston, or cylinder
- Worn valve guides or seals
- Restricted breather
- Air filter dirty or contaminated

Low Compression

- Cylinder head gasket leak

- No valve clearance (cam wear)
- Cylinder or piston worn
- Piston rings worn, leaking, broken, or sticking
- Bent valve or stuck valve
- Valve spring broken or weak
- Valve not seating properly (bent or carbon accumulated on sealing surface)
- Rocker arm sticking

Backfiring

- Speed limiter system malfunction
- Fouled spark plug or incorrect plug or plug gap
- Exhaust system air leaks
- Exhaust system air leaks
- Valve sticking
- Ignition system faulty:
- Spark plug cap cracked / broken
- Ignition coil faulty
- Ignition switch circuit faulty
- Poor connections in ignition system
- Ignition timing incorrect
- Sheared flywheel key

Cooling System

Overheating

- Low coolant level
- Air in cooling system
- Wrong type/mix of coolant
- Faulty pressure cap or system leaks
- Restricted system (mud or debris in radiator fins causing restriction to air flow, passages blocked in radiator, lines, pump, or water jacket, accident damage)
- Lean mixture (restricted jets, vents, fuel pump or fuel valve)
- Fuel pump output weak
- Electrical malfunction
- Water pump failure; loose impeller
- Thermistor failure
- Cooling fan inoperative or turning too slowly (perform current draw test)
- Low oil level

- Spark plug incorrect heat range
- Faulty hot light circuit
- Thermostat stuck closed or not opening completely
- Radiator is missing its internal diverter plate not allowing coolant to flow through entire radiator

Temperature Too Low

- Thermostat stuck open

Leak at Water Pump Weep Hole

- Faulty water pump mechanical seal (coolant leak)
- Faulty pump shaft oil seal (oil leak)

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CHAPTER 4

FUEL SYSTEM - GENERAL

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FUEL SYSTEM - GENERAL

GENERAL INFORMATION



WARNING

- * Gasoline is extremely flammable and explosive under certain conditions.
- * EFI components are under high pressure. Verify system pressure has been relieved before disassembly.
- * Never drain the fuel system when the engine is hot. Severe burns may result.
- * Do not overfill the tank. The tank is at full capacity when the fuel reaches the bottom of the filler neck. Leave room for expansion of fuel.
- * Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.
- * Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.
- * If you get gasoline in your eyes or if you should swallow gasoline, seek medical attention immediately.
- * If you spill gasoline on your skin or clothing, immediately wash with soap and water and change clothing.
- * Always stop the engine and refuel outdoors or in a well ventilated area.

Special Tools

PART NUMBER	TOOL DESCRIPTION	
2201519-A	Throttle Position Sensor (TPS) Tester	
	PU-47466	TPS Tester Wire Harness
	547927	TPS Tester Regulator
PU-43506-A	Fuel Pressure Gauge Kit	
PV-48656	Fuel Pressure Gauge Adaptor	
PU-47063-B	Digital Wrench® Diagnostic Software (Includes most recent version of software w/serial number, standard interface cable, USB-Serial Adaptor cable and SmartLink Module Kit)	
PU-47471	Digital Wrench® SmartLink Module Kit (PU-47470, PU-47469, PU-47468)	
	PU-47470	Digital Wrench® PC Interface Cable
	PU-47469	Digital Wrench® Vehicle Interface Cable

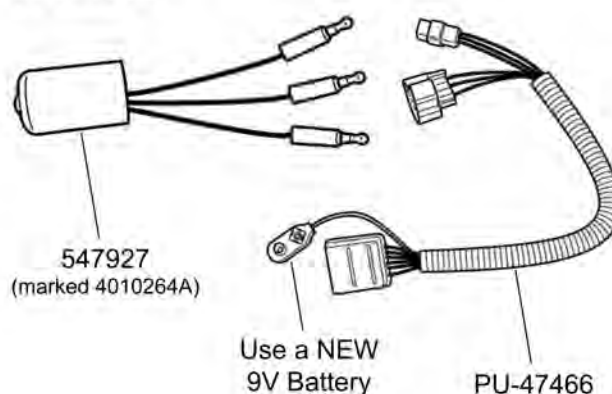
PART NUMBER	TOOL DESCRIPTION	
	PU-47468	Digital Wrench® SmartLink Module

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

Throttle Position Sensor (TPS) Tester - 2201519-A

This tester allows the use of a digital multi-meter to test TPS function as well as perform the TPS adjustment procedure.

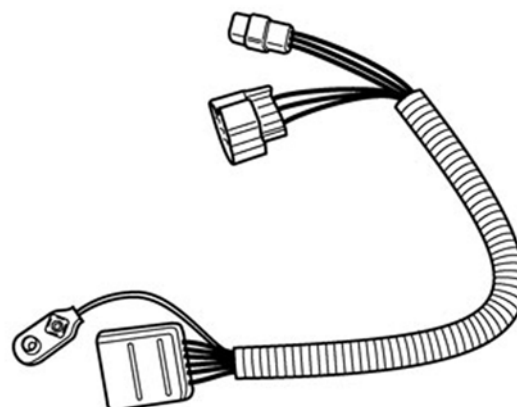
2201519-A



4

TPS Tester Wire Harness - PU-47466

This TPS wire harness is part of 2201519-A and incorporates two TPS connectors to allow for multi-use applications.

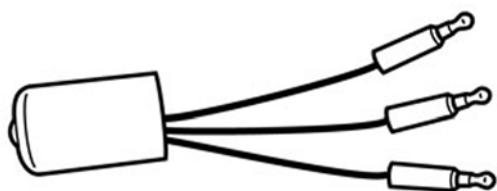


FUEL SYSTEM - GENERAL

NOTE: Voltage Regulator (547927) is required if using TPS Tester Wire Harness (PU-47466). You may already have this regulator (marked 4010264) as part of another TPS Tester Kit. If you do not have this regulator, you must order one from Bosch Automotive Service Solutions at 1-800-328-6657.

TPS Tester Regulator - 547927

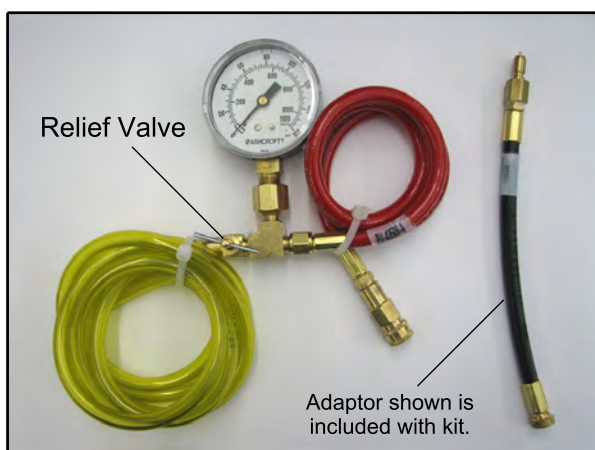
This tester regulator is part of 2201519-A. It regulates the 9 volt battery voltage to a 5 volt reference input, required when using the TPS Tester Wire Harness (PU-47466).



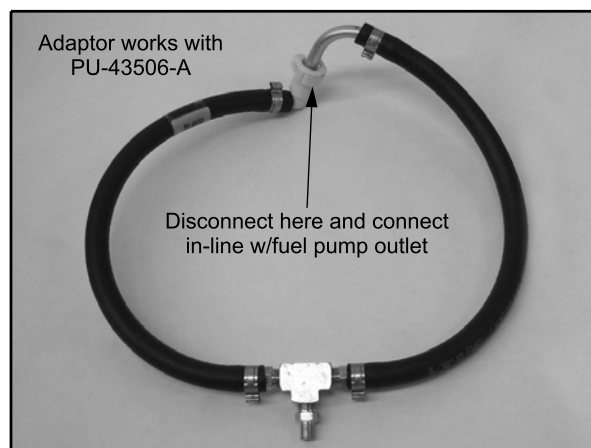
NOTE: You may already have this regulator (marked 4010264) as part of another TPS Tester Kit. If you do not have this regulator, you must order one from Bosch Automotive Service Solutions at 1-800-328-6657.

Fuel Pressure Gauge Kit - PU-43506-A

IMPORTANT: The EFI fuel system remains under high pressure, even when the engine is not running. Before attempting to service any part of the fuel system, pressure must be relieved (if applicable). The Fuel Pressure Gauge Kit has an integrated pressure relief valve that can be used to bleed off pressure once you have completed the fuel pressure test.



Fuel Pressure Gauge Adaptor - PV-48656



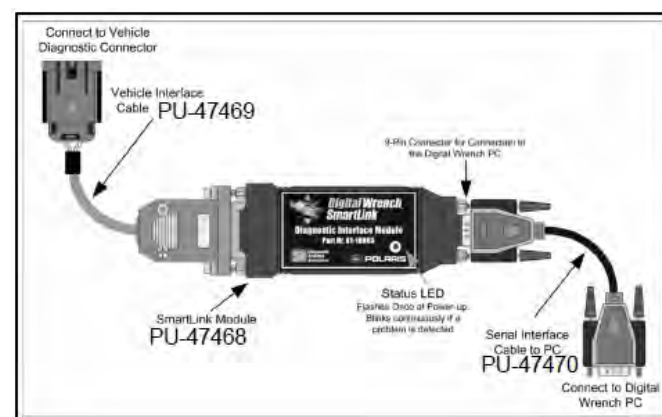
Digital Wrench® Diagnostic Software - PU-47063-B

This dealer-only software installs on laptop computers equipped with a CD drive and is designed to replace multiple shop tools often used to test EFI components. It also includes step-by-step diagnostic procedures to aid technician repair and troubleshooting.

IMPORTANT: If the PC you are using is not equipped with a 9-pin serial port, a USB to serial port adaptor will be necessary. A USB to serial port adaptor can be purchased through DSA at: www.diagsys.com

Digital Wrench® SmartLink Module Kit - PU-47471

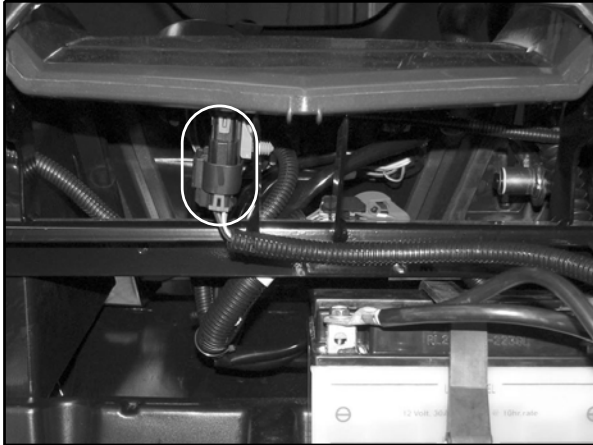
This module kit contains the necessary cables and hardware to communicate between the vehicle ECU and the Digital Wrench® diagnostic software. Polaris dealers can also order the following kit components separately: **SmartLink Module PU-47468**, **Vehicle Interface Cable PU-47469** and **PC Interface Cable PU-47470**. This module kit is used on all 8 pin connector-based Polaris EFI systems. This kit is available to Polaris dealers through our tool supplier Bosch Automotive Service Solutions at <http://polaris.service-solutions.com> or 1-800-328-6657.



FUEL SYSTEM - GENERAL

Digital Wrench® - Diagnostic Connector

Located under the hood connected to a sealed plug.

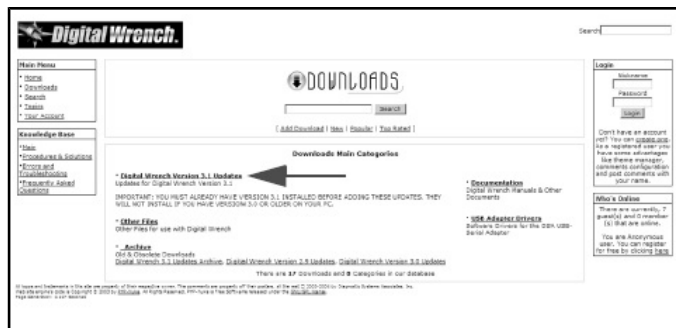


Digital Wrench® - Download Website

Located at: www.polaris.diaagsys.com



Download Digital Wrench® Updates:



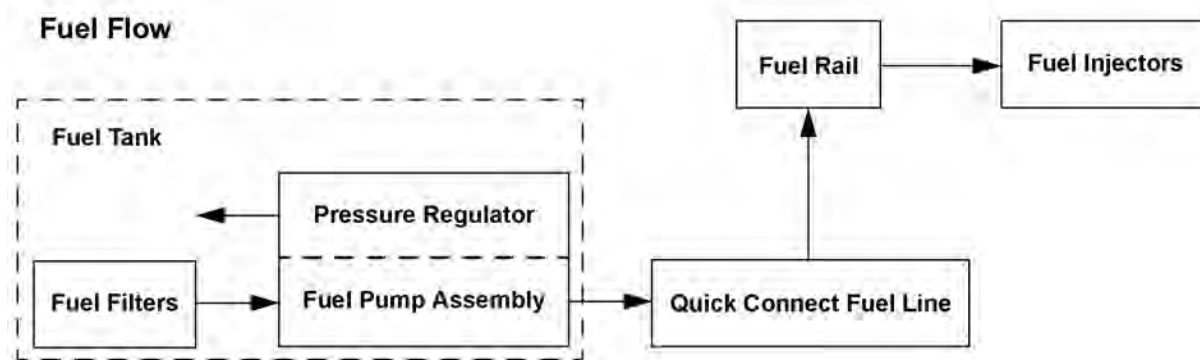
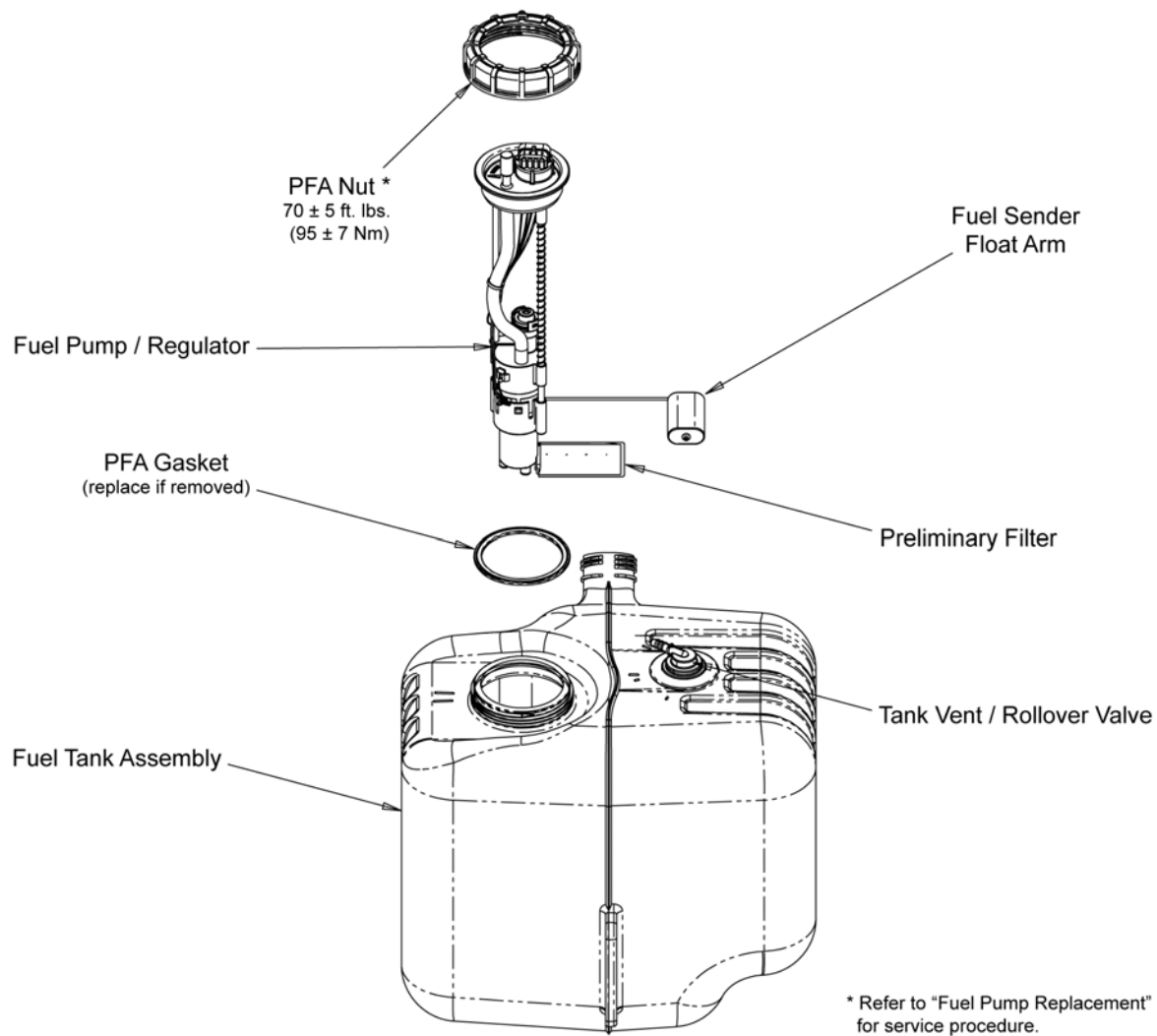
IMPORTANT: For the most recent information on Digital Wrench® software and update downloads please visit the website: www.polaris.diaagsys.com

EFI Service Notes

- For more convenient and accurate testing of EFI components, it is recommended dealers utilize the Digital Wrench® Diagnostic Software (dealer only), or testing may be done manually using the procedures provided.
- 80% of all EFI problems are caused by wiring harness connections.**
- For the purpose of troubleshooting difficult running issues, a known-good ECU from another *RANGER* 800 EFI of the same model and year may be used without damaging system or engine components.
- Never attempt to service any fuel system component while engine is running or ignition switch is "on."
- Cleanliness is essential and must be maintained at all times when servicing or working on the EFI system. Dirt, even in small quantities, can cause significant problems.
- Do not use compressed air if the system is open. Cover any parts removed and wrap any open joints with plastic if they will remain open for any length of time. New parts should be removed from their protective packaging just prior to installation.
- Clean any connector before opening to prevent dirt from entering the system.
- Although every precaution has been taken to prevent water intrusion failure, avoid direct water or spray contact with system components.
- Do not disconnect or reconnect the wiring harness connector to the control unit or any individual components with the ignition "on." This can send a damaging voltage spike through the ECU.
- Do not allow the battery cables to touch opposing terminals. When connecting battery cables attach the positive (+) cable to positive (+) battery terminal first, followed by negative (-) cable to negative (-) battery terminal.
- Never start the engine when the cables are loose or poorly connected to the battery terminals.
- Never disconnect battery while engine is running.
- Never use a battery boost-pack to start the engine.
- Do not charge battery with key switch "on."
- Always disconnect negative (-) battery cable lead before charging battery.
- Always unplug ECU from the wire harness before performing any welding on the unit.

FUEL SYSTEM - GENERAL

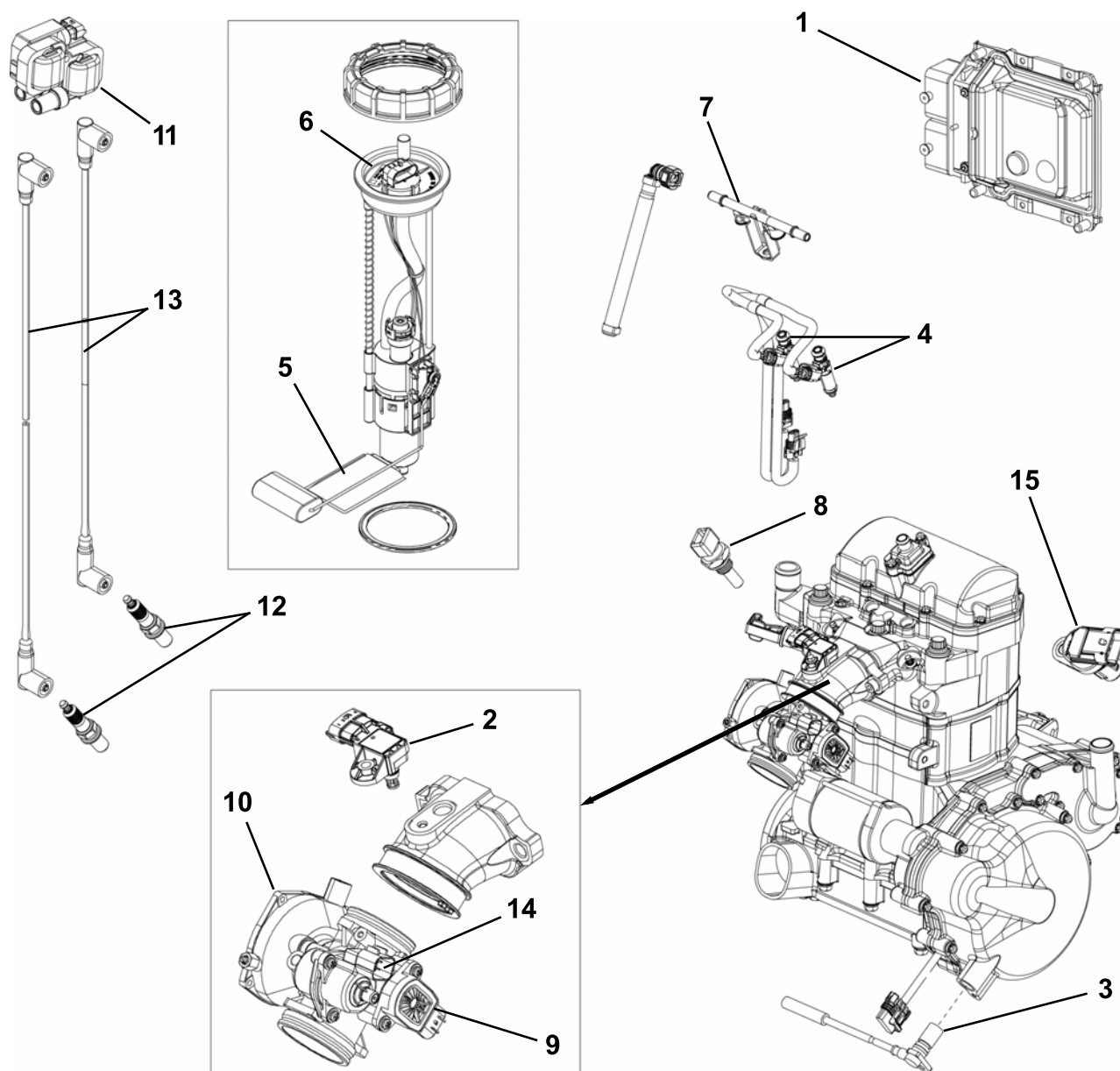
Fuel Tank Exploded View



EFI System Exploded View

1. Electronic Control Unit (ECU)
2. Temperature / Manifold Absolute Pressure Sensor (T-MAP)
3. Crankshaft Position Sensor (CPS)
4. Fuel Injectors
5. Fuel Filter
6. Fuel Pump / Regulator / Fuel Level Sender (located in fuel tank)
7. Fuel Rail
8. Engine Coolant Temperature Sensor (ECT)
9. Throttle Position Sensor (TPS)
10. Throttle Body
11. Ignition Coil
12. Spark Plugs

13. Spark Plug Wires
14. Idle Air Control (IAC)
15. Camshaft Phase Sensor

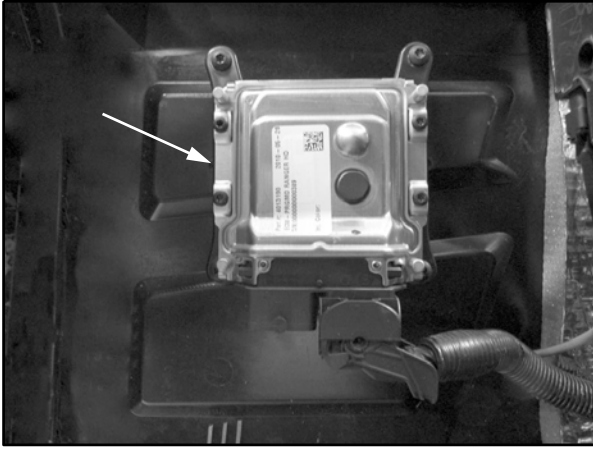


FUEL SYSTEM - GENERAL

EFI System Component Locations

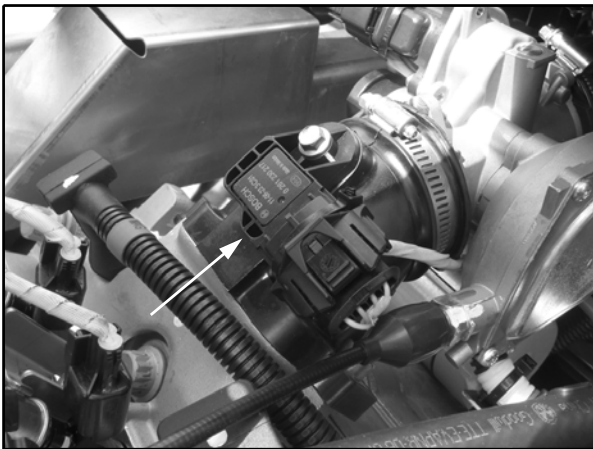
1. **Electronic Control Unit (ECU)**

- Located under the seat on the drivers side, mounted to the rear floor panel.



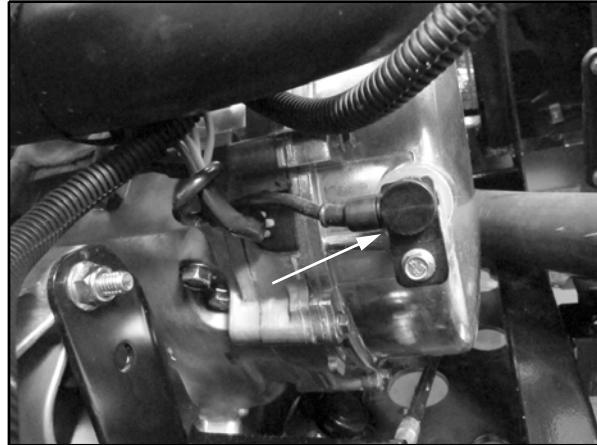
2. **Temperature and Manifold Absolute Pressure Sensor (T-MAP)**

- Located in the rubber intake boot between the throttle body and the cylinder head.



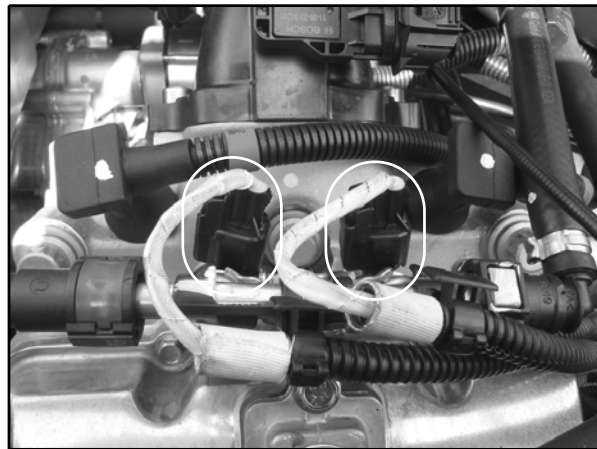
3. **Crankshaft Position Sensor (CPS)**

- Located in the magneto cover on the right-hand side of the engine.



4. **Fuel Injectors / Fuel Rail**

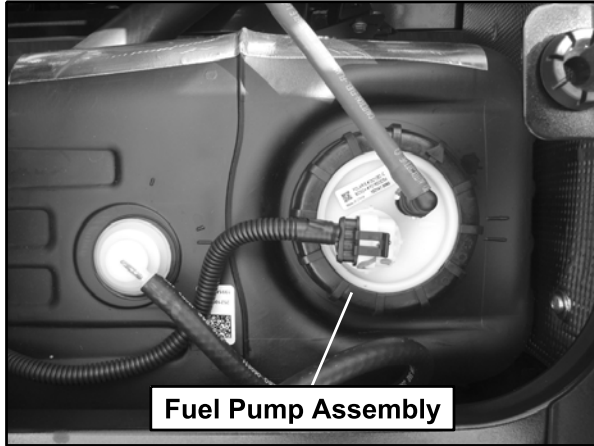
- Attached to the fuel rail located in the intake track of the cylinder head.



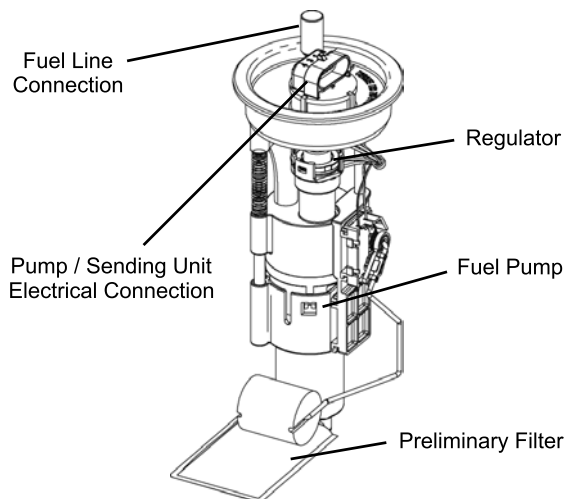
FUEL SYSTEM - GENERAL

5. **Fuel Pump / Regulator / Fuel Gauge Sender Assembly**

- Located under the seat base on the passenger side. Located in the fuel tank as an assembly.

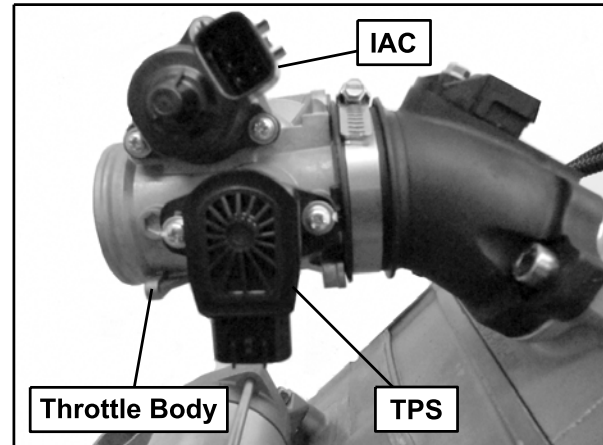


Located in Fuel Tank



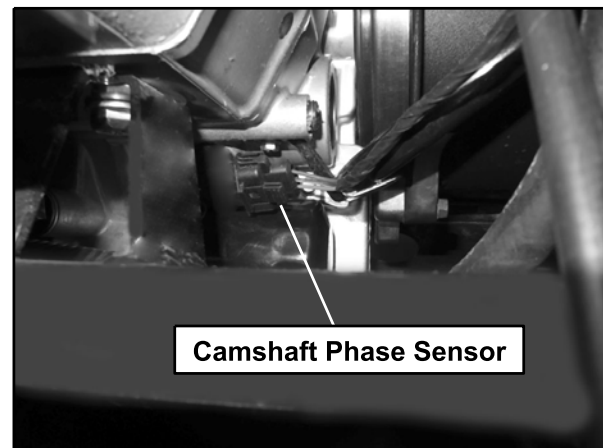
8. **Idle Air Control Motor (IAC)**

- Located on the upper right-hand side of the throttle body above the TPS.



9. **Camshaft Phase Sensor**

- Located in the engine block above the oil filter.



6. **Throttle Body**

- Located between the rubber air box boot and rubber cylinder head adaptor.

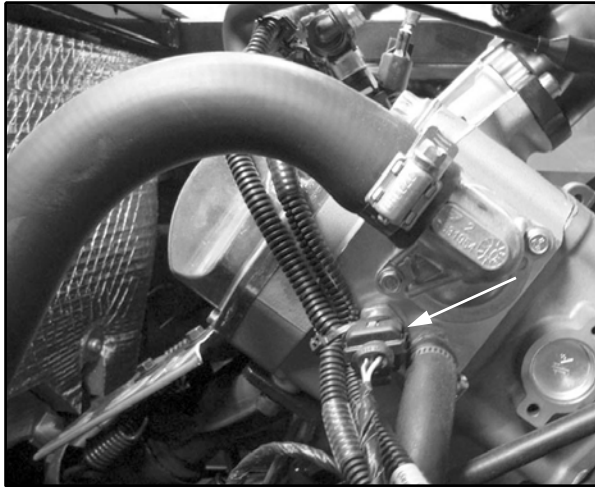
7. **Throttle Position Sensor (TPS)**

- Located on the right-hand side of the throttle body below the IAC motor.

FUEL SYSTEM - GENERAL

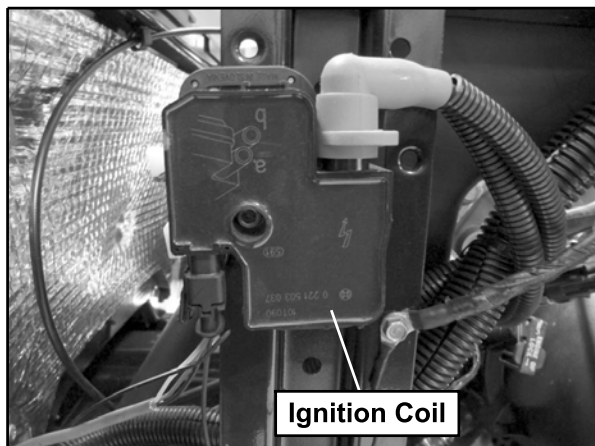
10. Engine Coolant Temperature Sensor (ECT)

- Located in the cylinder head next to the thermostat housing.

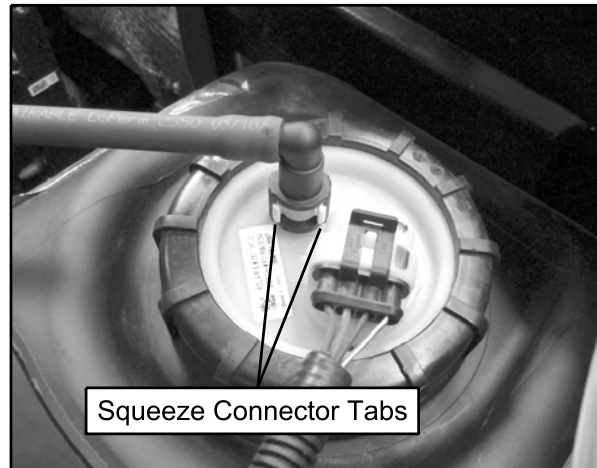


11. Ignition Coil

- Located under the seat on the drivers side, mounted on the vertical frame member.



2. Squeeze the connector tabs together and slide the white retainer forward.



3. Lift up on the fuel line to remove from the fuel pump outlet.
4. To install the line, verify the connector and fuel pump outlet are clean and free of debris.
5. Place the connector end over the fuel pump outlet and push the white retainer and tabs back into place.
6. Repeat this process to remove the fuel line from the fuel rail.

Fuel Line Removal / Installation

RANGER EFI models use quick connect fuel lines. Refer to the steps for fuel line removal / installation:



CAUTION

Verify fuel system has been depressurized before performing this procedure.

1. Thoroughly clean the connector and place a shop towel around the fuel line to catch any dripping fuel.

ELECTRONIC FUEL INJECTION

Principal Components

The Electronic Fuel Injection (EFI) system is a complete engine fuel and ignition management design. This system includes the following principal components:

- Fuel Pump
- Fuel Rail
- Fuel Line(s)
- Fuel Filter(s)
- Fuel Injectors
- Pressure Regulator
- Throttle Body / Intake Manifold
- Engine Control Unit (ECU)
- Ignition Coils
- Engine Coolant Temperature Sensor (ECT)
- Throttle Position Sensor (TPS)
- Crankshaft Position Sensor (CPS)
- Temperature and Manifold Absolute Pressure Sensor (T-MAP)
- Camshaft Phase Sensor
- Idle Air Control Motor (IAC)
- Wire Harness Assembly
- Check Engine Light

EFI Operation Overview

The EFI system is designed to provide peak engine performance with optimum fuel efficiency and lowest possible emissions. The ignition and injection functions are electronically controlled, monitored and continually corrected during operation to maintain peak performance.

The central EFI component is the Bosch Electronic Control Unit (ECU) which manages system operation, determining the best combination of fuel mixture and ignition timing for the current operating conditions.

An in-tank electric fuel pump is used to move fuel from the tank through the fuel line, to the fuel rail. The in-tank fuel pressure regulator maintains a system operating pressure and returns any excess fuel back into the tank. At the engine, fuel is fed through the fuel rail and into the injectors, which inject into the intake ports. The ECU controls the amount of fuel by varying the length of time that the injectors are "on." This range can vary depending on fuel requirements. The controlled injection of the fuel occurs every other crankshaft revolution, or once for each 4-stroke cycle. The total amount of fuel

needed for one firing of a cylinder is injected during each cycle. When the intake valve opens, the fuel/air mixture is drawn into the combustion chamber, ignited and burned.

The ECU controls the amount of fuel being injected and the ignition timing by monitoring the primary sensor signals for intake air temperature, manifold absolute pressure (load), engine temperature, speed (RPM), camshaft position and throttle position. These primary signals are compared to the programming in the ECU computer chip, and the ECU adjusts the fuel delivery and ignition timing to match the values.

During operation, the ECU has the ability to re-adjust temporarily; providing compensation for changes in overall engine condition and operating environment, so it will be able to maintain the ideal air/fuel ratio.

During certain operating periods such as cold starts, warm up, acceleration, etc., a richer air / fuel ratio is automatically calculated by the ECU.

Initial Priming / Starting Procedure

NOTE: The injection system must be purged of all air prior to the initial start up, and / or any time the system has been disassembled.

If the EFI system is completely empty of fuel or has been disassembled and repaired:

1. Cycle the key switch from "OFF" to "ON" 6 times, waiting for approximately 3 seconds at each "ON" cycle to allow the fuel pump to cycle and shut down.
2. Once step 1 is completed, turn the key switch to "START" until the engine starts or 5 seconds has passed.
3. If the engine failed to start, repeat step 1 for 2 more cycles and attempt to start the engine.

If the engine fails to start, a problem may still exist, and should be diagnosed.

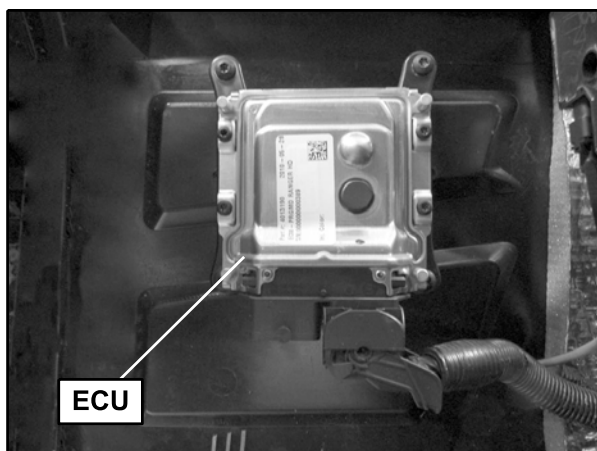
NOTE: Accurate testing of EFI components is recommended utilizing the Digital Wrench® Diagnostic Software (dealer only).

FUEL SYSTEM - GENERAL

ELECTRONIC CONTROL UNIT (ECU)

Operation Overview

The ECU is the brain or central processing computer of the entire EFI fuel/ignition management system. During operation, sensors continuously gather data which is relayed through the wiring harness to input circuits within the ECU. Signals to the ECU include: ignition (on/off), crankshaft position and speed (RPM), camshaft position (MAG/PTO), throttle position, engine coolant temperature, intake air temperature, intake manifold absolute pressure and battery voltage. The ECU compares the input signals to the programmed maps in its memory and determines the appropriate fuel and spark requirements for the immediate operating conditions. The ECU then sends output signals to set the injector duration and ignition timing.



During operation, the ECU continually performs a diagnostic check of itself, each of the sensors, and system performance. If a fault is detected, the ECU turns on the "Check Engine" light in the speedometer and stores the fault code in its fault memory. Depending on the significance or severity of the fault, normal operation may continue, or "Fail-Safe" operation (slowed speed, richer running) may be initiated. A technician can determine the cause of the "Check Engine" light by referencing the "Instrument Cluster Trouble Code Display" and "Diagnostic Trouble Code Table" or by using Digital Wrench®. The ECU requires a minimum of 7.0 volts to operate. The memory in the ECU is operational the moment the battery cables are connected.

To prevent engine over-speed and possible failure, an RPM limiting feature is programmed into the ECU. If the maximum RPM limit is exceeded, the ECU suppresses the injection signals, cutting off the fuel flow and retards the ignition timing. This process repeats itself in rapid succession, limiting operation to the preset maximum.

**Engine RPM Limit:
6500 RPM**

ECU Service

Never attempt to disassemble the ECU. It is sealed to prevent damage to internal components. Warranty is void if the case is opened or tampered with in any way.

All operating and control functions within the ECU are pre-set. No internal servicing or readjustment may be performed. If a problem is encountered, and you determine the ECU to be faulty, contact the Polaris Service Department for specific handling instructions. Do not replace the ECU without factory authorization.

The relationship between the ECU and the throttle position sensor (TPS) is very critical to proper system operation. If the TPS is faulty, or the mounting position of the TPS to the throttle body is altered, the TPS must be adjusted.

For the purpose of troubleshooting, a known-good ECU from another Polaris *RANGER* 800 EFI of the same model may be used without system or engine component damage.

ECU Replacement

1. Remove the (4) retaining screws holding the ECU.
2. With the ignition turned off, disconnect the wire harness from the ECU.
3. To install, reverse the procedures and tighten screws to specification.



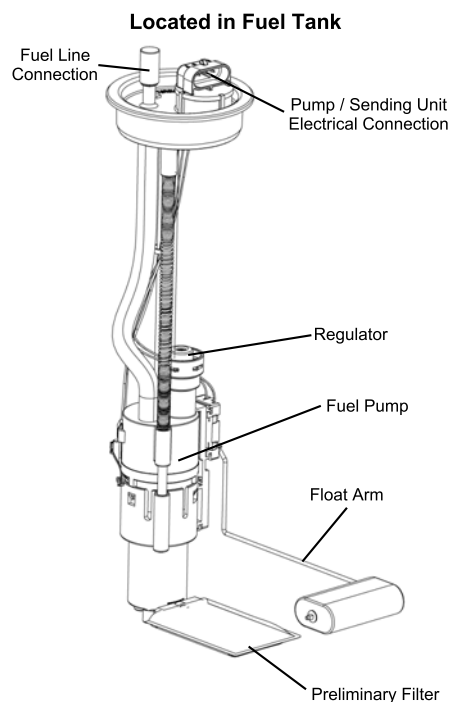
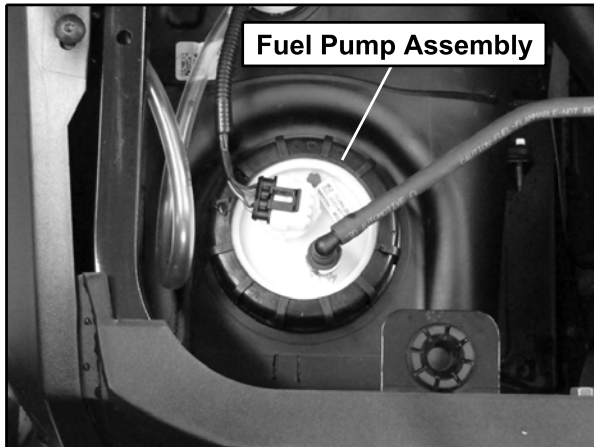
**ECU Retaining Screws:
10 in-lbs (1.1 Nm)**

FUEL SYSTEM - GENERAL

FUEL PUMP

Operation Overview

An electric fuel pump assembly is used to transfer fuel to the EFI system from inside the fuel tank. This assembly includes the fuel pump, fuel filters, regulator and fuel gauge sender. The pump is rated for a minimum output of 35 liters per hour at 58 +/- 2 psi (400 +/- 14 kPa) and has two non-serviceable fuel filters.



When the key switch is turned to "ON", the ECU activates the fuel pump, which pressurizes the system for start-up.

The ECU switches off the pump preventing the continued delivery of fuel in these instances:

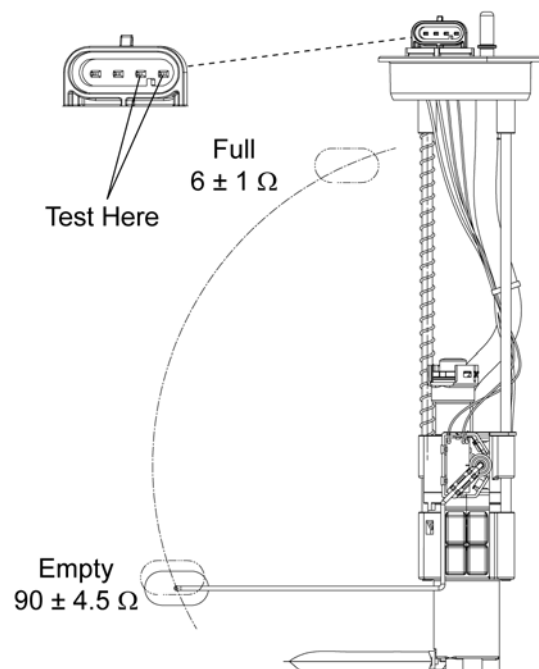
- If the key switch is not promptly turned to the "start" position.
- If the engine fails to start.
- If the engine is stopped with the key switch "on" (as in the case of an accident).

In these situations, the "check engine" light will turn on, but turn off after 4 cranking revolutions if system function is OK. Once the engine is running, the fuel pump remains on.

Fuel Sender Test

If the fuel gauge reading on the instrument cluster is not working, or if the display reading differs in large comparison to the fuel in the tank, perform a resistance test on the fuel sender.

Disconnect the fuel pump / sending unit connection and measure the resistance (see chapter 10 "Fuel Sender Testing"). If out of specification, replace the fuel pump assembly.



Fuel Sender Resistance Specifications:
Full: $6 \pm 1 \Omega$
Empty: $90 \pm 4.5 \Omega$

FUEL SYSTEM - GENERAL

Fuel Pump Test

If a fuel delivery problem is suspected, make certain the fuel pump filters are not plugged, that the pump is being activated through the ECU, all electrical connections are properly secured, the fuses are good, and a minimum of 7.0 volts is being supplied. If during starting the battery voltage drops below 7.0 volts, the ECU will fail to operate the system.

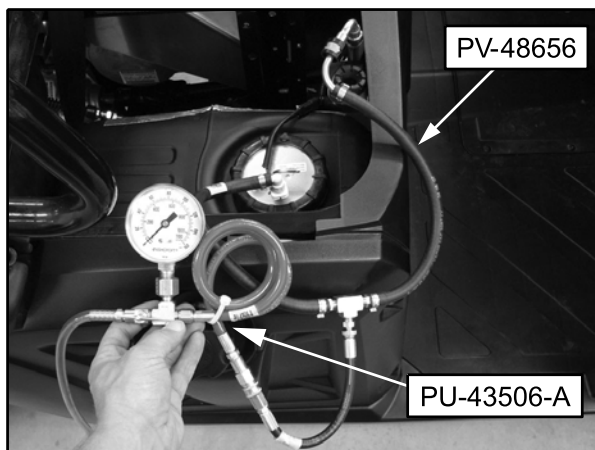


WARNING

Fuel is extremely flammable and may cause severe burns, injury, or death.

Do not use any device that produces a flame or electrical devices that may spark around fuel or fuel vapors.

1. Remove the seat base to access the fuel pump.
2. Cover the fuel line connection with a shop towel and disconnect the fuel line from the fuel pump.
3. Install the Fuel Pressure Gauge Adaptor (PV-48656) in-line between the fuel pump outlet and fuel line.
4. Connect the hose from the Fuel Pressure Gauge Kit (PU-43506-A) to the test valve on the Fuel Pressure Gauge Adaptor (PV-48656). Route the clear hose into a portable gasoline container or the vehicle's fuel tank.

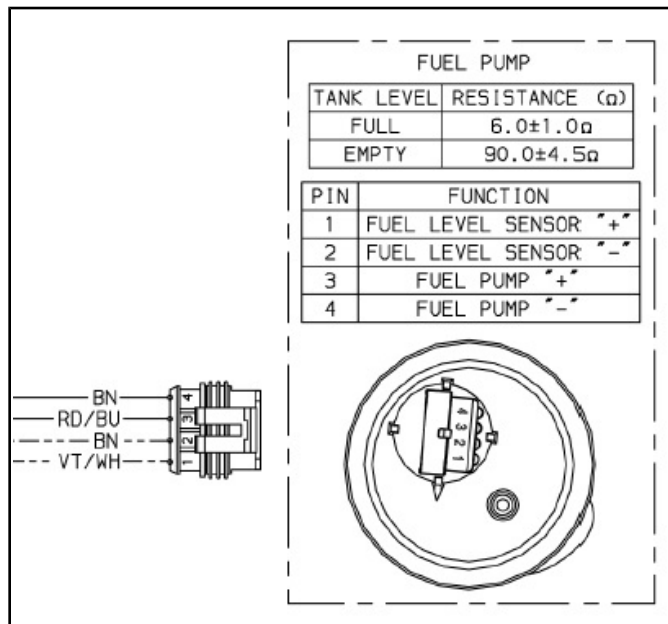


5. Turn on the key switch to activate the pump and check the system pressure on the gauge. If specified system pressure is observed, the ignition switch, ECU, fuel pump, and pressure regulator are working properly. Turn the key switch off and depress the valve button on the tester to relieve the system pressure.

Fuel Pump Pressure: 58 ± 2 psi (400 ± 14 kPa)

NOTE: If the fuel pressure is out of specification, replace the fuel pump assembly.

6. If the pump did not activate (Step 5), disconnect the harness connector from the fuel pump. Connect a DC voltmeter across terminals "3" and "4" in the plug on the vehicle fuel pump harness. Turn on the key switch and observe voltage to ensure a minimum of 7 volts is present.



NOTE: If the voltage was below 7 VDC, test the battery, ignition switch, relay(s), wiring harness and ECU.

7. If the reading is between 7 and 14 volts, turn key switch off and connect an ohmmeter between terminals "3" and "4" at the white fuel pump connector to check for continuity within the fuel pump.

NOTE: If there was no continuity between the pump terminals, replace the fuel pump assembly.

FUEL SYSTEM - GENERAL

8. If voltage at the plug was within the specified range, and there was continuity across the pump terminals, reconnect the plug to the fuel pump, making sure you have a clean connection. Turn on the key switch and listen for the pump to activate.

NOTE: If the pump starts, repeat steps 3, 4 and 5 to verify correct pressure.

9. If the pump still does not operate, check for correct ECU operation by plugging in a known-good ECU of the same model.

NOTE: If the pump still does not operate, replace the fuel pump assembly.

4. While holding a shop towel over the fuel line connector, disconnect the quick connect fuel line from the fuel pump.



CAUTION

It is possible for pressurized fuel to be present when disconnecting the fuel line. It is recommended to allow the vehicle to sit for a period of one hour after shutting off the engine before servicing the fuel pump. This allows the exhaust to cool and fuel pressure to drop.

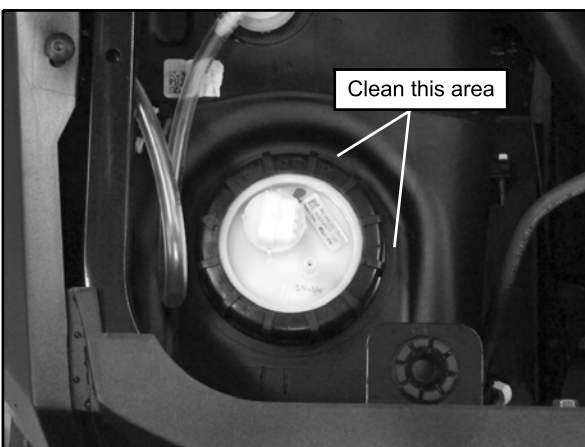
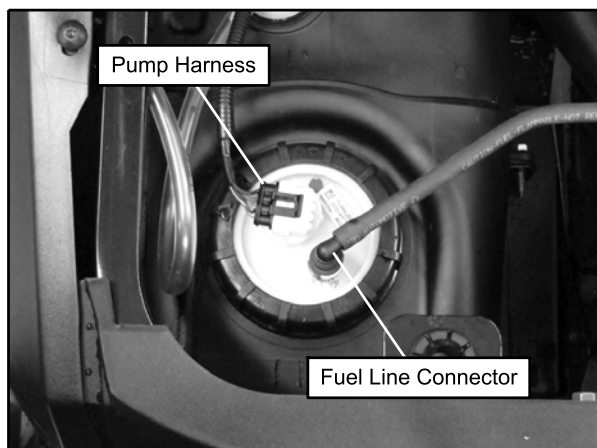
Fuel Pump Replacement



WARNING

Always wear safety goggles when working with high pressure or flammable fluids. Failure to do so could result in serious injury or complications.

1. Remove the lower seat base to access the fuel pump.
2. Ensure that static has been discharged by touching a ground source such as the engine or frame.
3. Disconnect the fuel pump electrical harness.



NOTE: A small amount of fuel may come out of the fuel line or tank. Properly drain fuel into a suitable container.

5. Be sure the top of the fuel tank is clean. If it requires cleaning, hand wash the top of the tank to ensure no debris will enter the fuel system when the fuel pump is removed.

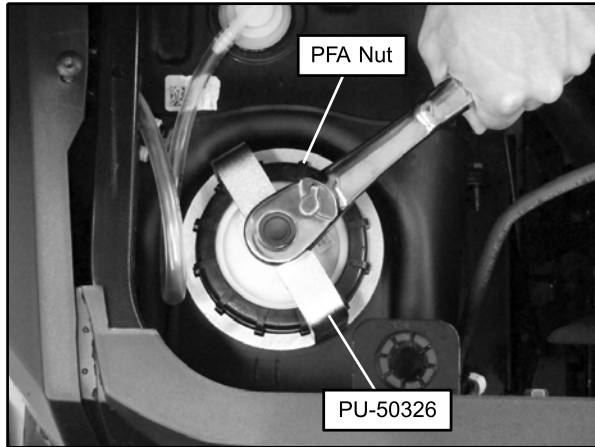
CAUTION

Failure to clean area around fuel pump may lead to debris entering the fuel tank during service. Excessive debris in fuel tank may cause premature wear of fuel pump and/or clogging of internal fuel filters.

4

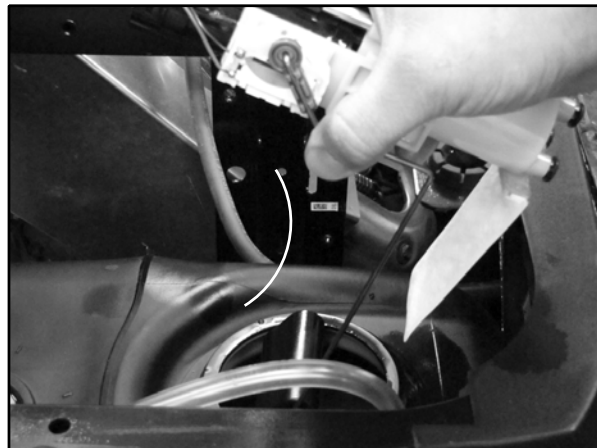
FUEL SYSTEM - GENERAL

6. Place the Fuel Pump Service Tool (PU-50326) over the fuel pump PFA nut. Using a 1/2" drive ratchet or breaker bar, loosen and remove the PFA nut. Discard the PFA nut.



NOTE: Apply downward force on the fuel pump flange while removing the fuel pump PFA nut.

7. Carefully lift the fuel pump out of the fuel tank. As the fuel pump assembly is being removed, be aware of float arm and pump pre-filter. Hold the float arm to the pump body as you lift and tilt the pump to ensure that the float arm is not bent when removed from the tank.



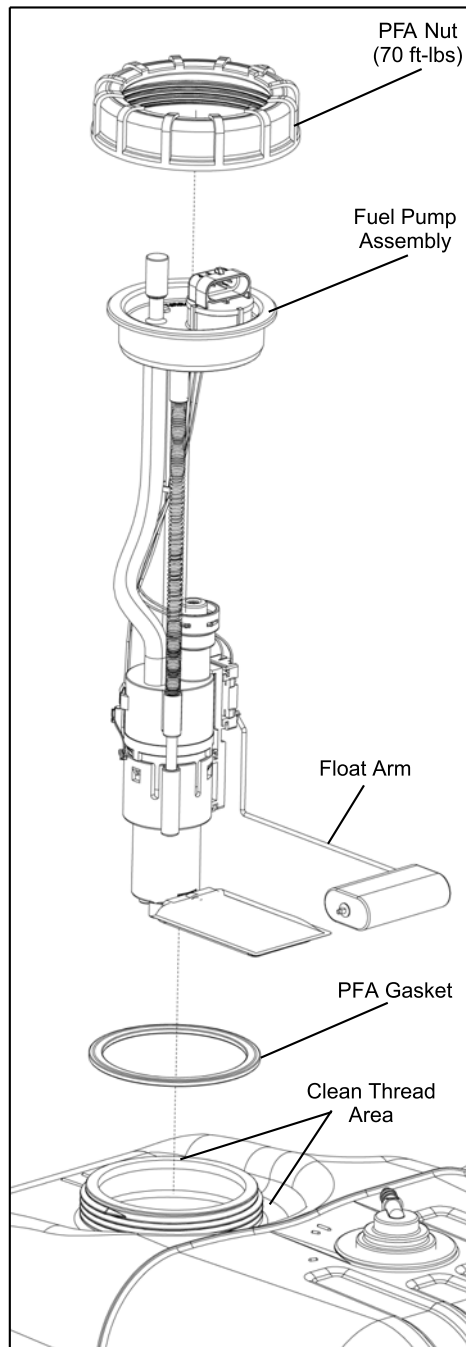
8. Transfer old fuel pump to a suitable container capable of safely holding fuel. The fuel pump will retain some fuel.
9. Inspect the inside of the fuel tank for debris (may require flashlight and mirror). If debris like mud or sand is present, fuel tank should be flushed and cleaned out prior to installation of new fuel pump assembly.

IMPORTANT: It is recommended to remove the fuel tank from the vehicle and rinse it with a small amount of clean fuel. Do not use water or any other chemicals to remove debris.

10. Remove new fuel pump assembly, gasket and PFA nut from packaging. Use care not to bend float arm during un-packaging. Do not lift or carry fuel pump assembly by the float arm.

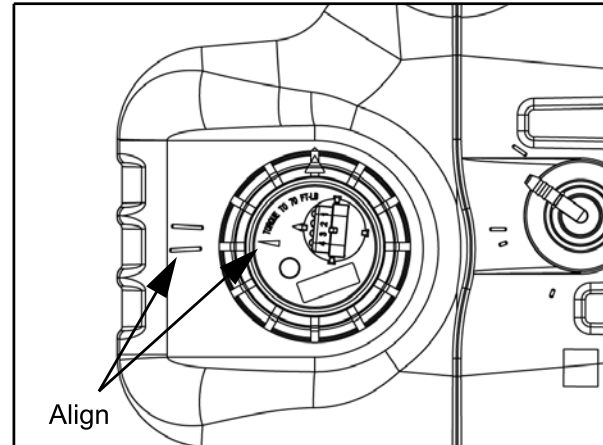
FUEL SYSTEM - GENERAL

11. Use cleaning wipes provided to clean fuel tank surface and threads. Remove all debris, grease and oil. Allow surfaces to dry completely.
12. Install new PFA gasket onto fuel pump assembly using care not to damage gasket or bend float arm.



13. Install fuel pump into fuel tank, hold float arm to the pump body and tilt assembly to ensure float arm does not get caught or bent during installation.
14. Gently push down on fuel pump flange ensuring flange is centered.

15. Roughly align orientation mark on fuel pump with orientation marks on fuel tank to ensure float arm does not get bent or snagged.



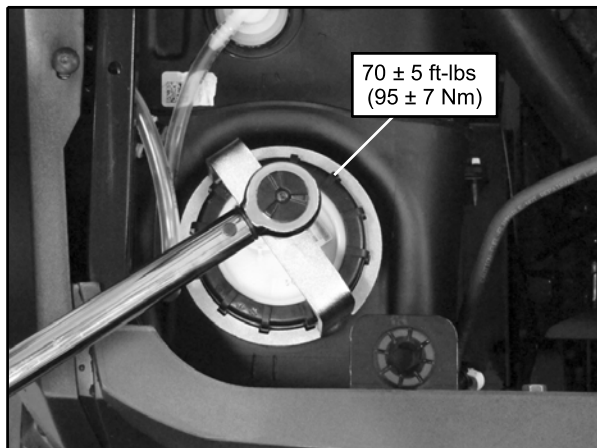
CAUTION

Failure to align the orientation marks may lead to interferences with the fuel level float arm and cause incorrect function.

16. While maintaining downward pressure, thread new PFA nut onto fuel tank and hand tighten. Use care when starting PFA nut, ensuring threads are properly aligned. Verify orientation marks are still aligned between fuel pump and fuel tank.

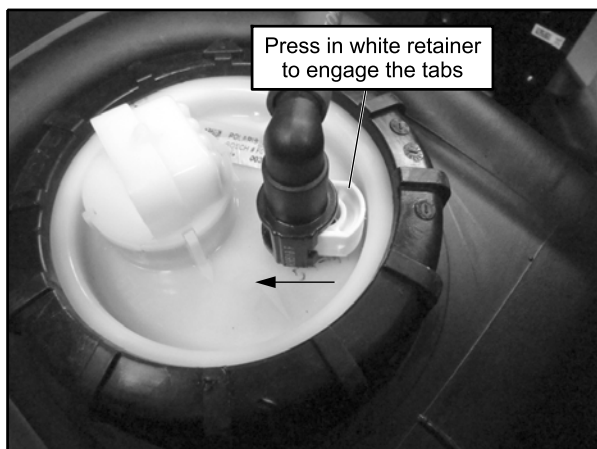
FUEL SYSTEM - GENERAL

17. Torque PFA nut to specification using the Fuel Pump Service Tool (PU-50326), 3 in. extension and a calibrated torque wrench.



Fuel Pump PFA Nut:
70 ± 5 ft-lbs (95 ± 7 Nm)

18. Verify alignment of fuel pump and tank orientation marks.
19. Connect the fuel line to the fuel pump outlet.



IMPORTANT: Be sure to engage the white retainer on fuel line until it snaps into place. Pull on fuel line lightly to confirm connection.

20. Connect the fuel pump electrical harness.
21. Install the lower seat base.

22. Test the fuel pump by turning on the key and listening for the pump to activate. Cycle the key several times to prime the system.

Fuel Tank Removal

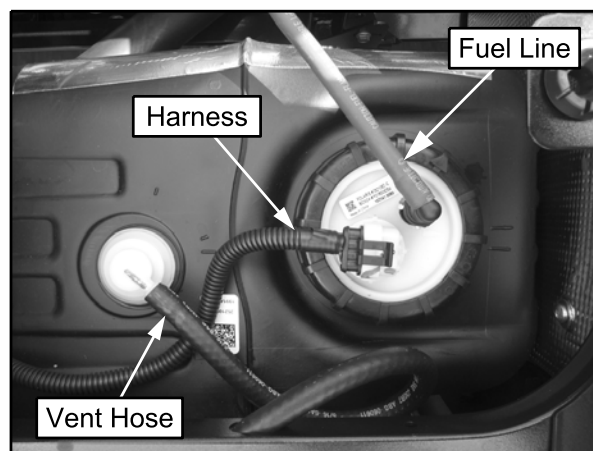


WARNING

Always wear safety goggles when working with high pressure or flammable fluids. Failure to do so could result in serious injury or complications.

NOTE: Syphon as much fuel from the tank as possible before attempting to remove it from the vehicle.

1. Open hood and disconnect the negative (-) battery cable.
2. Remove the lower seat base.
3. Disconnect the fuel line and electrical harness from the fuel pump.

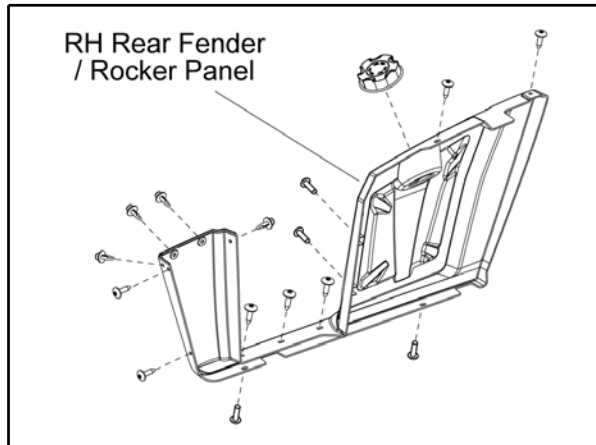


NOTE: A small amount of fuel may come out of the fuel line or tank. Plug the fuel line and tank inlet or use a shop towel during removal.

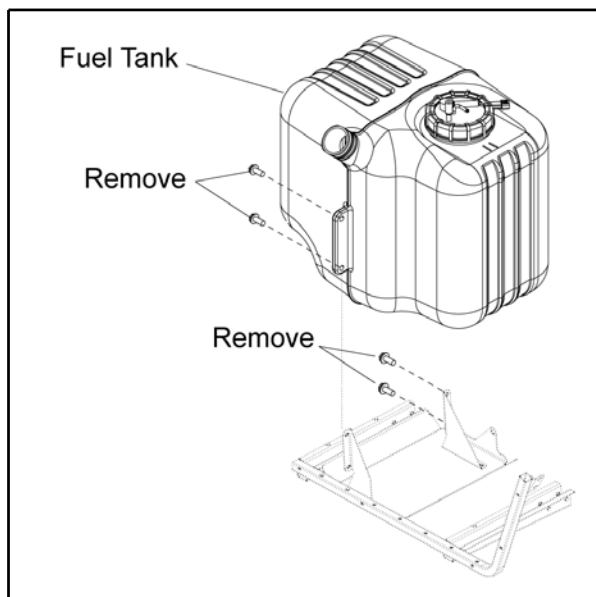
4. Remove the fuel tank vent hose.

FUEL SYSTEM - GENERAL

5. Remove the right rear fender/rocker panel assembly and the fuel cap. Reinstall the fuel cap after the fender/rocker panel has been removed.



6. Remove the (4) bolts retaining the fuel tank to the frame support.



7. Remove the (2) screws retaining the rear engine air intake baffle box and allow the box to hang down out of the way.



4

8. Carefully remove the fuel tank out the RH side of the frame.

NOTE: Properly drain fuel into a suitable container.

Fuel Tank Installation

1. Reinstall the fuel pump / tank assembly.
2. Reinstall the (4) fuel tank mounting bolts.
3. Reinstall the baffle box and the (2) retaining screws.
4. Reconnect the fuel pump electrical harness.
5. Install the fuel line and vent line, and verify they are secure.
6. Reinstall the right rear fender/rocker panel assembly.
7. Reconnect the negative battery cable. Test the fuel pump by turning on the key and listening for the pump to activate.

FUEL SYSTEM - GENERAL

FUEL PRESSURE REGULATOR

Operation Overview

The fuel pressure regulator maintains the required operating fuel system pressure. A rubber-fiber diaphragm divides the regulator into two separate sections: the fuel chamber and the pressure regulating chamber. The pressure regulating spring presses against the valve holder (part of the diaphragm), pressing the valve against the valve seat. The combination of atmospheric pressure and regulating spring tension equals the desired operating pressure. Any time the fuel pressure against the bottom of the diaphragm exceeds the desired (top) pressure, the valve opens, relieving the excess pressure, returning the excess fuel back to the tank.

Fuel Pump Pressure: 58 ± 2 psi (400 ± 14 kPa)
--

Fuel Pressure Regulator Test

Refer to the "Fuel Pump Test" procedure.

See "Fuel Pump Test", page 4.14

Fuel Pressure Regulator Replacement

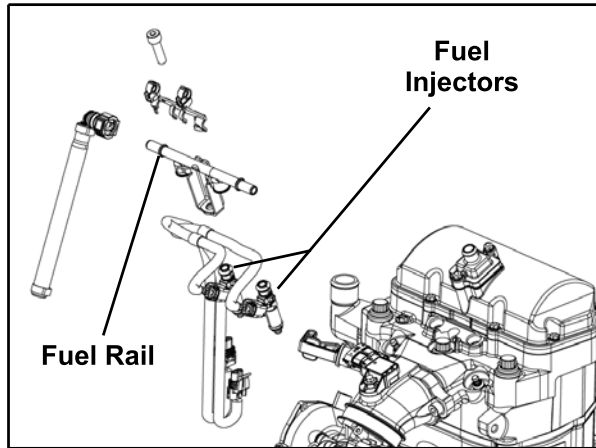
The regulator is a sealed, non-serviceable assembly. If it is faulty, the pump assembly must be replaced. Refer to the Fuel Pump / Tank Assembly Replacement procedure.

FUEL INJECTORS

Operation Overview

NOTE: All EFI units utilize quick connect fuel lines.

The fuel injectors mount into the cylinder head, and the fuel rail attaches to them at the top end. O-rings on both ends of the injector prevent external fuel leaks and also insulate it from heat and vibration.



When the key switch is on, the fuel rail is pressurized, and the EFI relay provides voltage to the injectors. During engine operation, the ECU completes the ground circuit, energizing the injectors. The valve needle in the injector is opened electromagnetically, and the pressure in the fuel rail forces fuel down through the inside. The "director plate" at the tip of the injector contains a series of calibrated openings which directs the fuel into the intake port in a cone-shaped spray pattern.

The amount of fuel injected is controlled by the ECU and determined by the length of time the valve needle is held open, also referred to as the "injection duration" or "pulse width". It may vary in length depending on the speed and load requirements of the engine.

The ECU gathers fuel injection timing information from the Crankshaft Position Sensor and Camshaft Phase Sensor to allow for sequential fuel injection.

Fuel Injector Service

Injector problems typically fall into three general categories- electrical, dirty / clogged, or leakage. An electrical problem usually causes one or both of the injectors to stop functioning. Several methods may be used to check if the injectors are operating.

- With the engine running at idle, feel for operational vibration, indicating that they are opening and closing.

- When temperatures prohibit touching, listen for a buzzing or clicking sound with a screwdriver or mechanic's stethoscope.
- Disconnect the electrical connector from an injector and listen for a change in idle performance (only running on one cylinder) or a change in injector noise or vibration.

NOTE: Do not apply voltage directly to the fuel injector(s). Excessive voltage will burn out the injector(s). Do not ground the injector(s) with the ignition on. Injector(s) will open/turn on if relay is energized.

If an injector is not operating, it can indicate either a bad injector, or a wiring/electrical connection problem. Check as follows:

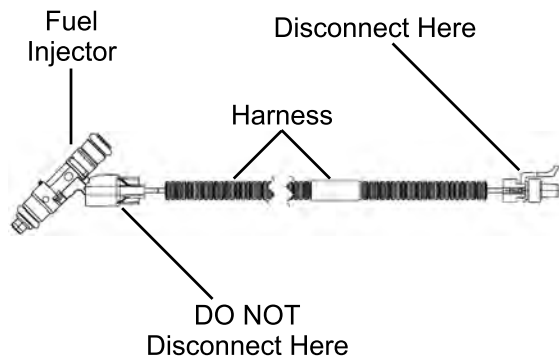
Injector leakage is very unlikely, but in rare instances it can be internal (past the tip of the valve needle), or external (weeping around the injector body). The loss of system pressure from the leakage can cause hot restart problems and longer cranking times.

Injector problems due to dirt or clogging are unlikely due to the design of the injectors, the high fuel pressure, the use of filters and the detergent additives in the gasoline. Symptoms that could be caused by dirty/clogged injectors include rough idle, hesitation/stumble during acceleration, or triggering of fault codes related to fuel delivery. Injector clogging is usually caused by a buildup of deposits on the director plate, restricting the flow of fuel, resulting in a poor spray pattern. Some contributing factors to injector clogging include; dirty air filters, higher than normal operating temperatures, short operating intervals and dirty, incorrect, or poor quality fuel. Cleaning of clogged injectors is not recommended; they should be replaced. Additives and higher grades of fuel can be used as a preventative measure if clogging has been a problem.

FUEL SYSTEM - GENERAL

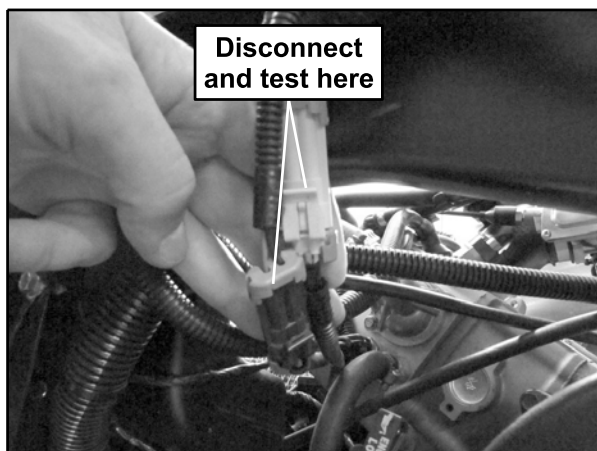
Fuel Injector Test

NOTE: The harness connector and locking spring is bonded to the fuel injectors with an epoxy. **DO NOT** attempt to disconnect the connector from the fuel injectors. Damage will occur to the injector and/or harness if attempting to separate at that location. Separate the fuel injector from the vehicle harness as shown in the illustration below.



IMPORTANT: Take note of PTO and MAG fuel injector harness connectors before disconnecting them. The harnesses are different and can not be connected incorrectly (PTO - Gray; MAG - Black).

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 harness pin terminals:

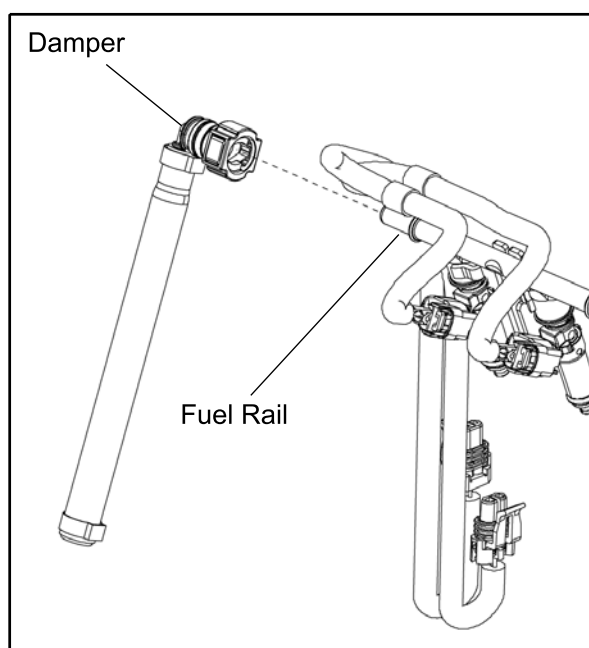


Fuel Injector Resistance Specification:
11.4 Ω - 12.6 Ω

NOTE: Be sure to connect like colored fuel injector connectors for proper engine function (PTO = GRAY, MAG = BLACK).

Fuel Injector Replacement

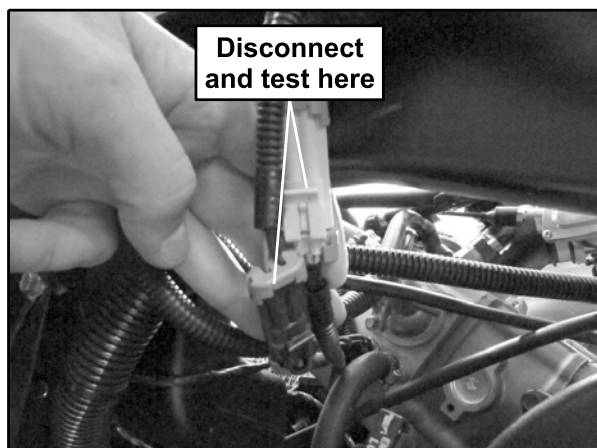
1. Be sure the engine has cooled enough to work on.
2. Thoroughly clean the area around the throttle body, intake boot and fuel injectors.
3. Place a suitable container below the fuel rail damper at the end of the fuel rail. Hold a shop rag over the damper and remove it to depressurize the fuel system.



4. Remove the seat base and under-seat storage container to access the fuel injector harnesses.

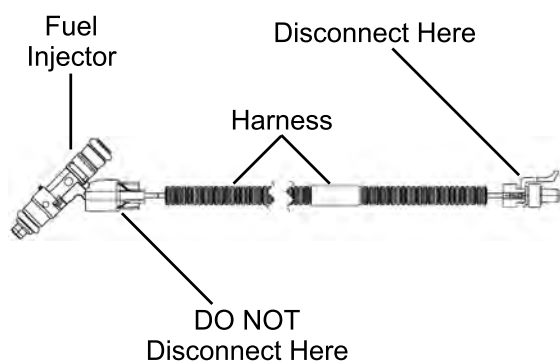
FUEL SYSTEM - GENERAL

5. Disconnect the fuel injector harness (s) as shown below.



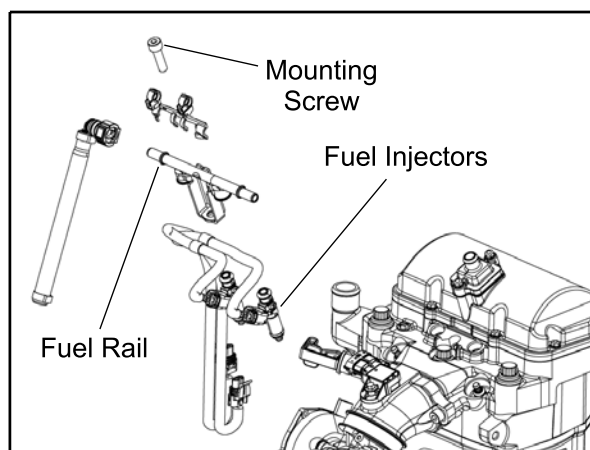
IMPORTANT: Take note of PTO and MAG fuel injector harness connectors before disconnecting them. The harnesses are different and can not be connected incorrectly (PTO - Gray; MAG - Black).

NOTE: The harness connector and locking spring is bonded to the fuel injectors with an epoxy. **DO NOT** attempt to disconnect the Bosch connector from the fuel injectors. Damage will occur to the injector and/or harness if attempting to separate at that location. Separate the fuel injector from the vehicle harness as shown in the illustration below.



6. Thoroughly clean the area around the fuel injectors including the throttle body manifold.

7. Using a 6 mm hex wrench, loosen the fuel rail mounting screw from the cylinder head. Carefully pull the rail away from the injectors and remove the injector (s) from the cylinder head along with the harness.



8. Reverse the previous steps to install the new injector (s) and reassemble.
9. Lubricate O-rings lightly with oil to aid installation. Torque the fuel rail mounting screw to specification.



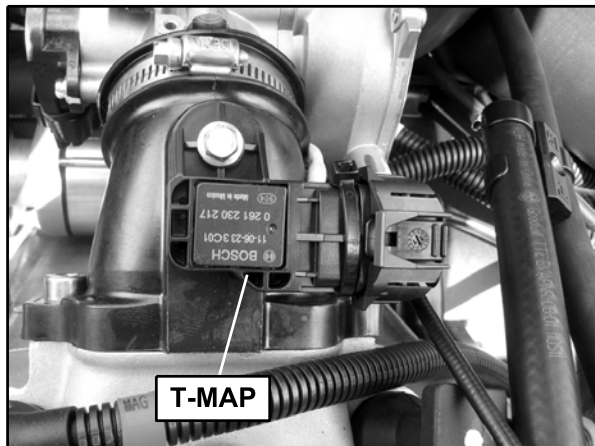
Fuel Rail Mounting Screw:
216 ± 24 in-lbs (24 Nm)

FUEL SYSTEM - GENERAL

TEMP / MANIFOLD ABSOLUTE PRESSURE SENSOR (T-MAP)

Operation Overview

Mounted on the throttle body intake manifold, the T-MAP sensor performs two functions in one unit.



Air passing through the intake is measured by the T-MAP and relayed to the ECU. These signals, comprised of separate air temperature and manifold absolute pressure readings, are processed by the ECU and compared to its programming for determining the fuel and ignition requirements during operation. The T-MAP sensor provides the ECU with engine load data.

T-MAP Sensor Test

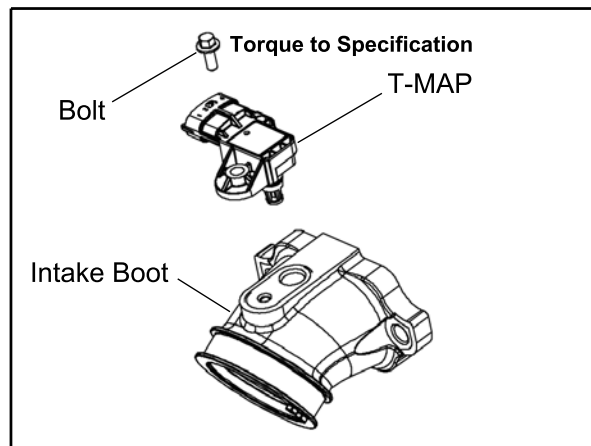
The T-MAP sensor is a non-serviceable item. If it is faulty, it must be replaced.

IMPORTANT: This sensor should only be tested using the Digital Wrench® Diagnostic Software (dealer only).

T-MAP Sensor Replacement

1. Remove the lower seat base to access the sensor.
2. Remove the cable tie from the sensor connector.
3. Disconnect vehicle harness from T-MAP sensor.
4. Remove the retaining bolt and remove the sensor from the intake boot.
5. Use a light coating of soapy water on the grommet to aid installation of the new sensor.

6. Install the sensor by inserting it with a twisting motion to properly seat the grommet.



7. Install the retaining bolt and torque to specification.

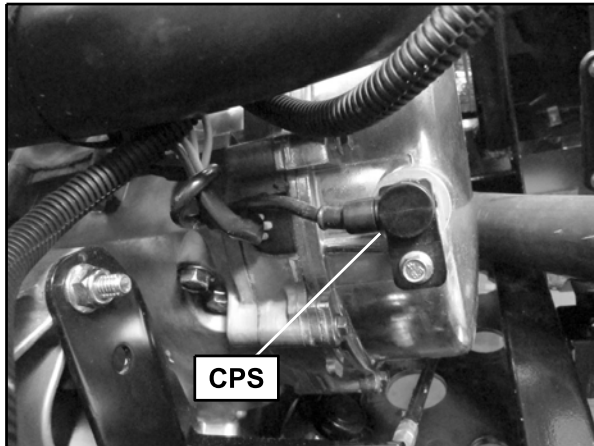


T-MAP Retaining Bolt:
25 ± 2.5 in-lbs (3 ± 0.3 Nm)

CRANKSHAFT POSITION SENSOR (CPS)

Operation Overview

The crankshaft position sensor is essential to engine operation, constantly monitoring the rotational speed (RPM) and position of the crankshaft.



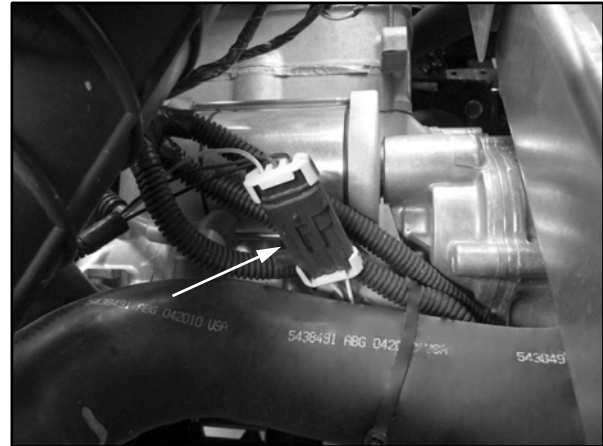
A ferromagnetic 60-tooth ring gear with two consecutive teeth missing is mounted on the flywheel. The inductive speed sensor is mounted 1.0 ± 0.26 mm (0.059 ± 0.010 in.) away from the ring gear. During rotation, an AC pulse is created within the sensor for each passing tooth. The ECU calculates engine speed from the time interval between the consecutive pulses.

The two-tooth gap creates an "interrupt" input signal, corresponding to specific crankshaft position. This signal serves as a reference for the control of ignition timing by the ECU. Synchronization of the CPS and crankshaft position takes place during the first two revolutions each time the engine is started. This sensor must be properly connected at all times. If the sensor fails or becomes disconnected for any reason, the engine will stop running.

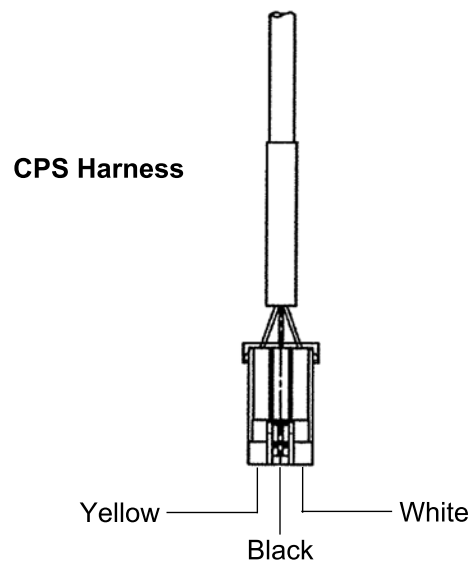
CPS Test

The CPS is a sealed, non-serviceable assembly. If fault code diagnosis indicates a problem with this sensor, test as follows:

1. Disconnect CPS (3-wire) harness connector on the right-hand side of the vehicle located by the air intake hose.



2. Connect an ohmmeter between the pin terminals leading from the Yellow and White wires. A resistance value of $560\Omega \pm 10\%$ at room temperature should be obtained.



CPS Resistance Specification:
Yellow to White: $560\Omega \pm 10\%$

FUEL SYSTEM - GENERAL

3. If the resistance is correct.
 - Test the main harness circuit between the sensor connector terminals and the corresponding pin terminals at the ECU (see wiring diagram).
 - Check the sensor mounting, air gap, flywheel ring gear for damage or runout, and flywheel key. Follow the "CPS Replacement" procedure to inspect CPS and flywheel ring gear for damage.
4. If the resistance is incorrect, follow the "CPS Replacement" procedure.

CPS Replacement

1. Disconnect the sensor from the vehicle harness at the connector.
2. Using a 6 mm hex wrench, remove the retaining bolt and replace the sensor.
3. Use a light coating of oil on the O-ring to aid installation.
4. Torque the retaining bolt to specification.

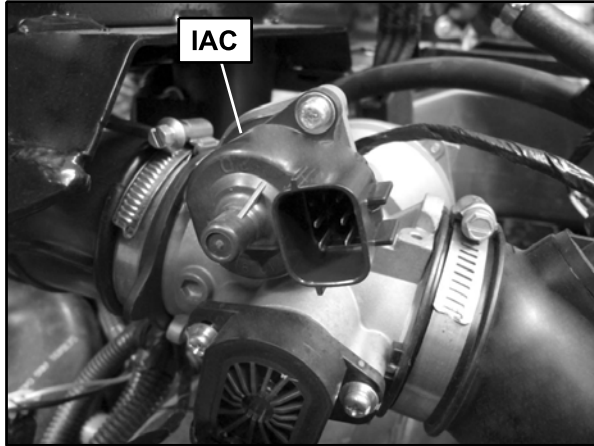


CPS Retaining Bolt:
25 in-lbs (2.8 Nm)

IDLE AIR CONTROL (IAC)

Operation Overview

The Idle Air Control (IAC) is used to stabilize the idle quality of the engine at cold start-up and after warm-up operations.



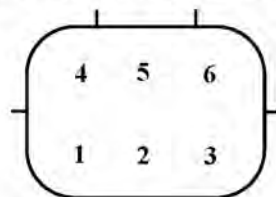
Mounted on the throttle body, the IAC contains 1 stepper motor which receives varying voltage signal pulses from the ECU. These pulses determine the IAC plunger setting, thereby controlling the amount of air bypassing the closed throttle body for idle control. If the IAC is disconnected or inoperative, it will remain at it's last operated position.

IAC Test

The IAC is a non-serviceable item. If it is faulty, it must be replaced. It can be 'bench tested' using the following method:

Set your meter to read Ohms. Check the resistance values at each of the following pin locations of the IAC. If any of the readings are out of specification, replace the IAC.

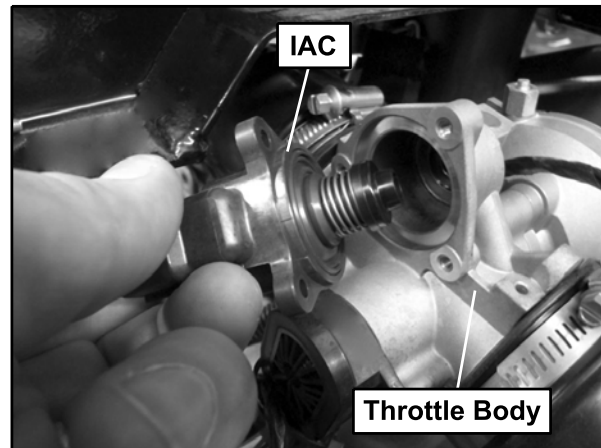
IAC Valve Connector



IAC RESISTANCE READINGS			
PINS	RESISTANCE	PINS	RESISTANCE
1 - 2	30 Ω $\pm$ 1.2 Ω	4 - 5	30 Ω $\pm$ 1.2 Ω
2 - 3	30 Ω $\pm$ 1.2 Ω	5 - 6	30 Ω $\pm$ 1.2 Ω
1 - 3	60 Ω $\pm$ 2.4 Ω	4 - 6	60 Ω $\pm$ 2.4 Ω

IAC Replacement

1. Remove the lower seat base.
2. Disconnect the vehicle harness from the IAC motor.
3. Remove the (3) Phillips-head mounting screws and remove the IAC from the throttle body.



4. Install the new IAC and torque the mounting screws to specification.



IAC Mounting Screw:
17.7 in-lbs (2 $\pm$ 0.5 Nm)

5. Reconnect the vehicle harness to the IAC motor.
6. Reinstall the lower seat base.

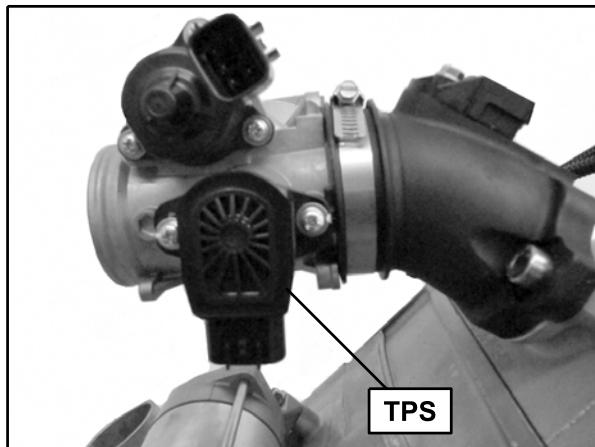
4

FUEL SYSTEM - GENERAL

THROTTLE POSITION SENSOR (TPS)

Operation Overview

The throttle position sensor (TPS) is used to indicate throttle plate angle to the ECU. Mounted on the throttle body and operated directly off the end of the throttle shaft, the TPS works like a rheostat, varying the voltage signal to the ECU in direct correlation to the angle of the throttle plate. This signal is processed by the ECU and compared to the internal pre-programmed “maps” to determine the required fuel and ignition settings for the amount of engine load.



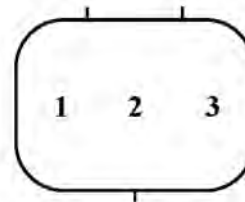
The correct position of the throttle body stop screw is established and set at the factory. DO NOT loosen the throttle body stop screw or alter its position in any manner. The stop screw controls the air flow calibration of the throttle body. If the stop screw is repositioned or adjusted, the throttle body assembly must be replaced.

TPS Resistance Tests

The TPS is a non-serviceable item. If it is faulty, it must be replaced. It can be tested using the following method:

With the test leads connected and the meter set to the ohms scale, observe the reading at the following pin locations of the TPS:

TPS Connector



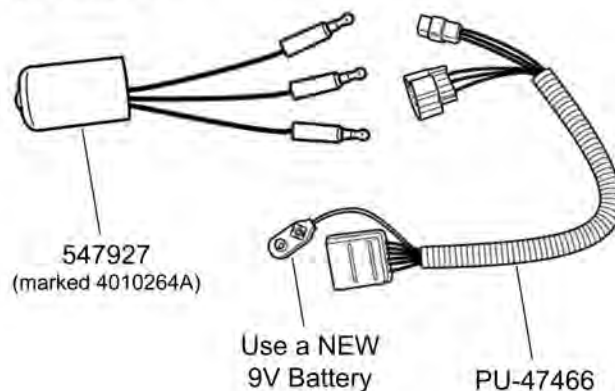
TPS RESISTANCE READINGS		
PINS	THROTTLE POSITION	RESISTANCE
2 - GND	—	∞
1 - 2	Closed	4k Ω - 5k Ω (reference)
1 - 2	Open	1150 Ω - 1250 Ω (reference)
1 - 3	—	4k Ω - 6k Ω

TPS Tester / Regulator

The TPS reading can be checked by using the Throttle Position Sensor (TPS) Tester (2201519-A).

Set-up the TPS Tester Wire Harness (PU-47466) and TPS Tester Regulator (547927) according to the instructions that accompanied the tester. Make sure the 9 Volt battery is new.

2201519-A

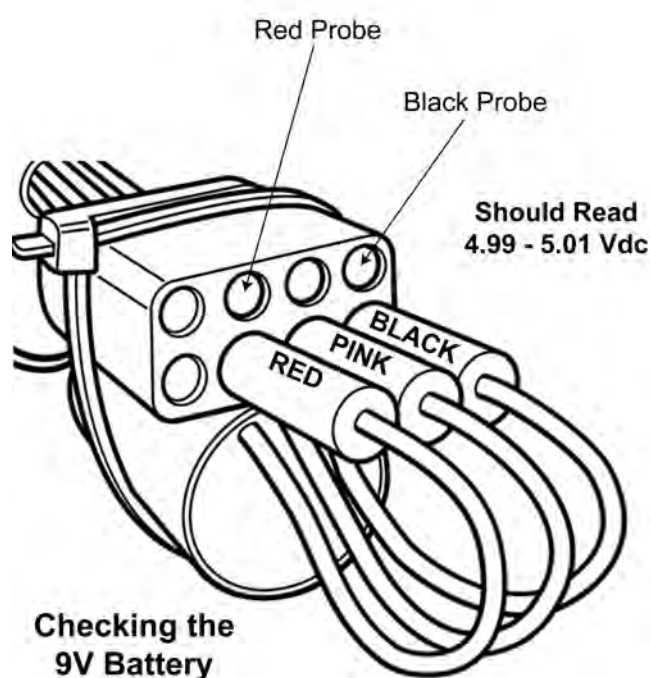


Verify TPS Tester Reference Voltage

A 5 volt reference voltage from the TPS Tester harness is required for the TPS test to be accurate. Refer to the instructions provided with the TPS Tester (2201519-A) or follow the bullet point steps below to check reference voltage.

Reference Voltage Test:

- Insert black voltmeter probe into the test port as shown.
- Insert red voltmeter probe into the test port as shown and verify the voltage reads 4.99-5.01 Vdc. If the reading is low, replace the 9 volt battery.



TPS Reference Voltage
5 Vdc Input

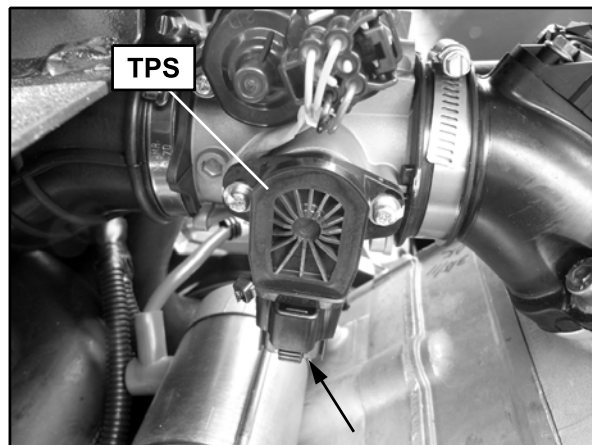
IMPORTANT: Always use a fresh 9 Volt battery.

TPS Replacement

NOTE: The correct position of the TPS angle on the throttle body is established and set at the factory. If the TPS is replaced or has been loosened it must be repositioned to obtain the proper voltage reading.

1. Remove the lower seat base.
2. Loosen the two hose clamps that secure the intake boots to the throttle body.

3. Disconnect the vehicle harness from the TPS.



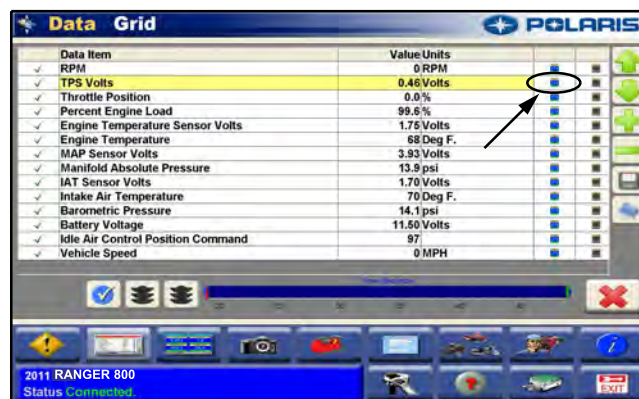
4. Rotate the throttle body to gain access to the TPS mounting screws.
5. Remove the (2) Phillips-head mounting screws and replace the TPS. Reconnect the vehicle harness to the TPS.

NOTE: If replacing the TPS or throttle body, you must set the TPS voltage to specification.

IMPORTANT: The TPS voltage reading using the TPS Tester tool will differ from the reading you get using the Digital Wrench® data display. Refer to the following procedures.

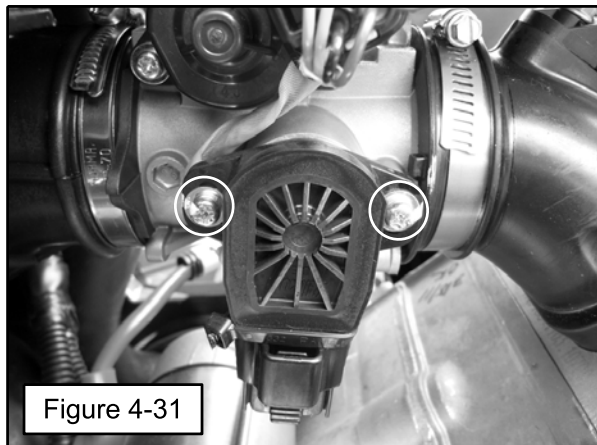
TPS Adjustment Using Digital Wrench®:

1. Assemble SmartLink Module and connect the diagnostic interface cable to the vehicle to allow Digital Wrench® use (see "Digital Wrench® - Diagnostic Connector").
2. Select the appropriate vehicle and open the data display grid. Click on the meter icon next to "TPS Volts".

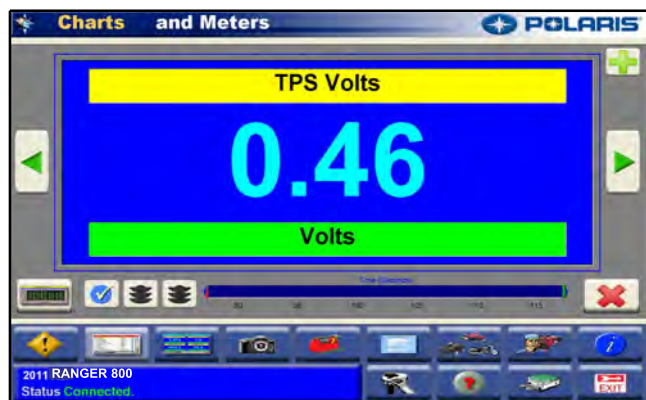


FUEL SYSTEM - GENERAL

3. Loosen the TPS mounting screws (see Figure 4-31).



4. Rotate the TPS until your display reading is within specification.



TPS Output Reading (Digital Wrench®):
0.46 ± 0.03 Vdc

5. Retighten the TPS mounting screws and torque to specification.

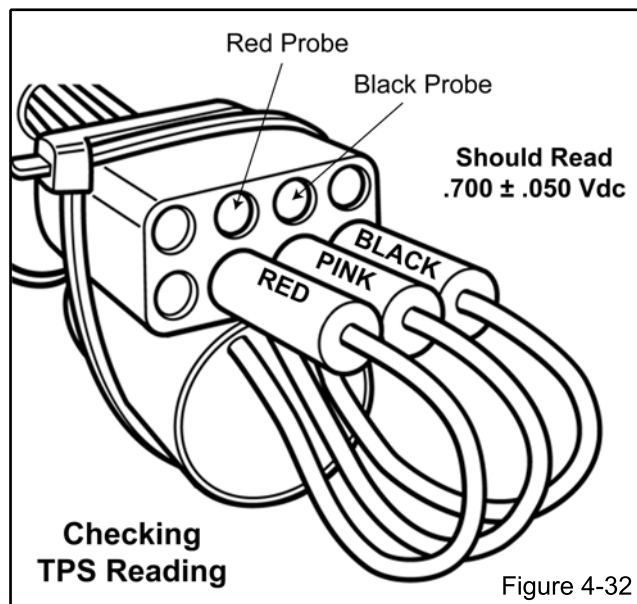


TPS Mounting Screws:
17.7 in-lbs (2 Nm)

6. Verify voltage reading did not change. If voltage reading is now out of specification, repeat steps 3 - 5.
7. Reposition the throttle body and securely tighten the hose clamps.
8. Reinstall the lower seat base.

TPS Adjustment Using TPS Tester (PN 2201519-A):

1. If Digital Wrench® is unavailable, assemble the TPS Tester according to the instructions. Refer to "TPS Tester / Regulator" for proper set-up and testing. Verify the 9 volt tester battery is new.
2. Plug the TPS Tester harness into the new TPS.
3. Set your voltmeter to read DC Volts. Insert the red and black voltmeter probes into the test ports as shown.



4. Loosen the TPS mounting screws (see Figure 4-31).
5. Rotate the TPS until your voltmeter reads within the specification (see Figure 4-32).

TPS Output Reading (TPS Tester):
0.70 ± 0.05 Vdc

6. Retighten the TPS mounting screws and torque to specification.



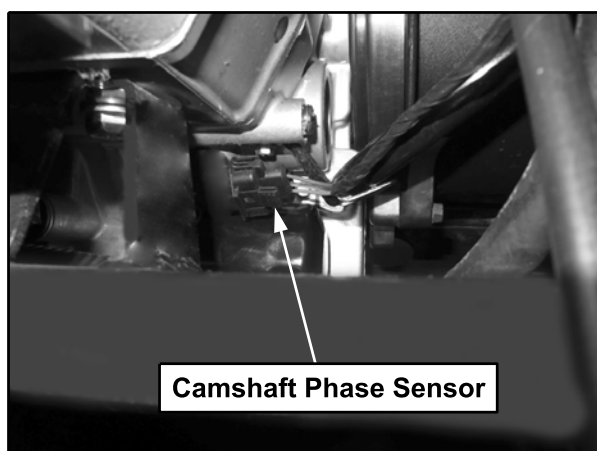
TPS Mounting Screws:
17.7 in-lbs (2 Nm)

7. Verify voltage reading did not change. If voltage reading is now out of specification, repeat steps 4 - 6.
8. Reconnect the vehicle harness to the TPS.
9. Reposition the throttle body and securely tighten the hose clamps.
10. Reinstall the lower seat base.

CAMSHAFT PHASE SENSOR

Operation Overview

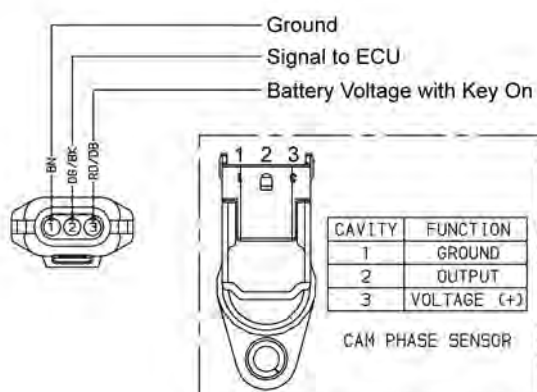
Mounted on the engine crankcase near the oil filter, the Cam Phase Sensor provides camshaft position information to the ECU to be used along with the crankshaft position data to allow for sequential fuel injection.



Cam Phase Sensor Test

The Cam Phase Sensor is a non-serviceable item. If it is faulty, it must be replaced.

With the ignition key switch on, the sensor should have battery voltage present on the Red / Dark Blue wire and ground present on the Brown wire.

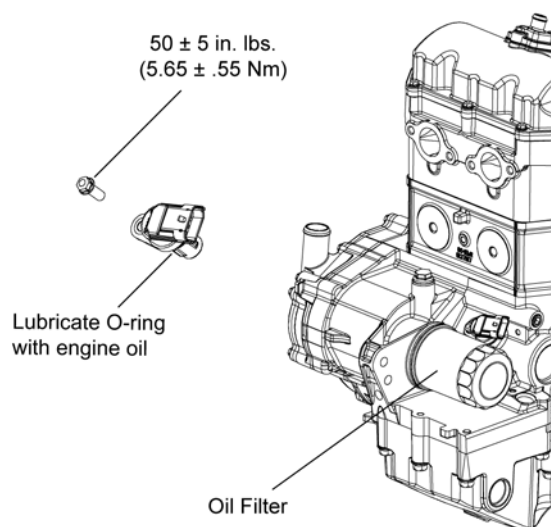


NOTE: Use Digital Wrench® Diagnostic Software (dealer only) if you suspect this sensor is faulty.

Cam Phase Sensor Replacement

1. Remove the seat base and under-seat storage container.

2. Disconnect vehicle harness from the sensor.
3. Remove the retaining bolt and remove the sensor from the engine.
4. Use a light coating of engine oil to lubricate the O-ring upon installation of the new sensor.
5. Install the sensor by inserting it with a twisting motion to allow it to properly seat.



6. Install the retaining bolt and torque to specification.



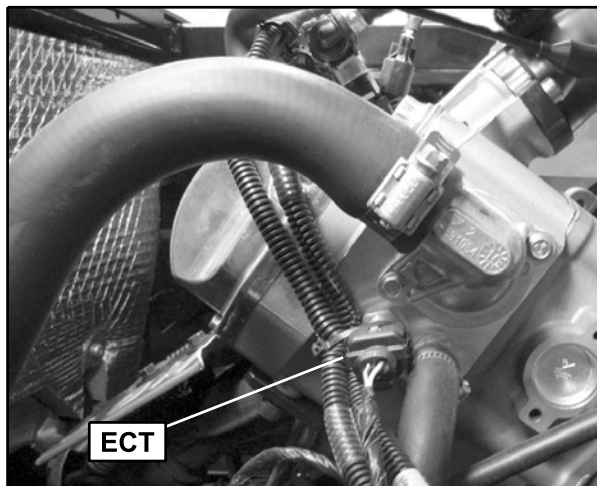
Cam Phase Sensor Retaining Bolt:
50 ± 5 in-lbs (5.65 ± 0.55 Nm)

FUEL SYSTEM - GENERAL

ENGINE COOLANT TEMPERATURE SENSOR (ECT)

Operation Overview

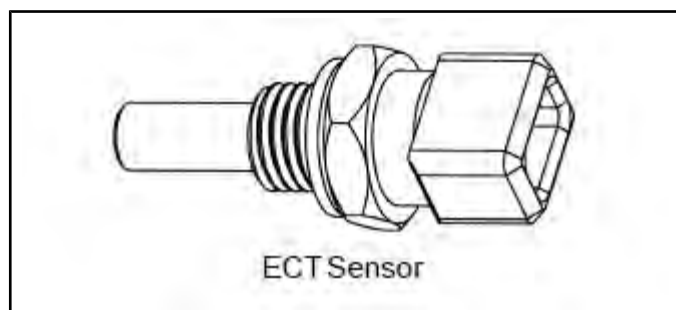
Mounted on the cylinder head, the engine temperature sensor measures coolant temperature. The engine temperature sensor is a Negative Temperature Coefficient (NTC) type sensor, as the temperature increases the resistance decreases.



Coolant passes through the cylinder and by the sensor probe, varying a resistance reading which is relayed to the ECU. This signal is processed by the ECU and compared to its programming for determining the fuel and ignition requirements during operation. The ECU also uses this signal to determine when to activate the fan during operation.

ECT Sensor Test

To quickly rule out other components and wiring related to the ECT, disconnect the harness from the ECT sensor and start the engine. After a few seconds, the fan should turn on and the "Check Engine" indicator should display on the instrument cluster. This indicates all other components are working properly.



Refer to Chapter 3 and 10 for additional ECT sensor information. Polaris dealers can test the sensor by using the Digital Wrench® Diagnostic Software (dealer only).

ECT SENSOR RESISTANCE READINGS	
TEMPERATURE °F (°C)	RESISTANCE
68 °F (20 °C)	2.5k Ω $\pm$ 6%
86 °F (30 °C)	1.7k Ω $\pm$ 6%
104 °F (40 °C)	1.2k Ω $\pm$ 6%
122 °F (50 °C)	834 Ω $\pm$ 6%
140 °F (60 °C)	596 Ω $\pm$ 6%
158 °F (70 °C)	435 Ω $\pm$ 6%
176 °F (80 °C)	323 Ω $\pm$ 6%
194 °F (90 °C)	243 Ω $\pm$ 6%
212 °F (100 °C)	186 Ω $\pm$ 6%

ECT Sensor Replacement

1. Remove the seat base and under-seat storage container to access the ECT sensor.
2. Drain coolant to level below sensor.
3. Disconnect sensor from engine harness.
4. Using a wrench, remove and replace the sensor, applying a light coating of thread sealant to aid installation.
5. Torque the sensor to specification.



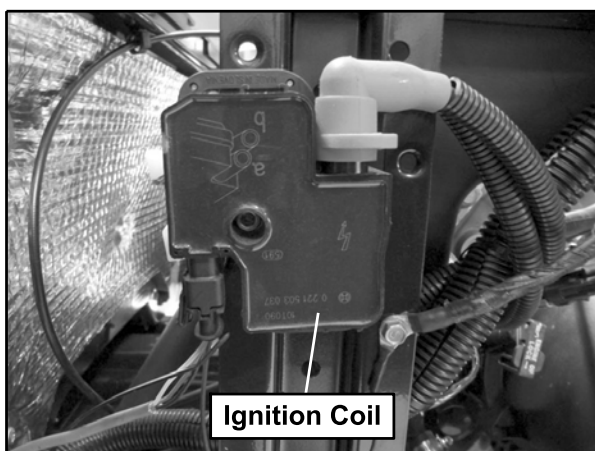
ECT Sensor:
17 ft-lbs (23 Nm)

6. Add the required amount of coolant and properly bleed the cooling system (see Chapter 3).

IGNITION COIL

Operation Overview

The ignition coil is used to provide high voltage to fire the spark plugs. When the ignition key is on, DC voltage is present in the primary side of the ignition coil windings. During engine rotation, an AC pulse is created within the crankshaft position sensor for each passing tooth on the flywheel. The two-tooth gap creates an “interrupt” input signal, corresponding to specific crankshaft position. This signal serves as a reference for the control of ignition timing. The ECU then calculates the time interval between the consecutive pulses, and determines when to trigger the voltage spike that induces the voltage from the primary to the secondary coil windings to fire the spark plugs.



4. Install the new ignition coil and/or high tension lead (s).



Ignition Coil Retaining Bolt:
75 in-lbs (8.5 Nm)

Ignition Coil / HT Lead Replacement

NOTE: Mark or note which ignition coil wire goes to which cylinder and ignition coil post. The engine will misfire if spark plug wires are installed incorrectly. The spark plug wires are marked with PTO and MAG from the factory and should be installed to the corresponding cylinder and ignition coil post.

1. Remove the seat base and under-seat storage container.
2. Disconnect the ignition coil harness and remove the high tension leads from the coil.
3. Remove the fastener retaining the ignition coil and remove it from the vehicle. If replacing the high tension lead(s), remove the other end of the lead(s) from the spark plug.

FUEL SYSTEM - GENERAL

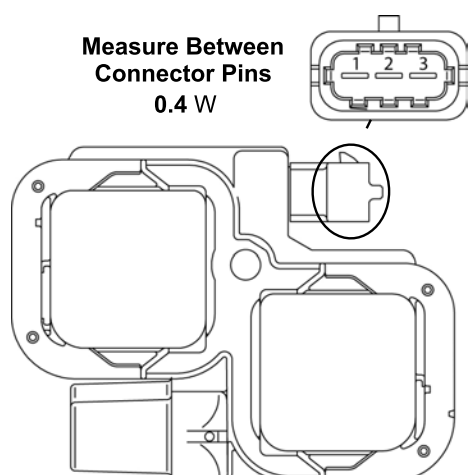
Ignition Coil Tests

The ignition coil can be tested by using an ohm meter. Use the following illustration and specification table to test the ignition coil resistance.

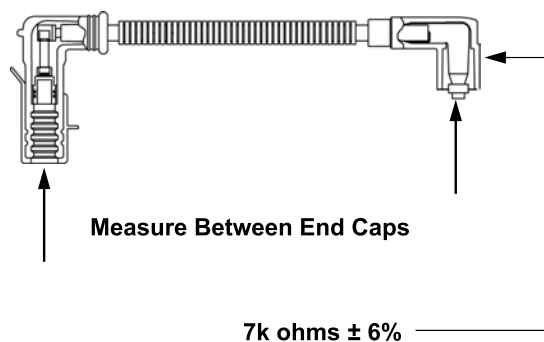
NOTE: The under-seat storage container must be removed to properly access the ignition coil harness for testing purposes.

IGNITION COIL RESISTANCE READINGS		
TEST	PIN CONNECTION	RESIST- ANCE
Primary	Between 1 & 2 Between 2 & 3	0.4 Ω
Secondary	Between High Tension Lead End Caps	7k $\Omega \pm 6\%$

Primary Test



Secondary Test



EFI DIAGNOSTICS

Instrument Cluster Trouble Code Display

NOTE: The diagnostic mode is accessible only when the check engine MIL has been activated.

Use the following procedure to display diagnostic trouble codes that were activated during current ignition cycle causing the MIL to illuminate. Diagnostic trouble codes will remain stored in the gauge (even if MIL turns off) until the key is turned off.

NOTE: If there is a diagnostic problem with the power steering system, the power steering MIL will illuminate and blink in place of the check engine MIL.

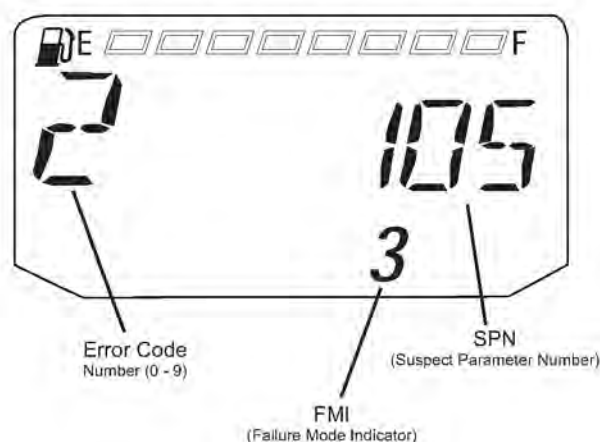
1. If the trouble code (s) are not displayed, use the MODE button to toggle until "CK ENG" displays on the information display area.



2. Press and hold the MODE button to enter the diagnostics code menu.

3. A set of three numbers will appear in the information area.

- The first number (located far left) can range from 0 to 9. This number represents the total number of trouble code present (example: 2 means there are 3 codes present).
- The second number (located top right) can be 2 to 6 digits in length. This number equates to the suspected area of fault (SPN).
- The third number (located bottom right) can be 1 to 2 digits in length. This number equates to the fault mode (FMI).



4. If more than one code exists, press the MODE button to advance to the next trouble code.
5. To exit the diagnostic mode, press and hold the MODE button or turn the ignition key OFF once the codes are recorded.

DIAGNOSTIC TROUBLE CODE TABLE				
COMPONENT	CONDITION	SPN	FMI	DIGITAL WRENCH® P-CODE
Throttle Position Sensor (TPS)	Voltage Too High	51	3	P0123
	Voltage Too Low		4	P0122
Vehicle Speed Signal	Data Erratic or Intermittent (or missing)	84	2	P0503
	Received Vehicle Speed Has Error		19	C1069
Manifold Absolute Pressure Sensor (T-MAP)	Voltage Too High	102	3	P0108
	Voltage Too Low		4	P0107
Intake Air Temperature (T-MAP)	Voltage Too High	105	3	P0113
	Voltage Too Low		4	P0112
Engine Temperature Sensor (ECT)	Voltage Too High	110	3	P0118

FUEL SYSTEM - GENERAL

DIAGNOSTIC TROUBLE CODE TABLE				
COMPONENT	CONDITION	SPN	FMI	DIGITAL WRENCH® P-CODE
	Voltage Too Low		4	P0117
	Temperature Too High		16	P0217
	Engine Overheat Shutdown		0	P1217
System Power (Battery Potential / Power Input)	Voltage Too High	168	3	P0563
	Voltage Too Low		4	C1063
				P0562
				C1064
Engine Speed (This is applicable when the EPS module gets the engine speed from the ECM)	Engine Speed Too High	190	0	C1059
	Received Engine Speed Has Error		19	C1066
Gear Sensor Signal	Voltage Too Low	523	4	P0916
ECU Memory	EEPROM: Read/Write Failure	628	12	C1073
Calibration	Checksum/CRC Error	630	13	C1074
Crankshaft Position Sensor (CPS)	Plausibility Fault	636	2	P0335
Camshaft Phase Sensor	Circuit Fault	637	8	P0340
Injector 1 (MAG)	Driver Circuit Open / Grounded	651	5	P0261
	Driver Circuit Short to B+		3	P0262
	Driver Circuit Grounded		4	P1262
Injector 2 (PTO)	Driver Circuit Open / Grounded	652	5	P0264
	Driver Circuit Short to B+		3	P0265
	Driver Circuit Grounded		4	P1265
Rear Differential Output	Driver Circuit Open / Grounded	746	5	P1691
	Driver Circuit Short to B+		3	P1692
	Driver Circuit Grounded		4	P1693
Fan Relay Driver Circuit	Driver Circuit Open / Grounded	1071	5	P1481
	Driver Circuit Short to B+		3	P1482
	Driver Circuit Grounded		4	P1483
Ignition Coil Primary Driver 1 (MAG)	Driver Circuit Short to B+	1268	3	P1353
Ignition Coil Primary Driver 2 (PTO)	Driver Circuit Short to B+	1269	3	P1354
Fuel Pump Driver Circuit	Driver Circuit Open / Grounded	1347	5	P0230
	Driver Circuit Short to B+		3	P0232
	Driver Circuit Grounded		4	P0231
ECU Output Supply Voltage 1	Voltage Too High	3597	3	P16A2
	Voltage Too Low		4	P16A1
ECU Output Supply Voltage 2	Voltage Too High	3598	3	P16A9

4.36

FUEL SYSTEM - GENERAL

DIAGNOSTIC TROUBLE CODE TABLE				
COMPONENT	CONDITION	SPN	FMI	DIGITAL WRENCH® P-CODE
	Voltage Too Low		4	P16A8
All Wheel Drive Control Circuit (AWD)	Driver Circuit Open / Grounded	520207	5	P1836
	Driver Circuit Short to B+		3	P1835
	Driver Circuit Grounded		4	P1834
Steering Over Current Shut Down	Current Above Normal or Grounded	520221	6	C1050
Steering Excessive Current Error	Current Above Normal or Grounded	520222	6	C1051
Steering Torque Partial Failure	Condition Exists	520223	31	C1052
Steering Torque Full Failure	Condition Exists	520224	31	C1053
EPS Inverter Temperature	Greater than 110° C (230° F)	520225	16	C1054
	Greater than 120° C (248° F)		0	C1055
EPS CAN Communications Receive Error	No RX Message for 2 Seconds	520226	2	U0100
EPS CAN Communications Transmit Error	No TX Message for 2 Seconds	520227	2	U1100
Position Encoder Error	Position Encoder Error	520228	11	C1065
EPS Software Error	Software Error	520229	12	C1070
IC CAN Communication with EPS	EPS Off Line (EPS DM1 not seen)	520230	31	U0131
EPS Power Save Condition	EPS: Key On, Engine Off, 5 Minute Power Save/Timeout	520231	31	C1071
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 3	Driver Circuit Open / Grounded	520268	5	P1515
	Driver Circuit Short to B+		3	P1519
	Driver Circuit Grounded		4	P1518
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 4	Driver Circuit Open / Grounded	520269	5	P1525
	Driver Circuit Short to B+		3	P1529
	Driver Circuit Grounded		4	P1528
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 6	Driver Circuit Open / Grounded	520270	5	P1535
	Driver Circuit Short to B+		3	P1539
	Driver Circuit Grounded		4	P1538
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 1	Driver Circuit Open / Grounded	520271	5	P1505
	Driver Circuit Short to B+		3	P1509
	Driver Circuit Grounded		4	P1508

FUEL SYSTEM - GENERAL

EFI Troubleshooting

Fuel Starvation / Lean Mixture

Symptoms: Hard start or no start, bog, backfire, popping through intake / exhaust, hesitation, detonation, low power, spark plug erosion, engine runs hot, surging, high idle, idle speed erratic.

- No fuel in tank
- Restricted tank vent, or routed improperly
- Fuel lines or fuel injectors restricted
- Fuel filter plugged
- Fuel pump inoperative
- Air leak in system
- Intake air leak (throttle shaft, intake ducts, airbox or air cleaner cover)
- Incorrect throttle stop screw adjustment
- Throttle cable incorrectly adjusted
- Air Leaks, dirty injector
- TPS damaged or adjusted
- Tight valves
- Ignition timing incorrect
- Belt dragging
- Dirty air cleaner
- Engine worn
- Spark Plug fouled
- Throttle stop screw set incorrectly (out of sync with ECU)
- Faulty electrical connection

Rich Mixture

Symptoms: Fouls spark plugs, black, sooty exhaust smoke, rough idle, poor fuel economy, engine runs rough/ misses, poor performance, bog, engine loads up, backfire.

- Air intake restricted (inspect intake duct)
- Air filter dirty/plugged
- Poor fuel quality (old fuel)
- Fouled spark plug
- TPS setting incorrect
- Injector failure

Poor Idle

Symptom: Idle Too High (If greater than 1300 RPM when engine is warm).

- Throttle stop screw set incorrect
- Throttle cable sticking, improperly adjusted, routed incorrectly
- Faulty electrical connection

Symptom: Idle Too Low (if less than 900 RPM when engine is warm).

- Plugged air filter
- Leaking injector (rich condition)
- Belt dragging
- Throttle stop screw tampering

Symptom: Erratic Idle.

DIGITAL WRENCH® OPERATION

Digital Wrench® Diagnostic Software Overview

IMPORTANT: Refer to Section 2, 3 and 4 in the Instruction Manual provided in the Digital Wrench® Diagnostic Kit to install the Polaris 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)

4

Special Tools

DIGITAL WRENCH® DIAGNOSTIC SOFTWARE	PART NUMBER
Digital Wrench® Diagnostic Kit	PU-47063-B
PU-47063-B (listed above) INCLUDES:	Digital Wrench® Software: PU-48731
	Standard Interface Cable: PU-47151
	SmartLink Module Kit: PU-47471
	USB-Serial Adapter Cable: PU-50621
Fuel Pressure Gauge Kit	PU-43506-A
Fuel Pressure Gauge Adapter	PV-48656
Fluke 73 Digital Multi-Meter or Fluke 77 DMM	PV-43546 (Fluke 77: PV-43568)
Laptop or Desktop Computer	Commercially Available (refer to diagnostic software user manual or HELP section for minimum requirements)

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, refer to "Digital Wrench® Version and Update ID".

ECU Replacement

Although the need for ECU 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 all supported Trouble Codes (that is, any fault that will turn on the 'Check Engine' indicator).

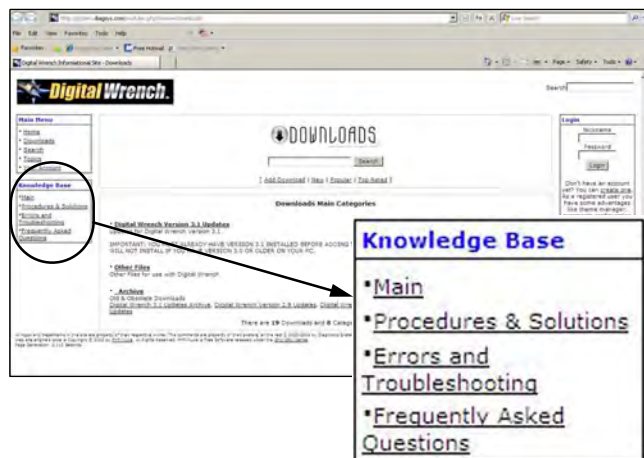
In addition, guided diagnostics are also available for many other electrical sub systems.

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.

FUEL SYSTEM - GENERAL

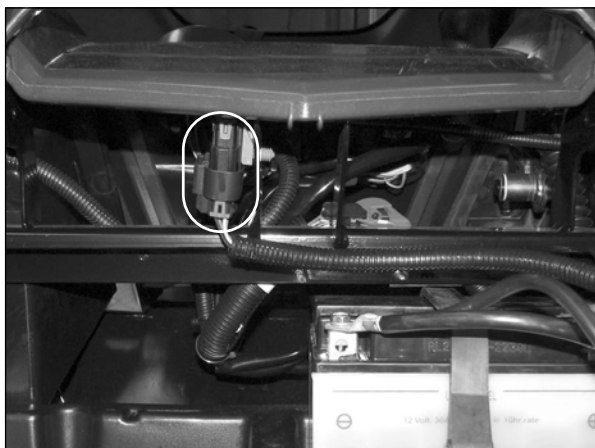
Digital Wrench® Communication Errors

If you experience problems connecting to a vehicle or any Digital Wrench® related problem, visit the Digital Wrench® Knowledge Base for the most current troubleshooting information, FAQs, downloads and software updates at: <http://polaris.diagnostics.com/>.



Digital Wrench® - Diagnostic Connector

The diagnostic connector is located under the hood as shown below.



Follow these steps to connect the diagnostic interface cable to the vehicle to allow Digital Wrench® use:

1. Assemble the SmartLink Module and attach the PC Interface Cable to your laptop (see page 4.3).
2. Remove the protective cap from the Digital Wrench® connector.
3. Connect the Vehicle Interface Cable to the Digital Wrench® diagnostic connector.

4. Turn the ignition key to the 'ON' position, select the appropriate vehicle and wait for the status to display 'Connected' in the lower left corner of the screen.
5. 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.



FUEL SYSTEM - GENERAL

- Proceed to <http://polaris.diaagsys.com> to see if a newer update is available.



- If a newer update is available, it should be downloaded before using Digital Wrench® (see “Digital Wrench® Updates”).

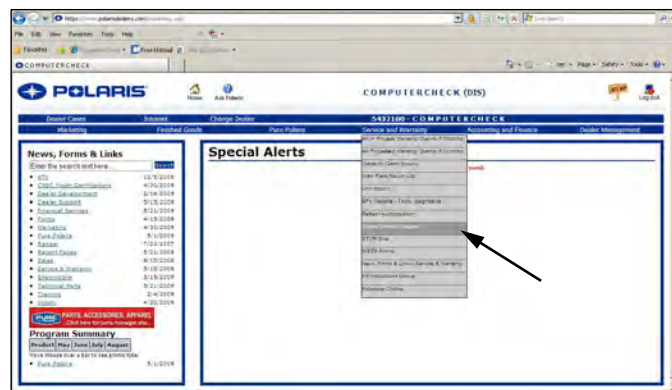
IMPORTANT: Always operate with the latest update.

Digital Wrench® Updates

Updates are released for Digital Wrench® via the Internet at: <http://polaris.diaagsys.com>. The Digital Wrench® website can also be accessed through the dealer website at: www.polarisdealers.com.

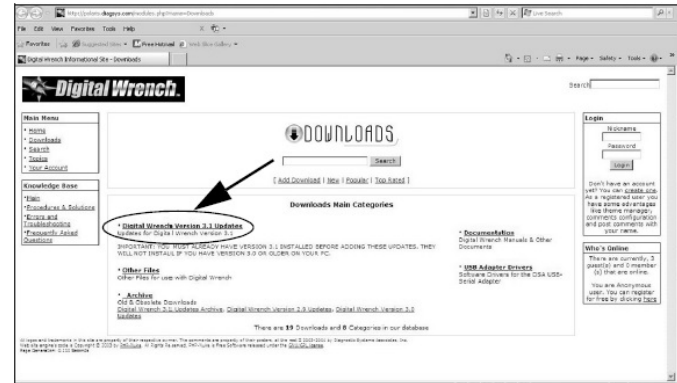
NOTE: Only authorized Polaris dealers and distributors can access the dealer website.

- Log on to www.polarisdealers.com.
- Locate the “Service and Warranty” drop-down menu.
- Click on “Digital Wrench® Updates”.



- The Digital Wrench® portal website should appear in a new web browser.

- Click on “Digital Wrench® Version Updates”.



IMPORTANT: 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.

- If the update file date listed is newer than your current version and update (see “Digital Wrench® Version and Update ID”), download the file.

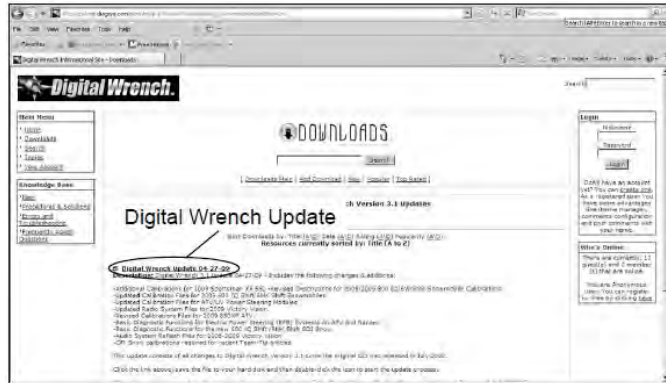


- Click on the link shown above, save the file to your hard disk and then double-click the icon to start the update process.

NOTE: Do not "run" or "open" the file from where they are. Select "save" and download them to your PC before running the install.

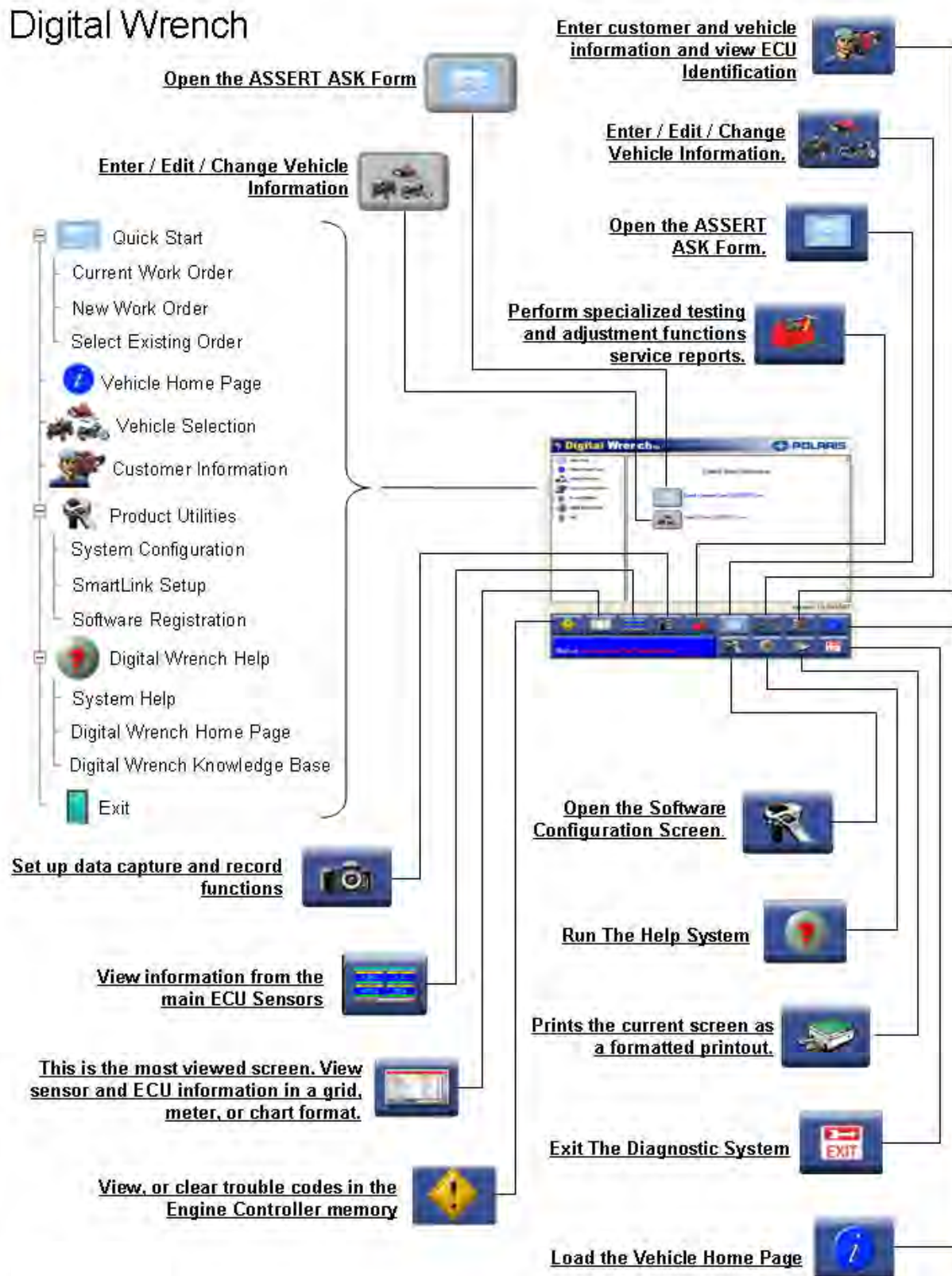
FUEL SYSTEM - GENERAL

- 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.

Digital Wrench® Feature Map



FUEL SYSTEM - GENERAL

Engine Controller Reprogramming (Reflash)

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 ECU.

The Digital Wrench® Engine Controller Reprogramming (or “Reflash”) feature allows reprogramming of the ECU fuel and ignition map. To successfully reprogram the ECU, 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.

IMPORTANT: Failure to follow the reprogramming instructions completely and correctly can result in an engine that does not run! Replacement ECUs 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 (see “Digital Wrench® Updates”).
- **CLOSE NON-ESSENTIAL PROGRAMS:** Polaris recommends 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.diagnostics.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®. See “Digital Wrench® Version and Update ID”, page 4.40

FUEL SYSTEM - GENERAL

- Connect the SmartLink Module cables to the PC and vehicle. See "Digital Wrench® - Diagnostic Connector", page 4.40



- Open the Digital Wrench® program.
- Select the model year, product line and vehicle description by selecting the "Change Vehicle Type" icon.



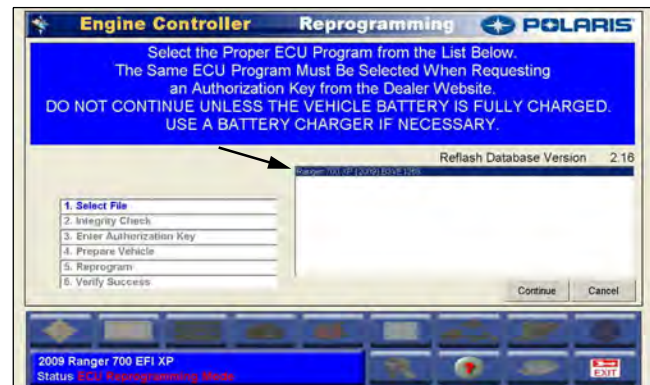
- Select the "Special Tests" icon.



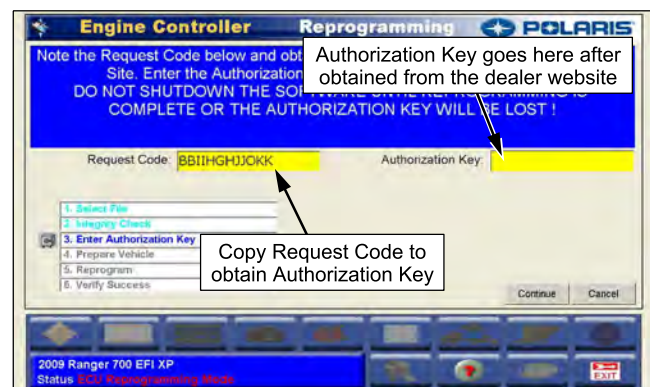
- Select "Engine Controller Reprogramming".



- 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.



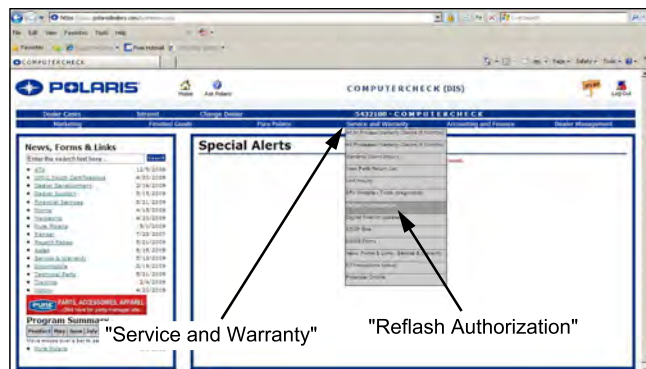
- Copy (CTRL +C) the Request Code that will be required on the dealer website in the next step. DO NOT CLOSE Digital Wrench® or the Request Code will be invalid. **NOTE: All characters are letters; there are no numbers in a request code.**



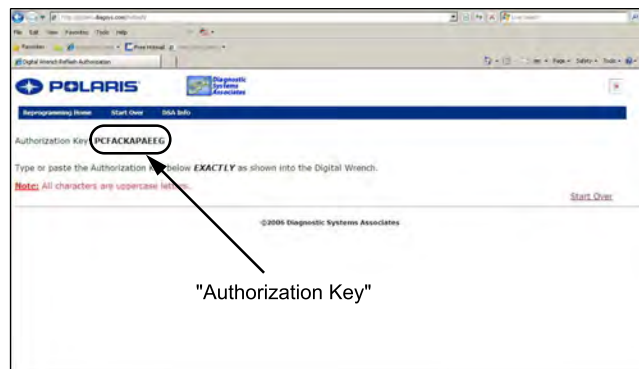
NOTE: Request Codes and Authorization Keys must be entered EXACTLY as they appear on the screen.

FUEL SYSTEM - GENERAL

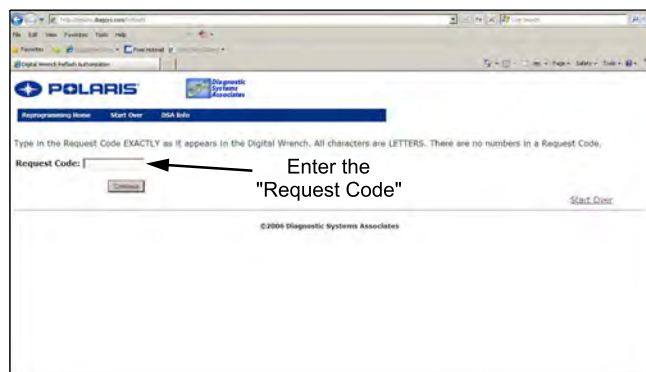
9. Go to **www.polarisdealers.com** and click on "ReFlash Authorization" from the "Service and Warranty" drop-down menu.



12. An "Authorization Key" will appear in the upper left corner of the screen. Copy (CTRL +C) this key exactly as it appears.



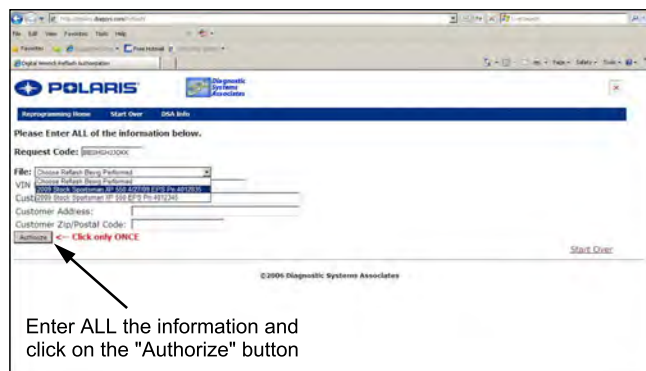
10. Enter or paste (CTRL+V) the Request Code into the box.



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 to complete the reprogramming procedure.



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.



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.

FUEL SYSTEM - GENERAL

Polaris Mobile Digital Wrench (PMDW)

Polaris Mobile Digital Wrench (PMDW) is a diagnostic software application (app) designed specifically for Android™ devices. When paired with the Wireless Vehicle Link (WVL), part number PU-51435, PMDW provides Polaris service technicians with many of the features and functions found in Digital Wrench.

PMDW Main Page:



PMDW App Notes:

- PMDW will not work on Microsoft Windows 8™ or Apple IOS™ products
- Device must be set to allow the installation of non-market applications
- An electronic user's guide is provided within the app. To access the user's guide, launch the app, and then click on the "Help" button in the Settings/Preferences menu.
- Only CAN-based vehicles are compatible with PMDW and the WVL. A complete list of compatible vehicles can be found in the user's guide.

4

Wireless Vehicle Link (WVL) – Part Number PU-51435:



To download the PMDW app, navigate your Android device to www.polarisdealers.com. Locate the Service and Warranty drop-down menu. Select: "Mobile Digital Wrench App Download". Tap on the link to download the app.

Android Device Minimum Specifications:

- Minimum operating system: Android 3.1 "Honeycomb" or higher (Android 4.0 or higher preferred)
- Dual core processor / 2 GB internal memory / external microSD (32 or 64 GB) slot / 500 MB RAM
- Rear facing camera with minimum 3.0 mega pixel resolution with auto/continuous focus
- Video, Microphone and Voice-to-text capable
- Internet and Bluetooth wireless technology capable

FUEL SYSTEM - GENERAL

NOTES

Lined area for notes.

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TORQUE SPECIFICATIONS

ITEM	TORQUE VALUE FT-LBS (NM)
Front Frame to Rear Frame Support Fasteners (CREW)	38-40 ft-lbs (52-54 Nm)
Main Frame to Rear Frame Fasteners (6X6)	34-36 ft-lbs (46-49 Nm)
Front Upper / Lower A-Arm Bolts	30 ft-lbs (41 Nm)
Mid Upper / Lower A-Arm Bolts	30 ft-lbs (41 Nm)
Rear Upper / Lower A-Arm Bolts	30 ft-lbs (41 Nm)
Front Ball Joint Pinch Bolts	23 ft-lbs (31 Nm)
Mid / Rear Lower Bearing Carrier	30 ft-lbs (41 Nm)
Mid / Rear Upper Bearing Carrier	30 ft-lbs (41 Nm)
Upper / Lower Shock Bolts	30 ft-lbs (41 Nm)
Stabilizer Bar to Frame	17 ft-lbs (23 Nm)
Stabilizer Bar Linkage Bushings	17 ft-lbs (23 Nm)
Front Wheel Hub Castle Nut	80 ft-lbs (108 Nm)
Mid / Rear Wheel Hub Castle Nut	110 ft-lbs (150 Nm)
Wheel Nuts (Cast Rims) Wheel Nuts (Steel Rims)	30 ft-lbs + 90° (1/4 turn) 35 ft-lbs (47 Nm)
Outer Tie Rod to Bearing Carrier	40 ft-lbs (54 Nm)
Tie Rod End Jam Nut	12-14 ft-lbs (17-19 Nm)
Seat Belt to Cab Frame	36-44 ft-lbs (49-60 Nm)
Seat Belt to Seat Base	36-44 ft-lbs (49-60 Nm)
Steering Wheel to Shaft	25-31 ft-lbs (34-42 Nm)
Upper Steering Shaft to U-Joint Shaft	15-19 ft-lbs (20-26 Nm)
Lower Steering Shaft to Steering Box	30 ft-lbs (41 Nm)
Steering Box	17 ft-lbs (23 Nm)

NOTE: Refer to exploded views throughout this chapter for more torque specifications, component identification, and location of components.

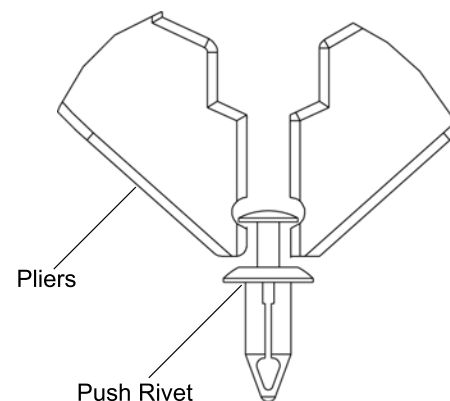
SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Shock Spanner Wrench	2871095
Shock Spring Compressor Tool	2870623
Multi-Function Pliers	2876389

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

Multi-Function Pliers

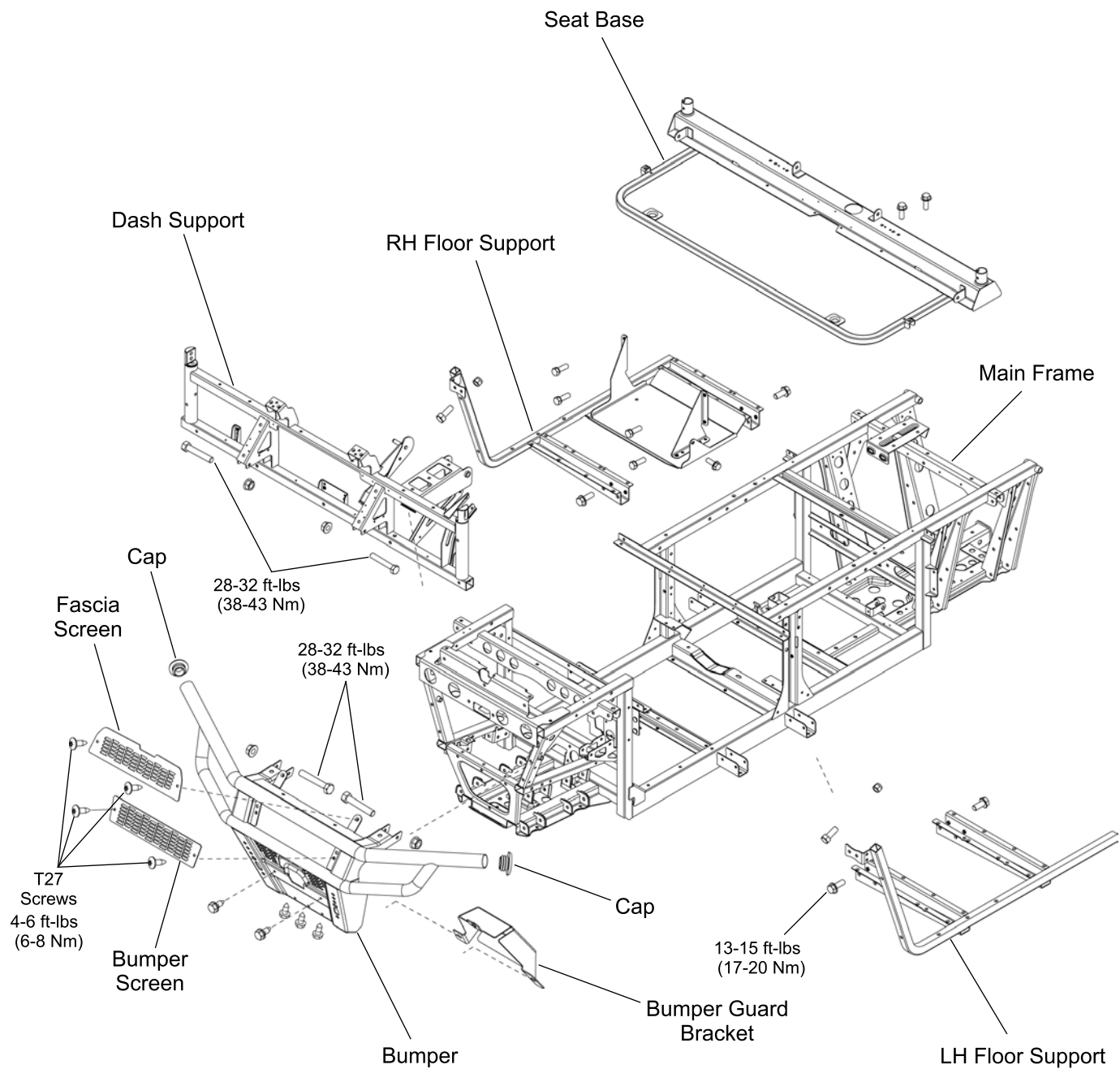
Included in the tool kit, this multi-function pliers is designed to remove plastic push rivets and install body components.



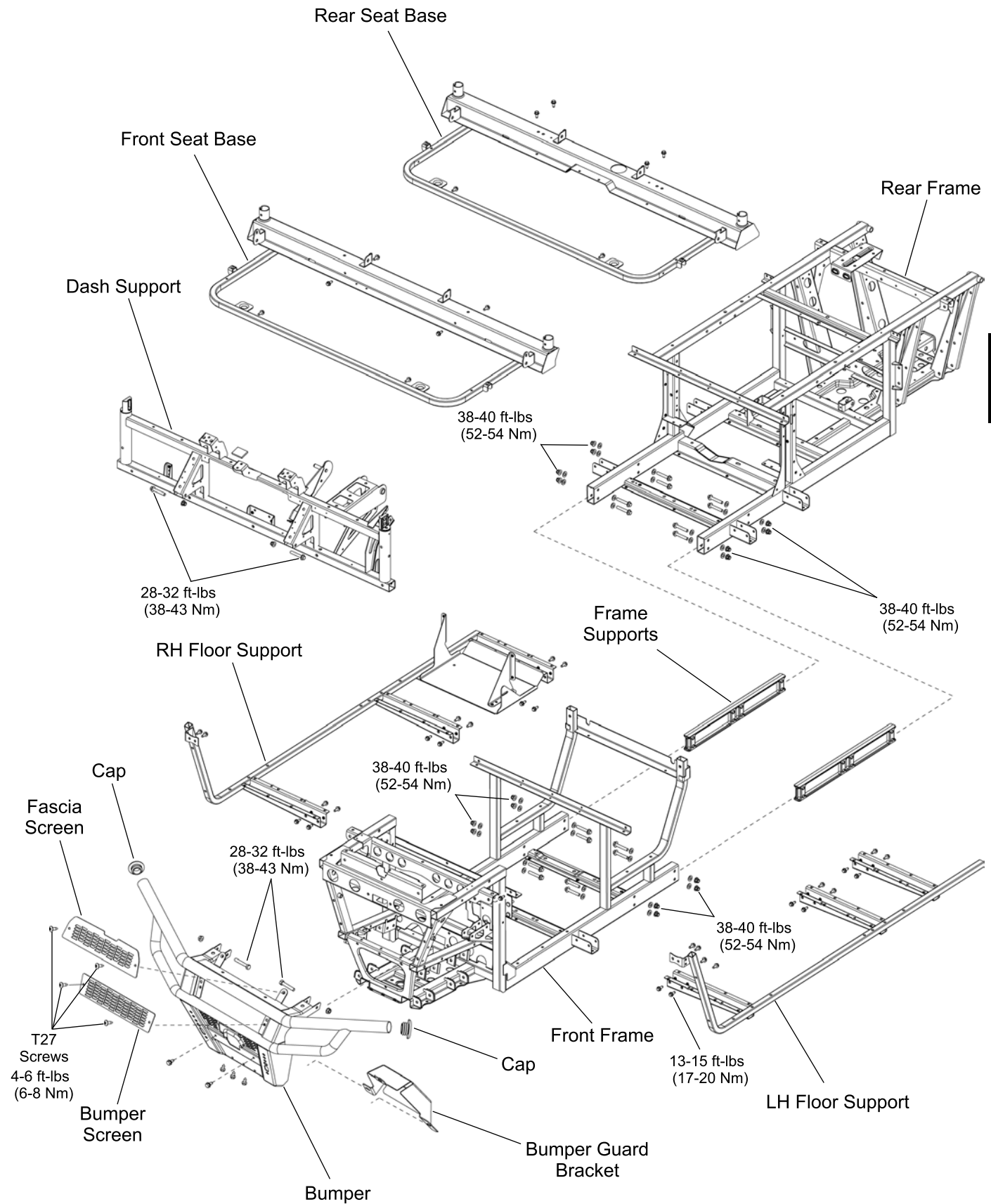
BODY / STEERING / SUSPENSION

CHASSIS / MAIN FRAME

Exploded View (4X4)



Exploded View (CREW)

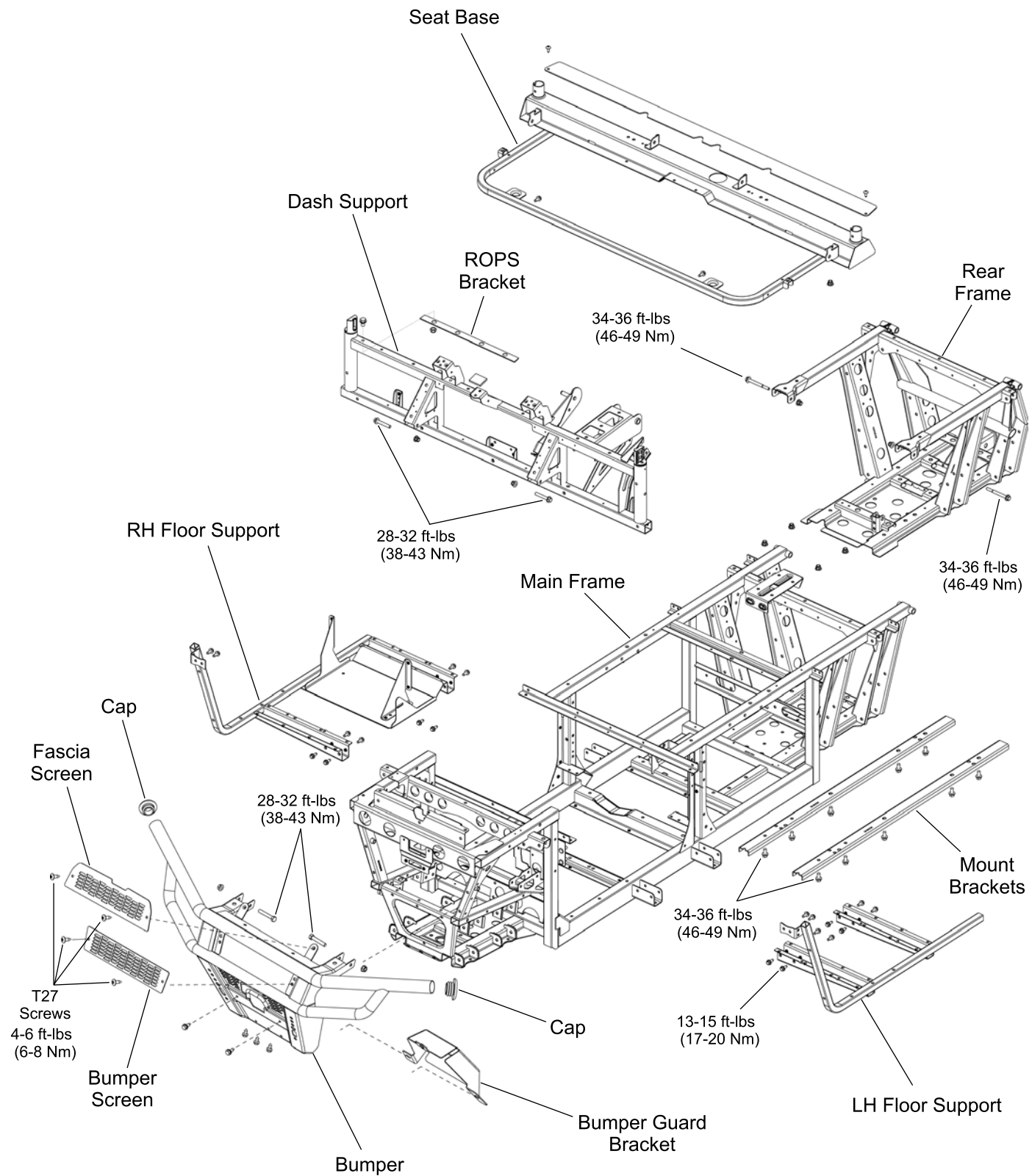


5

5.5

BODY / STEERING / SUSPENSION

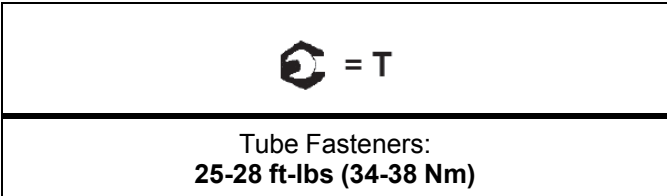
Exploded View (6X6)



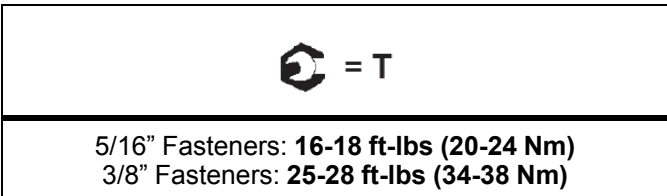
CAB FRAME / SEAT BACK / HEAD-
REST / PVT AIR INTAKE BAFFLE BOX

Exploded View / Assembly (4X4 / 6X6)

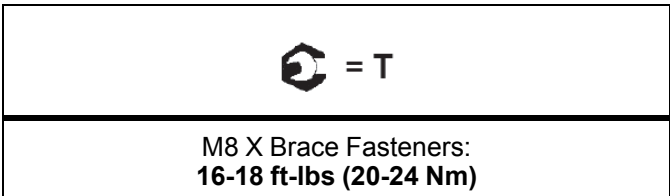
1. Assemble RH / LH cab frame side hoops by sliding tube over the rear coupler. Secure using (2) 5/16" bolts and nuts. Line up front side hoop couplers with front frame couplers and secure using (4) 3/8" screws and nuts. Leave all fasteners finger tight.
2. Attach the front cab frame cross tube to the side hoops using (4) M10 bolts. Attach the rear cab frame cross tube to the side hoops using (4) M10 bolts. Leave all fasteners finger tight.
3. Loosely install the rear cab frame X brace to the side hoops using (8) M8 bolts and nuts. Leave all fasteners finger tight.
4. Tighten (8) front and rear cab frame cross tube fasteners installed during Step 2 to specification.



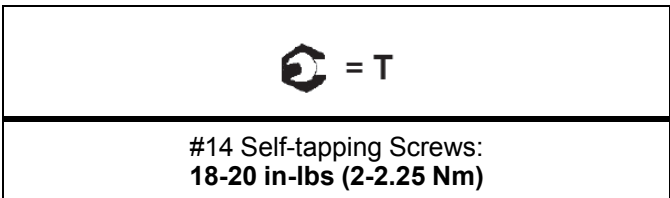
5. Tighten (2) 5/16" fasteners installed during Step 1 to specification and (4) 3/8" fasteners to specification.



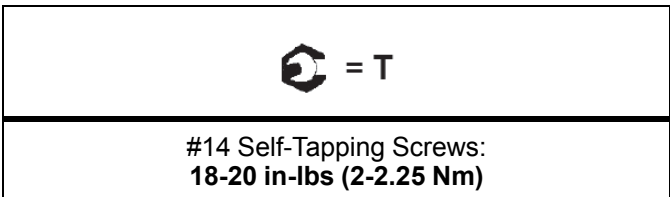
6. Tighten (8) M8 X brace fasteners installed during Step 3 to specification.



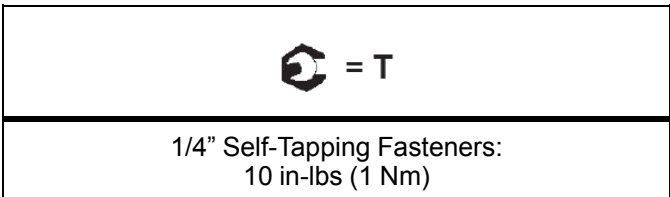
7. Fasten the seat back to the X brace using (8) #14 self-tapping screws. Tighten fasteners to specification.



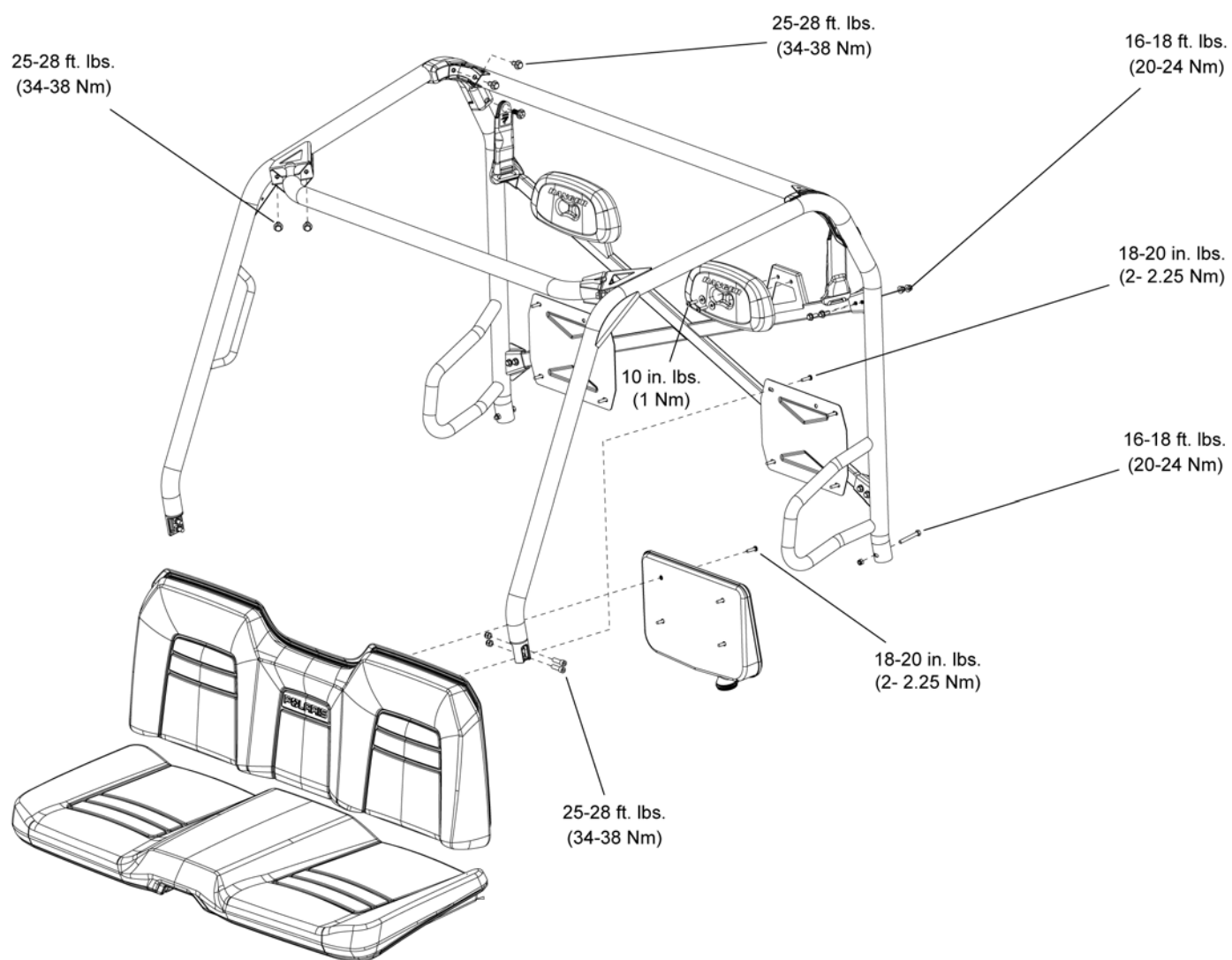
8. Slide the clutch air intake box over the clutch intake hose. Attach the clutch air intake box to the seat back using (4) #14 self-tapping screws. Tighten fasteners to specification.



9. Attach each headrest to the rear cab frame using four 1/4" self-tapping fasteners. Place washers between the fastener head and headrest as shown below. Torque fasteners to specification.

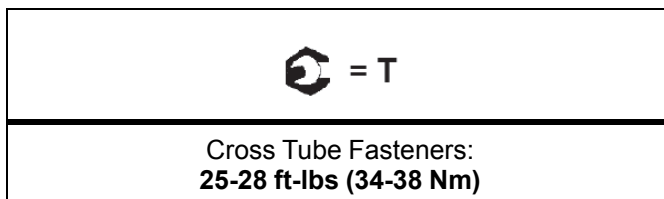


BODY / STEERING / SUSPENSION

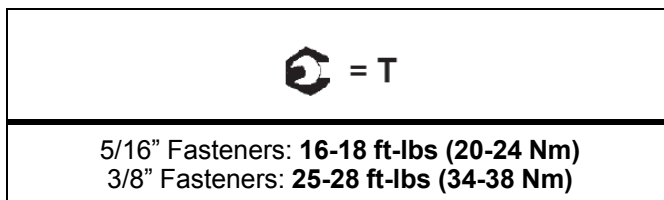


Exploded View / Assembly (CREW)

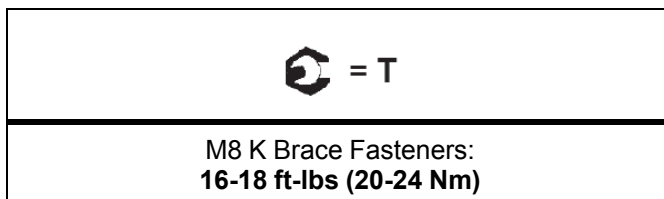
1. Assemble RH / LH front cab frame side hoops by sliding tube over the rear coupler. Secure using (2) 5/16" bolts and nuts. Line up front side hoop couplers with front frame couplers and secure using (4) 3/8" screws and nuts. Leave all fasteners finger tight.
2. Attach the front cab frame cross tube to the side hoops using (4) M10 screws. Install the rear cab frame cross tube to the side hoops using (4) M10 screws. Leave all fasteners finger tight.
3. Loosely install the rear cab frame K brace to the side hoops using (8) M8 screws and nuts. Leave all fasteners finger tight.
4. Tighten (8) front and rear cab frame cross tube fasteners installed during Step 2 to specification.



5. Tighten (2) 5/16" fasteners installed during Step 1 to specification and (4) 3/8" fasteners specification.

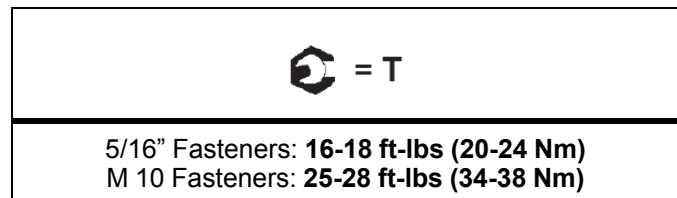


6. Tighten the (8) M8 K brace fasteners installed during Step 3 to specification.

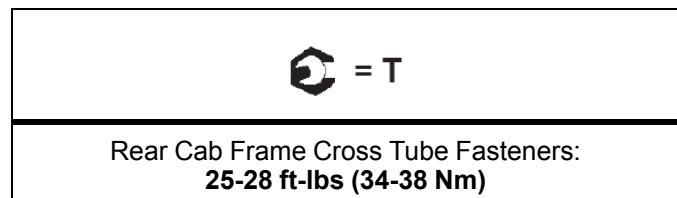


7. Assemble the RH and LH rear cab frame side hoops by sliding the tube over the rear coupler. Secure using (2) 5/16" bolts and nuts. Line up the front upper rear hoop couplers with the rear cab frame cross tube holes and secure using (2) M10 screws and nuts. Leave all fasteners finger tight.
8. Install the rear cab frame cross tube to the rear side hoops using (4) M10 screws. Leave all fasteners finger tight.
9. Loosely install the rear cab frame X brace to the rear side hoops using (8) M8 screws and nuts. Leave all fasteners finger tight.

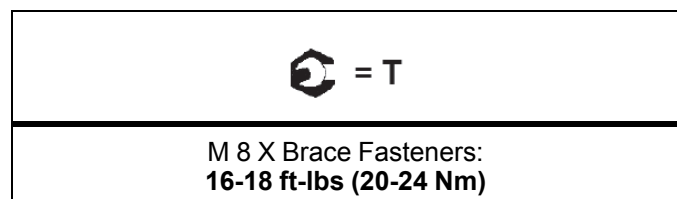
10. Tighten (2) 5/16" fasteners installed during Step 7 to specification and (4) M10 fasteners to specification.



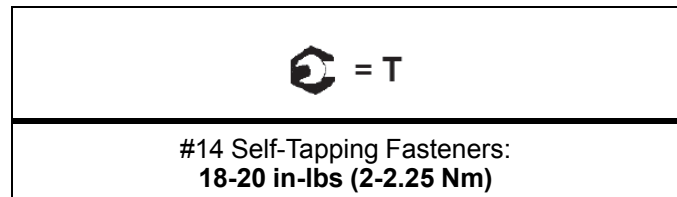
11. Tighten the (4) rear cab frame cross tube fasteners installed during Step 8 to specification.



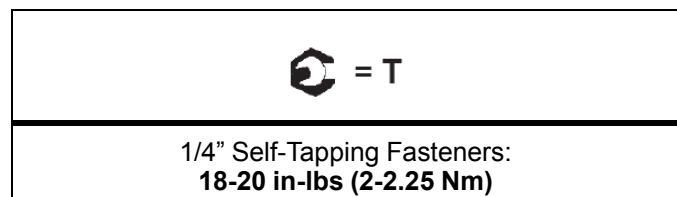
12. Tighten the (8) M8 X brace fasteners installed during Step 9 to specification.



13. Fasten the seat back to the rear cab frame X brace using (8) #14 self-tapping screws. Tighten fasteners to specification. Repeat this step to attach the front seat back to the mid cab frame K brace.



14. Slide the clutch air intake box over the clutch intake hose. Attach the clutch air intake box to the seat back using (4) #14 self-tapping screws. Tighten fasteners to specification.

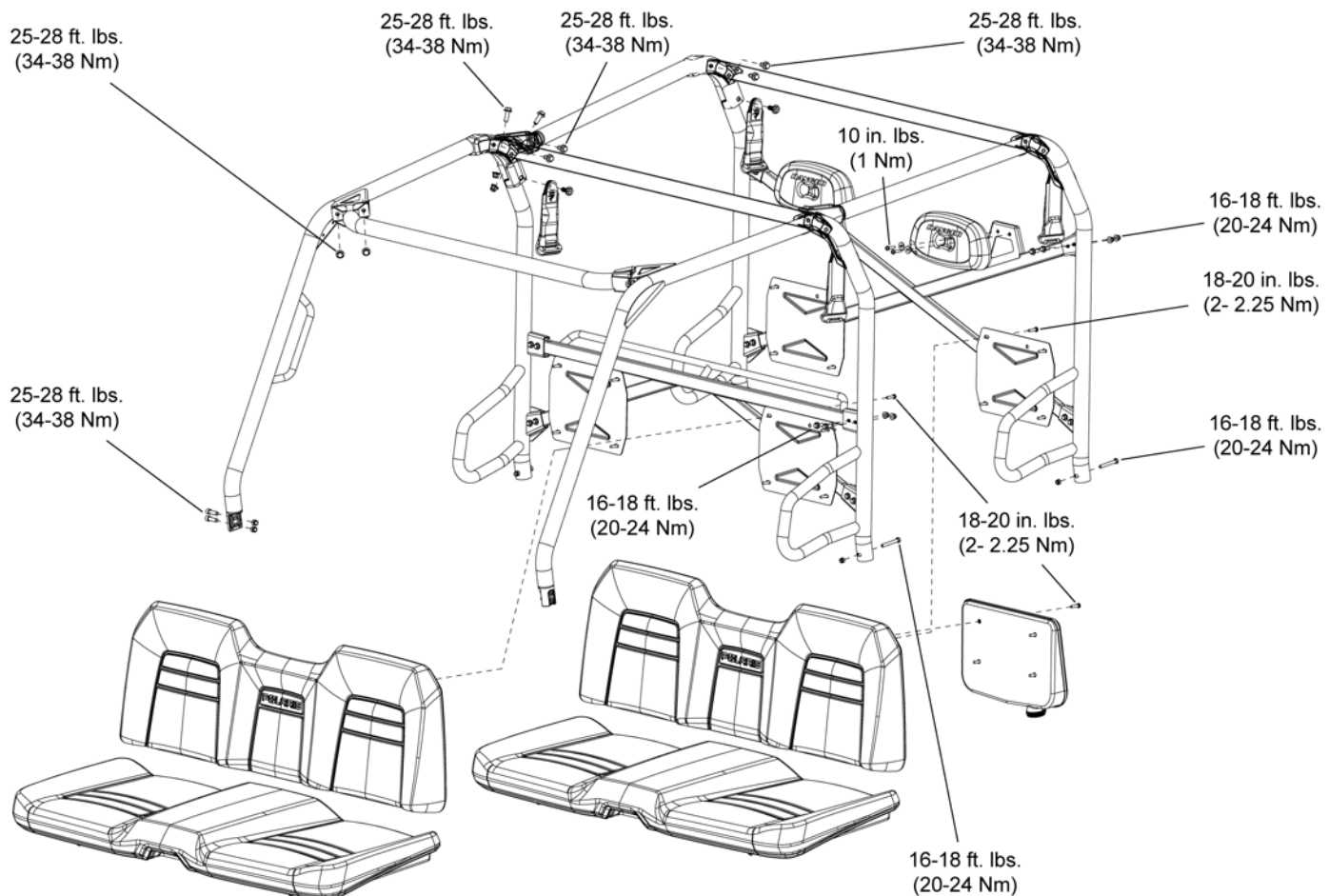


BODY / STEERING / SUSPENSION

15. Attach the headrest to the rear cab frame using (4) 1/4" self-tapping fasteners. Place washers between the fastener head and headrest as shown below. Torque fasteners to specification.



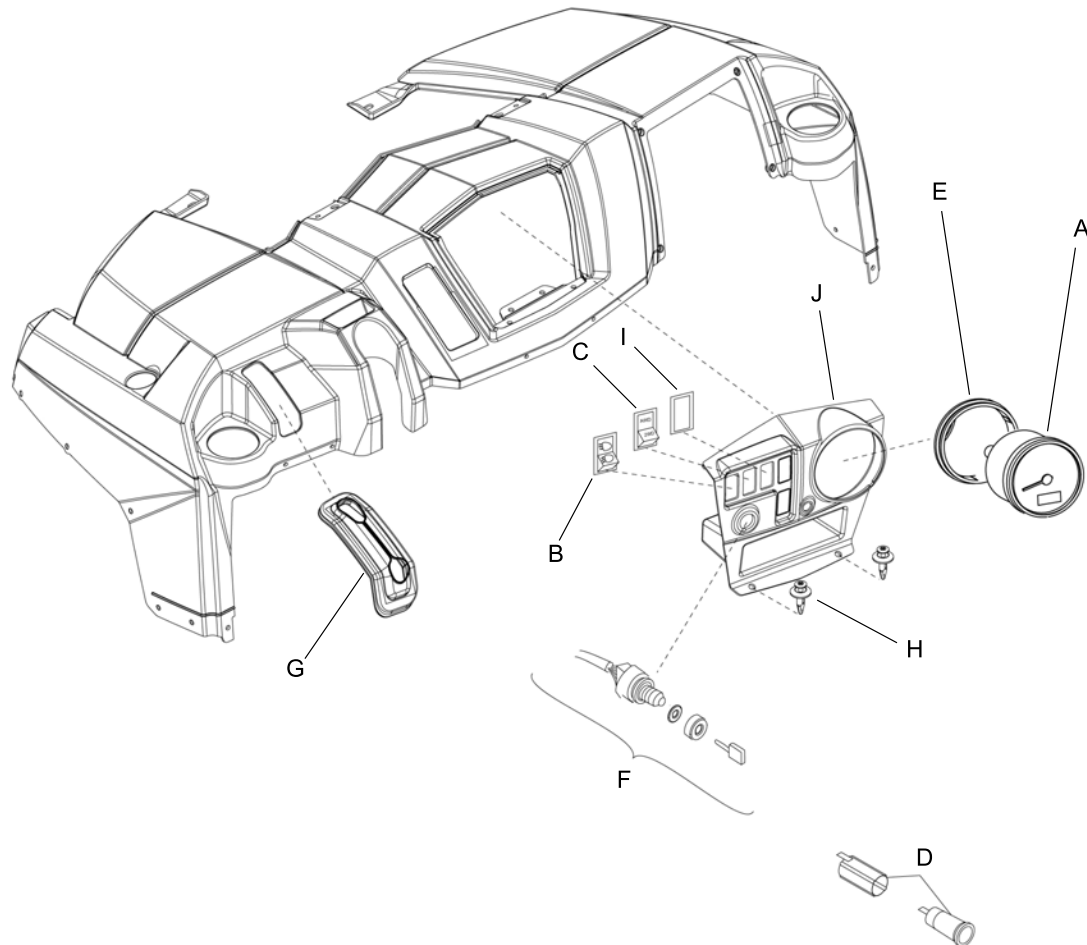
1/4" Self-Tapping Fasteners:
10 in-lbs (1 Nm)



BODY EXPLODED VIEWS

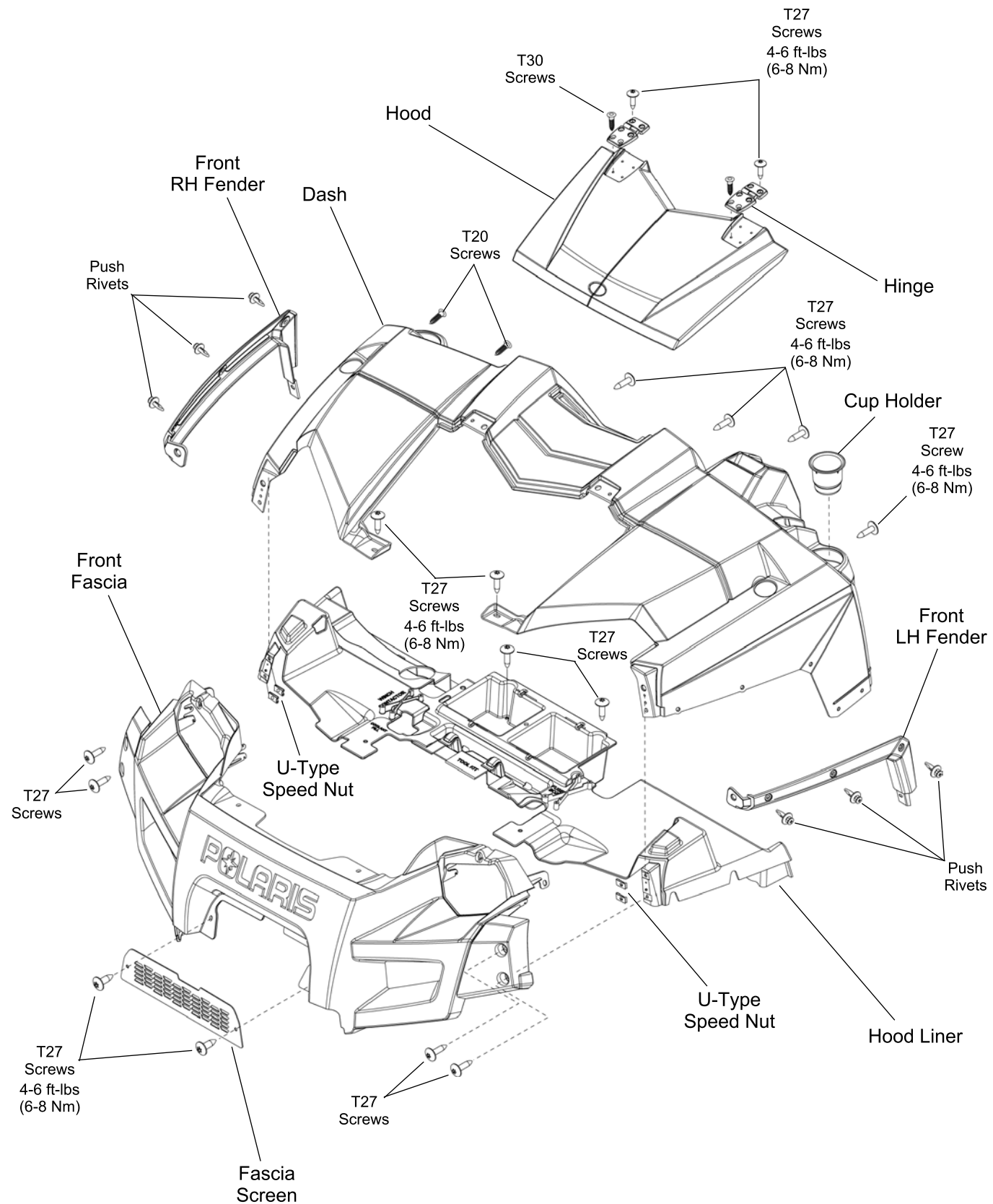
Dash Instruments / Controls

- A. Instrument Cluster (Speedo)
- B. Headlight Switch
- C. AWD / 2WD / TURF Switch
- D. 12 Volt Accessory Receptacle (2)
- E. Rubber Mount
- F. Key Switch
- G. Grommet
- H. Push Rivet
- I. Dash Plug
- J. Dash Panel

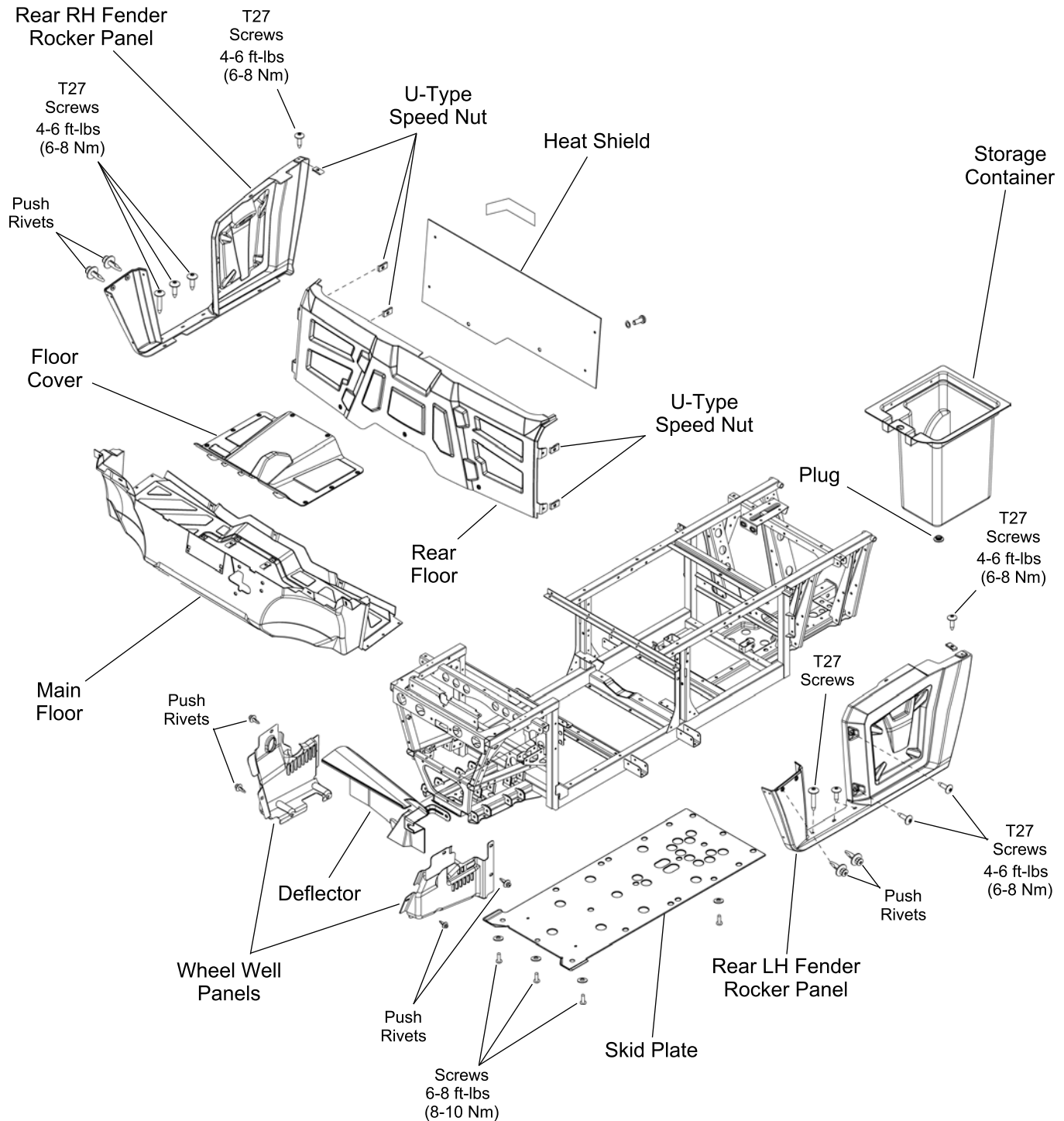


BODY / STEERING / SUSPENSION

Hood / Dash / Front Fenders / Front Fascia



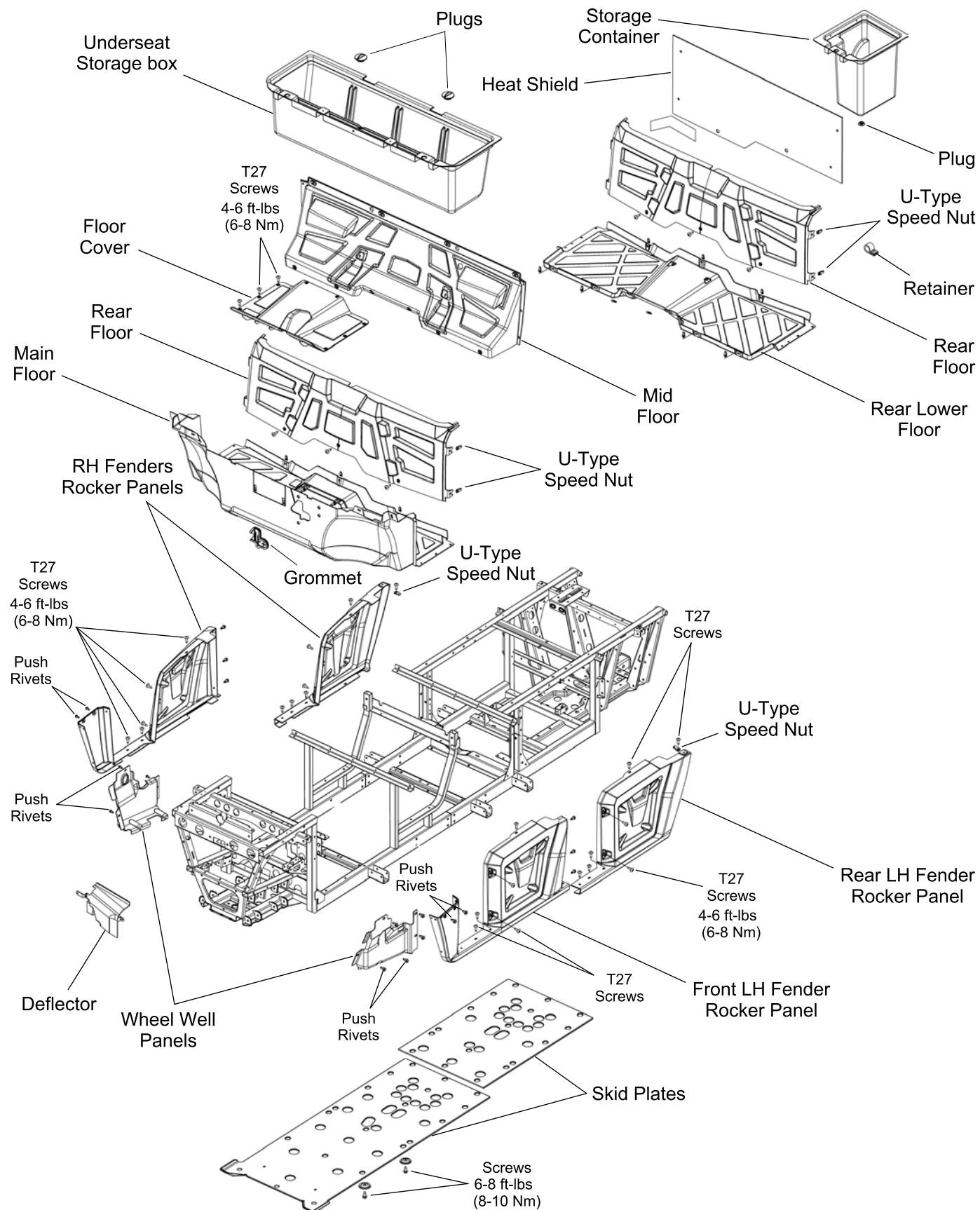
Floor / Rear Fenders (4X4 / 6X6)



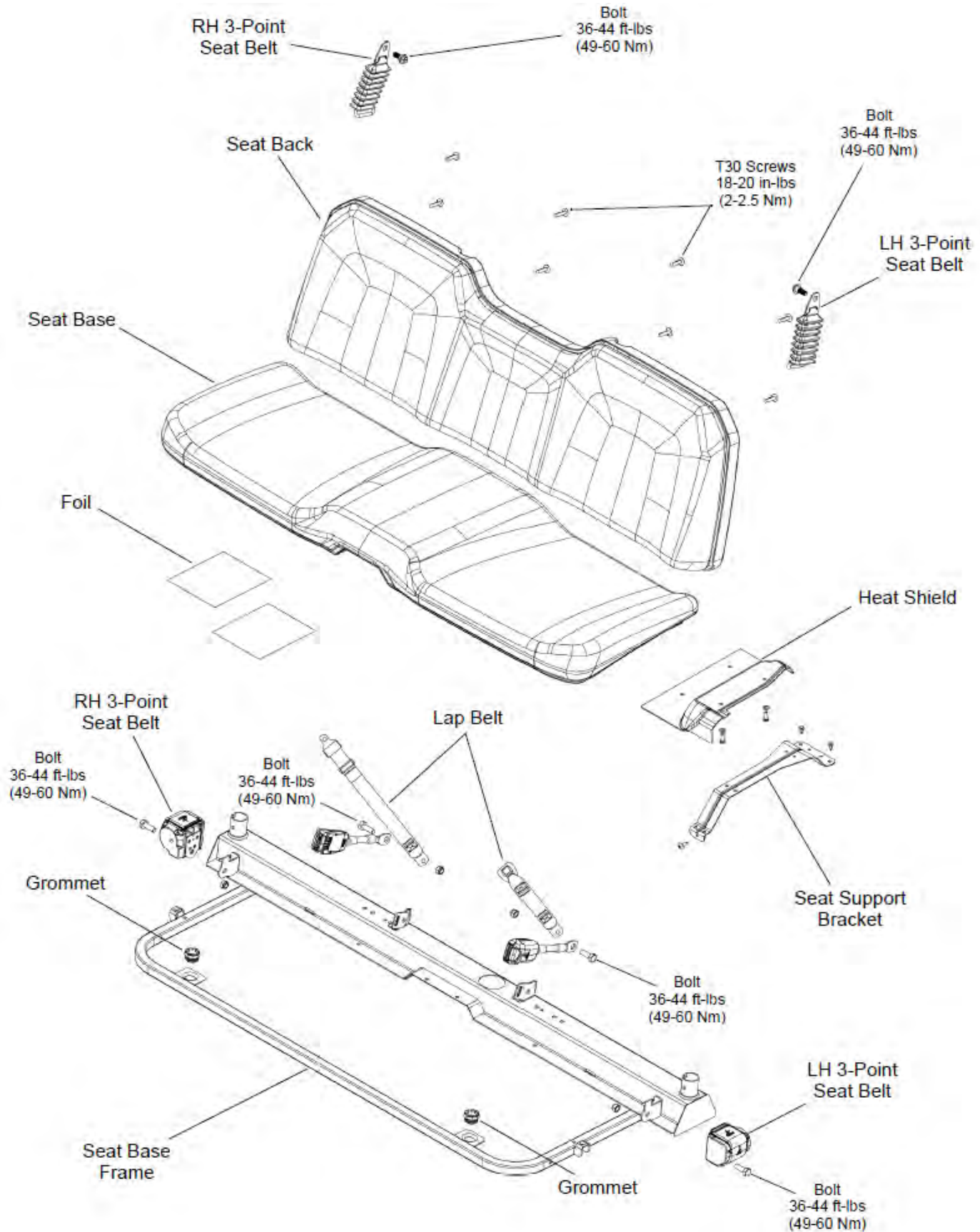
5

BODY / STEERING / SUSPENSION

Floor / Rear Fenders (CREW)

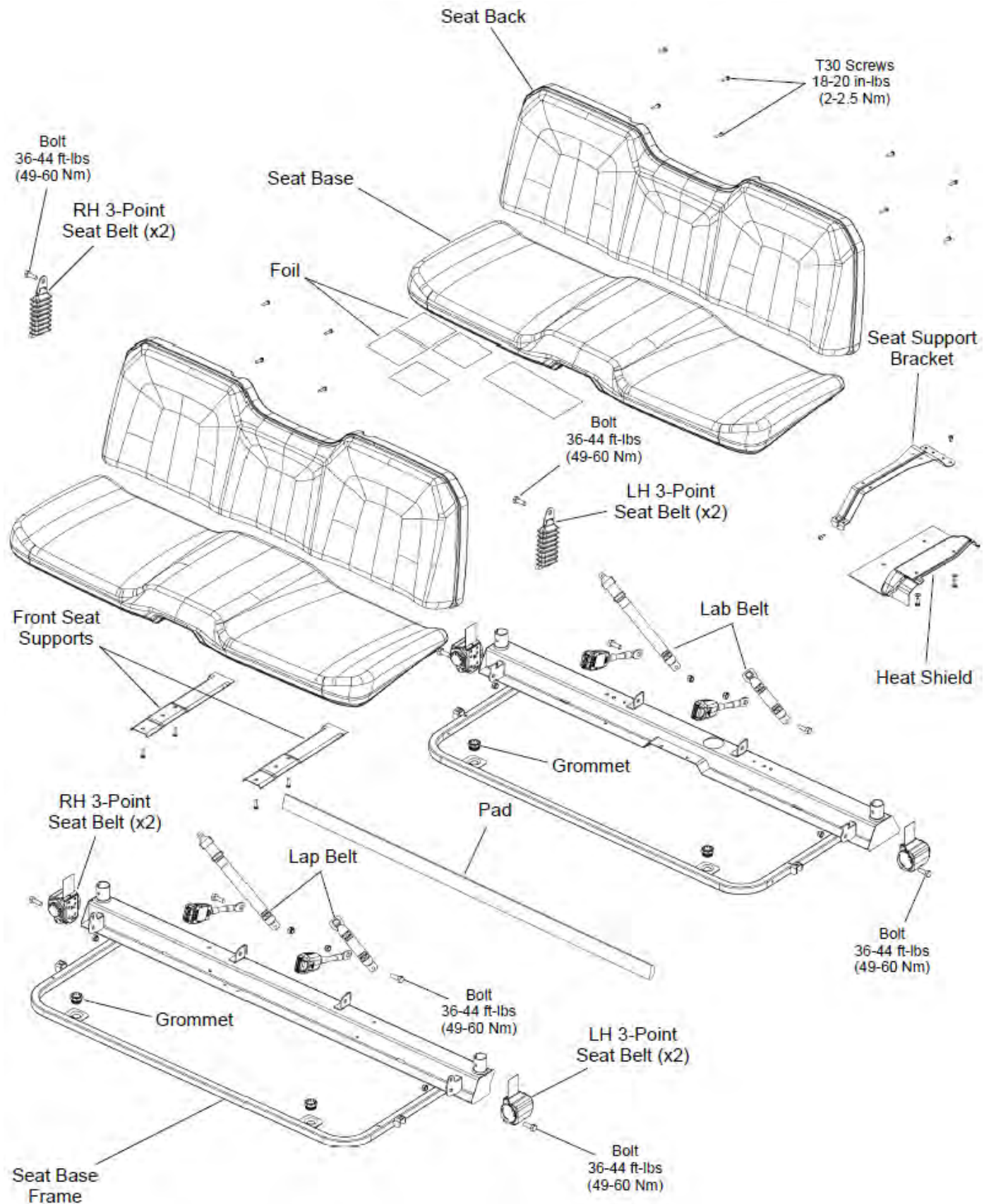


Seat Mounting / Seat Belts (4X4 / 6X6)



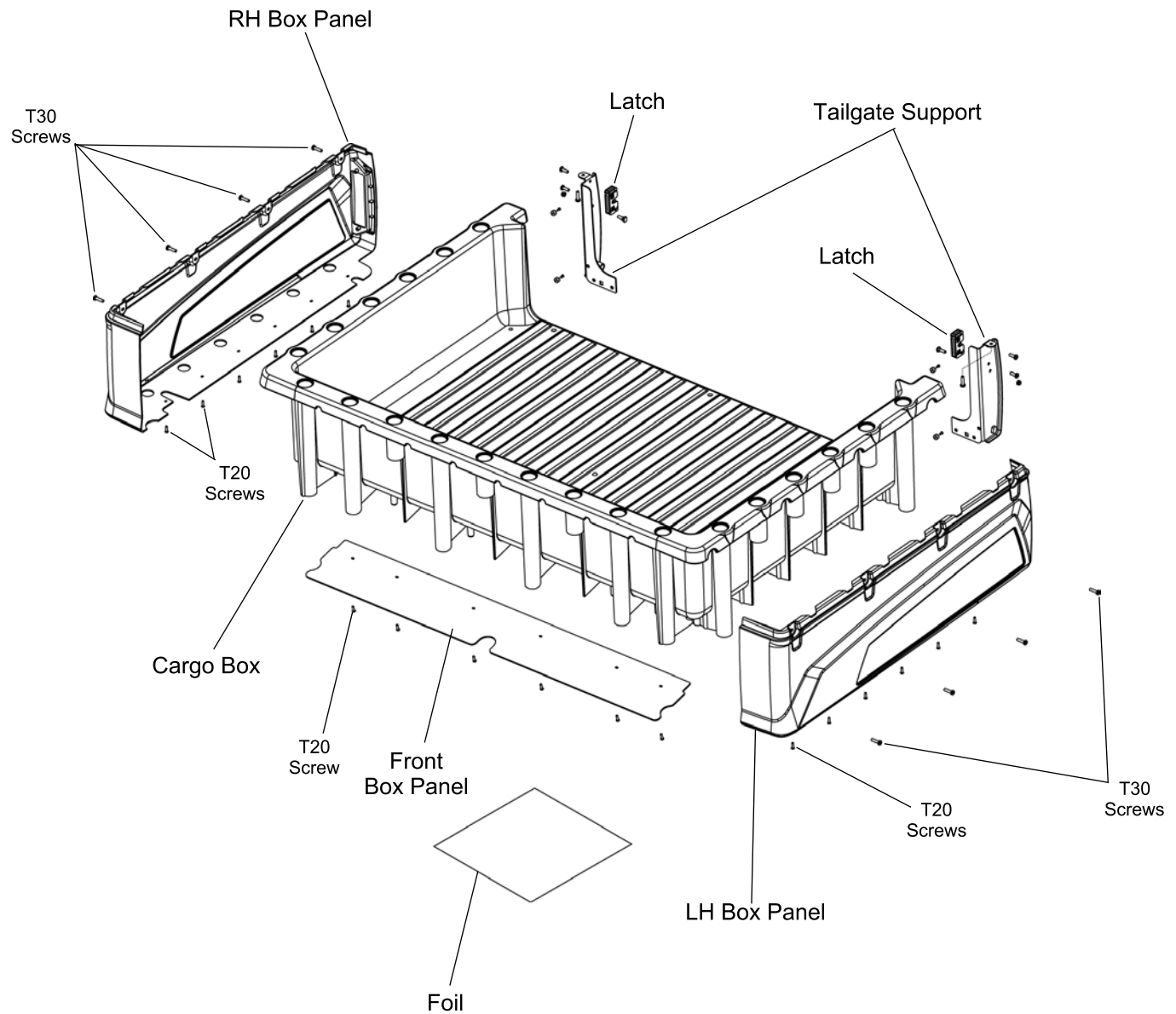
BODY / STEERING / SUSPENSION

Seat Mounting / Seat Belts (CREW)



REAR CARGO BOX

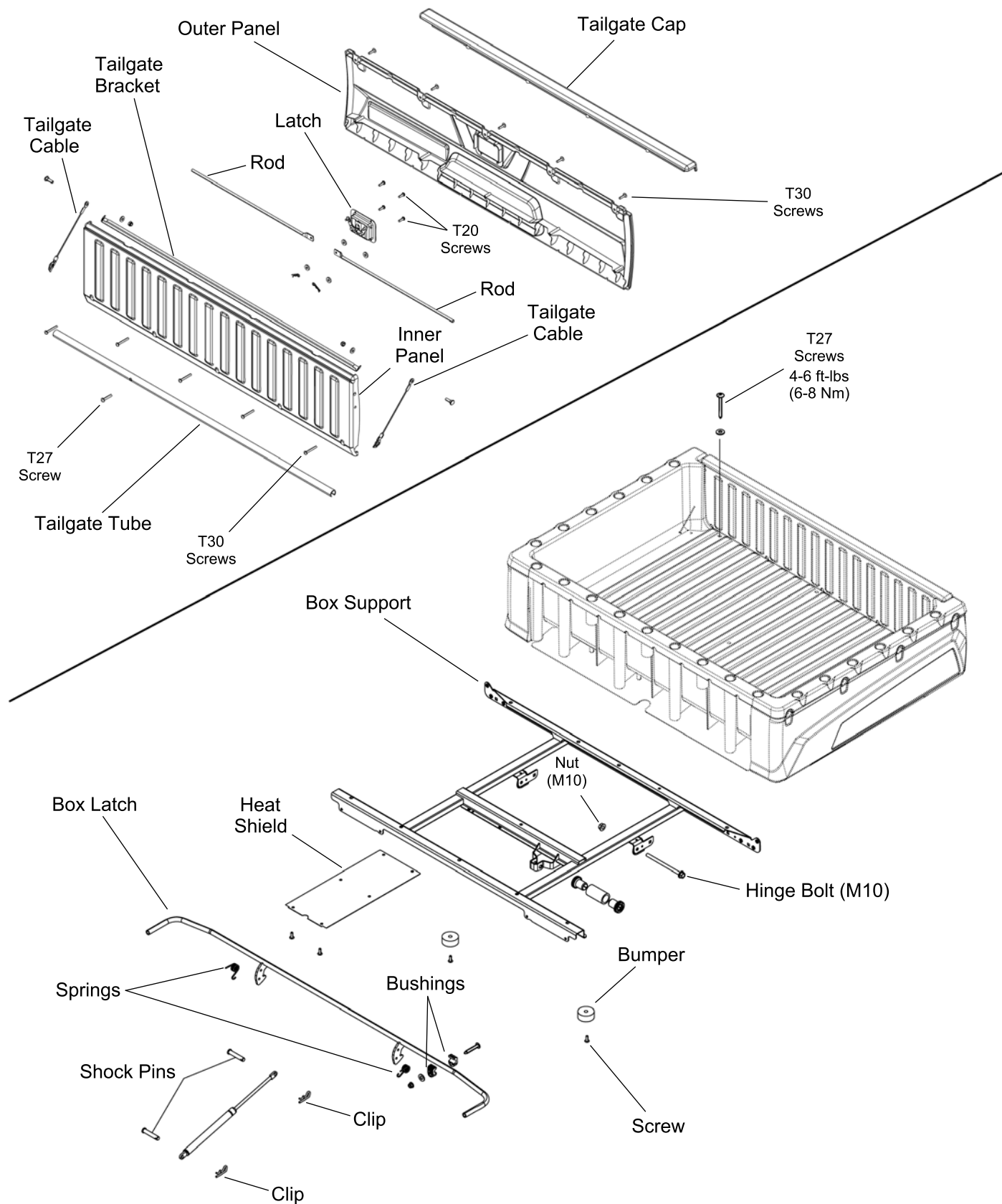
Cargo Box - Panels



5

BODY / STEERING / SUSPENSION

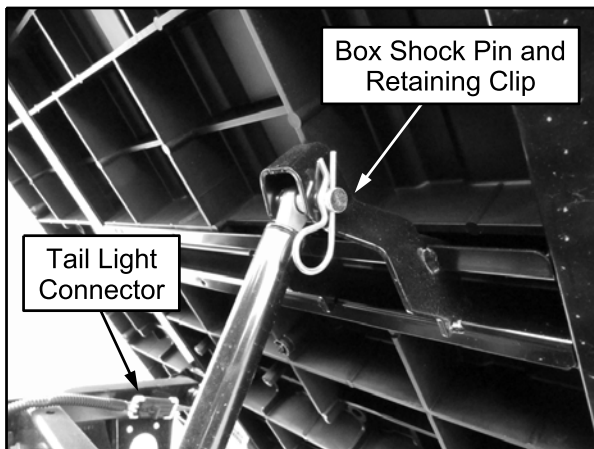
Cargo Box - Tailgate / Box Support



BODY / STEERING / SUSPENSION

Box Removal

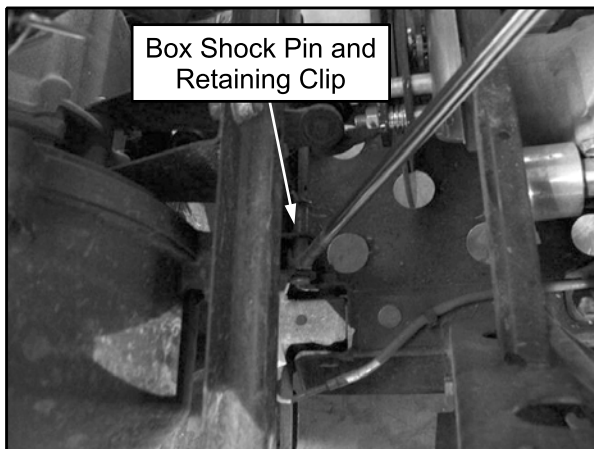
1. Lift the cargo box into the dump position.
2. Disconnect the rear wire harness attached to the tail lights.
3. Remove the upper clip and pin attaching the shock to the cargo box.



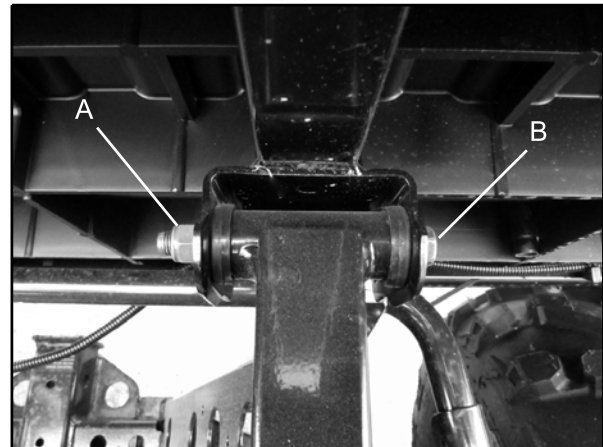
CAUTION

Safely support the box during the remainder of the removal process. The box is not as stable with the shock removed.

4. Remove the lower clip and pin attaching the shock to the vehicle frame if replacing the box shock.



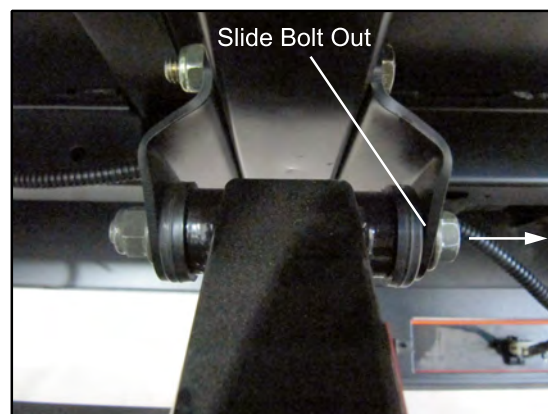
5. Remove nut (A) and bolt (B) that secure the box frame on both pivot points.



CAUTION

Safely support the box during the remainder of the removal process. The box is not as stable with the hinge pins removed.

5



6. With both hinge bolts removed, lift the box from the frame. Two people or an appropriate hoist may be needed to remove the box from the frame.

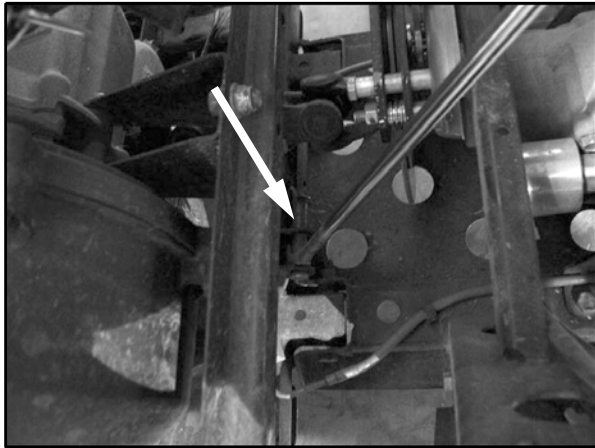
CAUTION

Use caution when removing the box. It is recommended to have two people carefully remove the box from the frame.

BODY / STEERING / SUSPENSION

Box Installation

1. If the shock was removed, install the lower portion of the shock to the frame and secure it with the pin and clip.



2. Place the cargo box onto the frame. Align the hinges of the box with the bracket on the frame.
3. Install the box hinge bolts on both sides.
4. Install the hinge bolt nuts on both sides and torque the nut to specification.



Hinge Bolt Nut:
30 ft-lbs (41 Nm)

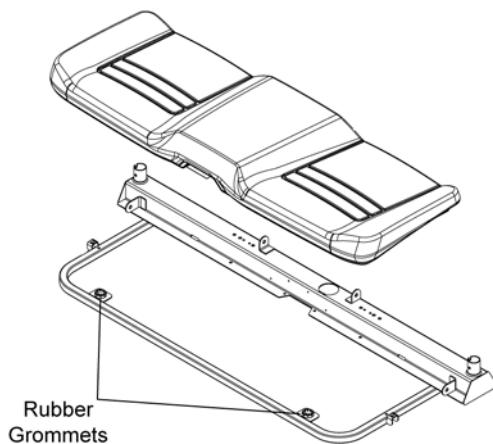
5. With the hinge bolts installed, attach the shock to the cargo box by inserting the pin and clip.
6. Connect tail light harness connector.
7. Lower the box and secure the latch.

BODY / STEERING / SUSPENSION

BODY COMPONENT REMOVAL

Lower Seat Base

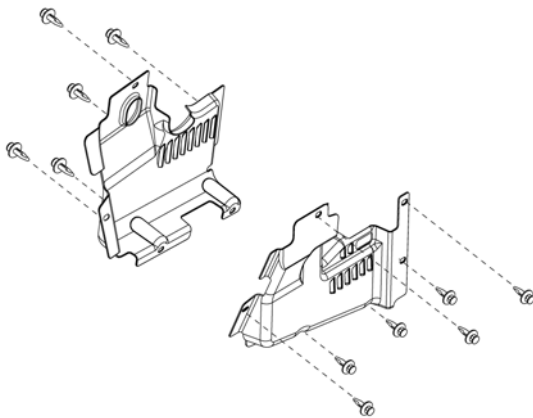
1. Lift up on the front of the seat base to disengage the seat from the rubber grommets.



2. Pull the seat base forward to disengage the rear tabs and remove the seat base from the vehicle.

Wheel Well Panels

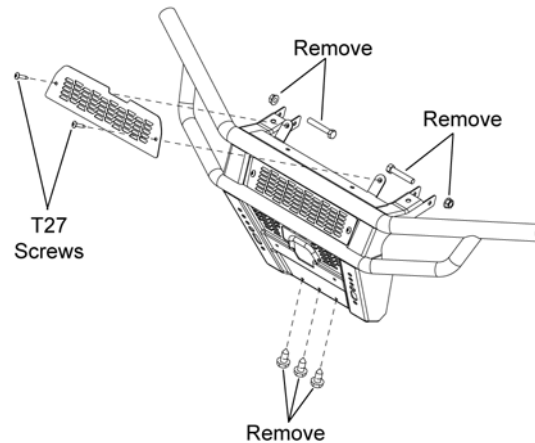
1. Using the multi-function pliers, remove the (6) push rivets from the LH panel and the (5) push rivets from the RH panel.



2. Pull both panels out from the wheel wells.

Front Bumper

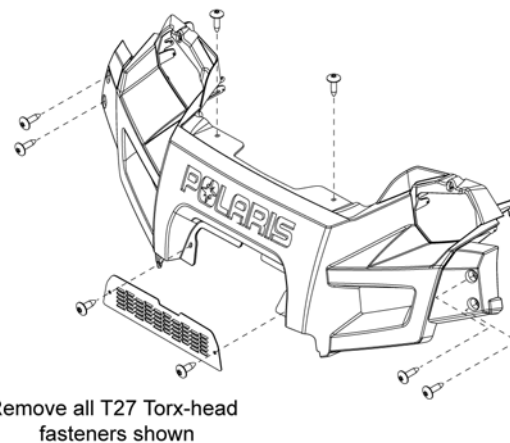
1. Remove the (2) T27 Torx-head screws retaining the fascia screen and remove the screen.



2. Remove the (3) bolts from lower portion of bumper.
3. Remove the fasteners from each side of the upper portion of the bumper.
4. Carefully remove the bumper from the vehicle.

Front Fascia

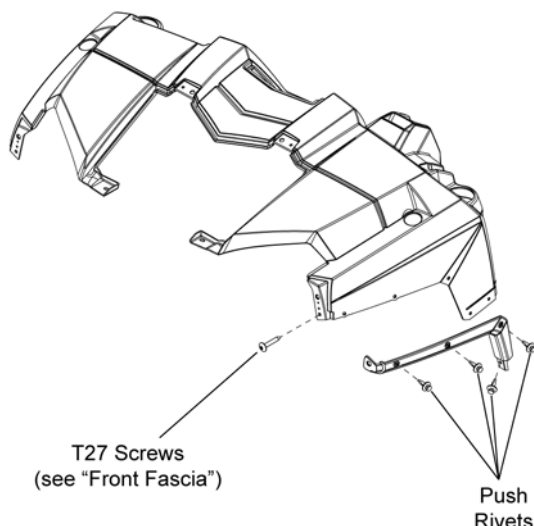
1. Remove the (2) T27 Torx-head screws retaining the fascia screen and remove the screen.



2. Remove the remaining T27 Torx-head screws retaining the front fascia.
3. Turn the headlight bulbs counter-clockwise 90° and remove the bulbs from the head lamps.
4. Carefully remove the fascia from the vehicle.

Front Fenders

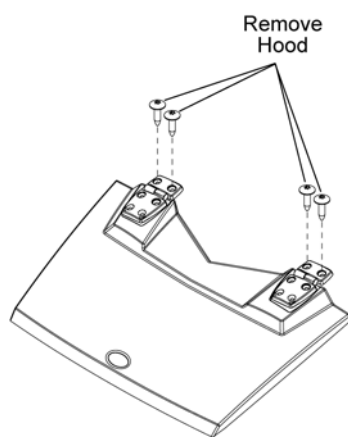
1. Remove the lower T27 Torx-head screws retaining the front fascia (see "Front Fascia").



2. Remove the (4) push rivets retaining the front fender and remove the fender from the vehicle.
3. Repeat this procedure to remove other front fender.

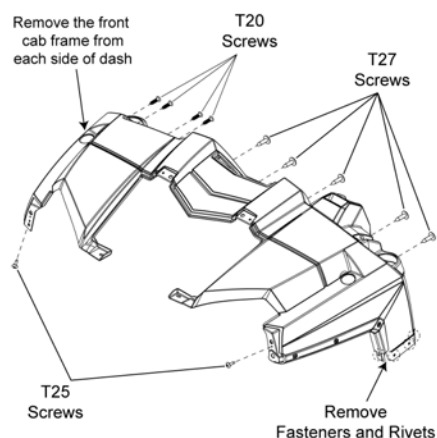
Hood / Dash

1. Remove front fascia (see "Front Fascia" removal).
2. Unlatch the hood and remove the (2) T27 Torx-head screws to remove the hood assembly.



3. Remove the front portion of the cab frame on each side to allow dash removal (see "Cab Frame - Exploded View").
4. Remove the (2) T25 Torx-head screws retaining the front of the dash to the hood liner.

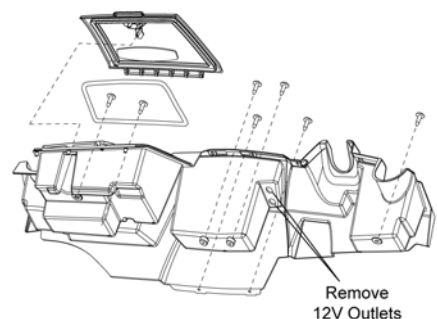
5. Open the glove box and remove the (4) T20 Torx-head screws from the dash.



6. Remove the (5) T25 Torx-head screws retaining the rear portion of the dash.
7. Remove the (8) fasteners from each side of the dash where it attaches to the front and rear fenders.
8. Remove the rubber boots from around the parking brake and shift lever.
9. Remove the (2) push rivets from dash panel (see "Dash Instruments/Controls"). Unhook all electrical components to allow panel to be completely removed.
10. Carefully remove the dash assembly from the vehicle.

Glove Box / Storage Panel

1. Remove the hood / dash (see "Hood / Dash").



2. Remove the (7) T27 Torx-head screws retaining the glove box storage panel.
3. Disconnect 12V power outlets and remove assembly.

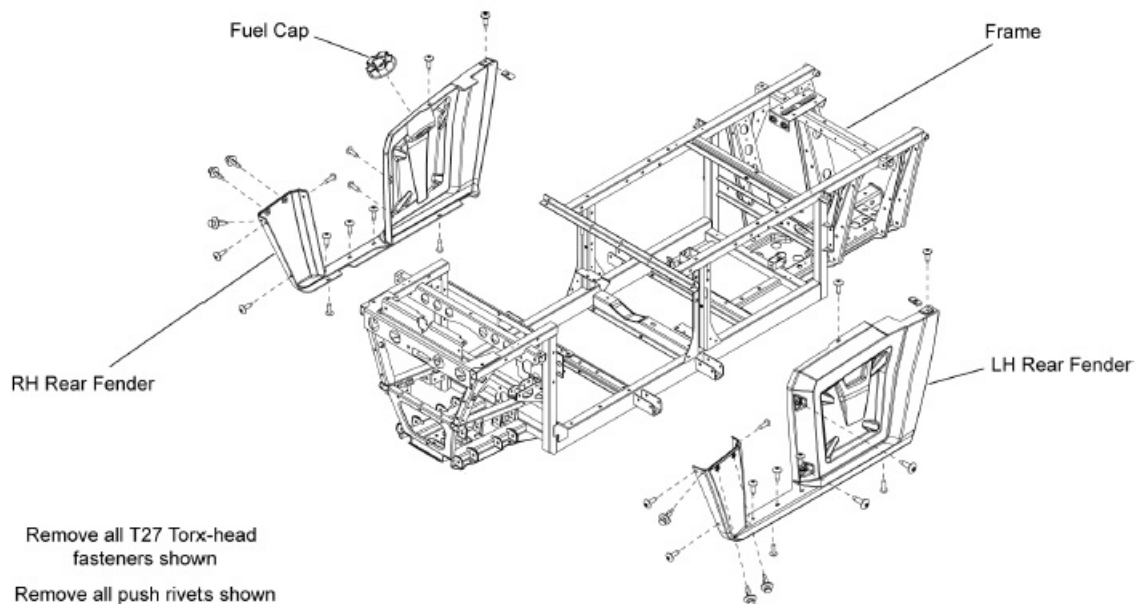
BODY / STEERING / SUSPENSION

Rear Fenders (4X4 / 6X6)

1. Remove (11) T27 Torx-head screws and (3) push rivets retaining the rear fender.

NOTE: If removing the RH side, remove the fuel cap as well. Reinstall fuel cap after fender removal.

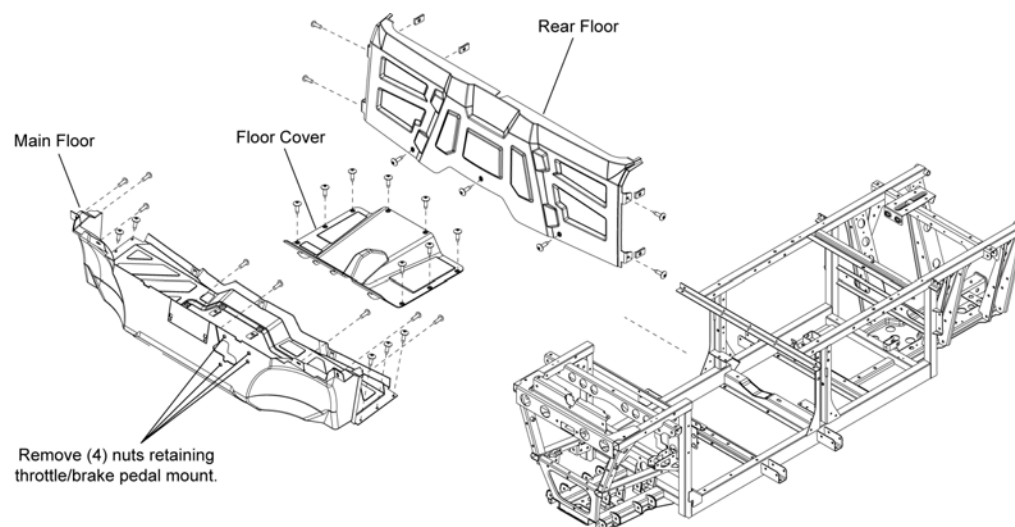
2. Repeat this procedure to remove other rear fender.



Floor (4X4 / 6X6)

1. Remove (7) T27 Torx-head screws retaining the rear floor. Disconnect ECU harness and remove the rear floor.
2. Remove (8) T27 Torx-head screws retaining the floor cover and remove the floor cover from the vehicle.

3. Loosen the glove box/storage panel fasteners to access the screws retaining the upper portion of the main floor (see "Glove Box / Storage Panel").
4. Remove (14) T27 Torx-head screws retaining the main floor. Remove (4) nuts retaining the brake/throttle pedal mount and remove the main floor from the vehicle.

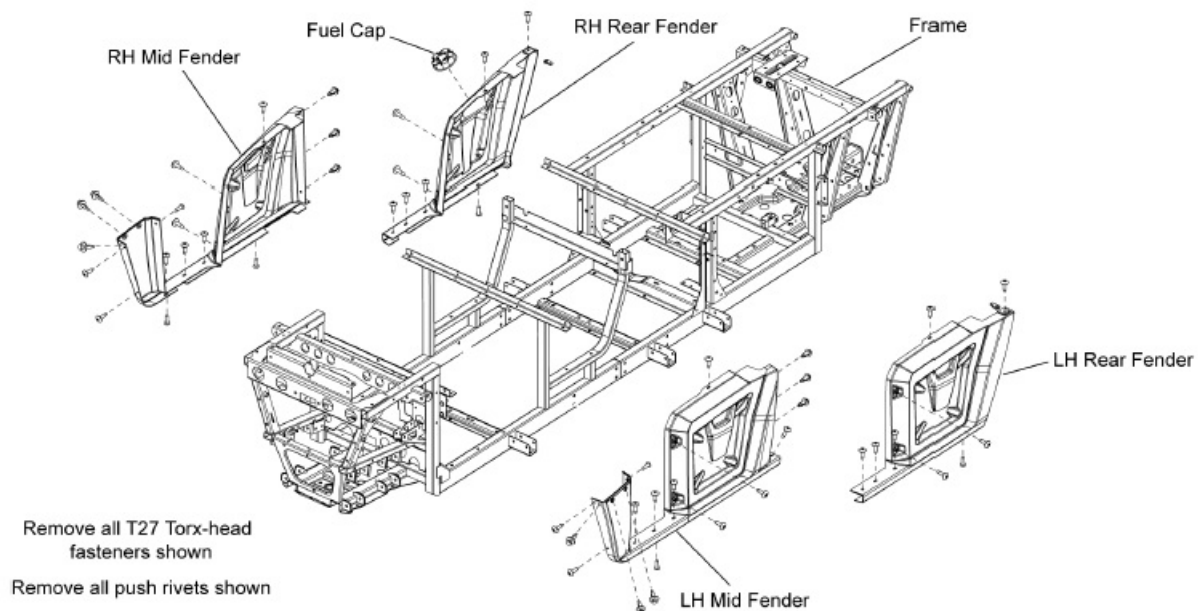


Mid / Rear Fenders (CREW)

1. Remove (19) T27 Torx-head screws and (6) push rivets retaining the fenders.

NOTE: If removing the rear RH side, remove the fuel cap as well. Reinstall fuel cap after fender removal.

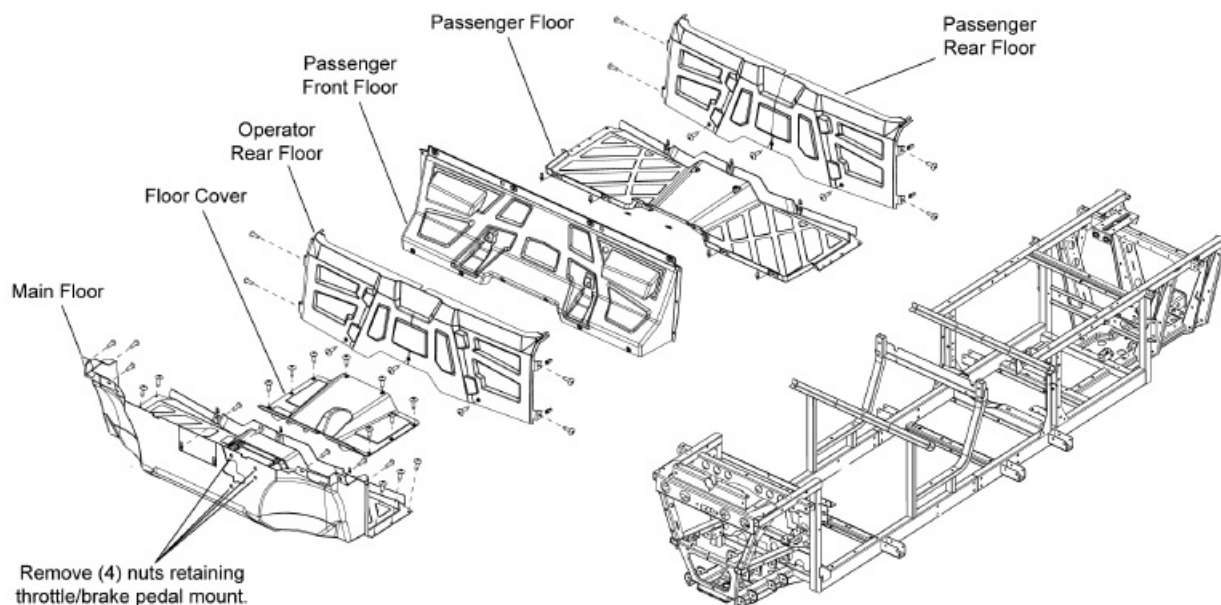
2. Repeat this procedure to remove the other fenders.



Floor (CREW)

1. Remove (7) T27 Torx-head screws retaining either rear floor. Disconnect ECU harness if removing the passenger rear floor.
2. Remove (8) T27 Torx-head screws retaining the floor cover and remove the floor cover from the vehicle.

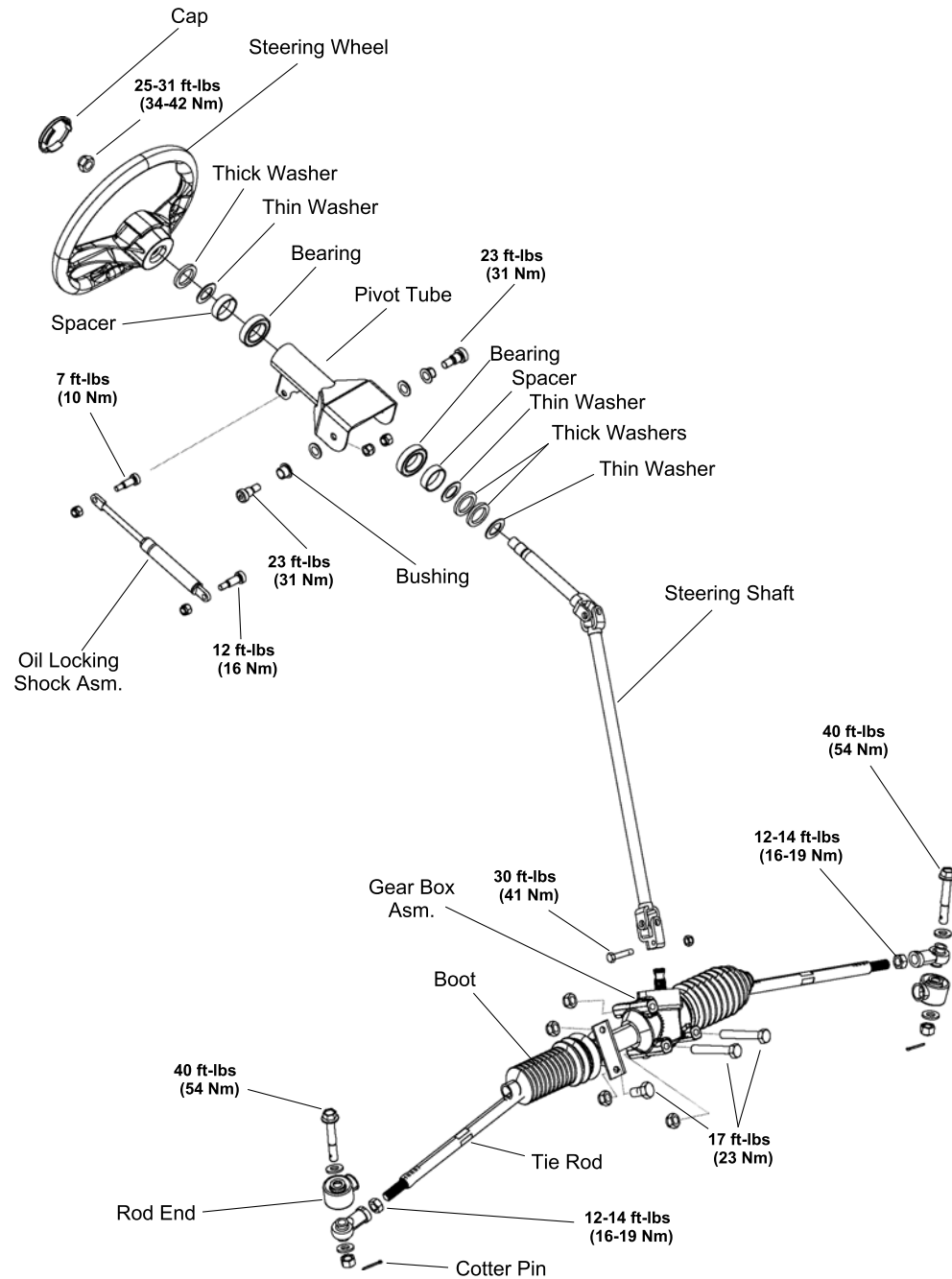
3. Loosen the glove box/storage panel fasteners to access the screws retaining the upper portion of the main floor (see "Glove Box / Storage Panel").
4. Remove (14) T27 Torx-head screws retaining the main floor and remove (4) nuts retaining the brake/throttle pedal mount. Remove main floor from vehicle.
5. See illustration if further disassembly is required.



BODY / STEERING / SUSPENSION

STEERING ASSEMBLY

Exploded View



Steering Wheel Removal (Non-EPS Models)

CAUTION

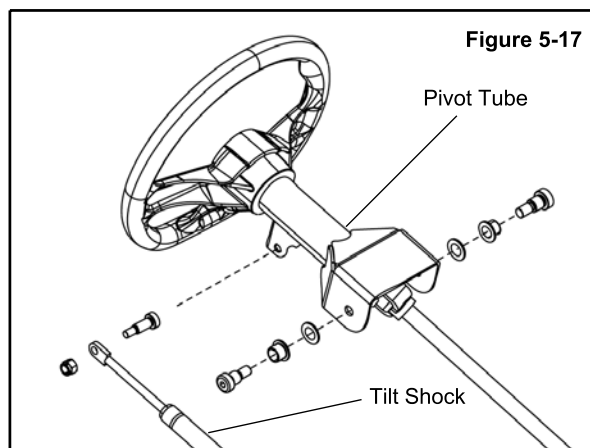
This procedure should NOT be used on EPS models. Using this procedure on an EPS model can permanently damage the EPS unit and cause a Power Steering Fault.

1. Remove the steering wheel cap.
2. Loosen the nut and back it half way off the steering shaft.
3. With a glove on your hand, place it under the steering wheel. Lift upward on the inner portion of the steering wheel while using a hammer to strike the steering shaft nut.

IMPORTANT: If the steering wheel will not pop loose, proceed to “Steering Shaft Removal”.

4. Once the steering wheel pops loose, completely remove the nut and lift the steering wheel off the shaft.

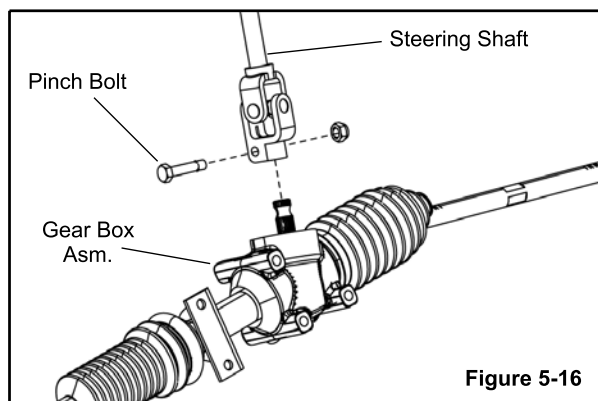
2. Remove the fastener retaining the upper portion of the steering wheel tilt shock to the pivot tube.



3. Remove the (2) fasteners that retain the pivot tube.
4. Remove the steering shaft, pivot tube and steering wheel from the vehicle as an assembly.
5. Refer to steps 11-13 of the “Steering Shaft Bearing Replacement” procedure for installation.

Steering Shaft Removal (Non-EPS Models)

1. Remove the pinch bolt retaining the lower portion of the steering shaft to the steering gear box assembly.



Steering Shaft Bearing Replacement

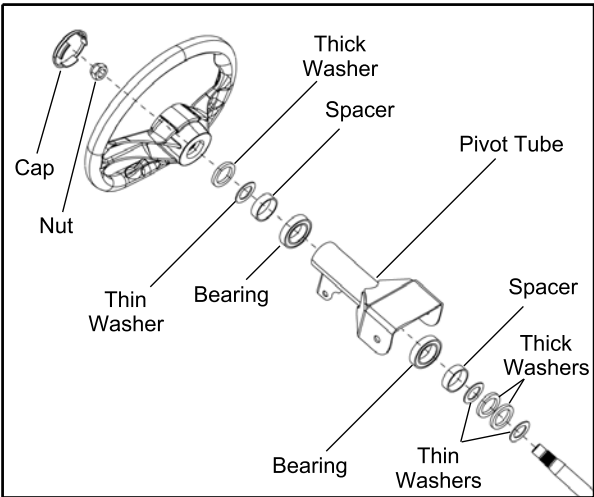
IMPORTANT: Replacement pivot tube assembly comes with new upper and lower bearings installed. Use this procedure if replacing just the bearings only.

1. Perform the “Steering Shaft Removal” procedure.
2. Remove the steering wheel cap and retaining nut.
3. Press steering shaft out of the steering wheel and pivot tube.
4. Note the order and location of the washers and spacers between the steering wheel and pivot tube.
5. Drive the bearings out of the pivot tube using a drift punch.
6. Inspect the pivot tube bearing surfaces for signs of excessive wear or damage.

BODY / STEERING / SUSPENSION

7. Apply Loctite® 271™ (Red) to the outer circumference of the new lower bearing race. Slide the new lower bearing onto the steering shaft and install the steering shaft through the pivot tube.

NOTE: Use care not to allow any of the Loctite® to get in the bearing.



NOTE: Be sure the lower washers and spacers are still on the steering shaft.

8. Apply Loctite® 271™ (Red) to the outer circumference of the new upper bearing race. Slide the new upper bearing onto the steering shaft and press it into the pivot tube by hand.

NOTE: Use care not to allow any of the Loctite® to get in the bearing.

NOTE: Bearings will be seated in the pivot housing upon tightening the steering wheel nut in step 14.

9. Reinstall the upper washers and spacers in the order in which they were removed.
10. Install the steering wheel and hand tighten the nut.
11. Reinstall the steering shaft assembly in the vehicle. Install the lower portion of the steering shaft onto the steering gear box assembly (see Figure 5-16). Torque the lower pinch bolt to specification.

 = T
Lower Pinch Bolt: 30 ft-lbs (41 Nm)

12. Install the (2) fasteners that retain the pivot tube (see Figure 5-17). Torque fasteners to specification.

 = T
Pivot Tube Fasteners: 23 ft-lbs (31 Nm)

13. Install the fastener retaining the upper portion of the steering wheel tilt shock to the pivot tube (see Figure 5-17). Torque fastener to specification.

 = T
Upper Tilt Shock Fastener: 7 ft-lbs (10 Nm)

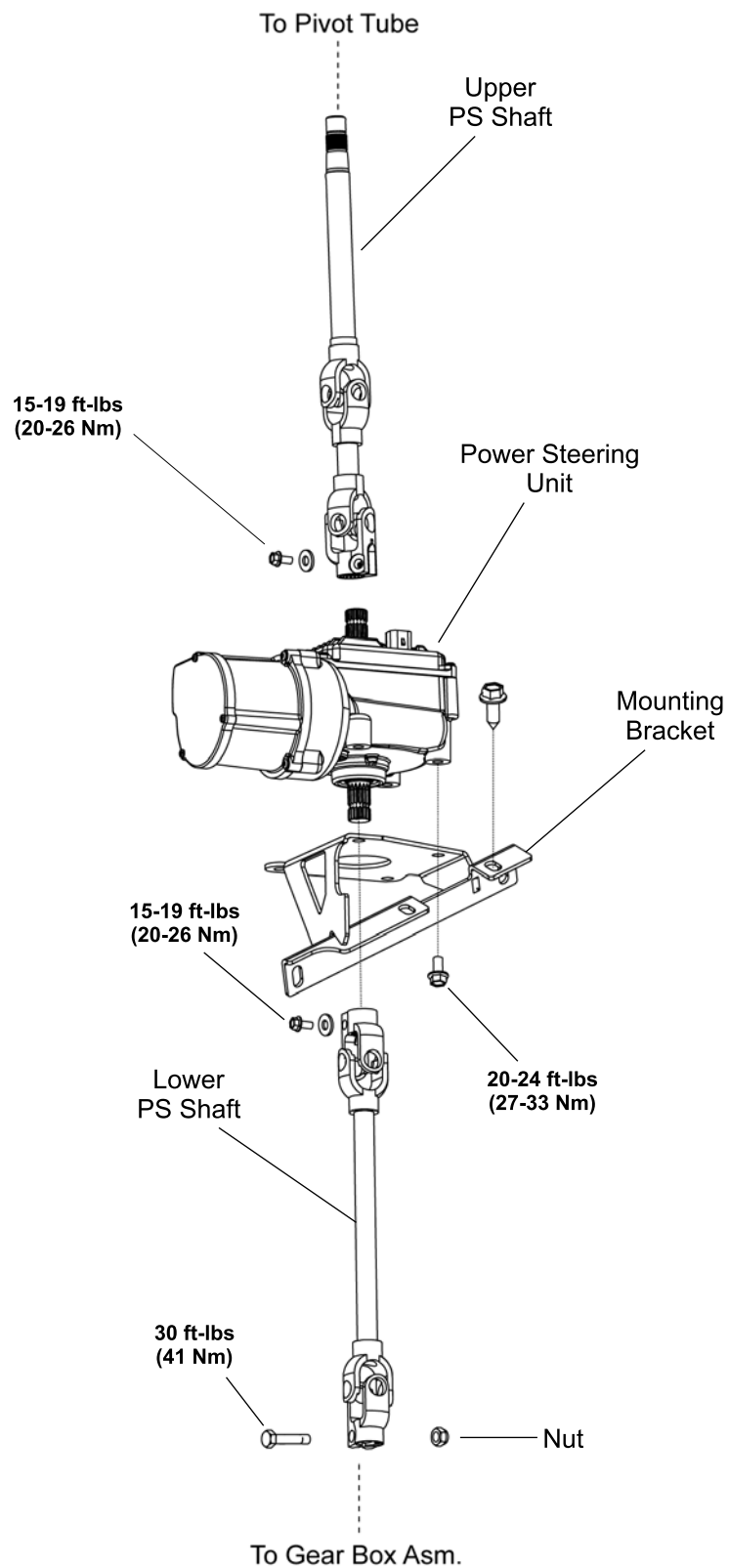
14. Be sure the front wheels are facing straight forward. Remove the steering wheel and align as needed. Torque the steering wheel nut to specification.

 = T
Steering Wheel Nut: 28 ft-lbs (38 Nm)

15. Wipe the pivot tube clean of any excess Loctite®.
16. Install steering wheel cap and field test steering operation.

POWER STEERING ASSEMBLY (EPS)

Exploded View



BODY / STEERING / SUSPENSION

Steering Wheel Removal (EPS Models)

1. Remove the upper steering shaft, pivot tube and steering wheel as an assembly *before* attempting to remove the steering wheel. Refer to "Power Steering Unit Removal (EPS Models)".

CAUTION

Striking the steering wheel or steering shaft while installed in the vehicle can permanently damage the EPS unit and cause a Power Steering Fault.

2. Remove the steering wheel cap.

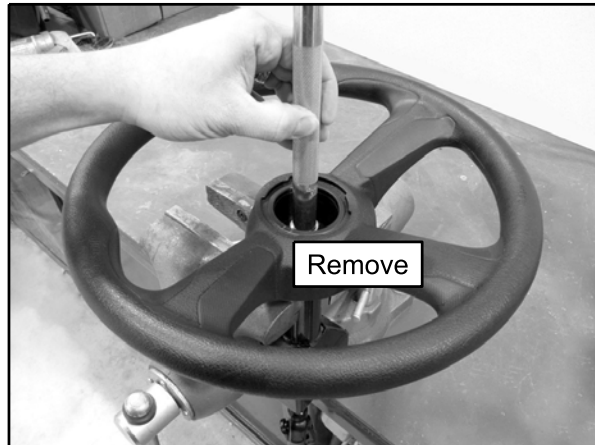


3. Loosen the nut and back it half way off the steering shaft.



4. Place the assembly in a vise.

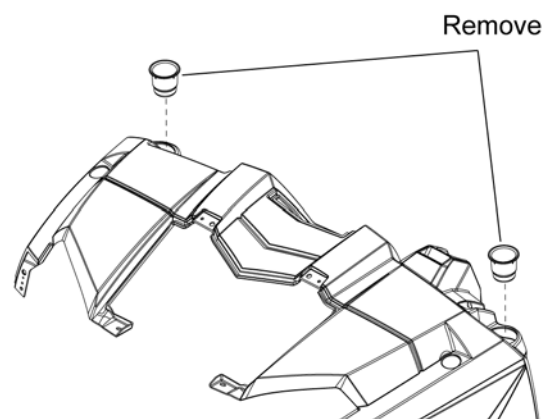
5. Using a large bronze drift and hammer, strike steering shaft nut to pop the steering wheel off the shaft taper.



6. Once the steering wheel pops loose, completely remove the nut and lift the steering wheel off the shaft.

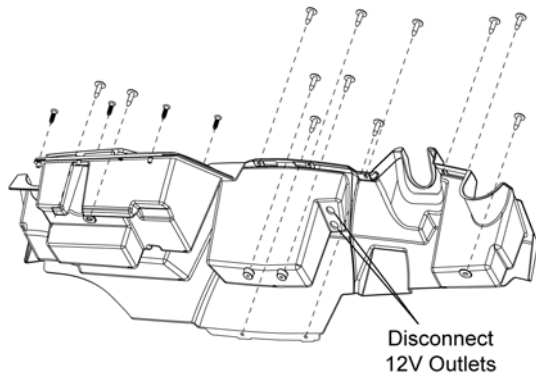
Power Steering Unit Removal

1. Remove the cup holders from the upper dash panel.

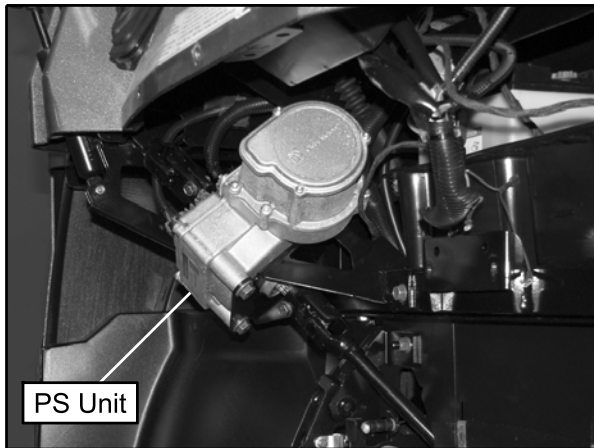


BODY / STEERING / SUSPENSION

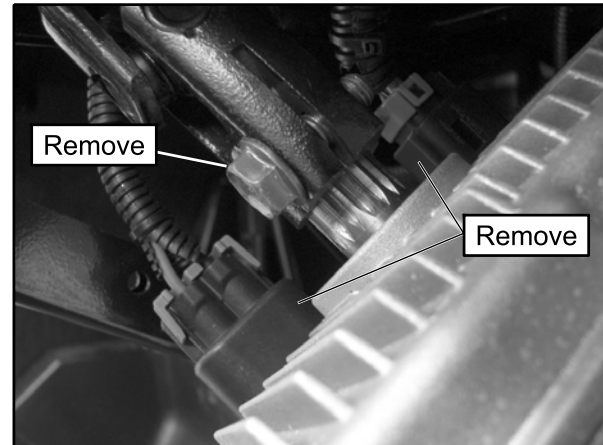
2. Remove the fasteners retaining the lower dash panel and glove box.



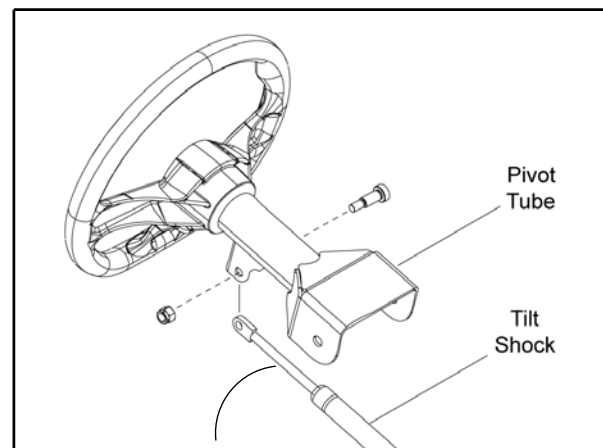
3. Carefully remove the lower dash panel assembly from the vehicle. Disconnect the 12V outlets upon removal.
4. Locate power steering unit under the steering column.



5. Disconnect the (2) electrical harnesses and remove the pinch bolt retaining the upper power steering shaft to the power steering unit.



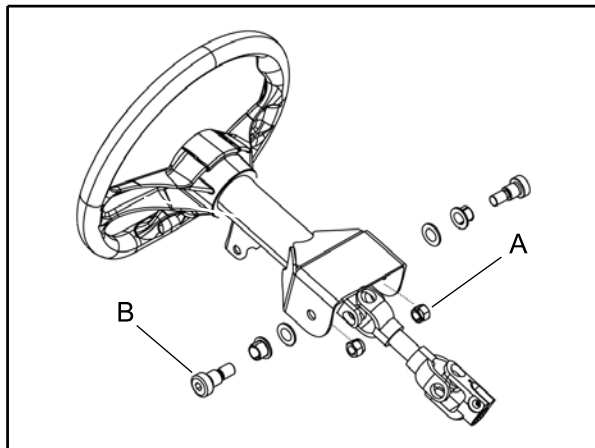
6. Remove the upper fastener retaining the steering tilt shock to the pivot tube and swing the shock down out of the way.



5

BODY / STEERING / SUSPENSION

- Secure the steering wheel in the upward position to gain access to nuts (A) through the dash slot. Reach up under dash to gain access to shoulder bolts (B). Remove both nuts and pivot tube shoulder bolts (A and B). DO NOT REMOVE STEERING WHEEL.

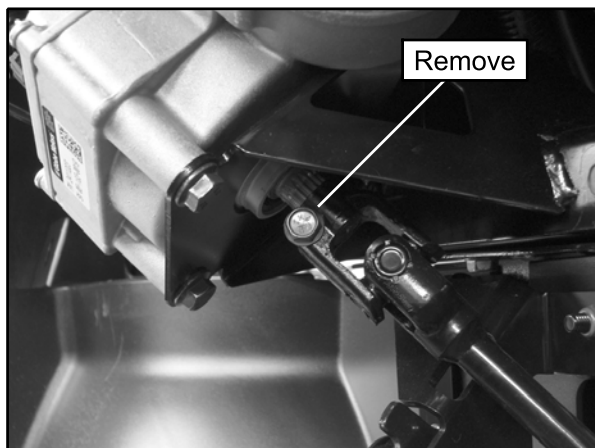


- Pull plastic dash up slightly and lift up on the steering wheel / pivot tube / upper steering shaft assembly. Remove assembly from vehicle and set in a suitable location.

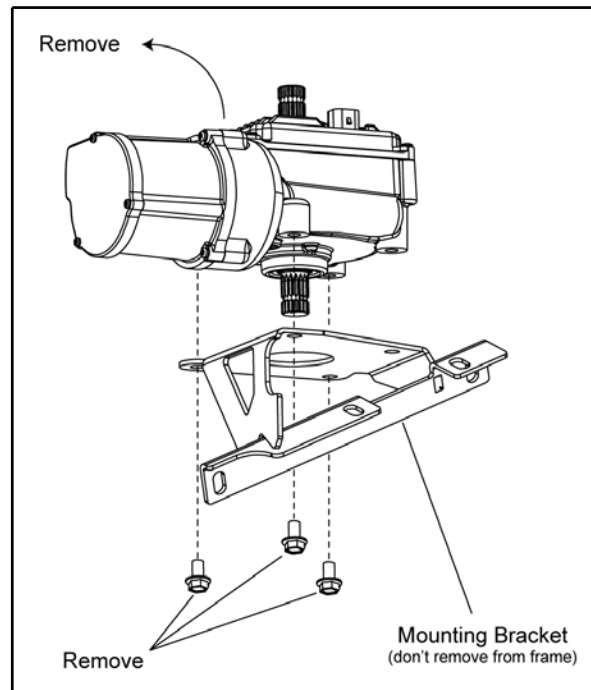
CAUTION

Striking the steering wheel or steering shaft can permanently damage the EPS unit and cause a Power Steering Fault.

- Remove the pinch bolt retaining the lower power steering shaft to the power steering unit.



- Remove the (3) bolts retaining the power steering unit to the mounting bracket and remove the power steering unit from the vehicle.



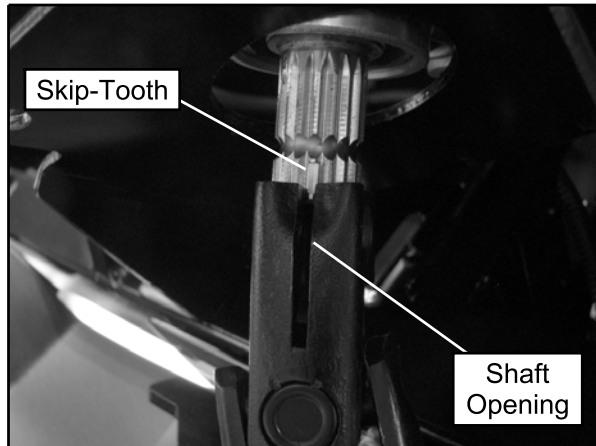
WARNING

Electronic Power Steering (EPS) units are not interchangeable between ATV and *RANGER* product lines.

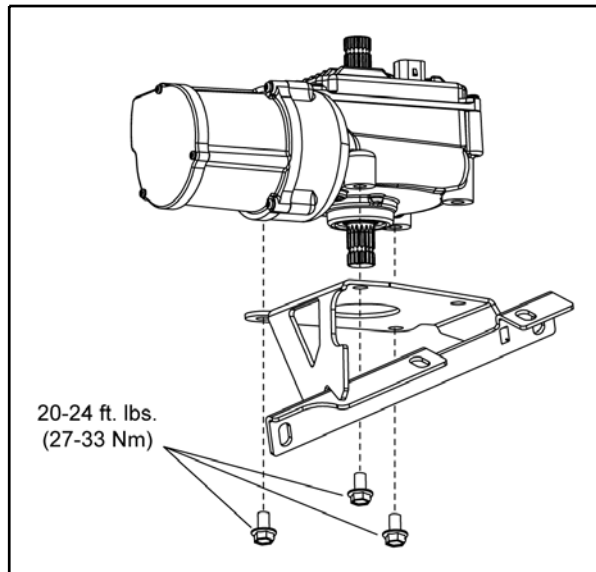
Power Steering Unit Installation

Refer to the "Power Steering Unit Removal" procedure for detailed photos and illustrations during installation.

1. Install power steering unit onto mount bracket and align skip-tooth spline on power steering stub shaft with the opening in the lower power steering shaft.



2. Torque the mounting bolts to specification.



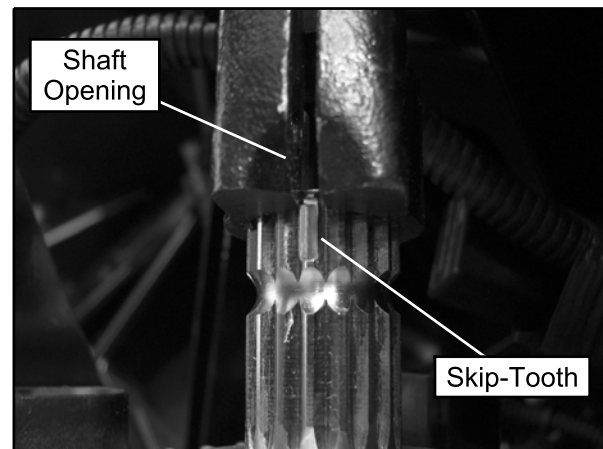
Power Steering Unit Mounting Bolts:
20-24 ft-lbs (27-33 Nm)

3. Install pinch bolt retaining the lower power steering shaft to power steering unit. Torque to specification.

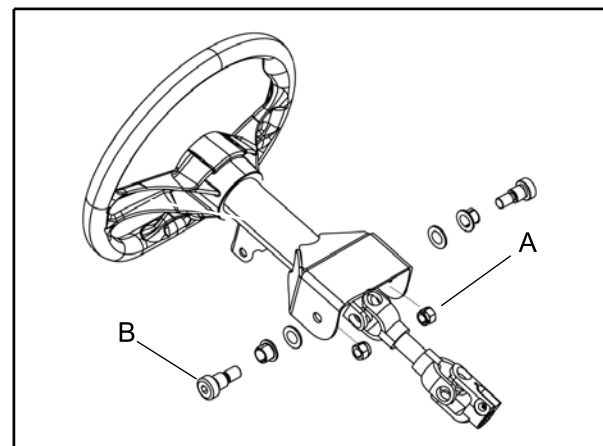


Lower Power Steering Shaft Pinch Bolt:
15-19 ft-lbs (20-26 Nm)

4. Position steering wheel / pivot tube / upper steering shaft assembly into the proper mounting location. Be sure front wheels are pointing straight ahead and that the steering wheel is straight when installing the upper steering shaft onto the upper power steering stub.
5. Align skip-tooth spline on power steering stub shaft with the opening in the upper power steering shaft.



6. Loosely install pivot tube shoulder bolts (B) and nuts (A).



5

BODY / STEERING / SUSPENSION

CAUTION

Striking the steering wheel or steering shaft can permanently damage the EPS unit and cause a Power Steering Fault.

7. Install upper shaft pinch bolt and torque to specification.



Upper Power Steering Shaft Pinch Bolt:
15-19 ft-lbs (20-26 Nm)

8. Verify that the pivot tube bushings are properly seated into the pivot tube. Torque the pivot tube shoulder bolts and nuts to specification.



Pivot Tube Shoulder Bolt:
23 ft-lbs (31 Nm)

9. Install tilt shock and torque fastener to specification.



Tilt Shock Fastener:
12 ft-lbs (16 Nm)

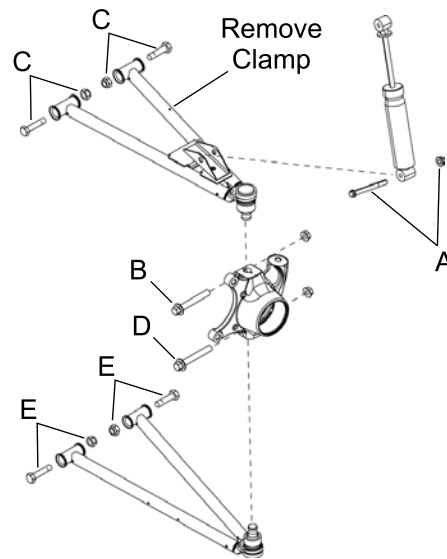
10. Reconnect both electrical harnesses onto the power steering unit. Be sure the connectors snap into place and the wires are routed correctly.
11. Reinstall the lower dash panel and glove box. Be sure to reconnect the 12V outlets upon assembly.
12. Turn the key switch on and test EPS operation.

FRONT A-ARMS

Removal / Replacement

The following procedure details upper and lower A-arm removal and replacement on one side of the vehicle.

1. Elevate and safely support the front of the vehicle and remove the front wheel.
2. Remove the lower shock fastener (A) from the upper A-arm.



3. Remove the brake line clamp from the A-arm.
4. Remove the upper ball joint pinch bolt (B) from the front bearing carrier.
5. Using a soft face hammer, tap on bearing carrier to loosen the upper A-arm ball joint end while lifting upward on the upper A-arm. Completely remove the ball joint end from the bearing carrier.
6. Loosen and remove the upper A-arm through-bolt fasteners (C) and remove the upper A-arm from the vehicle.
7. Examine A-arm bushings and pivot tubes (see "Exploded View"). Replace if worn. Discard hardware.

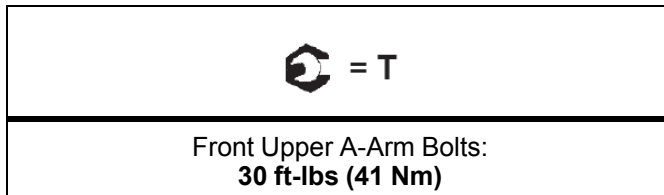


WARNING

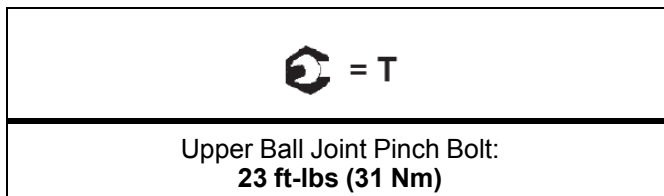
The locking agent on the existing bolts was destroyed during removal. DO NOT reuse old hardware. Serious injury or death could result if fasteners come loose during operation.

BODY / STEERING / SUSPENSION

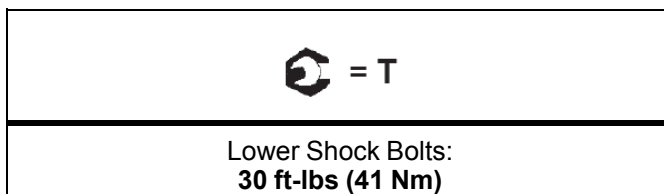
8. If not replacing the A-arm, thoroughly clean the A-arm and pivot tubes.
9. Install new ball joint into A-arm. Refer to "Ball Joint Replacement" section.
10. Insert new A-arm bushings and pivot tubes into new A-arm.
11. Install new upper A-arm assembly onto vehicle frame. Torque new bolts to **30 ft-lbs (41 Nm)**.



12. Insert upper A-arm ball joint end into the bearing carrier. Install the upper ball joint pinch bolt (B) into the bearing carrier and torque bolt to **23 ft-lbs (31 Nm)**.



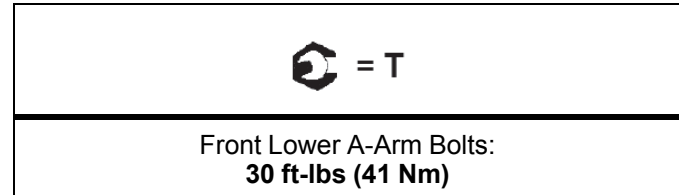
13. Attach shock to A-arm with fastener (A). Torque lower shock bolt to **30 ft-lbs (41 Nm)**.



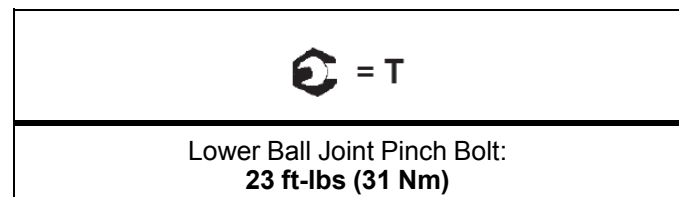
14. Remove the lower ball joint pinch bolt (D) from the front bearing carrier.
15. Using a soft face hammer, tap on bearing carrier to loosen the lower A-arm ball joint end while pushing downward on the lower A-arm. Completely remove the ball joint end from the bearing carrier.
16. Loosen and remove the lower A-arm through-bolt fasteners (E) and remove the lower A-arm from the vehicle.
17. Examine A-arm bushings and pivot tubes (see "Exploded View"). Replace if worn. Discard hardware.
18. If not replacing the A-arm, thoroughly clean the A-arm and pivot tubes.
19. Install new ball joint into A-arm. Refer to "Ball Joint Service" section.

20. Insert new A-arm bushings and pivot tubes into new A-arm.

21. Install new lower A-arm assembly onto vehicle frame. Torque new bolts to specification.



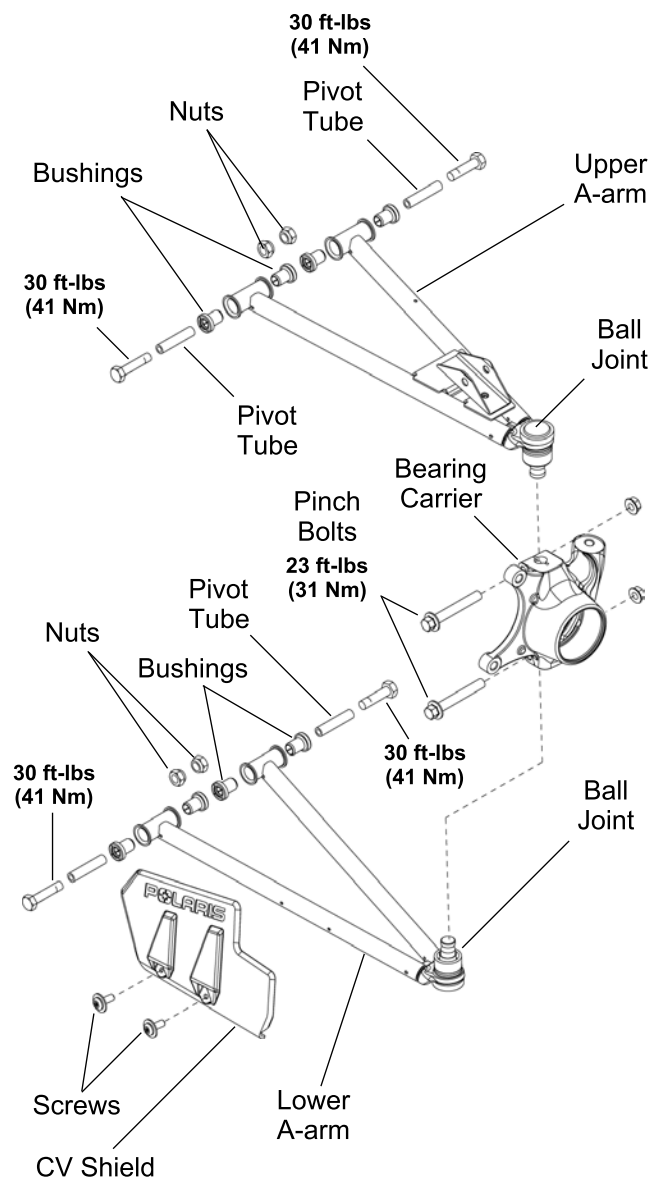
22. Insert lower A-arm ball joint end into the bearing carrier. Install the lower ball joint pinch bolt (D) into the bearing carrier and torque bolt to specification.



5

BODY / STEERING / SUSPENSION

Exploded View

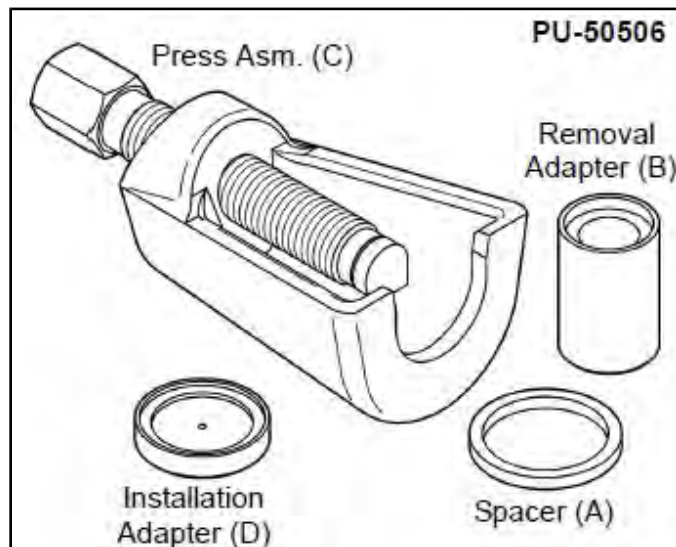


BALL JOINT SERVICE

Service Preparation

IMPORTANT: Do not reuse a ball joint if it has been removed. If removed, it must be replaced. Use this removal procedure only when replacing the ball joint.

NOTE: Ball joint tool PU-50506 will allow the upper and lower ball joints to be replaced with the A-arm installed on the vehicle.

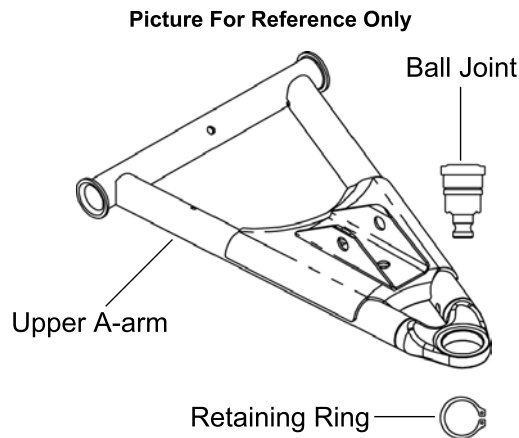


The A-arm does not need to be removed to perform this procedure if ball joint tool PU-50506 is used.

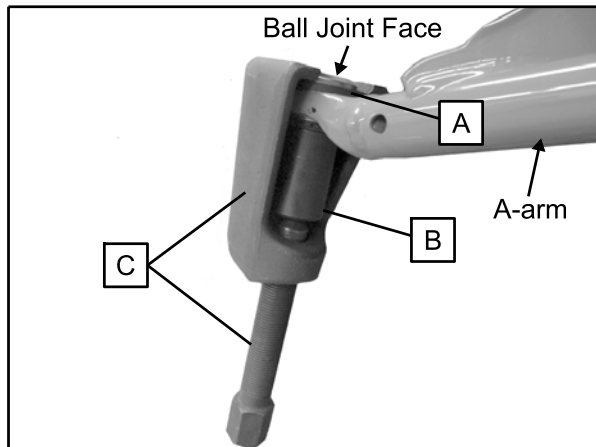
1. Properly lift and support the vehicle by the frame.
2. Remove the appropriate front wheel.
3. **To service the upper ball joint:**
 - Remove and discard the two front brake caliper mounting bolts and remove the caliper from the brake disc (see "Brakes" chapter).
 - Remove and discard the upper ball joint pinch bolt.
 - If necessary, remove the lower front shock fastener from the A-arm to gain enough clearance to install ball joint tool (PU-50506) on the upper ball joint.
4. **To service the lower ball joint:**
 - Remove and discard the lower ball joint pinch bolt.
 - If necessary, remove the lower front shock fastener from the A-arm to gain enough clearance to install ball joint tool (PU-50506) on the lower ball joint.

Ball Joint Removal

1. Remove the retaining ring from the ball joint.



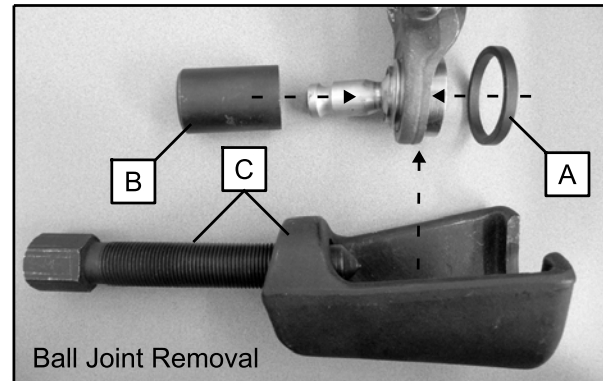
2. Install Spacer (A) over the top of the ball joint face.



3. Place Removal Adapter (B) over the ball joint shaft.
4. Install the Press Asm. (C) onto the A-arm to engage the ball joint Removal Adapter.

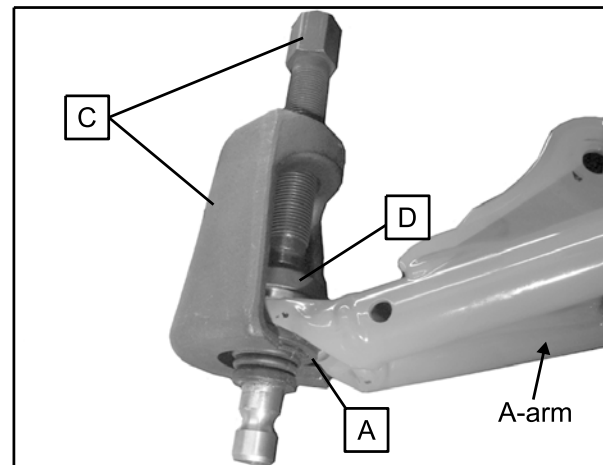
IMPORTANT: Be sure the Press Asm. opening is only contacting the Spacer (A) and not the ball joint face.

5. Tighten the Press Asm. screw and fully remove the ball joint from the A-arm.



Ball Joint Installation

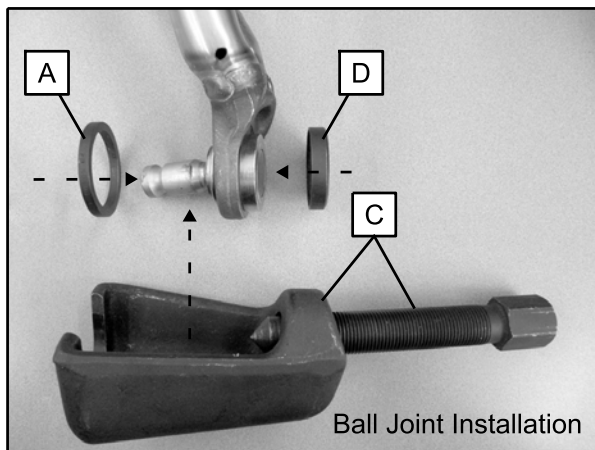
1. By hand, install the NEW ball joint into the A-arm.
2. Position the Installation Adapter (D) over the face of the ball joint.



3. Position the Spacer (A) over the shaft of the ball joint so it is against the A-arm.
4. Install the Press Asm. (C) onto the A-arm to engage the Installation Adapter and Spacer.

BODY / STEERING / SUSPENSION

5. Tighten the Press Asm. screw and fully install the ball joint into the arm.



10. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.



Front Ball Joint Pinch Bolts: **23 ft-lbs (31 Nm)**

Front Shock Mounting Bolts: **30 ft-lbs (41 Nm)**

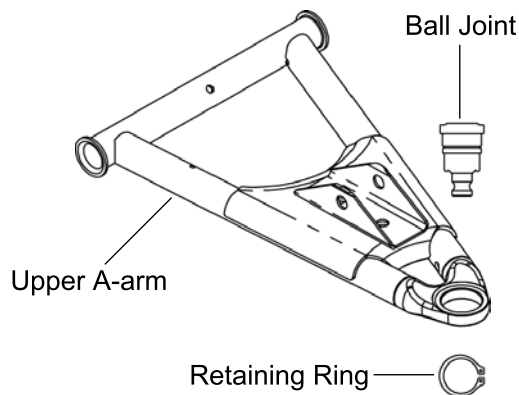
Front Caliper Mounting Bolts: **30 ft-lbs (41 Nm)**

Wheel Nuts (Alum): **30 ft-lbs (41 Nm) + 90° (1/4 turn)**

Wheel Nuts (Steel): **35 ft-lbs (47 Nm)**

6. After the new ball joint is fully installed into the A-arm, install a new retaining ring.

Picture For Reference Only



7. Repeat the ball joint service procedure for any additional A-arm ball joint replacements.
8. Insert upper / lower A-arm ball joint end into the bearing carrier. Install new pinch bolts and nuts. Torque to specification.
9. If needed, install new brake caliper mounting bolts and torque to specification.



CAUTION

New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

MID / REAR A-ARMS

Removal / Replacement

The following procedure details upper and lower A-arm removal and replacement on one side of the vehicle. Repeat the following steps to remove the A-arm(s) from the opposite side.

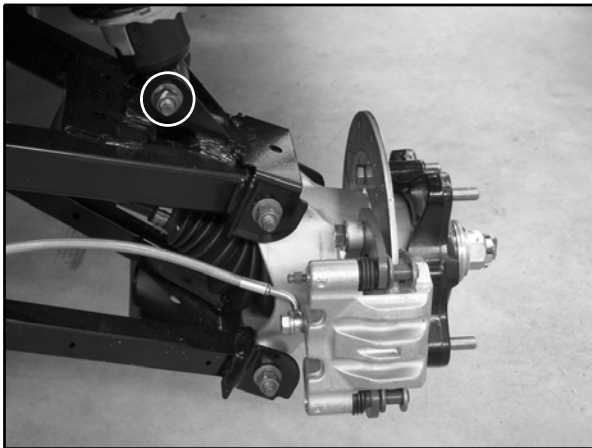
NOTE: Use the exploded view in this section as a reference during the procedure.

1. Elevate and safely support the rear of vehicle off the ground and remove the mid or rear wheel.

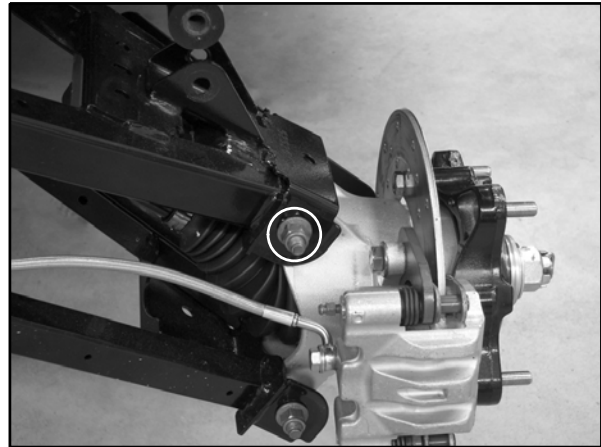


Upper A-arm Removal

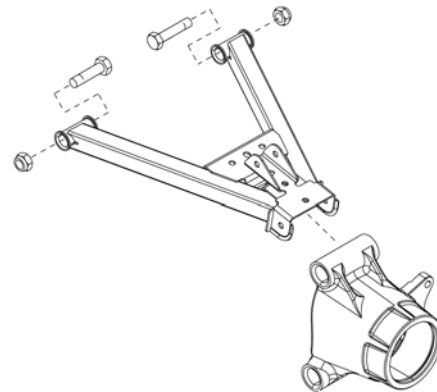
2. Remove the fastener retaining the lower portion of the shock and stabilizer linkage to the upper A-arm.



3. Remove the fastener attaching the upper A-arm to the bearing carrier.



4. Remove the fasteners attaching the upper A-arm to the frame and remove the upper A-arm from the vehicle.



5. Examine A-arm and bearing carrier bushings and pivot tubes (see "Exploded View"). Replace if worn. Discard hardware.

WARNING

The locking agent on the existing bolts was destroyed during removal. DO NOT reuse old hardware. Serious injury or death could result if fasteners come loose during operation.

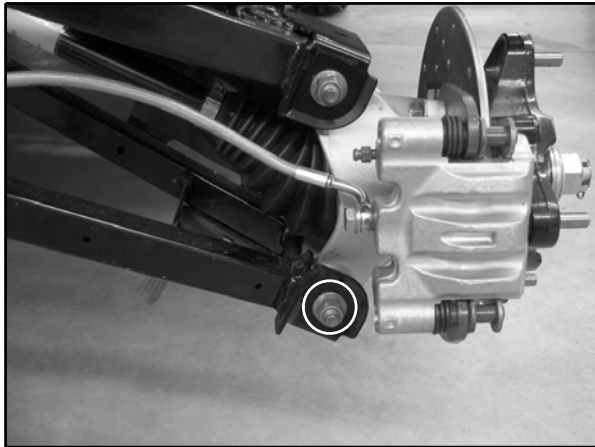
6. If not replacing the A-arm, thoroughly clean the a-arm and pivot tubes.
7. Insert new A-arm bushings and pivot tubes into the new A-arm.

Lower A-arm Removal

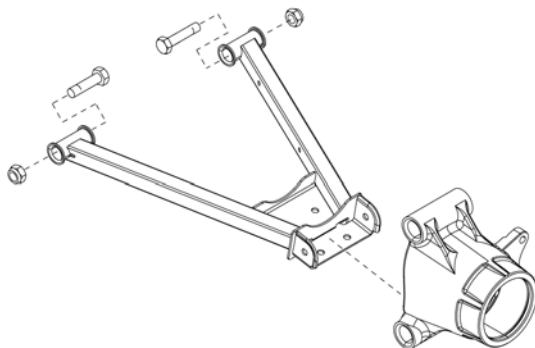
5

BODY / STEERING / SUSPENSION

8. Remove the fastener attaching the lower A-arm to the bearing carrier.



9. Remove the fasteners attaching the lower A-arm to the frame and remove the lower A-arm from the vehicle.



10. Examine A-arm and bearing carrier bushings and pivot tubes (see "Exploded View"). Replace if worn. Discard hardware.

WARNING

The locking agent on the existing bolts was destroyed during removal. DO NOT reuse old hardware. Serious injury or death could result if fasteners come loose during operation.

11. If not replacing the A-arm, thoroughly clean the a-arm and pivot tubes.
12. Insert new A-arm bushings and pivot tubes into the new A-arm.

Installation

1. Install lower A-arm assembly onto vehicle frame. Torque new fasteners to specification.



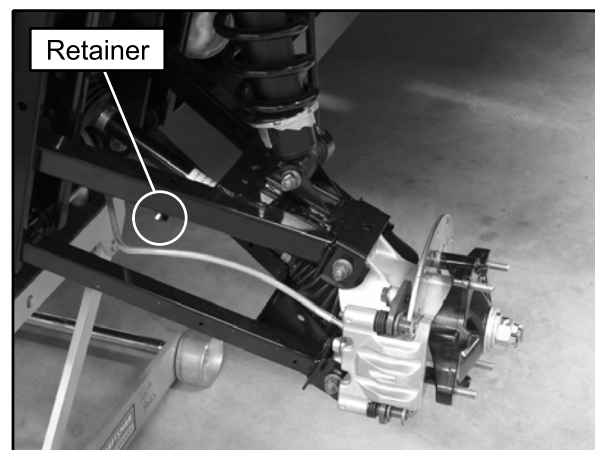
Mid / Rear Lower A-Arm Bolts:
30 ft-lbs (41 Nm)

2. Attach lower A-arm to bearing carrier. Torque new fastener to specification.



Mid / Rear Lower Bearing Carrier:
30 ft-lbs (41 Nm)

3. Route the brake line over the top of the lower A-arm and secure it in the retainer.



4. Install upper A-arm assembly onto vehicle frame. Torque new fasteners to specification.



Mid / Rear Upper A-Arm Bolts:
30 ft-lbs (41 Nm)

BODY / STEERING / SUSPENSION

5. Attach upper A-arm to bearing carrier. Torque new fastener to specification.



Mid / Rear Upper Bearing Carrier:
30 ft-lbs (41 Nm)

7. Install wheel and torque wheel nuts to specification (see Chapter 2).



Upon A-arm installation completion, test vehicle at low speeds before putting into service.

6. Reinstall the lower portion of the shock and stabilizer linkage to the upper A-arm. Torque shock / linkage fastener to specification.

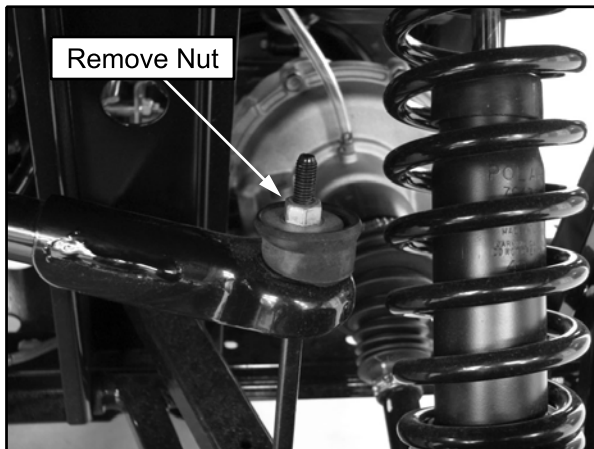


Shock / Linkage Fastener:
30 ft-lbs (41 Nm)

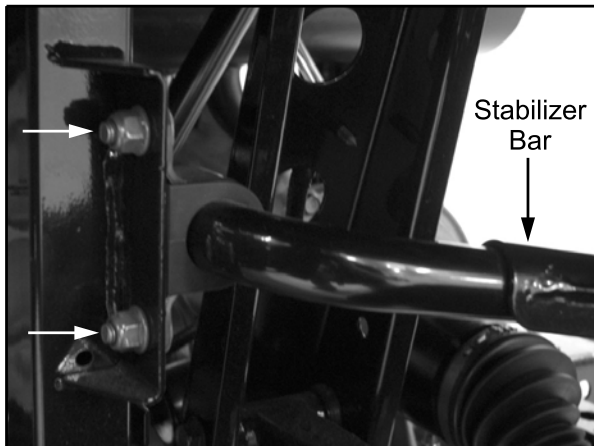
REAR STABILIZER BAR / LINKAGE

Removal / Installation

1. Elevate and safely support vehicle with weight removed from the rear wheel(s).
2. Remove the retaining nut from the upper portion of the stabilizer bar linkage bushing on each side of the vehicle.



3. Remove the two fasteners that secure the stabilizer bar to the main frame on each side.



4. Remove the stabilizer bar from the frame and inspect the stabilizer bar for straightness.
5. Inspect the stabilizer bar bushings and replace if needed.
6. Inspect the rubber bushings on the stabilizer linkage rod and replace if needed. If replacing the stabilizer linkage, remove the lower shock bolt from the upper A-arm.
7. Reverse this procedure for installation.

8. Torque the stabilizer bar retaining bolts and upper rubber linkage bushing nuts to specification.



Stabilizer Bar Retaining Bolts:
17 ft-lbs (23 Nm)



Upper Linkage Bushing:
17 ft-lbs (23 Nm)

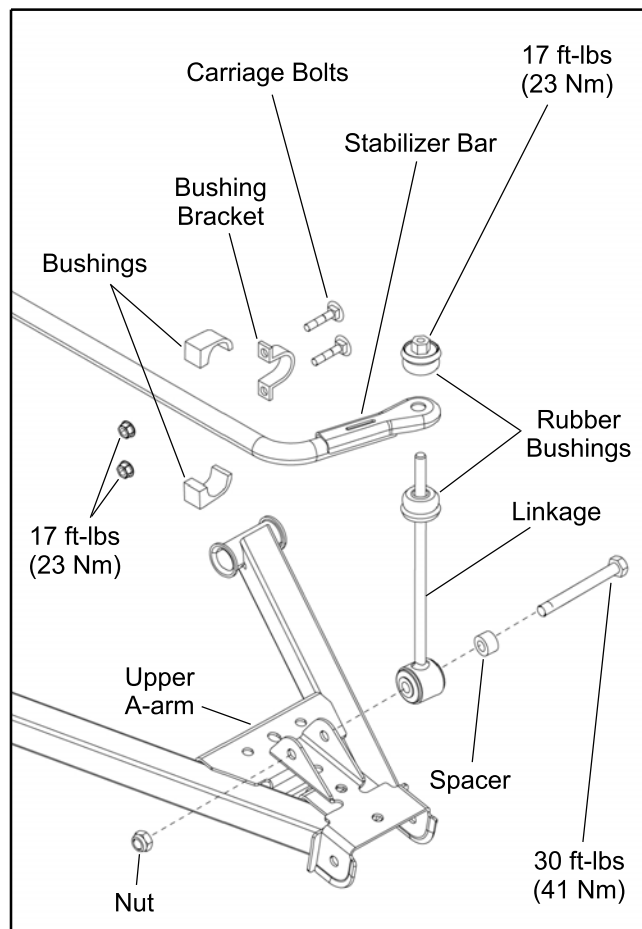
9. If the stabilizer linkage was removed, torque the lower shock retaining bolt to specification.



Shock Mounting Bolts:
30 ft-lbs (41 Nm)

BODY / STEERING / SUSPENSION

Exploded View



DECAL REPLACEMENT

WARNING

The following procedure involves the use of an open flame. Perform this procedure in a well ventilated area, away from gasoline or other flammable materials. Be sure the area to be flame treated is clean and free of gasoline or flammable residue.

WARNING

Do not flame treat components that are installed on the vehicle. Remove the component from the vehicle before flame treating.

The side panels, front and rear fender cabs are plastic polyethylene material. Therefore, they must be "flame treated" prior to installing a decal to ensure good adhesion. A bonus of the flame treating procedure is it can be used to reduce or eliminate the whitish stress marks that are sometimes left after a fender or cab is bent, flexed, or damaged.

CAUTION

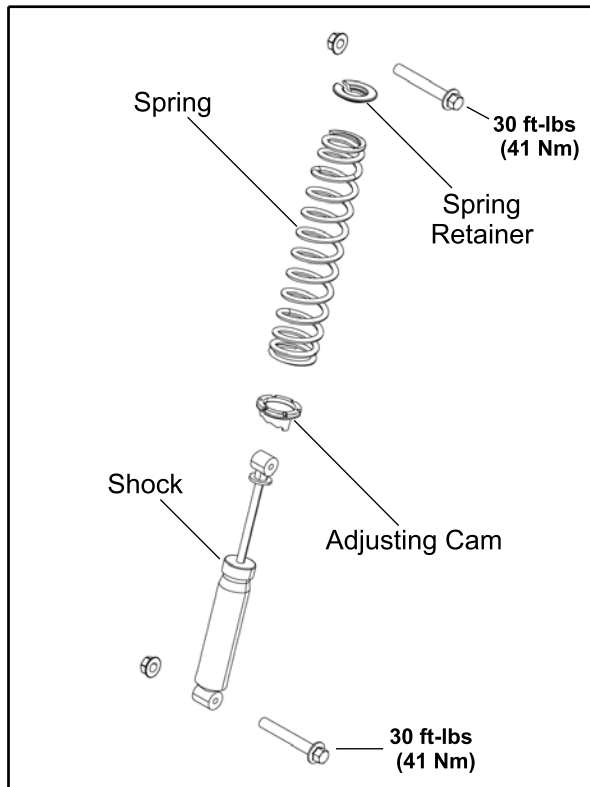
Do not flame treat painted plastic components. Painted plastic surfaces should only be wiped clean prior to decal adhesion.

To flame treat the decal area:

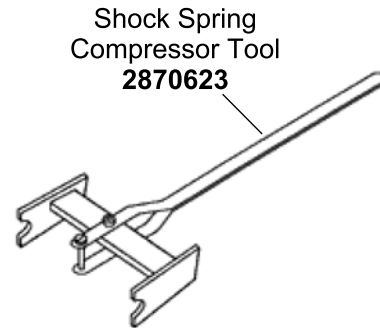
1. Pass the flame of a propane torch back and forth quickly over the area where the decal is to be applied until the surface appears slightly glossy. This should occur after just a few seconds of flame treating. Do not hold the torch too close to the surface (2-3 inches from the flame tip is recommended). Keep the torch moving to prevent damage.
2. Apply the decal on one edge first. Slowly lay down remainder of the decal while rubbing lightly over the decal surface to eliminate any air bubbles during the application.

SHOCKS / SPRINGS

Exploded View



2. Using a spring compressor, compress shock spring far enough to remove spring retainer.



3. Remove spring and other components from existing shock and install components onto the new shock.
4. Install the spring and spring retainer. If needed, use the spring compressor to compress the spring far enough to install the spring retainer.

IMPORTANT: The spring retainer gap should be 180° from the end of the spring upon installation.

5. Turn adjustment cam to set preload distance noted in Step 1 (see Chapter 2 for factory settings).
6. Reinstall shock onto vehicle and torque new fasteners to specification.

Shock Removal / Installation

1. Elevate the vehicle far enough off the ground to relieve the suspension load and support the A-arm.
2. Remove the upper and lower fasteners retaining the shock and remove the shock from the vehicle. Discard nuts and replace with new upon installation.
3. Reverse the procedure to reinstall the shock. Torque new fasteners to specification.



Shock Mounting Bolts:
30 ft-lbs (41 Nm)

Shock Replacement

1. Remove shock and note the spring preload distance or setting (see Chapter 2 for factory settings).

5

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CHAPTER 6

CLUTCHING

SPECIAL TOOLS AND SUPPLIES	6.3
TORQUE SPECIFICATIONS	6.3
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ALL MODELS	6.4
PVT SYSTEM OVERVIEW	6.4
GENERAL OPERATION	6.4
DRIVE CLUTCH OPERATION	6.4
DRIVEN CLUTCH OPERATION	6.5
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MAINTENANCE / INSPECTION	6.5
OVERHEATING / DIAGNOSIS	6.6
PVT SYSTEM SERVICE	6.7
PVT SEALING, GUARD, AND DUCTING COMPONENTS	6.7
DISASSEMBLY	6.7
ASSEMBLY	6.8
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CLUTCHING

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SPECIAL TOOLS AND SUPPLIES

PART NUMBER	TOOL DESCRIPTION
PA-49011	Clutch Alignment Tool
2871025	Clutch Bushing Replacement Tool Kit
2871226	Clutch Bushing Replacement Tool Kit
2871358-A	Clutch Holding Fixture
9314177	Clutch Holding Wrench
2870506	Drive Clutch Puller
2870341	Drive Clutch Spider Removal and Installation Tool
2870386	Piston Pin Puller
2870910	Roller Pin Tool
PU-50518	Universal Clutch Compressor

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

PART NUMBER	SPECIAL SUPPLIES
N/A	Loctite™ 609
8560054	RTV Silicone Sealer

TORQUE SPECIFICATIONS

PVT System Fastener Torques

ITEM	TORQUE VALUE
Drive Clutch Retaining Bolt	47 ft-lbs (64 Nm)
Driven Clutch Retaining Bolt	17 ft-lbs (23 Nm)
PVT Inner Cover Phillips-Head Screws	50 in-lbs (5.6 Nm)
PVT Inner Cover Hex-Head Screws	12 ft-lbs (16 Nm)
PVT Outer Cover Bolts	45-50 in. lbs (5-5.6 Nm)
Drive Clutch Spider	200 ft-lbs (271 Nm)
Drive Clutch Cover Plate	90 in-lbs (10 Nm)

CLUTCHING

HIGH ALTITUDE CLUTCH CHART

All Models

ALTITUDE		SHIFT WEIGHT	DRIVE SPRING	DRIVEN SPRING
Me- ters (Feet)	0-1500 (0-5000)	23-62 (5632337)	Black (7043594)	Blk / Almd (7043167)
	1500-3700 (5000 - 12000)	23-58 (B) (1322911)	Black (7043594)	Blk / Almd (7043167)

PVT SYSTEM OVERVIEW

General Operation



WARNING

All PVT maintenance or repairs should be performed by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual.

Because of the critical nature and precision balance incorporated into the PVT components, it is absolutely essential that no disassembly or repair be made without factory authorized special tools and service procedures.

The Polaris Variable Transmission (PVT) consists of three major assemblies:

- 1) The Drive Clutch
- 2) The Driven Clutch
- 3) The Drive Belt

The internal components of the drive clutch and driven clutch control engagement (initial vehicle movement), clutch upshift and backshift. During vehicle development, the PVT system is matched first to the engine power curve; then to average riding conditions and the vehicle's intended usage. Therefore, modifications or variations of components at random are never recommended. Proper clutch setup and careful inspection of existing components must be the primary objective when troubleshooting and tuning.

Drive Clutch Operation

Drive clutches primarily sense engine RPM. The two major components which control its shifting function are the shift weights and the coil spring. Whenever engine RPM is increased, centrifugal force is created, causing the shift weights to push against rollers on the moveable sheave, which is held open by coil spring preload. When this force becomes higher than the preload in the spring, the outer sheave moves inward and contacts the drive belt. This motion pinches the drive belt between the spinning sheaves and causes it to rotate, which in turn rotates the driven clutch.

At lower RPM, the drive belt rotates low in the drive clutch sheaves. As engine RPM increases, centrifugal force causes the drive belt to be forced upward on drive clutch sheaves.

Driven Clutch Operation

Driven clutches primarily sense torque, opening and closing according to the forces applied to it from the drive belt and the transmission input shaft. If the torque resistance at the transmission input shaft is greater than the load from the drive belt, the drive belt is kept at the outer diameter of the driven clutch sheaves.

As engine RPM and horsepower increase, the load from the drive belt increases, resulting in the belt rotating up toward the outer diameter of the drive clutch sheaves and downward into the sheaves of the driven clutch. This action, which increases the driven clutch speed, is called upshifting.

Should the throttle setting remain the same, and the vehicle is subjected to a heavier load, the drive belt rotates back up toward the outer diameter of the driven clutch and downward into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called backshifting.

In situations where loads vary (such as uphill and downhill), and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched PVT system should hold engine RPM at the peak of the power curve. This RPM should be maintained during clutch upshift and backshift. In this respect, the PVT system is similar to a power governor. Rather than vary throttle position, as a conventional governor does, the PVT system changes engine load requirements by either upshifting or backshifting.

PVT Break-In (Drive Belt / Clutches)

A proper break-in of the clutches and drive belt will ensure a longer life and better performance. Break in the clutches and drive belt by operating at slower speeds during the 10 hour break-in period as recommended (see Chapter 3 "Engine Break-In Period" for break-in example). Pull only light loads. Avoid aggressive acceleration and high speed operation during the break-in period.

Maintenance / Inspection

Under normal use the PVT system will provide years of trouble free operation. Periodic inspection and maintenance is required to keep the system operating at peak performance. The following list of items should be inspected and maintained to ensure maximum performance and service life of PVT components. Refer to the troubleshooting checklist at the end of this chapter for more information.

1. **Belt Inspection, Drive to Driven Clutch Alignment, and Clutch Center Distance.**

2. **Drive and Driven Clutch Buttons and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs.**
3. **Sheave Faces.** Clean and inspect for wear.
4. **PVT System Sealing.** Refer to appropriate illustrations on the following pages. The PVT system is air cooled by fins on the drive clutch stationary sheave. The fins create a low pressure area in the crankcase casting, drawing air into the system through an intake duct. The opening for this intake duct is located at a high point on the vehicle (location varies by model). The intake duct draws fresh air through a vented cover. All connecting air ducts (as well as the inner and outer covers) must be properly sealed to ensure clean air is being used for cooling the PVT system and also to prevent water and other contaminants from entering the PVT area. This is especially critical on units subjected to frequent water forging.

CLUTCHING

Overheating / Diagnosis

During routine maintenance, or whenever PVT system overheating is evident, it's important to check the inlet *and* outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating temperatures. The vehicle should be operated in Low when plowing or pulling heavy loads, or if extended low speed operation is anticipated.

CLUTCH DRIVE BELT & COVER RELATED ISSUES: DIAGNOSIS	
Possible Causes	Solutions / What to do
Loading the vehicle into a truck or tall trailer when in high range.	Shift transmission to Low during loading of the vehicle to prevent belt burning.
Starting out going up a steep incline from a stopped position.	When starting out on an incline, shift the transmission to Low.
Driving at low RPM or low ground speed (at approximately 3-7 MPH).	Drive at higher speed or use Low. The use of Low is highly recommended for cooler PVT operating temperatures and longer component life.
Insufficient engine warm-up when exposed to low ambient temperatures.	Warm engine at least 5 min., then with transmission in neutral, advance throttle to approx. 1/8 throttle in short bursts, 5 to 7 times. The belt will become more flexible and prevent belt burning.
Slow and easy clutch engagement.	Fast, effective use of the throttle for efficient engagement.
Towing/Pushing at low RPM/low ground speed.	Use Low only.
Plowing snow, dirt, etc./utility use.	Use Low only.
Stuck in mud or snow.	Shift the transmission to Low, carefully use fast, aggressive throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.
Climbing over large objects from a stopped position.	Shift the transmission to Low, carefully use fast, aggressive, brief throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.
Belt slippage from water or snow ingestion into the PVT system.	Shift the transmission to neutral. Using the throttle, vary the engine rpm from idle to full throttle. Repeat several times as required. During this procedure, the throttle should not be held at the full position for more than 10 seconds. Clutch seals should be inspected for damage if repeated leaking occurs.
Clutch malfunction.	For inspection of clutch components, please contact your Polaris dealer. Shift transmission to Low during loading of the vehicle to prevent belt burning.
Poor engine performance.	Fouled plugs, foreign material in gas tank, fuel lines, or carburetor. Contact you dealer for further service information.
GENERAL RANGE OPERATION GUIDELINES:	Low: Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, ect.), low ground speeds.
	High: High ground speeds, speeds above 7 MPH.

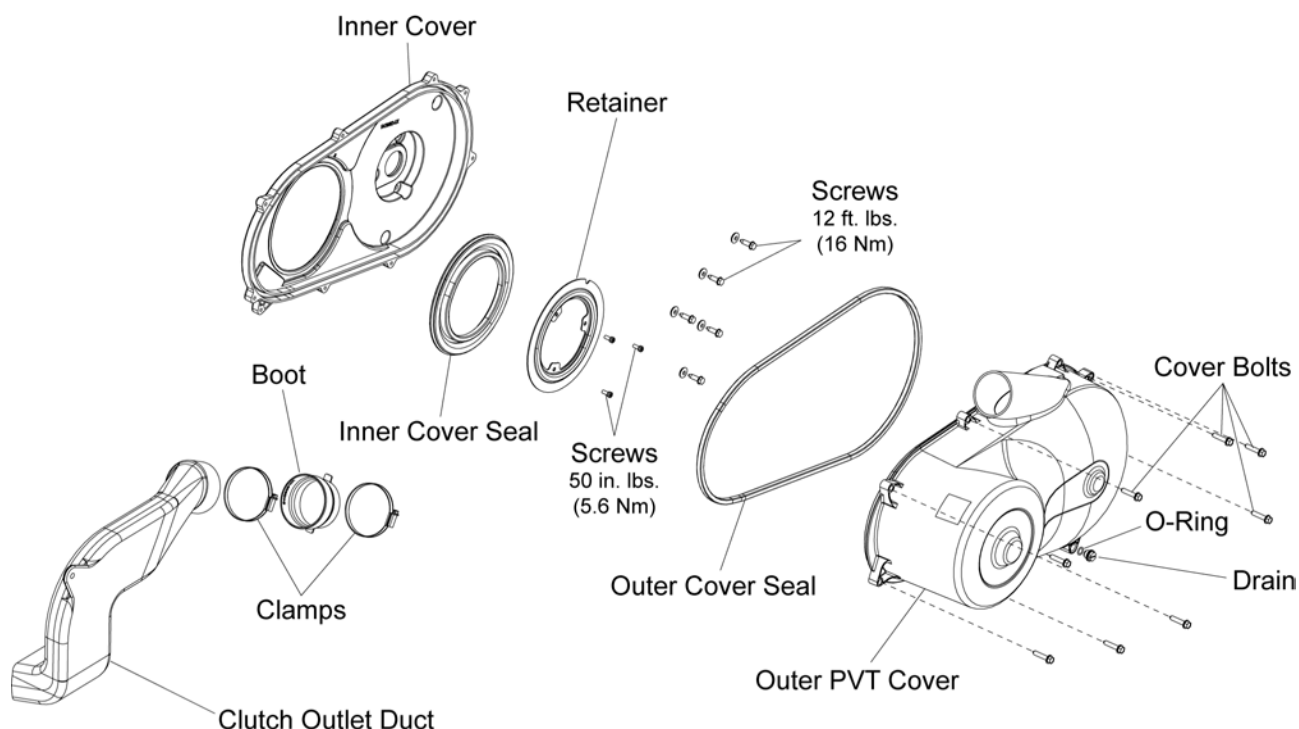
Operating in Low Gear

Low gear is the primary driving gear range for *RANGERS*. Low should be used in ALL driving applications except for driving on hard packed level surfaces with light loads. In this circumstance, High range may be used.

IMPORTANT: Using High range for heavy loads, hilly terrain, or in wet, muddy conditions will increase the chance of drive belt burning.

PVT SYSTEM SERVICE

PVT Sealing, Guard, and Ducting Components

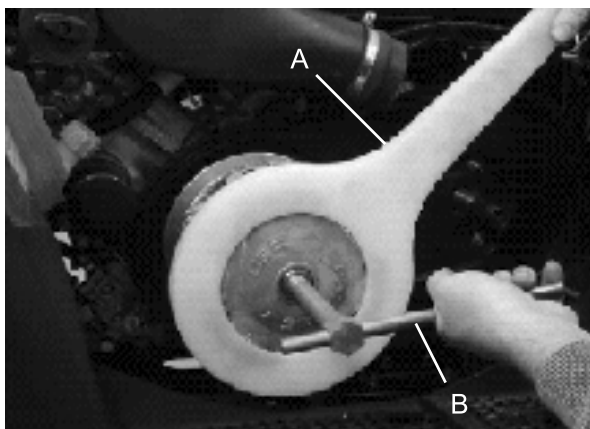


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Disassembly

Some fasteners and procedures will vary. Refer to the appropriate parts manual for proper fasteners and fastener placement.

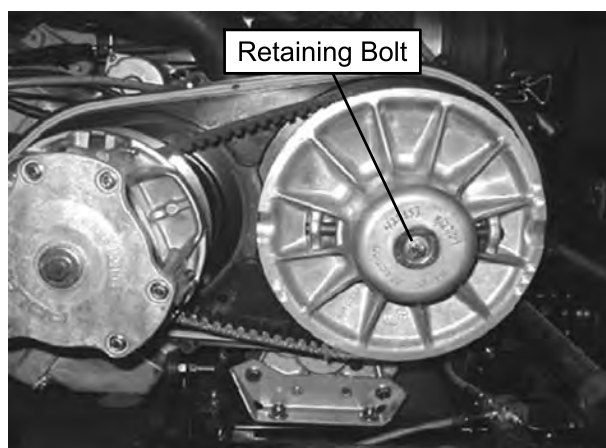
1. Remove seat and storage container to gain access to the PVT outer cover.
2. Remove PVT air outlet duct hose.
3. Remove outer PVT cover bolts (8).
4. Mark the drive belt direction of rotation and remove drive belt. See "Drive Belt Removal".



5. Install the Drive Clutch Holder (PN 9314177) (A).
6. Remove drive clutch retaining bolt and remove drive clutch using the Drive Clutch Puller (PN 2870506) (B).

Drive Clutch Puller: PN 2870506
Drive Clutch Holder: PN 9314177

7. Remove driven clutch retaining bolt and driven clutch.

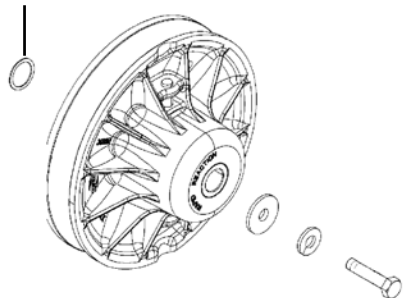


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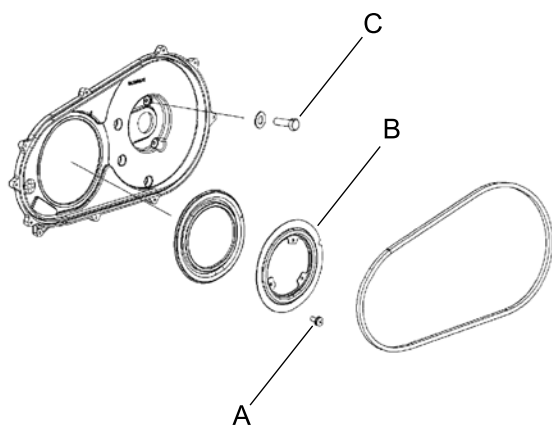
CLUTCHING

- Remove the driven clutch alignment washer(s) from the transmission input shaft.

Note Number of Washers



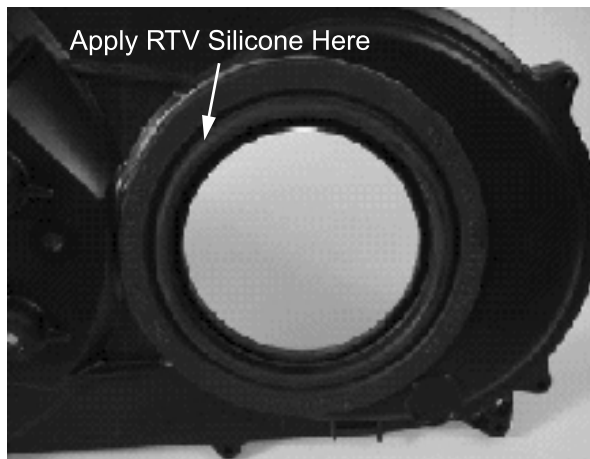
- Remove the front screws (A) and retainer plate (B).



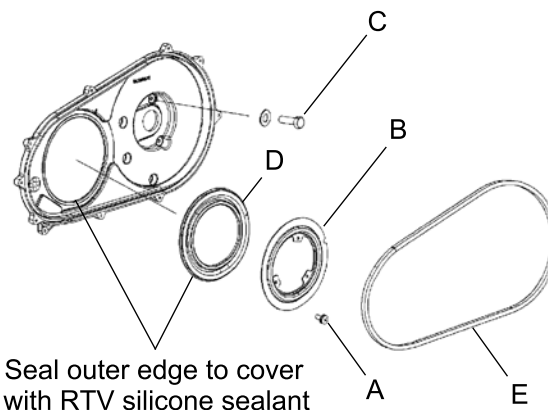
- Remove the rear inner cover retaining bolts (C).
- Remove cover along with foam seal on back of cover or shaft.

Assembly

- Inspect PVT inner cover-to engine seal. Replace if cracked or damaged.



- Place a new foam seal on transmission input shaft.
- Apply RTV silicone sealant to outside edge of inner cover-to-engine seal to ensure a water-tight fit between the seal and the cover. Surfaces must be clean to ensure adhesion.
- Reinstall cover and tighten the rear cover bolts (C) just enough to hold it in place.
- Fit the lip of inner cover seal (D) to engine. Install seal retainer plate (B) and tighten screws securely.

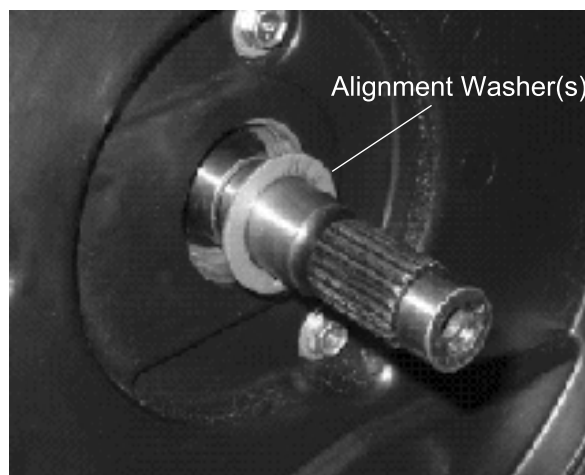


- Torque the front (A) and rear (C) inner cover screws to specification.



Front Inner Cover Screws (A): **50 in-lbs (5.6 Nm)**
Rear Inner Cover Screws (C): **12 ft-lbs (16 Nm)**

- Install clutch alignment washer (s) on transmission input shaft.



- Clean splines inside driven clutch and on the transmission input shaft.

9. Apply a light film of grease to the splines on the shaft.
10. Install the driven clutch, washer, lock washer, and retaining bolt. Torque to specification.



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Driven Clutch Retaining Bolt:
17 ft-lbs (23.5 Nm)

11. Clean end of taper on crankshaft and the taper bore inside drive clutch.
12. Install drive clutch and torque retaining bolt to specification.



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Drive Clutch Retaining Bolt:
47 ft-lbs (64 Nm)

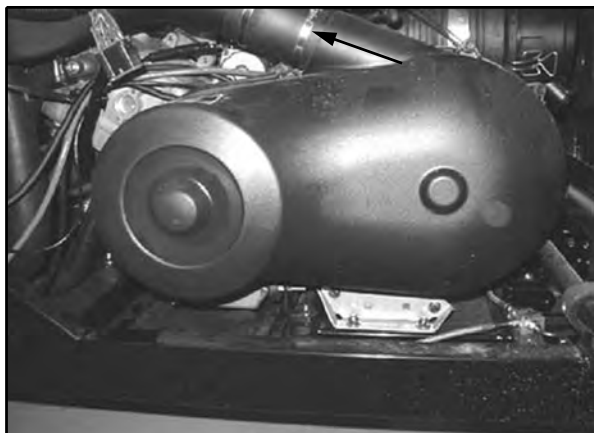
13. Reinstall drive belt noting direction of rotation. If a new belt is installed, install so numbers can be easily read.
14. Replace PVT outer clutch cover rubber gasket (E).
15. Reinstall PVT outer clutch cover and secure with screws (8). Torque screws to specification.



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Outer Clutch Cover Screw:
45-50 in-lbs (5-5.6 Nm)

16. Install the PVT cover outlet duct and tighten the clamps.



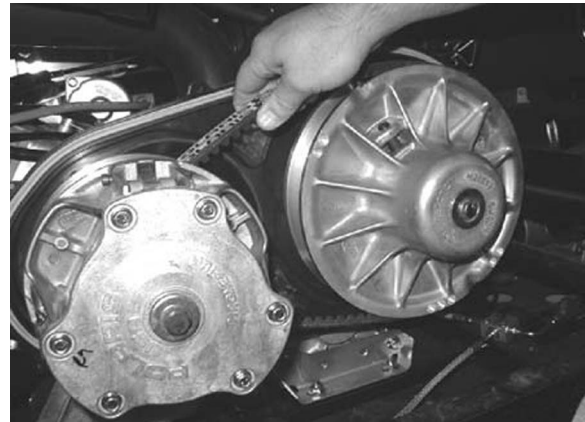
DRIVE BELT

Belt Removal

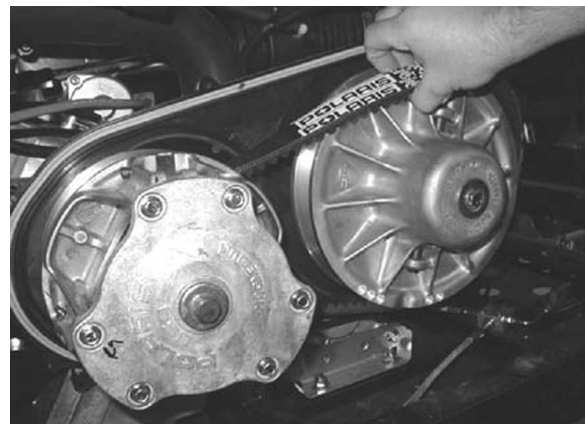
1. Remove outer PVT cover as described in "PVT SYSTEM SERVICE - Disassembly".
2. Mark the drive belt direction of rotation so that it can be installed in the same direction.

NOTE: Belt is normally positioned so that part numbers are easily read.

3. To remove drive belt, put transmission in gear, apply brake, pull upward and rearward on belt to open driven clutch sheaves.



4. Pull out and down on the drive belt to slip over the driven clutch outer sheave.



5. Slip belt over the drive clutch outer sheave and remove the belt from the vehicle.

Belt Inspection

1. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch engages the belt.

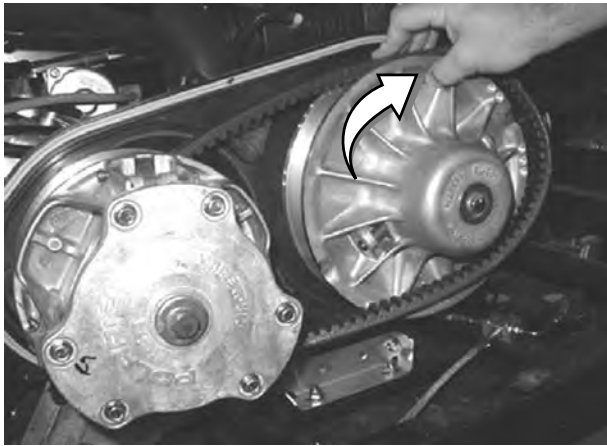
CLUTCHING

2. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Compare belt measurements with a new drive belt. Replace if necessary.
3. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See the troubleshooting chart at the end of this chapter for possible causes.

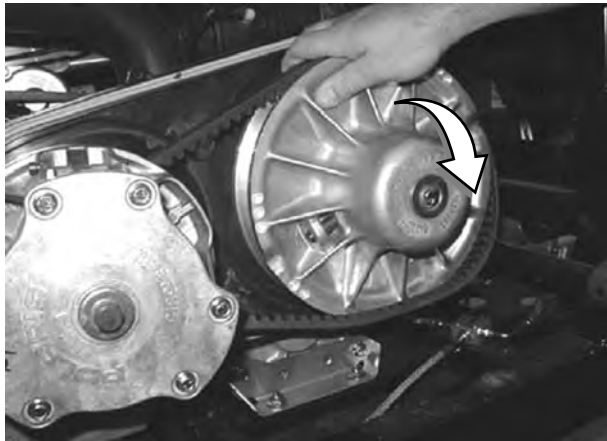
Belt Installation

NOTE: Be sure to install belt in the same direction as it was removed.

1. Loop belt over drive clutch and over driven sheave.



2. While pushing down on top of belt, turn the back or moveable driven sheave clockwise.



3. The belt then should be able to be pushed down into and between the sheaves.

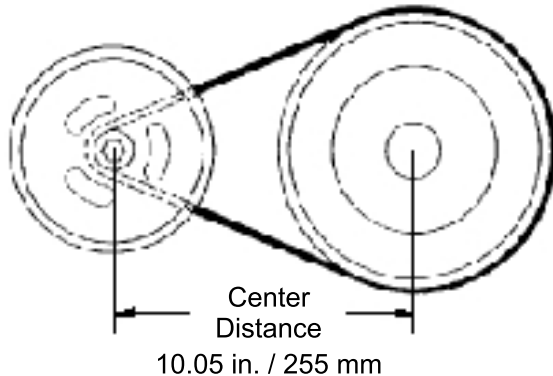
4. Install the outer clutch cover and (8) screws. Torque screws to specification.



Outer Clutch Cover Retaining Screws:
45-50 in-lbs (5.5 Nm)

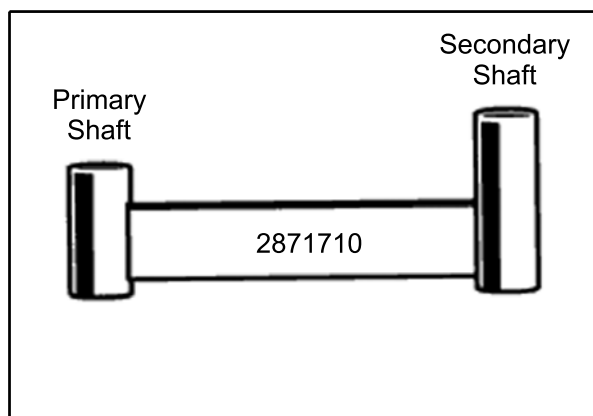
CLUTCH CENTER DISTANCE

Setting Center-To-Center Distance



Clutch center distance is controlled by the correct positioning of the engine and transmission mounting. The 10" Center Distance Tool (PN 2871710) should be used for the following:

- After engine installation.
- After transmission installation.
- After engine or transmission mount replacement.
- If the vehicle exhibits drive clutch drag or hard shifting while at idle speed, after clutch offset adjustment has been performed.



CLUTCH OFFSET

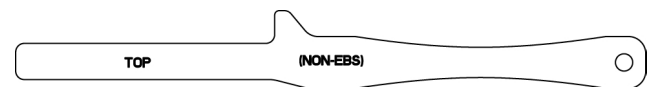
Clutch Offset Procedure / Alignment Tool

Clutch offset is controlled by the number of washers that are placed behind the driven clutch on the transmission input shaft. Adding washers behind the driven clutch will move the drive belt toward the moveable sheave. Removing washers will move the belt toward the stationary sheave.

If the vehicle exhibits drive clutch drag or hard shifting while at idle speed, a clutch offset adjustment is required.

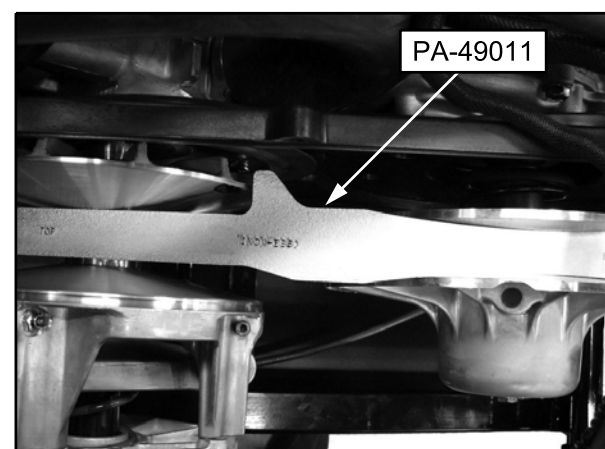
1. Remove the lower seat base.
2. Remove the LH storage container to gain access to the outer PVT cover.
3. Loosen the hose clamps and remove the PVT air outlet duct hose from the outer PVT cover.
4. Remove all outer PVT cover screws and cover.
5. Mark the drive belt direction of rotation and remove it. Refer to "DRIVE BELT - Belt Removal".
6. Install the Clutch Alignment Tool.

CLUTCH ALIGNMENT TOOL



PA-49011

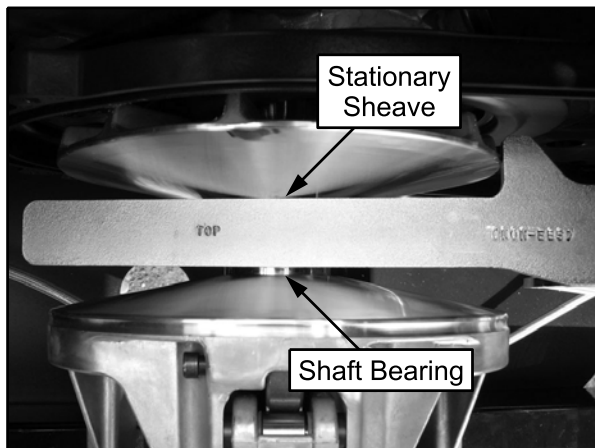
7. Place the alignment tool in the sheaves of the driven clutch and hold firmly as you rotate it down between the sheaves of the drive clutch.



**Clutch Alignment Tool:
PA-49011**

CLUTCHING

8. As you rotate the tool down between the drive clutch sheaves, the tool should touch the clutch shaft bearing while maintaining a clearance of roughly .020" between the tool and stationary sheave of the drive clutch.



9. If the alignment tool hits the stationary sheave before it reaches the shaft bearing, the driven clutch will need to be spaced out to correct the offset.
- Remove the driven clutch. Add the required amount of offset washers to obtain the correct measurement with the alignment tool. You may need to add more than one offset washer.

Offset Washers:
(0.030") PN: 7556454
(0.060") PN: 7556120

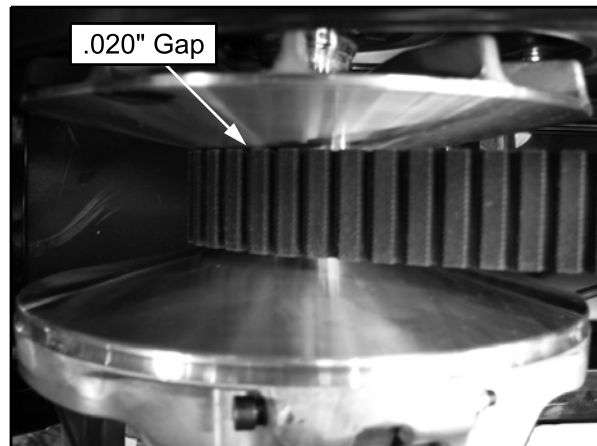
10. If the alignment tool touches the shaft bearing but has an excessive amount of clearance between the tool and stationary sheave, the driven clutch will need to be moved in to correct the offset.

- Remove the driven clutch. Remove the required amount of washers to obtain roughly 0.020" clearance between the tool and stationary sheave.

NOTE: The number of washers behind the driven clutch will vary between vehicles.

IMPORTANT: It may not be possible to achieve perfect offset with the tool as previously described, because of the thickness of the offset washers. It is better to have clearance between the tool and stationary sheave of the drive clutch than to have the tool touch the stationary sheave before it touches the shaft bearing.

11. After completing the clutch offset procedure, the belt should ride in the drive clutch with an approximate 0.020" gap between the belt and stationary sheave and a larger gap of approximately 0.130" between the belt and moveable sheave. There should always be clearance on both sides of the drive belt.



CAUTION

Do not start the engine with the outer clutch cover removed. Serious injury may result.

12. Inspect the outer clutch cover gasket. Replace if damaged.
13. Install the outer clutch cover and (8) screws. Torque screws to specification.



Outer Clutch Cover Retaining Screws:
45-50 in-lbs (5.5 Nm)

14. Position the PVT air outlet duct hose and tighten the hose clamps.
15. Install the LH storage container and lower seat base.
16. Sit in the driver's seat, apply the brake and start the engine. Place the gear selector in high range and test the vehicle for drive clutch drag or hard shifting while at idle speed. If shifting remains difficult, refer to "CLUTCH CENTER DISTANCE" to check positioning of the engine and transmission mounting.

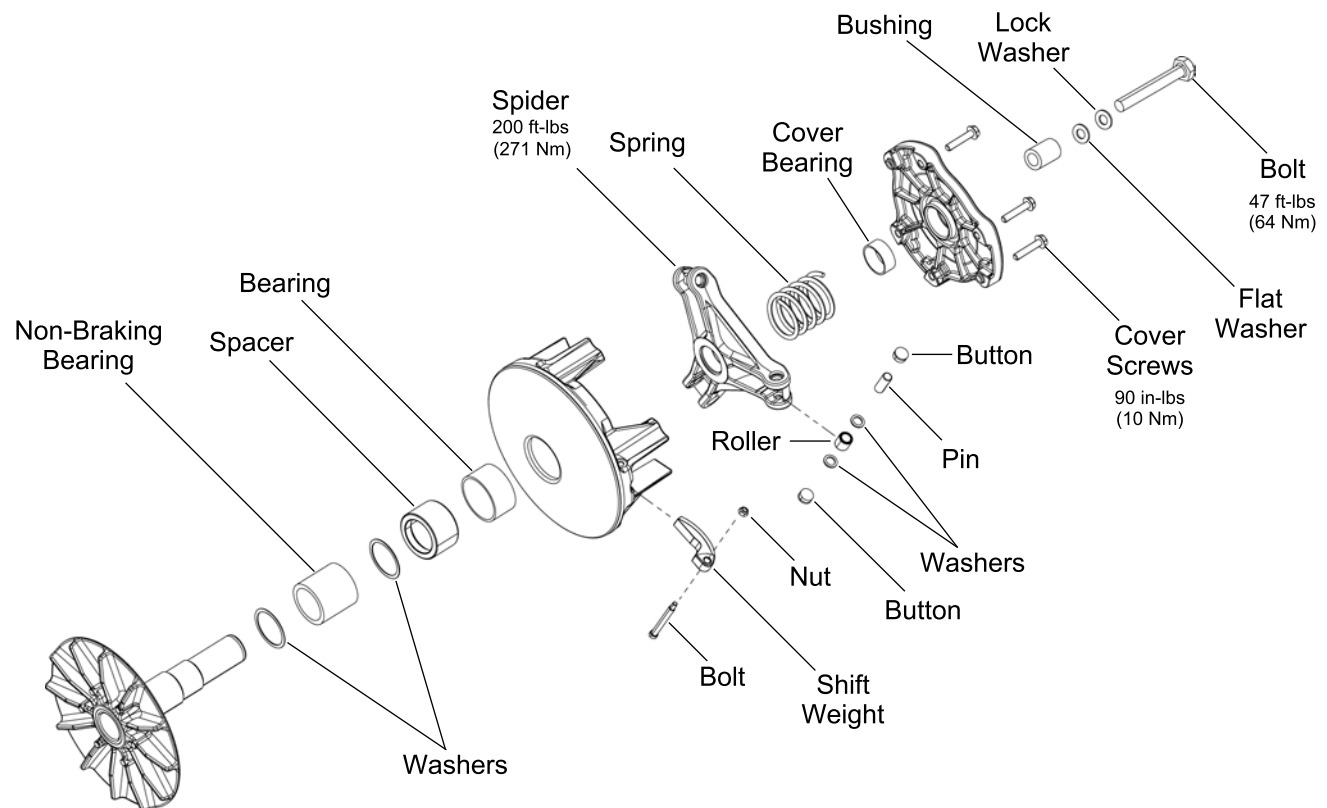


CAUTION

Do not leave the vehicle unattended.

DRIVE CLUTCH SERVICE

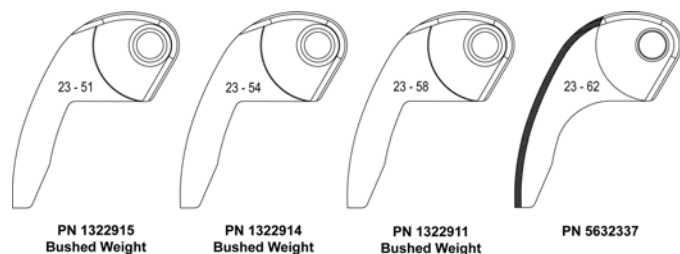
Exploded View



6

Shift Weights

Shown below are the shift weights which have been designed for this PVT system. These shift weights have many factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding of their positioning and the effects they may have on belt to sheave clearance, clutch balance and shifting pattern.



Clutch Disassembly

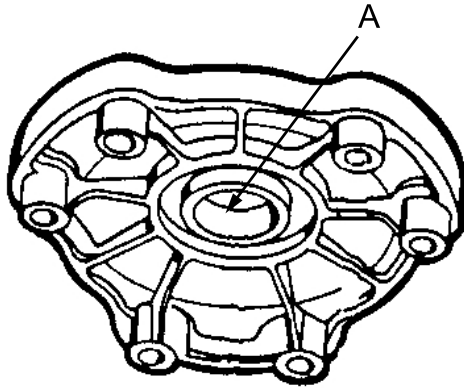
1. Using a permanent marker, mark the cover, spider, and moveable and stationary sheaves for reference, as the cast in X's may not have been in alignment before disassembly.



6.13

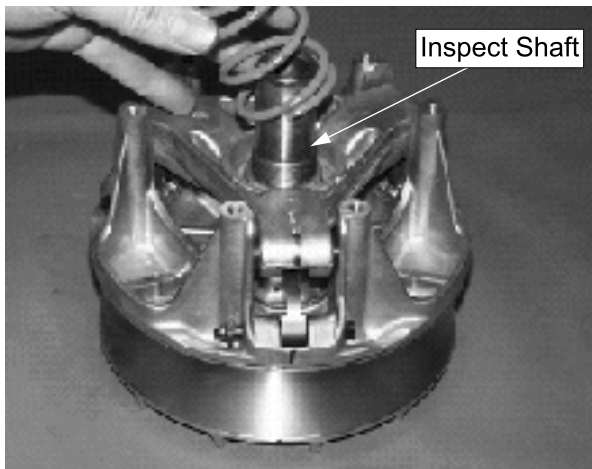
CLUTCHING

2. Mark the stationary sheave and clutch shaft to verify the shaft has not turned in the sheave after tightening the spider during clutch assembly.
3. Remove cover bolts evenly in a cross pattern and remove cover plate.
4. Inspect cover bushing (A). The outer cover bushing is manufactured with a Teflon™ coating. Wear is determined by the amount of Teflon™ remaining on the bushing.



Cover Bushing Inspection:
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

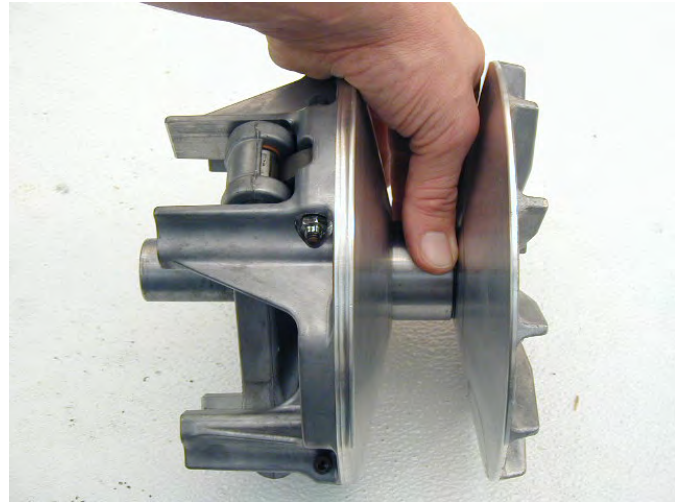
5. Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or damaged.



6. Remove and inspect the clutch spring. See "Drive Clutch Spring Specifications" for spring inspection.

Bearing Inspection

1. Rotate the clutch bearing in both clockwise and counter-clockwise directions. The non-braking bearing should rotate both directions on the shaft with only a slight amount of drag.
2. Verify there is no binding or rough spots. If problems are noted continue with disassembly.



Drive Clutch Spring Inspection



Never shim a drive clutch spring to increase its compression rate. This may result in complete stacking of the coils and subsequent clutch cover failure.

The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe relaxation the spring is subject to during operation, it should always be inspected for tolerance limits during any clutch operation diagnosis or repair.

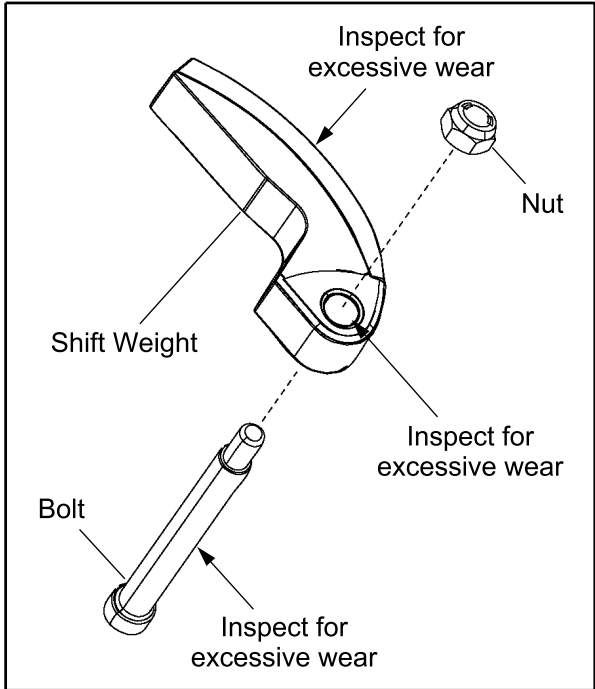
With the spring resting on a flat surface, measure its free length from the outer coil surfaces. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.



DRIVE CLUTCH SPRING SPECIFICATIONS	
Part Number	7043594
Color	Black
Free Length	2.80 in. (7.11 cm)

Shift Weight Inspection

1. Remove shift weight bolts and weights. Inspect the contact surface of the weight. The surface should be smooth and free of dents or gall marks. Inspect the weight pivot bore and bolts for wear or galling. If weights or bolts are worn or broken, replace in sets of three with new bolts and nuts.



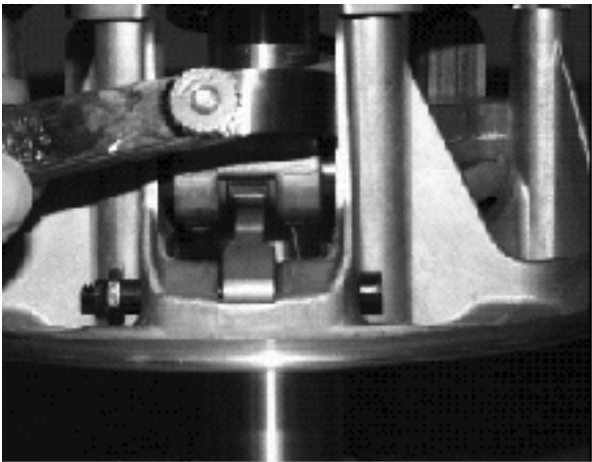
WARNING

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly!

NOTE: A damaged shift weight is usually caused by a damaged or stuck roller in the spider assembly. See “Roller, Pin and Thrust Washer Inspection”.

Button To Tower Clearance Inspection

1. Inspect for any clearance between spider button to tower. If clearance exceeds specification, replace all buttons and inspect surface of towers. See “Spider Removal” procedure.



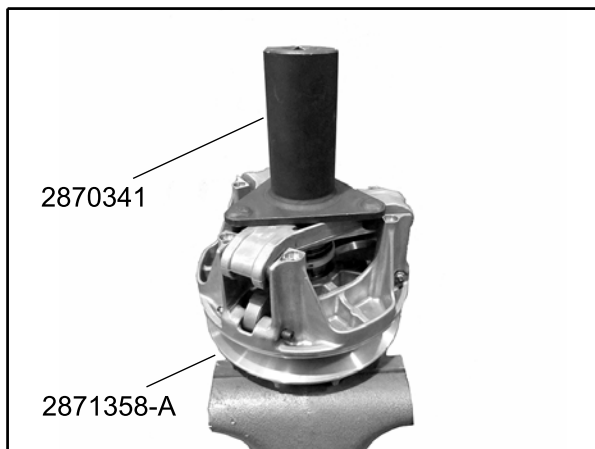
Button to Tower Clearance:
0 - 0.005" (0 - 0.127 mm)

2. Inspect sheave surfaces. Replace the entire clutch if worn, damaged or cracked.

CLUTCHING

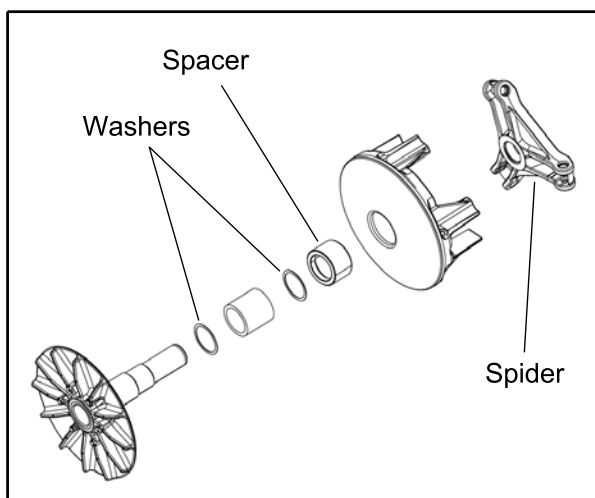
Spider Removal

1. Install clutch in holding fixture (PN 2871358-A) and loosen the spider (counterclockwise) using Clutch Spider Removal Tool (PN 2870341).



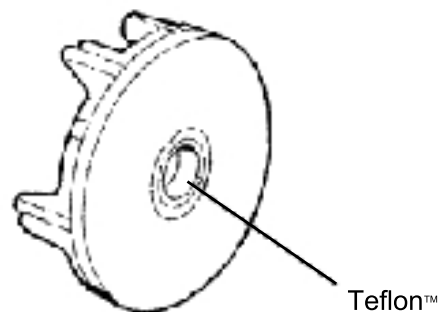
Clutch Holding Fixture: PN 2871358-A
Spider Removal Tool: PN 2870341

NOTE: To maintain proper clutch balance and belt-to-sheave clearance, be sure to reinstall the original quantity and thickness of washers/spacers beneath the spider during assembly.



Moveable Sheave Bushing Inspection

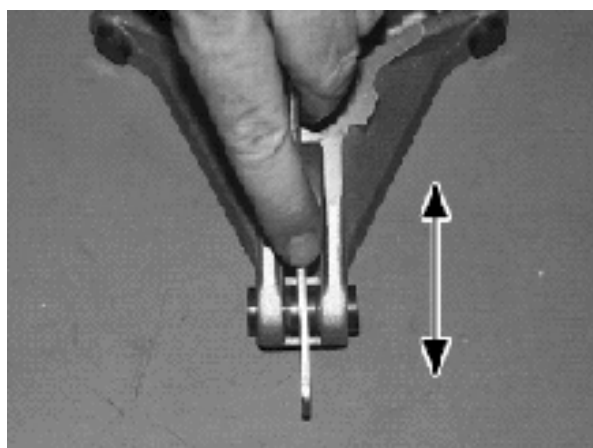
2. Inspect the Teflon™ coating on the moveable sheave bushing.



Moveable Sheave Bushing Inspection:
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to "Bushing Service" in this chapter.

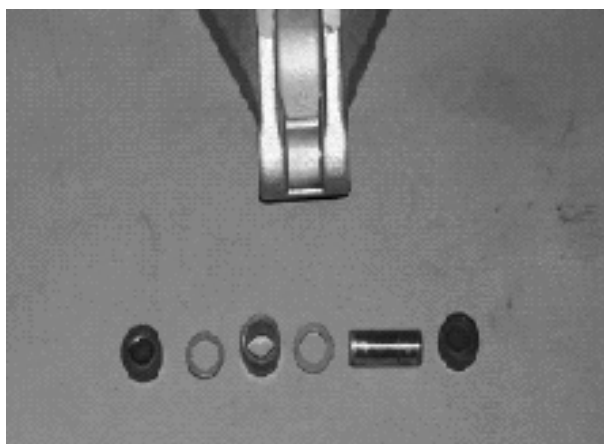
Roller, Pin, and Thrust Washer Inspection

1. Inspect all rollers, bushings and roller pins by pulling a flat metal rod across the roller. Turn roller with your finger. If you notice resistance, galling, or flat spots, replace rollers, pins and thrust washers in sets of three. Also inspect to see if roller and bushing are separating. Bushing must fit tightly in roller. Use the Roller Pin Tool (PN 2870910) to replace rollers and pins. Take care not to damage roller bushing or bearing surface of the new pin during installation.

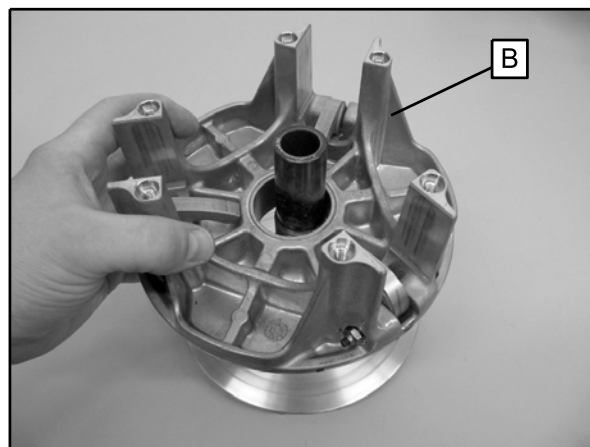


2. Rubber backed buttons can be used in all *RANGER* clutches if the hollow roller pin is changed to the solid roller pin.

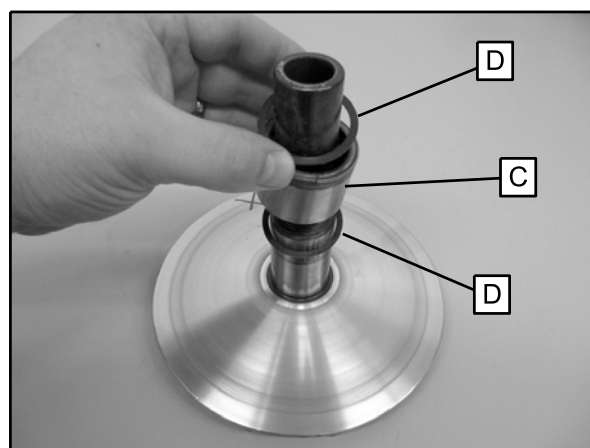
NOTE: The rubber side of the button is positioned toward the solid roller pin.



2. Remove the moveable clutch sheave (B). Inspect for damage or wear.



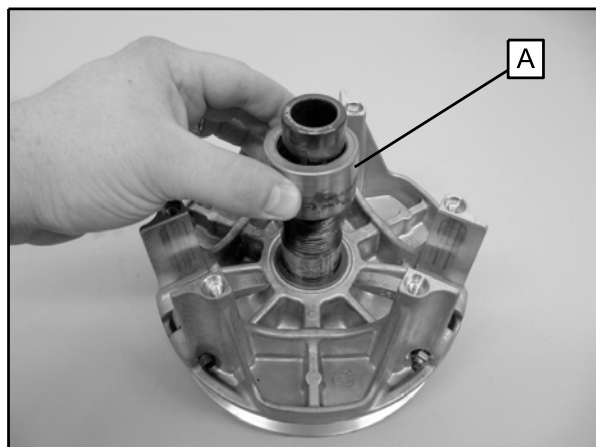
3. Lift bearing (C) and PTFE washers (D) off the shaft. Replace as an assembly if worn, damaged, or if problems were noted.



Clutch Inspection

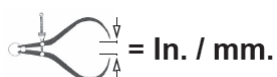
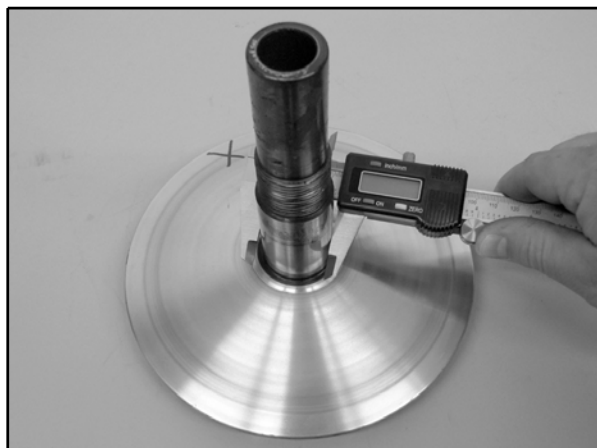
NOTE: Remove cover, spring and spider following instructions for drive clutch disassembly, then proceed as follows:

1. Remove the moveable sheave spacer (A). Inspect for damage or wear.



CLUTCHING

4. Inspect surface of shaft for pitting, grooves, or damage. Measure the outside diameter and compare to specifications. Replace the drive clutch assembly if shaft is worn or damaged.

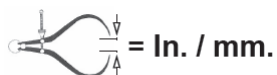


Shaft Diameter:

Standard: 1.3745" - 1.375" (34.91 - 34.93 mm)

Service Limit: 1.3730" (34.87 mm)

5. Visually inspect PTFE thrust washers for damage. Measure the thickness and compare to specification. Replace if worn or damaged.



PTFE Washer Thickness

Standard: 0.030" (0.76 mm)

Service Limit: 0.025" (0.64 mm)

Moveable Sheave Bushing Inspection

Inspect the Teflon™ coating (arrow) on the moveable sheave bushing. Inspect both sheaves for signs of wear, grooving or cracking. De-glaze sheave surfaces with a 3M™ Scotch-Brite Pad if needed.



Moveable Sheave Bushing Inspection:
Replace the cover bushing if more brass than Teflon is visible on the bushing. Refer to "Bushing Service" in this chapter.

Bushing Service

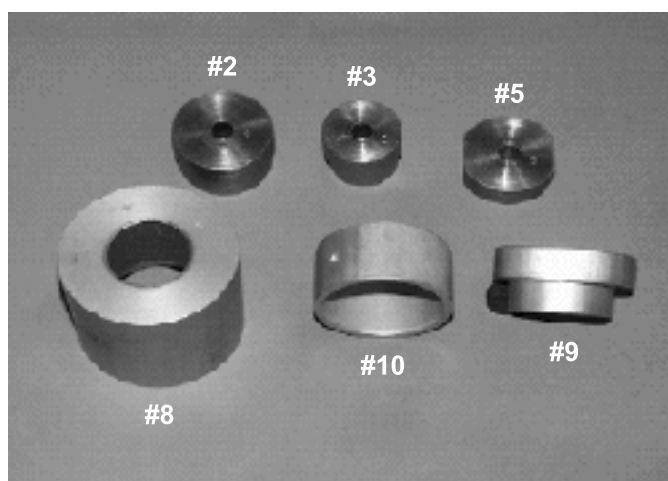
IMPORTANT: Special Tools Required

EBS CLUTCH BUSHING TOOL KIT - 2201379			
ITEM	QTY.	PART #	TOOL DESCRIPTION
A, B	1	5132027	EBS Puller Tool
C	1	5132501	EBS Puller Nut
D	1	5132029	EBS Main Adapter
E	1	5132028	EBS Bushing Removal Tool Instructions
—	1	9915111	Instructions

CLUTCHING

ADDITIONAL SPECIAL TOOLS		
QTY.	PART #	TOOL DESCRIPTION
1	2871226	Clutch Bushing Replacement Tool Kit
1	2870386	Piston Pin Puller

***Clutch Bushing Replacement Tool Kit (PN 2871226)**



ITEM	QTY.	PART #	TOOL DESCRIPTION
#2	1	5020628	P-90 Drive/Driven Clutch Bushing Install Tool
#3	1	5020629	Drive Clutch Cover Bushing Removal /Installation Tool (all clutches)
#5	1	5020631	P-90 Driven Clutch Cover Bushing Removal Tool
#8	1	5020632	Main Puller Adapter
#9	1	5010279	Adapter Reducer
#10	1	5020633	Number Two Puller Adapter

NOTE: Bushings are installed at the factory using Loctite®. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite® from bushing bore prior to installing new bushing.



CAUTION

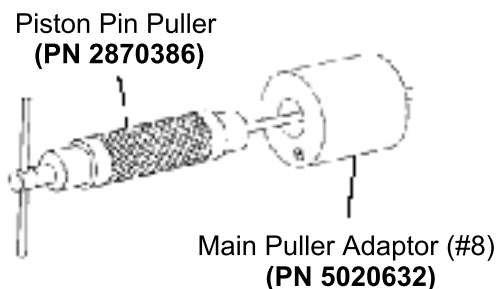
Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

Moveable Sheave - Bushing Removal

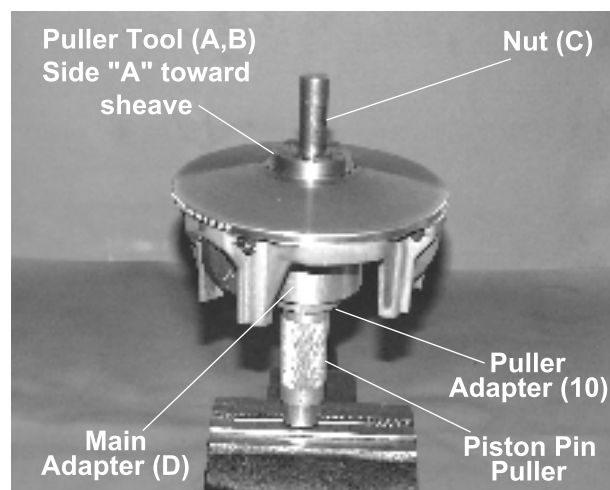
1. Remove clutch as outlined previously in this chapter.
2. Install handle end of the Piston Pin Puller (**PN 2870386**) securely into bench vise and lightly grease puller threads.

Piston Pin Puller: PN 2870386

3. Remove nut from puller rod and set aside.



4. Install puller adapter (Item 10 from kit **PN 2871226**).
5. Install main adapter (Item D) onto puller.



6. With towers pointing toward the vise, slide sheave onto puller rod.

CLUTCHING

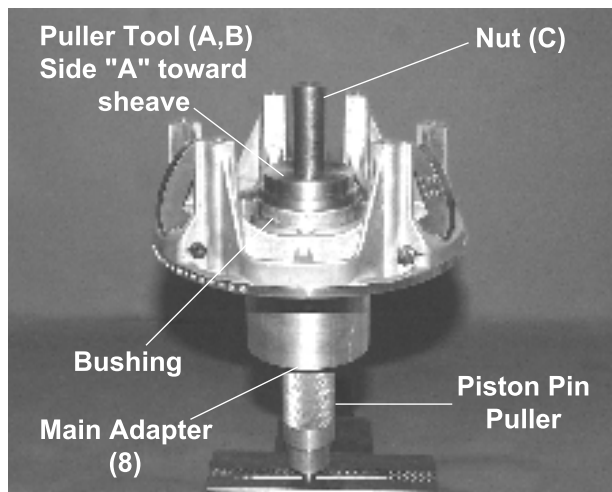
7. Install removal tool (Item A, B) into center of sheave with "A side" toward sheave.

NOTE: Use Bushing Tool PA-47336.

8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
9. Turn sheave counter-clockwise on puller rod until it comes free. Lift sheave off puller.
10. Remove nut from puller rod and set aside.
11. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

Drive Clutch Bushing Installation

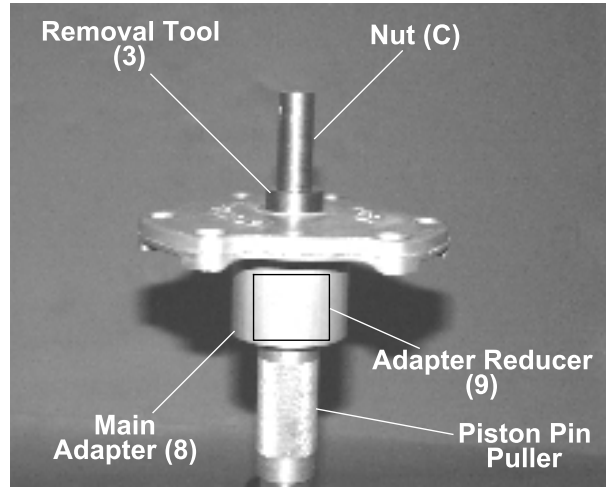
1. Place main adapter (Item 8) on puller.



2. Apply Loctite® 609 evenly to bushing bore inside moveable sheave.
3. Set bushing in place on sheave.
4. Insert installation puller tool (Item A, B) with "A" side down, into center of bushing. **NOTE: 800 EFI Clutch - Use Bushing Tool PA-47336.**
5. With towers pointing upward, slide sheave, bushing and tool onto puller rod.
6. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
7. Turn sheave counter-clockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut from puller rod and set aside.
9. Remove sheave from puller.
10. Remove installation tool.

Cover Bushing Removal

1. Install main adapter (Item 8) on puller.



2. Install adapter reducer (Item 9).
3. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
4. With inside of cover toward vise, slide cover onto puller.
5. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
6. Turn clutch cover counter-clockwise on puller rod until bushing is removed and cover comes free.
7. Remove nut from puller rod and set aside.
8. Remove bushing and bushing removal tool from puller. Discard bushing.

Cover Bushing Installation

1. Apply Loctite® 609 evenly to bushing bore in cover.
2. Working from inside of cover, insert new bushing and bushing installation tool into center of clutch cover.
3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
4. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
5. Turn clutch cover counter-clockwise on puller rod until bushing is seated.
6. Remove nut from puller rod. Take installation tool and clutch cover off rod.

Clutch Assembly

NOTE: The Teflon™ bushings are self-lubricating.

CLUTCHING

⚠ CAUTION

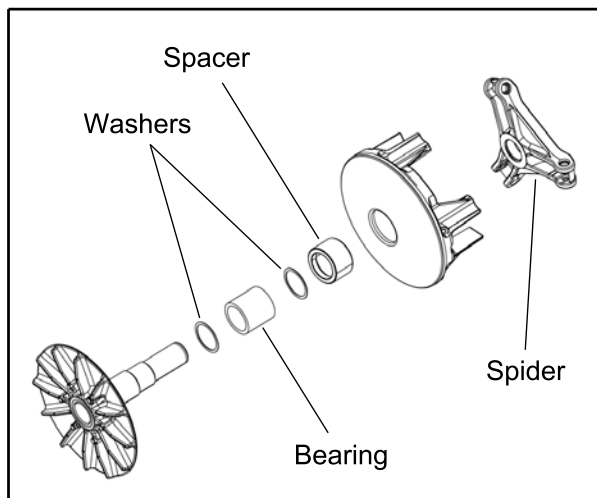
Do not apply oil or grease to the bushings.

Reassemble the drive clutch in the following sequence. Be sure the “X”, or the marks that were made earlier are aligned during each phase of assembly.



1. Install the fiber washers and bearing over the clutch shaft. There should be one fiber washer on each side of the bearing.
2. Install the moveable sheave and spacer onto the clutch shaft.

NOTE: To maintain proper clutch balance and belt-to-sheave clearance, be sure to reinstall the original quantity and thickness of washers/spacers beneath the spider during assembly.



3. Compress spider buttons for each tower and install spider, making sure that “X” or the marks that were made earlier on the spider, aligns with “X” or the marks that were made earlier on the moveable sheave.
4. Torque spider to specification using the holding fixture and spider tool. Torque with smooth motion to avoid damage to the stationary sheave.

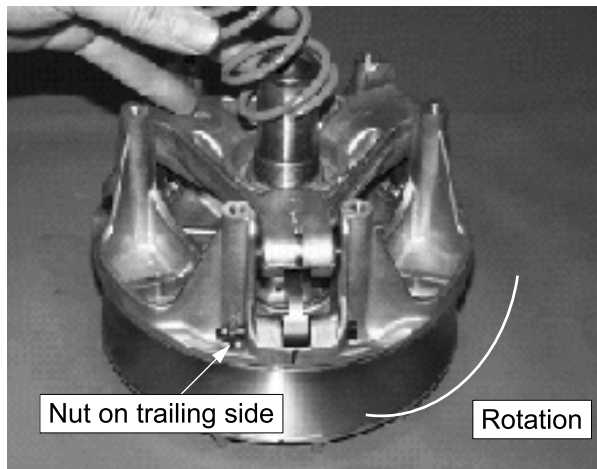


Spider:
200 ft-lbs (271 Nm)

5. After the spider has been torqued, remove the clutch assembly from the holding fixture and inspect the shaft and sheave alignment marks made during disassembly.

IMPORTANT: If the marks are no longer in alignment, the clutch will not be in balance and the drive clutch assembly must be replaced.

6. Install shift weights using new lock nuts on the bolts.



7. Reinstall clutch spring.
8. Reinstall cover, making sure that “X” or the marks that were made earlier the on spider, aligns with “X” or the marks that were made earlier on the cover.
9. Torque cover bolts evenly to specification.



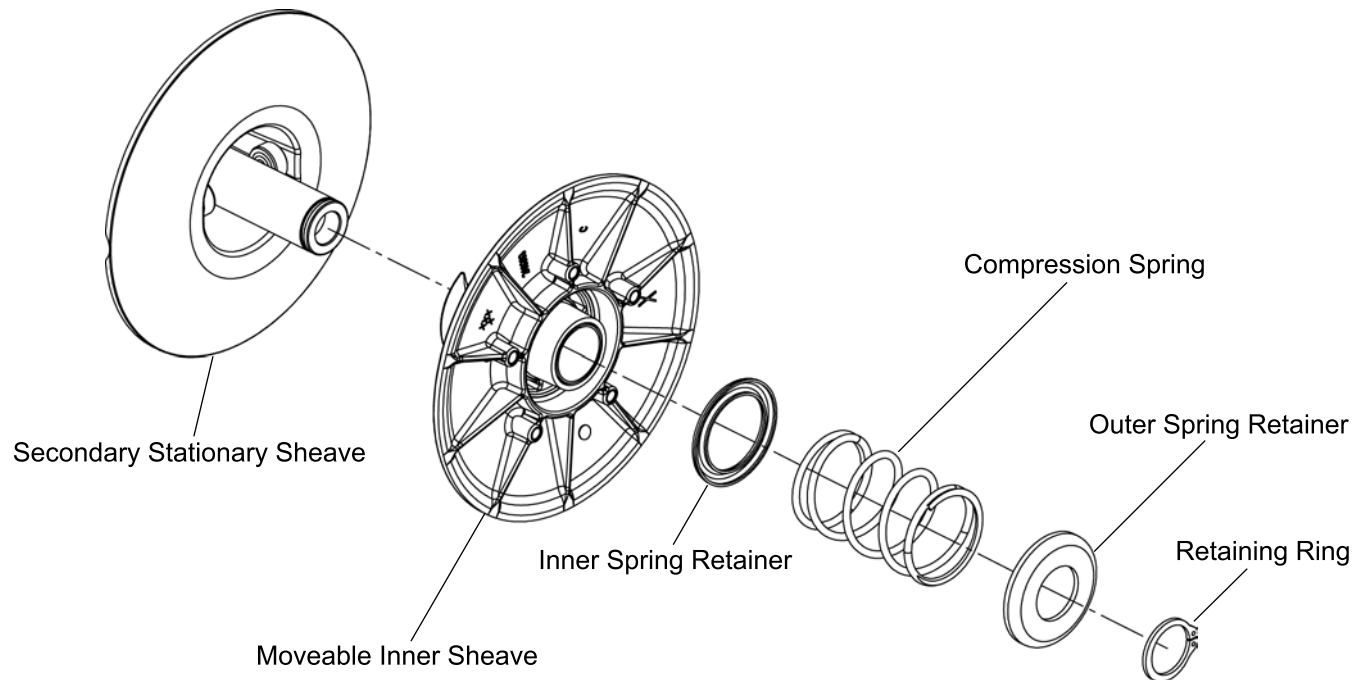
Cover Screw:
90 in-lbs (10.4 Nm)

6

CLUTCHING

DRIVEN CLUTCH SERVICE

Exploded View



Clutch Disassembly / Inspection

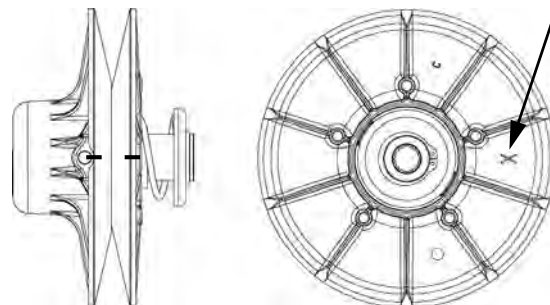


CAUTION

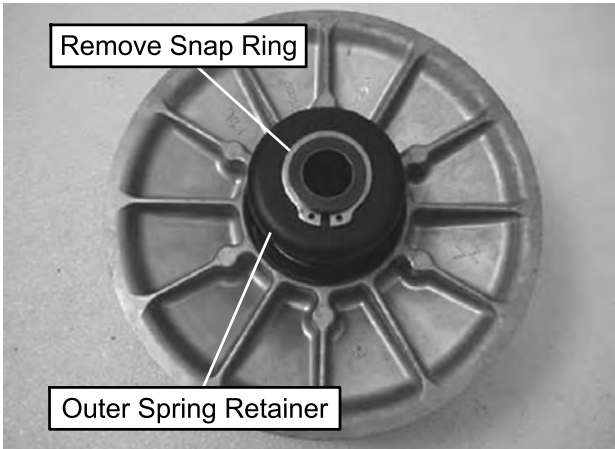
Wear eye protection when removing snap ring to prevent serious personal injury. Use caution when removing, the snap ring pressure is loaded by the compression spring.

1. Remove driven clutch from transmission input shaft.

2. Mark position of clutch sheaves before disassembly or use the X's on the sheaves for reference. This aids in reassembly and maintains clutch balance after reassembly.

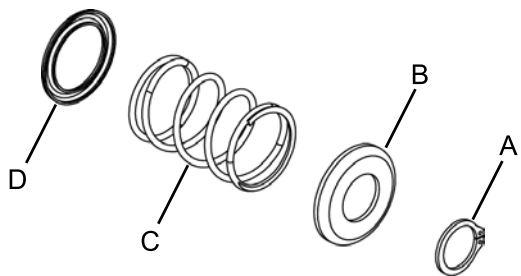
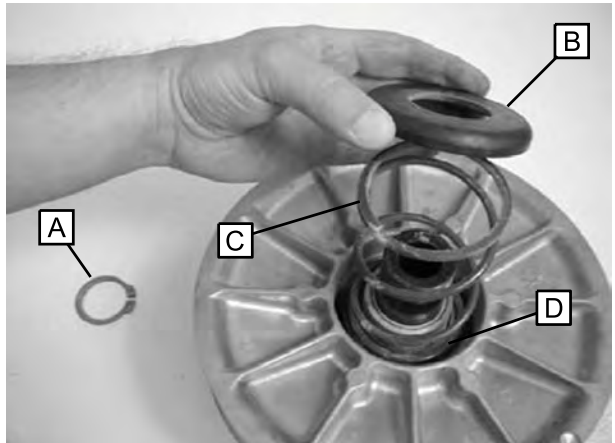


3. Place the driven clutch into the Universal Clutch Compressor **PU-50518**. Apply and hold downward pressure on the outer spring retainer. Carefully remove the snap ring. Remember the outer spring retainer contains strong spring pressure.

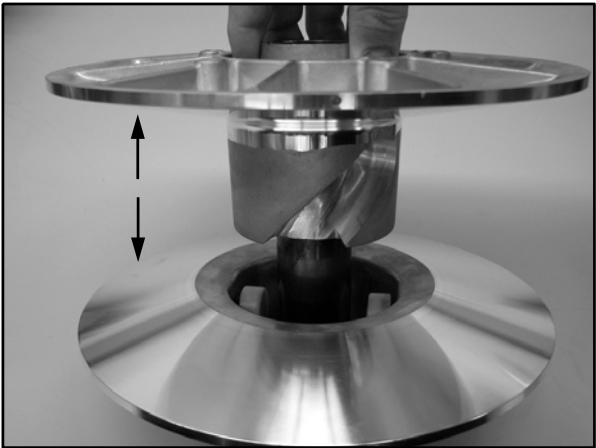


NOTE: Spring is compression only and has no torsional wind.

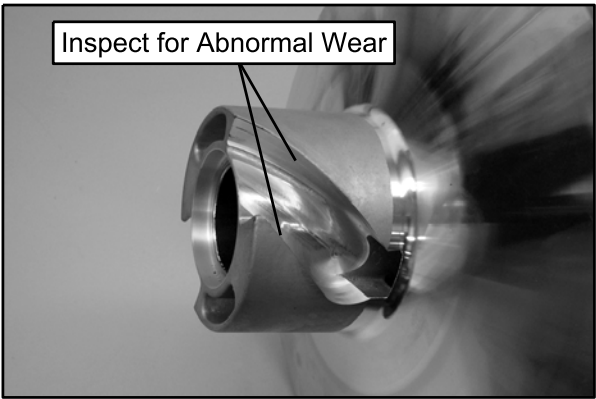
4. With the snap ring (A) removed and spring pressure relieved, remove the outer spring retainer (B), compression spring (C), and inner spring retainer (D).



5. Separate the two clutch sheaves.



6. Inspect the helix on the moveable sheave.



7. Inspect the inner spring retainer for wear and replace as needed.

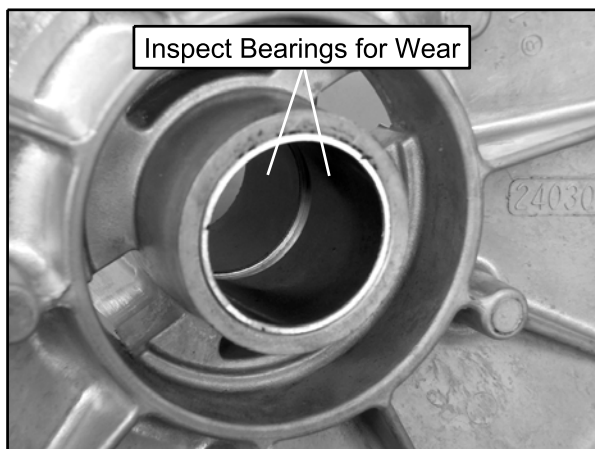


CLUTCHING

8. Check the rollers in the stationary sheave for wear. If rollers are worn, a new driven clutch assembly may be needed.



9. Inspect the bearings inside the moveable sheave.



Moveable Sheave Bearing Inspection:
Replace the bearing if more brass than Teflon™ is visible on the bearing.

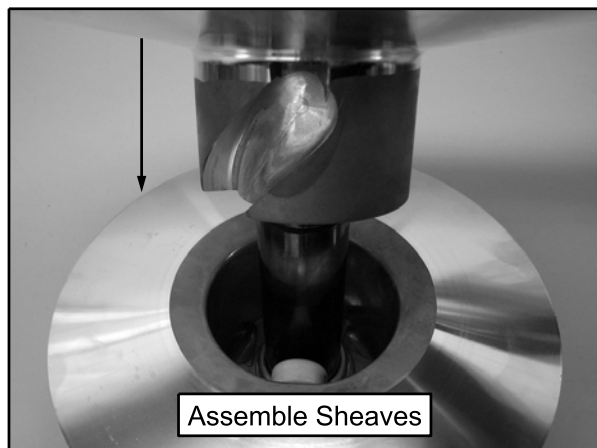
10. Inspect driven clutch sheave faces for wear or damage.
11. Clean and inspect splines on helix and transmission input shaft.
12. Lube splines with a light film of grease. **Do not lubricate the bearings!**

Clutch Assembly

1. Install the inner spring retainer if removed. **Do not apply oil or grease to the bearings.**



2. Align the "X" marks on each of the sheaves during reassembly.

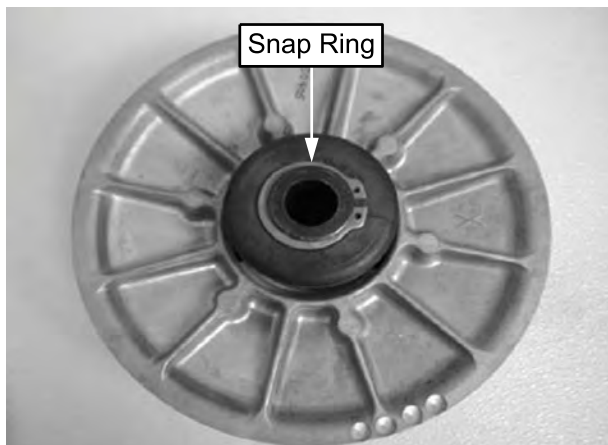


3. Install spring into inner retainer.

4. Install outer retainer on top of spring.



5. Place the driven clutch into the Universal Clutch Compressor **PU-50518**.
6. Apply and hold downward pressure on the outer spring retainer. Carefully install the snap ring.



CLUTCHING

TROUBLESHOOTING

SITUATION	PROBABLE CAUSE	REMEDY
Engine RPM below specified operating range, although engine is properly tuned	-Wrong or broken drive clutch spring -Drive clutch shift weight too heavy -Driven clutch spring broken or installed in wrong helix location	-Replace with recommended spring -Install correct shift weight kit to match engine application -Replace spring; refer to proper installation location
Erratic engine operating RPM during acceleration or load variations	-Drive clutch binding -Belt worn unevenly - thin / burnt spots -Driven clutch malfunction -Sheave face grooved	A. Disassemble drive clutch; inspect shift weights for wear and free operation B. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area - Replace belt A. Replace ramp buttons B. Inspect movable sheave for excessive bushing clearance -Replace the clutch
Engine RPM above specified operating range	-Incorrect drive clutch spring (too high of rate) -Drive clutch shift weights incorrect for application (too light) -Drive clutch binding -Driven clutch binding -Converter sheaves greasy; belt slippage	-Install correct recommended spring -Install correct recommended shift weights -Disassemble and clean clutch, inspecting shift weights and rollers; Reassemble without the spring and move sheaves through entire range to further determine probable cause -Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location -Clean sheaves with denatured alcohol or brake cleaner, install new belt
Harsh drive clutch engagement	-Drive belt worn too narrow -Excessive belt / sheave clearance with new belt	-Replace belt -Perform belt / sheave clearance adjustment with shim washers beneath spider
Drive belt turns over	-Wrong belt for application -Clutch alignment out of spec -Engine mount broken or loose	-Replace with correct belt -Adjust clutch alignment -Inspect / adjust or replace
Belt burnt, thin spots	-Abuse (continued throttle application when vehicle is stationary, excess load) -Dragging brake -Slow, easy clutch engagement	-Caution operator to operate machine within guidelines -Vehicle operated with park brake on; Inspect brake system

CLUTCHING

SITUATION	PROBABLE CAUSE	REMEDY
		-Fast, effective use of throttle for efficient engagement
PVT cover overheating (melting)	-Plugged air intake or outlet -Belt slippage due to water, oil, grease, etc., rubbing on cover -Clutches or weight being applied to cover while in operation -High vs. low range	-Clear obstruction -Inspect system; Clean, repair or replace as necessary; Seal PVT system ducts -Remove weight. Inform operator -Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual
Water ingestion	-Cover seals or ducts leaking -Operator error	-Find leak and repair as necessary -Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.
Belt slippage	-Belt worn out -Water ingestion -Belt contaminated with oil or grease	-Replace belt -Inspect and seal PVT system -Inspect and clean
PVT noise	-Belt worn or separated, thin spots, loose belt -Broken or worn clutch components, cover hitting clutches	-Replace belt -Inspect and repair as necessary
Engagement erratic or stabby	-Thin spots on belt, worn belt -Drive clutch bushings stick	-Replace belt. Refer to belt burnt troubleshooting and instruct operator -Inspect and repair clutches

[illegible]

CHAPTER 7

FINAL DRIVE

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SPECIAL TOOLS

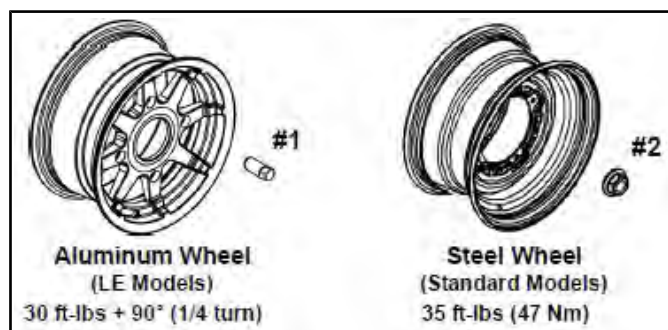
PART NUMBER	TOOL DESCRIPTION
2872608	Roll Pin Removal Tool
PU-48951	Axle Boot Clamp Tool

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

TORQUE SPECIFICATIONS

Wheel and Hub Torque Table

ITEM	NUT TYPE	SPECIFICATION
Aluminum Wheels (Cast)	Lug Nut #1	30 ft-lbs + 90° (1/4 turn)
Steel Wheels (Black / Camo)	Flange Nut #2	35 ft-lbs (47 Nm)
Front Hub Castle Nut	-	80 ft-lbs (108 Nm)
Mid / Rear Hub Castle Nut	-	110 ft-lbs (150 Nm)



FINAL DRIVE

FRONT BEARING CARRIER

Bearing Carrier Inspection / Removal

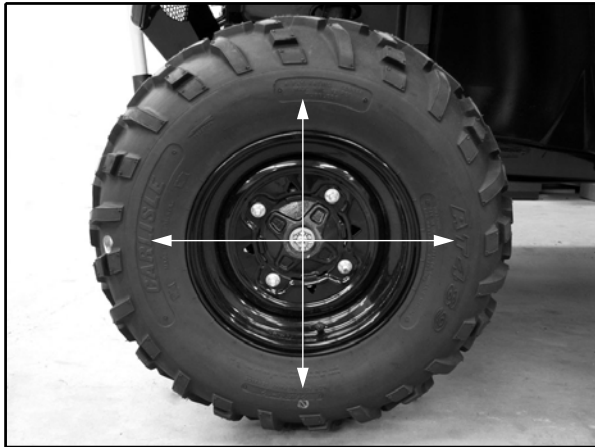
1. Elevate front of vehicle and safely support machine under the frame area.



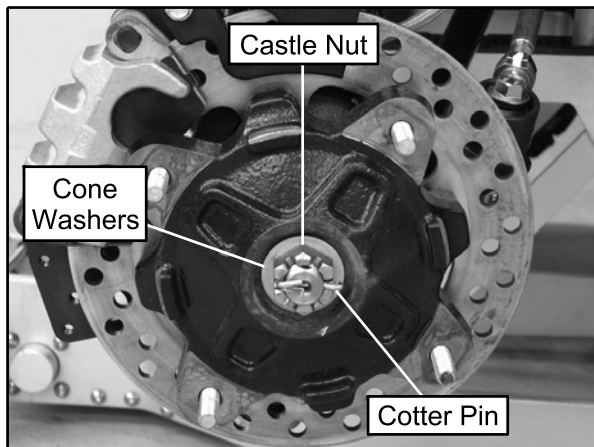
CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

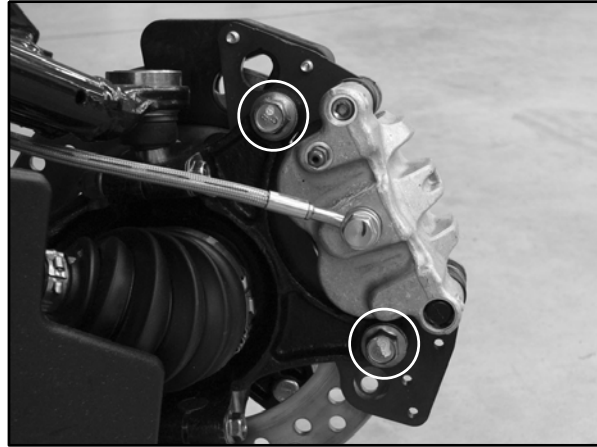
2. Check bearings for side play by grasping the top and bottom of the tire firmly and checking for movement. The tire should rotate smoothly without binding or rough spots.



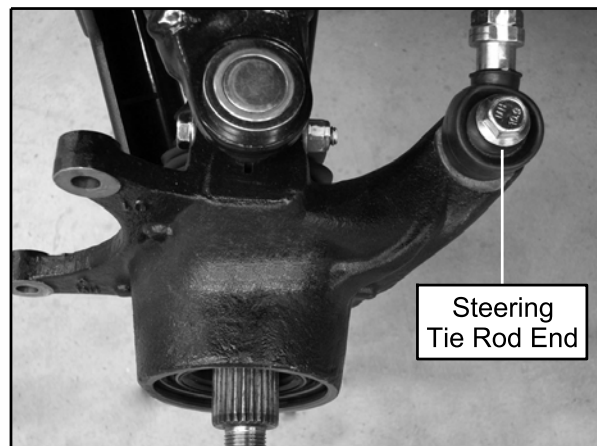
3. Remove the (4) wheel nuts and remove front wheel.
4. Remove the cotter pin and loosen the front wheel hub castle nut. Remove the nut, and (2) cone washers from the front wheel hub assembly.



5. Remove the two brake caliper mounting bolts. **CAUTION:** Do not hang caliper by the brake line. Use wire to hang caliper to prevent damage to brake line.



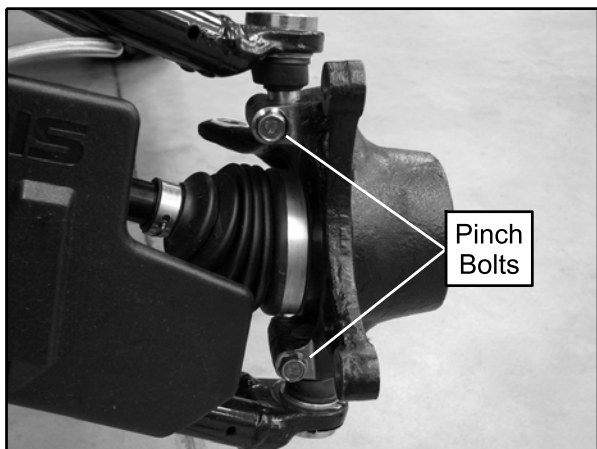
6. Remove the front wheel hub assembly.
7. Remove the steering tie rod end fastener from the front bearing carrier.



8. Remove lower shock mounting fastener attached to the upper A-arm and remove shock from the A-arm.



9. Remove the upper and lower ball joint pinch bolts.



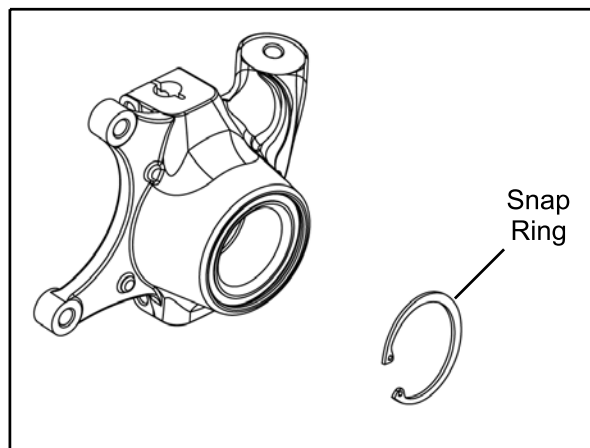
10. Using a soft faced hammer, lightly tap on the bearing carrier while removing upper and lower ball joint ends.
11. Remove the bearing carrier from the front drive shaft.
12. Rotate bearing by hand and check for smooth rotation. Visually inspect bearings for moisture, dirt, or corrosion.

NOTE: Due to extremely close tolerances and minimal wear, the bearing must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.
13. Replace bearing if moisture or corrosion is evident.

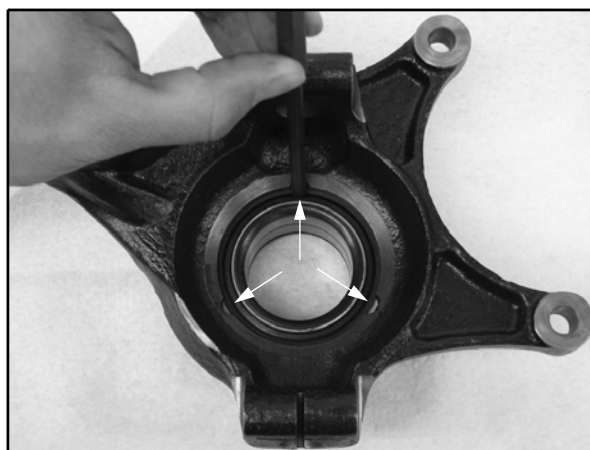
Bearing Replacement

Bearing Removal

1. Remove outer snap ring.



2. From back side of the bearing carrier, tap on the outer bearing race with a drift punch in the reliefs as shown.



3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.
4. Inspect bearing carrier housing for scratches, wear or damage. Replace front bearing carrier if damaged.

Bearing Installation

5. Thoroughly clean the front bearing carrier housing and the outer race on the new bearing. Be sure that all oil residue has been removed from each surface.

FINAL DRIVE

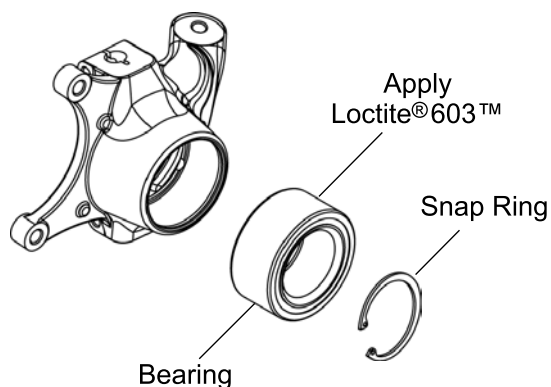
- Support the bottom of the bearing carrier housing.



CAUTION

Use an arbor and press only on the outer race, otherwise bearing damage may occur.

- Apply Loctite® 603™ retaining compound to the outer circumference of the new bearing race and carefully press the new bearing into the bearing carrier housing.



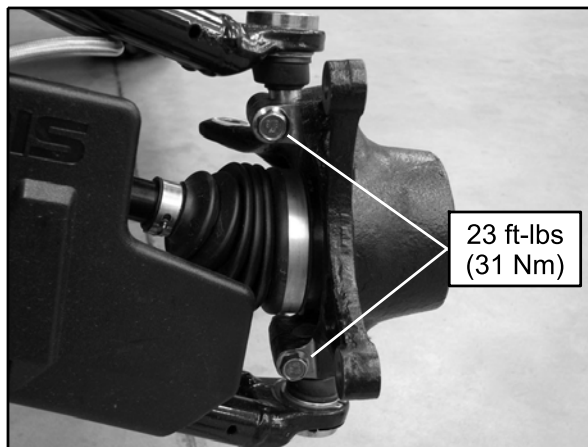
NOTE: Use care to not allow any of the Loctite® compound to get in the bearing.

- Wipe the housing clean of any excess compound and install the snap ring.

Bearing Carrier Installation

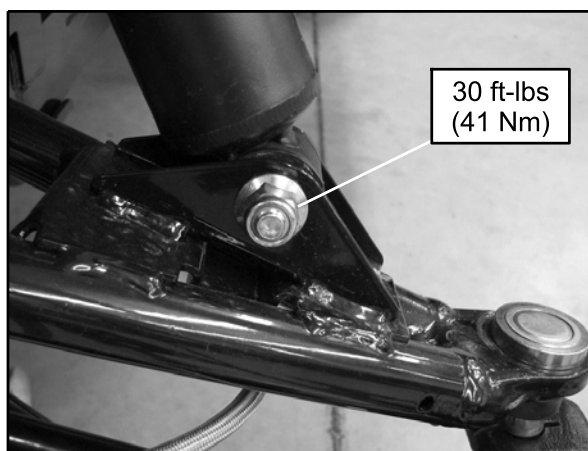
- Install the end of the drive shaft through the backside of the bearing carrier.
- Install the upper and lower ball joint ends into the front bearing carrier.

- Install pinch bolts and torque to specification.



Pinch Bolts:
23 ft-lbs (31 Nm)

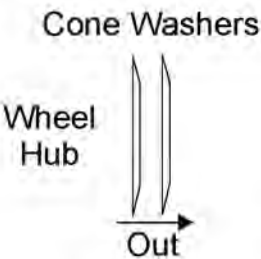
- Install shock to A-arm and torque fastener to specification.



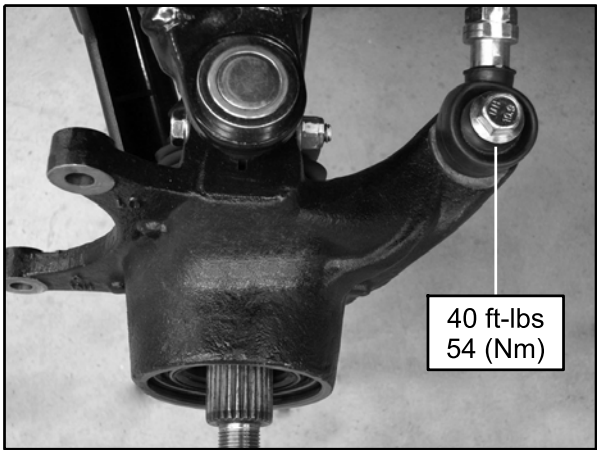
Shock Mounting Bolts:
30 ft-lbs (41 Nm)

- Apply grease to the drive shaft splines.

6. Install front wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.

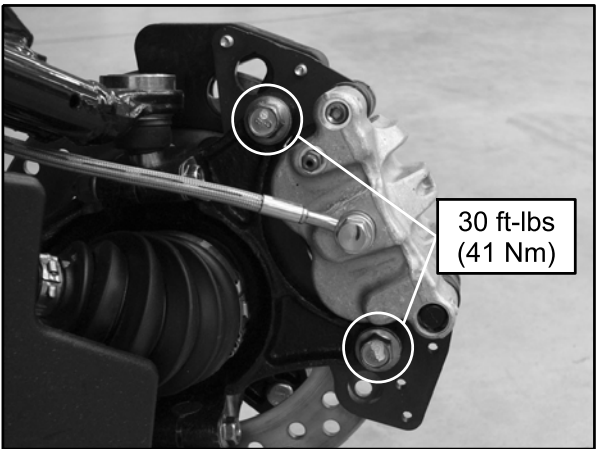


7. Install the steering tie rod end onto the front bearing carrier and torque fastener to **40 ft-lbs (54 Nm)**.



Tie Rod End Fastener:
40 ft-lbs (54 Nm)

8. Install the front brake caliper. Install the mounting bolts and torque to **30 ft-lbs (41 Nm)**.



Front Caliper Mounting Bolts:
30 ft-lbs (41 Nm)

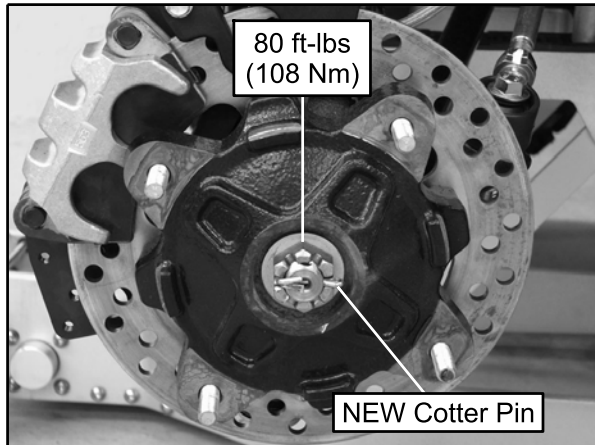


CAUTION

New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

FINAL DRIVE

9. Torque wheel hub nut to specification and install a NEW cotter pin. Tighten nut slightly if necessary to align cotter pin holes.



Front Hub Castle Nut:
80 ft-lbs (108 Nm)

10. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.



Wheel Nuts:
Steel Wheels: **35 ft-lbs (47 Nm)**
Aluminum Wheels: **30 ft-lbs + 90° (1/4 turn)**

11. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around the end of the shaft.

FRONT DRIVE SHAFT

Removal

1. Perform the "Bearing Carrier Inspection / Removal" procedure listed under the "FRONT BEARING CARRIER" section within this chapter.

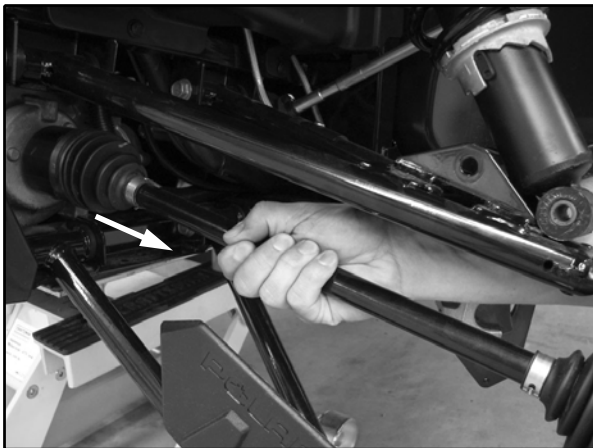
NOTE: Perform all removal steps with the exception of removing the steering tie rod end. It will not be necessary to remove the tie rod end from the front bearing carrier when removing the front drive shaft.



CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure.

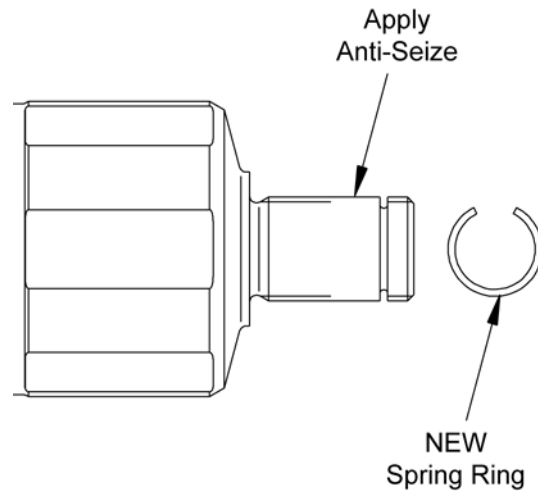
2. Remove the drive shaft from the front bearing carrier.
3. With a short, sharp jerk, remove drive shaft from the front gearcase.



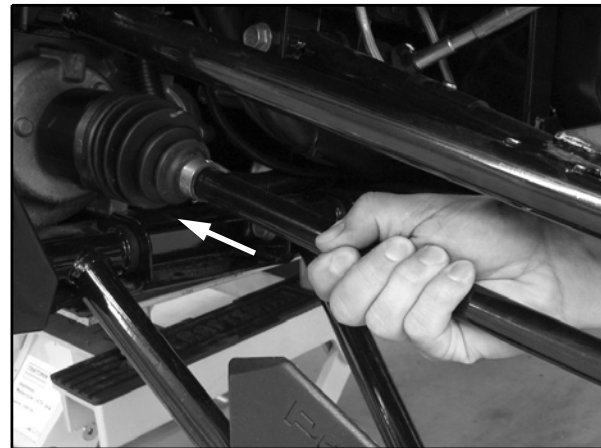
4. Refer to the "DRIVE SHAFT SERVICE" procedure if repairing the drive shaft.

Installation

1. Install new spring ring on the end of the drive shaft. Apply an anti-seize compound to splines.



2. Align splines of drive shaft with front gearcase and reinstall the drive shaft. Use a rubber mallet to tap on the outboard end of the drive shaft if necessary.



3. Install drive shaft into the front bearing carrier.
4. Perform the "Bearing Carrier Installation" procedure listed under the "FRONT BEARING CARRIER" section within this chapter.

FINAL DRIVE

FRONT PROPSHAFT

Removal / Installation (4X4)

1. Elevate and safely support vehicle under the frame. The use of a vehicle hoist is recommended for this procedure.



CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Access the front propshaft roll pin through the skid plate hole.
3. Use the Roll Pin Removal Tool (PN 2872608), to drive out the roll pin from the propshaft.

Roll Pin Removal Tool: PN 2872608

4. Remove the (8) T27 Torx-head screws retaining the floor cover and remove the cover from the vehicle.
5. Slide the propshaft back and away from front gearcase, then pull the shaft sharply forward to remove it from the transmission shaft.
6. Using care, pull the propshaft towards the left side of the frame and slide it out the left rear side of the vehicle in front of the PVT system.



7. Reverse this procedure to reinstall the front propshaft.

IMPORTANT: Use a NEW roll pin upon installation.

Removal / Installation (6X6)

1. Elevate and safely support vehicle under the frame. The use of a vehicle hoist is recommended for this procedure.



CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Access the front propshaft roll pin through the skid plate hole.
3. Use the Roll Pin Removal Tool (PN 2872608), to drive out the roll pin from prop shaft.

Roll Pin Removal Tool: PN 2872608

4. Remove the (8) T27 Torx-head screws retaining the floor cover and remove the cover from the vehicle.
5. Slide the propshaft back and away from front gearcase, then pull the shaft sharply forward to remove it from the transmission shaft.
6. Using care, pull the propshaft towards the right side of the frame and slide it out the right rear portion of the frame.



NOTE: Avoid making contact with the shift cable and cable mounting tab during removal to prevent component damage.

7. Reverse this procedure to install the front propshaft.

IMPORTANT: Use a NEW roll pin upon installation.

Removal / Installation (CREW)

1. Elevate and safely support vehicle under the frame. The use of a vehicle hoist is recommended for this procedure.

CAUTION

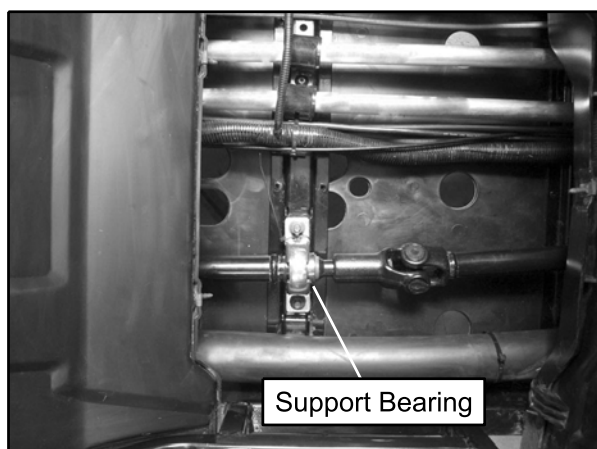
Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

NOTE: Propshaft roll pin removal is only required if removing the front portion of the propshaft.

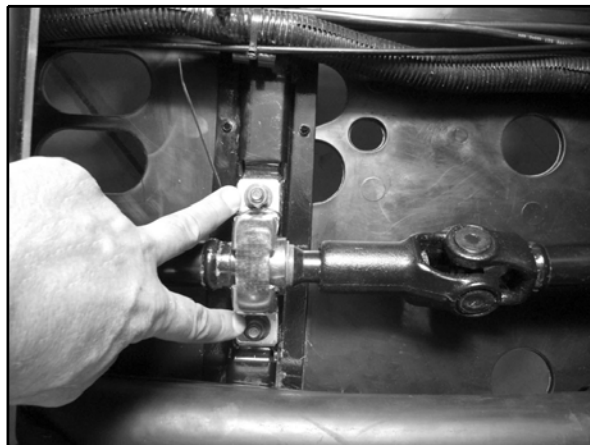
2. Access front propshaft roll pin through skid plate hole.
3. Use the Roll Pin Removal Tool (PN 2872608), to drive out the roll pin from prop shaft.

Roll Pin Removal Tool: PN 2872608

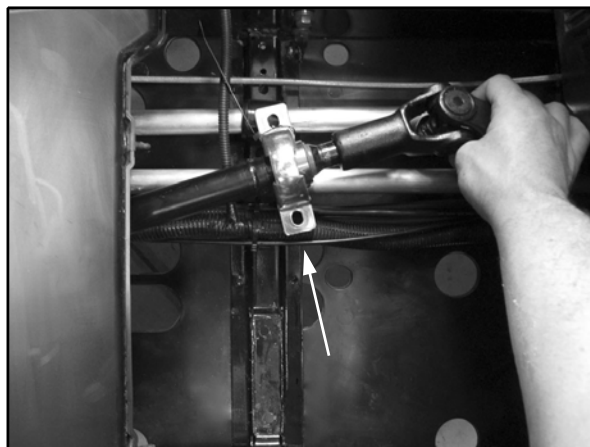
4. Remove the front seat base and large storage container to access the support bearing.



5. Remove (2) nuts and bolts retaining bearing support.



6. Slide the rear portion of the shaft back on the transmission shaft and move both shafts toward the left side of the vehicle to separate them.



7. If removing the front portion of the propshaft, slide it back and away from front gearcase to remove it.
8. If removing the rear portion, remove the bearing support (upper and lower half).

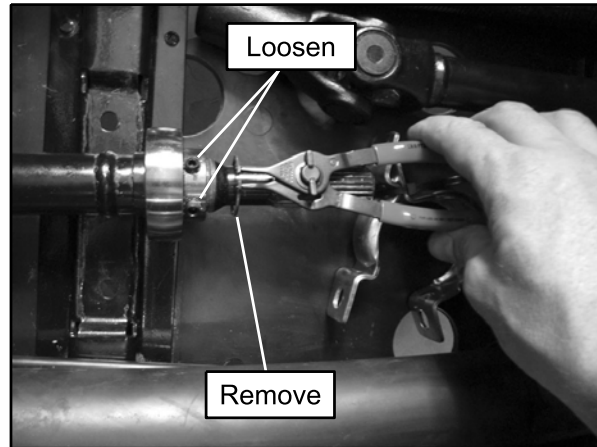
7

FINAL DRIVE

- Using care, pull the rear portion of the propshaft towards the left side of the frame and slide it out the left rear side of the vehicle in front of the PVT system.



- Remove the bearing support (upper and lower half) and the retaining ring. Loosen the (2) set screws retaining the bearing to the shaft.



- Reverse this procedure to reinstall and assemble the front propshaft.
- Torque bearing support fasteners to specification.



Bearing Support Fasteners:
30-36 ft-lbs (41-49 Nm)

IMPORTANT: If front propshaft was removed, use a **NEW** roll pin upon installation.

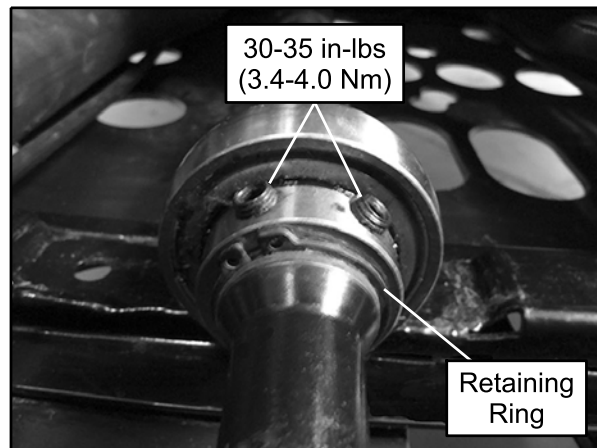
Support Bearing Replacement (CREW)

- Follow steps 4-6 of the “Removal / Installation (CREW)” procedure.

- Slide the bearing off the end of the shaft.

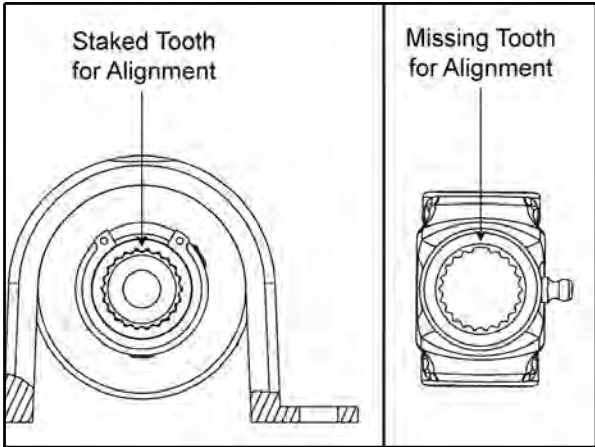
NOTE: If bearing is seized on the shaft, remove the rear portion of the shaft from the vehicle. Refer to “Removal / Installation (CREW)”.

- Clean surface of the shaft and install the new bearing.
- Install a new retaining ring and slide the bearing tight against the retaining ring.
- Apply Loctite® 242™ to the set screw threads and torque the (2) bearing set screws to specification.



Bearing Set Screws:
30-35 in-lbs (3.4-4.0 Nm)

7. Align the front and rear portions of the propshaft as shown below and slide them together.



8. Install the upper and lower halves of the bearing support along with the (2) fasteners. Torque the support bearing fasteners to specification.

 = T
Bearing Support Fasteners: 30-36 ft-lbs (41-49 Nm)

9. Grease the propshaft yoke(s).
10. Reinstall the large storage container and front seat base.

FINAL DRIVE

PROPSHAFT U-JOINT SERVICE

Disassembly

1. Remove internal or external snap ring from all bearing caps.



CAUTION

Always wear eye protection.



NOTE: If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct re-positioning during installation.

2. Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.



3. Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.

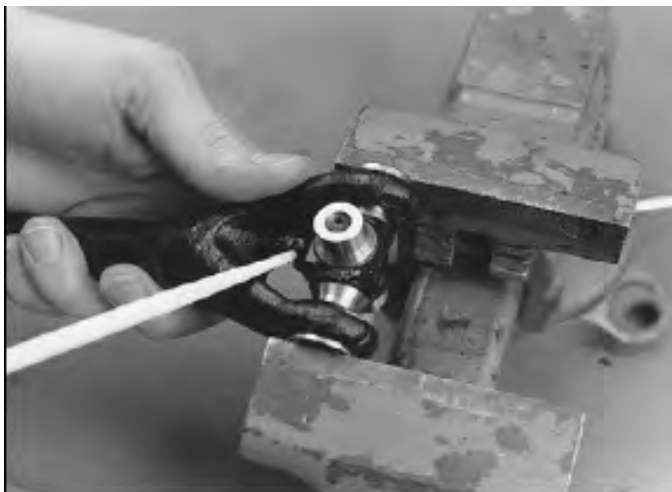


4. Force U-joint cross to one side and lift out of inner yoke.

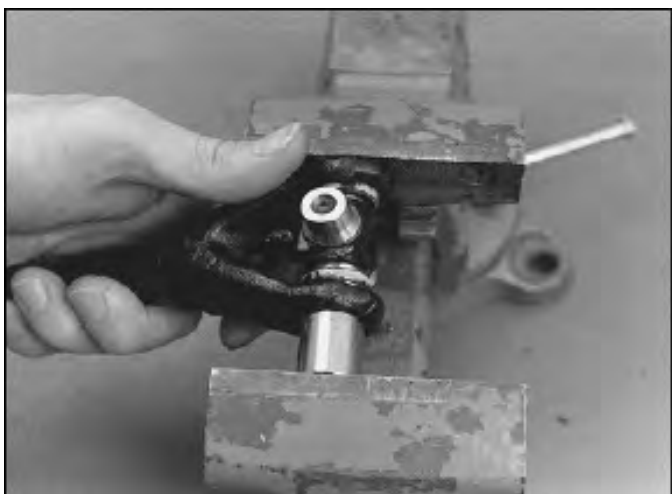


Assembly

1. Install new bearing caps in yoke by hand. Carefully install U-joint cross with grease fitting properly positioned inward toward center of shaft. Take care not to dislodge needle bearings upon installation of cross joint. Tighten vise to force bearing caps in.



2. Using a suitable arbor, fully seat bearing cap in one side.
3. Continually check for free movement of bearing cross as bearing caps are assembled.

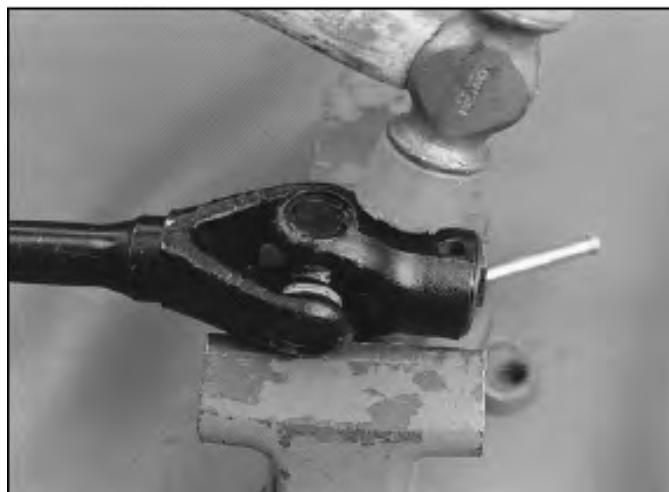


4. Install snap ring to contain bearing cap just installed. Repeat procedure for other side.

5. Install outer yoke, aligning marks made before disassembly.



6. Repeat Steps 1-4 to install bearing caps on outer yoke.
7. Seat all bearing caps against snap rings by supporting cross shaft and tapping on each corner as shown.

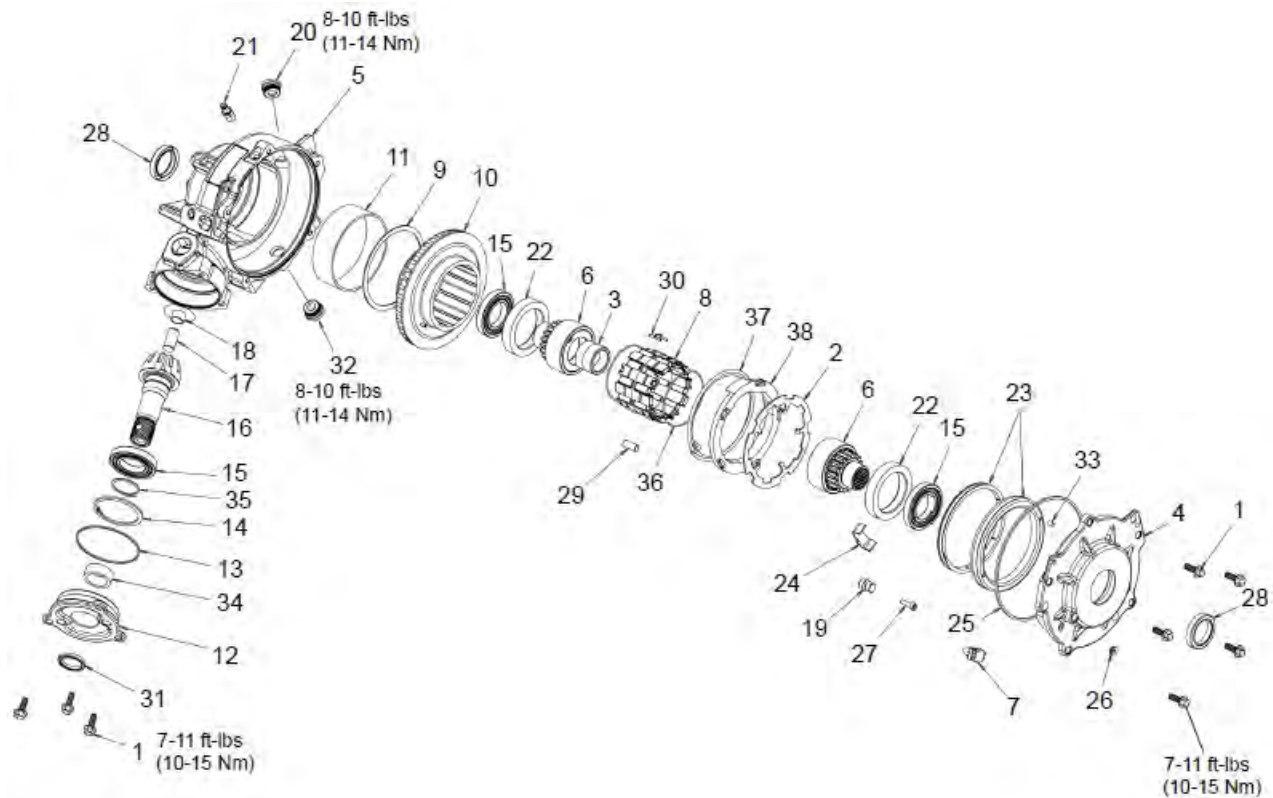


8. When installation is complete, yokes must pivot freely in all directions without binding. If the joint is stiff or binding, tap the yoke lightly to center the joint until it pivots freely in all directions.

FINAL DRIVE

FRONT GEARCASE - CENTRALIZED HILLIARD

Exploded View



REF#	DESCRIPTION	QTY	REF#	DESCRIPTION	QTY
1	Screws, 1/4-20	8	20	Fill Plug	1
2	Armature Plate	1	21	Vent Tube	1
3	Bushing	1	22	Nylon Spacer	2
4	Output Cover	1	23	AWD Coil / Coil Pocket Insert	1
5	Gearcase	1	24	Thrust Plate	1
6	Output Hub	2	25	O-Ring	1
7	Plastic Clip	1	26	Grommet	1
8	Roll Cage	1	27	Set Screw	1
9	Spacer, Gear	1	28	Oil Seal	2
10	Clutch Housing / Ring Gear	1	29	Rollers	20
11	Bushing	1	30	H-Clip Springs	20
12	Input Cover	1	31	Oil Seal	1
13	O-Ring	1	32	Drain Plug Asm. w/Magnet	1
14	Retaining Ring	1	33	Dowel Pin	1
15	Ball Bearing	3	34	Needle Roller Bearing	1
16	Pinion Gear	1	35	Retaining Ring	1
17	Dowel Pin	1	36	Spring, Wire Form	2
18	Bearing	1	37	Torsion Spring	1
19	Thrust Button Asm.	1	38	Spring Retainer	1

All Wheel Drive Operation

The AWD switch may be turned on or off while the vehicle is moving, however, AWD will not enable until the engine RPM drops below 3100. Once the AWD is enabled, it remains enabled until the switch is turned off.

Engage the AWD switch before getting into conditions where the front wheel drive may be needed. If the rear wheels are spinning, release the throttle before switching to AWD.



CAUTION

Switching to AWD while the rear wheels are spinning may cause severe drive shaft and gearcase damage. Always switch to AWD while the rear wheels have traction or are at rest.

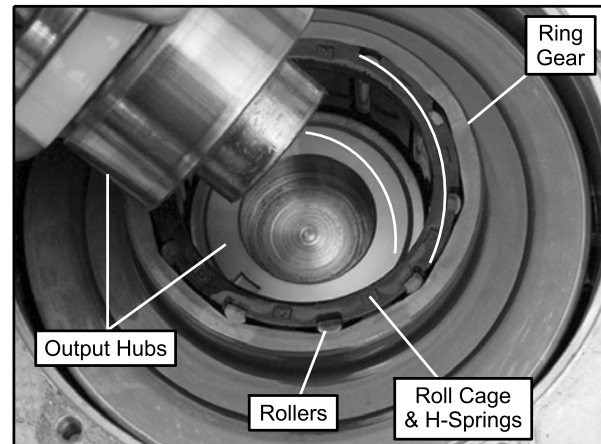
With the AWD switch off, the vehicle drives through the rear wheels only (2 wheel drive). When the AWD is enabled, the front drive acts as an on-demand AWD system. This means, the front drive will engage once the rear wheels have lost traction, and will remain engaged until the torque requirement goes away (i.e. rear wheels regain traction).



CAUTION

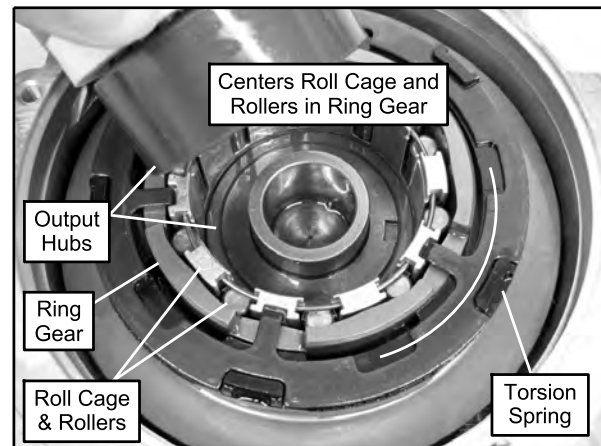
If the rear wheels are spinning, release the throttle before turning the AWD switch on.
If AWD is engaged while the wheels are spinning, severe drive shaft and front gearcase damage could result.

AWD Engagement: When the AWD switch is activated, the AWD coil is powered by a 12 Vdc input which creates a magnetic field. This magnetic field attracts an armature plate that is keyed to the roll cage. When the ring gear and roll cage are spinning (vehicle is moving), the energized coil and armature plate will apply drag to the roll cage that indexes the rollers inside the ring gear to an engagement position. While in the engagement position, the front drive will be in an “over-running” condition (not engaged), until the rear wheels lose traction. Once the rear wheels begin to lose traction, the front drive will engage by coupling the output hubs to the ring gear via the rollers. The front drive will remain engaged until the torque requirement goes away (i.e. rear wheels regain traction).



AWD Disengagement: Once the rear wheels regain traction, the front wheels will return to the “over-running” condition. The vehicle is now back to rear wheel drive until the next loss of rear wheel traction occurs.

Torsion Spring Operation: The torsion spring acts as a return mechanism to help disengage the coupling of the output hubs and ring gear by creating an “over-running” condition for the rollers upon disengagement.



FINAL DRIVE

AWD Diagnosis

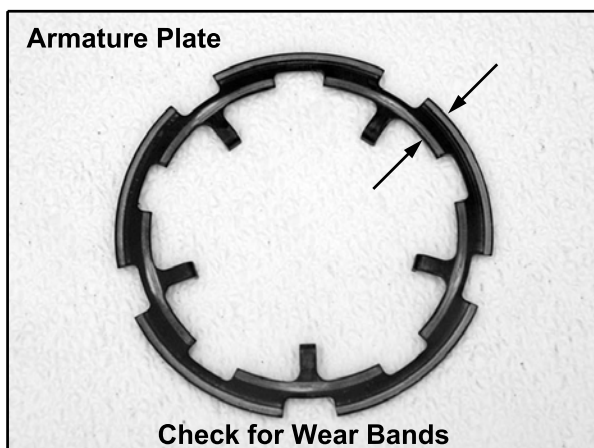
Symptom: AWD Will Not Engage

1. Check the gearcase coil resistance. To test the coil resistance, measure between Grey and Brown/White wires. Measurement should be within specification.

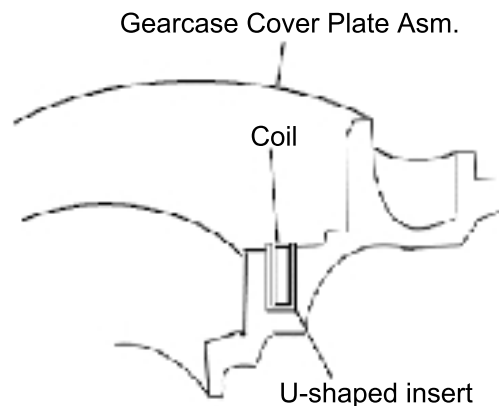


Front Gearcase Coil Resistance:
21.6 - 26.4 Ohms

2. Turn the ignition switch and AWD switch on and place gear selector in High or Low gear. Check for minimum battery voltage at Gray and Brown/White chassis wires that power the coil. A minimum of 11 Vdc should be present.
3. If electrical tests are within specification, remove gearcase (see "Gearcase Removal") and inspect components.
4. Inspect armature plate for a consistent wear pattern. There should be two distinct wear bands (one band inside the other). If only one band of wear is present (or if there is wear between the two bands), inspect the coil area as indicated in Step 5. A wear band with an interrupted wear mark may indicate a warped plate, which may cause intermittent operation.

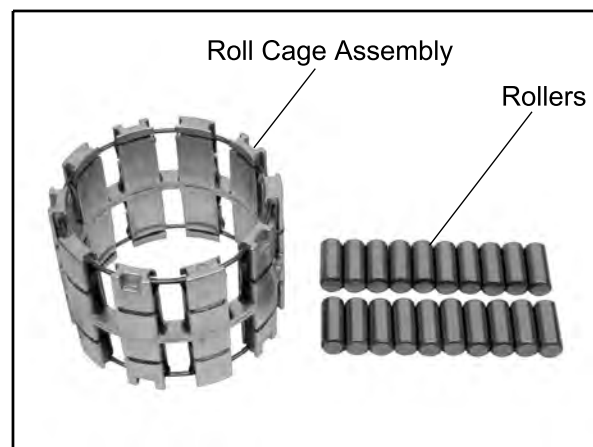


5. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature plate, thereby increasing pole gap. If the pole gap increases, the coil will not be strong enough to engage the AWD system. If this is found, replace the cover plate assembly.



**Side cutaway view of
Centralized Hilliard cover**

6. Inspect the rollers for nicks and scratches. The rollers must slide up, down, in and out freely within the roll cage sliding surfaces and H-springs.



7. Inspect the roll cage assembly for cracks or excessive wear. If damaged, replace the roll cage assembly.

Gearcase Removal

1. Stop engine, place machine in gear and set parking brake.

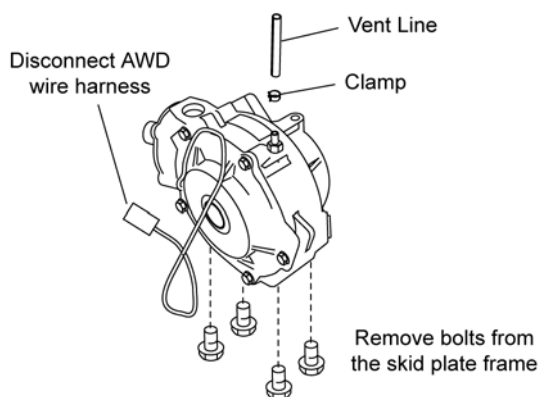
2. Elevate front of vehicle and safely support machine under the frame area.



CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure.

3. Remove both front drive shafts from the front gearcase (see "FRONT DRIVE SHAFT - Removal").
4. Remove the front propshaft from the front gearcase (see "FRONT PROPSHAFT - Removal").
5. Remove LH wheel well panel and disconnect AWD wire harness. Cut plastic tie strap to free the connector end from the main harness to allow gearcase removal.
6. Remove the (4) bolts securing the bottom of the gearcase to the skid plate frame.

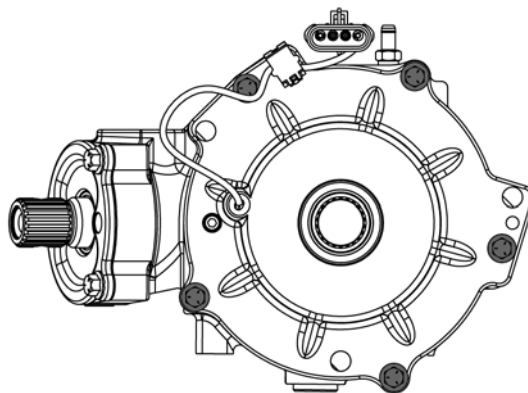


7. Remove the vent line from the gearcase.
8. Remove gearcase from front left-hand wheel well area and pull it out between upper and lower A-arms.



Disassembly / Inspection

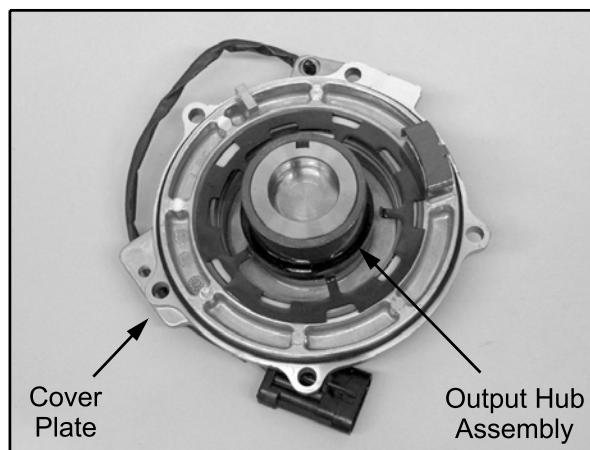
1. Drain and properly dispose of used lubricant. Remove any metal particles from the drain plug magnet.
2. Remove the (5) screws retaining the outer cover assembly.



3. Remove the output cover assembly from the gearcase.

NOTE: Thrust bushing located between the two output hubs is pressed into assembly.

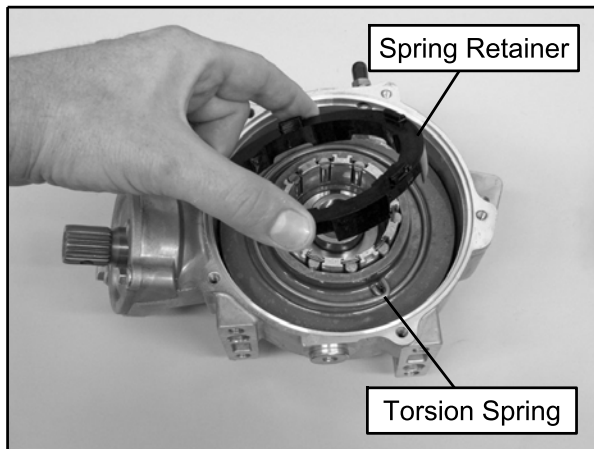
4. Remove the RH output hub assembly from the outer cover plate assembly.



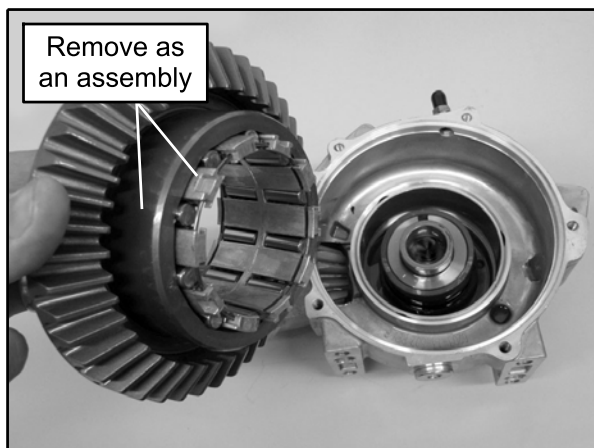
5. Inspect the bearing and contact surfaces of the output hub for signs of wear or damage. Replace component if found to be worn or damaged.
6. Remove and inspect the armature plate. Refer to "AWD Diagnosis" for detailed inspection process.

FINAL DRIVE

7. Remove the torsion spring retainer and torsion spring from the top of the ring gear.



8. Remove the clutch housing / ring gear and roll cage assembly from the gearcase housing.



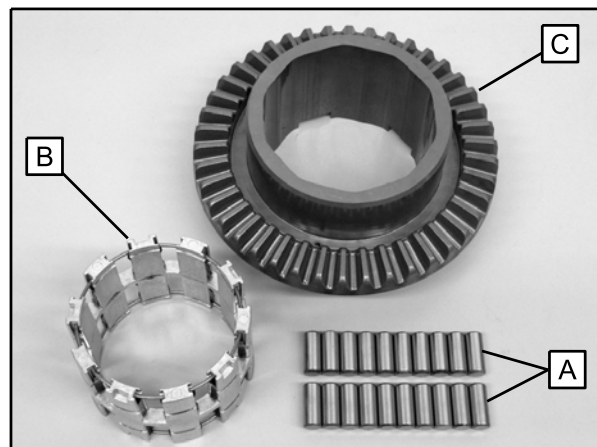
9. Remove LH output hub. Inspect the bearing and contact surfaces of the output hub for signs of wear or damage. Replace component if found to be worn or damaged.



10. Remove the roll cage assembly and rollers from the clutch housing. Use a shop towel to cover the housing in order to retain all the rollers.

NOTE: Rollers are spring loaded. Take care not to allow them to fall out or lose them upon removal of the roll cage.

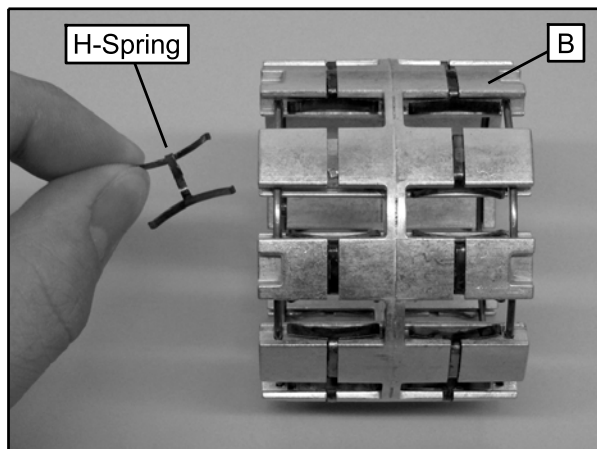
11. Thoroughly clean all parts and inspect the rollers (A) for nicks and scratches. The rollers must slide up and down and in and out freely within the roll cage (B) sliding surfaces and H-springs.



IMPORTANT: Refer to the “Electronic Parts Catalog” for individual part availability. Most parts are to be replaced as an assembly or as a complete kit.

12. Inspect clutch housing ring gear (C) for a consistent wear pattern. Inspect the ring gear for chipped, broken, or missing teeth.

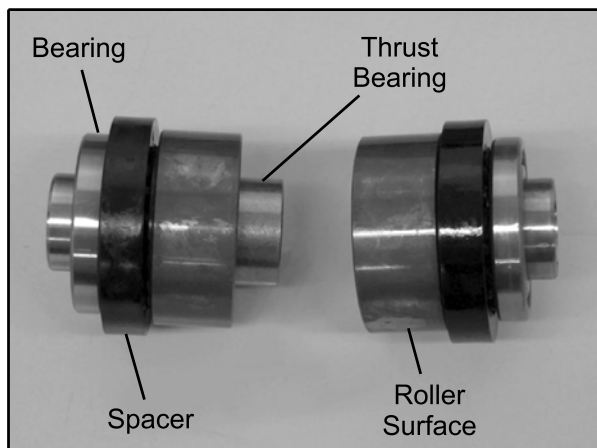
13. Inspect the roll cage assembly (B) sliding surfaces and H-springs. The sliding surfaces must be clean and free of nicks, burrs or scratches. If damaged, replace the roll cage assembly.



16. Inspect the armature plate for a consistent wear pattern. Uneven wear of the armature plate indicates a warped plate, which may cause intermittent operation.



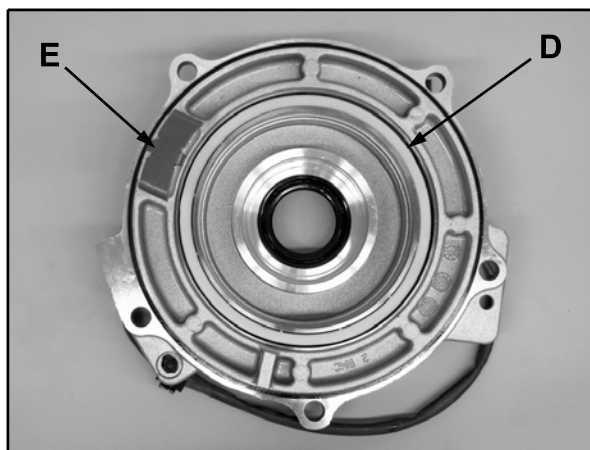
14. Inspect both output hub assemblies. Inspect the bearings and replace if needed.



15. Clean and inspect all remaining front gearcase components. Check each for excessive wear or damage.

NOTE: See "AWD DIAGNOSIS" in this section for more details.

17. Inspect the magnetic coil (D) in the outer cover plate assembly. Inspect the backlash pad (E) for excessive wear.

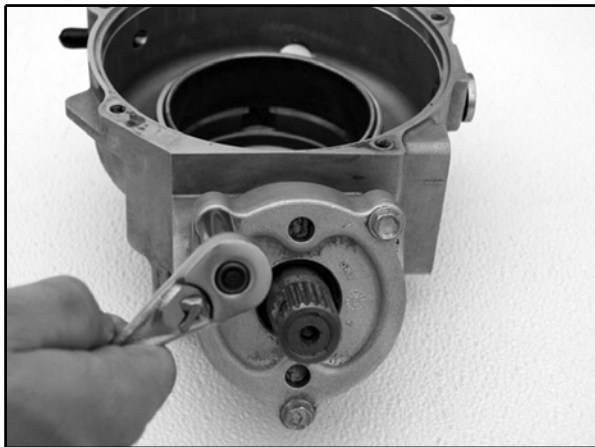


NOTE: See "AWD DIAGNOSIS" in this section for more details on the coil.

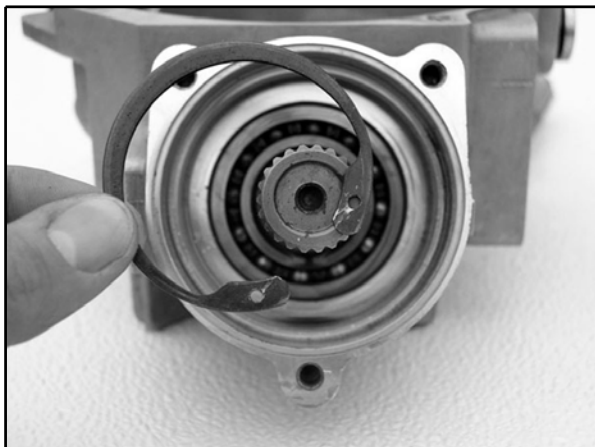
NOTE: The backlash for the centralized hilliard is set at the factory. No adjustment is required, unless the front cover needs to be replaced, or the back lash pad screw is removed. See the "Setting Ring Gear Backlash" procedure later in this chapter for details on backlash setting.

FINAL DRIVE

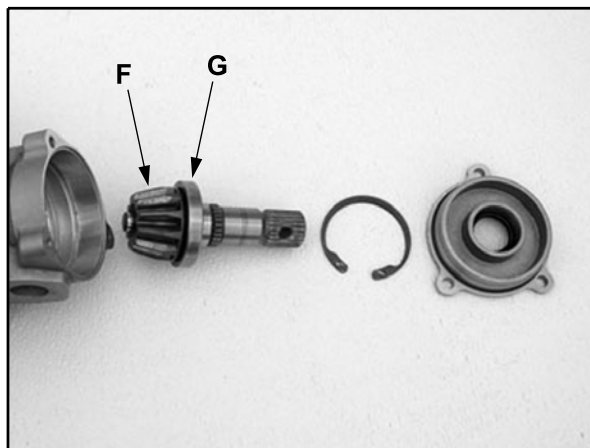
18. Remove the bolts retaining the input shaft cover and pinion gear assembly.



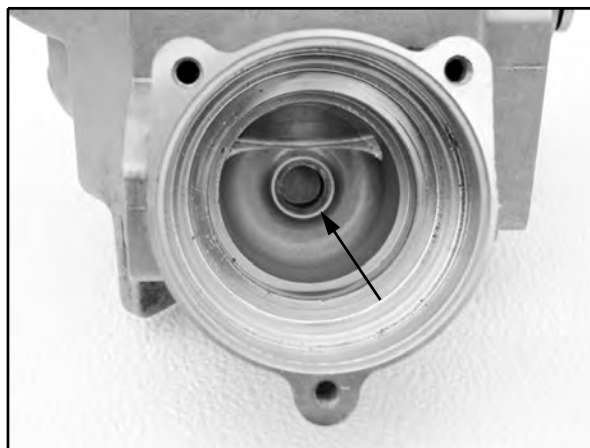
19. Remove the snap ring retaining the input shaft assembly.



20. Remove the input shaft assembly. Inspect the pinion gear (F) for chipped, broken, or missing teeth. Inspect the input shaft bearing (G) for signs of wear. Replace the input shaft cover O-ring prior to reassembly.



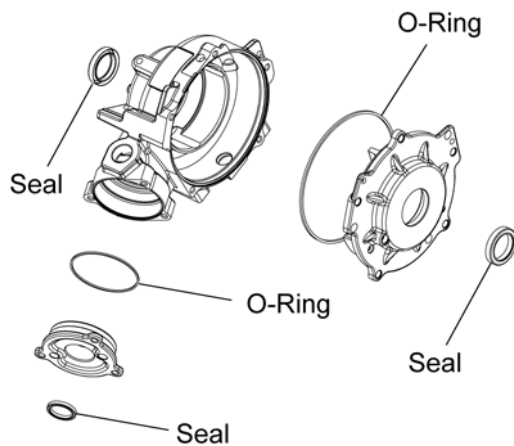
21. Inspect the input shaft bushing.



22. Thoroughly clean the gearcase components before beginning reassembly.

Assembly / Inspection

1. Replace all O-rings, seals and worn components.



2. Press the pinion shaft seal into the pinion cover, until the seal is flush with the sealing surface.
3. Inspect bearings on output and pinion shafts. To replace, press new bearing on to shaft.

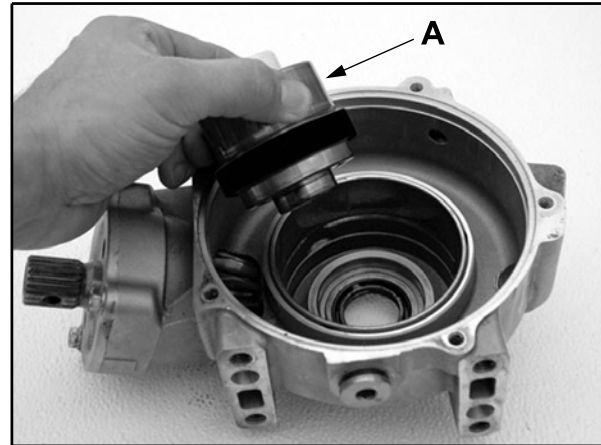
NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

4. Install input shaft, bearing, snap ring and input cover with a new O-ring. Torque screws to specification.

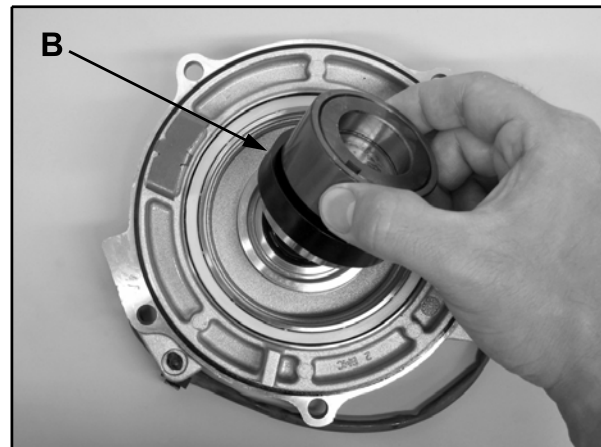


Input Cover Screws:
7-11 ft-lbs (10-15 Nm)

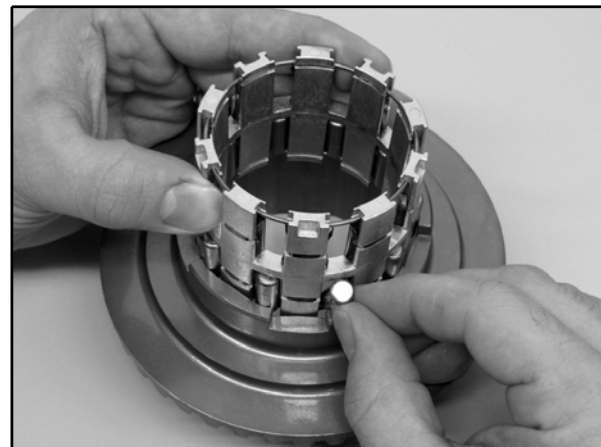
5. Install the LH output hub (A) into the gearcase housing. The output hub should spin freely.



6. Install the RH output hub (B) into the output cover. The output hub should spin freely.

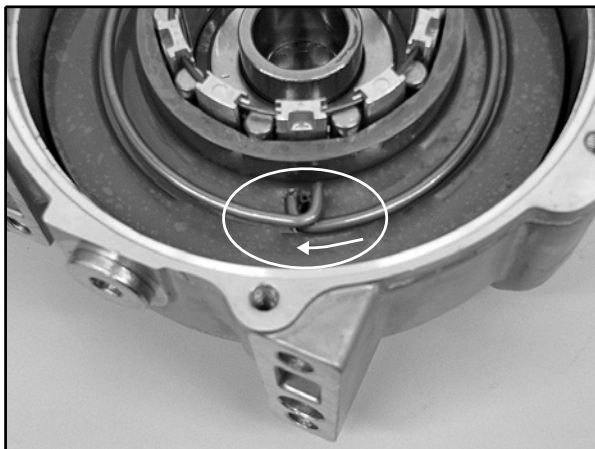


7. Carefully install the rollers into the roll cage assembly while installing the assembly into the clutch housing.

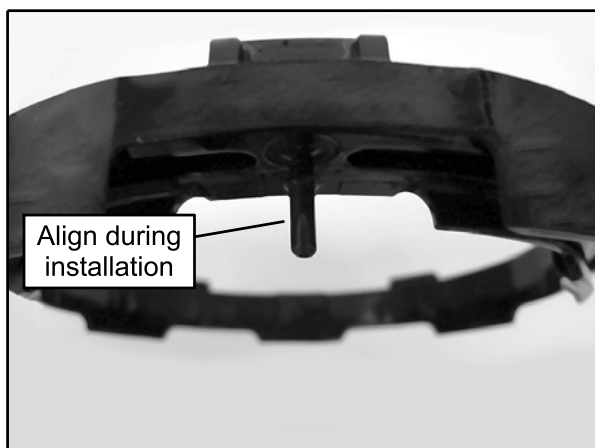


FINAL DRIVE

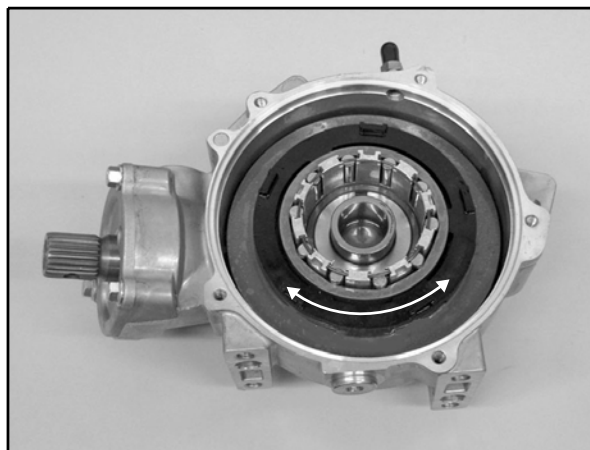
8. Carefully install the ring gear and roll cage assembly into the gearcase housing.
9. Install the torsion spring by wrapping each leg of the spring around the dowel pin on the ring gear.



10. Align spring retainer dowel pin with ring gear dowel pin and install the retainer on top of the torsion spring.



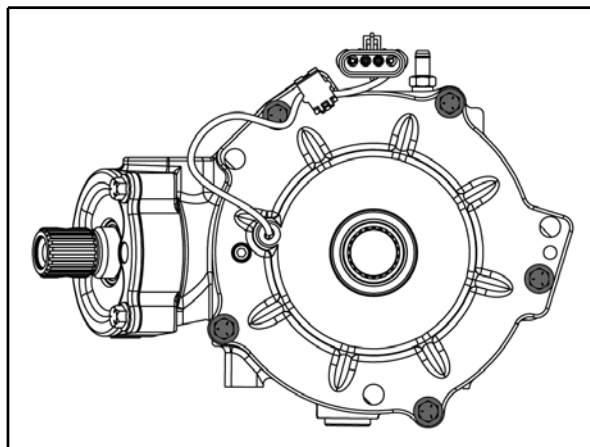
11. Check the action of the torsion spring to ensure proper installation of spring and retainer.



12. Install the armature plate on top of the roll cage / ring gear assembly. Be sure that the armature plate tabs are fully engaged into the roll cage assembly and is resting properly on the torsion spring retainer.
13. Install a new O-ring onto the cover plate assembly and install the cover plate onto the main gearcase.

NOTE: Verify the square O-ring is placed flat on the cover surface. If the O-ring is twisted, fluid leakage may occur.

14. Install the output cover screws and torque to specification.

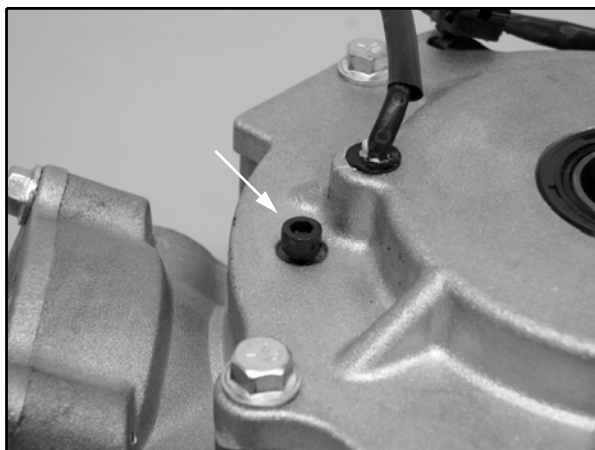


Output Cover Screws:
7-11 ft-lbs (10-15 Nm)

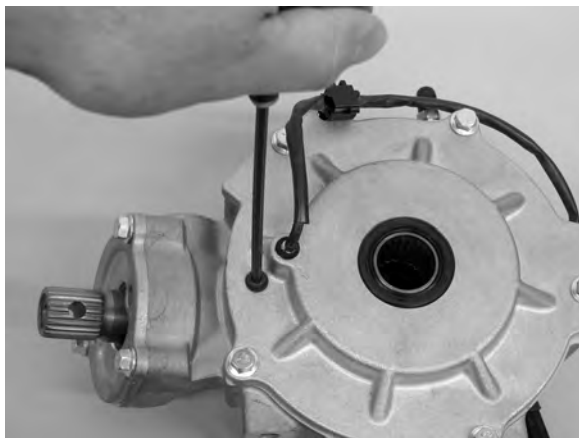
Setting Ring Gear Backlash

NOTE: Ring gear backlash is set at the factory. No adjustment is required, unless the front cover is replaced or the back lash pad screw is removed.

1. Lay the front gearcase on its side with the output cover facing up.
2. The backlash screw has locking agent that holds it into place. Use a heat gun to lightly heat up the locking agent on the screw.

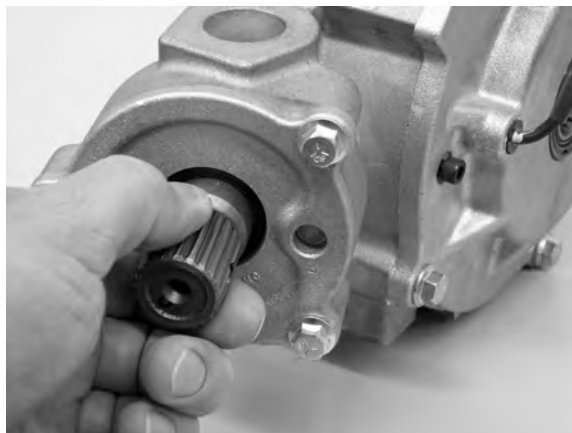


3. Using a 3/32 hex wrench, turn the back-lash screw out 3-4 turns. Re-apply Loctite 262™ onto the bottom screw threads.



4. Turn the screw in until it is lightly seated, then turn the screw out 1/4 turn.

5. Set the gearcase upright. Rotate the input shaft at least 4 times. This ensures the ring gear completes one full rotation.



6. If a tight spot is felt during rotation, loosen the backlash screw another 1/8 turn. Perform step 5 again. Repeat this procedure until the pinion shaft rotates smoothly 4 times (1 revolution of ring gear).

Gearcase Installation

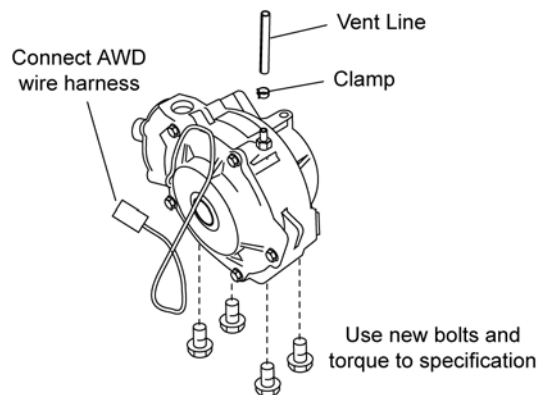
1. Install the gearcase through the front left-hand wheel well area between the upper and lower A-arms.



2. Install the vent line to the gearcase and ensure it's routed properly up top under the hood.
3. Install propshaft onto the front gearcase.

FINAL DRIVE

4. Install new mounting bolts and torque to specification.



Gearcase Mounting Bolts:
40 ft-lbs (54 Nm)

5. Drive a new roll pin into the front propshaft (see "FRONT PROPSHAFT - Installation").
6. Install the drive shafts into the front gearcase (see "FRONT DRIVE SHAFT - Installation").
7. Connect the AWD harness and tie the harness to the main harness using a plastic tie strap.
8. Reinstall the LH wheel well panel.
9. Add the proper lubricant to the front gearcase. Check drain plug for proper torque. Refer to Chapter 2 for fluid fill and change information.

MID / REAR BEARING CARRIER

Inspection

1. Support the machine securely with rear wheels elevated.



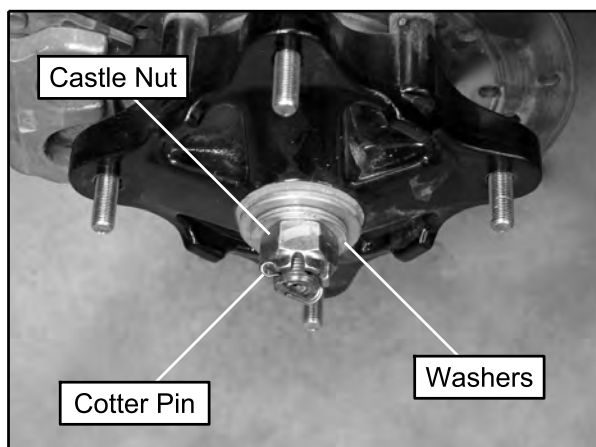
CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

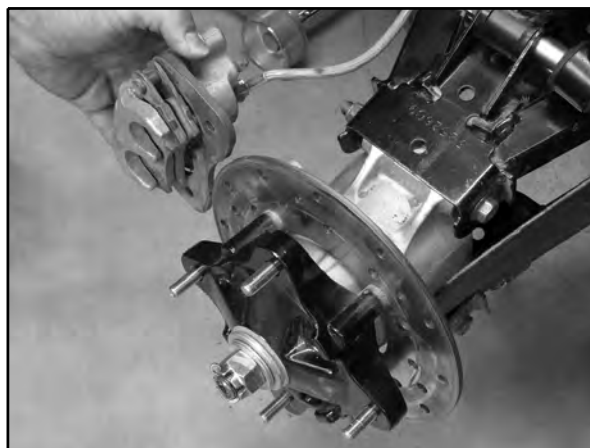
2. Check the bearings for side play. Grasp the top and bottom of the wheel or wheel hub and check for movement.
3. If movement is detected, inspect wheel hub, castle nut torque and bearing condition. The tire should rotate smoothly without binding or rough spots. Correct as necessary.

Removal

1. Elevate the rear end of the vehicle and safely support the vehicle under the main frame area.
2. Remove wheel nuts, washers and wheel.
3. Remove the cotter pin, castle nut and washers.



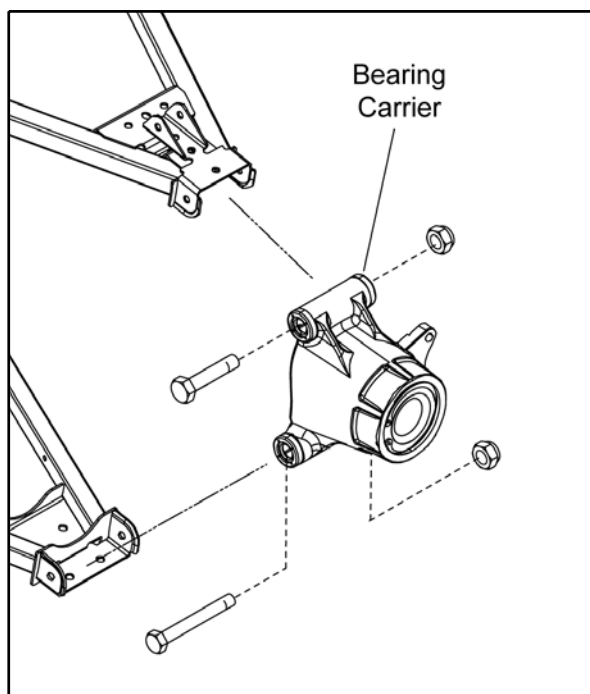
4. Remove the two brake caliper mounting bolts and remove the caliper from the bearing carrier.



CAUTION

Do not hang the caliper by the brake line. Use mechanics wire to hang the caliper to prevent possible damage to the brake line.

5. Slide the wheel hub out from the bearing carrier and drive shaft.
6. Remove the upper and lower A-arm fasteners from the bearing carrier.

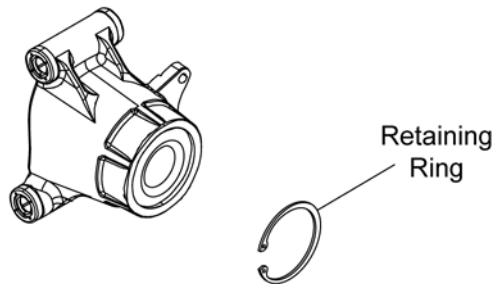


FINAL DRIVE

7. Remove the bearing carrier. Inspect the bearing again for smoothness and side to side movement, replace as needed.

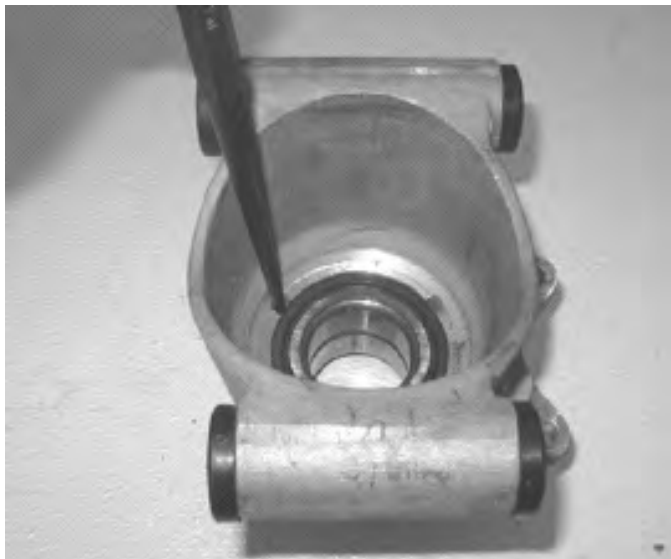
Disassembly

1. Remove the retaining ring from the bearing carrier.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.

NOTE: Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.



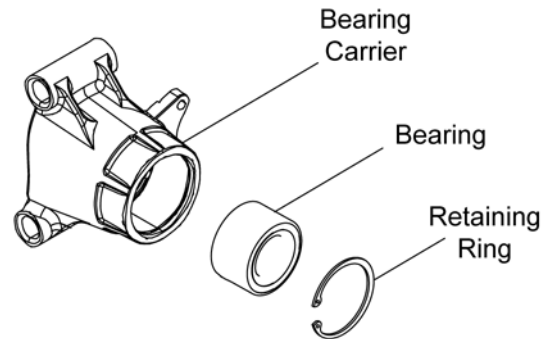
3. Inspect the bearing.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

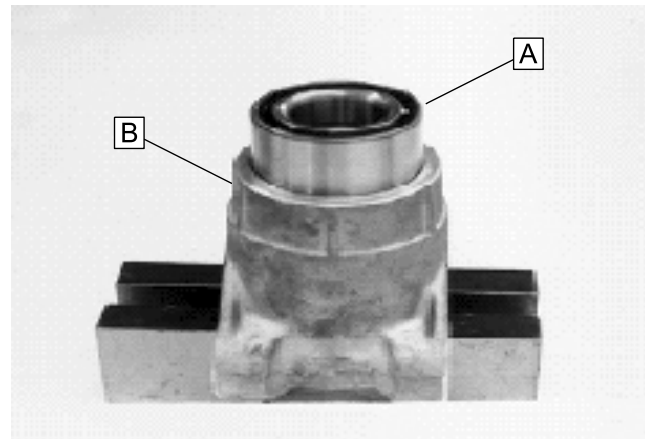
4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.
5. Replace the bearing carrier bushings if worn or damaged.

Assembly

1. Thoroughly clean the bearing carrier housing and prepare the components for assembly.



2. Support the bottom of the bearing carrier housing. Start the bearing (A) in the bearing carrier housing (B). Use an arbor press to install the bearing.



3. Press the bearing into place until the outer bearing race bottoms in housing.

 CAUTION

Use an arbor and press only on the outer race, otherwise bearing damage may occur.

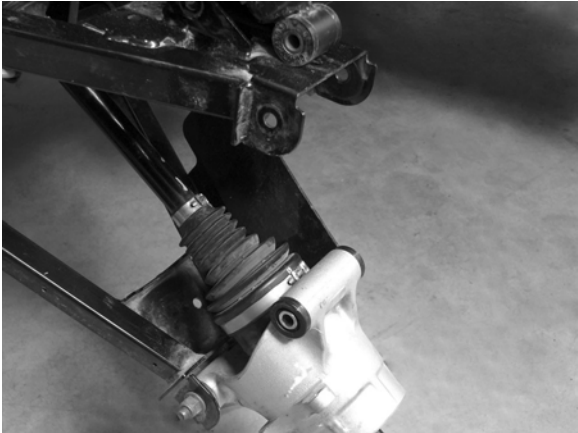


4. Install a new retaining ring into bearing carrier groove.

Installation

1. Place the bearing carrier over the drive shaft.
2. Align the bottom of the bearing carrier with the lower A-arm. If previously removed, install new lower A-arm bushings. Install the lower bearing carrier fastener.

3. With the drive shaft placed in the bearing carrier, align the top of the bearing carrier with the upper A-arm. If previously removed, install new upper A-arm bushings. Install the upper bearing carrier fastener.



NOTE: The lower shock bolt may need to be removed to allow the upper A-arm to move freely.

4. Torque the upper and lower bearing carrier fasteners to specification.



Bearing Carrier Fasteners:
30 ft-lbs (41 Nm)

5. Install the wheel hub assembly onto the drive shaft.
6. Install the washers (domed side out) and the wheel hub castle nut.
7. Install the wheel, washers and wheel nuts. Torque wheel nuts to specification.



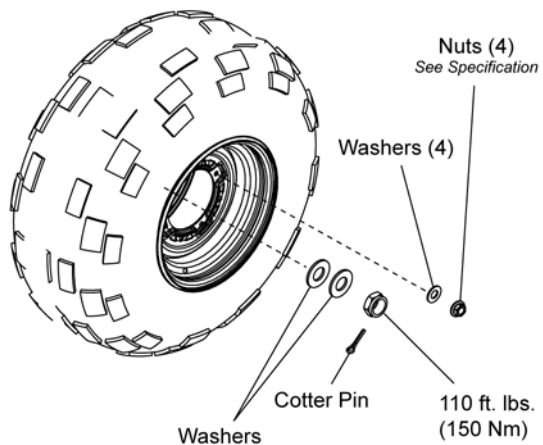
Wheel Nuts:
Steel Wheels: **35 ft-lbs (47 Nm)**
Aluminum Wheels: **30 ft-lbs + 90° (1/4 turn)**

FINAL DRIVE

8. Carefully lower the vehicle. Torque the wheel hub castle nut to specification. Install a new cotter key.



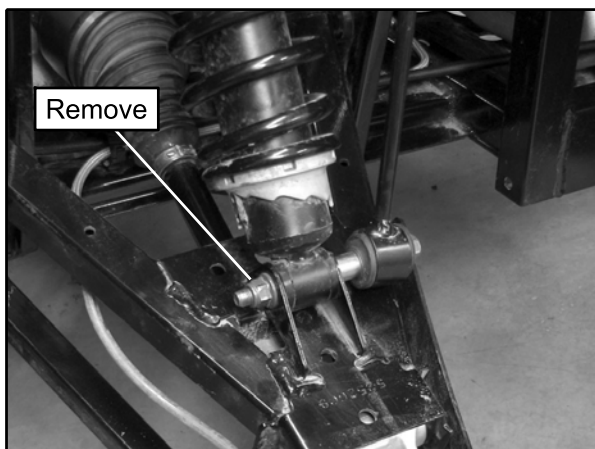
Mid / Rear Hub Castle Nut:
110 ft-lbs (150 Nm)



MID / REAR DRIVE SHAFT

Removal

1. Perform the "MID / REAR BEARING CARRIER - Removal" procedure, steps 1-5.
2. Remove lower shock fastener to free the upper A-arm.



3. Remove the upper bearing carrier fastener and separate the bearing carrier from the upper A-arm.



4. Slide the drive shaft out by pulling the bearing carrier outward and tipping it down to remove the shaft.



5. Remove the drive shaft using short, sharp jerks to free the circlip.

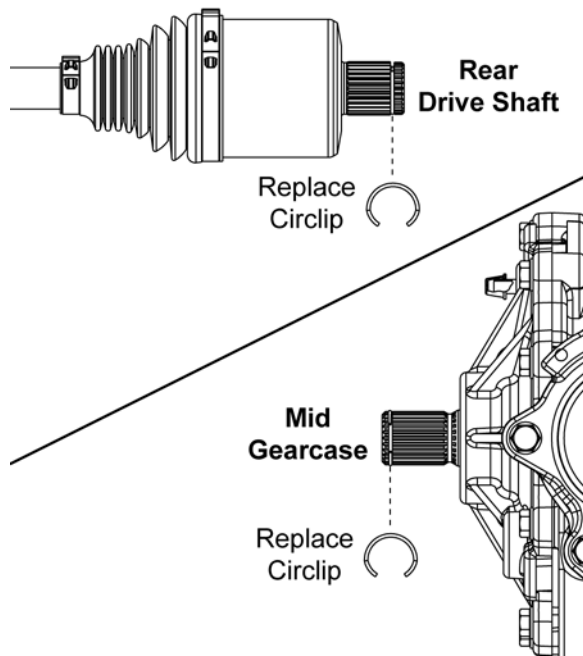


6. Refer to the "DRIVE SHAFT SERVICE" section if repairing the drive shaft.

FINAL DRIVE

Installation

1. Install a new circlip on the end of the drive shaft or mid gearcase output shaft (6X6). Apply an anti-seize compound to the splines.

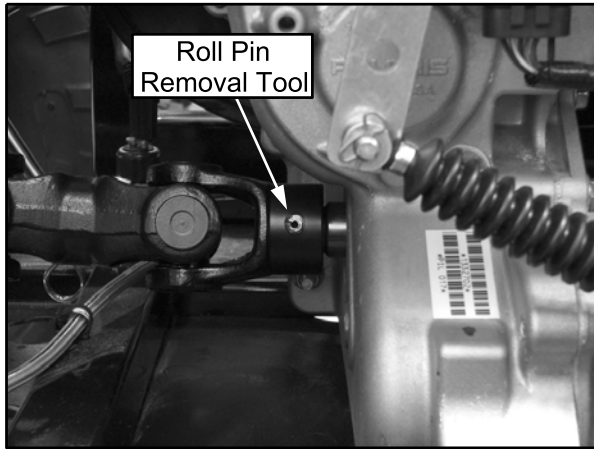


2. Align splines of the drive shaft with the transmission (4x4), mid gearcase or rear gearcase (6X6) and reinstall the drive shaft. Use a rubber mallet to tap on the outboard end of the drive shaft if necessary.
3. Install the drive shaft into the bearing carrier.
4. Perform the "MID / REAR BEARING CARRIER - Installation" procedure to reassemble the vehicle.

MID PROPSHAFT (6X6)

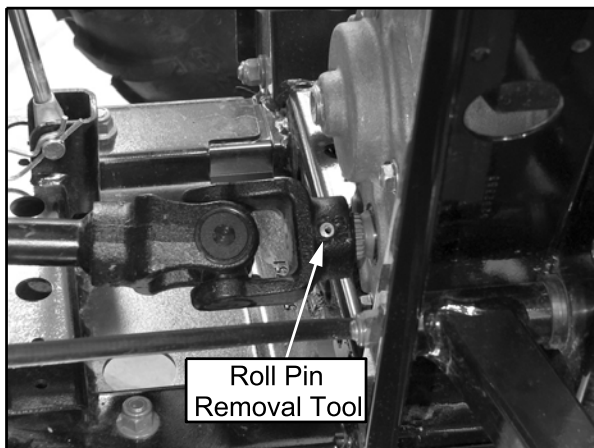
Removal

1. Drive the roll pin from the mid propshaft yoke located at the transmission.

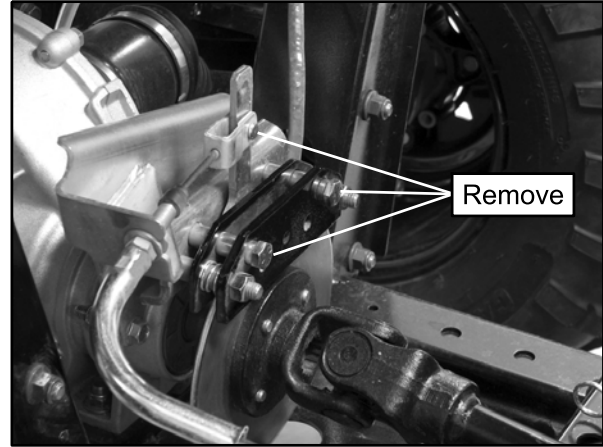


Roll Pin Removal Tool: PN 2872608

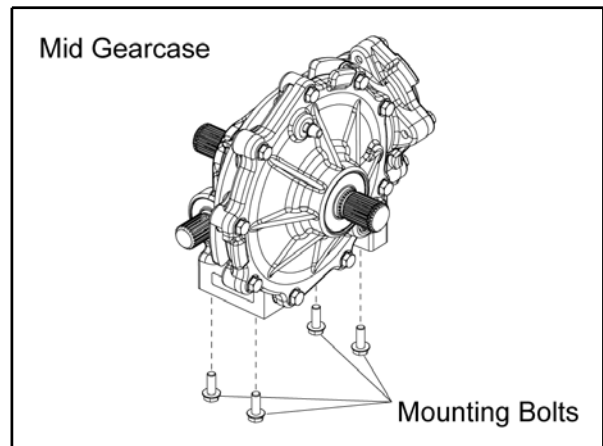
2. Drive the roll pin from the rear propshaft yoke located at the mid gearcase.



3. Remove parking brake caliper assembly from caliper mount bracket to allow the rear propshaft to slide back on the rear gearcase input shaft during removal.

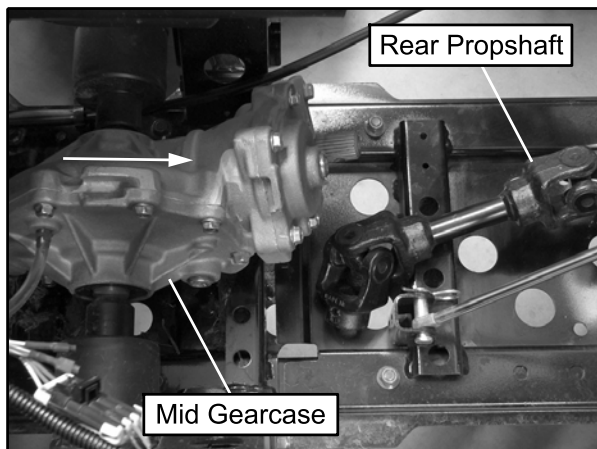


4. Slide rear propshaft back on rear gearcase input shaft and remove the propshaft from the mid gearcase.
5. Loosen (4) bolts retaining mid gearcase to the frame.



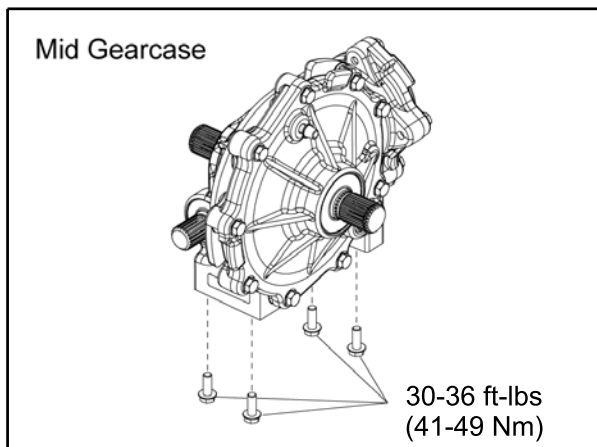
FINAL DRIVE

- Slide the mid gearcase forward. Lift up on the gearcase to clear the frame and slide the gearcase towards the rear of the vehicle to remove the mid propshaft from the transmission.



Installation

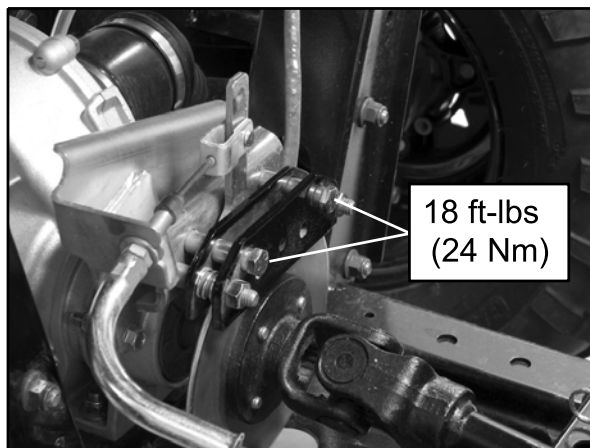
- Install the mid propshaft onto the transmission output shaft and align the roll pin holes. Drive a NEW roll pin into the propshaft yoke.
- Slide the mid gearcase forward in the frame. Install the mid propshaft onto the mid gearcase input shaft.
- Position the mid gearcase and install the (4) mounting bolts. Torque the bolts to specification.



Mid Gearcase - Mounting Bolts:
30-36 ft-lbs (41-49 Nm)

- Install the rear propshaft onto the mid gearcase and drive a NEW roll pin into the propshaft yoke.

- Install parking brake caliper assembly. Tighten the mounting bolts and torque to specification.

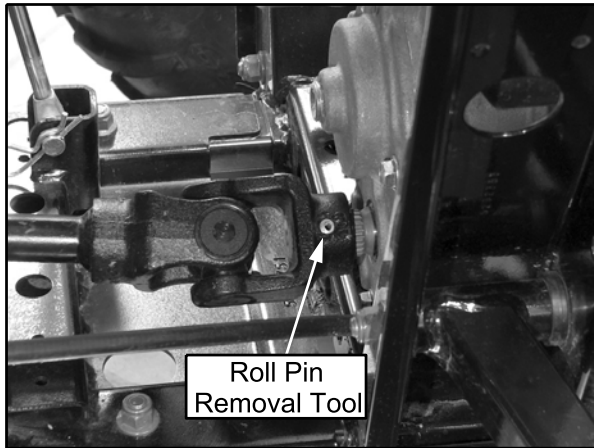


Parking Brake Caliper - Mounting Bolts:
18 ft-lbs (24 Nm)

MID GEARCASE (6X6)

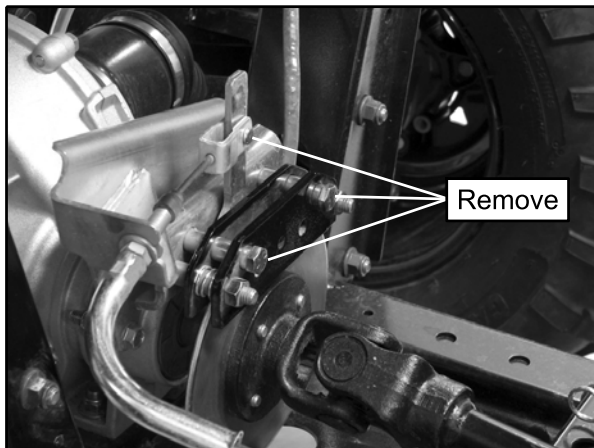
Gearcase Removal

1. Drive the roll pin from the rear propshaft yoke located at the mid gearcase.



Roll Pin Removal Tool: PN 2872608

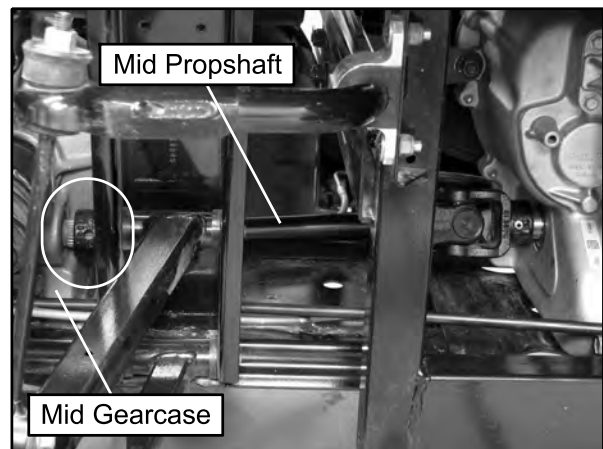
2. Remove the parking brake caliper assembly from the caliper mount bracket to allow the rear propshaft to slide back on the rear gearcase input shaft during removal.



3. Slide the rear propshaft back on the rear gearcase input shaft and remove the propshaft from the mid gearcase.
4. Perform the "MID / REAR DRIVE SHAFT - Removal" procedure to remove the drive shafts from the mid gearcase.



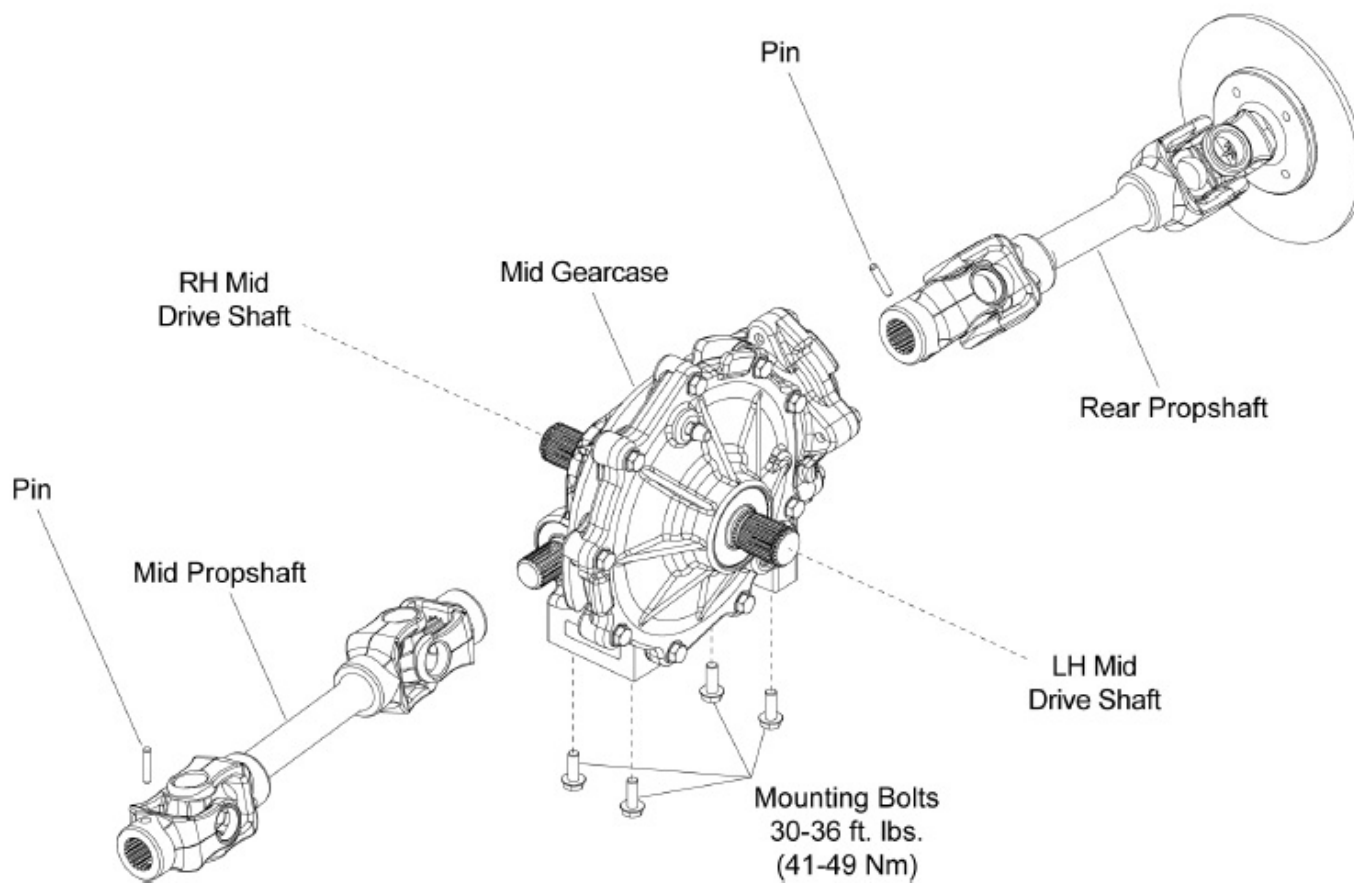
5. Remove the (4) bolts retaining the mid gearcase to the frame.
6. Slide the mid gearcase forward. Lift up on the gearcase to clear the frame and slide the gearcase rearward to remove the mid propshaft from the mid gearcase.



7. Lift the mid gearcase out of the frame.

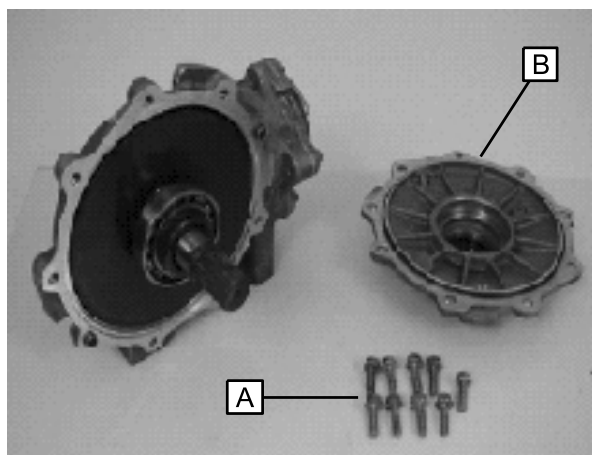
7

FINAL DRIVE



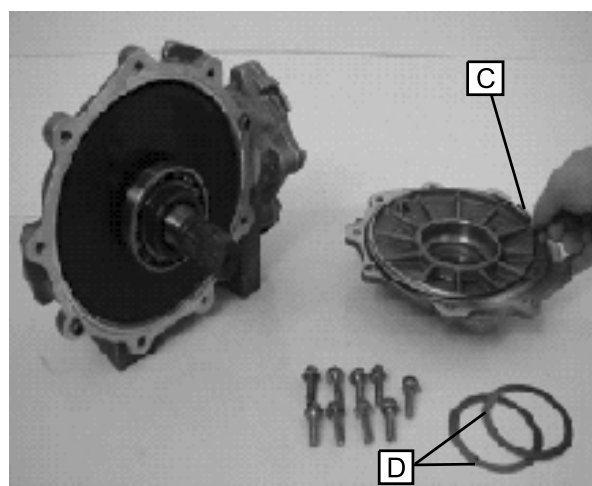
Gearcase Disassembly

1. Drain the oil from the mid drive gearcase. Properly dispose of the oil.
2. Remove the output cover bolts (A) and the output cover (B).

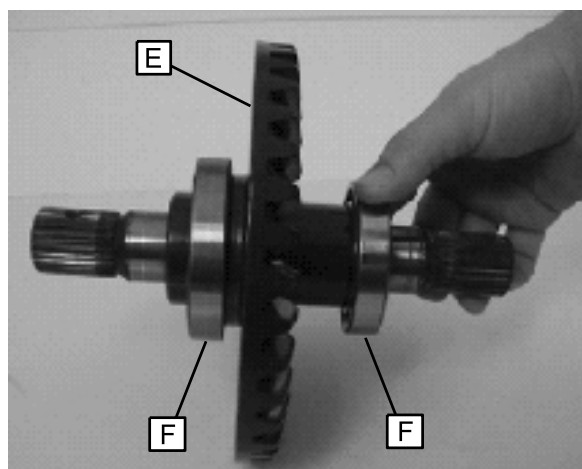


3. Remove the O-ring (C) and two shims (D) from the output cover.

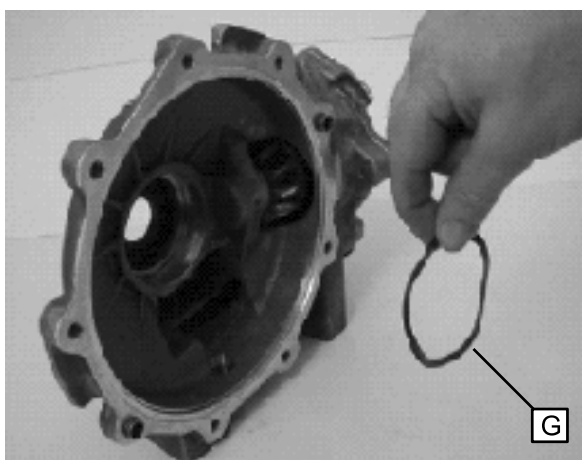
NOTE: The two shims are different thicknesses. Be sure to note the placement of the shims as they are removed from the output cover for later installation.



4. Remove the output shaft and ring gear assembly (E) from the gearcase. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Inspect and spin the bearings (F), the bearings should rotate smoothly.

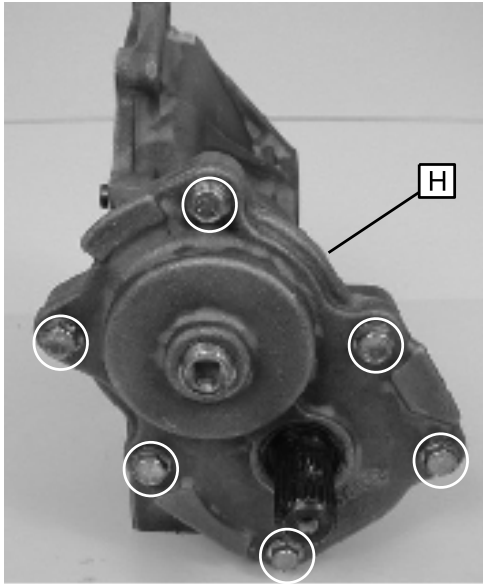


5. Remove the wave spring (G) from the gearcase assembly.

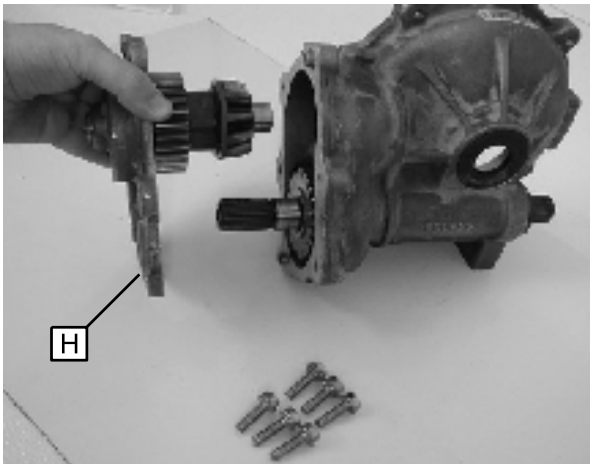


FINAL DRIVE

6. Remove the bolts from the input cover (H).

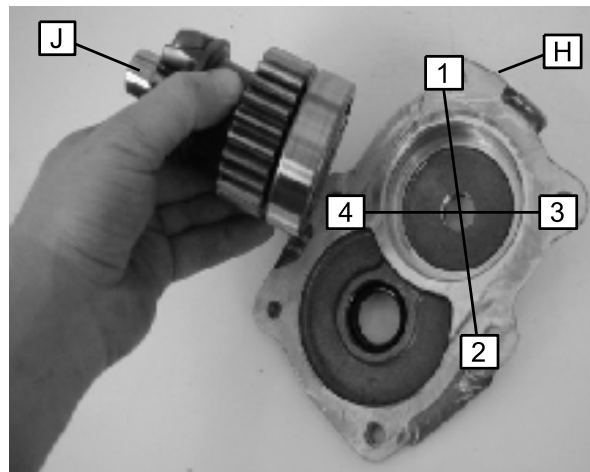


7. Remove the input cover (H) and pinion gear assembly from the gearcase.

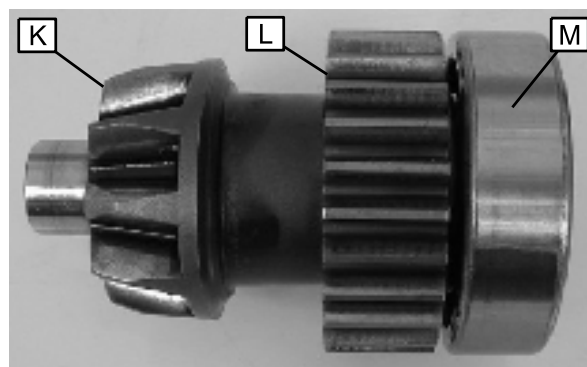


8. Remove the pinion gear assembly (J) from the front cover (H). If the pinion gear does not come loose from the front cover, use the following steps to aid in removal:

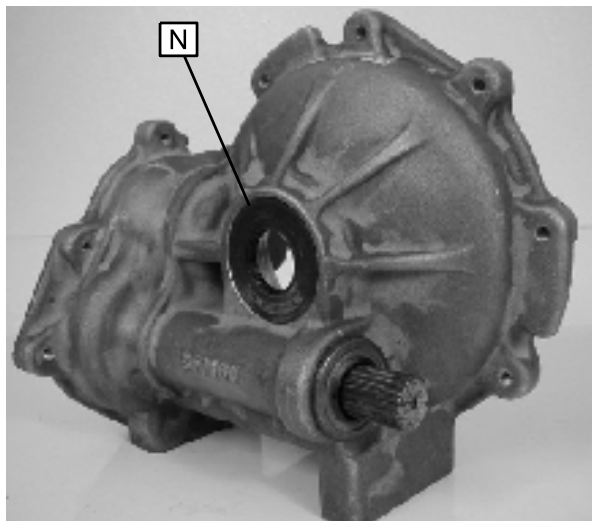
- Hold the pinion gear assembly.
- Use a rubber mallet to lightly tap around the bearing cup of the front cover.
- Tap the front cover in an X pattern (follow the pattern in the photo), until the pinion gear assembly comes loose.



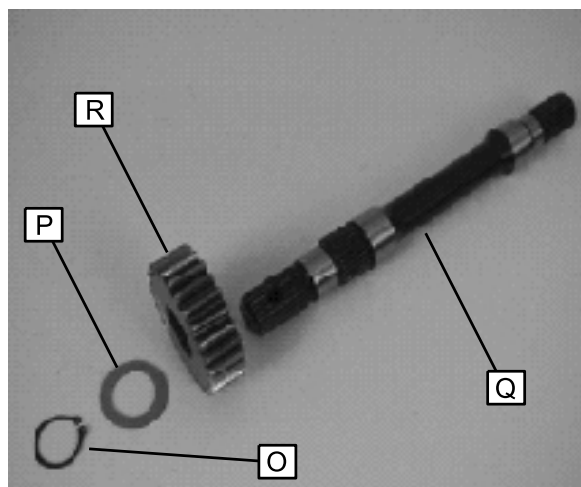
9. Inspect the pinion gear (K) and 26T output gear (L) for nicks or uneven wear. Inspect the bearing (M), the bearing should spin smoothly. Replace the parts as needed.



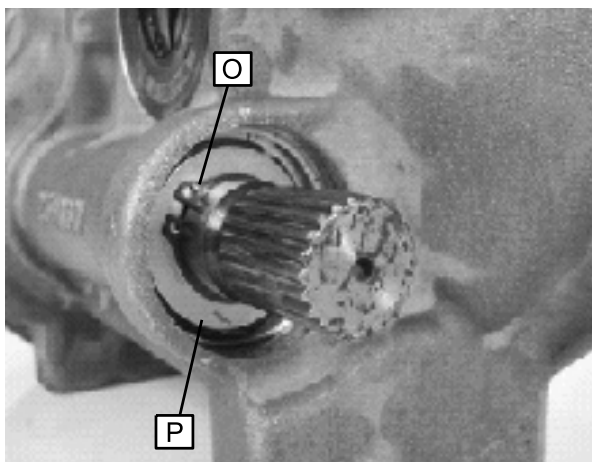
10. Remove the rear output seal (N).



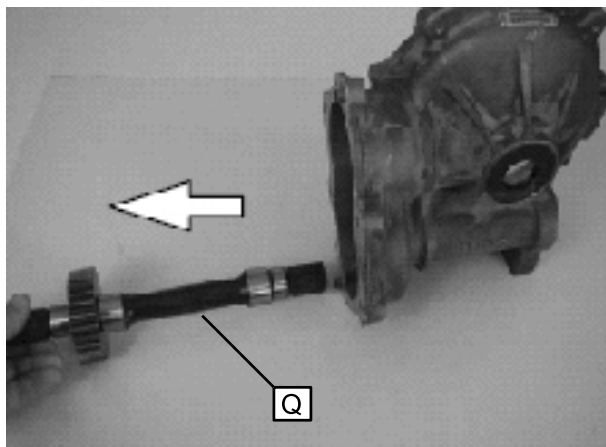
13. Remove the retaining ring (O), shim (P), and input gear (R) from the output shaft (Q). Inspect the input gear for abnormal wear, broken, or chipped teeth.



11. Remove the retaining ring (O) and shim (P) from the rear output thru shaft.

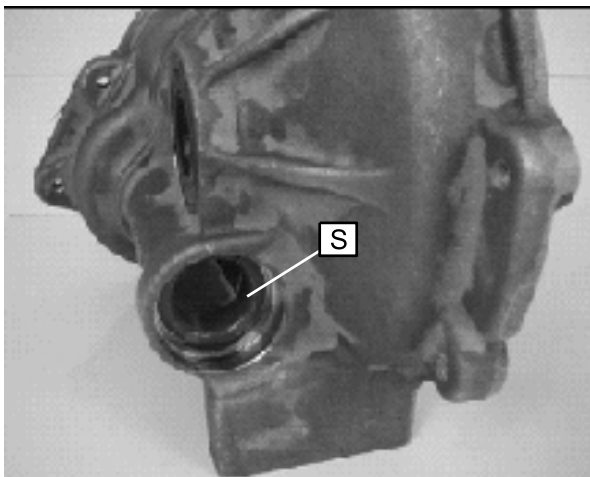
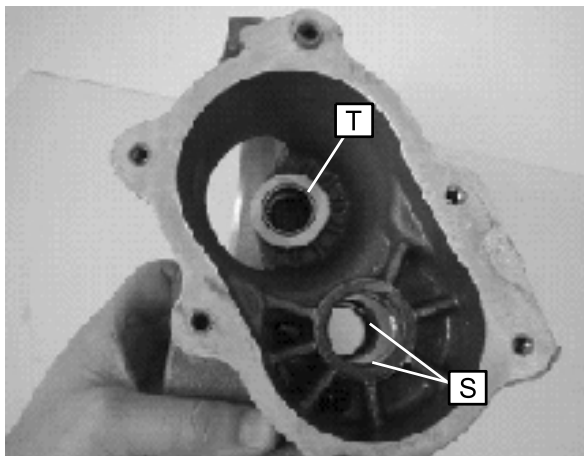


12. Carefully pull the output thru shaft (Q) through the gearcase.

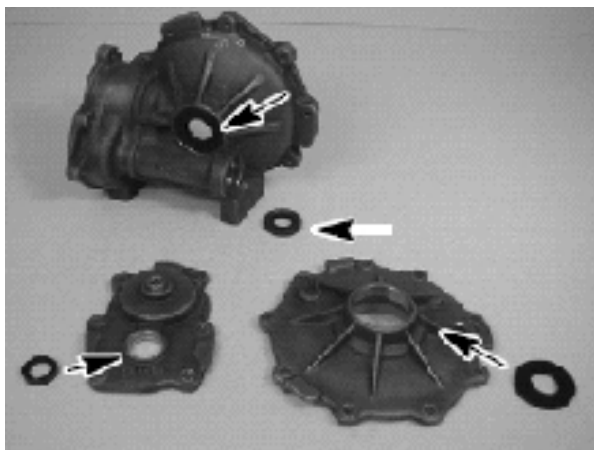


FINAL DRIVE

14. Inspect the two flange bearings (S) inside the gearcase. Inspect the pinion shaft bushing (T) for wear inside the gearcase.

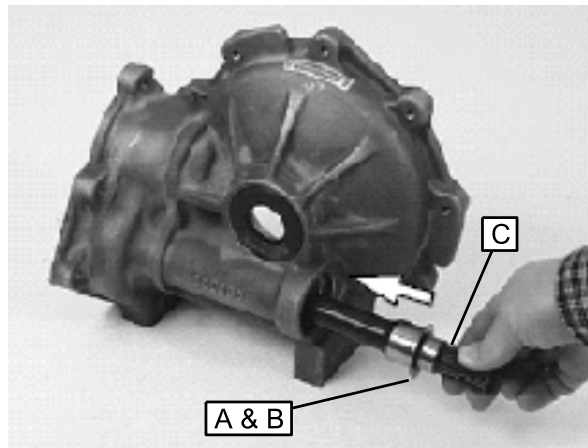


15. Replace all O-ring, seals, and worn components. Replace the seals as shown in the photo.

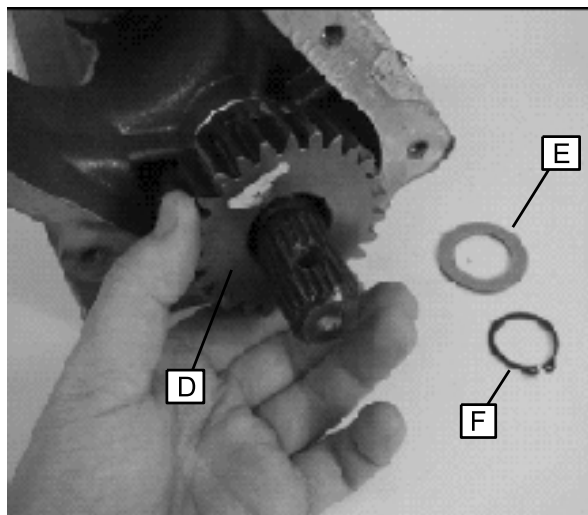


Gearcase Assembly

1. Install the shim (A) and a new retaining ring (B) onto the output end of the output shaft (C). Install the output thru shaft into the gearcase.

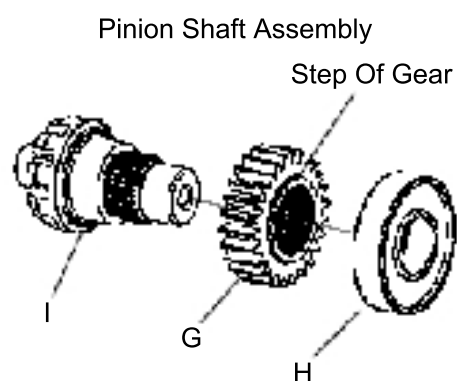


2. Install the 26T input gear (D), shim (E), and a new retaining ring (F) onto the output shaft.



3. Assemble the pinion shaft assembly (if previously disassembled). Install the 26T gear (G) and bearing (H) onto the pinion shaft (I).

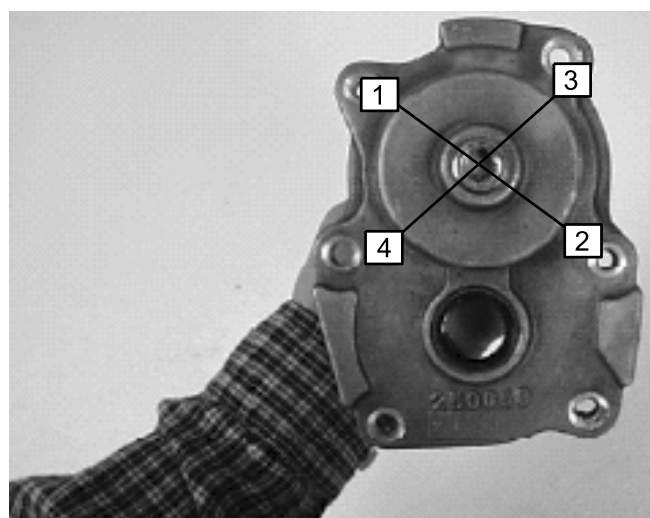
NOTE: When replacing the 26T output, be sure the step of the gear is facing towards the bearing (see below).



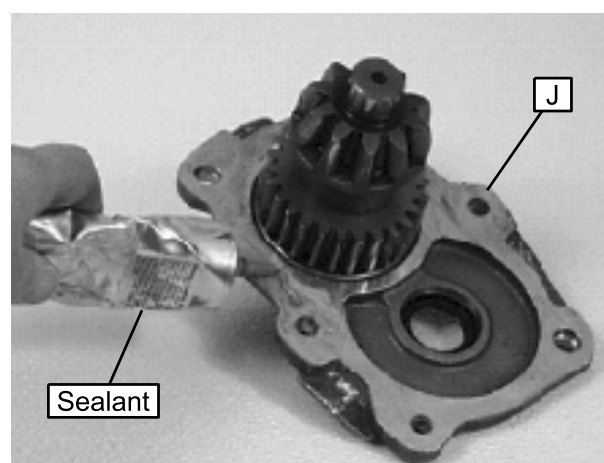
4. Install the pinion shaft assembly into the input cover.

NOTE: Alignment of the pinion shaft bearing into the input cover maybe be difficult. If needed, use the following steps to aid in installation:

- Hold the pinion gear assembly.
- Use a rubber mallet to lightly tap on the front of the input cover, around the bearing cup.
- Tap the front cover in an X pattern (follow the pattern in the photo), until the pinion gear assembly is fully seated.

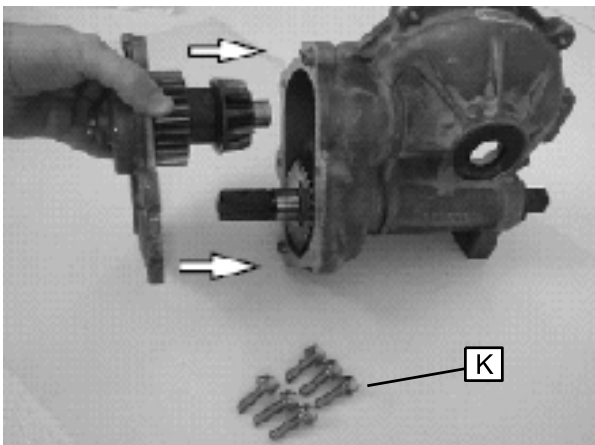


5. Apply Polaris Crankcase Sealant (PN 2871557) to the inside surface of the input cover (J).

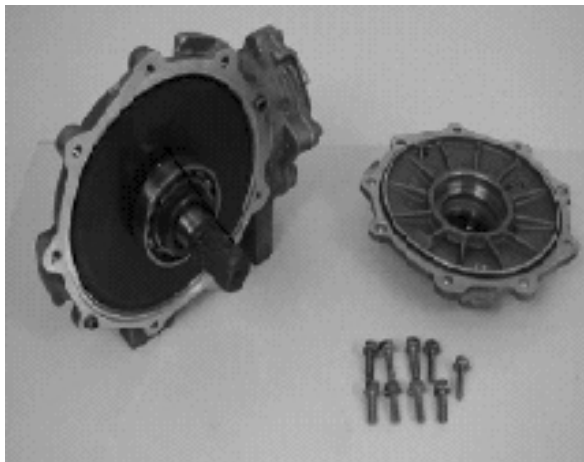


FINAL DRIVE

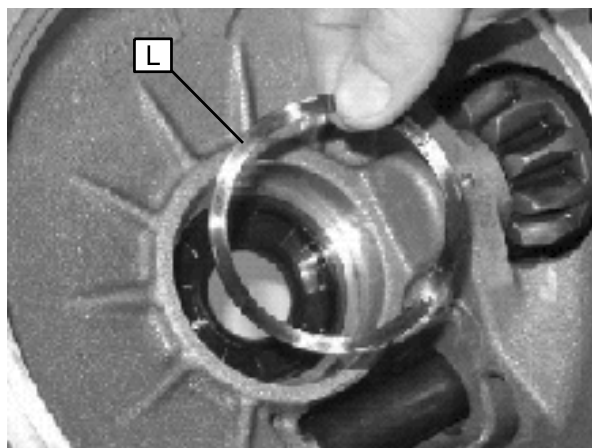
6. Install the pinion shaft assembly and input cover onto the gearcase. Install the input cover bolts (K). Torque the bolts to **18 - 23 ft-lbs (24 - 31 Nm)**.



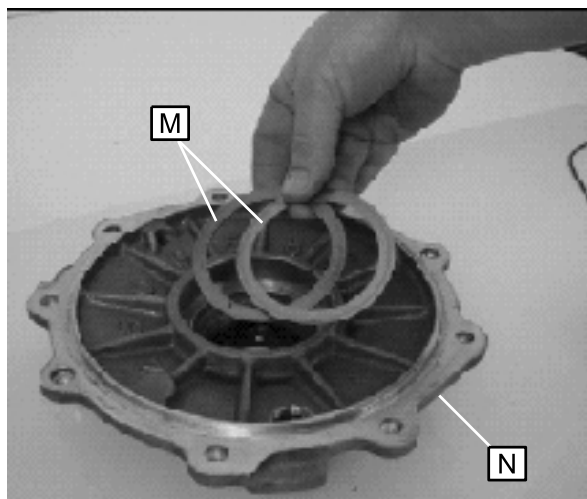
8. Install the output shaft and ring gear into the gearcase. Be sure the 10T input pinion gear and the output pinion gear mesh smoothly.



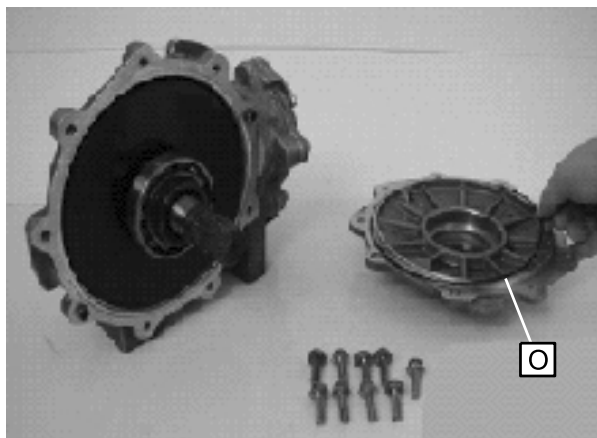
7. Install the wave spring (L) into the gearcase assembly. Be sure the wave spring is fully seated into the bearing cup of the gearcase.



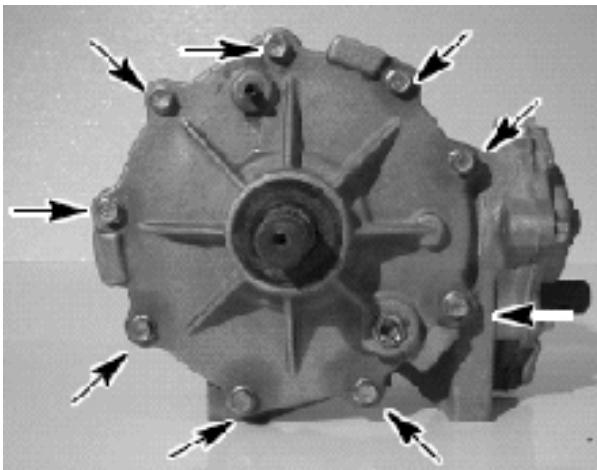
9. Install the shims (M) into the output cover (N). Install the shims in the order that they were removed during the disassembly process.



10. Install a new O-ring (O) onto the output cover.

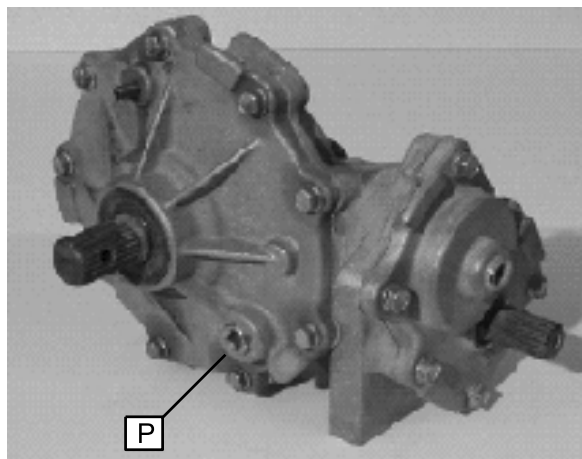


11. Carefully install the output cover. Install the output cover bolts and Torque the bolts to specification.



Output Cover Bolt:
18 - 23 ft-lbs (24 - 31 Nm)

12. Remove fill plug (P) and fill mid gearcase with 6.75 oz. (200 ml) of Polaris ATV Angle Drive Fluid (PN 2876160). Torque the fill plug to **14 ft-lbs (19 Nm)**.



Mid Gearcase Specifications:

Capacity: 6.75 oz. (200 ml)

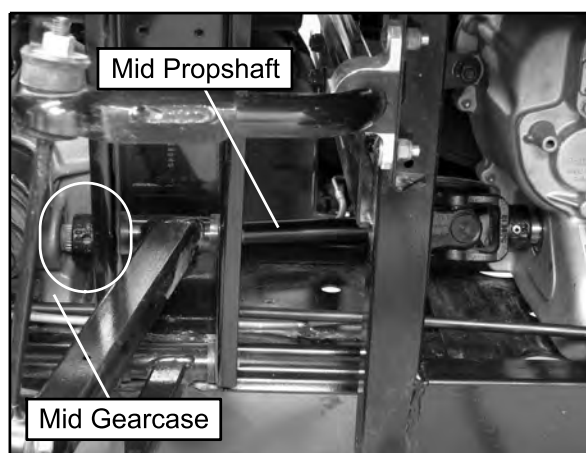
Specified Lubricant: ATV Angle Drive Fluid (PN 2876160)

Fill Plug Torque: 14 ft-lbs (19 Nm)

7

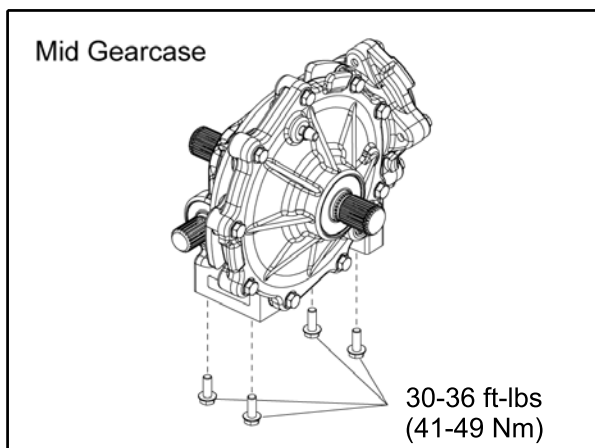
Gearcase Installation

1. Install the mid gearcase into the frame.
2. Slide the mid gearcase forward and install the mid propshaft onto the mid gearcase input shaft.



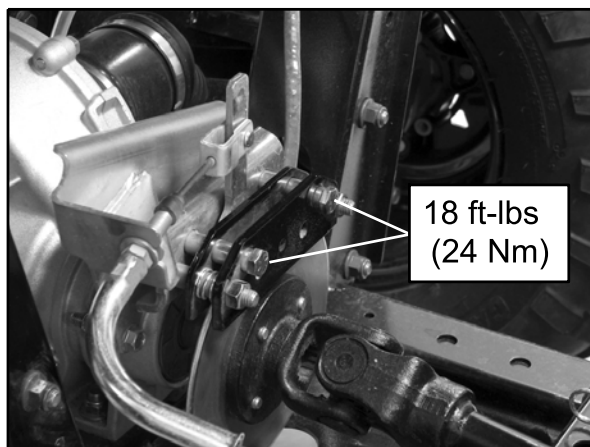
FINAL DRIVE

3. Position the mid gearcase and install the (4) mounting bolts. Torque the bolts to specification.
6. Install the parking brake caliper assembly. Tighten the two mounting bolts in increments and torque to specification.



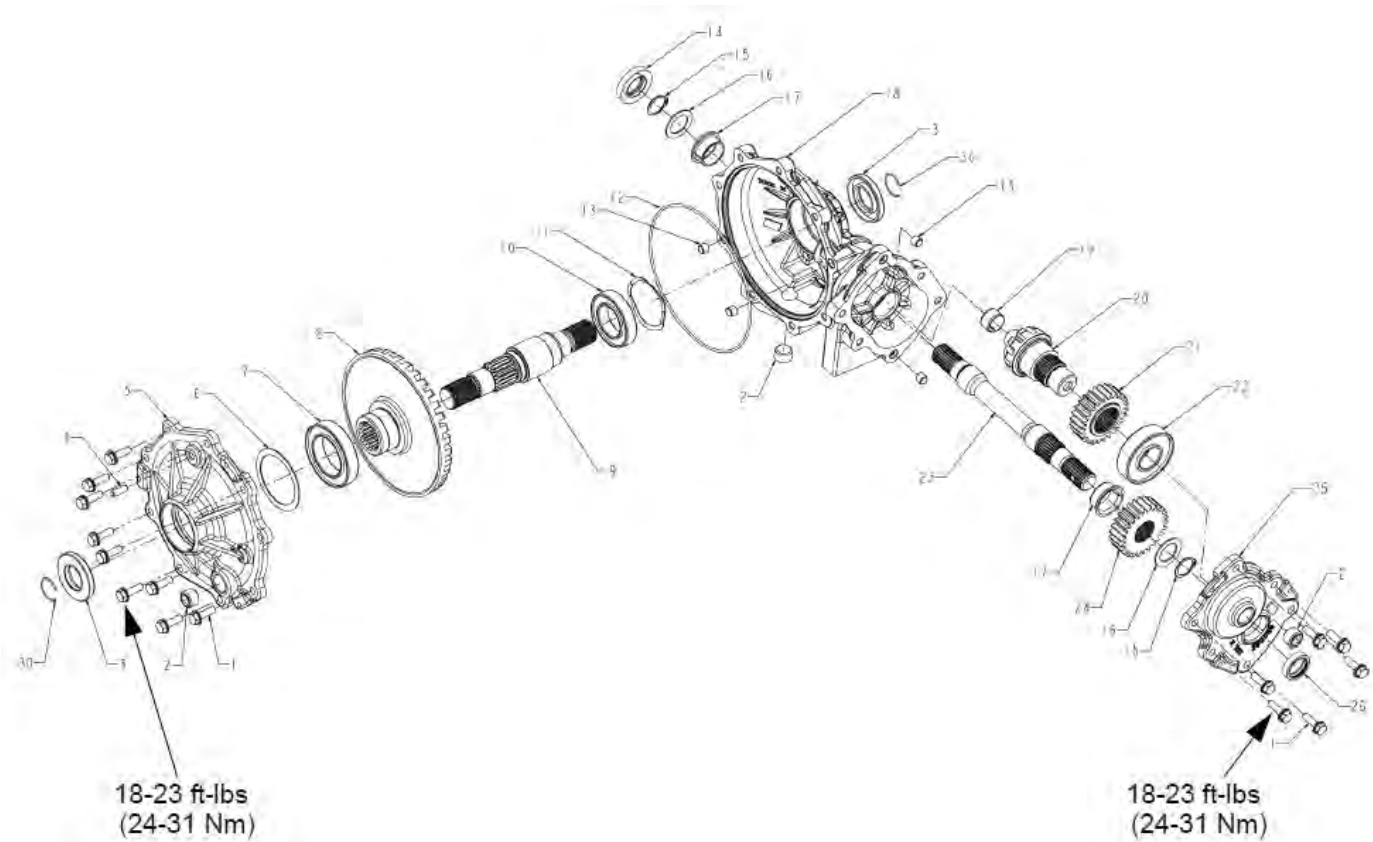
Mid Gearcase - Mounting Bolts:
30-36 ft-lbs (41-49 Nm)

4. Perform the "MID / REAR DRIVE SHAFT - Installation" procedure to reinstall the mid drive shafts.
5. Install the rear propshaft onto the mid gearcase and drive a NEW roll pin into the propshaft yoke.



Parking Brake Caliper - Mounting Bolts:
18 ft-lbs (24 Nm)

Mid Gearcase Exploded View



7

REF#	DESCRIPTION	QTY	REF#	DESCRIPTION	QTY
1	Screw (5/16-18 x 1.0)	15	16	Washer, Thrust	2
2	Plug, Square Socket	3	17	Bearing, Plain Flanged	2
3	Seal, Dual Lip	2	18	Gearcase	1
4	Tube, Vent 1/4" Hose	1	19	Bushing	1
5	Cover, Output	1	20	Pinion, 10T	1
6	Shim	1	21	Gear, 26T Output	1
7	Bearing, Ball	1	22	Bearing, Ball	1
8	Gear, Ring 37T	1	23	Shaft, Output Thru	1
9	Shaft, Output	1	24	Gear, 26T Input	1
10	Bearing, Ball	1	25	Cover, Input	1
11	Spring, Wave	1	26	Seal, Triple Lip	1
12	O-Ring	1	27	N/A	-
13	Pipe, Knock	4	28	N/A	-
14	Seal, Triple Lip	1	29	N/A	-
15	Ring, Retaining	2	30	Ring, Hog	2

FINAL DRIVE

DRIVE SHAFT SERVICE

Drive Shaft / CV Joint Handling Tips

Care should be exercised during drive shaft removal or when servicing CV joints. Drive shaft components are precision parts.

Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

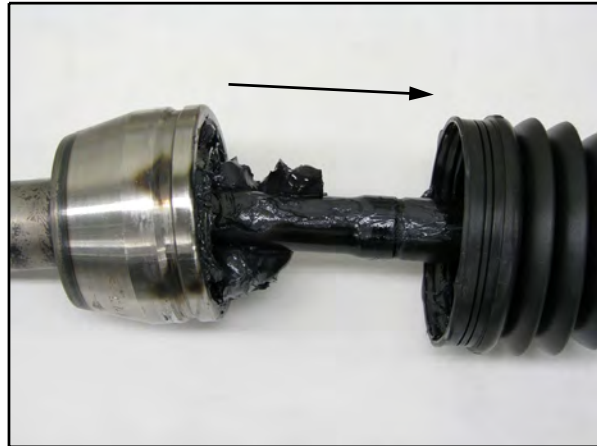
- The complete drive shaft and joint should be handled by getting hold of the interconnecting shaft to avoid disassembly or potential damage to the drive shaft joints.
- Over-angling of joints beyond their capacity could result in boot or joint damage.
- Make sure surface-ground areas and splines of shaft are protected during handling to avoid damage.
- Do not allow boots to come into contact with sharp edges or hot engine and exhaust components.
- The drive shaft is not to be used as a lever arm to position other suspension components.
- Never use a hammer or sharp tools to remove or to install boot clamps.
- Be sure joints are thoroughly clean and that the proper amount and type of grease is used to refill when joint boots are replaced and when joints are cleaned. Refer to text for grease capacity of CV joints and CV joint boots.

Outer CV Joint / Boot Replacement

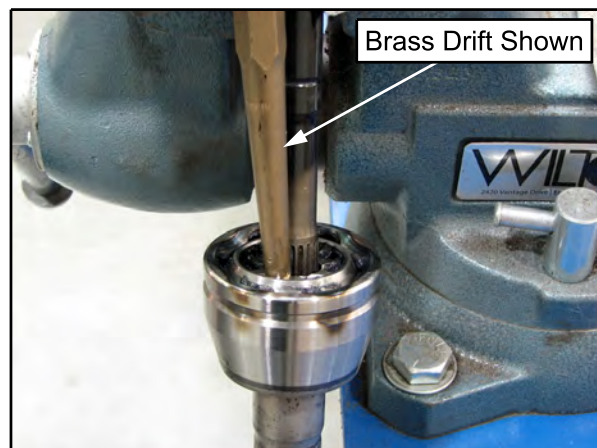
1. Use a side cutters to cut and discard the boot clamps.



2. Remove the large end of the boot from the CV joint and slide the boot down the shaft.

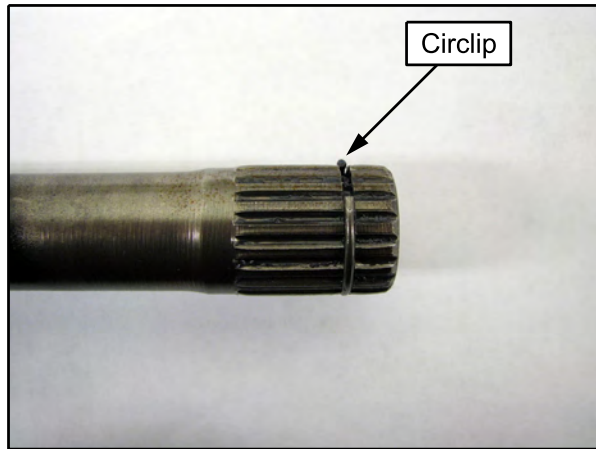


3. Clean the grease from the face of the joint.
4. Place the drive shaft in a soft-jawed vise.
5. Using a soft-faced hammer, or brass drift, strike inner race of the joint to drive the joint off the drive shaft. Be sure to tap evenly around the joint to avoid binding.



IMPORTANT: Tap on inner race only!

6. Make sure circlip is on the shaft and not left in the joint.



7. Remove the CV boot from the shaft.



CAUTION

Complete disassembly of the CV joint is NOT recommended. The internal components are precision fit and develop their own characteristic wear patterns. Intermixing the internal components could result in looseness, binding, and/or premature failure of the joint.

IMPORTANT: If the grease in the joint is obviously contaminated with water and/or dirt, the joint should be replaced.



8. Thoroughly clean the joint with an appropriate solvent and dry the joint to prevent any residual solvent from being left in the joint upon reassembly.

9. Visually inspect the joint by tilting the inner race to one side to expose each ball. Severe pitting, galling, play between the ball and its cage window, any cracking or damage to the cage, pitting or galling or chips in raceways call for joint replacement.

NOTE: Shiny areas in ball tracks and on the cage spheres are normal. Do not replace CV joints because parts have polished surfaces. Replace CV joint only if components are cracked, broken, worn or otherwise unserviceable.

10. Clean the splines on the end of the shaft and apply a light coat of grease prior to reassembly.
11. Slide the small boot clamp and boot (small end first) onto the drive shaft and position the boot in the groove machined in the shaft.
12. Install a NEW circlip on the end of the shaft.
13. Grease the joint with the special CV joint grease provided in the boot replacement kit. Fill the cavity behind the balls and the splined hole in the joint's inner race. Pack the ball tracks and outer face flush with grease. Place any remaining grease into the boot.



CAUTION

The grease provided in the replacement kit is specially formulated for wear resistance and durability. DO NOT use substitutes or mix with other lubricants.

NOTE: It is very important to use the correct type and quantity of grease by using all the grease included with the boot kit. DO NOT use a substitute grease and DO NOT overfill or under fill the CV joint.

Boot Replacement Grease Requirements:

Outer CV Joint Capacity:
Front - 74g / Rear - 90g

Grease Only Service Kit: PN 1350047 (50g)

FINAL DRIVE

- Slide the joint onto the drive shaft splines and align the circlip with the lead-in chamfer on the inner race of the joint.



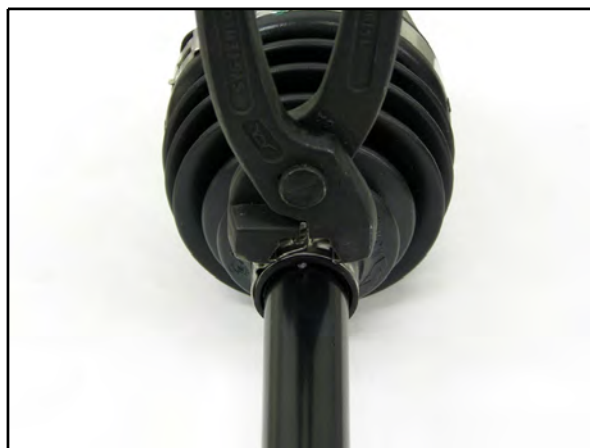
- Use a soft-faced hammer to tap the joint onto the drive shaft until it locks into place.
- Pull on joint to make sure it is securely locked in place.
- Remove excess grease from the CV joint's external surfaces and place the excess grease in the boot.
- Pull the boot over the joint and position the boot lips into the grooves on the joint housing and shaft. Make sure the boot is not dimpled or collapsed.
- Install and tighten the large clamp using the appropriate clamp tool.



**Axle Boot Clamp Tool: PU-48951
or
CV Boot Clamp Pliers: 8700226**

- While pulling out on the CV shaft, fully extend the CV joint and slide a straight O-ring pick or a small slotted screw driver between the small end of the boot and the shaft. This will allow the air pressure to equalize in the CV boot in the position that the joint will spend most of its life. Before you remove your instrument, be sure the small end of the boot is in the correct location on the shaft.

- Install and tighten the small clamp on the boot using the appropriate clamp tool.



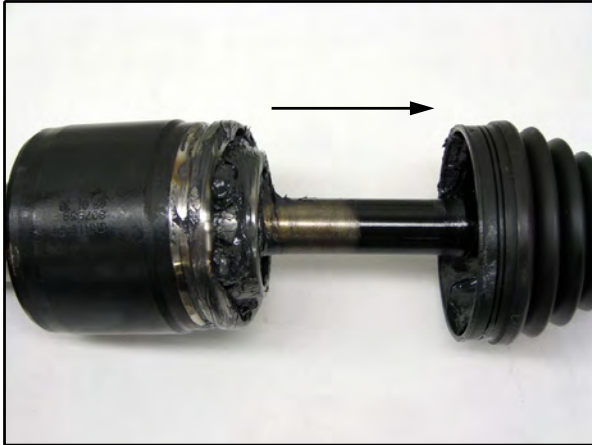
**Axle Boot Clamp Tool: PU-48951
or
CV Boot Clamp Pliers: 8700226**

Inner Plunging Joint / Boot Replacement

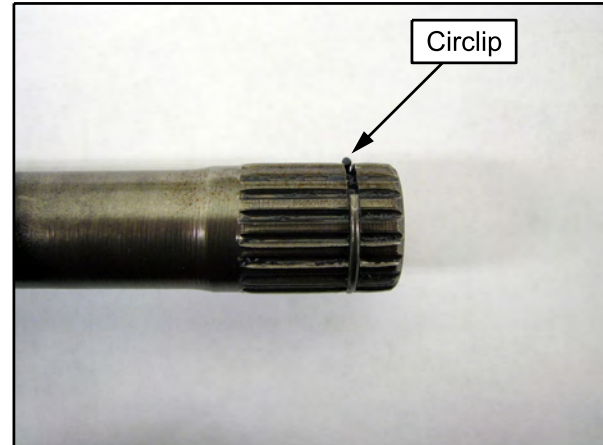
- Use a side cutters to cut and discard the boot clamps.



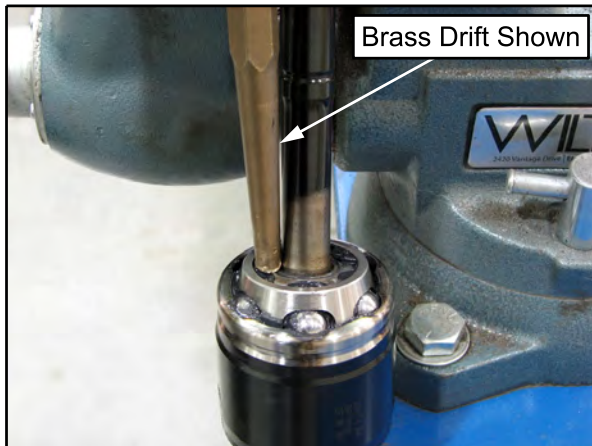
2. Remove the large end of the boot from the plunging joint and slide the boot down the shaft.



6. Make sure circlip is on the shaft and not left in the joint.



3. Clean the grease from the face of the joint.
4. Place the drive shaft in a soft-jawed vise.
5. Using a soft-faced hammer, or brass drift, strike inner race of the joint to drive the joint off the drive shaft. Be sure to tap evenly around the joint to avoid binding.



IMPORTANT: Tap on inner race only!

7. Remove the boot from the shaft.



CAUTION

Complete disassembly of the plunging joint is NOT recommended. The internal components are precision fit and develop their own characteristic wear patterns. Intermixing the internal components could result in looseness, binding, and/or premature failure of the joint.

IMPORTANT: If the grease in the joint is obviously contaminated with water and/or dirt, the joint should be replaced.



8. Thoroughly clean the joint with an appropriate solvent and dry the joint to prevent any residual solvent from being left in the joint upon reassembly.
9. Visually inspect joint for damage. Replace if needed.

FINAL DRIVE

10. Clean the splines on the end of the shaft and apply a light coat of grease prior to reassembly.
11. Slide the small boot clamp and boot (small end first) onto the drive shaft and position the boot in the groove machined in the shaft.
12. Install a NEW circlip on the end of the shaft.
13. Grease the joint with the special CV joint grease provided in the boot replacement kit. Fill the cavity behind the balls and the splined hole in the joint's inner race. Pack the ball tracks and outer face flush with grease. Place any remaining grease into the boot.
16. Use a soft-faced hammer to tap the joint onto the drive shaft until you reach the end of the splines and the joint locks in place.
17. Pull on the joint to test that the circlip is seated and that the joint is securely fastened to the shaft.
18. Remove excess grease from plunging joint's external surfaces and place the excess grease in the boot.
19. Pull the boot over the joint and position the boot lips into the grooves on the joint housing and shaft. Make sure the boot is not dimpled or collapsed.
20. Install and tighten the small clamp using the appropriate clamp tool.



CAUTION

The grease provided in the replacement kit is specially formulated for wear resistance and durability. DO NOT use substitutes or mix with other lubricants.

NOTE: It is very important to use the correct type and quantity of grease by using all the grease included with the boot kit. DO NOT use a substitute grease and DO NOT overfill or under fill the CV joint.

Boot Replacement Grease Requirements:

Inner Plunging Joint Capacity:
Front - 60g / Rear - 100g

Grease Only Service Kit: PN 1350047 (50g)

14. Fully compress the joint and push the drive shaft firmly into the inner race.
15. Align the circlip with the lead-in chamfer.



**Axle Boot Clamp Tool: PU-48951
or
CV Boot Clamp Pliers: 8700226**

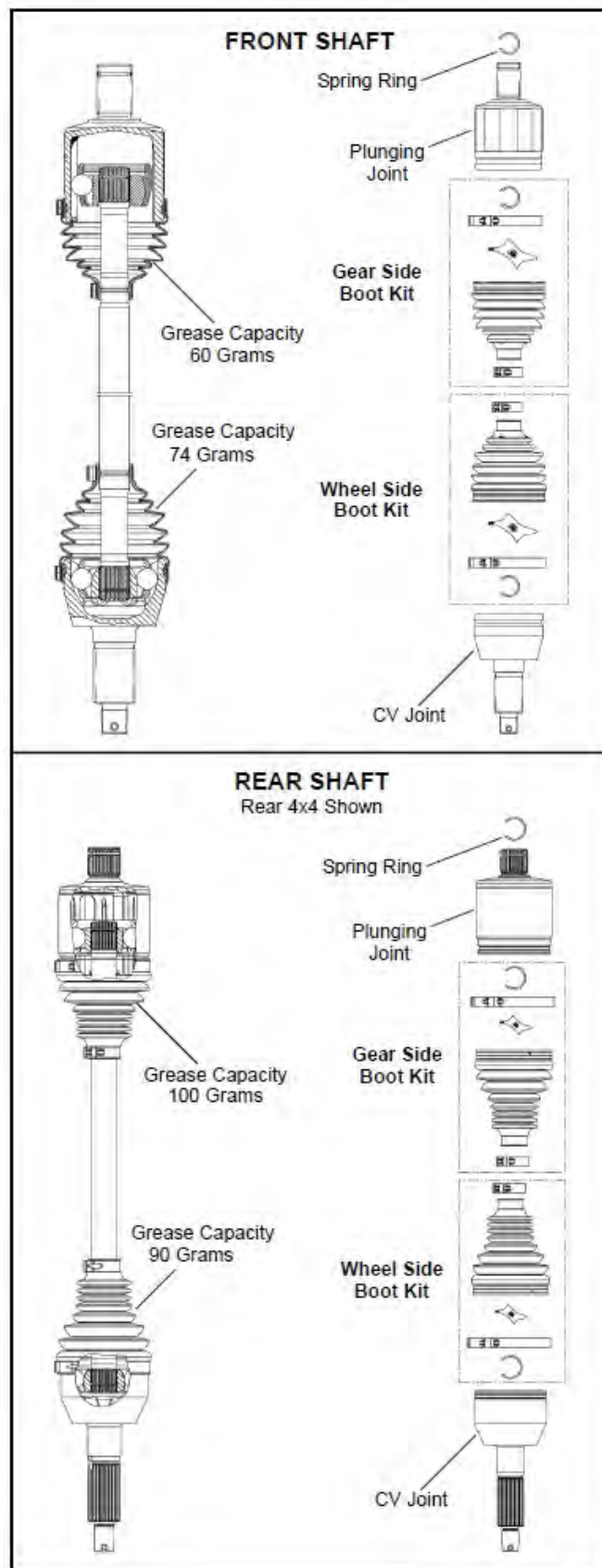
21. Pull out on drive shaft to center joint in the housing. Slide a straight O-ring pick or a small slotted screw driver between the large end of the boot and the joint housing and lift up to equalize air pressure in the boot.

22. Position the boot lip in the groove. Install and tighten the large clamp using the appropriate clamp tool.



**Axle Boot Clamp Tool: PU-48951
or
CV Boot Clamp Pliers: 8700226**

Drive Shaft Exploded View

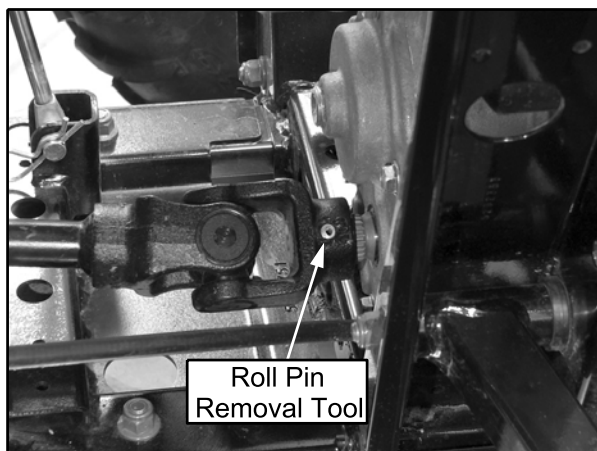


FINAL DRIVE

REAR PROPSHAFT (6X6)

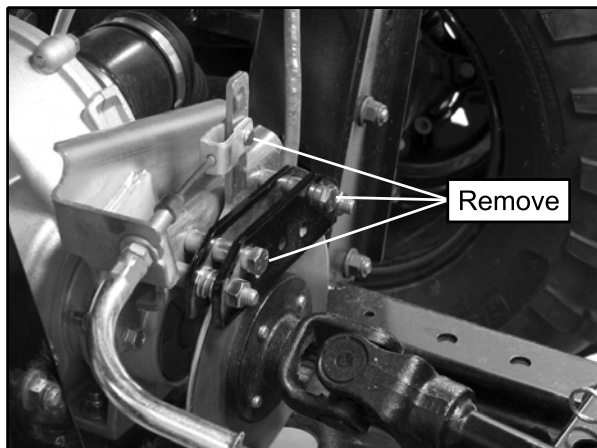
Removal

1. Drive the roll pin from the rear propshaft yoke located at the mid gearcase.



Roll Pin Removal Tool (PN 2872608)

2. Remove the parking brake caliper assembly from the caliper mount bracket to allow the rear propshaft to slide back on the rear gearcase input shaft.

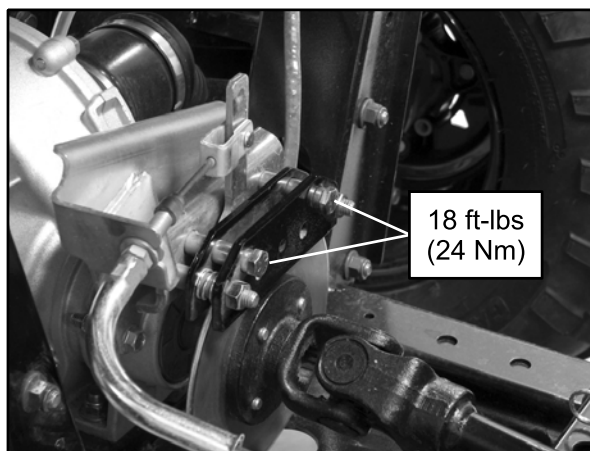


3. Slide the rear propshaft back on the rear gearcase input shaft, remove the propshaft from the mid gearcase and remove the propshaft from the vehicle.

Installation

1. Install the rear propshaft onto the rear gearcase input shaft.
2. Align the rear propshaft pin hole with the pin hole on the mid gearcase rear output shaft.

3. Slide the rear propshaft forward onto the mid gearcase rear output shaft and drive a NEW roll pin into the propshaft yoke.
4. Install the parking brake caliper assembly. Tighten the two mounting bolts in increments and torque to specification.

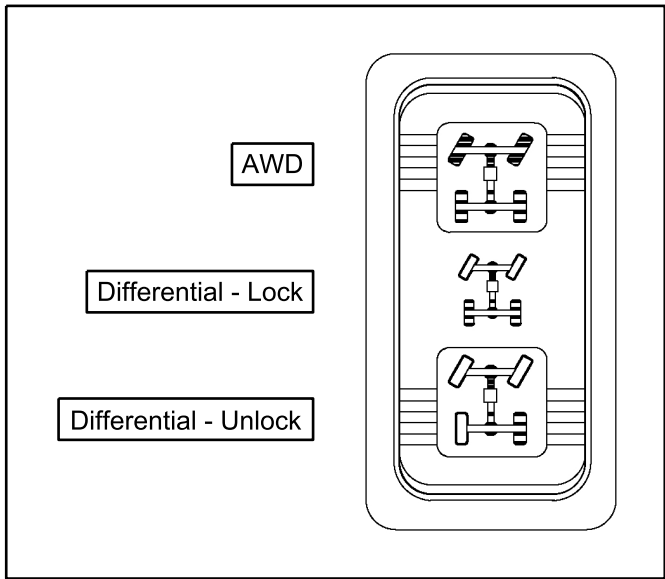


Parking Brake Caliper - Mounting Bolts:
18 ft-lbs (24 Nm)

REAR GEARCASE (6X6)

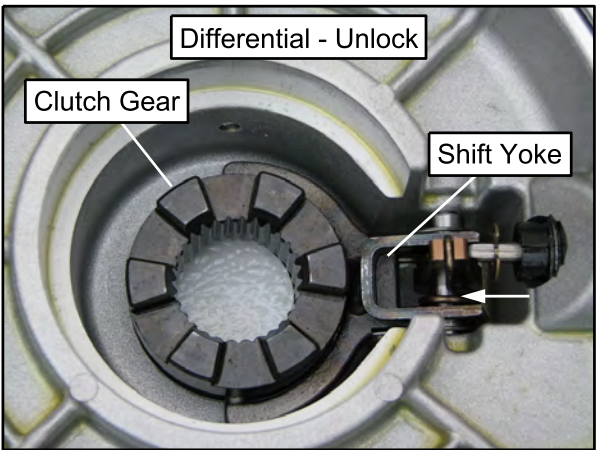
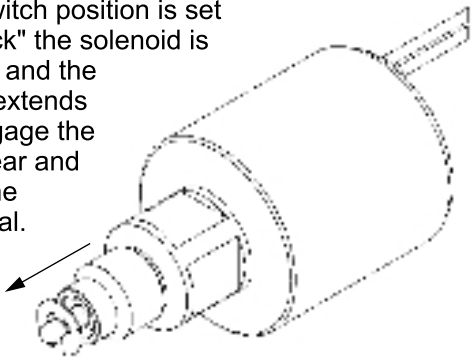
General Operation

The *RANGER* 6X6 rear gearcase has two traction operational modes: Differential Lock and Differential Unlock. Locking the rear differential is beneficial in low traction and rough terrain conditions. Unlocking the rear differential makes maneuvering easier and minimizes damage to turf and sensitive terrains.



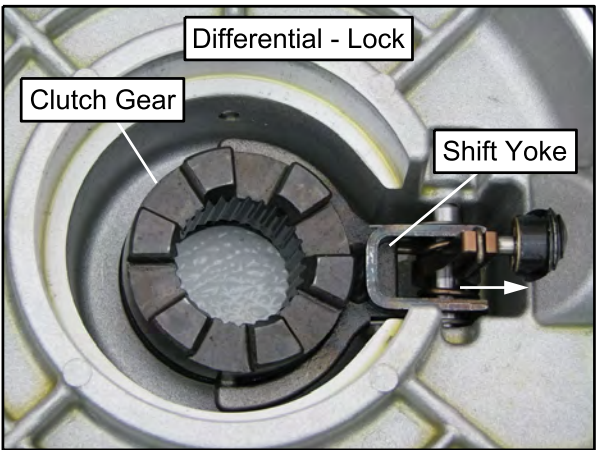
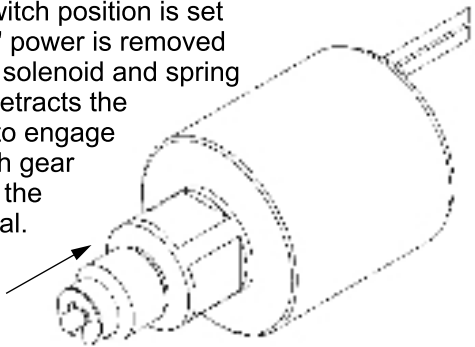
When "Differential-Unlock" is selected on the switch, the rear differential becomes unlocked for tighter turns. An electrical solenoid mounted in the rear gearcase housing actuates the shift yoke. The solenoid plunger extends out to move the shift yoke and slides the clutch gear away from the engagement dogs that are attached to the differential gear assembly. This unlocks the rear differential.

When switch position is set to "Unlock" the solenoid is powered and the plunger extends to disengage the clutch gear and unlock the differential.



When "Differential-Lock" is selected on the switch, power is removed from the electrical solenoid allowing the solenoid plunger to retract. Spring tension moves the shift yoke back into place and engages the clutch gear into the engagement dogs that are attached to the differential gear assembly, locking the rear differential as a solid rear axle.

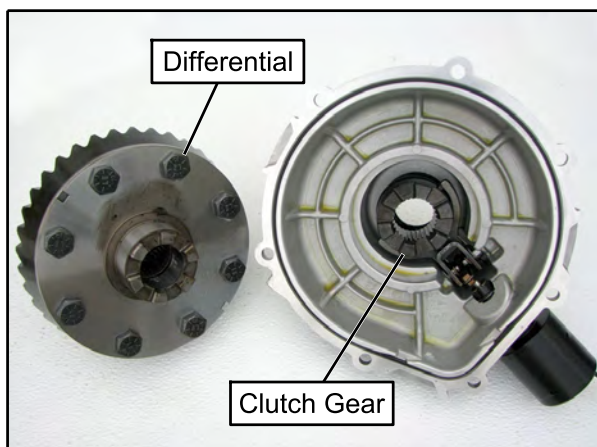
When switch position is set to "Lock" power is removed from the solenoid and spring tension retracts the plunger to engage the clutch gear and lock the differential.



7

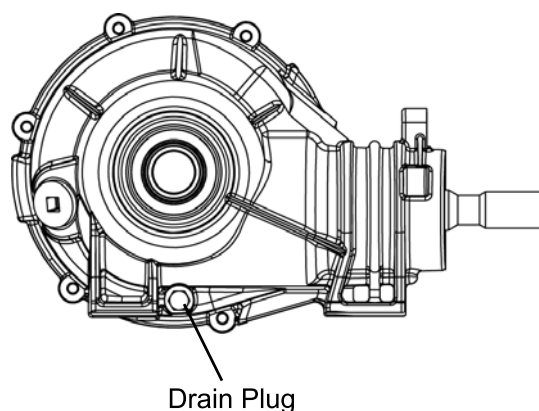
FINAL DRIVE

When the clutch gear is unlocked the rear drive shafts are dependent on the differential allowing tighter turns. When it's locked it becomes a solid rear axle increasing traction.



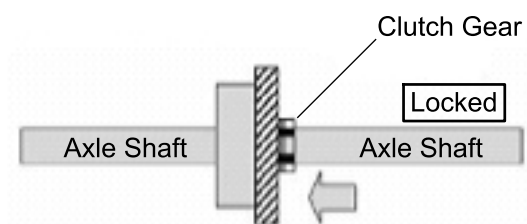
Gearcase Removal

1. Follow the "MID / REAR DRIVE SHAFT - Removal" procedure to remove the rear drive shafts from each side of the rear gearcase.
2. Disconnect the differential solenoid 2-wire harness.
3. Completely drain the lubricant from the rear gearcase.

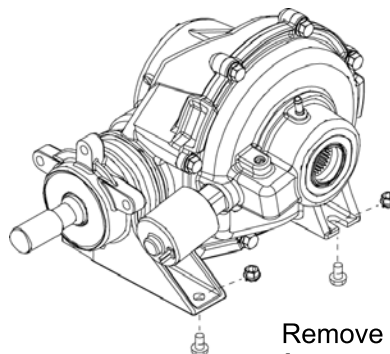
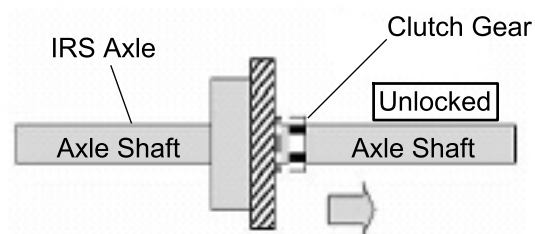


4. Remove the (4) bolts that secure the rear gearcase to the frame.

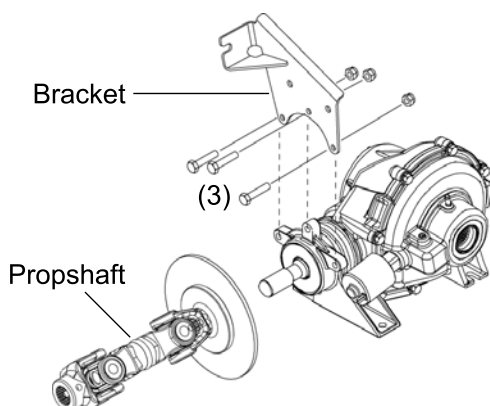
Locked Mode



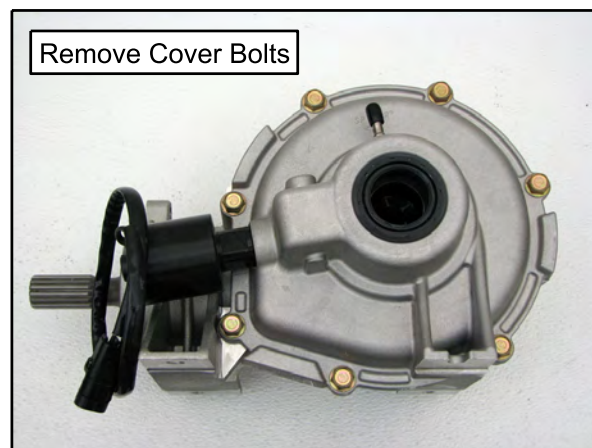
Unlocked Mode



- Remove the (3) fasteners retaining the parking brake caliper bracket to the rear gearcase and carefully pull the rear gear case assembly from the frame. Allow the rear propshaft to slide off of the rear gearcase shaft.



- Remove the (7) bolts that secure the cover to the housing.



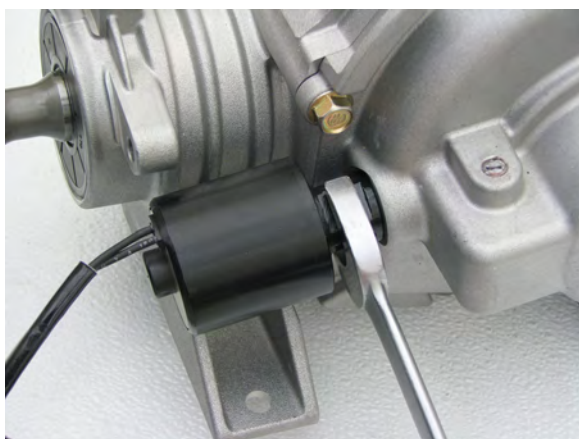
- Remove the differential assembly from the housing.



Gearcase Disassembly

IMPORTANT: The pinion gear assembly is **NOT** intended to be disassembled from the case, as it requires special OEM tooling in order to properly reassemble. If there is any damage to the pinion gear, bearings or case, the assembly must be replaced. Pinion and ring gear shimming information is **NOT** provided due to OEM manufacturing requirements.

- Remove the differential solenoid from the gearcase cover if servicing the solenoid, shift lever, shift lever spring, or shift yoke. If none of these items are being serviced, the solenoid can remain installed in the gearcase cover.



- Inspect the bevel gear for chipped, worn, or broken teeth.



FINAL DRIVE

5. Remove the small bearing from the differential assembly. Inspect the bearing for smoothness and wear.



7. Remove the large bearing from the differential assembly. Inspect the bearing for smoothness and wear.



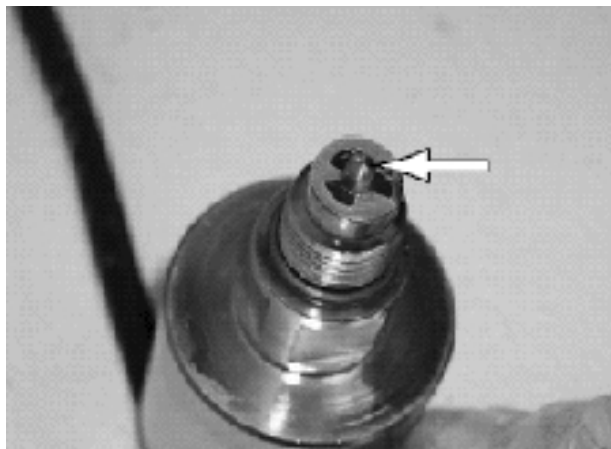
6. Remove the shims from the differential assembly. Be sure to keep the shims together for reassembly.



8. Remove the shims from the differential assembly. Be sure to keep the shims together for reassembly.



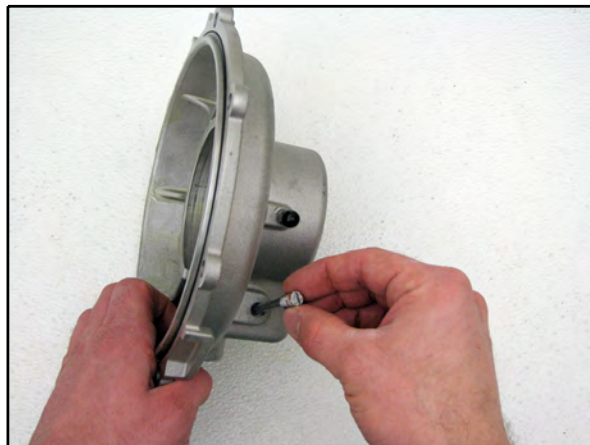
9. If the solenoid was removed for servicing, inspect the tip of the solenoid for wear. If the tip of the solenoid is flattened the solenoid must be replaced.



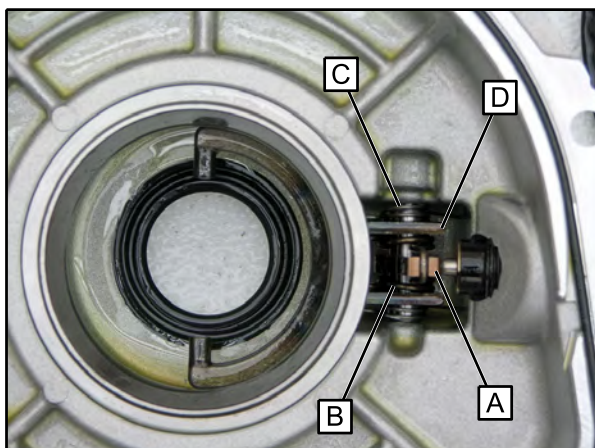
10. Remove the clutch gear from the gearcase cover.



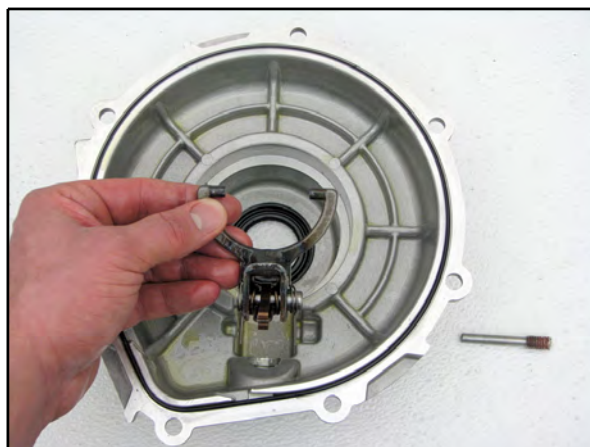
13. Remove the pin from the gearcase cover.



11. Inspect the shift lever (A), shift lever spring (B), shift return springs (C), and shift yoke (D) for excessive wear or damage. If disassembly is required proceed to the next step. If no disassembly is required proceed to "Rear Gearcase Assembly."



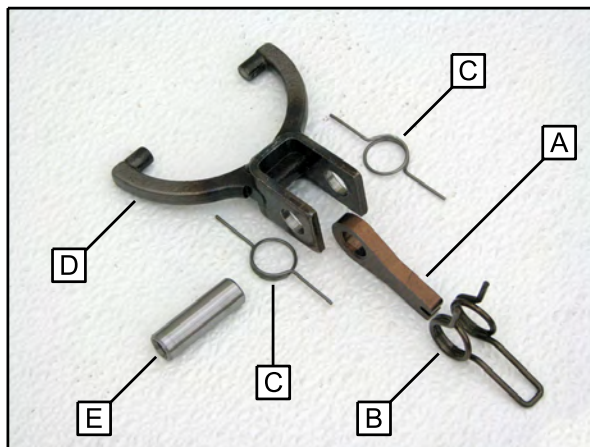
14. Carefully remove the shift yoke assembly from the gearcase cover.



12. Loosen the lock assembly pin.



15. Inspect the shift lever (A), shift lever spring (B), shift return springs (C), shift yoke (D), and lock pin bushing (E). Inspect the components for excessive wear or damage and replace as needed.

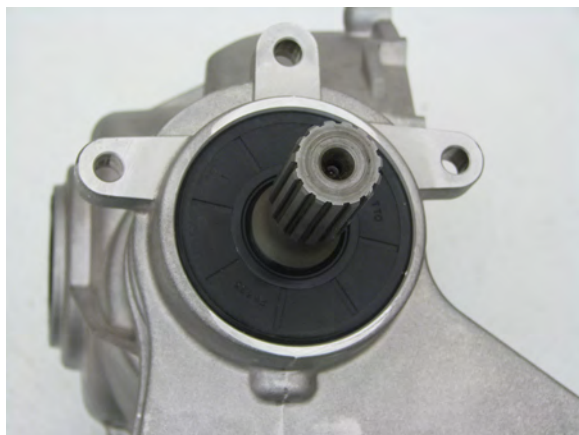


FINAL DRIVE

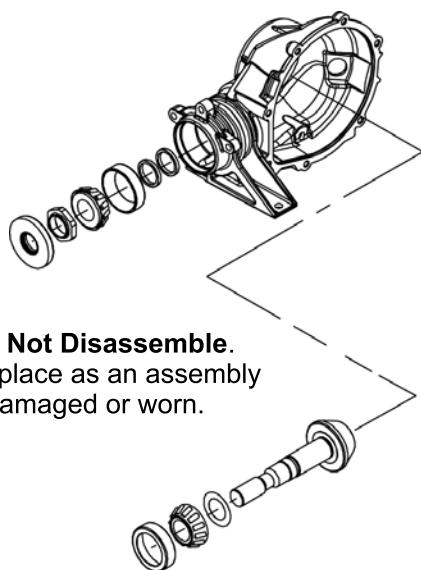
Rear Gearcase Assembly

NOTE: Grease all seals and O-rings with Polaris All Season Grease (PN 2871322) upon assembly.

1. Remove the pinion shaft oil seal using a seal puller and replace with a new seal.



NOTE: The pinion gear assembly is **NOT** intended to be disassembled from the case, as it requires special OEM tooling in order to properly reassemble. If there is any damage to the pinion gear, bearings or case, the assembly must be replaced.



Do Not Disassemble.
Replace as an assembly
if damaged or worn.

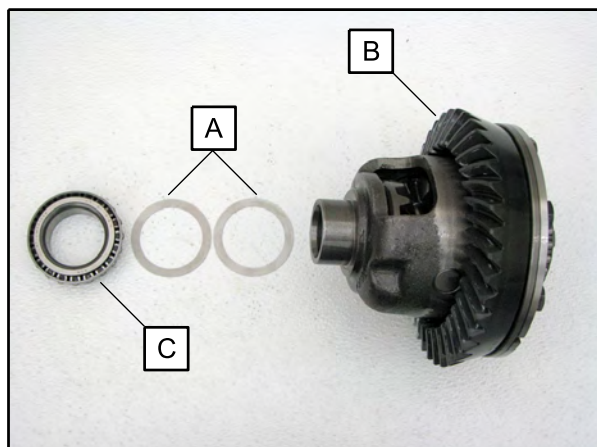
2. Replace the drive shaft oil seals located in the main gearcase and gearcase cover



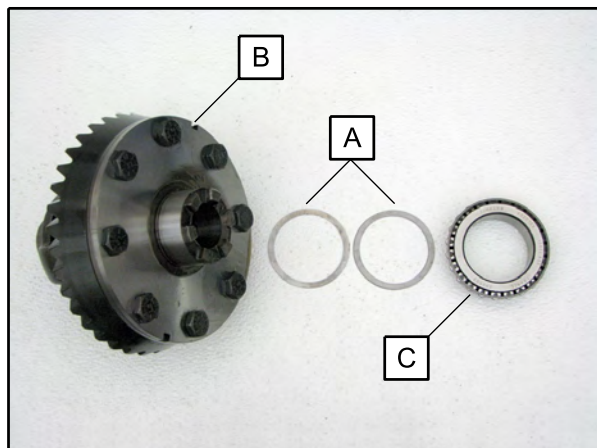
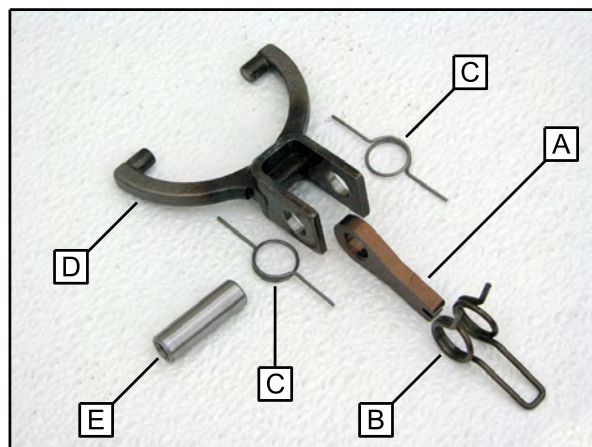
3. Replace all worn components.

FINAL DRIVE

4. Install the original shims (A) onto the differential assembly (B) on both sides. Install the bearings (C), replace with new bearings if needed.



6. If previously removed; assembly the shift lever (A), shift lever spring (B), shift return springs (C), shift yoke (D), and lock pin bushing (E).



7. Carefully install the shift yoke assembly into the gearcase cover.



5. Install the differential assembly into the carrier housing.

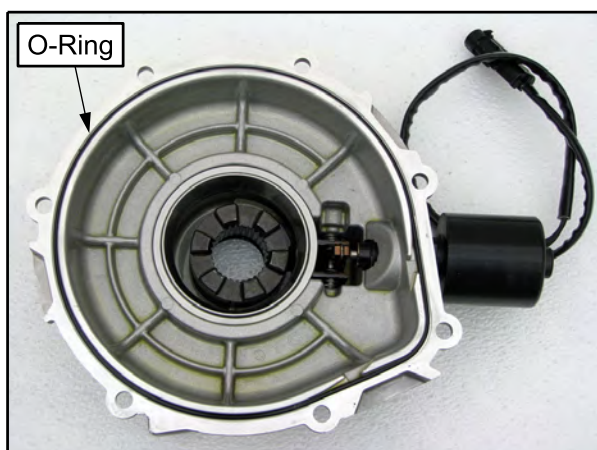


8. Install the lock assembly pin and tighten.

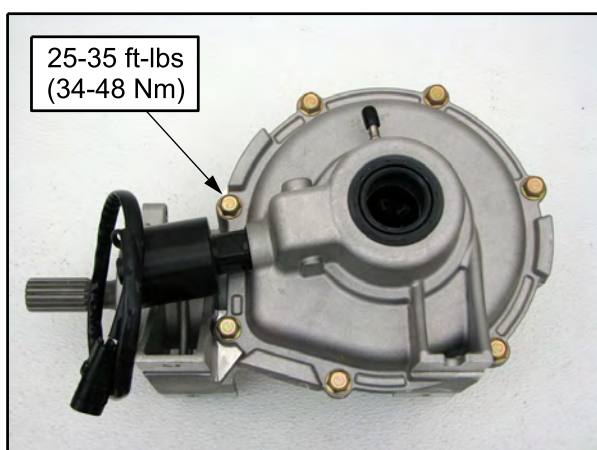


FINAL DRIVE

9. Install the new lightly greased O-ring onto the carrier cover.

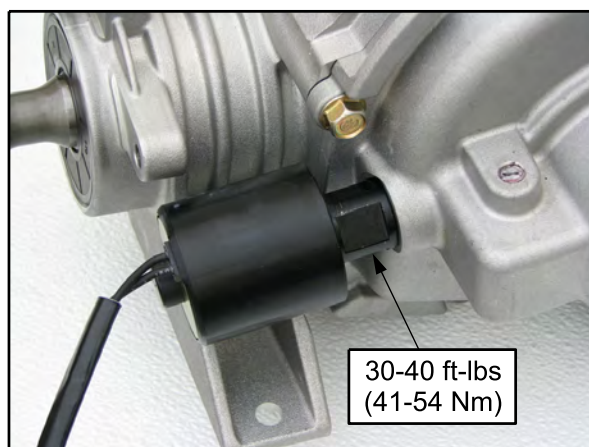


10. Assemble the gearcase halves and install the (7) bolts that secure the cover to the housing. Torque the bolts in a criss cross pattern to specification.



Cover Bolts:
25-35 ft-lbs (34-48 Nm)

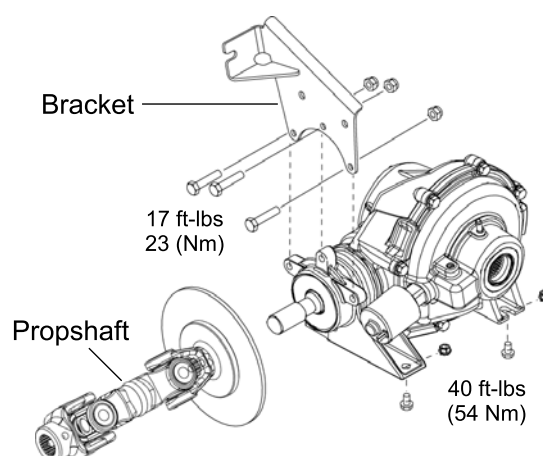
11. If previously removed, install the differential solenoid into the carrier cover. Torque solenoid to specification.



Solenoid:
30-40 ft-lbs (41-54 Nm)

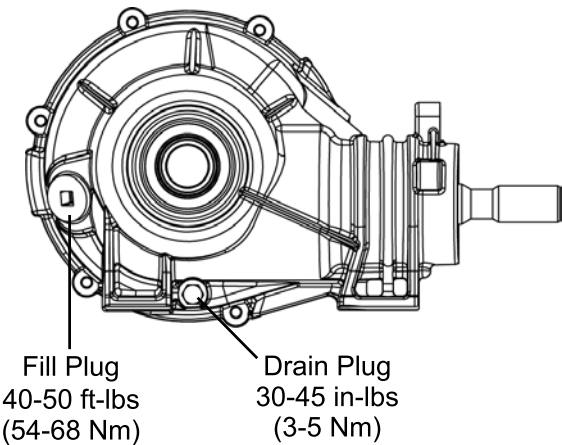
Rear Gearcase Installation

1. Place rear gearcase assembly into the frame. Slide the rear propshaft onto the rear gearcase input shaft.
2. Install the (4) gearcase mounting fasteners and torque the fasteners to **40 ft-lbs (54 Nm)**.
3. Install the parking brake caliper bracket fasteners and torque the fasteners to **17 ft-lbs (23 Nm)**.



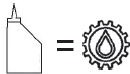
4. Connect the differential solenoid 2-wire harness.
5. Follow the "MID / REAR DRIVE SHAFT - Installation" procedure to reinstall the rear drive shafts.

6. Torque drain plug to specification.



Drain Plug: **30-45 in-lbs (3-5 Nm)**
Fill Plug: **40-50 ft-lbs (54-68 Nm)**

7. Add Polaris ATV Angle Drive Fluid (PN 2876160) to rear carrier. Refer to maintenance information in Chapter 2 for more details.

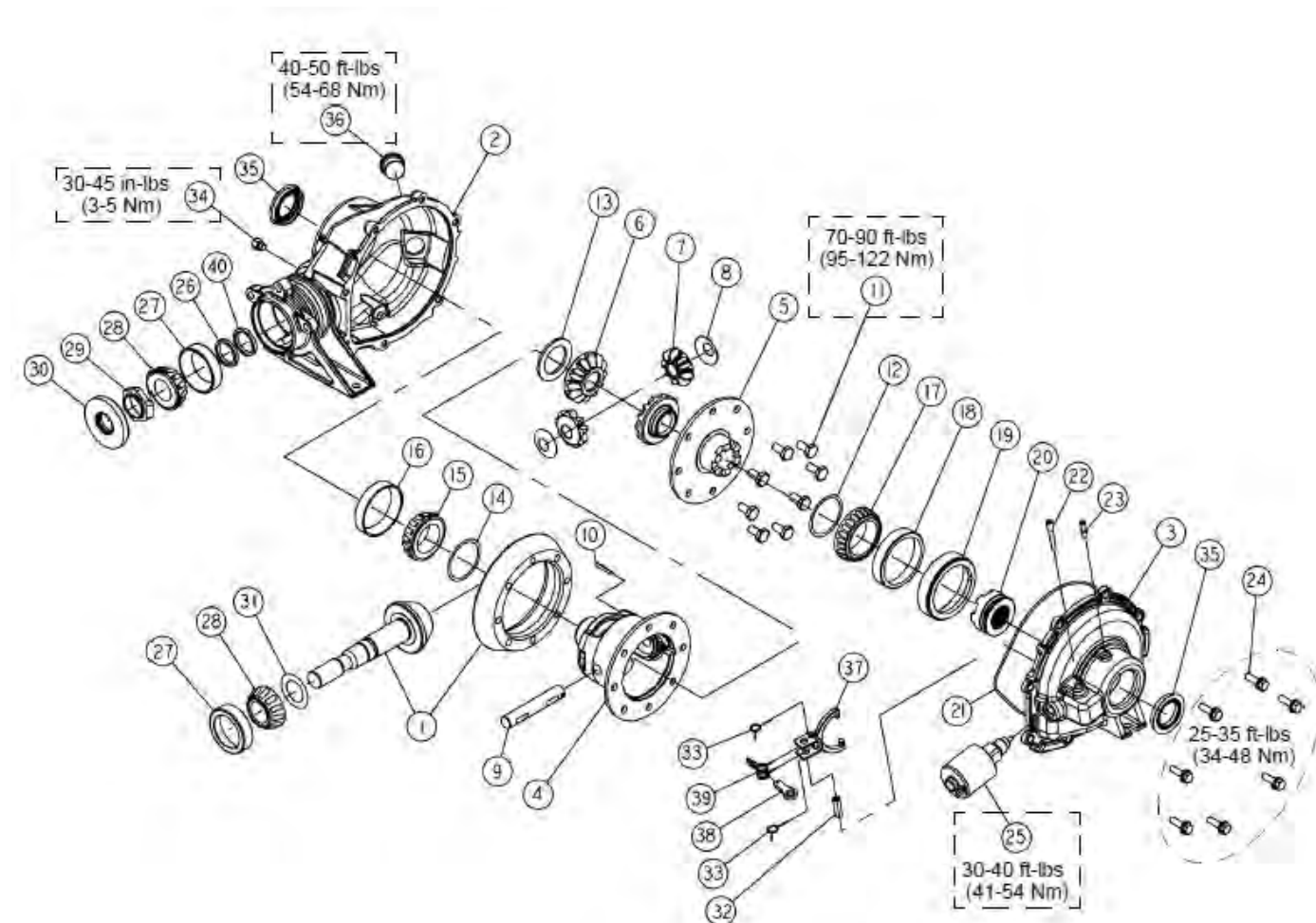


Rear Gearcase Lubricant / Capacity:
ATV Angle Drive Fluid / 18 fl. oz. (532 ml)

8. Torque fill plug to specification.

FINAL DRIVE

Rear Gearcase Exploded View



RE-F#	DESCRIPTION	QT-Y	RE-F#	DESCRIPTION	QT-Y	RE-F#	DESCRIPTION	QT-Y
1	Hypoid Gear Assembly	1	15	Bearing Cone - Diff	1	29	Pinion Nut	1
2	Carrier Housing Half	1	16	Bearing Cup - Diff	1	30	Oil Seal - Pinion	1
3	Carrier Cover Half	1	17	Bearing - Roller	1	31	Pinion Thrust-Washer	AR
4	Diff Case Half	1	18	Bearing - Cup	1	32	Lock Pin Bushing	1
5	Diff Case Cover Half	1	19	Bearing Assembly - Collar	1	33	Shift Return Spring	2
6	Diff Side Gear	2	20	Clutch Gear	1	34	Drain Plug	1
7	Diff Pinion Mate Gear	2	21	O-Ring - Housing Halves	1	35	Oil Seal - Shaft	2
8	Pinion Mate Thrust-Washer	2	22	Lock Assembly Pin	1	36	Fill Plug	1
9	Diff Cross Pin	1	23	Vent Tube	1	37	Shift Yoke	1
10	Diff Roll Pin	1	24	Flanged Hex Bolt - Housing	7	38	Shift Lever	1
11	Hex Bolt - Ring Gear	8	25	Diff Solenoid	1	39	Shift Lever Spring	1
12	Diff Case Thrust-Washer	AR	26	Spacer - Kit	AR	40	Pinion Spacer	1
13	Side Gear Thrust-Washer	1	27	Bearing Cup - Pinion	2			
14	Diff Case Thrust-Washer	AR	28	Bearing Cone - Pinion	2			

CHAPTER 8

TRANSMISSION - 4X4

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TRANSMISSION - 4X4

SPECIFICATIONS

Torque Specifications

ITEM	TORQUE VALUE
Bell Crank Nut	12-18 ft-lbs (16-24 Nm)
Case Bolts	25-30 ft-lbs (34-41 Nm)
Differential Cover Assembly Bolts	23-27 ft-lbs (31-37 Nm)
Differential Solenoid	23-27 ft-lbs (31-37 Nm)
Drain / Fill Plug	10-14 ft-lbs (14-19 Nm)
Gear Sector Cover	8-12 ft-lbs (11-16 Nm)
Oil Deflector Shield Screws	20-30 in-lbs (2.3-3.4 Nm)
Output Gear Assembly Retaining Screws	8-12 ft-lbs (11-16 Nm)
Park Brake Disc Mounting Bolt	10-15 ft-lbs (14-20 Nm)
Snorkel Tube Locking Screw	8-12 ft-lbs (11-16 Nm)
Shift Fork Retaining Screws	8-12 ft-lbs (11-16 Nm)
Transmission Mounting Bolts Front 5/16" Bolts	20 ft-lbs (27 Nm)
Transmission Mounting Bolts Lower / Rear 3/8" Bolts	37 ft-lbs (50 Nm)
Vehicle Speed Sensor Bolt	8-12 ft-lbs (11-16 Nm)

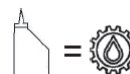
Special Tools

PART NUMBER	TOOL DESCRIPTION
PA-50231	Snorkel Tool
2871698 (Part of 2871702 Kit)	Rear Output Seal Driver
2871699 (Part of 2871702 Kit)	Rear Driveshaft Seal Guide

PART NUMBER	TOOL DESCRIPTION
2871282	Bearing Seal Driver (50 mm)

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

Lubrication



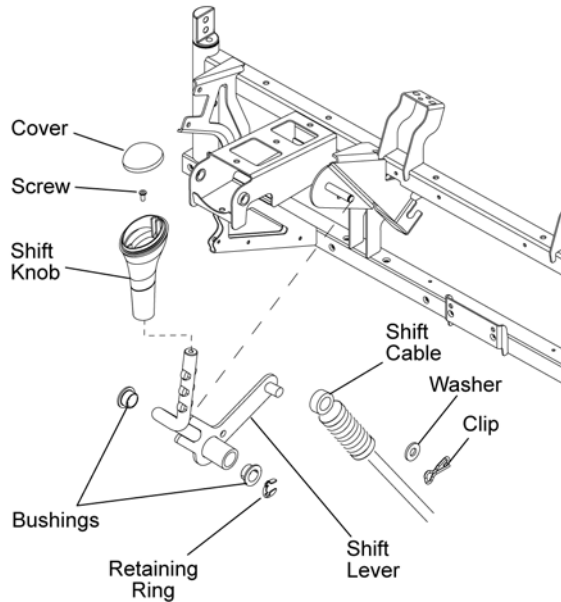
Recommended Transmission Lubricant:
AGL (PN 2878068) (Quart)

Capacity: 33.8 oz. (1000 ml)

SHIFT LEVER

Removal

1. Remove the (2) push rivets retaining the dash panel and remove the panel from the dash to access the shift lever.
2. Remove the shift knob cover, retaining screw and shift knob from the shift lever.



3. Remove grommet around shift lever from the dash.
4. Remove clip and washer retaining the shift cable to the shift lever. Disconnect cable end from the lever.
5. Remove the retaining ring, outer washer, and both bushings from the shift lever.
6. Slide the shift lever off the mounting bracket and out from the frame.

Installation

1. Repeat the steps in reverse order to install the gear shift lever.

SHIFT CABLE

Inspection

Shift cable adjustment is necessary when symptoms include:

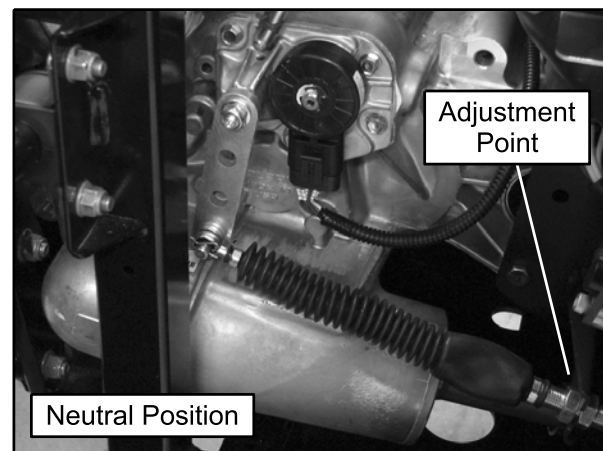
- Noise on deceleration
- Inability to engage a gear
- Excessive gear lash (noise)
- Gear selector is moving out of desired range

Inspect shift cable, clevis pins, and pivot bushings and replace if worn or damaged.

Adjustment

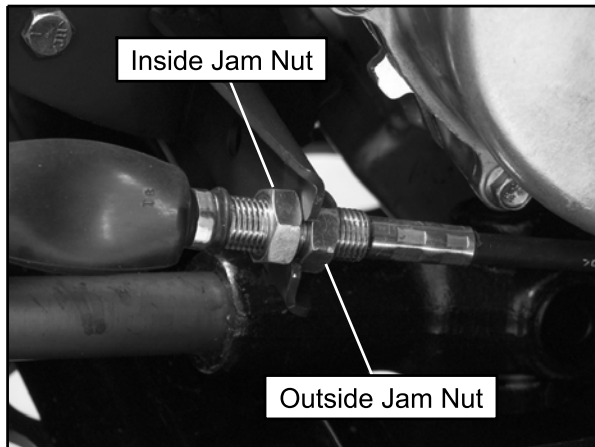
NOTE: The shift cable should be adjusted at the rear adjustment point located near the transmission. If adjustment is needed beyond that, remove the dash panel to access the shift cable adjustment point located underneath the shift lever.

1. Place gear selector in neutral. Make sure the transmission bell crank is engaged in the neutral position detents.



TRANSMISSION - 4X4

3. With two open-end wrenches, loosen the outside jam nut counterclockwise. Turn the outside jam nut 1 1/2 turns.

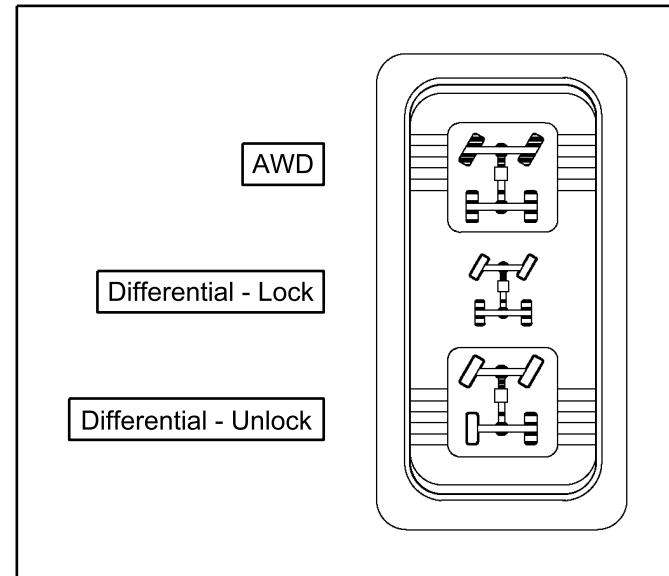


4. After turning the outside jam nut 1 1/2 turns. Hold the outside jam nut with a wrench and tighten the inside jam nut clockwise, until it is tight against the bracket.
5. Repeat Step 3 and Step 4 until the proper adjustment is made to the shift cable.
6. Use this procedure to loosen or tighten the shift linkage cable as needed.

TRANSMISSION SERVICE

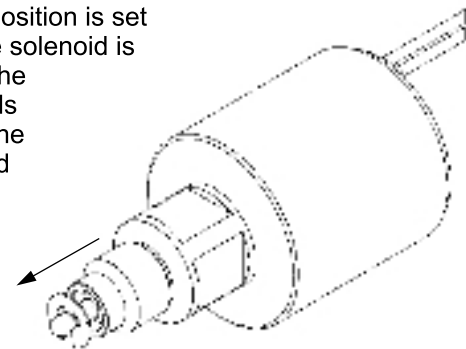
General Operation

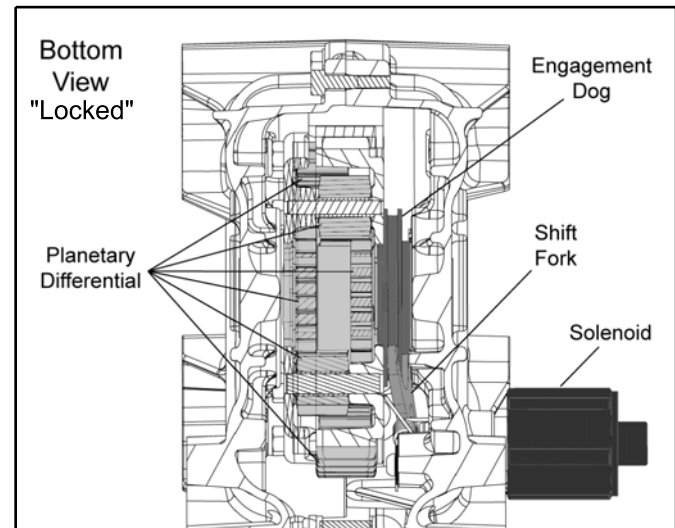
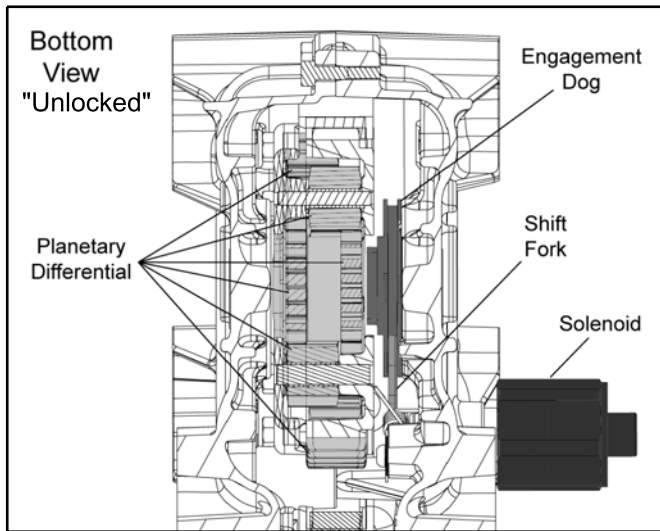
The *RANGER* 4x4 transmission has two traction operational modes: Differential Lock and Differential Unlock. Locking the rear differential is beneficial in low traction and rough terrain conditions. Unlocking the rear differential makes maneuvering easier and minimizes damage to turf and sensitive terrains.



When "Differential-Unlock" is selected on the switch, the rear differential becomes unlocked for tighter turns. An electrical solenoid mounted in the rear portion of the transmission actuates the shift fork. The solenoid plunger extends out to move the shift fork and slides the engagement dog away from the side gear that is part of the planetary differential assembly. This unlocks the rear differential. The rear drive shafts are now dependent on the differential allowing for tighter turns.

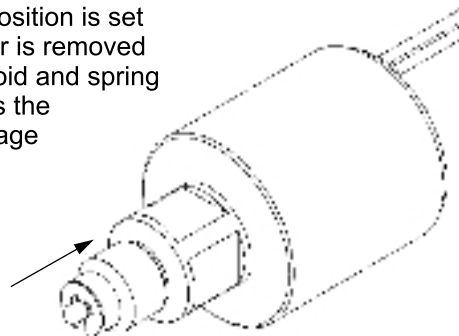
When switch position is set to "Unlock" the solenoid is powered and the plunger extends to disengage the clutch gear and unlock the differential.





When "Differential-Lock" is selected on the switch, power is removed from the electrical solenoid allowing the solenoid plunger to retract. Spring tension moves the shift fork back into place and engages the engagement dog to the side gear that is part of the planetary differential assembly. This locks the rear differential as a solid rear axle, increasing traction.

When switch position is set to "Lock" power is removed from the solenoid and spring tension retracts the plunger to engage the clutch gear and lock the differential.



Transmission Removal

1. Place vehicle on a level surface and block the front wheels.
2. Elevate the rear of the vehicle and safely support the vehicle under the rear frame area.



CAUTION

Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this procedure. Always wear eye protection.

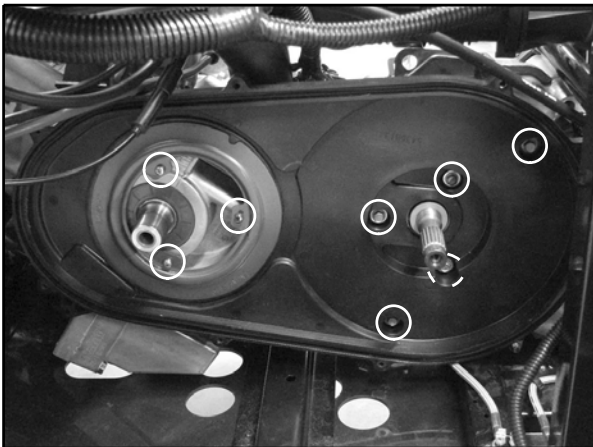
3. Remove the wheel nuts and washers from both rear wheels. Remove the rear wheels and set them off to the side.
4. If internal transmission repair is required, drain the transmission lubricant.
5. Remove the seat and side storage container to access the PVT system.
6. Disconnect the brake switch harness located below the outer PVT cover.
7. Using a 3/8" socket, extension and ratchet, remove the (9) screws retaining the outer PVT cover. Remove the cover from the vehicle.

TRANSMISSION - 4X4

8. Remove the drive belt, drive clutch and driven clutch (see Chapter 6 "Clutching").



9. Using a Phillips screwdriver, remove the (3) screws retaining the inner PVT cover to the engine. Using a 3/8" socket and ratchet, remove the (5) screws retaining the inner PVT cover to the transmission and remove the cover.



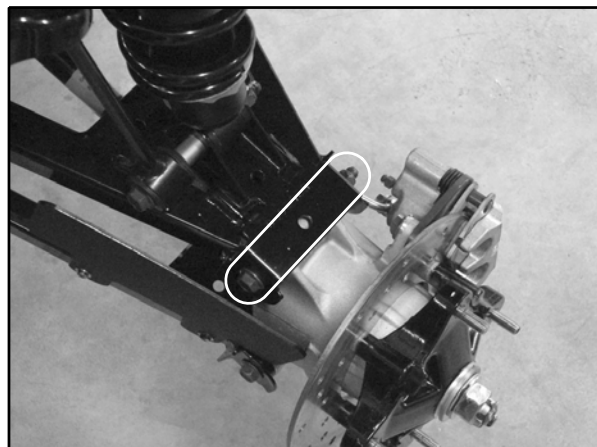
10. Using a 15mm socket, ratchet and wrench, remove the upper fastener from the rear shock on each side.



11. Remove the rear brake lines from the rear upper A-arm retainers.

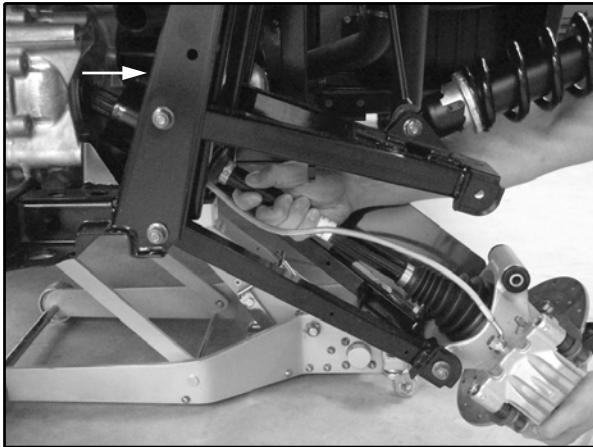


12. Using a 15mm socket, ratchet and wrench, remove the through-bolt retaining the rear upper A-arm to the bearing carrier on each side.

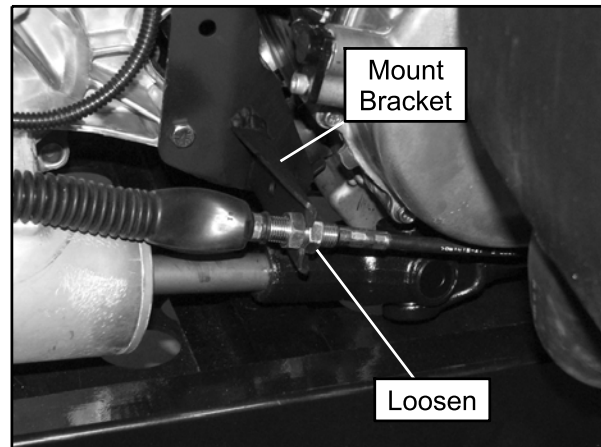


TRANSMISSION - 4X4

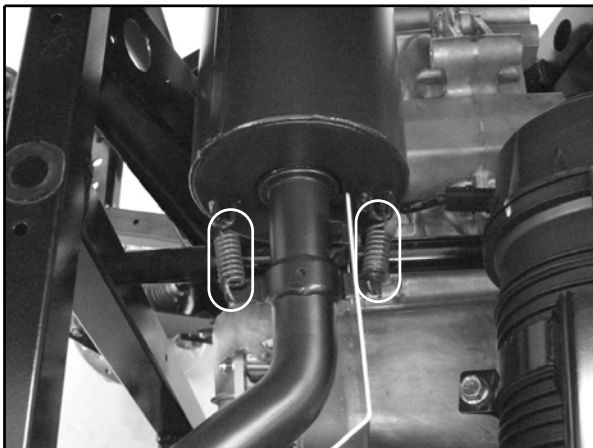
13. Remove the rear drive shafts from each side of the transmission by pulling out sharply on each shaft.



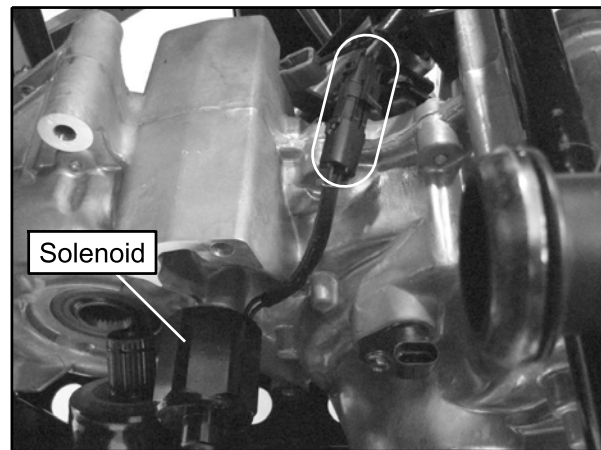
16. Using a 3/4" open-end wrench, loosen the lower jam nut on the shift cable and remove the shift cable from the mount bracket.



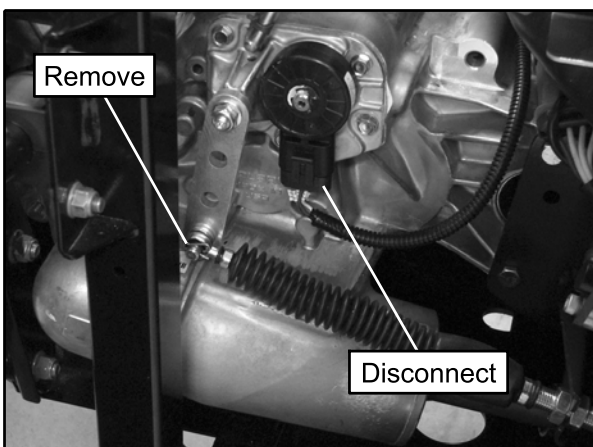
14. Remove the exhaust springs retaining the exhaust silencer and remove the silencer from the vehicle.



17. Disconnect the rear differential solenoid.



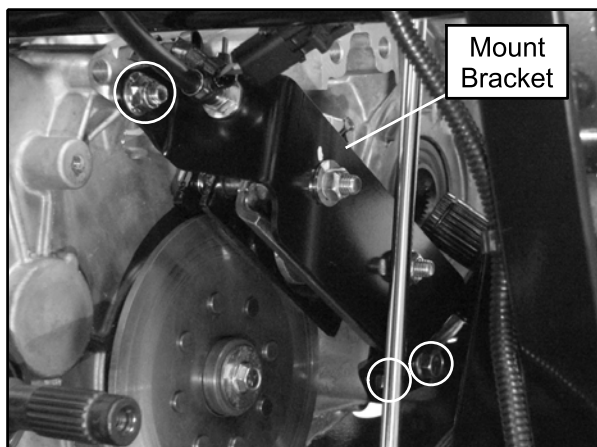
15. Remove the shift cable from the transmission bell crank and disconnect the gear selector switch.



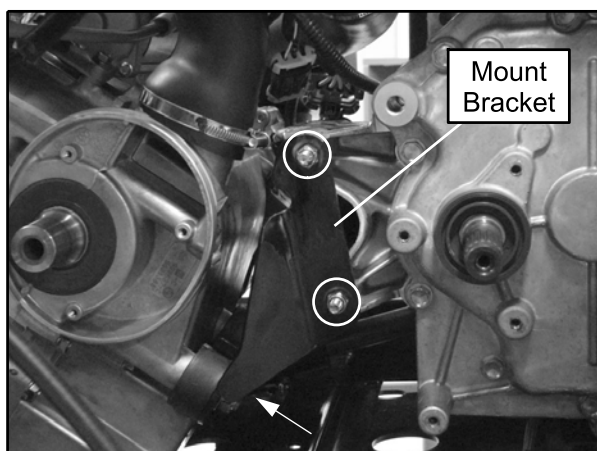
18. Disconnect the vehicle harness from the vehicle speed sensor located on the right-hand side of the transmission.

TRANSMISSION - 4X4

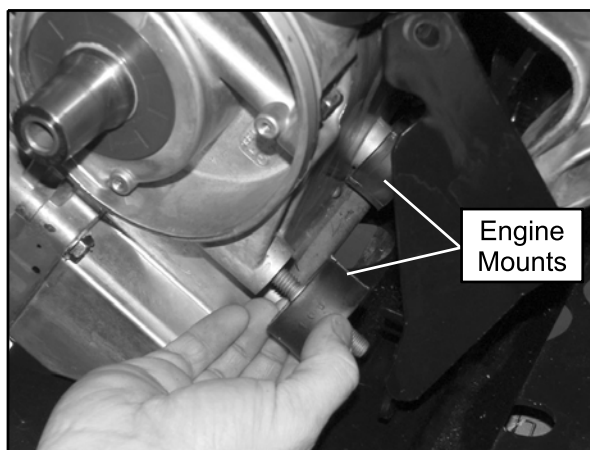
19. Remove the (3) fasteners retaining the parking brake mount bracket and remove the parking brake caliper as an assembly.



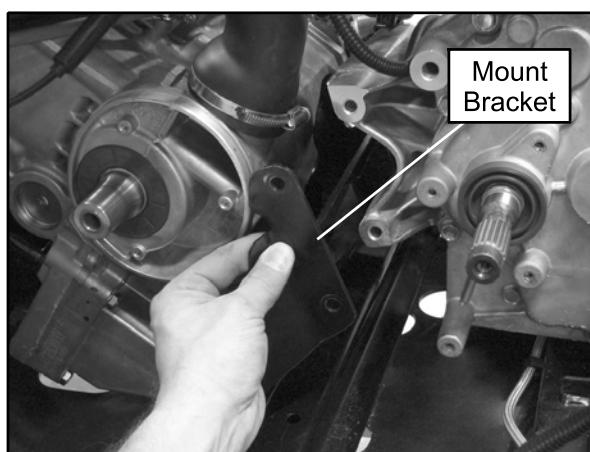
20. Remove the (2) through-bolts and (2) lower engine mount nuts from the engine-to-transmission mount bracket.



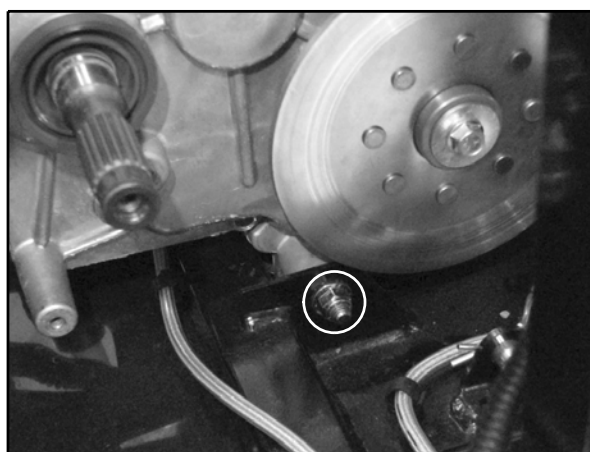
21. Remove the (2) rubber engine mounts from the engine.



22. Remove the engine-to-transmission mount bracket from the vehicle.

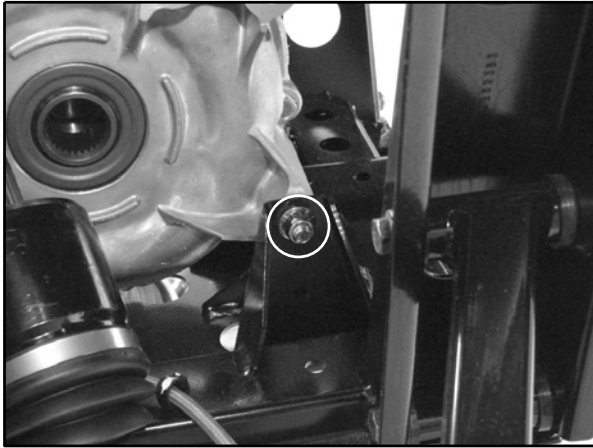


23. Remove the lower transmission through-bolt.

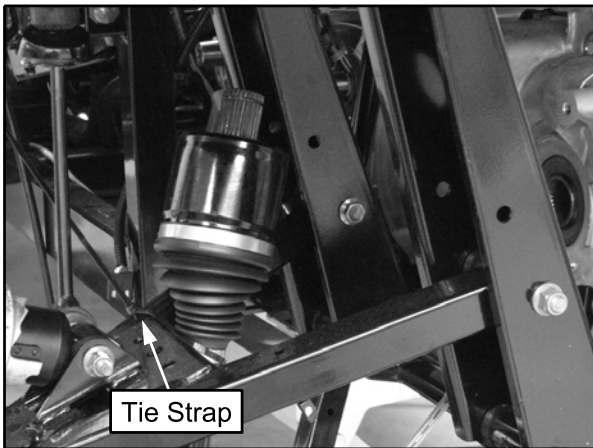


TRANSMISSION - 4X4

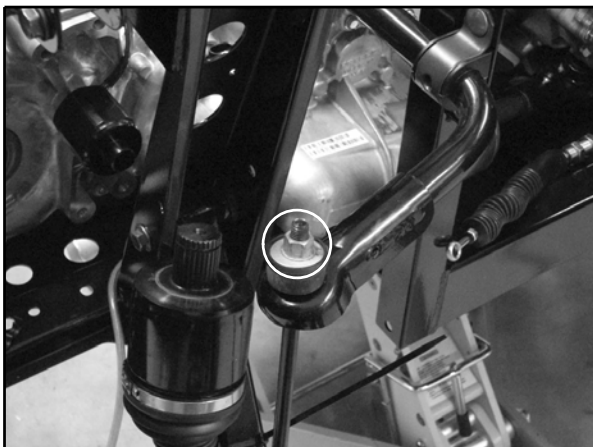
24. Remove the rear transmission through-bolt.



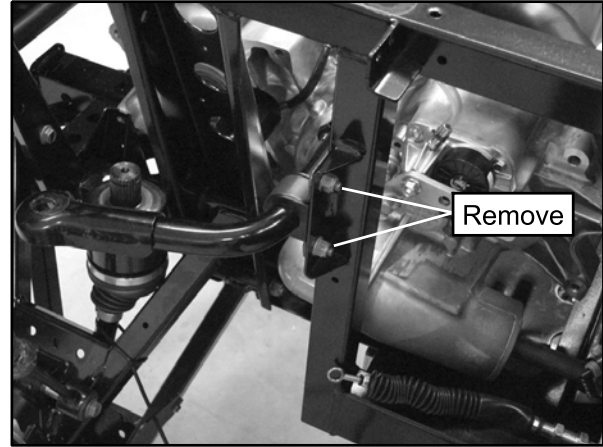
25. Retain each rear drive shaft to the lower A-arm to keep them out of the way during transmission removal.



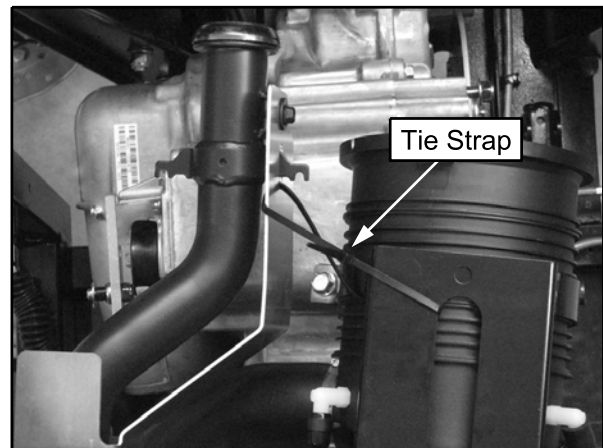
26. Using a 15mm socket and ratchet, remove the retaining nut from the upper portion of the stabilizer bar linkage bushing on each side of the vehicle.



27. Using a 1/2" socket and ratchet, remove the two fasteners that secure the stabilizer bar to the main frame on each side. Remove the stabilizer bar from the vehicle.



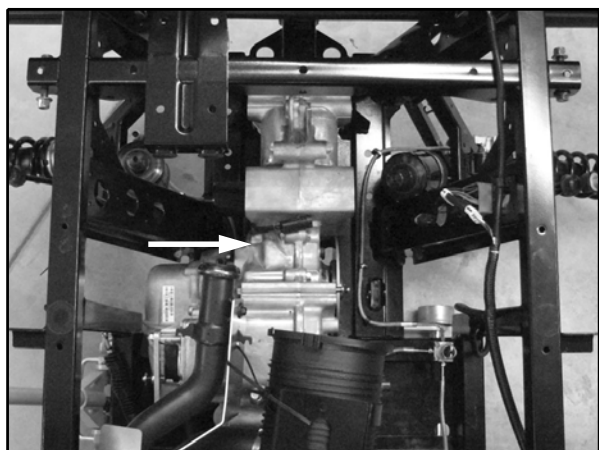
28. Tie the exhaust pipe to the airbox to hold it up during transmission removal. Remove airbox lid and air filter.



29. Remove lower clip and pin from the cargo box shock. Tie the shock out of the way or completely remove it.

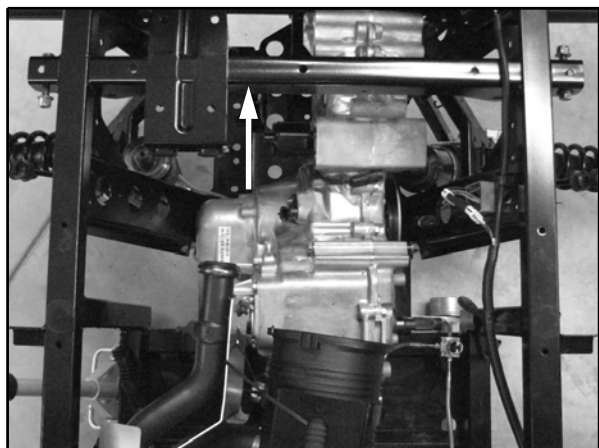
TRANSMISSION - 4X4

30. With the help of an assistant, lift up on the transmission and shift it over to the side to clear the vertical frame support.

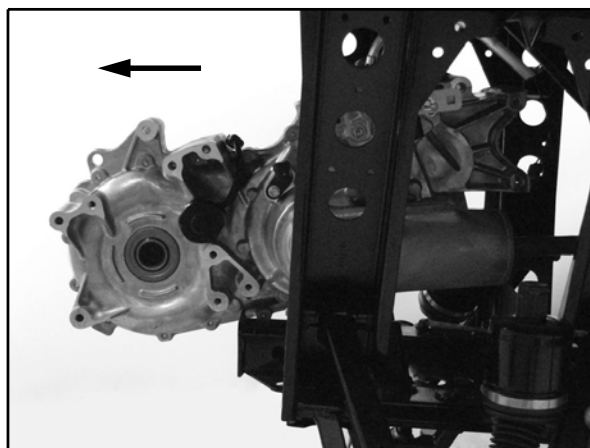


NOTE: The propshaft will slide off during removal.

31. With the help of an assistant, lift up on transmission and carefully move it towards the rear of the vehicle.



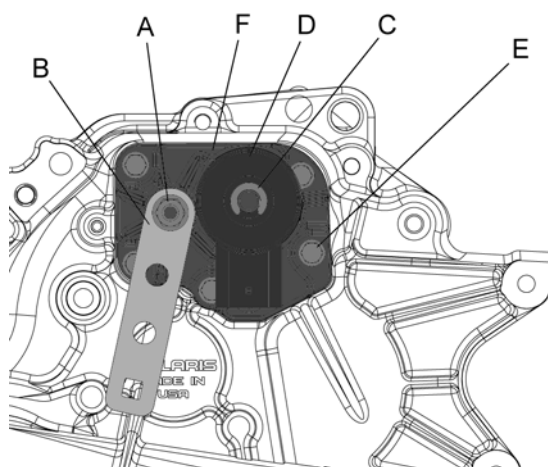
32. Close the cargo box. With the help of an assistant, remove the transmission from the rear of the vehicle as shown.



Transmission Disassembly

NOTE: Refer to the exploded view at the end of this chapter as a reference.

1. Place the transmission in Reverse before disassembly.
2. Drain and properly dispose of the transmission lubricant (see Chapter 2).
3. Remove the shift cable from the bellcrank (B).
4. Remove the bellcrank nut (A) and bellcrank (B).

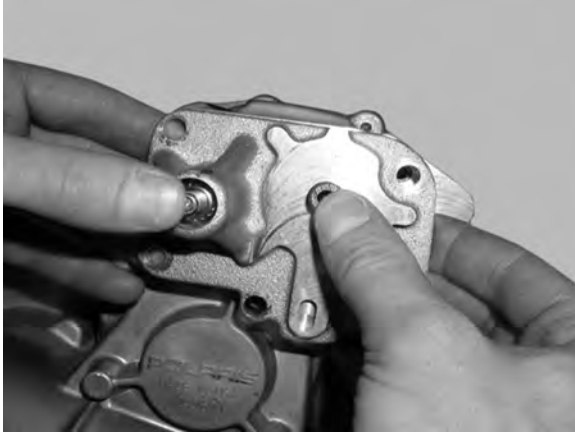


5. Remove the E-clip (C) that retains the gear selector switch (D) and remove the switch.

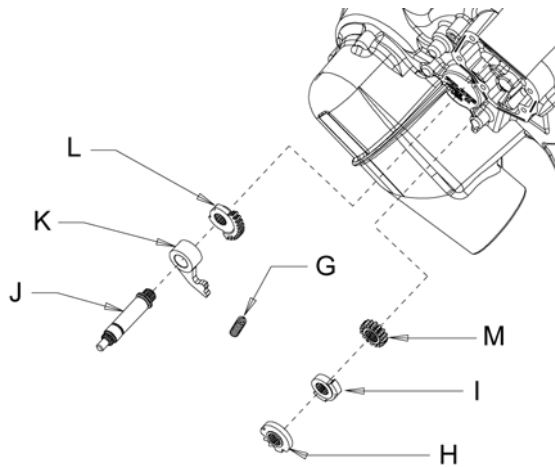
TRANSMISSION - 4X4

6. Remove the sector cover bolts (E) and remove the sector cover (F).

NOTE: Removal can be aided by using your thumbs to press down on the shafts while pulling the cover up with your fingers.



7. Remove the compression spring (G).

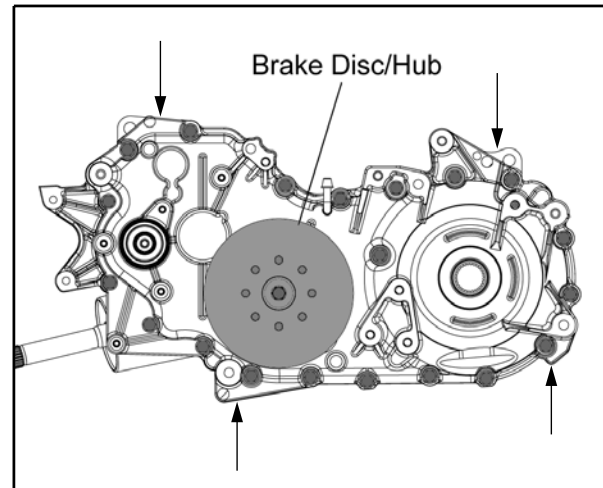


8. Remove the detent star (H). Note how the detent star fits onto the splined shaft with the raised edge facing outward for reassembly.
9. Remove the lockout disc (I). Note the raised edge facing outward for reassembly.
10. Remove the shift shaft (J), detent pawl (K) and the shift gears (L and M).

IMPORTANT: Note the timing marks on the shift gears (L and M) for reassembly purposes.

11. Remove the bolt and washer retaining the brake disc assembly to the transmission and remove the disc.

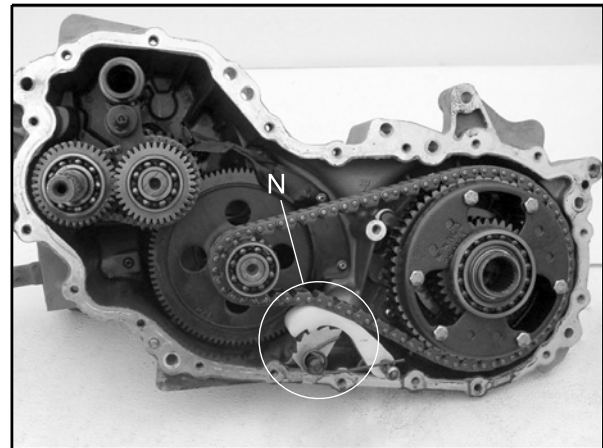
12. Remove all the transmission cover bolts. Using suitable pry bars, remove the cover using the designated pry points (indicated by the black arrows in the illustration below). Tap cover with soft face hammer to remove.



CAUTION

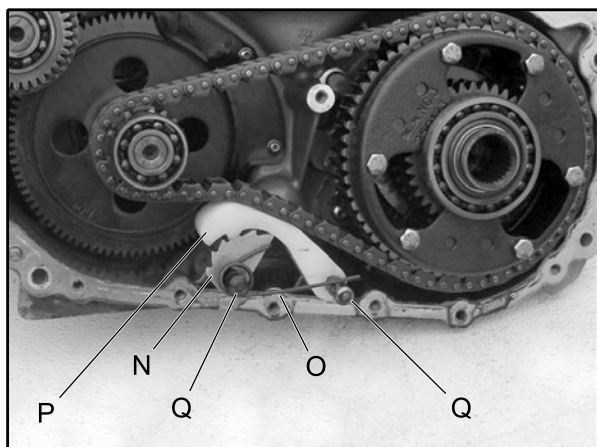
Do not pry on case sealing surfaces.
Use only the designated pry points on the transmission.

13. Note location of chain tensioner cam (N). If fully extended, chain is worn beyond service limit and should be replaced along with the chain tensioner shoe.

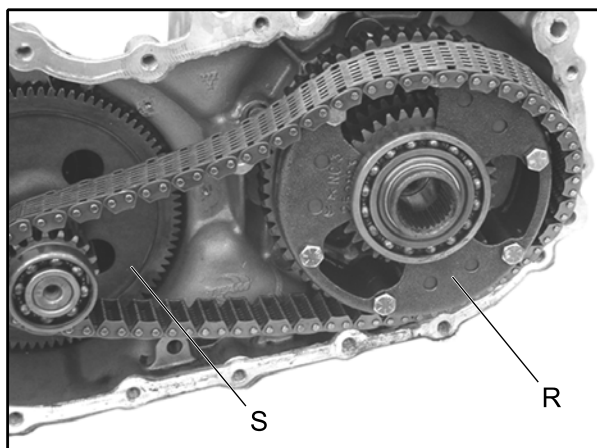


TRANSMISSION - 4X4

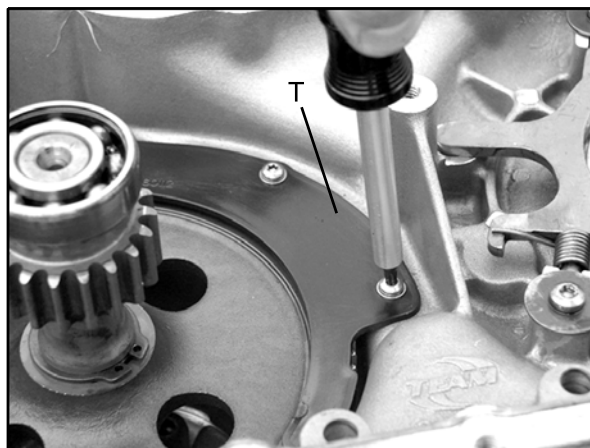
14. Remove the cam chain tensioner spring (O). Slide the cam chain tensioner shoe (P), pins (Q) and cam chain tensioner cam (N) from the assembly.



15. Remove the differential gear (R) and chain by gently prying underneath or tapping the differential gear from the opposite side until it tips toward the output gear (S). The differential gear is connected to the shift fork and must slide backwards to clear the fork arms once the chain is removed.



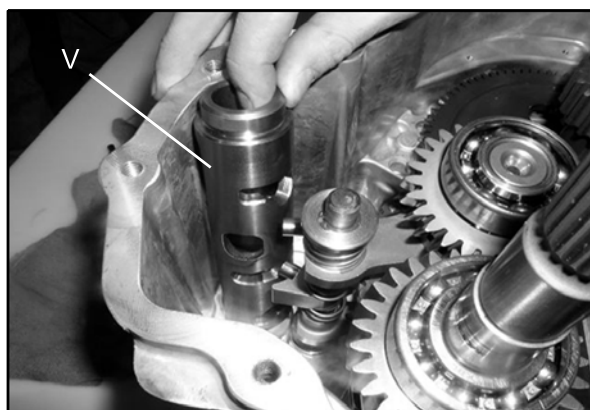
16. Using a T20 Torx driver, remove the screws that secure the oil deflector (T).



17. Using a T27 Torx driver, remove the screws that secure the output gear (U).



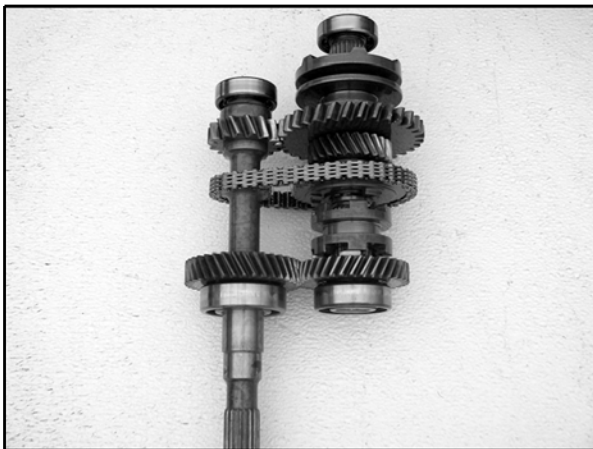
18. Remove the shift drum (V) from the gearcase by moving the drum up and to the right to clear the shift shaft.



19. Remove the output gear (U) and gear cluster assembly from the gearcase by pulling both assemblies straight up.

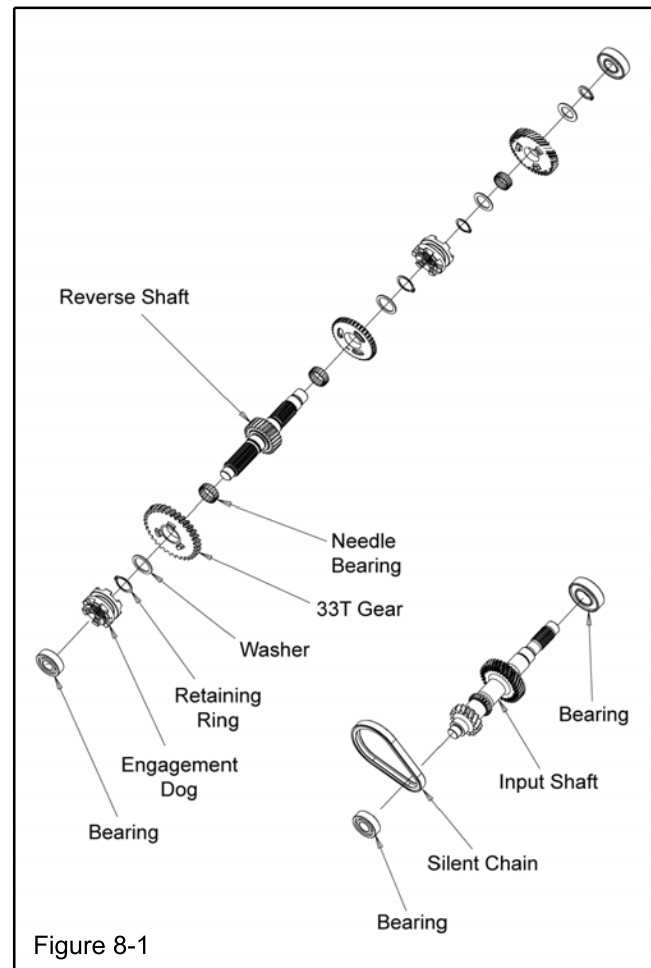


20. Place the gear cluster assembly on a clean surface for inspection.



Gear Cluster Disassembly

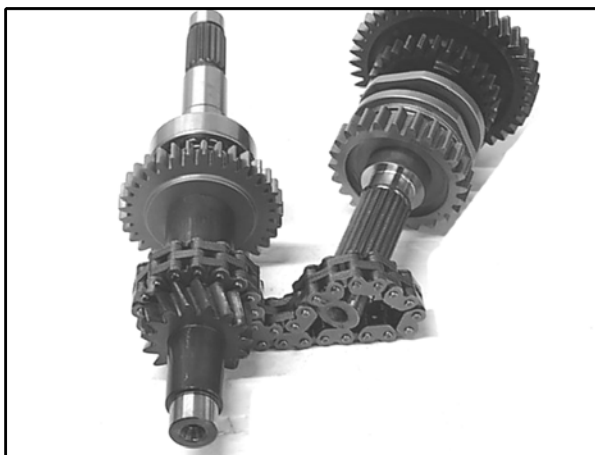
21. Remove the bearing from the reverse shaft using a bearing puller. Slide the engagement dog off of the reverse shaft (see Figure 8-1).



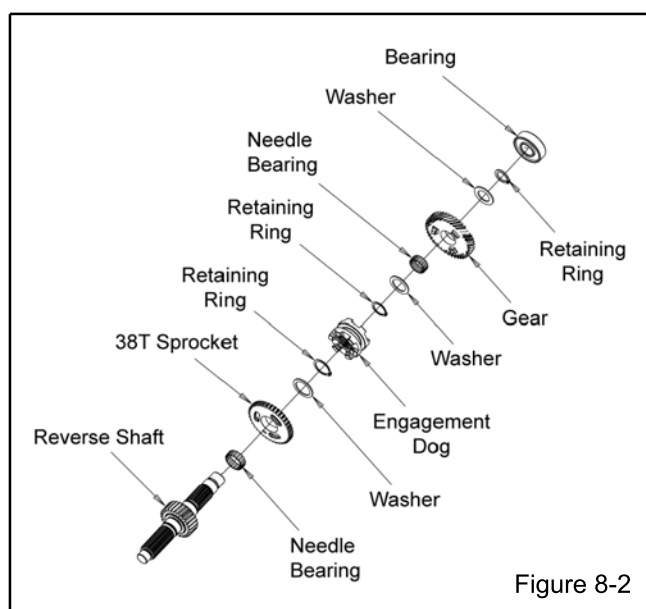
22. Remove the retaining ring and washer from the reverse shaft (see Figure 8-1).
23. Remove the bearing from the input shaft using a bearing puller (see Figure 8-1).
24. Remove the 33T gear and needle bearing from the reverse shaft (see Figure 8-1).

TRANSMISSION - 4X4

25. The reverse shaft should slide out of the silent chain to separate the assembly.

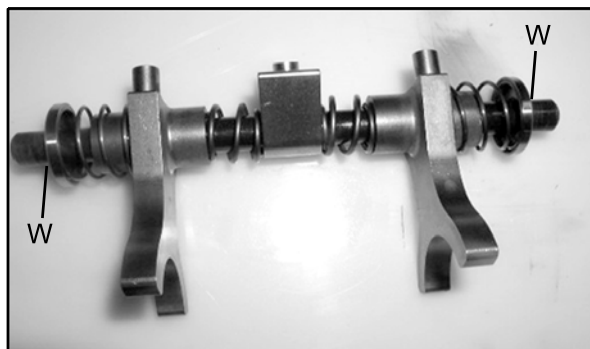


26. Remove the rest of the ball bearings from each shaft.
27. Disassemble the other end of the reverse shaft. Remove the retaining ring, washer, gear and needle bearing from the reverse shaft (see Figure 8-2).



28. Remove the washer, retaining ring and engagement dog from the reverse shaft (see Figure 8-2).
29. Remove the retaining ring, washer, 38T sprocket and needle bearing from reverse shaft (see Figure 8-2).

30. To disassemble the shift fork rail remove the snap ring (W) from the end of the shift rail on either side.

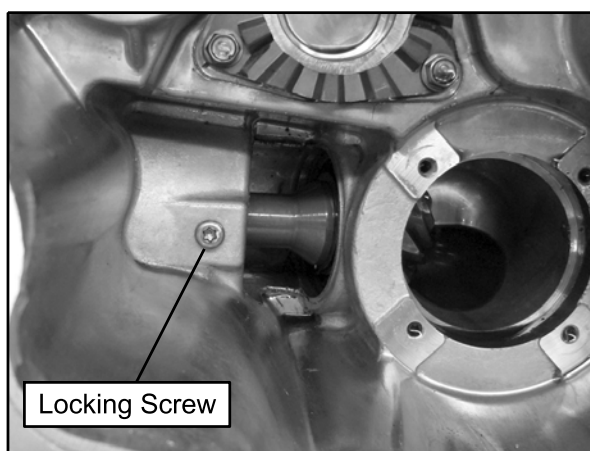


CAUTION

Use caution when disassembling the shift rail. The compressed springs on the shift rail may pop off causing eye or face injury.

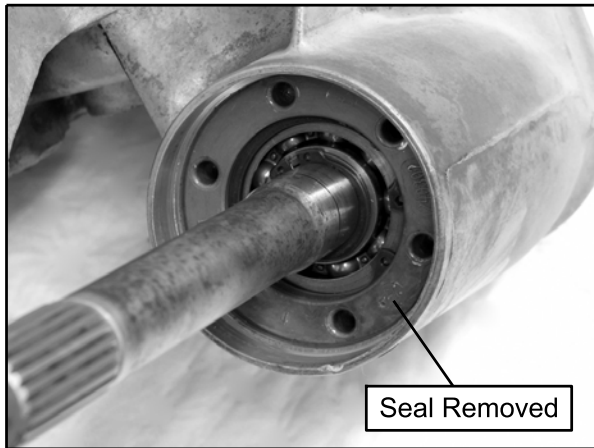
Snorkel Shaft Removal / Disassembly

31. Using a T27 Torx driver, remove the snorkel tube locking screw located inside the gearcase.

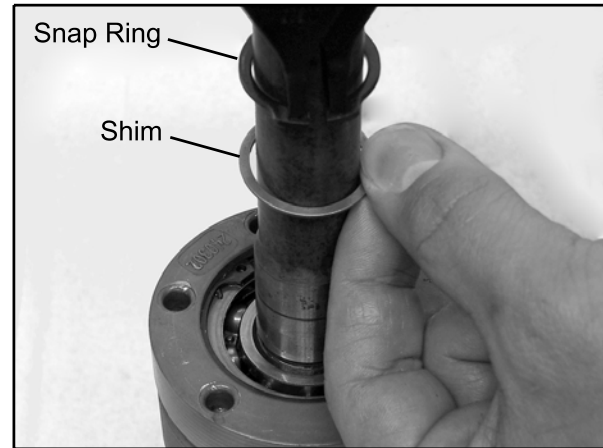


TRANSMISSION - 4X4

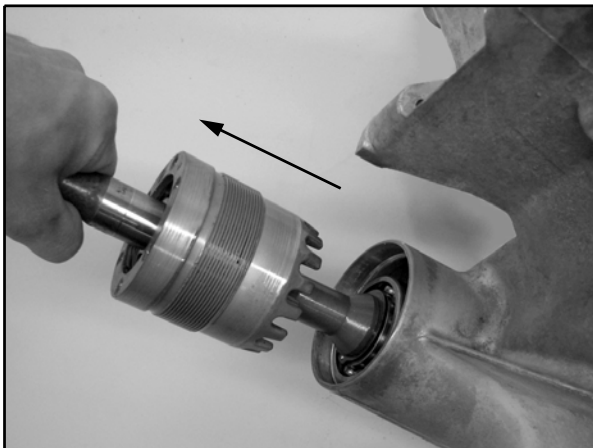
32. Remove the seal from the snorkel shaft to access the snorkel tube for removal.



34. Remove the snap ring and shim from the snorkel shaft.

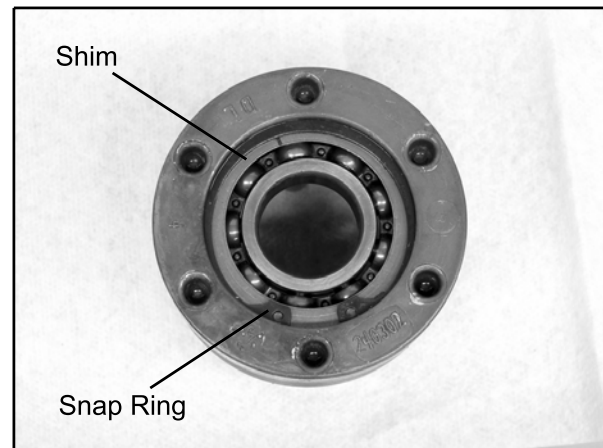


33. Using the Snorkel Tool (PA-50231), loosen and remove the snorkel tube and shaft assembly.



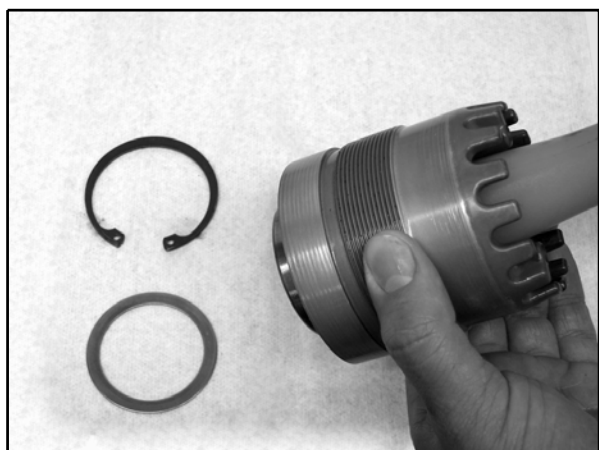
35. Use an arbor press to remove the snorkel tube from the snorkel shaft.

36. Remove the snap ring and shim retaining the bearing in the snorkel tube.

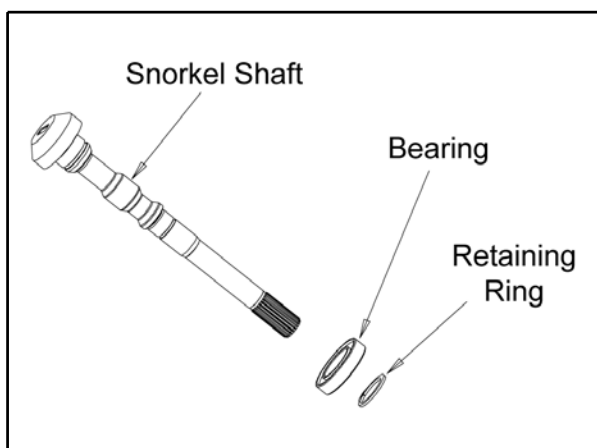


TRANSMISSION - 4X4

37. Lightly tap on the bearing from the opposite side to remove it from the snorkel tube.



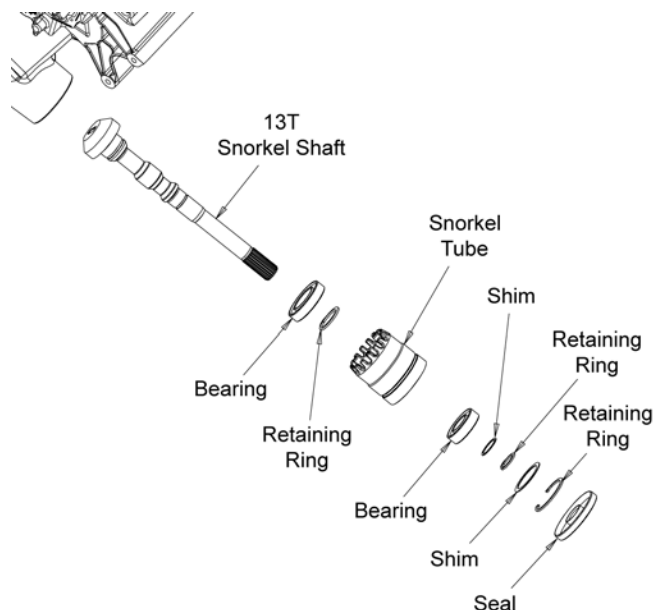
38. To remove the remaining bearing on the snorkel shaft, remove the retaining ring and press the bearing off.



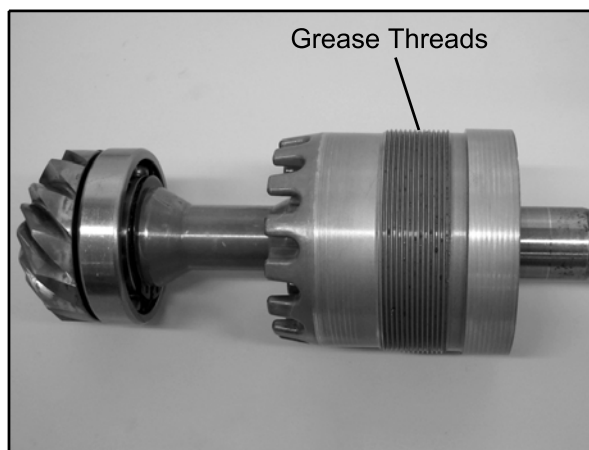
39. Remove all seals from the gearcase halves and clean the cases in preparation for assembly.

Snorkel / Output Gear Backlash Procedure

1. Reassemble the snorkel shaft assembly by reversing the disassembly procedure (see "Transmission Snorkel Shaft Removal / Disassembly" in previous section).

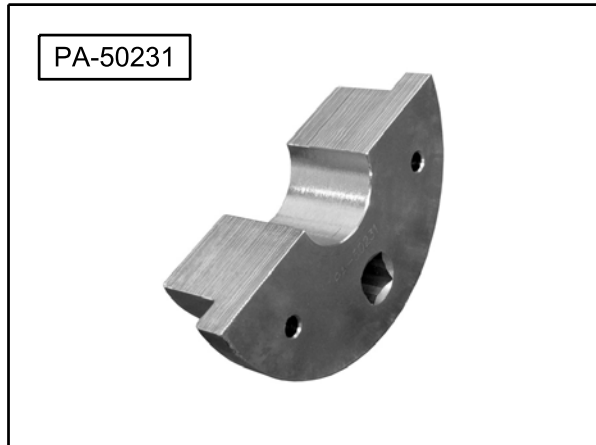


2. Apply a small amount of white lithium grease on the threads of the snorkel tube.

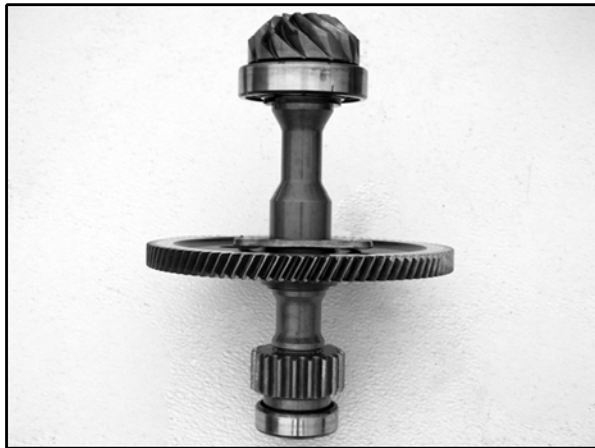


TRANSMISSION - 4X4

3. Install snorkel shaft into gearcase. Using Snorkel Tool (PA-50231), tighten snorkel tube about 10 full rotations. **Do not completely tighten snorkel tube.**

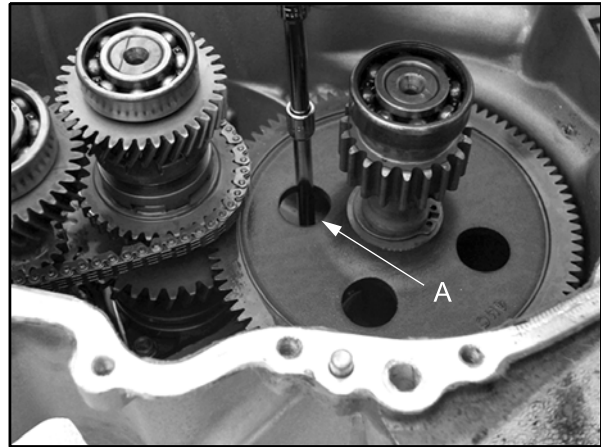


4. Inspect the output gear assembly and replace bearings if needed. Inspect each gear for damage, chips or abnormally worn teeth.



5. Install output gear assembly. Be sure to properly mesh the snorkel shaft bevel gear with output bevel gear.

6. Install the 4 Torx screws (A) that secure the output gear assembly. Torque the screws to specification.



Output Gear Retaining Screws:
8-12 ft-lbs (11-16 Nm)

7. Tighten the snorkel tube until it is lightly seated using the snorkel tool (PA-50231). Turn the output shaft to prevent binding while tightening the snorkel tube. Make sure the snorkel shaft gear and output bevel gear have 'zero' lash.

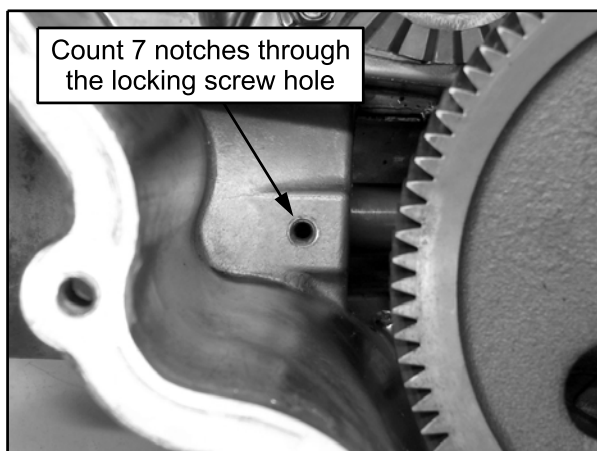
NOTE: It is important to have zero lash between the output gear and the snorkel shaft gear. If there is binding or excess lash, tighten or loosen the snorkel shaft until there is zero lash.

IMPORTANT: Do not overtighten the snorkel tube. Gears should rotate freely without binding.

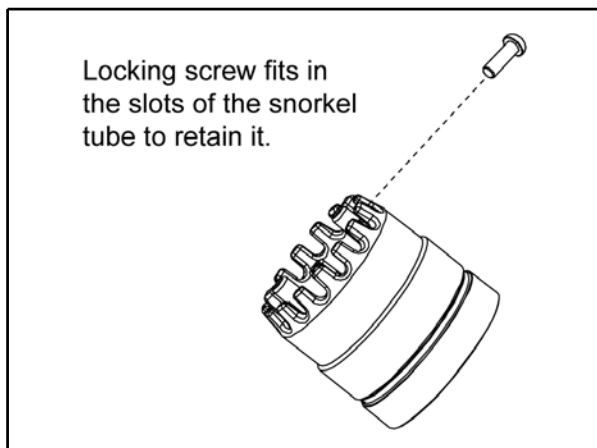
8. Look down into the gearcase at the snorkel locking screw hole opening to reference your starting point.

TRANSMISSION - 4X4

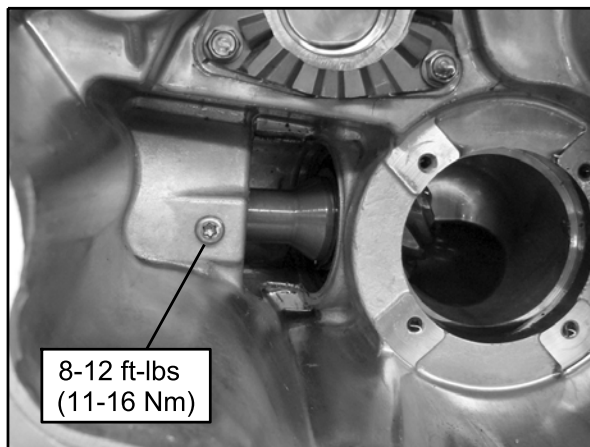
9. Slowly rotate the snorkel tube counterclockwise while counting the number of notches passing through the hole opening as you rotate the tube. Rotate the snorkel tube to the **7th** notch from the 'seated' position obtained in step 7.



10. Check the output shaft gear backlash again by feel. If the output shaft lash appears to be too tight, rotate the snorkel shaft counterclockwise to the next notch.
11. Once backlash is set, apply Loctite® 242™ to threads and install locking screw to secure the snorkel tube.

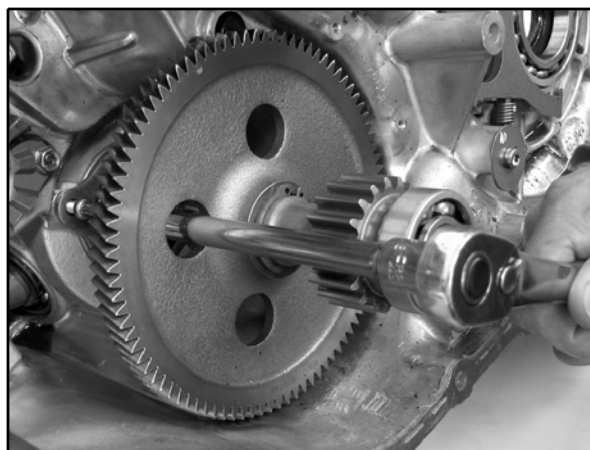


12. Torque the locking screw to specification.



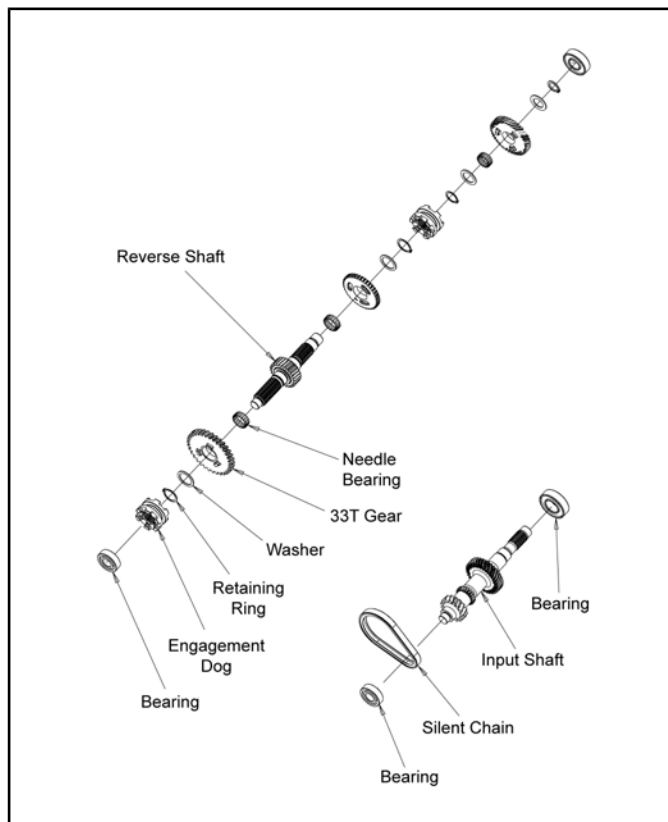
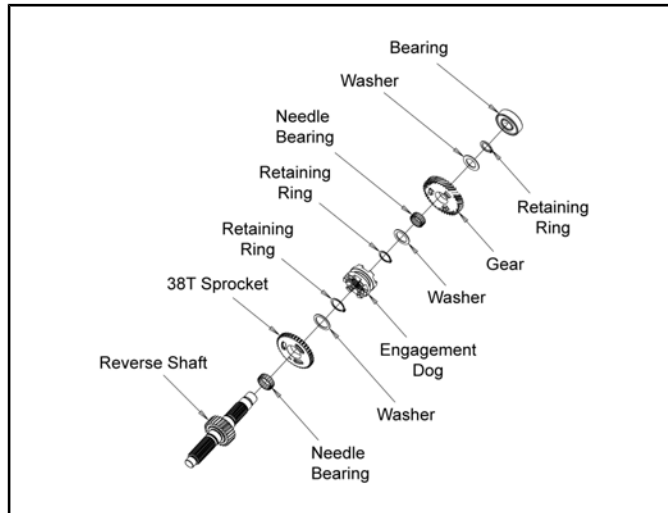
Snorkel Locking Screw:
8-12 ft-lbs (11-16 Nm)

13. With the snorkel shaft properly installed, remove the (4) Torx screws and remove the output shaft.

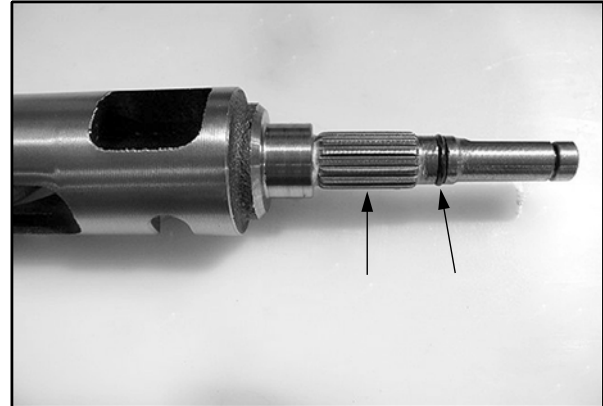


Transmission Assembly

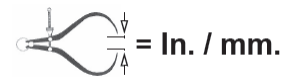
1. Assemble reverse shaft and input shaft if previously disassembled (see illustrations).



2. Inspect the shift drum for any damage or wear. Inspect the splines of the shift drum. Replace the O-ring on the end of the shift drum and lubricate it before assembly.



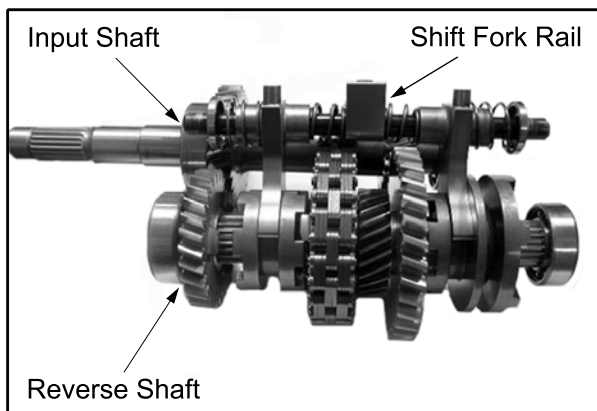
3. Stretch the silent chain on a flat surface and measure the length of 8 pitches in a minimum of three places on the chain. Replace the chain if the measurement is longer than the service limit.



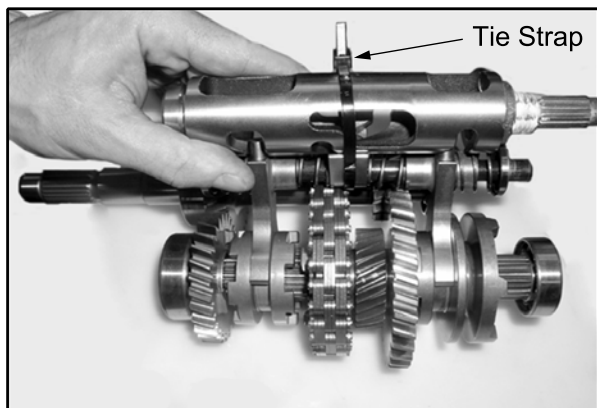
Silent Chain Service Limit (8 pitch):
3.090" (7.849 cm)

TRANSMISSION - 4X4

4. The shift drum, reverse shaft, input shaft, shift fork rail and output gear assembly must be installed at the same time to properly align all components.



NOTE: To ease assembly use a plastic tie strap to hold the shift forks and the shift drum together during assembly.

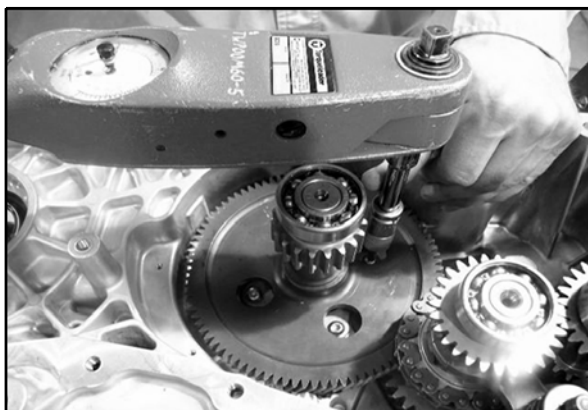


5. With the gearcase on it's side, hold the gear cluster assembly and output assembly together. Carefully install each shaft into their respective recess in the gearcase.



6. With all the components in the correct position, install the (4) output gear assembly retaining screws. Apply Loctite® 242™ to the threads of the screws. Torque the screws to specification.

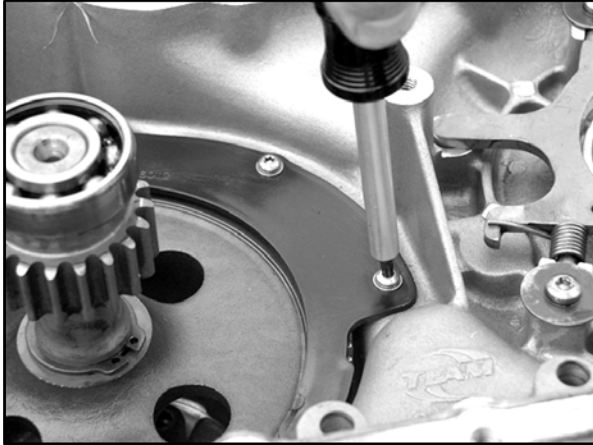
NOTE: If the transmission is in gear, place the transmission in Neutral.



Output Gear Retaining Screws:
8-12 ft-lbs (11-16 Nm)

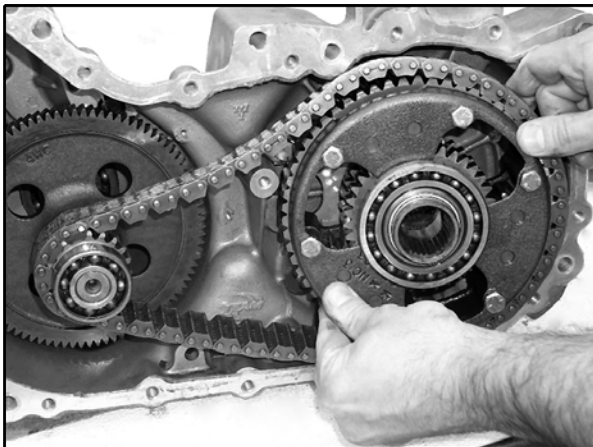
TRANSMISSION - 4X4

7. Install the oil deflector shield into the gearcase. Apply Loctite® 242™ to the threads of the screws. Torque the screws to specification.



Oil Deflector Retaining Screws:
20-30 in-lbs (2.3-3.4 Nm)

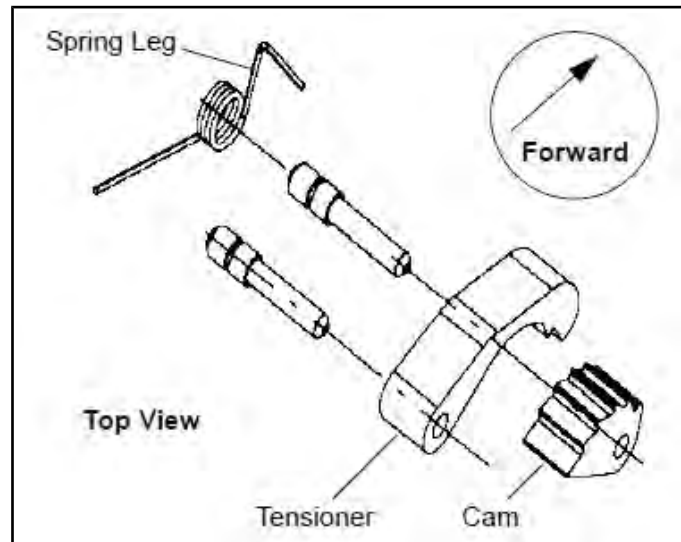
8. Install the rear drive differential and drive chain, following these precautions:
- The case half rear output seal should be removed prior to differential installation, as seal damage can occur with seal installed due to the angle of entry.
 - Install differential sliding geardog onto the shift fork arms at the same time the silent chain is installed.
 - The differential gear bearing may be lightly tapped into place. The output seal can be installed once the assembly is in place.



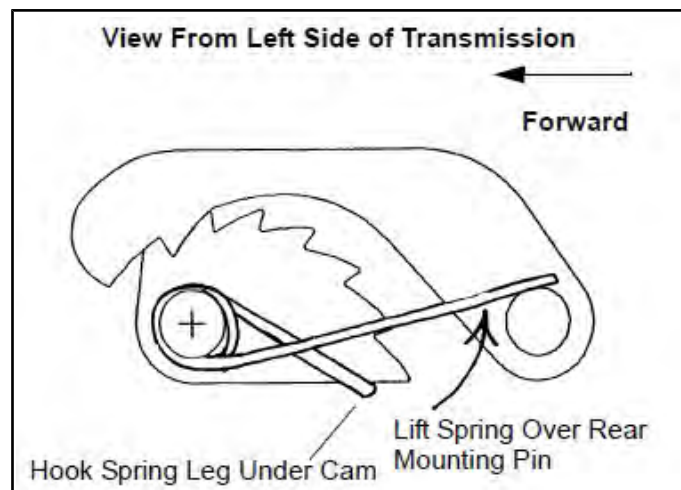
9. Tensioner Installation:

NOTE: Case-half mating may be difficult due to tensioner pressure on the silent chain during installation. Release tension at the ratcheting cam to aid case half installation. Install the tensioner spring after the case halves are mated but not yet touching.

- Assemble the tensioner cam and tensioner shoe and place them into the transmission.
- Insert the front pin through the tensioner cam and the rear pin through the tensioner shoe.



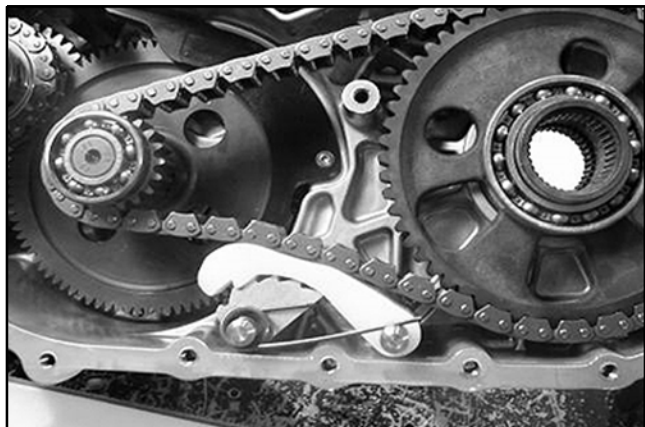
- Place the spring over the front pin and hook the spring leg under the cam.



8

TRANSMISSION - 4X4

- Lift the end of the spring up and over the rear pin. The tensioner cam will lift the shoe to provide chain tension.

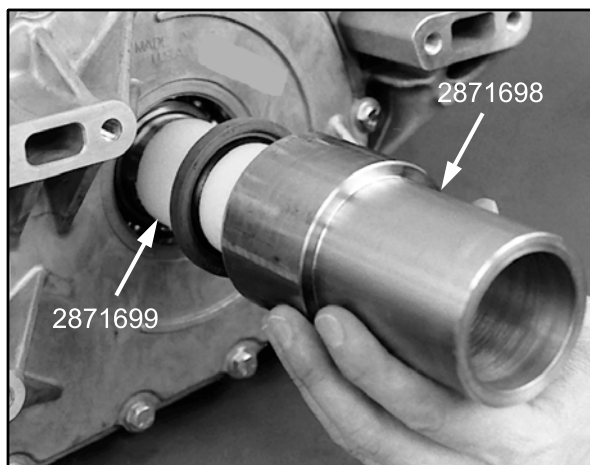
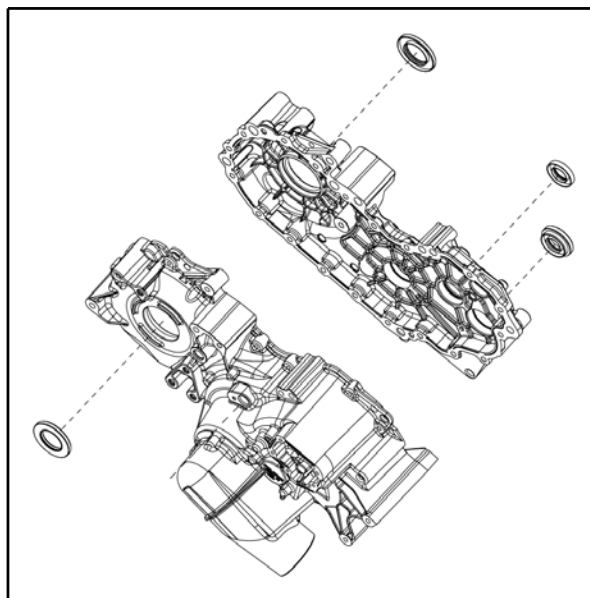


10. Apply a continuous bead of Crankcase 3 Bond Sealant (PN 2871557) to the LH gearcase mating surface and install the cover. Install and tighten the (20) screws in an even criss-cross pattern to evenly secure the cover. Torque the screws to specification.



Gearcase Cover Bolts:
25-30 ft-lbs (34-41 Nm)

11. Install all new seals into the gearcases. Use the Rear Output Seal Driver (PN 2871698) and Rear Driveshaft Seal Guide (PN 2871699) to install the seals into the gearcase halves (refer to the following illustration to identify the seals needing replacement).

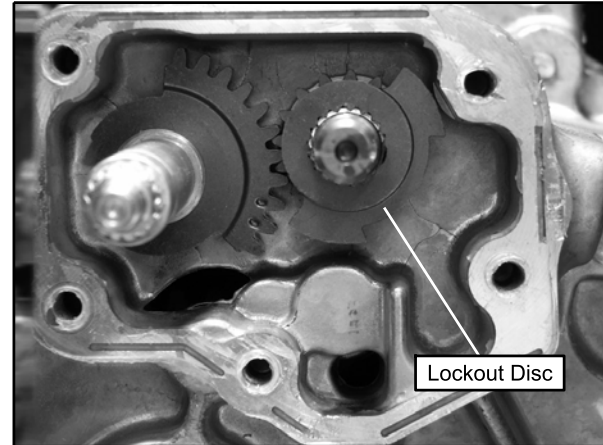


TRANSMISSION - 4X4

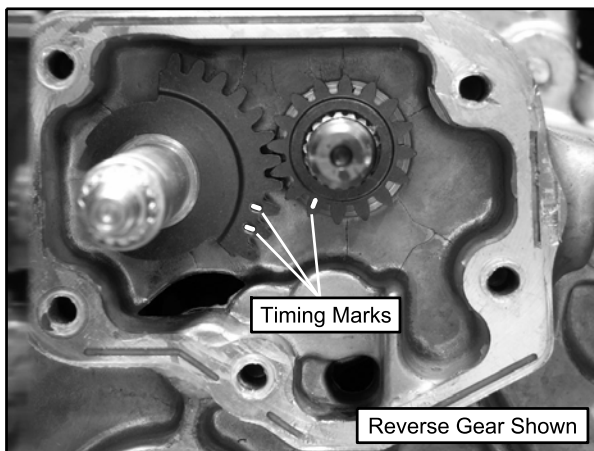
12. Thoroughly clean the shift shaft housing. **Be sure the transmission is in Reverse prior to reassembly.**



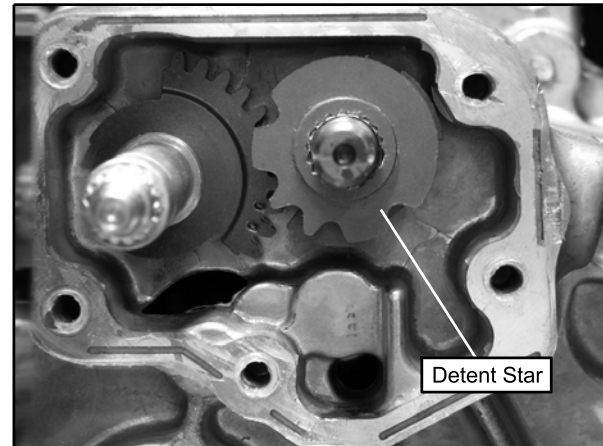
14. Install the lockout disc onto the shift drum shaft. Be sure to install the lockout disc with the raised edge facing outward.



13. Install the sector gear (16T) onto the shift drum shaft. Install the shift shaft assembly and sector gear (11T) into the bushing pocket on the left side. Align the timing marks on the gears as shown.

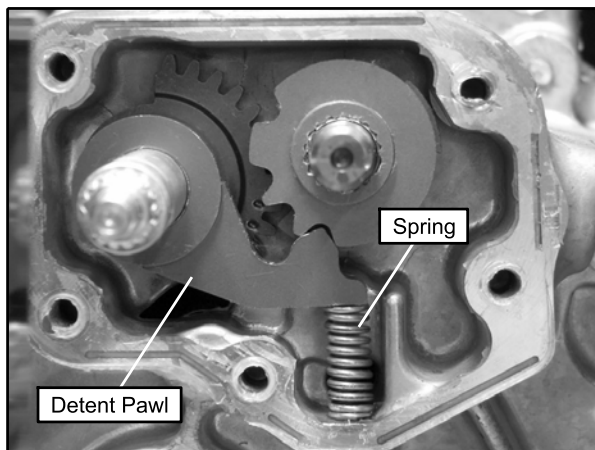


15. Install the detent star onto the shift drum shaft. Be sure to install the detent star with the raised edge facing outward.

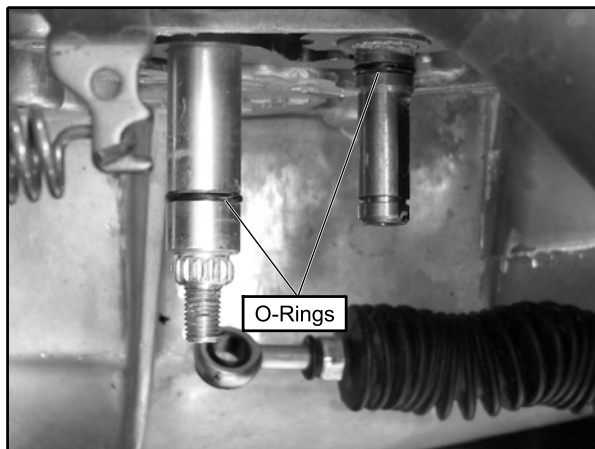


TRANSMISSION - 4X4

16. Install the detent pawl onto the shift shaft and carefully install the compression spring.



17. Install a new O-ring on each shift shaft. Apply a small amount of white lithium grease on the O-rings, shift shafts and component contact surfaces prior to installing the sector cover.



18. Apply Crankcase Sealant (3-Bond) (PN 2871557) onto the cover and transmission case mating surface. Install the sector cover and torque the bolts to specification.



Sector Cover Bolts:
8-12 ft-lbs (11-16 Nm)

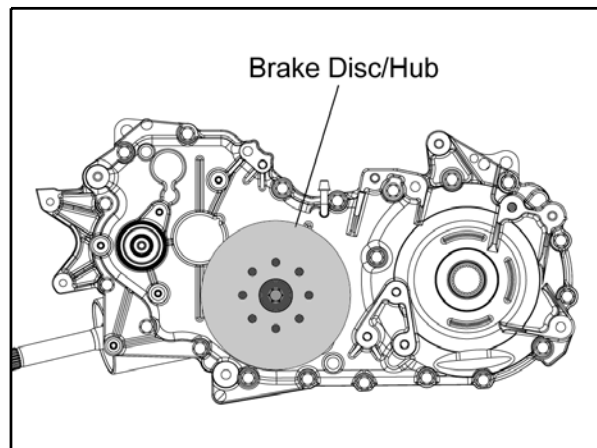
19. Install the bellcrank onto the shift shaft. **Note the key splined on the bellcrank and shift shaft.** Install the nut and torque to specification.



Bellcrank Nut:
12-18 ft-lbs (16-24 Nm)

20. Install the transmission gear selector switch and secure the switch with the retaining ring.

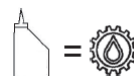
21. Install the brake disc assembly onto the output shaft. Apply Loctite® 262™ or 2760™ to the mounting bolt threads and torque the bolt to specification.



Park Brake Disc Mounting Bolt:
10-15 ft-lbs (14-20 Nm)

Transmission Installation

1. If transmission lubricant was drained, fill the transmission with the specified amount of Polaris AGL prior to installation.



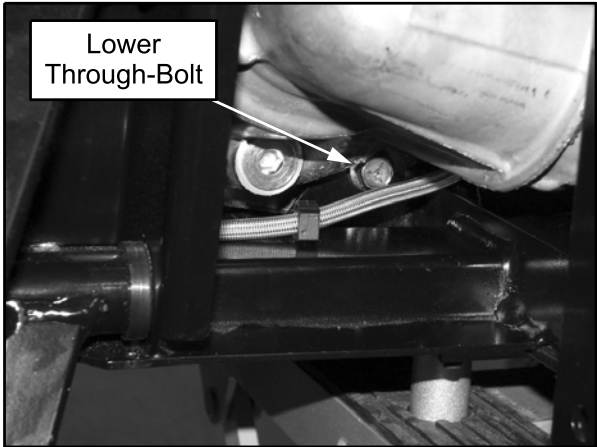
Recommended Transmission Lubricant:
AGL (PN 2878068) (Quart)

Capacity: 33.8 oz. (1000 ml)

TRANSMISSION - 4X4

- 2. Apply Polaris Premium All Season Grease (PN 2871423) to splines of front output shaft.
- 3. *With the help of an assistant*, position the transmission into the frame from the rear of the vehicle. Align the output shaft and propshaft splines while positioning the transmission to allow the shafts to slide together.
- 4. Install the engine-to-transmission mount bracket.
- 5. Install the (2) rubber engine mounts into the engine crankcase.
- 6. Position the engine-to-transmission mount bracket and install the (2) through-bolts and (2) lower engine mount nuts loosely.
- 7. Install the lower and rear transmission through-bolts.

IMPORTANT: Be sure the brake line is clear of the lower through-bolt upon installation.



- 8. Torque all transmission mount fasteners to specification.

 = T
Transmission Mounting Fastener: Front 5/16" Bolts: 20 ft-lbs (27 Nm) Lower / Rear 3/8" Bolts: 37 ft-lbs (50 Nm)

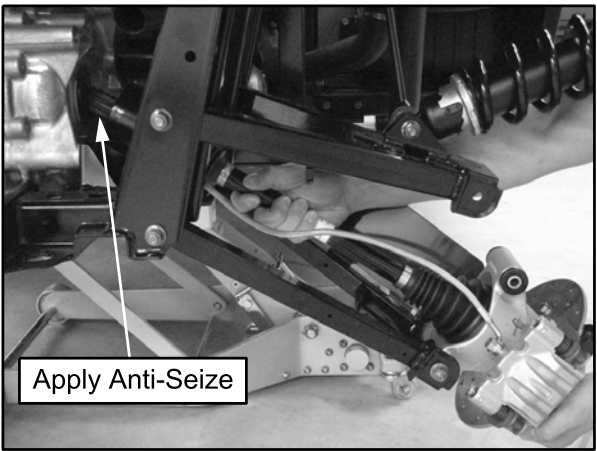
- 9. Install the parking brake caliper assembly and torque the mount bracket fasteners to specification.

 = T
Parking Brake Caliper to Mount Bracket: 18 ft-lbs (24 Nm) Mount Bracket to Transmission: 40 ft-lbs (54 Nm)

- 10. Connect electrical harnesses to the rear diff solenoid, gear selector switch and vehicle speed sensor.
- 11. Remove the tie straps retaining each drive shaft and the one retaining the exhaust pipe to the airbox. Reinstall the air filter and airbox lid.
- 12. Properly route the transmission vent line. Be sure vent line is not kinked or pinched.
- 13. Install the rear cargo box shock.
- 14. Install the stabilizer bar to the frame and to each stabilizer linkage. Torque fasteners to specification.

 = T
Stabilizer Bar Retaining Bolts: Stabilizer Linkage Rubber Bushing Nuts: 17 ft-lbs (24 Nm)

- 15. Apply anti-seize to the splines of each rear drive shaft and insert them into the transmission.

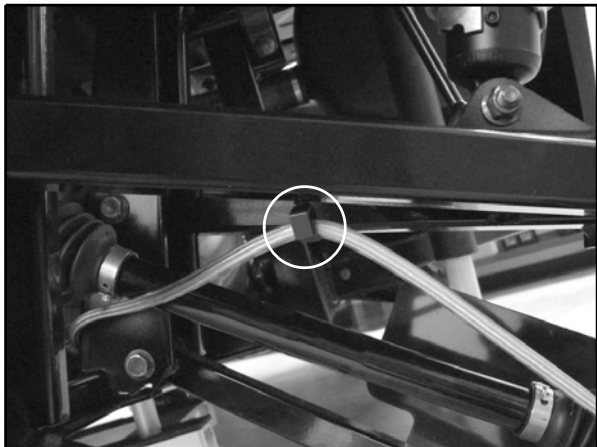


- 16. Attach the rear upper A-arms to the bearing carrier on each side and torque the fasteners to specification.

 = T
Rear Upper A-Arm to Bearing Carrier Bolts: 30 ft-lbs (41 Nm)

TRANSMISSION - 4X4

17. Place the rear brake line into the retainer located on each rear upper A-arm.

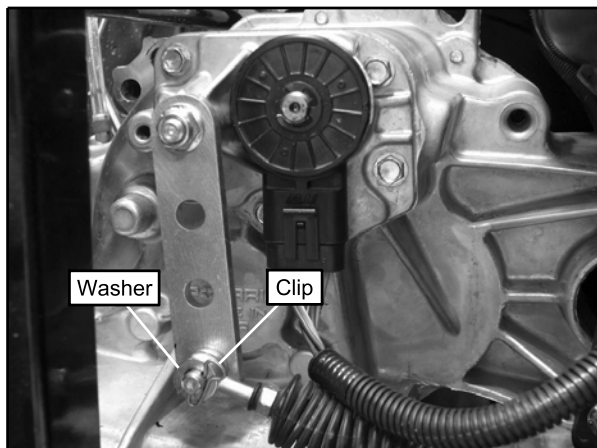


18. Attach the rear shocks to the frame and torque the upper fasteners to specification.



Rear Upper Shock Bolts:
30 ft-lbs (41 Nm)

19. Install the shift cable onto the mount bracket.
20. Install the shift cable onto the transmission bell crank end and secure with the outer washer and clip.



21. If both adjustment jam nuts were moved, adjust the shift cable (see "Shift Cable - Adjustment").
22. Install the exhaust silencer and (2) retaining springs.
23. Install the inner PVT cover and torque the (8) screws to specification (see Chapter 6).

24. Install the drive clutch, driven clutch and drive belt. Torque the clutch retaining bolts to specification (see Chapter 6).

NOTE: Align clutches as outlined in Chapter 6.

25. Install the outer PVT cover and (9) screws. Torque the screws to specification (see Chapter 6).
26. Install the brake switch harness below the outer PVT cover.
27. Install the rear wheels, washers and wheel nuts. Torque the wheel nuts to specification.



Wheel Nuts:
Steel Wheels: **35 ft-lbs (47 Nm)**
Aluminum Wheels: **30 ft-lbs (41 Nm) + 90°**

28. Carefully lower the vehicle to the ground and reinstall the side storage container and seat.

TROUBLESHOOTING

Troubleshooting Checklist

Check the following items when shifting difficulty is encountered.

- Shift cable adjustment/condition
- Idle speed (throttle cable routing)
- PVT clutch alignment
- Transmission lubricant type/quality
- Drive belt deflection (where applicable)
- Loose fasteners on sector gear cover
- Worn rod ends, clevis pins, or pivot arm bushings
- Shift selector rail travel
- Worn, broken or damaged internal transmission components

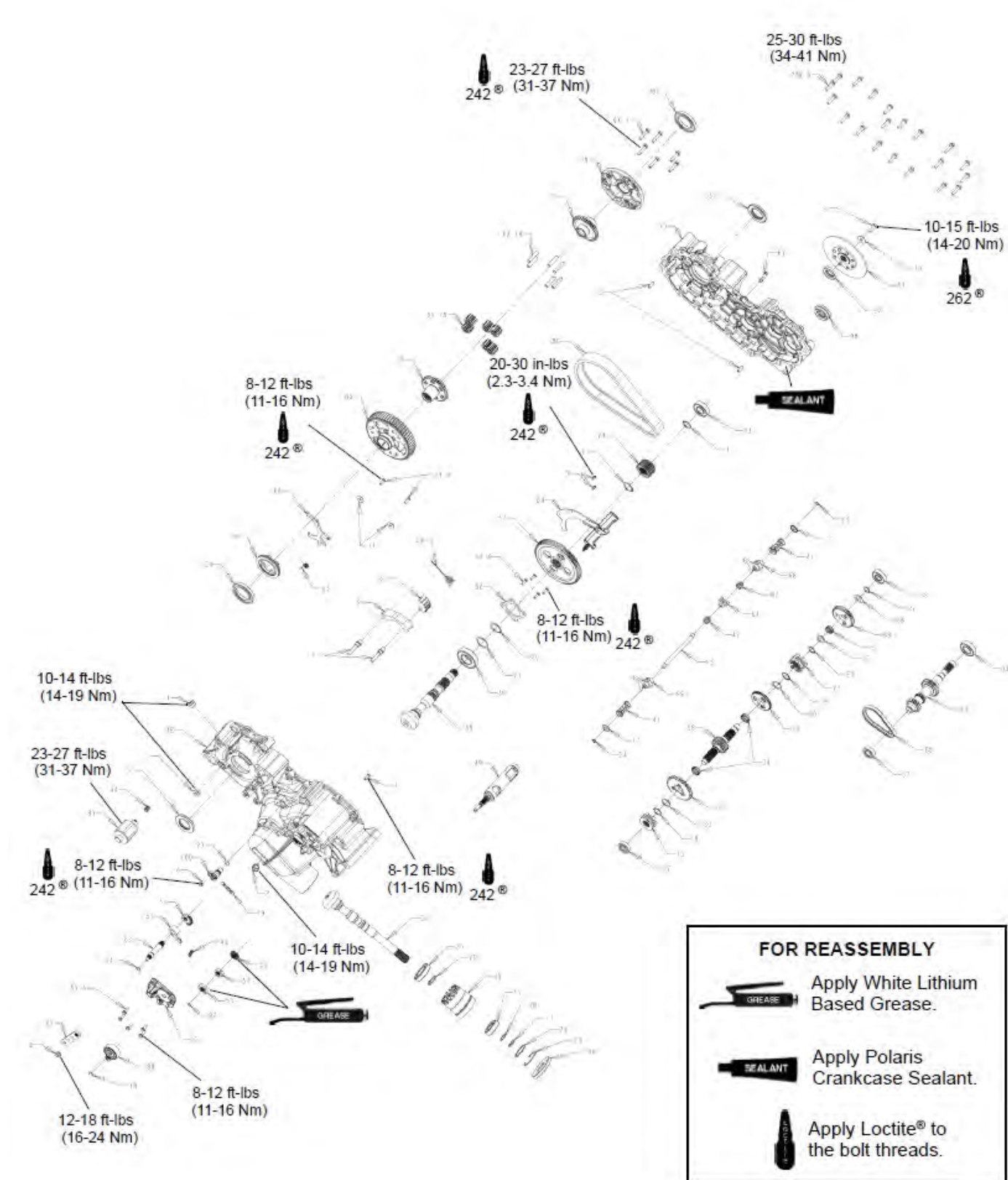
NOTE: To determine if shifting difficulty or problem is caused by an internal transmission problem, isolate the transmission by disconnecting the shift cable end from the transmission bellcrank. Manually select each gear range at the transmission bellcrank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding) or damage. Inspect all bearings, circlips, thrust washers and shafts for wear.

TRANSMISSION - 4X4

TRANSMISSION EXPLODED VIEW

RANGER 4X4 800 (PN 1332961); RANGER CREW 800 (PN 1332977)



TRANSMISSION - 4X4

REF.	QTY.	DESCRIPTION	REF.	QTY.	DESCRIPTION
1.	2	Fill Plug	49.	1	Shift Drum
2.	1	Drain Plug, Magnetic	50.	1	Gear, Sector 16T
3.	2	Screw, Self Tapping Torx	51.	1	Gear, Sector 31T
4.	7	Screw, Torx	52.	1	Detent Pawl
5.	20	Screw, Self Tapping Hex	53.	1	Detent Star
6.	6	Screw, Self Tapping Hex	54.	1	Lockout Disc
7.	6	Screw	55.	1	Input Shaft, 31T (CREW); Input Shaft, 35T (4X4)
8.	1	Screw	56.	1	Gear, Snorkel, 13T
9.	1	Lock Nut	57.	1	Gear, Output, 91T
10.	1	Washer	58.	1	Reverse Shaft, 26T
11.	2	Washer, Fender	59.	1	Pinion, Center Drive, 13T
12.	2	Washer, Cup	60.	1	Shoe, Chain Tensioner
13.	1	Washer, Fender	61.	1	Cam, Chain Tensioner
14.	2	Pin	62.	1	Bellcrank, Shift Drum
15.	2	Dowel Pin	63.	1	Shift Shaft
16.	6	Dowel Pin	64.	1	Shift Collar
17.	2	Retaining Ring, External	65.	1	Rail, Shift Shaft
18.	1	Snap Ring	66.	2	Shift Fork
19.	2	Retaining Ring	67.	1	Vent Tube
20.	2	Retaining Ring	68.	1	Fork, Pivot Shift, Rear Diff
21.	1	Retaining Ring	69.	1	Gear, 41T (CREW); Gear, 36T (4X4)
22.	1	Retaining Ring, External	70.	1	Sprocket, 38T, 6-Face
23.	1	Retaining Ring, Internal	71.	1	Gear, 33T, 6-Face
24.	2	Retaining Ring, External	72.	1	Engagement Dog, 6-Face
25.	1	Retaining Ring, External	73.	1	Sprocket, 19T
26.	1	Thrust Washer	74.	1	Engagement Dog
27.	1	Shim	75.	1	Engagement Dog, Low, 6-Face
28.	1	Shim	76.	1	Side Gear, 36T, Disconnect
29.	1	Shim	77.	1	Side Gear, 36T
30.	2	Thrust Washer	78.	6	Planet Gear Assembly
31.	1	Bearing, Needle	79.	1	Cover
32.	1	Bearing, Ball	80.	1	Carrier Assembly
33.	3	Bearing, Ball	81.	1	Brake Disc/Hub Assembly
34.	2	Bearing, Needle	82.	1	Bearing Cover, Center Drive
35.	1	Bearing, Ball	84.	1	Oil Deflector
36.	1	Bearing, Ball	85.	1	Chain
37.	2	Bearing, Ball	86.	1	Silent Chain

TRANSMISSION - 4X4

REF.	QTY.	DESCRIPTION	REF.	QTY.	DESCRIPTION
38.	2	Bearing, Ball	87.	1	Solenoid
39.	1	Torsion Spring	88.	1	Rotary Switch, 2-Pin
40.	1	Compression Spring	92.	1	O-Ring
41.	2	Compression Spring	93.	1	O-Ring
42.	2	Compression Spring	94.	1	O-Ring
43.	1	Torsion Spring	95.	1	Seal, Triple Lip
44.	1	Compression Spring	96.	1	Seal, Triple Lip
45.	1	Snorkel Tube	97.	2	Seal, Triple Lip
46.	1	Cover, Sector	98.	1	Seal, Dual Lip
47.	1	Cover, LH	100.	1	Speed Sensor
48.	1	Case, RH			

CHAPTER 9

TRANSMISSION - 6X6

TORQUE SPECIFICATIONS 9.2

SHIFT LEVER 9.2

 REMOVAL 9.2

 INSTALLATION 9.2

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TRANSMISSION SERVICE 9.4

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TROUBLESHOOTING 9.19

 TROUBLESHOOTING CHECKLIST 9.19

TRANSMISSION EXPLODED VIEW 9.20

 RANGER 6X6 800 (PN 1332978) 9.20

TRANSMISSION - 6X6

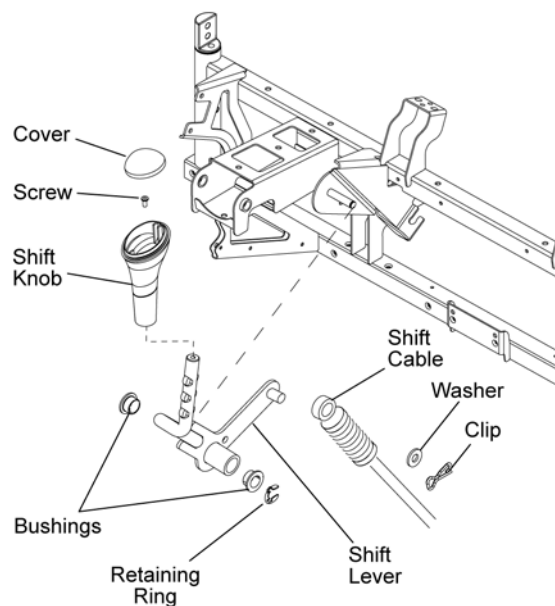
TORQUE SPECIFICATIONS

ITEM	TORQUE VALUE
Transmission Fill Plug	10-14 ft-lbs (14-19 Nm)
Transmission Drain Plug	10-14 ft-lbs (14-19 Nm)
Transmission Case Bolts	27-34 ft-lbs (37-46 Nm)
Transmission Mounting Bolts	40 ft-lbs (54 Nm)
Bell Crank Nut	12-18 ft-lbs (16-24 Nm)
Bell Crank Gear Cover	7-9 ft-lbs (10-12 Nm)

SHIFT LEVER

Removal

1. Remove the (2) push rivets retaining the dash panel and remove the panel from the dash to access the shift lever.
2. Remove the shift knob cover, retaining screw and shift knob from the shift lever.



3. Remove grommet around shift lever from the dash.
4. Remove clip and washer retaining shift cable to the shift lever. Disconnect the cable end from the lever.
5. Remove the retaining ring, outer washer, and both bushings from the shift lever.
6. Slide the shift lever off the mounting bracket and out from the frame.

Installation

1. Repeat the steps in reverse order to install the gear shift lever.

SHIFT CABLE

Inspection

Shift cable adjustment is necessary when symptoms include:

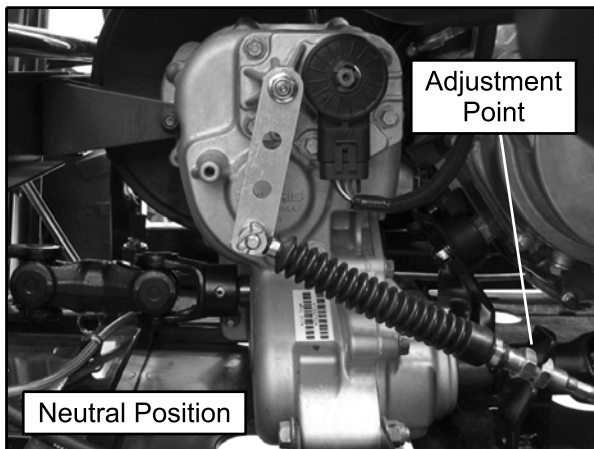
- Noise on deceleration
- Inability to engage a gear
- Excessive gear lash (noise)
- Gear selector is moving out of desired range

Inspect shift cable, clevis pins, and pivot bushings and replace if worn or damaged.

Adjustment

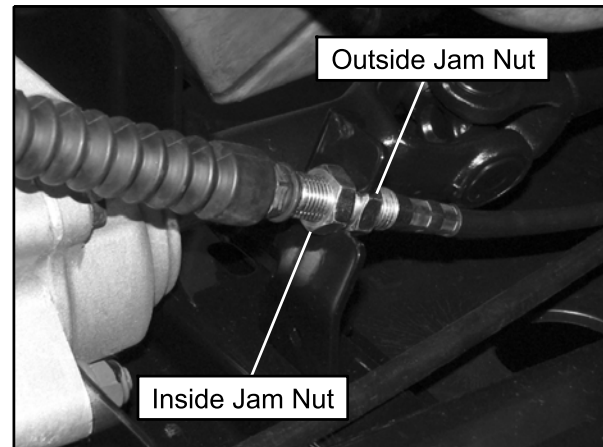
NOTE: The shift cable should be adjusted at the rear adjustment point located near the transmission. If adjustment is needed beyond that, remove the dash panel to access the shift cable adjustment point located underneath the shift lever.

1. Place gear selector in neutral. Make sure the transmission bell crank is engaged in the neutral position detents.



2. Locate the shift cable adjustment point attached to the frame in front of the transmission.

3. With two open-end wrenches loosen the outside jam nut counterclockwise. Turn the outside jam nut 1 1/2 turns.



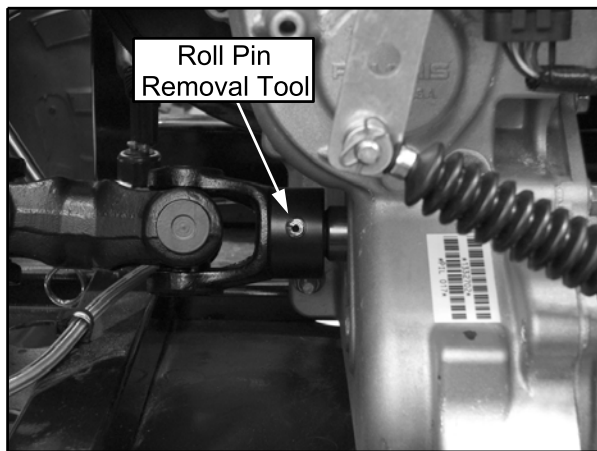
4. After turning the outside jam nut 1 1/2 turns. Hold the outside jam nut with a wrench and tighten the inside jam nut clockwise, until it is tight against the bracket.
5. Repeat Step 3 and Step 4 until the proper adjustment is made for the transmission cable.
6. Use this procedure to loosen or tighten the shift linkage cable as needed.

TRANSMISSION - 6X6

TRANSMISSION SERVICE

Transmission Removal

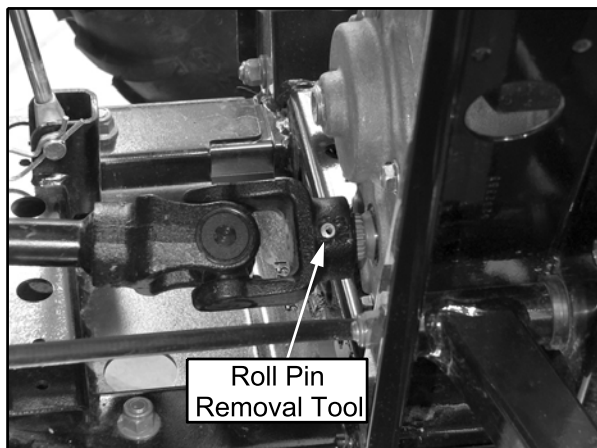
1. Drive the roll pin from the mid propshaft yoke located at the transmission.



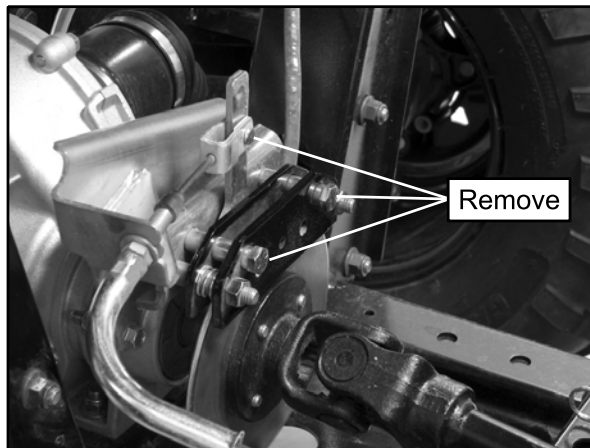
Roll Pin Removal Tool: PN 2872608

NOTE: The front propshaft yolk slides off during the transmission removal.

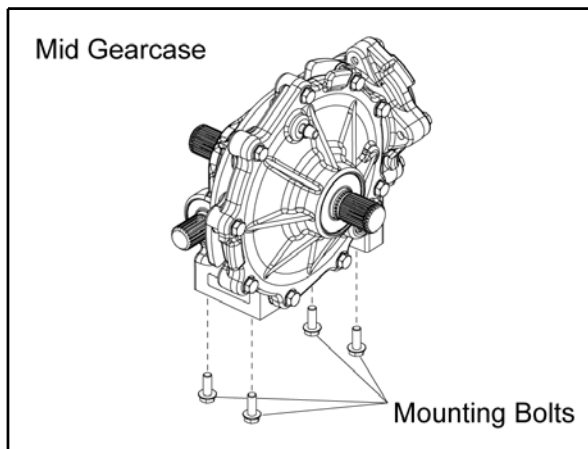
2. Drive the roll pin from the rear propshaft yoke located at the mid gearcase.



3. Remove parking brake caliper assembly from caliper mount bracket to allow the rear propshaft to slide back on the rear gearcase input shaft during removal.

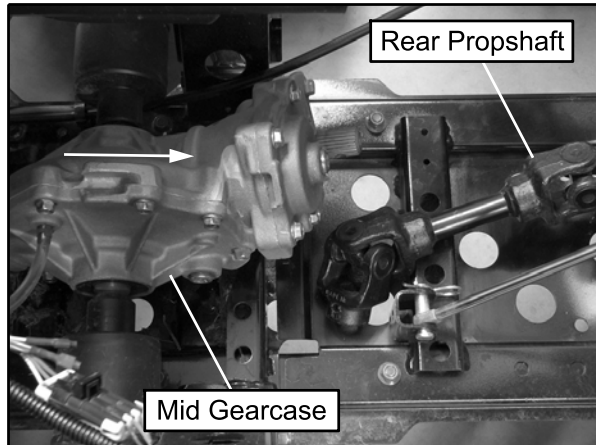


4. Slide rear propshaft back on rear gearcase input shaft and remove the propshaft from the mid gearcase.
5. Loosen the (4) bolts retaining the mid gearcase to the frame.

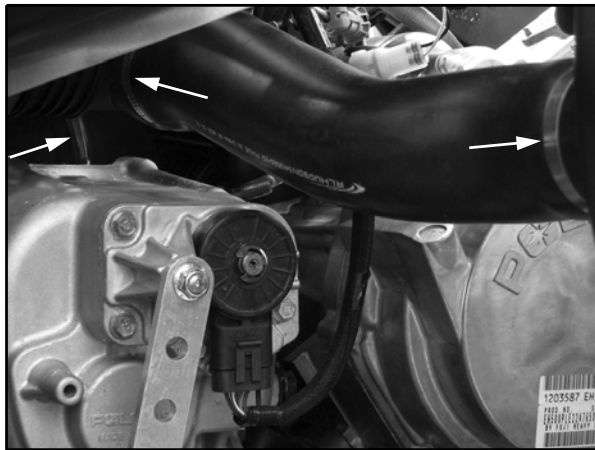


TRANSMISSION - 6X6

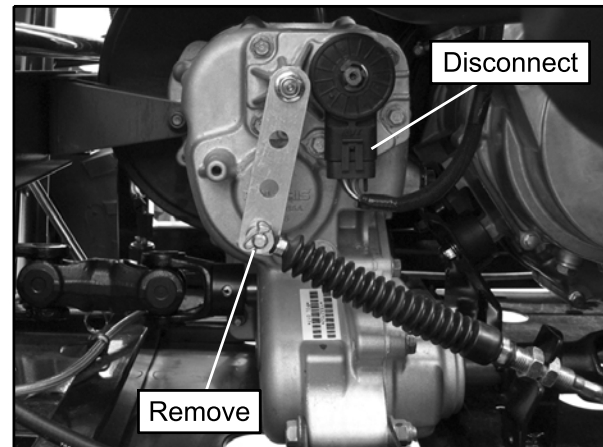
6. Slide the mid gearcase forward. Lift up on the gearcase to clear the frame and slide the gearcase towards the rear of the vehicle to remove the mid propshaft from the transmission.



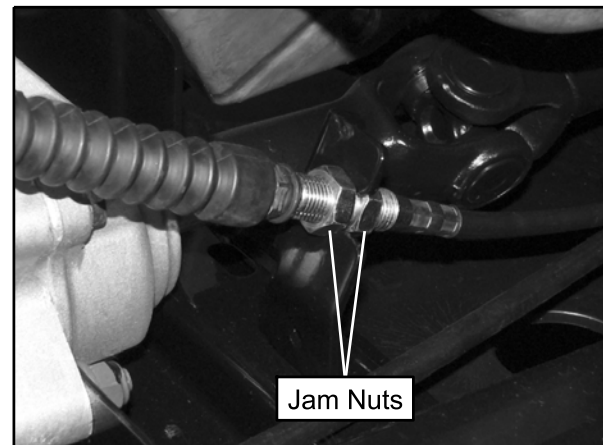
7. Remove the air intake hose from the air box and air intake baffle. Remove vent line from the top of transmission.



8. Disconnect the transmission switch and remove the pin clip from the shift cable end. Remove the washer and shift cable from the bellcrank.



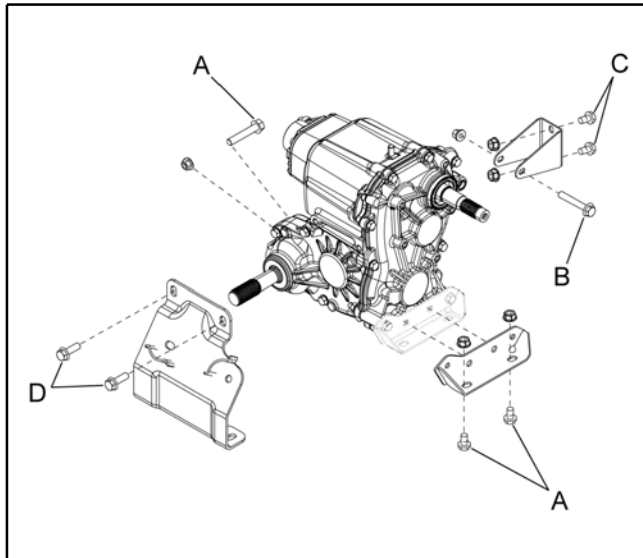
9. Loosen the transmission shift cable jam nuts. Remove the cable from the mounting bracket.



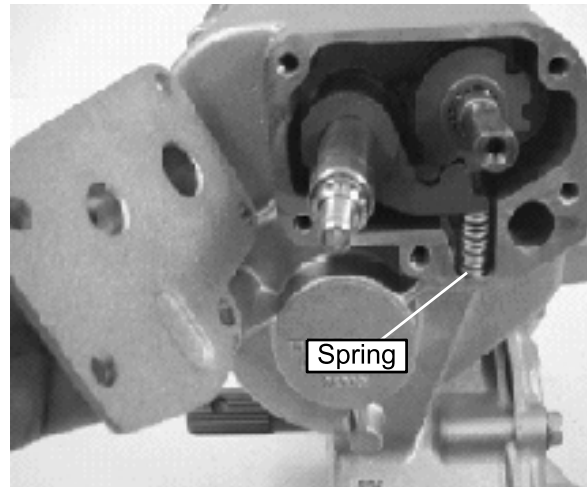
10. Remove the PVT system from the left side of the transmission (see Chapter 6 "Clutching").
11. Remove the transmission to frame bolts (A).
12. Remove the rear transmission mount bolt (B) and remove the rear transmission mount bracket bolts (C).

TRANSMISSION - 6X6

13. Remove the front transmission-to-engine mount bolts (D).

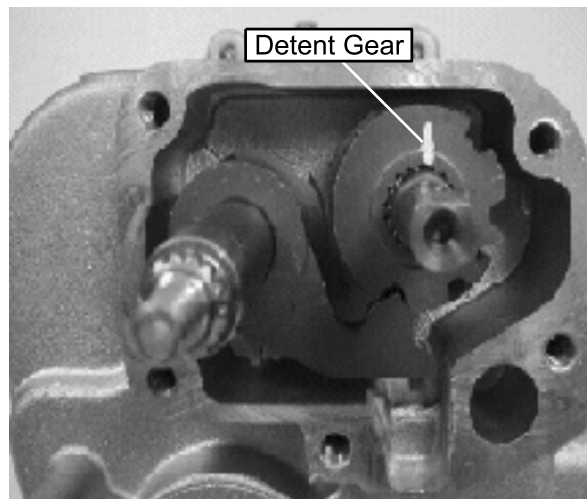


4. Remove the detent spring.



5. Mark the detent gear with a white pen. Remove the detent gear from the case.

NOTE: It may be helpful to place a mark just above the keyed spline.

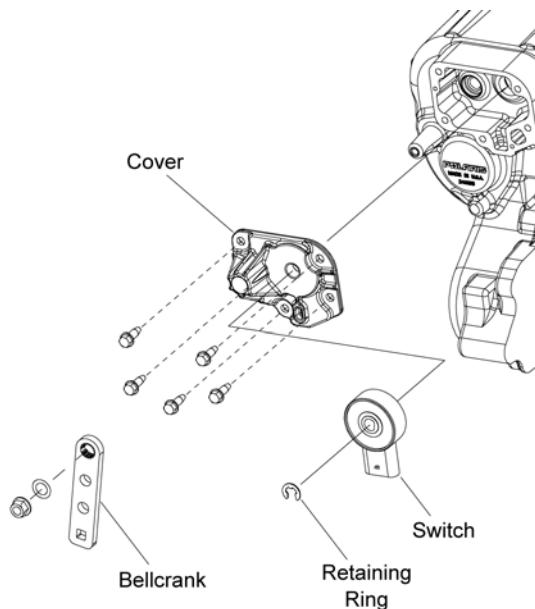


14. Remove transmission from right side of frame.

Transmission Disassembly

NOTE: Refer to the exploded view at the end of this chapter.

1. Remove the retaining ring and transmission switch.
2. Remove the nut and washer that secure the bell crank and remove the bellcrank.

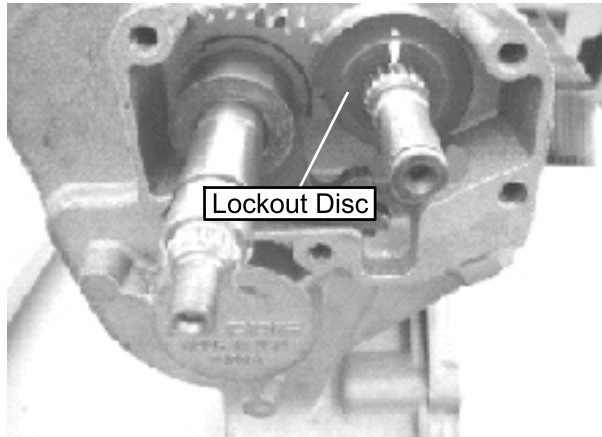


3. Remove the five bolts that secure the cover and remove the cover from the transmission.

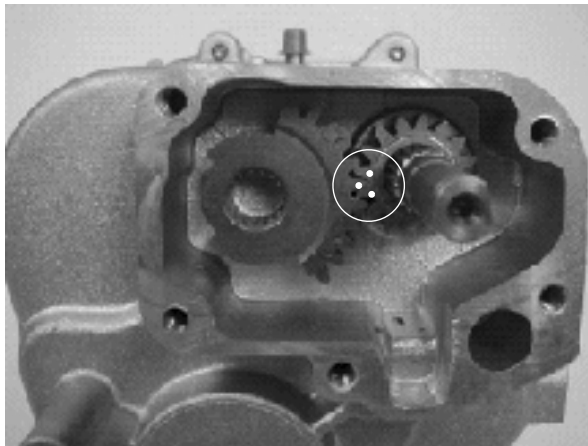
TRANSMISSION - 6X6

6. Mark the lockout disc, this will indicate which side of the disc faces outward during assembly. Remove the disc.

NOTE: It may be helpful to place a mark just above the keyed spline. Note the raised edge on the detent.

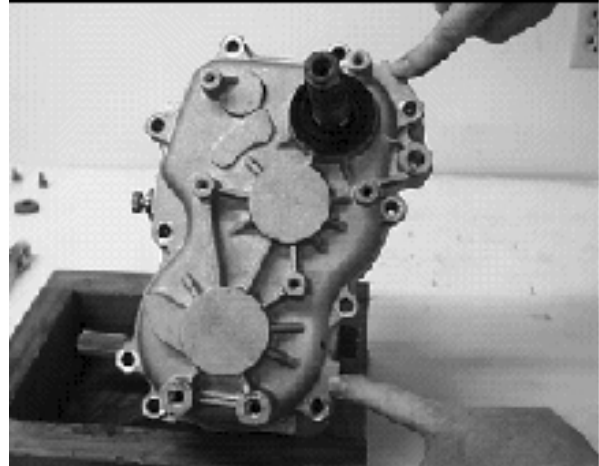


7. Remove the shift shaft and detent lever.
8. Note the transmission gear position and mark the two shift gears before removing them to aid with reassembly. Remove the shift gears from the case.

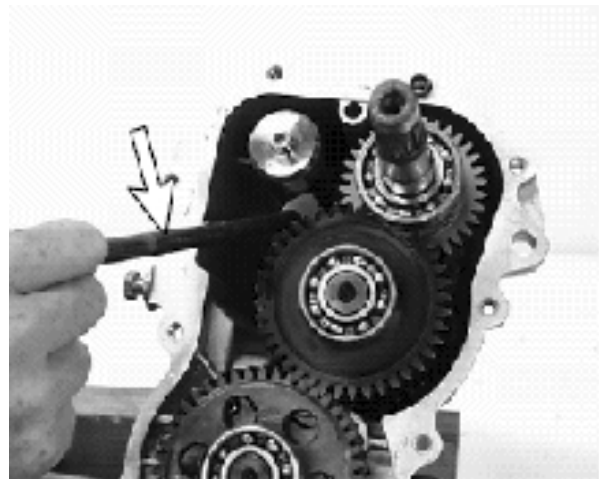


NOTE: Depending on what gear the transmission is in upon disassembly, the stamped timing marks may not be lined up. To avoid confusion, mark the two gears as described in Step 8.

9. Remove the bolts on the LH transmission case cover. Tap the cover off with a soft face hammer if necessary.



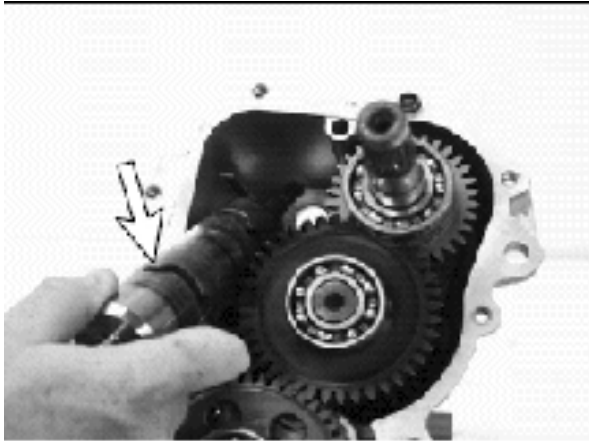
10. Lift shift rail 0.5"-1" (12.70-25.40 mm). Then rotate the shift rail / forks and shift drum, so the fork pins disengage from the drum.



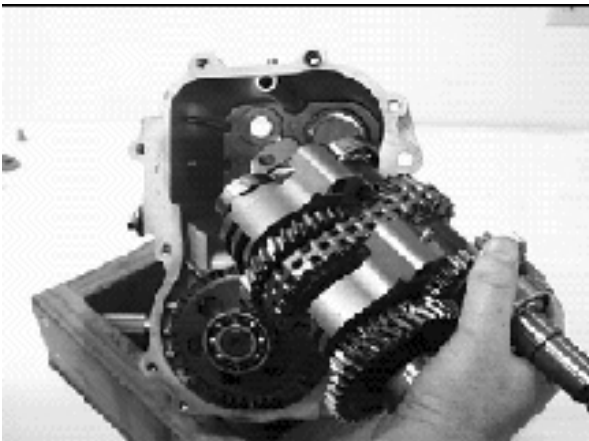
TRANSMISSION - 6X6

11. Remove the shift drum.

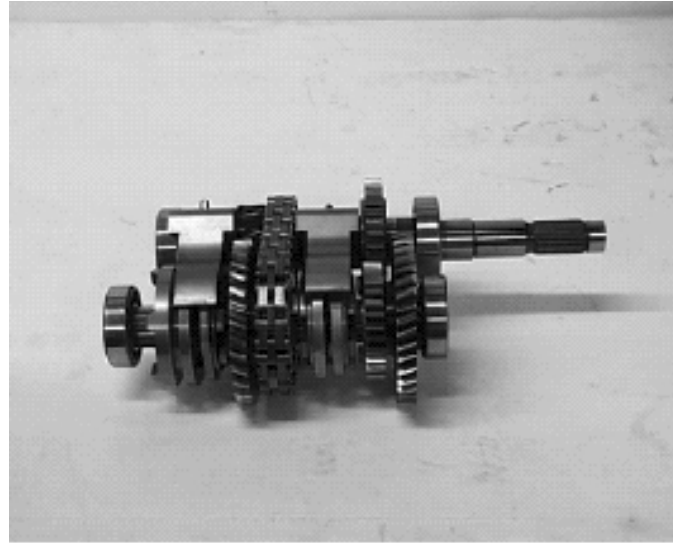
NOTE: You may have to tap the shift drum from the backside of the case to aid in removal.



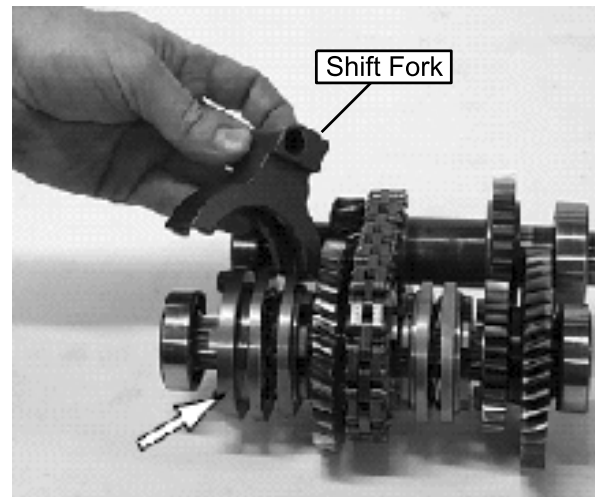
12. Remove the upper gear cluster and shift forks. You may need to move the assembly back and forth to aid in removal.



13. Set the upper gear cluster on a flat surface and inspect the components.



14. Remove the shift forks from the assembly. Note the correct position of each fork.



NOTE: The picture above depicts a transmission with a "Park" engagement dog on the end of the shaft instead of a regular engagement dog. The transmission will have a regular engagement dog in the location indicated by the arrow in the photo.

TRANSMISSION - 6X6

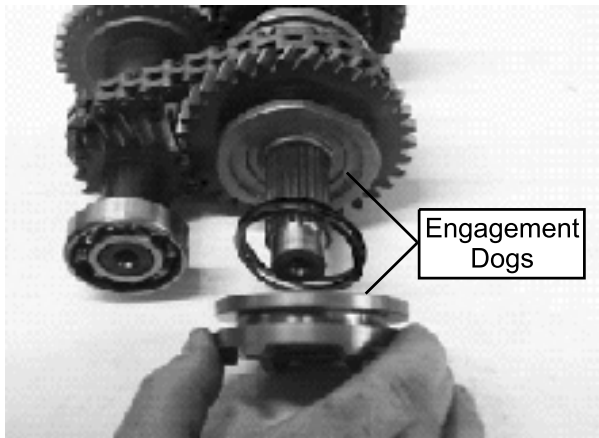
15. Remove the bearing from the reverse shaft with a puller.



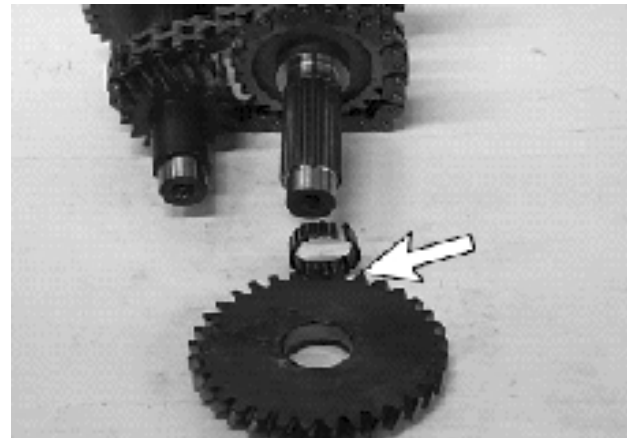
18. Remove the snap ring and washer from the reverse shaft.



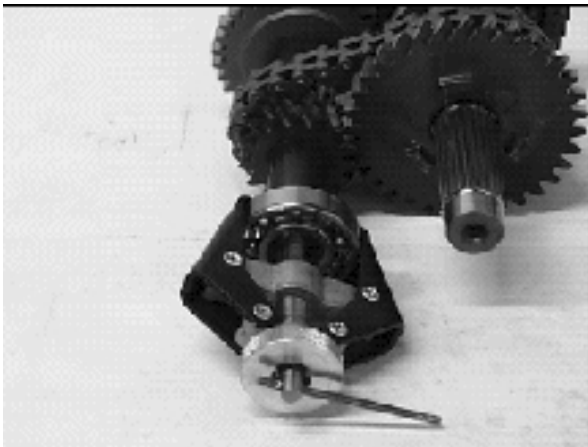
16. Remove the engagement dog. Remove the wave spring and reverse engagement dog.



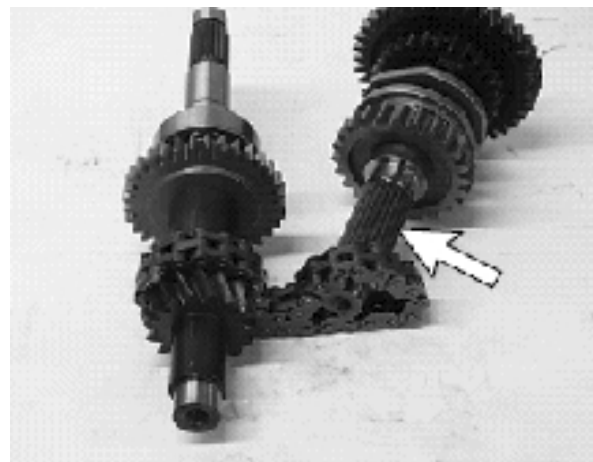
19. Remove low gear (33T) and the needle bearing.



17. Remove the bearing from the input shaft with a puller.



20. Remove the reverse gear shaft.



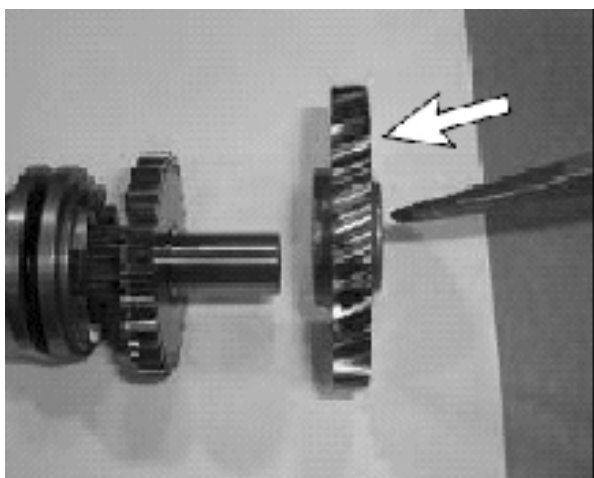
21. Remove the rest of the bearings from the shafts.

TRANSMISSION - 6X6

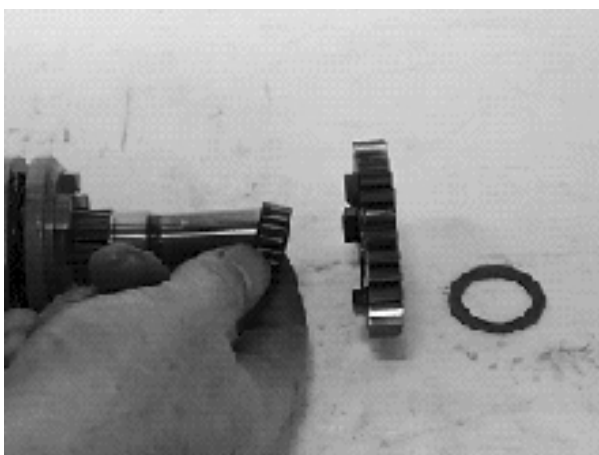
22. Use a press to remove the gear from the shaft.



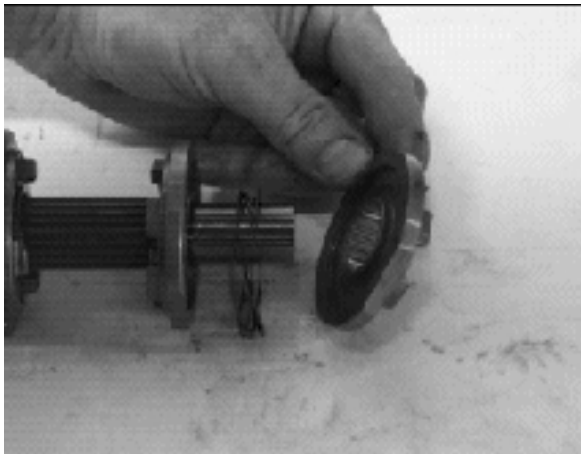
23. Make note of the direction of the gear and hub location.



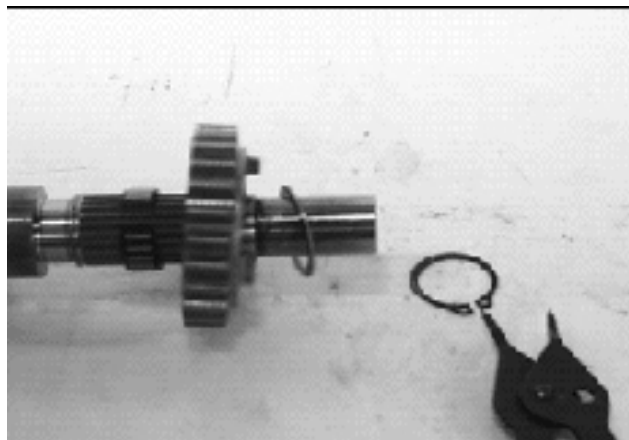
24. Remove the gear, split bearing, and washer from the reverse shaft.



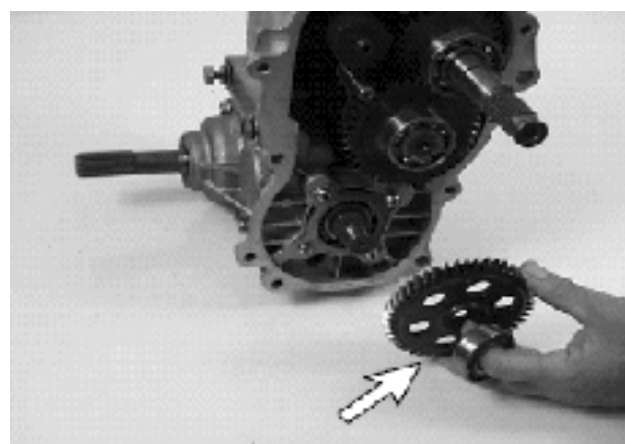
25. Slide off the shift dogs and wave springs.



26. Remove the snap ring, washer, gear, and split bearing.

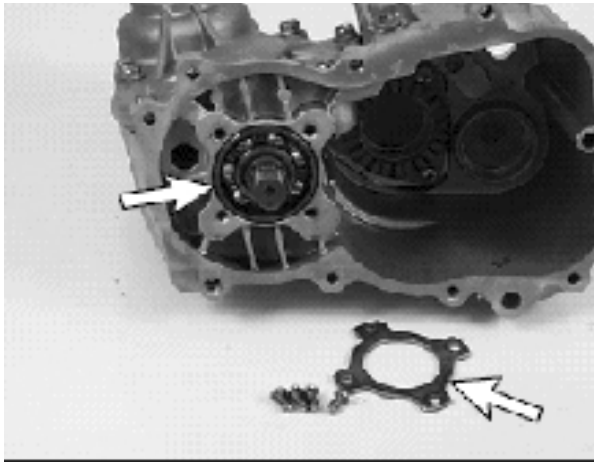


27. Remove bearing and the helical gear.

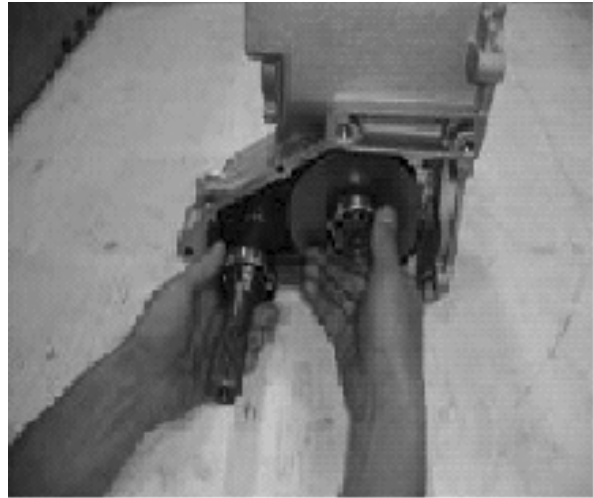


TRANSMISSION - 6X6

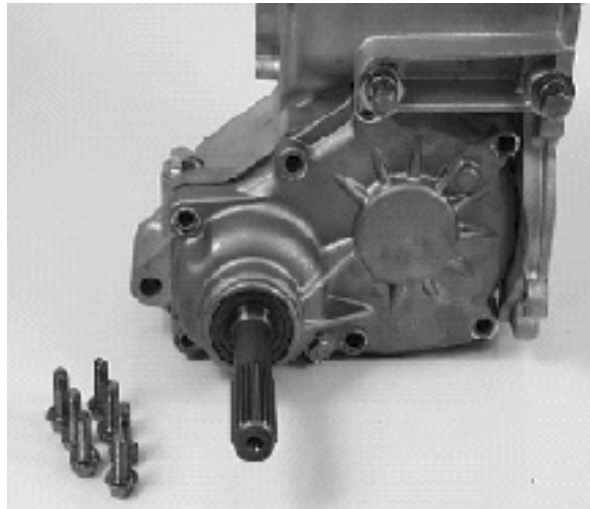
28. Remove the pinion shaft retainer plate and the pinion shaft.



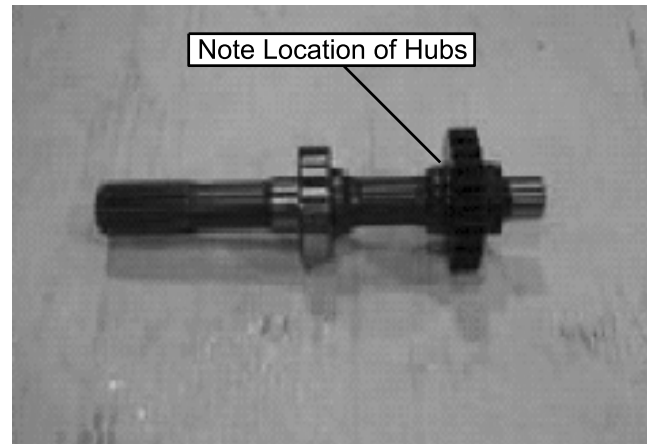
31. Remove the shafts as an assembly.



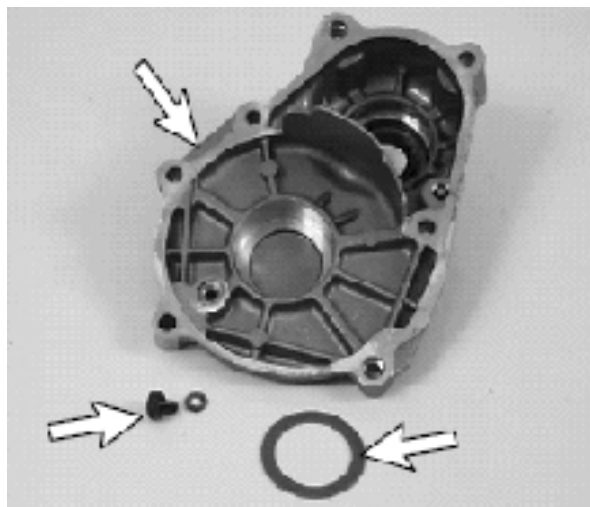
29. Remove the front housing cover screws.



32. Remove the silent chain from the assembly for shaft inspection.
33. Clean all components in a parts washer and inspect for wear.
34. Inspect engagement dogs of gears and replace if edges are rounded.
35. Inspect gear teeth for wear, cracks, chips or broken teeth. Note the location of the hubs on the gear.



30. Remove the front housing cover, shim, thrust button, and thrust button shim.



36. Remove seals from transmission case.

IMPORTANT: New seals should be installed after the transmission is completely assembled.

37. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

TRANSMISSION - 6X6

Transmission Assembly

1. Reinstall the chain onto the front output shaft and rear output shaft.
3. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply Polaris Crankcase Sealant to the mating surfaces.



2. Install front and rear output shafts into the case.

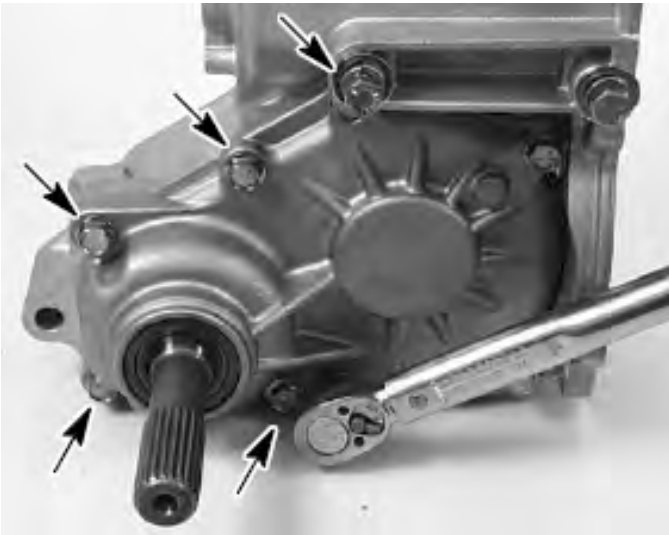


**Crankcase Sealant:
PN 2871557**

TRANSMISSION - 6X6

- 4. Reinstall the thrust button shim, thrust button, and other shims into the cover. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to specification.

NOTE: Make sure that the case locating pins (knock pipes) are in place.



 = T
Front Cover Bolts: 27-34 ft-lbs (37-46 Nm)

- 5. Apply grease to the seal lips. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new front and rear output shaft seals.
- 6. Install pinion shaft with bearing.
- 7. Install retainer plate with flat side toward bearing.

- 8. Apply Loctite™ 262 (Red) (PN 2871951) to screw threads and torque the pinion retainer plate screws to specification.



 = T
Pinion Retainer Plate Screws: 6-12 ft-lbs (8-16 Nm)

- 9. Install a new needle bearing, the 38T reverse sprocket, washer, and a new snap ring. Install the shift dogs and wave spring. Install the washer, a new needle bearing and the high gear. Install the press fit gear and ball bearing.

TRANSMISSION - 6X6

10. Install a new snap ring at this time. When installing the new snap ring, open the snap ring just far enough to go over the shaft, to avoid stressing the snap ring. If the snap ring is overstressed it could come off the shaft and cause internal damage to the transmission.

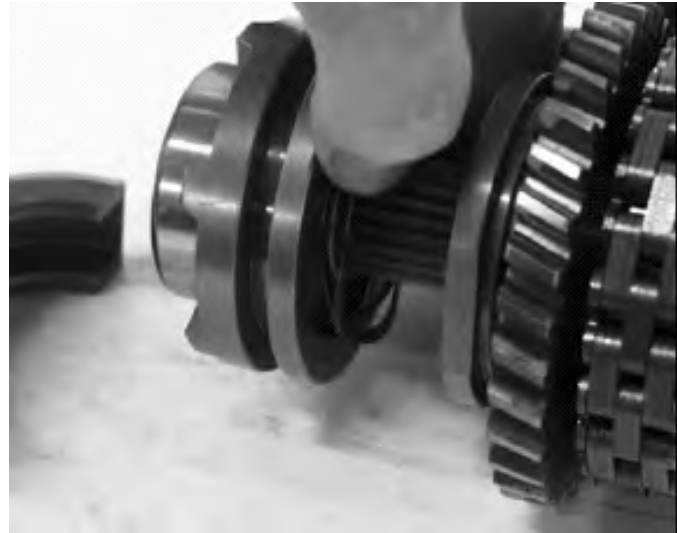


11. Slide the reverse shaft assembly through the silent chain.



12. Install a new needle bearing, the low gear, the thrust washer and the snap ring. Use of a new snap ring is recommended.
13. Install the engagement dogs, wave springs, and bearing.

14. Install the ball bearing onto the end of the input shaft.



15. As the engagement dogs are installed onto the shaft, place the wave springs into the spring groove. Keep the spring in place while the fork is being installed on the shaft and while placing the shafts into the case.

NOTE: Use caution when installing the fork, the spring can easily fall out.



NOTE: Installing the shift rail will aid in keeping the shift forks, shift dogs, and the springs in place.

TRANSMISSION - 6X6

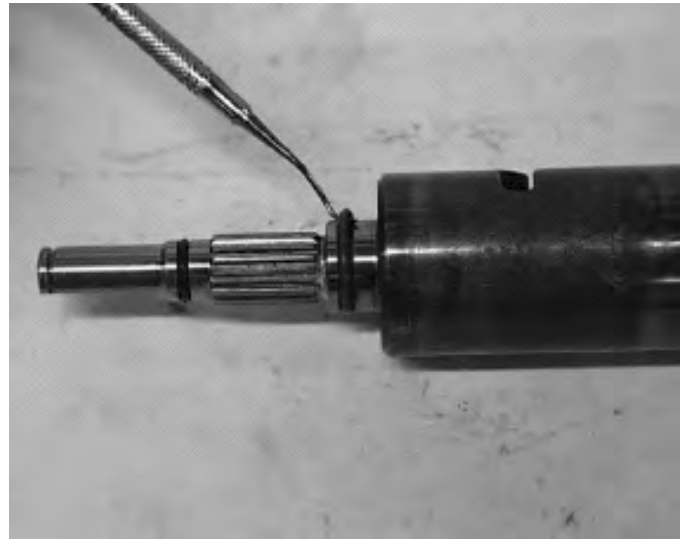
16. Carefully install the shaft assembly and gear cluster as a unit into their respective bearing case recesses. Tap with a soft face hammer to seat shaft assemblies.



17. Position the shift forks up and so the pins point toward the 9 o'clock position, before installing the shift drum assembly.



18. Replace and grease the O-rings on the shift drum before installation.



19. Install the shift drum into the case.

NOTE: Make sure shift shaft pins are properly positioned in the slot on selector arms.

20. Lift the shift rail slightly and rotate the rail/fork assembly so it meshes with the tracks on the shift drum. Be sure the wave springs are properly in place and that the shift rail is seated into the pocket on the backside of the case.



21. Install the helical gear and bearing onto the pinion shaft.
22. Clean the mating surfaces of the case and cover. Apply Crankcase Sealant (PN 2871557) to the mating surfaces. Be sure the locating pins (knock pipes) are in place. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to specification.

TRANSMISSION - 6X6

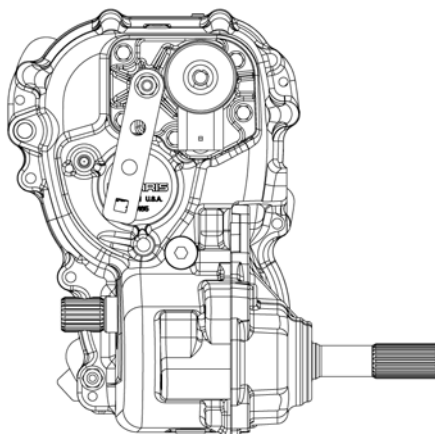
23. Reinstall the lower left-hand mount bracket if previously removed.



Front Cover Bolts:
27-34 ft-lbs (37-46 Nm)

24. Grease the seal lips of the input shaft seal. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new input shaft seal.

25. Install drain plug with a new sealing washer. Torque to specification.

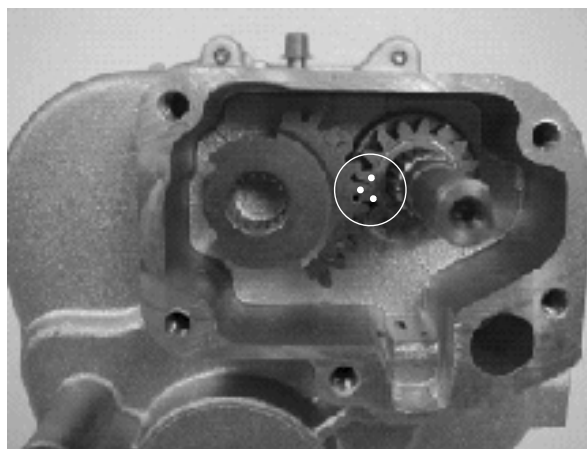


Drain Plug
10-14 ft. lbs. (14-19 Nm)



Drain Plug:
10-14 ft-lbs (14-19 Nm)

26. Place a small amount of grease (PN 2871551) into the pocket before installing the sector gear. Install the shift gear (16T) on the shift drum shaft. Install the sector gear in the bushing pocket on the left side. Align the timing marks you made on the gears during disassembly.

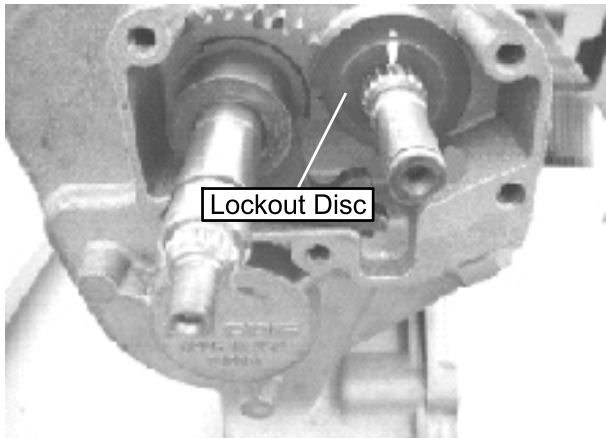


IMPORTANT: Note the location of the skip tooth on the splines. Apply a light coating of grease on the gear teeth.

27. Install the shift shaft along with the detent lever.

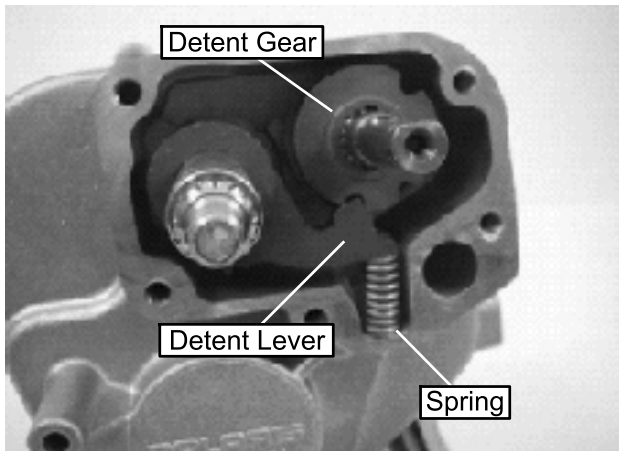
TRANSMISSION - 6X6

28. Install the lockout disc with the raised edge facing outward. Use the white mark that was previously applied for reference.

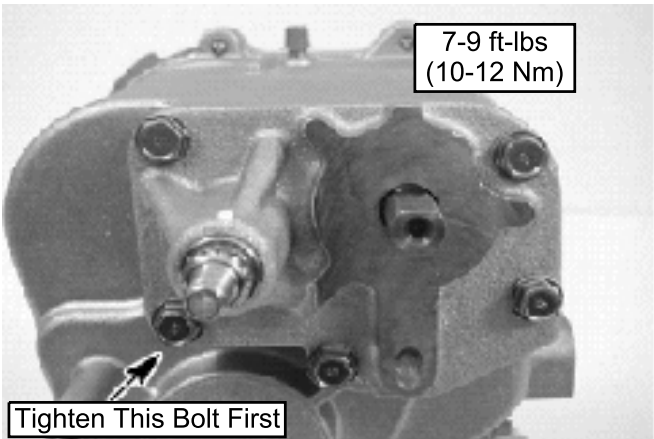


29. Install the detent gear with the raised edge facing outward. Note the keyed spline on the end of the shaft.

30. Install the detent lever spring. Install a new O-ring onto the shift shaft after the detent lever is assembled to the shaft. Place a small amount of grease on the small O-ring on the shift shaft and on the detent gear. Grease the O-ring on the end of the shift drum.



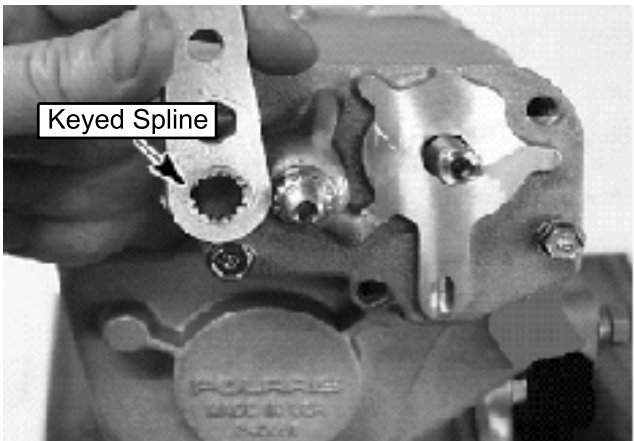
31. Install cover and hand tighten all of the bolts. Tighten the bolt indicated in the picture below first and torque the bolt to specification. This helps to align the cover and shaft to ensure smoother shifting.



32. Torque the remaining cover bolts to specification.

 = T
Cover Bolts: 7-9 ft-lbs (10-12 Nm)

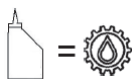
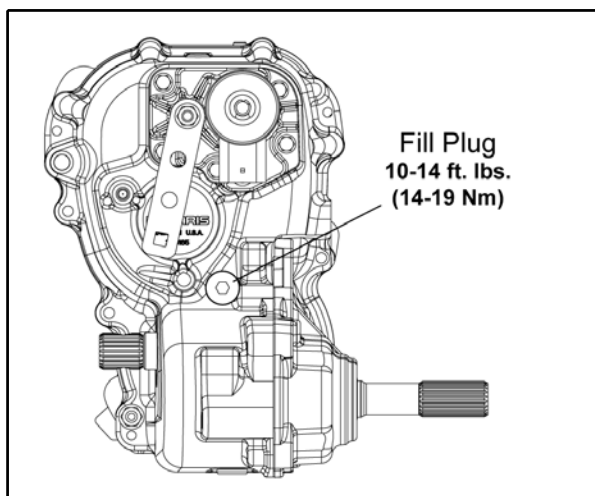
33. Install the bellcrank onto the shift shaft. Note the keyed spline on the bellcrank and shaft. Install the washer and nut. Torque bellcrank nut to specification.



 = T
Bellcrank Nut: 12-18 ft-lbs (16-24 Nm)

TRANSMISSION - 6X6

34. Install the transmission and add the recommended gearcase lubricant. Torque fill plug to specification.

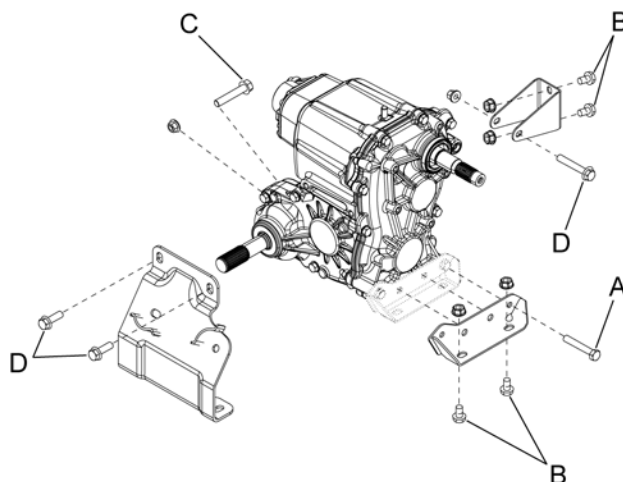


Recommended Transmission Lubricant:
AGL (PN 2878068)
43.6 oz. (1290 ml)

Transmission Installation

1. Install transmission from right side of vehicle.
2. Align the front output shaft to the front propshaft yoke on the vehicle and install the propshaft.
3. Install the mid propshaft onto the transmission output shaft and align the roll pin holes. Drive a NEW roll pin into the propshaft yoke.
4. Slide the mid gearcase forward in the frame. Install the mid propshaft onto the mid gearcase input shaft.
5. Position transmission in frame.
6. Loosely install the front transmission to frame bolts.
7. Loosely install the rear transmission to frame bolt.
8. Loosely install the three bottom transmission to frame bolts.

9. Tighten mounting fasteners in order A-D as shown.



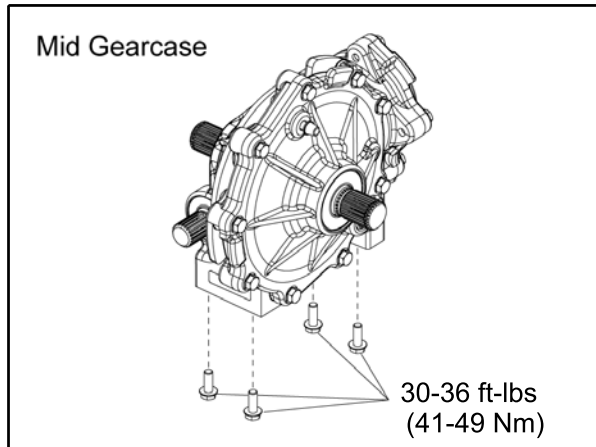
Transmission Mounting Bolts: B, C, D
40 ft-lbs (54 Nm)

NOTE: Be sure to tighten the lower transmission bolts first, this ensures that the transmission is tight against the lower frame and helps to properly align the transmission.

10. Reinstall transmission switch, shift cable, air intake hose and the vent hose on top of the transmission.
11. Reinstall the PVT system (see Chapter 6 "Clutching" for assembly procedure).

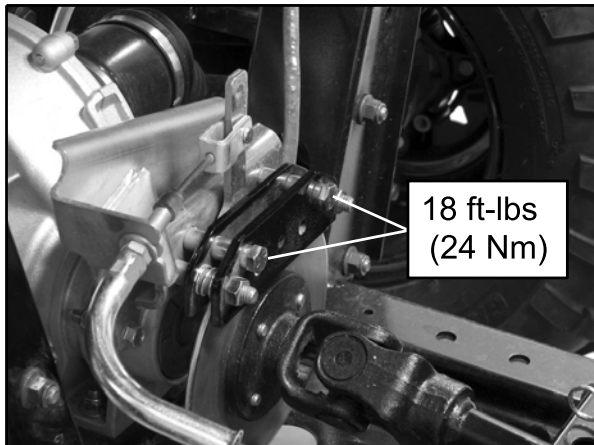
NOTE: Align clutches as outlined in Chapter 6.

12. Position the mid gearcase and install the (4) mounting bolts. Torque the bolts to specification.



Mid Gearcase - Mounting Bolts:
30-36 ft-lbs (41-49 Nm)

13. Install the rear propshaft onto the mid gearcase and drive a NEW roll pin into the propshaft yoke.
14. Install the parking brake caliper assembly. Tighten the two mounting bolts in increments and torque to specification.



Parking Brake Caliper - Mounting Bolts:
18 ft-lbs (24 Nm)

TROUBLESHOOTING

Troubleshooting Checklist

Check the following items when shifting difficulty is encountered.

- Shift cable adjustment/condition
- Idle speed (throttle cable routing)
- PVT alignment
- Transmission lubricant type/quality
- Drive belt deflection (where applicable)
- Loose fasteners on rod ends
- Loose fasteners on sector gear cover
- Worn rod ends, clevis pins, or pivot arm bushings
- Linkage rod adjustment and rod end positioning
- Shift selector rail travel
- Worn, broken or damaged internal transmission components (see NOTE below).

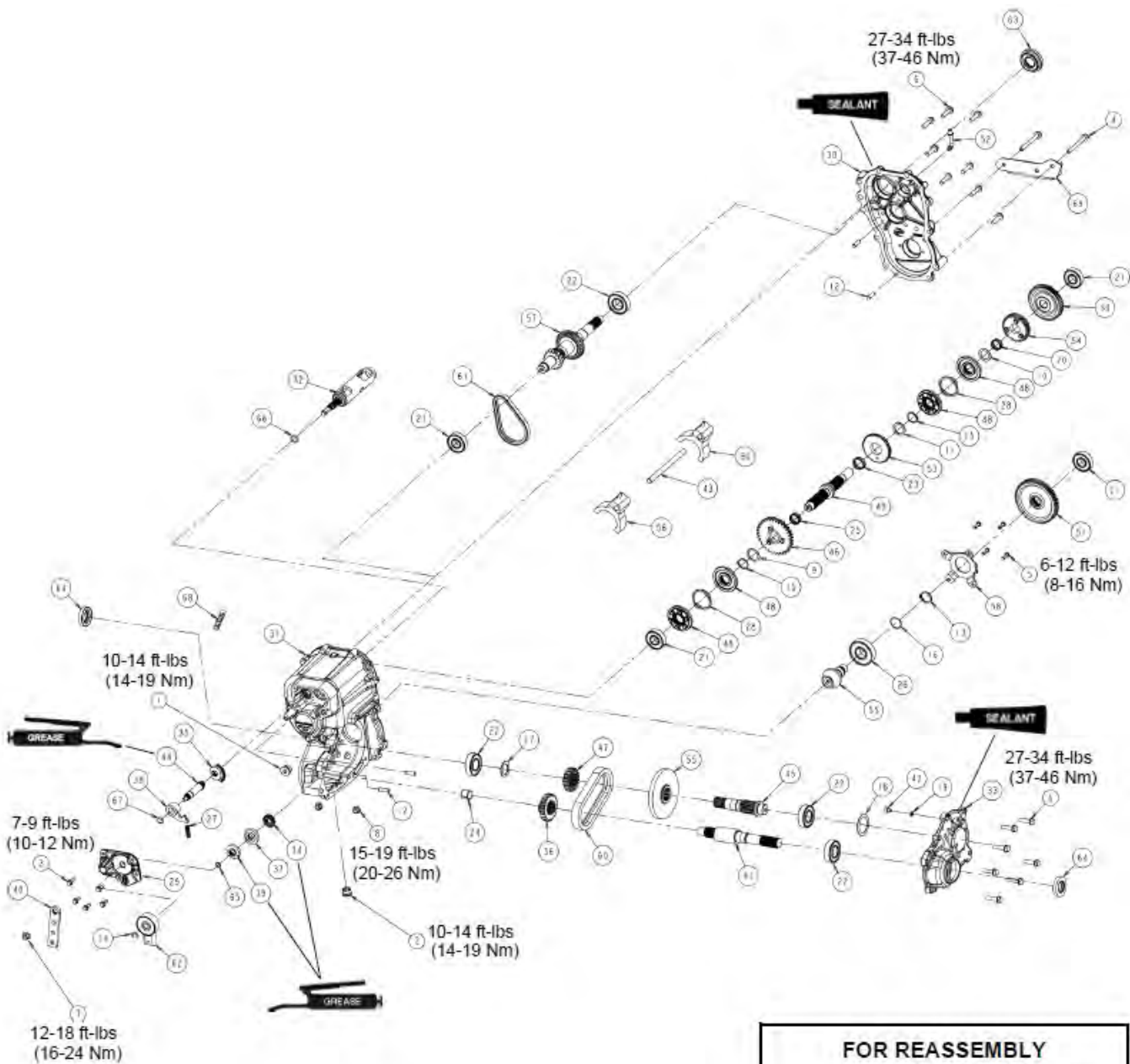
NOTE: To determine if shifting difficulty or problem is caused by an internal transmission problem, isolate the transmission by disconnecting linkage rod from transmission bellcrank. Manually select each gear range at the transmission bellcrank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding), damage. Inspect all bearings, circlips, thrust washers and shafts for wear.

TRANSMISSION - 6X6

TRANSMISSION EXPLODED VIEW

RANGER 6x6 800 (PN 1332978)



FOR REASSEMBLY

-  Apply White Lithium Based Grease.
-  Apply Polaris Crankcase Sealant.
-  Apply Loctite™ 262 to the bolt threads.

TRANSMISSION - 6X6

REF.	QTY.	DESCRIPTION	REF.	QTY.	DESCRIPTION
1.	1	Plug, Fill	36.	1	Sprocket, 22T
2.	1	Plug, Drain, Magnetic	37.	1	Lockout Disc
3.	5	Screw, Self-Tapping 1/4-20	38.	1	Detent Pawl
4.	2	Screw, 5/16-18	39.	1	Detent Star
5.	4	Screw, 1/4-20	40.	1	Bellcrank, Shift Drum
6.	15	Screws, Self-Tapping 5/16-18	41.	1	Output Shaft, Front Main
7.	1	Nut, Nylon Lock	42.	1	Trust Button
8.	2	Nut, Nylon Lock	43.	1	Rail, Shift Shaft
9.	1	Washer	44.	1	Shift Shaft
10.	1	Washer	45.	1	Output Shaft, Rear Main
11.	1	Washer	46.	1	Gear, 33T
12.	4	Dowel Pin	47.	1	Sprocket, 19T
13.	1	Retaining Ring, External	48.	4	Engagement Dog, 6 Face
14.	1	Retaining Ring, External	49.	1	Reverse Shaft
15.	2	Retaining Ring, External	50.	1	Gear, Mid-Output, 47T
16.	1	Spacer	51.	1	Gear, Mid-Output, 60T
17.	1	Thrust Washer	52.	1	Vent Tube
18.	1	Shim	53.	1	Sprocket, 38T
19.	1	Shim	54.	1	Gear, 36T
20.	1	Needle Bearing	55.	1	Gear Set, 10T/31T
21.	4	Ball Bearing	56.	2	Shift Fork w/Pin
22.	4	Ball Bearing	57.	1	Input Shaft, 37/19/15
23.	1	Needle Bearing	58.	1	Cover, Center Drive Bearing
24.	1	Plain Bearing	59.	-	N/A
25.	1	Needle Bearing	60.	1	Silent Chain, 11W/40P
26.	1	Ball Bearing	61.	1	Chain
27.	1	Spring, Compression	62.	1	Switch, Rotary; 2-Pin
28.	2	Spring, Wave	63.	1	Seal, Dual Lip
29.	1	Cover, Sector Gear	64.	2	Seal, Triple Lip
30.	1	Cover, LH Input	65.	1	O-Ring
31.	1	Gearcase, Main	66.	1	O-Ring
32.	1	Shift Drum	67.	1	O-Ring
33.	1	Cover, Output	68.	-	N/A
34.	1	Sector Gear, 16T	69.	1	Bracket, Transmission Mount
35.	1	Sector Gear, 31T			

TRANSMISSION - 6X6

NOTES

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

CHAPTER 10

BRAKES

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GENERAL SPECIFICATIONS

FRONT BRAKE SYSTEM		
Item	Standard	Service Limit
Front Brake Pad Thickness	0.298 ± 0.007" / 7.56 ± 0.178 mm	0.150" (3.8 mm)
Front Brake Disc Thickness	0.188" (4.78 mm)	0.170" (4.32 mm)
Front Brake Disc Runout	-	0.010" (0.254 mm)

REAR BRAKE SYSTEM		
Item	Standard	Service Limit
Rear Brake Pad Thickness	0.298 ± 0.007" / 7.56 ± 0.178 mm	0.150" (3.8 mm)
Rear Brake Disc Thickness	0.188" (4.78 mm)	0.170" (4.32 mm)
Rear Brake Disc Runout	-	0.010" (0.254 mm)

PARK BRAKE SYSTEM		
Item	Standard	Service Limit
Park Brake Pad Thickness	Inboard - 0.304" (7.72 mm) Outboard - 0.360" (9.14 mm)	0.240" (6.1 mm) 0.310" (7.87 mm)
Park Brake Disc Thickness	0.164" - 0.173" (4.17 - 4.39 mm)	0.150" (3.81 mm)

TORQUE SPECIFICATIONS

ITEM	TOR- QUE FT-LBS	TOR- QUE NM
Front Caliper Mounting Bolts	30	41
Rear Caliper Mounting Bolts	30	41
Park Brake Caliper to Mount Bracket Bolts	18	24
Park Brake Mount Bracket to Transmission Bolts (4x4)	40	54
Park Brake Mount Bracket to Rear Gearcase Bolts (6x6)	18	24
Park Brake Lever Mount Bolts	13	18
Brake Line Flare Fittings	12-15	16-20
Brake Line Banjo Bolts (All)	15	20
Front Brake Disc to Hub Bolts	18	24
Rear Brake Disc to Hub Bolts	28	38
Park Brake Disc Mounting Bolt	10-15	14-20
Brake Switch	12-15	16-20
Master Cylinder Mount Bolts	15	20

SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool

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

BRAKES

BRAKE SYSTEM SERVICE NOTES

Disc brake systems are light weight, low maintenance, and perform well in the conditions this vehicle will routinely encounter. There are a few things to remember when replacing disc brake pads or performing brake system service to ensure proper system function and maximum pad service life.

- Optional pads are available to suit conditions in your area. Select a pad to fit riding style and environment.
- DO NOT over-fill the master cylinder fluid reservoir.
- Make sure the brake pedal returns freely and completely.
- Adjust stop pin on front caliper after pad service.
- Check and adjust master cylinder reservoir fluid level after pad service.
- Make sure atmospheric vent on reservoir is unobstructed.
- Test for brake drag after any brake system service and investigate cause if brake drag is evident.
- Make sure caliper moves freely on guide pins (where applicable).
- Inspect caliper piston seals for foreign material that could prevent caliper pistons from returning freely.
- Perform a brake burnishing procedure after installing new pads to maximize service life.
- DO NOT lubricate or clean the brake components with aerosol or petroleum products. Use only approved brake cleaning products.

BRAKE NOISE TROUBLESHOOTING

Dirt or dust buildup on the brake pads and disc is the most common cause of brake noise (squeal caused by vibration). If cleaning does not reduce the occurrence of brake noise, Permatex™ Disc Brake Quiet can be applied to the back of the pads. Follow directions on the package. This will keep pads in contact with caliper piston(s) to reduce the chance of squeaks caused by dirt or dust.

BRAKE NOISE TROUBLESHOOTING	
Possible Cause	Remedy
Dirt, dust, or imbedded material on pads or disc	Spray disc and pads with CRC Brakeleen™ or an equivalent non-flammable aerosol brake cleaner. Remove pads and/or disc hub to clean imbedded material from disc or pads.
Pad(s) dragging on disc (noise or premature pad wear) because of improper adjustment Master cylinder reservoir overfilled Master cylinder compensating port restricted Master cylinder piston not returning completely Caliper piston(s) not returning Operator error (riding the brake)	Adjust pad stop (front calipers) Set to proper level Clean compensating port Inspect. Repair as necessary Clean piston(s) seal Educate operator
Loose wheel hub or bearings	Check wheel and hub for abnormal movement.
Brake disc warped or excessively worn	Replace disc
Brake disc misaligned or loose	Inspect and repair as necessary
Noise is from other source (axle, hub, disc or wheel)	If noise does not change when brake is applied check other sources. Inspect and repair as necessary
Wrong pad for conditions	Change to a softer or harder pad

HYDRAULIC BRAKE SYSTEM OPERATION

The Polaris brake system consists of the following components or assemblies: brake pedal, master cylinder, hydraulic brake lines, brake calipers, brake pads, and brake discs, which are secured to the drive line.

When the foot activated brake lever is applied it applies pressure on the piston within the master cylinder. As the master cylinder piston moves inward it closes a small opening (compensating port) within the cylinder and starts to build pressure within the brake system. As the pressure within the system is increased, the pistons located in the brake calipers move outward and apply pressure to the moveable brake pads. These pads contact the brake discs and move the calipers in their floating bracket, pulling the stationary side pads into the brake discs. The resulting friction reduces brake disc and vehicle speed.

The friction applied to the brake pads will cause the pads to wear. As these pads wear, the piston within the caliper moves further outward and becomes self adjusting. Fluid from the reservoir fills the additional area created when the caliper piston moves outward.

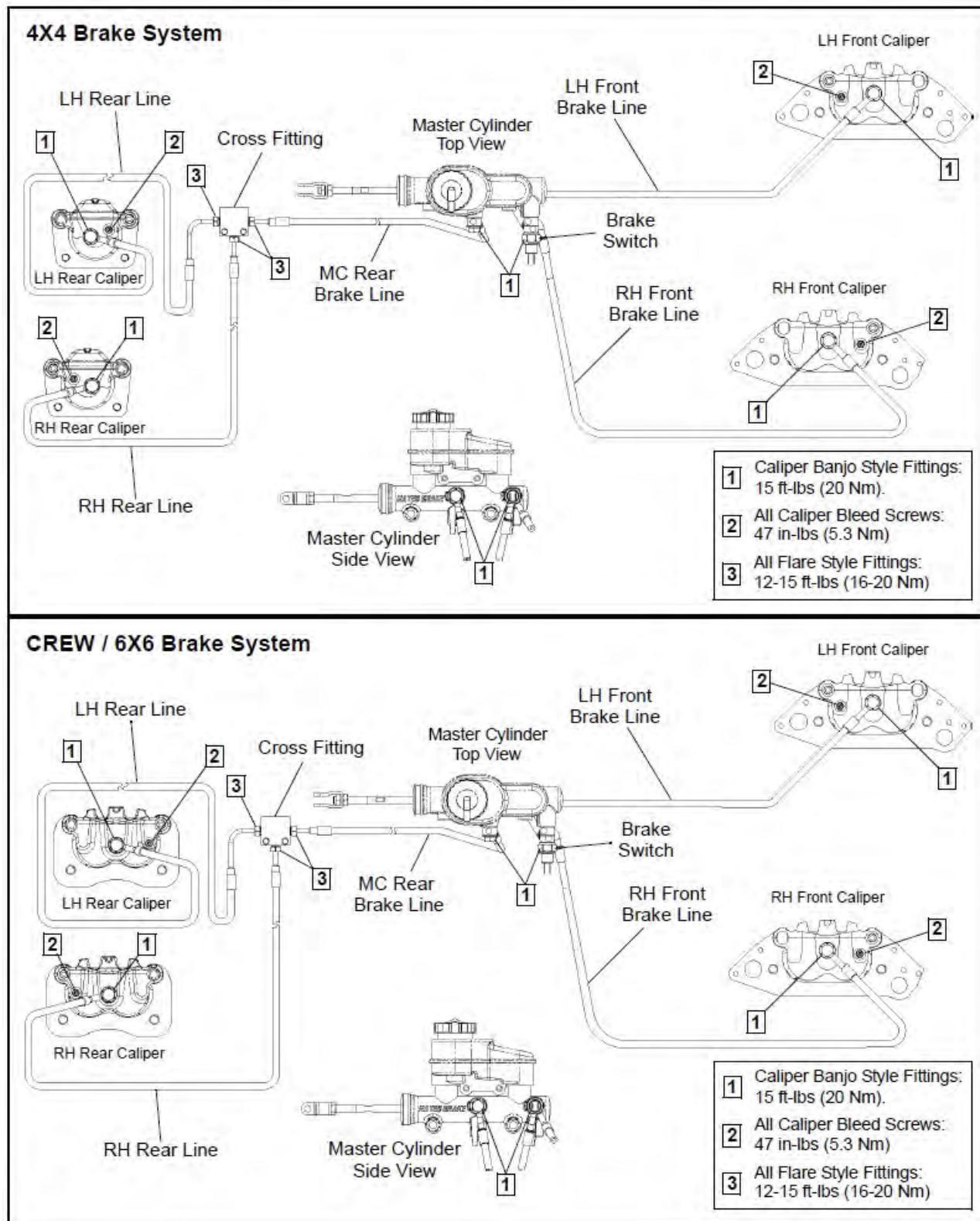
Brake fluid level is critical to proper system operation. Too little fluid will allow air to enter the system and cause the brakes to feel spongy. Too much fluid could cause brakes to drag due to fluid expansion.

Located within the master cylinder is the compensating port which is opened and closed by the master cylinder piston assembly. As the temperature within the hydraulic system changes, this port compensates for fluid expansion or contraction. Due to the high temperatures created within the system during heavy braking, it is very important that the master cylinder reservoir have adequate space to allow for fluid expansion. **Never overfill the reservoir! Do not fill the reservoir beyond the MAX LEVEL line!**

When servicing Polaris brake systems use only **Polaris DOT 4 Brake Fluid (PN 2872189)**. **WARNING:** Once a bottle is opened, use what is necessary and discard the rest in accordance with local laws. Do not store or use a partial bottle of brake fluid. Brake fluid is hygroscopic, meaning it rapidly absorbs moisture. This causes the boiling temperature of the brake fluid to drop, which can lead to early brake fade and the possibility of serious injury.

BRAKES

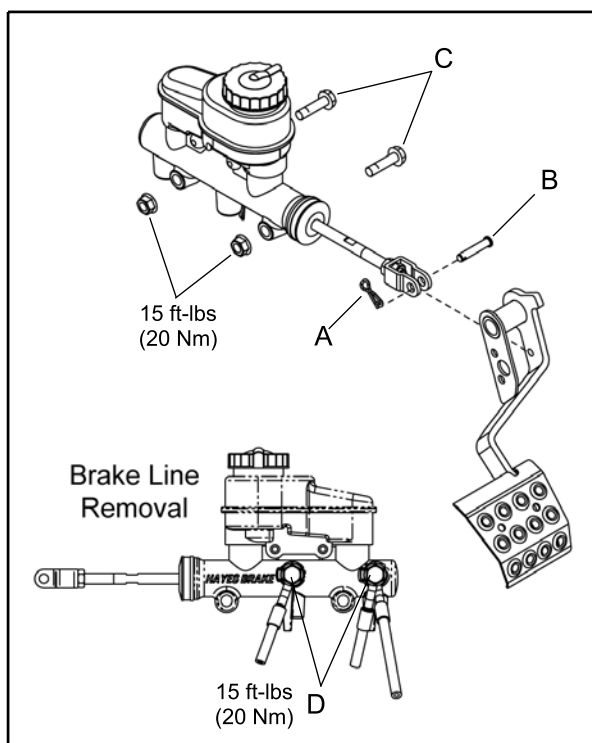
BRAKE SYSTEM EXPLODED VIEW



MASTER CYLINDER

Removal

1. Remove retaining clip (A) from the clevis pin (B) that attaches the master cylinder to the brake pedal lever.
2. Remove LH wheel well panel to access master cylinder.



3. Remove the two mounting bolts (C) that secure the master cylinder to the frame.
4. Remove master cylinder and place a fluid catch container under the master cylinder brake line banjo bolts (D).



CAUTION

Brake fluid will damage finished surfaces.
Do not allow brake fluid to come in contact with finished surfaces.

5. Loosen the brake line banjo bolts (D) and allow the fluid to drain.

NOTE: Make note of front and rear brake line orientation on the master cylinder.

6. Dispose of brake fluid properly and do not re-use.

Installation

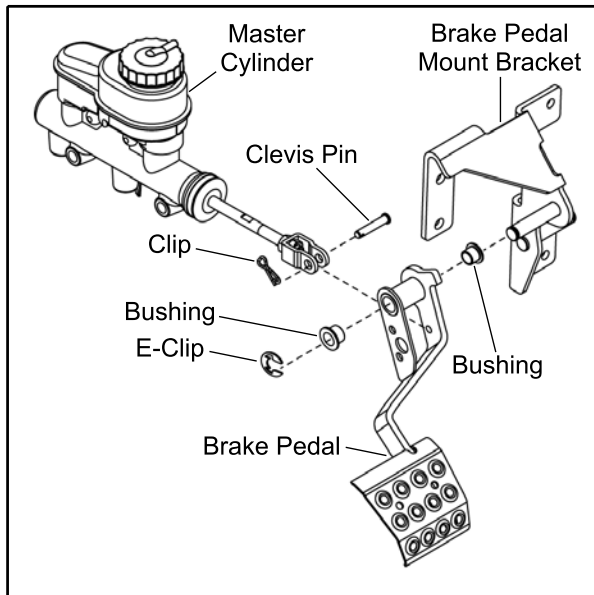
1. Reverse Steps 1-5 for master cylinder installation. **Refer to the torque specifications in the illustration.**

BRAKES

FOOT BRAKE PEDAL

Pedal Removal

1. Remove the E-clip from the end of the brake pedal mount bracket.



2. Remove the retaining clip and clevis pin from the master cylinder to free it from the brake pedal.
3. Slide the brake pedal and bushings off the mount bracket.

Pedal Installation

1. Reverse Steps 1-3 for foot brake installation.
2. Use a new E-clip upon installation.

BRAKE BLEEDING / FLUID CHANGE

NOTE: When bleeding the brakes or replacing the fluid always start with the furthest caliper from the master cylinder. This procedure should be used to change fluid or bleed brakes during regular maintenance.



CAUTION

Always wear safety glasses.



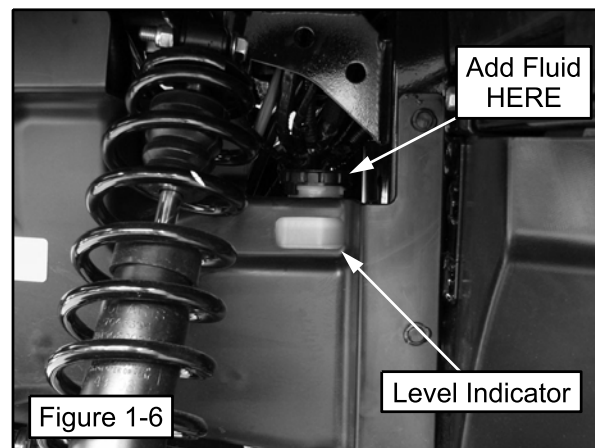
CAUTION

Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

1. Locate master cylinder reservoir in the front LH wheel well area (Figure 1-6). Clean reservoir cover thoroughly.
2. Remove cover from reservoir.
3. If changing fluid, remove old fluid from reservoir with a Mity Vac™ pump or similar tool.

Mity Vac™ (PN 2870975)

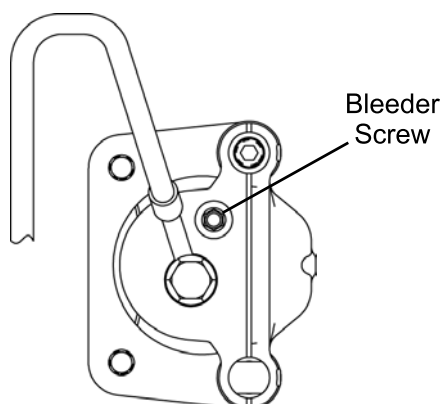
4. Add brake fluid to the indicated MAX level of reservoir (Figure 1-6).



**Polaris DOT 4 Brake Fluid:
P/N 2872189**

5. Begin bleeding procedure with caliper furthest from master cylinder.

6. Install a box-end wrench on caliper bleeder screw.
7. Attach a tight-fitting, clear hose to the bleeder fitting.



8. Place a small amount of fresh brake fluid into a small, clear container and place the other end of bleeder hose into the container.
9. Have an assistant slowly pump the brake pedal until pressure builds and then hold.
10. Quickly open and close the bleed screw while holding pressure on the brake pedal.

NOTE: Do not release brake pedal before bleeder screw is tight or air may be drawn into master cylinder.

11. Release brake pedal pressure. Check level of fluid in reservoir and add if necessary (Figure 1-6).
12. Repeat Steps 9, 10, and 11 until brake pedal is firm and no air can be seen moving through the clear hose. Add fluid as necessary to maintain level in reservoir.

**Master Cylinder Fluid Level:
Between the MIN and MAX line.**



CAUTION

Maintain at least 1/2"(1.27 cm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

13. Tighten bleeder screw and remove bleeder hose. Torque bleeder screw to specification.



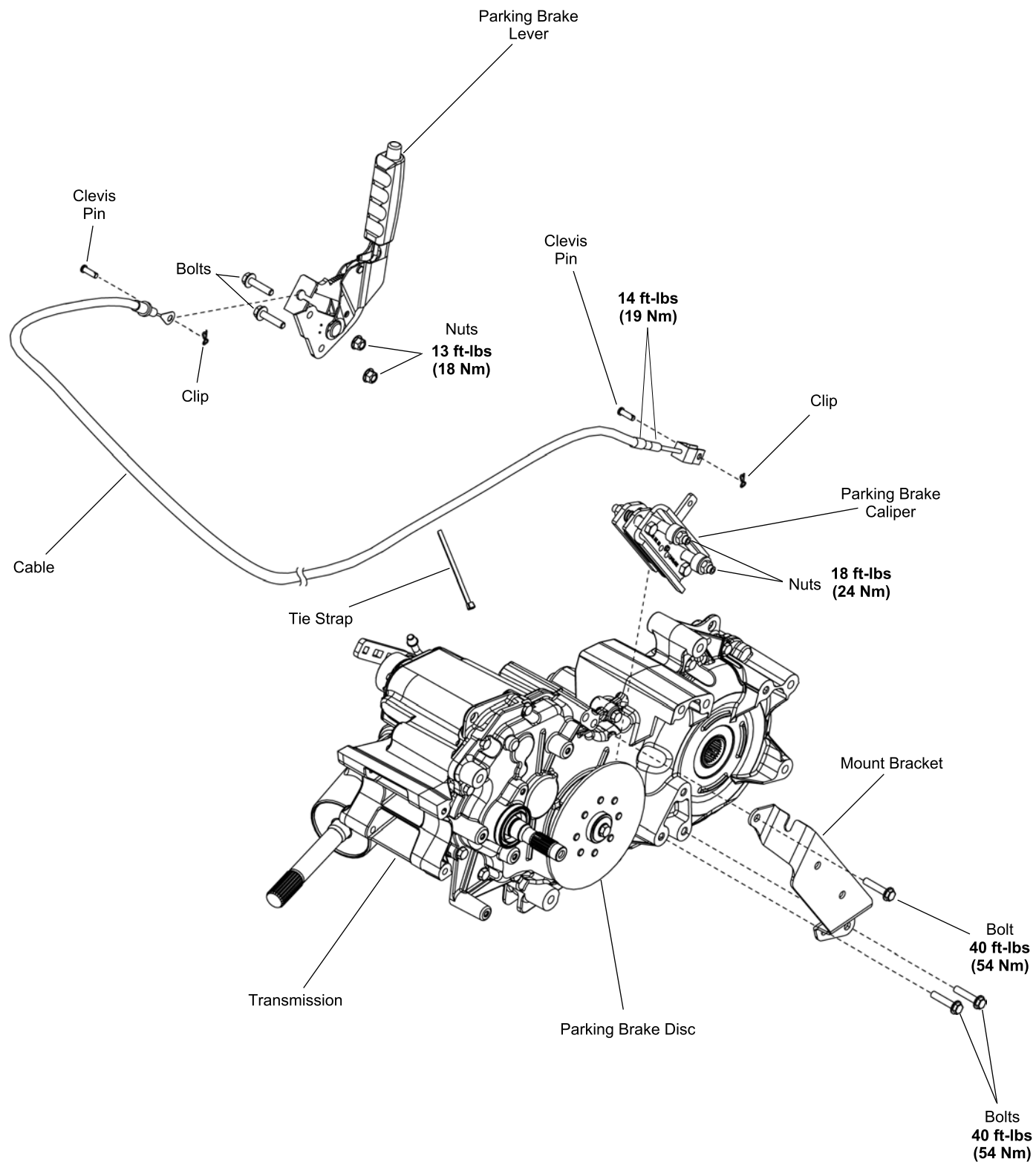
**Bleeder Screw:
47 in-lbs (5.3 Nm)**

14. Repeat Steps 9 - 13 for the remaining brake calipers.
15. Install master cylinder reservoir cover.
16. Field test machine at low speed before putting into service. Check for proper braking action and pedal reserve. With pedal firmly applied, pedal reserve should be no less than 1/2"(1.3 cm).
17. Check brake system for fluid leaks.

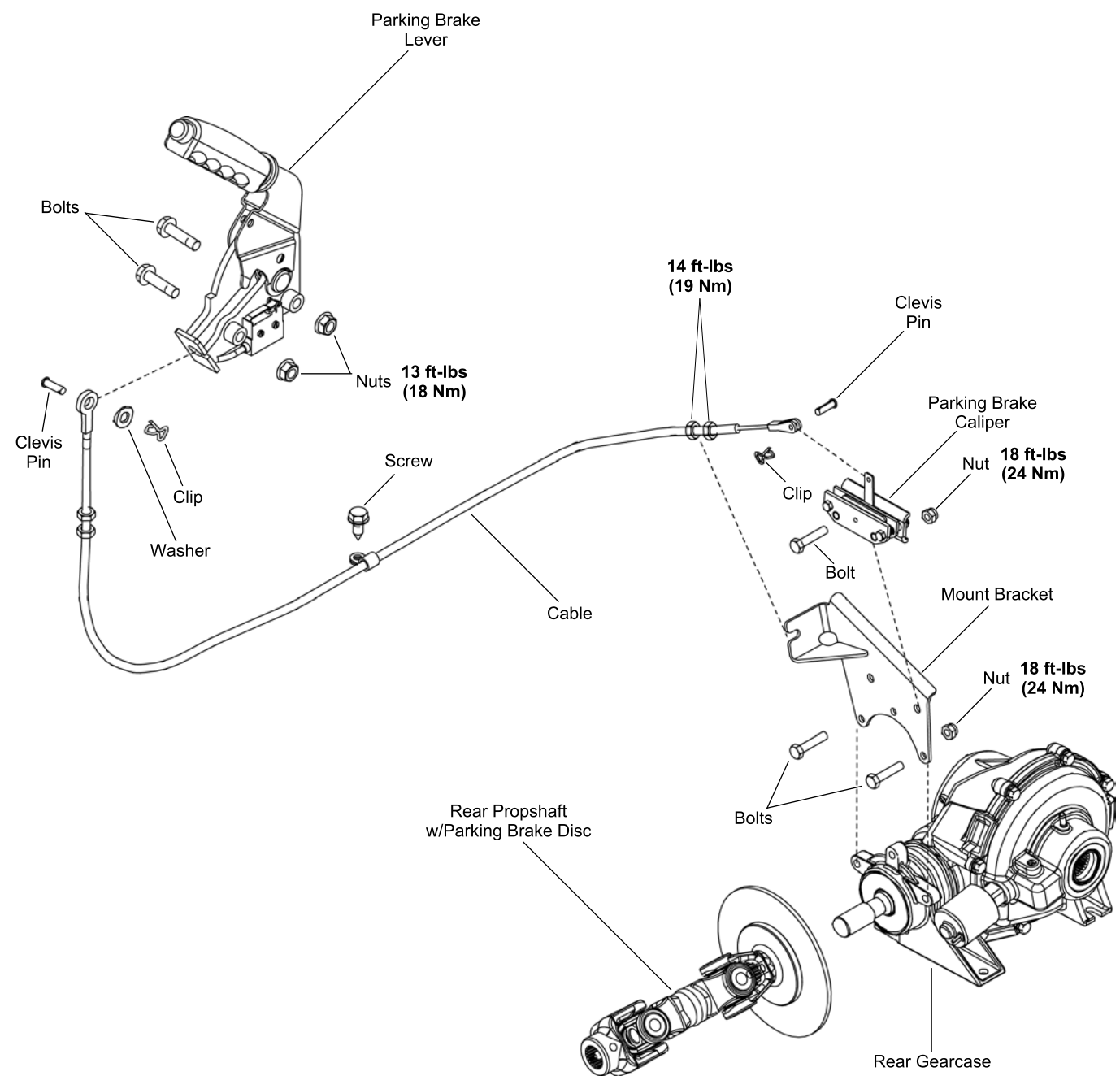
BRAKES

PARKING BRAKE

Exploded View (4X4 / CREW)



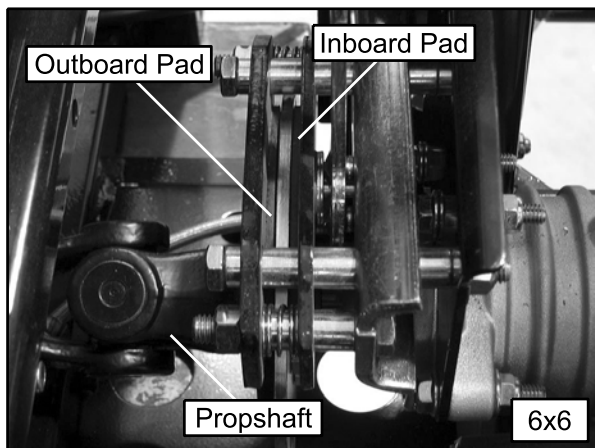
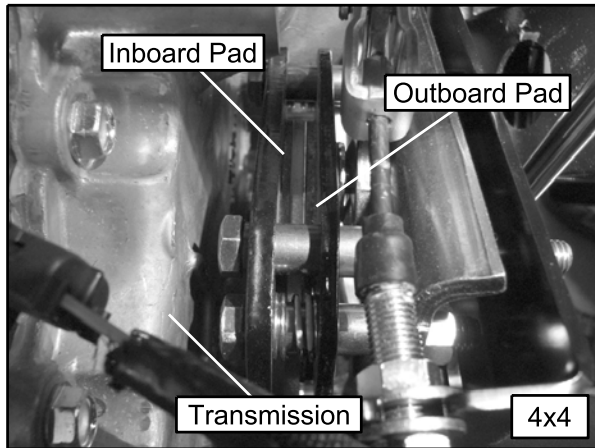
Exploded View (6X6)



BRAKES

Inspection

1. Inspect the parking brake cable and brake pads on the caliper assembly. Refer to the appropriate “**Caliper Removal**” procedure if service is required.



Reconnect parking brake connector as soon as it is practical and adjust parking brake cable to proper tension.

1. Pull back on the parking brake lever (located in the dash).
2. After 3 clicks the “(P)” brake light should illuminate on the instrument cluster and the wheels of the vehicle should not rotate when turning by hand. After 8 full clicks of lever travel, the vehicle should not roll while parked.
3. If the vehicle moves, adjustment is necessary.
4. Adjust the parking brake cable where the cable attaches to the caliper mount bracket. The mount bracket is located on the left-hand side of the transmission behind the outer PVT cover (4x4) or on the rear gearcase (6x6).

Adjustment Procedure

1. Place the vehicle in neutral on a flat level surface.
2. Carefully lift the rear of the vehicle off the ground and stabilize on jack stands.

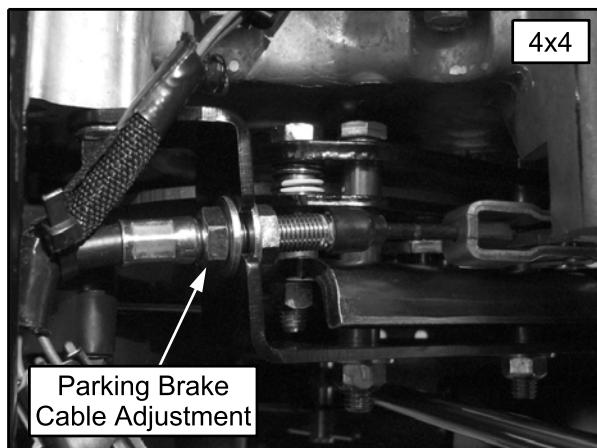
Cable Tension Adjustment

When the parking brake is fully engaged and the parking brake indicator is illuminated, engine speed is limited to 1300 RPM in all gears, including neutral. If throttle is applied, this limiting feature prevents operation, which protects the parking brake pads from excessive wear.

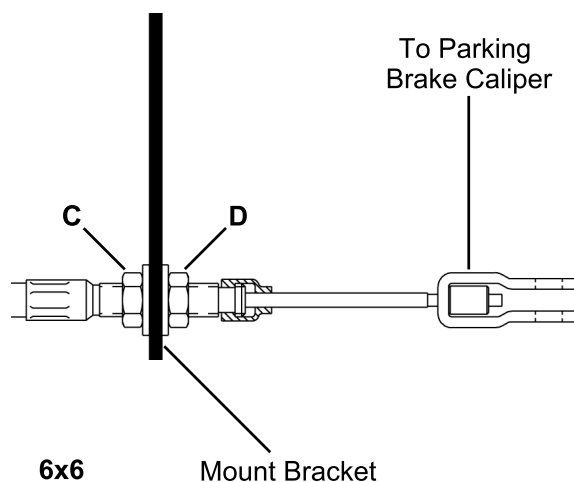
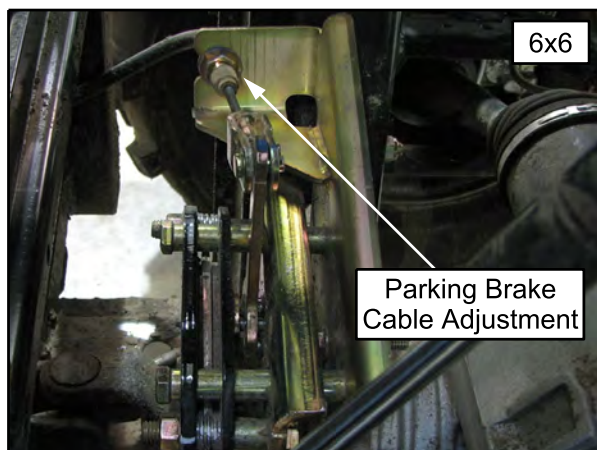
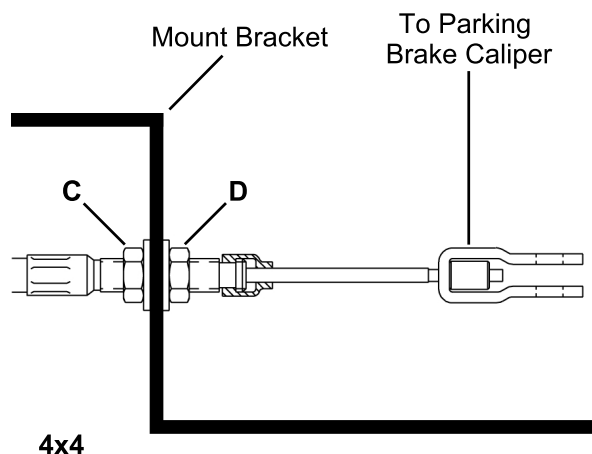
NOTE: Inspect the parking brake cable tension after the first 25 hours of operation and every 100 hours of operation afterwards to ensure proper cable tension.

Loss of tension in the parking brake cable will cause illumination of the parking brake light and activation of the limiting feature. If this occurs, inspect and adjust parking brake cable tension. If performing this service is difficult due to conditions or location, open the hood and temporarily disconnect the parking brake connector.

3. Locate the parking brake cable adjustment area where the cable attaches to the caliper mount bracket.



4. Use two open-end wrenches and loosen the outer jam nut (D). Back out the outer jam nut (D) 1 1/2 turns.



5. Now hold the outer jam nut (D) and turn in the inner jam nut (C) clockwise, until the jam nut is tight against the bracket.
6. Repeat Step 4 and Step 5 until the proper adjustment is obtained for the parking brake.

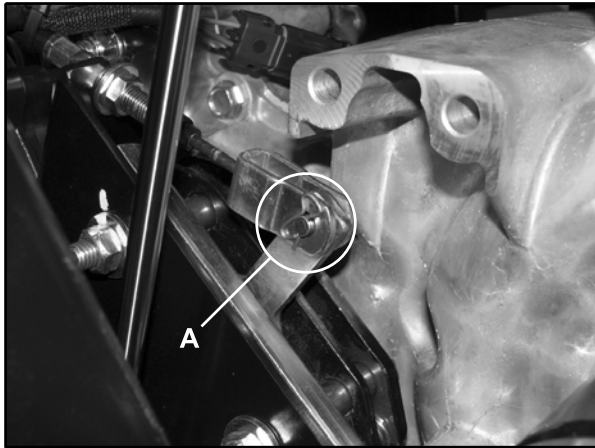
NOTE: See Chapter 10 for more information on the parking brake switch.

BRAKES

Caliper Removal (4x4)

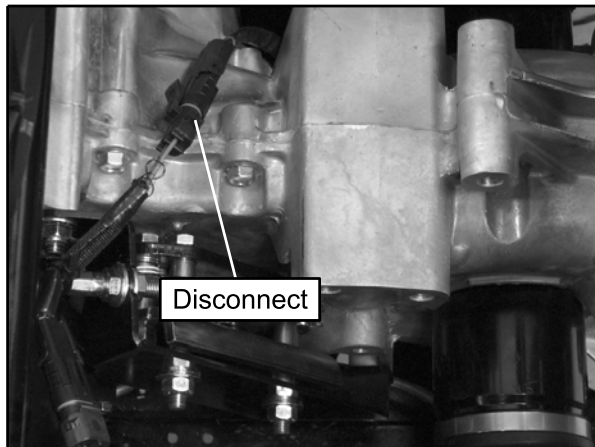
NOTE: Do not get oil, grease, or fluid on the parking brake pads. Damage to or contamination of the pads may cause the pads to function improperly.

1. Remove the clip and pin (A) from the parking brake cable.

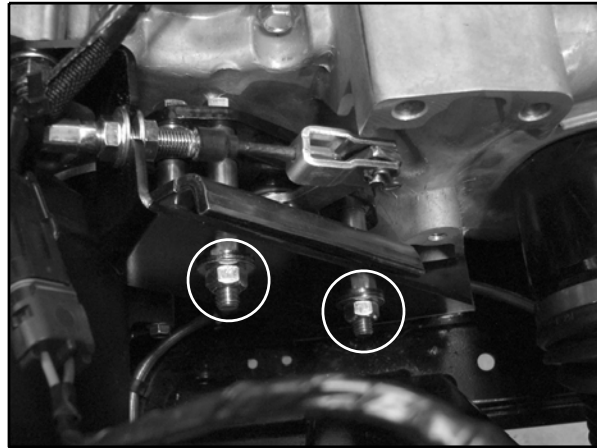


NOTE: Be sure the parking brake is not engaged.

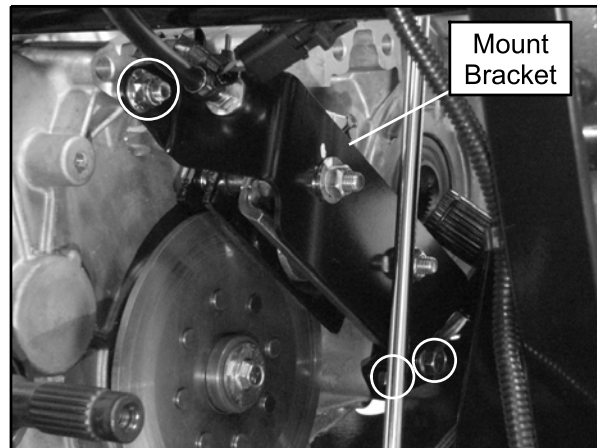
2. Disconnect the rear differential solenoid harness.



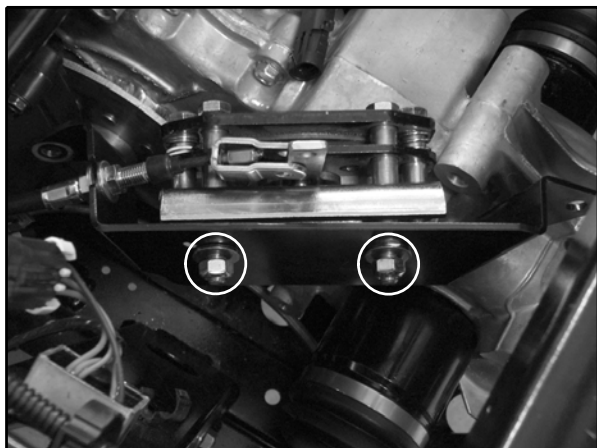
3. Loosen the (2) bolts that retain the caliper to the mount bracket.



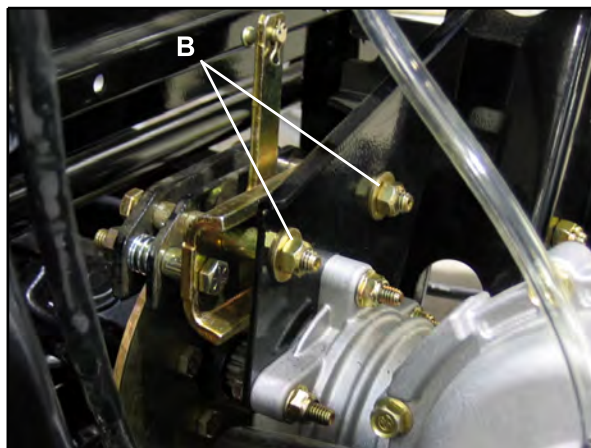
4. Remove the (3) fasteners retaining the parking brake mount bracket and remove the parking brake caliper as an assembly. **NOTE:** The image shown below has the PVT system removed for picture clarity.



5. Lift the parking brake caliper and mount bracket off the brake disc. Remove the (2) caliper mounting bolts and remove the caliper from the mount bracket.



2. Loosen the two brake caliper mounting bolts (B) in equal increments.



3. Remove mounting bolts from mount bracket and lift the parking brake caliper assembly out of the vehicle.

Caliper Removal (6x6)

NOTE: Do not get oil, grease, or fluid on the parking brake pads. Damage to or contamination of the pads may cause the pads to function improperly.

1. Remove the clip and pin (A) from the parking brake cable.

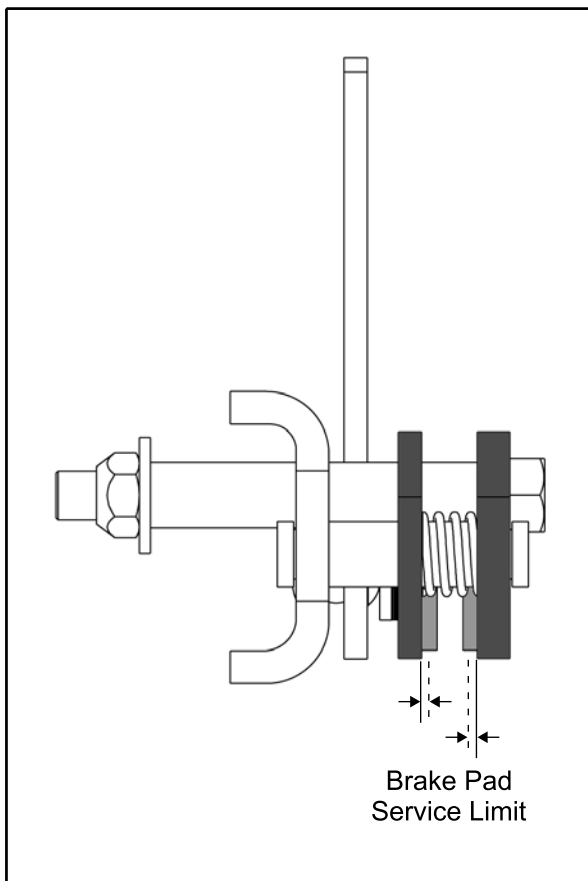


NOTE: Be sure the parking brake is not engaged.

BRAKES

Caliper Inspection

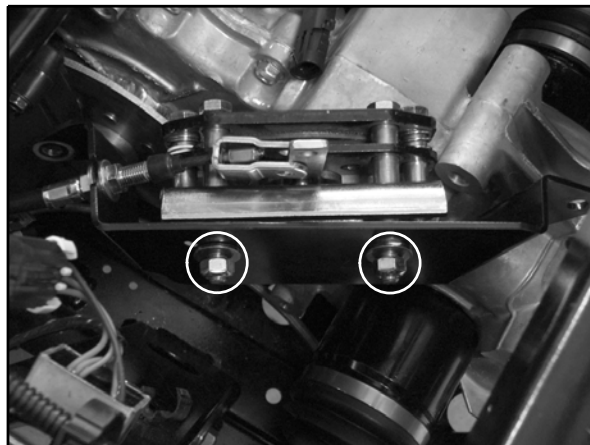
1. Inspect brake pads for excessive wear. Replace caliper assembly if required.
2. Measure the thickness of the brake pad material. Replace caliper assembly if pad material is worn past the service limit specification.



**Brake Pad Material
Service Limit: .030" (.762 mm)**

Caliper Installation (4x4)

1. Attach the parking brake caliper to the mount bracket and finger tighten the (2) mounting bolts.

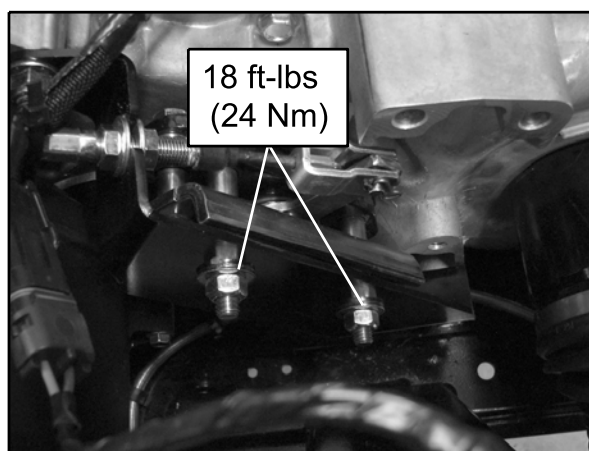


2. Place the parking brake assembly into place. Install and tighten the (3) mount bracket fasteners to specification.



**Parking Brake Caliper - Mount Bracket Bolts:
40 ft-lbs (54 Nm)**

3. Tighten the (2) parking brake caliper mounting bolts to specification.

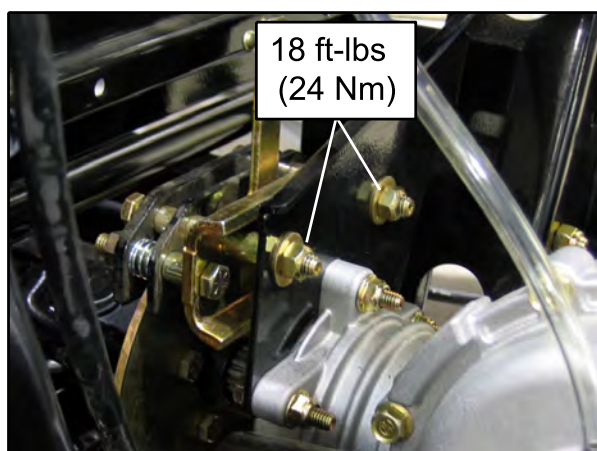


**Parking Brake Caliper - Mounting Bolts:
18 ft-lbs (24 Nm)**

4. Connect the rear differential solenoid harness.
5. Install the cable, pin and clip. Test the park brake for proper function.

Caliper Installation (6x6)

1. Install the parking brake assembly into place. Tighten the two mounting bolts in increments.



2. Torque the two mounting bolts to specification.



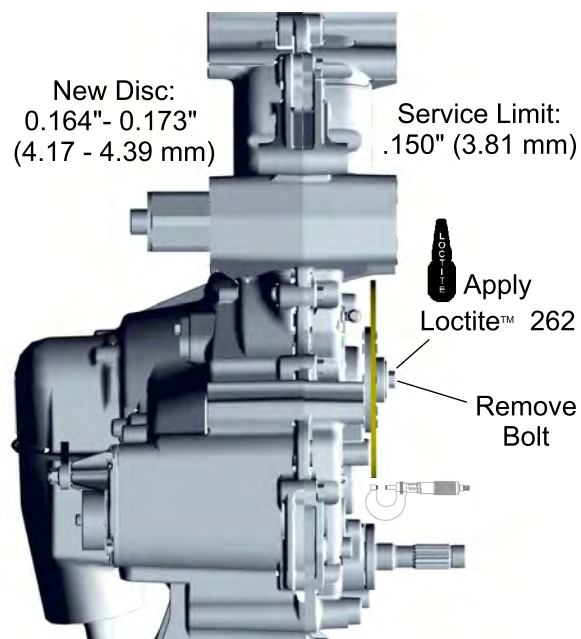
Parking Brake Caliper - Mounting Bolts:
18 ft-lbs (24 Nm)

3. Install the cable, pin, and clip. Test the park brake for proper function.

PARKING BRAKE DISC SERVICE

Disc Inspection / Removal (4X4)

1. Measure brake disc with a micrometer. If thickness of disc is less than specified, replace the disc assembly.
2. Remove the outer PVT cover, belt, drive clutch, driven clutch and inner PVT cover (see Chapter 6).
3. Using a 1/2" socket and ratchet, remove brake disc retaining bolt and remove disc from the transmission.



4. Reverse this procedure to reinstall brake disc. Torque the disc mounting bolt to **10-15 ft-lbs (14-20 Nm)**.

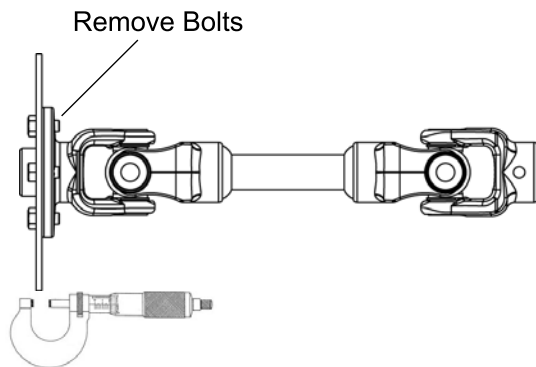
Disc Inspection / Removal (6X6)

1. Measure the brake disc with a micrometer. If the thickness of the disc is less than specified, replace the rear propshaft assembly.

BRAKES

2. Follow the rear prop shaft removal procedure listed in Chapter 7 to remove the rear propshaft assembly.

New Disc: 0.164" - 0.173" (4.17 - 4.39 mm)
Disc Service Limit: 0.150" (3.81 mm)



3. Refer to Chapter 7 to install rear propshaft assembly.

FRONT BRAKE PADS

Pad Removal

1. Elevate and support front of vehicle.

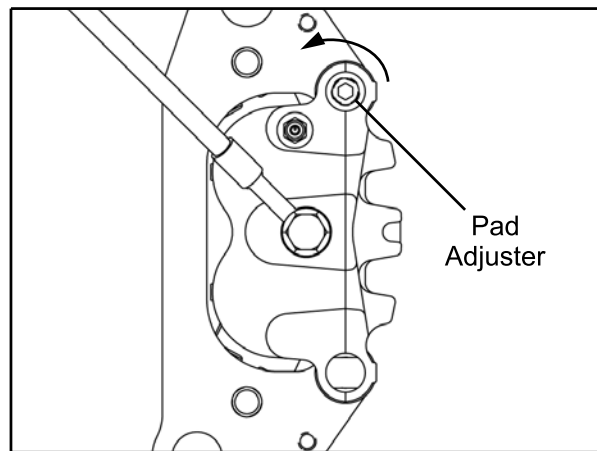


CAUTION

Use care when supporting vehicle so that it does not tip or fall.

Severe injury may occur if machine tips or falls.

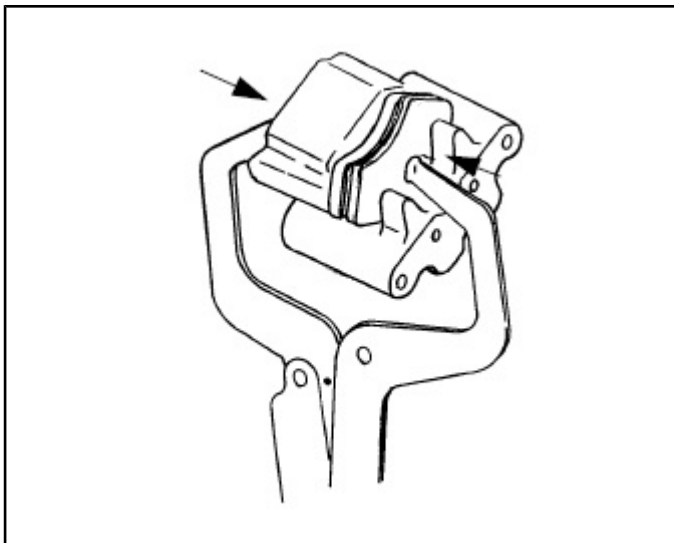
2. Remove the wheel nuts, washers and front wheel. Loosen pad adjuster screw.



3. Remove the upper and lower caliper mounting bolts and remove the caliper from the front hub.

NOTE: When removing caliper, use care not to damage brake line. Support caliper to avoid kinking or bending brake line.

4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.



NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

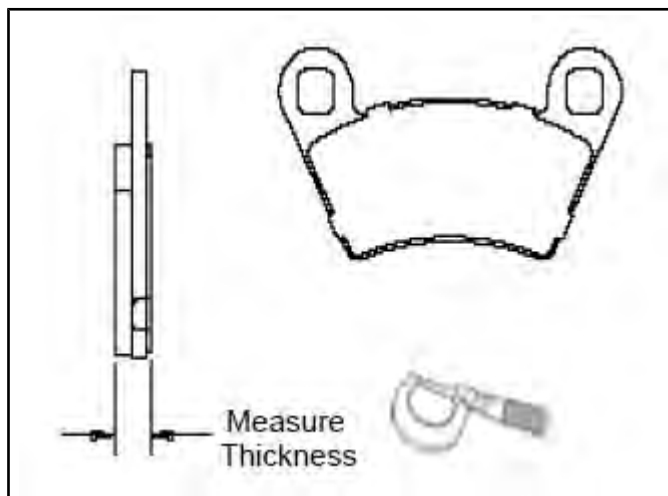
5. Push the mounting bracket inward and slip outer brake pad out between the bracket and caliper body.



6. Remove the inner pad from the bracket and caliper.

Pad Inspection

1. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.

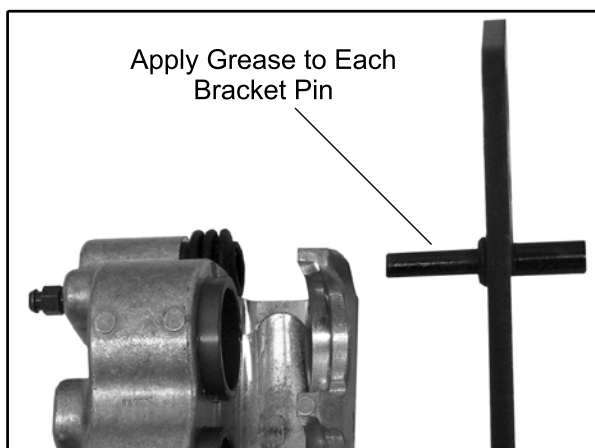


Front Brake Pad Thickness
New: 0.298 ± 0.007 " (7.56 ± 0.178 mm)
Service Limit: 0.150" (3.8 mm)

BRAKES

Pad Assembly / Installation

1. Lubricate mounting bracket pins with a light film of silicone grease and install rubber dust boots.



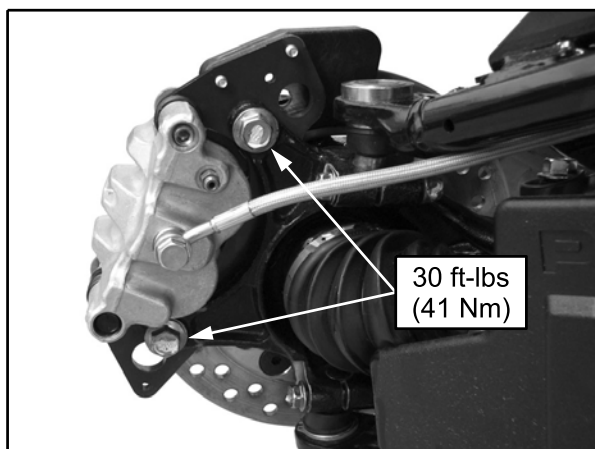
2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other.



WARNING

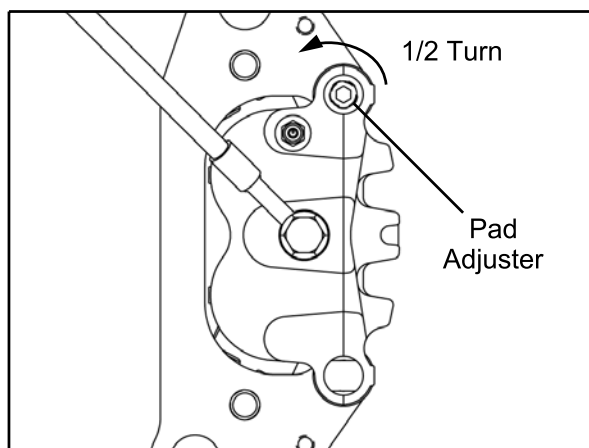
If brake pads are contaminated with grease, oil, or liquid soaked do not use the pads.
Use only new, clean pads.

3. Install caliper onto front hub and torque mounting bolts to specification.



Front Caliper Mounting Bolts:
30 ft-lbs (41 Nm)

4. Slowly pump brake pedal until pressure has been built up. Maintain at least 1/2, (12.7 mm) of brake fluid in reservoir to prevent air from entering brake system.
5. Install the pad adjuster set screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



6. Verify fluid level in reservoir is up to MAX line inside reservoir and install reservoir cap.

Master Cylinder Fluid

Up to MAX line inside reservoir

7. Install wheel and torque wheel nuts to specification.



Wheel Nuts:

Steel Wheels: 35 ft-lbs (47 Nm)

Aluminum Wheels: 30 ft-lbs + 90° (1/4 turn)

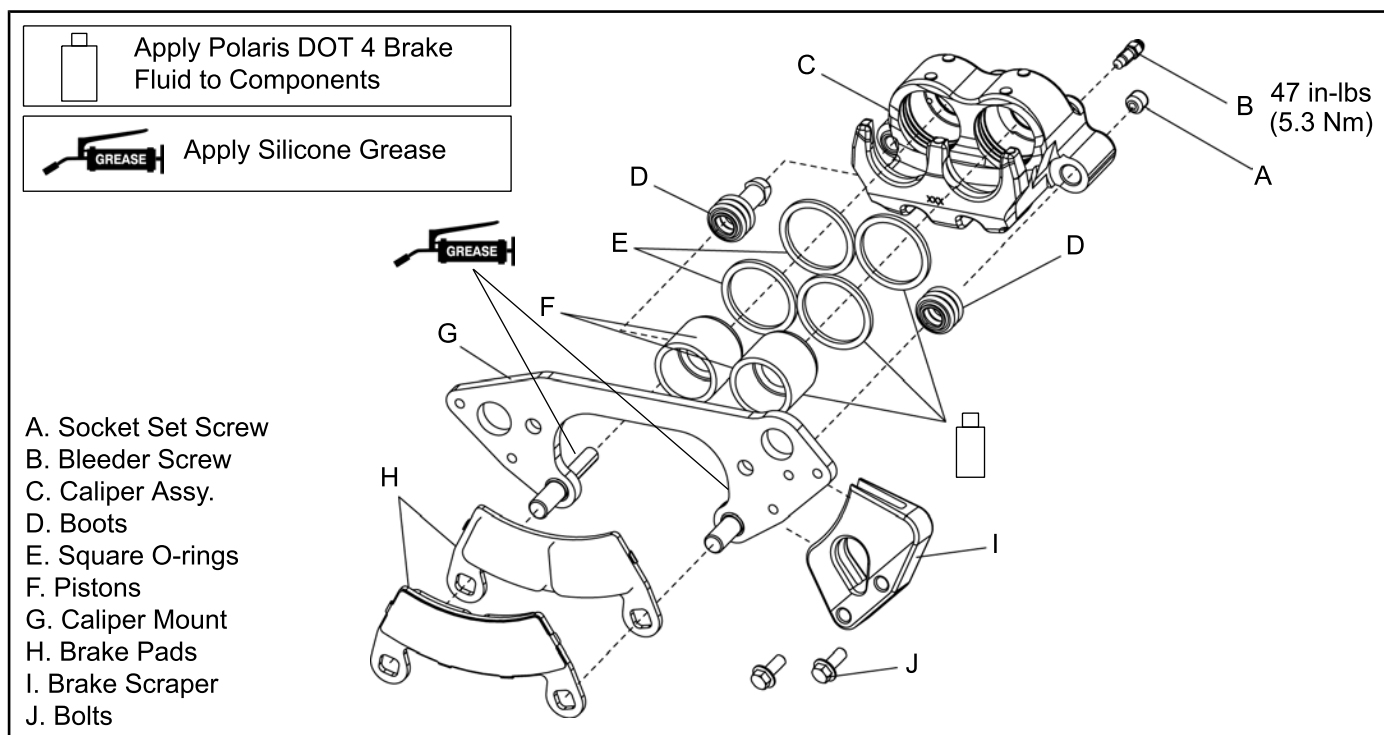
Brake Burnishing Procedure

It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warping may result. Repeat this procedure 10 times. **Do not make more than 3 stops per 1 mile (1.6 km).**

FRONT CALIPER SERVICE

Caliper Exploded View



Caliper Removal

1. Elevate and safely support the front of the vehicle.
2. Remove the (4) wheel nuts and the front wheel.

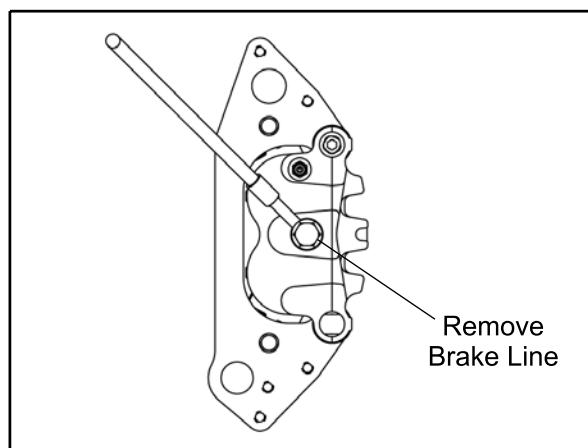
4. Place a container below the caliper to catch brake fluid when removing line. Remove brake line from caliper.



CAUTION

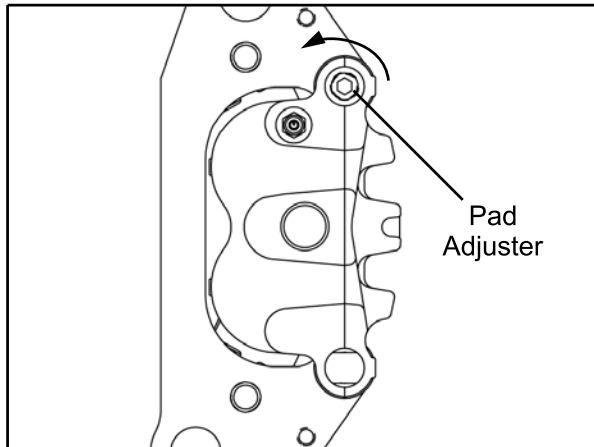
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur.

3. Clean caliper area before removal.

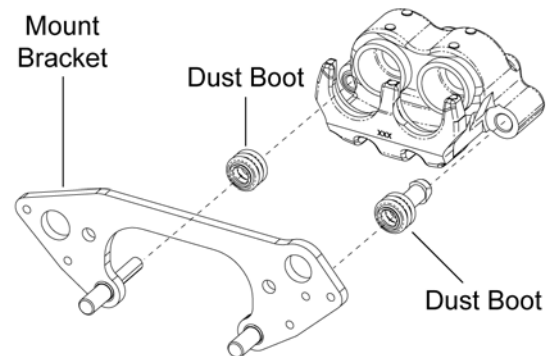


BRAKES

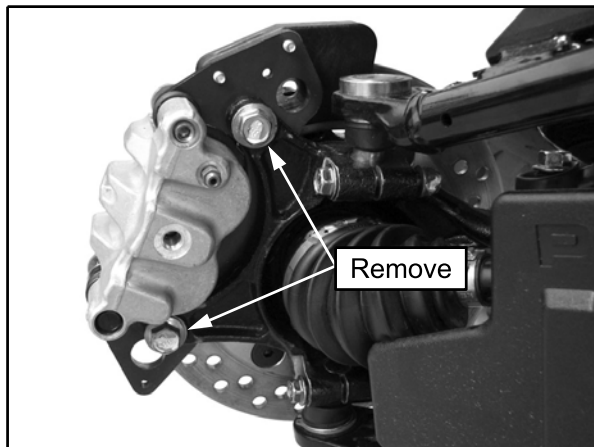
5. Loosen brake pad adjustment set screw to allow brake pad removal after the caliper is removed.



2. Remove the mount bracket assembly and dust boots from caliper. Thoroughly clean caliper before disassembly and prepare a clean work area.



6. Remove the two caliper mounting bolts and caliper.



3. Use a commercially available caliper piston pliers to extract the pistons from the caliper.



Caliper Disassembly

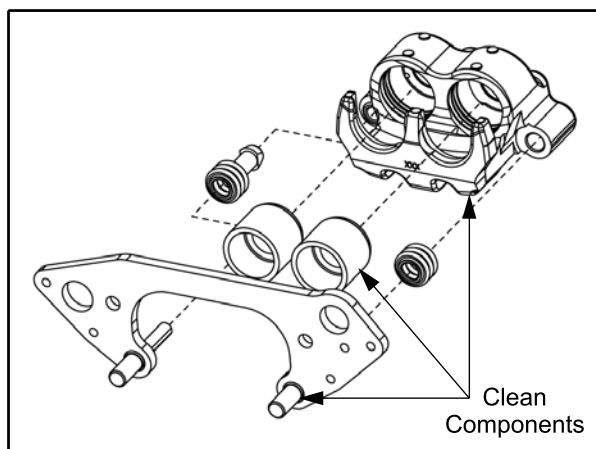
1. Remove both brake pads from the caliper (see "FRONT BRAKE PADS - Pad Removal").

IMPORTANT: Do not remove the caliper pistons with a standard pliers. The piston sealing surfaces will become damaged if a standard pliers is used.

- Once the pistons are removed, use a pick to carefully remove the square O-rings from the caliper. O-rings should be replaced during caliper service.



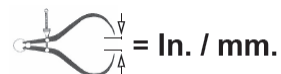
- Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.



IMPORTANT: Be sure to clean the seal grooves in caliper body.

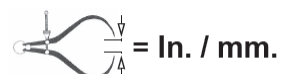
Caliper Inspection

- Inspect caliper body for nicks, scratches, pitting or wear. Measure bore size and compare to specifications. Replace if damaged or worn beyond service limit.



Caliper Piston Bore I.D.:
Std: 1.373" (34.87 mm)
Service Limit: 1.375" (34.93 mm)

- Inspect piston for nicks, scratches, pitting or wear. Measure piston diameter and replace if damaged or worn beyond service limit.



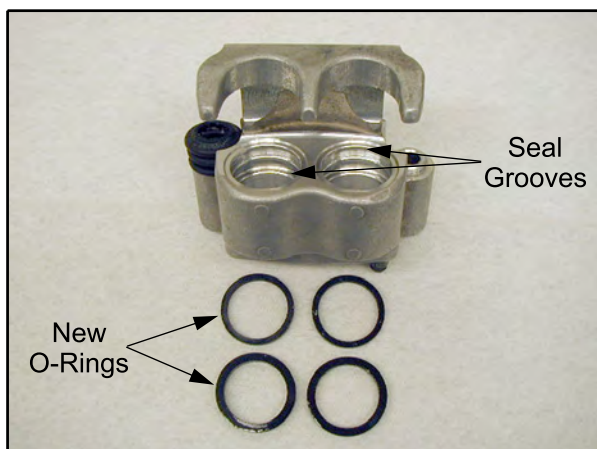
Caliper Piston O.D.:
Std: 1.370" (34.80 mm)
Service Limit: 1.368" (34.75 mm)

BRAKES

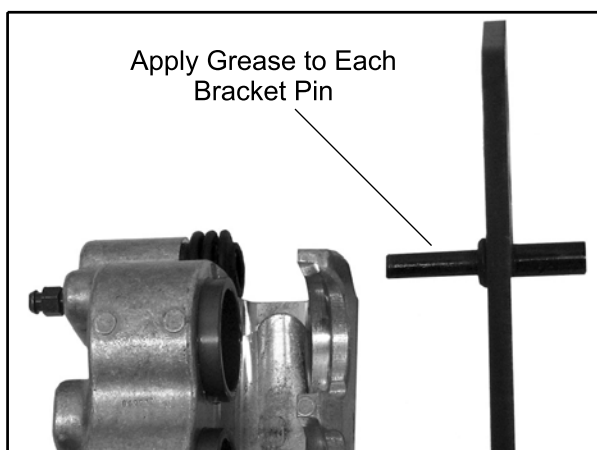
3. Inspect brake disc and pads as outlined in this chapter.

Caliper Assembly

1. Install new O-rings in the caliper body. Be sure the grooves are clean and free of residue or brakes may drag upon assembly.



2. Coat pistons with clean Polaris DOT 4 Brake Fluid. Install pistons with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.
3. Lubricate the mounting bracket pins with silicone grease and install the rubber dust seal boots.

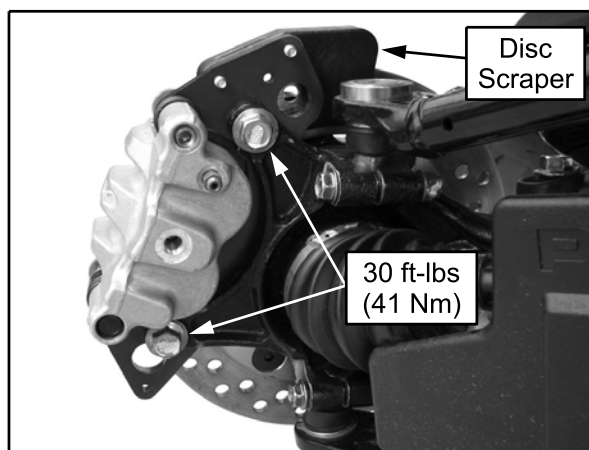


4. Compress the mounting bracket and make sure the dust seal boots are fully seated. Install the brake pads. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.

Caliper Installation

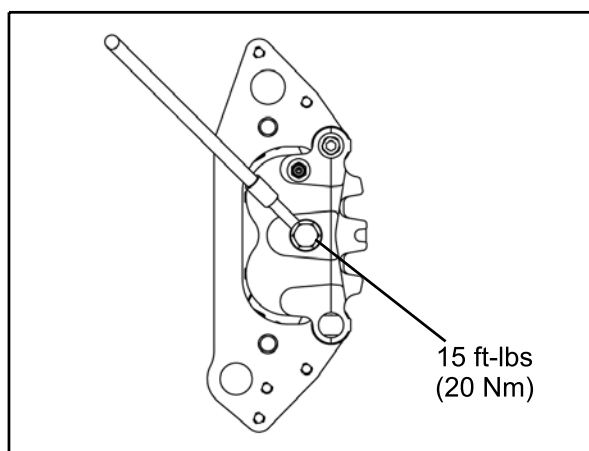
1. Install caliper and torque mounting bolts to specification.

IMPORTANT: If brake disc scraper was removed, be sure to reinstall it upon caliper installation.

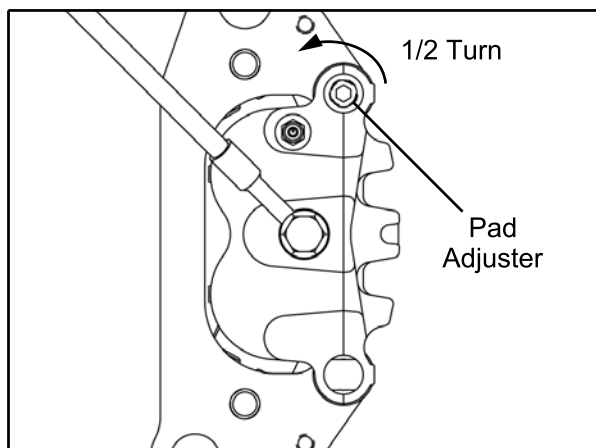


Front Caliper Mounting Bolts:
30 ft-lbs (41 Nm)

2. Install brake line and torque the banjo bolt to the proper torque specification.



3. Install the pad adjustment screw and turn until stationary pad contacts disc, then back off 1/2 turn.



4. Perform brake bleeding procedure as outlined earlier in this chapter.
5. Install wheel and torque wheel nuts to specification.



Wheel Nuts:
Steel Wheels: **35 ft-lbs (47 Nm)**
Aluminum Wheels: **30 ft-lbs + 90° (1/4 turn)**

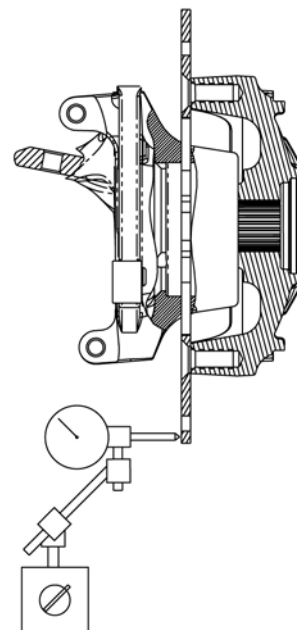
6. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

NOTE: If new brake pads are installed, brake burnishing is recommended (see "FRONT BRAKE PADS - Brake Burnishing Procedure").

FRONT BRAKE DISC

Disc Runout

1. Mount dial indicator as shown. Slowly rotate the disc and read total runout on the dial indicator. Replace disc if runout exceeds specification.



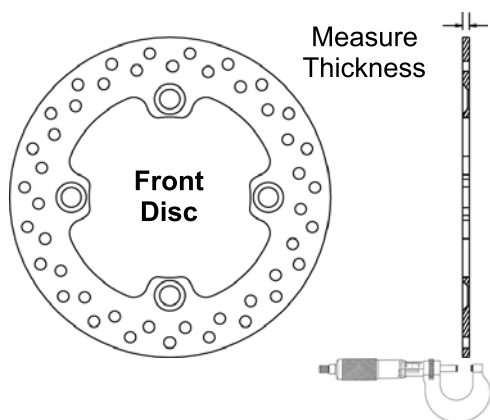
Brake Disc Runout:
Service Limit 0.010" (0.254 mm)

Disc Inspection

1. Visually inspect disc for scoring, scratches or gouges. Replace the disc if any deep scratches are evident.

BRAKES

2. Use a 0-1" micrometer and measure disc thickness at eight different points around the pad contact surface. Replace disc if worn beyond service limit.

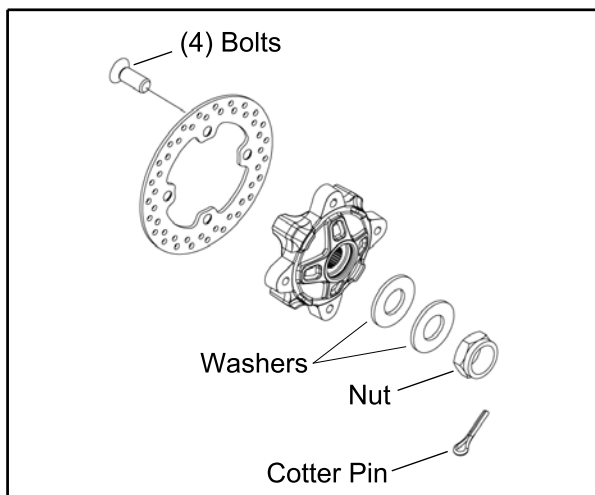


Brake Disc Thickness
New .188" (4.78 mm)
Service Limit 0.150" (3.8 mm)

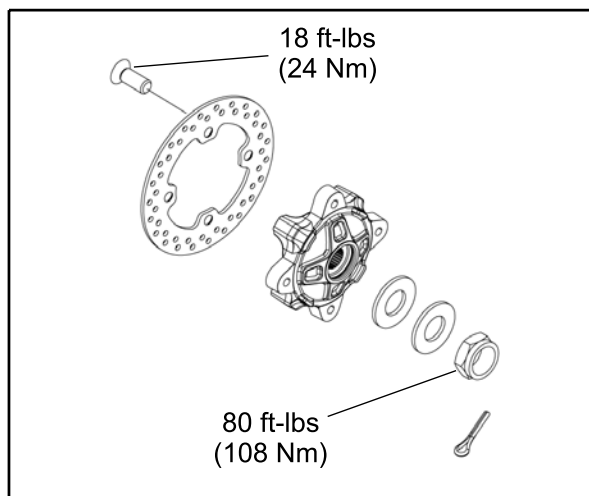
Brake Disc Thickness Variance
Service Limit: .002" (.051 mm)
difference between measurements

Disc Removal / Replacement

1. Remove front brake caliper (see "Front Caliper Service").
2. Remove cotter pin, castle nut and washers.
3. Remove the wheel hub assembly from the vehicle and remove the (4) bolts retaining the disc to the hub.



4. Clean the wheel hub mating surface and install new disc on wheel hub. Torque new bolts to specification.



Brake Disc Retaining Bolts:
18 ft-lbs (24 Nm)



CAUTION

Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

5. Install wheel hub assembly, washers, and castle nut. Torque castle nut to 80 ft-lbs (108 Nm) and install a new cotter pin.
6. Install front brake caliper (see "Front Caliper Service"). Follow bleeding procedure outlined earlier in this chapter.
7. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

REAR BRAKE PADS (4X4)

Pad Removal

1. Elevate and support rear of machine.



CAUTION

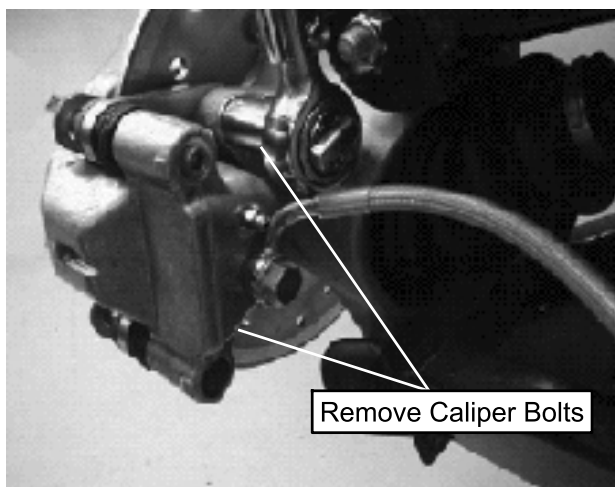
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Remove the rear wheel. Loosen pad adjuster screw 2-3 turns.



3. Clean caliper area before removal.
4. Remove caliper mounting bolts and lift caliper off of disc.

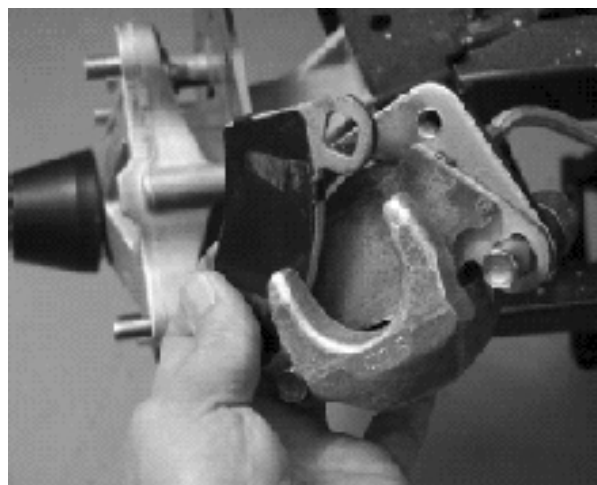
NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.



5. Push caliper piston into caliper bore slowly with pads installed.

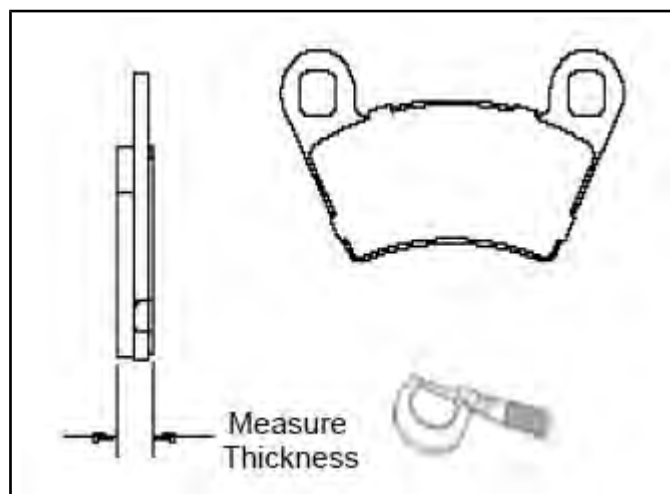
NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

6. Remove the brake pads.



Pad Inspection

1. Clean the caliper with brake cleaner or alcohol.
2. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Rear Brake Pad Thickness
New .298 + .007" (7.56 + .178 mm)
Service Limit .180" (4.6 mm)

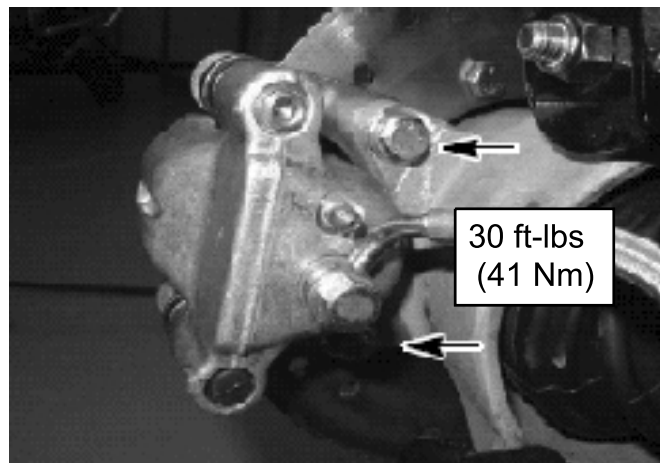
BRAKES

Pad Installation

1. Install new pads in caliper body.



2. Install caliper and torque mounting bolts.



Rear Brake Caliper Mounting Bolts:
30 ft-lbs (41 Nm)

3. Turn adjuster screw back in finger tight using a hex wrench.
4. Slowly pump brake pedal until pressure has been built up. Maintain at least 1/2" (12.7 mm) of brake fluid in reservoir to prevent air from entering master cylinder.

Brake Burnishing Procedure

It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warping may result. Repeat this procedure 10 times. **Do not make more than 3 stops per 1 mile (1.6 km).**

REAR BRAKE PADS (CREW / 6X6)

Pad Removal

1. Elevate and support rear of vehicle.

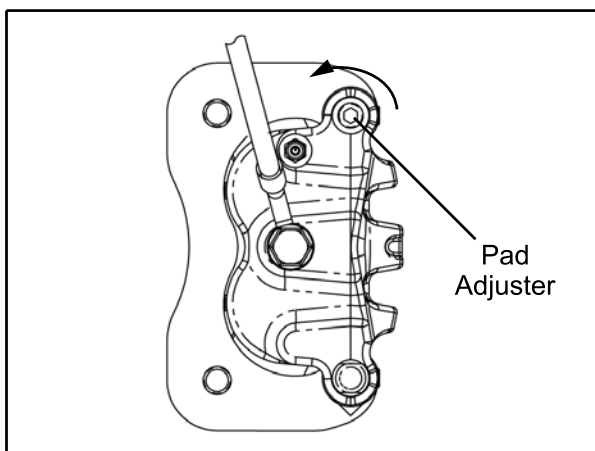


CAUTION

Use care when supporting vehicle so that it does not tip or fall.

Severe injury may occur if machine tips or falls.

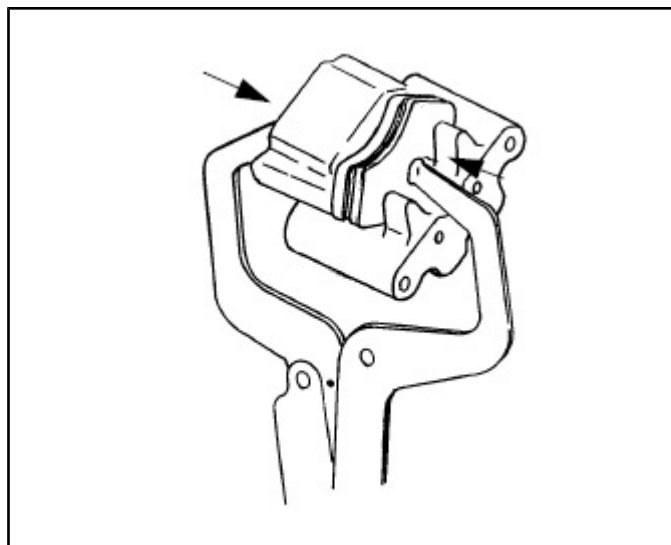
2. Remove the wheel nuts, washers and rear wheel. Loosen pad adjuster screw.



3. Remove the upper and lower caliper mounting bolts and remove the caliper from the front hub.

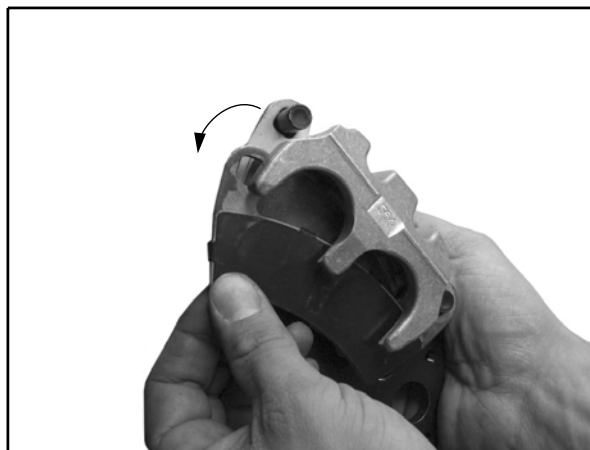
NOTE: When removing caliper, use care not to damage brake line. Support caliper to avoid kinking or bending brake line.

4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.



NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

5. Push the mounting bracket inward and slip outer brake pad out between the bracket and caliper body.

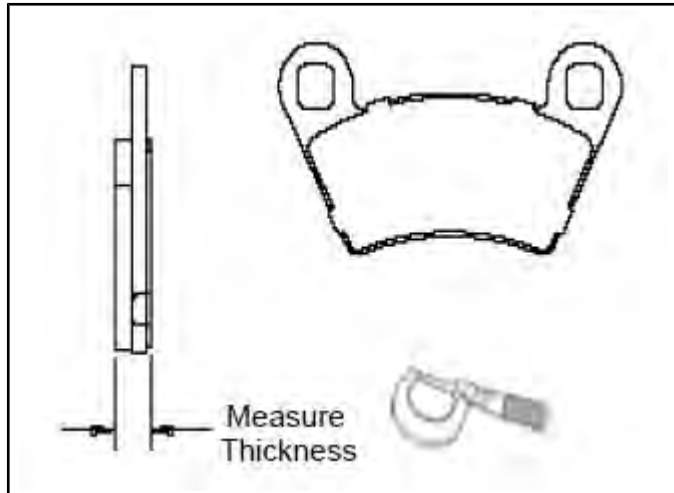


6. Remove the inner pad from the bracket and caliper.

BRAKES

Pad Inspection

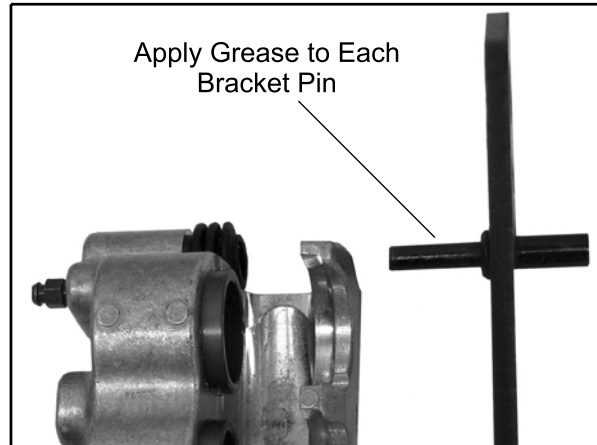
1. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Front Brake Pad Thickness
New: 0.298 ± 0.007" (7.56 ± 0.178 mm)
Service Limit: 0.150" (3.8 mm)

Pad Assembly / Installation

1. Lubricate mounting bracket pins with a light film of silicone grease and install rubber dust boots.

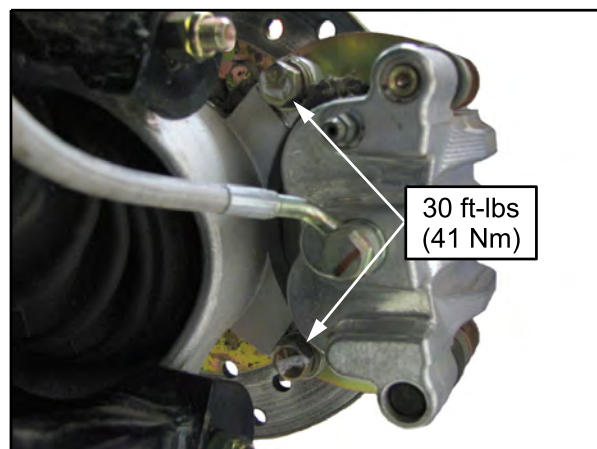


2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other.

WARNING

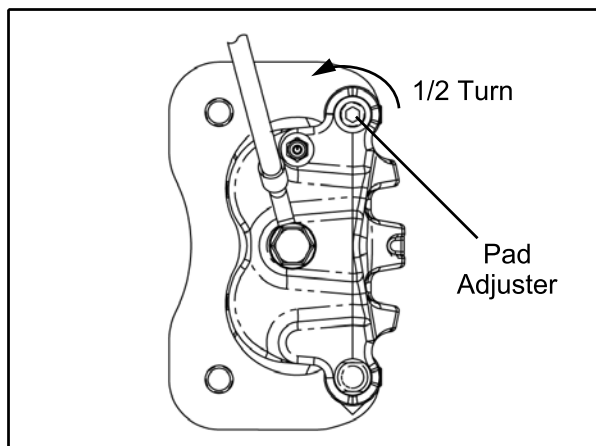
If brake pads are contaminated with grease, oil, or liquid soaked do not use the pads.
Use only new, clean pads.

3. Install caliper onto rear hub and torque mounting bolts to specification.



Rear Caliper Mount Bolt:
30 ft-lbs (41 Nm)

4. Slowly pump the brake pedal until pressure has been built up. Maintain at least 1/2, (12.7 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
5. Install the pad adjuster set screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



6. Verify fluid level in reservoir is up to MAX line inside reservoir and install reservoir cap.

Master Cylinder Fluid:

Up to MAX line inside reservoir

7. Install wheel and torque wheel nuts to specification.



Wheel Nuts:

Steel Wheels: **35 ft-lbs (47 Nm)**

Aluminum Wheels: **30 ft-lbs + 90° (1/4 turn)**

Brake Burnishing Procedure

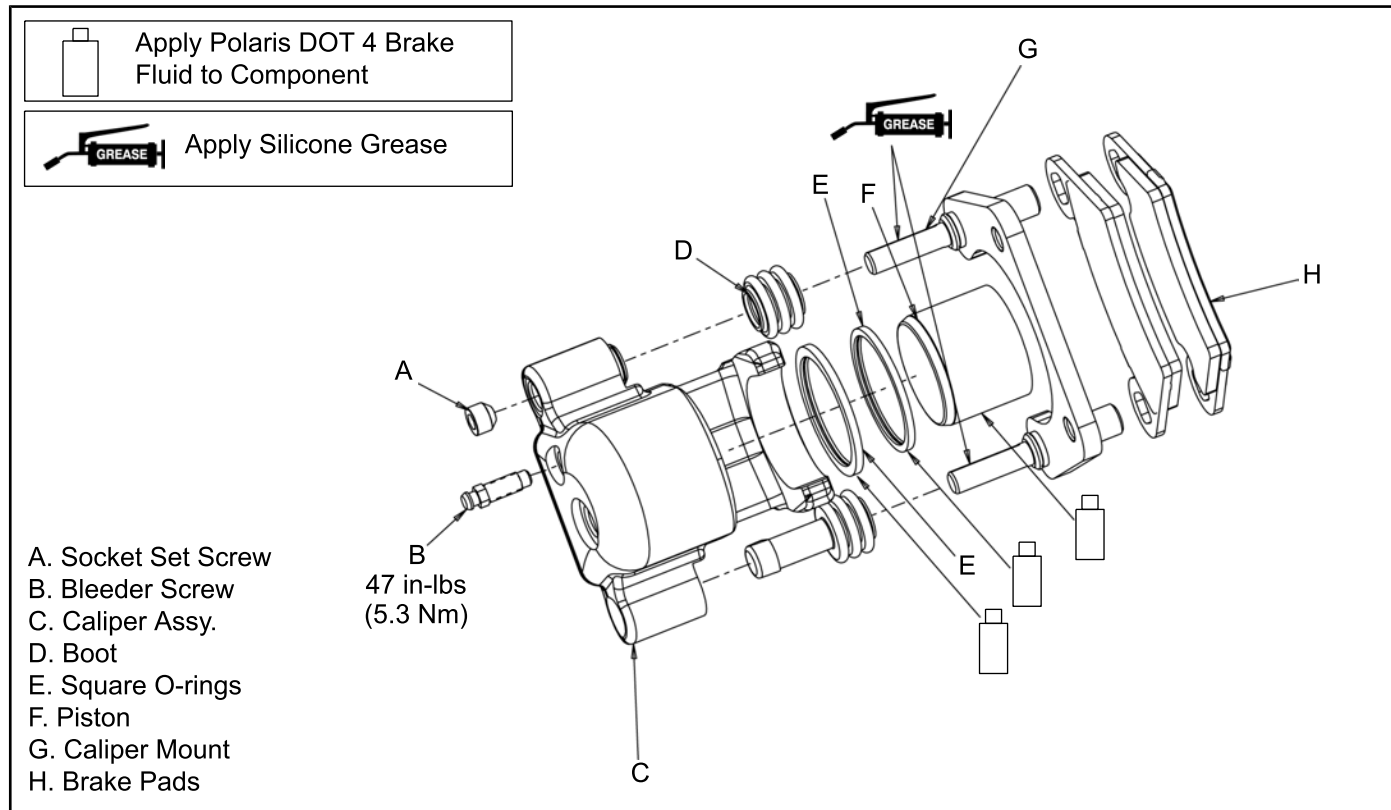
It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warping may result. Repeat this procedure 10 times. **Do not make more than 3 stops per 1 mile (1.6 km).**

BRAKES

REAR CALIPER SERVICE (4X4)

Rear Caliper Exploded View



Caliper Removal

1. Safely support the rear of the machine.



CAUTION

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Place a container to catch brake fluid draining from brake lines. Use a wrench to remove the brake line.



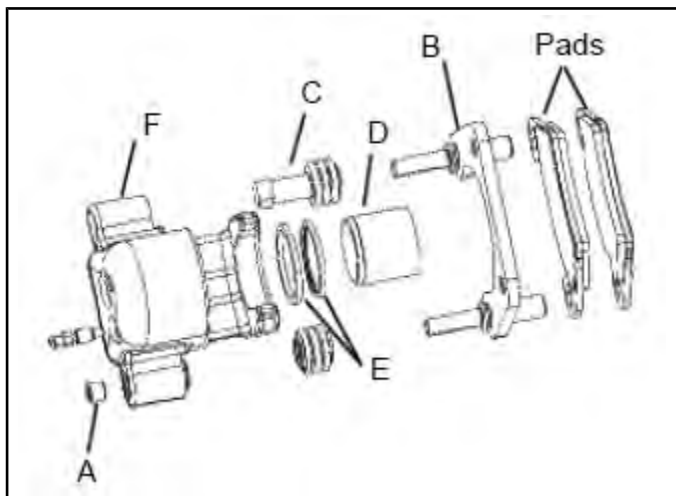
3. After the fluid has drained into the container, remove the two caliper mounting bolts and remove caliper.



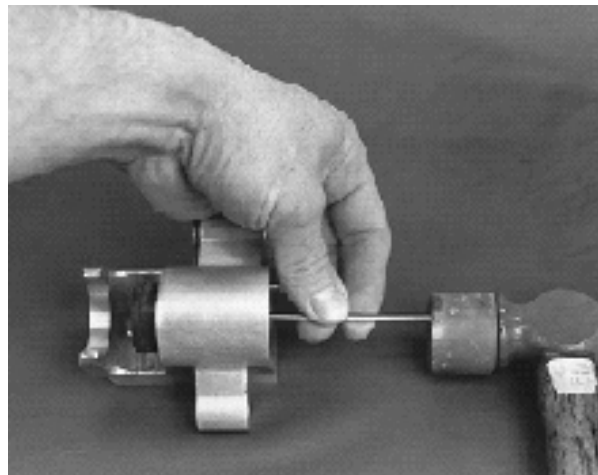
4. Clean disc, caliper body, and pistons with brake cleaner or alcohol.

Caliper Disassembly

1. Remove brake pad adjuster screw (A).
2. Push upper pad retainer pin inward and slip brake pads past edge, if pads are still installed.
3. Remove mounting bracket (B) and dust boot (C).



4. Remove piston (D) and square O-rings (E) from the caliper body (F).

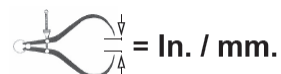


5. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

NOTE: Be sure to clean seal grooves in caliper body.

Caliper Inspection

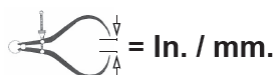
1. Inspect caliper body for nicks, scratches or wear. Measure bore size and compare to specifications. Replace if damage is evident or if worn beyond service limit.



Caliper Piston Bore I.D.:
Std: 1.505" (38.23 mm)
Service Limit: 1.507" (38.28 mm)

BRAKES

2. Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.

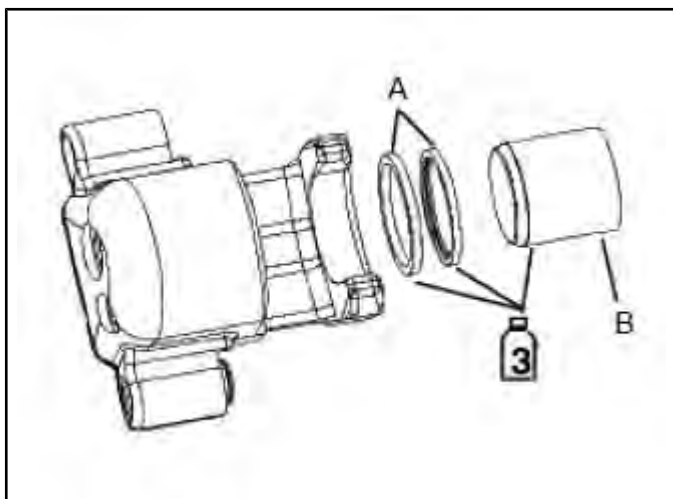


Caliper Piston O.D.:
Std: 1.500" (38.10 mm)
Service Limit: 1.498" (38.05 mm)

3. Inspect the brake disc and pads as outlined for brake pad replacement in this chapter.

Caliper Assembly

1. Install new square O-rings (A) in the caliper body. Be sure that the grooves are clean and free of residue or brakes may drag.



2. Coat the piston with clean DOT 4 Brake Fluid (PN 2872189). Install piston (B) with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.
3. Lubricate the mounting bracket pins with silicone grease and install the rubber dust seal boots.



4. Compress the mounting bracket and make sure the dust seals are fully seated. Install the brake pads. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.

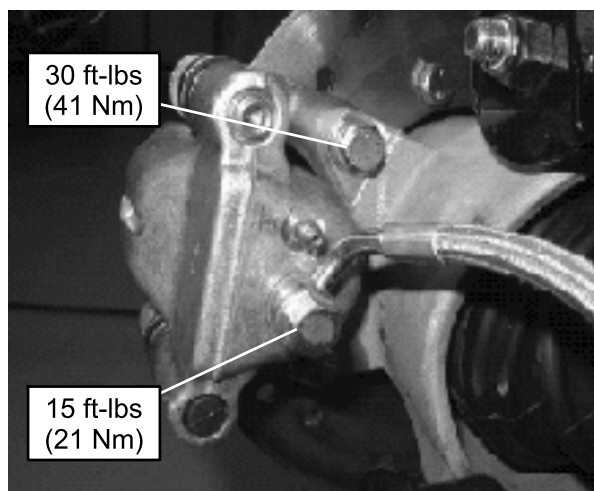
Caliper Installation

1. Install the rear caliper and mounting bolts. Torque mounting bolts to specification.



Rear Caliper Mounting Bolts:
30 ft-lbs (41 Nm)

2. Install brake line banjo bolt. Torque banjo bolt to specification.



Brake Line Banjo Bolt:
15 ft-lbs (21 Nm)

3. Install the rear wheel and torque wheel nuts to specification. Carefully lower the vehicle.



Wheel Nuts:
Steel Wheels: **35 ft-lbs (47 Nm)**
Aluminum Wheels: **30 ft-lbs + 90° (1/4 turn)**

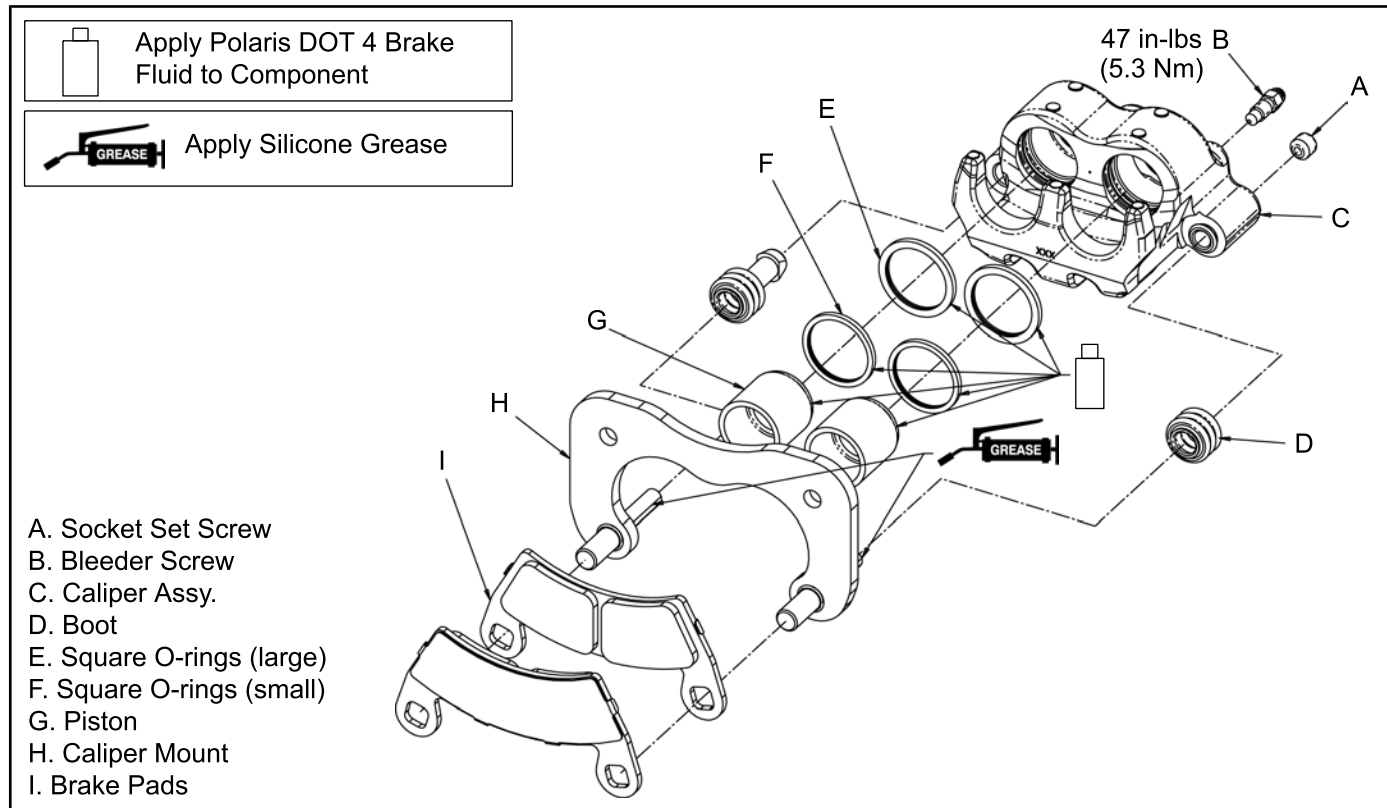
4. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

NOTE: If new brake pads are installed, brake burnishing is recommended (see "REAR BRAKE PADS - Brake Burnishing Procedure").

BRAKES

REAR CALIPER SERVICE (CREW / 6X6)

Rear Caliper Exploded View



Caliper Removal

1. Elevate and safely support the rear of the vehicle.

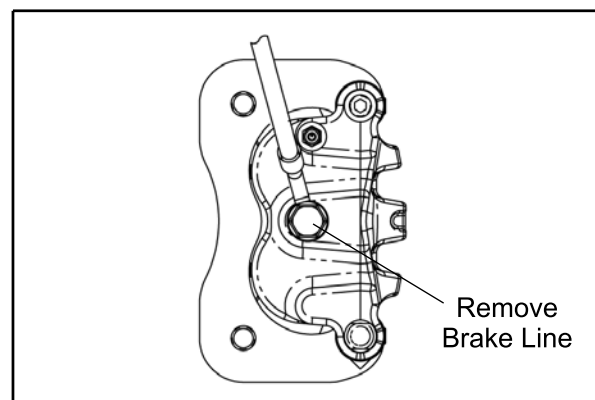


CAUTION

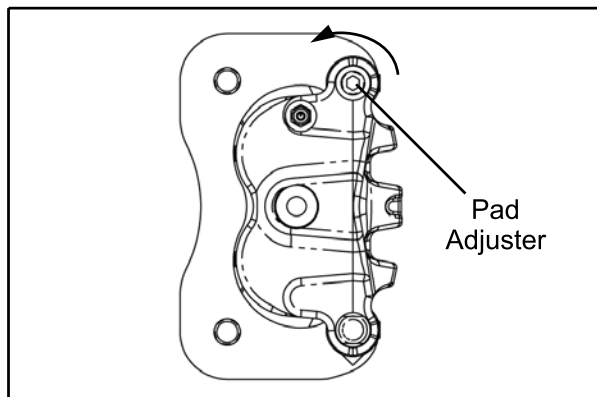
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur.

2. Remove (4) wheel nuts, (4) washers and rear wheel.
3. Clean caliper area before removal.

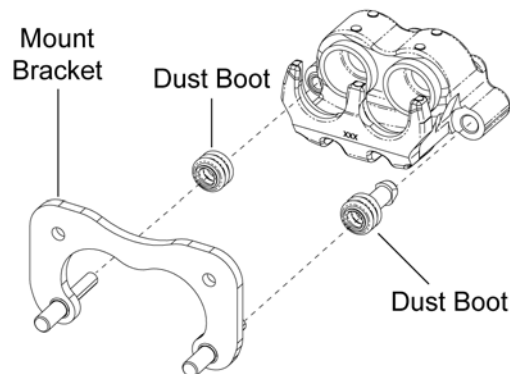
4. Place a container below the caliper to catch brake fluid. Remove brake line from caliper.



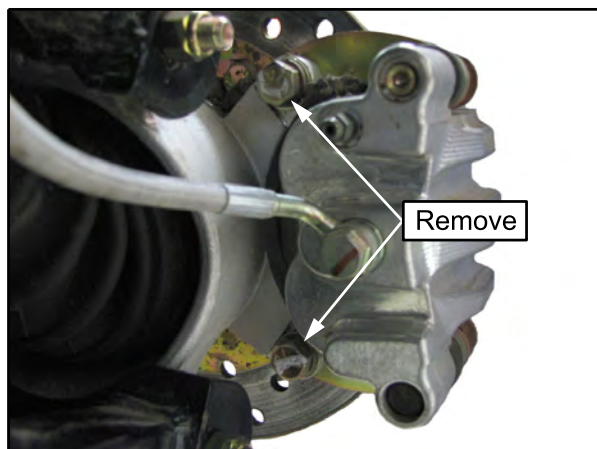
- Loosen brake pad adjustment set screw to allow brake pad removal after the caliper is removed.



- Remove mount bracket assembly and dust boots from caliper. Thoroughly clean caliper before disassembly and prepare a clean work area for disassembly.



- Remove the two caliper mounting bolts and caliper.



- Use a commercially available caliper piston pliers to extract the pistons from the caliper.



Caliper Disassembly

- Remove both brake pads from the caliper. Refer to "REAR BRAKE PADS (CREW / 6X6)".

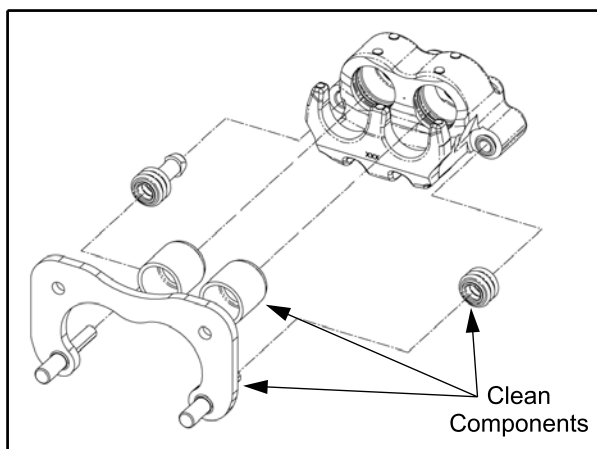
IMPORTANT: Do not remove the caliper pistons with a standard pliers. The piston sealing surfaces will become damaged if a standard pliers is used.

BRAKES

- Once the pistons are removed, use a pick to carefully remove the square O-rings from the caliper. O-rings should be replaced during caliper service.



- Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.



IMPORTANT: Be sure to clean the seal grooves in caliper body.

Caliper Inspection

- Inspect caliper body for nicks, scratches, pitting or wear. Measure bore size and compare to specifications. Replace if damaged or worn beyond service limit.



$$\text{Caliper Piston Bore I.D.} = \text{In. / mm.}$$

Caliper Piston Bore I.D.:
Std: 1.192" (30.28 mm)
Service Limit: 1.194" (34.33 mm)

- Inspect piston for nicks, scratches, pitting or wear. Measure piston diameter and replace if damaged or worn beyond service limit.



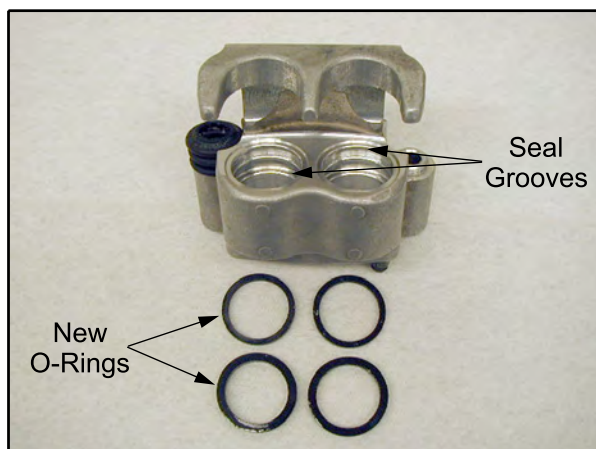
$$\text{Caliper Piston O.D.} = \text{In. / mm.}$$

Caliper Piston O.D.:
Std: 1.186" (30.12 mm)
Service Limit: 1.184" (30.07 mm)

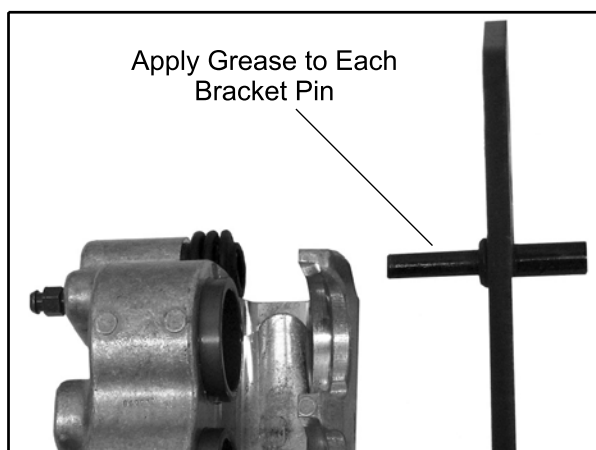
3. Inspect the brake disc and pads as outlined in this chapter.

Caliper Assembly

1. Install new O-rings in the caliper body. Be sure the grooves are clean and free of residue or brakes may drag upon assembly.



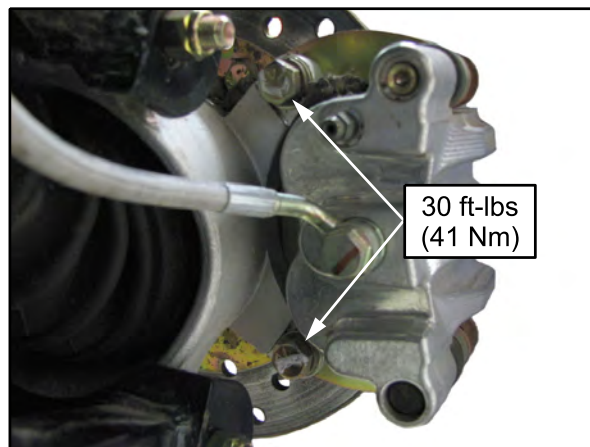
2. Coat pistons with clean Polaris DOT 4 Brake Fluid. Install pistons with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.
3. Lubricate the mounting bracket pins with silicone grease and install the rubber dust seal boots.



4. Compress the mounting bracket and make sure the dust seal boots are fully seated. Install the brake pads. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.

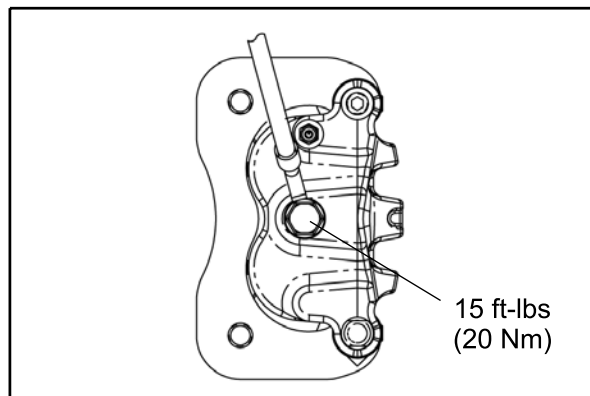
Caliper Installation

1. Install caliper and torque bolts to specification.



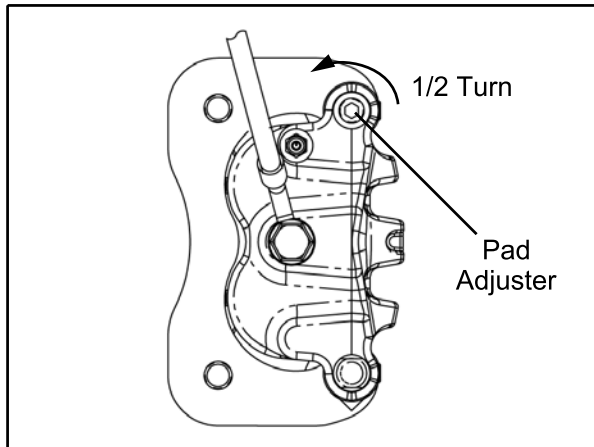
Rear Caliper Mount Bolt Torque:
30 ft-lbs (41 Nm)

2. Install brake line and torque the banjo bolt to the proper torque specification.



BRAKES

3. Install the pad adjustment screw and turn until stationary pad contacts disc, then back off 1/2 turn.



4. Perform brake bleeding procedure as outlined earlier in this chapter.
5. Install wheel and torque wheel nuts to specification.



Wheel Nuts:
Steel Wheels: **35 ft-lbs (47 Nm)**
Aluminum Wheels: **30 ft-lbs + 90° (1/4 turn)**

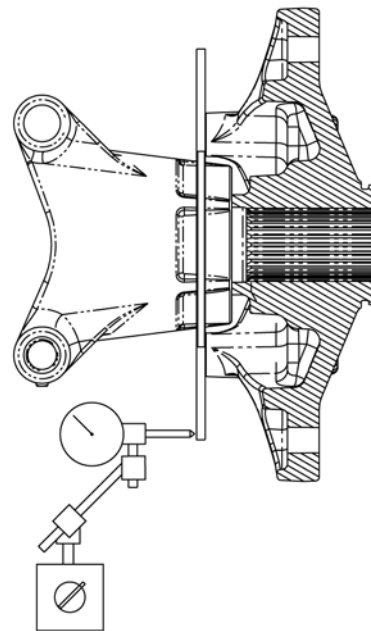
6. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

NOTE: If new brake pads are installed, brake burnishing is recommended (see "REAR BRAKE PADS - Brake Burnishing Procedure").

REAR BRAKE DISC

Disc Runout

1. Mount a dial indicator and measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specification.

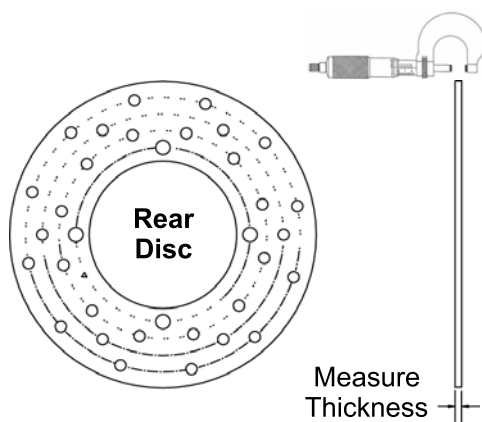


**Brake Disc Runout
Service Limit .010" (.254 mm)**

Disc Inspection

1. Visually inspect disc for scoring, scratches or gouges. Replace disc if any are evident.

- Use a 0-1" micrometer and measure disc thickness at 8 different points around perimeter of disc. Replace disc if worn beyond service limit.
- Clean the wheel hub mating surface and install new disc on wheel hub.
- Install new bolts and torque to specification.

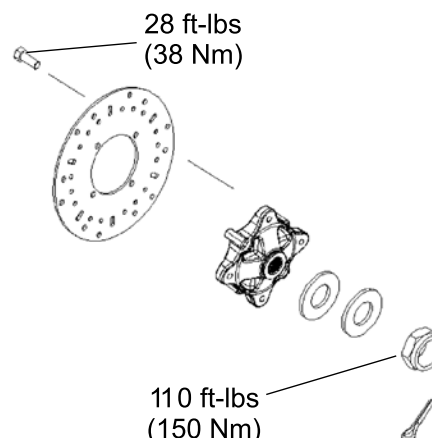
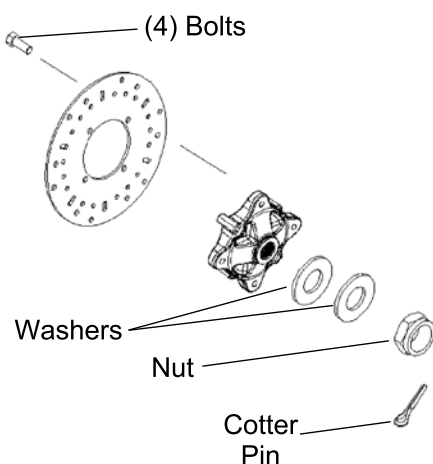


Brake Disc Thickness:
New 0.188" (4.78 mm)
Service Limit 0.170" (4.32 mm)

Brake Disc Thickness Variance:
Service Limit 0.002" (0.051 mm)
difference between measurements

Disc Removal / Replacement

- Remove rear brake caliper (see "Rear Caliper Service").
- Remove cotter pin, castle nut and washers.
- Remove the wheel hub assembly from the vehicle and remove the (4) bolts retaining the disc to the hub.



Brake Disc Retaining Bolts:
28 ft-lbs (38 Nm)



Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

- Install wheel hub assembly, washers, and castle nut. Torque castle nut to specification and install a new cotter pin.



Rear Hub Castle Nut:
110 ft-lbs (150 Nm)

- Install rear brake caliper (see "REAR CALIPER SERVICE"). Follow the bleeding procedure outlined earlier in this chapter.
- Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

BRAKES

TROUBLESHOOTING

Brakes Squeal / Poor Brake Performance

- Air in system
- Water in system (brake fluid contaminated)
- Caliper/disc misaligned
- Caliper dirty or damaged
- Brake line damaged or lining ruptured
- Worn disc and/or friction pads
- Incorrectly adjusted stationary pad
- Worn or damaged master cylinder or components
- Damaged break pad noise insulator

Pedal Vibration

- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

Caliper Overheats (Brakes Drag)

- Compensating port plugged
- Pad clearance set incorrectly
- Parking brake lever incorrectly adjusted
- Brake pedal binding or unable to return fully
- Parking brake left on
- Residue build up under caliper seals
- Operator riding brakes

Brakes Lock

- Alignment of caliper to disc
- Caliper pistons sticking
- Improper assembly of brake system components

CHAPTER 11

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GENERAL INFORMATION

Special Tools

PART NUMBER	TOOL DESCRIPTION
PV-43568	Fluke™ 77 Digital Multimeter
PV-43526	Connector Test Kit
2870630	Timing Light
PU-50338	Battery Hydrometer
2460761	Hall Sensor Probe Harness
2871745	Static Timing Light Harness
PU-47063	Digital Wrench® Diagnostic Software
PU-47471	Digital Wrench® SmartLink Module Kit

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

Electrical Service Notes

Keep the following notes in mind when diagnosing an electrical problem:

- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a 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.
- Voltage, amperage, and resistance values included in this manual are obtained with a Fluke™ 77 Digital Multimeter (PV-43568). This meter is used when diagnosing electrical problems. Readings obtained with other meters may differ.
- 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.

Components Under Hood

The following components can be accessed under the hood.

- Voltage Regulator (in front of radiator)
- Battery
- Battery Cables
- Terminal Block
- Starter Solenoid
- Relays
- Fuses
- Digital Wrench® Diagnostic Connector

Components Behind Dash Panel

The following components can be accessed with the dash panel removed (see Chapter 5 for removal).

- Instrument Cluster (Speedometer)
- AWD/2WD/TURF Switch
- Headlight Switch
- 12 VDC Accessory Power Points
- Ignition Switch
- Parking Brake Switch

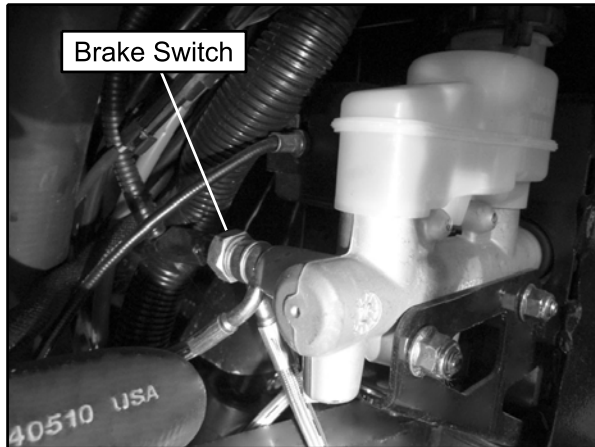
ELECTRICAL

SWITCHES / CONTROLS

Brake Light Switch

The brake light switch is located on the master cylinder behind the front left wheel well panel.

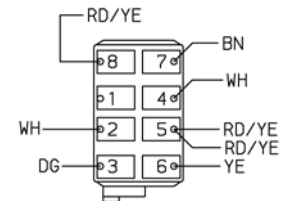
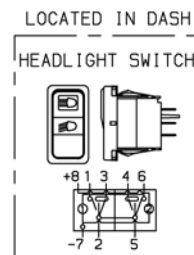
1. Remove the front left wheel well panel to access the back side of the master cylinder.
2. Disconnect the wire harness from the brake switch.



3. Connect an ohmmeter across switch contacts. Reading should be infinite (OL).
4. Apply foot brake and check for continuity between switch contacts. If there is no continuity or if resistance is greater than 0.5 ohms, clean the switch contacts and re-test. Replace switch if necessary.

Headlamp Switch

1. Disconnect the headlamp switch harness by depressing the connector locks and pulling on the connector. Do not pull on the wiring.
2. Test between the 3 sets of outputs (HIGH / LOW / OFF).
 - Move the switch to HIGH. There should be continuity between switch pins 2 and 3; 5 and 6.
 - Move the switch to LOW. There should be continuity between switch pins 2 and 3; 4 and 5.
 - Move the switch to OFF. There should be continuity between switch pins 1 and 2.

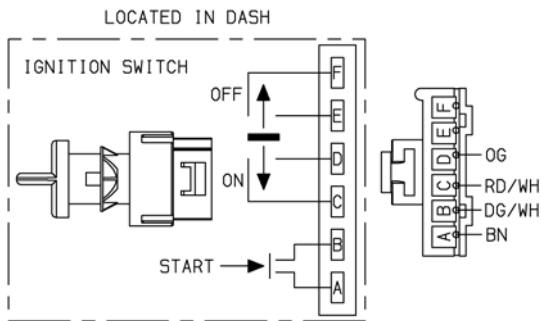


	1	2	3	4	5	6
HI						
LOW						
OFF						

NOTE: Pins 7 and 8 provide power and ground to light the switch lamp.

Ignition Key Switch

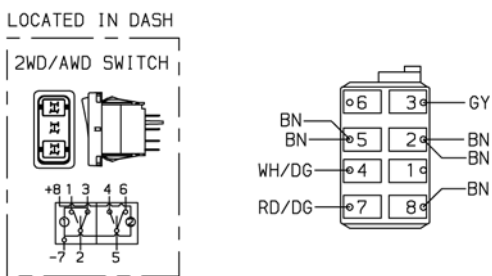
- 1. Disconnect the key switch harness by lifting the connector lock and pulling on the connector. Do not pull on the wiring.
- 2. Test between the 3 sets of outputs (OFF / ON / START). If any of the tests fail, replace ignition switch assembly.
 - Turn the ignition key to ON. There should be continuity between switch pins C and D.
 - Turn the ignition key to START. There should be continuity between switch pins A and B; C and D.



	OFF	ON	START
E, F	o		
A			p
B			p
C		p	p
D		p	p

AWD / 2WD / TURF Switch

- 1. Disconnect the AWD / 2WD / TURF switch harness by depressing the connector locks and pulling on the connector. Do not pull on the wiring.
- 2. Test between the 3 sets of outputs (AWD / 2WD / TURF). If any of the tests fail, replace the switch assembly.
 - Move the switch to AWD. There should be continuity between switch pins 2 and 3; 5 and 6.
 - Move the switch to 2WD. There should be no continuity between any pins.
 - Move the switch to TURF. There should be continuity between switch pins 1 and 2; 4 and 5.



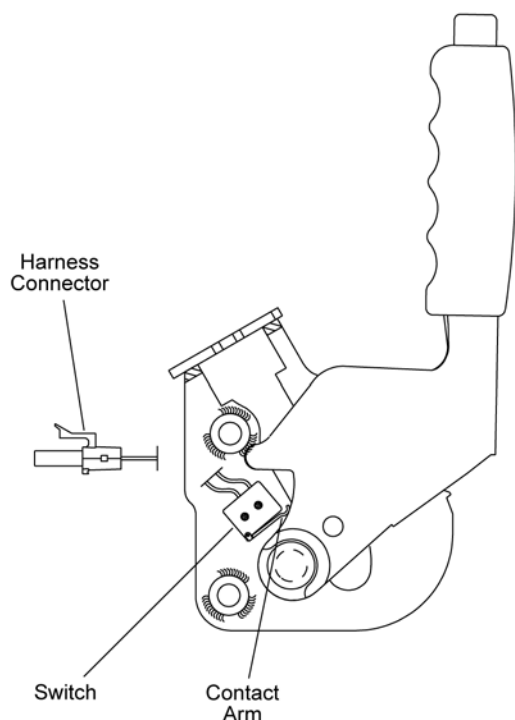
	1	2	3	4	5	6
AWD		o	o		o	o
2WD						
TURF	o	o		o	o	

NOTE: Pins 7 and 8 provide power and ground to light the switch lamp.

ELECTRICAL

Parking Brake Switch

The parking brake switch is located within the parking brake lever. Follow the parking brake lever under the dash to locate the internally mounted switch.



The switch remains in the "open" position when the park brake lever is not applied.

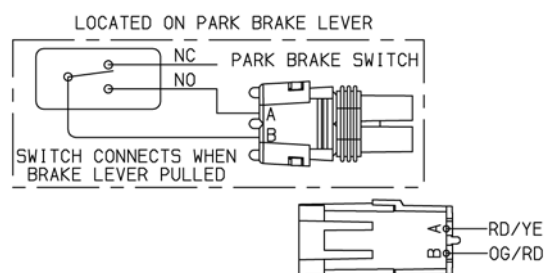
When the parking brake lever is applied, the switch makes contact and sends voltage to the ECU to illuminate "BRAKE" in the instrument cluster rider information display area (see "Park Brake Indicator").

NOTE: If the parking brake is applied the ECU will rev limit the engine at 1300 RPM until the parking brake is released. This feature has been added to prevent drive-away with the parking brake applied.

If trying to perform an engine diagnostic running test with the parking brake applied, disconnect the switch harness connector to allow the engine to rev higher than 1300 RPMs.

Testing The Parking Brake Switch

1. Disconnect the harness connector at the parking brake switch (Orange/Red and Red/Yellow wires).
2. Place the ohmmeter leads onto the switch terminals. The reading should be infinite (OL).



CAVITY	CAVITY	LEVER POSITION	CONTINUITY
A	B	BRAKE SET	YES
A	B	BRAKE RELEASED	NO

3. Apply the parking brake. Continuity should now exist between the switch terminals. If no continuity exists when the parking brake is applied, try to clean the switch terminals and re-test. Replace switch if necessary.

Park Brake Indicator

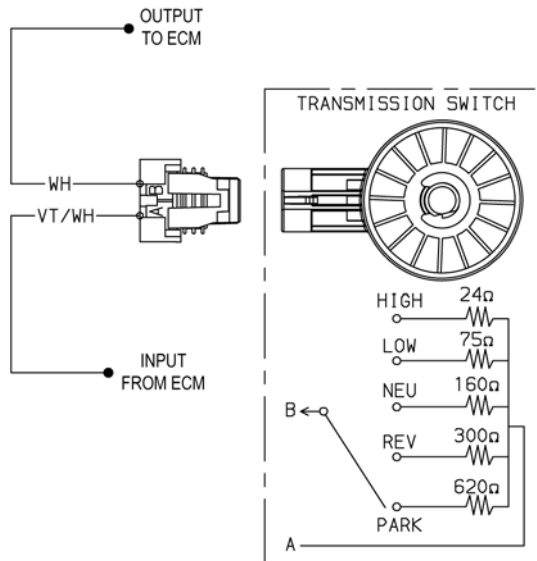
This warning is used to notify the operator that the park brake lever is engaged.

When the park brake is fully engaged, "BRAKE" appears in the rider information display. Engine speed is limited to 1300 RPM in all gears, except neutral. If throttle is applied, this limiting feature prevents operation, which protects the park brake pads from excessive wear.



Transmission (Gear Position) Switch

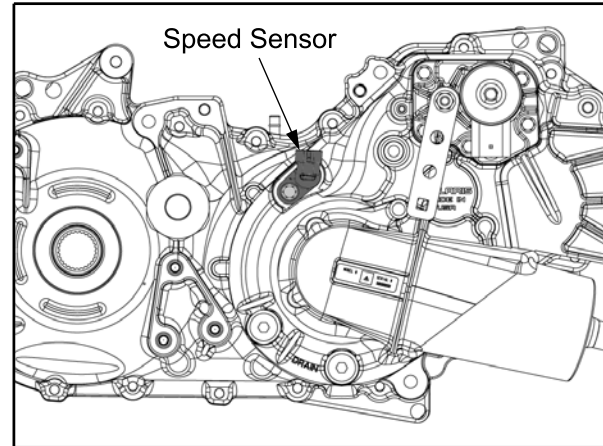
1. Disconnect the transmission switch harness by lifting the connector lock and pulling on the 2-pin connector. Do not pull on the wiring.
2. Test transmission switch for continuity in each gear position and compare to the specifications below.



VEHICLE SPEED SENSOR

Speed Sensor Location (4x4 Models)

The speed sensor is located in the transmission case and can be accessed through the rear RH wheel well area.



Speed Sensor Testing (4x4 Models)

Special Tools Required:

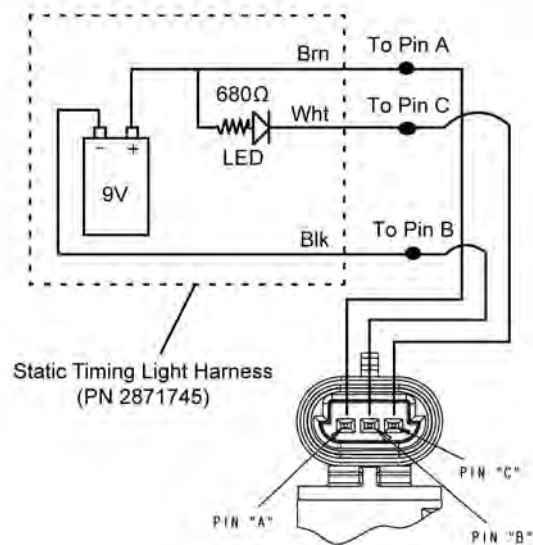
Static Timing Light Harness (PN 2871745)

Hall Sensor Probe Harness (PN 2460761)

1. Disconnect wire harness from speed sensor and remove sensor from the transmission.
2. Connect the wires from the Static Timing Light Harness to the sensor 3 pin connector using the Hall Sensor Probe Harness (PN 2460761).
3. Pass a screwdriver back and forth in front of the sensor tip.

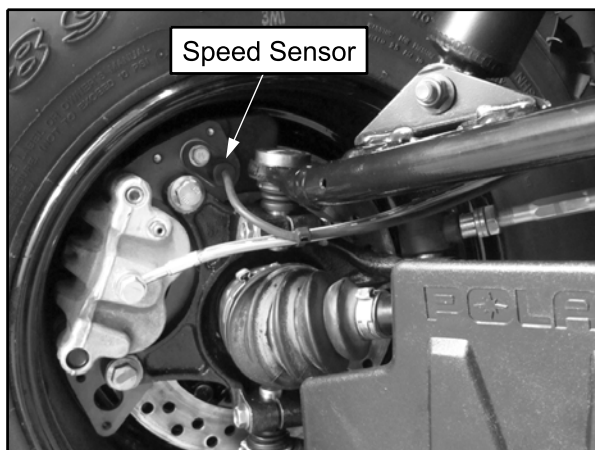
ELECTRICAL

4. Be sure connections are good and 9V battery is in good condition. If the light flashes, the sensor is good.



Speed Sensor Location (6x6 Models)

The speed sensor is located on the right front brake caliper mount bracket and can be accessed from the front of the vehicle by turning the steering wheel to the full right.



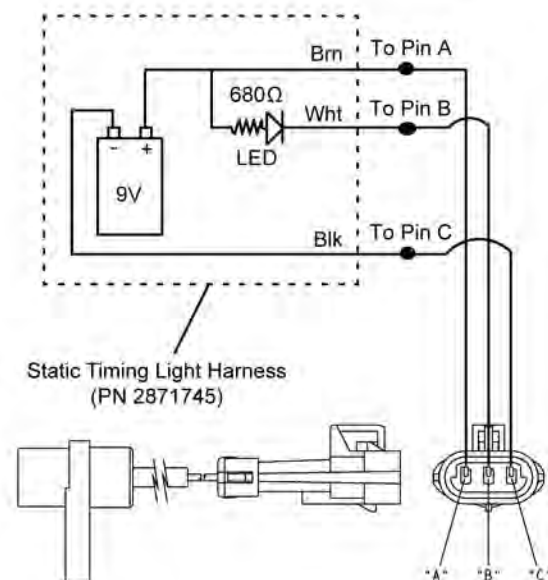
Speed Sensor Testing (6x6 Models)

Special Tools Required:

Static Timing Light Harness (PN 2871745)

Hall Sensor Probe Harness (PN 2460761)

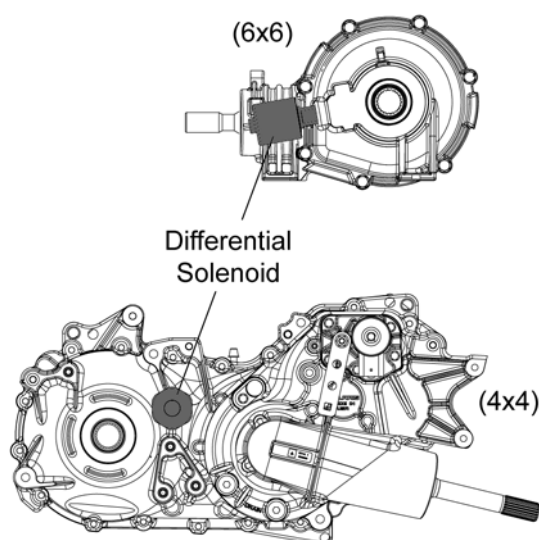
1. Disconnect wire harness from speed sensor and remove sensor from right front brake caliper mount.
2. Connect the wires from the Static Timing Light Harness to the sensor 3 pin connector using the Hall Sensor Probe Harness (PN 2460761).
3. Pass a screwdriver back and forth in front of the sensor tip.
4. Be sure connections are good and 9V battery is in good condition. If the light flashes, the sensor is good.



REAR DIFFERENTIAL SOLENOID

Differential Solenoid Overview

The differential solenoid is located on the right side of the transmission (4x4) or on the rear gear case (6x6). The solenoid actuates an engagement dog, which locks and unlocks the rear differential. Refer to Chapter 8 (4x4) or Chapter 7 (6x6) for information on mechanical operation.



Differential Solenoid Circuit Operation

The Rear Diff Solenoid Relay is located on the frame under the rear cargo box.

When the switch is pushed to activate "TURF", a ground is provided to the ECU from the AWD/2WD/TURF Switch.

Depending on engine speed, gear position criteria and park brake input, the ECU energizes the Rear Diff Solenoid Relay allowing it to enable the differential solenoid. **NOTE: The rear differential will not unlock if the parking brake is set.**

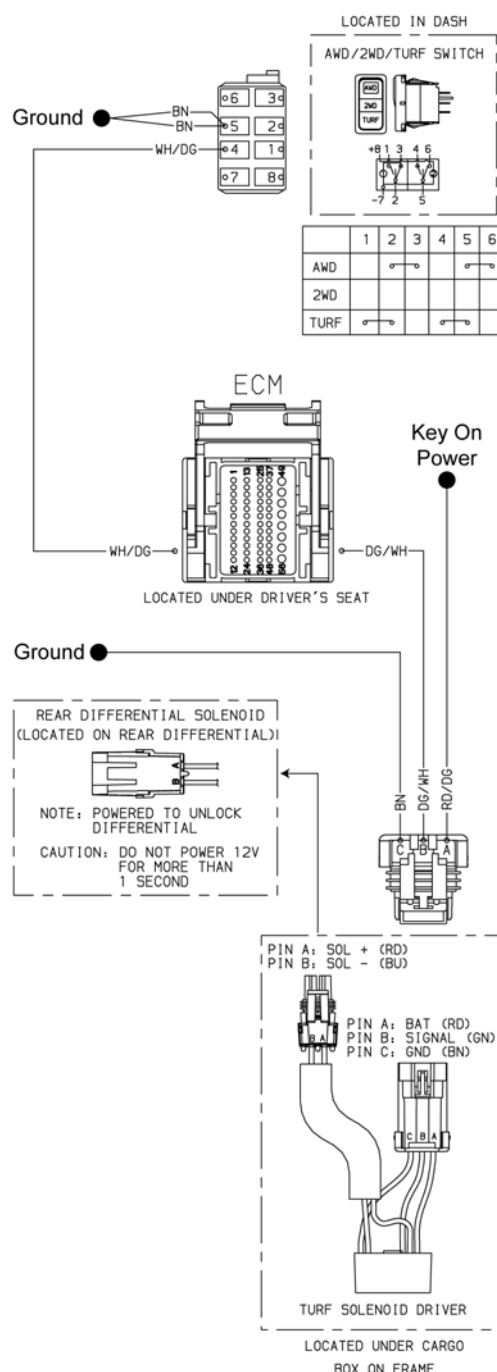
If the differential fails to switch from operational modes:

- Check the solenoid and relay connectors. Look for loose wires or bad connections.
- Check for power from the relay connector, to ensure the solenoid has power to be activated.
- Check the switch wires for loose connections.
- Remove solenoid from rear differential and ensure the solenoid plunger is actuating.



CAUTION

Do not power the solenoid with 12 Volts for more than 1 second, or damage may occur to solenoid.

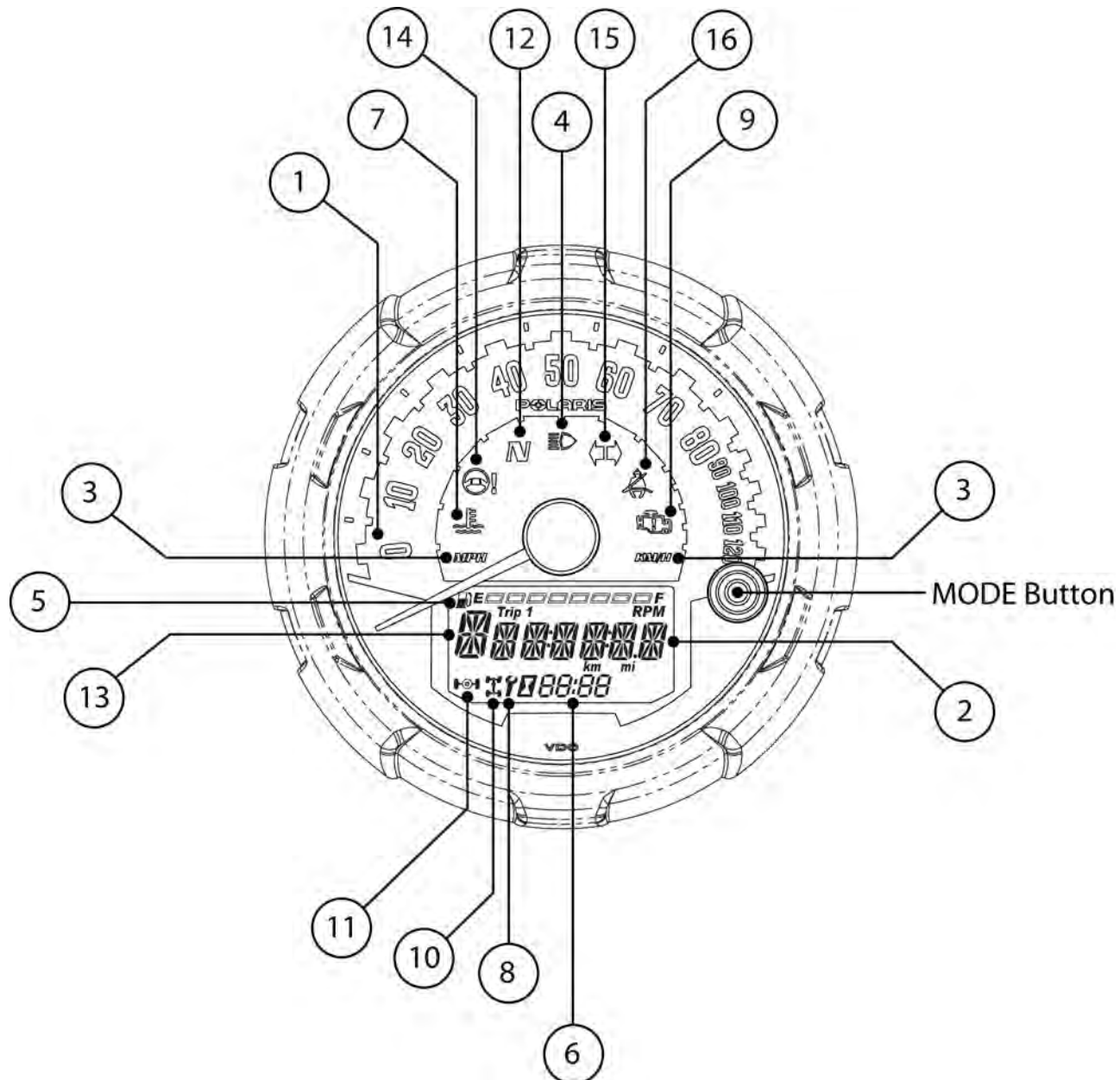


ELECTRICAL

INSTRUMENT CLUSTER

Overview

The instrument cluster displays critical vehicle information to the user. Reference the following page for display functions and descriptions.



NOTE: Some features are not applicable to all models.

IMPORTANT: The use of a high pressure washer may damage the instrument cluster. Wash the vehicle by hand or with a garden hose using mild soap. Certain products, including insect repellents and chemicals, will damage the instrument cluster lens. Do not use alcohol to clean the instrument cluster. Do not allow insect sprays to contact the lens. Immediately clean off any gasoline that splashes on the instrument cluster.

Rider Information Display

The rider information display is located in the instrument cluster. All segments will light up for 1 second at start-up.

NOTE: If the instrument cluster fails to illuminate, a battery over-voltage may have occurred and the instrument cluster may have shut off to protect the electronic speedometer.

1. **Vehicle Speed Display** - Analog display of vehicle speed in MPH or km/h.
2. **Information Display Area - Odometer / Trip Meter / Tachometer / Engine Temperature / Engine Hours / Service Info / Clock** - LCD display of the service hour interval, total vehicle miles or km., total engine hours, a trip meter, engine RPM and engine temperature.
3. **MPH / KM/H Display** - MPH is displayed when the instrument cluster is in the *Standard* mode. KM/H is displayed when the instrument cluster is in the *Metric* mode.
4. **High Beam Indicator** LED icon illuminates whenever the Headlamp switch is in the high beam position.
5. **Fuel Level Indicator** - LCD bar graph indicating current fuel level. All segments will flash when the last segment is cleared indicating a low fuel warning.
6. **Clock** - Displays current time in either 12-hour or 24-hour formats.
7. **Engine Temperature Indicator** - LED icon illuminates when the ECM determines the engine is overheating. The indicators will initially flash to indicate the engine is overheating. The indicators will stay lit and not flash if a severe overheating condition exists.
8. **Service Interval Indicator** - Preset at the factory and adjustable by the user, a flashing wrench symbol alerts the operator that the preset service interval has been reached and maintenance should be performed. The wrench icon will flash for 10 seconds upon start-up once it reaches 0.
9. **Check Engine MIL** - Illuminated when the ECM has detected a Diagnostic Trouble Code in the engine management system.
10. **AWD Indicator** - Illuminated when the AWD / TURF switch is in the *AWD* position.
11. **TURF Indicator** - Illuminated when the AWD / TURF switch is in the *TURF* position.
12. **Neutral Gear Indicator** - LED icon illuminates when gear selector is in the neutral (N) position.

13. **Gear Position Indicator** - Displays gear selector position.

H = High

L = Low

N = Neutral

R = Reverse

– = Gear Signal Error (shifter stuck between gears)

14. **Power Steering System MIL** - LED icon illuminates when a fault has occurred with the power steering system. This indicator illuminates when the key is turned to the ON position and goes off when the engine is started.
15. **Turn Signal / Hazard Lamp Indicator** - LED icon illuminates whenever the LH, RH or hazard lamps are activated (International Models Only).
16. **Helmet / Seat Belt Indicator** - LED icon illuminates for several seconds when the key is turned to the ON position. The lamp is a reminder to the operator to ensure all riders are wearing helmets and seat belts before operating the vehicle.

Information Display Area

The LCD portion of the instrument cluster is the information display area. Information displayed in this area includes: odometer, trip meter, engine RPM, engine hours, service interval, clock, engine Diagnostic Trouble Codes (DTCs) and power steering DTCs.

Odometer



The odometer records and displays the total distance traveled by the vehicle. The odometer can not be reset.

ELECTRICAL

Trip Meter



The trip meter records the miles traveled by the vehicle on each trip. To reset the trip meter:

1. Toggle the MODE button to TRIP 1.
2. To reset to 0, push and hold the MODE button until the distance display changes to 0.

Tachometer (RPM)



Engine RPM can be displayed digitally.

Engine Temperature



Engine temperature can be displayed in ° F or ° C. Refer to "Units of Measurement" to change the format.

Engine Hours



Engine hours are logged anytime the engine is running. Total hours can not be reset.

Programmed Service Interval



The initial factory service interval setting is 50 hours. Each time the engine is started, the engine hours are subtracted from the service interval hours. When the service interval reaches 0, the LCD wrench icon will flash for approximately 10 seconds each time the engine is started.

To change the hour setting or reset the function, follow these steps:

1. Toggle the MODE button until the wrench icon is displayed in the information area.
2. Press and hold the MODE button until the information display area begins to flash.
3. Toggle the MODE button to increase the service interval hours in 5 hour increments to a maximum of 100 hours.
4. To turn off the service interval function, toggle the MODE button until "OFF" is displayed.

Clock



The clock displays the time in a 12-hour or 24-hour format. Refer to “Units of Measurement” to change the format (Standard 12-hour / Metric-24 hour). To set the clock, follow these steps:

1. Toggle the MODE button until the odometer is displayed.
2. Press and hold the MODE button until the hour segment flashes. Release the button.
3. With the segment flashing, tap the MODE button to advance to the desired setting.
4. Press and hold the MODE button until the next segment flashes. Release the button.
5. Repeat steps 3-4 twice to set the 10 minute and 1 minute segments. After completing the 1-minute segment, step 4 will save the new settings and exit the clock mode.

Units of Measurement

	STANDARD DISPLAY	METRIC DISPLAY
Distance	Miles (MPH)	Kilometers (KM/ H)
Time	12-Hour Clock	24-Hour Clock
Tempera- ture	Fahrenheit	Celsius

To change between Standard and Metric units of measurement, follow these steps:

1. Turn the key to the OFF position.
2. Press and hold the MODE button while turning the key to the ON position.

3. When the display flashes the distance setting, tap the MODE button to advance to the desired setting.



4. Press and hold the MODE button to save the setting and advance to the next display option.

ELECTRICAL

5. Repeat the procedure to change remaining display settings.

Under / Over Voltage

This warning usually indicates that the vehicle is operating at an RPM too low to keep the battery charged. It may also occur when the engine is at idle and a high electrical load is applied (lights, cooling fan or other accessories).

If battery voltage drops below 11 volts, a warning screen will display “Lo” and provide the present battery voltage. If voltage drops below 8.5 volts, LCD backlighting and icons will turn off.



If battery voltage rises above 15 volts, a warning screen will display “OV” and provide the present battery voltage. If voltage rises above 16.5 volts, LCD backlighting and icons will turn off.



Park Brake Indicator

This warning is used to notify the operator that the park brake lever is engaged.

When the park brake is fully engaged, “BRAKE” appears in the rider information display. Engine speed is limited to 1300 RPM in all gears, except

neutral. If throttle is applied, this limiting feature prevents operation, which protects the park brake pads from excessive wear.



Diagnostic Mode

The diagnostic mode is accessible only when the check engine MIL has been activated.

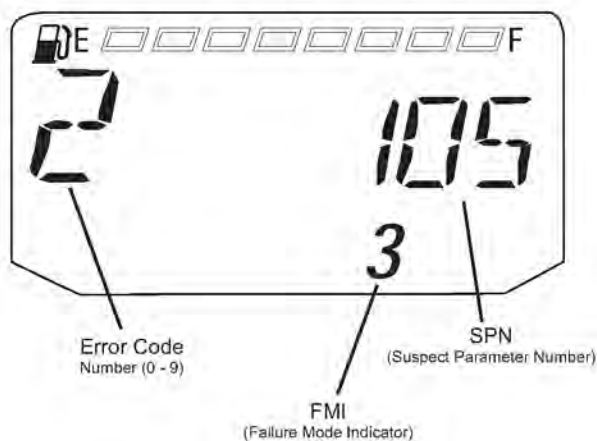
Use the following procedure to display diagnostic trouble codes that were activated during current ignition cycle causing the MIL to illuminate. Diagnostic trouble codes will remain stored in the gauge (even if MIL turns off) until the key is turned off.

1. If the trouble code (s) are not displayed, use the MODE button to toggle until “CK ENG” displays on the information display area.



2. Press and hold the MODE button to enter the diagnostics code menu.

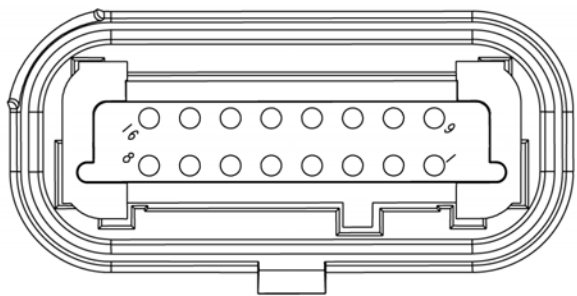
3. A set of three numbers will appear in the information area.
- The first number (located far left) can range from 0 to 9. This number represents the total number of trouble code present (example: 2 means there are 3 codes present).
 - The second number (located top right) can be 2 to 6 digits in length. This number equates to the suspected area of fault (SPN).
 - The third number (located bottom right) can be 1 to 2 digits in length. This number equates to the fault mode (FMI).



4. Use the trouble code reference table in the EFI Chapter for a description of each code.
5. If more than one code exists, press the MODE button to advance to the next trouble code.
6. To exit the diagnostic mode, press and hold the MODE button or turn the ignition key OFF once the codes are recorded.

NOTE: If there is a diagnostic problem with the power steering system, the power steering MIL will illuminate and blink in place of the check engine MIL.

Instrument Cluster Pinouts



FUNCTION	PIN
CAN High	1
CAN Low	2
Switched Power (Vdc)	3
Constant Power (Vdc)	4
Ground	5
High Beam Input	8
Fuel Level Sensor	11

Instrument Cluster Removal

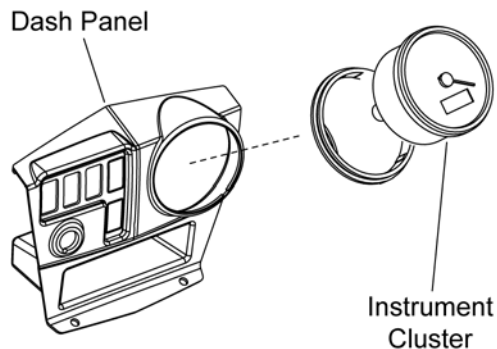
NOTE: Do not allow alcohol or petroleum products to come in contact with the instrument cluster lens.

1. Remove dash panel from the dash (see Chapter 5).
2. Disconnect the wire harness connector from the back side of the instrument cluster.



ELECTRICAL

3. Push the instrument cluster out from the back side of the dash panel, while securely holding the panel and rubber mount.



NOTE: Do not remove the rubber mount from the dash panel. Only remove the rubber mount if necessary.

Instrument Cluster Installation

1. Spray a soap and water mixture onto the outer surface area of the instrument cluster. This will help the instrument cluster slide into the rubber mount more easily.



2. Be sure the rubber mount inside the dash panel is fully installed and that the indexing key on the rubber mount is lined up with the keyway in the dash panel.
3. Hold the dash panel securely and insert the instrument cluster into the dash panel. Twist the instrument cluster gently in a clockwise motion to properly seat the instrument cluster. Apply pressure on the bezel while pressing down on the instrument cluster.

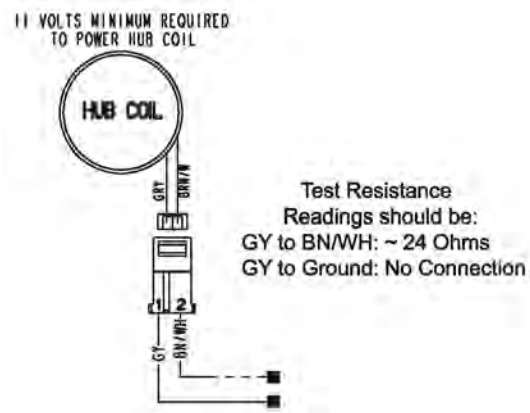
ALL WHEEL DRIVE COILS

Operation Overview

- When the AWD switch is "ON", 12 VDC power is present at the hub coil.
- If the criteria is met, the Engine Controller provides a ground path (brown/white wire). When this occurs the AWD icon should display in the instrument cluster.
- The AWD system must be grounded to operate.

Diagnosing System Failures

- Verify the AWD switch is functional and that a minimum of 11 volts is present at the hub coil.
- Verify the AWD hub coil is functional. Test the AWD hub coil using an ohm meter. See specifications below:



AWD Hub Coil Resistance:
24 Ω $\pm$ 5%

- Verify the wiring harness, wiring, connectors, connector pins and grounds are undamaged, clean and connected properly.
- Verify continuity of wire connections with a volt/ohm meter.

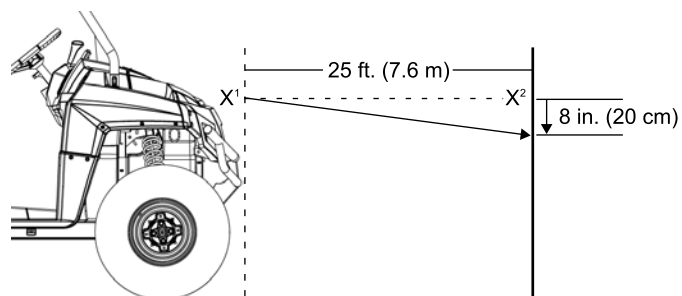
IMPORTANT: Verify all wires and wiring connections have been tested properly with a known good volt/ohm meter before suspecting a component failure. 80% of all electrical issues are caused by bad/failed connections and grounds.

HEADLIGHTS

Headlight Adjustment

The *RANGER* headlights are adjustable.

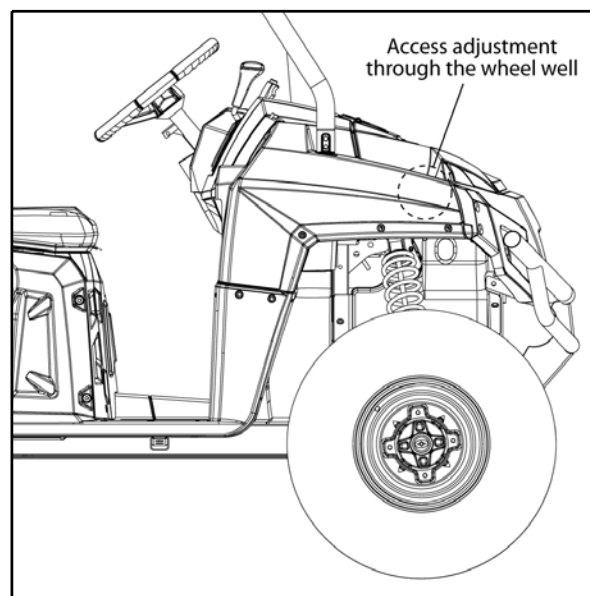
1. Place the vehicle on a level surface with the headlight approximately 25 ft. (7.6 m) from a wall.



2. Measure the distance from the floor to the center of the headlight (X¹) and make a mark on the wall at the same height (X²).
3. With the vehicle in Neutral and parking brake applied, start the engine and turn the headlight switch on.
4. The most intense part of the headlight beam should be aimed 8 in. (20 cm) below the mark placed on the wall in Step 2.

NOTE: Rider weight must be included in the seat while performing this procedure.

5. Locate the T25 Torx-head adjustment screw through the wheel well (see illustration). Adjust the beam to the desired position by loosening the adjustment screw and moving the lamp to the appropriate height.



6. Once the beam is set to the position, tighten the adjustment screw. Repeat the procedure to adjust the other headlight.



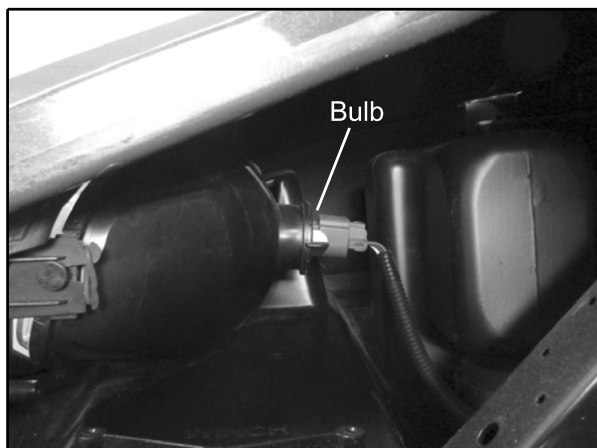
WARNING

Due to the nature of light utility vehicles and where they are operated, headlight lenses become dirty. Frequent washing is necessary to maintain lighting quality. Riding with poor lighting can result in severe injury or death.

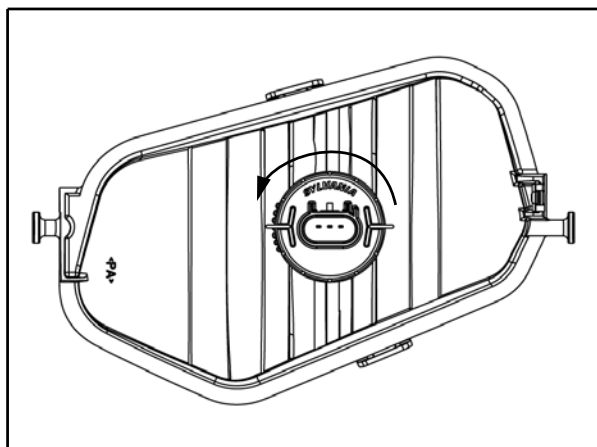
ELECTRICAL

Headlight Bulb Replacement

1. Open the hood.
2. Locate the bulb on the back side of headlight.



3. Turn the bulb counterclockwise to remove it.



4. Unplug the headlight bulb from the wiring harness. Be sure to pull on the connector, not on the wiring.

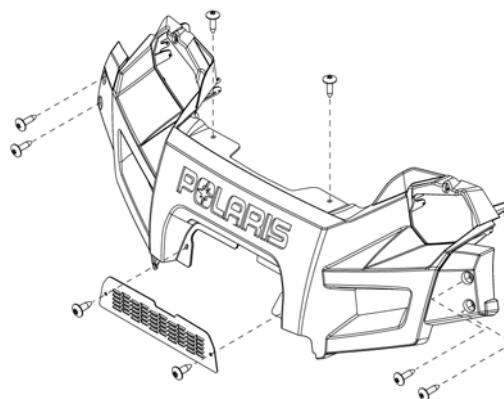


5. Install the wire harness onto the new headlight bulb.
6. Install the bulb into the housing and rotate it clockwise 90° to lock it in place.

NOTE: Make sure the tab on the bulb locates properly in the housing.

Headlight Housing Removal

1. Open the hood.
2. Remove the front fascia to access the headlight housing.



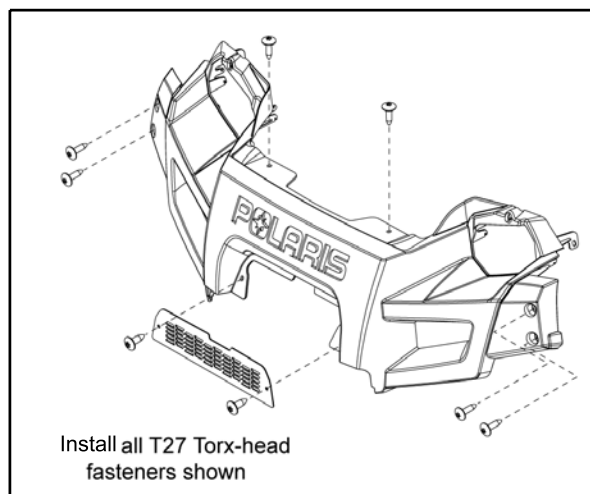
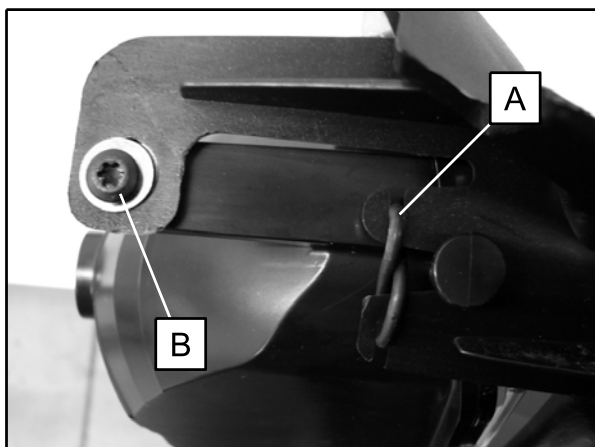
Remove all T27 Torx-head fasteners shown

3. Carefully pull the fascia out far enough to access the headlight housing.



4. Remove the bulb from the headlight housing (see "Headlight Bulb Replacement").

5. Remove the O-rings (A) from each side of the headlight housing. Remove the adjustment screw (B) and pull the headlight from the brackets.
4. Reinstall the front fascia and securely tighten all fasteners.

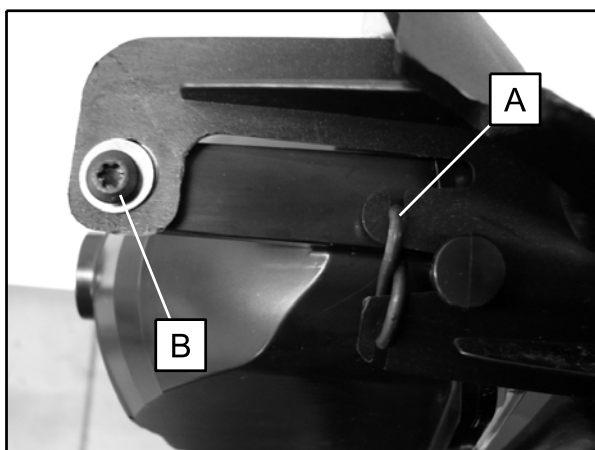


Install all T27 Torx-head fasteners shown

Headlight Housing Installation

1. Install the headlight housing by pressing the headlight tabs back into the brackets.
2. Secure the headlight housing with the rubber O-rings on each side (A). Install the adjustment screw (B).

NOTE: Be sure to twist the O-rings upon installation as shown below.



3. Reinstall the bulb into the housing and rotate it clockwise 90° to lock it in place.

ELECTRICAL

TAIL LIGHT / BRAKE LIGHT

LED Lamp Replacement

1. From the rear of the LED lamp, remove the (2) T20 Torx-head screws retaining the lamp assembly.



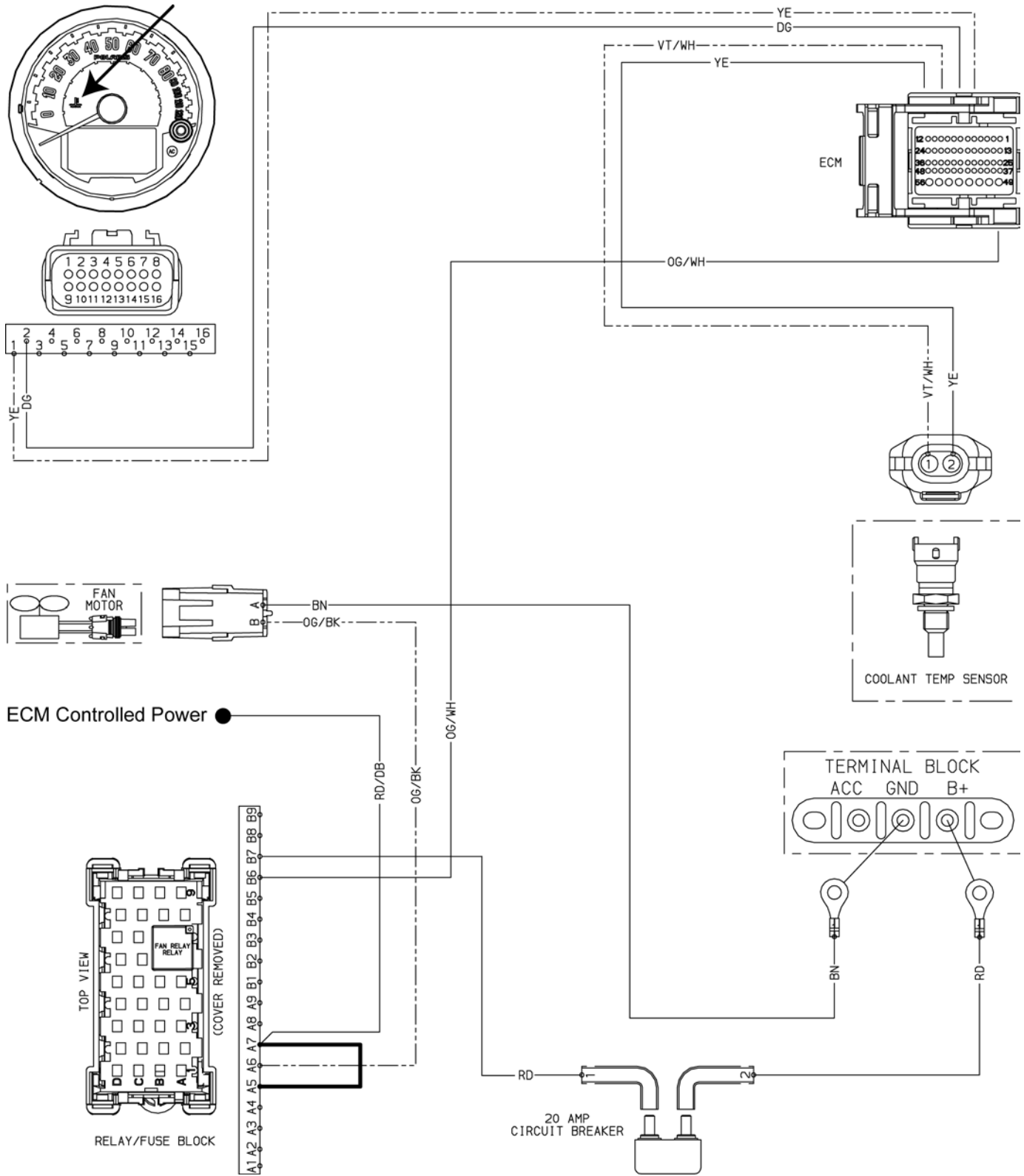
2. Remove the lamp from the cargo box and disconnect the tail light / brake light wire harness.

NOTE: Before replacing the LED lamp assembly, use a digital multi-meter to test the harness to ensure the lamp is receiving 12 volts and that a ground path is present.

3. If the LED still does not work, replace the LED lamp assembly with the recommended lamp.
4. Reinstall the assembly by reversing this procedure.
5. Test the tail light / brake light after installation to verify proper function.

COOLING SYSTEM

Cooling System Break-Out Diagram



ELECTRICAL

Fan Control Circuit Operation / Testing

Power is supplied to the fan via the Orange/Black wire when the relay is ON. The ground path for the fan motor is through the Brown harness wire. Refer to “RELAYS” later in this chapter for more information on fan functions.



CAUTION

Keep hands away from fan blades during operation. Serious personal injury could result.

NOTE: The fan may not function or operation may be delayed if coolant level is low or if air is trapped in the cooling system. Be sure cooling system is full and purged of air. Refer to Chapter 2 “Maintenance” for cooling system information.

Fan Control Circuit Bypass Test

1. Disconnect harness from coolant temperature sensor on the engine cylinder head (see Chapter 4 for location).
2. Start the engine. After a few seconds, the fan should start running and the “Check Engine” indicator should display on the instrument cluster. This indicates all other components are working properly.
3. If the fan does not run or runs slowly, check the fan motor wiring, ground, motor condition, circuit breaker and mechanical relay for proper operation. Repair or replace as necessary. If the fan runs with the sensor harness disconnected, but will not turn on when the engine is hot, check the coolant temperature sensor and connector terminals.

Coolant Temperature Sensor

The coolant temperature sensor can be tested using an ohmmeter or voltmeter.

1. With the engine and temperature sensor at room temperature (68°F = 20°C), disconnect the harness.
2. With the meter in the ohms mode, place the meter leads onto the sensor contacts.
3. Use the table Temperature / Resistance table to determine if the sensor needs to be replaced.

TEMPERATURE °F (°C)	RESISTANCE
68 °F (20 °C)	2.5 k Ω $\pm$ 6%
212 °F (100 °C)	186 Ω $\pm$ 2%

NOTE: If the coolant temperature sensor or circuit malfunctions the radiator fan will default to 'ON'.

EFI DIAGNOSTICS

EFI Component Testing

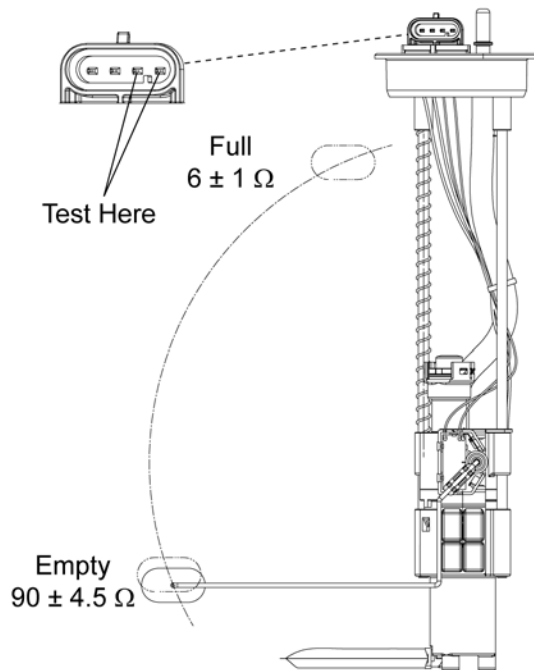
All EFI component information and diagnostic testing procedures are located in **Chapter 4**.

Refer to **Chapter 4** “Electronic Fuel Injection System (EFI)” when diagnosing an EFI System.

FUEL SENDER

Testing

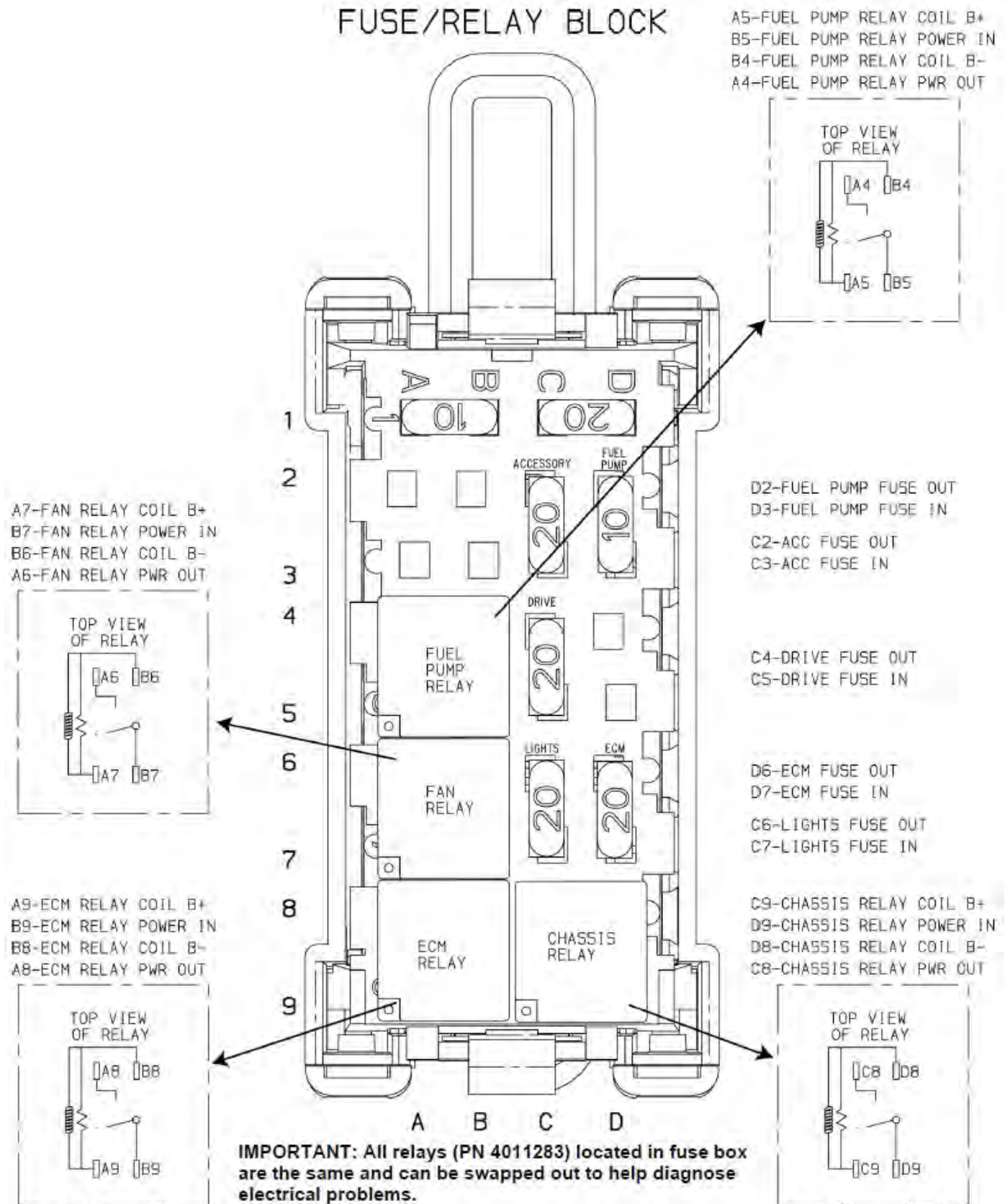
1. Drain the fuel tank and remove it from the vehicle (see Chapter 4).
2. Set fuel tank on a flat surface. Using an Ohm meter, measure the resistance of the fuel sender.



3. Allow the sender float to sit in the **empty position** and compare to specification.
4. Slowly tilt the tank so that gravity moves the sender float to the **full position** and compare to specification.
5. If the readings are out of specification, erratic or LCD display "sticks", check the following before replacing the fuel pump assembly:
 - Loose float
 - Float contact with tank
 - Bent float rod

If none of the conditions exist, the fuel sender assembly is faulty. Replace the fuel pump assembly (see Chapter 4).

Fuse Box Detail



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Relay Operation

Located in the fuse box under the hood, the relays assist with component operation like the cooling fan, fuel pump, EFI system, drive system and EPS.

CHASSIS RELAY provides power to the following systems:

- Lights (Headlights / Taillights)
- Drive (AWD / TURF)
- Accessory (12V Receptacles / Accessory Options)

COLOR	FUNCTION
Red	BUSS Bar - 12 Vdc constant battery voltage (fusible link protected).
Brown	Relay coil ground.
Orange	12 Vdc power input from key switch to enable relay.
White	Provides 12 Vdc power for lights, drive and accessory circuits.

ECM RELAY provides power to the following systems:

- Fuel Injectors
- Cam Phase Sensor
- Ignition Coil
- Fan Relay
- Fuel Pump Relay

COLOR	FUNCTION
Red / White	20-Amp fuse protected 12 Vdc constant battery voltage.
Dark Green / Yellow	ECU ground input to enable relay.
Red / White	20-Amp fuse protected 12 Vdc constant battery voltage.
Red / Dark Blue	Provides 12 Vdc power for EFI system circuits.

FAN RELAY provides power to the following system:

- Fan Motor

COLOR	FUNCTION
Red	20-Amp circuit breaker protected 12 Vdc constant battery power.
Orange / White	ECU ground input to enable relay.
Red / Dark Blue	BUSS Bar - 12 Vdc switched power from ECM relay.
Orange / Black	Provides 12 Vdc power for fan operation.

FUEL PUMP RELAY provides power to the following system:

- Fuel Pump

COLOR	FUNCTION
Red / Light Green	10-Amp fuse protected 12 Vdc battery voltage.
Dark Green / Yellow	ECU ground input to enable relay.
Red / Dark Blue	BUSS Bar - 12 Vdc switched power from ECM relay.
Red / Light Blue	Provides 12 Vdc power for fuel pump operation.

EPS RELAY provides power to the following system:

- Electronic Power Steering Unit

COLOR	FUNCTION
Red	30-Amp fuse protected 12 Vdc constant battery voltage.
Brown	Relay coil ground.
Orange	12 Vdc power input from key switch to enable relay.
Orange	Provides 12 Vdc power for EPS operation.

NOTE: The EPS Relay is mounted separately (outside the fuse/relay box), to the electronic power steering harness.

REAR DIFF SOLENOID RELAY provides power to the following system:

- Rear Differential Solenoid

COLOR	FUNCTION
Red / Dark Green	20-Amp fuse protected 12 Vdc battery voltage.
Dark Green / White	ECU input to enable relay.
Brown	Relay coil ground.
Red	Relay switched power to operate the Rear Diff Solenoid.
Blue	Ground to energize the Rear Diff Solenoid.

NOTE: The Rear Diff Solenoid Relay is mounted separately, attached to the frame under the rear cargo box.

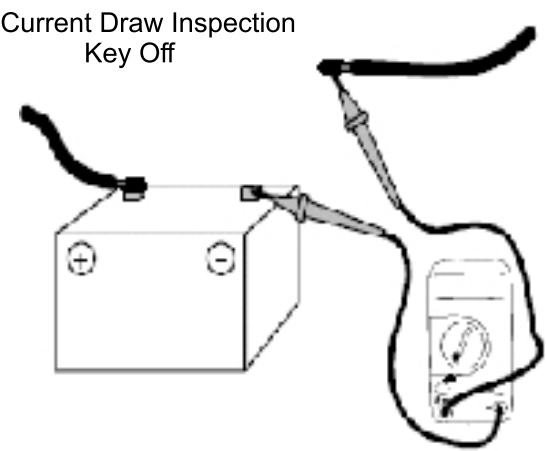
CHARGING SYSTEM

Current Draw - Key Off

 **CAUTION**

Do not connect or disconnect the battery cable or ammeter with the engine running. Damage will occur to electrical components.

Connect an ammeter in series with the negative battery cable. Check for current draw with the key off. If the draw is excessive, loads should be disconnected from the system one by one until the draw is eliminated. Check component wiring as well as the component for partial shorts to ground to eliminate the draw.



Current Draw - Key Off:
Maximum of .01 DCA (10 mA)

Charging System “Break Even” Test

 **CAUTION**

Do not allow the battery cables to become disconnected with the engine running. Follow the steps below as outlined to reduce the chance of damage to electrical components.

The “break even” point of the charging system is the point at which the alternator overcomes all system loads (lights, etc.) and begins to charge the battery. Depending on battery condition and system load, the break even point may vary slightly. The battery should be fully charged before performing this test.

ELECTRICAL



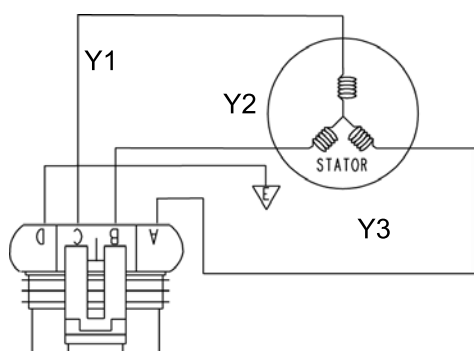
WARNING

Never start the engine with an ammeter connected in series. Damage to the meter or meter fuse will result.
Do not run test for extended period of time.
Do not run test with high amperage accessories.

1. Using an inductive amperage metering device, (set to DC amps) connect to the negative battery cable.
2. With engine off, and the key switch and lights in the ON position, the ammeter should read negative amps (battery discharge). Reverse meter lead if a positive reading is indicated.
3. Shift transmission into neutral with the parking brake applied and start the engine. With the engine running at idle, observe meter readings.
4. Increase engine RPM while observing ammeter and tachometer.
5. Note RPM at which the battery starts to charge (ammeter indication is positive).
6. With lights and other electrical loads off, the "break even" point should occur at approximately 1500 RPM or lower.
7. With the engine running, turn the lights on and engage parking brake to keep brake light on.
8. Repeat test, observing ammeter and tachometer. With lights on, charging should occur at or below 2000 RPM.

Charging System Alternator Tests

Three tests can be performed using a multi-meter to determine the condition of the stator (alternator).



STATOR

Perform tests at
Stator / Regulator connector

TEST 1: Resistance Value of Each Stator Leg

1. Measure the resistance value of each of the three stator legs: Y1 to Y2, Y1 to Y3, and Y2 to Y3. Each test should measure: **$0.22\Omega \pm 15\%$**

TEST	CONNECT METER LEADS TO:	OHMS READING
Battery Charge Coil	Y1 to Y2	$0.22\Omega \pm 15\%$
Battery Charge Coil	Y1 to Y3	$0.22\Omega \pm 15\%$
Battery Charge Coil	Y2 to Y3	$0.22\Omega \pm 15\%$

NOTE: If there are any significant variations in ohm readings between the three legs it is an indication that one of the three stator legs maybe weak or failed.

TEST 2: Resistance Value of Each Stator Leg to Ground

1. Measure the resistance value of each of the stator legs to ground: Y1 to Ground, Y2 to Ground, Y3 to Ground. Each test should measure: **Open Line (OL)**

TEST	CONNECT METER LEADS TO:	OHMS READING
Battery Charge Coil	Y1, Y2, or Y3 to Ground	Open Line (Infinity)

NOTE: Any measurement other than Infinity (open) will indicate a failed or shorted stator leg.

TEST 3: Measure AC Voltage Output of Each Stator Leg at Charging RPM

1. Set the selector dial to measure AC Voltage.
2. Start the engine and let it idle.
3. While holding the engine at a specified RPM, separately measure the voltage across each 'leg' of the stator by connecting the meter leads to the wires leading from the alternator (Y1 to Y2, Y1 to Y3, Y2 to Y3).

4. Refer to the following table for approximate AC Voltage readings according to RPM. Test each leg at the specified RPM in the table.

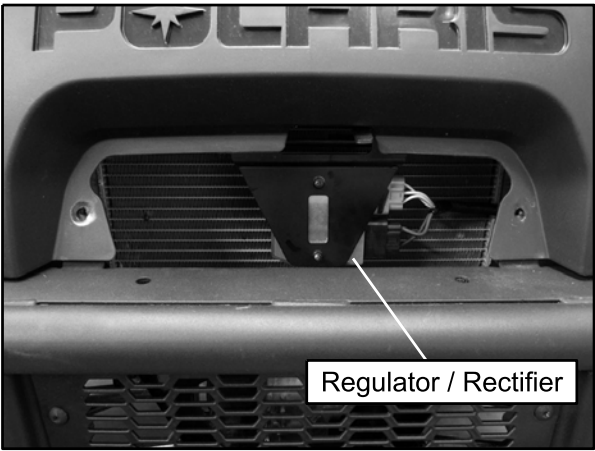
Example: The alternator current output reading should be approximately **18 VAC at 1300 RPM** between each 'leg'.

NOTE: If one or more of the stator leg output AC voltage varies significantly from the specified value, the stator may need to be replaced.

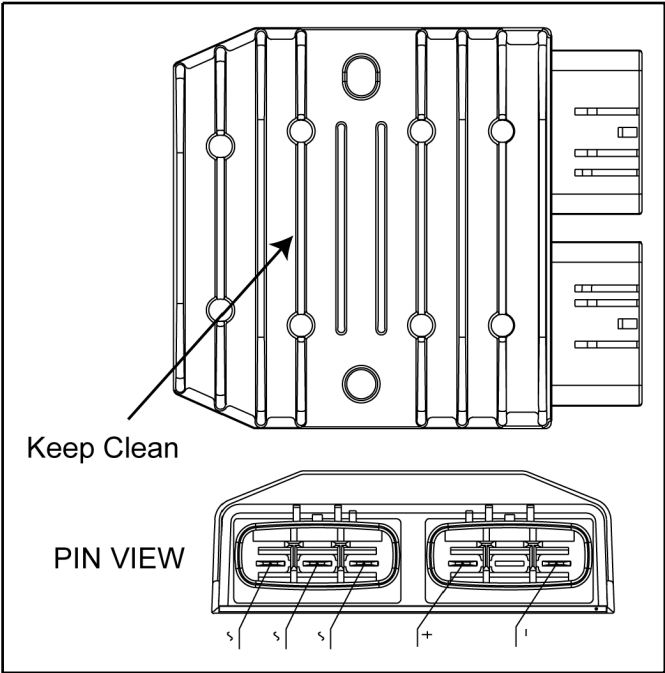
RPM READING	AC VOLTAGE (VAC) READING
1300	22 VAC $\pm$ 25%
3000	49 VAC $\pm$ 25%
5000	80 VAC $\pm$ 25%

Regulator / Rectifier

The Regulator / Rectifier is located in front of the radiator, accessed by removing the upper fascia screen.



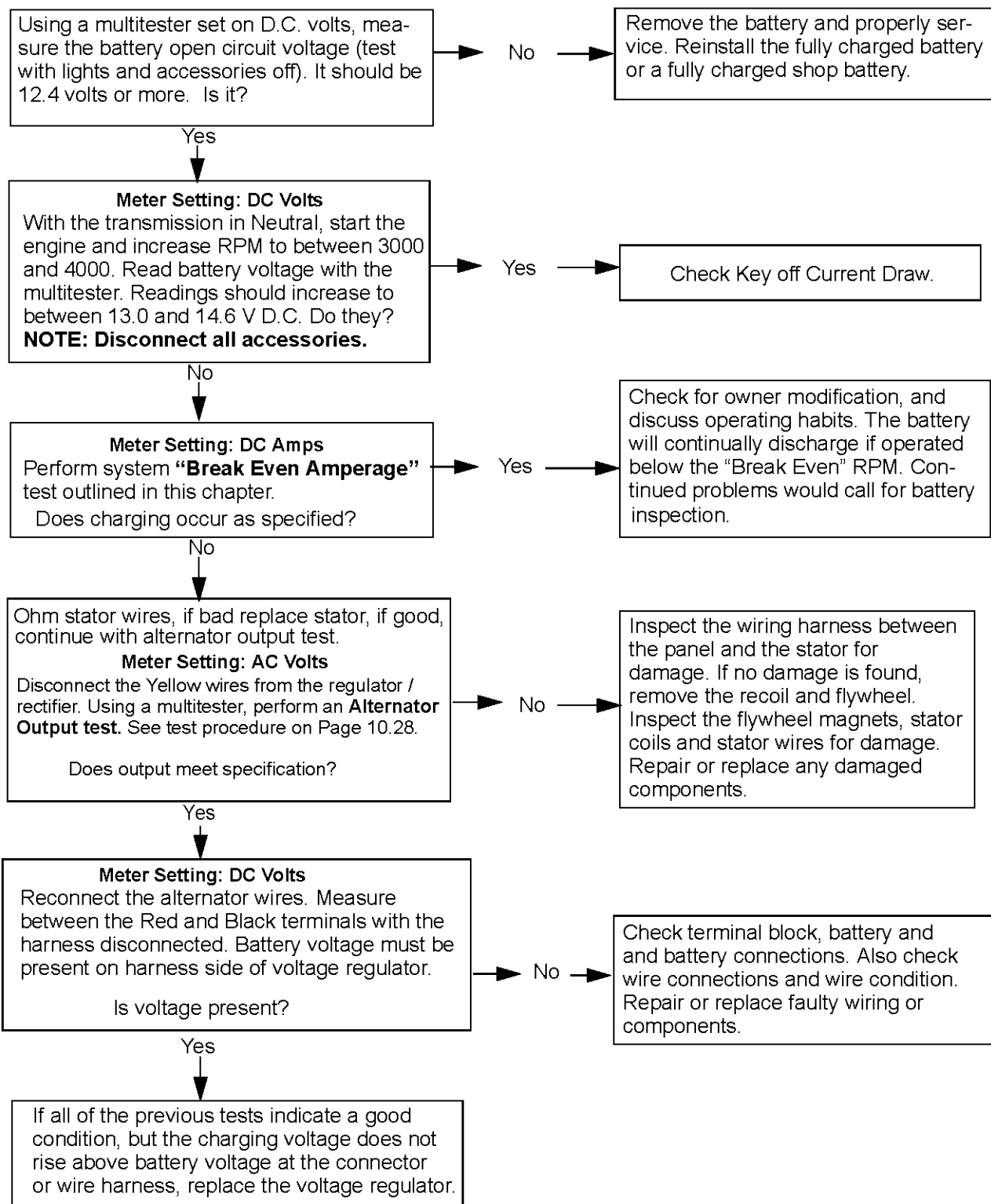
NOTE: If the regulator / rectifier overheats, the unit will turn itself off to cool down. The unit will turn on again after it has cooled down. If it turns off, verify the cooling fins are clean, free from debris and that adequate airflow is present.



ELECTRICAL

Charging System Testing Flow Chart

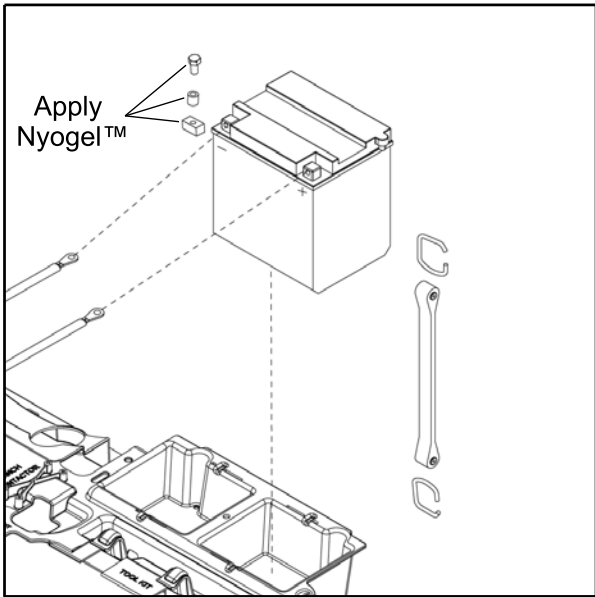
Whenever charging system problems are suspected, proceed with the following system check after verifying that all wires are in good condition, connected and not exposed or pinched:



BATTERY SERVICE

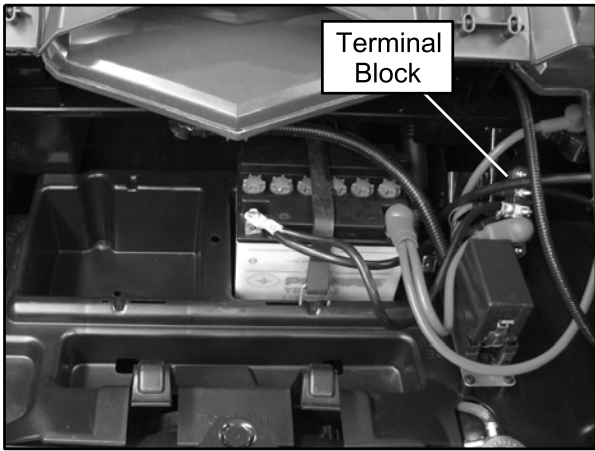
Battery Terminals / Bolts

Use Polaris corrosion resistant Nyogel™ grease (PN 2871329) on battery terminal bolts.



Battery Terminal Block

The terminal block is located under the hood next to the battery and fuse box. The terminal block provides easy hookup for accessories.



Terminal Block Nuts:
20-25 in. lbs. (2.3-2.8 Nm)

Battery Activation



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 OUT OF REACH OF CHILDREN.



WARNING

The gases given off by a battery are explosive. Any spark or open flame near a battery can cause an explosion which will spray battery acid on anyone close to it. Should there be contact with battery acid, wash the affected area with large quantities of cool water and seek immediate medical attention.

To ensure maximum service life and performance from a new battery, perform the following steps. NOTE: Do not service the battery unless it will be put into regular service within 30 days. After initial service, add only distilled water to the battery. Never add electrolyte after a battery has been in service.

NOTE: New Battery: Battery must be fully charged before use or battery life will be significantly reduced 10-30% of the battery's full potential.

To activate a new battery:

1. Remove all the filling plugs.
2. Remove the sealing tube (red cap) from vent fitting.
3. Place battery on a level surface. Fill battery with electrolyte to upper level marks on the battery case.

NOTE: Never activate a battery on the vehicle. Electrolyte spillage can cause damage.

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4. Set battery aside to allow for acid absorption and stabilization for 30 minutes.
5. Add electrolyte to bring the level back to the upper level mark on the battery case.
6. Charge battery for 3 - 5 hours at 1/10 of its amp/hour rating. Examples: 1/10 of 9 amp battery = 0.9 amp; 1/10 of 14 amp battery = 1.4 amp; 1/10 of 18 amp battery = 1.8 amp (recommended charging rates).
7. Check during initial charging to see if electrolyte level has fallen, and if so, fill with acid to the upper level. After adding, charge for another hour at the same rate.

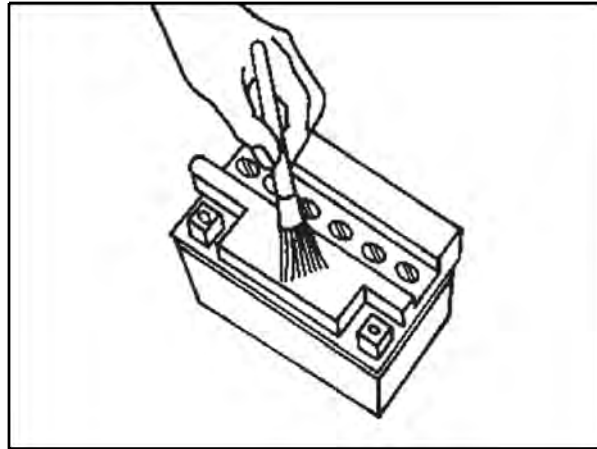
NOTE: This is the last time that electrolyte should be added. If the level becomes low after this point, add only distilled water.

8. When charging is complete, install the filling plugs firmly.

IMPORTANT: Do not apply excessive pressure. Finger tighten only. Do not over-tighten.

9. Wash off spilled acid with water and baking soda solution, paying particular attention that any acid is washed off the terminals. Dry the battery case.

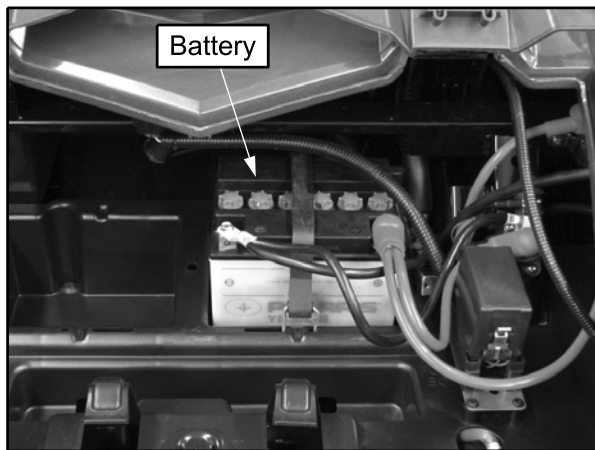
2. Make sure the battery top is clean and dry. A dirty battery actually discharges across the grime on top of the case. Use a soft brush and a baking soda solution. Make sure plugs are finger tight so cleaning solution doesn't get into the cells and neutralize the acid.



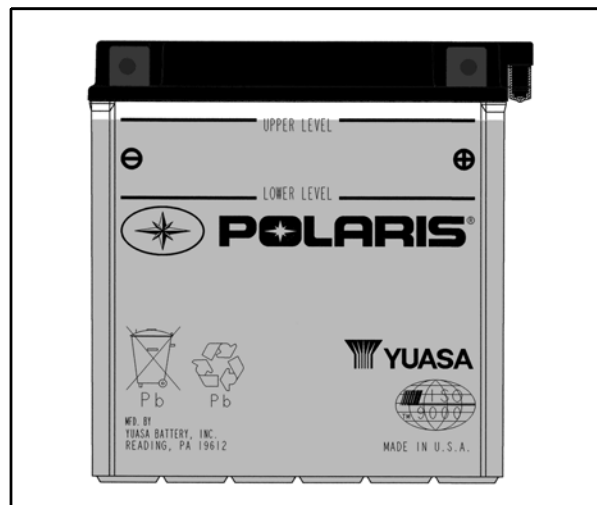
3. Inspect the battery terminals, screws and cables for breakage, corrosion or loose connections. Clean the terminals and cable ends with a wire brush and coat terminals with Nyogel™.
4. Check the electrolyte level and add distilled water if necessary.

Battery Inspection

The battery is located under the hood.



1. Inspect the battery case for obvious damage such as cracks or leaks. Look for discoloration, warping or raised top, which may indicate the battery has overheated or been overcharged.



IMPORTANT: Don't add acid, use distilled water only!

5. Check the vent tube. Make sure it's not kinked, pinched or otherwise obstructed.

Battery Removal / Installation

See Chapter 2 "Maintenance" for battery service procedures.

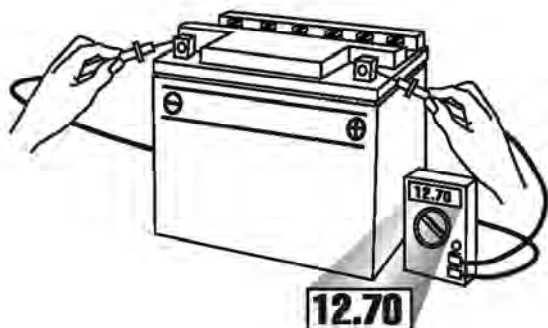
Conventional Battery Testing

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are three tests which can easily be made on a battery to determine its condition: OCV Test, Specific Gravity Test and Load Test.

OCV - Open Circuit Voltage Test

Battery voltage should be checked with a digital multimeter. Readings of 12.6 volts or less require further battery testing and charging. See the following chart.

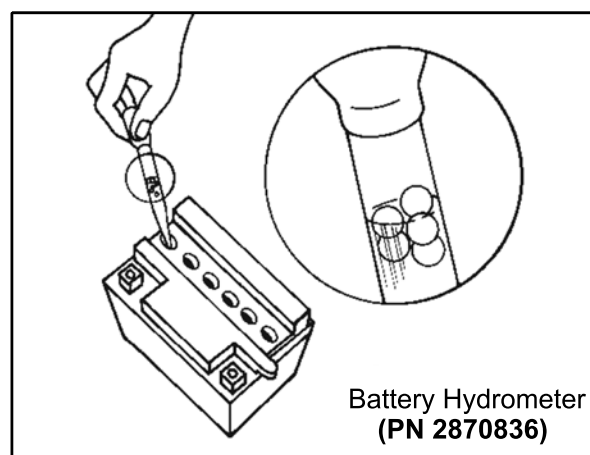


NOTE: Lead-acid batteries should be kept at or near a full charge as possible. Electrolyte level should be kept between the low and full marks. If the battery is stored or used in a partially charged condition, or with low electrolyte levels, hard crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

OPEN CIRCUIT VOLTAGE	
State of Charge	YuMicron™ Type
100% Charged	12.70 V
75% Charged	12.50 V
50% Charged	12.20 V
25% Charged	12.0 V
0% Charged	11.9 V or less

Specific Gravity Test

A tool such as a Battery Hydrometer (PN 2870836) can be used to measure electrolyte strength or specific gravity. As the battery goes through the charge/discharge cycle, the electrolyte goes from a heavy (more acidic) state at full charge to a light (more water) state when discharged. The hydrometer can measure state of charge and differences between cells in a multi-cell battery. Readings of 1.270 or greater should be observed in a fully charged battery. Differences of more than 0.025 between the lowest and highest cell readings indicate a need to replace the battery.



SPECIFIC GRAVITY	
State of Charge*	YuMicron™ Type
100% Charged	1.275
75% Charged	1.225
50% Charged	1.175
25% Charged	1.135
0% Charged	1.115 or less
* At 80° F. NOTE: Subtract 0.01 from the specific gravity reading at 40° F.	

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Load Test

A battery may indicate a full charge condition in the OCV test and the specific gravity test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered.

This is the best test of battery condition under starting load. Use a load testing device that has an adjustable load. Apply a load of three times the ampere-hour rating.

At 14 seconds into the test, check battery voltage. A good 12V battery will have at least 10.5 Volts. If the reading is low, charge the battery and retest.

Battery Conductance Analyzer

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.

Authorized Polaris dealers/distributors are required to use the conductance analyzer when testing 12V Polaris batteries.

Polaris MDX-610P
Conductance Analyzer



Polaris MDX-610P
Bosch Automotive Service Solutions PN: PU-50296

Charging Procedure

1. Remove the battery to prevent damage from leaking or spilled acid during charging.
2. Charge the battery with a charging output no larger than 1/10 of the battery's amp/hr rating. Charge as needed to raise the specific gravity to 1.270 or greater.
3. Install battery in vehicle. Coat threads of battery bolt with a corrosion resistant dielectric grease.

Dielectric Grease:
(PN 2871329)

4. Connect battery cables.



WARNING

To avoid the possibility of explosion, connect positive (+) cable first and negative (-) cable last.

5. After connecting the battery cables, install the cover on the battery and attach the hold down strap.
6. Install clear battery vent tube from vehicle to battery vent. **WARNING:** Vent tube must be free from obstructions and kinks and securely installed. If not, battery gases could accumulate and cause an explosion. Vent should be routed away from frame and body to prevent contact with electrolyte. Avoid skin contact with electrolyte, as severe burns could result. If electrolyte contacts the vehicle frame, corrosion will occur.
7. Route cables so they are tucked away in front and behind battery.

Off Season Storage

See Chapter 2 "Maintenance" for battery service procedures.

STARTER SYSTEM

Troubleshooting

Starter Motor Does Not Run

- Battery discharged - Low specific gravity
- Loose or faulty battery cables or corroded connections (see Voltage Drop Tests)
- Related wiring loose, disconnected, or corroded
- Poor ground connections at battery cable, starter motor or starter solenoid (see Voltage Drop Tests)
- Faulty key switch
- Faulty starter solenoid or starter motor
- Engine problem - seized or binding (can engine be rotated easily)

Starter Motor Turns Over Slowly

- Battery discharged - low specific gravity
- Excessive circuit resistance - poor connections (see Voltage Drop Test)
- Engine problem - seized or binding (can engine be rotated easily)
- Faulty or worn brushes in starter motor

Starter Motor Turns - Engine Does Not Rotate

- Faulty starter drive
- Faulty starter drive gears or starter motor gear
- Faulty flywheel gear or loose flywheel

Voltage Drop Test

The Voltage Drop Test is used to test for bad connections. When performing the test, you are testing the amount of voltage drop through the connection. A poor or corroded connection will appear as a high voltage reading. Voltage shown on the meter when testing connections should not exceed 0.1 VDC per connection or component.

To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the voltage drop tests in the "Starter System Testing Flow Chart".

**Voltage should not exceed
0.1 DC volts per connection**

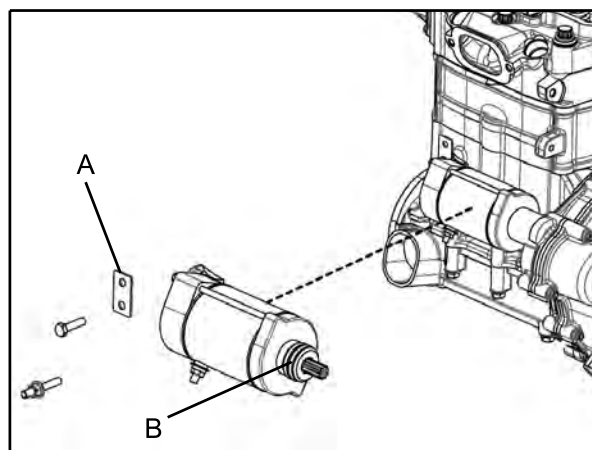
Starter Motor Removal

1. Disconnect the negative (-) battery cable and remove the seat base.

2. Remove the positive (+) battery cable from the starter motor.
3. Remove the nut securing the negative (-) battery cable from the lower starter mounting bolt.
4. Remove the (2) starter motor mounting bolts. The routing bracket (A) is mounted to the upper starter motor bolt.
5. Remove starter from the engine. Use a soft, rubber hammer to aid in starter removal.

Starter Motor Installation

1. Lubricate and install a new O-ring (B) onto the starter motor.
2. Install the starter motor onto the engine.
3. Install the upper and lower starter mounting bolts by hand.
4. Torque the upper starter mounting bolt to specification.
5. Torque the lower starter mounting bolt to specification.
6. Install the negative (-) battery cable to the lower mounting bolt. Install battery cable nut and torque to specification.
7. Install the positive (+) battery cable to the starter motor.
8. Install seat base and connect the battery.

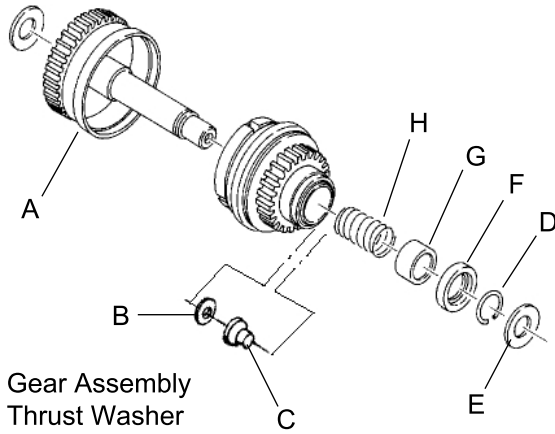


Starter Motor Mounting Bolts:
7 ft-lbs (9.5 Nm)

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Starter Drive Bendix

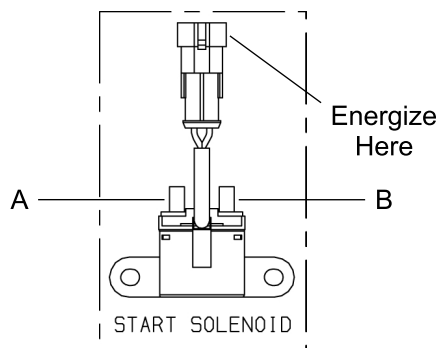
The engine's stator cover must be removed in order to service the starter drive bendix. Refer to "Starter Drive Bendix Removal / Installation", located in Chapter 3.



- A. Gear Assembly
- B. Thrust Washer
- C. Busing
- D. Retaining Ring
- E. Thrust Washer
- F. Stopper
- G. Cover
- H. Spring

Starter Solenoid Bench Test

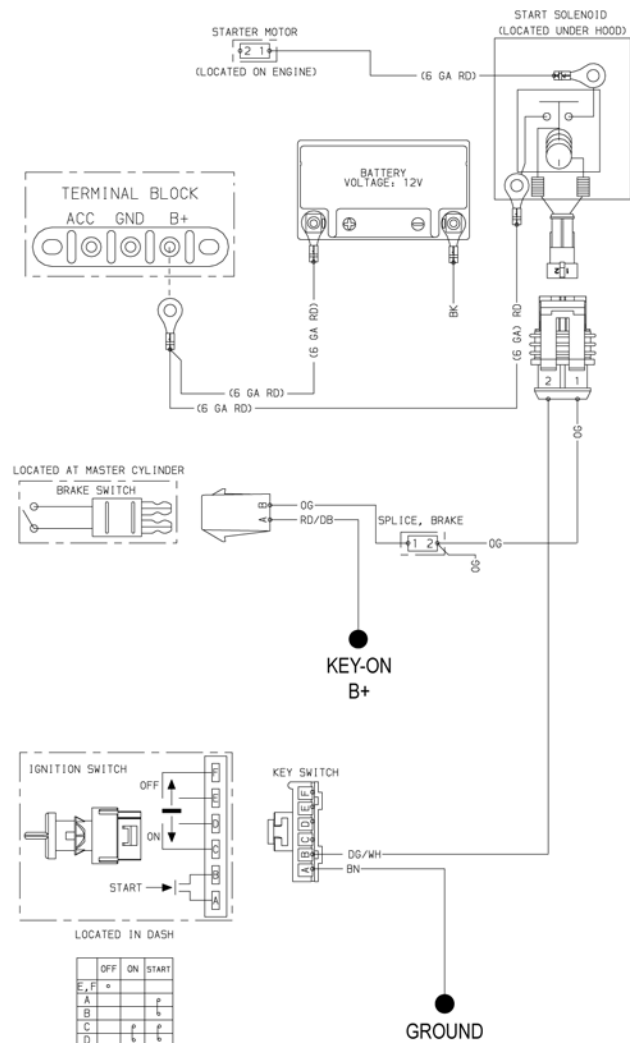
Test the start solenoid by powering the solenoid using battery voltage for a maximum of 5 seconds. With the solenoid energized, resistance should read about 0 - 0.5 ohms between terminals (A) and (B). If resistance measurement is out of specification, replace the starter solenoid.



Starter Solenoid Operation

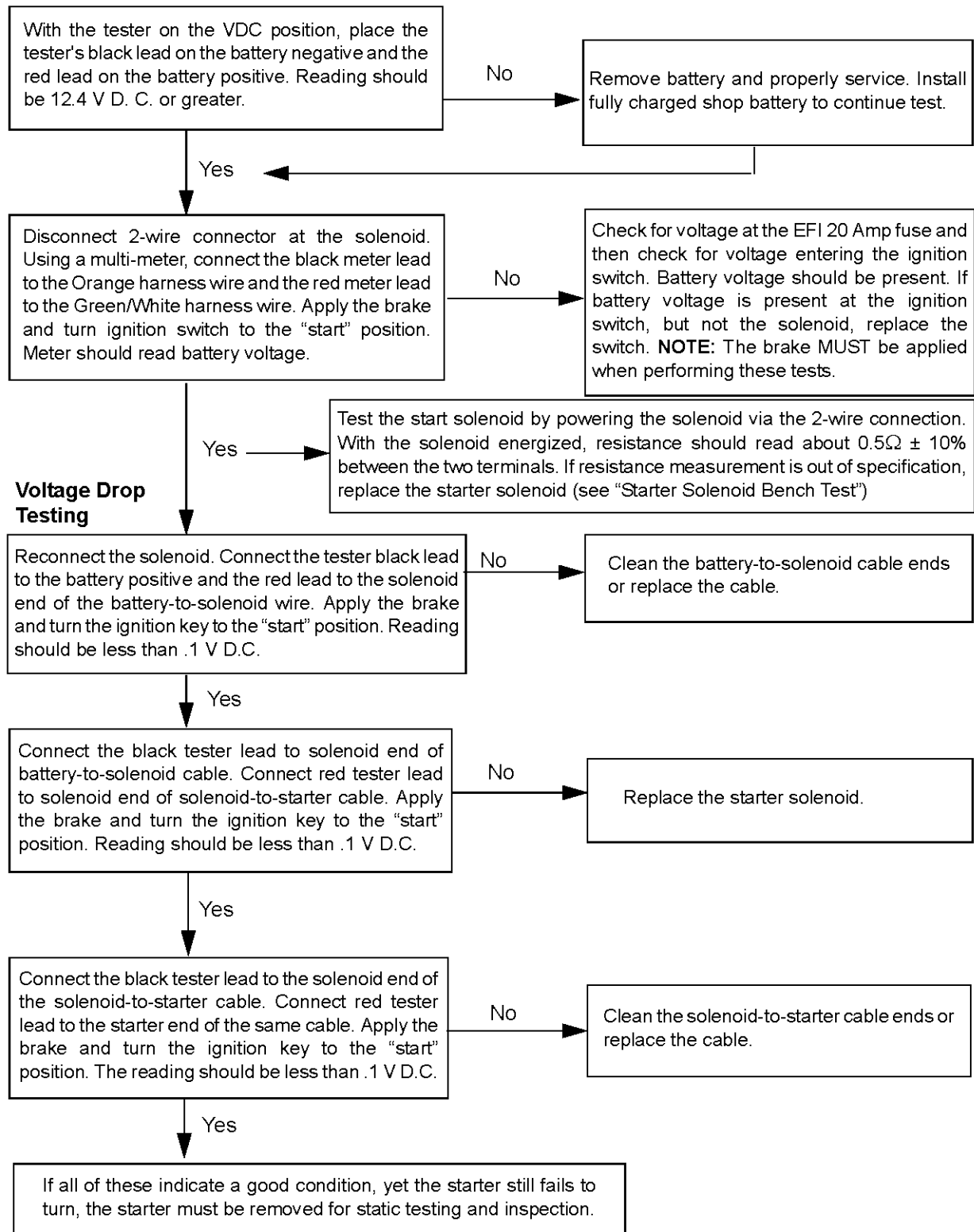
To energize the Starter Solenoid the following must occur:

- The brake must be applied to provide 12V power via the Orange wire.
- The key switch must be turned to the "Start" position to provide a ground path via the Green / White wire.
- Once the pull-in coil is energized, the solenoid provides a current path for 12V power to reach the starter motor.



STARTING SYSTEM TESTING FLOW CHART

Condition: Starter fails to turn over the engine.



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ELECTRONIC POWER STEERING (EPS)

EPS Operation

The EPS module is an intelligent electronic power steering system that operates off of the vehicle's 12V electrical system. It calculates steering assist by sensing the difference between the input torque of the steering post and the output torque required to turn the wheels, and then provides assist by energizing an electric motor. The process provides a smooth, seamless assist.

The system is continuously running diagnostic checks and monitoring factors such as battery voltage, ground speed and engine speed. In the event an internal or external issue that affects the EPS system is detected, the system will illuminate a fault indicator and transition to a normal mechanically coupled steering system. The system is Polaris Digital Wrench® compatible for simplified diagnostics and system troubleshooting through the vehicle's diagnostic port.

With the engine off and the key on, the power steering unit will operate for up to five minutes. After the five minutes, you will need to cycle the key switch and restart the engine to regain power steering operation.

NOTE: To conserve battery power, the EPS unit will shut down 5 minutes after the engine has stopped if the key remains in the ON position. At this point, the EPS Malfunction Indicator Light will illuminate to indicate the EPS has shut down and will set a fault code in Digital Wrench®.

The Power Steering 30A Fuse.

- If the fuse fails, the Power Steering Malfunction Indicator Light (MIL) on the instrument cluster will illuminate. During this time, the vehicle will have no power steering operation. You will be able to connect and communicate with the vehicle's Engine Controller, but not the Power Steering Controller, while using Digital Wrench®.

NOTE: DO NOT SPLICE OR CUT INTO THE CAN CIRCUITS.



WARNING

Electronic Power Steering (EPS) units are not interchangeable between ATV and *RANGER* product lines.

NOTE: See Chapter 5 "Body/Steering/Suspension" for power steering unit removal and installation procedures.

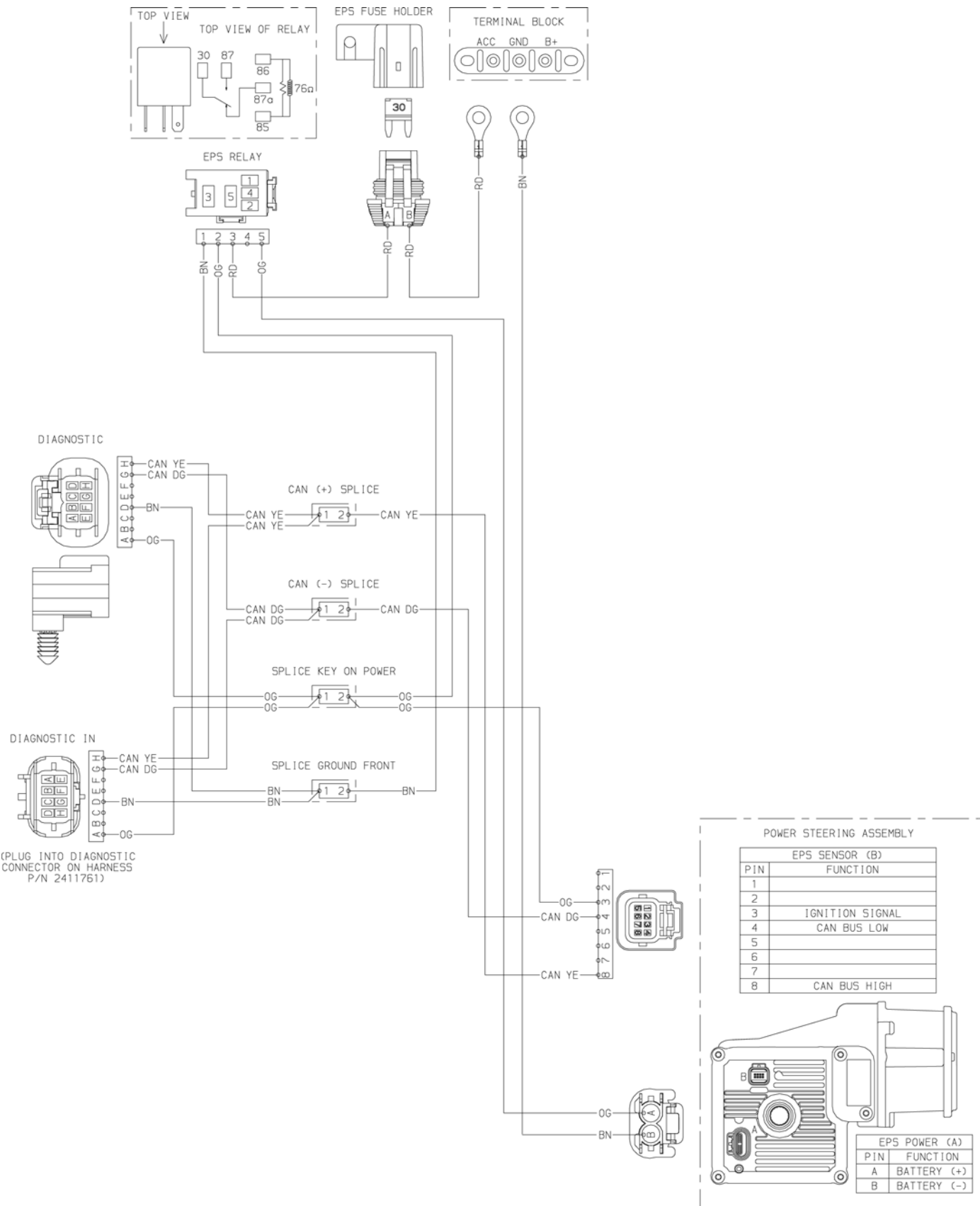
WIRE COLOR	FUNCTION
ORANGE (2-Pin)	Main Power (30A Protected)
BROWN (2-Pin)	Ground
ORANGE (8-Pin)	Key-On Battery Voltage
YELLOW (8-Pin)	CAN High Signal
GREEN (8-Pin)	CAN Low Signal

Proper EPS System Diagnosing

READ BEFORE YOU REPLACE THE EPS UNIT!

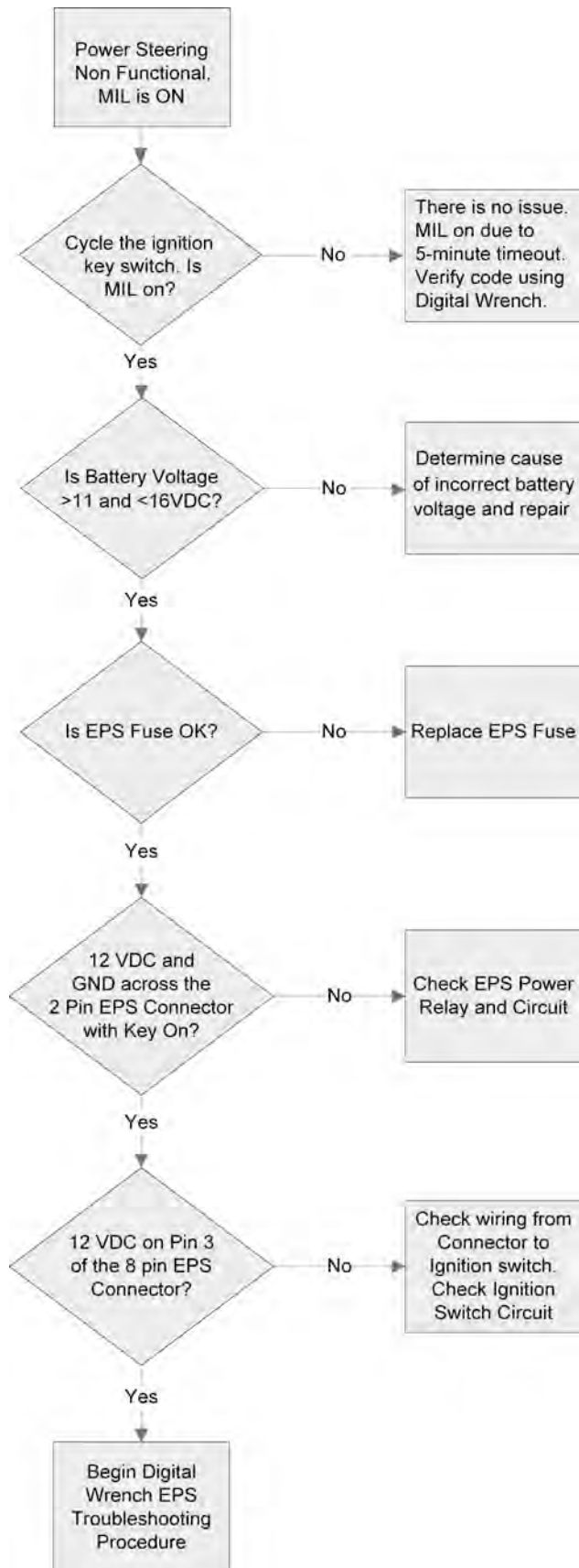
IMPORTANT: Verify the EPS unit has the latest software version and calibration loaded before replacing the EPS unit. If not, update to the latest version for each and follow the guided diagnostic procedure(s) available in Digital Wrench®.

EPS System Breakout

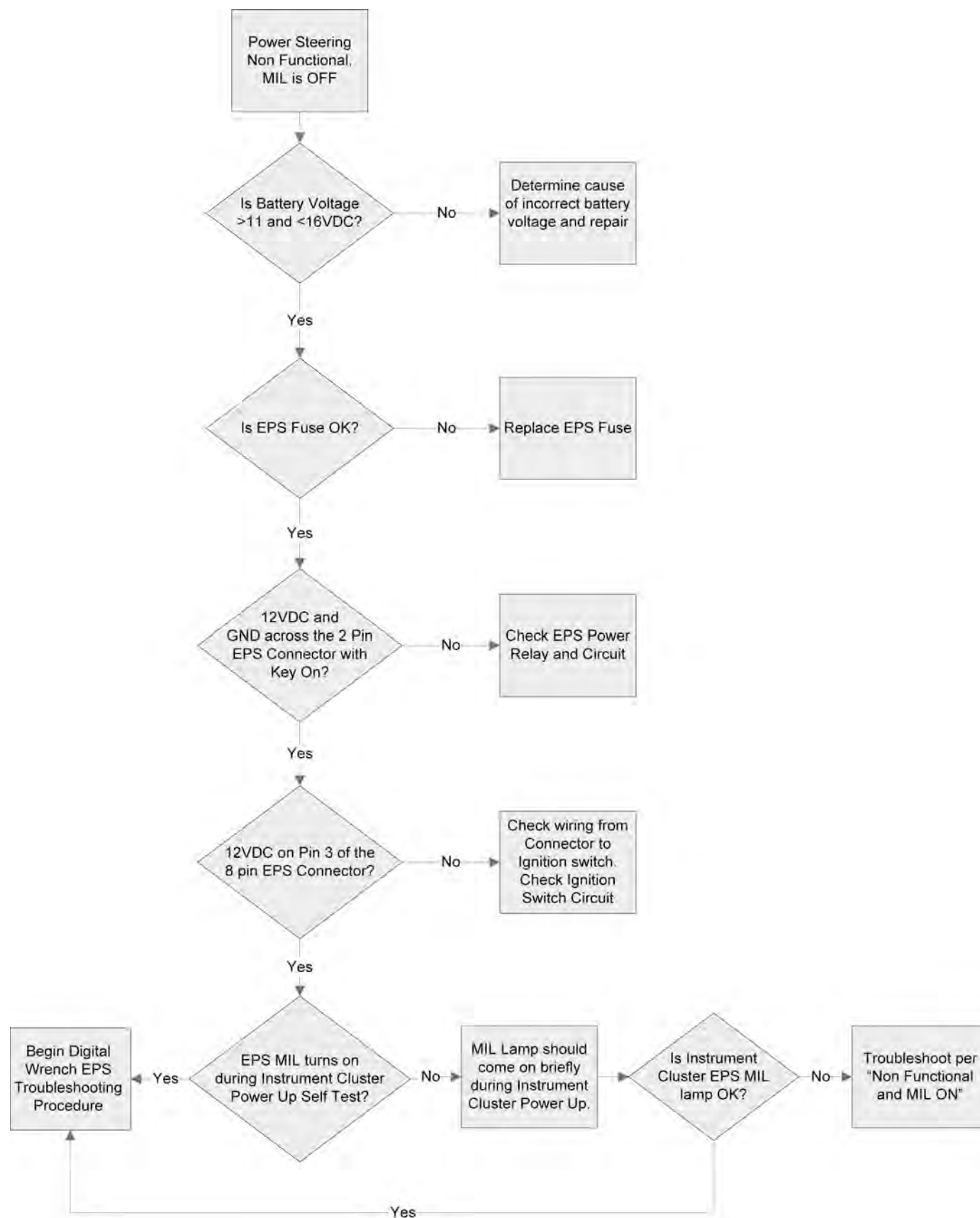


ELECTRICAL

EPS Troubleshooting (Power Steering Non-Functional with MIL ON)



EPS Troubleshooting (Power Steering Non-Functional with MIL OFF)



ELECTRICAL

EPS Troubleshooting (Using Digital Wrench®)

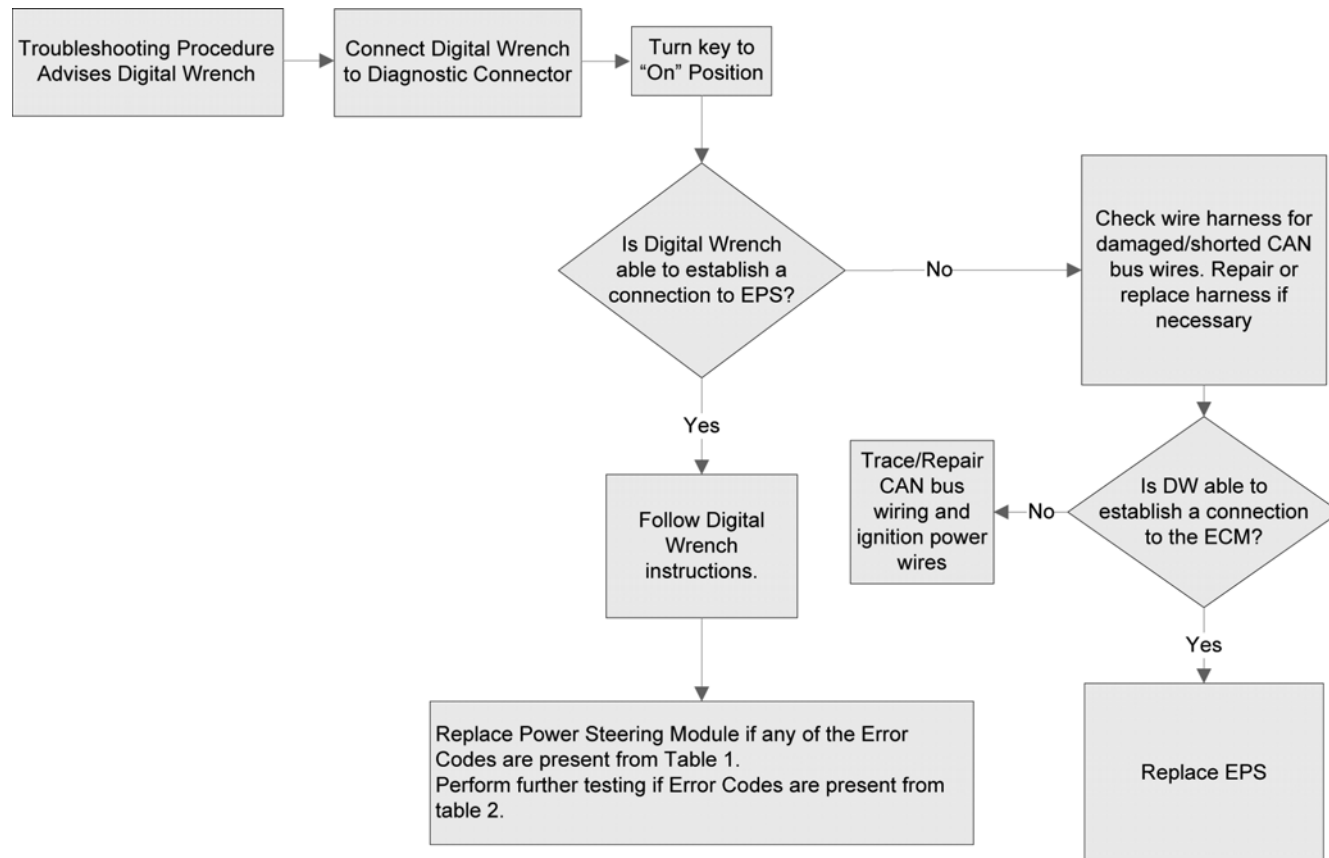


Table 1: Error Codes requiring Power Steering Replacement

1. Position Encoder Error
2. EPS Software Error
3. Steering Torque Sensor Full Failure
4. Steering Excessive Current Error *
5. Steering Over Current Shutdown *
6. Phase Sensing Over Current
7. Phase Sensing Excessive Current
8. Torque Sensor Range
9. Rotor Encoder Communication
10. Rotor Encoder Variance
11. SEPIC Voltage Low/High
12. EEPROM Failure

EPS Inverter Temperature Test:

1. Verify that Power Steering module heat sink surface (top surface) is clean and free of mud and dirt. Make a note of how much debris was on heat sink before cleaning. Record all power steering error codes and then clear all error codes. EPS inverter temperature can be monitored through Digital Wrench.
2. Allow vehicle to set and cool for at least 2 hours.
3. Drive vehicle for 30 minutes of left and right turning and then Connect Digital wrench and read Power Steering Error Codes. If Inverter Temperature Error Code is present, replace Power Steering Module. If error is not present, Module is OK. EPS inverter temperature can be checked using Digital wrench

Table 2: Error Codes Requiring Additional Troubleshooting

1. EPS Inverter Temperature- check for mud/debris on EPS
2. Battery Voltage Over / Under- check bike's charging system and battery.
3. Calibration Error – Relfash EPS Unit

Battery Voltage Over / Under Test:

1. Disconnect 2 pin Power Connector to EPS and verify battery voltage (12-14 VDC) is present on pins with key on. If voltage is low, investigate and correct cause. If voltage at pins is correct, check all connections for corrosion, damage, and tightness. Check pin 3 on 8 pin connector for 12V signal with key on.

* These Error Codes must have multiple occurrences or you must be able to duplicate the condition before replacing the EPS unit.

.1 WIRING DIAGRAMS

Click Link to view wiring diagrams.

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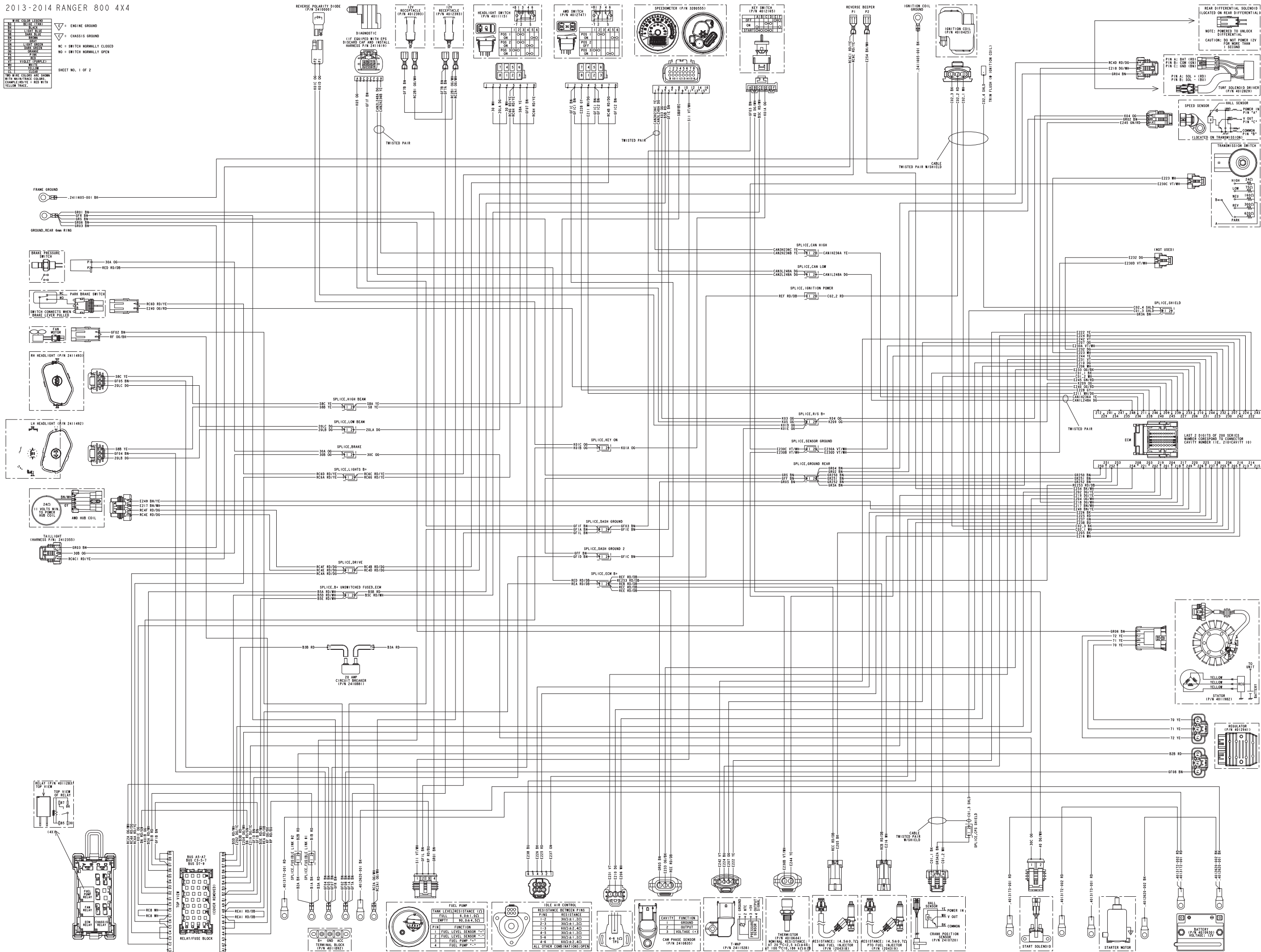
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SHEET NO. 1 OF 2



2013-2014 RANGER 800 4X4

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GT	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.	

E = ENGINE GROUND

C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

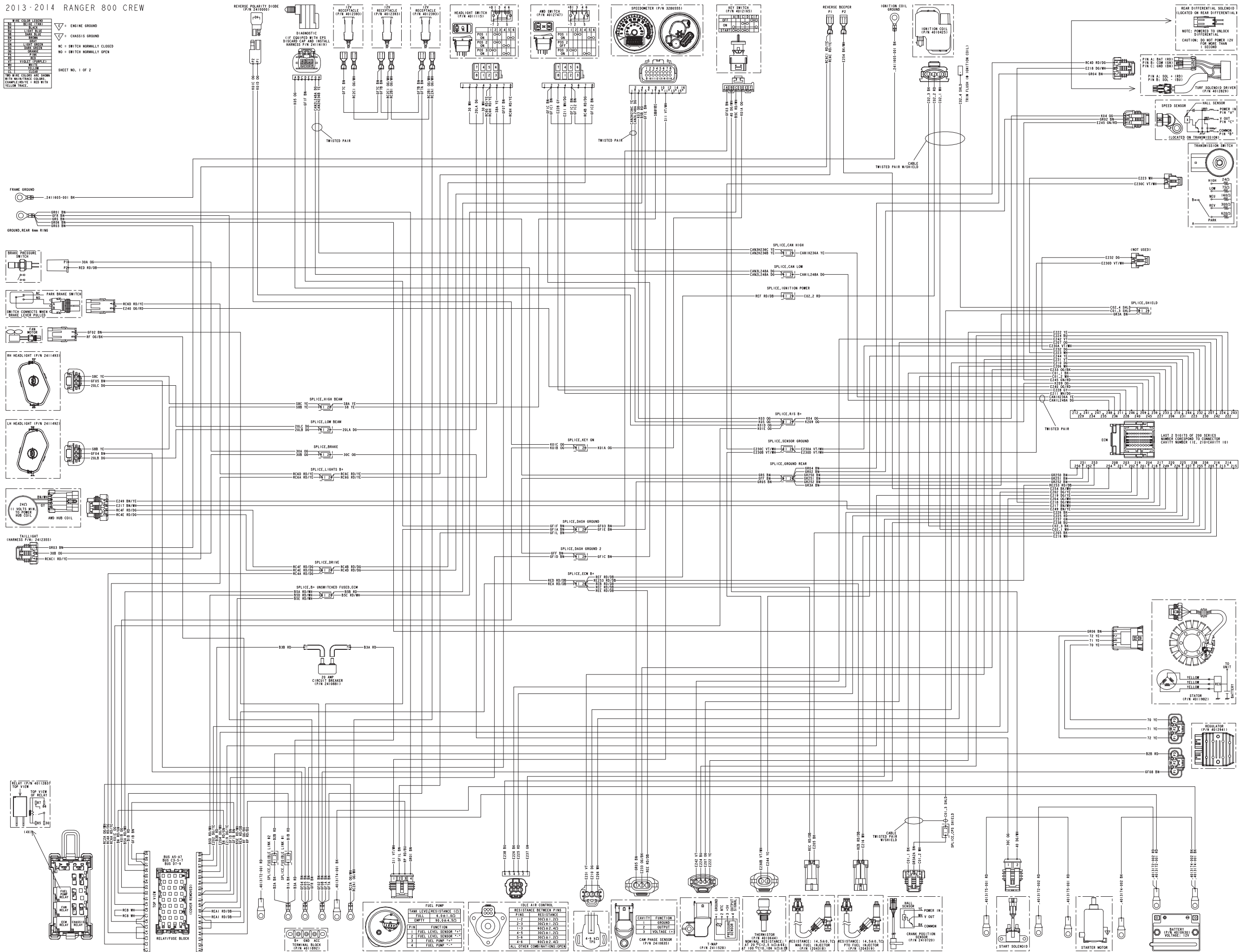
SHEET NO. 2 OF 2

CCT #	TYPE	GAUGE	COLOR	FROM COMPONENT	FROM PORT	TO COMPONENT	TO PORT	FUNCTION	INDEX
2411605-001	TXL	0.8	BK	IGNITION COIL GROUND	I	FRAME GROUND	I	IGNITION COIL GROUND TO FRAME GROUND	1
4012620-001	SGT	13.0	BK	BATTERY (-)	I	TERMINAL BLOCK (GROUND)	I	BATTERY (-) TO TERMINAL BLOCK (GROUND)	2
4012620-002	SGT	13.0	BK	BATTERY (-)	I	STARTER (GROUND)	I	BATTERY (-) TO STARTER (GROUND)	3
4013172-001	SGT	13.0	RD	BATTERY (+)	I	TERMINAL BLOCK (B+)	I	BATTERY (+) TO TERMINAL BLOCK (B+)	4
4013172-002	SGT	13.0	RD	BATTERY (+)	I	START SOLENOID	I	BATTERY (+) TO START SOLENOID	5
4013173-001	SGT	13.0	RD	START SOLENOID	I	STARTER	I	START SOLENOID TO STARTER	6
204A	TXL	0.8	DG	HEADLIGHT SWITCH	A	SPLICE, LOW BEAM	2	HEADLIGHT SWITCH LOW BEAM OUT	7
204B	TXL	0.8	DG	LH HEADLIGHT	A	SPLICE, LOW BEAM	1	LH HEADLIGHT LOW BEAM	8
204C	TXL	0.8	DG	RH HEADLIGHT	A	SPLICE, LOW BEAM	1	RH HEADLIGHT LOW BEAM	9
30	TXL	0.8	WH	HEADLIGHT SWITCH	2	HEADLIGHT SWITCH	4	HEADLIGHT SWITCH JUMPER	10
30A	TXL	0.8	OG	BRAKE SWITCH	P1	SPLICE, BRAKE	1	BRAKE SIGNAL	11
30B	TXL	0.8	OG	TAILLIGHT	B	SPLICE, BRAKE	1	BRAKE SIGNAL	12
30C	TXL	0.8	OG	START SOLENOID	I	SPLICE, BRAKE	2	BRAKE SIGNAL	13
40	TXL	0.8	DG/WH	KEY SWITCH	B	START SOLENOID	2	START SOLENOID CONTROL GROUND	14
70	TXL	2.0	YE	STATOR	A	VREG AC INPUT	P3	STATOR AC	15
71	TXL	2.0	YE	STATOR	B	VREG AC INPUT	P2	STATOR AC	16
72	TXL	2.0	YE	STATOR	C	VREG AC INPUT	P1	STATOR AC	17
B1A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	I	SPLICE, FUSIBLE LINK #1	I	FUSELINK CHASSIS B+	18
B1B	TXL	3.0	RD	RELAY/FUSE BLOCK	D7	SPLICE, FUSIBLE LINK #1	2	UNSWITCHED, B+ BUS D97	19
B2A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	I	SPLICE, FUSIBLE LINK #2	I	FUSELINK VREG OUTPUT B+	20
B2B	TXL	3.0	RD	VREG DC OUTPUT	P3	SPLICE, FUSIBLE LINK #2	2	VOLTAGE REGULATOR OUTPUT B+	21
B3A	TXL	1.0	RD	TERMINAL BLOCK 3 (B+)	I	CIRCUIT BREAKER	2	UNSWITCHED B+	22
B3B	TXL	1.0	RD	RELAY/FUSE BLOCK	B7	CIRCUIT BREAKER	2	UNSWITCHED FUSED, B+ FAN RELAY IN	23
B5A	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	D6	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED, B+ ECM FUSE OUT	24
B5B	TXL	0.5	RD	SPEEDOMETER	4	SPLICE, B+ UNSWITCHED FUSED, ECM	2	UNSWITCHED FUSED B+	25
B5C	TXL	0.8	RD/WH	KEY SWITCH	C	SPLICE, B+ UNSWITCHED FUSED, ECM	2	UNSWITCHED FUSED B+	26
B5D	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	B9	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED B+, ECM RELAY IN	27
B5E	TXL	0.5	RD/WH	RELAY/FUSE BLOCK	A9	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED B+, ECM RELAY COIL	28
B6	TXL	1.0	RD/GN	RELAY/FUSE BLOCK	B5	RELAY/FUSE BLOCK	D2	FUEL PUMP FUSE OUT TO FUEL PUMP RELAY B+ IN	29
BUSA75	BUS	BUS	BUS	RELAY/FUSE BLOCK	A5	RELAY/FUSE BLOCK	A7	ECM, B+ ECM RELAY OUT, BUS A75	30
BUSC53	BUS	BUS	BUS	RELAY/FUSE BLOCK	C3	RELAY/FUSE BLOCK	C5	SWITCHED B+	31
BUSC75	BUS	BUS	BUS	RELAY/FUSE BLOCK	C5	RELAY/FUSE BLOCK	C7	SWITCHED B+	32
BUSD97	BUS	BUS	BUS	RELAY/FUSE BLOCK	D7	RELAY/FUSE BLOCK	D9	UNSWITCHED B+	33
C01-1	TXL	0.8	BK	ECM	227	CRANK POSITION SENSOR	C	CRANK POSITION SENSOR NEGATIVE	34
C01-2	TXL	0.8	WH	ECM	239	CRANK POSITION SENSOR	A	CRANK POSITION SENSOR POSITIVE	35
C01-3	SHLD	0.8	SHLD	SPLICE, CPS SHIELD	2	SPLICE, SHIELD	1	SHIELD, CPS (C01)	36
C02-1	TXL	0.8	WH	ECM	256	IGNITION COIL	I	PTO IGNITION CONTROL	37
C02-2	TXL	0.8	RD	IGNITION COIL	2	SPLICE, IGNITION POWER	2	ECM, B+	38
C02-3	TXL	0.8	BK	ECM	255	IGNITION COIL	3	MAG IGNITION CONTROL	39
C02-4	SHLD	0.8	SHLD	TRIM FLUSH (Ø IGNITION COIL)	2	SPLICE, SHIELD	1	SHIELD, IGNITION COIL (C02)	40
CAN1H236A	TXL	0.5TP	YE	ECM	236	SPLICE, CAN HIGH	2	CAN HIGH	41
CAN1L248A	TXL	0.5TP	DG	ECM	248	SPLICE, CAN LOW	2	CAN LOW	42
CAN2H266B	TXL	0.5TP	YE	DIAGNOSTIC	H	SPLICE, CAN HIGH	1	CAN HIGH	43
CAN2L248A	TXL	0.5TP	DG	DIAGNOSTIC	G	SPLICE, CAN LOW	1	CAN LOW	44
CAN3H236C	TXL	0.5TP	YE	SPEEDOMETER	I	SPLICE, CAN HIGH	1	CAN HIGH	45
CAN3L248A	TXL	0.5TP	DG	SPEEDOMETER	J	SPLICE, CAN LOW	1	CAN LOW	46
E202	TXL	0.5	DG/YE	ECM	202	RELAY/FUSE BLOCK	B8	ECM RELAY COIL CONTROL	47
E204	TXL	0.5	OG/WH	ECM	204	RELAY/FUSE BLOCK	B6	FAN RELAY COIL CONTROL	48
E205	TXL	0.5	BK	ECM	205	MAG FUEL INJECTOR	A	MAG FUEL INJECTOR	49
E206	TFE	0.5	WH	ECM	206	TPS	3	3.3V SENSOR SUPPLY V2 (TPS)	50
E207	TFE	0.5	OG	ECM	207	T-MAP SENSOR	A7D	+5V SOURCE	51
E210	TFE	0.5	DG	ECM	210	TPS	2	TPS SIGNAL	52
E211	TXL	0.5	WH/DG	ECM	211	AWD/TURF SWITCH	4	TURF REQUEST	53
E216	TXL	0.5	WH	ECM	216	PTO FUEL INJECTOR	A	PTO FUEL INJECTOR	54
E217	TXL	0.5	BN/WH	ECM	217	AWD	B	AWD CONTROL	55
E218	TXL	0.5	DG/WH	ECM	218	TURF RELAY	B	TURF CONTROL	56
E219	TXL	0.5	DG/YE	ECM	219	RELAY/FUSE BLOCK	B4	FUEL PUMP RELAY COIL CONTROL	57
E222	TFE	0.5	YE	ECM	222	T-MAP SENSOR	4	MANIFOLD PRESSURE SIGNAL	58
E225	TXL	0.5	WH	ECM	223	TRANSMISSION SWITCH	B	TRANSMISSION SWITCH SIGNAL OUTPUT	59
E226	TFE	0.5	BU	ECM	224	T-MAP SENSOR	2	AIR TEMP SENSOR SIGNAL	60
E226	TFE	0.5	RD	ECM	225	IDLE AIR CONTROL	3	IAC PIN 3	61
E226	TFE	0.5	BK	ECM	226	IDLE AIR CONTROL	4	IAC PIN 4	62
E228	TXL	0.5	ST	ECM	228	AWD/TURF SWITCH	3	AWD REQUEST	63
E230A	TXL	0.5	VT/WH	ECM	230	SPLICE, SENSOR GROUND	2	SENSOR GROUND	64
E230B	TXL	0.5	VT/WH	COOLANT TEMP SENSOR	I	SPLICE, SENSOR GROUND	1	SENSOR GROUND	65
E230C	TXL	0.5	VT/WH	TRANSMISSION SWITCH	A	SPLICE, SENSOR GROUND	1	SENSOR GROUND	66
E230D	TXL	0.5	VT/WH	THROTTLE RELEASE SWITCH	A	SPLICE, SENSOR GROUND	2	SENSOR GROUND	67
E231	TFE	0.5	VT	ECM	231	TPS	1	TPS GROUND	68
E232	TXL	0.5	DG	ECM	232	THROTTLE RELEASE SWITCH	B	TPS SIGNAL	69
E233	TXL	0.5	OG/BK	ECM	233	CAM PHASE SENSOR	2	CAM POSITION SIGNAL	70
E237	TFE	0.5	GN	ECM	237	IDLE AIR CONTROL	1	IAC PIN 5	71
E238	TFE	0.5	BU	ECM	238	IDLE AIR CONTROL	6	IAC PIN 6	72
E240	TXL	0.5	OG/RD	ECM	240	PARK BRAKE SWITCH	B	TBD	73
E242	TFE	0.5	VT	ECM	242	T-MAP SENSOR	1	MANIFOLD PRESSURE GROUND	74
E244	TXL	0.5	YE	ECM	244	COOLANT TEMP SENSOR	2	COOLANT TEMP SIGNAL	75
E245	TXL	0.5	GN/RD	ECM	245	VEHICLE SPEED SENSOR	C	VEHICLE SPEED SIGNAL	76
E249	TXL	0.5	BN/YE	ECM	249	AWD	A	ADC CONTROL	77
E254	TXL	0.8	BK/WH	ECM	254	REVERSE BEEPER P2	I	REVERSE BEEPER DRIVER	78
G02	TXL	0.8	BN	FAN	A	TERMINAL BLOCK 2 (GROUND #2)	I	GROUND, FAN	79
G03	TXL	0.8	BN	KEY SWITCH	A	SPLICE, DASH GROUND	2	GROUND, KEY SWITCH	80
G04	TXL	0.8	BN	LH HEADLIGHT	B	TERMINAL BLOCK 2 (GROUND #1)	I	GROUND, HEADLIGHT	81
G05	TXL	0.8	BN	RH HEADLIGHT	B	TERMINAL BLOCK 2 (GROUND #1)	I	GROUND, HEADLIGHT	82
G06	TXL	0.8	BN	HEADLIGHT SWITCH	7	TERMINAL BLOCK 2 (GROUND #1)	I	HEADLIGHT SWITCH MARKER GROUND	83
G08	TXL	3.0	BN	VREG DC OUTPUT	P1	TERMINAL BLOCK 2 (GROUND #2)	I	REGULATOR GROUND	84
GF1A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	I	SPLICE, DASH GROUND	I	GROUND, FRONT SPLICE	85
GF1B	TXL	0.5	BN	RELAY/FUSE BLOCK	B2	RELAY/FUSE BLOCK	D8	CHASSIS RELAY COIL GROUND	86
GF1C	TXL	0.5	BN	AWD/TURF SWITCH	2	SPLICE, DASH GROUND 2	2	GROUND	87
GF1C1	TXL	0.5	BN	AWD/TURF SWITCH	2	AWD/TURF SWITCH	5	GROUND	88
GF1C2	TXL	0.5	BN	AWD/TURF SWITCH	5	AWD/TURF SWITCH	8	GROUND, AWD, TURF, SIGNAL	89
GF1D	TXL	0.5	BN	RELAY/FUSE BLOCK	B2	SPLICE, DASH GROUND 2	I	GROUND EPS RELAY COIL	90
GF1E	TXL	0.5	BN	SPEEDOMETER	5	SPLICE, DASH GROUND	2	GROUND, SPEEDOMETER	91
GF1F	TXL	0.5	BN	DIAGNOSTIC	D	SPLICE, DASH GROUND	I	GROUND, DIAGNOSTIC	92
BF1L	TXL	1.0	BN	FUEL PUMP/LEVEL	2	SPLICE, DASH GROUND	I	FUEL LEVEL, GROUND	93
GF7A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	I	I2V (-) RECEPTACLE A2	I	GROUND	94
GF7B	TXL	1.0	BN	I2V (-) RECEPTACLE A2	I	I2V (-) RECEPTACLE B2	I	GROUND	95
GF7F	TXL	1.0	BN	SPLICE, GROUND REAR	I	SPLICE, DASH GROUND 2	I	GROUND	96
GFR	TXL	3.0	BN	TERMINAL BLOCK 2 (GROUND #1)	I	GROUND, REAR 6mm RING	I	GROUND, FRONT REAR CONNECTION	97
GR01	TXL	1.0	BN	FUEL PUMP/LEVEL	4	GROUND, REAR 6mm RING	I	PUMP GROUND	98
GR02	TXL	0.8	BN	VEHICLE SPEED SENSOR	B	SPLICE, GROUND REAR	2	GROUND, VEHICLE SPEED SENSOR	99
GR03	TXL	0.8	BN	TAILLIGHT	C	GROUND, REAR 6mm RING	I	GROUND	100
GR04	TXL	0.8	BN	TURF RELAY	C	SPLICE, GROUND REAR	2	GROUND, TURF RELAY	101
GR05	TXL	0.5	BN	CAM PHASE SENSOR	I	SPLICE, GROUND REAR	I	GROUND	102
GR06	TXL	2.0	BN	STATOR	D	GROUND, REAR 6mm RING	I	GROUND, STATOR	103
GR250	TXL	0.8	BN	ECM	250	SPLICE, GROUND REAR	2	GROUND, ECM BATTERY	104
GR251	TXL	0.8	BN	ECM	251	SPLICE, GROUND REAR	2	GROUND, ECM BATTERY	105
GR252	TXL	0.8	BN	ECM	252	SPLICE, GROUND REAR	2	GROUND, ECM BATTERY	106
GR3A	TXL	0.5	BN	SPLICE, GROUND REAR	I	SPLICE, SHIELD	I	GROUND	107
GR3A2A	TXL	0.5	BN	CRANK POSITION SENSOR	B	SPLICE, CPS SHIELD	I	SHIELD, CPS	108
GRS	TXL	1.0	BN	GROUND, REAR 6mm RING	I	SPLICE, GROUND REAR	I	GROUND	109
K01A	TXL	1.0	OG	KEY SWITCH	D	SPLICE, KEY ON	2	KEY SWITCH OUT B+	110
K01B	TXL	0.8	OG	RELAY/FUSE BLOCK	D3	SPLICE, KEY ON	1	KEY SWITCH OUT B+, FUEL PUMP FUSE IN	111
K01C	TXL	0.8	OG	REVERSE POLARITY DIODE	P2	SPLICE, KEY ON	1	KEY SWITCH OUT B+	112
K01D	TXL	0.8	OG	REVERSE POLARITY DIODE	P1	SPLICE, R/S B+	1	KEY SWITCH OUT B+	113
K01E	TXL	0.5	OG	RELAY/FUSE BLOCK	C9	SPLICE, R/S B+	1	KEY SWITCH, B+ CHASSIS RELAY COIL POWER	114
K03	TXL	0.5	OG	SPEEDOMETER	3	SPLICE, R/S B+	1	KEY SWITCH OUT, B+	115
K04	TXL	0.5	OG	VEHICLE SPEED SENSOR	A	SPLICE, R/S B+	2	KEY SWITCH OUT, B+	116
K05	TXL	0.5	OG	DIAGNOSTIC	A	SPLICE, R/S B+	1	KEY SWITCH OUT, B+	117
K209	TXL	0.5	OG	ECM	209	SPLICE, R/S B+	2	KEY SWITCH OUT, B+	118
RC2A	TXL	1.0	OG/WH	RELAY/FUSE BLOCK	C2	TERMINAL BLOCK 1 (ACC)	I	ACCESSORIES, B+ ACC FUSE OUT	119
RC2A1	TXL	1.0	OG/WH	TERMINAL BLOCK 1 (ACC)	I	I2V (+) RECEPTACLE A1	I	FUSE ACCESSORIES, B+ (3/16)	120
RC2B1	TXL	1.0	OG/WH	I2V (+) RECEPTACLE A1	I	I2V (+) RECEPTACLE B1	I	FUSE ACCESSORIES, B+ (3/16)	121
RC4A	TXL	0.8	RD/DG	RELAY/FUSE BLOCK	C4	SPLICE, DRIVE	I	SWITCHED, B+ DRIVE FUSE OUT	122
RC4B	TXL	0.5	RD/DG	AWD/TURF SWITCH	A	SPLICE, DRIVE	2	SWITCHED, B+	123
RC4D	TXL	0.5	RD/DG	TURF RELAY	A	SPLICE, DRIVE	2	SWITCHED, B+, TURF	124
RC4E	TXL	0.5	RD/DG	AWD	D	SPLICE, DRIVE	1	SWITCHED, B+, ADC COIL	125
RC4F	TXL	0.5	RD/DG	AWD	C	SPLICE, DRIVE	1	SWITCHED, B+, AWD COIL	126
RC6A	TXL	0.8	RD/YE	RELAY/FUSE BLOCK	C6	SPLICE, LIGHTS B+	I	LIGHTS, B+ LIGHTS FUSE OUT	127
RC6C	TXL	0.8	RD/YE	REVERSE BEEPER P1	I	SPLICE, LIGHTS B+	2	LIGHTS, B+	128
RC6C1	TXL	0.8	RD/YE	TAILLIGHT	A	REVERSE BEEPER P1	I	LIGHTS, B+	129
RC6D	TXL	0.5	RD/YE	PARK BRA					

WIRE COLOR LEGEND	
BO	BRIGHT (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.

SHEET NO. 1 OF 2



2013-2014 RANGER 800 CREW

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GT	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.	

E = ENGINE GROUND

C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

SHEET NO. 2 OF 2

CCT #	TYPE	GAUGE	COLOR	FROM COMPONENT	FROM PORT	TO COMPONENT	TO PORT	FUNCTION	INDEX
2411603-001	TXL	0.8	BK	IGNITION COIL GROUND	1	FRAME GROUND TO FRAME GROUND	1	IGNITION COIL GROUND TO FRAME GROUND	1
4013172-001	SGT	13.0	RD	BATTERY (+)	1	TERMINAL BLOCK (B+)	1	BATTERY (+) TO TERMINAL BLOCK (B+)	2
4013172-002	SGT	13.0	RD	BATTERY (+)	1	START SOLENOID	1	BATTERY (+) TO START SOLENOID	3
4013174-001	SGT	13.0	BK	BATTERY (-)	1	TERMINAL BLOCK (GROUND)	1	BATTERY (-) TO TERMINAL BLOCK (GROUND)	4
4013174-002	SGT	13.0	BK	BATTERY (-)	1	STARTER (GROUND)	1	BATTERY (-) TO STARTER (GROUND)	5
4013175-001	SGT	13.0	RD	START SOLENOID	1	STARTER	1	START SOLENOID TO STARTER	6
20LA	TXL	0.8	DG	HEADLIGHT SWITCH	3	SPLICE, LOW BEAM	2	HEADLIGHT SWITCH LOW BEAM OUT	7
20LB	TXL	0.8	DG	LH HEADLIGHT	A	SPLICE, LOW BEAM	1	LH HEADLIGHT LOW BEAM	8
20LC	TXL	0.8	DG	RH HEADLIGHT	A	SPLICE, LOW BEAM	1	RH HEADLIGHT LOW BEAM	9
30	TXL	0.8	WH	HEADLIGHT SWITCH	2	HEADLIGHT SWITCH	4	HEADLIGHT SWITCH JUMPER	10
30A	TXL	0.8	OG	BRAKE SWITCH	P1	SPLICE, BRAKE	1	BRAKE SIGNAL	11
30B	TXL	0.8	OG	TAILLIGHT	B	SPLICE, BRAKE	1	BRAKE SIGNAL	12
30C	TXL	0.8	OG	START SOLENOID	B	SPLICE, BRAKE	1	BRAKE SIGNAL	13
40	TXL	0.8	DG/WH	KEY SWITCH	B	START SOLENOID	2	START SOLENOID CONTROL GROUND	14
70	TXL	2.0	YE	STATOR	A	VREG AC INPUT	P3	STATOR AC	15
71	TXL	2.0	YE	STATOR	B	VREG AC INPUT	P2	STATOR AC	16
72	TXL	2.0	YE	STATOR	C	VREG AC INPUT	P1	STATOR AC	17
B1A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	1	SPLICE, FUSIBLE LINK #1	1	FUSELINK CHASSIS B+	18
B1B	TXL	3.0	RD	RELAY/FUSE BLOCK	D7	SPLICE, FUSIBLE LINK #1	2	UNSWITCHED, B+ BUS D97	19
B2A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	1	SPLICE, FUSIBLE LINK #2	1	FUSELINK VREG OUTPUT B+	20
B2B	TXL	3.0	RD	VREG DC OUTPUT	P3	SPLICE, FUSIBLE LINK #2	1	VOLTAGE REGULATOR OUTPUT B+	21
B3A	TXL	1.0	RD	TERMINAL BLOCK 3 (B+)	1	CIRCUIT BREAKER	2	UNSWITCHED B+	22
B3B	TXL	1.0	RD	RELAY/FUSE BLOCK	B7	CIRCUIT BREAKER	1	UNSWITCHED FUSED, B+ FAN RELAY IN	23
B5A	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	D6	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED, B+ ECM FUSE OUT	24
B5B	TXL	0.5	RD	SPEEDOMETER	A	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED B+	25
B5C	TXL	0.8	RD/WH	KEY SWITCH	C	SPLICE, B+ UNSWITCHED FUSED, ECM	2	UNSWITCHED FUSED B+	26
B5D	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	B9	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED B+, ECM RELAY IN	27
B5E	TXL	0.5	RD/WH	RELAY/FUSE BLOCK	A9	SPLICE, B+ UNSWITCHED FUSED, ECM	1	UNSWITCHED FUSED B+ ECM RELAY COIL	28
B6	TXL	1.0	RD/WH	RELAY/FUSE BLOCK	B5	RELAY/FUSE BLOCK	D2	FUEL PUMP FUSE OUT TO FUEL PUMP RELAY B+ IN	29
BUS475	BUS	BUS	BUS	RELAY/FUSE BLOCK	A5	RELAY/FUSE BLOCK	A7	ECM, B+ ECM RELAY OUT, BUS 475	30
BUSC53	BUS	BUS	BUS	RELAY/FUSE BLOCK	C3	RELAY/FUSE BLOCK	C5	SWITCHED B+	31
BUSC75	BUS	BUS	BUS	RELAY/FUSE BLOCK	C5	RELAY/FUSE BLOCK	C7	SWITCHED B+	32
BUSD97	BUS	BUS	BUS	RELAY/FUSE BLOCK	D7	RELAY/FUSE BLOCK	D9	UNSWITCHED B+	33
C01-1	TXL	0.8	BK	ECM	227	CRANK POSITION SENSOR	C	CRANK POSITION SENSOR NEGATIVE	34
C01-2	TXL	0.8	WH	ECM	239	CRANK POSITION SENSOR	A	CRANK POSITION SENSOR POSITIVE	35
C01-3	SHLD	0.8	SHLD	SPLICE, CPS SHIELD	2	SPLICE, SHIELD	1	SHIELD, CPS (C01)	36
C02-1	TXL	0.8	WH	IGNITION COIL	2	SPLICE, IGNITION POWER	2	ECM, B+	37
C02-2	TXL	0.8	BK	ECM	255	IGNITION COIL	3	MAG IGNITION CONTROL	38
C02-3	SHLD	0.8	SHLD	TRIM FLUSH (Ø IGNITION COIL)	1	SPLICE, SHIELD	1	SHIELD, IGNITION COIL (C02)	39
CAN1H236A	TXL	0.5TP	YE	ECM	236	SPLICE, CAN HIGH	2	CAN HIGH	41
CAN1I248A	TXL	0.5TP	DG	ECM	248	SPLICE, CAN LOW	2	CAN LOW	42
CAN2H236B	TXL	0.5TP	YE	DIAGNOSTIC	H	SPLICE, CAN HIGH	1	CAN HIGH	43
CAN2I248A	TXL	0.5TP	DG	DIAGNOSTIC	G	SPLICE, CAN LOW	1	CAN LOW	44
CAN3H236C	TXL	0.5TP	YE	SPEEDOMETER	1	SPLICE, CAN HIGH	1	CAN HIGH	45
CAN3I248A	TXL	0.5TP	DG	SPEEDOMETER	2	SPLICE, CAN LOW	1	CAN LOW	46
E202	TXL	0.5	DG/YE	ECM	202	RELAY/FUSE BLOCK	B8	ECM RELAY COIL CONTROL	47
E204	TXL	0.5	OG/WH	ECM	204	RELAY/FUSE BLOCK	B6	FAN RELAY COIL CONTROL	48
E205	TFE	0.5	BK	ECM	205	MAG FUEL INJECTOR	A	MAG FUEL INJECTOR	49
E206	TFE	0.5	WH	ECM	206	TPS	3	3.3V SENSOR SUPPLY V2 (TPS)	50
E207	TFE	0.5	OG	ECM	207	T-MAP SENSOR	3	A/D +5V SOURCE	51
E210	TFE	0.5	DG	ECM	210	TPS	2	TPS SIGNAL	52
E211	TXL	0.5	WH/DG	ECM	211	AWD/TURF SWITCH	4	TURF REQUEST	53
E212	TXL	0.5	WH	ECM	216	PTO FUEL INJECTOR	A	PTO FUEL INJECTOR	54
E217	TXL	0.5	BN/WH	ECM	217	AWD	B	AWD CONTROL	55
E218	TXL	0.5	DG/WH	ECM	218	TURF RELAY	B	TURF CONTROL	56
E219	TFE	0.5	DG/TE	ECM	219	RELAY/FUSE BLOCK	B4	FUEL PUMP RELAY COIL CONTROL	57
E220	TFE	0.5	YE	ECM	222	T-MAP SENSOR	4	MANIFOLD PRESSURE SIGNAL	58
E225	TXL	0.5	WH	ECM	223	TRANSMISSION SWITCH	B	TRANSMISSION SWITCH SIGNAL OUTPUT	59
E226	TFE	0.5	BU	ECM	224	T-MAP SENSOR	2	AIR TEMP SENSOR SIGNAL	60
E228	TFE	0.5	RD	ECM	225	IDLE AIR CONTROL	3	IAC PIN 3	61
E229	TFE	0.5	BK	ECM	226	IDLE AIR CONTROL	4	IAC PIN 4	62
E230	TXL	0.5	GY	ECM	228	AWD/TURF SWITCH	3	AWD REQUEST	63
E230A	TXL	0.5	VT/WH	ECM	230	SPLICE, SENSOR GROUND	2	SENSOR GROUND	64
E230B	TXL	0.5	VT/WH	COOLANT TEMP SENSOR	A	SPLICE, SENSOR GROUND	1	SENSOR GROUND	65
E230C	TXL	0.5	VT/WH	TRANSMISSION SWITCH	A	SPLICE, SENSOR GROUND	1	SENSOR GROUND	66
E230D	TXL	0.5	VT/WH	THROTTLE RELEASE SWITCH	A	SPLICE, SENSOR GROUND	2	SENSOR GROUND	67
E231	TFE	0.5	VT	ECM	231	TPS	1	TPS SIGNAL	68
E232	TXL	0.5	DG	ECM	232	THROTTLE RELEASE SWITCH	B	TPS SIGNAL	69
E233	TXL	0.5	OG/BK	ECM	233	CAM PHASE SENSOR	2	CAM POSITION SIGNAL	70
E237	TFE	0.5	GN	ECM	237	IDLE AIR CONTROL	1	IAC PIN 1	71
E238	TFE	0.5	BU	ECM	238	IDLE AIR CONTROL	6	IAC PIN 6	72
E240	TXL	0.5	OG/RD	ECM	240	PARK BRAKE SWITCH	B	TPS	73
E242	TFE	0.5	VT	ECM	242	T-MAP SENSOR	1	MANIFOLD PRESSURE GROUND	74
E244	TXL	0.5	YE	ECM	244	COOLANT TEMP SENSOR	2	COOLANT TEMP SIGNAL	75
E245	TXL	0.5	GN/RD	ECM	245	VEHICLE SPEED SENSOR	C	VEHICLE SPEED SIGNAL	76
E249	TXL	0.5	BN/YE	ECM	249	AWD	A	ADC CONTROL	77
E254	TXL	0.8	BK/WH	ECM	254	REVERSE BEEPER P2	1	REVERSE BEEPER DRIVER	78
GF02	TXL	1.0	BN	FAN	A	TERMINAL BLOCK 2 (GROUND #2)	1	GROUND, FAN	79
GF03	TXL	0.8	BN	KEY SWITCH	A	SPLICE, DASH GROUND	2	GROUND, KEY SWITCH	80
GF04	TXL	0.8	BN	LH HEADLIGHT	B	TERMINAL BLOCK 2 (GROUND #1)	1	GROUND, HEADLIGHT	81
GF05	TXL	0.8	BN	RH HEADLIGHT	B	TERMINAL BLOCK 2 (GROUND #1)	1	GROUND, HEADLIGHT	82
GF07	TXL	0.5	BN	HEADLIGHT SWITCH	7	TERMINAL BLOCK 2 (GROUND #1)	1	HEADLIGHT SWITCH MARKER GROUND	83
GF08	TXL	3.0	BN	VREG DC OUTPUT	P1	TERMINAL BLOCK 2 (GROUND #2)	1	REGULATOR GROUND	84
GF1A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	1	SPLICE, DASH GROUND	1	GROUND, FRONT SPLICE	85
GF1B	TXL	0.5	BN	RELAY/FUSE BLOCK	B2	RELAY/FUSE BLOCK	D8	CHASSIS RELAY COIL GROUND	86
GF1C	TXL	0.5	BN	AWD/TURF SWITCH	2	SPLICE, DASH GROUND 2	2	GROUND	87
GF1C1	TXL	0.5	BN	AWD/TURF SWITCH	2	AWD/TURF SWITCH	5	GROUND	88
GF1C2	TXL	0.5	BN	AWD/TURF SWITCH	5	AWD/TURF SWITCH	8	GROUND, AWD, TURF, SIGNAL	89
GF1D	TXL	0.5	BN	RELAY/FUSE BLOCK	B2	SPLICE, DASH GROUND 2	1	GROUND, EPS RELAY COIL	90
GF1E	TXL	0.5	BN	SPEEDOMETER	5	SPLICE, DASH GROUND	2	GROUND, SPEEDOMETER	91
GF1F	TXL	0.5	BN	DIAGNOSTIC	D	SPLICE, DASH GROUND	1	GROUND, DIAGNOSTIC	92
GF1L	TXL	1.0	BN	FUEL PUMP/LEVEL	2	SPLICE, DASH GROUND	1	FUEL LEVEL, GROUND	93
GF7B	TXL	1.0	BN	12V (-) RECEPTACLE A2	1	12V (-) RECEPTACLE B2	1	GROUND	94
GF7C	TXL	1.0	BN	12V (-) RECEPTACLE B2	1	12V (-) RECEPTACLE C2	1	GROUND	95
GF7F	TXL	1.0	BN	SPLICE, GROUND REAR	1	SPLICE, DASH GROUND 2	1	GROUND	96
GF7F	TXL	3.0	BN	TERMINAL BLOCK 2 (GROUND #1)	1	GROUND, REAR 6mm RING	1	GROUND, FRONT REAR CONNECTION	98
GR01	TXL	1.0	BN	FUEL PUMP/LEVEL	4	GROUND, REAR 6mm RING	1	PUMP GROUND	99
GR02	TXL	0.5	BN	VEHICLE SPEED SENSOR	B	SPLICE, GROUND REAR	2	GROUND, VEHICLE SPEED SENSOR	100
GR03	TXL	0.8	BN	TAILLIGHT	C	GROUND, REAR 6mm RING	1	GROUND	101
GR04	TXL	0.8	BN	TURF RELAY	C	SPLICE, GROUND REAR	2	GROUND, TURF RELAY	102
GR05	TXL	0.5	BN	CAM PHASE SENSOR	1	SPLICE, GROUND REAR	1	GROUND	103
GR06	TXL	2.0	BN	STATOR	B	GROUND, REAR 6mm RING	1	GROUND, STATOR	104
GR250	TXL	0.8	BN	ECM	250	SPLICE, GROUND REAR	2	GROUND, ECM BATTERY	105
GR251	TXL	0.8	BN	ECM	251	SPLICE, GROUND REAR	2	GROUND, ECM BATTERY	106
GR252	TXL	0.8	BN	ECM	252	SPLICE, GROUND REAR	2	GROUND, ECM BATTERY	107
GR3A	TXL	0.5	BN	SPLICE, GROUND REAR	2	SPLICE, SHIELD	1	GROUND	108
GR3A2A	TXL	0.5	BN	CRANK POSITION SENSOR	B	SPLICE, CPS SHIELD	1	SHIELD, CPS	109
GR5	TXL	1.0	BN	GROUND, REAR 6mm RING	1	SPLICE, GROUND REAR	1	GROUND	110
K01A	TXL	1.0	OG	KEY SWITCH	D	SPLICE, KEY ON	2	KEY SWITCH OUT B+	111
K01B	TXL	0.8	OG	RELAY/FUSE BLOCK	D3	SPLICE, KEY ON	1	KEY SWITCH OUT B+, FUEL PUMP FUSE IN	112
K01C	TXL	0.8	OG	REVERSE POLARITY DIODE	P2	SPLICE, KEY ON	1	KEY SWITCH OUT B+	113
K01D	TXL	0.8	OG	REVERSE POLARITY DIODE	P1	SPLICE, R/S B+	1	KEY SWITCH OUT B+	114
K01E	TXL	0.5	OG	RELAY/FUSE BLOCK	C9	SPLICE, R/S B+	1	KEY SWITCH, B+ CHASSIS RELAY COIL POWER	115
K03	TXL	0.5	OG	SPEEDOMETER	3	SPLICE, R/S B+	1	KEY SWITCH OUT, B+	116
K04	TXL	0.5	OG	VEHICLE SPEED SENSOR	A	SPLICE, R/S B+	2	KEY SWITCH OUT, B+	117
K05	TXL	0.5	OG	DIAGNOSTIC	A	SPLICE, R/S B+	1	KEY SWITCH OUT, B+	118
K209	TXL	0.5	OG	ECM	209	SPLICE, R/S B+	2	KEY SWITCH OUT, B+	119
RC2A	TXL	1.0	OG/WH	RELAY/FUSE BLOCK	C2	TERMINAL BLOCK 1 (ACC)	1	ACCESSORIES, B+ ACC FUSE OUT	120
RC2A	TXL	1.0	OG/WH	TERMINAL BLOCK 1 (ACC)	1	12V (+) RECEPTACLE A1	1	FUSE ACCESSORIES, B+ (3/16)	121
RC2B1	TXL	1.0	OG/WH	12V (+) RECEPTACLE A1	1	12V (+) RECEPTACLE B1	1	FUSE ACCESSORIES, B+ (3/16)	122
RC2C1	TXL	1.0	OG/WH	12V (+) RECEPTACLE B1	1	12V (+) RECEPTACLE C1	1	FUSE ACCESSORIES, B+ (3/16)	123
RC4A	TXL	0.8	RD/DG	RELAY/FUSE BLOCK	C4	SPLICE, DRIVE	1	SWITCHED, B+ DRIVE FUSE OUT	124
RC4B	TXL	0.5	RD/DG	AWD/TURF SWITCH	A	SPLICE, DRIVE	2	SWITCHED, B+	125
RC4D	TXL	0.5	RD/DG	TURF RELAY	A	SPLICE, DRIVE	2	SWITCHED, B+, TURF	126
RC4E	TXL	0.5	RD/DG	AWD	D	SPLICE, DRIVE	1	SWITCHED, B+, ADC COIL	127
RC4F	TXL	0.5	RD/DG	AWD	C	SPLICE, DRIVE	1	SWITCHED, B+, AWD COIL	128
RC6A	TXL	0.8	RD/YE	RELAY/FUSE BLOCK	C6	SPLICE, LIGHTS B+	1	LIGHTS, B+ LIGHTS FUSE OUT	129
RC6C	TXL	0.8	RD/YE	REVERSE BEEPER P1	A	SPLICE, LIGHTS B+	2	LIGHTS, B+	130

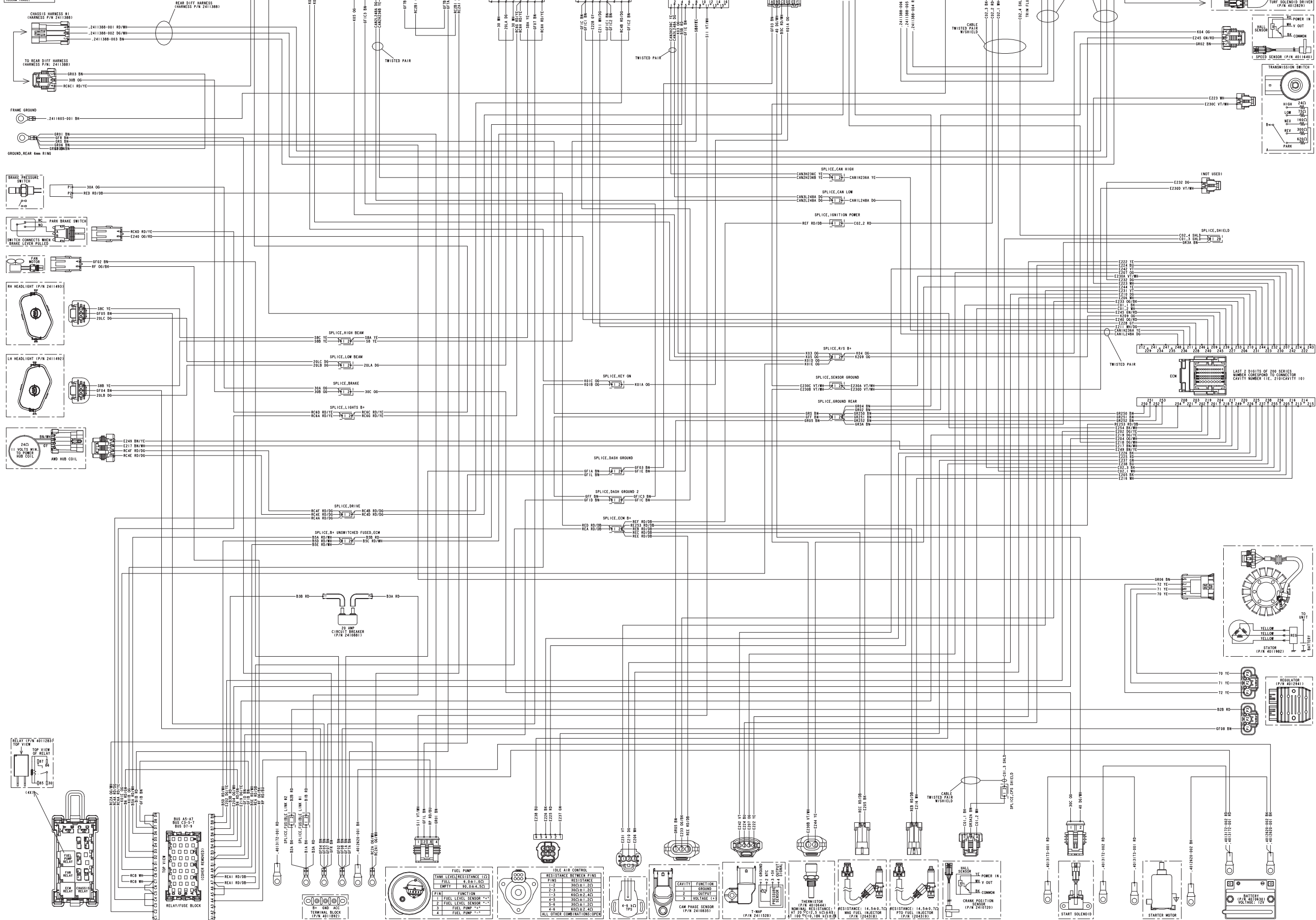
WIRE COLOR LEGEND	
BD	BETTER (TAN)
BL	BLACK
BO	LIGHT BLUE
DB	DARK BLUE
DR	BROWN
GY	GRAY
LG	LIGHT GREEN
DO	DARK GREEN
OG	ORANGE
PK	PINK
RD	RED
VT	VIOLET (PURPLE)
WT	WHITE
YL	YELLOW
CL	CLEAR

 = ENGINE GROUND
 = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED
 NO = SWITCH NORMALLY OPEN

TWO WIRE COLORS ARE SHOWN
 WITH MAIN/TRACE COLORS.
 EXAMPLE: RD/VT = RED WITH
 VIOLET TRACE

SHEET NO. 1 OF 2



2013 RANGER 800 6X6

WIRE COLOR LEGEND	
BG	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GT	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.

E = ENGINE GROUND

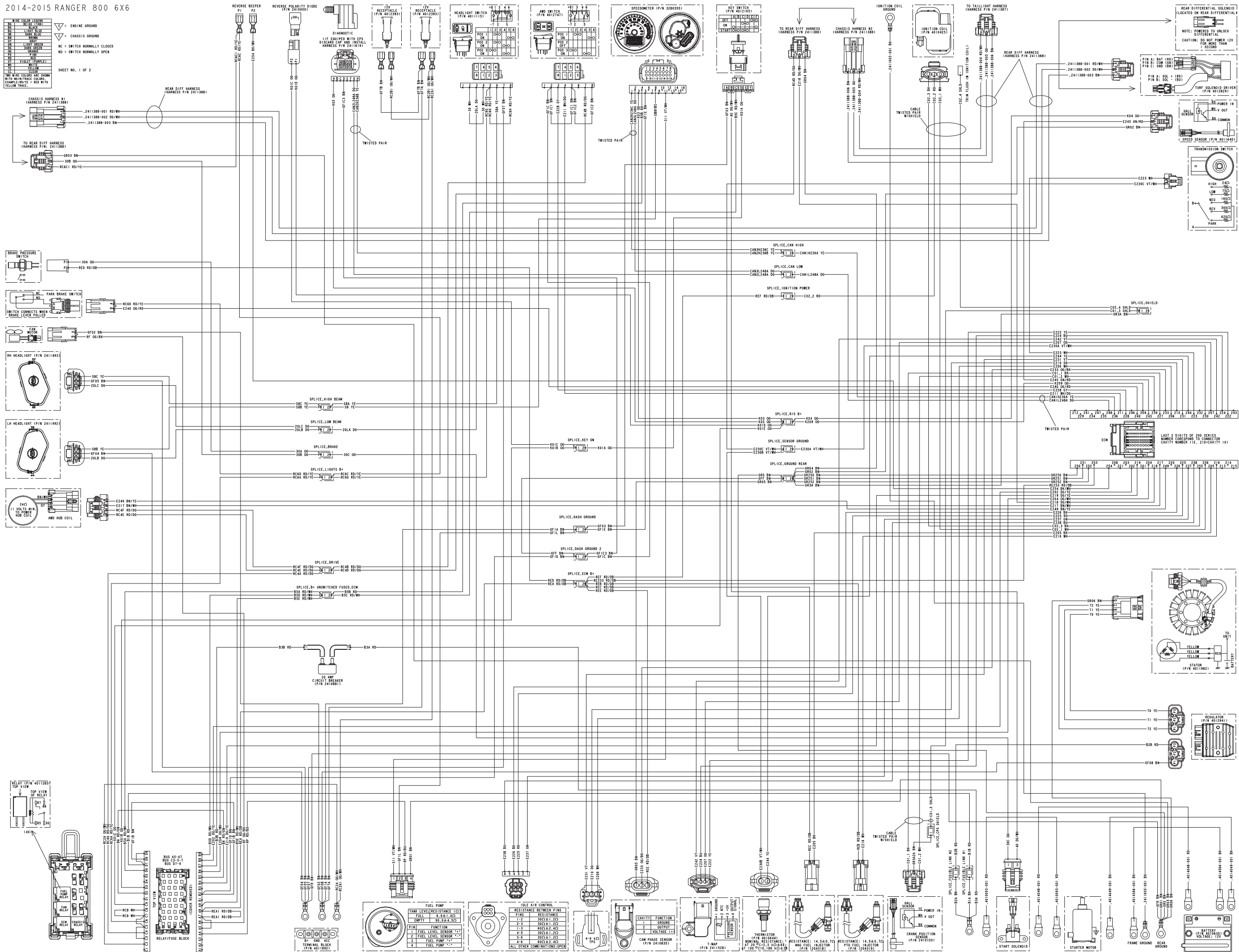
C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

SHEET NO. 2 OF 2

SCHEMATIC CABLE/WIRE TERMINATION TABLE									
CCT #	TYPE	GAUGE	COLOR	FROM COMPONENT	TO COMPONENT	TO PORT	FUNCTION		INDEX
.2411388-001	TXL	0.8	RD/WH	CHASSIS HARNESS #1	A TURF RELAY	A	SWITCHED,B+,TURF		2
.2411388-002	TXL	0.8	DG/WH	CHASSIS HARNESS #1	B TURF RELAY	B	TURF CONTROL		2
.2411388-003	TXL	0.8	BN	CHASSIS HARNESS #1	C TURF RELAY	C	GROUND		3
.2411388-004	TXL	0.8	RD/WH	CHASSIS HARNESS #2	A TAILLIGHT	A	LIGHTS,B+		4
.2411388-005	TXL	0.8	OG	CHASSIS HARNESS #2	B TAILLIGHT	B	BRAKE SIGNAL		5
.2411388-006	TXL	0.8	BN	CHASSIS HARNESS #2	C TAILLIGHT	C	GROUND		6
.2411605-001	TXL	0.8	BK	IGNITION COIL GROUND	I FRAME GROUND	I	IGNITION COIL GROUND TO FRAME GROUND		7
.4012620-001	SGT	13.0	OG	BATTERY (-)	I TERMINAL BLOCK (GROUND)	I	BATTERY (-) TO TERMINAL BLOCK (GROUND)		8
.4012620-002	SGT	13.0	BK	BATTERY (-)	I STARTER (GROUND)	I	BATTERY (-) TO STARTER (GROUND)		9
.4013172-001	SGT	13.0	RD	BATTERY (+)	I TERMINAL BLOCK (B+)	I	BATTERY (+) TO TERMINAL BLOCK (B+)		10
.4013172-002	SGT	13.0	RD	BATTERY (+)	I START SOLENOID	I	BATTERY (+) TO START SOLENOID		11
.4013173-001	SGT	13.0	OG	START SOLENOID	I STARTER	I	START SOLENOID TO STARTER		12
20LA	TXL	0.8	DG	HEADLIGHT SWITCH	3 SPLICE,LOW BEAM	2	HEADLIGHT SWITCH LOW BEAM OUT		13
20LB	TXL	0.8	DG	LH HEADLIGHT	A SPLICE,LOW BEAM	1	LH HEADLIGHT LOW BEAM		14
20LC	TXL	0.8	DG	RH HEADLIGHT	A SPLICE,LOW BEAM	1	RH HEADLIGHT LOW BEAM		15
30	TXL	0.8	WH	HEADLIGHT SWITCH	2 HEADLIGHT SWITCH	2	HEADLIGHT SWITCH JUMPER		16
30A	TXL	0.8	OG	BRAKE SWITCH	P1 SPLICE,BRAKE	1	BRAKE SIGNAL		17
30B	TXL	0.8	OG	TAILLIGHT	B SPLICE,BRAKE	1	BRAKE SIGNAL		18
30C	TXL	0.8	OG	START SOLENOID	I SPLICE,BRAKE	2	BRAKE SIGNAL		19
40	TXL	0.8	DG/WH	KEY SWITCH	B START SOLENOID	2	START SOLENOID CONTROL GROUND		20
70	TXL	2.0	YE	STATOR	A VREG AC INPUT	P3	STATOR AC		21
71	TXL	2.0	YE	STATOR	B VREG AC INPUT	P2	STATOR AC		22
72	TXL	2.0	YE	STATOR	C VREG AC INPUT	P1	STATOR AC		23
B1A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	I SPLICE,FUSIBLE LINK #1	1	FUSELINK CHASSIS B+		24
B1B	TXL	3.0	RD	RELAY/FUSE BLOCK	D7 SPLICE,FUSIBLE LINK #1	2	UNSWITCHED,B+ BUS D97		25
B2A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	I SPLICE,FUSIBLE LINK #2	1	FUSELINK VREG OUTPUT B+		26
B2B	TXL	3.0	RD	VREG DC OUTPUT	P3 SPLICE,FUSIBLE LINK #2	2	VOLTAGE REGULATOR OUTPUT B+		27
B3A	TXL	1.0	RD	TERMINAL BLOCK 3 (B+)	I CIRCUIT BREAKER	2	UNSWITCHED B+		28
B3B	TXL	1.0	RD	RELAY/FUSE BLOCK	I B7 CIRCUIT BREAKER	1	UNSWITCHED FUSED,B+ FAN RELAY IN		29
B5A	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	D6 SPLICE,B+ UNSWITCHED FUSED,ECM	1	UNSWITCHED FUSED,B+ ECM FUSE OUT		30
B5B	TXL	0.5	RD	SPEEDOMETER	4 SPLICE,B+ UNSWITCHED FUSED,ECM	2	UNSWITCHED FUSED B+		31
B5C	TXL	0.8	RD/WH	KEY SWITCH	C SPLICE,B+ UNSWITCHED FUSED,ECM	2	UNSWITCHED FUSED B+		32
B5D	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	I B9 SPLICE,B+ UNSWITCHED FUSED,ECM	1	UNSWITCHED FUSED B+,ECM RELAY IN		33
B5E	TXL	0.5	RD/WH	RELAY/FUSE BLOCK	A9 SPLICE,B+ UNSWITCHED FUSED,ECM	1	UNSWITCHED FUSED B+ ECM RELAY COIL		34
B6	TXL	1.0	RD/GN	RELAY/FUSE BLOCK	B5 RELAY/FUSE BLOCK	D2	FUEL PUMP FUSE OUT TO FUEL PUMP RELAY B+ IN		35
BUS475	BUS	BUS	BUS	RELAY/FUSE BLOCK	A1 RELAY/FUSE BLOCK	4	ECM,B+ ECM RELAY OUT,BUS A75		36
BUSC53	BUS	BUS	BUS	RELAY/FUSE BLOCK	C3 RELAY/FUSE BLOCK	C5	SWITCHED B+		37
BUSC75	BUS	BUS	BUS	RELAY/FUSE BLOCK	C5 RELAY/FUSE BLOCK	C7	SWITCHED B+		38
BUSD97	BUS	BUS	BUS	RELAY/FUSE BLOCK	D7 RELAY/FUSE BLOCK	D9	UNSWITCHED B+		39
C01_1	TXL	0.8	BK	ECM	227 CRANK POSITION SENSOR	C	CRANK POSITION SENSOR NEGATIVE		40
C01_2	TXL	0.8	WH	ECM	239 CRANK POSITION SENSOR	A	CRANK POSITION SENSOR POSITIVE		41
C01_3	SHLD	0.8	SHLD	SPLICE,CPS SHIELD	2 SPLICE,SHIELD	1	SHIELD,CPS (C01)		42
C02_1	TXL	0.8	WH	ECM	256 IGNITION COIL	1	PTO IGNITION CONTROL		43
C02_2	TXL	0.8	RD	IGNITION COIL	2 SPLICE,IGNITION POWER	2	ECM,B+		44
C02_3	TXL	0.8	BK	ECM	255 IGNITION COIL	3	MAG IGNITION CONTROL		45
C02_4	SHLD	0.8	SHLD	TRIM FLUSH (Ø IGNITION COIL)	- SPLICE,SHIELD	1	SHIELD,IGNITION COIL (C02)		46
CAN1H236A	TXL	0.5TP	YE	ECM	236 SPLICE,CAN HIGH	2	CAN HIGH		47
CAN1L248A	TXL	0.5TP	DG	ECM	248 SPLICE,CAN LOW	2	CAN LOW		48
CAN2H236B	TXL	0.5TP	YE	DIAGNOSTIC	H SPLICE,CAN HIGH	1	CAN HIGH		49
CAN2L248A	TXL	0.5TP	DG	DIAGNOSTIC	G SPLICE,CAN LOW	1	CAN LOW		50
CAN3H236C	TXL	0.5TP	YE	SPEEDOMETER	I SPLICE,CAN HIGH	1	CAN HIGH		51
CAN3L248A	TXL	0.5TP	DG	SPEEDOMETER	2 SPLICE,CAN LOW	1	CAN LOW		52
E202	TXL	0.5	DG/YE	ECM	202 RELAY/FUSE BLOCK	B8	ECM RELAY COIL CONTROL		53
E204	TXL	0.5	OG/WH	ECM	204 RELAY/FUSE BLOCK	B6	FAN RELAY COIL CONTROL		54
E205	TFE	0.5	BK	ECM	205 MAG FUEL INJECTOR	3	MAG FUEL INJECTOR		55
E206	TFE	0.5	WH	ECM	206 TPS	3	3.3V SENSOR SUPPLY V2 (TPS)		56
E207	TFE	0.5	OG	ECM	207 T-MAP SENSOR	A	A/D +5V SOURCE		57
E210	TFE	0.5	DG	ECM	210 TPS	2	TPS SIGNAL		58
E211	TXL	0.5	WH/DG	ECM	211 AWD/TURF SWITCH	4	TURF REQUEST		59
E216	TXL	0.5	WH	ECM	216 PTO FUEL INJECTOR	A	PTO FUEL INJECTOR		60
E217	TXL	0.5	BN/WH	ECM	217 AWD	B	AWD CONTROL		61
E21B	TXL	0.5	DG/WH	ECM	218 TURF RELAY	B	TURF CONTROL		62
E21B	TXL	0.5	DG/YE	ECM	219 RELAY/FUSE BLOCK	B4	FUEL PUMP RELAY COIL CONTROL		63
E222	TFE	0.5	YE	ECM	222 T-MAP SENSOR	1	MANIFOLD PRESSURE SIGNAL		64
E223	TXL	0.5	WH	ECM	223 TRANSMISSION SWITCH	B	TRANSMISSION SWITCH SIGNAL OUTPUT		65
E224	TFE	0.5	BU	ECM	224 T-MAP SENSOR	2	AIR TEMP SENSOR SIGNAL		66
E225	TFE	0.5	RD	ECM	225 IDLE AIR CONTROL	3	IAC PIN 3		67
E226	TFE	0.5	BK	ECM	226 IDLE AIR CONTROL	4	IAC PIN 4		68
E228	TXL	0.5	GT	ECM	228 AWD/TURF SWITCH	3	AWD REQUEST		69
E230A	TXL	0.5	VT/WH	ECM	230 SPLICE,SENSOR GROUND	2	SENSOR GROUND		70
E230B	TXL	0.5	VT/WH	COOLANT TEMP SENSOR	I SPLICE,SENSOR GROUND	1	SENSOR GROUND		71
E230C	TXL	0.5	VT/WH	TRANSMISSION SWITCH	A SPLICE,SENSOR GROUND	A	SENSOR GROUND		72
E230D	TXL	0.5	VT/WH	THROTTLE RELEASE SWITCH	A SPLICE,SENSOR GROUND	2	SENSOR GROUND		73
E2B1	TFE	0.5	VT	ECM	231 TPS	1	TPS GROUND		74
E2B2	TXL	0.5	DG	ECM	232 THROTTLE RELEASE SWITCH	B	TPS SIGNAL		75
E2B3	TXL	0.5	OG/BK	ECM	233 CAM PHASE SENSOR	2	CAM POSITION SIGNAL		76
E2B7	TFE	0.5	GN	ECM	237 IDLE AIR CONTROL	1	IAC PIN 1		77
E238	TFE	0.5	BU	ECM	238 IDLE AIR CONTROL	6	IAC PIN 6		78
E240	TXL	0.5	OG/RD	ECM	240 PARK BRAKE SWITCH	B	TBD		79
E242	TFE	0.5	YE	ECM	242 T-MAP SENSOR	1	MANIFOLD PRESSURE GROUND		80
E244	TXL	0.5	YE	ECM	244 COOLANT TEMP SENSOR	2	COOLANT TEMP SIGNAL		81
E245	TXL	0.5	GN/RD	ECM	245 VEHICLE SPEED SENSOR	B	VEHICLE SPEED SIGNAL		82
E249	TXL	0.5	BN/YE	ECM	249 AWD	A	ADC CONTROL		83
E244	TXL	0.8	BK/WH	ECM	234 REVERSE BEEPER P2	1	REVERSE BEEPER DRIVER		84
GF02	TXL	1.0	BN	FAN	A TERMINAL BLOCK 2 (GROUND #2)	1	GROUND,FAN		85
GF03	TXL	0.8	BN	KEY SWITCH	A SPLICE,DASH GROUND	2	GROUND,KEY SWITCH		86
GF04	TXL	0.8	BN	LH HEADLIGHT	B TERMINAL BLOCK 2 (GROUND #1)	1	GROUND,HEADLIGHT		87
GF05	TXL	0.8	BN	RH HEADLIGHT	B TERMINAL BLOCK 2 (GROUND #1)	1	GROUND,HEADLIGHT		88
GF07	TXL	0.5	BN	HEADLIGHT SWITCH	7 TERMINAL BLOCK 2 (GROUND #1)	1	HEADLIGHT SWITCH MARKER GROUND		89
GF08	TXL	3.0	BN	VREG DC OUTPUT	P1 TERMINAL BLOCK 2 (GROUND #2)	1	REGULATOR GROUND		90
GF1A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	I SPLICE,DASH GROUND	1	GROUND,FRONT SPLICE		91
GF1B	TXL	0.5	BN	RELAY/FUSE BLOCK	B2 RELAY/FUSE BLOCK	D8	CHASSIS RELAY COIL GROUND		92
GF1C	TXL	0.5	BN	AWD/TURF SWITCH	2 SPLICE,DASH GROUND 2	2	GROUND		93
GF1C1	TXL	0.5	BN	AWD/TURF SWITCH	2 AWD/TURF SWITCH	5	GROUND		94
GF1C2	TXL	0.5	BN	AWD/TURF SWITCH	5 AWD/TURF SWITCH	8	GROUND,AWD,TURF SIGNAL		95
GF1C3	TXL	0.8	BN	DIAGNOSTIC	D SPLICE,DASH GROUND 2	2	DIAGNOSTIC GROUND		96
GF1D	TXL	0.5	BN	RELAY/FUSE BLOCK	I B2 SPLICE,DASH GROUND 2	1	GROUND,EPS RELAY COIL		97
GF1E	TXL	0.5	BN	SPEEDOMETER	5 SPLICE,DASH GROUND	2	GROUND,SPEEDOMETER		98
GF1L	TXL	0.5	BN	FUEL PUMP/LEVEL	2 SPLICE,DASH GROUND	1	FUEL LEVEL,GROUND		99
GF1A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	I 12V (-) RECEPTACLE A2	1	GROUND		100
GF1B	TXL	1.0	BN	12V (-) RECEPTACLE A2	I 12V (-) RECEPTACLE B2	1	GROUND		101
GF1	TXL	1.0	BN	SPLICE,GROUND REAR	I SPLICE,DASH GROUND 2	1	GROUND		102
GF1R	TXL	3.0	BN	TERMINAL BLOCK 2 (GROUND #1)	I GROUND,REAR 6mm RING	1	GROUND,FRONT REAR CONNECTION		103
GR01	TXL	0.8	BN	FUEL PUMP/LEVEL	A GROUND,REAR 6mm RING	1	PUMP GROUND		104
GR02	TXL	0.5	BN	VEHICLE SPEED SENSOR	C SPLICE,GROUND REAR	2	GROUND,VEHICLE SPEED SENSOR		105
GR03	TXL	0.8	BN	TAILLIGHT	C GROUND,REAR 6mm RING	1	GROUND		106
GR04	TXL	0.8	BN	TURF RELAY	C SPLICE,GROUND REAR	2	GROUND,TURF RELAY		107
GR05	TXL	0.5	BN	CAM PHASE SENSOR	I SPLICE,GROUND REAR	1	GROUND		108
GR06	TXL	2.0	BN	STATOR	D GROUND,REAR 6mm RING	1	GROUND,STATOR		109
GR250	TXL	0.8	BN	ECM	250 SPLICE,GROUND REAR	2	GROUND,ECM BATTERY		110
GR251	TXL	0.8	BN	ECM	251 SPLICE,GROUND REAR	2	GROUND,ECM BATTERY		111
GR252	TXL	0.8	BN	ECM	252 SPLICE,GROUND REAR	2	GROUND,ECM BATTERY		112
GR3A	TXL	0.5	BN	SPLICE,GROUND REAR	2 SPLICE,SHIELD	1	GROUND		113
GR3A2A	TXL	0.5	BN	CRANK POSITION SENSOR	B SPLICE,CPS SHIELD	1	SHIELD,CPS		114
GR5	TXL	1.0	BN	GROUND,REAR 6mm RING	I SPLICE,GROUND REAR	1	GROUND		115
K01A	TXL	1.0	OG	KEY SWITCH	D SPLICE,KEY ON	2	KEY SWITCH OUT B+		116
K01B	TXL	0.8	OG	RELAY/FUSE BLOCK	D3 SPLICE,KEY ON	1	KEY SWITCH OUT B+,FUEL PUMP FUSE IN		117
K01C	TXL	0.8	OG	REVERSE POLARITY DIODE	P2 SPLICE,KEY ON	1	KEY SWITCH OUT B+		118
K01D	TXL	0.8	OG	REVERSE POLARITY DIODE	P1 SPLICE,R/S B+	1	KEY SWITCH OUT B+		119
K01E	TXL	0.5	OG	RELAY/FUSE BLOCK	C9 SPLICE,R/S B+	1	KEY SWITCH,B+ CHASSIS RELAY COIL POWER		120
K03	TXL	0.5	OG	SPEEDOMETER	3 SPLICE,R/S B+	1	KEY SWITCH OUT,B+		121
K04	TXL	0.5	OG	VEHICLE SPEED SENSOR	A SPLICE,R/S B+	2	KEY SWITCH OUT,B+		122
K05	TXL	0.5	OG	DIAGNOSTIC	A SPLICE,R/S B+	1	KEY SWITCH OUT,B+		123
K209	TXL	0.5	ECM	ECM	209 SPLICE,R/S B+	2	KEY SWITCH OUT,B+		124
RC2A	TXL	1.0	OG/WH	RELAY/FUSE BLOCK	I C2 TERMINAL BLOCK 1 (ACC)	1	ACCESSORIES,B+ ACC FUSE OUT		125
RC2A1	TXL	1.0	OG/WH	TERMINAL BLOCK 1 (ACC)	I 12V (+) RECEPTACLE A1	1	FUSE ACCESSORIES, B+ (3/16)		126
RC2B1	TXL	1.0	OG/WH	12V (+) RECEPTACLE A1	I 12V (+) RECEPTACLE B1	1	FUSE ACCESSORIES, B+ (3/16)		127
RC4A	TXL	0.8	RD/DG	RELAY/FUSE BLOCK	C4 SPLICE,DRIVE	1	SWITCHED,B+ DRIVE FUSE OUT		128
RC4B	TXL	0.5	RD/DG	AWD/TURF SWITCH	7 SPLICE,DRIVE	2	SWITCHED,B+		129
RC4D	TXL	0.5	RD/DG	TURF RELAY	A SPLICE,DRIVE	2	SWITCHED,B+,TURF		130
RC4E	TXL	0.5	RD/DG	AWD	D SPLICE,DRIVE	1	SWITCHED,B+,ADC COIL		131
RC4F	TXL	0.5	RD/DG	AWD	C SPLICE,DRIVE	1	SWITCHED,B+,AWD COIL		132
RC6A	TXL	1.0	RD/YE	RELAY/FUSE BLOCK	C6 SPLICE,LIGHTS B+	1	LIGHTS,B+ LIGHTS FUSE OUT		133
RC6C	TXL	0.8	RD/YE	REVERSE BEEPER P1	I SPLICE,LIGHTS B+	2	LIGHTS,B+		134
RC6C1	TXL	0.8	RD/YE	TAILLIGHT	A REVERSE BEEPER P1	1	LIGHTS,B+		135
RC6D	TXL	0.5	RD/YE	PARK BRAKE SWITCH	A SPLICE,LIGHTS B+	1	LIGHTS,B+		136
RC6G	TXL	0.8	RD/YE	HEADLIGHT SWITCH	5 SPLICE,LIGHTS B+	2	HEADLIGHT SWITCH POWER		137
RC6H	TXL	0.5	RD/YE	HEADLIGHT SWITCH	5 HEADLIGHT SWITCH	8	HEADLIGHT SWITCH MARKER POWER		138
RC8	TXL	3.0	WH	RELAY/FUSE BLOCK	C7 RELAY/FUSE BLOCK	C8	SWITCHED B+ CHASSIS REL POWER OUT		139
RE253	TXL	0.8	RD/DB	ECM	253 SPLICE,ECM B+	2	ECM,B+		140



2014-2015 RANGER 800 6X6

WIRE COLOR LEGEND	
BK	BEIGE (TAN)
BK	BLACK
BU	LIGHT BLUE
DB	DARK BLUE
BN	BROWN
GT	GRAY
GN	LIGHT GREEN
DG	DARK GREEN
OG	ORANGE
PK	PINK
WH	WHITE
YE	YELLOW
CL	CLEAR

TWO WIRE COLORS ARE SHOWN WITH MAIN/TRACE COLORS. EXAMPLE:RD/YE = RED WITH YELLOW TRACE.

E = ENGINE GROUND

C = CHASSIS GROUND

NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

SHEET NO. 2 OF 2

SCHEMATIC CABLE/WIRE TERMINATION TABLE									
CCT #	TYPE	GAUGE	COLOR	FROM COMPONENT	FROM PORT	TO COMPONENT	TO PORT	FUNCTION	INDEX
2411388-001	TXL	0.8	RD/WH	CHASSIS HARNESS #1	A	TURF RELAY	A	SWITCHED B+,TURF	2
2411388-002	TXL	0.8	DG/WH	CHASSIS HARNESS #1	B	TURF RELAY	B	TURF CONTROL	3
2411388-003	TXL	0.8	BN	CHASSIS HARNESS #1	C	TURF RELAY	C	GROUND	4
2411388-004	TXL	0.8	RD/WH	CHASSIS HARNESS #2	A	TAILLIGHT	A	LIGHTS,B+	5
2411388-005	TXL	0.8	DG	CHASSIS HARNESS #2	B	TAILLIGHT	B	BRAKE SIGNAL	6
2411388-006	TXL	0.8	BN	CHASSIS HARNESS #2	C	TAILLIGHT	C	GROUND	7
2411605-001	TXL	0.8	BK	IGNITION COIL GROUND	I	FRAME GROUND	I	IGNITION COIL GROUND TO FRAME GROUND	8
4010093-001	SGT	13.0	RD	START SOLENOID	I	STARTER	I	START SOLENOID TO STARTER	9
4014048-001	SGT	13.0	RD	BATTERY (+)	I	START SOLENOID	I	BATTERY (+) TO START SOLENOID	10
4014049-001	SGT	13.0	BK	BATTERY (-)	I	STARTER (GROUND)	I	BATTERY (-) TO STARTER (GROUND)	11
4014566-001	SGT	13.0	BK	BATTERY (-)	I	TERMINAL BLOCK (GROUND)	I	BATTERY (-) TO FRAME (GROUND)	12
201A	TXL	0.8	DG	HEADLIGHT SWITCH	3	SPLICE,LOW BEAM	2	HEADLIGHT SWITCH LOW BEAM OUT	13
201B	TXL	0.8	DG	LH HEADLIGHT	A	SPLICE,LOW BEAM	1	LH HEADLIGHT LOW BEAM	12
201C	TXL	0.8	DG	RH HEADLIGHT	A	SPLICE,LOW BEAM	1	RH HEADLIGHT LOW BEAM	13
30	TXL	0.8	WH	HEADLIGHT SWITCH	2	HEADLIGHT SWITCH	4	HEADLIGHT SWITCH JUMPER	15
30A	TXL	0.8	OG	BRAKE SWITCH	P1	SPLICE,BRAKE	I	BRAKE SIGNAL	16
30B	TXL	0.8	OG	TAILLIGHT	B	SPLICE,BRAKE	I	BRAKE SIGNAL	17
30C	TXL	0.8	OG	START SOLENOID	I	SPLICE,BRAKE	2	BRAKE SIGNAL	18
40	TXL	0.8	DG/WH	KEY SWITCH	B	START SOLENOID	2	START SOLENOID CONTROL GROUND	19
70	TXL	2.0	YE	STATOR	A	VREG AC INPUT	P3	STATOR AC	21
71	TXL	2.0	YE	STATOR	B	VREG AC INPUT	P2	STATOR AC	22
72	TXL	2.0	YE	STATOR	C	VREG AC INPUT	P1	STATOR AC	23
B1A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	I	SPLICE,FUSIBLE LINK #1	I	FUSELINK CHASSIS B+	24
B1B	TXL	3.0	RD	RELAY/FUSE BLOCK	D7	SPLICE,FUSIBLE LINK #1	2	UNSWITCHED,B+ BUS D97	25
B2A	FUSIBLE LINK	1.0	BK	TERMINAL BLOCK 3 (B+)	I	SPLICE,FUSIBLE LINK #2	I	FUSELINK VREG OUTPUT B+	26
B2B	TXL	3.0	RD	VREG DC OUTPUT	P3	SPLICE,FUSIBLE LINK #2	2	VOLTAGE REGULATOR OUTPUT B+	27
B3A	TXL	1.0	RD	TERMINAL BLOCK 3 (B+)	I	CIRCUIT BREAKER	2	UNSWITCHED B+	28
B3B	TXL	1.0	RD	RELAY/FUSE BLOCK	B7	CIRCUIT BREAKER	I	UNSWITCHED FUSED,B+ FAN RELAY IN	29
B5A	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	D6	SPLICE,B+ UNSWITCHED FUSED,ECM	I	UNSWITCHED FUSED,B+ ECM FUSE OUT	30
B5B	TXL	0.5	RD	SPEEDOMETER	4	SPLICE,B+ UNSWITCHED FUSED,ECM	2	UNSWITCHED FUSED B+	31
B5C	TXL	0.8	RD/WH	KEY SWITCH	C	SPLICE,B+ UNSWITCHED FUSED,ECM	2	UNSWITCHED FUSED B+	32
B5D	TXL	0.8	RD/WH	RELAY/FUSE BLOCK	B9	SPLICE,B+ UNSWITCHED FUSED,ECM	I	UNSWITCHED FUSED B+,ECM RELAY IN	33
B5E	TXL	0.5	RD/WH	RELAY/FUSE BLOCK	A9	SPLICE,B+ UNSWITCHED FUSED,ECM	I	UNSWITCHED FUSED B+,ECM RELAY COIL	34
B6	TXL	1.0	RD/WH	RELAY/FUSE BLOCK	B5	RELAY/FUSE BLOCK	D2	FUEL PUMP FUSE OUT TO FUEL PUMP RELAY B+ IN	35
BUSA75	BUS	BUS	BUS	RELAY/FUSE BLOCK	A5	RELAY/FUSE BLOCK	A7	ECM,B+ ECM RELAY OUT,BUS A75	36
BUSC53	BUS	BUS	BUS	RELAY/FUSE BLOCK	C3	RELAY/FUSE BLOCK	C5	SWITCHED B+	37
BUSC75	BUS	BUS	BUS	RELAY/FUSE BLOCK	C5	RELAY/FUSE BLOCK	C7	SWITCHED B+	38
BUSD97	BUS	BUS	BUS	RELAY/FUSE BLOCK	D7	RELAY/FUSE BLOCK	D9	UNSWITCHED B+	39
C01	TXL	0.8	BK	ECM	227	CRANK POSITION SENSOR	C	CRANK POSITION SENSOR NEGATIVE	40
C01.2	TXL	0.8	WH	ECM	239	CRANK POSITION SENSOR	A	CRANK POSITION SENSOR POSITIVE	41
C01.3	SHLD	0.8	SHLD	SPLICE,CPS SHIELD	2	SPLICE,SHIELD	I	SHIELD,CPS (CO1)	42
C02.1	TXL	0.8	WH	ECM	256	IGNITION COIL	I	PTO IGNITION CONTROL	43
C02.2	TXL	0.8	RD	IGNITION COIL	2	SPLICE,IGNITION POWER	2	ECM,B+	44
C02.3	TXL	0.8	BK	ECM	255	IGNITION COIL	3	MAG IGNITION CONTROL	45
C02.4	SHLD	0.8	SHLD	TRIM FLUSH (IGNITION COIL)	I	SPLICE,SHIELD	I	SHIELD,IGNITION COIL (CO2)	46
CAN1H236A	TXL	0.5TP	YE	ECM	236	SPLICE,CAN HIGH	2	CAN HIGH	47
CAN1L248A	TXL	0.5TP	DG	ECM	248	SPLICE,CAN LOW	2	CAN LOW	48
CAN2H236B	TXL	0.5TP	YE	DIAGNOSTIC	H	SPLICE,CAN HIGH	I	CAN HIGH	49
CAN2L248A	TXL	0.5TP	DG	DIAGNOSTIC	G	SPLICE,CAN LOW	I	CAN LOW	50
CAN3H236C	TXL	0.5TP	YE	SPEEDOMETER	I	SPLICE,CAN HIGH	I	CAN HIGH	51
CAN3L248A	TXL	0.5TP	DG	SPEEDOMETER	2	SPLICE,CAN LOW	I	CAN LOW	52
E202	TXL	0.5	DG/YE	ECM	202	RELAY/FUSE BLOCK	B8	ECM RELAY COIL CONTROL	53
E204	TXL	0.5	OG/WH	ECM	204	RELAY/FUSE BLOCK	B6	FAN RELAY COIL CONTROL	54
E205	TXL	0.5	BK	ECM	205	MAG FUEL INJECTOR	A	MAG FUEL INJECTOR	55
E206	TFE	0.5	WH	ECM	206	TPS	3	3.3V SENSOR SUPPLY V2 (TPS)	56
E207	TFE	0.5	OG	ECM	207	T-MAP SENSOR	3	A/D +5V SOURCE	57
E210	TFE	0.5	DG	ECM	210	TPS	2	TPS SIGNAL	58
E211	TXL	0.5	WH/DG	ECM	211	AWD/TURF SWITCH	4	TURF REQUEST	59
E216	TXL	0.5	WH	ECM	216	PTO FUEL INJECTOR	A	PTO FUEL INJECTOR	60
E217	TXL	0.5	BN/WH	ECM	217	AWD	B	AWD CONTROL	61
E218	TXL	0.5	DG/WH	ECM	218	TURF RELAY	B	TURF CONTROL	62
E219	TXL	0.5	DG/YE	ECM	219	RELAY/FUSE BLOCK	B4	FUEL PUMP RELAY COIL CONTROL	63
E222	TFE	0.5	YE	ECM	222	T-MAP SENSOR	4	MANIFOLD PRESSURE SIGNAL	64
E223	TXL	0.5	WH	ECM	223	TRANSMISSION SWITCH	B	TRANSMISSION SWITCH SIGNAL OUTPUT	65
E224	TFE	0.5	BU	ECM	224	T-MAP SENSOR	2	AIR TEMP SENSOR SIGNAL	66
E225	TFE	0.5	RD	ECM	225	IDLE AIR CONTROL	3	IAC PIN 3	67
E226	TFE	0.5	BK	ECM	226	IDLE AIR CONTROL	4	IAC PIN 4	68
E228	TXL	0.5	GY	ECM	228	AWD/TURF SWITCH	3	AWD REQUEST	69
E230A	TXL	0.5	VT/WH	ECM	230	SPLICE,SENSOR GROUND	2	SENSOR GROUND	70
E230B	TXL	0.5	VT/WH	COOLANT TEMP SENSOR	I	SPLICE,SENSOR GROUND	I	SENSOR GROUND	71
E230C	TXL	0.5	VT/WH	TRANSMISSION SWITCH	A	SPLICE,SENSOR GROUND	I	SENSOR GROUND	72
E231	TFE	0.5	VT	ECM	231	TPS	I	TPS GROUND	73
E233	TXL	0.5	OG/BK	ECM	233	CAM PHASE SENSOR	2	CAM POSITION SIGNAL	74
E237	TFE	0.5	GN	ECM	237	IDLE AIR CONTROL	I	IAC PIN 1	75
E238	TFE	0.5	BU	ECM	238	IDLE AIR CONTROL	6	IAC PIN 6	76
E240	TXL	0.5	OG/RD	ECM	240	PARK BRAKE SWITCH	B	TBD	77
E242	TFE	0.5	YE	ECM	242	T-MAP SENSOR	I	MANIFOLD PRESSURE GROUND	78
E244	TXL	0.5	YE	ECM	244	COOLANT TEMP SENSOR	2	COOLANT TEMP SIGNAL	79
E245	TXL	0.5	GN/RD	ECM	245	VEHICLE SPEED SENSOR	B	VEHICLE SPEED SIGNAL	80
E249	TXL	0.5	BN/YE	ECM	249	AWD	A	ADC CONTROL	81
E254	TXL	0.8	BK/WH	ECM	254	REVERSE BEEPER P2	I	REVERSE BEEPER DRIVER	82
GF02	TXL	1.0	BN	FAN	A	TERMINAL BLOCK 2 (GROUND #2)	I	GROUND,FAN	83
GF03	TXL	0.8	BN	KEY SWITCH	A	SPLICE,DASH GROUND	2	GROUND,KEY SWITCH	84
GF04	TXL	0.8	BN	LH HEADLIGHT	B	TERMINAL BLOCK 2 (GROUND #1)	I	GROUND,HEADLIGHT	85
GF05	TXL	0.8	BN	RH HEADLIGHT	B	TERMINAL BLOCK 2 (GROUND #1)	I	GROUND,HEADLIGHT	86
GF07	TXL	0.5	BN	HEADLIGHT SWITCH	7	TERMINAL BLOCK 2 (GROUND #1)	I	HEADLIGHT SWITCH MARKER GROUND	87
GF08	TXL	3.0	BN	VREG DC OUTPUT	P1	TERMINAL BLOCK 2 (GROUND #2)	I	REGULATOR GROUND	88
GF1A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	I	SPLICE,DASH GROUND	I	GROUND,FRONT SPLICE	89
GF1B	TXL	0.5	BN	RELAY/FUSE BLOCK	B2	RELAY/FUSE BLOCK	D8	CHASSIS RELAY COIL GROUND	90
GF1C	TXL	0.5	BN	AWD/TURF SWITCH	2	SPLICE,DASH GROUND 2	2	GROUND	91
GF1C1	TXL	0.5	BN	AWD/TURF SWITCH	2	AWD/TURF SWITCH	5	GROUND	92
GF1C2	TXL	0.5	BN	AWD/TURF SWITCH	5	AWD/TURF SWITCH	8	GROUND,AWD,TURF SIGNAL	93
GF1C3	TXL	0.8	BN	DIAGNOSTIC	D	SPLICE,DASH GROUND 2	2	DIAGNOSTIC GROUND	94
GF1D	TXL	0.5	BN	RELAY/FUSE BLOCK	B2	SPLICE,DASH GROUND 2	I	GROUND,EPS RELAY COIL	95
GF1E	TXL	0.5	BN	SPEEDOMETER	5	SPLICE,DASH GROUND	2	GROUND,SPEEDOMETER	96
GF1L	TXL	0.5	BN	FUEL PUMP/LEVEL	2	SPLICE,DASH GROUND	I	FUEL LEVEL,GROUND	97
GF1A	TXL	1.0	BN	TERMINAL BLOCK 2 (GROUND #2)	I	I2V (-) RECEPTACLE A2	I	GROUND	98
GF1B	TXL	1.0	BN	I2V (-) RECEPTACLE A2	I	I2V (-) RECEPTACLE B2	I	GROUND	99
GF1F	TXL	1.0	BN	SPLICE,GROUND REAR	I	SPLICE,DASH GROUND 2	I	GROUND	100
GF1R	TXL	3.0	BN	TERMINAL BLOCK 2 (GROUND #1)	I	GROUND,REAR 6mm RING	I	GROUND,FRONT REAR CONNECTION	101
GR01	TXL	1.0	BN	FUEL PUMP/LEVEL	A	GROUND,REAR 6mm RING	I	FUEL PUMP GROUND	102
GR02	TXL	0.5	BN	VEHICLE SPEED SENSOR	C	SPLICE,GROUND REAR	2	GROUND,VEHICLE SPEED SENSOR	103
GR03	TXL	0.8	BN	TAILLIGHT	C	GROUND,REAR 6mm RING	I	GROUND	104
GR04	TXL	0.8	BN	TURF RELAY	C	SPLICE,GROUND REAR	2	GROUND,TURF RELAY	105
GR05	TXL	0.5	BN	CAM PHASE SENSOR	I	SPLICE,GROUND REAR	I	GROUND	106
GR06	TXL	2.0	BN	STATOR	D	GROUND,REAR 6mm RING	I	GROUND,STATOR	107
GR250	TXL	0.8	BN	ECM	250	SPLICE,GROUND REAR	2	GROUND,ECM BATTERY	108
GR251	TXL	0.8	BN	ECM	251	SPLICE,GROUND REAR	2	GROUND,ECM BATTERY	109
GR252	TXL	0.8	BN	ECM	252	SPLICE,GROUND REAR	2	GROUND,ECM BATTERY	110
GR3A	TXL	0.5	BN	SPLICE,GROUND REAR	2	SPLICE,SHIELD	I	GROUND	111
GR3A2A	TXL	0.5	BN	CRANK POSITION SENSOR	B	SPLICE,CPS SHIELD	I	SHIELD,CPS	112
GR5	TXL	1.0	BN	GROUND,REAR 6mm RING	I	SPLICE,GROUND REAR	I	GROUND	113
K01A	TXL	1.0	OG	KEY SWITCH	D	SPLICE,KEY ON	2	KEY SWITCH OUT B+	114
K01B	TXL	0.8	OG	RELAY/FUSE BLOCK	D3	SPLICE,KEY ON	I	KEY SWITCH OUT B+,FUEL PUMP FUSE IN	115
K01C	TXL	0.8	OG	REVERSE POLARITY DIODE	P2	SPLICE,KEY ON	I	KEY SWITCH OUT B+	116
K01D	TXL	0.8	OG	REVERSE POLARITY DIODE	P1	SPLICE,R/S B+	I	KEY SWITCH OUT B+	117
K01E	TXL	0.5	OG	RELAY/FUSE BLOCK	C9	SPLICE,R/S B+	I	KEY SWITCH,B+ CHASSIS RELAY COIL POWER	118
K03	TXL	0.5	OG	SPEEDOMETER	3	SPLICE,R/S B+	I	KEY SWITCH OUT,B+	119
K04	TXL	0.5	OG	VEHICLE SPEED SENSOR	A	SPLICE,R/S B+	2	KEY SWITCH OUT,B+	120
K05	TXL	0.5	OG	DIAGNOSTIC	A	SPLICE,R/S B+	I	KEY SWITCH OUT,B+	121
K209	TXL	0.5	OG	ECM	209	SPLICE,R/S B+	2	KEY SWITCH OUT,B+	122
RC2A	TXL	1.0	OG/WH	RELAY/FUSE BLOCK	C2	TERMINAL BLOCK 1 (ACC)	I	ACCESSORIES,B+ ACC FUSE OUT	123
RC2A1	TXL	1.0	OG/WH	TERMINAL BLOCK 1 (ACC)	I	I2V (+) RECEPTACLE A1	I	FUSE ACCESSORIES, B+ (3/16)	124
RC2B1	TXL	1.0	OG/WH	I2V (+) RECEPTACLE A1	I	I2V (+) RECEPTACLE B1	I	FUSE ACCESSORIES, B+ (3/16)	125
RC4A	TXL	0.8	RD/DG	RELAY/FUSE BLOCK	C4	SPLICE,DRIVE	I	SWITCHED,B+ DRIVE FUSE OUT	126
RC4B	TXL	0.5	RD/DG	AWD/TURF SWITCH	7	SPLICE,DRIVE	2	SWITCHED,B+	127
RC4D	TXL	0.5	RD/DG	TURF RELAY	A	SPLICE,DRIVE	2	SWITCHED,B+,TURF	128
RC4E	TXL	0.5	RD/DG	AWD	D	SPLICE,DRIVE	I	SWITCHED,B+,AND COIL	129
RC4F	TX								

2013 - 2014 RANGER EPS

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.	

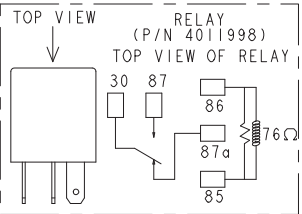
E = ENGINE GROUND

C = CHASSIS GROUND

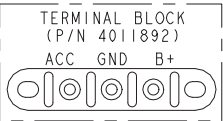
NC = SWITCH NORMALLY CLOSED

NO = SWITCH NORMALLY OPEN

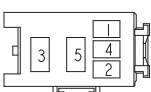
SHEET NO. 1 OF 1



EPS FUSE HOLDER



EPS RELAY

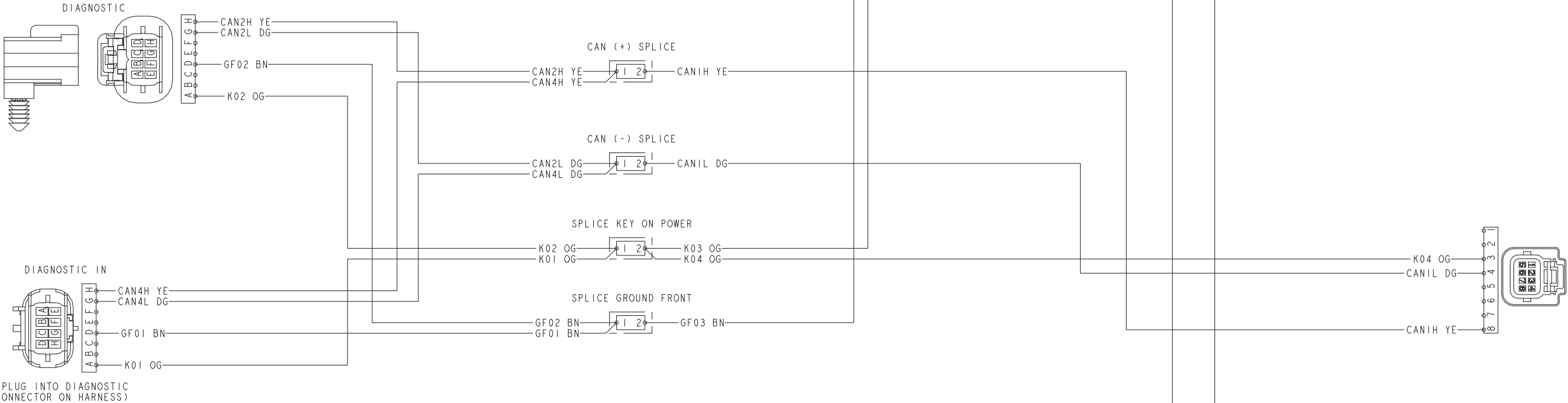


GF03 BN
K03 OG
B1A RD
RS01 OG

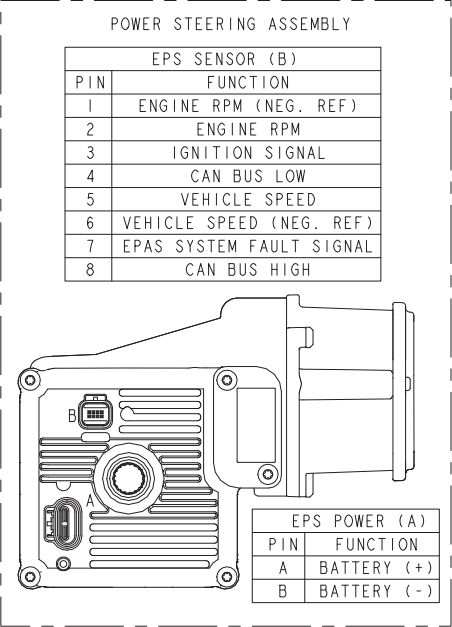


B1A RD
B1 RD

B1 RD
GF04 BN



SCHEMATIC CABLE/WIRE TERMINATION TABLE									
INDEX	CCT #	TYPE	GAUGE	COLOR	FROM COMPONENT	FROM PORT	TO COMPONENT	TO PORT	FUNCTION
1	B1	TXL	5.0	RD	EPS FUSE HOLDER	B	TERMINAL BLOCK 1 B+	1	BATTERY B+
2	B1A	TXL	5.0	RD	EPS FUSE HOLDER	A	EPS RELAY	3	BATTERY B+ FUSED
3	CANIH	TXL	0.5TP	YE	EPS SIGNAL CAN	8	CAN (+) SPLICE	2	CAN HIGH
4	CANIL	TXL	0.5TP	DG	EPS SIGNAL CAN	4	CAN (-) SPLICE	2	CAN LOW
5	CAN2H	TXL	0.5TP	YE	DIAGNOSTIC	H	CAN (+) SPLICE	1	CAN HIGH
6	CAN2L	TXL	0.5TP	DG	DIAGNOSTIC	G	CAN (-) SPLICE	1	CAN LOW
7	CAN4H	TXL	0.5TP	YE	DIAGNOSTIC IN	H	CAN (+) SPLICE	1	CAN HIGH
8	CAN4L	TXL	0.5TP	DG	DIAGNOSTIC IN	G	CAN (-) SPLICE	1	CAN LOW
9	GF01	TXL	0.5	BN	DIAGNOSTIC IN	D	SPLICE GROUND FRONT	1	GROUND
10	GF02	TXL	0.5	BN	DIAGNOSTIC	D	SPLICE GROUND FRONT	1	GROUND
11	GF03	TXL	0.5	BN	EPS RELAY	1	SPLICE GROUND FRONT	2	GROUND
12	GF04	TXL	5.0	BN	EPS POWER	B	TERMINAL BLOCK 2 GROUND	1	GROUND
13	K01	TXL	0.5	OG	DIAGNOSTIC IN	A	SPLICE KEY ON POWER	1	KEY ON POWER
14	K02	TXL	0.5	OG	DIAGNOSTIC	A	SPLICE KEY ON POWER	1	KEY ON POWER
15	K03	TXL	0.5	OG	EPS RELAY	2	SPLICE KEY ON POWER	2	KEY ON POWER
16	K04	TXL	0.5	OG	EPS SIGNAL CAN	3	SPLICE KEY ON POWER	2	KEY ON POWER
17	RS01	TXL	5.0	OG	EPS POWER	A	EPS RELAY	5	BATTERY B+ SWITCHED



2013 - 2014 RANGER (CARGO BOX)

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.	

- E

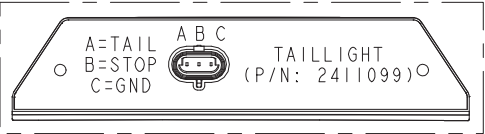
= ENGINE GROUND
- C

= CHASSIS GROUND
- NC

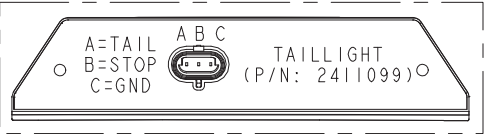
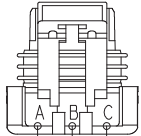
= SWITCH NORMALLY CLOSED
- NO

= SWITCH NORMALLY OPEN

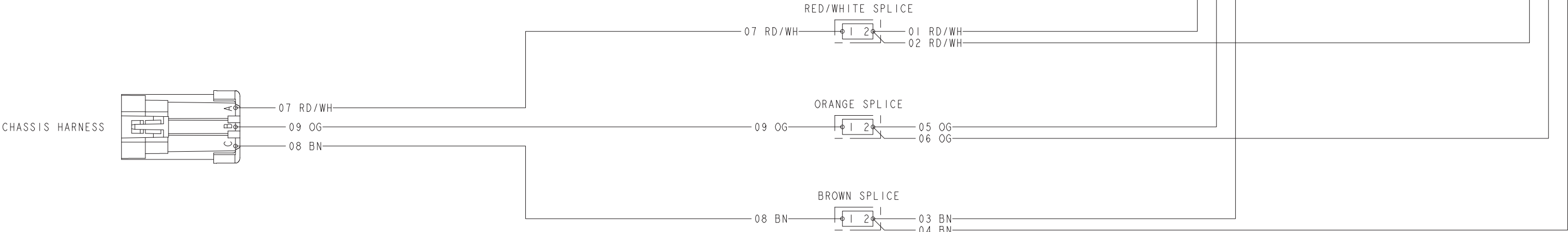
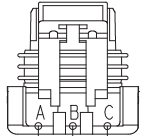
SHEET NO. 1 OF 1



LH TAILLIGHT



RH TAILLIGHT



SCHEMATIC CABLE/WIRE TERMINATION TABLE									
INDEX	CCT #	TYPE	GAUGE	COLOR	FROM COMPONENT	FROM PORT	TO COMPONENT	TO PORT	FUNCTION
1	01	TXL	0.8	RD/WH	LH TAILLIGHT	A	RED/WHITE SPLICE	2	FUSED LIGHT POWER
2	02	TXL	0.8	RD/WH	RH TAILLIGHT	A	RED/WHITE SPLICE	2	FUSED LIGHT POWER
3	03	TXL	0.8	BN	LH TAILLIGHT	C	BROWN SPLICE	2	TAILLIGHT GROUND
4	04	TXL	0.8	BN	RH TAILLIGHT	C	BROWN SPLICE	2	TAILLIGHT GROUND
5	05	TXL	0.8	OG	LH TAILLIGHT	B	ORANGE SPLICE	2	BRAKE SIGNAL
6	06	TXL	0.8	OG	RH TAILLIGHT	B	ORANGE SPLICE	2	BRAKE SIGNAL
7	07	TXL	0.8	RD/WH	CHASSIS HARNESS	A	RED/WHITE SPLICE	1	FUSED LIGHT POWER
8	08	TXL	0.8	BN	CHASSIS HARNESS	C	BROWN SPLICE	1	TAILLIGHT GROUND
9	09	TXL	0.8	OG	CHASSIS HARNESS	B	ORANGE SPLICE	1	BRAKE SIGNAL